SUBARU

FORESTER

2003 Model Year

PDF Service Manual

GENERAL INFORMATION SECTION (Pub.No.G8070GE1)

ENGINE 1 SECTION (Pub.No.G8070GE2)

ENGINE 2 SECTION (Pub.No.G8070GE3)

TRANSMISSION SECTION (Pub.No.G8070GE4)

CHASSIS SECTION (Pub.No.G8070GE5)

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WIRING SYSTEM SECTION (Pub.No.G8070GE7)

GENERAL INFORMATION SECTION

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This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FUJI HEAVY INDUSTRIES LTD. G8070GE1

FOREWORD

FW

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1. Foreword

A: FOREWORD

These manuals are used when performing maintenance, repair, or diagnosis of the Subaru FORESTER.

Applied model: SG***** from 2003MY

The manuals contain the latest information at the time of publication. Changes in specifications, methods, etc. may be made without notice.

HOW TO USE THIS MANUALS

HU

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1. How to Use This Manuals

A: HOW TO USE THIS MANUALS

1. STRUCTURE

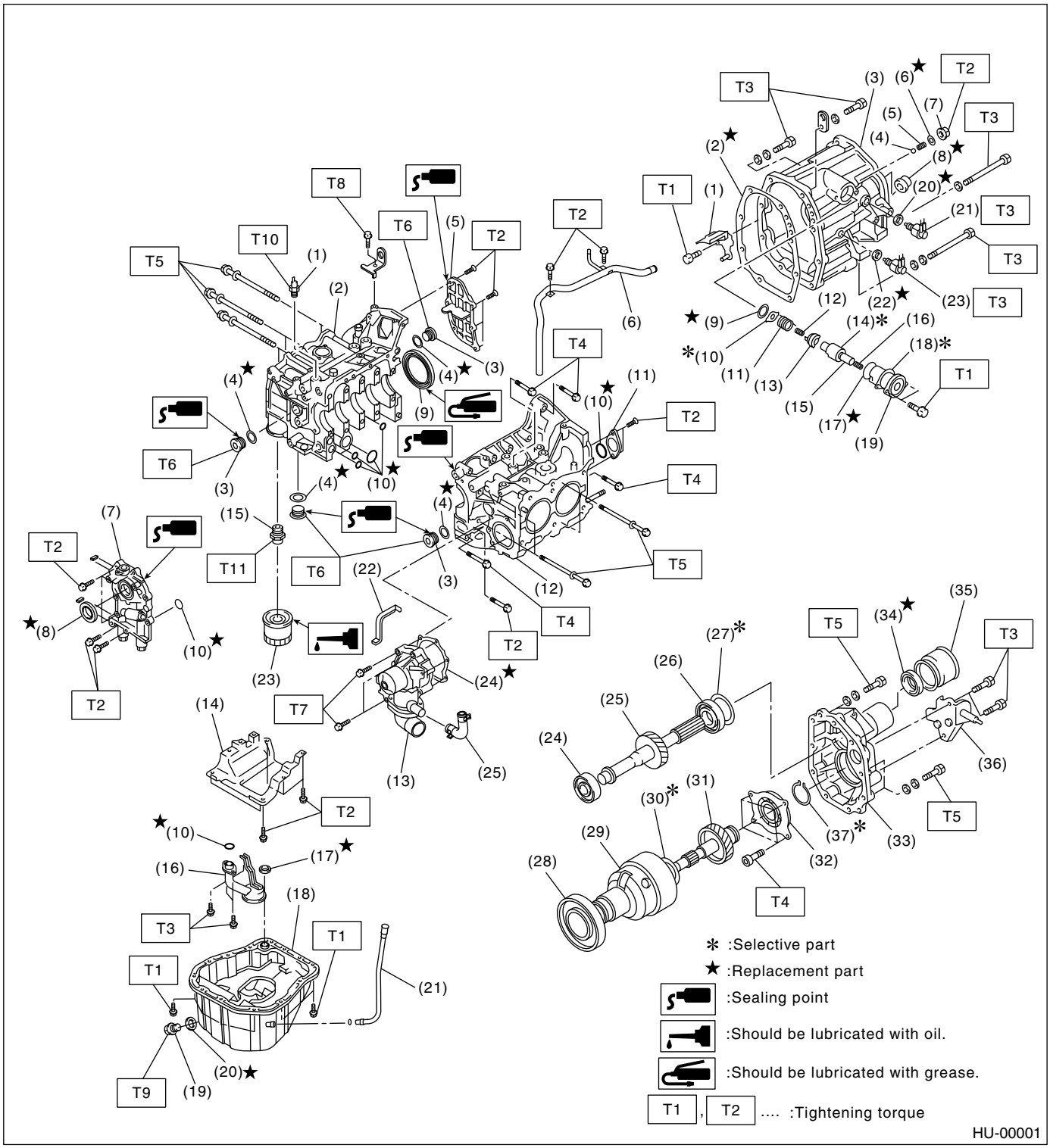
Each section consists of SCT that are broken down into SC that are divided into sections for each component. The specification, maintenance and other information for the components are included, and diagnosis information has also been added where necessary.

2. INDEX

The first page has an index with tabs.

3. COMPONENTS

Illustrations are listed for each component. The information necessary for repair work (tightening torque, grease up points, etc.) is described on these illustrations. Information is described using symbol. To order the parts, refer to parts catalogue.
Example:



4. SPECIFICATIONS

If necessary, specifications are also included.

5. INSPECTION

Inspections are included to be carried out before and after maintenance.

6. MAINTENANCE

• Maintenance instructions for serviceable parts describes work area and detailed steps with illustration. It also describes the use of special tool, tightening torque, cautions for each procedure.
• If many serviceable parts are included in one service procedure, appropriate reference are provided for each part.

Example:

15.Main Shaft Assembly for Single-Range (A)

A: REMOVAL (B)

1) Remove the manual transmission assembly from vehicie. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.> (C)

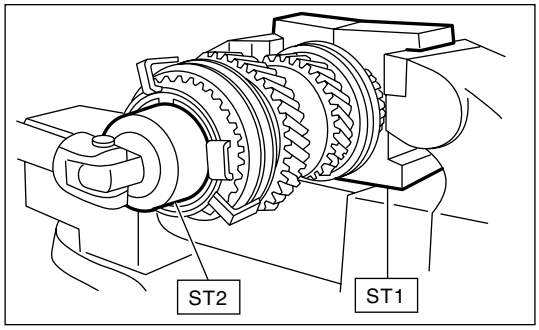
---

11) Tighten the lock nuts to the specified torque using ST1 and ST2.

NOTE: (D)
Secure the lock nuts in two Places affer tightening.

ST2 499987003 SOCKET WRENCH
ST1 498937000 (E) TRANSMISSION HOLDER (F)

Tightening torque:
118 N·m (12.0 kgf-m, 86.8 ft-lb) (G)



(H)

HU-00002

(A) Component
(B) Process
(C) Reference
(D) Caution
(E) Tool number of special tool
(F) Name of special tool
(G) Tightening torque
(H) Illustration

7. DIAGNOSIS

Tables showing a step-by-step process make it easy to conduct diagnosis.

8. SI UNITS

Measurements in these manuals are according to the SI units. Metric and yard/pound measurements are also included.

Example:

Tightening torque:
44 N·m (4.5 kgf-m, 33 ft-lb)

SPECIFICATIONS

SPC

Page

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1. Forester

A: DIMENSIONS

Model			2.0L Non-turbo	2.0L Turbo	2.5L Non-turbo
Overall length		mm (in)	4,450 (175.2)		
Overall width		mm (in)	1,735 (68.3)		
Overall height (at C.W.)		mm (in)	1,590 (62.6)	1,585 (62.4)	1,590 (62.6)
Compartment	Length	mm (in)	1,795 (70.7)		
	Width	mm (in)	1,455 (57.3)		
	Height	mm (in)	1,245 (49.0), 1,210 (47.6)★		
Wheelbase		mm (in)	2,525 (99.4)		
Tread	Front	mm (in)	1,495 (58.9)		
	Rear	mm (in)	1,485 (58.5)		
Minimum road clearance		mm (in)	190 (7.5)	195 (7.7)	200 (7.9)

★: With sunroof

B: ENGINE

Model		2.0L Non-turbo	2.0L Turbo	2.5L Non-turbo
Engine type		Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine		
Valve arrangement		Overhead camshaft type		
Bore × Stroke	mm (in)	92 × 75 (3.62 × 2.95)		99.5 × 79 (3.92 × 3.11)
Displacement	cm^3 (cu in)	1,994 (121.67)		2,457 (149.94)
Compression ratio		10.0 ± 0.2	8.0 ± 0.2	10.0 ± 0.2
Firing order		1 — 3 — 2 — 4		
Idle speed at Park/Neutral position	rpm	650 ± 100	700 ± 100	650 ± 100
Maximum output	kW (PS)/rpm	92 (125)/5,600	130 (177)/5,600	115 (156)/5,600
Maximum torque	N·m (kgf-m, ft-lb)/rpm	184 (18.8)/3,600	245 (25.0)/3,200	223 (22.7)/3,600

C: ELECTRICAL

Model		2.0L Non-turbo	2.0L Turbo	2.5L Non-turbo
Ignition timing at idling speed BTDC/rpm		10°±10°/650	12°±10°/700	MT: 10°±10°/650 AT: 15°±10°/650
Spark plug	Type and manufacturer	CHAMPION: RC10YC4	NGK: PFR6G	CHAMPION: RC10YC4
		Alternate CHAMPION: RC8YC4 NGK: BKR6E-11 DENSO: K20PR-U11		**Alternate** CHAMPION: RC8YC4 NGK: BKR6E-11 DENSO: K20PR-U11
Generator		12 V — 90 A		
Battery	Type and capacity (5HR)	MT: 12 V — 48 AH (55D23L) AT: 12 V — 52 AH (65D23L)		12 V — 27 AH (34B19L) 12 V — 48 AH (55D23L)★

★: For Australia model

D: TRANSMISSION

Model			2.0L Non-turbo		2.0L Turbo		2.5L Non-turbo	
Transmission type			5MT	4AT	5MT	4AT	5MT	4AT
Clutch type			DSPD	TCC	DSPD	TCC	DSPD	TCC
Gear ratio		1st	3.454	2.785	3.454	2.785	3.454	2.785
		2nd	2.062	1.545	1.947	1.545	2.062	1.545
		3rd	1.448	1.000	1.366	1.000	1.448	1.000
		4th	1.088	0.694	0.972	0.694	1.088	0.694
		5th	0.871	—	0.738	—	0.780	—
		Reverse	3.333	2.272	3.333	2.272	3.333	2.272
		Dual range	1.447	—	—	—	1.196	—
Reduction gear (Front drive)	1st reduction	Type of gear	—	Helical	—	Helical	—	Helical
		Gear ratio	—	1.000	—	1.000	—	1.000
	Final reduction	Type of gear	Hypoid	Hypoid	Hypoid	Hypoid	Hypoid	Hypoid
		Gear ratio	4.111	4.444	4.444	4.111	4.111	4.444
Reduction gear (Rear drive)	Transfer reduction	Type of gear	Helical	—	Helical	—	Helical	—
		Gear ratio	1.000	—	1.081★, 1.000	—	1.000	—
	Final reduction	Type of gear	Hypoid	Hypoid	Hypoid	Hypoid	Hypoid	Hypoid
		Gear ratio	4.111	4.444	4.111★, 4.444	4.111	4.111	4.444

5MT: 5 forward speeds with synchromesh and 1-reverse
4AT: Electronically controlled fully-automatic, 4-forward speeds and 1-reverse
DSPD: Dry Single Plate Diaphragm
TCC: Torque Converter Clutch
★: Europe spec vehicle

E: STEERING

Type		Rack and Pinion
Turns, lock to lock		3.0
Minimum turning circle m (ft)	Curb to curb	10.6 (34.8)
	Wall to wall	11.4 (37.4)

F: SUSPENSION

Front	Macpherson strut type, Independent, Coil spring
Rear	Dual-link type, Independent, Coil spring

G: BRAKE

Model	2.0L Non-turbo, 2.5L Non-turbo	2.0L Turbo, 2.5L Non-turbo★
Service brake system	Dual circuit hydraulic with vacuum suspended power unit	
Front	Ventilated disc brake	
Rear	Drum brake	Disc brake
Parking brake	Mechanical on rear brakes	

★: RHD model

H: TIRE

Rim size	15 × 6J	16 × $6^{1}/_{2}$J
Tire size	205/70 R15 95H	215/60 R16 95V, P215/60 R16 94H
Type	Steel belted radial, Tubeless	

I: CAPACITY

Model	2.0L Non-turbo		2.0L Turbo		2.5L Non-turbo	
	5MT	4AT	5MT	4AT	5MT	4AT
Fuel tank ℓ (US gal, Imp gal)	60 (15.9, 13.2)					
Engine oil (When replacing) ℓ (US qt, Imp qt)	Approx. 4.0 (4.2, 3.5)		Approx. 4.5 (4.8, 4.0)		Approx. 4.0 (4.2, 3.5)	
Transmission gear oil ℓ (US qt, Imp qt)	4.0 (4.2, 3.5)	—	3.5 (3.7, 3.1) 3.9 (4.1, 3.4)★1	—	4.0 (4.2, 3.5)	—
Automatic transmission fluid ℓ (US qt, Imp qt)	—	8.4 (8.9, 7.4)	—	9.3 (9.8, 8.2)	—	9.3 (9.8, 8.2)
AT differential gear oil ℓ (US qt, Imp qt)	—	1.2 (1.3, 1.1)	—	1.2 (1.3, 1.1)	—	1.2 (1.3, 1.1)
AWD rear differential gear oil ℓ (US qt, Imp qt)	0.8 (0.8, 0.6)					
Power steering fluid ℓ (US qt, Imp qt)	0.7 (0.7, 0.6)					
Engine coolant ℓ (US qt, Imp qt)	6.6 (7.0, 5.8)	6.5 (6.9, 5.7)	7.4 (7.8, 6.5)	7.3 (7.7, 6.4)★2	6.9 (7.3, 6.1)	6.8 (7.2, 6.0)

★1: With oil pump
★2: MT vehicles with oil cooler included

J: WEIGHT

1. LHD MODEL

Option code★			EC		K4		KS	
Model			2.0L				2.5L	
			AWD					
			2.0X				2.5X	
			5MT	4AT	5MT	4AT	5MT	4AT
Curb weight (C.W.)	Front	kgf (lb)	760 (1,675)	775 (1,710)	775 (1,710)	790 (1,740)	780 (1,720)	800 (1,765)
	Rear	kgf (lb)	600 (1,325)	600 (1,325)	595 (1,310)	595 (1,310)	620 (1,365)	620 (1,365)
	Total	kgf (lb)	1,360 (3,000)	1,375 (3,035)	1,370 (3,020)	1,385 (3,050)	1,400 (3,085)	1,420 (3,130)
Maximum permissible axle weight (M.P.A.W.)	Front	kgf (lb)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)
	Rear	kgf (lb)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)
Maximum permissible weight (M.P.W.)	Total	kgf (lb)	1,880 (4,140)	1,880 (4,140)	1,880 (4,140)	1,880 (4,140)	1,880 (4,140)	1,880 (4,140)
Option	Sport package base		—	—	—	—	—	—
	Aluminum wheel		❍	❍	❍	❍	❍	❍
	Front fog light		—	—	—	—	❍	❍
	Cruise control		—	—	—	—	❍	❍
	High-grade audio		—	—	—	—	—	—
	Sport steering		—	—	—	—	—	—
	Leather package base		—	—	—	—	—	—
	Leather seat, Leather door trim		—	—	—	—	—	—
	Air conditioner		—	—	❍	❍	❍	❍
	Side airbag		—	—	—	—	—	—
	Sunroof		—	—	—	—	—	—
	Self-leveling function Rr		❍	❍	—	—	—	—
	Cold area pack A		❍	❍	—	—	—	—
	Cold area pack B		—	—	—	—	—	—
	Cold area pack C		—	—	—	—	—	—
	Security system		—	—	—	—	—	—

Option code★			EC		K4	
Model			2.0L			
			AWD			
			2.0XT			
			5MT	4AT	5MT	4AT
Curb weight (C.W.)	Front	kgf (lb)	790 (1,740)	810 (1,785)	815 (1,795)	835 (1,840)
	Rear	kgf (lb)	620 (1,365)	620 (1,365)	630 (1,390)	630 (1,390)
	Total	kgf (lb)	1,410 (3,105)	1,430 (3,150)	1,445 (3,185)	1,465 (3,230)
Maximum permissible axle weight (M.P.A.W.)	Front	kgf (lb)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)
	Rear	kgf (lb)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)
Maximum permissible weight (M.P.W.)	Total	kgf (lb)	1,950 (4,295)	1,950 (4,295)	1,950 (4,295)	1,950 (4,295)
Option	Sport package base		—	—	—	—
	Aluminum wheel		❍	❍	❍	❍
	Front fog light		❍	❍	—	—
	Cruise control		—	—	❍	❍
	High-grade audio		—	—	—	—
	Sport steering		—	—	—	—
	Leather package base		❍	❍	❍	❍
	Leather seat, Leather door trim		—	—	—	—
	Air conditioner		—	—	❍	❍
	Side airbag		—	—	❍	❍
	Sunroof		—	—	❍	❍
	Self-leveling function Rr		❍	❍	—	—
	Cold area pack A		❍	❍	—	—
	Cold area pack B		—	—	—	—
	Cold area pack C		—	—	—	—
	Security system		—	—	—	—

★: For the option codes, refer to ID section. <Ref. to ID-6, Option code.>

2. RHD MODEL

Option code★			EK		KA		EK	
Model			2.0L		2.5L		2.0L	
			AWD					
			2.0X		2.5X		2.0XT	
			5MT	4AT	5MT	4AT	5MT	4AT
Curb weight (C.W.)	Front	kgf (lb)	775 (1,705)	790 (1,740)	765 (1,685)	785 (1,730)	815 (1,795)	835 (1,840)
	Rear	kgf (lb)	600 (1,325)	600 (1,325)	625 (1,380)	625 (1,380)	635 (1,400)	635 (1,400)
	Total	kgf (lb)	1,375 (3,030)	1,390 (3,065)	1,390 (3,065)	1,410 (3,110)	1,450 (3,195)	1,470 (3,240)
Maximum permissible axle weight (M.P.A.W.)	Front	kgf (lb)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)
	Rear	kgf (lb)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)
Maximum permissible weight (M.P.W.)	Total	kgf (lb)	1,880 (4,145)	1,880 (4,145)	1,950 (4,300)	1,950 (4,300)	1,950 (4,300)	1,950 (4,300)
Option	Sport package base		—	—	—	—	—	—
	Aluminum wheel		❍	❍	❍	❍	❍	❍
	Front fog light		—	—	❍	❍	❍	❍
	Cruise control		—	—	❍	❍	❍	❍
	High-grade audio		—	—	❍	❍	—	—
	Sport steering		—	—	❍	❍	—	—
	Leather package base		—	—	❍	❍	❍	❍
	Leather seat, Leather door trim		—	—	❍	❍	❍	❍
	Air conditioner		❍	❍	❍	❍	❍	❍
	Side airbag		—	—	❍	❍	❍	❍
	Sunroof		—	—	❍	❍	❍	❍
	Self-leveling function Rr		❍	❍	—	—	❍	❍
	Cold area pack A		❍	❍	❍	❍	—	—
	Cold area pack B		—	—	—	—	—	—
	Cold area pack C		—	—	—	—	❍	❍
	Security system		—	—	—	—	—	—

★: For the option codes, refer to ID section. <Ref. to ID-6, Option code.>

3. OPTION

Option		Front kgf (lb)	Rear kgf (lb)	Total kgf (lb)
Sport package base		0.1 (0.2)	0.4 (0.9)	0.5 (1.1)
Aluminum wheel	15 IN	–6.5 (–14.3)	–6.5 (–14.3)	–13.0 (–28.6)
	16 IN	–7.3 (–16.1)	–7.3 (–16.1)	–14.6 (–32.2)
Front fog light		0.7 (1.5)	–0.1 (–0.2)	0.6 (1.3)
Cruise control		1.5 (3.3)	0.2 (0.5)	1.7 (3.8)
High-grade audio		0.8 (1.8)	0.4 (0.9)	1.2 (2.7)
Sport steering		0.2 (0.5)	0.1 (0.2)	0.3 (0.7)
Leather package base		0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Leather seat, Leather door trim		1.2 (2.6)	3.0 (6.6)	4.2 (9.2)
Air conditioner		16.9 (37.3)	–1.4 (–3.1)	15.5 (34.2)
Side airbag		2.0 (4.4)	2.4 (5.3)	4.4 (9.7)
Sunroof		3.5 (7.7)	13.2 (29.1)	16.7 (36.8)
Self-leveling function Rr	2.0X	0.1 (0.2)	3.0 (6.6)	3.1 (6.8)
	2.0XT	0.1 (0.2)	3.1 (6.8)	3.2 (7.0)
Cold area pack A		0.1 (0.2)	0.2 (0.5)	0.3 (0.7)
Cold area pack B		0.1 (0.2)	0.3 (0.7)	0.4 (0.9)
Cold area pack C		0.1 (0.2)	0.3 (0.7)	0.4 (0.9)
Security system		0.3 (0.7)	0.3 (0.7)	0.6 (1.4)

PRECAUTION

PC

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1. Precaution 2

1. Precaution

A: PRECAUTION

Please clearly understand and adhere to the following general precautions. They must be strictly followed to avoid minor or serious injury to the person doing the work or people in the area.

1. ABS

Handle the ABS as a total system. Do not disassemble or attempt to repair individual parts. Doing so could prevent the ABS system from operating when needed or cause it to operate incorrectly and result in injury.

2. BRAKE FLUID

If brake fluid gets in your eyes or on your skin, do the following:

- Wash out your eyes and seek immediate medical attention.
- Wash your skin with soap and then rinse thoroughly with water.

3. ELECTRIC FAN

The electric fan may rotate without warning, even when the engine is not on. Do not place your hand, cloth, tools, or other items near the fan at any time.

4. ROAD TESTS

Always conduct road tests in accordance with traffic rules and regulations to avoid bodily injury and interrupting traffic.

5. AIRBAG

To prevent bodily injury from unexpected deployment of airbags and unnecessary maintenance, follow the instructions in this manual when performing maintenance on airbag components or nearby, and airbag wiring harnesses or nearby.
To prevent unexpected deployment, perform one of the steps below and then wait at least 20 seconds to discharge electricity before beginning work.

- Step 1: Turn the ignition switch OFF.
- Step 2: Disconnect the ground cable from battery.

6. AIRBAG DISPOSAL

To prevent bodily injury from unexpected airbag deployment, do not dispose airbag modules in the same way as other refuse. Follow the special instructions for disposal in this manual. Follow all government regulations concerning disposal of refuse.

7. AIRBAG MODULE

Adhere to the following when handing and storing the airbag module to prevent bodily injury from unexpected deployment:

- Do not hold the harnesses or connectors to carry module.
- Do not face the bag in the direction that it opens towards yourself or other people.
- Do not face the bag in the direction that it opens towards the floor or walls.

8. AIRBAG SPECIAL TOOLS

To prevent unexpected deployment, only use special tools.

9. WINDOW

Always wear safety glasses when working around any glass to prevent glass fragments from damaging your eyes.

10.WINDOW ADHESIVE

Always use the specified urethane adhesive when attaching glass to prevent it from coming loose and falling, resulting in accidents and injury.

NOTE

NT

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1. Note.....2

1. Note

A: NOTE

This is information that can improve efficiency of maintenance and assure sound work.

1. FASTENER NOTICE

Fasteners are used to prevent parts from damage and dislocation due to looseness. Fasteners must be tightened to the specified torque.
Do not apply paint, lubricant, rust retardant, or other substances to the surface around bolts, fasteners, etc. Doing so will make it difficult to obtain the correct torque and result in looseness and other problems.

2. STATIC ELECTRICITY DAMAGE

Do not touch the ECM, connectors, logic boards, and other such parts when there is a risk of static electricity. Always use a static electricity prevention cord or touch grounded metal before conducting work.

3. IGNITION OFF BATTERY

When removing the battery cables, always be sure to turn the ignition off to prevent electrical damage to the ECM from rush current.

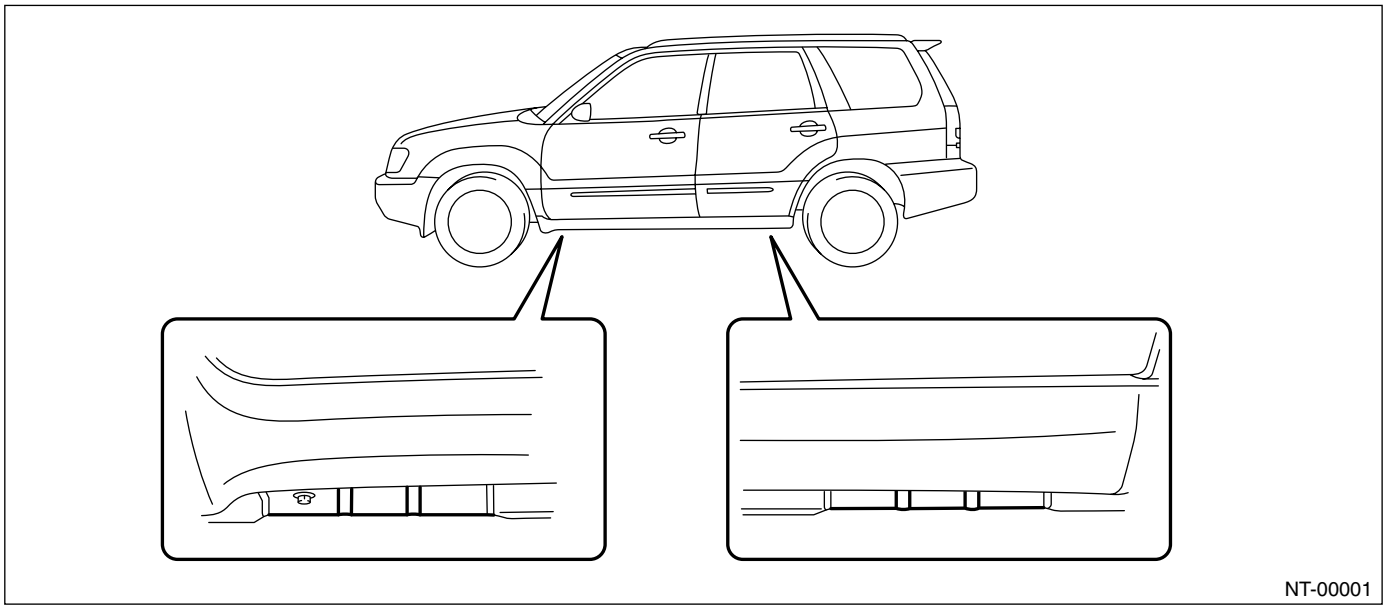
4. SERVICE PARTS

Use authentic service parts for maximum performance and maintenance, when conducting repairs. Subaru/FHI will not be responsible for poor performance resulting from the use of parts not specified by a genuine dealer.

5. LIFTS AND JACKS

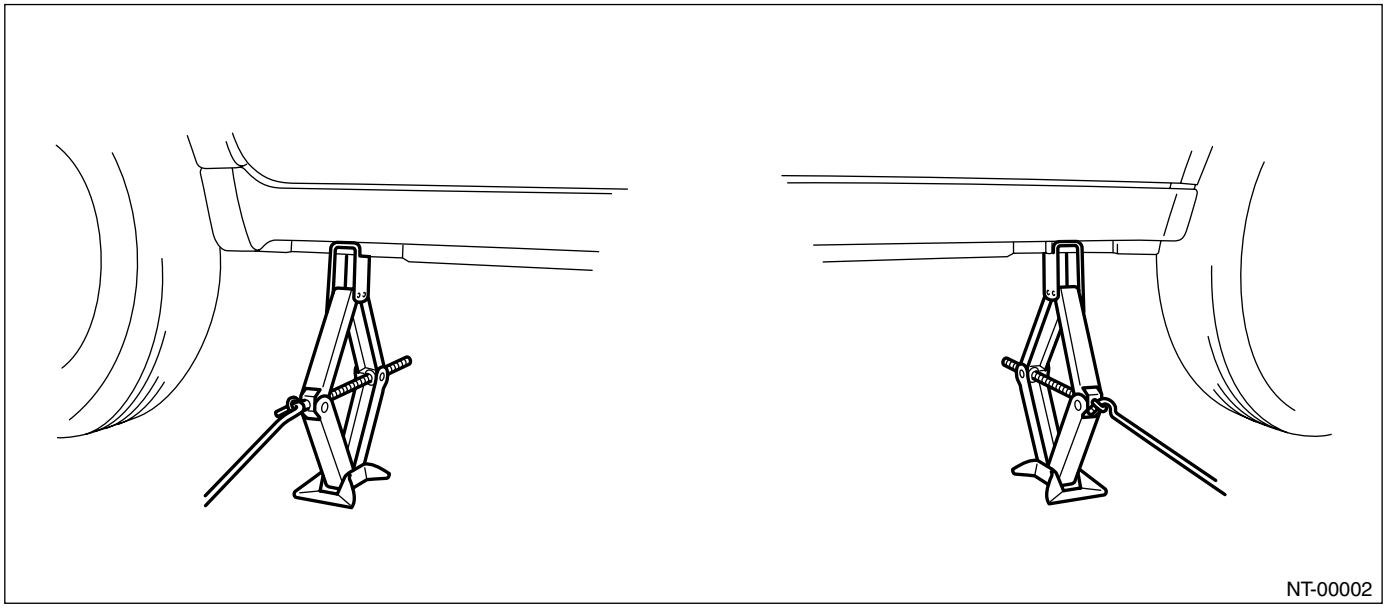
When using a lift or jack-ridged rack to raise a vehicle, always follow instructions concerning jack-up points and weight limits to prevent the vehicle from falling, which could result in injury. Be especially careful to make sure the vehicle is balanced before raising it.

• Support Locations



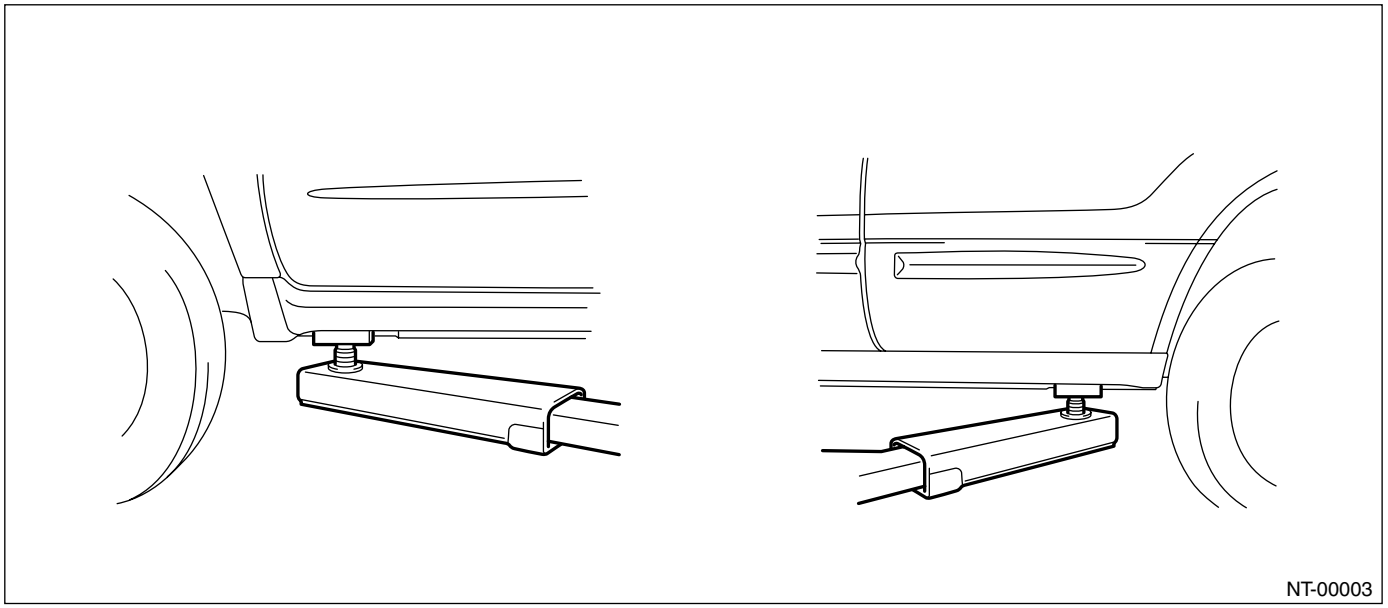
NT-00001

• Pantograph jack

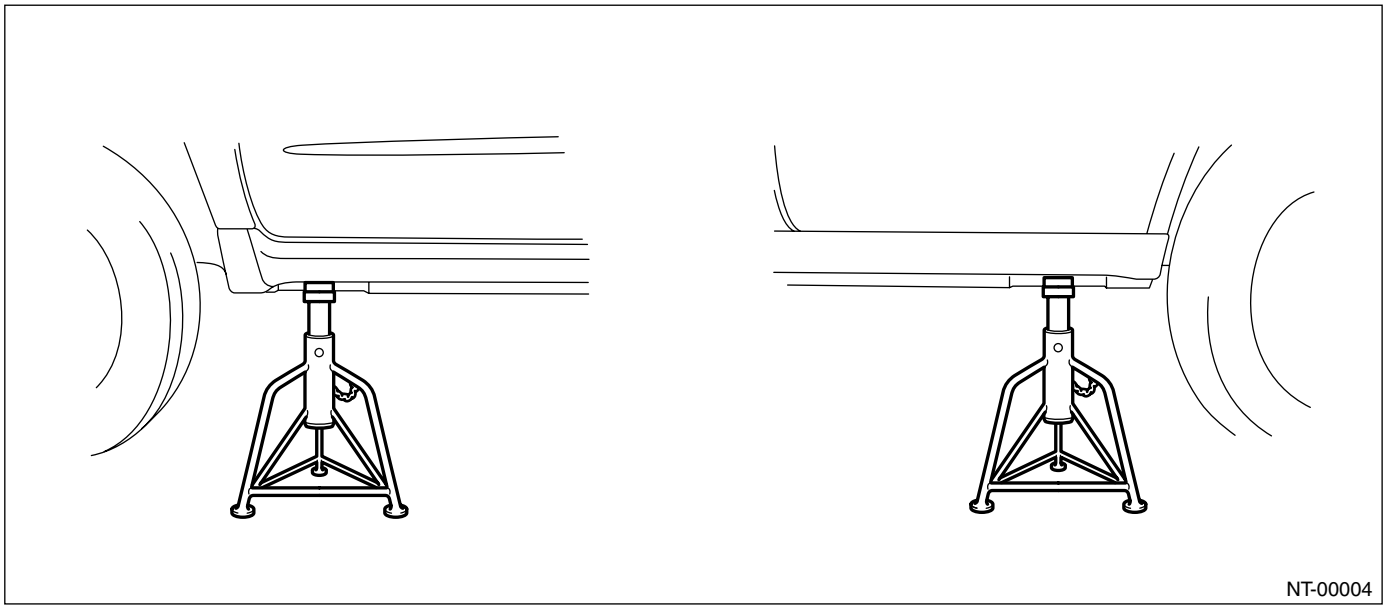


NT-00002

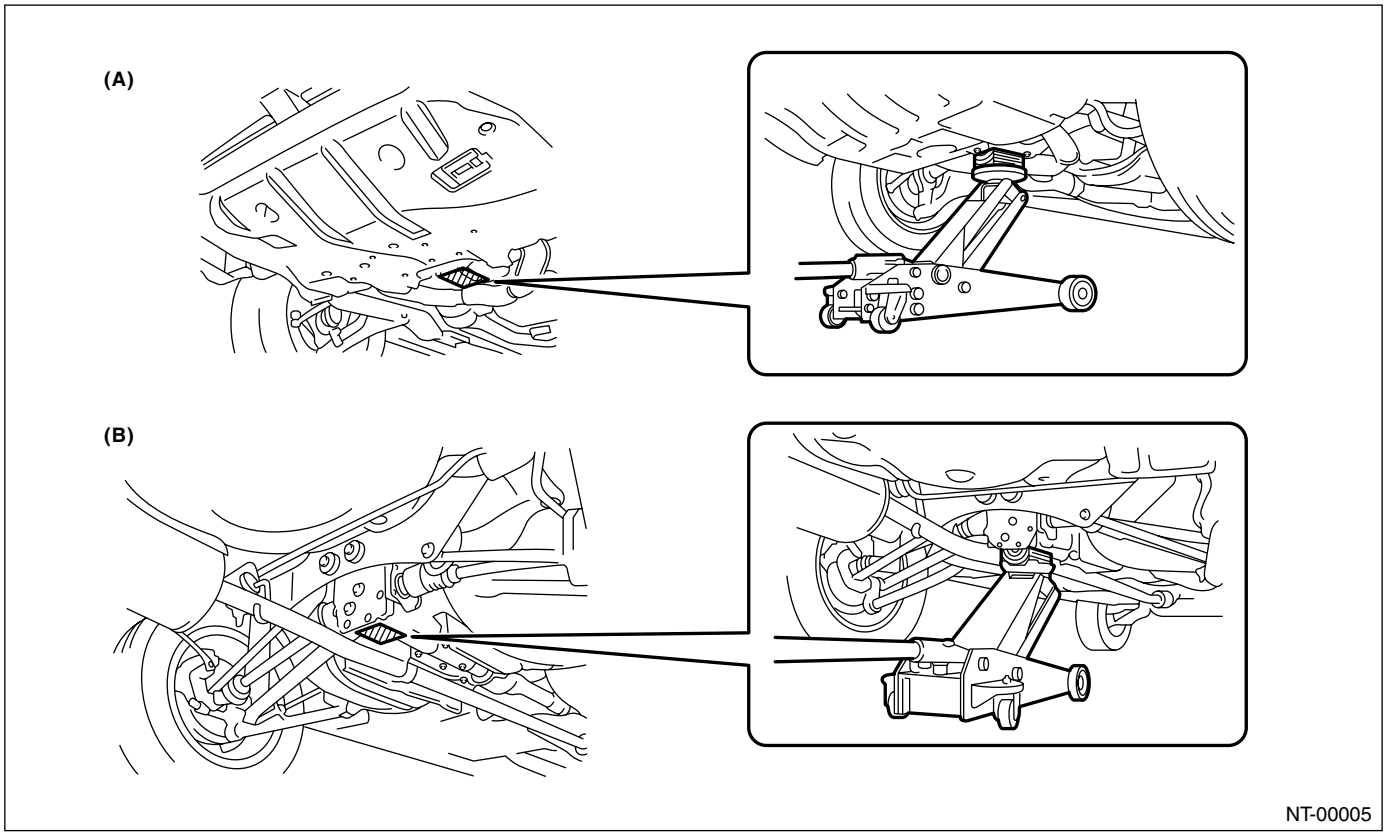
- **Lift**



- **Safety stand**



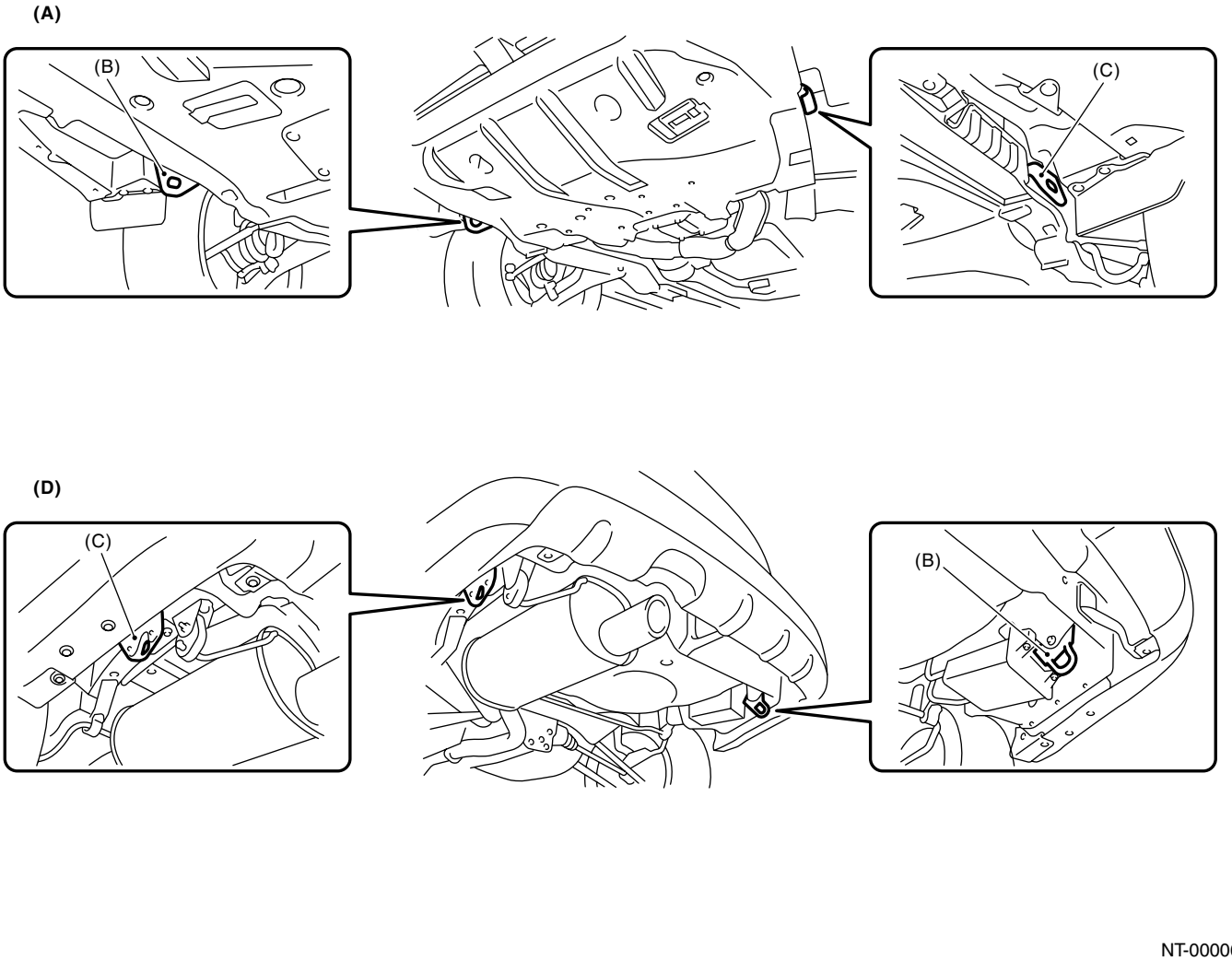
• Jack-up point



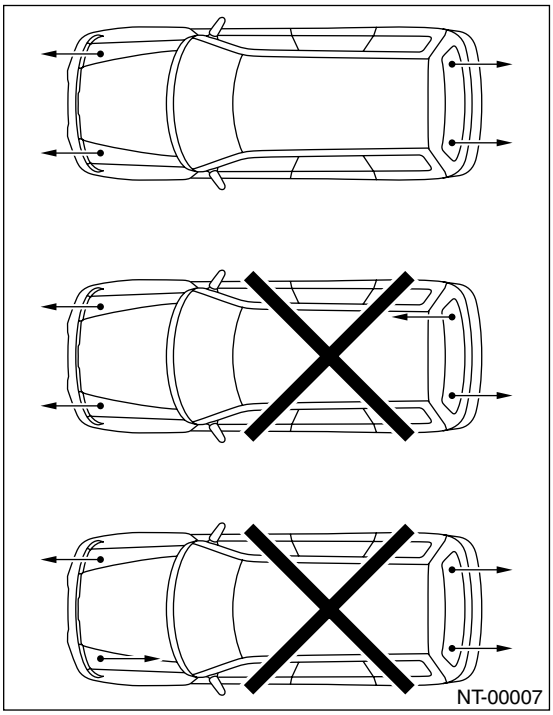
(A) Front
(B) Rear

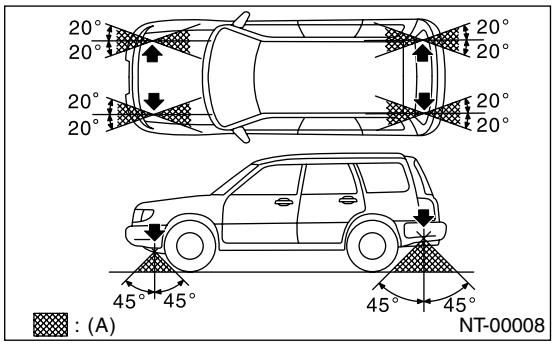
6. TIE-DOWNS

Tie-downs are used when transporting vehicles and when using the chassis dynamo. Attach tie-downs only to the specified points on the vehicle.



(A) Front
(B) Hook for towing and tie-down
(C) Hook for tie-down
(D) Rear





(A) Tie-down range

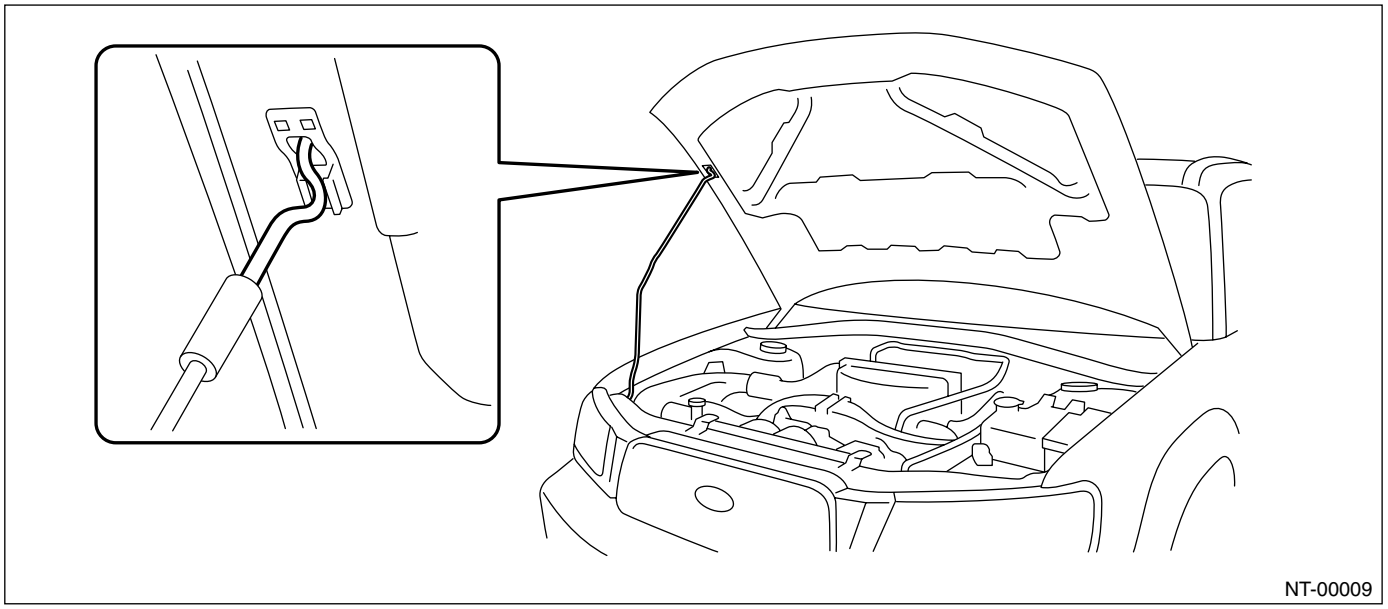
7. TOWING

Avoid towing vehicles except when the vehicle cannot be driven. Use a loader instead of towing. When towing other vehicles, to prevent excessive weight from damaging the hook or vehicle:

- Do not tow other vehicles with a front towing hook.
- Make sure the vehicle towing is heavier that the vehicle being towed.

8. FRONT HOOD STAY INSTALLATION

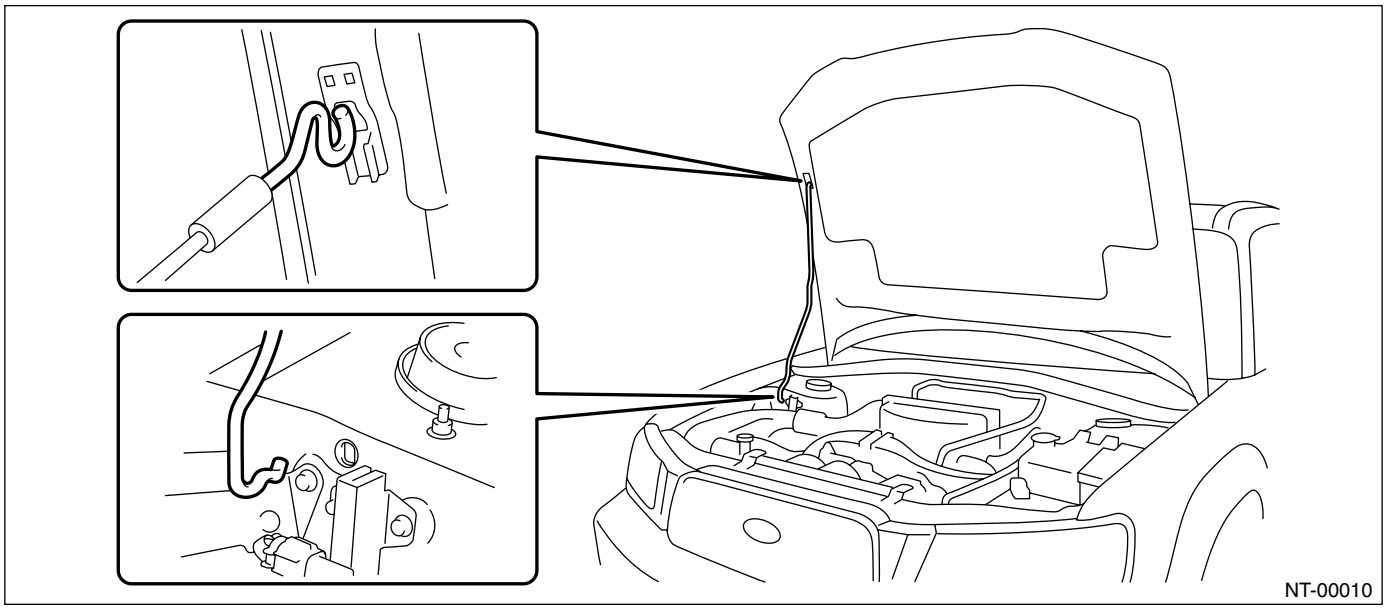
• At the check and general maintenance



• When wider hood opening is necessary

Set stay into the hole of hood inner as shown in the figure below.

NOTE:
Before setting the hood in this position, remove the windshield washer hose attaching clip from the hood.



9. TRAINING

For information about training, contact a dealer or agent.

10.GENERAL SCAN TOOL

Using general scan tools will greatly improve efficiency of repairing engine electronic controls. The Subaru Select Monitor can be used to diagnose the engine and also the ABS, the air conditioner, and other parts.

IDENTIFICATION

ID

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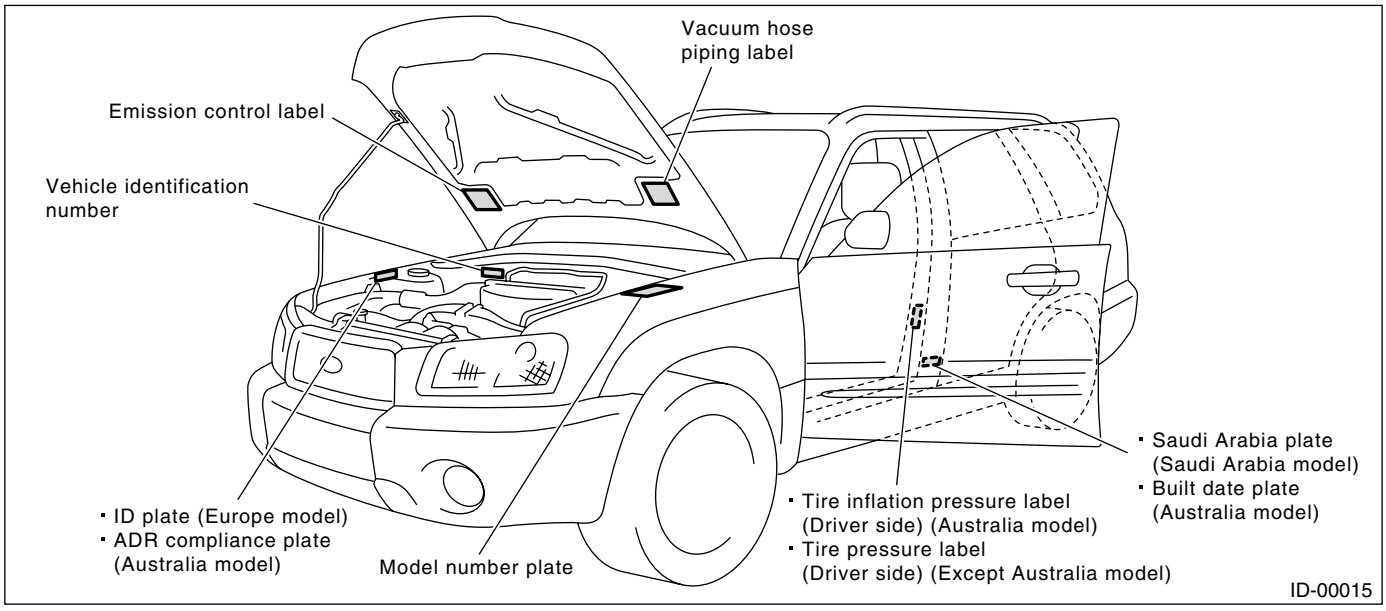
1. Identification 2

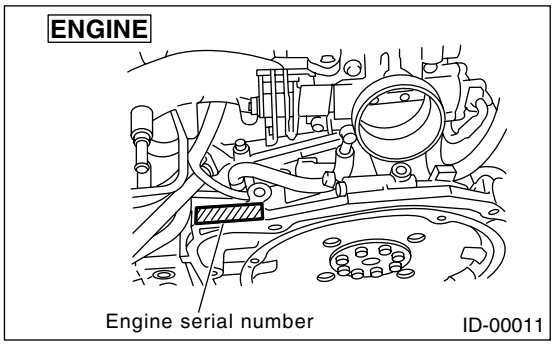
1. Identification

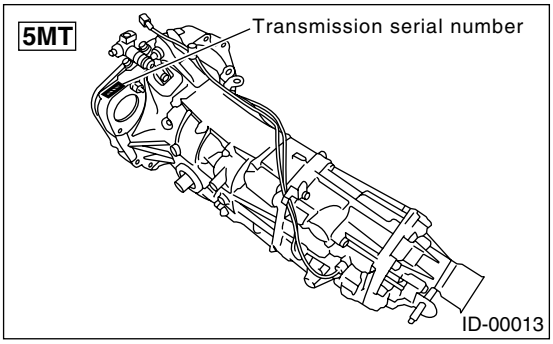
A: IDENTIFICATION

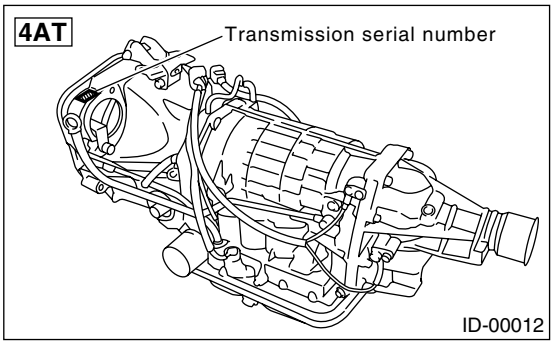
1. IDENTIFICATION NUMBER AND LABEL LOCATIONS

The VIN (Vehicle Identification Numbers) is used to classify the vehicle.
Positioning of the plate label for identification

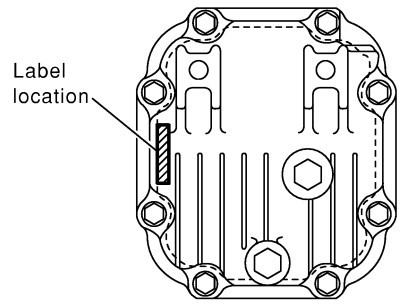




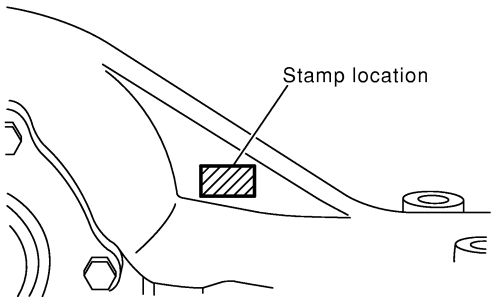




VA-type

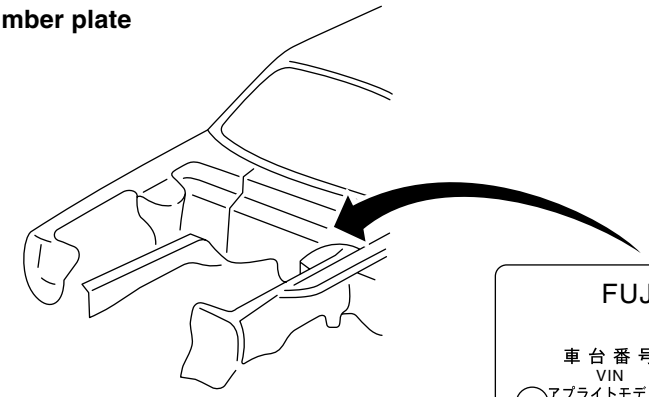


T-type



ID-00016

Model number plate



FUJI HEAVY INDUSTRIES LTD.

型　式

車台番号 VIN: JF1SG5LK43G002001

アプライトモデル applied model: SG5AL1K　オプションコード option code: ECAJ

トリムコード trim code: 410　エンジン型式 engine type: EJ201NWUAA

外装飾コード Color code: 230　ミッション型式 transmission type: TY755XF3AA

富士重工業株式会社

ID-00017

2. MEANING OF V.I.N.

The meaning of the VIN is as follows:

• Europe, Australia and General (Except GCC)

]JF1SG5LK43G002001[

The starting and ending brackets ( ][ ) are stop marks.

Digits	Code	Meaning	Details
1 to 3	JF1	Manufacturer body area	JF1: Passenger car, FHI made JF2: MPV, FHI made
4	S	Car line	S: FORESTER
5	G	Body type	G: Wagon
6	5	Displacement	5: 2.0L AWD 9: 2.5L AWD
7	L	Steering position	K: RHD (Right-hand drive) L: LHD (Left-hand drive)
8	K	Engine & transmission	R: SOHC MPI 4-speed AT K: SOHC MPI Full-time AWD 5-speed MT Dual range D: DOHC Turbo Full-time AWD 5-speed MT P: DOHC Turbo 4-speed AT
9	4	Drive type	3: Full-time AWD Single range 4: Full-time AWD Dual range 5: AWD AT
10	3	Model year	3: 2003MY 4: 2004MY 5: 2005MY
11	G	Factory location	G: FHI (Gunma)
12 to 17	002001	Serial number	—

• GCC countries (Saudi Arabia, etc.)

]JF1SG93MX3J002001[

The starting and ending brackets ( ][ ) are stop marks.

Digits	Code	Meaning	Details
1 to 3	JF1	Manufacturer body area	JF1: Passenger car, FHI made
4	S	Car line	S: FORESTER
5	G	Body type	G: Wagon
6	9	Displacement	9: 2.5L AWD
7	3	Grade	3: 2.5X
8	M	Restraint	M: Manual belts, dual airbag
9	X	Check digit	0 — 9 & X
10	3	Model year	3: 2003MY 4: 2004MY 5: 2005MY
11	J	Transmission type	H: Full-time AWD 4-speed AT J: Full-time AWD 5-speed MT dual range
12 to 17	002001	Serial number	—

3. MODEL NUMBER PLATE

The model number plate indicates: the applied model, the option code, the trim code, the engine type, the transmission type, and the exterior color code. This information is helpful when placing orders for parts.

SG5AL1K

Digits	Code	Meaning	Details
1	S	Series	S: FORESTER
2	G	Body type	G: Wagon
3	5	Engine displacement Drive system Suspension system	5: 2.0L AWD 9: 2.5L AWD
4	A	Minor change	A: Initial
5	L	Destination	K: RHD (Right-hand drive) L: LHD (Left-hand drive)
6	1	Grade	1: 2.0X 3: HUNTER Ver 5: 2.0XT 7: 2.5X
7	K	Transmission, fuel feed system	R: SOHC MPI 4-speed AT K: SOHC MPI Full-time AWD 5-speed MT Dual range D: DOHC Turbo Full-time AWD 5-speed MT P: DOHC Turbo 4-speed AT

The engine and transmission type are as follows:

- **Engine**

EJ201NWUAA

Digits	Code	Meaning	Details
1 and 2	EJ	Engine type	EJ: 4 cylinders
3 and 4	20	Displacement	20: 2.0L 25: 2.5L
5	1	Fuel feed system	1: D-MPI SOHC-A 5: L-MPI Turbo
6	N	Emission control	—
7	W	Transmission	W: MT X: AT
8	U	Minor change	U: Initial
9 to 10	AA	Detailed specifications	Used when ordering parts. See the parts catalog for details.

• Transmission

TY755XF3AA

Digits	Code	Meaning	Details
1	T	Transmission	T: Transmission
2	Y	Transmission type	Y: Full-time AWD MT center differential Z: Full-time AWD AT MPT
3 and 4	75	Classification	75: MT 1A: AT
5	5	Series	3: AT 5: MT
6	X	Transmission specifications	V: Full-time AWD 5-speed MT with viscous coupling center differential single range X: Full-time AWD 5-speed MT Dual range with viscous coupring center differential Z: Full-time AWD 4-speed AT with MPT
7	F	Mounted body	F: 2.5L SOHC R: 2.0L SOHC N: 2.0L DOHC Turbo
8	3	Minor change	3: Initial
9 to 10	AA	Detailed specifications	Used when ordering parts. See the parts catalog for details.

• Rear differential 1

VA1REK

Digits	Code	Meaning	Details
1	V	For AWD	V: AWD
2	A	Type	A: A type
3	1	Hypoid gear diameter mm (in)	1: 152 (6.0) dia.
4	R	Installation position	R: Rear
5	E	Reduction gear ratio	E: 4.111 F: 4.444
6	K	Specification differences	—

• Rear differential 2

HP

Code	Reduction gear ratio	LSD
HP	4.111	Viscous
JP	4.111	Viscous
CF	4.444	Viscous

• Option code

ECAJ

Digits	Code	Meaning	Details
1 to 2	EC	Destination	EC: EC K4: K4 KS: KS EK: EK KA: KA
3 to 4	AJ	Main option of vehicle	—

RECOMMENDED MATERIALS

RM

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1. Recommended Materials

A: RECOMMENDED MATERIALS

1. GENERAL

To insure the best performance, always use the specified oil, gasoline, adhesive, sealant, etc. or that of equivalent quality.

2. FUEL

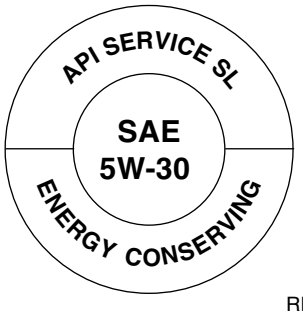
Always use a gasoline of the same or higher octane value than specified in the owner's manual. Ignoring the specifications below will result in damage or poor operation of the engine and fuel injection system. Use the specified gasoline to correct performance.

• Unleaded gasoline

Use unleaded gasoline and not leaded gasoline installed to reduce air pollution. Using leaded gasoline will damage the catalytic converter.

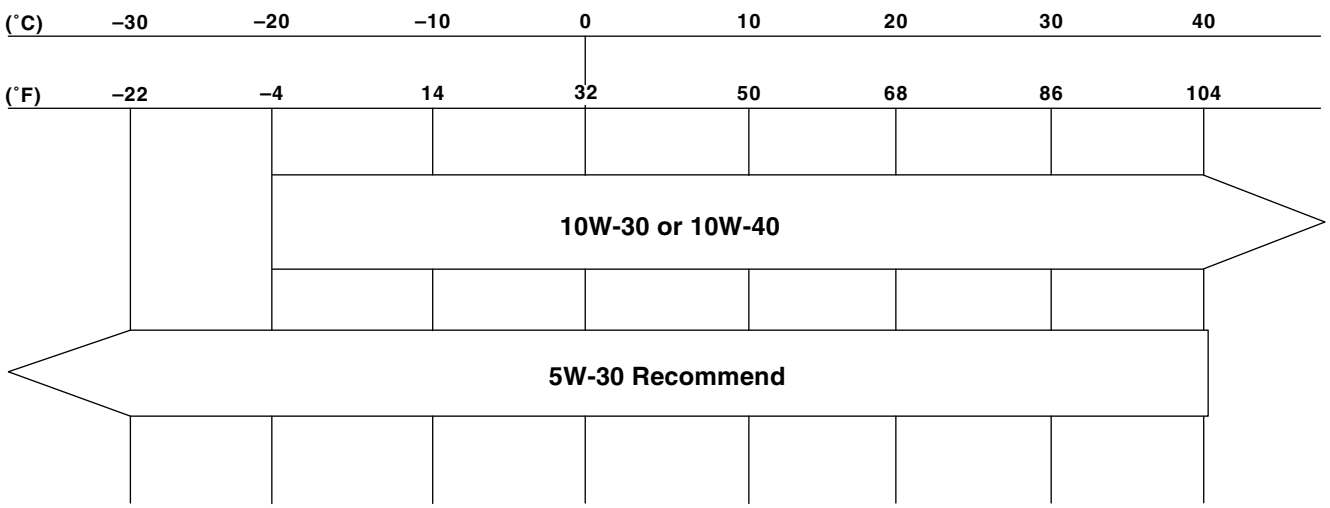
3. LUBRICANTS

Use either the lubricants in the table below or equivalent lubricants. See the table below to choose the correct SAE viscosity.

Lubricant	Recommended			Alternative
	API Spec.	CCMC Spec.	ACEA Spec.	
Engine oil	SL or SJ Grade “Energy conserving”  RM-00001 RM-00002	G4 or G5	A1, A2 or A3	API: SH or SG
Manual transmission oil	GL-5	—	—	—
Front differential (AT)	GL-5	—	—	—
Rear differential	GL-5	—	—	—

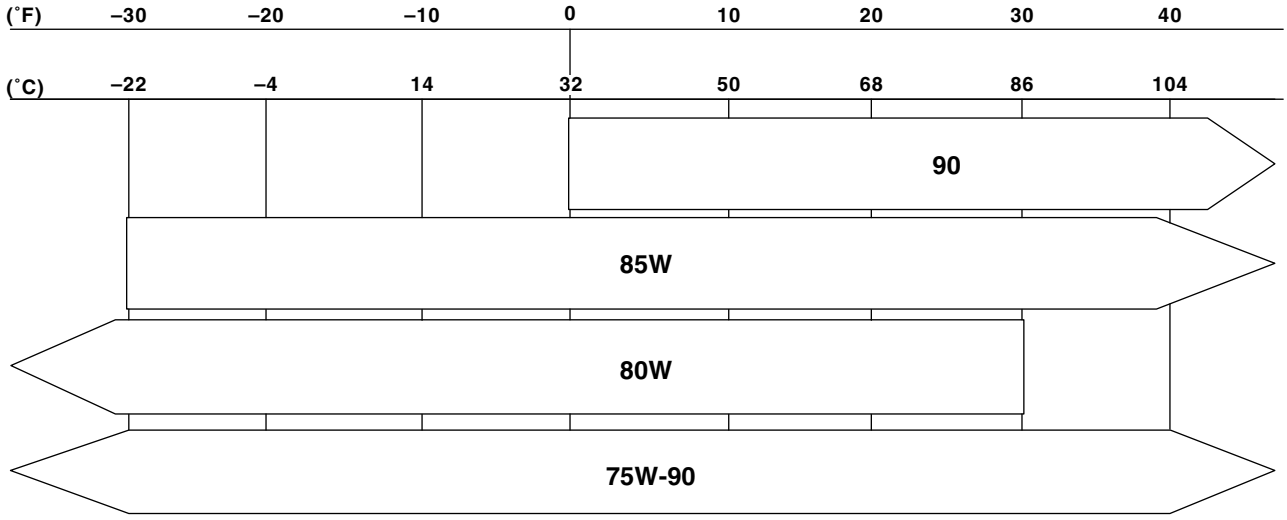
SAE viscosity No. and applicable temperature SAE J300

Engine oil



RM-00003

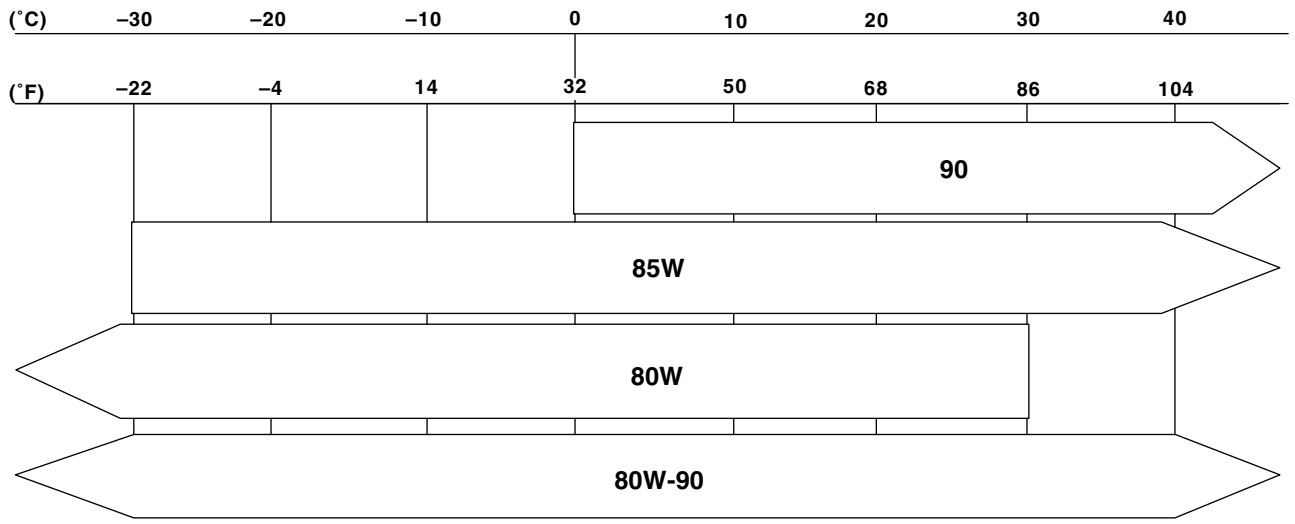
Manual transmission oil and rear differential



RM-00004

SAE viscosity No. and applicable temperature SAE J300

Front differential (AT)



RM-00005

4. FLUID

Use the fluids specified in the table below. Do not mix two different kinds or makes of fluid.

Fluid	Recommended	Alternative	Remarks
Automatic transmission fluid	DEXRON III	—	—
Power steering fluid	DEXRON III	—	—
Brake fluid	FMVSS No. 116 DOT3	FMVSS No. 116 DOT4	—
Clutch fluid	FMVSS No. 116 DOT3	FMVSS No. 116 DOT4	—

5. COOLANT

Use genuine coolant to protect the engine.

Coolant	Recommended	Item number	Alternative
Coolant	SUBARU coolant	000016218	None
Water for dilution	Distilled water	—	Tap water (Soft water)

6. REFRIGERANT

Standard air conditioners on Subaru vehicles use HFC134a refrigerant. Do not mix it with other refrigerants. Also, do not use any air compressor oil except for ZXL200PG.

Air conditioner	Recommended	Item number	Alternative
Refrigerant	HFC134a	—	None
Compressor oil	ZXL200PG	—	None

7. GREASE

Use the grease and supplementary lubricants shown in the table below.

Grease	Application point	Recommended	Item number	Alternative
Supplementary lubricants	• O_2 sensor • Bolts, etc.	SUBARU CRC	004301003	—

Grease	Application point	Recommended	Item number	Alternative
Grease	MT main shaft	FX 2200 clutch grease	000040901	—
	Clutch master cylinder push rod	Slicolube G-40M	004404003	—
	• Gear shift lever • Select lever • Clutch operating cylinder • Accelerator pedal • Clutch pedal • Brake pedal • Hill holder • Clutch bearing • Clutch release lever • Steering shaft bearing	SUNLIGHT2	003602010	—
	Steering gear box	Valiant grease M-2	003608001	—
	Disc brake	Niglube RX-2	K0779GA102	—
	• Drum brake • Drum brake wheel cylinder	Molykote No. 7439	003602001	—
	• Brake pad • Brake shoe	Molykote AS-880N	K0777YA010	—
	Front axle AAR	One luber C	—	—
	Front axle AC	HTBJ	—	—
	Rear axle BJ	Molylex No. 2	003601001	—
	Rear axle EBJ	NTG2218	—	—
	Rear axle DOJ	VU-3A702	23223GA050	—
	• Water pump • Door latch • Door striker	Slicolube G-30M	004404002	—

8. ADHESIVES

Use the adhesives shown in the table below, or equivalent.

Adhesive	Application point	Recommended	Item number	Alternative
Adhesive	Windshield and body	Essex Chemical Crop's Urethane E	—	Sunstar 580
	Soft vinyl	Cemedine 540	—	3M's EC-776 EC-847 or EC-1022 (Spray type)
	Momentary sealant	Cemedine 3000	—	Armstrong's Eastman 910

9. SEAL MATERIAL

Use seal material shown in the table below, or equivalent.

Seal material	Application point	Recommended	Item number	Alternative
Seal material	• Engine case • Torque converter clutch case	Three Bond 1215	004403007	Dow Corning's No. 7038
	Transmission	Three Bond 1217B	K0877YA020	—
	Rear differential	Three Bond 1324	004403042	—
	Rear differential	Three Bond 1105	004403010	Dow Corning's No. 7038
	Weatherstrip	Starcalking B-33A	000018901	Butyl Rubber sealant
	Steering adjusting screw	Three Bond 1102	004403006	—
	SOHC cam cap	Three Bond 1280B	K0877YA018	—

PRE-DELIVERY INSPECTION

PI

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1. Pre-delivery Inspection.....2

1. Pre-delivery Inspection

A: GENERAL

The purposes of the pre-delivery inspection (PDI) are as follows.

- Remove the additional parts used for ensuring the vehicle quality during transportation and restore the vehicle to its normal state.
- Check if the vehicle before delivery is in a normal state.
- Check for any damage or missing parts that may have taken place during transportation or storage.
- Make sure to provide a complete vehicle to the customer.

Because of the above reasons, all dealerships must always carry out the PDIs before delivering a vehicle.

In addition, all franchised shops and PDI centers must check the status of every vehicle received to identify who is responsible for any possible defects.

B: PDI PROCEDURE

Follow the procedures shown in the table below.

Static Checks Just After Vehicle Receipt

Step	Check point
1. Appearance check	(1) If the vehicle is covered with protective coating, visually check the vehicle body for damage and dents. If the protective coating has been removed, visually check the body paints for small areas of damage or stains. (2) Visually check the glass and light lenses for any damage and cracks or excessive gaps to the body sheet metal. (3) Visually check the plated parts for any damage.
2. Tire check	(4) Check the tires for damage, abnormal conditions, and dents on the wheels. (5) Check the tire air pressure.
3. Fuse installation	(6) If the vehicle is about to be delivered to the customer, attach a room lamp fuse.
4. Connection of air conditioner harness	(7) If the vehicle is about to be delivered to the customer, connect the air conditioner harness.
5. Check the doors for lock/unlock and open/close operations.	(8) Using the key, check if the door can be locked and unlocked normally. (9) Open and close all doors to see that there are no abnormal conditions.
6. Operation check of double lock	(10) Check that the double lock operates normally.
7. Operation check of the child lock system.	(11) Check the child lock system operate normally.
8. Check the rear gate for lock/unlock and open/close operations.	(12) Check if the rear gate can be unlocked normally from the emergency door. (13) Open and close the rear gate to see that there are no abnormal conditions. (14) Operate the power door locking switch to check that the rear gate is locked and unlocked normally.
9. Operation check of fuel lid opener lock release lever	(15) Operate the fuel lid opener to check that the fuel lid is unlocked normally.
10. Accessory check	Check that the following accessories are provided: • Owner's manual • Warranty booklet • Service booklet • Spare key • Jack • Tool set • Spare tire
11. Operation check of hood lock release system	(16) Operate the hood lock release lever to check that the hood opens normally.
12. Battery	(17) Check the battery for any abnormal conditions such as rust and trace of battery fluid leaks.
13. Brake fluid	(18) Check the fluid amount.
14. Engine oil	(19) Check the oil amount.
15. Transmission fluid	(20) Check the fluid amount. (21) For AT, check the front differential oil.
16. AT front differential oil	(22) Check the AT front differential oil amount.
17. Coolant	(23) Check the coolant amount.
18. Clutch fluid	(24) Check the clutch fluid amount.
19. Window washer fluid	(25) Check the window washer fluid amount.
20. Hood latch check	(26) Check that the hood is closed and latched securely.
21. Keyless entry system	(27) Check that the keyless entry system operates normally.
22. Security system	(28) Check that the security system operates normally.
23. Seat	(29) Check the seat surfaces for smears or dirt. (30) Check the seat installation conditions and functionality.
24. Seat belt	(31) Check the seat belt installation conditions and functionality.
25. Wheel alignment	(32) Check that the wheel alignments are properly adjusted.

Checks with the Engine Running

Step	Check point
26. Test mode connectors	(1) Test mode connectors
27. Starting condition	(2) Start the engine and check that the engine starts smoothly.
28. Exhaust system	(3) Check that the exhaust noise is normal and no leaks are found.
29. Indicator light	(4) Check that all the indicator lights operate normally.
30. Clock	(5) Check that the clock operates normally.
31. Radio	(6) Check that the radio system operates normally.
32. Cigarette lighter	(7) Check that the cigarette lighter operates normally.
33. Lighting system	(8) Check that the lighting systems operate normally.
34. Window washer	(9) Check that the window washer system operates normally.
35. Wiper	(10) Check that the wiper system operates normally.
36. Power window operation check	(11) Check the power window for correct operations.

Dynamic Test with the Vehicle Running

Step	Check point
37. Brake test	(1) Check that the foot brake operates normally.
38. Parking brake	(2) Check that the parking brake operates normally.
39. AT shift control	(3) Check the AT shift patterns are correct.
40. Heater & ventilation	(4) Check that the heater & ventilation system operates normally.
41. Air conditioner	(5) Check that the air conditioner operates normally.
42. Speed control	(6) Check that the speed control operates normally.

Checks after Dynamic Test

Step	Check point
43. ATF level	(1) Check that the ATF level is normal.
44. Power steering fluid level	(2) Check that the power steering fluid level is normal.
45. Fluid leak check	(3) Check for fluid/oil leaks.
46. Water leak check	(4) Spray the vehicle with water and check for water leaks.
47. Appearance check 2	(5) Remove the protective coating (wrap guard).(if any) (6) Check the body paints for damage and smears. (7) Check the plated parts for damage and rust.

1. APPEARANCE CHECK

1) If the vehicle is covered with protective coating, visually check the vehicle body for damage and dents.
2) If there is no protective coating, check the body paints for small areas of damage or stains and repair as necessary.
3) Check the window glass, door glass, and lights for any cracks or damage and repair or replace the parts as necessary.
4) Check the plated parts, such as the grilles and door knobs, for damage or loss of gloss and repair or replace the parts as necessary.

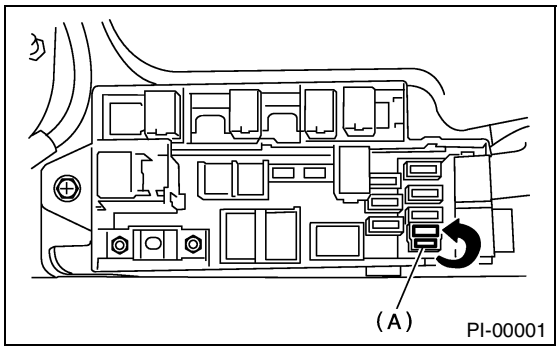
2. TIRE CHECK

- Check the tire outer faces for any damage.
- Check the tire air pressure by referring to the following table.

Tire size	Tire inflation pressure kPa (kg/cm^2, psi)	
	Front	Rear
205/70R15	200 (2.0, 29)	190 (1.9, 28)
215/60R16	200 (2.0, 29)	190 (1.9, 28)

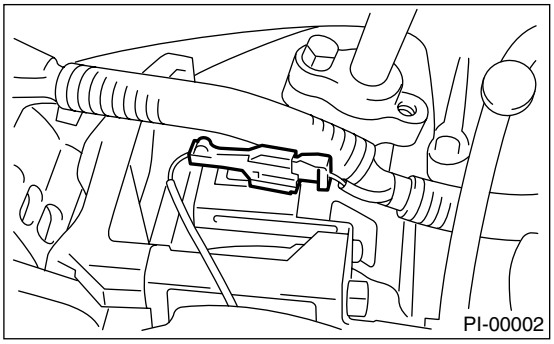
3. FUSE INSTALLATION

A vehicle just delivered has no fuse for the room lamp circuit to prevent battery discharge. Attach a 15 A fuse (A) as shown in the figure.



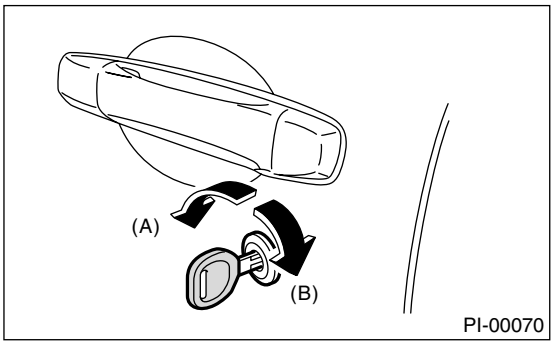
4. CONNECTION OF AIR CONDITIONER HARNESS

A vehicle just delivered has its air conditioner harness disconnected to protect the air conditioner compressor. Connect the harness as shown in the figure.



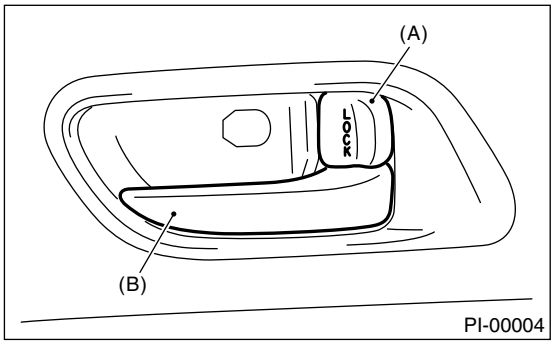
5. CHECK THE DOORS FOR LOCK/UNLOCK AND OPEN/CLOSE OPERATIONS.

1) Using the key, lock and unlock the door several times to check for normal operation. Open and close the door several times for smooth movement.



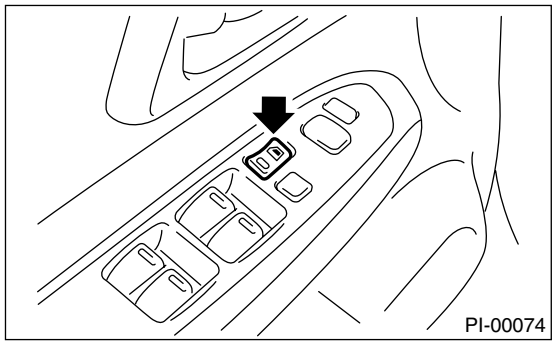
(A) Unlock
(B) Lock

2) Close the driver's door completely, and place the door lock knob (A) to the lock position. Then pull inside door handles (B) to ensure that doors will not open.
For other doors, place the door lock knob (A) to the lock positions and then pull the inside door handles to ensure that the doors will not open.

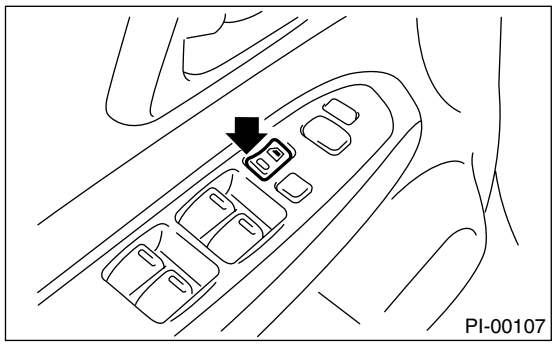


(A) Door lock knob
(B) Inside door handle

3) Press the driver's side power door lock switch to lock side. Check that all doors including rear gate are locked.



4) Press the driver's side power door lock switch to unlock side. Check that all doors including rear gate are unlocked.

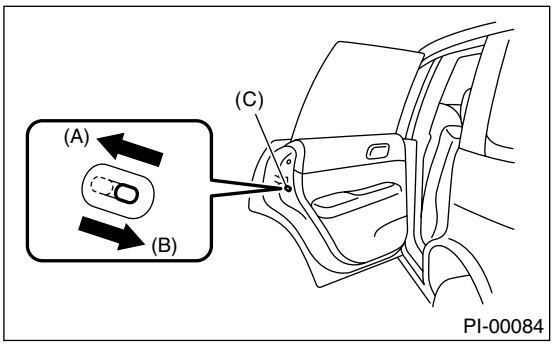


6. CHECK DOUBLE LOCK OPERATION.

1) Fully open all the windows.
2) Remove the key.
3) Lock all the doors using the key or transmitter.
4) Verify that all the doors including rear gate are not unlocked when pressing power door lock switch to unlock side.
5) Verify that the door is not opened when operating door lock knob to unlock position and pulling inner remote. Perform the same check for other doors.

7. CHECK THE OPERATION OF CHILD SAFETY LOCKS

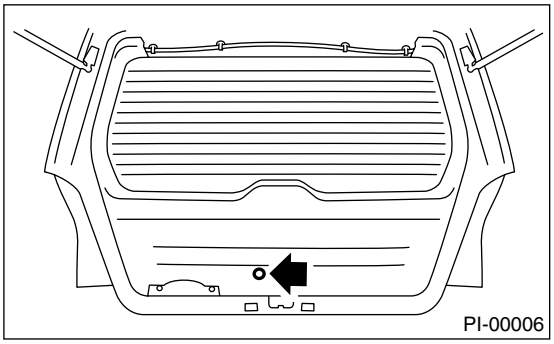
1) Set the child safety lock on both rear doors to the lock positions.
2) Close the rear doors completely.
3) Check that the lock levers of the rear doors are in the unlock positions. Then, pull the inside door handles of the rear doors to ensure that the doors will not open.
4) Next, pull the outside door handles of the rear doors to ensure that the doors will open.



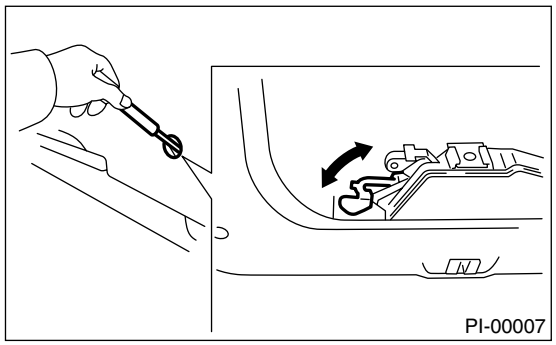
(A) Unlock
(B) Lock
(C) Child safety lock

8. CHECK THE REAR GATE FOR LOCK/UNLOCK AND OPEN/CLOSE OPERATIONS.

1) Open and close the rear gate several times for smooth movement.
2) Operate the rear gate lever to check that the rear gate is locked and unlocked normally.
(1) Remove the blind cover inside the rear gate.



(2) Using a screwdriver, check the rear gate is lock/unlock.



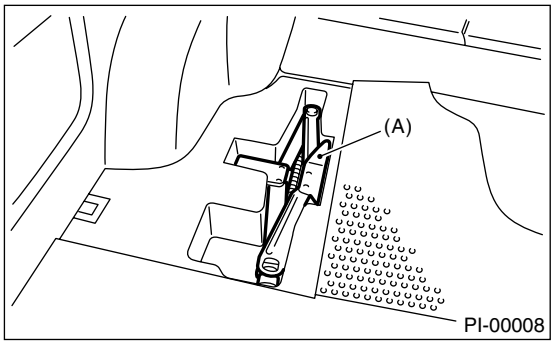
9. OPERATION CHECK OF FUEL LID OPENER LOCK RELEASE LEVER

Operate the fuel lid opener and verify that the fuel lid opens normally. Check that the filler cap is securely closed.

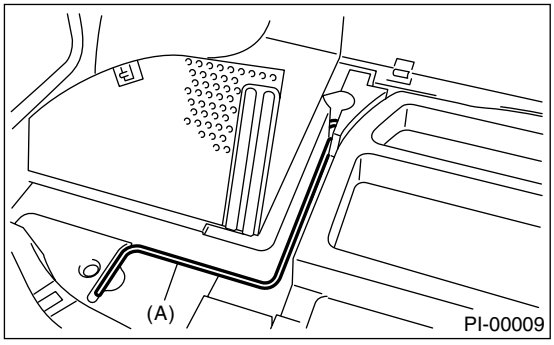
10.ACCESSORY CHECK

Check that the following accessories are provided in the luggage compartment or cargo area.

- Owner's manual
- Warranty booklet
- Service booklet
- Spare key
- Jack
- Tool set
- Spare tire



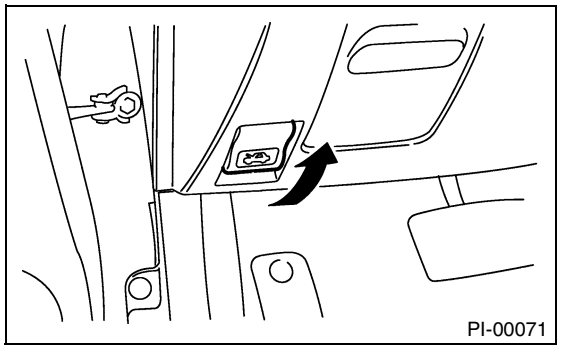
(A) Jack



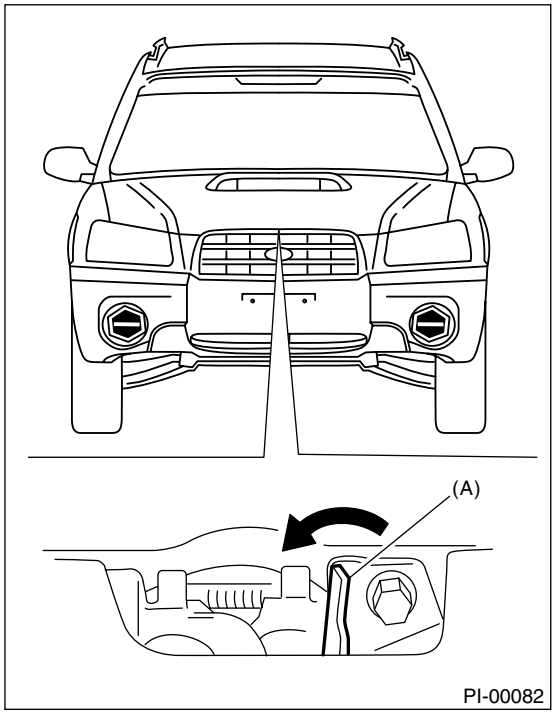
(A) Jack handle

11.OPERATION CHECK OF HOOD LOCK RELEASE SYSTEM

Operate the hood release knob and check that the hood is unlocked normally.

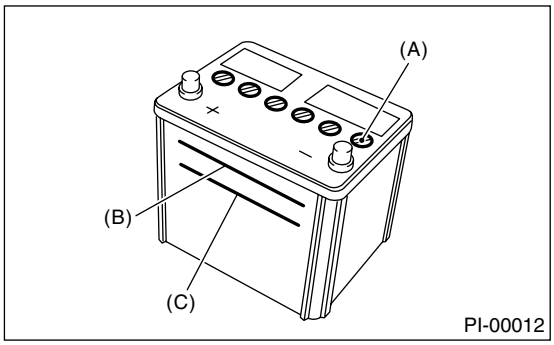


Operate the lever (A) and check that the hood is opened normally. Then support the hood with hood stay.



12.BATTERY

Check the battery terminals to make sure that no rust or corrosions due to fluid leaks are found. Check that the battery caps are securely tightened.



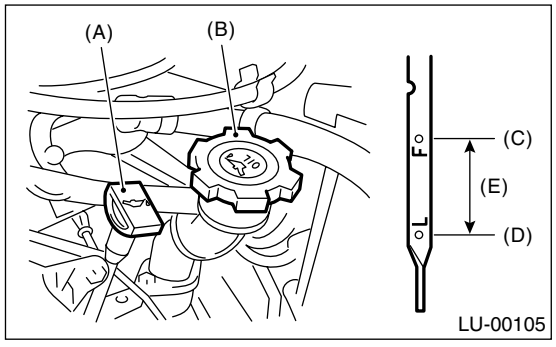
(A) Cap
(B) Upper level
(C) Lower level

13.BRAKE FLUID

Check the brake fluid amount. If the amount is insufficient, carry out a brake line test to identify brake fluid leaks and check the brake operation. After that, refill the brake fluid tank with the specified type of fluid.

14.ENGINE OIL

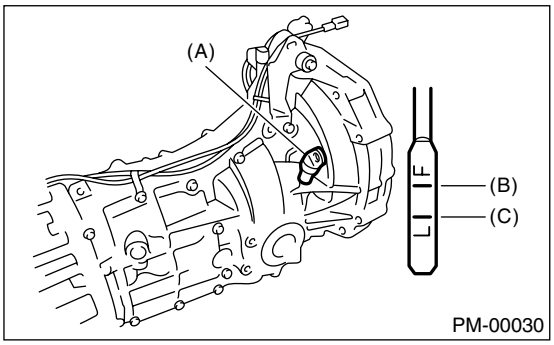
Check the engine oil amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of the specified engine oil.



(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1 ℓ (1.1 US qt, 0.9 Imp qt)

15.TRANSMISSION FLUID

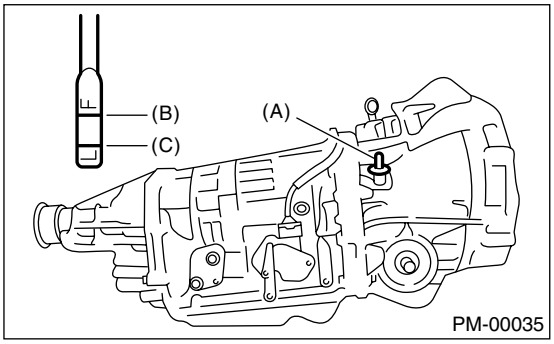
Check the transmission fluid amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of the specified fluid.



(A) Oil level gauge
(B) Upper level
(C) Lower level

16.AT FRONT DIFFERENTIAL OIL

Check the AT front differential oil amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of the specified AT front differential oil.



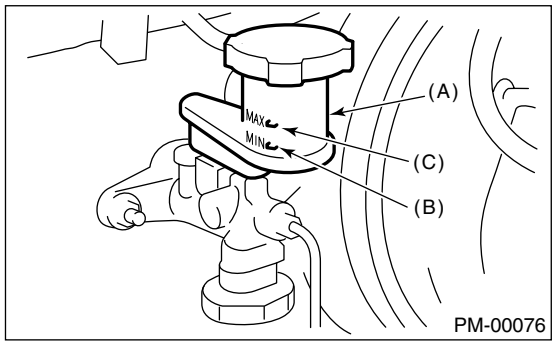
(A) Oil level gauge
(B) Upper level
(C) Lower level

17.COOLANT

Check the coolant amount on the reservoir. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of coolant with the specified concentration.

18.CLUTCH FLUID

Check the clutch fluid amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of the specified fluid.



(A) Reservoir tank
(B) MIN level
(C) MAX level

19.WINDOW WASHER FLUID

Check the window washer fluid amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of washer fluid commercially available.

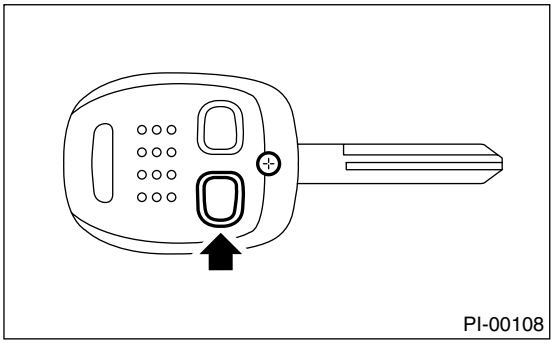
20.HOOD LATCH CHECK

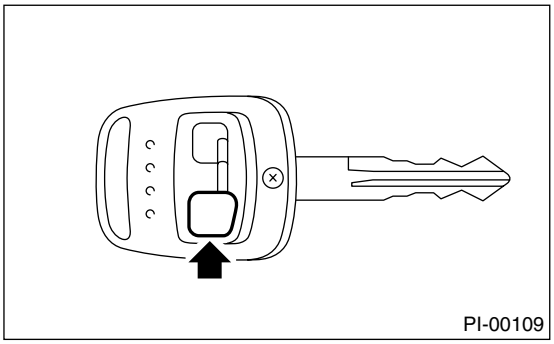
Retract the hood stay and close the hood. Check that the hood is securely latched.

21.KEYLESS ENTRY SYSTEM

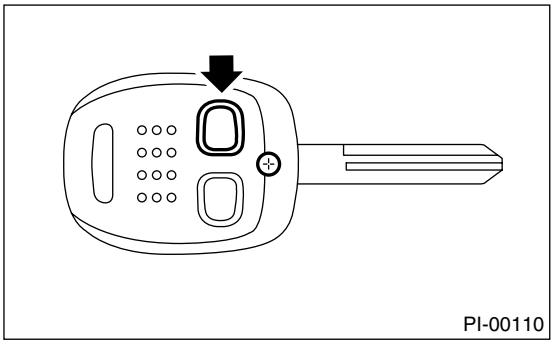
Check the keyless entry system operations as follows:

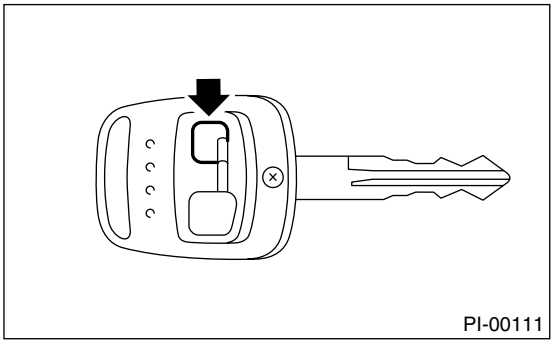
- Fully open all the door windows.
- Remove the key from the ignition switch and close all the doors including rear gate.
- Press the “LOCK” button on the transmitter once and check if all the doors are locked, and the hazard light flashes once.





- Press the “UNLOCK” button on the transmitter once and check if the all doors are unlocked, and the hazard light flashes twice.





- Close all doors and rear gate, press the “LOCK” button of the transmitter. Press the “UNLOCK” button of the transmitter and wait for 30 seconds. Check that all doors and the rear gate are automatically locked again.

22.SEAT

Check that each seat provides full functionality in sliding and reclining. Check all available functions of the rear seat.

23.SEAT BELT

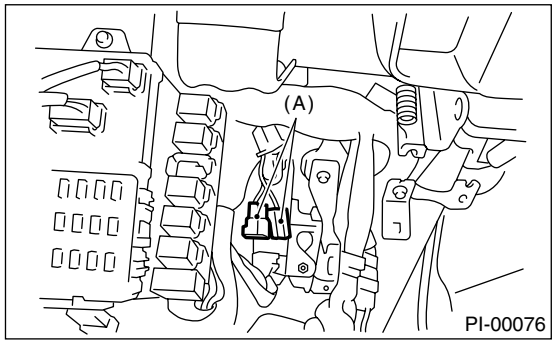
Pull out the seat belt and then release it. Check that the belt webbing retracts smoothly.

24.WHEEL ALIGNMENT

Check the wheel alignments. <Ref. to FS-7, Wheel Alignment.> and <Ref. to RS-9, Wheel Alignment.>

25.TEST MODE CONNECTORS

Turn the ignition switch to ON and check that the check-engine light starts blinking. If the light blinks, return the ignition key to LOCK and disconnect the test mode connector. Then, turn the ignition key to ON again. If the check-engine light blinks at that time in spite of the disconnected test mode connector, carry out an engine diagnosis.



(A) Test mode connector (Green)

26.STARTING CONDITION

Start the engine and check that the engine starts smoothly. If any battery voltage problems are found, recharge or replace the battery. If any abnormal noises are observed, immediately stop the engine and check and repair the necessary components.

27.EXHAUST SYSTEM

Listen to the exhaust noise to see if no abnormal noises are observed.

28.INDICATOR LIGHT

Check that all the indicator lights are off.

29.CLOCK

Check the clock for normal operations and enough accuracy.

30.RADIO

Check the radio for full functionality and normal noise level. Also check the CD unit operations.

31.CIGARETTE LIGHTER

Check the cigarette lighter operations.

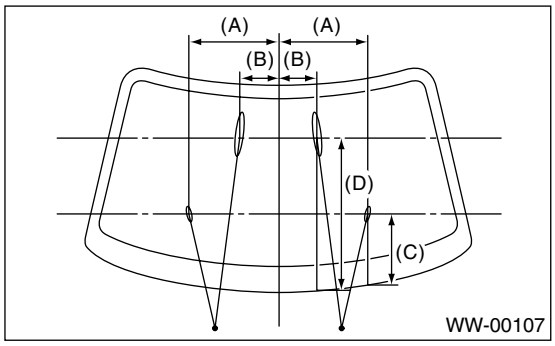
32.LIGHTING SYSTEM

- Check the headlight operations.
- Check the brake light operations.
- Check the other lights for normal operations.

33.WINDOW WASHER

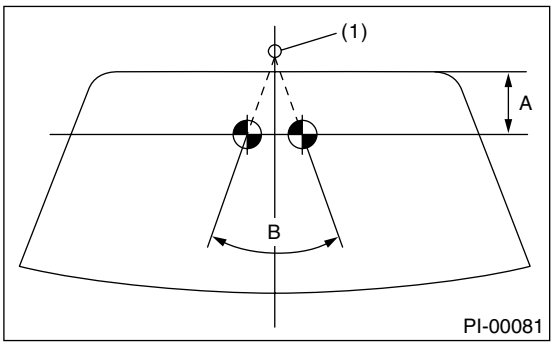
Check that the window washer system injects washer fluid to the specified area of windshield shown in the figure.

Front injection position:
A: 350 mm (13.78 in)
B: 150 mm (5.91 in)
C: 275 mm (10.83 in)
D: 600 mm (23.62 in)



(1) Nozzle

Rear injection position:
A: 36 mm (1.42 in)
B: 72°



(1) Nozzle

34.WIPER

Check the front and rear wipers for normal operations.

35.POWER WINDOW OPERATION CHECK

Manipulate the power window switches one by one to check that each of the power windows goes up and down with no abnormal noises.

36.BRAKE TEST

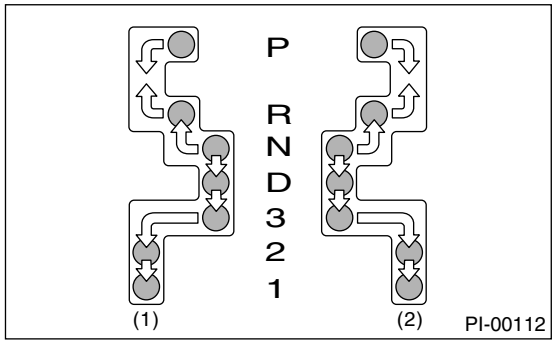
Check the foot brake for normal operations.

37.PARKING BRAKE

Check the parking brake for normal operations.

38.AT SHIFT CONTROL

Set the AT select lever to each gear position while checking that the demanded gear position is correctly attained.



(1) RHD model
(2) LHD model

Selector Position	Gear Position			
	1st	2nd	3rd	4th
D	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	—
2	Yes	Yes	—	—
1	Yes	—	—	—

39.HEATER & VENTILATION

Operate the heater and ventilation system to check for normal airflow outlet control, air inlet control, airflow capacity, and heating performance.

40.AIR CONDITIONER

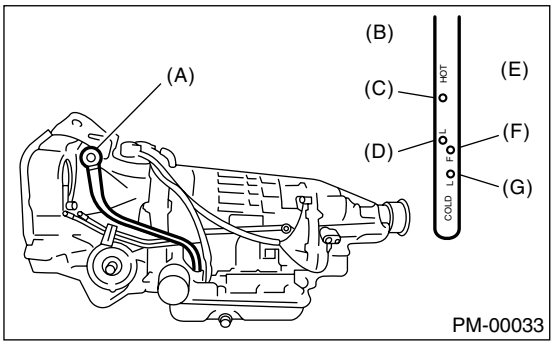
Operate the air conditioner. Check that the A/C compressor operates normally and enough cooling is provided.

41.CRUISE CONTROL

Operate the cruise control system. Check that the system is activated and deactivated correctly.

42.ATF LEVEL

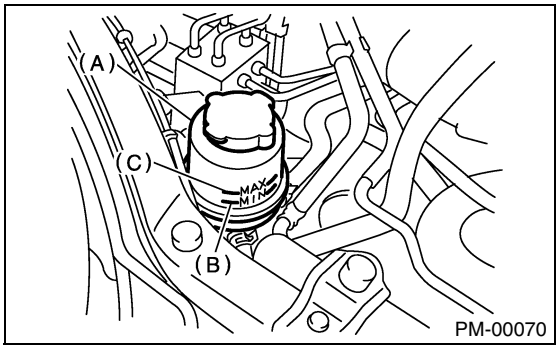
Check that the ATF level is normal. If insufficient, check that no leaks are found. Then add the necessary amount of the specified ATF.



(A) Level gauge
(B) “HOT” side
(C) Upper level
(D) Lower level
(E) “COLD” side
(F) Upper level
(G) Lower level

43.POWER STEERING FLUID LEVEL

Check that the power steering fluid level is normal. If insufficient, check that no leaks are found. Then add the necessary amount of the specified power steering fluid.



(A) Reservoir tank
(B) MIN level
(C) MAX level

44.FLUID LEAK CHECK

Check the entire areas of the vehicle for any trace of coolant/oil/fluid leaks.

45.WATER LEAK TEST

Spray the vehicle with water and check that no water enters the passenger compartment.

• Before performing the water leakage test, remove anything that may obstruct the operation or which must be kept dry.

• Close all windows completely, and then close all doors tightly. Close the hood before starting the test.
• Connect a hose to a tap, and spray water on the vehicle. The rate of water discharge must be approx. 20 — 25 ℓ (5.3 — 6.6 US gal, 4.4 — 5.5 Imp gal) per minute.
When spraying water on areas adjacent to the floor and wheel house, increase the pressure. When directing water on areas other than the floor portion and wheel house, decrease the pressure. But the force of water must be made strong occasionally by pressing the end of the hose.

NOTE:
Be sure to keep the hose at least 10 cm (3.9 in) from the vehicle.
Check the following areas:
• Front window and body framework mating portion
• Door mating portions
• Glass mating portions
• Rear quarter window mating portions
• Rear window and body framework mating portion
• Around roof drips

If any dampness in the compartment is discovered after the water has been applied, carefully check all areas that may have possibly contributed to the leak.

46.APPEARANCE CHECK 2

Check the vehicle body paints, plated faces, glass, and lenses for any dirt or damage.

PERIODIC MAINTENANCE SERVICES

PM

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1. General Description

A: GENERAL

Be sure to perform periodic maintenance in order to maintain vehicle performance and find problems before they become serious.

2. Schedule

A: MAINTENANCE SCHEDULE 1

1. FOR EUROPE AREA

For periodic maintenance of over 120,000 km (75,000 miles) or 96 months, carry out inspection by referring to the following table. For a maintenance period gone beyond these tables, apply them repeatedly as a set of 120,000 km (75,000 miles) or 96 months.

			Maintenance interval [Number of months or km (miles), whichever occurs first]										
	Month				12	24	36	48	60	72	84	96	Remarks
	× 1,000 km		1.6	5	15	30	45	60	75	90	105	120	
	× 1,000 miles		1	3	9	19	28	38	47	56	66	75	
1	Engine oil				**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	
2	Engine oil filter				**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	
3	Spark plug	For Turbo									**R**		
		Others				**R**		**R**		**R**		**R**	
4	Drive belt(s)				**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	
5	Camshaft drive belt					**I**		**I**		**I**		**I**	
6	Fuel line					**I**		**I**		**I**		**I**	
7	Fuel filter						**R**			**R**			
8	Air cleaner element			**I**	**R**	**I**	**R**	**I**	**R**	**I**	**R**	**I**	
9	Cooling system					**I**		**I**		**I**		**I**	
10	Coolant					**I**		**I**		**I**		**I**	
11	Clutch system					**I**		**I**		**I**		**I**	
12	Hill-holder system					**I**		**I**		**I**		**I**	
13	Transmission oil					**I**		**R**		**I**		**R**	
14	ATF					**I**		**R**		**I**		**R**	
15	Front & rear differential					**I**		**R**		**I**		**R**	
16	Brake line					**I**		**I**		**I**		**I**	
17	Brake fluid					**R**		**R**		**R**		**R**	
18	Disk brake pads & discs				**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	
19	Brake linings & drums					**I**		**I**		**I**		**I**	
20	Parking brake					**I**		**I**		**I**		**I**	
21	Suspension					**I**		**I**		**I**		**I**	
22	Wheel bearing											**(I)**	
23	Axle boot & joint				**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	
24	Steering system					**I**		**I**		**I**		**I**	

Symbols used:
R: Replace
I: Inspection
(I): Recommended service for safe vehicle operation.

NOTE:
(1) When the vehicle is used in extremely dusty conditions, the air cleaner element should be replaced more often.
(2) ATF filter is a maintenance free part. ATF filter needs replacement, when it is physically damaged or ATF leaked.

2. EXCEPT FOR EUROPE AREA

For periodic maintenance of over 50,000 km (30,000 miles) or 48 months, carry out inspections by referring to the following tables. For a maintenance period gone beyond these tables, apply them repeatedly as a set of 50,000 km (30,000 miles) or 48 months.

		Maintenance Interval [Number of months or km (miles), whichever occurs first]					
	Months		12	24	36	48	Remarks
	× 1,000 km	5	12.5	25	37.5	50	
	× 1,000 miles	3	7.5	15	22.5	30	
1	Engine oil		R	R	R	R	
2	Engine oil filter		R	R	R	R	

For periodic maintenance of over 100,000 km (60,000 miles) or 48 months, carry out inspections by referring to the following tables. For a maintenance period gone beyond these tables, apply them repeatedly as a set of 100,000 km (60,000 miles) or 48 months.

			Maintenance Interval [Number of months or km (miles), whichever occurs first]					
	Months			12	24	36	48	Remarks
	× 1,000 km		1.6	25	50	75	100	
	× 1,000 miles		1	15	30	45	60	
3	Spark plugs	For Turbo					R	
		Others		R	R	R	R	
4	Drive belt(s)			I	I	I	I	
5	Camshaft drive belt						R	
6	Fuel line				I		I	
7	Fuel filter				R		R	
8	Air cleaner element			I	R	I	R	
9	Cooling system				I		I	
10	Coolant				R		R	
11	Clutch system		I	I	I	I	I	
12	Hill-holder system		I	I	I	I	I	
13	Transmission oil				R		R	
14	ATF				R		R	
15	Front & rear differential oil				R		R	
16	Brake line				I		I	
17	Brake fluid				R		R	
18	Disc brake pads & discs			I	I	I	I	
19	Brake linings and drums				I		I	
20	Parking brake			I	I	I	I	
21	Suspension			I	I	I	I	
22	Wheel bearing						(I)	
23	Axle boots & joints			I	I	I	I	
24	Steering system (Power steering)			I	I	I	I	

Symbols used:
R: Replace
I: Inspection
(I): Recommended service for safe vehicle operation.

NOTE:
(1) When the vehicle is used in extremely dusty conditions, the air cleaner element should be replaced more often.
(2) ATF filter is a maintenance free part. ATF filter needs replacement, when it is physically damaged or ATF leaked.

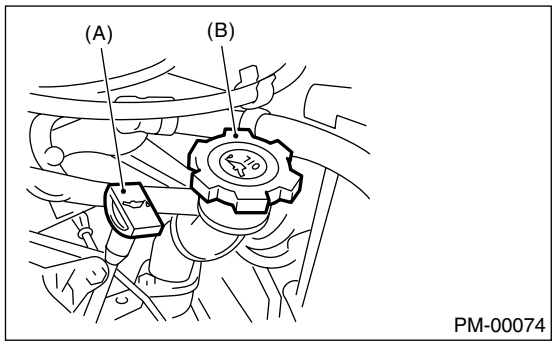
B: MAINTENANCE SCHEDULE 2

Item	Every	Repeat short distance drive	Repeat rough/muddy road drive	Extremely cold weather area	Salt or other corrosive used or coastal area	High humidity or mountain area	Repeat towing trailer
Engine oil		Replace more frequently		Replace more frequently			Replace more frequently
Engine oil filter		Replace more frequently		Replace more frequently			Replace more frequently
Fuel line	6 months				I		
	12,500 km						
	7,500 miles						
Transmission oil							Replace more frequently
ATF							Replace more frequently
Front & rear differential oil							Replace more frequently
Brake line	6 months	I	I		I		I
	12,500 km						
	7,500 miles						
Brake fluid	12 months					R	
	25,000 km						
	15,000 miles						
Brake pads	6 months	I	I		I		I
	12,500 km						
	7,500 miles						
Brake linings and drums	6 months	I	I		I		I
	12,500 km						
	7,500 miles						
Parking brake	6 months	I	I		I		I
	12,500 km						
	7,500 miles						
Suspension	6 months		I	I	I		I
	12,500 km						
	7,500 miles						
Axle boots & joints	6 months	I	I	I	I		I
	12,500 km						
	7,500 miles						
Steering system (Power steering)	6 months	I	I	I	I		I
	12,500 km						
	7,500 miles						

3. Engine Oil

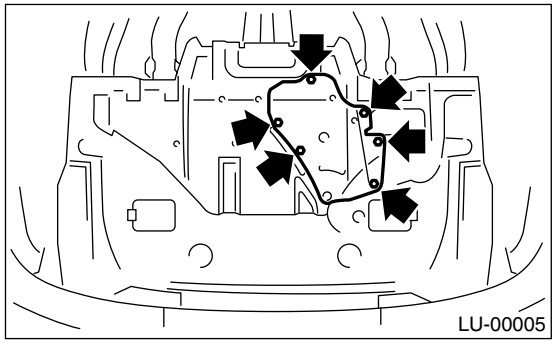
A: REPLACEMENT

1) Open the engine oil filler cap for quick draining of the engine oil.

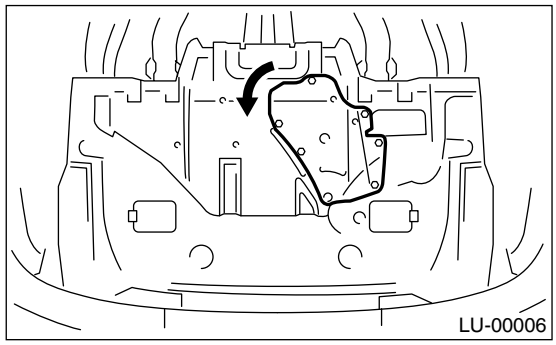


(A) Oil level gauge
(B) Oil filler cap

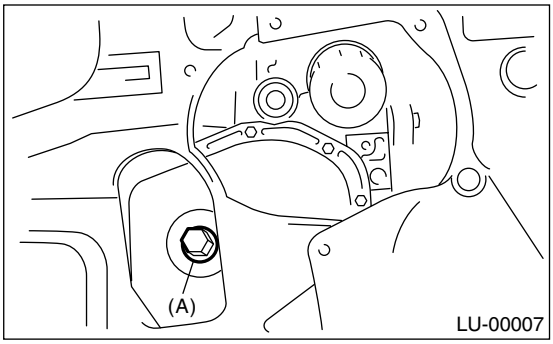
2) Remove six clips.



3) Turn the service hole cover counterclockwise.



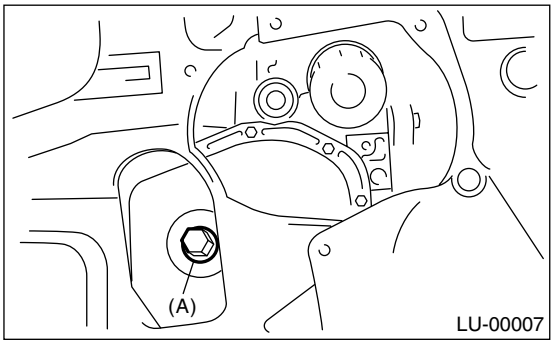
4) Drain the engine oil by loosening engine oil drain plug.



(A) Oil drain plug

5) Replace the drain plug gasket.
6) Tighten the engine oil drain plug after draining engine oil.

Tightening torque:
44 N·m (4.5 kgf-m, 33 ft-lb)

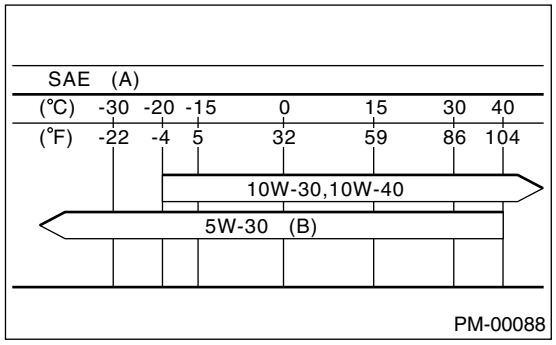


(A) Oil drain plug

7) Fill engine oil through the filler pipe up to center between upper level and lower level. Make sure that the vehicle is placed level when checking oil level. Use engine oil of proper quality and viscosity, selected in accordance with the table in figure.

Recommended oil
API classification
SL or SJ or SH with the words "Energy Conserving or Energy conserving II", CCMC specification G4 or G5, ACEA specification A1, A2 or A3, or New API mark displayed on the container (If it is impossible to get SL or SJ or SH grade, you may use SG grade.)

Engine oil capacity
Non-turbo model:
Upper level
Approx. 4.0 ℓ (4.2 US qt, 3.5 Imp qt)
Lower level
Approx. 3.0 ℓ (3.2 US qt, 2.6 Imp qt)
Turbo model:
Upper level
Approx. 4.5 ℓ (4.8 US qt, 4.0 Imp qt)
Lower level
Approx. 3.5 ℓ (3.7 US qt, 3.1 Imp qt)



(A) Visosity No. and applicable temperature
(B) Preferred

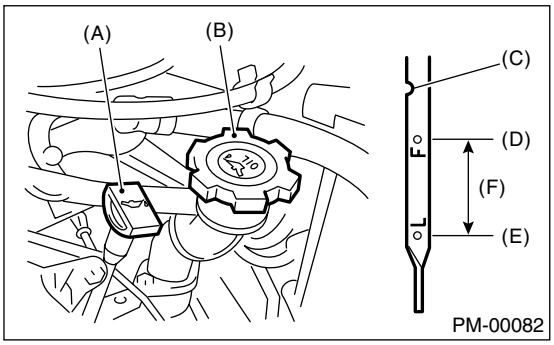
The proper viscosity helps vehicle get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

NOTE:
• When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the API classification and SAE viscosity No. designated by SUBARU.
• If vehicle is used in desert areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used:
API classification: SL, SJ or SH
SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50

8) Close the engine oil filler cap.
9) Start the engine and warm it up for a time.
10) After the engine stops, recheck the oil level. <Ref. to PM-7, INSPECTION, Engine Oil.>

B: INSPECTION

1) Park the vehicle on a level surface.
2) Remove the oil level gauge and wipe it clean.
3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.
4) Remove it again and note the reading. If the engine oil level is below the "L" line, add oil to bring the level up to the "F" line.



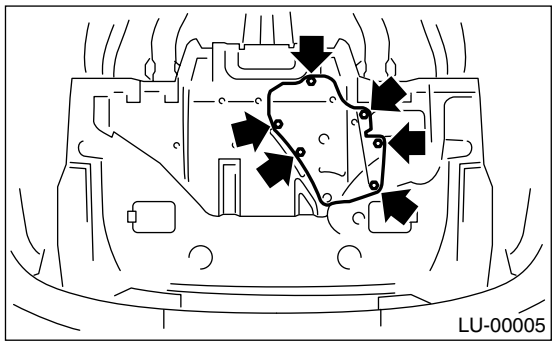
(A) Oil level gauge
(B) Oil filler cap
(C) Notch mark
(D) Upper level
(E) Lower level
(F) Approx. 1 ℓ (1.1 Us qt, 0.9 Imp qt)

5) After turning off the engine, wait a few minutes for the oil to drain back into oil pan before checking the level.
6) Just after driving or while the engine is warm, engine oil level may show in the range between the "F" line and the notch mark. This is caused by thermal expansion of the engine oil.
7) To prevent overfilling the engine oil, do not add oil above the "F" line when the engine is cold.

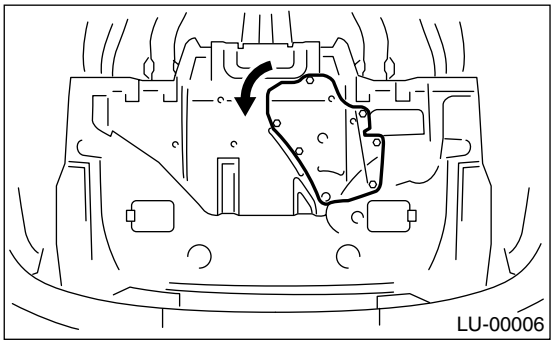
4. Engine Oil Filter

A: REPLACEMENT

1) Remove six clips.

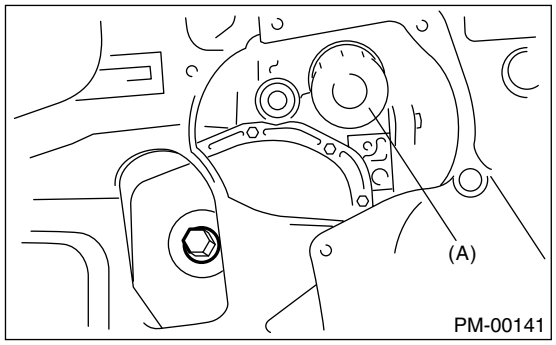


2) Turn the service hole cover counterclockwise.



3) Remove the oil filter with ST.

ST	498547000	OIL FILTER WRENCH (Non-turbo model)
ST	18332AA000	OIL FILTER WRENCH (Turbo model)



(A) Engine oil filter

4) Get a new oil filter and apply a thin coat of engine oil to the seal rubber.
5) Install the oil filter by turning it by hand, being careful not to damage the seal rubber.
6) Tighten more (approx. 2/3 to 3/4 turn) after the seal rubber contacts the cylinder block. Do not tighten excessively, or oil may leak.
7) After installing the oil filter, run the engine and make sure that no oil is leaking around seal rubber.

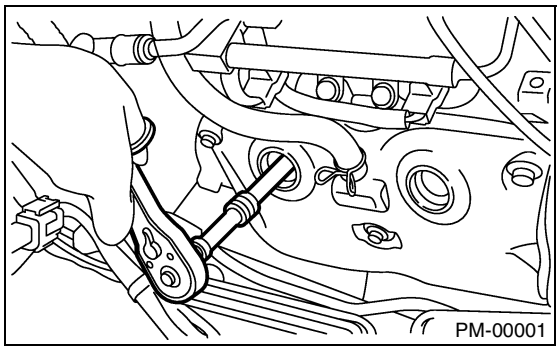
NOTE:
The filter element and filter case are permanently joined; therefore, interior cleaning is not necessary.

8) Check the engine oil level. <Ref. to PI-3, PDI PROCEDURE, Pre-delivery Inspection.>

5. Spark Plugs

A: REPLACEMENT

1) Remove the intake duct and intake chamber.
2) Remove the washer tank and put it aside.
3) Disconnect the spark plug cord.
4) Remove the spark plug with a plug-wrench.



5) Set the new spark plug.

Recommended spark plug :
SOHC
CHAMPION: RC10YC4
Alternate:
NGK: BKR6E-11
NGK: BKR5E-11
Spark plug gap
1.0 — 1.1 mm (0.039 — 0.043 in)
DOHC turbo model
NGK: PFR6B-11
Spark plug gap
0.7 — 0.8 mm (0.028 — 0.031 in)

6) Tighten the spark plug lightly with hand, and then secure with a plug-wrench to the specified torque.

Tightening torque:
20.6 N·m (2.10 kgf-m, 15.19 ft-lb)

NOTE:
• Be sure to place the gasket between the cylinder head and spark plug.
• If a torque wrench is not available, tighten the spark plug until gasket contacts cylinder head; then tighten further 1/4 to 1/2 turns.

6. Drive Belt(s)

A: INSPECTION

1) Replace the belts, if cracks, fraying or wear is found.
2) Check the drive belt tension and adjust it if necessary by changing the generator installing position and/or idler pulley installing position. <Ref. to PM-10, REPLACEMENT, Drive Belt(s).>

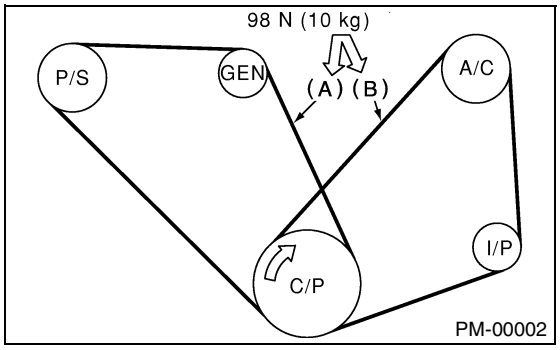
Belt tension

(A)

Replaced: 7 — 9 mm (0.276 — 0.354 in)
Reused: 9.0 — 10.0 mm (0.354 — 0.394 in)

(B)

Replaced: 7.5 — 8.5 mm (0.295 — 0.335 in)
Reused: 9.0 — 10.0 mm (0.354 — 0.394 in)

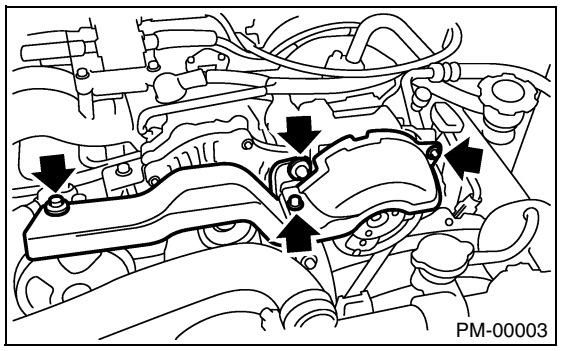


(A) Front side belt
(B) Rear side belt
C/P Crankshaft pulley
GEN Generator
P/S Power steering oil pump pulley
A/C Air conditioning compressor pulley
I/P Idler pulley

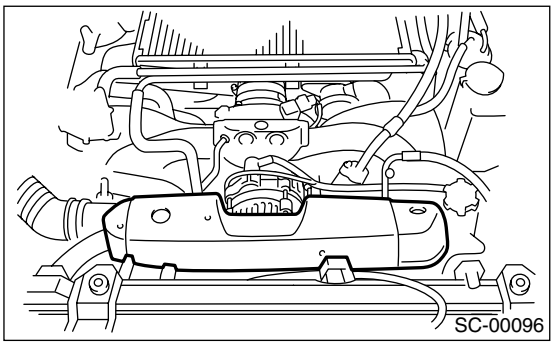
B: REPLACEMENT

1. V-BELT COVER

1) Remove the V-belt cover.
NON-TURBO MODEL



TURBO MODEL

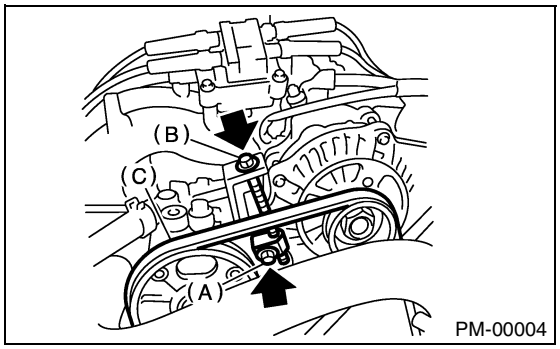


2. FRONT SIDE BELT (DRIVING POWER STEERING OIL PUMP AND GENERATOR)

NOTE:
Wipe off any oil or water on the belt and pulley.
1) Loosen the lock bolt (A).
2) Loosen the slider bolt (B).
3) Remove the front side belt (C).
4) Install a new belt, and tighten the slider bolt so as to obtain the specified belt tension.
5) Tighten the lock bolt (A).

6) Tighten the slider bolt (B).

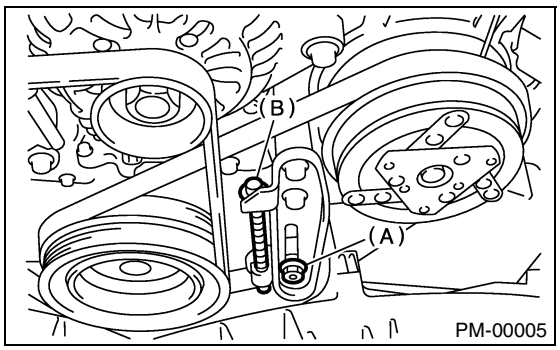
Tightening torque:
Lock bolt
25 N·m (2.5 kgf-m, 18 ft-lb)
Slider bolt:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



3. REAR SIDE BELT (DRIVING AIR CONDITIONER)

NOTE:
Wipe off any oil or water on the belt and pulley.
1) Remove the front side belt.
2) Loosen the lock nut (A).
3) Loosen the slider bolt (B).
4) Remove the rear side belt.
5) Install a new belt, and tighten the slider bolt so as to obtain the specified belt tension.
6) Tighten the lock nut (A).
7) Install the front side belt. <Ref. to ME(SOHC)-42, REAR SIDE BELT, INSTALLATION, V-belt.>

Tightening torque:
23 N·m (2.3 kgf-m, 17.0 ft-lb)

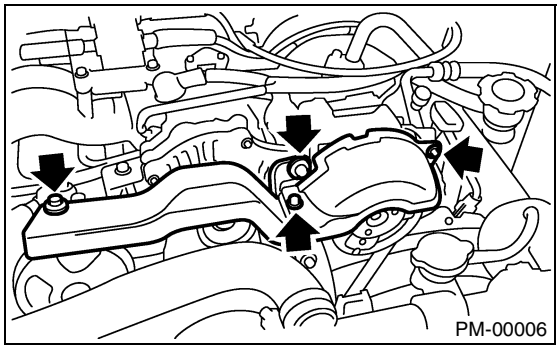


7. Camshaft Drive Belt

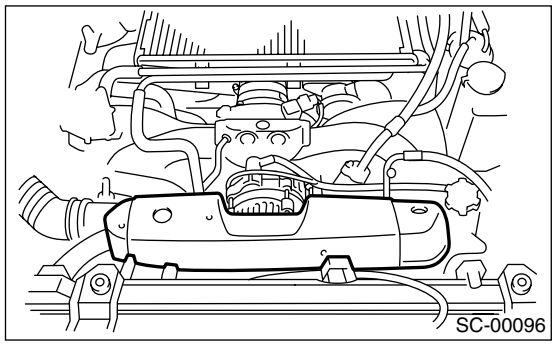
A: REPLACEMENT

1. NON-TURBO MODEL

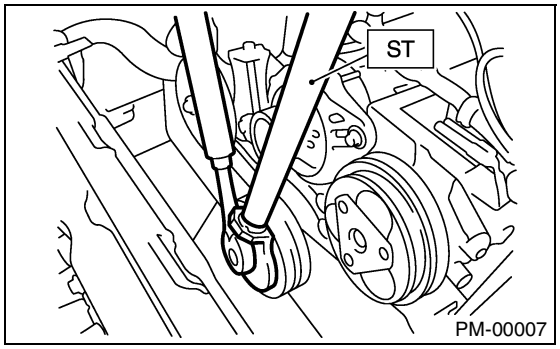
1) Remove the radiator fan and air conditioner fan. <Ref. to CO(SOHC)-34, Radiator Main Fan and Fan Motor.>,<Ref. to CO(SOHC)-40, Radiator Sub Fan and Fan Motor.>
2) Sheild the radiator from any damage using cardboard and blanket.
3) Remove the V-belt cover.
NON-TURBO MODEL



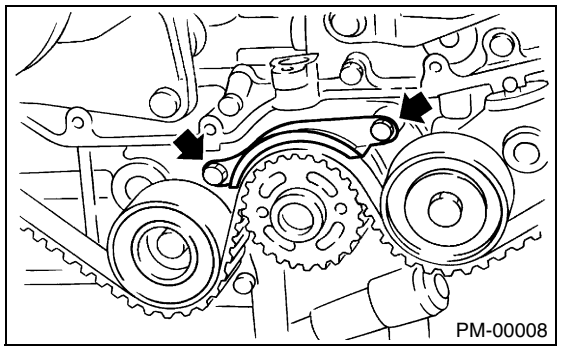
TURBO MODEL



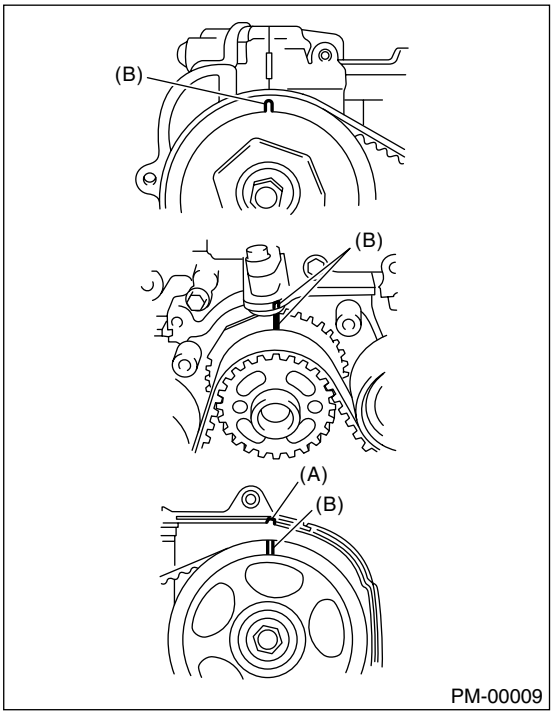
4) Remove the V-belts. <Ref. to ME(SOHC)-41, V-belt.>
5) Remove the air conditioning compressor drive belt tensioner.
6) To lock the crankshaft, use ST. Remove the pulley bolt.
ST 499977100 CRANKSHAFT PULLEY WRENCH



7) Remove the crankshaft pulley.
8) Remove the left side belt cover.
9) Remove the front timing belt cover.
10) Remove the timing belt guide. (MT vehicle only)



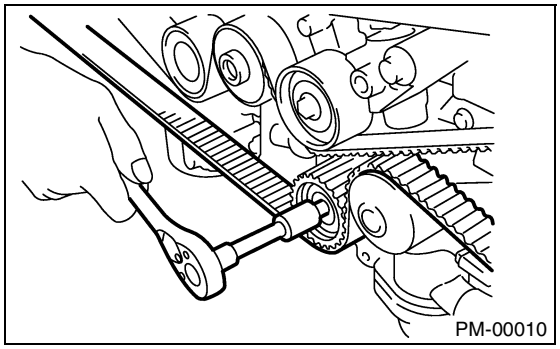
11) Turn the crankshaft and align alignment marks on crankshaft, and right and left camshaft sprockets with notches of belt cover and cylinder block.
ST 499987500 CRANKSHAFT SOCKET



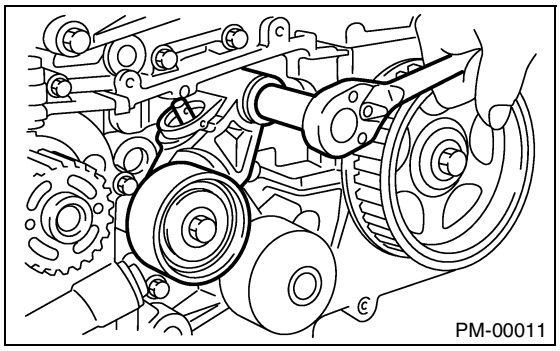
(A) Notch
(B) Alignment mark

12) Remove the belt idler.

13) Remove the belt idler (No. 2).



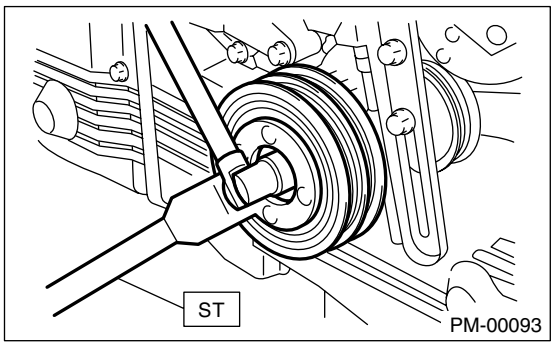
14) Remove the timing belt.
15) Remove the automatic belt tension adjuster assembly.



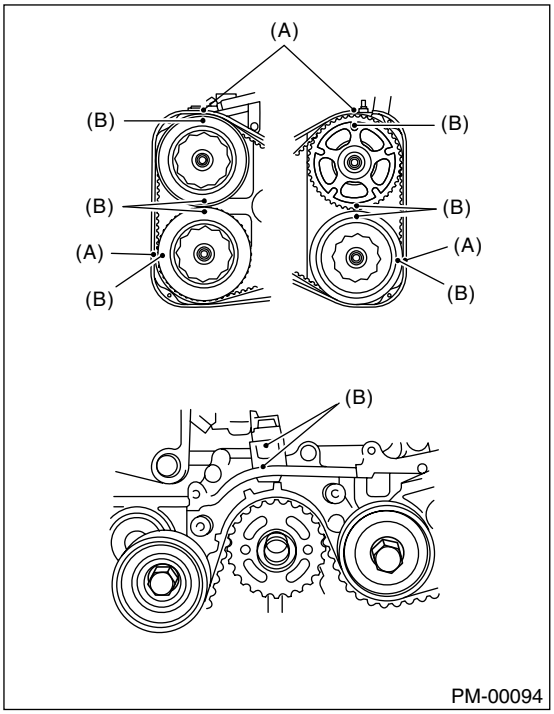
16) Install in the reverse order of removal. <Ref. to ME(SOHC)-47, INSTALLATION, Timing Belt Assembly.>

2. TURBO MODEL

1) Remove the radiator fan and air conditioner fan. <Ref. to CO(SOHC)-34, Radiator Main Fan and Fan Motor.>,<Ref. to CO(SOHC)-40, Radiator Sub Fan and Fan Motor.>
2) Protect the radiator with cardboard and blanket.
3) Remove the V-belts. <Ref. to ME(TURBO)-44, V-belt.>
4) Remove the air conditioning compressor drive belt tensioner.
5) Remove the pulley bolt. To lock the crankshaft use ST.
ST 499977300 CRANKSHAFT PULLEY WRENCH

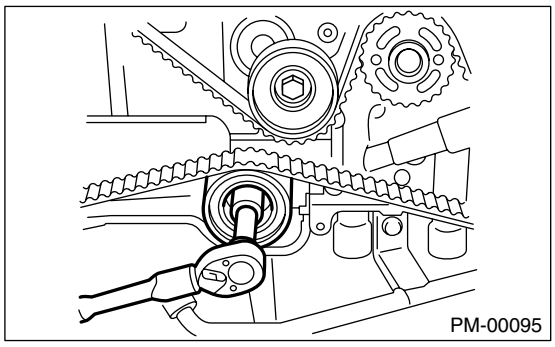


6) Remove the crankshaft pulley.
7) Remove the air conditioning compressor drive belt tensioner.
8) Remove the belt cover (LH).
9) Remove the belt cover (RH).
10) Remove the front belt cover.
11) Turn the crankshaft and align alignment marks on crankshaft, and right and left camshaft sprockets with notches of belt cover and cylinder block. To turn the crankshaft, use ST.
ST 499987500 CRANKSHAFT SOCKET



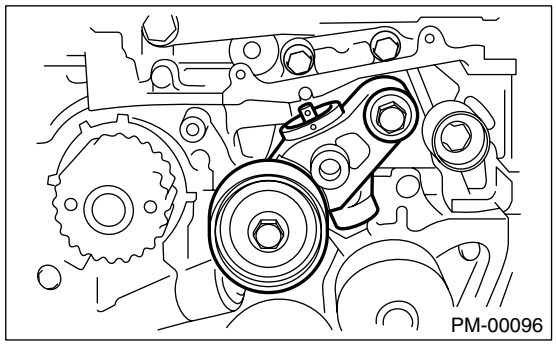
(A) Notch
(B) Alignment mark

12) Remove the belt idler.



13) Remove the timing belt.

14) Remove the automatic belt tension adjuster assembly.



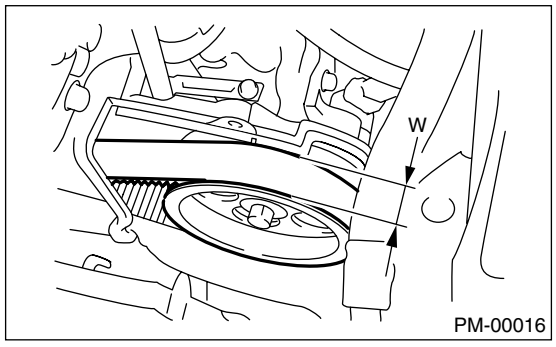
15) Install in the reverse order of removal. <Ref. to ME(TURBO)-48, Timing Belt Assembly.>

CAUTION:
When installing the timing belt, be sure to align all alignment marks on the belt with corresponding marks on the sprockets. If incorrectly installed, interference between pistons and valves may occur.

B: INSPECTION

1. SOHC MODEL

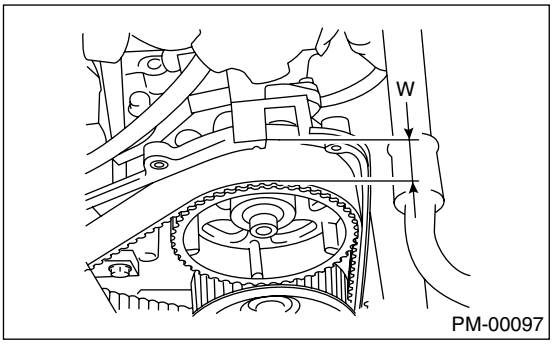
1) Remove the front timing belt cover and timing belt cover (LH).
2) While cranking the engine at least four rotations, check the timing belt back surface for cracks or damage. Replace the faulty timing belt as needed.
3) Measure the timing belt width W. If it is less than 27 mm (1.06 in), check idlers, tensioner, water pump pulley and cam sprocket to determine idler alignment (squareness). Replace the worn timing belt.



4) Install the front timing belt cover and timing belt cover (LH).

2. DOHC MODEL

1) Remove the timing belt cover (LH).
2) While cranking the engine at least four rotations, check the timing belt back surface for cracks or damage. Replace the faulty timing belt as needed.
3) Measure the timing belt width W. If it is less than 30 mm (1.18 in), check idlers, tensioner, water pump pulley and cam sprocket to determine idler alignment (squareness). Replace the worn timing belt.
4) Install the timing belt cover (LH).



8. Fuel Line

A: INSPECTION

The fuel line is located mostly internally, so check pipes, areas near pipes, and engine compartment piping for rust, hose damage, loose bands, etc. If faulty parts are found, repair or replace them. <Ref. to FU(SOHC)-65, Fuel Delivery, Return and Evaporation Lines.>

9. Fuel Filter

A: REPLACEMENT

For fuel filter replacement procedures, refer to “FU” section. <Ref. to FU(SOHC)-62, Fuel Filter.>

B: INSPECTION

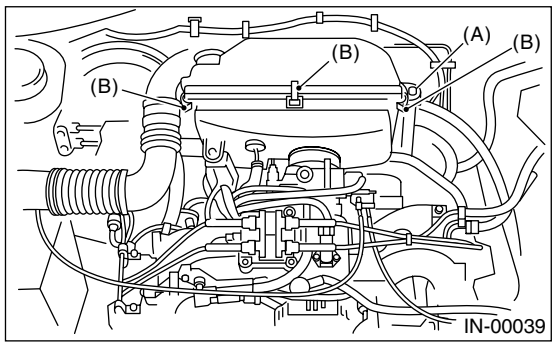
1) If it is clogged, or if replacement interval has been reached, replace it.
2) If water is found in it, shake and expel the water from inlet port.

10.Air Cleaner Element

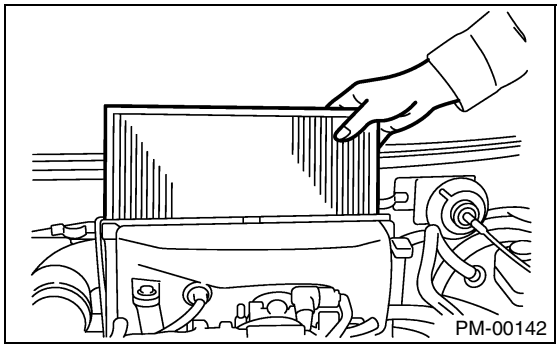
A: REPLACEMENT

1. NON-TURBO MODEL

1) Remove the air intake duct from air cleaner case.
2) Remove the bolt (A) which installs air cleaner case to stays.
3) Remove the clip (B) above the air cleaner case.



4) Remove the air cleaner.

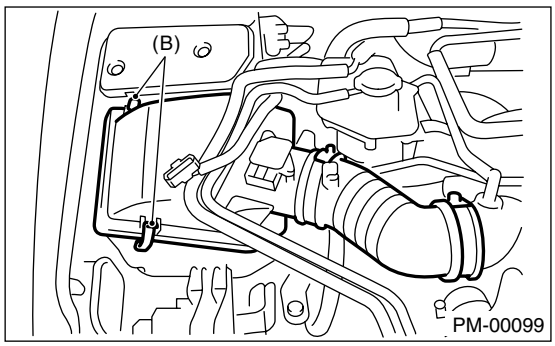


5) Install in the reverse order of removal.

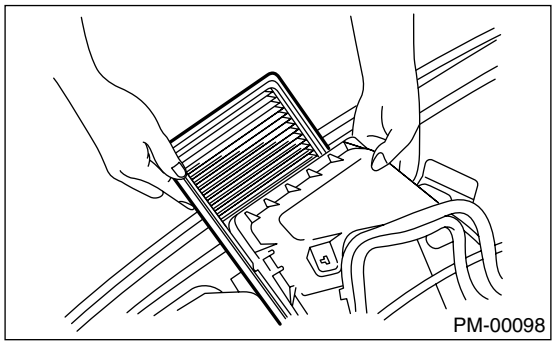
CAUTION:
Fasten with a clip after inserting the lower tab of the case.

2. TURBO MODEL

1) Remove the clip (B) above the air cleaner case.

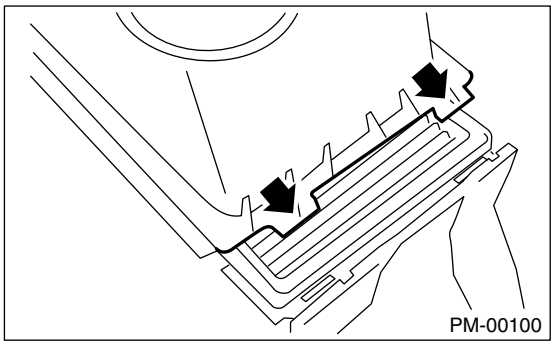


2) Remove the air cleaner.



3) Install in the reverse order of removal.

CAUTION:
Align the protruding portion of air cleaner upper cover with holes of air cleaner lower case, then secure upper cover to case.

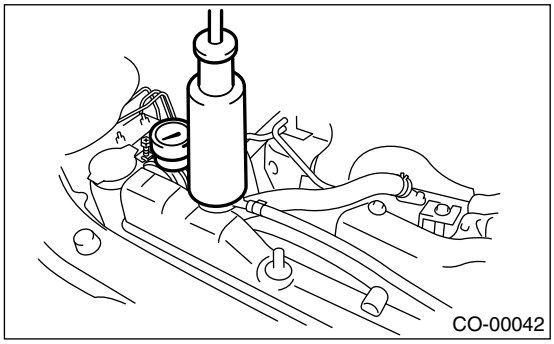


11.Cooling System

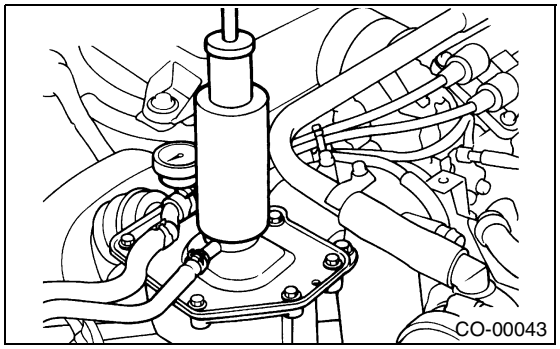
A: INSPECTION

1) Check the radiator for leakage, filling it with coolant and attach the radiator cap tester to filler neck. Then apply a pressure of 157 kPa (1.6 kg/cm^2, 23 psi) and check the following points:
- Each portion of radiator for leakage
- Hose joints and other connections for leakage

NOTE:
• When attaching or detaching tester and when operating tester, use special care not to deform radiator filler neck.
NON-TURBO MODEL



TURBO MODEL



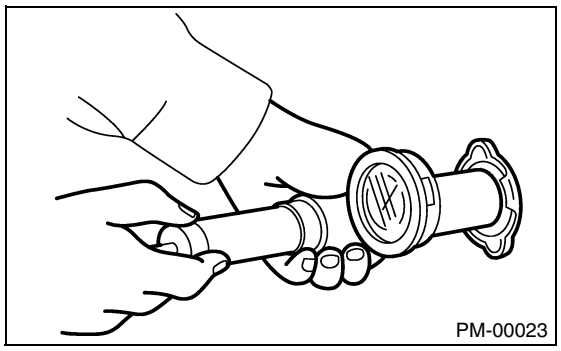
• When performing this check, be sure to keep the engine stationary and fill the radiator with coolant.
• Wipe off check points before applying pressure.
• Use care not to spill coolant when detaching the tester from radiator.

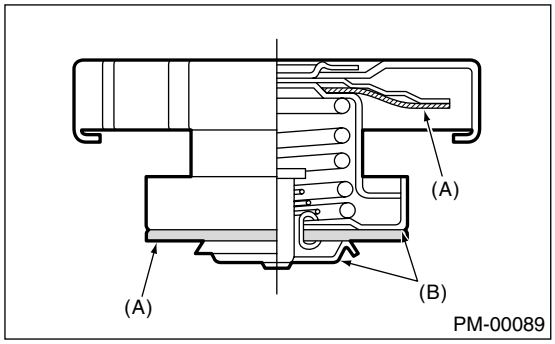
2) Check the radiator cap valve open pressure using radiator cap tester.

NOTE:
Rust or dirt on the cap may prevent the valve from functioning normally: be sure to clean the cap before testing.

Raise the pressure until the needle of gauge stops and see if the pressure can be retained for 5 to 6 seconds. The radiator cap is normal if a pressure above the service limit value has been maintained for this period.

Radiator cap valve open pressure
Standard value:
93 — 123 kPa (0.95 — 1.25 kg/cm^2, 14 — 18 psi)
Service limit:
83 kPa (0.85 kg/cm^2, 12 psi)





(A) Deformation
(B) Deformation, damage, rust

3) Start the engine, and then check it does not overheat or it is cooled excessively. If it overheats or it is cooled excessively, check the cooling system. <Ref. to CO(SOHC)-20, Water Pump.>, <Ref. to CO(SOHC)-25, Thermostat.>, <Ref. to CO(SOHC)-27, Radiator.>, <Ref. to CO(SOHC)-33, Radiator Cap.>
4) Check the electric fan operates using Subaru Select Monitor, when the coolant temperature exceeds 95°C (203°F). If not operate, check the electric fan system. <Ref. to CO(SOHC)-11, Radiator Fan System.>

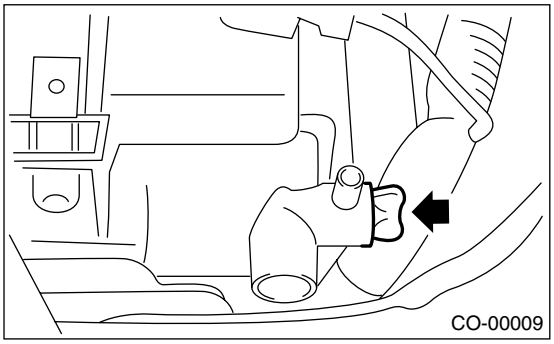
12.Coolant

A: REPLACEMENT

1. REPLACEMENT OF COOLANT

WARNING:
The radiator is of the pressurized type. Do not attempt to open the radiator cap immediately after the engine has been stopped.

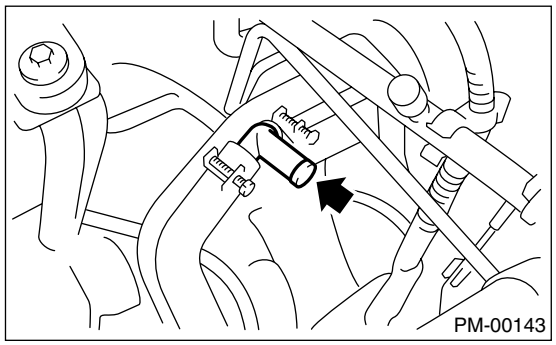
1) Lift-up the vehicle.
2) Remove the under cover.
3) Place a container under drain pipe.
4) Loosen and remove the drain cock to drain engine coolant into container.



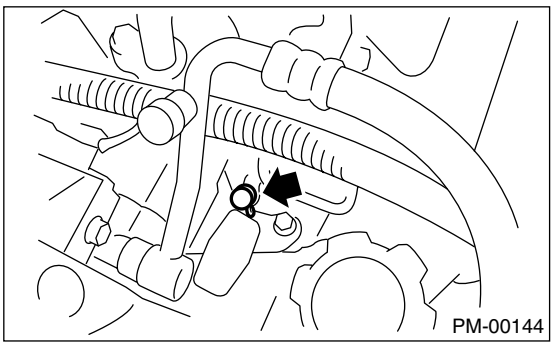
5) For quick draining, open the radiator cap.

NOTE:
Be careful not to spill coolant on the floor.

6) Drain the coolant from reservoir tank.
7) Tighten the radiator drain cock securely after draining coolant.
8) Remove the air bleeder valve cap of heater hose part. (RHD Non-turbo model)



9) Remove the rubber cap of air bleeder pipe from the side of A/C compressor, and then install the viny hose. (Turbo model)



10) Slowly pour the coolant into radiator. Pour the coolant up to air bleeder hole, and then install the cap. (RHD Non-turbo and Turbo model)
11) Pour the coolant from radiator filler port to neck of filler, then pour into reservoir tank up to “FULL” level.

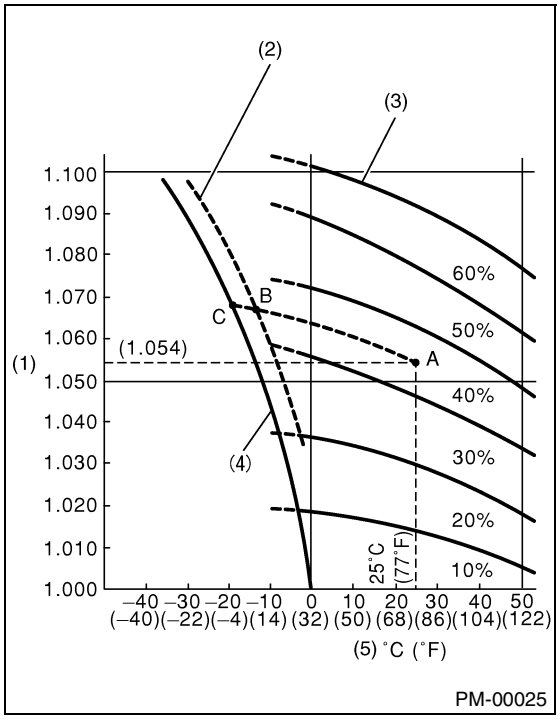
Coolant capacity (fill up to “FULL” level)
2.0 L Non-turbo AT model:
Approx. 6.5 ℓ (6.9 US qt, 5.7 Imp qt)
2.0 L Non-turbo MT model:
Approx. 6.6 ℓ (7.0 US qt, 5.8 Imp qt)
2.0 L Turbo AT and MT with oil cooler model:
Approx. 7.3 ℓ (7.7 US qt, 6.4 Imp qt)
2.0 L Turbo MT without oil cooler model:
Approx. 7.4 ℓ (7.8 US qt, 6.5 Imp qt)
2.5 L AT model:
Approx. 6.8 ℓ (7.2 US qt, 6.0 Imp qt)
2.5 L MT model:
Approx. 6.9 ℓ (7.3 US qt, 6.1 Imp qt)

NOTE:
The SUBARU Genuine Coolant containing anti-freeze and anti-rust agents is especially made for SUBARU engine, which has an aluminum crankcase. Always use SUBARU Genuine Coolant, since other coolant may cause corrosion.

12) Securely install the radiator cap.
13) Run the engine for more than 5 minutes at 2,000 to 3,000 rpm. (Run the engine until radiator becomes hot in order to purge the air trapped in cooling system.)
14) Stop the engine and wait until coolant temperature lowers. Then open the radiator cap to check coolant level and add coolant up to radiator filler neck. Next, add coolant into reservoir tank up to “FULL” level.
15) After adding coolant, securely install the radiator and reservoir tank caps.

2. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

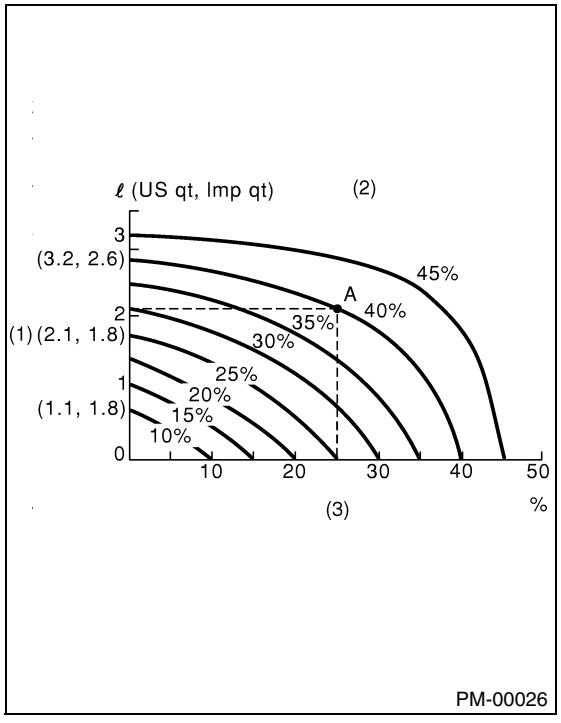
The concentration and safe operating temperature of the SUBARU coolant is shown in the diagram. Measuring the temperature and specific gravity of the coolant will provide this information.
[Example]
If the coolant temperature is 25°C (77°F) and its specific gravity is 1.054, the concentration is 35% (point A), the safe operating temperature is −14°C (7°F) (point B), and the freezing temperature is −20°C (−4°F) (point C).



(1) Coolant gravity
(2) Safe operating temperature
(3) Concentration of coolant
(4) Freezing temperature
(5) Coolant temperature

3. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50%).
The amount of coolant that should be replaced can be determined using the diagram.
[Example]
Assume that the coolant concentration must be increased from 25% to 40%. Find point A, where the 25% line of coolant concentration intersects with the 40% curve of the necessary coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of coolant to be drained is 2.1 ℓ (2.2 US qt, 1.8 Imp qt). Drain 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of the undiluted solution of SUBARU coolant.
If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.



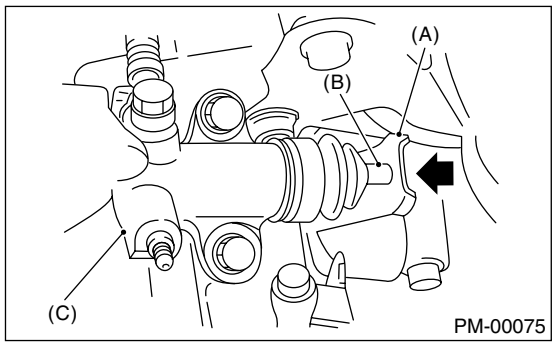
(1) Quantity of coolant to be drained
(2) Necessary concentration of coolant
(3) Concentration of coolant in vehicle cooling system

13.Clutch System

A: INSPECTION AND ADJUSTMENT

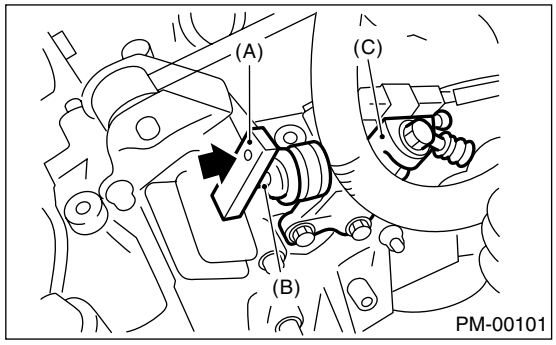
1) Push the release lever to retract the push rod of the operating cylinder and check if the fluid level in the clutch reservoir tank rises or not.

NON-TURBO MODEL



(A) Release lever
(B) Push rod
(C) Operating cylinder

TURBO MODEL



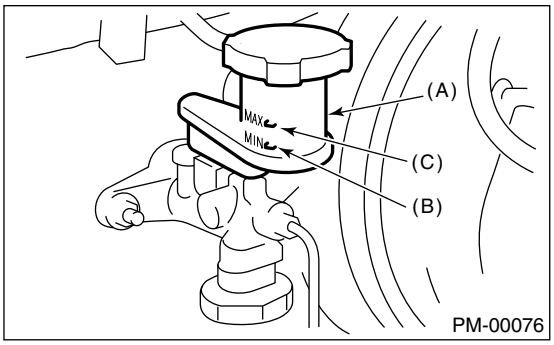
(A) Release lever
(B) Push rod
(C) Operating cylinder

2) If the fluid level rises, pedal free play is correct.
3) If the fluid level does not rise, or the push rod cannot be retracted, adjust the clutch pedal. <Ref. to CL-37, Clutch Pedal.>
4) Check the fluid level using the scale on the outside of the clutch master cylinder tank (A). If the level is below “MIN” (B), inspect the clutch master cylinder, operating cylinder and hydraulic line for fluid leaks. If fluid leaks are found, repair or replace. If fluid leaks are not found, add clutch fluid to bring it up to “MAX” (C) of clutch reservoir tank.

Recommended clutch fluid:
FMVSS No. 116, fresh DOT3 or DOT4 brake fluid

CAUTION:
Prevent the clutch fluid from being splashed over vehicle body. If the clutch fluid is splashed over vehicle body, flush it, and then wipe it up.

NOTE:
• Avoid mixing different brakes of brake fluid to prevent degradation of the fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.



(A) Reservoir tank
(B) MIN lever
(C) MAX lever

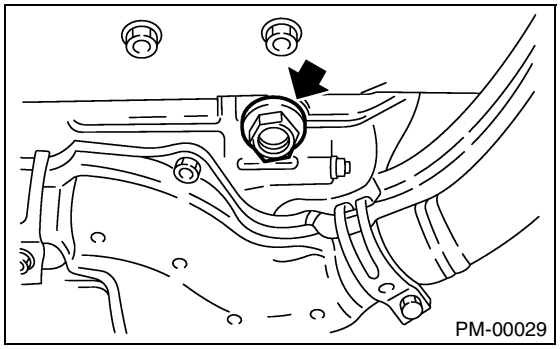
14.Transmission Oil

A: REPLACEMENT

1. MANUAL TRANSMISSION

1) Drain the gear oil by removing drain plug after allowing the engine to cool for 3 to 4 hours.

NOTE:
- Before starting work, cool off the engine well.
- If transmission gear oil adheres to the exhaust pipe, wipe it off completely.



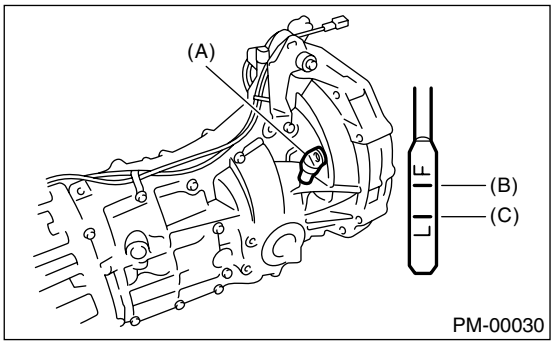
2) Replace the gasket with new one, and then tighten it to the specified torque.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)

3) Fill transmission gear oil through the oil level gauge hole up to the upper point of level gauge.

NOTE:
Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.

Gear oil capacity:
Non-turbo model
4.0 ℓ (4.2 US qt, 3.5 Imp qt)
Turbo model
Without oil pump
3.5 ℓ (3.7 US qt, 3.1 Imp qt)
With oil pump
3.9 ℓ (4.1 US qt, 3.4 Imp qt)



(A) Oil level gauge
(B) Upper level
(C) Lower level

15.Hill-holder System

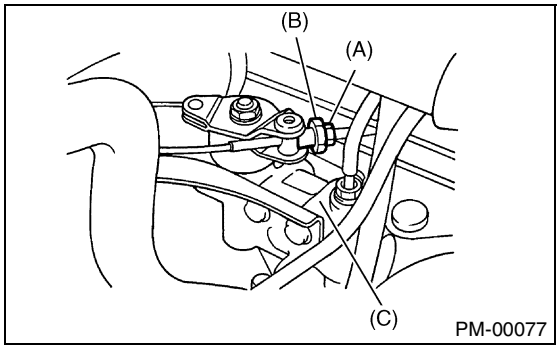
A: INSPECTION AND ADJUSTMENT

1) Confirm the stopping and starting performance by activating the hill-holder on an uphill road of 3° or higher inclination.

(1) When the vehicle does not stop;
Tighten the adjusting nut of PHV cable.

(2) When the vehicle does not start properly;
A; When the hill-holder is released later than engagement of clutch (engine tends to stall): Loosen the adjusting nut gradually until smooth starting is enabled.
B; When the hill-holder is released earlier than engagement to clutch (vehicle slips down slightly): Tighten the adjusting nut so that hill-holder is released later than engagement of clutch (status in A). Then make adjustment the same as in A.

NOTE:
• Whenever turning the adjusting nut, hold the inner cable with pliers to prevent it from turning.
• Replace the pressure hold valve (PHV) or PHV cable with a new one, if they are defective and/or damaged.



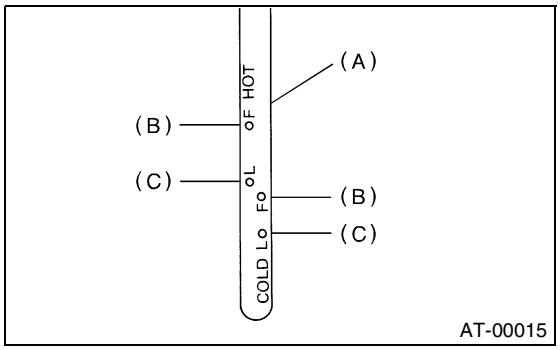
(A) Lock nut
(B) Adjusting nut
(C) Pressure hold valve

16.ATF

A: INSPECTION

CAUTION:
The level of ATF varies with fluid temperature. Pay attention to the fluid temperature when checking ATF level.

1) Raise the ATF temperature by driving a distance of 5 to 10 km (3 to 6 miles). Otherwise, idle the engine to raise ATF temperature to 60 — 80 °C (140 — 176 °F) on Subaru Select Monitor. <Ref. to AT-18, READ CURRENT DATA, OPERATION, Subaru Select Monitor.>
2) Make sure the vehicle is level.
3) After selecting all positions (P, R, N, D, 3, 2, 1), set the select lever in "P" range. Measure the ATF level with the engine idling for one or two minutes.



(A) ATF level gauge
(B) Upper level
(C) Lower level

4) Make sure that ATF level is above the center of upper and lower marks.

NOTE:
When the transmission is hot, the level should be above the center of upper and lower marks, and when it is cold, the level should be found below the center of these two marks.

5) If the ATF level is below the center between upper and lower marks, add the recommended ATF until the ATF level is found above the center between upper and lower marks.

CAUTION:
- **Use care not to exceed the upper limit level.**
- **Remember that the addition of ATF to the upper limit mark when the transmission is cold will result in overfilling of ATF, causing a transmission failure.**

6) Check ATF level after raising ATF temperature to 60 — 80 °C (140 —176 °F) by running the vehicle or by idling the engine again.
7) Check the ATF for leaks.

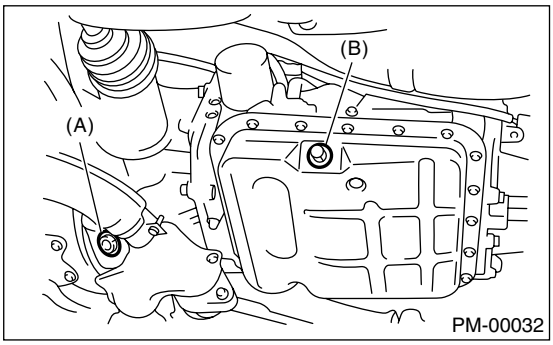
Check for leaks in the transmission. If there are leaks, it is necessary to repair or replace gasket, oil seals, plugs or other parts.

B: REPLACEMENT

1. AUTOMATIC TRANSMISSION FLUID

1) Drain the ATF (Automatic Transmission Fluid) by removing drain plug after allowing the engine to cool for 3 to 4 hours.

NOTE:
Before starting work, cool off the engine well.



(A) Front differential drain plug
(B) ATF drain plug

2) Replace the gasket with a new one, and then tighten the specified torque.

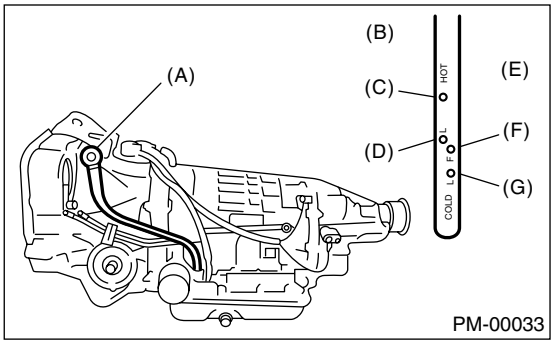
Tightening torque:
25 N·m (2.55 kgf-m, 18.4 ft-lb)

3) Fill ATF up to the middle of the "COLD" side on level gauge by using the gauge hole.

Recommended fluid:
Dexron III type automatic transmission fluid

Fluid capacity:
Fill the same amount drained from ATF drain plug hole.

4) Check the ATF level. <Ref. to PM-24, INSPECTION, ATF.>



(A) Level gauge
(B) Hot side
(C) Upper level
(D) Lower level
(E) Cold side
(F) Upper level
(G) Lower level

2. ATF FILTER

NOTE:
ATF filter is a maintenance free part. ATF filter needs replacement, when it has physically damaged or ATF leaked.

For the replacement procedures of the ATF filter: <Ref. to AT-69, ATF Filter.>

17.Front & Rear Differential Oil

A: REPLACEMENT

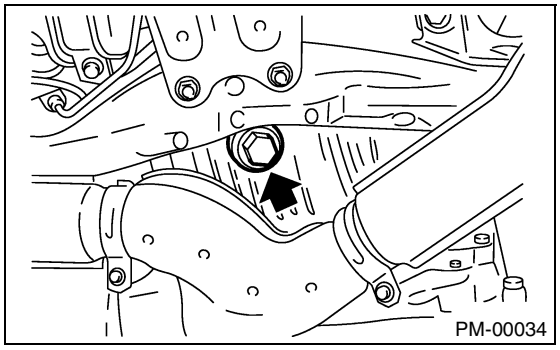
1. FRONT DIFFERENTIAL (MANUAL TRANSMISSION)

For MT vehicle, manual transmission oil works as differential oil to lubricate differential. Refer to “Transmission Oil”. <Ref. to PM-22, Transmission Oil.>

2. FRONT DIFFERENTIAL (AUTOMATIC TRANSMISSION)

1) Drain the differential gear oil by removing drain plug after allowing the engine to cool for 3 to 4 hours.

NOTE:
- Before starting work, cool off the engine well.
- If front differential gear oil adheres to the exhaust pipe, wipe it off completely.



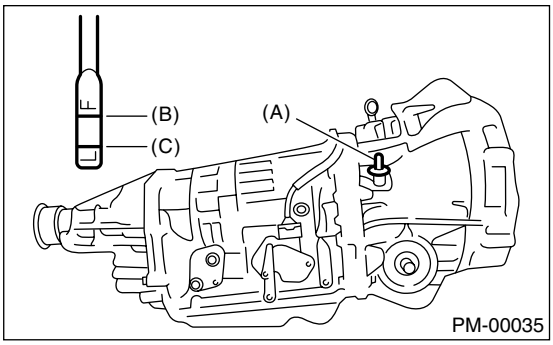
2) Replace the gasket with a new one, and then tighten the drain plug to specified torque.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)

3) Fill differential gear oil through the oil level gauge hole up to the upper point of level gauge.

NOTE:
Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.

Differential gear oil capacity:
1.1 — 1.3 ℓ (1.2 — 1.4 US qt, 1.0 — 1.1 Imp qt)



(A) Oil level gauge
(B) Upper level
(C) Lower level

3. REAR DIFFERENTIAL

1) Drain the oil by removing drain plug.
2) Remove the filler plug for quick draining oil.
3) Install the drain plug after draining oil.

NOTE:
- Apply fluid packing to the drain plug threads except for 2.0 L Non-turbo model.

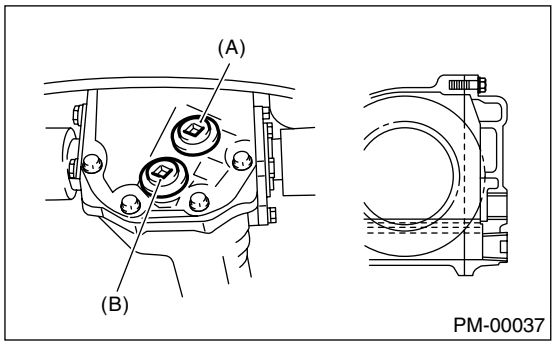
Fluid packing:
Three Bond 1105 (Part No. 004403010)

- Use a new aluminum gasket for 2.0 L Non-turbo model.

Tightening torque:
Except for 2.0 L Non-turbo model:
49.0 N·m (5.0 kgf-m, 36.2 ft-lb)
2.0 L Non-turbo model:
34 N·m (3.5 kgf-m, 25.3 ft-lb)

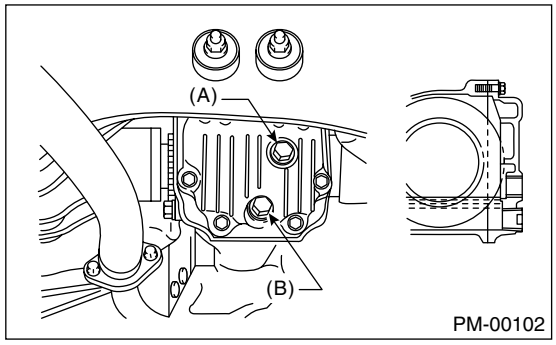
Tightening torque:

4) After installing the drain plug onto rear differential gear case firmly, fill oil up fully to the mouth of filler plug.
EXCEPT FOR 2.0L NON-TURBO MODEL



(A) Filler plug
(B) Drain plug

2.0L NON-TURBO MODEL



(A) Filler plug
(B) Drain plug

Oil capacity:
0.8 ℓ (0.8 US qt, 0.7 Imp qt)

NOTE:
Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.

5) Install the filler plug onto rear differential gear case firmly.

NOTE:
• Apply fluid packing to the filler plug threads except for 2.0 L Non-turbo model.

Fluid packing:
Three Bond 1105 (Part No. 004403010)

• Use a new aluminum gasket for 2.0 L Non-turbo model.

Tightening torque:
Except for 2.0 L Non-turbo model:
49.0 N·m (5.0 kgf-m, 36.2 ft-lb)
2.0 L Non-turbo model:
34 N·m (3.5 kgf-m, 25.3 ft-lb)

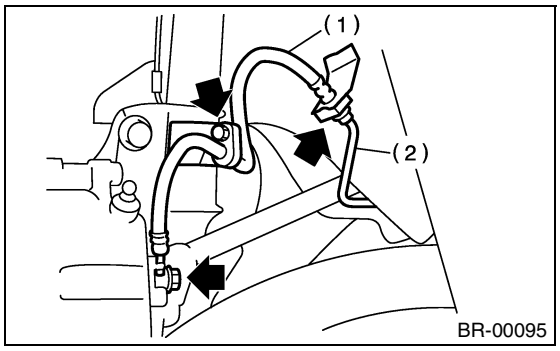
18.Brake Line

A: INSPECTION

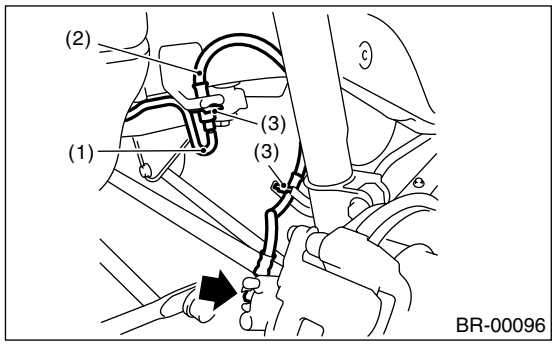
1. BRAKE LINE

1) Check scratches, swelling, corrosion, traces of fluid leakage on the brake hoses or pipe joints.
2) Check the possibility of adjacent parts interfering with brake pipes/hoses during driving, and loose connections/clamps.
3) Check any trace of fluid leakage, scratches, etc. on the master cylinder, wheel cylinder and pressure control valve.

NOTE:
• When the brake fluid level in the reservoir tank is lower than the specified limit, the brake fluid warning light on the combination meter will come on.
• Visually check the brake hose (using a mirror where it is difficult to see) for any damage.



(1) Front brake hose
(2) Front brake pipe



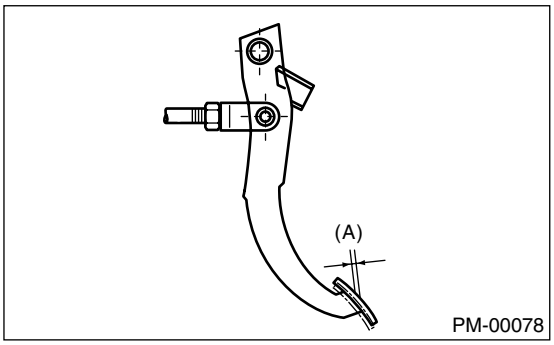
(1) Rear brake pipe
(2) Brake hose
(3) Clamp

B: CHECKING

1. SERVICE BRAKE

1) Check the free play of brake pedal with a force of less than 10 N (1 kgf, 2 lb).

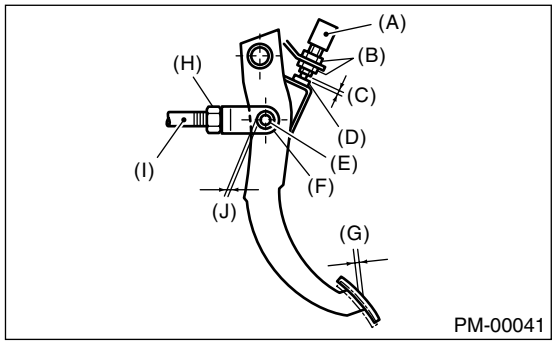
Brake pedal free play:
0.5 — 2.0 mm (0.02 — 0.08 in)



(A) Brake pedal free play

2) If the free play is out of specifications above, adjust the brake pedal as follows:
(1) Be sure the engine is off. (No vacuum is applied to brake booster.)
(2) There should be play between brake booster clevis and pin at brake pedal installing portion.
[Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lb) to a stroke of 0.5 to 2.0 mm (0.02 to 0.08 in).]
(3) Depress the surface of brake pad by hand.

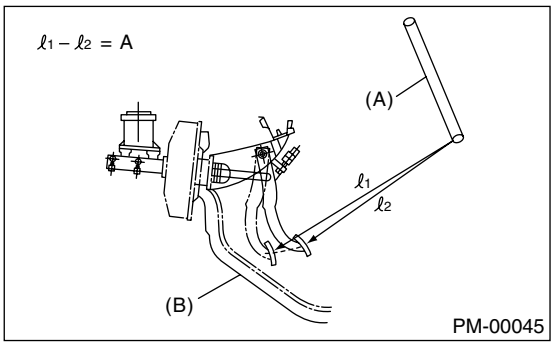
(4) If there is no free play between clevis pin and clevis, turn the brake switch adjusting nut until the clearance between stopper and screw of brake switch becomes 0.3 mm (0.012 in).



(A) Brake switch
(B) Adjusting nut
(C) 0.3 mm (0.012 in)
(D) Stopper
(E) Clevis pin
(F) Clevis
(G) Brake pedal free play
(H) Lock nut
(I) Brake booster operating rod
(J) Play at pin

3) Check the pedal stroke.
While the engine is idling, depress the brake pedal with a 490 N (50 kgf, 110 lb) load and measure the distance between brake pedal and steering wheel. With the brake pedal released, measure the distance between pedal and steering wheel again. The difference between the two measurements must be less than specified value. If the distance is more than specified, there is possibility of air inside the hydraulic unit.

Brake pedal reserve distance: A
For Australia
105 mm (4.13 in)/ 490 N (50 kgf, 110 lb) or less
Except for Australia
90 mm (3.54 in)/ 490 N (50 kgf, 110 lb) or less

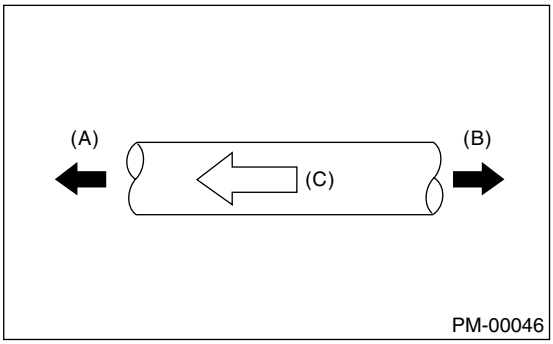


(A) Steering wheel
(B) Toe board

4) Check to see if air is in the hydraulic brake line by the feel of pedal operation. If air appears to exist in the line, bleed it from the system.
5) Check for even operation of all brakes, using a brake tester or by driving the vehicle for a short distance on a straight road.

2. BRAKE SERVO SYSTEM

1) With the engine off, depress the brake pedal several times applying the same pedal force: Make sure the travel distance should not change.
2) With the brake pedal depressed, start the engine: Make sure the pedal should move slightly toward the floor.
3) With the brake pedal depressed, stop the engine and keep the pedal depressed for 30 seconds: Make sure the pedal height should not change.
4) Check valve is built into the vacuum hose. Disconnect the vacuum hose to inspect function of check valve.
Blow air into the vacuum hose from its brake booster side end: Air must flow out of engine side end of hose. Next blow air into the hose from engine side: Air should not flow out of hose.
Replace both check valve and vacuum hose if the check valve is faulty. Engine side of vacuum hose is indicated by marking “ENG” as shown.



(A) Engine side
(B) Brake booster side
(C) ENG

5) Check the vacuum hose for cracks or other damage.

NOTE:
When installing the vacuum hose on the engine and brake booster, do not use soapy water or lubricating oil on their connections.

6) Check vacuum hose to make sure it is tight and secure.

19.Brake Fluid

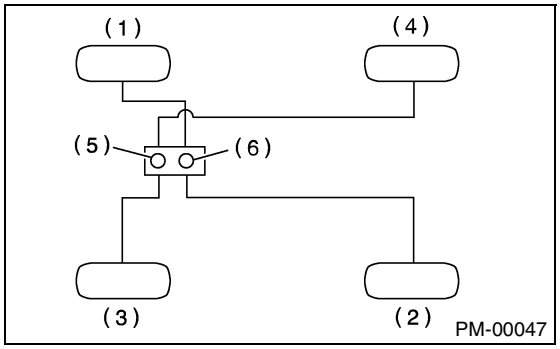
A: REPLACEMENT

1) Either jack-up the vehicle and place a safety stand under it, or lift-up the vehicle.
2) Remove both front and rear wheels.
3) Draw out the brake fluid from master cylinder with syringe.
4) Refill the reservoir tank with recommended brake fluid.

Recommended brake fluid:
FMVSS No. 116, fresh DOT3 or 4 brake fluid

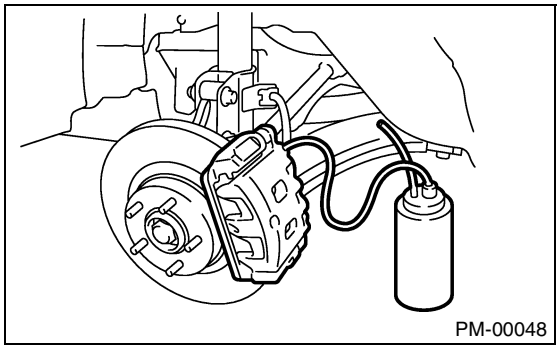
NOTE:
• Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.

Bleeding sequence (1) → (2) → (3) → (4)



(1) Front right
(2) Rear left
(3) Front left
(4) Rear right
(5) Secondary
(6) Primary

5) Install one end of a vinyl tube onto the air bleeder and insert the other end of the tube into a container to collect the brake fluid.



NOTE:
• Cover the bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
• During the bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
• The brake pedal operating must be very slow.
• For convenience and safety, two people should do the work.
• The amount of brake fluid required is approx. 500 mℓ (16.9 US fl oz, 17.6 Imp fl oz) for total brake system.

6) Instruct your co-worker to depress the brake pedal slowly two or three times and then hold it depressed.
7) Loosen the bleeder screw approx. 1/4 turn until a small amount of brake fluid drains into container, and then quickly tighten the screw.
8) Repeat steps 6) and 7) above until there are no air bubbles in the drained brake fluid and new fluid flows through vinyl tube.

NOTE:
Add brake fluid as necessary while performing the air bleed operation, in order to prevent the tank from running short of brake fluid.

9) After completing the bleeding operation, hold brake pedal depressed and tighten the screw and install bleeder cap.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

10) Bleed air from each wheel cylinder by following the previous 5 steps.
11) Depress the brake pedal with a force of approx. 294 N (30 kgf, 66 lb) and hold it there for approx. 20 seconds. At this time check the pedal to see if it makes any unusual movement. Visually inspect the bleeder screws and brake pipe joints to make sure that there is no fluid leakage.
12) Install the wheels, and drive the vehicle for a short distance between 2 to 3 km (1 to 2 miles) to make sure that brakes are operating properly.

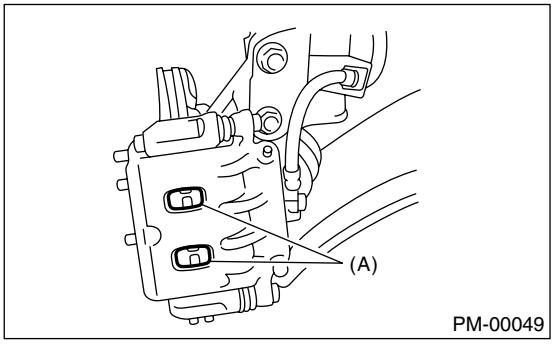
20.Disc Brake Pads and Discs

A: INSPECTION

1. DISC BRAKE PAD AND DISC

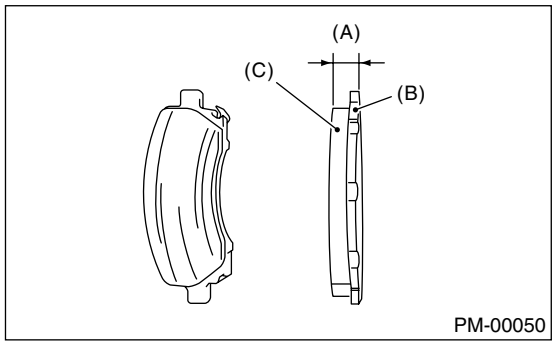
1) Jack-up the vehicle and support with rigid racks. Then remove the wheels.
2) Visually check the pad thickness through inspection hole of disc brake assembly. Replace the pad if necessary.

NOTE:
When replacing a pad, always replace the pads for both the right and left wheels at the same time. Also replace the pad clips if they are twisted or worn.



(A) Inspection hole

Pad thickness including back metal mm (in)		
	Front	Rear
Standard	17 (0.67)	14 (0.55)
Service limit	7.5 (0.295)	6.5 (0.256)



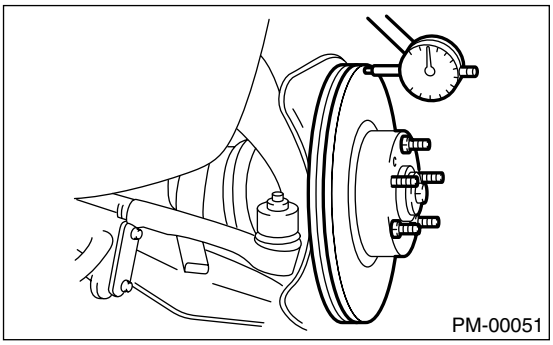
(1) Thickness of pad
(2) Back metal
(3) Lining

3) Check the disc rotor, and correct or replace if it is damaged or worn.

Brake disc thickness mm (in)		
	Front	Rear
Standard	24 (0.94)	10 (0.39)
Wear limit	22 (0.87)	8.5 (0.335)

4) Remove the caliper body. <Ref. to BR-21, Front Disc Brake Assembly.>, <Ref. to BR-27, Rear Disc Brake Assembly.>
5) Tighten the wheel nuts to secure disk rotor.
6) Set a dial gauge at a point less than 10 mm (0.39 in) from outer periphery of rotor, and then measure the disk rotor runout.

Disc rotor runout limit:
Front: 0.075 mm (0.0030 in)
Rear: 0.070 mm (0.0028 in)



21.Brake Linings and Drums

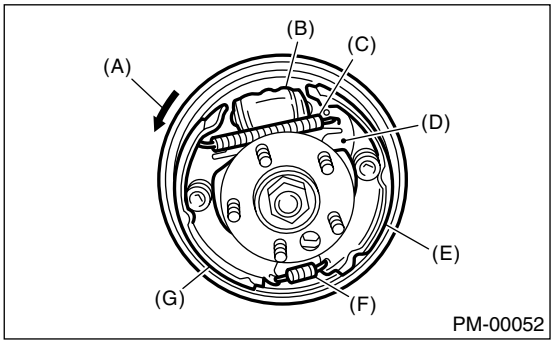
A: INSPECTION

1. REAR DRUM BRAKE

1) Remove the brake drum, and check that there is no fluid leakage from wheel cylinder.
If there is fluid leakage from wheel cylinder, inspect the wheel cylinder, and then repair or replace it.
2) Inspect the brake shoes for damage or deformities and check brake linings for wear.

NOTE:
• Always replace both leading and trailing brake shoes for the right and left wheels at the same time.
• When either the right and left brake assembly is replaced, always replace the leading shoe and trailing shoe of the other.

Thickness of lining (except back metal)
Standard value: 4.1 mm (0.161 in)
Service limit: 1.5 mm (0.059 in)

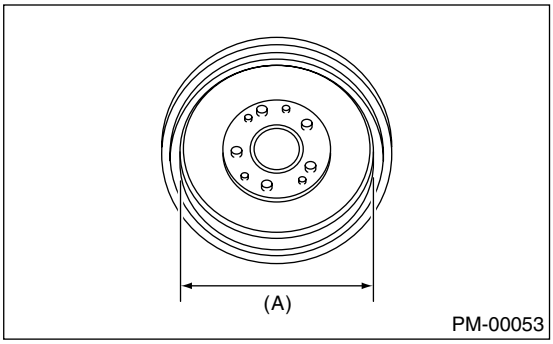


(A) Rotational direction of drum (Forward)
(B) Wheel cylinder
(C) Upper shoe return spring
(D) Adjusting lever
(E) Trailing shoe
(F) Lower shoe return spring
(G) Leading shoe

3) Check the brake drum for wear, dents or other damage.
If the inside surface of brake drum is streaked, correct the surface with emery cloth (#200 or more). If it is unevenly worn, tapered, or the outside surface of brake drum is damaged, correct or replace it.

Brake drum inner diameter
Standard value: 228.6 mm (9.000 in)
Service limit: 230.6 mm (9.079 in)

If deformation or wear of back plate, shoe, etc. is noticeable, replace the affected parts.



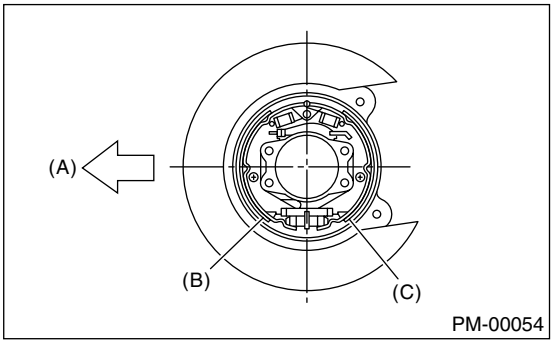
(A) Inside diameter

2. PARKING BRAKE (REAR DISC BRAKE)

Inspect the brake linings and drums of both sides of the rear brake at the same time by removing brake drums.
1) Inspect the brake shoes for damage or deformation and check brake linings for wear.

NOTE:
Always replace both primary and secondary brake shoes for the right and left wheels at the same time.

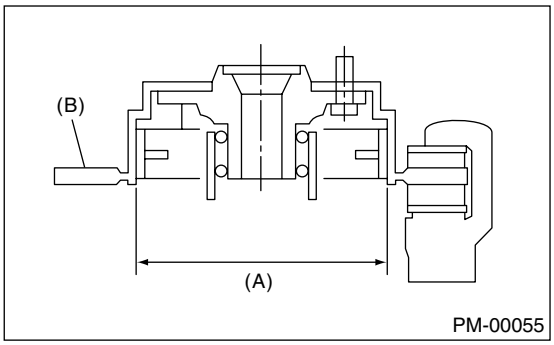
Brake lining thickness (except back metal)
Standard value: 3.2 mm (0.126 in)
Wear limit: 1.5 mm (0.059 in)



(A) Forward
(B) Brake shoe (Primary side)
(C) Brake shoe (Secondary side)

2) Check the disk rotor for wear, dents or other damage. If the inside surface of disk rotor is streaked, correct the surface with emery cloth (#200 or more). If it is unevenly worn or tapered, correct or replace it.

Brake drum inside diameter
Standard value: 170 mm (6.69 in)
Wear limit: 171 mm (6.73 in)



(A) Inside diameter
(B) Disk

3) If the deformation or wear of back plate, shoe, etc. is noticeable, replace them.
4) When the shoe return spring tension is excessively weakened, replace it.

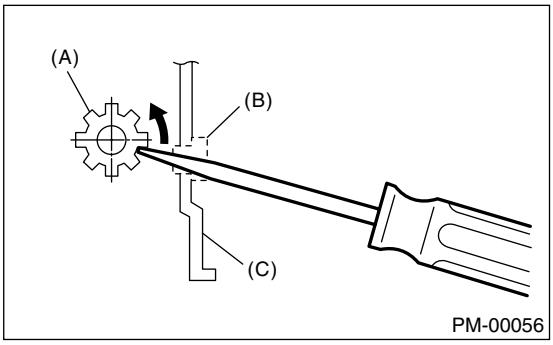
B: ADJUSTMENT

1. REAR DRUM BRAKE

The main brake is adjusted automatically, and so there is no need to adjust it.

2. PARKING BRAKE (REAR DISC BRAKE)

For rear disc brake, adjust the parking brake after bleeding air.
1) Remove the rear cover (rubber) installed at back plate.
2) Turn the adjuster toward arrow mark (upward) until it is locked slightly, by using a flat tip screwdriver as shown in illustration.



(A) Adjuster
(B) Cover (rubber)
(C) Back plate

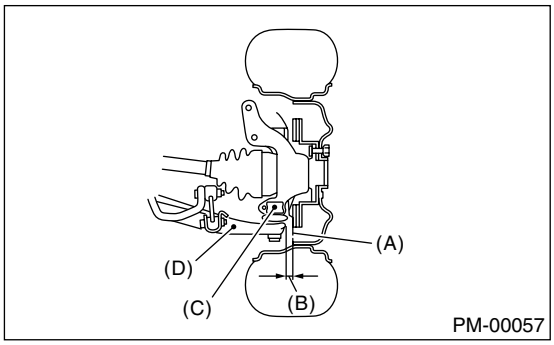
3) Turn back (downward) the adjuster 3 to 4 notches.
4) Install the cover (rubber) at original position correctly.

22.Suspension

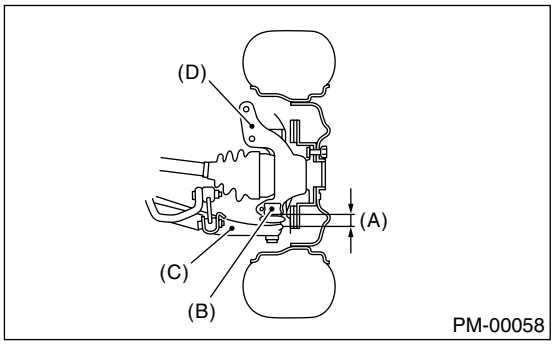
A: INSPECTION

1. SUSPENSION BALL JOINT

1) Jack-up the vehicle until front wheels are off ground.
2) Next, grasp the bottom of tire and move it in and out. If relative movement (B) is observed between the brake disc cover (A) and end of transverse link (D), ball joint (C) may be excessively worn.



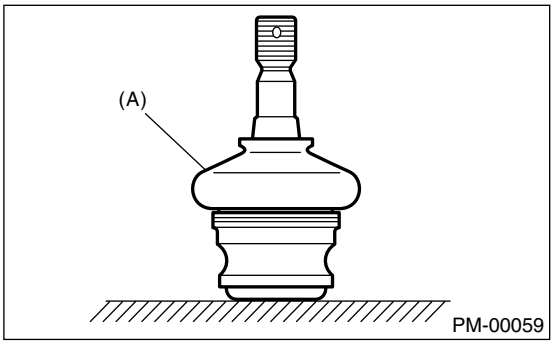
3) Next, grasp the end of transverse link and move it up and down. Relative movement (A) between the housing (D) and transverse link (C) boss indicates ball joint (B) may be excessively worn.



4) If relative movement is observed in the immediately preceding two steps, remove and inspect the ball joint. If free play exceeds standard, replace the ball joint. <Ref. to FS-18, Front Ball Joint.>
5) Damage of dust seal
Visually inspect the ball joint dust seal. If it is damaged, remove the transverse link. <Ref. to FS-16, Front Transverse Link.> And measure free play of ball joint. <Ref. to FS-18, Front Ball Joint.>

(1) When looseness exceeds standard value, replace the ball joint.
(2) If the dust seal is damaged, replace with the new ball joint.

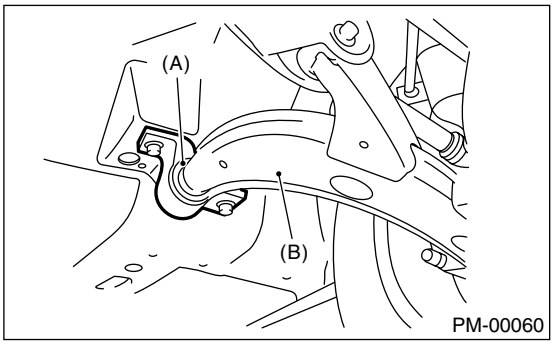
NOTE:
When the transverse link ball joint has been removed or replaced, check the toe-in of front wheel. If the front wheel toe-in is not at specified value, adjust the toe-in. <Ref. to FS-7, Wheel Alignment.>



(A) Dust seal

2. TRANSVERSE LINK'S REAR BUSHING

Check oil leaks at around liquid-filled bushing. If oil leaks, replace the bushing.



(A) Rear bushing
(B) Transverse link

3. WHEEL ARCH HEIGHT

1) Unload cargoes and set the vehicle in curb weight (empty) condition.
2) Then, check the wheel arch height of front and rear suspensions to ensure that they are within specified values. <Ref. to FS-7, Wheel Alignment.>
3) When the wheel arch height is out of standard, visually inspect the following components and replace deformed parts.
- Suspension components [Front strut assembly and rear shock absorber assembly]
- Parts connecting between suspension and body.

4) When no components are deformed, adjust the wheel arch height by replacing coil spring in the suspension which wheel arch height is out of standard. <Ref. to FS-7, Wheel Alignment.> <Ref. to RS-9, Wheel Alignment.>

4. WHEEL ALIGNMENT OF FRONT SUSPENSION

1) Check the alignment of front suspension to ensure that following items conform to standard values.
- Toe-in
- Camber angle
- Caster angle
- Steering angle

<Ref. to FS-7, Wheel Alignment.>
2) When the caster angle does not conform to reference, visually inspect the following components and replace deformed parts.
- Suspension components [Strut assembly, crossmember, transverse link, etc.]
- Body parts to which suspensions are installed.

3) When the toe-in and camber are out of standard value, adjust them so that they conform to respective service standard.
4) When the right-and-left turning angles of tire are out of standard, adjust to standard value.

5. WHEEL ALIGNMENT OF REAR SUSPENSION

1) Check the alignment of rear suspension to ensure that following items are within standard values.
- Toe-in
- Camber angle
- Thrust angle

<Ref. to RS-9, Wheel Alignment.>
2) When the camber angle does not conform to reference, visually inspect parts listed below. If deformation is observed, replace the damaged parts.
- Suspension components [Shock absorber, link F, link R, link UPR, arm R, sub frame, etc.]
- Body parts to which suspensions are installed.

3) When the toe-in and thrust angle are out of standard value, adjust them so that they conform to respective service standard.

6. OIL LEAKAGE OF STRUT

Visually inspect the front strut and rear strut for oil leakage as instructed. Replace front strut and rear strut if oil leaks excessively.

7. TIGHTNESS OF BOLTS AND NUTS

Check the bolts and nuts shown in the figure for looseness. Retighten the bolts and nuts to specified torque. If the self-lock nuts and bolts are removed, replace them with new ones.
Front suspension: <Ref. to FS-2, General Description.>
Rear suspension: <Ref. to RS-2, General Description.>

8. DAMAGE TO SUSPENSION PARTS

1) Check the following parts and the fastening portion of the vehicle body for deformation or excessive rusting which impairs the suspension. If necessary, replace the damaged parts with new ones. If minor rust formation, pitting, etc. are noted, remove the rust and apply remedial anti-corrosion measures.
- Front suspension
  - Transverse link
  - Crossmember
  - Strut
- Rear suspension
  - Crossmember
  - Lateral links
  - Trailing link
  - Strut
- In the district where salt is sprayed to melt snow on a road in winter, check suspension parts for damage caused by rust every 12 months after lapse of 60 months. Take rust prevention measure as required.

23.Wheel Bearing

A: INSPECTION

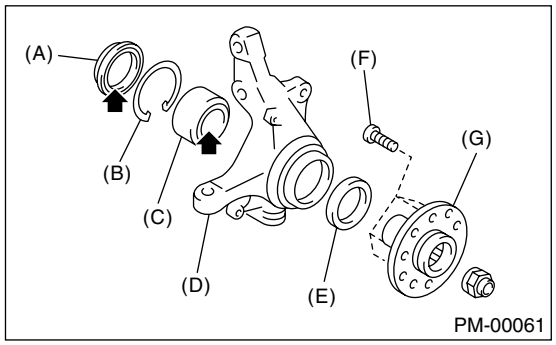
1. FRONT WHEEL BEARING

NOTE:
Inspect the condition of front wheel bearing grease.

1) Jack-up the front of vehicle.
2) While holding the front wheel by hand, swing it in and out to check bearing free play.
3) Loosen the wheel nuts and remove front wheel.
4) If bearing free play exists in step 2) above, attach a dial gauge to the hub and measure axial displacement in axial direction.

Service limit:
Straight-ahead position within 0.05 mm (0.0020 in)

5) Remove the bolts and self-locking nuts, and extract transverse link from front crossmember.
6) Remove the AAR of front drive shaft from transmission. <Ref. to DS-17, Front Axle.>
7) While supporting the front drive shaft horizontally with one hand, turn the hub with the other to check for noise or binding.
If the hub is noisy or binds, disassemble the front axle and check condition of oil seals, bearing, etc.



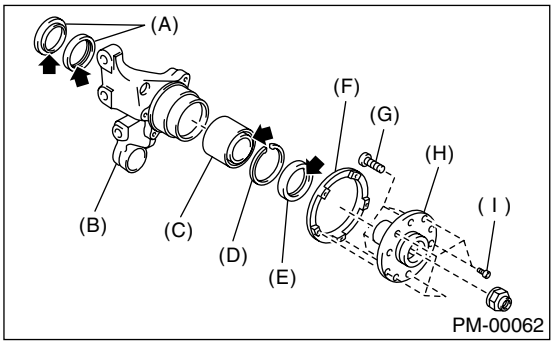
(A) Inner oil seal
(B) Snap ring
(C) Bearing
(D) Hausing
(E) Outer oil seal
(F) Hub bolt
(G) Hub

2. REAR WHEEL BEARING

1) Jack-up the rear of vehicle.
2) While holding the rear wheel by hand, swing it in and out to check bearing free play.
3) Loosen the wheel nuts and remove rear wheel.
4) If the bearing free play exists in step 2) above, attach a dial gauge to the hub COMPL and measure axial displacement in axial direction.

Service limit:
Straight-ahead position within 0.05 mm (0.0020 in)

5) Remove the DOJ of rear drive shaft from rear differential. <Ref. to DS-37, Rear Drive Shaft.>
6) While supporting the rear drive shaft horizontally with one hand, turn the hub COMPL with the other to check for noise or binding.
If the hub COMPL is noisy or binds, disassemble the rear axle and check condition of oil seals, bearings, etc.



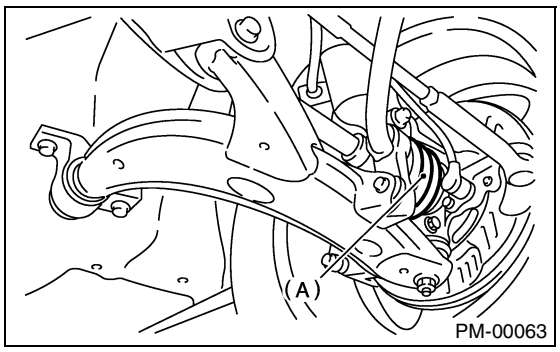
(A) Inner oil seal
(B) Rear housing
(C) Bearing
(D) Snap ring
(E) Outer oil seal
(F) Tone wheel
(G) Hub bolt
(H) Hub
(I) Socket bolt

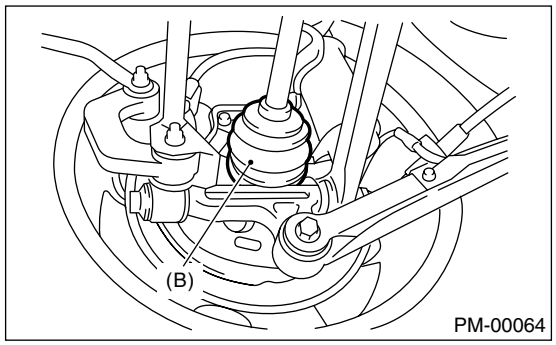
24.Axle Boots & Joints

A: INSPECTION

1. FRONT AND REAR AXLE BOOTS

Inspect the front axle boots (A) and rear axle boots (B) for deformation, damage or failure. If faulty, replace them with new ones. <Ref. to DS-31, Front Drive Shaft.> <Ref. to DS-37, Rear Drive Shaft.>





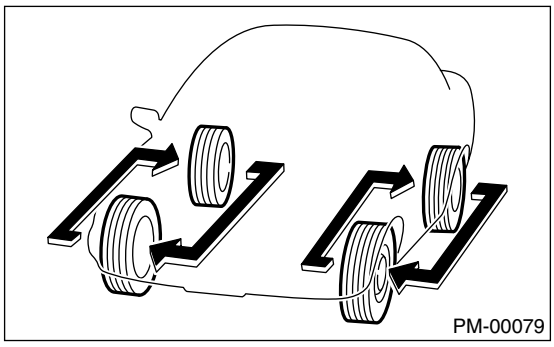
2. PROPELLER SHAFT

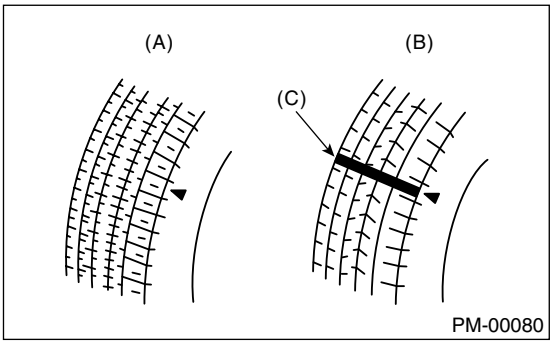
Inspect the propeller shaft for damage or failure. If faulty, replace with a new one. <Ref. to DS-14, Propeller Shaft.>

25.Tire Rotation

A: INSPECTION

1) Replace the tire if the tread depth is less than 1.6 mm (0.063 in) or if wear indicators appear across the tire tread. (It is recommended that both right and left tires are replace as a set.)
2) Adjust the wheel alignment if abnormally uneven tire wear is found.
3) Also, rotate the tires between the front and rear tires as illustrared, in order to ensure uniform tire wear.





(A) New tread
(B) Worn tread
(C) Tread wear indicator

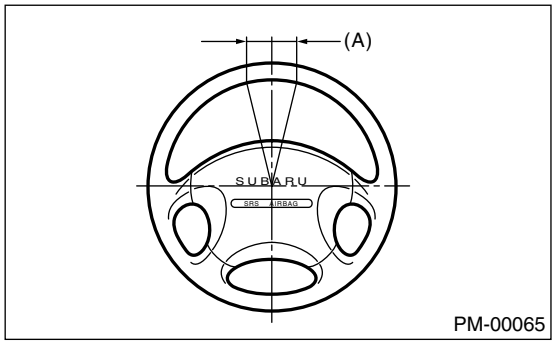
26.Steering System (Power Steering)

A: INSPECTION

1. STEERING WHEEL

1) Set the steering wheel in a straight-ahead position, and check the wheel spokes to make sure they are correctly set in their specified positions.
2) Lightly turn the steering wheel to the right and left to determine the point where front wheels start to move.
Measure the distance of the movement of steering wheel at the outer periphery of wheel.

Steering wheel free play:
0 — 17 mm (0 — 0.67 in)



(A) Steering wheel free play

Move the steering wheel vertically toward the shaft to ascertain if there is play in the direction.

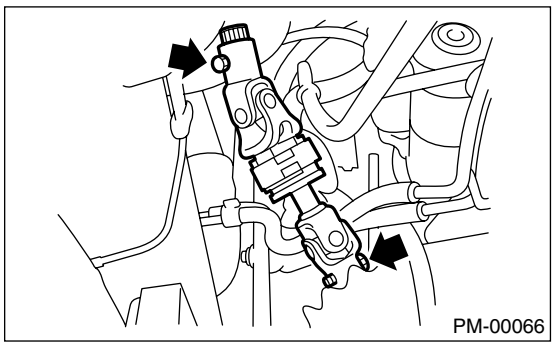
Maximum permissible play:
0.5 mm (0.020 in)

3) Drive the vehicle and check the following items during operation.
(1) Steering force:
The effort required for steering should be smooth and even at all points, and should not vary.
(2) Pull to one side:
Steering wheel should not be pulled to either side while driving on a level surface.
(3) Wheel runout:
Steering wheel should not show any sign of runout.
(4) Return factor:
Steering wheel should return to its original position after it has been turned and then released.

2. STEERING SHAFT JOINT

1) When the steering wheel free play is excessive, disconnect the universal joint of steering shaft and check it for any play and yawing torque (at the point of the crossing direction). Also inspect for any damage to sealing or worn serrations. If the joint is loose, retighten the mounting bolts to the specified torque.

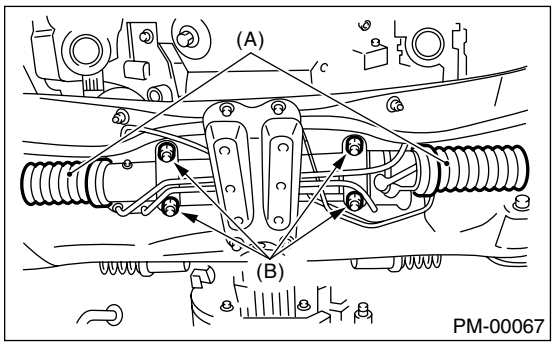
Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)



3. GEARBOX

1) With wheels placed on a level surface, turn the steering wheel 90° in both the right and left directions.
While the wheel is being rotated, reach under the vehicle and check for looseness in gearbox.

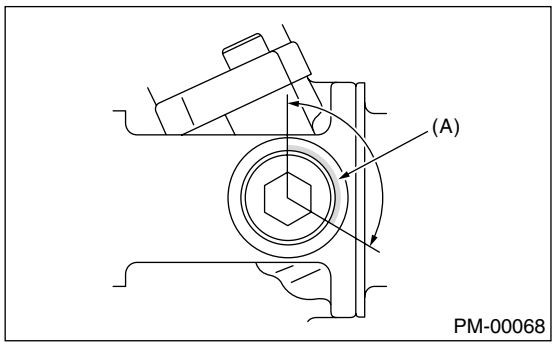
Tightening torque:
59 N·m (6.0 kgf-m, 43.4 ft-lb)



(A) Boot
(B) Gear box mounting bolt

2) Check the boot for damage, cracks or deterioration.
3) With the vehicle on a level surface, quickly turn the steering wheel to the right and left.
While the steering wheel is being rotated, check the gear backlash. If any unusual noise is noticed, adjust the gear backlash in the following manner.
(1) Tighten the adjusting screw to 7.4 N·m (0.75 kgf-m, 5.4 ft-lb) and then loosen. Repeat this operation twice.

(2) Retighten the adjusting screw to 7.4 N·m (0.75 kgf-m, 5.4 ft-lb) and back off 25°.
(3) Apply liquid packing to at least 1/3 of entire perimeter of adjusting screw thread.



(A) Apply liquid packing to at least 1/3 of entire perimeter

(4) Install the lock nut. While holding the adjusting screw with a wrench, tighten the lock nut using ST.

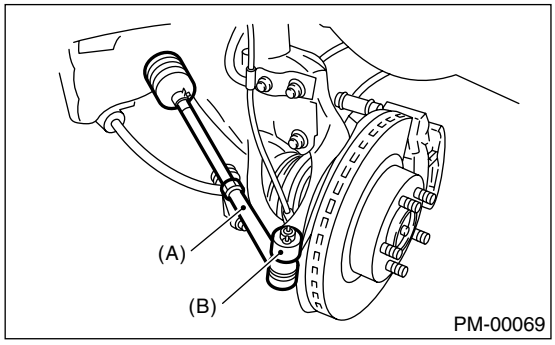
ST 926230000 SPANNER

Tightening torque (Lock nut):
39 N·m (4.0 kgf-m, 29 ft-lb)

Hold the adjusting screw with a wrench to prevent it from turning, while tightening the lock nut.

4. TIE-ROD

1) Check the tie-rod and tie-rod ends for bends, scratches or other damage.



(A) Tie-rod end
(B) Knuckle arm

2) Check the connections of knuckle ball joints for play, inspect for damage on dust seals, and check free play of ball studs. If the castle nut is loose, retighten it to the specified torque, then tighten further up to 60° until the cotter pin hole is aligned.

Tightening torque:
27 N·m (2.75 kgf-m, 19.9 ft-lb)

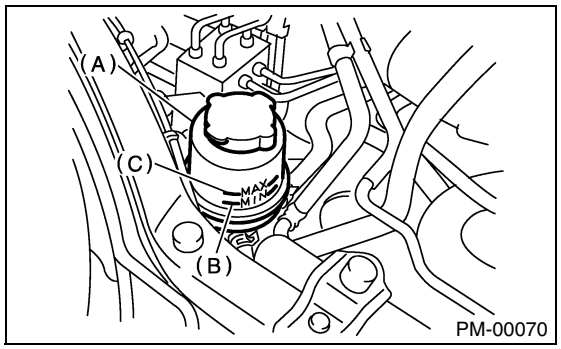
3) Check the lock nut on tie-rod end for tightness. If it is loose, retighten it to the specified torque.

Tightening torque:
83 N·m (8.5 kgf-m, 61.5 ft-lb)

5. POWER STEERING FLUID LEVEL

NOTE:
• Check at power steering fluid temperature 20°C (68°F); read the fluid level on the “COLD” side.
• Check at power steering fluid temperature 80°C (176°F); read the fluid level on the “HOT” side.

1) Place the vehicle with engine “OFF” on a flat and level surface.
2) Check the fluid level using the scale on the outside of reservoir tank (A). If the level is below “MIN” (B), add fluid to bring it up to “MAX” (C).



NOTE:
If the fluid level is at MAX level or above, drain fluid to keep the level in specified range of indicator by using a syringe or the like.

Recommended fluid:
Dexron III

Fluid capacity:
0.7 ℓ (0.7 US qt, 0.6 Imp qt)

6. POWER STEERING FLUID FOR LEAKS

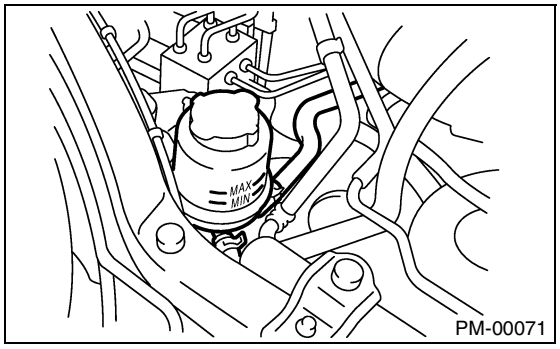
Inspect the underside of oil pump and gearbox for power steering system, hoses, piping and their couplings for fluid leaks.
If fluid leaks are found, correct them by retightening their fitting bolts (or nuts) and/or replacing their parts.

NOTE:
• Wipe the leakage fluid off after correcting fluid leaks, or a wrong diagnosis is taken later.
• Also pay attention to clearances between hoses (or pipings) and other parts when inspecting fluid leaks.

7. HOSES OF OIL PUMP FOR DAMAGES

Check the pressure hose and return hose of oil pump for crack, swell or damage. Replace the hose with a new one if necessary.

NOTE:
Prevent the hoses from revolving and/or turning when installing hoses.



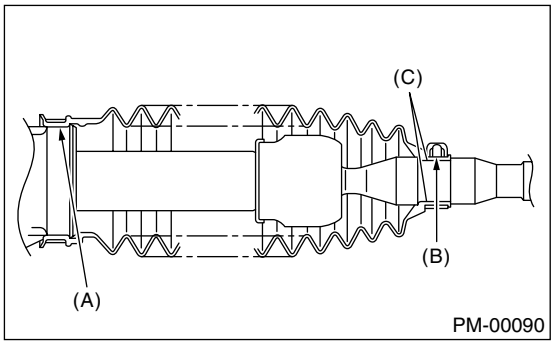
8. POWER STEERING PIPES FOR DAMAGE

Check the power steering pipes for corrosion and damage.
Replace the pipes with a new one if necessary.

9. GEARBOX BOOTS

Inspect both sides of gearbox boots as follows, and correct the defects if necessary.
1) (A) and (B) positions of gearbox boot are fitted correspondingly in (A) and (B) grooves of gearbox and the rod (C).
2) Clips are fitted outside of (A) and (B) positions of boot.
3) Boot does not have crack and hole.

NOTE:
Rotate (B) the position of gearbox boot against twist of it produced by adjustment of toe-in, etc.



10.FITTING BOLTS AND NUTS

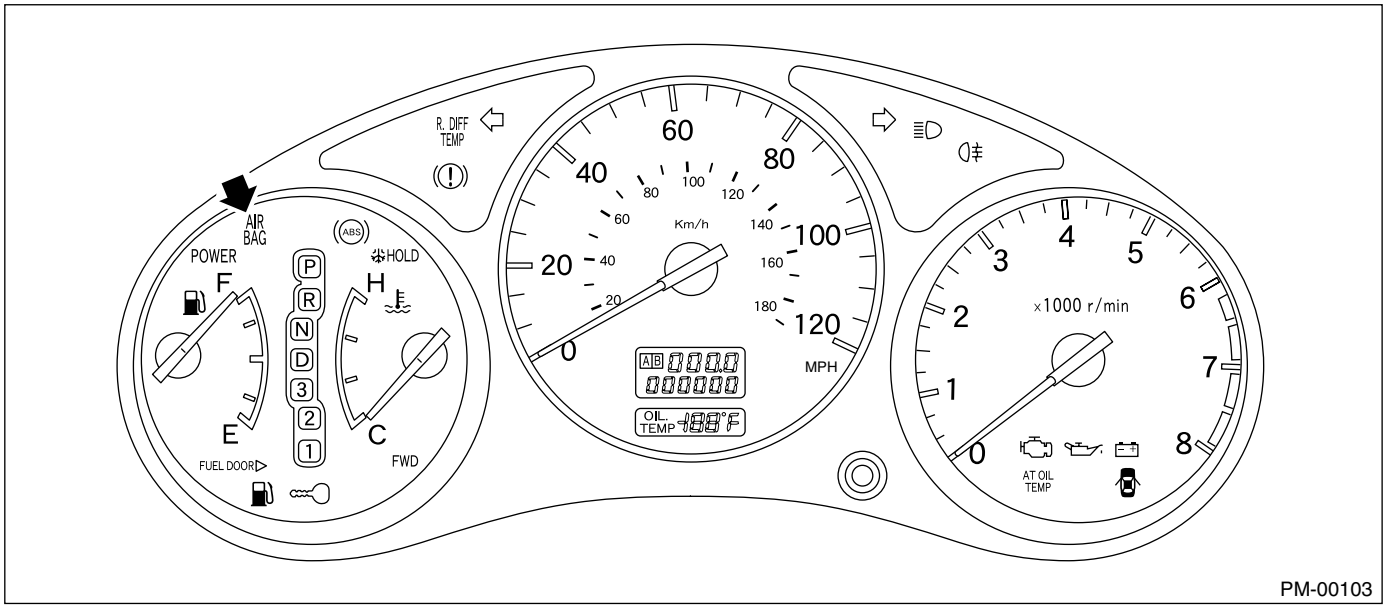
Inspect the fitting bolts and nuts of oil pump and bracket for looseness, and retighten them if necessary.
Inspect and/or retighten them when engine is cold.

27.Supplemental Restraint System

A: INSPECTION

Check the airbag system in accordance with the result of the self-diagnosis. <Ref. to AB-2, Basic Diagnostic Procedure.>

1) Ensure that airbag connectors are connected. If not, properly connect. When the ignition switch is turned ON with the connector(s) disconnected, the airbag warning light blinks to identify the fault.



PM-00103

2) Turn the ignition switch to ON, and connect the airbag diagnosis terminal of the service connector (located below lower cover) to ground terminal.

3) The warning light blinks to indicate a trouble code (a fault is identified). When the airbag system is in good order (no trouble codes are stored in the memory), the warning light blinks on and off at 0.6 second intervals (as long as the diagnosis terminal is connected to ground terminal).

4) When the warning light indicates a trouble code, check the airbag system in accordance with the trouble-shooting procedure. <Ref. to AB-2, Basic Diagnostic Procedure.>

ENGINE 1 SECTION

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FUEL INJECTION (FUEL SYSTEMS)	FU(SOHC)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(SOHC)
INTAKE (INDUCTION)	IN(SOHC)
MECHANICAL	ME(SOHC)
EXHAUST	EX(SOHC)
COOLING	CO(SOHC)
LUBRICATION	LU(SOHC)
SPEED CONTROL SYSTEMS	SP(SOHC)
IGNITION	IG(SOHC)
STARTING/CHARGING SYSTEMS	SC(SOHC)
ENGINE (DIAGNOSTICS)	EN(SOHC)

FUEL INJECTION (FUEL SYSTEMS)

FU(SOHC)

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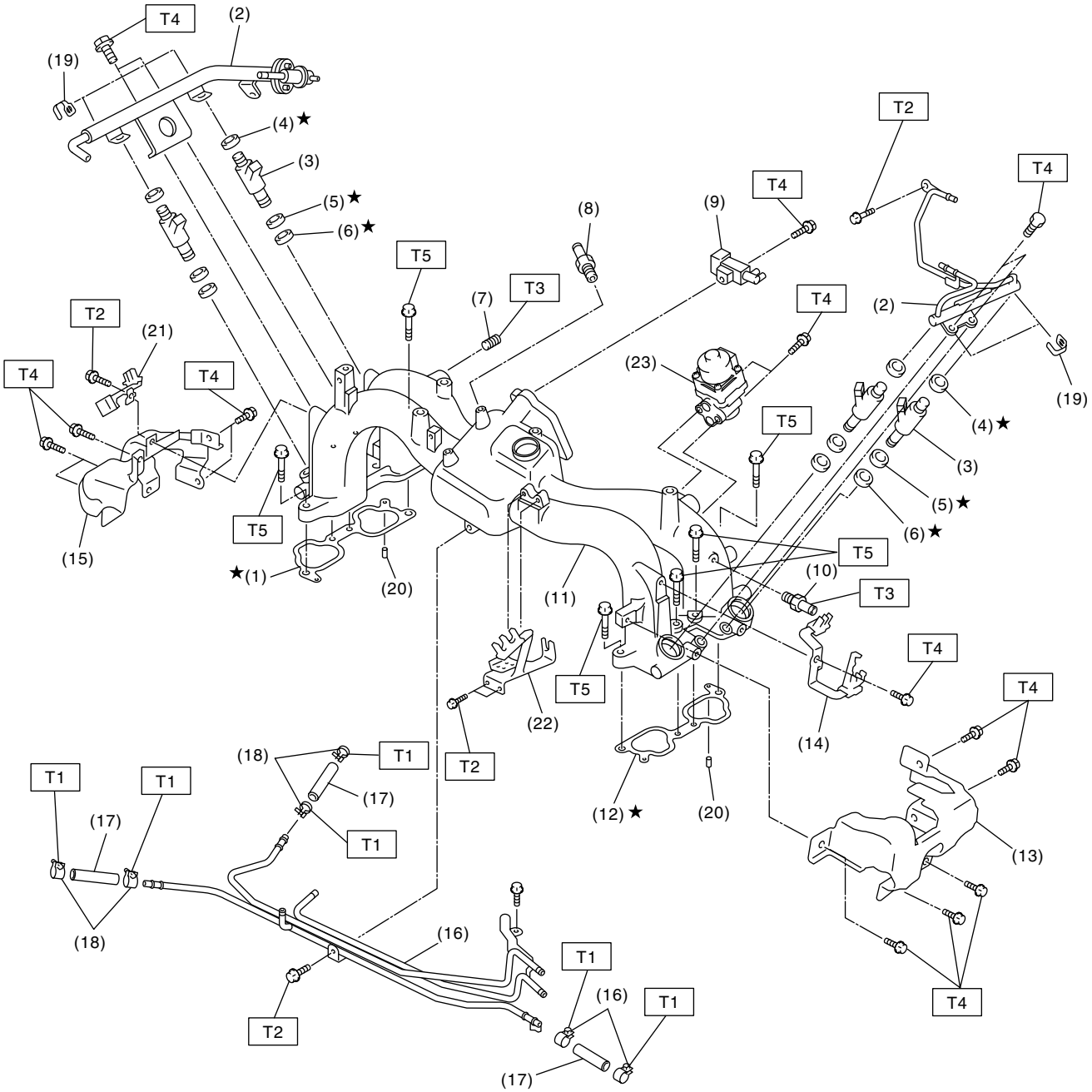
1. General Description

A: SPECIFICATIONS

Model		Specification
Fuel tank	Capacity	60 ℓ (15.9 US gal, 13.2 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	370 — 677 kPa (3.77 — 6.9 kg/cm^2, 53.6 — 98 psi)
	Discharge flow	More than 65 ℓ (17.2 US gal, 14.3 Imp gal)/h [12 V at 300 kPa (3.06 kg/cm^2, 43.5 psi)]
Fuel filter		Cartridge type

B: COMPONENT

1. INTAKE MANIFOLD

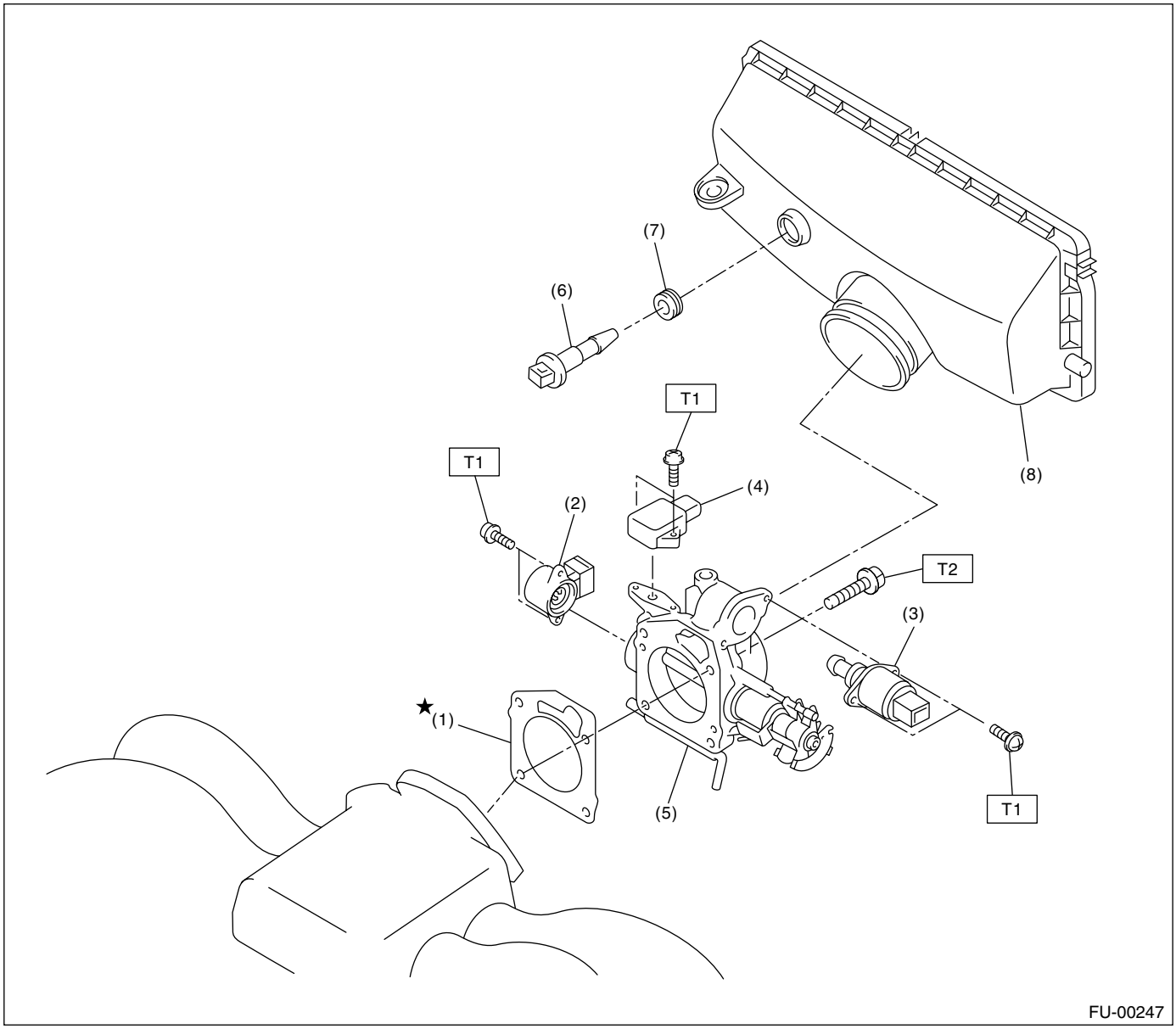


FU-00377

(1) Intake manifold gasket RH
(2) Fuel injector pipe
(3) Fuel injector
(4) O-ring
(5) O-ring
(6) O-ring
(7) Plug
(8) PCV valve
(9) Purge control solenoid valve
(10) Nipple
(11) Intake manifold
(12) Intake manifold gasket LH
(13) Fuel pipe protector LH
(14) Plug cord holder LH
(15) Fuel pipe protector RH
(16) Fuel pipe ASSY
(17) Fuel hose
(18) Clip
(19) Clip
(20) Guide pin
(21) Plug cord holder RH
(22) Accelerator cable bracket
(23) EGR valve

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.5 (0.15, 1.1)
T2: 5.0 (0.51, 3.7)
T3: 17 (1.7, 12.5)
T4: 19 (1.9, 13.7)
T5: 25 (2.5, 18.1)

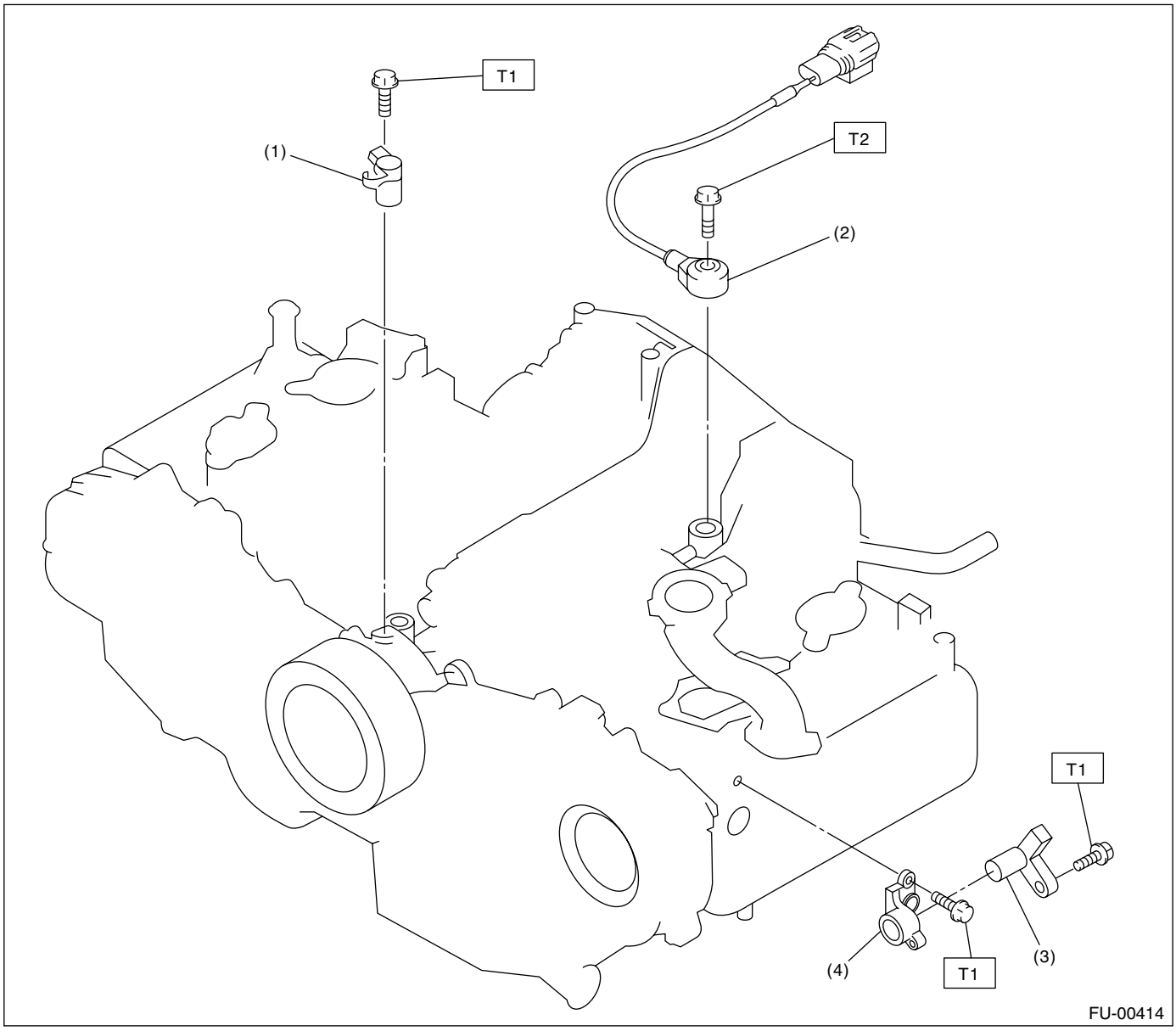
2. AIR INTAKE SYSTEM



(1) Gasket
(2) Throttle position sensor
(3) Idle air control solenoid valve
(4) Pressure sensor
(5) Throttle body
(6) Intake air temperature sensor
(7) Grommet
(8) Air cleaner case

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.6 (0.16, 1.2)
T2: 22 (2.2, 15.9)

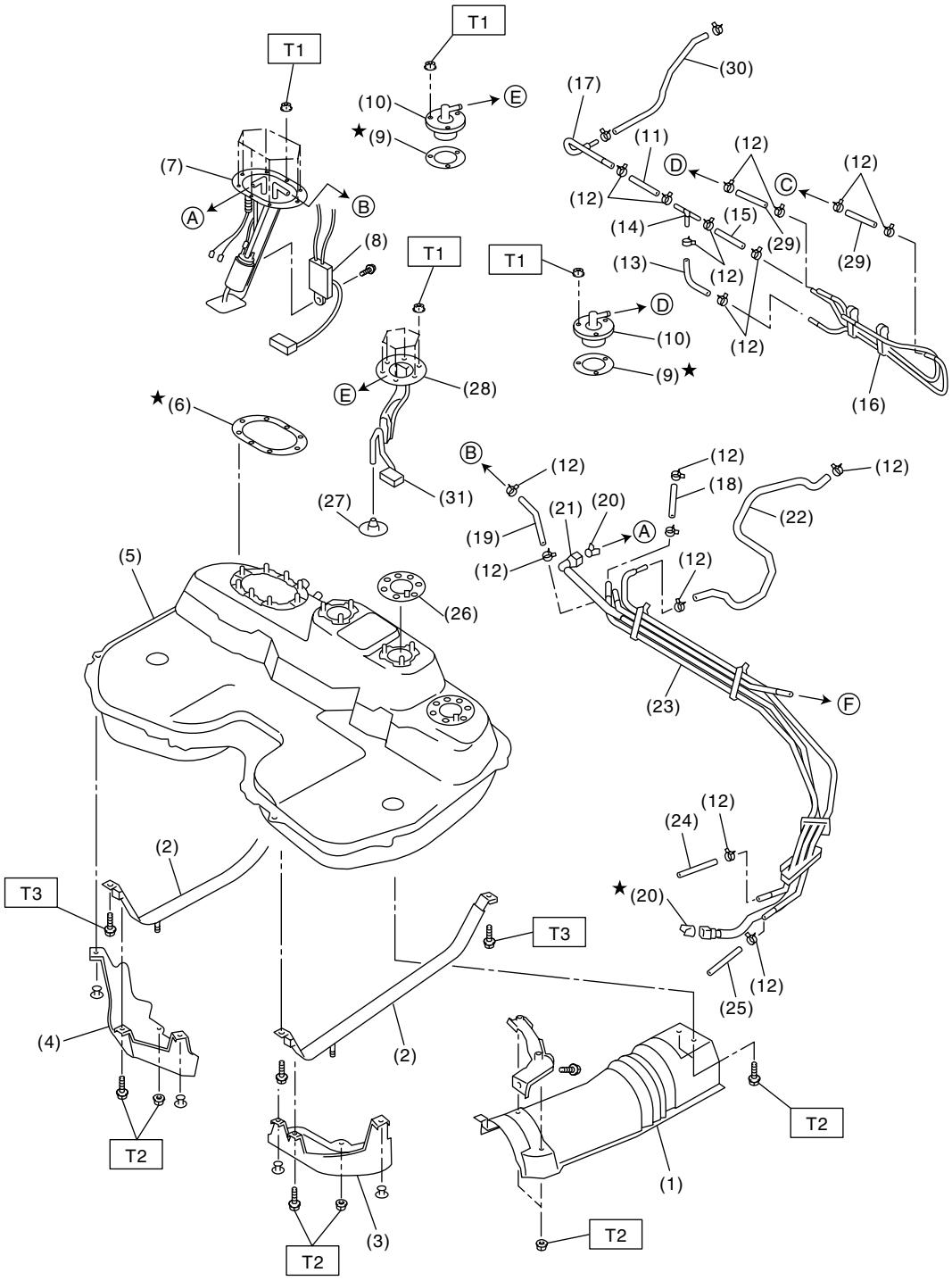
3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



(1) Crankshaft position sensor
(2) Knock sensor
(3) Camshaft position sensor
(4) Camshaft position sensor support

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 24 (2.4, 17.4)

4. FUEL TANK

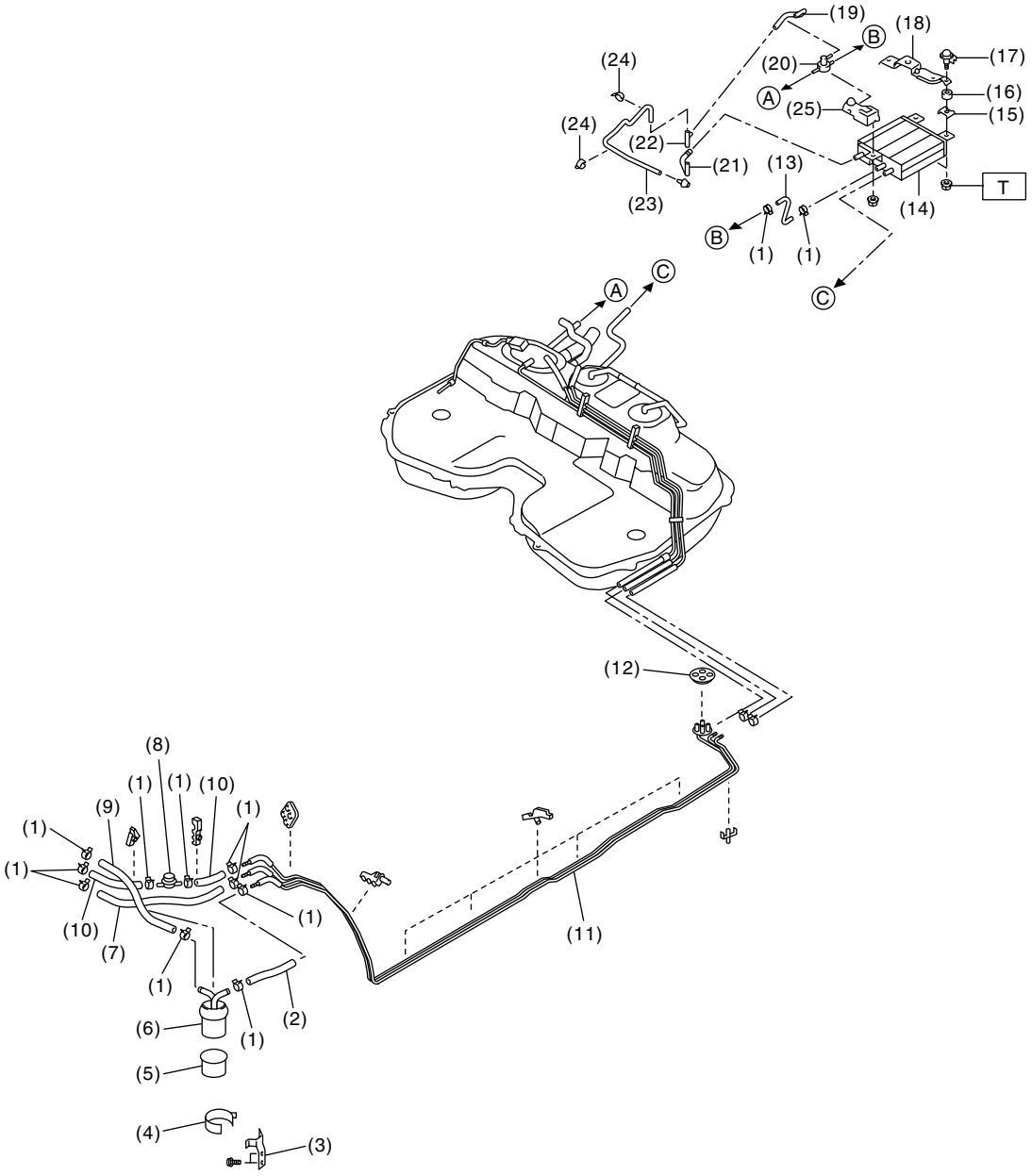


FU-00004

(1) Heat shield cover
(2) Fuel tank band
(3) Protector LH
(4) Protector RH
(5) Fuel tank
(6) Fuel pump gasket
(7) Fuel pump ASSY
(8) Fuel meter unit
(9) Fuel cut valve gasket
(10) Fuel cut valve
(11) Evaporation hose A
(12) Clip
(13) Evaporation hose B
(14) Joint pipe
(15) Evaporation hose C
(16) Evaporation pipe ASSY
(17) Evaporation pipe
(18) Evaporation hose D
(19) Fuel return hose A
(20) Retainer
(21) Quick connector
(22) Evaporation hose E
(23) Fuel pipe ASSY
(24) Evaporation hose F
(25) Fuel return hose B
(26) Fuel sub meter gasket
(27) Jet pump filter
(28) Fuel sub meter unit
(29) Evaporation hose G
(30) Evaporation hose H

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 7.4 (0.75, 5.4)
T3: 33 (3.4, 24.3)

5. FUEL LINE

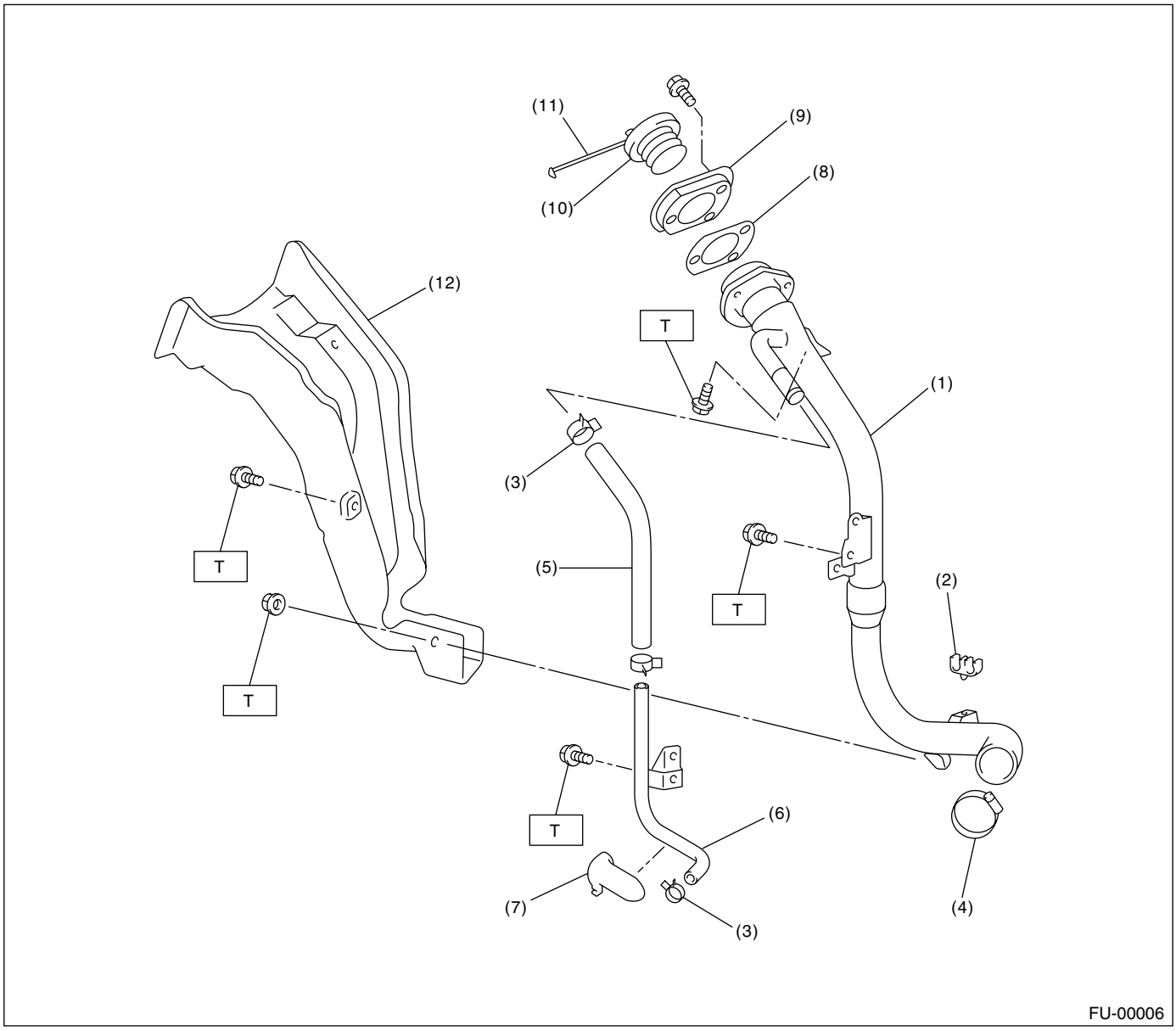


FU-00516

(1) Clip
(2) Fuel delivery hose A
(3) Fuel filter bracket
(4) Fuel filter holder
(5) Fuel filter cup
(6) Fuel filter
(7) Evaporation hose
(8) Fuel damper
(9) Fuel delivery hose B
(10) Fuel return hose
(11) Fuel pipe ASSY
(12) Grommet
(13) Canister hose A
(14) Canister
(15) Canister bracket plate
(16) Cushion
(17) Canister bracket spacer
(18) Rear canister bracket
(19) Two-way valve return hose
(20) Two-way valve
(21) Two-way valve drain hose A
(22) Connector
(23) Two-way valve drain hose B
(24) Clamp
(25) Front canister bracket

Tightening torque: N·m (kgf-m, ft-lb)
T: 23 (2.3, 17.0)

6. FUEL FILLER PIPE



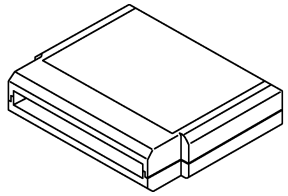
(1) Fuel filler pipe ASSY
(2) Evaporation hose holder
(3) Clip
(4) Clamp
(5) Air vent hose
(6) Air vent pipe
(7) Air vent pipe holder
(8) Filler pipe packing
(9) Filler ring
(10) Filler cap
(11) Filler cap tether
(12) Filler pipe protector

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect negative terminal from battery.
- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

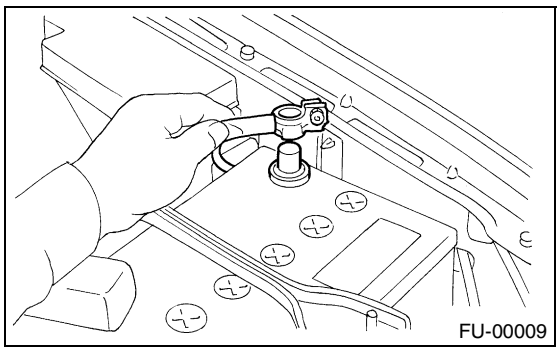
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA210	24082AA210 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical system.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

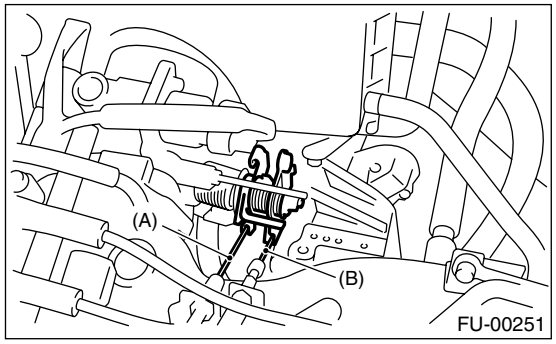
2. Throttle Body

A: REMOVAL

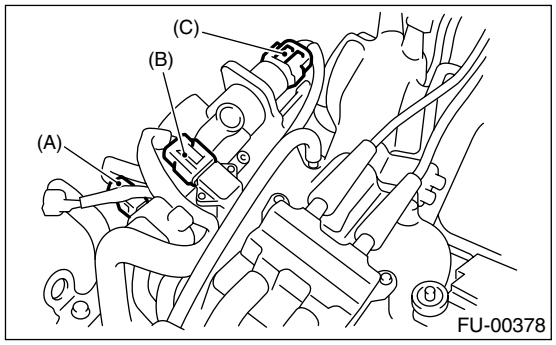
1) Disconnect the ground cable from battery.



2) Remove the air cleaner case.<Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
3) Disconnect the accelerator cable (A).
4) Disconnect the cruise control cable (B). (With cruise control model)

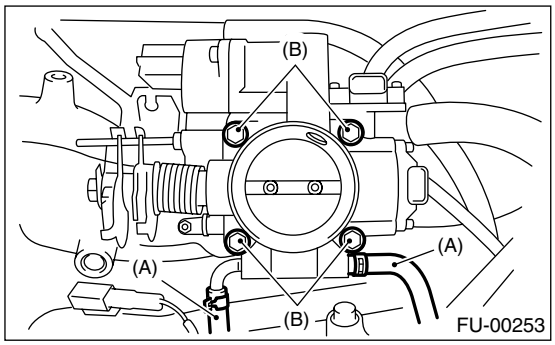


5) Disconnect the connectors from idle air control solenoid valve, throttle position sensor and pressure sensor.



(A) Throttle position sensor
(B) Pressure sensor
(C) Idle air control solenoid valve

6) Disconnect the engine coolant hoses (A) from the throttle body.
7) Remove the bolts (B) which install throttle body to the intake manifold.



B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
Replace the gasket with a new one.

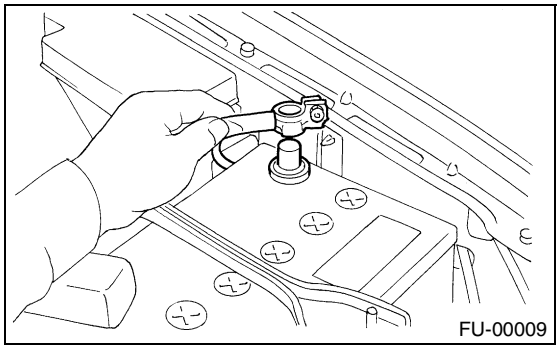
Tightening torque:
Throttle body;
22 N·m (2.2 kgf-m, 15.9 ft-lb)

2) Adjust the accelerator cable play. <Ref. to SP(SOHC)-9, INSTALLATION, Accelerator Control Cable.>

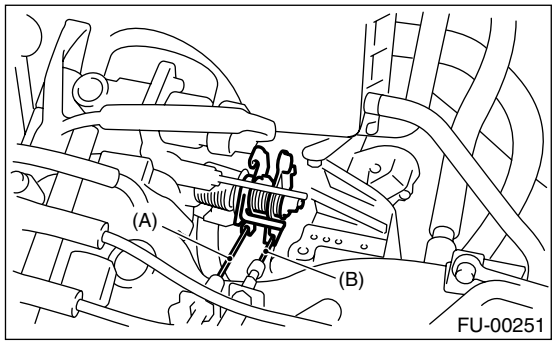
3. Intake Manifold

A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(SOHC)-49, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel flap lid, and remove the fuel filler cap.
3) Disconnect the ground cable from battery.

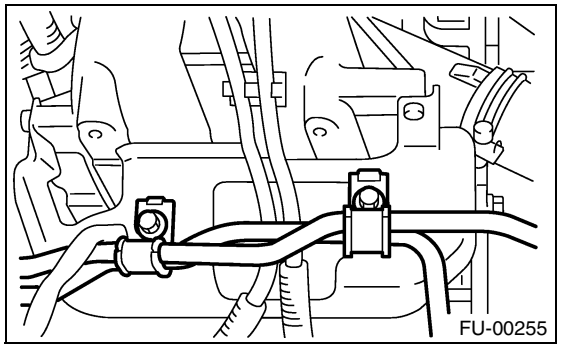


4) Remove the air intake duct and air cleaner case. <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
5) Disconnect the accelerator cable (A).
6) Disconnect the cruise control cable (B). (With cruise control model)

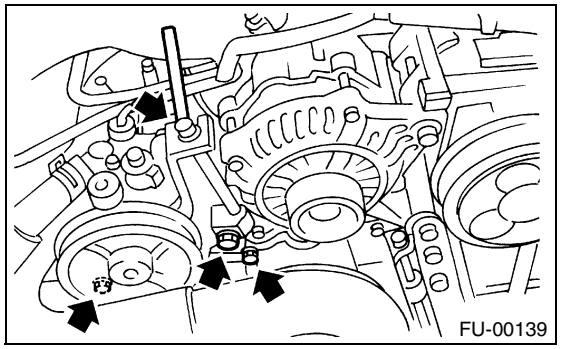


7) Remove the power steering pump and reservoir tank from bracket.
(1) Remove the resonator chamber. <Ref. to IN(SOHC)-8, REMOVAL, Resonator Chamber.>
(2) Remove the front side V-belt. <Ref. to ME(SOHC)-41, REMOVAL, V-belt.>
(3) Remove the bolts which hold power steering pipes onto the intake manifold protector.

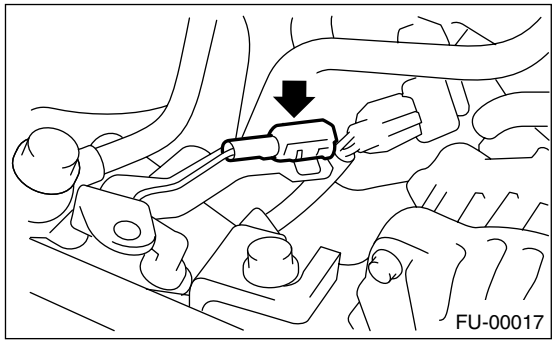
NOTE:
Do not disconnect the power steering hose.



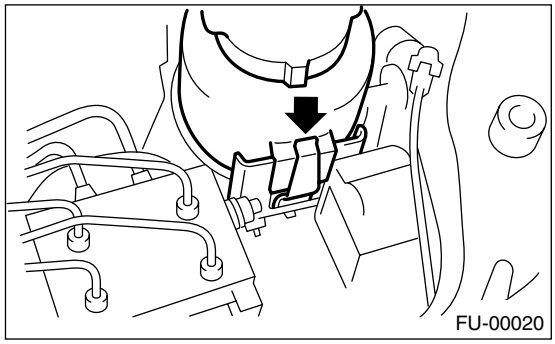
(4) Remove the bolts which install power steering pump bracket.



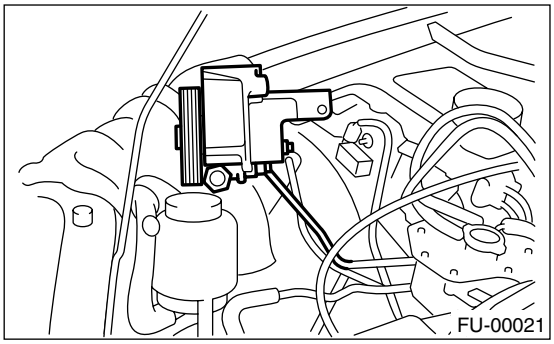
(5) Disconnect the connector from the power steering pump switch.



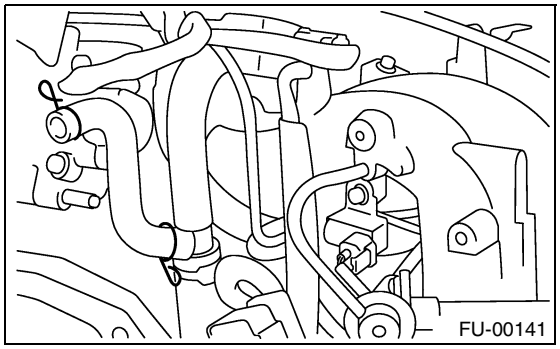
(6) Remove the power steering tank from the bracket by pulling it upwards.



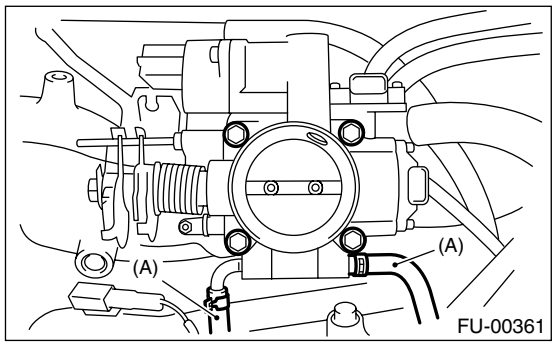
(7) Place the power steering pump on the right side wheel apron.



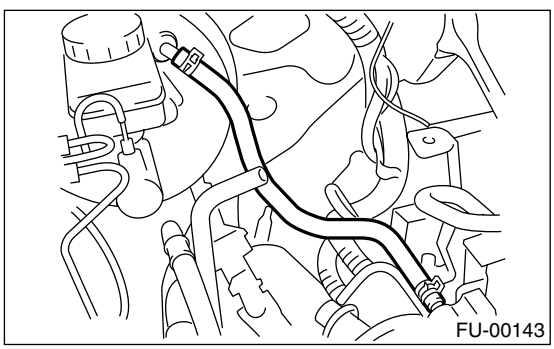
8) Disconnect the spark plug cords from the spark plugs.
9) Disconnect the PCV hose from the intake manifold.



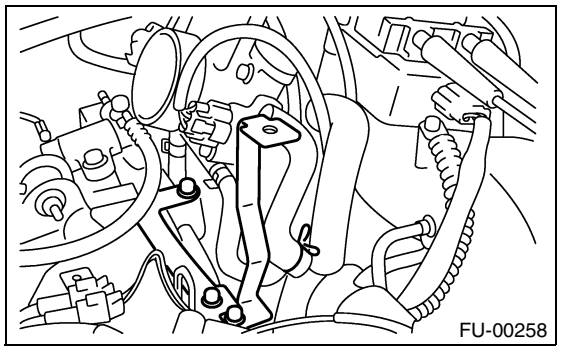
10) Disconnect the engine coolant hose (A) from the throttle body.



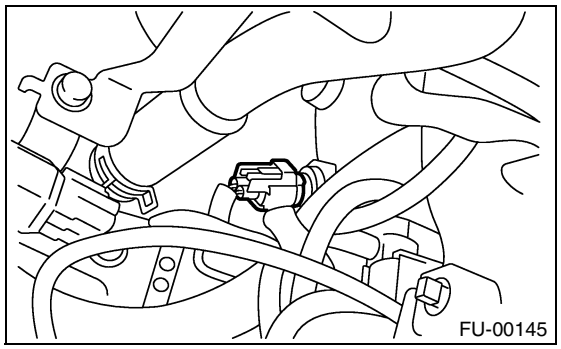
11) Disconnect the brake booster hose.



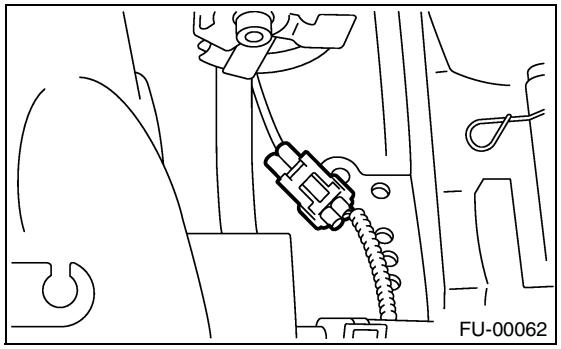
12) Remove the air cleaner case stay RH and engine harness bracket, and disconnect the engine harness connectors from the bulkhead harness connectors.



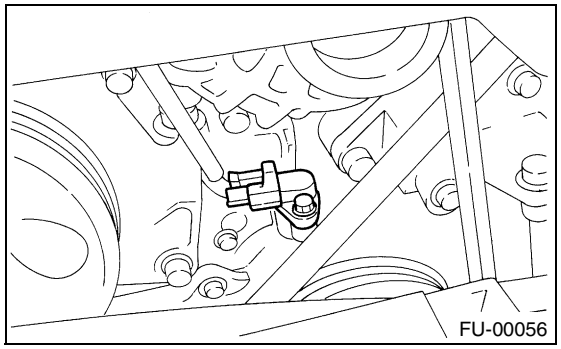
13) Disconnect the connectors from the engine coolant temperature sensor.



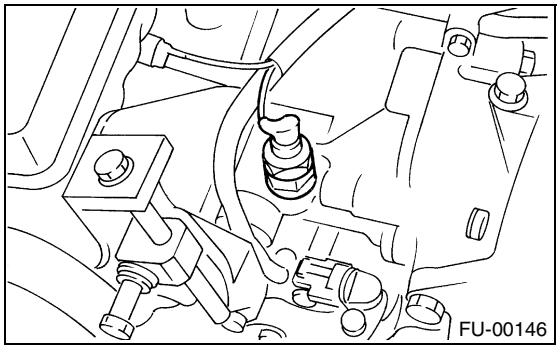
14) Disconnect the knock sensor connector.



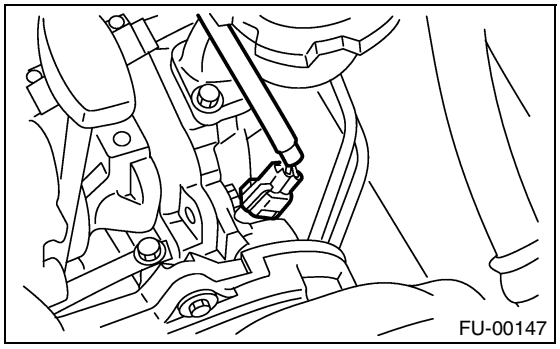
15) Disconnect the connector from the crankshaft position sensor.



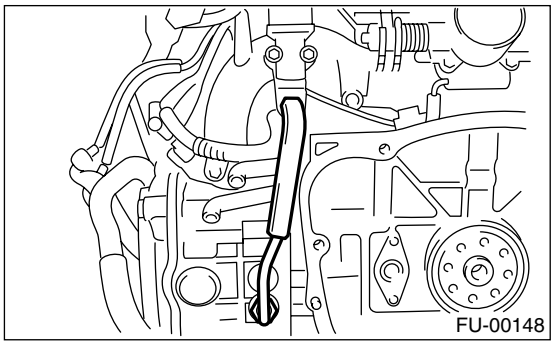
16) Disconnect the connector from the oil pressure switch.



17) Disconnect the connector from the camshaft position sensor.

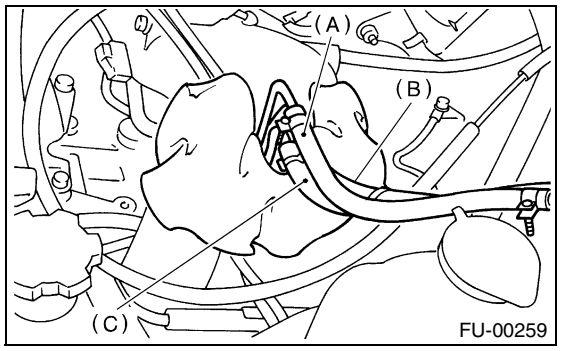


18) Remove the EGR pipe from intake manifold.



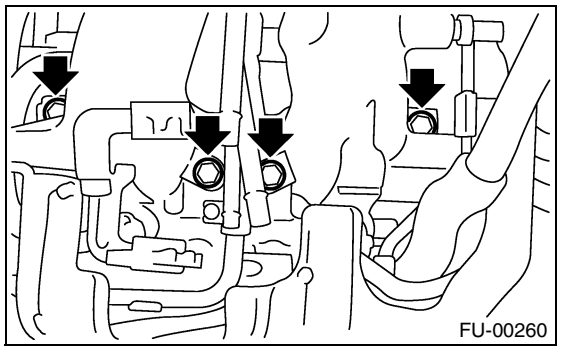
19) Disconnect the fuel hoses from the fuel pipes.

WARNING:
- **Do not spill fuel.**
- **Catch fuel from hoses in a container or cloth.**



(A) Fuel delivery hose
(B) Return hose
(C) Evaporation hose

20) Remove the bolts which hold intake manifold onto the cylinder heads.



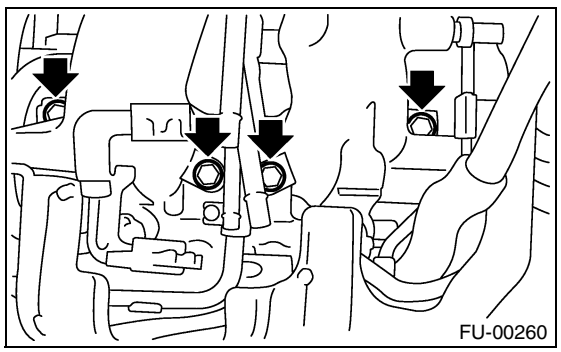
21) Remove the intake manifold.

B: INSTALLATION

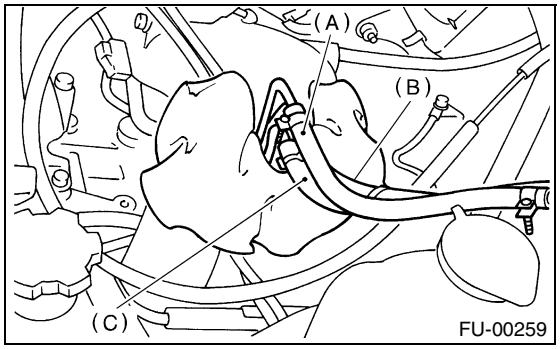
1) Install the intake manifold onto the cylinder heads.

NOTE:
Replace the gaskets with new ones.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



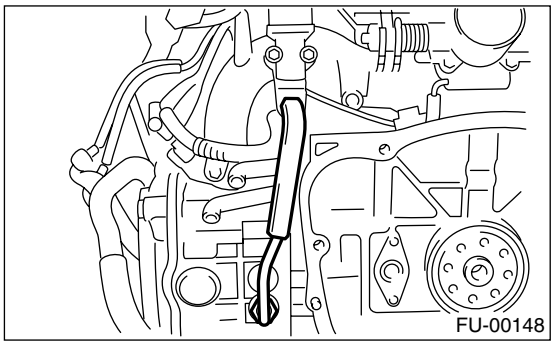
2) Connect the fuel hoses.



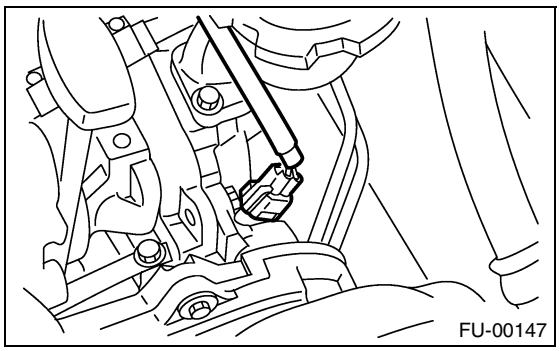
(A) Fuel delivery hose
(B) Return hose
(C) Evaporation hose

3) Connect the EGR pipe to intake manifold.

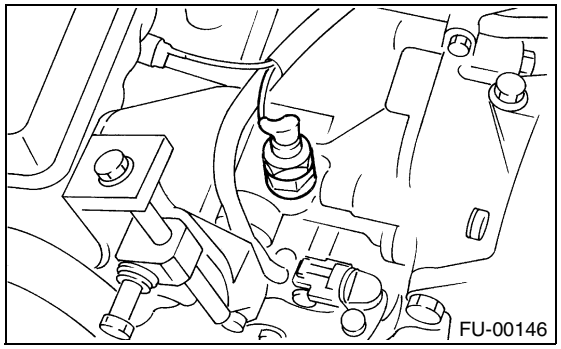
Tightening torque:
34 N·m (3.4 kgf-m, 24.6 ft-lb)



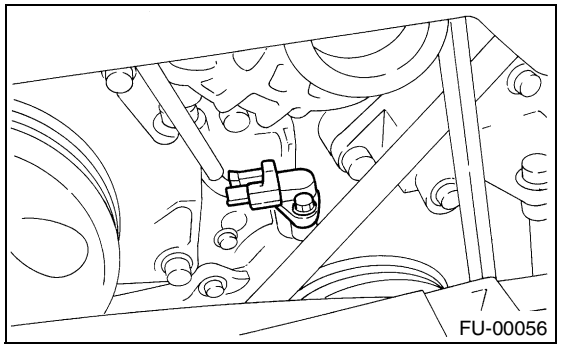
4) Connect the connector to the camshaft position sensor.



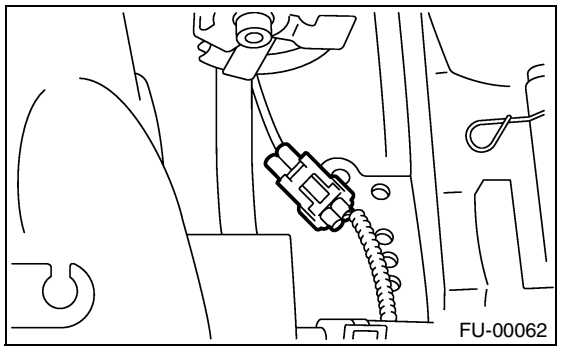
5) Connect the connector to the oil pressure switch.



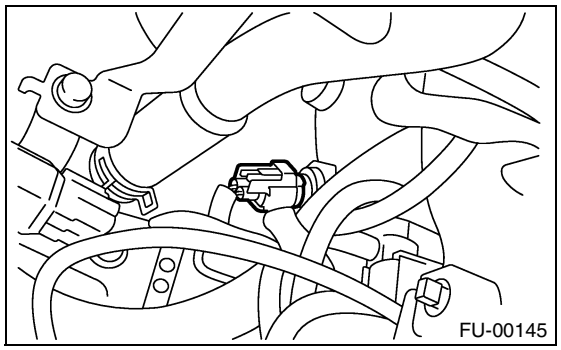
6) Connect the connector to the crankshaft position sensor.



7) Connect the knock sensor connector.

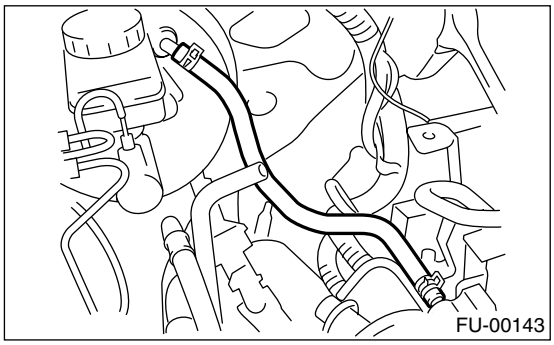


8) Connect the connectors to the engine coolant temperature sensor.

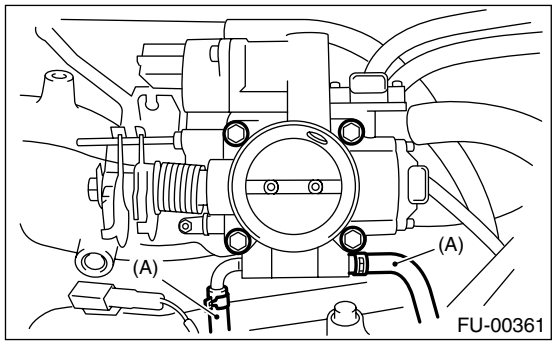


9) Install the air cleaner case stay RH and engine harness bracket, and connect the engine harness connectors to the bulkhead connectors.

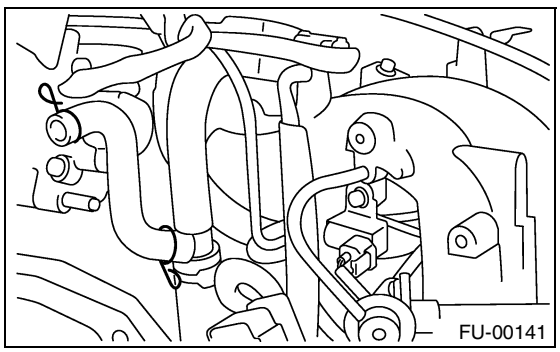
10) Connect the brake booster hose.



11) Connect the engine coolant hose (A) to the throttle body.

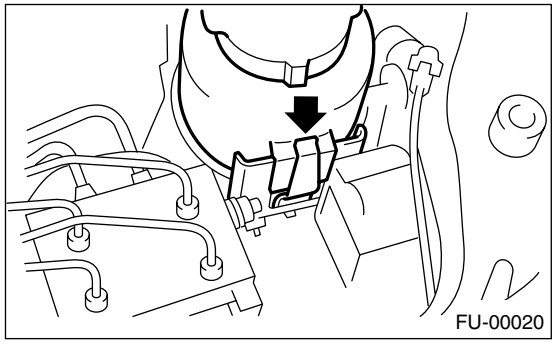


12) Connect the PCV hose to the intake manifold.

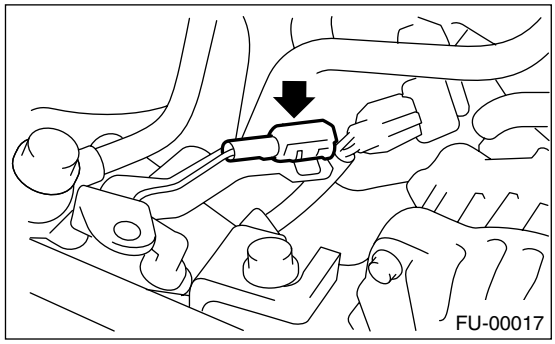


13) Connect the spark plug cords to the spark plugs.
14) Install the power steering pump and reservoir tank to bracket.

(1) Install the reservoir tank to bracket.

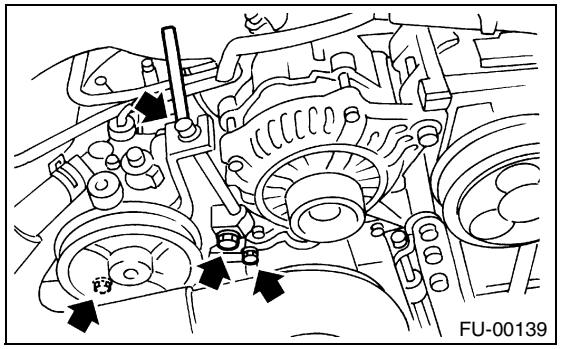


(2) Connect the connector to the power steering pump switch.

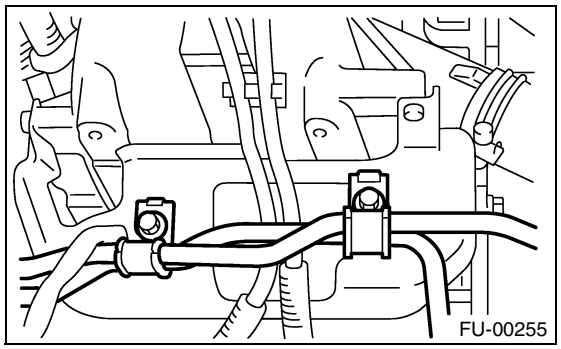


(3) Tighten the bolts which install power steering pump bracket.

Tightening torque:
22 N·m (2.2 kgf-m, 15.9 ft-lb)

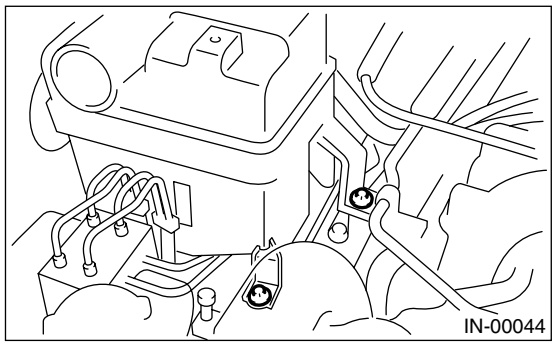


(4) Install the power steering pipes onto the right side intake manifold protector.

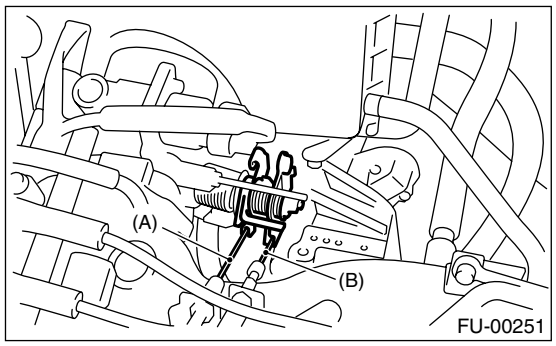


(5) Install the front side V-belt. <Ref. to ME(SOHC)-41, INSTALLATION, V-belt.>
(6) Install the resonator chamber.

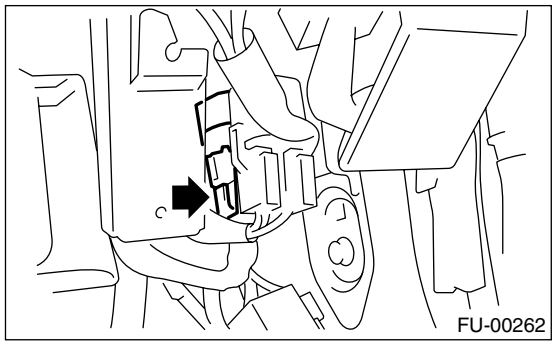
Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)



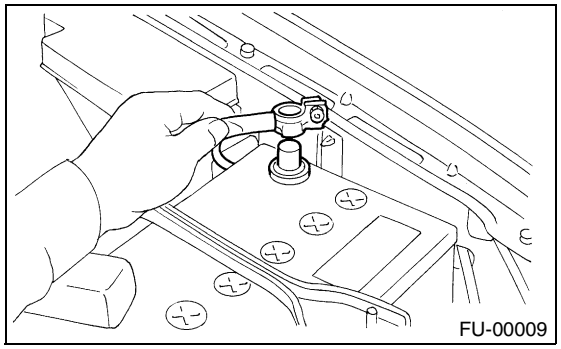
15) Connect the accelerator cable (A). <Ref. to SP(SOHC)-9, INSTALLATION, Accelerator Control Cable.>
16) Connect the cruise control cable (B). (With cruise control models)



17) Install the air intake duct and air cleaner case. <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.> and <Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.>
18) Connect the connector to the fuel pump relay.

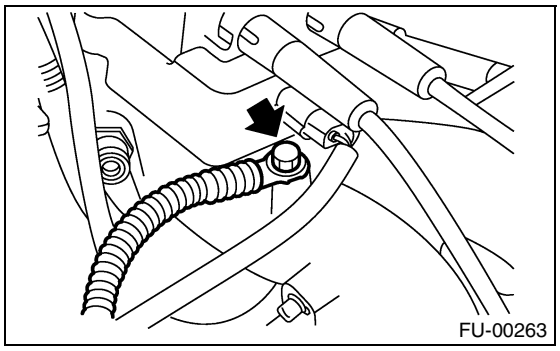


19) Connect the battery ground cable to battery.

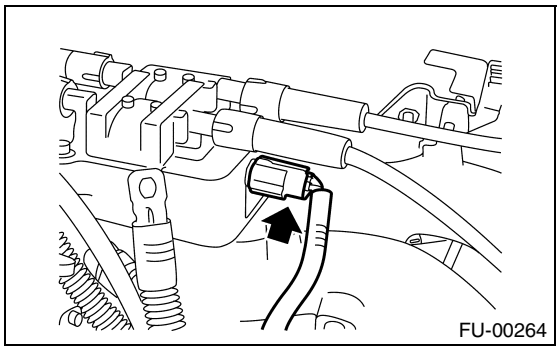


C: DISASSEMBLY

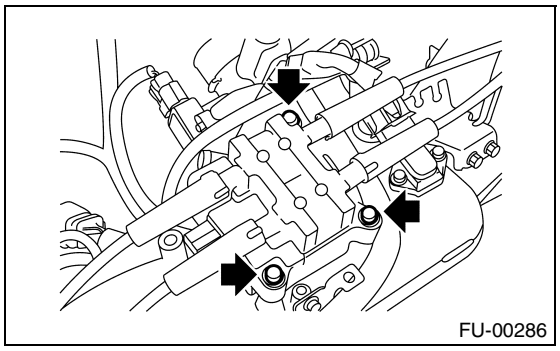
1) Disconnect the engine ground terminal from the intake manifold.



2) Disconnect the connector from the ignition coil and ignitor assembly.

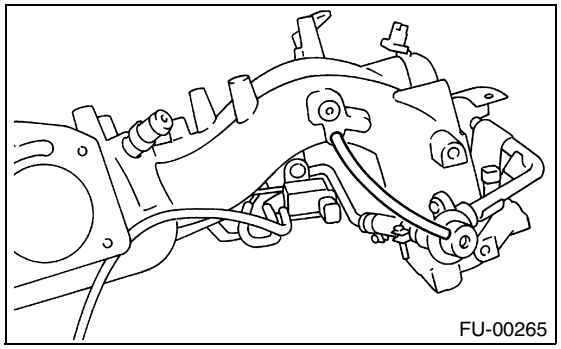


3) Remove the ignition coil and ignitor assembly.

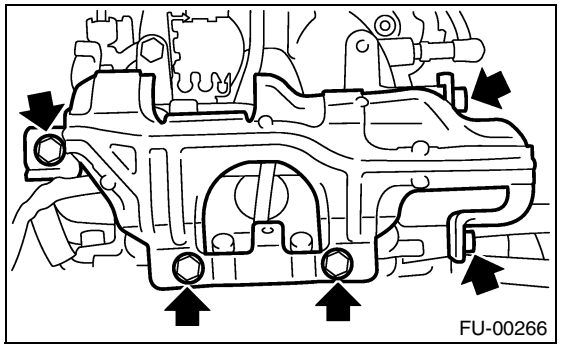


4) Remove the throttle body.<Ref. to FU(SOHC)-13, REMOVAL, Throttle Body.>
5) Remove the EGR valve.<Ref. to FU(SOHC)-36, REMOVAL, EGR Valve.>

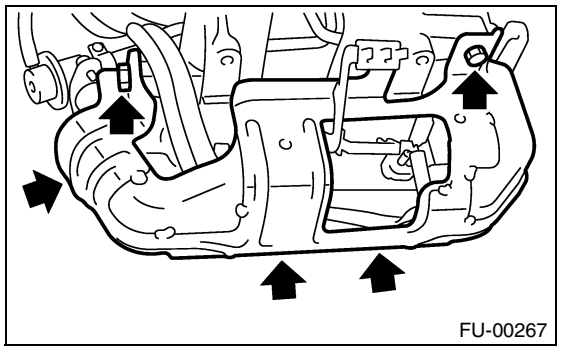
6) Disconnect the pressure regulator vacuum hose from the intake manifold.



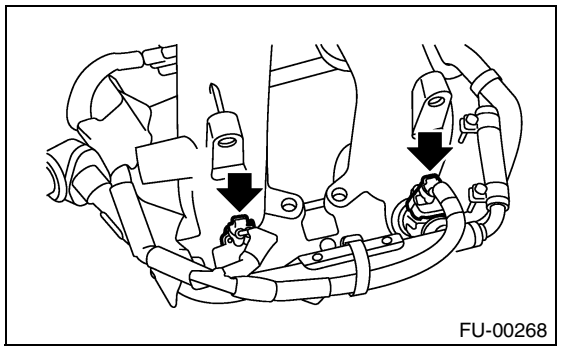
7) Remove the fuel pipe protector LH.



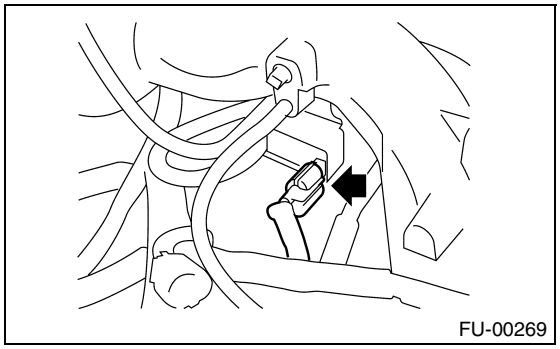
8) Remove the fuel pipe protector RH.



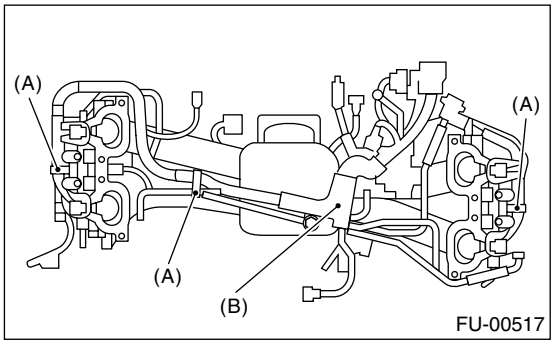
9) Disconnect the connectors from the fuel injectors.



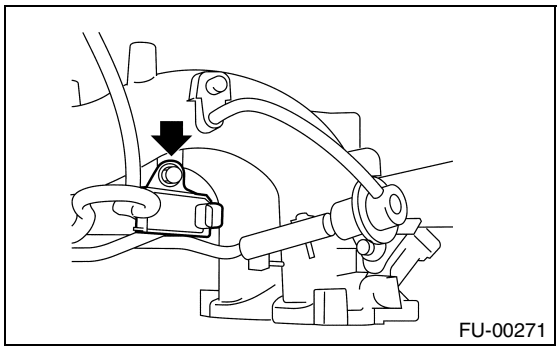
10) Disconnect the connector from the purge control solenoid valve.



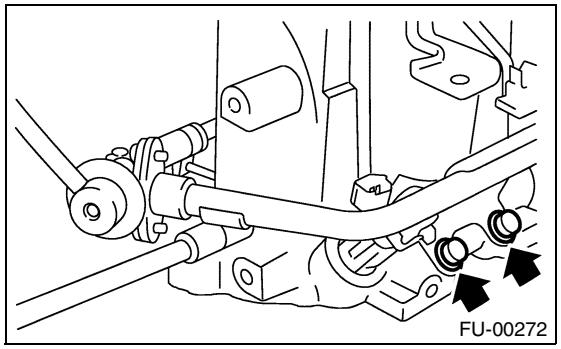
11) Disconnect the air by-pass hose from the purge control solenoid valve.
12) Remove the harness bands (A) and harness bracket (B) which hold engine harness onto the intake manifold.



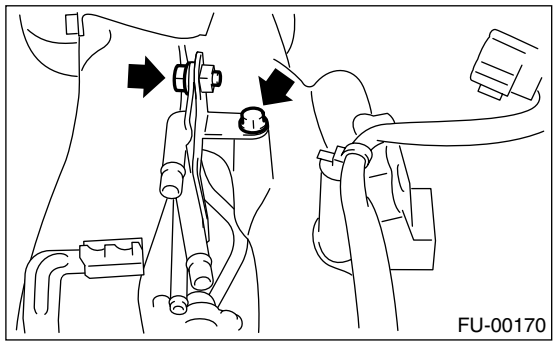
13) Remove the engine harness from the intake manifold.
14) Remove the purge control solenoid valve.



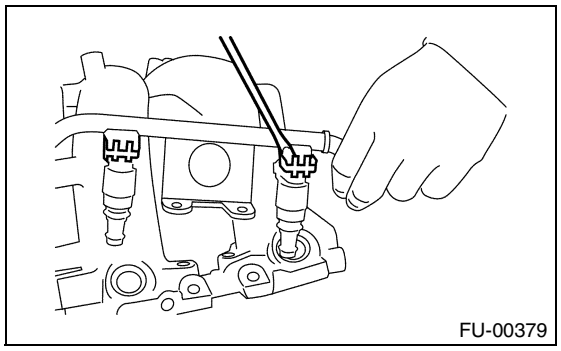
15) Remove the bolt which installs injector pipe on the intake manifold as shown in figure.



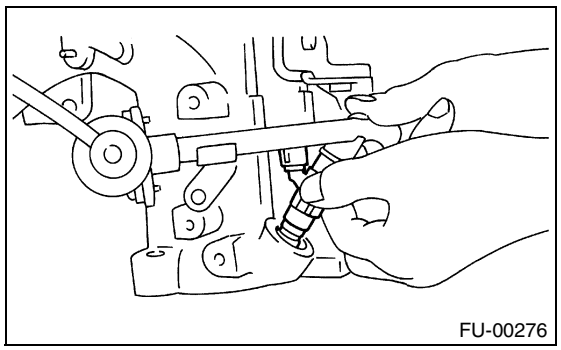
16) Remove the two bolts which hold fuel pipes on the left side of intake manifold.



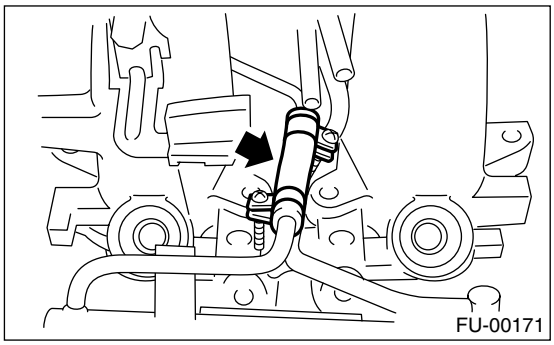
17) Remove the fuel injectors.
(1) Remove the fuel injector securing clip.



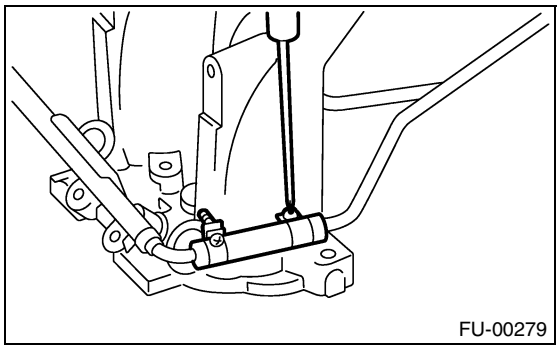
(2) Remove the fuel injector while lifting up the fuel injector pipe.



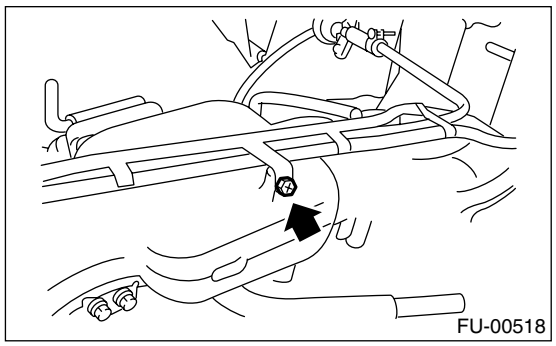
18) Loosen the clamp which holds the front left side fuel hose to the injector pipe and remove the pipe.



19) Loosen the clamp which holds the front right side fuel hose to the injector pipe and remove the pipe.



20) Remove the fuel injector pipe.
21) Remove the bolt which installs the fuel pipes on the intake manifold.

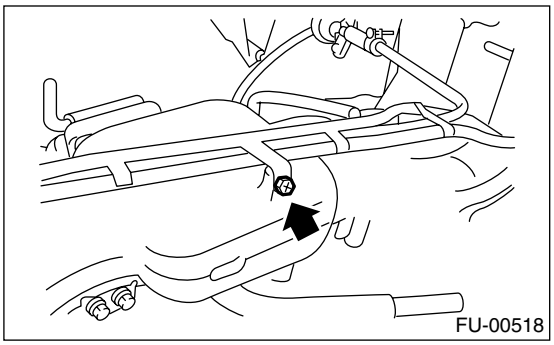


22) Remove the fuel pipe assembly and pressure regulator, from the intake manifold.

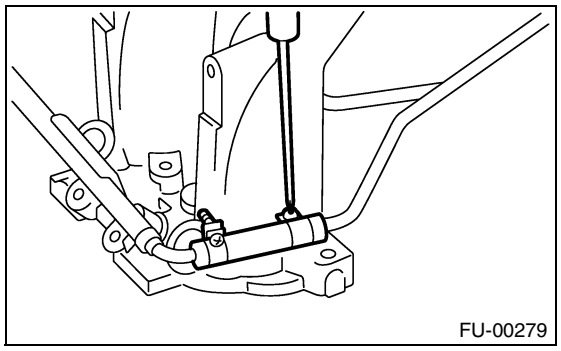
D: ASSEMBLY

1) Install the fuel pipe assembly and pressure regulator, etc. to the intake manifold.
2) Tighten the bolt which installs the fuel pipes on the intake manifold.

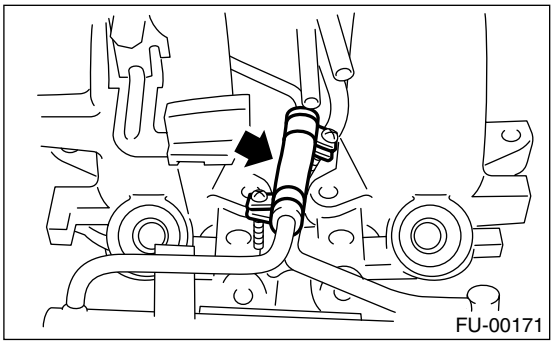
Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



3) Connect the right side fuel hose to the injector pipe, and tighten the clamp screw.

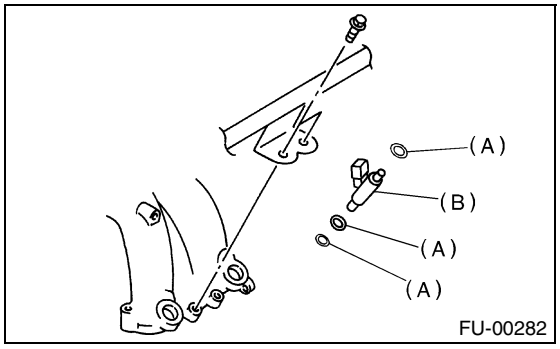


4) Install the fuel injector pipe.
5) Connect the left side fuel hose to the injector pipe, and tighten the clamp screw.



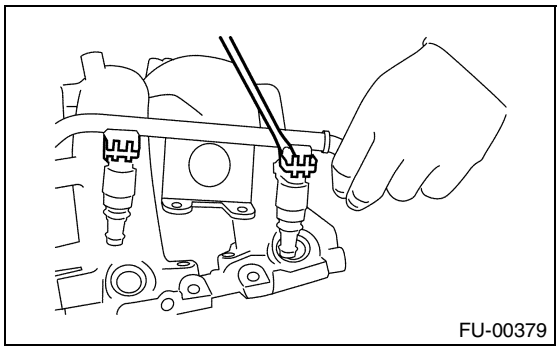
6) Install the fuel injectors.

NOTE:
Replace the O-rings with new ones.



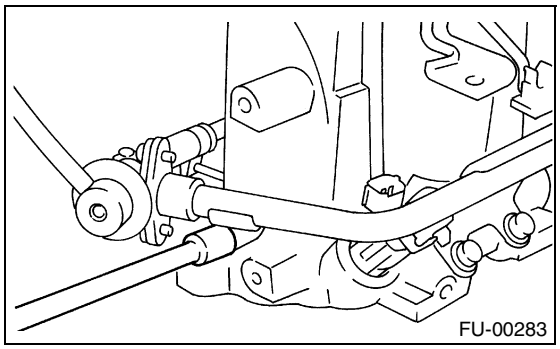
(A) O-ring
(B) Fuel injector

NOTE:
Do not forget to install the fuel injector securing clip.

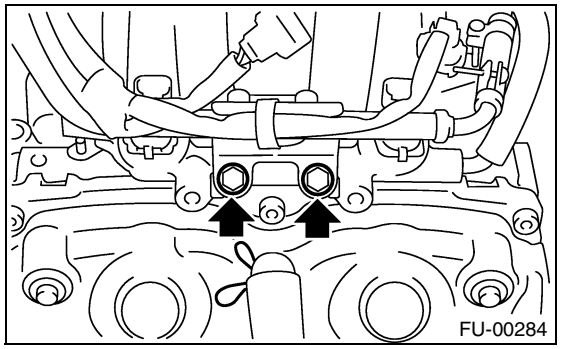


7) Tighten the bolt which installs the injector pipe on the intake manifold.

Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)

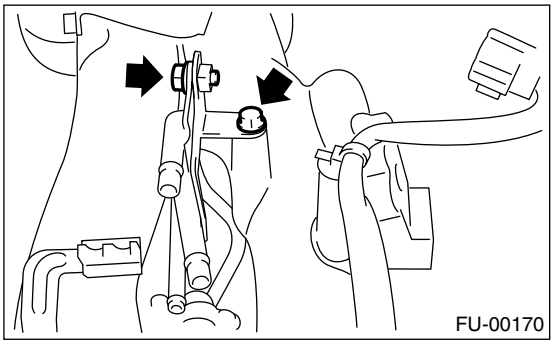


Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



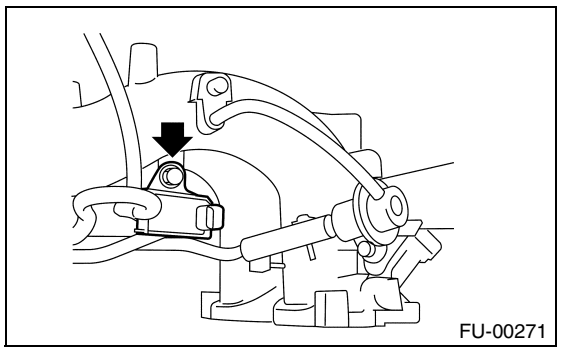
8) Tighten the two bolts which install the fuel pipes on the left side of intake manifold.

Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



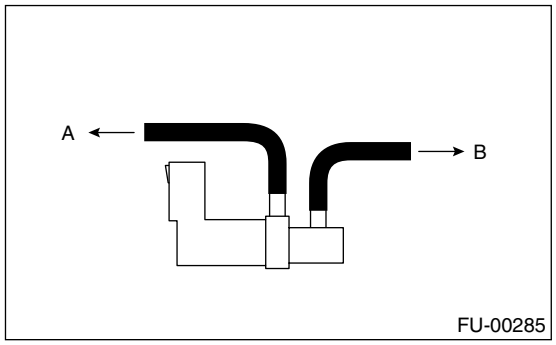
9) Install the purge control solenoid valve.

Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



10) Connect the hoses to the purge control solenoid valve.

NOTE:
Connect the evaporation hose as shown in the figure.

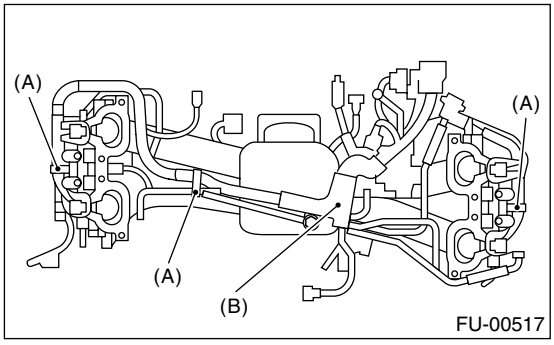


(A) To fuel pipe
(B) To intake manifold

11) Install the engine harness onto the intake manifold.

Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)

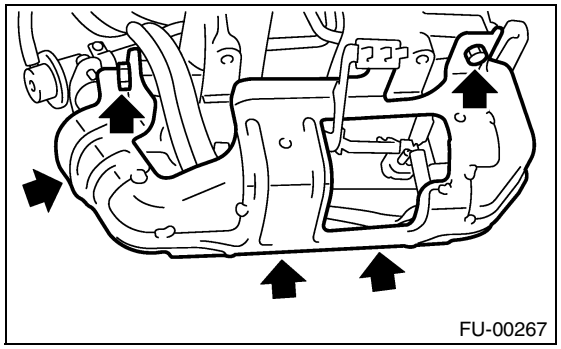
12) Connect the connectors to the fuel injectors and purge control solenoid valve.
13) Hold the engine harness by harness band (A) and harness bracket (B).



NOTE:
Do not use harness band on harnesses where they are supposed to be protected by the fuel pipe protector.

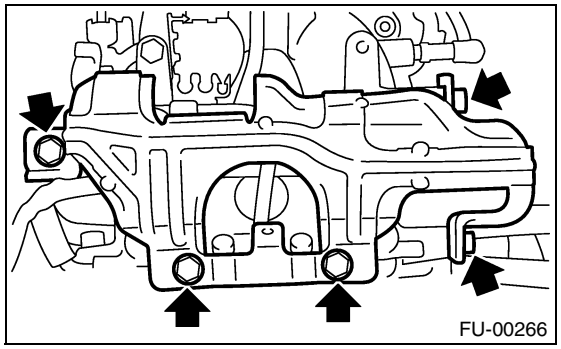
14) Install the fuel pipe protector RH.

Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)

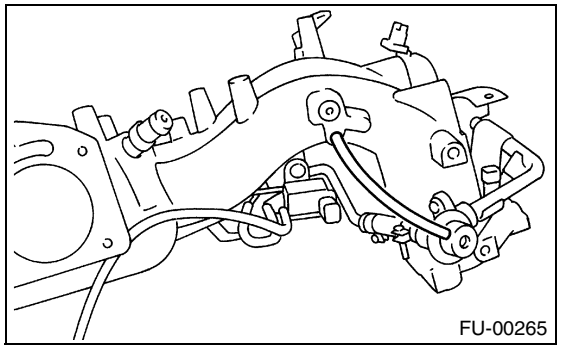


15) Install the fuel pipe protector LH.

Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)

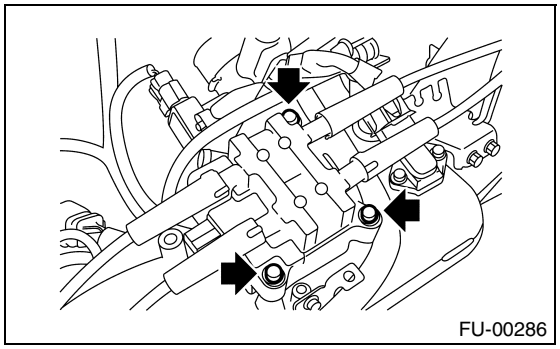


16) Connect the pressure regulator vacuum hose to the intake manifold.



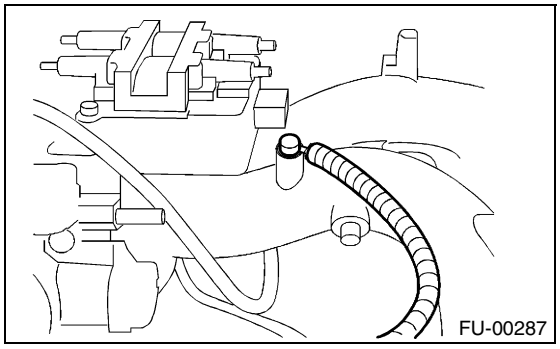
17) Install the EGR valve.<Ref. to FU(SOHC)-36, INSTALLATION, EGR Valve.>
18) Install the throttle body to the intake manifold.<Ref. to FU(SOHC)-13, INSTALLATION, Throttle Body.>

19) Install the ignition coil and ignitor assembly.



20) Connect the connector to the ignition coil and ignitor assembly.
21) Install the engine ground terminal to the intake manifold.

Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



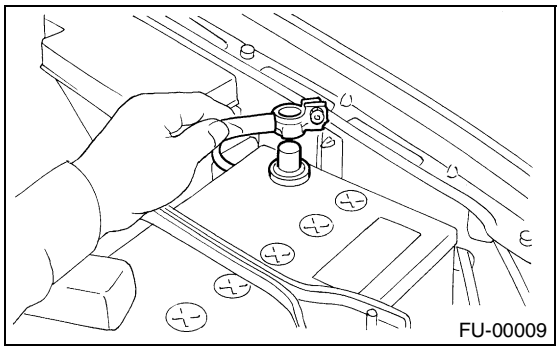
E: INSPECTION

Make sure the fuel pipe and fuel hoses are not cracked and that connections are tight.

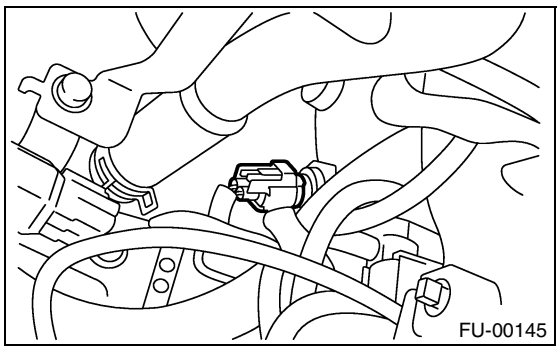
4. Engine Coolant Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the air intake duct and air cleaner assembly. <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
3) Disconnect the connector from the engine coolant temperature sensor.

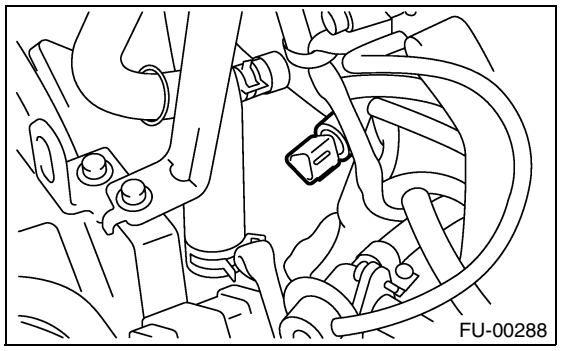


4) Remove the engine coolant temperature sensor.

B: INSTALLATION

Install in the reverse order of removal.

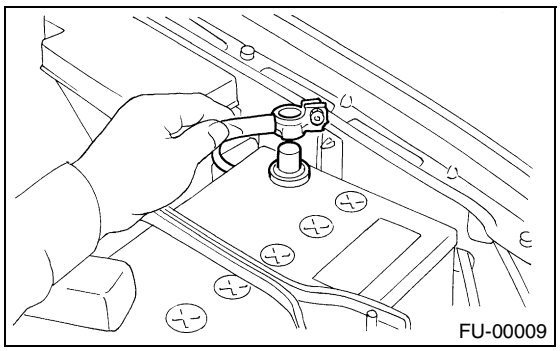
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



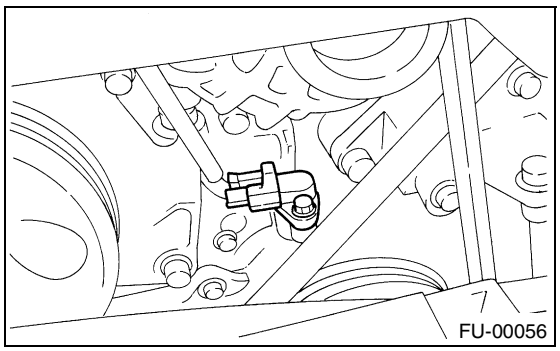
5. Crankshaft Position Sensor

A: REMOVAL

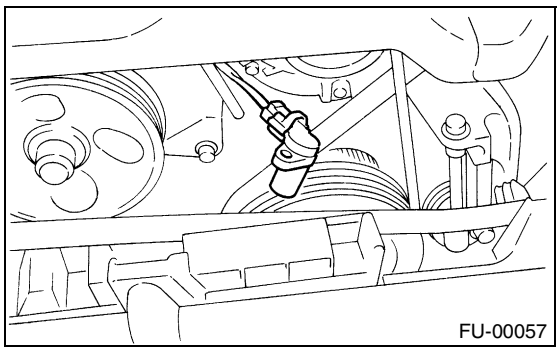
1) Disconnect the ground cable from battery.



2) Remove the bolt which install crankshaft position sensor to the cylinder block.



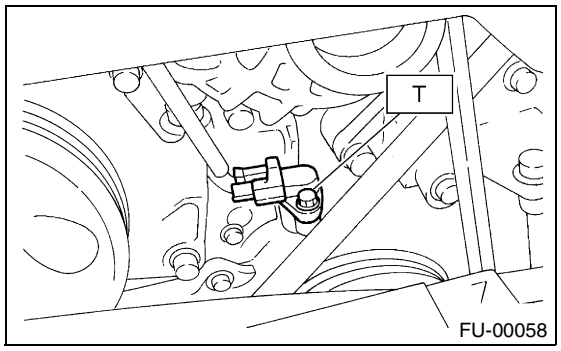
3) Remove the crankshaft position sensor, and disconnect the connector from it.



B: INSTALLATION

Install in the reverse order of removal.

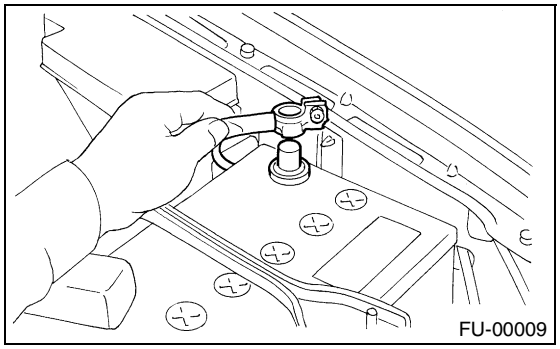
Tightening torque:
T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



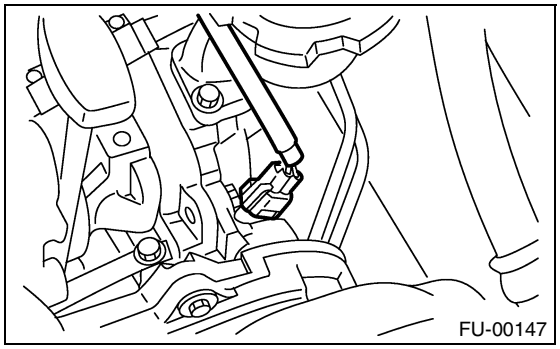
6. Camshaft Position Sensor

A: REMOVAL

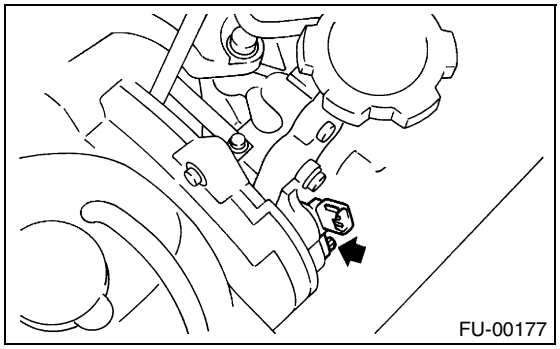
1) Disconnect the ground cable from battery.



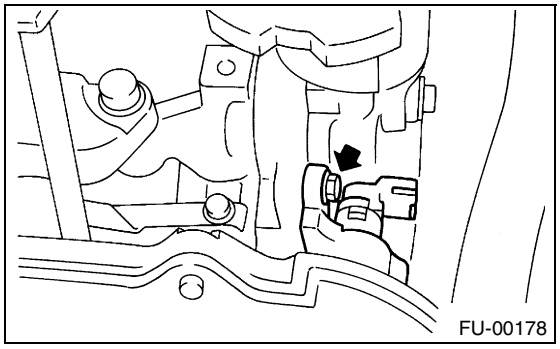
2) Disconnect the connector from the camshaft position sensor.



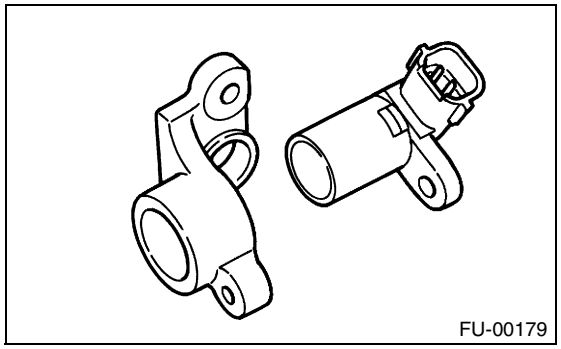
3) Remove the bolt which installs camshaft position sensor to the camshaft position sensor support.



4) Remove the bolt which installs camshaft position sensor support to the camshaft cap LH.



5) Remove the camshaft position sensor and camshaft position sensor support as a unit.
6) Remove the camshaft position sensor itself.



B: INSTALLATION

Install in the reverse order of removal.

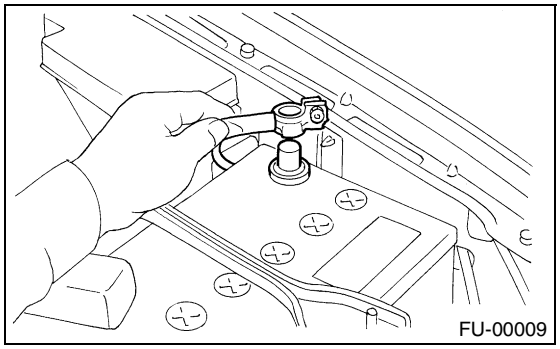
Tightening torque:

- ***Camshaft position sensor support; 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)***
- ***Camshaft position sensor; 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)***

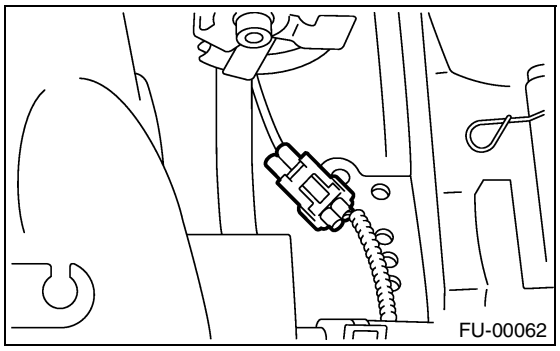
7. Knock Sensor

A: REMOVAL

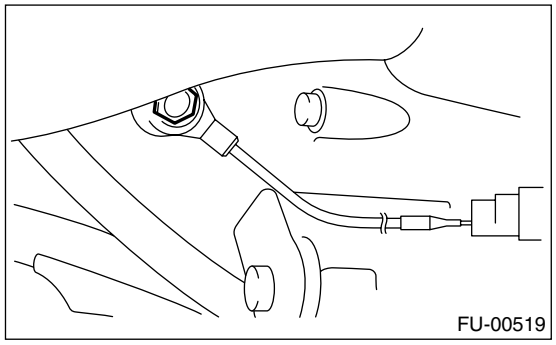
1) Disconnect the ground cable from battery.



2) Remove the air cleaner case.<Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
3) Disconnect the knock sensor connector.



4) Remove the knock sensor from the cylinder block.

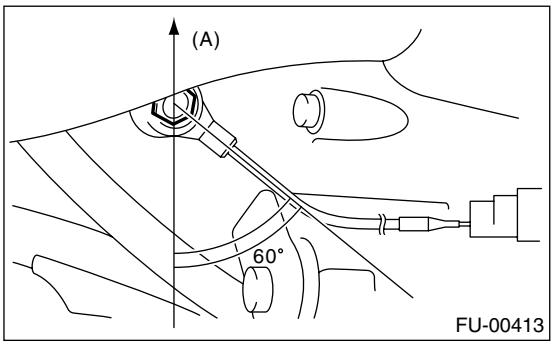


B: INSTALLATION

1) Install the knock sensor to the cylinder block.

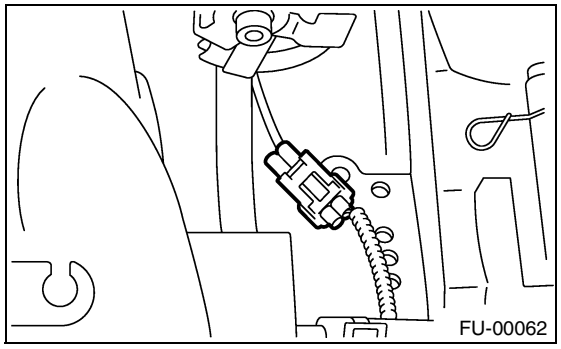
Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

NOTE:
The extraction area of the knock sensor cord must be positioned at a 60° angle relative to the engine rear.

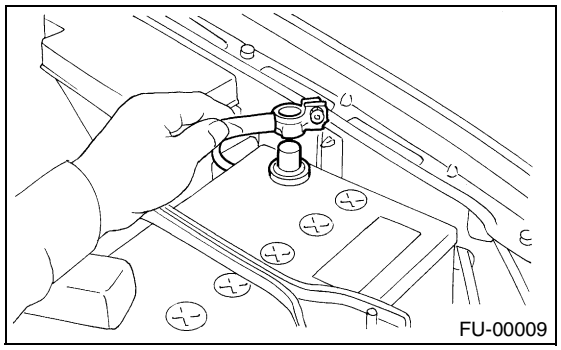


(A) Front side

2) Connect the knock sensor connector.



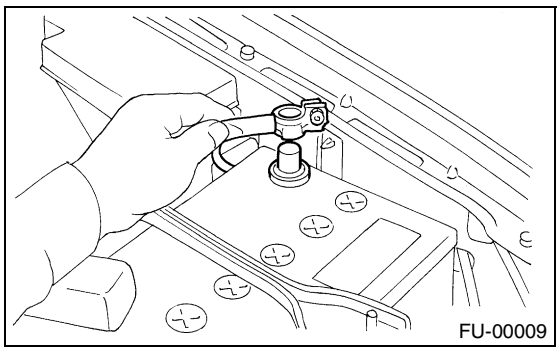
3) Install the air cleaner case. <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
4) Connect the battery ground cable to battery.



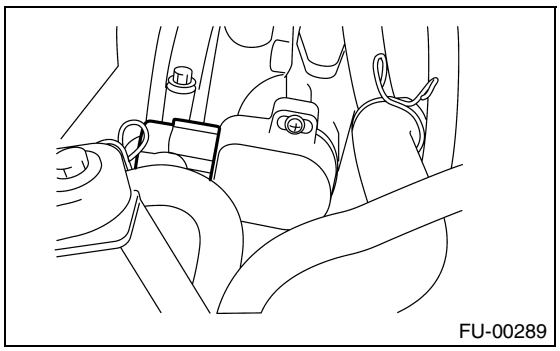
8. Throttle Position Sensor

A: REMOVAL

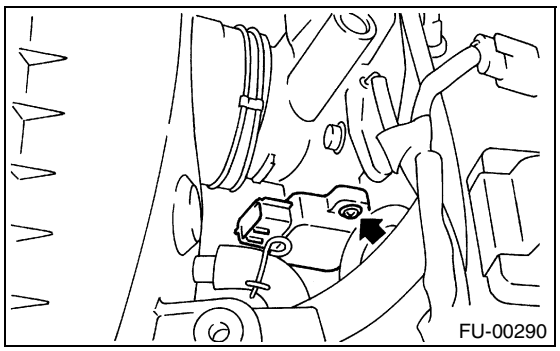
1) Disconnect the ground cable from battery.



2) Disconnect the connector from the throttle position sensor.



3) Remove the throttle position sensor holding screws, and remove it.

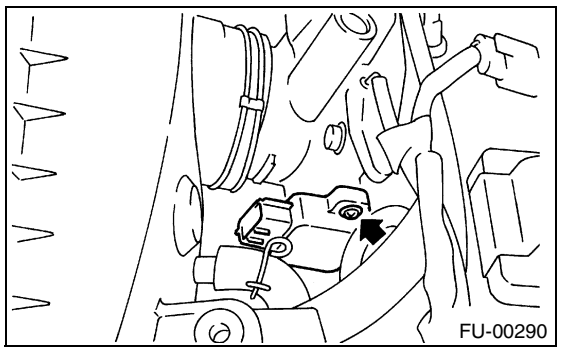


B: INSTALLATION

Install in the reverse order of removal.

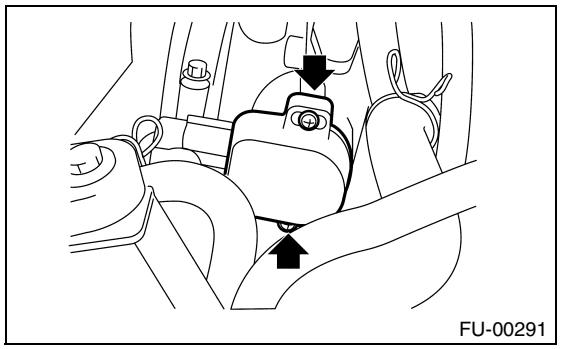
Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)

CAUTION:
When installing throttle position sensor, adjust to the specified data.



C: ADJUSTMENT

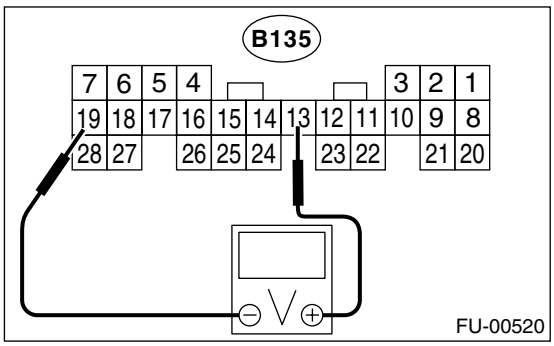
1) Turn the ignition switch to OFF.
2) Loosen the throttle position sensor holding screws.



3) When using voltage meter;
   (1) Take out the ECM.
   (2) Turn the ignition switch to ON.

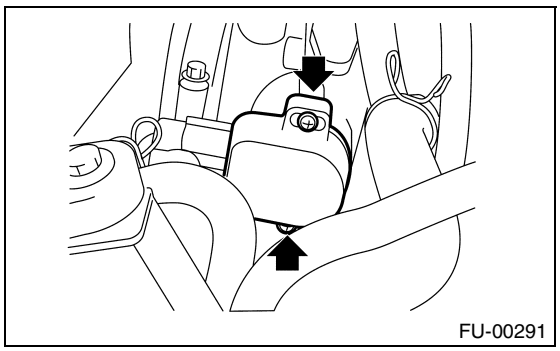
(3) Adjust the throttle position sensor to the proper position to allow the voltage signal to the ECM to be in specification.

Connector & terminal / Specified voltage
(B134) No. 13 (+) — (B134) No. 19 (–) / 0.45 — 0.55 V
[Fully closed.]

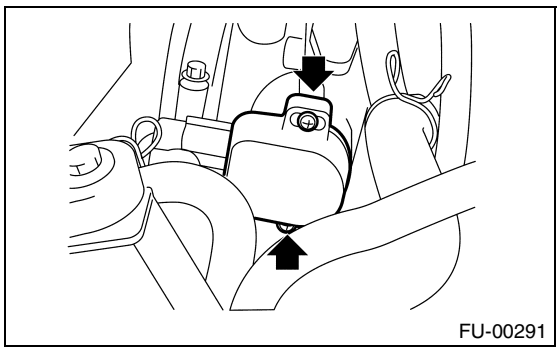


(4) Tighten the throttle position sensor holding screws.

Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)

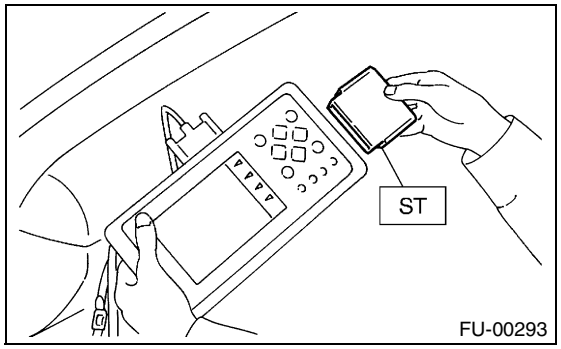


4) When using Subaru Select Monitor;
(1) Turn the ignition switch to OFF.
(2) Loosen the throttle position sensor holding screws.

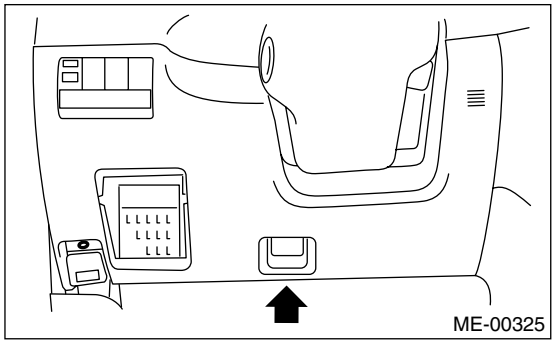


NOTE:
For detailed operation procedures, refer to the Subaru Select Monitor Operation Manual.

(3) Insert the cartridge to the Subaru Select Monitor.



(4) Connect the Subaru Select Monitor to the data link connector.

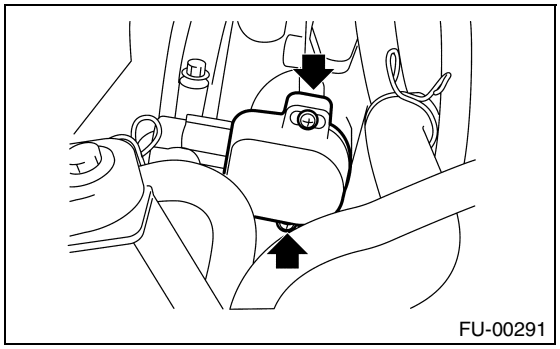


5) Turn the ignition switch to ON, and the Subaru Select Monitor switch to ON.
6) Select the {2. Each System Check} in Main Menu.
7) Select the {Engine Control System} in Selection Menu.
8) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.
9) Select the {1.12 Data Display} in Data Display Menu.
10) Adjust the throttle position sensor to the proper position to match with the following specifications.

Condition: Throttle fully closed
Throttle opening angle 0.00%
Throttle sensor voltage 0.50 V

11) Tighten the throttle position sensor holding screws.

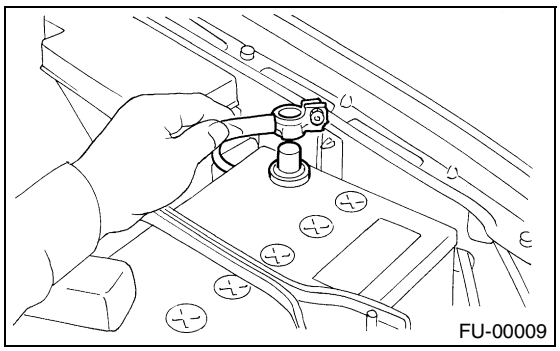
Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



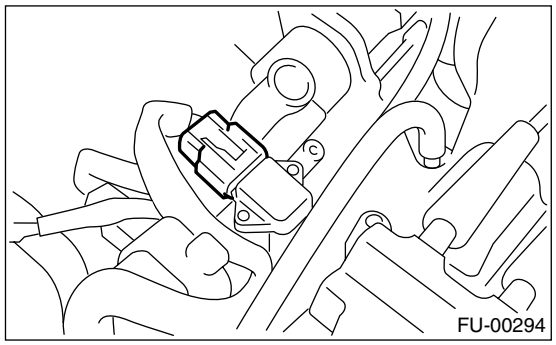
9. Pressure Sensor

A: REMOVAL

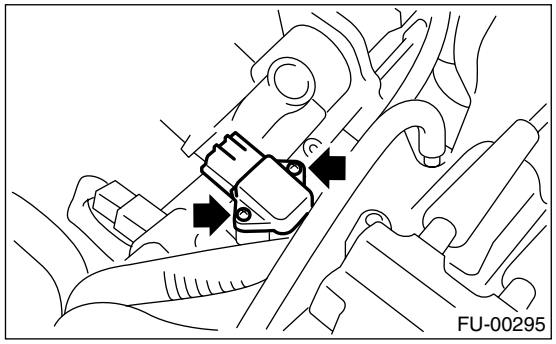
1) Disconnect the ground cable from battery.



2) Disconnect the connector from the pressure sensor.



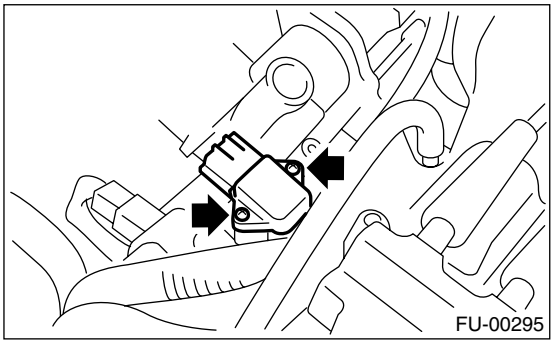
3) Remove the pressure sensor.



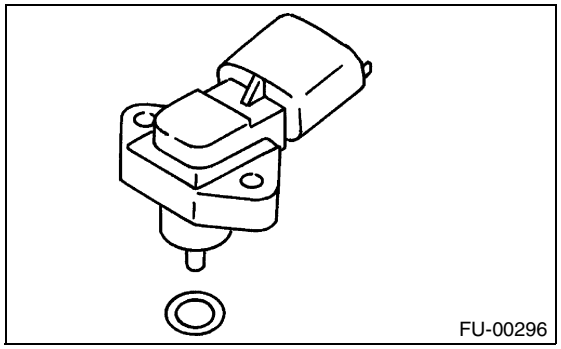
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



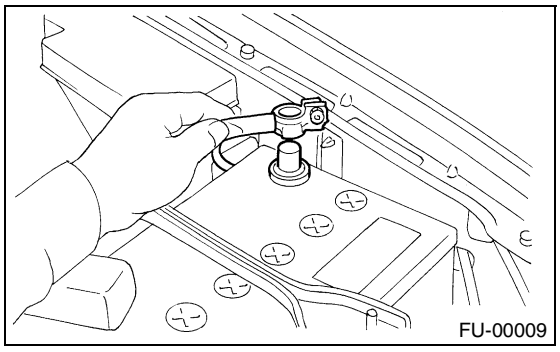
NOTE:
Replace the O-ring with a new one.



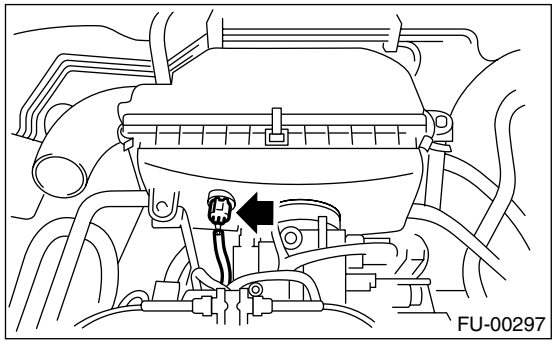
10.Intake Air Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector from the intake air temperature sensor.
3) Remove the intake air temperature sensor from air cleaner case.



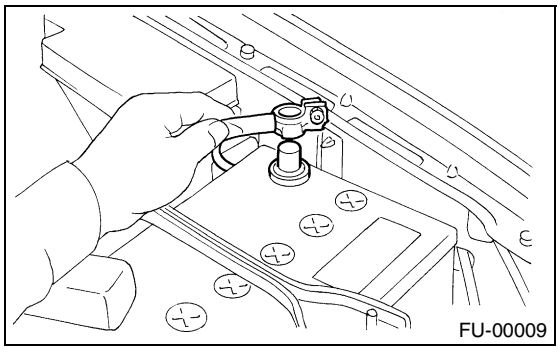
B: INSTALLATION

Install in the reverse order of removal.

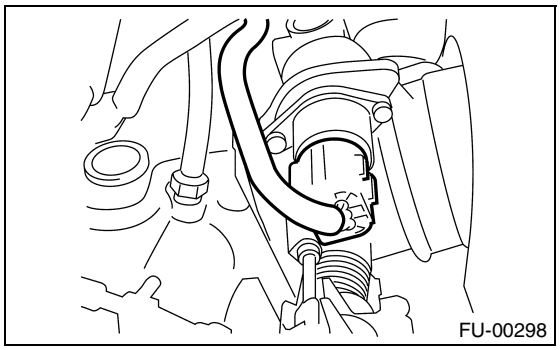
11.Idle Air Control Solenoid Valve

A: REMOVAL

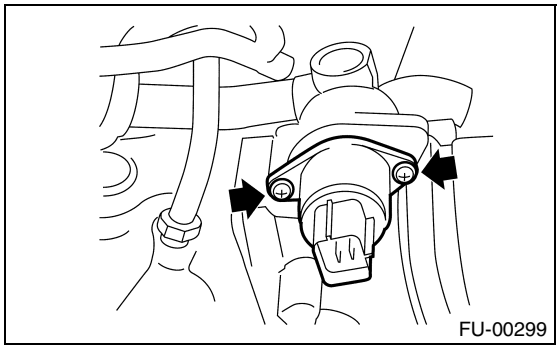
1) Disconnect the ground cable from battery.



2) Disconnect the connector from the idle air control solenoid valve.



3) Remove the idle air control solenoid valve from the throttle body.

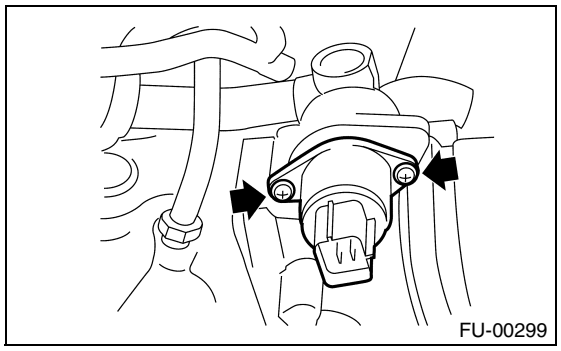


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Always use new gasket.

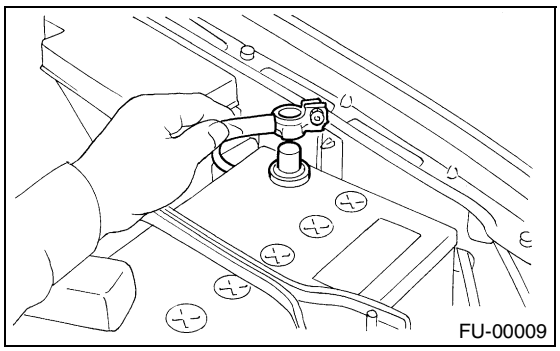
Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



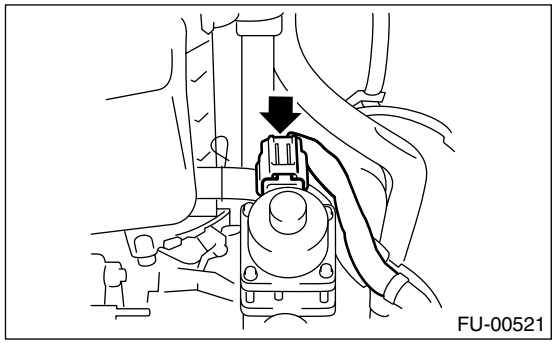
12.EGR Valve

A: REMOVAL

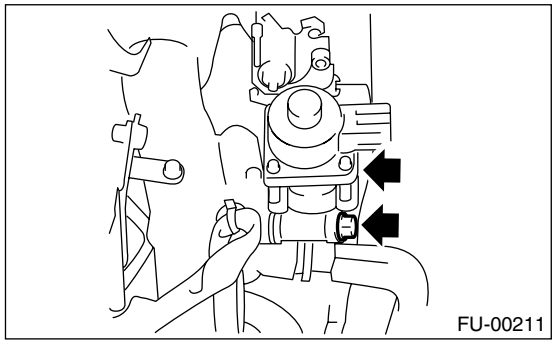
1) Disconnect the ground cable from battery.



2) Disconnect the connector from EGR valve.



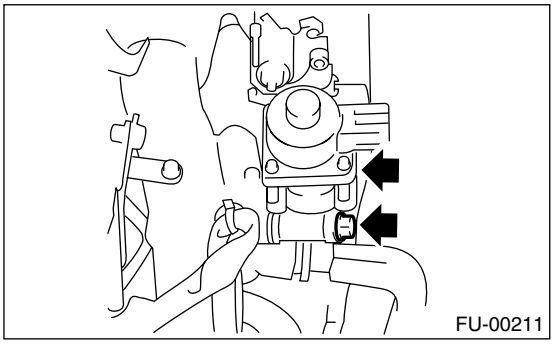
3) Remove the EGR valve from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)

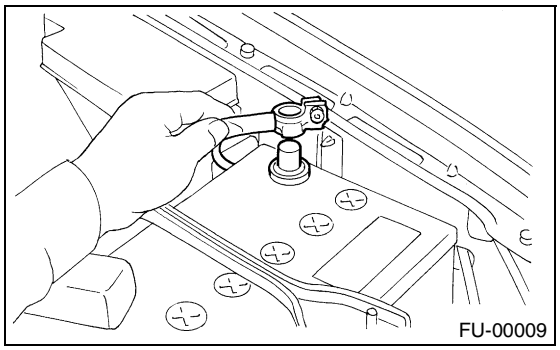


13.Fuel Injector

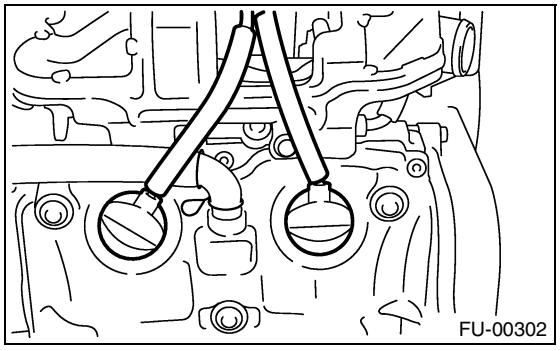
A: REMOVAL

1. RH SIDE

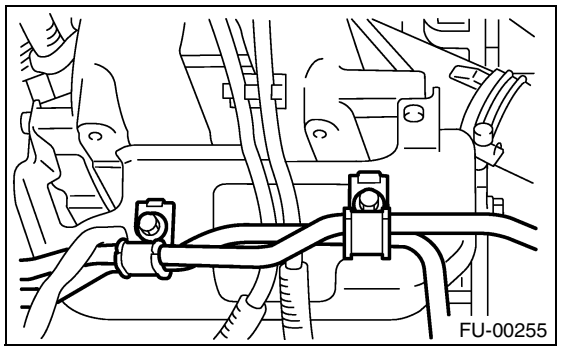
1) Release the fuel pressure. <Ref. to FU(SOHC)-49, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel flap lid, and remove the fuel filler cap.
3) Disconnect the ground cable from battery.



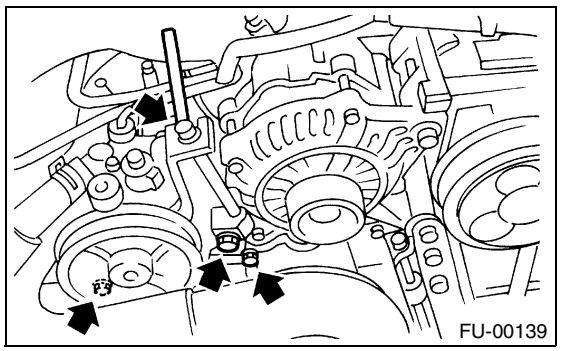
4) Remove the resonator chamber. <Ref. to IN(SOHC)-8, REMOVAL, Resonator Chamber.>
5) Remove the spark plug cords from the spark plugs (#1 and #3 cylinders).



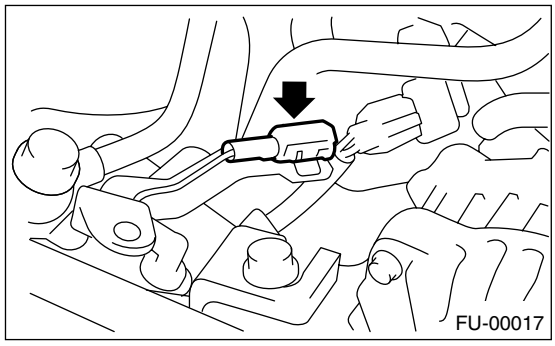
6) Remove the power steering pump and tank from the brackets.
(1) Remove the front side V-belt. <Ref. to ME(SOHC)-41, REMOVAL, V-belt.>
(2) Remove the bolts which hold the power steering pipes onto the intake manifold protector.



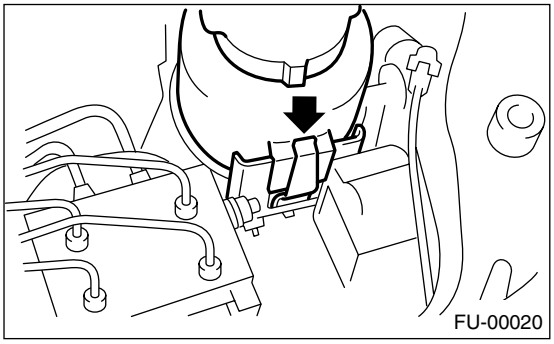
(3) Remove the bolts which install the power steering pump to the bracket.



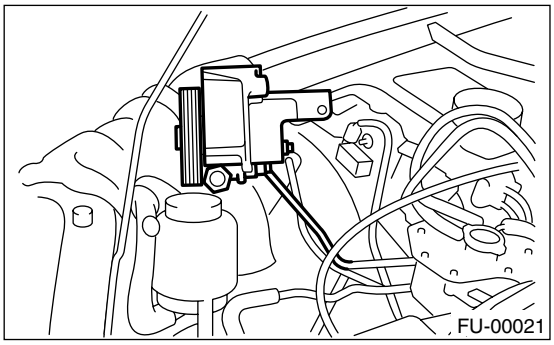
(4) Disconnect the connector from the power steering pump switch.



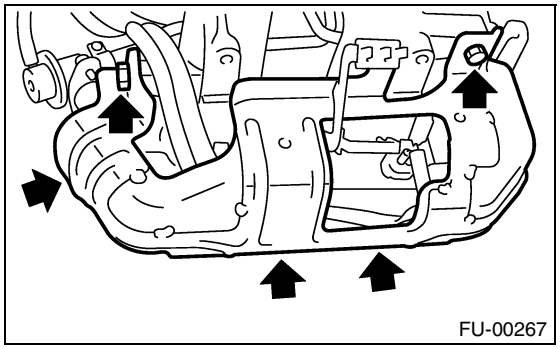
(5) Remove the power steering tank from the bracket by pulling it upwards.



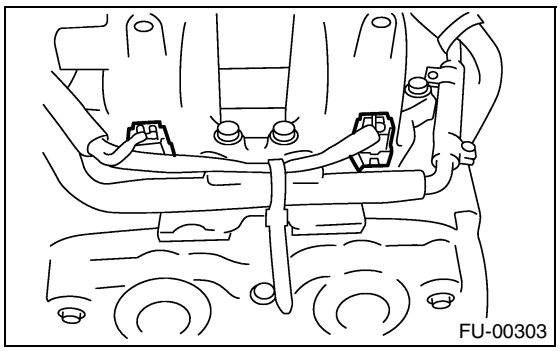
(6) Place the power steering pump and tank on the right side wheel apron.



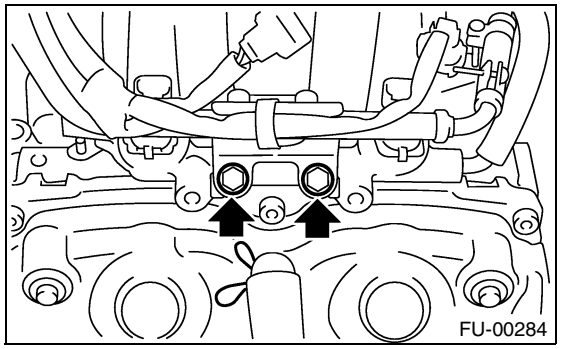
7) Remove the fuel pipe protector RH.

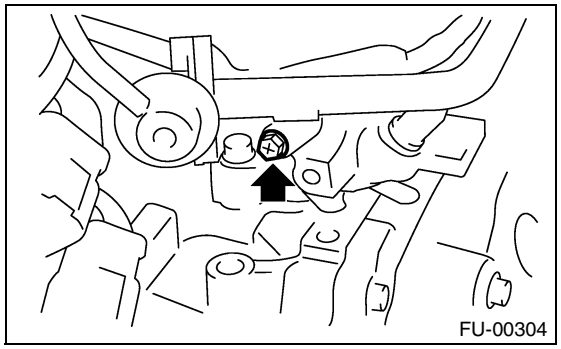


8) Disconnect the connector from fuel injector.



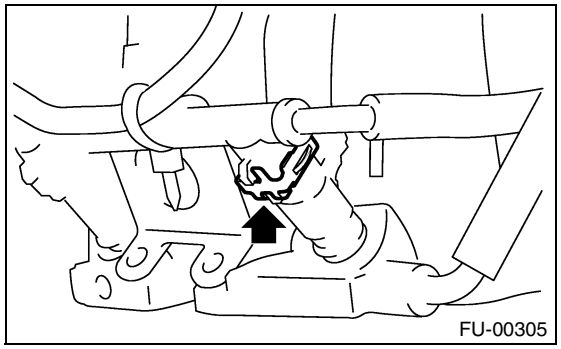
9) Remove the bolt which holds the injector pipe to the intake manifold.



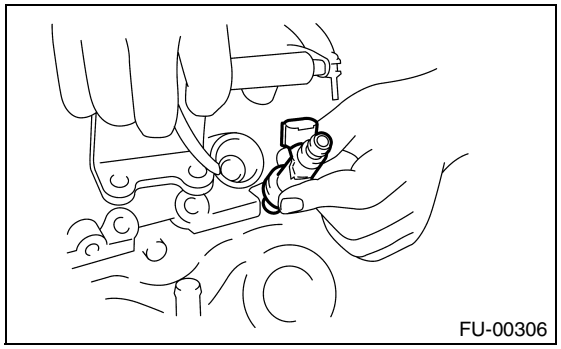


10) Remove the fuel injector from the intake manifold.

(1) Remove the fuel injector securing clip.

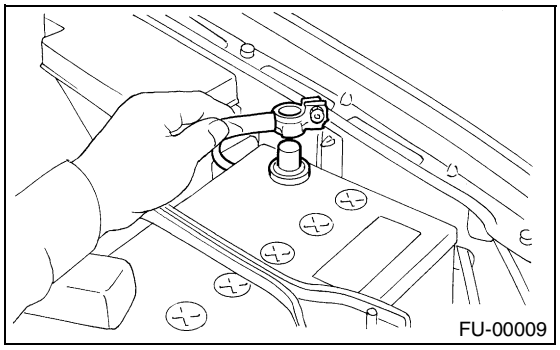


(2) Remove the fuel injector while lifting up the fuel injector pipe.

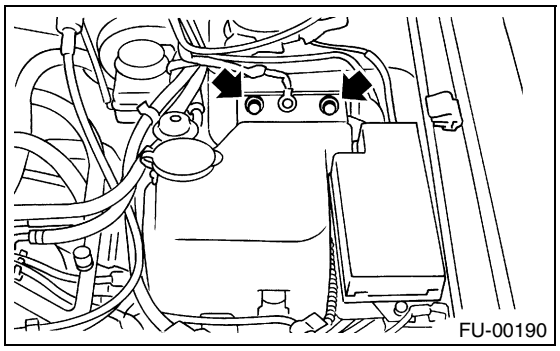


2. LH SIDE

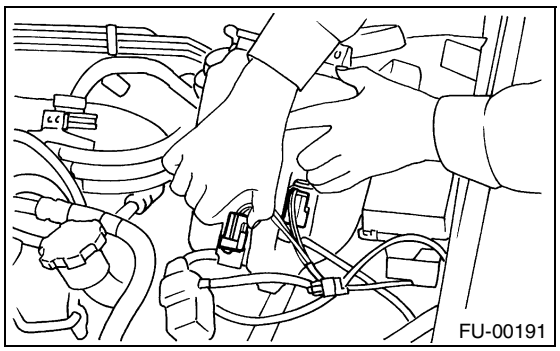
1) Release the fuel pressure. <Ref. to FU(SOHC)-49, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel flap lid, and remove the fuel filler cap.
3) Disconnect the ground cable from battery.



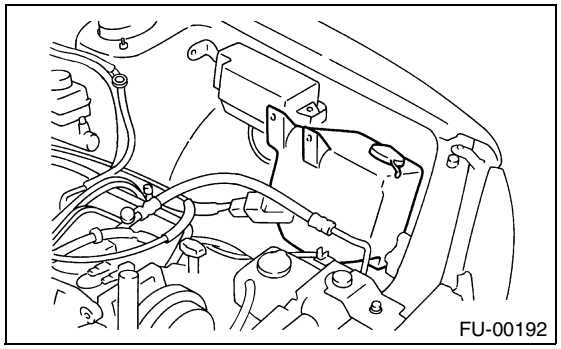
4) Remove the two bolts which install the washer tank on the body.



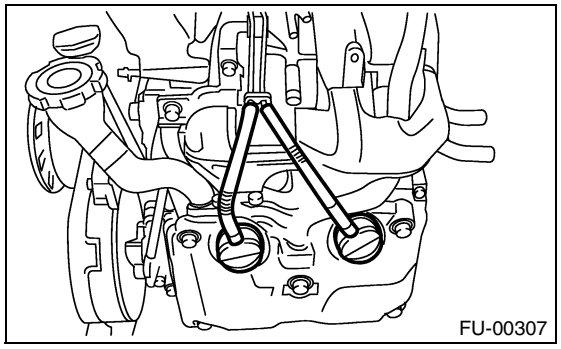
5) Disconnect the connector from the front window washer motor.
6) Disconnect the connector from the rear gate glass washer motor.



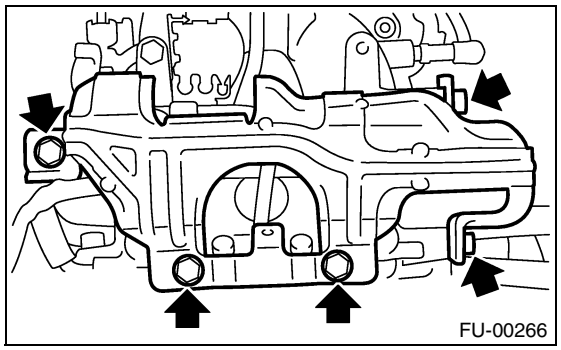
7) Disconnect the rear window glass washer hose from the washer motor, then plug the connection with a suitable cap.
8) Move the washer tank, and secure it away from the working area.



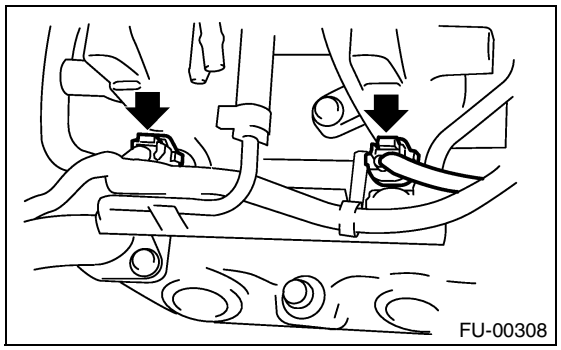
9) Remove the spark plug cords from the spark plugs (#2 and #4 cylinders).



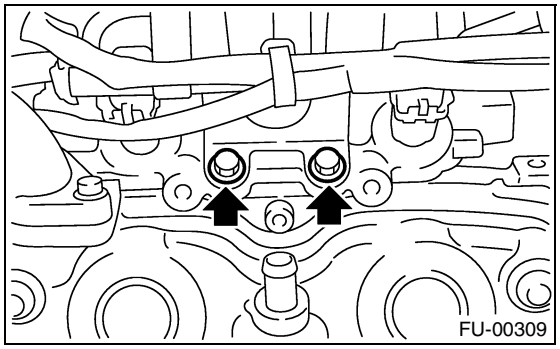
10) Remove the fuel pipe protector LH.



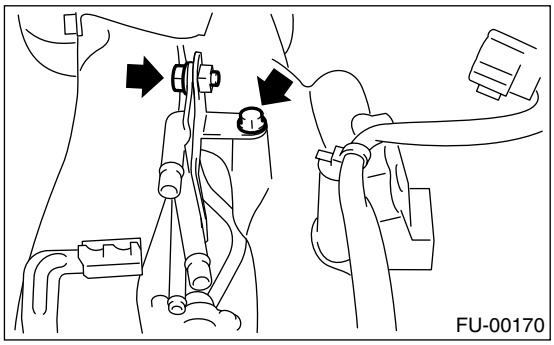
11) Disconnect the connector from the fuel injector.



12) Remove the bolt which holds the injector pipe to the intake manifold.

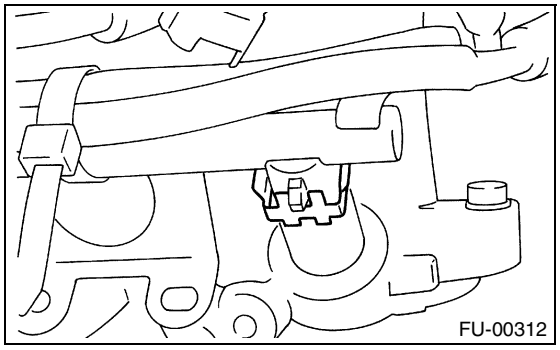


13) Remove the bolt which holds the fuel pipe on the left side intake manifold.

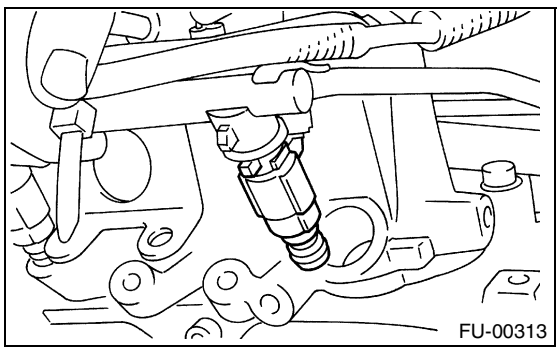


14) Remove the fuel injector from the intake manifold.

(1) Remove the fuel injector securing clip.



(2) Remove the fuel injector while lifting up the fuel injector pipe.

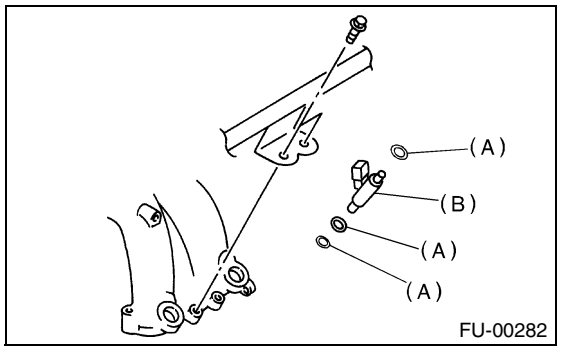


B: INSTALLATION

1. RH SIDE

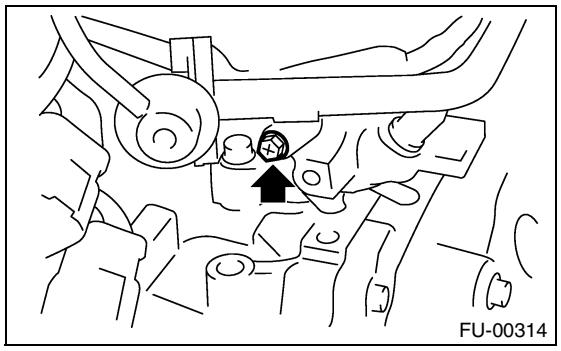
Install in the reverse order of removal.

NOTE:
Replace O-rings with new ones.

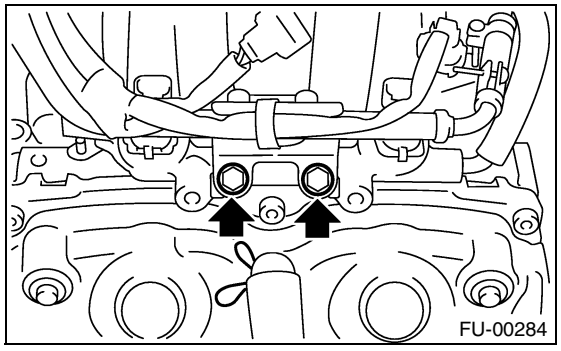


(A) O-ring
(B) Fuel injector

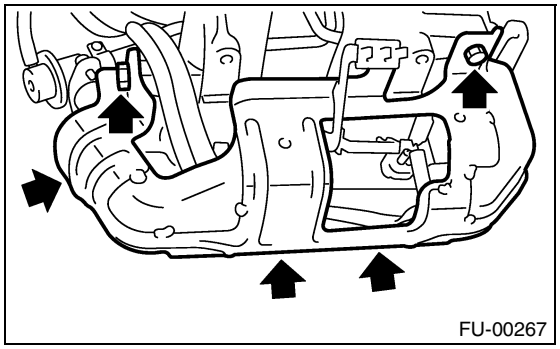
Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



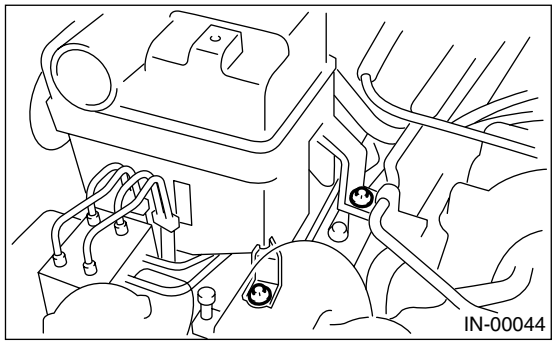
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



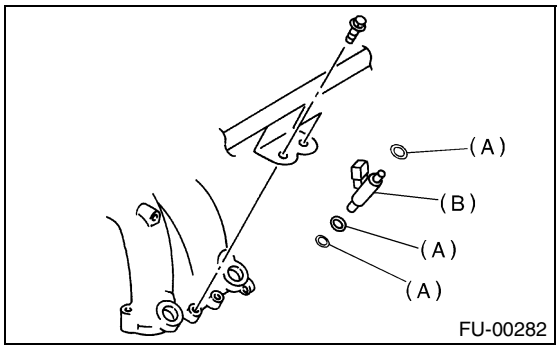
Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)



2. LH SIDE

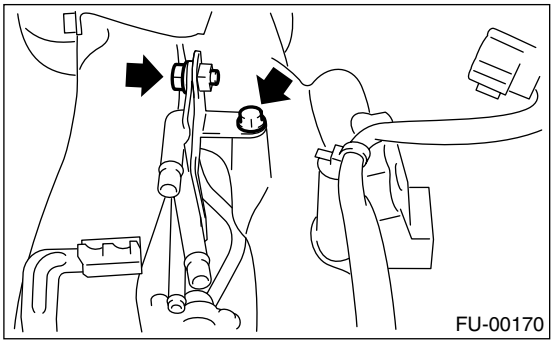
Install in the reverse order of removal.

CAUTION:
Replace O-rings with new ones.

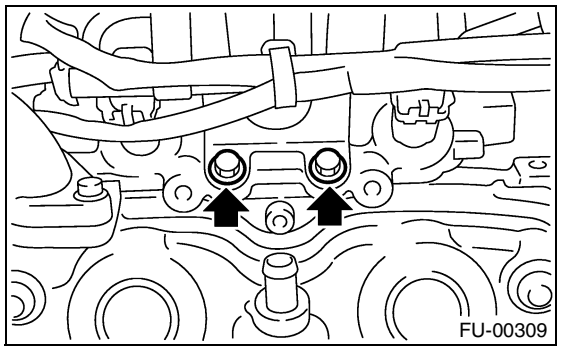


(A) O-ring
(B) Fuel injector

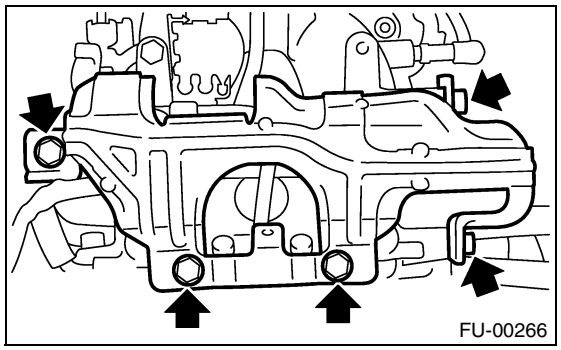
Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



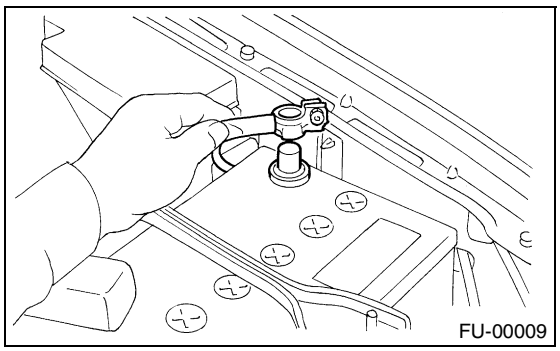
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



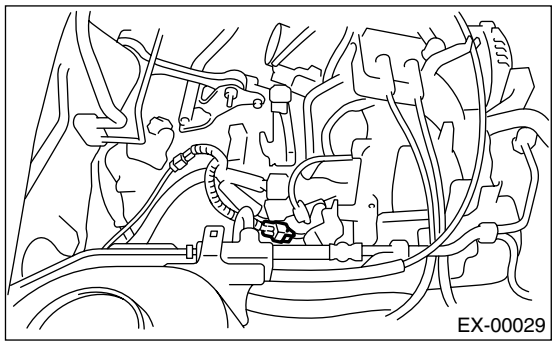
14.Front Oxygen (A/F) Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector from engine hanger, and then disconnect the connector from front oxygen (A/F) sensor.

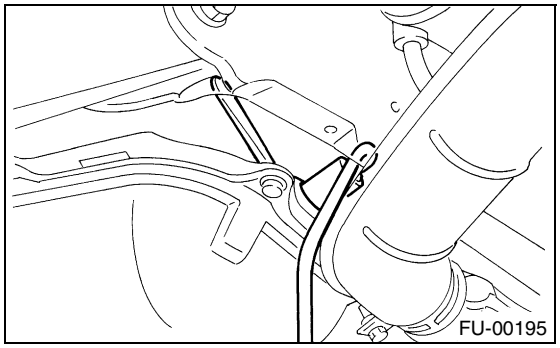


3) Lift-up the vehicle.
4) Apply SUBARU CRC or its equivalent to the threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

5) Remove the front oxygen (A/F) sensor.

CAUTION:
When removing the oxygen (A/F) sensor, wait until exhaust pipe cools, otherwise it will damage exhaust pipe.

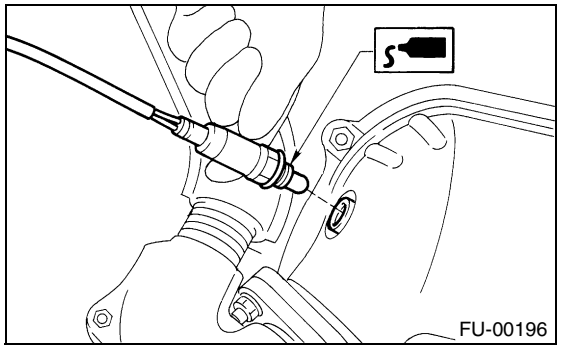


B: INSTALLATION

1) Before installing front oxygen (A/F) sensor, apply the anti-seize compound only to the threaded portion of front oxygen (A/F) sensor to make the next removal easier.

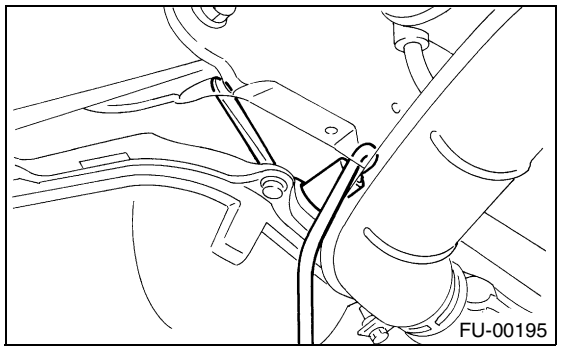
Anti-seize compound:
SS-30 by JET LUBE

CAUTION:
Never apply anti-seize compound to protector of front oxygen (A/F) sensor.

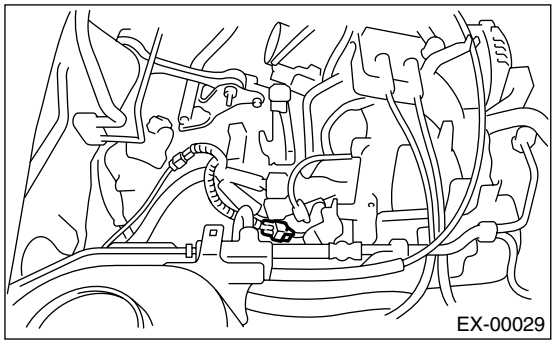


2) Install the front oxygen (A/F) sensor.

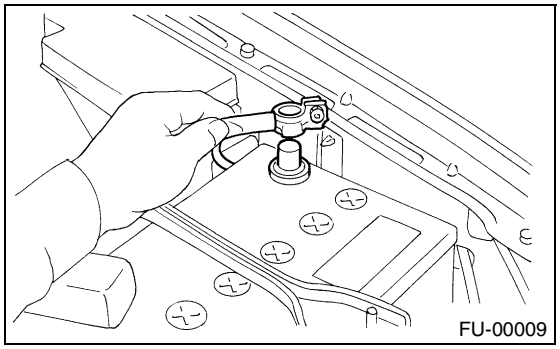
Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)



3) Lower the vehicle.
4) Connect the connector to front oxygen (A/F) sensor, and then connect the connector to engine hanger.



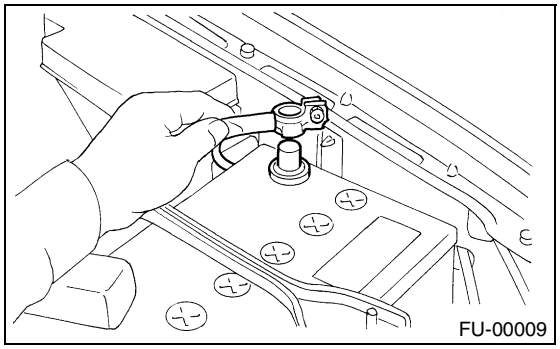
5) Connect the battery ground cable to battery.



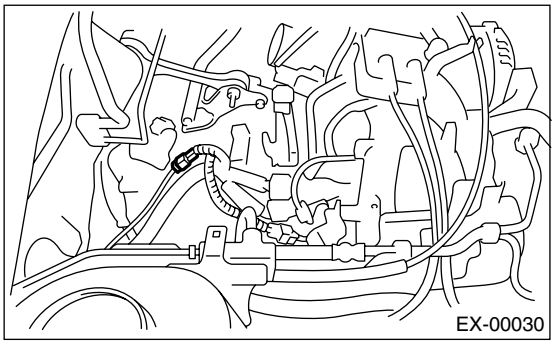
15.Rear Oxygen Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Lift-up the vehicle.
3) Disconnect the connector from the rear oxygen sensor.

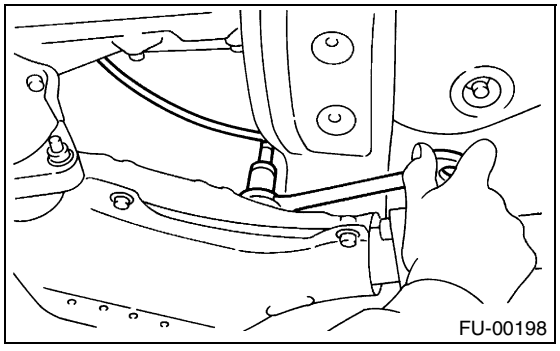


4) Apply SUBARU CRC or its equivalent to the threaded portion of rear oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

5) Remove the rear oxygen sensor.

CAUTION:
When removing the oxygen sensor, wait until exhaust pipe cools, otherwise it will damage exhaust pipe.

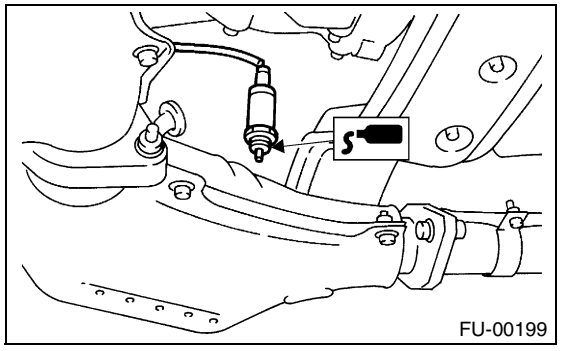


B: INSTALLATION

1) Before installing rear oxygen sensor, apply the anti-seize compound only to the threaded portion of rear oxygen sensor to make the next removal easier.

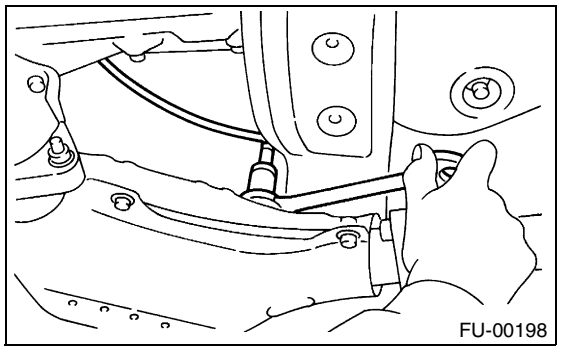
CAUTION:
Never apply anti-seize compound to protector of rear oxygen sensor.

Anti-seize compound:
SS-30 by JET LUBE

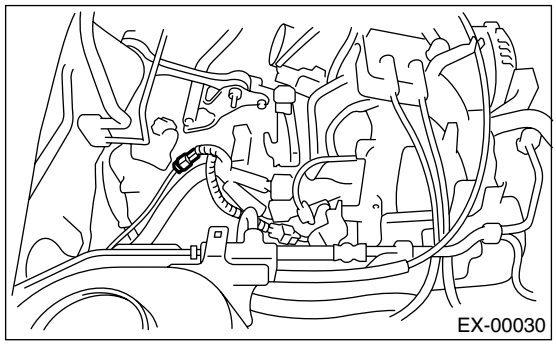


2) Install the rear oxygen sensor.

Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)

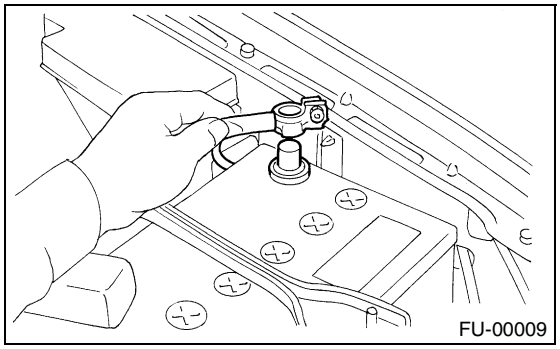


3) Connect the connector to the rear oxygen sensor.



4) Lower the vehicle.

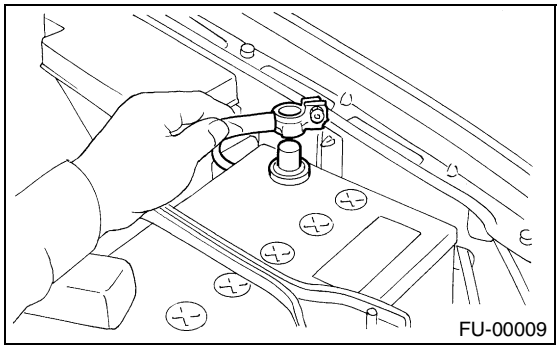
5) Connect the battery ground cable to battery.



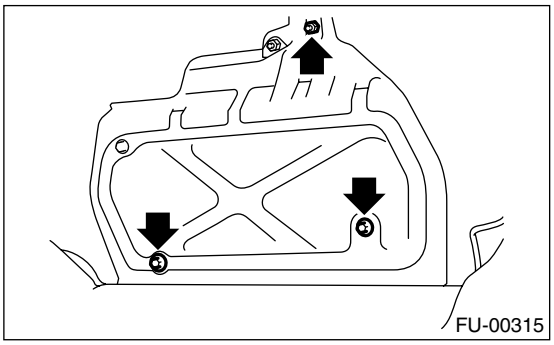
16.Engine Control Module

A: REMOVAL

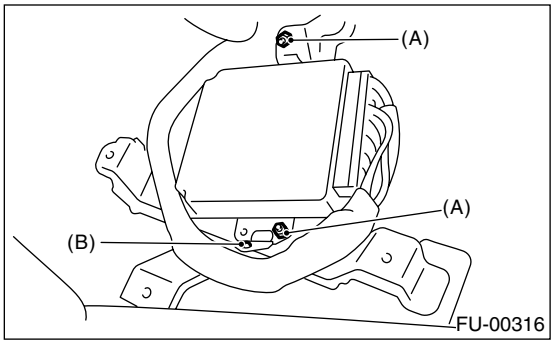
1) Disconnect the ground cable from battery.



2) Remove the lower inner trim of passenger side. <Ref. to EI-44, REMOVAL, Lower Inner Trim.>
3) Detach the floor mat of front passenger seat.
4) Remove the protect cover.



5) Remove the nuts (A) which hold ECM to the bracket.
6) Remove the clip (B) from the bracket.



7) Disconnect the ECM connectors and take out the ECM.

B: INSTALLATION

Install in the reverse order of removal.

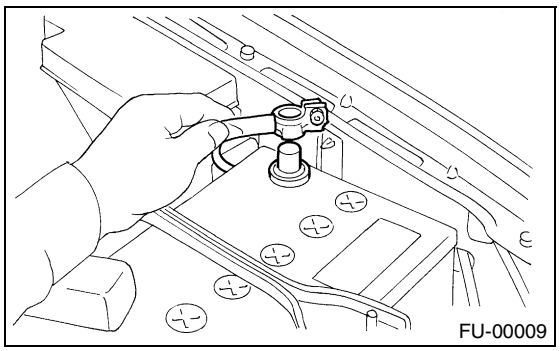
CAUTION:
When replacing ECM, be careful not to use the wrong spec. ECM to avoid any damage to the fuel injection system.

Tightening torque:
5 N·m (0.51 kgf-m, 3.7 ft-lb)

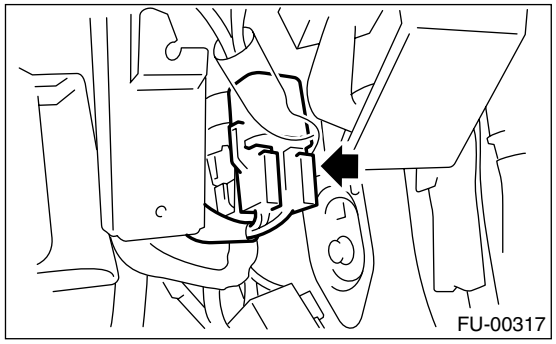
17.Main Relay

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the passenger's side front side sill cover.
3) Remove the bolt which holds main bracket on the body.
4) Disconnect the connectors from the main relay.



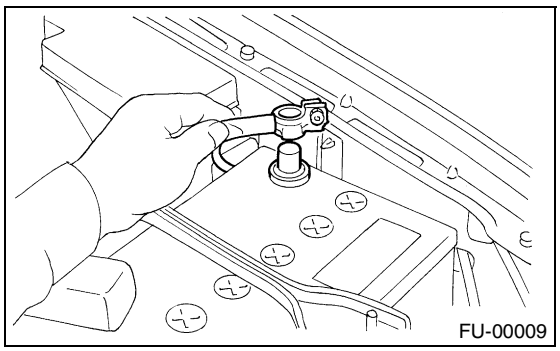
B: INSTALLATION

Install in the reverse order of removal.

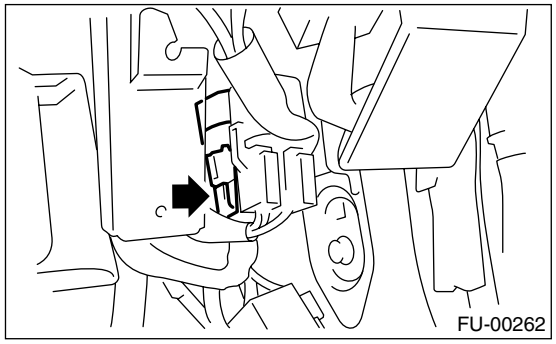
18.Fuel Pump Relay

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the passenger's side front side sill cover.
3) Remove the bolt which holds fuel pump relay bracket on the body.
4) Disconnect the connector from the fuel pump.



5) Remove the fuel pump relay from the mounting bracket.

B: INSTALLATION

Install in the reverse order of removal.

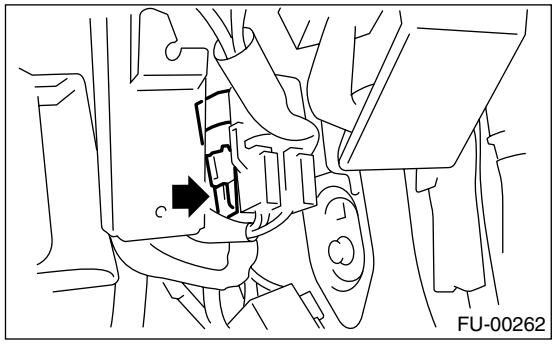
19.Fuel

A: OPERATION

1. RELEASING OF FUEL PRESSURE

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

1) Disconnect the connector from fuel pump relay.

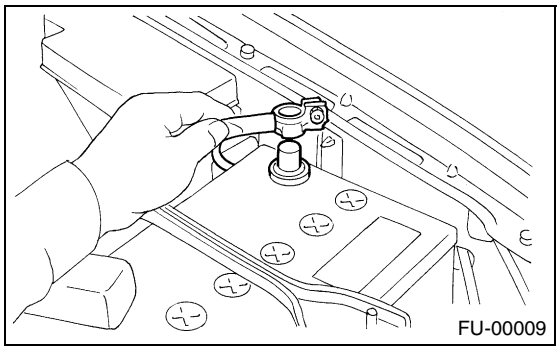


2) Start the engine and run it until it stalls.
3) After the engine stalls, crank it for 5 more seconds.
4) Turn the ignition switch to OFF.

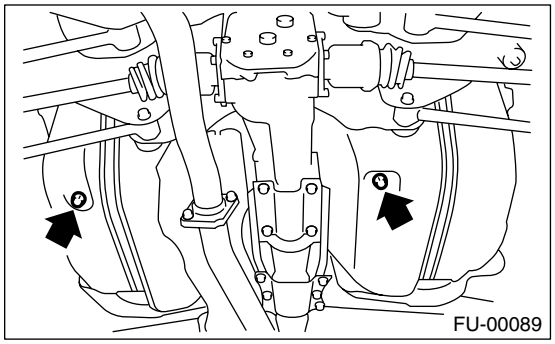
2. DRAINING FUEL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.

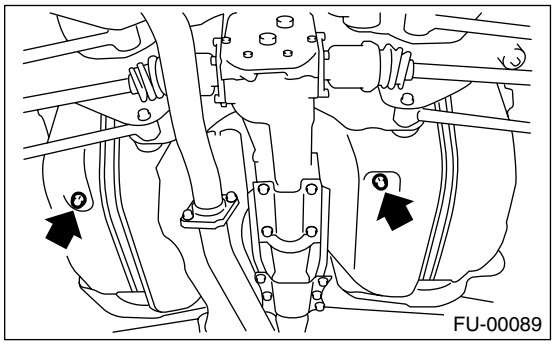


3) Open the fuel filler flap lid and remove fuel filler cap.
4) Lift-up the vehicle.
5) Drain fuel from the fuel tank.
Set a container under the vehicle and remove the drain plug from fuel tank.



6) Tighten the fuel drain plug.

Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)

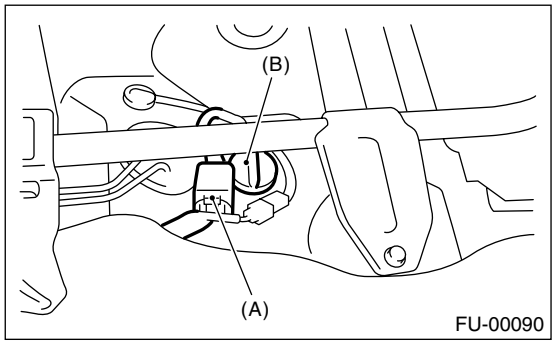


20.Fuel Tank

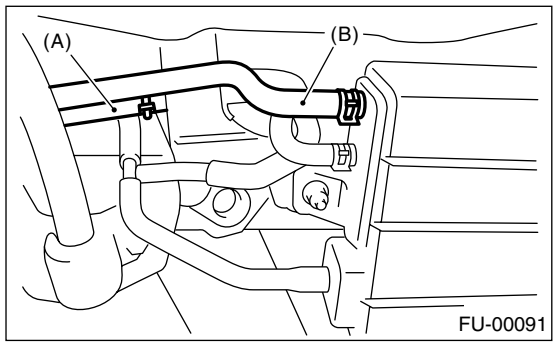
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

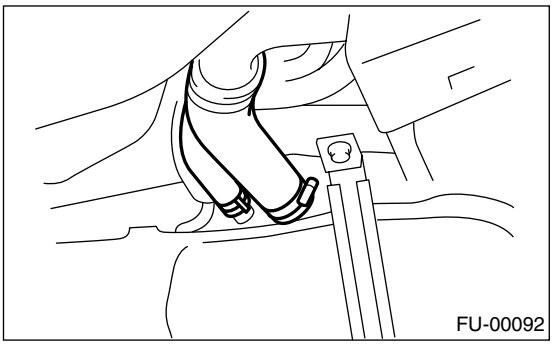
1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(SOHC)-49, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
3) Drain fuel from the fuel tank. <Ref. to FU(SOHC)-49, DRAINING FUEL, OPERATION, Fuel.>
4) Remove the rear seat.
5) Disconnect the connector (A) of fuel tank cord to rear harness.
6) Push the grommet (B) which holds fuel tank cord on floor panel into under the body.



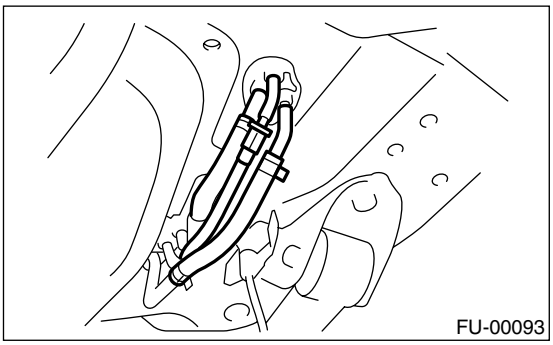
7) Remove the rear crossmember. <Ref. to RS-19, REMOVAL, Rear Crossmember.>
8) Disconnect the two-way valve hose (A) from two-way valve and disconnect the canister hose (B) from canister.



9) Loosen the clamp and disconnect the fuel filler hose and air vent hose from fuel filler pipe.

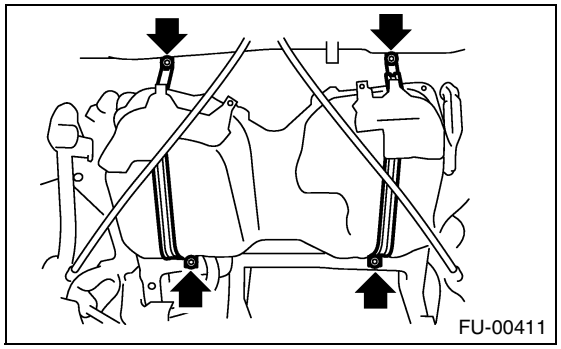


10) Move the clips, and disconnect quick connector. <Ref. to FU(SOHC)-65, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
11) Disconnect the fuel hoses.



12) Support the fuel tank with transmission jack, and remove the bolts from bands and dismount fuel tank from the vehicle.

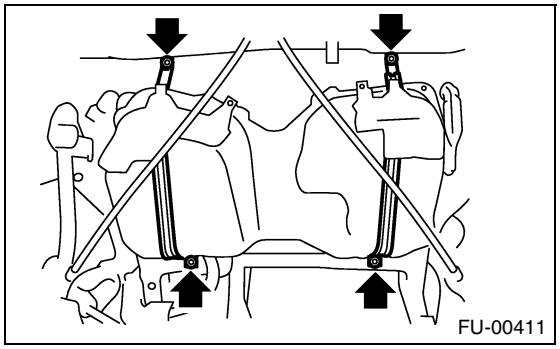
WARNING:
A helper is required to perform this work.



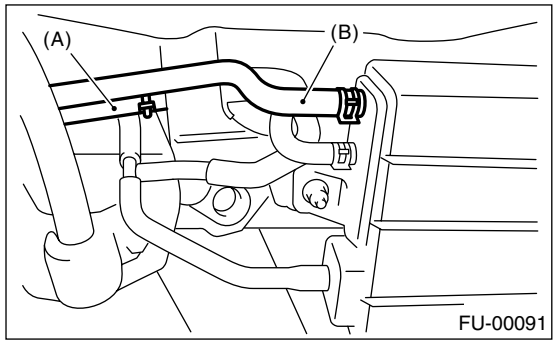
B: INSTALLATION

1) Support the fuel tank with transmission jack and push the fuel tank harness into access hole with grommet.
2) Set the fuel tank and temporarily tighten the bolts of fuel tank bands.

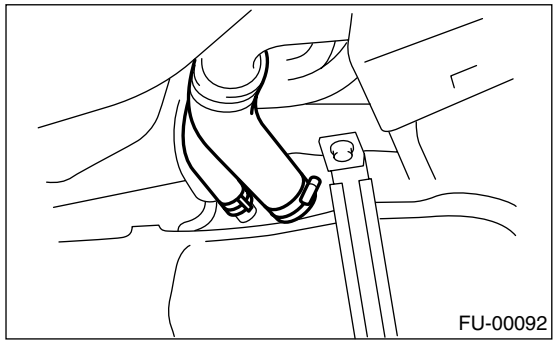
WARNING:
A helper is required to perform this work.



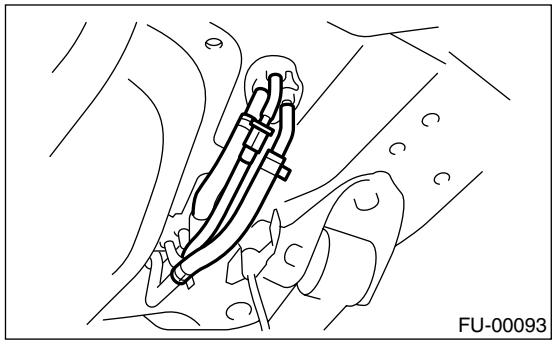
3) Connect the two-way valve hose (A) to two-way valve and connect the canister hose (B) to canister.



4) Connect the fuel filler hose and air vent hose.

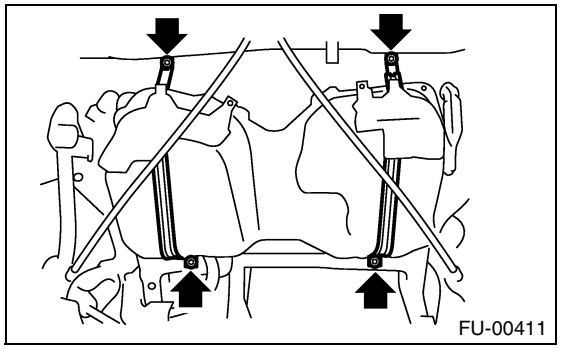


5) Connect the fuel hoses, and secure them with clips and quick connector. <Ref. to FU(SOHC)-66, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

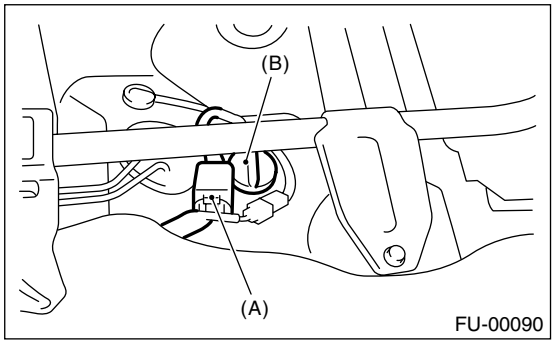


6) Tighten the band mounting bolts.

Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)

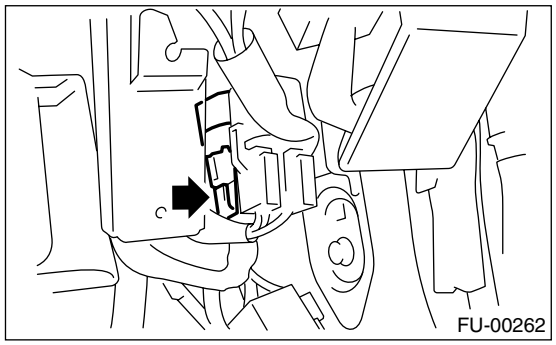


7) Install the rear crossmember. <Ref. to RS-19, INSTALLATION, Rear Crossmember.>
8) Connect the connector (A) to fuel tank cord and plug the service hole with grommet (B).



9) Set the rear seat and floor mat.

10) Connect the connector to fuel pump relay.



C: INSPECTION

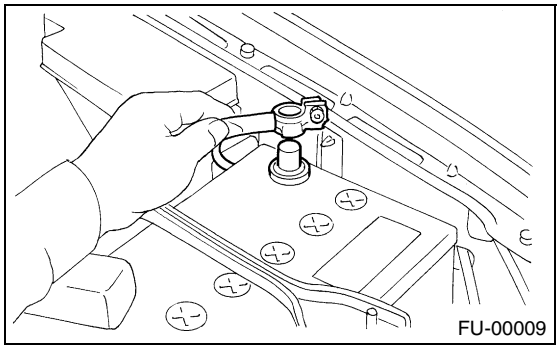
1) Make sure there are no cracks, holes, or other damage on the fuel tank.
2) Make sure that the fuel hoses and fuel pipes are not cracked and that connections are tight.

21.Fuel Filler Pipe

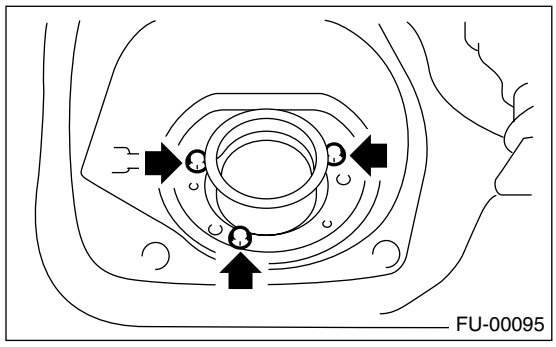
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

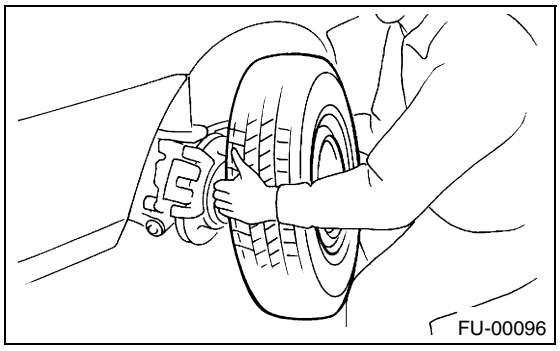
1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(SOHC)-49, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
3) Open the fuel filler flap lid and remove fuel filler cap.
4) Disconnect the ground cable from battery.


FU-00009

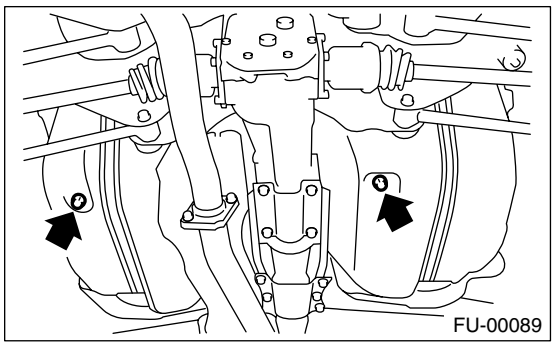
5) Remove the screws holding packing in place.


FU-00095

6) Loosen the rear right side wheel nuts.
7) Lift-up the vehicle.
8) Remove the rear right side wheel.

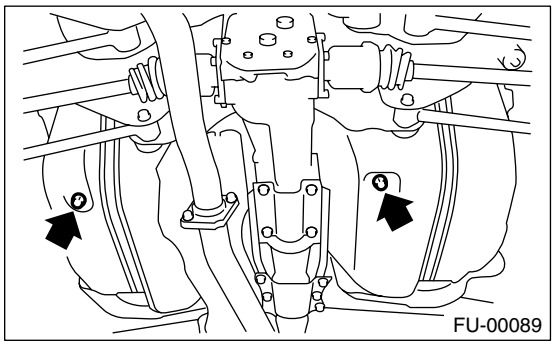

FU-00096

9) Drain fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.

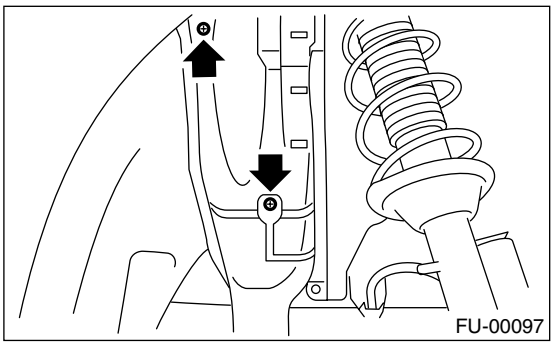

FU-00089

10) Tighten the fuel drain plug and then install the front right side tank cover.

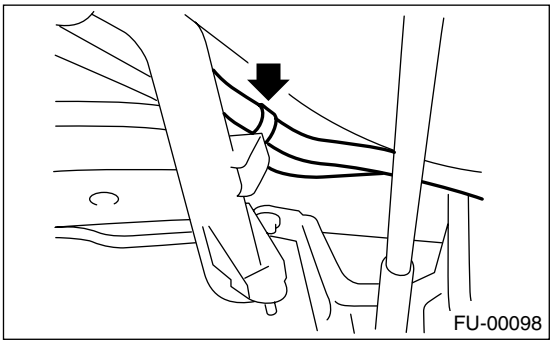
Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)


FU-00089

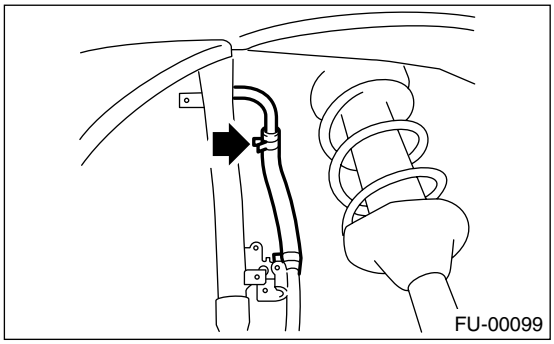
11) Remove the fuel filler pipe protector.


FU-00097

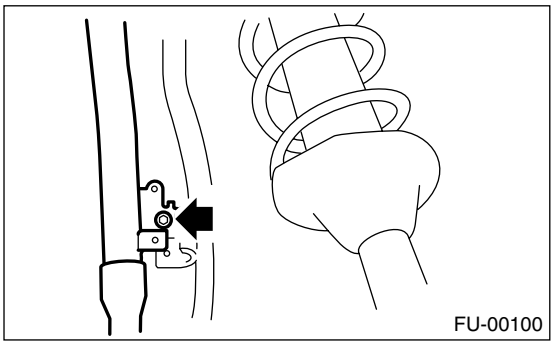
12) Separate the evaporation hoses from clip of fuel filler pipe.


FU-00098

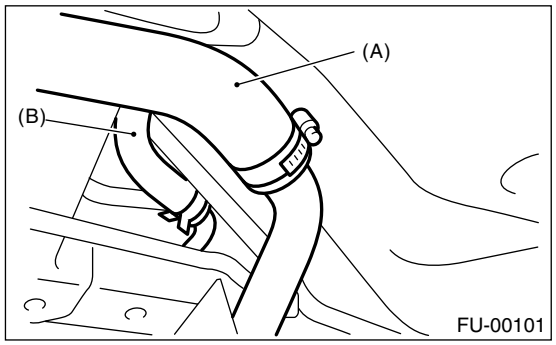
13) Disconnect the air vent hose from fuel filler pipe.



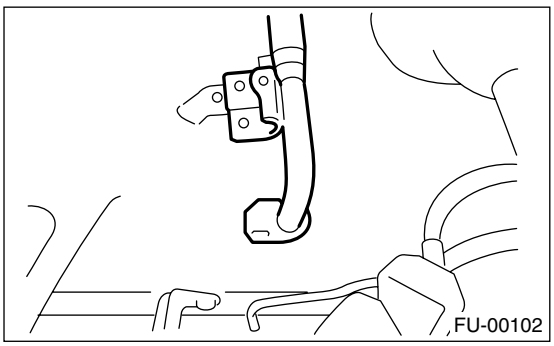
14) Remove the bolts which hold fuel filler pipe bracket on body.



15) Loosen the clamp and separate fuel filler hose (A) from fuel filler pipe.
16) Move the clip and separate air vent hose (B).



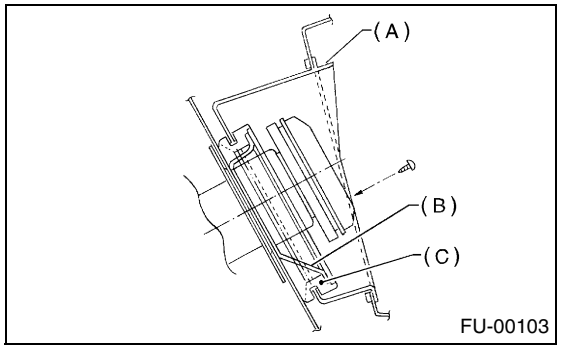
17) Remove the fuel filler pipe to under side of the vehicle.
18) Remove the air vent pipe together with clip from body.



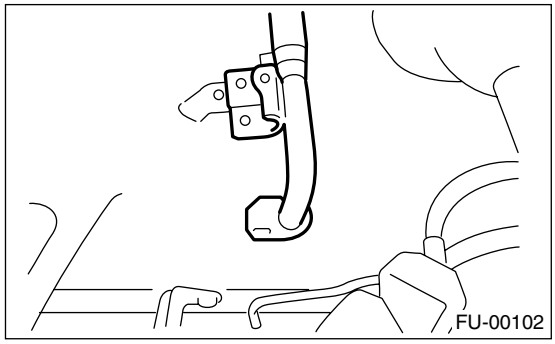
B: INSTALLATION

1) Hold the fuel filler flap open.
2) Set the fuel saucer (A) with rubber packing (C) and insert the fuel filler pipe into hole from the inner side of apron.
3) Align the holes in fuel filler pipe neck and set cup (B), and tighten the screws.

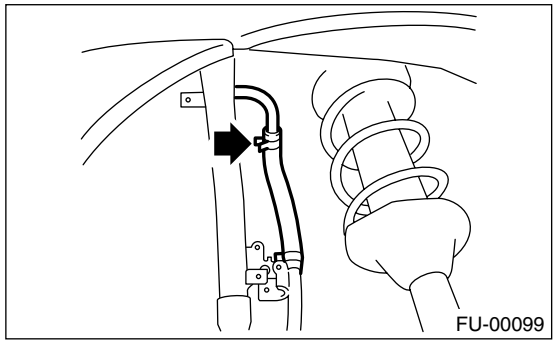
NOTE:
If the edges of rubber packing are folded toward inside, straighten it with a screwdriver.



4) Install the air vent pipe.

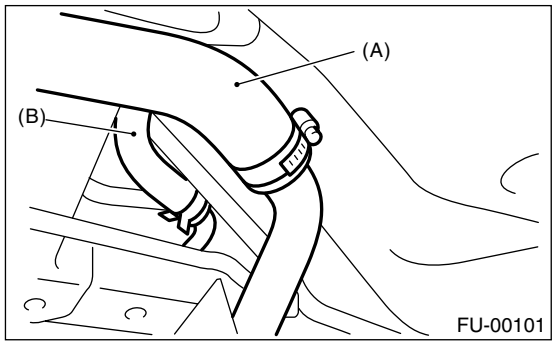


5) Connect the air vent hose to fuel filler pipe.



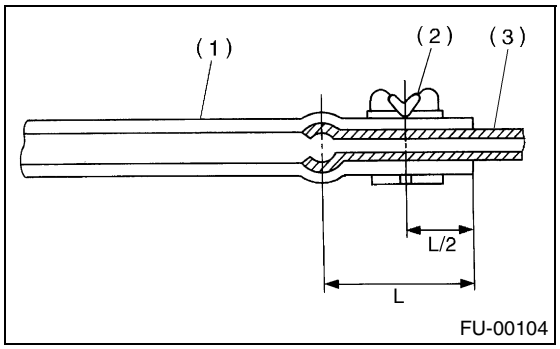
6) Insert the fuel filler hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten the clamp.

CAUTION:
Do not allow clips to touch the air vent hose (B) and rear suspension crossmember.



7) Insert the air vent hose approx. 25 to 30 mm (0.98 to 1.18 in) into the lower end of air vent pipe and hold clip.

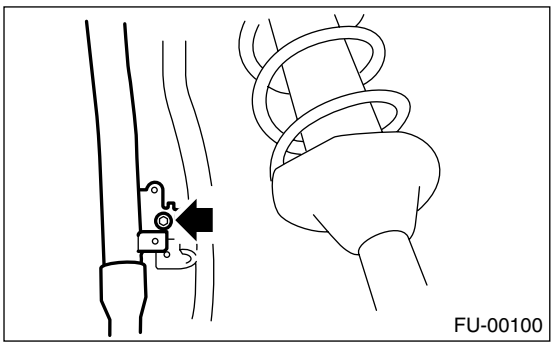
L = 27.5±2.5 mm (1.083±0.098 in)



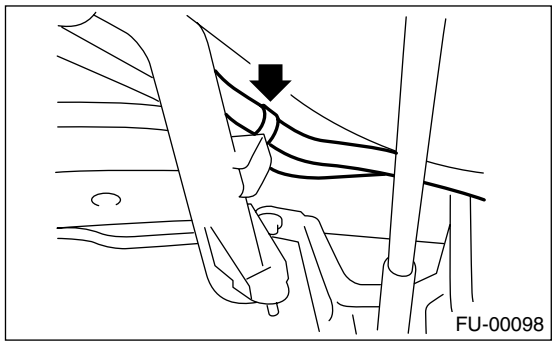
(1) Hose
(2) Clip
(3) Pipe

8) Tighten the bolt which holds fuel filler pipe bracket on body.

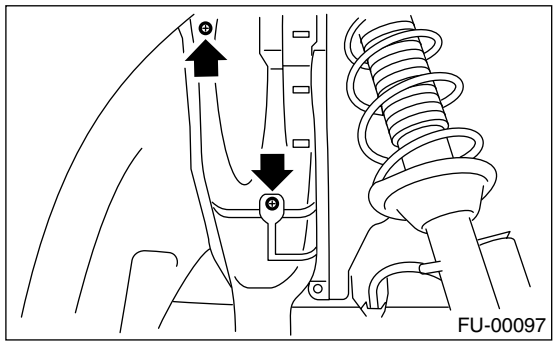
Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



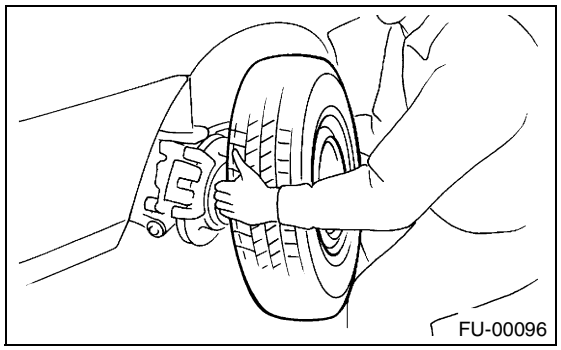
9) Hold the evaporation hoses onto clip of fuel filler pipe.



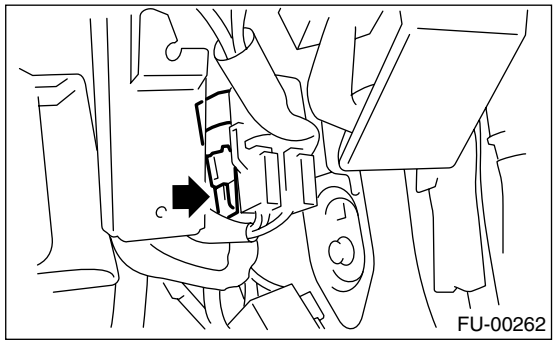
10) Install the fuel filler pipe protector.



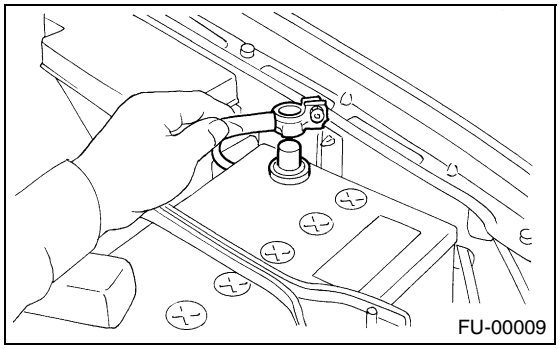
11) Install the rear right wheel.



12) Lower the vehicle.
13) Tighten the wheel nuts.
14) Connect the connector to fuel pump relay.



15) Connect the battery ground cable to battery.



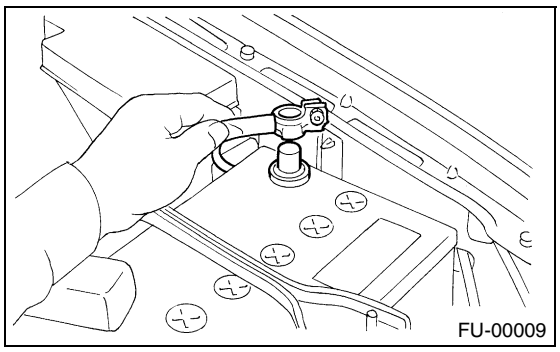
22.Fuel Pump

A: REMOVAL

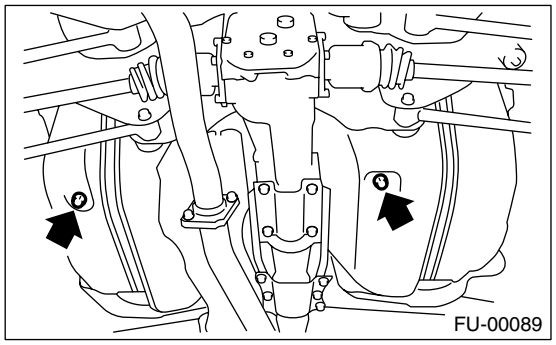
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

NOTE:
Fuel pump assembly consists of fuel pump and fuel level sensor.

1) Release the fuel pressure. <Ref. to FU(SOHC)-49, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid and remove fuel filler cap.
3) Disconnect the ground cable from battery.

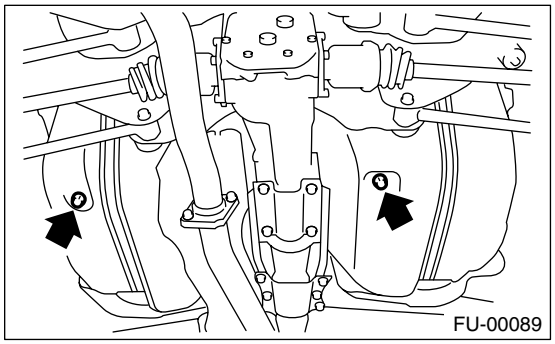

FU-00009

4) Lift-up the vehicle.
5) Drain fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.

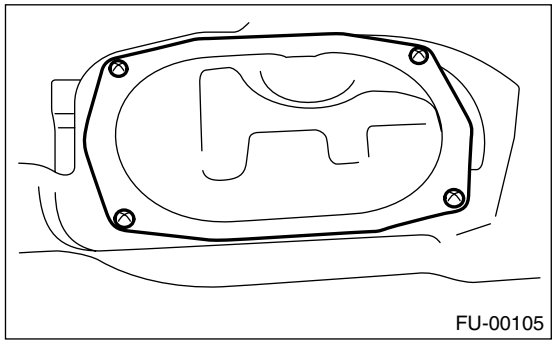

FU-00089

6) Tighten the fuel drain plug.

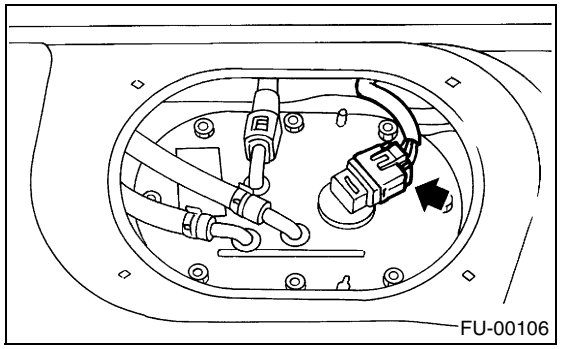
Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)


FU-00089

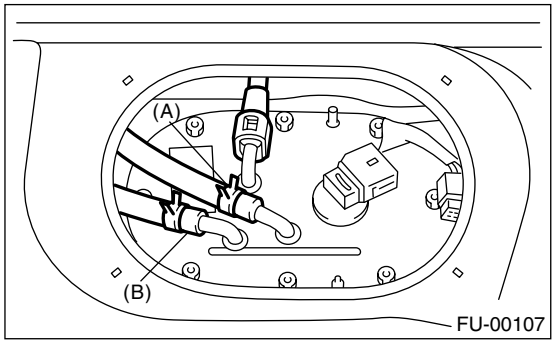
7) Raise the rear seat and turn floor mat up.
8) Remove the access hole lid.


FU-00105

9) Disconnect the connector from fuel pump.

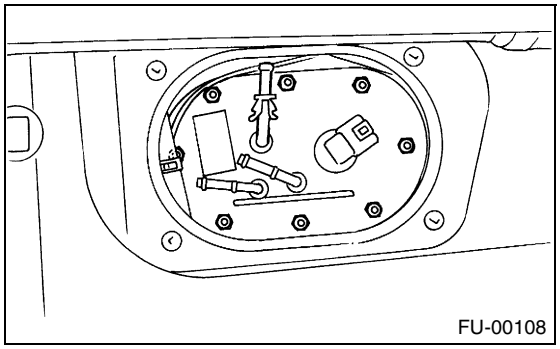

FU-00106

10) Disconnect the quick connector and then disconnect fuel delivery hose. <Ref. to FU(SOHC)-65, Fuel Delivery, Return and Evaporation Lines.>
11) Move the clips, and then disconnect the fuel return hose (A) and jet pump hose (B).



FU-00107

12) Remove the nuts which install fuel pump assembly onto fuel tank.


FU-00108

13) Take off the fuel pump assembly from fuel tank.

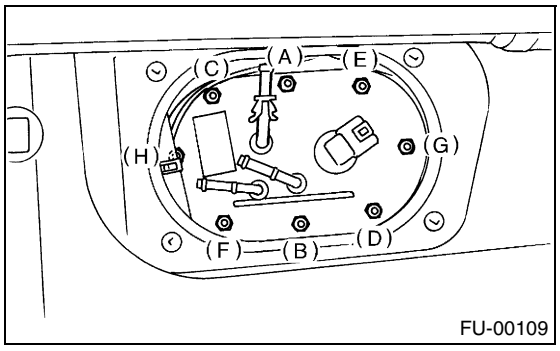
B: INSTALLATION

Install in the reverse order of removal. Do the following:

NOTE:
Always use new gaskets.

(1) Ensure sealing portion is free from fuel or foreign particles before installation.
(2) Tighten the nuts in alphabetical sequence shown in the figure to specified torque.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

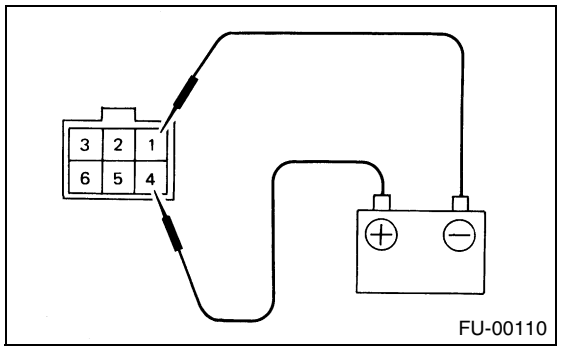


FU-00109

C: INSPECTION

Connect the lead harness to connector terminal of fuel pump and apply battery power supply to check whether the pump operates.

WARNING:
• Wipe off the fuel completely.
• Keep the battery as far apart from fuel pump as possible.
• Be sure to turn the battery supply ON and OFF on battery side.
• Do not run the fuel pump for a long time under non-load condition.



FU-00110

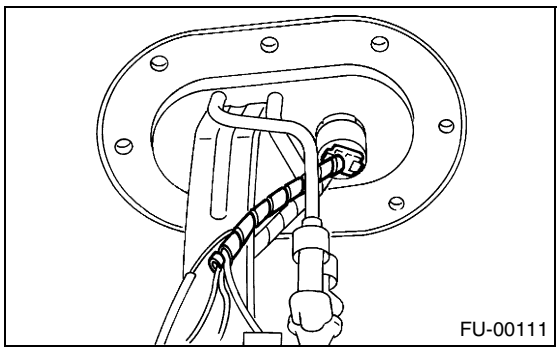
23.Fuel Level Sensor

A: REMOVAL

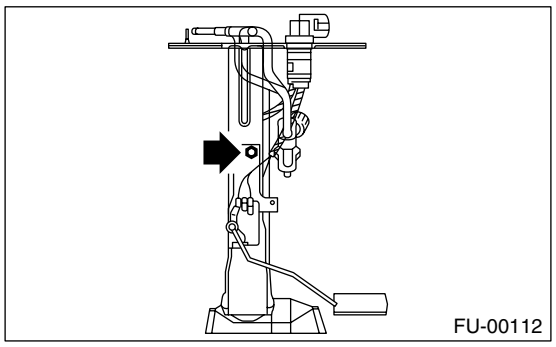
WARNING:
- **Place “NO FIRE” signs near the working area.**
- **Be careful not to spill fuel.**

NOTE:
Fuel level sensor is built in fuel pump assembly.

1) Remove the fuel pump assembly. <Ref. to FU(SOHC)-57, REMOVAL, Fuel Pump.>
2) Disconnect the connector from fuel pump bracket.



3) Remove the bolt which installs fuel level sensor on mounting bracket.



B: INSTALLATION

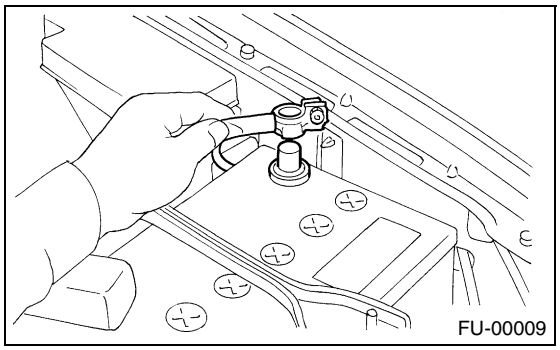
Install in the reverse order of removal.

24.Fuel Sub Level Sensor

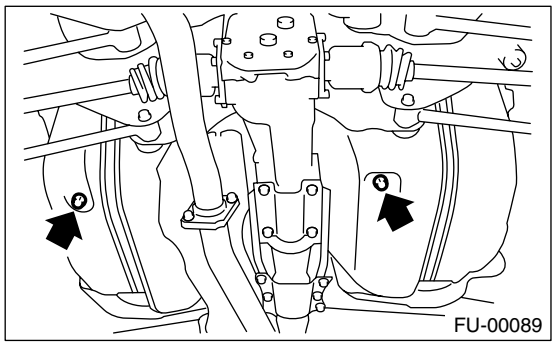
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

1) Disconnect the ground cable from battery.

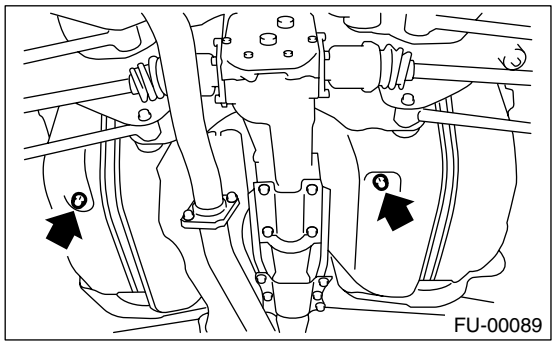


2) Lift-up the vehicle.
3) Drain fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.

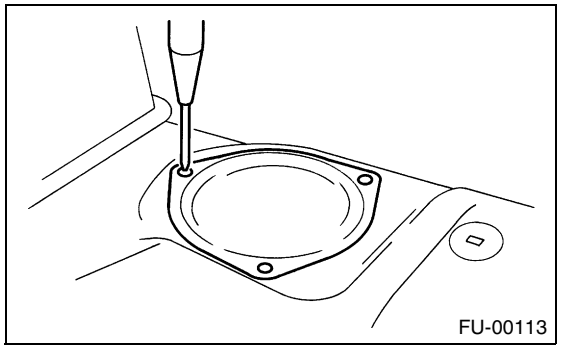


4) Tighten the fuel drain plug.

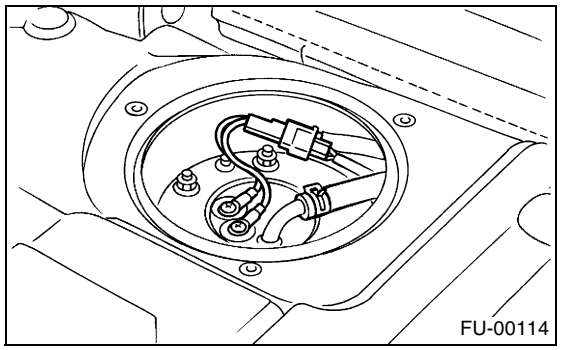
Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)



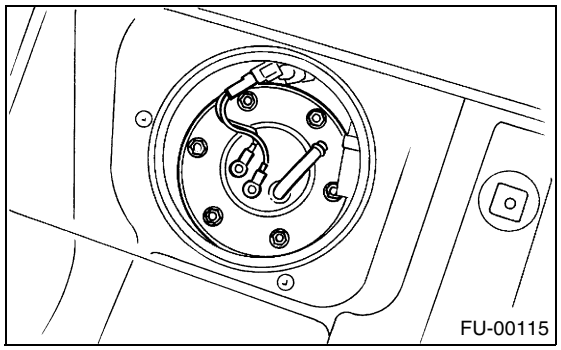
5) Remove the rear seat.
6) Remove the service hole cover.



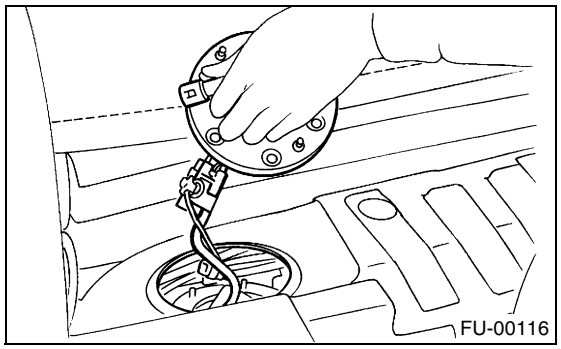
7) Disconnect the connector from fuel sub meter.
8) Disconnect the fuel jet pump hose.



9) Remove the bolts which install fuel sub meter unit on fuel tank.



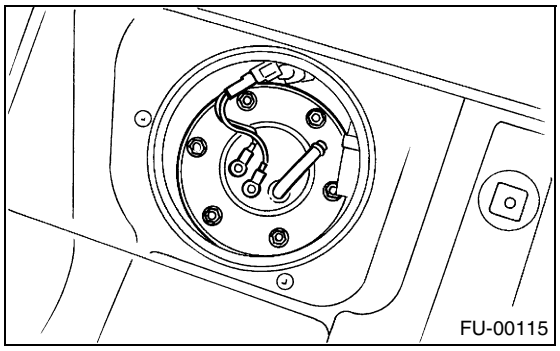
10) Remove the fuel sub meter unit.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

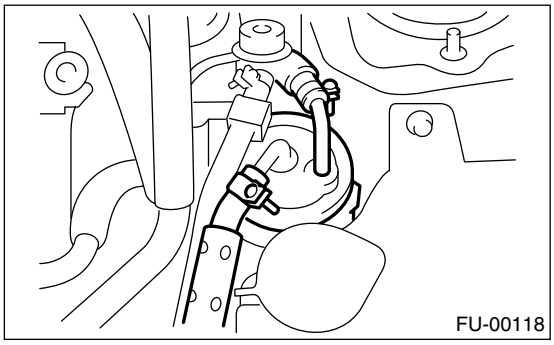


25.Fuel Filter

A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

1) Release the fuel pressure. <Ref. to FU(SOHC)-49, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Disconnect the fuel delivery hoses from fuel filter.



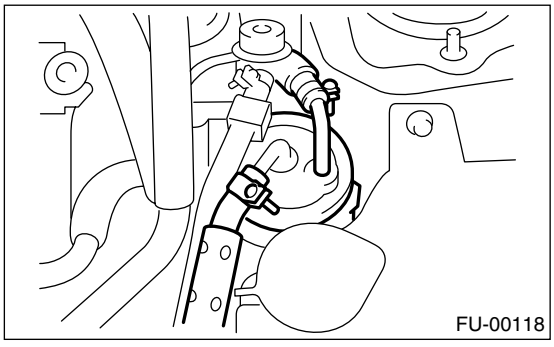
3) Remove the filter from holder.

B: INSTALLATION

CAUTION:
- **If fuel hoses are damaged at the connecting portion, replace it with a new one.**
- **If clamps are badly damaged, replace with new ones.**

1) Install in the reverse order of removal.
2) Tighten the hose clamp screws.

Tightening torque:
1.25 N·m (0.13 kgf-m, 0.94 ft-lb)



C: INSPECTION

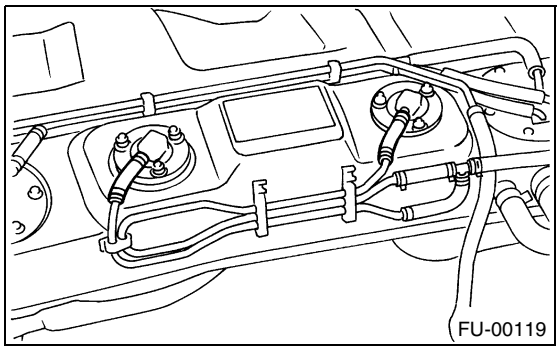
1) Check the inside of fuel filter for dirt and water sediment.
2) If it is clogged, or if replacement interval has been reached, replace it.
3) If water is found in it, shake and expel the water from inlet port.

26.Fuel Cut Valve

A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

1) Remove the fuel tank. <Ref. to FU(SOHC)-50, REMOVAL, Fuel Tank.>
2) Move the clip and disconnect the evaporation hose from fuel cut valve.

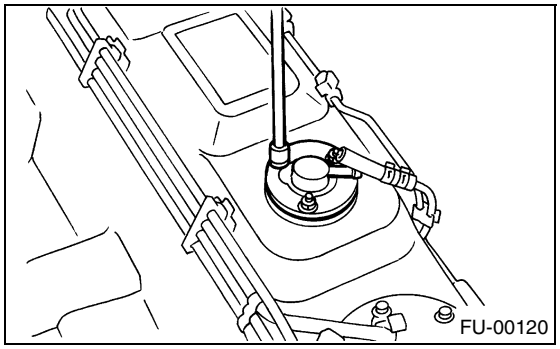


3) Remove the bolts which install fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

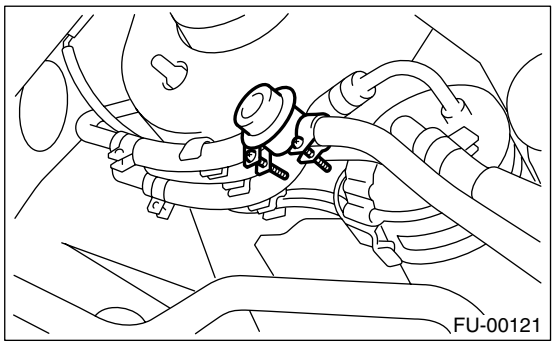
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



27.Fuel Damper Valve

A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(SOHC)-49, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Remove the fuel damper valve from fuel return line.



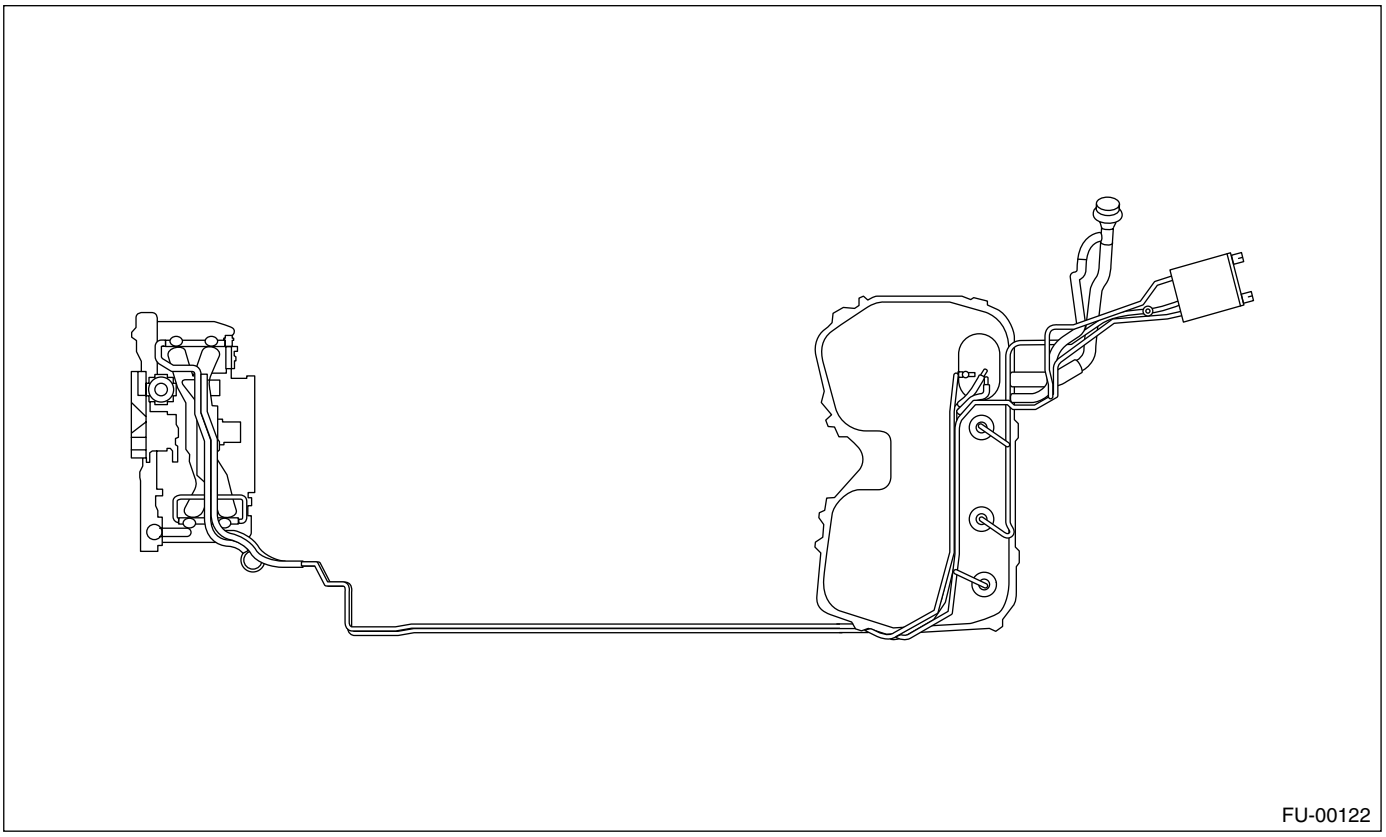
B: INSTALLATION

Install in the reverse order of removal.

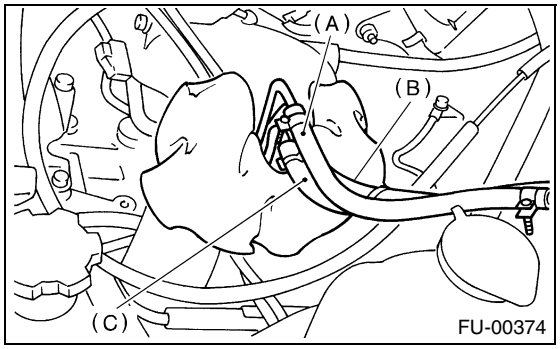
28.Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(SOHC)-49, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
3) Open the fuel filler flap lid and remove fuel filler cap.
4) Remove the floor mat. <Ref. to EI-49, REMOVAL, Floor Mat.>
5) Remove the fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.

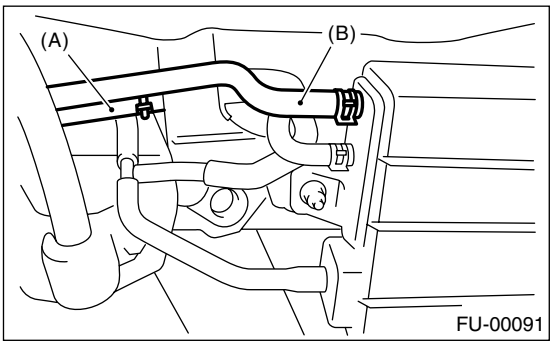


6) In the engine compartment, detach the fuel delivery hose (A), return hose (B) and evaporation hose (C).



7) Lift-up the vehicle.

8) Disconnect the two-way valve hose (A) from two-way valve and disconnect the canister hose (B) from canister.

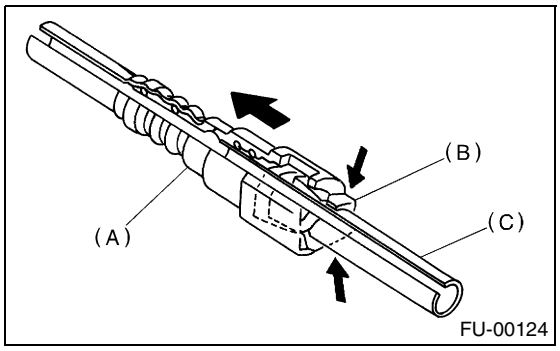


9) Separate the quick connector on fuel delivery line.

(1) Clean the pipe and connector, if they are covered with dust.

(2) Hold the connector (A) and push retainer (B) down.

(3) Pull out the connector (A) from retainer (B).

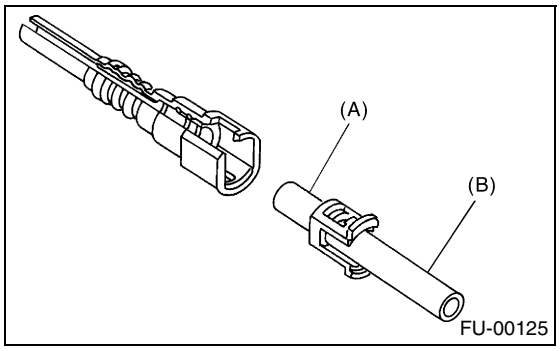


(A) Connector
(B) Retainer
(C) Pipe

B: INSTALLATION

1) Connect the quick connector on fuel delivery line.

NOTE:
- Always use a new retainer.
- Make sure that the connected portion is not damaged or has dust. If necessary, clean the seal surface of pipe.

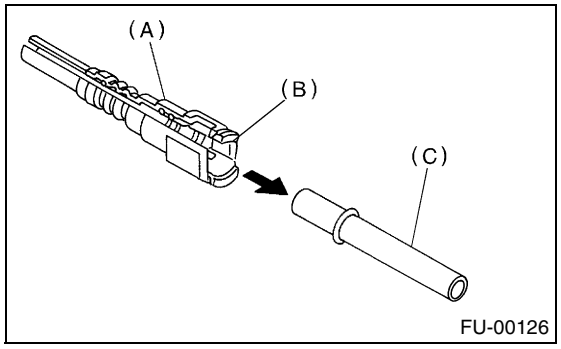


(A) Seal surface
(B) Pipe

(1) Set the new retainer (B) to connector (A).

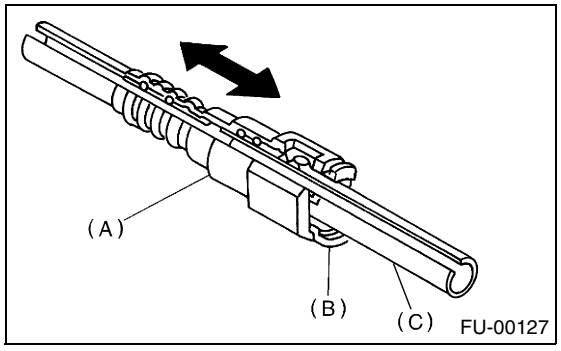
(2) Push the pipe into connector completely.

NOTE:
At this time, two clicking sounds are heard.



(A) Connector
(B) Retainer
(C) Pipe

CAUTION:
- **Pull the connector to ensure it is connected securely.**
- **Ensure the two retainer pawls are engaged in their mating positions in the connector.**
- **Be sure to inspect the hoses and their connections for any leakage of fuel.**

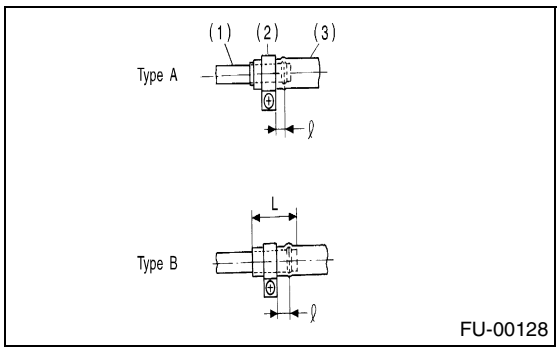


(A) Connector
(B) Retainer
(C) Pipe

2) Connect the fuel delivery hose to pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).
Type A: When the fitting length is specified.
Type B: When the fitting length is not specified.

ℓ : 2.5±1.5 mm (0.098±0.059 in)

L: 22.5±2.5 mm (0.886±0.098 in)

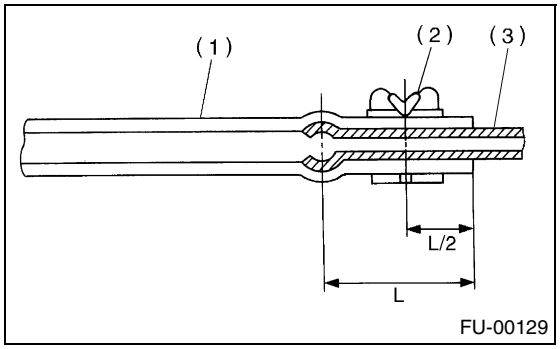


(1) Fitting
(2) Clamp
(3) Hose

3) Connect the evaporation hose to pipe by approx. 15 mm (0.59 in) from the hose end.

L = 17.5±2.5 mm (0.689±0.098 in)

CAUTION:
Be sure to inspect the hoses and their connections for any leakage of fuel.



(1) Hose
(2) Clip
(3) Pipe

C: INSPECTION

1) Make sure that there are no cracks on the fuel pipes and fuel hoses.
2) Make sure that the fuel pipe and fuel hose connections are tight.

29.Fuel System Trouble in General

A: INSPECTION

Trouble and possible cause			Corrective action
1. Insufficient fuel supply to the injector			
1)	Fuel pump will not operate.		
	❍	Defective terminal contact.	Inspect connections, especially ground, and tighten securely.
	❍	Trouble in electromagnetic or electronic circuit parts.	Replace the fuel pump.
2)		Lowering of fuel pump function.	Replace the fuel pump.
3)		Clogged dust or water in the fuel filter.	Replace the fuel filter, clean or replace fuel tank.
4)		Clogged or bent fuel pipe or hose.	Clean, correct or replace the fuel pipe or hose.
5)		Air is mixed in the fuel system.	Inspect or retighten each connection part.
6)		Clogged or bent breather tube or pipe.	Clean, correct or replace the air breather tube or pipe.
7)		Damaged diaphragm of pressure regulator.	Replace.
2. Leakage or blow out fuel			
1)		Loosened joints of the fuel pipe.	Retightening.
2)		Cracked fuel pipe, hose and fuel tank.	Replace.
3)		Defective welding part on the fuel tank.	Replace.
4)		Defective drain packing of the fuel tank.	Replace.
5)		Clogged or bent air breather tube or air vent tube.	Clean, correct or replace the air breather tube or air vent tube.
3. Gasoline smell inside of compartment			
1)		Loose joints at air breather tube, air vent tube and fuel filler pipe.	Retightening.
2)		Defective packing air tightness on the fuel saucer.	Correct or replace the packing.
3)		Cracked fuel separator.	Replace the separator.
4)		Inoperative fuel pump modulator or circuit.	Replace.
4. Defective fuel meter indicator			
1)		Defective operation of fuel level sensor.	Replace.
2)		Defective operation of fuel meter.	Replace.
5. Noise			
1)		Large operation noise or vibration of fuel pump.	Replace.

NOTE:

• When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank.

To prevent water condensation.

(1) Top off the fuel tank or drain the fuel completely.

(2) Drain the water condensation from the fuel filter.

• Refilling the fuel tank.

Refill the fuel tank while there is still some fuel left in the tank.

• Protecting the fuel system against freezing and water condensation.

(3) Cold areas:

In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use an anti-freeze solution in the cooling system. Refueling will also complement the effect of anti-freeze solution each time the fuel level drops to about one-half. After the winter season, drain the water which may have accumulated in the fuel filter and fuel tank in the manner same as that described under “Affected areas” below.

(4) Affected areas:

When the water condensation is notched in the fuel filter, drain the water from both the fuel filter and fuel tank or use a water removing agent (or anti-freeze solution) in the fuel tank.

• Observe the instructions, notes, etc., indicated on the label affixed to the anti-freeze solution (water removing agent) container before use.

EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES)
EC(SOHC)

		Page
1.	General Description	2
2.	Front Catalytic Converter	3
3.	Rear Catalytic Converter	6
4.	EGR Valve	7
5.	Canister	8
6.	Purge Control Solenoid Valve	9
7.	Two-way Valve	10

1. General Description

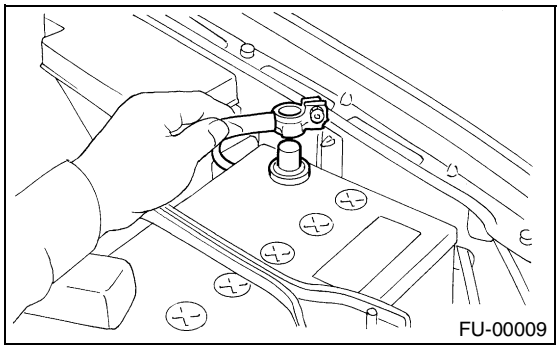
A: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

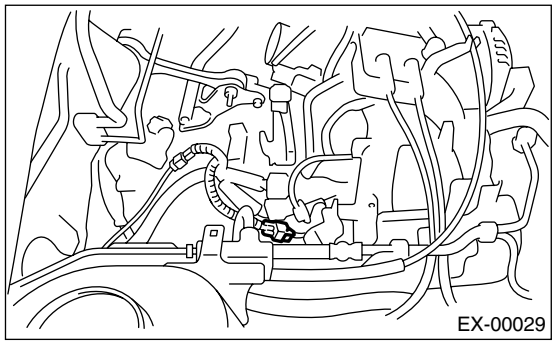
2. Front Catalytic Converter

A: REMOVAL

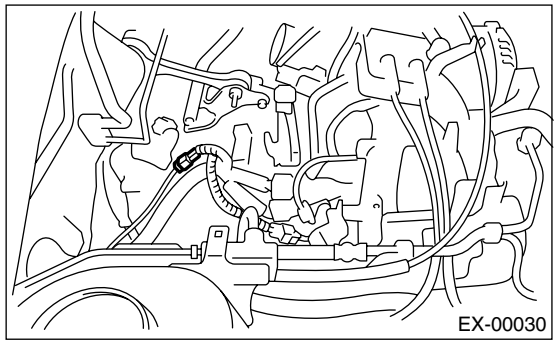
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



3) Disconnect the front oxygen (A/F) sensor connector.

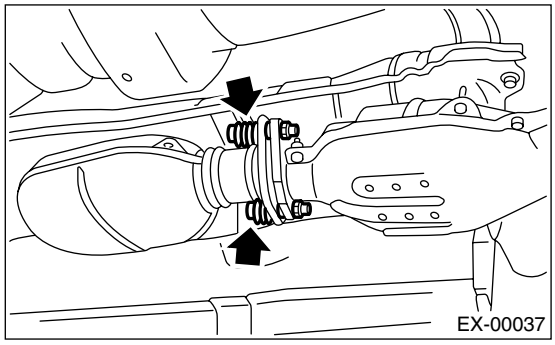


4) Disconnect the connector from rear oxygen sensor connector.

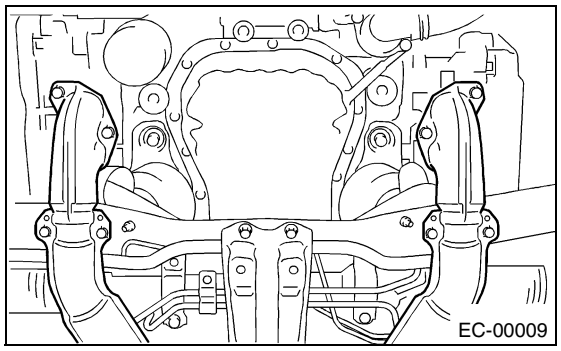


5) Lift-up the vehicle.
6) Remove the under cover.
7) Separate the center exhaust pipe from rear exhaust pipe.

CAUTION:
Be careful, the exhaust pipe is hot.

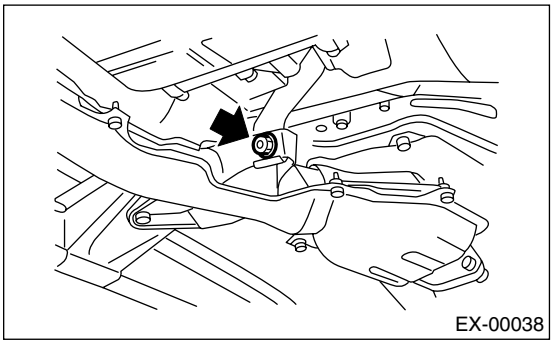


8) Remove the nuts which hold front exhaust pipe onto cylinder heads.

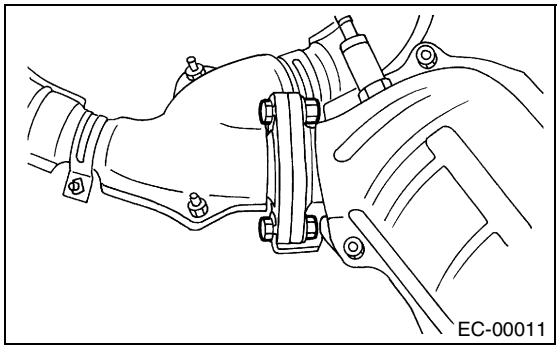


9) Remove the front and center exhaust pipe from hanger bracket.

CAUTION:
Be careful not to pull down the front exhaust pipe and center exhaust pipe.



10) Separate the front catalytic converter from front exhaust pipe.

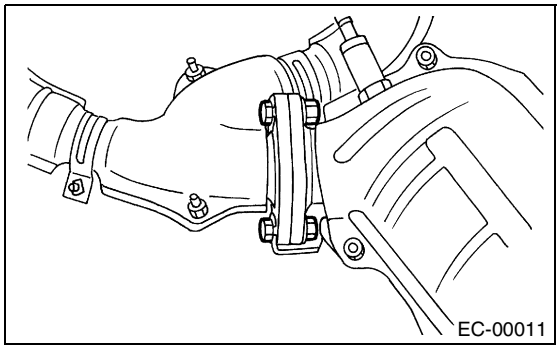


B: INSTALLATION

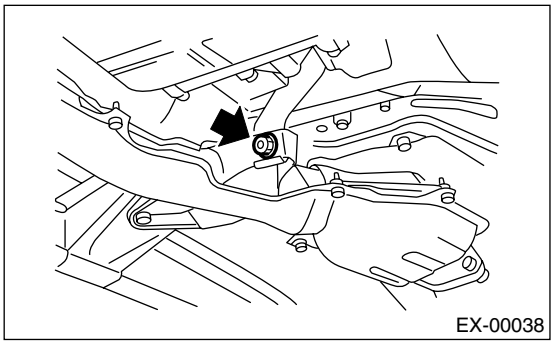
NOTE:
Replace gaskets with new ones.

1) Install the front catalytic converter to front exhaust pipe.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)

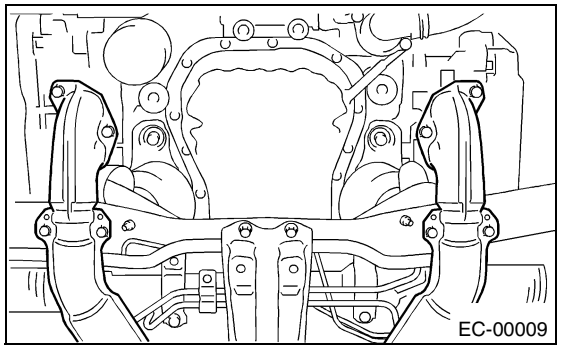


2) Install the front and center exhaust pipe assembly to the vehicle. And temporarily tighten the bolt which installs center exhaust pipe to hanger bracket.



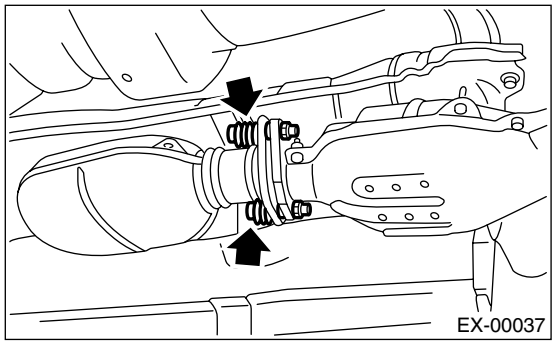
3) Tighten the nuts which hold front exhaust pipe onto cylinder heads.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)



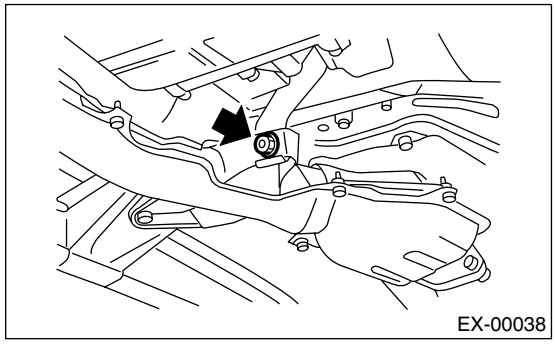
4) Tighten the bolts which install front and center exhaust pipe to rear exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



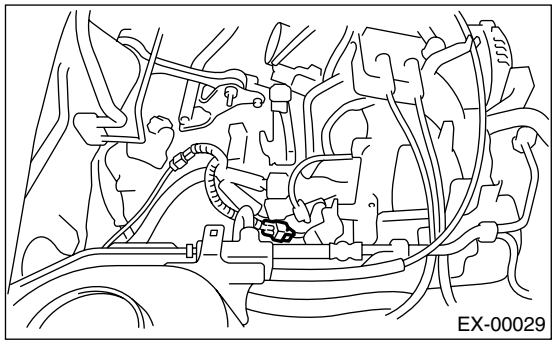
5) Tighten the bolt which holds front and center exhaust pipe assembly to hanger bracket.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)

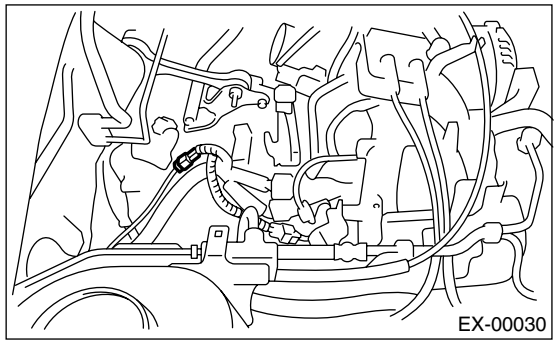


6) Install the under cover.

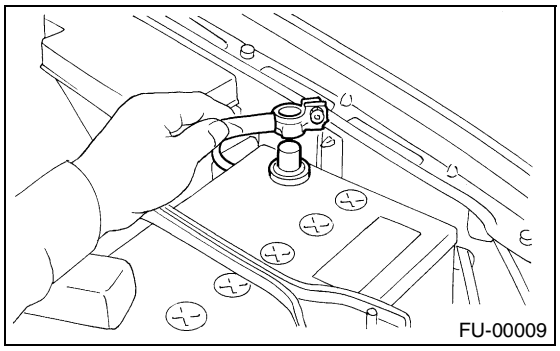
7) Lower the vehicle.
8) Connect the front oxygen (A/F) sensor connector.



9) Connect the connector to rear oxygen sensor connector.



10) Connect the battery ground cable to battery.



C: INSPECTION

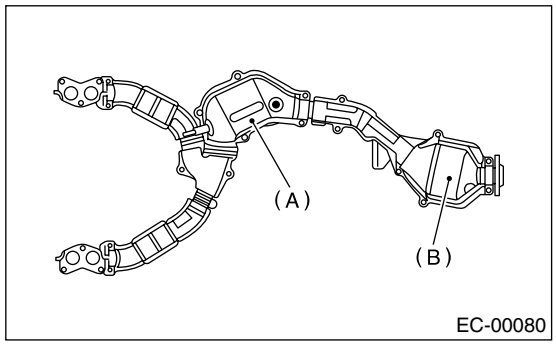
1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

3. Rear Catalytic Converter

A: REMOVAL

1. WITH OBD

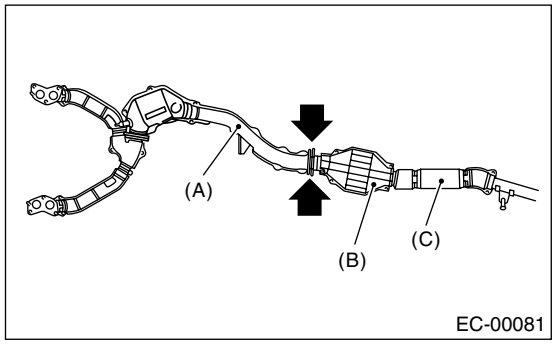
The front and rear catalytic converter and center exhaust pipe are integrated into one unit. Therefore, the removal and installation procedures are the same as the those for the front catalytic converter. <Ref. to EC(SOHC)-3, REMOVAL, Front Catalytic Converter.>



(A) Front catalytic converter
(B) Rear catalytic converter

2. WITHOUT OBD

Rear catalytic converter and rear exhaust pipe are integrated into one unit. Refer to Rear Exhaust Pipe for removal procedures. <Ref. to EX(SOHC)-11, REMOVAL, Rear Exhaust Pipe.>

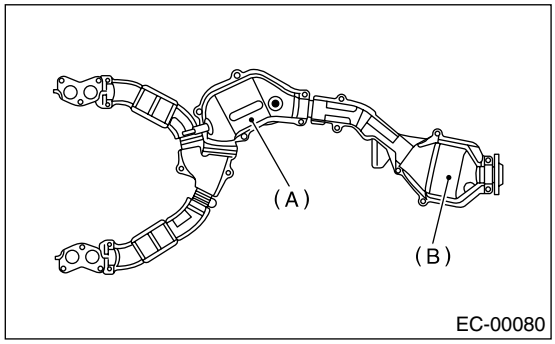


(A) Front exhaust pipe
(B) Rear catalytic converter
(C) Rear exhaust pipe

B: INSTALLATION

1. WITH OBD

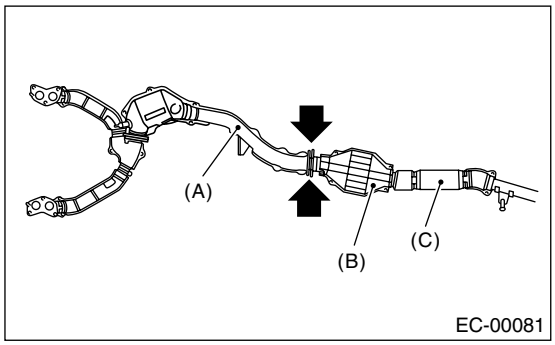
Install in the reverse order of removal.



(A) Front catalytic converter
(B) Rear catalytic converter

2. WITHOUT OBD

Install in the reverse order of removal.



(A) Front exhaust pipe
(B) Rear catalytic converter
(C) Rear exhaust pipe

C: INSPECTION

1. WITH OBD

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

2. WITHOUT OBD

Inspect in the same procedures as the vehicle with OBD.

4. EGR Valve

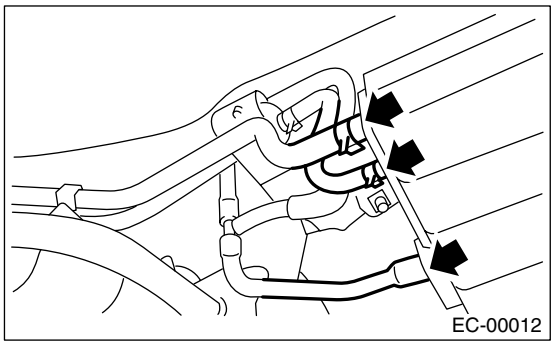
A: PROCEDURE

For EGR valve removal and installation procedures, refer to FU section. <Ref. to FU(SOHC)-36, EGR Valve.>

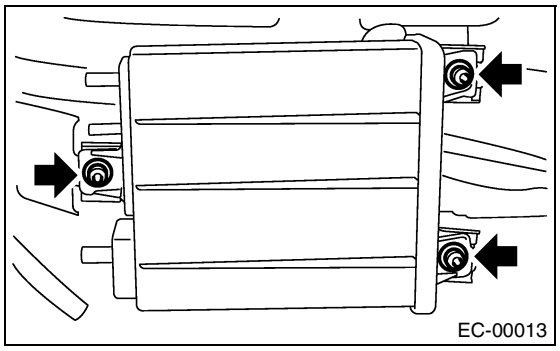
5. Canister

A: REMOVAL

1) Lift-up the vehicle.
2) Loosen the two clamps which hold two canister hoses, and disconnect the three evaporation hoses from canister.



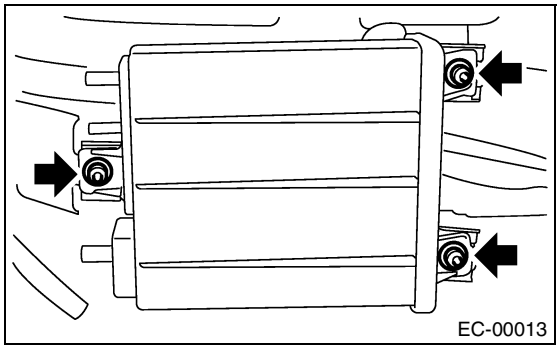
3) Remove the canister from body.



B: INSTALLATION

1) Install in the reverse order of removal.

Tightening torque:
23 N·m (2.3 kgf-m, 17 ft-lb)



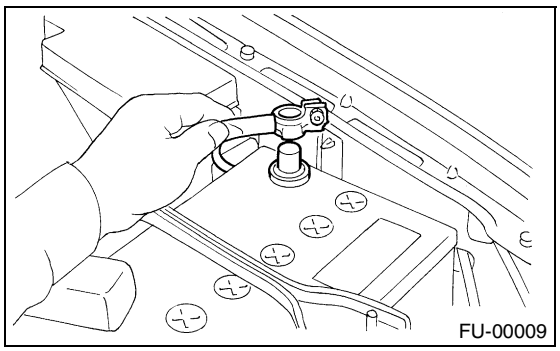
C: INSPECTION

Make sure the canister and canister hoses are not cracked or loose.

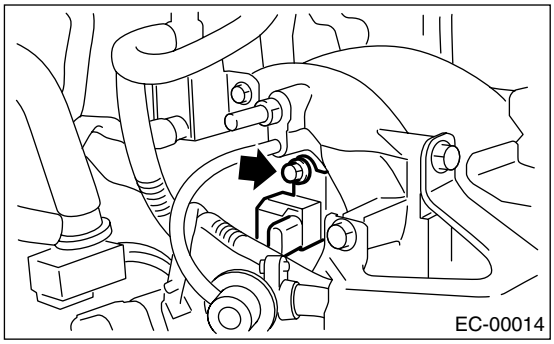
6. Purge Control Solenoid Valve

A: REMOVAL

1) Disconnect the ground cable from battery.



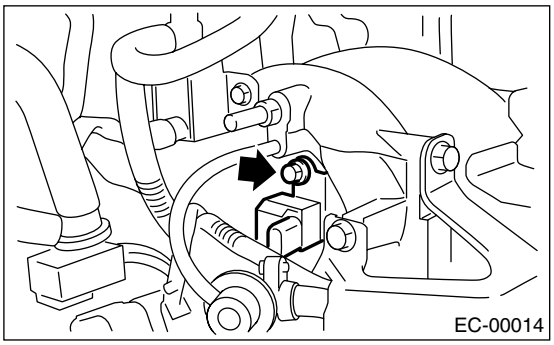
2) Disconnect the connector and hoses from purge control solenoid valve, and then remove the purge control solenoid valve.



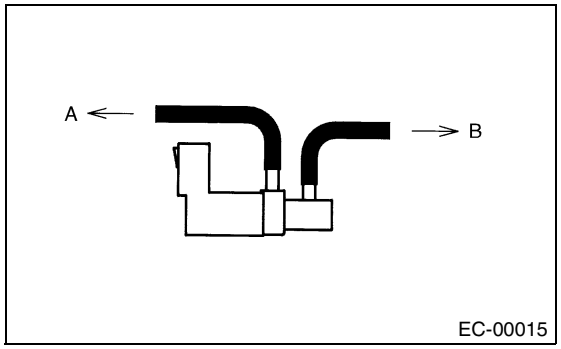
B: INSTALLATION

1) Install in the reverse order of removal.

Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



NOTE:
Connect the evaporation hoses as shown in the figure.



(A) To fuel pipe
(B) To intake manifold

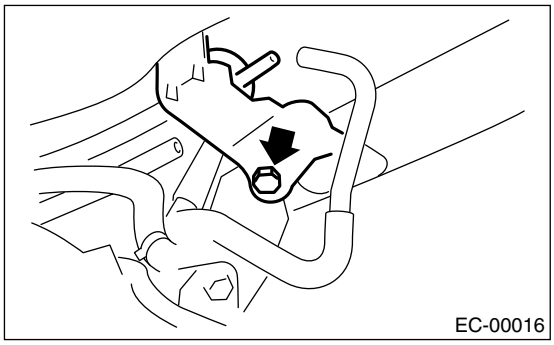
C: INSPECTION

Make sure hoses are not cracked or loose.

7. Two-way Valve

A: REMOVAL

1) Lift-up the vehicle.
2) Remove the canister from body. <Ref. to EC(SOHC)-8, REMOVAL, Canister.>
3) Remove the two-way valve with bracket as a single unit from body.



4) Remove the two-way valve from bracket.

B: INSTALLATION

1) Install in the reverse order of removal.

C: INSPECTION

1) Make sure that the hoses are not cracked or loose.

INTAKE (INDUCTION)

IN(SOHC)

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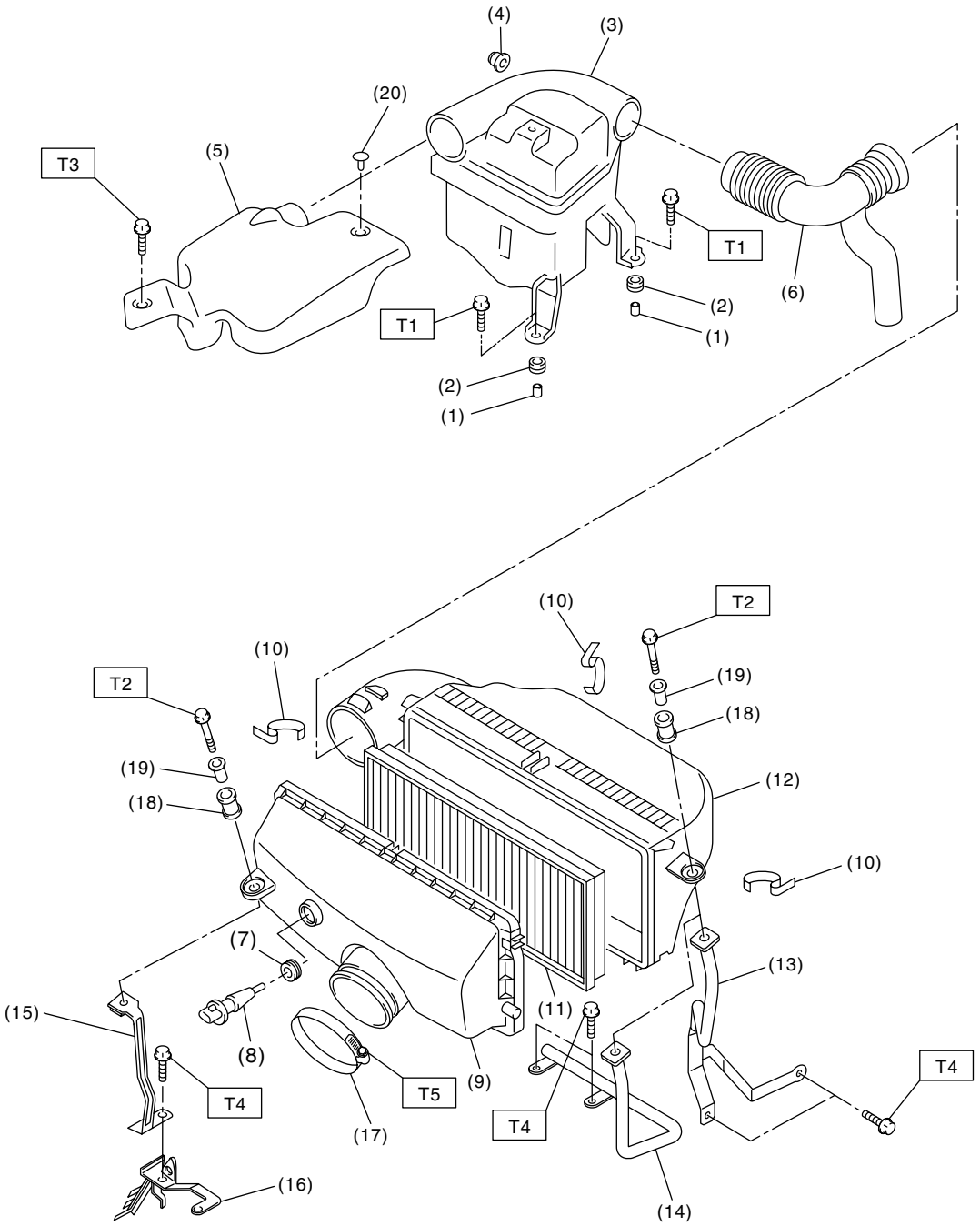
2. Air Cleaner Element 5
3. Air Cleaner Case 6
4. Air Intake Duct 7
5. Resonator Chamber 8

1. General Description

A: COMPONENT



IN-00076

(1) Spacer
(2) Bush
(3) Resonator chamber
(4) Cushion
(5) Air intake duct A
(6) Air intake duct B
(7) Bush
(8) Intake air temperature sensor
(9) Air cleaner case A
(10) Clip
(11) Air cleaner element
(12) Air cleaner case B
(13) Stay LH (MT vehicles)
(14) Stay LH (AT vehicles)
(15) Stay RH
(16) Engine harness bracket
(17) Clamp
(18) Bush
(19) Spacer
(20) Clip

Tightening torque: N·m (kgf-m, ft-lb)
T1: 33 (3.4, 24.6)
T2: 6.5 (0.66, 4.8)
T3: 7.5 (0.76, 5.5)
T4: 16 (1.6, 11.6)
T5: 3 (0.3, 2.2)

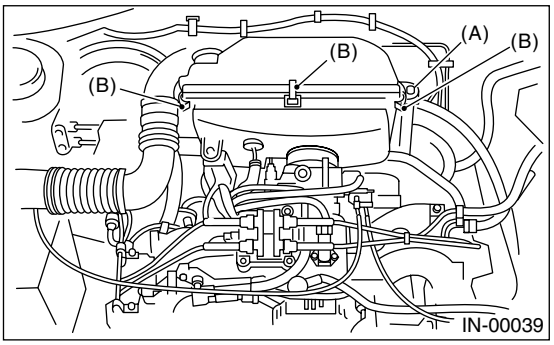
B: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensor or units, be sure to disconnect the ground cable from battery.

2. Air Cleaner Element

A: REMOVAL

1) Remove the air intake duct from air cleaner case.
2) Remove the bolt (A) which secures air cleaner case to stay.
3) Remove the clip (B) above the air cleaner case.



4) Remove the air cleaner element.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
• Fasten with a clip after inserting the lower tab of the case.
• Refer to “COMPONENT” for tightening torque. <Ref. to IN(SOHC)-2, COMPONENT, General Description.>

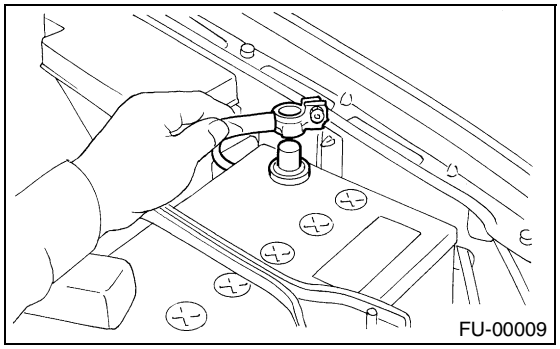
C: INSPECTION

Replace if excessively damaged or dirty.

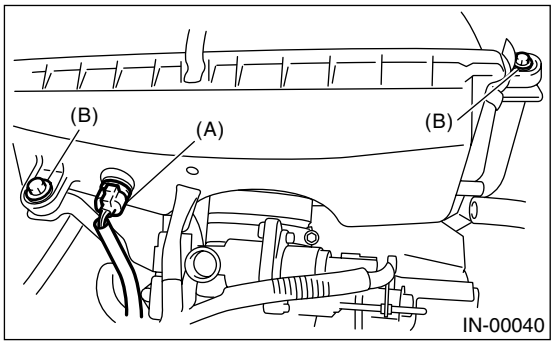
3. Air Cleaner Case

A: REMOVAL

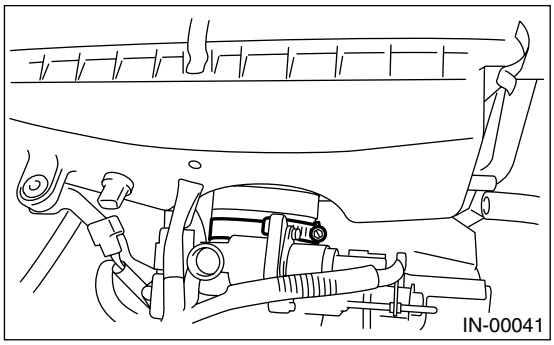
1) Disconnect the ground cable from battery.



2) Disconnect the connector (A) of intake air temperature sensor.
3) Romove the bolt (B) whch installs air cleaner case to stay.



4) Disconnect the hoses and intake duct from air cleaner case.
5) Loosen the clamp which connects air cleaner case to throttle body.



6) Remove the air cleaner case.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Refer to “COMPONENT” for tightening torque. <Ref. to IN(SOHC)-2, COMPONENT, General Description.>

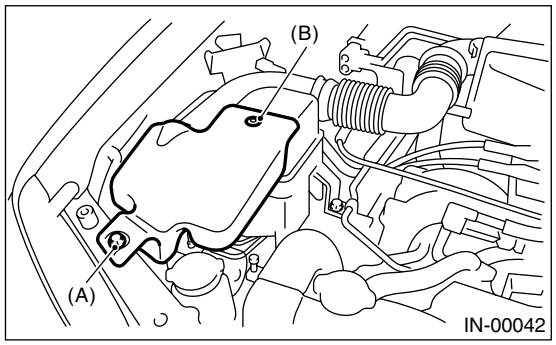
C: INSPECTION

Inspect for cracks and loose connections.

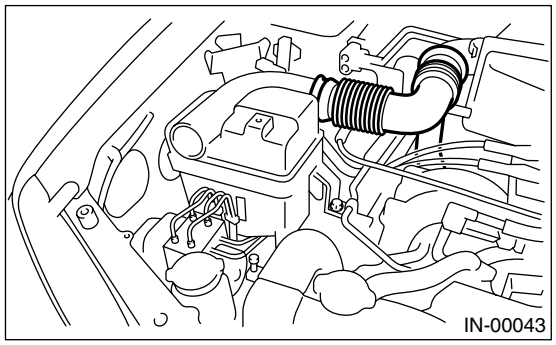
4. Air Intake Duct

A: REMOVAL

1) Remove the bolt (A) which installs air intake duct A on the front side of body.
2) Remove the clip (B) which connects air intake duct A to resonator chamber.
3) Remove the air intake duct A.



4) Remove the air intake duct B from resonator chamber and air cleaner case.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Refer to “COMPONENT” for tightening torque. <Ref. to IN(SOHC)-2, COMPONENT, General Description.>

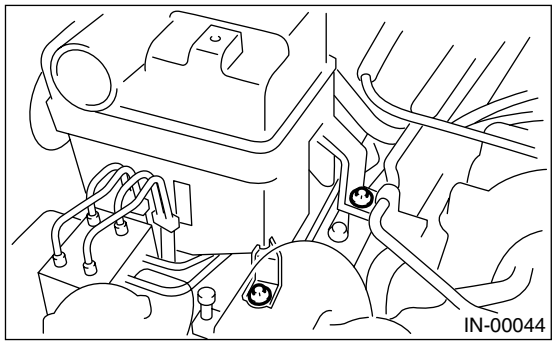
C: INSPECTION

1) Inspect for cracks and loose connections.
2) Inspect that no foreign objects are mixed in the air intake duct.

5. Resonator Chamber

A: REMOVAL

1) Remove the air intake duct. <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
2) Remove the resonator chamber.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Refer to “COMPONENT” for tightening torque. <Ref. to IN(SOHC)-2, COMPONENT, General Description.>

C: INSPECTION

Inspect for cracks and loose connections.

MECHANICAL

ME(SOHC)

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1. General Description

A: SPECIFICATIONS

Engine	Model			2000 cc	2500 cc
	Type			Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine	
	Valve arrangement			Belt driven, single over-head camshaft, 4-valve/cylinder	
	Bore x Stroke		mm (in)	92 x 75 (3.62 x 2.95)	99.5 x 79.0 (3.917 x 3.110)
	Displacement		cm^3 (cu in)	1,994 (121.67)	2,457 (150)
	Compression ratio			10.0	
	Compression pressure (at 200 — 300 rpm)		kPa (kg/cm^2, psi)	1,079 — 1,275 (11.0 — 13.0, 156 — 185)	
	Number of piston rings			Pressure ring: 2, Oil ring: 1	
	Intake valve timing	Opening		4° BTDC	1° BTDC
		Closing		48° ABDC	51° ABDC
	Exhaust valve timing	Opening		48° BBDC	50° BBDC
		Closing		4° ATDC	6° ATDC
	Valve clearance	Intake	mm (in)	0.20±0.02 (0.0079±0.0008)	
		Exhaust	mm (in)	0.25±0.02 (0.0098±0.0008)	
	Idling speed [At neutral position on MT, or “P” or “N” position on AT]		rpm	650±100 (No load) 850±100 (A/C switch ON)	
	Firing order			1 → 3 → 2 → 4	
	Ignition timing		BTDC/rpm	10°±10°/700	

NOTE:
STD: Standard I.D.: Inner Diameter O.D.: Outer Diameter US: Undersize OS: Oversize

Belt tensioner adjuster	Protrusion of adjuster rod				5.2 — 6.2 mm (0.205 — 0.244 in)
Belt tensioner	Spacer O.D.				17.955 — 17.975 mm (0.7069 — 0.7077 in)
	Tensioner bush I.D.				18.00 — 18.08 mm (0.7087 — 0.7118 in)
	Clearance between spacer and bush			STD	0.025 — 0.125 mm (0.0010 — 0.0049 in)
				Limit	0.175 mm (0.0069 in)
	Side clearance of spacer			STD	0.20 — 0.55 mm (0.0079 — 0.0217 in)
				Limit	0.81 mm (0.0319 in)
Valve rocker arm	Clearance between shaft and arm			STD	0.020 — 0.054 mm (0.0008 — 0.0021 in)
				Limit	0.10 mm (0.0039 in)
Camshaft	Bend limit				0.025 mm (0.0010 in)
	Thrust clearance			STD	0.030 — 0.090 mm (0.0012 — 0.0035 in)
				Limit	0.11 mm (0.0039 in)
	Cam lobe height	2000 cc	Intake	STD	38.732 — 38.832 mm (1.5249 — 1.5288 in)
				Limit	38.632 mm (1.5209 in)
			Exhaust	STD	39.257 — 39.357 mm (1.5455 — 1.5495 in)
				Limit	39.157 mm (1.5416 in)
		2500 cc	Intake	STD	39.485 — 39.585 mm (1.5545 — 1.5585 in)
				Limit	39.385 mm (1.5506 in)
			Exhaust	STD	39.257 — 39.357 mm (1.5455 — 1.5495 in)
				Limit	39.157 mm (1.5416 in)
	Camshaft journal O.D.				31.928 — 31.945 mm (1.2570 — 1.2577 in)
	Camshaft journal hole I.D. (Cylinder head)				32.000 — 32.018 mm (1.2598 — 1.2605 in)
	Oil clearance			STD	0.055 — 0.090 mm (0.0022 — 0.0035 in)
				Limit	0.10 mm (0.0039 in)

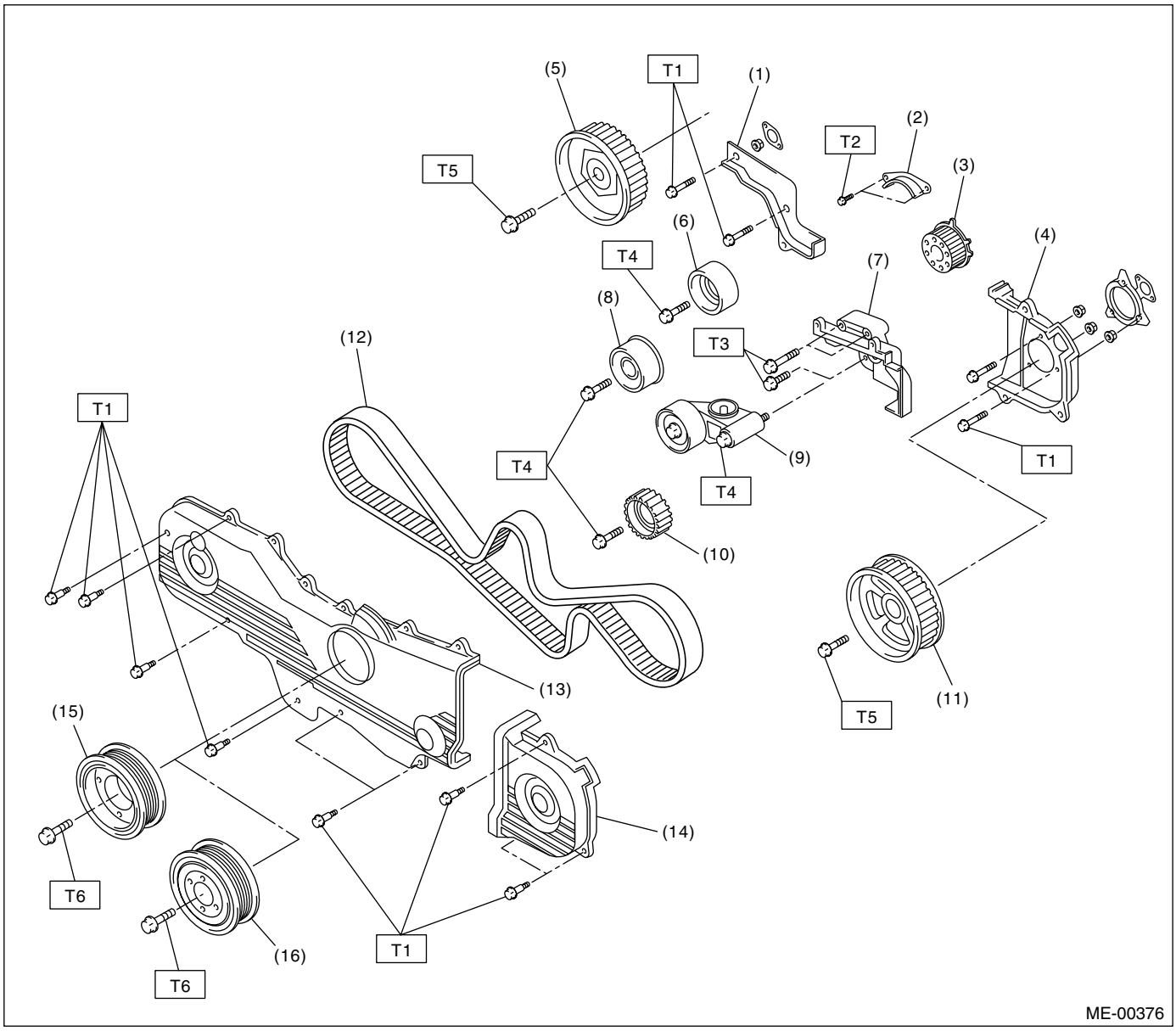
Cylinder head	Surface warpage limit (mating with cylinder block)				0.05 mm (0.0020 in)
	Surface grinding limit				0.1 mm (0.004 in)
	Standard height				97.5 mm (3.84 in)
Valve seat	Refacing angle				90°
	Contacting width		Intake	STD	1.1 mm (0.043 in)
				Limit	1.8 mm (0.070 in)
			Exhaust	STD	1.5 mm (0.059 in)
				Limit	2.2 mm (0.087 in)
Valve guide	Inner diameter				6.000 — 6.012 mm (0.2362 — 0.2367 in)
	Protrusion above head			Intake	20.0 — 20.5 mm (0.787 — 0.807 in)
				Exhaust	16.5 — 17.0 mm (0.650 — 0.669 in)
Valve	Head edge thickness		Intake	STD	1.0 mm (0.039 in)
				Limit	0.6 mm (0.024 in)
			Exhaust	STD	1.2 mm (0.047 in)
				Limit	0.6 mm (0.024 in)
	Stem diameter			Intake	5.950 — 5.965 mm (0.2343 — 0.2348 in)
				Exhaust	5.945 — 5.960 mm(0.2341 — 0.2346 in)
	Stem oil clearance		STD	Intake	0.035 — 0.062 mm (0.0014 — 0.0024 in)
				Exhaust	0.040 — 0.067 mm (0.0016 — 0.0026 in)
			Limit	—	0.15 mm (0.0059 in)
	Overall length			Intake	120.6 mm (4.75 in)
				Exhaust	121.7 mm (4.79 in)
Valve spring	Free length				54.30 mm (2.1378 in)
	Squareness				2.5°, 2.4 mm (0.094 in)
	Tension/spring height			Set	214 — 246 N (22 — 25 kgf, 48 — 55 lb)/ 45.0 mm (1.772 in)
				Lift	526 — 582 N (54 — 59 kgf, 119 — 130 lb)/ 34.7 mm (1.366 in)
Cylinder block	Surface warpage limit (mating with cylinder head)				0.05 mm (0.0020 in)
	Surface grinding limit				0.1 mm (0.004 in)
	Cylinder bore	2000 cc	STD	A	92.005 — 92.015 mm (3.6222 — 3.6226 in)
				B	91.995 — 92.005 mm (3.6218 — 3.6222 in)
		2500 cc	STD	A	99.505 — 99.515 mm (3.9175 — 3.9179 in)
				B	99.495 — 99.505 mm (3.9171 — 3.9175 in)
	Taper			STD	0.015 mm (0.0006 in)
				Limit	0.050 mm (0.0020 in)
	Out-of-roundness			STD	0.010 mm (0.0004 in)
				Limit	0.050 mm (0.0020 in)
	Piston clearance			STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
				Limit	0.050 mm (0.0020 in)
	Enlarging (boring) limit				0.5 mm (0.020 in)
Piston	Outer diameter	2000 cc	STD	A	91.985 — 91.995 mm (3.6214 — 3.6218 in)
				B	91.975 — 91.985 mm (3.6211 — 3.6214 in)
			0.25 mm (0.0098 in) OS		92.225 — 92.235 mm (3.6309 — 3.6313 in)
			0.50 mm (0.0197 in) OS		92.475 — 92.485 mm (3.6407 — 3.6411 in)
		2500 cc	STD	A	99.485 — 99.495 mm (3.9167 — 3.9171 in)
				B	99.475 — 99.485 mm (3.9163 — 3.9167 in)
			0.25 mm (0.0098 in) OS		99.725 — 99.735 mm (3.9262 — 3.9266 in)
			0.50 mm (0.0197 in) OS		99.975 — 99.985 mm (3.9360 — 3.9364 in)
	Standard inner diameter of piston pin hole				23.000 — 23.006 mm (0.9055 — 0.9057 in)

Piston pin	Outer diameter				22.994 — 23.000 mm (0.9053 — 0.9055 in)
	Standard clearance between piston pin and piston				0.004 — 0.008 mm (0.0002 — 0.0003 in)
	Degree of fit				Piston pin must be fitted into position with thumb at 20°C (68°F).
Piston ring	Piston ring gap	Top ring	STD		0.20 — 0.35 mm (0.0079 — 0.0138 in)
			Limit		1.0 mm (0.039 in)
		Second ring	2000 cc	STD	0.35 — 0.50 mm (0.0138 — 0.0197 in)
				Limit	1.0 mm (0.039 in)
			2500 cc	STD	0.37 — 0.52 mm (0.0146 — 0.0204 in)
				Limit	1.0 mm (0.039 in)
		Oil ring	STD		0.20 — 0.50 mm (0.0079 — 0.0197 in)
			Limit		1.5 mm (0.059 in)
	Clearance between piston ring and piston ring groove	Top ring	STD		0.040 — 0.080 mm (0.0016 — 0.0031 in)
			Limit		0.15 mm (0.0059 in)
		Second ring	STD		0.030 — 0.070 mm (0.0012 — 0.0028 in)
			Limit		0.15 mm (0.0059 in)
Connecting rod	Bend twist per 100 mm (3.94 in) in length		Limit		0.10 mm (0.0039 in)
	Side clearance		STD		0.070 — 0.330 mm (0.0028 — 0.0130 in)
			Limit		0.4 mm (0.016 in)
Connecting rod bearing	Oil clearance	2000 cc	STD		0.010 — 0.038 mm (0.0004 — 0.0015 in)
			Limit		0.05 mm (0.0020 in)
		2500 cc	STD		0.012 — 0.038 mm (0.0005 — 0.0015 in)
			Limit		0.05 mm (0.0020 in)
	Thickness at center portion	2000 cc	STD		1.492 — 1.501 mm (0.0587 — 0.0591 in)
			0.03 mm (0.0012 in) US		1.510 — 1.513 mm (0.0594 — 0.0596 in)
			0.05 mm (0.0020 in) US		1.520 — 1.523 mm (0.0598 — 0.0600 in)
			0.25 mm (0.0098 in) US		1.620 — 1.623 mm (0.0638 — 0.0639 in)
		2500 cc	STD		1.490 — 1.502 mm (0.0587 — 0.0591 in)
			0.03 mm (0.0012 in) US		1.504 — 1.512 mm (0.0592 — 0.0595 in)
			0.05 mm (0.0020 in) US		1.514 — 1.522 mm (0.0596 — 0.0599 in)
			0.25 mm (0.0098 in) US		1.614 — 1.622 mm (0.0635 — 0.0639 in)
Connecting rod bushing	Clearance between piston pin and bushing		STD		0 — 0.022 mm (0 — 0.0009 in)
			Limit		0.030 mm (0.0012 in)

Crankshaft	Bend limit			0.035 mm (0.0014 in)
	Crank pin and crank journal	Out-of-roundness		0.020 mm (0.0008 in) or less
		Grinding limit		0.250 mm (0.0098 in)
	Crank pin outer diameter		STD	51.984 — 52.000 mm (2.0466 — 2.0472 in)
			0.03 mm (0.0012 in) US	51.954 — 51.970 mm (2.0454 — 2.0461 in)
			0.05 mm (0.0020 in) US	51.934 — 51.950 mm (2.0446 — 2.0453 in)
			0.25 mm (0.0098 in) US	51.734 — 51.750 mm (2.0368 — 2.0374 in)
	Crank journal outer diameter	#1, #3	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
		#2, #4, #5	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
	Thrust clearance		STD	0.030 — 0.115 mm (0.0012 — 0.0045 in)
			Limit	0.25 mm (0.0098 in)
	Oil clearance	#1	STD	0.003 — 0.030 mm (0.0001 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
		#2	STD	0.012 — 0.033 mm (0.0005 — 0.0013 in)
			Limit	0.045 mm (0.0018 in)
		#3	STD	0.003 — 0.030 mm (0.0001 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
		#4	STD	0.012 — 0.033 mm (0.0005 — 0.0013 in)
			Limit	0.045 mm (0.0018 in)
		#5	STD	0.010 — 0.031 mm (0.0004 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
Crankshaft bearing	Crankshaft bearing thickness	#1, #3	STD	1.998 — 2.011 mm (0.0787 — 0.0792 in)
			0.03 mm (0.0012 in) US	2.017 — 2.020 mm (0.0794 — 0.0795 in)
			0.05 mm (0.0020 in) US	2.027 — 2.030 mm (0.0798 — 0.0799 in)
			0.25 mm (0.0098 in) US	2.127 — 2.130 mm (0.0837 — 0.0839 in)
		#2, #4, #5	STD	2.000 — 2.013 mm (0.0787 — 0.0793 in)
			0.03 mm (0.0012 in) US	2.019 — 2.022 mm (0.0795 — 0.0796 in)
			0.05 mm (0.0020 in) US	2.029 — 2.032 mm (0.0799 — 0.0800 in)
			0.25 mm (0.0098 in) US	2.129 — 2.132 mm (0.0838 — 0.0839 in)

B: COMPONENT

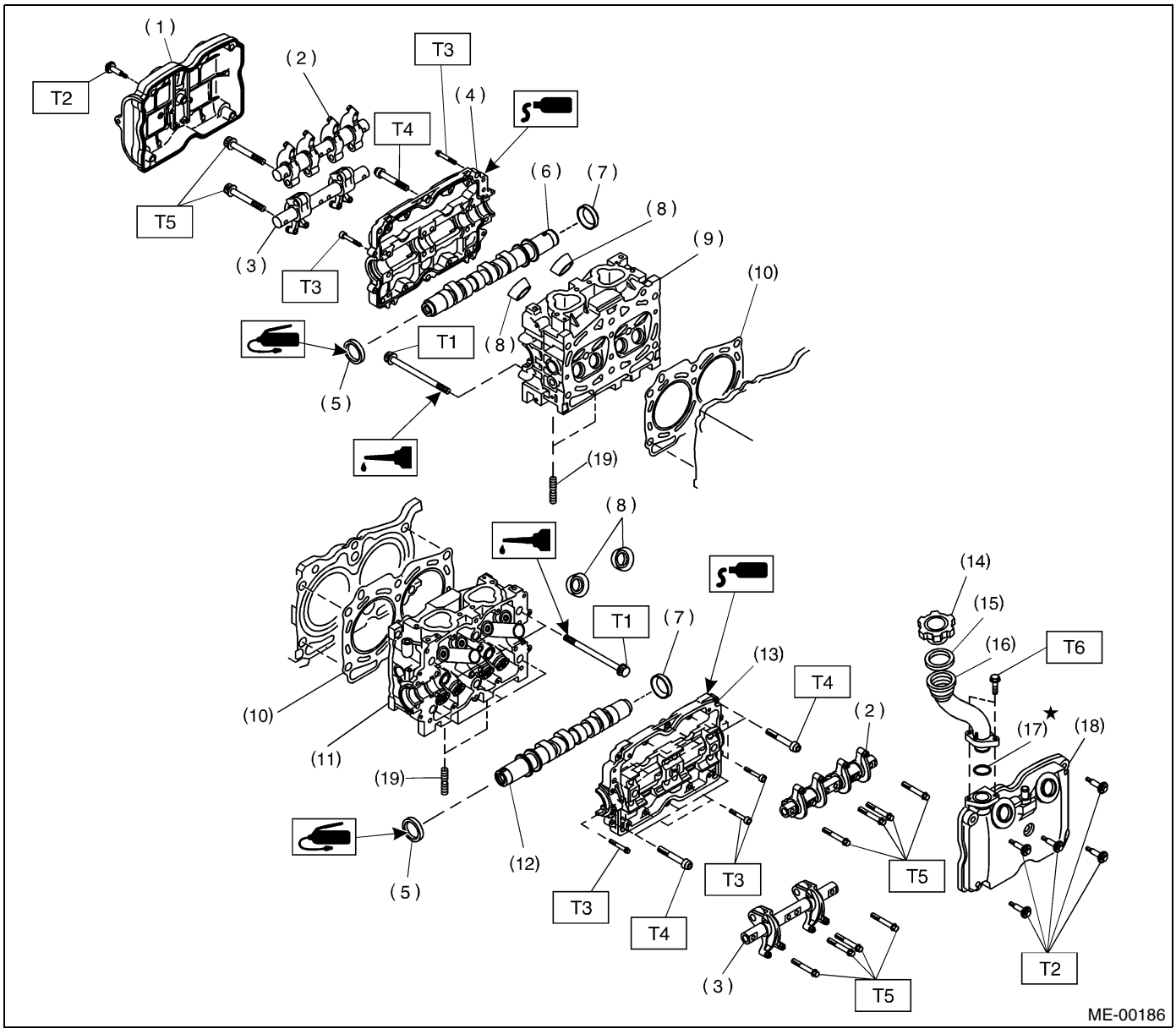
1. TIMING BELT



(1) Belt cover No. 2 (RH)
(2) Timing belt guide (MT vehicles only)
(3) Crankshaft sprocket
(4) Belt cover No. 2 (LH)
(5) Camshaft sprocket No. 1
(6) Belt idler (No. 1)
(7) Tensioner bracket
(8) Belt idler (No. 2)
(9) Automatic belt tension adjuster ASSY
(10) Belt idler No. 2
(11) Camshaft sprocket No. 2
(12) Timing belt
(13) Front belt cover
(14) Belt cover (LH)
(15) Crankshaft pulley (2000 cc model)
(16) Crankshaft pulley (2500 cc model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 10 (1.0, 7.2)
T3: 25 (2.5, 18.1)
T4: 39 (4.0, 28.9)
T5: 78 (8.0, 57.9)
T6: <Ref. to ME(SOHC)-43, INSTALLATION, Crankshaft Pulley.>

2. CYLINDER HEAD AND CAMSHAFT

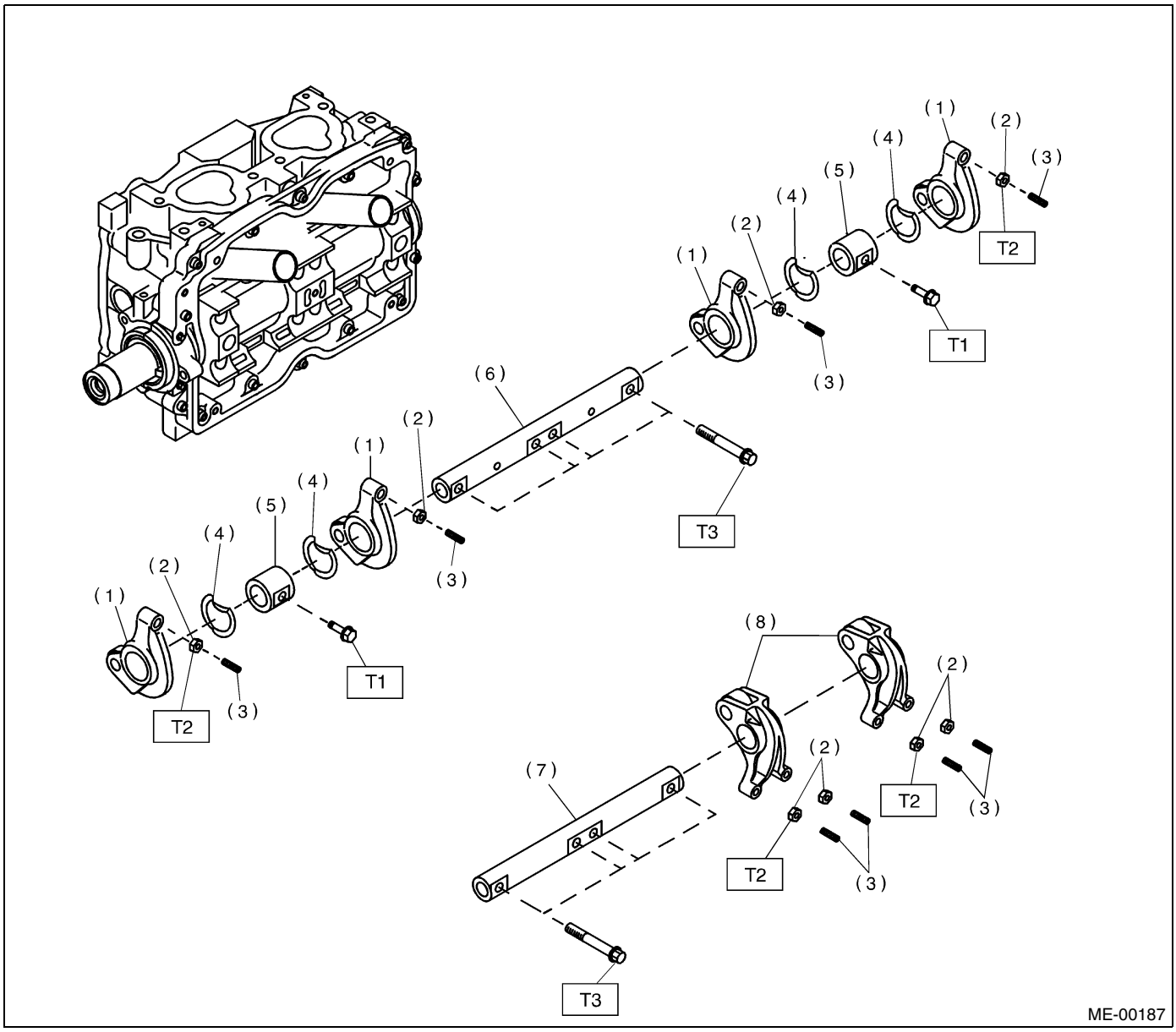


(1) Rocker cover (RH)
(2) Intake valve rocker ASSY
(3) Exhaust valve rocker ASSY
(4) Camshaft cap (RH)
(5) Oil seal
(6) Camshaft (RH)
(7) Plug
(8) Spark plug pipe gasket
(9) Cylinder head (RH)
(10) Cylinder head gasket
(11) Cylinder head (LH)
(12) Camshaft (LH)
(13) Camshaft cap (LH)
(14) Oil filler cap
(15) Gasket
(16) Oil filler duct
(17) O-ring
(18) Rocker cover (LH)
(19) Stud bolt

Tightening torque: N·m (kgf-m, ft-lb)

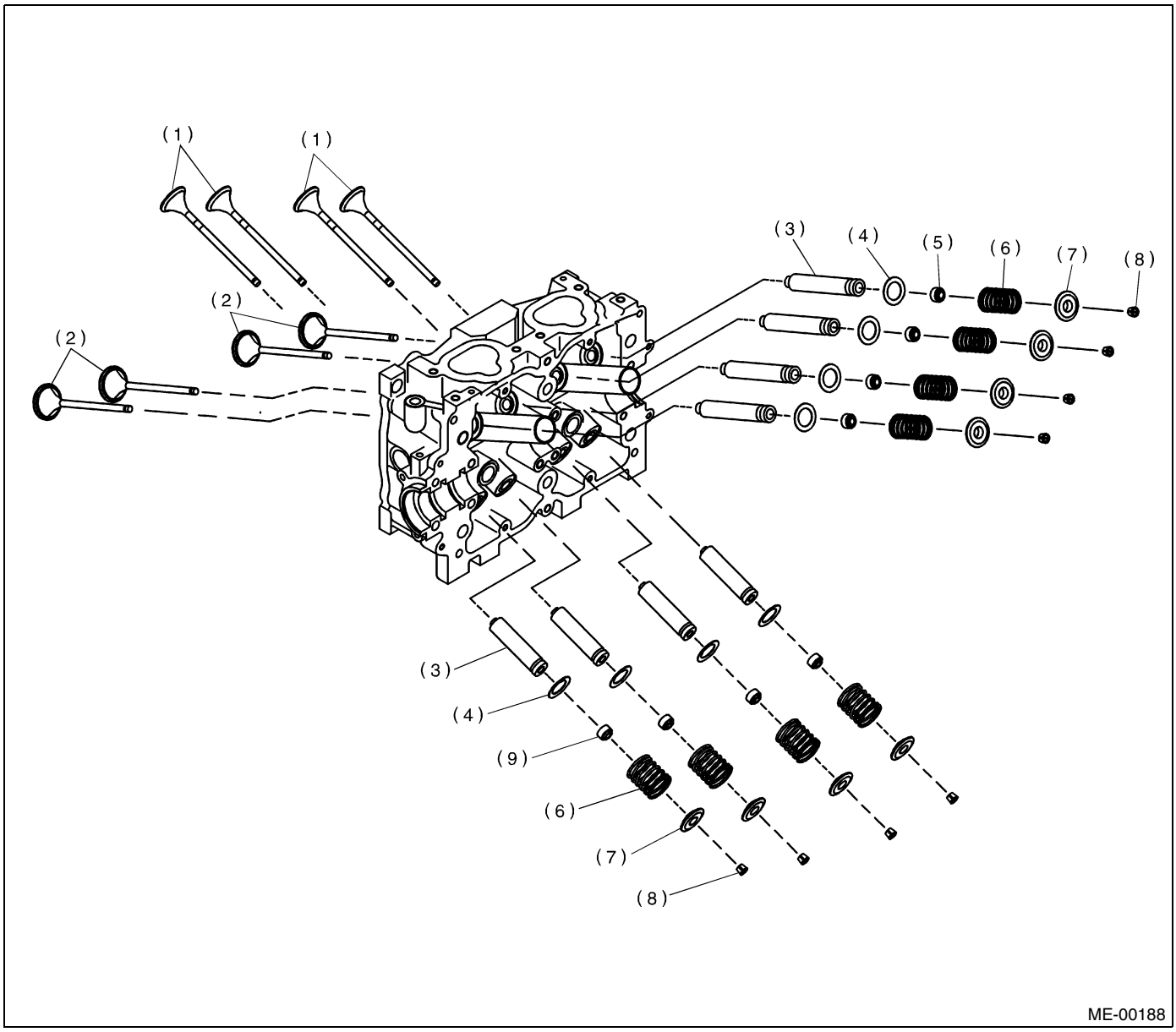
T1: <Ref. to ME(SOHC)-60, INSTALLATION, Cylinder Head Assembly.>
T2: 5 (0.5, 3.6)
T3: 10 (1.0, 7.2)
T4: 18 (1.8, 13.0)
T5: 25 (2.5, 18.1)
T6: 6.4 (0.65, 4.7)

3. VALVE ROCKER ASSEMBLY



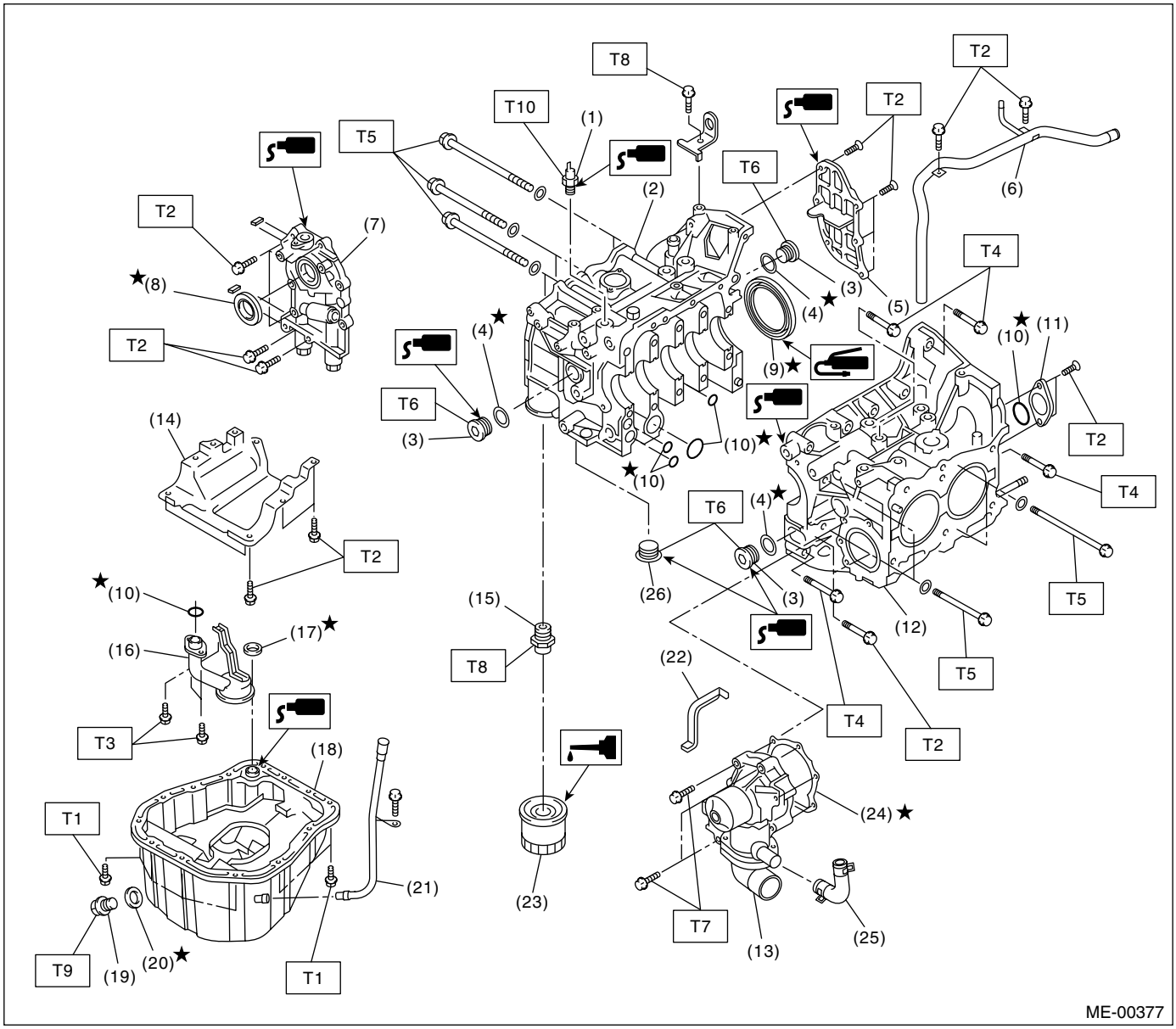
(1)	Intake valve rocker arm	(5)	Rocker shaft support	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	Valve rocker nut	(6)	Intake rocker shaft	***T1: 5 (0.5, 3.6)***
(3)	Valve rocker adjust screw	(7)	Exhaust rocker shaft	***T2: 10 (1.0, 7.2)***
(4)	Spring	(8)	Exhaust valve rocker arm	***T3: 25 (2.5, 18.1)***

4. CYLINDER HEAD AND VALVE ASSEMBLY



(1) Exhaust valve
(2) Intake valve
(3) Valve guide
(4) Valve spring seat
(5) Intake valve oil seal
(6) Valve spring
(7) Retainer
(8) Retainer key
(9) Exhaust valve oil seal

5. CYLINDER BLOCK

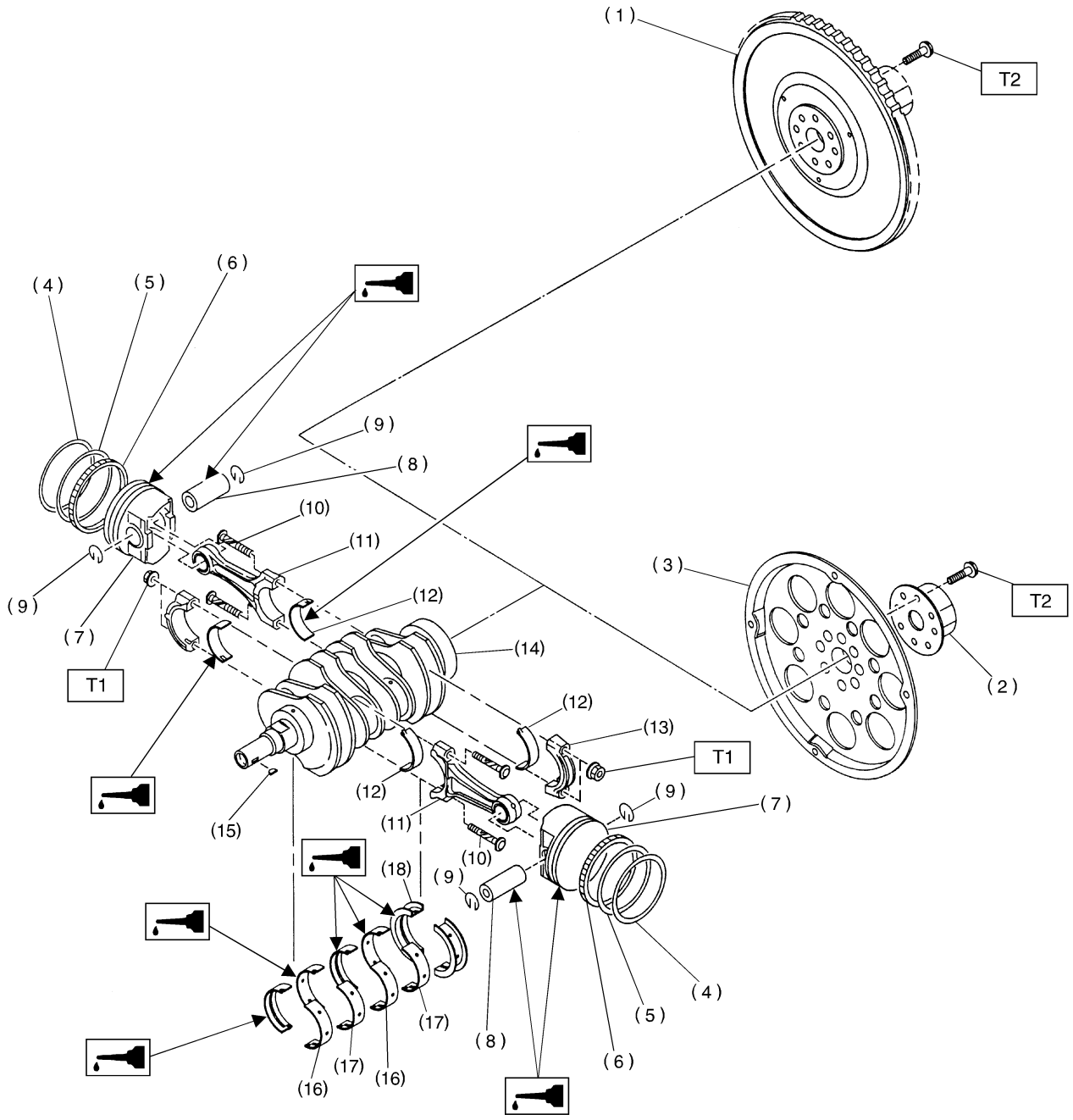


(1) Oil pressure switch
(2) Cylinder block (RH)
(3) Service hole plug
(4) Gasket
(5) Oil separator cover
(6) Water by-pass pipe
(7) Oil pump
(8) Front oil seal
(9) Rear oil seal
(10) O-ring
(11) Service hole cover
(12) Cylinder block (LH)
(13) Water pump
(14) Baffle plate
(15) Oil filter connector
(16) Oil strainer
(17) Gasket
(18) Oil pan
(19) Drain plug
(20) Metal gasket
(21) Oil level gauge guide
(22) Water pump sealing
(23) Oil filter
(24) Gasket
(25) Water pump hose
(26) Plug

Tightening torque: N·m (kgf-m, ft-lb)

T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7.2)
T4: 25 (2.5, 18.1)
T5: <Ref. to ME(SOHC)-72, INSTALLATION, Cylinder Block.>
T6: 70 (7.1, 50.6)
T7: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)
T8: 45 (4.6, 33.3)
T9: 44 (4.5, 33)
T10: 25 (2.5, 18.1)

6. CRANKSHAFT AND PISTON

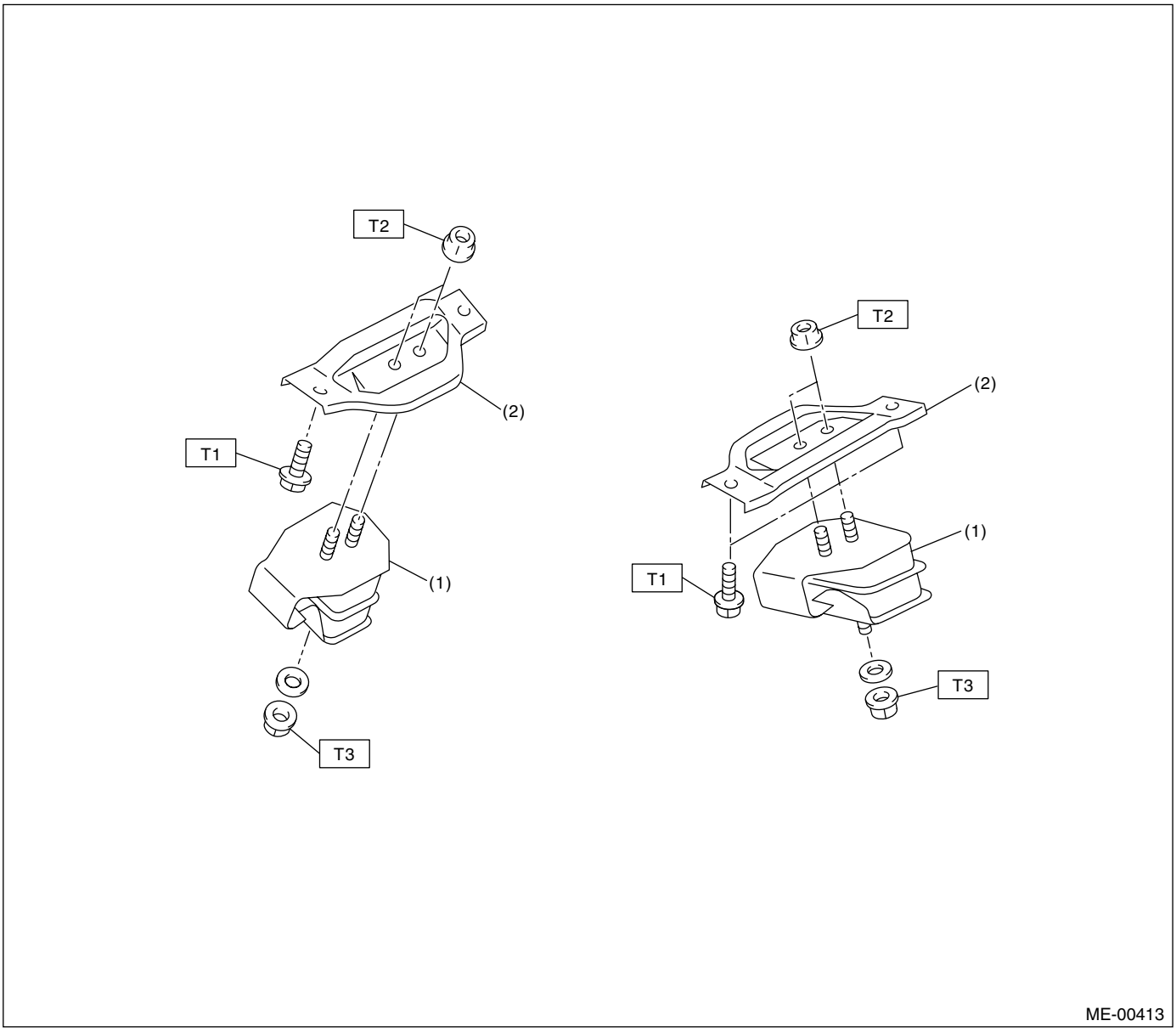


ME-00190

(1) Flywheel (MT vehicles only)
(2) Reinforcement (AT vehicles only)
(3) Drive plate (AT vehicles only)
(4) Top ring
(5) Second ring
(6) Oil ring
(7) Piston
(8) Piston pin
(9) Circlip
(10) Connecting rod bolt
(11) Connecting rod
(12) Connecting rod bearing
(13) Connecting rod cap
(14) Crankshaft
(15) Woodruff key
(16) Crankshaft bearing #1, #3
(17) Crankshaft bearing #2, #4
(18) Crankshaft bearing #5

Tightening torque: N·m (kgf-m, ft-lb)
T1: 45 (4.6, 33.3)
T2: 72 (7.3, 52.8)

7. ENGINE MOUNTING



(1) Front cushion rubber
(2) Front engine mounting bracket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 35 (3.6, 25.8)
T2: 42 (4.3, 31.0)
T3: 85 (8.7, 63)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
• All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.
• Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
• Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
• All removed parts, if to be reused, should be reinstalled in the original positions and directions.
• Bolts, nuts and washers should be replaced with new ones as required.
• Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
• Remove or install engine in an area where chain hoists, lifting devices, etc. are available for ready use.
• Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
• Prior to starting work, prepare the following:
Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
• Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.

D: PREPARATION TOOL

1. SPECIAL TOOLS

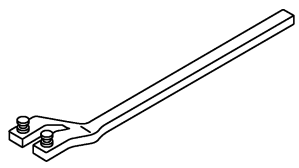
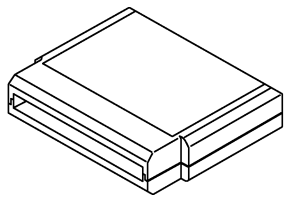
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18231AA010	18231AA010	CAMSHAFT SPROCKET WRENCH	• Used for removing and installing camshaft sprocket. (LH side) • Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.
 ST24082AA210	24082AA210 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.

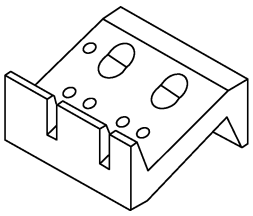
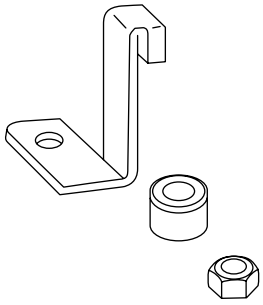
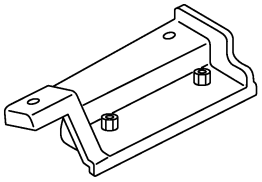
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)
 ST-498267800	498267800	CYLINDER HEAD TABLE	• Used for replacing valve guides. • Used for removing and installing valve springs.
 ST-498277200	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.
 ST-498457000	498457000	ENGINE STAND ADAPTER RH	Used with ENGINE STAND (499817000).

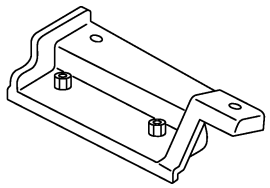
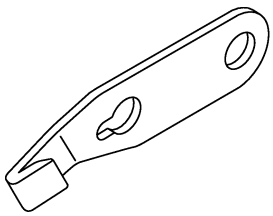
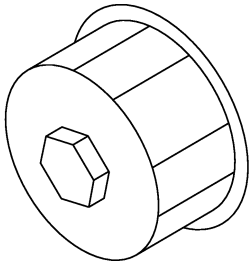
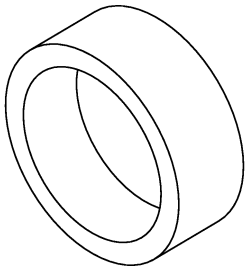
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498457100	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817000).
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening and tightening crankshaft pulley bolt, etc.
 ST-498547000	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter.
 ST-398744300	398744300 (2000 cc model)	PISTON GUIDE	Used for installing piston in cylinder.

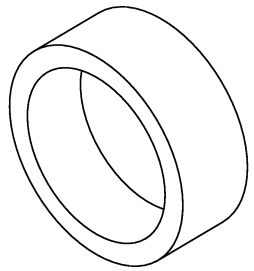
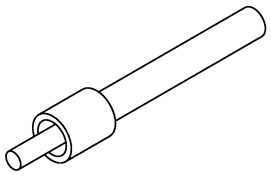
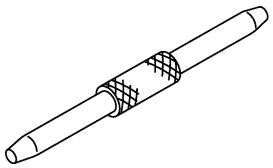
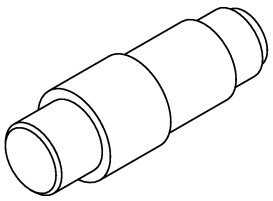
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498747300	498747300 (2500 cc model)	PISTON GUIDE	Used for installing piston in cylinder.
 ST-498857100	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.
 ST-499017100	499017100	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.
 ST-499037100	499037100	CONNECTING ROD BUSHING REMOVER & INSTALLER	Used for removing and installing connecting rod bushing.

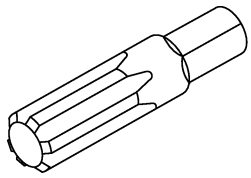
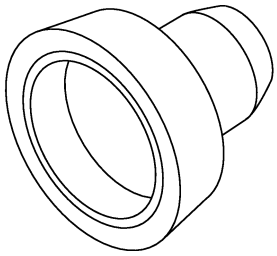
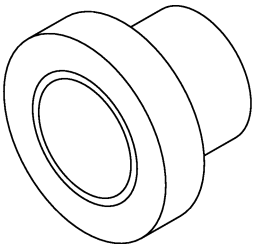
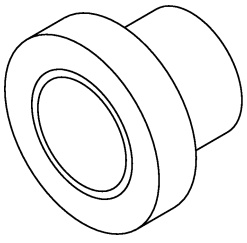
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499057000	499057000	TORX PLUS	Used for removing flywheel (Dual mass flywheel).
 ST-499587200	499587200	CRANKSHAFT OIL SEAL INSTALLER	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL GUIDE (499597100).
 ST-499587500	499587500	OIL SEAL INSTALLER	Used for installing camshaft oil seal.
 ST-499587700	499587700	CAMSHAFT OIL SEAL INSTALLER	Used for installing cylinder head plug.

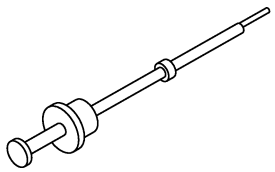
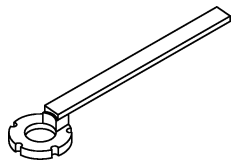
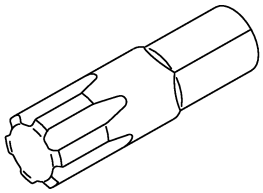
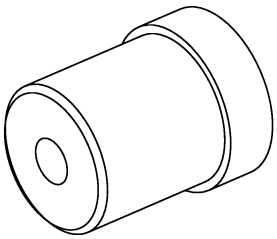
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499097700	499097700	PISTON PIN REMOVER ASSY	Used for removing piston pin.
 ST-499207400	499207400	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket. (RH side)
 ST-499497000	499497000	TORX PLUS	Used for removing and installing camshaft cap.
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.

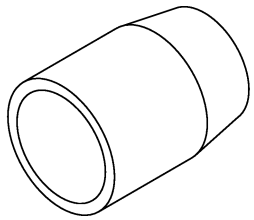
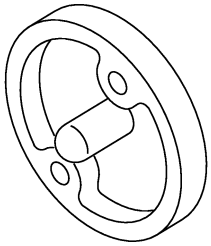
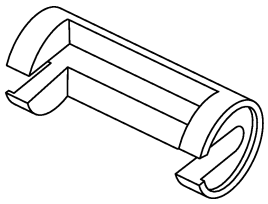
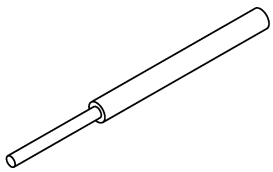
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499597000	499597000	OIL SEAL GUIDE	• Used for installing camshaft oil seal. • Used with CAMSHAFT OIL SEAL INSTALLER (499587500).
 ST-499597100	499597100	CRANKSHAFT OIL SEAL GUIDE	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).
 ST-499718000	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.
 ST-499767200	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.

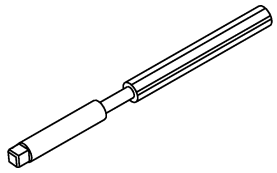
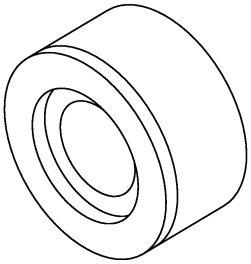
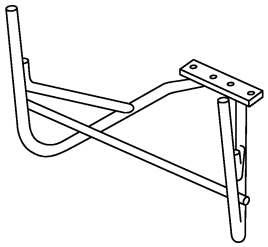
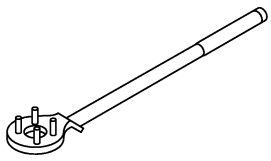
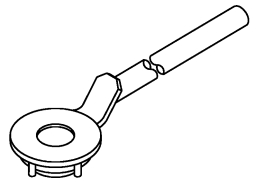
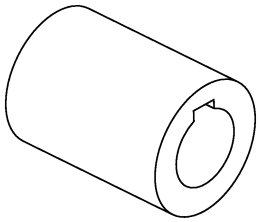
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499767400	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 ST-499767700	499767700 (Intake side) 499767800 (Exhaust side)	VALVE GUIDE ADJUSTER	Used for installing valve guides.
 ST-499817100	499817100	ENGINE STAND	• Stand used for engine disassembly and assembly. • Used with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolts. (2500 cc model)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977400	499977400	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolts. (2000 cc model)
 ST-499987500	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Compression Gauge	Used for measuring compression.
Tachometer (Secondary pick-up type)	Used for measuring idle speed.
Timing Light	Used for measuring ignition timing.

E: PROCEDURE

It is possible to conduct the following service procedures with engine on the vehicle, however, the procedures described in this section are based on the condition that the engine is removed from the vehicle.

- V-belt
- Timing Belt
- Valve Rocker Assembly
- Camshaft
- Cylinder Head

2. Compression

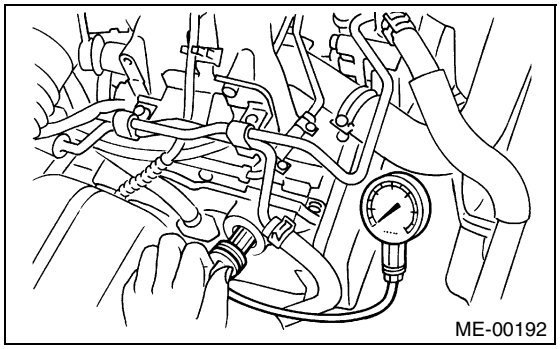
A: INSPECTION

CAUTION:
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

1) After warming-up the engine, turn the ignition switch to OFF.
2) Make sure that the battery is fully charged.
3) Lower the fuel pressure. <Ref. to FU(SOHC)-49, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
4) Remove all the spark plugs. <Ref. to IG(SOHC)-5, REMOVAL, Spark Plug.>
5) Fully open the throttle valve.
6) Check the starter motor for satisfactory performance and operation.
7) Hold the compression gauge tight against spark plug hole.

NOTE:
When using a screw-in type compression gauge, the screw (put into cylinder head spark plug hole) should be less than 18 mm (0.71 in) long.

8) Crank the engine by means of starter motor, and then read the maximum value on the gauge when the pointer is steady.



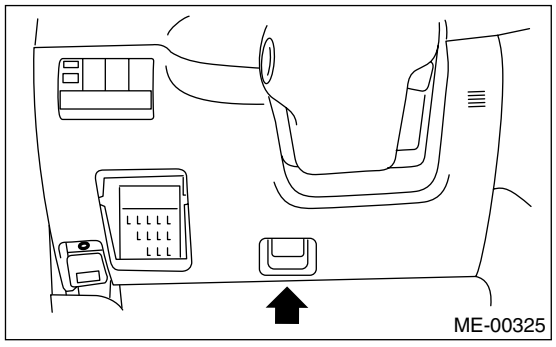
9) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (350 rpm and fully open throttle):
Standard;
1,275 kPa (13.0 kgf/cm^2, 185 psi)
Limit;
1,020 kPa (10.4 kgf/cm^2, 148 psi)
Difference between cylinders;
49 kPa (0.5 kgf/cm^2, 7 psi), or less

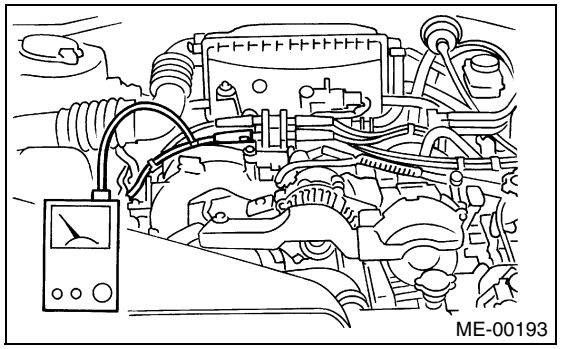
3. Idle Speed

A: INSPECTION

1) Before checking idle speed, check the following:
   (1) Ensure the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and the hoses are connected properly.
   (2) Ensure the malfunction indicator light (CHECK ENGINE light) does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and then turn the igintion switch to OFF.
4) When using the SUBARU SELECT MONITOR, refer to the following. <Ref. to ME(SOHC)-14, SPECIAL TOOLS, PREPARATION TOOL, General Description.>
   (1) Insert the cartridge to SUBARU SELECT MONITOR.
   (2) Connect the SUBARU SELECT MONITOR to data link connector.



   (3) Turn the igintion switch to ON, and SUBARU SELECT MONITOR switch to ON.
   (4) Select the {2. Each System Check} in Main Menu.
   (5) Select the {Engine Control System} in Selection Menu.
   (6) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.
   (7) Select the {1.12 Data Display} in Data Display Menu.
   (8) Start the engine, and then read the engine idle speed.
5) When using the tachometer (Secondary pick-up type).
   (1) Attach the pick-up clip to No. 1 cylinder spark plug cord.
   (2) Start the engine, and then read the engine idle speed.



NOTE:
• When using the OBD-II general scan tool, carefully read its operation manual.
• This ignition system provides simultaneous ignition for #1 and #2 plugs. It must be noted that some tachometers may register twice that of actual engine speed.

6) Check the idle speed when unloaded. (With headlights, heater fan, rear defroster, radiator fan, air conditioning, etc. OFF)

Idle speed (No load and gears in neutral (MT vehicles), or N or P (AT vehicles) position):
650±100 rpm (MT vehicles)
700±100 rpm (AT vehicles)

7) Check the idle speed when loaded. (Turn the air conditioning switch to “ON” and operate the compressor for at least 1 minute before measurement.)

Idle speed [A/C “ON”, no load and gears in neutral (MT vehicles) or N or P (AT vehicles) position]:
850±100 rpm

NOTE:
Idle speed can not be adjusted manually, because the idle speed is automatically adjusted.
If the specified idle speed can not be maintained, refer to General On-board Diagnosis Tabele under “Engine Control System”. <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.>

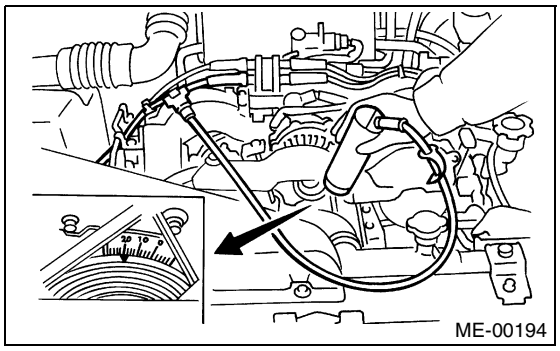
4. Ignition Timing

A: INSPECTION

CAUTION:
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

1) Warm-up the engine.
2) To check the ignition timing, connect a timing light to #1 cylinder spark plug cord, and illuminate the timing mark with timing light.
3) Start the engine at idle speed and check the ignition timing.

Ignition timing [BTDC/rpm]:
10°±8°/650 (MT vehicles)
15°±8°/700 (AT vehicles)



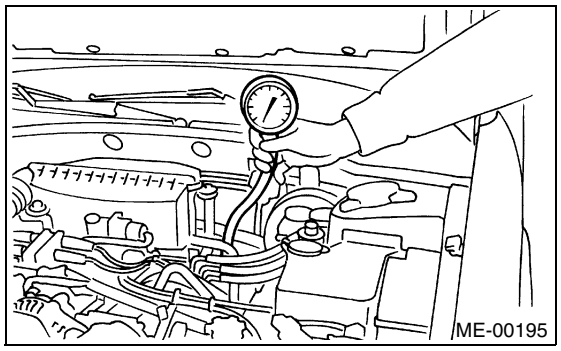
If the timing is not correct, check the ignition control system.
Refer to Engine Control System. <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.>

5. Intake Manifold Vacuum

A: INSPECTION

1) Warm-up the engine.
2) Disconnect the brake vacuum hose, and then install the vacuum gauge to hose fitting on manifold.
3) Keep the engine at idle speed, and then read the vacuum gauge indication.

By observing the gauge needle movement, the internal condition of engine can be diagnosed as described below.



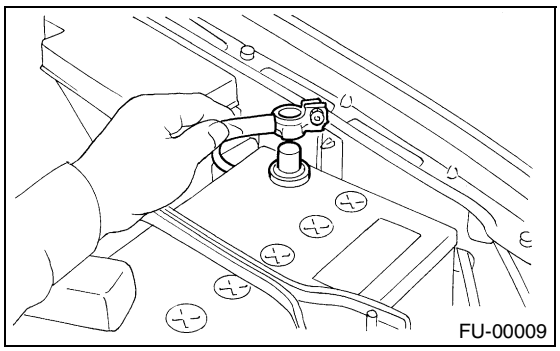
Vacuum pressure (at idling, A/C "OFF"):
Less than –60.0 kPa (–450 mmHg, –17.72 in-Hg)

Diagnosis of engine condition by measurement of manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Leakage around intake manifold gasket or disconnection or damaged vacuum hose
2. When engine speed is reduced slowly from higher speed, needle stops temporarily when it is lowering or becomes steady above normal position.	Back pressure too high, or exhaust system clogged
3. Needle intermittently drops to position lower than normal position.	Leakage around cylinder
4. Needle drops suddenly and intermittently from normal position.	Sticky valves
5. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases.	Weak or broken valve springs
6. Needle vibrates above and below normal position in narrow range.	Defective ignition system

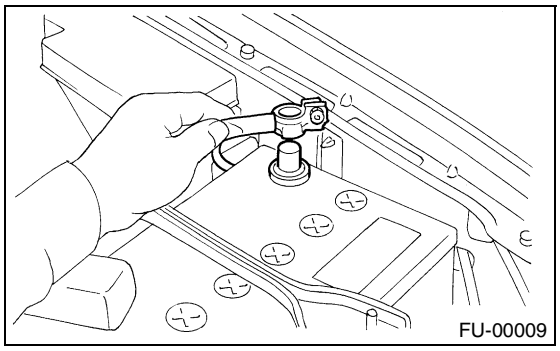
6. Engine Oil Pressure

A: INSPECTION

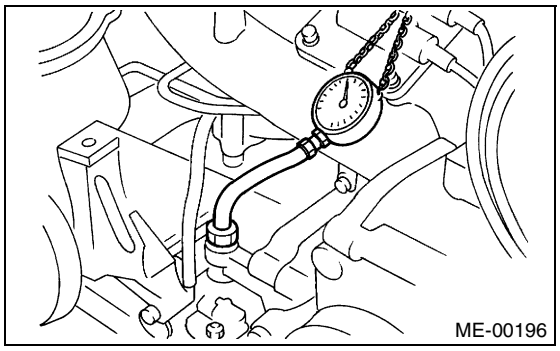
1) Disconnect the ground cable from battery.



2) Remove the generator from bracket. <Ref. to SC(SOHC)-15, REMOVAL, Generator.>
3) Disconnect the connector from oil pressure switch.
4) Remove the oil pressure switch from engine cylinder block. <Ref. to LU(SOHC)-21, REMOVAL, Oil Pressure Switch.>
5) Connect the oil pressure gauge hose to cylinder block.
6) Connect the battery ground cable to battery.



7) Start the engine, and then measure the oil pressure.



Oil pressure:
88 kPa (0.9 kg/cm^2, 13 psi) or more at 800 rpm
294 kPa (3.0 kg/cm^2, 43 psi) or more at 5,000 rpm

CAUTION:
• If the oil pressure is out of specification, check the oil pump, oil filter and lubrication line. <Ref. to LU(SOHC)-25, INSPECTION, Engine Lubrication System Trouble in General.>
• If the oil pressure warning light is turned ON and oil pressure is in specification, replace the oil pressure switch. <Ref. to LU(SOHC)-25, INSPECTION, Engine Lubrication System Trouble in General.>

NOTE:
The specified data is based on an engine oil temperature of 80°C (176°F).

8) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU(SOHC)-21, INSTALLATION, Oil Pressure Switch.>

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

9) Install the generator and V-belt in the reverse order of removal, and then adjust the V-belt deflection. <Ref. to ME(SOHC)-41, INSTALLATION, V-belt.>

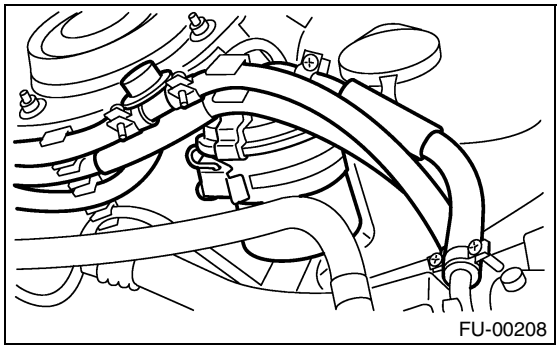
7. Fuel Pressure

A: INSPECTION

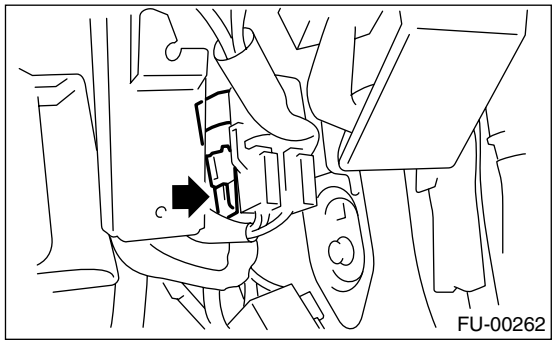
WARNING:
Before removing the fuel pressure gauge, lower the fuel pressure.

NOTE:
If out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.

1) Lower the fuel pressure. <Ref. to FU(SOHC)-49, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel flap lid, and then remove the fuel filler cap.
3) Disconnect the fuel delivery hoses from fuel damper, and then connect the fuel pressure gauge.

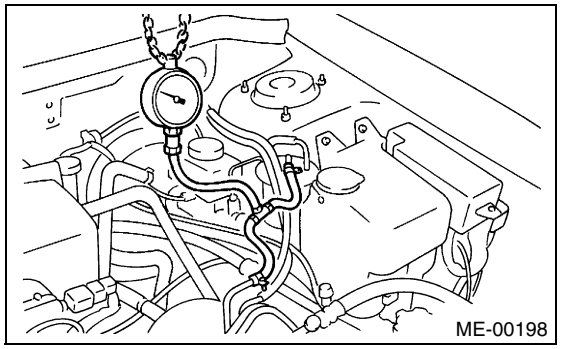


4) Connect the connector of fuel pump relay.



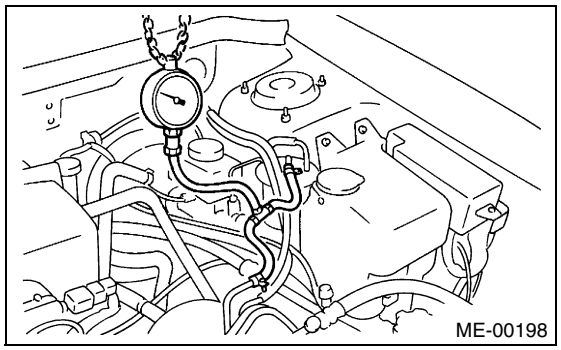
5) Start the engine.
6) Measure the fuel pressure while disconnecting the pressure regulator vacuum hose from intake manifold.

Fuel pressure:
Standard; 284 — 314 kPa (2.9 — 3.2 kg/cm^2, 41 — 46 psi)



7) After connecting the pressure regulator vacuum hose, measure the fuel pressure.

Fuel pressure:
Standard; 206 — 235 kPa (2.1 — 2.4 kg/cm^2, 30 — 34 psi)



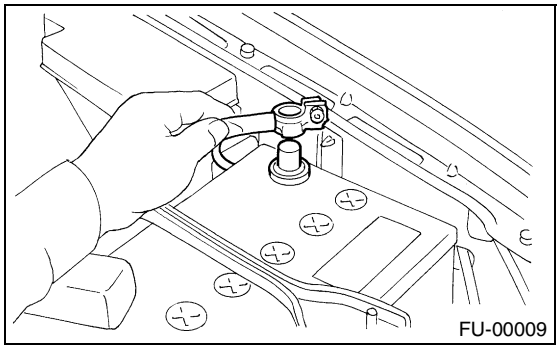
NOTE:
The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kg/cm^2, 1 to 3 psi) higher than standard values during high-altitude operations.

8. Valve Clearance

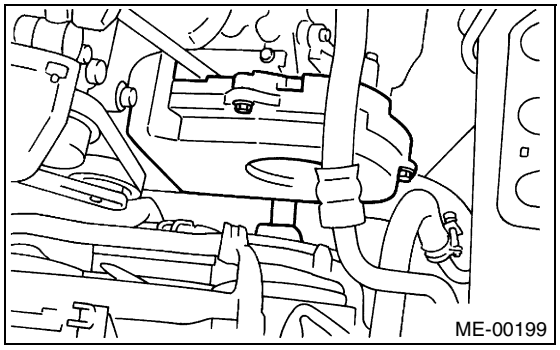
A: INSPECTION

NOTE:
Inspection and adjustment of the valve clearance should be performed while engine is cold.

1) Set the vehicle on a lift.
2) Lift-up the vehicle.
3) Remove the under cover.
4) Lower the vehicle.
5) Disconnect the ground cable from battery.

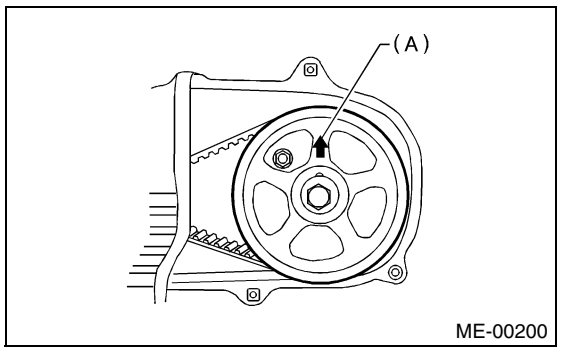


6) Remove the belt cover (LH).



7) When inspecting the #1 and #3 cylinders;
   (1) Disconnect the spark plug cords from spark plugs RH side. <Ref. to IG(SOHC)-5, RH SIDE, REMOVAL, Spark Plug.>
   (2) Disconnect the PCV hose from rocker cover (RH).
   (3) Remove the bolts, and then remove the rocker cover (RH).
8) When inspecting the #2 and #4 cylinders;
   (1) Disconnect the spark plug cords from spark plugs (LH Side) <Ref. to IG(SOHC)-5, LH SIDE, REMOVAL, Spark Plug.>.
   (2) Disconnect the PCV hose from rocker cover (LH).
   (3) Remove the bolts, and then remove the rocker cover (LH).
9) Set the #1 cylinder piston to top dead center of compression stroke by rotating crankshaft pulley clockwise using a socket wrench.

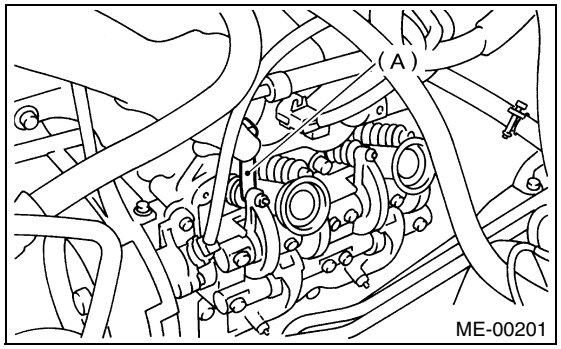
NOTE:
When arrow mark (A) on the camshaft sprocket (LH) comes exactly to the top, #1 cylinder piston is brought to the top dead center of compression stroke.



10) Measure the #1 cylinder valve clearance by using thickness gauge.

CAUTION:
• Insert the thickness gauge (A) in as horizontal a direction as possible with respect to the valve stem end face.
• Measure the exhaust valve clearances while lifting-up the vehicle.

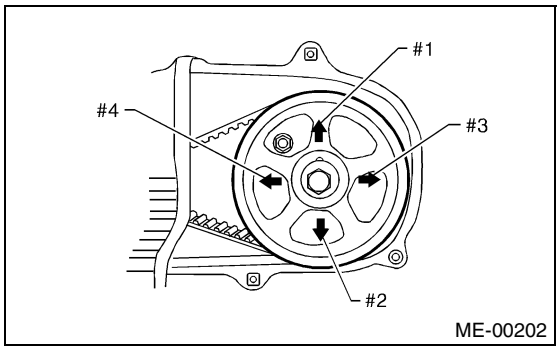
Valve clearance:
Intake;
0.20±0.02 mm (0.0079±0.0008 in)
Exhaust;
0.25±0.02 mm (0.0098±0.0008 in)



11) If necessary, adjust the valve clearance. <Ref. to ME(SOHC)-30, ADJUSTMENT, Valve Clearance.>

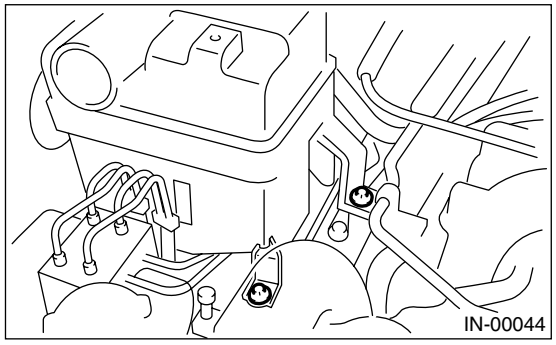
12) Similar to measurement procedures used for #1 cylinder, measure the #2, #3 and #4 cylinder valve clearances.

NOTE:
• Be sure to set the cylinder pistons to their respective top dead centers on compression stroke before measuring valve clearances.
• To set the #3, #2 and #4 cylinder pistons to their top dead centers on compression stroke, turn the crankshaft pulley clockwise 90° at a time starting with arrow mark on camshaft sprocket (LH) facing up.



13) After inspection, install the related parts in the reverse order of removal.

Resonator chamber:
Air cleaner case;
33 N·m (3.4 kgf-m, 25 ft-lb)

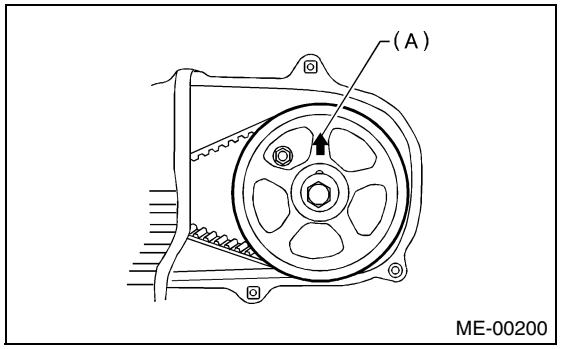


B: ADJUSTMENT

NOTE:
Adjustment of the valve clearance should be performed while engine is cold.

1) Set the #1 cylinder piston to top dead center of compression stroke by rotating crankshaft pulley clockwise using socket wrench.

NOTE:
When arrow mark (A) on the camshaft sprocket (LH) comes exactly to the top, #1 cylinder piston is brought to the top dead center of compression stroke.

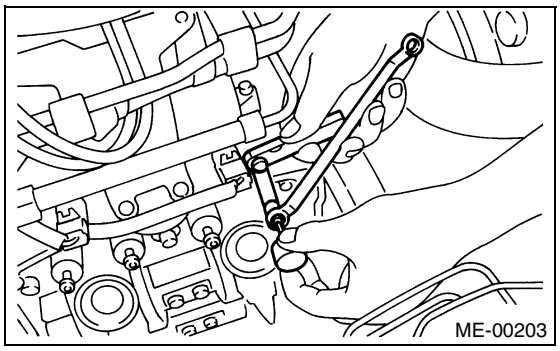


2) Adjust the #1 cylinder valve clearance.
(1) Loosen the valve rocker nut and screw.
(2) Place suitable thickness gauge.
(3) While noting the valve clearance, tighten the valve rocker adjust screw.
(4) When specified valve clearance is obtained, tighten the valve rocker nut.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)

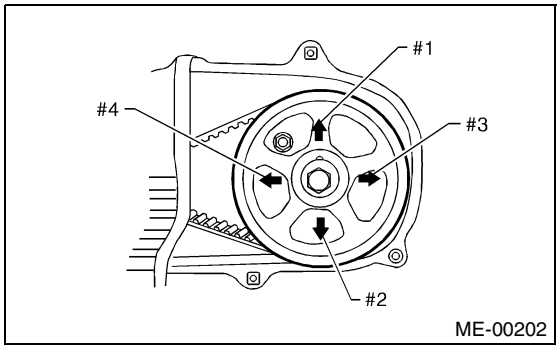
CAUTION:
• Insert the thickness gauge in as horizontal a direction as possible with respect to the valve stem end face.
• Adjust the exhaust valve clearances while lifting up the vehicle.

Valve clearance:
Intake;
0.20±0.02 mm (0.0079±0.0008 in)
Exhaust;
0.25±0.02 mm (0.0098±0.0008 in)



3) Ensure the valve clearances are within specifications.
4) Turn the crankshaft two complete rotations until #1 cylinder piston is again set to the top dead center on compression stroke.
5) Ensure the valve clearances are within specifications. If necessary, readjust the valve clearances.
6) Similar to adjustment procedures used for #1 cylinder, adjust the #2, #3 and #4 cylinder valve clearances.

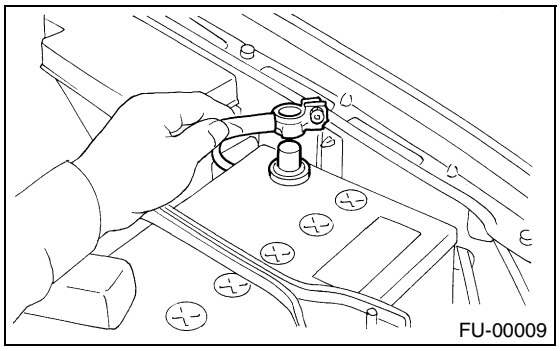
NOTE:
• Be sure to set the cylinder pistons to their respective top dead centers on compression stroke before adjusting valve clearances.
• To set the #3, #2 and #4 cylinder pistons to their top dead centers on compression stroke, turn the crankshaft pulley clockwise 90° at a time starting with arrow mark on camshaft sprocket (LH) facing up.



9. Engine Assembly

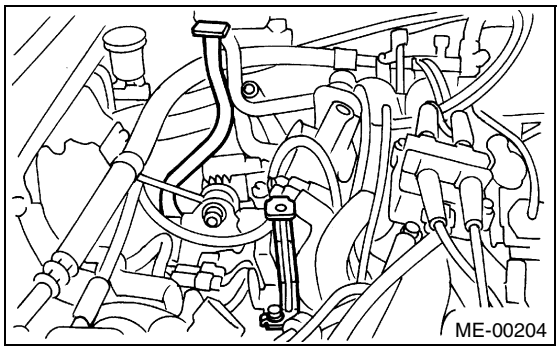
A: REMOVAL

1) Set the vehicle on lift arms.
2) Open the front hood fully, and then support with the hood stay.
3) Lower the fuel pressure. <Ref. to FU(SOHC)-49, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
4) Disconnect the A/C pressure hoses from A/C compressor.
5) Remove the fuel filler cap.
6) Disconnect the ground cable from battery.

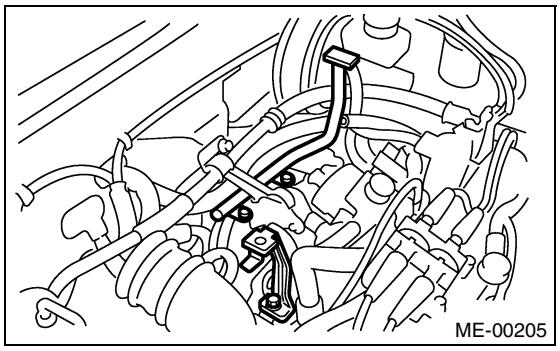

FU-00009

7) Remove the air intake duct and air cleaner case. <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
8) Remove the under cover.
9) Remove the radiator from vehicle. <Ref. to CO(SOHC)-27, REMOVAL, Radiator.>
10) Remove the air cleaner case stay.

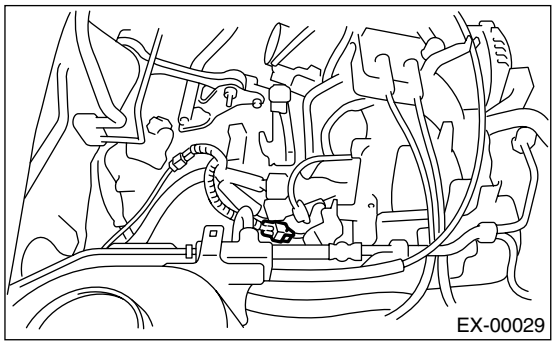
- MT VEHICLES


ME-00204

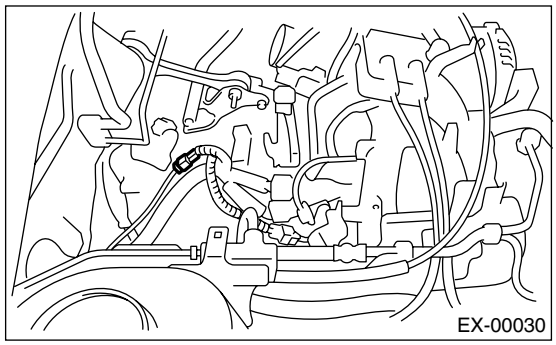
- AT VEHICLES


ME-00205

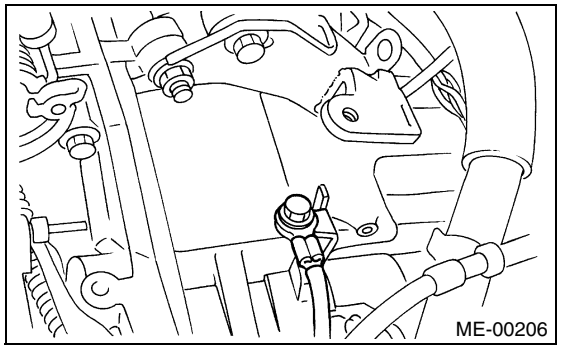
11) Disconnect the following connectors and cables.
(1) Front oxygen (A/F) sensor connector


EX-00029

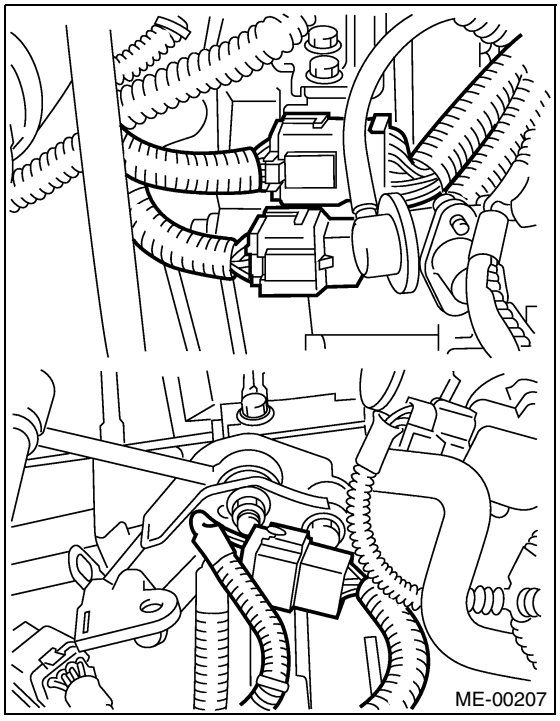
(2) Rear oxygen sensor connector


EX-00030

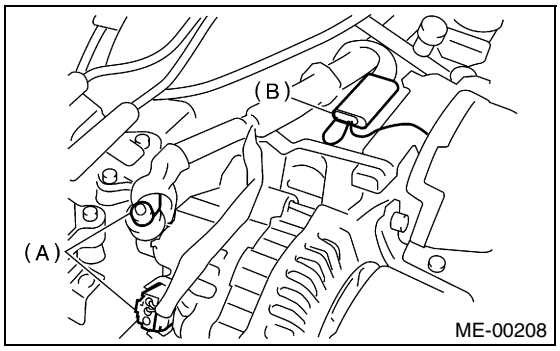
(3) Engine ground cable


ME-00206

(4) Engine harness connectors

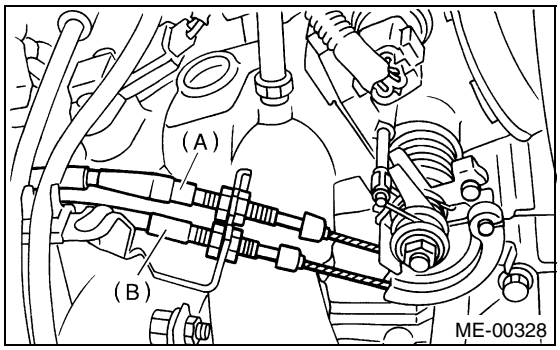


(5) Generator connector, terminal and A/C compressor connector

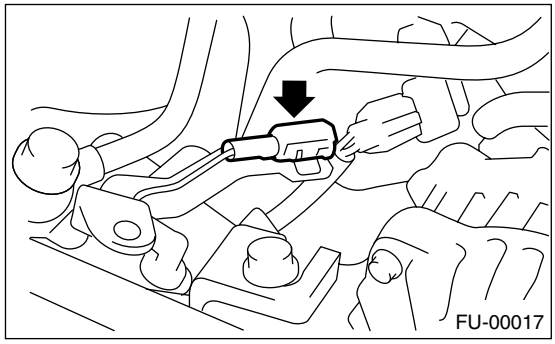


(A) Generator connector and terminal
(B) A/C compressor connector

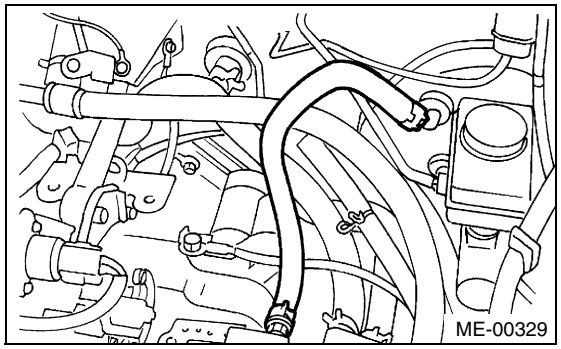
(6) Accelerator cable (A) and cruise control cable (B)



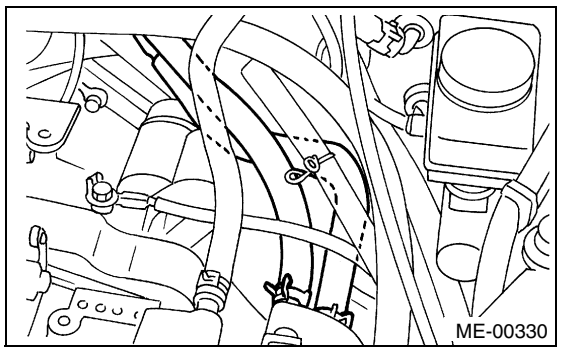
(7) Pressure switch



12) Disconnect the following hoses.
(1) Brake booster vacuum hose

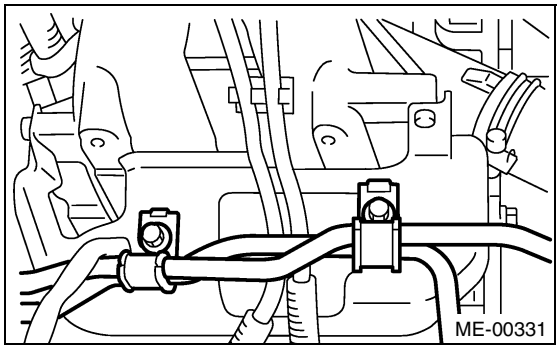


(2) Heater inlet outlet hose

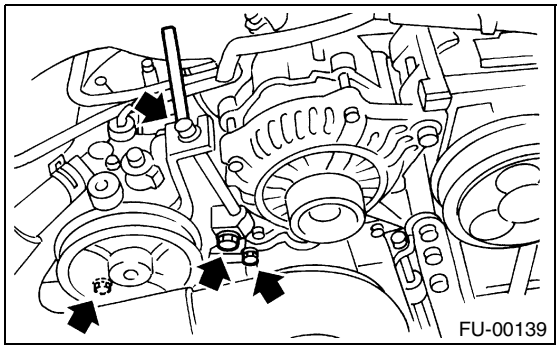


13) Remove the power steering pump from bracket.
(1) Remove the resonator chamber.
(2) Loosen the lock bolt and slider bolt, and then remove the front side V-belt.<Ref. to ME(SOHC)-41, FRONT SIDE BELT, REMOVAL, V-belt.>

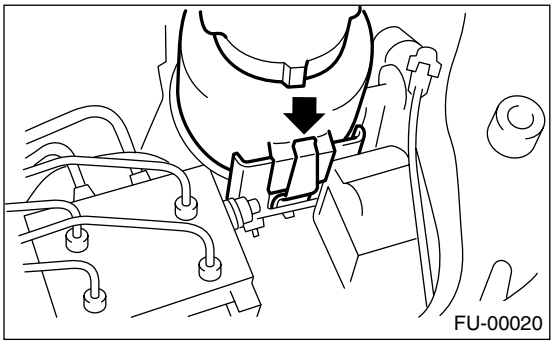
(3) Remove the pipe with bracket.



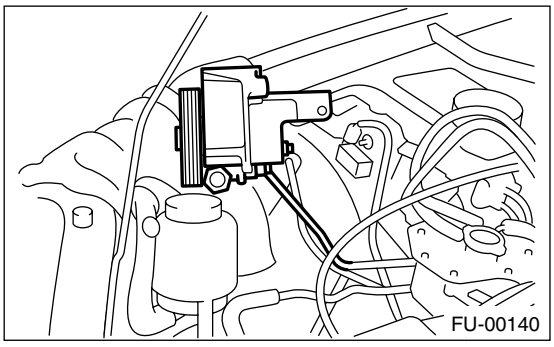
(4) Remove the bolts which install power steering pump bracket.



(5) Remove the power steering tank from bracket by pulling it upward.

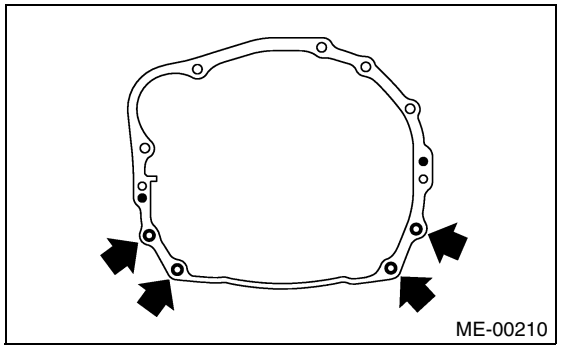


(6) Place the power steering pump on right side wheel apron.

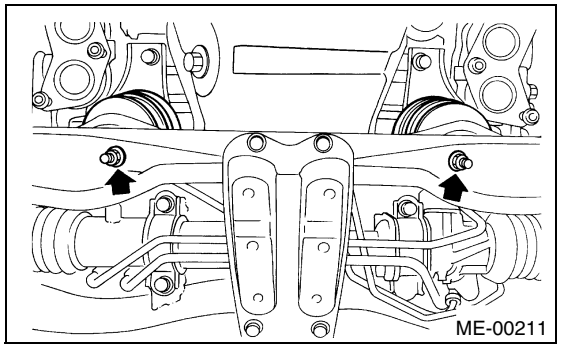


14) Remove the front and center exhaust pipe. <Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.>

15) Remove the nuts which hold lower side of transmission to engine.



16) Remove the nuts which install front cushion rubber onto front crossmember.



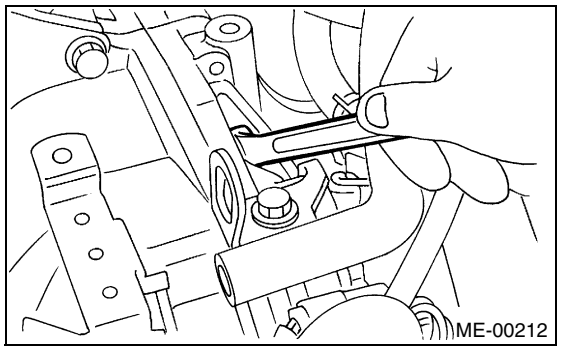
17) Separate the torque converter clutch from drive plate. (AT vehicles)

(1) Lower the vehicle.

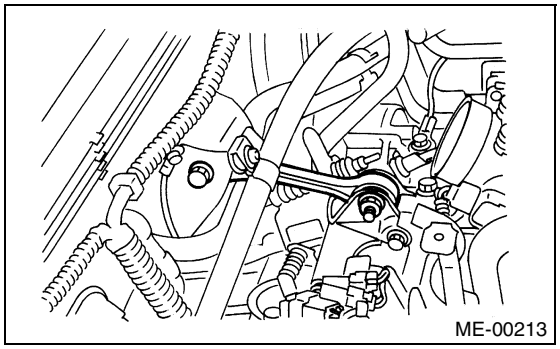
(2) Remove the service hole plug.

(3) Remove the bolts which hold torque converter clutch to drive plate.

(4) Remove other bolts while rotating the engine using socket wrench.

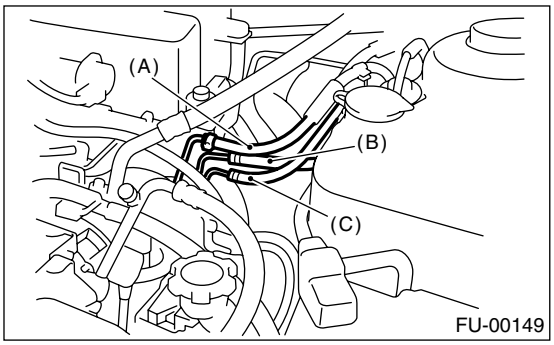


18) Remove the pitching stopper.

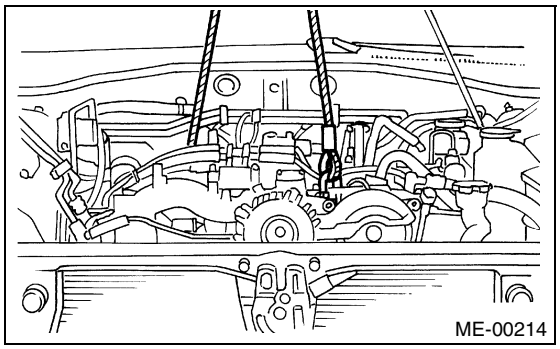


19) Disconnect the fuel deliverly hose (A), return hose (B) and evaporation hose (C).

CAUTION:
• Disconnect the hose with its end wrapped with cloth to prevent fuel from splashing.
• Catch fuel from the hose into container.

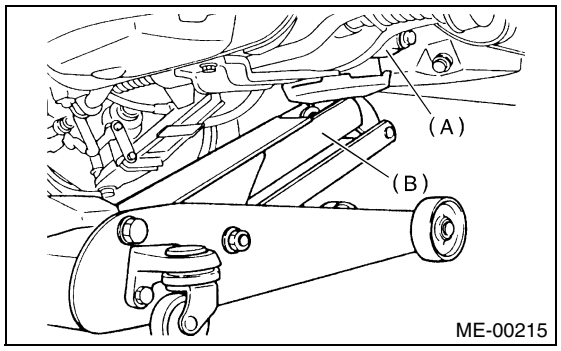


20) Support the engine with a lifting device and wire ropes.



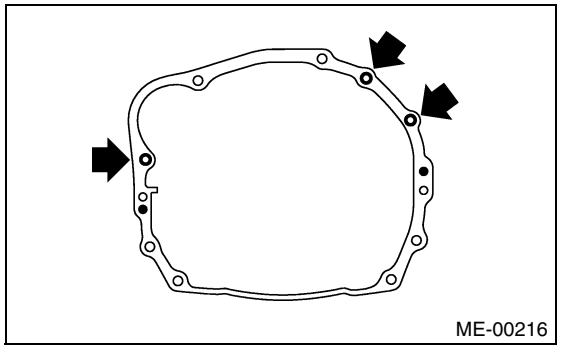
21) Support the transmission with a garage jack.

CAUTION:
Before moving the engine away from transmission, check to be sure no work has been overlooked. Doing this is very important in order to facilitate re-installation and because the transmission lowers under its own weight.

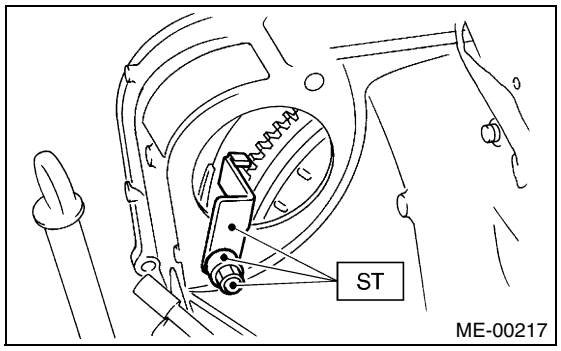


(A) Transmission
(B) Garage jack

22) Separation of the engine and transmission.
(1) Remove the starter. <Ref. to SC(SOHC)-6, REMOVAL, Starter.>
(2) Remove the bolts which hold upper side of transmission to engine.



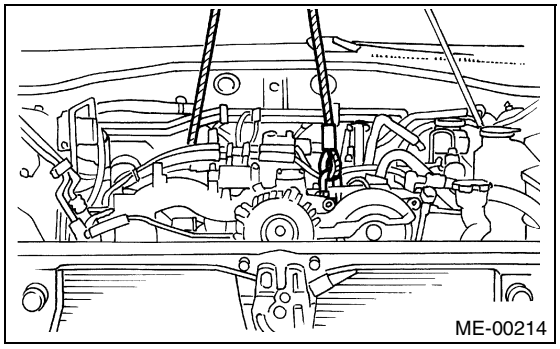
23) Install the ST to torque converter clutch case. (AT vehicles)
ST 498277200 STOPPER SET



24) Remove the engine from vehicle.
(1) Slightly raise the engine.
(2) Raise the transmission with garage jack.
(3) Move the engine horizontally until main shaft is withdrawn from clutch cover.

(4) Slowly move the engine away from engine compartment.

NOTE:
Be careful not to damage the adjacent parts or body panels with crank pulley, oil level gauge, etc.


ME-00214

25) Remove the front cushion rubbers.

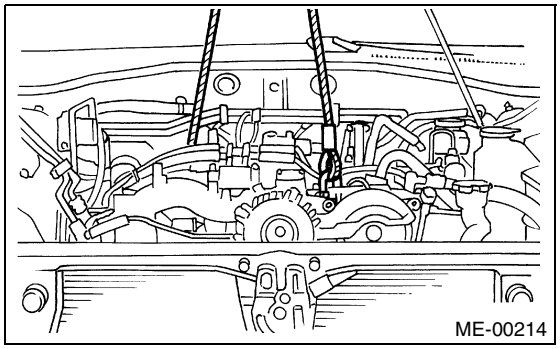
B: INSTALLATION

1) Install the front cushion rubbers.

Tightening torque:
34 N·m (3.5 kgf-m, 25.3 ft-lb)

2) Install the engine onto transmission.
(1) Position the engine in engine compartment and align it with transmission.

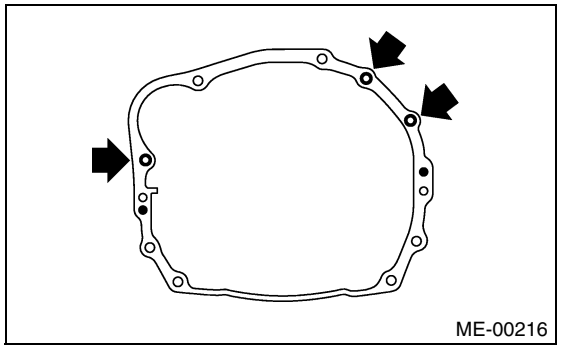
NOTE:
Be careful not to damage the adjacent parts or body panels with crank pulley, oil level gauge, etc.


ME-00214

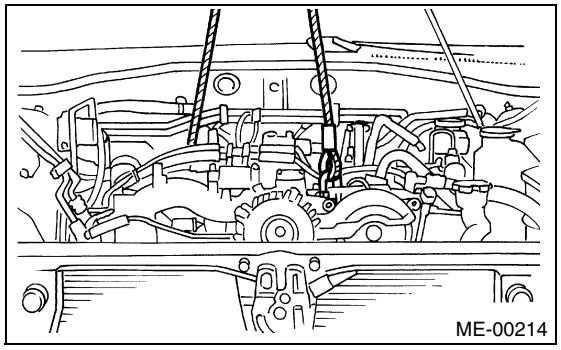
(2) Apply a small amount of grease to the spline of main shaft. (MT vehicles)

3) Tighten the bolts which hold upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

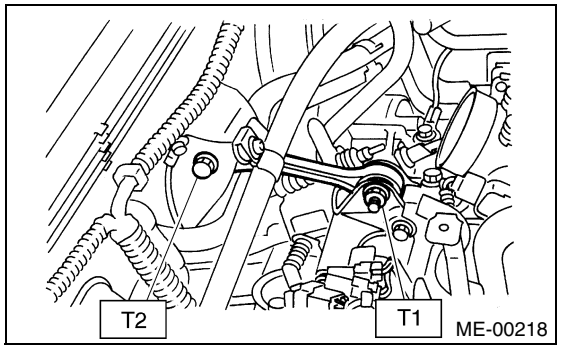

ME-00216

4) Remove the lifting device and wire ropes.


ME-00214

5) Remove the garage jack.
6) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



ME-00218

7) Remove the ST from torque converter clutch case. (AT vehicles)

NOTE:
Be careful not to drop the ST into torque converter clutch case when removing ST.

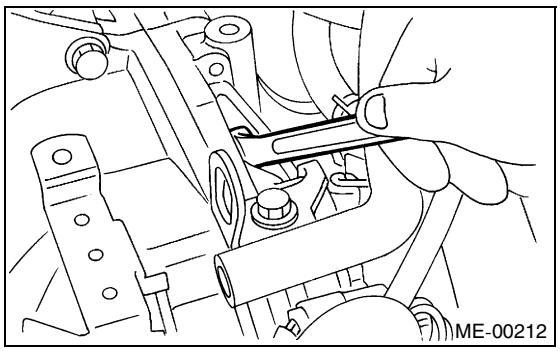
ST 498277200 STOPPER SET

8) Install the starter. <Ref. to SC(SOHC)-6, INSTALLATION, Starter.>
9) Install the torque converter clutch onto drive plate. (AT vehicles)

(1) Tighten the bolts which hold torque converter clutch to drive plate.
(2) Tighten other bolts while rotating the engine by using a socket wrench.

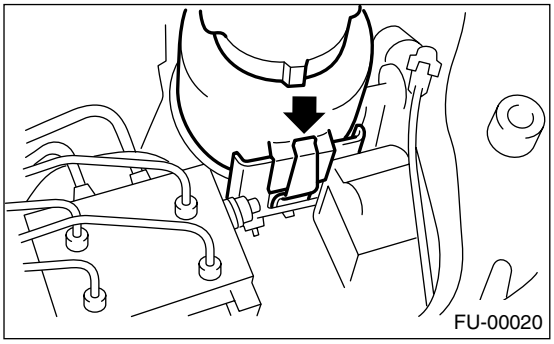
NOTE:
Be careful not to drop the bolts into torque converter clutch housing.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



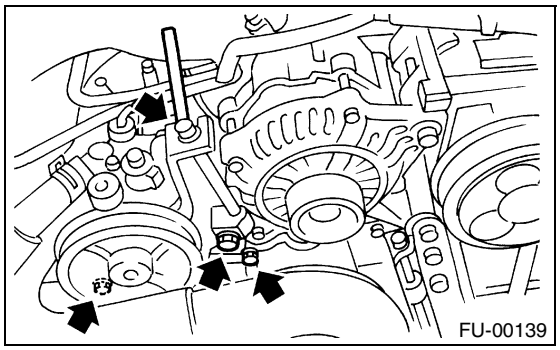
(3) Clog the plug onto service hole.

10) Install the power steering pump on bracket.
(1) Install the power steering tank on bracket.

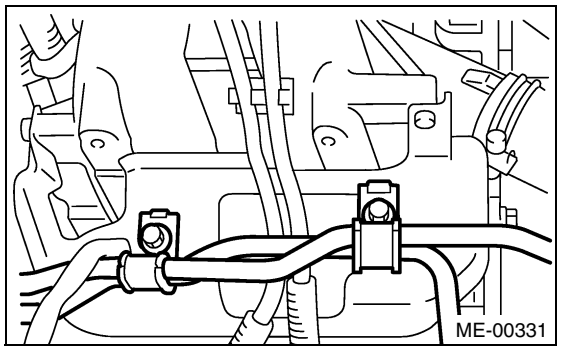


(2) Install the power steering pump on bracket, and then tighten the bolts.

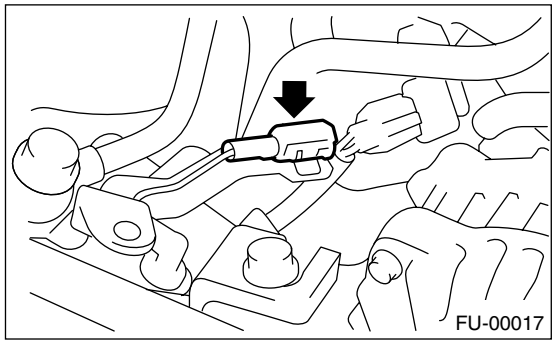
Tightening torque:
20.1 N·m (2.05 kgf-m, 14.8 ft-lb)



(3) Tighten the bolts which install power steering pump bracket, and then install the spark plug cords.

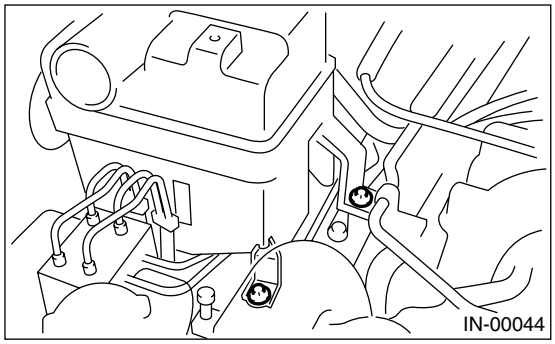


(4) Connect the power steering switch connector.



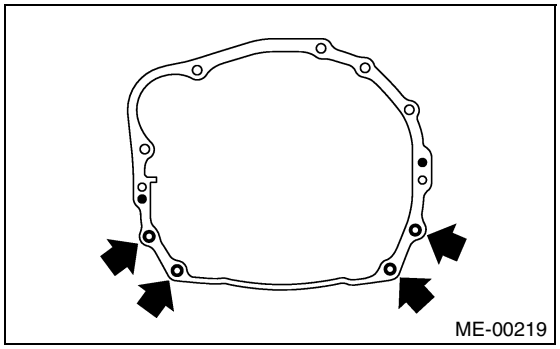
(5) Install the front side V-belt, and adjust it. <Ref. to ME(SOHC)-41, FRONT SIDE BELT, INSTALLATION, V-belt.>
(6) Install the resonator chamber.

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)



11) Tighten the nuts which hold lower side of transmission to engine.

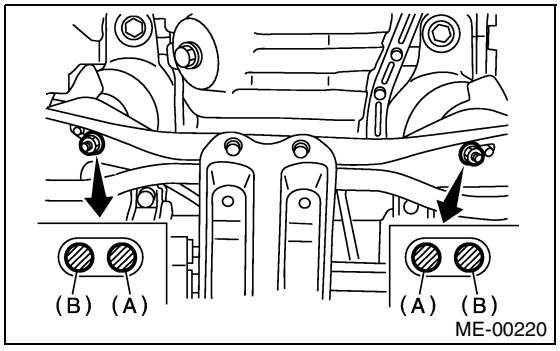
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



12) Tighten the nuts which install front cushion rubber onto crossmember.

Tightening torque:
85 N·m (8.7 kgf-m, 63 ft-lb)

NOTE:
Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



13) Install the front and center exhaust pipe. <Ref. to EX(SOHC)-8, INSTALLATION, Front Exhaust Pipe.>
14) Connect the following hoses.
(1) Fuel delivery hose, return hose and evaporation hose
(2) Heater inlet and outlet hoses
(3) Brake booster vacuum hose
15) Connect the following connectors.
(1) Engine ground cables

Tightening torque:
14 N·m (1.4 kgf-m, 10.1 ft-lb)

(2) Engine harness connectors
(3) Generator connector and terminal
(4) A/C compressor connectors
(5) Power steering pressure switch
16) Connect the following cables.
(1) Accelerator cable
(2) Cruise control cable (With cruise control)
17) Adjust each connected cable.
18) Install the air cleaner case stay.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)

19) Install the A/C pressure hoses. <Ref. to AC-43, INSTALLATION, Hose and Tube.>
20) Install the radiator to vehicle. <Ref. to CO(SOHC)-29, INSTALLATION, Radiator.>
21) Install the air intake duct and air cleaner case. <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.>
22) Install the under cover.
23) Install battery in the vehicle, and then connect the cables.
24) Fill engine coolant. <Ref. to CO(SOHC)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
25) Check the ATF level and correct if necessary. (AT vehicles) <Ref. to AT-29, INSPECTION, Automatic Transmission Fluid.>
26) Charge the A/C system with refrigerant. <Ref. to AC-27, OPERATION, Refrigerant Charging Procedure.>
27) Remove the front hood stay, and then close the front hood.
28) Take off the vehicle from lift arms.

C: INSPECTION

1) Make sure the pipes and hoses are installed correctly.
2) Make sure the engine coolant and ATF are at specified levels.

10.Engine Mounting

A: REMOVAL

1) Remove the engine assembly. <Ref. to ME(SOHC)-32, REMOVAL, Engine Assembly.>
2) Remove the engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Engine mounting;
34 N·m (3.5 kgf-m, 25.3 ft-lb)

C: INSPECTION

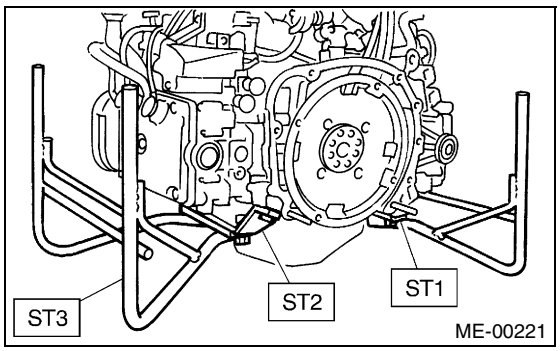
Make sure there are no cracks or other damage.

11.Preparation for Overhaul

A: PROCEDURE

1) After removing the engine from body, secure it in the ST shown below.

ST1	498457000	ENGINE STAND ADAPTER RH
ST2	498457100	ENGINE STAND ADAPTER LH
ST3	499817100	ENGINE STAND



2) In this section the procedures described under each index are all connected and stated in order. It will be the complete procedure for overhauling of the engine itself when you go through all steps in the process.
Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

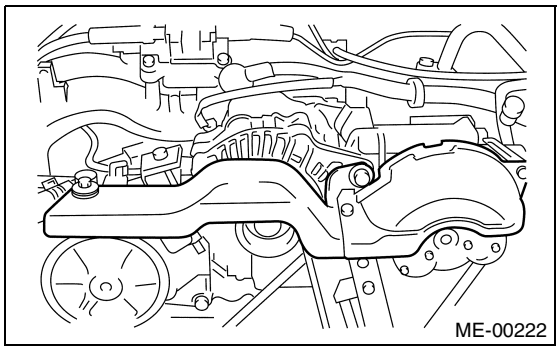
12.V-belt

A: REMOVAL

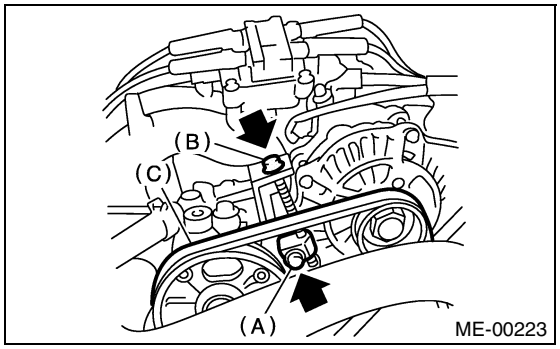
1. FRONT SIDE BELT

NOTE:
Perform the following procedures 1) to 4) with the engine installed to body.

1) Remove the V-belt cover.

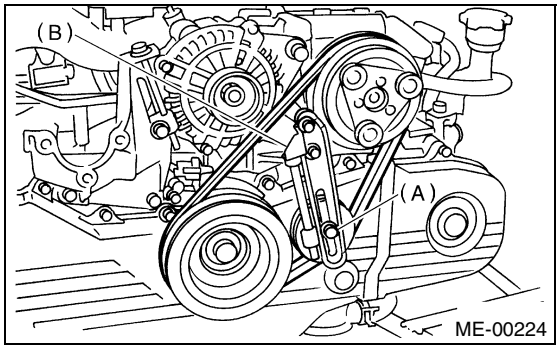


2) Loosen the lock bolt (A).
3) Loosen the slider bolt (B).
4) Remove the front side belt (C).

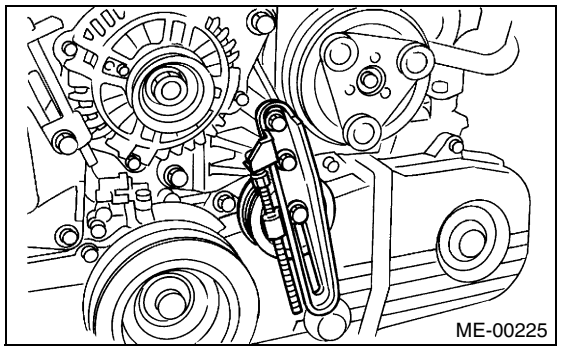


2. REAR SIDE BELT

1) Loosen the lock nut (A).
2) Loosen the slider bolt (B).



3) Remove the A/C belt.
4) Remove the A/C belt tensioner.

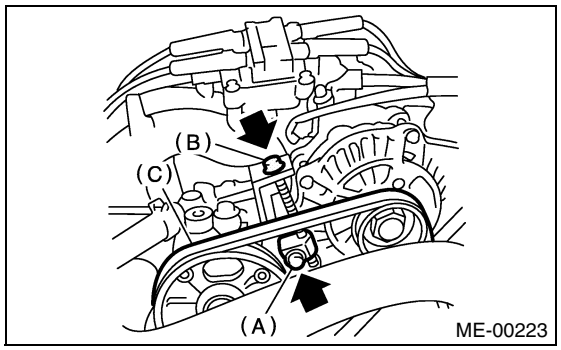


B: INSTALLATION

1. FRONT SIDE BELT

1) Wipe off any oil or water on the belt and pulley.
2) Install the belt (C), and tighten the slider bolt so as to obtain the specified belt tension <Ref. to ME(SOHC)-42, INSPECTION, V-belt.>
3) Tighten the lock bolt (A)
4) Tighten the slider bolt (B).

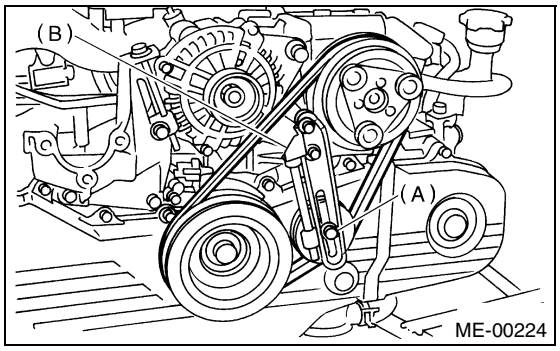
Tightening torque:
Lock bolt through bolt:
25 N·m (2.5 kgf-m, 18.1 ft-lb)
Slider bolt:
8 N·m (0.8 kgf-m, 5.5 ft-lb)



2. REAR SIDE BELT

1) Install the belt, and tighten the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME(SOHC)-42, INSPECTION, V-belt.>
2) Tighten the lock nut (A).

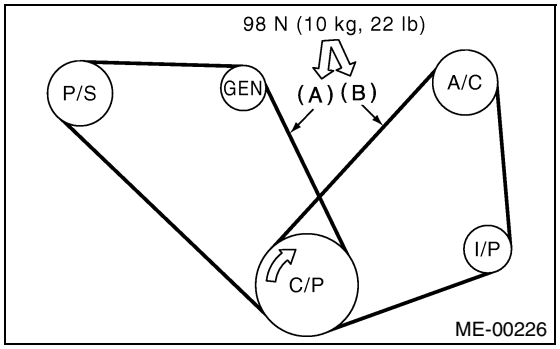
Tightening torque:
Lock nut (A);
22.6 N·m (2.3 kgf-m, 16.6 ft-lb)



C: INSPECTION

1) Replace the belts, if cracks, fraying or wear is found.
2) Check the drive belt tension and adjust it if necessary by changing the generator installing position and/or idler pulley installing position.

Belt tension
(A)
replaced: 7 — 9 mm (0.276 — 0.354 in)
reused: 9 — 11 mm (0.354 — 0.433 in)
(B)
replaced: 7.5 — 8.5 mm (0.295 — 0.335 in)
reused: 9.0 — 10.0 mm (0.354 — 0.394 in)



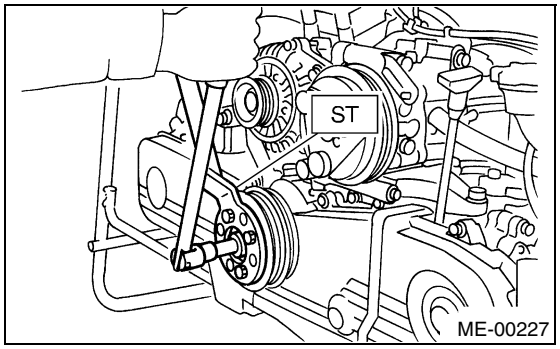
C/P	Crankshaft pulley
GEN	Generator
P/S	Power steering oil pump pulley
A/C	Air conditioning compressor pulley
I/P	Idler pulley

13.Crankshaft Pulley

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(SOHC)-41, REMOVAL, V-belt.>
2) Remove the crankshaft pulley bolt. To lock the crankshaft, use ST.

ST 499977400 CRANK PULLEY WRENCH (2000 cc model)
ST 499977100 CRANK PULLEY WRENCH (2500 cc model)



3) Remove the crankshaft pulley.

B: INSTALLATION

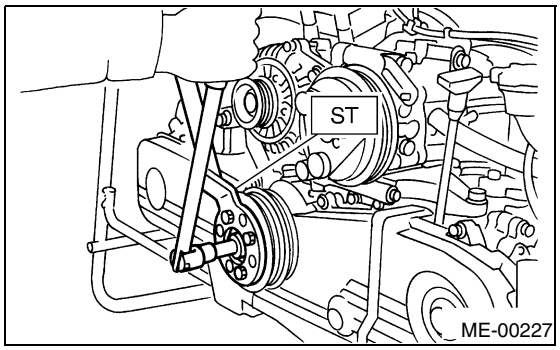
1. 2000 CC MODEL

1) Install the crankshaft pulley.
2) Install the pulley bolt.
To lock the crankshaft, use ST.

ST 499977400 CRANK PULLEY WRENCH

(1) Clean the crankshaft pulley thread using an air gun.
(2) Apply engine oil to the crankshaft pulley bolt seat and thread.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(4) Tighten the crankshaft pulley bolts.

Tightening torque:
127 N·m (13.0 kgf-m, 94.0 ft-lb)



3) Confirm that the tightening angle of crankshaft pulley bolt is 45 degrees or more. If the tightening angle of crankshaft pulley bolt is less than 45 degrees, conduct the following procedures.

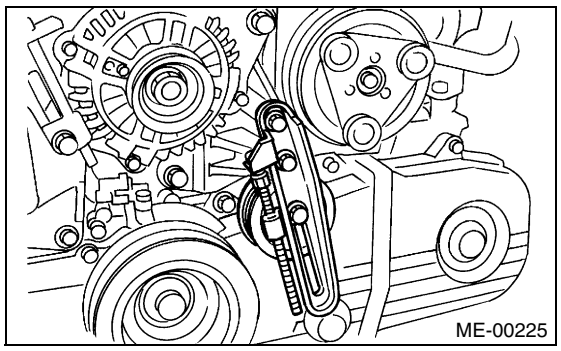
(1) Replace the crankshaft pulley bolts and clean them.

Crankshaft pulley bolt:
12369AA011

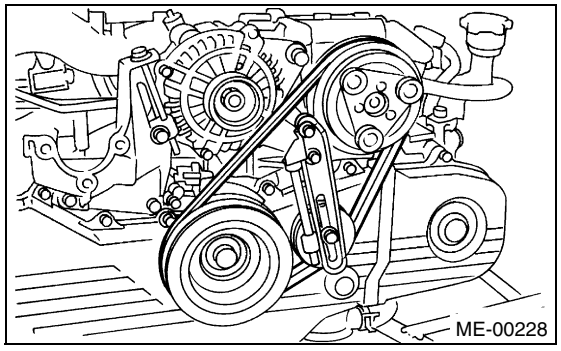
(2) Clean the crankshaft thread using an air gun.
(3) Apply engine oil to the crankshaft pulley bolt seal and thread.
(4) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(5) Tighten the crankshaft pulley bolts keeping them in an angle between 45 degrees and 60 degrees.

NOTE:
Conduct the tightening procedures by confirming the turning angle of crankshaft pulley bolt referring to the gauge indicated on belt cover.

4) Install the A/C belt tensioner.



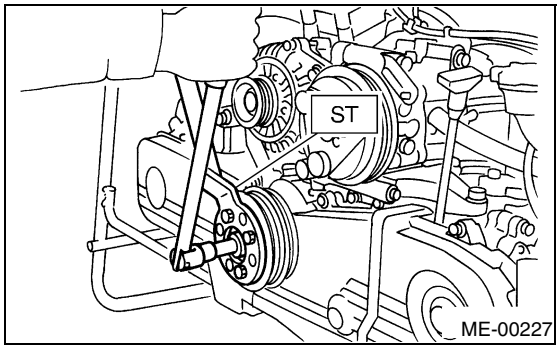
5) Install the A/C belt.



2. 2500 CC MODEL

1) Install the crankshaft pulley.
2) Install the pulley bolt.
To lock the crankshaft, use ST.
ST 499977100 CRANK PULLEY WRENCH
(1) Clean the crankshaft pulley thread using an air gun.
(2) Apply engine oil to the crankshaft pulley bolt seat and thread.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(4) Tighten the crankshaft pulley bolts.

Tightening torque:
177 N·m (18.0 kgf-m, 130.2 ft-lb)



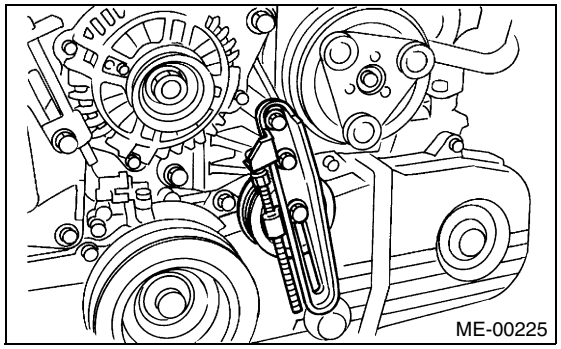
3) Confirm that the tightening angle of crankshaft pulley bolt is 65 degrees or more. If the tightening angle of crankshaft pulley bolt is less than 65 degrees, conduct the following procedures.
(1) Replace the crankshaft pulley bolts and clean them.

Crankshaft pulley bolt:
12369AA011

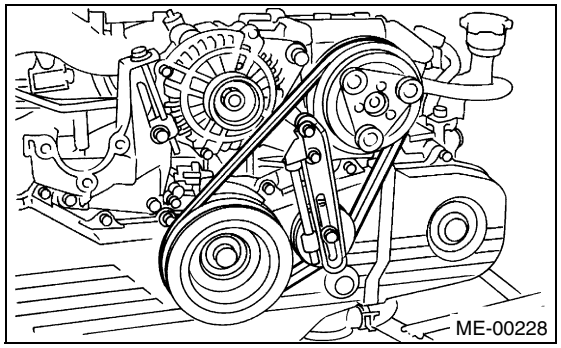
(2) Clean the crankshaft thread using an air gun.
(3) Apply engine oil to the crankshaft pulley bolt seal and thread.
(4) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(5) Tighten the crankshaft pulley bolts keeping them in an angle between 65 degrees and 75 degrees.

NOTE:
Conduct the tightening procedures by confirming the turning angle of crankshaft pulley bolt referring to the gauge indicated on belt cover.

4) Install the A/C belt tensioner.



5) Install the A/C belt.



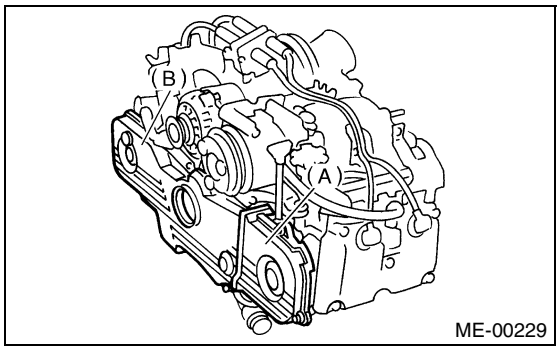
C: INSPECTION

1) Make sure the V-belt is not worn or otherwise damaged.
2) Check the tension of the belt. <Ref. to ME(SOHC)-42, INSPECTION, V-belt.>

14.Belt Cover

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(SOHC)-41, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(SOHC)-43, REMOVAL, Crankshaft Pulley.>
3) Remove the belt cover (LH).
4) Remove the front belt cover.



(A) Belt cover (LH)
(B) Front belt cover

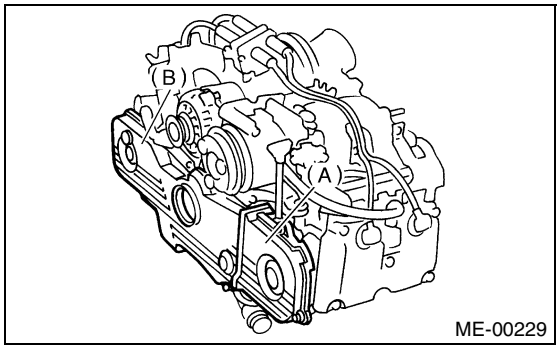
B: INSTALLATION

1) Install the front belt cover.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

2) Install the belt cover (LH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



(A) Belt cover (LH)
(B) Front belt cover

3) Install the crankshaft pulley. <Ref. to ME(SOHC)-43, INSTALLATION, Crankshaft Pulley.>
4) Install the V-belt. <Ref. to ME(SOHC)-41, INSTALLATION, V-belt.>

C: INSPECTION

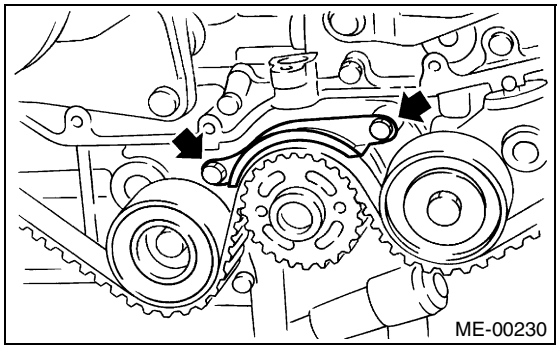
Make sure the cover is not damaged.

15.Timing Belt Assembly

A: REMOVAL

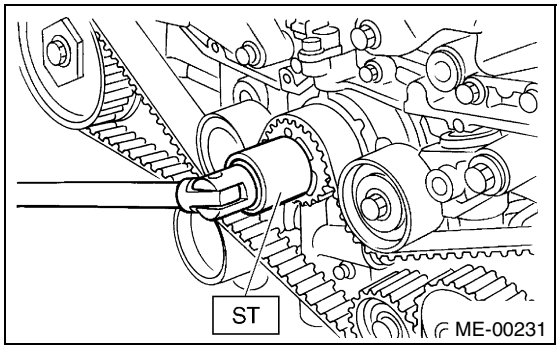
1. TIMING BELT

1) Remove the V-belt. <Ref. to ME(SOHC)-41, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(SOHC)-43, REMOVAL, Crankshaft Pulley.>
3) Remove the belt cover. <Ref. to ME(SOHC)-45, REMOVAL, Belt Cover.>
4) Remove the timing belt guide. (MT vehicles)

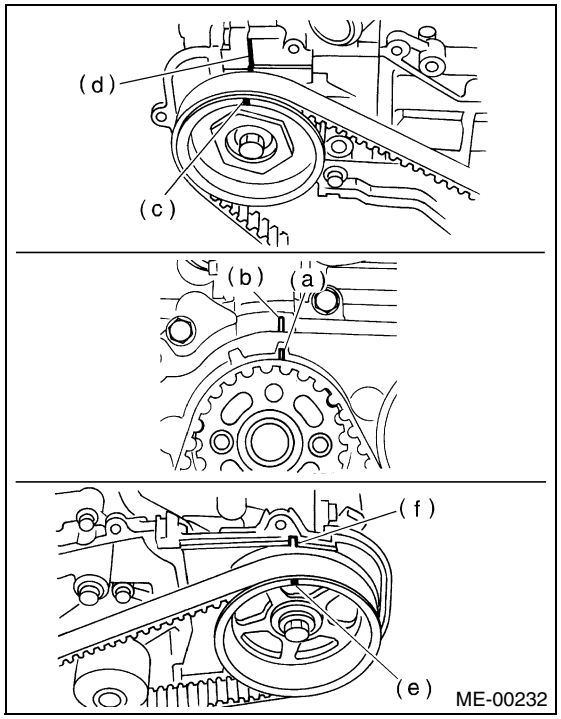

ME-00230

5) If the alignment mark (a) and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing the timing belt as shown in procedures below.
   (1) Turn the crankshaft using ST. Align the mark (a) of sprocket to cylinder block notch (b) and ensure the right side cam sprocket mark (c), cam cap and cylinder head matching surface (d) and/or left side cam sprocket mark (e) and belt cover notch (f) are properly adjusted.

ST 499987500 CRANKSHAFT SOCKET

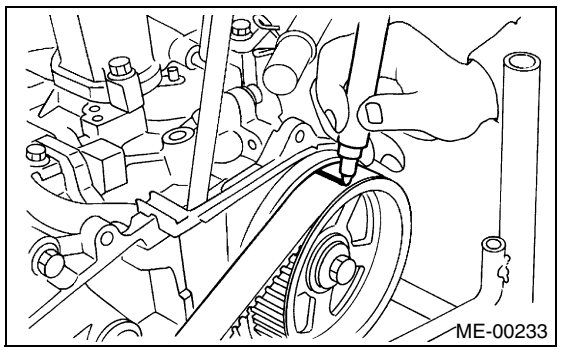


ME-00231

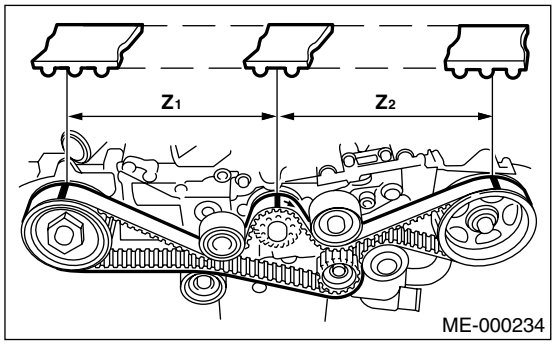


ME-00232

(2) Using white paint, put alignment and/or arrow marks on the timing belts in relation to crank sprocket and cam sprockets.


ME-00233

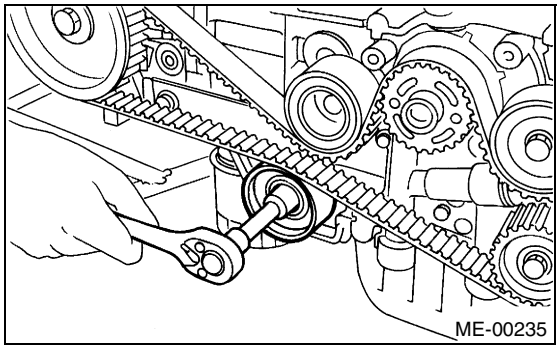
Specified data:
Z_1: 46.8 tooth length
Z_2: 43.7 tooth length



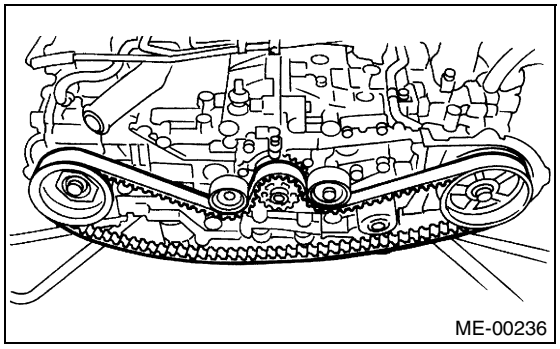
ME-000234

6) Remove the belt idler (No. 2).

7) Remove the belt idler No. 2.

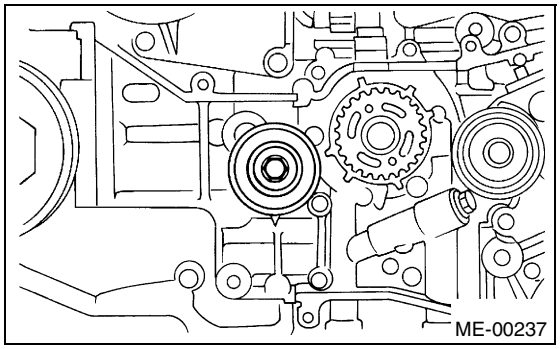


8) Remove the timing belt.

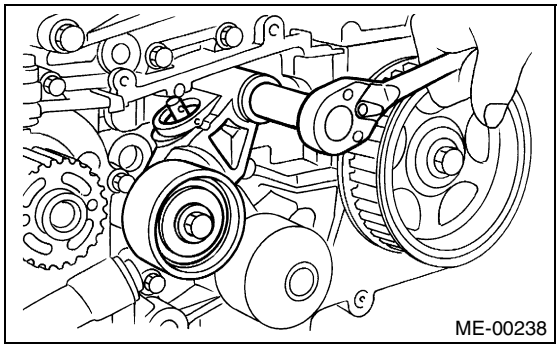


2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

1) Remove the belt idler (No. 1).



2) Remove the automatic belt tension adjuster assembly.



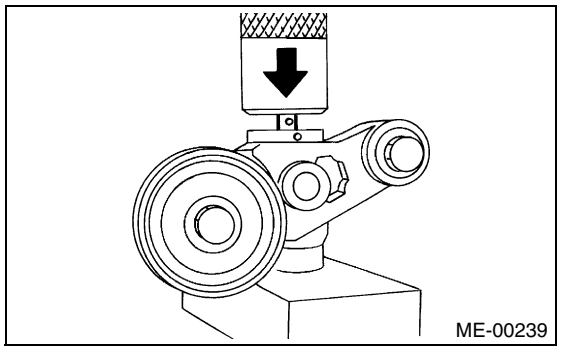
B: INSTALLATION

1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

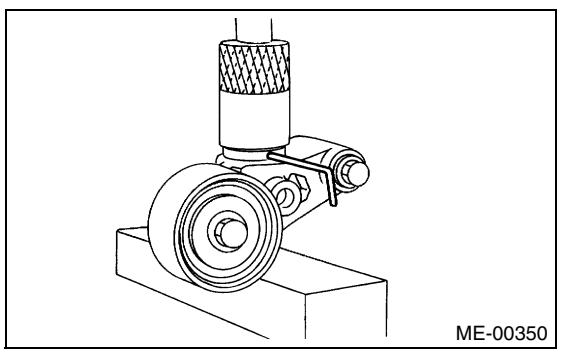
1) Preparation for installation of automatic belt tension adjuster assembly;

CAUTION:
• Always use a vertical type pressing tool to move the adjuster rod down.
• Do not use a lateral type vise.
• Push the adjuster rod vertically.
• Press-in the push adjuster rod gradually taking more than 3 minutes.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
• Press the adjuster rod as far as the end surface of cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.
• Do not release the press pressure until stopper pin is completely inserted.

(1) Attach the automatic belt tension adjuster assembly to the vertical pressing tool.
(2) Slowly move the adjuster rod down with a pressure of 294 N (30 kgf, 66 lb) until the adjuster rod is aligned with the stopper pin hole in the cylinder.

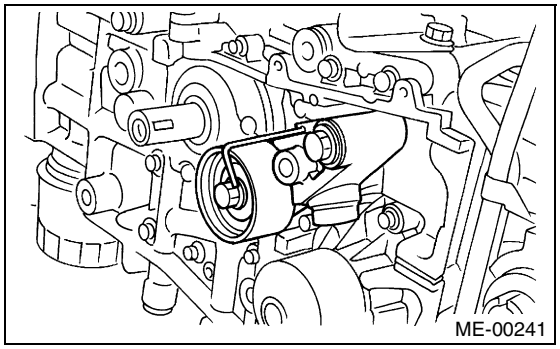


(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (0.08 in) (nominal) dia. hex bar wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.



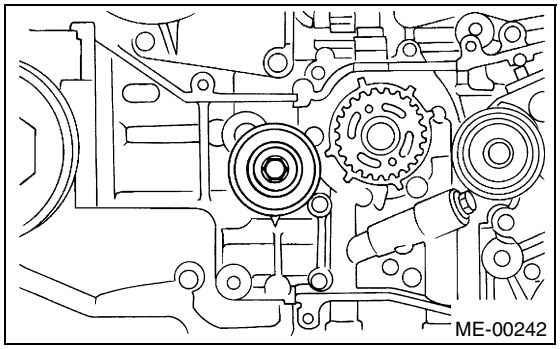
2) Install the automatic belt tension adjuster assembly.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)



3) Install the belt idler (No. 1).

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)



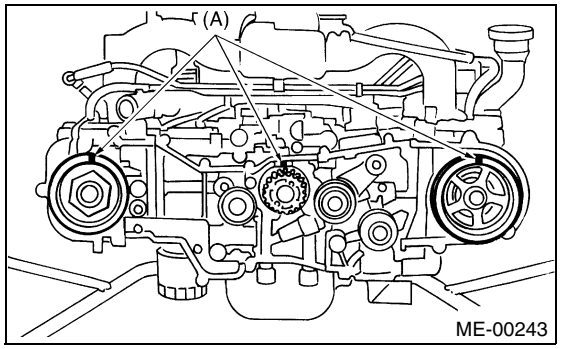
2. TIMING BELT

1) Preparation for the installation of automatic belt tension adjuster assembly. <Ref. to ME(SOHC)-47, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt Assembly.>
2) Installation of timing belt
(1) Turn the camshaft sprocket No. 2 using ST1, and then turn the camshaft sprocket No. 1 using ST2 so that their alignment marks (A) come to top positions.

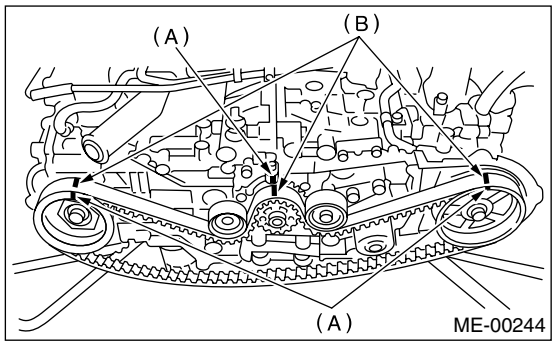
ST1 18231AA010 CAMSHAFT SPROCKET WRENCH

NOTE:
Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.

ST2 499207400 CAMSHAFT SPROCKET WRENCH



(2) While aligning alignment marks (B) on the timing belt with marks (A) on sprockets, position the timing belt properly.

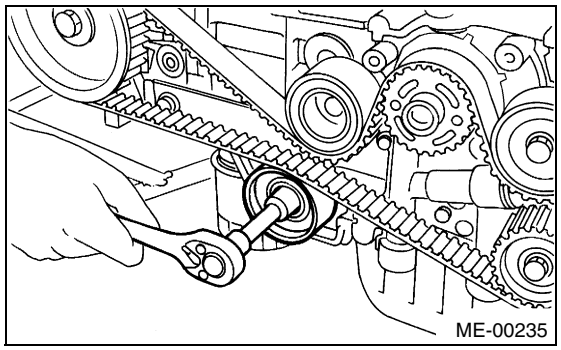


3) Install the belt idler No. 2.

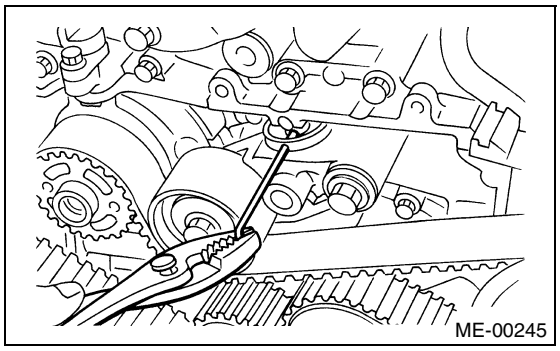
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

4) Install the belt idler (No. 2).

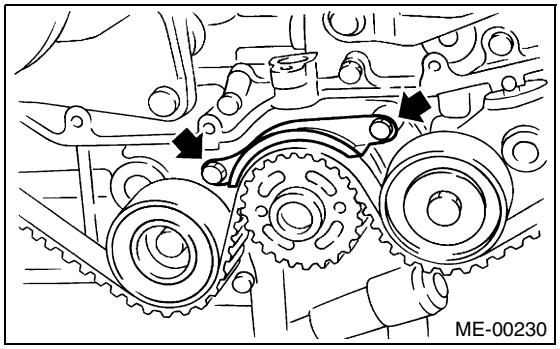
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)



5) After ensuring that the marks on timing belt and camshaft sprockets are aligned, remove the stopper pin from belt tension adjuster.

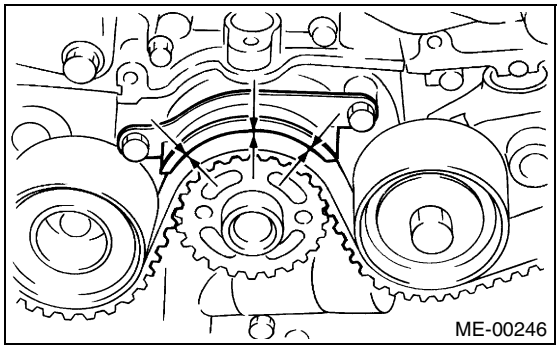

ME-00245

6) Install the timing belt guide. (MT vehicles)
(1) Temporarily tighten the remaining bolts.


ME-00230

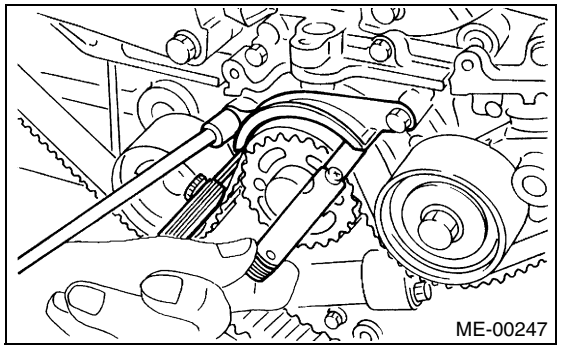
(2) Check and adjust the clearance between timing belt and timing belt guide by using thickness gauge.

Clearance:
1.0±0.5 mm (0.039±0.020 in)


ME-00246

(3) Tighten the remaining bolts.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)


ME-00247

7) Install the belt cover. <Ref. to ME(SOHC)-45, INSTALLATION, Belt Cover.>
8) Install the crankshaft pulley. <Ref. to ME(SOHC)-43, REMOVAL, Crankshaft Pulley.>
9) Install the V-belt. <Ref. to ME(SOHC)-41, INSTALLATION, V-belt.>

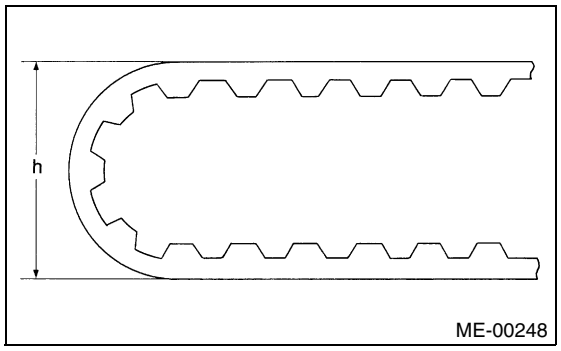
C: INSPECTION

1. TIMING BELT

1) Check the timing belt teeth for breaks, cracks, and wear. If any fault is found, replace the belt.
2) Check the condition of back side of belt; if any crack is found, replace the belt.

CAUTION:
• Be careful not to let oil, grease or coolant contact the belt. Remove quickly and thoroughly if this happens.
• Do not bend the belt sharply.

Bending radius: h
60 mm (2.36 in) or more



ME-00248

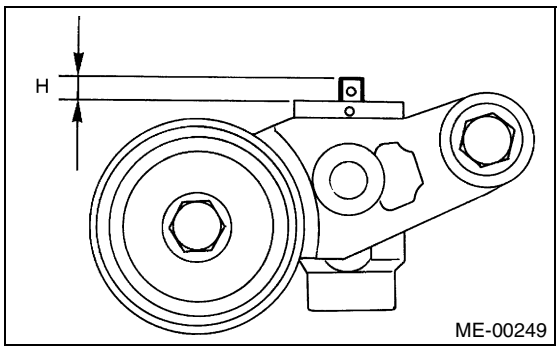
2. AUTOMATIC BELT TENSION ADJUSTER

1) Visually check oil seals for leaks, and rod ends for abnormal wear or scratches. If necessary, replace faulty parts.
2) Check that the adjuster rod does not move when a pressure of 294 N (30 kgf, 66 lb) is applied to it. This is to check adjuster rod stiffness.
3) If the adjuster rod is not stiff and moves freely when applying 294 N (30 kgf, 66 lb), check it using the following procedures:
   (1) Slowly press the adjuster rod down to the end surface of the cylinder. Repeat this motion 2 or 3 times.
   (2) With the adjuster rod moved all the way up, apply a pressure of 294 N (30 kgf, 66 lb) to it. Check adjuster rod stiffness.
   (3) If the adjuster rod is not stiff and moves down, replace the automatic belt tension adjuster assembly with a new one.

CAUTION:
• Always use a vertical type pressing tool to move the adjuster rod down.
• Do not use a lateral type vise.
• Push the adjuster rod vertically.
• Press-in the adjuster rod gradually taking more than 3 minutes.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
• Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.

4) Measure the extension of rod beyond the body. If it is not within specifications, replace with a new one.

Rod extension: H
5.7±0.5 mm (0.224±0.020 in)



3. BELT TENSION PULLEY

1) Check the mating surfaces of timing belt and contact point of adjuster rod for abnormal wear or scratches. Replace the automatic belt tension adjuster assembly if faulty.
2) Check the tension pulley for smooth rotation. Replace if noise or excessive play is noted.
3) Check the tension pulley for grease leakage.

4. BELT IDLER

1) Check the belt idler for smooth rotation. Replace if noise or excessive play is noted.
2) Check the belt outer contacting surfaces of idler pulley for abnormal wear and scratches.
3) Check the belt idler for grease leakage.

16.Camshaft Sprocket

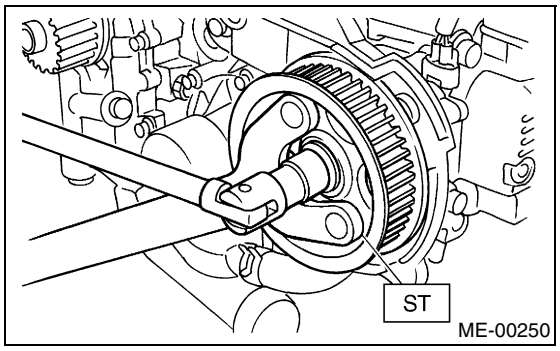
A: REMOVAL

1. REMOVAL

1) Remove the V-belt. <Ref. to ME(SOHC)-41, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(SOHC)-43, REMOVAL, Crankshaft Pulley.>
3) Remove the belt cover. <Ref. to ME(SOHC)-45, REMOVAL, Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(SOHC)-46, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft position sensor. <Ref. to FU(SOHC)-28, REMOVAL, Camshaft Position Sensor.>
6) Remove the camshaft sprocket No. 2. To lock the camshaft, use ST.

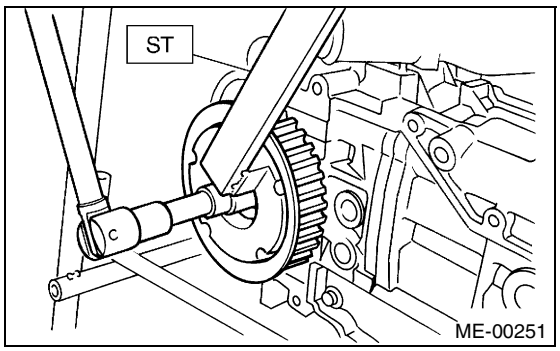
ST 18231AA010 CAMSHAFT SPROCKET WRENCH

NOTE:
Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.



7) Remove the camshaft sprocket No. 1. To lock the camshaft, use ST.

ST 499207400 CAMSHAFT SPROCKET WRENCH



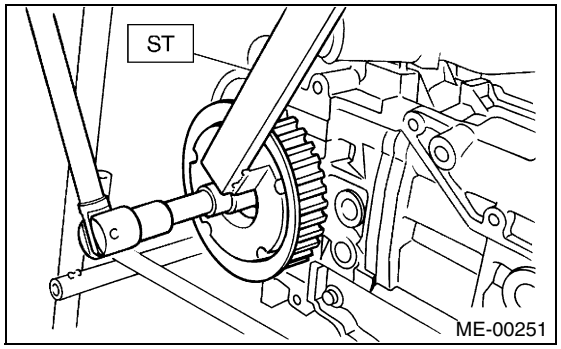
B: INSTALLATION

1) Install the camshaft sprocket No. 1. To lock the camshaft, use ST.

ST 499207400 CAMSHAFT SPROCKET WRENCH

Tightening torque:
78 N·m (8.0 kgf-m, 57.9 ft-lb)

NOTE:
Do not confuse the right and left side camshaft sprockets during installation. The camshaft sprocket No. 2 is identified by a projection used to monitor camshaft position sensor.

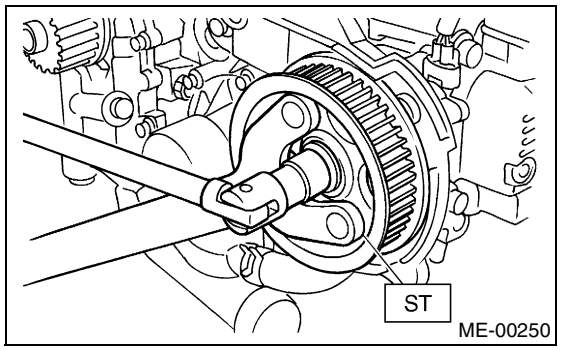


2) Install the camshaft sprocket No. 2. To lock camshaft, use ST.

ST 18231AA010 CAMSHAFT SPROCKET WRENCH

NOTE:
Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.

Tightening torque:
78 N·m (8.0 kgf-m, 57.9 ft-lb)



3) Install the camshaft position sensor. <Ref. to FU(SOHC)-28, INSTALLATION, Camshaft Position Sensor.>
4) Install the timing belt assembly. <Ref. to ME(SOHC)-47, INSTALLATION, Timing Belt Assembly.>
5) Install the belt cover. <Ref. to ME(SOHC)-45, INSTALLATION, Belt Cover.>
6) Install the crankshaft pulley. <Ref. to ME(SOHC)-43, INSTALLATION, Crankshaft Pulley.>

7) Install the V-belt. <Ref. to ME(SOHC)-41, INSTALLATION, V-belt.>

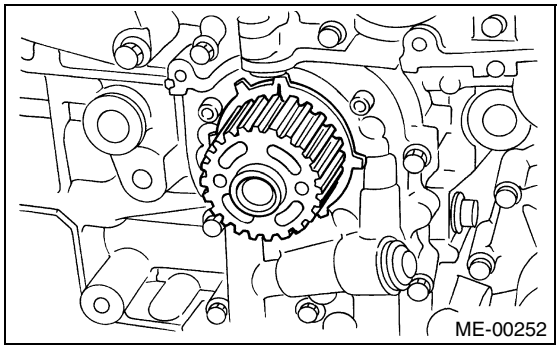
C: INSPECTION

1) Check the sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.
3) Check the camshaft sprocket notch for sensor for damage and contamination of foreign matter.

17.Crankshaft Sprocket

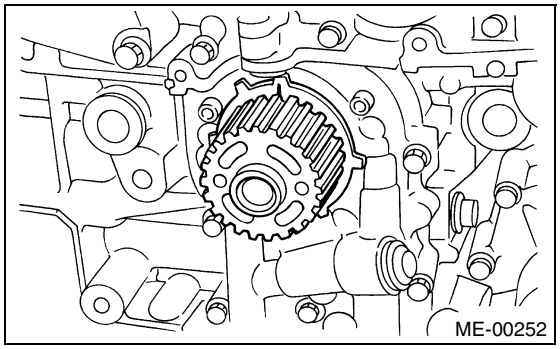
A: REMOVAL

1) Remove the V-belt. <Ref. to ME(SOHC)-41, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(SOHC)-43, REMOVAL, Crankshaft Pulley.>
3) Remove the belt cover. <Ref. to ME(SOHC)-45, REMOVAL, Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(SOHC)-46, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(SOHC)-51, REMOVAL, Camshaft Sprocket.>
6) Remove the crankshaft sprocket.



B: INSTALLATION

1) Install the crankshaft sprocket.



2) Install the camshaft sprocket. <Ref. to ME(SOHC)-51, INSTALLATION, Camshaft Sprocket.>
3) Install the timing belt assembly. <Ref. to ME(SOHC)-47, INSTALLATION, Timing Belt Assembly.>
4) Install the belt cover. <Ref. to ME(SOHC)-45, INSTALLATION, Belt Cover.>
5) Install the crankshaft pulley. <Ref. to ME(SOHC)-43, INSTALLATION, Crankshaft Pulley.>
6) Install the V-belt. <Ref. to ME(SOHC)-41, INSTALLATION, V-belt.>

C: INSPECTION

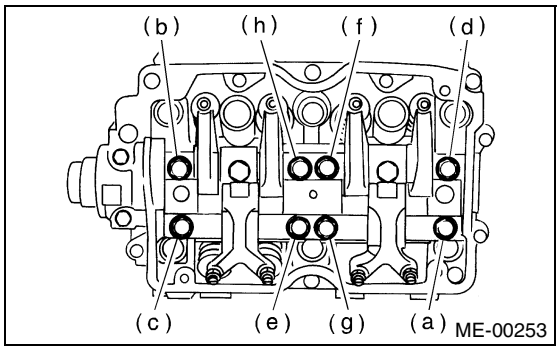
1) Check the sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.
3) Check the crankshaft sprocket notch for sensor for damage and contamination of foreign matter.

18.Valve Rocker Assembly

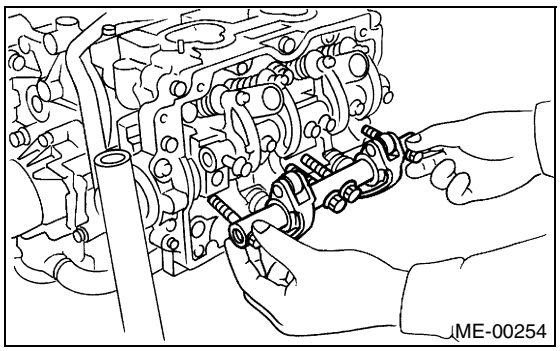
A: REMOVAL

1) Remove the V-belt. <Ref. to ME(SOHC)-41, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(SOHC)-43, REMOVAL, Crankshaft Pulley.>
3) Remove the belt cover. <Ref. to ME(SOHC)-45, REMOVAL, Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(SOHC)-46, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(SOHC)-51, REMOVAL, Camshaft Sprocket.>
6) Disconnect the PCV hose and remove rocker cover.
7) Removal of valve rocker assembly
   (1) Remove the bolts (a) through (h) in alphabetical sequence.

NOTE:
Leave two or three threads of bolts (g and h) engaged to retain the valve rocker assembly.



   (2) Remove the valve rocker assembly.



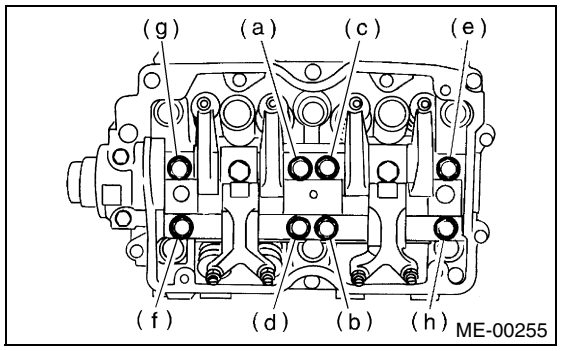
B: INSTALLATION

1) Installation of valve rocker assembly
   (1) Temporarily tighten the bolts (a) through (d) equally as shown in the figure.

NOTE:
Do not allow the valve rocker assembly to gouge knock pins.

   (2) Tighten the bolts (e) through (h) to specified torque.
   (3) Tighten the bolts (a) through (d) to specified torque.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



2) Adjust the valve clearances. <Ref. to ME(SOHC)-30, ADJUSTMENT, Valve Clearance.>
3) Install the rocker cover and connect PCV hose.
4) Install the camshaft sprocket. <Ref. to ME(SOHC)-51, INSTALLATION, Camshaft Sprocket.>
5) Install the timing belt assembly. <Ref. to ME(SOHC)-47, INSTALLATION, Timing Belt Assembly.>
6) Install the belt cover. <Ref. to ME(SOHC)-45, INSTALLATION, Belt Cover.>
7) Install the crankshaft pulley. <Ref. to ME(SOHC)-43, INSTALLATION, Crankshaft Pulley.>
8) Install the V-belt. <Ref. to ME(SOHC)-41, INSTALLATION, V-belt.>

C: DISASSEMBLY

1) Remove the bolts which secure rocker shaft.
2) Extract the rocker shaft. Remove the valve rocker arms, springs and shaft supports from rocker shaft.

NOTE:
Arrange all removed parts in order so that they can be installed in their original positions.

3) Remove the nut and adjuster screw from valve rocker.

D: ASSEMBLY

1) Install the adjuster screw and nut to valve rocker.
2) Arrange the valve rocker arms, springs and shaft supports in assembly order and insert valve rocker shaft.

Tightening torque (Shaft supports installing bolts):
5 N·m (0.5 kgf-m, 3.6 ft-lb)

NOTE:
Valve rocker arms, rocker shaft and shaft supports have identification marks. Ensure the parts with same markings are properly assembled.

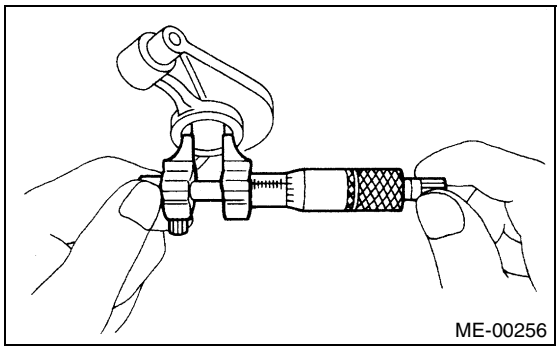
3) Install the valve rocker shaft securing bolts.

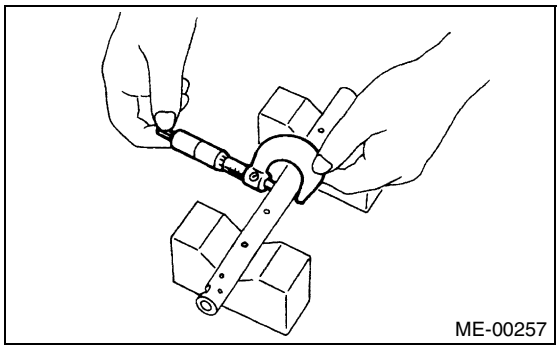
E: INSPECTION

1. VALVE ROCKER ARM AND ROCKER SHAFT

1) Measure the inside diameter of valve rocker arm and outside diameter of valve rocker shaft, and determine the difference between the two (= oil clearance).

Clearance between arm and shaft:
Standard
0.020 — 0.054 mm (0.0008 — 0.0021 in)
Limit
0.10 mm (0.0039 in)


ME-00256


ME-00257

2) If oil clearance exceeds the limit, replace the valve rocker arm or shaft, whichever shows greater amount of wear.

Rocker arm inside diameter:
22.020 — 22.041 mm (0.8669 — 0.8678 in)

Rocker shaft diameter:
21.987 — 22.000 mm (0.8656 — 0.8661 in)

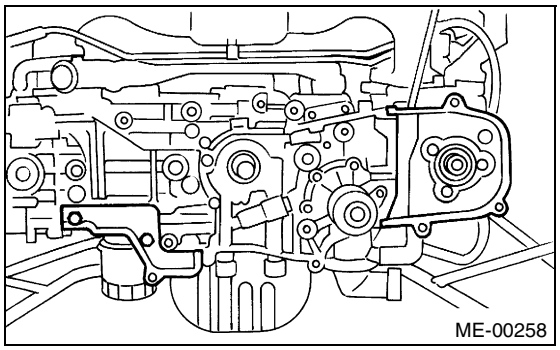
3) If cam or valve contact surface of valve rocker arm is worn or dented excessively, replace the valve rocker arm.
4) Check that the valve rocker arm roller rotates smoothly. If not, replace the valve rocker arm.

19.Camshaft

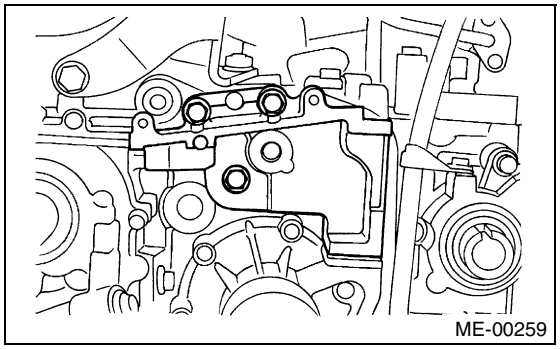
A: REMOVAL

1) Remove the V-belt. <Ref. to ME(SOHC)-41, INSTALLATION, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(SOHC)-43, REMOVAL, Crankshaft Pulley.>
3) Remove the belt cover. <Ref. to ME(SOHC)-45, REMOVAL, Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(SOHC)-46, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(SOHC)-51, REMOVAL, Camshaft Sprocket.>
6) Remove the crankshaft sprocket. <Ref. to ME(SOHC)-53, REMOVAL, Crankshaft Sprocket.>
7) Remove the belt cover No. 2 (LH).
8) Remove the belt cover No. 2 (RH).

NOTE:
Do not damage or lose the seal rubber when removing belt covers.

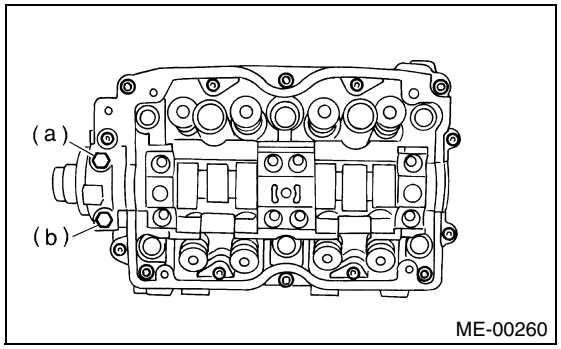

ME-00258

9) Remove the tensioner bracket.


ME-00259

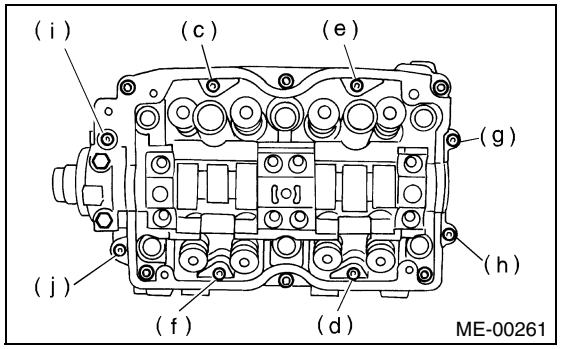
10) Remove the camshaft position sensor support. (LH side only)
11) Remove the oil level gauge guide. (LH side only)
12) Remove the valve rocker assembly. <Ref. to ME(SOHC)-54, REMOVAL, Valve Rocker Assembly.>
13) Remove the camshaft cap.

(1) Remove the bolts (a) through (b) in alphabetical sequence.



ME-00260

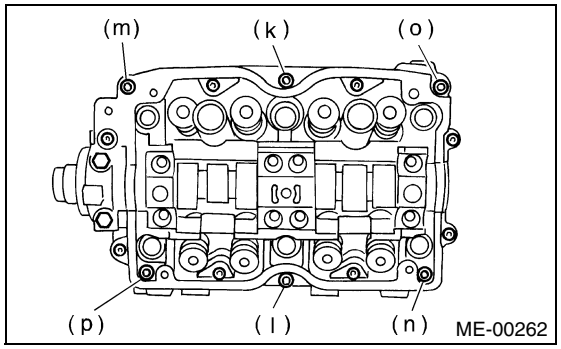
(2) Equally loosen the bolts (c) through (j) all the way in alphabetical sequence.



ME-00261

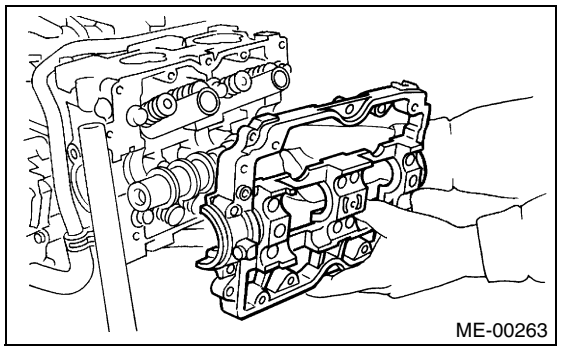
(3) Remove the bolts (k) through (p) in alphabetical sequence using ST.

ST 499497000 TORX PLUS



ME-00262

(4) Remove the camshaft cap.


ME-00263

14) Remove the camshaft.
15) Remove the oil seal.

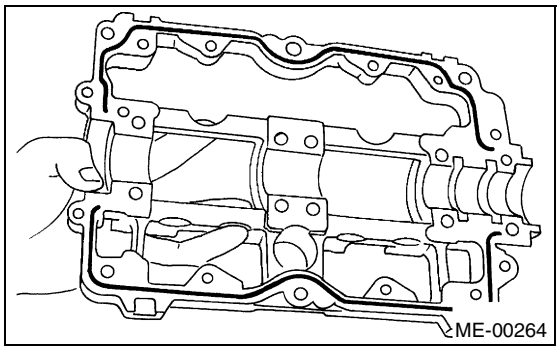
16) Remove the plug from rear side of camshaft.

CAUTION:
• Do not remove the oil seal unless necessary.
• Do not scratch the journal surface when removing oil seal.

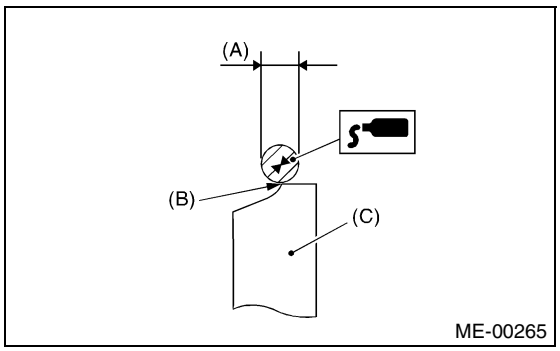
B: INSTALLATION

1) Apply a coat of engine oil to the camshaft journals, and then install the camshaft.
2) Install the camshaft cap.
(1) Apply liquid gasket on the around of camshaft cap.

Liquid gasket:
THREE BOND 1280B
P/N K0877YA018

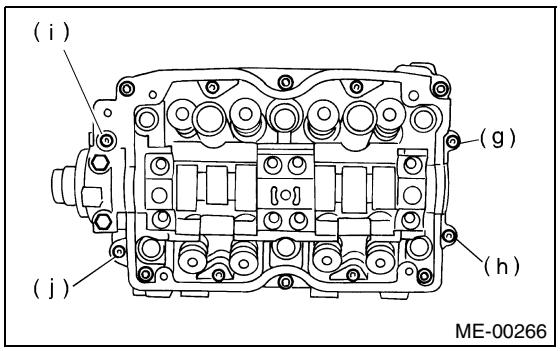

ME-00264

NOTE:
Apply a coat of 3 mm (0.12 in) dia (A). liquid gasket along edge (B) of the camshaft cap (C) mating surface.



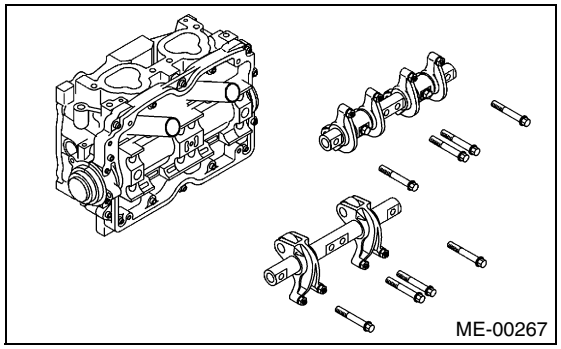
ME-00265

(2) Temporarily tighten the bolts (g) through (j) in alphabetical sequence.



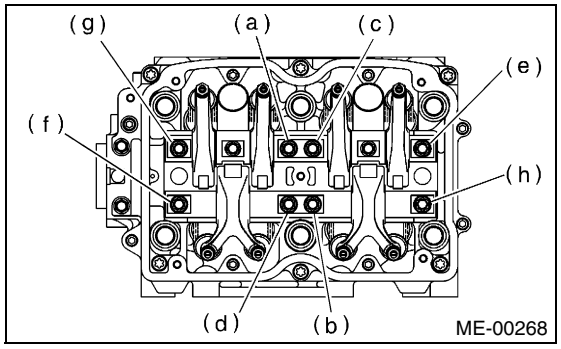
ME-00266

(3) Install the valve rocker assembly.


ME-00267

(4) Tighten the bolts (a) through (h) in alphabetical sequence.

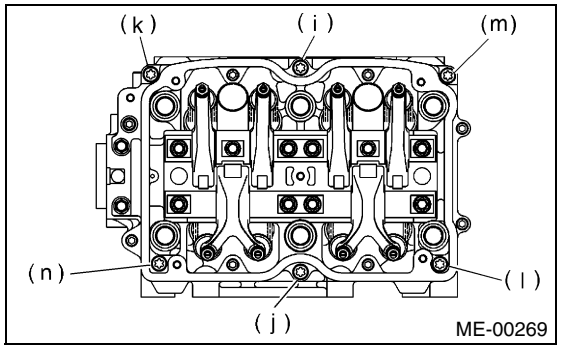
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



ME-00268

(5) Tighten the TORX bolts (i) through (n) in alphabetical sequence using ST.
ST 499497000 TORX PLUS

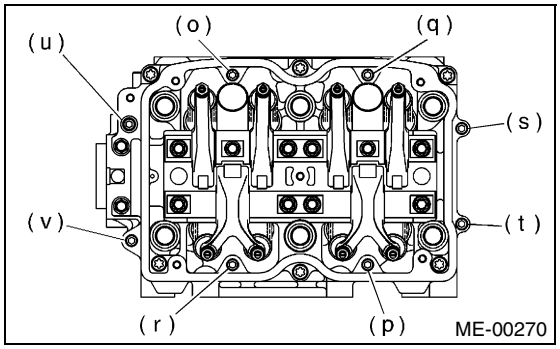
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



ME-00269

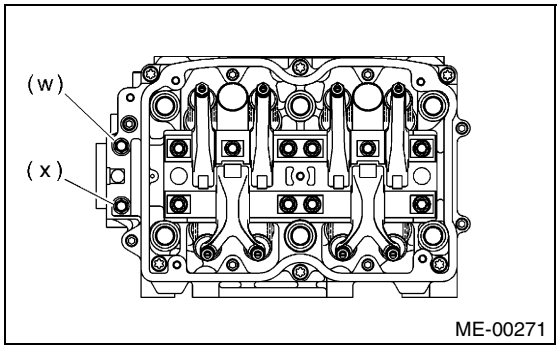
(6) Tighten the bolts (o) through (v) in alphabetical sequence.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



(7) Tighten the bolts (w) through (x) in alphabetical sequence.

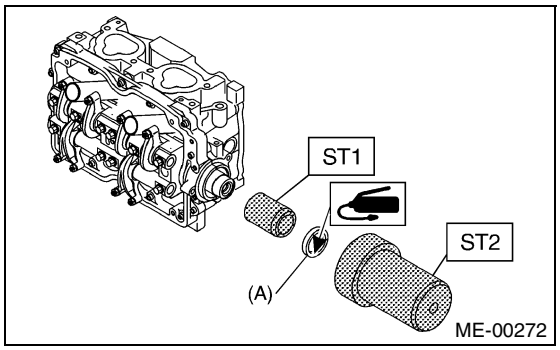
Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



3) Apply a coat of grease to oil seal lips, and then install the oil seal (A) on camshaft using ST1 and ST2.

NOTE:
Use a new oil seal.

ST1 499597000 OIL SEAL GUIDE
ST2 499587500 OIL SEAL INSTALLER



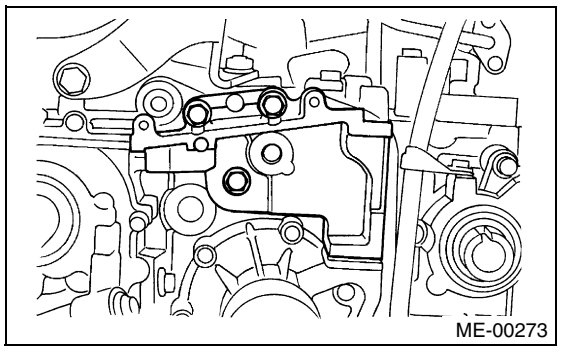
4) Install the plug using ST.

ST 499587700 CAMSHAFT OIL SEAL INSTALLER

5) Adjust the valve clearance. <Ref. to ME(SOHC)-30, ADJUSTMENT, Valve Clearance.>

6) Install the rocker cover and connect PCV hose.
7) Install the oil level gauge guide. (LH side only)
8) Install the camshaft position sensor support. (LH side only)
9) Install the tensioner bracket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

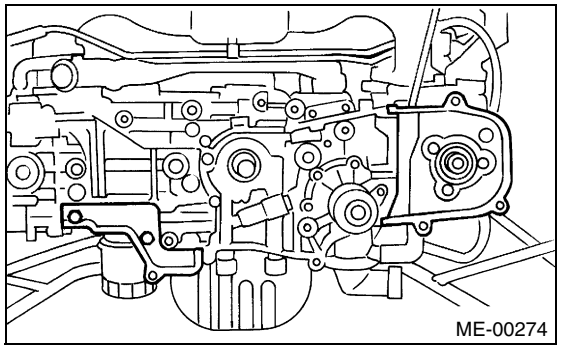


10) Install the belt cover No. 2 (RH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

11) Install the belt cover No. 2 (LH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



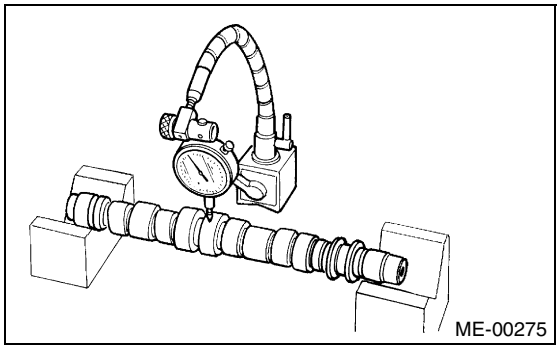
12) Install the crankshaft sprocket.
<Ref. to ME(SOHC)-53, INSTALLATION, Crankshaft Sprocket.>
13) Install the camshaft sprocket. <Ref. to ME(SOHC)-51, INSTALLATION, Camshaft Sprocket.>
14) Install the timing belt assembly. <Ref. to ME(SOHC)-47, INSTALLATION, Timing Belt Assembly.>
15) Install the belt cover. <Ref. to ME(SOHC)-45, INSTALLATION, Belt Cover.>
16) Install the crankshaft pulley. <Ref. to ME(SOHC)-43, INSTALLATION, Crankshaft Pulley.>
17) Install the V-belt. <Ref. to ME(SOHC)-41, INSTALLATION, V-belt.>

C: INSPECTION

1. CAMSHAFT

1) Measure the bend, and repair or replace if necessary.

Limit:
0.025 mm (0.0010 in)



2) Check the journal for damage and wear. Replace if faulty.
3) Measure the outside diameter of camshaft journal and inside diameter of cylinder head journal, and determine the difference between two (= oil clearance). If the oil clearance exceeds specifications, replace the camshaft or cylinder head as necessary.

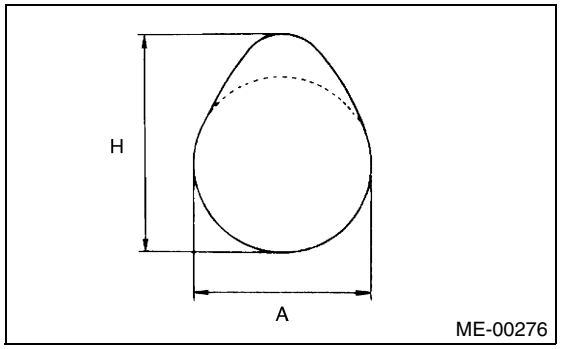
		Unit: mm (in)
Clearance at journal	Standard	0.055 — 0.090 (0.0022 — 0.0035)
	Limit	0.10 (0.0039)
Camshaft journal O.D.		31.928 — 31.945 (1.2570 — 1.2577)
Journal hole I.D.		32.000 — 32.018 (1.2598 — 1.2605)

4) Check the cam face condition; remove the minor faults by grinding with oil stone. Measure the cam height H; replace if the limit has been exceeded.

Cam height: H

Model	Item	Unit: mm (in)	
2000 cc	Intake	STD	38.732 — 38.832 (1.5249 — 1.528885)
		Limit	38.632 (1.5209)
	Exhaust	STD	39.257 — 39.357 (1.5455 — 1.5495)
		Limit	39.157 (1.5416)
2500 cc	Intake	STD	39.485 — 39.585 (1.5545 — 1.5585)
		Limit	39.385 (1.5506)
	Exhaust	STD	39.257 — 39.357 (1.5455 — 1.5495)
		Limit	39.157 (1.5416)

Cam base circle diameter A:
IN: 34.00 mm (1.3386 in)
EX: 34.00 mm (1.3386 in)

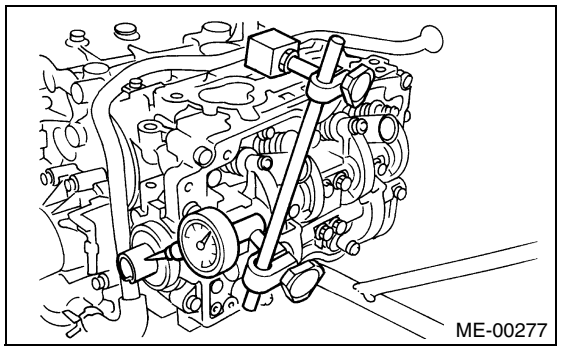


2. CAMSHAFT SUPPORT

Measure the thrust clearance of camshaft with dial gauge. If the clearance exceeds the limit, replace the camshaft support.

Standard:
0.030 — 0.090 mm (0.0012 — 0.0035 in)

Limit:
0.10 mm (0.0039 in)

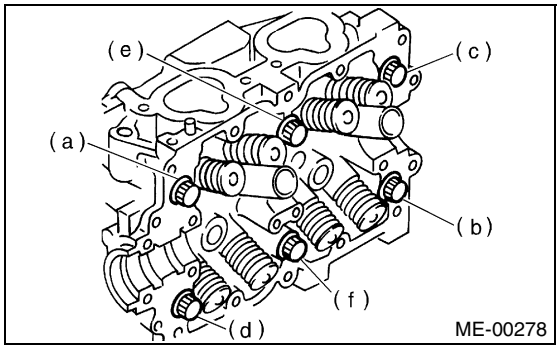


20.Cylinder Head Assembly

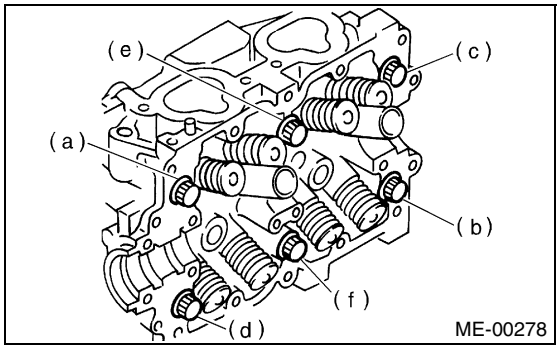
A: REMOVAL

1) Remove the V-belt. <Ref. to ME(SOHC)-41, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(SOHC)-43, REMOVAL, Crankshaft Pulley.>
3) Remove the belt cover. <Ref. to ME(SOHC)-45, REMOVAL, Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(SOHC)-46, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(SOHC)-51, REMOVAL, Camshaft Sprocket.>
6) Remove the intake manifold. <Ref. to FU(SOHC)-14, REMOVAL, Intake Manifold.>
7) Remove the bolt which installs A/C compressor bracket on cylinder head.
8) Remove the valve rocker assembly. <Ref. to ME(SOHC)-54, REMOVAL, Valve Rocker Assembly.>
9) Remove the camshaft. <Ref. to ME(SOHC)-56, REMOVAL, Camshaft.>
10) Remove the cylinder head bolts in alphabetical sequence shown in the figure.

NOTE:
Leave the bolts (a) and (c) engaged by three or four threads to prevent cylinder head from falling.



11) While tapping the cylinder head with a plastic hammer, separate it from cylinder block.
12) Remove the bolts (a) and (c) to remove cylinder head.



13) Remove the cylinder head gasket.

CAUTION:
Do not scratch the mating surface of cylinder head and cylinder block.

14) Similarly, remove the right side cylinder head.

B: INSTALLATION

1) Install the cylinder head and gaskets on cylinder block.

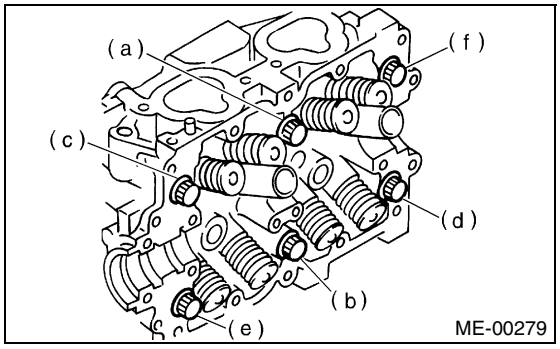
CAUTION:
- **Use new cylinder head gaskets.**
- **Be careful not to scratch the mating surface of cylinder block and cylinder head.**

2) Tighten the cylinder head bolts.
   (1) Apply a coat of engine oil to the washers and bolt threads.
   (2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence.
   Then tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence.
   (3) Back off all bolts by 180° first; back them off by 180° again in reverse order of installation.
   (4) Tighten the bolts (a) and (b) to 34 N·m (3.5 kgf-m, 25 ft-lb) in reverse order of installation.
   (5) Tighten the bolts (c), (d), (e) and (f) to 15 N·m (1.5 kgf-m, 11 ft-lb).
   (6) Tighten all bolts by 80 to 90° in alphabetical sequence.

CAUTION:
Do not tighten bolts more than 90°.

(7) Further tighten all bolts by 80 to 90° in alphabetical sequence shown in figure below.

CAUTION:
Ensure that the total "re-tightening angle" [in the former two steps], do not exceed 180°.

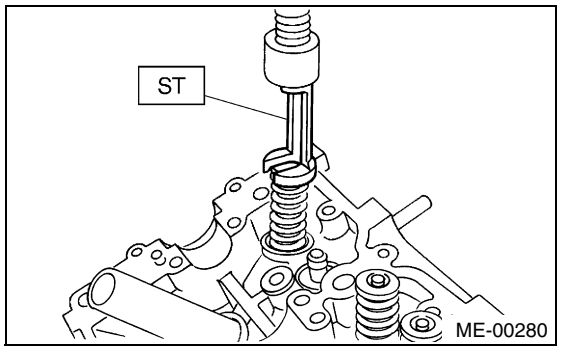


3) Install the camshaft. <Ref. to ME(SOHC)-57, INSTALLATION, Camshaft.>
4) Install the valve rocker assembly. <Ref. to ME(SOHC)-54, INSTALLATION, Valve Rocker Assembly.>
5) Install the A/C compressor bracket on cylinder head.
6) Install the intake manifold. <Ref. to FU(SOHC)-16, INSTALLATION, Intake Manifold.>
7) Install the camshaft sprocket. <Ref. to ME(SOHC)-51, INSTALLATION, Camshaft Sprocket.>
8) Install the timing belt assembly. <Ref. to ME(SOHC)-47, INSTALLATION, Timing Belt Assembly.>
9) Install the belt cover. <Ref. to ME(SOHC)-45, INSTALLATION, Belt Cover.>
10) Install the crankshaft pulley. <Ref. to ME(SOHC)-43, INSTALLATION, Crankshaft Pulley.>
11) Install the V-belt. <Ref. to ME(SOHC)-41, INSTALLATION, V-belt.>

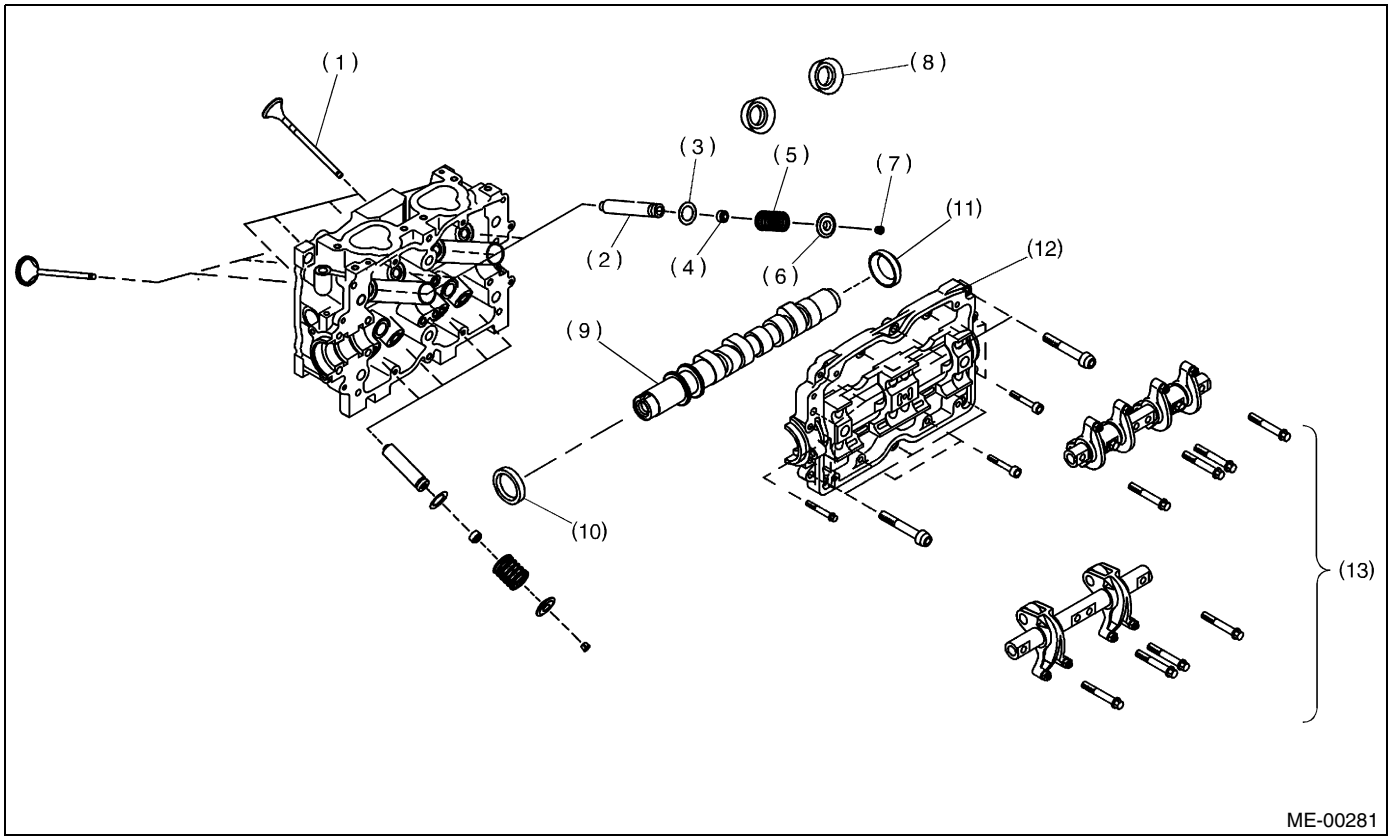
C: DISASSEMBLY

1) Place the cylinder head on ST.
ST 498267800 CYLINDER HEAD TABLE
2) Set the ST on valve spring. Compress the valve spring, and then remove the valve spring retainer key. Remove each valve and valve spring.
ST 499718000 VALVE SPRING REMOVER

CAUTION:
- **Mark each valve to prevent confusion.**
- **Use extreme care not to damage the lips of intake valve oil seals and exhaust valve oil seals.**



D: ASSEMBLY



(1)	Valve	(6)	Retainer	(11)	Plug
(2)	Valve guide	(7)	Retainer key	(12)	Camshaft cap
(3)	Valve spring seat	(8)	Spark plug gasket	(13)	Valve rocker ASSY
(4)	Oil seal	(9)	Camshaft		
(5)	Valve spring	(10)	Oil seal		

1) Installation of valve spring and valve

(1) Place the cylinder head on ST.

ST 498267800 CYLINDER HEAD TABLE

(2) Coat the stem of each valve with engine oil and insert valve into valve guide.

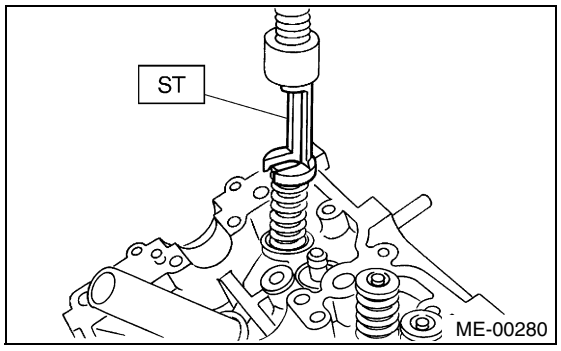
NOTE:
When inserting the valve into valve guide, use special care not to damage the oil seal lip.

(3) Install the valve spring and retainer.

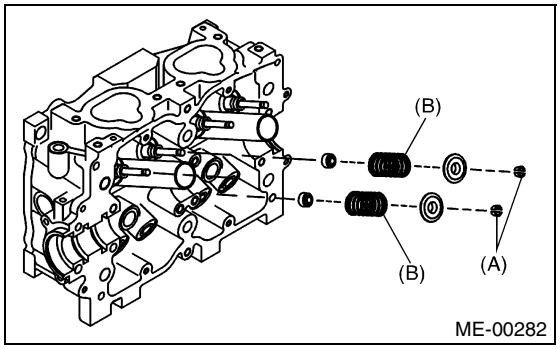
NOTE:
Be sure to install the valve springs with their close-coiled end facing the seat on the cylinder head.

(4) Set the ST on valve spring.

ST 499718000 VALVE SPRING REMOVER



(5) Compress the valve spring, and then fit the valve spring retainer key.



(A) Retainer
(B) Painted face

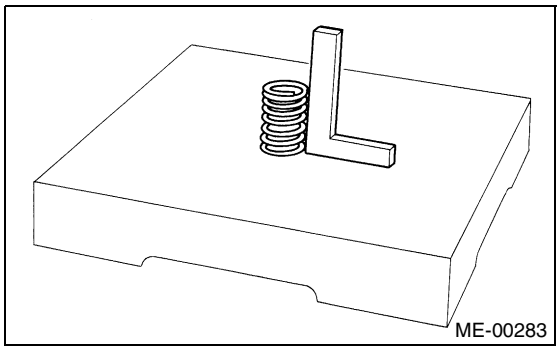
(6) After installing, tap the valve spring retainers lightly with plastic hammer for better seating.

E: INSPECTION

1. VALVE SPRING

1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not to the specifications presented below.
2) To measure the squareness of valve spring, stand the spring on a surface plate and measure its deflection at the top using a try square.

Free length	54.30 mm (2.1378 in)
Squareness	2.5°, 2.4 mm (0.094 in)
Tension/spring height	215 — 246 N (21.9 — 25.1 kgf, 48.2 — 55.3 lb)/ 45.0 mm (1.772 in)
	527 — 582 N (53.7 — 59.3 kgf, 118.1 — 130.8 lb)/ 34.7 mm (1.366 in)



2. INTAKE AND EXHAUST VALVE OIL SEAL

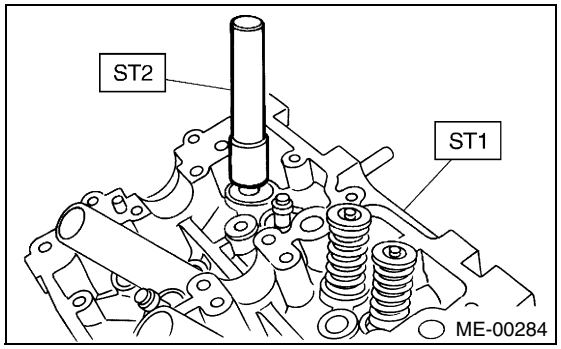
Replace the oil seal with new one, if lip is damaged or spring out of place, or when the surfaces of intake valve and valve seat are reconditioned or intake valve guide is replaced. Use pliers to pinch and remove oil seal from valve.
1) Place the cylinder head on ST1.
2) Press-fit oil seal to the specified dimension indicated in the figure using ST2.

CAUTION:
• Apply engine oil to oil seal before press-fitting.
• When press-fitting oil seal, do not use hammer or strike in.
• Differentiate between intake valve oil seal and exhaust valve oil seal by noting their difference in color.

ST1 498267800 CYLINDER HEAD TABLE
ST2 498857100 VALVE OIL SEAL GUIDE

Color of rubber part:
Intake [Black]
Exhaust [Brown]

Color of spring part:
Intake [Silver]
Exhaust [Silver]



F: ADJUSTMENT

1. CYLINDER HEAD

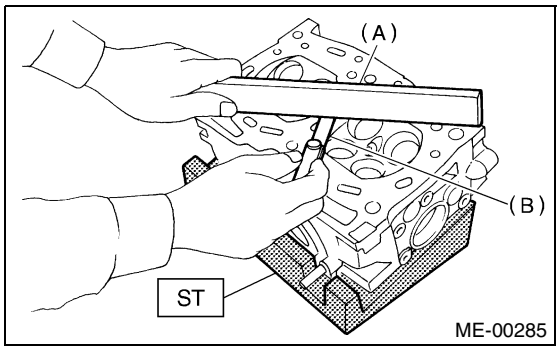
1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect important areas by means of red lead check.
Also make sure that gasket installing surface shows no trace of gas and water leaks.
2) Place the cylinder head on ST.
ST 498267800 CYLINDER HEAD TABLE
3) Measure the warping of the cylinder head surface that mates with crankcase using a straight edge and thickness gauge.
If the warping exceeds 0.05 mm (0.0020 in), regrind the surface with a surface grinder.

Warping limit:
0.05 mm (0.0020 in)

Grinding limit:
0.1 mm (0.004 in)

Standard height of cylinder head:
97.5 mm (3.839 in)

NOTE:
Uneven torque for the cylinder head bolts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.

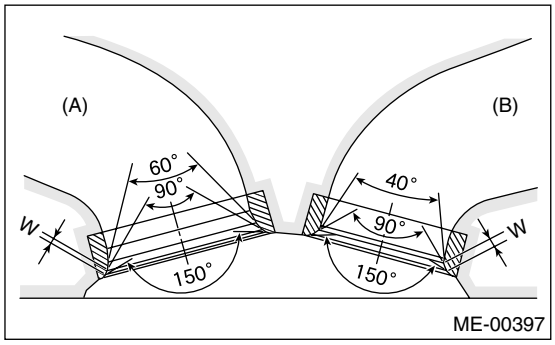


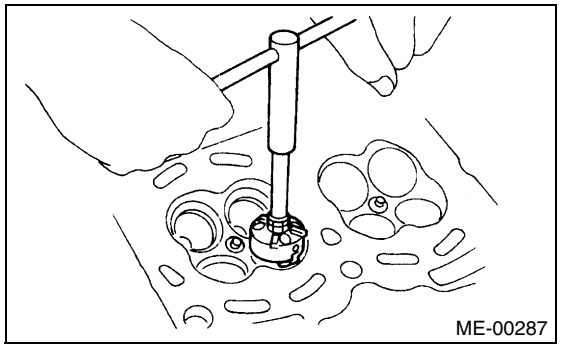
(A) Straight edge
(B) Thickness gauge

2. VALVE SEAT

Inspect the intake and exhaust valve seats, and then correct the contact surfaces with valve seat cutter if they are defective or when valve guides are replaced.

Valve seat width: W
Intake (A)
Standard 1.1 mm (0.043 in)
Limit 1.8 mm (0.071 in)
Exhaust (B)
Standard 1.5 mm (0.059 in)
Limit 2.2 mm (0.087 in)

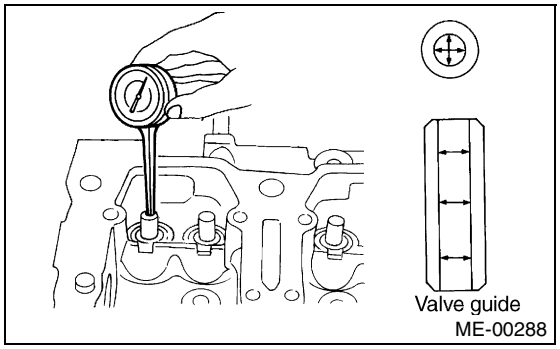


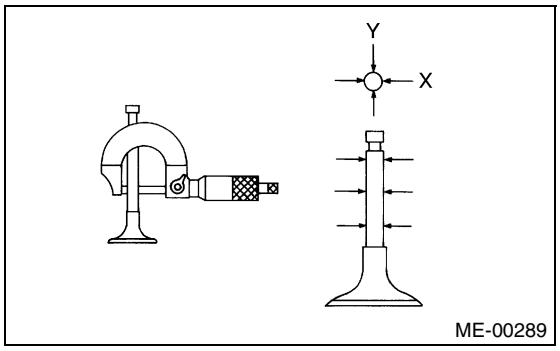


3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outside diameter of valve stem and the inside diameter of valve guide with outside and inside micrometers respectively.

Clearance between the valve guide and valve stem:
Standard
Intake 0.035 — 0.062 mm (0.0014 — 0.0024 in)
Exhaust 0.040 — 0.067 mm (0.0016 — 0.0026 in)
Limit
0.15 mm (0.0059 in)





2) If the clearance between valve guide and stem exceeds the limit, replace the valve guide or valve itself whichever shows greater amount of wear. See the following procedure for valve guide replacement.

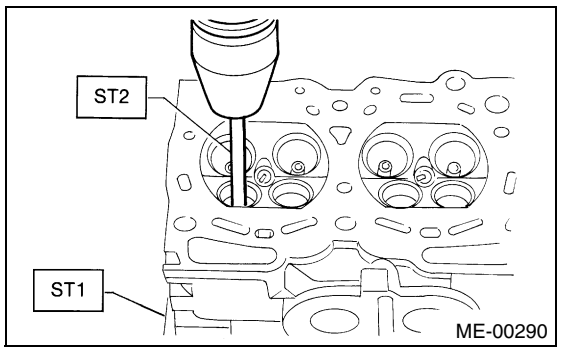
Valve guide inner diameter:
6.000 — 6.012 mm (0.2362 — 0.2367 in)

Valve stem outer diameters:
Intake
5.950 — 5.965 mm (0.2343 — 0.2348 in)
Exhaust
5.945 — 5.960 mm (0.2341 — 0.2346 in)

(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.

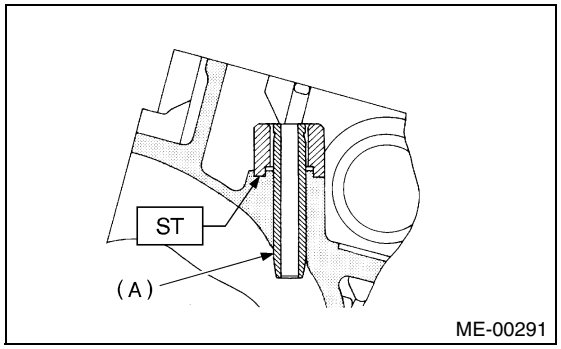
(2) Insert the ST2 into valve guide and press it down to remove valve guide.

ST1 498267800 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



(3) Turn the cylinder head upside down and place ST as shown in the figure.

Intake side:
ST 499767700 VALVE GUIDE ADJUSTER
Exhaust side:
ST 499767800 VALVE GUIDE ADJUSTER

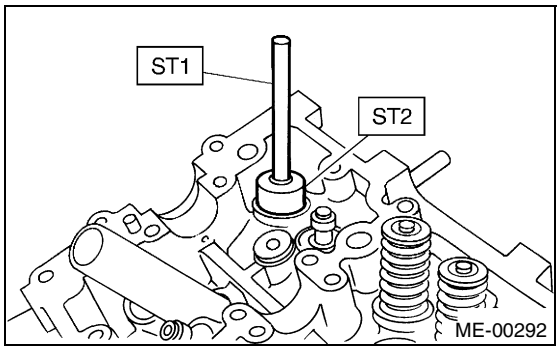


(A) Valve guide

(4) Before installing new oversize valve guide, make sure that neither scratches nor damages exist on the inside surface of valve guide holes in cylinder head.

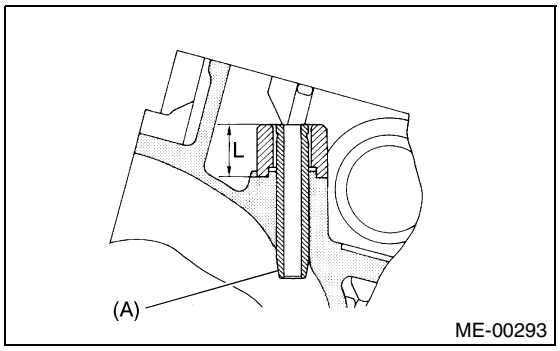
(5) Put new valve guide, coated with sufficient oil, in the cylinder, and then insert the ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499767200 VALVE GUIDE REMOVER
Intake side:
ST2 499767700 VALVE GUIDE ADJUSTER
Exhaust side:
ST2 499767800 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion: L
Intake
20.0 — 20.5 mm (0.787 — 0.807 in)
Exhaust
16.5 — 17.0 mm (0.650 — 0.669 in)

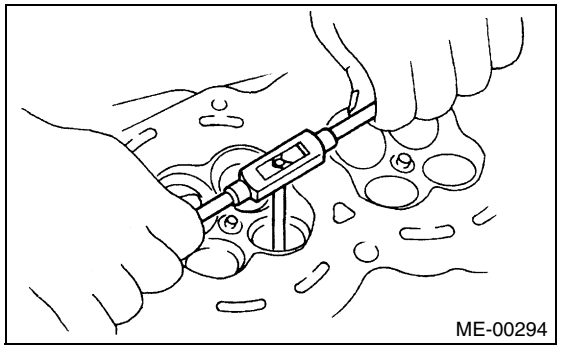


(A) Valve guide

(7) Ream the inside of valve guide with ST. Gently rotate the reamer clockwise while pressing it lightly into valve guide, and return it also rotating clockwise. After reaming, clean the valve guide to remove chips.

CAUTION:
• Apply engine oil to the reamer when reaming.
• If the inner surface of the valve guide is torn, the edge of the reamer should be slightly ground with an oil stone.
• If the inner surface of the valve guide becomes lustrous and the reamer does not chips, use a new reamer or remedy the reamer.

ST 499767400 VALVE GUIDE REAMER



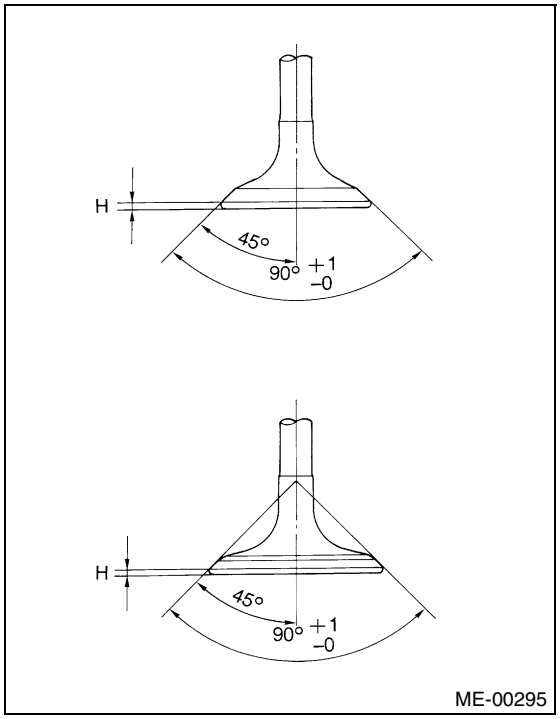
(8) Recheck the contact condition between valve and valve seat after replacing valve guide.

4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if “H” is less than the specified limit.

H:
Intake
Standard 1.0 mm (0.039 in)
Limit 0.6 mm (0.024 in)
Exhaust
Standard 1.2 mm (0.047 in)
Limit 0.6 mm (0.024 in)

Valve overall length:
Intake
120.6 mm (4.75 in)
Exhaust
121.7 mm (4.79 in)



2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. <Ref. to ME(SOHC)-64, VALVE SEAT, ADJUSTMENT, Cylinder Head Assembly.> Install a new intake valve oil seal after lapping.

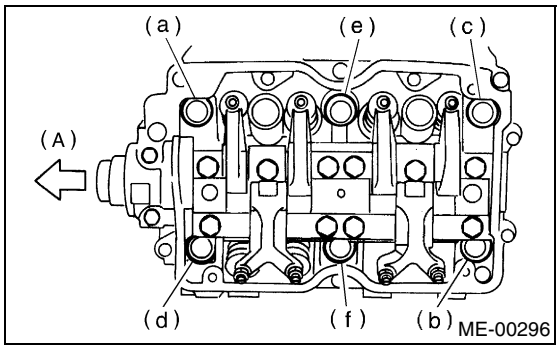
21.Cylinder Block

A: REMOVAL

NOTE:
Before conducting this procedure, drain the engine oil completely if applicable.

1) Remove the intake manifold. <Ref. to FU(SOHC)-14, REMOVAL, Intake Manifold.>
2) Remove the V-belt. <Ref. to ME(SOHC)-41, REMOVAL, V-belt.>
3) Remove the crankshaft pulley. <Ref. to ME(SOHC)-43, REMOVAL, Crankshaft Pulley.>
4) Remove the belt cover. <Ref. to ME(SOHC)-45, REMOVAL, Belt Cover.>
5) Remove the timing belt assembly. <Ref. to ME(SOHC)-46, REMOVAL, Timing Belt Assembly.>
6) Remove the camshaft sprocket. <Ref. to ME(SOHC)-51, REMOVAL, Camshaft Sprocket.>
7) Remove the crankshaft sprocket. <Ref. to ME(SOHC)-43, REMOVAL, Crankshaft Pulley.>
8) Remove the generator and A/C compressor with their brackets.
9) Remove the rocker cover.
10) Remove the cylinder head bolts in alphabetical sequence shown in the figure.

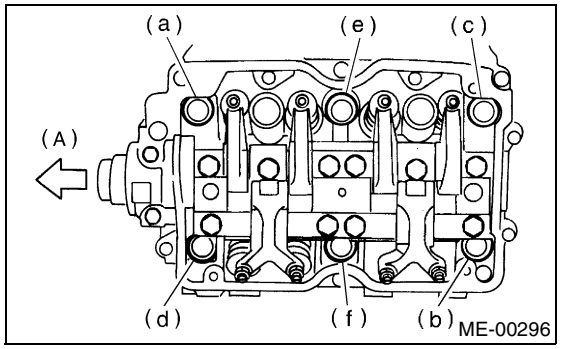
NOTE:
Leave bolts (a) and (c) engaged by three or four threads to prevent cylinder head from falling.



(A) Front

11) While tapping the cylinder head with a plastic hammer, separate it from cylinder block.

12) Remove the bolts (a) and (c) to remove cylinder head.



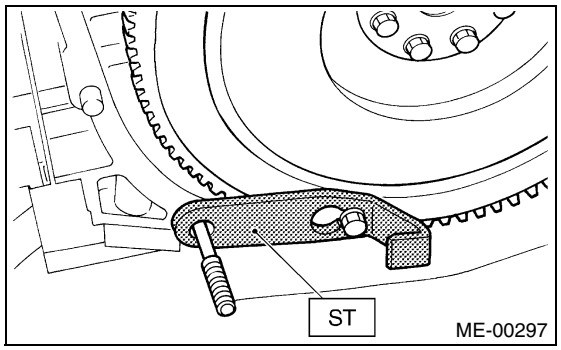
(A) Front

13) Remove the cylinder head gasket.

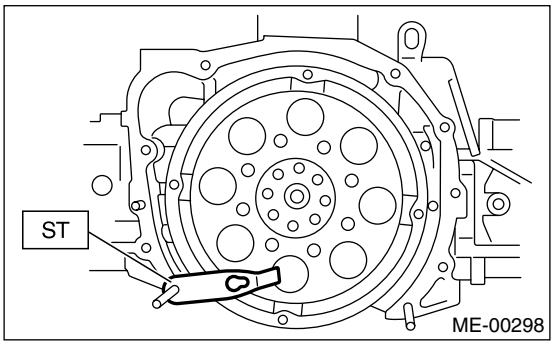
NOTE:
Do not scratch the mating surface of cylinder head and cylinder block.

14) Similarly, remove the right side cylinder head.
15) Remove the clutch housing cover. (MT vehicles)
16) Remove the flywheel (MT vehicles) or drive plate (AT vehicles).
Using the ST, lock the crankshaft.
ST 498497100 CRANKSHAFT STOPPER

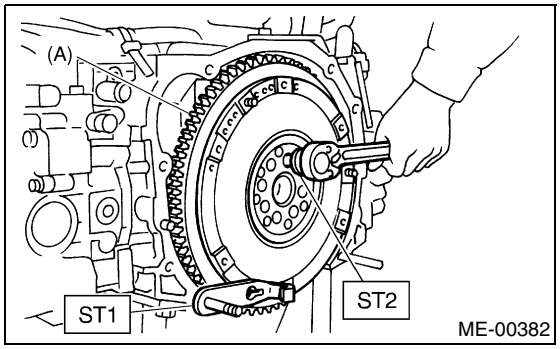
- MT VEHICLES



- AT VEHICLES

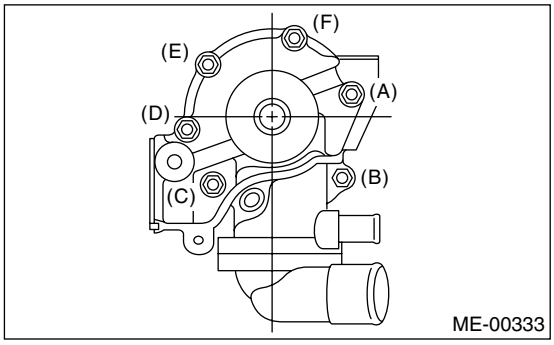


NOTE:
Using STs, remove the flywheel. (2500 cc MT model)
ST1 498497100 CRANKSHAFT STOPPER
ST2 499057000 TORX PLUS



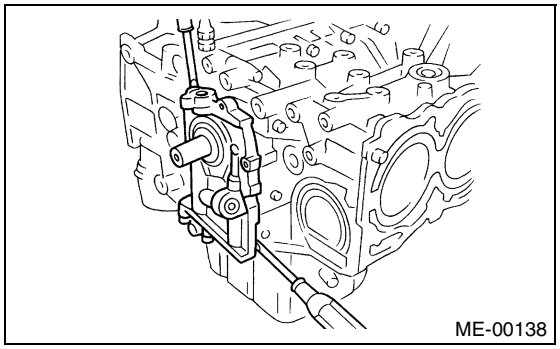
(A) Flywheel

17) Remove the oil separator cover.
18) Remove the water by-pass pipe for heater.
19) Loosen the bolts in alphabetical sequence as shown in the figure, and then remove water pump.



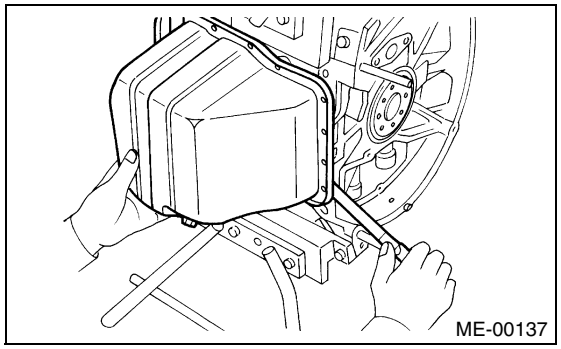
20) Remove the oil pump from cylinder block.
Use a flat-bladed screwdriver as shown in the figure when removing oil pump.

NOTE:
Be careful not to scratch the mating surface of cylinder block and oil pump.

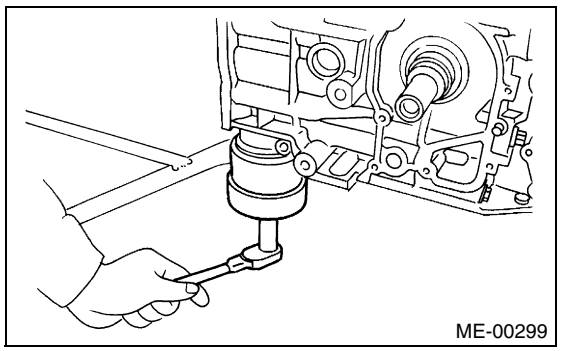


21) Removal of oil pan
(1) Turn the cylinder block to face the #2 and #4 piston sides upward.
(2) Remove the bolts which secure oil pan to cylinder block.
(3) Insert a oil pan cutter blade between cylinder block-to-oil pan clearance, and then remove the oil pan.

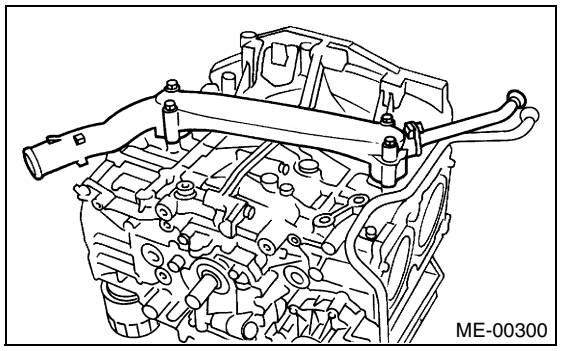
NOTE:
Do not use a screwdriver or similar tool in place of oil pan cutter.

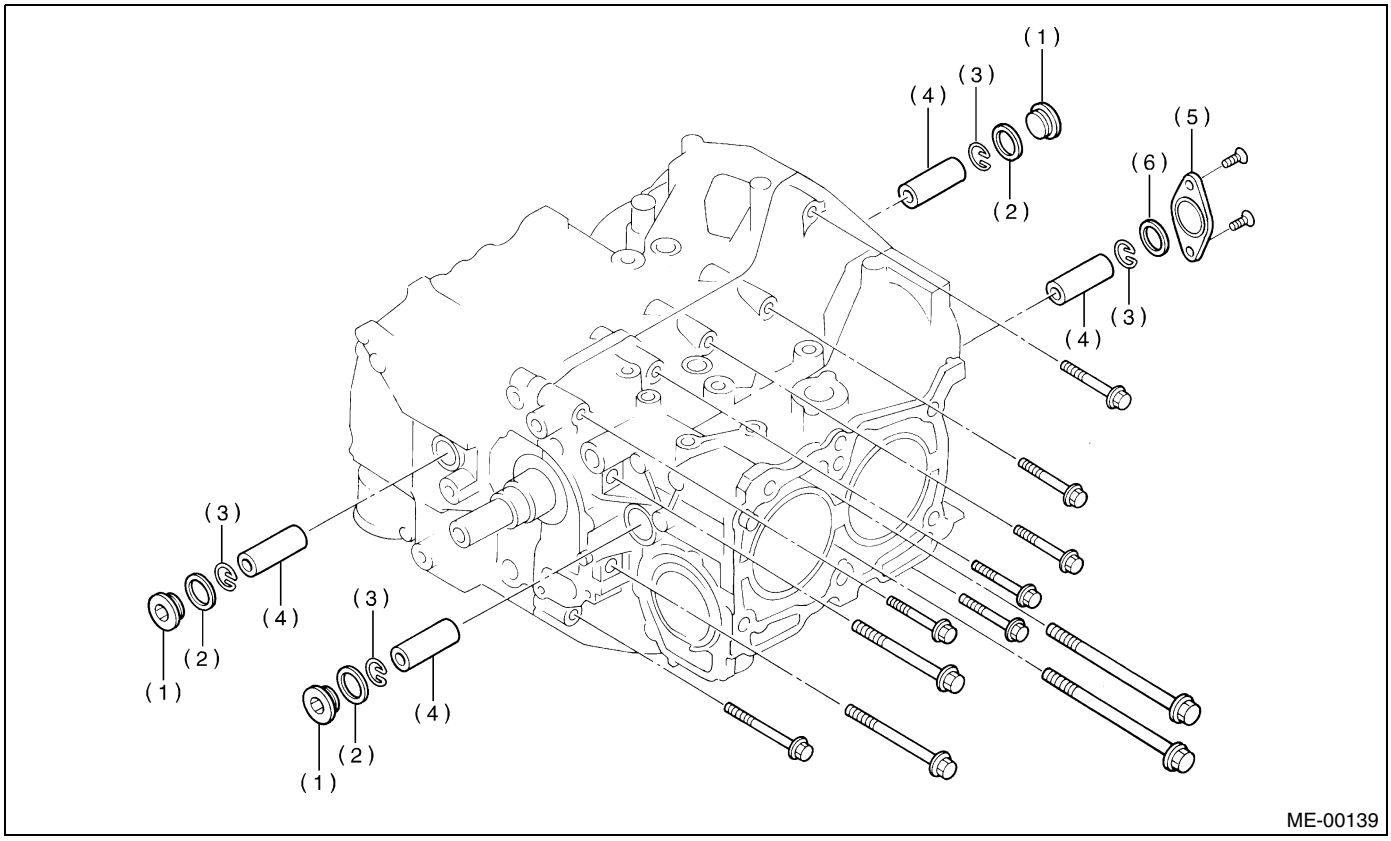


22) Remove the oil strainer stay.
23) Remove the oil strainer.
24) Remove the baffle plate.
25) Remove the oil filter using ST.
ST 498547000 OIL FILTER WRENCH



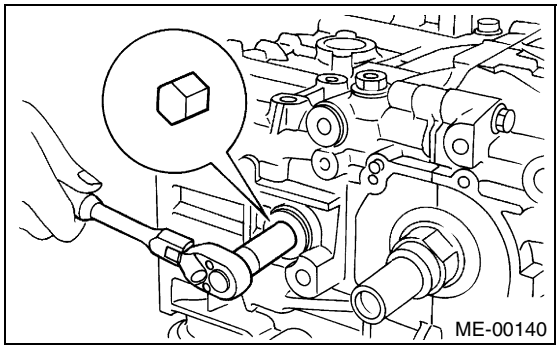
26) Remove the water pipe.





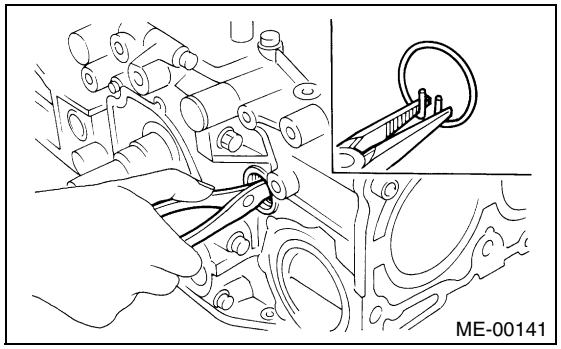
(1) Service hole plug
(2) Gasket
(3) Circlip
(4) Piston pin
(5) Service hole cover
(6) O-ring

27) Remove the service hole cover and service hole plugs using hexagon wrench [14 mm (0.55 in)].



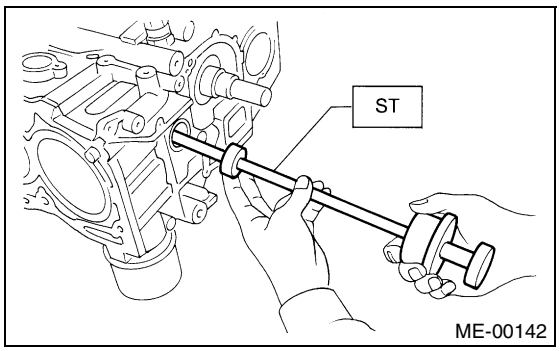
28) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, and then remove the piston circlip through service hole of #1 and #2 cylinders.

ST 499897200 PISTON SNAP RING PLIER



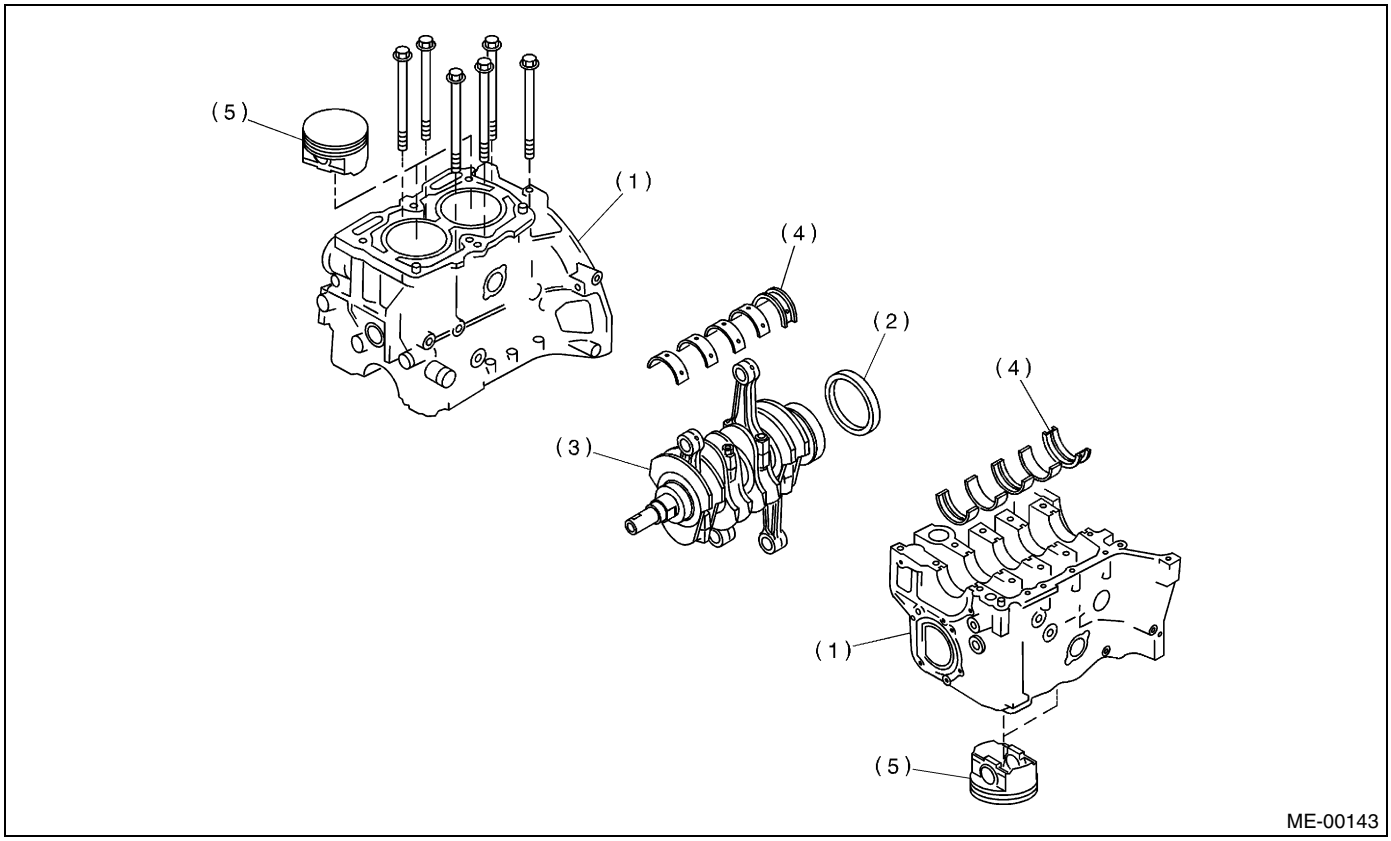
29) Draw out the piston pin from #1 and #2 pistons using ST.
ST 499097700 PISTON PIN REMOVER

NOTE:
Be careful not to confuse the original combination of piston, piston pin and cylinder.



30) Similarly remove the piston pins from #3 and #4 pistons.
31) Remove the bolts which connect cylinder block on the side of #2 and #4 cylinders.
32) Back off the bolts which connect cylinder block on the side of #1 and #3 cylinders two or three turns.
33) Set up the cylinder block so that #1 and #3 cylinders are on the upper side, and then remove the cylinder block connecting bolts.
34) Separate the cylinder blocks (RH) and (LH).

NOTE:
When separating the cylinder block, do not allow the connecting rod to fall and damage the cylinder block.



(1) Cylinder block
(2) Rear oil seal
(3) Crankshaft
(4) Crankshaft bearing
(5) Piston

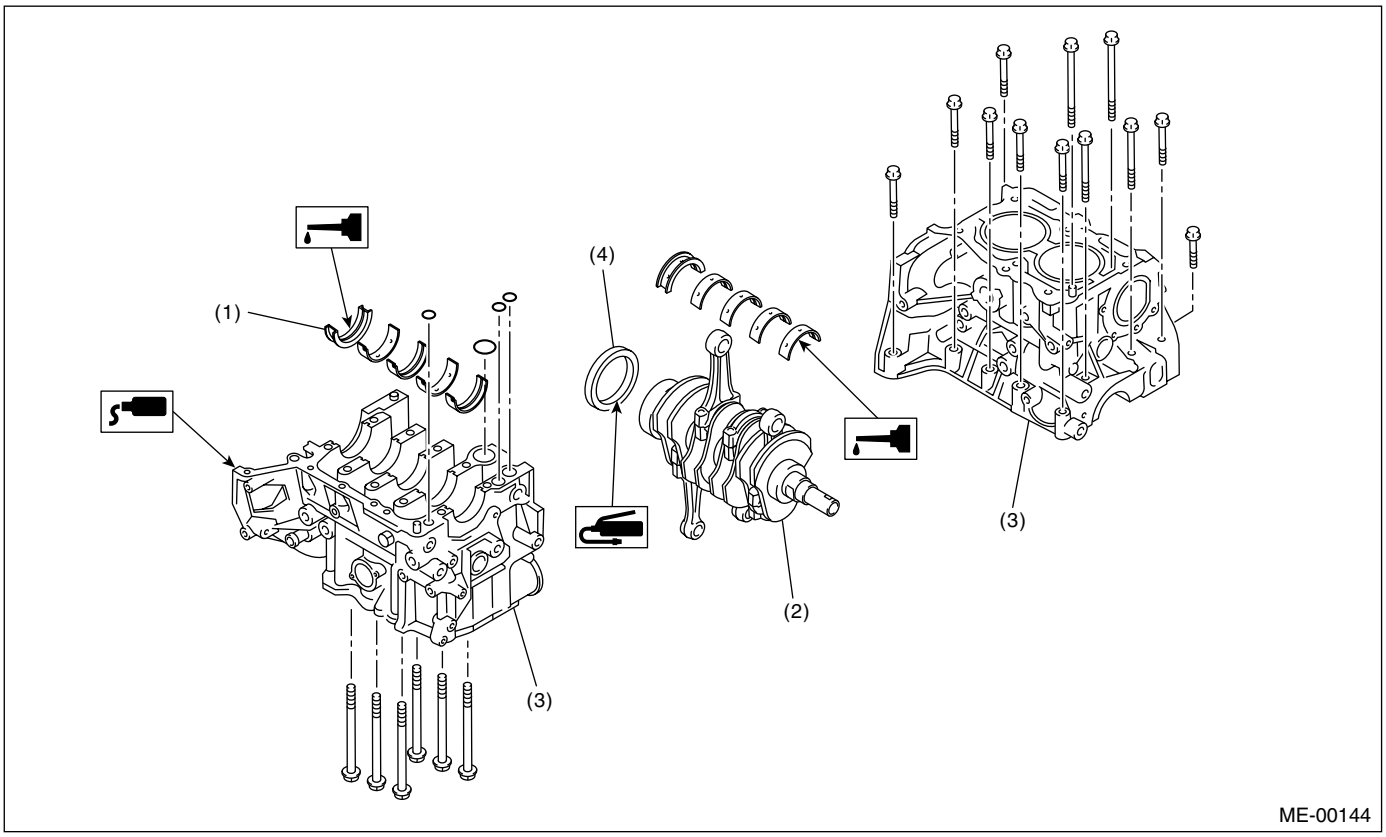
35) Remove the rear oil seal.
36) Remove the crankshaft together with connecting rod.
37) Remove the crankshaft bearings from cylinder block using hammer handle.

NOTE:
Do not confuse the combination of crankshaft bearings. Press bearing at the end opposite to locking lip.

38) Draw out each piston from cylinder block using wooden bar or hammer handle.

NOTE:
Do not confuse the combination of piston and cylinder.

B: INSTALLATION



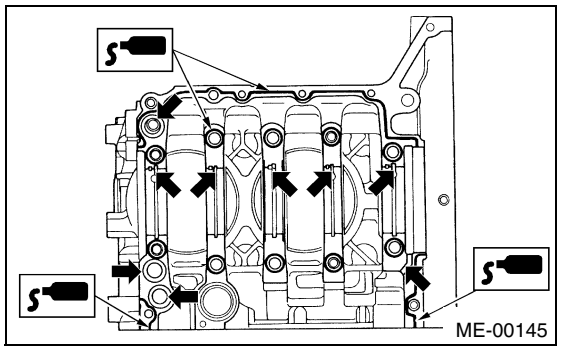
(1) Crankshaft bearing
(2) Crankshaft
(3) Cylinder block
(4) Rear oil seal

NOTE:
Remove oil in the mating surface of bearing and cylinder block before installation. Also apply a coat of engine oil to crankshaft pins.

1) Position the crankshaft on #2 and #4 cylinder block.
2) Apply fluid packing to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

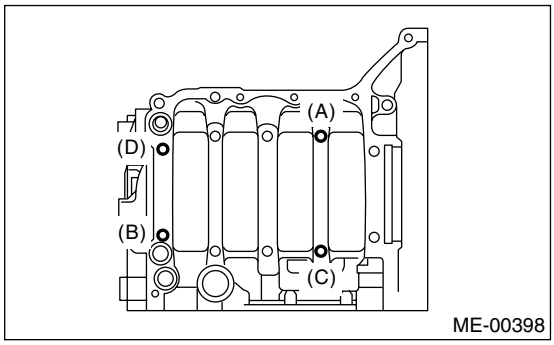
Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent

NOTE:
Do not allow fluid packing to jut into O-ring grooves, oil passages, bearing grooves, etc.



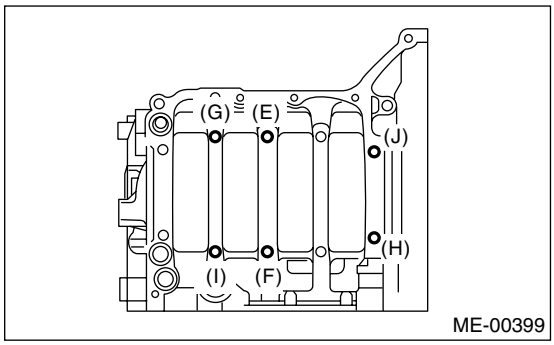
3) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (LH side)

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

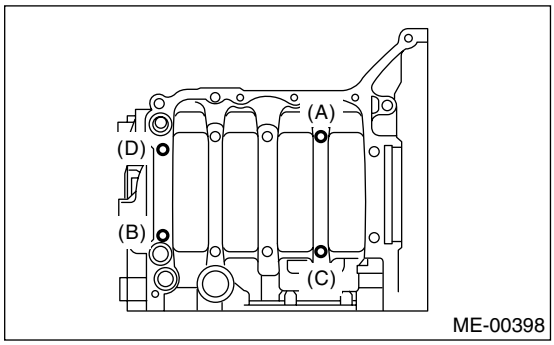


4) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (RH side)

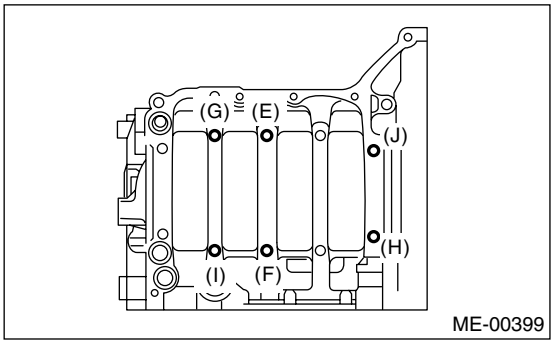
Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)



5) Further tighten the LH side bolts (A — D) to 90° in alphabetical sequence.

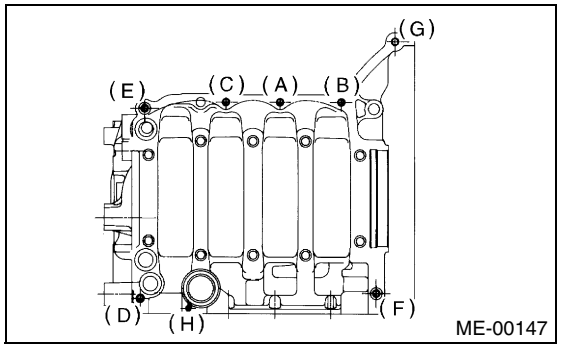


6) Further tighten the RH side bolts (E — J) to 90° in alphabetical sequence.

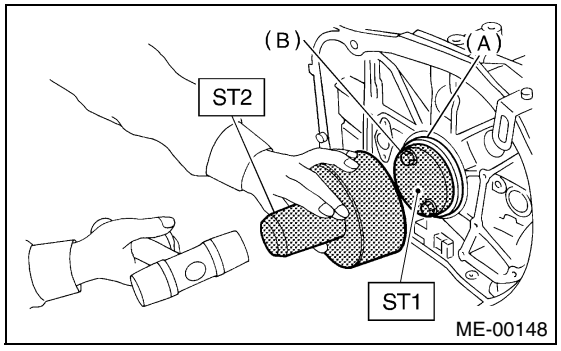


7) Tighten the 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.

Tightening torque:
(A) — (G): 25 N·m (2.5 kgf-m, 18.1 ft-lb)
(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



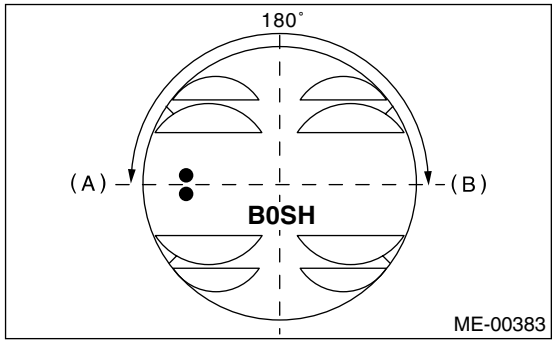
8) Install the rear oil seal using ST1 and ST2.
ST1 499597100 OIL SEAL GUIDE
ST2 499587200 OIL SEAL INSTALLER



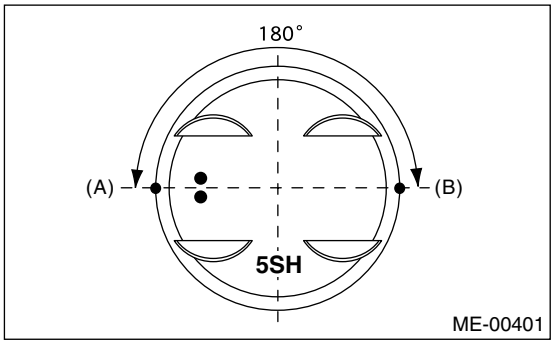
(A) Rear oil seal
(B) Fly wheel attaching bolt

9) Position the top ring gap at (A) or (B) in the figure.

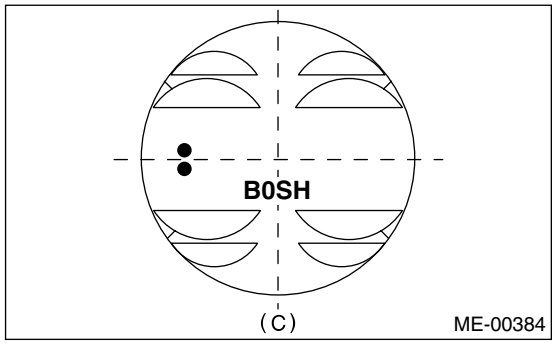
10) Position the second ring gap at 180° on the reverse side for top ring gap.
• 2000 cc MODEL



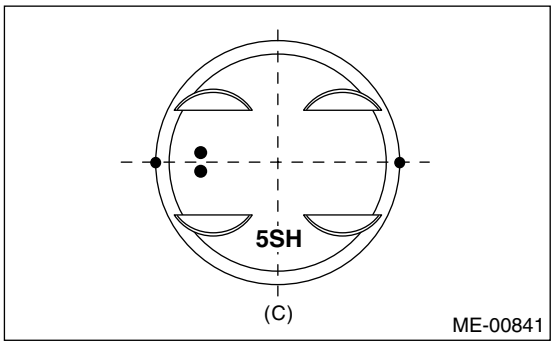
• 2500 cc MODEL



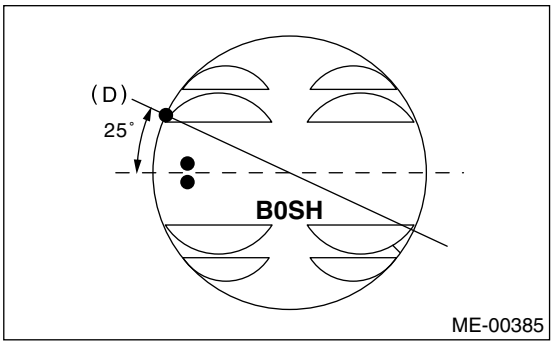
11) Position the expander gap at (C) in the figure.
• 2000 cc MODEL



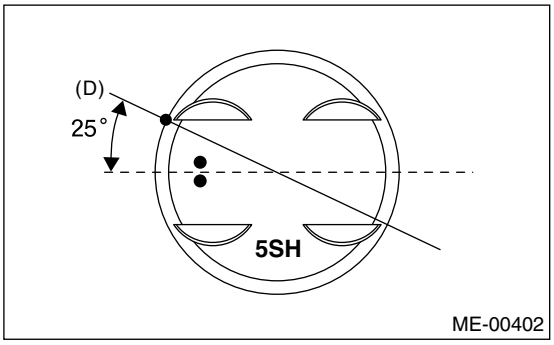
• 2500 cc MODEL



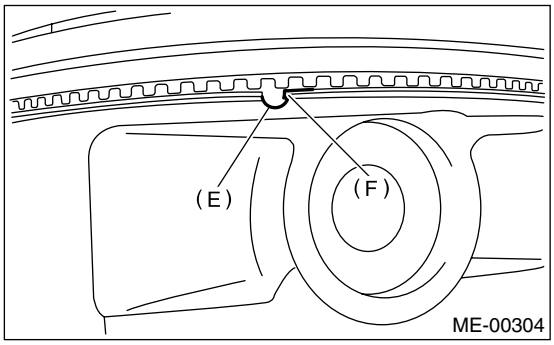
12) Position the lower rail gap at (D) in the figure.
• 2000 cc MODEL



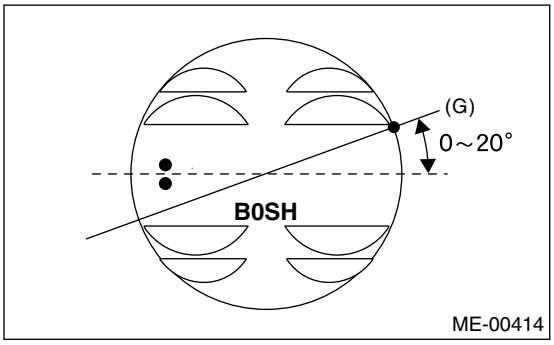
• 2500 cc MODEL



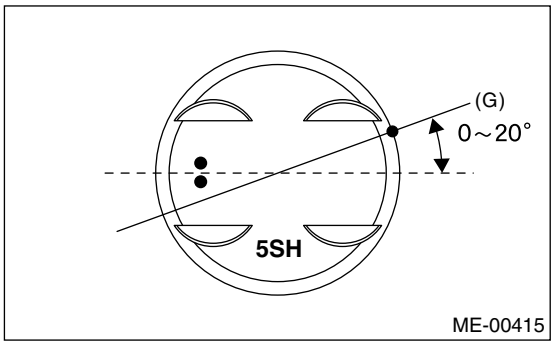
NOTE:
Align the lower rail stopper (F) to the lateral hole (E) on the piston.



13) Position the upper rail gap at (G) in the figure.
• 2000 cc MODEL



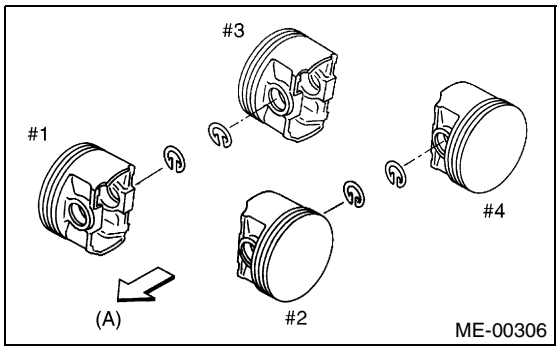
• 2500 cc MODEL



CAUTION:
• Ensure ring gaps do not face the same direction.
• Ensure ring gaps are not within the piston skirt area.

14) Install circlip.
Install circlips in the piston holes located opposite service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

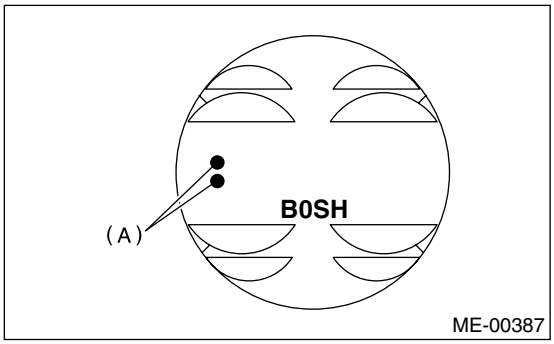
NOTE:
Use new circlips.



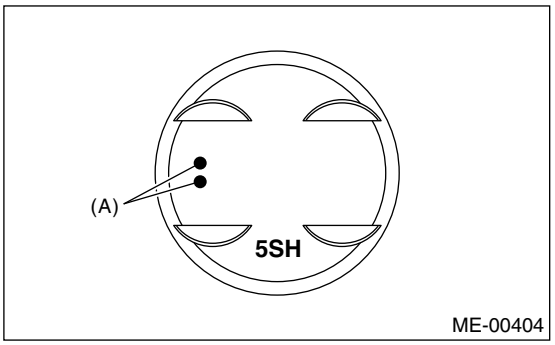
(A) Front side

CAUTION:
Piston front mark faces towards the front of the engine.

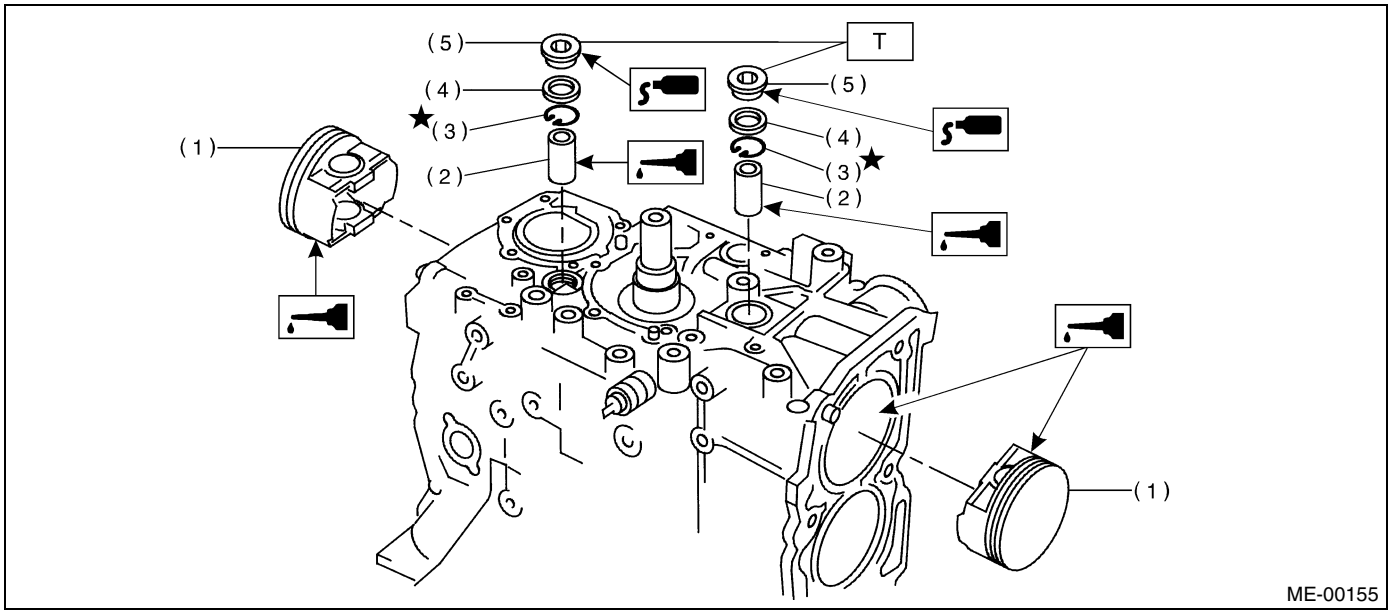
• 2000 cc MODEL



• 2500 cc MODEL



(A) Front mark



(1) Piston
(2) Piston pin
(3) Circlip
(4) Gasket
(5) Service hole plug

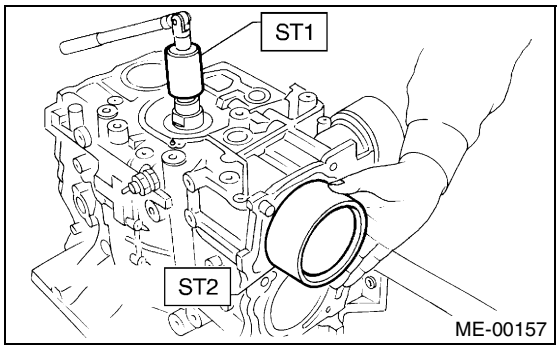
Tightening torque: N·m (kgf-m, ft-lb)
T: 70 (7.0, 50.6)

15) Installing piston
(1) Turn the cylinder block to face the #1 and #2 piston side upward.
(2) Using the ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

ST1 499987500 CRANKSHAFT SOCKET

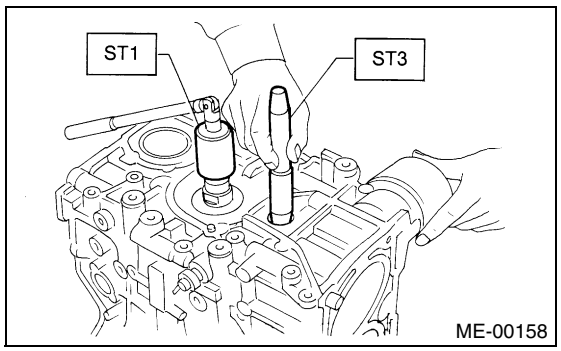
(3) Apply a coat of engine oil to pistons and cylinders, and then insert the pistons in their cylinders using ST2.

ST2 398744300 PISTON GUIDE (2000 cc model)
ST2 498747300 PISTON GUIDE (2500 cc model)



16) Installing piston pin
(1) Apply a coat of engine oil to the ST3 before insertion.
(2) Insert the ST3 into service hole to align piston pin hole with connecting rod small end.

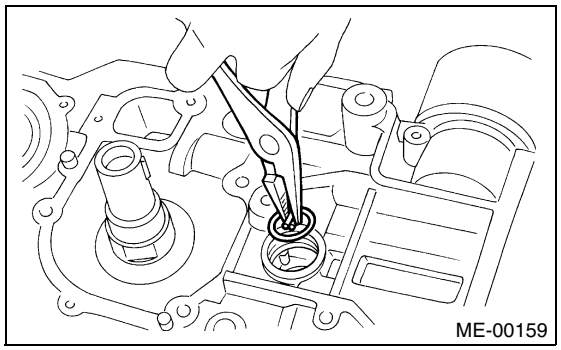
ST3 499017100 PISTON PIN GUIDE



(3) Apply a coat of engine oil to the piston pin, and then insert the piston pin into piston and connecting rod through service hole.
(4) Install the circlip.

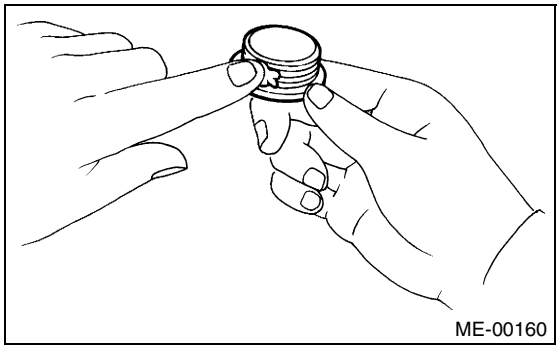
NOTE:
Use new circlips.

ST3 499897200 PISTON SNAPRING PLIER



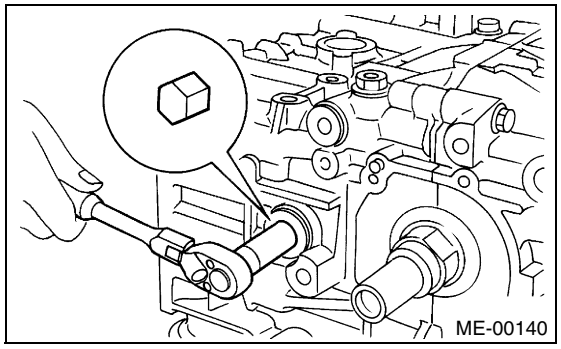
(5) Apply fluid packing around the service hole plug.

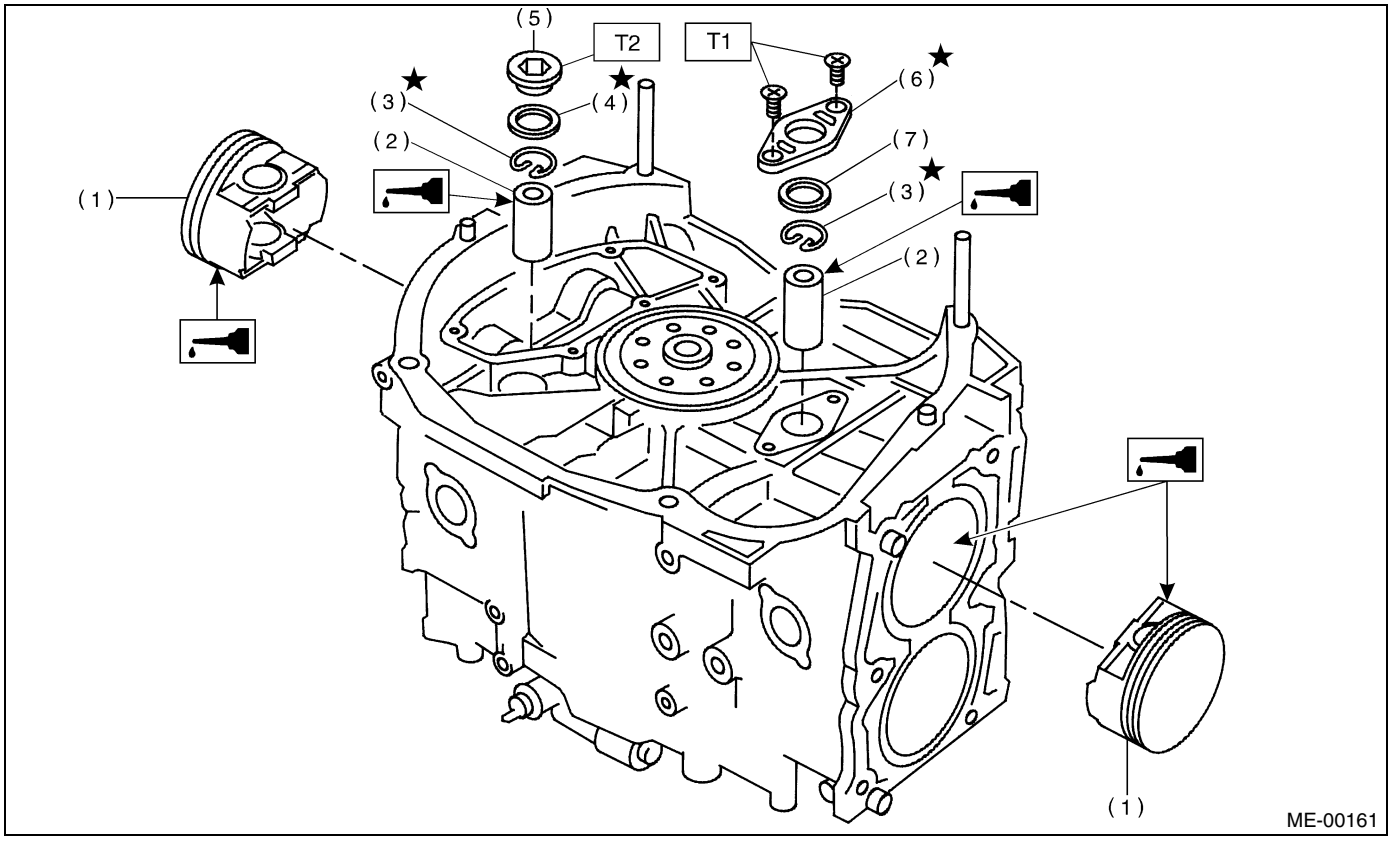
Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



(6) Install the service hole plug and gasket.

NOTE:
Use a new gasket.



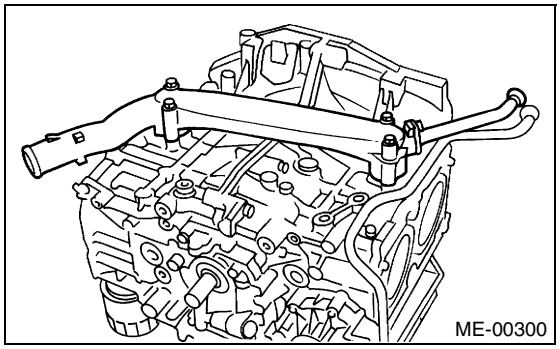


(1) Piston
(2) Piston pin
(3) Circlip
(4) Gasket
(5) Service hole plug
(6) Service hole cover
(7) O-ring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 70 (7.1, 51.4)

(7) Turn the cylinder block to face the #3 and #4 piston side upward. Using the same procedures as used for #1 and #2 cylinders, install the pistons and piston pins.

17) Install the water pipe.



18) Install the baffle plate.

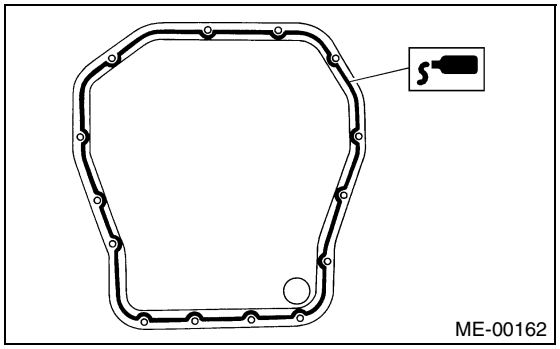
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

19) Install the oil strainer and O-ring.

Tightening torque:
10 N·m (1.0 kgf-m, 7 ft-lb)

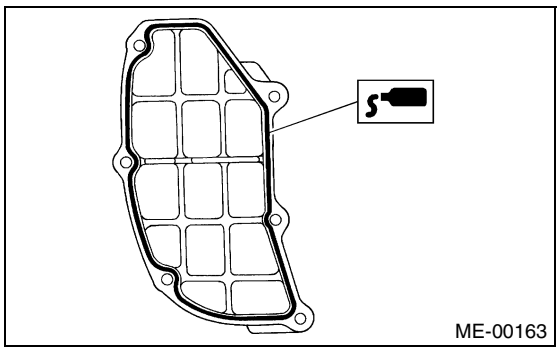
20) Install the oil strainer stay.
21) Apply fluid packing to the matching surfaces, and then install the oil pan.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



22) Apply fluid packing to the matching surfaces, and then install the oil separator cover.

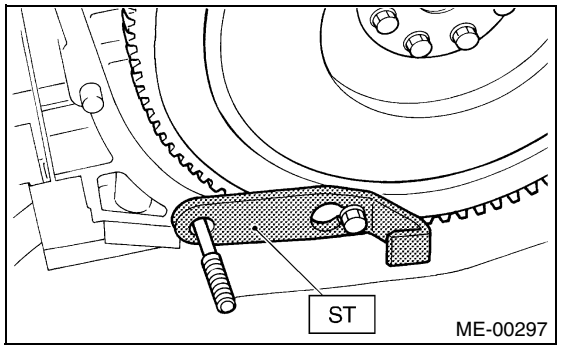
Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



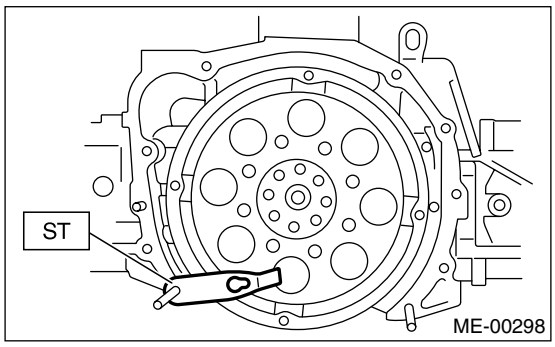
23) Install the flywheel or drive plate.
To lock the crankshaft, use ST.
ST 498497100 CRANKSHAFT STOPPER

Tightening torque:
72 N·m (7.3 kgf-m, 52.8 ft-lb)

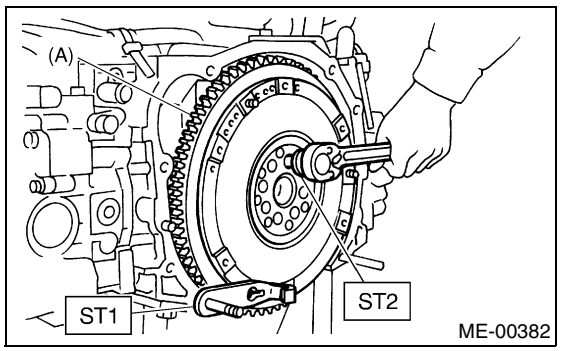
- MT VEHICLES



- AT VEHICLES



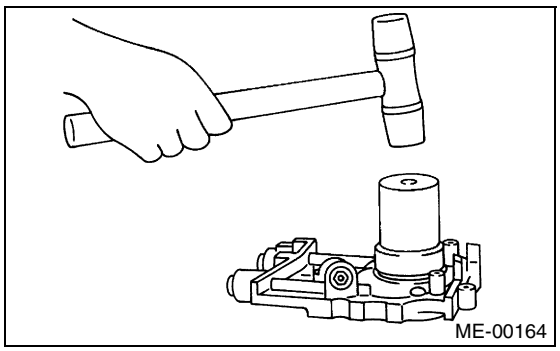
NOTE:
Using STs, remove the flywheel. (2500 cc MT model)
ST1 498497100 CRANKSHAFT STOPPER
ST2 499057000 TORX PLUS



(A) Flywheel

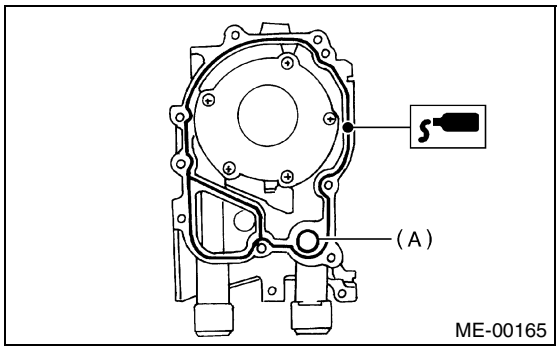
24) Install the housing cover.

25) Installation of oil pump
(1) Discard the front oil seal after removal. Replace with a new one using the ST.
ST 499587100 OIL SEAL INSTALLER



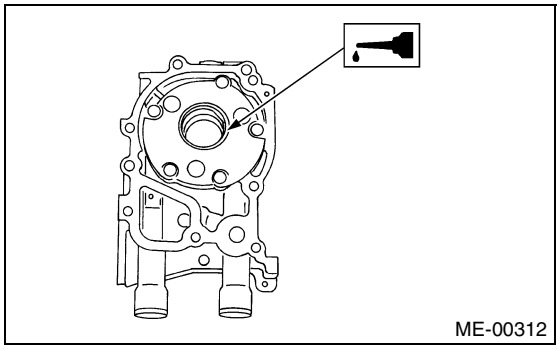
(2) Apply fluid packing to the matching surface of oil pump.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



(A) O-ring

(3) Apply a coat of engine oil to the inside of oil seal.



(4) Install the oil pump on cylinder block. Be careful not to damage the oil seal during installation.

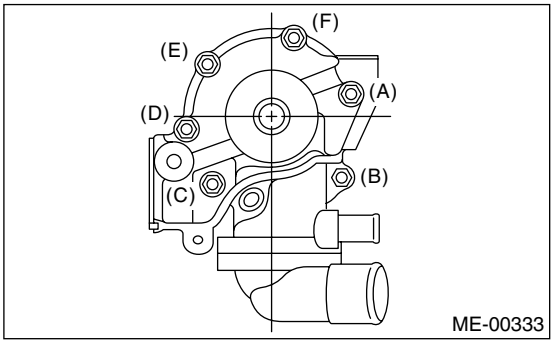
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

CAUTION:
• Do not forget to the install the O-ring and seal when installing oil pump.
• Align flat surface of oil pump's inner rotor with crankshaft before installation.

26) Install the water pump and gasket.

Tightening torque:
First; 12 N·m (1.2 kgf-m, 8.7 ft-lb)
Second; 12 N·m (1.2 kgf-m, 8.7 ft-lb)

CAUTION:
• Be sure to use a new gasket.
• When installing the water pump, tighten the bolts in two stages in alphabetical sequence as shown in the figure.

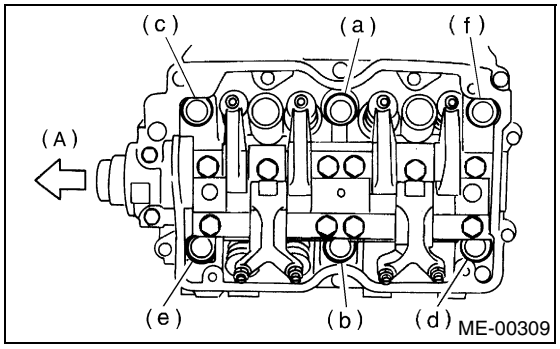


27) Install the water by-pass pipe for heater.
28) Install the oil filter using ST.
ST 498547000 OIL FILTER WRENCH
29) Tighten the cylinder head bolts.
(1) Apply a coat of engine oil to the washers and bolt threads.
(2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence.
Then tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence.
(3) Back off all bolts by 180° first; back them off by 180° again.
(4) Tighten the bolts (a) and (b) to 34 N·m (3.5 kgf-m, 25 ft-lb).
(5) Tighten the bolts (c), (d), (e) and (f) to 15 N·m (1.5 kgf-m, 11 ft-lb).
(6) Tighten all bolts by 80 to 90° in alphabetical sequence.

CAUTION:
Do not tighten bolts more than 90°.

(7) Further tighten all bolts by 80 to 90° in alphabetical sequence.

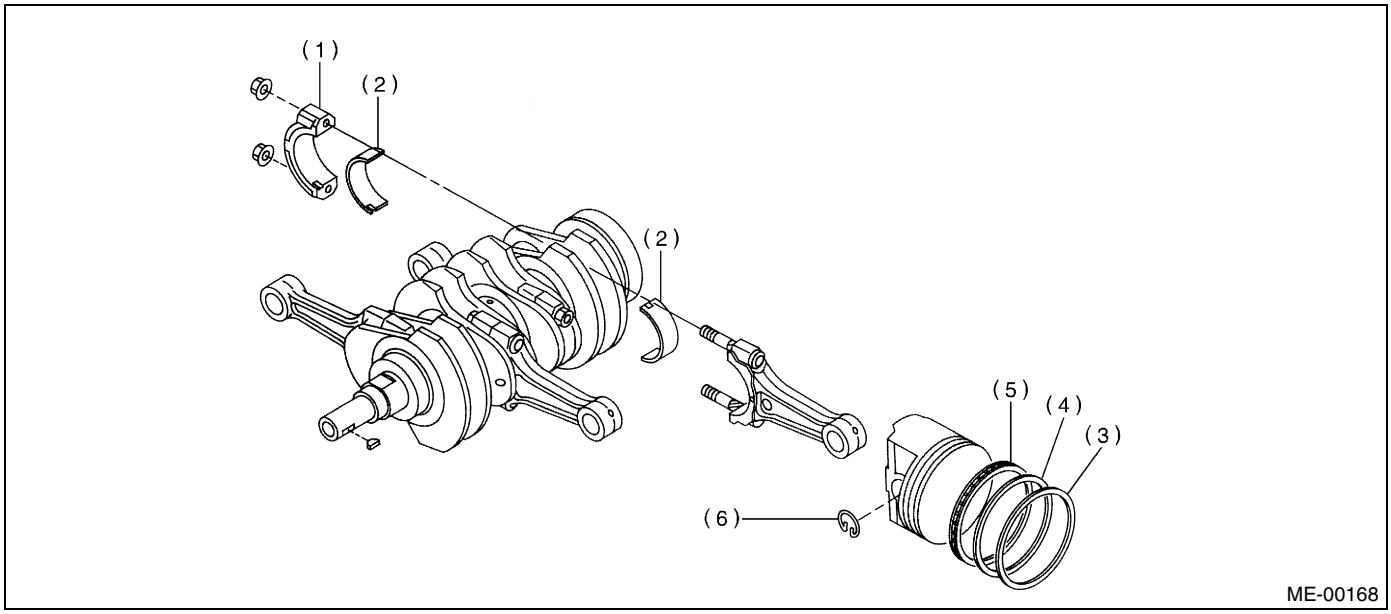
CAUTION:
Ensure that the total "re-tightening angle" [in the former two steps], do not exceed 180°.



(A) Front

30) Install the oil level gauge guide, and then tighten the attaching bolt (left side only).
31) Install the rocker cover.
32) Install the crankshaft sprocket.
<Ref. to ME(SOHC)-53, INSTALLATION, Crankshaft Sprocket.>
33) Install the camshaft sprocket. <Ref. to ME(SOHC)-51, INSTALLATION, Camshaft Sprocket.>
34) Install the timing belt assembly. <Ref. to ME(SOHC)-47, INSTALLATION, Timing Belt Assembly.>
35) Install the belt cover. <Ref. to ME(SOHC)-45, INSTALLATION, Belt Cover.>
36) Install the crankshaft pulley. <Ref. to ME(SOHC)-43, INSTALLATION, Crankshaft Pulley.>
37) Install the generator and A/C compressor brackets on cylinder head.
38) Install the V-belt. <Ref. to ME(SOHC)-41, INSTALLATION, V-belt.>
39) Install the intake manifold. <Ref. to FU(SOHC)-16, INSTALLATION, Intake Manifold.>

C: DISASSEMBLY



(1) Connecting rod cap
(2) Connecting rod bearing
(3) Top ring
(4) Second ring
(5) Oil ring
(6) Circlip

1) Remove the connecting rod cap.
2) Remove the connecting rod bearing.

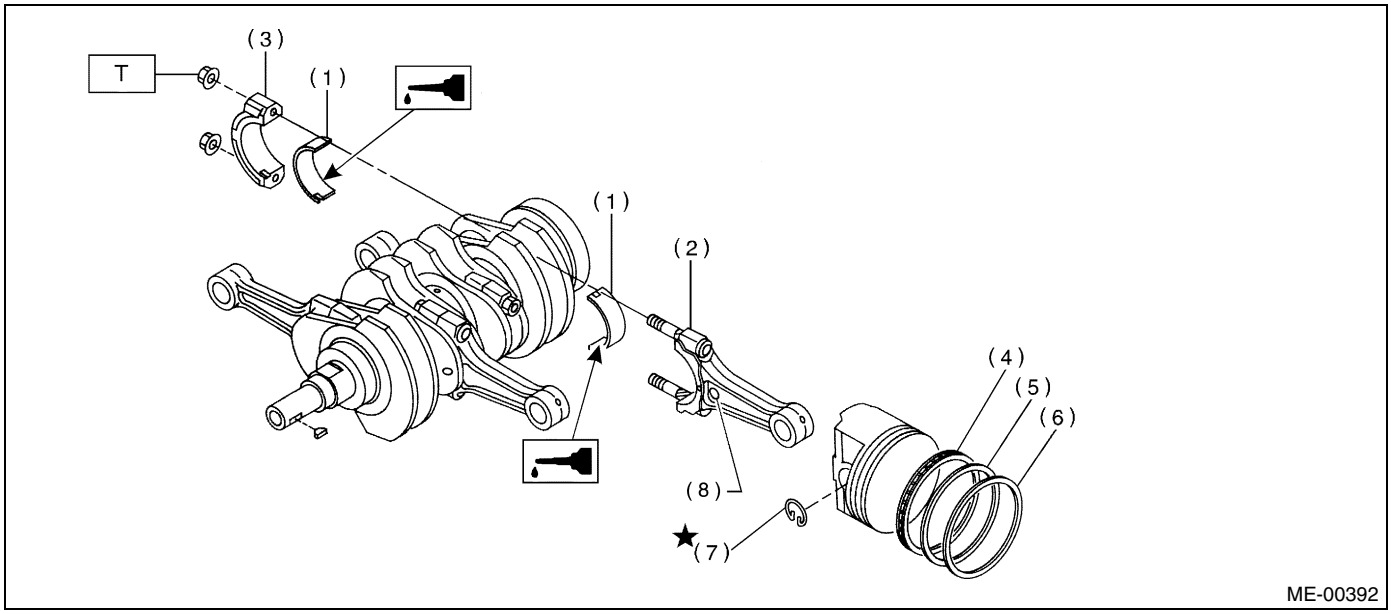
NOTE:
Arrange the removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

3) Remove the piston rings using the piston ring expander.
4) Remove the oil ring by hand.

NOTE:
Arrange the removed piston rings in good order to prevent confusion.

5) Remove the circlip.

D: ASSEMBLY



(1) Connecting rod bearing
(2) Connecting rod
(3) Connecting rod cap
(4) Oil ring
(5) Second ring
(6) Top ring
(7) Circlip
(8) side mark

Tightening torque: N·m (kgf-m, ft-lb)
T: 45 (4.6, 33)

1) Apply oil to the surfaces of the connecting rod bearings.
2) Install the connecting rod bearings on connecting rods and connecting rod caps.
3) Position each connecting rod with the marked side facing forward, and then install them.
4) Install the connecting rod cap with connecting rod nut.
Ensure the arrow on connecting rod cap faces the front during installation.

CAUTION:
• Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
• When tightening the connecting rod nuts, apply oil on the threads.

5) Install the expander, lower rail and upper rail in this order by hand. Then install the second ring and top ring with a piston ring expander.

E: INSPECTION

1. CYLINDER BLOCK

1) Visually check for cracks and damage. Especially, inspect the important parts by means of red lead check.
2) Check the oil passages for clogging.
3) Inspect the crankcase surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

Warping limit:
0.05 mm (0.0020 in)

Grinding limit:
0.1 mm (0.004 in)

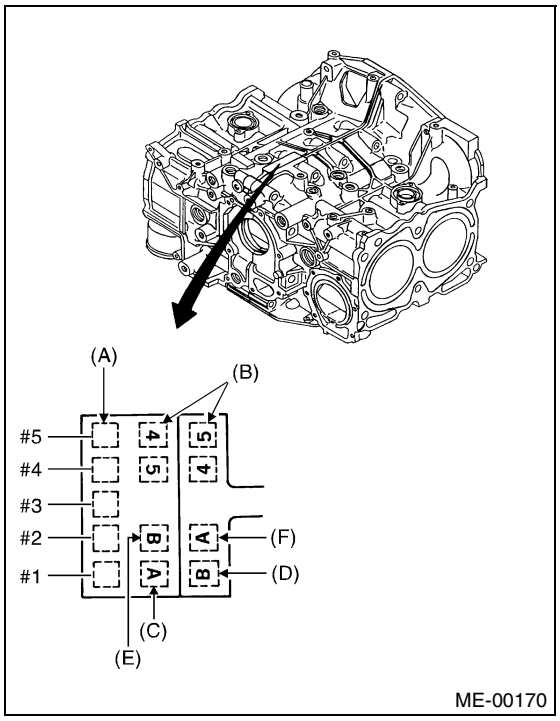
Standard height of cylinder block:
201.0 mm (7.91 in)

2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on cylinder block's front upper surface.

NOTE:
• Measurement should be performed at a temperature 20°C (68°F).
• Standard sized pistons are classified into two grades, “A” and “B”. These grades should be used as a guide line in selecting a standard piston.

Standard diameter:
2000 cc model
A: 92.005 — 92.015 mm (3.6222 — 3.6226 in)
B: 91.995 — 92.005 mm (3.6218 — 3.6222 in)
2500 cc model
A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)
B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)



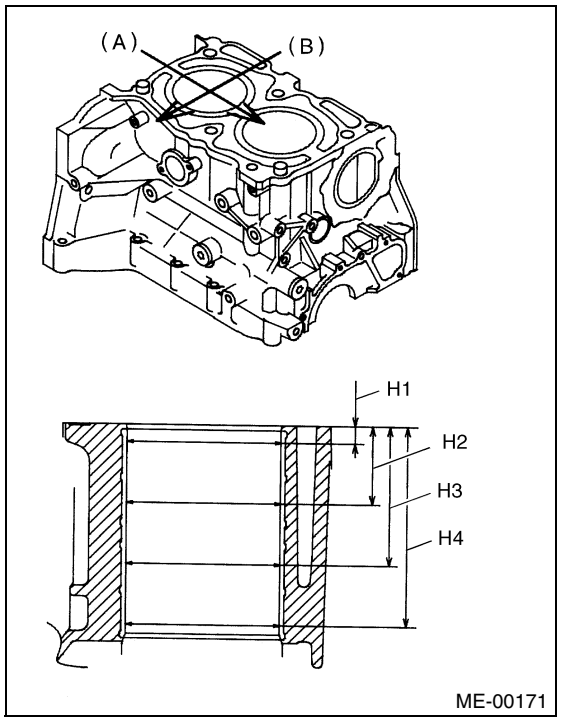
(A) Main journal size mark
(B) Cylinder block RH-LH combination mark
(C) #1 cylinder bore size mark
(D) #2 cylinder bore size mark
(E) #3 cylinder bore size mark
(F) #4 cylinder bore size mark

2) How to measure the inner diameter of each cylinder
Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights shown in the figure, using a cylinder bore gauge.

NOTE:
Measurement should be performed at a temperature 20°C (68°F).

Taper:
Standard
0.015 mm (0.0006 in)
Limit
0.050 mm (0.0020 in)

Out-of-roundness:
Standard
0.010 mm (0.0004 in)
Limit
0.050 mm (0.0020 in)



(A) Piston pin direction
(B) Thrust direction
H1 10 mm (0.39 in)
H2 45 mm (1.77 in)
H3 80 mm (3.15 in)
H4 115 mm (4.35 in)

3) When the piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

4) How to measure the outer diameter of each piston
Measure the outer diameter of each piston at the height shown in the figure. (Thrust direction)

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Piston grade point H:
- ***2000 cc model***
  40.0 mm (1.575 in)
- ***2500 cc model***
  37.0 mm (1.457 in)

Piston outer diameter:

Standard:
- ***2000 cc model***
  A: 91.985 — 91.995 mm
  (3.6214 — 3.6218 in)
  B: 91.975 — 91.985 mm
  (3.6211 — 3.6214 in)

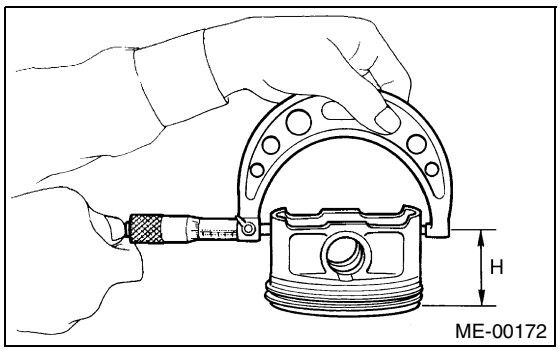
0.25 mm (0.0098 in) oversize
92.225 — 92.235 mm
(3.6309 — 3.6313 in)

0.50 mm (0.0197 in) oversize
92.475 — 92.485 mm
(3.6407 — 3.6411 in)

- ***2500 cc model***
  A: 99.485 — 99.495 mm
  (3.9167 — 3.9171 in)
  B: 99.475 — 99.485 mm
  (3.9163 — 3.9167 in)

0.25 mm (0.0098 in) oversize
99.725 — 99.735 mm
(3.9262 — 3.9266 in)

0.50 mm (0.0197 in) oversize
99.975 — 99.985 mm
(3.9360 — 3.9364 in)



5) Calculate the clearance between cylinder and piston.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Cylinder to piston clearance at 20°C (68°F):
Standard
0.010 — 0.030 mm (0.0004 — 0.0012 in)
Limit
0.050 mm (0.0020 in)

6) Boring and honing
(1) If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured exceeds the specified limit or if there is any damage on the cylinder wall, rebore it to use an oversize piston.

CAUTION:
When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and use oversize pistons. Do not perform boring on one cylinder only, nor use an oversize piston for one cylinder only.

(2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the crankcase.

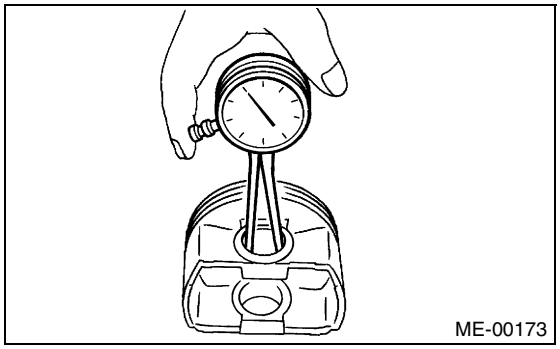
NOTE:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

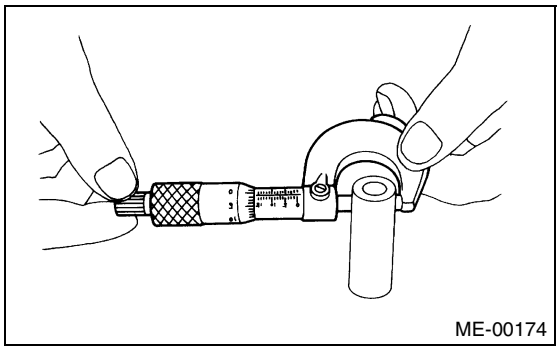
Limit of cylinder enlarging (boring):
0.5 mm (0.020 in)

3. PISTON AND PISTON PIN

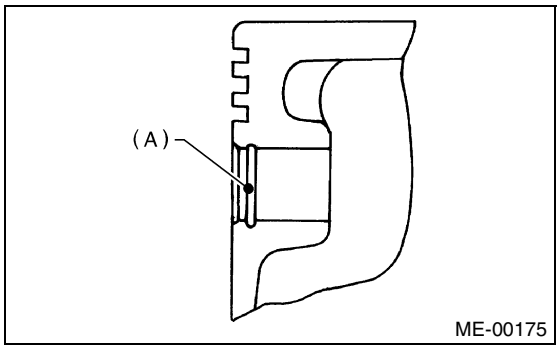
1) Check the pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.
2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(SOHC)-82, CYLINDER AND PISTON, INSPECTION, Cylinder Block.> If any of the clearances is not to specification, replace the piston or bore the cylinder to use an oversize piston.
3) Make the sure that piston pin can be inserted into piston pin hole with a thumb at 20°C (68°F). Replace if defective.

Standard clearance between piston pin and hole in piston:
Standard
0.004 — 0.008 mm (0.0002 — 0.0003 in)
Limit
0.020 mm (0.0008 in)


ME-00173


ME-00174

4) Check the circlip installation groove on piston for burr (A). If necessary, remove the burr from groove so that piston pin can lightly move.



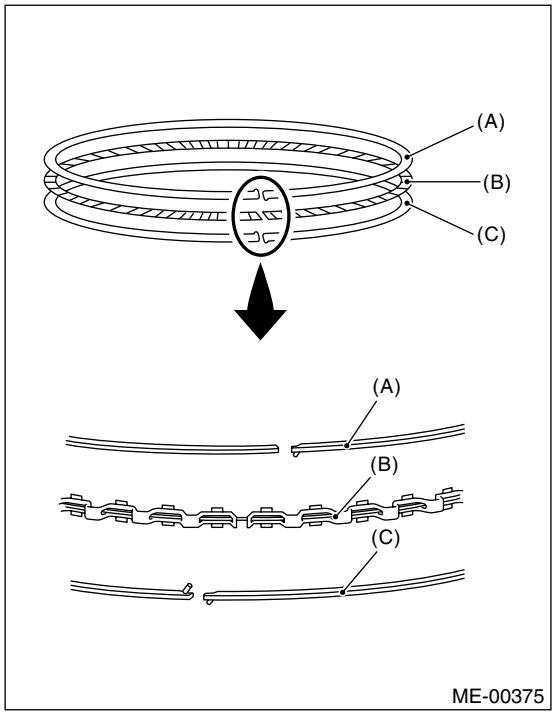
ME-00175

5) Check the piston pin circlip for distortion, cracks and wear.

4. PISTON RING

1) If the piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new one of the same size as the piston.

CAUTION:
• Marks are shown on the end of top and second rings. When installing the rings to piston, face these marks upward.
• Oil ring is composed of upper rail, expander and lower rail. Be careful of the rail direction when installing oil ring to the pisiton.



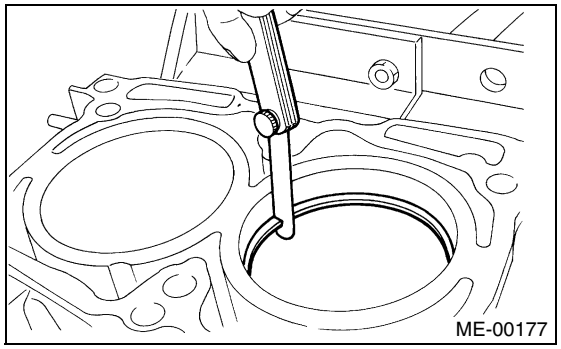
(A) Upper rail
(B) Expander
(C) Lower rail

2) Clean the piston ring groove and piston ring.

3) Squarely place the piston ring and oil ring in cylinder, and then measure the piston ring gap with a thickness gauge.

Unit: mm (in)

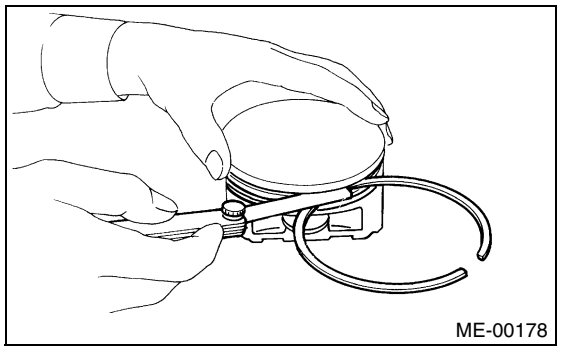
			Standard	Limit
Piston ring gap	Top ring		0.20 — 0.35 (0.0079 — 0.0138)	1.0 (0.039)
	Second ring	2000 cc	0.35 — 0.50 (0.0138 — 0.0197)	1.0 (0.039)
		2500 cc	0.37 — 0.52 (0.0146 — 0.0204)	
	Oil ring rail		0.20 — 0.50 (0.0079 — 0.0197)	1.5 (0.059)



4) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

Unit: mm (in)

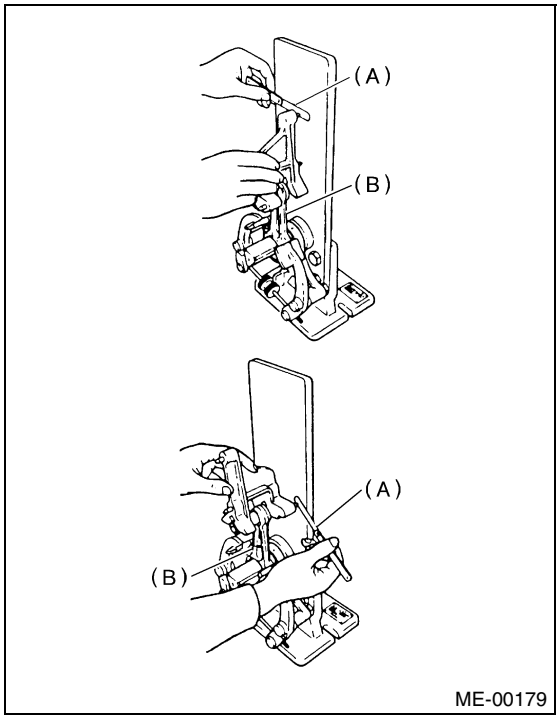
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	0.15 (0.0059)



5. CONNECTING ROD

1) Replace the connecting rod, if the large or small end thrust surface is damaged.
2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if the bend or twist exceeds the limit.

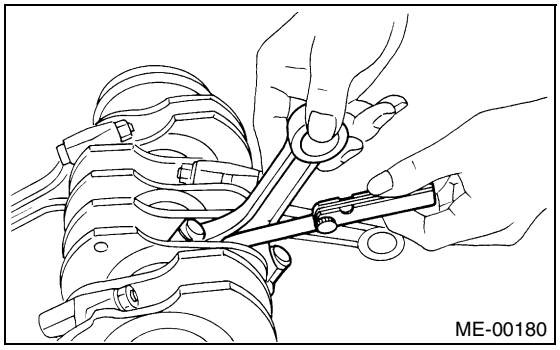
Limit of bend or twist per 100 mm (3.94 in) in length:
0.10 mm (0.0039 in)



(A) Thickness gauge
(B) Connecting rod

3) Install the connecting rod fitted with bearing to crankshaft, and then measure the side clearance (thrust clearance). Replace the connecting rod if the side clearance exceeds the specified limit.

Connecting rod side clearance:
Standard
0.070 — 0.330 mm (0.0028 — 0.0130 in)
Limit
0.4 mm (0.016 in)



4) Inspect the connecting rod bearing for scar, peeling, seizure, melting, wear, etc.
5) Measure the oil clearance on individual connecting rod bearings by means of plastigauge. If any oil clearance is not within specification, replace the defective bearing with a new one of standard size or undersize as necessary. (See the table below.)

Connecting rod oil clearance:

• 2000 cc MODEL
Standard
0.010 — 0.038 mm (0.0004 — 0.0015 in)
Limit
0.05 mm (0.0020 in)

Unit: mm (in)

Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.492 — 1.501 (0.0587 — 0.0591)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.510 — 1.513 (0.0594 — 0.0596)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.520 — 1.523 (0.0598 — 0.0600)	51.934 — 51.950 (2.0446 — 2.0453)
0.25 (0.0098) undersize	1.620 — 1.623 (0.0638 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

Connecting rod oil clearance:

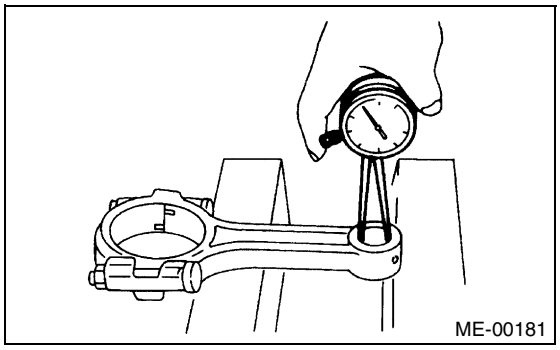
• 2500 cc MODEL
Standard
0.012 — 0.038 mm (0.0005 — 0.0015 in)
Limit
0.05 mm (0.0020 in)

Unit: mm (in)

Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.490 — 1.502 (0.0587 — 0.0591)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.504 — 1.512 (0.0592 — 0.0595)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.514 — 1.522 (0.0596 — 0.0599)	51.934 — 51.950 (2.0446 — 2.0453)
0.25 (0.0098) undersize	1.614 — 1.622 (0.0635 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

6) Inspect the bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at connecting rod small end.

Clearance between piston pin and bushing:
Standard
0 — 0.022 mm (0 — 0.0009 in)
Limit
0.030 mm (0.0012 in)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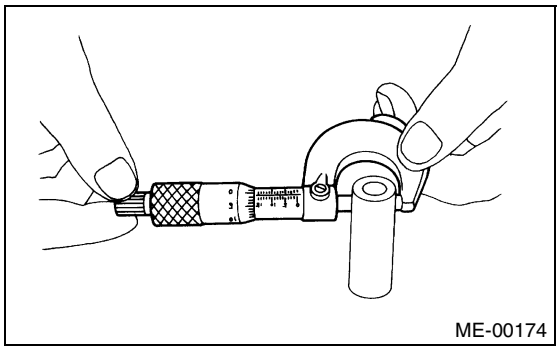
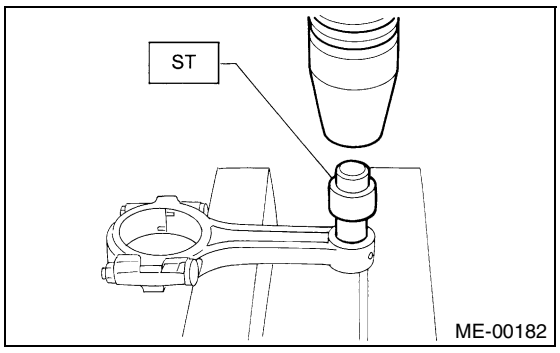

ME-00174

7) Replacement procedure is as follows.
(1) Remove the bushing from connecting rod with ST and press.
(2) Press the bushing with ST after applying oil on the periphery of bushing.

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



ME-00182

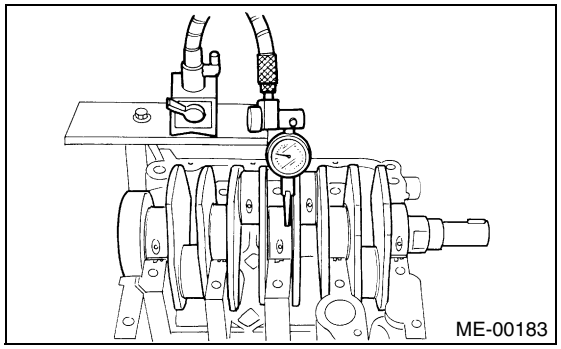
(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
(4) After the completion of reaming, clean the bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

1) Clean the crankshaft completely and check for cracks by means of red lead check etc., and replace if defective.
2) Measure the crankshaft bend, and correct or replace if it exceeds the limit.

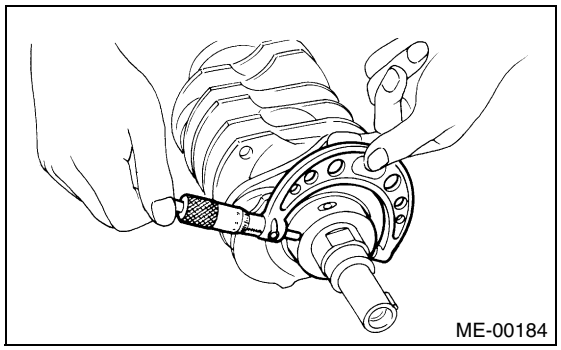
NOTE:
If a suitable V-block is not available, install the #1 and #5 crankshaft bearing on cylinder block, position the crankshaft on these bearings and measure the crankshaft bend using a dial gauge.

Crankshaft bend limit:
0.035 mm (0.0014 in)


ME-00183

3) Inspect the crank journal and crank pin for wear. If they are not within the specifications, replace the bearing with a suitable (undersize) one, and then replace or recondition the crankshaft as necessary. When grinding the crank journal or crank pin, finish them to specified dimensions according to the undersize bearing to be used.

Crank pin and crank journal:
Out-of-roundness
0.020 mm (0.0008 in) or less
Taper limit
0.07 mm (0.0028 in)
Grinding limit
0.250 mm (0.0098 in)


ME-00184

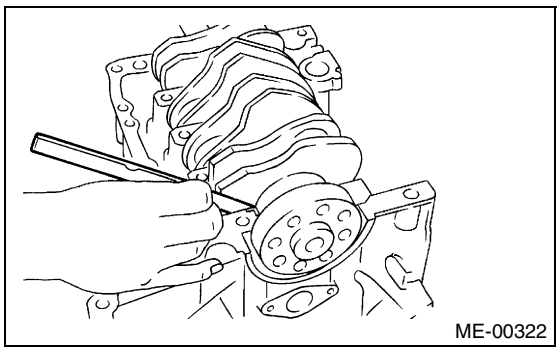
Unit: mm (in)

		Crank journal diameter		Crank pin diameter	
		#1, #3	#2, #4, #5	2000 cc	2500 cc
Standard	Journal O.D.	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	51.984 — 52.000 (2.0466 — 2.0472)	51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.998 — 2.011 (0.0787 — 0.0792)	2.000 — 2.013 (0.0787 — 0.0793)	1.492 — 1.501 (0.0587 — 0.0591)	1.490 — 1.502 (0.0587 — 0.0591)
0.03 (0.0012) undersize	Journal O.D.	59.962 — 59.978 (2.3607 — 2.3613)	59.962 — 59.978 (2.3607 — 2.3613)	51.954 — 51.970 (2.0454 — 2.0461)	51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.022 (0.0795 — 0.0796)	1.510 — 1.513 (0.0594 — 0.0596)	1.504 — 1.512 (0.0592 — 0.0595)
0.05 (0.0020) undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	51.934 — 51.950 (2.0446 — 2.0453)	51.934 — 51.950 (2.0446 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.520 — 1.523 (0.0598 — 0.0600)	1.514 — 1.522 (0.0596 — 0.0599)
0.25 (0.0098) undersize	Journal O.D.	59.742 — 59.758 (2.3520 — 2.3527)	59.742 — 59.758 (2.3520 — 2.3527)	51.734 — 51.750 (2.0368 — 2.0374)	51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.620 — 1.623 (0.0638 — 0.0639)	1.614 — 1.622 (0.0635 — 0.0639)

O.D.: Outer Diameter

4) Measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace bearing.

Crankshaft thrust clearance:
Standard
0.030 — 0.115 mm (0.0012 — 0.0045 in)
Limit
0.25 mm (0.0098 in)


ME-00322

5) Inspect the individual crankshaft bearings for signs of flaking, seizure, melting, and wear.

6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specification, replace the defective bearing with an undersize one, and then replace or recondition the crankshaft as necessary.

Unit: mm (in)		
Crankshaft oil clearance		
#1	Standard	0.003 — 0.030 (0.0001 — 0.0012)
	Limit	0.040 (0.0016)
#2	Standard	0.012 — 0.033 (0.0005 — 0.0013)
	Limit	0.045 (0.0018)
#3	Standard	0.003 — 0.030 (0.0001 — 0.0012)
	Limit	0.040 (0.0016)
#4	Standard	0.012 — 0.033 (0.0005 — 0.0013)
	Limit	0.045 (0.0018)
#5	Standard	0.010 — 0.031 (0.0004 — 0.0012)
	Limit	0.040 (0.0016)

22.Engine Trouble in General

A: INSPECTION

NOTE:
"RANK" shown in the chart refer to the possibility of reason for the trouble in order ("Very often" to "Rarely")
A — Very often
B — Sometimes
C — Rarely

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
1. Engine will not start.			
1) Starter does not turn.	• Starter	• Defective battery-to-starter harness	B
		• Defective starter switch	C
		• Defective inhibitor switch or neutral switch	C
		• Defective starter	B
	• Battery	• Poor terminal connection	A
		• Run-down battery	A
		• Defective charging system	B
	• Friction	• Seizure of crankshaft and connecting rod bearing	C
		• Seized camshaft	C
		• Seized or stuck piston and cylinder	C
2) Initial combustion does not occur.	• Starter	• Defective starter	C
	• Engine control system <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.>		A
	• Fuel line	• Defective fuel pump and relay	A
		• Lack of or insufficient fuel	B
	• Belt	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	B
		• Improper engine oil (low viscosity)	B
3) Initial combustion occurs.	• Engine control system <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
	• Fuel line	• Defective fuel pump and relay	C
		• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Belt	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	B
		• Improper engine oil (low viscosity)	B

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
4) Engine stalls after initial combustion.	• Engine control system <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	B
		• Loosened or cracked PCV hose	C
		• Loosened or cracked vacuum hose	C
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Dirty air cleaner element	C
	• Fuel line	• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Belt	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	B
		• Improper engine oil (low viscosity)	B
2. Rough idle and engine stall	• Engine control system <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	A
		• Loosened or cracked PCV hose	A
		• Loosened or cracked vacuum hose	A
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Defective PCV valve	C
		• Loosened oil filler cap	B
		• Dirty air cleaner element	C
	• Fuel line	• Defective fuel pump and relay	C
		• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Belt	• Defective timing	C
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	B
		• Loosened cylinder head bolts or defective gasket	B
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	B
		• Incorrect valve timing	A
		• Improper engine oil (low viscosity)	B
	• Lubrication system	• Incorrect oil pressure	B
		• Defective rocker cover gasket	C
	• Cooling system	• Overheating	C
	• Others	• Malfunction of evaporative emission control system	A
		• Stuck or damaged throttle valve	B
		• Accelerator cable out of adjustment	C

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
3. Low output, hesitation and poor acceleration	• Engine control system <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	A
		• Loosened or cracked PCV hose	A
		• Loosened or cracked vacuum hose	B
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Defective PCV valve	B
		• Loosened oil filler cap	B
		• Dirty air cleaner element	A
	• Fuel line	• Defective fuel pump and relay	B
		• Clogged fuel line	B
		• Lack of or insufficient fuel	C
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	B
		• Loosened cylinder head bolts or defective gasket	B
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
		• Improper engine oil (low viscosity)	B
	• Lubrication system	• Incorrect oil pressure	B
	• Cooling system	• Overheating	C
		• Over cooling	C
	• Others	• Malfunction of evaporative emission control system	A
4. Surging	• Engine control system <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	A
		• Loosened or cracked PCV hose	A
		• Loosened or cracked vacuum hose	A
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Defective PCV valve	B
		• Loosened oil filler cap	B
		• Dirty air cleaner element	B
	• Fuel line	• Defective fuel pump and relay	B
		• Clogged fuel line	B
		• Lack of or insufficient fuel	C
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	C
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
		• Improper engine oil (low viscosity)	B
	• Cooling system	• Overheating	B
	• Others	• Malfunction of evaporative emission control system	C

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
5. Engine does not return to idle.	• Engine control system <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked vacuum hose	A
	• Others	• Stuck or damaged throttle valve	A
		• Accelerator cable out of adjustment	B
6. Dieseling (Run-on)	• Engine control system <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.>		A
	• Cooling system	• Overheating	B
	• Others	• Malfunction of evaporative emission control system	B
7. After burning in exhaust system	• Engine control system <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	C
		• Loosened or cracked PCV hose	C
		• Loosened or cracked vacuum hose	B
		• Defective PCV valve	B
		• Loosened oil filler cap	C
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	C
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
	• Lubrication system	• Incorrect oil pressure	C
	• Cooling system	• Over cooling	C
	• Others	• Malfunction of evaporative emission control system	C
8. Knocking	• Engine control system <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened oil filler cap	B
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Incorrect valve timing	B
	• Cooling system	• Overheating	A
9. Excessive engine oil consumption	• Intake system	• Loosened or cracked PCV hose	A
		• Defective PCV valve	B
		• Loosened oil filler cap	C
	• Compression	• Defective valve stem	A
		• Worn or stuck piston rings, cylinder and piston	A
	• Lubrication system	• Loosened oil pump attaching bolts and defective gasket	B
		• Defective oil filter seal	B
		• Defective crankshaft oil seal	B
		• Defective rocker cover gasket	B
		• Loosened oil drain plug or defective gasket	B
		• Loosened oil pan fitting bolts or defective oil pan	B

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
10. Excessive fuel consumption	• Engine control system <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Dirty air cleaner element	A
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	C
		• Worn or stuck piston rings, cylinder and piston	B
		• Incorrect valve timing	B
	• Lubrication system	• Incorrect oil pressure	C
	• Cooling system	• Over cooling	C
	• Others	• Accelerator cable out of adjustment	B

23.Engine Noise

A: INSPECTION

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	• Valve mechanism is defective. • Incorrect valve clearance • Worn valve rocker • Worn camshaft • Broken valve spring
Heavy and dull clank	Oil pressure is low.	• Worn crankshaft main bearing • Worn connecting rod bearing (big end)
	Oil pressure is normal.	• Loose flywheel mounting bolts • Damaged engine mounting
High-pitched clank (Spark knock)	Sound is noticeable when accelerating with an overload.	• Ignition timing advanced • Accumulation of carbon inside combustion chamber • Wrong spark plug • Improper gasoline
Clank when engine speed is medium (1,000 to 2,000 rpm).	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn crankshaft main bearing • Worn bearing at crankshaft end of connecting rod
Knocking sound when engine is operating under idling speed and engine is warm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn cylinder liner and piston ring • Broken or stuck piston ring • Worn piston pin and hole at piston end of connecting rod
	Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)	• Unusually worn valve lifter • Worn cam gear • Worn camshaft journal bore in crankcase
Squeaky sound	—	• Insufficient generator lubrication
Rubbing sound	—	• Defective generator brush and rotor contact
Gear scream when starting engine	—	• Defective ignition starter switch • Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	• Loose drive belt • Defective water pump shaft
Hissing sound	—	• Loss of compression • Air leakage in air intake system, hoses, connections or manifolds
Timing belt noise	—	• Loose timing belt • Belt contacting case/adjacent part
Valve tappet noise	—	• Incorrect valve clearance

NOTE*:
When disconnecting fuel injector connector, Malfunction Indicator Light (CHECK ENGINE light) illuminates and trouble code is stored in ECM memory.
Therefore, carry out the CLEAR MEMORY MODE <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.> after connecting fuel injector connector.

EXHAUST

EX(SOHC)

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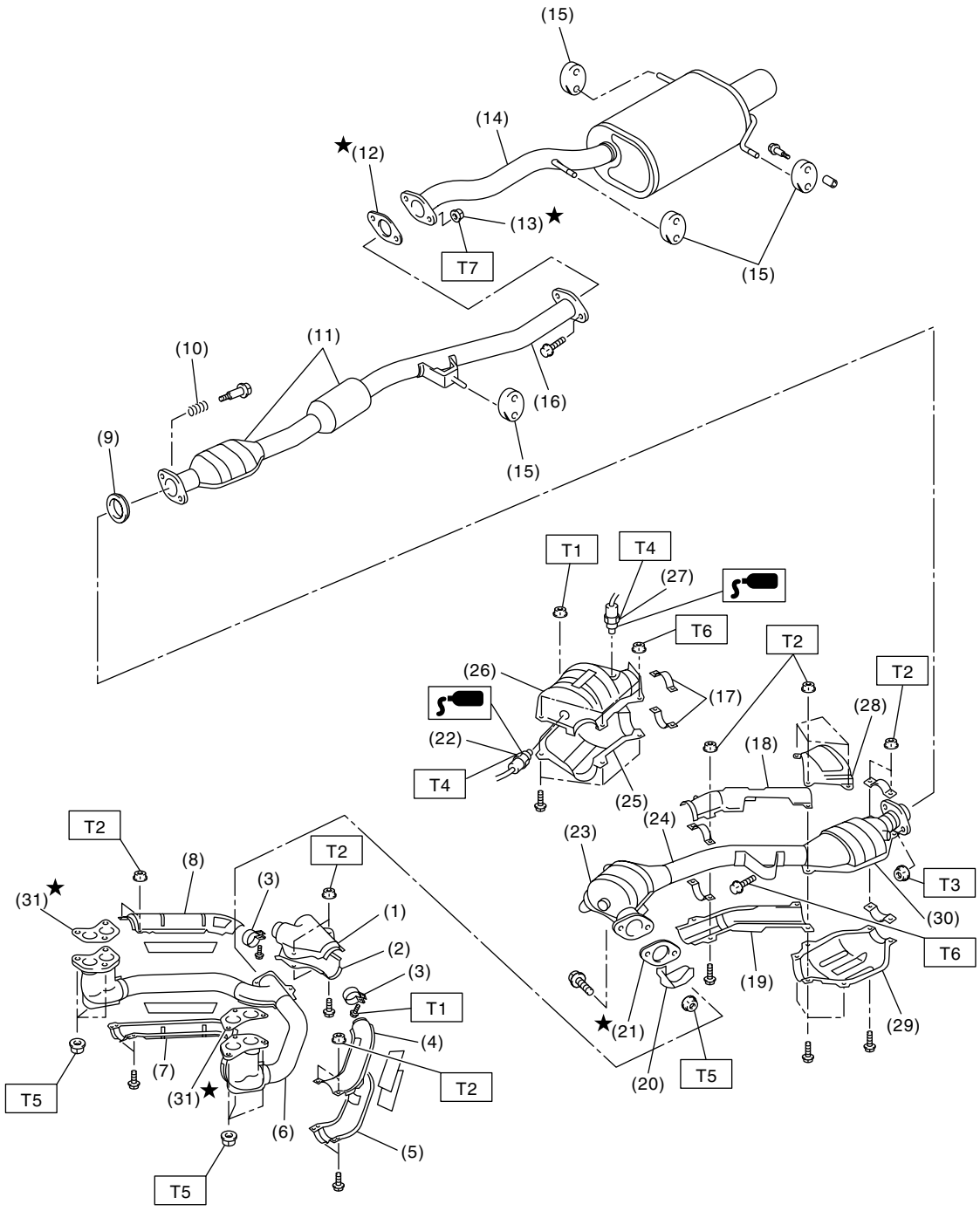
1.	General Description	2
2.	Front Exhaust Pipe	7
3.	Center Exhaust Pipe	10
4.	Rear Exhaust Pipe	11
5.	Muffler	13

1. General Description

A: COMPONENT

1. 2000 CC MODEL

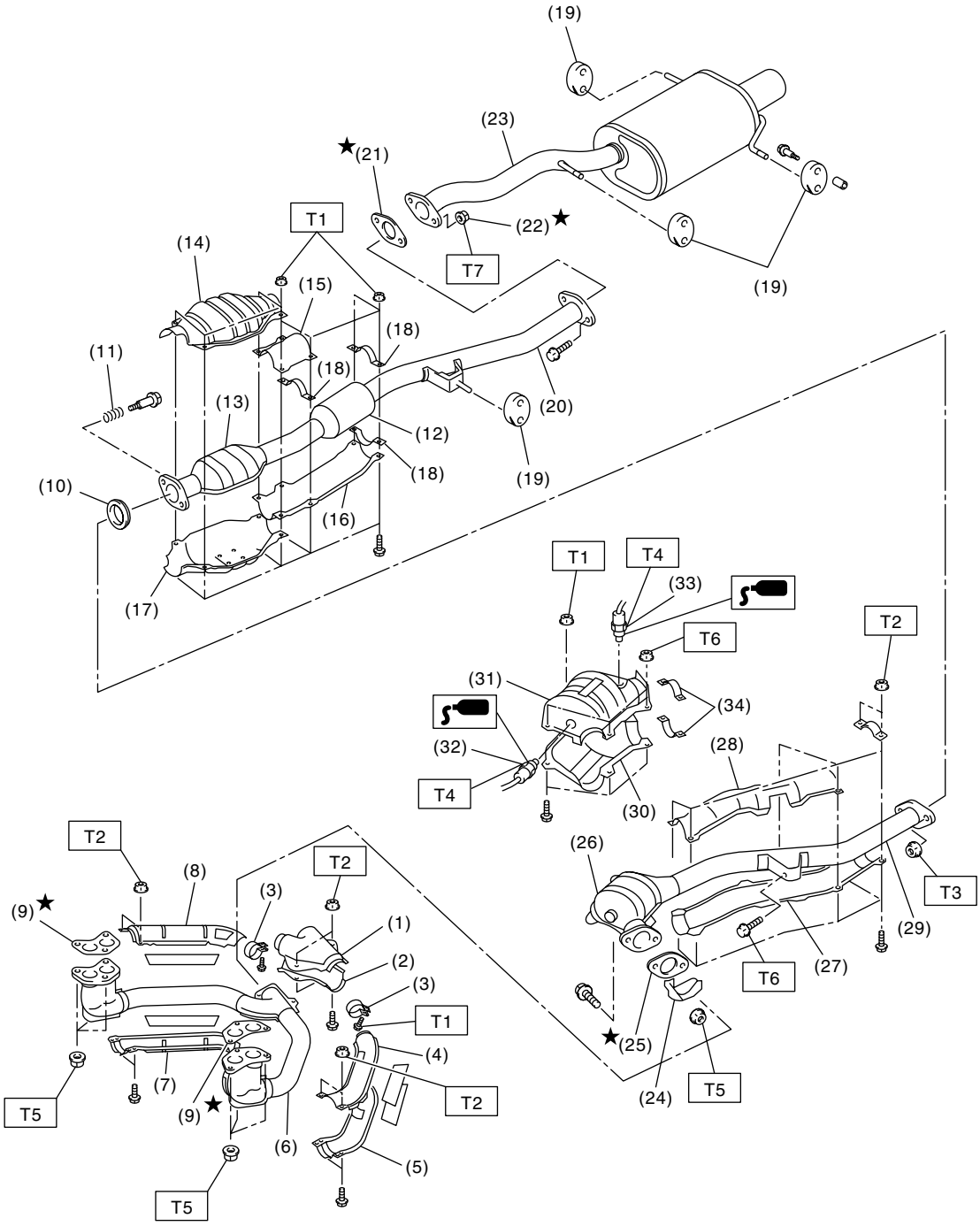


EX-00035

(1) Upper front exhaust pipe cover CTR
(2) Lower front exhaust pipe cover CTR
(3) Clamp
(4) Upper front exhaust pipe cover LH
(5) Lower front exhaust pipe cover LH
(6) Front exhaust pipe
(7) Lower front exhaust pipe cover RH
(8) Upper front exhaust pipe cover RH
(9) Gasket
(10) Spring
(11) Chamber
(12) Gasket
(13) Self-locking nut
(14) Muffler
(15) Cushion rubber
(16) Rear exhaust pipe
(17) Clamp
(18) Upper center exhaust pipe cover
(19) Lower center exhaust pipe cover
(20) Protector
(21) Gasket
(22) Front oxygen (A/F) sensor
(23) Front catalytic converter
(24) Center exhaust pipe
(25) Lower front catalytic converter cover
(26) Upper front catalytic converter cover
(27) Rear oxygen sensor
(28) Upper rear catalytic converter cover
(29) Lower rear catalytic converter cover
(30) Rear catalytic converter
(31) Gasket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 13 (1.3, 9.4)
T3: 18 (1.8, 13.0)
T4: 21 (2.1, 15.2)
T5: 30 (3.1, 22.4)
T6: 35 (3.6, 26.0)
T7: 48 (4.9, 35.4)

2. 2500 CC MODEL



EX-00072

(1) Upper front exhaust pipe cover CTR
(2) Lower front exhaust pipe cover CTR
(3) Clamp
(4) Upper front exhaust pipe cover LH
(5) Lower front exhaust pipe cover LH
(6) Front exhaust pipe
(7) Lower front exhaust pipe cover RH
(8) Upper front exhaust pipe cover RH
(9) Gasket
(10) Gasket
(11) Spring
(12) Chamber
(13) Rear catalytic converter
(14) Upper rear catalytic converter cover
(15) Upper rear exhaust cover
(16) Lower rear exhaust cover
(17) Lower rear catalytic converter cover
(18) Clamp
(19) Cushion rubber
(20) Rear exhaust pipe
(21) Gasket
(22) Self-locking nut
(23) Muffler
(24) Protector
(25) Gasket
(26) Front catalytic converter
(27) Lower center exhaust cover
(28) Upper center exhaust cover
(29) Center exhaust pipe
(30) Lower front catalytic converter cover
(31) Upper front catalytic converter cover
(32) Front oxygen (A/F) sensor
(33) Rear oxygen sensor
(34) Clamp

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 13 (1.3, 9.4)
T3: 18 (1.8, 13.0)
T4: 21 (2.1, 15.2)
T5: 30 (3.1, 22.4)
T6: 35 (3.6, 26.0)
T7: 48 (4.9, 35.4)

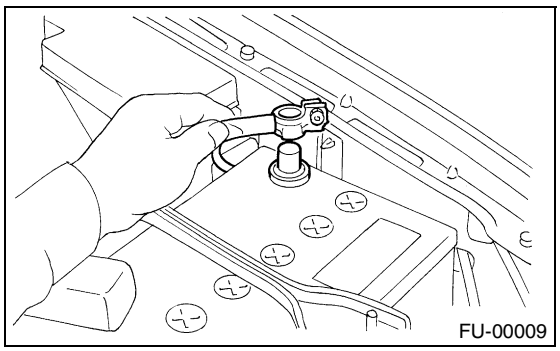
B: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

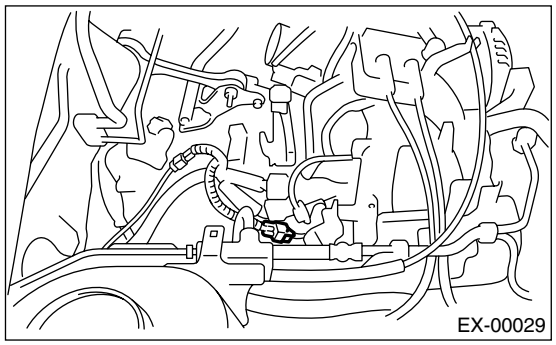
2. Front Exhaust Pipe

A: REMOVAL

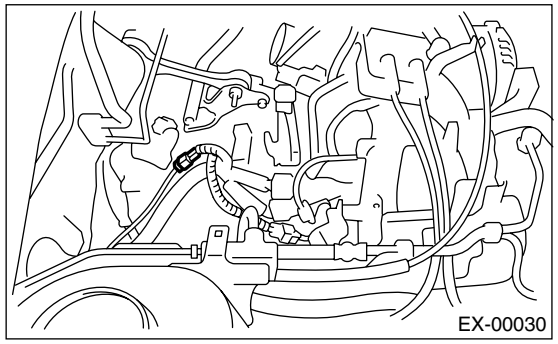
1) Disconnect the ground cable from battery.



2) Disconnect the front oxygen (A/F) sensor connector.



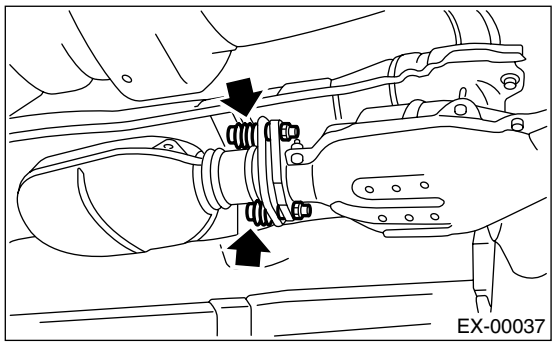
3) Disconnect the rear oxygen sensor connector.



4) Lift-up the vehicle.

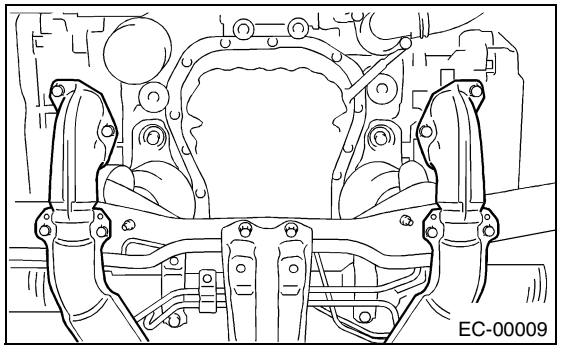
5) Separate the front and center exhaust pipe assembly from rear exhaust pipe.

CAUTION:
Be careful, the exhaust pipe is hot.

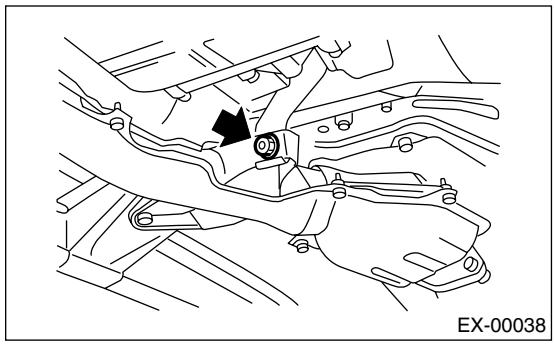


6) Remove the under cover.

7) Remove the nuts which hold front exhaust pipe onto cylinder heads.



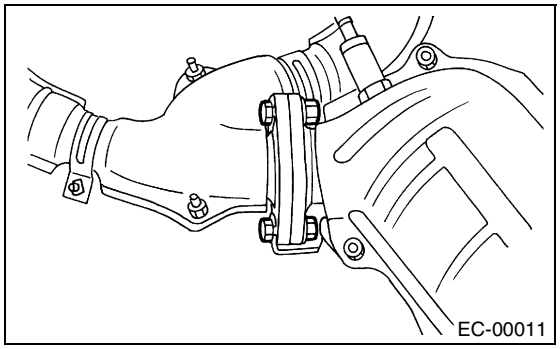
8) Remove the bolt which installs front and center exhaust pipe assembly to hanger bracket.



9) Remove the front and center exhaust pipe assembly from vehicle.

CAUTION:
• Be careful not to let the front and center exhaust pipe assembly fall off when removing as it is quite heavy.
• After removing the front and center exhaust pipe assembly, do not apply excessive pulling force on the rear exhaust pipe.

10) Separate the front exhaust pipe from center exhaust pipe.



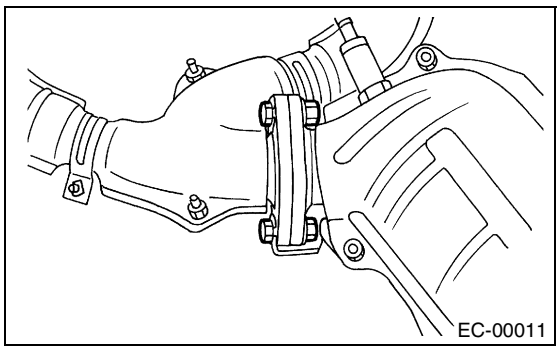
11) Remove the front oxygen (A/F) sensor and the rear oxygen sensor. <Ref. to FU(SOHC)-42, REMOVAL, Front Oxygen (A/F) Sensor.> and <Ref. to FU(SOHC)-44, REMOVAL, Rear Oxygen Sensor.>

B: INSTALLATION

1) Install the front oxygen (A/F) sensor and the rear oxygen sensor. <Ref. to FU(SOHC)-42, INSTALLATION, Front Oxygen (A/F) Sensor.> and <Ref. to FU(SOHC)-44, INSTALLATION, Rear Oxygen Sensor.>
2) Install the front exhaust pipe to center exhaust pipe.

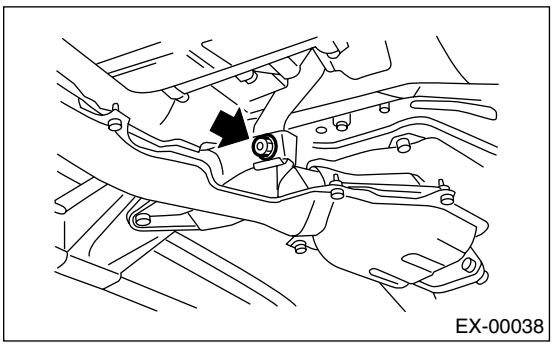
NOTE:
Replace the gaskets with new ones.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)



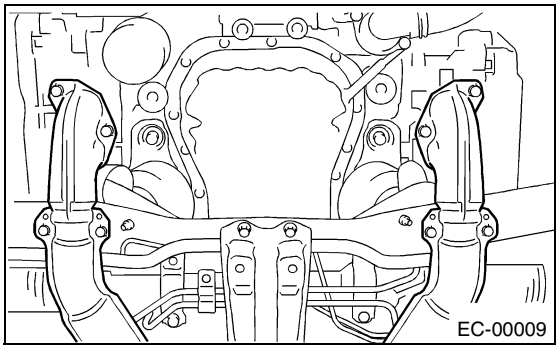
3) Install the front and center exhaust pipe assembly to vehicle.

4) Temporarily tighten the bolt which installs front and center exhaust pipe assembly to hanger bracket.



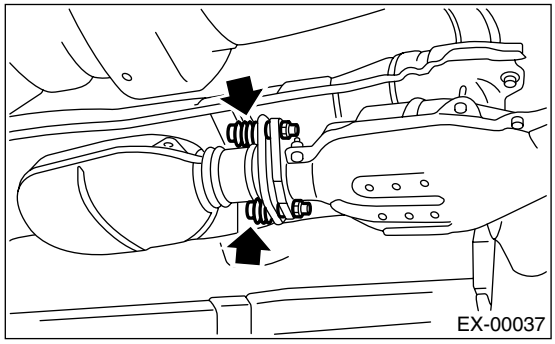
5) Tighten the nuts which hold front exhaust pipe onto cylinder heads.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)



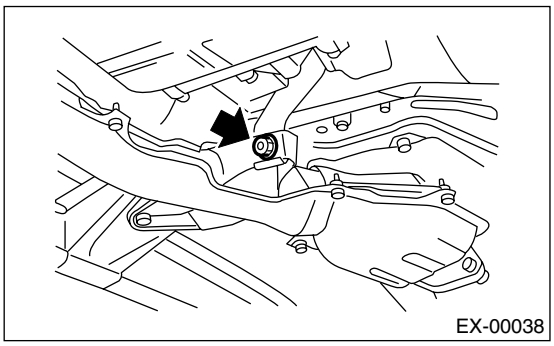
6) Install the under cover.
7) Tighten the bolts which install front and center exhaust pipe assembly to rear exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

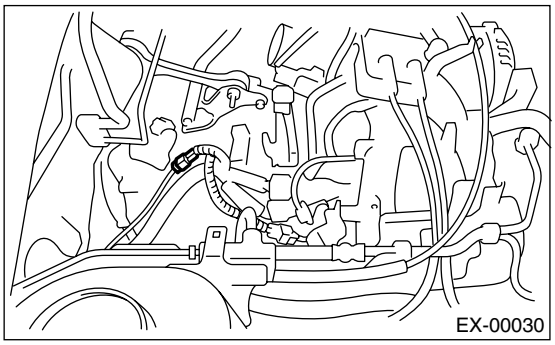


8) Tighten the bolt which holds front and center exhaust pipe assembly to hanger bracket.

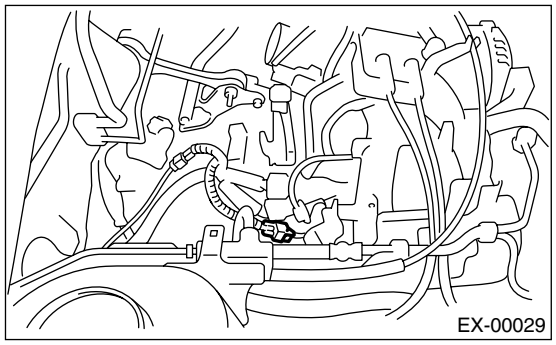
Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)


EX-00038

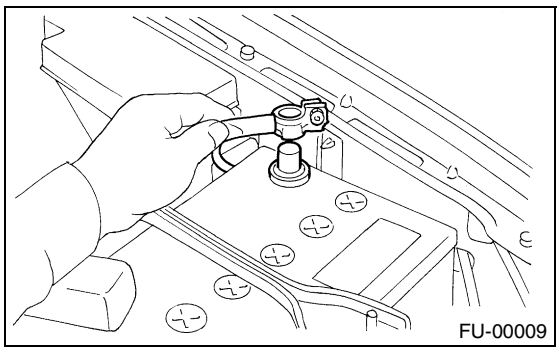
9) Lower the vehicle.
10) Connect the rear oxygen sensor connector.


EX-00030

11) Connect the front oxygen (A/F) sensor connector.


EX-00029

12) Connect the battery ground cable to battery.


FU-00009

C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

3. Center Exhaust Pipe

A: REMOVAL

After removing the center and front exhaust pipes as one unit, separate them. Refer to the procedure for removing the front exhaust pipe. <Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.>

B: INSTALLATION

Install the center exhaust pipe and front exhaust pipe as one unit. Refer to the procedure for installing the front exhaust pipe. <Ref. to EX(SOHC)-8, INSTALLATION, Front Exhaust Pipe.>

C: INSPECTION

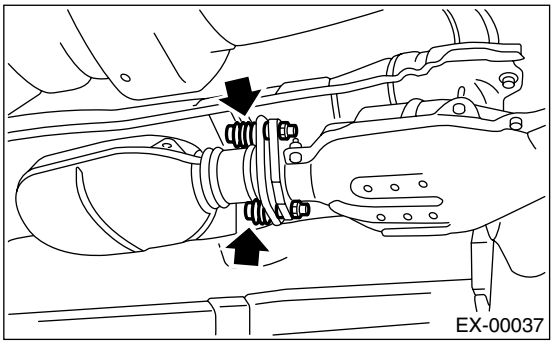
1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

4. Rear Exhaust Pipe

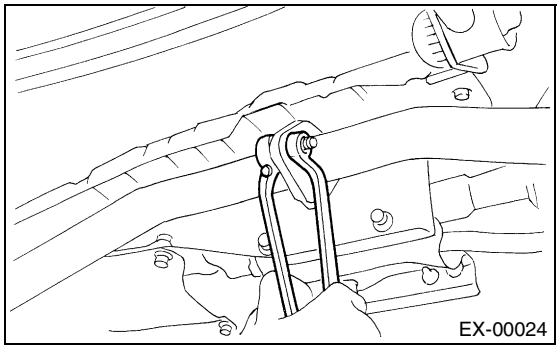
A: REMOVAL

1) Separate the rear exhaust pipe from center exhaust pipe.

CAUTION:
Be careful, the exhaust pipe is hot.



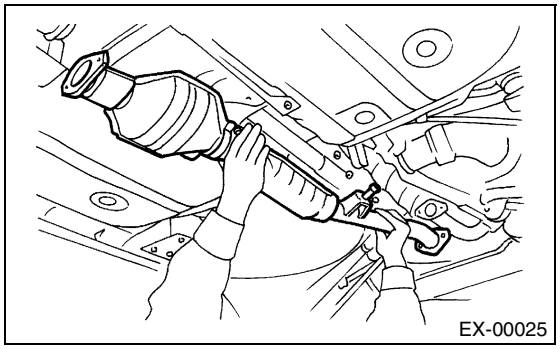
2) Separate the rear exhaust pipe from muffler.



3) Apply a coat of SUBARU CRC to mating area of the cushion rubbers in advance.

SUBARU CRC (Part No. 004301003)

4) Remove the rear exhaust pipe bracket from the cushion rubber.

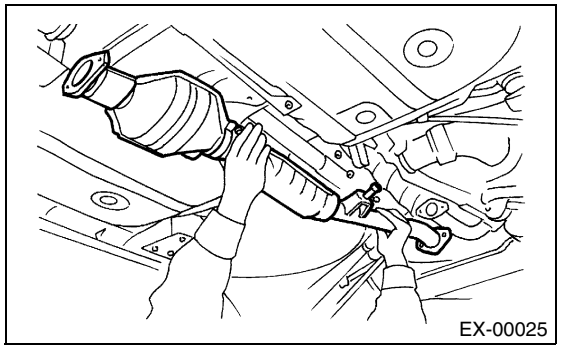


B: INSTALLATION

1) Apply a coat of SUBARU CRC to mating area of the cushion rubbers in advance.

SUBARU CRC (Part No. 004301003)

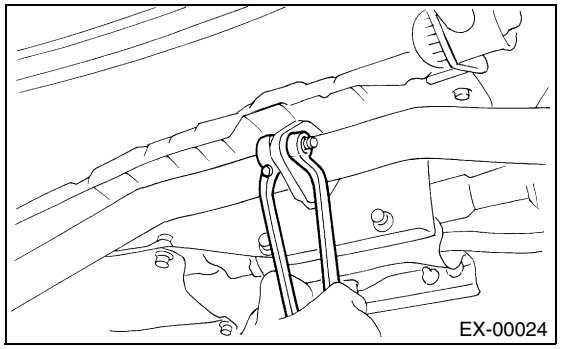
2) Install the rear exhaust pipe bracket to cushion rubber.



NOTE:
Replace the gaskets with new ones.

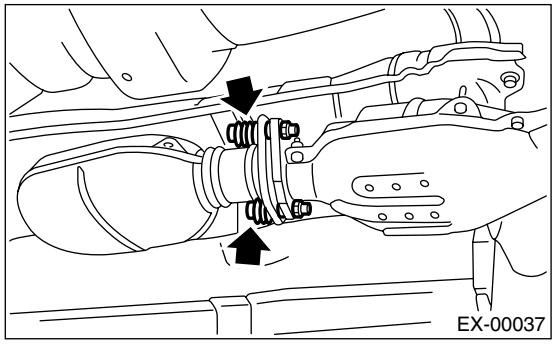
3) Install the rear exhaust pipe to muffler.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)



4) Install the rear exhaust pipe to center exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



C: INSPECTION

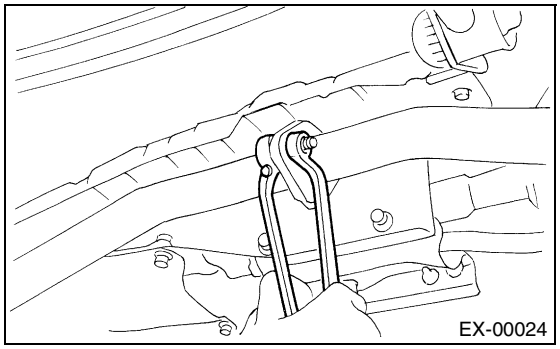
1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.
3) Make sure the cushion rubber is not worn or cracked.

5. Muffler

A: REMOVAL

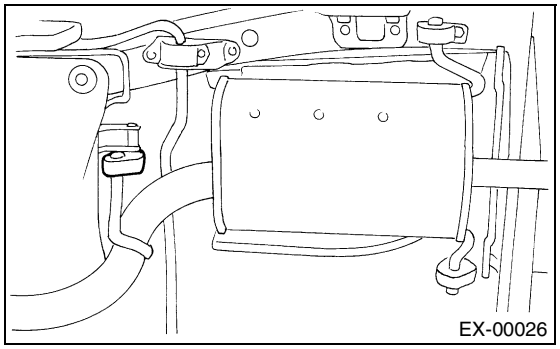
1) Separate the muffler from rear exhaust pipe.

CAUTION:
Be careful, the exhaust pipe is hot.



2) Apply a coat of SUBARU CRC to mating area of the cushion rubbers in advance.

SUBARU CRC (Part No. 004301003)



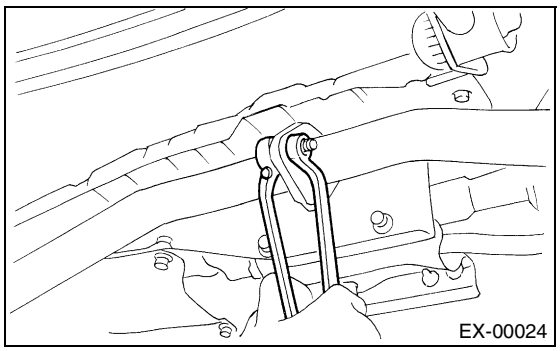
3) Remove the front, right and left cushion rubber, and detach the muffler assembly.

B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
Replace the gasket with a new one.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)



C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.
3) Make sure the cushion rubber is not worn or cracked.

MUFFLER

COOLING

CO(SOHC)

		Page
1.	General Description	2
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8.	Radiator Main Fan and Fan Motor	34
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1. General Description

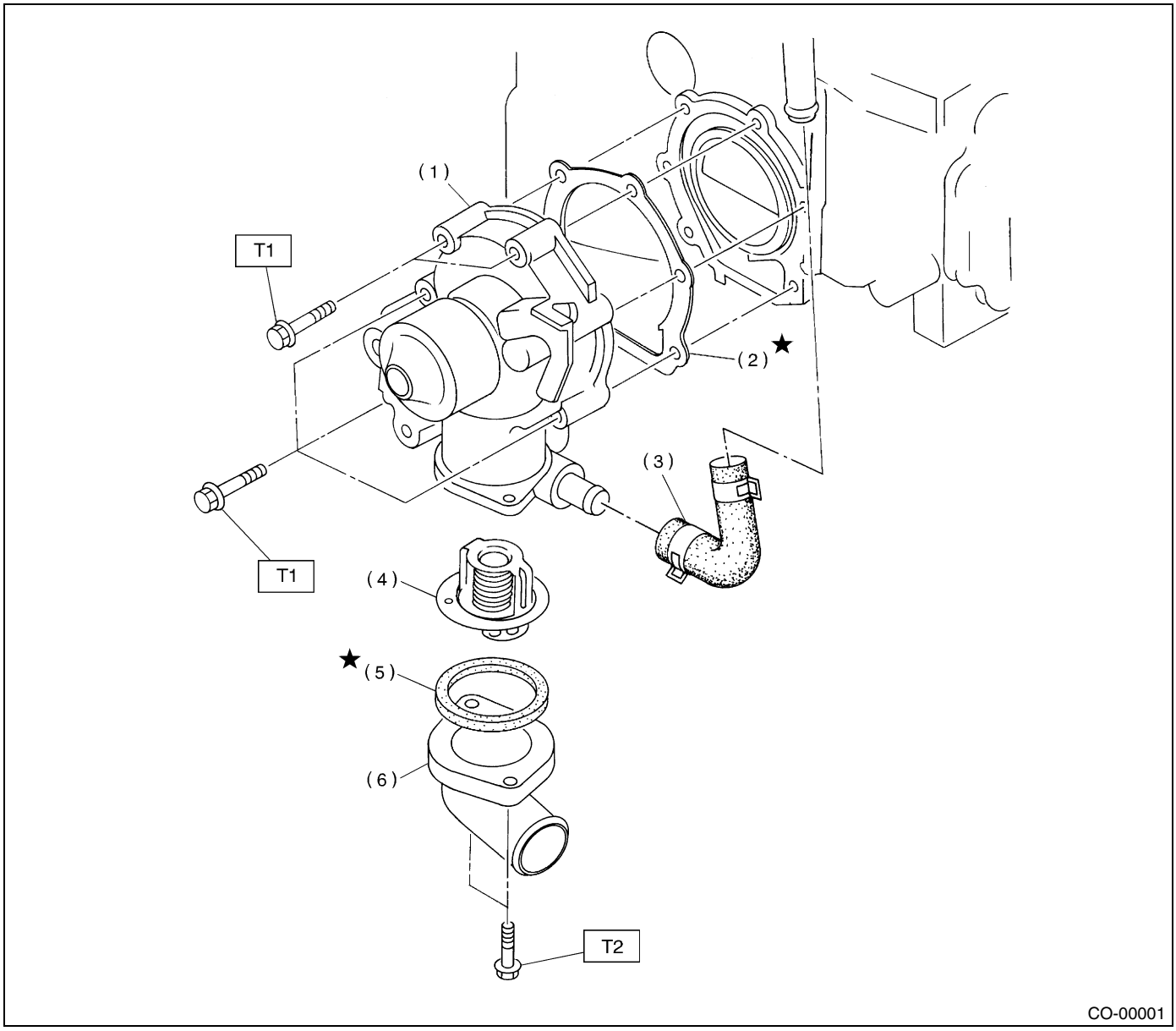
A: SPECIFICATIONS

Model			Non-turbo	Turbo
Cooling system			Electric fan + Forced engine coolant circulation system	
Total engine coolant capacity ℓ (US qt, Imp qt)			2.0L AT: Approx. 6.5 (6.87, 5.72) 2.0L MT: Approx. 6.6 (6.98, 5.81) 2.5L AT: Approx. 6.8 (7.19, 5.98) 2.5L MT: Approx. 6.9 (7.29, 6.07)	AT: Approx. 7.3 (7.71, 6.42) MT with oil cooler: Approx. 7.3 (7.71, 6.42) MT without oil cooler: Approx. 7.4 (7.82, 6.51)
Water pump	Type		Centrifugal impeller type	
	Discharge performance I	Discharge	20 ℓ (5.3 US gal, 4.4 Imp gal)/min.	
		Pump speed—Discharge pressure	760 rpm — 2.9 kPa (0.3 mAq)	
		Engine coolant temperature	85°C (185°F)	
	Discharge performance II	Discharge	100 ℓ (26.4 US gal, 22.0 Imp gal)/min.	
		Pump speed—Discharge pressure	3,000 rpm — 49.0 kPa (5.0 mAq)	
		Engine coolant temperature	85°C (185°F)	
	Discharge performance III	Discharge	200 ℓ (52.8 US gal, 44.0 Imp gal)/min.	
		Pump speed—Discharge pressure	6,000 rpm — 225.4 kPa (23.0 mAq)	
		Engine coolant temperature	85°C (185°F)	
	Impeller diameter		76 mm (2.99 in)	
	Number of impeller vanes		8	
	Pump pulley diameter		60 mm (2.36 in)	
	Clearance between impeller and case	Standard	0.5 — 0.7 mm (0.020 — 0.028 in)	
		Limit	1.0 mm (0.039 in)	
	"Thrust" runout of impeller end		0.5 mm (0.020 in)	
Thermostat	Type		Wax pellet type	
	Starts to open		80 — 84°C (176 — 183°F)	76 — 80°C (169 — 176°F)
	Fully opened		95°C (203°F)	91°C (196°F)
	Valve lift		9.0 mm (0.354 in) or more	
	Valve bore		35 mm (1.38 in)	
Radiator fan	Motor	Main fan	70 W	
		Sub fan	70 W	
	Fan diameter × Blade		320 mm (11.81 in) × 5 (main fan) 320 mm (11.81 in) × 7 (sub fan)	
Radiator	Type		Down flow, pressure type	
	Core dimensions	Width × Height × Thickness	691.5 × 360 × 16 mm (27.22 × 14.17 × 0.63 in)	
	Pressure range in which cap valve is open		Above: 108±15 kPa (1.1±0.15 kg/cm^2, 16±2 psi) Below: −1.0 to −4.9 kPa (−0.01 to −0.05 kg/cm^2, −0.1 to −0.7 psi)	
	Fins		Corrugated fin type	
Reservoir tank	Capacity		0.5 ℓ (0.5 US qt, 0.4 Imp qt)	

B: COMPONENT

1. WATER PUMP

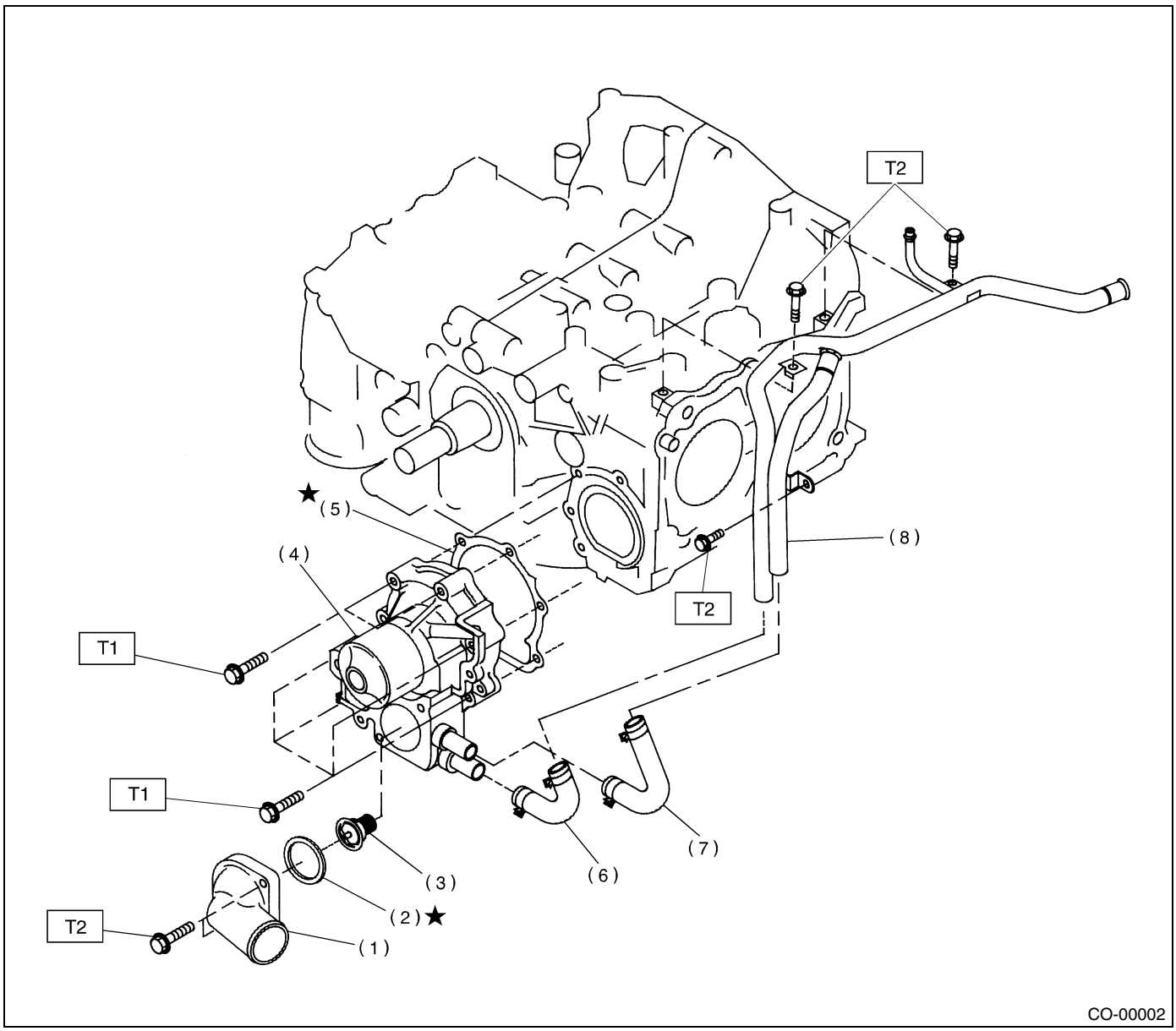
• NON-TURBO MODEL



(1) Water pump ASSY
(2) Gasket
(3) Heater by-pass hose
(4) Thermostat
(5) Gasket
(6) Thermostat cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)
T2: 6.5 (0.66, 4.8)

• TURBO MODEL

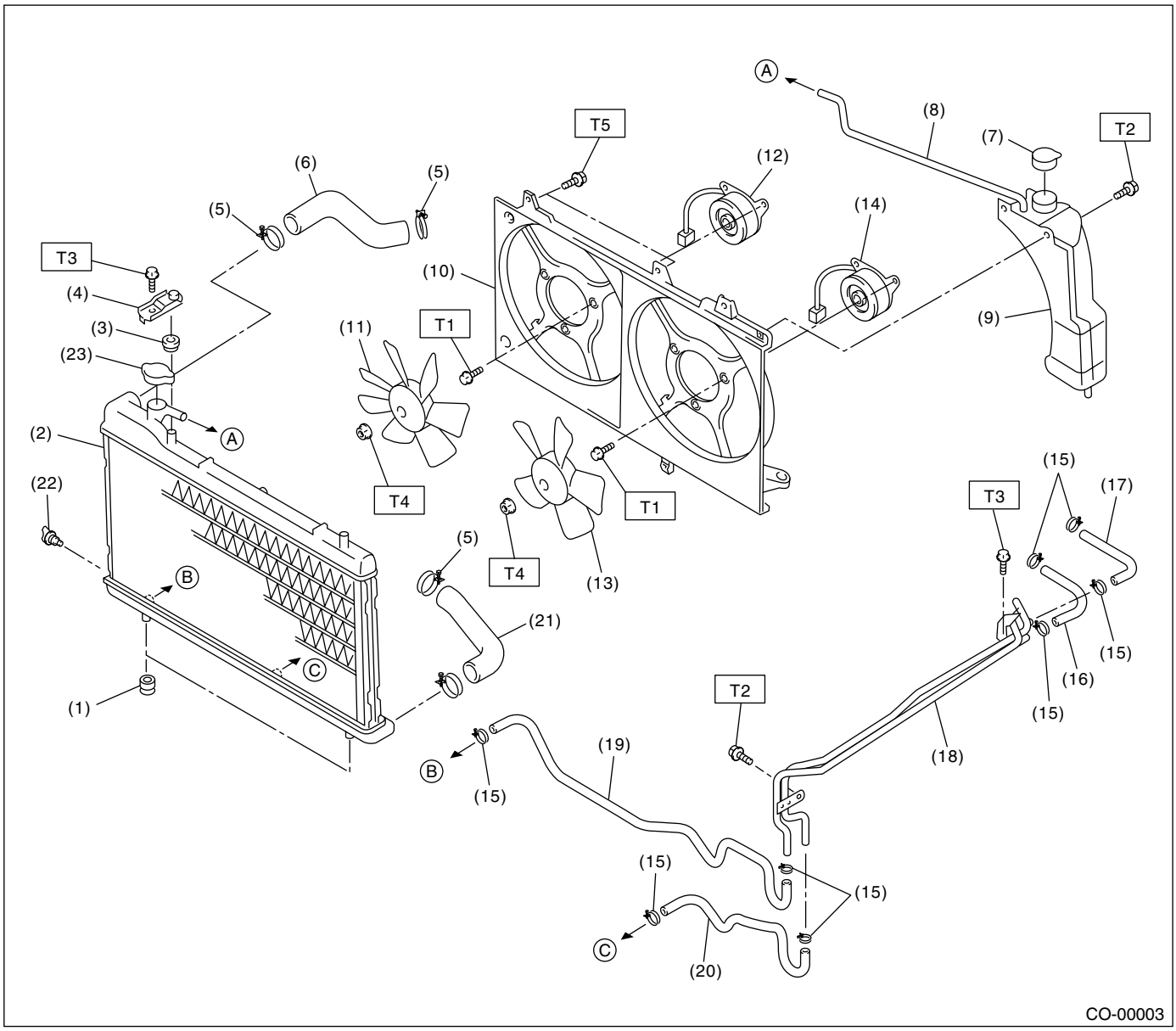


(1) Thermostat cover
(2) Gasket
(3) Thermostat
(4) Water pump ASSY
(5) Gasket
(6) Heater by-pass hose
(7) Coolant filler tank by-pass hose
(8) Water by-pass pipe

Tightening torque: N·m (kgf-m, ft-lb)
T1: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)
T2: 6.5 (0.66, 4.8)

2. RADIATOR AND RADIATOR FAN

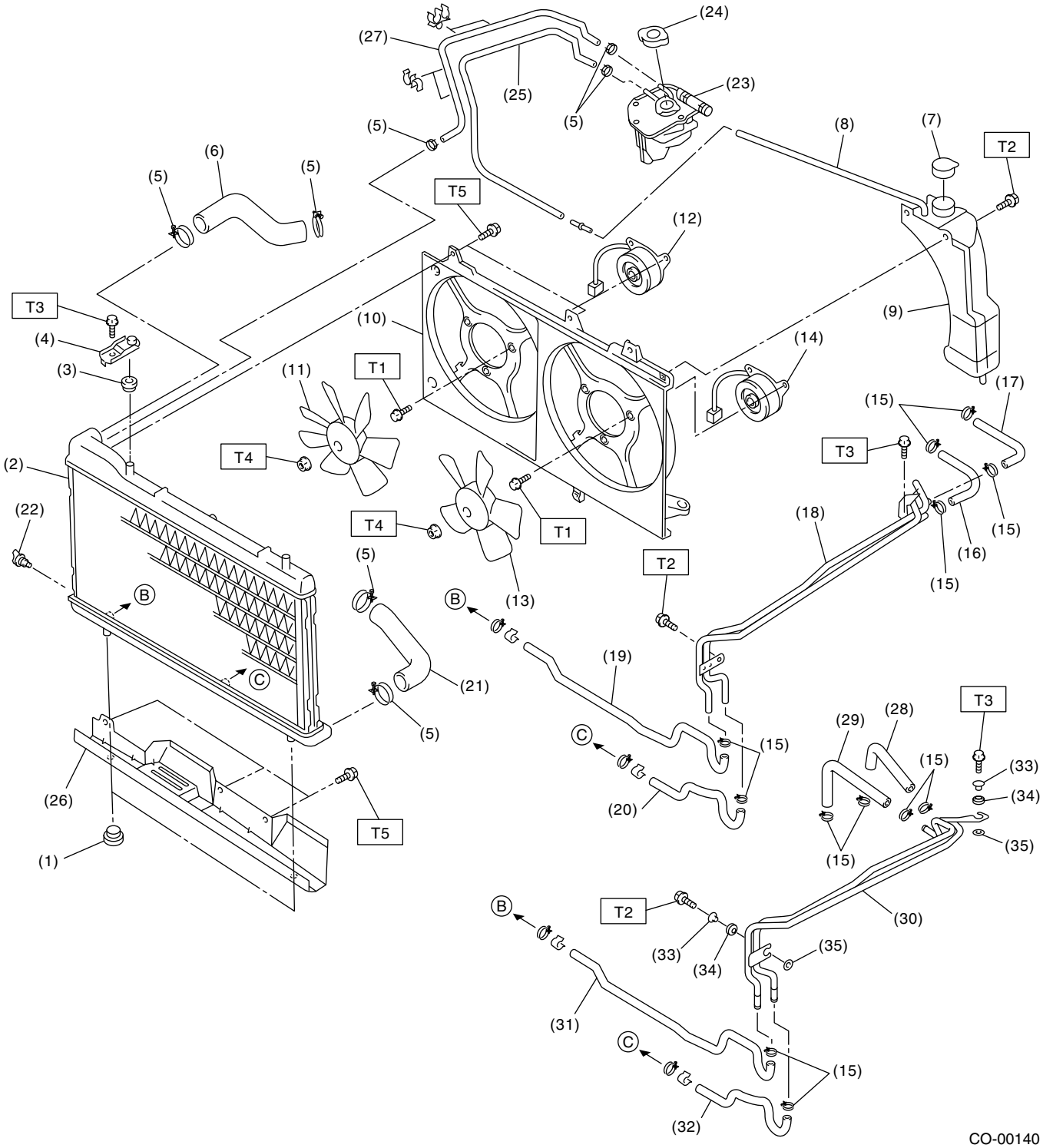
• NON-TURBO MODEL



(1)	Radiator lower cushion	(13)	Radiator main fan	(21)	Radiator outlet hose
(2)	Radiator	(14)	Radiator main fan motor	(22)	Radiator drain plug
(3)	Radiator upper cushion	(15)	ATF hose clamp (AT vehicles only)	(23)	Radiator cap
(4)	Radiator upper bracket				
(5)	Clamp	(16)	ATF inlet hose A (AT vehicles only)		
(6)	Radiator inlet hose				
(7)	Engine coolant reservoir tank cap	(17)	ATF outlet hose A (AT vehicles only)		
(8)	Over flow hose				
(9)	Engine coolant reservoir tank	(18)	ATF pipe (AT vehicles only)		
(10)	Radiator sub fan shroud	(19)	ATF inlet hose B (AT vehicles only)		
(11)	Radiator sub fan				
(12)	Radiator sub fan motor	(20)	ATF outlet hose B (AT vehicles only)		

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 7.5 (0.76, 5.5)
T3: 18 (1.8, 13.0)
T4: 3.4 (0.35, 2.5)
T5: 4.9 (0.50, 3.6)

• TURBO MODEL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C
(15)
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CO-00140

(1) Radiator lower cushion
(2) Radiator
(3) Radiator upper cushion
(4) Radiator upper bracket
(5) Clamp
(6) Radiator inlet hose
(7) Engine coolant reservoir tank cap
(8) Over flow hose
(9) Engine coolant reservoir tank
(10) Radiator fan shroud
(11) Radiator sub fan
(12) Radiator sub fan motor
(13) Radiator main fan
(14) Radiator main fan motor
(15) ATF hose clamp (AT vehicles only)
(16) ATF inlet hose A (AT vehicles only)
(17) ATF outlet hose A (AT vehicles only)
(18) ATF pipe (AT vehicles only)
(19) ATF inlet hose B (AT vehicles only)
(20) ATF outlet hose B (AT vehicles only)
(21) Radiator outlet hose
(22) Radiator drain plug
(23) Engine coolant filler tank
(24) Engine coolant filler tank cap
(25) Engine overflow hose
(26) Radiator under cover (AT vehicles only)
(27) Engine air breather hose
(28) Oil cooler inlet hose A (MT vehicles with oil cooler)
(29) Oil cooler outlet hose A (MT vehicles with oil cooler)
(30) Oil cooler pipe (MT vehicles with oil cooler)
(31) Oil cooler inlet hose B (MT vehicles with oil cooler)
(32) Oil cooler outlet hose B (MT vehicles with oil cooler)
(33) Spacer (MT vehicles with oil cooler)
(34) Cushion (MT vehicles with oil cooler)
(35) Setting washer (MT vehicles with oil cooler)

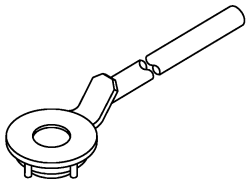
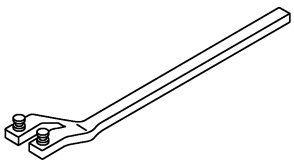
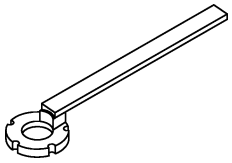
Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 7.5 (0.76, 5.5)
T3: 18 (1.8, 13.0)
T4: 3.4 (0.35, 2.5)
T5: 4.9 (0.50, 3.6)

C: CAUTION

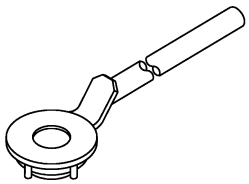
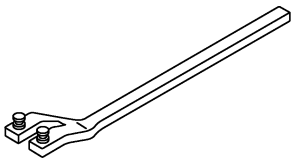
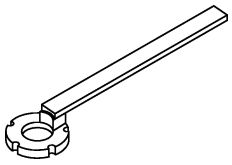
• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

D: PREPARATION TOOL

1. NON-TURBO MODEL

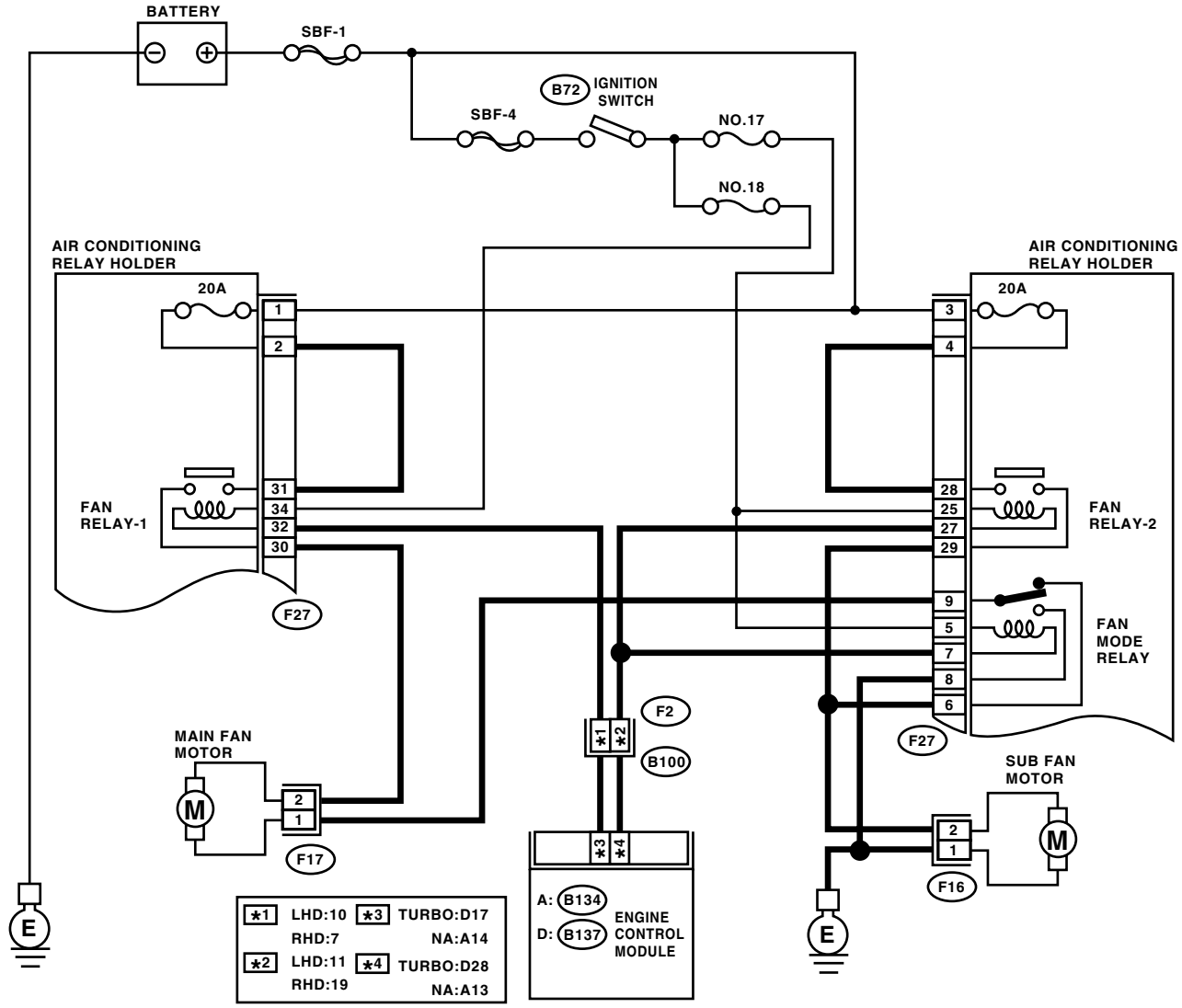
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977400	499977400 (2000 cc model) 499977100 (2500 cc model)	CRANK PULLEY WRENCH	Used for stopping crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 ST18231AA010	18231AA010	CAMSHAFT SPROCKET WRENCH (For left side)	• Used for removing and installing camshaft sprocket (LH). • Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.
 ST-499207400	499207400	CAMSHAFT SPROCKET WRENCH (For right side)	Used for removing and installing camshaft sprocket (RH).

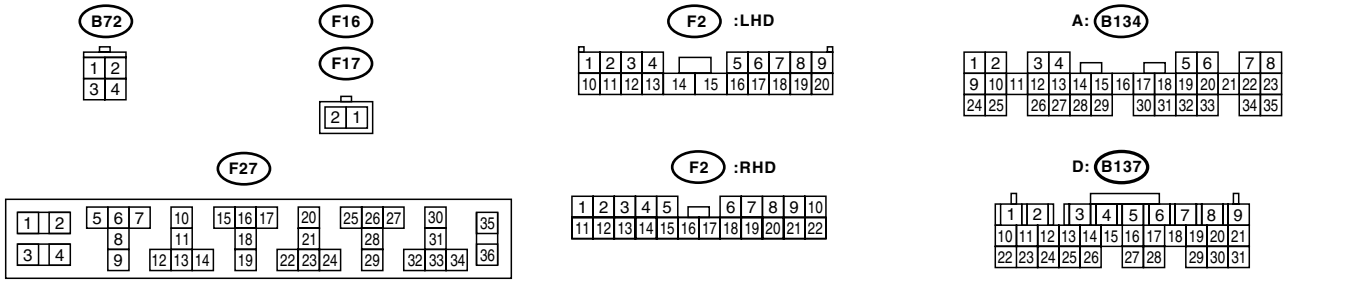
2. TURBO MODEL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977400	499977400	CRANK PULLEY WRENCH	Used for stopping crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 ST18231AA010	18231AA010	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket. (Intake)
 ST-499207400	499207400	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket. (Exhaust)

2. Radiator Fan System

A: SCHEMATIC





CO-00141

B: INSPECTION

DETECTING CONDITION:

- Engine coolant temperature is above 95°C (203°F).
- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOM:

- Radiator main fan and sub fan does not rotate under the above conditions.

	Step	Value	Yes	No
1	**CHECK OPERATION OF RADIATOR FAN.** 1)Connect the test mode connector. 2)Turn the ignition switch to ON. 3)Using Subaru Select Monitor, check the compulsory operation of radiator fan relay. Do the radiator main and sub fan rotate at low speed? NOTE: •With Subaru Select Monitor When checking the compulsory operation of radiator fan, the radiator main and sub fan repeat the rotation in order of following: low speed rotation → high speed rotation → off. •Subaru Select Monitor Refer to Compulsory Valve Operation Check Mode for detail procedures. <Ref. to EN(SOHC)-48, Compulsory Valve Operation Check Mode.>	Main and sub radiator fan rotate at low speed.	Go to step **2.**	Go to step **3.**
2	**CHECK OPERATION OF RADIATOR FAN.** 1)Connect the test mode connector. 2)Turn the ignition switch to ON. 3)Using Subaru Select Monitor, check the compulsory operation of radiator fan relay. Do the radiator main and sub fan rotate at high speed? NOTE: •With Subaru Select Monitor When checking the compulsory operation of radiator fan, the radiator main and sub fan repeat the rotation in order of following: low speed rotation → high speed rotation → off. •Subaru Select Monitor Refer to Compulsory Valve Operation Check Mode for detail procedures. <Ref. to EN(SOHC)-48, Compulsory Valve Operation Check Mode.>	Main and sub radiator fans rotate faster at high speed.	Radiator main fan system is okay.	Go to step **32.**
3	**CHECK POWER SUPPLY TO FAN RELAY 1.** 1)Turn the ignition switch to OFF. 2)Remove the fan relay 1 from A/C relay holder. 3)Measure the voltage between fan relay 1 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 31 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **4.**	Go to step **5.**

	Step	Value	Yes	No
4	**CHECK POWER SUPPLY TO FAN RELAY 1.** 1)Turn the ignition switch to ON. 2)Measure the voltage between fan relay 1 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 34 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **8.**	Go to step **7.**
5	**CHECK FUSE.** 1)Remove the 20 A fuse from A/C relay holder. 2)Check the condition of fuse. Is the fuse blown out?	Fuse is blown out.	Replace the fuse.	Go to step **6.**
6	**CHECK HARNESS OF 20 A FUSE TERMINAL AND FAN RELAY 1 TERMINAL.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between 20 A fuse terminal and fan relay 1 terminal. ***Terminal*** ***No. 2 — No. 31:*** Is the measured value less than specified value?	1 Ω	Repair the power supply line.	Repair the open harness.
7	**CHECK FUSE.** 1)Turn the ignition switch to OFF 2)Remove the fuse No. 18. 3)Check the condition of fuse. Is the fuse blown out?	Fuse is blown out.	Replace the fuse.	Repair the power supply line.
8	**CHECK FAN RELAY 1.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between fan relay 1 terminals. ***Terminal*** ***No. 30 — No. 31:*** Is the measured value more than specified value?	1 MΩ	Go to step **9.**	Replace the fan relay 1.
9	**CHECK FAN RELAY 1.** 1)Connect the battery to fan relay terminals No. 32 and No. 34. 2)Measure the resistance between fan relay 1 terminals. ***Terminal*** ***No. 30 — No. 31:*** Is the measured value less than specified value?	1 Ω	Go to step **10.**	Replace the fan relay 1.
10	**CHECK HARNESS BETWEEN FAN RELAY 1 TERMINAL AND MAIN FAN MOTOR CONNECTOR.** 1)Disconnect the connector from main fan motor. 2)Measure the resistance between fan relay 1 terminal and main fan motor connector. ***Connector & terminal*** ***(F17) No. 2 — (F27) No. 30:*** Is the measured value less than specified value?	1 Ω	Go to step **11.**	Repair the open harness between fan relay 1 terminal and main fan motor connector.

	Step	Value	Yes	No
11	**CHECK HARNESS BETWEEN MAIN FAN MOTOR CONNECTOR AND FAN MODE RELAY CONNECTOR.** 1)Remove the fan mode relay from A/C relay holder. 2)Measure the resistance between main fan motor connector and fan mode relay connector. ***Connector & terminal*** ***(F17) No. 1 — (F27) No. 9:*** Is the measured value less than specified value?	1 Ω	Go to step **12.**	Repair the open harness between main fan motor connector and fan mode relay connector.
12	**CHECK POOR CONTACT.** Check poor contact in main fan motor connector. Is there poor contact in main fan motor connector?	There is poor contact.	Repair poor contact in main fan motor connector.	Go to step **13.**
13	**CHECK MAIN FAN MOTOR.** Connect the battery positive (+) terminal to terminal No.2, and ground (-) terminal to terminal No.1 of main fan motor. Does the main fan rotate?	Main fan rotates.	Go to step **14.**	Replace the main fan motor.
14	**CHECK FAN MODE RELAY.** Measure the resistance of fan mode relay. ***Terminal*** ***No. 6 — No. 9:*** Is the measured value less than specified value?	1 Ω	Go to step **15.**	Replace the fan mode relay.
15	**CHECK RESISTANCE BETWEEN FAN MODE RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR.** 1)Disconnect the connector from sub fan motor. 2)Measure the resistance between fan mode relay terminal and sub fan motor connector. ***Connector & terminal*** ***(F16) No. 2 — (F27) No. 6:*** Is the measured value less than specified value?	1 Ω	Go to step **16.**	Repair the open harness between fan mode relay terminal and sub fan motor connector.
16	**CHECK SUB FAN MOTOR AND GROUND CIRCUIT.** Measure the resistance between sub fan motor connector and chassis ground. ***Connector & terminal*** ***(F16) No. 1 — Chassis ground:*** Is the measured value less than specified value?	5 Ω	Go to step **17.**	Repair the open harness between sub fan motor connector and chassis ground.
17	**CHECK POOR CONTACT.** Check poor contact in sub fan motor connector. Is there poor contact in sub fan motor connector?	There is poor contact.	Repair poor contact in sub fan motor connector.	Go to step **18.**
18	**CHECK SUB FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 2, and ground (-) terminal to terminal No. 1 of sub fan motor. Does the sub fan rotate?	Sub fan rotates.	Go to step **19.**	Replace the sub fan motor.

	Step	Value	Yes	No
19	**CHECK HARNESS BETWEEN FAN RELAY 1 AND ECM.** 1)Disconnect the connector from ECM. 2)Measure the resistance between fan relay 1 terminal and ECM connector. ***Connector & terminal*** ***Turbo: (B137) No. 17 — (F27) No. 32:*** ***Non-turbo: (B134) No. 14 — (F27) No. 32:*** Is the measured value less than specified value?	1 Ω	Go to step **20.**	Repair the open harness between fan relay 1 terminal and ECM.
20	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Contact with SOA (distributor) service.
21	**CHECK POWER SUPPLY TO FAN RELAY 2.** 1)Turn the ignition switch to OFF. 2)Remove the fan relay 2 from A/C relay holder. 3)Measure the voltage between fan relay 2 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 28 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **22.**	Go to step **23.**
22	**CHECK POWER SUPPLY TO FAN RELAY 2.** 1)Turn the ignition switch to ON. 2)Measure the voltage between fan relay 2 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 25 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **26.**	Go to step **25.**
23	**CHECK FUSE.** 1)Remove the 20 A fuse from A/C relay holder. 2)Check the condition of fuse. Is the fuse blown out?	Fuse is blown out.	Replace the fuse.	Go to step **24.**
24	**CHECK HARNESS BETWEEN 20 A FUSE TERMINAL AND FAN RELAY 2 TERMINAL.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between 20 A fuse terminal and fan relay 2 terminal. ***Terminal*** ***No. 4 — No. 28:*** Is the measured value less than specified value?	1 Ω	Repair the power supply line.	Repair the open harness.
25	**CHECK FUSE.** 1)Turn the ignition switch to OFF. 2)Remove the fuse No. 17. 3)Check the condition of fuse. Is the fuse blown out?	Fuse is blown out.	Replace the fuse.	Repair the power supply line.
26	**CHECK FAN RELAY 2.** 1)Turn the ignition switch to OFF. 2)Remove the fan relay 2 from A/C relay holder. 3)Measure the resistance of fan relay 2. ***Terminal*** ***No. 28 — No. 29:***	1 MΩ	Go to step **27.**	Replace the fan relay 2.

	Step	Value	Yes	No
27	**CHECK FAN RELAY 2.** 1)Connect the battery to terminals No. 25 and No. 27 of fan relay. 2)Measure the resistance of fan relay 2. ***Terminal*** ***No. 28 — No. 29:*** Is the measured value less than specified value?	1 Ω	Go to step **28.**	Replace the fan relay 2.
28	**CHECK HARNESS BETWEEN FAN RELAY 2 TERMINAL AND SUB FAN MOTOR CONNECTOR.** 1)Disconnect the connector from sub fan motor. 2)Measure the resistance between fan relay 2 terminal and sub fan motor connector. ***Connector & terminal*** ***(F16) No. 2 — (F27) No. 29:*** Is the measured value less than specified value?	1 Ω	Go to step **30.**	Repair the open harness between fan relay 2 terminal and sub fan motor connector.
29	**CHECK HARNESS BETWEEN FAN RELAY 2 AND ECM.** 1)Disconnect the connector from ECM. 2)Measure the resistance between fan relay 2 terminal and ECM connector. 3)Check the condition of fuse. ***Connector & terminal*** ***Turbo: (B137) No. 28 — (F27) No. 27:*** ***Non-turbo: (B134) No. 13 — (F27) No. 27:*** Is the measured value less than specified value?	1 Ω	Go to step **30.**	Repair the open harness between fan relay 2 terminal and ECM.
30	**CHECK HARNESS BETWEEN FAN MODE RELAY AND ECM.** Measure the resistance between fan mode relay terminal and ECM connector. ***Connector & terminal*** ***Turbo: (B137) No. 28 — (F27) No. 7:*** ***Non-turbo: (B134) No. 13 — (F27) No. 7:*** Is the measured value less than specified value?	1 Ω	Go to step **31.**	Repair the open harness between fan mode relay terminal and ECM.
31	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair the poor contact in ECM connector.	Contact with your SOA (distributor) service.
32	**CHECK OPERATION OF RADIATOR FAN.** Does the radiator main fan rotate when the radiator main and sub fan do not rotate at high speed?	The Radiator main fan rotates.	Go to step **21.**	Go to step **33.**
33	**CHECK GROUND CIRCUIT OF FAN MODE RELAY.** 1)Remove the fan mode relay from A/C relay holder. 2)Measure the resistance between fan mode relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 8 — Chassis ground:*** Is the measured value less than specified value?	1 Ω	Go to step **34.**	Repair the open harness between fan mode relay and chassis ground.

	Step	Value	Yes	No
34	**CHECK POWER SUPPLY TO FAN MODE RELAY.** 1)Turn the ignition switch to ON. 2)Measure the voltage between fan mode relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 5 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **35.**	Repair the power supply line.
35	**CHECK FAN MODE RELAY.** 1)Turn the ignition switch to OFF. 2)Remove the fan mode relay. 3)Measure the resistance of fan mode relay. ***Terminal*** ***(F27) No. 8 — (F27) No. 9:*** Is the measured value more than specified value?	1 MΩ	Go to step **36.**	Replace the fan mode relay.
36	**CHECK FAN MODE RELAY.** 1)Connect the battery to terminals No. 5 and No. 7 of fan mode relay. 2)Measure the resistance of fan mode relay. ***Terminal*** ***(F27) No. 8 — (F27) No. 9:*** Is the measured value less than specified value?	1 Ω	Go to step **29.**	Replace the fan mode relay.

NOTE:
Inspection by your Subaru distributor is required, because probable cause is deterioration of multiple parts.

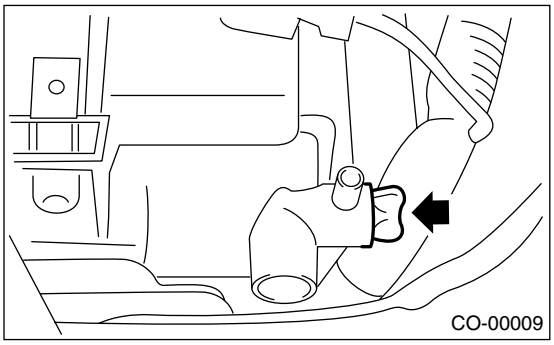
3. Engine Coolant

A: REPLACEMENT

1. DRAINING OF ENGINE COOLANT

1) Lift-up the vehicle.
2) Remove the under cover.
3) Remove the drain cock to drain engine coolant into container.

NOTE:
Remove the radiator cap so that engine coolant will drain faster.



4) Install the drain cock.

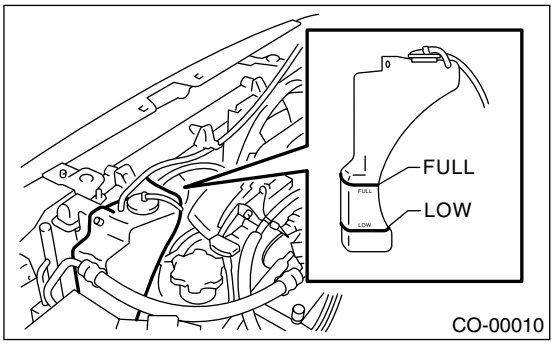
2. FILLING OF ENGINE COOLANT

1) For Turbo model, remove the rubber cap of air bleeding pipe at compressor left side in front of engine, and then install the vinyl hose.
For Non-turbo model (RHD), remove the air bleeding valve cap of heater hose.
2) Fill engine coolant.
3) When engine coolant is filled up to the air bleeding pipe (valve), install the cap.
4) Fill engine coolant into the radiator up to filler neck position.

Coolant capacity (fill up to "FULL" level):
2.0 L Non-turbo (AT) model
Approx. 6.5 ℓ (6.87 US qt, 5.72 Imp qt)
2.0 L Non-turbo (MT) model
Approx. 6.6 ℓ (6.98 US qt, 6.14 Imp qt)
2.5 L Non-turbo (AT) model
Approx. 6.8 ℓ (7.19 US qt, 5.98 Imp qt)
2.5 L Non-turbo (MT) model
Approx. 6.9 ℓ (7.29 US qt, 6.07 Imp qt)
2.0 L Turbo (AT and MT with oil cooler) model
Approx. 7.3 ℓ (7.72 US qt, 6.42 Imp qt)
2.0 L Turbo (MT without oil cooler) model
Approx. 7.4 ℓ (7.82 US qt, 6.51 Imp qt)

NOTE:
The SUBARU Genuine Coolant containing anti-freeze and anti-rust agents is especially made for SUBARU engine, which has an aluminum crank-case. Always use SUBARU Genuine Coolant, since other coolant may cause corrosion.

5) Fill engine coolant into the reservoir tank up to Full level.

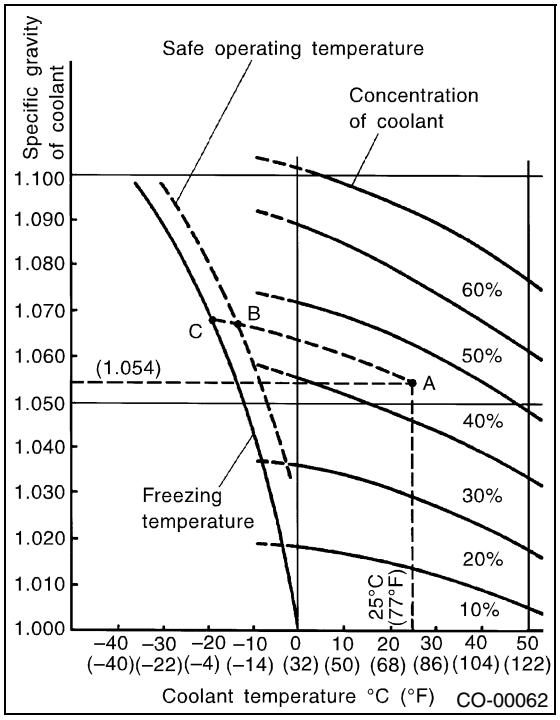


6) Warm-up the engine completely for more than 5 minutes at 2,000 to 3,000 rpm.
7) If the engine coolant level drops in radiator, add engine coolant to filler neck position.
8) If the engine coolant level drops from Full level of reservoir tank, add engine coolant to Full level.
9) Attach the radiator cap and reservoir tank cap properly.

B: INSPECTION

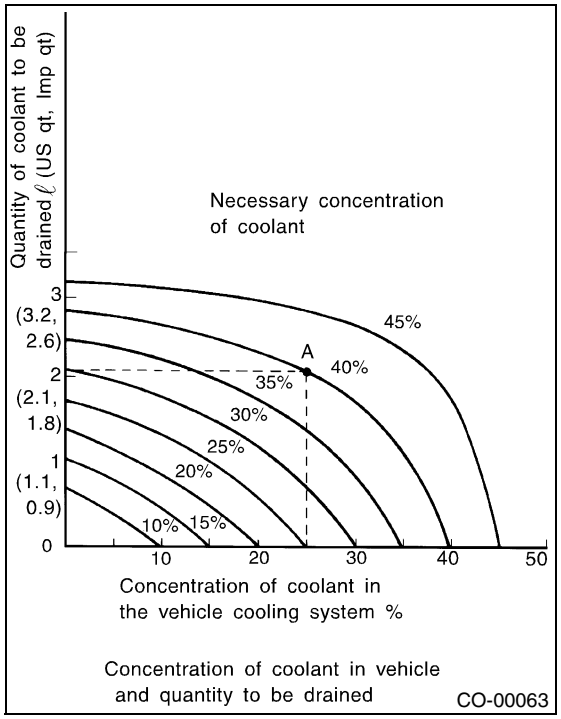
1. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

The concentration and safe operating temperature of the SUBARU coolant is shown in the diagram. Measuring the temperature and specific gravity of the coolant will provide this information.
[Example]
If the coolant temperature is 25°C (77°F) and its specific gravity is 1.054, the concentration is 35% (point A), the safe operating temperature is –14°C (7°F) (point B), and the freezing temperature is –20°C (–4°F) (point C).



2. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50%).
The amount of coolant that should be replaced can be determined using the diagram.
[Example]
Assume that the coolant concentration must be increased from 25% to 40%. Find point A, where the 25% line of coolant concentration intersects with the 40% curve of the necessary coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of coolant to be drained is 2.1 ℓ (2.2 US qt, 1.8 Imp qt). Drain 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of the undiluted solution of SUBARU coolant.
If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.

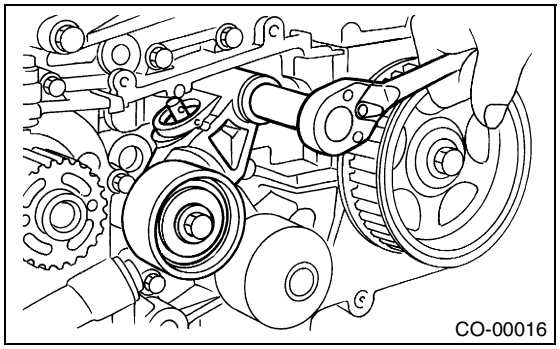


4. Water Pump

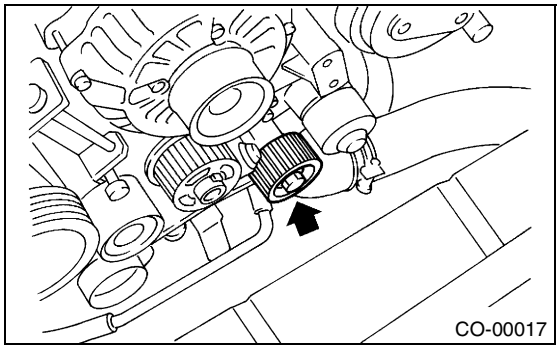
A: REMOVAL

1. NON-TURBO MODEL

1) Remove the radiator. <Ref. to CO(SOHC)-27, REMOVAL, Radiator.>
2) Remove the V-belts. <Ref. to ME(SOHC)-41, REMOVAL, V-belt.>
3) Remove the timing belt. <Ref. to ME(SOHC)-46, TIMING BELT, REMOVAL, Timing Belt Assembly.>
4) Remove the automatic belt tension adjuster.


CO-00016

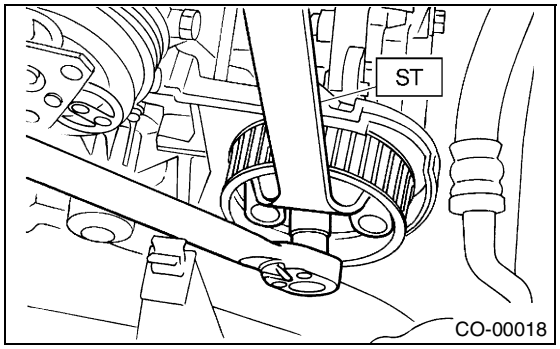
5) Remove the belt idler No. 2.


CO-00017

6) Remove the camshaft sprocket (LH) by using ST.

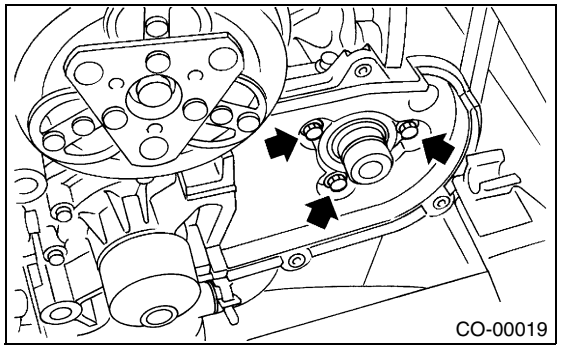
ST 18231AA010 CAMSHAFT SPROCKET WRENCH

NOTE:
Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.

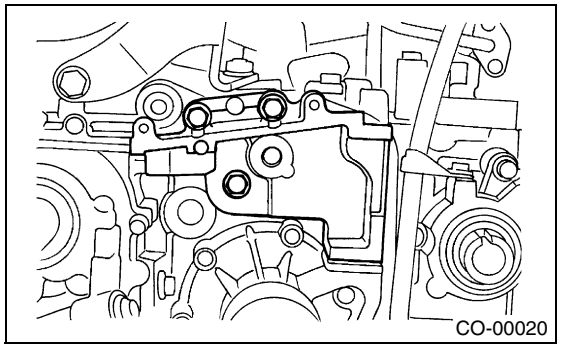


CO-00018

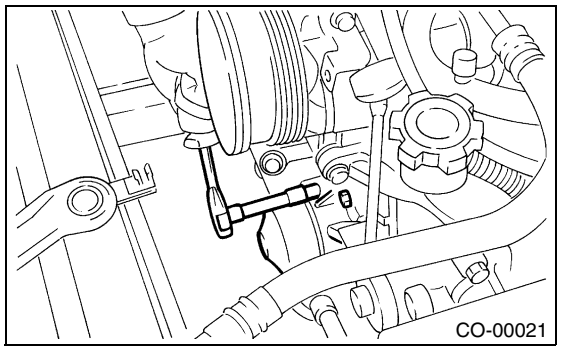
7) Remove the belt cover No. 2 (LH).


CO-00019

8) Remove the tensioner bracket.

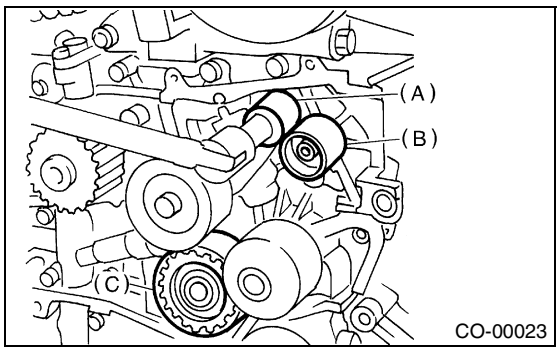

CO-00020

9) Disconnect the hose from water pump.
10) Remove the water pump.


CO-00021

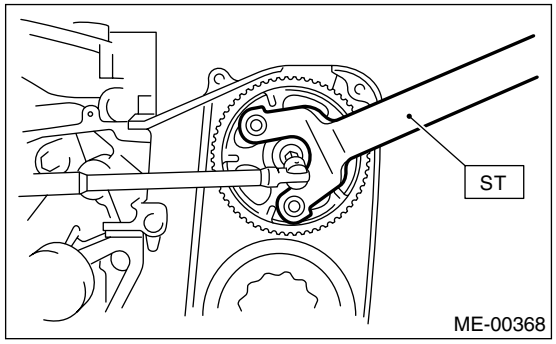
2. TURBO MODEL

1) Remove the radiator. <Ref. to CO(SOHC)-27, REMOVAL, Radiator.>
2) Remove the V-belts. <Ref. to ME(TURBO)-44, REMOVAL, V-belt.>
3) Remove the timing belt. <Ref. to ME(TURBO)-48, REMOVAL, Timing Belt Assembly.>
4) Remove the automatic belt tension adjuster (A).
5) Remove the belt idler (B).
6) Remove the belt idler No. 2 (C).

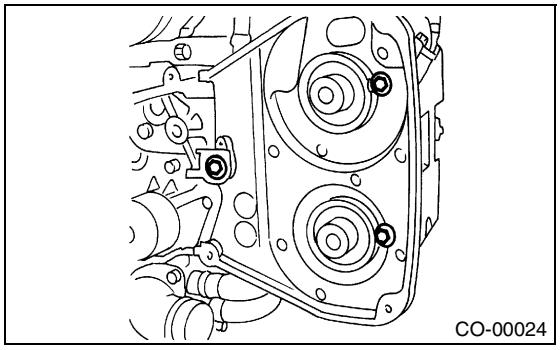


7) Remove the camshaft position sensor. <Ref. to FU(TURBO)-30, REMOVAL, Camshaft Position Sensor.>
8) Remove the camshaft sprockets (LH) by using ST.

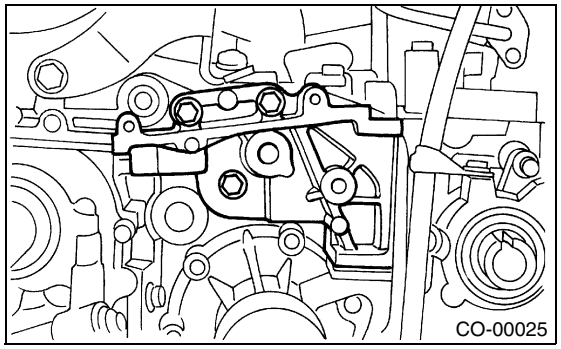
ST	18231AA010	CAMSHAFT SPROCKET WRENCH (Intake)
ST	499207400	CAMSHAFT SPROCKET WRENCH (Exhaust)



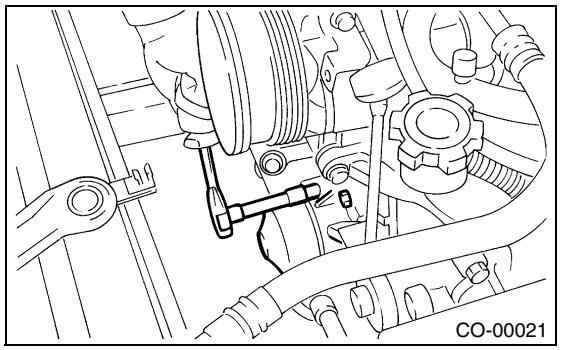
9) Remove the belt cover No. 2 (LH).



10) Remove the tensioner bracket.



11) Disconnect the hose from water pump.
12) Remove the water pump.



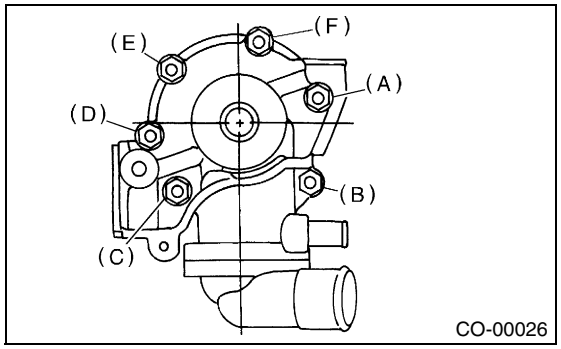
B: INSTALLATION

1. NON-TURBO MODEL

1) Install water pump onto cylinder block (LH).

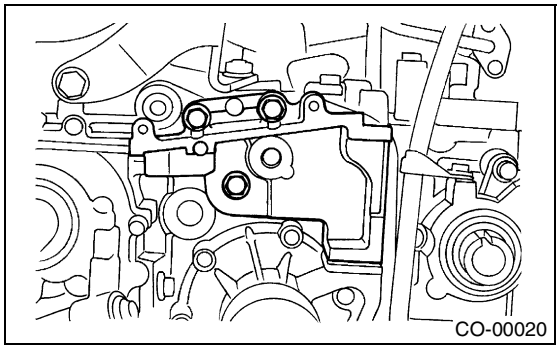
NOTE:
- Replace the gasket with a new one.
- When installing the water pump, tighten bolts in two stages in alphabetical sequence as shown in the figure.

Tightening torque:
First:
12 N·m (1.2 kgf-m, 8.7 ft-lb)
Second:
12 N·m (1.2 kgf-m, 8.7 ft-lb)



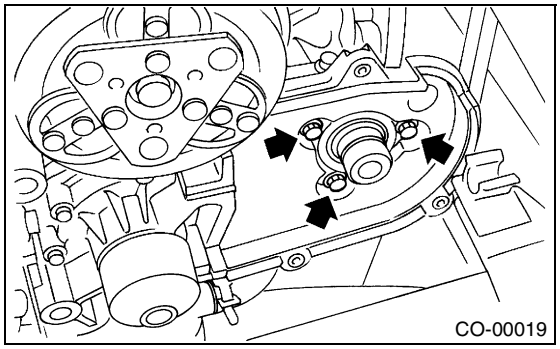
2) Connect the hose to water pump.
3) Install the tensioner bracket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



4) Install the belt cover No. 2 (LH).

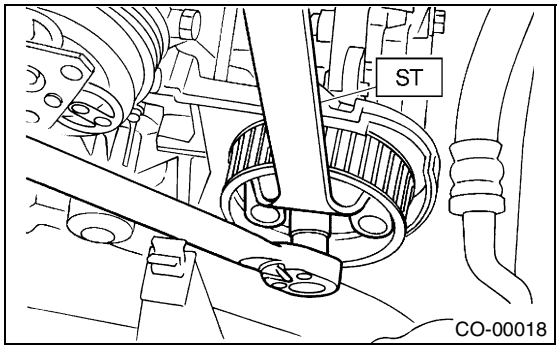
Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



5) Install the camshaft sprockets (LH) by using ST.
ST 18231AA010 CAMSHAFT SPROCKET WRENCH

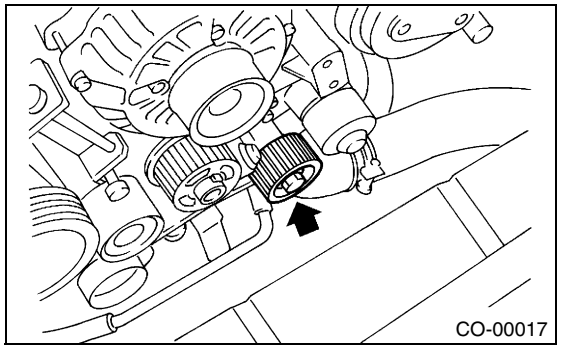
NOTE:
Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.

Tightening torque:
78 N·m (8.0 kgf-m, 57.9 ft-lb)



6) Install the belt idler No. 2.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)



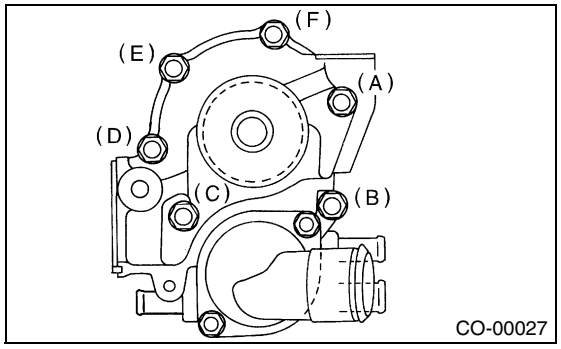
7) Install the automatic belt tension adjuster which tension rod is holded with pin. <Ref. to ME(SOHC)-47, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt Assembly.>
8) Install the timing belt. <Ref. to ME(SOHC)-48, TIMING BELT, INSTALLATION, Timing Belt Assembly.>
9) Install the V-belts. <Ref. to ME(SOHC)-41, INSTALLATION, V-belt.>
10) Install the radiator. <Ref. to CO(SOHC)-29, INSTALLATION, Radiator.>

2. TURBO MODEL

1) Install the water pump onto cylinder block (LH).

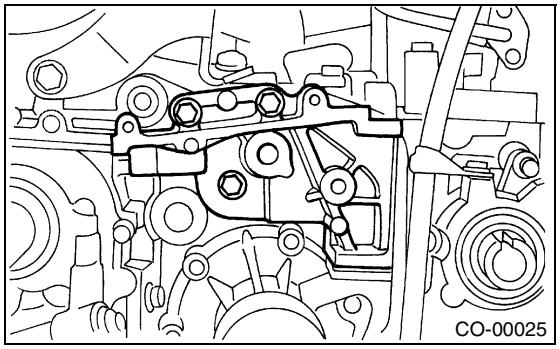
NOTE:
- Replace the gasket with a new one.
- When installing the water pump, tighten bolts in two stages in alphabetical sequence as shown in the figure.

Tightening torque:
First:
12 N·m (1.2 kgf-m, 8.7 ft-lb)
Second:
12 N·m (1.2 kgf-m, 8.7 ft-lb)



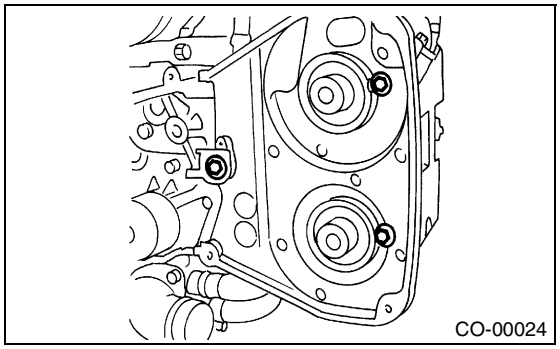
2) Connect the hose to water pump.
3) Install the tensioner bracket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



4) Install the belt cover No. 2 (LH).

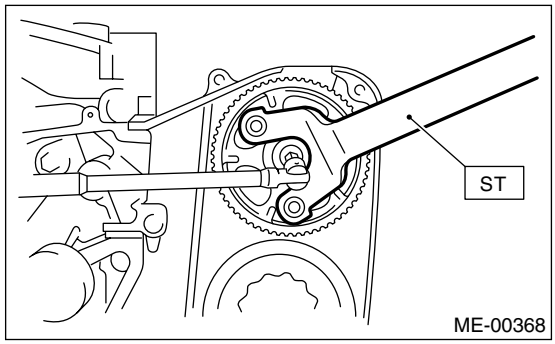
Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



5) Install the camshaft sprockets (LH) by using ST.

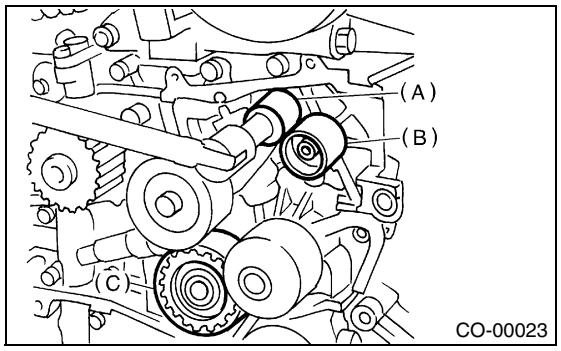
ST	18231AA010	CAMSHAFT SPROCKET WRENCH (Intake)
ST	499207400	CAMSHAFT SPROCKET WRENCH (Exhaust)

Tightening torque:
98 N·m (10.0 kgf-m, 72.4 ft-lb)



6) Install the camshaft position sensor. <Ref. to FU(TURBO)-30, INSTALLATION, Camshaft Position Sensor.>
7) Install the belt idler No. 2 (C).
8) Install the belt idler (B).
9) Install the automatic belt tension adjuster (A) which has tension rod held by pin. <Ref. to ME(TURBO)-50, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt Assembly.>

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

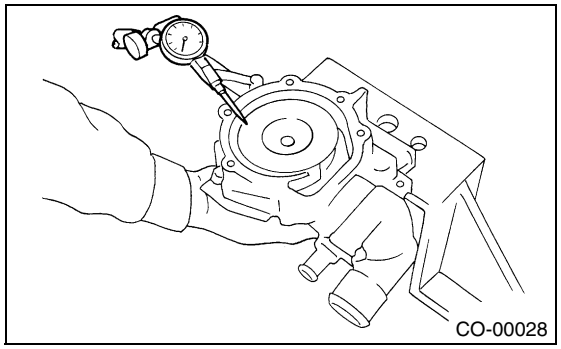


10) Install the timing belt. <Ref. to ME(TURBO)-51, TIMING BELT, INSTALLATION, Timing Belt Assembly.>
11) Install the V-belts. <Ref. to ME(TURBO)-44, INSTALLATION, V-belt.>
12) Install the radiator. <Ref. to CO(SOHC)-29, INSTALLATION, Radiator.>

C: INSPECTION

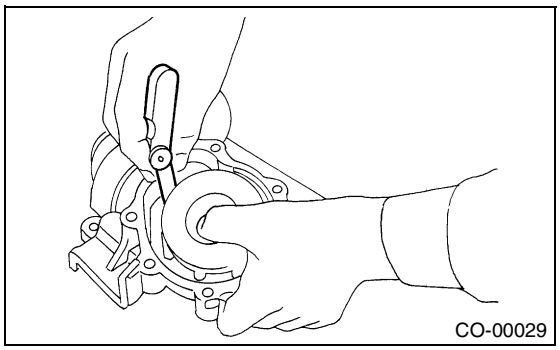
1) Check the water pump bearing for smooth rotation.
2) Check the water pump pulley for abnormalities.
3) Using a dial gauge, measure the impeller runout in thrust direction while rotating the pulley.

"Thrust" runout limit:
0.5 mm (0.020 in)



4) Check the clearance between impeller and pump case.

Clearance between impeller and pump case:
Standard
0.5 — 0.7 mm (0.020 — 0.028 in)
Limit
1.0 mm (0.039 in)

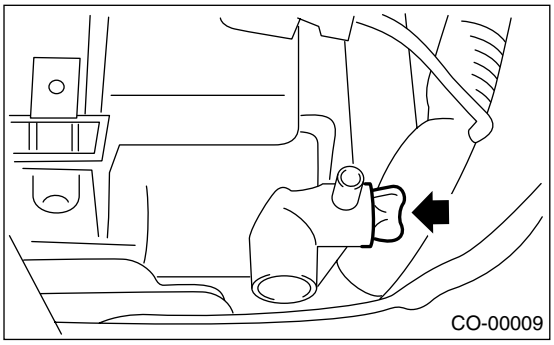


5) After water pump installation, check the pulley shaft for engine coolant leaks. If leaks are noted, replace the water pump assembly.

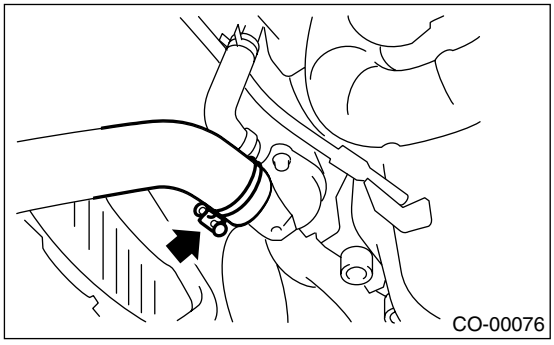
5. Thermostat

A: REMOVAL

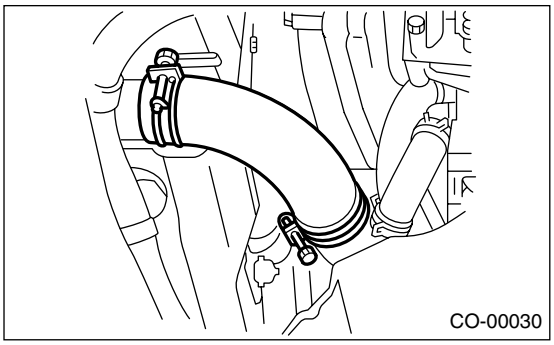
1) Set the vehicle on a lift.
2) Lift-up the vehicle.
3) Remove the under cover.
4) Drain the engine coolant completely. <Ref. to CO(SOHC)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>


CO-00009

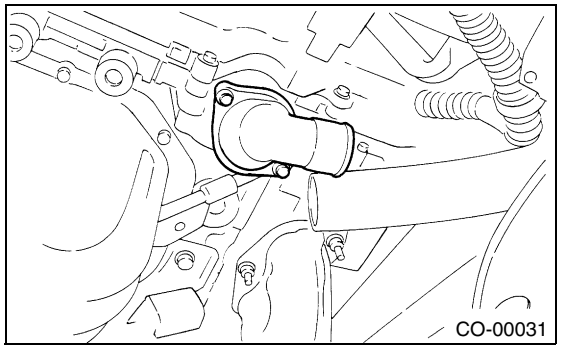
5) Disconnect the radiator outlet hose from thermostat cover.
• NON-TURBO MODEL


CO-00076

6) Disconnect the radiator outlet hose.
• TURBO MODEL


CO-00030

7) Remove the thermostat cover and gasket, and pull out the thermostat.

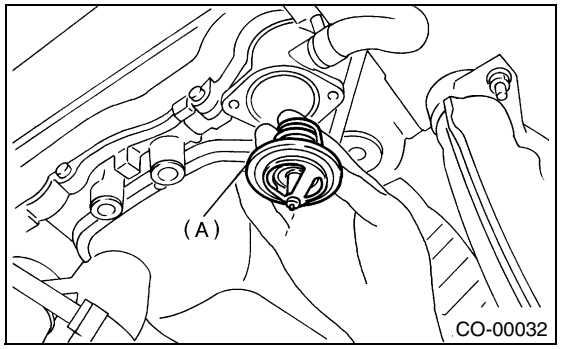

CO-00031

B: INSTALLATION

1) Install the thermostat in the water pump, and then install the thermostat cover together with a gasket.

NOTE:
• When reinstalling the thermostat, use a new gasket.
• The thermostat must be installed with the jiggle pin (A) facing to front side.

Tightening torque:
6.5 N·m (0.65 kgf-m, 4.7 ft-lb)



CO-00032

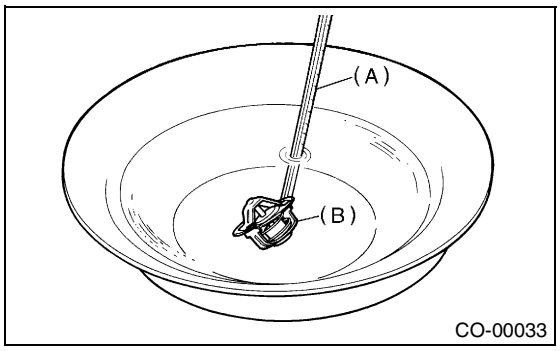
2) Fill engine coolant. <Ref. to CO(SOHC)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

Replace the thermostat if the valve does not close completely at an ambient temperature or if the following test shows unsatisfactory results.
Immerse the thermostat and thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. The measurement should be to the specification.

Starts to open:
Non-turbo model
80 — 84°C (176 — 183°F)
Turbo model
76 — 80°C (169 — 176°F)

Fully opens:
Non-turbo model
95°C (203°F)
Turbo model
91°C (196°F)



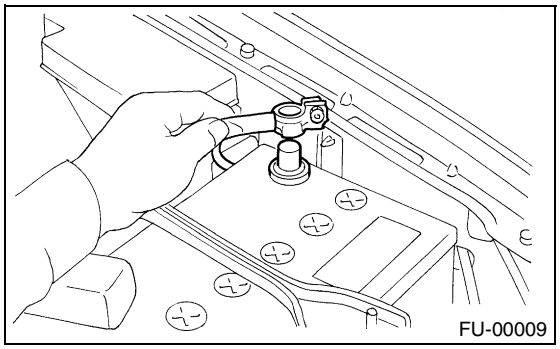
(A) Thermometer
(B) Thermostat

6. Radiator

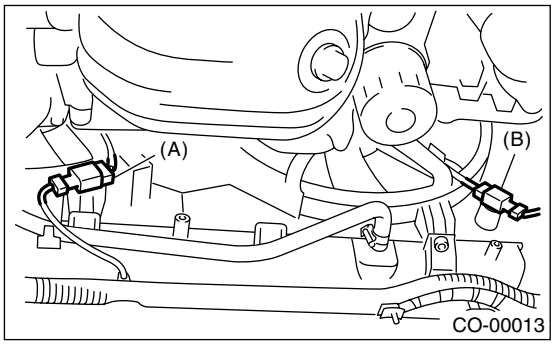
A: REMOVAL

1. NON-TURBO MODEL

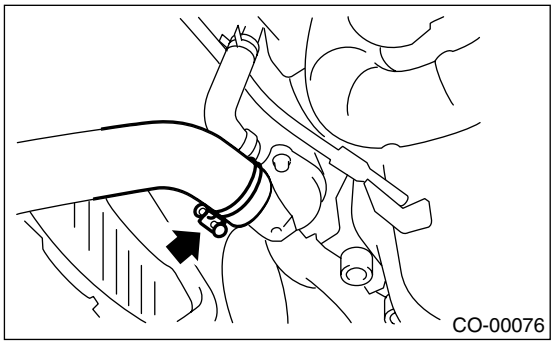
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



3) Lift-up the vehicle.
4) Remove the under cover.
5) Drain the engine coolant completely. <Ref. to CO(SOHC)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
6) Disconnect the connectors of radiator main fan motor (A) and sub fan motor (B).

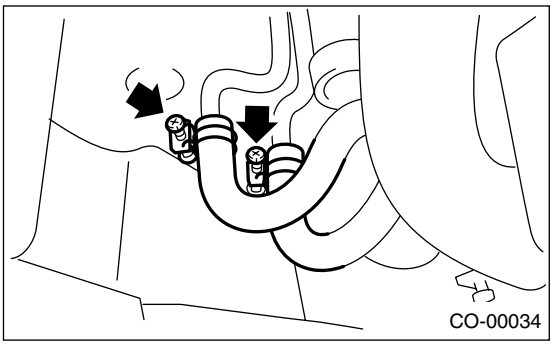


7) Disconnect the radiator outlet hose from water pump.

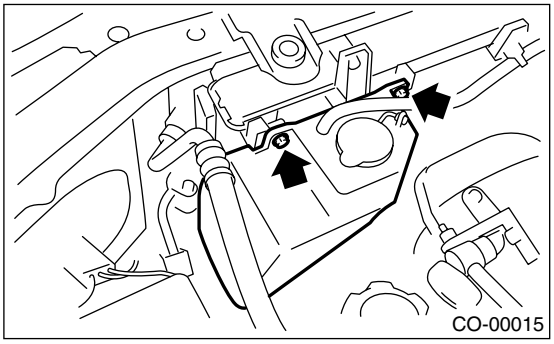


8) Disconnect the ATF cooler hoses from ATF pipe. (AT vehicles)

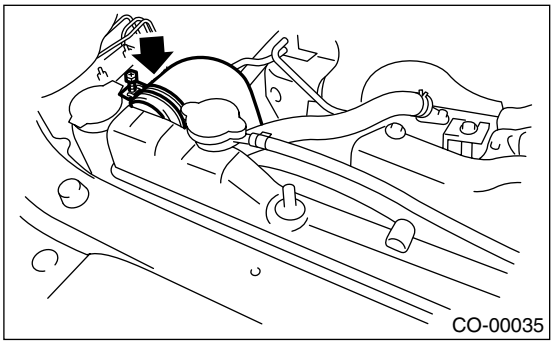
Plug the openings in the hose and radiator with caps in order to prevent ATF from leaking.



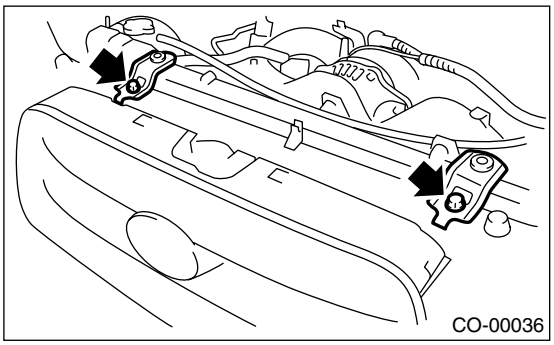
9) Lower the vehicle.
10) Disconnect the over flow hose.
11) Remove the reservoir tank.



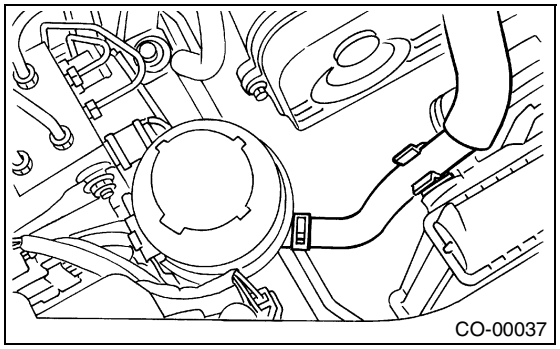
12) Disconnect the radiator inlet hose from engine.



13) Remove the radiator upper brackets.



14) Detach the power steering hose from clip on radiator.

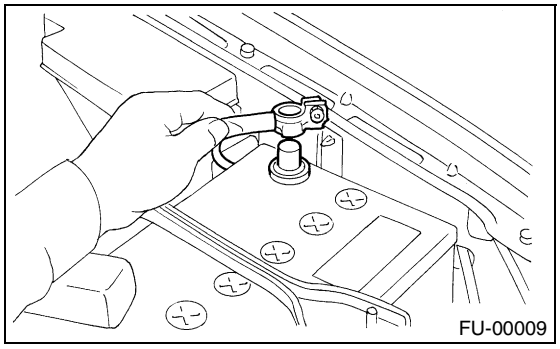


15) Lift the radiator up and away from the vehicle.

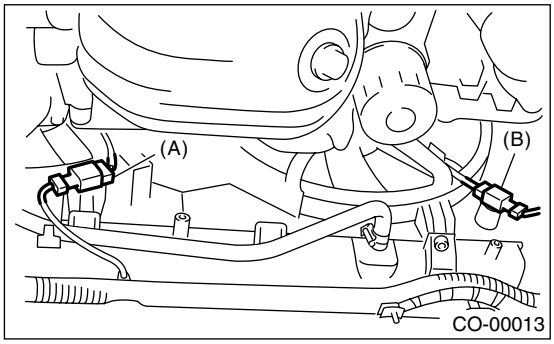
2. TURBO MODEL

WARNING:
The radiator is pressurized. Wait until the engine cools down before working on the radiator.

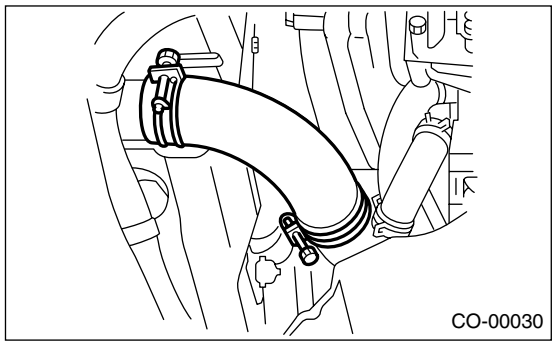
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



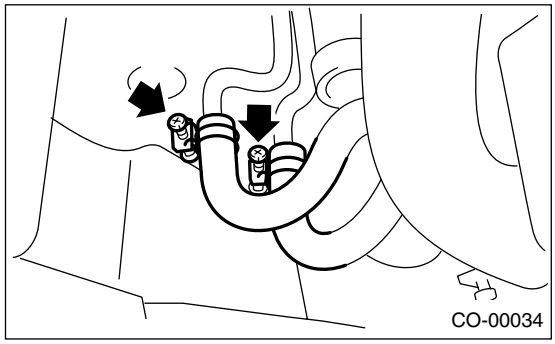
3) Lift-up the vehicle.
4) Remove the under cover.
5) Drain the engine coolant completely. <Ref. to CO(SOHC)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
6) Disconnect the connectors of radiator main fan motor (A) and sub fan motor (B).



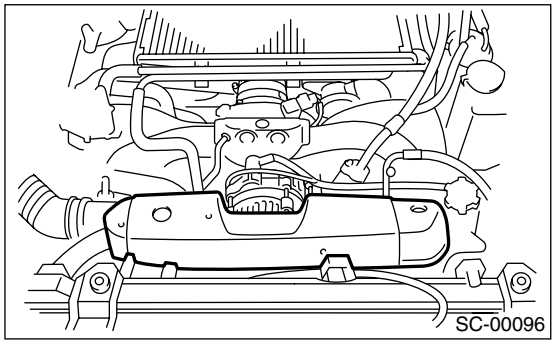
7) Disconnect the radiator outlet hose from thermostat cover.



8) Disconnect the ATF cooler hose from ATF pipe. (AT vehicles)
Plug the openings in the hose and radiator with caps in order to prevent ATF from leaking.
9) Disconnect the oil cooler hose from oil cooler pipe. (MT vehicles with oil cooler)
Install the cap to prevent oil from leaking.

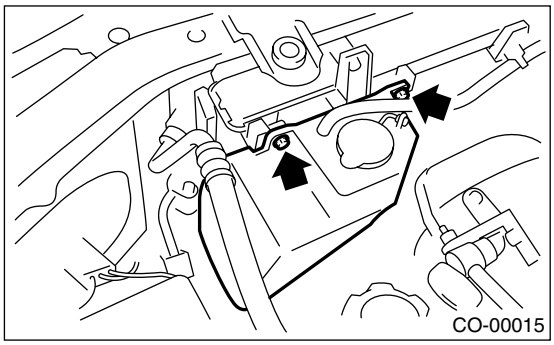


10) Lower the vehicle.
11) Remove the V-belt covers.

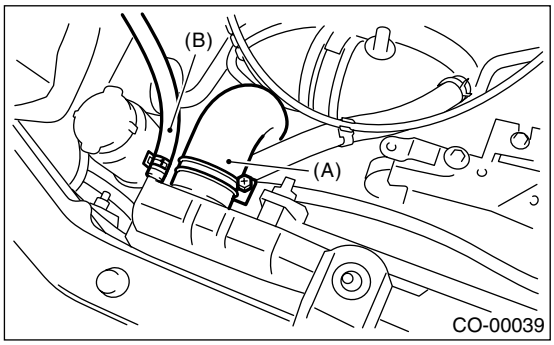


12) Disconnect the overflow hose.

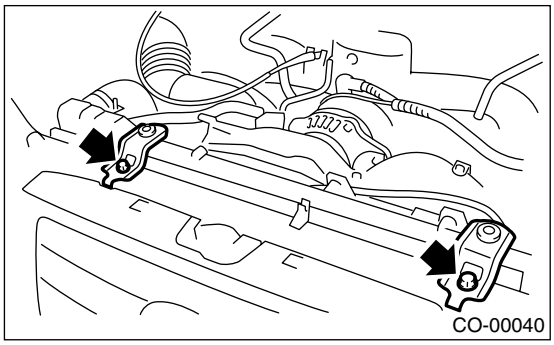
13) Remove the reservoir tank.



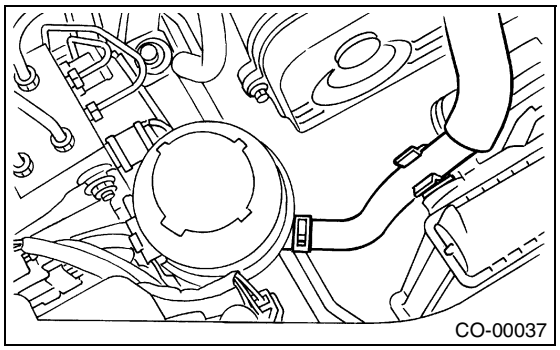
14) Disconnect the radiator inlet hose (A) and water tank hose (B) from radiator.



15) Remove the radiator upper brackets.

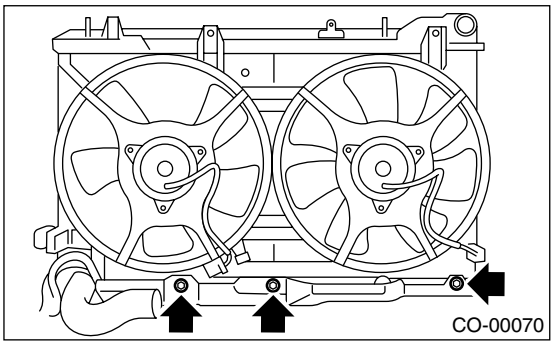


16) Disconnect the power steering hose from clips on radiator.



17) Lift the radiator up and away from the vehicle.

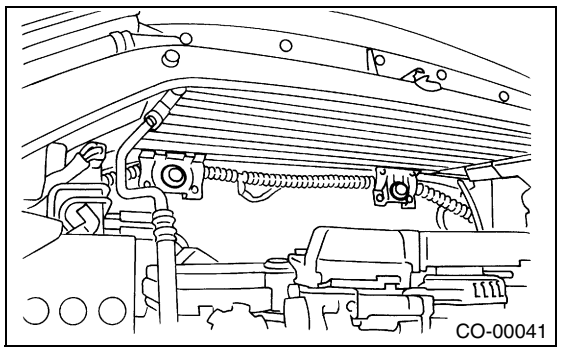
18) Remove the radiator under cover (AT vehicles).



B: INSTALLATION

1. NON-TURBO MODEL

1) Attach the radiator mounting cushions to holes on the vehicle.

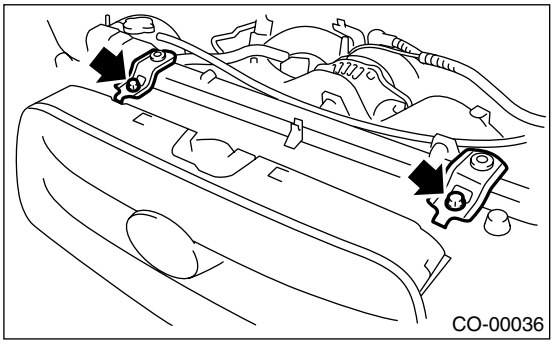


2) Install the radiator to vehicle.

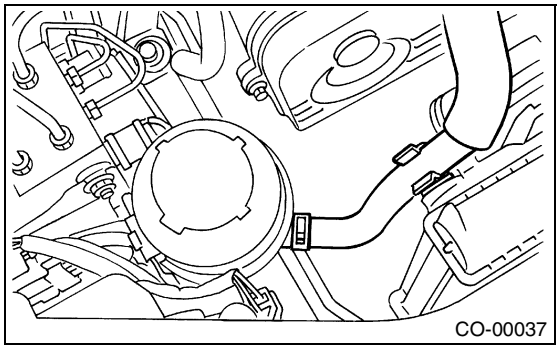
NOTE:
Fit pins on the lower side of radiator into cushions on the body side.

3) Install the radiator brackets and tighten bolts.

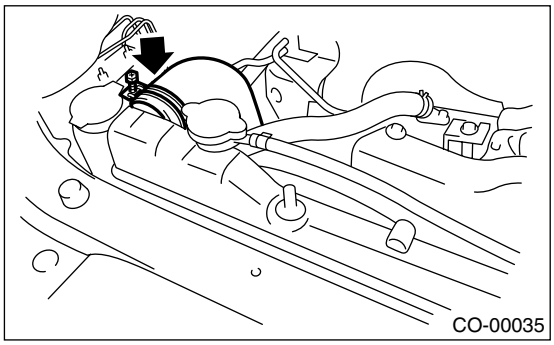
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



4) Attach the power steering hose to radiator.

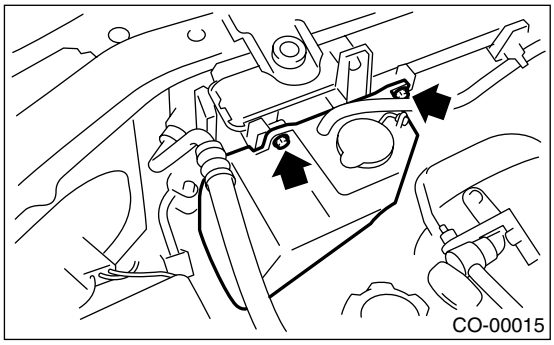


5) Connect the radiator inlet hose.

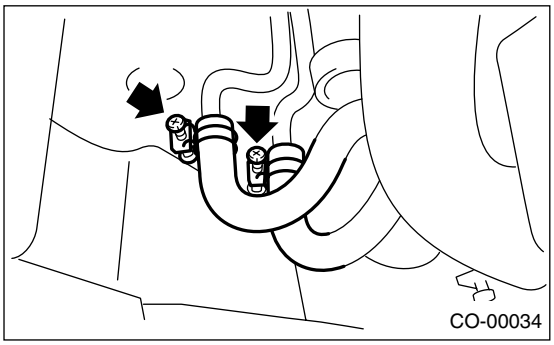


6) Install the reservoir tank.

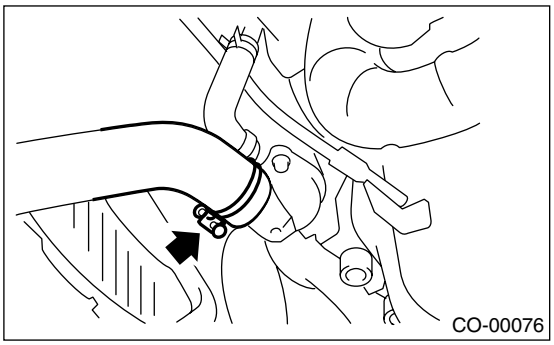
Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)



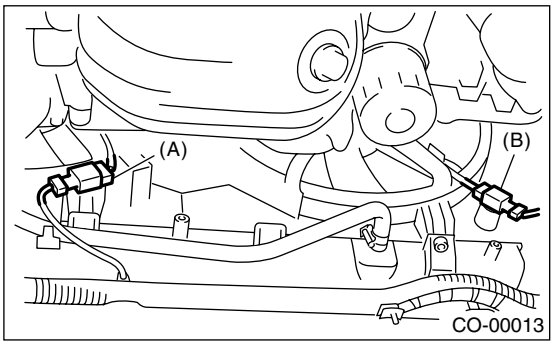
7) Connect the overflow hose.
8) Lift-up the vehicle.
9) Connect the ATF cooler hoses. (AT vehicles)



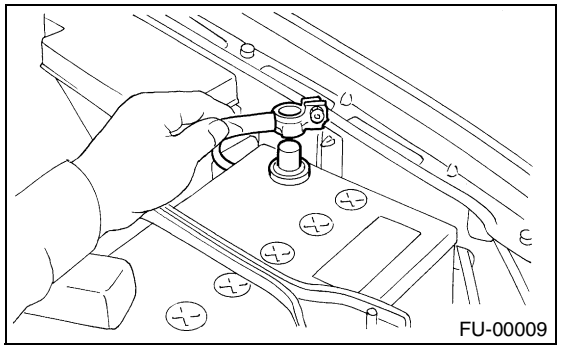
10) Connect the radiator outlet hose.



11) Connect the connectors to radiator main fan motor (A) and sub fan motor (B).



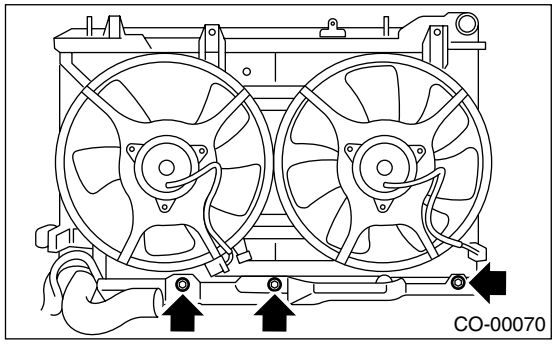
12) Install the under cover.
13) Lower the vehicle.
14) Connect the battery ground cable to battery.



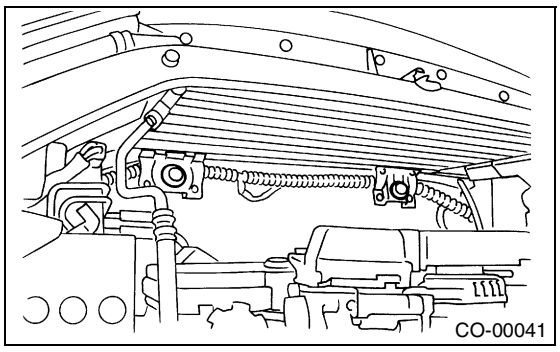
15) Fill engine coolant. <Ref. to CO(SOHC)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
16) Check the ATF level. <Ref. to AT-29, INSPECTION, Automatic Transmission Fluid.>

2. TURBO MODEL

1) Install the radiator under cover to radiator.



2) Attach the radiator mounting cushions to holes on the vehicle.

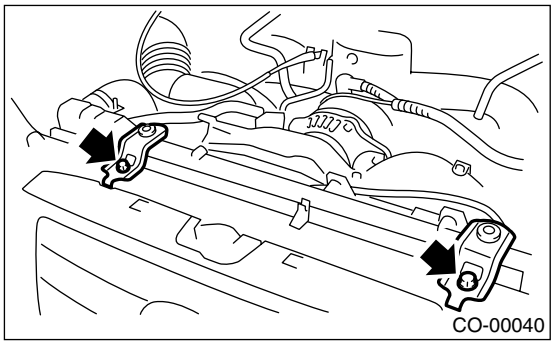


3) Install the radiator to vehicle.

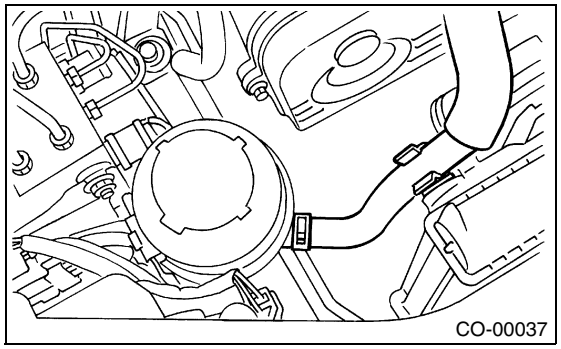
NOTE:
Fit pins on the lower side of radiator into cushions on body side.

4) Install the radiator brackets, and then tighten the bolts.

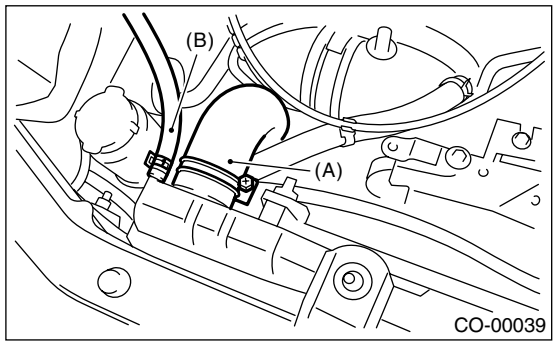
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



5) Connect the power steering hose to radiator.

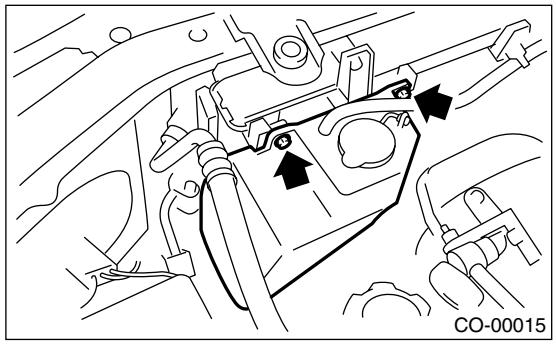


6) Connect the radiator inlet hose (A) and water tank hose (B).

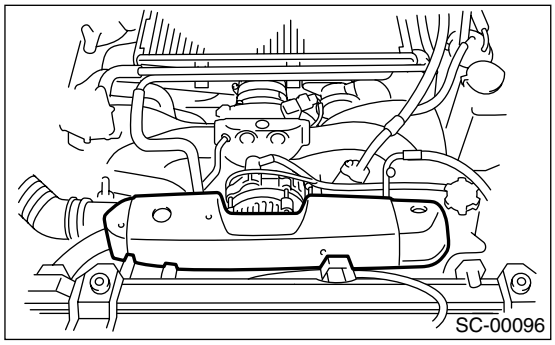


7) Install the reservoir tank.

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

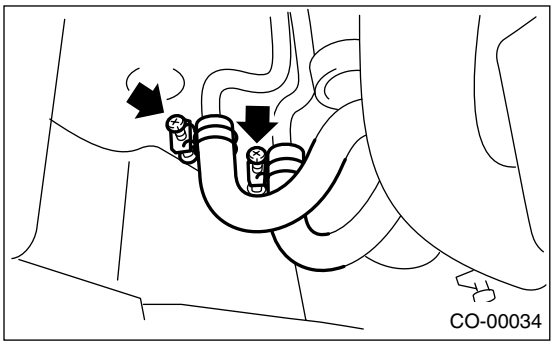


8) Connect the over flow hose.
9) Install the V-belt cover.

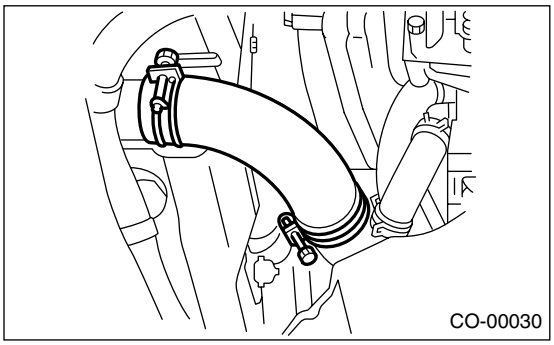


10) Lift-up the vehicle.
11) Connect the ATF cooler hoses. (AT vehicles).

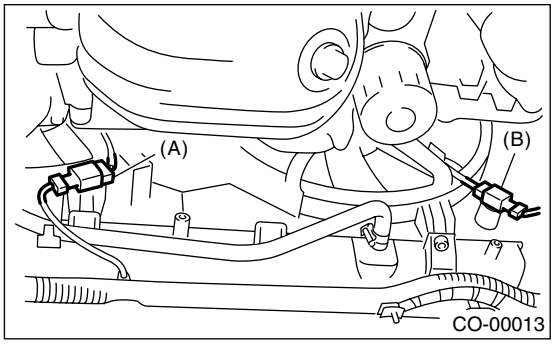
12) Connect the oil cooler hose. (MT vehicles with oil cooler)



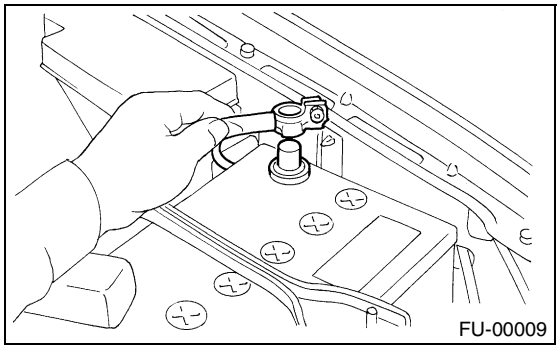
13) Connect the radiator outlet hose.



14) Connect the connectors to radiator main fan motor (A) and sub fan motor (B).



15) Install the under cover.
16) Lower the vehicle.
17) Connect the battery ground cable to battery.



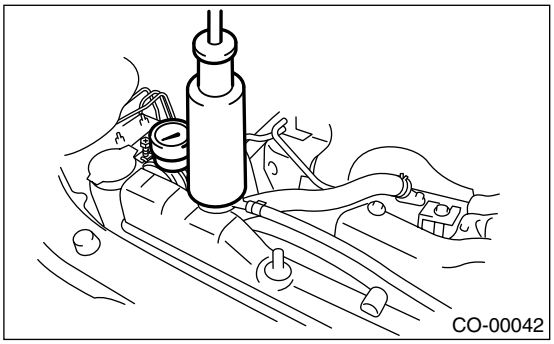
18) Fill engine coolant. <Ref. to CO(SOHC)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

19) Check the ATF level. <Ref. to AT-29, INSPECTION, Automatic Transmission Fluid.>

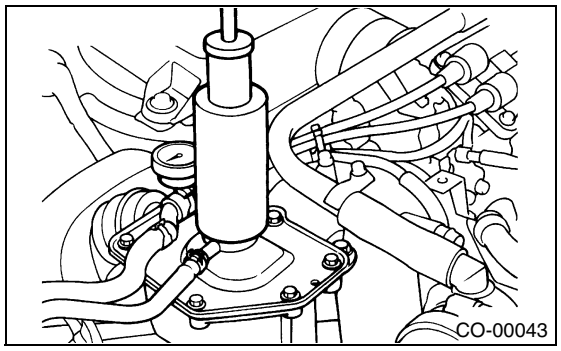
C: INSPECTION

1) Remove the radiator cap, top off radiator, and then attach the tester to radiator in place of cap.

- NON-TURBO MODEL



- TURBO MODEL



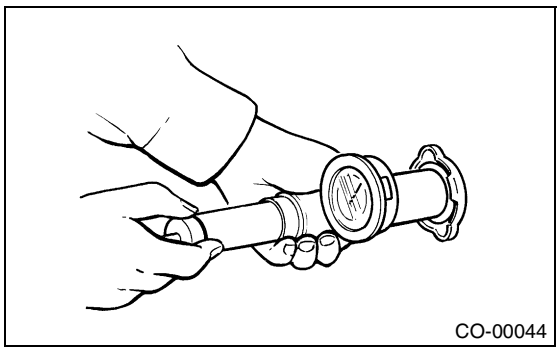
2) Apply a pressure of 157 kPa (1.6 kg/cm^2, 23 psi) to the radiator to check if:
   (1) Engine coolant leaks at/around radiator.
   (2) Engine coolant leaks at/around hoses or connections.

CAUTION:
- **Engine should be off.**
- **Wipe engine coolant from check points in advance.**
- **Be careful to prevent engine coolant from spurting out when removing the tester.**
- **Be careful also not to deform the filler neck of radiator when installing or removing tester.**

7. Radiator Cap

A: INSPECTION

1) Attach the radiator cap to tester.



2) Increase the pressure until tester gauge pointer stops. Radiator cap is functioning properly if it holds the service limit pressure for 5 to 6 seconds.

Standard pressure:
93 — 123 kPa (0.95 — 1.25 kg/cm^2, 14 — 18 psi)

Service limit pressure:
83 kPa (0.85 kg/cm^2, 12 psi)

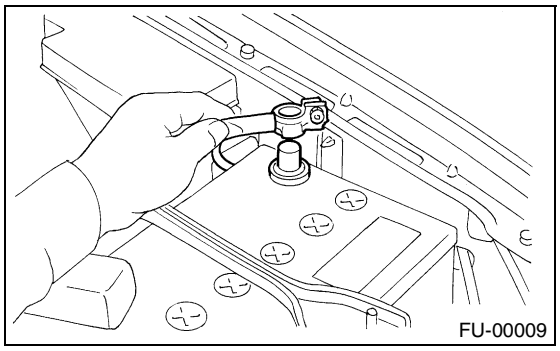
CAUTION:
Be sure to remove foreign matter and rust from the cap in advance otherwise, results of pressure test will be incorrect.

8. Radiator Main Fan and Fan Motor

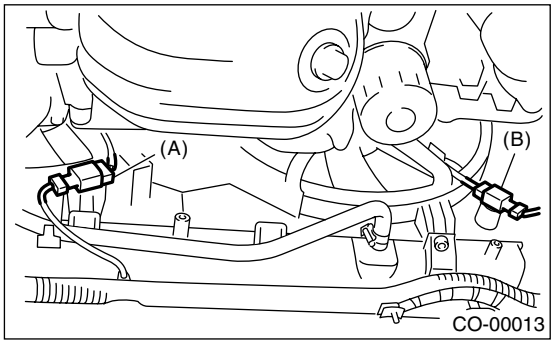
A: REMOVAL

1. NON-TURBO MODEL

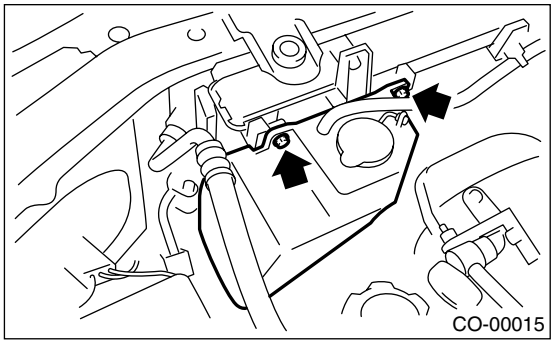
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



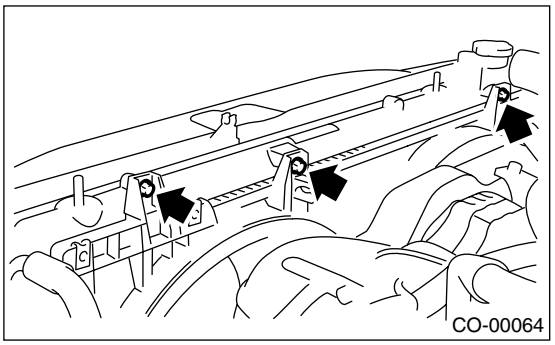
3) Lift-up the vehicle.
4) Remove the under cover.
5) Drain the coolant aprrox. 1 ℓ (1.06 US qt, 0.88 Imp qt). <Ref. to CO(SOHC)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
6) Disconnect the connector of main fan motor (A) and sub fan motor (B).



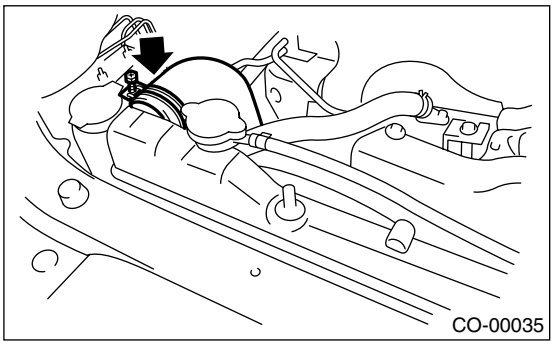
7) Remove the ATF hose from two clips of radiator fan motor assembly. (AT vehicles)
8) Lower the vehicle.
9) Disconnect the over flow hose.
10) Remove the reservoir tank.



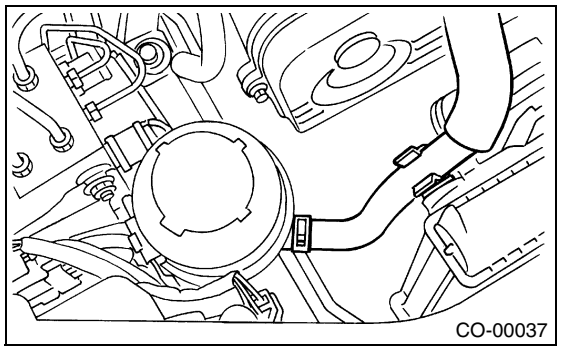
11) Remove the radiator fan motor assembly mounting bolts.



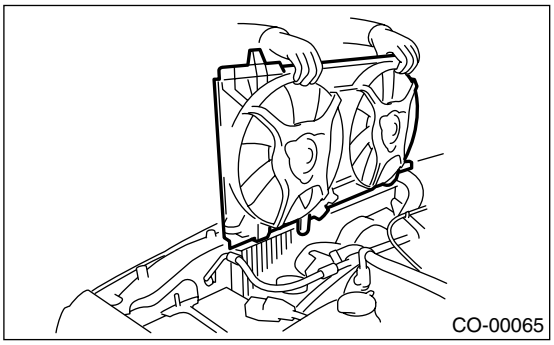
12) Disconnect the radiator inlet hose from engine.



13) Detach the power steering hose from clip on radiator.

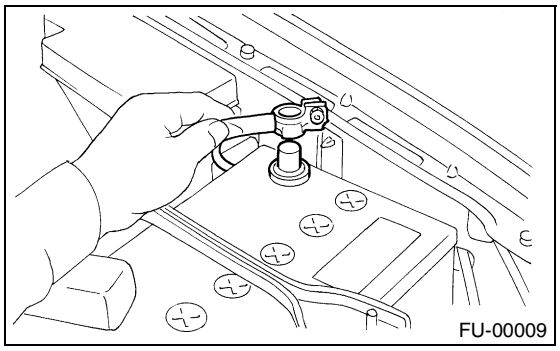


14) Rise up the radiator fan motor assembly to remove it from vehicle.

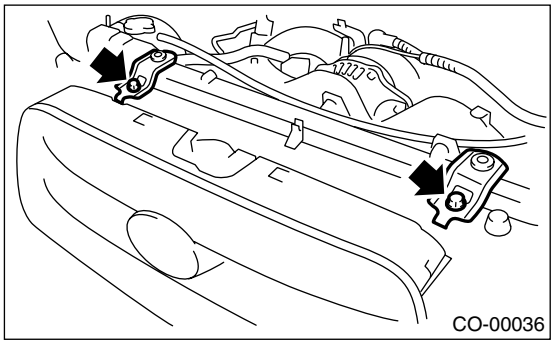


2. TURBO MODEL

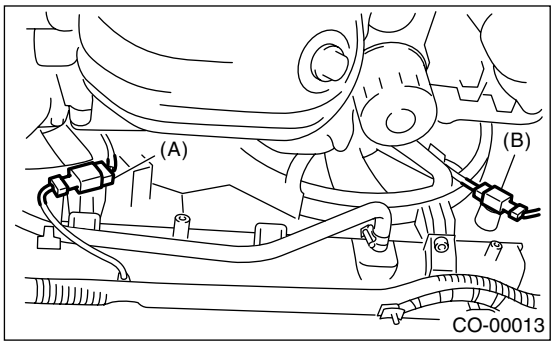
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



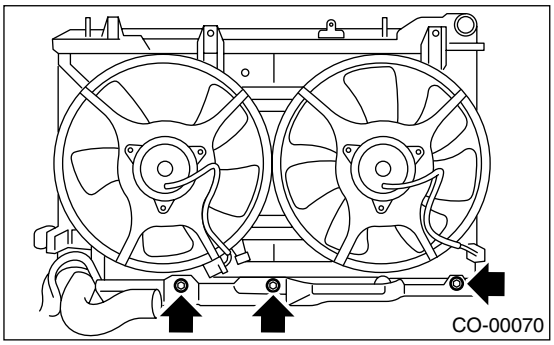
3) Remove the radiator upper bracket. (AT vehicles)



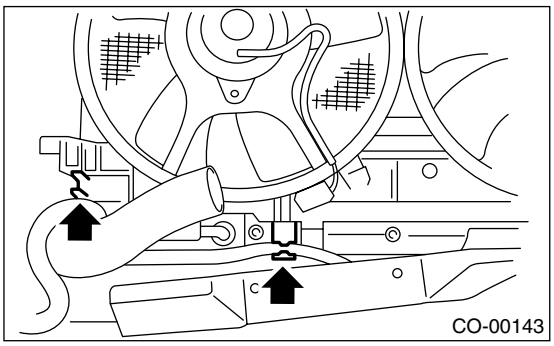
4) Lift-up the vehicle.
5) Remove the under cover.
6) Drain the engine coolant approx. 1 ℓ (1.06 US qt, 0.88 Imp qt). <Ref. to CO(SOHC)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
7) Disconnect the radiator main fan motor connector (A) and sub fan motor connector (B).



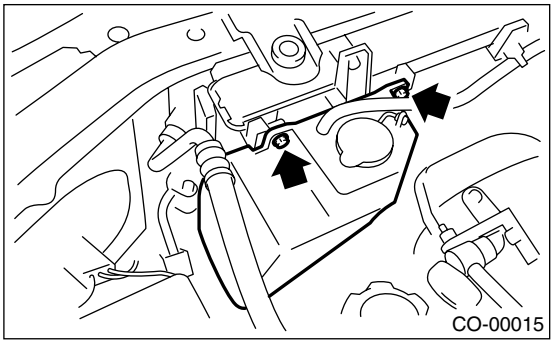
8) Remove the radiator under cover securing bolt. (AT vehicles)



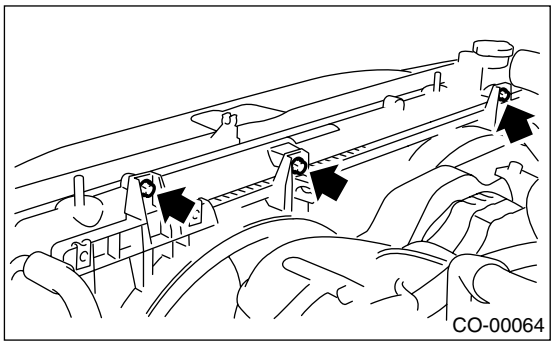
9) Pull the radiator lower hose upward to space radiator from radiator under cover. Remove the ATF hose to radiator fan motor assembly two clips. (AT vehicles)



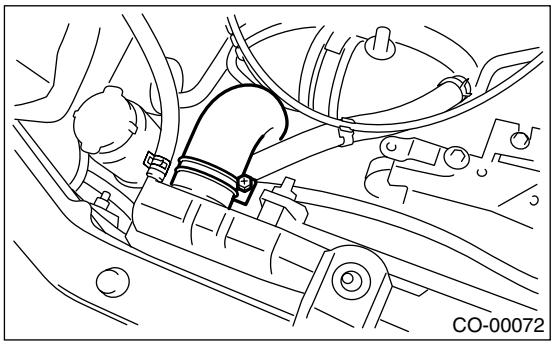
10) Lower the vehicle.
11) Remove the V-belt cover.
12) Disconnect the overflow hose.
13) Remove the reservoir tank.



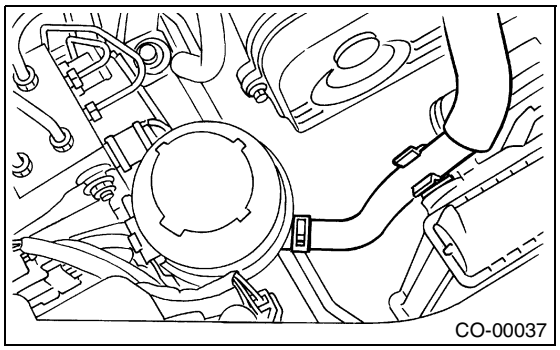
14) Remove the radiator fan motor assembly securing bolt.



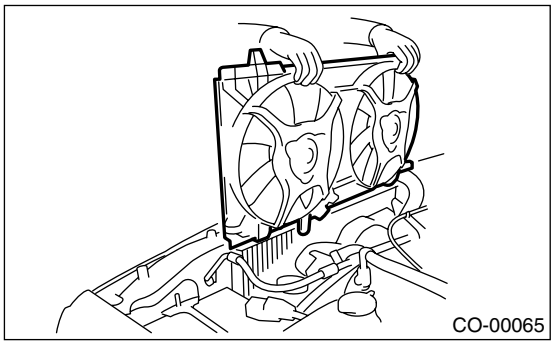
15) Disconnect the radiator inlet hose.



16) Disconnect the power steering hose from radiator clip.



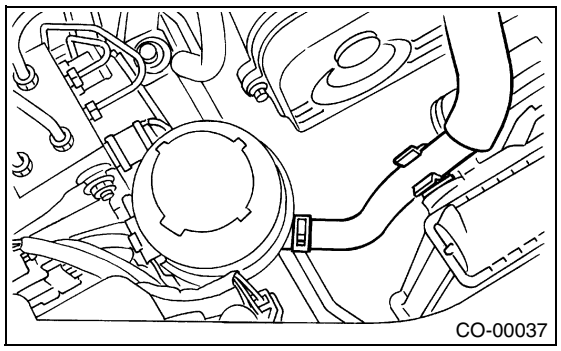
17) Remove the radiator fan motor assembly from vehicle.



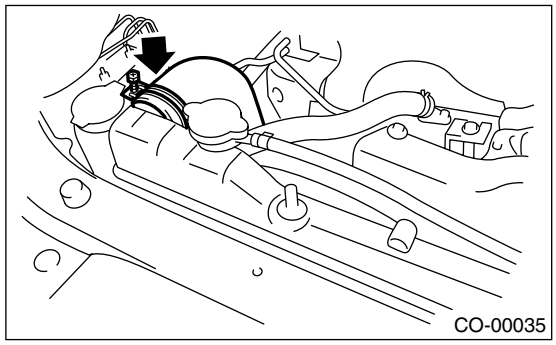
B: INSTALLATION

1. NON-TURBO MODEL

1) install the radiator fan motor assembly to radiator.
2) Connect the power steering hose to radiator.

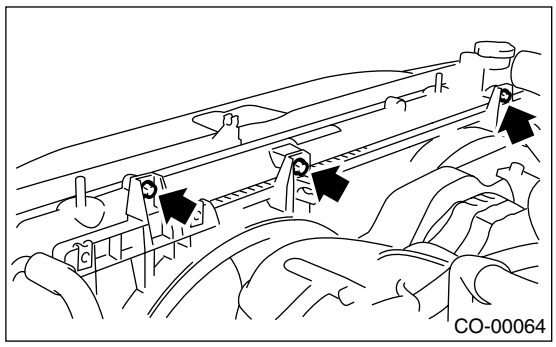


3) Connect the radiator inlet hose.



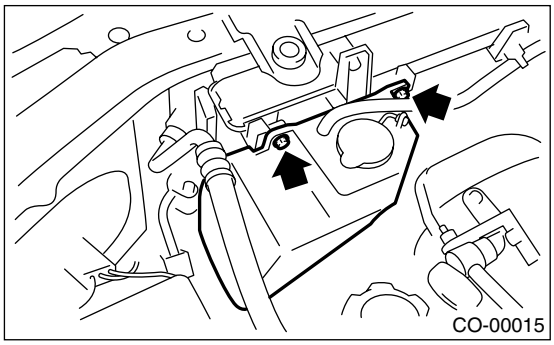
4) Install the radiator fan motor assembly mounting bolts.

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

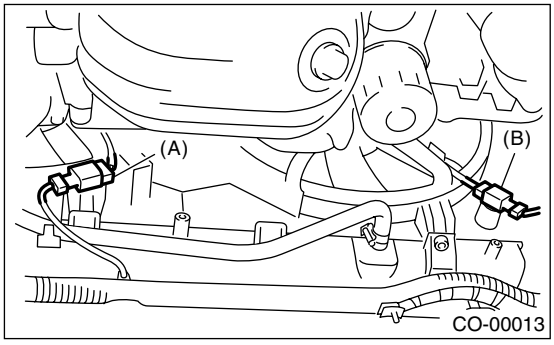


5) Install the reservoir tank.

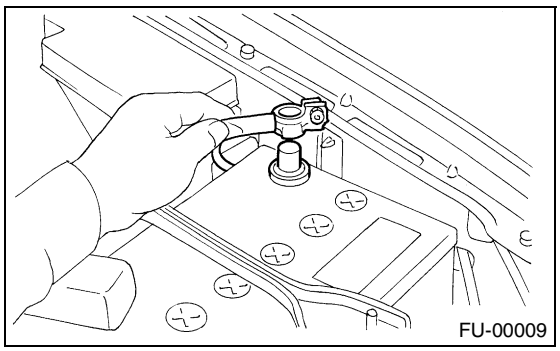
Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)



6) Install the over-flow hose.
7) Lift-up the vehicle.
8) Install the ATF hose to two clips of radiator fan motor assembly. (AT vehicles)
9) Connect the main fan motor (A) and sub fan motor (B).



10) Install the under cover.
11) Lower the vehicle.
12) Connect the battery ground cable to battery.

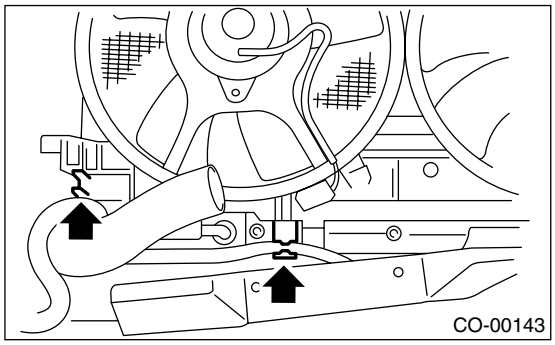


13) Fill the engine coolant. <Ref. to CO(SOHC)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

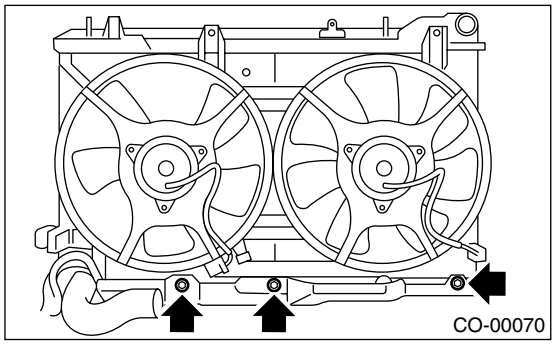
2. TURBO MODEL

1) Install the radiator fan motor assembly.
2) Lift-up the vehicle.
3) Pull the radiator lower hose upward to space radiator from radiator under cover. Install the ATF hose to radiator fan motor assembly two clips. (AT vehicles)

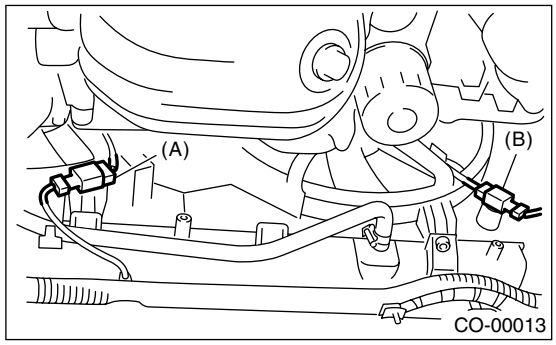
NOTE:
Fit securely the pins on lower side of radiator into body side.



4) Tighten the radiator under cover securing bolt. (AT vehicles)

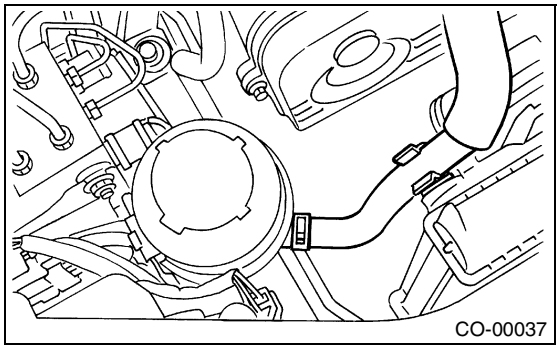


5) Connect the radiator main fan motor connector (A) and sub fan motor connector (B).

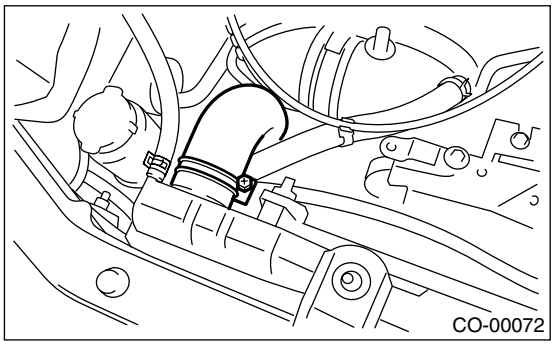


6) Install the under cover.
7) Lower the vehicle.

8) Connect the power steering hose to radiator clip.

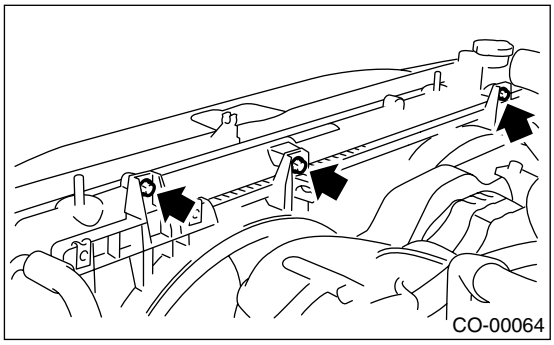


9) Connect the radiator inlet hose to radiator.

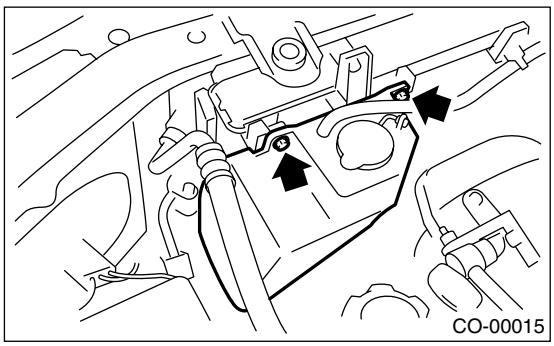


10) Install the radiator fan motor assembly mounting bolts.

Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)

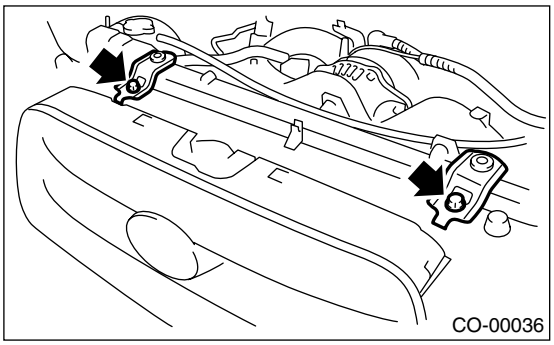


11) Install the reservoir tank.

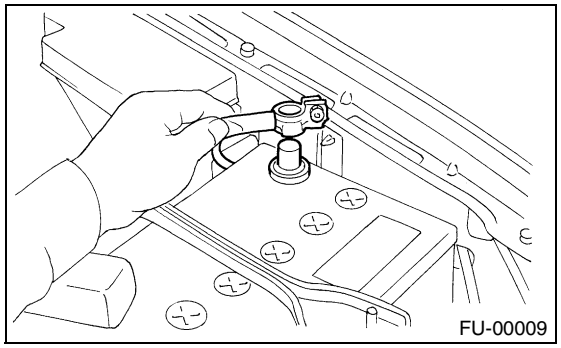


12) Connect the overflow hose.
13) Install the V-belt cover.

14) Install the radiator upper bracket. (AT vehicles)



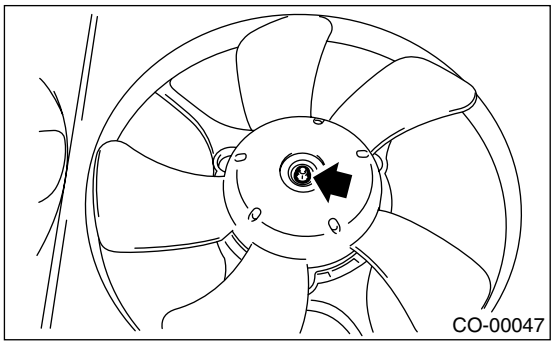
15) Connect the battery ground cable to battery.



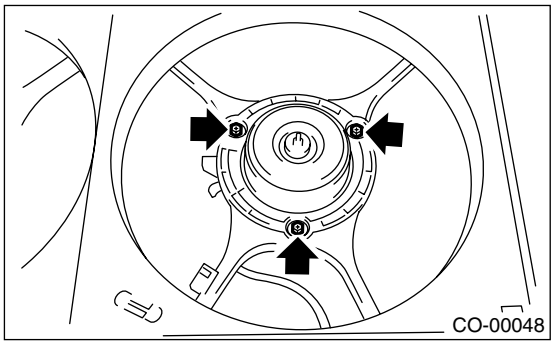
16) Fill the engine coolant. <Ref. to CO(SOHC)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: DISASSEMBLY

1) Remove the clip which holds motor connector onto shroud.
2) Remove the nut which holds fan itself onto fan motor and shroud assembly.



3) Remove the bolts which install fan motor onto shroud.



D: ASSEMBLY

Assemble in the reverse order of disassembly.

NOTE:
Refer to COMPONENT for tightening torque. <Ref. to CO(SOHC)-3, COMPONENT, General Description.>

9. Radiator Sub Fan and Fan Motor

A: REMOVAL

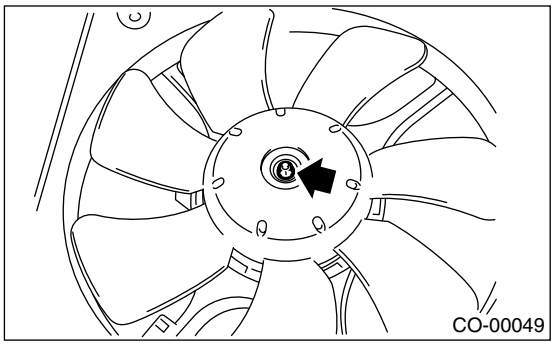
Refer to Radiator Main Fan and Fan Motor. <Ref. to CO(SOHC)-34, REMOVAL, Radiator Main Fan and Fan Motor.>

B: INSTALLATION

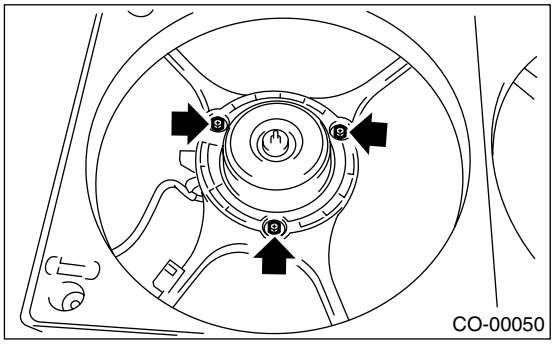
Refer to Radiator Main Fan and Fan Motor. <Ref. to CO(SOHC)-36, INSTALLATION, Radiator Main Fan and Fan Motor.>

C: DISASSEMBLY

1) Remove the clip which holds motor connector onto shroud.
2) Remove the nut which holds fan itself onto fan motor and shroud assembly.



3) Remove the bolts which install fan motor onto shroud.



D: ASSEMBLY

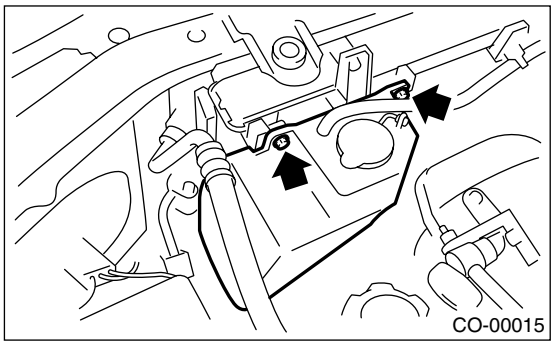
Assemble in the reverse order of disassembly.

NOTE:
Refer to COMPONENT for tightening torque. <Ref. to CO(SOHC)-3, COMPONENT, General Description.>

10.Reservoir Tank

A: REMOVAL

1) Disconnect the over flow hose from radiator filler neck position.
2) Remove the bolts which install reservoir tank onto radiator main fan shroud.
3) Remove the reservoir tank.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Refer to COMPONENT for tightening torque. <Ref. to CO(SOHC)-3, COMPONENT, General Description.>

C: INSPECTION

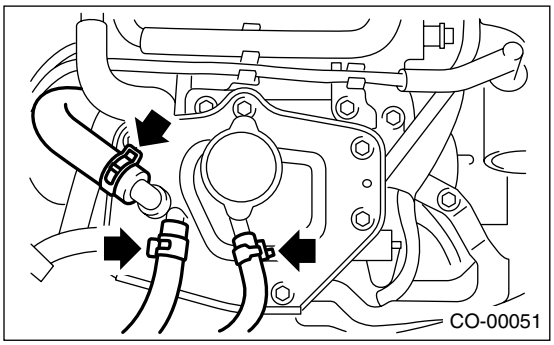
Make sure the engine coolant level is between full and low.

11.Coolant Filler Tank

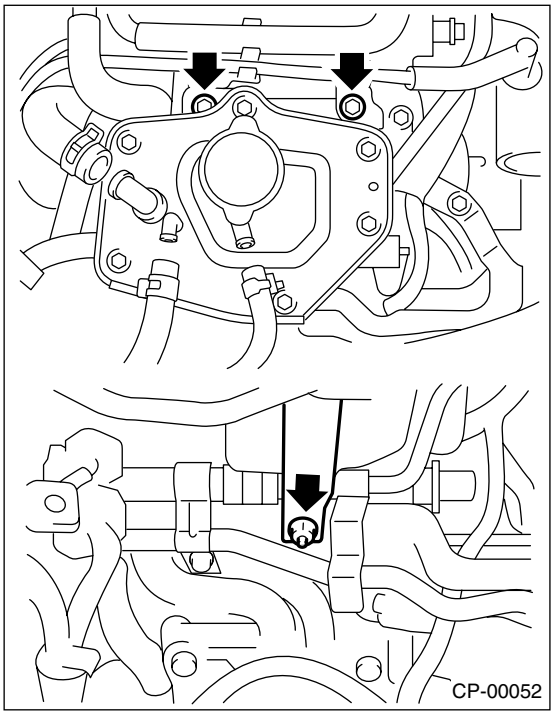
A: REMOVAL

WARNING:
The radiator is pressurized. Wait until the engine cools down before working on the radiator.

1) Drain the coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt). <Ref. to CO(SOHC)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
2) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(TURBO)-7, REMOVAL, Air Cleaner.>
3) Remove the air cleaner element.
4) Disconnect the engine coolant hoses from coolant filler tank.



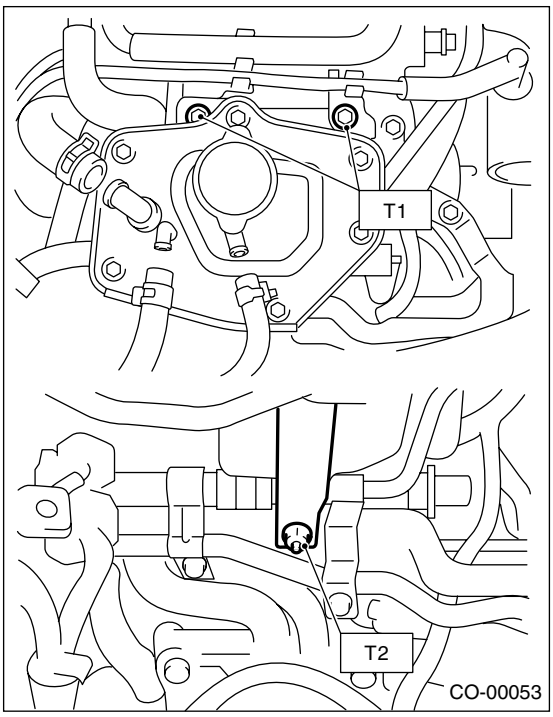
5) Remove the bolts and nut which install coolant filler tank.
6) Disconnect the engine coolant hose which connects under side of coolant filler tank.
7) Remove the coolant filler tank.



B: INSTALLATION

1) Install in the reverse order of removal.

Tightening torque:
T1: 19 N·m (1.9 kgf-m, 13.7 ft-lb)
T2: 21 N·m (2.1 kgf-m, 15.2 ft-lb)



2) Fill engine coolant. <Ref. to CO(SOHC)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

12.Engine Cooling System Trouble in General

A: INSPECTION

Trouble	Possible cause	Corrective action
Over-heating	a. Insufficient engine coolant	Replenish the engine coolant, inspect for leakage, and repair.
	b. Loose timing belt	Repair or replace the timing belt tensioner.
	c. Oil on drive belt	Replace.
	d. Malfunction of thermostat	Replace.
	e. Malfunction of water pump	Replace.
	f. Clogged engine coolant passage	Clean.
	g. Improper ignition timing	Inspect and repair the ignition control system. <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(TURBO)-2, PROCEDURE, Basic Diagnostic Procedure.>
	h. Clogged or leaking radiator	Clean or repair, or replace.
	i. Improper engine oil in engine coolant	Replace the engine coolant.
	j. Air/fuel mixture ratio too lean	Inspect and repair the fuel injection system. <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(TURBO)-2, PROCEDURE, Basic Diagnostic Procedure.>
	k. Excessive back pressure in exhaust system	Clean or replace.
	l. Insufficient clearance between piston and cylinder	Adjust or replace.
	m. Slipping clutch	Repair or replace.
	n. Dragging brake	Adjust.
	o. Defective thermostat	Replace.
	p. Malfunction of electric fan	Inspect the radiator fan relay, engine coolant temperature sensor or radiator motor and replace there.
Over-cooling	a. Atmospheric temperature extremely low	Partly cover the radiator front area.
	b. Defective thermostat	Replace.
Engine coolant leaks.	a. Loosened or damaged connecting units on hoses	Repair or replace.
	b. Leakage from water pump	Replace.
	c. Leakage from water pipe	Repair or replace.
	d. Leakage around cylinder head gasket	Retighten the cylinder head bolts or replace gasket.
	e. Damaged or cracked cylinder head and crankcase	Repair or replace.
	f. Damaged or cracked thermostat case	Repair or replace.
	g. Leakage from radiator	Repair or replace.
Noise	a. Defective drive belt	Replace.
	b. Defective radiator fan	Replace.
	c. Defective water pump bearing	Replace the water pump.
	d. Defective water pump mechanical seal	Replace the water pump.

LUBRICATION

LU(SOHC)

		Page
1.	General Description	2
2.	Oil Pressure System	8
3.	Engine Oil	10
4.	Oil Pump	13
5.	Oil Pan and Strainer	17
6.	Oil Pressure Switch	21
7.	Engine Oil Cooler	22
8.	Engine Oil Filter	24
9.	Engine Lubrication System Trouble in General	25

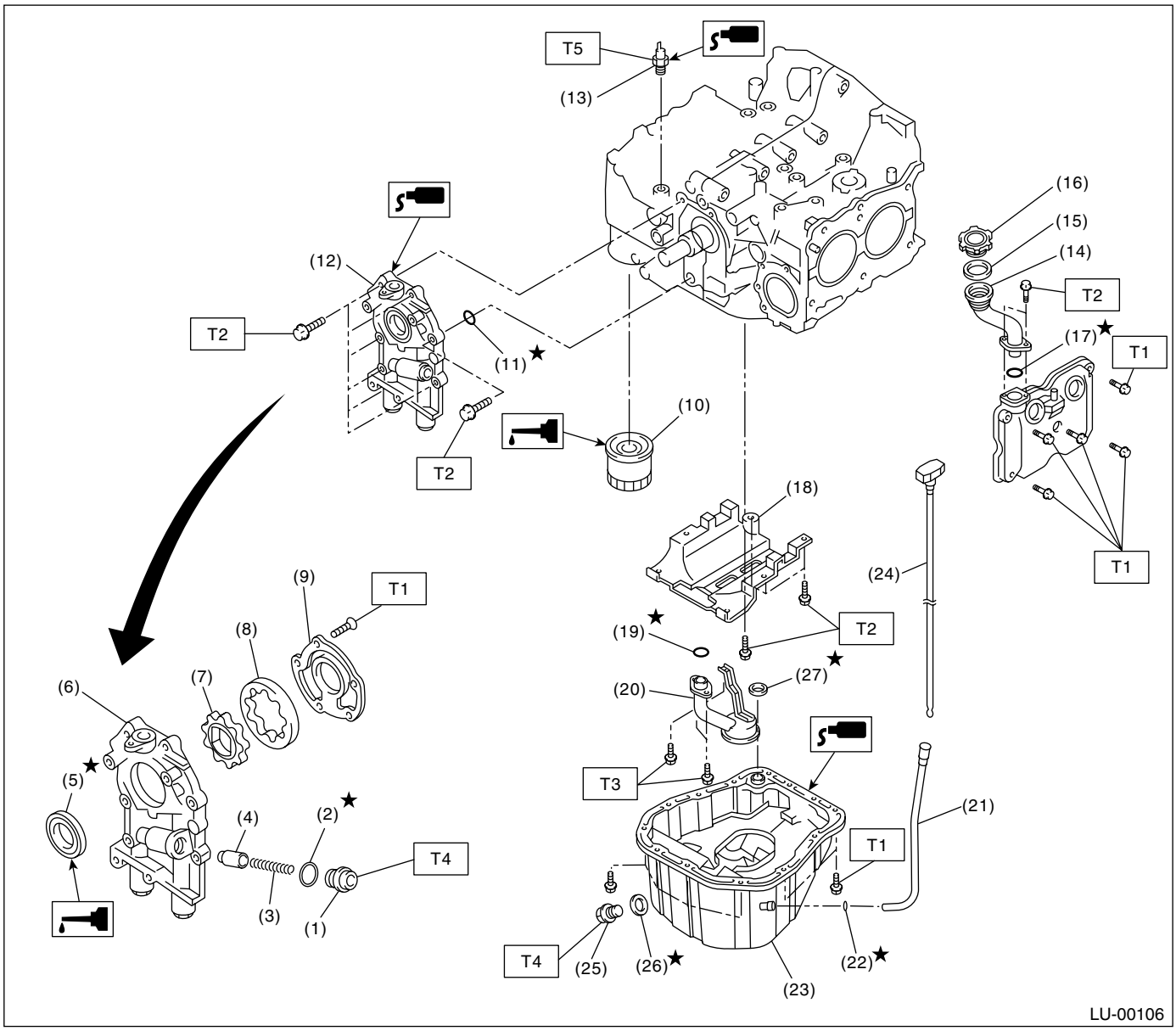
1. General Description

A: SPECIFICATIONS

Lubrication method					Forced lubrication
Oil pump	Pump type				Trochoid type
	Number of teeth		Inner rotor		9
			Outer rotor		10
	Outer rotor diameter × thickness		Non-turbo model		78 × 7 mm (3.07 × 0.28 in)
			Turbo model		78 × 10 mm (3.07 × 0.39 in)
	Tip clearance between inner and outer rotor			STANDARD	0.04 — 0.14 mm (0.0016 — 0.0055 in)
				LIMIT	0.18 mm (0.0071 in)
	Side clearance between inner rotor and pump case			STANDARD	0.02 — 0.07 mm (0.0008 — 0.0028 in)
				LIMIT	0.12 mm (0.0047 in)
	Case clearance between outer rotor and pump case			STANDARD	0.10 — 0.175 mm (0.0039 — 0.0069 in)
				LIMIT	0.20 mm (0.0079 in)
	Capacity at 80°C (176°F)	Non-turbo model	600 rpm	- Discharge pressure	98 kPa (1.0 kg/cm^2, 14 psi)
				- Discharge quantity	3.2 ℓ (3.4 US qt, 2.8 Imp qt)/min.
			5,000 rpm	- Discharge pressure	294 kPa (3.0 kg/cm^2, 43 psi)
				- Discharge quantity	32.6 ℓ (34.4 US qt, 28.7 Imp qt)/min.
		Turbo model	600 rpm	- Discharge pressure	98 kPa (1.0 kg/cm^2, 14 psi)
				- Discharge quantity	4.6 ℓ (4.9 US qt, 4.0 Imp qt)/min.
			5,000 rpm	- Discharge pressure	294 kPa (3.0 kg/cm^2, 43 psi)
				- Discharge quantity	47.0 ℓ (49.7 US qt, 41.4 Imp qt)/min.
	Relief valve operation pressure		Non-turbo model		490 kPa (5.0 kg/cm^2, 71 psi)
			Turbo model		588 kPa (6.0 kg/cm^2, 85 psi)
Oil filter	Type				Full-flow filter type
	Filtration area			Non-turbo	760 cm^2 (118 sq in)
				Turbo	800 cm^2 (124 sq in)
	By-pass valve opening pressure			Non-turbo	157 kPa (1.60 kg/cm^2, 22.8 psi)
				Turbo	160 kPa (1.63 kg/cm^2, 23.2 psi)
	Outer diameter × width			Non-turbo	80 × 70 mm (3.15 × 2.76 in)
				Turbo	68 × 65 mm (2.68 × 2.56 in)
	Oil filter to engine thread size				M 20 × 1.5
Oil pressure switch	Type				Immersed contact point type
	Working voltage — wattage				12 V — 3.4 W or less
	Warning light activation pressure				14.7 kPa (0.15 kg/cm^2, 2.1 psi)
	Proof pressure				More than 981 kPa (10 kg/cm^2, 142 psi)
Oil capacity (at replacement)			Non-turbo model		4.0 ℓ (4.2 US qt, 3.5 Imp qt)
			Turbo model		4.5 ℓ (4.8 US qt, 4.0 Imp qt)

B: COMPONENT

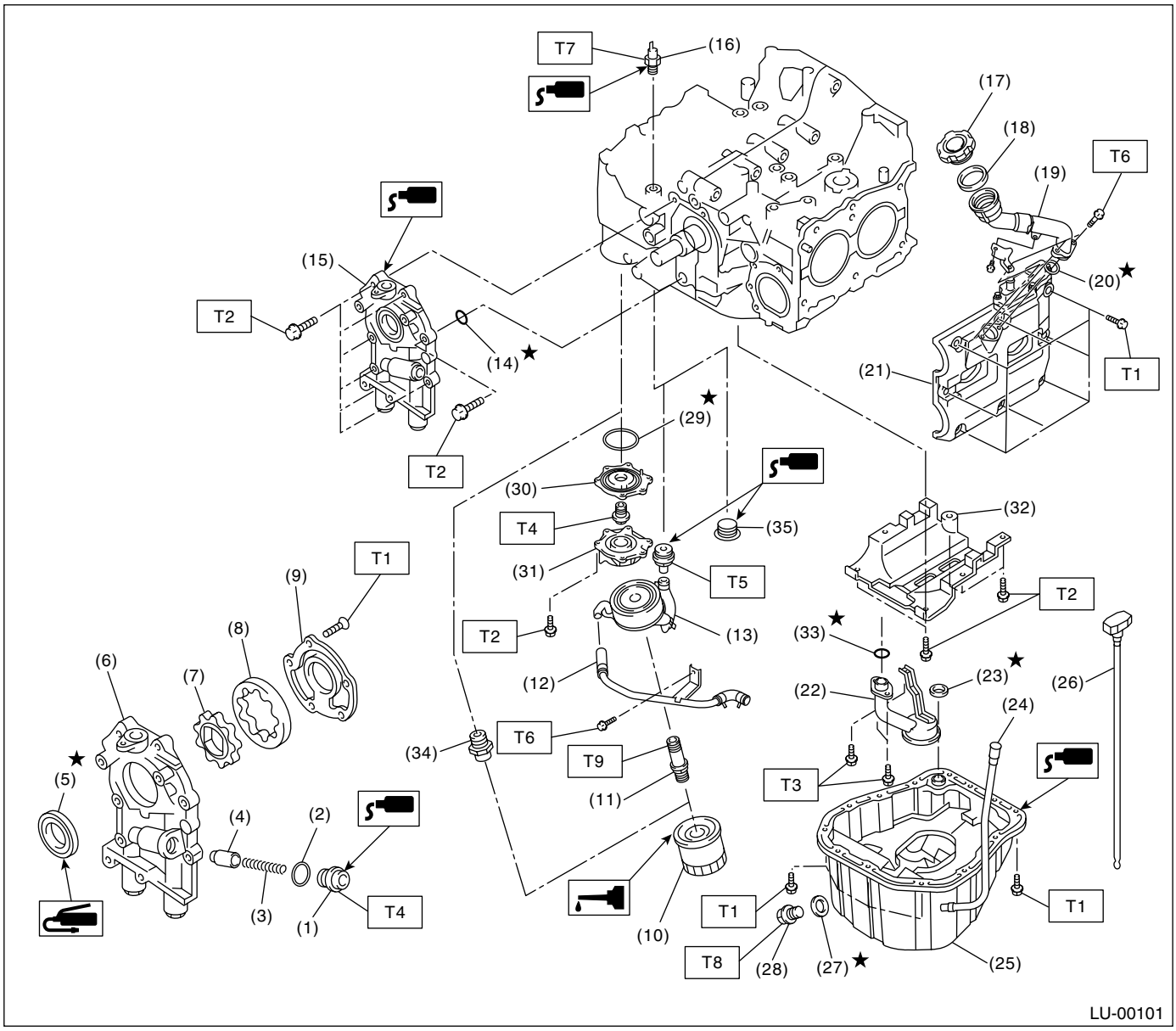
1. NON-TURBO MODEL



(1) Plug
(2) Gasket
(3) Relief valve spring
(4) Relief valve
(5) Oil seal
(6) Oil pump case
(7) Inner rotor
(8) Outer rotor
(9) Oil pump cover
(10) Oil filter
(11) O-ring
(12) Oil pump ASSY
(13) Oil pressure switch
(14) Oil filler duct
(15) O-ring
(16) Oil filler cap
(17) O-ring
(18) Baffle plate
(19) O-ring
(20) Oil strainer
(21) Oil level gauge guide
(22) O-ring
(23) Oil pan
(24) Oil level gauge
(25) Drain plug
(26) Metal gasket
(27) Gasket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7.2)
T4: 44 (4.5, 32.5)
T5: 25 (2.5, 18.1)

2. TURBO MODEL



(1) Plug
(2) Gasket
(3) Relief valve spring
(4) Relief valve
(5) Oil seal
(6) Oil pump case
(7) Inner rotor
(8) Outer rotor
(9) Oil pump cover
(10) Oil filter
(11) Oil cooler connector (with oil cooler)
(12) Water by-pass pipe (with oil cooler)
(13) Oil cooler (with oil cooler)
(14) O-ring
(15) Oil pump ASSY
(16) Oil pressure switch
(17) Oil filler cap
(18) O-ring
(19) Oil filler duct
(20) O-ring
(21) Rocker cover
(22) Oil strainer
(23) Gasket
(24) Oil level gauge guide
(25) Oil pan
(26) Oil level gauge
(27) Metal gasket
(28) Drain plug
(29) O-ring
(30) Adapter (1)
(31) Adapter (2)
(32) Baffle plate
(33) O-ring
(34) Oil filter connector (without oil cooler)
(35) Plug (without oil cooler)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7.0)
T4: 44 (4.5, 32.5)
T5: 69 (7.0, 50.9)
T6: 6.4 (0.65, 4.7)
T7: 25 (2.5, 18.1)
T8: 44 (4.5, 32.5)
T9: 54 (5.5, 40)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

D: PREPARATION TOOL

1. SPECIAL TOOLS

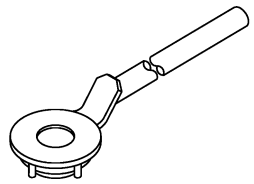
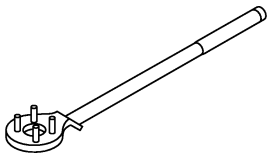
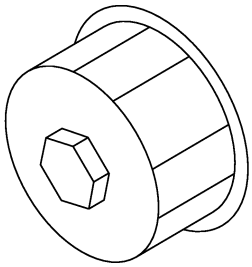
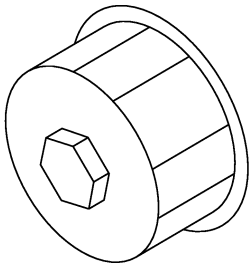
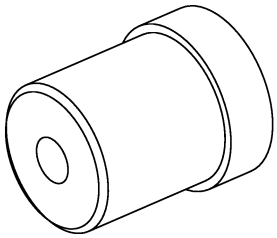
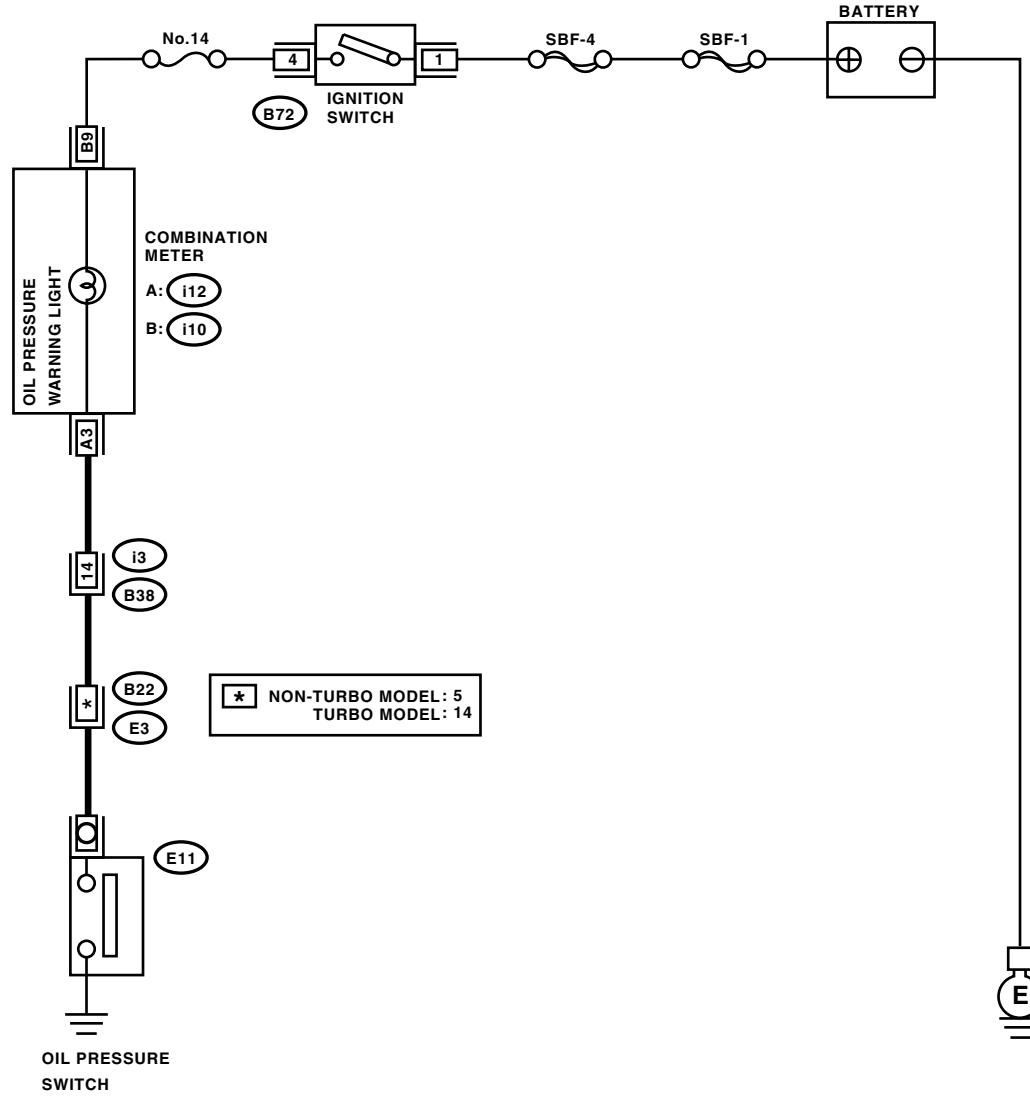
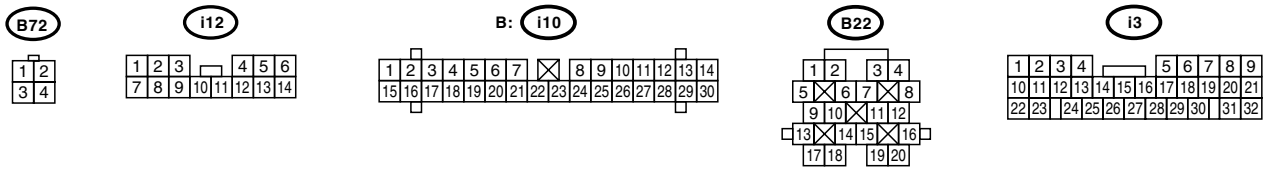
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977400	499977400 (2000 cc model)	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolt.
 ST-499977100	499977100 (2500 cc model)	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolt.
 ST-498547000	498547000 (Non-turbo model)	OIL FILTER WRENCH	• Used for removing and installing oil filter.
 ST18332AA000	18332AA000 (Turbo model)	OIL FILTER WRENCH	• Used for removing and installing oil filter. • Tool for Turbo model is a general purpose tool from KTC (KYOTO TOOL CO., LTD.) in Japan. (KTC part No.: AVSA-067) For availability as same as Subaru genuine part, tool No. is established.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.

2. Oil Pressure System

A: SCHEMATIC





LU-00102

B: INSPECTION

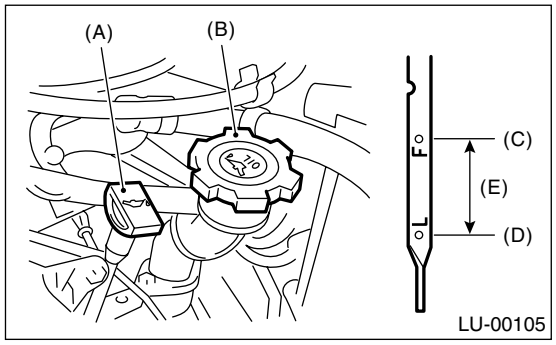
	Step	Value	Yes	No
1	**CHECK COMBINATION METER.** 1)Turn the ignition switch to ON. (engine OFF) 2)Check other warning lights. Does the warning lights go on?	Warning lights go on.	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>
2	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND OIL PRESSURE SWITCH.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from oil pressure switch. 3)Turn the ignition switch ON. 4)Measure the voltage of harness between the combination meter connector and chassis ground. ***Connector & terminal*** ***(E11) No. 1 (+) — Chassis ground (-):*** Is the measured value more than specified value?	10 V	Replace the oil pressure switch.	Go to step **3.**
3	**CHECK COMBINATION METER.** 1)Turn the ignition switch to OFF. 2)Remove the combination meter. 3)Measure the resistance of combination meter. ***Terminal*** ***No. B9 — No. A3:*** Is the measured value less than specified value?	10 Ω	Replace the harness connector between combination meter and oil pressure switch.	Repair or replace the combination meter and the oil pressure switch warning light bulb.

3. Engine Oil

A: INSPECTION

1) Park the vehicle on a level surface.
2) Remove the oil level gauge and wipe it clean.
3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.
4) Remove it again and note the reading. If the engine oil level is below the “L” line, add oil to bring the level up to “F” line.
5) After turning off the engine, wait a few minutes for the oil to drain back into the oil pan before checking the level.
6) Just after driving or while the engine is warm, engine oil level may show in the range between the “F” line and notch mark. This is caused by thermal expansion of the engine oil.

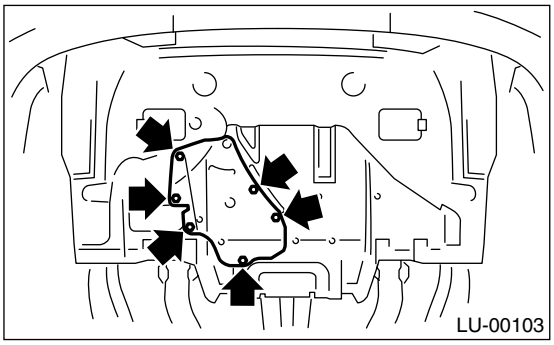
NOTE:
To prevent overfilling the engine oil, do not add oil above the “F” line when the engine is cold.



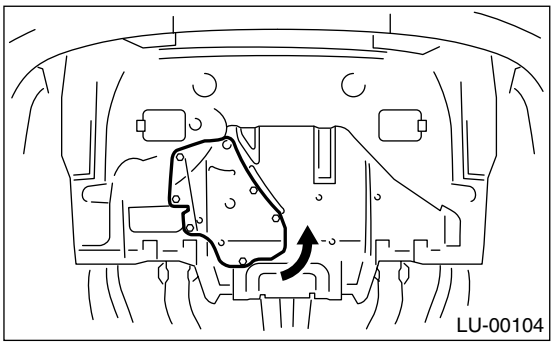
(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1.0 ℓ (1.1 Us qt, 0.9 Imp qt)

B: REPLACEMENT

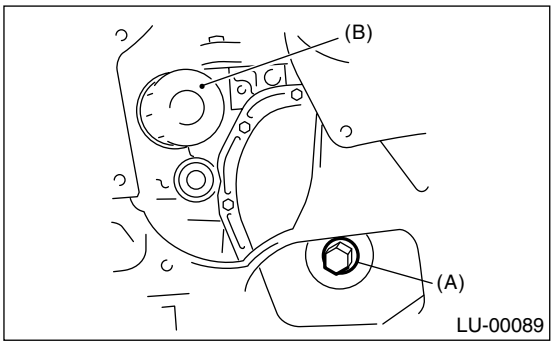
1) Open the engine oil filler cap for quick draining of the engine oil.
2) Remove six clips.



3) Turn the service hole cover counterclockwise.



4) Drain the engine oil by loosening the engine oil drain plug.

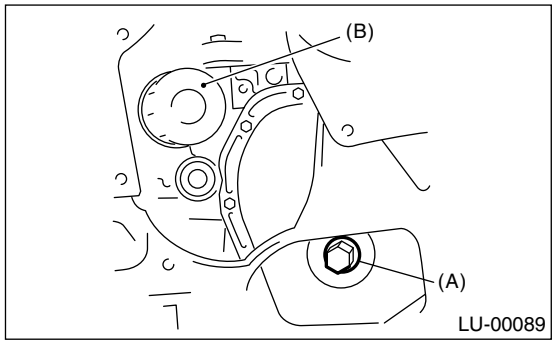


(A) Drain plug
(B) Oil filter

5) Replace the drain plug gasket.

6) Tighten the engine oil drain plug after draining engine oil.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)



(A) Drain plug
(B) Oil filter

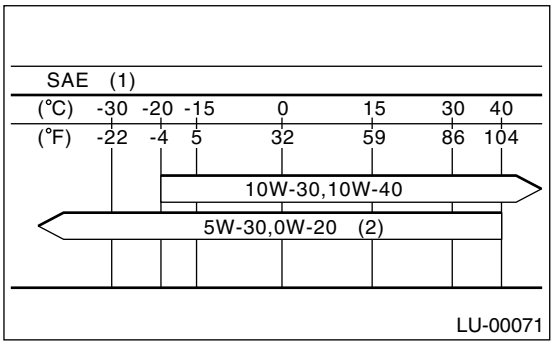
7) Install the service hole cover.
8) Fill engine oil through the filler pipe up to upper point on level gauge. Make sure that the vehicle is placed level when checking oil level. Use the engine oil of proper quality and viscosity, selected in accordance with the table in figure.

Recommended oil
API classification
SL or SJ or SH with the words "Energy Conserving or Energy conserving II", CCMC specification G4 or G5, ACEA specification A1, A2 or A3, or New API mark displayed on the container (If it is impossible to get SL or SJ or SH grade, you may use SG grade.)

Engine oil capacity: (Non-turbo model)
Upper level
4.0 ℓ (4.2 US qt, 3.5 Imp qt)
Lower level
3.0 ℓ (3.2 US qt, 2.6 Imp qt)

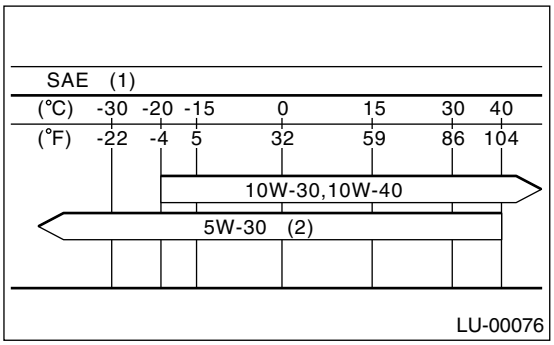
Engine oil capacity: (Turbo model)
Upper level
4.5 ℓ (4.8 US qt, 4.0 Imp qt)
Lower level
3.5 ℓ (3.7 US qt, 3.1 Imp qt)

- NON-TURBO MODEL



(1) SAE Viscosity No. and Applicable Temperature
(2) PREFERRED

- TURBO MODEL



(1) SAE Viscosity No. and Applicable Temperature
(2) PREFERRED

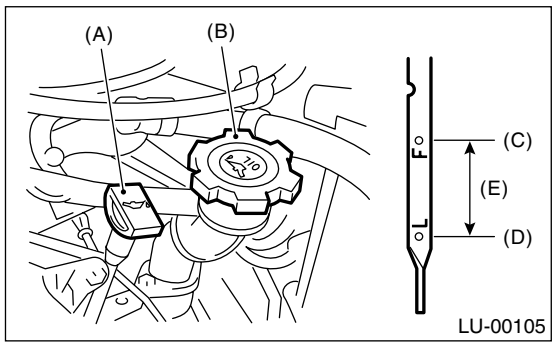
The proper viscosity helps vehicle get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

CAUTION:
When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the API classification and SAE viscosity No. designated by SUBARU.

NOTE:
If the vehicle is used in areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: API classification: SL or SJ or SH
SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50.

9) Close the engine oil filler cap.
10) Start the engine and warm it up for a time.

11) After the engine stops, recheck the oil level. If necessary, add engine oil up to the upper level on level gauge.

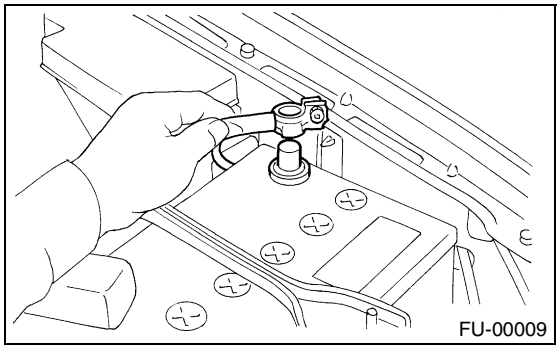


(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1.0 ℓ (1.1 Us qt, 0.9 Imp qt)

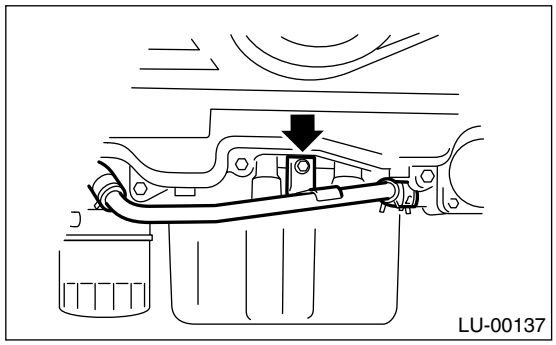
4. Oil Pump

A: REMOVAL

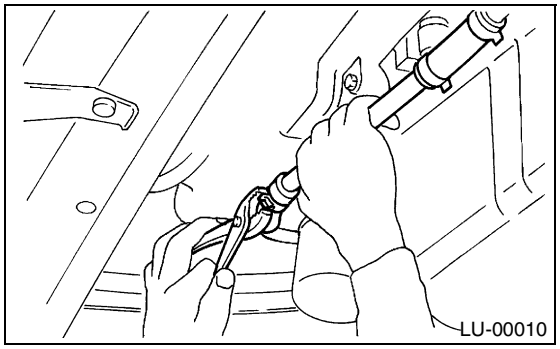
1) Disconnect the ground cable from battery.



2) Lift-up the vehicle.
3) Remove the under cover.
4) Remove the bolts which install water pipe of oil cooler to oil pump. (Turbo model)

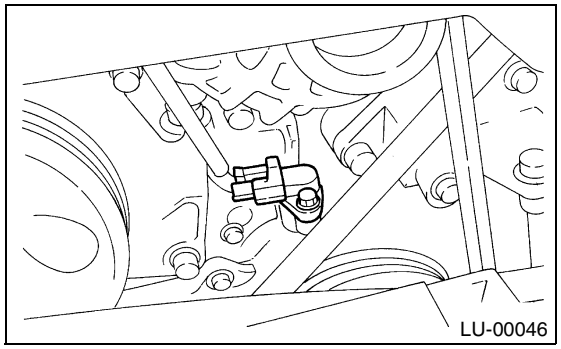


5) Remove the water pipe and hoses between oil cooler and water pump. (Turbo model)

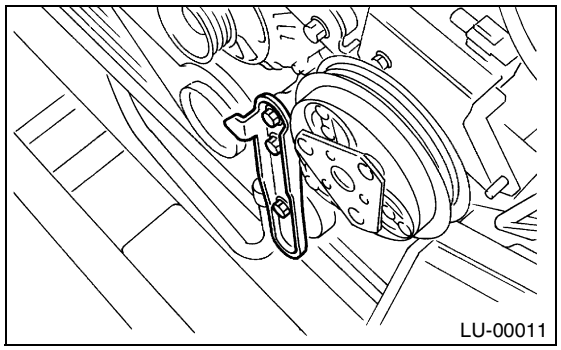


6) Remove the radiator. <Ref. to CO(SOHC)-27, REMOVAL, Radiator.>

7) Remove the crankshaft position sensor.

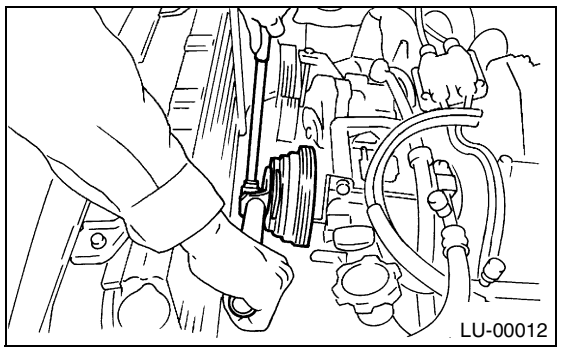


8) Remove the V-belts.
<Ref. to ME(SOHC)-41, REMOVAL, V-belt.> or <Ref. to ME(TURBO)-44, REMOVAL, V-belt.>
9) Remove the rear side V-belt tensioner.



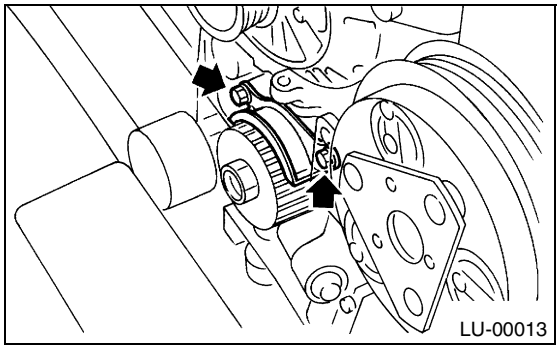
10) Remove the crankshaft pulley by using ST.

ST	499977400	CRANKSHAFT PULLEY WRENCH (2000 cc model)
ST	499977100	CRANKSHAFT PULLEY WRENCH (2500 cc model)

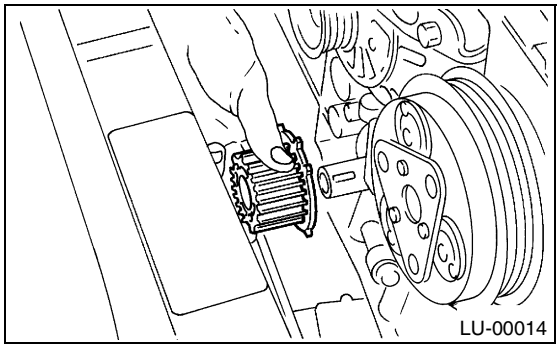


11) Remove the water pump. <Ref. to CO(SOHC)-20, REMOVAL, Water Pump.>

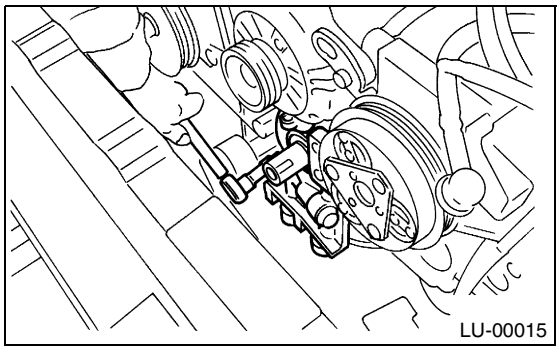
12) Remove the timing belt guide. (MT vehicles)



13) Remove the crankshaft sprocket.

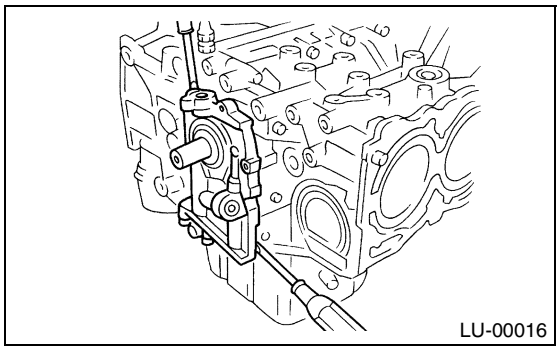


14) Remove the bolts which install oil pump onto cylinder block.



15) Remove the oil pump by using flat tip screwdriver.

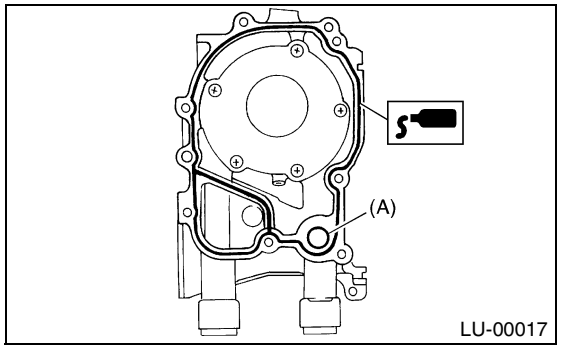
CAUTION:
Be careful not to scratch the mating surfaces of cylinder block and oil pump.



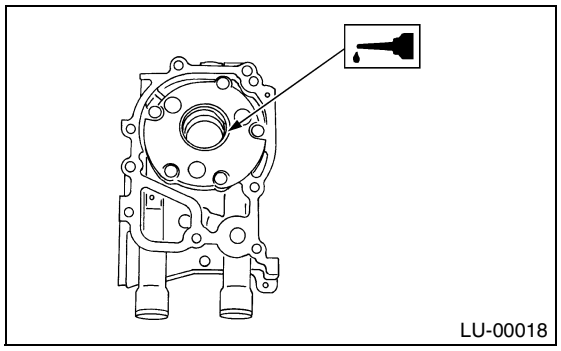
B: INSTALLATION

Install in the reverse order of removal.
Do the following:
1) Apply fluid packing to the matching surfaces of oil pump.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



2) Replace the O-ring (A) with a new one.
3) Apply a coat of engine oil to the inside of oil seal.

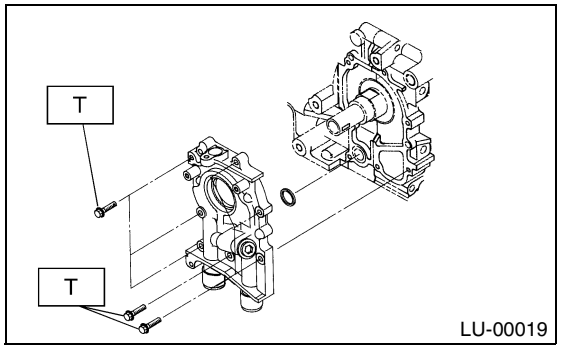


4) Be careful not to scratch the oil seal when installing oil pump on cylinder block.
5) Position the oil pump, aligning the notched area with crankshaft, and push the oil pump straight.

CAUTION:
Make sure the oil seal lip is not folded.

6) Install the oil pump.

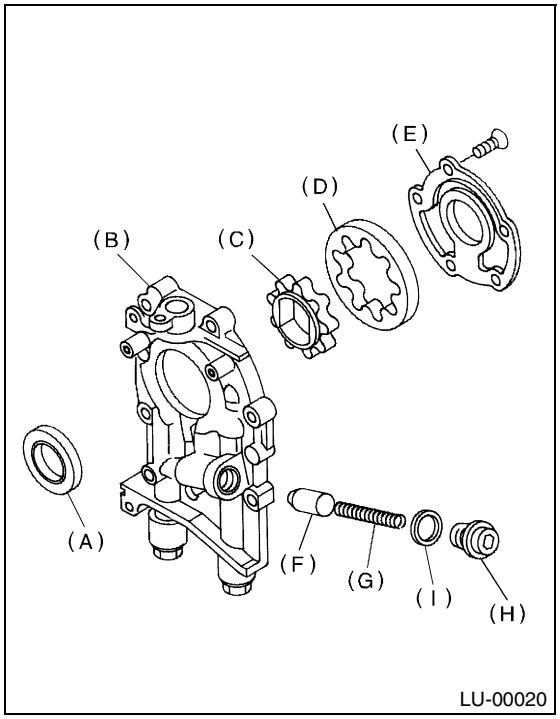
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



C: DISASSEMBLY

Remove the screws which secure oil pump cover and disassemble oil pump. Inscribe alignment marks on the inner and outer rotors so that they can be replaced in their original positions during reassembly.

CAUTION:
Before disassembling the oil pump, remove the relief valve.

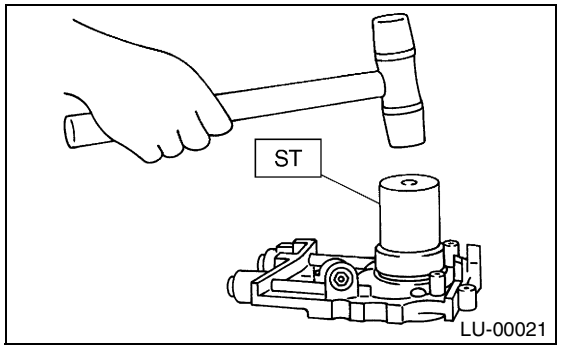


(A) Oil seal
(B) Pump case
(C) Inner rotor
(D) Outer rotor
(E) Pump cover
(F) Relief valve
(G) Relief valve spring
(H) Plug
(I) Gasket

D: ASSEMBLY

1) Install the front oil seal by using ST.
ST 499587100 OIL SEAL INSTALLER

NOTE:
Use a new oil seal.

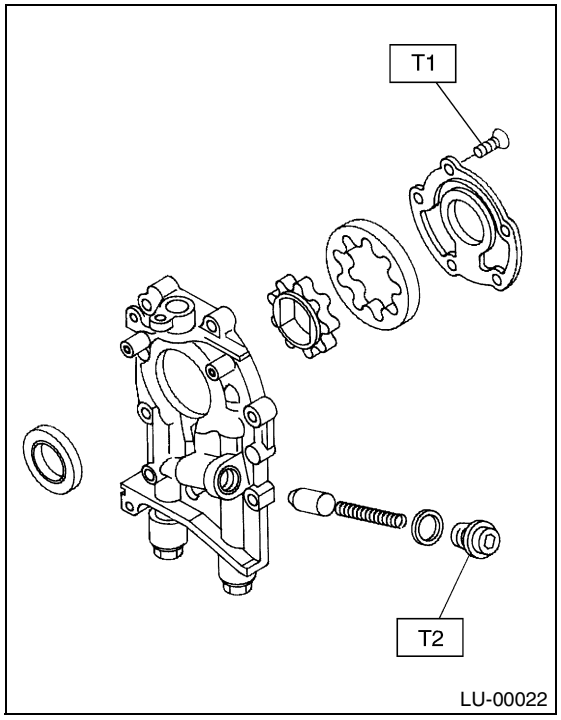


2) Apply a coat of engine oil to the inner and outer rotors.
3) Install the inner and outer rotors in their original positions.
4) Install the oil relief valve and relief valve spring and plug.

NOTE:
Use a new gasket.

5) Install the oil pump cover.

Tightening torque:
T1: 5 N·m (0.5 kgf-m, 3.6 ft-lb)
T2: 44 N·m (4.5 kgf-m, 32.5 ft-lb)

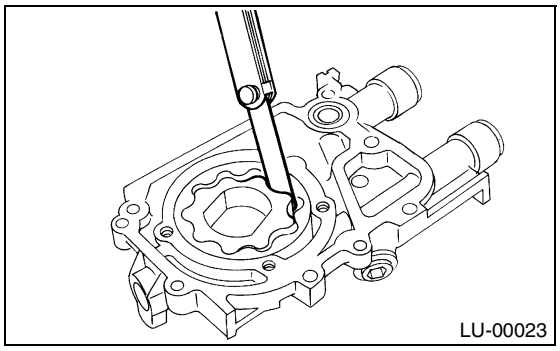


E: INSPECTION

1. TIP CLEARANCE

Measure the tip clearance of rotors. If clearance exceeds the limit, replace the rotors as a matched set.

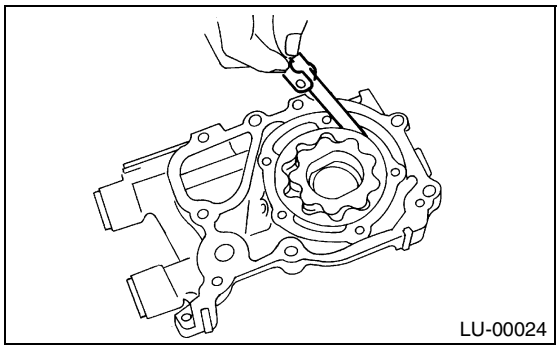
Tip clearance:
Standard
0.04 — 0.14 mm (0.0016 — 0.0055 in)
Limit
0.18 mm (0.0071 in)



2. CASE CLEARANCE

Measure the clearance between the outer rotor and oil pump rotor housing. If clearance exceeds the limit, replace the rotor.

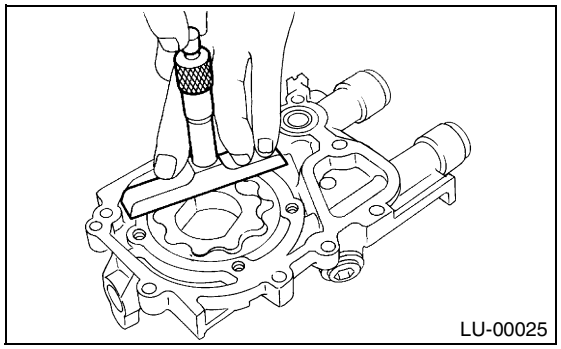
Case clearance:
Standard
0.10 — 0.175 mm (0.0039 — 0.0069 in)
Limit
0.20 mm (0.0079 in)



3. SIDE CLEARANCE

Measure the clearance between the oil pump inner rotor and pump cover. If clearance exceeds the limit, replace the rotor or pump body.

Side clearance:
Standard
0.02 — 0.07 mm (0.0008 — 0.0028 in)
Limit
0.12 mm (0.0047 in)



4. OIL RELIEF VALVE

Check the valve for fitting condition and damage, and the relief valve spring for damage and deterioration. Replace the parts if defective.

Relief valve spring:
Non-turbo model
Free length
72.8 mm (2.866 in)
Installed length
54.7 mm (2.154 in)
Load when installed
81.3 N (8.29 kgf, 18.24 lb)
Turbo model
Free length
73.7 mm (2.902 in)
Installed length
54.7 mm (2.154 in)
Load when installed
93.1 N (9.49 kgf, 20.88 lb)

5. OIL PUMP CASE

Check the oil pump case for worn shaft hole, clogged oil passage, worn rotor chamber, cracks, and other faults.

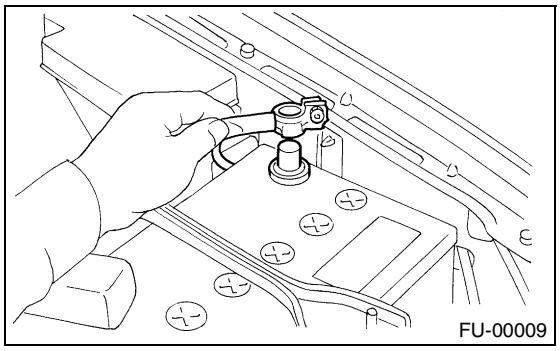
6. OIL SEAL

Check the oil seal lips for deformation, hardening, wear, etc. and replace if defective.

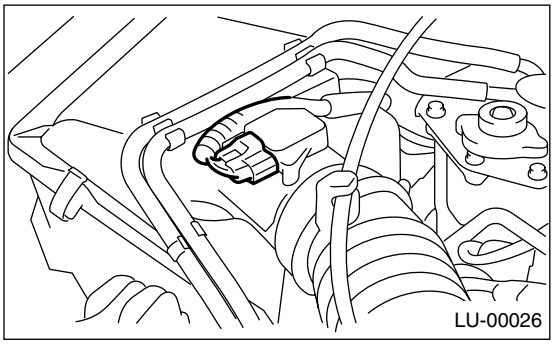
5. Oil Pan and Strainer

A: REMOVAL

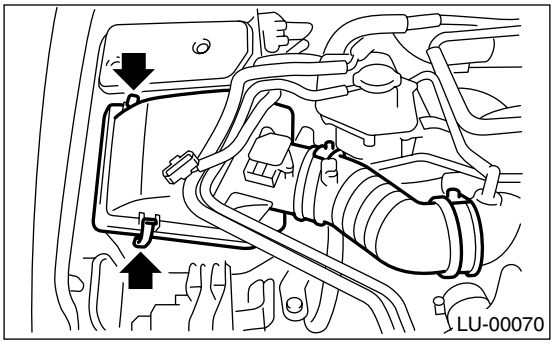
1) Set the vehicle on lift arms.
2) Remove the front wheels.
3) Disconnect the ground cable from battery.



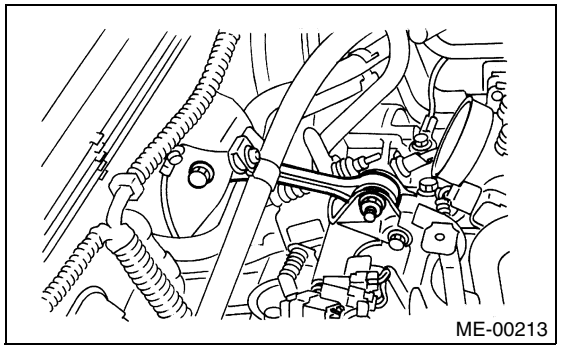
4) Remove the air intake duct and air cleaner case. (Non-turbo model) <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
5) Disconnect the connector from mass air flow sensor. (Turbo model)



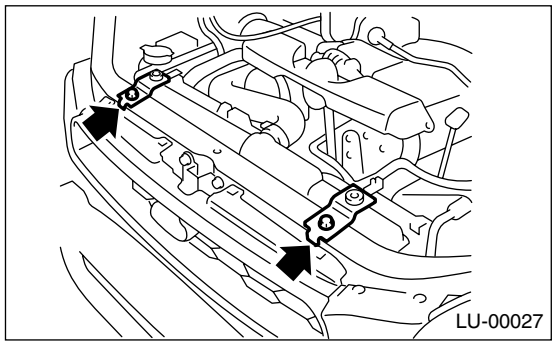
6) Remove the air intake boot and air cleaner upper cover. (Turbo model)



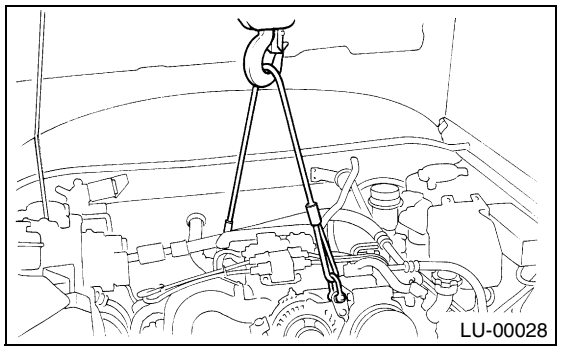
7) Remove the intercooler (Turbo model) <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
8) Remove the pitching stopper.



9) Remove the radiator upper brackets.



10) Support the engine with a lifting device and wire ropes.

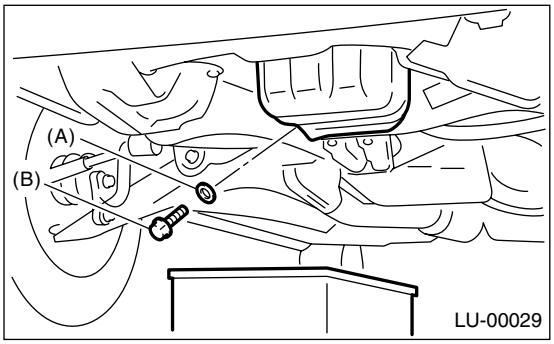


11) Lift-up the vehicle.

CAUTION:
When lifting up the vehicle, rise up the wire rope together.

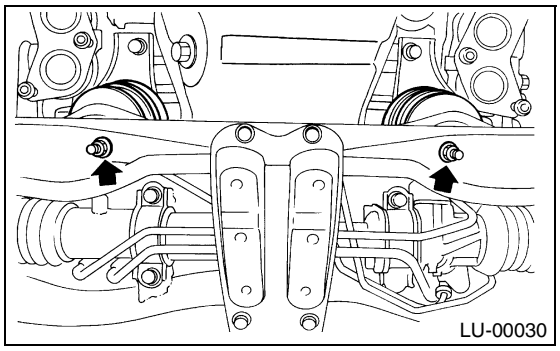
12) Remove the under cover.

13) Drain the engine oil.
Set a container under the vehicle, and remove the drain plug from oil pan.



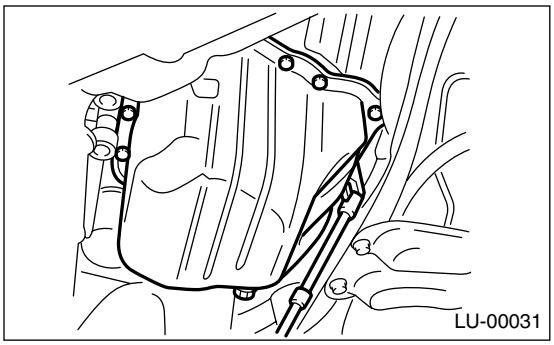
(A) Gasket
(B) Drain plug

14) Remove the front and center exhaust pipes. (Non-turbo model) <Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.>
15) Remove the nuts which install front cushion rubber onto front crossmember.

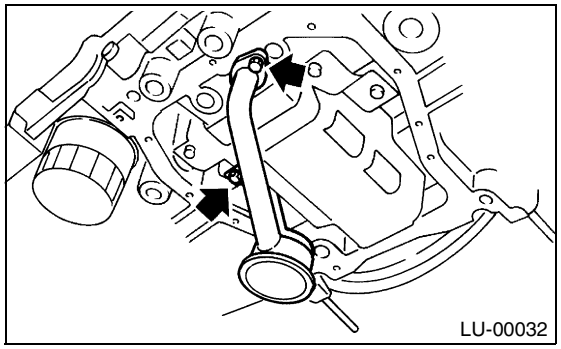


16) Remove the bolts which install oil pan on cylinder block while raising up engine.
17) Insert the oil pan cutter blade between the cylinder block-to-oil pan clearance.

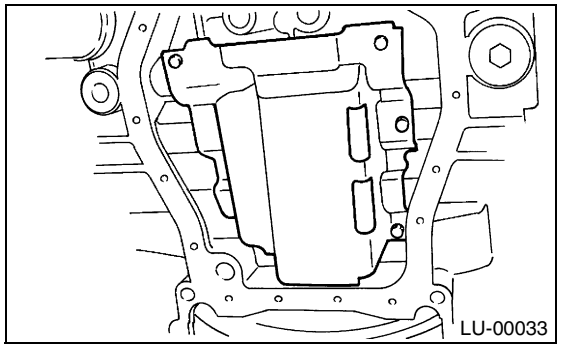
CAUTION:
Do not use a screwdriver or similar tool in place of oil pan cutter.



18) Remove the oil strainer.



19) Remove the baffle plate.

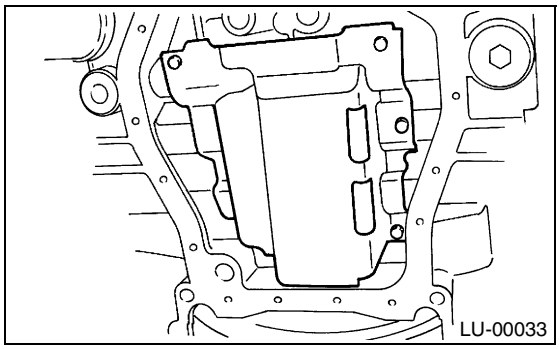


B: INSTALLATION

CAUTION:
Before installing the oil pan, clean sealant from oil pan and engine block.

1) Install the baffle plate.

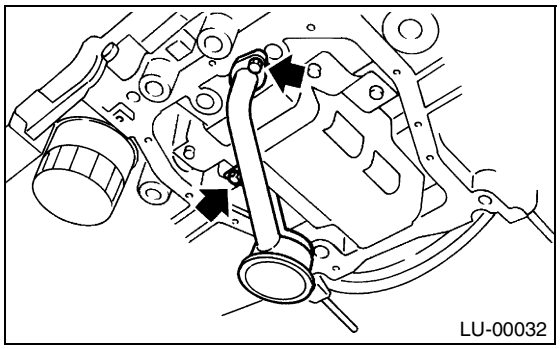
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



2) Install the oil strainer onto baffle plate.

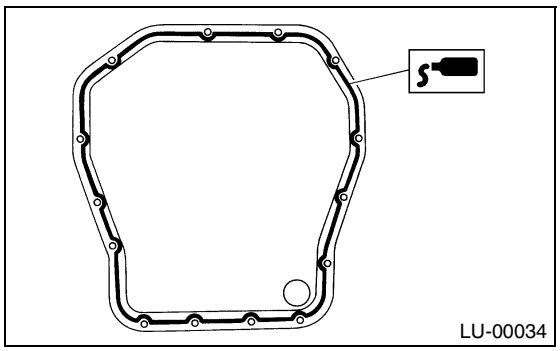
NOTE:
Replace the O-ring with a new one.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



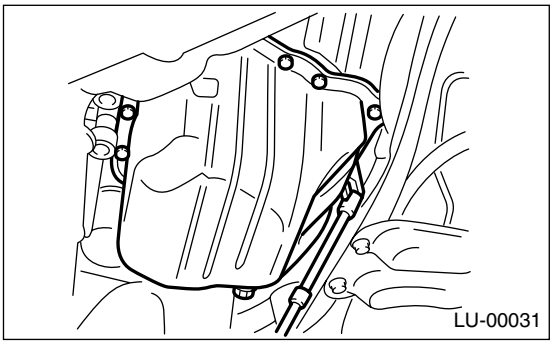
3) Apply fluid packing to the mating surfaces and install oil pan.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



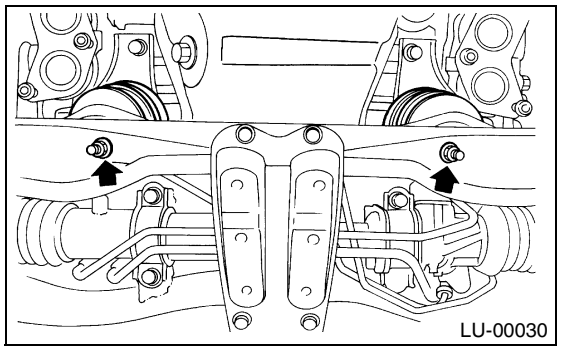
4) Tighten the bolts which install the oil pan onto engine block.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



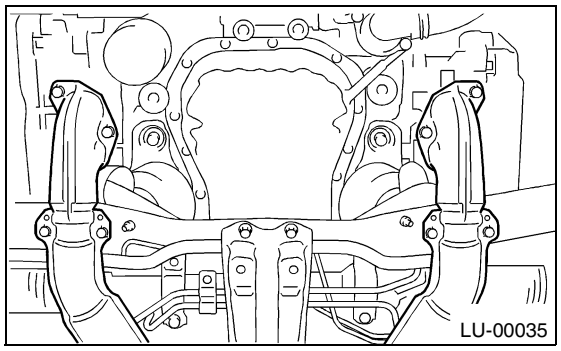
5) Lower the engine onto front crossmember.
6) Tighten the nuts which install front cushion rubber onto front crossmember.

Tightening torque:
69 N·m (7.0 kgf-m, 50.9 ft-lb)



7) Install the front and center exhaust pipes. (Non-Turbo model) <Ref. to EX(SOHC)-8, INSTALLATION, Front Exhaust Pipe.>

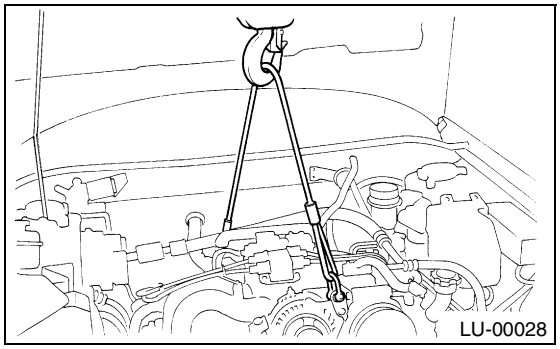
NOTE:
Always use new gaskets.



8) Install the under cover.
9) Lower the vehicle.

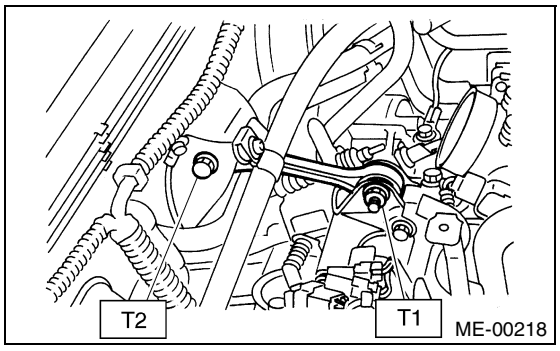
CAUTION:
When lowering the vehicle, lower the lifting device and wire rope together.

10) Remove the lifting device and steel cables.

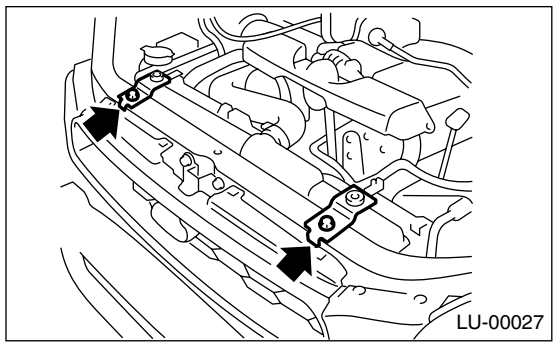


11) Install the pitching stopper.

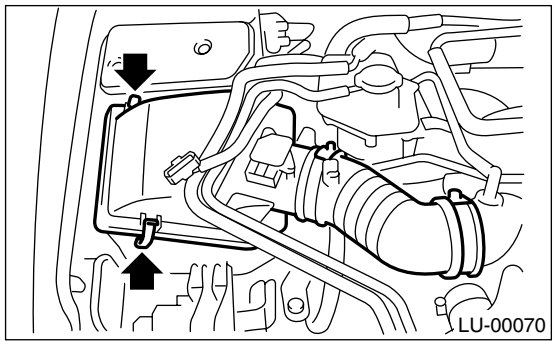
Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)



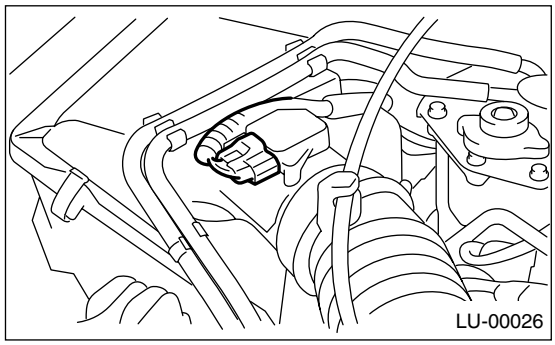
12) Install the radiator upper brackets.



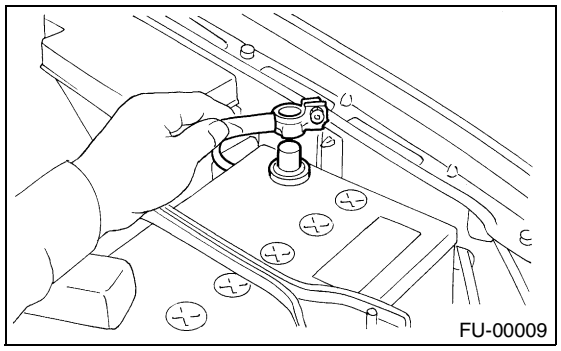
13) Install the air intake duct and air cleaner case. (Non-turbo model) <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.> and <Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.>
14) Install the intercooler. (Turbo model) <Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>
15) Install the air intake boot and air cleaner upper cover. (Turbo model)



16) Connect the connector to mass air flow sensor. (Turbo model)



17) Install the front wheels.
18) Connect the battery ground cable to battery.



19) Fill engine oil. <Ref. to LU(SOHC)-10, INSPECTION, Engine Oil.>

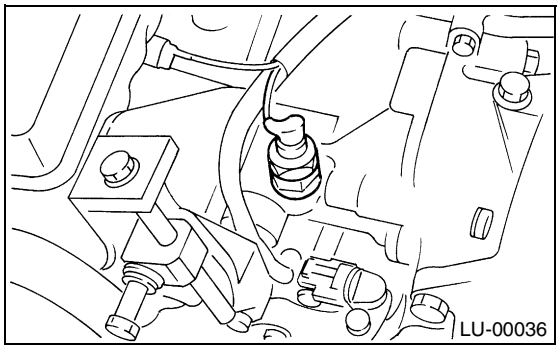
C: INSPECTION

By visual check make sure the oil pan, oil strainer, oil strainer stay and baffle plate are not damaged.

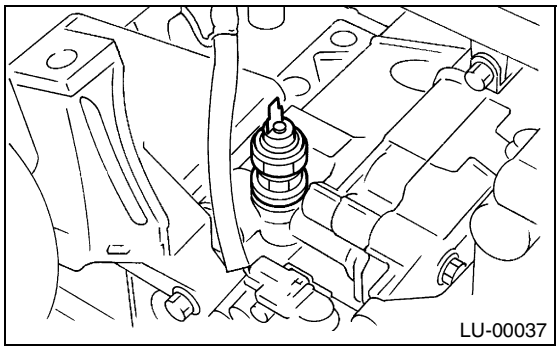
6. Oil Pressure Switch

A: REMOVAL

1) Remove the generator from bracket. <Ref. to SC(SOHC)-15, REMOVAL, Generator.>
2) Disconnect the terminal from oil pressure switch.



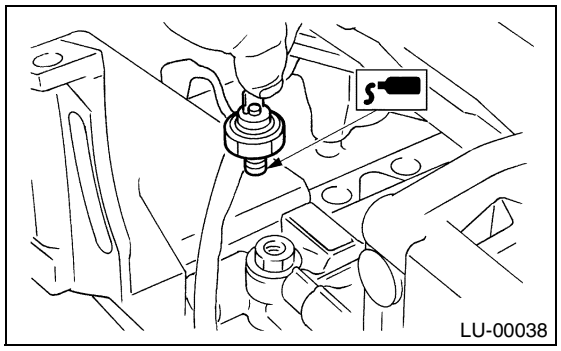
3) Remove the oil pressure switch.



B: INSTALLATION

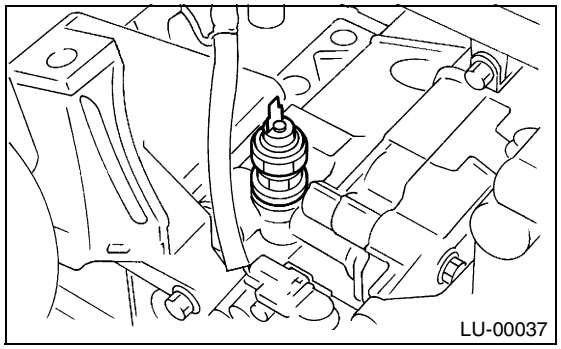
1) Apply fluid packing to the oil pressure switch threads.

Fluid packing:
Part No. 004403007
THREE BOND 1324 or equivalent

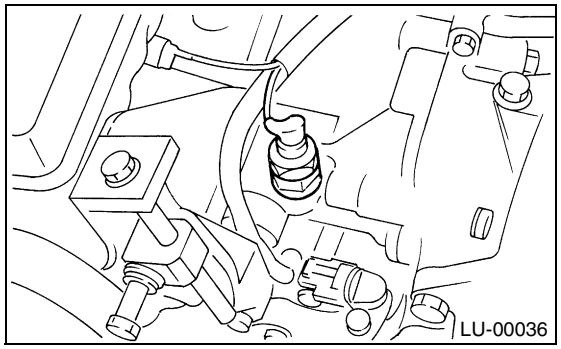


2) Install the oil pressure switch onto engine block.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



3) Connect the terminal of oil pressure switch.



4) Install the generator on bracket. <Ref. to SC(SOHC)-15, INSTALLATION, Generator.>

C: INSPECTION

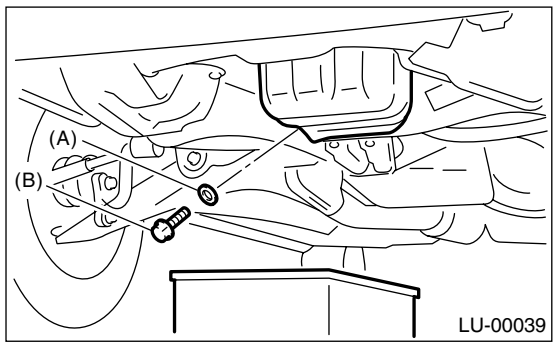
Make sure oil does not leak or seep from where the oil pressure switch is installed.

7. Engine Oil Cooler

A: REMOVAL

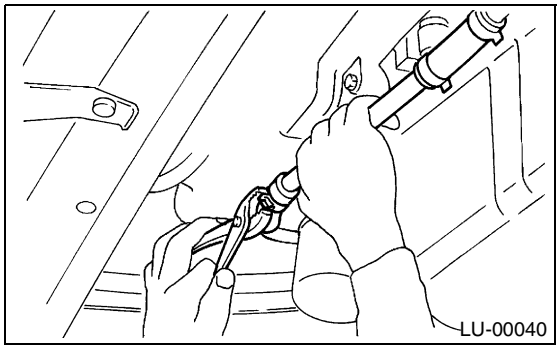
NOTE:
Engine oil cooler is equipped with turbo model only.

1) Lift-up the vehicle.
2) Remove the under cover.
3) Drain the engine oil.
Set a container under the vehicle, and remove the drain plug from oil pan.

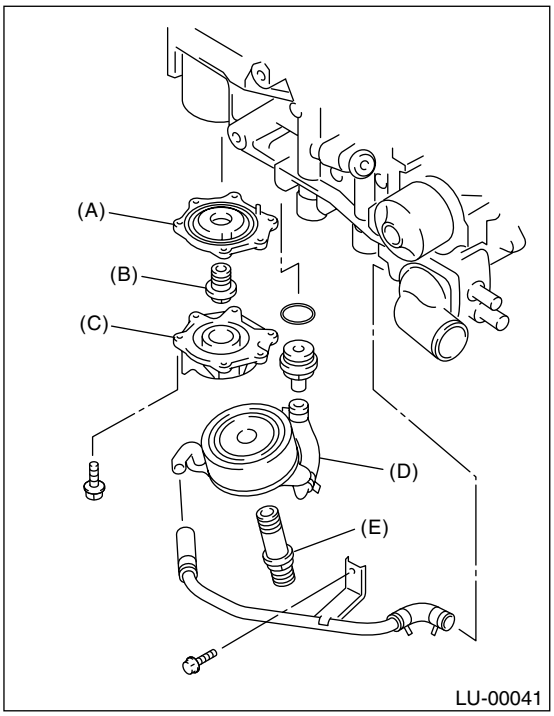


(A) Gasket
(B) Drain plug

4) Drain the engine coolant.
5) Remove the water by-pass pipe between oil cooler and water pump.



6) Remove the engine oil filter. <Ref. to LU(SOHC)-24, REMOVAL, Engine Oil Filter.>
7) Remove the connector and remove oil cooler.
8) Remove the adapters (1) and (2).

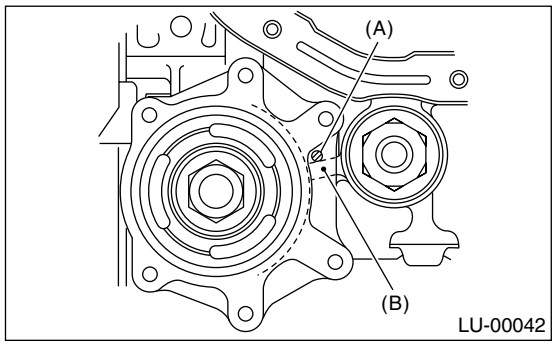


(A) Adapter (1)
(B) Adapter connector
(C) Adapter (2)
(D) Oil cooler
(E) Oil cooler connector

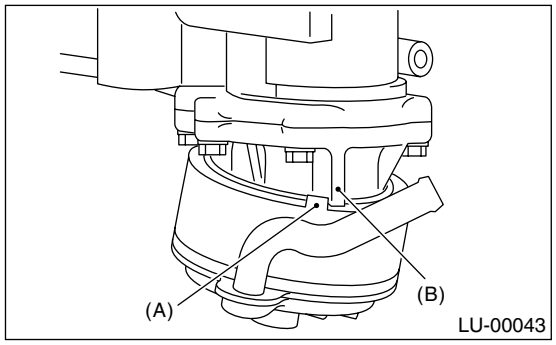
B: INSTALLATION

NOTE:
Engine oil cooler is equipped with turbo model only.

1) Install in the reverse order of removal.
2) Contact the knock pin (A) of adapter (1) to cylinder block rib to install adapter (1).

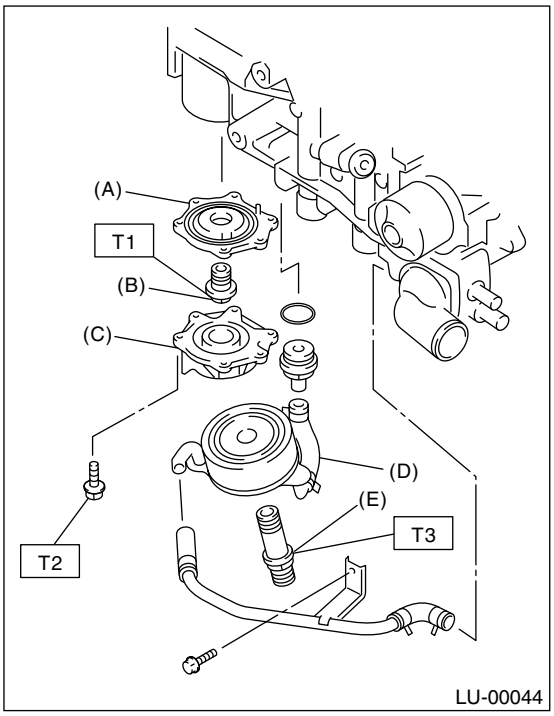


3) Install the adapter (2).
4) Contact the engine oil cooler stopper (A) to adapter (2) rib to install engine oil cooler.



Tightening torque:
T1: 6.4 N·m (0.7 kgf-m, 5.1 ft-lb)
T2: 44 N·m (4.5 kgf-m, 33 ft-lb)
T3: 54 N·m (5.5 kgf-m, 40 ft-lb)

NOTE:
Always use a new O-ring.



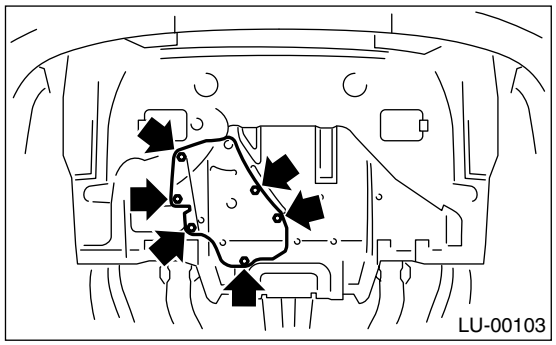
C: INSPECTION

1) Check that the coolant passages are not clogged using air blow method.
2) Check the mating surfaces of cylinder block, O-ring groove and oil filter for damage.

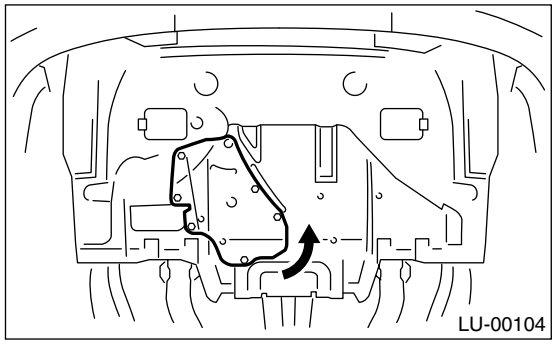
8. Engine Oil Filter

A: REMOVAL

1) Remove six clips on the under cover.

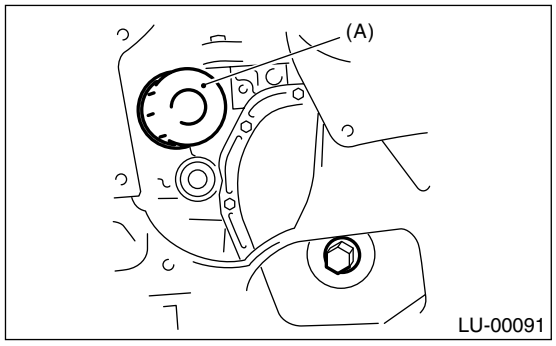


2) Turn the service hole cover counterclockwise.



3) Remove the oil filter with ST.

ST	498547000	OIL FILTER WRENCH (Non-trbo model)
ST	18332AA000	OIL FILTER WRENCH (Turbo model)



B: INSTALLATION

1) Get a new oil filter and apply a thin coat of engine oil to the seal rubber.
2) Install the oil filter by turning it by hand, being careful not to damage seal rubber.
3) Tighten more (approx. 2/3 to 3/4 turn) after the seal rubber contacts the oil pump case. Do not tighten excessively, or oil may leak.

C: INSPECTION

1) After installing the oil filter, run the engine and make sure that no oil is leaking around seal rubber.

NOTE:
The filter element and filter case are permanently jointed; therefore, interior cleaning is not necessary.

2) Check the engine oil level. <Ref. to LU(SOHC)-10, INSPECTION, Engine Oil.>

9. Engine Lubrication System Trouble in General

A: INSPECTION

Before performing diagnostics, make sure that the engine oil level is correct and no oil leakage exists.

Trouble	Possible cause		Corrective action
1. Warning light remains on.	1) Oil pressure switch failure	Cracked diaphragm or oil leakage within switch	Replace.
		Broken spring or seized contacts	Replace.
	2) Low oil pressure	Clogged oil filter	Replace.
		Malfunction of oil by-pass valve of oil filter	Clean or replace.
		Malfunction of oil relief valve of oil pump	Clean or replace.
		Clogged oil passage	Clean.
		Excessive tip clearance and side clearance of oil pump rotor and gear	Replace.
		Clogged oil strainer or broken pipe	Clean or replace.
	3) No oil pressure	Insufficient engine oil	Replenish.
		Broken pipe of oil strainer	Replace.
		Stuck oil pump rotor	Replace.
2. Warning light does not go on.	1) Burn-out bulb		Replace.
	2) Poor contact of switch contact points		Replace.
	3) Disconnection of wiring		Repair.
3. Warning light flickers momentarily.	1) Poor contact at terminals		Repair.
	2) Defective wiring harness		Repair.
	3) Low oil pressure		Check for the same possible causes as listed in 1.—2).

SPEED CONTROL SYSTEMS

SP(SOHC)

Page

1. General Description 2
2. Accelerator Pedal 4
3. Accelerator Control Cable 9

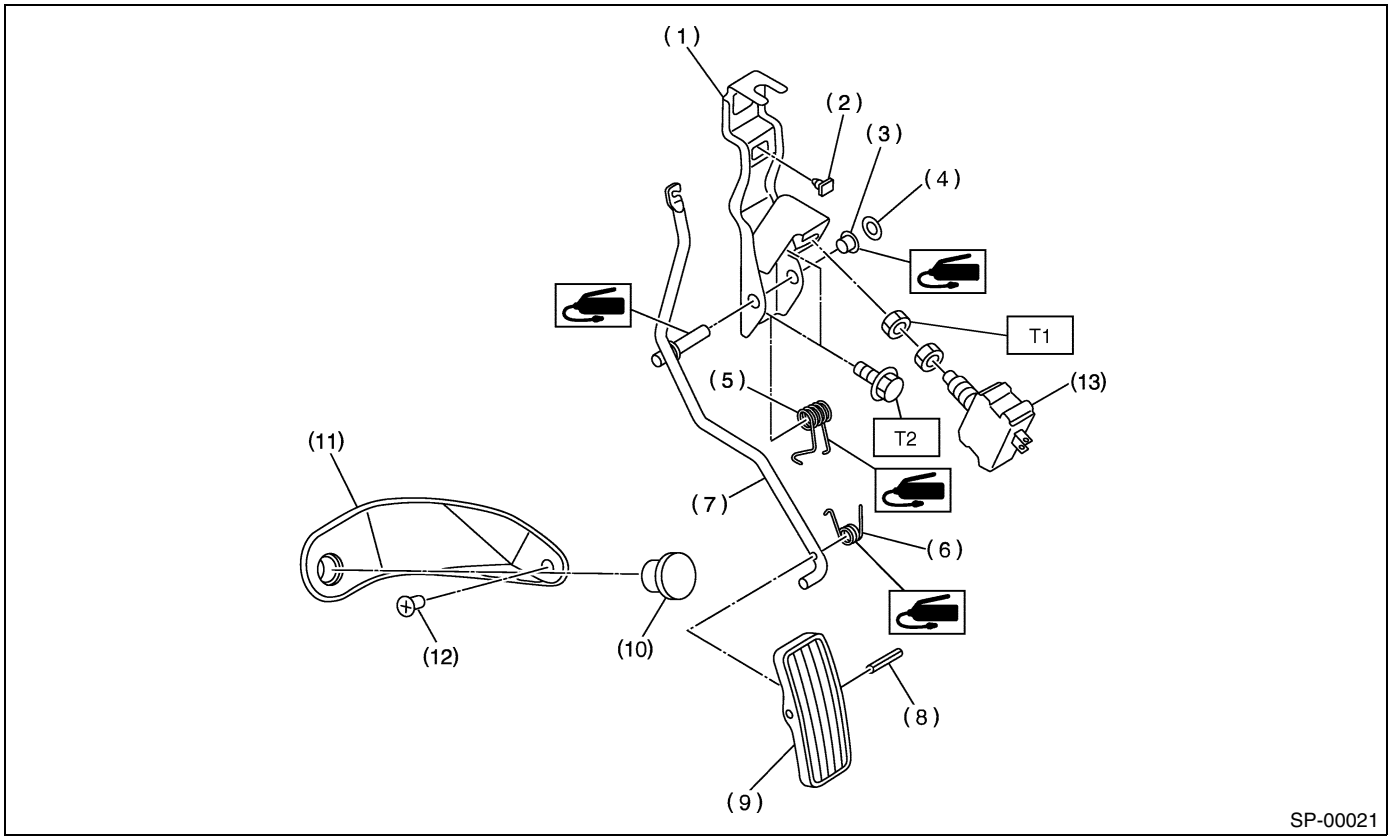
1. General Description

A: SPECIFICATION

Accelerator pedal	Free play	At pedal pad	0 — 4 mm (0 — 0.16 in)
	Stroke	At pedal pad	52 — 57 mm (2.05 — 2.24 in)

B: COMPONENT

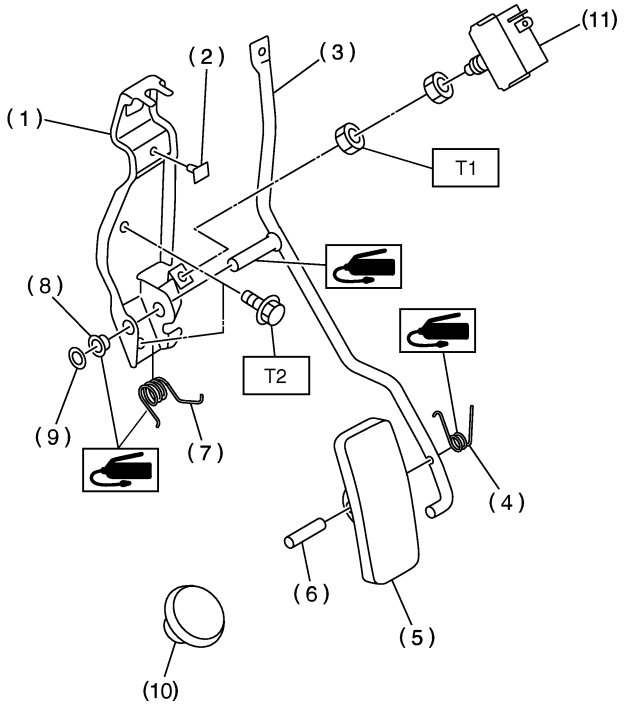
1. LHD MODEL



(1) Accelerator bracket
(2) Stopper
(3) Bushing
(4) Clip
(5) Accelerator spring
(6) Accelerator pedal spring
(7) Accelerator pedal lever
(8) Spring pin
(9) Accelerator pedal
(10) Accelerator stopper
(11) Accelerator plate
(12) Clip
(13) Kick-down switch (AT vehicles only)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 12 (1.2, 9.0)
T2: 18 (1.8, 13.0)

2. RHD MODEL



SP-00022

(1) Accelerator bracket
(2) Stopper
(3) Accelerator pedal lever
(4) Accelerator pedal spring
(5) Accelerator pedal
(6) Spring pin
(7) Accelerator spring
(8) Bushing
(9) Clip
(10) Accelerator stopper
(11) Kick-down switch (AT vehicles only)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 12 (1.2, 9.0)
T2: 18 (1.8, 13.0)

C: CAUTION

- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination, including dirt and corrosion, before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

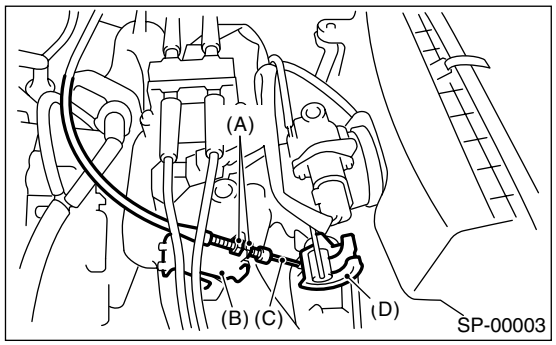
2. Accelerator Pedal

A: REMOVAL

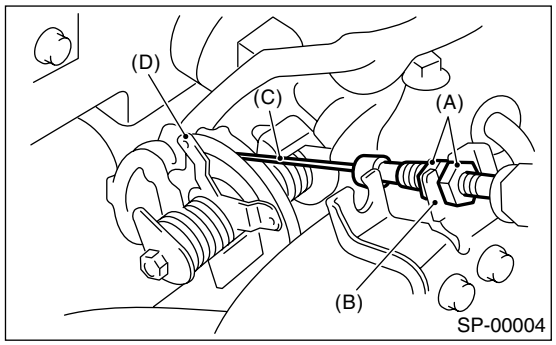
1) Disconnect the ground cable from battery.
2) Remove the lock nut from accelerator cable bracket.
3) Separate the accelerator cable from bracket.
4) Remove the accelerator cable end from throttle cam.

NOTE:
Be careful not to kink the accelerator cable.

- SOHC MODEL



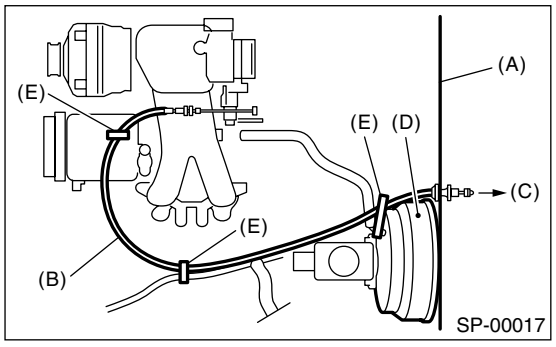
- DOHC turbo MODEL



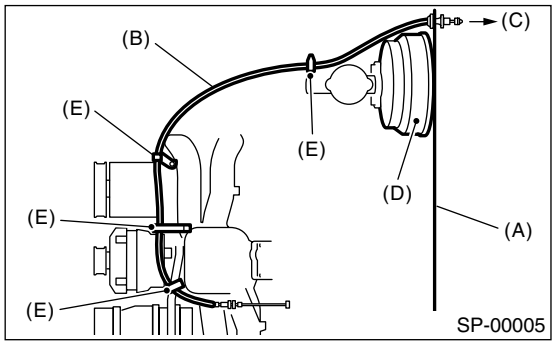
(A) Lock nut
(B) Accelerator cable bracket
(C) Accelerator cable
(D) Throttle cam

5) Remove the clip inside engine compartment.

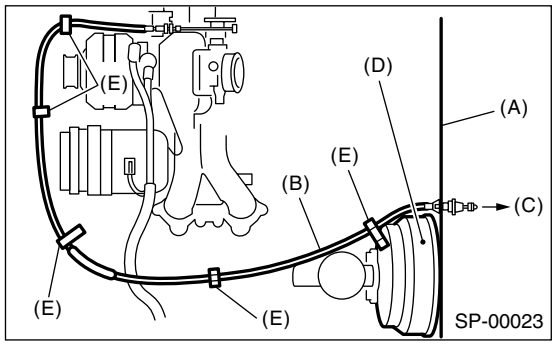
- LHD SOHC MODEL



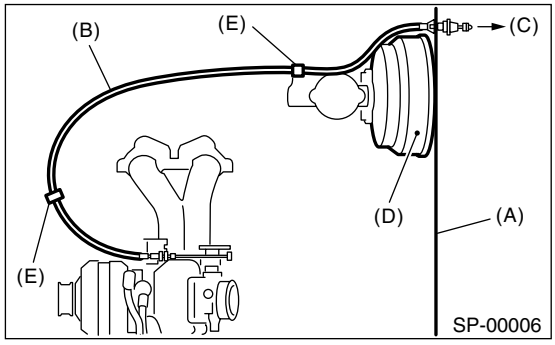
- RHD SOHC MODEL



- LHD DOHC turbo MODEL



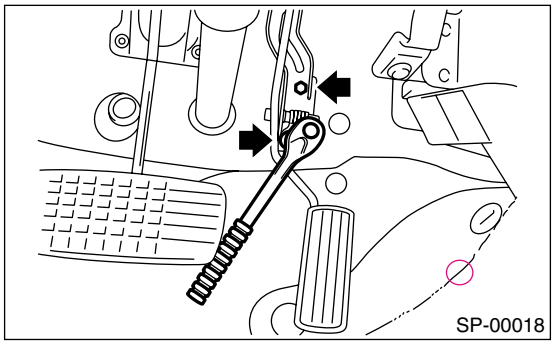
- RHD DOHC turbo MODEL



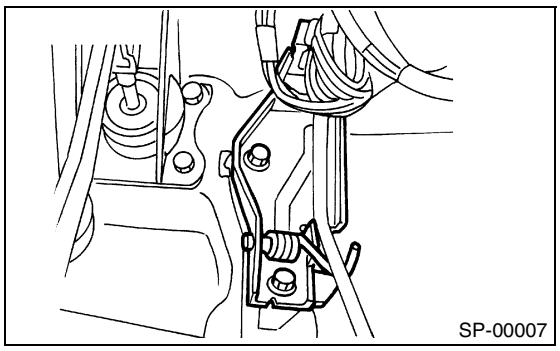
(A) Toe board
(B) Accelerator cable
(C) To accelerator pedal
(D) Brake booster
(E) Clip

6) Remove the instrument panel lower cover from instrument panel, and connector.
7) Disconnect the connector from kick-down switch. (AT vehicles)
8) Remove the accelerator pedal connecting bolt from accelerator pedal bracket.

- LHD MODEL

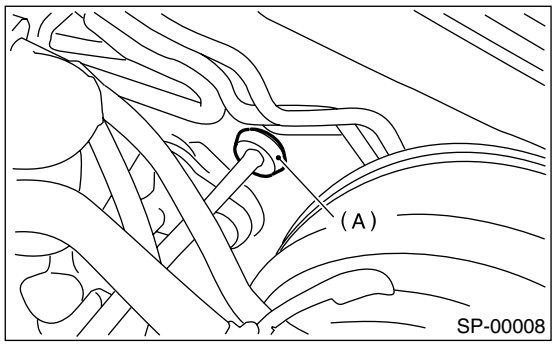


- RHD MODEL

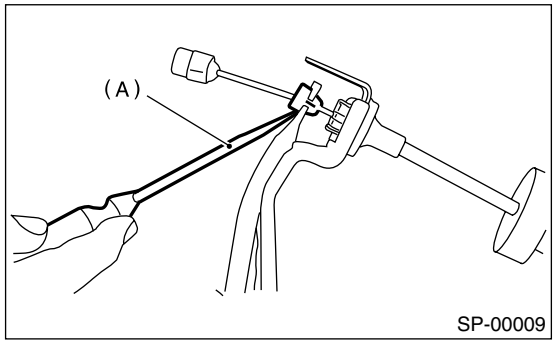


9) Disconnect the grommet from toe board.

NOTE:
From the inside compartment, push the grommet (A) into hole.

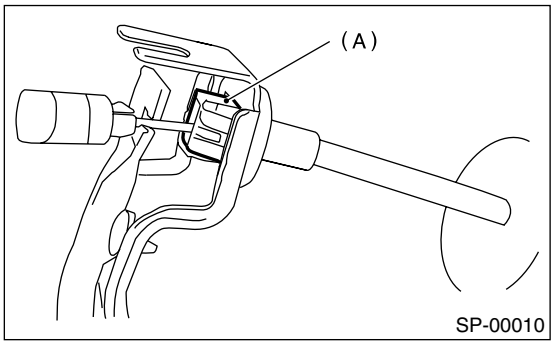


10) Pull out the cable from toe board hole.
11) Disconnect the accelerator cable bushing from accelerator pedal lever.



(A) Flat tip screwdriver

12) Disconnect the accelerator cable stopper (A) from bracket.



13) Separate the accelerator cable and bracket.

B: INSTALLATION

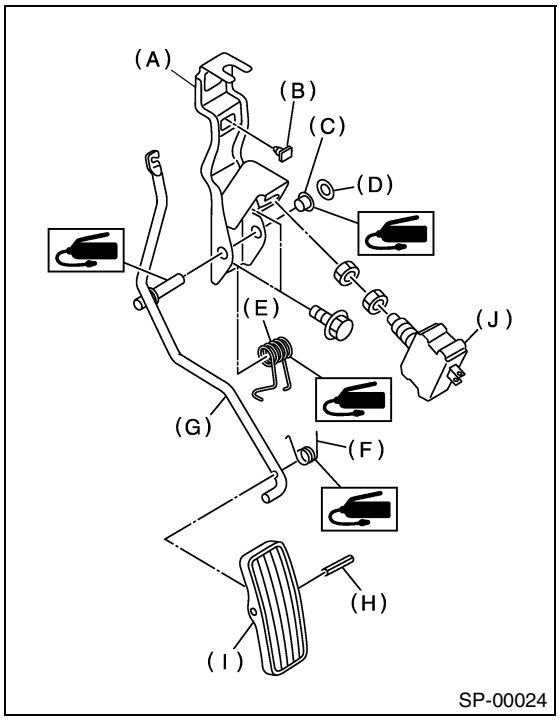
1) Install in the reverse order of removal.

NOTE:
- If the cable clamp is damaged, replace it with a new one.
- Never fail to cover the outer cable end with boot.
- Be careful not to kink the accelerator cable.
- For tightening torque, refer to “COMPONENT“. <Ref. to SP(SOHC)-2, COMPONENT, General Description.>

C: DISASSEMBLY

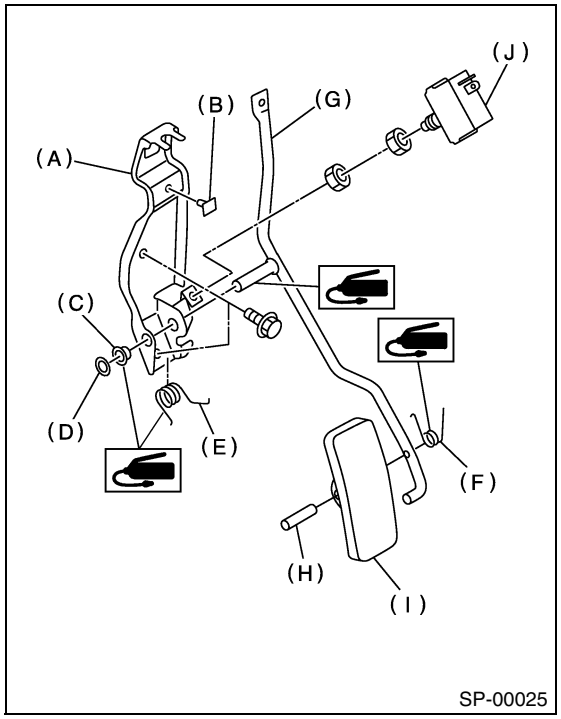
1) Remove the clip, and then remove the accelerator pedal from bracket.
2) Pull out the spring pin, and then remove the accelerator pedal from accelerator pedal lever.

- LHD MODEL



(A) Accelerator bracket
(B) Stopper
(C) Bushing
(D) Clip
(E) Accelerator spring
(F) Accelerator pedal spring
(G) Accelerator pedal lever
(H) Spring pin
(I) Accelerator pedal
(J) Kick-down switch (AT model)

- RHD MODEL



(A) Accelerator bracket
(B) Stopper
(C) Bushing
(D) Clip
(E) Accelerator spring
(F) Accelerator pedal spring
(G) Accelerator pedal lever
(H) Spring pin
(I) Accelerator pedal
(J) Kick-down switch (AT model)

D: ASSEMBLY

Assemble in the reverse order of disassembly.

NOTE:
Clean and apply grease to the portions indicated in the figure.

Grease:
Part No. 003602010
SUNLIGHT No.2

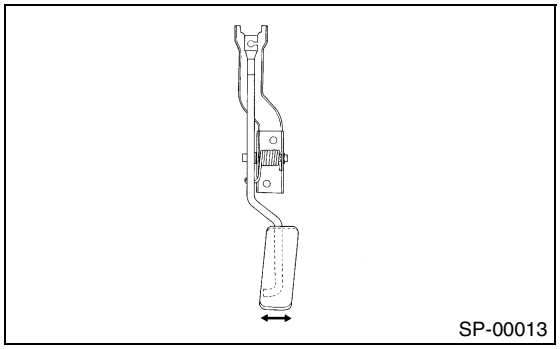
E: INSPECTION

1. ACCELERATOR PEDAL

Lightly move the pedal pad in lateral direction to ensure that pedal deflection is in specified range.

CAUTION:
If excessive deflection is noted, replace the bushing and clip with new ones.

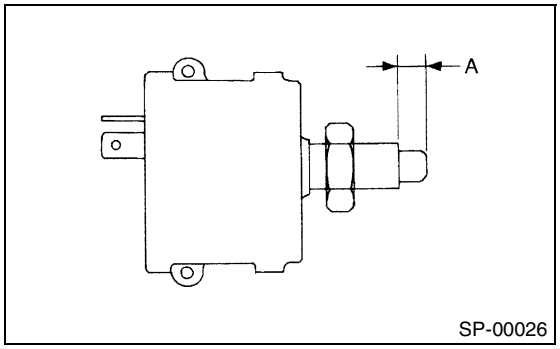
Deflection of accelerator pedal:
Service limit
±2.0 mm (±0.079 in) or less



2. KICK-DOWN SWITCH

If the kick-down switch does not operate properly (or if it does not stop at the specified position), replace with a new one.

Specified position: A
2.0 — 3.5 mm (0.079 — 0.098 in)

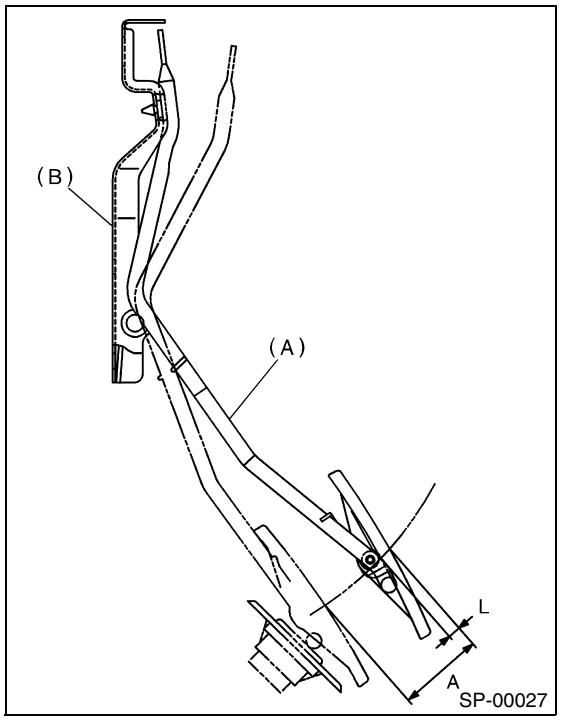


F: ADJUSTMENT

1) Check the pedal stroke and free play by operating accelerator pedal by hand.
2) If it is not within specified value, adjust it by turning the nut connecting the accelerator cable to throttle body.

Free play at pedal pad: L
0 — 4 mm (0 — 0.16 in)

Stroke at pedal pad: A
52 — 57 mm (2.05 — 2.24 in)



(A) Accelerator pedal
(B) Accelerator pedal bracket

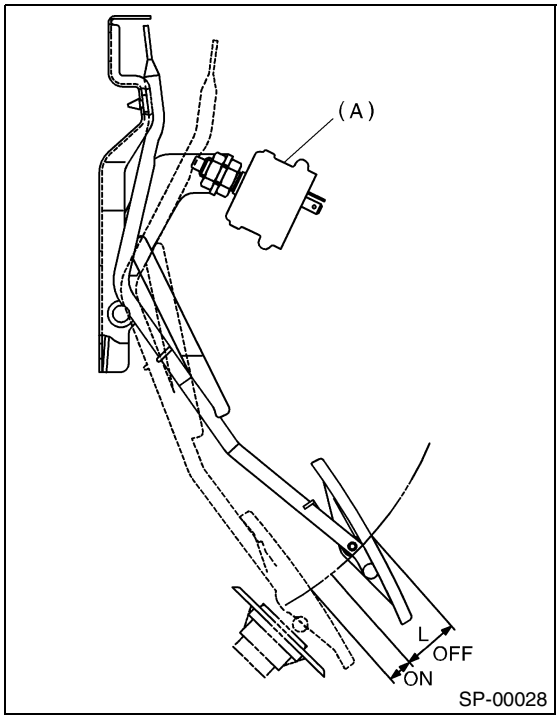
Accelerator cable lock nut tightening torque:
12 N·m (1.2 kgf-m, 9 ft-lb)

3) Check to ensure the kick-down switch operates at the specified value in relation to the stroke of the accelerator pedal.
If it is not within specified value, adjust it by adjusting the position of kick-down switch.

CAUTION:
Be careful not to rotate the kick-down switch.

Kick-down switch stroke: L
47 — 49 mm (1.85 — 1.93 in)

Kick-down switch tightening torque:
12 N·m (1.2 kgf-m, 9 ft-lb)



(A) Kick down switch

3. Accelerator Control Cable

A: REMOVAL

1) Remove the accelerator pedal. <Ref. to SP(SOHC)-4, REMOVAL, Accelerator Pedal.>
2) Separate the accelerator cable and accelerator pedal.

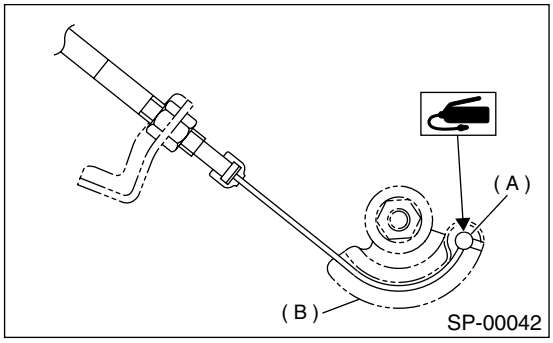
B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
- If the cable clamp is damaged, replace it with a new one.
- Never fail to cover the outer cable end with boot.
- Be careful not to kink the accelerator cable.
- Do not apply grease to except specified part.

2) Apply grease to engine side accelerator cable end.

Grease:
Part No. 004404002
Slicolube G-30M



3) Adjustment after pedal installation. <Ref. to SP(SOHC)-5, INSTALLATION, Accelerator Pedal.>

C: INSPECTION

1) Make sure the inner cable is not twisted or worn.
2) Make sure the outer cable is not cracked.

IGNITION

IG(SOHC)

Page

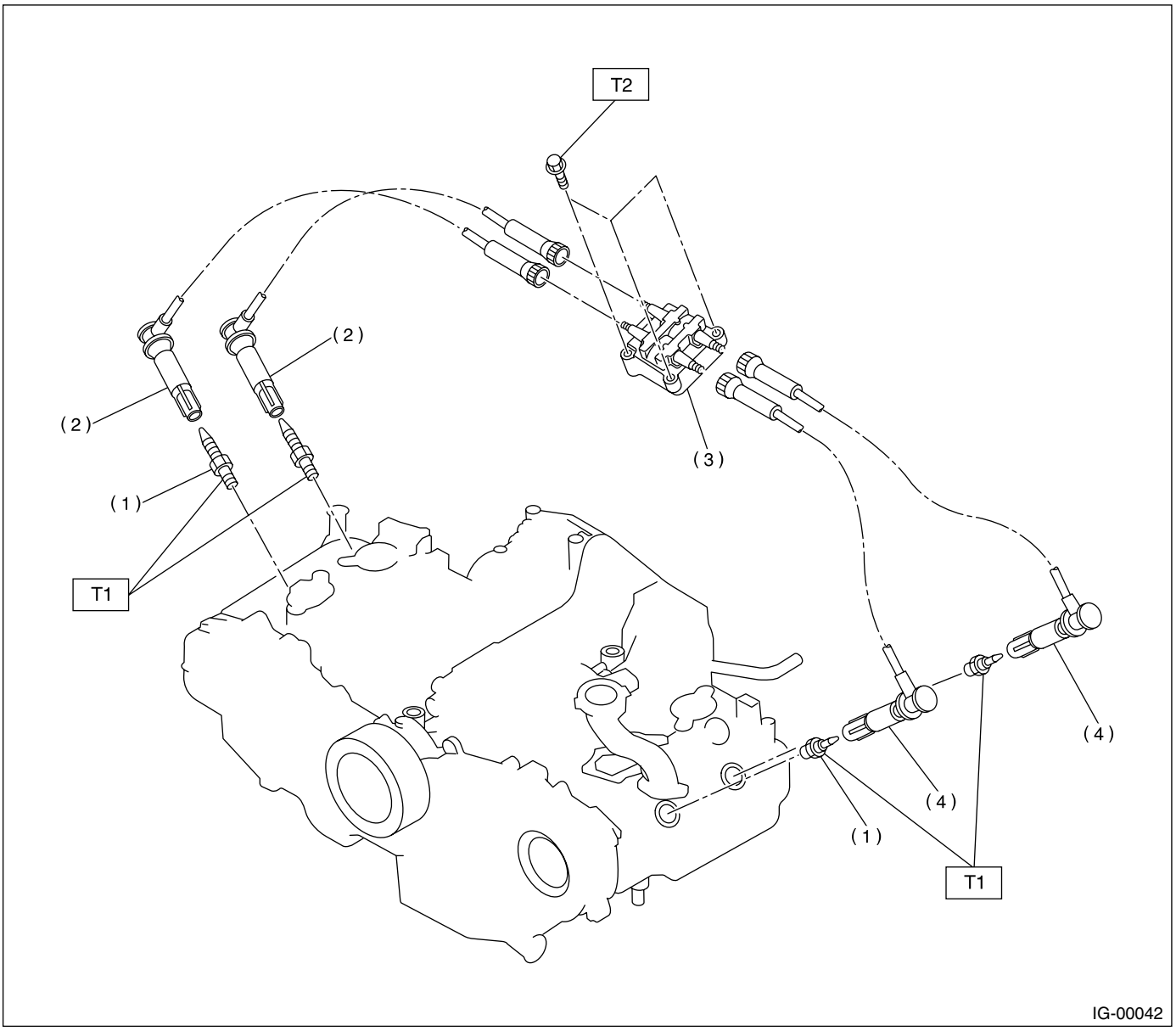
1. General Description 2
2. Spark Plug 5
3. Ignition Coil and Ignitor Assembly 8
4. Spark Plug Cord 10

1. General Description

A: SPECIFICATIONS

Item		Designation
Ignition coil/ignitor assembly	Model	FH0137
	Manufacturer	DIAMOND
	Primary coil resistance	0.73 Ω±10%
	Secondary coil resistance	12.8 kΩ±15%
	Insulation resistance between primary terminal and case	More than 100 MΩ
Spark plug	Type and manufacturer	CHAMPION: RC10YC4 NGK: BKR5E-11 (Alternate)
	Thread size mm	14, P = 1.25
	Spark gap mm (in)	1.0 — 1.1 (0.039 — 0.043)

B: COMPONENT



(1) Spark plug
(2) Spark plug cord (#1, #3)
(3) Ignition coil and ignitor ASSY
(4) Spark plug cord (#2, #4)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 21 (2.1, 15.2)
T2: 6.4 (0.65, 4.7)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

2. Spark Plug

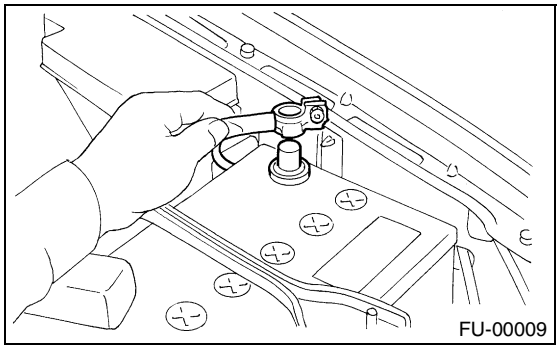
A: REMOVAL

CAUTION:
All spark plugs installed on an engine, must be of the same heat range.

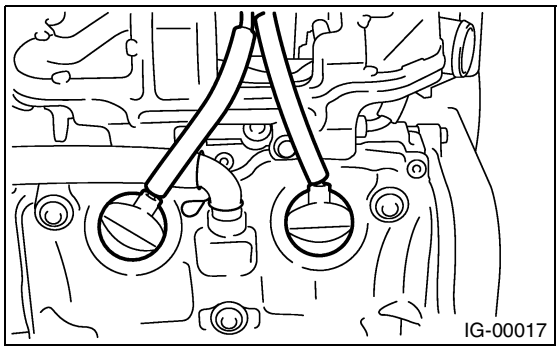
Spark plug
CHAMPION: RC10YC4 NGK: BKR5E-11 (Alternate)

1. RH SIDE

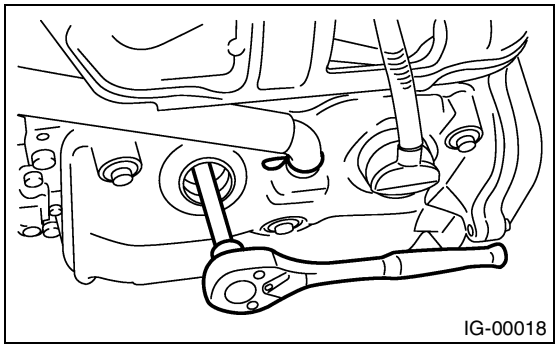
1) Disconnect the ground cable from battery.



2) Remove the air cleaner case. <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
3) Remove the spark plug cords by pulling boot, not the cord itself.

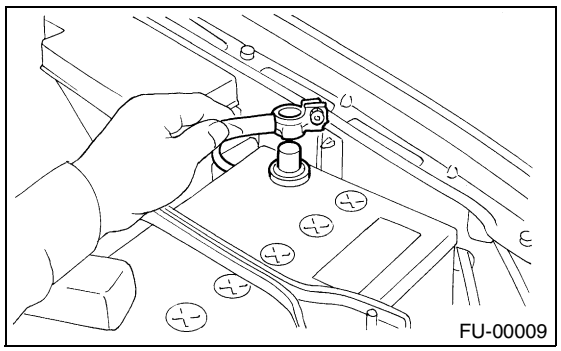


4) Remove the spark plugs with spark plug sockets.

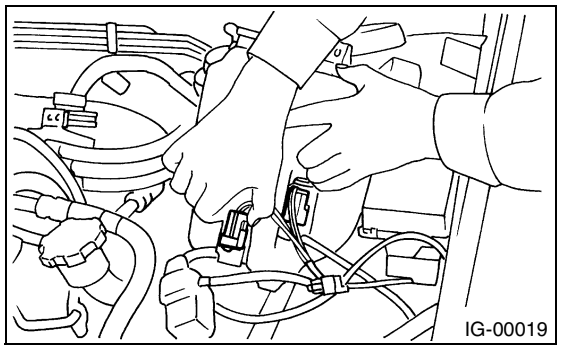


2. LH SIDE

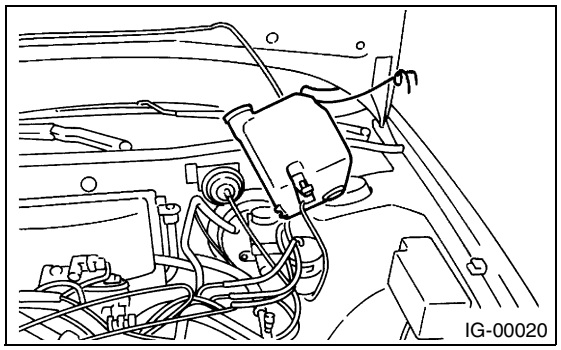
1) Disconnect the ground cable from battery.



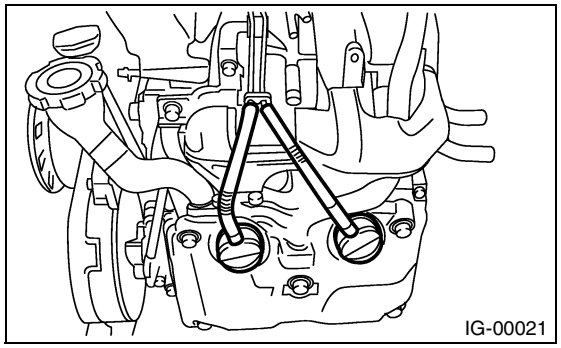
2) Disconnect the washer motor connector.



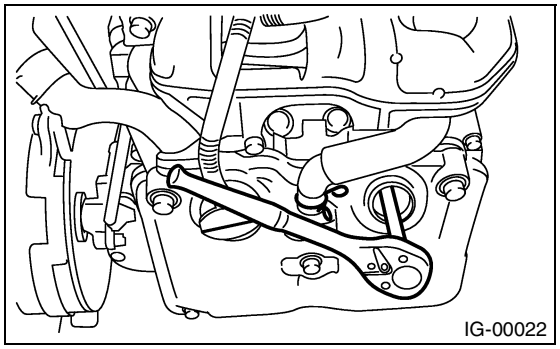
3) Disconnect the rear window glass washer hose from washer motor, then plug connection with a suitable cap.
4) Remove the two bolts which hold washer tank, then take the tank away from the working area.



5) Remove the spark plugs cord by pulling boot, not the cord itself.



6) Remove the spark plugs with spark plug sockets.


IG-00022

B: INSTALLATION

1. RH SIDE

1) Install in the reverse order of removal.

Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.2 ft-lb)

CAUTION:
The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

2. LH SIDE

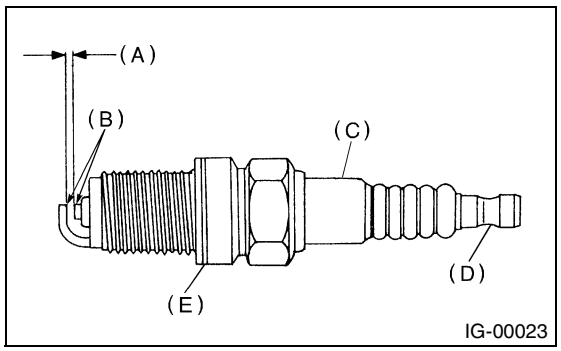
1) Install in the reverse order of removal.

Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.2 ft-lb)

CAUTION:
The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

C: INSPECTION

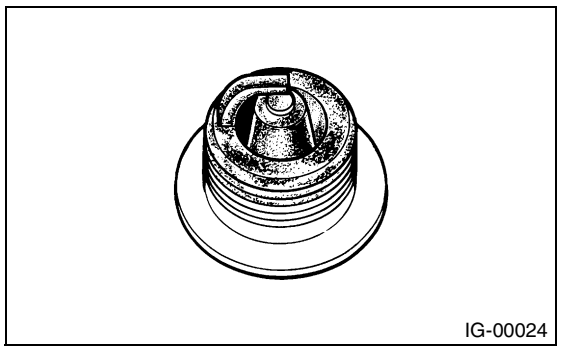
Check the electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion.



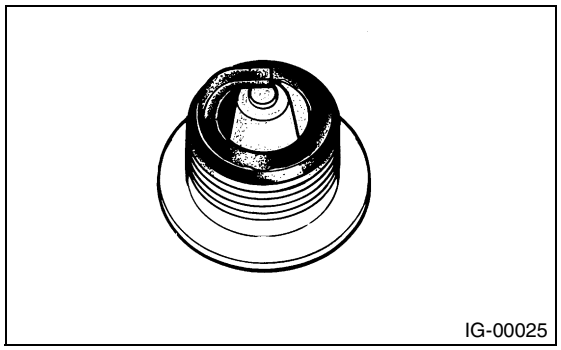
IG-00023

(A) Electrode gap
(B) Carbon accumulation or wear
(C) Cracks
(D) Damage
(E) Damaged gasket

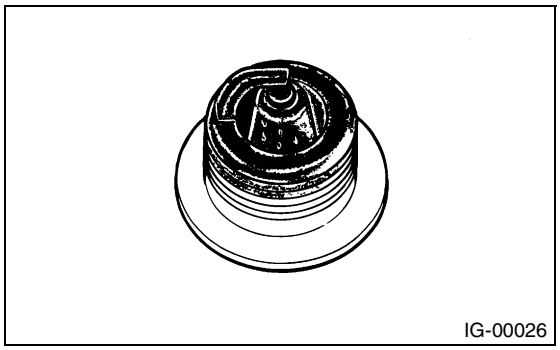
1) Normal:
Brown to grayish-tan deposits and slight electrode wear indicates correct spark plug heat range.


IG-00024

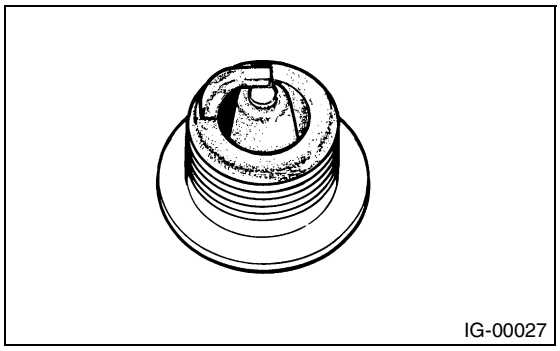
2) Carbon fouled:
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.
It is advisable to replace with plugs having hotter heat range.


IG-00025

3) Oil fouled:
Wet black deposits show excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems. If the same condition remains after repair, use a hotter plug.


IG-00026

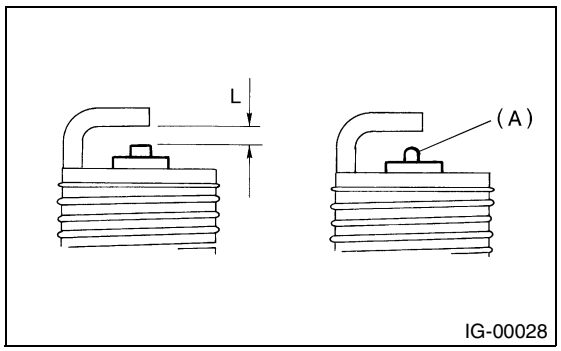
4) Overheating:
White or light gray insulator with black or gray brown spots and bluish burnt electrodes indicates engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc. It is advisable to replace with plugs having colder heat range.


IG-00027

D: CLEANING
Clean the spark plugs in a sand blast type cleaner. Avoid excessive blasting. Clean and remove the carbon or oxide deposits, but do not wear away porcelain.
If deposits are too stubborn, replace the spark plugs.

E: ADJUSTMENT
Correct it if the spark plug gap is measured with a gap gauge, and it is necessary.

Spark plug gap: L
1.0 — 1.1 mm (0.039 — 0.043 in)



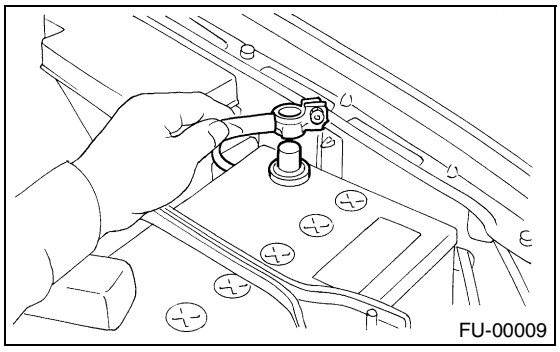
IG-00028

NOTE:
Replace with a new spark plug if this area (A) is worn to “ball” shape.

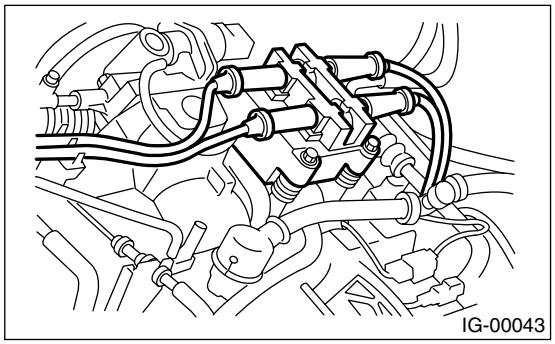
3. Ignition Coil and Ignitor Assembly

A: REMOVAL

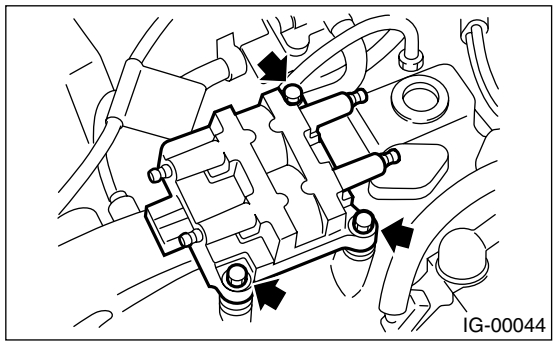
1) Disconnect the ground cable from battery.



2) Disconnect the spark plug cords from ignition coil and ignitor assembly.



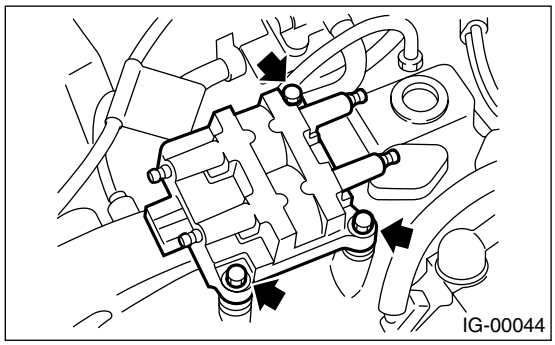
3) Disconnect the connector from ignition coil and ignitor assembly.
4) Remove the ignition coil and ignitor assembly.



B: INSTALLATION

1) Install in the reverse order of removal.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



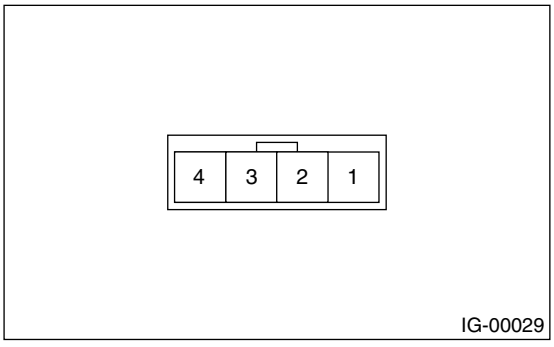
C: INSPECTION

Using the accurate tester, inspect the following items, and replace if defective.
1) Primary resistance
2) Secondary coil resistance

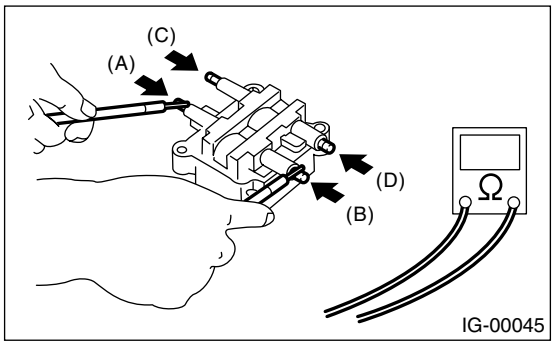
CAUTION:
If the resistance is extremely low, this indicates the presence of a short-circuit.

Specified resistance:

[Primary side]
Between terminal No. 1 and No. 4
0.73 Ω±10%
Between terminal No. 1 and No. 2
0.73 Ω±10%



[Secondary side]
Between (A) and (B)
12.8 kΩ±15%
Between (C) and (D)
12.8 kΩ±15%



3) Insulation between primary terminal and case:
100 MΩ or more.

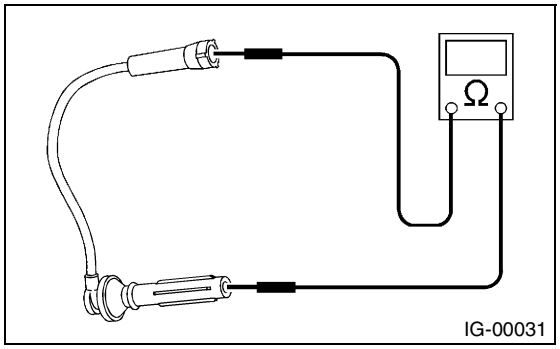
4. Spark Plug Cord

A: INSPECTION

Check for:
1) Damage to cords, deformation, burning or rust formation of terminals
2) Resistance values of cords

Resistance value:

#1 cord: 5.6 — 10.6 kΩ
#2 cord: 7.3 — 13.7 kΩ
#3 cord: 5.9 — 11.1 kΩ
#4 cord: 7.3 — 13.7 kΩ



STARTING/CHARGING SYSTEMS

SC(SOHC)

		Page
1.	General Description	2
2.	Starter	6
3.	Generator	15
4.	Battery	21

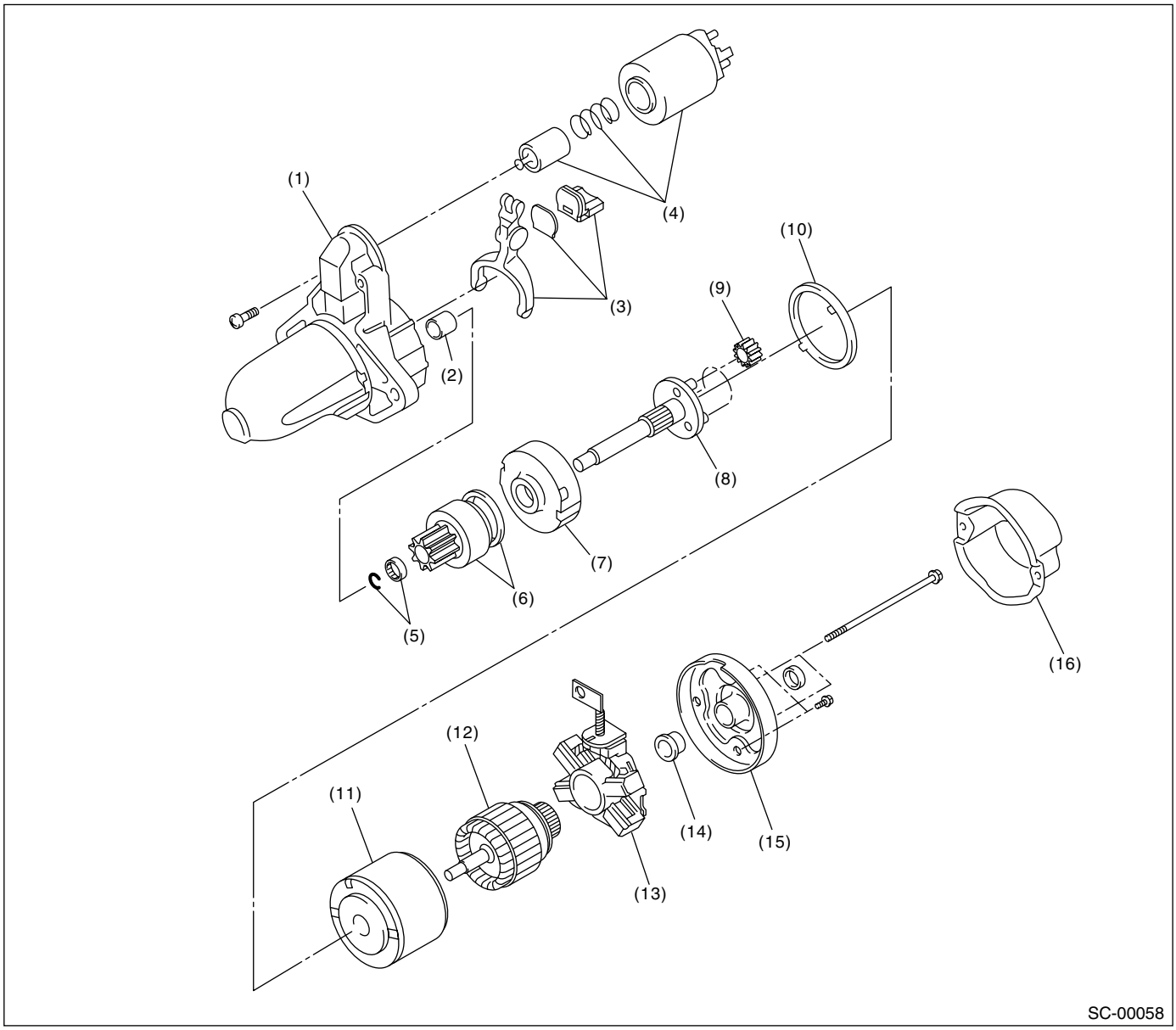
1. General Description

A: SPECIFICATIONS

Item			Designation	
Starter	Type		Reduction type	
	Vehicle type		MT vehicles	AT vehicles
	Model		M000T30471	M000T20171
	Manufacturer		Mitsubishi Electric	
	Voltage and output		12 V — 1.0 kW	12 V — 1.4 kW
	Direction of rotation		Counterclockwise (viewed from pinion gear side)	
	Number of pinion teeth		8	9
	No-load characteristics	Voltage	11 V	
		Current	95 A or less	90 A or less
		Rotating speed	2,500 rpm or more	2,000 rpm or more
	Load characteristics	Voltage	7.5 V	7.7 V
		Current	300 A	400 A
		Torque	8.84 N (0.90 kgf, 1.99 lb) or more	16.7 N (1.70 kgf, 3.75 lb) or more
		Rotating speed	870 rpm or more	710 rpm or more
	Lock characteristics	Voltage	4 V	3.5 V
		Current	680 A or less	960 A or less
		Torque	17 N (1.73 kgf, 12.5 lb) or more	31 N (3.16 kgf, 22.9 lb) or more
Generator	Type		Rotating-field three-phase type, Voltage regulator built-in type, with load response control system	
	Model		A002TB6991	
	Manufacturer		Mitsubishi Electric	
	Voltage and output		12 V — 90 A	
	Polarity on ground side		Negative	
	Rotating direction		Clockwise (viewed from pulley side)	
	Armature connection		3-phase Y-type	
	Output current		1,500 rpm — 36 A or more 2,500 rpm — 65 A or more 5,000 rpm — 86 A or more	
	Regulated voltage		14.1 — 14.8 V [20°C (68°F)]	

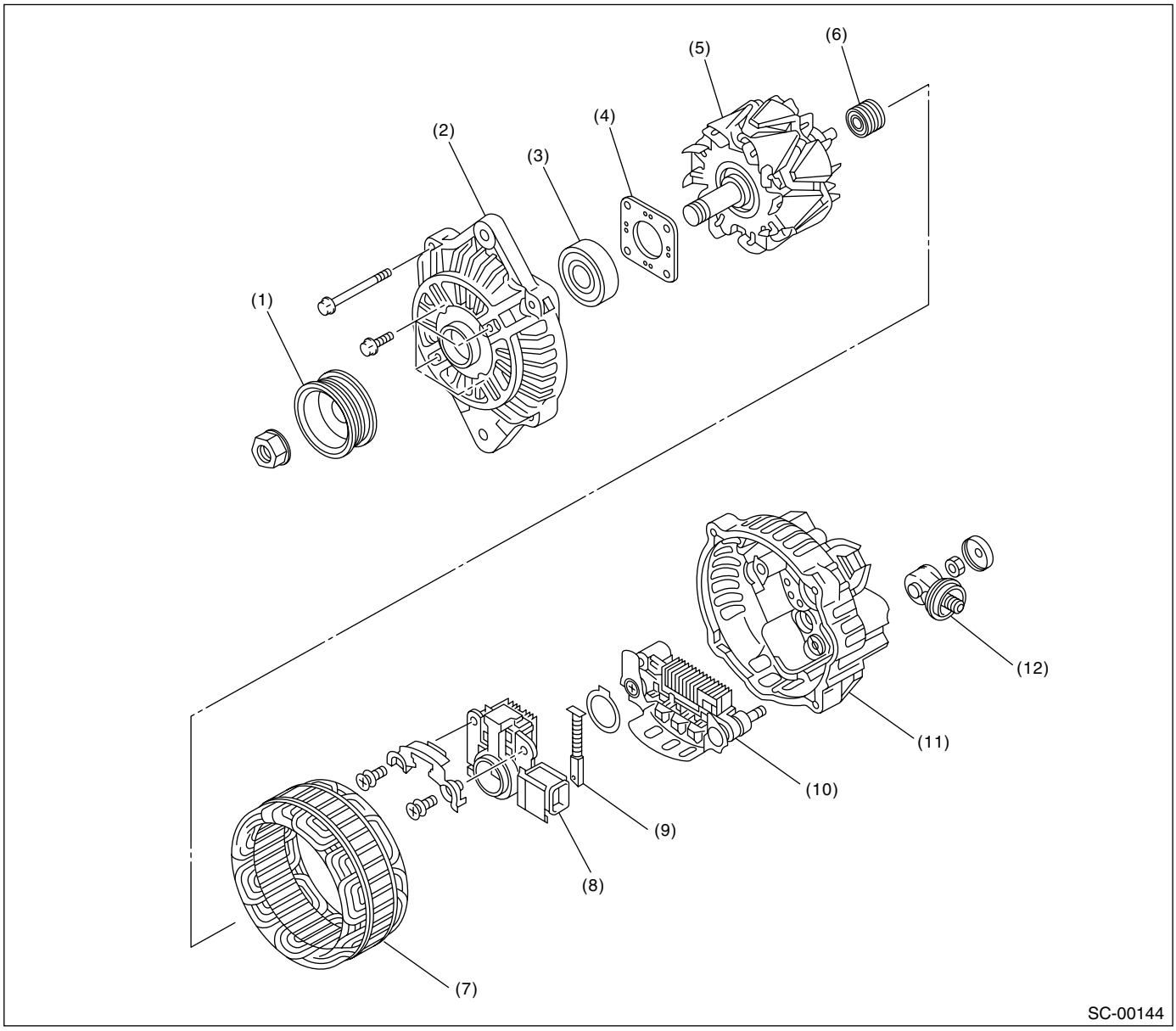
B: COMPONENT

1. STARTER



(1) Front bracket
(2) Sleeve bearing
(3) Lever set
(4) Magnet switch ASSY
(5) Stopper set
(6) Over running clutch
(7) Internal gear ASSY
(8) Shaft ASSY
(9) Gear ASSY
(10) Packing
(11) Yoke ASSY
(12) Armature
(13) Brush holder ASSY
(14) Sleeve bearing
(15) Rear cover
(16) Rear cover set

2. GENERATOR



(1) Pulley
(2) Front cover
(3) Ball bearing
(4) Bearing retainer
(5) Rotor
(6) Bearing
(7) Stator coil
(8) IC regulator with brush
(9) Brush
(10) Rectifier
(11) Rear cover
(12) Terminal

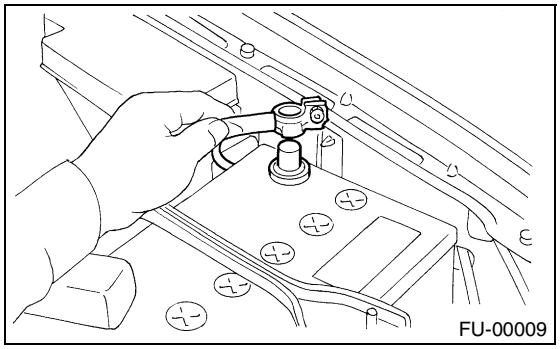
C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

2. Starter

A: REMOVAL

1) Disconnect the ground cable from battery.

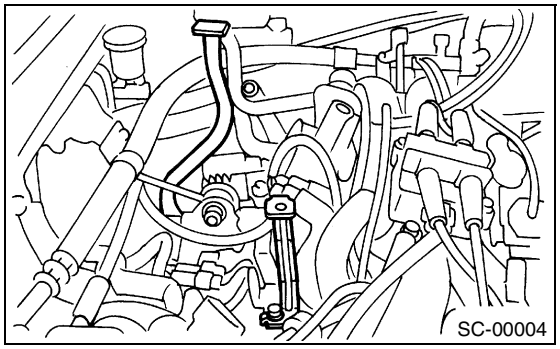


2) Remove the air cleaner case. (SOHC model) <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>

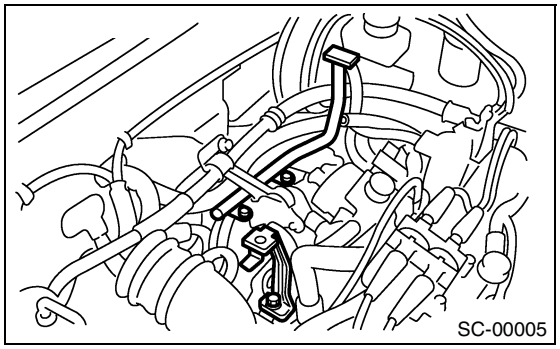
3) Remove the intercooler. (Turbo model) <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>

4) Remove the air cleaner case stay. (SOHC model)

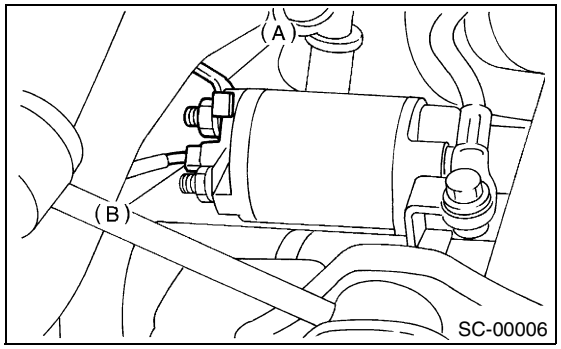
- MT vehicles



- AT vehicles

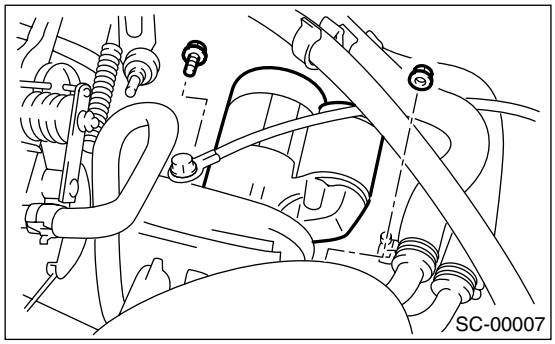


5) Disconnect the connector and terminal from starter.



(A) Terminal
(B) Connector

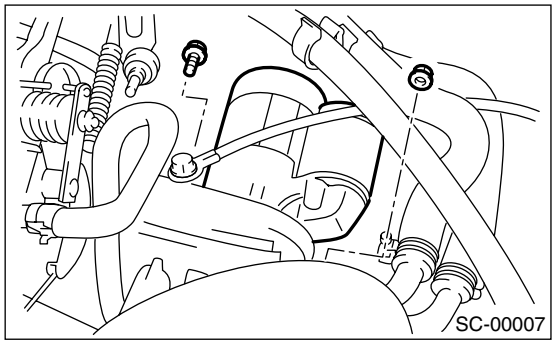
6) Remove the starter from transmission.



B: INSTALLATION

Install in the reverse order of removal.

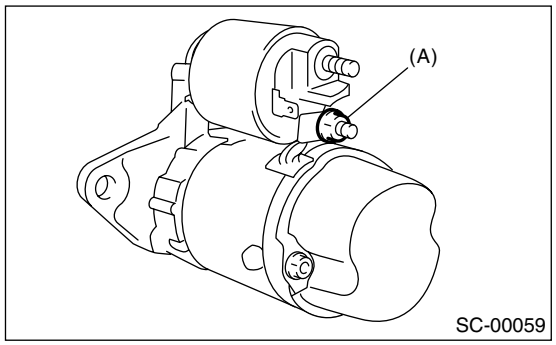
Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)



C: DISASSEMBLY

1. STARTER ASSEMBLY

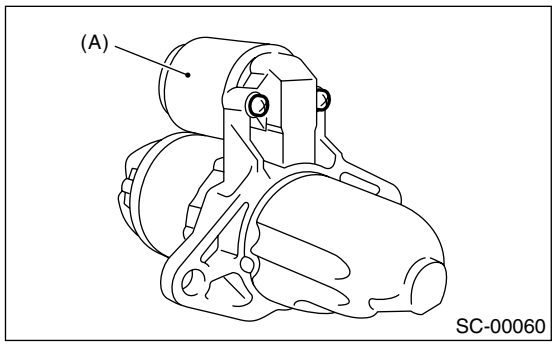
1) Loosen the nut which holds terminal M of switch assembly, and then disconnect the connector.



(A) Terminal M

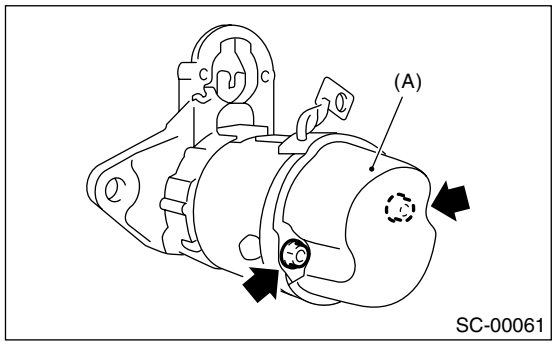
2) Remove the bolts which hold switch assembly, and then remove the switch assembly, plunger and plunger spring from starter as a unit.

NOTE:
Be careful because the pinion gap adjustment washer may sometimes be used on the mounting surface of switch assembly.



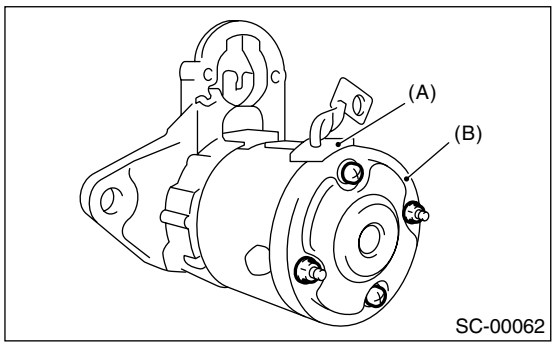
(A) Switch ASSY

3) Remove both the nuts, and then remove rear cover set.



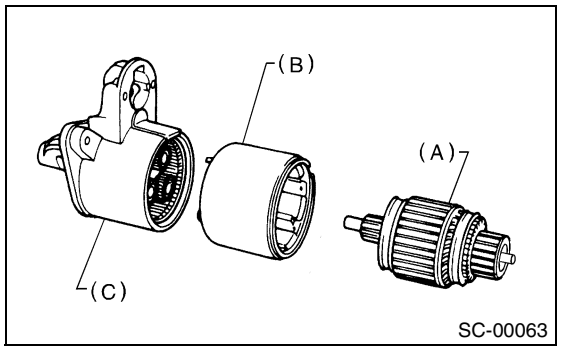
(A) Rear cover set

4) Remove both through-bolts and brush holder screws, and then detach the rear cover and brush holder.



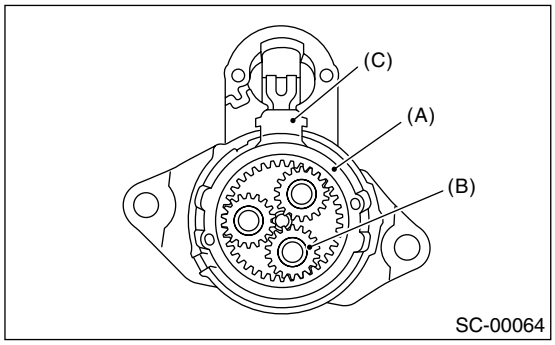
(A) Brush holder
(B) Rear cover

5) Remove the armature and yoke from front bracket.



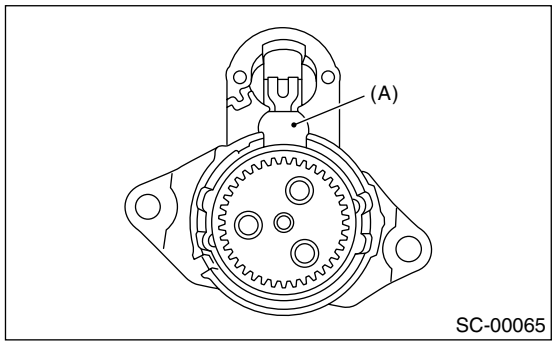
(A) Armature
(B) Yoke
(C) Front bracket

6) Remove the packing A, planetary gear and packing B.



(A) Packing A
(B) Planetary gear
(C) Packing B

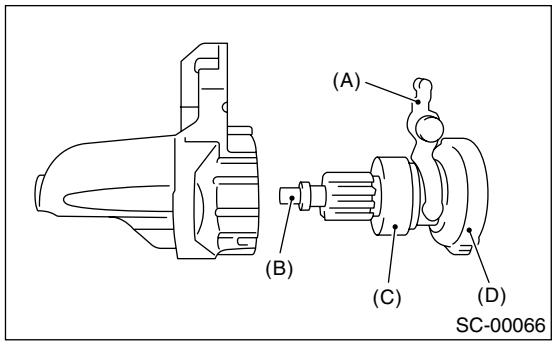
7) Remove the plate.



(A) Plate

8) Remove the shaft assembly and overrunning clutch from front bracket as a unit.

NOTE:
Check the following points before removal.
- Lever direction
- Position of internal gear assembly

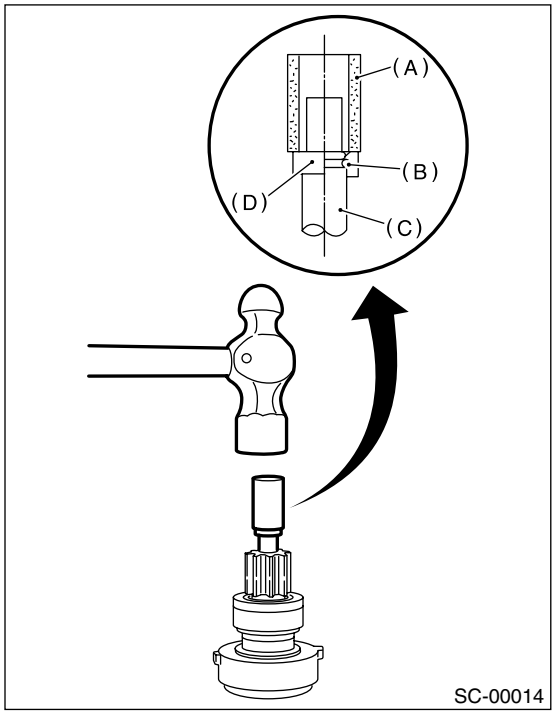


(A) Lever
(B) Shaft ASSY
(C) Overrunning clutch
(D) Internal gear ASSY

9) Remove the overrunning clutch from shaft assembly as follows:

(1) Remove the stopper from ring by lightly tapping the stopper with an appropriate tool (such as a 14 mm (0.55 in) a fit socket wrench).

(2) Remove the ring, stopper and clutch from shaft.

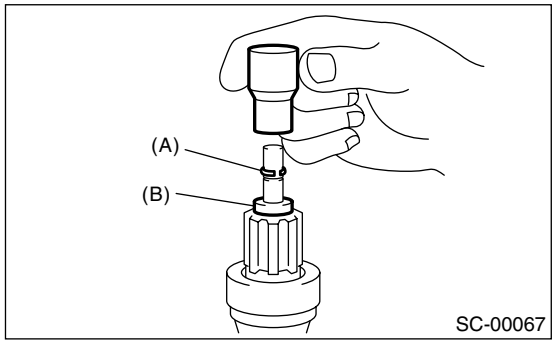


(A) Socket wrench
(B) Ring
(C) Shaft
(D) Stopper

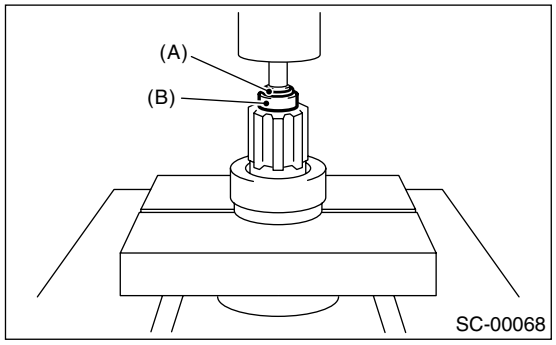
D: ASSEMBLY

NOTE:
Apply grease to the following parts before assembly.
- Sleeve bearing
- Pinion shaft rotational portion
- Shaft spline portion
- Inside of reduction system
- Lever fulcrum/Clutch rotational portion

1) Install the overrunning clutch to shaft assembly.
2) Install the stopper to shaft assembly as follows.
   (1) Insert the ring into the shaft groove by lightly tapping it with an appropriate tool (such as a fit socket wrench).

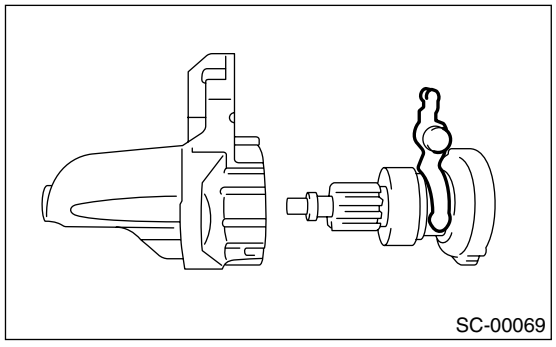


   (2) Install the stopper to ring using a press.

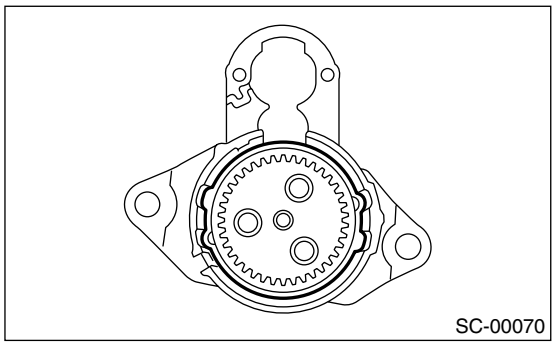


(A) Ring
(B) Stopper

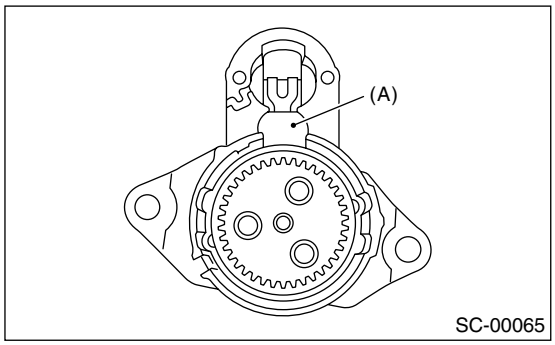
3) Install the shaft assembly to front bracket while taking care of the following points.
   (1) Lever direction



   (2) Internal gear position

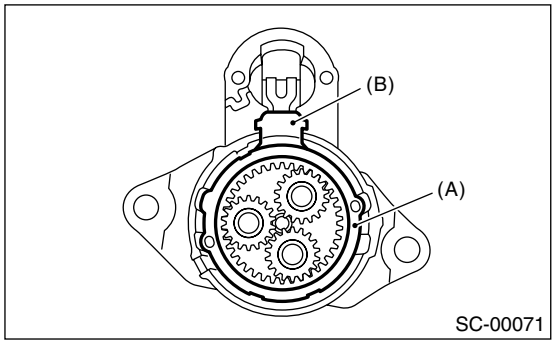


4) Install the plate.



(A) Plate

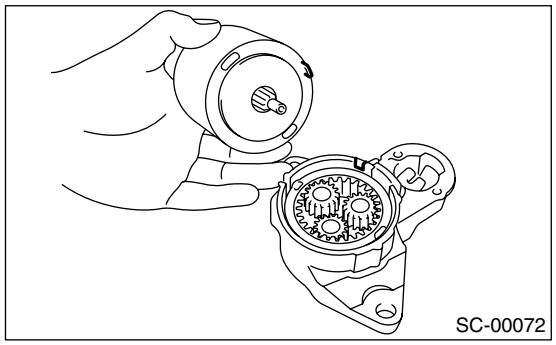
5) Install the planetary gear.
6) Install packing A and B while taking care of installing positions.



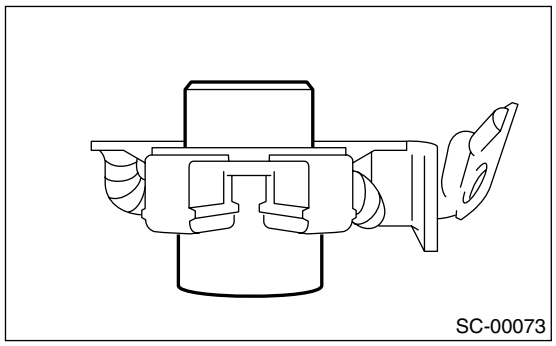
(A) Packing A
(B) Packing B

7) Install the armature to yoke.

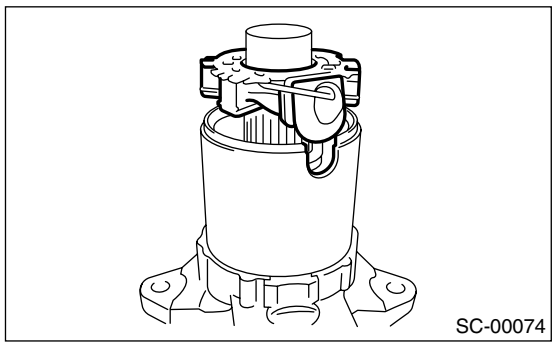
8) Install the yoke to front bracket matching front bracket to groove of yoke.



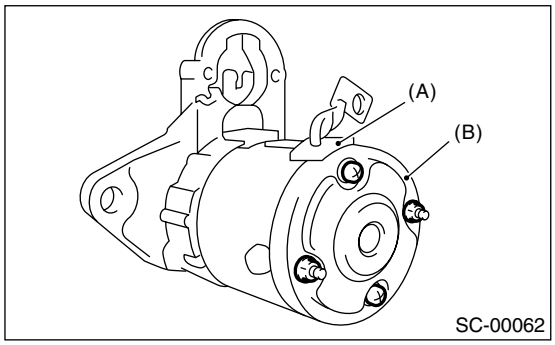
9) Install the brush holder to yoke as follows.
(1) Press the brush down into brush holder, and then fix the brush in that position using an appropriate tool (such as a fit socket wrench).



(2) Match the brush holder to groove of yoke, and then slide the brush holder into yoke to install.

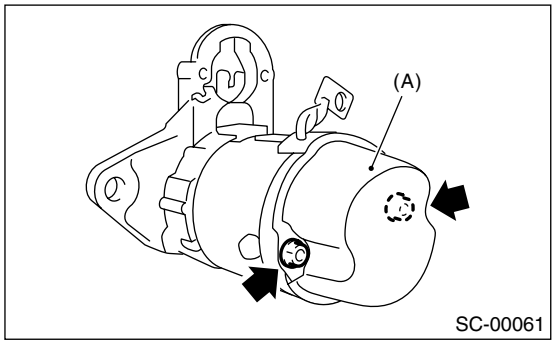


10) Install the rear cover matching it's groove to brush holder.



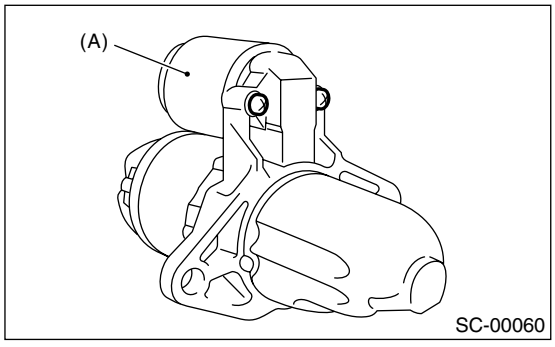
(A) Brush holder
(B) Rear cover

11) Install rear cover set.



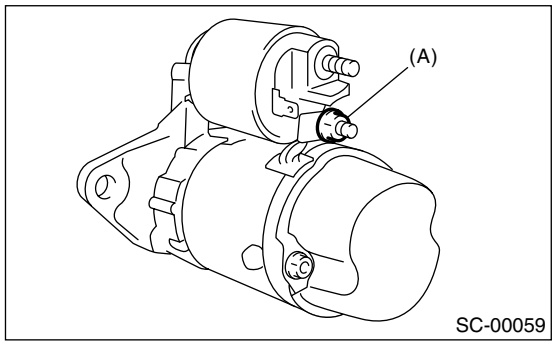
(A) Rear cover set

12) Install the switch assembly to front bracket as follows.
(1) Insert the plunger and plunger spring into switch assembly.
(2) Hook the plunger protrusion on lever edge to install plunger to front bracket.



(A) Switch ASSY

13) Connect the connector to terminal M of switch assembly.



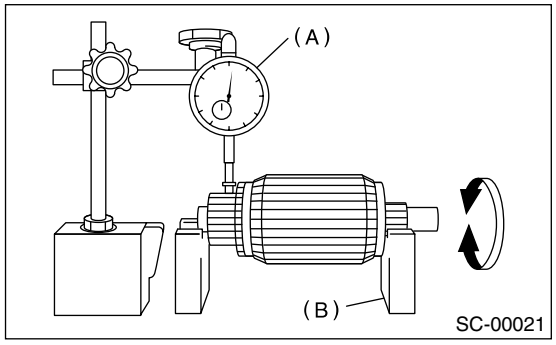
(A) Terminal M

E: INSPECTION

1. ARMATURE

1) Check the commutator for any sign of burns of rough surfaces or stepped wear. If wear is of a minor nature, correct it by using sand paper.
2) Run-out test
Check the commutator run-out, and then replace if it exceeds the limit.

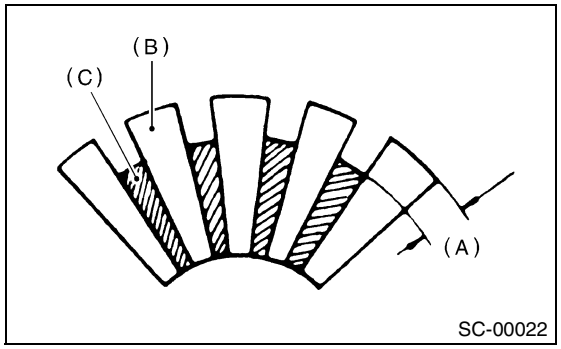
Commutator run-out:
Standard
0.05 mm (0.0020 in)
Service limit
Less than 0.10 mm (0.0039 in)



(A) Dial gauge
(B) V-block

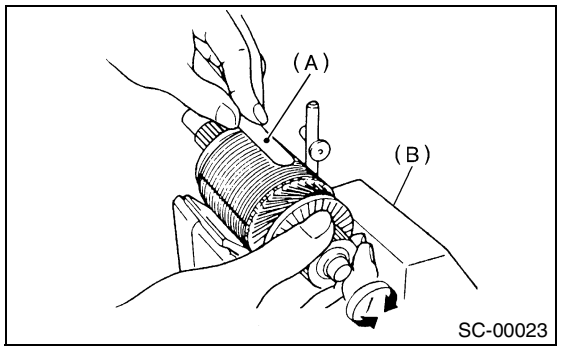
3) Depth of segment mold
Check the depth of segment mold.

Depth of segment mold:
0.5 mm (0.020 in)



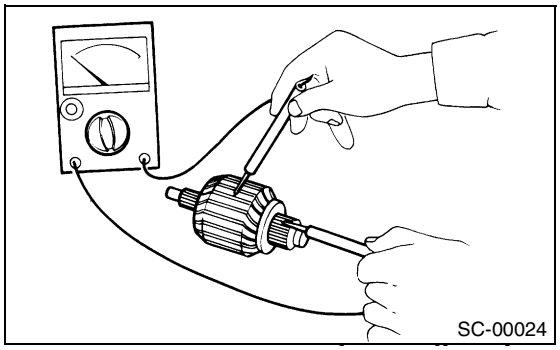
(A) Depth of mold
(B) Segment
(C) Mold

4) Armature short-circuit test
Check the armature for short-circuit by placing it on growler tester. Hold a iron sheet against the armature core while slowly rotating armature. A short-circuited armature will cause the iron sheet to vibrate and to be attracted to core. If the iron sheet is attracted or vibrates, the armature, which is short-circuited, must be replaced or repaired.



(A) Iron sheet
(B) Grower tester

5) Armature ground test
Using a circuit tester, touch one probe to the commutator segment and the other to shaft. There should be no continuity. If there is continuity, the armature is grounded.
Replace the armature if it is grounded.


SC-00024

2. YOKE

Make sure the pole is set in position.

3. OVERRUNNING CLUTCH

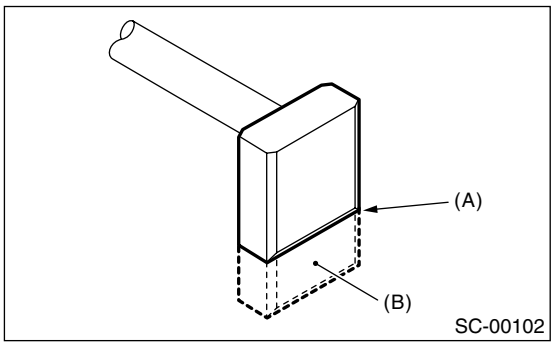
Inspect the teeth of pinion for wear and damage. Replace if it is damaged. Rotate the pinion in direction of rotation (counterclockwise). It should rotate smoothly. But in opposite direction, it should be locked.

CAUTION:
Do not clean the overrunning clutch with oil to prevent grease from flowing out.

4. BRUSH AND BRUSH HOLDER

1) Brush length
Measure the brush length, and then replace if it exceeds the service limit.
Replace if abnormal wear or cracks are noticed.

Brush length:
Standard
12.3 mm (0.484 in)
Service limit
7.0 mm (0.276 in)



SC-00102

(A) Service limit line
(B) Brush

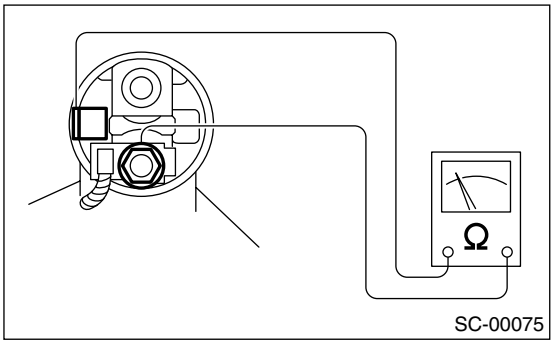
2) Brush movement
Be sure the brush moves smoothly inside brush holder.
3) Brush spring force
Measure the brush spring force with a spring scale. If it is less than the service limit, replace the brush holder.

Brush spring force:
Standard
15.9 — 19.5 N (1.62 — 1.99 kgf, 3.57 — 4.38 lb) (when new)
Service limit
2.5 N (0.25 kgf, 0.56 lb)

5. SWITCH ASSEMBLY

Be sure there is continuity between the terminals S and M, and between terminal S and ground. Use a circuit tester (set in “ohm”).
Also check to be sure there is no continuity between terminal M and B.

Terminal / Specified resistance:
S — M / Less than 1 Ω
S — Ground / Less than 1 Ω
M — B / More than 1 MΩ



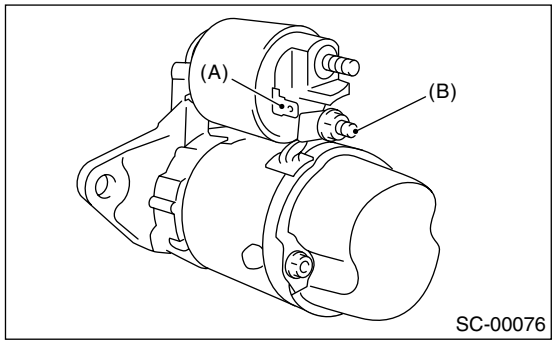
SC-00075

6. SWITCH ASSEMBLY OPERATION

1) Connect the terminal S of switch assembly to positive terminal of battery with a lead wire, and starter body to ground terminal of battery. The pinion should be forced endwise on shaft.

CAUTION:
With the pinion forced endwise on shaft, starter motor can sometimes rotate because current flows, through pull-in coil, to motor. This is not a problem.

2) Disconnect the connector from terminal M, and then connect the positive terminal of battery and terminal M using a lead wire and ground terminal to starter body.
In this test set up, the pinion should return to its original position even when it is pulled out with a screwdriver.

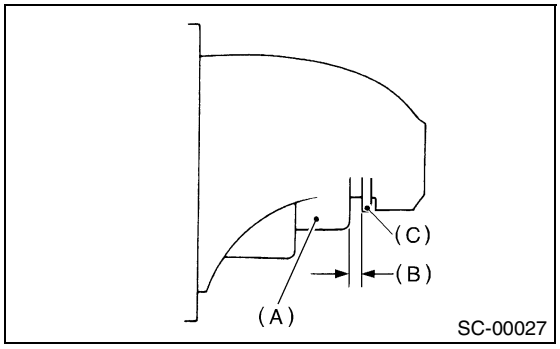


(A) Terminal S
(B) Terminal M

7. PINION GAP

1) Measure the pinion gap while the pinion is pulled out as shown in the figure.

Pinion gap:
0.5 — 2.0 mm (0.020 — 0.079 in)

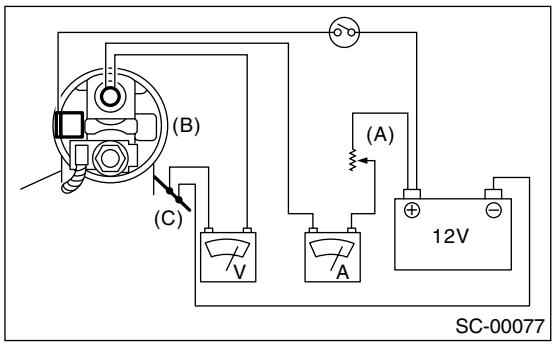


(A) Pinion
(B) Gap
(C) Stopper

If the motor is running with the pinion forced endwise on shaft, disconnect the connector from terminal M of switch assembly, and then connect terminal M to ground terminal (–) of battery with a lead wire. Next, gently push the pinion back with your fingertips, and then measure the pinion gap.
2) If the pinion gap is outside specified range, remove or add number of adjustment washers used on the mounting surface of switch assembly until correct pinion gap is obtained.

8. PERFORMANCE TEST

The starter should be submitted to performance tests whenever it has been overhauled, to assure its satisfactory performance when installed on the engine.
Three performance tests, no-load test, load test, and lock test, are presented here; however, if the load test and lock test cannot be performed, carry out at least the no-load test.
For these performance tests, use the circuit shown in figure.



(A) Variable resistance
(B) Magnetic switch
(C) Starter body

1) No-load test
With switch on, adjust the variable resistance to obtain 11 V, take the ammeter reading, and then measure the starter speed. Compare these values with the specifications.

No-load test (Standard):

Voltage / Current
MT vehicles
MAX. 11 V / 95 A
AT vehicles
MAX. 11 V / 90 A

Rotating speed
MT vehicles
2,500 rpm or more
AT vehicles
2,000 rpm or more

2) Load test
Apply the specified braking torque to starter. The condition is satisfactory if the current draw and starter speed are within the specifications.

Load test (Standard):

Voltage / Load
MT vehicles
7.5 V/8.84 N (0.90 kgf, 1.99 lb)
AT vehicles
7.7 V/16.7 N (1.70 kgf, 3.75 lb)

Current / Speed
MT vehicles
300 A/870 rpm or more
AT vehicles
400 A/710 rpm or more

3) Lock test
With the starter stalled, or not rotating, measure the torque developed and current draw when the voltage is adjusted to the specified voltage.

Lock test (Standard):

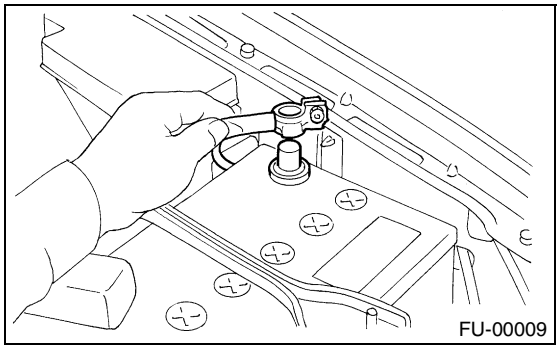
Voltage / Current
MT vehicles
4 V/680 A or less
AT vehicles
3.5 V/960 A or less

Torque
MT vehicles
17.0 N (1.73 kgf, 3.82 lb) or more
AT vehicles
31.0 N (3.16 kgf, 6.97 lb) or more

3. Generator

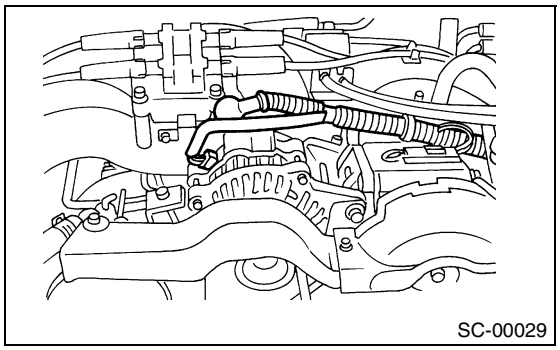
A: REMOVAL

1) Disconnect the ground cable from battery.

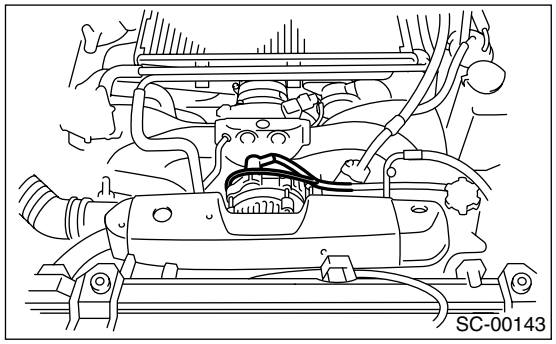


2) Disconnect the connector and terminal from generator.

- SOHC MODEL

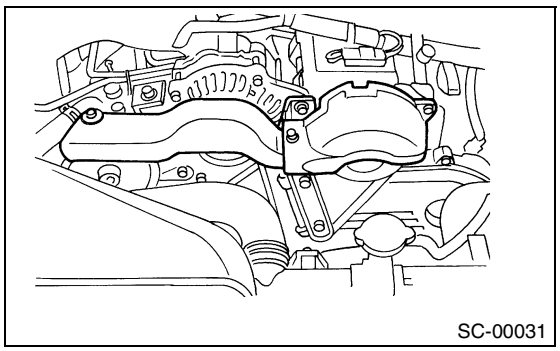


- TURBO MODEL

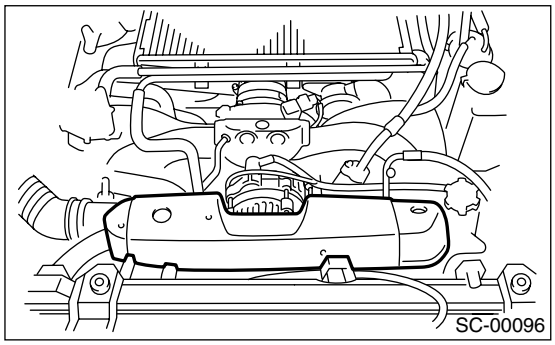


3) Remove the V-belt cover.

- SOHC MODEL

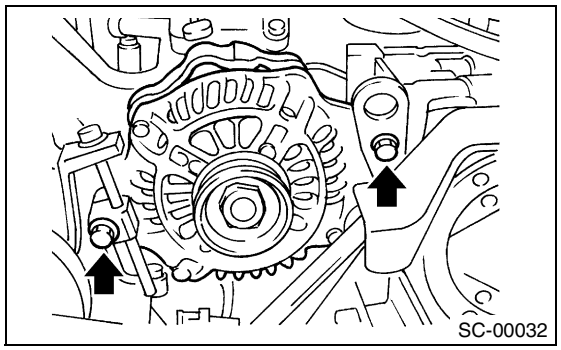


- TURBO MODEL



4) Remove the front side V-belt.
<Ref. to ME(SOHC)-41, FRONT SIDE BELT, REMOVAL, V-belt.> or <Ref. to ME(TURBO)-44, FRONT SIDE BELT, REMOVAL, V-belt.>

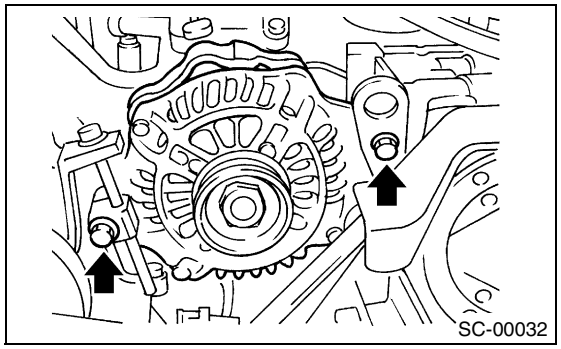
5) Remove the bolts which install generator onto bracket.



B: INSTALLATION

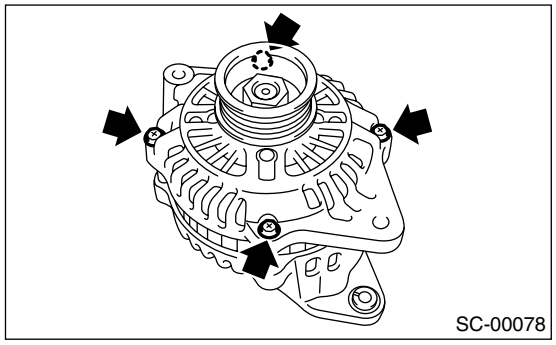
Install in the reverse order of removal.

CAUTION:
Check and adjust the V-belt tension. <Ref. to ME(SOHC)-42, INSPECTION, V-belt.> or <Ref. to ME(TURBO)-45, INSPECTION, V-belt.>

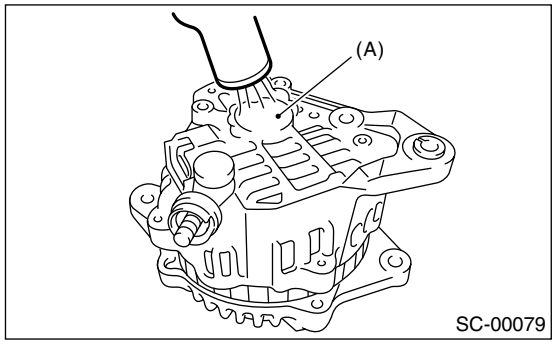


C: DISASSEMBLY

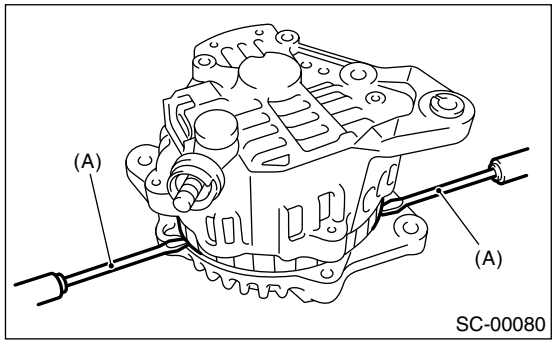
1) Remove the four through-bolts.



2) Heat the portion (A) of rear cover to 50°C (122°F) with heater drier.

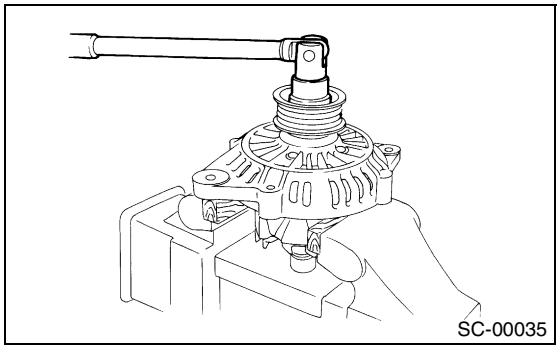


3) Then insert the tip of a flat tip screwdriver into the gap between stator core and front cover. Pry them apart to disassemble.

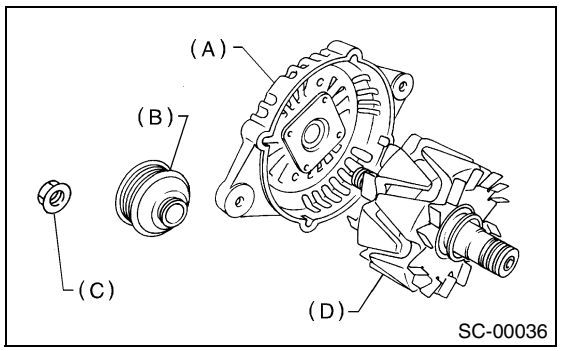


(A) Screwdriver

4) Hold the rotor with a vise and remove pulley nut.

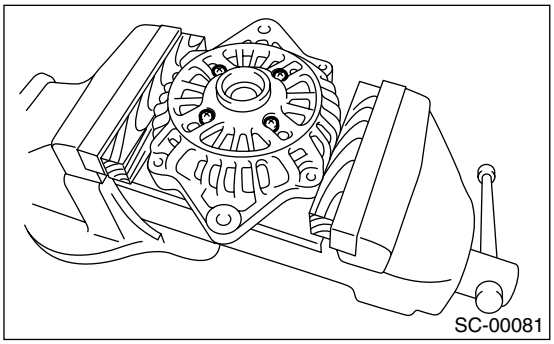


CAUTION:
When holding the rotor with vise, insert aluminum plates or wood pieces on the contact surfaces of vise to prevent rotor from damage.

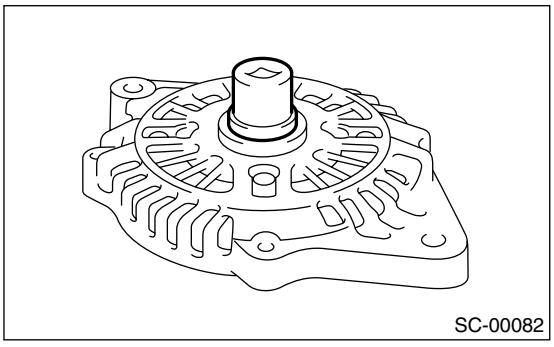


(A) Front cover
(B) Pulley
(C) Nut
(D) Rotor

5) Remove the ball bearing as follows.
(1) Remove the bolt, and then remove the bearing retainer.

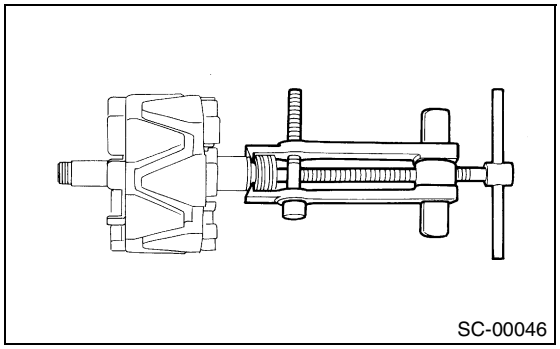


(2) Firmly install an appropriate tool (such as a fit socket wrench) to bearing inner race.



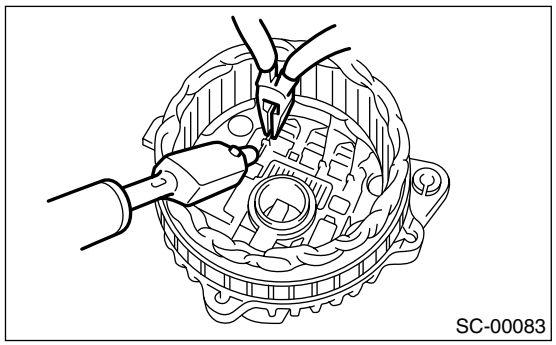
(3) Push the ball bearing off the front cover using a press.

6) Remove the bearing from rotor using a bearing puller.

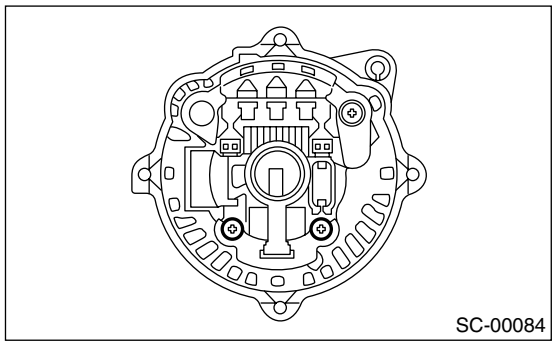

SC-00046

7) Unsolder connection between rectifier and stator coil to remove the stator coil.

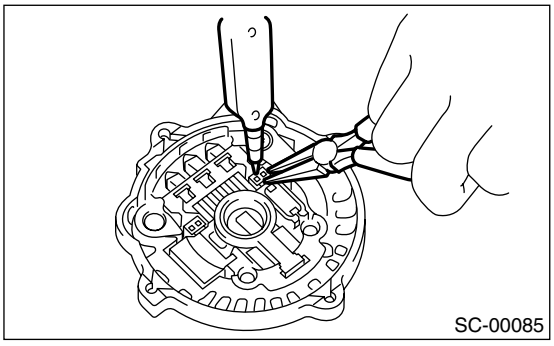
CAUTION:
Do not allow the 180 — 270 W soldering bit to contact the terminals for more than 5 seconds at a time because the rectifier cannot withstand heat very well.


SC-00083

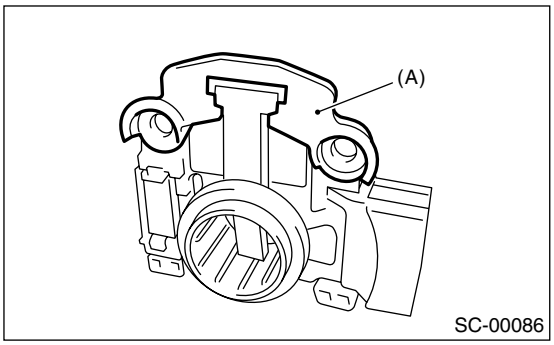
8) Remove the IC regulator as follows.
(1) Remove the screws which secure IC regulator to rear cover.


SC-00084

(2) Unsolder the connection between IC regulator and rectifier to remove the IC regulator.


SC-00085

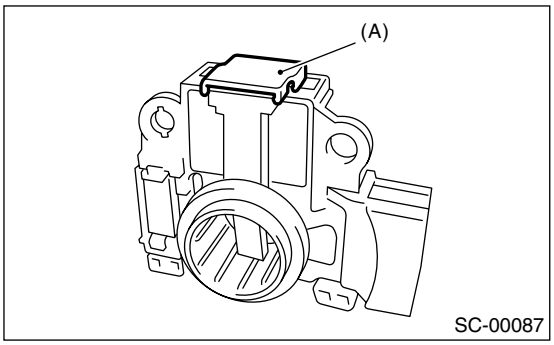
9) Remove the brush as follows.
(1) Remove cover A.



SC-00086

(A) Cover A

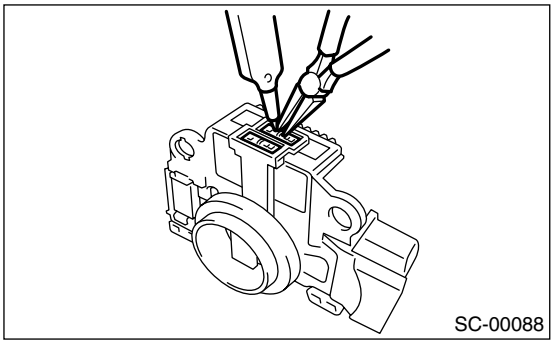
(2) Remove the cover B.



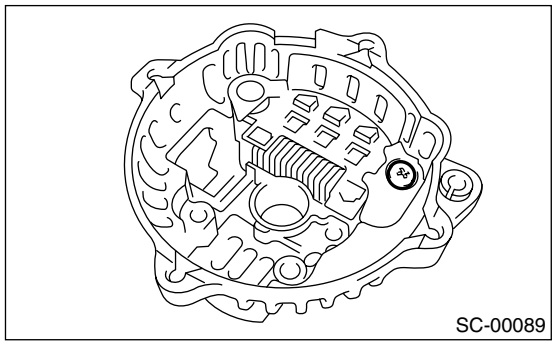
SC-00087

(A) Cover B

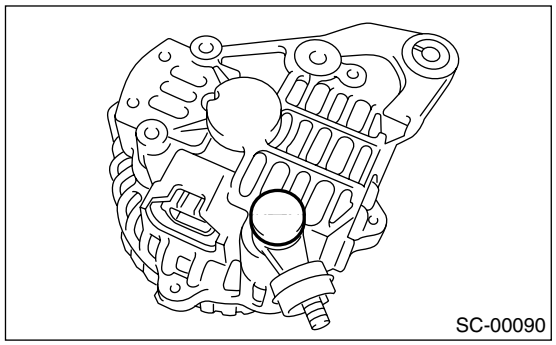
(3) Separate the brush from connection to remove.


SC-00088

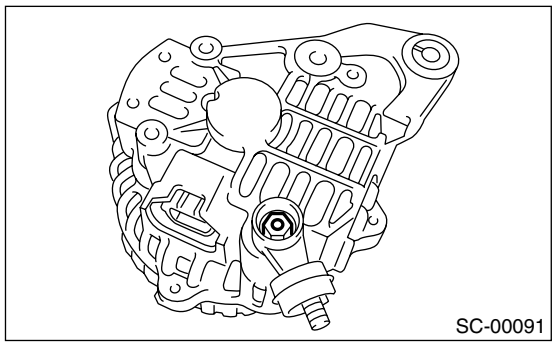
10) Remove the rectifier as follows.
(1) Remove the bolts which secure the rectifier.



(2) Remove the cover of terminal B.



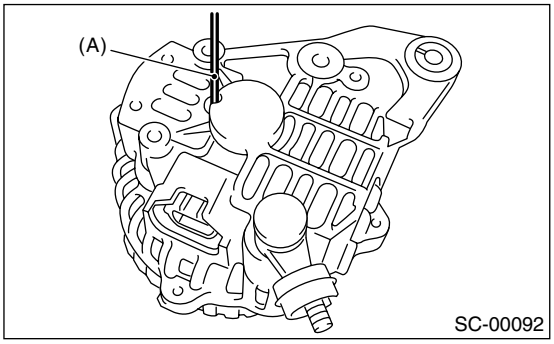
(3) Remove the nut of terminal B, and then remove the rectifier.



D: ASSEMBLY

To assemble, reverse order of disassembly.
1) Pulling up brush
Before assembling, press the brush down into brush holder, and then fix them in that position by passing a [1 mm (0.08 in) dia. length 4 to 5 cm (1.6 to 2.0 in)] wire through the hole shown in the figure.

CAUTION:
Be sure to remove the wire after reassembly.



(A) Wire

2) Install the ball bearing.
(1) Set the ball bearing on the front cover, and then securely install an appropriate tool (such as a fit socket wrench) to the bearing outer race.
(2) Press the ball bearing into the specified position using a press.
(3) Install the bearing retainer.
3) Press the bearing (rear side) into the rotor shaft using a press to install.
4) Heat the bearing box in rear cover [50 to 60°C (122 to 140°F)], and then press the rear bearing into rear cover.

CAUTION:
Grease should not be applied to rear bearing.
Remove the oil completely if it is found on bearing box.

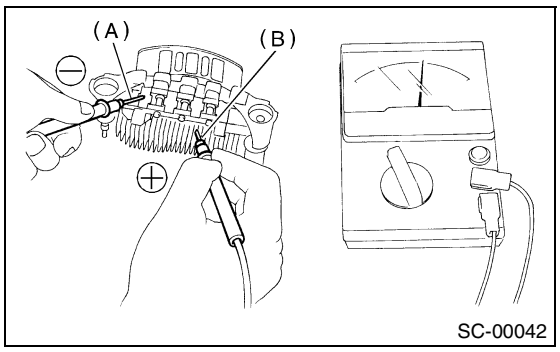
5) After reassembly, turn the pulley by hand to check that rotor turns smoothly.

E: INSPECTION

1. DIODE

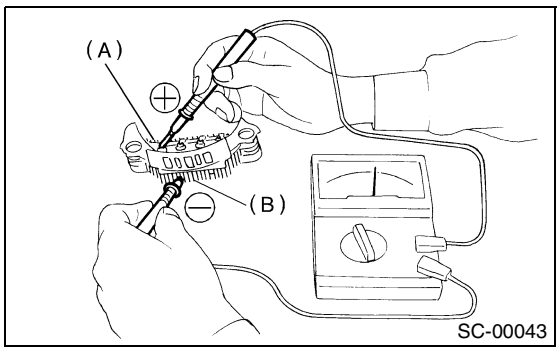
CAUTION:
Never use a mega tester (measuring use for high voltage) or any other similar measure for this test; otherwise, the diodes may be damaged.

1) Checking positive diode
Check for continuity between the diode lead and positive side heat sink. The positive diode is in good condition if resistance is 1 Ω or less only in the direction from the diode lead to heat sink.



(A) Diode lead
(B) Heat sink (Positive side)

2) Checking negative diode
Check for continuity between the negative side heat sink and diode lead. The negative diode is in good condition if resistance is 1 Ω or less only in the direction from the heat sink to diode lead.



(A) Diode lead
(B) Heat sink (Negative side)

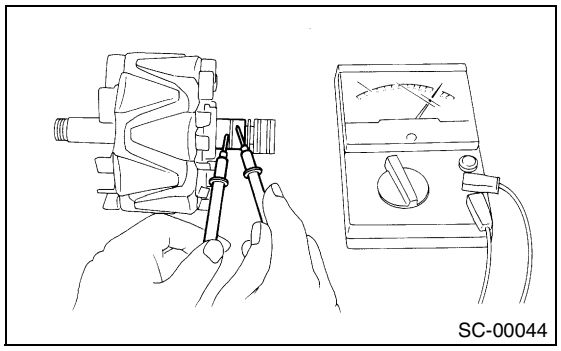
2. ROTOR

1) Slip ring surface
Inspect the slip rings for contamination or any roughness of the sliding surface. Repair the slip ring surface using a lathe or sand paper.
2) Slip ring outer diameter
Measure the slip ring outer diameter. If the slip ring is worn replace rotor assembly.

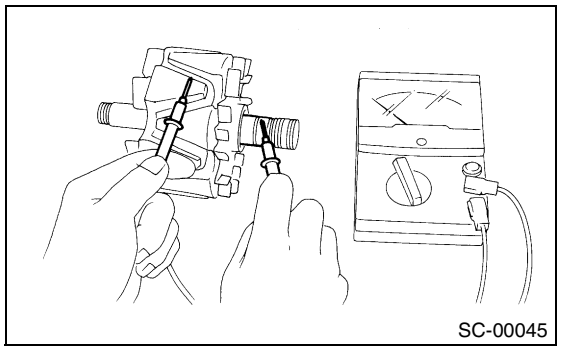
Slip ring outer diameter:
Standard
22.7 mm (0.894 in)
Limit
22.1 mm (0.870 in)

3) Continuity test
Check the resistance between slip rings using circuit tester.
If the resistance is not within specification, replace the rotor assembly.

Specified resistance:
Approx. 1.8 — 2.2 Ω



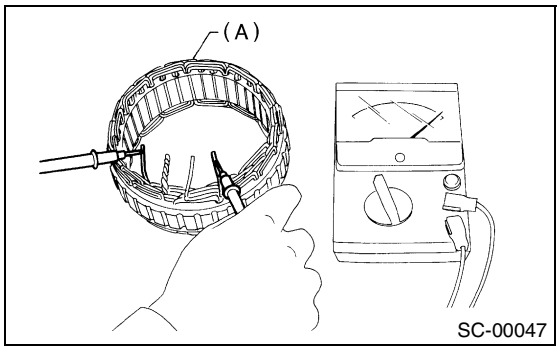
4) Insulation test
Check the continuity between slip ring and rotor core or shaft. If resistance is 1 Ω or less, the rotor coil is grounded, and so replace the rotor assembly.



5) Ball bearing (rear side)
Check the rear ball bearing. Replace if it is noisy or if the rotor does not turn smoothly.

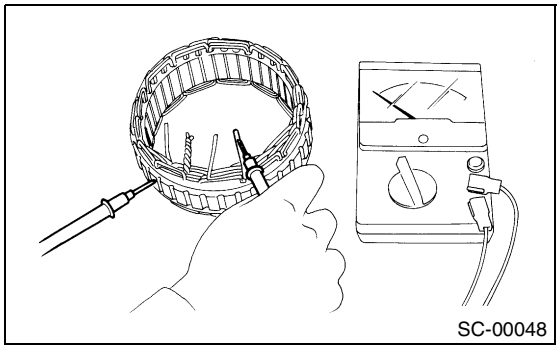
3. STATOR

1) Continuity test
Inspect the stator coil for continuity between each end of the lead wires. If resistance is 1 M Ω or more, the lead wire is broken, and so replace the stator assembly.



(A) Stator

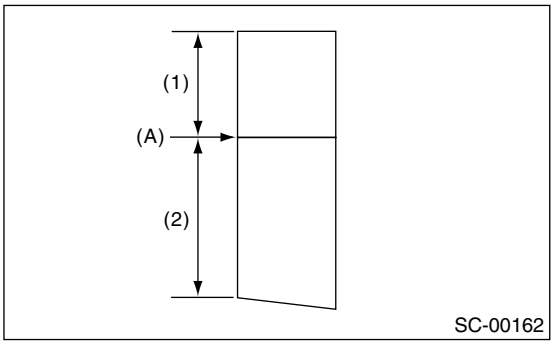
2) Insulation test
Inspect the stator coil for continuity between stator core and each end of lead wire. If resistance is 1 Ω or less, the stator coil is grounded, and so replace the stator assembly.



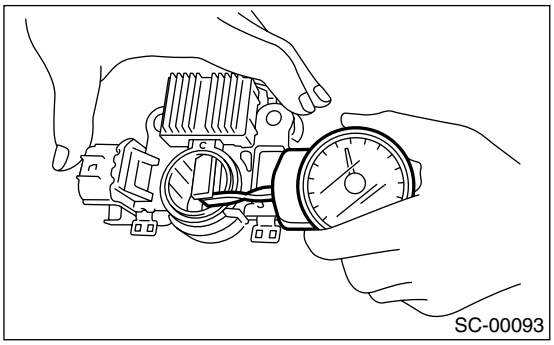
4. BRUSH

1) Measure the length of each brush. If wear exceeds the service limit, replace the brush. Each brush has the service limit mark (A) on it.

Brush length:
Service limit (1)
5.0 mm (0.197 in)
Standard (2)
18.5 mm (0.728 in)



2) Checking brush spring for proper pressure
Using a spring pressure indicator, push the brush into the brush holder until its tip protrudes 2 mm (0.08 in). Then measure the pressure of brush spring. If the pressure is less than 2.2 N (224 g, 7.91 oz), replace the brush spring with a new one. The new spring must have a pressure of 4.8 to 6.0 N (489 to 612 g, 17.26 to 21.60 oz).



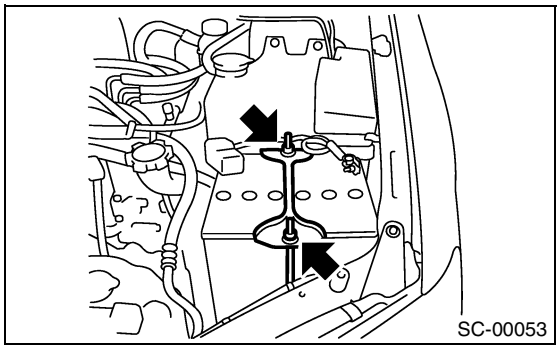
5. BEARING (FRONT SIDE)

Check the front ball bearing. If the resistance is felt while rotating, or if abnormal noise is heard, replace the ball bearing.

4. Battery

A: REMOVAL

1) Disconnect the positive (+) cable after disconnecting the ground (–) cable of battery.
2) Remove the flange nuts from battery rods, and then take off the battery holder.



3) Remove the battery.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)

NOTE:
• Clean the battery cable terminals, and then apply grease to retard formation of corrosion.
• Connect the positive (+) cable of battery and then the ground (–) cable of battery.

C: INSPECTION

WARNING:
• Electrolyte has toxicity; be careful handling the fluid.
• Avoid contact with skin, eyes or clothing. Especially at contact with eyes, blush with water for 15 minutes and get prompt medical attention.
• Batteries produce explosive gasses. Keep sparks, flame, cigarettes away.
• Ventilate when charging or using in enclosed space.
• For safety, in case an explosion does occur, wear eye protection or shield your eyes when working near any battery. Never lean over a battery.
• Do not let the battery fluid contact eyes, skin, fabrics, or paint-work because battery fluid is corrosive acid.
• To lessen the risk of sparks, remove rings, metal watch-bands, and other metal jewelry. Never allow metal tools to contact the positive battery terminal and anything connected to it while you are at the same time in contact with any other metallic portion of the vehicle because a short circuit will be caused.

1. EXTERNAL PARTS:

Check for the existence of dirt or cracks on battery case, top cover, vent plugs, and terminal posts. If necessary, clean with water and wipe with a dry cloth.
Apply a thin coat of grease on the terminal posts to prevent corrosion.

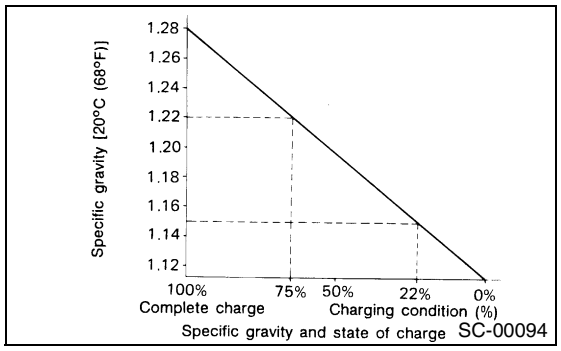
2. ELECTROLYTE LEVEL:

Check the electrolyte level in each cell. If the level is below MIN LEVEL, bring the level to MAX LEVEL by pouring distilled water into the battery cell. Do not fill beyond MAX LEVEL.

3. SPECIFIC GRAVITY OF ELECTROLYTE:

1) Measure the specific gravity of electrolyte using a hydrometer and a thermometer.
Specific gravity varies with temperature of electrolyte so that it must be corrected at 20°C (68°F) using the following equation:

$S_{20} = St + 0.0007 \times (t - 20)$
S_{20}: Specific gravity corrected at electrolyte temperature of 20°C
St: Measured specific gravity
t: Measured temperature (°C)
Determine whether or not battery must be charged, according to corrected specific gravity.
Standard specific gravity: 1.220 — 1.290 [at 20°C (68°F)]



2) Measuring the specific gravity of the electrolyte in battery will disclose the state of charge of battery. The relation between specific gravity and state of charge is as shown in the figure.

D: MEASUREMENT

WARNING:
• Do not bring an open flame close to the battery at this time.

CAUTION:
• Prior to charging, corroded terminals should be cleaned with a brush and common baking soda solution.
• Be careful since the battery electrolyte overflows while charging the battery.
• Observe the instructions when handling battery charger.
• Before charging the battery on vehicle, disconnect battery ground terminal. Failure to follow this rule may damage alternator's diodes or other electrical units.

1. JUDGMENT OF BATTERY IN CHARGED CONDITION

1) Specific gravity of electrolyte is held at a specific value in a range from 1.250 to 1.290 for more than one hour.
2) Voltage per battery cell is held at a specific value in a range from 2.5 to 2.8 volts for more than one hour.

2. CHECK HYDROMETER FOR STATE OF CHARGE

Hydrometer indicator	State of charge	Required action
Green dot	Above 65%	Load test
Dark dot	Below 65%	Charge battery
Clear dot	Low electrolyte	Replace battery* (If cranking complaint)

*: Check electrical system before replacement.

3. NORMAL CHARGING

Charge the battery at current value specified by manufacturer or at approx. 1/10 of battery's ampere-hour rating.

4. QUICK CHARGING

Quick charging is a method in which the battery is charged in a short period of time with a relatively large current by using a quick charger.
Since a large current flow raises electrolyte temperature, the battery is subject to damage if large current is used for prolonged time. For this reason, the quick charging must be carried out within a current range that will not increase the electrolyte temperature above 40°C (104°F).
It should be also remembered that the quick charging is a temporary means to bring battery voltage up to a fair value and, as a rule, a battery should be charged slowly with a low current.

CAUTION:
• Observe the items in 1. NORMAL CHARGING.
• Never use more than 10 amperes when charging the battery because that will shorten battery life.

ENGINE (DIAGNOSTICS)

EN(SOHC)

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1. Basic Diagnostic Procedure

A: PROCEDURE

1. ENGINE

	Step	Check	Yes	No
1	**CHECK ENGINE START FAILURE.** 1)Ask the customer when and how the trouble occurred using the interview check list. <Ref. to EN(SOHC)-4, CHECK, Check List for Interview.> 2)Start the engine. Does the engine start?	Engine starts.	Go to step **2.**	Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(SOHC)-60, Diagnostics for Engine Starting Failure.>
2	**CHECK ILLUMINATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).** Does CHECK ENGINE malfunction indicator lamp illuminate?	CHECK ENGINE malfunction indicator light illuminates.	Go to step **3.**	Inspection using "General Diagnostics Table". <Ref. to EN(SOHC)-261, INSPECTION, General Diagnostic Table.>
3	**CHECK INDICATION OF DTC ON DISPLAY.** 1)Turn the ignition switch to OFF. 2)Connect the Subaru Select Monitor or the OBD-II general scan tool to data link connector. 3)Turn the ignition switch to ON and the Subaru Select Monitor or OBD-II general scan tool switch to ON. 4)Read the DTC on the Subaru Select Monitor or OBD-II general scan tool. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	DTC is indicated.	Record the diagnostic trouble code. Repair the trouble cause. <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).> Go to step **4.**	Repair the related parts. NOTE: If DTC is not shown on display although the MIL illuminates, perform diagnostics of MIL (CHECK ENGINE malfunction indicator lamp) circuit or combination meter. <Ref. to EN(SOHC)-50, Engine Malfunction Indicator Lamp (MIL).>
4	**PERFORM THE DIAGNOSIS.** 1)Perform the clear memory mode. <Ref. to EN(SOHC)-47, Clear Memory Mode.> 2)Perform the inspection mode. <Ref. to EN(SOHC)-40, Inspection Mode.> Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	DTC is indicated.	Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-81, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnosis.

2. AUTOMATIC TRANSMISSION

When the trouble code about automatic transmission is shown on display, carry out the following basic check. After that, carry out the replacement or repair work.

1) ATF level check <Ref. to AT-29, Automatic Transmission Fluid.>
2) Differential gear oil level check <Ref. to AT-30, Differential Gear Oil.>
3) ATF leak check <Ref. to AT-29, Automatic Transmission Fluid.>
4) Differential gear oil leak check <Ref. to AT-30, Differential Gear Oil.>
5) Stall test <Ref. to AT-32, Stall Test.>
6) Line pressure test <Ref. to AT-35, Line Pressure Test.>
7) Transfer clutch pressure test <Ref. to AT-37, Transfer Clutch Pressure Test.>
8) Time lag test <Ref. to AT-34, Time Lag Test.>
9) Road test <Ref. to AT-31, Road Test.>
10) Shift characteristics <Ref. to AT-37, Transfer Clutch Pressure Test.>

2. Check List for Interview

A: CHECK

1. CHECK LIST NO. 1

Check the following items when problem has occurred.

NOTE:
Use copies of this page for interviewing customers.

Customer's name		Engine no.	
Date of sale		Fuel brand	
Date of repair		Odometer reading	km
Vin no.			miles
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others:		
Outdoor temperature	°C (°F)		
	❑ Hot ❑ Warm ❑ Cool ❑ Cold		
Place	❑ Highway ❑ Suburbs ❑ Inner city ❑ Uphill ❑ Downhill ❑ Rough road ❑ Others:		
Engine temperature	❑ Cold ❑ Warming-up ❑ After warming-up ❑ Any temperature ❑ Others:		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	❑ Not affected ❑ At starting ❑ While idling ❑ At racing ❑ While accelerating ❑ While cruising ❑ While decelerating ❑ While turning (RH/LH)		
Headlight	❑ ON/❑ OFF	Rear defogger	❑ ON/❑ OFF
Blower	❑ ON/❑ OFF	Radio	❑ ON/❑ OFF
A/C compressor	❑ ON/❑ OFF	CD/Cassette	❑ ON/❑ OFF
Cooling fan	❑ ON/❑ OFF	Car phone	❑ ON/❑ OFF
Front wiper	❑ ON/❑ OFF	CB	❑ ON/❑ OFF
Rear wiper	❑ ON/❑ OFF		

2. CHECK LIST NO. 2

Check the following items about the vehicle's state when MIL turns on.

NOTE:
Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. ❑ Yes/❑ No
❑ Low fuel warning light ❑ Charge indicator light ❑ AT diagnostics indicator light ❑ ABS warning light ❑ Engine oil pressure warning light
b) Fuel level
• Lack of gasoline: ❑ Yes/❑ No • Indicator position of fuel gauge:
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: ❑ Yes/❑ No
• What:
d) Intentional connecting or disconnecting of hoses: ❑ Yes/❑ No
• What:
e) Installing of parts other than genuine parts: ❑ Yes/❑ No
• What: • Where:
f) Occurrence of noise: ❑ Yes/❑ No
• From where: • What kind:
g) Occurrence of smell: ❑ Yes/❑ No
• From where: • What kind:
h) Intrusion of water into engine compartment or passenger compartment: ❑ Yes/❑ No
i) Troubles occurred
❑ Engine does not start. ❑ Engine stalls during idling. ❑ Engine stalls while driving. ❑ Engine speed decreases. ❑ Engine speed does not decrease. ❑ Rough idling ❑ Poor acceleration ❑ Back fire ❑ After fire ❑ No shift ❑ Excessive shift shock

3. General Description

A: CAUTION

1) Airbag system wiring harness is routed near the engine control module (ECM), main relay and fuel pump relay.

CAUTION:
- All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
- Be careful not to damage the Airbag system wiring harness when servicing the engine control module (ECM), transmission control module (TCM), main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.
- The ECM will be destroyed instantly.
- The fuel injector and other part will be damaged in just a few minutes more.

3) Do not disconnect the battery terminals while the engine is running.
- A large counter electromotive force will be generated in the generator, and this voltage may damage electronic parts such as ECM, etc.

4) Before disconnecting the connectors of each sensor and the ECM, be sure to turn OFF the ignition switch.

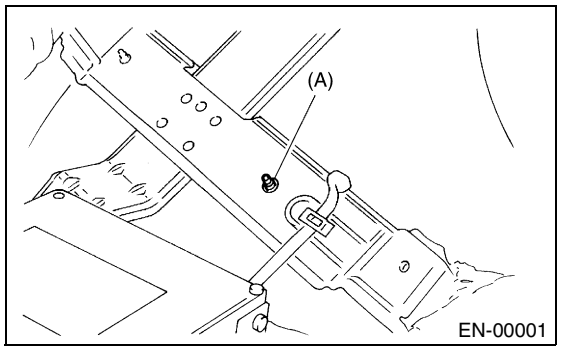
5) Poor contact has been identified as a primary cause of this problem. To measure the voltage and/or resistance of individual sensors or all electrical control modules at the harness side connector, use a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.

6) Before removing the ECM from the located position, disconnect two cables on battery.
- Otherwise, the ECM may be damaged.

CAUTION:
When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage on fuel injection system.

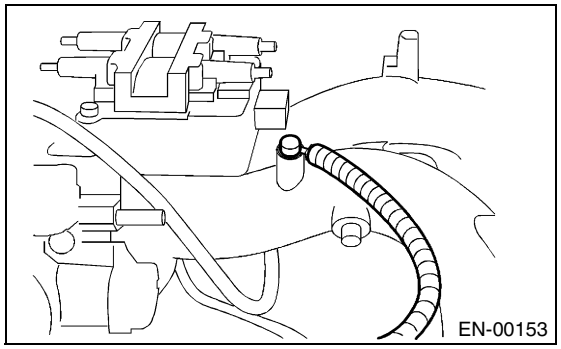
7) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

8) Use ECM mounting stud bolts at the body head grounding point when measuring voltage and resistance inside the passenger compartment.

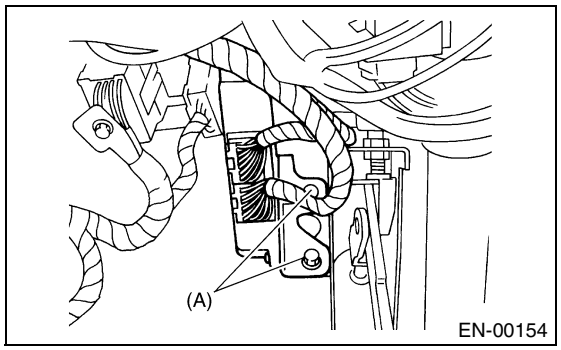


(A) Stud bolt

9) Use engine grounding terminal or engine proper as the grounding point to the body when measuring voltage and resistance in the engine compartment.



10) Use TCM mounting stud bolts at the body head grounding point when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

11) Every MFI-related part is a precision part. Do not drop them.

12) Observe the following cautions when installing a radio in MFI equipped models.

CAUTION:
• The antenna must be kept as far apart as possible from the control unit.
(The ECM is located under the steering column, inside of the instrument panel lower trim panel.)
• The antenna feeder must be placed as far apart as possible from the ECM and MFI harness.
• Carefully adjust the antenna for correct matching.
• When mounting a large power type radio, pay special attention to the three items above mentioned.
• Incorrect installation of the radio may affect the operation of the ECM.

13) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than five seconds to release pressure in the fuel system. If engine starts during this operation, run it until it stops.
14) Problems in the electronic-controlled automatic transmission may be caused by failure of the engine, the electronic control system, the transmission proper, or by a combination of these. These three causes must be distinguished clearly when performing diagnostics.
15) Diagnostics should be conducted by rotating with simple, easy operations and proceeding to complicated, difficult operations. The most important thing in diagnostics is to understand the customer's complaint, and distinguish between the three causes.
16) In AT vehicles, do not continue the stall for more than five seconds at a time (from closed throttle, fully open throttle to stall engine speed).
17) On ABS vehicle, when performing driving test in jacked-up or lifted-up position, sometimes the warning light may be lit, but this is not a malfunction of the system. The reason for this is the speed difference between the front and rear wheels. After diagnosis of engine control system, perform the ABS memory clearance procedure of self-diagnosis system.

B: INSPECTION

Before performing diagnostics, check the following items which might affect engine problems:

1. BATTERY

1) Measure battery voltage and specific gravity of electrolyte.

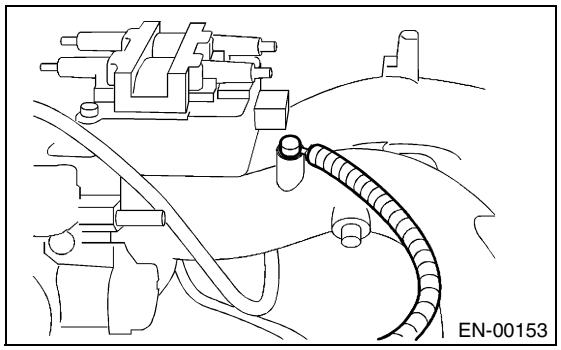
Standard voltage: 12 V

Specific gravity: Above 1.260

2) Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. ENGINE GROUNDING

Make sure the engine grounding terminal is properly connected to the engine.



C: NOTE

1. DESCRIPTION

• The on-board diagnostics (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. CHECK ENGINE malfunction indicator lamp (MIL) in the combination meter indicates occurrence of a fault or trouble.
• Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.
• The OBD system incorporated with the vehicles within this engine family complies with Section 1968.1, California Code of Regulations (OBD-II regulation). The OBD system monitors the components and the system malfunction listed in Engine Section which affects on emissions.
• When the system decides that a malfunction occurs, MIL illuminates. At the same time of the MIL illumination or blinking, a diagnostic trouble code (DTC) and a freeze frame engine conditions are stored into on-board computer.
• The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer when it detects a malfunction first.
• If the OBD system detects the various malfunctions including the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or misfire.
• When the malfunction does not occur again for three consecutive driving cycles, MIL is turned off, but DTC remains at on-board computer.
• The OBD-II system is capable of communication with a general scan tool (OBD-II general scan tool) formed by ISO 9141 CARB.

• The OBD-II diagnostics procedure is different from the usual diagnostics procedure. When troubleshooting OBD-II vehicles, connect Subaru Select Monitor or the OBD-II general scan tool to the vehicle.

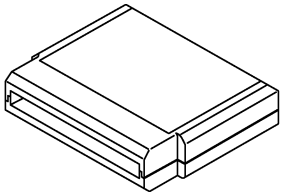
2. ENGINE AND EMISSION CONTROL SYSTEM

• The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.
With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, depending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.
• Further, all the operating conditions of the engine are converted into electric signals, and this results in additional features of the system, such as large improved adaptability, easier addition of compensating element, etc.
The MFI system also has the following features:
- Reduced emission of harmful exhaust gases.
- Reduced in fuel consumption.
- Increased engine output.
- Superior acceleration and deceleration.
- Superior startability and warm-up performance in cold weather since compensation is made for coolant and intake air temperature.

3. AUTOMATIC TRANSMISSION AND ELECTRONIC-HYDRAULIC CONTROL SYSTEM

The electronic-hydraulic control system consists of various sensors and switches, a transmission control module (TCM) and the hydraulic controller including solenoid valves. The system controls the transmission proper including shift control, lock-up control, overrunning clutch control, line pressure control and shift timing control. It also controls the AWD transfer clutch. In other words, the system detects various operating conditions from various input signals and sends output signals to shift solenoids 1, 2 and low clutch timing solenoid and 2-4 brake timing solenoid, line pressure duty solenoid, lock-up duty solenoid, transfer duty solenoid and 2-4 brake duty solenoid (a total of eight solenoids).

D: PREPARATION TOOL

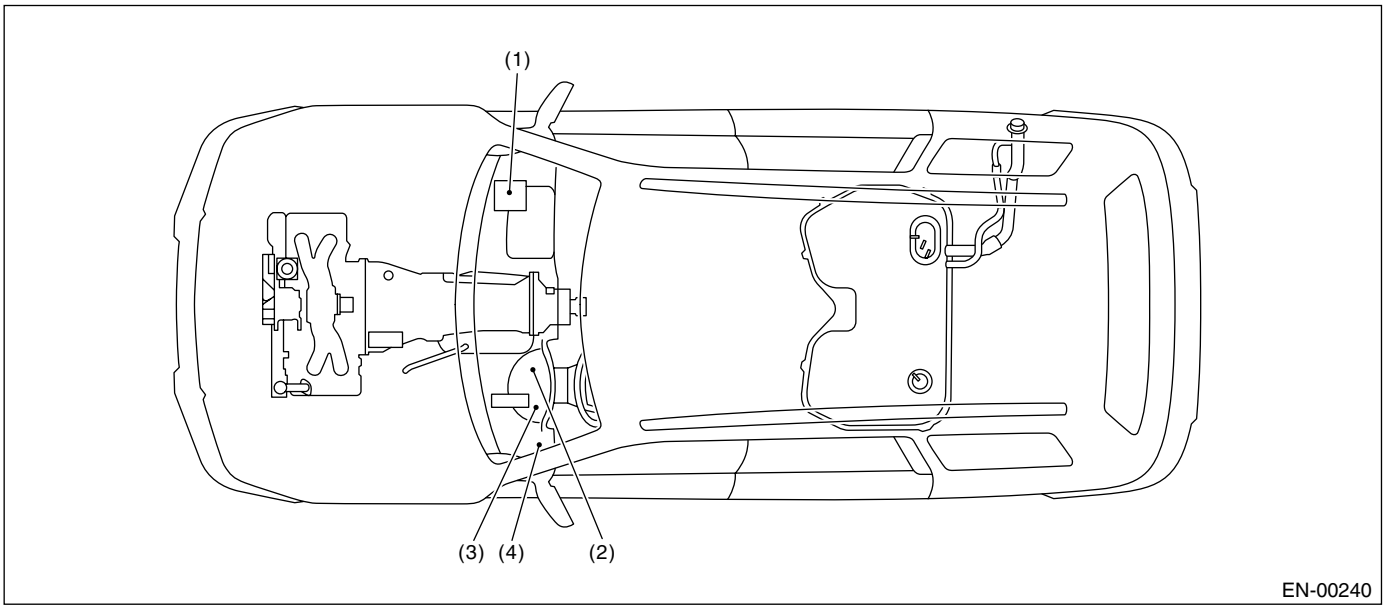
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA210	24082AA210 (New adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

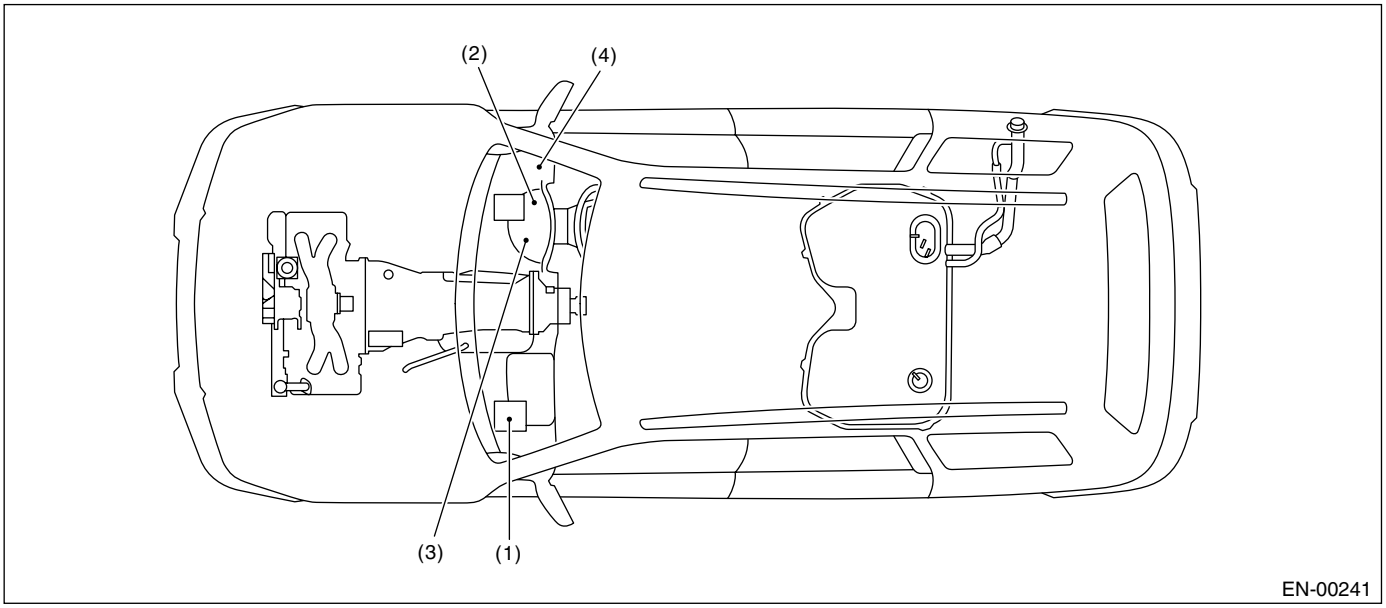
4. Electrical Components Location

A: LOCATION

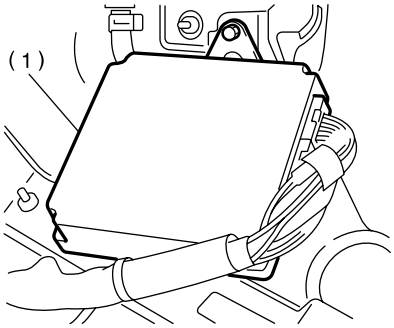
1. ENGINE

• MODULE





(1) Engine control module (ECM)
(2) CHECK ENGINE malfunction indicator lamp (MIL)
(3) Test mode connector
(4) Data link connector



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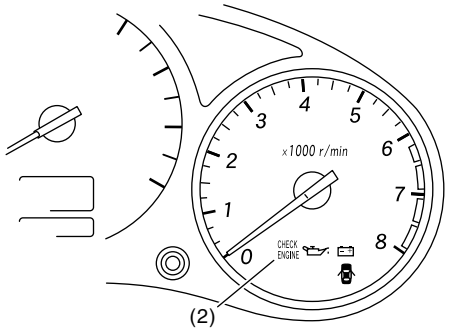

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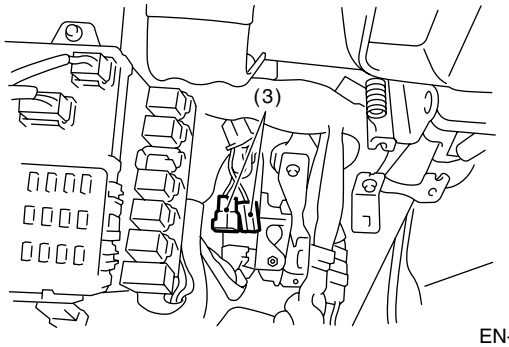
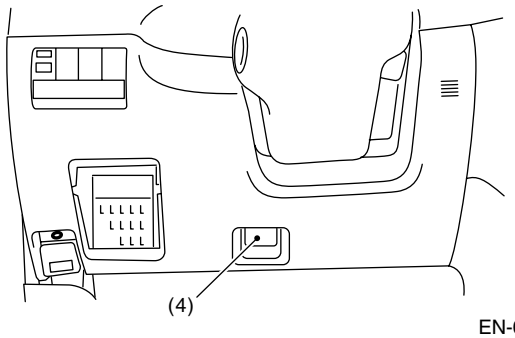
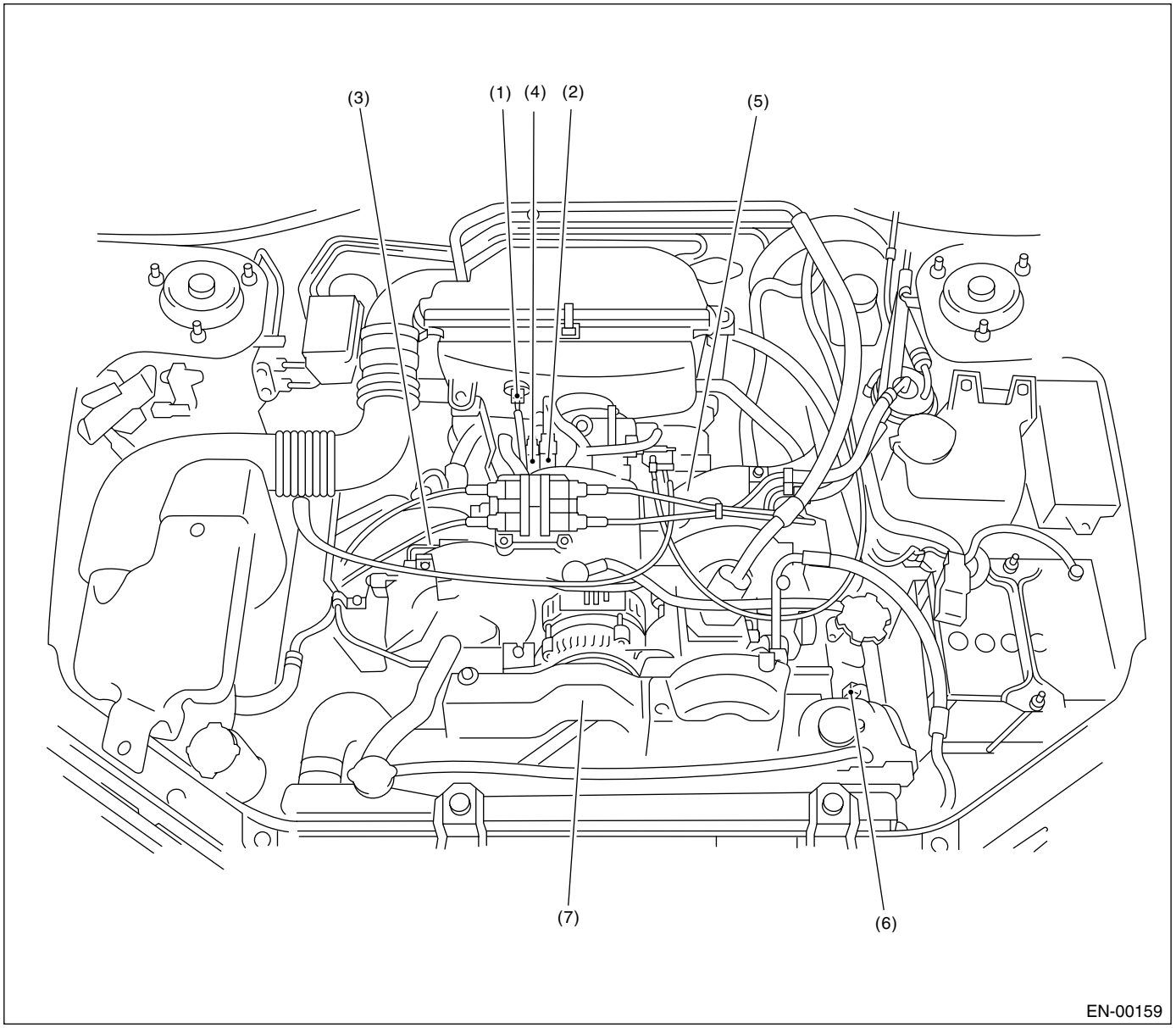


EN-00158



EN-00236

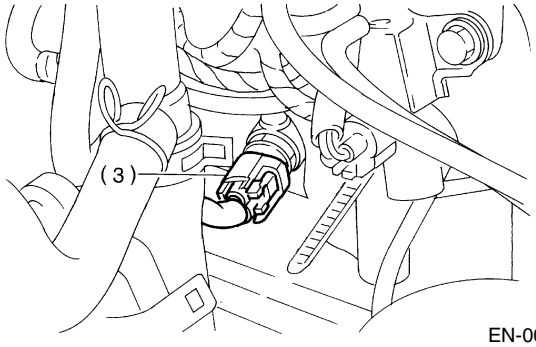
• SENSOR



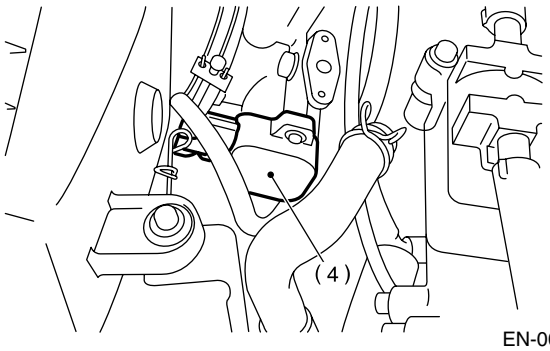
(1) Intake air temperature sensor
(2) Pressure sensor
(3) Engine coolant temperature sensor
(4) Throttle position sensor
(5) Knock sensor
(6) Camshaft position sensor
(7) Crankshaft position sensor

EN-00006

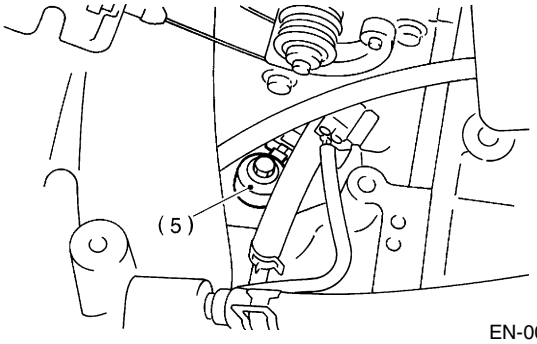
EN-00160



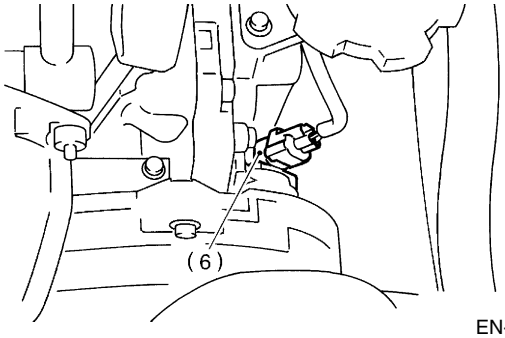
EN-00008



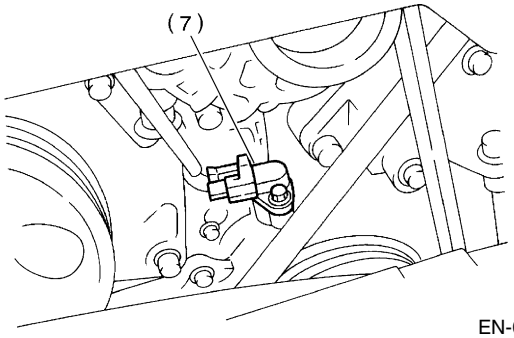
EN-00161



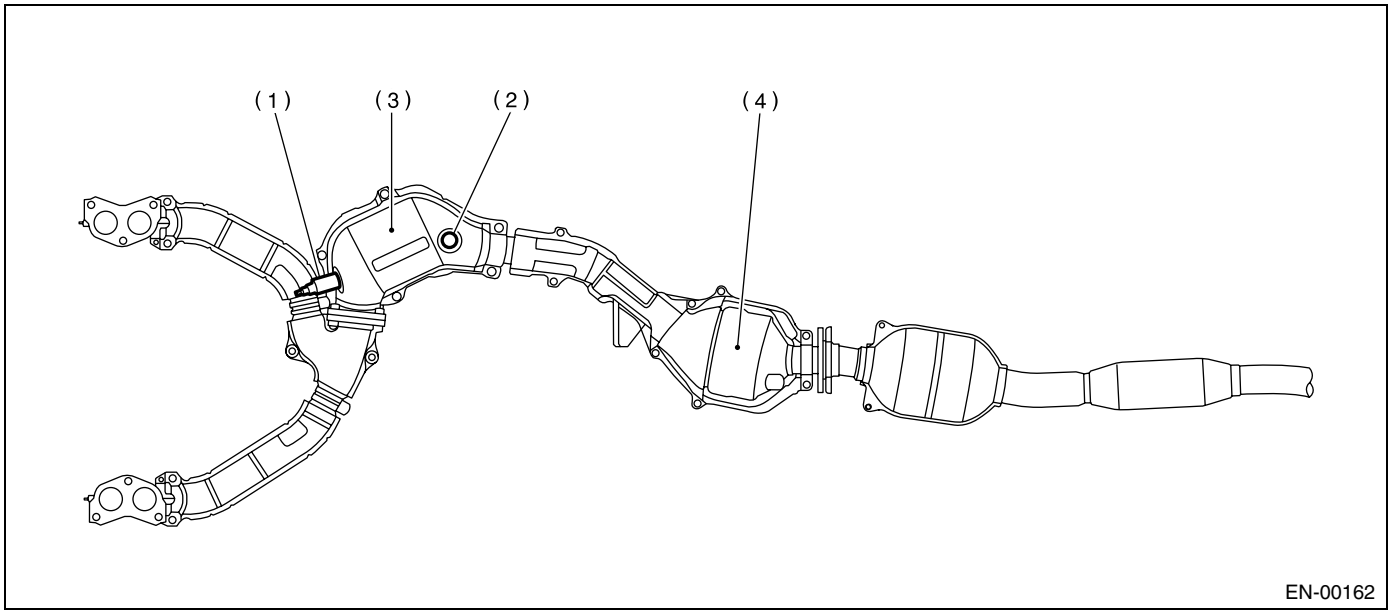
EN-00010



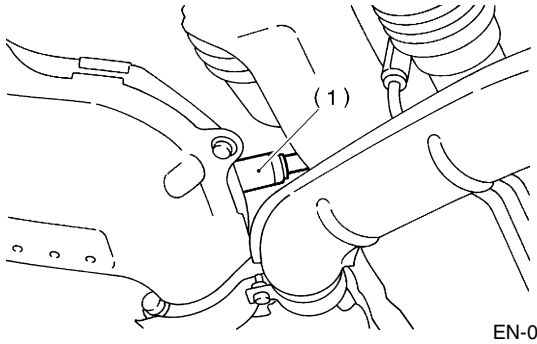
EN-00011

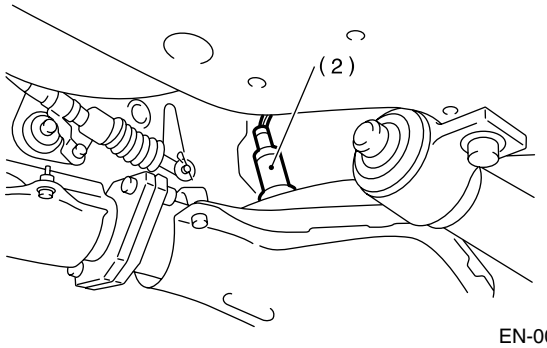


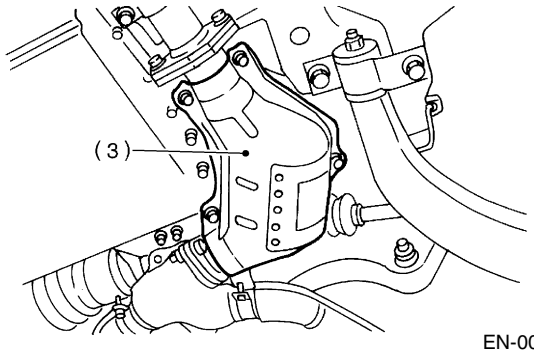
EN-00012

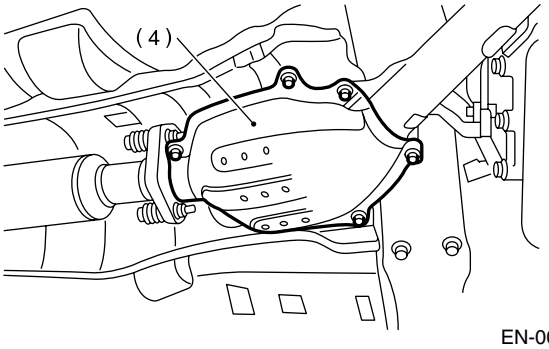


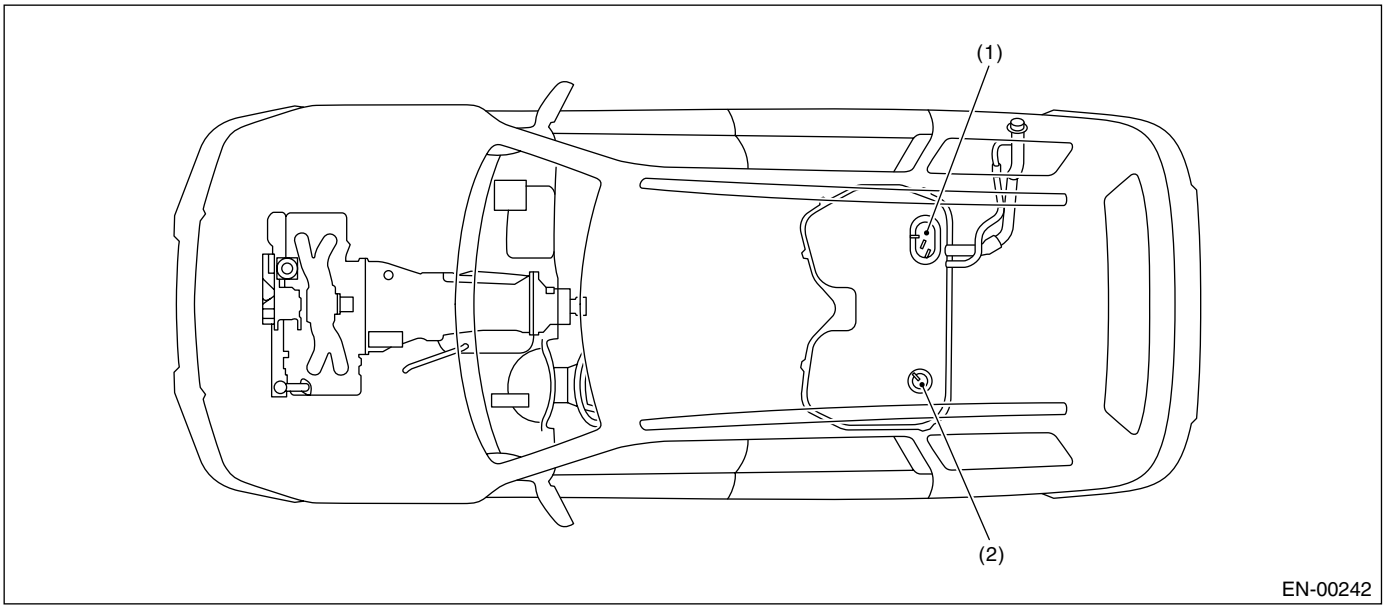
(1) Front oxygen (A/F) sensor
(2) Rear oxygen sensor
(3) Front catalytic converter
(4) Rear catalytic converter

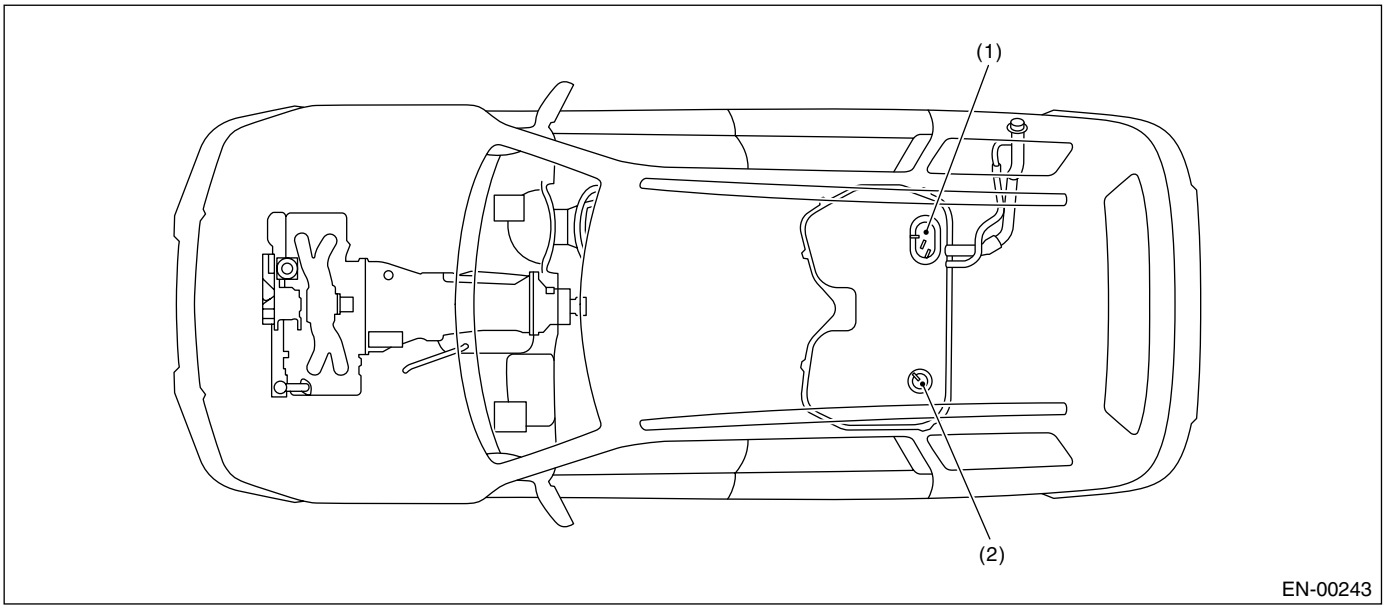




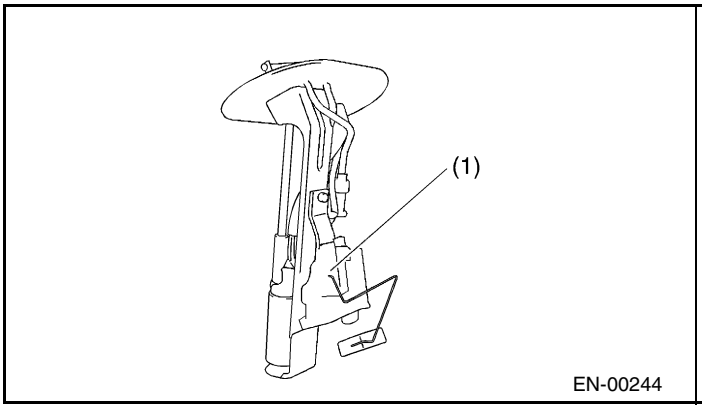


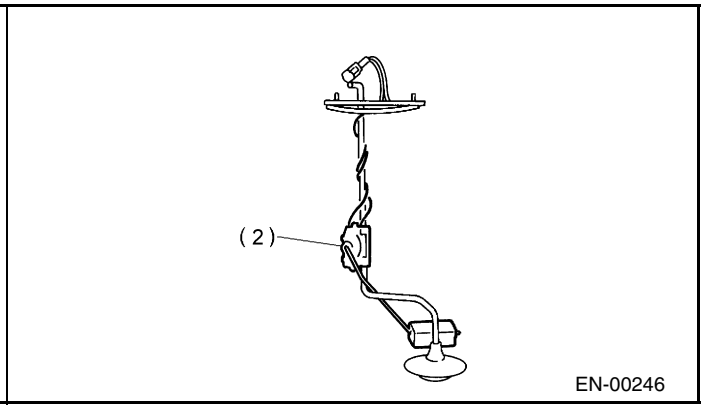




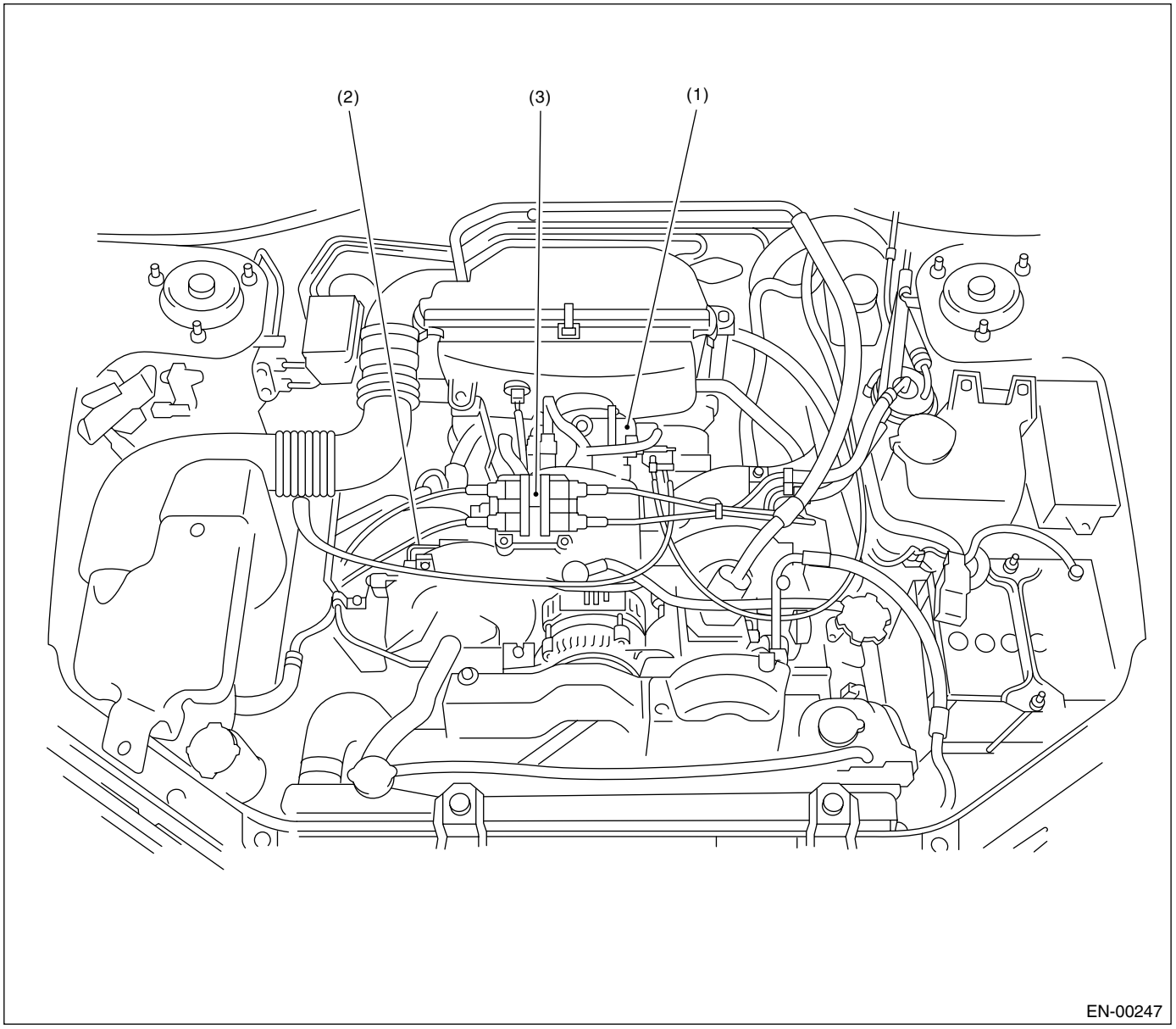


(1) Fuel level sensor (2) Fuel sub level sensor

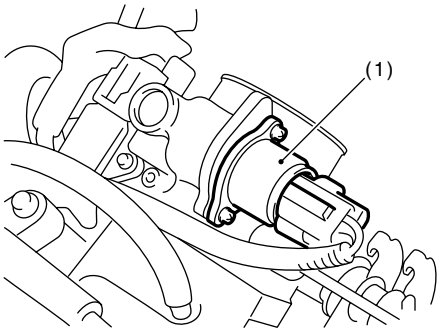




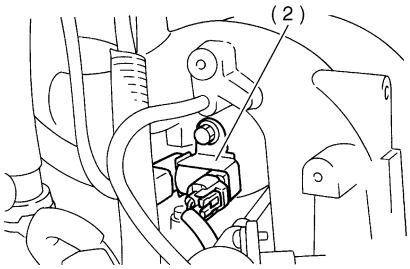
• SOLENOID VALVE, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS



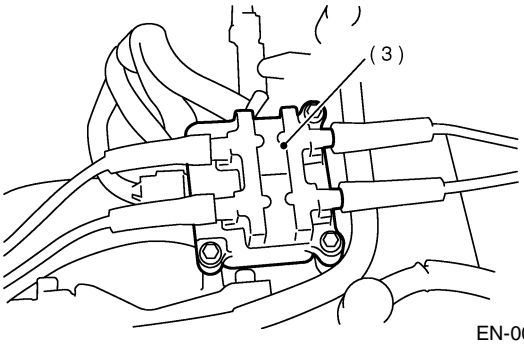
(1) Idle air control solenoid valve (2) Purge control solenoid valve (3) Ignition coil / ignitor ASSY



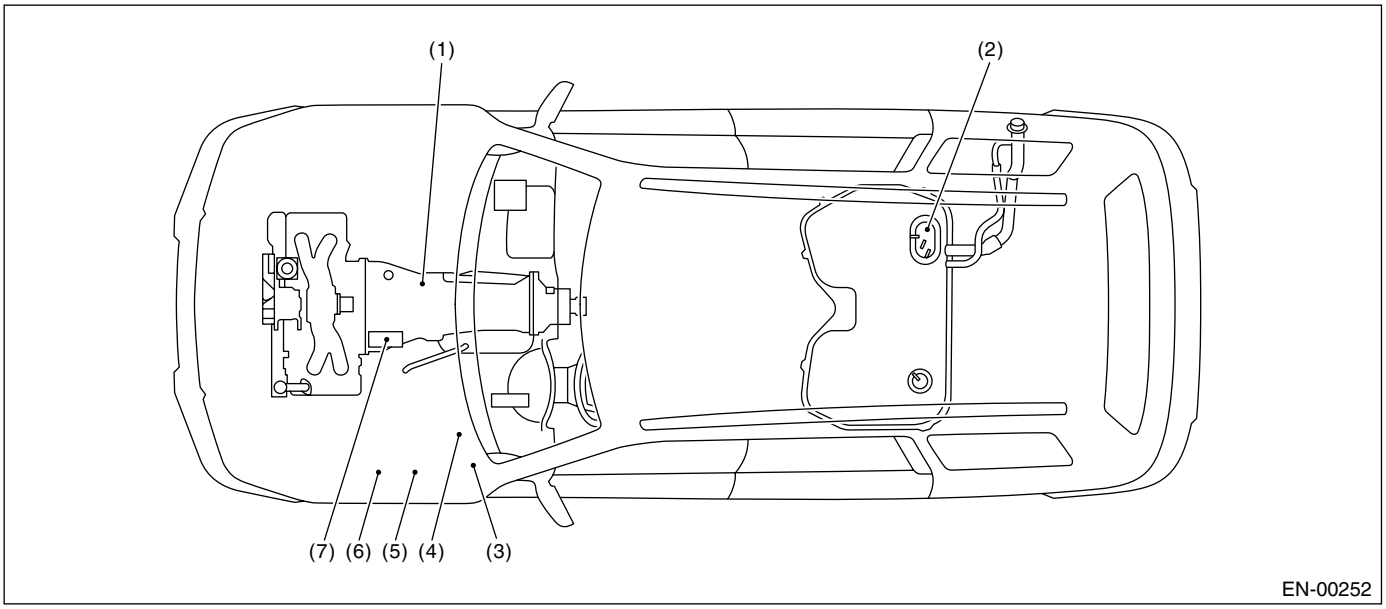
EN-00249

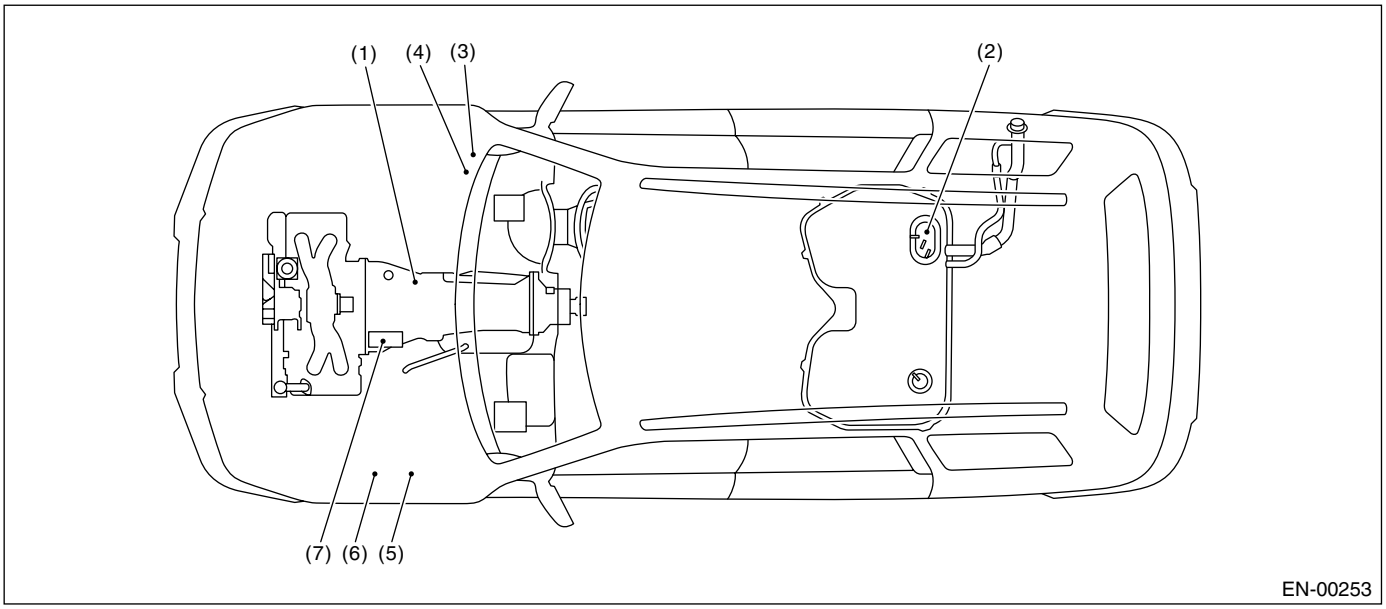


EN-00250

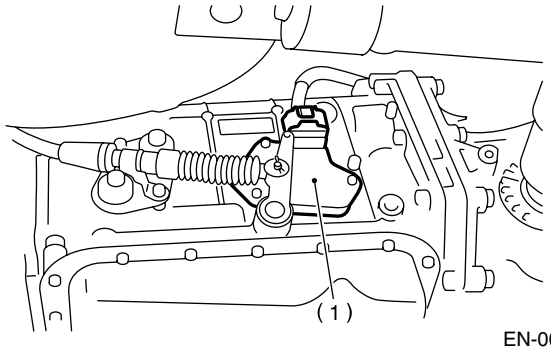


EN-00251

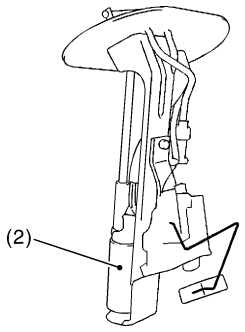




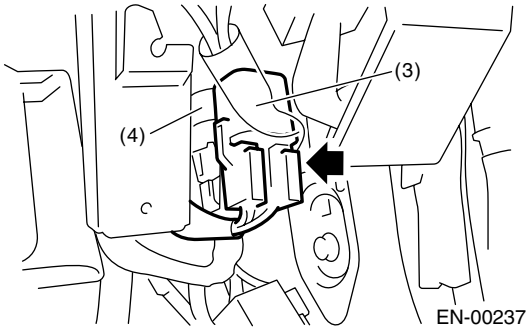
(1) Inhibitor switch
(2) Fuel pump
(3) Main relay
(4) Fuel pump relay
(5) Radiator main fan relay
(6) Radiator sub fan relay
(7) Starter



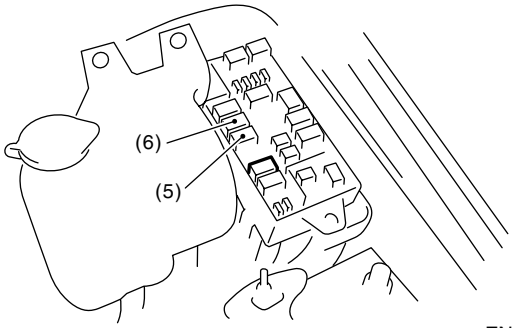
EN-00178



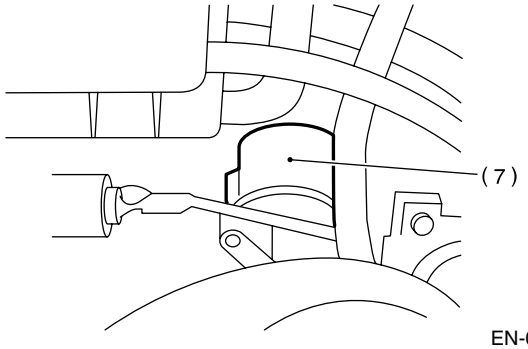
EN-00254



EN-00237



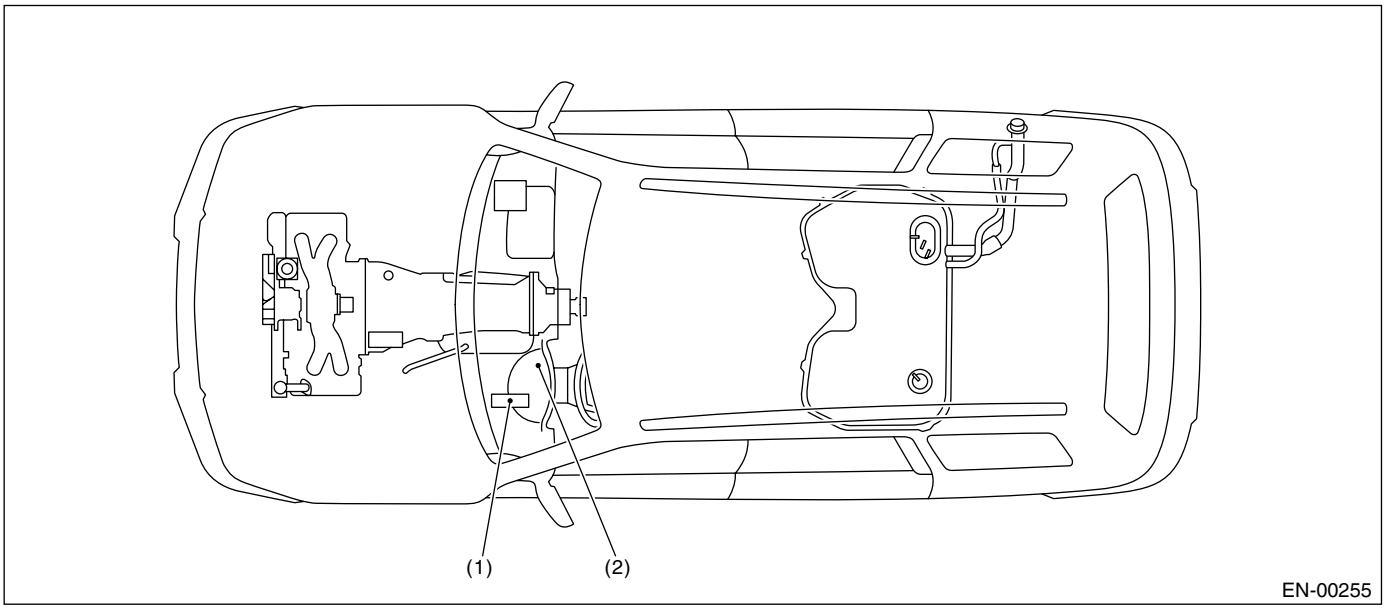
EN-00180

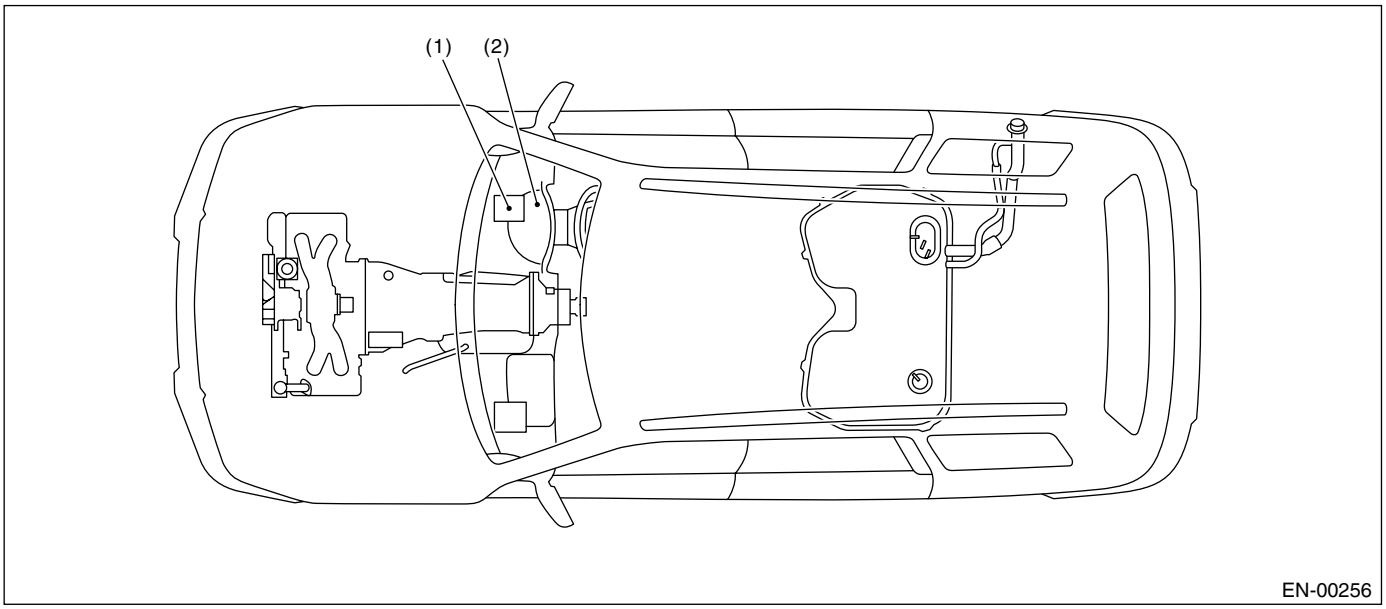


EN-00181

2. TRANSMISSION

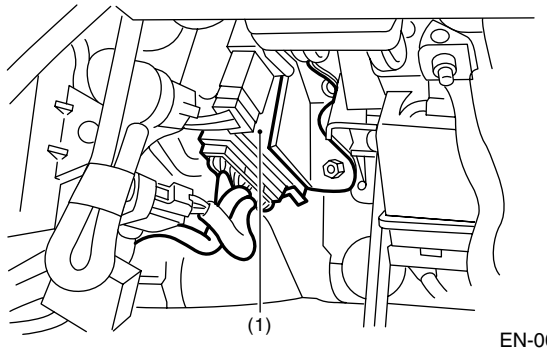
• MODULE



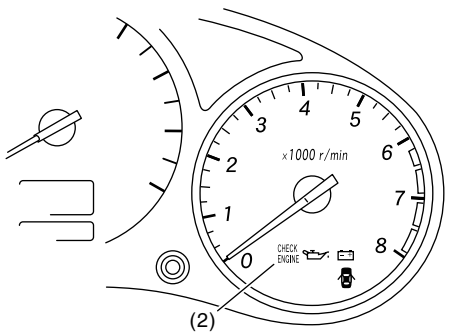


(1) Transmission Control Module (TCM) (for AT vehicles)

(2) AT diagnostic indicator light (for AT vehicles)

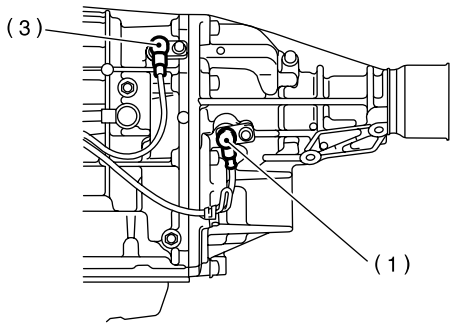


EN-00183

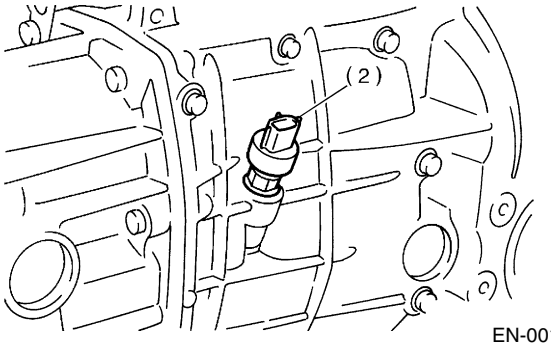


EN-00157

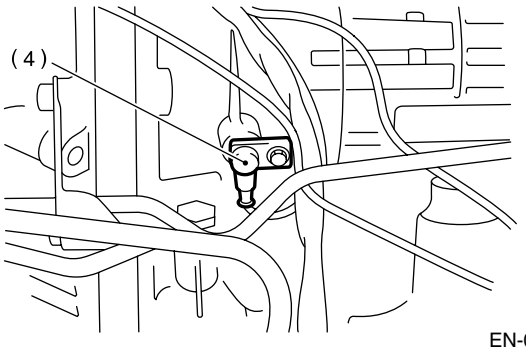
• SENSOR



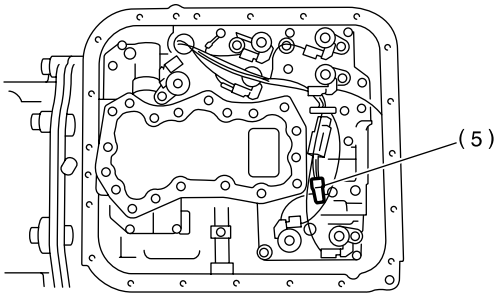
EN-00184



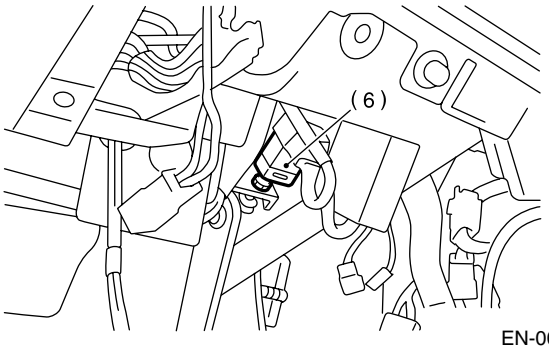
EN-00107



EN-00186



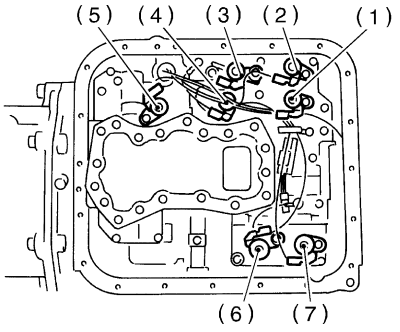
EN-00187



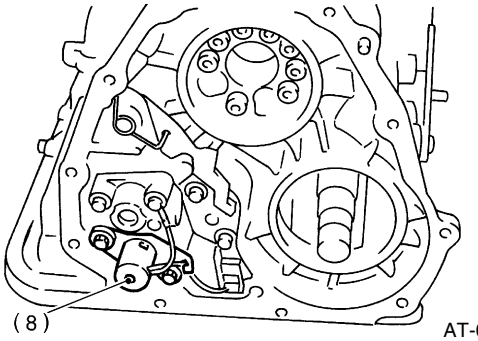
EN-00188

(1) Rear vehicle speed sensor (for AT vehicles)
(2) Front vehicle speed sensor (for MT vehicles)
(3) Front vehicle speed sensor (for AT vehicles)
(4) Torque converter turbine speed sensor
(5) ATF temperature sensor (for AT vehicles)
(6) Brake light switch

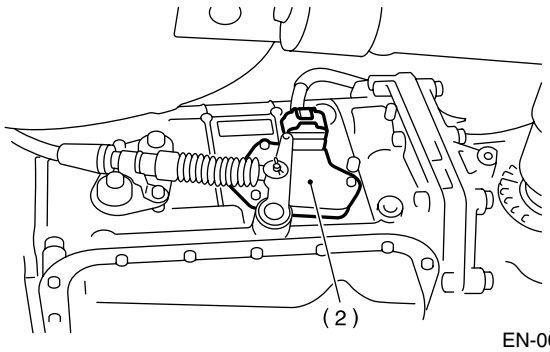
• SOLENOID VALVE AND SWITCH (AT VEHICLES)



AT-00334



AT-00335

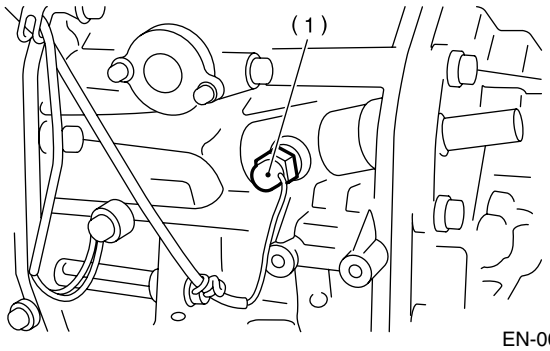


EN-00189

SUBARU.

(1) Shift solenoid valve 1
(2) Shift solenoid valve 2
(3) Line pressure duty solenoid
(4) Low clutch timing solenoid
(5) Lock up duty solenoid
(6) 2-4 brake duty solenoid
(7) 2-4 brake timing solenoid
(8) Transfer duty solenoid
(9) Inhibitor switch

• SOLENOID VALVE AND SWITCH (MT VEHICLES)



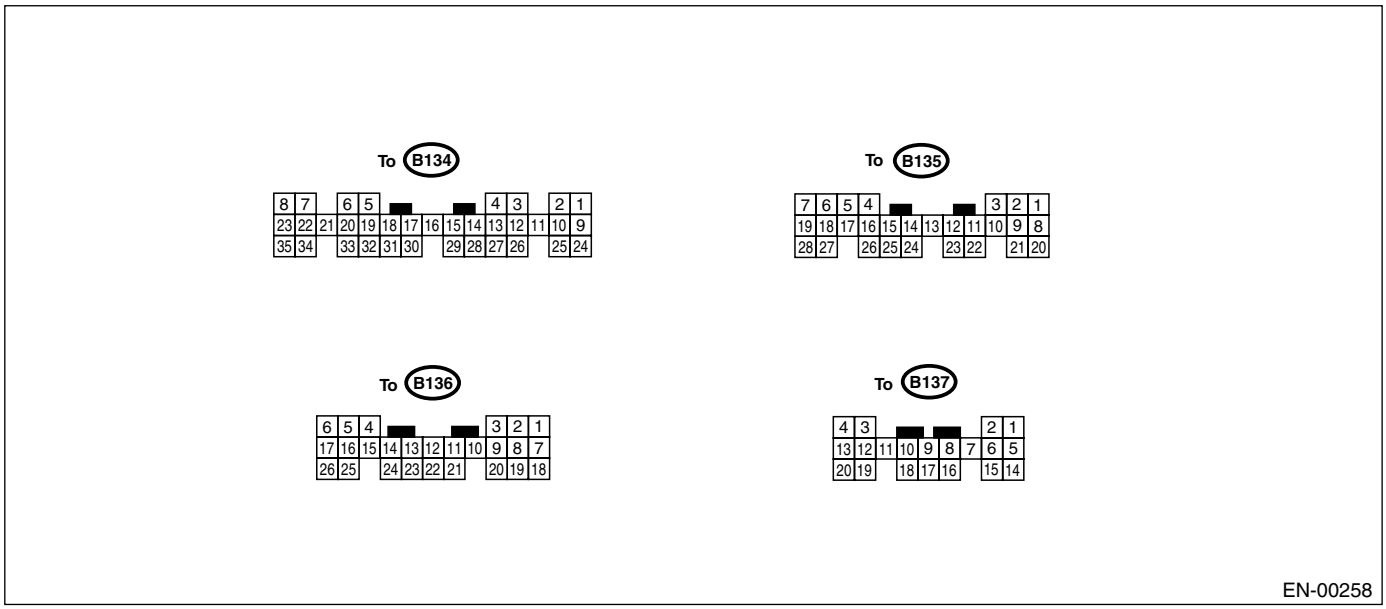
EN-00192

SUBARU.

(1) Neutral position switch

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Crankshaft position sensor	Signal (+)	B135	6	0	–7 to +7	Sensor output waveform
	Signal (–)	B135	17	0	0	—
	Shield	B135	28	0	0	—
Camshaft position sensor	Signal (+)	B135	7	0	–7 to +7	Sensor output waveform
	Signal (–)	B135	18	0	0	—
	Shield	B135	28	0	0	—
Throttle position sensor	Signal	B135	13	Fully closed: 0.2 — 1.0 Fully opened: 4.2 — 4.7		—
	Power supply	B135	3	5	5	—
	GND (sensor)	B135	19	0	0	—
Rear oxygen sensor	Signal	B135	14	0	0 — 0.9	—
	Shield	B137	15	0	0	—
	GND (sensor)	B135	19	0	0	—
Front oxygen (A/F) sensor heater	Signal 1	B136	13	0 — 1.0	0 — 1.0	—
	Signal 2	B136	22	0 — 1.0	0 — 1.0	—
Rear oxygen sensor heater signal		B136	4	0 — 1.0	0 — 1.0	—
Engine coolant temperature sensor	Signal	B135	12	1.0 — 1.4	1.0 — 1.4	After warm-up the engine.
	GND (sensor)	B135	19	0	0	After warm-up the engine.
Vehicle speed signal		B137	10	0 or 5	0 or 5	"5" and "0" are repeatedly displayed when vehicle is driven.
Starter switch		B136	20	0	0	Cranking: 8 — 14

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
A/C switch		B136	11	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch		B136	10	10 — 13	13 — 14	—
Neutral position switch	MT	B136	21	ON: 12±0.5 OFF: 0		Switch is ON when gear is in neutral position.
	AT	B136	21	ON: 0 OFF: 12±0.5		Switch is ON when shift is in “N” or “P” position.
Test mode connector		B136	3	5	5	When connected: 0
Knock sensor	Signal	B135	16	2.8	2.8	—
	Shield	B135	27	0	0	—
Back-up power supply		B135	9	10 — 13	13 — 14	Ignition switch “OFF”: 10 — 13
Control unit power supply		B135	1	10 — 13	13 — 14	—
		B135	2	10 — 13	13 — 14	—
Sensor power supply		B135	3	5	5	—
Ignition control	#1, #2	B134	33	0	1 — 3.4	Waveform
	#3, #4	B134	32	0	1 — 3.4	Waveform
Fuel injector	#1	B134	34	10 — 13	1 — 14	Waveform
	#2	B134	23	10 — 13	1 — 14	Waveform
	#3	B134	22	10 — 13	1 — 14	Waveform
	#4	B134	8	10 — 13	1 — 14	Waveform
Idle air control solenoid valve	Signal 1	B134	20	—	1 — 13	Waveform
	Signal 2	B134	6	—	1 — 13	Waveform
	Signal 3	B134	5	—	1 — 13	Waveform
	Signal 4	B134	19	—	1 — 13	Waveform
	Power supply	B135	2	10 — 13	13 — 14	—
Fuel pump relay control		B134	2	ON: 0.5, or less OFF: 10 — 13	0.5, or less	—
A/C relay control		B134	9	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 1 control		B134	14	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 2 control		B134	13	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	With A/C vehicles only
Self-shutoff control		B136	12	10 — 13	13 — 14	—
Malfunction indicator lamp		B134	28	—	—	Light “ON”: 1, or less Light “OFF”: 10 — 14
Engine speed output		B134	10	—	0 — 13, or more	Waveform
Torque control 1 signal		B136	1	5	5	—
Torque control 2 signal		B136	18	5	5	—
Torque control cut signal		B136	15	8	8	—
Purge control solenoid valve		B134	29	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
Fuel level sensor		B135	25	0.12 — 4.75	0.12 — 4.75	—
EGR solenoid valve	Signal 1	B134	18	0 or 10 — 13	0 or 10 — 13	—
	Signal 2	B134	17	0 or 10 — 13	0 or 10 — 13	—
	Signal 3	B134	16	0 or 10 — 13	0 or 10 — 13	—
	Signal 4	B134	15	0 or 10 — 13	0 or 10 — 13	—
AT diagnosis input signal		B137	19	Less than 1 ←→ More than 4	Less than 1 ←→ More than 4	Waveform

Content	Connector No.	Terminal No.	Signal (V)		Note
			Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Small light switch	B137	20	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Blower fan switch	B137	13	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Rear defogger switch	B137	4	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Front oxygen (A/F) sensor signal 1	B136	13	—	2.05 — 2.25	—
Front oxygen (A/F) sensor signal 2	B136	22	—	1.75 — 1.95	—
Pressure sensor	B135	15	4.0 — 4.8	1.1 — 1.9	—
Intake air temperature sensor	B137	6	3.15 — 3.33	3.15 — 3.33	Intake air temperature: 25°C (75°F)
SSM/GST communication line	B137	16	Less than 1 ←→ More than 4	Less than 1 ←→ More than 4	—
GND (sensors)	B136	19	0	0	—
GND (injectors)	B134	35	0	0	—
GND (ignition system)	B136	26	0	0	—
GND (power supply)	B134	7	0	0	—
GND (control systems)	B137	14	0	0	—
	B135	21	0	0	—
GND (oxygen sensor heater 1)	B136	5	0	0	—
GND (oxygen sensor heater 2)	B136	16	0	0	—

6. Engine Condition Data

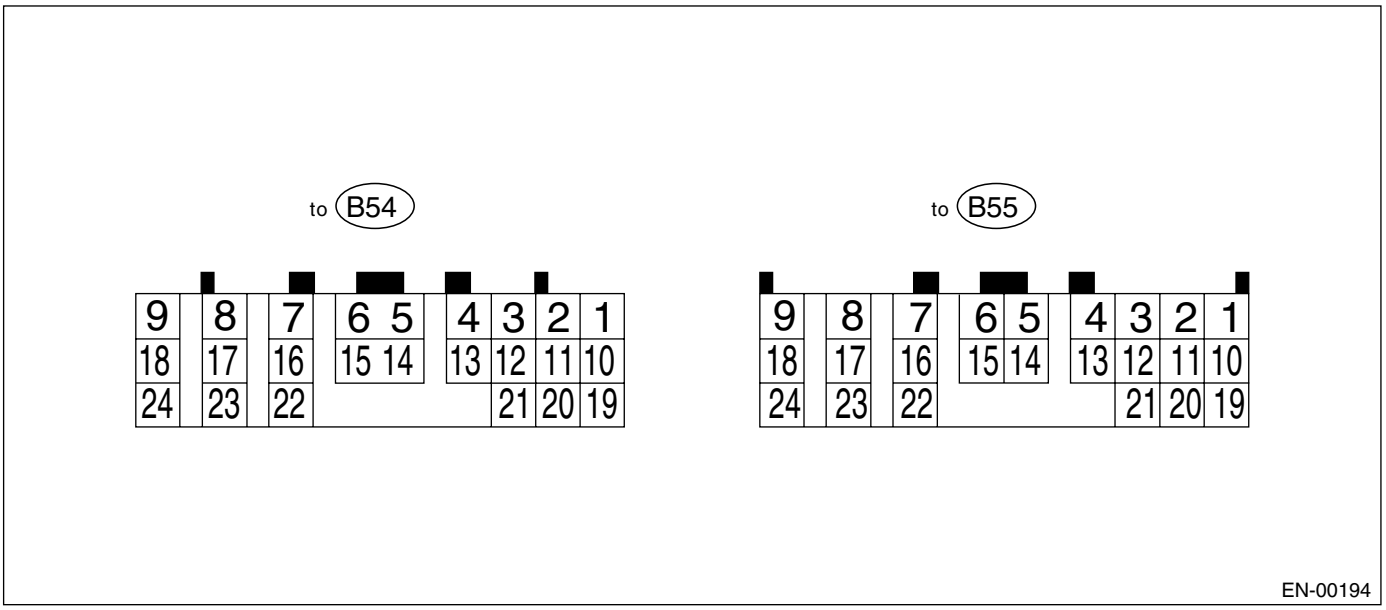
A: ELECTRICAL SPECIFICATION

Content	Specified data
Engine load	1.6 — 2.9 (%): Idling
	6.4 — 12.8 (%): 2,500 rpm racing

Measuring condition:
- After warm-up the engine.
- Gear position is in “N” or “P” position.
- A/C is turned OFF.
- All accessory switches are turned OFF.

7. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION



NOTE:
Check with ignition switch ON.

Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Back-up power supply		B55	6	Ignition switch OFF	10 — 13	—
Ignition power supply		B54	23	Ignition switch ON (with engine OFF)	10 — 13	—
		B54	24			
Inhibitor switch	"P" range switch	B55	23	Selector lever in "P" range	Less than 1	—
				Selector lever in any other than "P" range	More than 8	
	"N" range switch	B55	22	Selector lever in "N" range	Less than 1	—
				Selector lever in any other than "N" range	More than 8	
	"R" range switch	B55	17	Selector lever in "R" range	Less than 1	—
				Selector lever in any other than "R" range	More than 8	
	"D" range switch	B55	8	Selector lever in "D" range	Less than 1	—
				Selector lever in any other than "D" range	More than 8	
	"3" range switch	B55	18	Selector lever in "3" range	Less than 1	—
				Selector lever in any other than "3" range	More than 8	
	"2" range switch	B54	10	Selector lever in "2" range	Less than 1	—
				Selector lever in any other than "2" range	More than 8	
	"1" range switch	B54	1	Selector lever in "1" range	Less than 1	—
				Selector lever in any other than "1" range	More than 8	
Brake switch		B55	24	Brake pedal depressed.	More than 10.5	—
				Brake pedal released.	Less than 1	

Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
ABS signal	B54	19	ABS switch ON	Less than 1	—
			ABS switch OFF	More than 6.5	
AT OIL TEMP light	B54	3	Light ON	Less than 1	—
			Light OFF	More than 9	
Throttle position sensor	B55	2	Throttle fully closed.	Approx. 0.5	—
			Throttle fully open.	Approx. 4.3	
Throttle position sensor power supply	B55	1	Ignition switch ON (With engine OFF)	4.8 — 5.3	—
ATF temperature sensor	B55	11	ATF temperature 20°C (68°F)	1.6 — 2.0	2.1 — 2.9 k
			ATF temperature 80°C (176°F)	0.4 — 0.9	275 — 375
Rear vehicle speed sensor	B55	3	Vehicle stopped.	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Front vehicle speed sensor	B55	5	Vehicle stopped.	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Torque converter turbine speed sensor	B55	12	Engine idling after warm-up (D range).	0	450 — 650
			Engine idling after warm-up (N range).	More than 1 (AC range)	
Vehicle speed output signal	B55	13	Vehicle speed at most 10 km/h (6 MPH)	Less than 1← →More than 5	—
Engine speed signal	B55	4	Ignition switch ON (with engine OFF)	0	—
			Ignition switch ON (with engine ON)	0 — 13 or more	
Cruise set signal	B54	11	When cruise control is set (SET lamp ON)	Less than 1	—
			When cruise control is not set (SET lamp OFF)	More than 6.5	
Torque control 1 signal	B54	13	Ignition switch ON (with engine ON)	More than 4.8	—
Torque control 2 signal	B54	21	Ignition switch ON (with engine ON)	More than 4.8	—
Torque control cut signal	B54	2	Ignition switch ON	8	—
Intake manifold pressure signal	B55	20	Engine idling after warm-up.	0.4 — 1.8	—
AT load signal	B55	20	Engine idling after warm-up.	1.2 — 1.8	—
Shift solenoid 1	B54	7	1st gear	More than 9	10 — 16
			3rd gear	Less than 1	
Shift solenoid 2	B54	6	2nd gear	More than 9	10 — 16
			4th gear	Less than 1	
Line pressure duty solenoid	B54	9	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 5.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 1	
Dropping resistor	B54	18	Throttle fully closed (with engine OFF) after warm-up.	More than 8.5	9 — 15
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	

TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

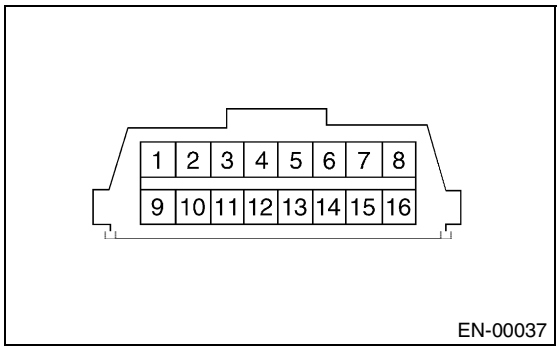
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Lock-up duty solenoid	B54	16	When lock up occurs.	More than 8.5	10 — 17
			When lock up is released.	Less than 0.5	
Transfer duty solenoid	B54	15	Fuse on FWD switch	More than 8.5	10 — 17
			Fuse removed from FWD switch (with throttle fully open and with select lever in 1st gear).	Less than 0.5	
2-4 brake duty solenoid	B54	8	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 5.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 1	
2-4 brake dropping resistor	B54	17	Throttle fully closed (with engine OFF) after warm-up.	More than 8.5	9 — 15
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
2-4 brake timing solenoid	B54	5	1st gear	Less than 1	10 — 16
			3rd gear	More than 9	
Low clutch timing solenoid	B54	14	2nd gear	Less than 1	10 — 16
			4th gear	More than 9	
Sensor ground line	B55	21	—	0	Less than 1
System ground line	B55	9	—	0	Less than 1
		19			
FWD switch	B55	14	Fuse removed.	More than 9	—
			Fuse installed.	Less than 1	
FWD indicator light	B54	12	Fuse on FWD switch	Less than 1	—
			Fuse removed from FWD switch	More than 9	
Data link signal (Subaru Select Monitor)	B55	7	—	—	—
		16	—	—	
AT diagnosis signal	B54	4	Ignition switch ON	Less than 1 ← → More than 4	—

8. Data Link Connector

A: NOTE

1) This connector is used both for OBD-II general scan tools and the Subaru Select Monitor.
2) Terminal No. 4 to No. 6 of the data link connector is used for the Subaru Select Monitor signal.

CAUTION:
Do not connect any scan tools other than the OBD-II general scan tools and the Subaru Select Monitor, because the circuit for the Subaru Select Monitor may be damaged.



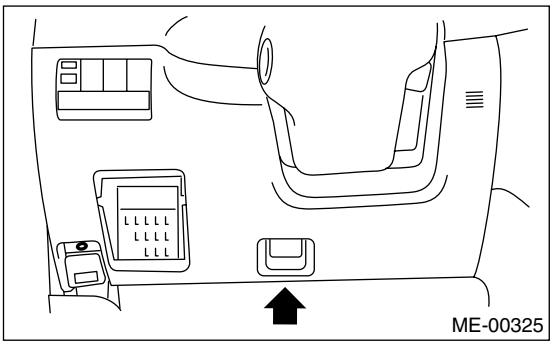
Terminal No.	Contents	Terminal No.	Contents
1	Power supply	9	Blank
2	Blank	10	K line of ISO 9141 CARB
3	Blank	11	Blank
4	Blank	12	Ground
5	Blank	13	Ground
6	Line end check signal	14	Blank
7	Blank	15	Blank
8	Blank	16	Blank

9. OBD-II General Scan Tool

A: OPERATION

1. HOW TO USE OBD-II GENERAL SCAN TOOL

1) Prepare a general scan tool (OBD-II general scan tool) required by SAE J1978.
2) Connect the OBD-II general scan tool to the data link connector located in the lower portion of the instrument panel (on the driver's side).



3) Using the OBD-II general scan tool, call up diagnostic trouble code(s) and freeze frame data.
OBD-II general scan tool functions consist of:
(1) MODE $01: Current powertrain diagnostic data
(2) MODE $02: Powertrain freeze frame data
(3) MODE $03: Emission-related powertrain diagnostic trouble codes
(4) MODE $04: Clear/Reset emission-related diagnostic information
Read out data according to repair procedures. (For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual.)

NOTE:
For details concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).>

2. MODE $01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refers to data denoting the current operating condition of analog input/output, digital input/output and/or the powertrain system.
A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
01	Number of emission-related powertrain trouble codes and MIL status	ON/OFF
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
10	Air flow rate from pressure sensor	g/sec
11	Throttle valve opening angle	%
13	Check whether oxygen sensor is installed.	—
14	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor—bank 1	V and %
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor—bank 2	V and %
1C	On-board diagnosis system	—

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access generic OBD-II PIDs (MODE $01).

3. MODE $02 (POWERTRAIN FREEZE FRAME DATA)

Refers to data denoting the operating condition when trouble is sensed by the on-board diagnosis system. A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
02	Trouble code that caused CARB required freeze frame data storage	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access freeze frame data (MODE $02).

4. MODE $03 (EMISSION-RELATED POWERTRAIN DIAGNOSTIC TROUBLE CODE)

Refer to Read Diagnostic Trouble Code for information about data denoting emission-related powertrain diagnostic trouble codes. <Ref. to EN(SOHC)-39, Read Diagnostic Trouble Code.>

5. MODE $04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION)

Refers to the mode used to clear or reset emission-related diagnostic information (OBD-II trouble diagnostic information).

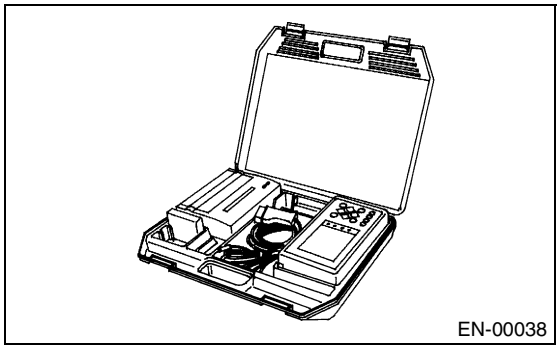
NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to clear or reset emission-related diagnostic information (MODE $04).

10.Subaru Select Monitor

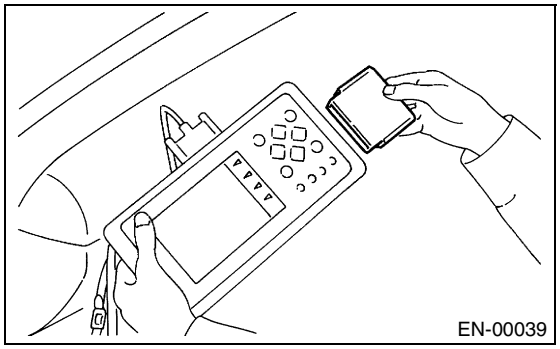
A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

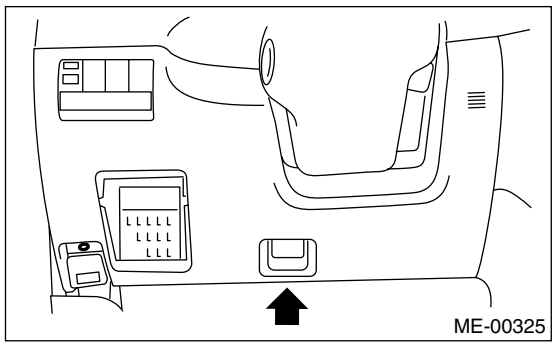
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(SOHC)-8, PREPARATION TOOL, General Description.>



2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(SOHC)-8, PREPARATION TOOL, General Description.>



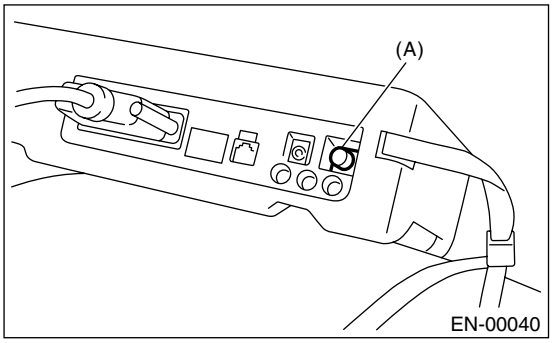
4) Connect the Subaru Select Monitor to data link connector.
(1) Data link connector located in the lower portion of the instrument panel (on the driver's side).



(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

6) Using the Subaru Select Monitor, call up diagnostic trouble code(s) and various data, then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (NORMAL MODE)

Refer to Read Diagnostic Trouble Code for information about how to indicate DTC. <Ref. to EN(SOHC)-39, Read Diagnostic Trouble Code.>

3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (OBD MODE)

Refer to Read Diagnostic Trouble Code for information about how to indicate DTC. <Ref. to EN(SOHC)-39, Read Diagnostic Trouble Code.>

4. READ CURRENT DATA FOR ENGINE. (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Vehicle speed signal	Vehicle Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Engine coolant temperature signal	Coolant Temp.	°C or °F
Ignition timing signal	Ignition Timing	deg
Throttle position signal	Throttle Opening Angle	%
Throttle position signal	Throttle Sensor Voltage	V
Injection pulse width	Fuel Injection #1 Pulse	ms
Idle air control signal	ISC Valve Step	STEP
Engine load data	Engine Load	%
Front oxygen (A/F) sensor resistance	A/F Sensor #1 Resistance	Ohm
Front oxygen (A/F) sensor output signal	A/F Sensor #1	—
Rear oxygen sensor output signal	Rear O_2 Sensor	V
Short term fuel trim	A/F Correction #1	%
Knock sensor signal	Knocking Correction	deg
Atmospheric absolute pressure signal	Atmosphere Pressure	mmHg or kPa or inHg or psi
Intake manifold relative pressure signal	Mani. Relative Pressure	mmHg or kPa or inHg or psi
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psi
A/F correction (short term fuel trim) by rear oxygen sensor	A/F Correction #3	%
Long term whole fuel trim	A/F Learning #1	%
Front oxygen (A/F) sensor heater current	Front O_2 Heater #1	A
Rear oxygen sensor heater current	Rear O_2 Heater Current	A
Canister purge control solenoid valve duty ratio	CPC Valve Duty Ratio	%
Fuel level signal	Fuel Level	V
Intake air temperature signal	Intake Air Temp.	°C or °F
Learned ignition timing	Learned Ignition Timing	deg
EGR signal	EGR step	STEP
Ignition switch signal	Ignition Switch	ON or OFF
Test mode connector signal	Test Mode Signal	ON or OFF
Neutral position switch signal	Neutral Position Switch	ON or OFF
Air conditioning switch signal	A/C Switch	ON or OFF
Air conditioning signal	A/C Compressor Signal	ON or OFF
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF
Fuel pump relay signal	Fuel Pump Relay	ON or OFF
Knocking signal	Knocking Signal	ON or OFF
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF
Power steering switch signal	P/S Switch	ON or OFF
Engine torque control signal #1	Torque Control Signal #1	ON or OFF

Contents	Display	Unit of measure
Engine torque control signal #2	Torque Control Signal #2	ON or OFF
Engine torque control permission signal	Torque Permission Signal	ON or OFF
Rear oxygen sensor rich signal	Rear O_2 Rich Signal	ON or OFF
Starter switch signal	Starter Switch Signal	ON or OFF
Idle switch signal	Idle Switch Signal	ON or OFF
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF
Rear defogger switch signal	Rear Defogger Switch	ON or OFF
Blower fan switch signal	Blower Fan Switch	ON or OFF
Small light switch signal	Light Switch	ON or OFF
AT vehicle ID signal	AT Vehicle ID Signal	ON or OFF
A/C middle pressure switch signal	A/C Mid Pressure Switch	ON or OFF

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

5. READ CURRENT DATA FOR ENGINE. (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {Current Data Display & Save} and press the [YES] key.
6) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
7) Using the scroll key, move the display screen up or down until the desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Number of diagnosis code	Number of Diagnosis Code	—
Malfunction indicator lamp status	MI (MIL)	ON or OFF
Monitoring test of misfire	Misfire monitoring	Complete or incomplete
Monitoring test of fuel system	Fuel system monitoring	Complete or incomplete
Monitoring test of comprehensive component	Component monitoring	Complete or incomplete
Test of catalyst	Catalyst Diagnosis	Complete or incomplete
Test of heated catalyst	Heated catalyst	No support
Test of evaporative emission purge control system	Evaporative purge system	Complete or incomplete
Test of secondary air system	Secondary air system	No support
Test of air conditioning system refrigerant	A/C system refrigerant	No support
Test of oxygen sensor	Oxygen sensor	Complete or incomplete
Test of oxygen sensor heater	O_2 Heater Diagnosis	Complete or incomplete
Test of EGR system	EGR system	—
Air fuel ratio control system for bank 1	Fuel System for Bank 1	—
Engine load data	Calculated load value	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing advance for #1 cylinder	Ignition timing adv. #1	°
Intake air temperature signal	Intake Air Temp.	°C or °F
Intake air amount	Mass Air Flow	g/s
Throttle position signal	Throttle Opening Angle	%
Rear oxygen sensor output signal	Oxygen Sensor #12	V
Air fuel ratio correction by rear oxygen sensor	Short term fuel trim #12	%
On-board diagnostic system	OBD System	—
Oxygen sensor #11	Oxygen sensor #11	Support
Oxygen sensor #12	Oxygen sensor #12	Support
A/F sensor #11	A/F sensor #11	—

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

6. READ FREEZE FRAME DATA FOR ENGINE. (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {Freeze Frame Data} and press the [YES] key.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Diagnostic trouble code (DTC) for freeze frame data	Freeze frame data	DTC
Air fuel ratio control system for bank 1	Fuel system for Bank1	ON or OFF
Engine load data	Engine Load	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

7. LED OPERATION MODE FOR ENGINE

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On the «Data Display Menu» display screen, select the {Data & LED Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Message	LED “ON” requirements
Ignition switch signal	Ignition Switch	ON or OFF	When ignition switch is turned ON.
Test mode connector signal	Test Mode Signal	ON or OFF	When test mode connector is connected.
Neutral position switch signal	Neutral Position Switch	ON or OFF	When neutral position signal is entered.
Air conditioning switch signal	A/C Switch	ON or OFF	When air conditioning switch is turned ON.
Air conditioning relay signal	A/C Relay	ON or OFF	When air conditioning relay is in function.
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF	When radiator main fan relay is in function.
Fuel pump relay signal	Fuel Pump Relay	ON or OFF	When fuel pump relay is in function.
Knocking signal	Knocking Signal	ON or OFF	When knocking signal is entered.
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF	When radiator sub fan relay is in function.
Engine torque control signal #1	Torque Control Signal #1	ON or OFF	When engine torque control signal 1 is entered.
Engine torque control signal #2	Torque Control Signal #2	ON or OFF	When engine torque control signal 2 is entered.
Engine torque control permission signal	Torque Control Permit	ON or OFF	When engine torque control permission signal is entered.
Front oxygen (A/F) sensor rich signal	Front O_2 Rich Signal #1	ON or OFF	When front oxygen (A/F) sensor mixture ratio is rich.
Rear oxygen sensor rich signal	Rear O_2 Rich Signal	ON or OFF	When rear oxygen sensor mixture ratio is rich.
Starter switch signal	Starter Switch Signal	ON or OFF	When starter switch signal is entered.
Idle switch signal	Idle Switch Signal	ON or OFF	When idle switch signal is entered.
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF	When crankshaft position sensor signal is entered.
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF	When camshaft position sensor signal is entered.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

8. READ CURRENT DATA FOR AT.

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of transmission type.
4) On the «Transmission Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Rear vehicle speed sensor signal	Vehicle Speed #1	km/h or MPH
Front vehicle speed sensor signal	Vehicle Speed #2	km/h or MPH
Engine speed signal	Engine Speed	rpm
Automatic transmission fluid temperature signal	ATF Temp.	°C or °F
Throttle position signal	Throttle Sensor Voltage	V
Gear position	Gear Position	—
Line pressure control duty ratio	Line Pressure Duty Ratio	%
Lock up clutch control duty ratio	Lock Up Duty Ratio	%
Transfer clutch control duty ratio	Transfer Duty Ratio	%
Power supply for throttle position sensor	Throttle Sensor Power	V
Torque converter turbine speed signal	AT Turbine Speed	rpm
2-4 brake timing pressure control duty ratio	2-4B Duty Ratio	%
Intake manifold pressure sensor voltage	Mani. Pressure Voltage	V
2 wheel drive switch signal	2WD Switch	ON or OFF
Kick down switch signal	Kick Down Switch	ON or OFF
Stop lamp switch signal	Stop Lamp Switch	ON or OFF
Anti lock brake system signal	ABS Signal	ON or OFF
Cruise control system signal	Cruise Control Signal	ON or OFF
Neutral/Parking range signal	N/P Range Signal	ON or OFF
Reverse range signal	R Range Signal	ON or OFF
Drive range signal	D Range Signal	ON or OFF
3rd range signal	3rd Range Signal	ON or OFF
2nd range signal	2nd Range Signal	ON or OFF
1st range signal	1st Range Signal	ON or OFF
Shift control solenoid A	Shift Solenoid #1	ON or OFF
Shift control solenoid B	Shift Solenoid #2	ON or OFF
Torque control output signal #1	Torque Control Signal #1	ON or OFF
Torque control output signal #2	Torque Control Signal #2	ON or OFF
Torque control cut signal	Torque Control Cut Sig.	ON or OFF
2-4 brake timing control solenoid valve	2-4 Brake Timing Sol.	ON or OFF
Low clutch timing control solenoid valve	Low Clutch Timing Sol.	ON or OFF
Automatic transmission diagnosis indicator lamp	AT Diagnosis Lamp	ON or OFF

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

11. Read Diagnostic Trouble Code

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press the [YES] key.
5) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)} and press the [YES] key.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {Diagnosis Code(s) Display} and press the [YES] key.
6) Make sure that a diagnostic trouble code (DTC) is shown on the display screen.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).>

3. OBD-II GENERAL SCAN TOOL

Refers to data denoting emission-related powertrain diagnostic trouble codes.
For details concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).>

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access emission-related powertrain diagnostic trouble codes (MODE $03).

12.Inspection Mode

A: OPERATION

Carry out trouble diagnosis shown in the following DTC table.
When performing trouble diagnosis which is not shown in the DTC table, refer to the next item Drive cycle. <Ref. to EN(SOHC)-45, Drive Cycle.>

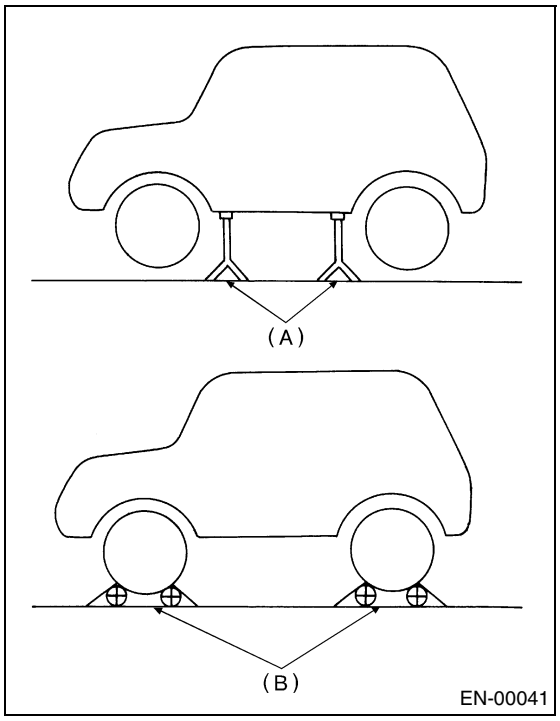
DTC No.	Item
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)
P0068	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input
P0112	Intake Air Temperature Circuit Low Input
P0113	Intake Air Temperature Circuit High Input
P0117	Engine Coolant Temperature Circuit Low Input
P0118	Engine Coolant Temperature Circuit High Input
P0122	Throttle/Pedal Position Sensor/Switch “A” Circuit Low Input
P0123	Throttle/Pedal Position Sensor/Switch “A” Circuit High Input
P0129	Barometric Pressure Too Low
P0131	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)
P0132	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 1)
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)
P0335	Crankshaft Position Sensor “A” Circuit
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)
P0341	Camshaft Position Sensor “A” Circuit Range/Performance (Bank 1 or Single Sensor)
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low
P0462	Fuel Level Sensor Circuit Low Input
P0463	Fuel Level Sensor Circuit High Input
P0502	Vehicle Speed Sensor Circuit Low Input
P0503	Vehicle Speed Sensor Circuit High Input
P0512	Starter Request Circuit
P0513	Incorrect immobilizer key
P0519	Idle Control System Malfunction (Fail-safe)
P0565	Cruise Control Set Signal Circuit Malfunction for AT
P0604	Internal Control Module Random Access Memory (RAM) Error
P0703	Torque Converter/Brake Switch “B” Circuit
P0705	Transmission Range Sensor Circuit (PRNDL Input)
P0710	Transmission Fluid Temperature Sensor Circuit
P0716	Input/Turbine Speed Sensor Circuit
P0720	Output Speed Sensor Circuit
P0726	Engine Speed Input Circuit
P0731	Gear 1 Incorrect Ratio
P0732	Gear 2 Incorrect Ratio
P0733	Gear 3 Incorrect Ratio

DTC No.	Item
P0734	Gear 4 Incorrect Ratio
P0741	Torque Converter Clutch Circuit Performance or Stuck Off
P0743	Torque Converter Clutch Circuit Electrical
P0748	Pressure Control Solenoid “A” Electrical
P0753	Shift Solenoid “A” Electrical
P0758	Shift Solenoid “B” Electrical
P0771	AT Low Clutch Timing Solenoid Valve Circuit Malfunction
P0778	Pressure Control Solenoid “B” Electrical
P0785	Shift/Timing Solenoid
P0851	Neutral Switch Input Circuit Low
P0852	Neutral Switch Input Circuit High
P0864	TCM Communication Circuit Range/Performance
P0865	TCM Communication Circuit Low
P0866	TCM Communication Circuit High
P1110	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)
P1111	Atmospheric Pressure Sensor Circuit Malfunction (High Input)
P1492	EGR Signal Line 1 Circuit (Low)
P1493	EGR Signal Line 1 Circuit (High)
P1494	EGR Signal Line 2 Circuit (Low)
P1495	EGR Signal Line 2 Circuit (High)
P1496	EGR Signal Line 3 Circuit (Low)
P1497	EGR Signal Line 3 Circuit (High)
P1498	EGR Signal Line 4 Circuit (Low)
P1499	EGR Signal Line 4 Circuit (High)
P1510	ISC Solenoid Valve Signal #1 Circuit Malfunction (Low Input)
P1511	ISC Solenoid Valve Signal #1 Circuit Malfunction (High Input)
P1512	ISC Solenoid Valve Signal #2 Circuit Malfunction (Low Input)
P1513	ISC Solenoid Valve Signal #2 Circuit Malfunction (High Input)
P1514	ISC Solenoid Valve Signal #3 Circuit Malfunction (Low Input)
P1515	ISC Solenoid Valve Signal #3 Circuit Malfunction (High Input)
P1516	ISC Solenoid Valve Signal #4 Circuit Malfunction (Low Input)
P1517	ISC Solenoid Valve Signal #4 Circuit Malfunction (High Input)
P1518	Starter Switch Circuit Low input
P1560	Back-up Voltage Circuit Malfunction
P1570	Antenna
P1571	Reference Code Incompatibility
P1572	IMM Circuit Failure (Except Antenna Circuit)
P1574	Key Communication Failure
P1576	EGI Control Module EEPROM
P1577	IMM Control Module EEPROM
P1698	Engine Torque Control Cut Signal Circuit Malfunction (Low Input)
P1699	Engine Torque Control Cut Signal Circuit Malfunction (High Input)
P1700	Throttle Position Sensor Circuit Malfunction for AT
P1711	Engine Torque Control Signal #1 Circuit Malfunction
P1712	Engine Torque Control Signal #2 Circuit Malfunction

1. PREPARATION FOR THE INSPECTION MODE

1) Make sure that the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)] and the battery voltage is 12 V or more.
2) Raise the vehicle using a garage jack and place on safety stands or drive the vehicle onto free rollers.

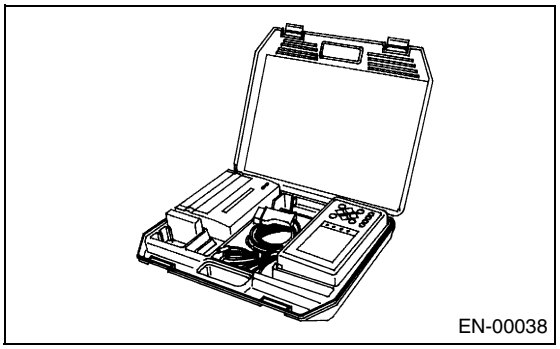
WARNING:
• Before raising the vehicle, ensure the parking brake is applied.
• Do not use a pantograph jack in place of a safety stand.
• Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
• Do not abruptly depress/release the clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause vehicle to jump off free rollers.
• In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the safety stands and the vehicle.
• Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



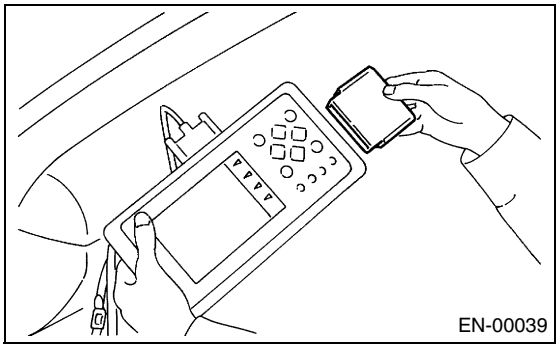
(A) Safety stand
(B) Free rollers

2. SUBARU SELECT MONITOR

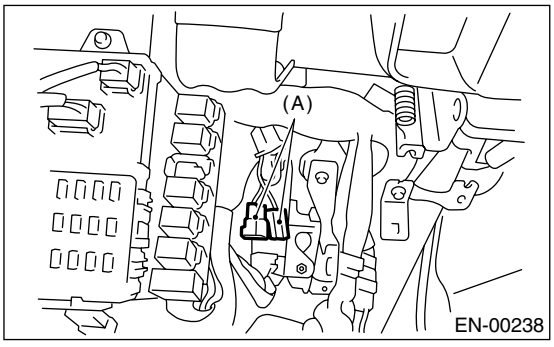
1) After performing the diagnostics and clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(SOHC)-47, Clear Memory Mode.>
2) Warm up the engine.
3) Prepare the Subaru Select Monitor kit. <Ref. to EN(SOHC)-8, PREPARATION TOOL, General Description.>



4) Connect the diagnosis cable to Subaru Select Monitor.
5) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(SOHC)-8, PREPARATION TOOL, General Description.>

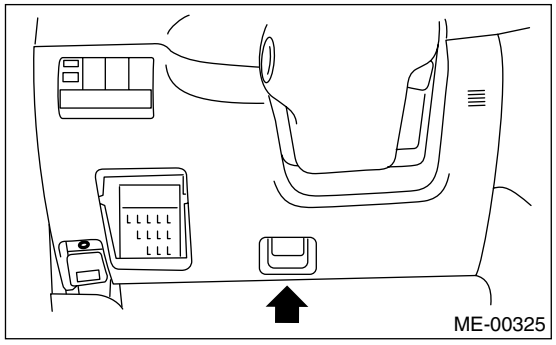


6) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).



7) Connect the Subaru Select Monitor to data link connector.

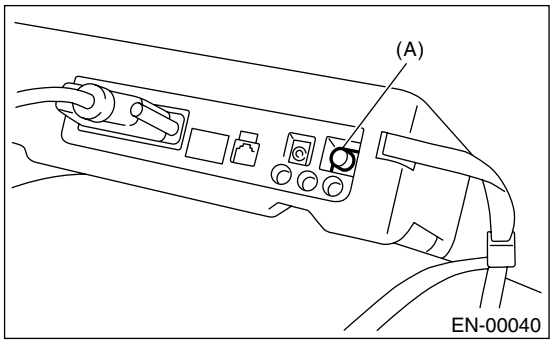
(1) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.

8) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

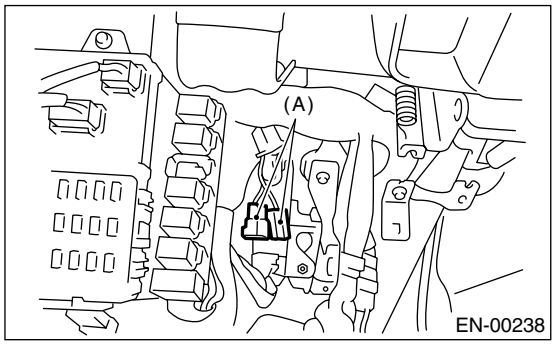
9) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
10) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
11) Press the [YES] key after displayed the information of engine type.
12) On the «Engine Diagnosis» display screen, select the {Dealer Check Mode Procedure} and press the [YES] key.
13) When the “Perform Inspection (Dealer Check) Mode?” is shown on the display screen, press the [YES] key.
14) Perform subsequent procedures as instructed on the display screen.

• If trouble still remains in the memory, the corresponding diagnostic trouble code (DTC) appears on the display screen.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning the diagnostic trouble codes (DTCs), refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).>
• Release the parking brake.
• The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

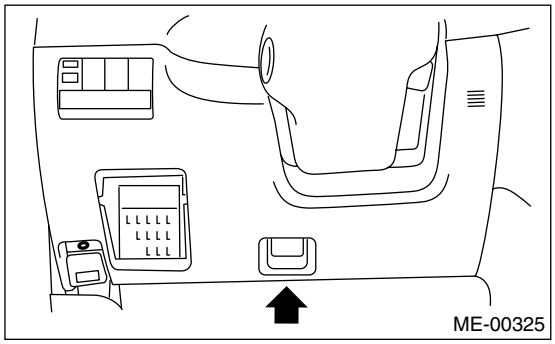
3. OBD-II GENERAL SCAN TOOL

1) After performing the diagnostics and clearing memory, check for any remaining unresolved trouble data: <Ref. to EN(SOHC)-47, Clear Memory Mode.>
2) Warm up the engine.
3) Connect the test mode connector (A) at the lower side of instrument panel (on the driver's side).



4) Connect the OBD-II general scan tool to its data link connector in the lower portion of instrument panel (on the driver's side).

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.



5) Start the engine.

NOTE:
• Ensure the selector lever is placed in “P” position before starting. (AT vehicles)
• Depress the clutch pedal when starting engine. (MT vehicles)

6) Using the selector lever or shift lever, turn the “P” position switch and “N” position switch to ON.
7) Depress the brake pedal to turn brake switch ON. (AT vehicles)
8) Keep the engine speed in 2,500 — 3,000 rpm range for 40 seconds.
9) Place the selector lever or shift lever in “D” position (AT vehicles) or “1st” gear (MT vehicles) and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:
• On AWD vehicles, release the parking brake.
• The speed difference between front and rear wheels may light ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

10) Using the OBD-II general scan tool, check for diagnostic trouble code(s) (DTC(s)) and record the result(s).

NOTE:
• For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.
• For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).>

13.Drive Cycle

A: OPERATION

There are three drive patterns for the trouble diagnosis. Driving in the specified pattern allows to diagnose malfunctioning items listed below. After the malfunctioning items listed below are repaired, always check whether they correctly resume their functions by driving in the required drive pattern.

1. PREPARATION FOR THE DRIVE CYCLE

1) Make sure that the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)], and battery voltage is 12V or more.
2) After performing the diagnostics and cleaning memory, check for any remaining unresolved trouble data. <Ref. to EN(SOHC)-47, Clear Memory Mode.>
3) Separate the test mode connector.

NOTE:
• Except for the water temperature specified items at starting, the diagnosis is carried out after engine warm up.
• Carry out the diagnosis which is marked * on DTC twice, then, after finishing first diagnosis, stop the engine and do second time at the same condition.

2. AFTER RUNNING 20 MINUTES AT 80 KM/H (50 MPH), IDLE ENGINE FOR 1 MINUTE.

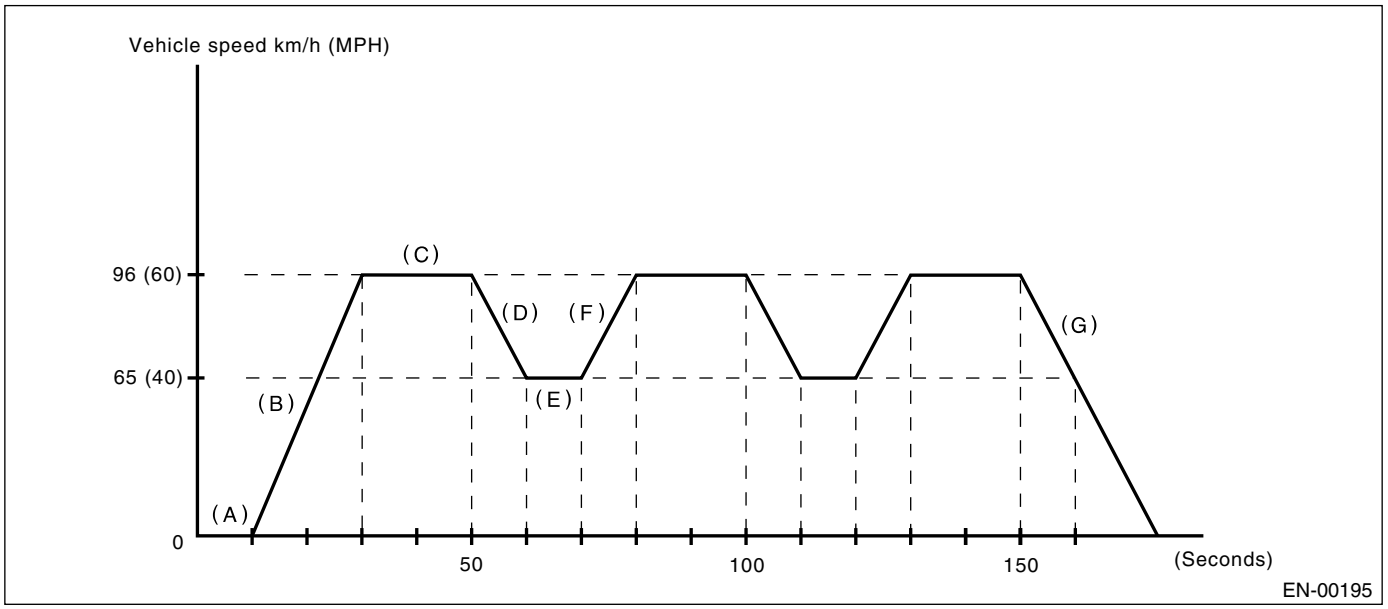
DTC No.	Item	Condition
*P0030	HO2S Heater Control Circuit Range/Performance (Bank 1 Sensor 1)	—
*P0111	Intake Air Temperature Circuit Range/Performance	Coolant temperature at start is less than 30°C (86°F).
*P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	Coolant temperature at start is less than 20°C (68°F).
*P0130	O_2 Sensor Circuit (Bank 1 Sensor 1)	—
*P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	—
*P0420	Catalyst System Efficiency Below Threshold (Bank 1)	—
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	—
*P0461	Fuel Level Sensor Performance Problem (Travel Distance)	—
*P0464	Fuel Level Sensor Circuit Intermittent	—
*P1137	O_2 Sensor Circuit (Bank1 Sensor1)	—

3. IDLE FOR 10 MINUTES

NOTE:
Before the diagnosis, drive the vehicle at 4 km/h (6 MPH) or more.

DTC No.	Item	Condition
*P0483	Cooling Fan Rationality Check	—
*P0506	Idle Control System RPM Lower Than Expected	—
*P0507	Idle Control System RPM Higher Than Expected	—

4. DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN



(A) Idle engine for 1 minute.
(B) Accelerate to 97 km/h (60 MPH) within 20 seconds.
(C) Drive vehicle at 97 km/h (60 MPH) for 20 seconds.
(D) Decelerate with fully closed throttle to 64 km/h (40 MPH).
(E) Drive vehicle at 64 km/h (40 MPH) for 10 seconds.
(F) Accelerate to 97 km/h (60 MPH) within 10 seconds.
(G) Stop vehicle with throttle fully closed.Stop vehicle with throttle fully closed.Stop vehicle with throttle fully closed.

DTC No.	Item	Condition
*P0121	Throttle/Pedal Position Sensor/Switch “A” Circuit Range/Performance	—
*P0139	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	—
*P0171	System too Lean (Bank 1)	—
*P0172	System too Rich (Bank 1)	—
*P0301	Cylinder 1 Misfire Detected	—
*P0302	Cylinder 2 Misfire Detected	—
*P0303	Cylinder 3 Misfire Detected	—
*P0304	Cylinder 4 Misfire Detected	—
*P0400	Exhaust gas recirculation flow	—

14.Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.
5) When the 'Done' and 'Turn Ignition Switch OFF' are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:
• After the memory has been cleared, the idle air control solenoid valve must be initialized. To do this, turn the ignition switch to the ON position. Wait 3 seconds before starting the engine.
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {4. Diagnosis Code(s) Cleared} and press the [YES] key.
6) When the 'Clear Diagnostic Code?' is shown on the display screen, press the [YES] key.
7) Turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:
• After the memory has been cleared, the idle air control solenoid valve must be initialized. To do this, turn the ignition switch to the ON position. Wait 3 seconds before starting the engine.
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

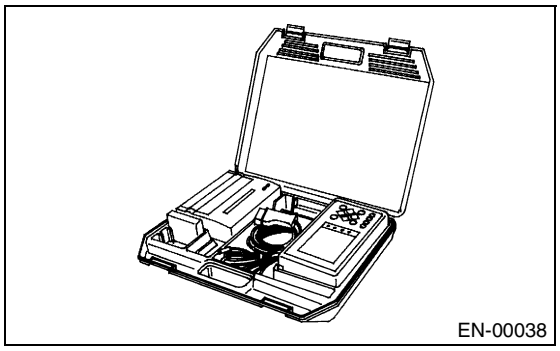
3. OBD-II GENERAL SCAN TOOL

For clear memory procedures using the OBD-II general scan tool, refer to the OBD-II General Scan Tool Instruction Manual.
After the memory has been cleared, the idle air control solenoid valve must be initialized. To do this, turn the ignition switch to the ON position. Wait 3 seconds before starting the engine.

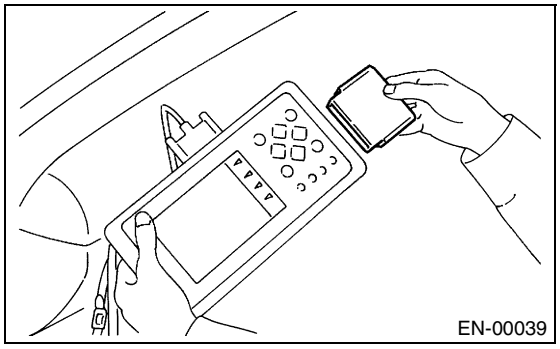
15.Compulsory Valve Operation Check Mode

A: OPERATION

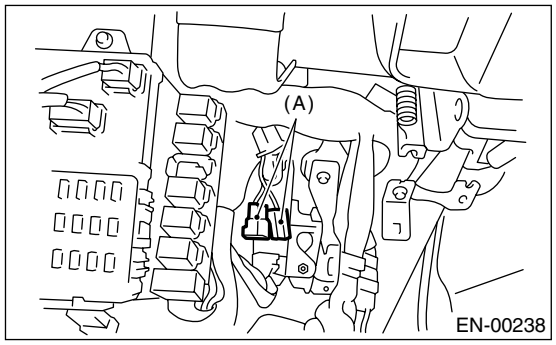
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(SOHC)-8, PREPARATION TOOL, General Description.>



2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(SOHC)-8, PREPARATION TOOL, General Description.>

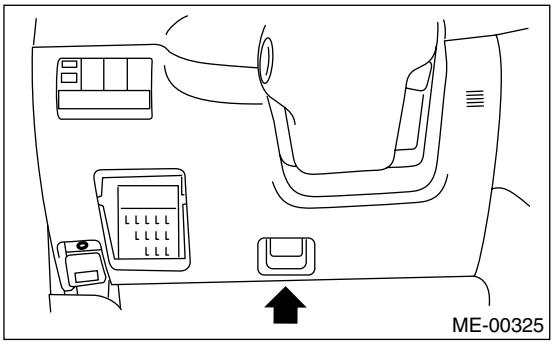


4) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).



5) Connect the Subaru Select Monitor to data link connector.

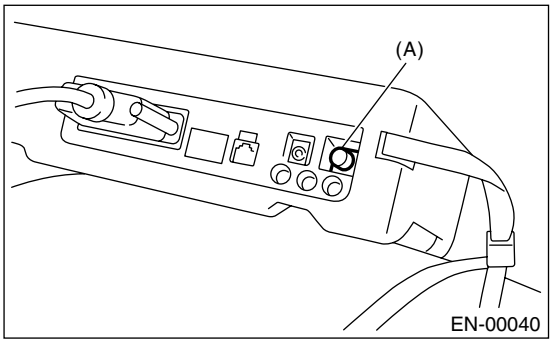
(1) Connect Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

6) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

7) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
8) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
9) Press the [YES] key after displayed the information of engine type.
10) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode} and press the [YES] key.
11) On the «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation} and press the [YES] key.
12) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and press the [YES] key.
13) Pressing the [NO] key completes the compulsory operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

- A list of the support data is shown in the following table.

Contents	Display
Compulsory fuel pump relay operation check	Fuel Pump Relay
Compulsory radiator fan relay operation check	Radiator Fan Relay
Compulsory air conditioning relay operation check	A/C Compressor Relay
Compulsory purge control solenoid valve operation check	CPC Solenoid Valve

NOTE:
- The following parts will be displayed but not functional because they are not installed on the vehicle.

Display
EGR Solenoid Valve
ASV Solenoid Valve
PCV Solenoid Valve
Vent Control Solenoid Valve
FICD Solenoid
Pressure Switching Sol. 1
Pressure Switching Sol. 2
Fuel Tank Sensor Control Valve

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

16.Engine Malfunction Indicator Lamp (MIL)

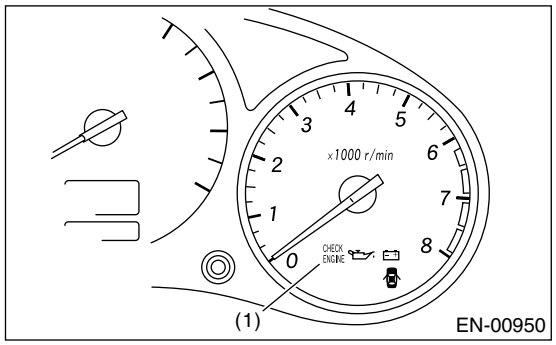
A: PROCEDURE

1. Activation of check engine malfunction indicator lamp (MIL). <Ref. to EN(SOHC)-51, ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL), Engine Malfunction Indicator Lamp (MIL).>
↓
2. Check engine malfunction indicator lamp (MIL) does not come on. <Ref. to EN(SOHC)-52, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>
↓
3. Check engine malfunction indicator lamp (MIL) does not go off. <Ref. to EN(SOHC)-55, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF., Engine Malfunction Indicator Lamp (MIL).>
↓
4. Check engine malfunction indicator lamp (MIL) does not blink at a cycle of 3 Hz. <Ref. to EN(SOHC)-56, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT BLINK AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MIL).>
↓
5. Check engine malfunction indicator lamp (MIL) remains blinking at a cycle of 3 Hz. <Ref. to EN(SOHC)-58, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) REMAINS BLINKING AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MIL).>

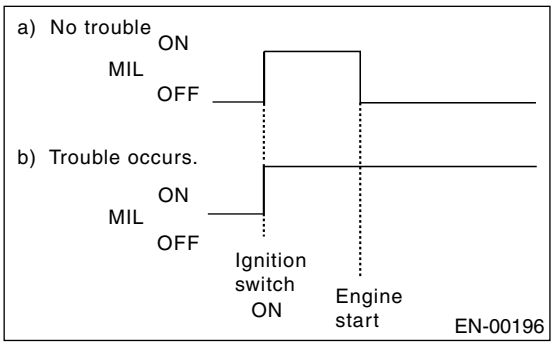
B: ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL)

1) When the ignition switch is turned to ON (engine off), the CHECK ENGINE malfunction indicator lamp (MIL) (1) in the combination meter illuminates.

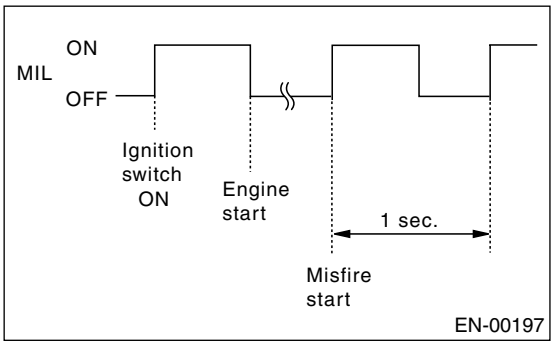
NOTE:
If the MIL does not illuminate, perform diagnostics of the CHECK ENGINE light circuit or the combination meter circuit. <Ref. to EN(SOHC)-52, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>



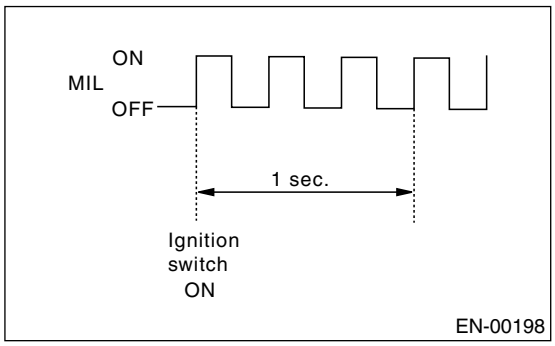
2) After starting the engine, the MIL goes out. If it does not, either the engine or the emission control system is malfunctioning.



3) If the diagnosis system senses a misfire which could damage the catalyzer, the MIL will blink at a cycle of 1 Hz.

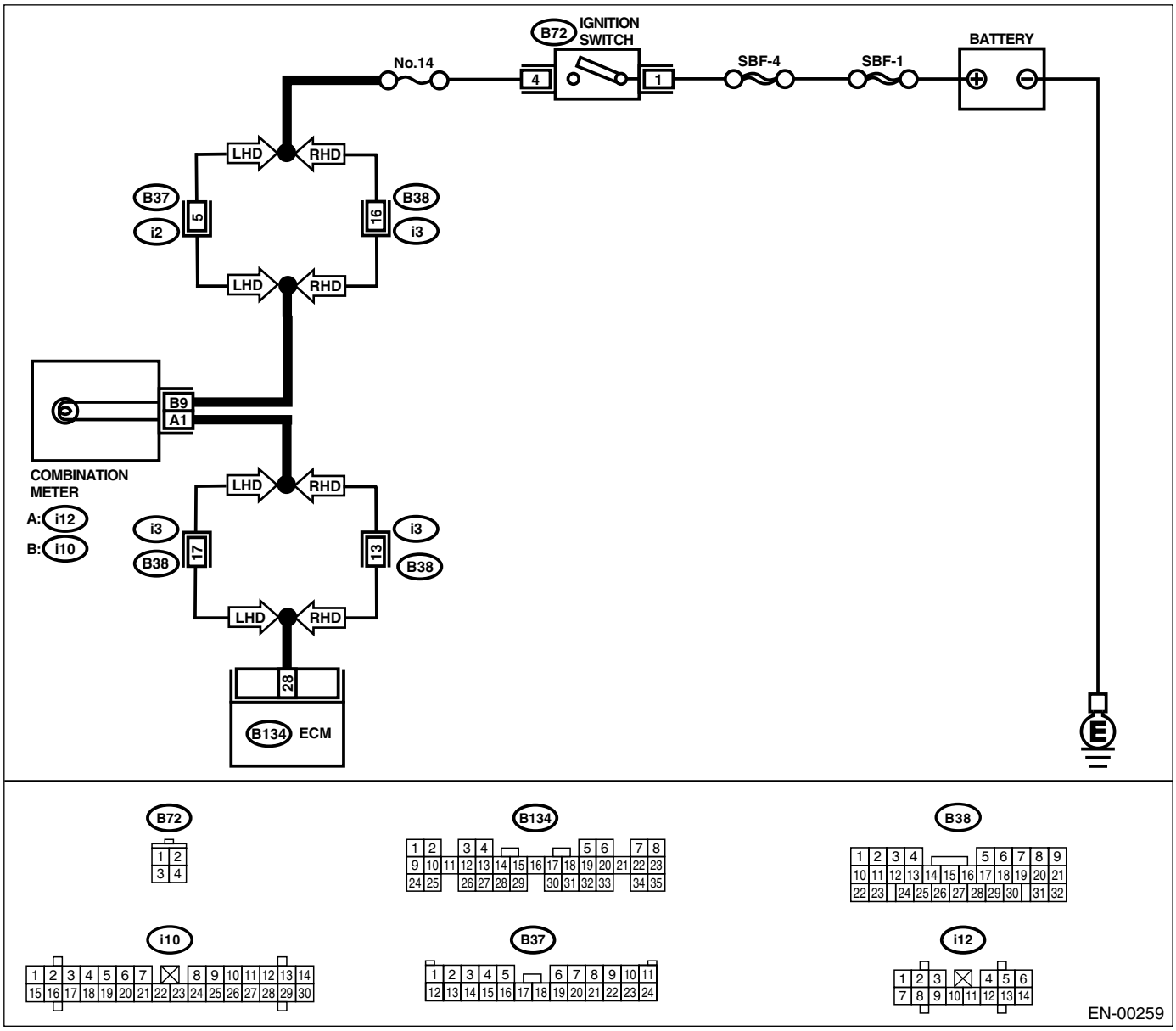


4) When the ignition switch is turned to ON (engine off) or to “START” with the test mode connector connected, the MIL blinks at a cycle of 3 Hz.



C: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON.

- **DIAGNOSIS:**
  - The CHECK ENGINE malfunction indicator lamp (MIL) circuit is open or shorted.
- **TROUBLE SYMPTOM:**
  - When the ignition switch is turned ON (engine OFF), MIL does not come on.
- **WIRING DIAGRAM:**



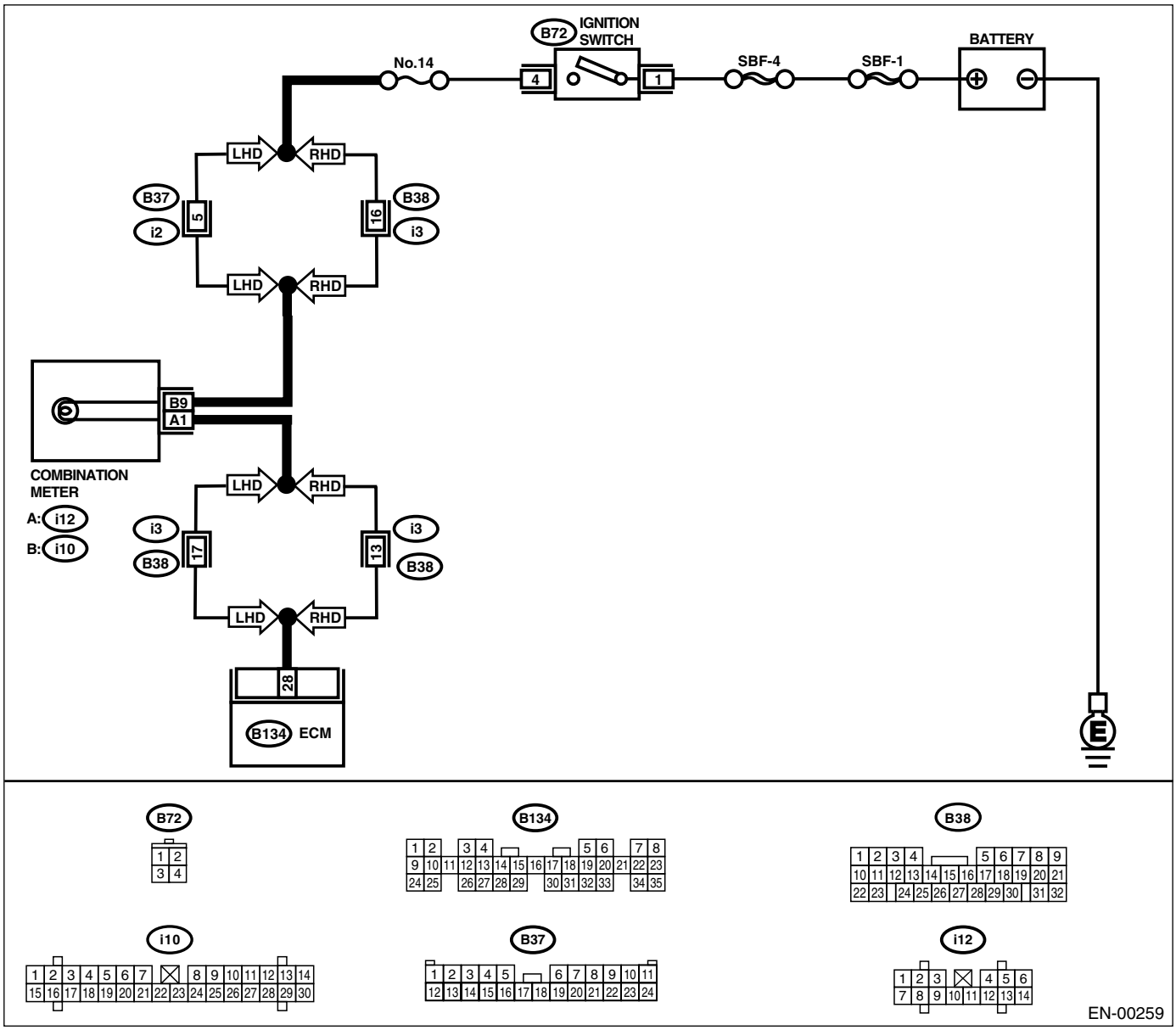
Step		Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 28 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **4.**	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK POOR CONTACT.** Does the MIL illuminate when shaking or pulling ECM connector and harness?	MIL illuminates.	Repair poor contact in ECM connector.	Go to step **3.**
3	**CHECK ECM CONNECTOR.** Is the ECM connector correctly connected?	Correctly connected.	Replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>	Repair connection of ECM connector.
4	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Remove the combination meter. <Ref. to IDI-12, Combination Meter Assembly.> 3)Disconnect the connector from ECM and combination meter. 4)Measure the resistance of harness between ECM and combination meter connector. ***Connector & terminal*** ***(B134) No. 28 — (i12) No. 1:*** Is the measured value less than specified value?	1 Ω	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connector
5	**CHECK POOR CONTACT.** Check poor contact in combination meter connector. Is there poor contact in combination meter connector?	Poor contact occurs.	Repair poor contact in combination meter connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i12) No. 9 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **7.**	Check the following and repair if necessary. NOTE: • Broken down ignition relay. • Blown out fuse (No. 5). • If replaced fuse (No. 5) blows easily, check the harness for short circuit of harness between fuse (No. 5) and ignition relay connector. • Open or short circuit in harness between fuse (No. 5) and battery terminal • Open circuit in harness between fuse (No. 5) and ignition relay connector • Poor contact in ignition relay connector • Poor contact in ignition switch connector

	Step	Check	Yes	No
7	**CHECK LAMP BULB.** Remove the engine malfunction indicator lamp bulb. Is the lamp bulb condition OK?	Lamp bulb is OK.	Repair combination meter connector.	Replace the lamp bulb.

D: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF.

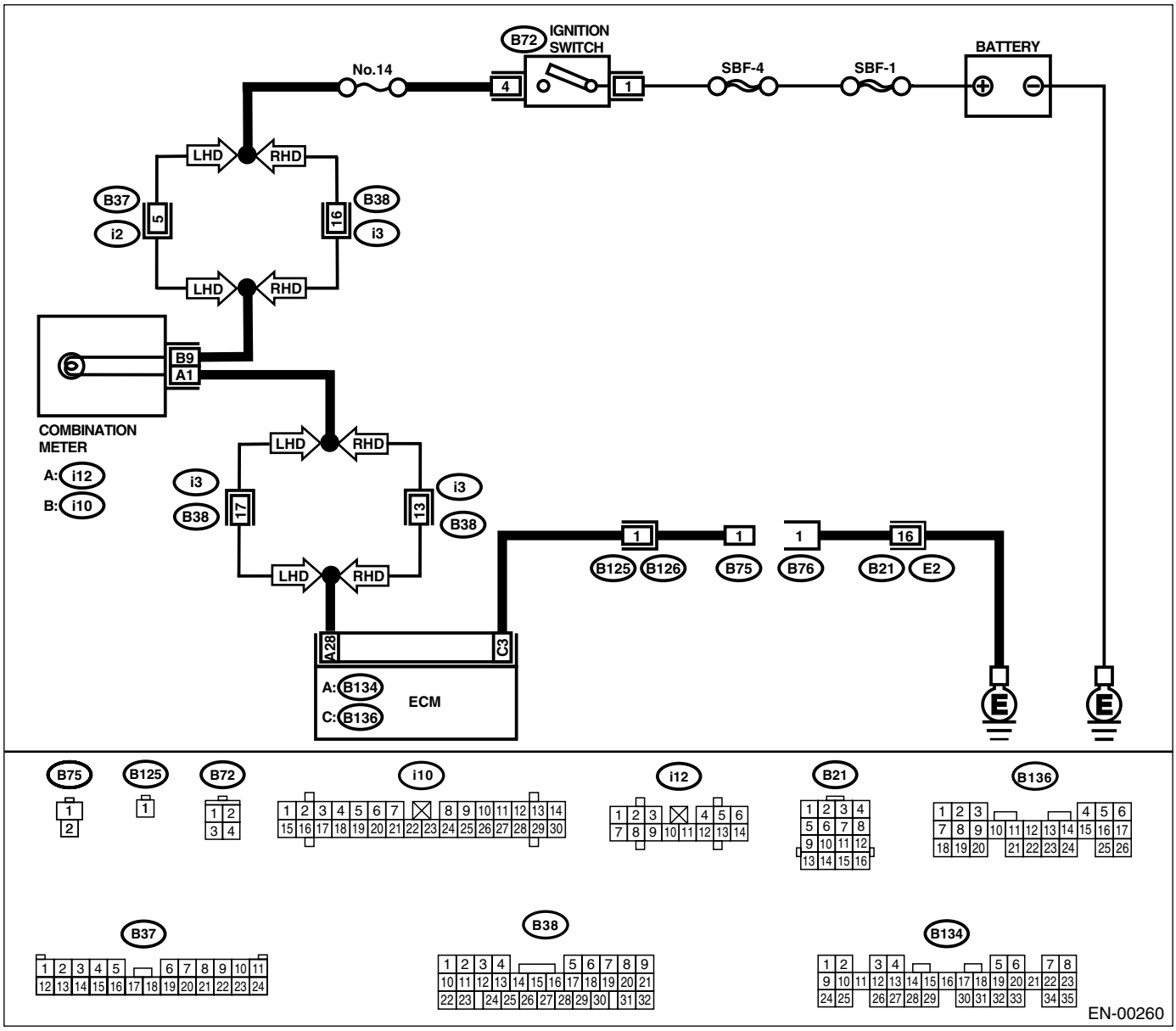
- **DIAGNOSIS:**
  - The CHECK ENGINE malfunction indicator lamp (MIL) circuit is shorted.
- **TROUBLE SYMPTOM:**
  - Although MIL comes on when the engine runs, trouble code is not shown on the Subaru select monitor or OBD-II general scan tool display.
- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Turn the ignition switch to ON. Does the MIL illuminate?	MIL illuminates.	Repair short circuit in harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>

E: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT BLINK AT A CYCLE OF 3 HZ.

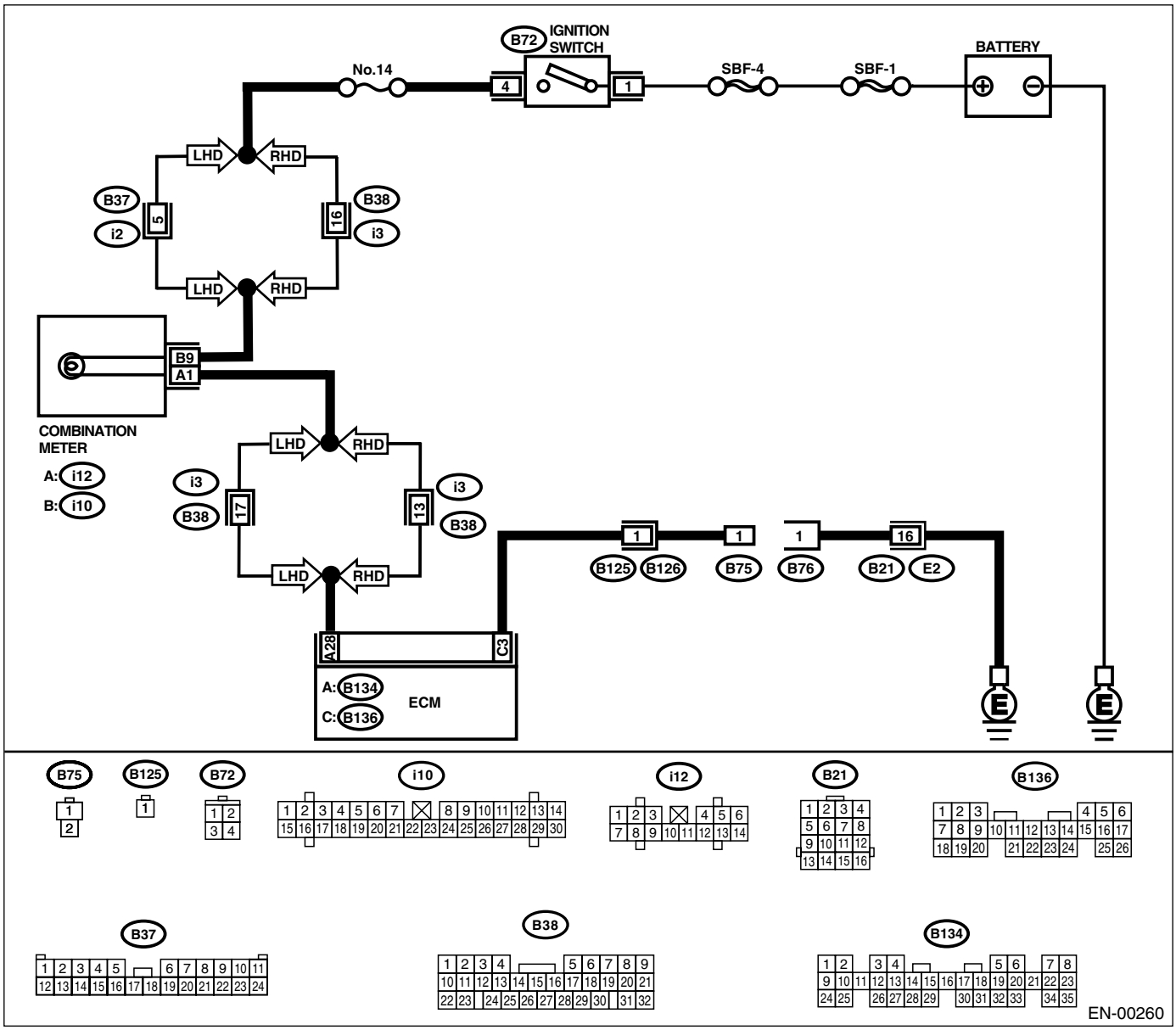
- **DIAGNOSIS:**
  - The CHECK ENGINE malfunction indicator lamp (MIL) circuit is open or shorted.
  - Test mode connector circuit is in open.
- **TROUBLE SYMPTOM:**
  - When in inspection mode, MIL does not blink at a cycle of 3 Hz.
- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).** 1)Turn the ignition switch to OFF. 2)Disconnect the test mode connector. 3)Turn the ignition switch to ON. (engine OFF) Does the MIL illuminate?	MIL illuminates.	Go to step **2.**	Repair the MIL circuit. <Ref. to EN(SOHC)-52, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>
2	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Turn the ignition switch to ON. Does the MIL illuminate?	MIL illuminates.	Repair ground short circuit in harness between combination meter and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between test mode connector and chassis ground. ***Connector & terminal*** ***(B76) No. 1 — Chassis ground:*** Is the measured value less than specified value?	1 Ω	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between test mode connector and chassis ground
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair poor contact in ECM connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR.** 1)Connect the test mode connector. 2)Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 3 — Chassis ground:*** Is the measured value less than specified value?	1 Ω	Go to step **6.**	Repair open circuit in harness between ECM and test mode connector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>

F: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) REMAINS BLINKING AT A CYCLE OF 3 HZ.

- **DIAGNOSIS:**
  - Test mode connector circuit is shorted.
- **TROUBLE SYMPTOM:**
  - MIL blinks at a cycle of 3 Hz when the ignition switch is turned to ON.
- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK TEST MODE CONNECTOR.** 1)Disconnect the test mode connector. 2)Turn the ignition switch to ON. Does the MIL blink?	MIL blinks.	Go to step **2.**	System is in good order. NOTE: MIL blinks at a cycle of 3 Hz when test mode connector is connected.
2	**CHECK HARNESS BETWEEN ECM CONNECTOR AND ENGINE GROUNDING TERMINAL.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 3 — Chassis ground:*** Is the measured value less than specified value?	5 Ω	Repair short circuit in harness between ECM and test mode connector.	Replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>

17.Diagnostics for Engine Starting Failure

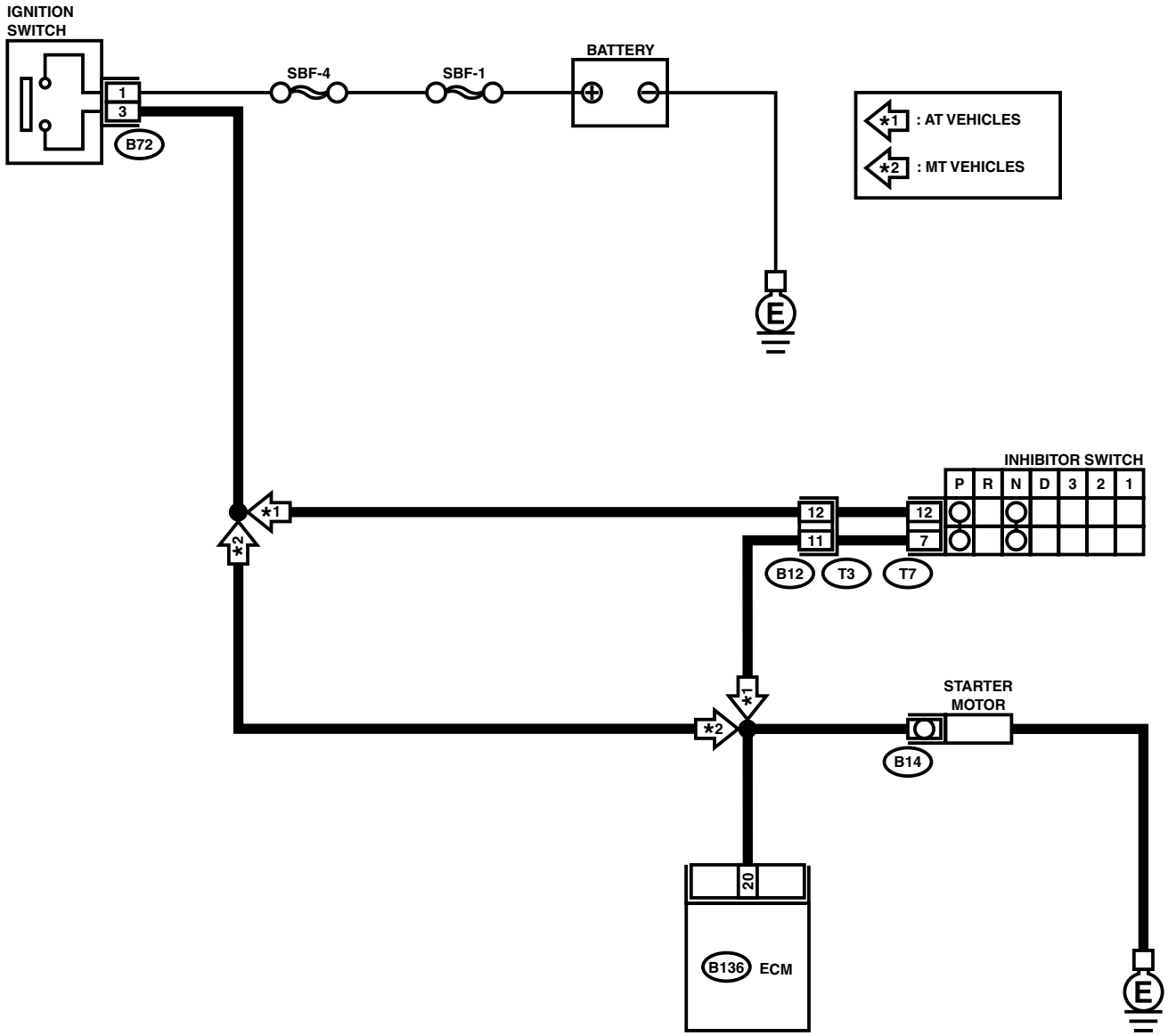
A: PROCEDURE

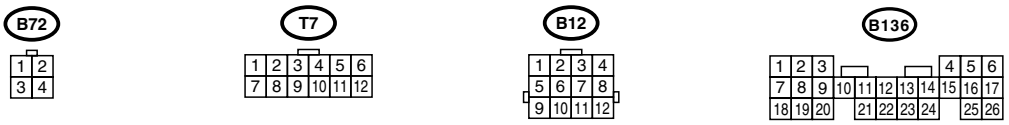
1. Inspection of starter motor circuit. <Ref. to EN(SOHC)-61, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
2. Inspection of ECM power supply and ground line. <Ref. to EN(SOHC)-64, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ignition control system. <Ref. to EN(SOHC)-67, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
4. Inspection of fuel pump circuit. <Ref. to EN(SOHC)-70, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel injector circuit. <Ref. to EN(SOHC)-73, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

B: STARTER MOTOR CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE<Ref. to EN(SOHC)-47, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(SOHC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-00261

DIAGNOSTICS FOR ENGINE STARTING FAILURE

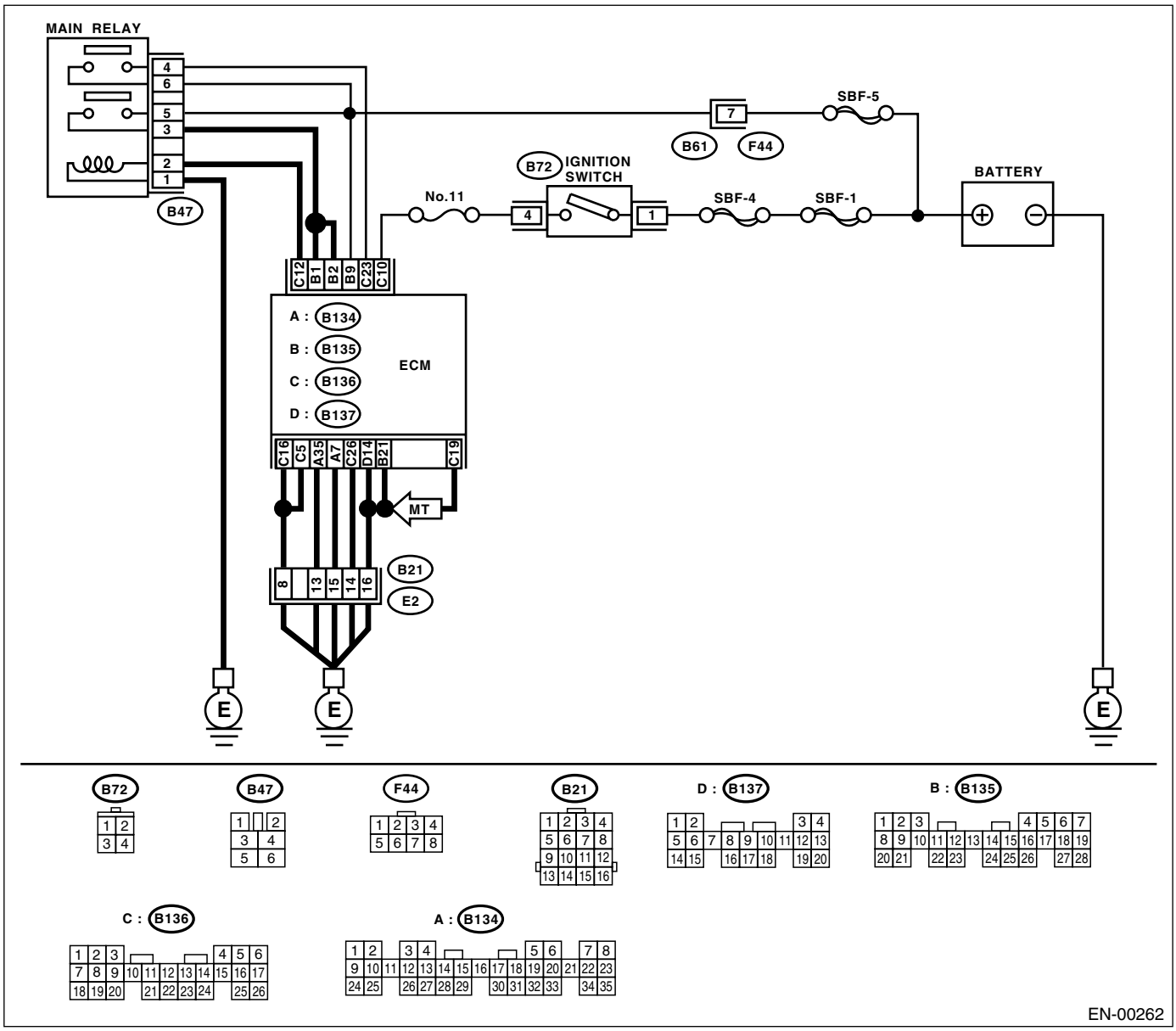
	Step	Check	Yes	No
1	**CHECK BATTERY.** Is the measured value more than specified value?	12 V	Go to step **2.**	Charge or replace the battery.
2	**CHECK INPUT SIGNAL FOR STARTER MOTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from starter motor. 3)Turn the ignition switch to ST. 4)Measure the power supply voltage between starter motor connector terminal and engine ground. ***Connector & terminal*** ***(B14) No. 1 (+) — Engine ground (–):*** Is the measured value more than specified value? NOTE: •On AT vehicles, place the selector lever in the "P" or "N" position. •On MT vehicles, depress the clutch pedal.	10 V	Go to step **3.**	Go to step **4.**
3	**CHECK GROUND CIRCUIT OF STARTER MOTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the terminal from starter motor. 3)Measure the resistance of ground cable between ground cable terminal and engine ground. Is the measured value less than specified value?	5 Ω	Check the starter motor. <Ref. to SC(SOHC)-6, Starter.>	Repair open circuit of ground cable.
4	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1)Disconnect the connector from ignition switch. 2)Measure the power supply voltage between ignition switch connector and chassis ground. ***Connector & terminal*** ***(B72) No. 1 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **5.**	Repair open circuit in harness between ignition switch and battery, and check fuse SBF No. 4 and SBF No. 1.
5	**CHECK IGNITION SWITCH.** 1)Disconnect the connector from ignition switch. 2)Measure the resistance between ignition switch terminals while turning ignition switch to the "ST" position. ***Terminals*** ***No. 1 — No. 3:*** Is the measured value less than specified value?	5 Ω	Go to step **6.**	Replace the ignition switch.
6	**CHECK TRANSMISSION TYPE.** Is the target AT vehicle?	Target is AT vehicle.	Go to step **7.**	A temporary poor contact. Check each connector for poor contact.

	Step	Check	Yes	No
7	**CHECK INPUT VOLTAGE OF INHIBITOR SWITCH.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from inhibitor switch. 3)Connect the connector to ignition switch. 4)Measure the input voltage between inhibitor switch connector terminal and engine ground while turning ignition switch to ST. ***Connector & terminal*** ***(B12) No. 12 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Go to step **8.**	Repair open or ground short circuit in harness between inhibitor switch and ignition switch. NOTE: Check security system (if equipped).
8	**CHECK INHIBITOR SWITCH.** 1)Place the selector lever in the “P” or “N” position. 2)Measure the resistance between inhibitor switch terminals. ***Connector & terminal*** ***(T3) No. 11 — No. 12:*** Is the measured value less than specified value?	1 Ω	Repair open or ground short circuit in harness between inhibitor switch and starter motor.	Replace the inhibitor switch.<Ref. to AT-48, Inhibitor Switch.>

C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE<Ref. to EN(SOHC)-47, Clear Memory Mode.> and INSPECTION MODE. <Ref. to EN(SOHC)-40, Inspection Mode.>

- **WIRING DIAGRAM:**



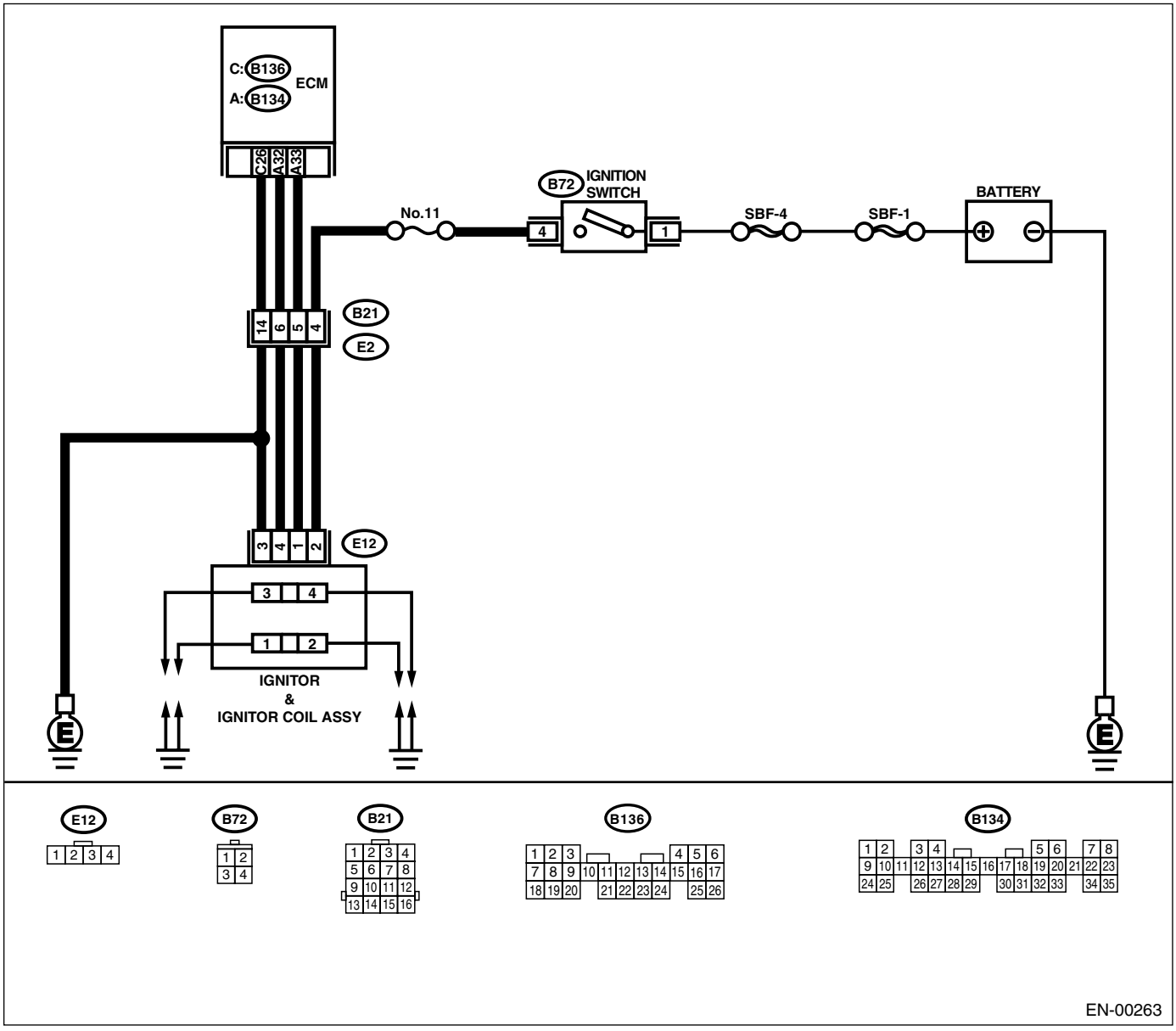
	Step	Check	Yes	No
1	**CHECK MAIN RELAY.** 1)Turn the ignition switch to OFF. 2)Remove the main relay. 3)Connect the battery to main relay terminals No. 1 and No. 2. 4)Measure the resistance between main relay terminals. ***Terminals*** ***No. 3 — No. 5:*** ***No. 4 — No. 6:*** Is the measured value less than specified value?	10 Ω	Go to step **2.**	Replace the main relay.
2	**CHECK GROUND CIRCUIT OF ECM.** 1)Disconnect the connector from ECM. 2)Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 7 — Chassis ground:*** ***(B134) No. 35 — Chassis ground:*** ***(B135) No. 21 — Chassis ground:*** ***(B136) No. 5 — Chassis ground:*** ***(B136) No. 16 — Chassis ground: (MT vehicles)*** ***(B136) No. 19 — Chassis ground:*** ***(B136) No. 26 — Chassis ground:*** ***(B137) No. 14 — Chassis ground:*** Is the measured value less than specified value?	5 Ω	Go to step **3.**	Repair open circuit in harness between ECM connector and engine grounding terminal.
3	**CHECK INPUT VOLTAGE OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **4.**	Repair open or ground short circuit of power supply circuit.
4	**CHECK INPUT VOLTAGE OF ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 10 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **5.**	Repair open or ground short circuit of power supply circuit.
5	**CHECK HARNESS BETWEEN ECM AND MAIN RELAY CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 12 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **6.**	Repair ground short circuit in harness between ECM connector and main relay connector, then replace the ECM.

	Step	Check	Yes	No
6	**CHECK OUTPUT VOLTAGE FROM ECM.** 1)Connect the connector to ECM. 2)Turn the ignition switch to ON. 3)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 12 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **7.**	Replace the ECM.
7	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Check the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 2 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **8.**	Repair open circuit in harness between ECM connector and main relay connector.
8	**CHECK GROUND CIRCUIT OF MAIN RELAY.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 1 — Chassis ground:*** Is the measured value less than specified value?	5 Ω	Go to step **9.**	Repair open circuit between main relay and chassis ground.
9	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Measure the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 5 (+) — Chassis ground (–):*** ***(B47) No. 6 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **10.**	Repair open or ground short circuit in harness of power supply circuit.
10	**CHECK INPUT VOLTAGE OF ECM.** 1)Connect the main relay connector. 2)Turn the ignition switch to ON. 3)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 1 (+) — Chassis ground (–):*** ***(B135) No. 2 (+) — Chassis ground (–):*** ***(B136) No. 23 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Check ignition control system. <Ref. to EN(SOHC)-67, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair open or ground short circuit in harness between ECM connector and main relay connector.

D: IGNITION CONTROL SYSTEM

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE<Ref. to EN(SOHC)-47, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(SOHC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



DIAGNOSTICS FOR ENGINE STARTING FAILURE

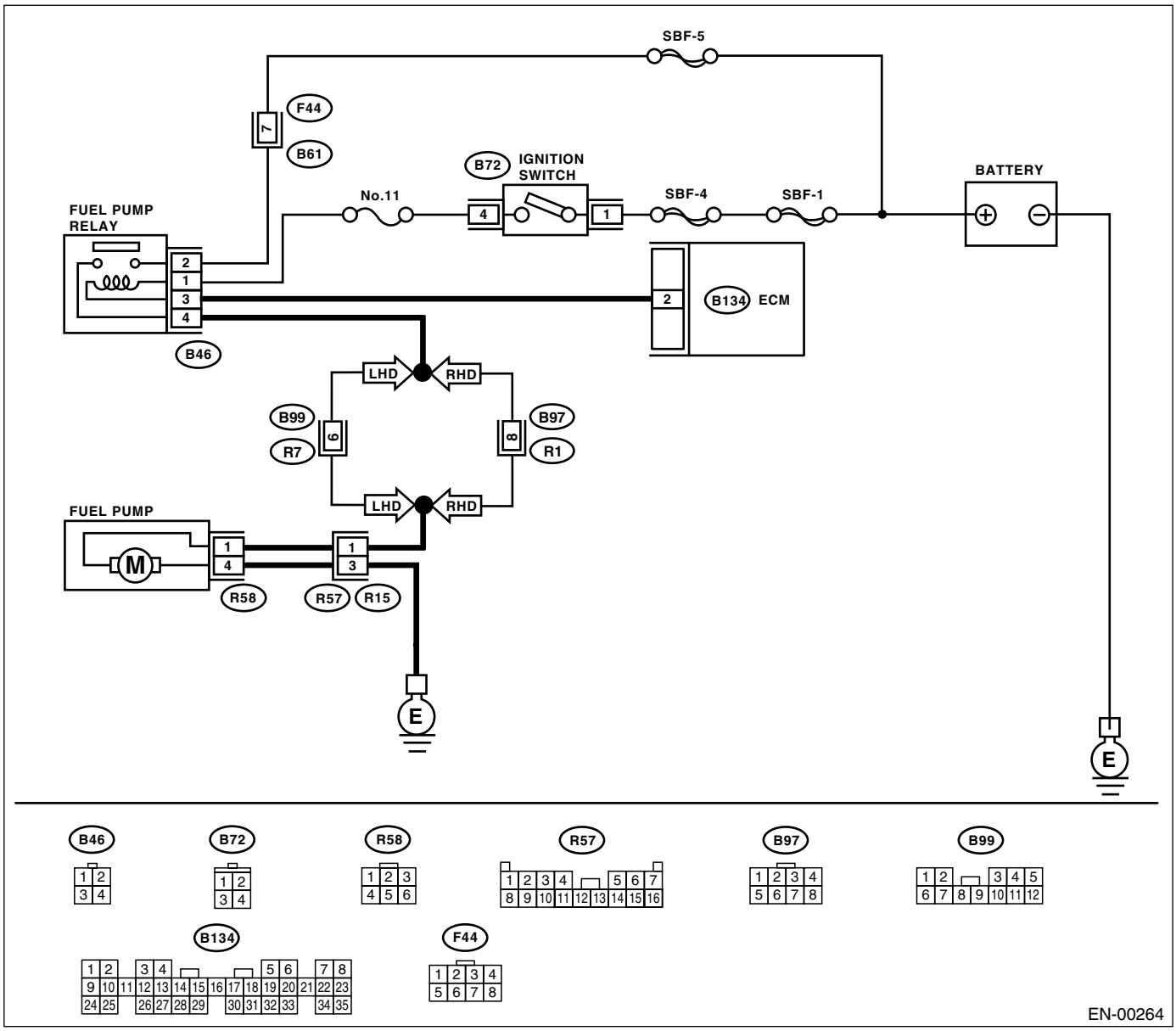
	Step	Check	Yes	No
1	**CHECK IGNITION SYSTEM FOR SPARKS.** 1)Remove the plug cord cap from each spark plug. 2)Install the new spark plug on plug cord cap. **CAUTION:** **Do not remove the spark plug from engine.** 3)Contact the spark plug's thread portion on engine. 4)While opening the throttle valve fully, crank the engine to check that spark occurs at each cylinder. Does spark occur at each cylinder?	Spark occurs at each cylinder.	Check fuel pump system. <Ref. to EN(SOHC)-70, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **2.**
2	**CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL & IGNITOR ASSEMBLY.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ignition coil & ignitor assembly. 3)Turn the ignition switch to ON. 4)Measure the power supply voltage between ignition coil & ignitor assembly connector and engine ground. ***Connector & terminal*** ***(E12) No. 2 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ignition coil & ignitor assembly, and ignition switch connector • Poor contact in coupling connectors
3	**CHECK HARNESS OF IGNITION COIL & IGNITOR ASSEMBLY GROUND CIRCUIT.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ignition coil & ignitor assembly connector and engine ground. ***Connector & terminal*** ***(E12) No. 3 — Engine ground:*** Is the measured value less than specified value?	5 Ω	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ignition coil & ignitor assembly connector and engine grounding terminal
4	**CHECK IGNITION COIL & IGNITOR ASSEMBLY.** 1)Remove the spark plug cords. 2)Measure the resistance between spark plug cord contact portions to check secondary coil. ***Terminals*** ***No. 1 — No. 2:*** ***No. 3 — No. 4:*** Is the measured value within specified value?	10 — 15 kΩ	Go to step **5.**	Replace the ignition coil & ignitor assembly. <Ref. to IG(SOHC)-8, Ignition Coil and Ignitor Assembly.>
5	**CHECK INPUT SIGNAL FOR IGNITION COIL & IGNITOR ASSEMBLY.** 1)Connect the connector to ignition coil & ignitor assembly. 2)Check if voltage varies synchronously with engine speed when cranking, while monitoring voltage between ignition coil & ignitor assembly connector and engine ground. ***Connector & terminal*** ***(E12) No. 1 (+) — Engine ground (–):*** ***(E12) No. 4 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Go to step **6.**	Replace the ignition coil & ignitor assembly. <Ref. to IG(SOHC)-8, Ignition Coil and Ignitor Assembly.>

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Disconnect the connector from ignition coil & ignitor assembly. 4)Measure the resistance of harness between ECM and ignition coil & ignitor assembly connector. ***Connector & terminal*** ***(B134) No. 33 — (E12) No. 1:*** ***(B134) No. 32 — (E12) No. 4:*** Is the measured value less than specified value?	1 Ω	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and ignition coil & ignitor assembly connector • Poor contact in coupling connector
7	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.** Measure the resistance of harness between ECM and engine ground. ***Connector & terminal:*** ***(B134) No. 33 — Engine ground:*** ***(B134) No. 32 — Engine ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **8.**	Repair ground short circuit in harness between ECM and ignition coil & ignitor assembly connector.
8	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Check fuel pump circuit. <Ref. to EN(SOHC)-70, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>

E: FUEL PUMP CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE<Ref. to EN(SOHC)-47, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(SOHC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**

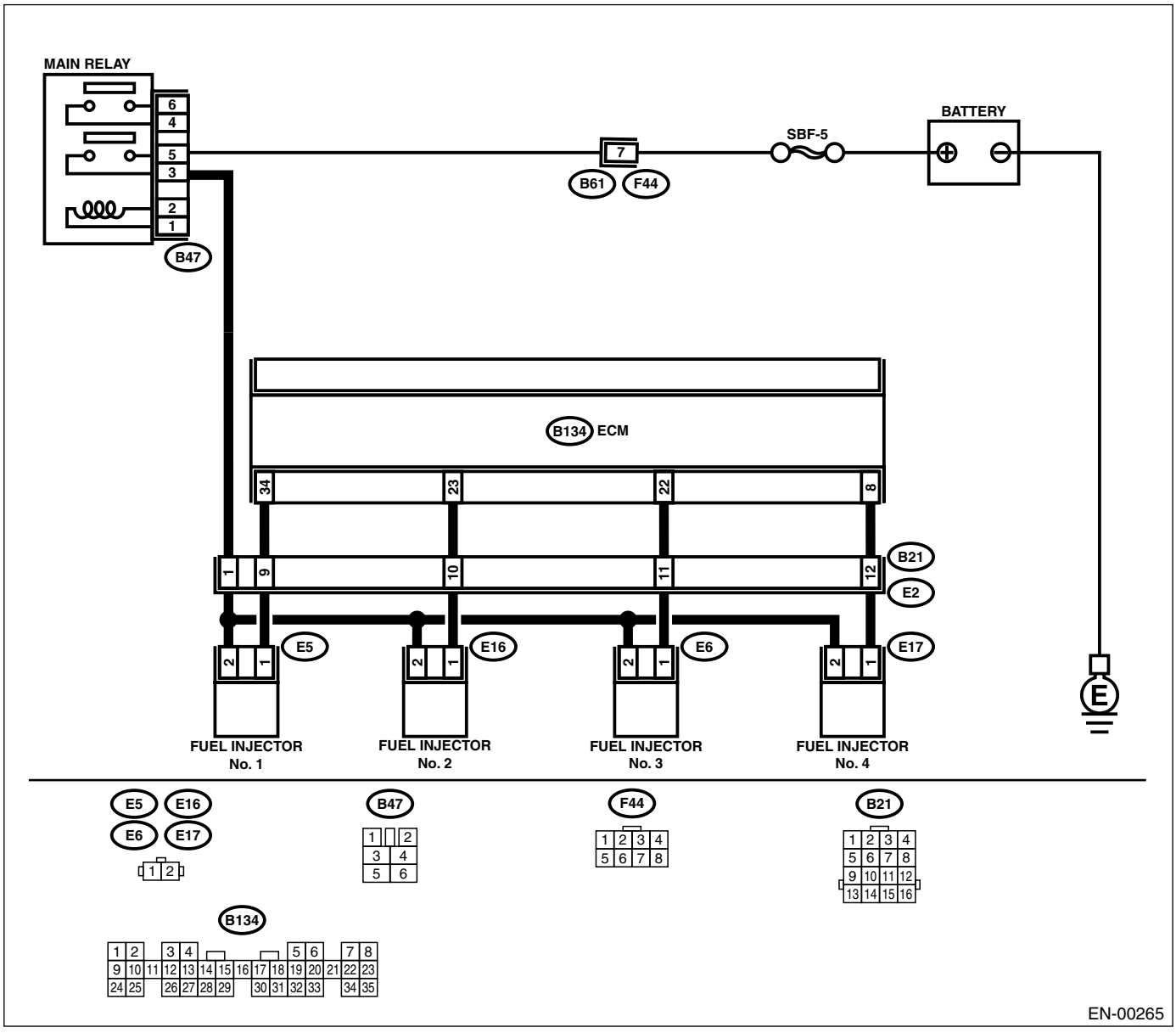


	Step	Check	Yes	No
1	**CHECK OPERATING SOUND OF FUEL PUMP.** Make sure that fuel pump is in operation for two seconds when turning the ignition switch to ON. Does the fuel pump produce operating sound? NOTE: Fuel pump operation can also be executed using Subaru Select Monitor (Function mode: FD01). For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(SOHC)-48, Compulsory Valve Operation Check Mode.>	Operating sound occurs.	Check fuel injector circuit. <Ref. to EN(SOHC)-73, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **2.**
2	**CHECK GROUND CIRCUIT OF FUEL PUMP.** 1)Turn the ignition switch to OFF. 2)Remove the fuel pump access hole lid. 3)Disconnect the connector from fuel pump. 4)Measure the resistance of harness connector between fuel pump and chassis ground. ***Connector & terminal*** ***(R58) No. 4 — Chassis ground:*** Is the measured value less than specified value?	5 Ω	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between fuel pump connector and chassis grounding terminal • Poor contact in coupling connector
3	**CHECK POWER SUPPLY TO FUEL PUMP.** 1)Turn the ignition switch to ON. 2)Measure the voltage of power supply circuit between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 1 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Replace the fuel pump. <Ref. to FU(SOHC)-57, Fuel Pump.>	Go to step **4.**
4	**CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of harness connector between fuel pump and fuel pump relay. ***Connector & terminal*** ***(R58) No. 1 — (B46) No. 4:*** Is the measured value less than specified value?	1 Ω	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between fuel pump connector and chassis grounding terminal • Poor contact in coupling connectors
5	**CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR.** Measure the resistance of harness between fuel pump and fuel pump relay connector. ***Connector & terminal*** ***(R58) No. 1 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **6.**	Repair short circuit in harness between fuel pump and fuel pump relay connector.

	Step	Check	Yes	No
6	**CHECK FUEL PUMP RELAY.** 1)Disconnect the connectors from fuel pump relay and main relay. 2)Remove the fuel pump relay and main relay with bracket. 3)Connect the battery to fuel pump relay connector terminals No. 1 and No. 3. 4)Measure the resistance between connector terminals of fuel pump relay. ***Terminals*** ***No. 2 — No. 4:*** Is the measured value less than specified value?	10 Ω	Go to step **7.**	Replace the fuel pump relay. <Ref. to FU(SOHC)-48, Fuel Pump Relay.>
7	**CHECK HARNESS BETWEEN ECM AND FUEL PUMP RELAY CONNECTOR.** 1)Disconnect the connectors from ECM. 2)Measure the resistance of harness between ECM and fuel pump relay connector. ***Connector & terminal*** ***(B134) No. 2 — (B46) No. 3:*** Is the measured value less than specified value?	1 Ω	Go to step **8.**	Repair open circuit in harness between ECM and fuel pump relay connector.
8	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair poor contact in ECM connector.	Check fuel injector circuit. <Ref. to EN(SOHC)-73, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

F: FUEL INJECTOR CIRCUIT

CAUTION:
- **Check or repair only faulty parts.**
- **After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(SOHC)-47, Clear Memory Mode.> and INSPECTION MODE. <Ref. to EN(SOHC)-40, Inspection Mode.>**
- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OPERATION OF EACH FUEL INJECTOR.** While cranking the engine, check that each fuel injector emits “operating” sound. Use a sound scope or attach a screwdriver to the injector for this check. Does the fuel injector emits operating sound?	Operating sound occurs.	Check the fuel pressure. <Ref. to ME(SOHC)-28, INSPECTION, Fuel Pressure.>	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK POWER SUPPLY TO EACH FUEL INJECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from #1 cylinder fuel injector. 3)Turn the ignition switch to ON. 4)Measure the power supply voltage between the fuel injector terminal and engine ground. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector (B22) • Poor contact in fuel injector connector
3	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** 1)Disconnect the connector from ECM. 2)Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***#1 (B134) No. 34 — (E5) No. 1:*** ***#2 (B134) No. 23 — (E16) No. 1:*** ***#3 (B134) No. 22 — (E6) No. 1:*** ***#4 (B134) No. 8 — (E17) No. 1:*** Is the measured value less than specified value?	1 Ω	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***#1 (B134) No. 34 — Chassis ground:*** ***#2 (B134) No. 23 — Chassis ground:*** ***#3 (B134) No. 22 — Chassis ground:*** ***#4 (B134) No. 8 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **5.**	Repair ground short circuit in harness between ECM and fuel injector connector.
5	**CHECK EACH FUEL INJECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between each fuel injector terminals. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within specified value?	5 — 20 Ω	Go to step **6.**	Replace the faulty fuel injector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair poor contact in ECM connector.	Inspection using “General Diagnostic Table”. <Ref. to EN(SOHC)-261, INSPECTION, General Diagnostic Table.>

18.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC No.	Item	Index
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to EN(SOHC)-81, DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1/SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to EN(SOHC)-83, DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to EN(SOHC)-86, DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to EN(SOHC)-88, DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to EN(SOHC)-91, DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0068	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance	<Ref. to EN(SOHC)-93, DTC P0068 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to EN(SOHC)-95, DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to EN(SOHC)-98, DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0111	Intake Air Temperature Circuit Range/Performance	<Ref. to EN(SOHC)-101, DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake Air Temperature Circuit Low Input	<Ref. to EN(SOHC)-103, DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake Air Temperature Circuit High Input	<Ref. to EN(SOHC)-105, DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to EN(SOHC)-108, DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine Coolant Temperature Circuit High Input	<Ref. to EN(SOHC)-110, DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0121	Throttle/Pedal Position Sensor/ Switch “A” Circuit Range/Performance	<Ref. to EN(SOHC)-113, DTC P0121 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0122	Throttle/Pedal Position Sensor/ Switch “A” Circuit Low Input	<Ref. to EN(SOHC)-115, DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0123	Throttle/Pedal Position Sensor/ Switch “A” Circuit High Input	<Ref. to EN(SOHC)-118, DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to EN(SOHC)-120, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0129	Barometric Pressure Too Low	<Ref. to EN(SOHC)-122, DTC P0129 — BAROMETRIC PRESSURE TOO LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P0130	O_2 Sensor Circuit (Bank 1 Sensor 1)	<Ref. to EN(SOHC)-123, DTC P0130 — O_2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0131	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to EN(SOHC)-126, DTC P0131 — O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0132	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to EN(SOHC)-128, DTC P0132 — O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to EN(SOHC)-130, DTC P0133 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to EN(SOHC)-132, DTC P0134 — O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to EN(SOHC)-134, DTC P0137 — O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to EN(SOHC)-137, DTC P0138 — O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to EN(SOHC)-140, DTC P0139 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System too Lean (Bank 1)	<Ref. to EN(SOHC)-141, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System too Rich (Bank 1)	<Ref. to EN(SOHC)-142, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 Misfire Detected	<Ref. to EN(SOHC)-144, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 Misfire Detected	<Ref. to EN(SOHC)-144, DTC P0302 — CYLINDER 2 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 Misfire Detected	<Ref. to EN(SOHC)-144, DTC P0303 — CYLINDER 3 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 Misfire Detected	<Ref. to EN(SOHC)-145, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to EN(SOHC)-152, DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<Ref. to EN(SOHC)-154, DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to EN(SOHC)-156, DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	<Ref. to EN(SOHC)-158, DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	<Ref. to EN(SOHC)-160, DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0341	Camshaft Position Sensor “A” Circuit Range/Performance (Bank 1 or Single Sensor)	<Ref. to EN(SOHC)-162, DTC P0341 — CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0400	Exhaust Gas Recirculation Flow	<Ref. to EN(SOHC)-165, DTC P0400 — EXHAUST GAS RECIRCULATION FLOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to EN(SOHC)-168, DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	<Ref. to EN(SOHC)-170, DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	<Ref. to EN(SOHC)-173, DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0461	Fuel Level Sensor Circuit Range/Performance	<Ref. to EN(SOHC)-176, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel Level Sensor Circuit Low Input	<Ref. to EN(SOHC)-178, DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0463	Fuel Level Sensor Circuit High Input	<Ref. to EN(SOHC)-181, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to EN(SOHC)-184, DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Cooling Fan Rationality Check	<Ref. to EN(SOHC)-186, DTC P0483 — COOLING FAN RATIONALITY CHECK —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0502	Vehicle Speed Sensor Circuit Low Input	<Ref. to EN(SOHC)-189, DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0503	Vehicle Speed Sensor Circuit High Input	<Ref. to EN(SOHC)-190, DTC P0503 — VEHICLE SPEED SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle Control System RPM Lower Than Expected	<Ref. to EN(SOHC)-192, DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0507	Idle Control System RPM Higher Than Expected	<Ref. to EN(SOHC)-194, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter Request Circuit	<Ref. to EN(SOHC)-196, DTC P0512 — STARTER REQUEST CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0513	Incorrect Immobilizer Key	<Ref. to IM-20, DTC P0153 INCORRECT IMMOBILIZER KEY (USE OF UNREGISTERED KEY), Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P0519	Idle Control System Circuit Performance	<Ref. to EN(SOHC)-199, DTC P0519 — IDLE CONTROL SYSTEM CIRCUIT PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0565	Cruise Control On Signal	<Ref. to EN(SOHC)-201, DTC P0565 — CRUISE CONTROL ON SIGNAL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to EN(SOHC)-203, DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0691	Cooling Fan 1 Control Circuit Low	<Ref. to EN(SOHC)-205, DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0692	Cooling Fan 1 Control Circuit High	<Ref. to EN(SOHC)-209, DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0703	Torque Converter/Brake Switch “B” Circuit	<Ref. to EN(SOHC)-212, DTC P0703 — TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P0705	Transmission Range Sensor Circuit (PRNDL Input)	<Ref. to AT-114, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>
P0710	Transmission Fluid Temperature Sensor Circuit	<Ref. to AT-43, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0716	Input/Turbine Speed Sensor Circuit Range/Performance	<Ref. to AT-59, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0720	Output Speed Sensor Circuit	<Ref. to AT-54, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0726	Engine Speed Input Circuit Range/ Performance	<Ref. to AT-38, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0731	Gear 1 Incorrect Ratio	<Ref. to EN(SOHC)-214, DTC P0731 — GEAR 1 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0732	Gear 2 Incorrect Ratio	<Ref. to EN(SOHC)-214, DTC P0732 — GEAR 2 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0733	Gear 3 Incorrect Ratio	<Ref. to EN(SOHC)-214, DTC P0733 — GEAR 3 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0734	Gear 4 Incorrect Ratio	<Ref. to EN(SOHC)-215, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0741	Torque Converter Clutch Circuit Performance or Stuck Off	<Ref. to EN(SOHC)-216, DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0743	Torque Converter Clutch Circuit Electrical	<Ref. to AT-87, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0748	Pressure Control Solenoid “A” Electrical	<Ref. to AT-79, DTC 75 LINE PRESSURE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0753	Shift Solenoid “A” Electrical	<Ref. to AT-66, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0758	Shift Solenoid “B” Electrical	<Ref. to AT-69, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0771	Shift Solenoid “E” Performance or Stuck Off	<Ref. to AT-72, DTC 73 LOW CLUTCH TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0778	Pressure Control Solenoid “B” Electrical	<Ref. to AT-83, DTC 76 2-4 BRAKE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0785	Shift/Timing Solenoid	<Ref. to AT-75, DTC 74 2-4 BRAKE TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Neutral Switch Input Circuit Low	<Ref. to EN(SOHC)-218, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT VEHICLES) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).><Ref. to EN(SOHC)-220, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (MT VEHICLES) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Neutral Switch Input Circuit High	<Ref. to EN(SOHC)-223, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0864	TCM Communication Circuit Range/ Performance	<Ref. to EN(SOHC)-226, DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0865	TCM Communication Circuit Low	<Ref. to EN(SOHC)-228, DTC P0865 — TCM COMMUNICATION CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0866	TCM Communication Circuit High	<Ref. to EN(SOHC)-230, DTC P0866 — TCM COMMUNICATION CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1110	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)	<Ref. to EN(SOHC)-232, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1111	Atmospheric Pressure Sensor Circuit Malfunction (High Input)	<Ref. to EN(SOHC)-233, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P1134	A/F Sensor Micro-computer Problem	<Ref. to EN(SOHC)-234, DTC P1134 — A/F SENSOR MICRO-COMPUTER PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1137	O_2 Sensor Circuit (Bank1 Sensor1)	<Ref. to EN(SOHC)-235, DTC P1137 — O_2 SENSOR CIRCUIT (BANK1 SENSOR1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1492	EGR Solenoid Valve Signal #1 Circuit Malfunction (Low Input)	<Ref. to EN(SOHC)-238, DTC P1492 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1493	EGR Solenoid Valve Signal #1 Circuit Malfunction (High Input)	<Ref. to EN(SOHC)-238, DTC P1493 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1494	EGR Solenoid Valve Signal #2 Circuit Malfunction (Low Input)	<Ref. to EN(SOHC)-238, DTC P1494 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1495	EGR Solenoid Valve Signal #2 Circuit Malfunction (High Input)	<Ref. to EN(SOHC)-238, DTC P1495 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1496	EGR Solenoid Valve Signal #3 Circuit Malfunction (Low Input)	<Ref. to EN(SOHC)-238, DTC P1496 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1497	EGR Solenoid Valve Signal #3 Circuit Malfunction (High Input)	<Ref. to EN(SOHC)-238, DTC P1497 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1498	EGR Solenoid Valve Signal #4 Circuit Malfunction (Low Input)	<Ref. to EN(SOHC)-239, DTC P1498 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1499	EGR Solenoid Valve Signal #4 Circuit Malfunction (High Input)	<Ref. to EN(SOHC)-241, DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1510	ISC Solenoid Valve Signal #1 Circuit Malfunction (Low Input)	<Ref. to EN(SOHC)-243, DTC P1510 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 1 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1511	ISC Solenoid Valve Signal #1 Circuit Malfunction (High Input)	<Ref. to EN(SOHC)-243, DTC P1511 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 1 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1512	ISC Solenoid Valve Signal #2 Circuit Malfunction (Low Input)	<Ref. to EN(SOHC)-243, DTC P1512 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 2 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1513	ISC Solenoid Valve Signal #2 Circuit Malfunction (High Input)	<Ref. to EN(SOHC)-243, DTC P1513 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 2 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1514	ISC Solenoid Valve Signal #3 Circuit Malfunction (Low Input)	<Ref. to EN(SOHC)-243, DTC P1514 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 3 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1515	ISC Solenoid Valve Signal #3 Circuit Malfunction (High Input)	<Ref. to EN(SOHC)-243, DTC P1515 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 3 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1516	ISC Solenoid Valve Signal #4 Circuit Malfunction (Low Input)	<Ref. to EN(SOHC)-244, DTC P1516 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1517	ISC Solenoid Valve Signal #4 Circuit Malfunction (High Input)	<Ref. to EN(SOHC)-246, DTC P1517 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter Switch Circuit Low input	<Ref. to EN(SOHC)-248, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P1560	Back-up Voltage Circuit Malfunction	<Ref. to EN(SOHC)-251, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1570	Antenna	<Ref. to IM-21, DTC P1570 ANTENNA, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1571	Reference Code Incompatibility	<Ref. to IM-15, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1572	IMM Circuit Failure (Except antenna circuit)	<Ref. to IM-16, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1574	Key Communication Failure	<Ref. to IM-19, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1576	EGI Control Module EEPROM	<Ref. to IM-20, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1577	IMM Control Module EEPROM	<Ref. to IM-20, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1698	Engine Torque Control Cut Signal Circuit Malfunction (Low Input)	<Ref. to EN(SOHC)-253, DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1699	Engine Torque Control Cut Signal Circuit Malfunction (High Input)	<Ref. to EN(SOHC)-255, DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1700	Throttle Position Sensor Circuit Malfunction for AT	<Ref. to AT-47, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1711	Engine Torque Control Signal #1 Circuit Malfunction	<Ref. to EN(SOHC)-257, DTC P1711 — ENGINE TORQUE CONTROL SIGNAL #1 CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1712	Engine Torque Control Signal #2 Circuit Malfunction	<Ref. to EN(SOHC)-259, DTC P1712 — ENGINE TORQUE CONTROL SIGNAL #2 CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

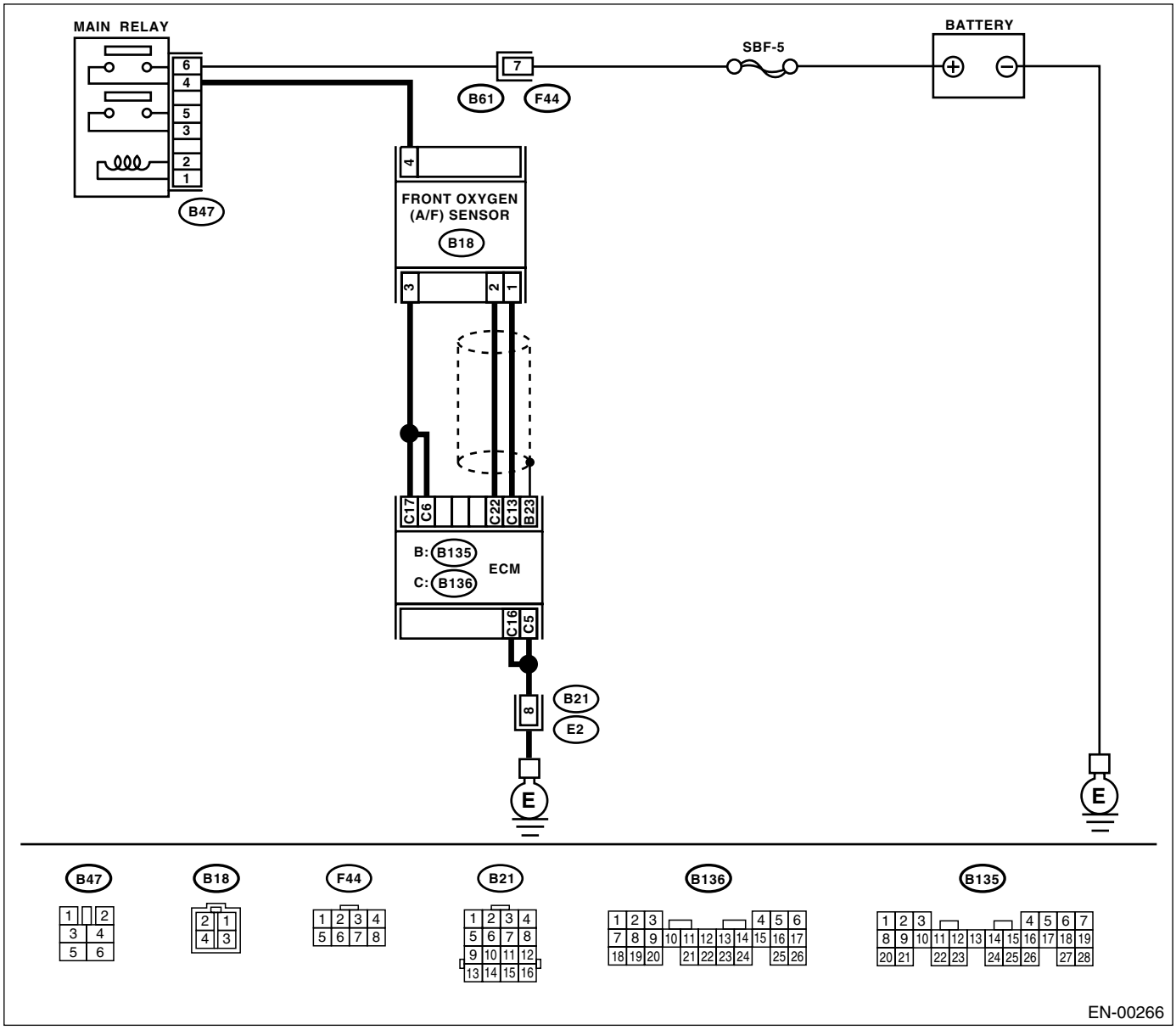
19.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1/SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, Inspection Mode.> .

- **WIRING DIAGRAM:**



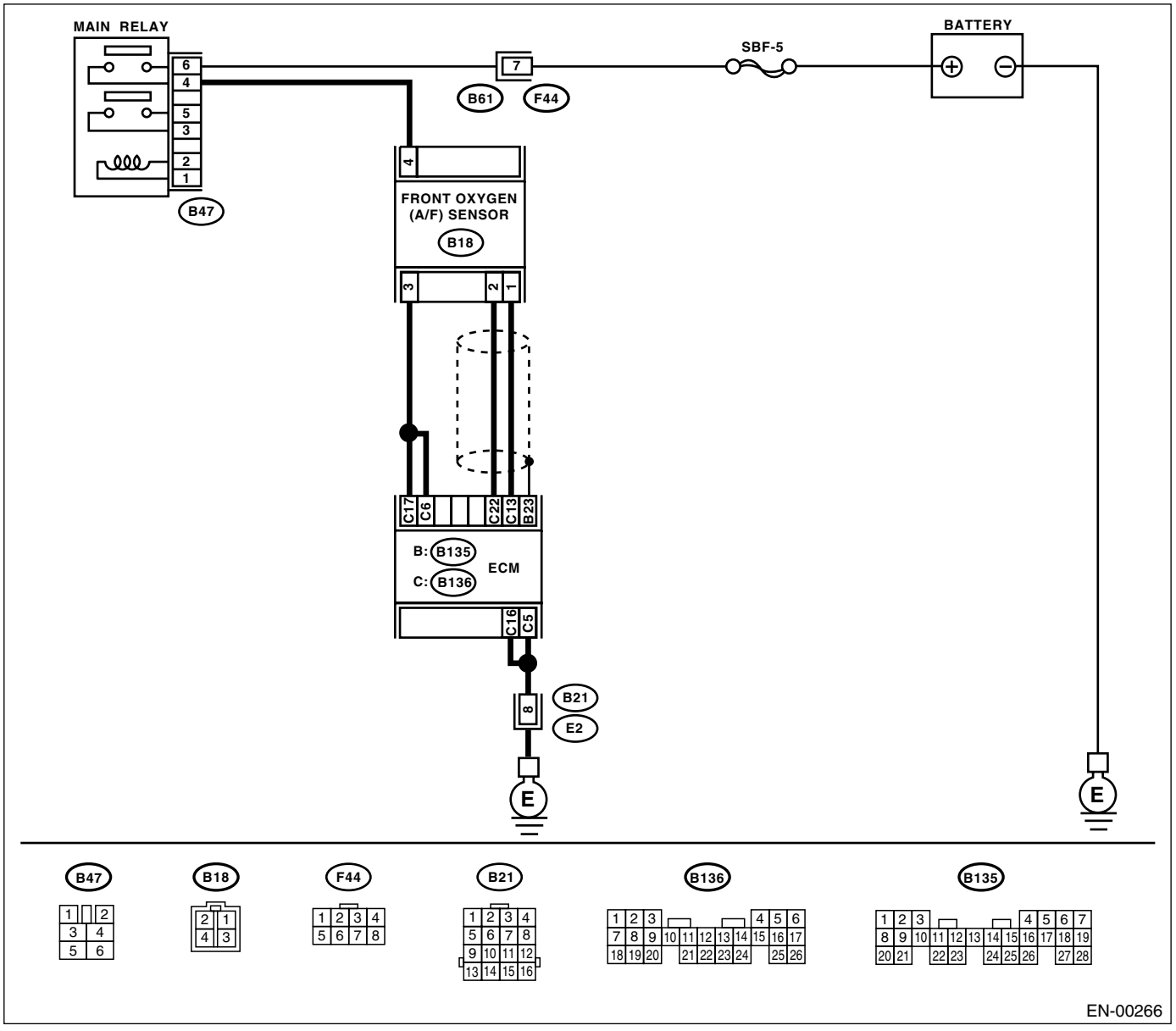
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1)Start the engine and warm-up engine. 2)Turn the ignition switch to OFF. 3)Disconnect the connectors from ECM and front oxygen (A/F) sensor. 4)Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 6 — (B18) No. 3:*** ***(B136) No. 17 — (B18) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 13 — (B18) No. 1:*** ***(B136) No. 22 — (B18) No. 2:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK HARNESS BETWEEN MAIN RELAY AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between main relay and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B47) No. 4 — (B18) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
4	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance less than 5 Ω?	Go to step **5.**	Replace the front oxygen (A/F) sensor. <Ref. to FU(SOHC)-42, Front Oxygen (A/F) Sensor.>
5	**CHECK POOR CONTACT.** Check the poor contact in ECM and front oxygen (A/F) sensor connector.	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair the poor contact in ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(SOHC)-42, Front Oxygen (A/F) Sensor.>

B: DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Does the Subaru Select Monitor or OBD-II general scan tool display DTC P0031 and P0037 at the same time?	DTC P0031 and P0037 are displayed.	Go to step **2.**	Go to step **5.**

	Step	Check	Yes	No
2	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from front oxygen (A/F) sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between front oxygen (A/F) sensor connector and engine ground. ***Connector & terminal*** ***(B18) No. 4 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Go to step **3.**	Repair power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in main relay connector
3	**CHECK GROUND CIRCUIT OF ECM.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 5 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:*** Is the measured value less than specified value?	5 Ω	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine ground terminal • Poor contact in ECM connector Poor contact in coupling connector
4	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or OBD-II general scan tool. Is the measured value more than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	0.2 A	Repair poor contact in connector. NOTE: In this case, repair the following: • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Go to step **5.**
5	**CHECK INPUT SIGNAL FROM ECM.** 1)Start and idle the engine. 2)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 6 (+) — Chassis ground (–):*** ***(B136) No. 17 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1.0 V	Go to step **7.**	Go to step **6.**

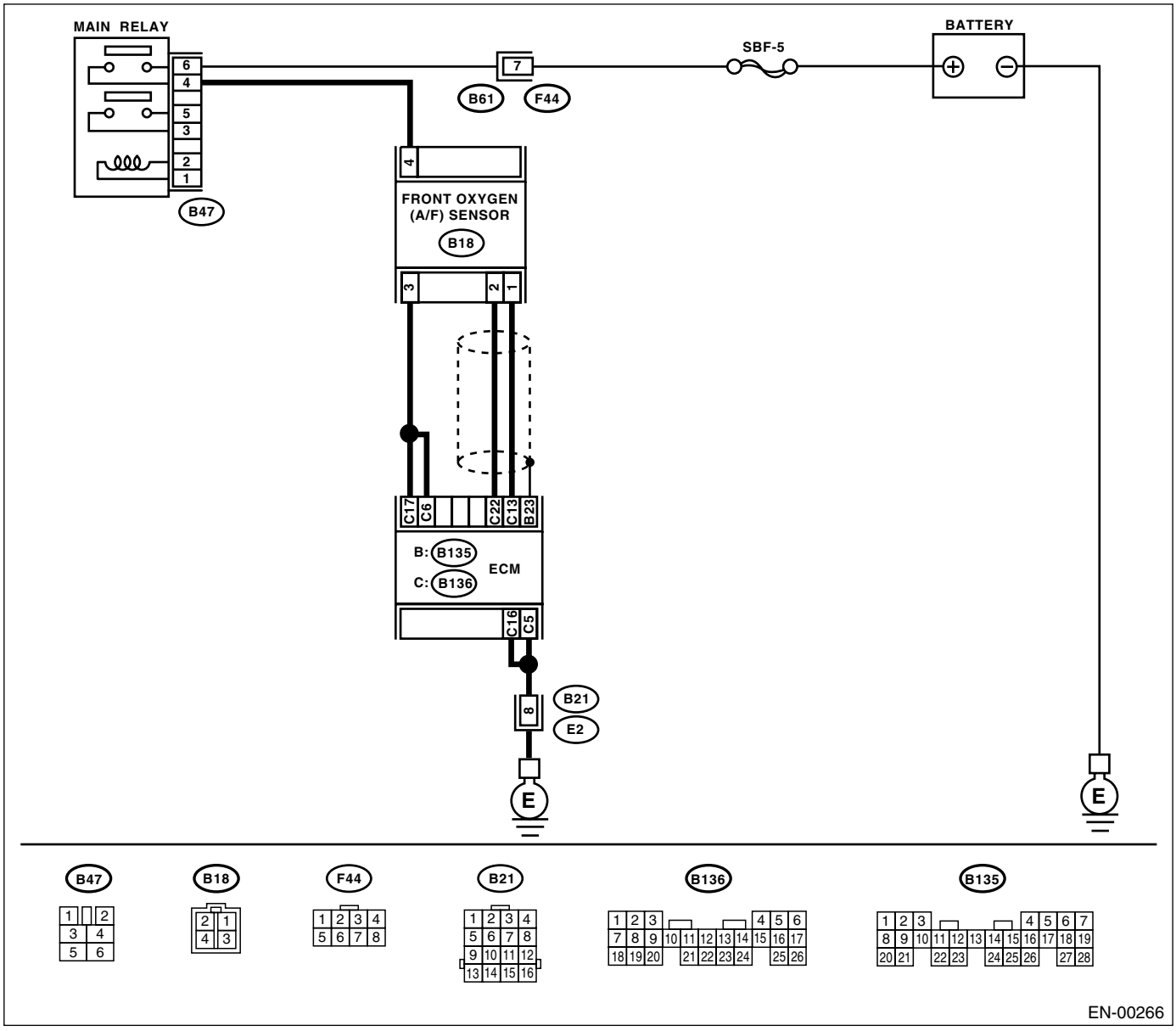
	Step	Check	Yes	No
6	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 6 (+) — Chassis ground (–):*** ***(B136) No. 17 (+) — Chassis ground (–):*** Shake the ECM harness and connector, while monitoring value of voltage meter. Is the measured value less than specified value?	1.0 V	Repair poor contact in ECM connector.	Go to step **7.**
7	**CHECK FRONT OXYGEN (A/F) SENSOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 3 — No. 4:*** Is the measured value less than specified value?	10 Ω	Repair harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Replace the front oxygen (A/F) sensor. <Ref. to FU(SOHC)-49, Fuel.>

C: DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



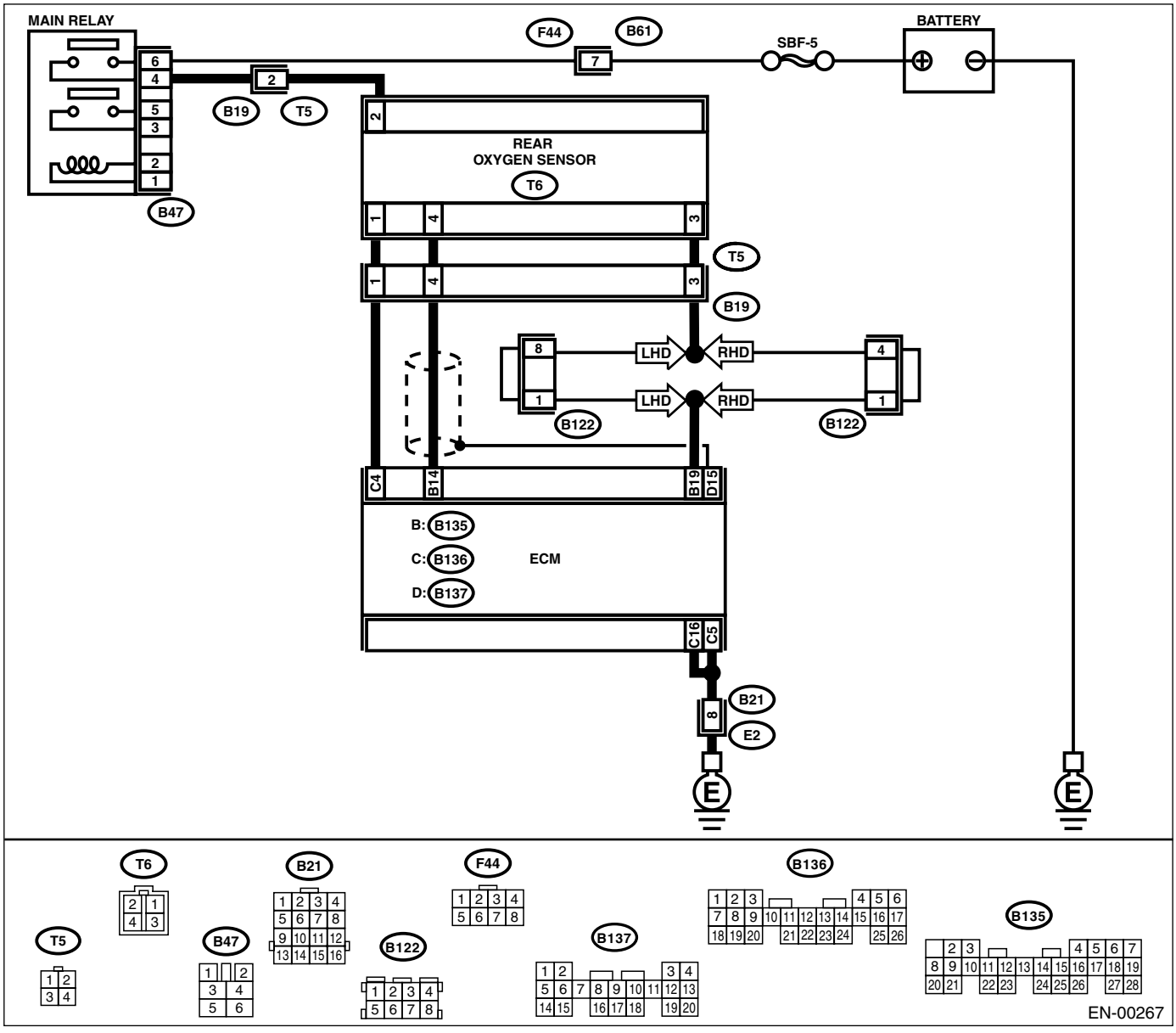
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 6 (+) — Chassis ground (–):*** ***(B136) No. 17 (+) — Chassis ground (–):*** Is the measured value more than specified value?	8 V	Go to step **2.**	Go to step **3.**
2	**CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.** 1)Turn the ignition switch to OFF. 2)Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3)Turn the ignition switch to ON. 4)Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. Is the measured value more than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	2.3 A	Replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>	END
3	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 6 (+) — Chassis ground (–):*** ***(B136) No. 17 (+) — Chassis ground (–):*** Shake the ECM harness and connector, while monitoring value of voltage meter. Is the measured value more than specified value?	8 V	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END

D: DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-47, OPERATION**, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40,** OPERATION**, Inspection Mode.>.**

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF ECM.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 5 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:*** Is the measured value less than specified value?	5 Ω	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine ground terminal • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of rear oxygen sensor heater current using Subaru Select Monitor or OBD-II general scan tool. Is the measured value more than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	0.2 A	Repair the connector. NOTE: In this case, repair the following: • Poor contact in rear oxygen sensor connector • Poor contact in rear oxygen sensor connecting harness connector • Poor contact in ECM connector	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Start and idle the engine. 2)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1.0 V	Go to step **6.**	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — Chassis ground (–):*** Shake the ECM harness and connector, while monitoring value of voltage meter. Is the change of measured value within specified value?	1.0 V	Repair poor contact in ECM connector.	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Disconnect the connector from rear oxygen sensor. 2)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1.0 V	Replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>	Repair battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>

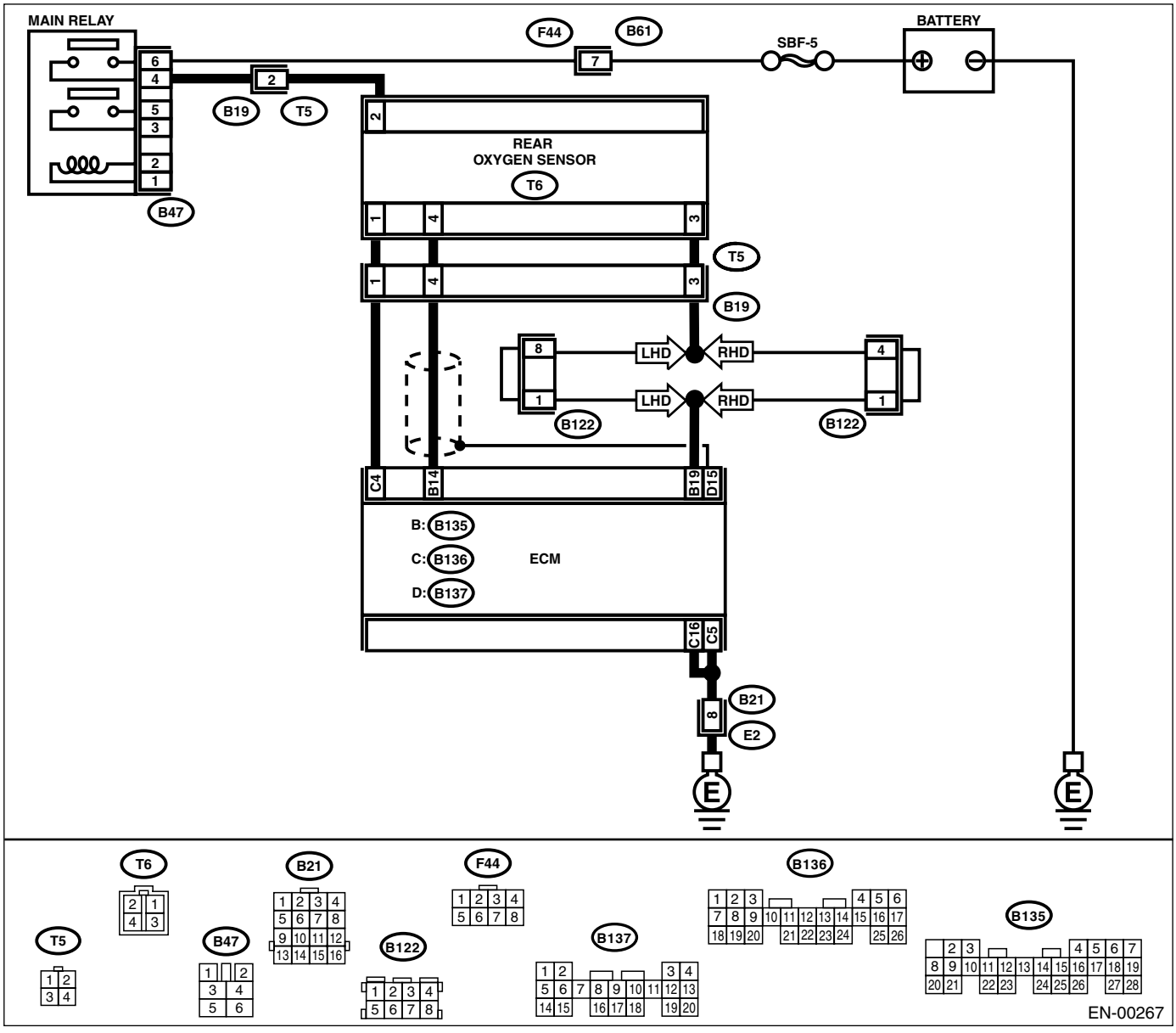
	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from rear oxygen sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between rear oxygen sensor connector and engine ground or chassis ground. ***Connector & terminal*** ***(T6) No. 2 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **7.**	Repair power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and rear oxygen sensor connector • Poor contact in rear oxygen sensor connector • Poor contact in coupling connector
7	**CHECK REAR OXYGEN SENSOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between rear oxygen sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value less than specified value?	30 Ω	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Replace the rear oxygen sensor. <Ref. to FU(SOHC)-44, Rear Oxygen Sensor.>

E: DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — Chassis ground (–):*** Is the measured value more than specified value?	8 V	Go to step **2.**	Go to step **3.**

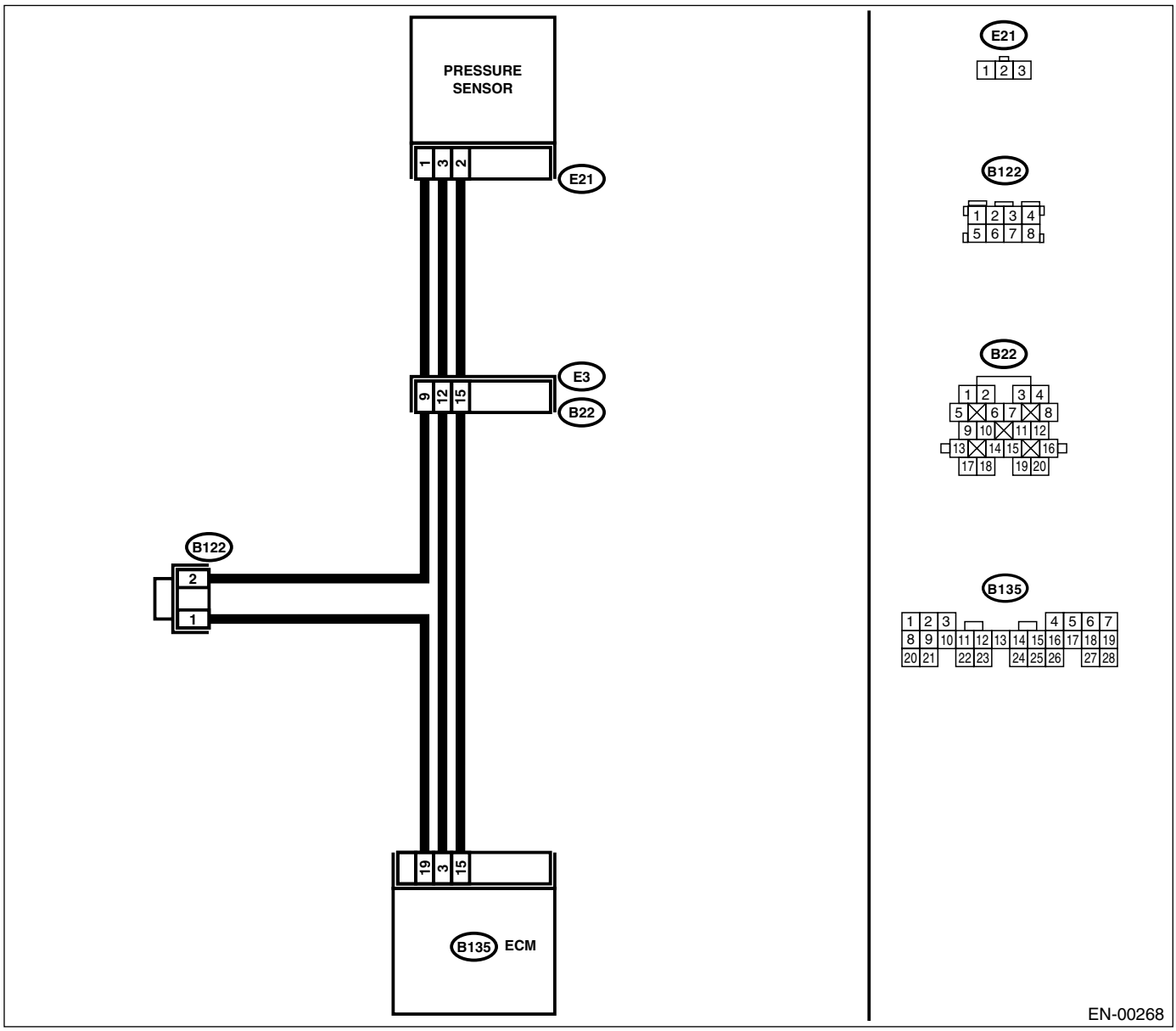
	Step	Check	Yes	No
2	**CHECK CURRENT DATA.** 1)Turn the ignition switch to OFF. 2)Repair the battery short circuit in harness between ECM and rear oxygen sensor connector. 3)Turn the ignition switch to ON. 4)Read the data of rear oxygen sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. Is the measured value more than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	7 A	Replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>	END
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair poor contact in ECM connector.	END

F: DTC P0068 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



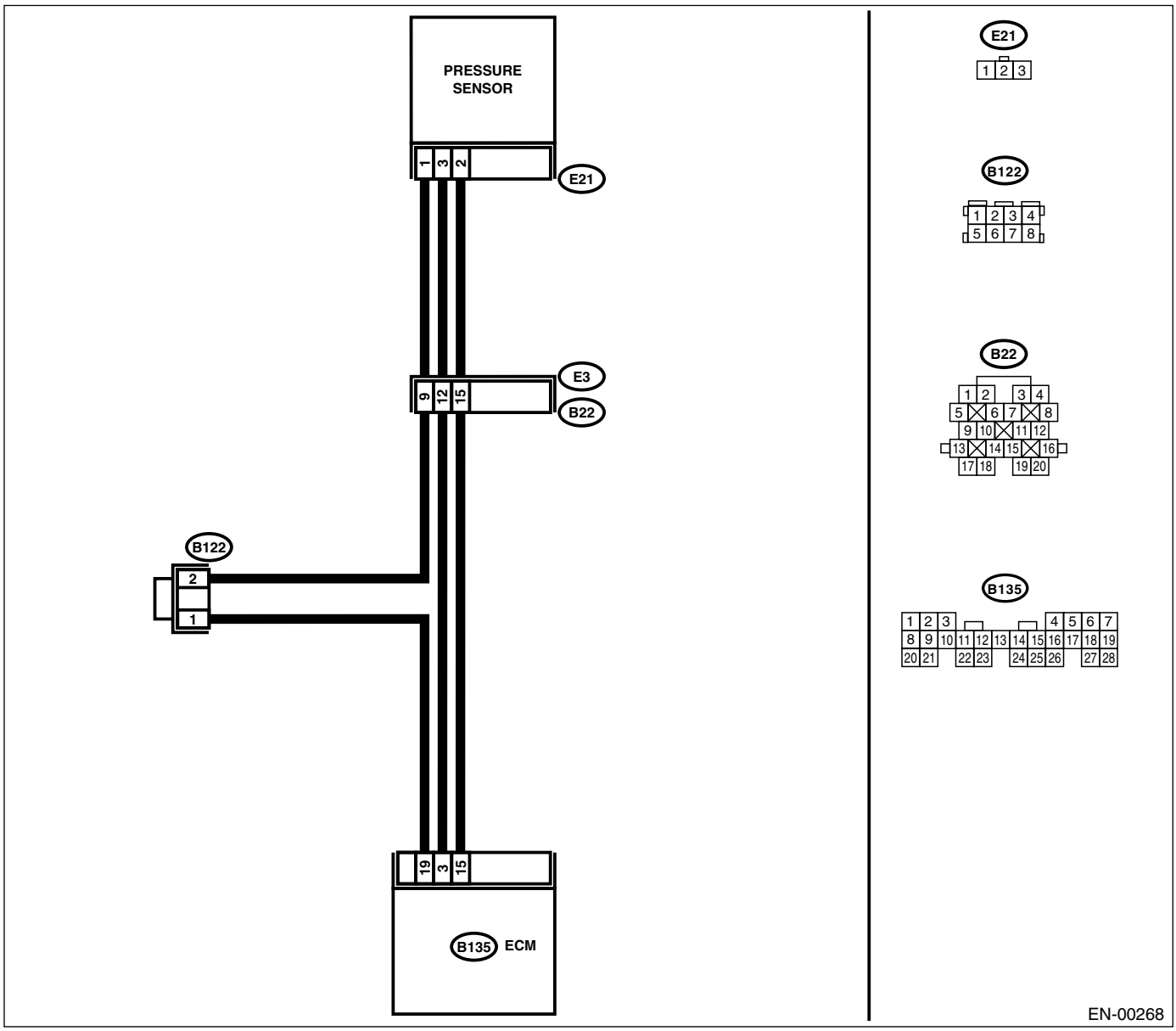
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.** Are there holes, loose bolts or disconnection of hose on air intake system?	There are holes, loose bolts or disconnection of hose.	Repair air intake system.	Go to step **3.**
3	**CHECK PRESSURE SENSOR.** 1)Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2)Place the shift lever in the selector lever in "N" or "P" position. 3)Turn the A/C switch to OFF. 4)Turn all accessory switches to OFF. 5)Read the data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value within specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Ignition ON: 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg), Idling: 20.0 — 46.7 kPa (150 — 350 mmHg, 5.91 — 13.78 inHg)	Go to step **4.**	Replace the intake air temperature sensor and pressure sensor. <Ref. to FU(SOHC)-33, Pressure Sensor.>
4	**CHECK THROTTLE POSITION.** Read the data of throttle position signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value less than specified value when throttle is fully closed? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	5 %	Go to step **5.**	Adjust or replace the throttle position sensor. <Ref. to FU(SOHC)-30, Throttle Position Sensor.>
5	**CHECK THROTTLE POSITION.** Is the measured value more than specified value when throttle is fully open?	85 %	Replace the pressure sensor. <Ref. to FU(SOHC)-33, Pressure Sensor.>	Replace the throttle position sensor. <Ref. to FU(SOHC)-30, Throttle Position Sensor.>

G: DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value less than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	13.3 kPa (100 mmHg, 3.94 inHg)	Go to step **3.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM and pressure sensor connector. Is there poor contact in ECM or pressure sensor connector?	Poor contact occurs.	Repair poor contact in ECM or pressure sensor connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time.
3	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4.5 V	Go to step **5.**	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (–):*** Shake the ECM harness and connector, while monitoring value of voltage meter. Is the measured value more than specified value?	4.5 V	Repair poor contact in ECM connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 15 (+) — Chassis ground (–):*** Is the measured value less than specified value?	0.2 V	Go to step **7.**	Go to step **6.**
6	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read the data of atmospheric absolute pressure signal using Subaru Select Monitor. Shake the ECM harness and connector, while monitoring value of voltage meter. Is the measured value more than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.>	13.3 kPa (100 mmHg, 3.94 inHg)	Repair poor contact in ECM connector.	Go to step **7.**

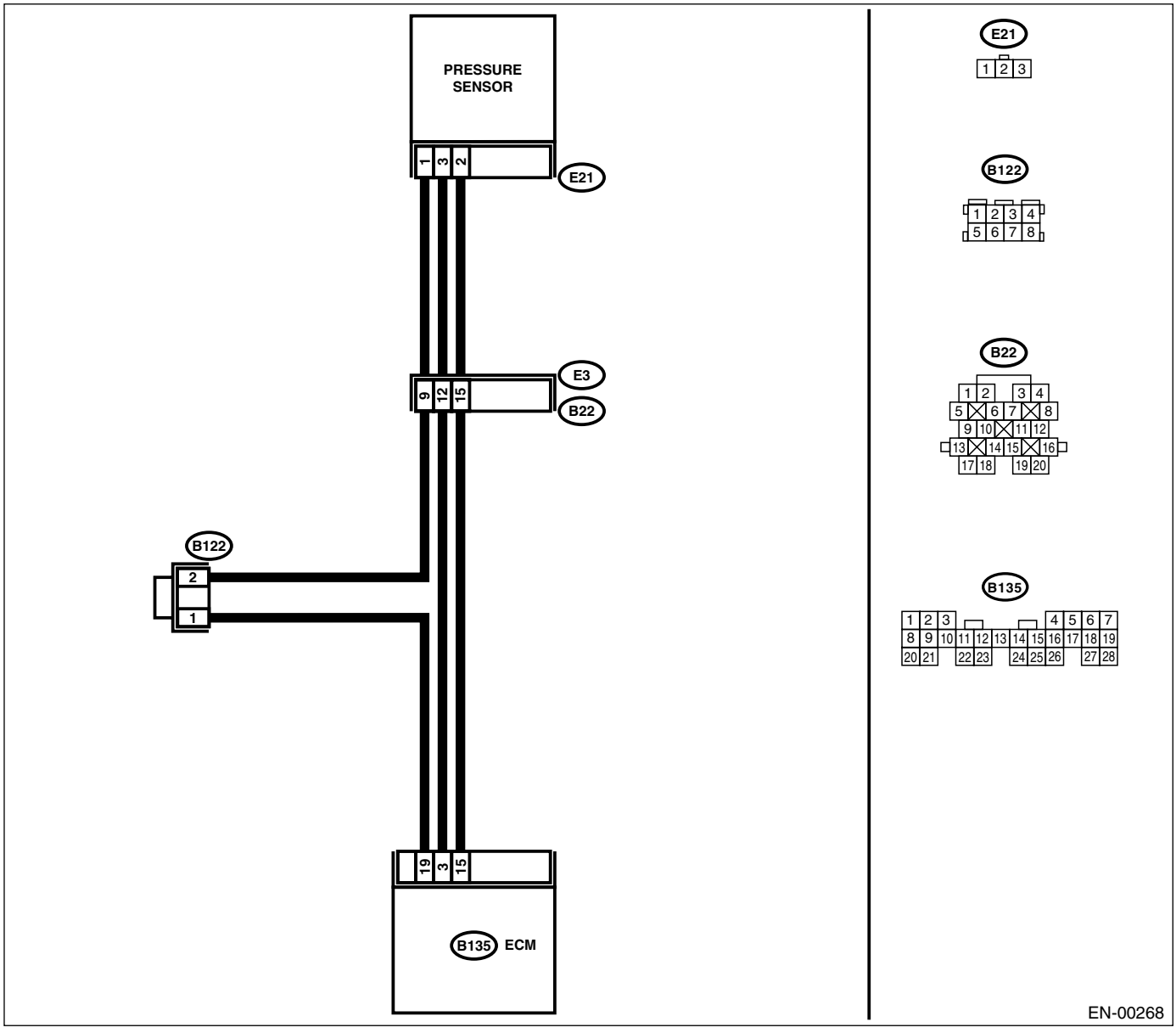
	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN PRESSURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from pressure sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (–):*** Is the measured value more than specified value?	4.5 V	Go to step **8.**	Repair open circuit in harness between ECM and pressure sensor connector.
8	**CHECK HARNESS BETWEEN PRESSURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM and pressure sensor connector. ***Connector & terminal*** ***(B135) No. 19 — (E20) No. 1:*** Is the measured value less than specified value?	1 Ω	Go to step **9.**	Repair open circuit in harness between ECM and pressure sensor connector.
9	**CHECK POOR CONTACT.** Check poor contact in pressure sensor connector. Is there poor contact in pressure sensor connector?	Poor contact occurs.	Repair poor contact in pressure sensor connector.	Replace the pressure sensor. <Ref. to FU(SOHC)-33, Pressure Sensor.>

H: DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value more than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	119.5 kPa (896.5 mmHg, 35.29 inHg)	Go to step **10.**	Go to step **2.**
2	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4.5 V	Go to step **4.**	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (–):*** Shake the ECM harness and connector, while monitoring value of voltage meter. Is the measured value more than specified value?	4.5 V	Repair poor contact in ECM connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 15 (+) — Chassis ground (–):*** Is the measured value less than specified value?	0.2 V	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read the data of atmospheric absolute pressure signal using Subaru Select Monitor. Shake the ECM harness and connector, while monitoring value of voltage meter. Is the measured value more than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.>	13.3 kPa (100 mmHg, 3.94 inHg)	Repair poor contact in ECM connector.	Go to step **6.**

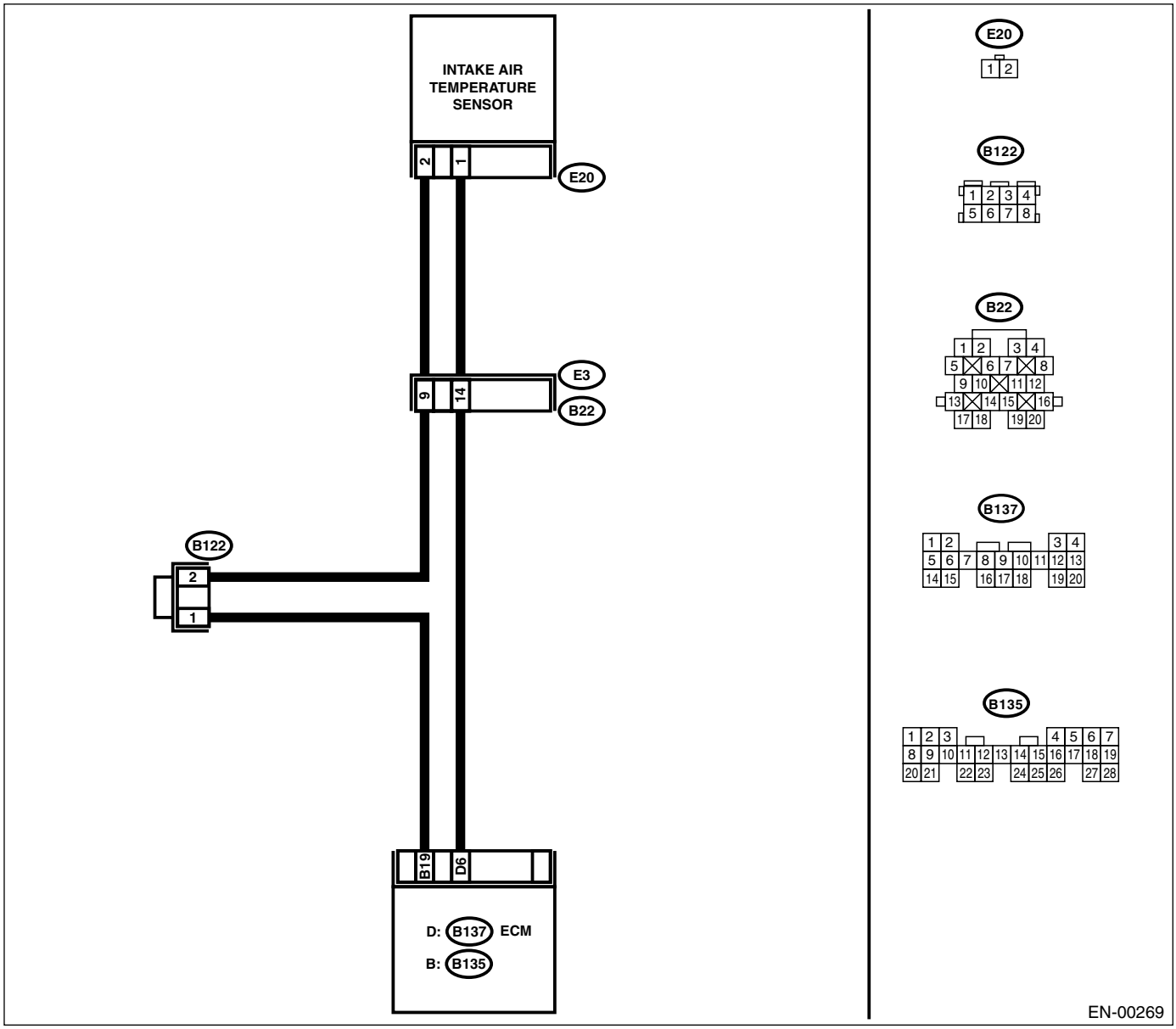
	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN PRESSURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from pressure sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (–):*** Is the measured value more than specified value?	4.5 V	Go to step **7.**	Repair open circuit in harness between ECM and pressure sensor connector.
7	**CHECK HARNESS BETWEEN PRESSURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM and pressure sensor connector. ***Connector & terminal*** ***(B135) No. 15 — (E21) No. 2:*** Is the measured value less than specified value?	1 Ω	Go to step **8.**	Repair open circuit in harness between ECM and pressure sensor connector.
8	**CHECK HARNESS BETWEEN PRESSURE SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between ECM and pressure sensor connector. ***Connector & terminal*** ***(B135) No. 19 — (E21) No. 1:*** Is the measured value less than specified value?	1 Ω	Go to step **9.**	Repair open circuit in harness between ECM and pressure sensor connector.
9	**CHECK POOR CONTACT.** Check poor contact in pressure sensor connector. Is there poor contact in pressure sensor connector?	Poor contact occurs.	Repair poor contact in pressure sensor connector.	Replace the pressure sensor. <Ref. to FU(SOHC)-33, Pressure Sensor.>
10	**CHECK HARNESS BETWEEN PRESSURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF and Subaru Select Monitor or the OBD-II general scan tool switch to OFF. 2)Disconnect the connector from pressure sensor. 3)Turn the ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON. 4)Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value more than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	119.5 kPa (896.5 mmHg, 35.29 inHg)	Repair battery short circuit in harness between ECM and pressure sensor connector.	Replace the pressure sensor. <Ref. to FU(SOHC)-33, Pressure Sensor.>

I: DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



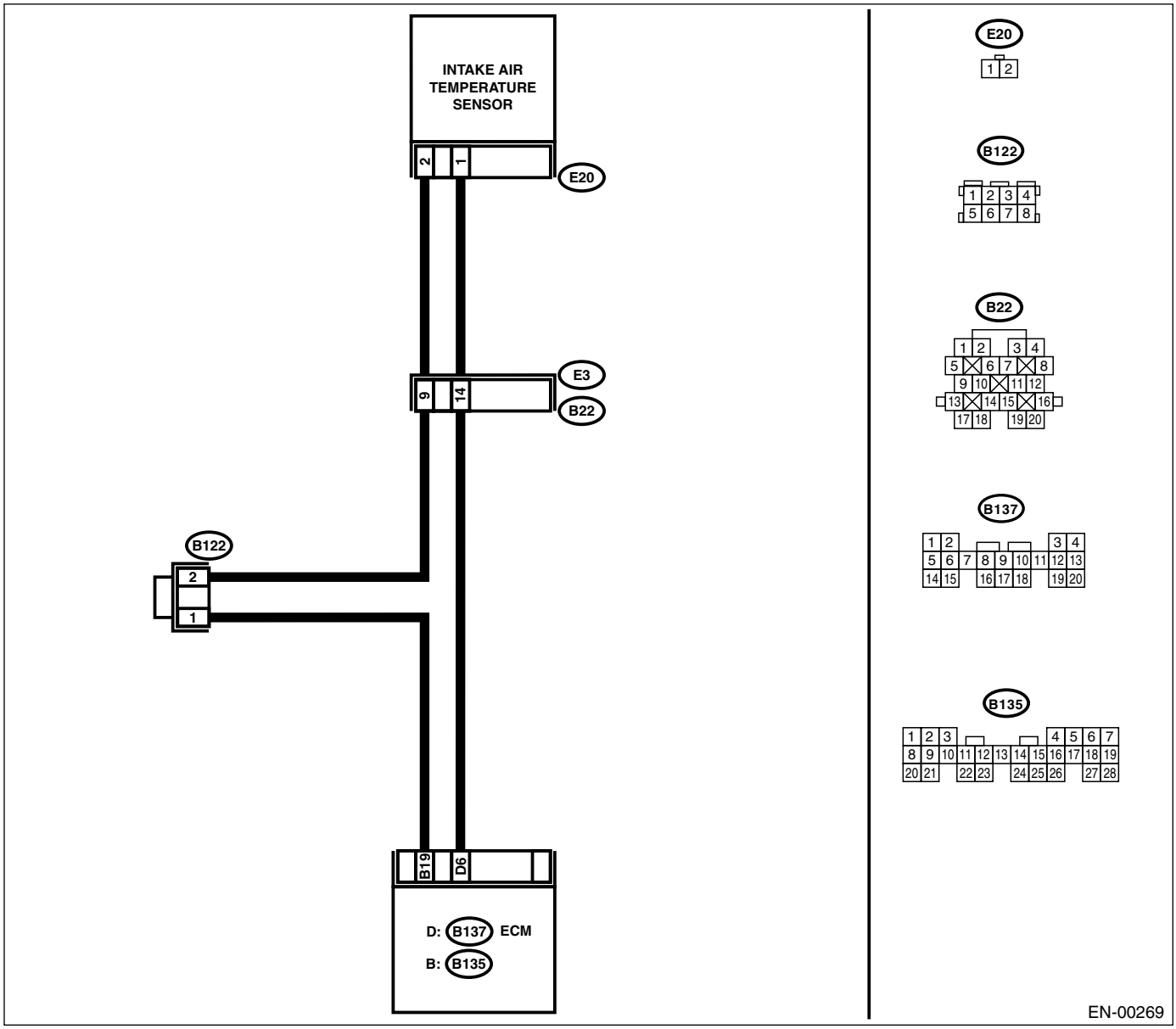
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0111.	Go to step **2.**
2	**CHECK ENGINE COOLANT TEMPERATURE.** 1)Start the engine and warm it up completely. 2)Measure the engine coolant temperature using Subaru Select Monitor or OBD-II general scan tool. Is the measured value within specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	75°C (167°F) — 95°C (203°F)	Replace the intake air temperature sensor. <Ref. to FU(SOHC)-34, Intake Air Temperature Sensor.>	Inspect DTC P0125 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).>

J: DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



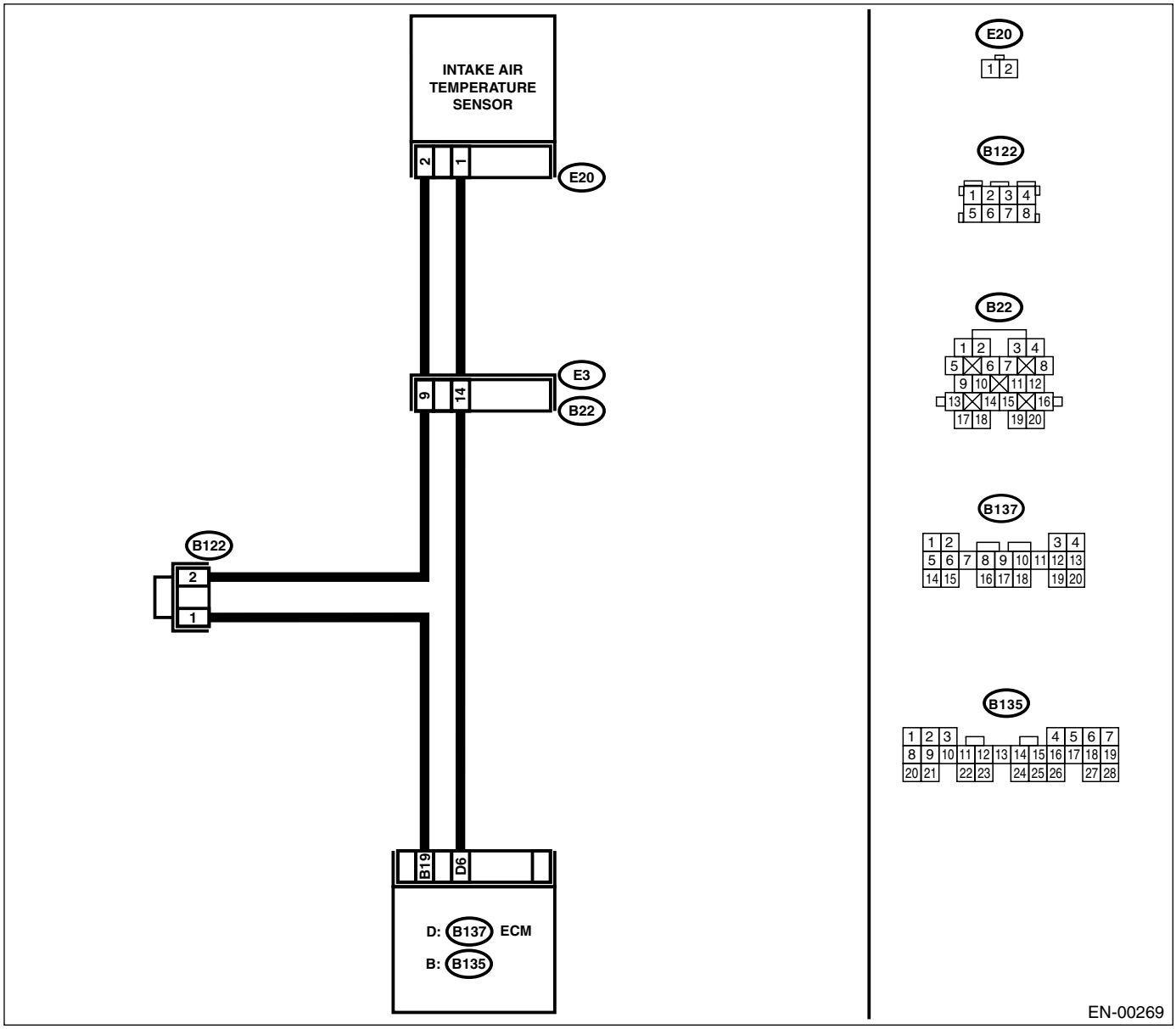
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. Is the measured value more than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	120°C (248°F)	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from intake air temperature sensor. 3)Turn the ignition switch to ON. 4)Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. Is the measured value less than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	–40°C (–40°F)	Replace the intake air temperature sensor. <Ref. to FU(SOHC)-34, Intake Air Temperature Sensor.>	Repair ground short circuit in harness between intake air temperature sensor and ECM connector.

K: DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. Is the measured value less than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	–40°C (–40°F)	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from intake air temperature sensor. 3)Measure the voltage between intake air temperature and pressure sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 1 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Repair battery short circuit in harness between intake air temperature sensor and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 1 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Repair battery short circuit in harness between intake air temperature sensor and ECM connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 1 (+) — Engine ground (–):*** Is the measured value more than specified value?	3 V	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between intake air temperature sensor and ECM connector • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector

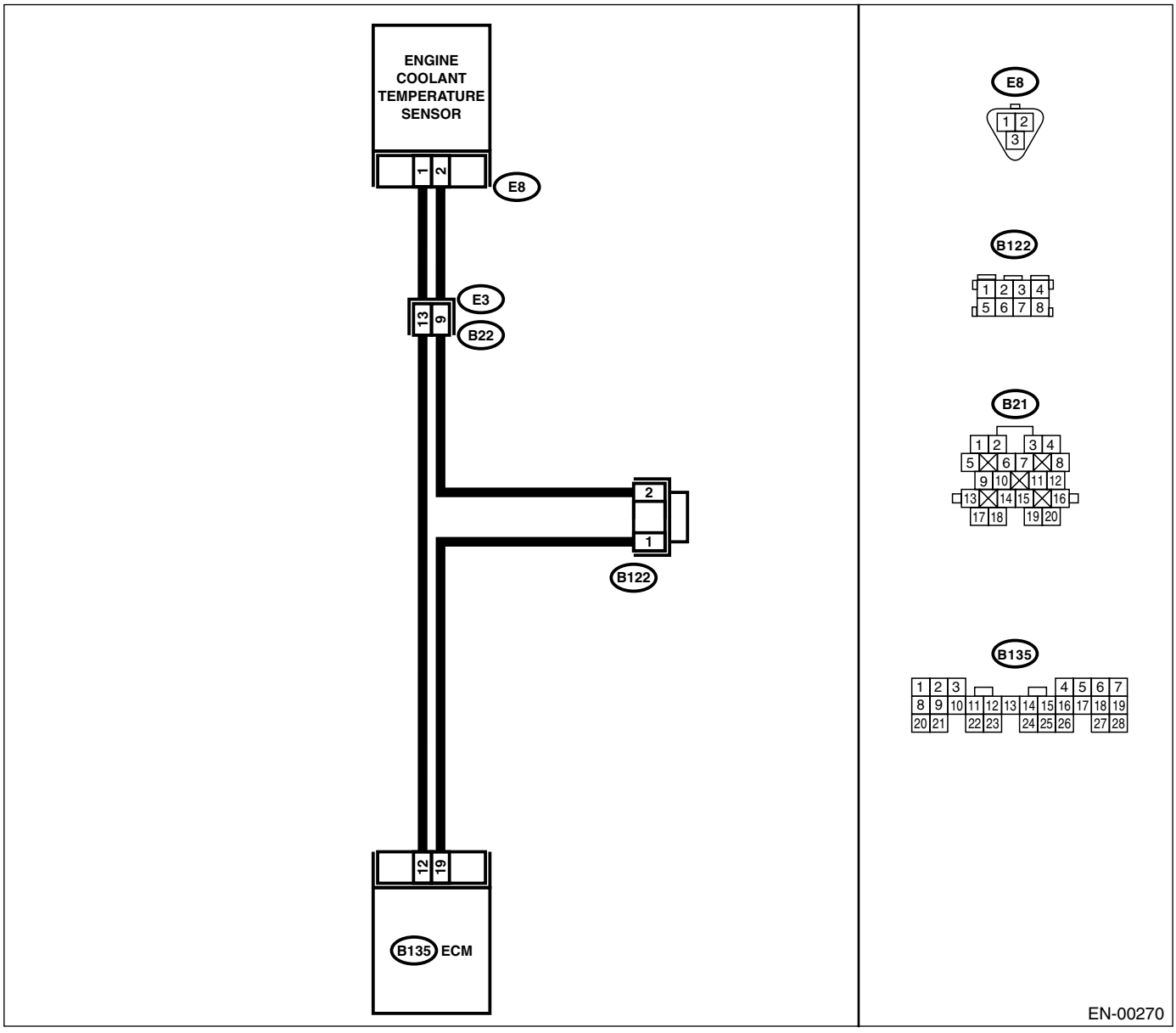
	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of harness between intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 2 — Engine ground:*** Is the measured value less than specified value?	5 Ω	Replace the intake air temperature sensor. <Ref. to FU(SOHC)-34, Intake Air Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between intake air temperature sensor and ECM connector • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector

L: DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Hard to start
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



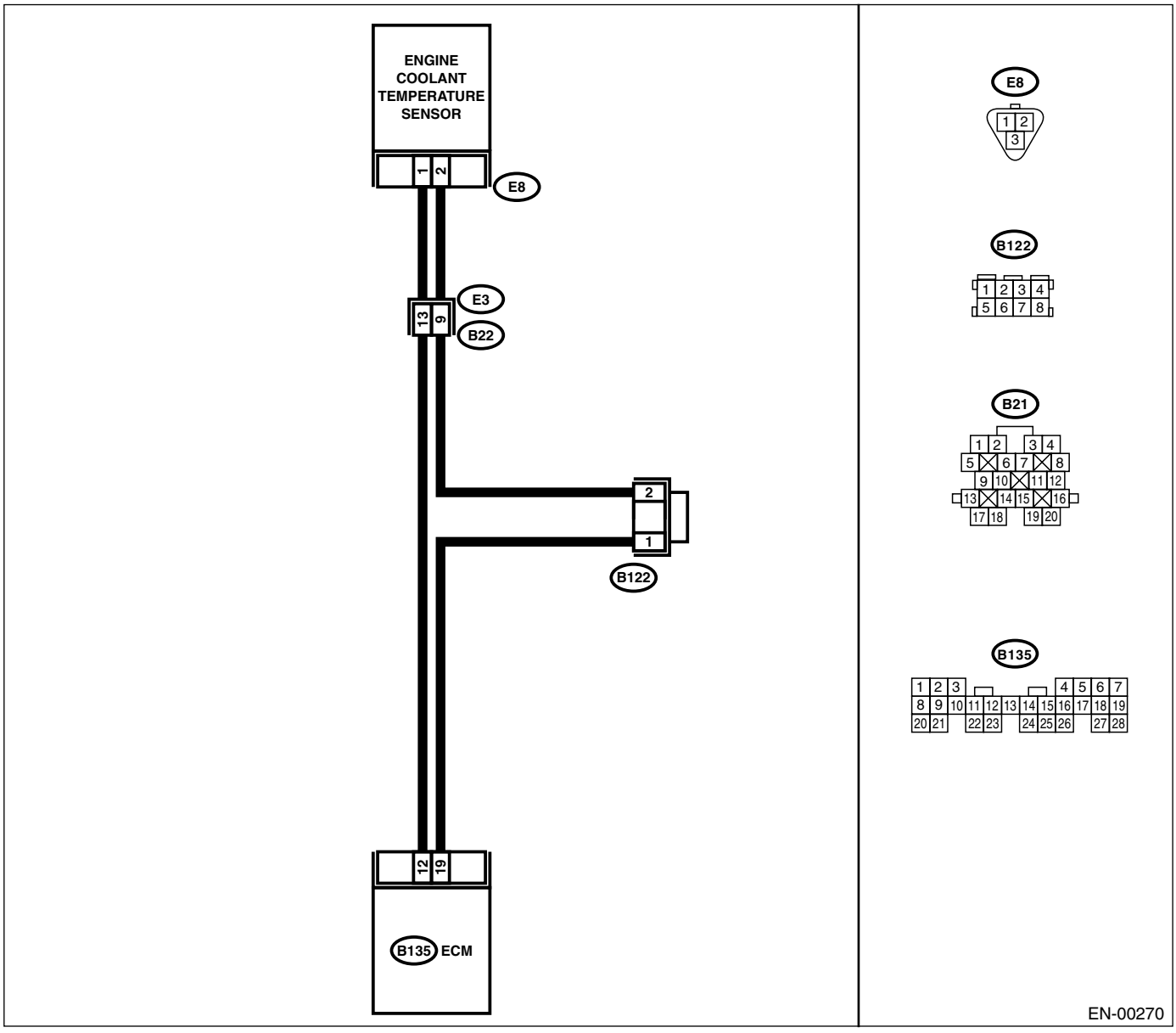
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value more than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	150°C (302°F)	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from engine coolant temperature sensor. 3)Turn the ignition switch to ON. 4)Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value less than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	–40°C (–40°F)	Replace the engine coolant temperature sensor. <Ref. to FU(SOHC)-26, Engine Coolant Temperature Sensor.>	Repair ground short circuit in harness between engine coolant temperature sensor and ECM connector.

M: DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Hard to start
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value less than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	–40°C (–40°F)	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from engine coolant temperature sensor. 3)Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **4.**

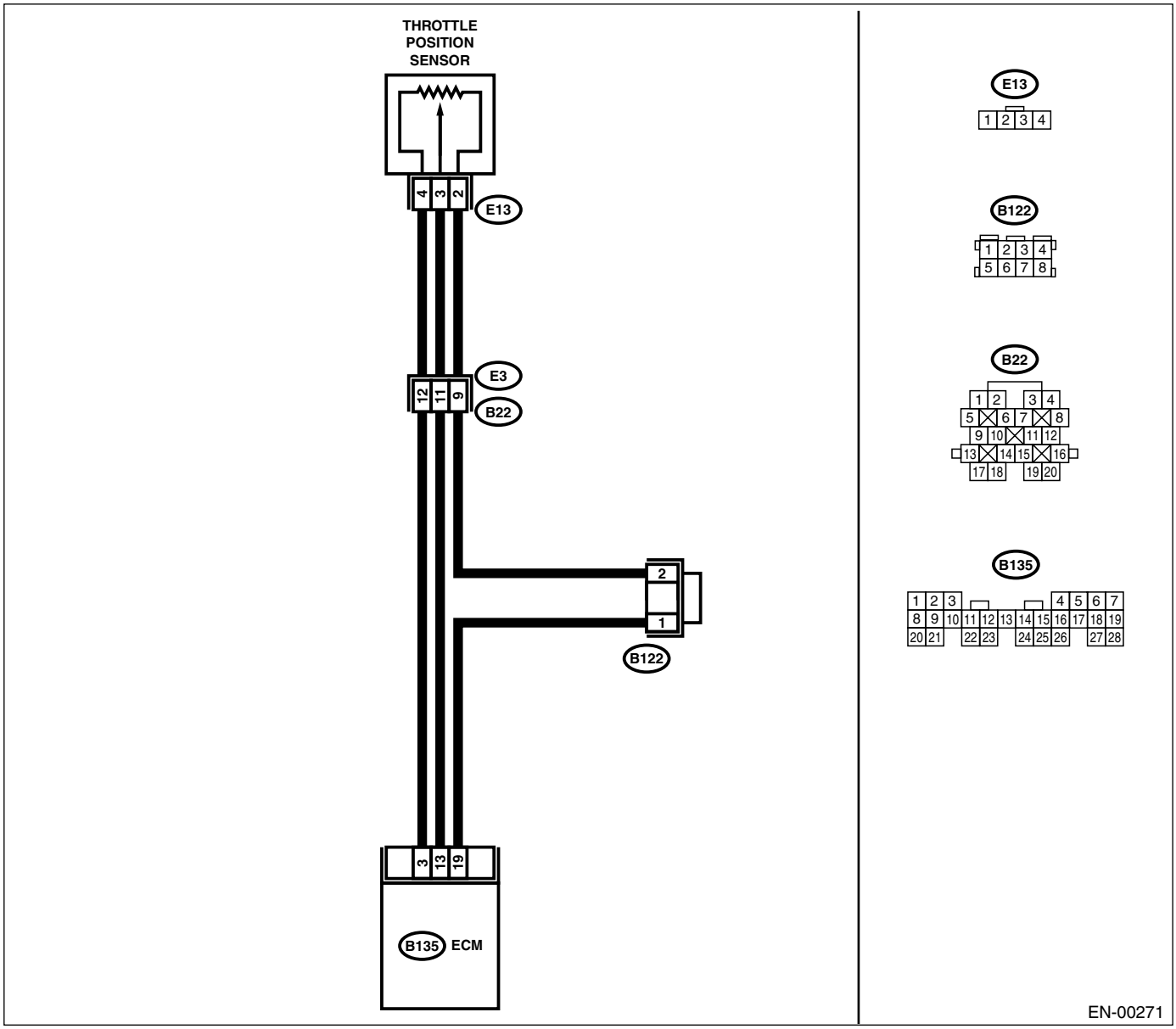
	Step	Check	Yes	No
4	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 (+) — Engine ground (–):*** Is the measured value more than specified value?	4 V	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
5	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of harness between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 — Engine ground:*** Is the measured value less than specified value?	5 Ω	Replace the engine coolant temperature sensor. <Ref. to FU(SOHC)-26, Engine Coolant Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

N: DTC P0121 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



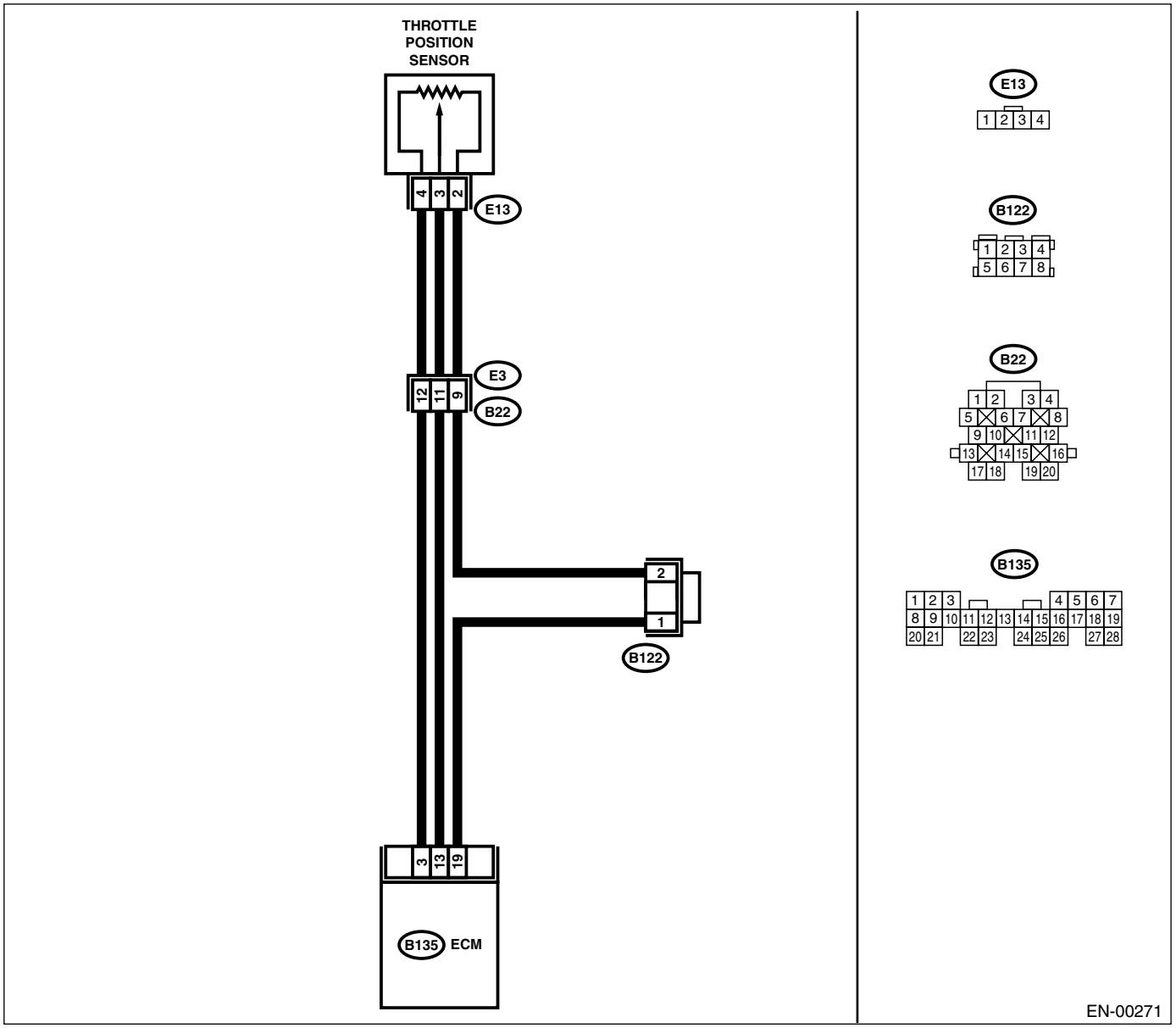
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any the DTC displayed?	Other DTC is displayed.	Inspect DTC P0122 or P0123 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0121.	Replace the throttle position sensor. <Ref. to FU(SOHC)-30, Throttle Position Sensor.>

O: DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value less than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	0.1 V	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground while throttle valve is fully closed. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4.5 V	Go to step **4.**	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (–):*** Shake the ECM harness and connector, while monitoring value of voltage meter. Is the measured value more than specified value?	4.5 V	Repair poor contact in ECM connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 13 (+) — Chassis ground (–):*** Is the measured value less than specified value?	0.1 V	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 13 (+) — Chassis ground (–):*** Shake the ECM harness and connector, while monitoring value of voltage meter. Is the measured value more than specified value?	0.1 V	Repair poor contact in ECM connector.	Go to step **6.**

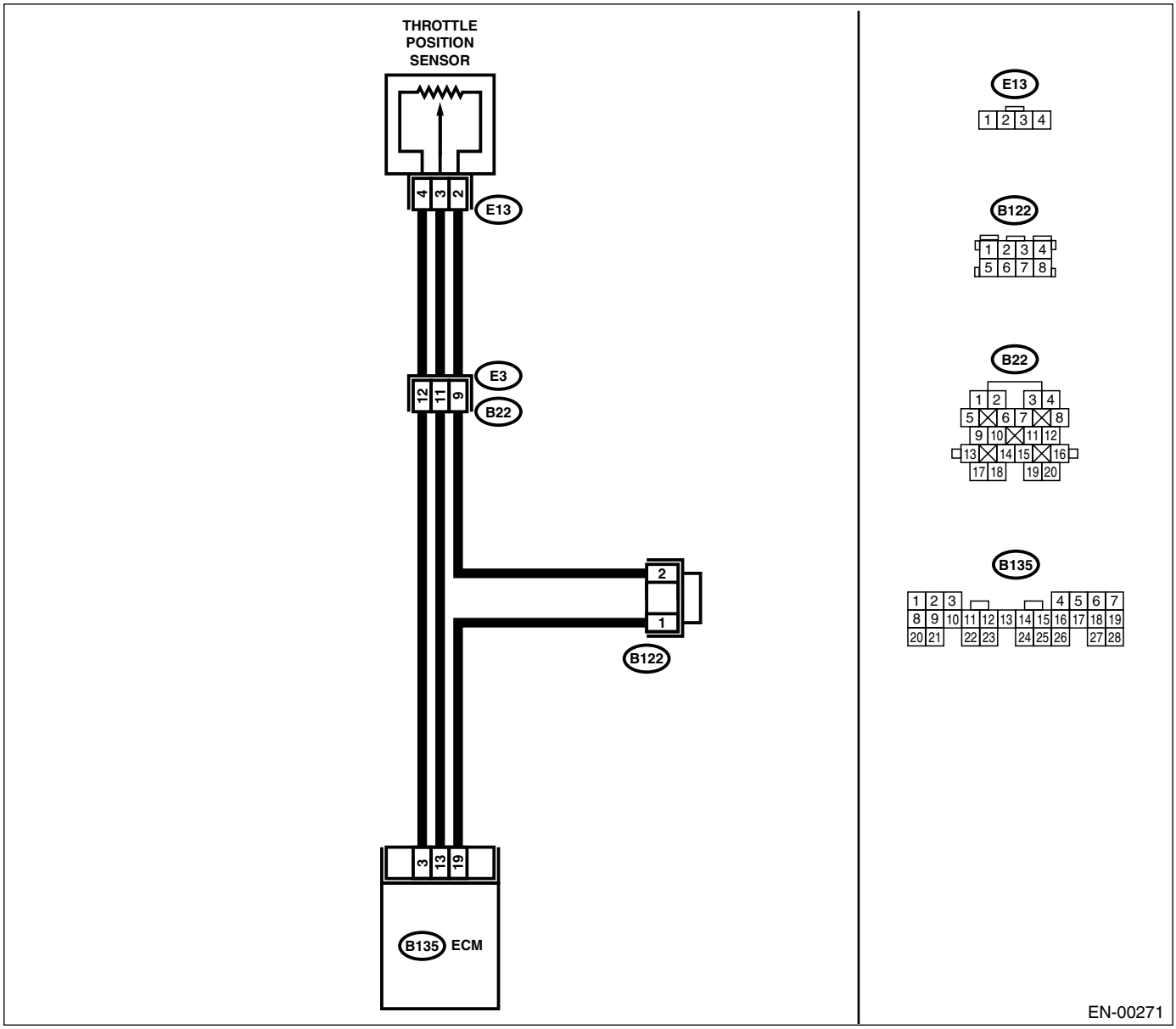
	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from throttle position sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 4 (+) — Engine ground (–):*** Is the measured value more than specified value?	4.5 V	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
7	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of harness between ECM connector and throttle position sensor connector. ***Connector & terminal*** ***(B135) No. 13 — (E13) No. 3:*** Is the measured value less than specified value?	1 Ω	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in ECM connector • Poor contact in throttle position sensor connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** Measure the resistance of harness between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 3 — Engine ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **9.**	Repair ground short circuit in harness between throttle position sensor and ECM connector.
9	**CHECK POOR CONTACT.** Check poor contact in throttle position sensor connector. Is there poor contact in throttle position sensor connector?	Poor contact occurs.	Repair poor contact in throttle position sensor connector.	Replace the throttle position sensor. <Ref. to FU(SOHC)-30, Throttle Position Sensor.>

P: DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



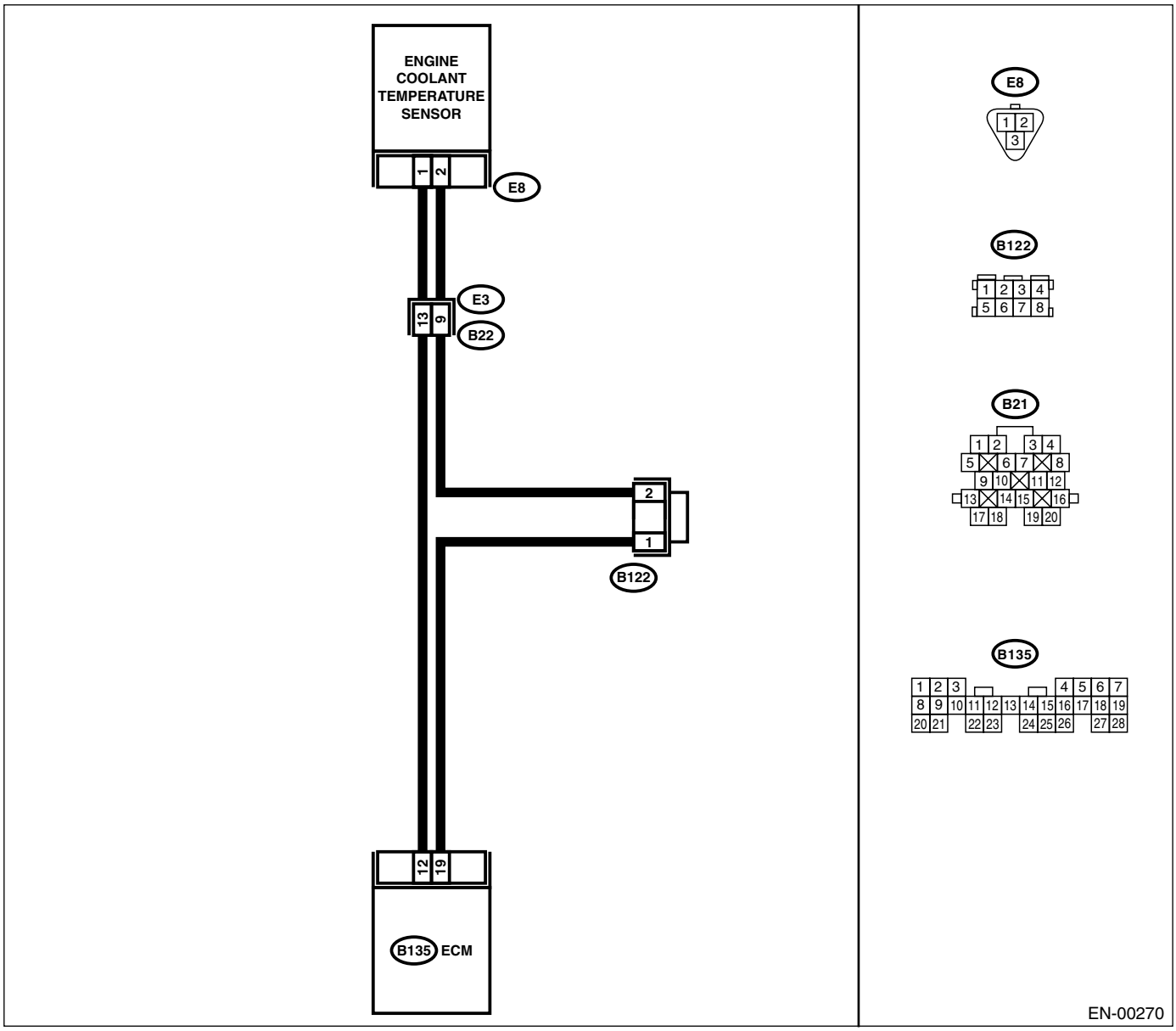
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value more than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	4.9 V	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from throttle position sensor. 3)Measure the resistance of harness between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 2 — Engine ground:*** Is the measured value less than specified value?	5 Ω	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
3	**CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 3 (+) — Engine ground (–):*** Is the measured value more than specified value?	4.9 V	Repair battery short circuit in harness between throttle position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>	Replace the throttle position sensor. <Ref. to FU(SOHC)-30, Throttle Position Sensor.>

Q: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine would not return to idling.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect DTC P0117 or P0118 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0125.	Go to step **2.**
2	**CHECK THERMOSTAT.** Does the thermostat remain opened?	Thermostat remain opened.	Replace the thermostat. <Ref. to CO(SOHC)-25, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(SOHC)-26, Engine Coolant Temperature Sensor.>

R: DTC P0129 — BAROMETRIC PRESSURE TOO LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

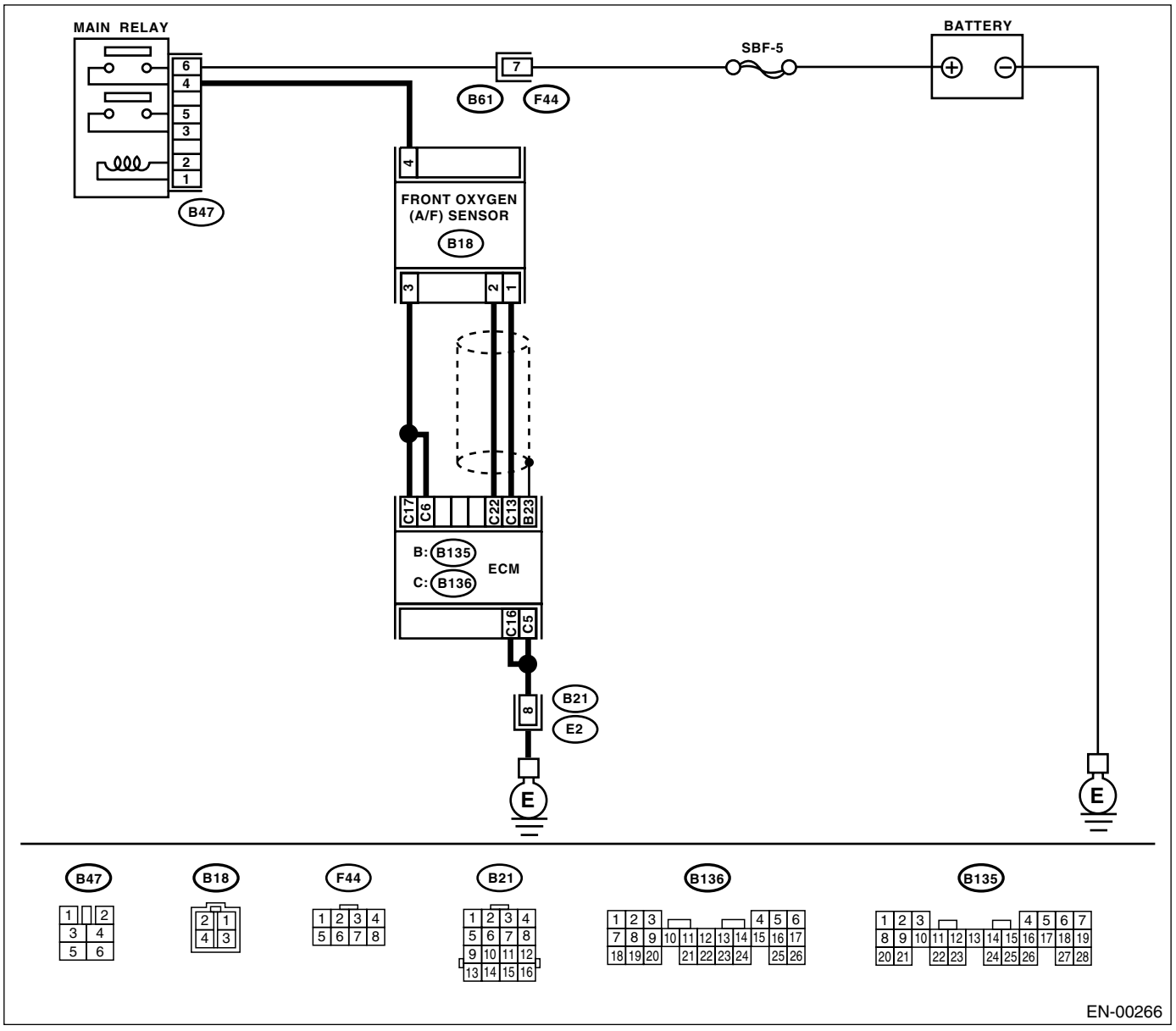
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	It is not necessary to inspect DTC P0129.	Replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>

S: DTC P0130 — O_2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK FRONT OXYGEN (A/F) SENSOR DATA.** 1)Start the engine. 2)While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 70°C (160°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3)Read the data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value within specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	0.85 — 1.15	Go to step **3.**	Go to step **4.**
3	**CHECK FRONT OXYGEN (A/F) SENSOR DATA.** 1)Race the engine at speeds from idling to 5,000 rpm for a total of 5 cycles. 2)Read the data of front oxygen (A/F) sensor signal during racing using Subaru Select Monitor or OBD-II general scan tool. Is the measured value more than specified value? NOTE: •Air fuel ratio is rich at normal condition or during racing. •To increase engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed.	1.1 V	Go to step **6.**	Go to step **4.**
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3)Measure the resistance between ECM and front oxygen (A/F) sensor. Is the measured value less than specified value? ***Connector & terminals*** ***(B136) No. 13 — (B18) No. 1:*** ***(B136) No. 22 — (B18) No. 2:***	5 Ω	Go to step **5.**	Repair open circuit between ECM and front oxygen (A/F) sensor.
5	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between ECM and chassis ground. Is the measured value more than specified value? ***Connector & terminals*** ***(B136) No. 13 — Chassis ground:*** ***(B136) No. 22 — Chassis ground:***	1 MΩ	Go to step **6.**	Repair ground short circuit between ECM and front oxygen (A/F) sensor.

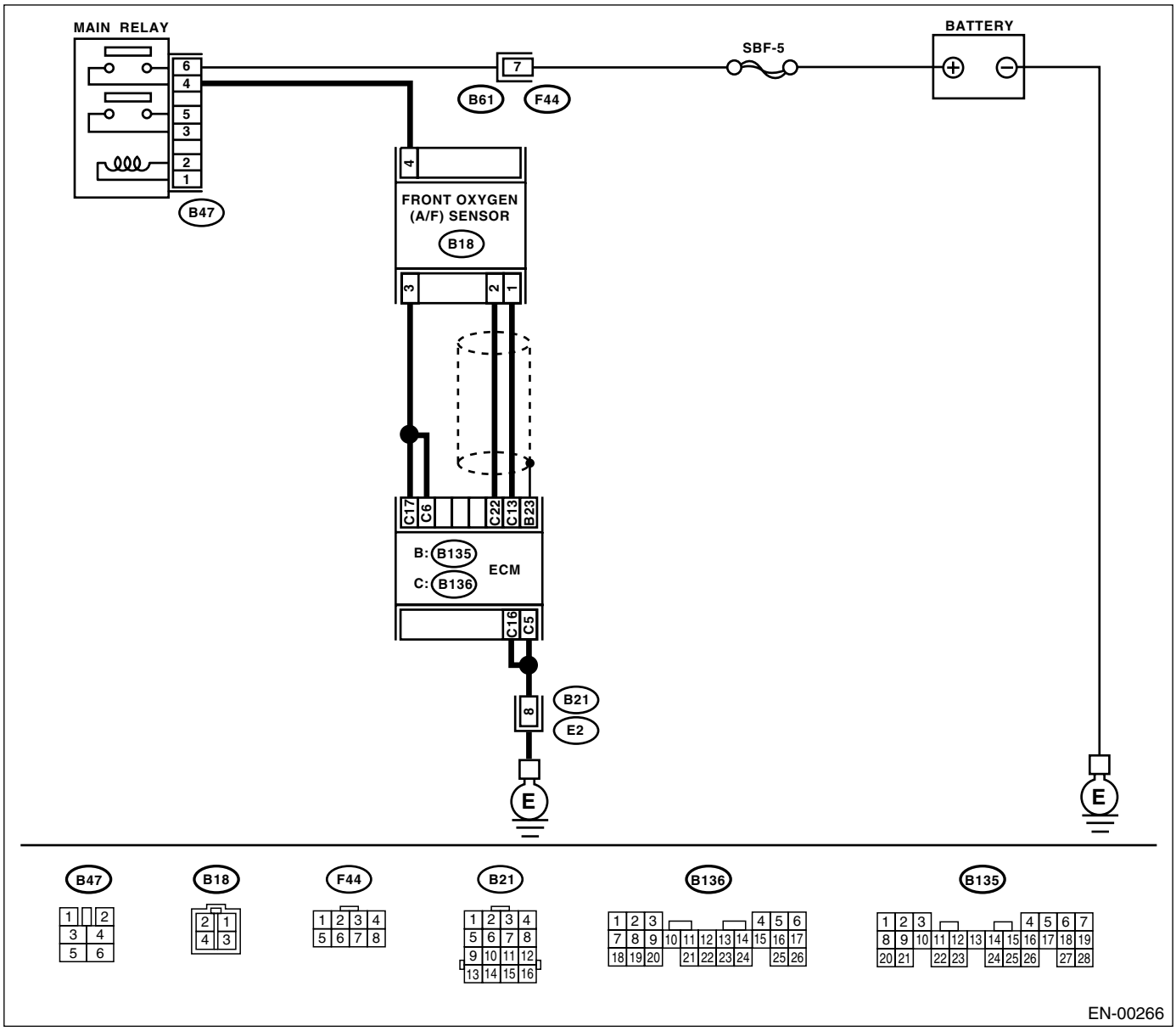
	Step	Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. Is there a fault in exhaust system? NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness of front oxygen (A/F) sensor •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	There is a fault.	Repair or replace faulty parts.	Replace the front oxygen (A/F) sensor. <Ref. to FU(SOHC)-42, Front Oxygen (A/F) Sensor.>

T: DTC P0131 — O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



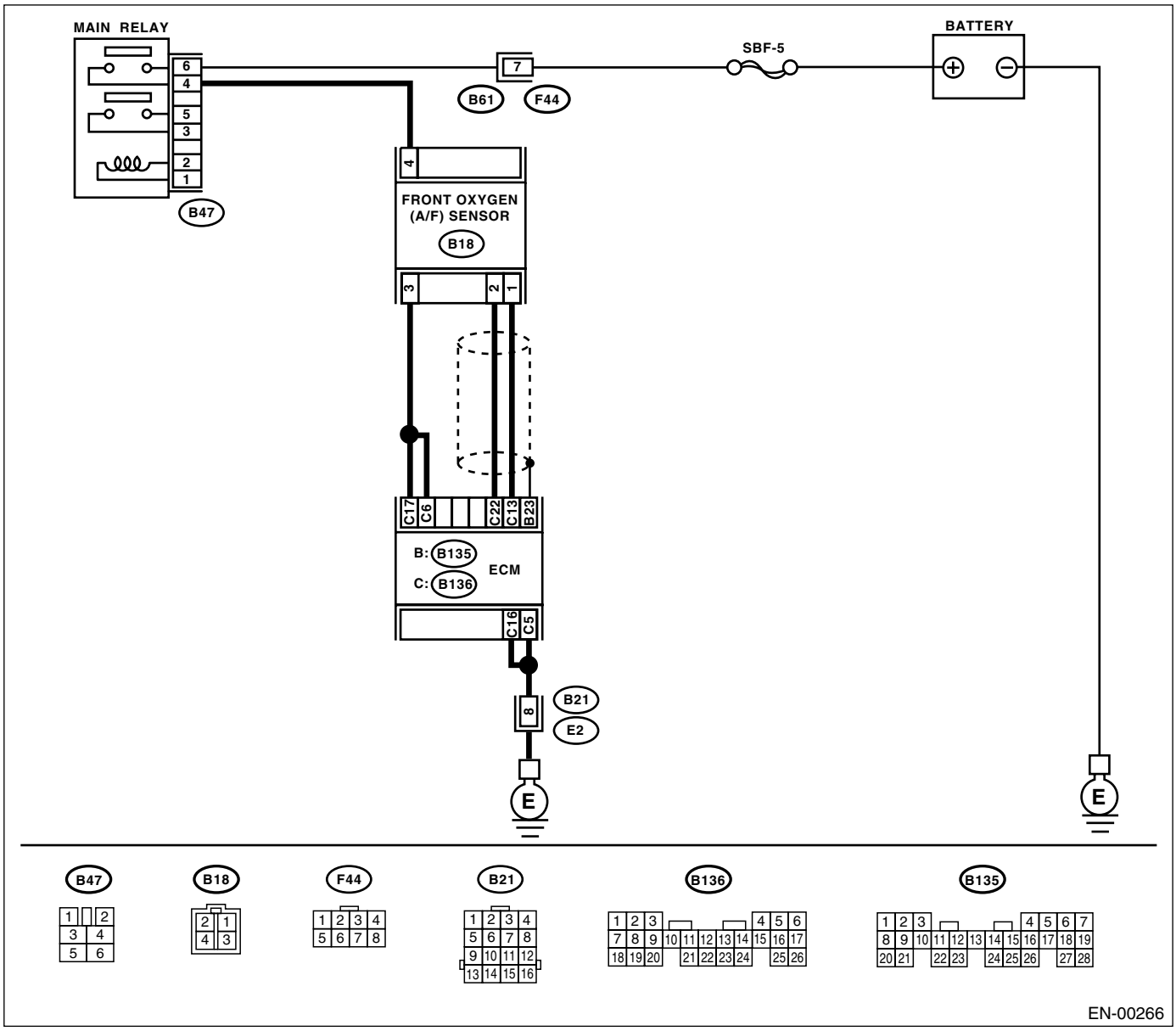
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3)Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 13 — Chassis ground:*** ***(B136) No. 22 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Replace the front oxygen (A/F) sensor. <Ref. to FU(SOHC)-42, Front Oxygen (A/F) Sensor.>	Repair ground short circuit in harness between ECM and front oxygen(A/F) sensor connector.

U: DTC P0132 — O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



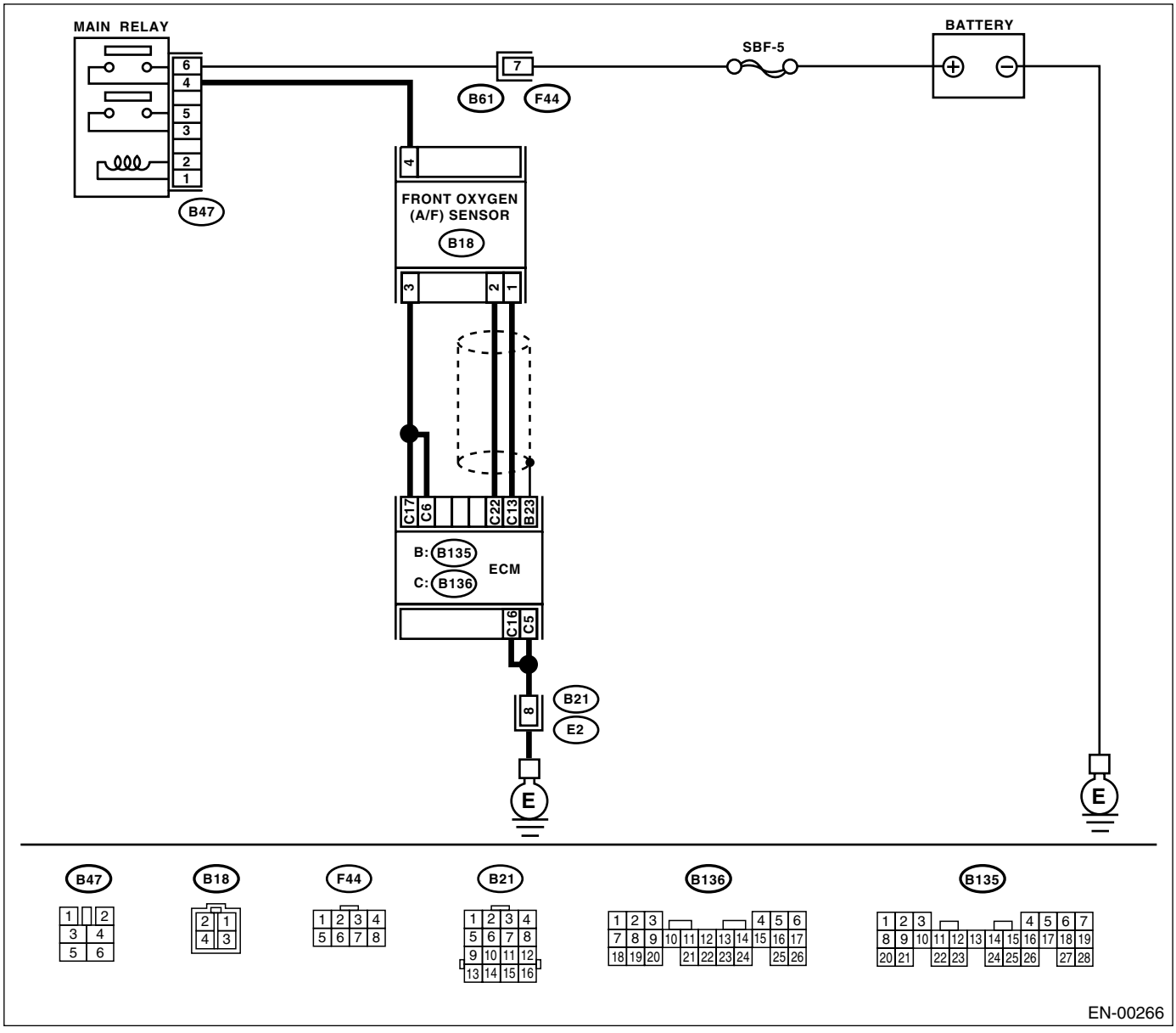
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from front oxygen (A/F) sensor. 3)Measure the resistance of harness between ECM connector and chassis ground. Is the measured value more than specified value? ***Connector & terminal*** ***(B136) No. 13 — Chassis ground:*** ***(B136) No. 22 — Chassis ground:***	8 V	Replace the front oxygen (A/F) sensor. <Ref. to FU(SOHC)-42, Front Oxygen (A/F) Sensor.>	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.

V: DTC P0133 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



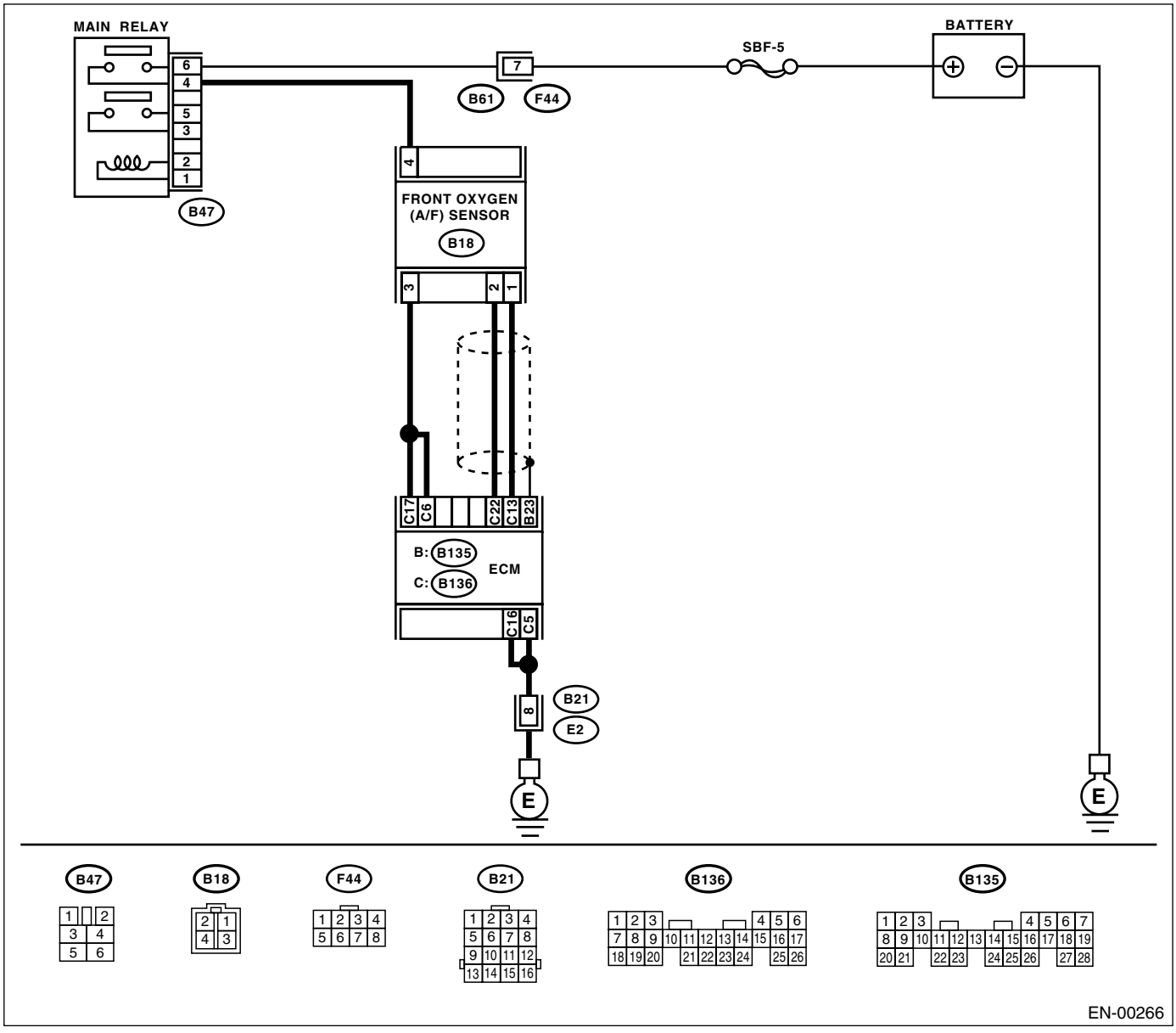
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0133.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** Is there a fault in exhaust system? NOTE: Check the following items. •Loose installation of front portion of exhaust pipe onto cylinder heads •Loose connection between front exhaust pipe and front catalytic converter •Damage of exhaust pipe resulting in a hole	There is a fault.	Repair exhaust system.	Replace the front oxygen (A/F) sensor. <Ref. to FU(SOHC)-42, Front Oxygen (A/F) Sensor.>

W: DTC P0134 — O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



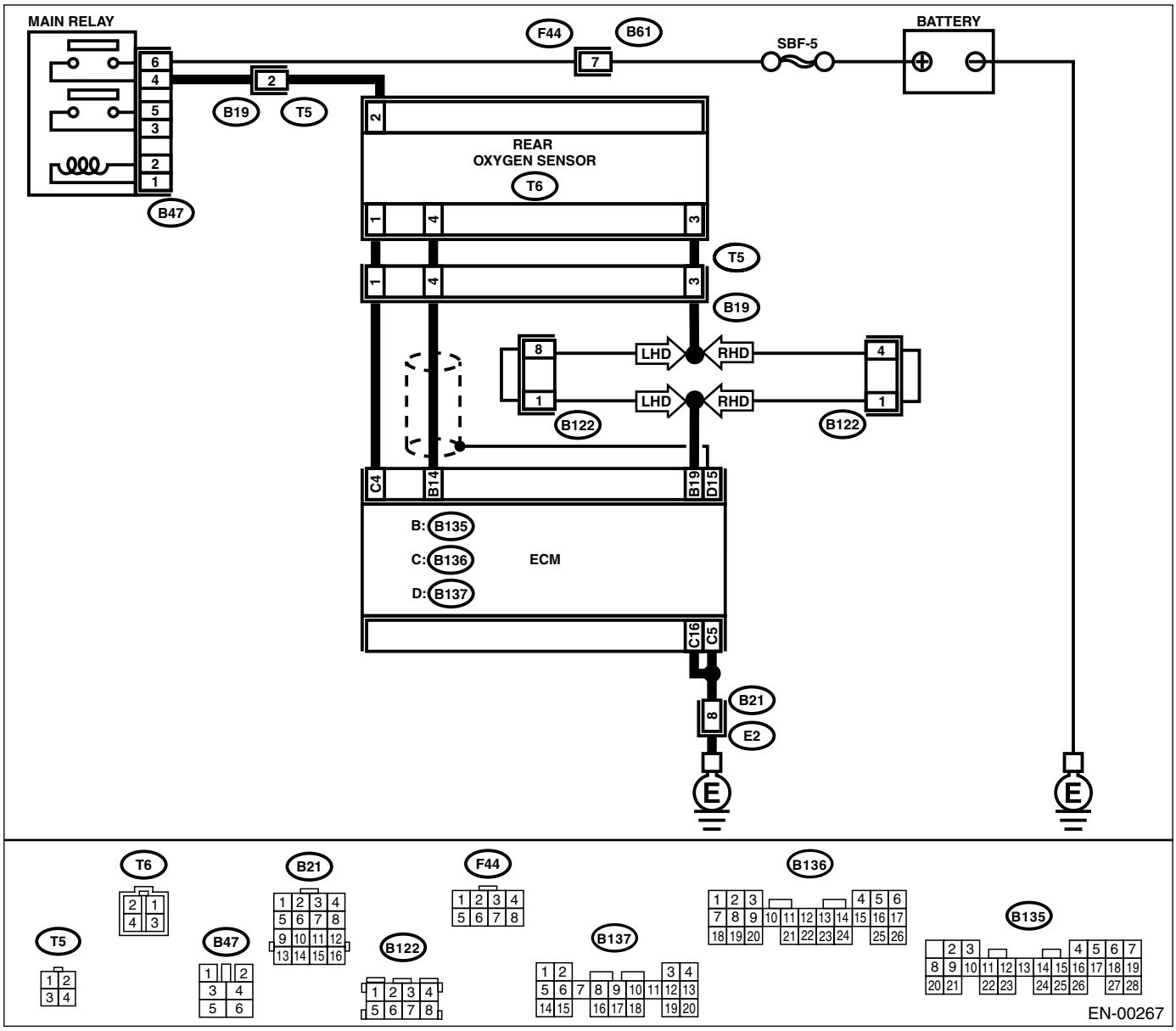
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3)Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 13 — (B18) No. 1:*** ***(B136) No. 22 — (B18) No. 2:*** Is the measured value less than specified value?	1 Ω	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
2	**CHECK POOR CONTACT.** Check poor contact in front oxygen (A/F) sensor connector. Is there poor contact in front oxygen (A/F) sensor connector?	Poor contact occurs.	Repair poor contact in front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(SOHC)-42, Front Oxygen (A/F) Sensor.>

X: DTC P0137 — O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	DTC P0131, P0132 or P0134 is displayed.	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0137.	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1)Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 5,000 rpm for two minutes. 2)Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. Does the value fluctuate? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	490 mV	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and rear oxygen sensor. 3)Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 14 — (T6) No. 4:*** ***(B135) No. 19 — (T6) No. 3:*** Is the measured value more than specified value?	3 Ω	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from rear oxygen sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(T6) No. 4 (+) — Engine ground (–):*** Is the measured value within specified value?	0.2 — 0.5 V	Replace the rear oxygen sensor. <Ref. to FU(SOHC)-42, Front Oxygen (A/F) Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

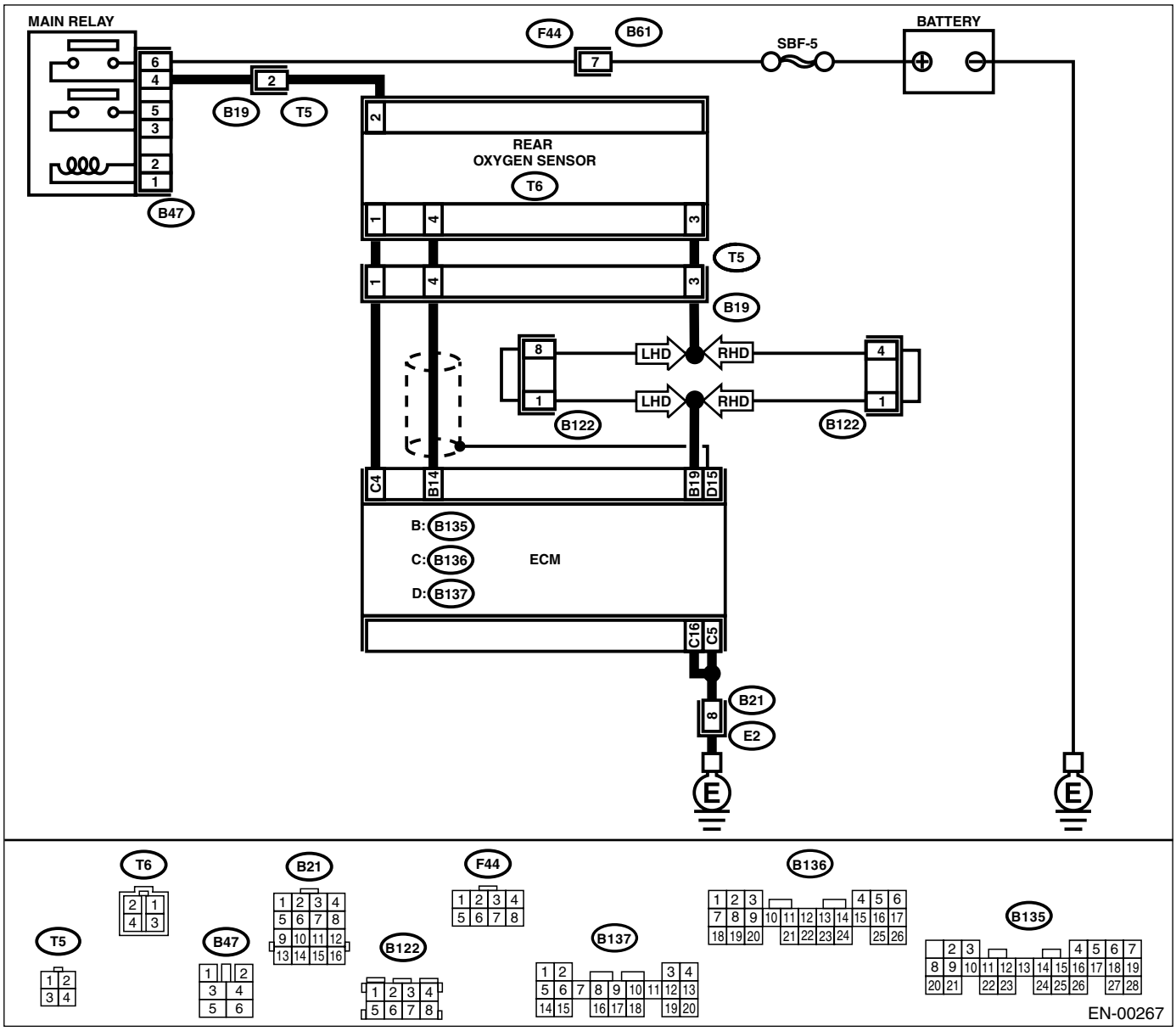
	Step	Check	Yes	No
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. Is there a fault in exhaust system? NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	There is a fault.	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(SOHC)-42, Front Oxygen (A/F) Sensor.>

Y: DTC P0138 — O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0138.	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1)Warm-up the engine until engine coolant temperature is above 70°C (158°F), and immediately decrease the engine speed from 5,000 rpm. 2)Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. Does the value fluctuate? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	250 mV	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and rear oxygen sensor. 3)Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 14 — (T6) No. 4:*** ***(B135) No. 19 — (T6) No. 3:*** Is the measured value more than specified value?	3 Ω	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from rear oxygen sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(T6) No. 4 (+) — Engine ground (–):*** Is the measured value within specified value?	0.2 — 0.5 V	Replace the rear oxygen sensor. <Ref. to FU(SOHC)-42, Front Oxygen (A/F) Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

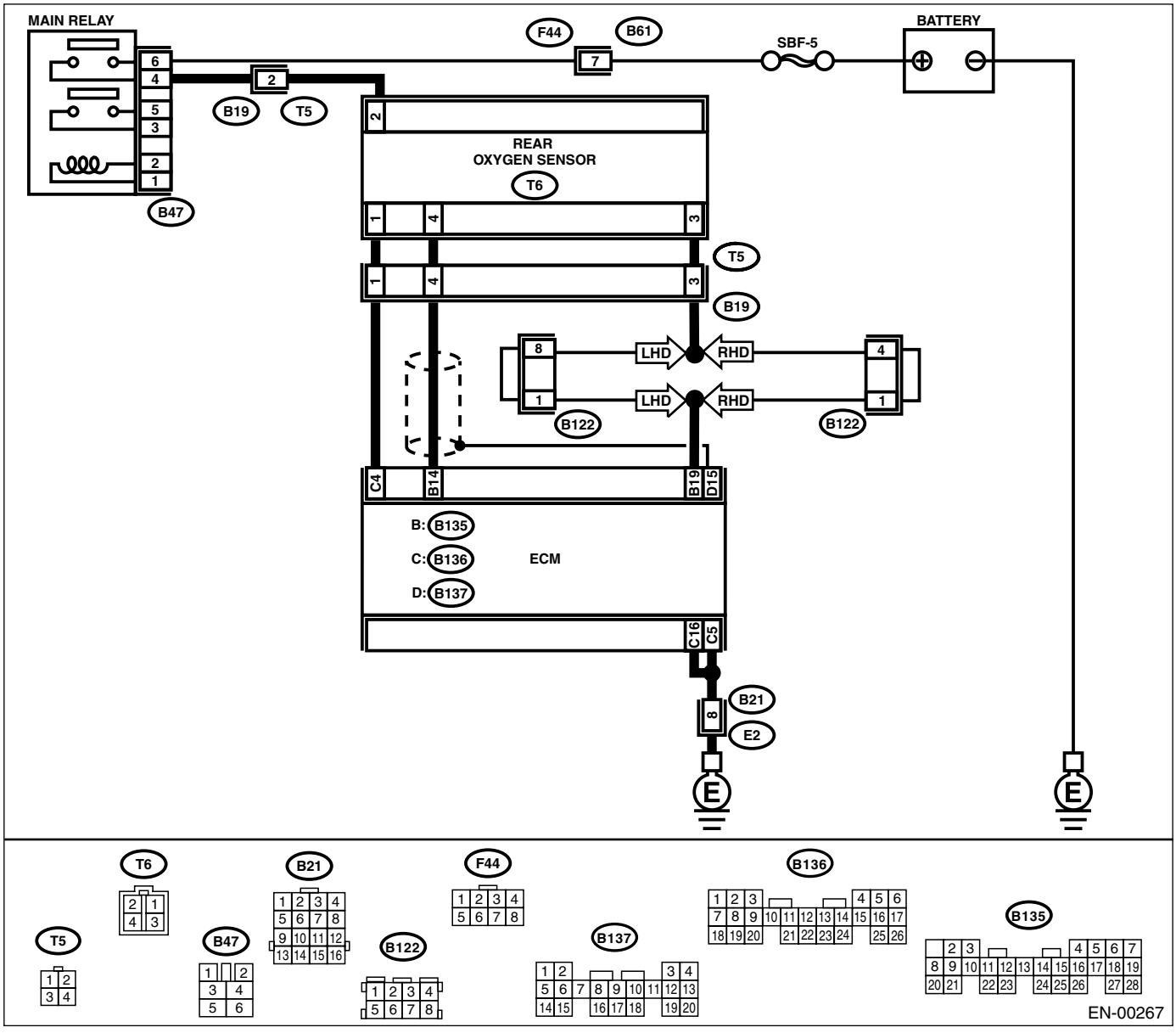
	Step	Check	Yes	No
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. Is there a fault in exhaust system? NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	There is a fault.	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(SOHC)-42, Front Oxygen (A/F) Sensor.>

Z: DTC P0139 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0139.	Replace the rear oxygen sensor. <Ref. to FU(SOHC)-42, Front Oxygen (A/F) Sensor.>

AA:DTC P0171 — SYSTEM TOO LEAN (BANK 1) —

Refer to DTC P0172 for diagnostic procedure. <Ref. to EN(SOHC)-142, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AB:DTC P0172 — SYSTEM TOO RICH (BANK 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.** Are there holes or loose bolts on exhaust system?	There are holes or loose bolts.	Repair exhaust system.	Go to step **2.**
2	**CHECK EGR VALVE.** Is the EGR valve stuck?	EGR valve is stuck.	Replace the EGR valve.	Go to step **3.**
3	**CHECK AIR INTAKE SYSTEM.** Are there holes, loose bolts or disconnection of hose on air intake system?	There are holes, loose bolts or disconnection of hose.	Repair air intake system.	Go to step **4.**
4	**CHECK PURGE CONTROL SOLENOID VALVE.** Is the purge control solenoid valve stuck?	EGR valve is stuck.	Replace the purge control solenoid valve.	Go to step **5.**
5	**CHECK PCV VALVE.** Is PCV valve operated?	PCV valve is not operated.	Replace the PCV valve.	Go to step **6.**
6	**CHECK FUEL PRESSURE.** **Warning:** **•Place "NO FIRE" signs near the working area.** **•Be careful not to spill fuel on the floor.** 1)Release fuel pressure. (1) Disconnect the connector from fuel pump relay. (2) Start the engine and run it until it stalls. (3) After the engine stalls, crank it for five more seconds. (4) Turn the ignition switch to OFF. 2)Connect the connector to fuel pump relay. 3)Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4)Install the fuel filler cap. 5)Start the engine and idle while gear position is neutral. 6)Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. Is the measured value within specified value? **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	284 — 314 kPa (2.9 — 3.2 kg/cm^2, 41 — 46 psi)	Go to step **7.**	Repair the following items. Fuel pressure too high • Clogged fuel return line or bent hose Fuel pressure too low • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
7	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. Is the measured value within specified value? **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: •If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. •If out of specification as measured at this step, check or replace pressure regulator and pressure regulator vacuum hose.	206 — 235 kPa (2.1 — 2.4 kg/cm^2, 30 — 34 psi)	Go to step **8.**	Repair the following items. Fuel pressure too high • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure too low • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
8	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1)Start the engine and warm-up completely. 2)Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value within specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	70°C (158°F) — 100°C (212°F)	Go to step **9.**	Replace the engine coolant temperature sensor. <Ref. to FU(SOHC)-26, Engine Coolant Temperature Sensor.>
9	**CHECK PRESSURE SENSOR SIGNAL.** 1)Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2)Place the selector lever in “N” or “P” position. 3)Turn the A/C switch to OFF. 4)Turn all accessory switches to OFF. 5)Read the data of pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value within specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. Specification:	Idling: 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg) , Ignition ON: 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg)	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Replace the Pressure sensor. <Ref. to FU(SOHC)-33, Pressure Sensor.>

AC:DTC P0301 — CYLINDER 1 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(SOHC)-145, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AD:DTC P0302 — CYLINDER 2 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(SOHC)-145, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AE:DTC P0303 — CYLINDER 3 MISFIRE DETECTED —

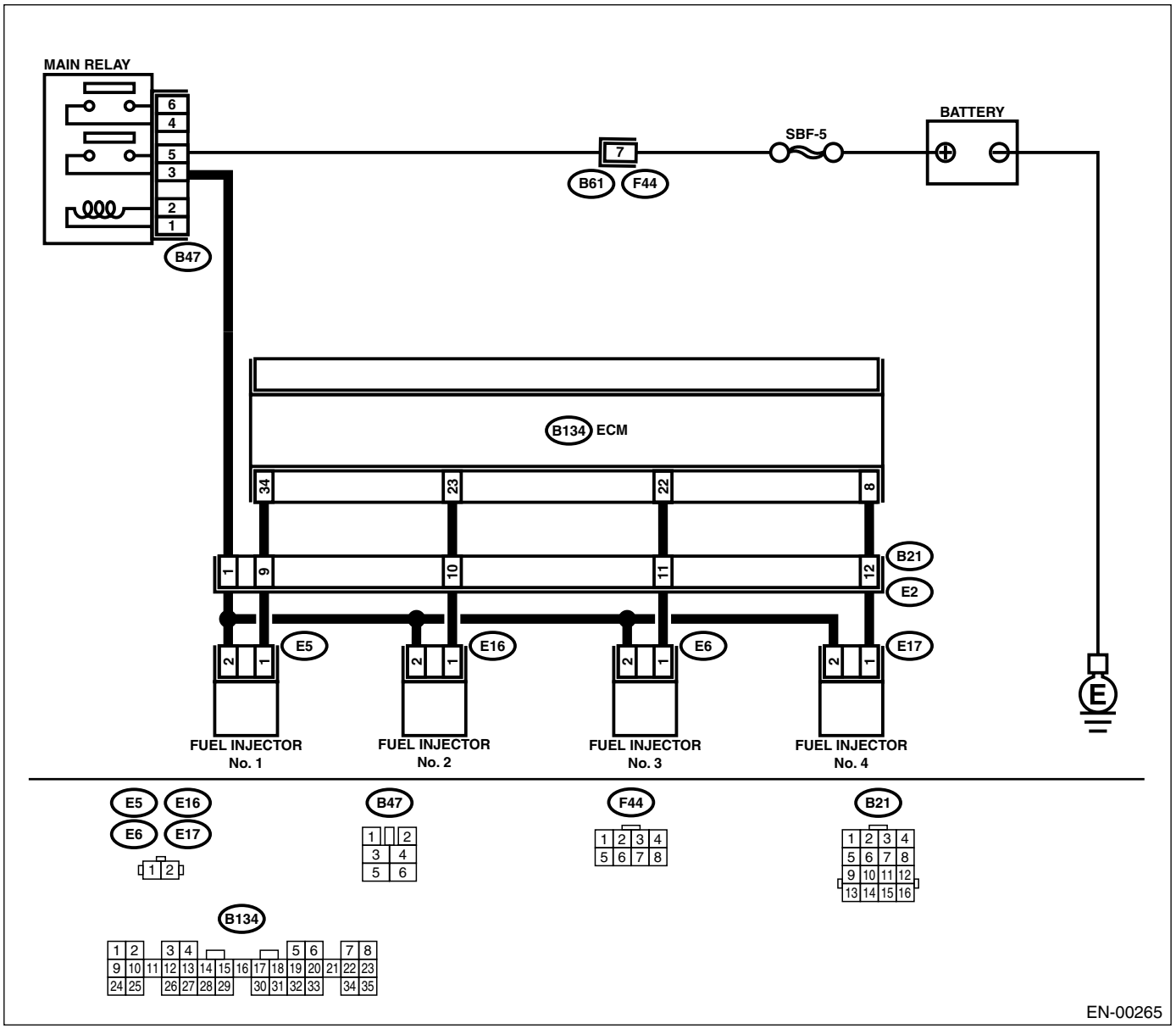
NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(SOHC)-145, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AF:DTC P0304 — CYLINDER 4 MISFIRE DETECTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - Immediately at fault recognition (A misfire which could damage catalyst occurs.)
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Erroneous idling
  - Rough driving

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0301, P0302, P0303 and P0304.	Go to step **2.**
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 34 (+) — Chassis ground (–):*** ***#2 (B134) No. 23 (+) — Chassis ground (–):*** ***#3 (B134) No. 22 (+) — Chassis ground (–):*** ***#4 (B134) No. 8 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **7.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from fuel injector on faulty cylinders. 3)Measure the voltage between ECM connector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 1 — Engine ground:*** ***#2 (E16) No. 1 — Engine ground:*** ***#3 (E6) No. 1 — Engine ground:*** ***#4 (E17) No. 1 — Engine ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **4.**	Repair ground short circuit in harness between fuel injector and ECM connector.
4	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** Measure the resistance of harness connector between ECM connector and fuel injector on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 34 — (E5) No. 1:*** ***#2 (B134) No. 23 — (E16) No. 1:*** ***#3 (B134) No. 22 — (E6) No. 1:*** ***#4 (B134) No. 8 — (E17) No. 1:*** Is the measured value less than specified value?	1 Ω	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector

	Step	Check	Yes	No
5	**CHECK FUEL INJECTOR.** Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within specified value?	5 — 20 Ω	Go to step **6.**	Replace the faulty fuel injector. <Ref. to FU(SOHC)-37, Fuel Injector.>
6	**CHECK POWER SUPPLY LINE.** 1)Turn the ignition switch to ON. 2)Measure the voltage between fuel injector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Repair poor contact in all connectors in fuel injector circuit.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel injector connector on faulty cylinders • Poor contact in coupling connector • Poor contact in main relay connector • Poor contact in fuel injector connector on faulty cylinders
7	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from fuel injector on faulty cylinder. 3)Turn the ignition switch to ON. 4)Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 34 (+) — Chassis ground (–):*** ***#2 (B134) No. 23 (+) — Chassis ground (–):*** ***#3 (B134) No. 22 (+) — Chassis ground (–):*** ***#4 (B134) No. 8 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Repair battery short circuit in harness between ECM and fuel injector. After repair, replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>	Go to step **8.**
8	**CHECK FUEL INJECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value less than specified value?	1 Ω	Replace the faulty fuel injector <Ref. to FU(SOHC)-37, Fuel Injector.> and ECM <Ref. to FU(SOHC)-46, Engine Control Module.>	Go to step **9.**
9	**CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.** Is the camshaft position sensor or crankshaft position sensor loosely installed?	Sensor is loosely installed.	Tighten camshaft position sensor or crankshaft position sensor.	Go to step **10.**

	Step	Check	Yes	No
10	**CHECK CRANKSHAFT SPROCKET.** Remove the timing belt cover. Is the crankshaft sprocket rusted or does it have broken teeth?	Sprocket is rusted or teeth is broken.	Replace the crankshaft sprocket. <Ref. to ME(SOHC)-53, Crankshaft Sprocket.>	Go to step **11.**
11	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft using ST, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block. ST 499987500CRANKSHAFT SOCKET Is the timing belt dislocated from its proper position?	Belt is dislocated.	Repair installation condition of timing belt. <Ref. to ME(SOHC)-46, Timing Belt Assembly.>	Go to step **12.**
12	**CHECK FUEL LEVEL.** Is the fuel meter indication higher than the “Lower” level?	Indication is higher than the “Lower” level.	Go to step **13.**	Replenish fuel so fuel meter indication is higher than the “Lower” level. After replenishing fuel, Go to step **13.**
13	**CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).** 1)Clear the memory using Subaru Select Monitor. <Ref. to EN(SOHC)-47, Clear Memory Mode.> 2)Start the engine, and drive the vehicle more than 10 minutes. Does the MIL illuminate or blink?	MIL illuminates or blinks.	Go to step **15.**	Go to step **14.**

	Step	Check	Yes	No
14	**CHECK CAUSE OF MISFIRE DIAGNOSED.** Was the cause of misfire identified when the engine is running. Ex. Disconnection of spark plug cord.	Cause of misfire is identified.	Finish diagnostics operation, if the engine has no abnormality.	1. Repair poor contact. NOTE: In this case, repair the following: • Poor contact in ignitor connector • Poor contact in ignition coil connector • Poor contact in fuel injector connector on faulty cylinders • Poor contact in ECM connector • Poor contact in coupling connector 2. If there is no poor contact, check the followings and contact with your Subaru distributor service. • Fuel condition • Whether addition agent is used or not • Plug condition • Plug cord condition • Engine oil condition
15	**CHECK AIR INTAKE SYSTEM.** Is there a fault in air intake system?	There is a fault.	Repair air intake system. NOTE: Check the following items: • Are there air leaks or air suction caused by loose or dislocated nuts and bolts? • Are there cracks or any disconnection of hoses?	Go to step **16.**

	Step	Check	Yes	No
16	**CHECK MISFIRE SYMPTOM.** 1)Turn the ignition switch to ON. 2)Read the diagnostic trouble code (DTC). •Subaru Select Monitor <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool Does the Subaru Select Monitor or OBD-II general scan tool display only one DTC? For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual. NOTE: Perform diagnosis according to the items listed below.	Only one DTC is displayed.	Go to step **21.**	Go to step **17.**
17	**CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Go to step **22.**	Go to step **18.**
18	**CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Go to step **23.**	Go to step **19.**
19	**CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Go to step **24.**	Go to step **20.**
20	**CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Go to step **25.**	Go to step **26.**
21	**ONLY ONE CYLINDER** Is there a fault in that cylinder?	There is a fault.	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Spark plug cord • Fuel injector • Compression ratio	Go to DTC P0171. <Ref. to EN(SOHC)-141, DTC P0171 — SYSTEM TOO LEAN (BANK 1) — , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	**GROUP OF #1 AND #2 CYLINDERS** Are there faults in #1 and #2 cylinders?	There are faults.	Repair or replace faulty parts. NOTE: • Check the following items. • Spark plugs • Fuel injectors • Ignition coil • Compression ratio • If no abnormal is discovered, check for “IGNITION CONTROL SYSTEM” of #1 and #2 cylinders side. <Ref. to EN(SOHC)-67, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Go to DTC P0171. <Ref. to EN(SOHC)-141, DTC P0171 — SYSTEM TOO LEAN (BANK 1) — , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

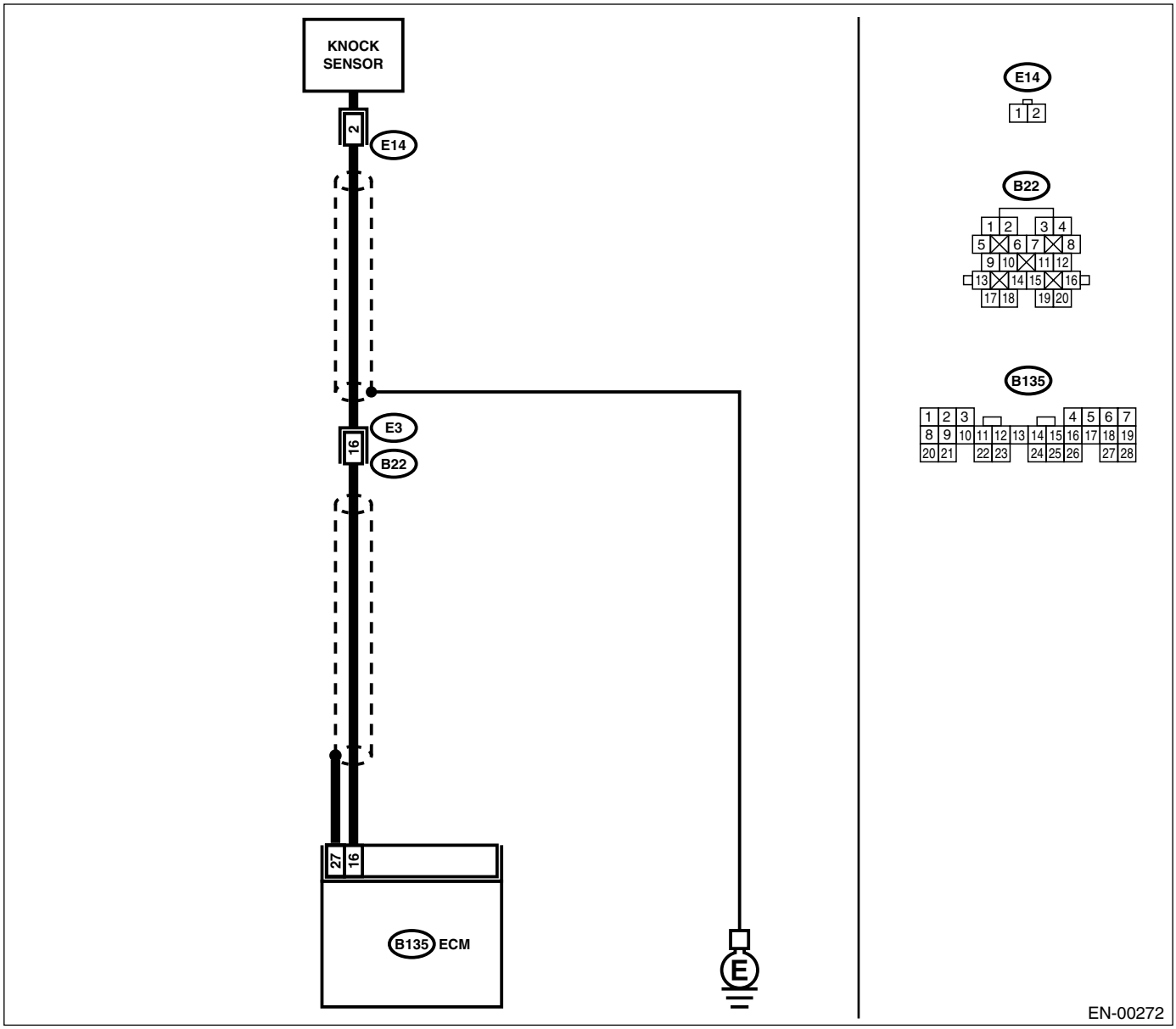
	Step	Check	Yes	No
23	**GROUP OF #3 AND #4 CYLINDERS** Are there faults in #3 and #4 cylinders?	There are faults.	Repair or replace faulty parts. NOTE: • Check the following items. • Spark plugs • Fuel injectors • Ignition coil • If no abnormal is discovered, check for "16. D: IGNITION CONTROL SYSTEM" of #3 and #4 cylinders side. <Ref. to EN(SOHC)-67, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Go to DTC P0171. <Ref. to EN(SOHC)-141, DTC P0171 — SYSTEM TOO LEAN (BANK 1) — , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	**GROUP OF #1 AND #3 CYLINDERS** Are there faults in #1 and #3 cylinders?	There are faults.	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Skipping timing belt teeth	Go to DTC P0171. <Ref. to EN(SOHC)-141, DTC P0171 — SYSTEM TOO LEAN (BANK 1) — , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
25	**GROUP OF #2 AND #4 CYLINDERS** Are there faults in #2 and #4 cylinders?	There are faults.	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Compression ratio • Skipping timing belt teeth	Go to DTC P0171. <Ref. to EN(SOHC)-141, DTC P0171 — SYSTEM TOO LEAN (BANK 1) — , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
26	**CYLINDER AT RANDOM** Is the engine idle rough?	Engine idle is rough.	Go to DTC P0170. <Ref. to EN(SOHC)-141, DTC P0171 — SYSTEM TOO LEAN (BANK 1) — , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Compression ratio

AG:DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Poor driving performance
  - Knocking occurs.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



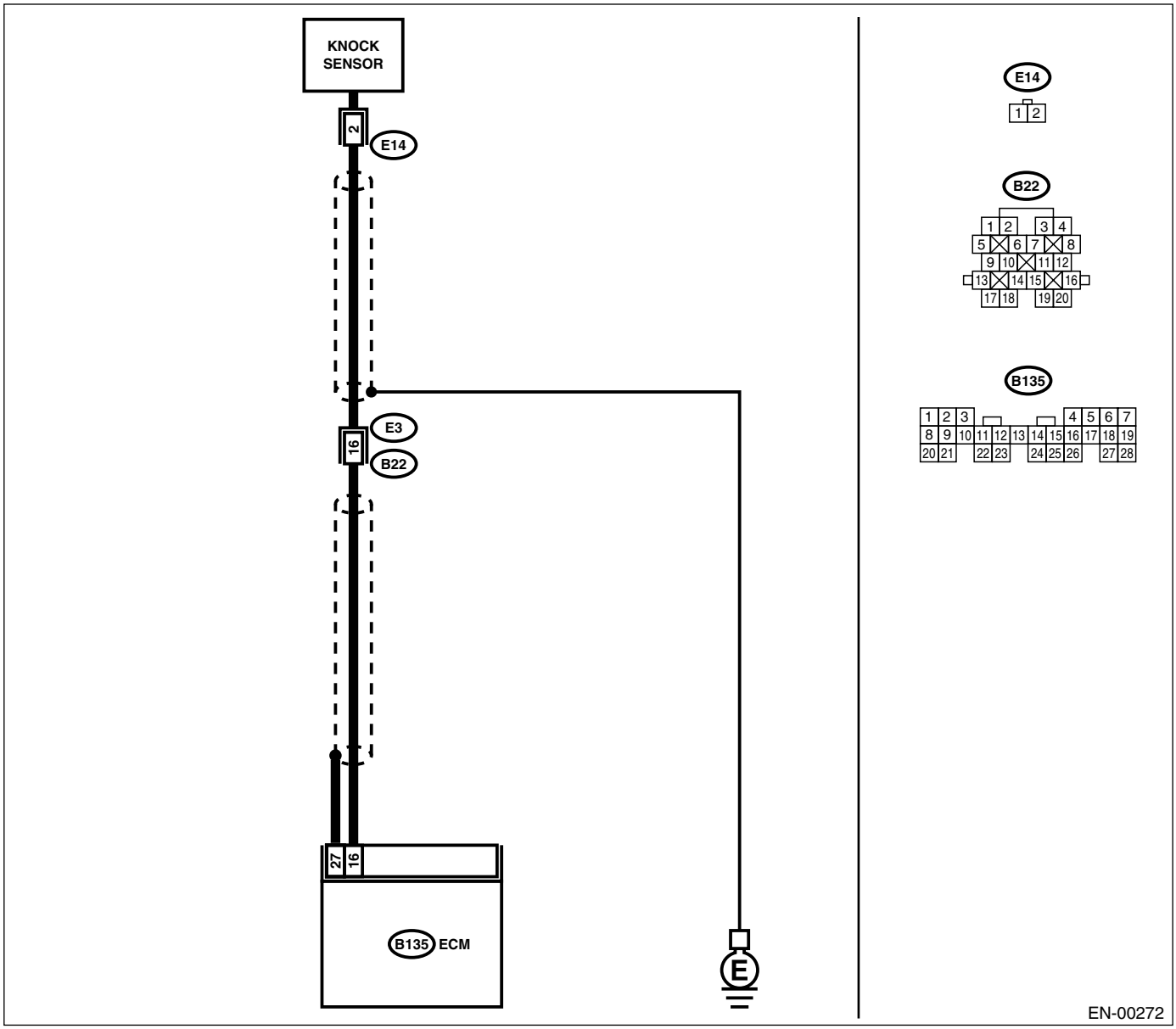
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance between ECM harness connector and chassis ground. ***Connector & terminal*** ***(B135) No. 16 — Chassis ground:*** Is the measured value more than specified value?	700 kΩ	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector
2	**CHECK KNOCK SENSOR.** 1)Disconnect the connector from knock sensor. 2)Measure the resistance between knock sensor connector terminal and engine ground. ***Terminal*** ***No. 2 — Engine ground:*** Is the measured value more than specified value?	700 kΩ	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector
3	**CHECK CONDITION OF KNOCK SENSOR INSTALLATION.** Is the knock sensor installation bolt tightened securely?	Bolt is tightened securely.	Replace the knock sensor. <Ref. to FU(SOHC)-29, Knock Sensor.>	Tighten knock sensor installation bolt securely.

AH:DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Poor driving performance
  - Knocking occurs.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



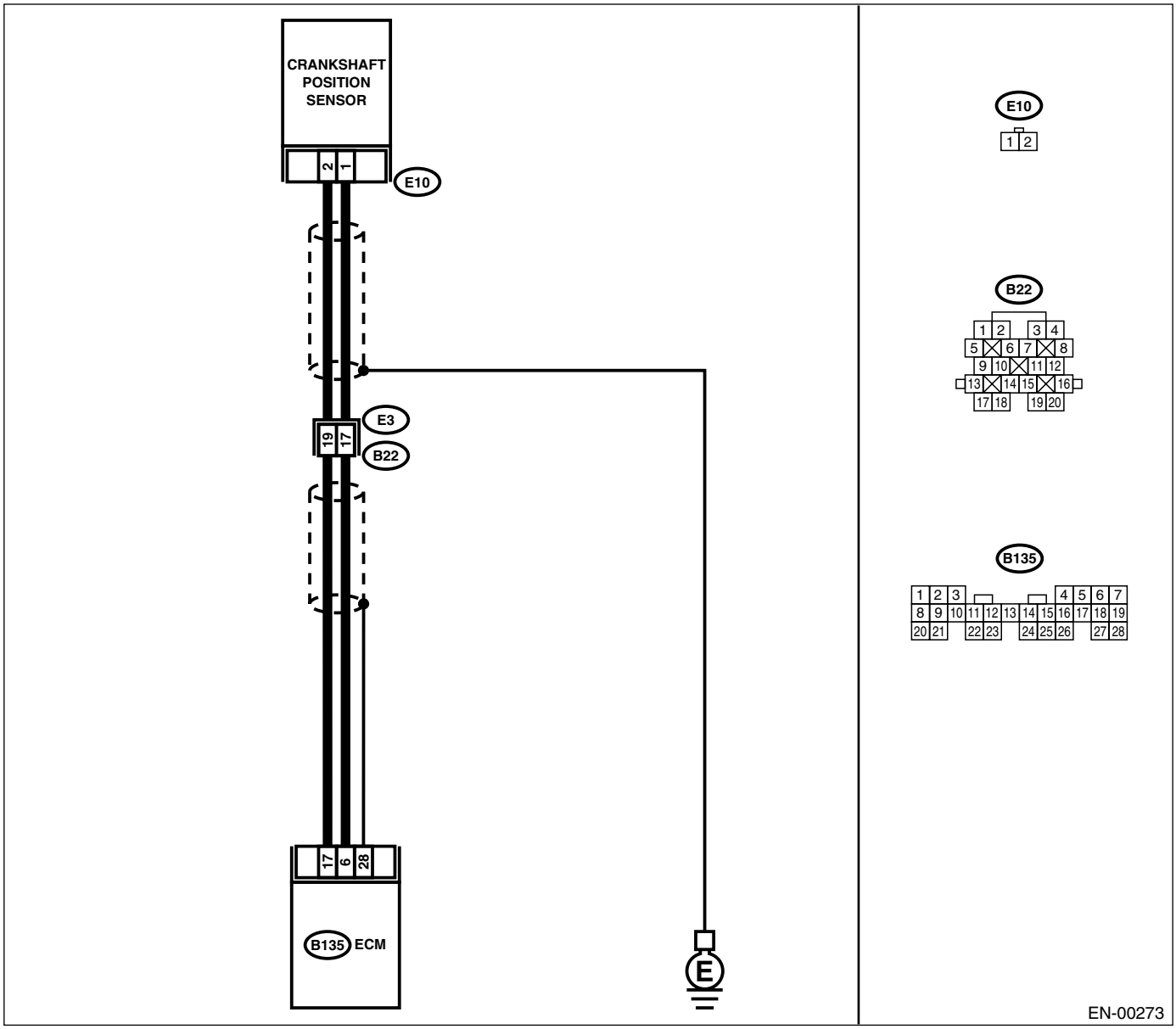
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 16 — Chassis ground:*** Is the measured value less than specified value?	400 kΩ	Go to step **2.**	Go to step **3.**
2	**CHECK KNOCK SENSOR.** 1)Disconnect the connector from knock sensor. 2)Measure the resistance between knock sensor connector terminal and engine ground. ***Terminal*** ***No. 2 — Engine ground:*** Is the measured value less than specified value?	400 kΩ	Replace the knock sensor. <Ref. to FU(SOHC)-29, Knock Sensor.>	Repair ground short circuit in harness between knock sensor connector and ECM connector. NOTE: The harness between both connectors is shielded. Repair short circuit of harness together with shield.
3	**CHECK INPUT SIGNAL FOR ECM.** 1)Connect the connectors to ECM and knock sensor. 2)Turn the ignition switch to ON. 3)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 16 (+) — Chassis ground (–):*** Is the measured value more than specified value?	2 V	Even if MIL lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in knock sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Repair poor contact in ECM connector.

AI: DTC P0335 — CRANKSHAFT POSITION SENSOR "A" CIRCUIT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



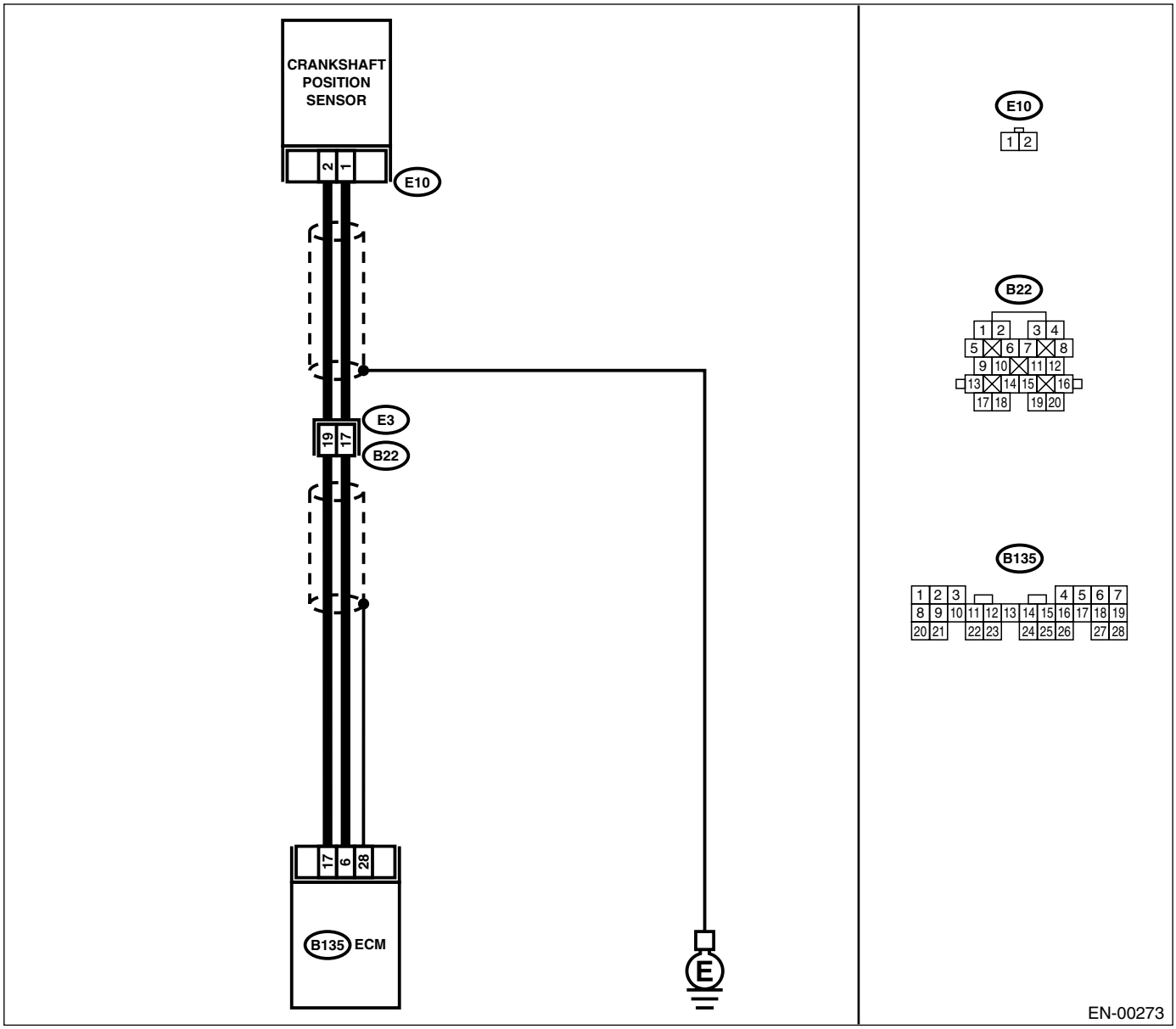
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from crankshaft position sensor. 3)Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:*** Is the measured value more than specified value?	100 kΩ	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector	Go to step **2.**
2	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:*** Is the measured value less than specified value?	10 Ω	Repair ground short circuit in harness between crankshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.	Go to step **3.**
3	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 2 — Engine ground:*** Is the measured value less than specified value? Is the measured value less than specified value?	5 Ω	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
4	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.** Is the crankshaft position sensor installation bolt tightened securely?	Bolt is tightened securely.	Go to step **5.**	Tighten crankshaft position sensor installation bolt securely.
5	**CHECK CRANKSHAFT POSITION SENSOR.** 1)Remove the crankshaft position sensor. 2)Measure the resistance between connector terminals of crankshaft position sensor. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within specified value?	1 — 4 kΩ	Repair poor contact in crankshaft position sensor connector.	Replace the crankshaft position sensor. <Ref. to FU(SOHC)-27, Crankshaft Position Sensor.>

AJ:DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/ PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



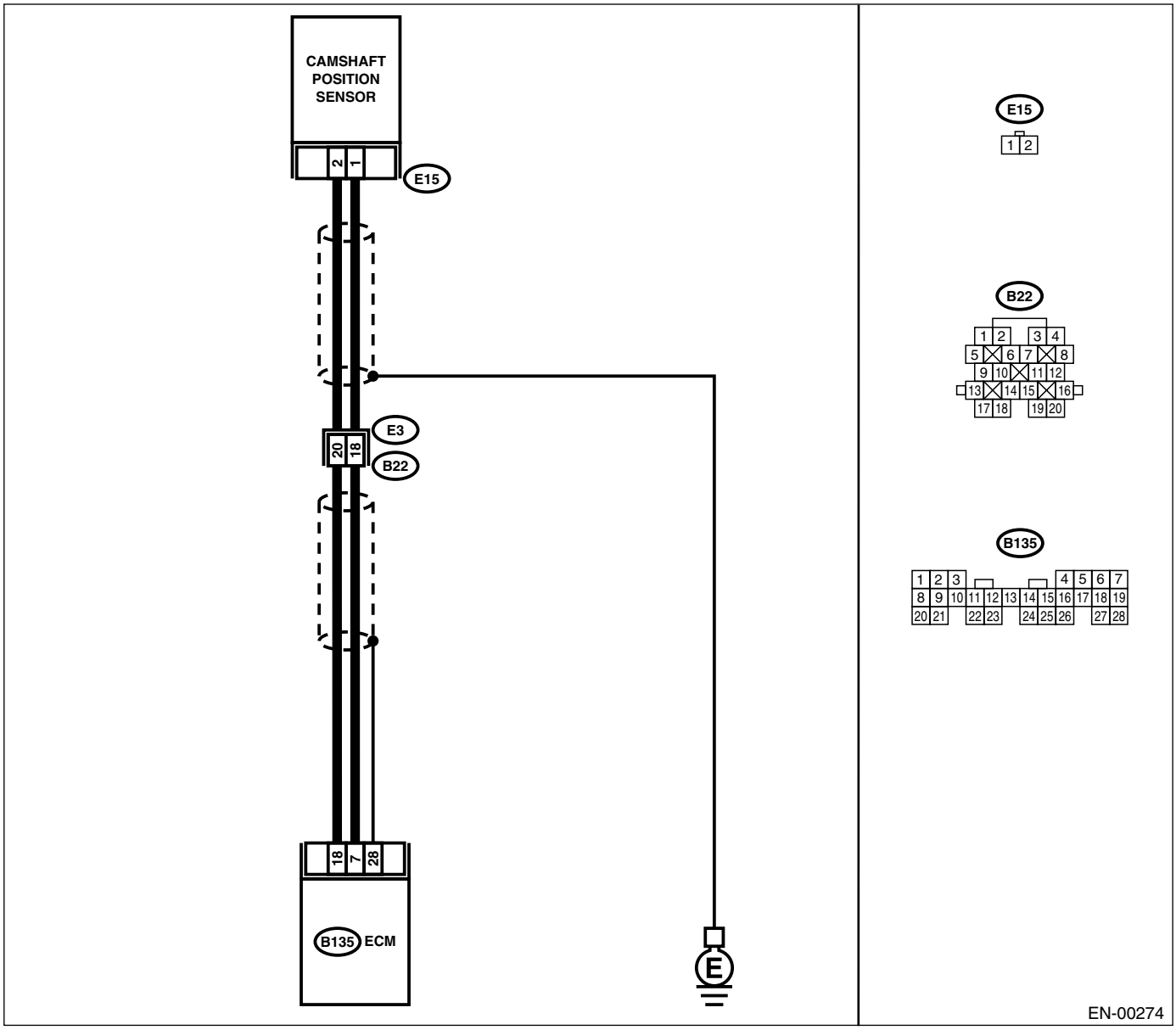
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect DTC P0335 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.** Turn the ignition switch to OFF. Is the crankshaft position sensor installation bolt tightened securely?	Bolt is tightened security.	Go to step **3.**	Tighten crankshaft position sensor installation bolt securely.
3	**CHECK CRANKSHAFT SPROCKET.** Remove the front belt cover. Are crankshaft sprocket teeth cracked or damaged?	There is crack or damage.	Replace the crankshaft sprocket. <Ref. to ME(SOHC)-53, Crankshaft Sprocket.>	Go to step **4.**
4	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft using ST, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block. ST 499987500CRANKSHAFT SOCKET Is the timing belt dislocated from its proper position?	Belt is dislocated.	Repair installation condition of timing belt. <Ref. to ME(SOHC)-46, Timing Belt Assembly.>	Replace the crankshaft position sensor. <Ref. to <Ref. to FU(SOHC)-27, Crankshaft Position Sensor.>

AK:DTC P0340 — CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



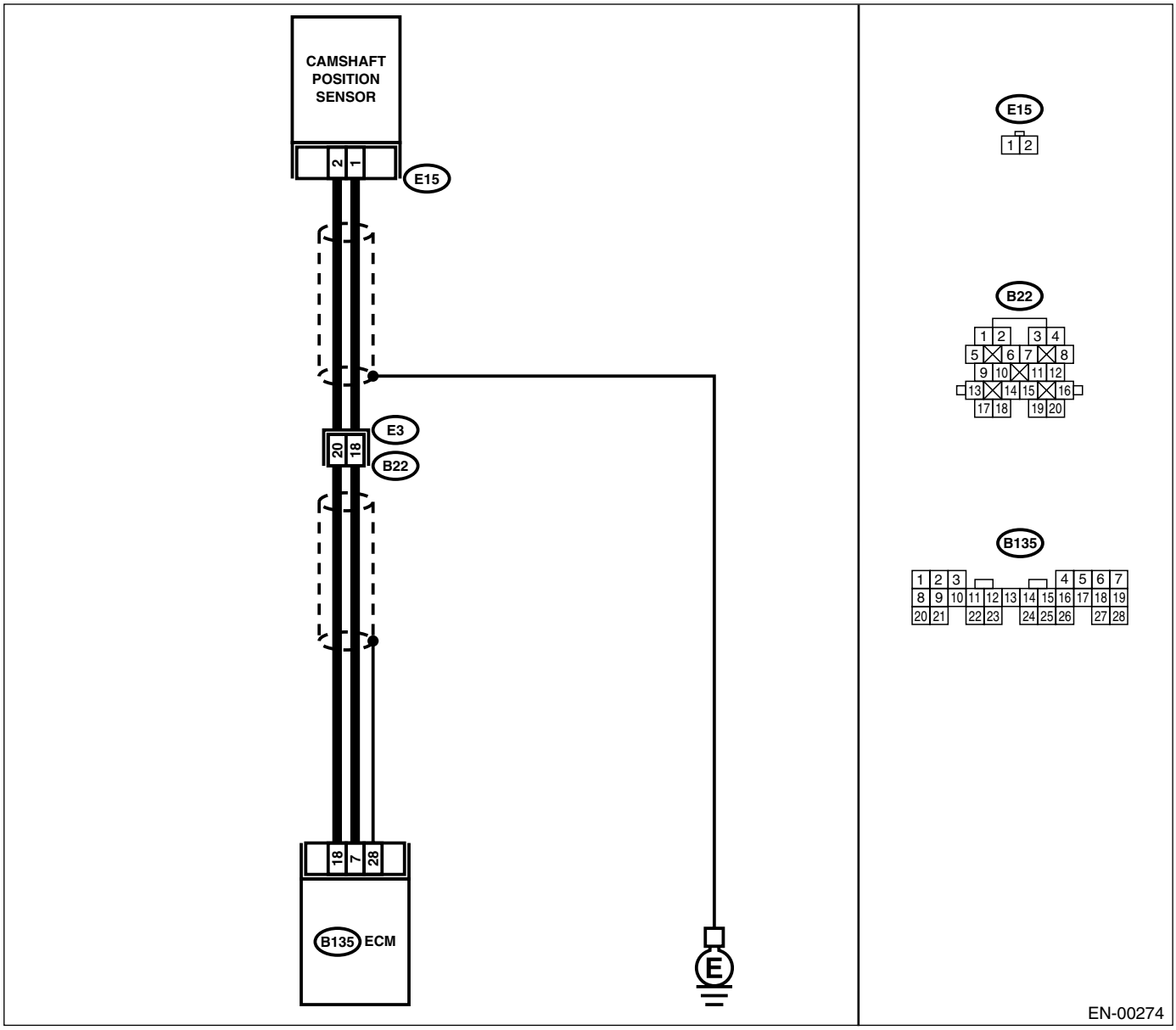
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from camshaft position sensor. 3)Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:*** Is the measured value more than specified value?	100 kΩ	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector	Go to step **2.**
2	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:*** Is the measured value less than specified value?	10 Ω	Repair ground short circuit in harness between camshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.	Go to step **3.**
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 2 — Engine ground:*** Is the measured value less than specified value?	5 Ω	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
4	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.** Is the camshaft position sensor installation bolt tightened securely?	Bolt is tightened securely.	Go to step **5.**	Tighten camshaft position sensor installation bolt securely.
5	**CHECK CAMSHAFT POSITION SENSOR.** 1)Remove the camshaft position sensor. 2)Measure the resistance between connector terminals of camshaft position sensor. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within specified value?	1 — 4 kΩ	Repair poor contact in camshaft position sensor connector.	Replace the camshaft position sensor. <Ref. to FU(SOHC)-28, Camshaft Position Sensor.>

AL:DTC P0341 — CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from camshaft position sensor. 3)Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:*** Is the measured value more than specified value?	100 kΩ	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector	Go to step **3.**
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:*** Is the measured value less than specified value?	10 Ω	Repair ground short circuit in harness between camshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.	Go to step **4.**
4	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 2 — Engine ground:*** Is the measured value less than specified value?	5 Ω	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
5	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.** Is the camshaft position sensor installation bolt tightened securely?	Bolt is tightened securely.	Go to step **6.**	Tighten camshaft position sensor installation bolt securely.

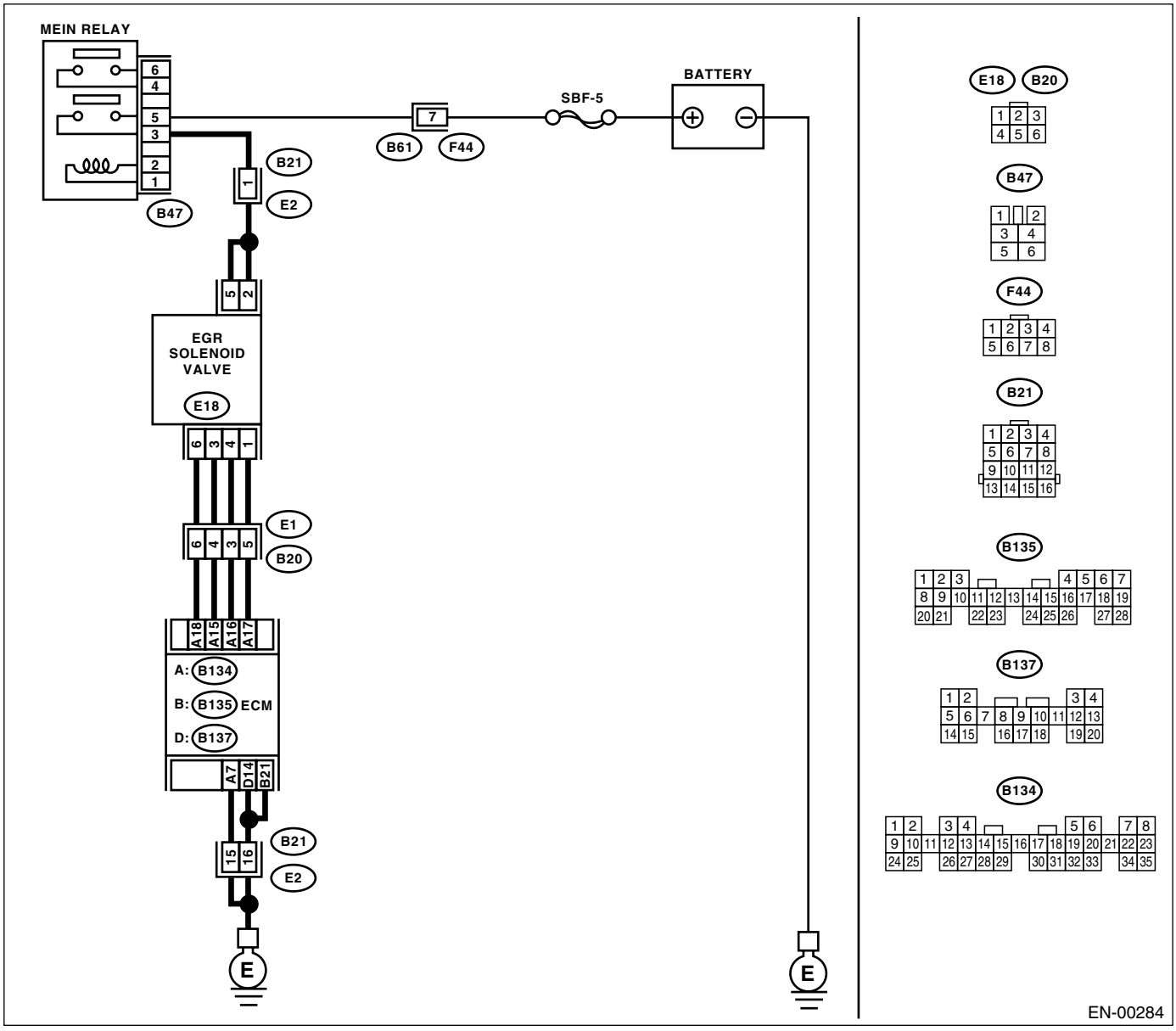
	Step	Check	Yes	No
6	**CHECK CAMSHAFT POSITION SENSOR.** 1)Remove the camshaft position sensor. 2)Measure the resistance between connector terminals of camshaft position sensor. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within specified value?	1 — 4 kΩ	Go to step **7.**	Replace the camshaft position sensor. <Ref. to FU(SOHC)-28, Camshaft Position Sensor.>
7	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.** Turn the ignition switch to OFF. Is the camshaft position sensor installation bolt tightened securely?	Bolt is tightened securely.	Go to step **8.**	Tighten camshaft position sensor installation bolt securely.
8	**CHECK CAMSHAFT SPROCKET.** Remove the front belt cover. <Ref. to ME(SOHC)-45, Belt Cover.> Are camshaft sprocket teeth cracked or damaged?	There is crack or damage.	Replace the camshaft sprocket. <Ref. to ME(SOHC)-51, Camshaft Sprocket.>	Go to step **9.**
9	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the camshaft using ST, and align alignment mark on camshaft sprocket with alignment mark on timing belt cover LH. ST 499207100 CAMSHAFT SPROCKET WRENCH Is the timing belt dislocated from its proper position?	Belt is dislocated.	Repair installation condition of timing belt. <Ref. to ME(SOHC)-46, Timing Belt Assembly.>	Replace the camshaft position sensor. <Ref. to FU(SOHC)-28, Camshaft Position Sensor.>

AM:DTC P0400 — EXHAUST GAS RECIRCULATION FLOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Poor driving performance on low engine speed
  - Erroneous idling
  - Poor driving performance.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is there any other DTC on display?	Other DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CURRENT DATA.** 1)Start engine. 2)Rear the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value more than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	53.3 kPa (400 mmHg, 15.75 inHg)	Check if EGR valve, intake manifold pressure sensor and throttle body are securely installed.	Go to step **3.**
3	**CHECK POWER SUPPLY TO EGR SOLENOID VALVE.** 1)Disconnect connector from EGR solenoid valve. 2)Turn ignition switch to ON. 3)Measure voltage between EGR solenoid valve and engine ground. ***Connector & terminal*** ***(E18) No. 2 — Engine ground:*** ***(E18) No. 5 — Engine ground:*** Is the measured value more than specified value?	10 V	Go to step **4.**	Repair open circuit in harness between main relay and EGR solenoid valve connector.
4	**CHECK EGR SOLENOID VALVE.** Measure resistance between EGR solenoid valve terminals. NOTE: Make sure there are no foreign objects caught between EGR solenoid valve and valve seat. ***Terminals*** ***No. 1 — No. 2:*** ***No. 3 — No. 2:*** ***No. 4 — No. 5:*** ***No. 6 — No. 5:*** Is the measured value within specified value?	20 — 30 Ω	Go to step **5.**	Replace EGR solenoid valve. <Ref. to EC(SOHC)-7, EGR Valve.>

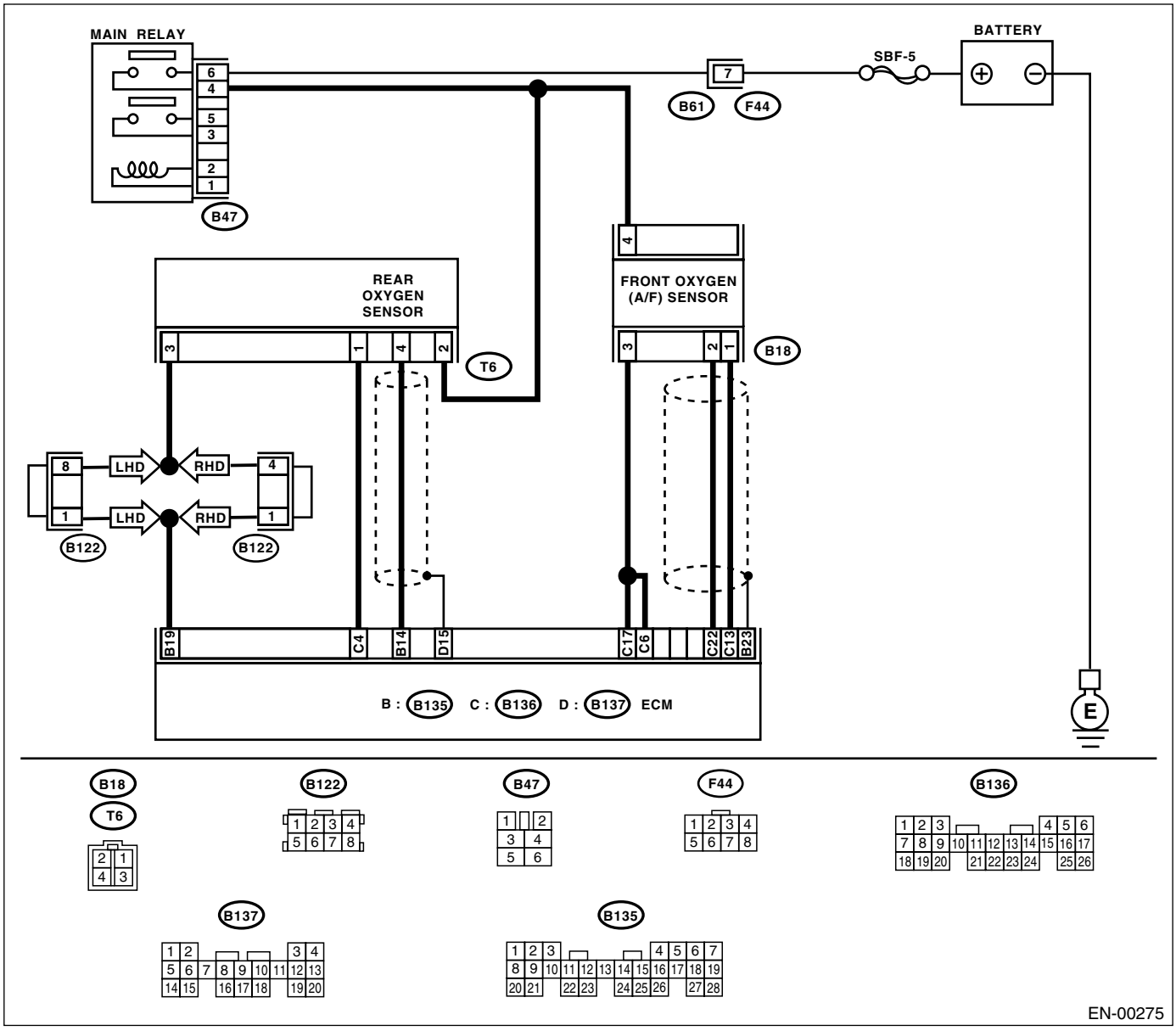
	Step	Check	Yes	No
5	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn ignition switch to OFF. 2)Connect connectors to ECM and EGR solenoid valve. 3)Turn ignition switch to ON. 4)Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 15 — Chassis ground:*** ***(B134) No. 16 — Chassis ground:*** ***(B134) No. 17 — Chassis ground:*** ***(B134) No. 18 — Chassis ground:*** Is the measured value within specified value?	0 — 10 V	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN EGR SOLENOID VALVE AND ECM CONNECTOR.** 1)Turn ignition switch to OFF. 2)Disconnect connectors from EGR solenoid valve and ECM. 3)Measure resistance of harness between EGR solenoid valve and ECM connector. ***Connector & terminal*** ***(B134) No. 18 — (E18) No. 6:*** ***(B134) No. 17 — (E18) No. 1:*** ***(B134) No. 16 — (E18) No. 4:*** ***(B134) No. 15 — (E18) No. 3:*** Is the measured value less than specified value?	1 Ω	Go to step **7.**	Repair open circuit in harness between ECM and EGR solenoid valve connector.
7	**CHECK HARNESS BETWEEN EGR SOLENOID VALVE AND ECM CONNECTOR.** Measure resistance of harness between EGR solenoid valve and chassis ground. ***Connector & terminal*** ***(B134) No. 15 — Chassis ground:*** ***(B134) No. 16 — Chassis ground:*** ***(B134) No. 17 — Chassis ground:*** ***(B134) No. 18 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **8.**	Repair short circuit in harness between main relay and EGR solenoid valve connector.
8	**CHECK POOR CONTACT.** Check poor contact in ECM and EGR solenoid valve connector. Is there poor contact in ECM and EGR solenoid valve connector?	Poor contact occurs.	Repair poor contact in ECM and EGR solenoid valve connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time.

AN:DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Idle mixture is out of specifications.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



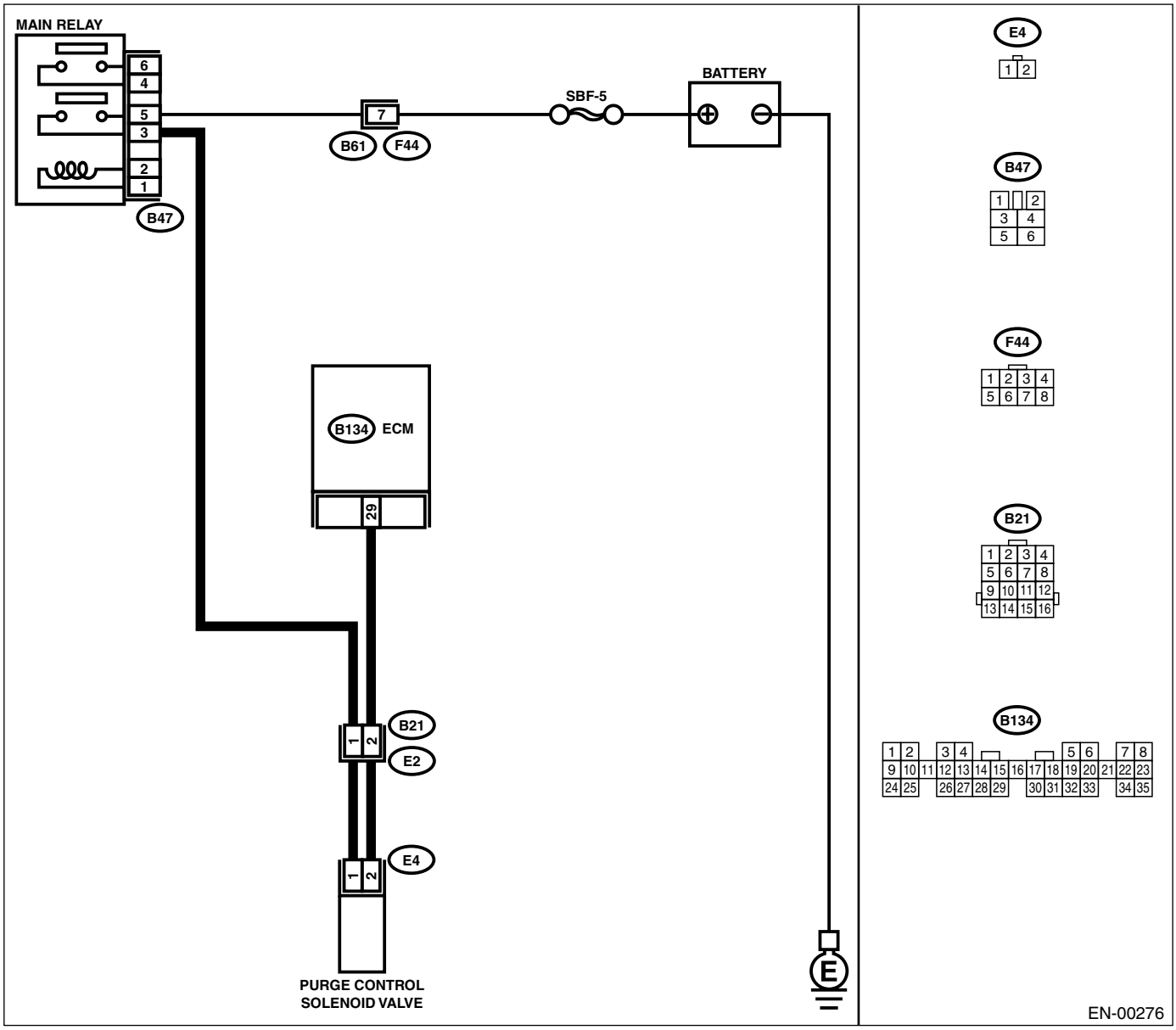
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0420.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes. Is there a fault in exhaust system? NOTE: Check the following positions. •Between cylinder head and front exhaust pipe •Between front exhaust pipe and front catalytic converter •Between front catalytic converter and rear catalytic converter	There is a fault.	Repair or replace the exhaust system. <Ref. to EX(SOHC)-2, General Description.>	Go to step **3.**
3	**CHECK CATALYTIC CONVERTER.** Remove the catalytic converter. Is there damage at rear face or front face of front catalyst?	There is damage.	Replace the catalytic converter. <Ref. to EC(SOHC)-3, Front Catalytic Converter.>	Go to step **5.**
4	**CHECK REAR OXYGEN SENSOR GROUND HARNESS.** 1)Disconnect the rear oxygen sensor and ECM connectors. 2)Measure the resistance between rear oxygen sensor connector and ECM connector. ***Connector & terminal*** ***(T6) No. 3 — (B135) No. 19:*** Is the measured value less than specified value?	1 Ω	Go to step **5.**	Repair the open circuit in harness between ECM and rear oxygen sensor.
5	**CHECK SHIELD HARNESS.** Is the shield harness opened?	Shield harness is not opened.	Contact with your Subaru distributor service.	Repair the shield harness.

AO:DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 29 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Even if MIL lights up, the circuit has returned to a normal condition at this time. Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Go to step **2.**
2	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from purge control solenoid valve and ECM. 3)Measure the resistance of harness between purge control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E4) No. 2 — Engine ground:*** Is the measured value less than specified value?	1 MΩ	Go to step **3.**	Repair ground short circuit in harness between ECM and purge control solenoid valve connector.
3	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and purge control solenoid valve of harness connector. ***Connector & terminal*** ***(B134) No. 29 — (E4) No. 2:*** Is the measured value less than specified value?	1 Ω	Go to step **4.**	Repair open circuit in harness between ECM and purge control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and purge control solenoid valve connector • Poor contact in coupling connector
4	**CHECK PURGE CONTROL SOLENOID VALVE.** 1)Remove the purge control solenoid valve. 2)Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within specified value?	10 — 100 Ω	Go to step **5.**	Replace the purge control solenoid valve. <Ref. to EC(SOHC)-9, Purge Control Solenoid Valve.>

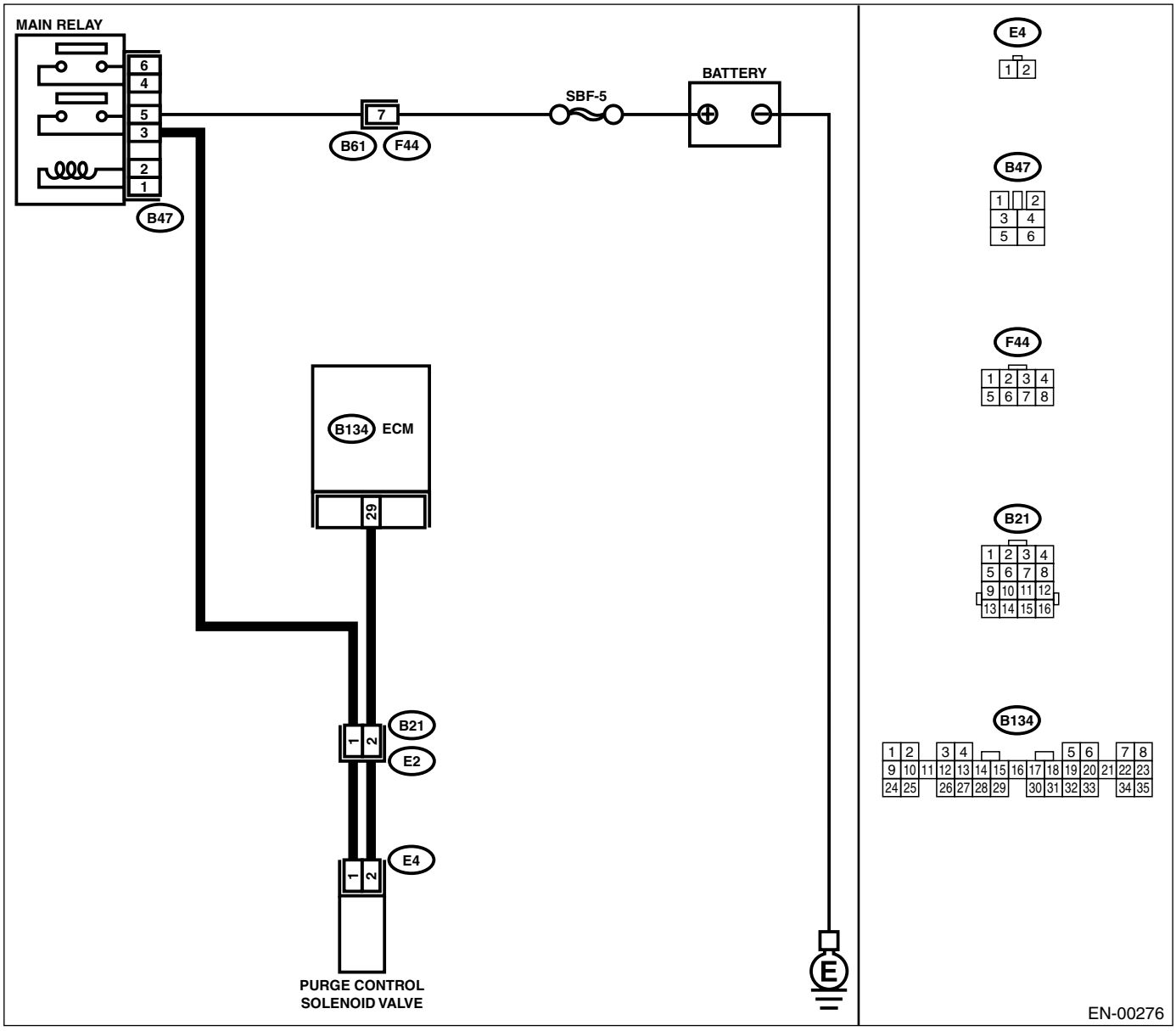
	Step	Check	Yes	No
5	**CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.** 1)Turn the ignition switch to ON. 2)Measure the voltage between purge control solenoid valve and engine ground. ***Connector & terminal*** ***(E4) No. 1 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Go to step **6.**	Repair open circuit in harness between main relay and purge control solenoid valve connector.
6	**CHECK POOR CONTACT.** Check poor contact in purge control solenoid valve connector. Is there poor contact in purge control solenoid valve connector?	Poor contact occurs.	Repair poor contact in purge control solenoid valve connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AP:DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to OFF. 2)Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3)Turn the ignition switch to ON. 4)While operating the purge control solenoid valve, measure voltage between ECM and chassis ground. Is the change of measured value within specified value? NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(SOHC)-48, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 29 (+) — Chassis ground (–):***	0 — 10 V	Go to step **2.**	Even if MIL light up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 29 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **4.**	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>
4	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from purge control solenoid valve. 3)Turn the ignition switch to ON. 4)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 29 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Repair battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>	Go to step **5.**
5	**CHECK PURGE CONTROL SOLENOID VALVE.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value less than specified value?	1 Ω	Replace the purge control solenoid valve <Ref. to EC(SOHC)-9, Purge Control Solenoid Valve.> and ECM <Ref. to FU(SOHC)-46, Engine Control Module.>	Go to step **6.**

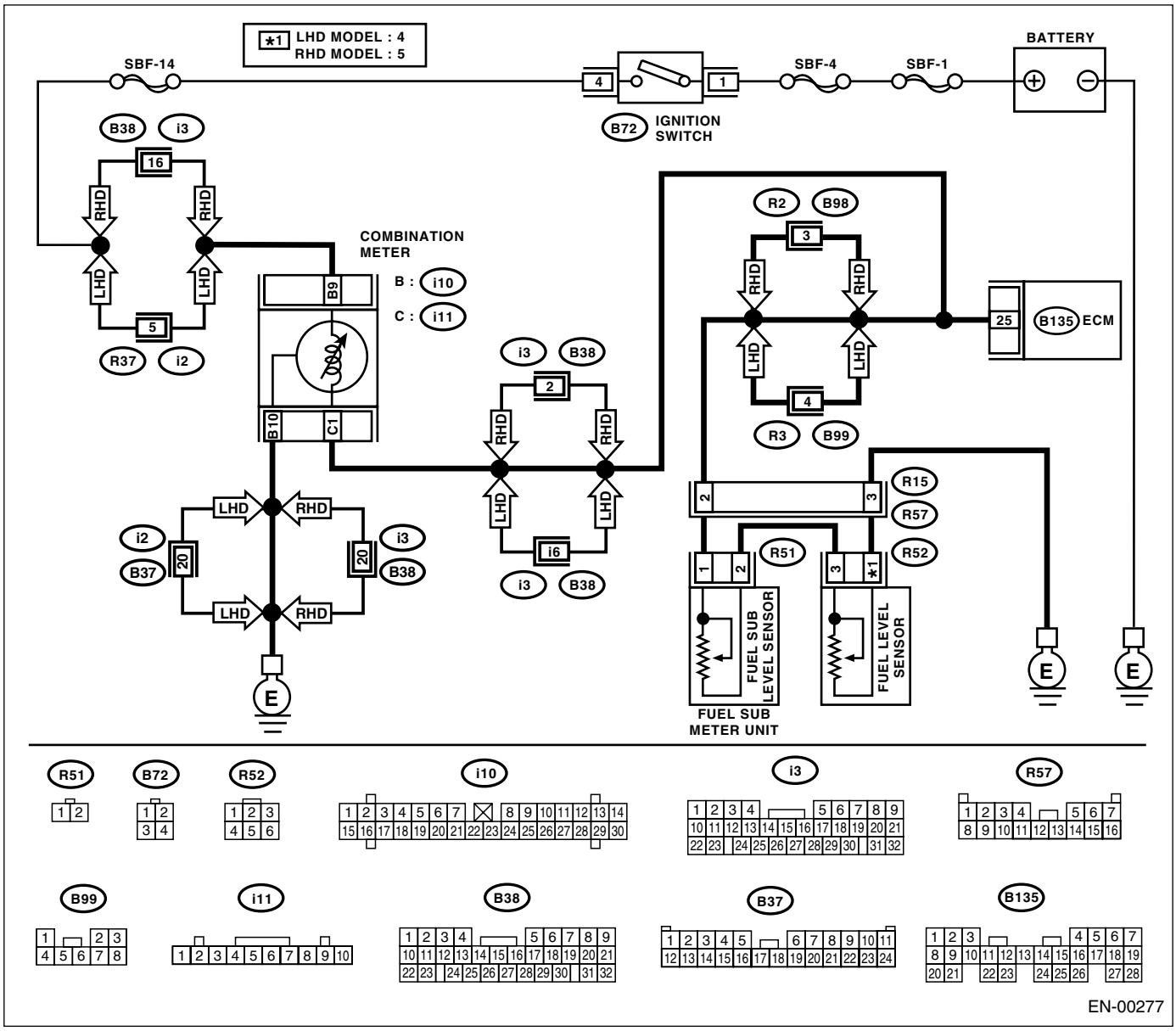
	Step	Check	Yes	No
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>

AQ:DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



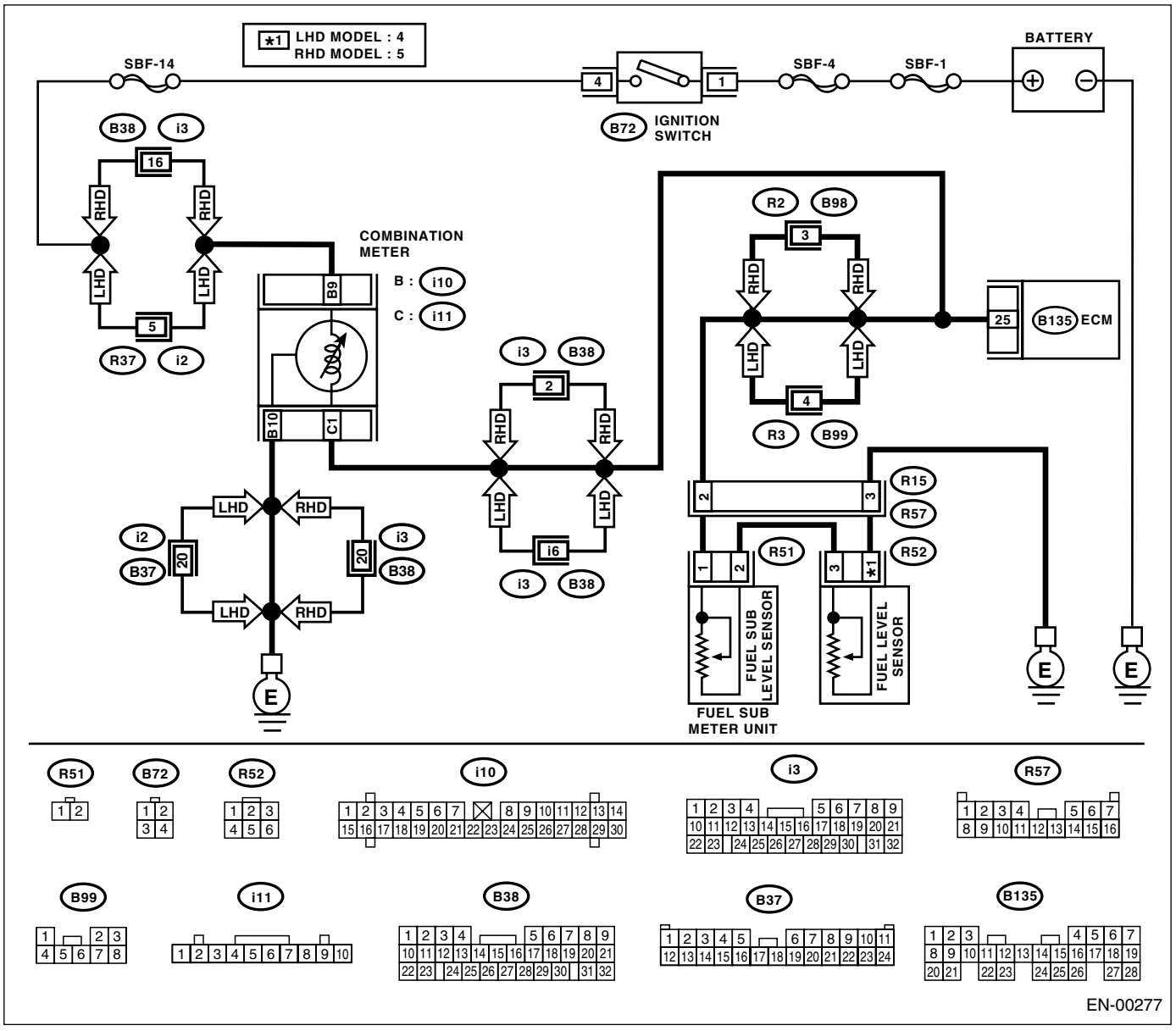
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect this trouble.	Replace the fuel level sensor <Ref. to FU(SOHC)-59, Fuel Level Sensor.> and fuel sub level sensor <Ref. to FU(SOHC)-59, Fuel Level Sensor.>

AR:DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.** Does the speedometer and tachometer operate normally?	Meters operate normally.	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>

	Step	Check	Yes	No
2	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. (Engine OFF) 2)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (–):*** Is the measured value less than specified value?	0.12 V	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read the data of fuel level sensor signal using Subaru Select Monitor. Shake the ECM harness and connector, while monitoring value of voltage meter. Is the measured value less than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.>	0.12 V	Repair poor contact in ECM connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in combination meter connector • Poor contact in ECM connector • Poor contact in coupling connectors
4	**CHECK INPUT VOLTAGE OF ECM.** 1)Turn the ignition switch to OFF. 2)Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3)Turn the ignition switch to ON. 4)Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (–):*** Is the measured value more than specified value?	0.12 V	Go to step **5.**	Go to step **6.**
5	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from connector (i10) and ECM connector. 3)Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 25 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **7.**	Repair ground short circuit in harness between ECM and combination meter connector.
6	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** Measure the resistance between ECM and combination meter connector. ***Connector & terminal*** ***(B135) No. 25 — (i10) No. 3:*** Is the measured value less than specified value?	10 Ω	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>	Repair open circuit between ECM and combination meter connector. NOTE: In this case, repair the following: Poor contact in coupling connector

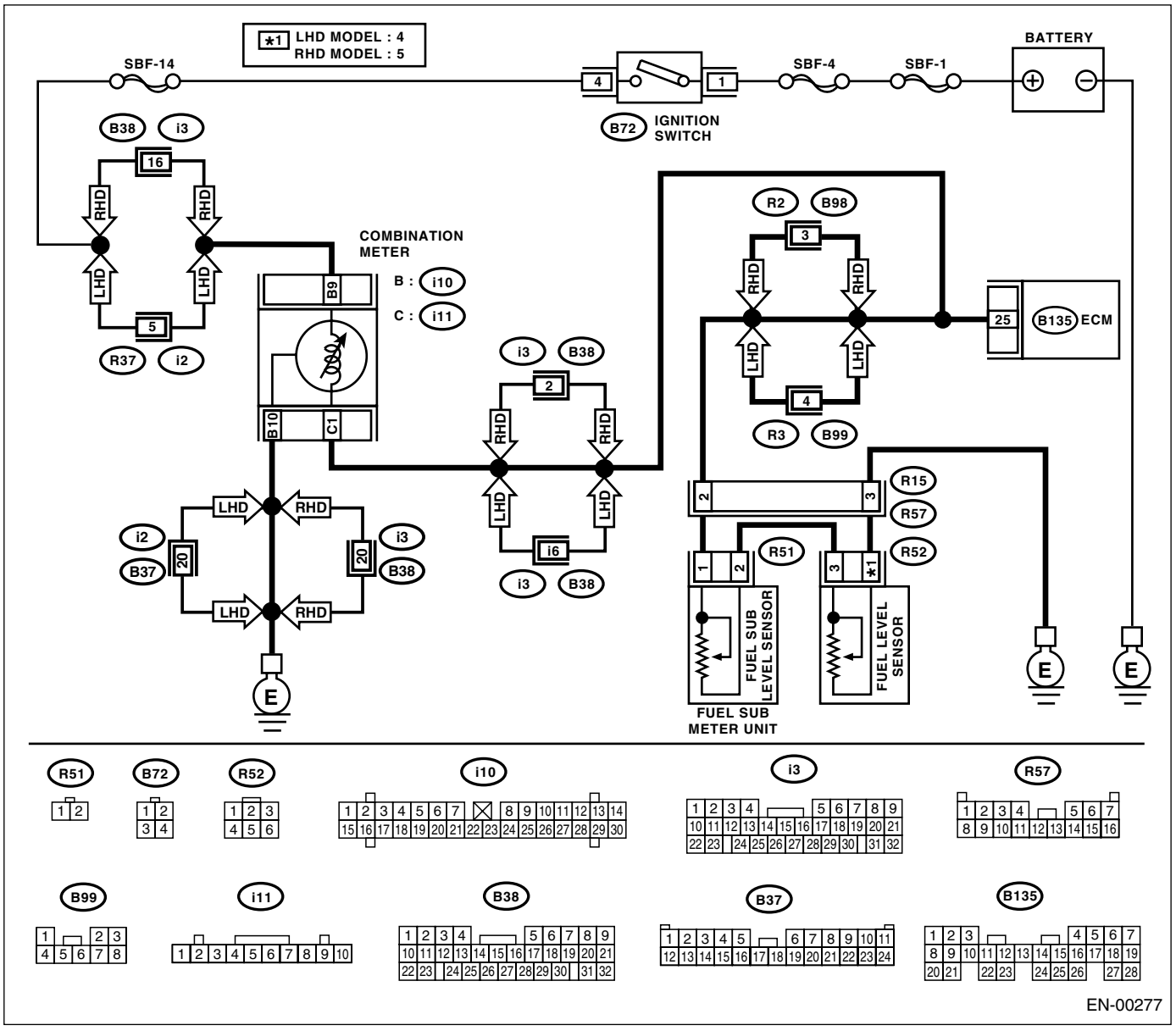
	Step	Check	Yes	No
7	**CHECK FUEL TANK CORD.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from fuel sub level sensor. 3)Measure the resistance between fuel sub level sensor and chassis ground. ***Connector & terminal*** ***(R51) No. 1 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **8.**	Repair ground short circuit in fuel tank cord.
8	**CHECK FUEL TANK CORD.** 1)Disconnect the connector from fuel pump assembly. 2)Measure the resistance between fuel pump assembly and chassis ground. ***Connector & terminal*** ***(R51) No. 2 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **9.**	Repair ground short circuit in fuel tank cord.
9	**CHECK FUEL LEVEL SENSOR.** 1)Remove the fuel pump assembly. <Ref. to FU(SOHC)-57, Fuel Pump.> 2)Measure the resistance between fuel level sensor and terminals with its float set to the full position. ***Terminals*** ***RHD model*** ***No. 3 — No. 5:*** ***LHD model*** ***No. 3 — No. 4:*** Is the measured value within specified value?	0.5 — 2.5 Ω	Go to step **10.**	Replace the fuel level sensor.
10	**CHECK FUEL SUB LEVEL SENSOR.** 1)Remove the fuel sub level sensor. <Ref. to FU(SOHC)-60, Fuel Sub Level Sensor.> 2)Measure the resistance between fuel sub level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within specified value?	0.5 — 2.5 Ω	Repair poor contact in harness between ECM and combination meter connector.	Replace the fuel sub level sensor.

AS:DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.** Does the speedometer and tachometer operate normally?	Meters operates normally.	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>

	Step	Check	Yes	No
2	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. (Engine OFF) 2)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4.75 V	Go to step **3.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in fuel pump connector • Poor contact in coupling connector
3	**CHECK INPUT VOLTAGE OF ECM.** 1)Turn the ignition switch to OFF. 2)Disconnect the combination meter connector (i11) and ECM connector. 3)Turn the ignition switch to ON. 4)Measure the voltage of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4.75 V	Go to step **4.**	Repair battery short circuit between ECM and combination meter connector.
4	**CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD.** 1)Turn the ignition switch to OFF. 2)Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3)Measure the resistance between ECM and fuel tank cord. ***Connector & terminal*** ***(B135) No. 25 — (R15) No. 2:*** Is the measured value less than specified value?	5 Ω	Go to step **5.**	Repair open circuit between ECM and fuel tank cord.
5	**CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND.** Measure the resistance between fuel tank cord and chassis ground. ***Connector & terminal*** ***(R15) No. 3 — Chassis ground:*** Is the measured value less than specified value?	5 Ω	Go to step **6.**	Repair open circuit between fuel tank cord and chassis ground. NOTE: In this case, repair the following: Poor contact in coupling connectors

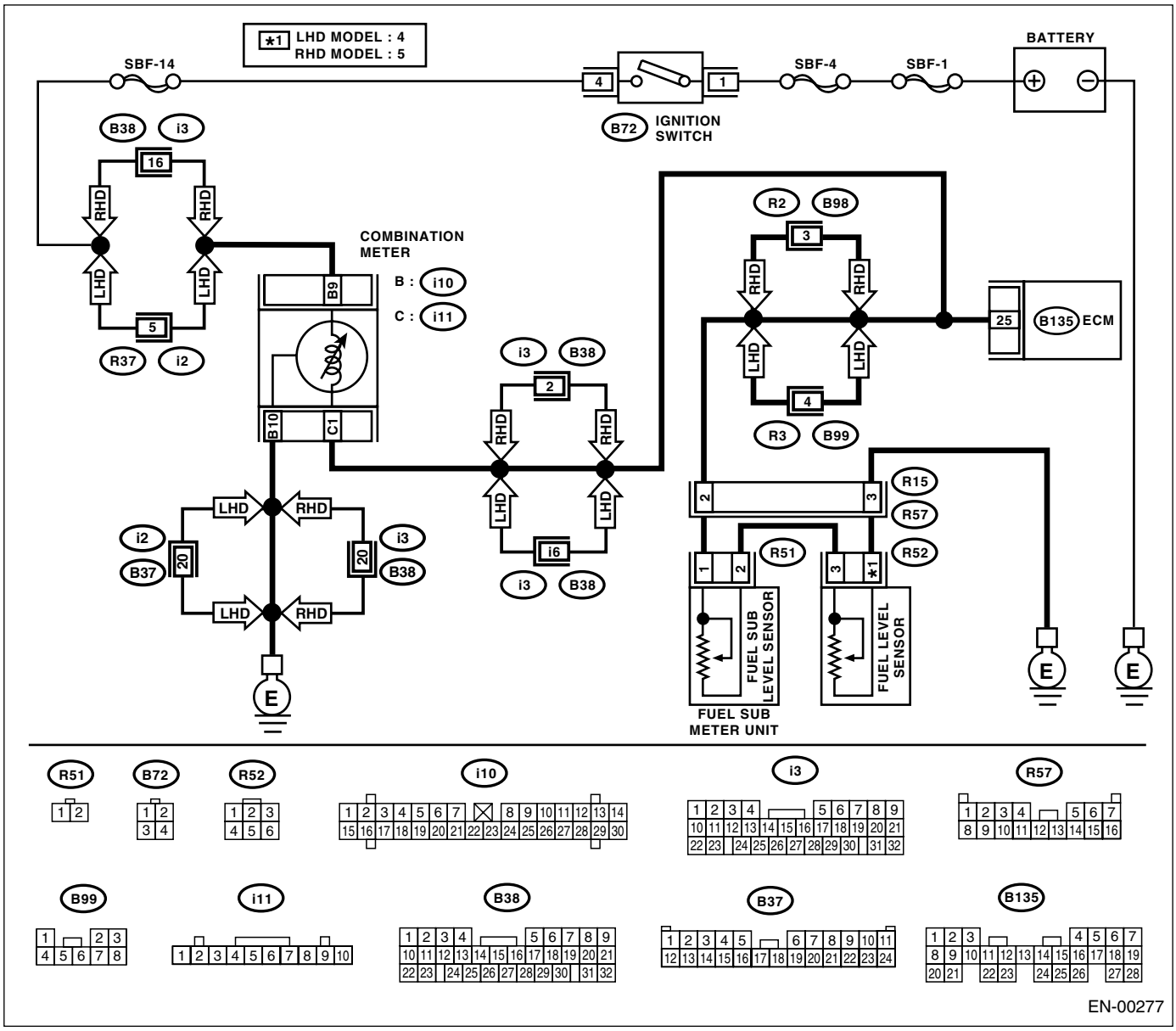
	Step	Check	Yes	No
6	**CHECK FUEL TANK CORD.** 1)Disconnect the connector from fuel level sensor. 2)Measure the resistance between fuel level sensor and coupling connector. ***Connector & terminal*** ***RHD model*** ***(R57) No. 3 — (R52) No. 5:*** ***LHD model*** ***(R57) No. 3 — (R52) No. 4:*** Is the measured value less than specified value?	10 Ω	Go to step **7.**	Repair open circuit between coupling connector and fuel level sensor.
7	**CHECK FUEL TANK CORD.** 1)Disconnect the connector from fuel sub level sensor. 2)Measure the resistance between fuel level sensor and fuel sub level sensor. ***Connector & terminal*** ***(R52) No. 3 — (R51) No. 2:*** Is the measured value less than specified value?	10 Ω	Go to step **8.**	Repair open circuit between fuel level sensor and fuel sub level sensor.
8	**CHECK FUEL TANK CORD.** Measure the resistance between fuel sub level sensor and coupling connector. ***Connector & terminal*** ***(R57) No. 2 — (R51) No. 1:*** Is the measured value less than specified value?	10 Ω	Go to step **9.**	Repair open circuit between coupling connector and fuel sub level sensor.
9	**CHECK FUEL LEVEL SENSOR.** 1)Remove the fuel pump assembly. <Ref. to FU(SOHC)-57, Fuel Pump.> 2)While moving the fuel level sensor float up and down, measure resistance between fuel level sensor terminals. ***Terminals*** ***RHD model*** ***No. 3 — No. 5:*** ***LHD model*** ***No. 3 — No. 4:*** Is the measured value more than specified value?	54.5 Ω	Replace the fuel level sensor. <Ref. to FU(SOHC)-59, Fuel Level Sensor.>	Go to step **10.**
10	**CHECK FUEL SUB LEVEL SENSOR.** 1)Remove the fuel sub level sensor. <Ref. to FU(SOHC)-60, Fuel Sub Level Sensor.> 2)While moving the fuel sub level sensor float up and down, measure resistance between fuel sub level sensor terminals. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value more than specified value?	41.5 Ω	Replace the fuel sub level sensor. <Ref. to FU(SOHC)-60, Fuel Sub Level Sensor.>	Replace the combination meter. <Ref. to IDI-12, Combination Meter Assembly.>

AT:DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect DTC P0462 or P0463 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL LEVEL SENSOR.** 1)Remove the fuel pump assembly. <Ref. to FU(SOHC)-57, Fuel Pump.> 2)While moving the fuel level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. ***Terminals*** ***RHD model*** ***No. 3 — No. 5:*** ***LHD model*** ***No. 3 — No. 4:*** Does the resistance change smoothly?	Resistance changes smoothly.	Go to step **3.**	Replace the fuel level sensor. <Ref. to FU(SOHC)-59, Fuel Level Sensor.>
3	**CHECK FUEL SUB LEVEL SENSOR.** 1)Remove the fuel sub level sensor. <Ref. to FU(SOHC)-59, Fuel Level Sensor.> 2)While moving the fuel sub level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. ***Terminals*** ***No. 1 — No. 2:*** Does the resistance change smoothly?	Resistance changes smoothly.	Repair poor contact in ECM, combination meter and coupling connectors.	Replace the fuel sub level sensor. <Ref. to FU(SOHC)-59, Fuel Level Sensor.>

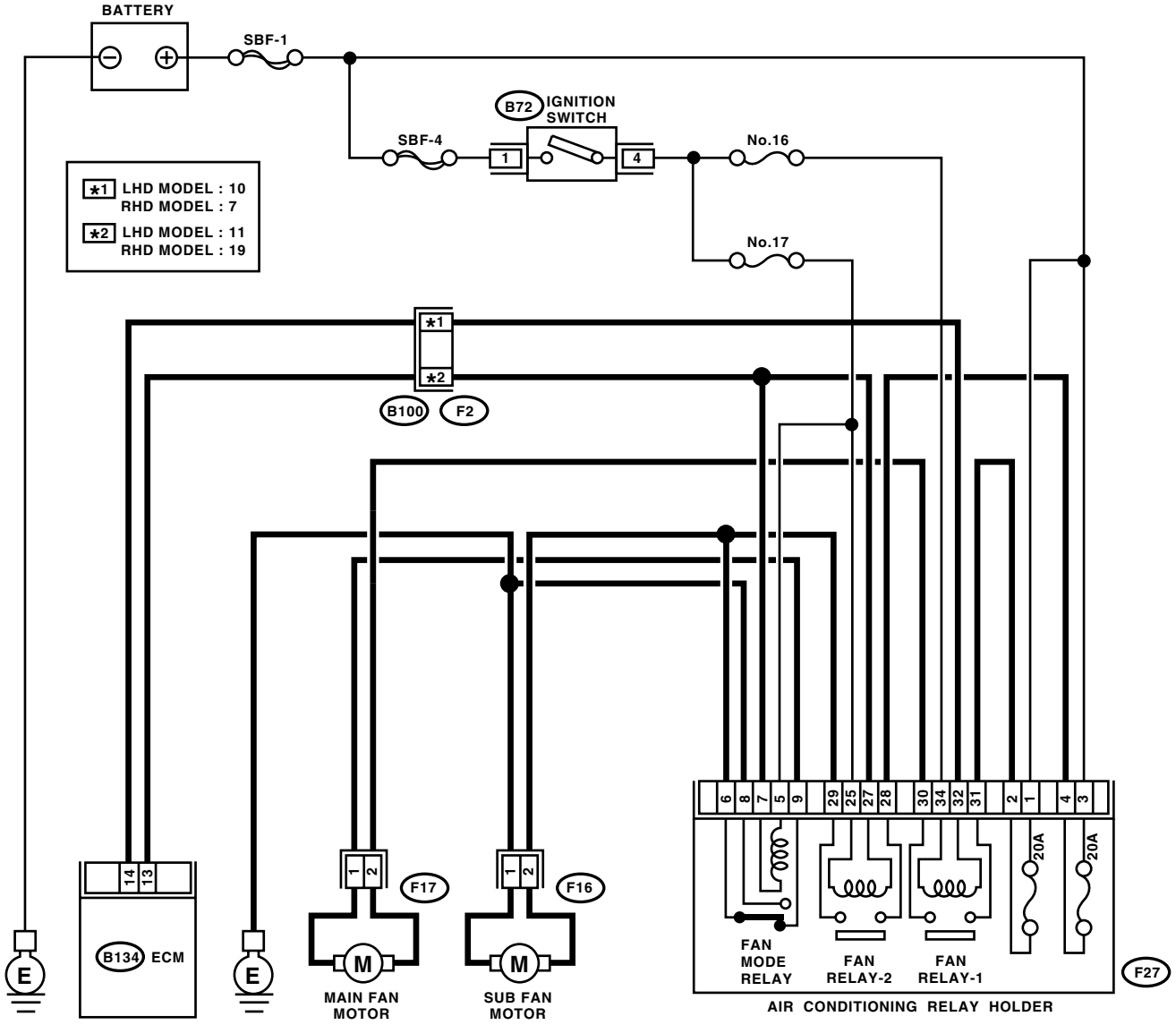
AU:DTC P0483 — COOLING FAN RATIONALITY CHECK —

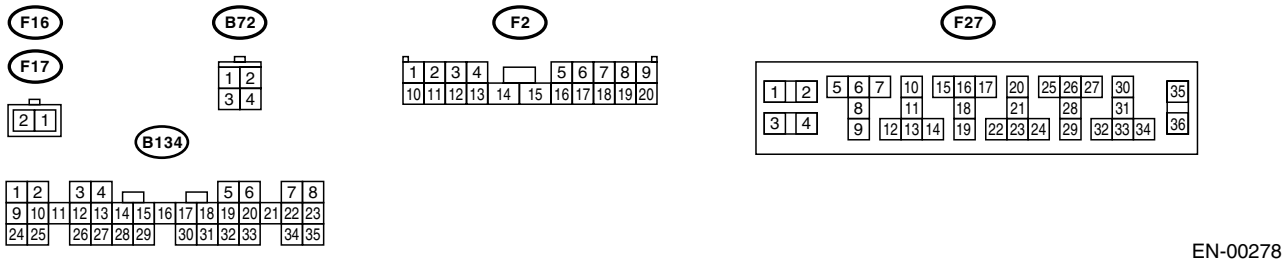
- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Occurrence of noise
  - Overheating

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

NOTE:
If the vehicle, with the engine idling, is placed very close to a wall or another vehicle, preventing normal cooling function, the OBD system may detect malfunction.

- **WIRING DIAGRAM:**





EN-00278

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).>	Check radiator fan and fan motor. <Ref. to CO(SOHC)-34, Radiator Main Fan and Fan Motor.> and <Ref. to CO(SOHC)-40, Radiator Sub Fan and Fan Motor.>

AV:DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —

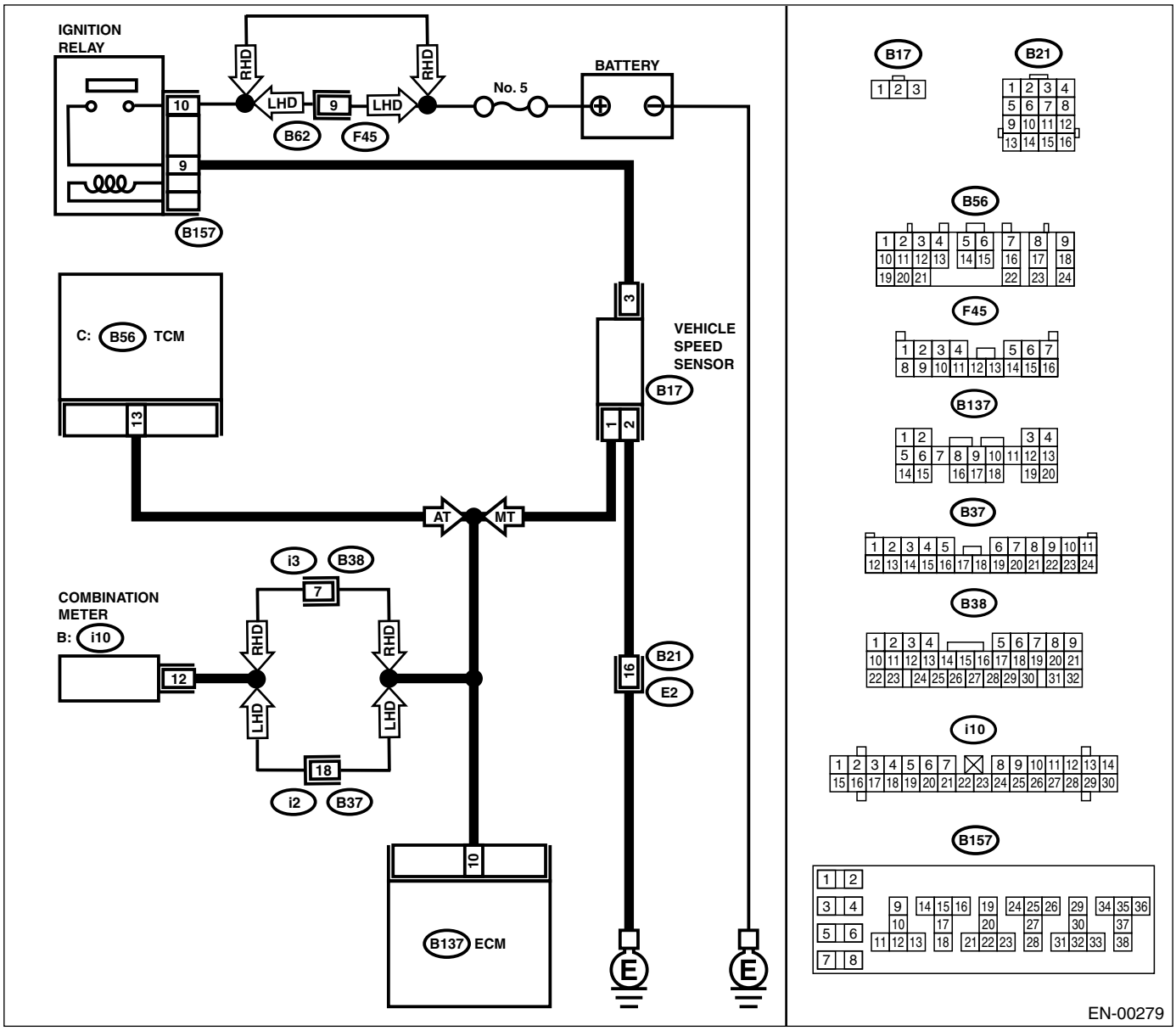
NOTE:
For the diagnostic procedure, refer to DTC P0503. <Ref. to EN(SOHC)-190, DTC P0503 — VEHICLE SPEED SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AW:DTC P0503 — VEHICLE SPEED SENSOR CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK TRANSMISSION TYPE.** Is the target AT vehicle?	Target is AT vehicle.	Go to step **2.**	Go to step **3.**

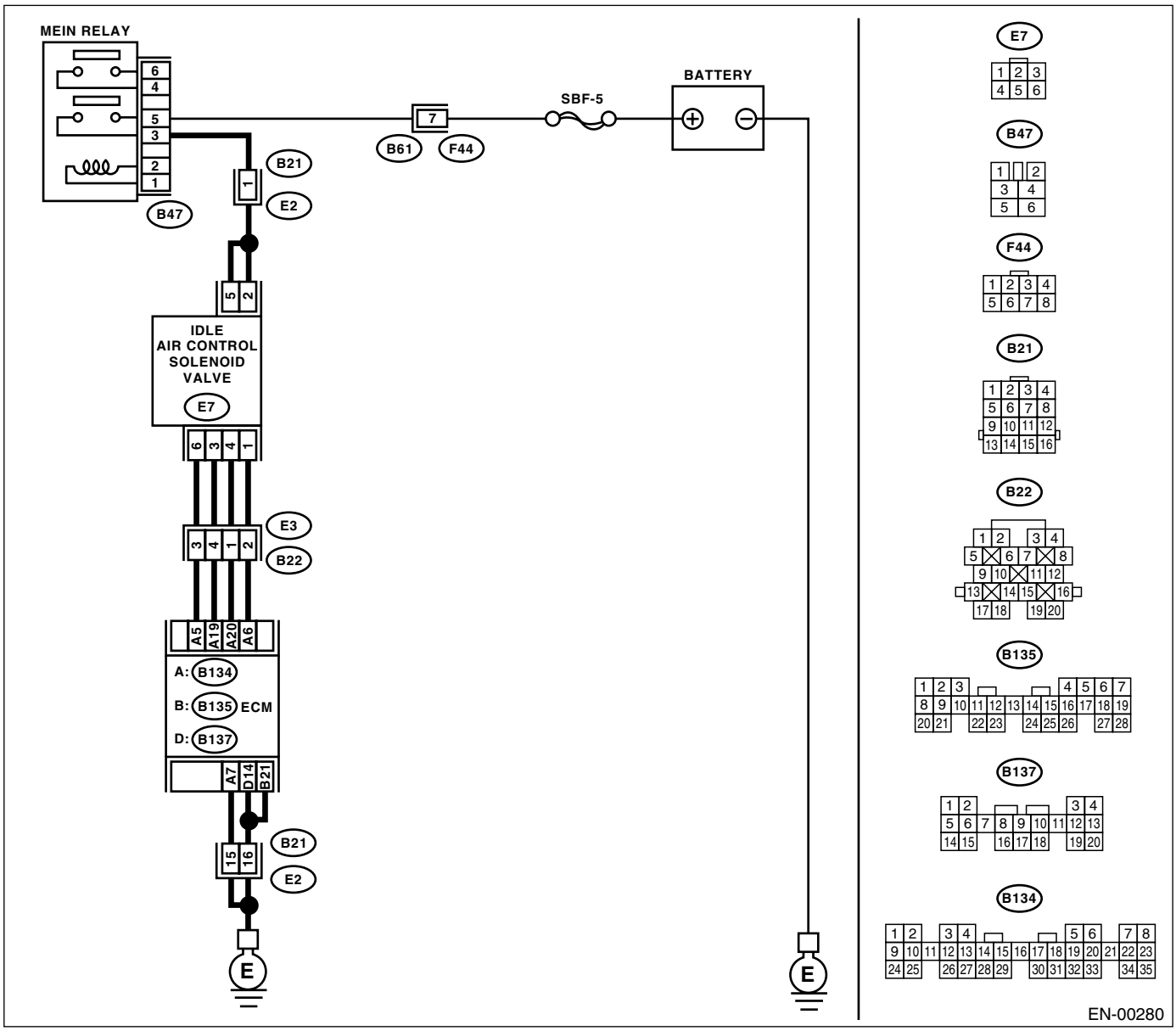
	Step	Check	Yes	No
2	**CHECK DTC P0720 ON DISPLAY.** Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0720?	DTC P0720 is indicated.	Check front vehicle speed sensor signal circuit. <Ref. to AT-54, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK SPEEDOMETER OPERATION IN COMBINATION METER.** Does the speedometer operate normally?	Meter operate normally.	Go to step **4.**	Check speedometer and vehicle speed sensor. <Ref. to IDI-15, Speedometer.> and <Ref. to AT-52, Front Vehicle Speed Sensor.> and <Ref. to AT-56, Rear Vehicle Speed Sensor.> and <Ref. to AT-57, Torque Converter Turbine Speed Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from combination meter. 3)Measure the resistance between ECM and combination meter. ***Connector & terminal (B137) No. 10 — (i10) No. 12:*** Is the measured value less than specified value?	10 Ω	Repair poor contact in ECM connector.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in ECM connector • Poor contact in combination meter connector • Poor contact in coupling connector

AX:DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine is difficult to start.
  - Engine does not start.
  - Erroneous idling
  - Engine stalls.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



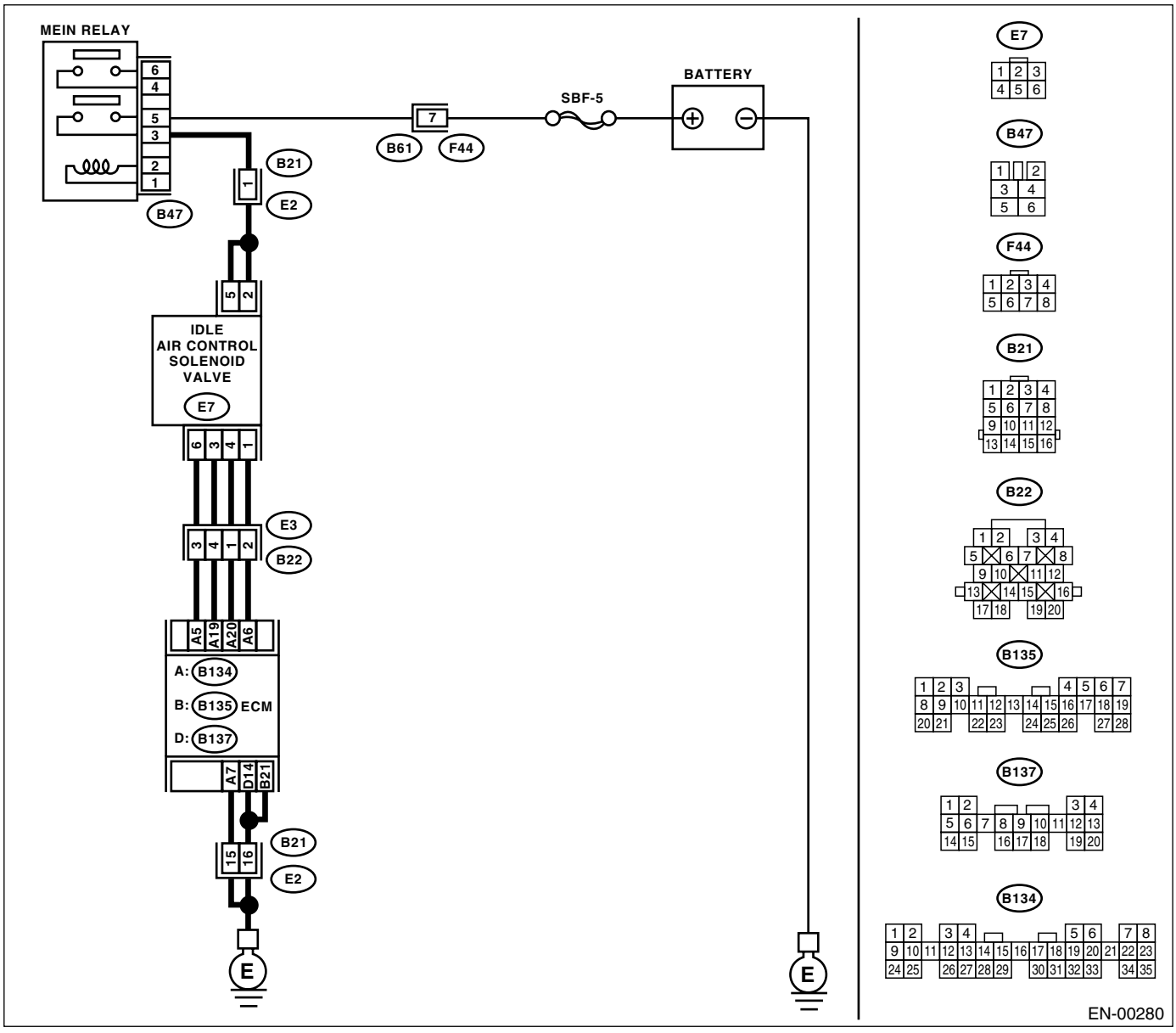
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0506.	Go to step **2.**
2	**CHECK AIR BY-PASS LINE.** 1)Turn the ignition switch to OFF. 2)Remove the idle air control solenoid valve from throttle body. <Ref. to FU(SOHC)-35, REMOVAL, Idle Air Control Solenoid Valve.> 3)Remove the throttle body from intake manifold. <Ref. to FU(SOHC)-13, REMOVAL, Throttle Body.> 4)Using an air gun, force air into the idle air control solenoid valve installation area. Confirm that forced air subsequently escapes from throttle body interior. Does air flow out?	Air flows out.	Replace the idle air control solenoid valve. <Ref. to FU(SOHC)-35, INSTALLATION, Idle Air Control Solenoid Valve.>	Replace the throttle body. <Ref. to FU(SOHC)-13, INSTALLATION, Throttle Body.>

AY:DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine keeps running at higher revolution than specified idling revolution.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



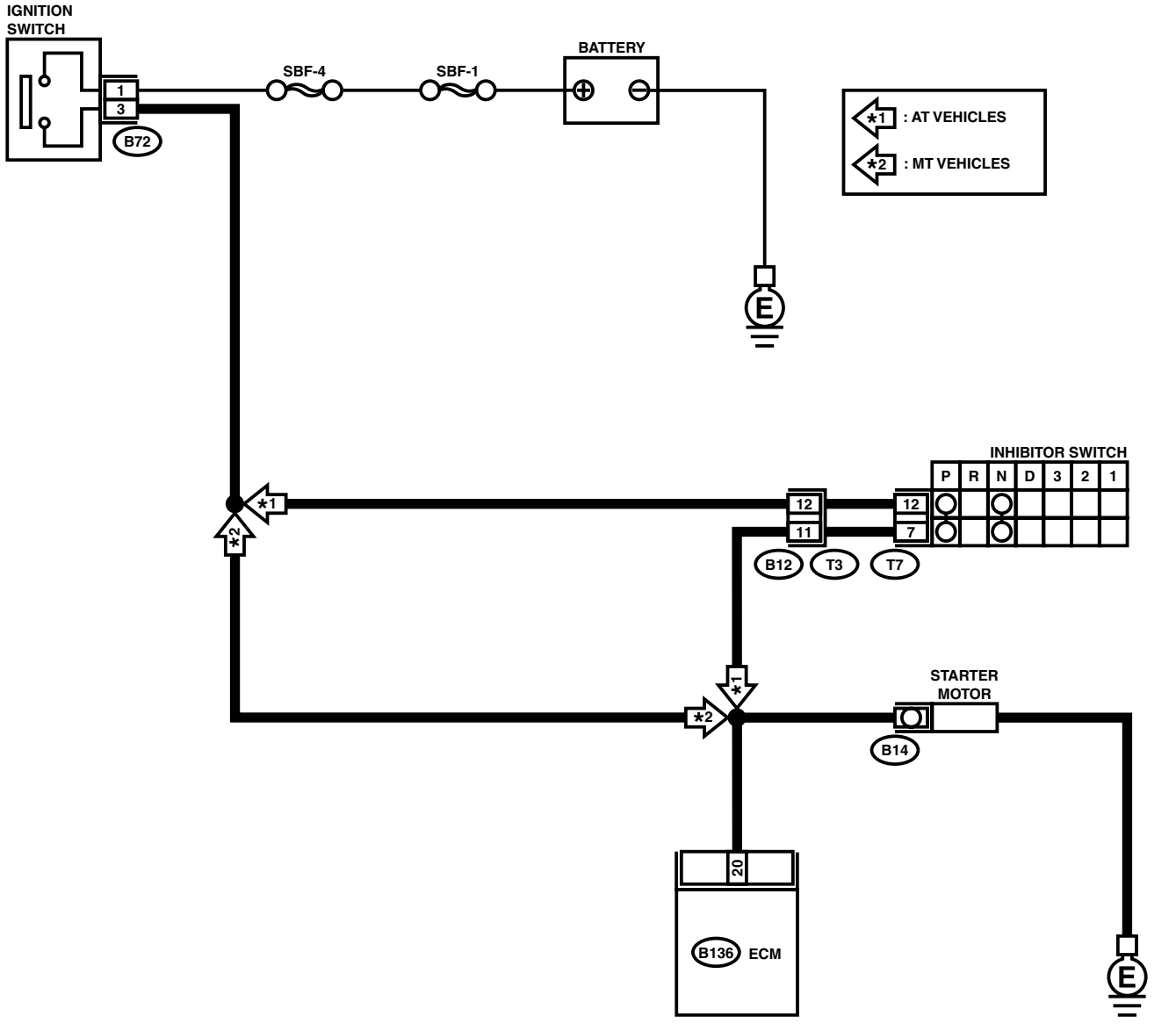
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.** 1)Turn the ignition switch to ON. 2)Start the engine, and idle it. 3)Check the following items. •Loose installation of intake manifold, idle air control solenoid valve and throttle body •Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket •Disconnections of vacuum hoses Is there a fault in air intake system?	There is a fault.	Repair air suction and leaks.	Go to step **3.**
3	**CHECK THROTTLE CABLE.** Is throttle cable play correct?	Play is correct.	Go to step **4.**	Adjust throttle cable. <Ref. to SP(SOHC)-9, INSTALLATION, Accelerator Control Cable.>
4	**CHECK AIR BY-PASS LINE.** 1)Turn the ignition switch to OFF. 2)Remove the idle air control solenoid valve from throttle body. <Ref. to FU(SOHC)-35, REMOVAL, Idle Air Control Solenoid Valve.> 3)Confirm that there are no foreign particles in air by-pass line. Is air by-pass line clogged by foreign particles?	Line is clogged.	Remove foreign particles from air by-pass line.	Replace the idle air control solenoid valve. <Ref. to FU(SOHC)-35, INSTALLATION, Idle Air Control Solenoid Valve.>

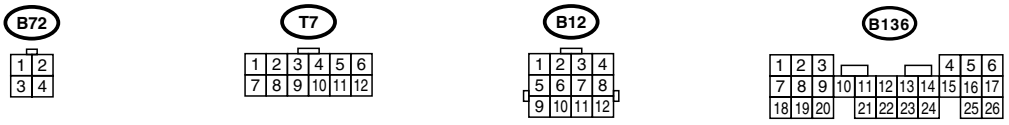
AZ:DTC P0512 — STARTER REQUEST CIRCUIT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-00261

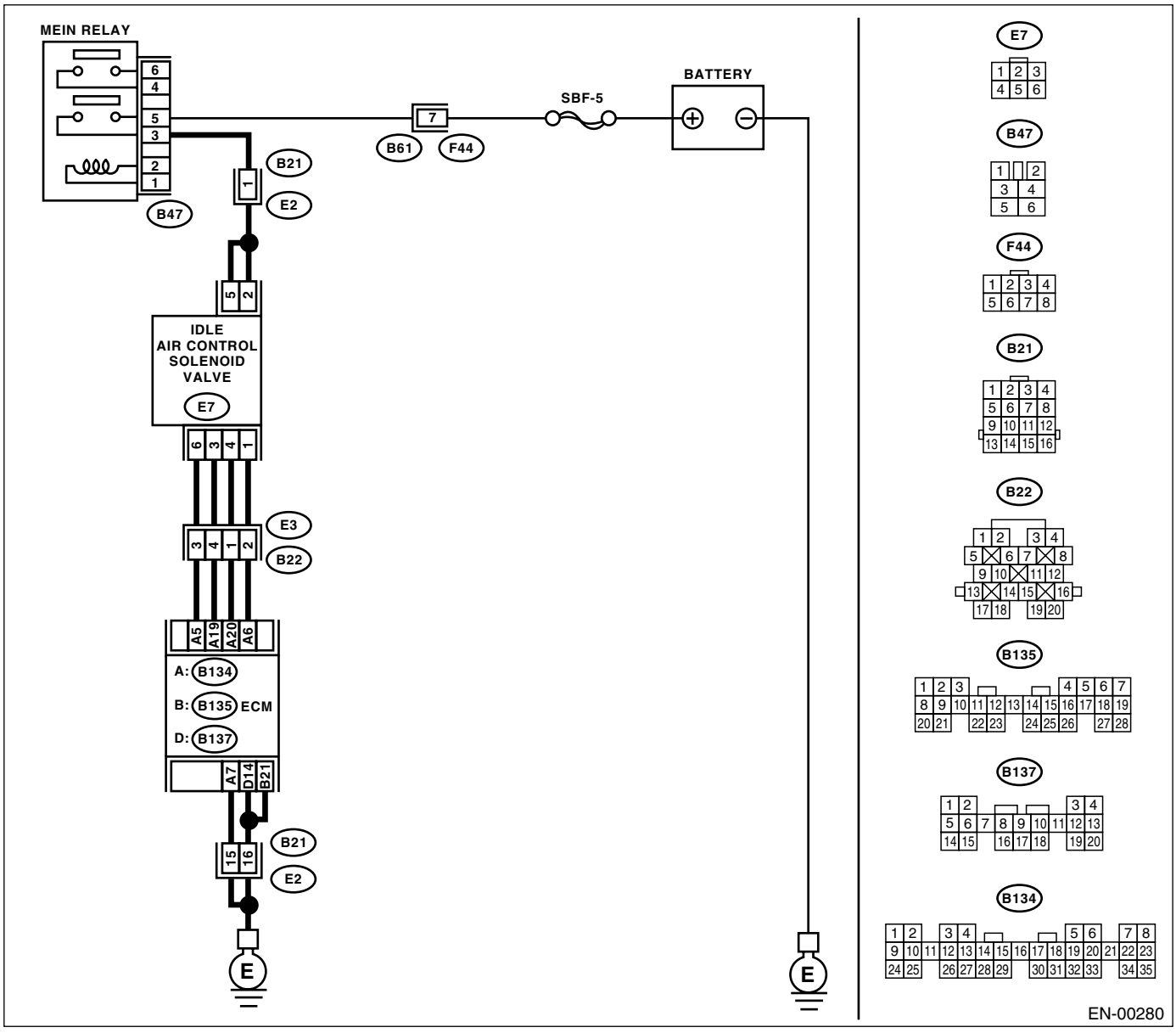
	Step	Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.** Does the starter motor operate when ignition switch is turned to “ON”? NOTE: Place the inhibitor switch in each position. (AT model) Depress or release the clutch pedal. (MT model)	Starter motor operates.	Repair battery short circuit in starter motor circuit.	Check starter motor circuit. <Ref. to EN(SOHC)-61, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

BA:DTC P0519 — IDLE CONTROL SYSTEM CIRCUIT PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine keeps running at higher revolution than specified idling revolution.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



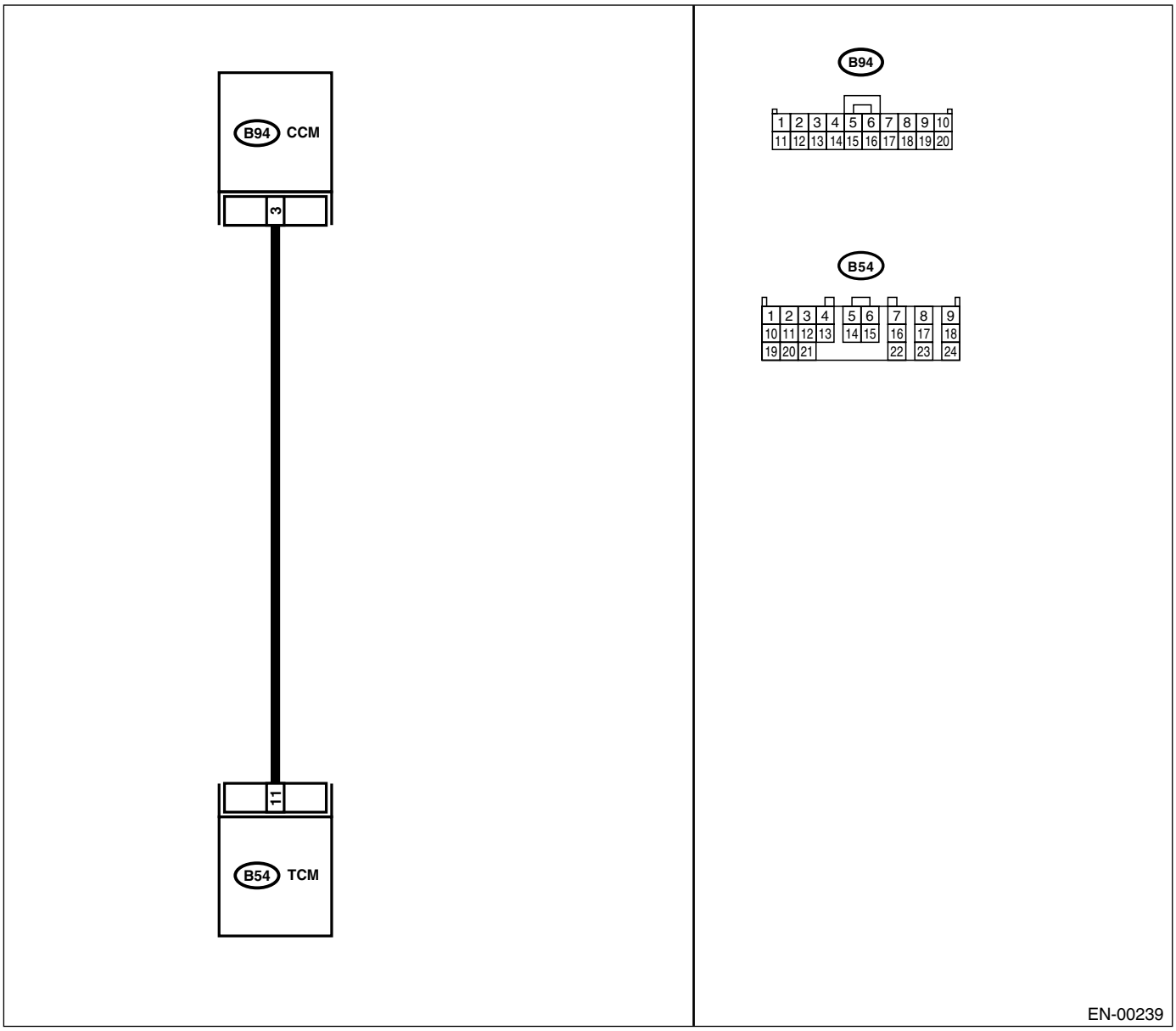
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0519.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.** 1)Turn the ignition switch to ON. 2)Start the engine, and idle it. 3)Check the following items. •Loose installation of intake manifold, idle air control solenoid valve and throttle body •Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket •Disconnections of vacuum hoses Is there a fault in air intake system?	There is a fault.	Repair air suction and leaks.	Go to step **3.**
3	**CHECK THROTTLE CABLE.** Is throttle cable play correct?	Play is correct.	Go to step **4.**	Adjust throttle cable. <Ref. to SP(SOHC)-9, INSTALLATION, Accelerator Control Cable.>
4	**CHECK AIR BY-PASS LINE.** 1)Turn the ignition switch to OFF. 2)Remove the idle air control solenoid valve from throttle body. <Ref. to FU(SOHC)-35, Idle Air Control Solenoid Valve.> 3)Confirm that there are no foreign particles in air by-pass line. Is air by-pass line clogged by foreign particles?	Line is clogged.	Remove foreign particles from air by-pass line.	Replace the idle air control solenoid valve. <Ref. to FU(SOHC)-35, Idle Air Control Solenoid Valve.>

BB:DTC P0565 — CRUISE CONTROL ON SIGNAL —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



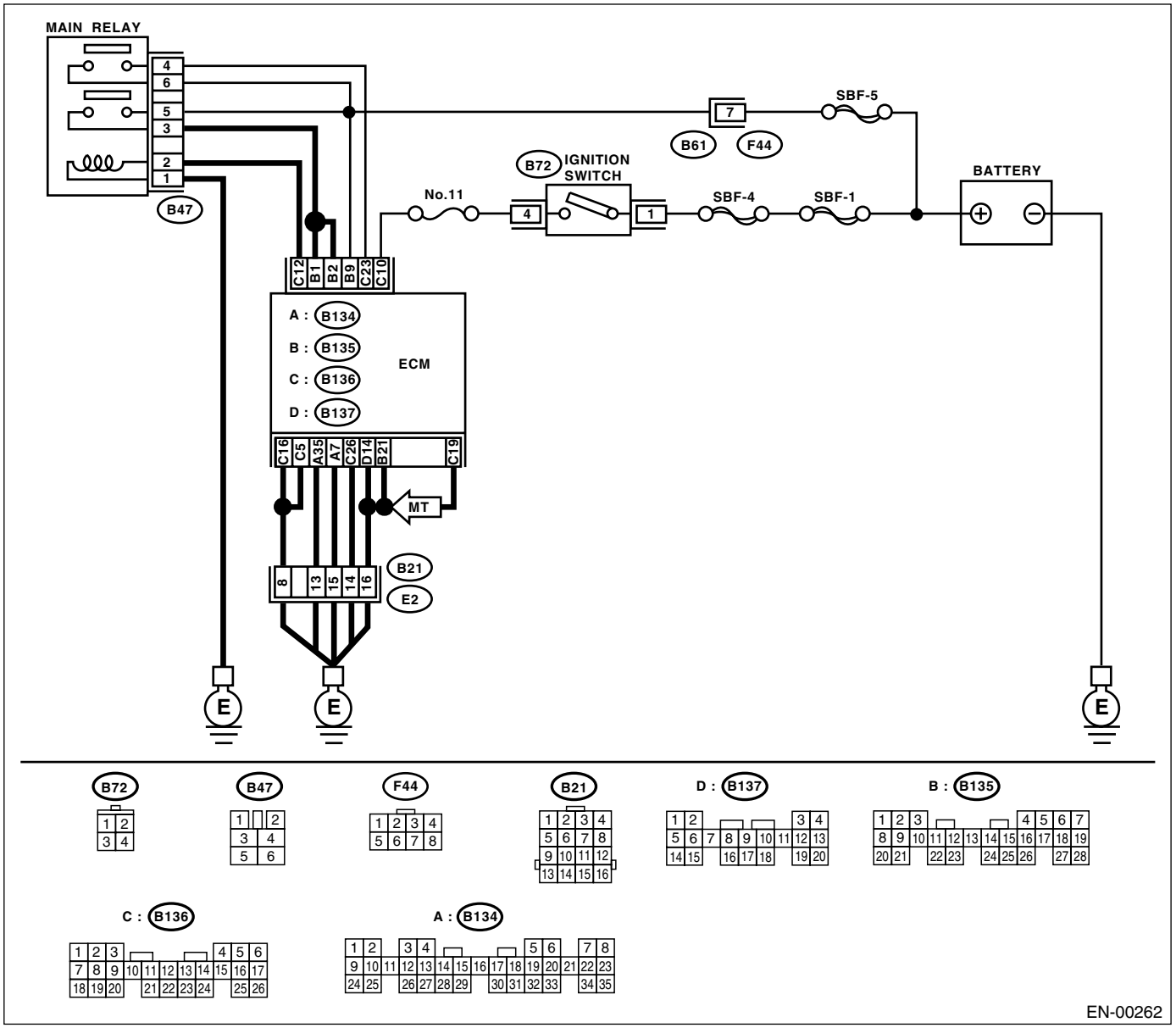
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from TCM and CCM. 3)Measure the resistance of harness between TCM and CCM connector. ***Connector & terminal*** ***(B54) No. 11— (B94) No. 3:*** Is the measured value less than specified value?	1 Ω	Go to step **2.**	Repair open circuit in harness between TCM and CCM connector.
2	**CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 11 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **3.**	Repair short circuit in harness between TCM and CCM connector.
3	**CHECK INPUT SIGNAL FOR TCM.** 1)Connect the connector to TCM and CCM. 2)Lift-up the vehicle or set the vehicle on free rollers. **CAUTION:** **On AWD models, raise all wheels off ground.** 3)Start the engine. 4)Turn the cruise control main switch to ON. 5)Move selector lever to “D” and slowly increase vehicle speed to 50 km/h (31 MPH). 6)Turn the cruise control command switch to ON. 7)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 11 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **4.**	Check cruise control command switch circuit. <Ref. to CC-8, INSPECTION, Cruise Control Command Switch.>
4	**CHECK POOR CONTACT.** Check poor contact in TCM connector. Is there poor contact in TCM connector?	Poor contact occurs.	Repair poor contact in TCM connector.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

BC:DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine does not start.
  - Engine stalls.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



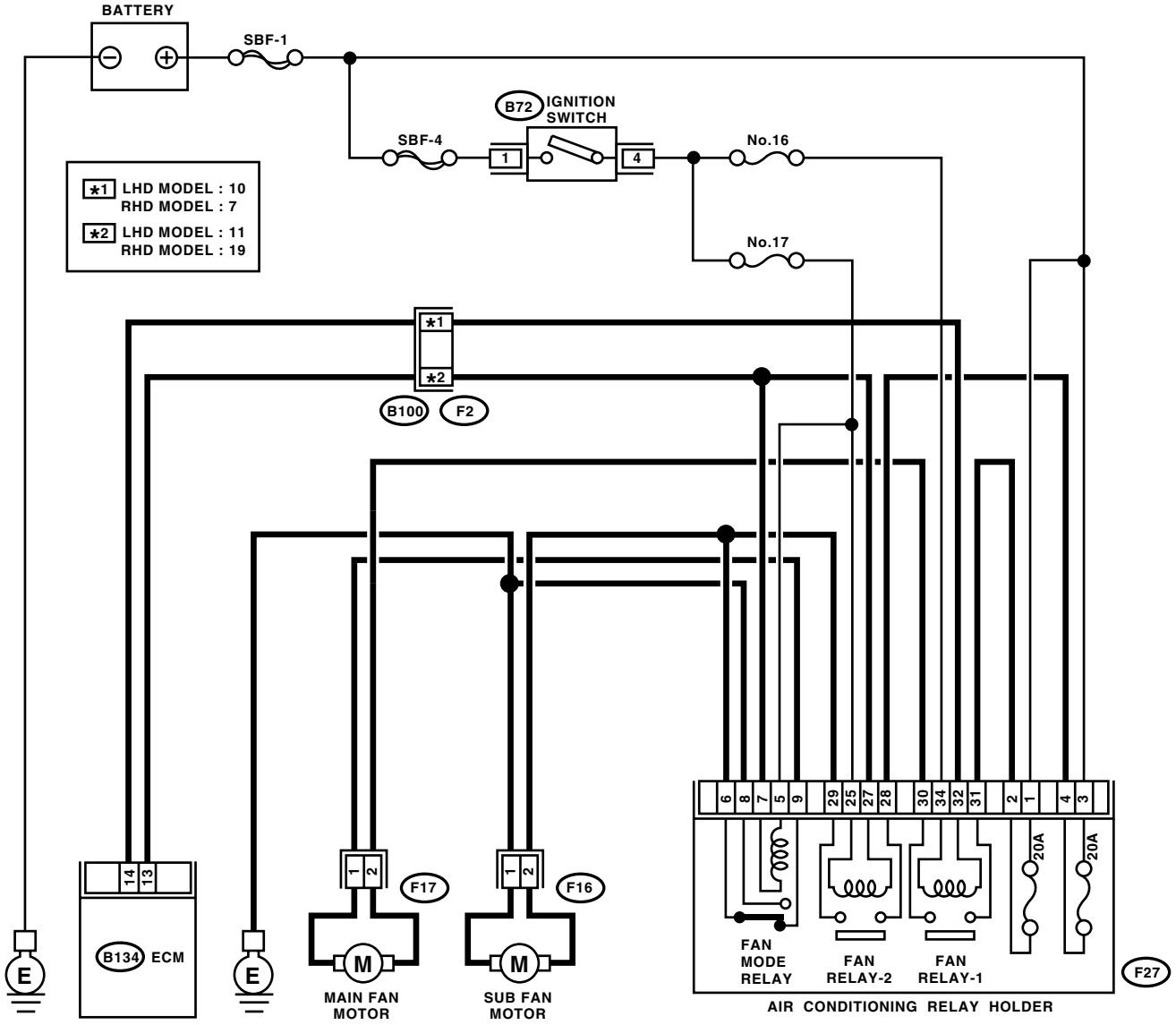
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>	It is not necessary to inspect DTC P0601.

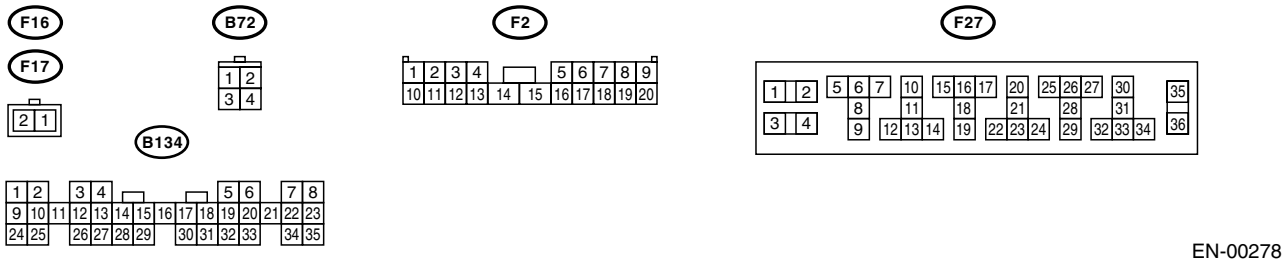
BD:DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Radiator fan does not operate properly.
  - Overheating

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-00278

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to OFF. 2)Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3)Turn the ignition switch to ON. 4)While operating the radiator fan relay, measure voltage between ECM terminal and ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode".<Ref. to EN(SOHC)-32, Subaru Select Monitor.> ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (–):*** Is the change of measured value within specified value?	0 — 10 V	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK GROUND SHORT CIRCUIT IN RADIATOR MAIN FAN RELAY CONTROL CIRCUIT.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM. 3)Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 14 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	Repair ground short circuit in radiator main fan relay control circuit.	Go to step **3.**
3	**CHECK POWER SUPPLY FOR RELAY.** 1)Remove the main fan relay from A/C relay holder. 2)Turn the ignition switch to ON. 3)Measure the voltage between fuse and relay box (F/B) connector and chassis ground. ***Connector & terminal*** ***(F27) No. 34 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **4.**	Repair open circuit in harness between ignition switch and fuse and relay box (F/B) connector.
4	**CHECK MAIN FAN RELAY.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between main fan relay terminals. ***Terminal*** ***No. 32 — No. 34:*** Is the measured value within specified value?	87 — 107 Ω	Go to step **5.**	Replace the main fan relay.
5	**CHECK OPEN CIRCUIT IN MAIN FAN RELAY CONTROL CIRCUIT.** Measure the resistance of harness between ECM and main fan relay connector. ***Connector & terminal*** ***(B134) No. 14 — (F27) No. 32:*** Is the measured value less than specified value?	1 Ω	Go to step **6.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and main fan relay connector • Poor contact in coupling connector

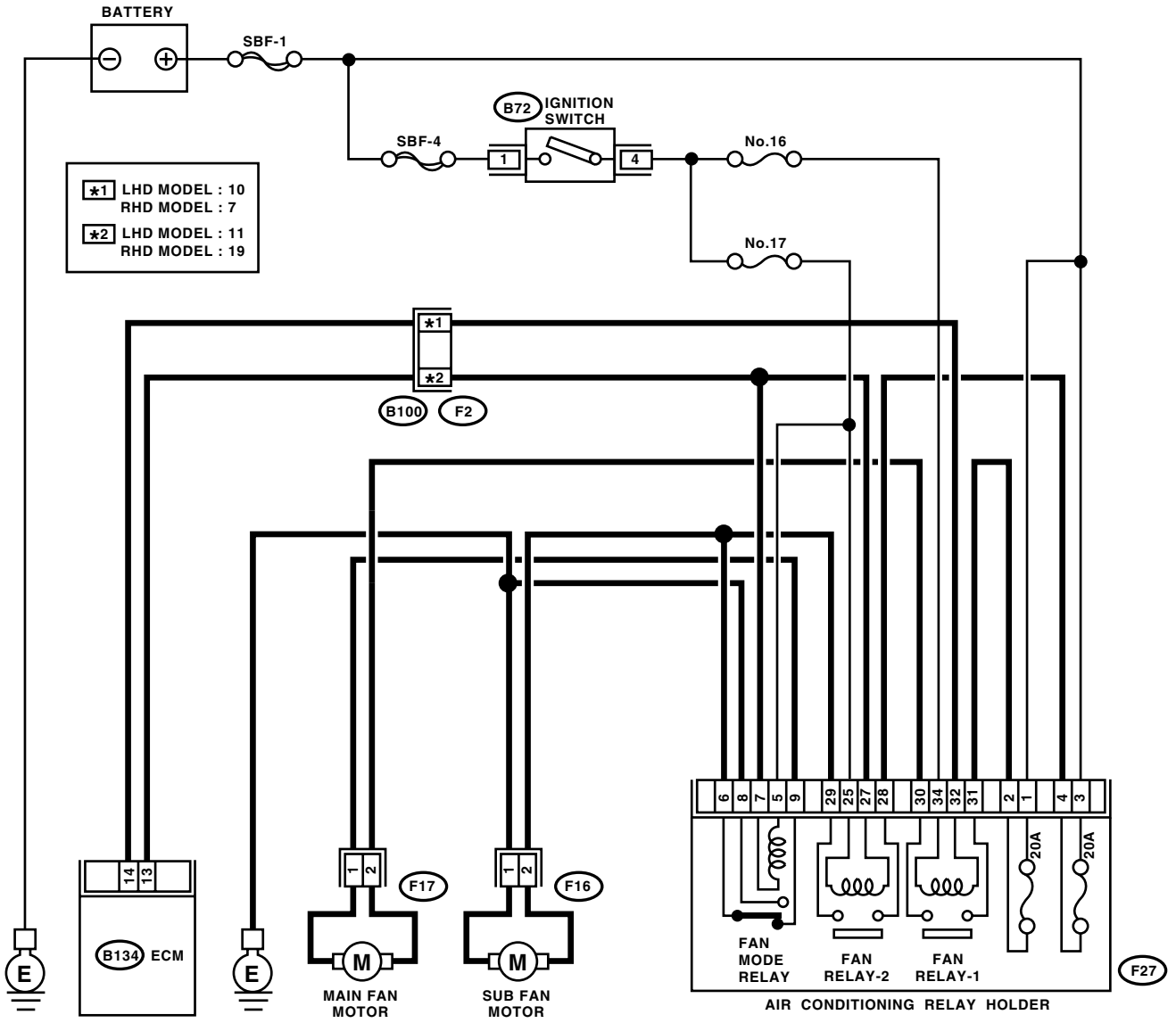
	Step	Check	Yes	No
6	**CHECK POOR CONTACT.** Check poor contact in ECM or main fan relay connector. Is there poor contact in ECM or main fan relay connector?	Poor contact occurs.	Repair poor contact in ECM or main fan relay connector.	Contact with SOA (distributor) service.

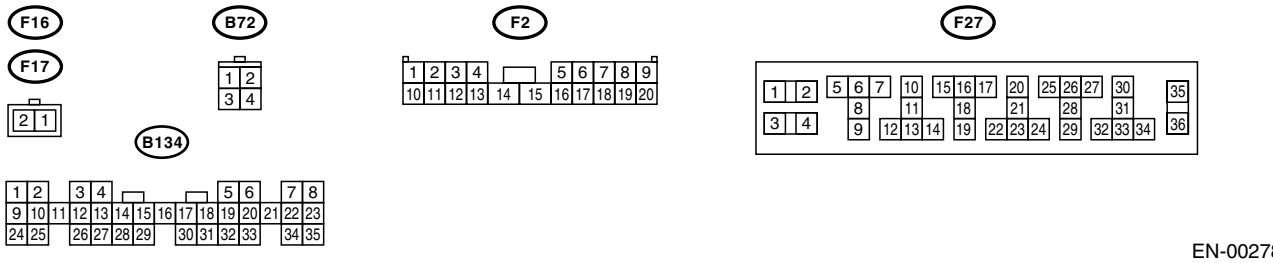
BE:DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Radiator fan does not operate properly.
  - Overheating

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-00278

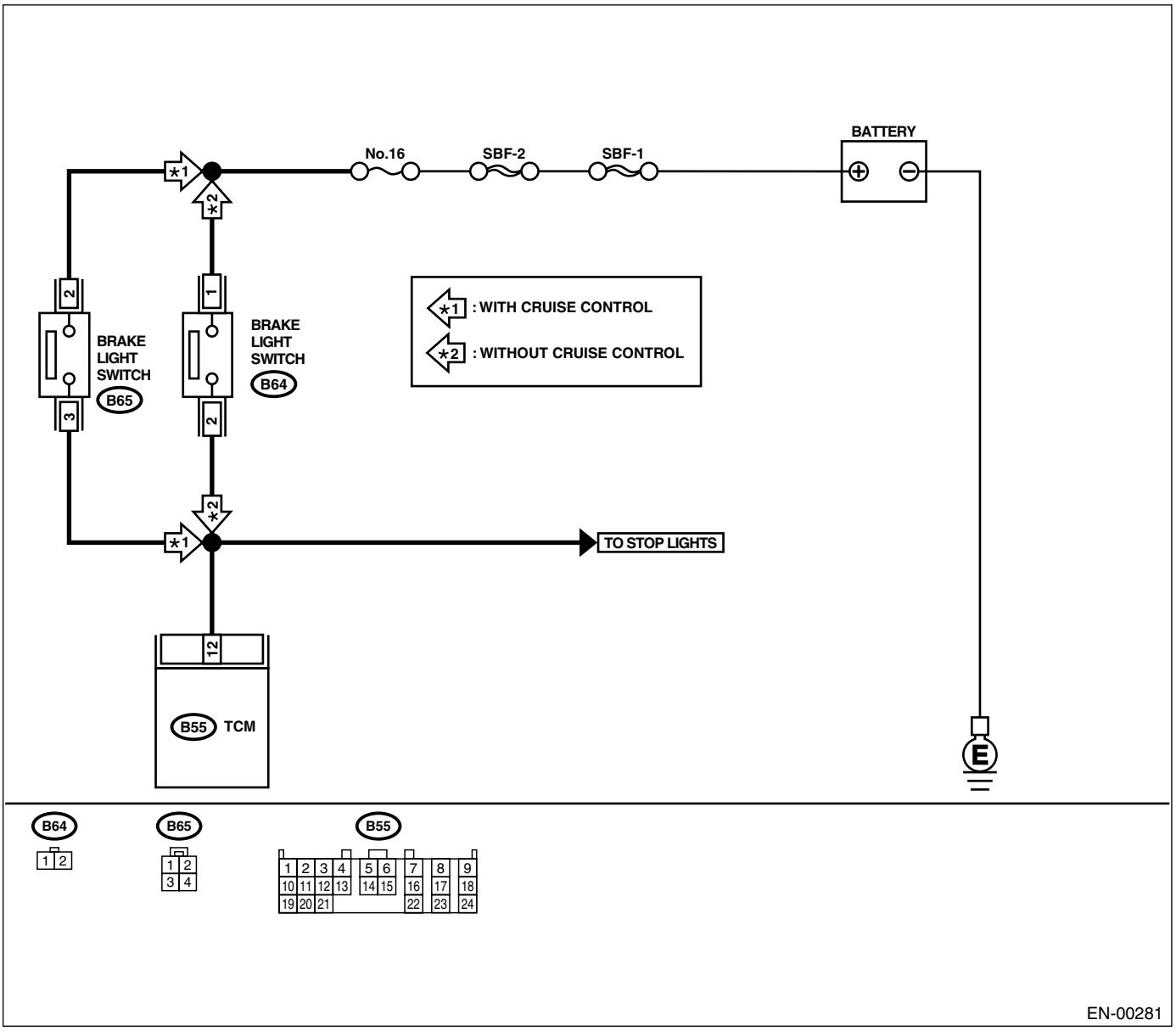
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to OFF. 2)Connect the test mode connector at the lower portion of instrument panel (on the drive's side). 3)Turn the ignition switch to ON. 4)While operating the radiator fan relay, measure voltage between ECM and chassis ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode".<Ref. to EN(SOHC)-48, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (–):*** ***(B134) No. 13 (+) — Chassis ground (–):*** Is the change of measured value within specified value?	0 — 10 V	Even if MIL lights up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.** 1)Turn the ignition switch to OFF. 2)Remove the main fan relay and sub fan relay. (with A/C models) 3)Disconnect the test mode connector. 4)Turn the ignition switch to ON. 5)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (–):*** ***(B134) No. 13 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Repair battery short circuit in radiator fan relay control circuit. After repair, replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>	Go to step **3.**
3	**CHECK MAIN FAN RELAY.** 1)Turn the ignition switch to OFF. 2)Remove the main fan relay. 3)Measure the resistance between main fan relay terminals. ***Terminal*** ***No. 30 — No. 31:*** Is the measured value less than specified value?	1 Ω	Replace the main fan relay and ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>	Go to step **4.**
4	**CHECK SUB FAN RELAY.** 1)Remove the sub fan relay. 2)Measure the resistance between sub fan relay terminals. ***Terminal*** ***No. 28 — No. 29*** Is the measured value less than specified value?	1 Ω	Replace the sub fan relay and ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>

BF:DTC P0703 — TORQUE CONVERTER/BRAKE SWITCH "B" CIRCUIT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00281

Step		Check	Yes	No
1	**CHECK OPERATION OF BRAKE LIGHT.** Does the brake light illuminate when depressing the brake pedal?	Brake light illuminates.	Go to step **2.**	Repair or replace the brake light circuit.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR.** 1)Disconnect the connectors from TCM and brake light switch. 2)Measure the resistance of harness between TCM and brake light switch connector. ***Connector & terminal*** • ***Without cruise control*** ***(B55) No. 12 — (B64) No. 2:*** • ***With cruise control*** ***(B55) No. 12 — (B65) No. 3*** Is the measured value less than specified value?	1 Ω	Go to step **3.**	Repair or replace the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between TCM and brake light switch connector • Poor contact in TCM connector • Poor contact in brake light switch connector
3	**CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 12 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **4.**	Repair ground short circuit in harness between TCM and brake light switch connector.
4	**CHECK INPUT SIGNAL FOR TCM.** 1)Connect the connectors to TCM and brake light switch. 2)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 12 (+) — Chassis ground (–):*** Is the measured value less than specified value when releasing brake pedal?	1 V	Go to step **5.**	Adjust or replace the brake light switch. <Ref. to LI-8, STOP LIGHT SWITCH, INSPECTION, Stop Light System.>
5	**CHECK INPUT SIGNAL FOR TCM.** Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 12 (+) — Chassis ground (–):*** Is the measured value more than specified value when depressing brake pedal?	10 V	Go to step **6.**	Adjust or replace the brake light switch. <Ref. to LI-8, STOP LIGHT SWITCH, INSPECTION, Stop Light System.>
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector. Is there poor contact in TCM connector?	Poor contact occurs.	Repair poor contact in TCM connector.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

BG:DTC P0731 — GEAR 1 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(SOHC)-215, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BH:DTC P0732 — GEAR 2 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(SOHC)-215, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BI: DTC P0733 — GEAR 3 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(SOHC)-215, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BJ:DTC P0734 — GEAR 4 INCORRECT RATIO —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Shift point too high or too low; engine brake not effected in “3” range; excessive shift shock; excessive tight corner “braking”

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK THROTTLE POSITION SENSOR CIRCUIT.** Check throttle position sensor circuit. <Ref. to AT-47, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in throttle position sensor circuit?	There is a trouble.	Repair or replace the throttle position sensor circuit.	Go to step **3.**
3	**CHECK FRONT VEHICLE SPEED SENSOR CIRCUIT.** Check front vehicle speed sensor circuit. <Ref. to AT-54, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in front vehicle speed sensor circuit?	There is a trouble.	Repair or replace the front vehicle speed sensor circuit.	Go to step **4.**
4	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT.** Check torque converter turbine speed sensor circuit. <Ref. to AT-59, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in torque converter turbine speed sensor circuit?	There is a trouble.	Repair or replace the torque converter turbine speed sensor circuit.	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in TCM connector. Is there poor contact in TCM connector?	Poor contact occurs.	Repair poor contact in TCM connector.	Go to step **6.**
6	**CHECK MECHANICAL TROUBLE.** Check mechanical trouble in automatic transmission. Is there any mechanical trouble in automatic transmission?	There is a mechanical trouble.	Repair or replace the automatic transmission. <Ref. to AT-31, INSPECTION, Road Test.>	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

BK:DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - No lock-up (after engine warm-up)
  - No shift or excessive tight corner “braking”

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK LOCK-UP DUTY SOLENOID CIRCUIT.** Check lock-up duty solenoid circuit. <Ref. to AT-87, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in lock-up duty solenoid circuit?	There is a trouble.	Repair or replace the lock-up duty solenoid circuit.	Go to step **3.**
3	**CHECK THROTTLE POSITION SENSOR CIRCUIT.** Check throttle position sensor circuit. <Ref. to AT-47, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in throttle position sensor circuit?	There is a trouble.	Repair or replace the throttle position sensor circuit.	Go to step **4.**
4	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT.** Check torque converter turbine speed sensor circuit. <Ref. to AT-59, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in torque converter turbine speed sensor circuit?	There is a trouble.	Repair or replace the torque converter turbine speed sensor circuit.	Go to step **5.**
5	**CHECK ENGINE SPEED INPUT CIRCUIT.** Check engine speed input circuit. <Ref. to AT-38, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in engine speed input circuit?	There is a trouble.	Repair or replace the engine speed input circuit.	Go to step **6.**

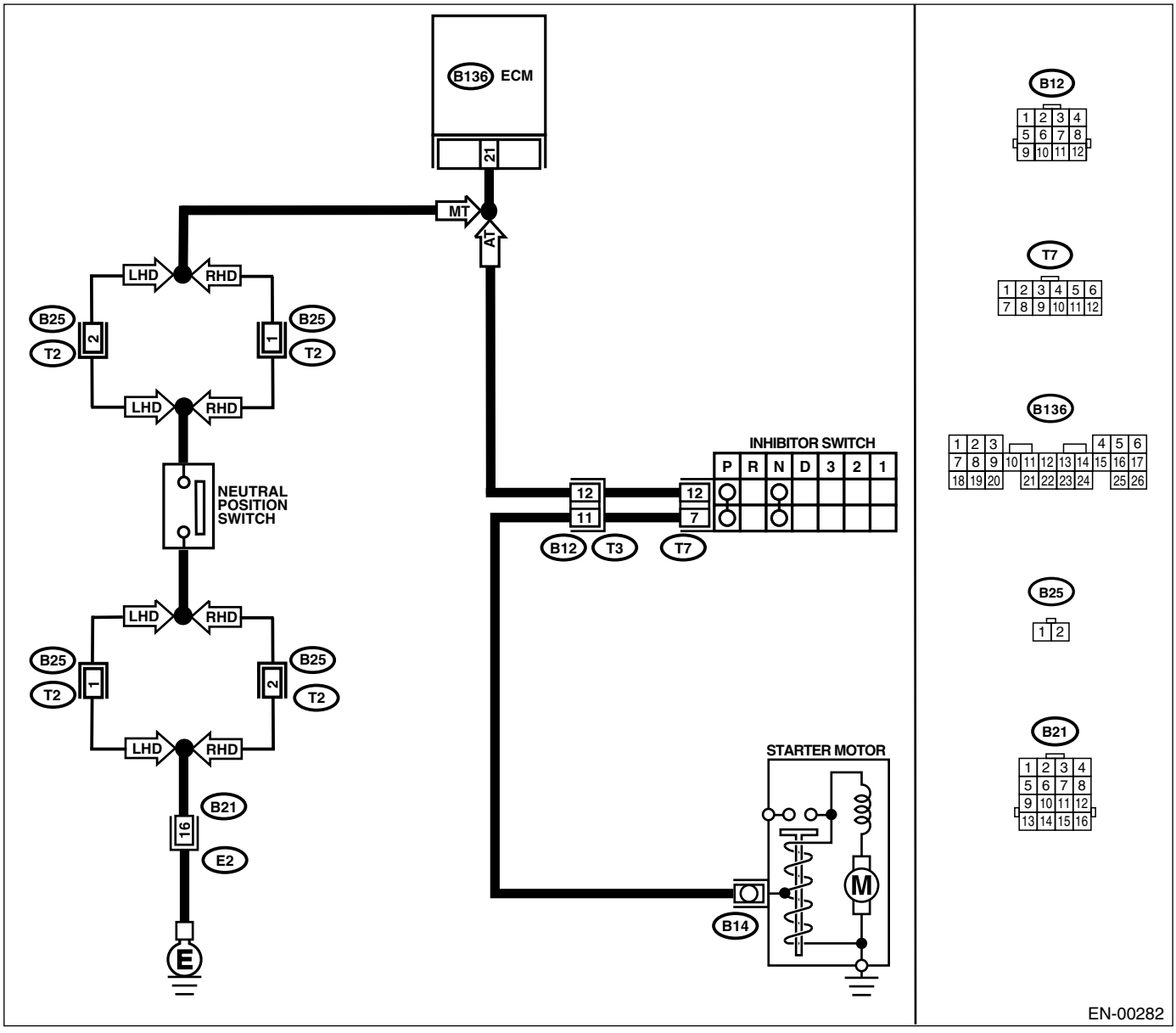
	Step	Check	Yes	No
6	**CHECK INHIBITOR SWITCH CIRCUIT.** Check inhibitor switch circuit. <Ref. to AT-114, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).> Is there any trouble in inhibitor switch circuit?	There is a trouble.	Repair or replace the inhibitor switch circuit.	Go to step **7.**
7	**CHECK BRAKE LIGHT SWITCH CIRCUIT.** Check brake light switch circuit. <Ref. to AT-106, CHECK BRAKE SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).> Is there any trouble in brake light switch circuit?	There is a trouble.	Repair or replace the brake light switch circuit.	Go to step **8.**
8	**CHECK ATF TEMPERATURE SENSOR CIRCUIT.** Check ATF temperature sensor circuit. <Ref. to AT-43, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in ATF temperature sensor circuit?	There is a trouble.	Repair or replace the ATF temperature sensor circuit.	Go to step **9.**
9	**CHECK POOR CONTACT.** Check poor contact in TCM connector. Is there poor contact in TCM connector?	Poor contact occurs.	Repair poor contact in TCM connector.	Go to step **10.**
10	**CHECK MECHANICAL TROUBLE.** Check mechanical trouble in automatic transmission. Is there any mechanical trouble in automatic transmission?	There is a mechanical trouble.	Repair or replace the automatic transmission. <Ref. to AT-31, INSPECTION, Road Test.>	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

BL:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT VEHICLES) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



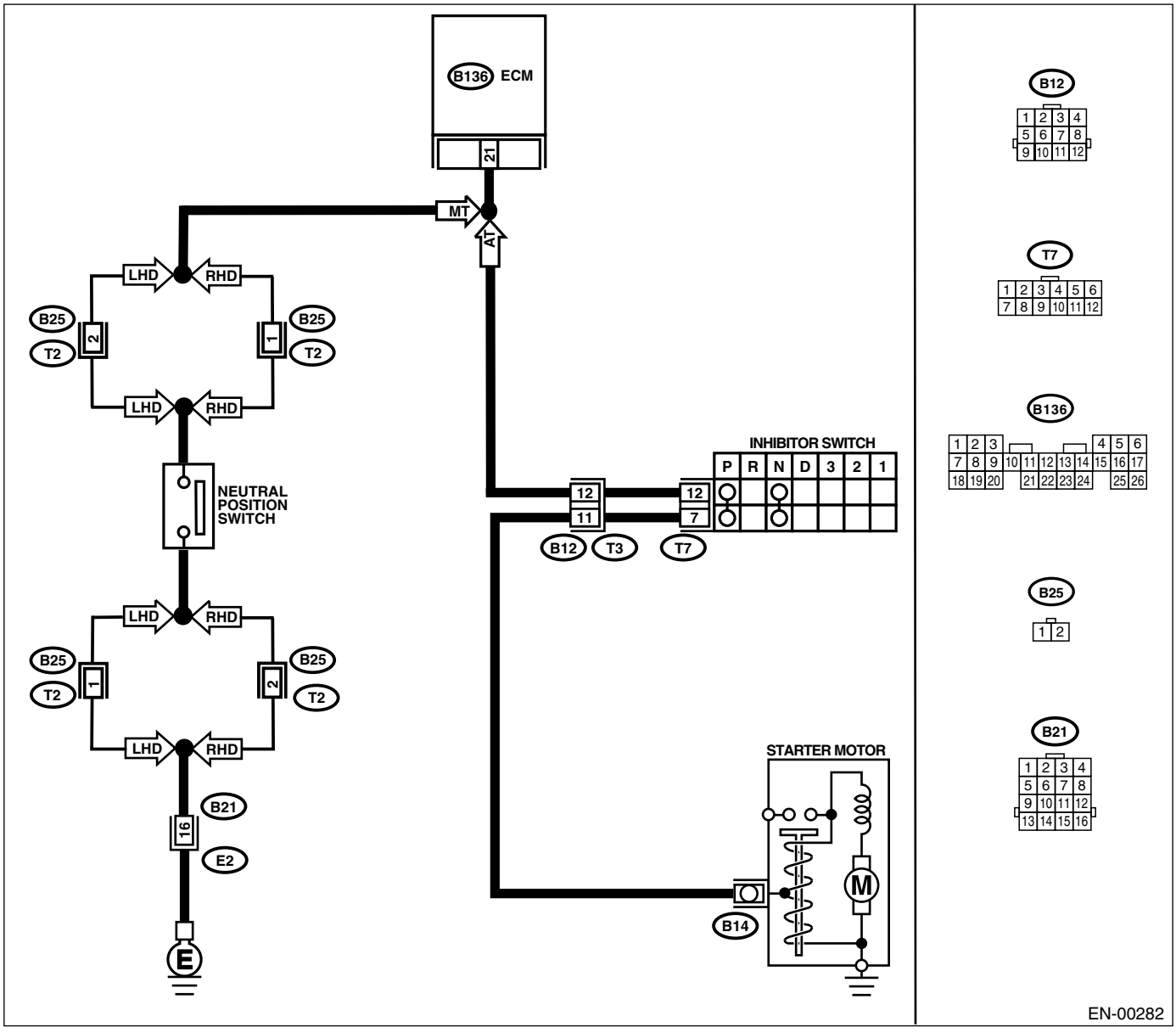
	Step	Check	Yes	No
1	**CHECK DTC P0705 ON DISPLAY.** Is DTC P0705 indicated?	DTC P0705 is indicated.	Inspect DTC P0705 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. 2)Place the select lever except for "N" and "P" positions. 3)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (–):*** Is the measured value within specified value?	4.5 — 5.5 V	Even if MIL lights up, the circuit has returned to a normal condition at this time.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and transmission harness connector (T3). 3)Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 21 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **4.**	Repair ground short circuit in harness between ECM and transmission harness connector.
4	**CHECK TRANSMISSION HARNESS CONNECTOR.** 1)Disconnect the connector from inhibitor switch. 2)Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(T3) No. 12 — Engine ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **5.**	Repair ground short circuit in harness between transmission harness and inhibitor switch connector.
5	**CHECK INHIBITOR SWITCH.** Measure the resistance between inhibitor switch connector the receptacle's terminals in selector lever except for "N" position. ***Terminals*** ***No. 7 — No. 12:*** Is the measured value more than specified value?	1 MΩ	Go to step **6.**	Replace the inhibitor switch. <Ref. to AT-48, Inhibitor Switch.>
6	**CHECK SELECTOR CABLE CONNECTION.** Is there any fault in selector cable connection to inhibitor switch?	There is a fault.	Repair selector cable connection. <Ref. to CS-10, INSPECTION, Select Cable.>	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BM:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (MT VEHICLES) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. 2)Place the shift lever in neutral. 3)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10V	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1)Place the shift lever in a position except for neutral. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1V	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair poor contact in ECM connector.	Contact with SOA (distributor) service.
4	**CHECK NEUTRAL POSITION SWITCH.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from transmission harness. 3)Place the shift lever in neutral. 4)Measure the resistance between transmission harness and connector terminals. ***Connector & terminal*** ***(T2) No. 1 — No. 2:*** Is the measured value more than specified value?	1MΩ	Go to step **5.**	Repair short circuit in transmission harness or replace neutral position switch.
5	**CHECK NEUTRAL POSITION SWITCH.** 1)Place the shift lever in a position except for neutral. 2)Measure the resistance between transmission harness connector terminals. Is the measured value less than specified value?	1Ω	Go to step **6.**	Repair short circuit in transmission harness or replace neutral position switch.
6	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **7.**	Repair ground short circuit in harness between ECM and transmission harness connector.

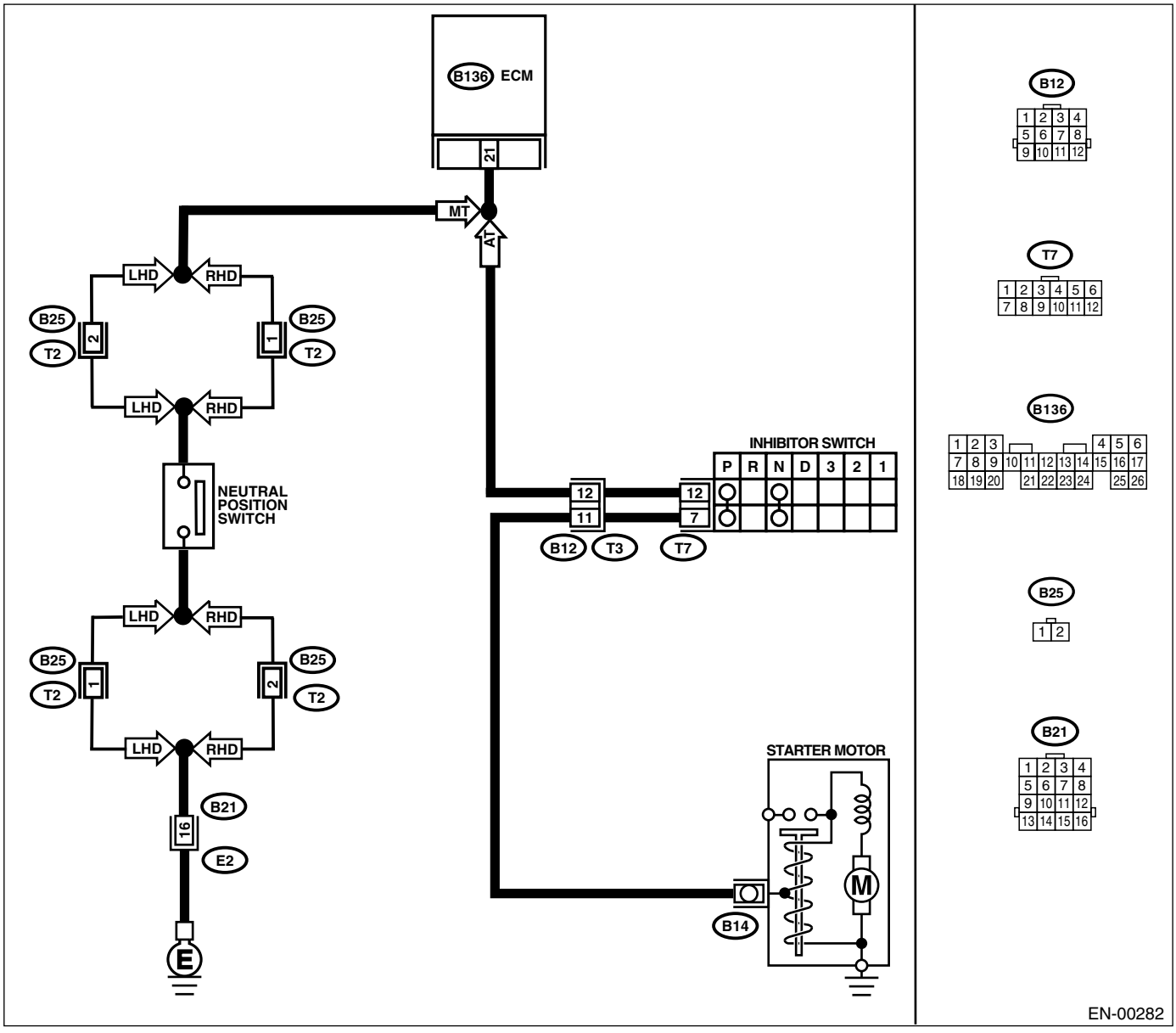
	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** 1)Disconnect the connector from ECM. 2)Measure the resistance of harness between ECM and transmission harness connector. ***Connector & terminal*** ***With OBD*** ***(B136) No. 21 — (B25) No. 1:*** ***RHD model*** ***(B136) No. 21 — (B25) No. 2:*** Is the measured value less than specified value?	1 Ω	Go to step **8.**	Repair open circuit in harness between ECM and transmission harness connector.
8	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***LHD model*** ***(B25) No. 2 — Engine ground:*** ***RHD model*** ***(B25) No. 1 — Engine ground:*** Is the measured value less than specified value?	5 Ω	Go to step **9.**	Repair open circuit between transmission harness connector and engine ground terminal.
9	**CHECK POOR CONTACT.** Check poor contact in transmission harness connector. Is there poor contact in transmission harness connector?	Poor contact occurs.	Repair poor contact in transmission harness connector.	Contact with SOA (distributor) service.

BN:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK DTC P0705 ON DISPLAY.** Is DTC P0705 indicated?	DTC P0705 is indicated.	Inspect DTC P0705 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground in selector lever "N" and "P" positions. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **3.**	Go to step **5.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground in selector lever except for "N" and "P" positions. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (–):*** Is the measured value within specified value?	4.5 — 5.5 V	Go to step **4.**	Go to step **5.**
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair poor contact in ECM connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Repair battery short circuit in harness between ECM and inhibitor switch connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and inhibitor switch. 3)Measure the resistance of harness between ECM and inhibitor switch connector. ***Connector & terminal*** ***(B136) No. 21 — (T7) No. 12:*** Is the measured value less than specified value?	1 Ω	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and inhibitor switch connector • Poor contact in coupling connector • Poor contact in inhibitor switch connector • Poor contact in ECM connector

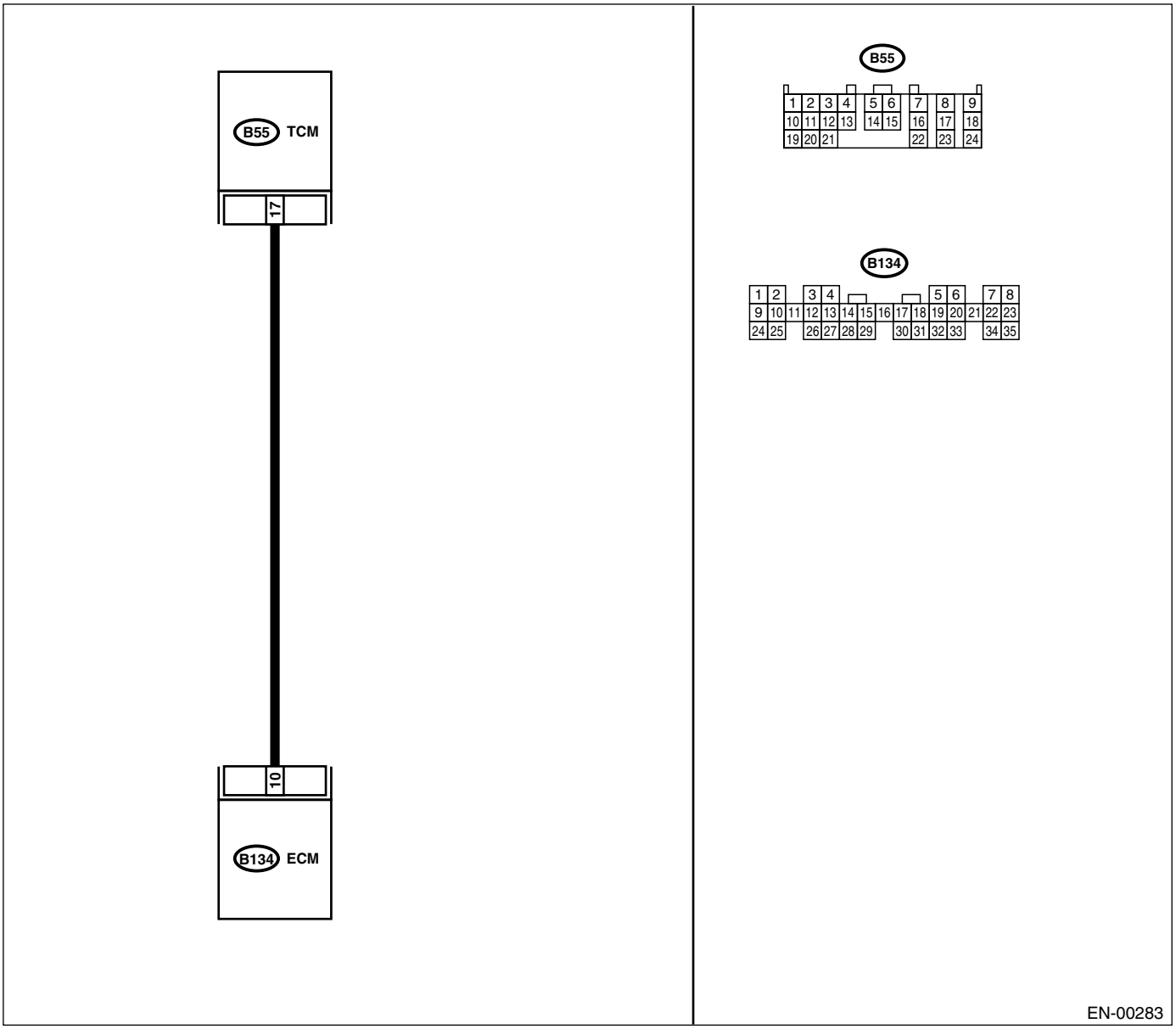
	Step	Check	Yes	No
7	**CHECK INHIBITOR SWITCH GROUND LINE.** Measure the resistance of harness between inhibitor switch connector and engine ground. ***Connector & terminal*** ***(T7) No. 7 — Engine ground:*** Is the measured value less than specified value?	5 Ω	Go to step **8.**	Repair open circuit in harness between inhibitor switch connector and starter motor ground line. NOTE: In this case, repair the following: • Open circuit in harness between inhibitor switch connector and starter motor ground line • Poor contact in starter motor connector • Poor contact in starter motor ground • Starter motor
8	**CHECK INHIBITOR SWITCH.** Measure the resistance between inhibitor switch connector receptacle's terminals in selector lever “N” and “P” positions. ***Terminals*** ***No. 7 — No. 12:*** Is the measured value less than specified value?	1 Ω	Go to step **9.**	Replace the inhibitor switch. <Ref. to AT-48, Inhibitor Switch.>
9	**CHECK SELECTOR CABLE CONNECTION.** Is there any fault in selector cable connection to inhibitor switch?	There is a fault.	Repair selector cable connection. <Ref. to CS-10, INSPECTION, Select Cable.>	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BO:DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK DRIVING CONDITION.** 1)Start and warm-up the engine until the radiator fan makes one complete rotation. 2)Drive the vehicle. Is the AT shift control functioning properly?	Shift control is functioning properly.	Go to step **2.**	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

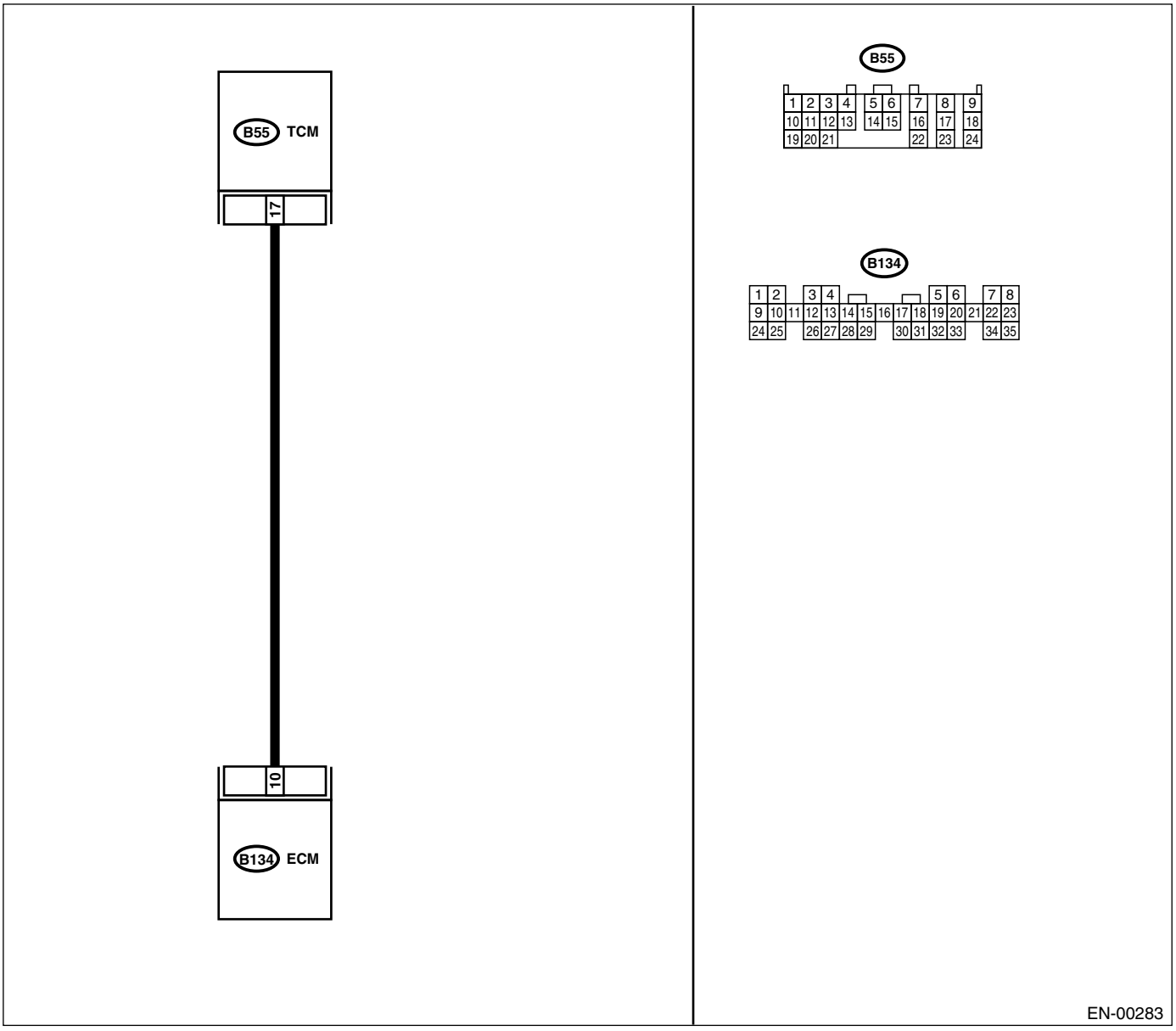
	Step	Check	Yes	No
2	**CHECK ACCESSORY.** Are car phone and/or CB installed on vehicle?	Car phone and/or CB is installed.	Repair grounding line of car phone or CB system.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

BP:DTC P0865 — TCM COMMUNICATION CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



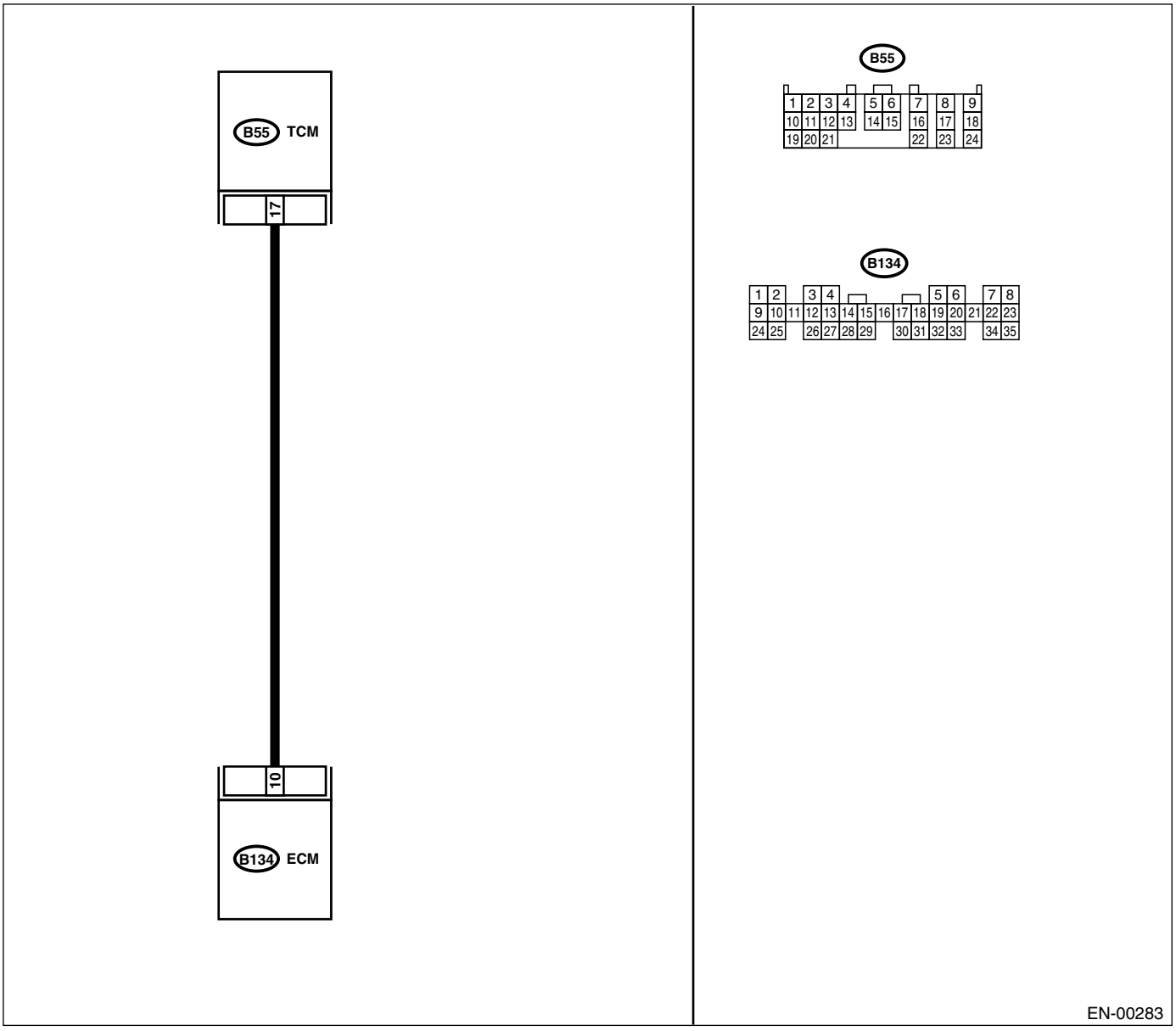
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 10 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. NOTE: In this case, repair the following: • Poor contact in ECM connector • Poor contact in TCM connector
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM and TCM. 3)Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 10 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **3.**	Repair ground short circuit in harness between ECM and TCM connector.
3	**CHECK OUTPUT SIGNAL FOR ECM.** 1)Connect the connector to ECM. 2)Turn the ignition switch to ON. 3)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 10 (+) — Chassis ground (–):*** Is the measured value more than specified value?	5 V	Go to step **4.**	Repair poor contact in ECM connector.
4	**CHECK TROUBLE CODE FOR AUTOMATIC TRANSMISSION.** Read the trouble code for automatic transmission. <Ref. to AT-20, Read Diagnostic Trouble Code (DTC).> Does the trouble code appear for automatic transmission?	DTC appears.	Inspect trouble code for automatic transmission. <Ref. to AT-38, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

BQ:DTC P0866 — TCM COMMUNICATION CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 10 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Repair battery short circuit in harness between ECM and TCM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 10 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4 V	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 10 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Repair poor contact in ECM connector.	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 10 (+) — Chassis ground (–):*** Is the change of measured value within specified value?	1 V — 4 V	Even if MIL lights up, the circuit has returned to a normal condition at this time. NOTE: In this case, repair the following: • Poor contact in ECM connector • Poor contact in TCM connector	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 17 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4 V	Go to step **6.**	Repair open circuit in harness between ECM and TCM connector.
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector. Is there poor contact in TCM connector?	Poor contact occurs.	Repair poor contact in TCM connector.	Check TCM power supply line and grounding line.

BR:DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	It is not necessary to inspect DTC P0129.	Replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>

BS:DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

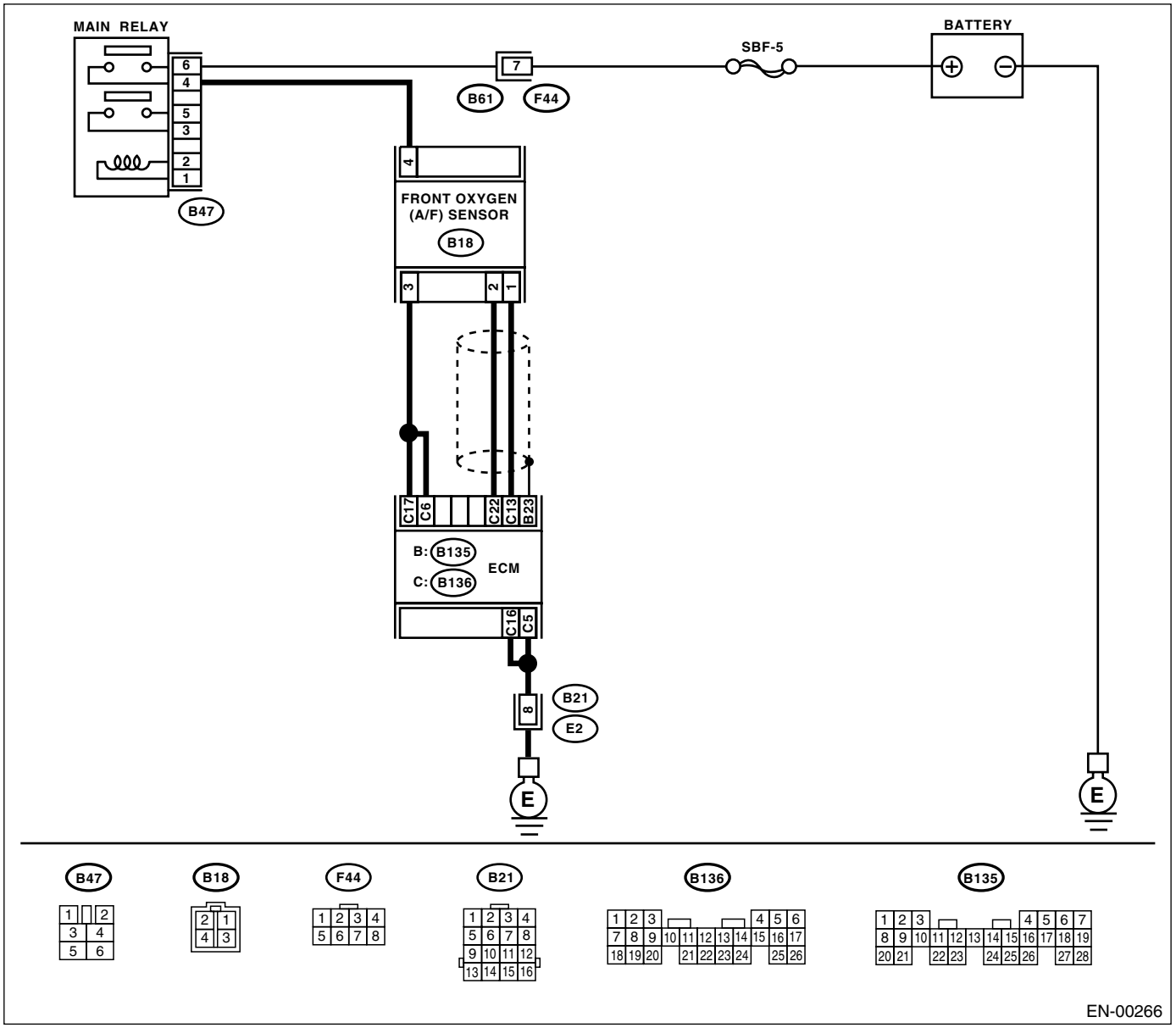
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	It is not necessary to inspect DTC P1111.	Replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>

BT:DTC P1134 — A/F SENSOR MICRO-COMPUTER PROBLEM —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, Inspection Mode.> .

- **WIRING DIAGRAM:**



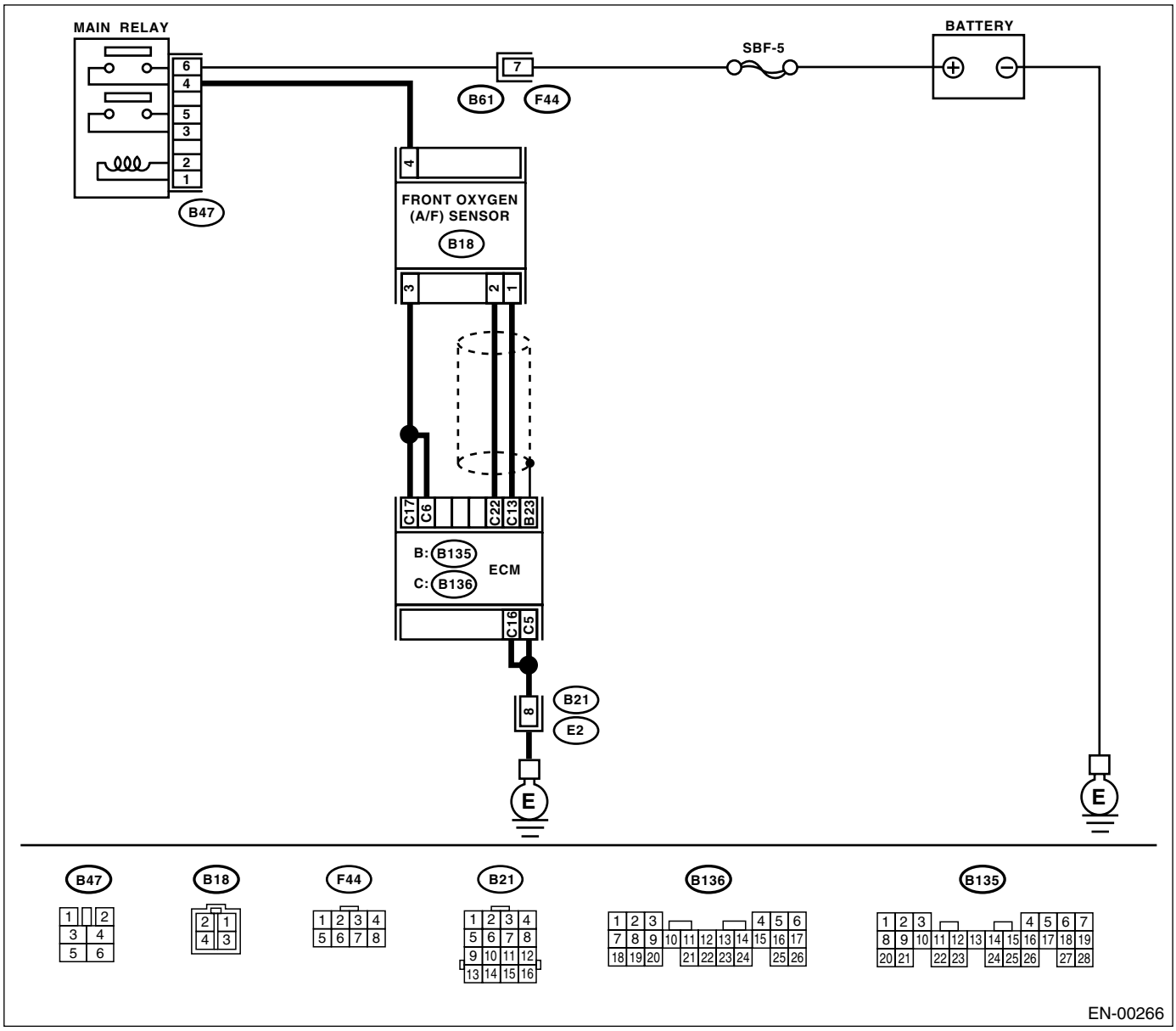
Step		Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1134?	Replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>	It is not necessary to inspect DTC P1134.

BU: DTC P1137 — O_2 SENSOR CIRCUIT (BANK1 SENSOR1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FRONT OXYGEN (A/F) SENSOR DATA.** 1)Start the engine. 2)While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 70°C (160°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3)Read the data of front oxygen (A/F) sensor signal during idling using Subaru Select Monitor or OBD-II general scan tool. Is the measured value within specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	0.85 — 1.15	Go to step **3.**	Go to step **4.**
3	**CHECK FRONT OXYGEN (A/F) SENSOR DATA.** Race the engine at speeds from idling to 5,000 rpm for a total of 5 cycles. Is the measured value more than specified value during racing? NOTE: •Air fuel ratio is rich at normal condition or during racing. •To increase engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed.	1.1 V	Go to step **6.**	Go to step **4.**
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3)Measure the resistance between ECM and front oxygen (A/F) sensor. ***Connector & terminals*** ***(B136) No. 13 — (B18) No. 1:*** ***(B136) No. 22 — (B18) No. 2:*** Is the measured value less than specified value?	5 Ω	Go to step **5.**	Repair open circuit between ECM and front oxygen (A/F) sensor.

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminals*** ***(B136) No. 13 — Chassis ground:*** ***(B136) No. 22 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **6.**	Repair ground short circuit between ECM and front oxygen (A/F) sensor.
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. Is there a fault in exhaust system? NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness of front oxygen (A/F) sensor •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	There is a fault.	Repair or replace faulty parts.	Replace the front oxygen (A/F) sensor. <Ref. to FU(SOHC)-42, Front Oxygen (A/F) Sensor.>

BV:DTC P1492 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT) —

NOTE:
For the diagnostic procedure, refer to DTC P1498. <Ref. to EN(SOHC)-239, DTC P1498 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BW:DTC P1493 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT) —

NOTE:
For the diagnostic procedure, refer to DTC P1499. <Ref. to EN(SOHC)-241, DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BX:DTC P1494 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT) —

NOTE:
For the diagnostic procedure, refer to DTC P1498. <Ref. to EN(SOHC)-239, DTC P1498 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BY:DTC P1495 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT) —

NOTE:
For the diagnostic procedure, refer to DTC P1499. <Ref. to EN(SOHC)-241, DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BZ:DTC P1496 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT) —

NOTE:
For the diagnostic procedure, refer to DTC P1498. <Ref. to EN(SOHC)-239, DTC P1498 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CA:DTC P1497 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT) —

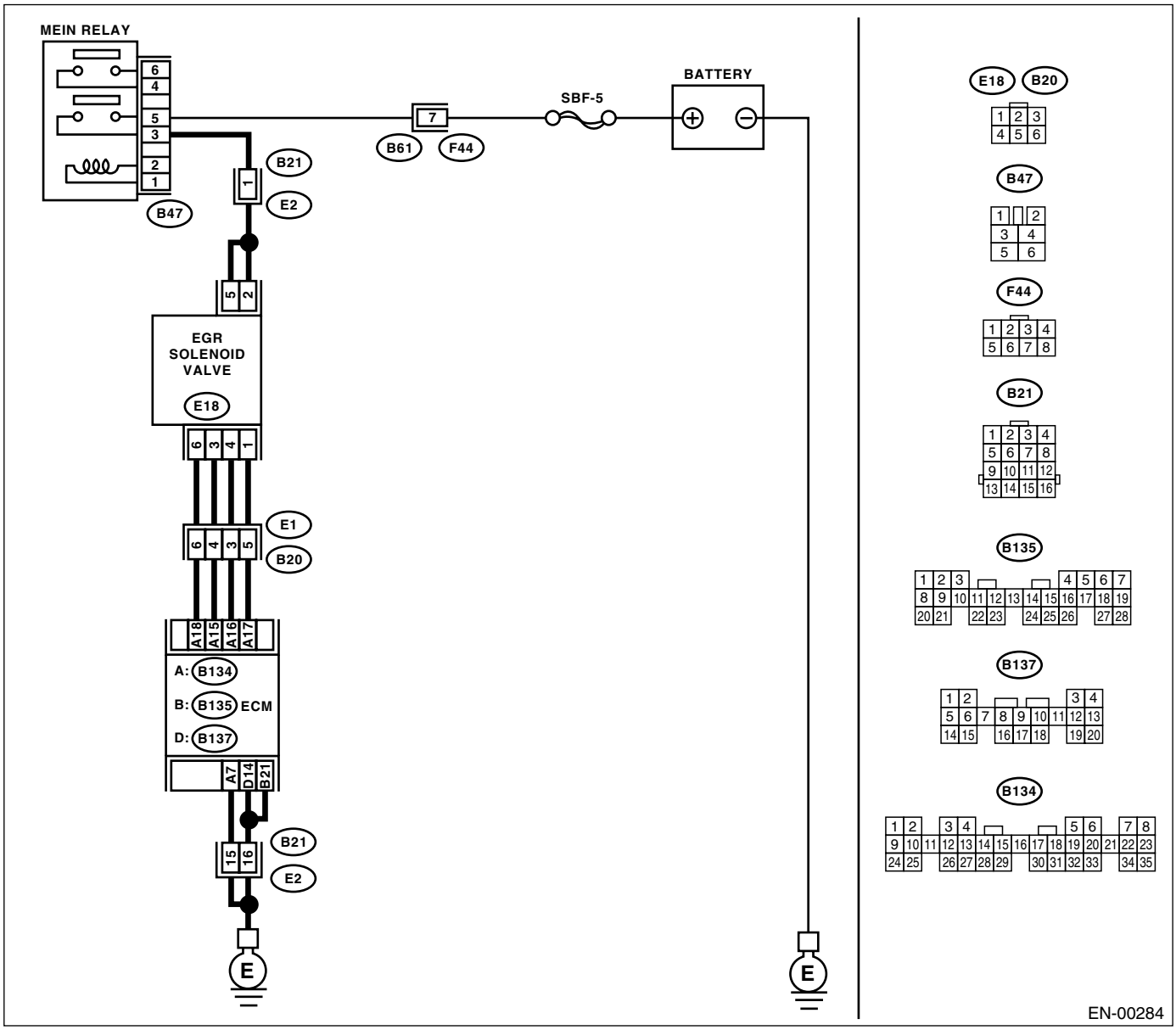
NOTE:
For the diagnostic procedure, refer to DTC P1499. <Ref. to EN(SOHC)-241, DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CB:DTC P1498 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance.
  - Engine breathing

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



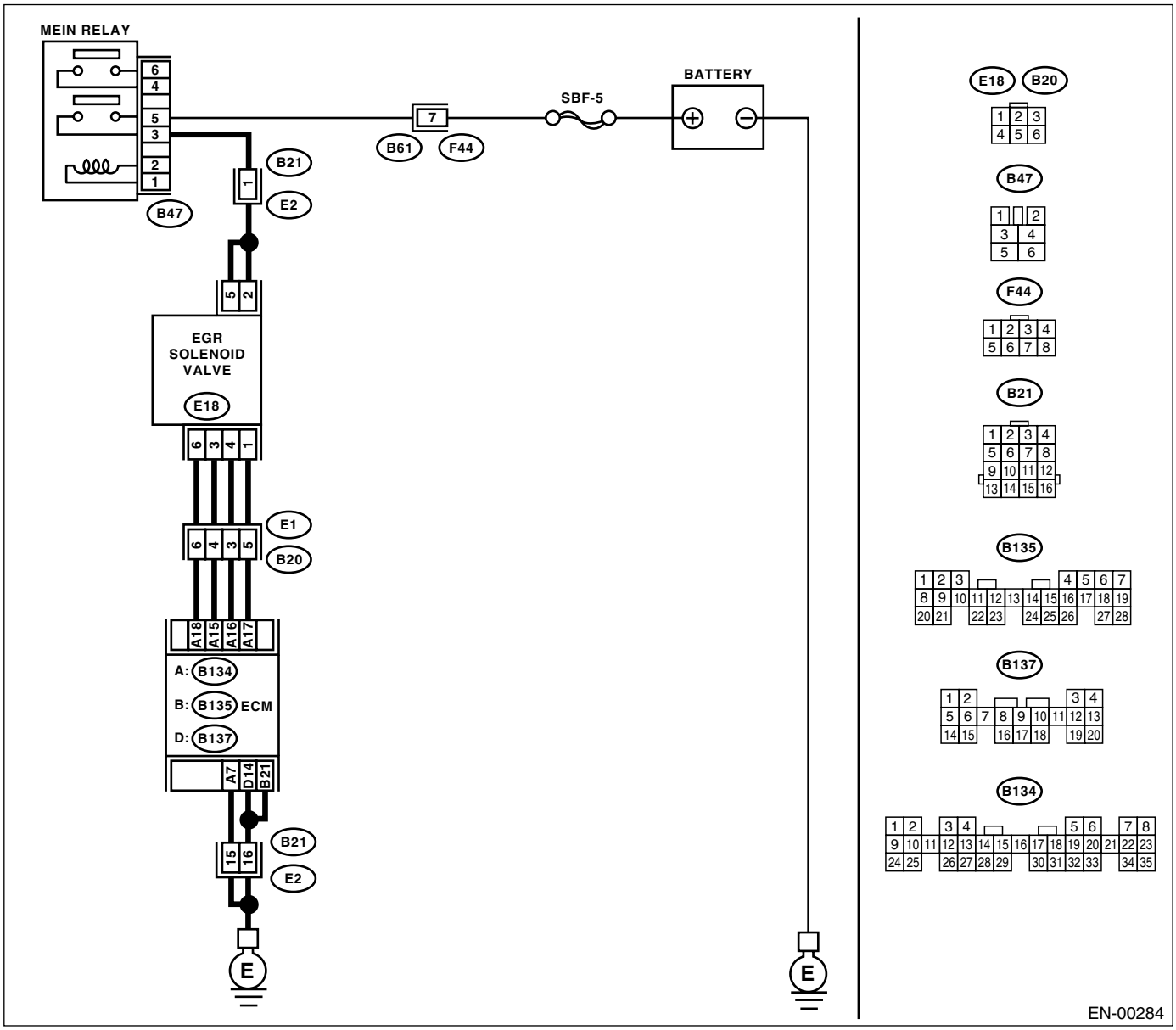
	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO EGR SOLENOID VALVE.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from EGR solenoid valve. 3)Turn the ignition switch to ON. 4)Measure the voltage between EGR solenoid valve connector and engine ground. ***Connector & terminal*** ***(E18) No. 2 (+) — Engine ground (–):*** ***(E18) No. 5 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between EGR solenoid valve and main relay connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN ECM AND EGR SOLENOID VALVE CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ECM and EGR solenoid valve connector. ***Connector & terminal*** ***DTC P1492; (B134) No. 18 — (E18) No. 6:*** ***DTC P1494; (B134) No. 17 — (E18) No. 1:*** ***DTC P1496; (B134) No. 16 — (E18) No. 4:*** ***DTC P1498; (B134) No. 15 — (E18) No. 3:*** Is the measured value less than specified value?	1 Ω	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and EGR solenoid valve connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN ECM AND EGR SOLENOID VALVE CONNECTOR.** 1)Disconnect the connector from ECM. 2)Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***DTC P1492; (B134) No. 18 — Chassis ground:*** ***DTC P1494; (B134) No. 17 — Chassis ground:*** ***DTC P1496; (B134) No. 16 — Chassis ground:*** ***DTC P1498; (B134) No. 15 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **4.**	Repair ground short circuit in harness between ECM and EGR solenoid valve connector.
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector and EGR solenoid valve connector. Is there poor contact in ECM connector or EGR solenoid valve connector?	Poor contact occurs.	Repair poor contact in ECM connector or EGR solenoid valve connector.	Replace the EGR solenoid valve. <Ref. to FU(SOHC)-35, Idle Air Control Solenoid Valve.>

CC:DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance.
  - Engine breathing

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Go to step **2.**	Go to step **3.**
2	**CHECK GROUND CIRCUIT FOR ECM.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 7 — Chassis ground:*** ***(B137) No. 14 — Chassis ground:*** ***(B135) No. 21 — Chassis ground:*** Is the measured value less than specified value?	5 Ω	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM connector and engine ground terminal • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN ECM AND EGR SOLENOID VALVE CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from EGR solenoid valve. 3)Turn the ignition switch to ON. 4)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***DTC P1493; (B134) No. 18 (+) — Chassis ground (–):*** ***DTC P1495; (B134) No. 17 (+) — Chassis ground (–):*** ***DTC P1497; (B134) No. 16 (+) — Chassis ground (–):*** ***DTC P1499; (B134) No. 15 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Repair battery short circuit in harness between ECM and EGR solenoid valve connector. After repair, replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>	Replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>

CD:DTC P1510 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 1 CIRCUIT LOW INPUT —

NOTE:
For the diagnostic procedure, refer to DTC P1516. <Ref. to EN(SOHC)-244, DTC P1516 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CE:DTC P1511 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 1 CIRCUIT HIGH INPUT —

NOTE:
For the diagnostic procedure, refer to DTC P1517. <Ref. to EN(SOHC)-246, DTC P1517 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CF:DTC P1512 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 2 CIRCUIT LOW INPUT —

NOTE:
For the diagnostic procedure, refer to DTC P1516. <Ref. to EN(SOHC)-244, DTC P1516 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CG:DTC P1513 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 2 CIRCUIT HIGH INPUT —

NOTE:
For the diagnostic procedure, refer to DTC P1517. <Ref. to EN(SOHC)-246, DTC P1517 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CH:DTC P1514 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 3 CIRCUIT LOW INPUT —

NOTE:
For the diagnostic procedure, refer to DTC P1516. <Ref. to EN(SOHC)-244, DTC P1516 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CI: DTC P1515 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 3 CIRCUIT HIGH INPUT —

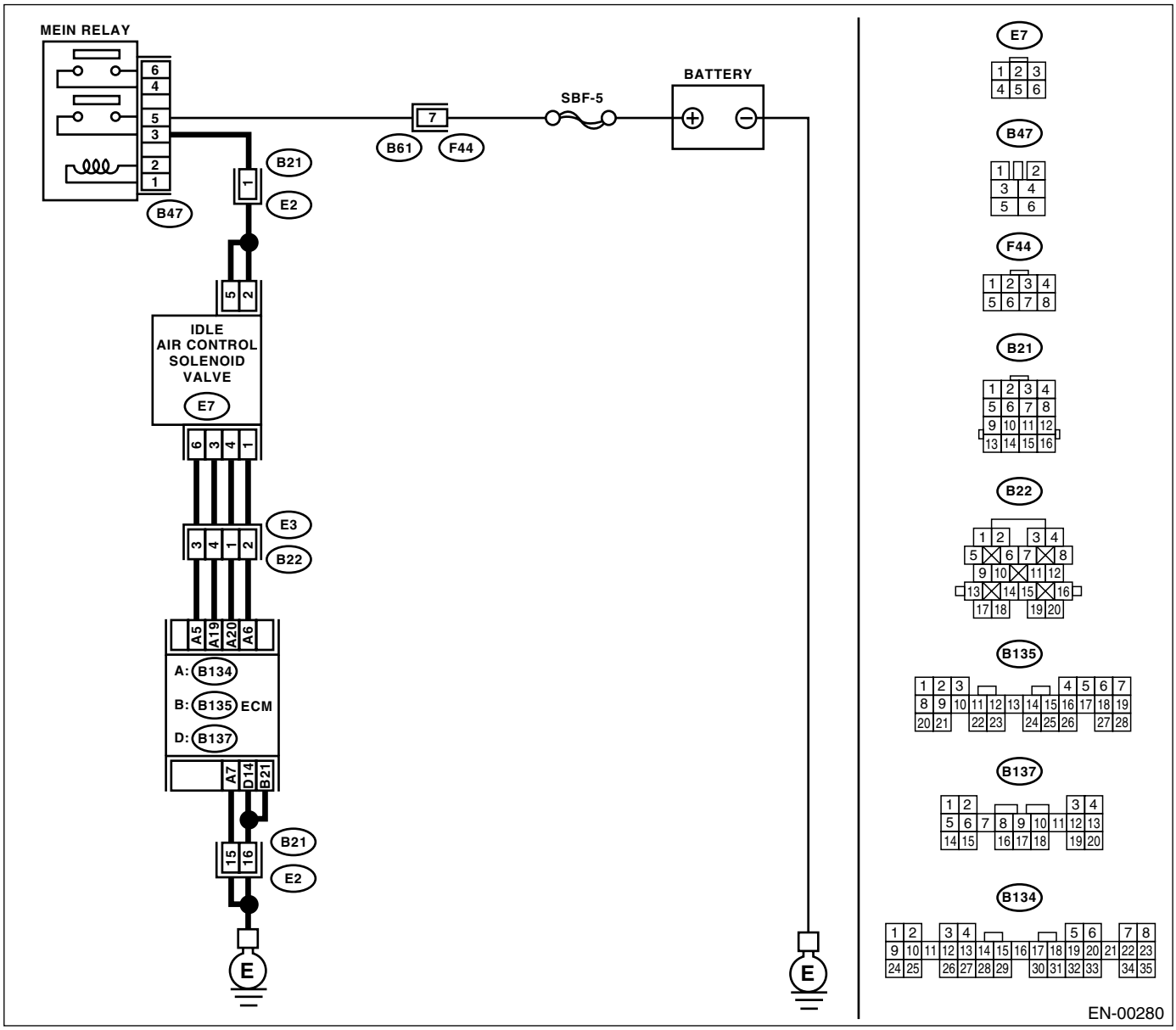
NOTE:
For the diagnostic procedure, refer to DTC P1517. <Ref. to EN(SOHC)-246, DTC P1517 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CJ:DTC P1516 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Engine breathing

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



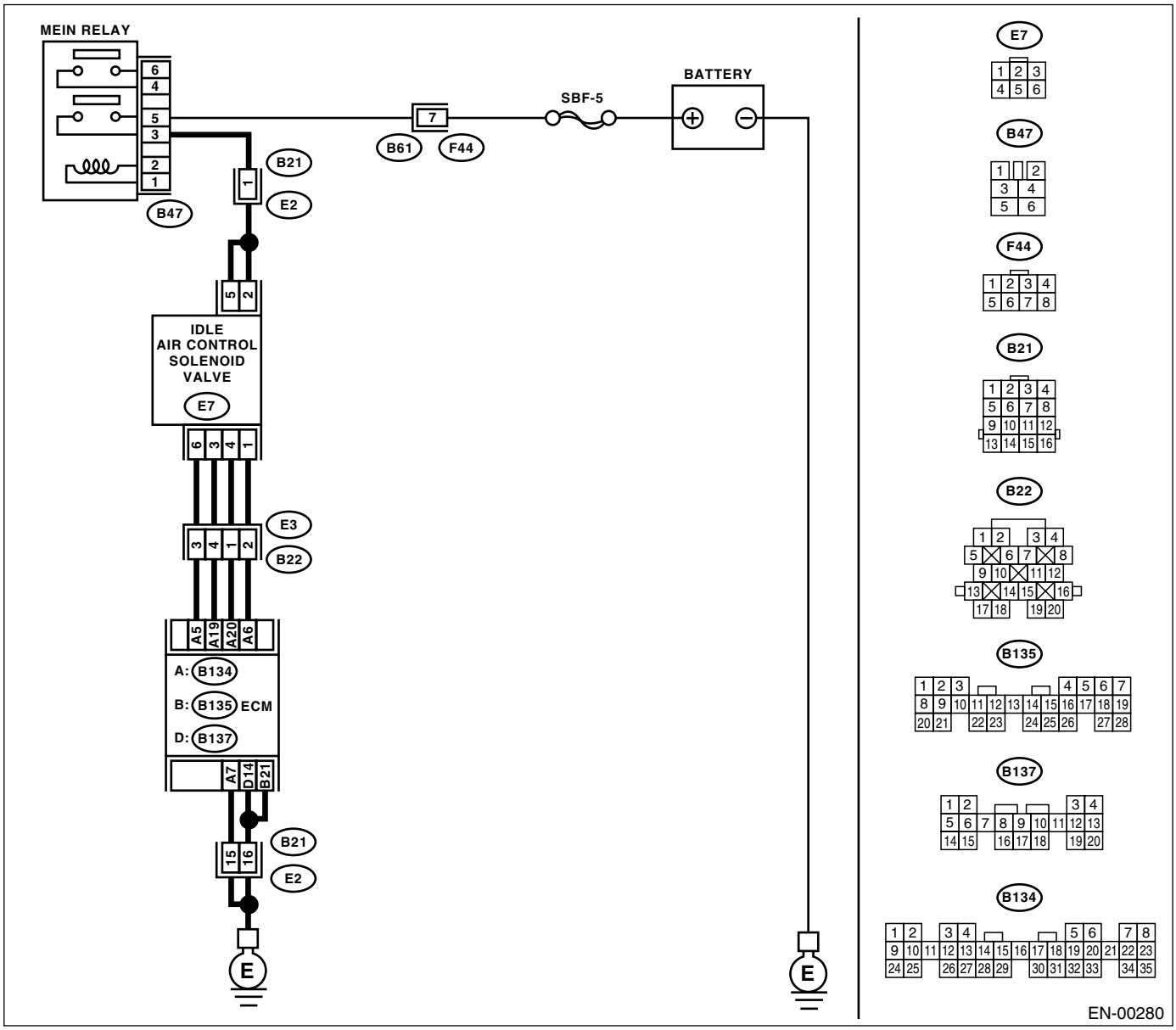
	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from idle air control solenoid valve. 3)Turn the ignition switch to ON. 4)Measure the voltage between idle air control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E7) No. 2 (+) — Engine ground (–):*** ***(E7) No. 5 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between idle air control solenoid valve and main relay connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ECM and idle air control solenoid valve connector. ***Connector & terminal*** ***DTC P1510; (B134) No. 20 — (E7) No. 4:*** ***DTC P1512; (B134) No. 6 — (E7) No. 1:*** ***DTC P1514; (B134) No. 5 — (E7) No. 6:*** ***DTC P1516; (B134) No. 19 — (E7) No. 3:*** Is the measured value less than specified value?	1 Ω	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and idle air control solenoid valve connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** 1)Disconnect the connector from ECM. 2)Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***DTC P1510; (B134) No. 20 — Chassis ground:*** ***DTC P1512; (B134) No. 6 — Chassis ground:*** ***DTC P1514; (B134) No. 5 — Chassis ground:*** ***DTC P1516; (B134) No. 19 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **4.**	Repair ground short circuit in harness between ECM and idle air control solenoid valve connector.
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector and idle air control solenoid valve connector. Is there poor contact in ECM connector or idle air control solenoid valve connector?	Poor contact occurs.	Repair poor contact in ECM connector or idle air control solenoid valve connector.	Replace the idle air control solenoid valve. <Ref. to FU(SOHC)-35, Idle Air Control Solenoid Valve.>

CK:DTC P1517 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Engine breathing

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



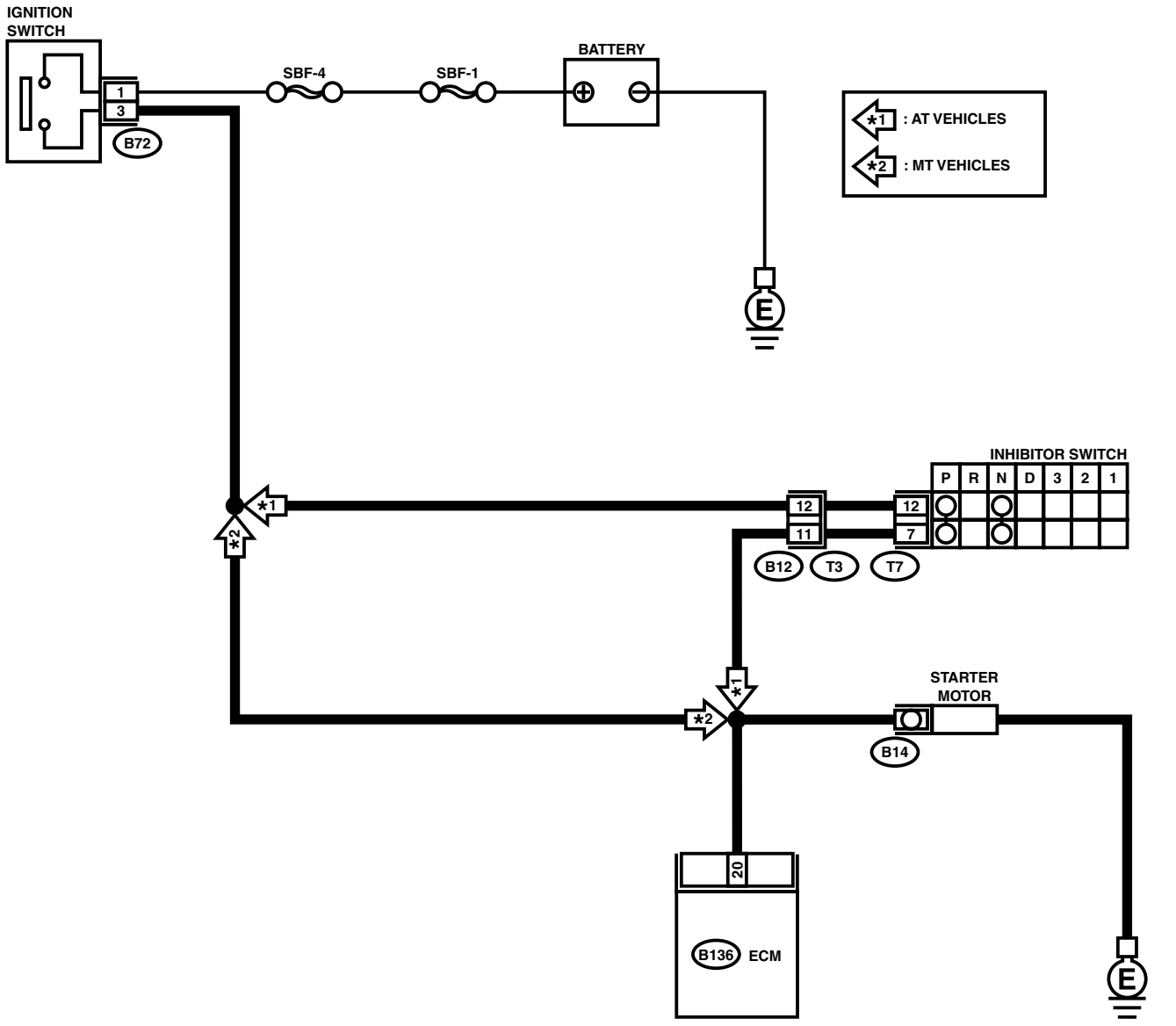
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Go to step **2.**	Go to step **3.**
2	**CHECK GROUND CIRCUIT FOR ECM.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 7 — Chassis ground:*** ***(B137) No. 14 — Chassis ground:*** ***(B135) No. 21 — Chassis ground:*** Is the measured value less than specified value?	5 Ω	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM connector and engine ground terminal • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from idle air control solenoid valve. 3)Turn the ignition switch to ON. 4)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***DTC P1511; (B134) No. 20 (+) — Chassis ground (–):*** ***DTC P1513; (B134) No. 6 (+) — Chassis ground (–):*** ***DTC P1515; (B134) No. 5 (+) — Chassis ground (–):*** ***DTC P1517; (B134) No. 19 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Repair battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>	Replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>

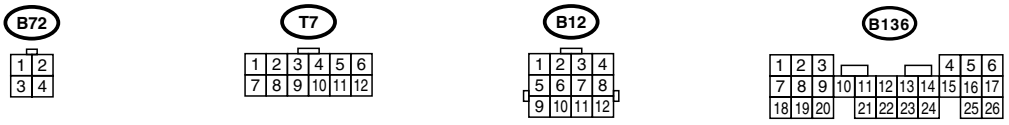
CL:DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-00261

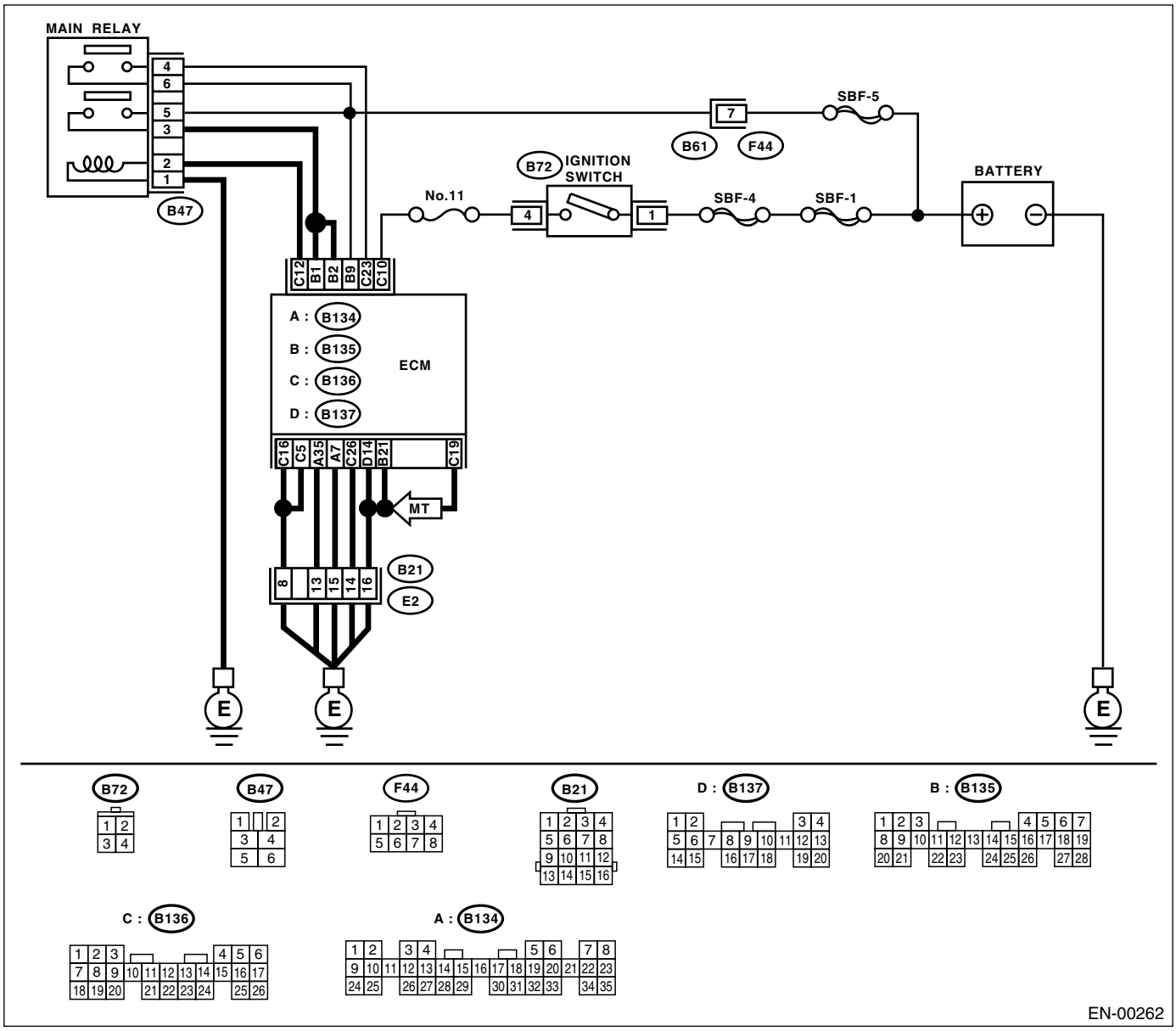
	Step	Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.** Does the starter motor operate when ignition switch is turned to “ST”? NOTE: Place the inhibitor switch in the “P” or “N” position. (AT model) Depress the clutch pedal. (MT model)	Starter motor operates.	Repair harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between ECM and starter motor connector. • Poor contact in ECM connector.	Check starter motor circuit. <Ref. to EN(SOHC)-61, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

CM:DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



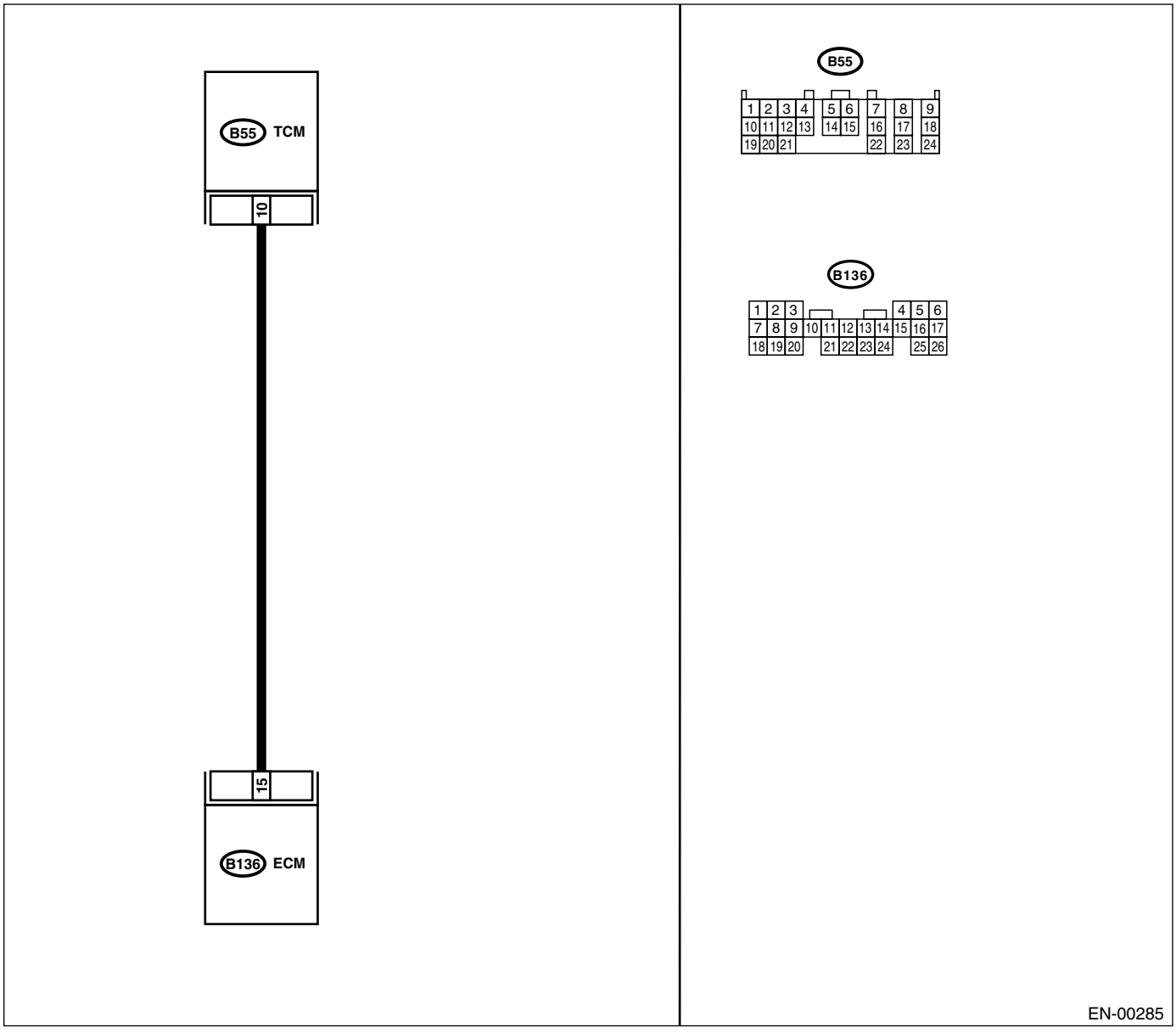
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to OFF. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 9 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.** 1)Disconnect the connector from ECM. 2)Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 9 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	Repair ground short circuit in harness between ECM connector and battery terminal.	Go to step **3.**
3	**CHECK FUSE SBF-5.** Is fuse blown?	Fuse is blown out.	Replace the fuse.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and battery • Poor contact in ECM connector • Poor contact in battery terminal

CN:DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (LOW INPUT) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



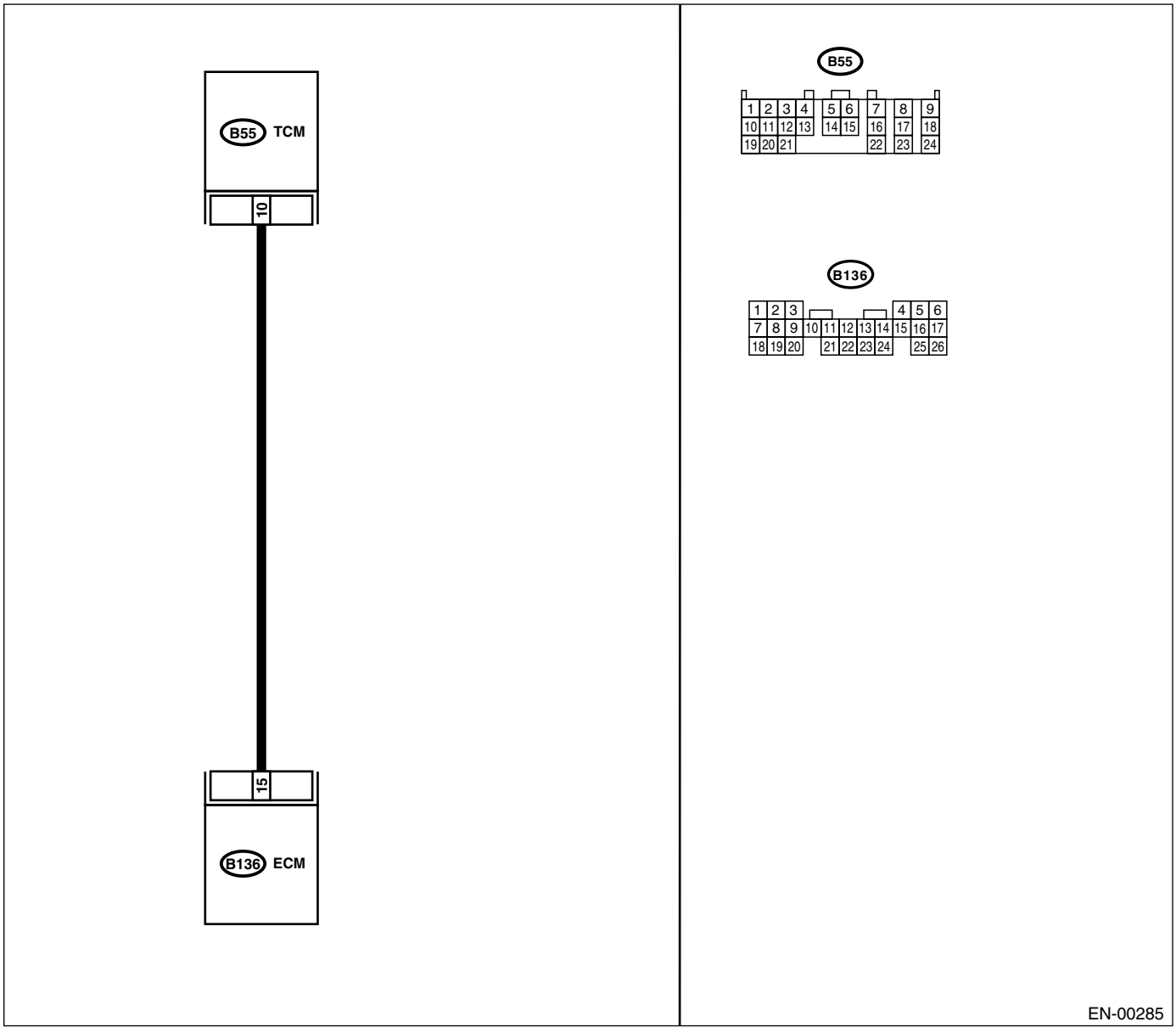
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Start the engine, and warm-up the engine. 2)Turn the ignition switch to OFF. 3)Turn the ignition switch to ON. 4)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 15 (+) — Chassis ground (–):*** Is the measured value more than specified value?	3 V	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and TCM. 3)Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 15 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **3.**	Repair ground short circuit in harness between ECM and TCM connector.
3	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the resistance of harness between ECM and TCM connector. ***Connector & terminal*** ***(B136) No. 15 — (B55) No. 10:*** Is the measured value less than specified value?	1 Ω	Repair poor contact in ECM or TCM connector.	Repair open circuit in harness between ECM and TCM connector.

CO:DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (HIGH INPUT) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



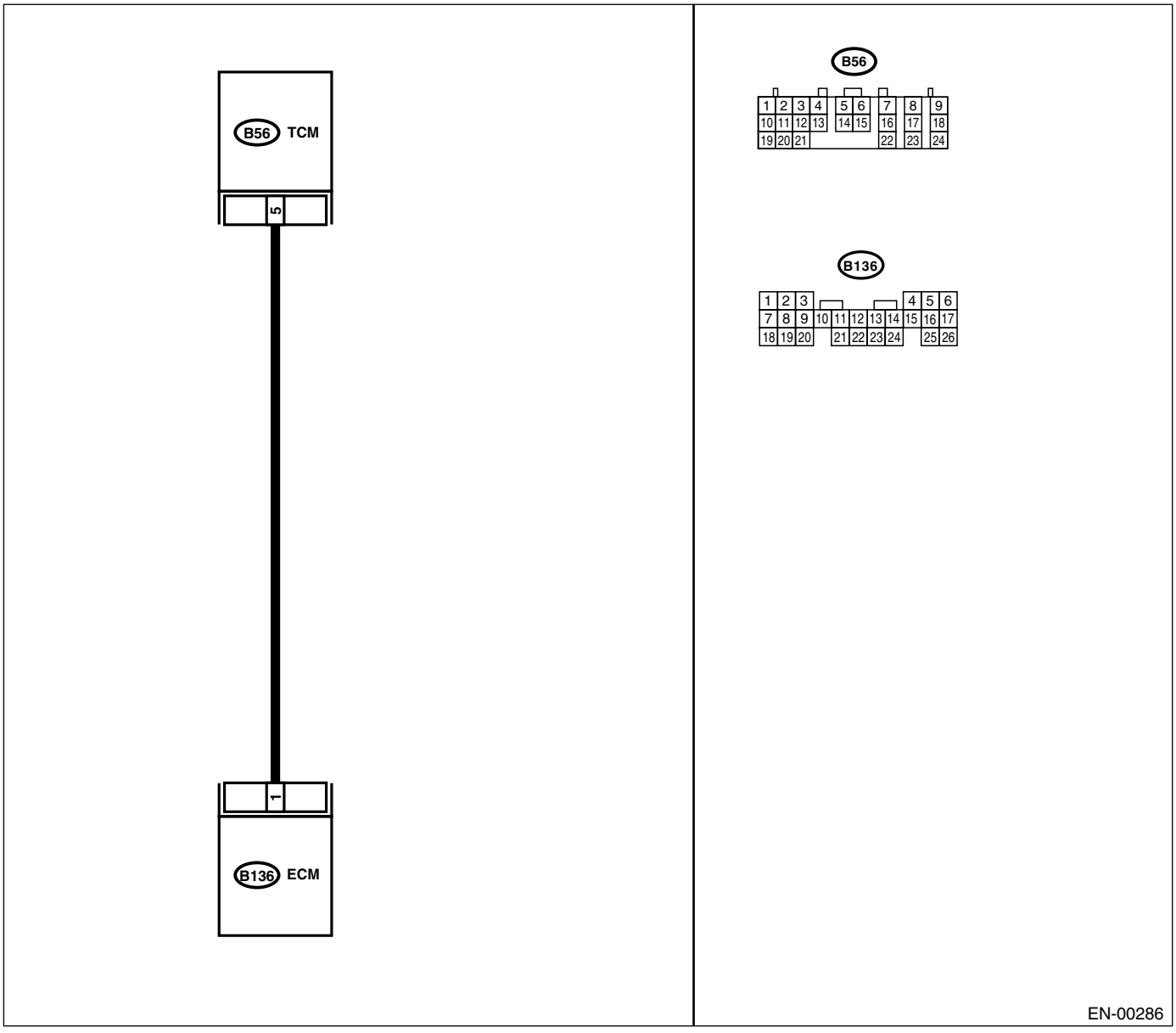
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Start the engine, and warm-up the engine. 2)Turn the ignition switch to OFF. 3)Disconnect the connector from TCM. 4)Turn the ignition switch to ON. 5)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 15 (+) — Chassis ground (–):*** Is the measured value less than specified value?	3 V	Go to step **2.**	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 15 (+) — Chassis ground (–):*** Shake the ECM harness and connector, while monitoring value of voltage meter. Is the measured value more than specified value?	10 V	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

CP:DTC P1711 — ENGINE TORQUE CONTROL SIGNAL #1 CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Excessive shift shock

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



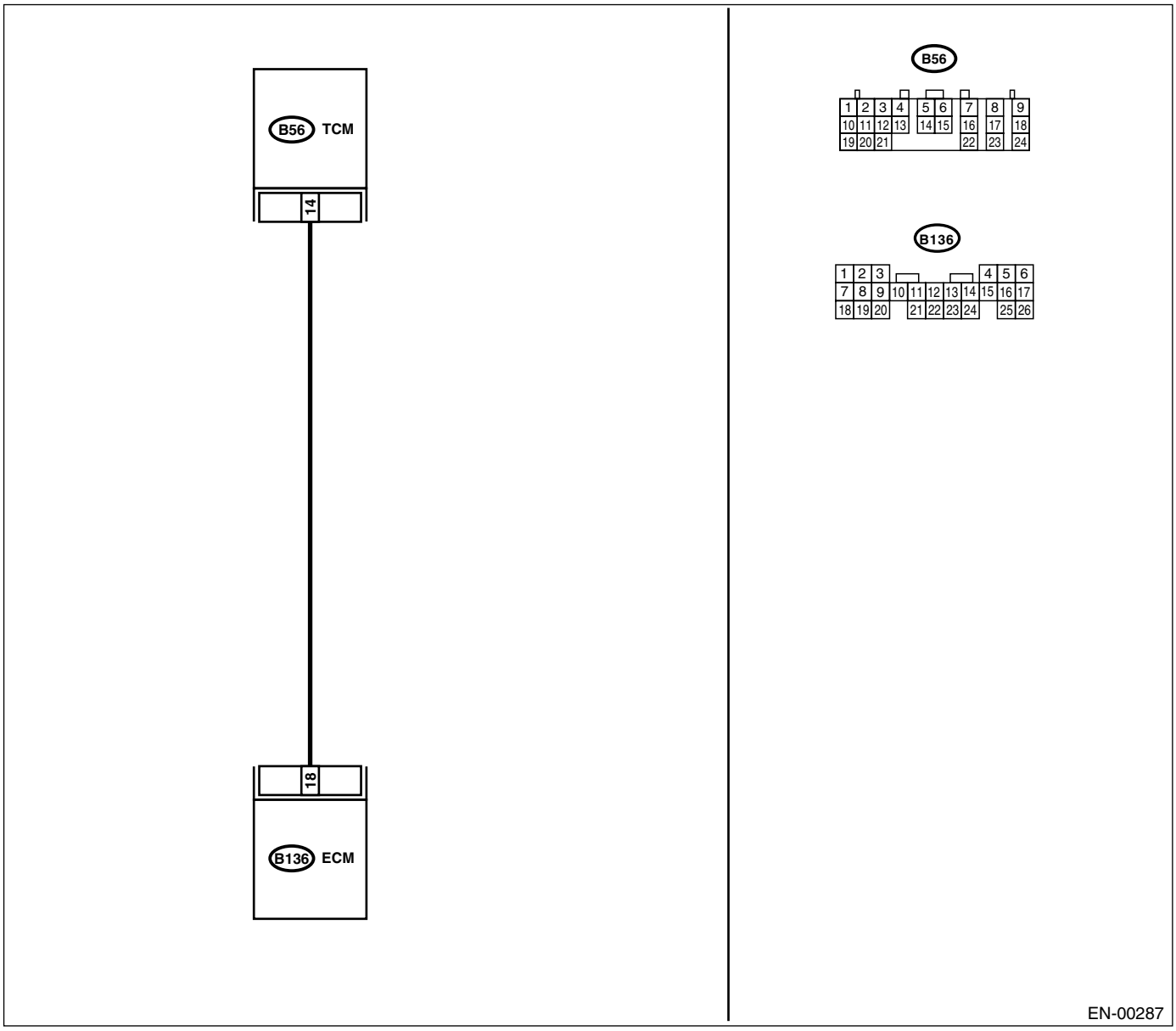
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 1 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4.5 V	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 1 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Repair battery short circuit in harness between ECM and TCM connector.	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>
4	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and TCM. 3)Measure the resistance of harness between ECM and TCM connector. ***Connector & terminal*** ***(B136) No. 1 — (B56) No. 5:*** Is the measured value less than specified value?	1 Ω	Go to step **5.**	Repair open circuit in harness between ECM and TCM connector.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 1 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **6.**	Repair ground short circuit in harness between ECM and TCM connector.
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector. Is there poor contact in TCM connector?	Poor contact occurs.	Repair poor contact in TCM connector.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

CQ:DTC P1712 — ENGINE TORQUE CONTROL SIGNAL #2 CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Excessive shift shock

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 18 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4.5 V	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 18 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Repair battery short circuit in harness between ECM and TCM connector.	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>
4	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and TCM. 3)Measure the resistance of harness between ECM and TCM connector. ***Connector & terminal*** ***(B136) No. 18 — (B56) No. 14:*** Is the measured value less than specified value?	1 Ω	Go to step **5.**	Repair open circuit in harness between ECM and TCM connector.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 18 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **6.**	Repair ground short circuit in harness between ECM and TCM connector.
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector. Is there poor contact in TCM connector?	Poor contact occurs.	Repair poor contact in TCM connector.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

20.General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(SOHC)-89, Engine Trouble in General.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Idle air control solenoid valve 2) Pressure sensor 3) Intake air temperature sensor 4) Ignition parts (*1) 5) Engine coolant temperature sensor (*2) 6) Crankshaft position sensor (*3) 7) Camshaft position sensor (*3) 8) Fuel injection parts (*4)
2. Rough idling	1) Idle air control solenoid valve 2) Pressure sensor 3) Intake air temperature sensor 4) Engine coolant temperature sensor (*2) 5) Ignition parts (*1) 6) Air intake system (*5) 7) Fuel injection parts (*4) 8) Throttle position sensor 9) Crankshaft position sensor (*3) 10) Camshaft position sensor (*3) 11) Oxygen sensor 12) Fuel pump and fuel pump relay
3. Engine does not return to idle.	1) Idle air control solenoid valve 2) Engine coolant temperature sensor 3) Accelerator cable (*6) 4) Throttle position sensor 5) Pressure sensor 6) Intake air temperature sensor
4. Poor acceleration	1) Pressure sensor 2) Intake air temperature sensor 3) Throttle position sensor 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay 6) Engine coolant temperature sensor (*2) 7) Crankshaft position sensor (*3) 8) Camshaft position sensor (*3) 9) A/C switch and A/C cut relay 10) Engine torque control signal circuit 11) Ignition parts (*1)
5. Engine stalls or engine sags or hesitates at acceleration.	1) Pressure sensor 2) Intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Purge control solenoid valve 7) Fuel injection parts (*4) 8) Throttle position sensor 9) Fuel pump and fuel pump relay

Symptom	Problem parts
6. Surge	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Pressure sensor 4) Engine coolant temperature sensor (*2) 5) Crankshaft position sensor (*3) 6) Camshaft position sensor (*3) 7) Fuel injection parts (*4) 8) Throttle position sensor 9) Fuel pump and fuel pump relay
7. Spark knock	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Pressure sensor 4) Engine coolant temperature sensor 5) Knock sensor 6) Fuel injection parts (*4) 7) Fuel pump and fuel pump relay
8. After burning in exhaust system	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Pressure sensor 4) Engine coolant temperature sensor (*2) 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay

*1: Check ignition coil & ignitor assembly and spark plug.
*2: Indicate the symptom occurring only in cold temperatures.
*3: Ensure the secure installation.
*4: Check fuel injector, fuel pressure regulator and fuel filter.
*5: Inspect air leak in air intake system.
*6: Adjust accelerator cable.

2. AUTOMATIC TRANSMISSION

NOTE:
Check general diagnostics table with non-conformity symptom for automatic transmission. <Ref. to AT-2, Basic Diagnostic Procedure.>

ENGINE 2 SECTION

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

FUEL INJECTION (FUEL SYSTEMS)	FU(TURBO)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(TURBO)
INTAKE (INDUCTION)	IN(TURBO)
MECHANICAL	ME(TURBO)
EXHAUST	EX(TURBO)
COOLING	CO(TURBO)
LUBRICATION	LU(TURBO)
SPEED CONTROL SYSTEMS	SP(TURBO)
IGNITION	IG(TURBO)
STARTING/CHARGING SYSTEMS	SC(TURBO)
ENGINE(DIAGNOSTICS)	EN(TURBO)

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FUEL INJECTION (FUEL SYSTEMS)

FU(TURBO)

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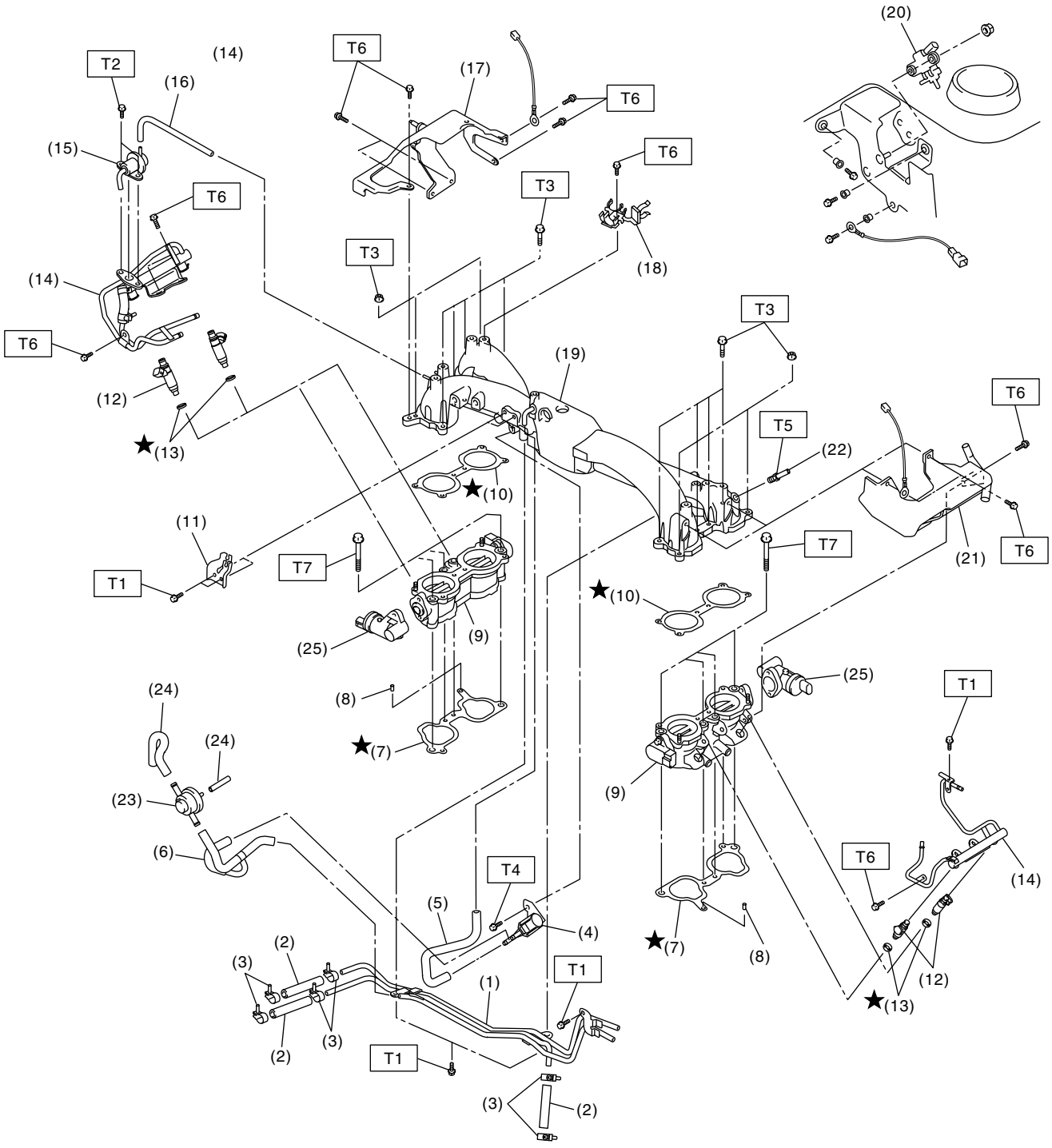
1. General Description

A: SPECIFICATIONS

Fuel tank	Capacity	60 ℓ (15.9 US gal, 13.2 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	450 — 677 kPa (4.59 — 6.9 kg/cm^2, 65.27 — 98.2 psi)
	Discharge flow	More than 130 ℓ (34.3 US gal, 28.6 Imp gal)/h [12 V at 300 kPa (3.06 kg/cm^2, 43.5 psi)]
Fuel filter		Cartridge type

B: COMPONENT

1. INTAKE MANIFOLD

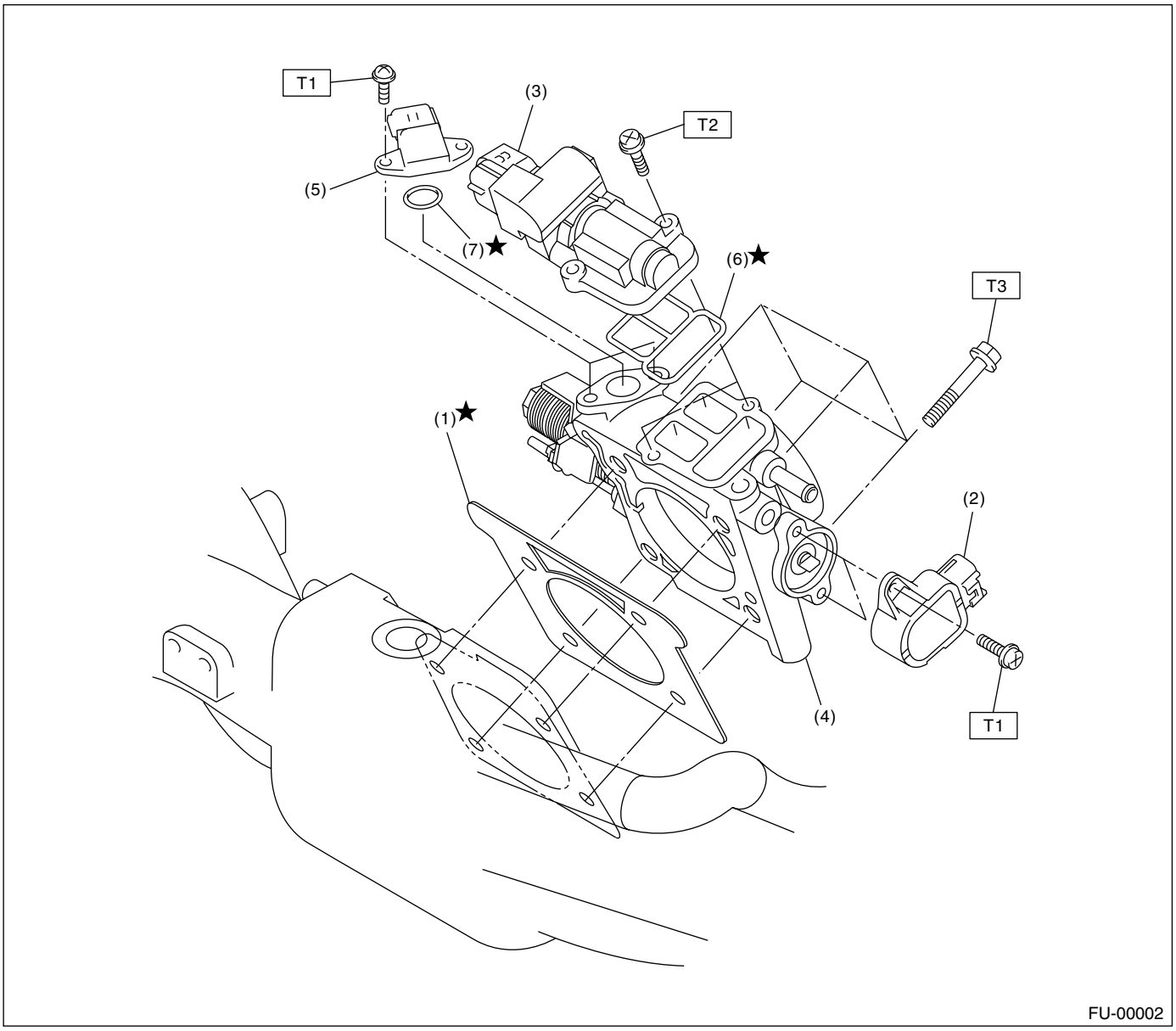


FU-00362

(1) Fuel pipe ASSY
(2) Fuel hose
(3) Clip
(4) Purge control solenoid valve
(5) Vacuum hose
(6) Vacuum control hose
(7) Intake manifold gasket
(8) Guide pin
(9) Tumble generator valve ASSY
(10) Gasket
(11) Accelerator cable bracket (MT vehicles only)
(12) Fuel injector
(13) Insulator
(14) Fuel injector pipe
(15) Pressure regulator
(16) Pressure regulator hose
(17) Fuel pipe protector RH
(18) Blow-by hose stay
(19) Intake manifold
(20) Wastegate control solenoid valve ASSY
(21) Fuel pipe protector LH
(22) Nipple
(23) Purge valve
(24) Purge hose
(25) Tumble generator valve actuator

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5.0 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 8.25 (0.84, 6.1)
T4: 16 (1.6, 11.8)
T5: 17 (1.7, 12.5)
T6: 19 (1.9, 14.0)
T7: 25 (2.5, 18.4)

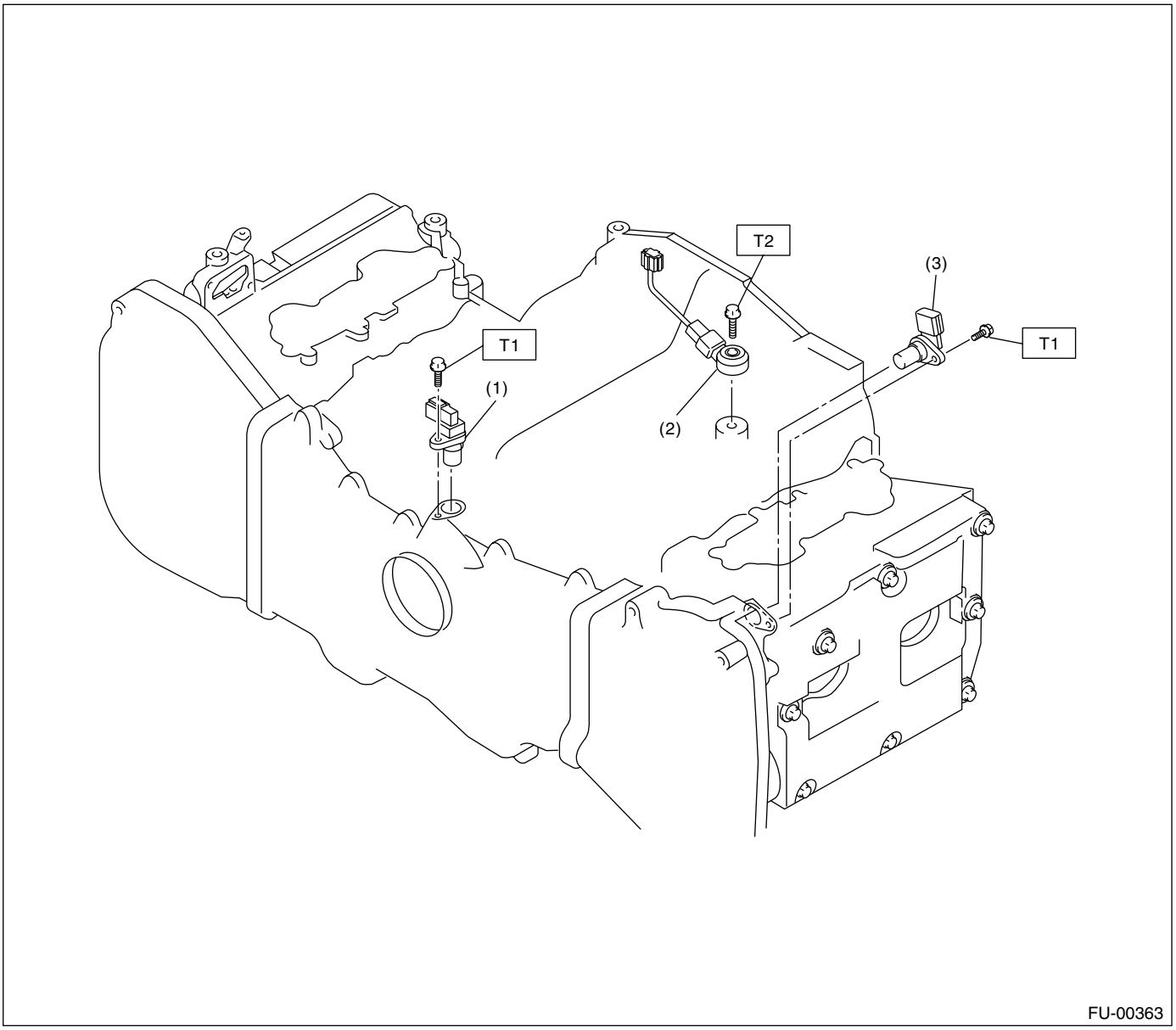
2. AIR INTAKE SYSTEM



(1)	Gasket	(5)	Pressure sensor
(2)	Throttle position sensor	(6)	Gasket
(3)	Idle air control solenoid valve	(7)	O-ring
(4)	Throttle body		

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.6 (0.16, 1.2)
T2: 2.8 (0.29, 2.1)
T3: 22 (2.2, 16.2)

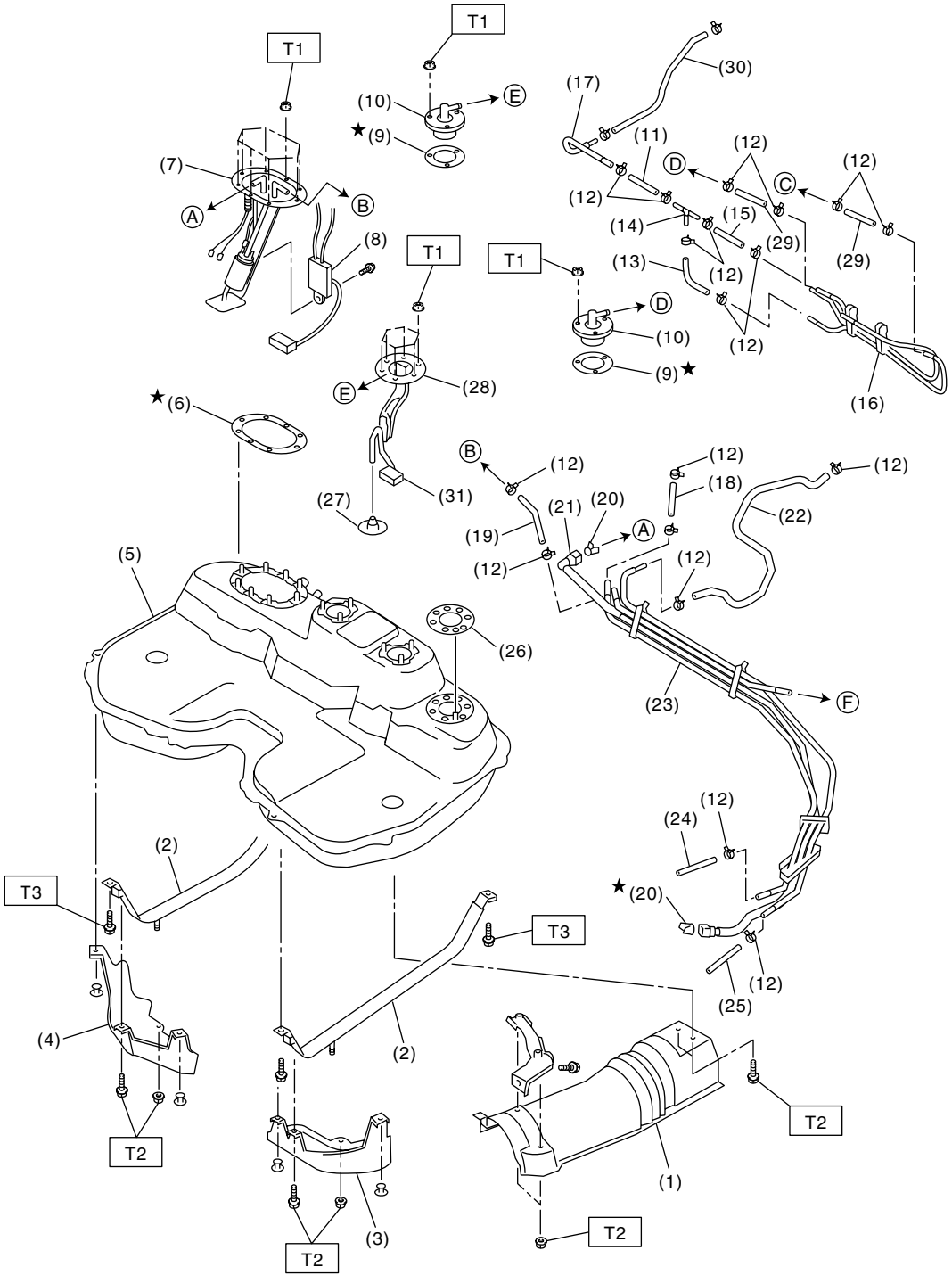
3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



(1) Crankshaft position sensor
(2) Knock sensor
(3) Camshaft position sensor

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 24 (2.4, 17.4)

4. FUEL TANK

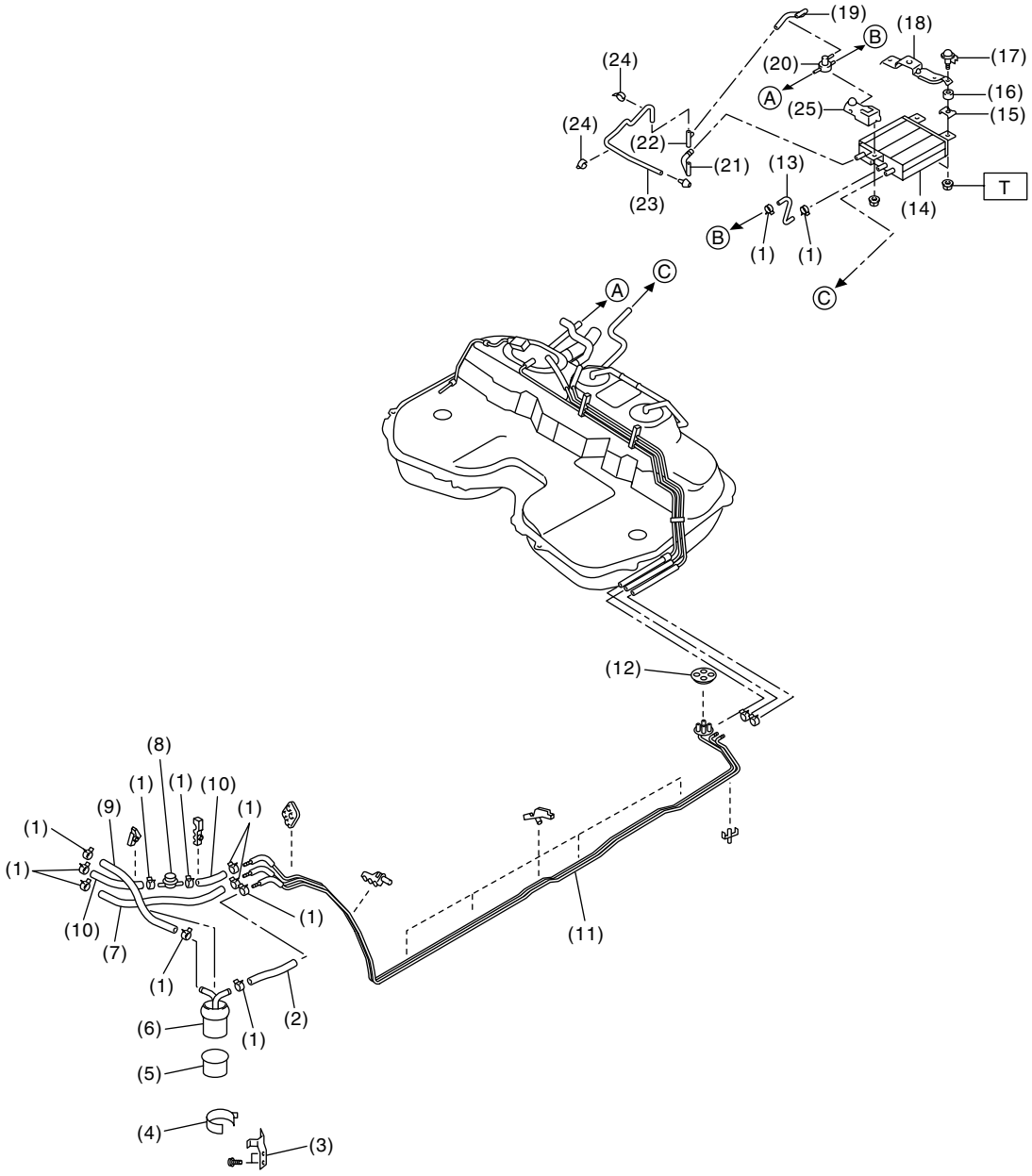


FU-00422

(1) Heat shield cover
(2) Fuel tank band
(3) Protector LH
(4) Protector RH
(5) Fuel tank
(6) Fuel pump gasket
(7) Fuel pump ASSY
(8) Fuel meter unit
(9) Fuel cut valve gasket
(10) Fuel cut valve
(11) Evaporation hose A
(12) Clip
(13) Evaporation hose B
(14) Joint pipe
(15) Evaporation hose C
(16) Evaporation pipe ASSY
(17) Evaporation pipe
(18) Evaporation hose D
(19) Fuel return hose A
(20) Retainer
(21) Quick connector
(22) Evaporation hose E
(23) Fuel pipe ASSY
(24) Evaporation hose F
(25) Fuel return hose B
(26) Fuel sub level sensor gasket
(27) Jet pump filter
(28) Fuel sub level sensor unit
(29) Evaporation hose G
(30) Evaporation hose H

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 7.4 (0.75, 5.4)
T3: 33 (3.4, 24.3)

5. FUEL LINE

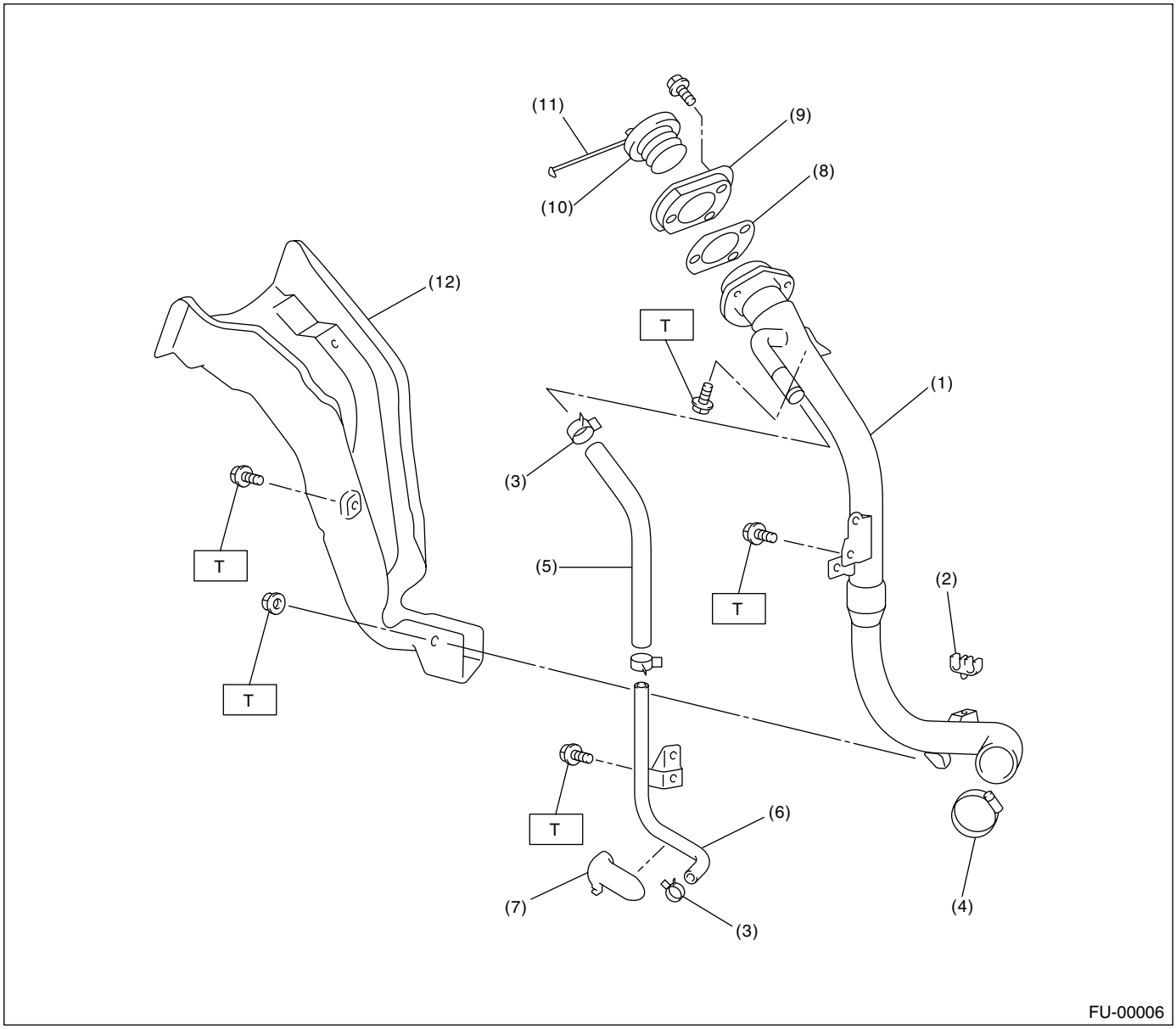


FU-00516

(1) Clip
(2) Fuel delivery hose A
(3) Fuel filter bracket
(4) Fuel filter holder
(5) Fuel filter cup
(6) Fuel filter
(7) Evaporation hose
(8) Fuel damper
(9) Fuel delivery hose B
(10) Fuel return hose
(11) Fuel pipe ASSY
(12) Grommet
(13) Canister hose A
(14) Canister
(15) Canister bracket plate
(16) Cushion
(17) Canister bracket spacer
(18) Rear canister bracket
(19) Two-way valve return hose
(20) Two-way valve
(21) Two-way valve drain hose A
(22) Connector
(23) Two-way valve drain hose B
(24) Clamp
(25) Front canister bracket

Tightening torque: N·m (kgf-m, ft-lb)
T: 23 (2.3, 17.0)

6. FUEL FILLER PIPE



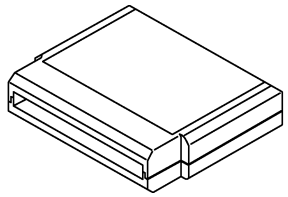
(1) Fuel filler pipe ASSY
(2) Evaporation hose holder
(3) Clip
(4) Clamp
(5) Air vent hose
(6) Air vent pipe
(7) Air vent pipe holder
(8) Filler pipe packing
(9) Filler ring
(10) Filler cap
(11) Filler cap tether
(12) Filler pipe protector

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

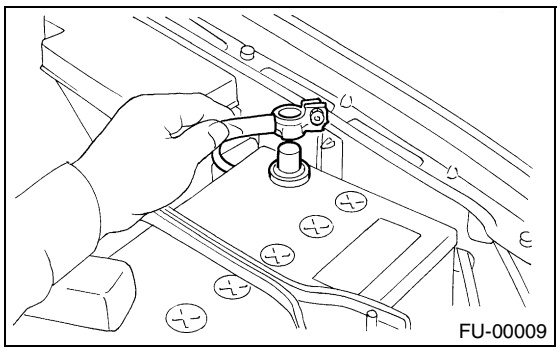
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA210	24082AA210 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical system.
ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems.

2. Throttle Body

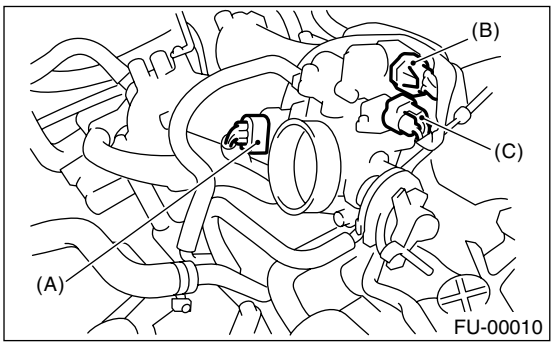
A: REMOVAL

1) Disconnect the ground cable from battery.

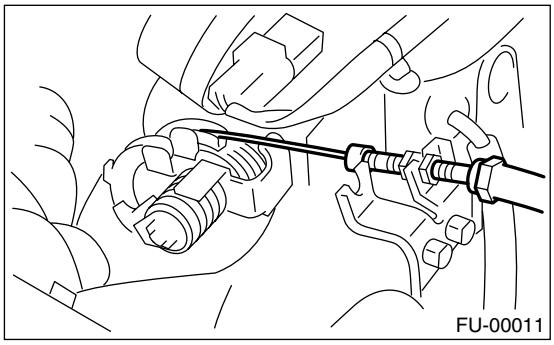


2) Remove the intercooler. <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>

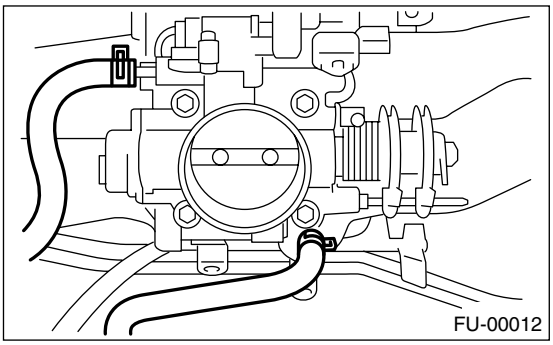
3) Disconnect the connector from the throttle position sensor (A) and idle air control solenoid valve (B) and pressure sensor (C).



4) Disconnect the accelerator cable.



5) Disconnect the engine coolant hoses from throttle body.



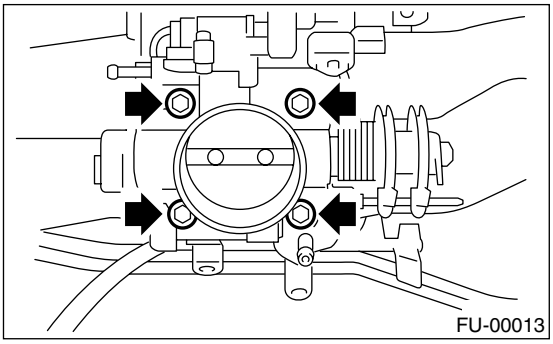
6) Remove the bolts which secure throttle body to intake manifold.

B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
Always use a new gasket.

Tightening torque:
22 N·m (2.2 kgf-m, 16.2 ft-lb)

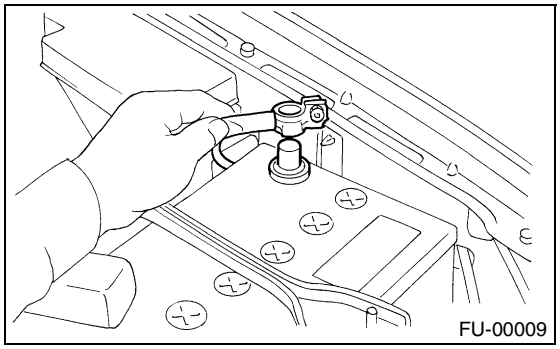


2) Adjust the accelerator cable play. <Ref. to SP(SOHC)-9, INSTALLATION, Accelerator Control Cable.>

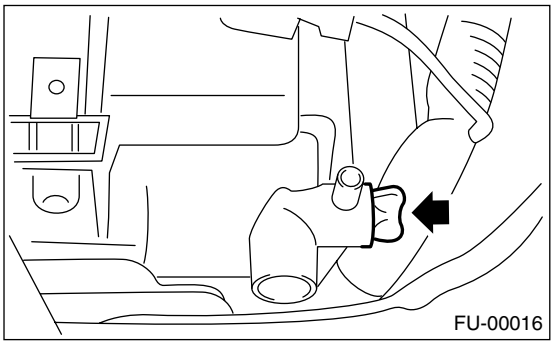
3. Intake Manifold

A: REMOVAL

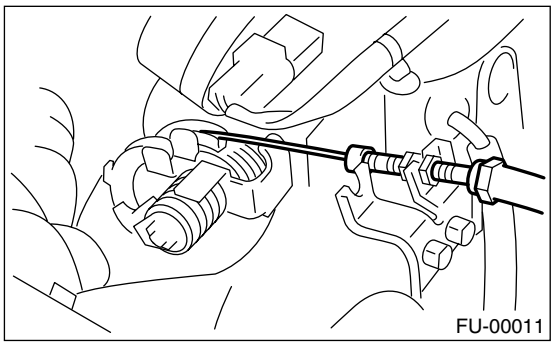
1) Release the fuel pressure. <Ref. to FU(TURBO)-52, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid and remove fuel filler cap.
3) Disconnect the ground cable from battery.



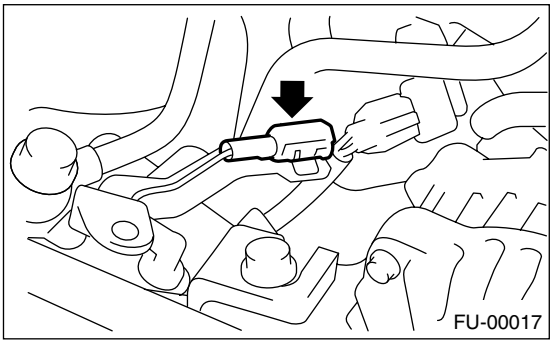
4) Lift-up the vehicle.
5) Remove the under cover.
6) Drain the coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt).



7) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(TURBO)-7, REMOVAL, Air Cleaner.>
8) Remove the air cleaner element.
9) Remove the intercooler. <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
10) Disconnect the accelerator cable.

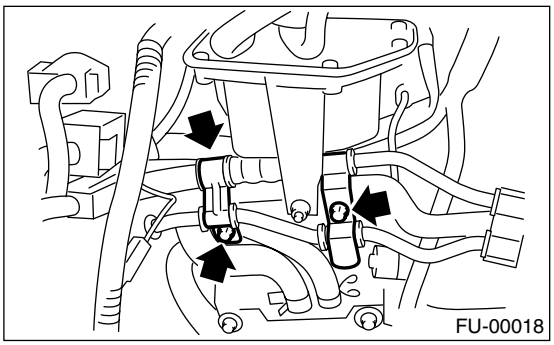


11) Remove the coolant filler tank. <Ref. to CO(SOHC)-42, REMOVAL, Coolant Filler Tank.>
12) Remove the power steering pump.
(1) Remove the front side V-belt. <Ref. to ME(TURBO)-44, REMOVAL, V-belt.>
(2) Disconnect the power steering switch connector.

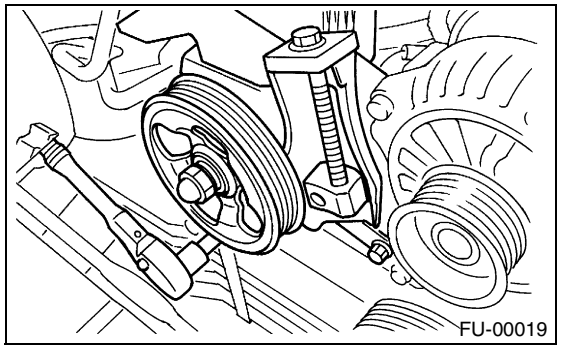


(3) Remove the bolts which secure power steering pipe brackets to intake manifold.

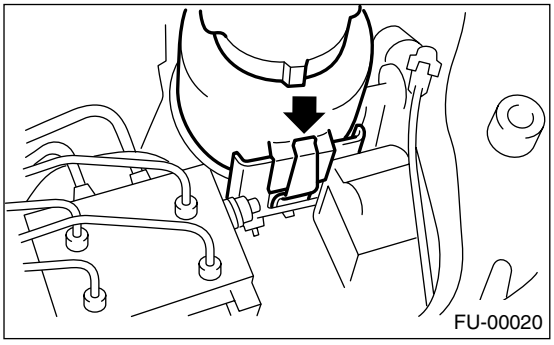
NOTE:
Do not disconnect the power steering hose.



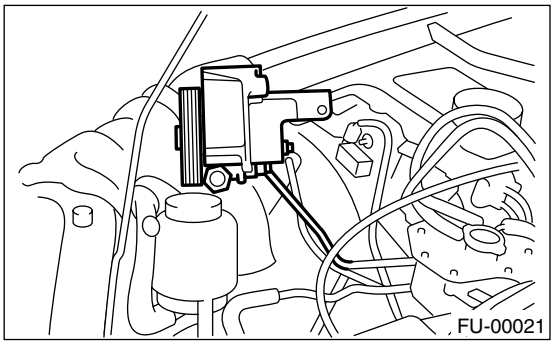
(4) Remove the bolts which secure power steering pump bracket.



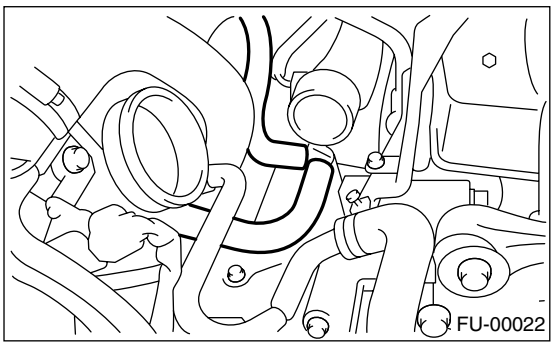
(5) Remove the power steering tank from the bracket by pulling it upward.



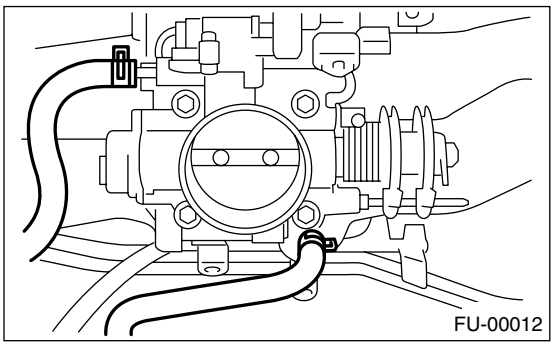
(6) Place the power steering pump on right side wheel apron.



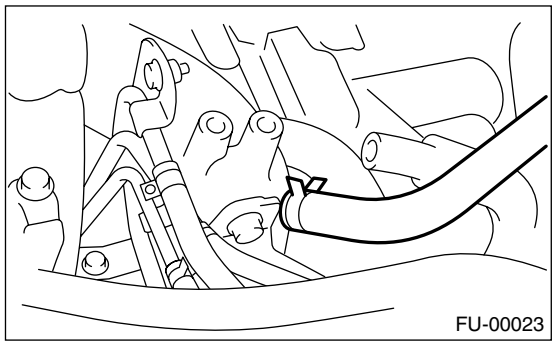
13) Disconnect the emission hose from PCV valve.



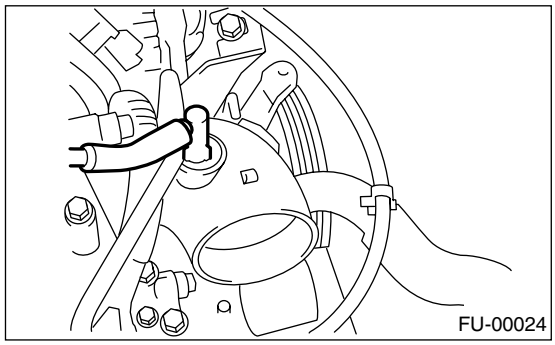
14) Disconnect the engine coolant hoses from throttle body.



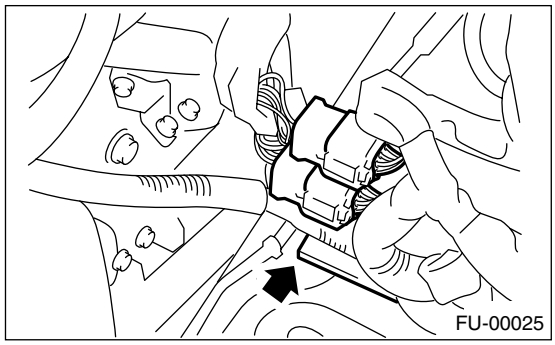
15) Disconnect the brake booster hose.

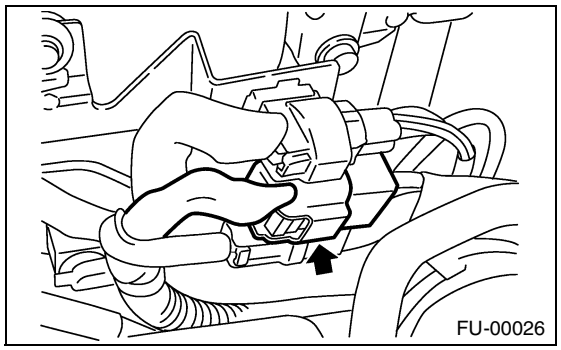


16) Disconnect the pressure hose from intake duct.

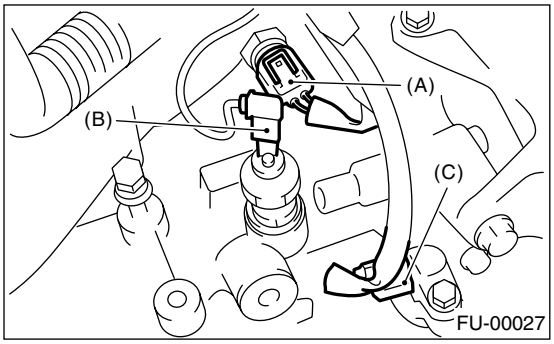


17) Disconnect the engine harness connectors from bulkhead harness connectors.

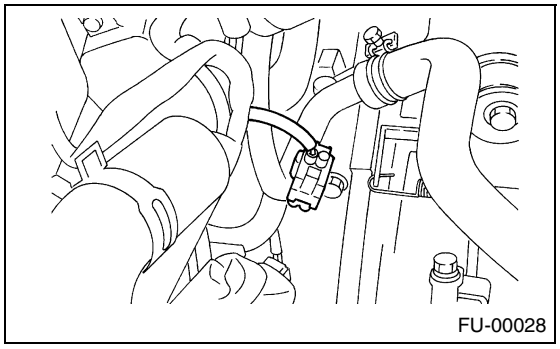




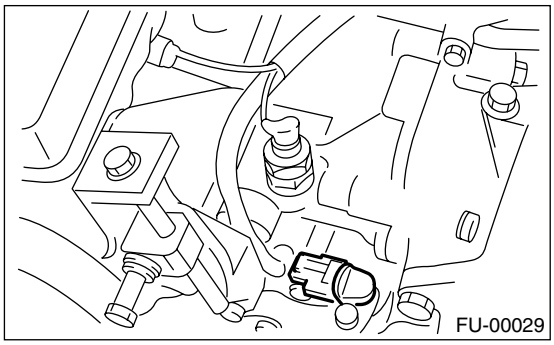
18) Disconnect the connectors from the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



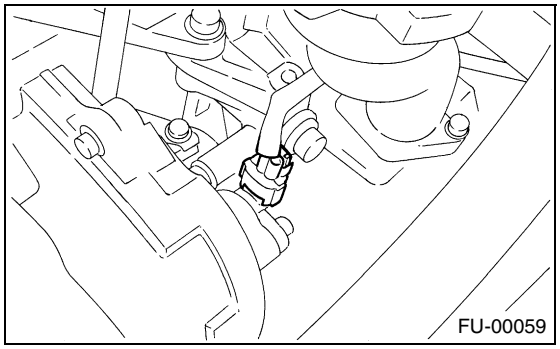
19) Disconnect the knock sensor connector.



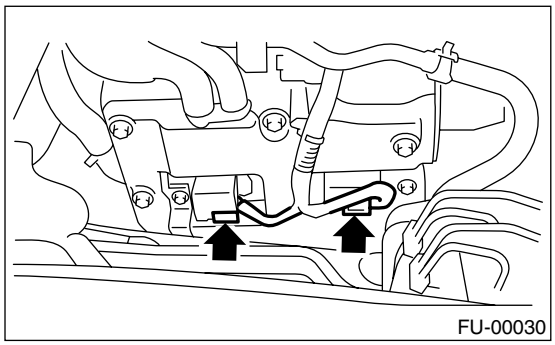
20) Disconnect the connector from crankshaft position sensor.



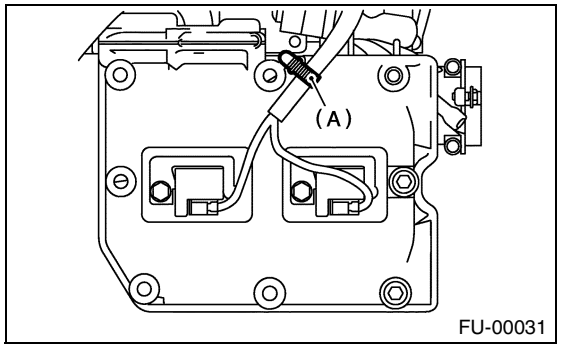
21) Disconnect the connector from camshaft position sensor.



22) Disconnect the connector from ignition coil.

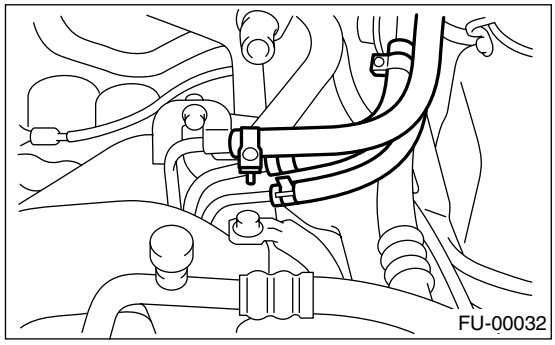


23) Disconnect the engine harness fixed by clip (A) from the bracket.

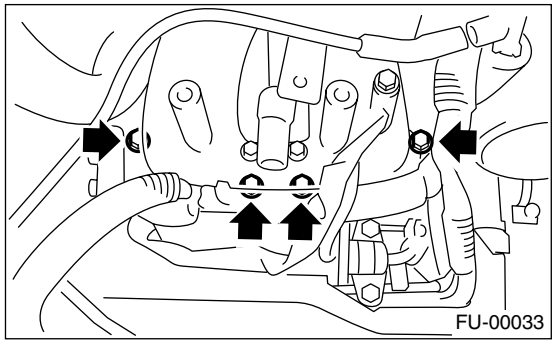


24) Disconnect the fuel delivery hose, return hose and evaporation hose.

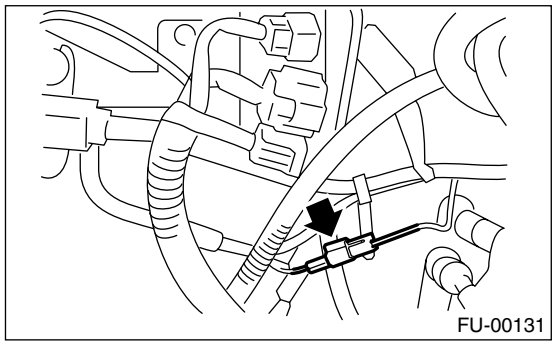
CAUTION:
- **Do not spill fuel.**
- **Catch the fuel from hoses in a container or cloth.**

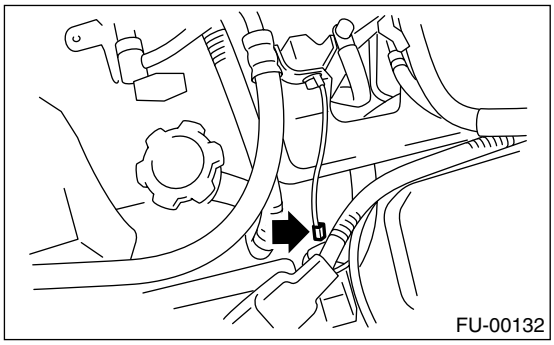


25) Remove the bolts which secure intake manifold to the cylinder heads.



26) Disconnect the ground cable connector.





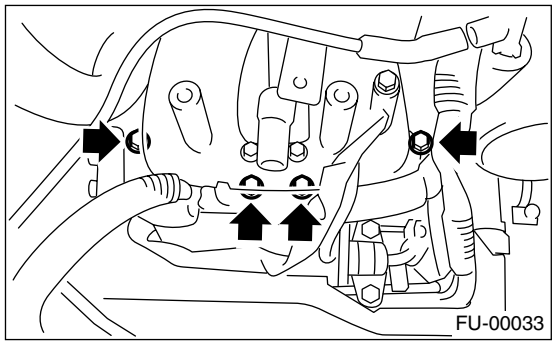
27) Remove the intake manifold.

B: INSTALLATION

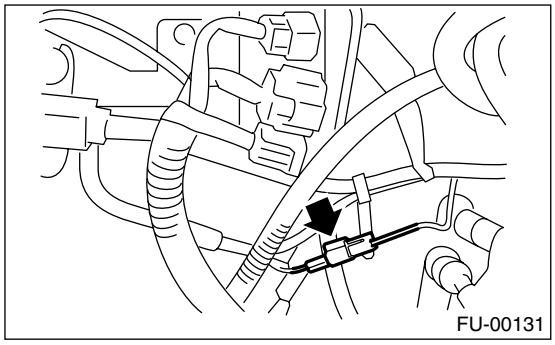
1) Install the intake manifold onto cylinder heads.

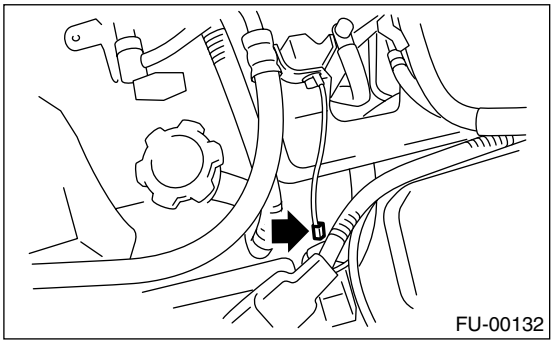
NOTE:
Always use new gaskets.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

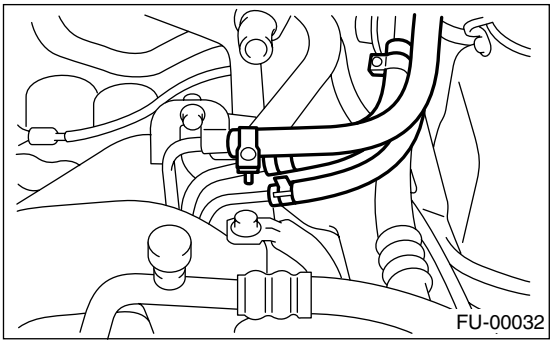


2) Connect the ground cable.

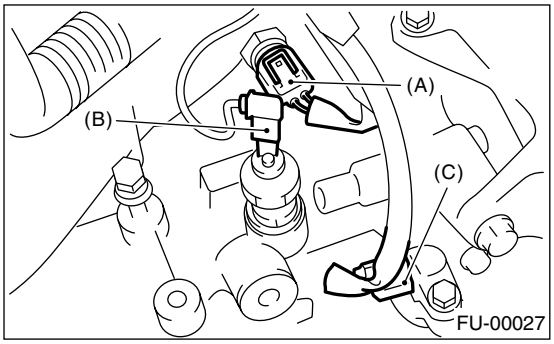




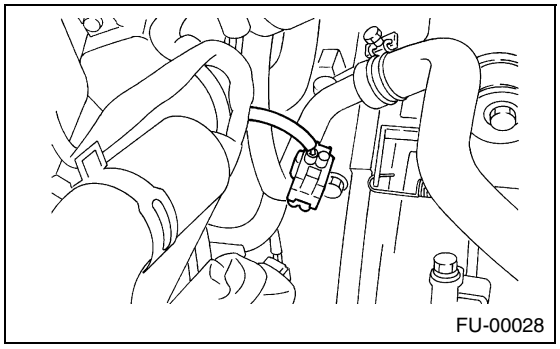
3) Connect the fuel delivery hose, return hose, and evaporation hose.



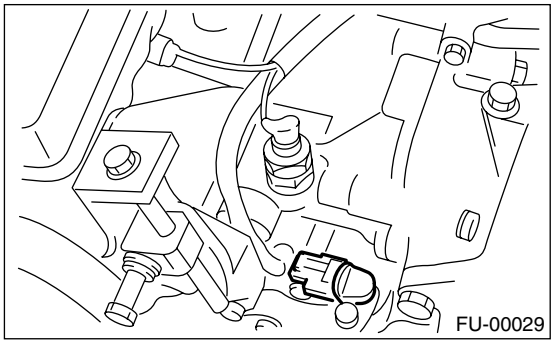
4) Connect the connector to the oil pressure switch (B), crankshaft position sensor (C) and engine coolant temperature sensor (A).



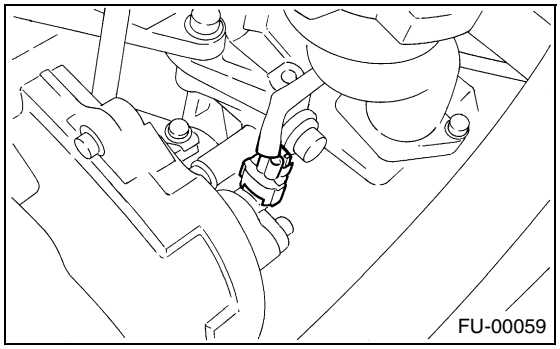
5) Connect the connector to knock sensor.



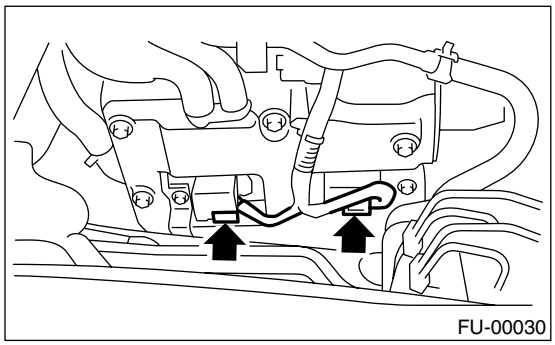
6) Connect the connector to crankshaft position sensor.



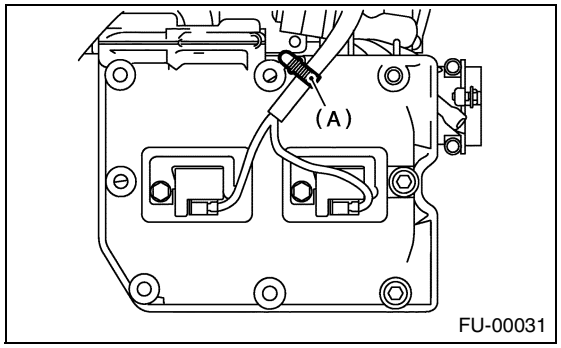
7) Connect the connector to camshaft position sensor.



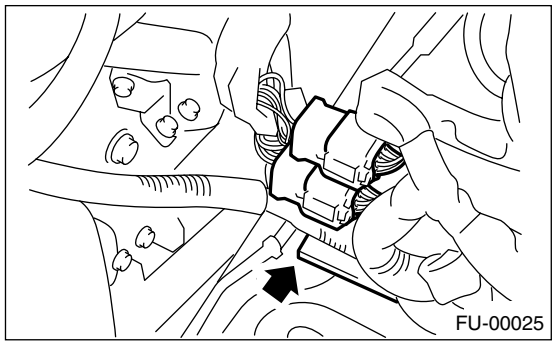
8) Connect the connector to ignition coil.

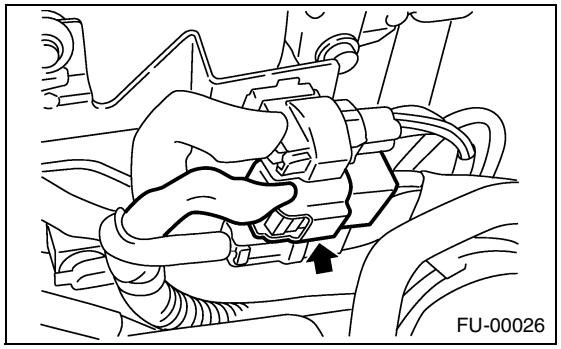


9) Connect the engine harness with clip (A) to the bracket.

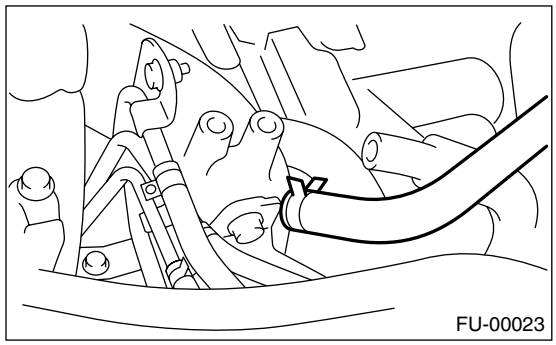


10) Connect the engine harness connector to bulkhead harness connectors.

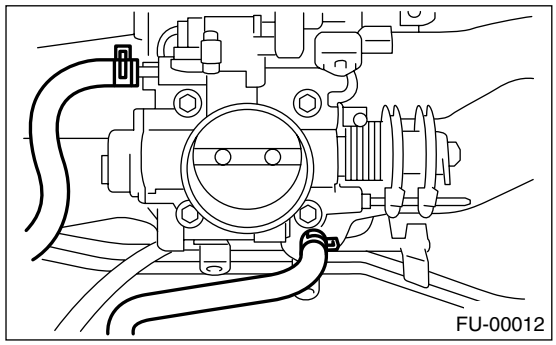




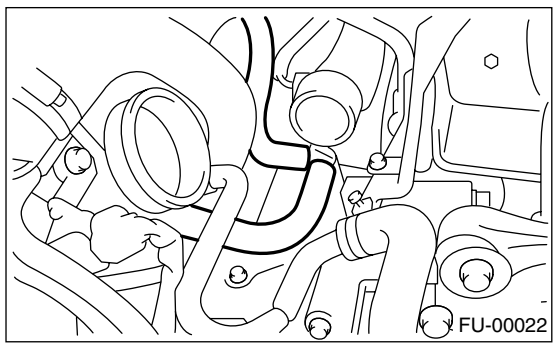
11) Connect the brake booster vacuum hose.



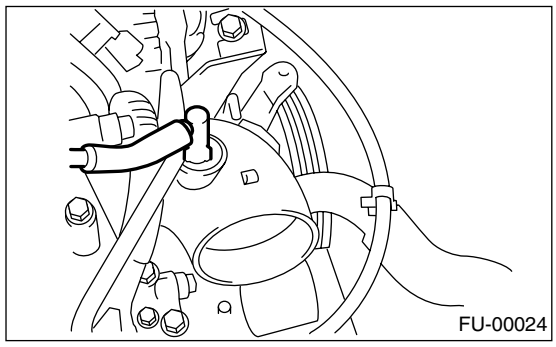
12) Connect the engine coolant hoses to throttle body.



13) Connect the emission hose to PCV valve.

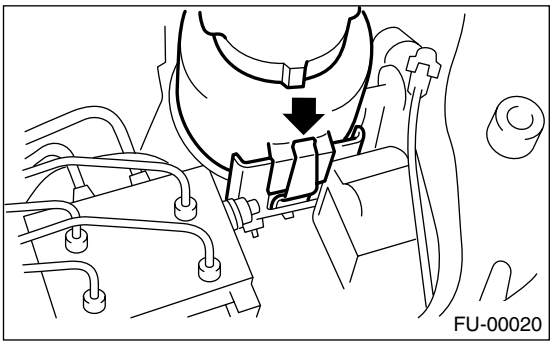


14) Connect the pressure hose to intake duct.

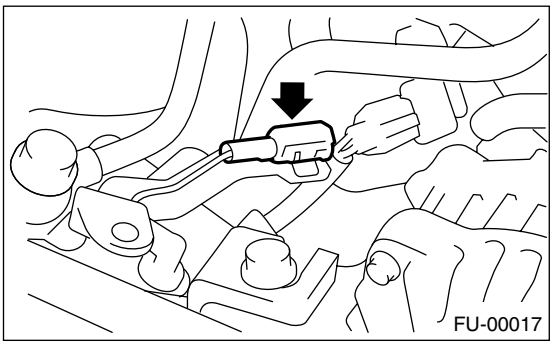


15) Install the power steering pump.

(1) Install the power steering tank on bracket.

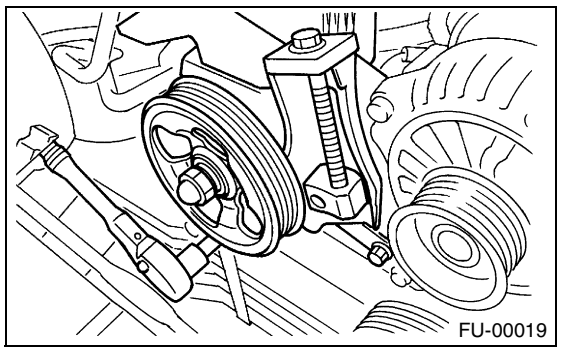


(2) Connect the connector to power steering pump switch.

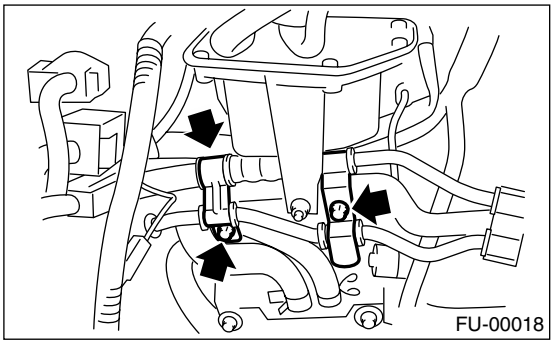


(3) Install the power steering pump, and then tighten the bolts.

Tightening torque:
22 N·m (2.2 kgf-m, 16.2 ft-lb)



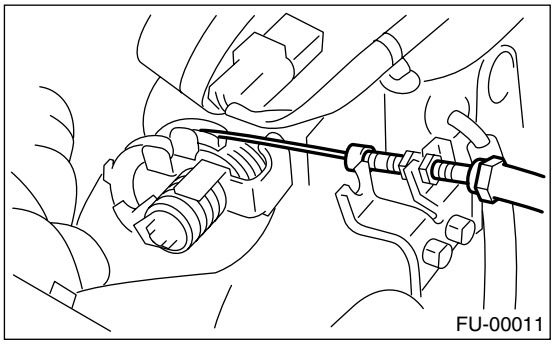
(4) Install the power steering pipe brackets on right side intake manifold.



(5) Install the front side V-belt. <Ref. to ME(TURBO)-44, REMOVAL, V-belt.>

16) Install the coolant filler tank. <Ref. to CO(SOHC)-42, INSTALLATION, Coolant Filler Tank.>

17) Connect the accelerator cable. <Ref. to SP(SOHC)-9, INSTALLATION, Accelerator Control Cable.>

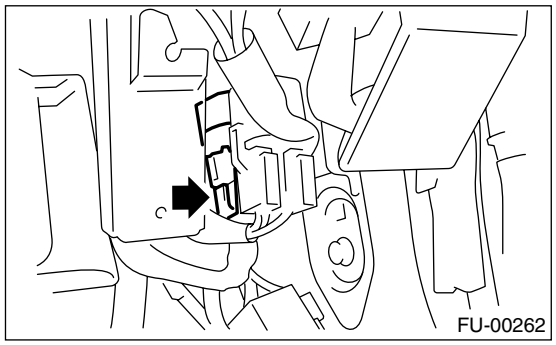


18) Install the intercooler. <Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>

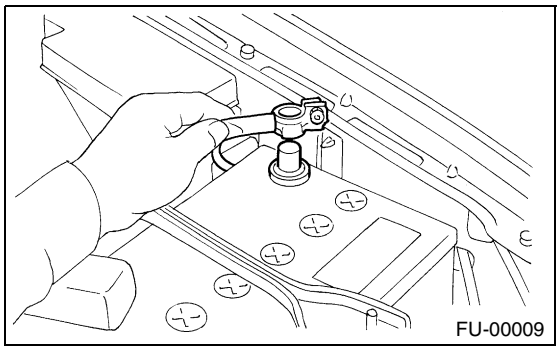
19) Install the air cleaner element.

20) Install the air cleaner upper cover and air intake duct as a unit. <Ref. to IN(TURBO)-7, INSTALLATION, Air Cleaner.>

21) Connect the connector to fuel pump relay.



22) Connect the battery ground cable to battery.



23) Lift-up the vehicle.

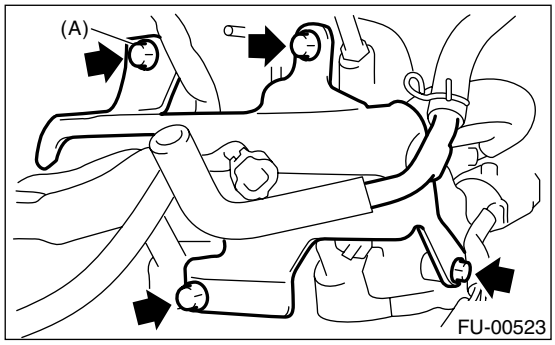
24) Install the under cover.

25) Fill the coolant. <Ref. to CO(SOHC)-18, FILLING OF ENGINE COOLANT, Engine Coolant.>

C: DISASSEMBLY

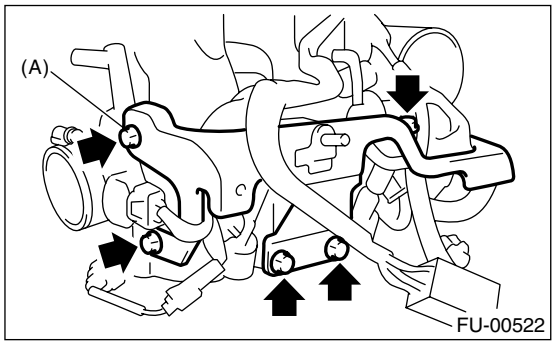
1) Remove the fuel pipe protector LH.

NOTE:
Bolt (A) is tightened together with ground cable.

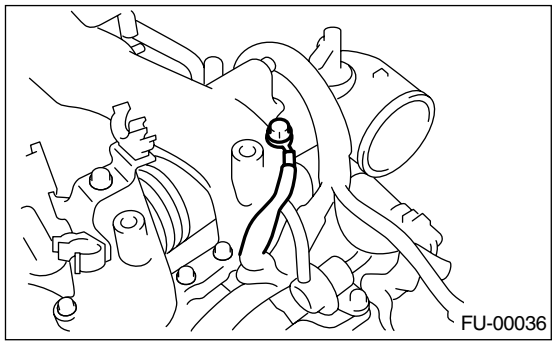


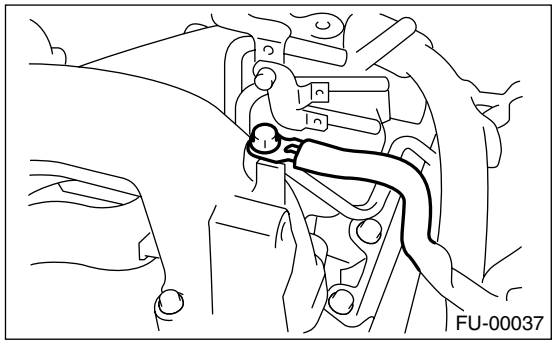
2) Remove the fuel pipe protector RH.

NOTE:
Bolt (A) is tightened together with ground cable.

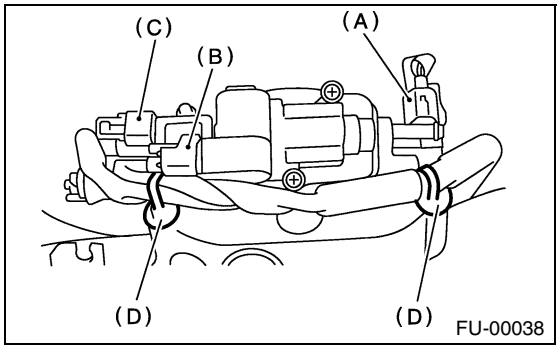


3) Remove the engine ground cable from intake manifold.

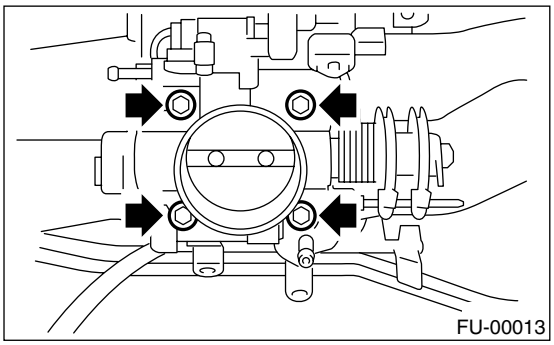




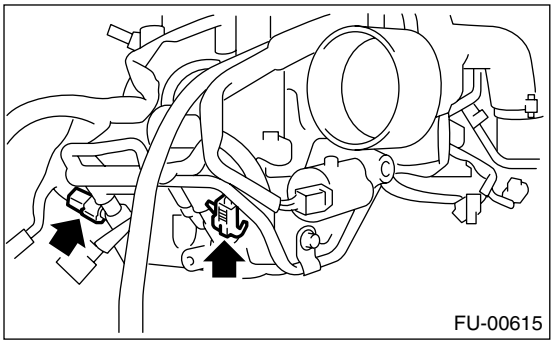
4) Disconnect the connector from the throttle position sensor (A), idle air control solenoid valve (B) and pressure sensor (C).
5) Disconnect the engine harness fixed by clip (D) from the intake manifold.



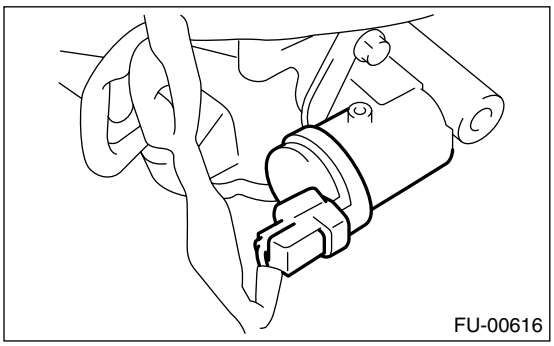
6) Remove the throttle body from intake manifold.



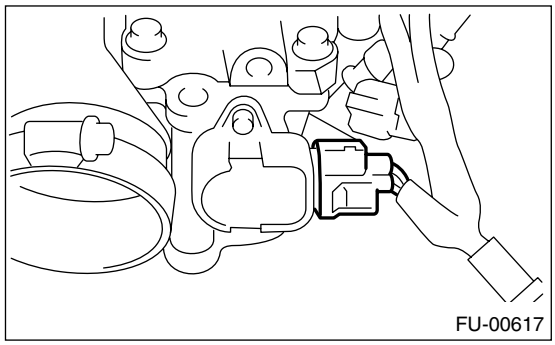
7) Disconnect the connector from fuel injector.



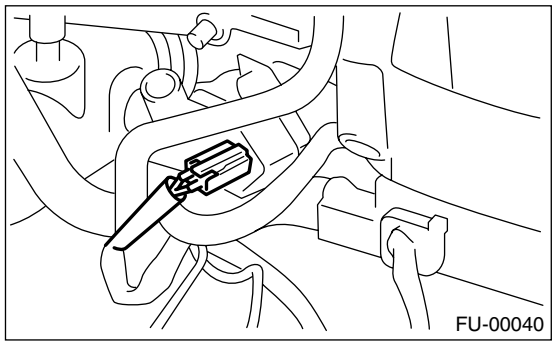
8) Disconnect the connector from tumble generator valve actuator.



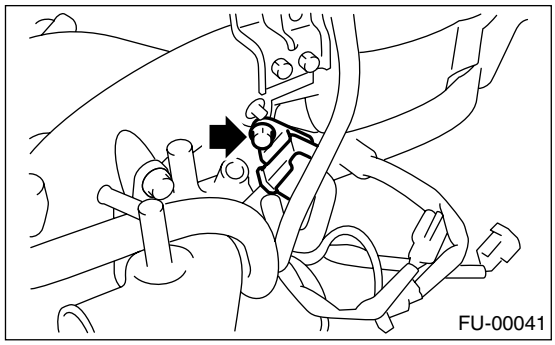
9) Disconnect the connector from tumble generator valve sensor.



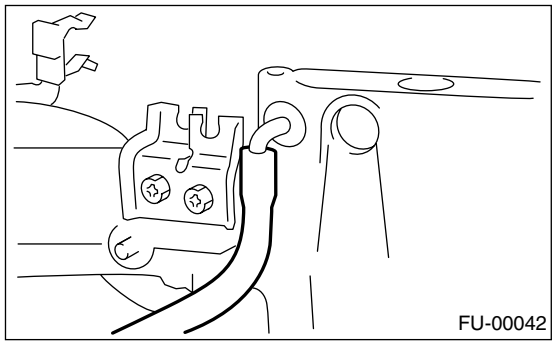
10) Disconnect the connector from purge control solenoid valve.



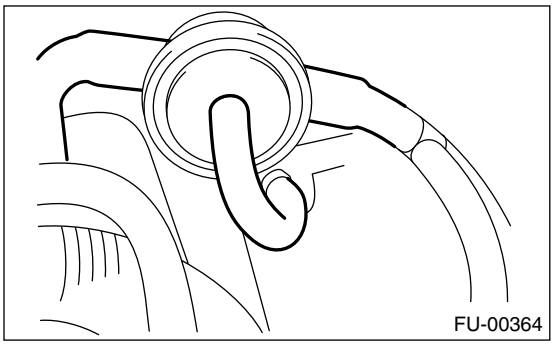
11) Remove the purge control solenoid valve.



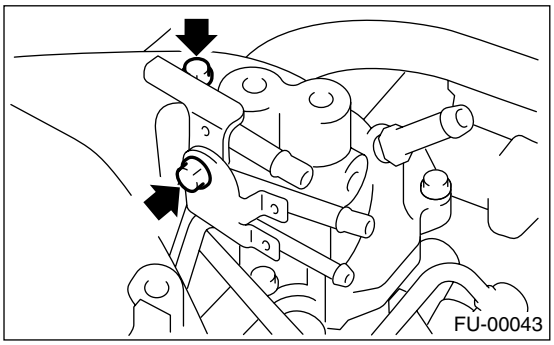
12) Disconnect the evaporation hose from intake manifold.



13) Disconnect the evaporation hose from purge valve.

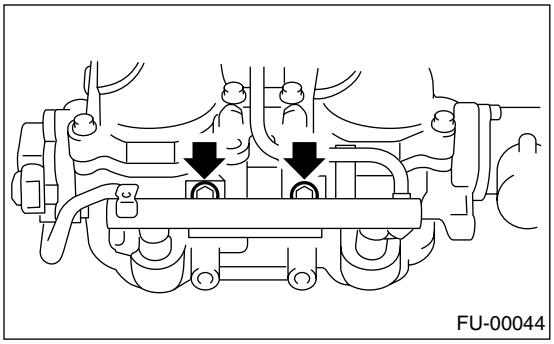


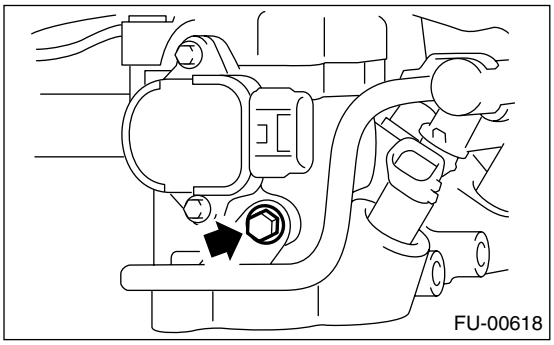
14) Remove the two bolts which hold fuel pipes on the left side of intake manifold.



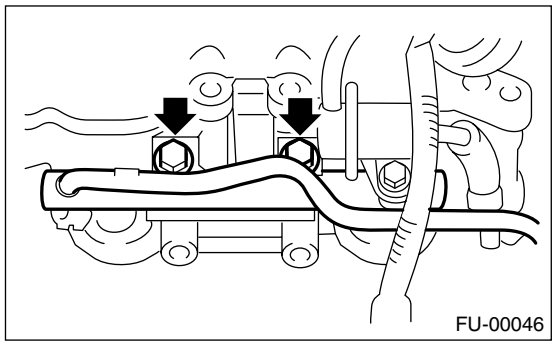
15) Remove the bolts which hold fuel injector pipe onto intake manifold.

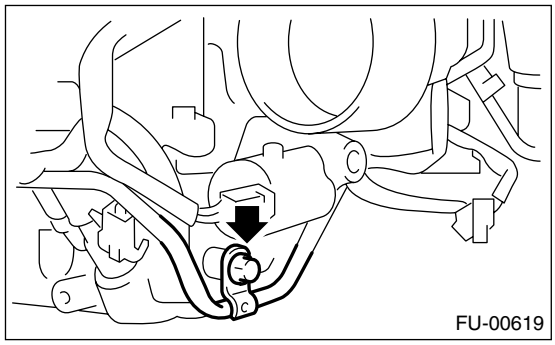
- LH SIDE



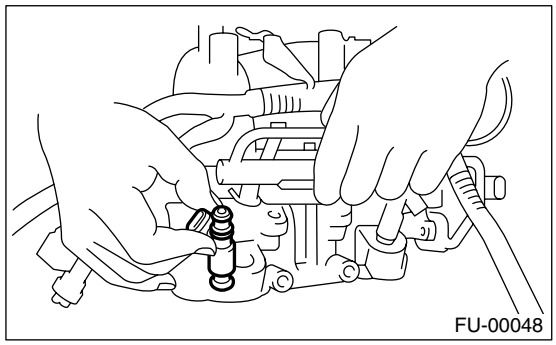


- RH SIDE

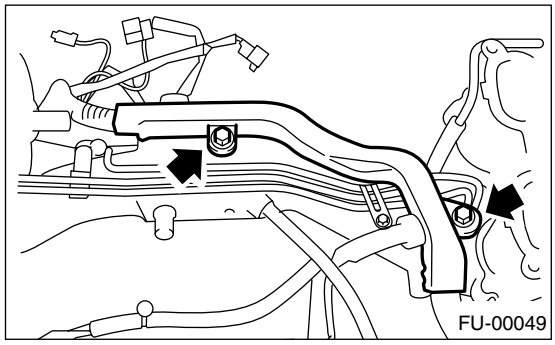




16) Remove the fuel injector.

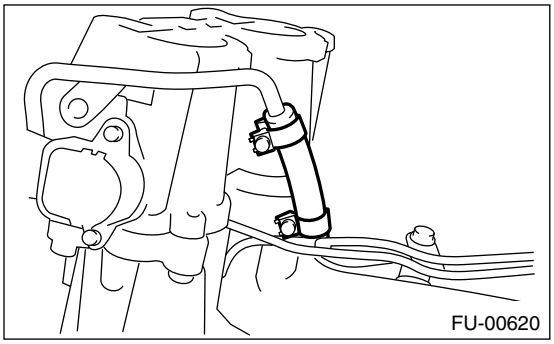


17) Remove the harness bracket which holds engine harness onto intake manifold.

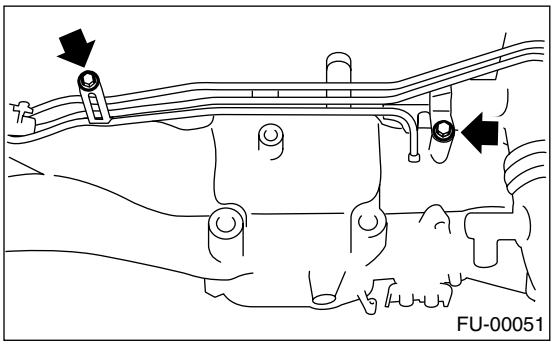


18) Remove the engine harness from intake manifold.

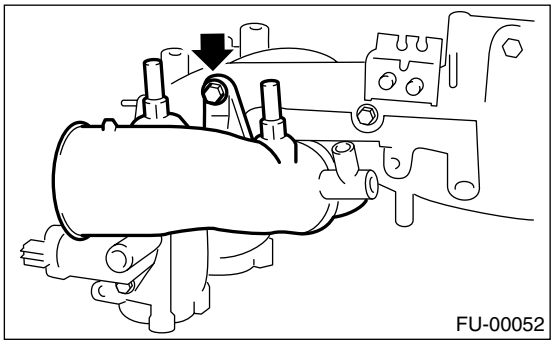
19) Loosen the clamp which holds front left side fuel hose to injector pipe, and remove the pipe from clamp.



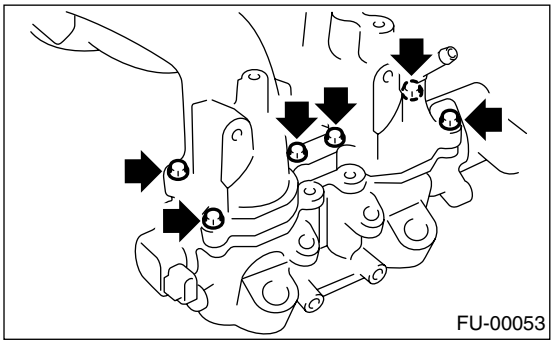
20) Remove the fuel injector pipe LH.
21) Remove the bolts which install fuel pipe on intake manifold.



22) Remove the fuel pipe assembly and pressure regulator from intake manifold.
23) Remove the intake duct from intake manifold.



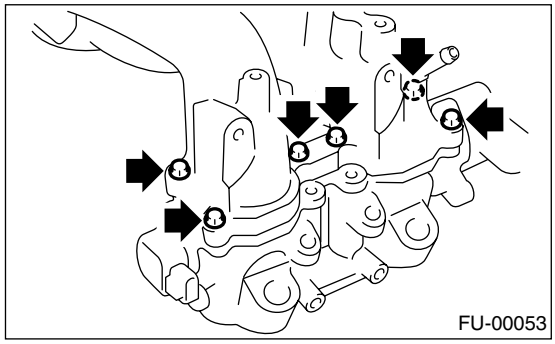
24) Remove the intake manifold.



D: ASSEMBLY

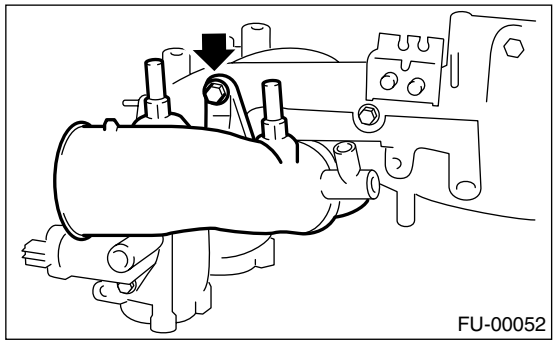
NOTE:
Replace the gasket with a new one.
1) Install the intake manifold.

Tightening torque:
8.25 N·m (0.84 kgf-m, 6.1 ft-lb)



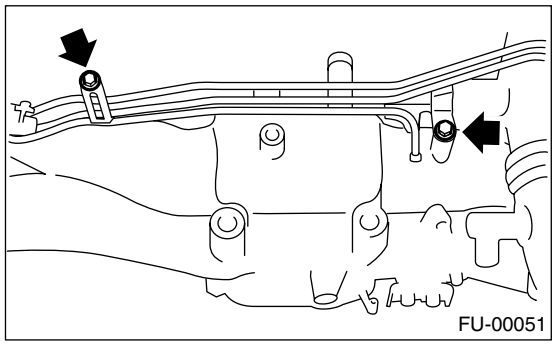
2) Install the air intake duct to intake manifold.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



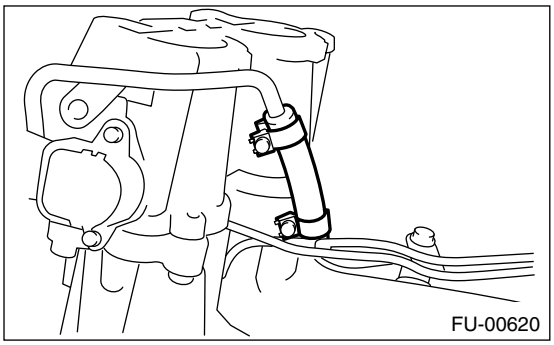
3) Install the fuel pipe assembly and pressure regulator to intake manifold.

Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)



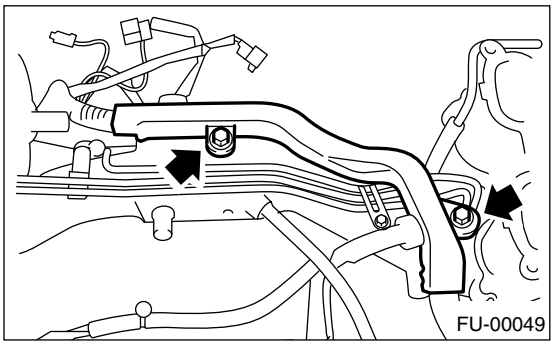
4) Install the fuel injector pipe LH.

5) Connect the left side fuel hose to injector pipe, and tighten the clamp screw.

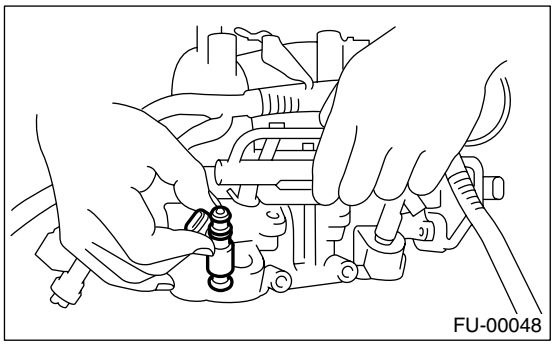


6) Install the engine harness to intake manifold.
7) Install the harness bracket which holds engine harness onto intake manifold.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



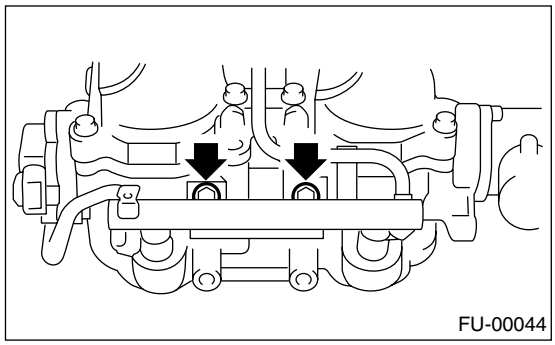
8) Install the fuel injector.

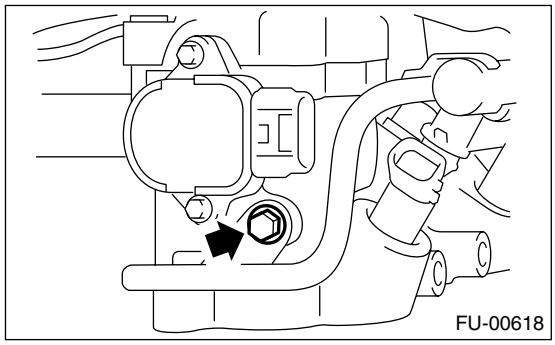


9) Tighten the bolts which install fuel injector pipe onto intake manifold.

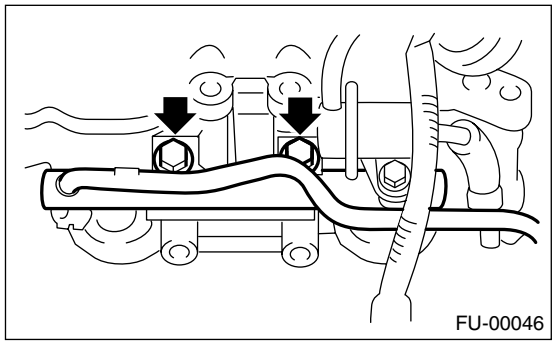
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)

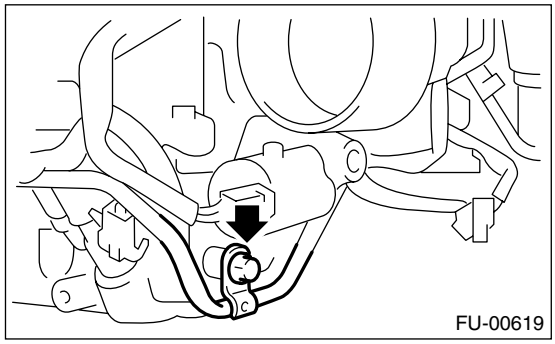
- LH SIDE





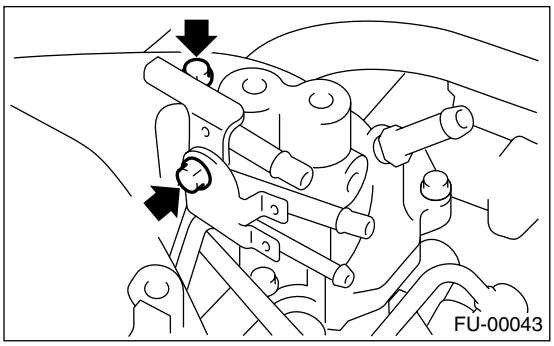
- RH SIDE





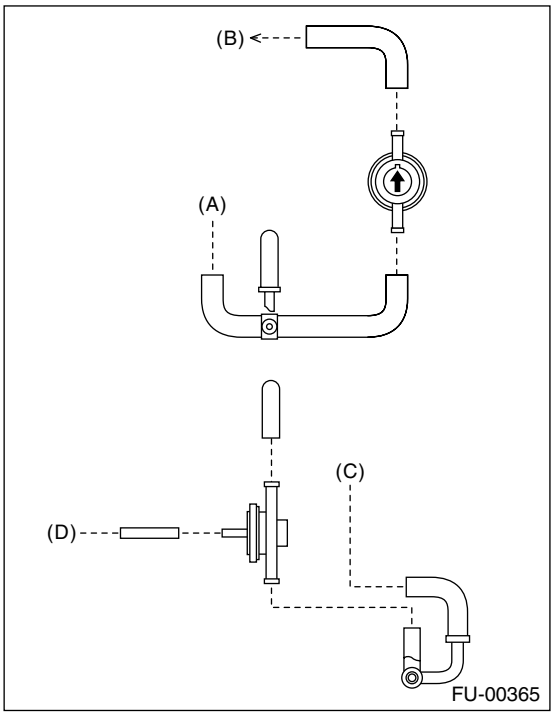
10) Tighten the two bolts which install fuel pipes on the left side of intake manifold.

Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)



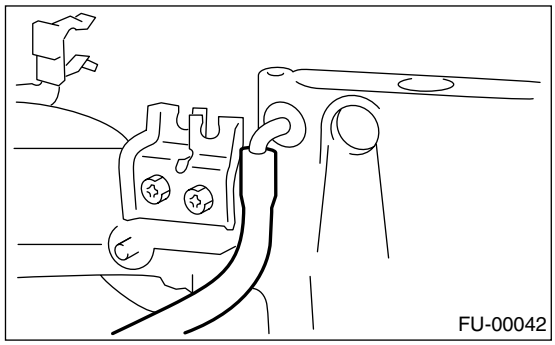
11) Connect the evaporation hoses to purge valve.

NOTE:
Connect the evaporation hose as shown in the figure.



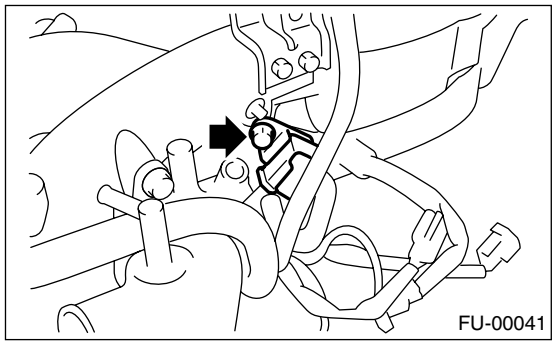
(A) To fuel pipe ASSY
(B) To intake duct
(C) To purge control solenoid valve
(D) To intake manifold

12) Connect the evaporation hose to intake manifold.



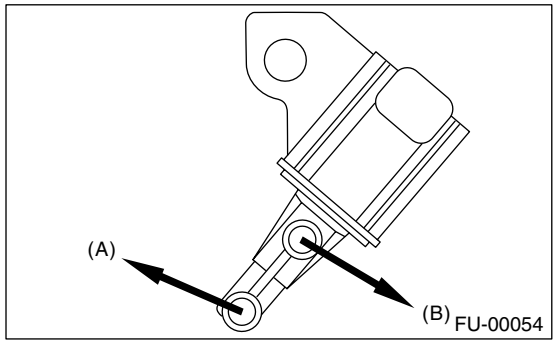
13) Install the purge control solenoid valve.

Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



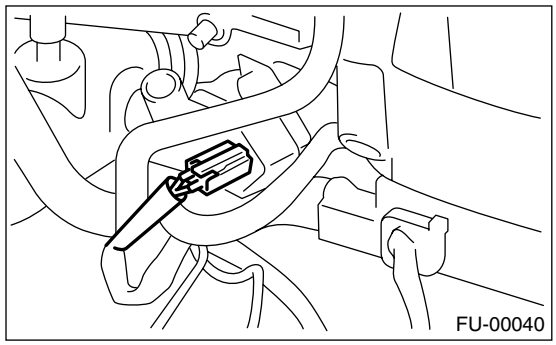
14) Connect the hoses to purge control solenoid valve.

NOTE:
Connect the evaporation hose as shown in the figure.

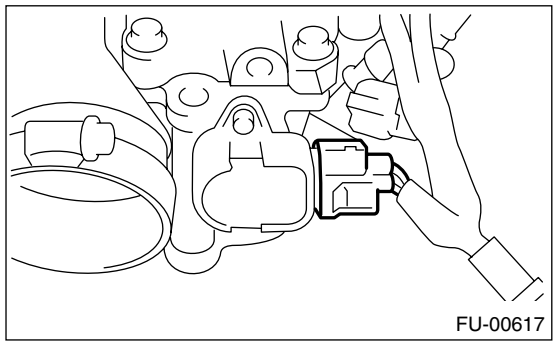


(A) To intake manifold
(B) To fuel pipe

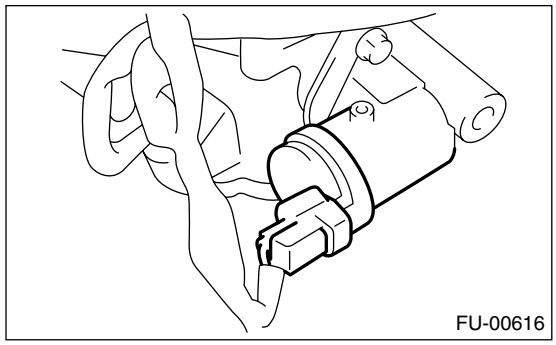
15) Connect the connector to purge control solenoid valve.



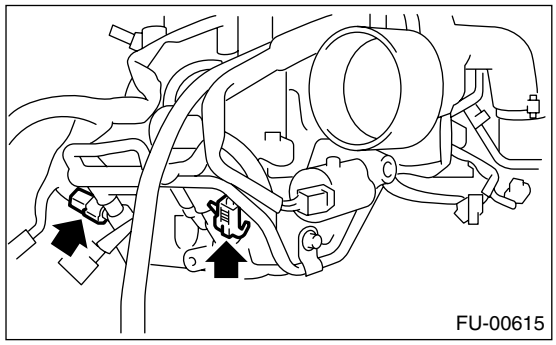
16) Connect the connector to tumble generator valvle sensor.



17) Connect the connector to tumble generator valvle actuator.



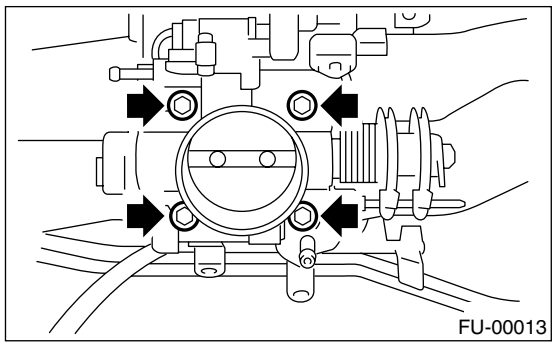
18) Connect the connector to fuel injector.



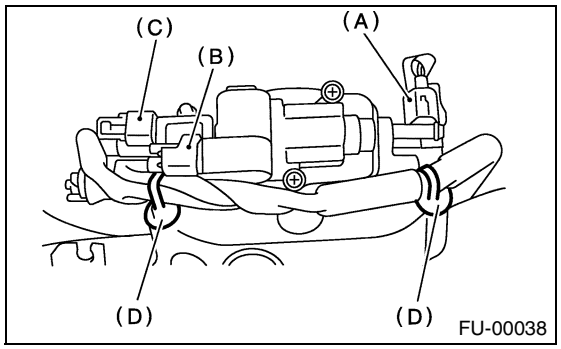
19) Install the throttle body to intake manifold.

NOTE:
Replace the gasket with a new one.

Tightening torque:
22 N·m (2.2 kgf-m, 16.2 ft-lb)

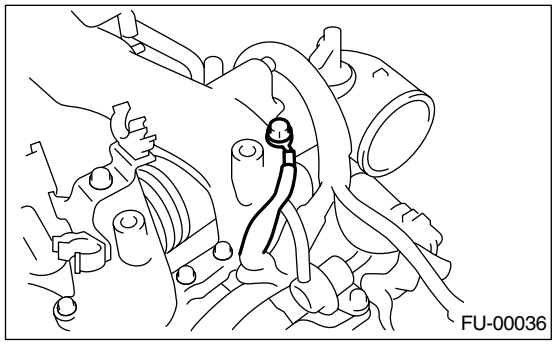


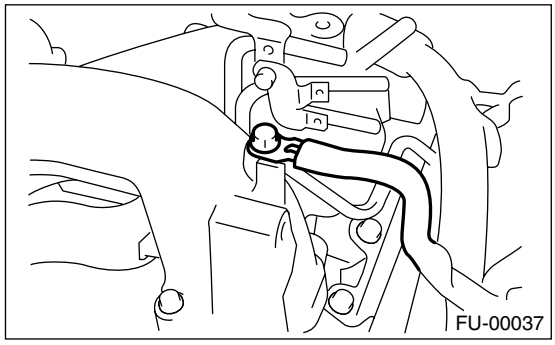
20) Connect the connector to the throttle position sensor (A), idle air control solenoid valve (B) and pressure sensor (C).
21) Connect the engine harness with clip (D) to the intake manifold. (MT vehicles)



22) Install the engine ground cable to intake manifold.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)

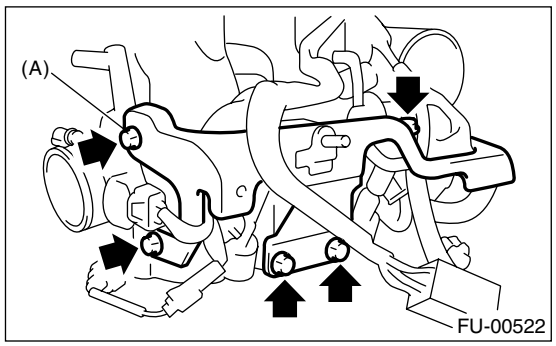




23) Install the fuel pipe protector RH.

NOTE:
Securely tighten bolt (A) together with ground cable.

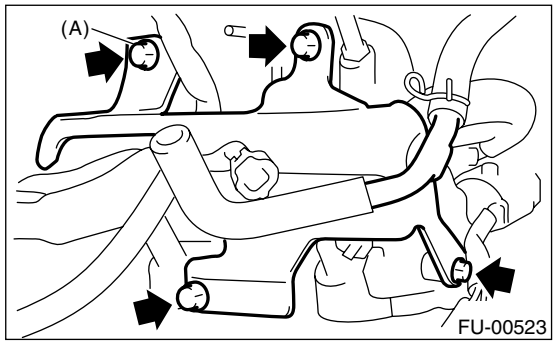
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



24) Install the fuel pipe protector LH.

NOTE:
Securely tighten bolt (A) together with ground cable.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



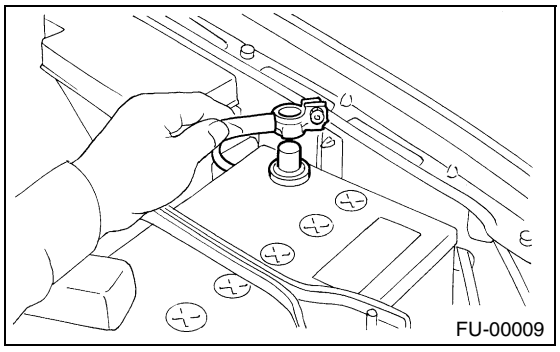
E: INSPECTION

Make sure the fuel pipe and fuel hoses are not cracked and that connections are tight.

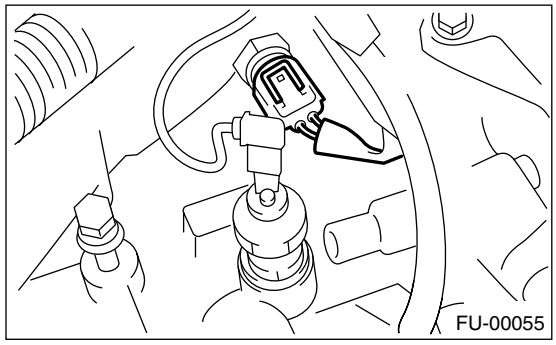
4. Engine Coolant Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the generator <Ref. to SC(SOHC)-15, REMOVAL, Generator.>
3) Drain the engine coolant. <Ref. to CO(SOHC)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
4) Disconnect the connector from engine coolant temperature sensor.



5) Remove the engine coolant temperature sensor.

B: INSTALLATION

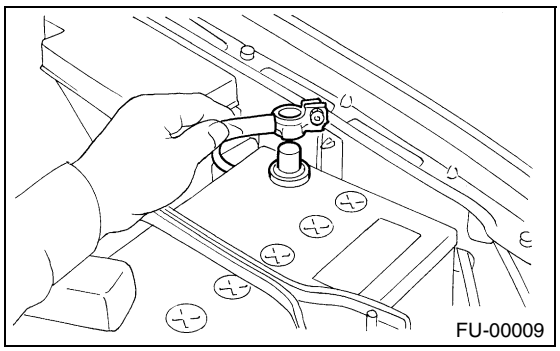
Install in the reverse order of removal.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

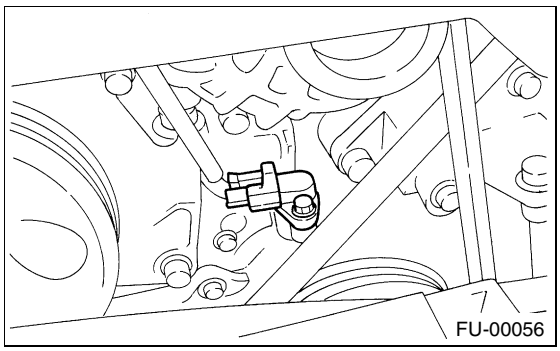
5. Crankshaft Position Sensor

A: REMOVAL

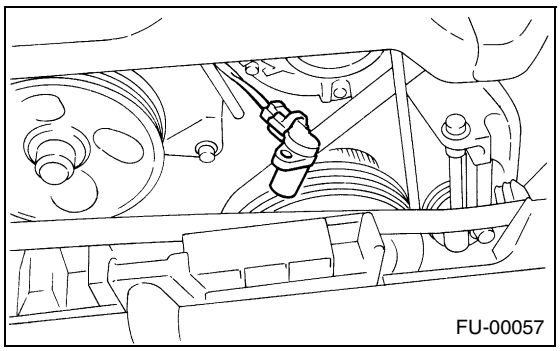
1) Disconnect the ground cable from battery.



2) Remove the bolt which installs crankshaft position sensor to cylinder block.



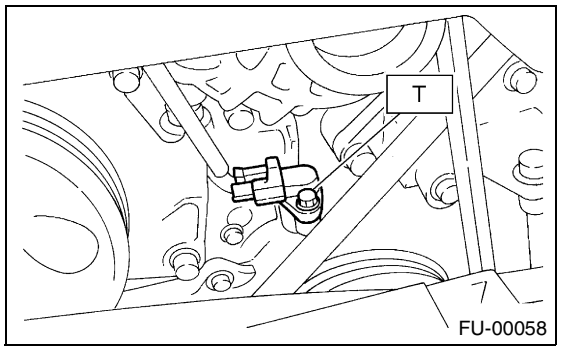
3) Remove the crankshaft position sensor, and disconnect the connector from it.



B: INSTALLATION

Install in the reverse order of removal.

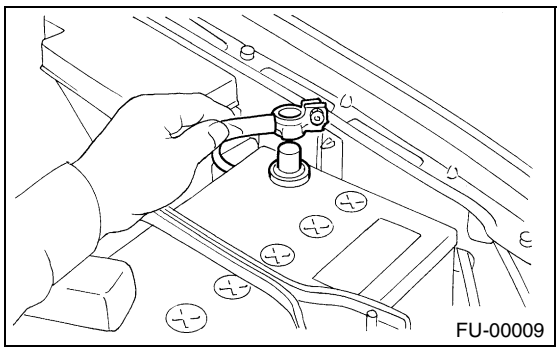
Tightening torque:
T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



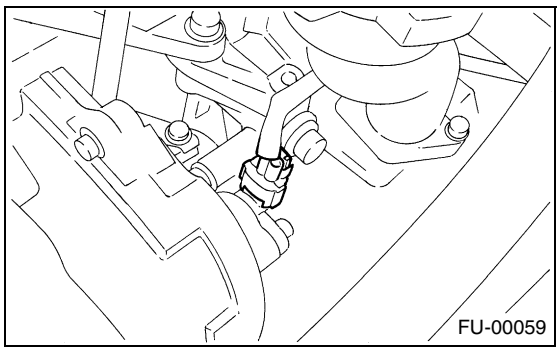
6. Camshaft Position Sensor

A: REMOVAL

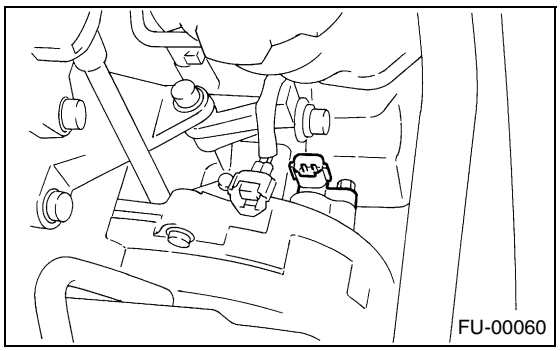
1) Disconnect the ground cable from battery.



2) Disconnect the connector from camshaft position sensor.



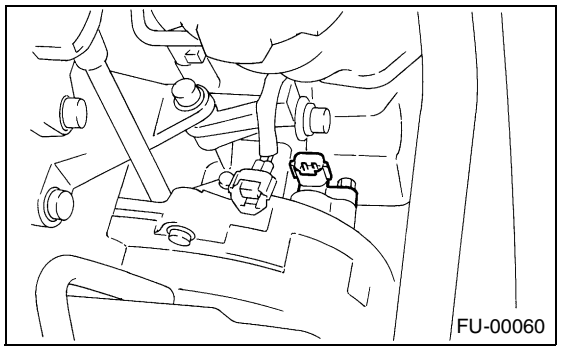
3) Remove the camshaft position sensor from camshaft support LH.



B: INSTALLATION

Install in the reverse order of removal.

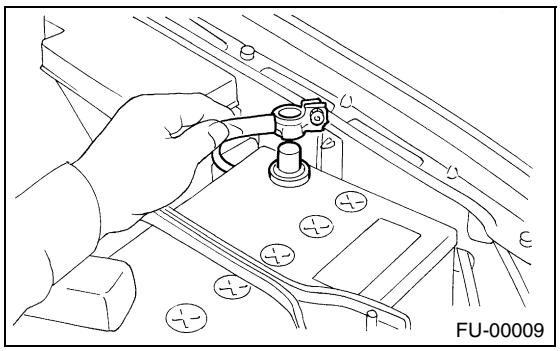
Tightening torque:
T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



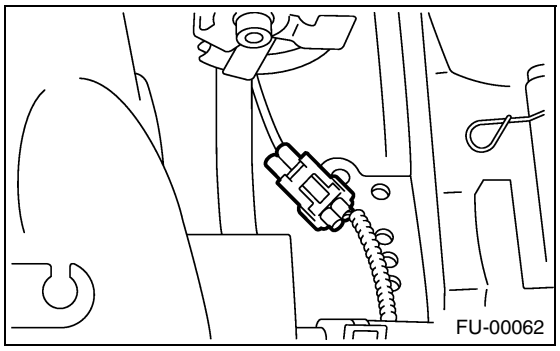
7. Knock Sensor

A: REMOVAL

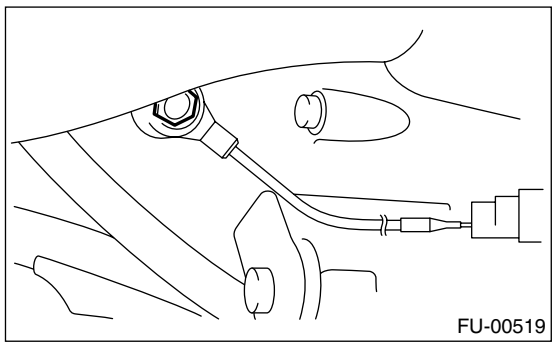
1) Disconnect the ground cable from battery.



2) Remove the intercooler. <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
3) Disconnect the knock sensor connector.



4) Remove the knock sensor from cylinder block.

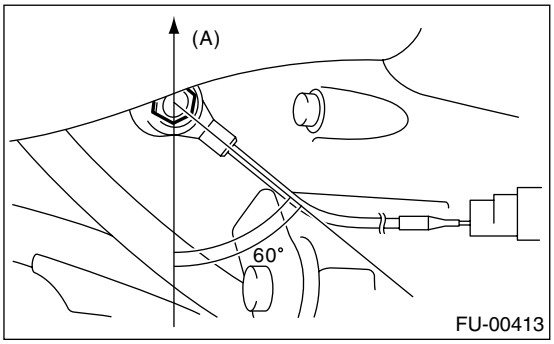


B: INSTALLATION

1) Install the knock sensor to cylinder block.

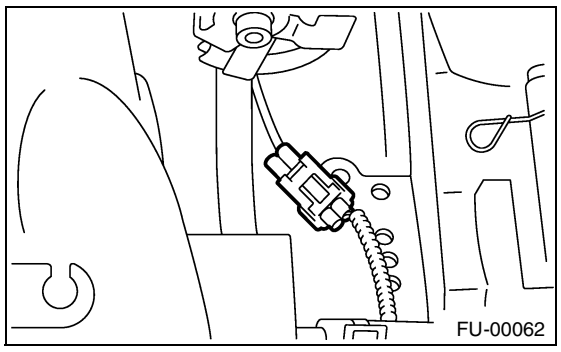
Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

NOTE:
The extraction area of the knock sensor cord must be positioned at a 60° angle relative to engine rear.

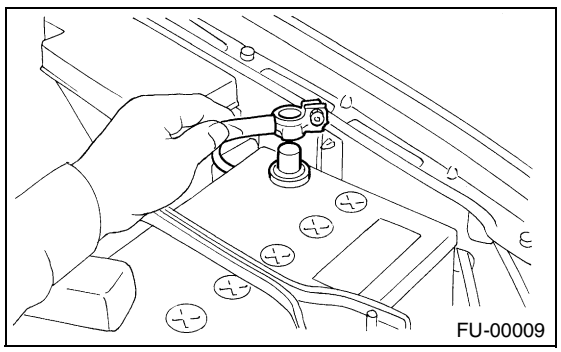


(A) Front side

2) Connect the knock sensor connector.



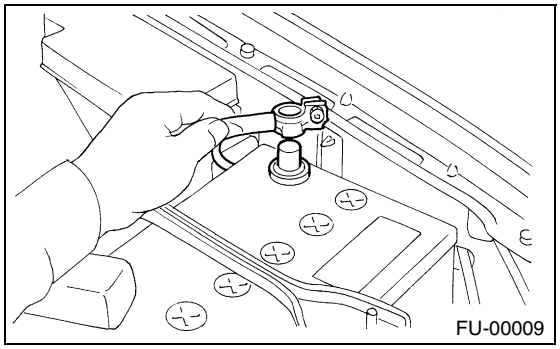
3) Install the intercooler. <Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>
4) Connect the battery ground cable to battery.



8. Throttle Position Sensor

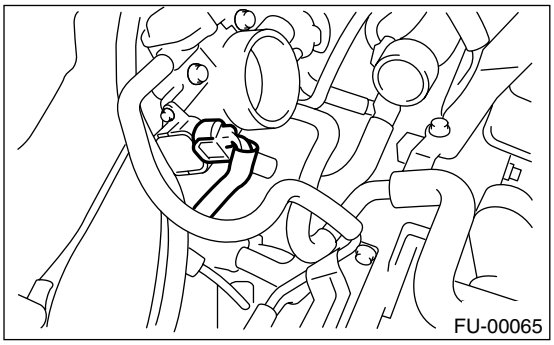
A: REMOVAL

1) Disconnect the ground cable from battery.

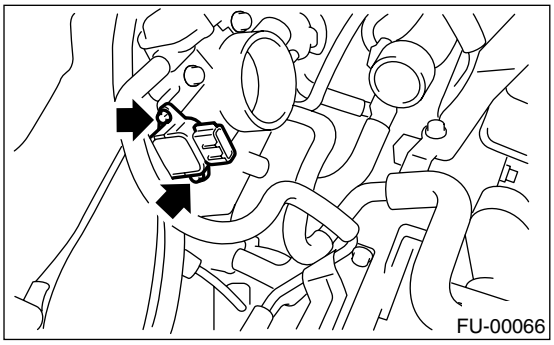


2) Remove the intercooler. <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>

3) Disconnect the connector from throttle position sensor.



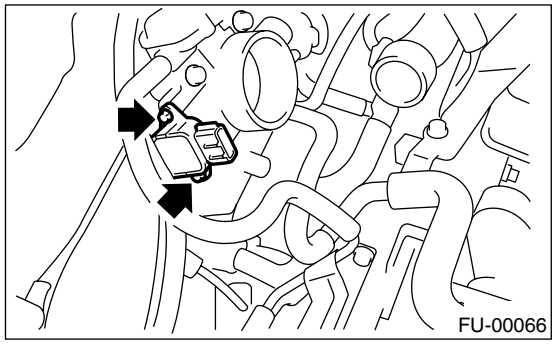
4) Remove the throttle position sensor holding screws, and remove it.



B: INSTALLATION

Install in the reverse order of removal.

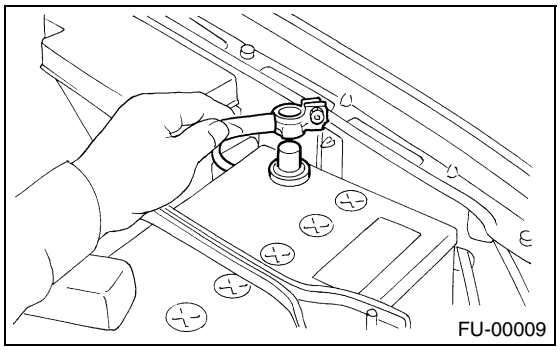
Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



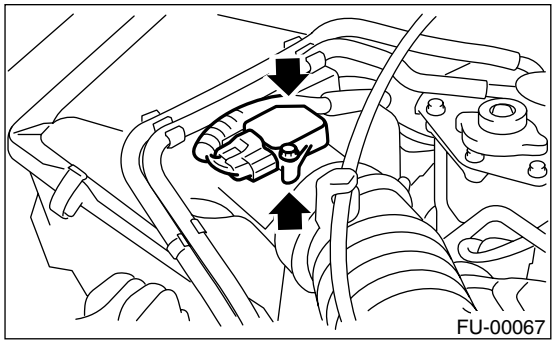
9. Mass Air Flow and Intake Air Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector mass air flow and intake air temperature sensor.
3) Remove the mass air flow and intake air temperature sensor.



B: INSTALLATION

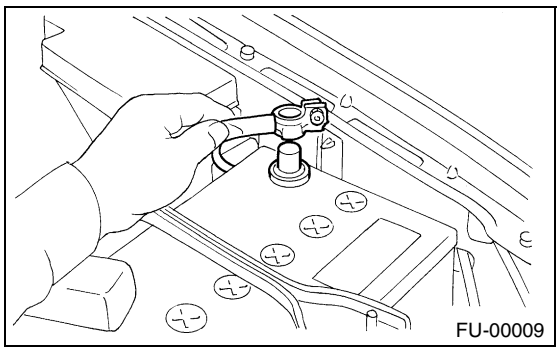
Install in the reverse order of removal.

Tightening torque:
1.7N·m (0.17 kgf-m, 1.2 ft-lb)

10.Pressure Sensor

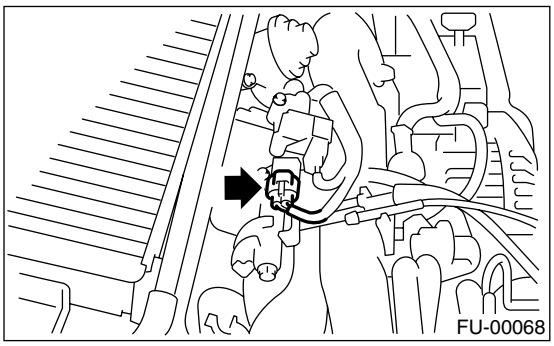
A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the idle air control solenoid valve. <Ref. to FU(TURBO)-35, REMOVAL, Idle Air Control Solenoid Valve.>

3) Disconnect the connectors from pressure sensor.



4) Remove the pressure sensor from throttle body.

B: INSTALLATION

Install in the reverse order of removal.

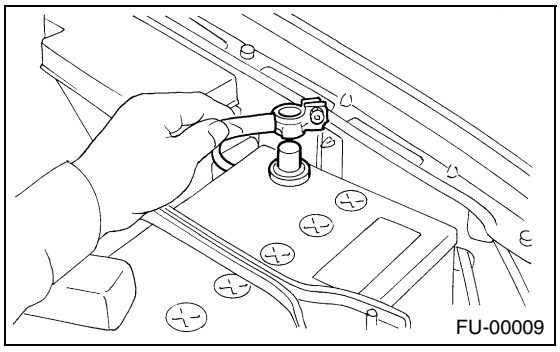
NOTE:
Replace the O-ring for the pressure sensor with new ones.

Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)

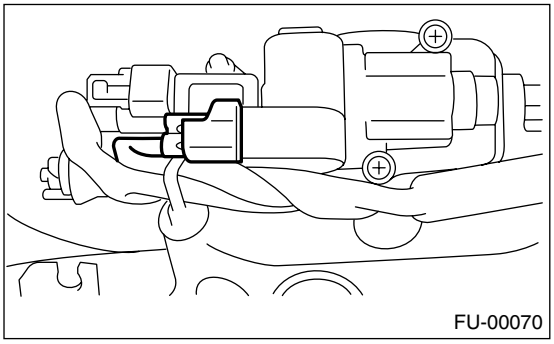
11.Idle Air Control Solenoid Valve

A: REMOVAL

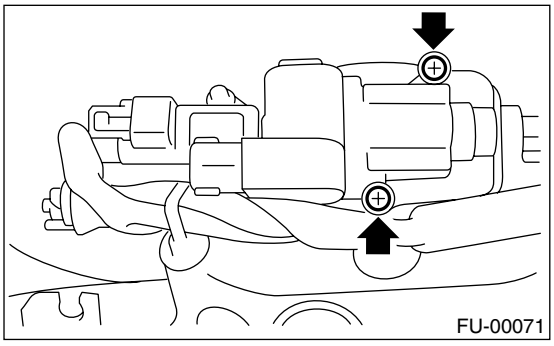
1) Disconnect the ground cable from battery.



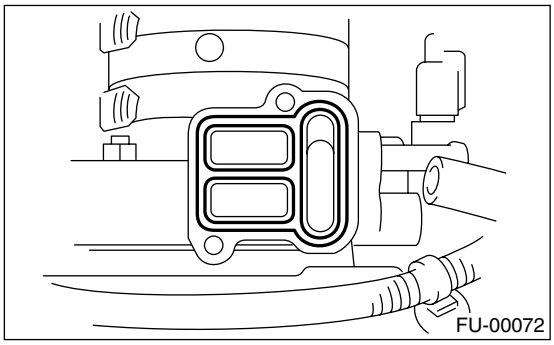
2) Disconnect the connector from idle air control solenoid valve.



3) Remove the idle air control solenoid valve from throttle body.



4) Remove the gasket from throttle body.

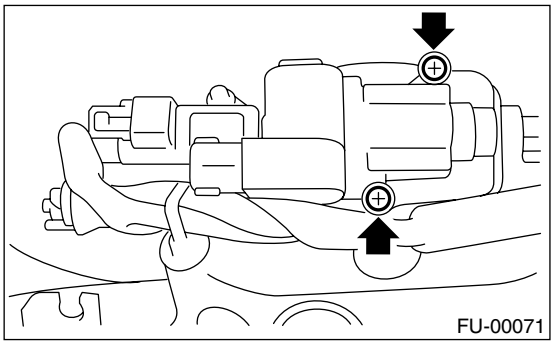


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace the gasket with a new one.

Tightening torque:
2.8 N·m (0.29 kgf-m, 2.1 ft-lb)

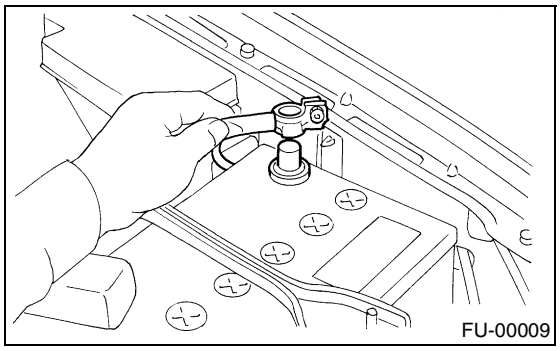


12.Fuel Injector

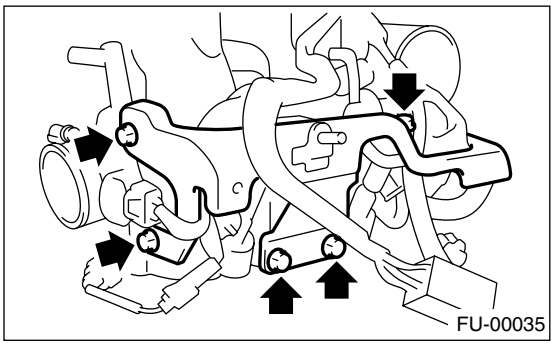
A: REMOVAL

1. RH SIDE

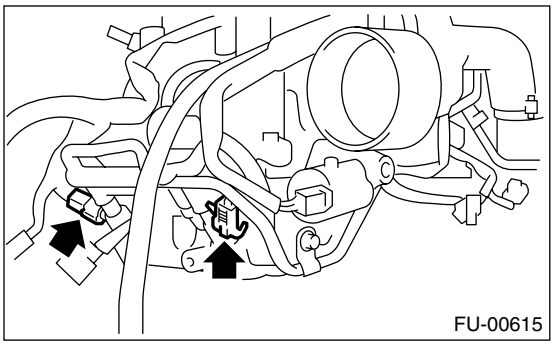
1) Release the fuel pressure. <Ref. to FU(TURBO)-52, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid and remove fuel filler cap.
3) Disconnect the ground cable from battery.



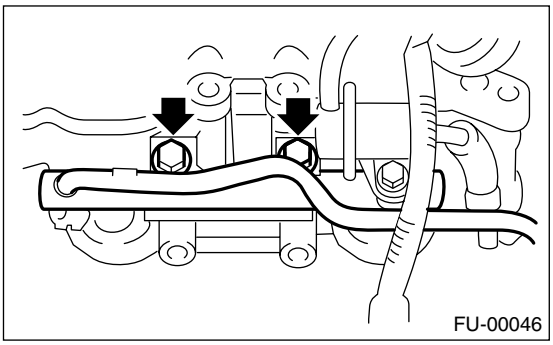
4) Remove the intake manifold. <Ref. to FU(TURBO)-14, REMOVAL, Intake Manifold.>
5) Remove the fuel pipe protector RH.

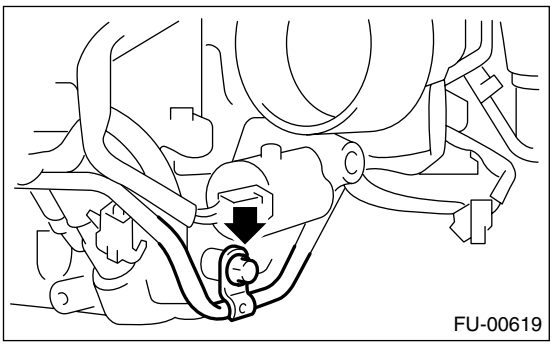


6) Disconnect the connector from fuel injector.

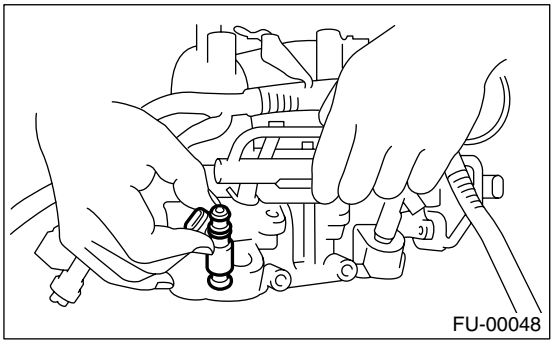


7) Remove the bolts which hold injector pipe to intake manifold.



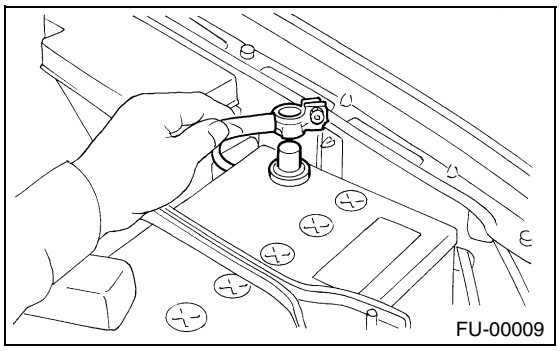


8) Remove the fuel injector while lifting up the fuel injector pipe.

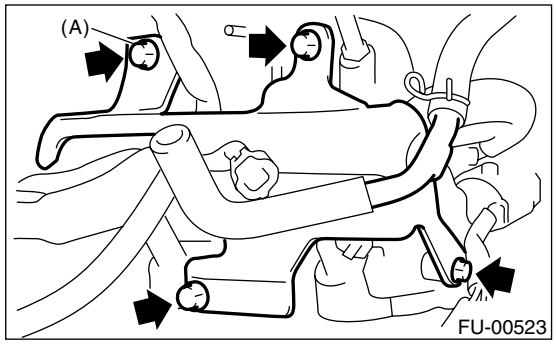


2. LH SIDE

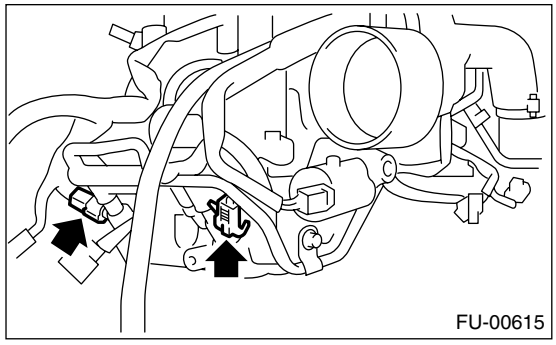
1) Release the fuel pressure. <Ref. to FU(TURBO)-52, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid and remove fuel filler cap.
3) Disconnect the ground cable from battery.



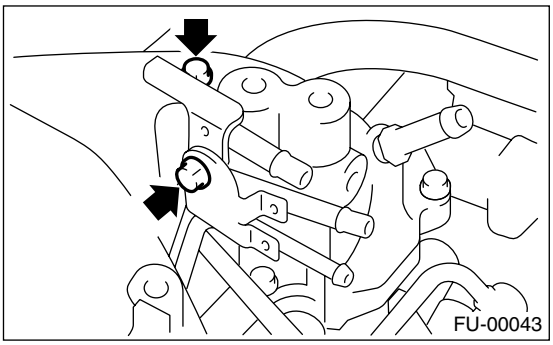
4) Remove the intake manifold. <Ref. to FU(TURBO)-14, REMOVAL, Intake Manifold.>
5) Remove the bolts (A), and then remove the fuel pipe protector LH.

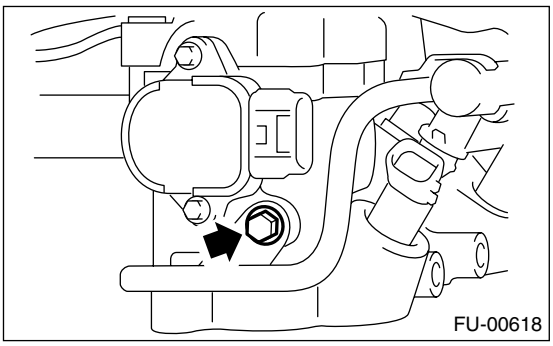


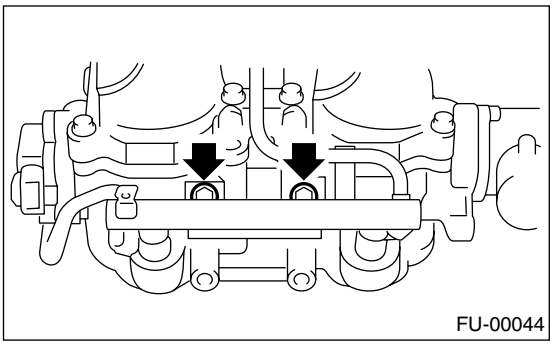
6) Disconnect the connector from fuel injector.



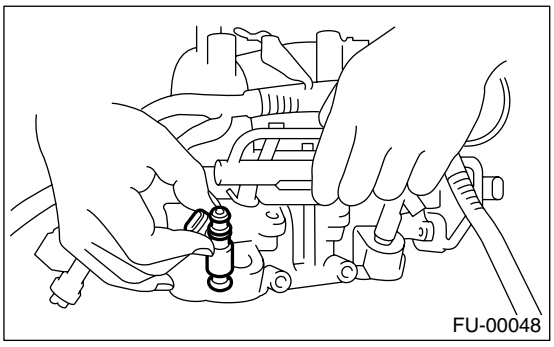
7) Remove the bolts which hold injector pipe to intake manifold.







8) Remove the fuel injector while lifting up the fuel injector pipe.

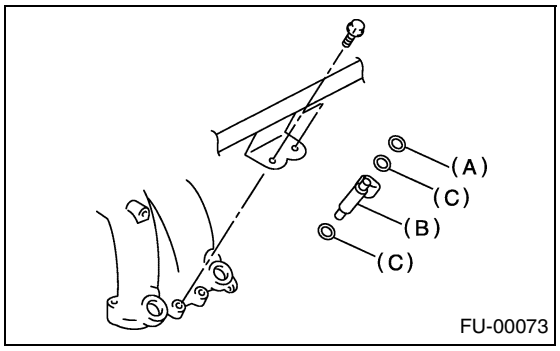


B: INSTALLATION

1. RH SIDE

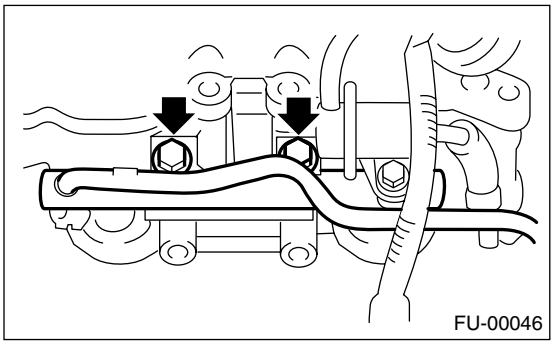
Install in the reverse order of removal.

NOTE:
Replace the O-ring and insulators with new ones.

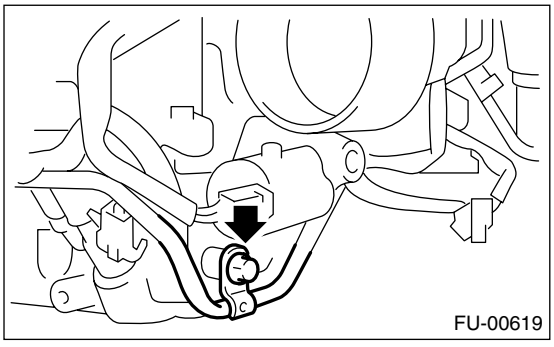


(A) O-ring
(B) Fuel injector
(C) Insulator

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)

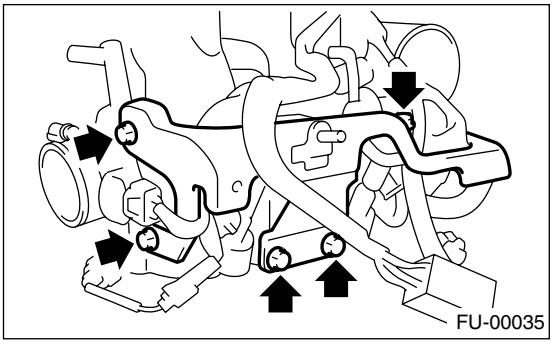


Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



NOTE:
Securely tighten bolt together with ground cable.

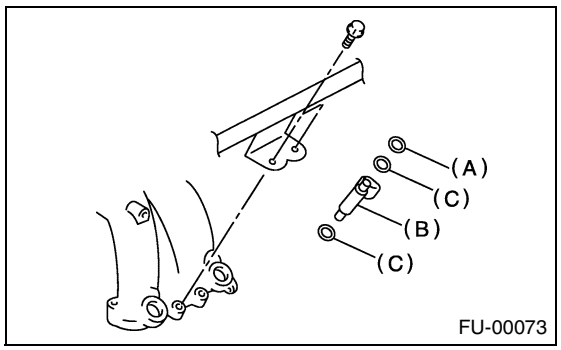
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



2. LH SIDE

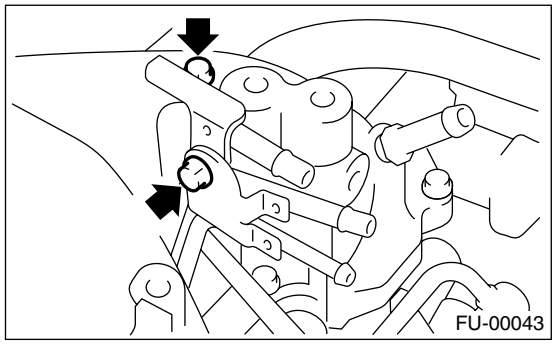
Install in the reverse order of removal.

NOTE:
Replace the O-ring and insulators with new ones.

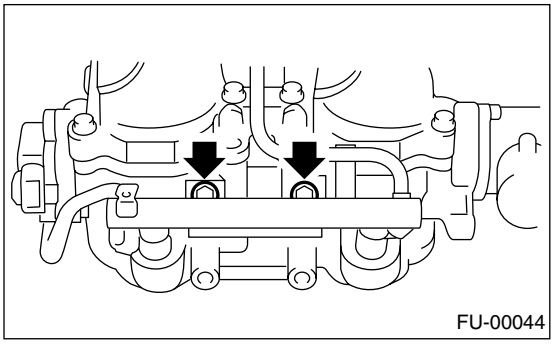


(A) O-ring
(B) Fuel injector
(C) Insulator

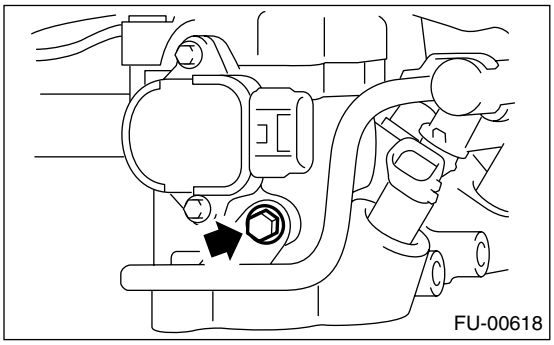
Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)



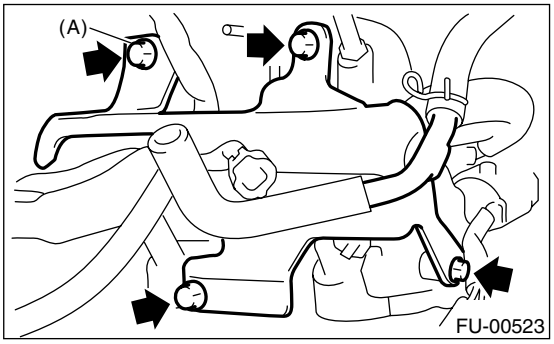
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



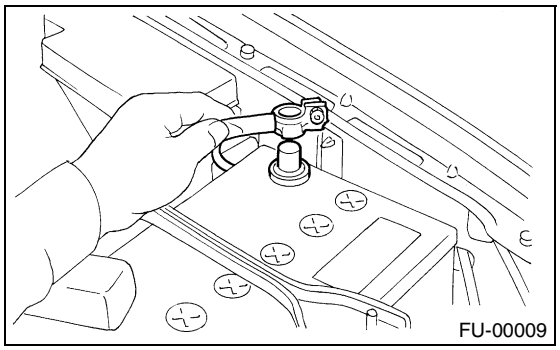
Tightening torque (A):
19 N·m (1.9 kgf-m, 14.0 ft-lb)



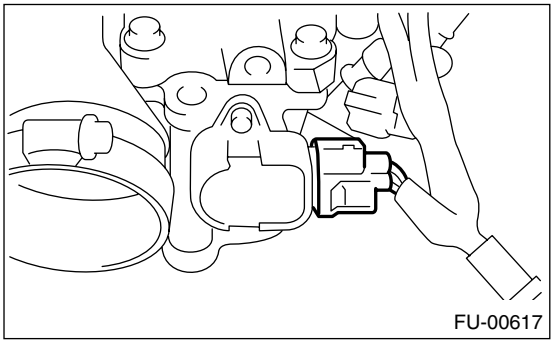
13. Tumble Generator Valve Assembly

A: REMOVAL

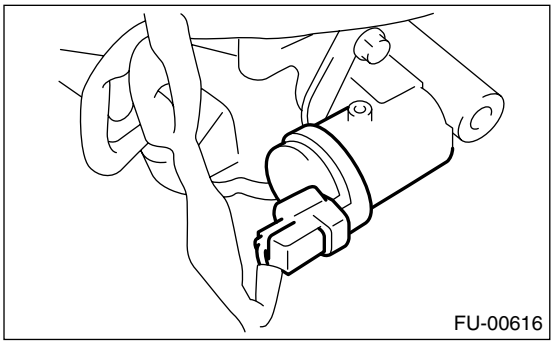
1) Release the fuel pressure. <Ref. to FU(TURBO)-52, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid and remove fuel filler cap.
3) Disconnect the ground cable from battery.



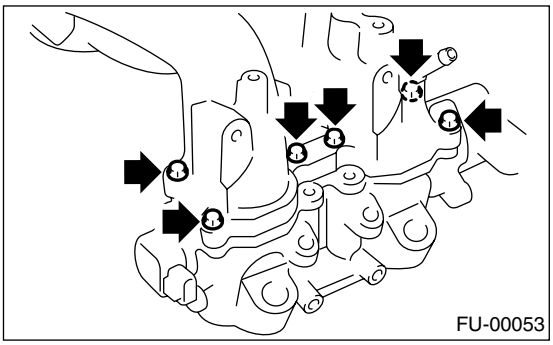
4) Remove the intake manifold. <Ref. to FU(TURBO)-14, REMOVAL, Intake Manifold.>
5) Disconnect the connector from tumble generator valve sensor.



6) Disconnect the connector from tumble generator valve actuator.



7) Remove the fuel injector. <Ref. to FU(TURBO)-36, REMOVAL, Fuel Injector.>
8) Remove the tumble generator valve body from intake manifold.

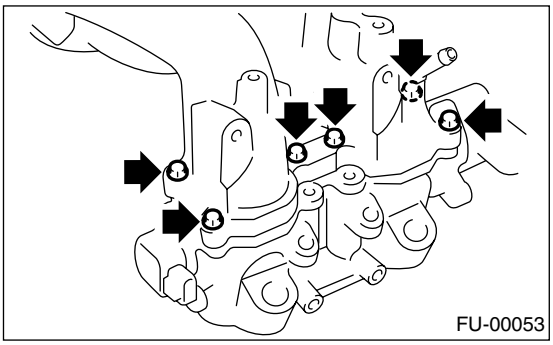


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Always use new gaskets.

Tightening torque:
8.25 N·m (0.84 kgf-m, 6.1 ft-lb)

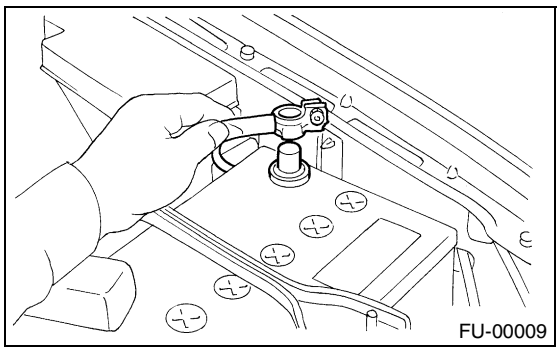


14.Tumble Generator Valve Actuator

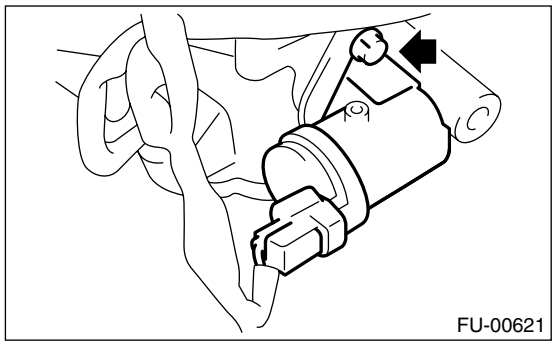
A: REMOVAL

1. RH SIDE

1) Release the fuel pressure. <Ref. to FU(TURBO)-52, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid and remove fuel filler cap.
3) Disconnect the ground cable from battery.

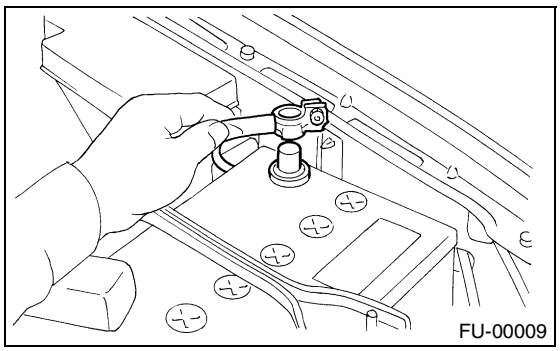


4) Remove the intake manifold. <Ref. to FU(TURBO)-14, REMOVAL, Intake Manifold.>
5) Disconnect the connector from tumble generator valve actuator RH.
6) Remove the tumble generator valve RH.

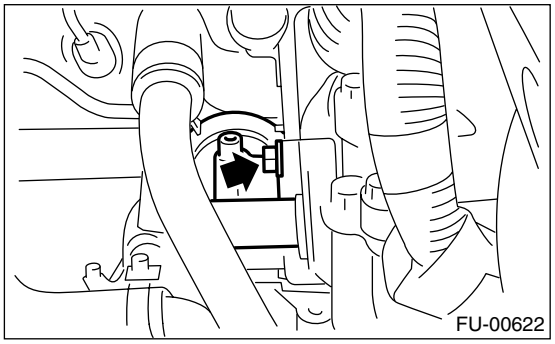


2. LH SIDE

1) Disconnect the ground cable from battery.



2) Disconnect the connector from tumble generator valve LH.
3) Remove the tumble generator valve actuator LH.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

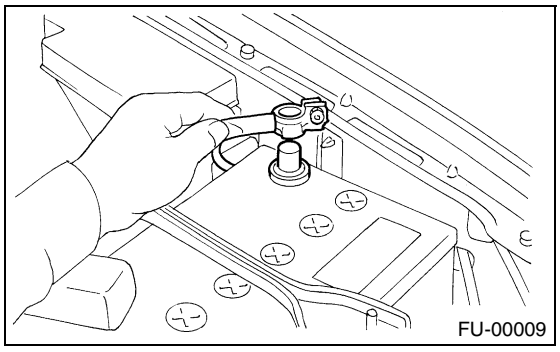
2. LH SIDE

Install in the reverse order of removal.

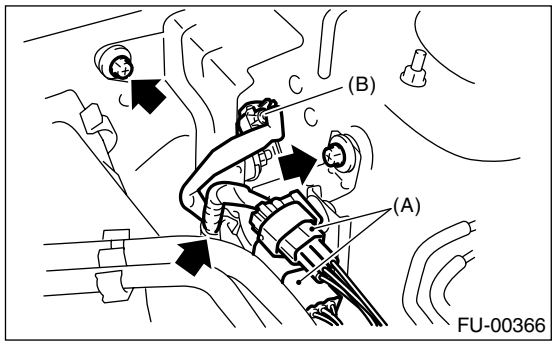
15. Wastegate Control Solenoid Valve

A: REMOVAL

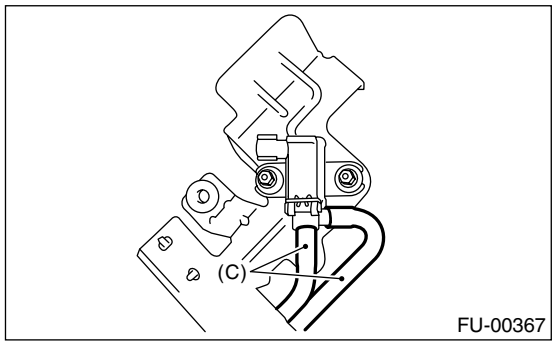
1) Disconnect the ground cable from battery.



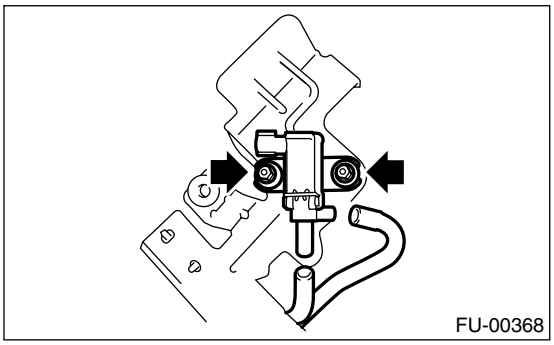
2) Disconnect the engine harness connector (A) from bracket.
3) Disconnect the connector (B) from wastegate control solenoid valve.
4) Remove the bracket from body.



5) Disconnect the pressure hoses (C) from wastegate control solenoid valve.



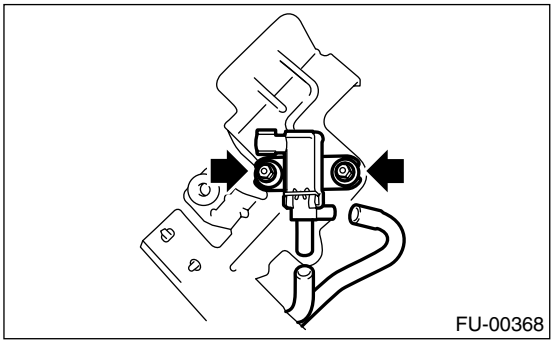
6) Remove the wastegate control solenoid valve from bracket.



B: INSTALLATION

Install in the reverse order of removal.

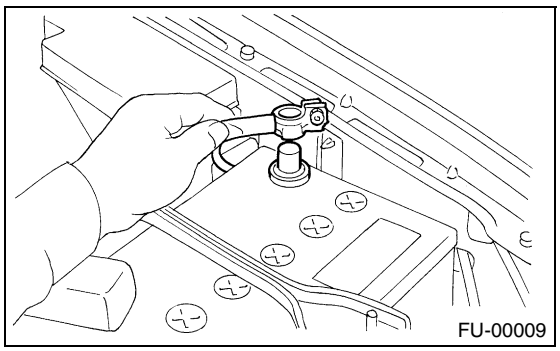
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



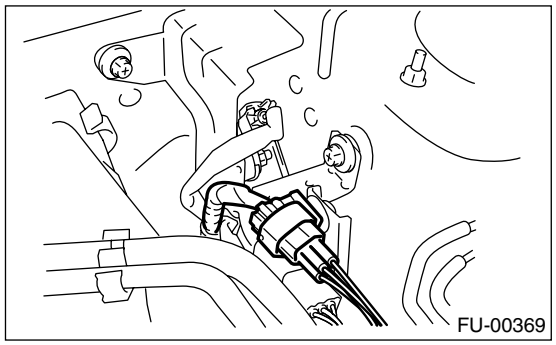
16.Front Oxygen (A/F) Sensor

A: REMOVAL

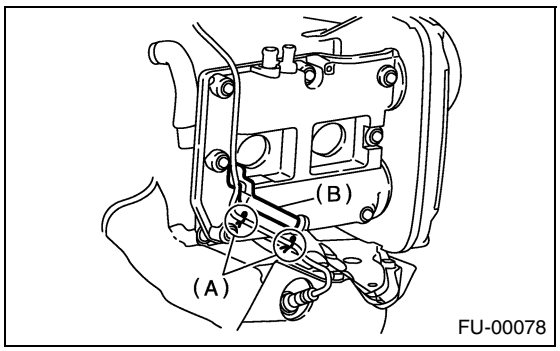
1) Disconnect the ground cable from battery.



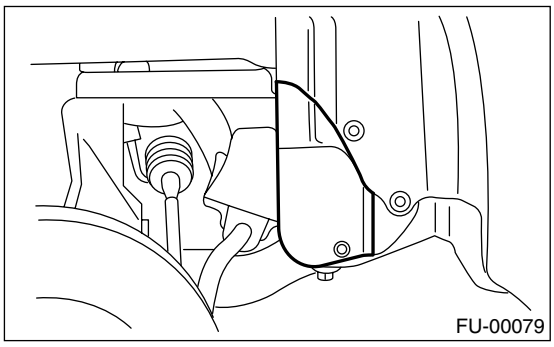
2) Disconnect the connector from front oxygen (A/F) sensor.



3) Disconnect the engine harness fixed by clip (A) from the bracket (B).



4) Remove the front right side wheel.
5) Lift-up the vehicle.
6) Remove the service hole cover.

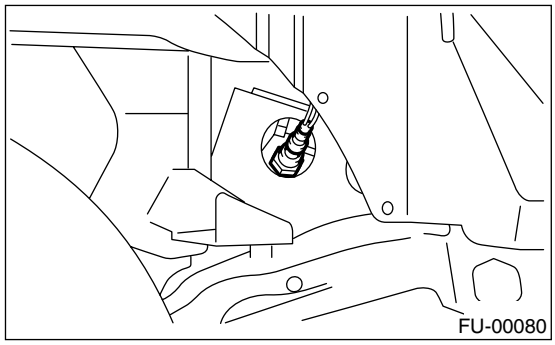


7) Apply SUBARU CRC or its equivalent to the threaded portion of front oxygen (A/F) sensor, and leave it for 1 minute or more.

SUBARU CRC (Part No. 004301003)

8) Remove the front oxygen (A/F) sensor.

CAUTION:
When removing the oxygen (A/F) sensor, wait until the exhaust pipe cools, otherwise it will damage exhaust pipe.



B: INSTALLATION

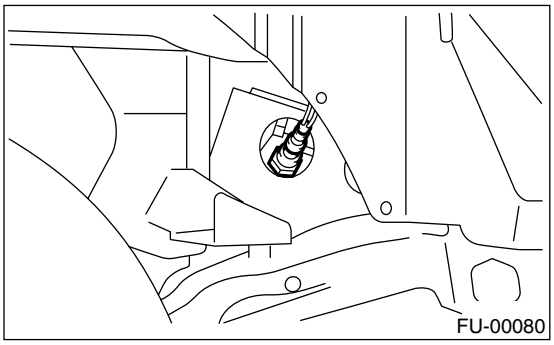
1) Before installing the front oxygen (A/F) sensor, apply anti-seize compound only to the threaded portion of front oxygen (A/F) sensor to make the next removal easier.

Anti-seize compound:
SS-30 by JET LUBE

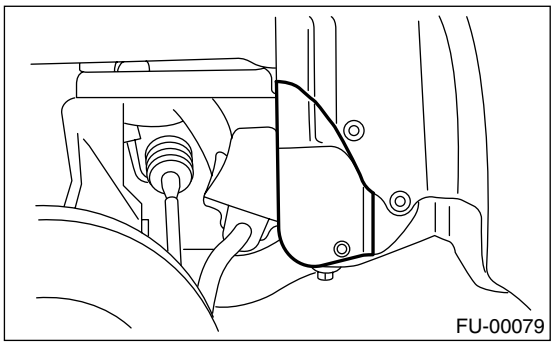
CAUTION:
Never apply anti-seize compound to the protector of front oxygen (A/F) sensor.

2) Install the front oxygen (A/F) sensor.

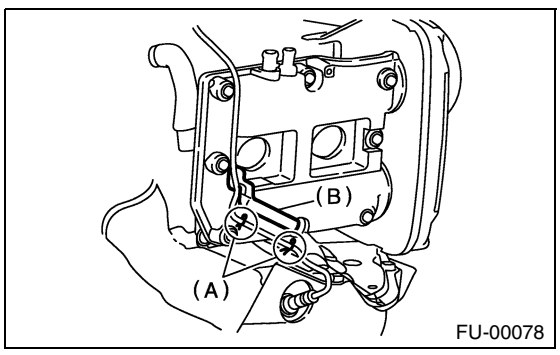
Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)



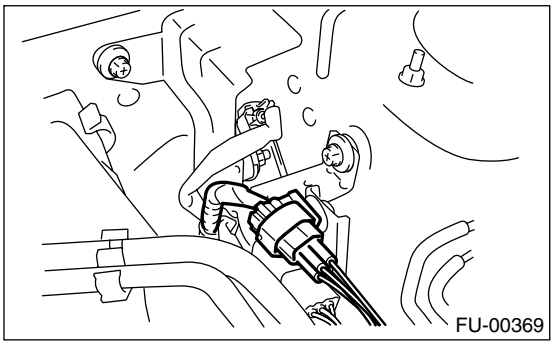
3) Install the service hole cover.



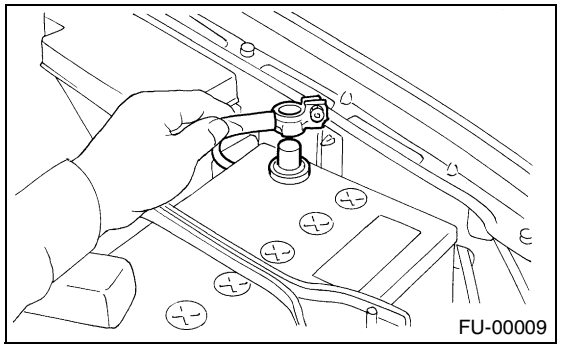
4) Lower the vehicle.
5) Install the front right side wheel.
6) Connect the engine harness with clip (A) to the bracket (B).



7) Connect the connector of front oxygen (A/F) sensor.



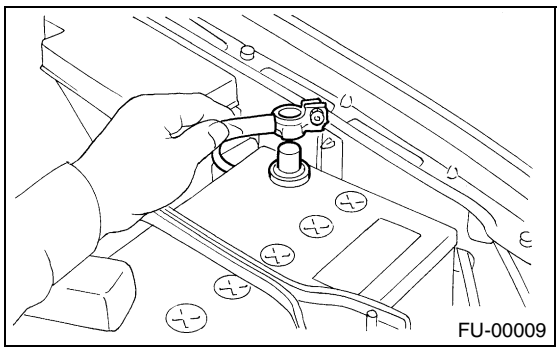
8) Connect the battery ground cable to battery.



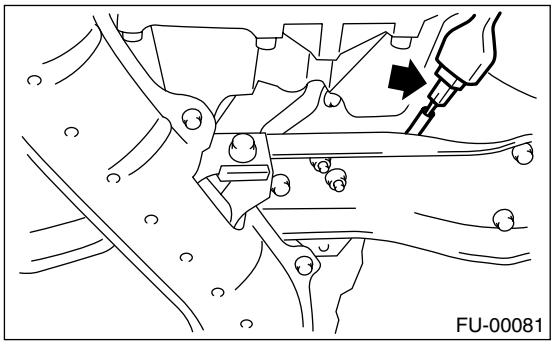
17.Rear Oxygen Sensor

A: REMOVAL

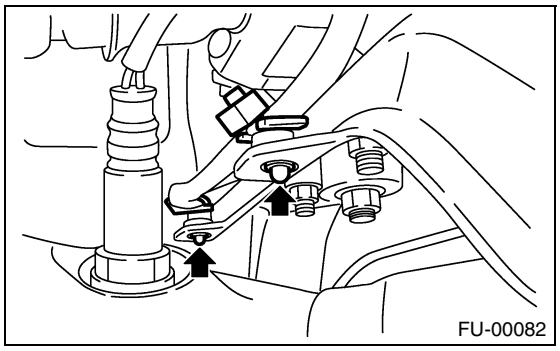
1) Disconnect the ground cable from battery.



2) Lift-up the vehicle.
3) Disconnect the connector from rear oxygen sensor.



4) Remove the clip by pulling out from the upper side of crossmember.

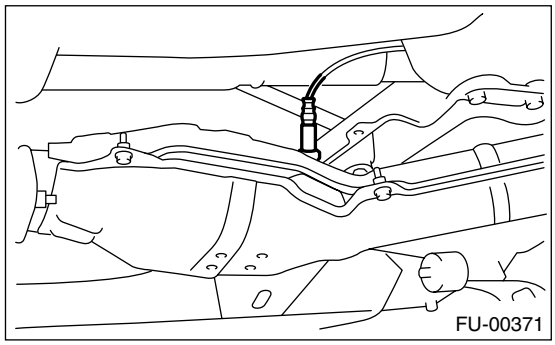


5) Apply SUBARU CRC or its equivalent to the threaded portion of rear oxygen sensor, and leave it for 1 minute or more.

SUBARU CRC (Part No. 004301003)

6) Remove the rear oxygen sensor.

CAUTION:
When removing the oxygen sensor, wait until the exhaust pipe cools, otherwise it will damage exhaust pipe.



B: INSTALLATION

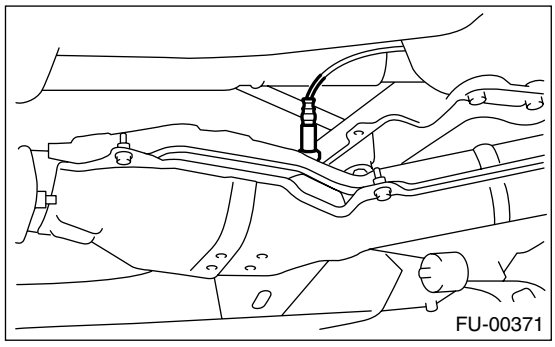
1) Before installing the rear oxygen sensor, apply anti-seize compound only to the threaded portion of rear oxygen sensor to make the next removal easier.

CAUTION:
Never apply anti-seize compound to the protector of rear oxygen sensor.

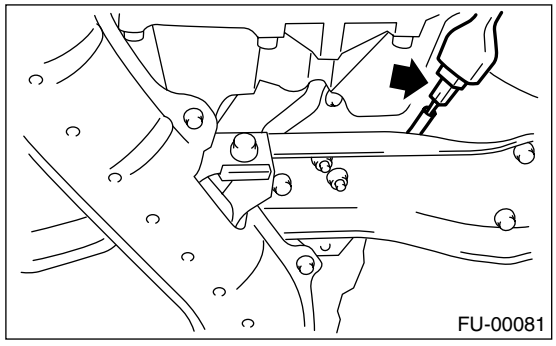
Anti-seize compound:
SS-30 by JET LUBE

2) Install the rear oxygen sensor.

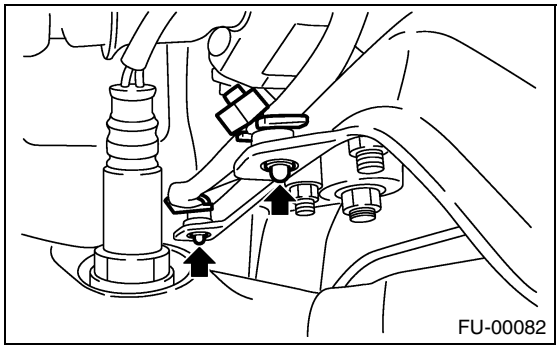
Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)



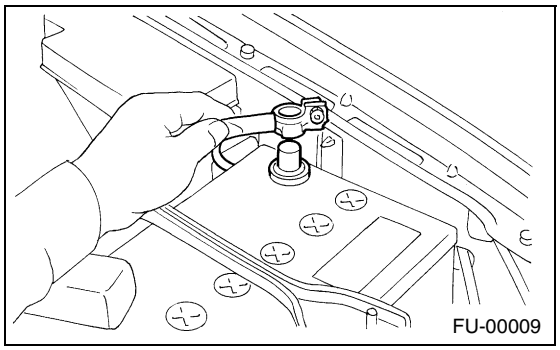
3) Connect the connector to rear oxygen sensor.



4) Connect the clip to crossmember.



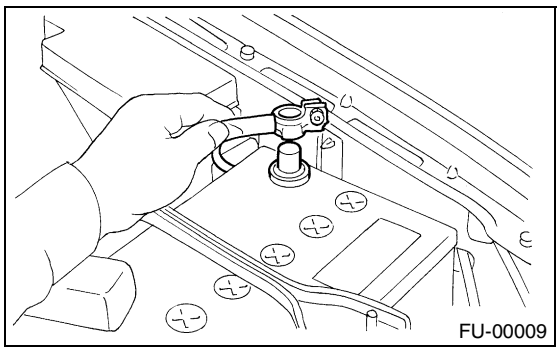
5) Lower the vehicle.
6) Connect the battery ground cable to battery.



18.Exhaust Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



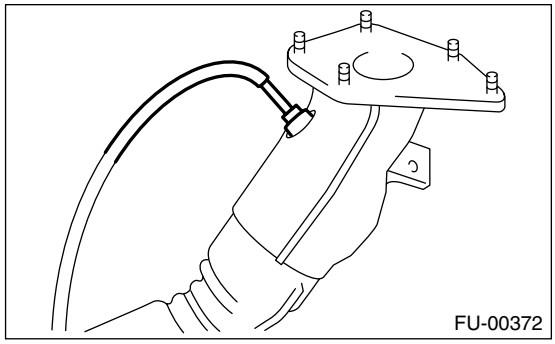
2) Remove the joint pipe. <Ref. to EX(TURBO)-11, REMOVAL, Joint Pipe.>

3) Apply SUBARU CRC or its equivalent to the threaded portion of exhaust temperature sensor, and leave it for 1 minute or more.

SUBARU CRC (Part No. 004301003)

4) Remove the exhaust temperature sensor.

CAUTION:
When removing the exhaust temperature sensor, wait until the exhaust pipe cools, otherwise it will damage exhaust pipe.



B: INSTALLATION

1) Before installing the exhaust temperature sensor, apply anti-seize compound only to the threaded portion of rear oxygen sensor to make the next removal easier.

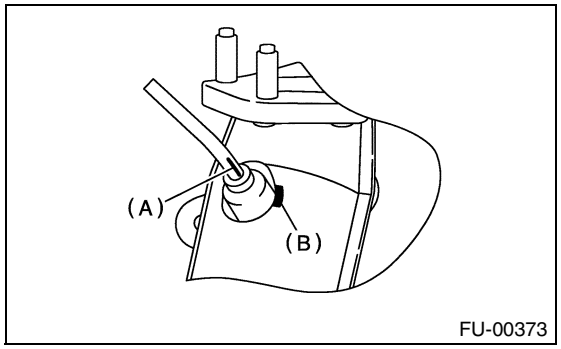
CAUTION:
Never apply anti-seize compound to the protector of exhaust temperature sensor.

Anti-seize compound:
SS-30 by JET LUBE

2) Install the exhaust temperature sensor.

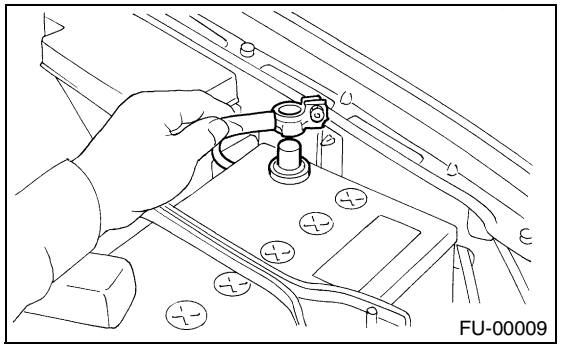
NOTE:
Align the marking (A) of exhaust temperature sensor to the marking (B) of joint pipe, and tighten the screws.

Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)



3) Install the joint pipe <Ref. to EX(TURBO)-11, INSTALLATION, Joint Pipe.>.

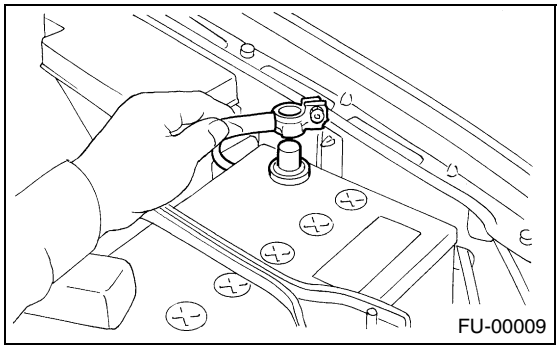
4) Connect the battery ground cable to battery.



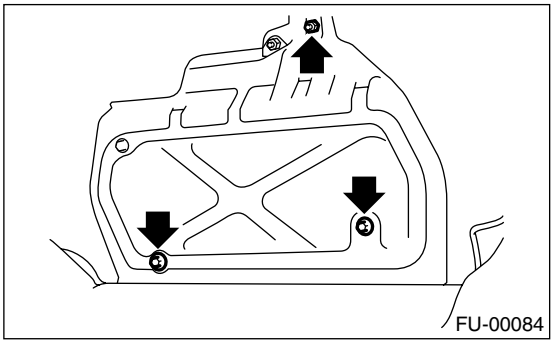
19.Engine Control Module

A: REMOVAL

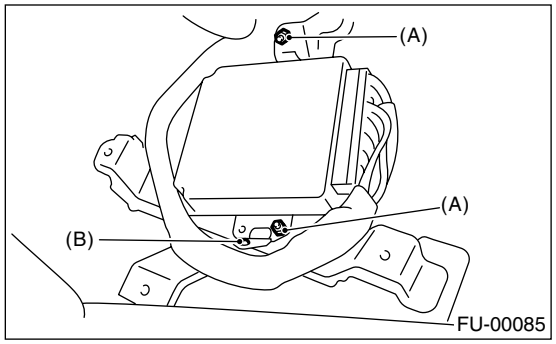
1) Disconnect the ground cable from battery.



2) Remove the lower inner trim of passenger side. <Ref. to EI-44, REMOVAL, Lower Inner Trim.>
3) Detach the floor mat of front passenger seat side.
4) Remove the protect cover.



5) Remove the nuts (A) which hold ECM to bracket.
6) Remove the clip (B) from bracket.



7) Disconnect the ECM connectors and take out the ECM.

B: INSTALLATION

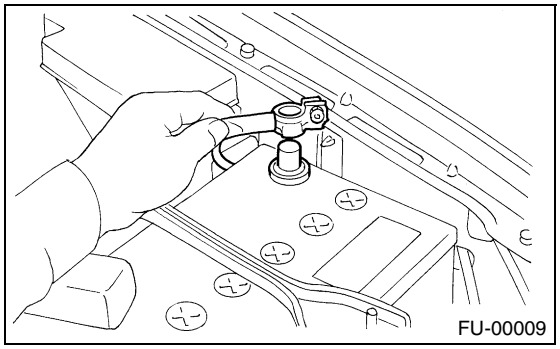
Install in the reverse order of removal.

NOTE:
When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage to fuel injection system.

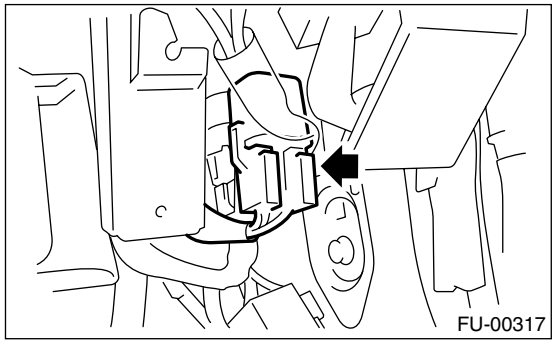
20.Main Relay

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the glove box. <Ref. to EI-37, REMOVAL, Glove Box.>
3) Remove the bolt which holds main relay bracket on body.
4) Disconnect the connectors from main relay.



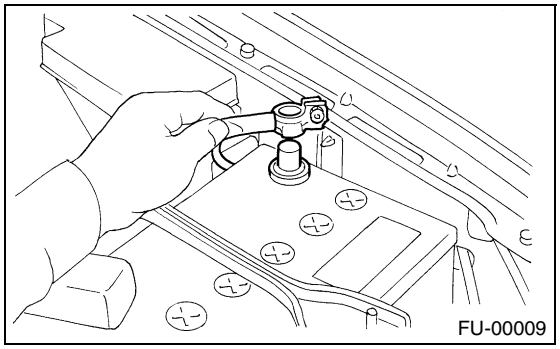
B: INSTALLATION

Install in the reverse order of removal.

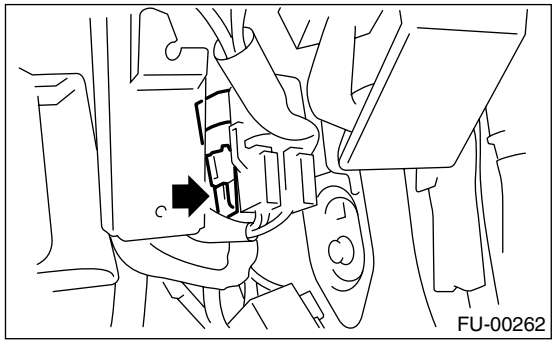
21.Fuel Pump Relay

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the glove box.<Ref. to EI-37, REMOVAL, Glove Box.>
3) Remove the bolt which holds fuel pump relay bracket on body.
4) Disconnect the connector from fuel pump relay.



5) Remove the fuel pump relay from mounting bracket.

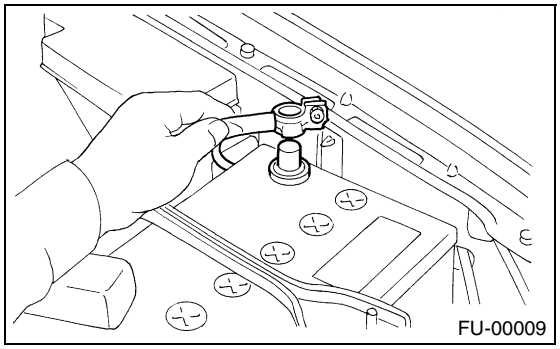
B: INSTALLATION

Install in the reverse order of removal.

22.Fuel Pump Controller

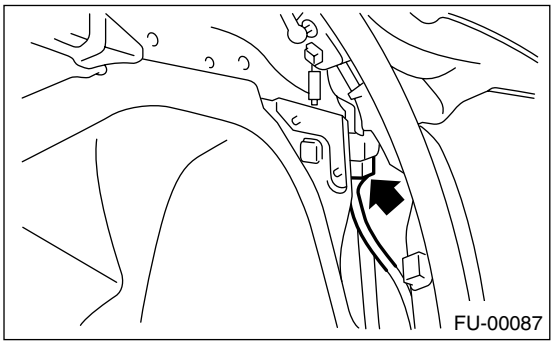
A: REMOVAL

1) Disconnect the ground cable from battery.

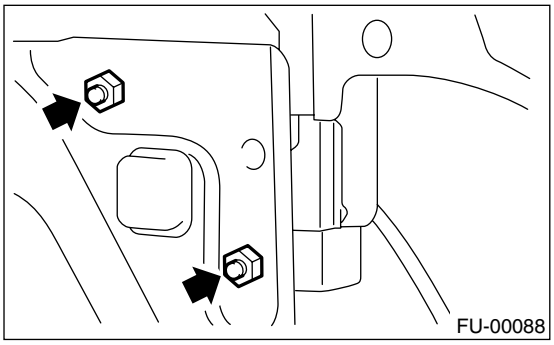


2) Remove the rear quarter trim. <Ref. to EI-45, REMOVAL, Rear Quarter Trim.>

3) Disconnect the connector from fuel pump controller.



4) Remove the fuel pump controller.



B: INSTALLATION

Install in the reverse order of removal.

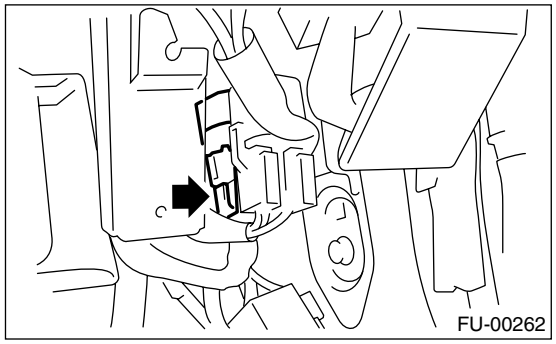
23.Fuel

A: OPERATION

1. RELEASING OF FUEL PRESSURE

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

1) Disconnect the connector from fuel pump relay.

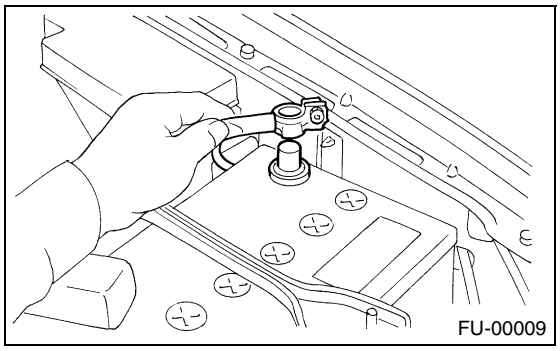


2) Start the engine and run it until it stalls.
3) After the engine stalls, crank it for 5 more seconds.
4) Turn the ignition switch to OFF.

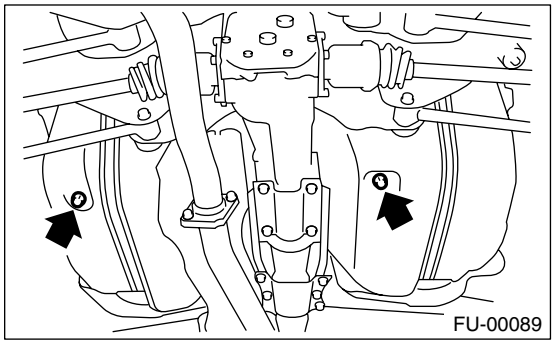
2. DRAINING FUEL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.

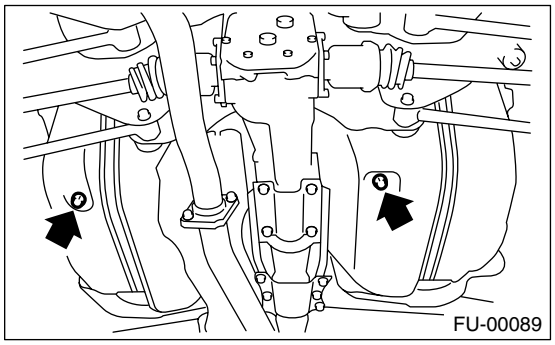


3) Open the fuel filler flap lid and remove fuel filler cap.
4) Lift-up the vehicle.
5) Drain fuel from the fuel tank.
Set a container under the vehicle and remove the drain plug from fuel tank.



6) Tighten the fuel drain plug.

Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)

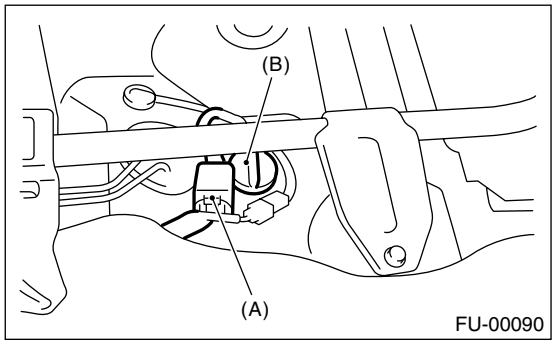


24.Fuel Tank

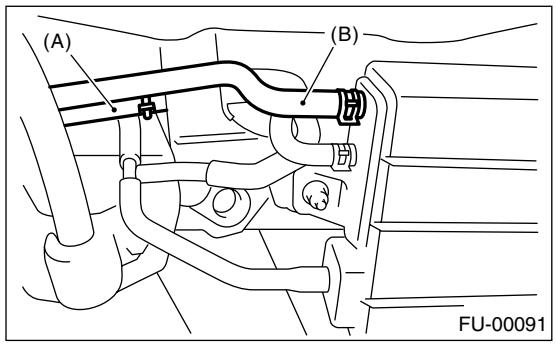
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

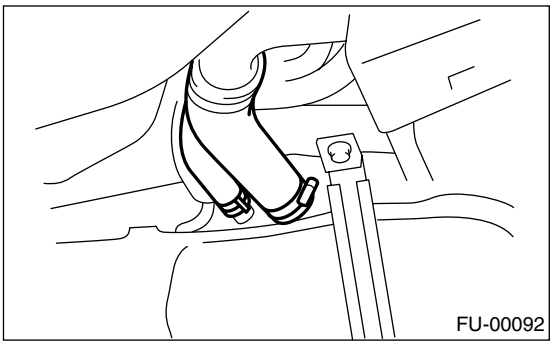
1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(TURBO)-52, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
3) Drain fuel from the fuel tank. <Ref. to FU(TURBO)-52, DRAINING FUEL, OPERATION, Fuel.>
4) Remove the rear seat.
5) Disconnect the connector (A) of fuel tank cord to rear harness.
6) Push the grommet (B) which holds fuel tank cord on floor panel into under the body.



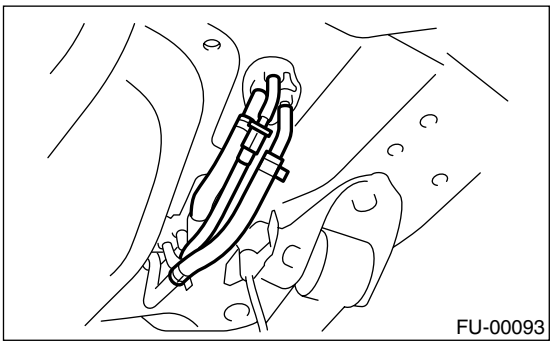
7) Remove the rear crossmember. <Ref. to RS-19, REMOVAL, Rear Crossmember.>
8) Disconnect the two-way valve hose (A) from two-way valve and disconnect the canister hose (B) from canister.



9) Loosen the clamp and disconnect the fuel filler hose and air vent hose from fuel filler pipe.

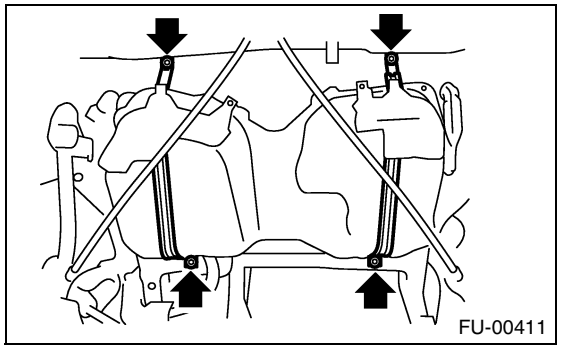


10) Move the clips, and disconnect quick connector. <Ref. to FU(TURBO)-67, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
11) Disconnect the fuel hoses.



12) Support the fuel tank with transmission jack, and remove the bolts from bands and dismount fuel tank from the vehicle.

WARNING:
A helper is required to perform this work.

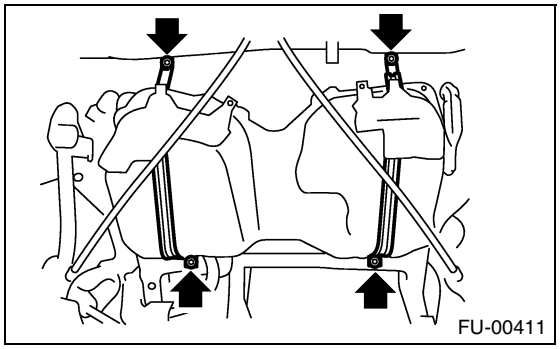


B: INSTALLATION

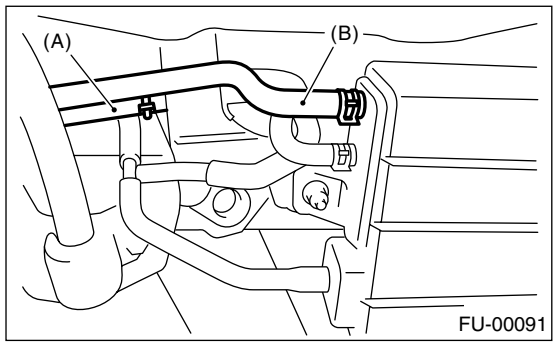
1) Support the fuel tank with transmission jack and push the fuel tank harness into access hole with grommet.

2) Set the fuel tank and temporarily tighten the bolts of fuel tank bands.

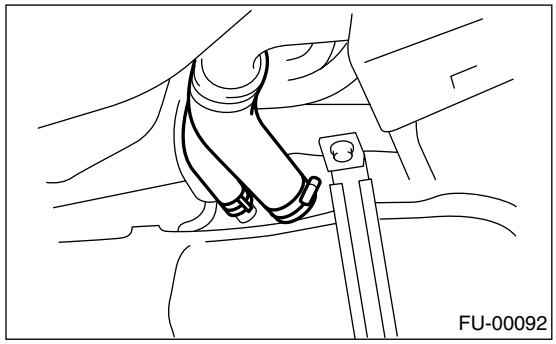
WARNING:
A helper is required to perform this work.



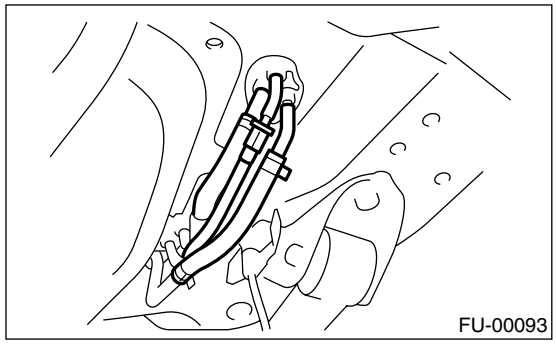
3) Connect the two-way valve hose (A) to two-way valve and connect the canister hose (B) to canister.



4) Connect the fuel filler hose and air vent hose.

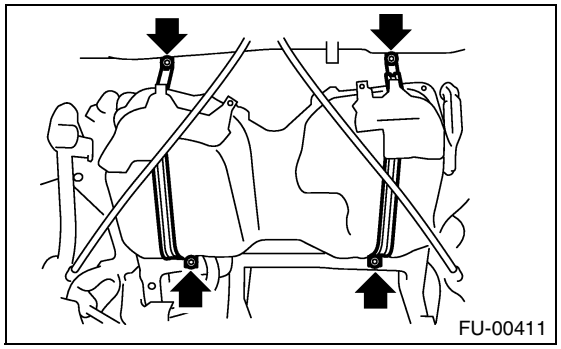


5) Connect the fuel hoses, and secure them with clips and quick connector. <Ref. to FU(TURBO)-68, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

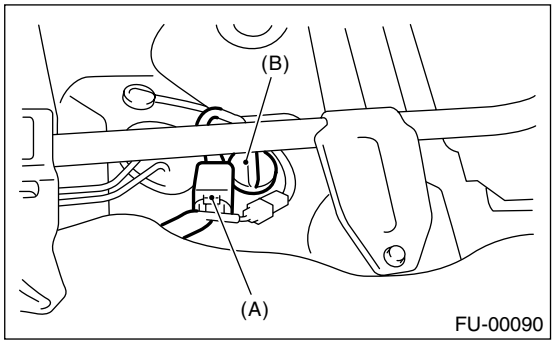


6) Tighten the band mounting bolts.

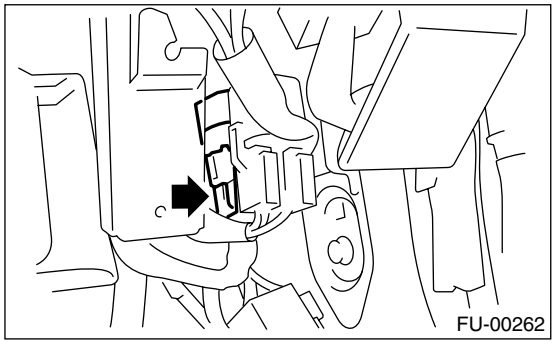
Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)



7) Install the rear crossmember. <Ref. to RS-19, INSTALLATION, Rear Crossmember.>
8) Connect the connector (A) to fuel tank cord and plug the service hole with grommet (B).



9) Set the rear seat and floor mat.
10) Connect the connector to fuel pump relay.



C: INSPECTION

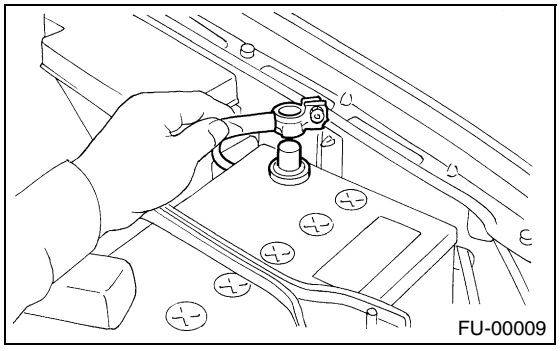
1) Make sure there are no cracks, holes, or other damage on the fuel tank.
2) Make sure that the fuel hoses and fuel pipes are not cracked and that connections are tight.

25.Fuel Filler Pipe

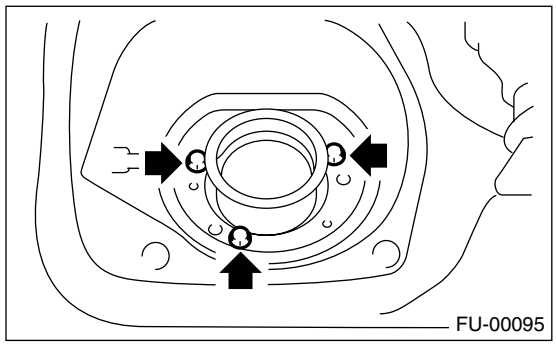
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

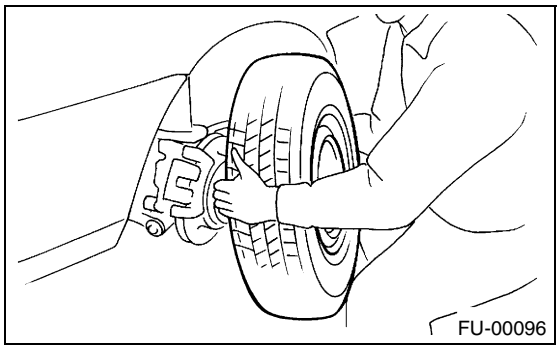
1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(TURBO)-52, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
3) Open the fuel filler flap lid and remove fuel filler cap.
4) Disconnect the ground cable from battery.


FU-00009

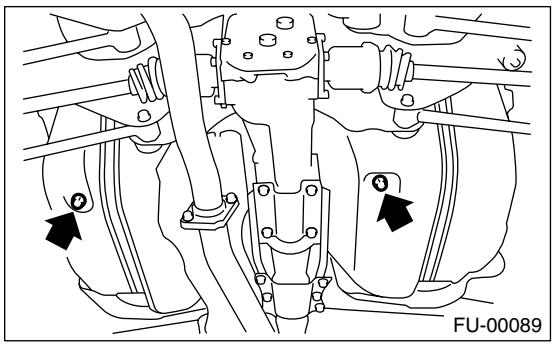
5) Remove the screws holding packing in place.


FU-00095

6) Loosen the rear right side wheel nuts.
7) Lift-up the vehicle.
8) Remove the rear right side wheel.

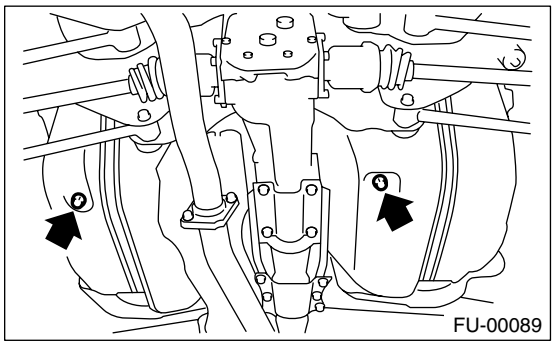

FU-00096

9) Drain fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.

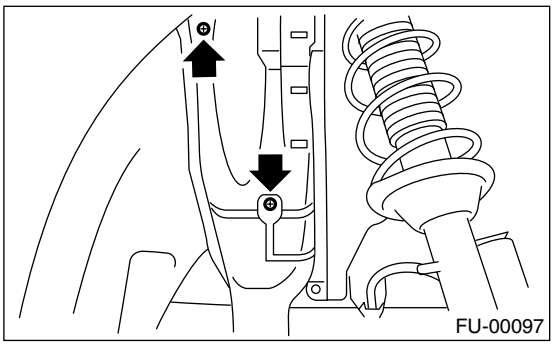

FU-00089

10) Tighten the fuel drain plug and then install the front right side tank cover.

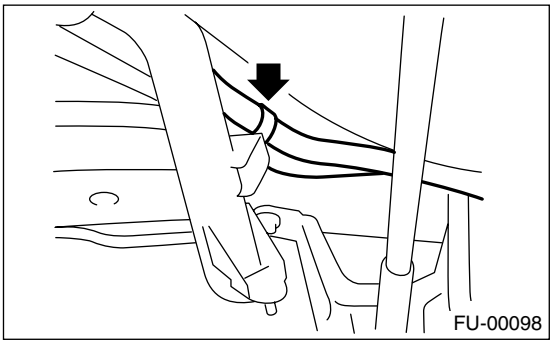
Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)


FU-00089

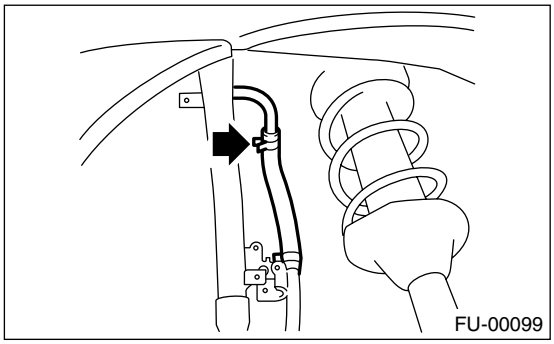
11) Remove the fuel filler pipe protector.


FU-00097

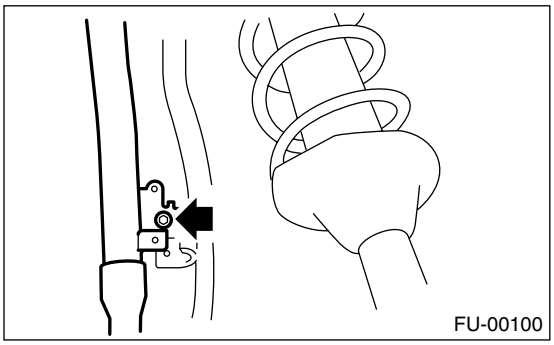
12) Separate the evaporation hoses from clip of fuel filler pipe.


FU-00098

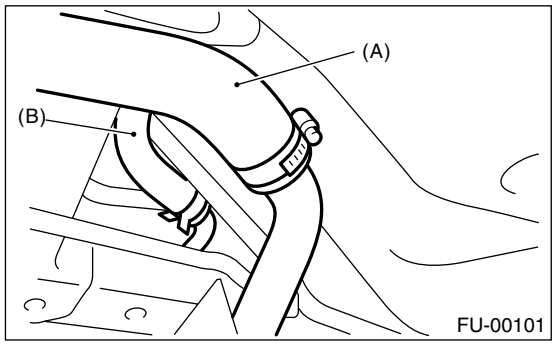
13) Disconnect the air vent hose from fuel filler pipe.



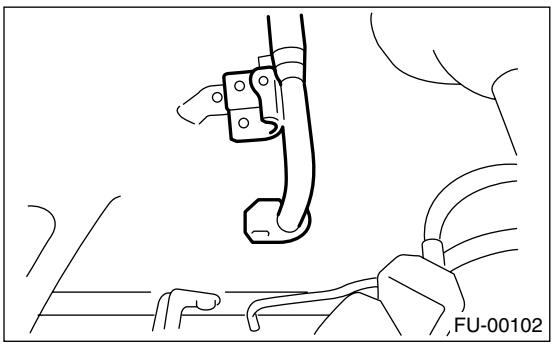
14) Remove the bolts which hold fuel filler pipe bracket on body.



15) Loosen the clamp and separate fuel filler hose (A) from fuel filler pipe.
16) Move the clip and separate air vent hose (B).



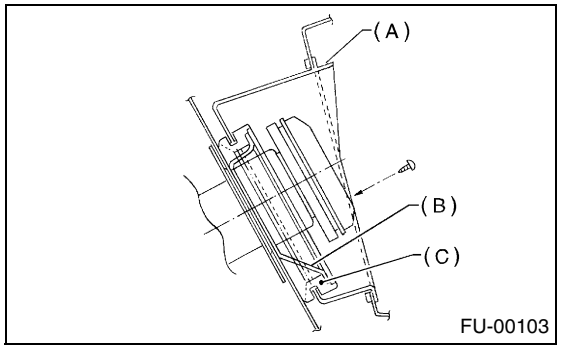
17) Remove the fuel filler pipe to under side of the vehicle.
18) Remove the air vent pipe together with clip from body.



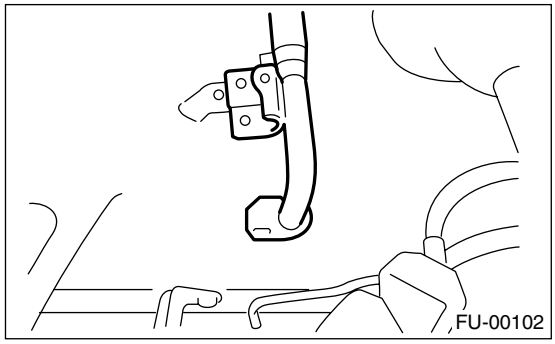
B: INSTALLATION

1) Hold the fuel filler flap open.
2) Set the fuel saucer (A) with rubber packing (C) and insert the fuel filler pipe into hole from the inner side of apron.
3) Align the holes in fuel filler pipe neck and set cup (B), and tighten the screws.

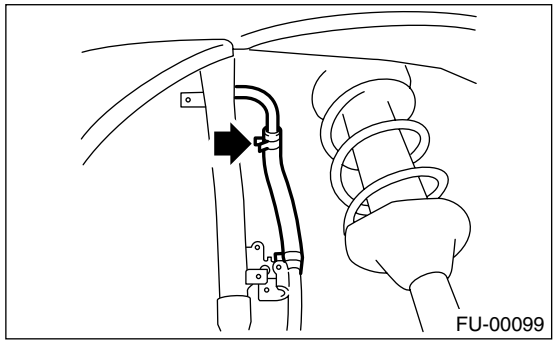
NOTE:
If the edges of rubber packing are folded toward inside, straighten it with a screwdriver.



4) Install the air vent pipe.

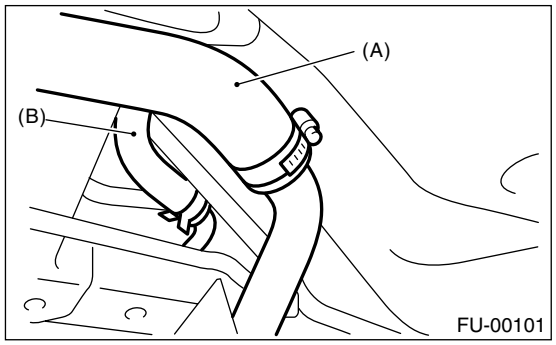


5) Connect the air vent hose to fuel filler pipe.



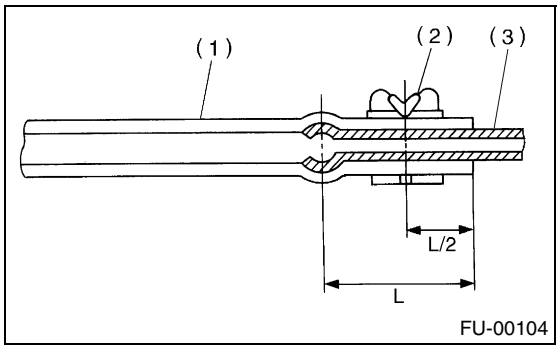
6) Insert the fuel filler hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten the clamp.

CAUTION:
Do not allow clips to touch the air vent hose (B) and rear suspension crossmember.



7) Insert the air vent hose approx. 25 to 30 mm (0.98 to 1.18 in) into the lower end of air vent pipe and hold clip.

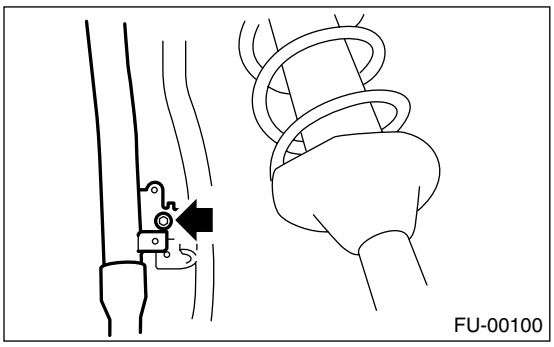
L = 27.5±2.5 mm (1.083±0.098 in)



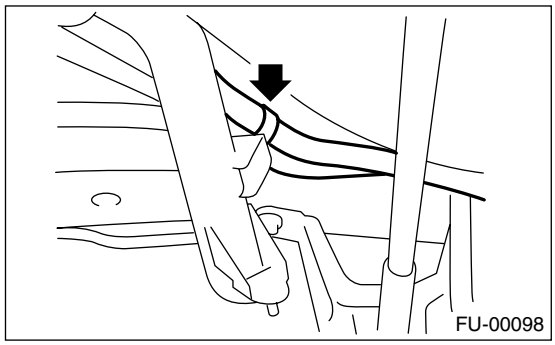
(1) Hose
(2) Clip
(3) Pipe

8) Tighten the bolt which holds fuel filler pipe bracket on body.

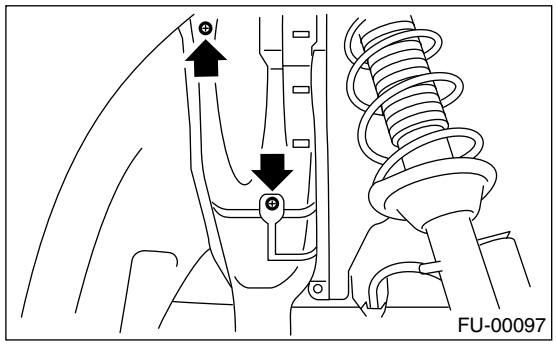
Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



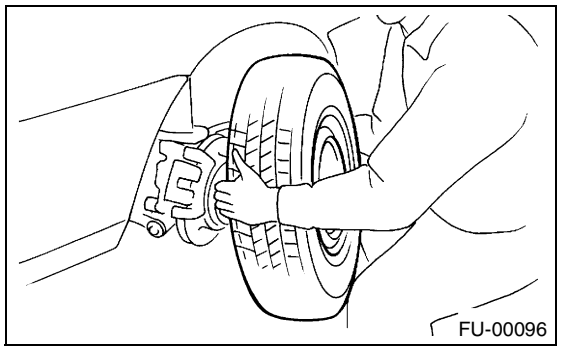
9) Hold the evaporation hoses onto clip of fuel filler pipe.



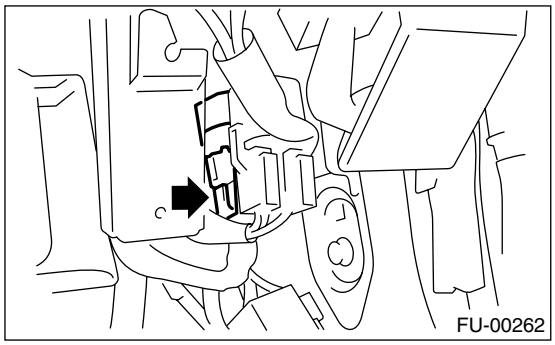
10) Install the fuel filler pipe protector.



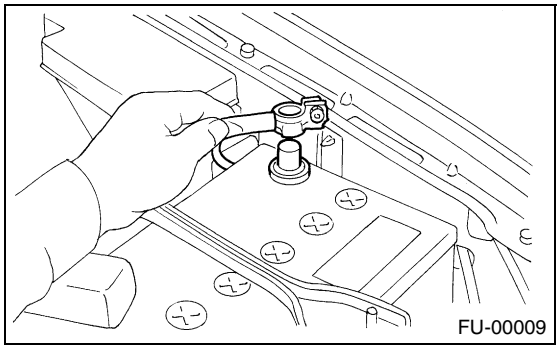
11) Install the rear right wheel.



12) Lower the vehicle.
13) Tighten the wheel nuts.
14) Connect the connector to fuel pump relay.



15) Connect the battery ground cable to battery.



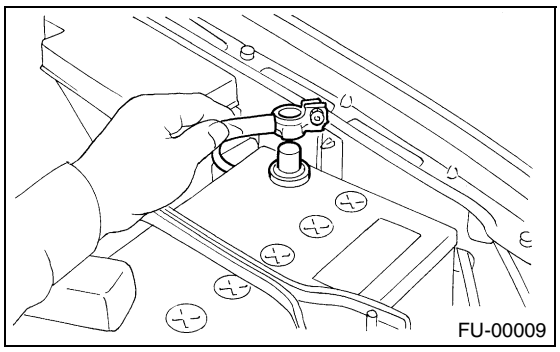
26.Fuel Pump

A: REMOVAL

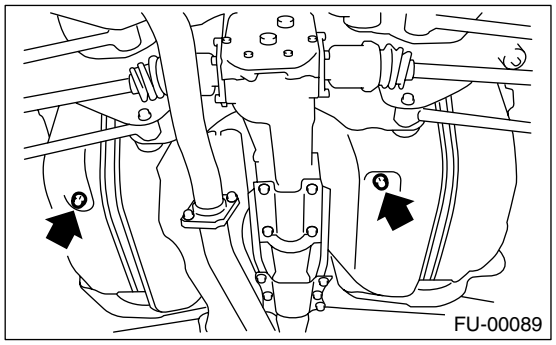
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

NOTE:
Fuel pump assembly consists of fuel pump and fuel level sensor.

1) Release the fuel pressure. <Ref. to FU(TURBO)-52, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid and remove fuel filler cap.
3) Disconnect the ground cable from battery.

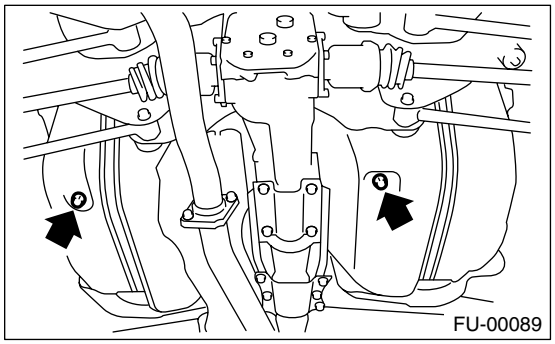

FU-00009

4) Lift-up the vehicle.
5) Drain fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.

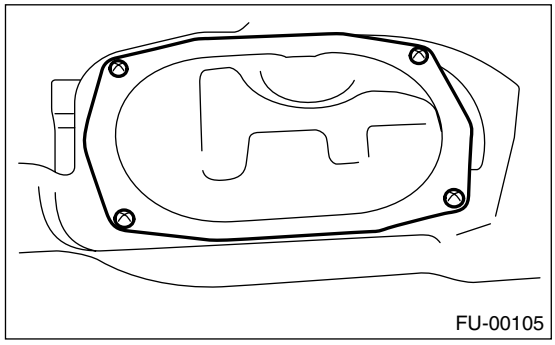

FU-00089

6) Tighten the fuel drain plug.

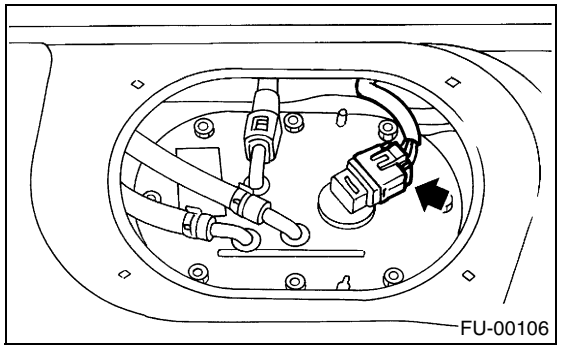
Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)


FU-00089

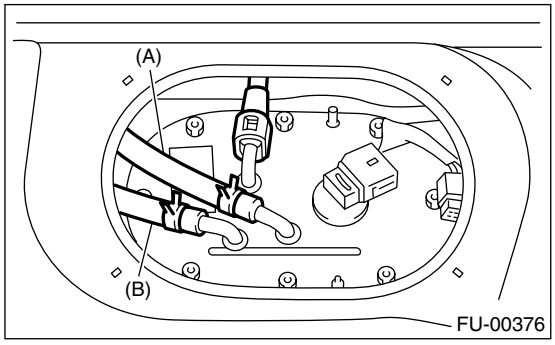
7) Raise the rear seat and turn floor mat up.
8) Remove the access hole lid.


FU-00105

9) Disconnect the connector from fuel pump.

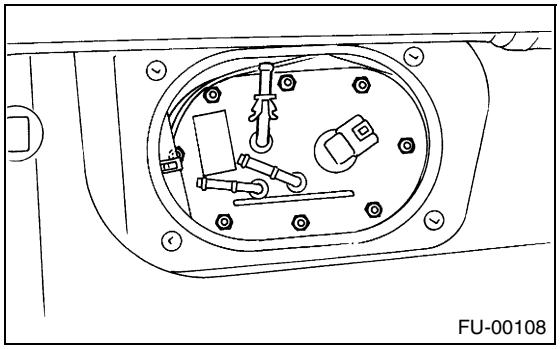

FU-00106

10) Disconnect the quick connector and then disconnect fuel delivery hose. <Ref. to FU(TURBO)-67, Fuel Delivery, Return and Evaporation Lines.>
11) Move the clips, and then disconnect the fuel return hose (A) and jet pump hose (B).



FU-00376

12) Remove the nuts which install fuel pump assembly onto fuel tank.



13) Take off the fuel pump assembly from fuel tank.

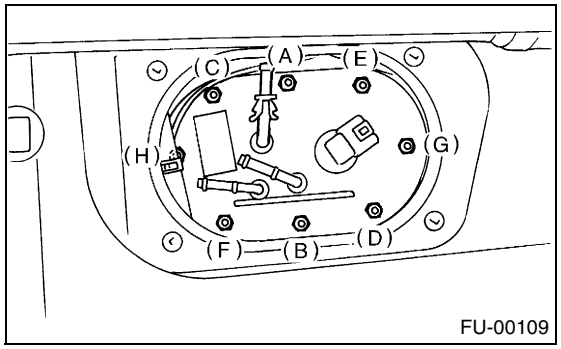
B: INSTALLATION

Install in the reverse order of removal. Do the following:

NOTE:
Replace the gaskets with new ones.

(1) Ensure sealing portion is free from fuel or foreign particles before installation.
(2) Tighten the nuts in alphabetical sequence shown in the figure to specified torque.

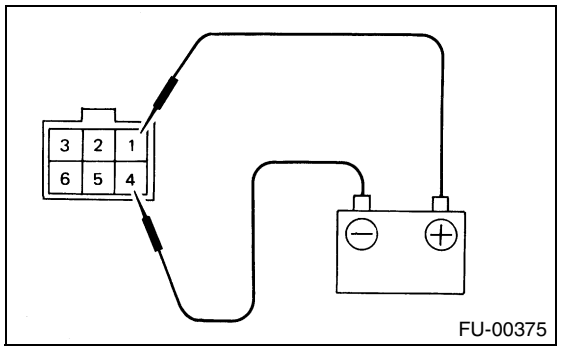
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



C: INSPECTION

Connect the lead harness to connector terminal of fuel pump and apply battery power supply to check whether the pump operates.

WARNING:
• Wipe off the fuel completely.
• Keep the battery as far apart from fuel pump as possible.
• Be sure to turn the battery supply ON and OFF on battery side.
• Do not run the fuel pump for a long time under non-load condition.



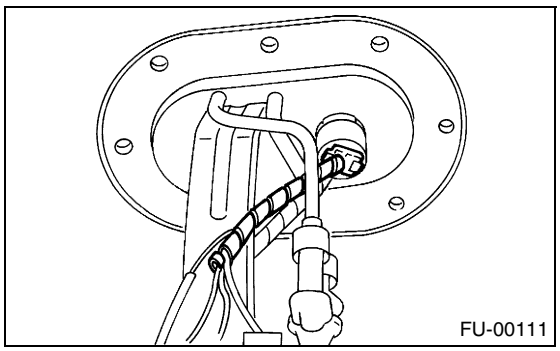
27.Fuel Level Sensor

A: REMOVAL

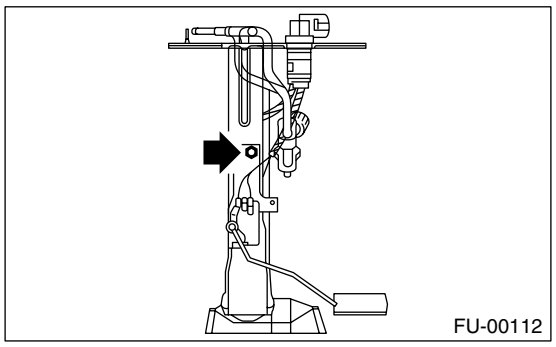
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

NOTE:
Fuel level sensor is built in fuel pump assembly.

1) Remove the fuel pump assembly. <Ref. to FU(TURBO)-59, REMOVAL, Fuel Pump.>
2) Disconnect the connector from fuel pump bracket.



3) Remove the bolt which installs fuel level sensor on mounting bracket.



B: INSTALLATION

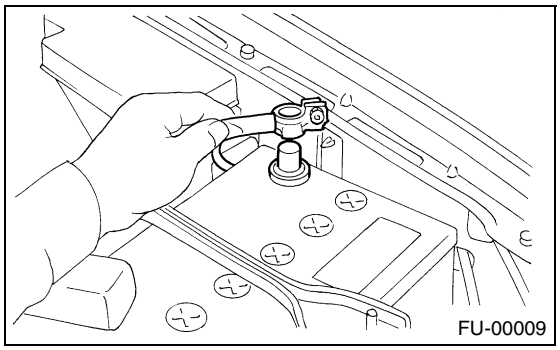
Install in the reverse order of removal.

28.Fuel Sub Level Sensor

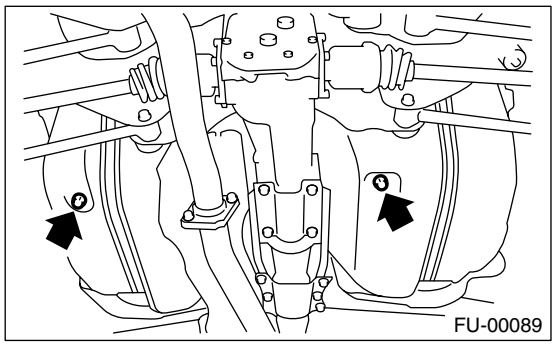
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

1) Disconnect the ground cable from battery.

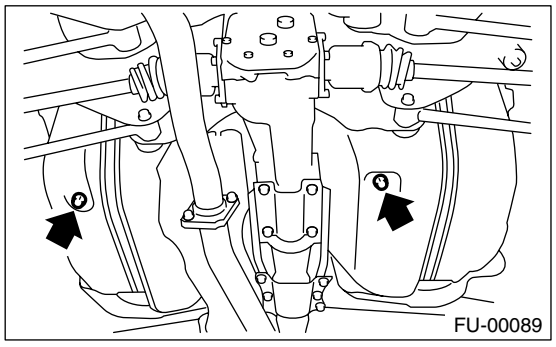


2) Lift-up the vehicle.
3) Drain fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.

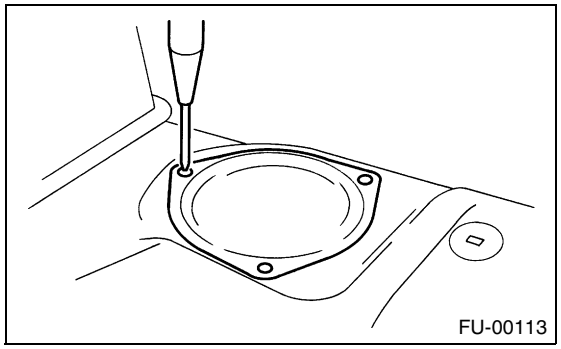


4) Tighten the fuel drain plug.

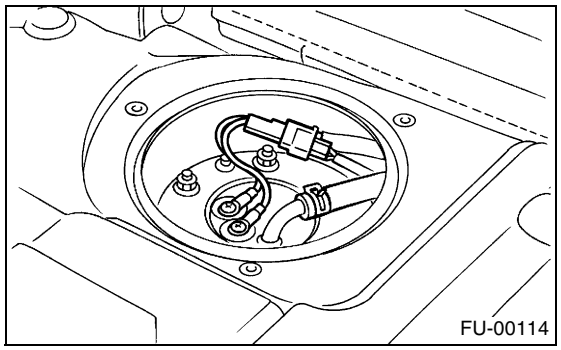
Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)



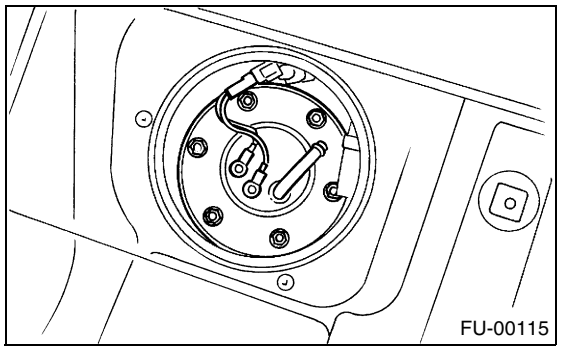
5) Remove the rear seat.
6) Remove the service hole cover.



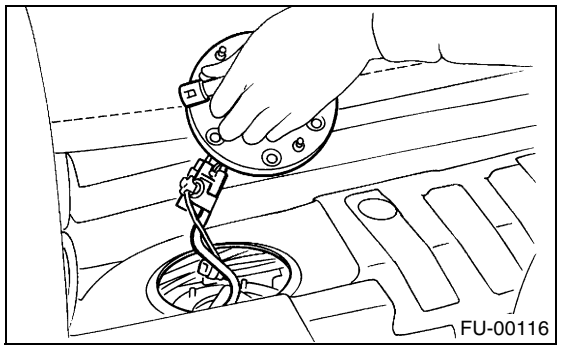
7) Disconnect the connector from fuel sub level sensor.
8) Disconnect the fuel jet pump hose.



9) Remove the bolts which install fuel sub level sensor on fuel tank.



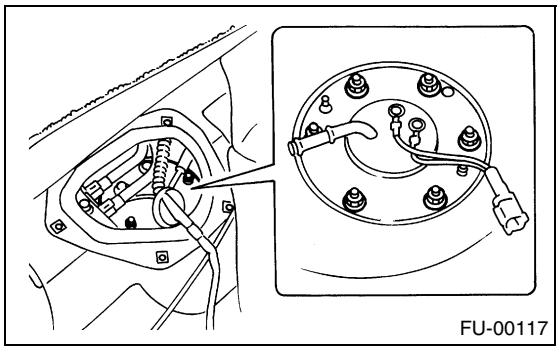
10) Remove the fuel sub level sensor.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

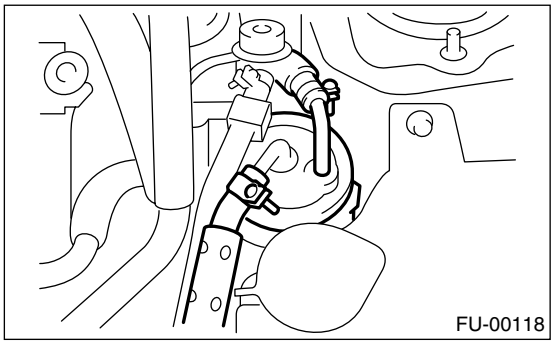


29.Fuel Filter

A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

1) Release the fuel pressure. <Ref. to FU(TURBO)-52, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Disconnect the fuel delivery hoses from fuel filter.



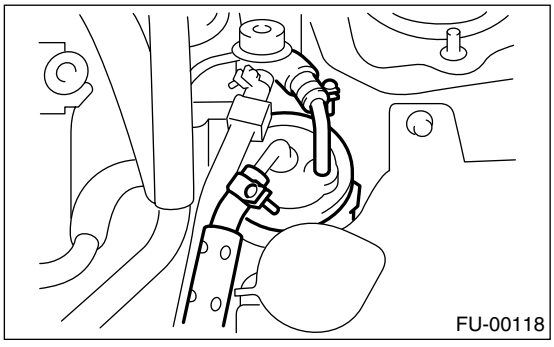
3) Remove the filter from holder.

B: INSTALLATION

CAUTION:
- **If fuel hoses are damaged at the connecting portion, replace it with a new one.**
- **If clamps are badly damaged, replace with new ones.**

1) Install in the reverse order of removal.
2) Tighten the hose clamp screws.

Tightening torque:
1.25 N·m (0.13 kgf-m, 0.94 ft-lb)



C: INSPECTION

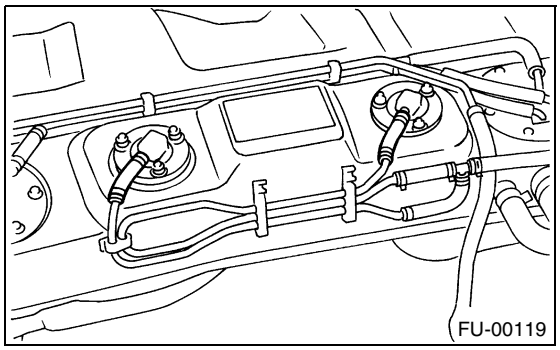
1) Check the inside of fuel filter for dirt and water sediment.
2) If it is clogged, or if replacement interval has been reached, replace it.
3) If water is found in it, shake and expel the water from inlet port.

30.Fuel Cut Valve

A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

1) Remove the fuel tank. <Ref. to FU(TURBO)-53, REMOVAL, Fuel Tank.>
2) Move the clip and disconnect the evaporation hose from fuel cut valve.

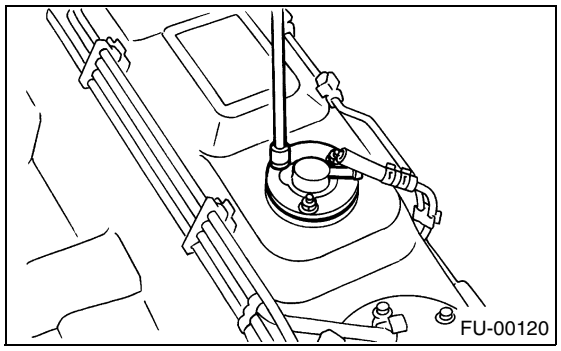


3) Remove the bolts which install fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

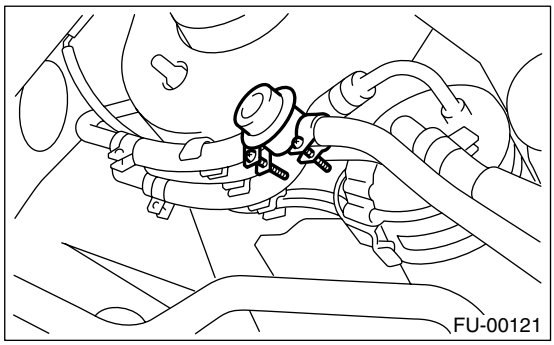
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



31.Fuel Damper Valve

A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(TURBO)-52, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Remove the fuel damper valve from fuel return line.



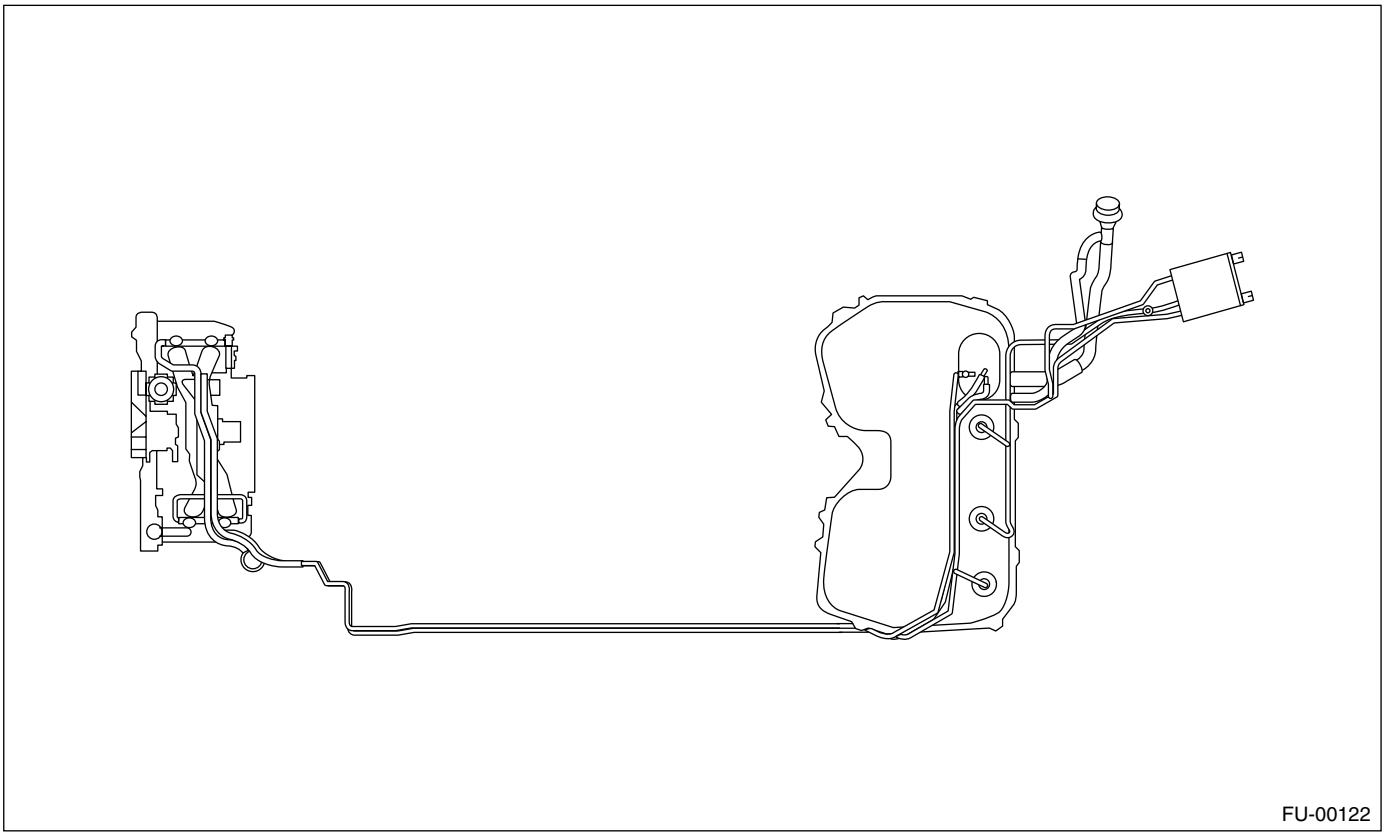
B: INSTALLATION

Install in the reverse order of removal.

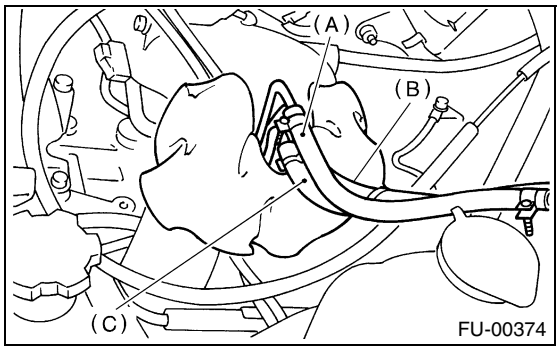
32. Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(TURBO)-52, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
3) Open the fuel filler flap lid and remove fuel filler cap.
4) Remove the floor mat. <Ref. to EI-49, REMOVAL, Floor Mat.>
5) Remove the fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.

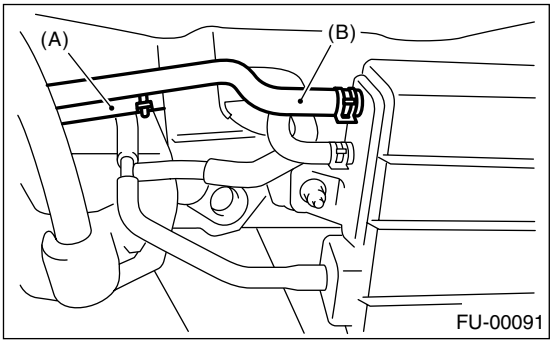


6) In the engine compartment, detach the fuel delivery hoses (A), return hoses (B) and evaporation hoses (C).

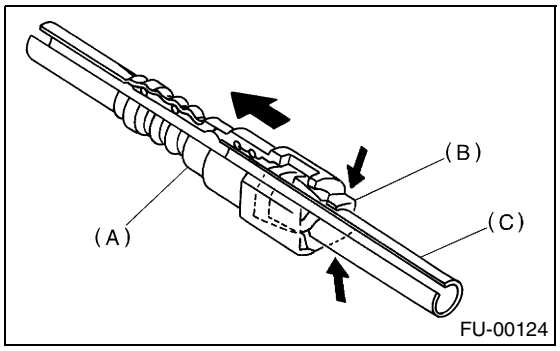


7) Lift-up the vehicle.

8) Disconnect the two-way valve hose (A) from two-way valve and disconnect the canister hose (B) from canister.



9) Separate the quick connector on fuel delivery line.
(1) Clean the pipe and connector, if they are covered with dust.
(2) Hold the connector (A) and push retainer (B) down.
(3) Pull out the connector (A) from retainer (B).

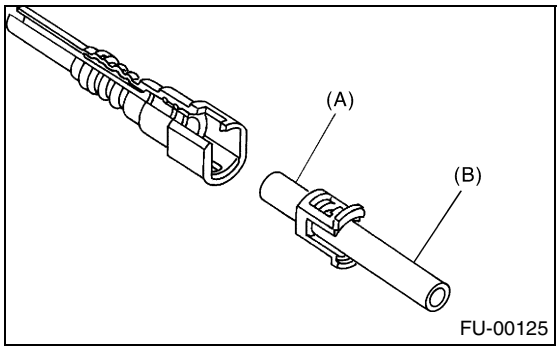


(A) Connector
(B) Retainer
(C) Pipe

B: INSTALLATION

1) Connect the quick connector on fuel delivery line.

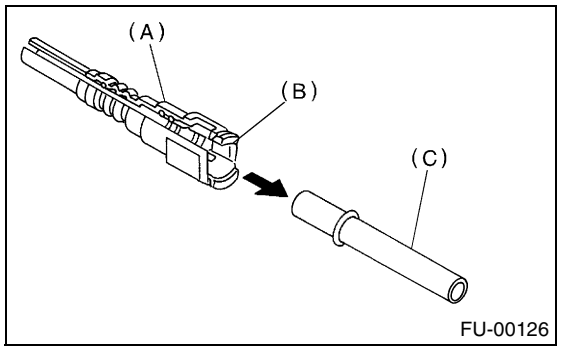
NOTE:
- Replace the retainer with a new one.
- Make sure that the connected portion is not damaged or has dust. If necessary, clean the seal surface of pipe.



(A) Seal surface
(B) Pipe

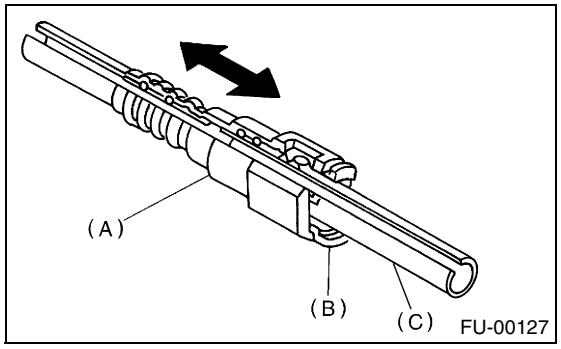
(1) Set the new retainer (B) to connector (A).
(2) Push the pipe into connector completely.

NOTE:
At this time, two clicking sounds are heard.



(A) Connector
(B) Retainer
(C) Pipe

CAUTION:
• Pull the connector to ensure it is connected securely.
• Ensure the two retainer pawls are engaged in their mating positions in the connector.
• Be sure to inspect the hoses and their connections for any leakage of fuel.

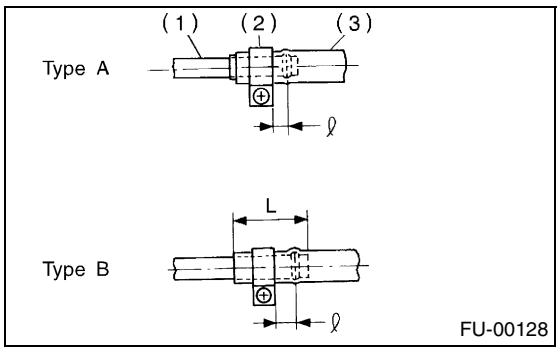


(A) Connector
(B) Retainer
(C) Pipe

2) Connect the fuel delivery hose to pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).
Type A: When the fitting length is specified.
Type B: When the fitting length is not specified.

ℓ : 2.5±1.5 mm (0.098±0.059 in)

L: 22.5±2.5 mm (0.886±0.098 in)

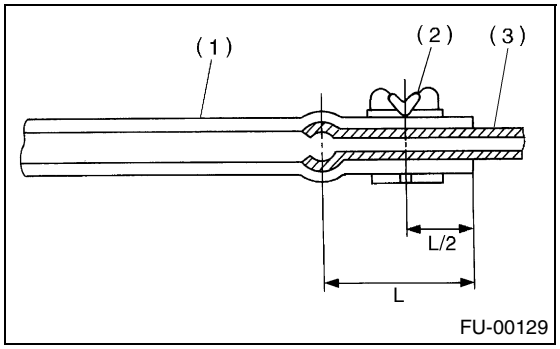


(1) Fitting
(2) Clamp
(3) Hose

3) Connect the evaporation hose to pipe by approx. 15 mm (0.59 in) from the hose end.

L = 17.5±2.5 mm (0.689±0.098 in)

CAUTION:
Be sure to inspect the hoses and their connections for any leakage of fuel.



(1) Hose
(2) Clip
(3) Pipe

C: INSPECTION

1) Make sure that there are no cracks on the fuel pipes and fuel hoses.
2) Make sure that the fuel pipe and fuel hose connections are tight.

33.Fuel System Trouble in General

A: INSPECTION

Trouble and possible cause			Corrective action
1. Insufficient fuel supply to the injector			
1)	Fuel pump will not operate.		
	❍	Defective terminal contact.	Inspect connections, especially ground, and tighten securely.
	❍	Trouble in electromagnetic or electronic circuit parts.	Replace the fuel pump.
2)		Lowering of fuel pump function.	Replace the fuel pump.
3)		Clogged dust or water in the fuel filter.	Replace the fuel filter, clean or replace fuel tank.
4)		Clogged or bent fuel pipe or hose.	Clean, correct or replace the fuel pipe or hose.
5)		Air is mixed in the fuel system.	Inspect or retighten each connection part.
6)		Clogged or bent breather tube or pipe.	Clean, correct or replace the air breather tube or pipe.
7)		Damaged diaphragm of pressure regulator.	Replace.
2. Leakage or blow out fuel			
1)		Loosened joints of the fuel pipe.	Retightening.
2)		Cracked fuel pipe, hose and fuel tank.	Replace.
3)		Defective welding part on the fuel tank.	Replace.
4)		Defective drain packing of the fuel tank.	Replace.
5)		Clogged or bent air breather tube or air vent tube.	Clean, correct or replace the air breather tube or air vent tube.
3. Gasoline smell inside of compartment			
1)		Loose joints at air breather tube, air vent tube and fuel filler pipe.	Retightening.
2)		Defective packing air tightness on the fuel saucer.	Correct or replace the packing.
3)		Cracked fuel separator.	Replace the separator.
4)		Inoperative fuel pump modulator or circuit.	Replace.
4. Defective fuel meter indicator			
1)		Defective operation of fuel level sensor.	Replace.
2)		Defective operation of fuel meter.	Replace.
5. Noise			
1)		Large operation noise or vibration of fuel pump.	Replace.

NOTE:

• When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank.

To prevent water condensation.

(1) Top off the fuel tank or drain the fuel completely.

(2) Drain the water condensation from the fuel filter.

• Refilling the fuel tank.

Refill the fuel tank while there is still some fuel left in the tank.

• Protecting the fuel system against freezing and water condensation.

(3) Cold areas:

In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use an anti-freeze solution in the cooling system. Refueling will also complement the effect of anti-freeze solution each time the fuel level drops to about one-half. After the winter season, drain the water which may have accumulated in the fuel filter and fuel tank in the manner same as that described under “Affected areas” below.

(4) Affected areas:

When the water condensation is notched in the fuel filter, drain the water from both the fuel filter and fuel tank or use a water removing agent (or anti-freeze solution) in the fuel tank.

• Observe the instructions, notes, etc., indicated on the label affixed to the anti-freeze solution (water removing agent) container before use.

EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES)
EC(TURBO)

Page

1. General Description 2
2. Front Catalytic Converter 3
3. Rear Catalytic Converter 4
4. Precatalytic Converter 5
5. Canister 6
6. Purge Control Solenoid Valve 7
7. Two-way Valve 8

1. General Description

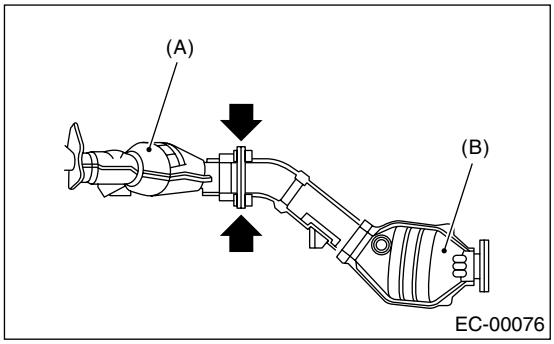
A: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

2. Front Catalytic Converter

A: REMOVAL

1) Remove the front catalytic converter and center exhaust pipe as a unit. <Ref. to EX(TURBO)-7, REMOVAL, Center Exhaust Pipe.>
2) Separate the front catalytic converter (A) from rear catalytic converter (B).



B: INSTALLATION

NOTE:
Replace the gaskets with new ones.
Install in the reverse order of removal.

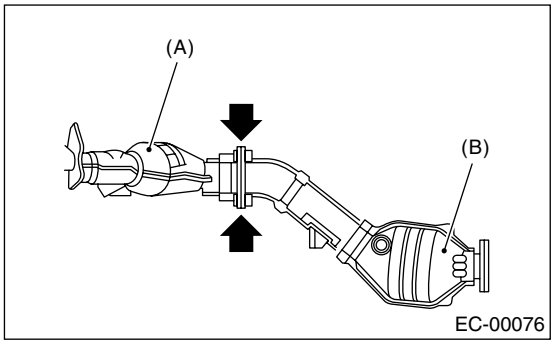
C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

3. Rear Catalytic Converter

A: REMOVAL

1) Remove the rear catalytic converter and center exhaust pipe as a unit. <Ref. to EX(TURBO)-7, REMOVAL, Center Exhaust Pipe.>
2) Separate the rear catalytic converter (B) from front catalytic converter (A).



B: INSTALLATION

NOTE:
Replace the gaskets with new ones.
Install in the reverse order of removal.

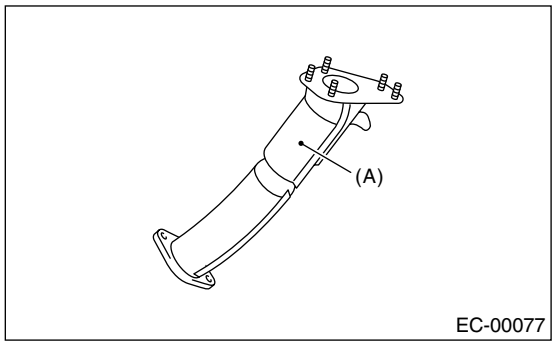
C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

4. Precatalytic Converter

A: REMOVAL

Precatalytic converter (A) is built in the joint pipe. Refer to the removal of joint pipe for removal procedure. <Ref. to EX(TURBO)-11, REMOVAL, Joint Pipe.>



B: INSTALLATION

Precatalytic converter is built in the joint pipe. Refer to the installation of joint pipe for installation procedure. <Ref. to EX(TURBO)-11, INSTALLATION, Joint Pipe.>

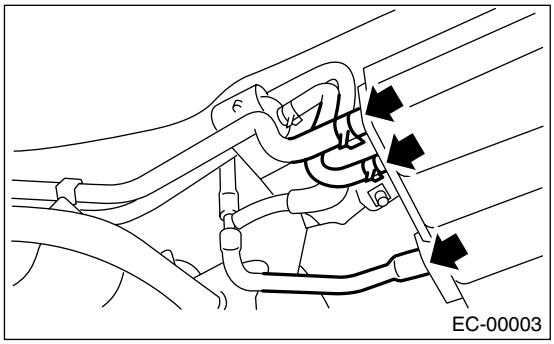
C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

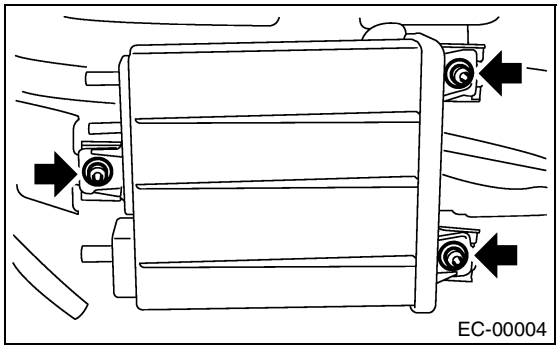
5. Canister

A: REMOVAL

1) Lift-up the vehicle.
2) Loosen the two clamps which hold two canister hoses, and disconnect the three evaporation hoses from canister.



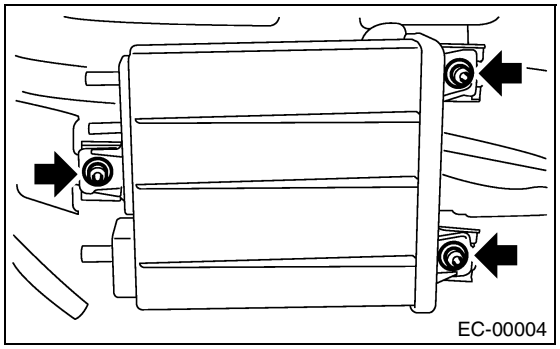
3) Remove the canister from body.



B: INSTALLATION

1) Install in the reverse order of removal.

Tightening torque:
23 N·m (2.3 kgf-m, 17 ft-lb)



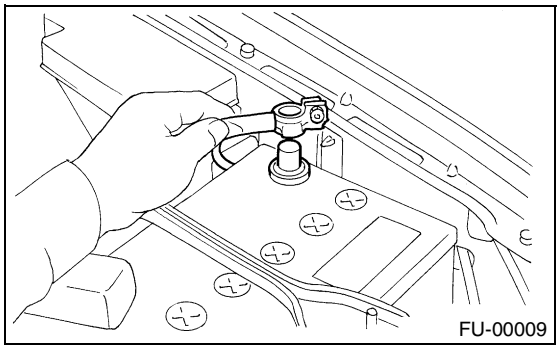
C: INSPECTION

Make sure the canister and canister hoses are not cracked or loose.

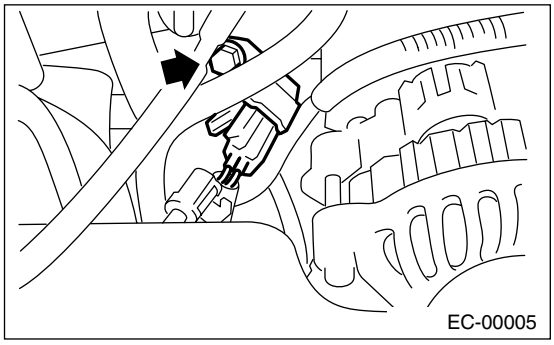
6. Purge Control Solenoid Valve

A: REMOVAL

1) Disconnect the ground cable from battery.



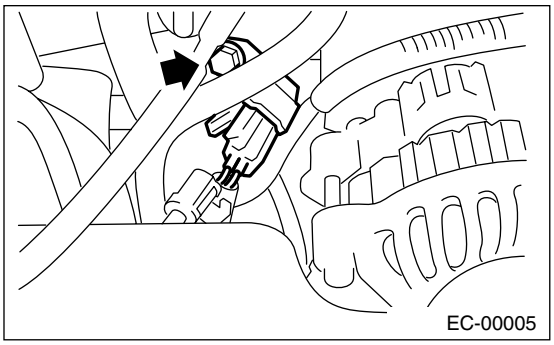
2) Disconnect the connector and hoses from purge control solenoid valve.
3) Remove the bolt which installs the purge control solenoid valve onto intake manifold.



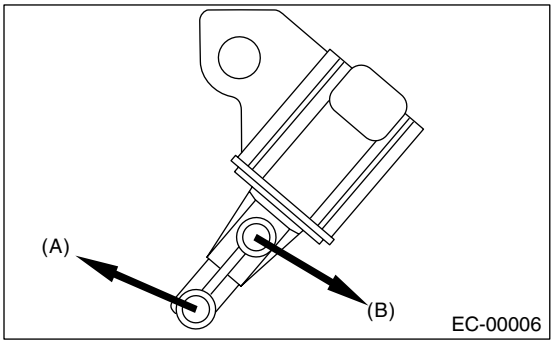
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



NOTE:
Connect the evaporation hoses as shown in the figure.



(A) To intake manifold
(B) To purge valve

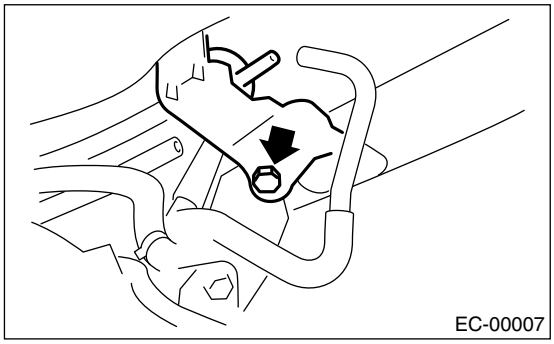
C: INSPECTION

Make sure the hoses are not cracked or loose.

7. Two-way Valve

A: REMOVAL

1) Lift-up the vehicle.
2) Remove the canister from body. <Ref. to EC(TURBO)-6, REMOVAL, Canister.>
3) Remove the two-way valve with bracket as a single unit from body.



4) Remove the two-way valve from bracket.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Make sure that the hoses are not cracked or loose.

INTAKE (INDUCTION)

IN(TURBO)

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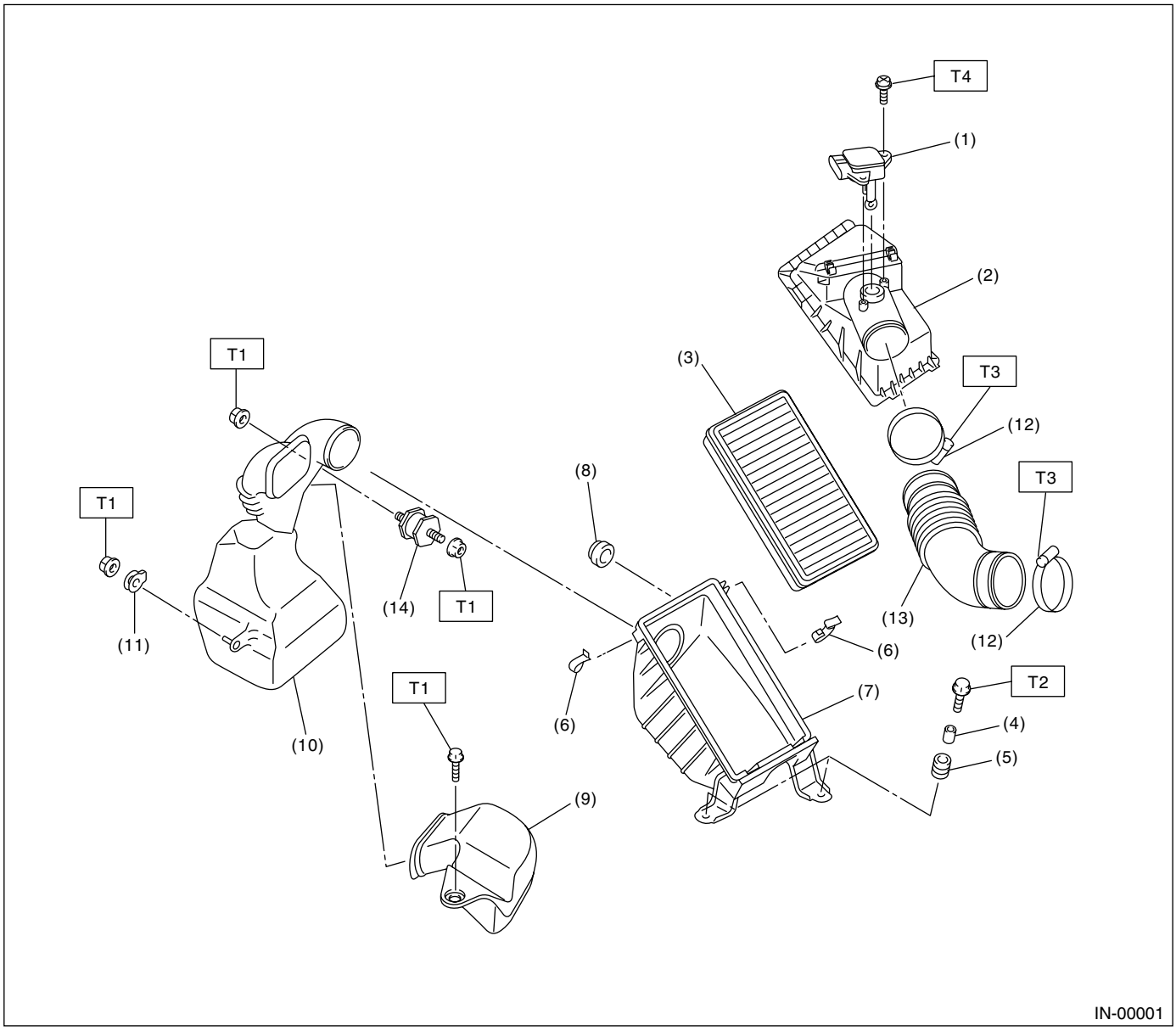
8.	Resonator Chamber	15

1. General Description

A: COMPONENT

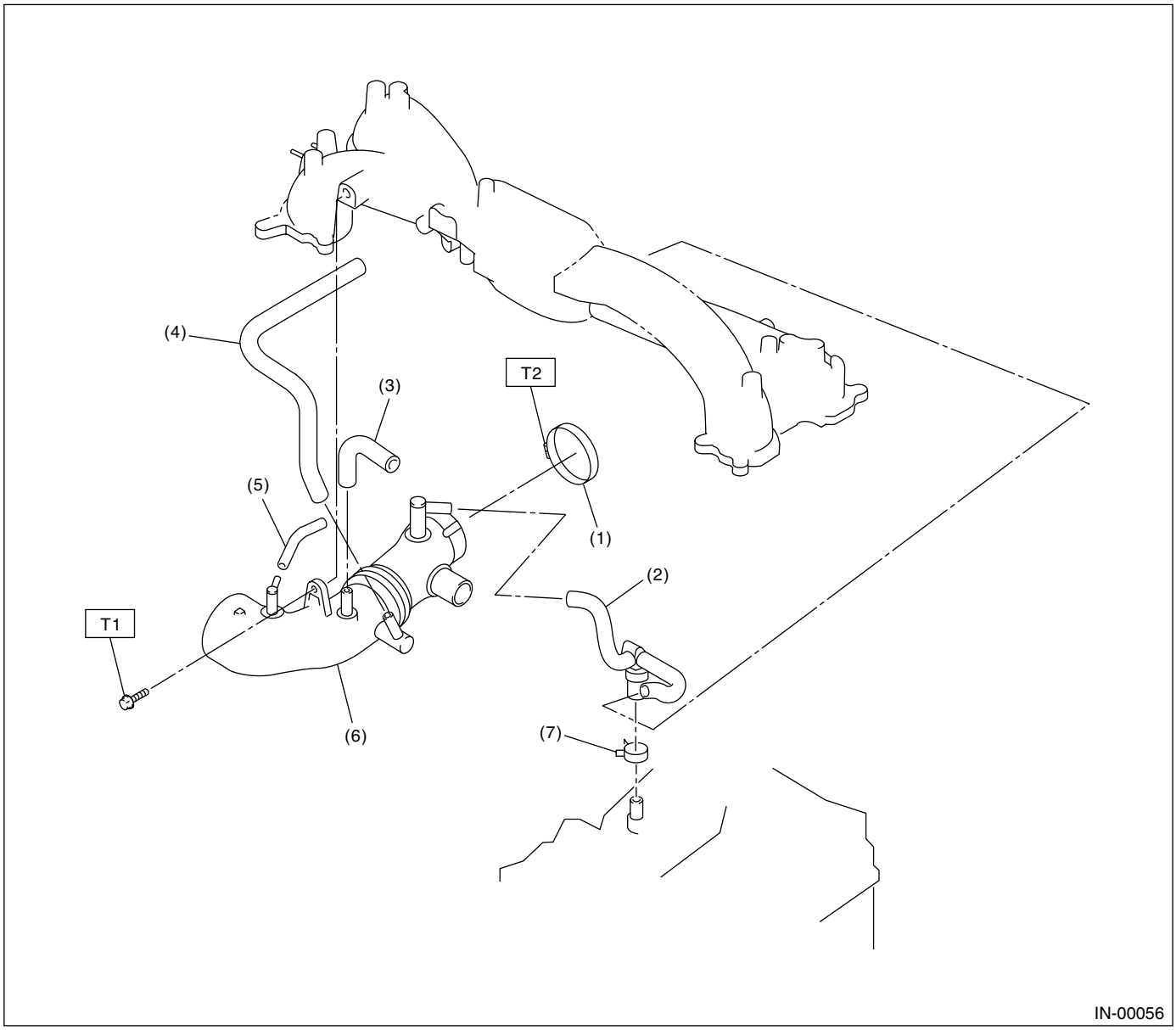
1. AIR CLEANER



(1)	Mass air flow and intake air temperature sensor	(8)	Cushion rubber
(2)	Air cleaner upper cover	(9)	Air intake duct
(3)	Air cleaner element	(10)	Resonator chamber ASSY
(4)	Spacer	(11)	Cushion rubber
(5)	Bushing	(12)	Clamp
(6)	Clip	(13)	Air intake boot
(7)	Air cleaner lower case	(14)	Cushion

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 33 (3.4, 24.6)
T3: 2.5 (0.25, 1.8)
T4: 1.7 (0.17, 1.2)

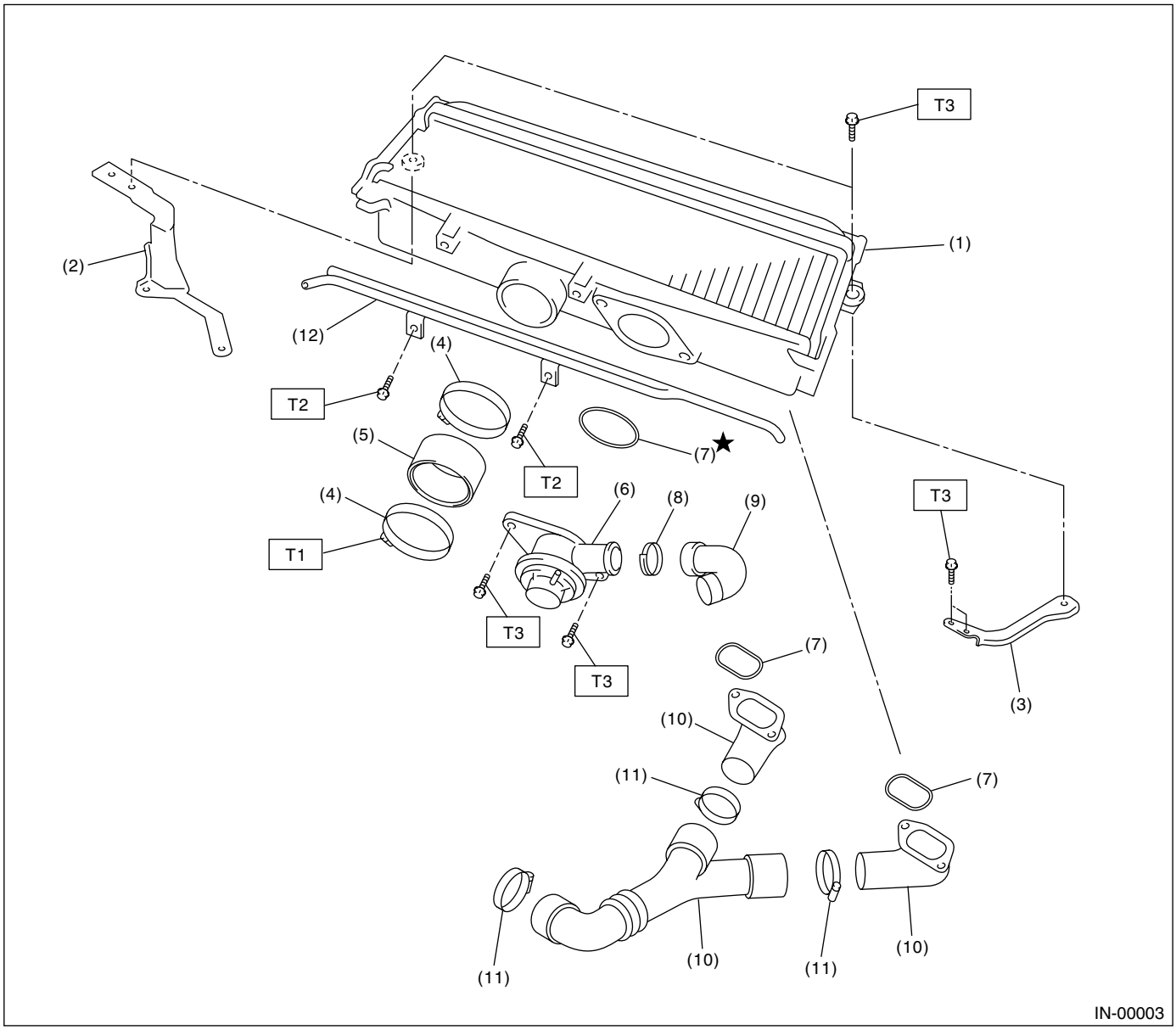
2. INTAKE DUCT



(1) Clamp
(2) PCV hose ASSY
(3) Air by-pass hose A
(4) Air by-pass hose B
(5) Air by-pass hose C
(6) Intake duct
(7) Clamp

Tightening torque: N·m (kgf-m, ft-lb)
T1: 19 (1.9, 13.7)
T2: 3 (0.3, 2.2)

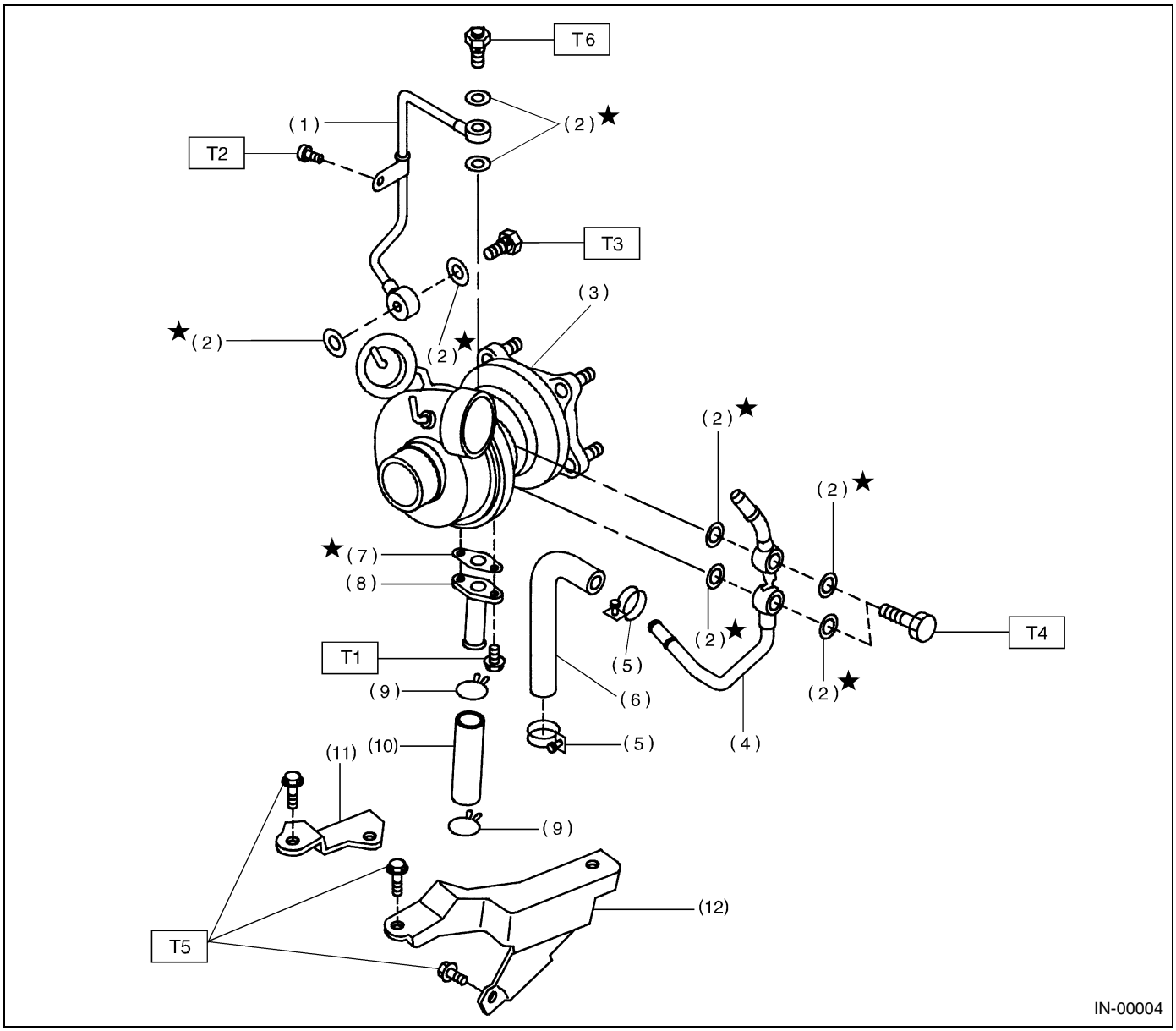
3. INTERCOOLER



(1)	Intercooler	(7)	O-ring
(2)	Intercooler bracket RH	(8)	Clamp
(3)	Intercooler bracket LH	(9)	Air by-pass hose A
(4)	Clamp	(10)	Intercooler duct
(5)	Air intake duct	(11)	Clamp
(6)	Air by-pass valve	(12)	PCV pipe

Tightening torque: N·m (kgf-m, ft-lb)
T1: 3 (0.3, 2.2)
T2: 6.1 (0.62, 4.5)
T3: 16 (1.6, 11.6)

4. TURBOCHARGER



(1) Oil inlet pipe
(2) Metal gasket
(3) Turbocharger
(4) Water pipe
(5) Clamp
(6) Engine coolant hose
(7) Gasket
(8) Oil outlet pipe
(9) Clip
(10) Oil outlet hose
(11) Turbocharger bracket RH
(12) Turbocharger bracket LH

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 4.9 (0.50, 3.6)
T3: 29 (3.0, 21.7)
T4: 30 (3.1, 22.4)
T5: 33 (3.4, 24.6)
T6: 16 (1.6, 11.6)

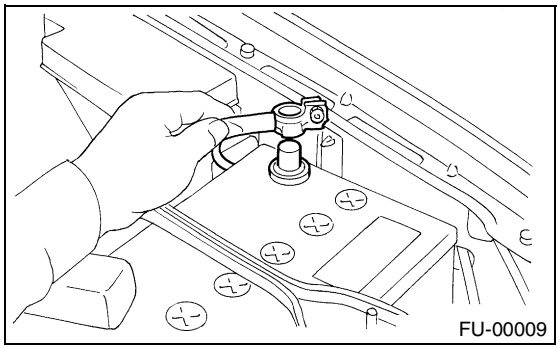
B: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensor or units, be sure to disconnect the ground cable from battery.

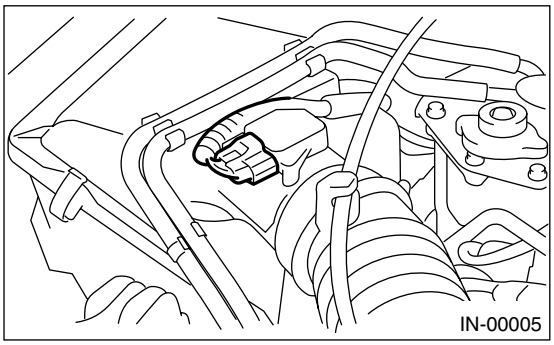
2. Air Cleaner

A: REMOVAL

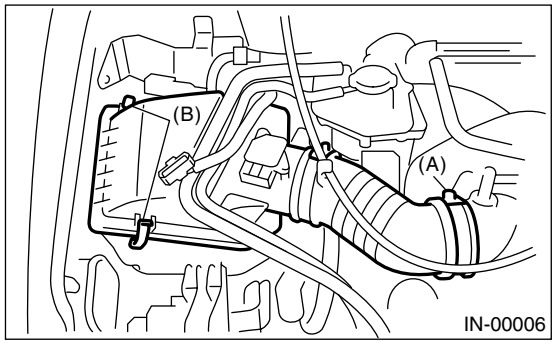
1) Disconnect the ground cable from battery.



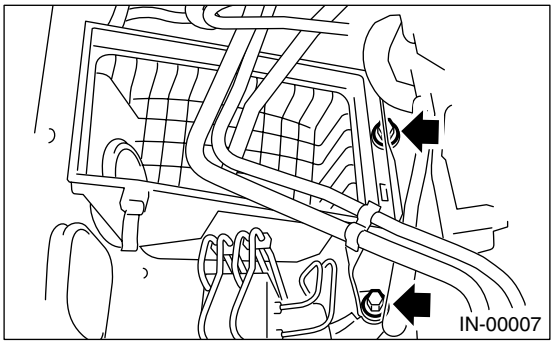
2) Disconnect the connector from mass air flow sensor.



3) Loosen the clamp (A) which connects air intake boot and intake duct.
4) Remove the clip (B) from air cleaner upper cover.



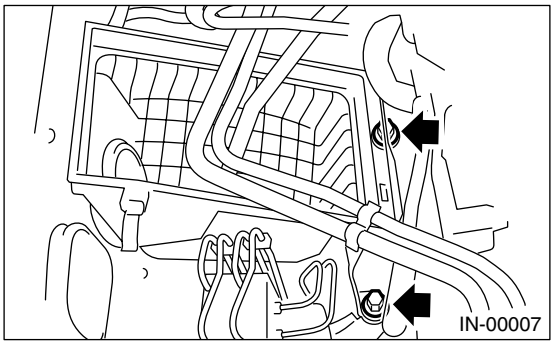
5) Remove the air cleaner upper cover.
6) Remove the air cleaner element.
7) Remove the air cleaner lower case.



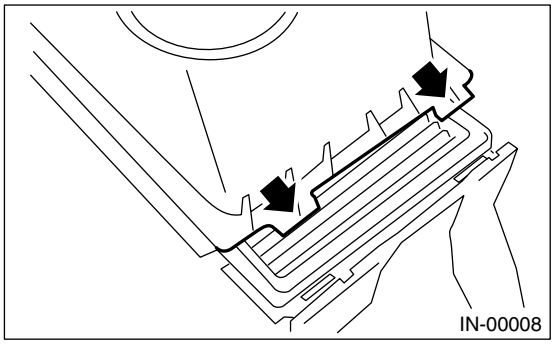
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)



NOTE:
Before installing the air cleaner upper cover, align the holes with protruding portions of air cleaner lower case, then secure the upper cover to lower case.



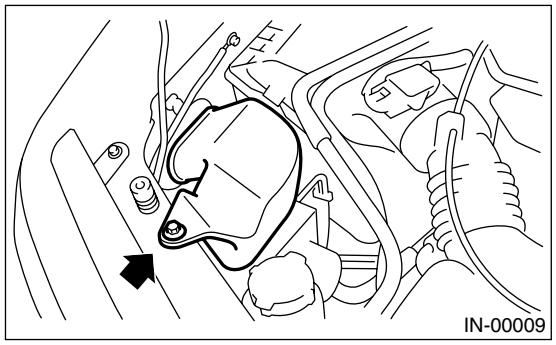
C: INSPECTION

Replace if excessively damaged or dirty.

3. Air Intake Duct

A: REMOVAL

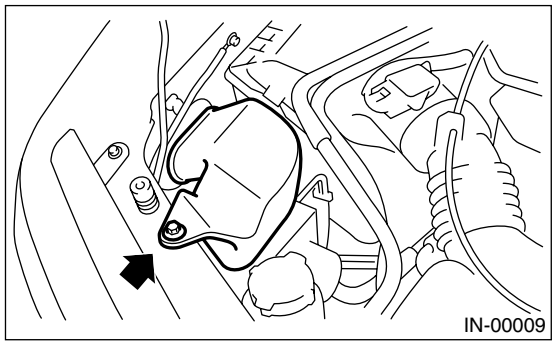
1) Remove the bolts which install air intake duct on the front side of body.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 55 ft-lb)



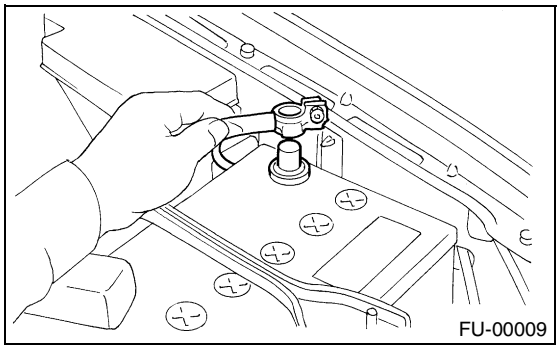
C: INSPECTION

1) Inspect for cracks and loose connections.
2) Inspect that no foreign objects are mixed in the air intake duct.

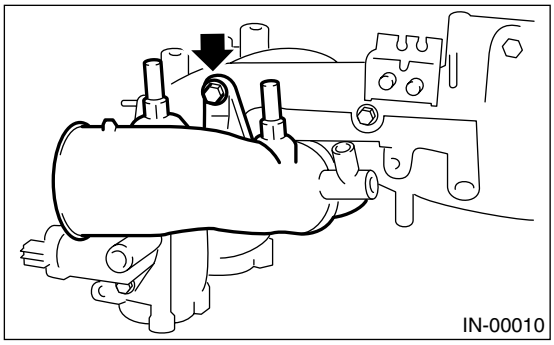
4. Intake Duct

A: REMOVAL

1) Disconnect the ground cable from battery.



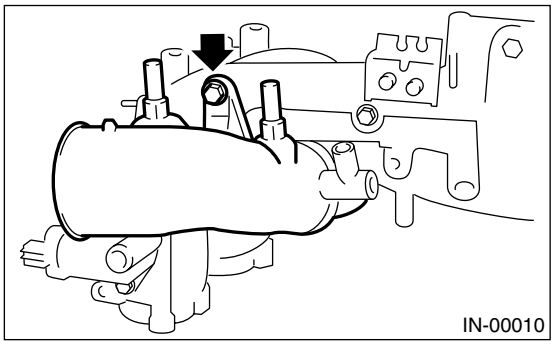
2) Remove the intake manifold. <Ref. to FU(TURBO)-14, REMOVAL, Intake Manifold.>
3) Remove the sensor, engine harness, and fuel pipe attached to intake manifold. <Ref. to FU(TURBO)-20, DISASSEMBLY, Intake Manifold.>
4) Remove the intake duct from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

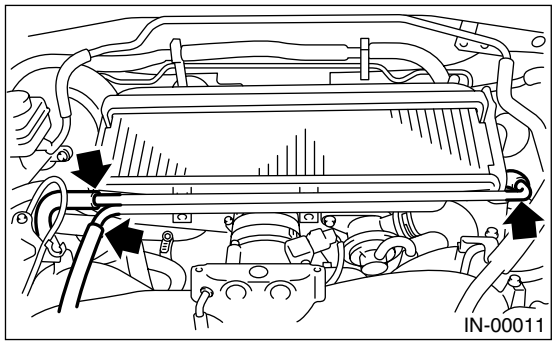
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



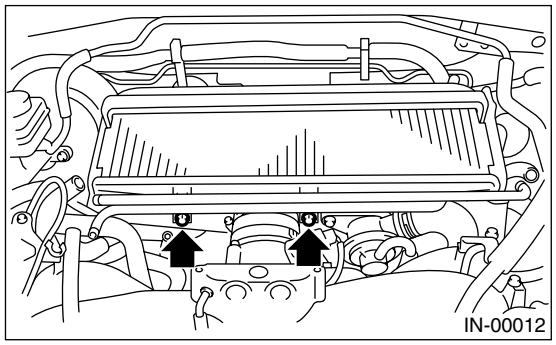
5. Intercooler

A: REMOVAL

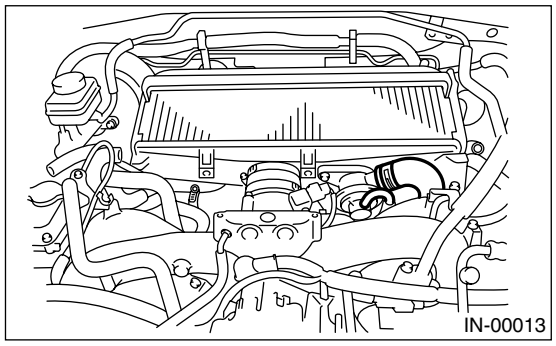
1) Disconnect the PCV hose from PCV pipe.



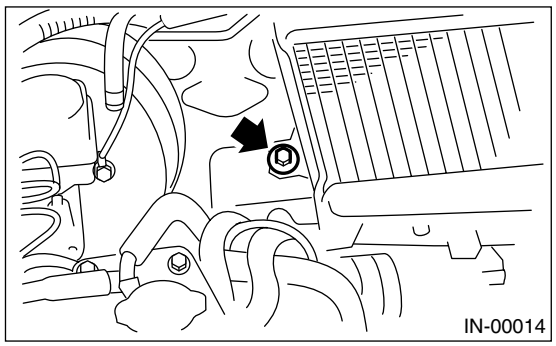
2) Remove the PCV pipe from intercooler.

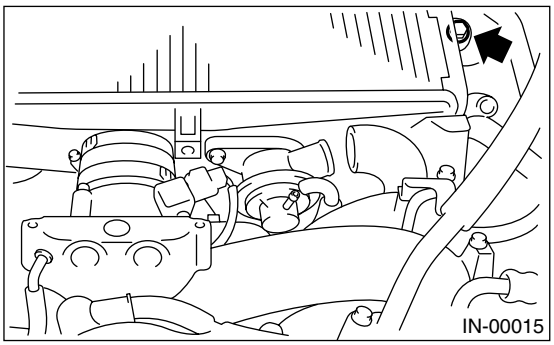


3) Disconnect the hose from air by-pass valve.

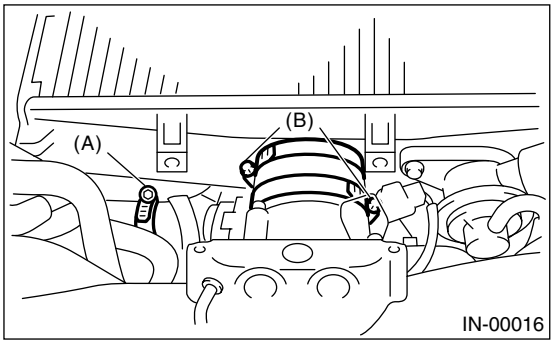


4) Remove the bolts which secure intercooler to bracket.





5) Loosen the clamp (A) which connects turbocharger and intercooler duct.
6) Loosen the clamp (B) which connects throttle body and intercooler.

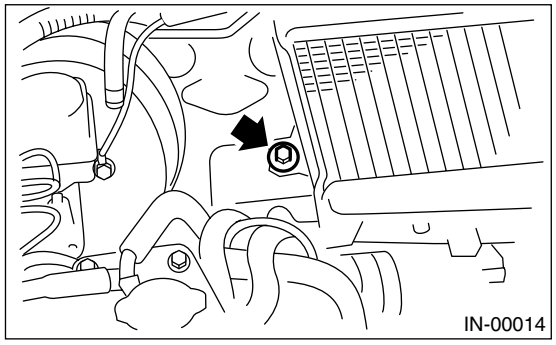


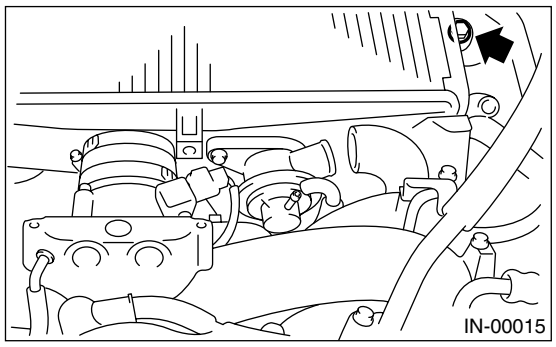
7) Disconnect the intercooler duct from turbocharger.
8) Remove the intercooler from throttle body.

B: INSTALLATION

Install in the reverse order of removal.

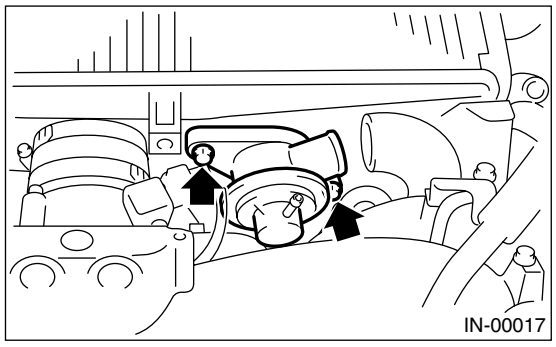
Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)


IN-00014

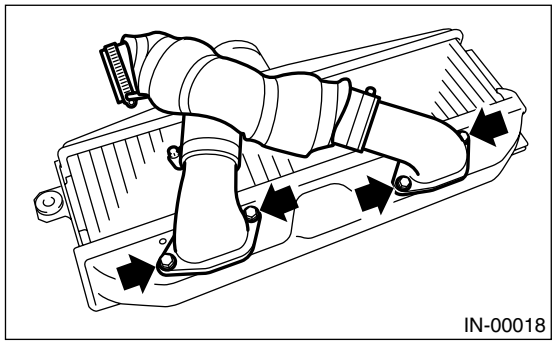

IN-00015

C: DISASSEMBLY

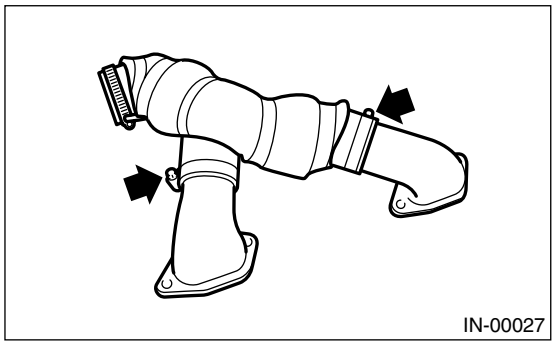
1) Remove the air by-pass valve from intercooler.


IN-00017

2) Remove the intercooler ducts from intercooler.


IN-00018

3) Separate the ducts.

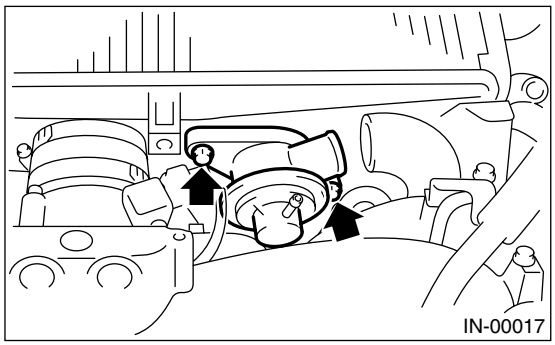

IN-00027

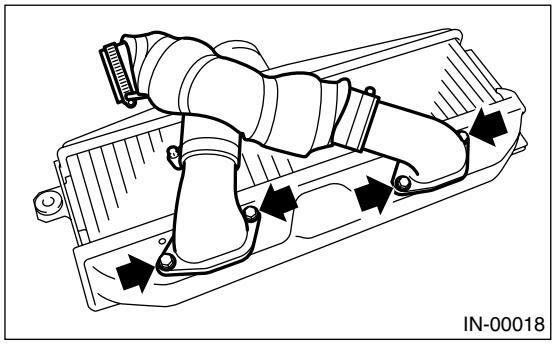
D: ASSEMBLY

Assemble in the reverse order of disassembly.

NOTE:
Install the O-ring in proper position.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)

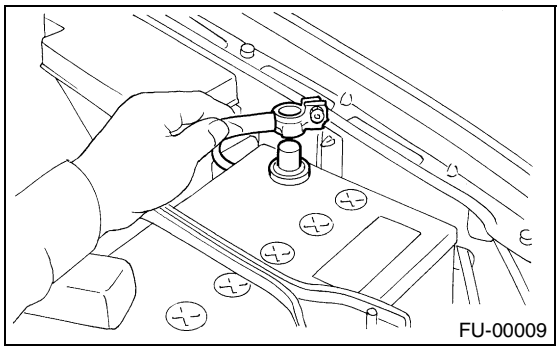

IN-00017


IN-00018

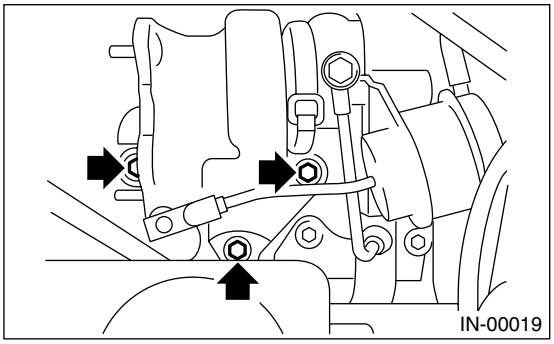
6. Turbocharger

A: REMOVAL

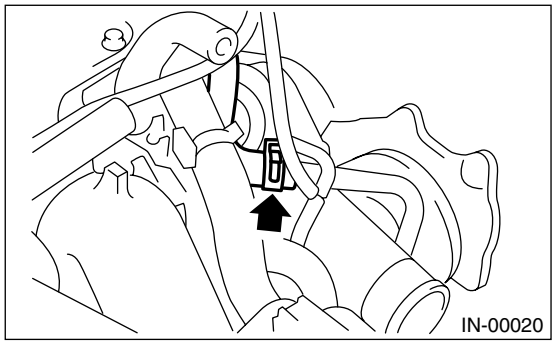
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



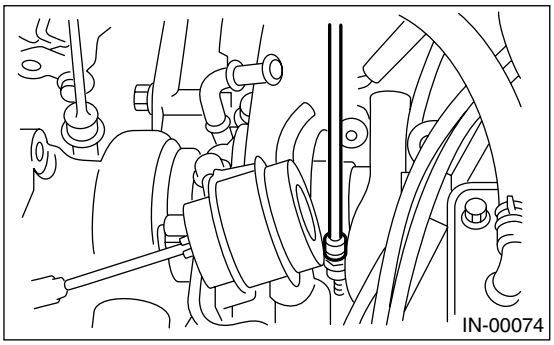
3) Remove the center exhaust pipe. <Ref. to EX(TURBO)-7, REMOVAL, Center Exhaust Pipe.>
4) Lower the vehicle.
5) Separate the turbocharger joint pipe from turbocharger.



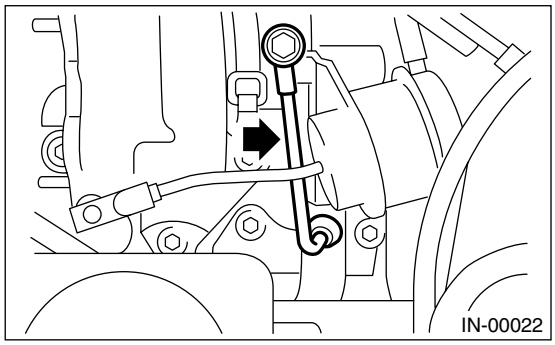
6) Disconnect the engine coolant hose which is connected to coolant filler tank.



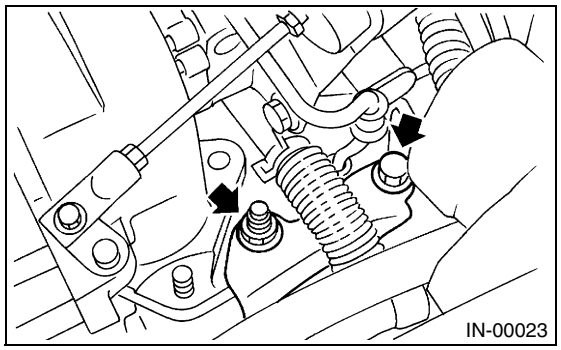
7) Loosen the clamp which secures turbocharger to intake duct.



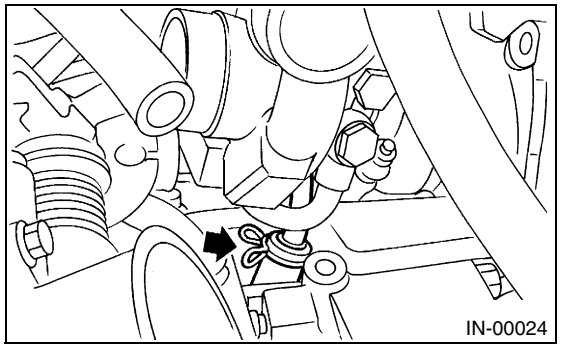
8) Remove the bolt which secures bracket of oil pipe to turbocharger.
9) Remove the oil pipe from turbocharger.



10) Remove the turbocharger bracket.



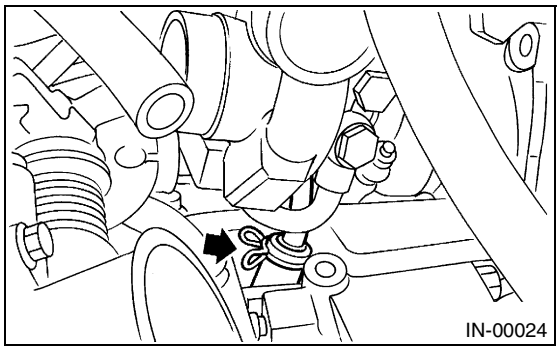
11) Disconnect the oil outlet hose from pipe.



12) Take out the turbocharger from engine compartment.

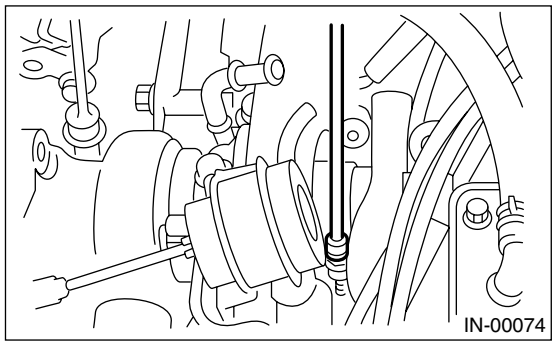
B: INSTALLATION

1) Connect the oil outlet hose to outlet pipe.



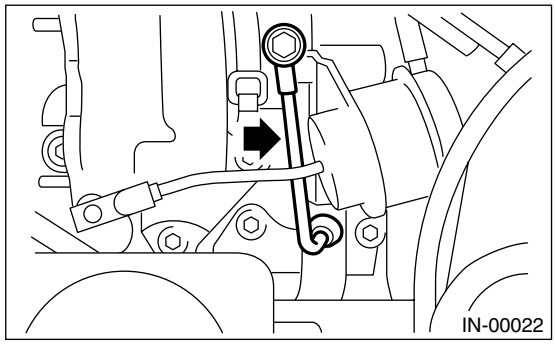
2) Install the turbocharger to intake duct.

Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)



3) Install the oil pipe to turbocharger.

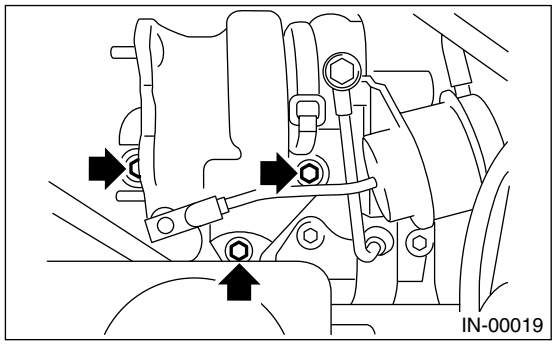
Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



4) Install the joint pipe to turbocharger.

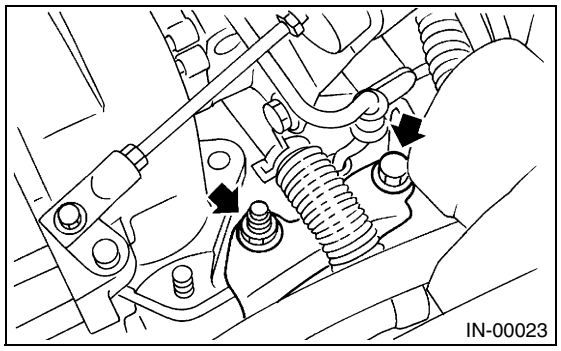
NOTE:
Replace the gasket with a new one.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)

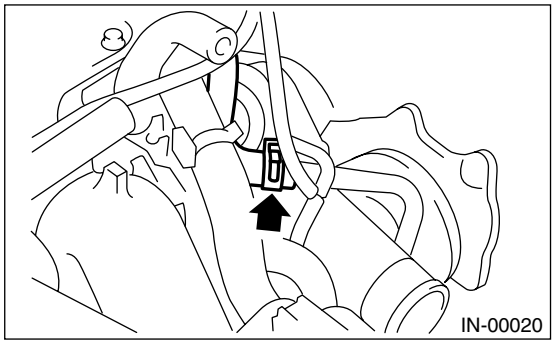


5) Install the turbocharger bracket.

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)



6) Connect the engine coolant hose which is connected to coolant filler tank.

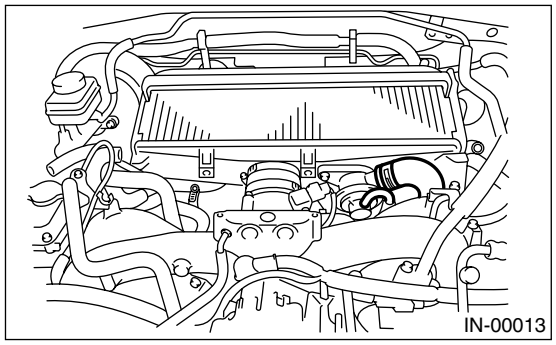


7) Lift-up the vehicle.
8) Install the center exhaust pipe. <Ref. to EX(TURBO)-8, INSTALLATION, Center Exhaust Pipe.>

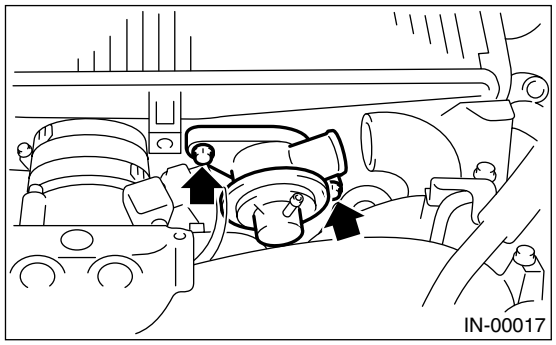
7. Air By-pass Valve

A: REMOVAL

1) Disconnect the air by-pass hoses from air by-pass valve.



2) Remove the air by-pass valve from intercooler.

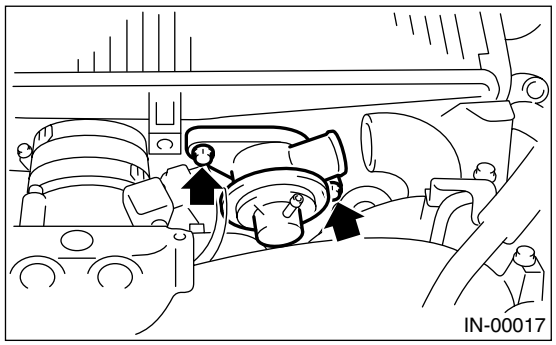


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Install the O-ring in proper position.

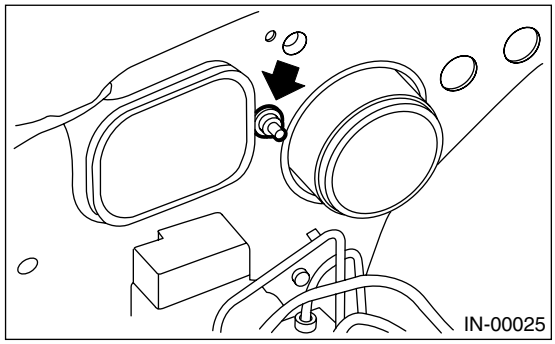
Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



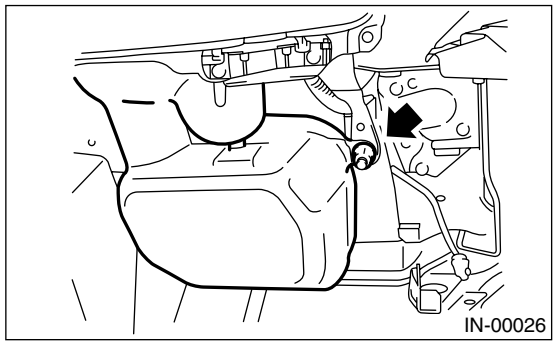
8. Resonator Chamber

A: REMOVAL

1) Set the vehicle on a lift.
2) Remove the air intake duct. <Ref. to IN(TURBO)-8, REMOVAL, Air Intake Duct.>
3) Remove the air cleaner lower case. <Ref. to IN(TURBO)-7, REMOVAL, Air Cleaner.>
4) Remove the resonator chamber mounting bolt on the right of engine compartment.



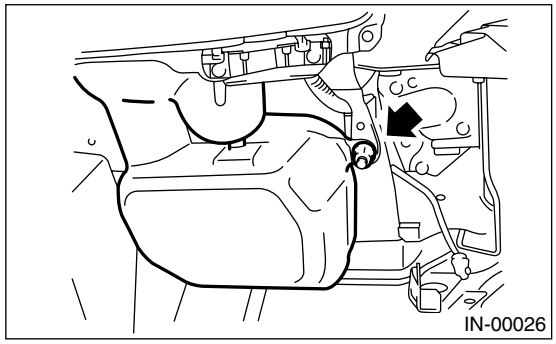
5) Remove the front right tire, and lift the vehicle.
6) Remove the front mudguard RH.
7) Remove the resonator chamber from the inside front fender.

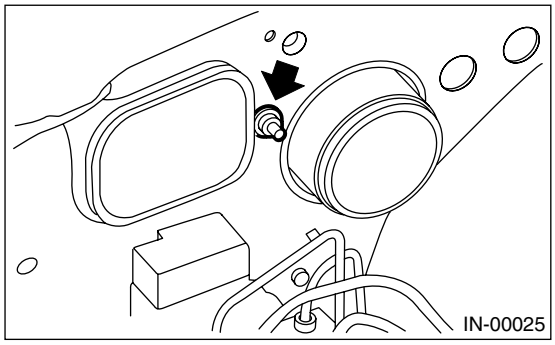


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)





C: INSPECTION

Inspect for cracks and loose connections. Check that no foreign objects are mixed in the resonator chamber.

MECHANICAL

ME(TURBO)

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1. General Description

A: SPECIFICATIONS

Engine	Type			Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine	
	Valve arrangement			Belt driven, double overhead camshaft, 4-valve/cylinder	
	Bore x Stroke		mm (in)	92 x 75 (3.62 x 2.95)	
	Piston displacement		cm^3 (cu in)	1,994 (121.67)	
	Compression ratio			8.0	
	Compression pressure (at 200 — 300 rpm)		kPa (kgf/cm^2, psi)	981 — 1,177 (10 — 12, 142 — 171)	
	Number of piston rings			Pressure ring: 2, Oil ring: 1	
	Intake valve timing	Opening		3°BTDC	
		Closing		33°ABDC	
	Exhaust valve timing	Opening		33° BBDC	
		Closing		3° ATDC	
	Valve clearance	Intake	mm (in)	0.20±0.02 (0.0079±0.0008)	
		Exhaust	mm (in)	0.25±0.02 (0.0098±0.0008)	
	Idling speed [At neutral position]		rpm	MT	750±100 (No load) 800±150 (A/C switch ON)
				AT	750±100 (No load) 825±150 (A/C switch ON)
	Firing order			1 → 3 → 2 → 4	
	Ignition timing		BTDC/rpm	12°±3°/750 rpm	

NOTE:
STD: Standard I.D.: Inner Diameter O.D.: Outer Diameter OS: Oversize US: Undersize

Belt tension adjuster	Protrusion of adjuster rod			5.2 — 6.2 mm (0.205 — 0.244 in)
Belt tensioner	Spacer O.D.			17.955 — 17.975 mm (0.7069 — 0.7077 in)
	Tensioner bush I.D.			18.0 — 18.08 mm (0.7087 — 0.7118 in)
	Clearance between spacer and bush		STD	0.025 — 0.125 mm (0.0010 — 0.0049 in)
			Limit	0.175 mm (0.0069 in)
	Side clearance of spacer		STD	0.2 — 0.55 mm (0.0079 — 0.0217 in)
			Limit	0.81 mm (0.0319 in)
Camshaft	Bend limit			0.020 mm (0.0079 in)
	Thrust clearance		STD	0.015 — 0.070 mm (0.0006 — 0.0028 in)
			Limit	0.10 mm (0.0039 in)
	Cam lobe height	Intake	STD	44.75 — 44.85 mm (1.762 — 1.766 in)
			Limit	44.65 mm (1.758 in)
		Exhaust	STD	44.65 — 44.75 mm (1.758 — 1.762 in)
			Limit	44.55 mm (1.754 in)
	Jounal O.D.	STD	Front	37.946 — 37.963 mm (1.4939 — 1.4946 in)
			Center rear	29.946 — 29.963 mm (1.1790 — 1.1796 in)
	Oil clearance		STD	0.037 — 0.072 mm (0.0015 — 0.0028 in)
			Limit	0.10 mm (0.0039 in)
Cylinder head	Surface warpage limit			0.05 mm (0.0020 in)
	Surface grinding limit			0.3 mm (0.012 in)
	Standard height			127.5 mm (5.02 in)
Valve seat	Refacing angle			90°
	Contacting width	Intake	STD	1.0 mm (0.039 in)
			Limit	1.7 mm (0.067 in)
		Exhaust	STD	1.5 mm (0.059 in)
			Limit	2.2 mm (0.087 in)
Valve guide	Inner diameter			6.000 — 6.012 mm (0.2362 — 0.2367 in)
	Protrusion above head			15.8 — 16.2 mm (0.622 — 0.638 in)
Valve	Head edge thickness	Intake	STD	1.2 mm (0.047 in)
			Limit	0.8 mm (0.031 in)
		Exhaust	STD	1.5 mm (0.059 in)
			Limit	0.8 mm (0.031 in)
	Stem diameter		Intake	5.955 — 5.970 mm (0.2344 — 0.2350 in)
			Exhaust	5.945 — 5.960 mm(0.2341 — 0.2346 in)
	Stem oil clearance	STD	Intake	0.030 — 0.057 mm (0.0012 — 0.0022 in)
			Exhaust	0.040 — 0.067 mm (0.0016 — 0.0026 in)
		Limit	—	0.15 mm (0.0059 in)
	Overall length		Intake	104.4 mm (4.110 in)
			Exhaust	104.7 mm (4.122 in)
Valve spring	Free length			44.67 mm (1.7587 in)
	Squareness			2.5°, 2.0 mm (0.079 in)
	Tension/spring height			206 — 236 N (21.0 — 24.1 kgf, 46.2 — 53.0 lb)/ 36.0 mm (1.417 in) 485 — 537 N (49.5 — 54.8 kgf, 109.2 — 120.6 lb)/ 26.6 mm (1.047 in)

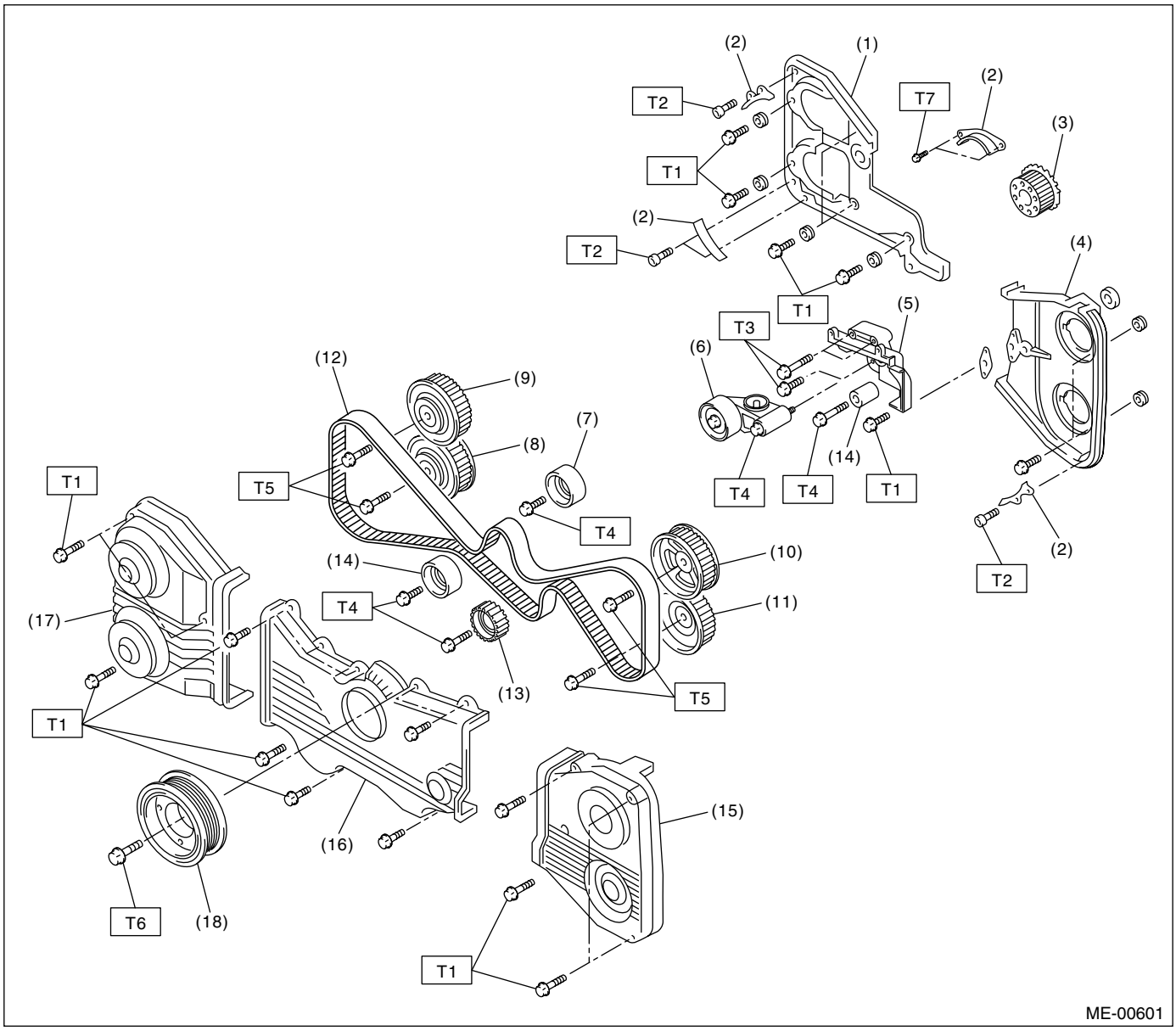
Cylinder block	Surface warpage limit (mating with cylinder head)			0.05 mm (0.0020 in)
	Surface grinding limit			0.1 mm (0.004 in)
	Cylinder bore	STD	A	92.005 — 92.015 mm (3.6222 — 3.6226 in)
			B	91.995 — 92.005 mm (3.6218 — 3.6222 in)
	Taper		STD	0.015 mm (0.0006 in)
			Limit	0.050 mm (0.0020 in)
	Out-of-roundness		STD	0.010 mm (0.0004 in)
			Limit	0.050 mm (0.0020 in)
	Piston clearance		STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.050 mm (0.0020 in)
	Enlarging (boring) limit			0.5 mm (0.020 in)
Piston	Outer diameter	STD	A	91.985 — 91.995 mm (3.6214 — 3.6218 in)
			B	91.975 — 91.985 mm (3.6211 — 3.6214 in)
		0.25 mm (0.0098 in) OS		92.225 — 92.235 mm (3.6309 — 3.6313 in)
		0.50 mm (0.0197 in) OS		92.475 — 92.485 mm (3.6407 — 3.6411 in)
Piston pin	Standard clearance between piston pin and hole in piston		STD	0.004 — 0.008 mm (0.0002 — 0.0003 in)
			Limit	0.020 mm (0.0008 in)
	Degree of fit			Piston pin must be fitted into position with thumb at 20°C (68°F).
Piston ring	Piston ring gap	Top ring	STD	0.20 — 0.25 mm (0.0079 — 0.0098 in)
			Limit	1.0 mm (0.039 in)
		Second ring	STD	0.35 — 0.50 mm (0.0138 — 0.0197 in)
			Limit	1.0 mm (0.039 in)
		Oil ring	STD	0.20 — 0.50 mm (0.0079 — 0.0197 in)
			Limit	1.5 mm (0.059 in)
	Clearance between piston ring and piston ring groove	Top ring	STD	0.055 — 0.090 mm (0.0022 — 0.0035 in)
			Limit	0.15 mm (0.0059 in)
		Second ring	STD	0.030 — 0.070 mm (0.0012 — 0.0028 in)
			Limit	0.15 mm (0.0059 in)
Connecting rod	Bend twist per 100 mm (3.94 in) in length		Limit	0.10 mm (0.0039 in)
	Side clearance		STD	0.070 — 0.330 mm (0.0028 — 0.0130 in)
			Limit	0.4 mm (0.016 in)
Connecting rod bearing	Oil clearance		STD	0.020 — 0.046 mm (0.0008 — 0.0018 in)
			Limit	0.05 mm (0.0020 in)
	Thickness at center portion		STD	1.486 — 1.498 mm (0.0585 — 0.0590 in)
			0.03 mm (0.0012 in) US	1.504 — 1.512 mm (0.0592 — 0.0595 in)
			0.05 mm (0.0020 in) US	1.514 — 1.522 mm (0.0596 — 0.0599 in)
			0.25 mm (0.0098 in) US	1.614 — 1.622 mm (0.0635 — 0.0639 in)
Connecting rod bushing	Clearance between piston pin and bushing		STD	0 — 0.022 mm (0 — 0.0009 in)
			Limit	0.030 mm (0.0012 in)

Crankshaft	Bend limit			0.035 mm (0.0014 in)
	Crank pin and crank journal	Out-of-roundness		0.020 mm (0.0008 in) or less
		Grinding limit		0.25 mm (0.0098 in)
	Crank pin outer diameter		STD	51.984 — 52.000 mm (2.0466 — 2.0472)
			0.03 mm (0.0012 in) US	51.954 — 51.970 mm (2.0454 — 2.0461)
			0.05 mm (0.0020 in) US	51.934 — 51.950 mm (2.0447 — 2.0453)
			0.25 mm (0.0098 in) US	51.734 — 51.750 mm (2.0368 — 2.0374)
	Crank journal outer diameter	#1, #3, #5	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
		#2, #4	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
	Thrust clearance		STD	0.030 — 0.115 mm (0.0012 — 0.0045 in)
			Limit	0.25 mm (0.0098 in)
	Oil clearance	#1	STD	0.003 — 0.030 mm (0.0001 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
		#2	STD	0.012 — 0.033 mm (0.0005 — 0.0013 in)
			Limit	0.045 mm (0.0018 in)
		#3	STD	0.003 — 0.030 mm (0.0001 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
		#4	STD	0.012 — 0.033 mm (0.0005 — 0.0013 in)
			Limit	0.045 mm (0.0018 in)
		#5	STD	0.010 — 0.031 mm (0.0004 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)

Crankshaft bearing	Crankshaft bearing thickness	#1, #3	STD	1.998 — 2.011 mm (0.0787 — 0.0792 in)
			0.03 mm (0.0012 in) US	2.017 — 2.020 mm (0.0794 — 0.0795 in)
			0.05 mm (0.0020 in) US	2.027 — 2.030 mm (0.0798 — 0.0799 in)
			0.25 mm (0.0098 in) US	2.127 — 2.130 mm (0.0837 — 0.0839 in)
		#2, #4, #5	STD	2.000 — 2.013 mm (0.0787 — 0.0793 in)
			0.03 mm (0.0012 in) US	2.019 — 2.022 mm (0.0795 — 0.0796 in)
			0.05 mm (0.0020 in) US	2.029 — 2.032 mm (0.0799 — 0.0800 in)
			0.25 mm (0.0098 in) US	2.129 — 2.132 mm (0.0838 — 0.0839 in)

B: COMPONENT

1. TIMING BELT

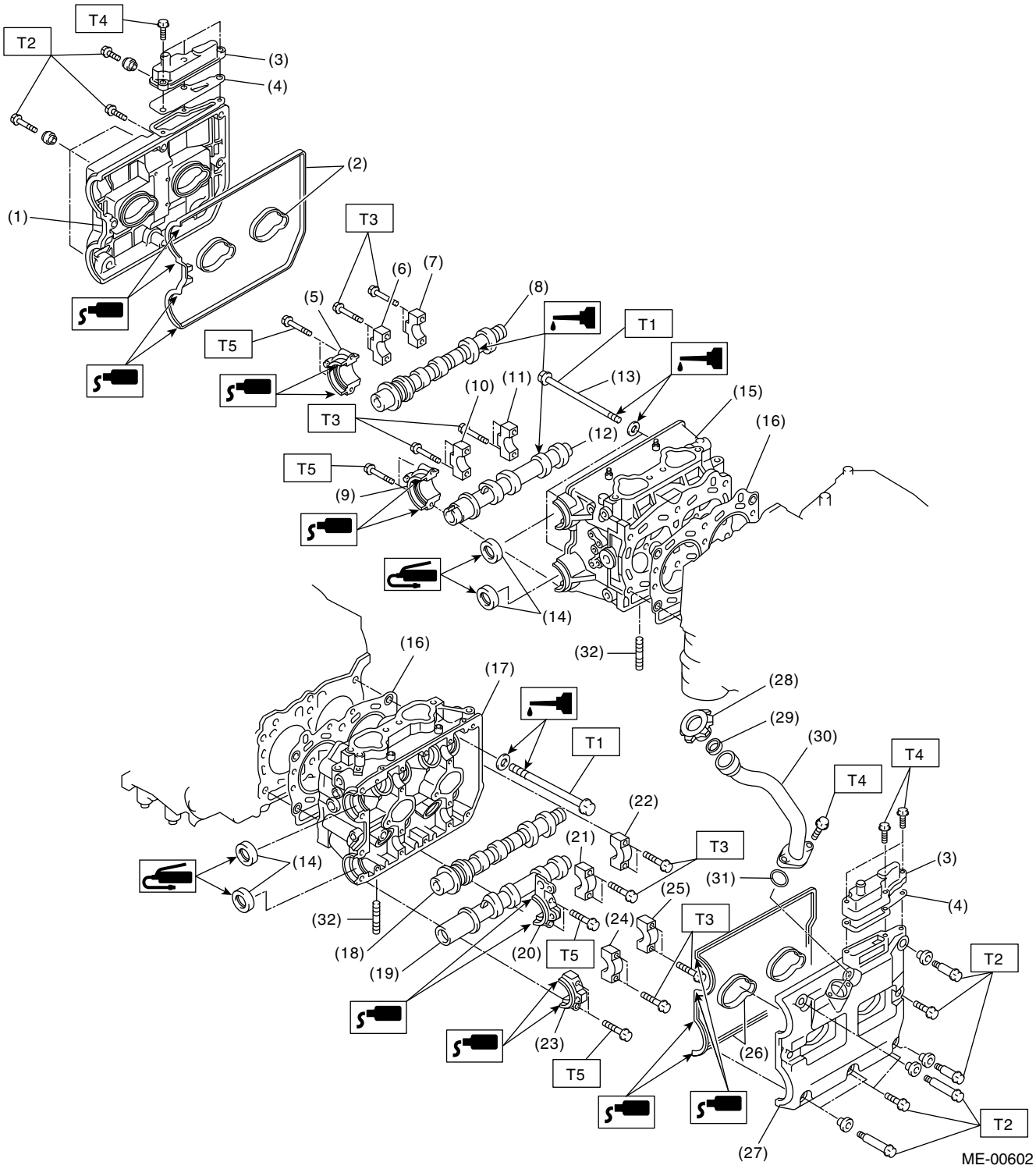


(1)	Belt cover No. 2 (RH)	(9)	Intake camshaft sprocket (RH)
(2)	Timing belt guide (MT vehicles only)	(10)	Intake camshaft sprocket (LH)
(3)	Crankshaft sprocket	(11)	Exhaust camshaft sprocket (LH)
(4)	Belt cover No. 2 (LH)	(12)	Timing belt
(5)	Tensioner bracket	(13)	Belt idler No. 2
(6)	Automatic belt tension adjuster ASSY	(14)	Belt idler
(7)	Belt idler	(15)	Belt cover (LH)
(8)	Exhaust camshaft sprocket (RH)	(16)	Front belt cover
		(17)	Belt cover (RH)
		(18)	Crankshaft pulley

Tightening torque: N·m (kgf-m, ft-lb)

- ***T1: 5 (0.5, 3.6)***
- ***T2: 6.4 (0.65, 4.7)***
- ***T3: 25 (2.5, 18.1)***
- ***T4: 39 (4.0, 28.9)***
- ***T5: 98 (10, 72.4)***
- ***T6: <Ref. to ME(TURBO)-46, INSTALLATION, Crankshaft Pulley.>***
- ***T7: 10 (1.0, 7.2)***

2. CYLINDER HEAD AND CAMSHAFT

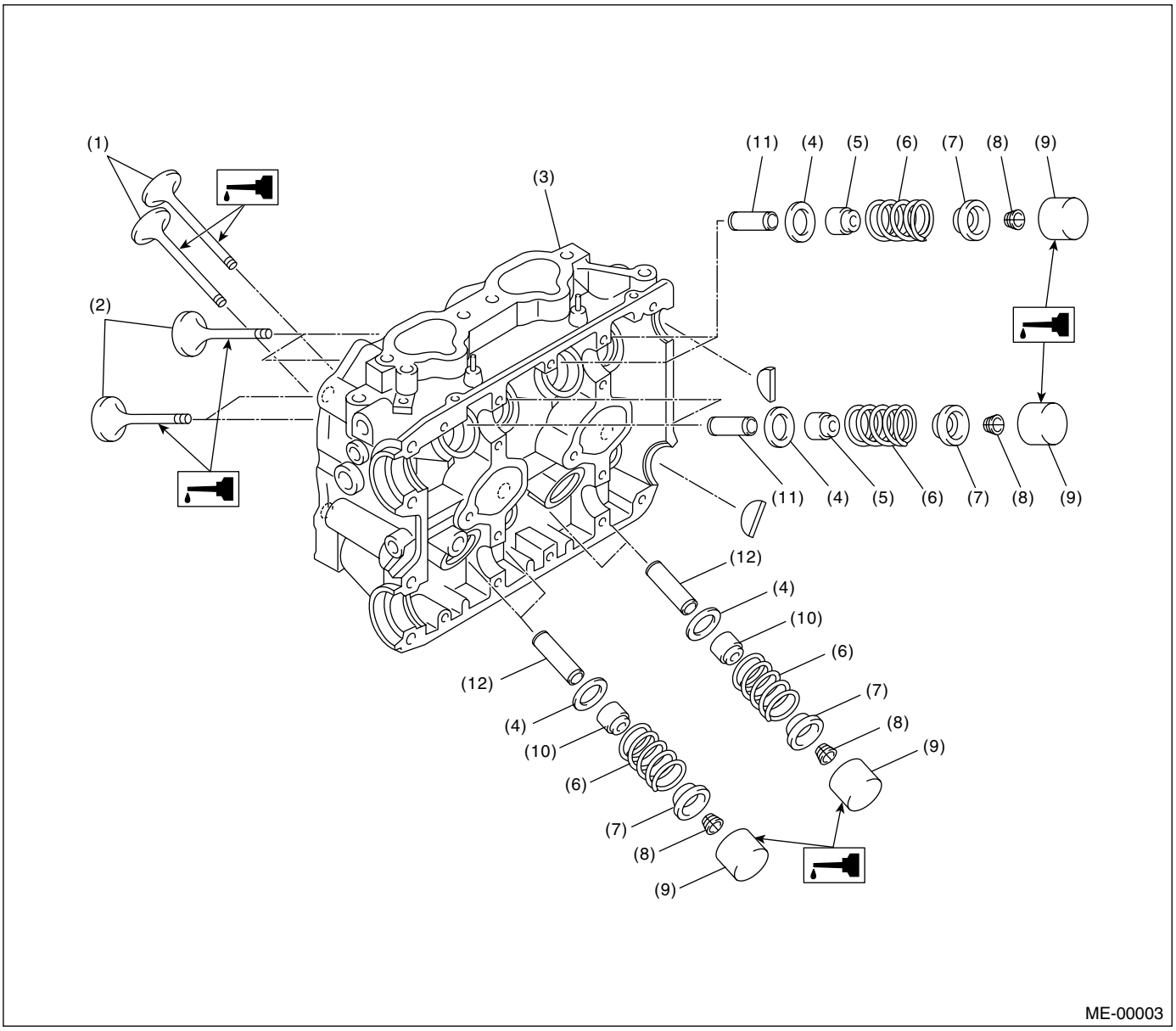


(1) Rocker cover (RH)
(2) Rocker cover gasket (RH)
(3) Oil separator cover
(4) Gasket
(5) Intake camshaft cap (Front RH)
(6) Intake camshaft cap (Center RH)
(7) Intake camshaft cap (Rear RH)
(8) Intake camshaft cap (RH)
(9) Exhaust camshaft cap (Front RH)
(10) Exhaust camshaft cap (Center RH)
(11) Exhaust camshaft cap (Rear RH)
(12) Exhaust camshaft (RH)
(13) Cylinder head bolt
(14) Oil seal
(15) Cylinder head (RH)
(16) Cylinder head gasket (RH)
(17) Cylinder head (LH)
(18) Intake camshaft (LH)
(19) Exhaust camshaft (LH)
(20) Intake camshaft cap (Front LH)
(21) Intake camshaft cap (Center LH)
(22) Intake camshaft cap (Rear LH)
(23) Exhaust camshaft cap (Front LH)
(24) Exhaust camshaft cap (Center LH)
(25) Exhaust camshaft cap (Rear LH)
(26) Rocker cover gasket (LH)
(27) Rocker cover (LH)
(28) Oil filler cap
(29) Gasket
(30) Oil filler duct
(31) O-ring
(32) Stud bolt

Tightening torque: N·m (kgf-m, ft-lb)

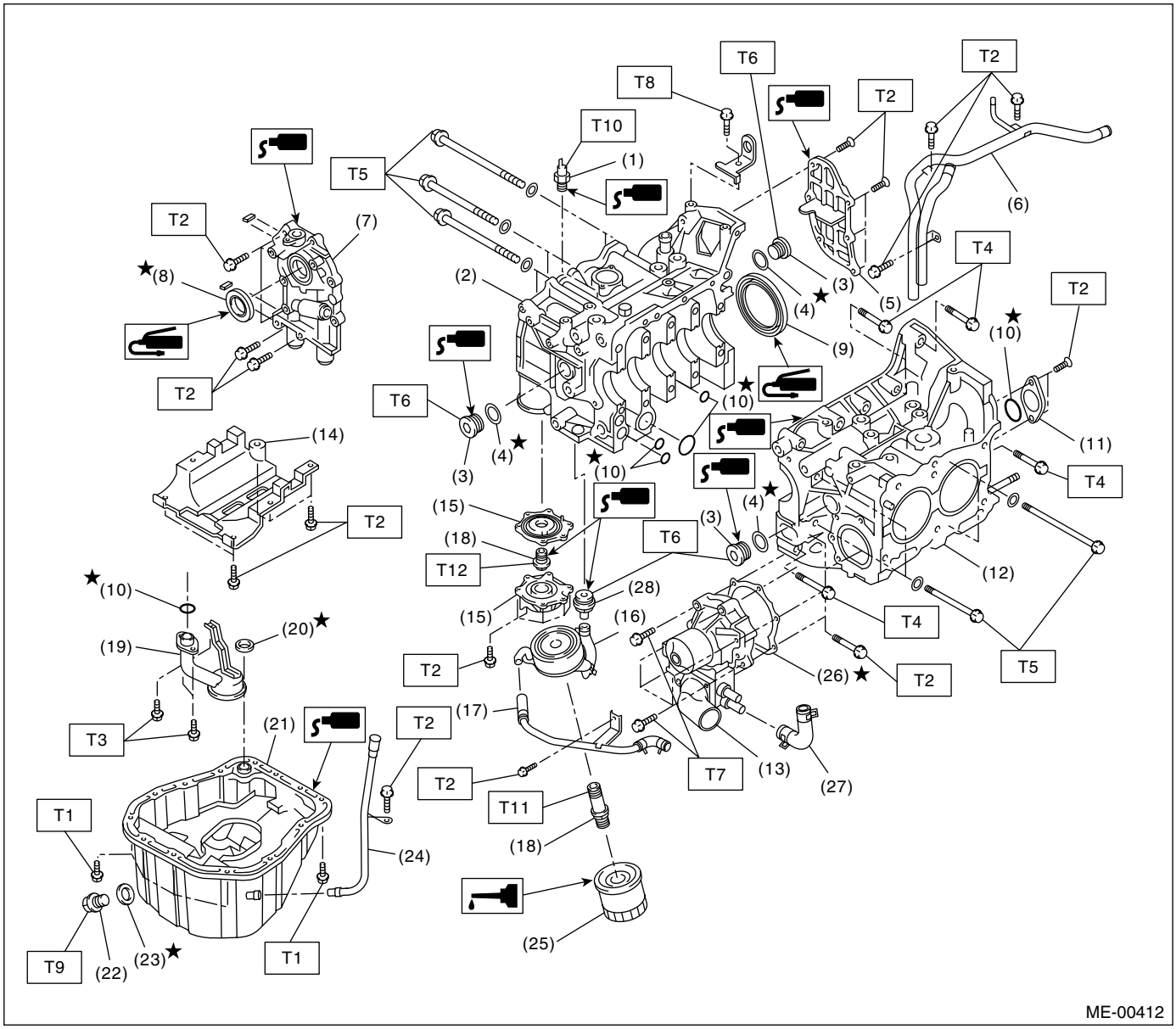
T1: <Ref. to ME(TURBO)-63, INSTALLATION, Cylinder Head Assembly.>
T2: 5 (0.5, 3.6)
T3: 20 (2.0, 14.5)
T4: 6.4 (0.65, 4.7)
T5: 10 (1.0, 7.2)

3. CYLINDER HEAD AND VALVE ASSEMBLY



(1) Exhaust valve
(2) Intake valve
(3) Cylinder head
(4) Valve spring seat
(5) Intake valve oil seal
(6) Valve spring
(7) Retainer
(8) Retainer key
(9) Valve lifter
(10) Exhaust valve oil seal
(11) Intake valve guide
(12) Exhaust valve guide

4. CYLINDER BLOCK

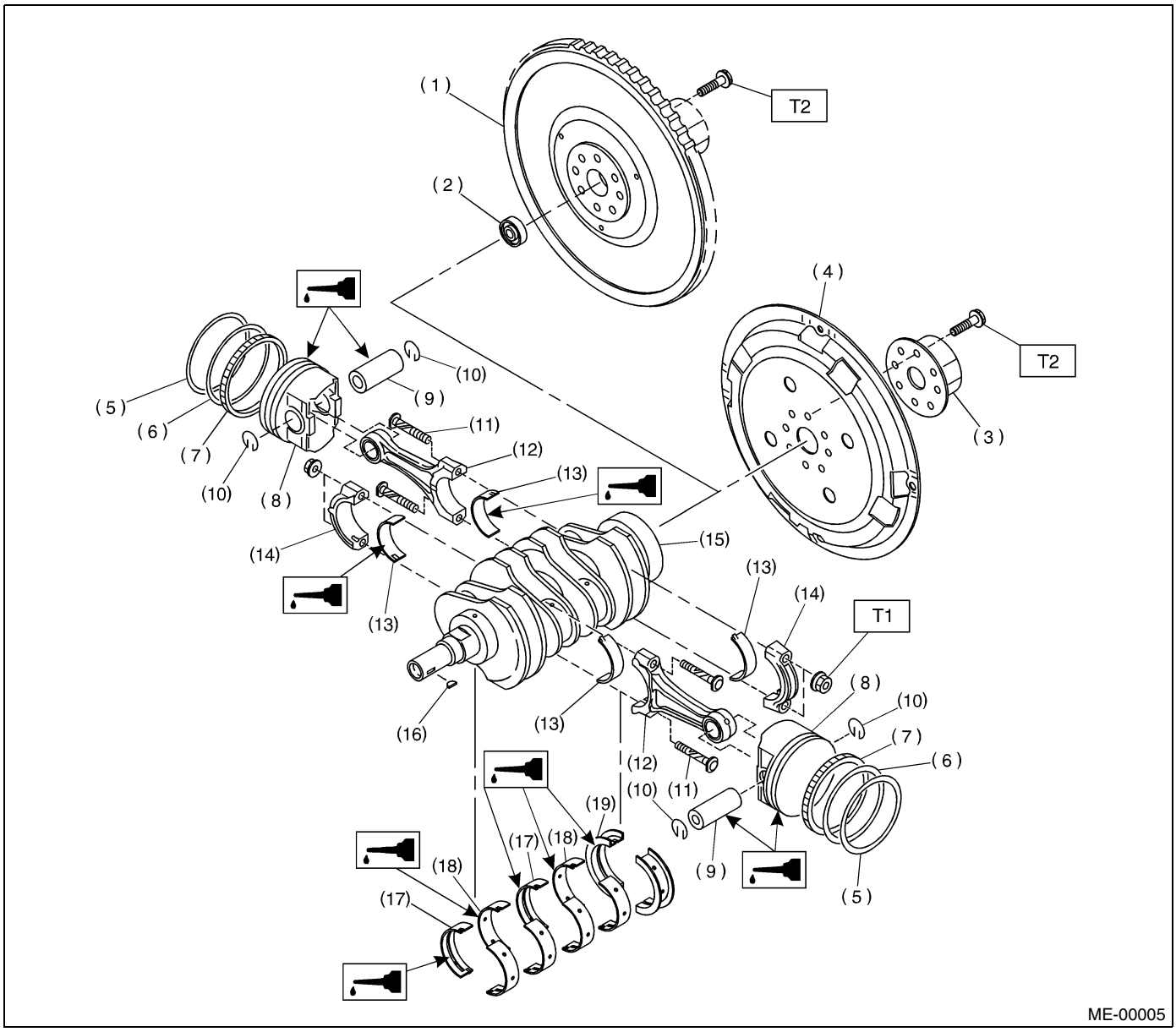


(1) Oil pressure switch
(2) Cylinder block (RH)
(3) Service hole plug
(4) Gasket
(5) Oil separator cover
(6) Water by-pass pipe
(7) Oil pump
(8) Front oil seal
(9) Rear oil seal
(10) O-ring
(11) Service hole cover
(12) Cylinder block (LH)
(13) Water pump
(14) Baffle plate
(15) Adapter
(16) Oil cooler
(17) Waster by-pass pipe
(18) Connector
(19) Oil strainer
(20) Gasket
(21) Oil pan
(22) Drain plug
(23) Metal gasket
(24) Oil level gauge guide
(25) Oil filter
(26) Gasket
(27) Water pump hose
(28) Plug

Tightening torque: N·m (kgf-m, ft-lb)

T1:	***5 (0.5, 3.6)***
T2:	***6.4 (0.65, 4.7)***
T3:	***10 (1.0, 7.2)***
T4:	***25 (2.5, 18.1)***
T5:	***<Ref. to ME(TURBO)-74, INSTALLATION, Cylinder Block.>***
T6:	***70 (7.1, 50.6)***
T7:	***First 12 (1.2, 8.7) Second 12 (1.2, 8.7)***
T8:	***16 (1.6, 11.6)***
T9:	***44 (4.5, 33)***
T10:	***25 (2.5, 18.1)***
T11:	***54 (5.5, 40)***
T12:	***45 (4.6, 33)***

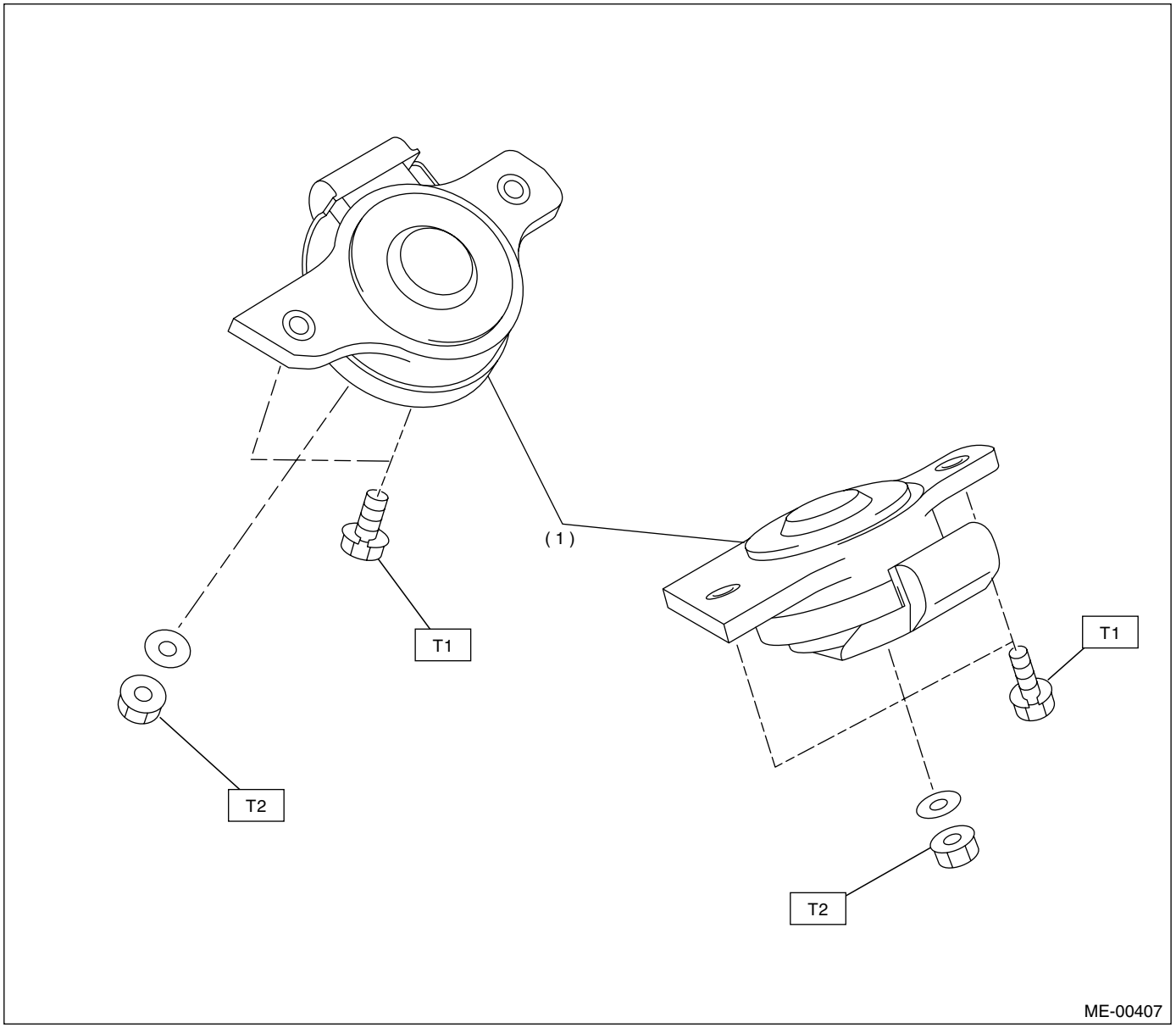
5. CRANKSHAFT AND PISTON



(1) Flywheel (MT vehicles only)
(2) Ball bearing (MT vehicles only)
(3) Reinforcement (AT vehicles only)
(4) Drive plate (AT vehicles only)
(5) Top ring
(6) Second ring
(7) Oil ring
(8) Piston
(9) Piston pin
(10) Circlip
(11) Connecting rod bolt
(12) Connecting rod
(13) Connecting rod bearing
(14) Connecting rod cap
(15) Crankshaft
(16) Woodruff key
(17) Crankshaft bearing #1, #3
(18) Crankshaft bearing #2, #4
(19) Crankshaft bearing #5

Tightening torque: N·m (kgf-m, ft-lb)
T1: 45 (4.6, 33.3)
T2: 72 (7.3, 52.8)

6. ENGINE MOUNTING



(1) Front cushion rubber

Tightening torque: N·m (kgf-m, ft-lb)
T1: 34 (3.5, 25.3)
T2: 85 (8.7, 62.7)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
• All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.
• Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
• Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
• All removed parts, if to be reused, should be reinstalled in the original positions and directions.
• Bolts, nuts and washers should be replaced with new ones as required.
• Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
• Remove or install the engine in an area where chain hoists, lifting devices, etc. are available for ready use.
• Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
• Prior to starting work, prepare the following:
Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
• Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.

D: PREPARATION TOOL

1. SPECIAL TOOLS

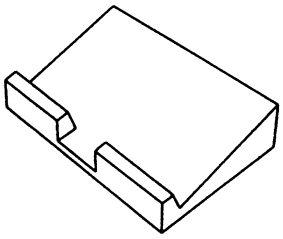
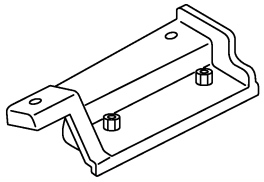
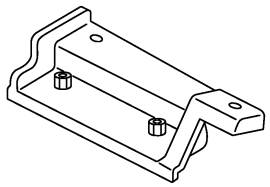
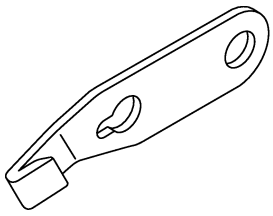
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498267600	498267600	CYLINDER HEAD TABLE	• Used for replacing valve guides. • Used for removing and installing valve springs.
 ST-498457000	498457000	ENGINE STAND ADAPTER RH	Used with ENGINE STAND (499817000).
 ST-498457100	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817000).
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening and tightening crankshaft pulley bolt, etc.

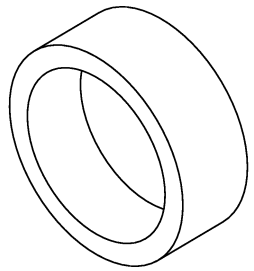
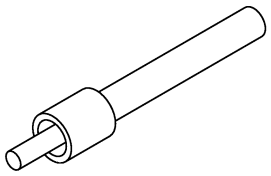
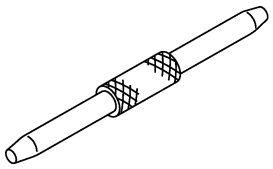
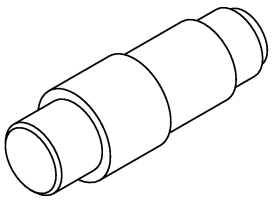
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398744300	398744300	PISTON GUIDE	Used for installing piston in cylinder for 2000 cc engine.
 ST-498857100	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.
 ST-499017100	499017100	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.
 ST-499037100	499037100	CONNECTING ROD BUSHING REMOVER & INSTALLER	Used for removing and installing connecting rod bushing.

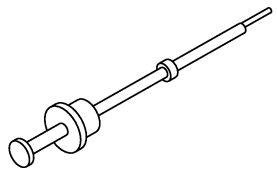
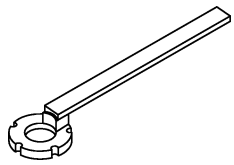
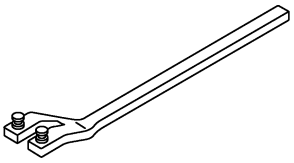
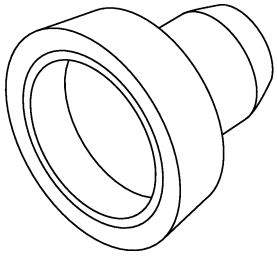
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499097700	499097700	PISTON PIN REMOVER ASSY	Used for removing piston pin.
 ST-499207400	499207400	CAMSHAFT SPROCKET WRENCH	Used for removing and installing exhaust camshaft sprocket.
 ST18231AA010	18231AA010 (Newly adopted tool)	CAMSHAFT SPROCKET WRENCH	Used for removing and installing intake camshaft sprocket. (Intake camshaft sprocket LH)
 ST-499587200	499587200	CRANKSHAFT OIL SEAL INSTALLER	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL GUIDE (499597100).

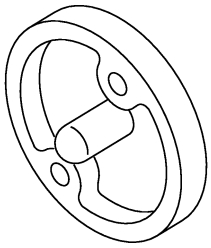
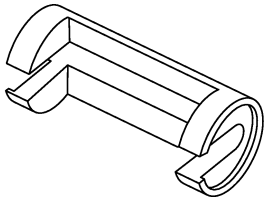
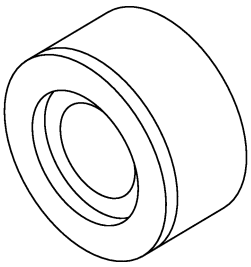
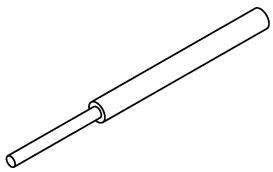
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499597100	499597100	CRANKSHAFT OIL SEAL GUIDE	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).
 ST-499718000	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.
 ST18251AA020	18251AA020	VALVE GUIDE ADJUSTER	Used for installing intake and exhaust valve guides.
 ST-499767200	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.

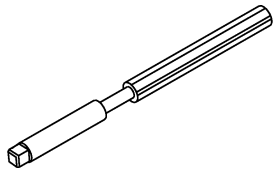
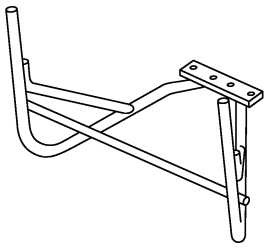
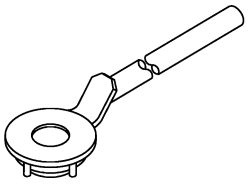
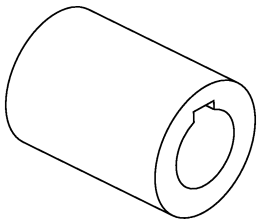
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499767400	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 ST-499817000	499817000	ENGINE STAND	• Stand used for engine disassembly and assembly. • Used with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).
 ST-499977400	499977400	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 ST-499987500	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.

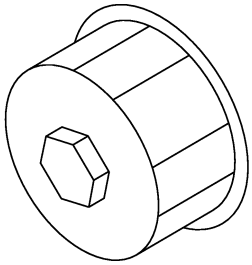
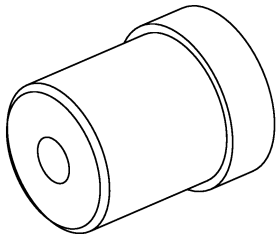
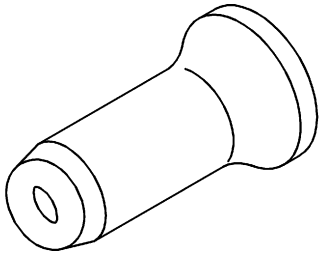
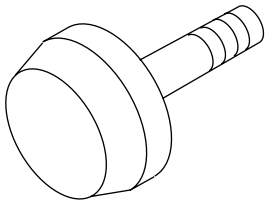
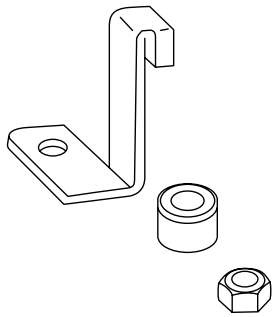
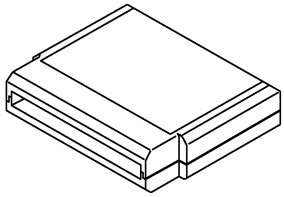
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18332AA000	18332AA000	OIL FILTER WRENCH	Used for removing and installing the oil filter.
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.
 ST-499587600	499587600	OIL SEAL INSTALLER	Used for installing camshaft oil seal for DOHC engine.
 ST-499597200	499597200	OIL SEAL GUIDE	• Used for installing camshaft oil seal for DOHC engine. • Used with OIL SEAL GUIDE (499587600).

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498277200	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.
 ST24082AA210	24082AA210 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Compression Gauge	Used for measuring compression.

E: PROCEDURE

It is possible to conduct the following service procedures with engine on the vehicle, however, the procedures described in this section are based on the condition that the engine is removed from the vehicle.

- V-belt
- Timing Belt
- Camshaft
- Cylinder Head

2. Compression

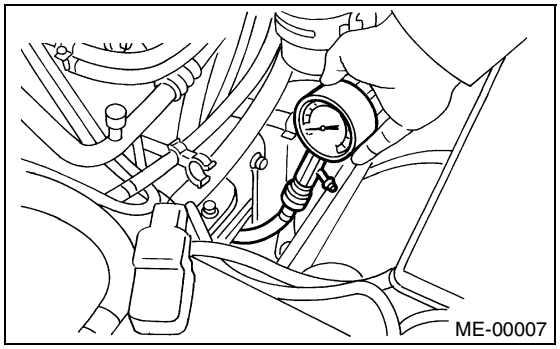
A: INSPECTION

CAUTION:
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

1) After warming-up the engine, turn the ignition switch to OFF.
2) Make sure that the battery is fully charged.
3) Release the fuel pressure. <Ref. to FU(TURBO)-52, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
4) Remove all the spark plugs. <Ref. to IG(TURBO)-5, REMOVAL, Spark Plug.>
5) Fully open the throttle valve.
6) Check the starter motor for satisfactory performance and operation.
7) Hold the compression gauge tight against spark plug hole.

NOTE:
When using a screw-in type compression gauge, the screw (put into cylinder head spark plug hole) should be less than 18 mm (0.71 in) long.

8) Crank the engine by means of starter motor, and then read the maximum value on the gauge when the pointer is steady.



9) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (350 rpm and fully open throttle):
Standard;
951 — 1,147 kPa (9.7 — 11.7 kgf/cm^2, 138 — 166 psi)
Limit;
834 kPa (8.5 kgf/cm^2, 121 psi)
Difference between cylinders;
49 kPa (0.5 kgf/cm^2, 7 psi)

3. Idle Speed

A: INSPECTION

1. USING SUBARU SELECT MONITOR

1) Before checking the idle speed, check the following:
   (1) Ensure the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and that the hoses are connected properly.
   (2) Ensure the malfunction indicator light (CHECK ENGINE light) does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and then turn the ignition switch to OFF.
4) Insert the cartridge to SUBARU SELECT MONITOR.
5) Connect the SUBARU SELECT MONITOR to data link connector.
6) Turn the ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.
7) Select the {2. Each System Check} in Main Menu.
8) Select the {Engine Control System} in Selection Menu.
9) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.
10) Select the {1.12 Data Display} in Data Display Menu.
11) Start the engine, and then read the engine idle speed.
12) Check the idle speed when unloaded. (With headlights, heater fan, rear defroster, radiator fan, air conditioning, etc. OFF)

Idle speed [No load and gears in neutral]:
750±100 rpm

13) Check the idle speed when loaded. (Turn the air conditioning switch to “ON” and operate the compressor for at least 1 minute before measurement.)

Idle speed [A/C “ON”, no load and gears in neutral]:
800±150 rpm (MT vehicles)
825±150 rpm (AT vehicles)

NOTE:
As idle speed is controlled by the automatic adjustment type, it can not be adjusted manually. If the idle speed is out of specifications, refer to General On-board Diagnosis Table under “Engine Control System”. <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.>

4. Ignition Timing

A: INSPECTION

1. USING SUBARU SELECT MONITOR

1) Before checking the ignition timing speed, check the following:
   (1) Ensure the air cleaner element is free from clogging, spark plugs are in good condition, and that hoses are connected properly.
   (2) Ensure the malfunction indicator light (CHECK ENGINE light) does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and then turn the ignition switch to OFF.
4) Insert the cartridge to SUBARU SELECT MONITOR.
5) Connect the SUBARU SELECT MONITOR to data link connector.
6) Turn the ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.
7) Select the {2. Each System Check} in Main Menu.
8) Select the {Engine Control System} in Selection Menu.
9) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.
10) Select the {1.12 Data Display} in Data Display Menu.
11) Start the engine, at idle speed and check the ignition timing.

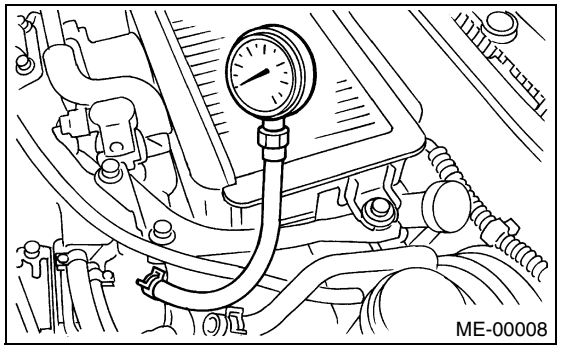
Ignition timing [BTDC/rpm]:
12°±3°/750

If the timing is not correct, check the ignition control system. Refer to Engine Control System. <Ref. to EN(TURBO)-2, Basic Diagnostic Procedure.>

5. Intake Manifold Vacuum

A: INSPECTION

1) Warm-up the engine.
2) Disconnect the brake vacuum hose, and then install the vacuum gauge to hose fitting on manifold.
3) Keep the engine at the idle speed, and then read the vacuum gauge indication.
By observing the gauge needle movement, the internal condition of engine can be diagnosed as described below.



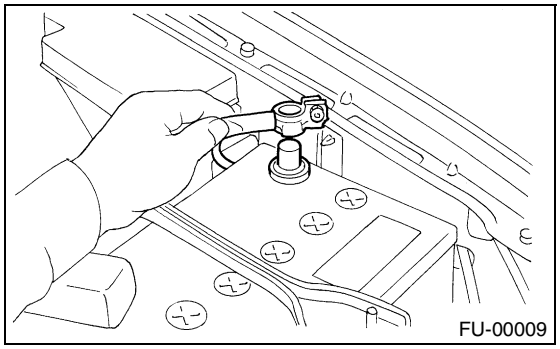
Vacuum pressure (at idling, A/C "OFF"): Less than –60.0 kPa (–450 mmHg, –17.72 inHg)

Diagnosis of engine condition by measurement of manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Leakage around intake manifold gasket or disconnection or damaged vacuum hose
2. When engine speed is reduced slowly from higher speed, needle stops temporarily when it is lowering or becomes steady above normal position.	Back pressure too high, or exhaust system clogged
3. Needle intermittently drops to position lower than normal position.	Leakage around cylinder
4. Needle drops suddenly and intermittently from normal position.	Sticky valves
5. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases.	Weak or broken valve springs
6. Needle vibrates above and below normal position in narrow range.	Defective ignition system or throttle chamber idle adjustment

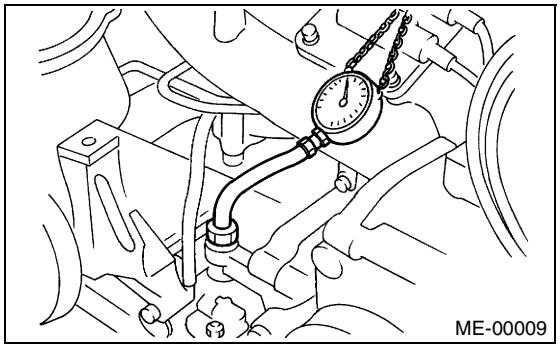
6. Engine Oil Pressure

A: INSPECTION

1) Remove the oil pressure switch from engine cylinder block. <Ref. to LU(SOHC)-21, REMOVAL, Oil Pressure Switch.>
2) Connect the oil pressure gauge hose to cylinder block.
3) Connect the battery ground cable to battery.



4) Start the engine, and then measure the oil pressure.



Oil pressure:
98 kPa (1.0 kg/cm^2, 14 psi) or more at 800 rpm
294 kPa (3.0 kg/cm^2, 43 psi) or more at 5,000 rpm

- If the oil pressure is out of specification, check oil pump, oil filter and lubrication line. <Ref. to LU(SOHC)-25, INSPECTION, Engine Lubrication System Trouble in General.>
- If the oil pressure warning light is turned ON and oil pressure is in specification, replace the oil pressure switch. <Ref. to LU(SOHC)-25, INSPECTION, Engine Lubrication System Trouble in General.>

NOTE:
The specified data is based on an engine oil temperature of 80°C (176°F).

5) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU(SOHC)-21, INSTALLATION, Oil Pressure Switch.>

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

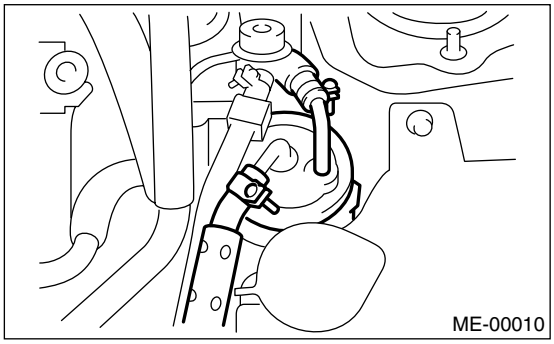
7. Fuel Pressure

A: INSPECTION

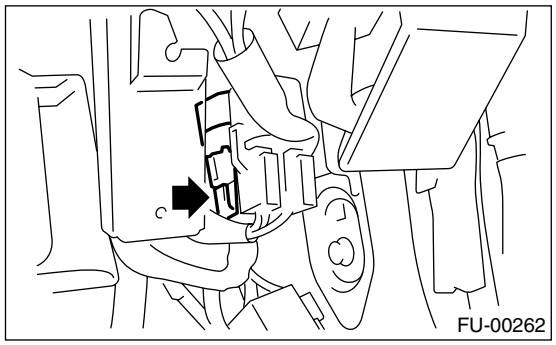
CAUTION:
Before removing the fuel pressure gauge, release the fuel pressure.

NOTE:
If out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.

1) Release the fuel pressure. <Ref. to FU(TURBO)-52, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel flap lid, and then remove the fuel filler cap.
3) Disconnect the fuel delivery hoses from fuel filter, and then connect the fuel pressure gauge.

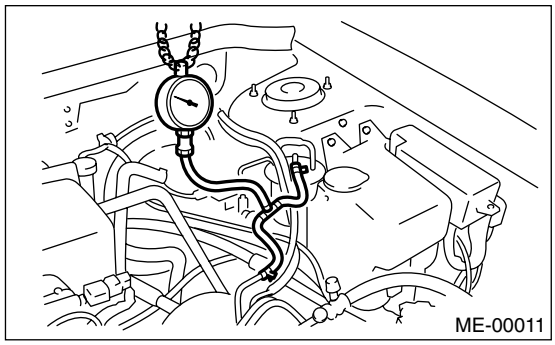


4) Connect the connector of fuel pump relay.



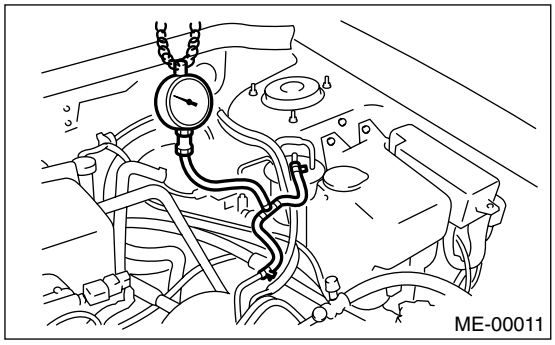
5) Start the engine.
6) Measure the fuel pressure while disconnecting the pressure regulator vacuum hose from intake manifold.

Fuel pressure:
Standard; 284 — 314 kPa (2.9 — 3.2 kgf/cm^2, 41 — 46 psi)



7) After connecting the pressure regulator vacuum hose, measure the fuel pressure.

Fuel pressure:
Standard; 230 — 260 kPa (2.35 — 2.65 kgf/cm^2, 33 — 38 psi)



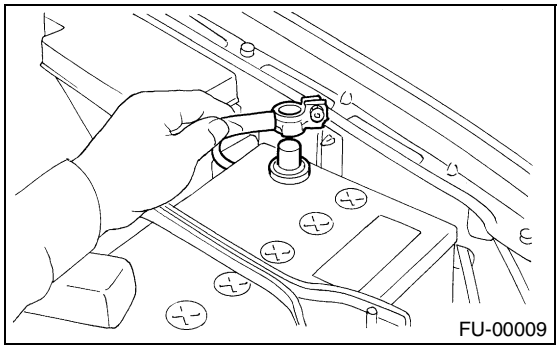
NOTE:
The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm^2, 1 to 3 psi) higher than standard values during high-altitude operations.

8. Valve Clearance

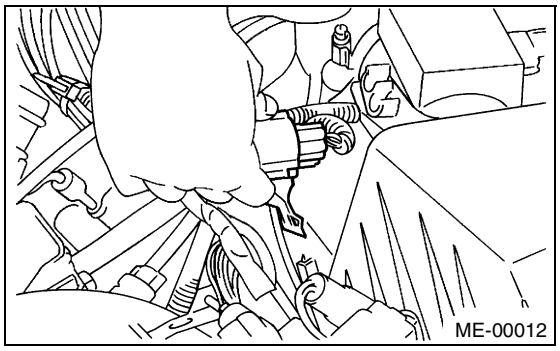
A: INSPECTION

Inspection and adjustment of the valve clearance should be performed while engine is cold.

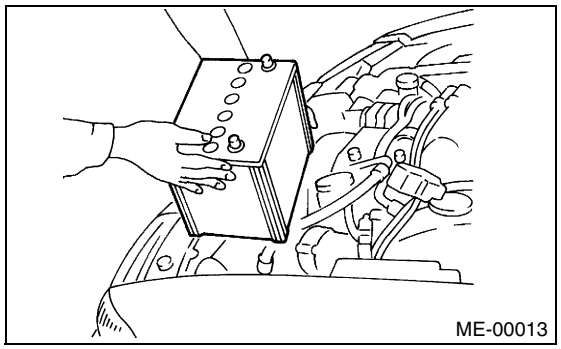
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



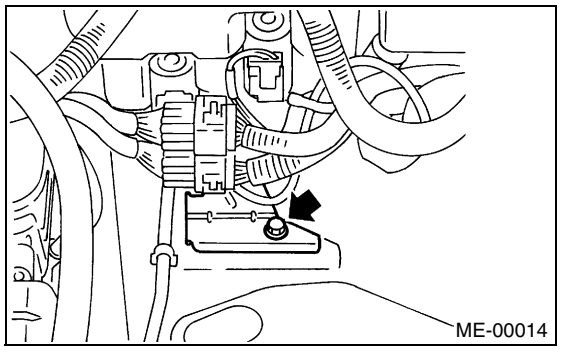
3) Remove the air intake duct. <Ref. to IN(TURBO)-8, REMOVAL, Air Intake Duct.>
4) Remove the bolt which secures belt cover (RH).
5) Lift-up the vehicle.
6) Remove the under cover.
7) Loosen the remaining bolts which secure belt cover (RH), and then remove the belt cover.
8) Lower the vehicle.
9) When inspecting the #1 and #3 cylinders:
   (1) Pull out the engine harness connector with bracket from air cleaner upper cover.



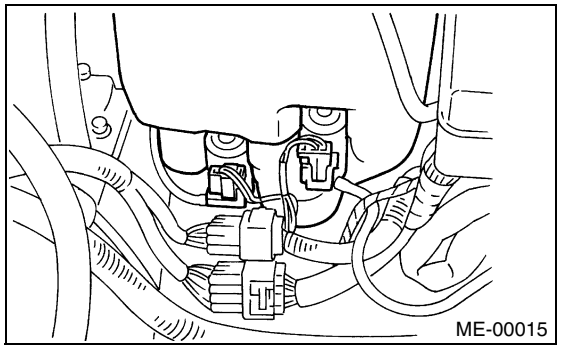
   (2) Remove the air cleaner case. <Ref. to IN(TURBO)-7, REMOVAL, Air Cleaner.>
   (3) Disconnect the ignition coil connector.
   (4) Remove the ignition coil.
   (5) Place a suitable container under the vehicle.
   (6) Disconnect the PCV hose from rocker cover (RH).
   (7) Remove the bolts, and then remove the rocker cover (RH).
10) When inspecting the #2 and #4 cylinders:
   (1) Disconnect the battery cable, and then remove the battery and battery carrier.



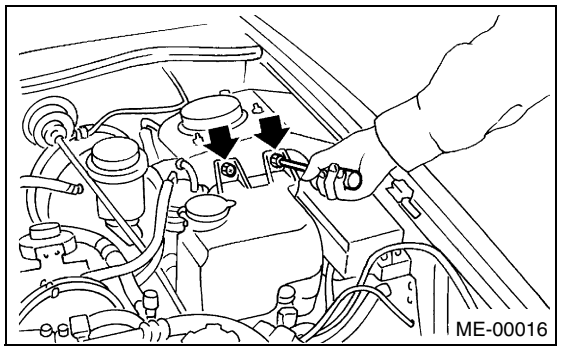
   (2) Remove the bolt which secures engine harness bracket onto body.



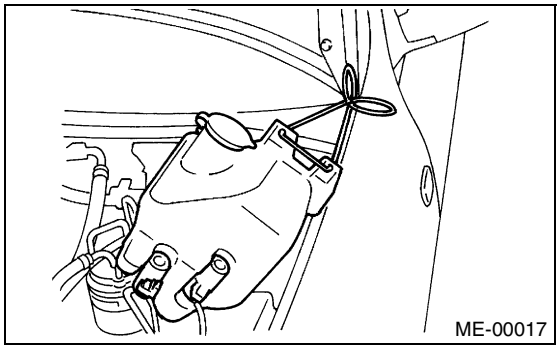
   (3) Disconnect the washer motor connectors.



   (4) Remove the washer tank mounting bolts.



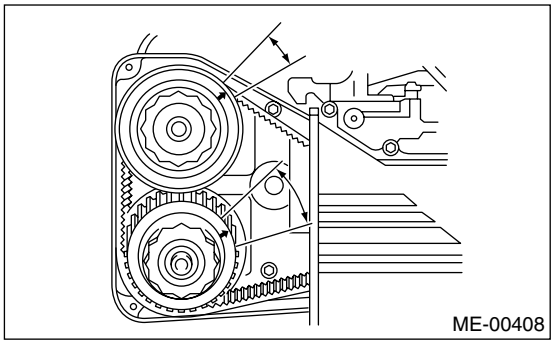
(5) Move the washer tank upward.



(6) Disconnect the ignition coil connector.
(7) Remove the ignition coil.
(8) Place a suitable container under the vehicle.
(9) Disconnect the PCV hose from rocker cover (LH).
(10) Remove the bolts, and then remove the rocker cover (LH).

11) Turn the crankshaft pulley clockwise until arrow mark on the camshaft sprocket is set to position shown in the figure.

NOTE:
Turn the crankshaft using socket wrench.

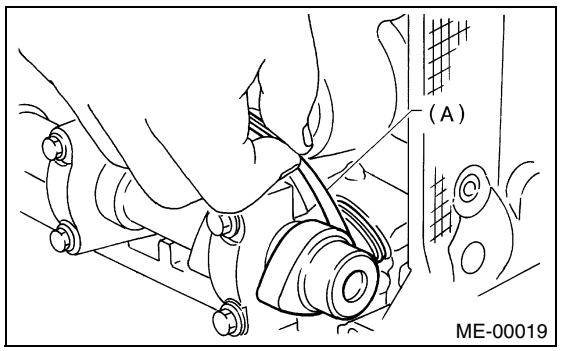


12) Measure the #1 cylinder intake valve and #3 cylinder exhaust valve clearance by using thickness gauge (A).

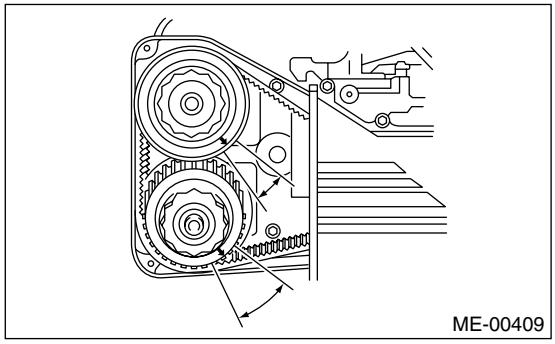
NOTE:
• Insert the thickness gauge in as horizontal a direction as possible with respect to the shim.
• Measure the exhaust valve clearances while lifting-up the vehicle.

Valve clearance:
Intake: 0.20±0.02 mm (0.0079±0.0008 in)
Exhaust: 0.25±0.02 mm (0.0098±0.0008 in)

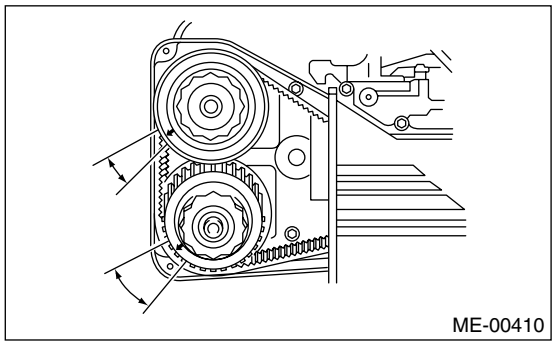
NOTE:
If the measured value is not within specification, take notes of the value in order to adjust the valve clearance later on.



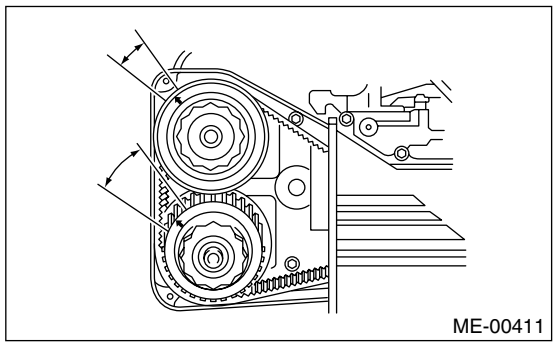
13) If necessary, adjust the valve clearance. <Ref. to ME(TURBO)-31, ADJUSTMENT, Valve Clearance.>
14) Further turn the crankshaft pulley clockwise. Using the same procedures described previously, and then measure the valve clearances again.
(1) Set the arrow mark on camshaft sprocket to position shown in the figure, and then measure the #2 cylinder exhaust valve and #3 cylinder intake valve clearances.



(2) Set the arrow mark on camshaft sprocket to position shown in the figure, and then measure the #2 cylinder intake valve and #4 cylinder exhaust valve clearances.

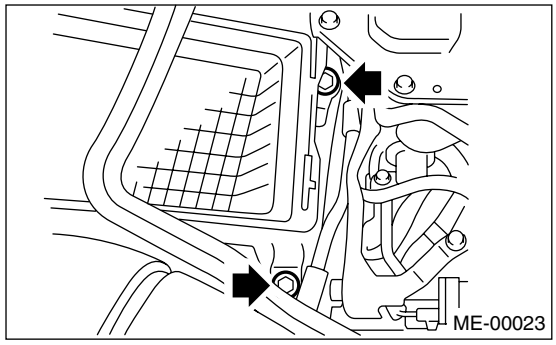


(3) Set the arrow mark on camshaft sprocket to position shown in the figure, and then measure the #1 cylinder exhaust valve and #4 cylinder intake valve clearances.


ME-00411

15) After inspection, install the related parts in the reverse order of removal.

Tightening torque:
32 N·m (3.3 kgf-m, 24 ft-lb)

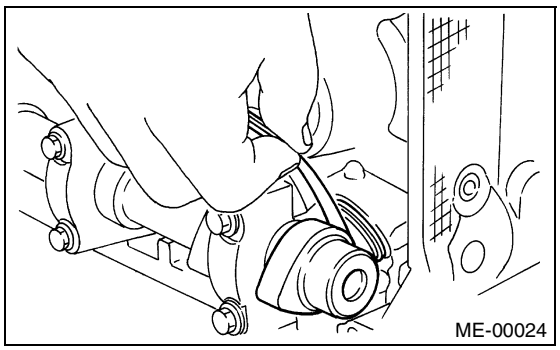

ME-00023

B: ADJUSTMENT

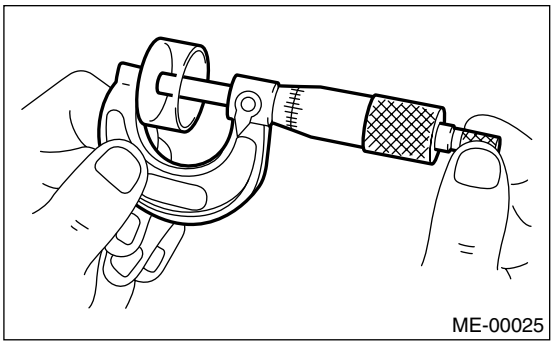
CAUTION:
Adjustment of the valve clearance should be performed while engine is cold.

1) Measure all valve clearances. <Ref. to ME(TURBO)-29, INSPECTION, Valve Clearance.>

NOTE:
Record each valve clearance after it has been measured.


ME-00024

2) Remove the camshaft. <Ref. to ME(TURBO)-58, REMOVAL, Camshaft.>
3) Remove the valve lifter.
4) Measure the thickness of valve lifter with a micrometer.


ME-00025

5) Select a shim of suitable thickness using measured valve clearance and valve lifter thickness, by referring to the following table.
6) Set the suitable shim selected in step 4) to valve lifter.

Unit: mm
Intake valve: S =(V + T) - 0.20 Exhaust valve: S =(V + T) - 0.25
S: Valve lifter thickness to be used V: Measured valve clearance T: Shim thickness required

Part No.	Thickness mm (in)
13228 AB101	4.68 (0.1843)
13228 AB111	4.69 (0.1846)
13228 AB121	4.70 (0.1850)
13228 AB131	4.71 (0.1854)
13228 AB141	4.72 (0.1858)
13228 AB151	4.73 (0.1862)
13228 AB161	4.74 (0.1866)
13228 AB171	4.75 (0.1870)
13228 AB181	4.76 (0.1874)
13228 AB191	4.77 (0.1878)
13228 AB201	4.78 (0.1882)
13228 AB211	4.79 (0.1886)
13228 AB221	4.80 (0.1890)
13228 AB231	4.81 (0.1894)
13228 AB241	4.82 (0.1898)
13228 AB251	4.83 (0.1902)
13228 AB261	4.84 (0.1906)
13228 AB271	4.85 (0.1909)
13228 AB281	4.86 (0.1913)
13228 AB291	4.87 (0.1917)
13228 AB301	4.88 (0.1921)
13228 AB311	4.89 (0.1925)
13228 AB321	4.90 (0.1929)
13228 AB331	4.91 (0.1933)
13228 AB341	4.92 (0.1937)
13228 AB351	4.93 (0.1941)
13228 AB361	4.94 (0.1945)
13228 AB371	4.95 (0.1949)
13228 AB381	4.96 (0.1953)
13228 AB391	4.97 (0.1957)
13228 AB401	4.98 (0.1961)
13228 AB411	4.99 (0.1965)
13228 AB421	5.00 (0.1969)
13228 AB431	5.01 (0.1972)
13228 AB441	5.02 (0.1976)
13228 AB451	5.03 (0.1980)
13228 AB461	5.04 (0.1984)
13228 AB471	5.05 (0.1988)
13228 AB481	5.06 (0.1992)
13228 AB491	5.07 (0.1996)
13228 AB501	5.08 (0.2000)
13228 AB511	5.09 (0.2004)
13228 AB521	5.10 (0.2008)
13228 AB531	5.11 (0.2012)
13228 AB541	5.12 (0.2016)
13228 AB551	5.13 (0.2020)
13228 AB561	5.14 (0.2024)
13228 AB571	5.15 (0.2028)
13228 AB581	5.16 (0.2031)
13228 AB591	5.17 (0.2035)
13228 AB601	5.18 (0.2039)

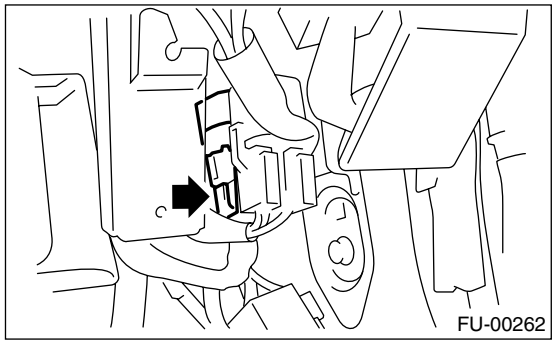
Part No.	Thickness mm (in)
13228 AB611	5.19 (0.2043)
13228 AB621	5.20 (0.2047)
13228 AB631	5.21 (0.2051)
13228 AB641	5.22 (0.2055)
13228 AB651	5.23 (0.2059)
13228 AB661	5.24 (0.2063)
13228 AB671	5.25 (0.2067)
13228 AB681	5.26 (0.2071)
13228 AB691	5.27 (0.2075)
13228 AB701	4.38 (0.1724)
13228 AB711	4.40 (0.1732)
13228 AB721	4.42 (0.1740)
13228 AB731	4.44 (0.1748)
13228 AB741	4.46 (0.1756)
13228 AB751	4.48 (0.1764)
13228 AB761	4.50 (0.1771)
13228 AB771	4.52 (0.1780)
13228 AB781	4.54 (0.1787)
13228 AB791	4.56 (0.1795)
13228 AB801	4.58 (0.1803)
13228 AB811	4.60 (0.1811)
13228 AB821	4.62 (0.1819)
13228 AB831	4.64 (0.1827)
13228 AB841	4.66 (0.1835)
13228 AB851	5.29 (0.2083)
13228 AB861	5.31 (0.2091)
13228 AB871	5.33 (0.2098)
13228 AB881	5.35 (0.2106)
13228 AB891	5.37 (0.2114)
13228 AB901	5.39 (0.2122)
13228 AB911	5.41 (0.2123)
13228 AB921	5.43 (0.2138)
13228 AB931	5.45 (0.2146)
13228 AB941	5.47 (0.2154)
13228 AB951	5.49 (0.2161)
13228 AB961	5.51 (0.2169)
13228 AB971	5.53 (0.2177)
13228 AB981	5.55 (0.2185)
13228 AB991	5.57 (0.2193)
13228 AC001	5.59 (0.2201)
13228 AC011	5.61 (0.2209)
13228 AC021	5.63 (0.2217)
13228 AC031	5.65 (0.2224)

7) Inspect all valves for clearance again at this stage. If the valve clearance is not correct, repeat the procedure over again from the first step.
8) After inspection, install the related parts in the reverse order of removal.

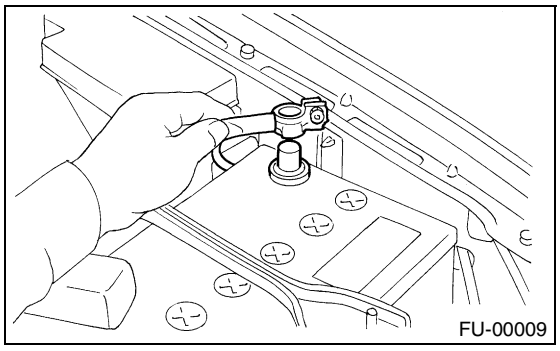
9. Engine Assembly

A: REMOVAL

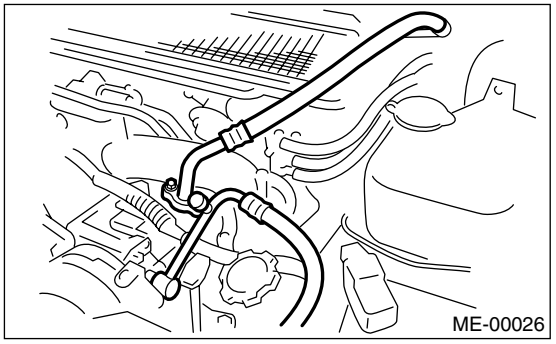
1) Set the vehicle on lift arms.
2) Open the front hood fully, and then support with the hood stay.
3) Collect the refrigerant from A/C system.
4) Release the fuel pressure.
   (1) Disconnect the fuel pump relay connector.



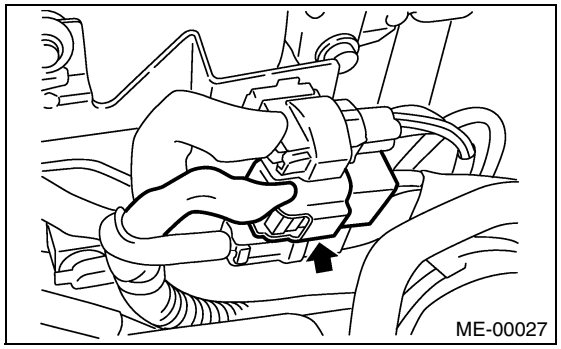
   (2) Start the engine, and run until stalls.
   (3) After the engine stalls, crank it for 5 seconds more.
   (4) Turn the ignition switch to OFF.
5) Remove the filler cap.
6) Disconnect the ground cable from battery.



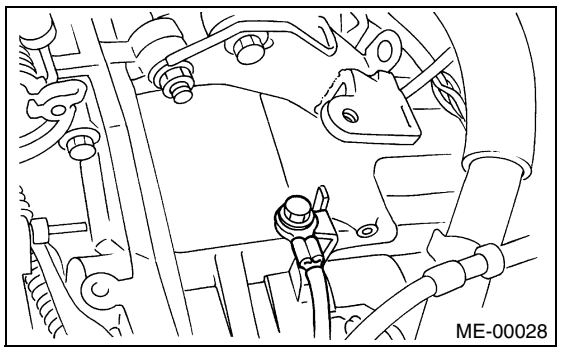
7) Remove the radiator from vehicle. <Ref. to CO(SOHC)-27, REMOVAL, Radiator.>
8) Remove the coolant filler tank. <Ref. to CO(SOHC)-42, REMOVAL, Coolant Filler Tank.>
9) Disconnect the A/C pressure hoses from A/C compressor.



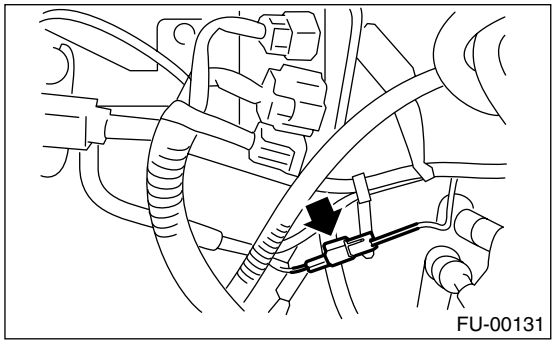
10) Remove the intercooler. <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
11) Disconnect the following connectors and cable.
   (1) Engine harness connector

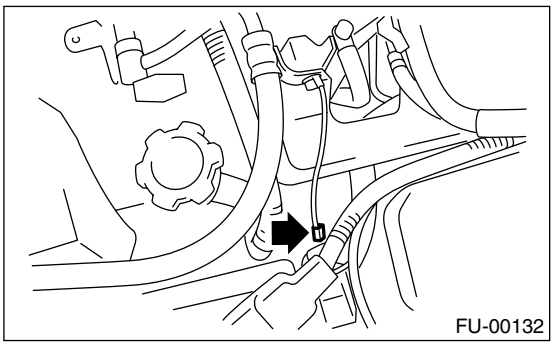


   (2) Engine ground terminal

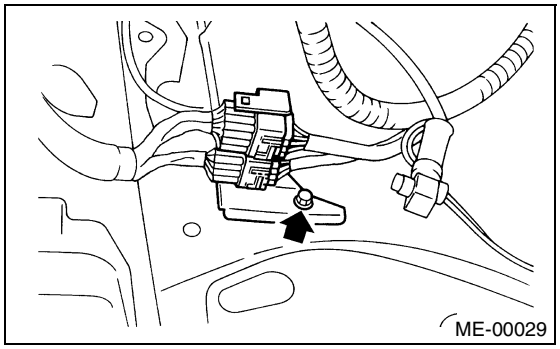


   (3) Disconnect the right and left side engine ground cables.

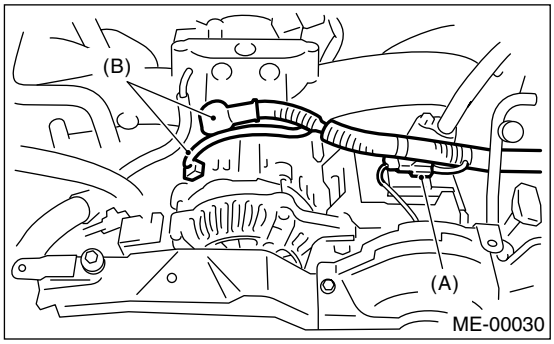




(4) Engine harness connector

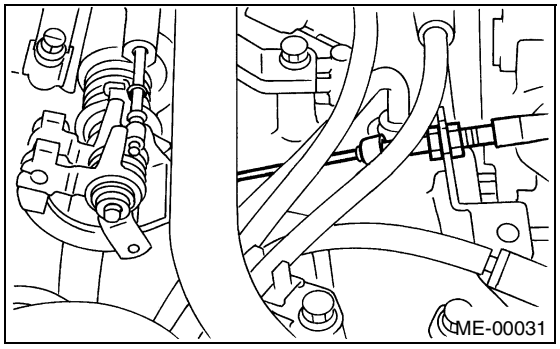


(5) Generator connector, terminal and A/C compressor connectors

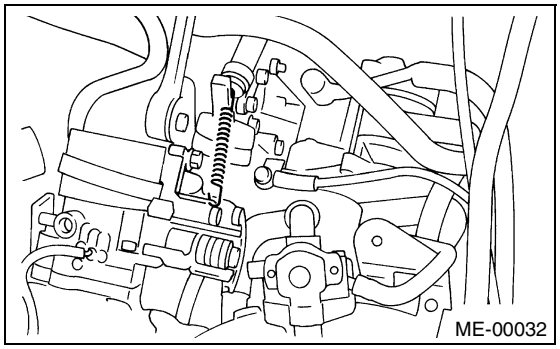


(A) A/C compressor connector
(B) Generator connector and terminal

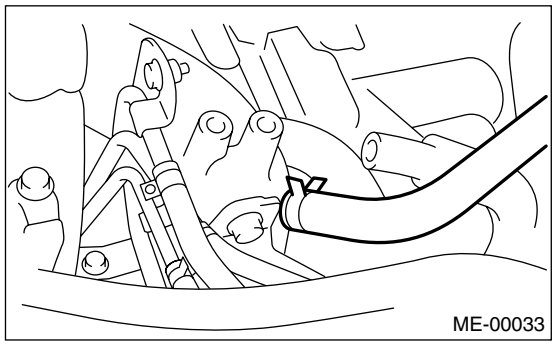
(6) Accelerator cable (MT vehicles)



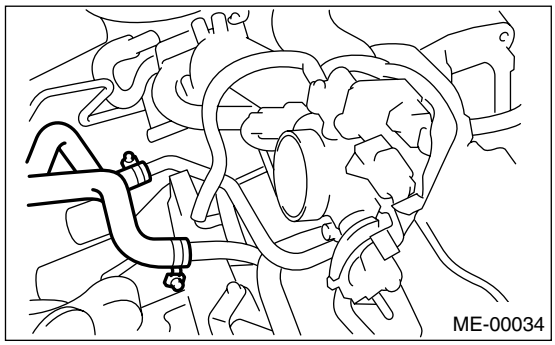
(7) Clutch release spring (MT vehicles)



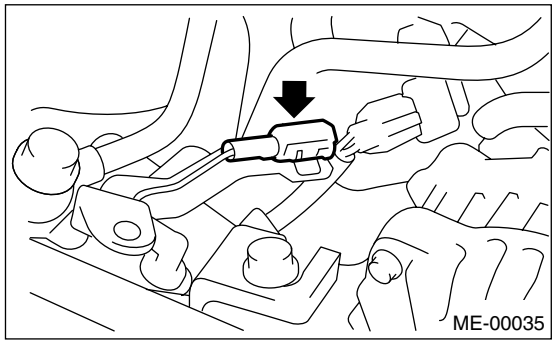
12) Disconnect the following hoses.
(1) Brake booster vacuum hose



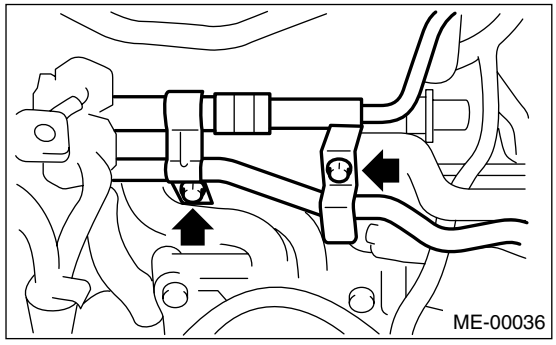
(2) Heater inlet outlet hose



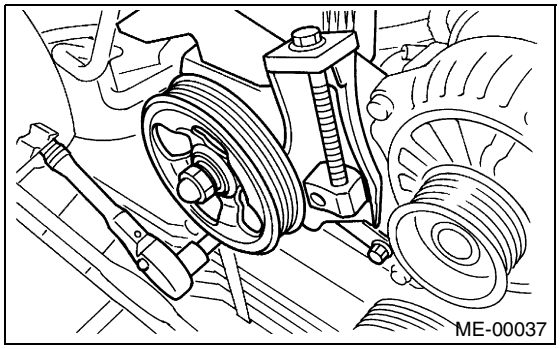
13) Remove the power steering pump from bracket.
(1) Loosen the lock bolt and slider bolt, and then remove the front side V-belt. <Ref. to ME(TURBO)-44, FRONT SIDE BELT, REMOVAL, V-belt.>
(2) Disconnect the power steering switch connector.



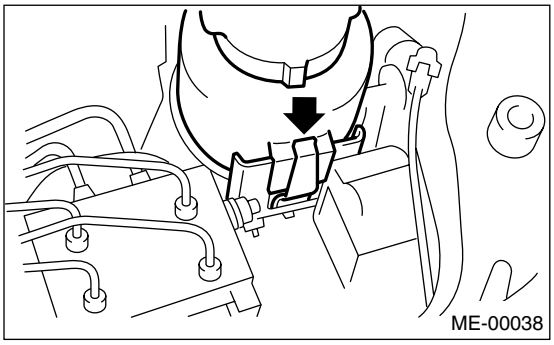
(3) Remove the pipe with bracket from intake manifold.



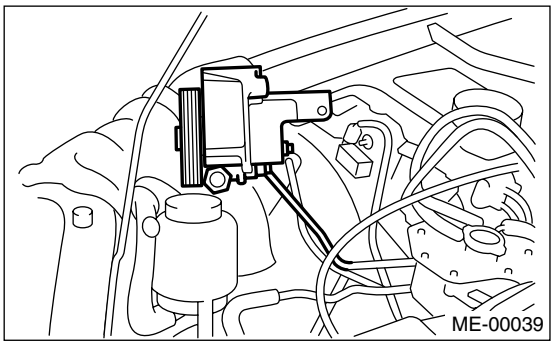
(4) Remove the power steering pump from engine.



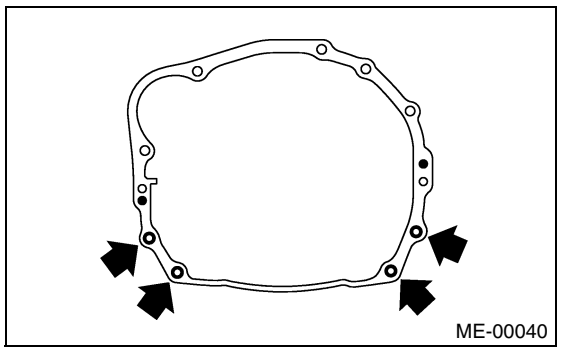
(5) Remove the power steering tank from bracket by pulling it upward.



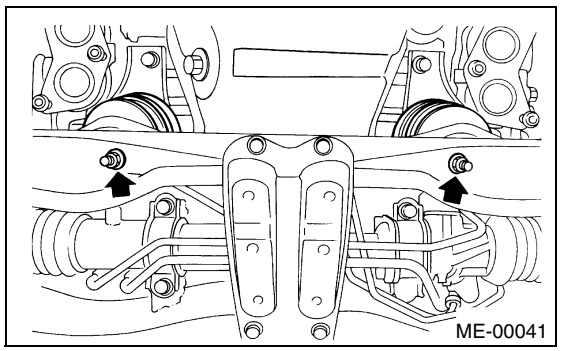
(6) Place the power steering pump on right side wheel apron.



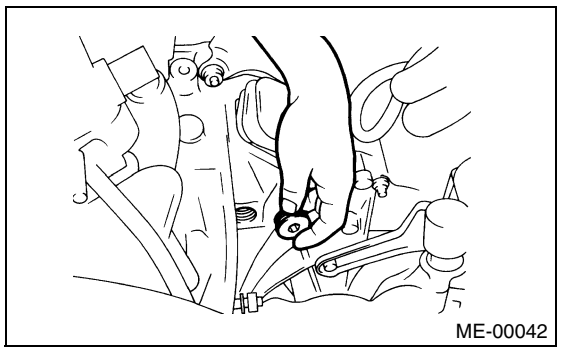
14) Lift-up the vehicle.
15) Remove the ATF cooler pipe from frame. (AT vehicles)
16) Remove the center exhaust pipe. <Ref. to EX(TURBO)-7, REMOVAL, Center Exhaust Pipe.>
17) Remove the nuts which hold lower side of transmission to engine.



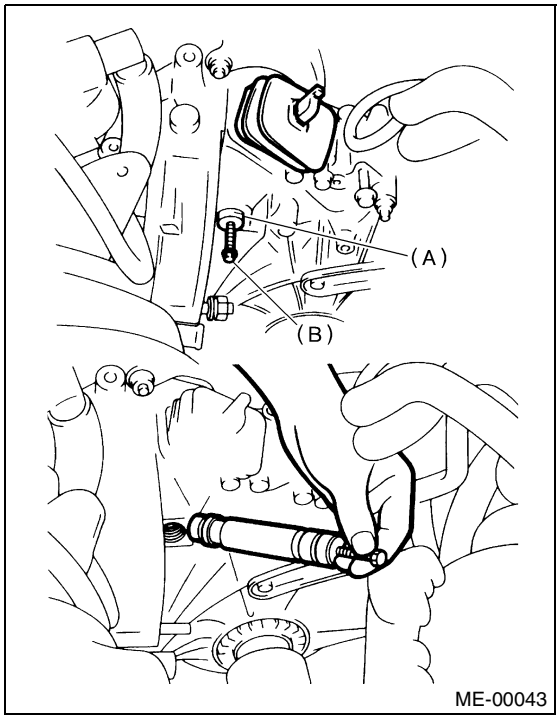
18) Remove the nuts which install front cushion rubber onto front crossmember.



19) Lower the vehicle.
20) Separate the clutch release fork from release bearing. (MT vehicles)
(1) Remove the clutch operating cylinder from transmission.
(2) Remove the plug using a 10 mm hexagon wrench.



(3) Screw the 6 mm dia. bolt into release fork shaft, and remove it.

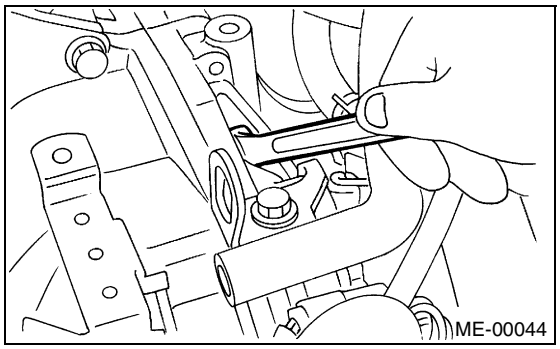


(A) Shaft
(B) Bolt

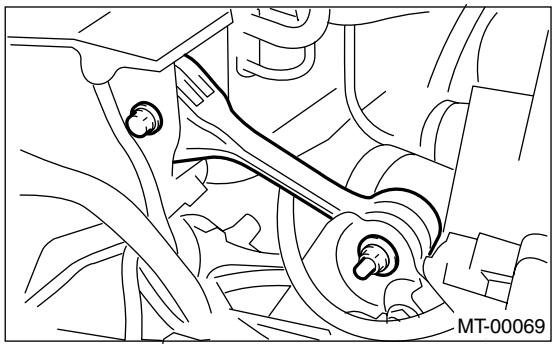
(4) Raise the release fork, and then unfasten the release bearing tabs to free release fork.

NOTE:
Step (4) is required to prevent interference with engine when removing the engine from transmission.

21) Separate the torque converter clutch from drive plate. (AT vehicles)
(1) Lower the vehicle.
(2) Remove the service hole plug.
(3) Remove the bolts which hold torque converter clutch to drive plate.
(4) Remove the other bolts while rotating the engine using socket wrench.

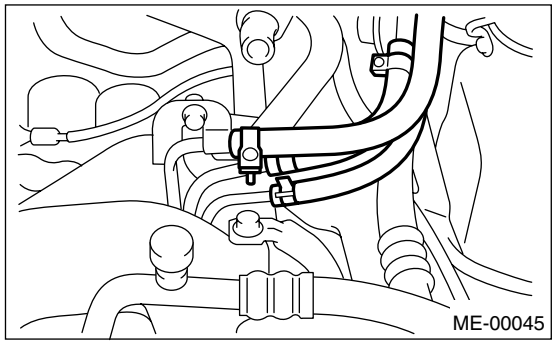


22) Remove the pitching stopper.

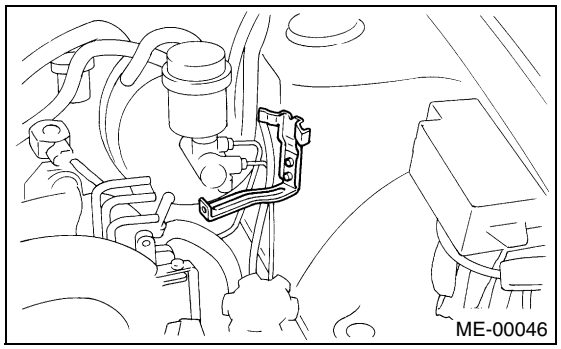


23) Disconnect the fuel delivery hose, return hose and evaporation hose.

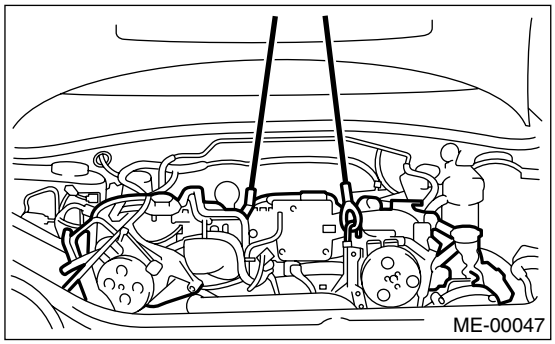
NOTE:
• Catch fuel from the hose into container.
• Disconnect the hose with its end wrapped with cloth to prevent fuel from splashing.



24) Remove the fuel filter and bracket.

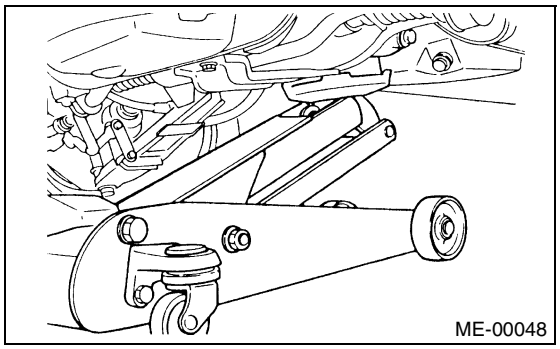


25) Support the engine with a lifting device and wire ropes.



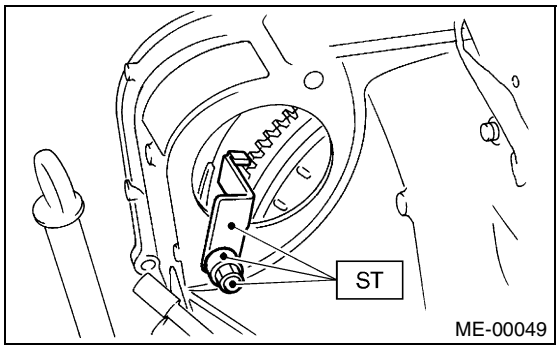
26) Support the transmission with a garage jack.

NOTE:
Before moving the engine away from transmission, check to be sure no work has been overlooked. Doing this is very important in order to facilitate re-installation and because transmission lowers under its own weight.


ME-00048

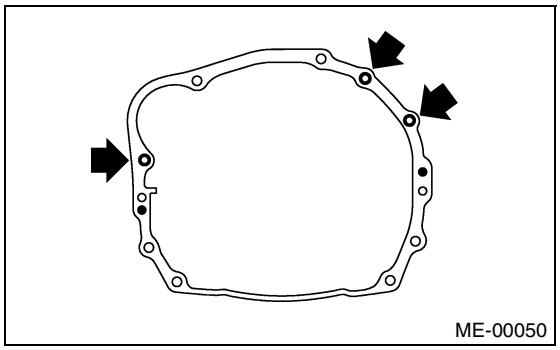
27) Separation of the engine and transmission.
(1) Remove the starter. <Ref. to SC(SOHC)-6, REMOVAL, Starter.>
(2) Install the ST to torque converter clutch case. (AT vehicles)

ST 498277200 STOPPER SET



ME-00049

(3) Remove the bolts which hold right upper side of transmission to engine.


ME-00050

28) Remove the engine from vehicle.
(1) Slightly raise the engine.
(2) Raise the transmission with garage jack.
(3) Move the engine horizontally until the mainshaft is withdrawn from clutch cover.
(4) Slowly move the engine away from engine compartment.

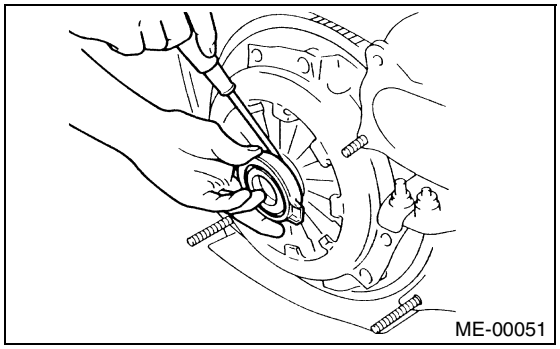
NOTE:
Be careful not to damage adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

29) Remove the front cushion rubbers.

B: INSTALLATION

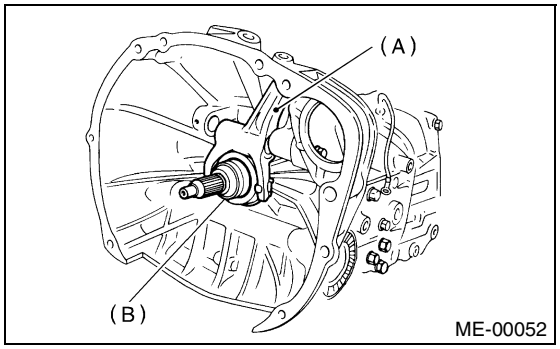
1) Install the clutch release fork and bearing onto transmission. (MT vehicles)

(1) Remove the release bearing from clutch cover with flat type screw driver.



(2) Install the release bearing on transmission.

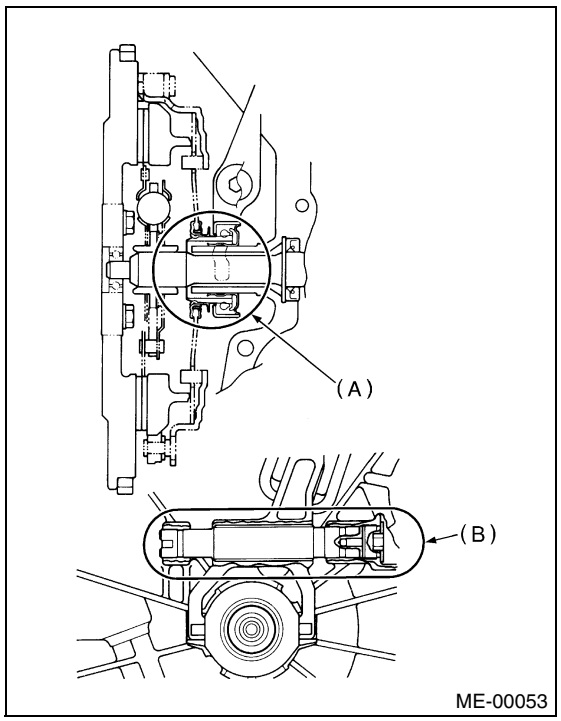
(3) Install the release fork into release bearing tab.



(A) Release fork
(B) Release bearing

(4) Apply grease to the specified points.

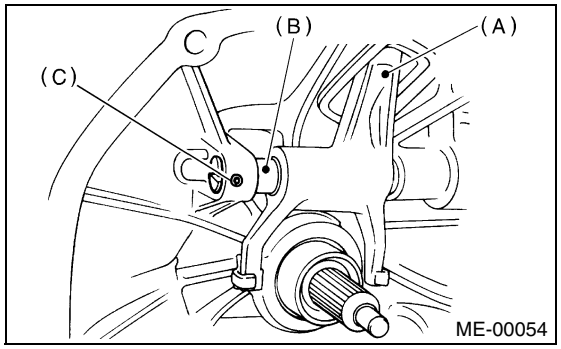
- Spline FX2200
- Shaft SUNLIGHT 2



(A) Spline (FX2200)
(B) Shaft (SUNLIGHT 2)

(5) Insert the release fork shaft into release fork.

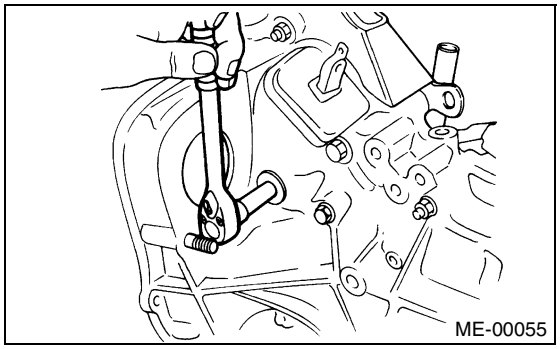
CAUTION:
Make sure the cutout portion of release fork shaft contacts spring pin.



(A) Release fork
(B) Release shaft
(C) Spring pin

(6) Tighten the plug.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)



2) Install the front cushion rubbers to engine.

Tightening torque:
34 N·m (3.5 kgf-m, 25.3 ft-lb)

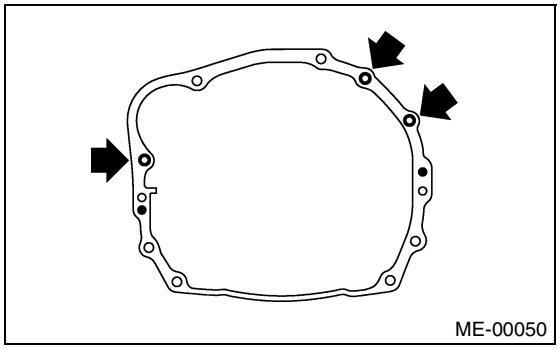
3) Install the engine onto transmission.
(1) Position the engine in engine compartment, and then align it with the transmission.

NOTE:
Be careful not to damage the adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

(2) Apply a small amount of grease to the splines of mainshaft. (MT vehicles)

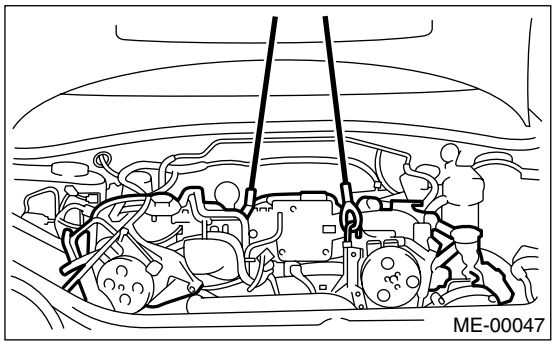
4) Tighten the bolts which hold right upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



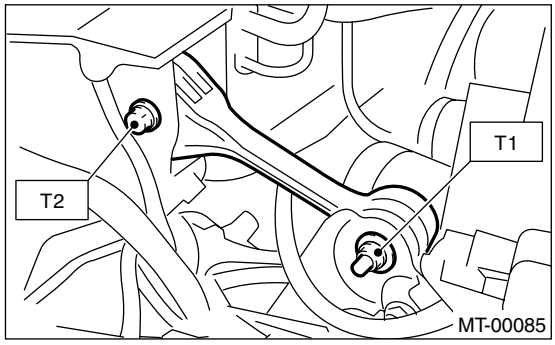
5) Remove the lifting device and wire ropes.

6) Remove the garage jack.



7) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



8) Remove the ST from torque converter clutch case. (AT vehicles)

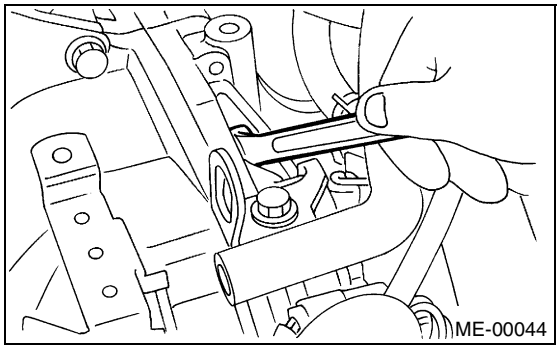
NOTE:
Be careful not to drop the ST into torque converter clutch case when removing ST.
ST 498277200 STOPPER SET

9) Install the starter. <Ref. to SC(SOHC)-6, INSTALLATION, Starter.>

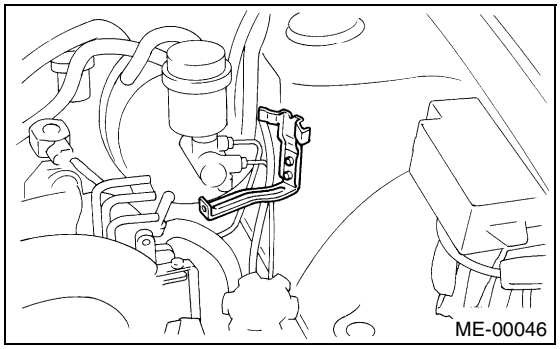
10) Install the torque converter clutch onto drive plate. (AT vehicles)
(1) Tighten the bolts which hold torque converter clutch to drive plate.
(2) Tighten other bolts while rotating the engine by using ST.

CAUTION:
Be careful not to drop bolts into the torque converter clutch housing.
ST 499977300 CRANK PULLEY WRENCH

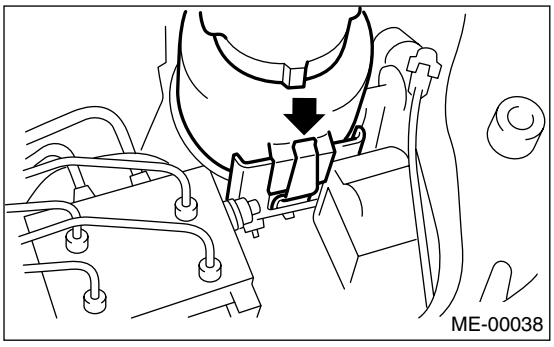
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(3) Clog the service hole with plug.
11) Install the fuel filter and bracket.

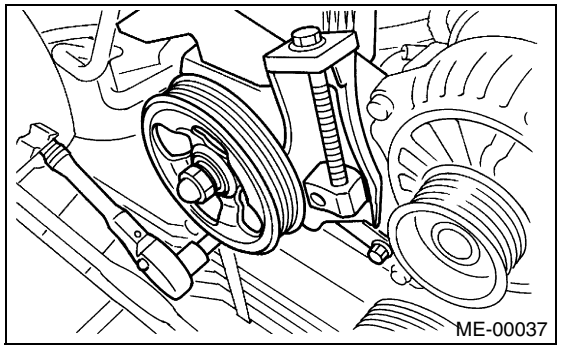


12) Install the power steering pump on bracket.
(1) Install the power steering tank on bracket.

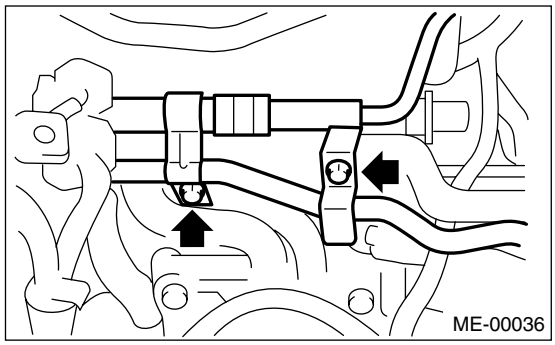


(2) Install the power steering pump.

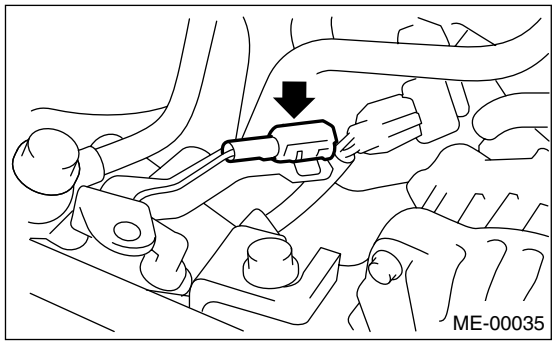
Tightening torque:
20.1 N·m (2.05 kgf-m, 14.8 ft-lb)



(3) Install the power steering pipe bracket on right side intake manifold.



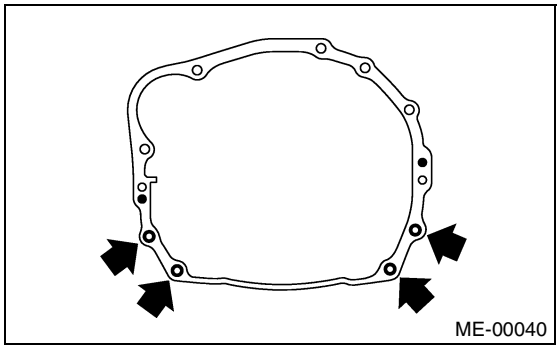
(4) Connect the power steering switch connector.



(5) Install the front side V-belt, and adjust it. <Ref. to ME(TURBO)-44, FRONT SIDE BELT, INSTALLATION, V-belt.>
13) Lift-up the vehicle.

14) Tighten the nuts which hold lower side of transmission to engine.

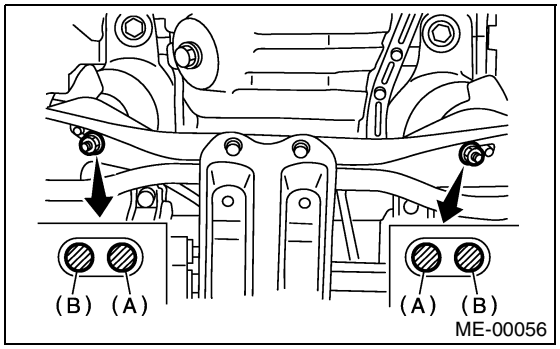
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



15) Tighten the nuts which install front cushion rubber onto crossmember.

Tightening torque:
83 N·m (8.5 kgf-m, 61 ft-lb)

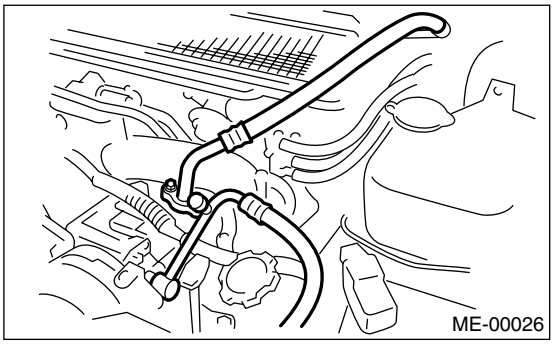
NOTE:
Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



16) Install the ATF cooler pipe to frame. (AT vehicles)
17) Install the center exhaust pipe.
<Ref. to EX(TURBO)-8, INSTALLATION, Center Exhaust Pipe.>
18) Lower the vehicle.
19) Connect the following hoses:
(1) Fuel delivery hose, return hose and evaporation hose
(2) Heater inlet and outlet hoses
(3) Brake booster vacuum hose
20) Connect the following connectors and terminals:
(1) Engine ground terminal
(2) Engine harness connectors
(3) Generator connector and terminal
(4) A/C compressor connectors
21) Connect the following cables:
(1) Accelerator cable
(2) Clutch release spring
22) After connecting each cable, adjust them.
23) Install the air intake system.
(1) Install the intercooler. <Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>
(2) Install the air cleaner element and air cleaner upper cover.
(3) Install the engine harness connector bracket.
(4) Install the filler hose to air cleaner case.
24) Install the A/C pressure hoses.

NOTE:
Use new O-rings.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



25) Install the radiator. <Ref. to CO(SOHC)-29, INSTALLATION, Radiator.>
26) Install the coolant filler tank. <Ref. to CO(SOHC)-42, INSTALLATION, Coolant Filler Tank.>
27) Install the window washer tank.
28) Install the battery in the vehicle, and connect cables.
29) Fill coolant.
<Ref. to CO(SOHC)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
30) Charge the A/C system with refrigerant.
<Ref. to AC-27, OPERATION, Refrigerant Charging Procedure.>
31) Remove the front hood stay, and close the front hood.
32) Take off the vehicle from lift arms.

10.Engine Mounting

A: REMOVAL

1) Remove the engine assembly. <Ref. to ME(TURBO)-33, REMOVAL, Engine Assembly.>
2) Remove the engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Engine mounting;
34 N·m (3.5 kgf-m, 25.3 ft-lb)

C: INSPECTION

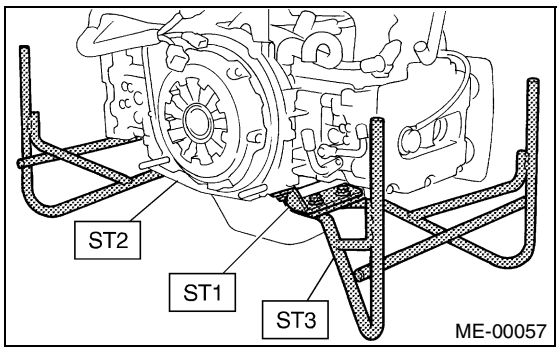
Make sure there are no cracks or other damage.

11.Preparation for Overhaul

A: PROCEDURE

1) After removing the engine from body, secure it in the ST shown below.

ST1	498457000	ENGINE STAND ADAPTER RH
ST2	498457100	ENGINE STAND ADAPTER LH
ST3	499817000	ENGINE STAND



2) In this section the procedures described under each index are all connected and stated in order. It will be the complete procedure for overhauling of the engine itself when you go through all steps in the process.
Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

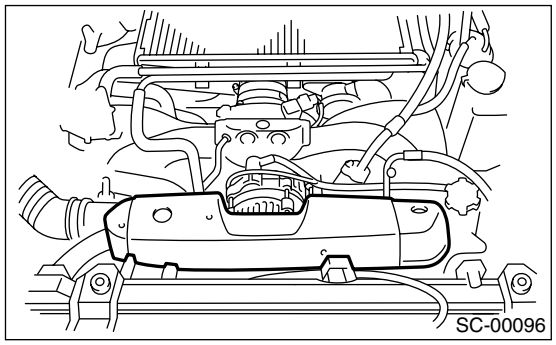
12.V-belt

A: REMOVAL

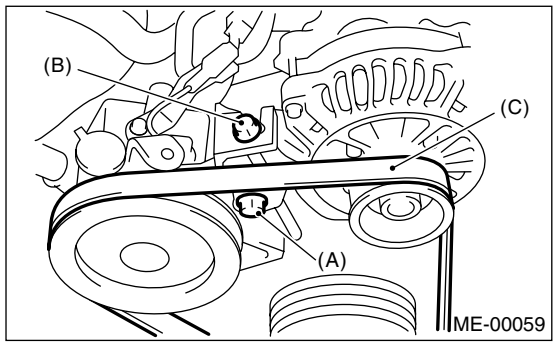
1. FRONT SIDE BELT

NOTE:
Perform the following procedures 1) to 4) with the engine installed to body.

1) Remove the V-belt cover.

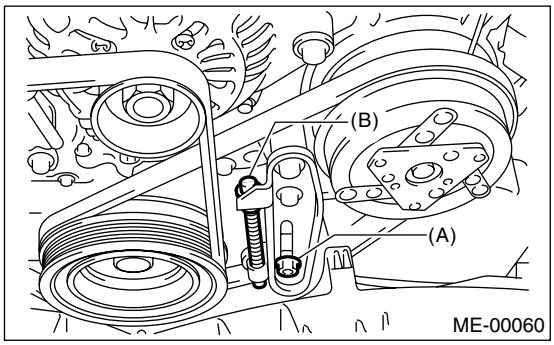


2) Loosen the lock bolt (A).
3) Loosen the slider bolt (B).
4) Remove the front side belt (C).

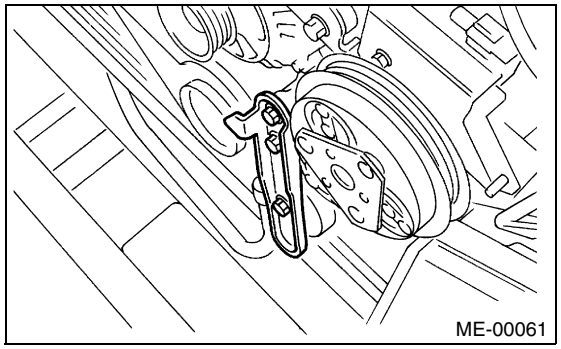


2. REAR SIDE BELT

1) Loosen the lock nut (A).
2) Loosen the slider bolt (B).



3) Remove the A/C belt.
4) Remove the A/C belt tensioner.



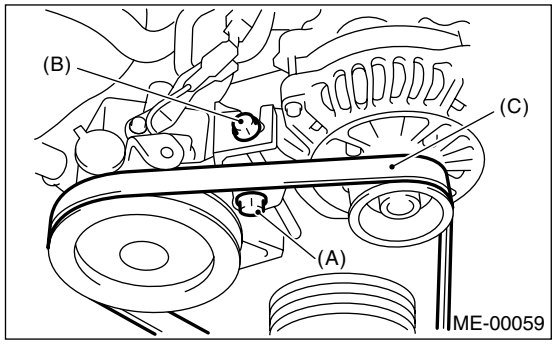
B: INSTALLATION

1. FRONT SIDE BELT

CAUTION:
Wipe off any oil or water on the belt and pulley.

1) Install the belt (C), and tighten the slider bolt so as to obtain the specified belt tension <Ref. to ME(TURBO)-45, INSPECTION, V-belt.>
2) Tighten the lock bolt (A)
3) Tighten the slider bolt (B).

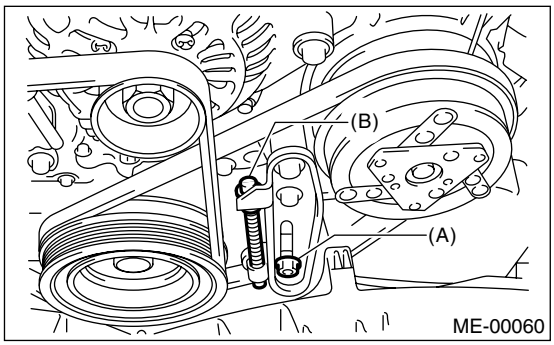
Tightening torque:
Lock bolt through bolt:
25 N·m (2.5 kgf-m, 18.1 ft-lb)
Slider bolt:
8 N·m (0.8 kgf-m, 5.5 ft-lb)



2. REAR SIDE BELT

1) Install the belt, and tighten the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME(TURBO)-45, INSPECTION, V-belt.>
2) Tighten the lock nut (A).

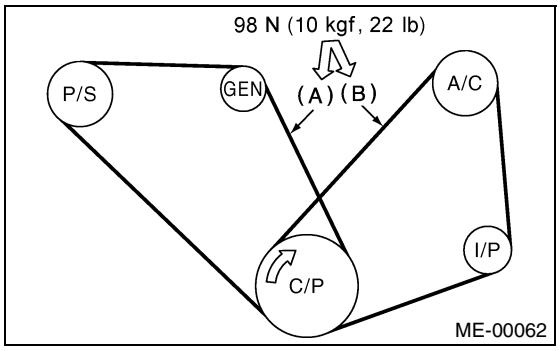
Tightening torque:
Lock nut (A);
22.6 N·m (2.3 kgf-m, 16.6 ft-lb)



C: INSPECTION

1) Replace the belts, if cracks, fraying or wear is found.
2) Check the drive belt tension and adjust it if necessary by changing generator installing position and/or idler pulley installing position.

Belt tension
(A)
replaced: 7 — 9 mm (0.276 — 0.354 in)
reused: 9 — 11 mm (0.354 — 0.433 in)
(B)*
replaced: 7.5 — 8.5 mm (0.295 — 0.335 in)
reused: 9.0 — 10.0 mm (0.354 — 0.394 in)
****: with air conditioner***



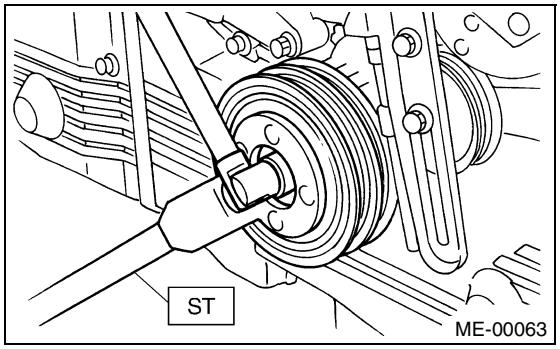
C/P	Crankshaft pulley
GEN	Generator
P/S	Power steering oil pump pulley
A/C	Air conditioning compressor pulley
I/P	Idler pulley

13.Crankshaft Pulley

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(TURBO)-44, REMOVAL, V-belt.>
2) Remove the crankshaft pulley bolt. To lock the crankshaft, use ST.

ST 499977400 CRANKSHAFT PULLEY WRENCH



3) Remove the crankshaft pulley.

B: INSTALLATION

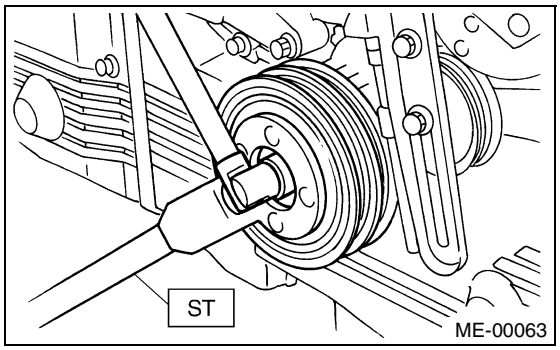
1) Install the crankshaft pulley.
2) Install the pulley bolt.

To lock the crankshaft, use ST.

ST 499977400 CRANKSHAFT PULLEY WRENCH

(1) Clean the crankshaft pulley thread using an air gun.
(2) Apply engine oil to the crankshaft pulley bolt seat and thread.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(4) Tighten the crankshaft pulley bolts.

Tightening torque:
127 N·m (13 kgf-m, 94.0 ft-lb)



3) Confirm that the tightening angle of crankshaft pulley bolt is 45 degrees or more. If not, conduct the following procedures (1) through (4).

CAUTION:
If the tightening angle of crankshaft pulley bolt is less than 45 degrees, the bolt should be damaged. In this case, the bolt must be replaced.

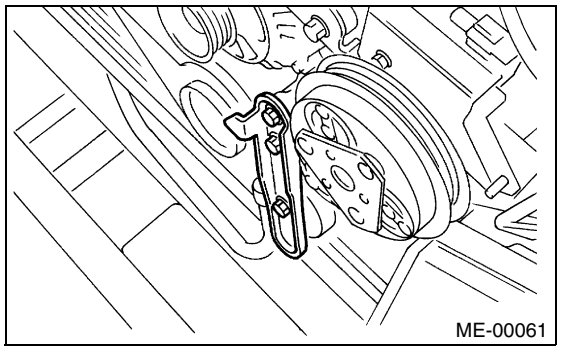
(1) Replace the crankshaft pulley bolts and clean them.

Crankshaft pulley bolt:
12369AA011

(2) Clean the crankshaft thread using an air gun.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(4) Tighten the crankshaft pulley bolts keeping them in an angle between 45 degrees and 60 degrees.

NOTE:
Conduct the tightening procedures by confirming the turning angle of the crankshaft pulley bolt referring to the gauge indicated on the belt cover.

4) Install the A/C belt tensioner.



5) Install the V-belt. <Ref. to ME(TURBO)-44, INSTALLATION, V-belt.>

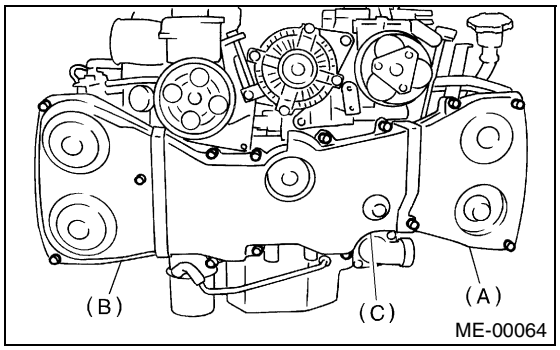
C: INSPECTION

1) Make sure the V-belt is not worn or otherwise damaged.
2) Check the tension of the belt. <Ref. to ME(TURBO)-45, INSPECTION, V-belt.>

14.Belt Cover

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(TURBO)-44, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(TURBO)-46, REMOVAL, Crankshaft Pulley.>
3) Remove the belt cover (LH) (A).
4) Remove the belt cover (RH) (B).
5) Remove the front belt cover (C).



B: INSTALLATION

1) Install the front belt cover (C).

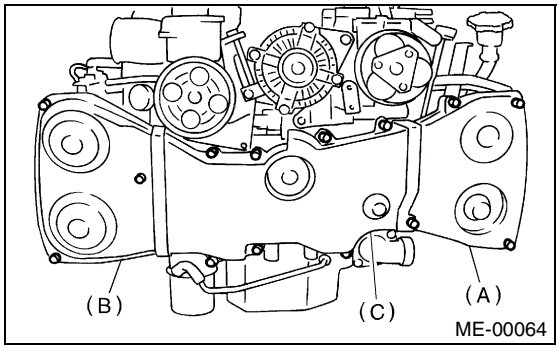
Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

2) Install the belt cover (RH) (B).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

3) Install the belt cover (LH) (A).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



4) Install the crankshaft pulley. <Ref. to ME(TURBO)-46, INSTALLATION, Crankshaft Pulley.>
5) Install the V-belt. <Ref. to ME(TURBO)-44, INSTALLATION, V-belt.>

C: INSPECTION

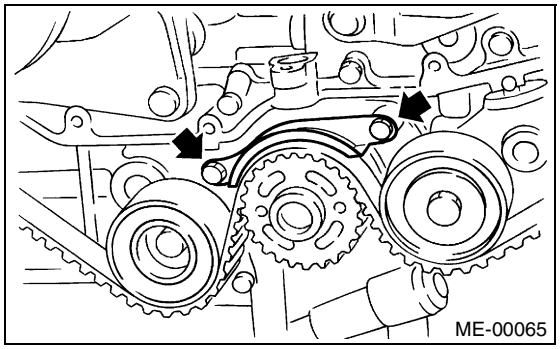
Make sure the cover is not damaged.

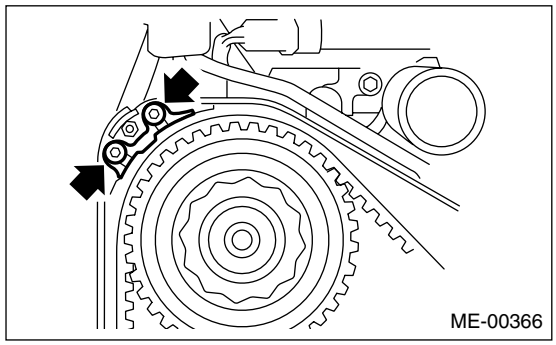
15.Timing Belt Assembly

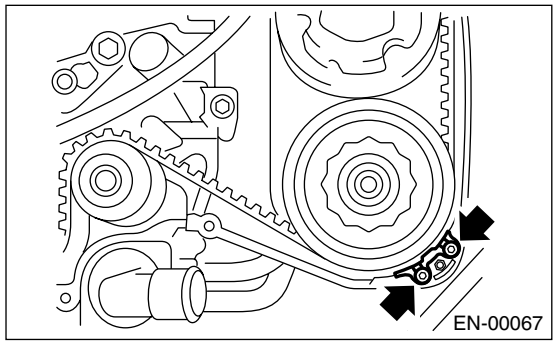
A: REMOVAL

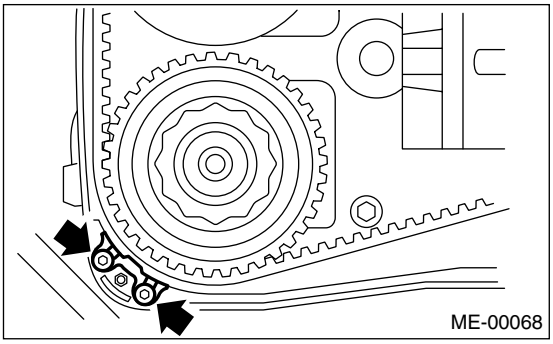
1. TIMING BELT

1) Remove the V-belt. <Ref. to ME(TURBO)-44, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(TURBO)-46, REMOVAL, Crankshaft Pulley.>
3) Remove the belt cover. <Ref. to ME(TURBO)-47, REMOVAL, Belt Cover.>
4) Remove the timing belt guides. (MT vehicles)


ME-00065

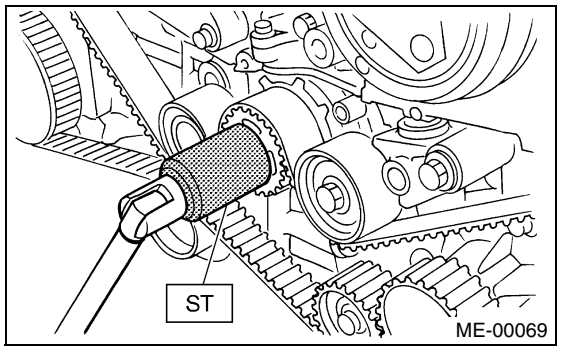

ME-00366


EN-00067


ME-00068

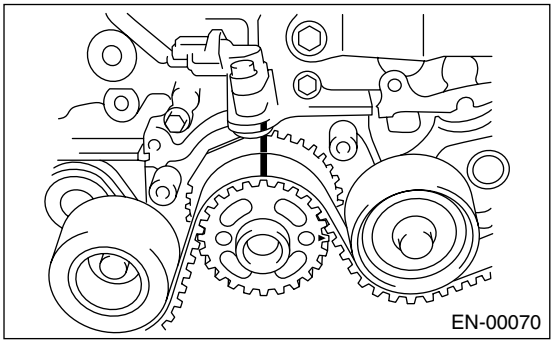
5) If the alignment mark and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing the timing belt as follows:
   (1) Turn the crankshaft using ST, and align the alignment marks on crankshaft sprocket, intake camshaft sprocket (LH), exhaust camshaft sprocket (LH), intake camshaft sprocket (RH) and exhaust camshaft sprocket (RH) with notches of belt cover and cylinder block.

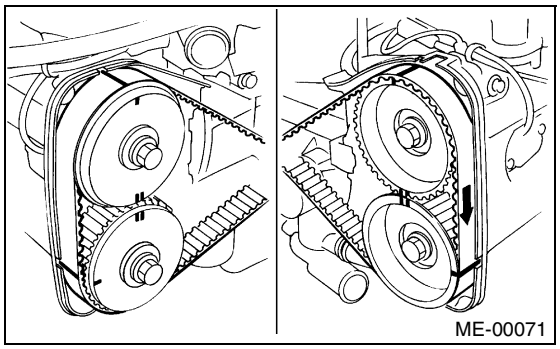
ST 499987500 CRANKSHAFT SOCKET



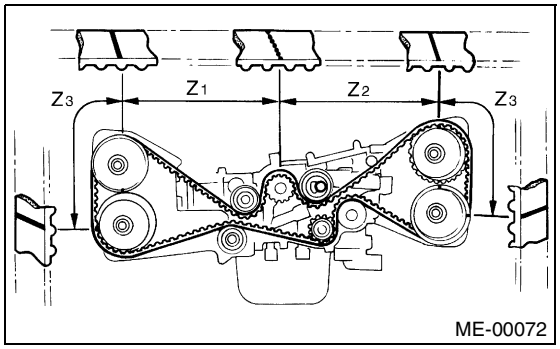
ME-00069

(2) Using white paint, put alignment and/or arrow marks on the timing belts in relation to the sprockets.


EN-00070

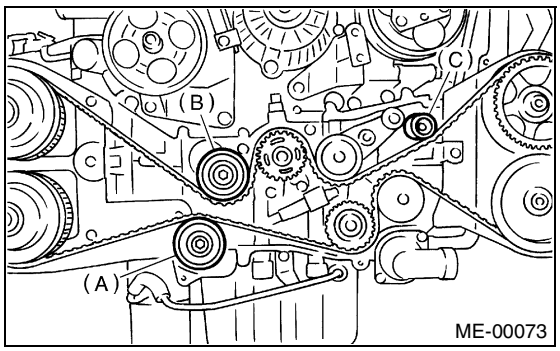

ME-00071

Z_1: 54.5 tooth length
Z_2: 51 tooth length
Z_3: 28 tooth length



ME-00072

6) Remove the belt idler (A).



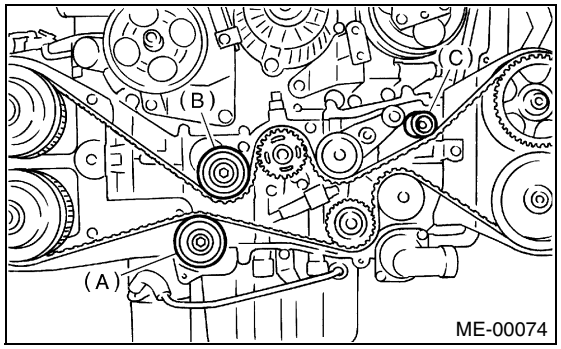
ME-00073

7) Remove the timing belt.

CAUTION:
After the timing belt has been removed, never rotate the intake and exhaust, camshaft sprocket. If the camshaft sprocket is rotated, the intake and exhaust valve heads strike together and valve stems are bent.

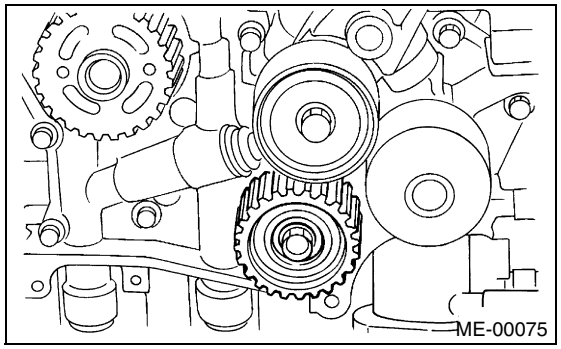
2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

1) Remove the belt idler (B) and (C).

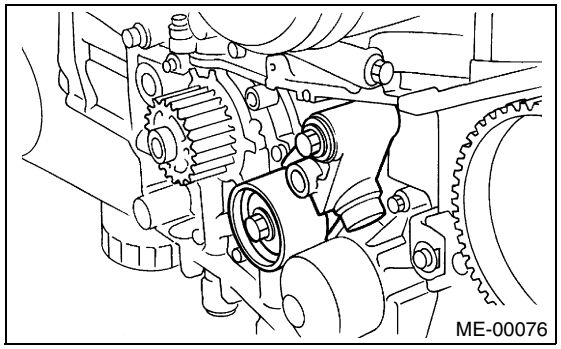


ME-00074

2) Remove the belt idler No. 2.


ME-00075

3) Remove the automatic belt tension adjuster assembly.


ME-00076

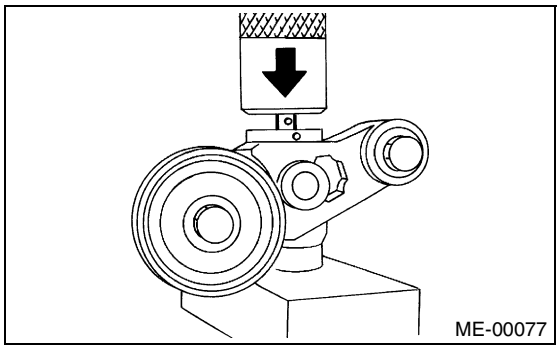
B: INSTALLATION

1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

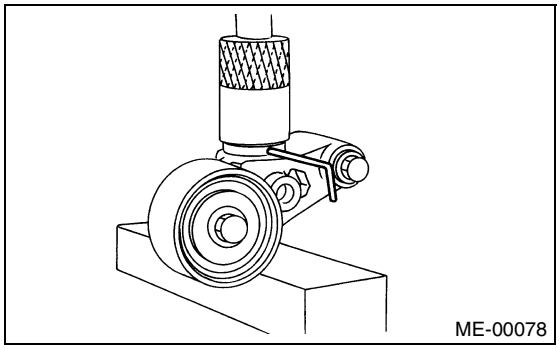
1) Preparation for installation of automatic belt tension adjuster assembly:

NOTE:
• Always use a vertical type pressing tool to move the adjuster rod down.
• Do not use a lateral type vise.
• Push the adjuster rod vertically.
• Be sure to slowly move the adjuster rod down applying a pressure of 294 N (30 kgf, 66 lb).
• Press-in the push adjuster rod gradually taking more than 3 minutes.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
• Press the adjuster rod as far as the end surface of cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.
• Do not release the press pressure until stopper pin is completely inserted.

(1) Attach the automatic belt tension adjuster assembly to the vertical pressing tool.
(2) Slowly move the adjuster rod down with a pressure of 294 N (30 kgf, 66 lb) until the adjuster rod is aligned with the stopper pin hole in the cylinder.

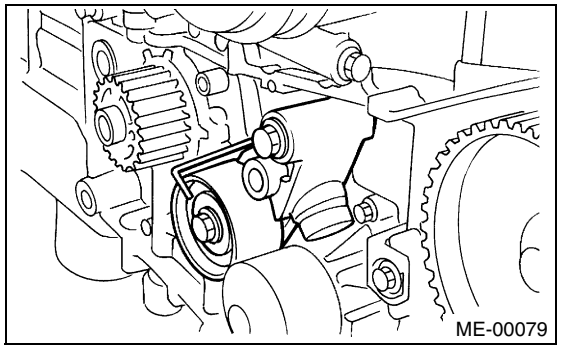

ME-00077

(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (0.08 in) (nominal) dia. hex bar wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.


ME-00078

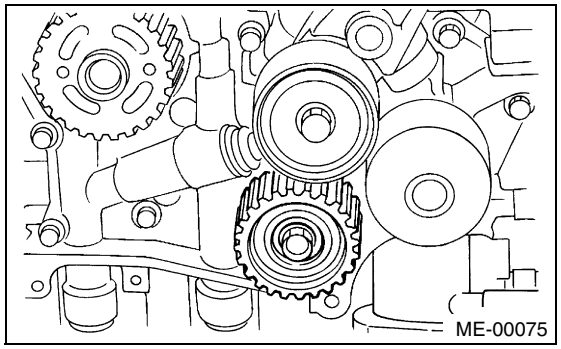
2) Install the automatic belt tension adjuster assembly.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)


ME-00079

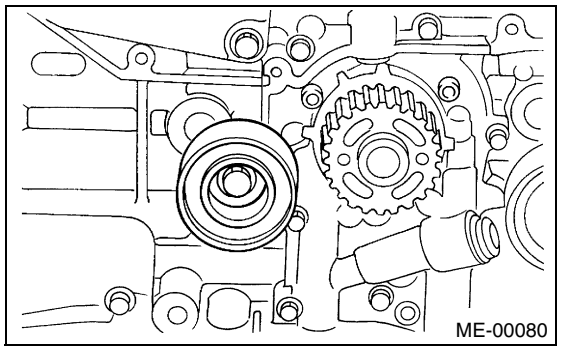
3) Install the belt idler No. 2.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)


ME-00075

4) Install the belt idler.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

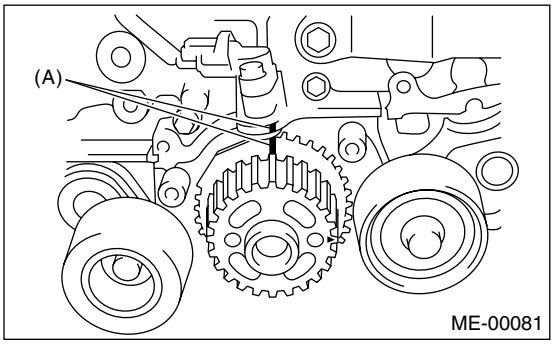

ME-00080

2. TIMING BELT

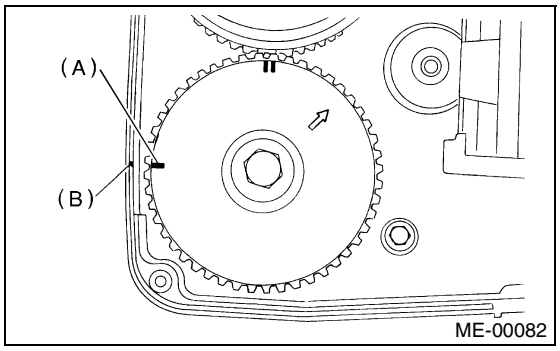
1) Preparation for installation of automatic belt tension adjuster assembly. <Ref. to ME(TURBO)-50, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, Timing Belt Assembly.>

2) Crankshaft and camshaft sprocket alignment.

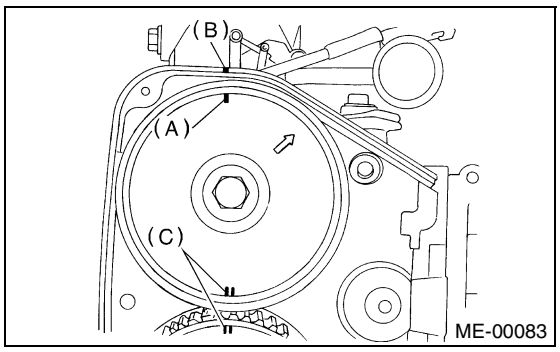
(1) Align mark (A) on the crankshaft sprocket with mark on the oil pump cover at cylinder block.



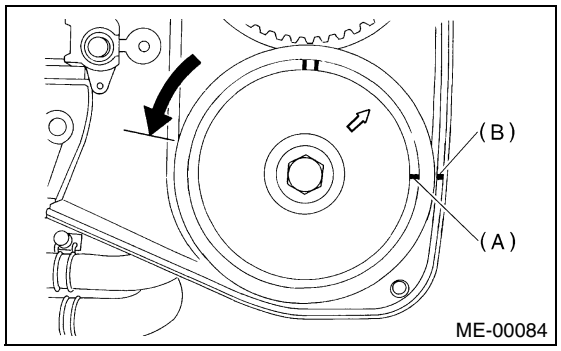
(2) Align single line mark (A) on the exhaust camshaft sprocket (RH) with notch (B) on belt cover.



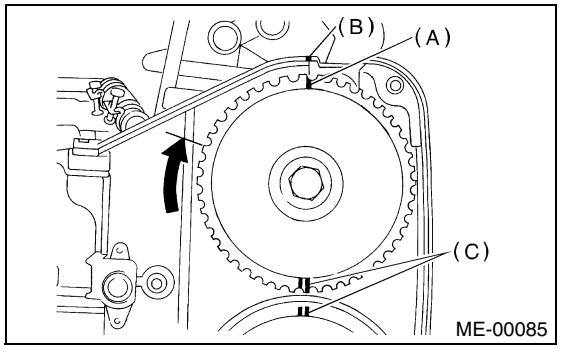
(3) Align single line mark (A) on the intake camshaft sprocket (RH) with notch (B) on belt cover. (Make sure double lines (C) on intake camshaft and exhaust camshaft sprockets are aligned.)



(4) Align single line mark (A) on exhaust camshaft sprocket (LH) with notch (B) on belt cover by turning the sprocket counterclockwise (as viewed from front of engine).

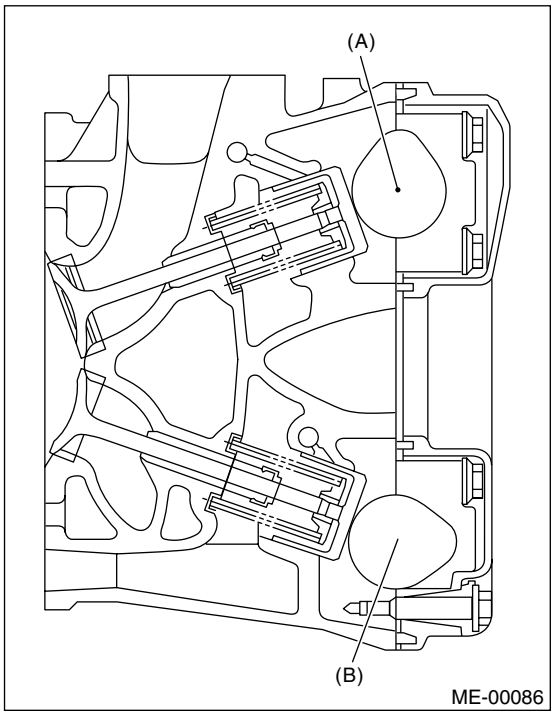


(5) Align the single line mark (A) on intake camshaft sprocket (LH) with notch (B) on belt cover by turning the sprocket clockwise (as viewed from front of engine).
Ensure the double lines (C) on intake and exhaust camshaft sprockets are aligned.



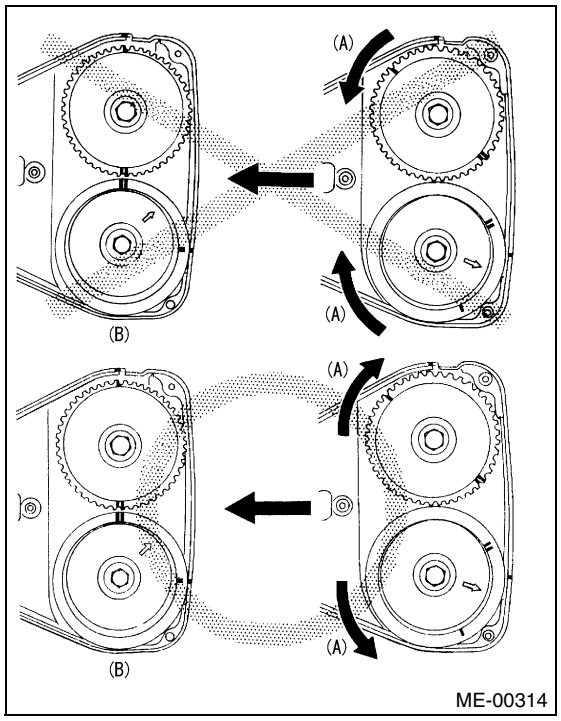
(6) Ensure the camshaft and crankshaft sprockets are positioned properly.

CAUTION:
• Intake and exhaust camshafts for this DOHC engine can be independently rotated with the timing belts removed. As can be seen from the figure, if the intake and exhaust valves are lifted simultaneously, their heads will interfere with each other, resulting in bent valves.



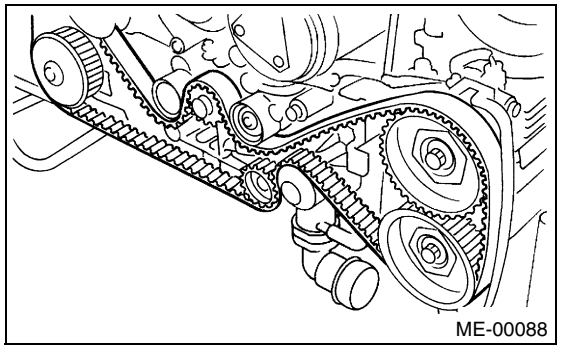
(A) Intake camshaft
(B) Exhaust camshaft

• When the timing belts are not installed, four camshafts are held at the "zero-lift" position, where all cams on camshafts do not push the intake and exhaust valves down. (Under this condition, all valves remain unlifted.)
• When the camshafts are rotated to install the timing belts, #2 intake and #4 exhaust cam of left-hand camshafts are held to push their corresponding valves down. (Under this condition, these valves are held lifted.) Right-side camshafts are held so that their cams do not push valves down.
• Left-hand camshafts must be rotated from the "zero-lift" position to the position where the timing belt is to be installed at as small an angle as possible, in order to prevent mutual interference of intake and exhaust valve heads.
• Do not allow the camshafts to rotate in the direction shown in the figure as this causes both intake and exhaust valves to lift simultaneously, resulting in interference with their heads.



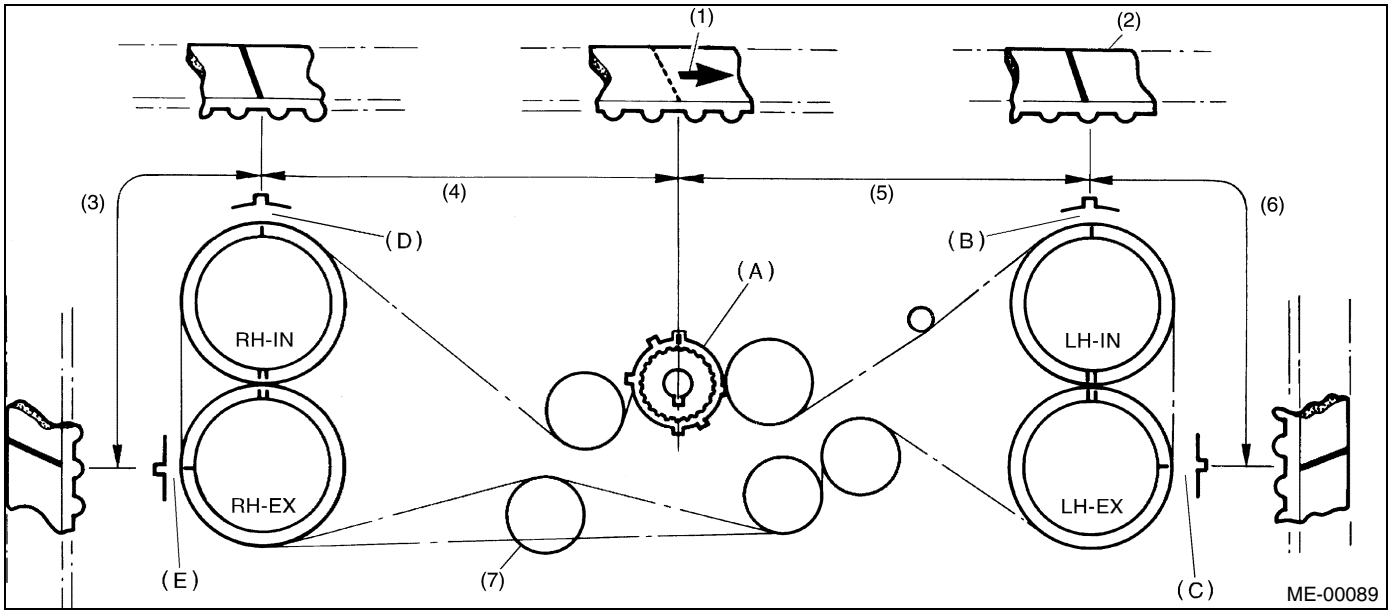
(A) Rotating direction
(B) Timing belt installation position

3) Installation of timing belt:



Align the alignment mark on timing belt with marks on sprockets in alphabetical order shown in the figure. While aligning marks, position the timing belt properly.

CAUTION:
• Disengagement of more than three timing belt teeth may result in interference between the valve and piston.
• Ensure the belt's rotating direction is correct.

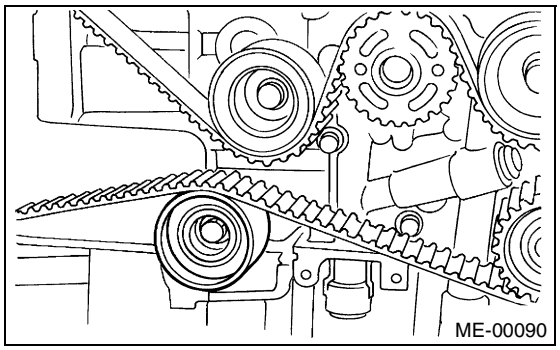


(1) Arrow mark
(2) Timing belt
(3) 28 tooth length
(4) 54.5 tooth length
(5) 51 tooth length
(6) 28 tooth length
(7) Install it in the end

4) Install the belt idlers.

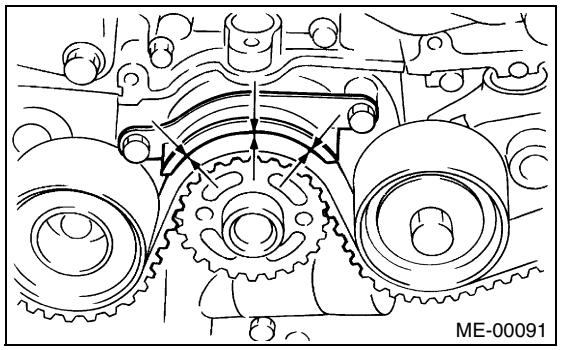
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

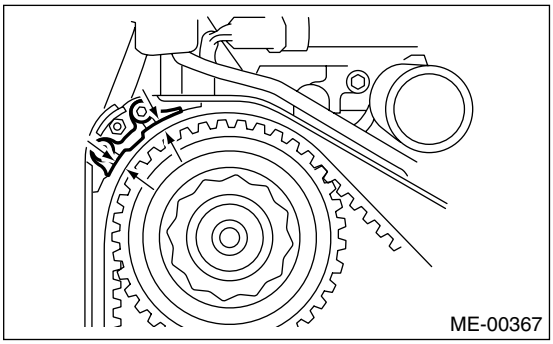
NOTE:
Make sure that the marks on the timing belt and sprockets are aligned.

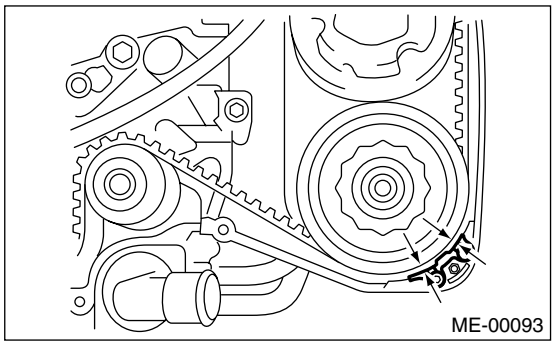


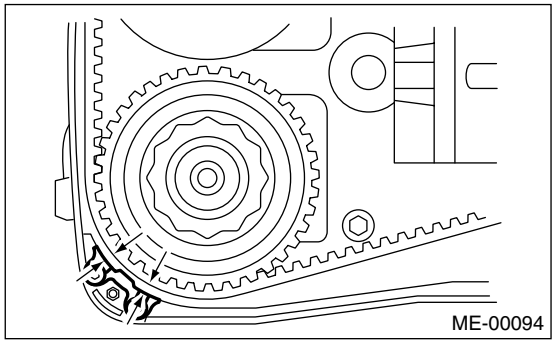
5) After ensuring that the marks on the timing belt and sprockets are aligned, remove the stopper pin from tensioner adjuster.
6) Install the timing belt guide. (MT vehicles)
(1) Temporarily tighten the bolts.
(2) Check and adjust the clearance between timing belt and timing belt guide.

Clearance:
1.0±0.5 mm (0.039±0.020 in)



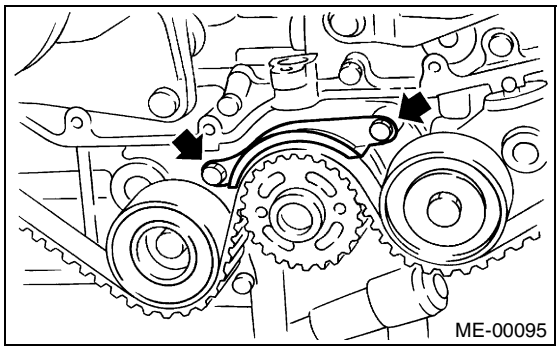




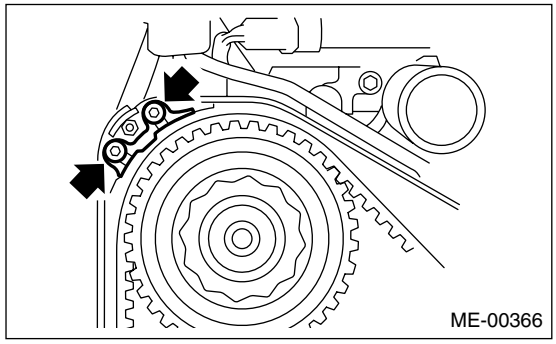


(3) Tighten the bolts.

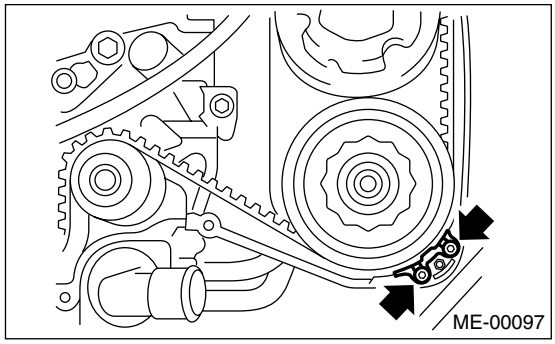
Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



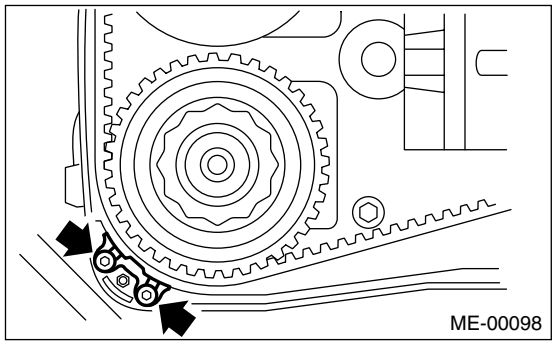
Tightening torque:
6.4 N·m (0.7 kgf-m, 5.1 ft-lb)



Tightening torque:
6.4 N·m (0.7 kgf-m, 5.1 ft-lb)



Tightening torque:
6.4 N·m (0.7 kgf-m, 5.1 ft-lb)



7) Install the belt cover. <Ref. to ME(TURBO)-47, INSTALLATION, Belt Cover.>
8) Install the crankshaft pulley. <Ref. to ME(TURBO)-46, INSTALLATION, Crankshaft Pulley.>
9) Install the V-belt. <Ref. to ME(TURBO)-44, INSTALLATION, V-belt.>

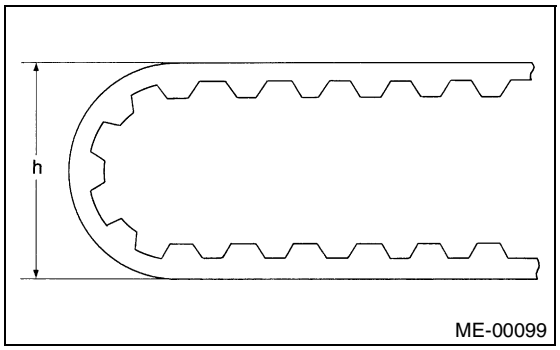
C: INSPECTION

1. TIMING BELT

1) Check the timing belt teeth for breaks, cracks, and wear. If any fault is found, replace the belt.
2) Check the condition of back side of belt; if any crack is found, replace the belt.

NOTE:
• Be careful not to let oil, grease or coolant contact the belt. Remove quickly and thoroughly if this happens.
• Do not bend the belt sharply.

Bending radius: h
60 mm (2.36 in) or more



2. AUTOMATIC BELT TENSION ADJUSTER

1) Visually check the oil seals for leaks, and rod ends for abnormal wear or scratches. If necessary, replace the automatic belt tension adjuster assembly.

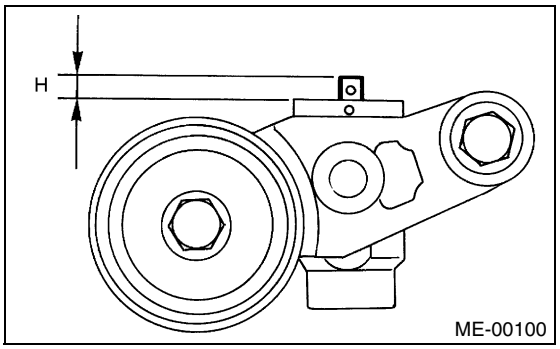
NOTE:
Slight traces of oil at rod's oil seal does not indicate a problem.

2) Check that the adjuster rod does not move when a pressure of 294 N (30 kgf, 66 lb) is applied to it. This is to check adjuster rod stiffness.
3) If the adjuster rod is not stiff and moves freely when applying 294 N (30 kgf, 66 lb), check it using the following procedures:
(1) Slowly press the adjuster rod down to the end surface of the cylinder. Repeat this motion 2 or 3 times.
(2) With the adjuster rod moved all the way up, apply a pressure of 294 N (30 kgf, 66 lb) to it. Check the adjuster rod stiffness.
(3) If the the adjuster rod is not stiff and moves down, replace the automatic belt tension adjuster assembly with a new one.

NOTE:
• Always use a vertical type pressing tool to move the adjuster rod down.
• Do not use a lateral type vise.
• Push the adjuster rod vertically.
• Press-in the push adjuster rod gradually taking more than 3 minutes.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
• Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.

4) Measure the extension of rod beyond the body. If it is not within specifications, replace with a new one.

Rod extension: H
5.7±0.5 mm (0.224±0.020 in)



3. BELT TENSION PULLEY

1) Check the mating surfaces of timing belt and contact point of adjuster rod for abnormal wear or scratches. Replace the belt tension pulley if faulty.
2) Check the belt tension pulley for smooth rotation. Replace if noise or excessive play is noted.
3) Check the belt tension pulley for grease leakage.

4. BELT IDLER

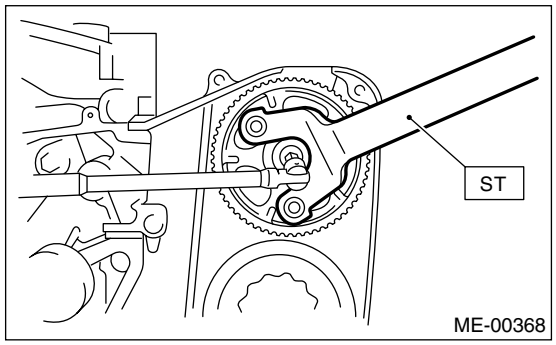
1) Check the idler for smooth rotation. Replace if noise or excessive play is noted.
2) Check the outer contacting surfaces of idler pulley for abnormal wear and scratches.
3) Check the idler for grease leakage.

16.Camshaft Sprocket

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(TURBO)-44, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(TURBO)-46, REMOVAL, Crankshaft Pulley.>
3) Remove the belt cover. <Ref. to ME(TURBO)-47, REMOVAL, Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(TURBO)-48, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft position sensor. <Ref. to FU(TURBO)-30, REMOVAL, Camshaft Position Sensor.>
6) Remove the camshaft sprockets. To lock the camshaft, use ST.

ST	18231AA010	CAMSHAFT SPROCKET WRENCH (INTAKE LH)
ST	499207400	CAMSHAFT SPROCKET WRENCH (Except INTAKE LH)



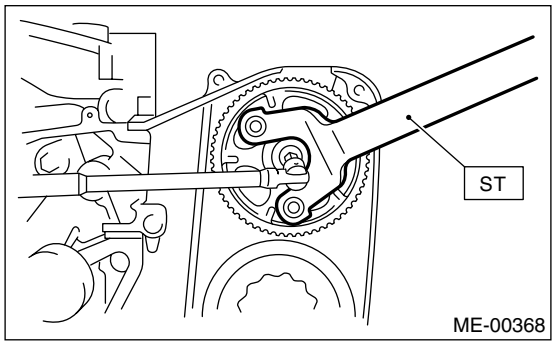
B: INSTALLATION

1) Install the camshaft sprocket. To lock the camshaft, use ST.

ST	18231AA010	CAMSHAFT SPROCKET WRENCH (INTAKE LH)
ST	499207400	CAMSHAFT SPROCKET WRENCH (Except INTAKE LH)

Tightening torque:
98 N·m (10 kgf-m, 72.4 ft-lb)

NOTE:
Do not confuse the right and left side camshaft sprockets intake side during installation. The camshaft sprocket LH is identified by a projection used to monitor camshaft position sensor.



2) Install the camshaft position sensor. <Ref. to FU(TURBO)-30, INSTALLATION, Camshaft Position Sensor.>
3) Install the timing belt assembly. <Ref. to ME(TURBO)-50, INSTALLATION, Timing Belt Assembly.>
4) Install the belt cover. <Ref. to ME(TURBO)-47, INSTALLATION, Belt Cover.>
5) Install the crankshaft pulley. <Ref. to ME(TURBO)-46, INSTALLATION, Crankshaft Pulley.>
6) Install the V-belt. <Ref. to ME(TURBO)-44, INSTALLATION, V-belt.>

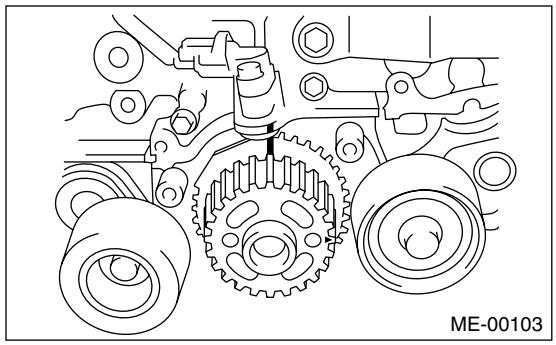
C: INSPECTION

1) Check the sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.
3) Check the crankshaft sprocket notch used for sensor for damage and contamination of foreign matter.

17.Crankshaft Sprocket

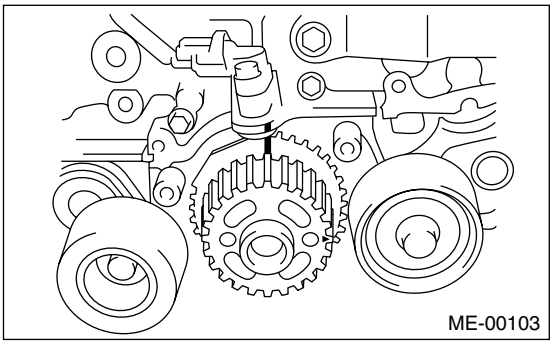
A: REMOVAL

1) Remove the V-belt. <Ref. to ME(TURBO)-44, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(TURBO)-46, REMOVAL, Crankshaft Pulley.>
3) Remove the belt cover. <Ref. to ME(TURBO)-47, REMOVAL, Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(TURBO)-48, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(TURBO)-56, REMOVAL, Camshaft Sprocket.>
6) Remove the crankshaft sprocket.



B: INSTALLATION

1) Install the crankshaft sprocket.



2) Install the camshaft sprocket. <Ref. to ME(TURBO)-56, INSTALLATION, Camshaft Sprocket.>
3) Install the timing belt assembly. <Ref. to ME(TURBO)-50, INSTALLATION, Timing Belt Assembly.>
4) Install the belt cover. <Ref. to ME(TURBO)-47, INSTALLATION, Belt Cover.>
5) Install the crankshaft pulley. <Ref. to ME(TURBO)-46, INSTALLATION, Crankshaft Pulley.>
6) Install the V-belt. <Ref. to ME(TURBO)-44, INSTALLATION, V-belt.>

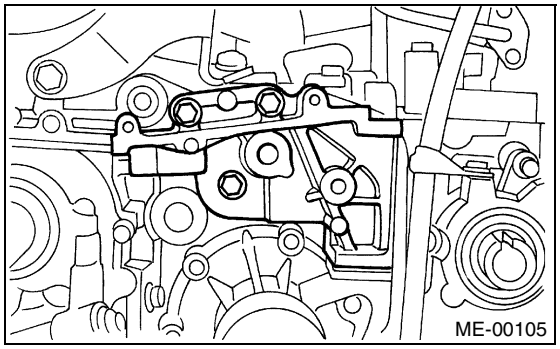
C: INSPECTION

1) Check the sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.
3) Check the crankshaft sprocket notch used for sensor for damage and contamination of foreign matter.

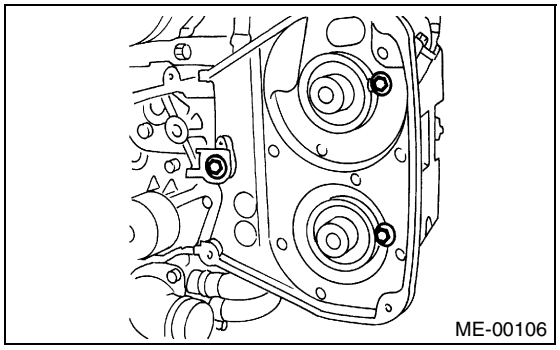
18.Camshaft

A: REMOVAL

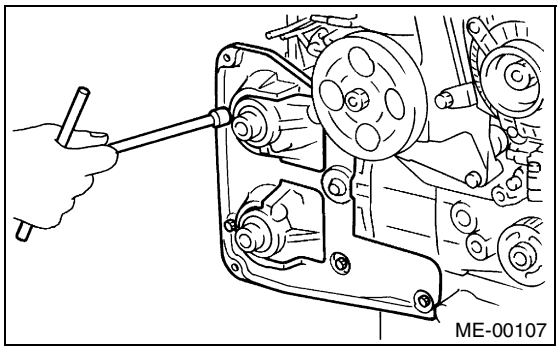
1) Remove the V-belt. <Ref. to ME(TURBO)-44, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(TURBO)-46, REMOVAL, Crankshaft Pulley.>
3) Remove the belt cover. <Ref. to ME(TURBO)-47, REMOVAL, Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(TURBO)-48, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(TURBO)-56, REMOVAL, Camshaft Sprocket.>
6) Remove the crankshaft sprocket. <Ref. to ME(TURBO)-57, REMOVAL, Crankshaft Sprocket.>
7) Remove the tensioner bracket.


ME-00105

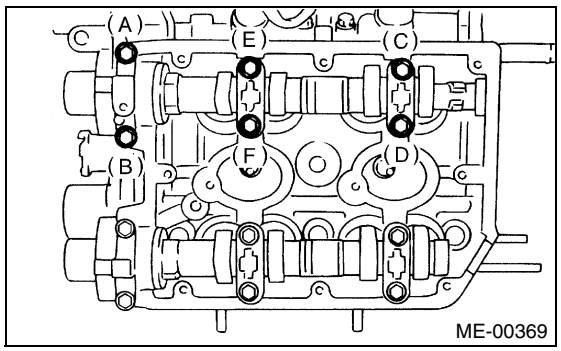
8) Remove the belt cover No. 2 (LH).


ME-00106

9) Remove the belt cover No.2 (RH).

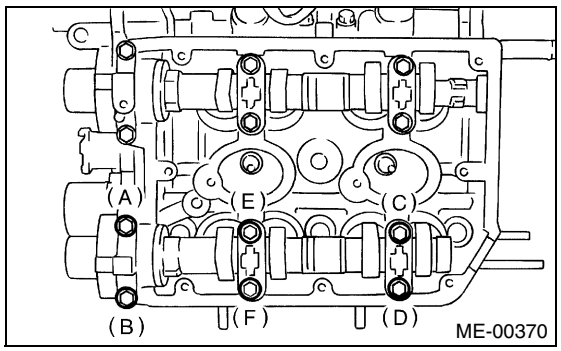

ME-00107

10) Disconnect the ignition coil connector.
11) Remove the ignition coil.
12) Remove the rocker cover and gasket.
13) Loosen the intake camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



ME-00369

14) Remove the camshaft cap and intake camshaft.
15) Loosen the exhaust camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



ME-00370

16) Remove the camshaft caps and exhaust camshaft.

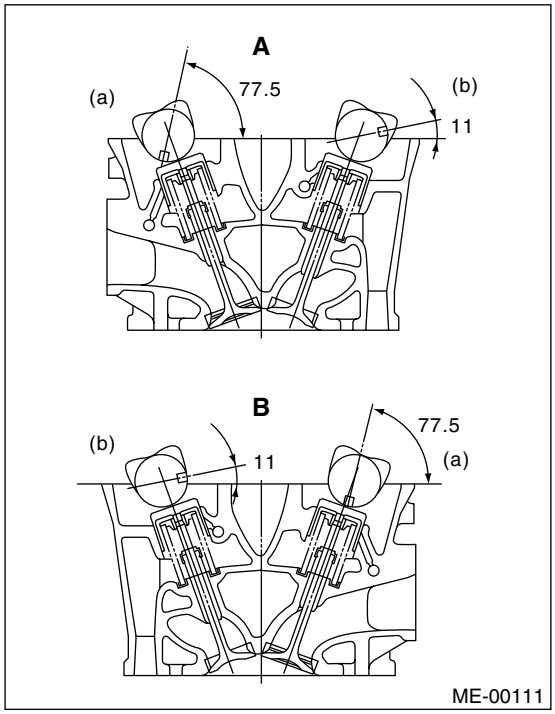
NOTE:
Arrange the camshaft caps in order so that they can be installed in their original positions.

17) Similarly, remove the camshafts (RH) and related parts.

B: INSTALLATION

1) Camshaft installation:
Apply engine oil to the cylinder head at camshaft bearing location before installing the camshaft. Install the camshaft so that each valves is close to or in contact with “base circle” of cam lobe.

NOTE:
• When the camshafts are positioned as shown in the figure, camshafts need to be rotated at a minimum to align with the timing belt during installation.
• Camshaft (RH) need not be rotated when set at the position shown in the figure.
Intake camshaft (LH): Rotate 80° clockwise.
Exhaust camshaft (LH): Rotate 45° counterclockwise.

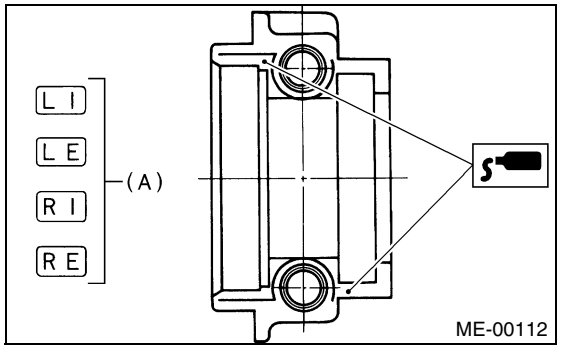


A Left side cylinder head
B Right side cylinder head
(a) Intake camshaft
(b) Exhaust camshaft

2) Camshaft cap installation:
(1) Apply fluid packing sparingly to the cap mating surface.

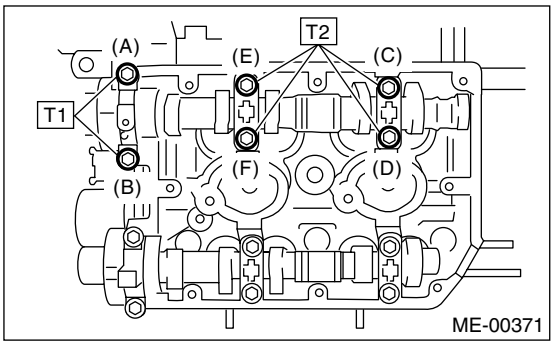
NOTE:
Do not apply fluid packing excessively. Failure to do so may cause excess packing to come out and flow toward oil seal, resulting in oil leaks.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



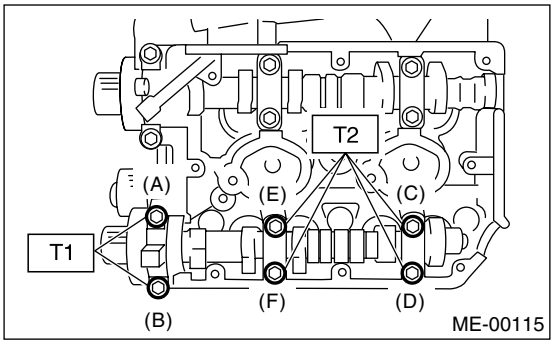
(2) Apply engine oil to cap bearing surface and install the cap on camshaft as shown by identification mark (A).
(3) Gradually tighten the camshaft cap in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque.

Tightening torque:
T1: 10 N·m (1.0 kgf-m, 7.2 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)



(4) Similarly, tighten the cap on exhaust side.
After tightening the cap, ensure the camshaft rotates only slightly while holding it at “base” circle.

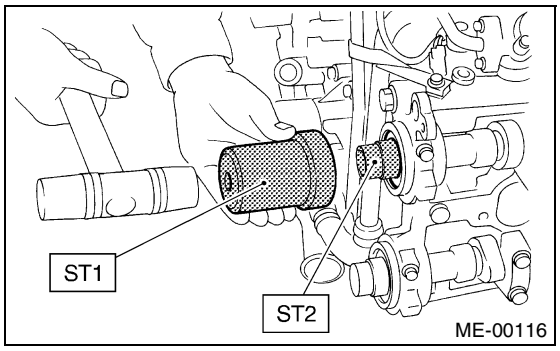
Tightening torque:
T1: 10 N·m (1.0 kgf-m, 7.2 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)



3) Camshaft oil seal installation:
Apply grease to the new oil seal lips and press onto the front end of camshaft by using ST1 and ST2.

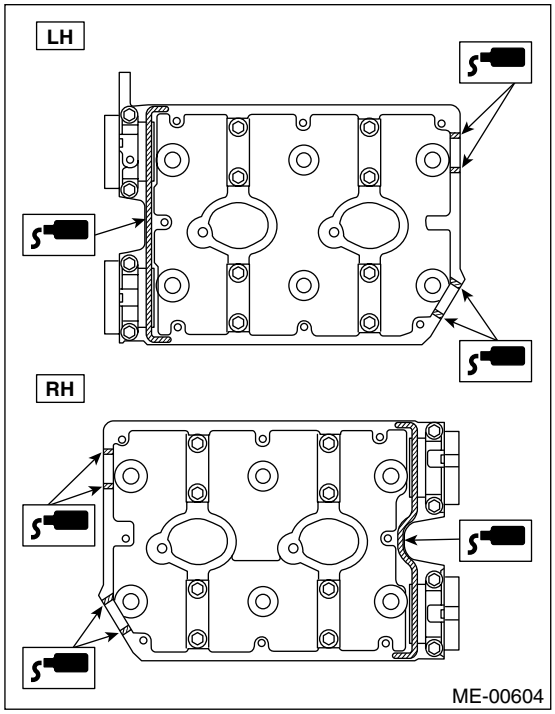
NOTE:
Use a new oil seal.

ST1 499587600 OIL SEAL INSTALLER
ST2 499597200 OIL SEAL GUIDE



4) Rocker cover installation:
(1) Install the gasket on rocker cover.
Install the peripheral gasket and ignition coil gasket.
(2) Apply fluid packing to the indicated portion on rocker cover.

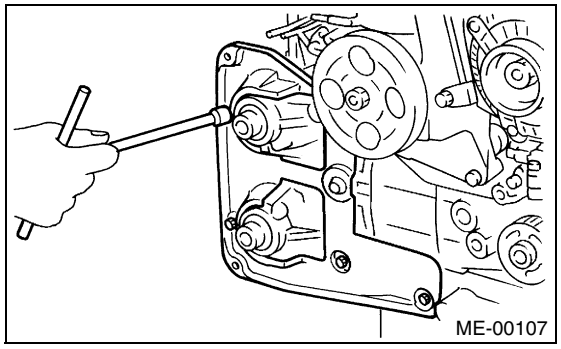
Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



(3) Install the rocker cover on cylinder head.
Ensure the gasket is properly positioned during installation.

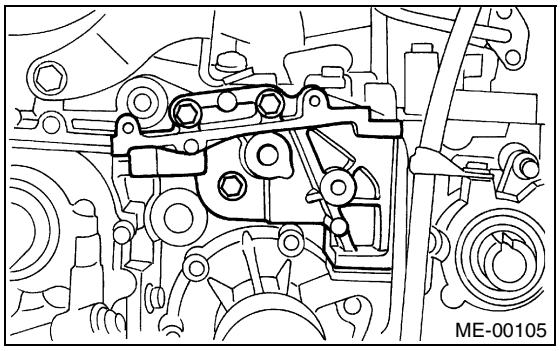
5) Install the ignition coil.
6) Connect the ignition coil connector.
7) Similarly, install the parts on right-hand side.
8) Install the belt cover No. 2 (RH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



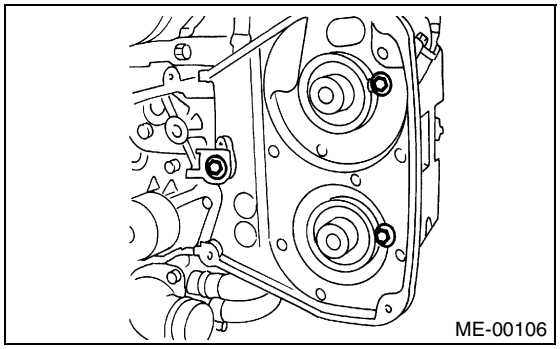
9) Install the tensioner bracket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



10) Install the belt cover No. 2 (LH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

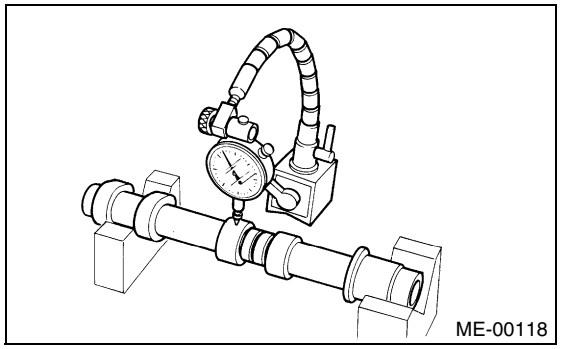


11) Install the crankshaft sprocket.
<Ref. to ME(TURBO)-57, INSTALLATION, Crankshaft Sprocket.>
12) Install the camshaft sprockets.
<Ref. to ME(TURBO)-56, INSTALLATION, Camshaft Sprocket.>
13) Install the timing belt assembly.
<Ref. to ME(TURBO)-50, INSTALLATION, Timing Belt Assembly.>
14) Install the belt cover. <Ref. to ME(TURBO)-47, INSTALLATION, Belt Cover.>
15) Install the crankshaft pulley. <Ref. to ME(TURBO)-46, INSTALLATION, Crankshaft Pulley.>
16) Install the V-belt. <Ref. to ME(TURBO)-44, INSTALLATION, V-belt.>

C: INSPECTION

1) Measure the bend, and repair or replace if necessary.

Limit:
0.020 mm (0.0008 in)

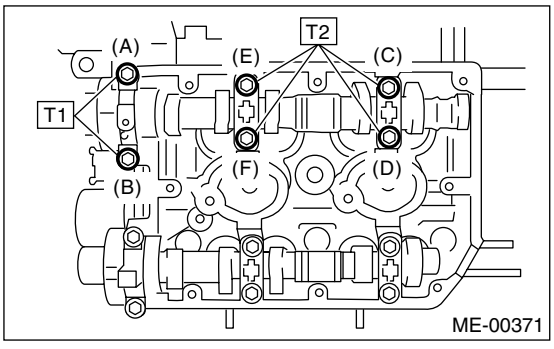


2) Check the journal for damage and wear. Replace if faulty.
3) Measure the outside diameter of camshaft journal. If the jounal diameter is not as specified, check the oil clearance.

	Camshaft journal	
	Front	Center, rear
Standard	37.946 — 37.963 mm (1.4939 — 1.4946 in)	29.946 — 29.963 mm (1.1790 — 1.1796 in)

4) Measurement of the camshaft journal oil clearance:
(1) Clean the bearing caps and camshaft journals.
(2) Place the camshafts on cylinder head.
(Without installing the valve rocker.)
(3) Place a plastigauge across each of the camshaft journals.
(4) Gradually tighten the cap in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque.
Do not turn the camshaft.

Tightening torque:
T1: 10 N·m (1.0 kgf-m, 7.2 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)

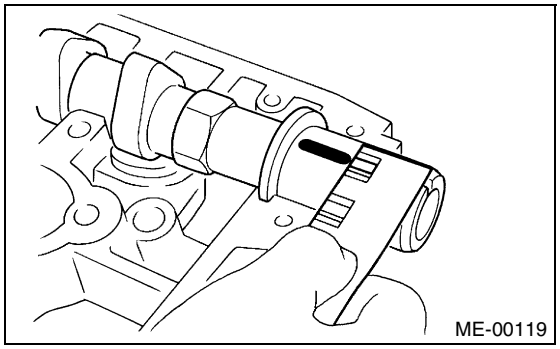


(5) Remove the bearing caps.
(6) Measure the widest point of plastigauge on each journal.

If the oil clearance exceeds the limit, replace the camshaft. If necessary, replace the camshaft caps and cylinder head as a set.

Standard:
0.037 — 0.072 mm (0.0015 — 0.0028 in)

Limit:
0.10 mm (0.0039 in)



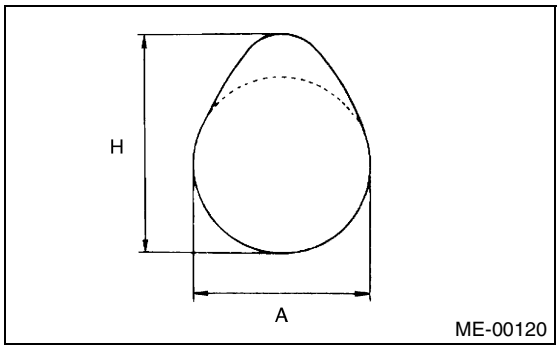
(7) Completely remove the plastigauge.

5) Check the cam face condition; remove the minor faults by grinding with oil stone. Measure the cam height H; replace if the limit has been exceeded.

Cam height: H
Standard:
Intake:
44.75 — 44.85 mm (1.762 — 1.766 in)
Exhaust:
44.65 — 44.75 mm (1.758 — 1.762 in)

Limit:
Intake:
44.65 mm (1.758 in)
Exhaust:
44.55 mm (1.754 in)

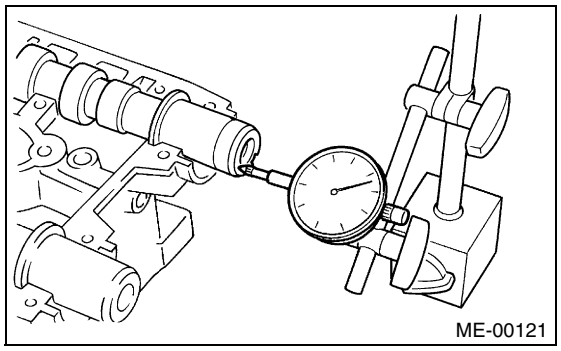
Cam base circle diameter A:
37.0 mm (1.457 in)



6) Measure the thrust clearance of camshaft with dial gauge. If the clearance exceeds the limit, replace the caps and cylinder head as a set. If necessary replace the camshaft.

Standard:
0.015 — 0.070 mm (0.0006 — 0.0028 in)

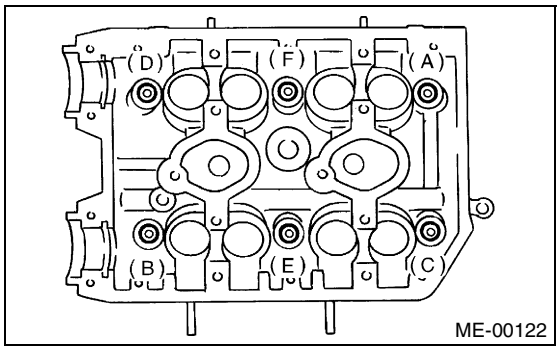
Limit:
0.1 mm (0.004 in)



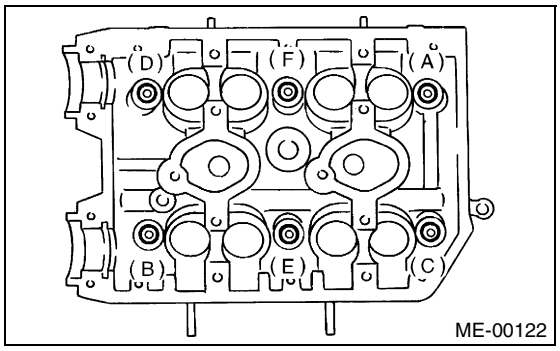
19.Cylinder Head Assembly

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(TURBO)-44, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(TURBO)-46, REMOVAL, Crankshaft Pulley.>
3) Remove the belt cover. <Ref. to ME(TURBO)-47, REMOVAL, Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(TURBO)-48, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(TURBO)-56, REMOVAL, Camshaft Sprocket.>
6) Remove the intake manifold. <Ref. to FU(TURBO)-14, REMOVAL, Intake Manifold.>
7) Remove the bolt which installs A/C compressor bracket on cylinder head.
8) Remove the camshaft. <Ref. to ME(TURBO)-58, REMOVAL, Camshaft.>
9) Remove the cylinder head bolts in alphabetical sequence shown in the figure.
Leave bolts (A) and (D) engaged by three or four threads to prevent the cylinder head from falling.



10) While tapping the cylinder head with a plastic hammer, separate it from cylinder block.
Remove the bolts (A) and (D) to remove cylinder head.



11) Remove the cylinder head gasket.

NOTE:
Do not scratch the mating surface of cylinder head and cylinder block.

12) Similarly, remove the right side cylinder head.

B: INSTALLATION

1) Install the cylinder head and gaskets on cylinder block.

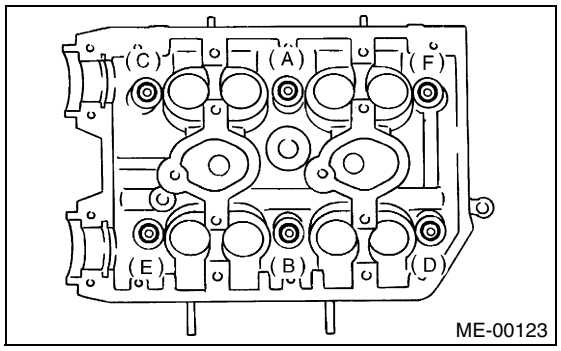
NOTE:
- Use new cylinder head gaskets.
- Be careful not to scratch the mating surface of cylinder head and cylinder block.

2) Tighten the cylinder head bolts.
   (1) Apply a coat of engine oil to the washers and bolt threads.
   (2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence.
   (3) Tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence again.
   (4) Back off all bolts by 180° first; back them off by 180° again in reverse order of installation.
   (5) Tighten all bolts to 39 N·m (4.0 kgf-m, 29 ft-lb) in alphabetical sequence.
   (6) Tighten all bolts 80 to 90° in alphabetical sequence.
   (7) Tighten all bolts by 40 to 45° in alphabetical sequence again.

NOTE:
Do not tighten the bolts by more than 45°.

   (8) Further tighten all bolts (A) and (B) by 40 to 45°.

NOTE:
Ensure that the total “re-tightening angle” in the previous two steps do not exceed 90°.



3) Install the camshaft. <Ref. to ME(TURBO)-59, INSTALLATION, Camshaft.>
4) Install the A/C compressor bracket on cylinder head.
5) Install the intake manifold. <Ref. to FU(TURBO)-17, INSTALLATION, Intake Manifold.>
6) Install the camshaft sprocket. <Ref. to ME(TURBO)-56, INSTALLATION, Camshaft Sprocket.>
7) Install the timing belt assembly. <Ref. to ME(TURBO)-50, INSTALLATION, Timing Belt Assembly.>
8) Install the belt cover. <Ref. to ME(TURBO)-47, INSTALLATION, Belt Cover.>

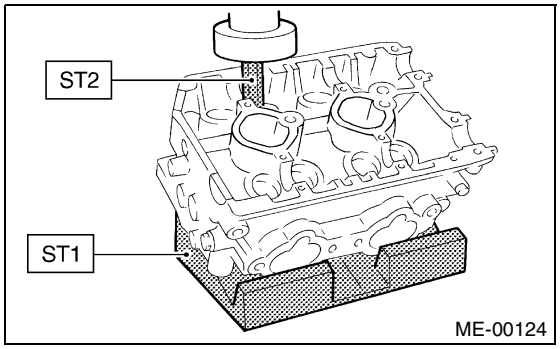
9) Install the crankshaft pulley. <Ref. to ME(TURBO)-46, INSTALLATION, Crankshaft Pulley.>
10) Install the V-belt. <Ref. to ME(TURBO)-44, INSTALLATION, V-belt.>

C: DISASSEMBLY

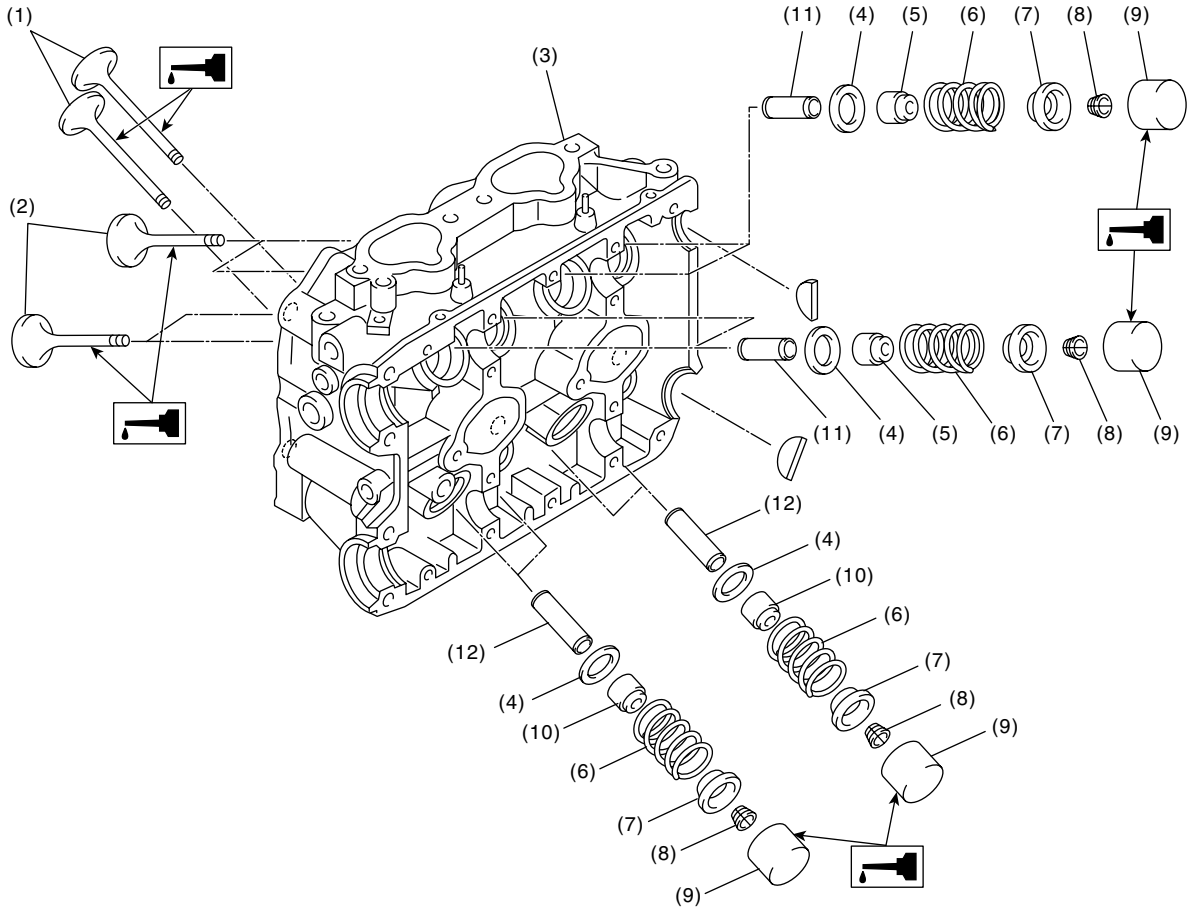
1) Remove the valve shims and valve lifters.
2) Compress the valve spring and remove the valve spring retainer key. Remove each valve and valve spring.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499718000 VALVE SPRING REMOVER

NOTE:
- Keep the removed parts in order for re-installing in their original positions.
- Mark each valve to prevent confusion.
- Use extreme care not to damage the lips of the intake valve oil seals and exhaust valve oil seals.



D: ASSEMBLY



(1) Exhaust valve
(2) Intake valve
(3) Cylinder head
(4) Valve spring seat
(5) Intake valve oil seal
(6) Valve spring
(7) Retainer
(8) Retainer key
(9) Valve lifter
(10) Exhaust valve oil seal
(11) Intake valve guide
(12) Exhaust valve guide

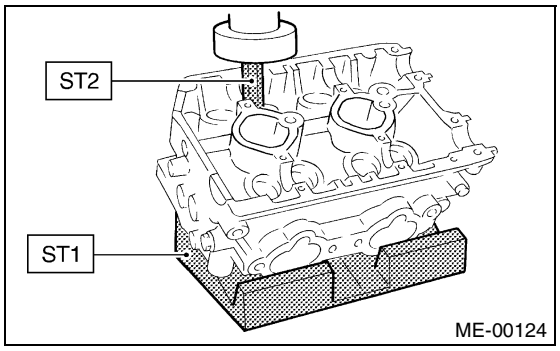
1) Installation of valve spring and valve:
(1) Coat the stem of each valve with engine oil and insert the valve into valve guide.

NOTE:
When inserting the valve into valve guide, use special care not to damage the oil seal lip.

(2) Set the cylinder head on ST1.
(3) Install the valve spring and retainer using ST2.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499718000 VALVE SPRING REMOVER

NOTE:
Be sure to install the valve springs with their close-coiled end facing the seat on the cylinder head.



(4) Compress the valve spring, and then fit the valve spring retainer key.
(5) After installing, tap the valve spring retainers lightly with wooden hammer for better seating.

2) Apply oil to the surface of the valve lifter.
3) Install the valve lifter.

E: INSPECTION

1. CYLINDER HEAD

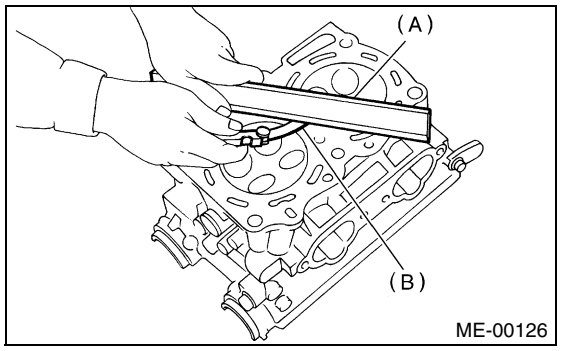
1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect the important areas by means of red check.
2) Measure the warping of the cylinder head surface that mates with crankcase by using a straight edge (A) and thickness gauge (B).
If the warping exceeds 0.05 mm (0.0020 in), regrind the surface with a surface grinder.

Warping limit:
0.05 mm (0.0020 in)

Grinding limit:
0.3 mm (0.012 in)

Standard height of cylinder head:
127.5 mm (5.02 in)

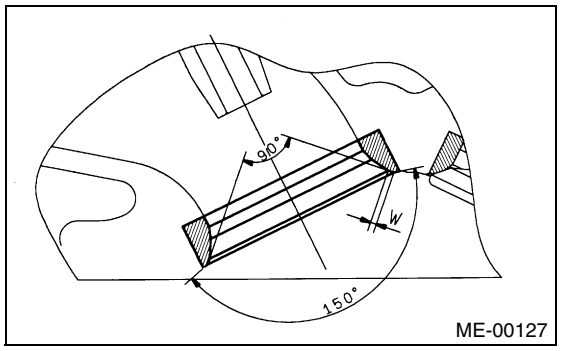
NOTE:
Uneven torque for the cylinder head nuts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.



2. VALVE SEAT

Inspect the intake and exhaust valve seats, and then correct the contact surfaces with valve seat cutter if they are defective or when valve guides are replaced.

Valve seat width: W
Intake
Standard 1.0 mm (0.039 in)
Limit
1.7 mm (0.067 in)
Exhaust
Standard
1.5 mm (0.059 in)
Limit
2.2 mm (0.087 in)



3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outside diameter of valve stem and the inside diameter of valve guide with outside and inside micrometers respectively.

Clearance between the valve guide and valve stem:
Standard
Intake
0.030 — 0.057 mm (0.0012 — 0.0022 in)
Exhaust
0.040 — 0.067 mm (0.0016 — 0.0026 in)
Limit
0.15 mm (0.0059 in)

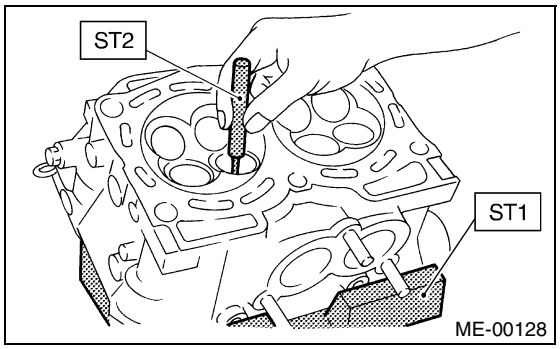
2) If the clearance between valve guide and stem exceeds the limit, replace the valve guide or valve itself whichever shows greater amount of wear. See the following procedure for valve guide replacement.

Valve guide inner diameter:
6.000 — 6.012 mm (0.2362 — 0.2367 in)

Valve stem outer diameters:
Intake
5.955 — 5.970 mm (0.2344 — 0.2350 in)
Exhaust
5.945 — 5.960 mm (0.2341 — 0.2346 in)

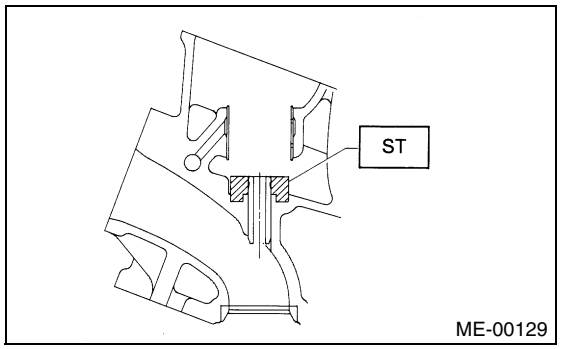
(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.
(2) Insert the ST2 into valve guide and press it down to remove the valve guide.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



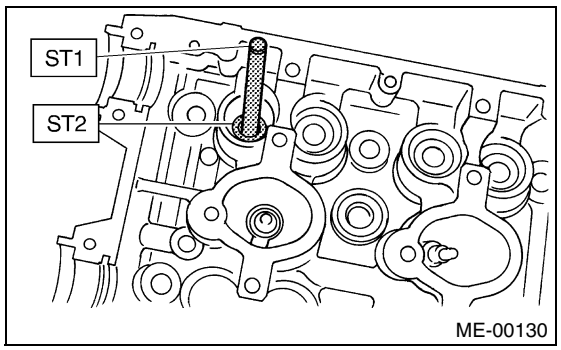
(3) Turn the cylinder head upside down and place ST as shown in the figure.

ST 18251AA020 VALVE GUIDE ADJUSTER



(4) Before installing a new valve guide, make sure that neither scratches nor damages exist on the inside surface of the valve guide holes in cylinder head.
(5) Put a new valve guide, coated with sufficient oil, in cylinder, and insert ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499767200 VALVE GUIDE REMOVER
ST2 18251AA020 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion: L
15.8 — 16.2 mm (0.622 — 0.638 in)

(7) Ream the inside of valve guide with ST. Gently rotate the reamer clockwise while pressing it lightly into the valve guide, and return it also rotating clockwise. After reaming, clean the valve guide to remove chips.

ST 499767400 VALVE GUIDE REAMER

NOTE:
• Apply engine oil to the reamer when reaming.
• If the inner surface of the valve guide is torn, the edge of the reamer should be slightly ground with an oil stone.
• If the inner surface of the valve guide becomes lustrous and the reamer does not chips, use a new reamer or remedy the reamer.

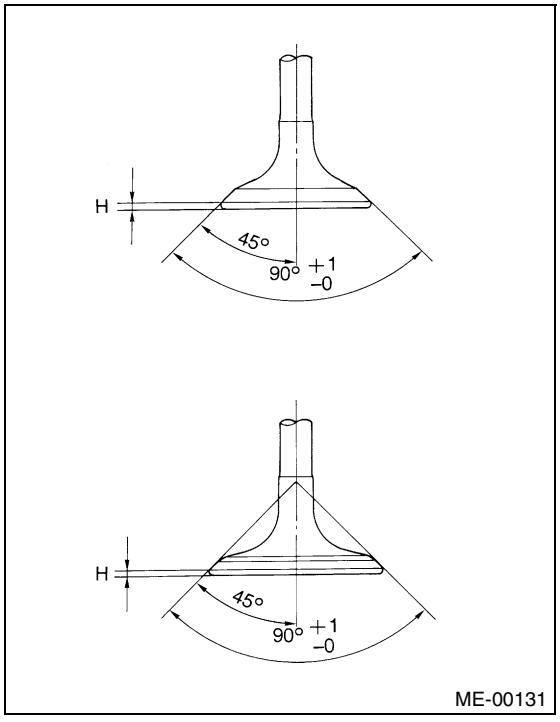
(8) Recheck the contact condition between valve and valve seat after replacing the valve guide.

4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if "H" is less than the specified limit.

H:
Intake
Standard
1.2 mm (0.047 in)
Limit
0.8 mm (0.031 in)
Exhaust
Standard
1.5 mm (0.059 in)
Limit
0.8 mm (0.031 in)

Valve overall length:
Intake
104.4 mm (4.110 in)
Exhaust
104.7 mm (4.122 in)

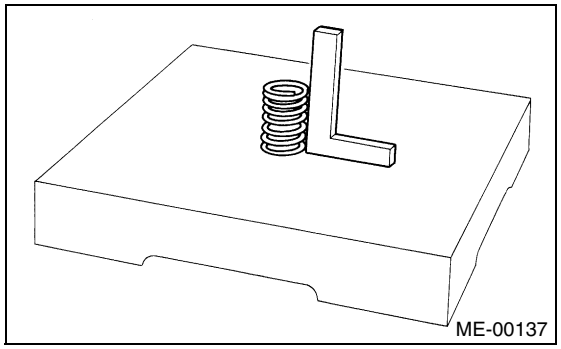


2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. Install a new intake valve oil seal after lapping.

5. VALVE SPRINGS

1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not within specifications presented in the table.
2) To measure the squareness of valve spring, stand the spring on a surface plate and measure its deflection at the top using a try square.

	Valve spring
Free length	44.67 mm (1.7587 in)
Tension/spring height	206 — 236 N (21.0 — 24.1 kgf, 46.2 — 53.1 lb) /36.0 mm (1.417 in)
	485 — 537 N (49.5 — 54.8 kgf, 109.2 — 120.6 lb) /26.6 mm (1.047 in)
Squareness	2.5°, 2.0 mm (0.079 in)



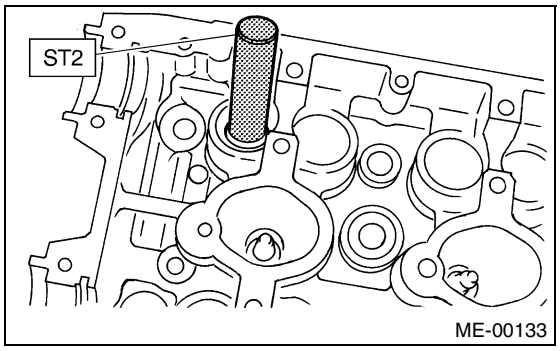
6. INTAKE AND EXHAUST VALVE OIL SEAL

Replace the oil seal with a new one, if the lip is damaged or spring out of place, or when the surfaces of intake valve and valve seat are reconditioned or intake valve guide is replaced.
1) Place the cylinder head on ST1.
2) Press in the oil seal to the specified dimension indicated in the figure by using ST2.
ST1 498267600 CYLINDER HEAD TABLE
ST2 498857100 VALVE OIL SEAL GUIDE

NOTE:
• Apply engine oil to oil seal before force-fit-ting.
• Differentiate between the intake valve oil seal and exhaust valve oil seal by noting their dif-ference in color.

Color of rubber part:
Intake [Black]
Exhaust [Brown]

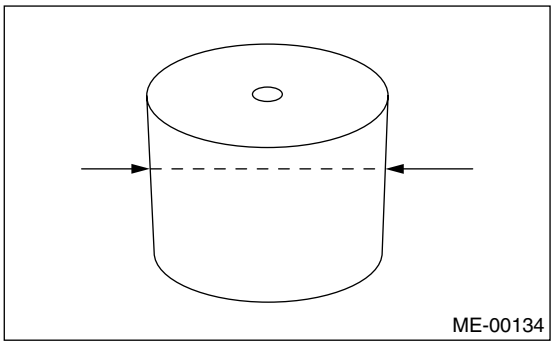
Color of spring part:
Intake [Silver]
Exhaust [Silver]



7. VALVE LIFTER

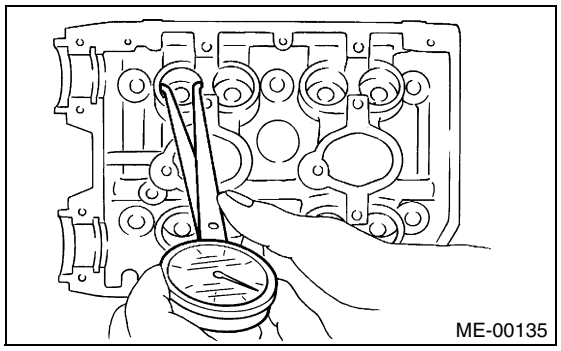
1) Check the valve lifter visually.
2) Measure the outer diameter of valve lifter.

Outer diameter:
34.959 — 34.975 mm (1.3763 — 1.3770 in)



3) Measure the inner diameter of valve lifter mating part on cylinder head.

Inner diameter:
34.994 — 35.016 mm (1.3777 — 1.3786 in)



NOTE:
If difference between outer diameter of valve lifter and inner diameter of valve lifter mating part is over the limit, replace the cylinder head.

Standard:
0.019 — 0.057 mm (0.0007 — 0.0022 in)

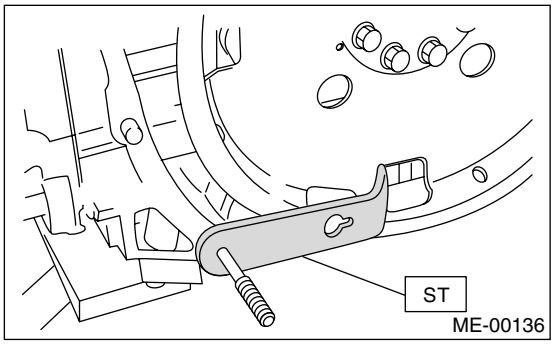
Limit:
0.100 mm (0.0039 in)

20.Cylinder Block

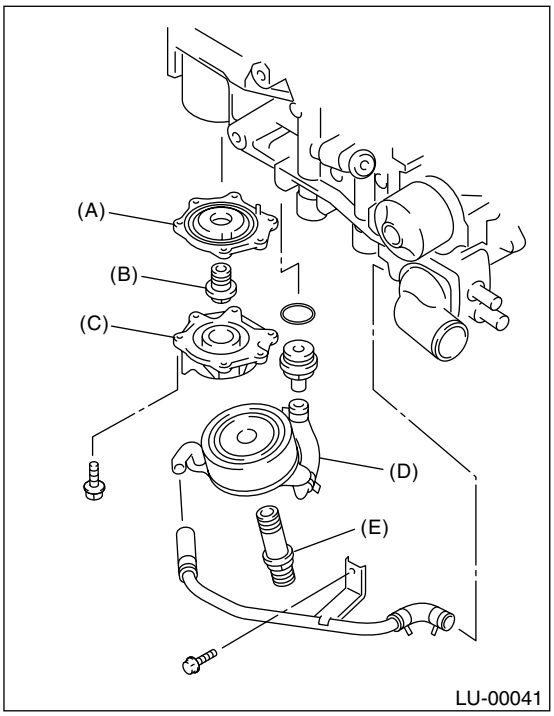
A: REMOVAL

NOTE:
Before conducting this procedure, drain the engine oil completely if applicable.

1) Remove the intake manifold. <Ref. to FU(TURBO)-14, REMOVAL, Intake Manifold.>
2) Remove the V-belt. <Ref. to ME(TURBO)-44, REMOVAL, V-belt.>
3) Remove the crankshaft pulley. <Ref. to ME(TURBO)-46, REMOVAL, Crankshaft Pulley.>
4) Remove the belt cover. <Ref. to ME(TURBO)-47, REMOVAL, Belt Cover.>
5) Remove the timing belt assembly. <Ref. to ME(TURBO)-48, REMOVAL, Timing Belt Assembly.>
6) Remove the camshaft sprocket. <Ref. to ME(TURBO)-56, REMOVAL, Camshaft Sprocket.>
7) Remove the crankshaft sprocket. <Ref. to ME(TURBO)-57, REMOVAL, Crankshaft Sprocket.>
8) Remove the generator and A/C compressor with their brackets.
9) Remove the cylinder head assembly. <Ref. to ME(TURBO)-63, REMOVAL, Cylinder Head Assembly.>
10) Remove the clutch disc and cover. (MT vehicles) <Ref. to CL-17, REMOVAL, Clutch Disc and Cover.>
11) Remove the flywheel. (MT vehicles) <Ref. to CL-21, REMOVAL, Flywheel.>
12) Remove the drive plate. (AT vehicles)
Using the ST, lock crankshaft.
ST 498497100 CRANKSHAFT STOPPER

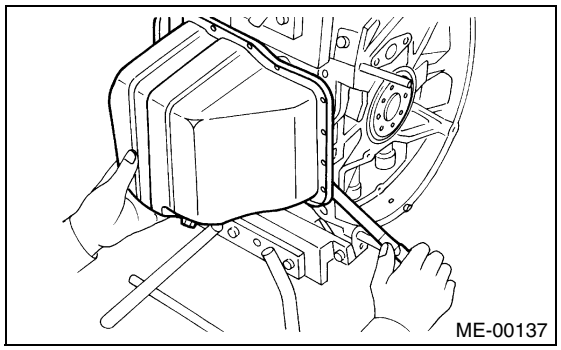


13) Remove the oil separator cover.
14) Remove the water by-pass pipe for heater.
15) Remove the oil filter.
16) Remove the oil cooler.



(A) Adapter (1)
(B) Adapter connector
(C) Adapter (2)
(D) Oil cooler
(E) Oil cooler connector

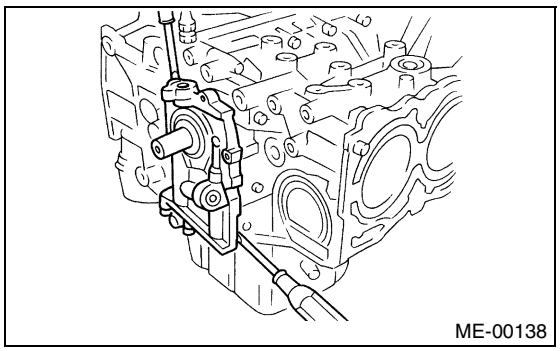
17) Removal of oil pan:
(1) Turn the cylinder block with #2 and #4 piston sides facing upward.
(2) Remove the bolts which secure oil pan to cylinder block.
(3) Insert a oil pan cutter blade between cylinder block-to-oil pan clearance, and then remove the oil pan.
Do not use a screwdriver or similar tool in place of oil pan cutter.

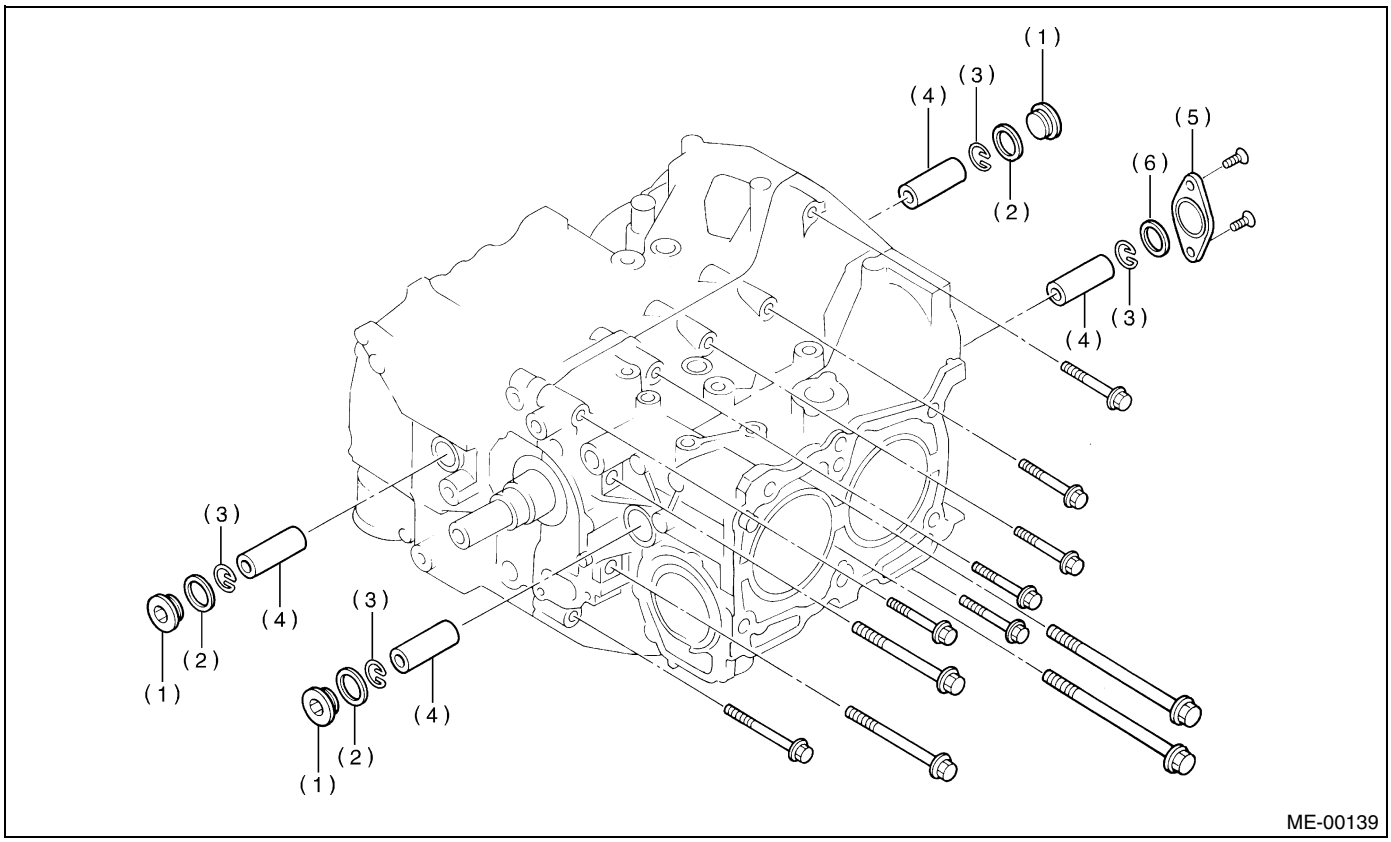


18) Remove the oil strainer stay.
19) Remove the oil strainer.
20) Remove the baffle plate.
21) Remove the water pipes.
22) Remove the water pump.

23) Remove the oil pump from cylinder block.
Use a flat-bladed screwdriver as shown in the figure when removing the oil pump.

NOTE:
Be careful not to scratch the mating surface of cylinder block and oil pump.

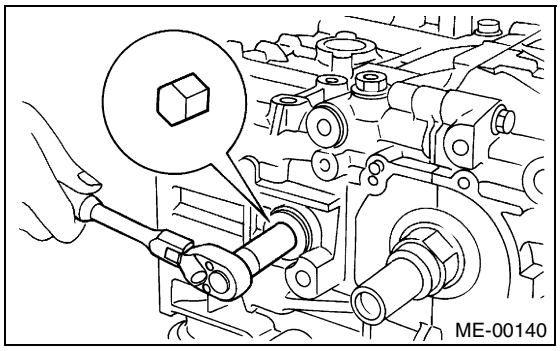

ME-00138



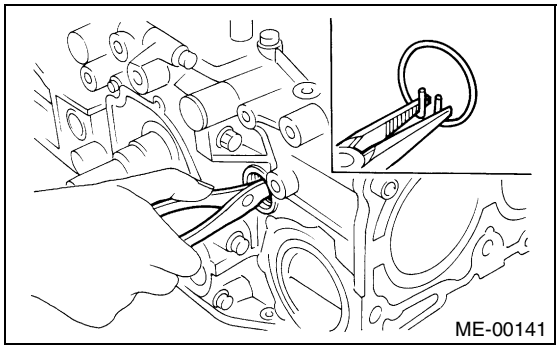
ME-00139

(1) Service hole plug
(2) Gasket
(3) Circlip
(4) Piston pin
(5) Service hole cover
(6) O-ring

24) Remove the service hole cover and service hole plugs using hexagon wrench [14 mm (0.55 in)].

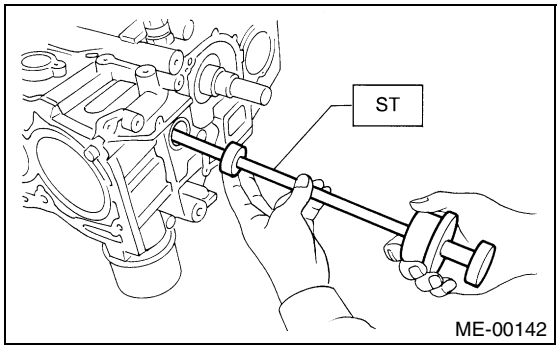


25) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, and then remove the piston circlip through service hole of #1 and #2 cylinders.
ST 499897200 PISTON CIRCLIP PLIERS



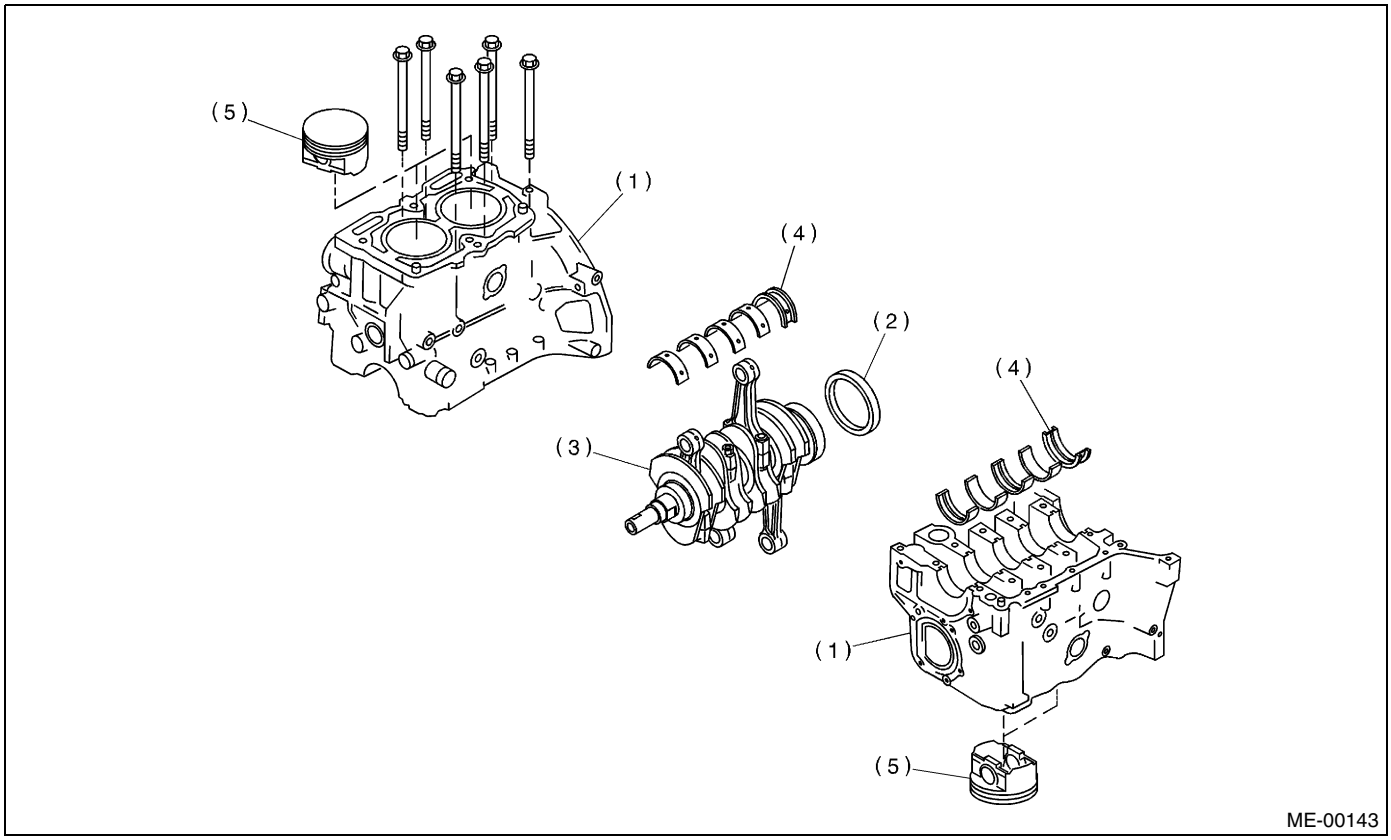
26) Draw out the piston pin from #1 and #2 pistons using ST.
ST 499097700 PISTON PIN REMOVER

NOTE:
Be careful not to confuse the original combination of piston, piston pin and cylinder.



27) Similarly remove the piston pins from #3 and #4 pistons.
28) Remove the bolts which connect cylinder block on the side of #2 and #4 cylinders.
29) Back off the bolts which connect cylinder block on the side of #1 and #3 cylinders two or three turns.
30) Set up the cylinder block so that #1 and #3 cylinders are on the upper side, then remove the cylinder block connecting bolts.
31) Separate the cylinder blocks (LH) and (RH).

NOTE:
When separating the cylinder block, do not allow the connecting rod to fall and damage the cylinder block.



(1) Cylinder block
(2) Rear oil seal
(3) Crankshaft
(4) Crankshaft bearing
(5) Piston

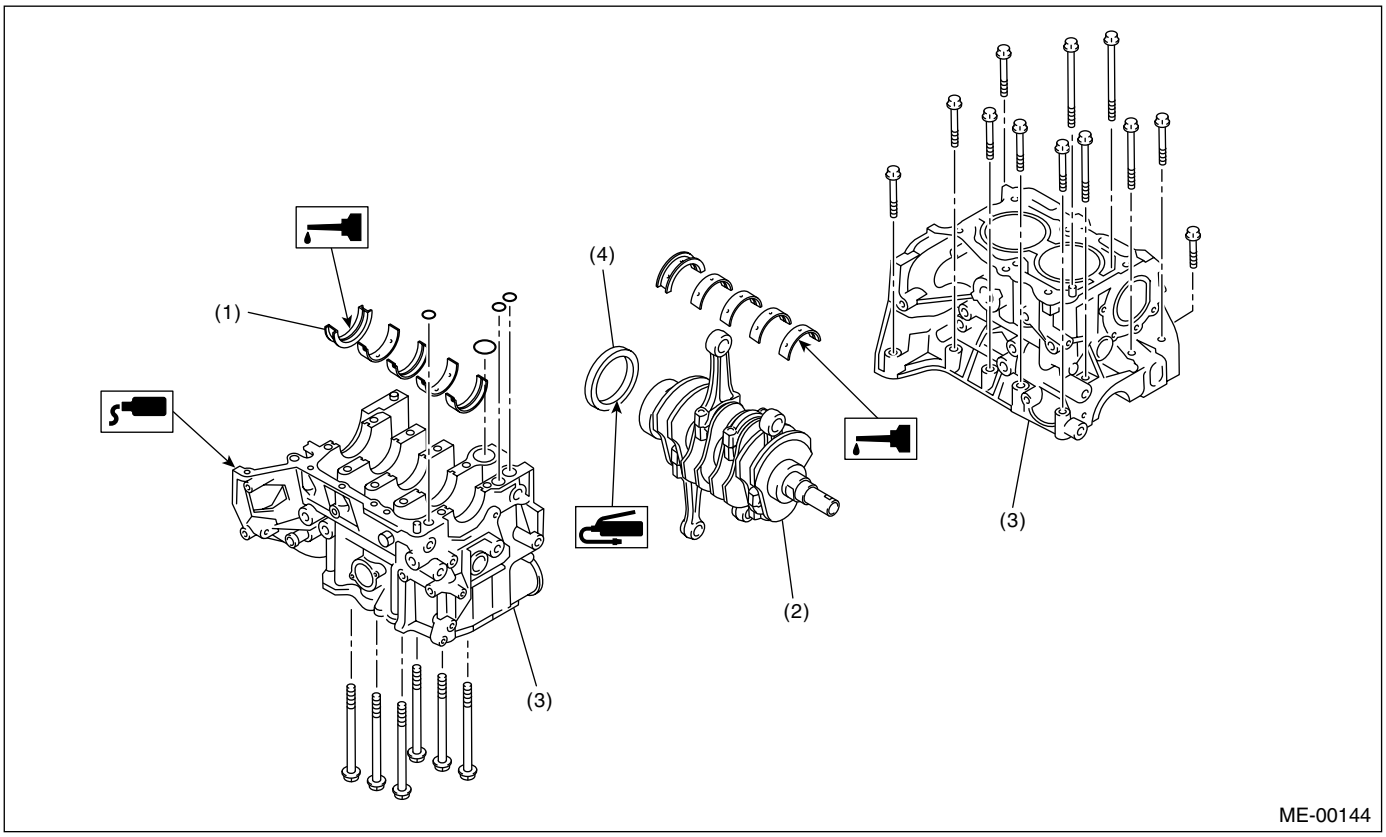
32) Remove the rear oil seal.
33) Remove the crankshaft together with connecting rod.
34) Remove the crankshaft bearings from cylinder block using a hammer handle.

NOTE:
Do not confuse the combination of crankshaft bearings.
Press the bearing at the end opposite to locking lip.

35) Draw out each piston from cylinder block using a wooden bar or hammer handle.

NOTE:
Do not confuse the combination of piston and cylinder.

B: INSTALLATION

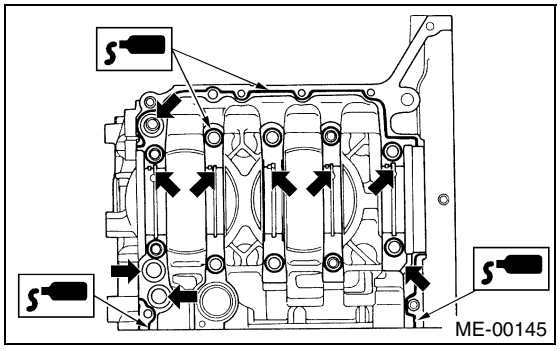


(1) Crankshaft bearing
(2) Crankshaft
(3) Cylinder block
(4) Rear oil seal

1) Remove oil in the mating surface of bearing and cylinder block before installation. Also apply a coat of engine oil to crankshaft pins.
2) Position the crankshaft on #2 and #4 cylinder block.
3) Apply fluid packing to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

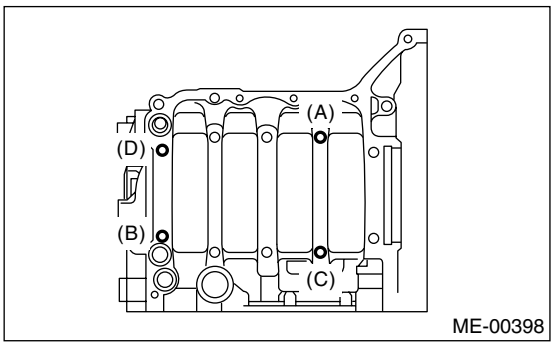
Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent

NOTE:
Do not allow fluid packing to jut into O-ring grooves, oil passages, bearing grooves, etc.



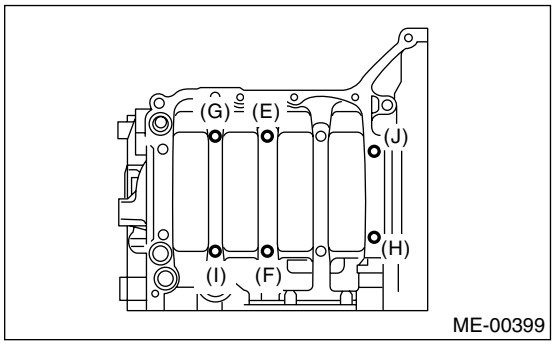
4) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (LH side)

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

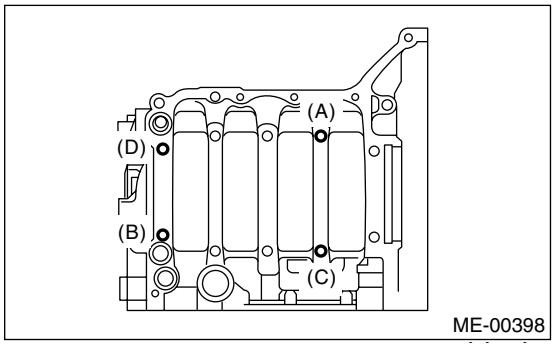


5) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (RH side)

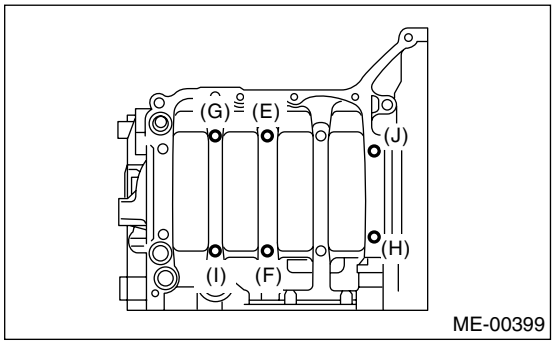
Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)



6) Further tighten the LH side bolts (A — D) to 90° in alphabetical sequence.

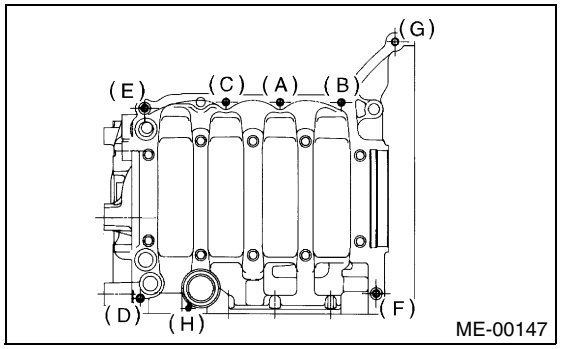


7) Further tighten the RH side bolts (E — J) to 90° in alphabetical sequence.

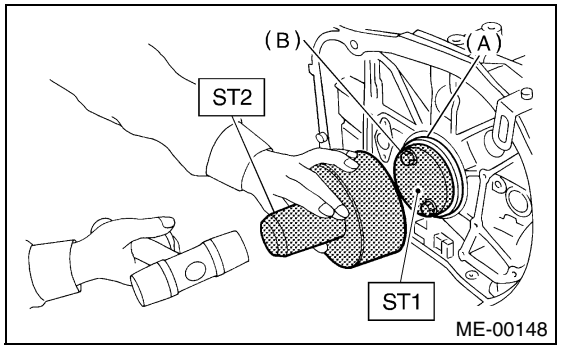


8) Tighten the 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.

Tightening torque:
(A) — (G): 25 N·m (2.5 kgf-m, 18.1 ft-lb)
(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

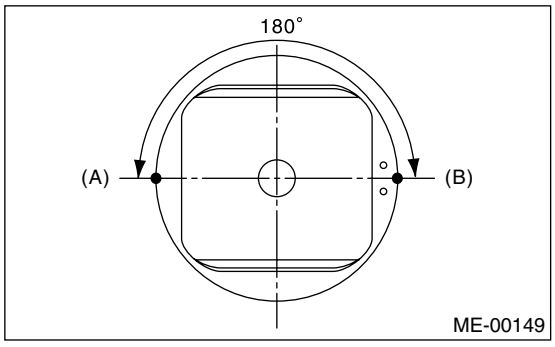


9) Install the rear oil seal using ST1 and ST2.
ST1 499597100OIL SEAL GUIDE
ST2 499587200 OIL SEAL INSTALLER

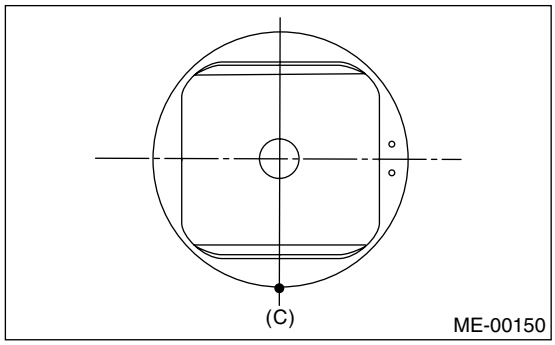


(A) Rear oil seal
(B) Flywheel attaching bolt

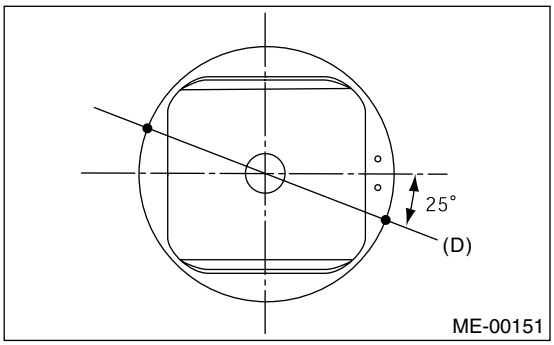
10) Position the top ring gap at (A) or (B) in the figure.
11) Position the second ring gap at 180° on the reverse side for the top ring gap.



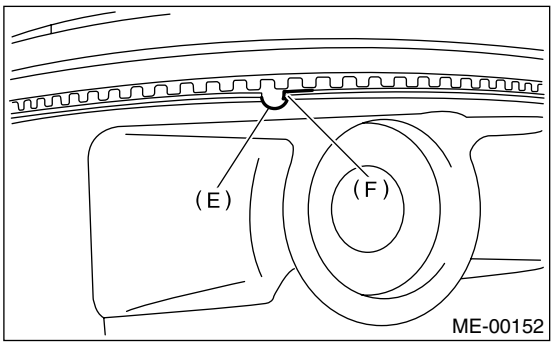
12) Position the expander gap at (C) in the figure.



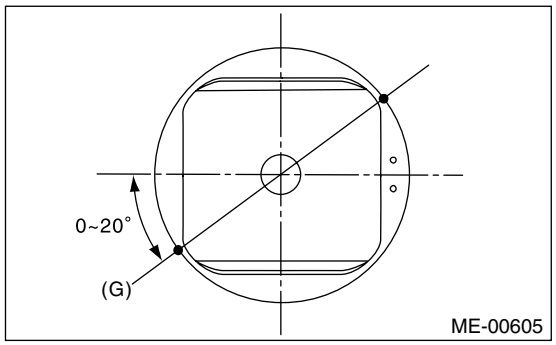
13) Position the lower rail gap at (D) in the figure.



14) Align lower rail spin stopper (F) with piston side surface hole (E).



15) Position the upper rail gap at (G) in the figure.

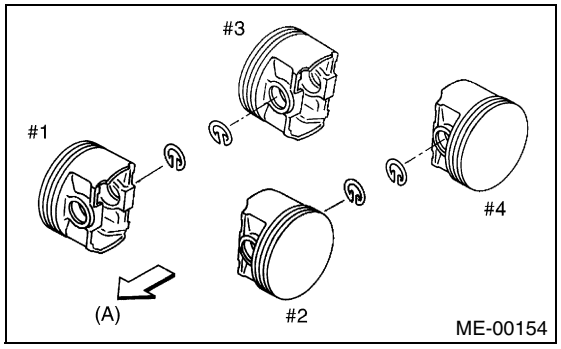


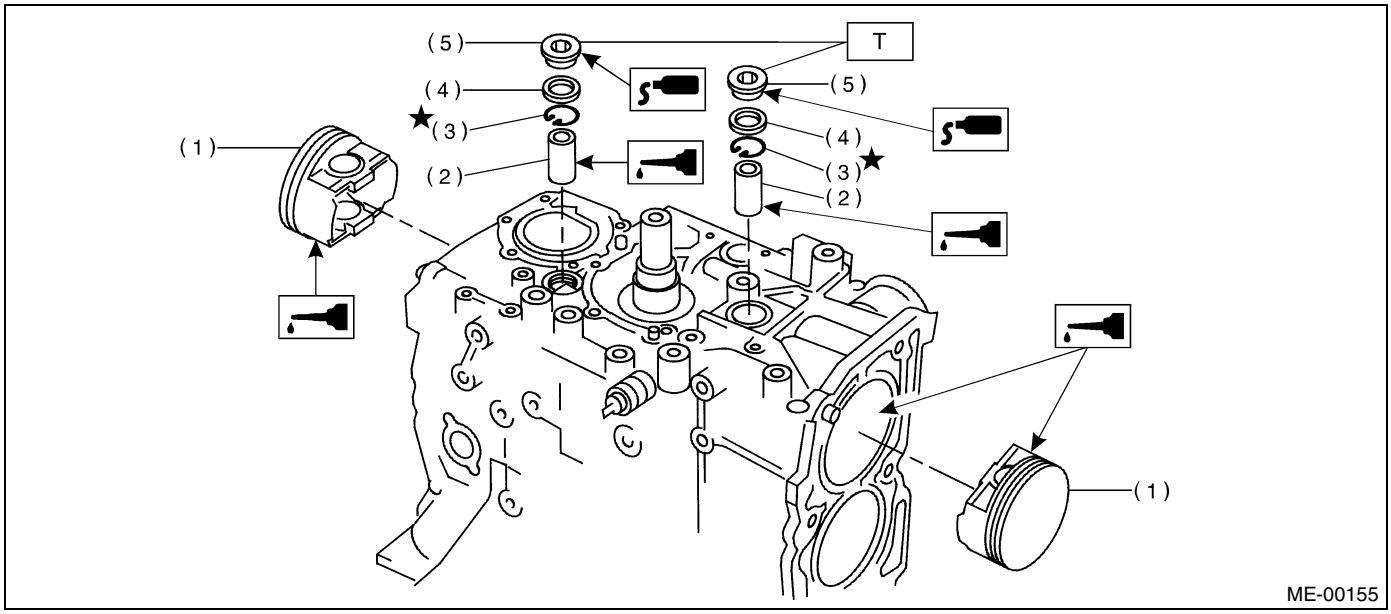
NOTE:
- Ensure ring gaps do not face the same direction.
- Ensure ring gaps are not within the piston skirt area.

16) Install the circlip.

Install the circlips in piston holes located opposite of service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

NOTE:
Use new circlips.





(1) Piston
(2) Piston pin
(3) Circlip
(4) Gasket
(5) Service hole plug

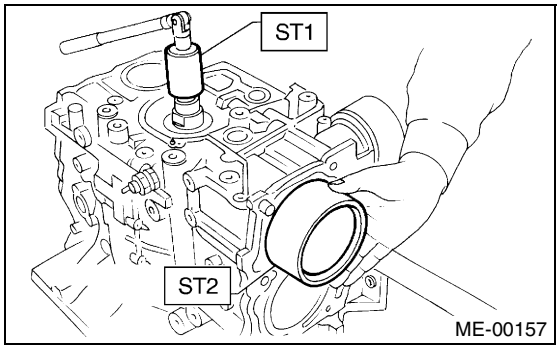
Tightening torque: N·m (kgf-m, ft-lb)
T: 70 (7.1, 51.4)

17) Installing the piston:
(1) Turn the cylinder block so that #1 and #2 cylinders face upward.
(2) Using the ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

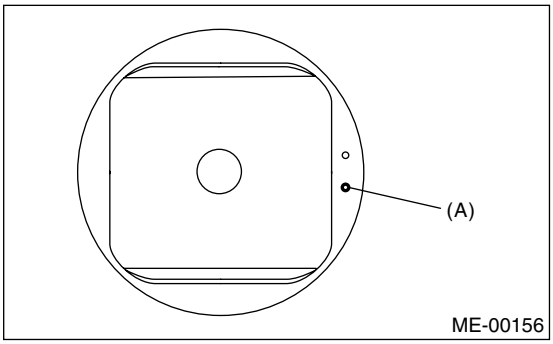
ST1 499987500 CRANKSHAFT SOCKET

(3) Apply a coat of engine oil to the pistons and cylinders and insert pistons in their cylinders using ST2.

ST2 398744300 PISTON GUIDE



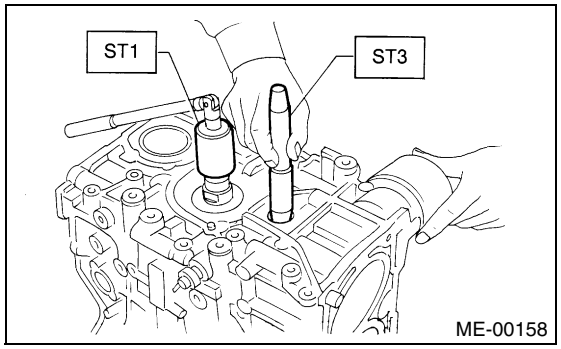
NOTE:
Piston front mark faces towards the front of the engine.



(A) Front mark

18) Installing piston pin:
(1) Apply a coat of engine oil to ST3, and then insert the ST3 into service hole to align piston pin hole with connecting rod small end.

ST3 499017100 PISTON PIN GUIDE

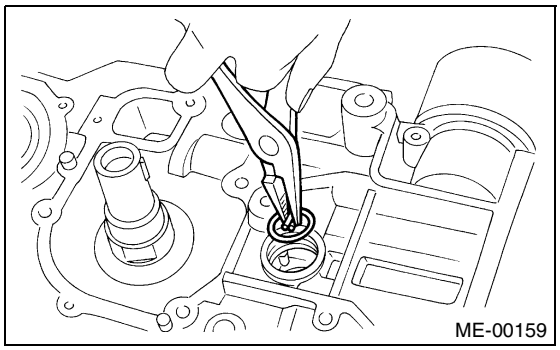


(2) Apply a coat of engine oil to the piston pin and insert piston pin into piston and connecting rod through service hole.

(3) Using the ST, install the circlip.

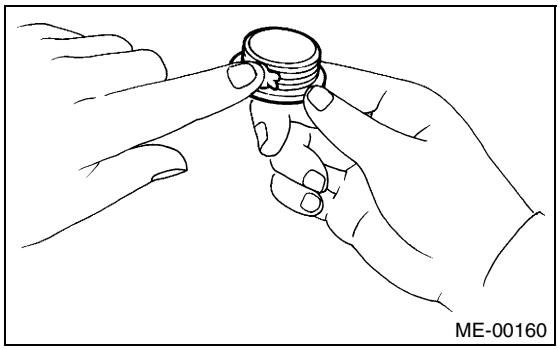
ST 499897200 PISTON CIRCLIP PLIERS

NOTE:
Use new circlips.



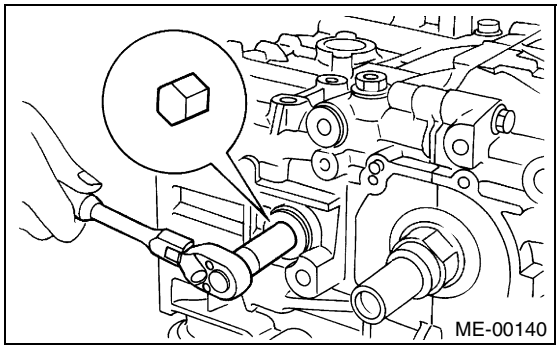
(4) Apply fluid packing around the service hole plug.

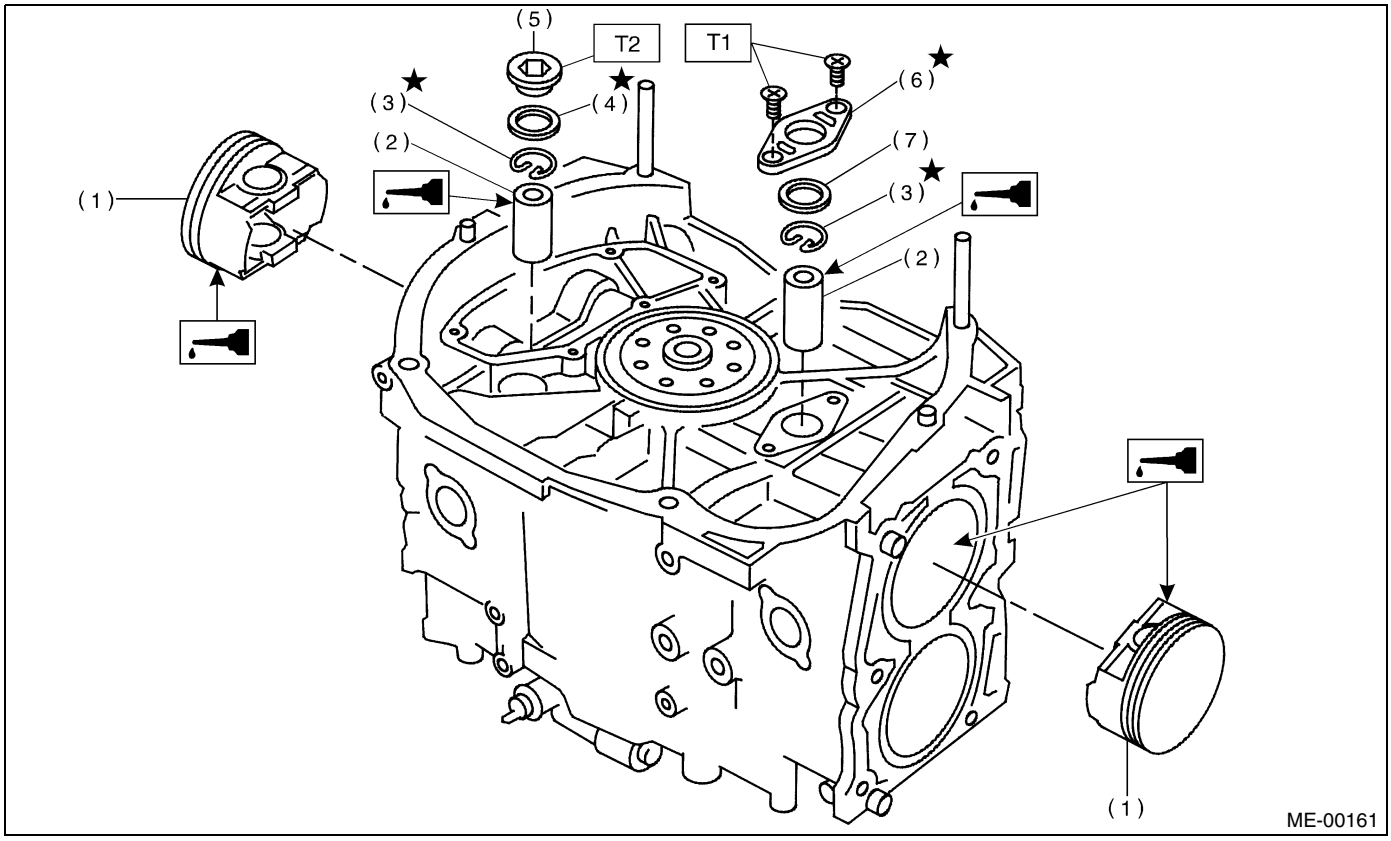
Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



(5) Install the service hole plug and gasket.

NOTE:
Use a new gasket.





(1) Piston
(2) Piston pin
(3) Circlip
(4) Gasket
(5) Service hole plug
(6) Service hole cover
(7) O-ring

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*6.4 (0.65, 4.7)*
T2:	*70 (7.1, 51.4)*

(6) Turn the cylinder block so that #3 and #4 cylinders face upward. Using the same procedures as used for #1 and #2 cylinders, install the pistons and piston pins.

19) Install the water pipe.

20) Install the baffle plate.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

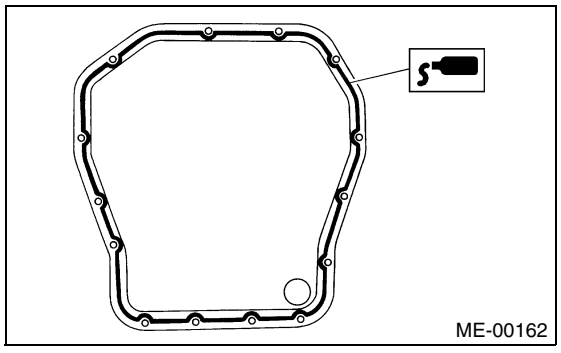
21) Install the oil strainer and O-ring

Tightening torque:
10 N·m (1.0 kgf-m, 7 ft-lb)

22) Install the oil strainer stay.

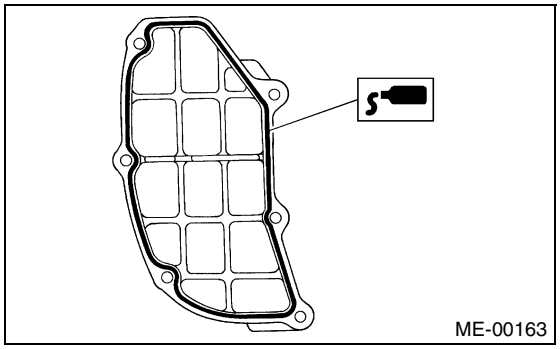
23) Apply fluid packing to the matching surfaces, and then install the oil pan.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



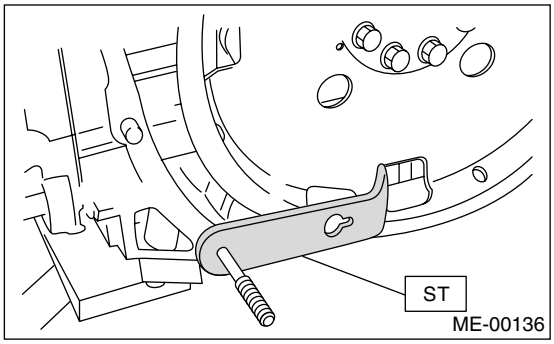
24) Apply fluid packing to the matching surfaces, and then install the oil separator cover.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent

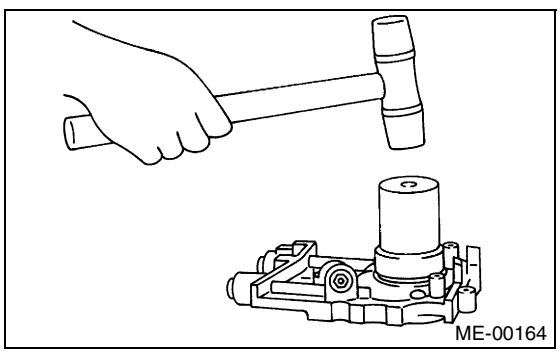


25) Install the drive plate. (AT vehicles)
To lock the crankshaft, use ST.
ST 498497100 CRANKSHAFT STOPPER

Tightening torque:
72 N·m (7.3 kgf-m, 52.8 ft-lb)

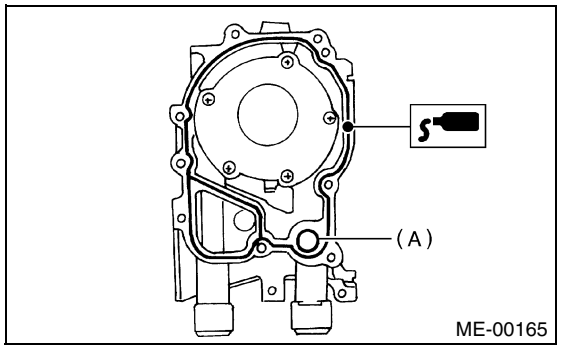


26) Install the flywheel. (MT vehicles) <Ref. to CL-21, INSTALLATION, Flywheel.>
27) Install the clutch disc and cover. (MT vehicles) <Ref. to CL-17, INSTALLATION, Clutch Disc and Cover.>
28) Installation of oil pump:
(1) Discard the front oil seal after removal. Replace with a new one using the ST.
ST 499587100 OIL SEAL INSTALLER



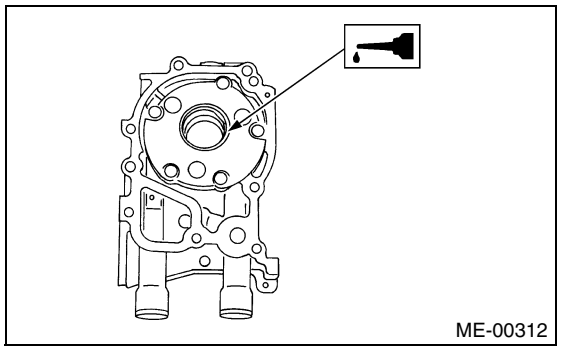
(2) Apply fluid packing to the matching surface of oil pump.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



(A) O-ring

(3) Apply a coat of engine oil to the inside of the oil seal.



(4) Install the oil pump on cylinder block. Be careful not to damage the oil seal during installation.

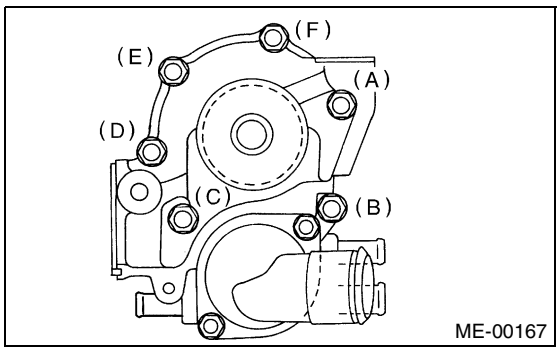
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

NOTE:
• Do not forget to install the O-ring and seal when installing the oil pump.
• Align the flat surface of oil pump's inner rotor with crankshaft before installation.

29) Install the water pump and gasket.

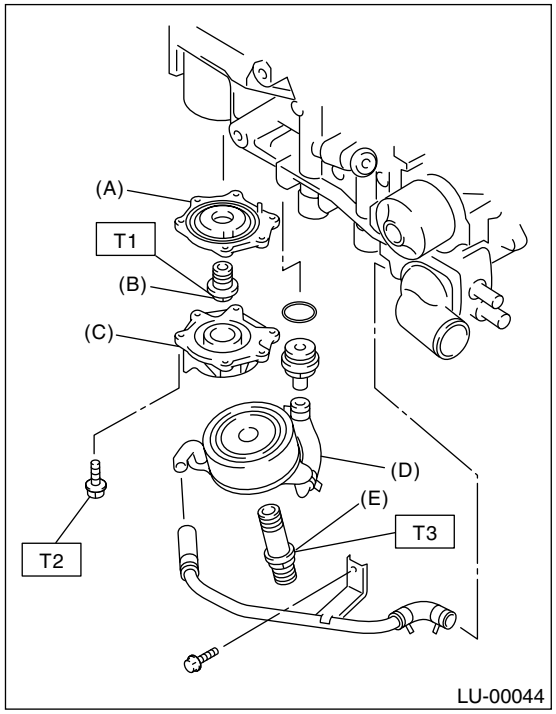
Tightening torque:
First; 12 N·m (1.2 kgf-m, 8.7 ft-lb)
Second; 12 N·m (1.2 kgf-m, 8.7 ft-lb)

NOTE:
• Be sure to use a new gasket.
• When installing the water pump, tighten bolts in two stages in alphabetical sequence as shown in the figure.



30) Install the water by-pass pipe for heater.
31) Install the oil cooler.

Tightening torque:
T1: 45 N·m (4.6 kgf-m, 33 ft-lb)
T2: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)
T3: 54 N·m (5.3 kgf-m, 39 ft-lb)



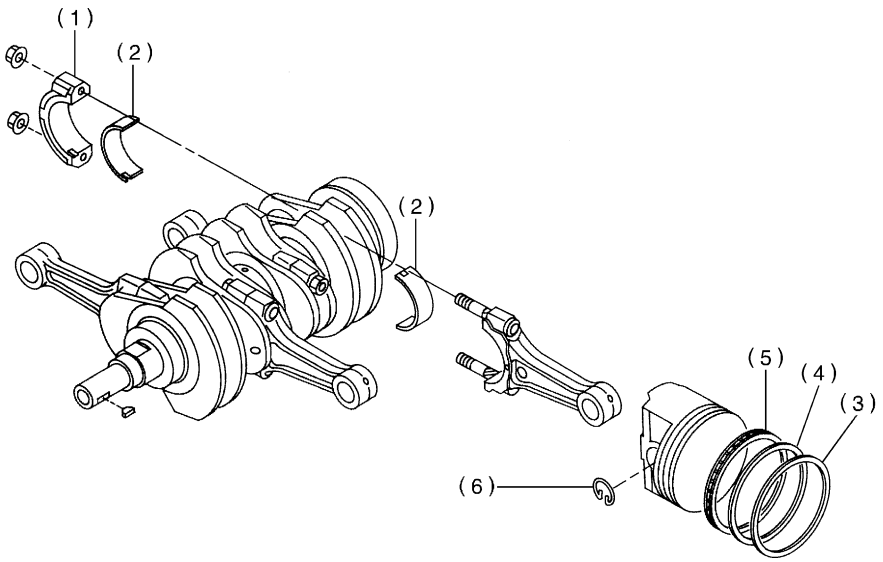
(A) Adapter (1)
(B) Adapter connector
(C) Adapter (2)
(D) Oil cooler
(E) Oil cooler connector

32) Install the oil filter using ST.
ST 18332AA000 OIL FILTER WRENCH
33) Install the water by-pass pipe between oil cooler and water pump.
34) Install the water pipe.

NOTE:
Always use a new O-ring.

35) Install the cylinder head assembly. <Ref. to ME(TURBO)-63, INSTALLATION, Cylinder Head Assembly.>
36) Install the oil level gauge guide and tighten the attaching bolt (left side only).
37) Install the rocker cover.
38) Install the crankshaft sprocket.
<Ref. to ME(TURBO)-57, INSTALLATION, Crankshaft Sprocket.>
39) Install the camshaft sprocket.
<Ref. to ME(TURBO)-56, INSTALLATION, Camshaft Sprocket.>
40) Install the timing belt assembly. <Ref. to ME(TURBO)-50, INSTALLATION, Timing Belt Assembly.>
41) Install the belt cover. <Ref. to ME(TURBO)-47, INSTALLATION, Belt Cover.>
42) Install the crankshaft pulley. <Ref. to ME(TURBO)-46, INSTALLATION, Crankshaft Pulley.>
43) Install the generator and A/C compressor brackets on cylinder head.
44) Install the V-belt. <Ref. to ME(TURBO)-44, INSTALLATION, V-belt.>
45) Install the intake manifold. <Ref. to FU(TURBO)-14, REMOVAL, Intake Manifold.>

C: DISASSEMBLY



(1) Connecting rod cap
(2) Connecting rod bearing
(3) Top ring
(4) Second ring
(5) Oil ring
(6) Circlip

1) Remove the connecting rod cap.
2) Remove the connecting rod bearing.

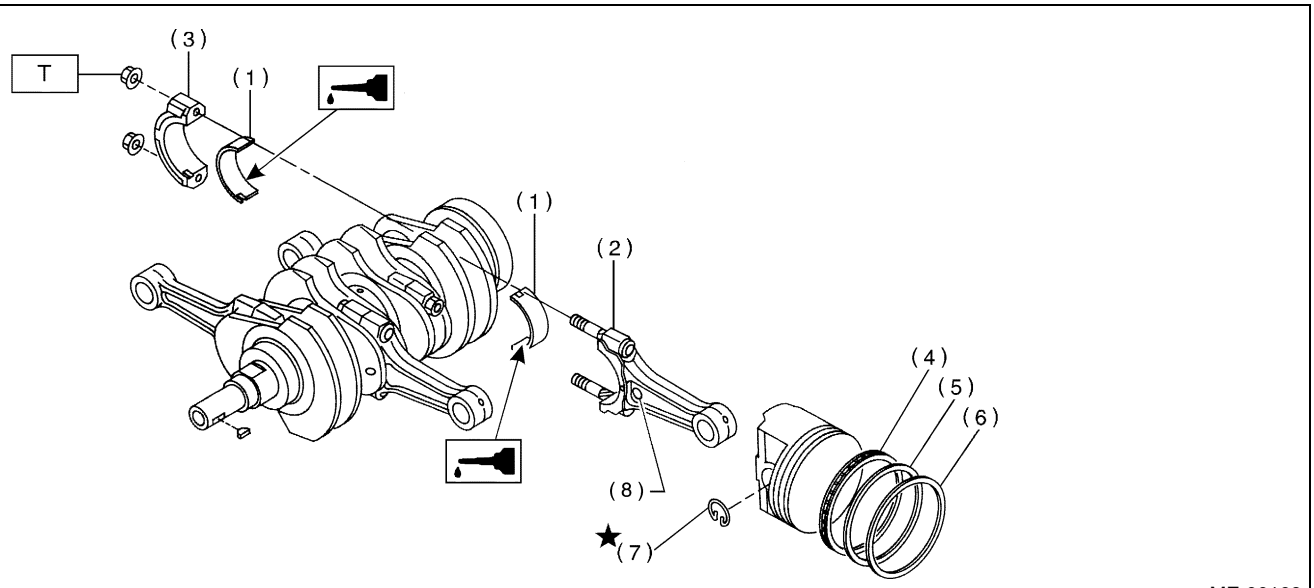
NOTE:
Arrange the removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

3) Remove the piston rings using the piston ring expander.
4) Remove the oil ring by hand.

NOTE:
Arrange the removed piston rings in proper order to prevent confusion.

5) Remove the circlip.

D: ASSEMBLY



(1) Connecting rod bearing
(2) Connecting rod
(3) Connecting rod cap
(4) Oil ring
(5) Second ring
(6) Top ring
(7) Circlip
(8) Side mark

Tightening torque: N·m (kgf-m, ft-lb)
T: 45 (4.6, 33)

1) Apply oil to the surfaces of the connecting rod bearings. Install the connecting rod bearings on connecting rods and connecting rod caps.
2) Install the connecting rod on crankshaft.

NOTE:
Position each connecting rod with the side marked facing forward.

3) Install the connecting rod cap with connecting rod nut.
Ensure the arrow on connecting rod cap faces the front during installation.

NOTE:
• Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
• When tightening the connecting rod nuts, apply oil on the threads.

4) Install the oil ring spacer, upper rail and lower rail in this order by hand. Then install the second ring and top ring with a piston ring expander.

E: INSPECTION

1. CYLINDER BLOCK

1) Visually check for cracks and damage. Especially, inspect the important parts by means of red lead check.
2) Check the oil passages for clogging.
3) Inspect the crankcase surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

Warping limit:
0.05 mm (0.0020 in)

Grinding limit:
0.1 mm (0.004 in)

Standard height of cylinder block:
201.0 mm (7.91 in)

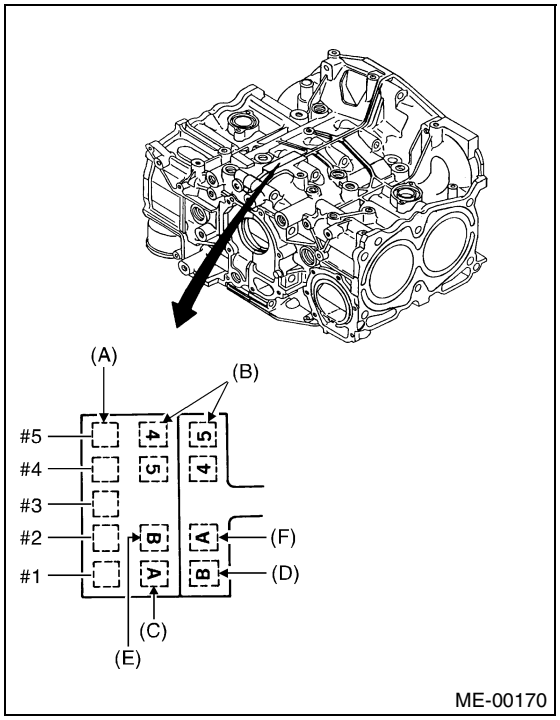
2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on cylinder block's front upper surface.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

NOTE:
Standard sized pistons are classified into two grades, “A” and “B”. These grades should be used as a guide line in selecting a standard piston.

Standard diameter:
A: 92.005 — 92.015 mm (3.6222 — 3.6226 in)
B: 91.995 — 92.005 mm (3.6218 — 3.6222 in)



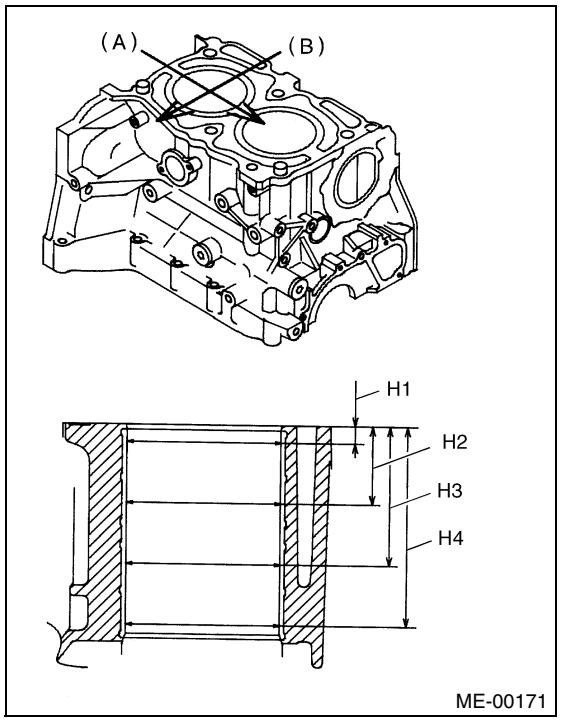
(A) Main journal size mark
(B) Cylinder block RH-LH combination mark
(C) #1 cylinder bore size mark
(D) #2 cylinder bore size mark
(E) #3 cylinder bore size mark
(F) #4 cylinder bore size mark

2) How to measure the inner diameter of each cylinder:
Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights shown in the figure, using a cylinder bore gauge.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Taper:
Standard
0.015 mm (0.0006 in)
Limit
0.050 mm (0.0020 in)

Out-of-roundness:
Standard
0.010 mm (0.0004 in)
Limit
0.050 mm (0.0020 in)



(A) Piston pin direction
(B) Thrust direction
H1: 10 mm (0.39 in)
H2: 45 mm (1.77 in)
H3: 80 mm (3.15 in)
H4: 115 mm (4.53 in)

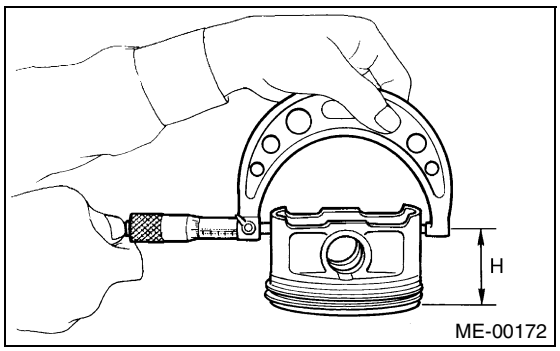
3) When the piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

4) How to measure the outer diameter of each piston:
Measure the outer diameter of each piston at the height shown in the figure. (Thrust direction)

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Piston grade point H:
38.7 mm (1.524 in)

Piston outer diameter:
Standard
A: 91.985 — 91.995 mm
(3.6214 — 3.6218 in)
B: 91.975 — 91.985 mm
(3.6211 — 3.6214 in)
0.25 mm (0.0098 in) oversize
92.225 — 92.235 mm
(3.6309 — 3.6313 in)
0.50 mm (0.0197 in) oversize
92.475 — 92.485 mm
(3.6407 — 3.6411 in)



5) Calculate the clearance between cylinder and piston.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Cylinder to piston clearance at 20°C (68°F):
Standard
0.010 — 0.030 mm (0.0004 — 0.0012 in)
Limit
0.050 mm (0.0020 in)

6) Boring and honing:
(1) If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured exceeds the specified limit or if there is any damage on the cylinder wall, rebore it to use an oversize piston.

CAUTION:
When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and use oversize pistons. Do not perform boring on one cylinder only, nor use an oversize piston for one cylinder only.

(2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the crankcase.

NOTE:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

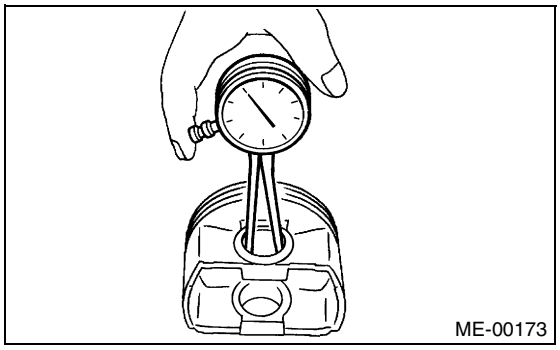
Limit of cylinder enlarging (boring):
0.5 mm (0.020 in)

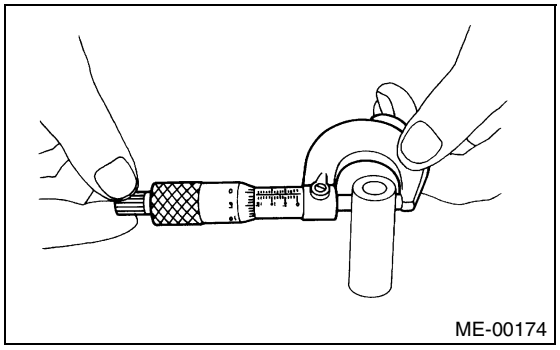
3. PISTON AND PISTON PIN

1) Check the pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.
2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(TURBO)-84, CYLINDER AND PISTON, INSPECTION, Cylinder Block.> If any of the clearances is not within specification, replace the piston or bore the cylinder to use an oversize piston.

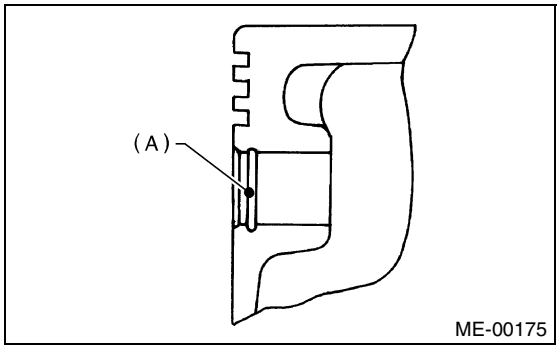
3) Make sure that the piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if defective.

Standard clearance between piston pin and hole in piston:
Standard
0.004 — 0.008 mm (0.0002 — 0.0003 in)
Limit
0.020 mm (0.0008 in)


ME-00173


ME-00174

4) Check the circlip installation groove on piston for burr (A). If necessary, remove the burr from groove so that the piston pin can lightly move.



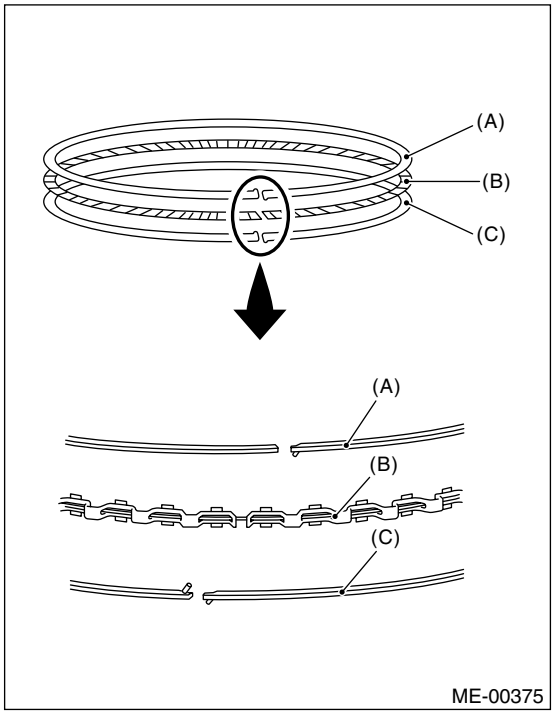
ME-00175

5) Check the piston pin circlip for distortion, cracks and wear.

4. PISTON RING

1) If the piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new one of the same size as the piston.

NOTE:
• Marks are shown on the end of top and second rings. When installing the rings to piston, face this mark upward.
• Oil ring consists of upper rail, expander and lower rail. When installing on piston, be careful of each rail's direction.



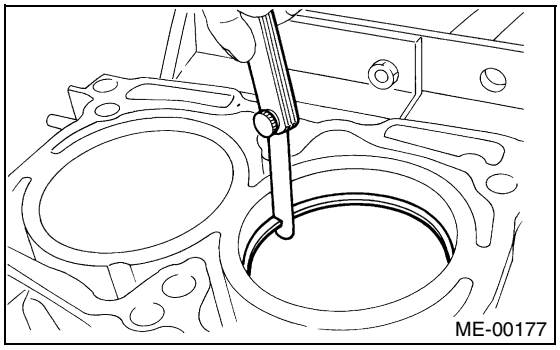
ME-00375

(A) Upper rail
(B) Expander
(C) Lower rail

2) Squarely place the piston ring and oil ring in cylinder, and then measure the piston ring gap with a thickness gauge.

Unit: mm (in)

		Standard	Limit
Piston ring gap	Top ring	0.20 — 0.25 (0.0079 — 0.0098)	1.0 (0.039)
	Second ring	0.35 — 0.50 (0.0138 — 0.0197)	1.0 (0.039)
	Oil ring rail	0.20 — 0.50 (0.0079 — 0.0197)	1.5 (0.059)

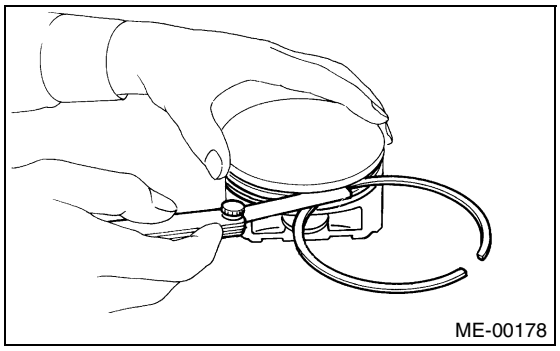

ME-00177

3) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

NOTE:
Before measuring the clearance, clean the piston ring groove and piston ring.

Unit: mm (in)

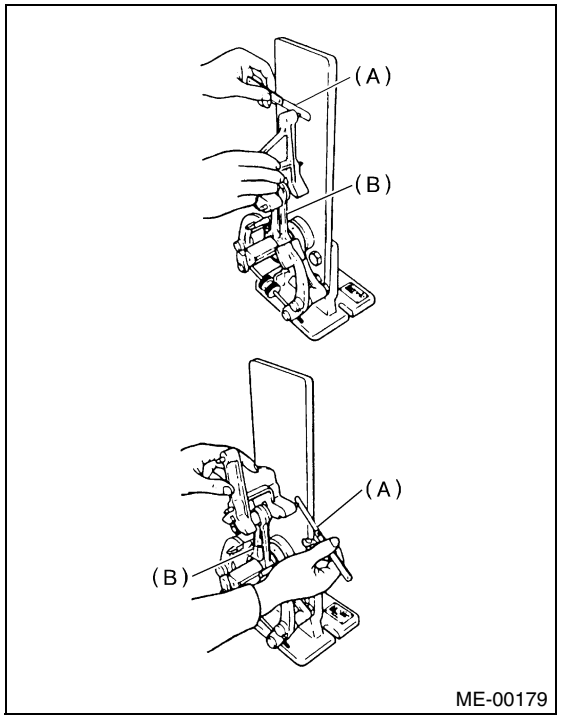
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.055 — 0.090 (0.0022 — 0.0035)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	0.15 (0.0059)


ME-00178

5. CONNECTING ROD

1) Replace the connecting rod, if the large or small end thrust surface is damaged.
2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if the bend or twist exceeds the limit.

Limit of bend or twist per 100 mm (3.94 in) in length:
0.10 mm (0.0039 in)

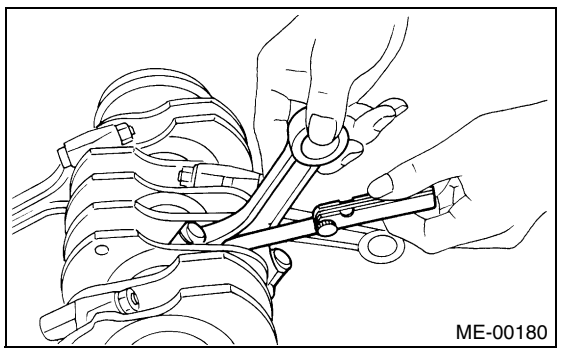


ME-00179

(A) Thickness gauge
(B) Connecting rod

3) Install the connecting rod fitted with bearing to crankshaft, and then measure the side clearance (thrust clearance). Replace the connecting rod if the side clearance exceeds the specified limit.

Connecting rod side clearance:
Standard
0.070 — 0.330 mm (0.0028 — 0.0130 in)
Limit
0.4 mm (0.016 in)


ME-00180

4) Inspect the connecting rod bearing for scar, peeling, seizure, melting, wear, etc.
5) Measure the oil clearance on individual connecting rod bearings by means of plastigauge. If any oil clearance is not within specification, replace the defective bearing with a new one of standard size or undersize as necessary. (See the table below.)

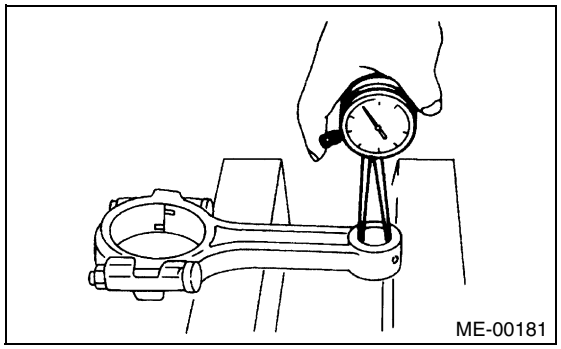
Connecting rod oil clearance:
Standard
0.020 — 0.046 mm (0.0008 — 0.0018 in)
Limit
0.05 mm (0.0020 in)

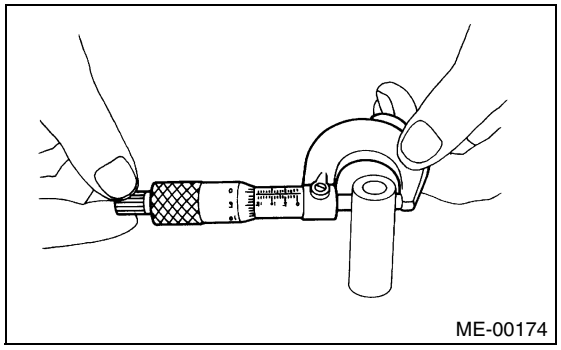
Unit: mm (in)

Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.486 — 1.498 (0.0585 — 0.0590)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.504 — 1.512 (0.0592 — 0.0595)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.514 — 1.522 (0.0596 — 0.0599)	51.934 — 51.950 (2.0447 — 2.0453)
0.25 (0.0098) undersize	1.614 — 1.622 (0.0635 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

6) Inspect the bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at connecting rod small end.

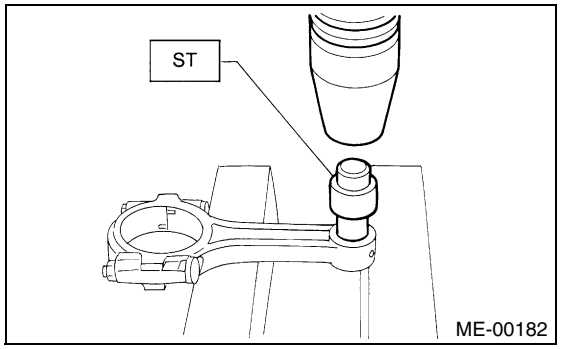
Clearance between piston pin and bushing:
Standard
0 — 0.022 mm (0 — 0.0009 in)
Limit
0.030 mm (0.0012 in)


ME-00181


ME-00174

7) Replacement procedure is as follows:
(1) Remove the bushing from connecting rod with ST and press.
(2) Press the bushing with ST after applying oil on the periphery of bushing.

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



ME-00182

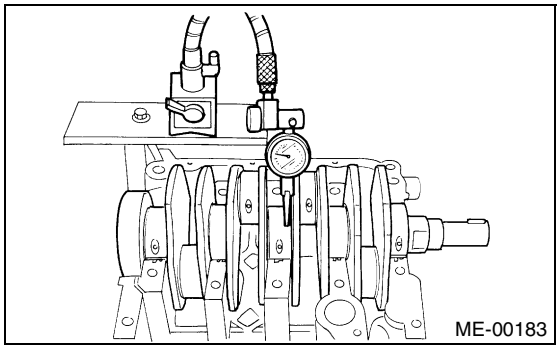
(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
(4) After the completion of reaming, clean the bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

1) Clean the crankshaft completely and check for cracks by means of red lead check etc., and replace if defective.
2) Measure the crankshaft bend, and correct or replace if it exceeds the limit.

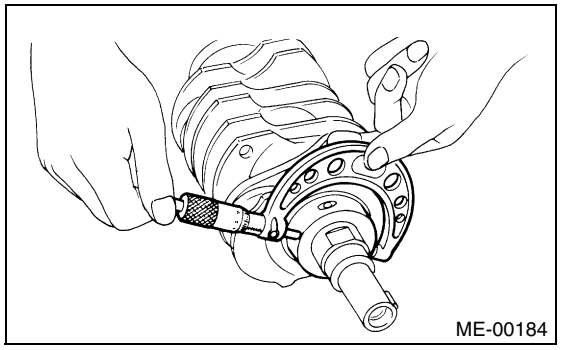
NOTE:
If a suitable V-block is not available, install the #1 and #5 crankshaft bearing on cylinder block, position the crankshaft on these bearings and measure the crankshaft bend using a dial gauge.

Crankshaft bend limit:
0.035 mm (0.0014 in)


ME-00183

3) Inspect the crank journal and crank pin for wear. If they are not within the specifications, replace the bearing with a suitable (undersize) one, and then replace or recondition the crankshaft as necessary. When grinding the crank journal or crank pin, finish them to specified dimensions according to the undersize bearing to be used.

Crank pin and crank journal:
Out-of-roundness
0.020 mm (0.0008 in) or less
Taper limit
0.07 mm (0.0028 in)
Grinding limit
0.250 mm (0.0098 in)


ME-00184

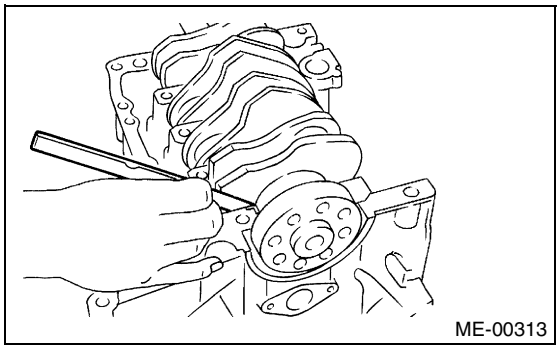
Unit: mm (in)

		Crank journal diameter		Crank pin diameter
		#1, #3, #5	#2, #4	
Standard	Journal O.D.	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.998 — 2.011 (0.0787 — 0.0792)	2.000 — 2.013 (0.0787 — 0.0793)	1.486 — 1.498 (0.0585 — 0.0590)
0.03 (0.0012) undersize	Journal O.D.	59.962 — 59.978 (2.3607 — 2.3613)	59.962 — 59.978 (2.3607 — 2.3613)	51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.022 (0.0795 — 0.0796)	1.504 — 1.512 (0.0592 — 0.0595)
0.05 (0.0020) undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	51.934 — 51.950 (2.0447 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.514 — 1.522 (0.0596 — 0.0599)
0.25 (0.0098) undersize	Journal O.D.	59.742 — 59.758 (2.3520 — 2.3527)	59.742 — 59.758 (2.3520 — 2.3527)	51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.614 — 1.622 (0.0635 — 0.0639)

O.D.: Outer Diameter

4) Measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace the bearing.

Crankshaft thrust clearance:
Standard
0.030 — 0.115 mm (0.0012 — 0.0045 in)
Limit
0.25 mm (0.0098 in)


ME-00313

5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting, and wear.
6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specification, replace the defective bearing with an undersize one, and replace or recondition the crankshaft as necessary.

Unit: mm (in)

Crankshaft oil clearance		
#1	STD	0.003 — 0.030 (0.0001 — 0.0012)
	Limit	0.040 (0.0016)
#2	STD	0.012 — 0.033 (0.0005 — 0.0013)
	Limit	0.045 (0.0018)
#3	STD	0.003 — 0.030 (0.0001 — 0.0012)
	Limit	0.040 (0.0016)
#4	STD	0.012 — 0.033 (0.0005 — 0.0013)
	Limit	0.045 (0.0018)
#5	STD	0.010 — 0.031 (0.0004 — 0.0012)
	Limit	0.040 (0.0016)

21.Engine Trouble in General

A: INSPECTION

NOTE:
"RANK" shown in the chart refers to the possibility of reason for the trouble in order ("Very often" to "Rarely")

A — Very often
B — Sometimes
C — Rarely

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
1. Engine will not start.			
1) Starter does not turn.	• Starter	• Defective battery-to-starter harness	B
		• Defective starter switch	C
		• Defective inhibitor switch or neutral switch	C
		• Defective starter	B
	• Battery	• Poor terminal connection	A
		• Run-down battery	A
		• Defective charging system	B
	• Friction	• Seizure of crankshaft and connecting rod bearing	C
		• Seized camshaft	C
		• Seized or stuck piston and cylinder	C
2) Initial combustion does not occur.	• Starter	• Defective starter	C
	• Engine control system <Ref. to EN(TURBO)-2, Basic Diagnostic Procedure.>		A
	• Fuel line	• Defective fuel pump and relay	A
		• Lack of or insufficient fuel	B
	• Belt	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	B
		• Improper engine oil (low viscosity)	B
3) Initial combustion occur.	• Engine control system <Ref. to EN(TURBO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
	• Fuel line	• Defective fuel pump and relay	C
		• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Belt	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	B
		• Improper engine oil (low viscosity)	B

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
4) Engine stalls after initial combustion.	• Engine control system <Ref. to EN(TURBO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	B
		• Loosened or cracked PCV hose	C
		• Loosened or cracked vacuum hose	C
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Dirty air cleaner element	C
	• Fuel line	• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Belt	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	B
		• Improper engine oil (low viscosity)	B
2. Rough idle and engine stall	• Engine control system <Ref. to EN(TURBO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	A
		• Loosened or cracked PCV hose	A
		• Loosened or cracked vacuum hose	A
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Defective PCV valve	C
		• Loosened oil filler cap	B
		• Dirty air cleaner element	C
	• Fuel line	• Defective fuel pump and relay	C
		• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Belt	• Defective timing	C
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	B
		• Loosened cylinder head bolts or defective gasket	B
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	B
		• Incorrect valve timing	A
		• Improper engine oil (low viscosity)	B
	• Lubrication system	• Incorrect oil pressure	B
		• Defective rocker cover gasket	C
	• Cooling system	• Overheating	C
	• Others	• Malfunction of evaporative emission control system	A
		• Stuck or damaged throttle valve	B
		• Accelerator cable out of adjustment	C

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
3. Low output, hesitation and poor acceleration	• Engine control system <Ref. to EN(TURBO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	A
		• Loosened or cracked PCV hose	A
		• Loosened or cracked vacuum hose	B
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Defective PCV valve	B
		• Loosened oil filler cap	B
		• Dirty air cleaner element	A
	• Fuel line	• Defective fuel pump and relay	B
		• Clogged fuel line	B
		• Lack of or insufficient fuel	C
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	B
		• Loosened cylinder head bolts or defective gasket	B
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
		• Improper engine oil (low viscosity)	B
	• Lubrication system	• Incorrect oil pressure	B
	• Cooling system	• Overheating	C
		• Over cooling	C
	• Others	• Malfunction of evaporative emission control system	A
4. Surging	• Engine control system <Ref. to EN(TURBO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	A
		• Loosened or cracked PCV hose	A
		• Loosened or cracked vacuum hose	A
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Defective PCV valve	B
		• Loosened oil filler cap	B
		• Dirty air cleaner element	B
	• Fuel line	• Defective fuel pump and relay	B
		• Clogged fuel line	B
		• Lack of or insufficient fuel	C
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	C
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
		• Improper engine oil (low viscosity)	B
	• Cooling system	• Overheating	B
	• Others	• Malfunction of evaporative emission control system	C

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
5. Engine does not return to idle.	• Engine control system <Ref. to EN(TURBO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked vacuum hose	A
	• Others	• Stuck or damaged throttle valve	A
		• Accelerator cable out of adjustment	B
6. Dieseling (Run-on)	• Engine control system <Ref. to EN(TURBO)-2, Basic Diagnostic Procedure.>		A
	• Cooling system	• Overheating	B
	• Others	• Malfunction of evaporative emission control system	B
7. After burning in exhaust system	• Engine control system <Ref. to EN(TURBO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	C
		• Loosened or cracked PCV hose	C
		• Loosened or cracked vacuum hose	B
		• Defective PCV valve	B
		• Loosened oil filler cap	C
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	C
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
	• Lubrication system	• Incorrect oil pressure	C
	• Cooling system	• Over cooling	C
	• Others	• Malfunction of evaporative emission control system	C
8. Knocking	• Engine control system <Ref. to EN(TURBO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened oil filler cap	B
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Incorrect valve timing	B
	• Cooling system	• Overheating	A
9. Excessive engine oil consumption	• Intake system	• Loosened or cracked PCV hose	A
		• Defective PCV valve	B
		• Loosened oil filler cap	C
	• Compression	• Defective valve stem	A
		• Worn or stuck piston rings, cylinder and piston	A
	• Lubrication system	• Loosened oil pump attaching bolts and defective gasket	B
		• Defective oil filter o-ring	B
		• Defective crankshaft oil seal	B
		• Defective rocker cover gasket	B
		• Loosened oil drain plug or defective gasket	B
		• Loosened oil pan fitting bolts or defective oil pan	B

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
10. Excessive fuel consumption	• Engine control system <Ref. to EN(TURBO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Dirty air cleaner element	A
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	C
		• Worn or stuck piston rings, cylinder and piston	B
		• Incorrect valve timing	B
	• Lubrication system	• Incorrect oil pressure	C
	• Cooling system	• Over cooling	C
	• Others	• Accelerator cable out of adjustment	B

22.Engine Noise

A: INSPECTION

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	• Valve mechanism is defective. • Incorrect valve clearance • Worn valve rocker • Worn camshaft • Broken valve spring
Heavy and dull clank	Oil pressure is low.	• Worn crankshaft main bearing • Worn connecting rod bearing (big end)
	Oil pressure is normal.	• Loose flywheel mounting bolts • Damaged engine mounting
High-pitched clank (Spark knock)	Sound is noticeable when accelerating with an overload.	• Ignition timing advanced • Accumulation of carbon inside combustion chamber • Wrong spark plug • Improper gasoline
Clank when engine speed is medium (1,000 to 2,000 rpm).	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn crankshaft main bearing • Worn bearing at crankshaft end of connecting rod
Knocking sound when engine is operating under idling speed and engine is warm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn cylinder liner and piston ring • Broken or stuck piston ring • Worn piston pin and hole at piston end of connecting rod
	Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)	• Unusually worn valve lifter • Worn cam gear • Worn camshaft journal bore in crankcase
Squeaky sound	—	• Insufficient generator lubrication
Rubbing sound	—	• Defective generator brush and rotor contact
Gear scream when starting engine	—	• Defective ignition starter switch • Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	• Loose drive belt • Defective water pump shaft
Hissing sound	—	• Loss of compression • Air leakage in air intake system, hoses, connections or manifolds
Timing belt noise	—	• Loose timing belt • Belt contacting case/adjacent part
Valve tappet noise	—	• Incorrect valve clearance

NOTE*:
When disconnecting the fuel injector connector, Malfunction Indicator Light (CHECK ENGINE light) illuminates and trouble code is stored in ECM memory.
Therefore, carry out the CLEAR MEMORY MODE <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(TURBO)-42, OPERATION, Inspection Mode.> after connecting the fuel injector connector.

EXHAUST

EX(TURBO)

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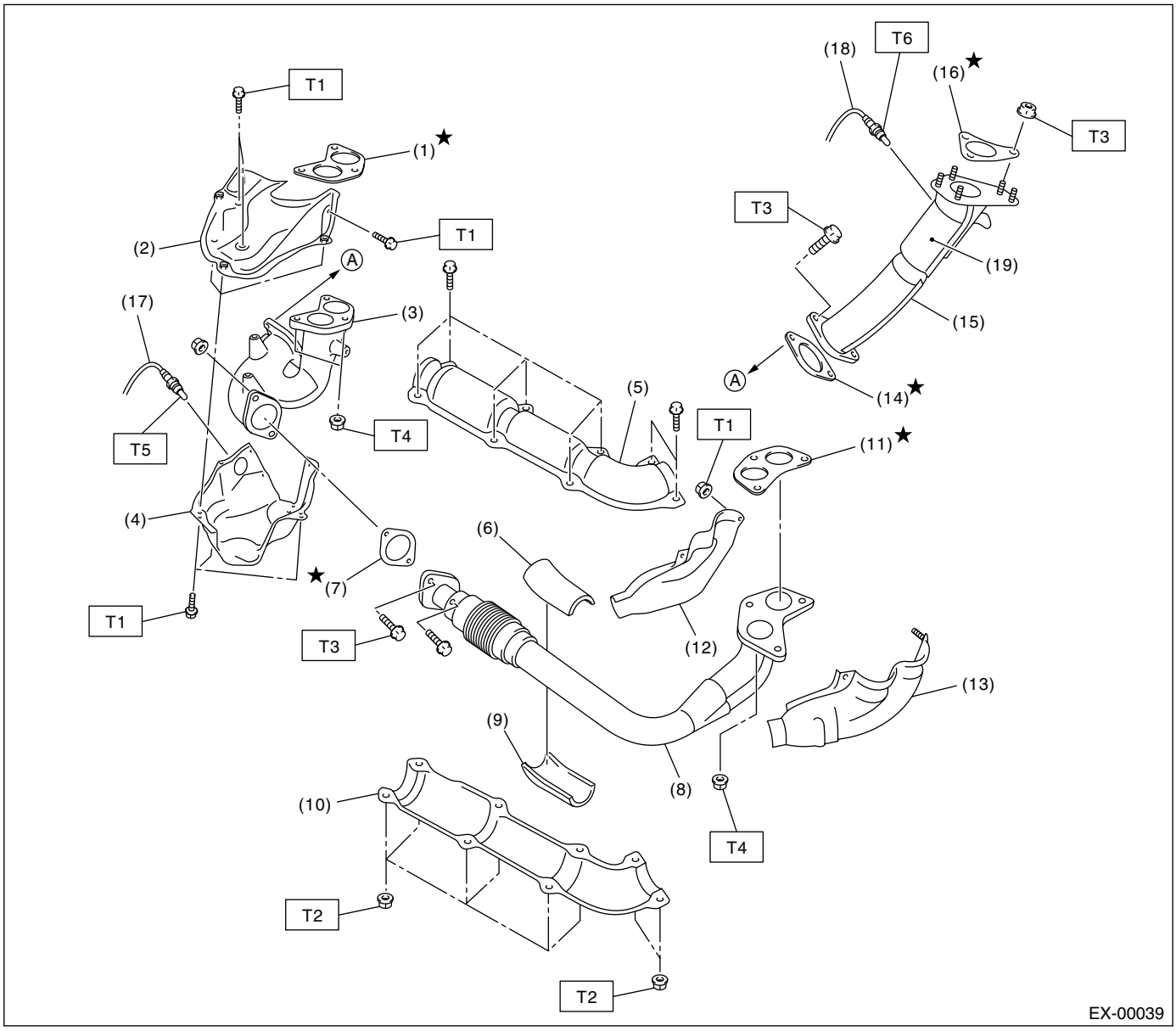
2. Front Exhaust Pipe....5
3. Center Exhaust Pipe 7
4. Joint Pipe 11
5. Rear Exhaust Pipe 12
6. Muffler 14

1. General Description

A: COMPONENT

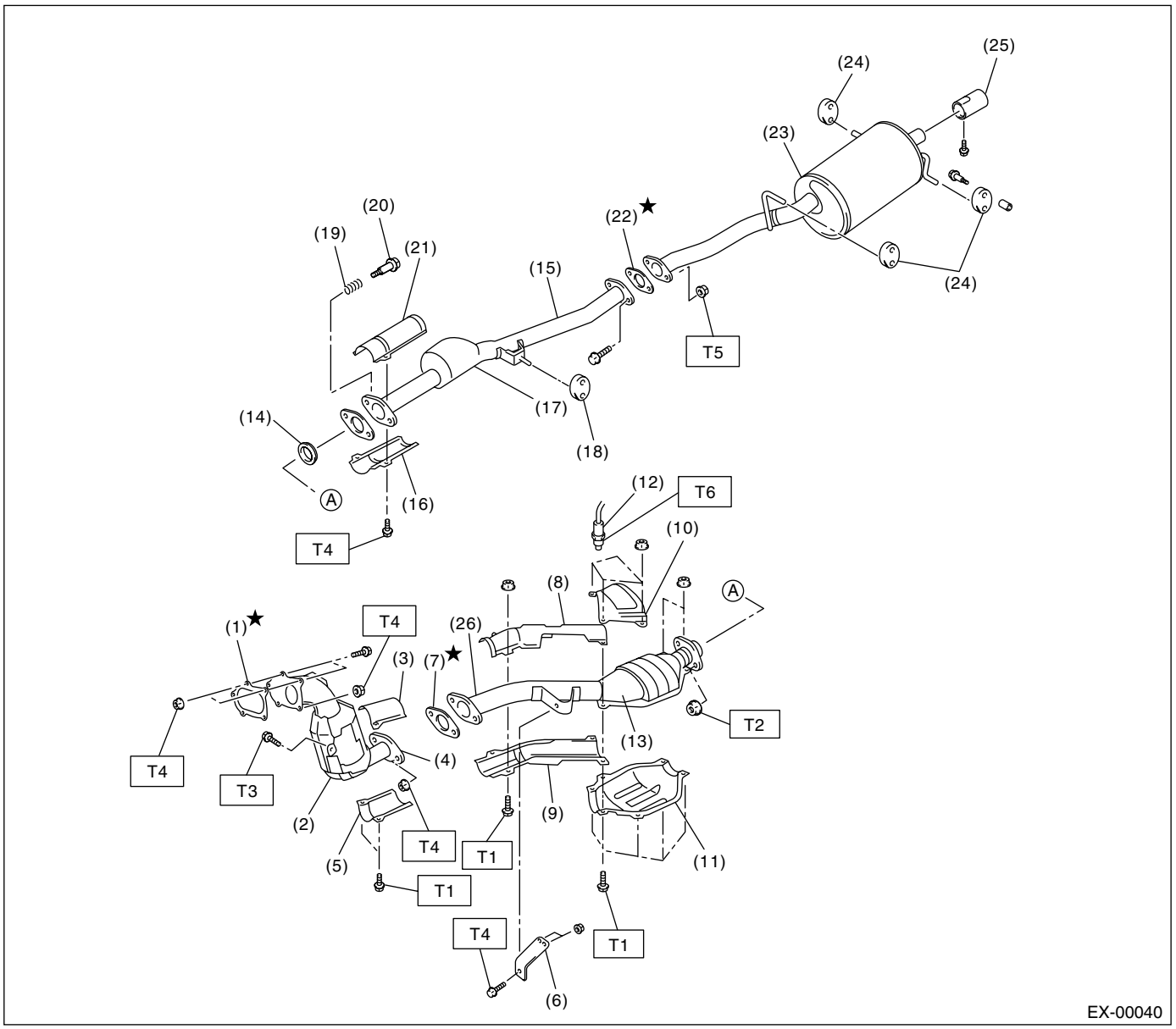
1. FRONT EXHAUST PIPE



(1) Gasket
(2) Upper exhaust manifold cover (RH)
(3) Exhaust manifold (RH)
(4) Lower exhaust manifold cover (RH)
(5) Front exhaust pipe upper cover
(6) Front exhaust pipe upper insulator
(7) Gasket
(8) Front exhaust pipe
(9) Front exhaust pipe lower insulator
(10) Front exhaust pipe lower cover
(11) Gasket
(12) Upper exhaust manifold cover (LH)
(13) Lower exhaust manifold cover (LH)
(14) Gasket
(15) Turbocharger joint pipe
(16) Gasket
(17) Front oxygen (A/F) sensor
(18) Exhaust temperature sensor
(19) Precatalytic converter

Tightening torque: N·m (kgf-m, ft-lb)
T1: 19 (1.9, 13.7)
T2: 7.5 (0.8, 5.5)
T3: 35 (3.6, 26.0)
T4: 40 (4, 28.9)
T5: <Ref. to FU(TURBO)-44, INSTALLATION, Front Oxygen (A/F) Sensor.>
T6: <Ref. to FU(TURBO)-47, INSTALLATION, Exhaust Temperature Sensor.>

2. CENTER AND REAR EXHAUST PIPE, AND MUFFLER



EX-00040

(1) Gasket
(2) Front catalytic converter
(3) Upper center pipe cover (Front)
(4) Center exhaust pipe (Front)
(5) Lower center pipe cover (Front)
(6) Bracket
(7) Gasket
(8) Upper center pipe cover (Rear)
(9) Lower center pipe cover (Rear)
(10) Upper rear catalytic converter cover
(11) Lower rear catalytic converter cover
(12) Rear oxygen sensor
(13) Rear catalytic converter
(14) Gasket
(15) Rear exhaust pipe
(16) Lower rear exhaust pipe cover (Front)
(17) Chamber
(18) Cushion
(19) Spring
(20) Bolt
(21) Upper rear exhaust pipe cover (Front)
(22) Gasket
(23) Muffler
(24) Cushion
(25) Muffler cutter
(26) Center exhaust pipe (Rear)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 13 (1.3, 9.6)
T2: 18 (1.8, 13.0)
T3: 30 (3.1, 22.4)
T4: 35 (3.6, 26.0)
T5: 48 (4.9, 35.4)
T6: <Ref. to FU(TURBO)-45, INSTALLATION, Rear Oxygen Sensor.>

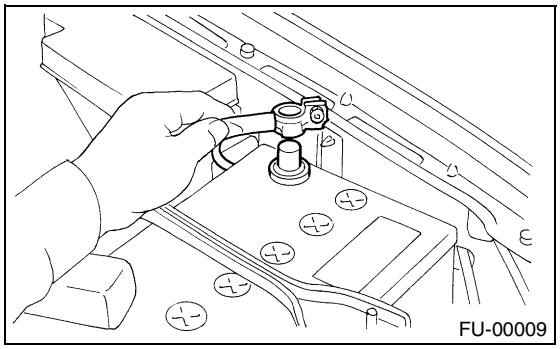
B: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

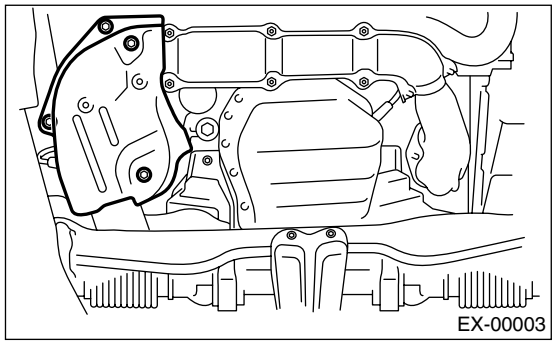
2. Front Exhaust Pipe

A: REMOVAL

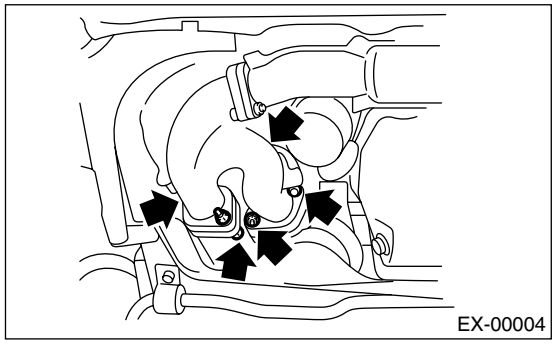
1) Disconnect the ground cable from battery.

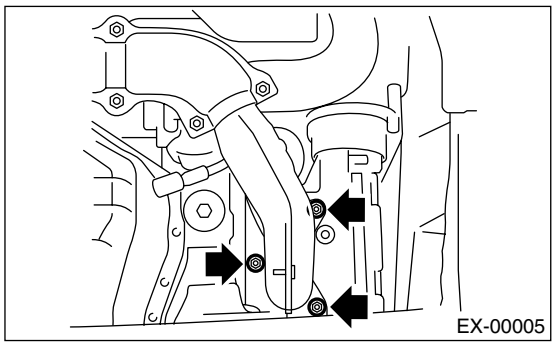


2) Remove the front oxygen (A/F) sensor. <Ref. to FU(TURBO)-43, REMOVAL, Front Oxygen (A/F) Sensor.>
3) Remove the under cover.
4) Remove the lower exhaust manifold cover (RH).

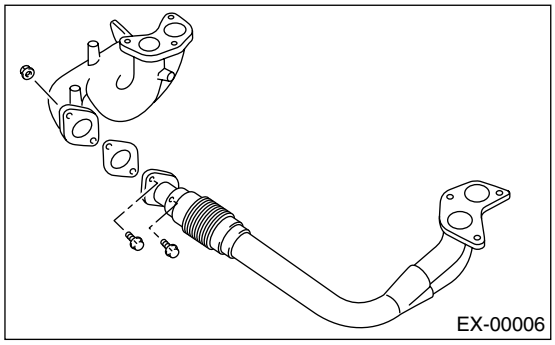


5) Remove the nuts which hold front exhaust pipe assembly to turbocharger joint pipe.
6) While holding the front exhaust pipe assembly with one hand, remove the nuts which hold front exhaust pipe assembly to cylinder head exhaust port.





7) Remove the front exhaust pipe assembly.
8) Remove the covers from exhaust manifold and front exhaust pipe.
9) Separate the front exhaust pipe from exhaust manifolds.

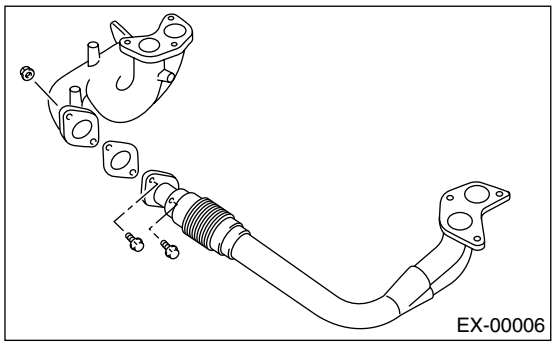


B: INSTALLATION

NOTE:
Replace the gaskets with new ones.

1) Assemble the front exhaust pipe and exhaust manifolds.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)



2) Install the front exhaust pipe covers.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

3) Install the upper exhaust manifold cover (RH).

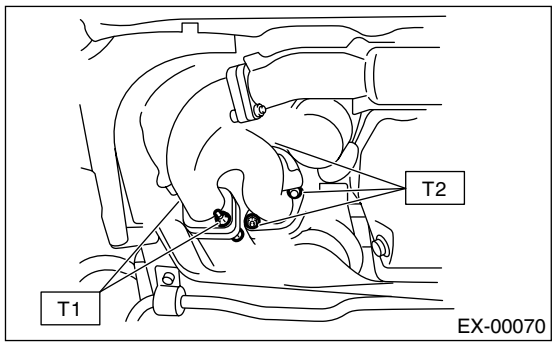
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)

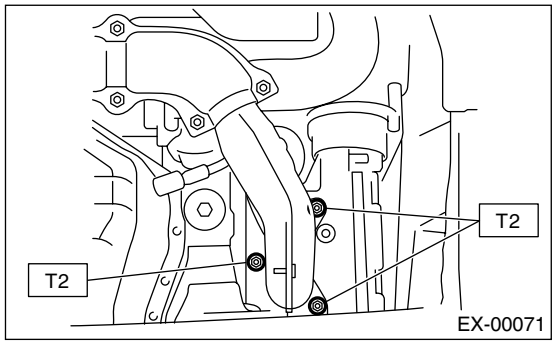
4) Install the front exhaust pipe assembly.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)

5) Connect the exhaust manifold (RH) to turbocharger joint pipe.

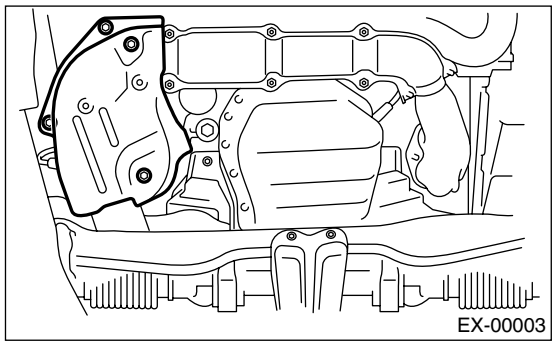
Tightening torque:
T1: 35 N·m (3.6 kgf-m, 26.0 ft-lb)
T2: 40 N·m (4.0 kgf-m, 28.9 ft-lb)





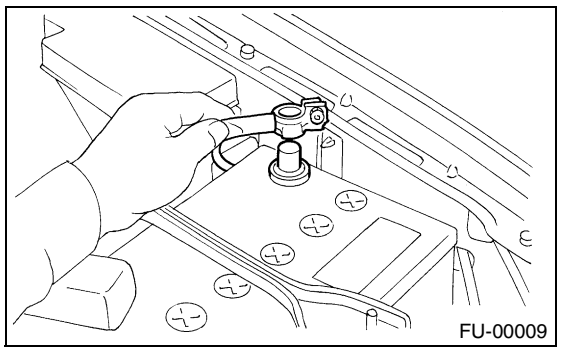
6) Install the lower exhaust manifold cover (RH).

Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



7) Install the front oxygen (A/F) sensor. <Ref. to FU(TURBO)-44, INSTALLATION, Front Oxygen (A/F) Sensor.>
8) Install the under cover.

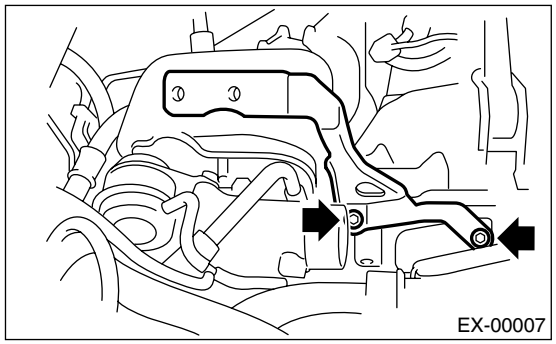
9) Connect the battery ground cable to battery.



3. Center Exhaust Pipe

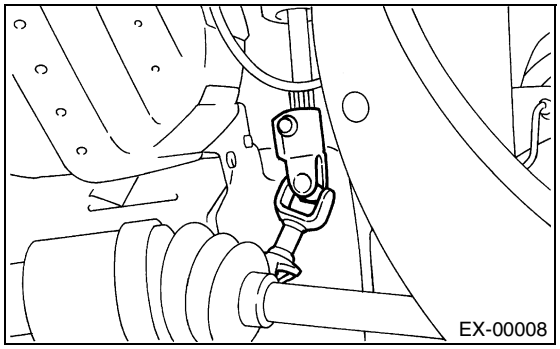
A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Remove the intercooler. <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
4) Remove the intercooler bracket.



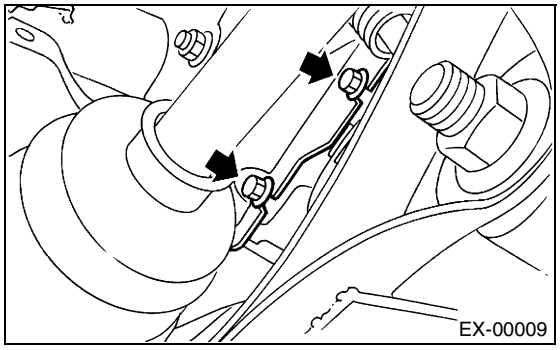
5) Lift-up the vehicle.
6) Remove the under cover.
7) Remove the universal joint bolts and then remove the universal joint. (RHD model)

CAUTION:
Scribe alignment marks on the universal joint so that it can be reassembled at the original serration.

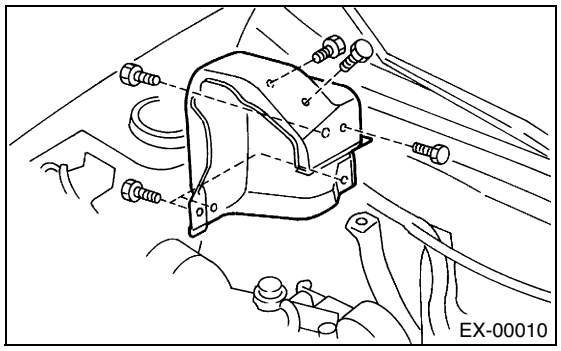


8) Remove the bolts which install lower side of turbocharger upper cover.

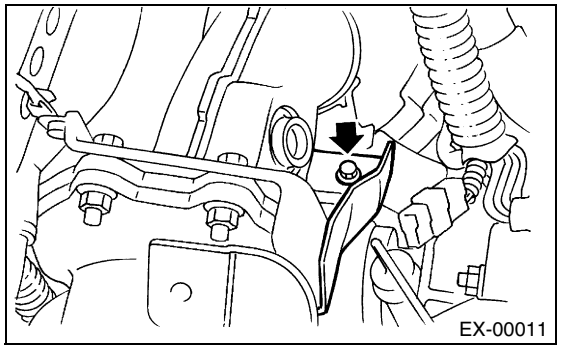
CAUTION:
Be careful, the turbocharger and exhaust pipe are hot.



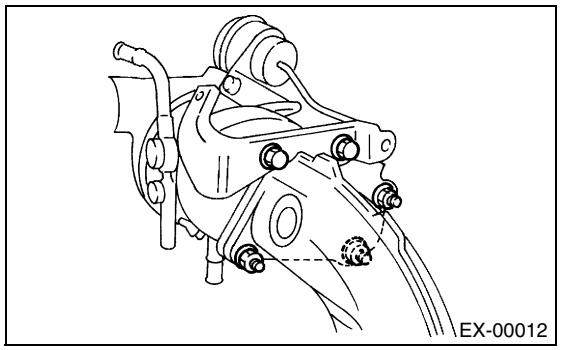
9) Lower the vehicle.
10) Remove the turbocharger upper cover.



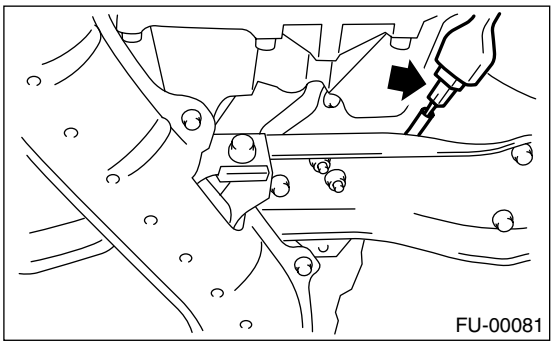
11) Remove the bolts which install upper side of turbocharger upper cover, and remove it.



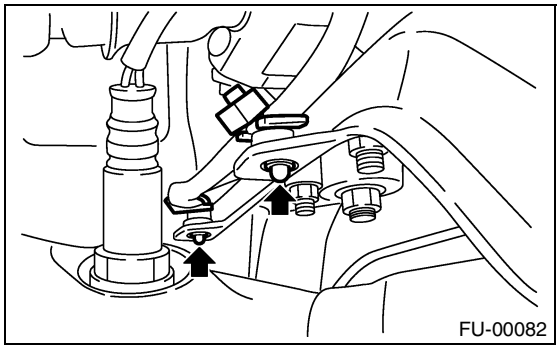
12) Separate the center exhaust pipe from turbocharger.



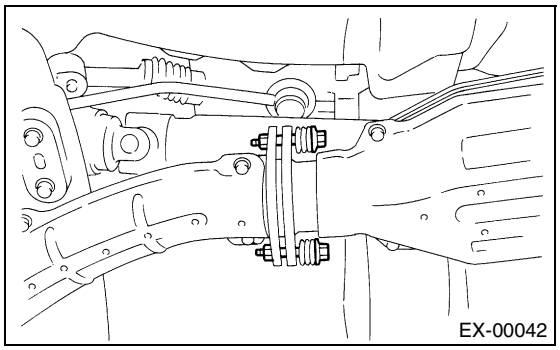
13) Lift-up the vehicle.
14) Disconnect the connector from rear oxygen sensor.



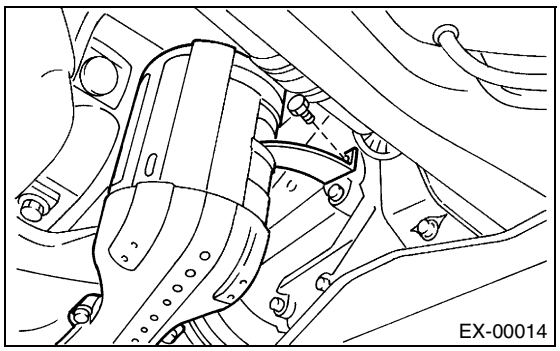
15) Vertically draw out the clip from crossmember.



16) Separate the center exhaust pipe from rear exhaust pipe.

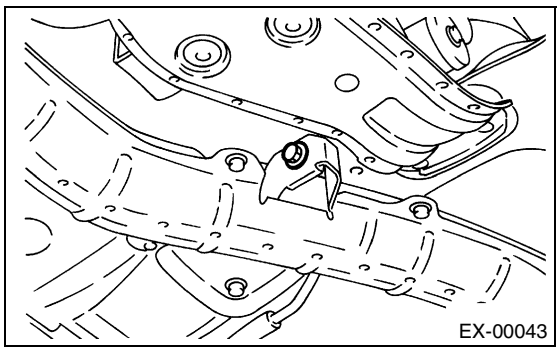


17) Remove the bolt which holds center exhaust pipe bracket to transmission.

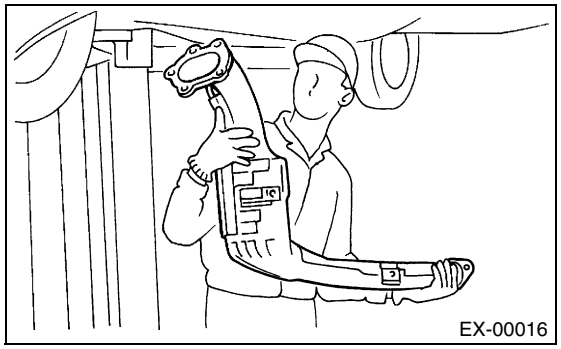


18) Remove the intercooler bracket.
19) Remove the bolt which holds center exhaust pipe to hanger bracket.

CAUTION:
Be careful not to pull down the center exhaust pipe.



20) Remove the center exhaust pipe.

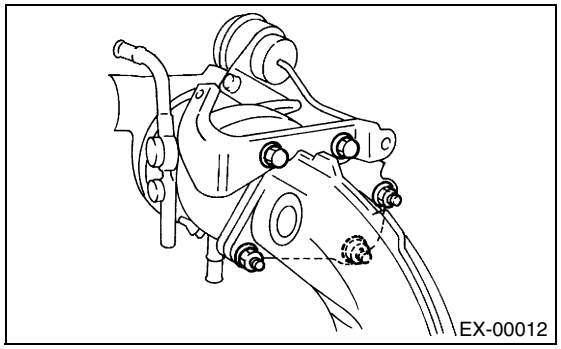


B: INSTALLATION

NOTE:
Replace the gaskets with new ones.

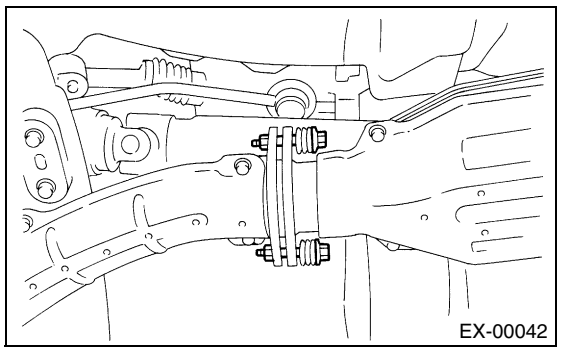
1) Install the center exhaust pipe and temporarily tighten the bolt which holds center exhaust pipe to hanger bracket.
2) Temporarily tighten the bolt which holds center pipe to transmission.
3) Connect the center exhaust pipe to turbocharger.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)

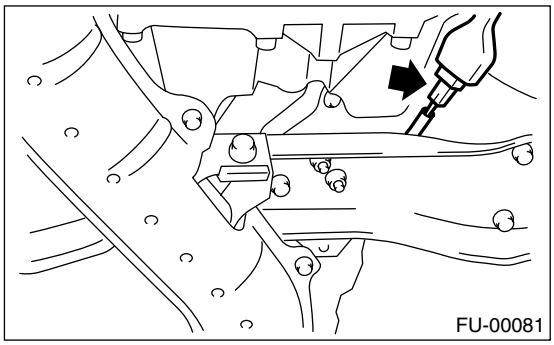


4) Install the center exhaust pipe to rear exhaust pipe.

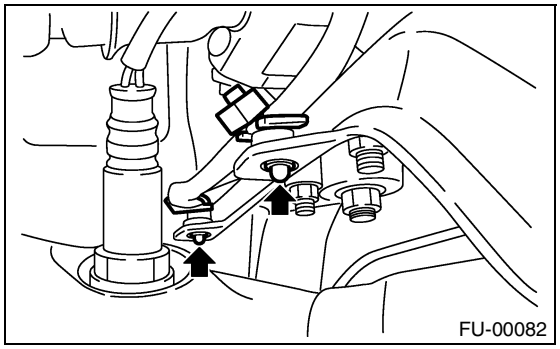
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



5) Connect the connector to rear oxygen sensor.

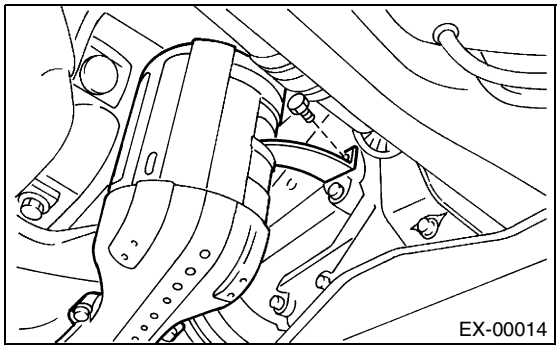


6) Secure the clip on crossmember.



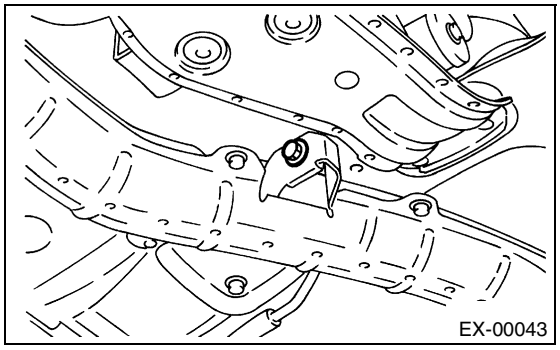
7) Tighten the bolt which holds center exhaust pipe bracket to transmission.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)



8) Tighten the bolt which holds center exhaust pipe to hanger bracket.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)



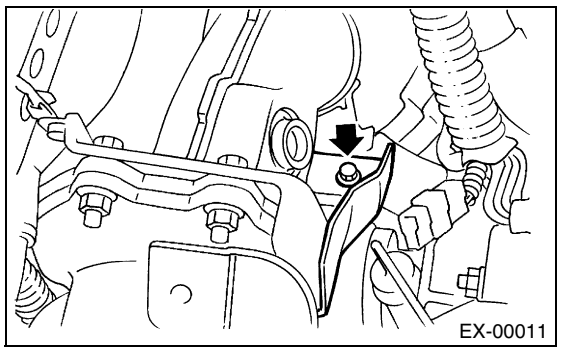
9) Tighten the bolts which hold intercooler bracket.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)

10) Lower the vehicle.

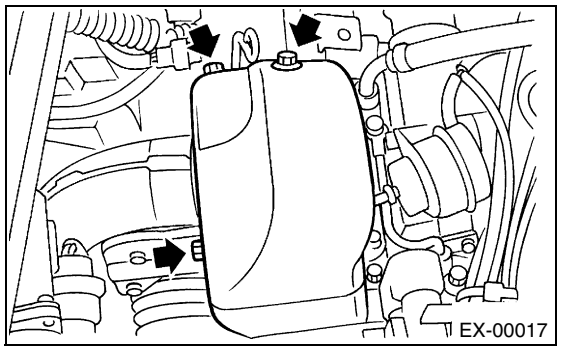
11) Place the turbocharger lower cover, and tighten the bolts which install upper side of lower cover.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



12) Place the turbocharger upper cover, and tighten the bolts which install upper side of upper cover.

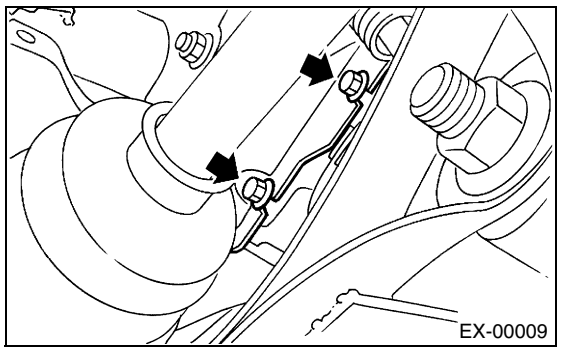
Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



13) Lift-up the vehicle.

14) Tighten the bolts which install under side of turbocharger upper cover.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

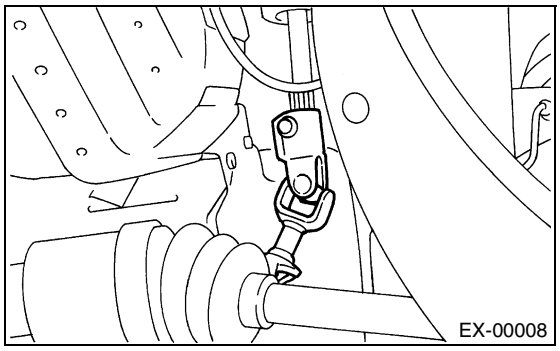


15) Install the universal joint.
(1) Align the bolt hole on long yoke side of universal joint with the cutout at serrated section of shaft end, and insert the universal joint.
(2) Align the bolt hole on short yoke side of universal joint with the cutout at serrated section of gearbox assembly. Lower the universal joint completely.
(3) Temporarily tighten the bolt on short yoke side. Raise the universal joint to make sure the bolt is properly passing through the cutout at serrated section.
(4) Tighten the bolt on long yoke side, then that on the short yoke side.

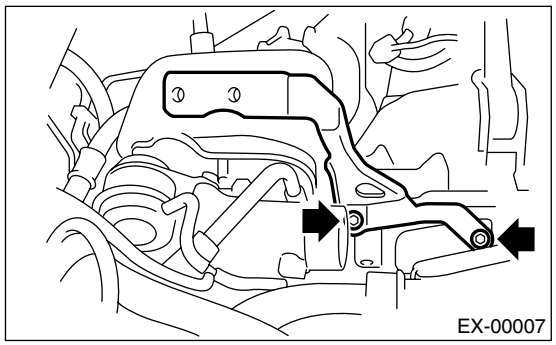
Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

CAUTION:
• Make sure that the universal joint bolts are tightened through notches in shaft serration.
• Excessively large tightening torque of universal joint bolts may lead to heavy steering wheel operation.

Standard clearance between gearbox to DOJ:
Over 15 mm (0.59 in)



16) Install the under cover.
17) Lower the vehicle.
18) Install the intercooler bracket.

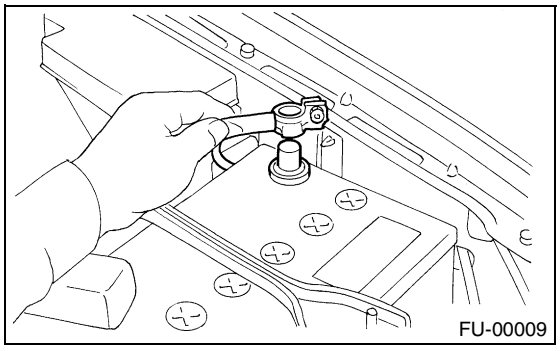


19) Install the intercooler. <Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>
20) Align the center of roll connector. <Ref. to AB-13, ROLL CONNECTOR, INSPECTION, Inspection Locations After a Collision.>

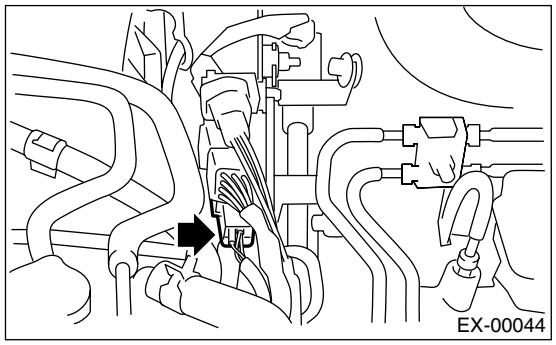
4. Joint Pipe

A: REMOVAL

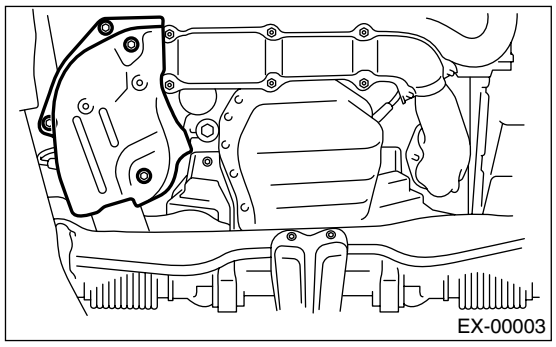
1) Disconnect the ground cable from battery.



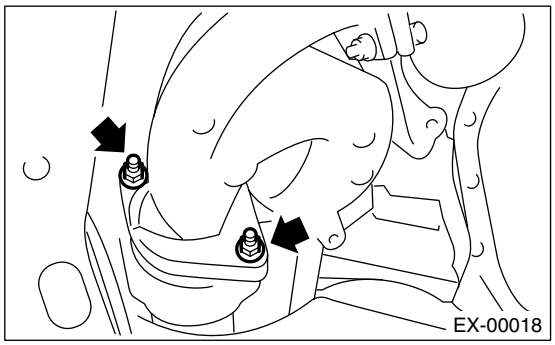
2) Disconnect the exhaust temperature sensor connector.



3) Remove the front oxygen (A/F) sensor. <Ref. to FU(TURBO)-43, REMOVAL, Front Oxygen (A/F) Sensor.>
4) Remove the under cover.
5) Remove the lower exhaust manifold cover (RH).



6) Remove the nuts which hold front exhaust manifold to joint pipe.

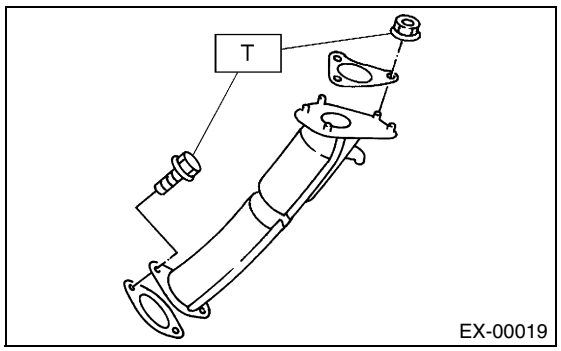


7) Remove the center exhaust pipe. <Ref. to EX(TURBO)-7, REMOVAL, Center Exhaust Pipe.>
8) Remove the turbocharger. <Ref. to IN(TURBO)-12, REMOVAL, Turbocharger.>
9) Take off the joint pipe in the upward direction.

B: INSTALLATION

Install in the reverse order of removal.

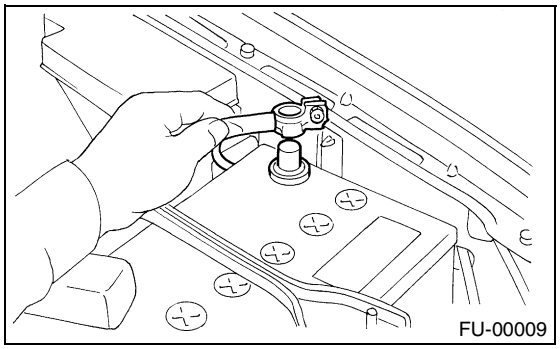
Tightening torque:
T: 35 N·m (3.6 kgf-m, 26.0 ft-lb)



5. Rear Exhaust Pipe

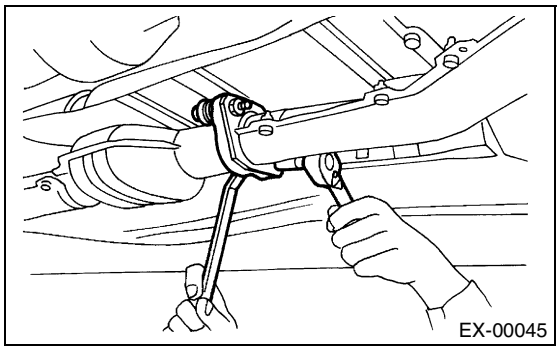
A: REMOVAL

1) Disconnect the ground cable from battery.



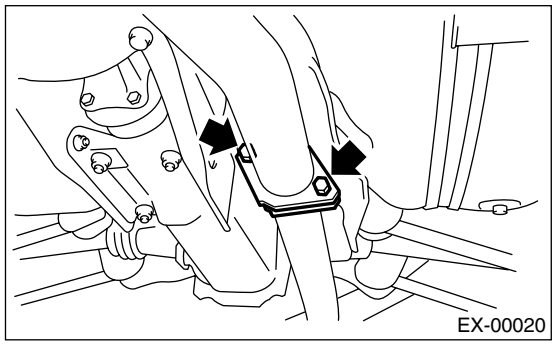
2) Lift-up the vehicle.
3) Separate the rear exhaust pipe from center exhaust pipe.

CAUTION:
Be careful, the exhaust pipe is hot.

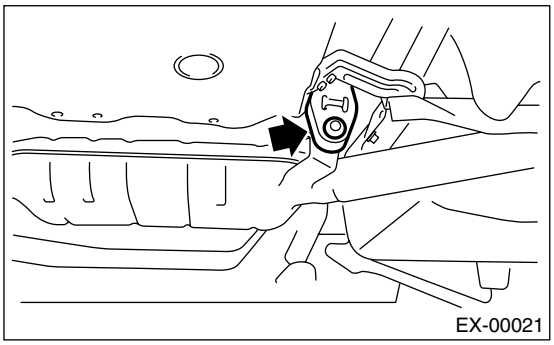


4) Separate the rear exhaust pipe from muffler.

CAUTION:
Be careful not to pull down the rear exhaust pipe.



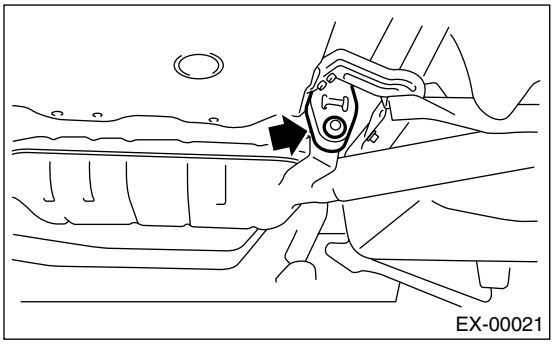
5) Separate the rear exhaust pipe from cushion rubber, and then remove.



B: INSTALLATION

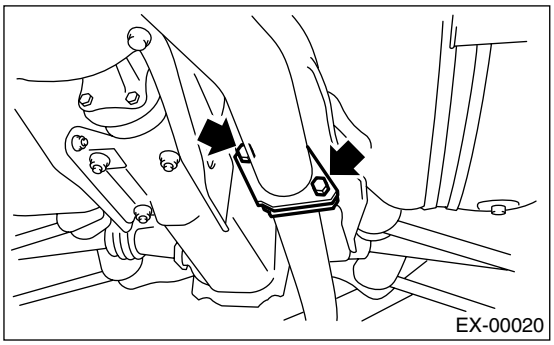
NOTE:
Replace the gasket and nuts with new ones.

1) Install the rear exhaust pipe to cushion rubber.



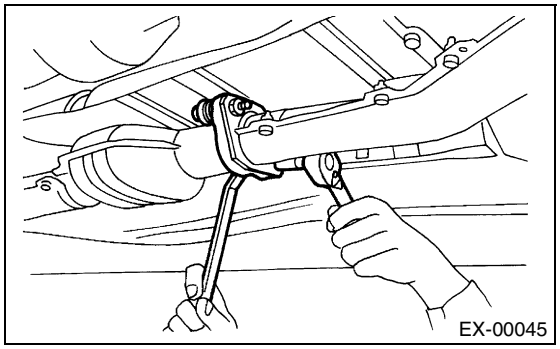
2) Install the rear exhaust pipe to muffler.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)

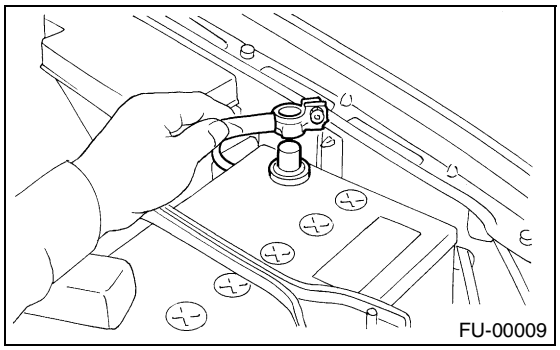


3) Install the rear exhaust pipe to center exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



4) Lower the vehicle.
5) Connect the battery ground cable to battery.



C: INSPECTION

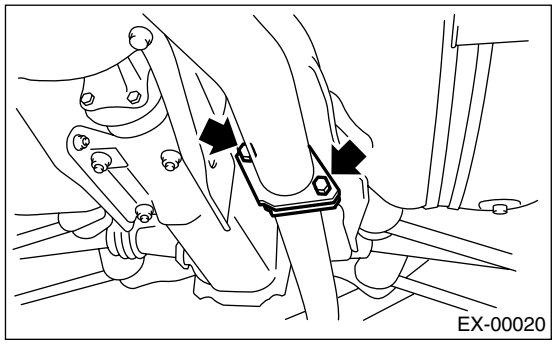
1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.
3) Make sure the cushion rubber is not worn or cracked.

6. Muffler

A: REMOVAL

1) Separate the muffler from rear exhaust pipe.

CAUTION:
Be careful, the exhaust pipe is hot.

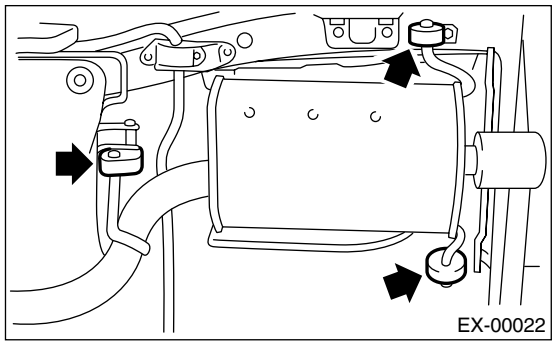


2) Remove the rubber cushions, and detach the muffler.

CAUTION:
Be careful not to drop the muffler during removal.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC to the mating area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)

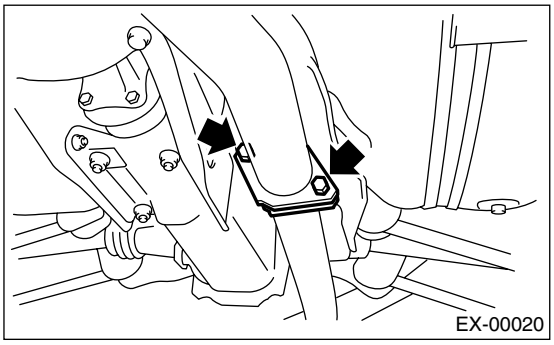


B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
Replace the gasket and nuts with new ones.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)



C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.
3) Make sure the cushion rubber is not worn or cracked.

COOLING

CO(TURBO)

Page
1. General Description 2

1. General Description

1) Specifications for Turbo model is included in CO(SOHC) section. <Ref. to CO(SOHC)-2, General Description.>

LUBRICATION

LU(TURBO)

Page

1. General Description 2

1. General Description

Specifications for Turbo model is included in LU(SOHC) section. <Ref. to LU(SOHC)-2, General Description.>

SPEED CONTROL SYSTEMS

SP(TURBO)

Page

1. General Description 2

1. General Description

Specifications for Turbo model is the same as that for Non-turbo model. <Ref. to SP(SOHC)-2, General Description.>

IGNITION

IG(TURBO)

Page

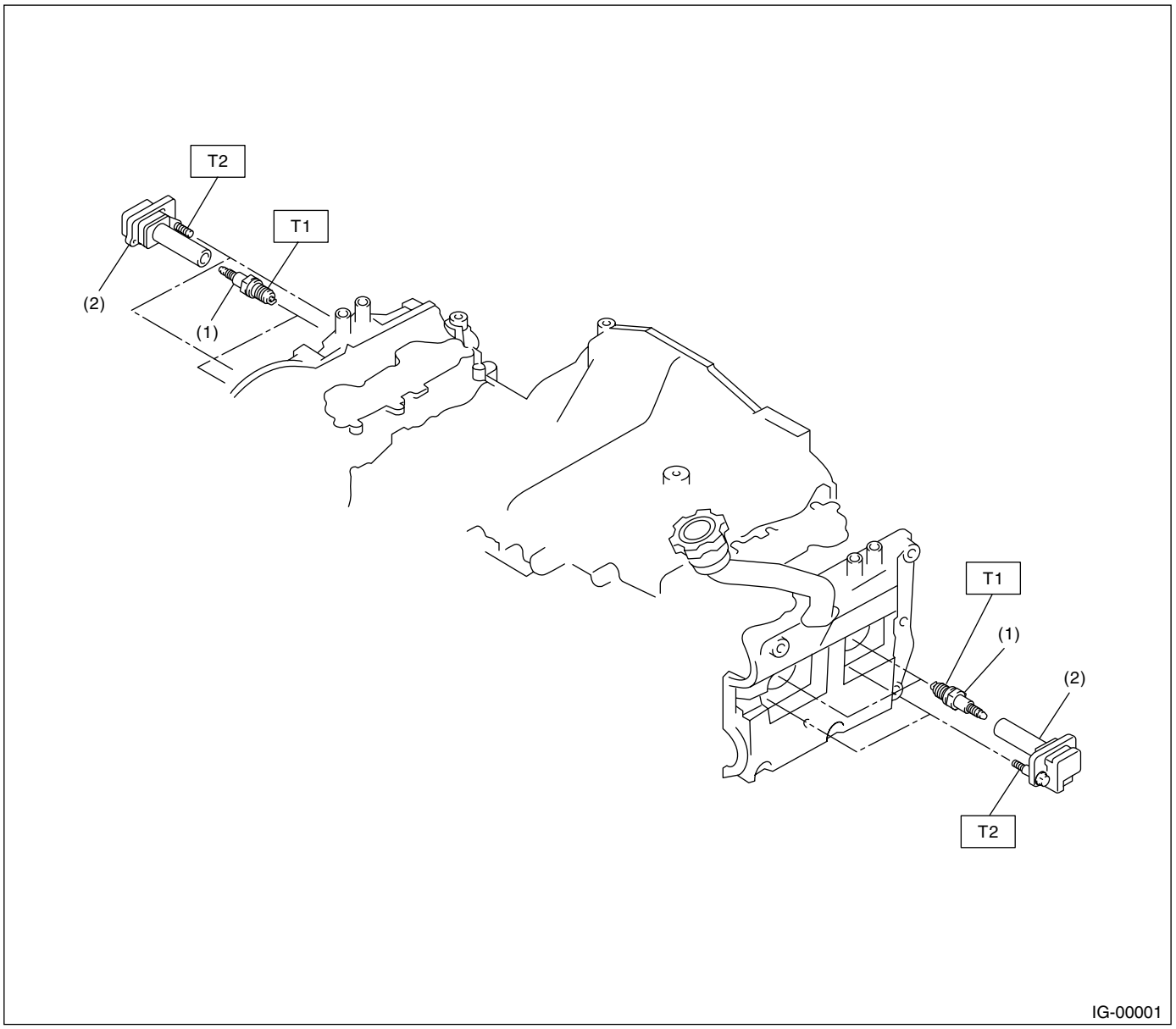
1. General Description 2
2. Spark Plug.....5
3. Ignition Coil and Ignitor Assembly.....8

1. General Description

A: SPECIFICATIONS

Item			Designation
Ignition coil and ignitor assembly	Model		FK0140
	Ignition type		Direct ignition
	Manufacturer		DIAMOND
Spark plug	Type and manufacturer		NGK: PFR6G
	Thread size	mm	14, P = 1.25
	Spark gap	mm (in)	0.7 — 0.8 (0.028 — 0.031)
	Electrode		Platinum

B: COMPONENT



(1) Spark plug
(2) Ignition coil and ignitor ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 21 (2.1, 15.2)
T2: 16 (1.6, 11.7)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

2. Spark Plug

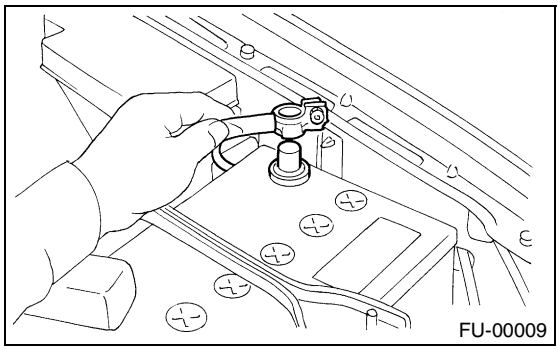
A: REMOVAL

CAUTION:
All spark plugs installed on an engine, must be of the same heat range.

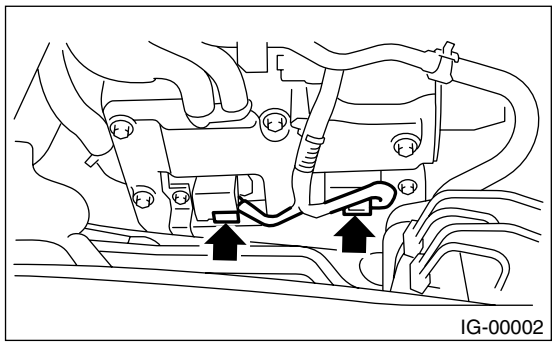
Spark plug:
NGK: PFR6G

1. RH SIDE

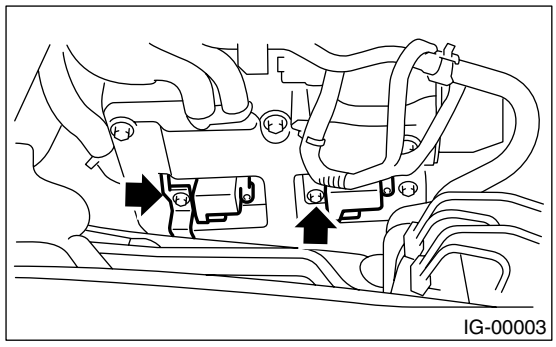
1) Disconnect the ground cable from battery.



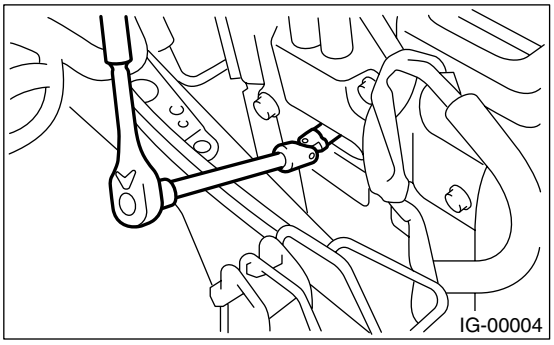
2) Remove the air cleaner lower case. <Ref. to IN(TURBO)-7, REMOVAL, Air Cleaner.>
3) Disconnect the connector from ignition coil.



4) Remove the ignition coil.

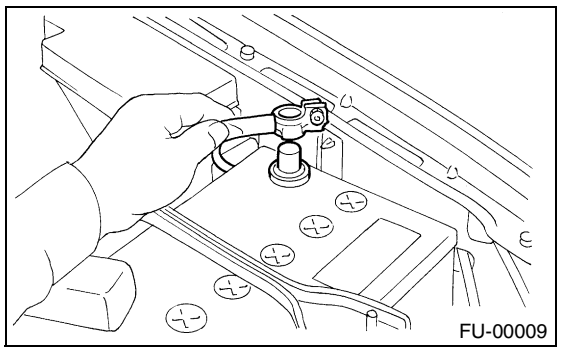


5) Remove the spark plugs with the spark plug sockets.

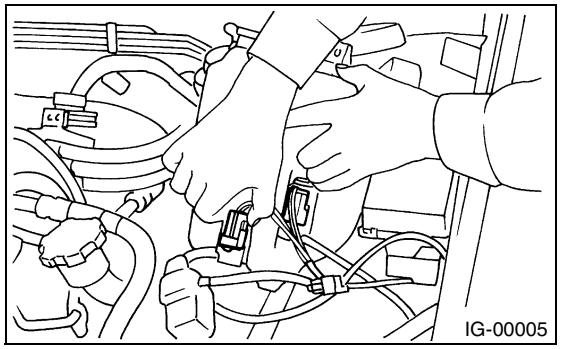


2. LH SIDE

1) Disconnect the battery cables, and then remove the battery and battery carrier.

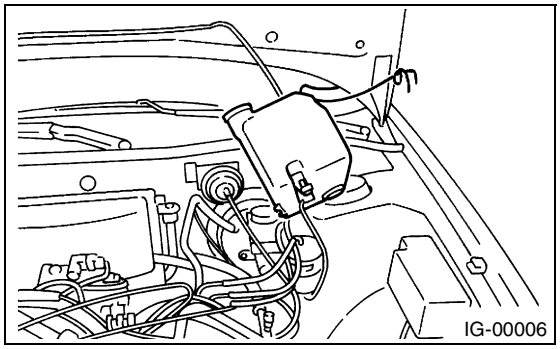


2) Disconnect the washer motor connector.

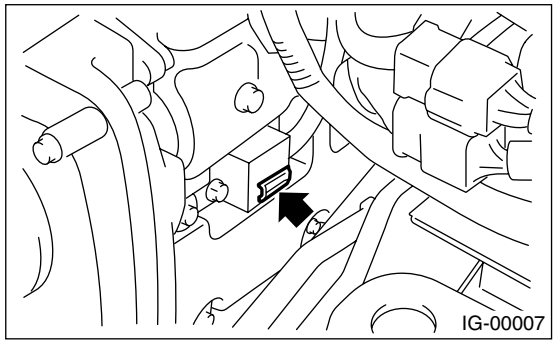


3) Disconnect the rear window glass washer hose from washer motor, then plug connection with a suitable cap.

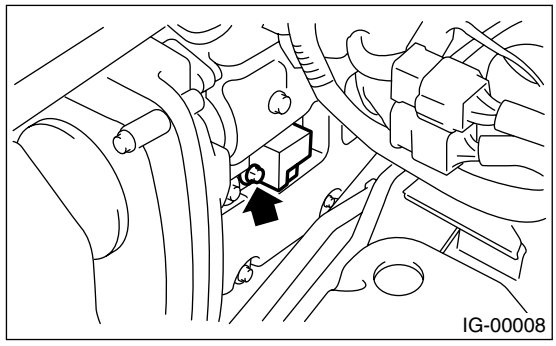
4) Remove the two bolts which hold washer tank, then take the tank away from working area.



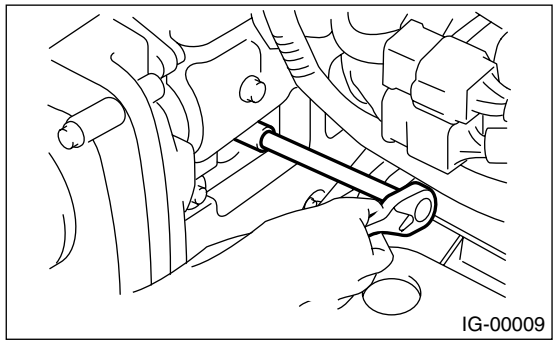
5) Disconnect the connector from ignition coil.



6) Remove the ignition coil.



7) Remove the spark plugs with the spark plug sockets.



B: INSTALLATION

1. RH SIDE

1) Install in the reverse order of removal.

Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.2 ft-lb)

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 11.7 ft-lb)

NOTE:
The above torque should be only applied to new spark plugs without oil on their threads.
In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

2. LH SIDE

1) Install in the reverse order of removal.

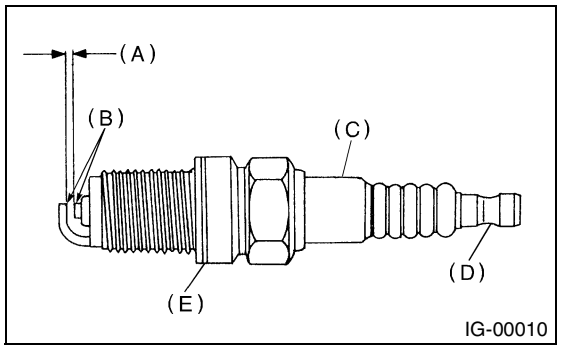
Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.2 ft-lb)

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 11.7 ft-lb)

NOTE:
The above torque should be only applied to new spark plugs without oil on their threads.
In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

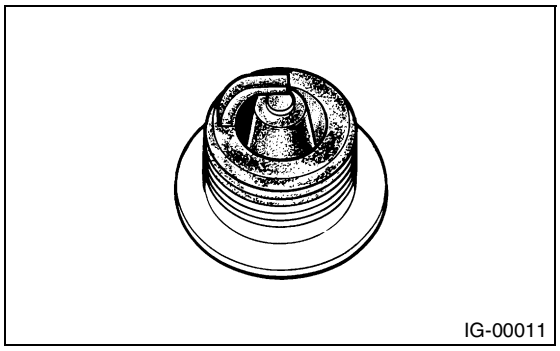
C: INSPECTION

Check the electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion.

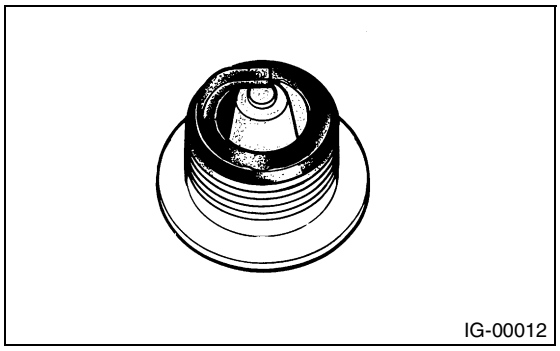


(A) Electrode gap
(B) Carbon accumulation or wear
(C) Cracks
(D) Damage
(E) Damaged gasket

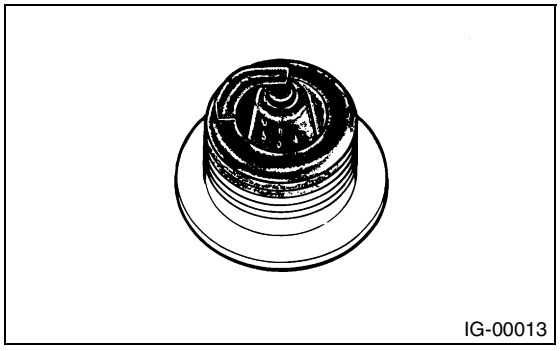
1) Normal:
Brown to grayish-tan deposits and slight electrode wear indicates correct spark plug heat range.


IG-00011

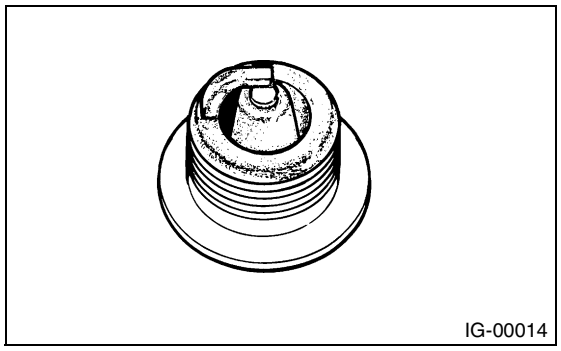
2) Carbon fouled:
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.
It is advisable to replace with plugs having hotter heat range.


IG-00012

3) Oil fouled:
Wet black deposits show excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems. If the same condition remains after repair, use a hotter plug.


IG-00013

4) Overheating:
White or light gray insulator with black or gray brown spots and bluish burnt electrodes indicates engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc. It is advisable to replace with plugs having colder heat range.

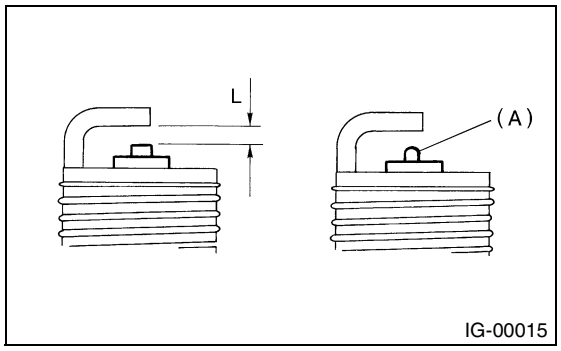

IG-00014

D: ADJUSTMENT

Clean the spark plugs with a wire brush. Clean and remove the carbon or oxide deposits, but do not wear away porcelain.
If deposits are too stubborn, replace the plugs.
After cleaning the spark plugs, correct the spark plug gap using a gap gauge.

NOTE:
Do not use spark plug cleaners, because the spark plugs are applied with platinum tips.

Spark plug gap: L
0.7 — 0.8 mm (0.028 — 0.031 in)



IG-00015

NOTE:
Replace with a new spark plug if this area (A) is worn to “ball” shape.

3. Ignition Coil and Ignitor Assembly

A: REMOVAL

Direct ignition type has been adopted.
Refer to the “Spark Plug Removal” for removal procedure. <Ref. to IG(TURBO)-5, REMOVAL, Spark Plug.>

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
16 N·m (1.6 kgf-m, 11.7 ft-lb)

C: INSPECTION

Ignitor is integrated with the coil. Therefore resistance cannot be measured.

STARTING/CHARGING SYSTEMS

SC(TURBO)

Page

1. General Description 2

1. General Description

1) Specifications for Turbo model is the same as that for Non-turbo model. <Ref. to SC(SOHC)-2, General Description.>

ENGINE (DIAGNOSTICS)

EN(TURBO)

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1. Basic Diagnostic Procedure

A: PROCEDURE

1. ENGINE

	Step	Check	Yes	No
1	**CHECK ENGINE START FAILURE.** 1)Ask the customer when and how trouble occurred using the interview check list. <Ref. to EN(TURBO)-4, CHECK, Check List for Interview.> 2)Start the engine. Does the engine start?	Engine starts.	Go to step **2.**	Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(TURBO)-61, Diagnostics for Engine Starting Failure.>
2	**CHECK ILLUMINATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).** Does the CHECK ENGINE malfunction indicator lamp illuminate?	CHECK ENGINE warning light illuminates.	Go to step **3.**	Inspection using "General Diagnostics Table". <Ref. to EN(TURBO)-308, General Diagnostic Table.>
3	**CHECK INDICATION OF DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** 1)Turn the ignition switch to OFF. 2)Connect the Subaru Select Monitor or OBD-II general scan tool to data link connector. 3)Turn the ignition switch to ON and the Subaru Select Monitor or OBD-II general scan tool switch to ON. 4)Read the DTC on Subaru Select Monitor or OBD-II general scan tool. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	DTC is displayed.	Record the DTC code. Repair the trouble cause. <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).> Go to step **4.**	Repair the related parts. NOTE: If a DTC is not shown on display although MIL illuminates, perform diagnostics of MIL (CHECK ENGINE malfunction indicator lamp) circuit or combination meter. <Ref. to EN(TURBO)-52, Engine Malfunction Indicator Lamp (MIL).>
4	**PERFORM THE DIAGNOSIS.** 1)Perform the clear memory mode. <Ref. to EN(TURBO)-49, Clear Memory Mode.> 2)Perform the inspection mode. <Ref. to EN(TURBO)-42, Inspection Mode.> Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	DTC is displayed.	Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-84, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnosis.

2. AUTOMATIC TRANSMISSION

When the diagnostic trouble code (DTC) about automatic transmission is shown on display, carry out the following basic check. After that, carry out the replacement or repair work.

1) ATF level check <Ref. to AT-29, Automatic Transmission Fluid.>
2) Differential gear oil level check <Ref. to AT-30, Differential Gear Oil.>
3) ATF leak check <Ref. to AT-29, Automatic Transmission Fluid.>
4) Differential gear oil leak check <Ref. to AT-30, Differential Gear Oil.>
5) Stall test <Ref. to AT-32, Stall Test.>
6) Line pressure test <Ref. to AT-35, Line Pressure Test.>
7) Transfer clutch pressure test <Ref. to AT-37, Transfer Clutch Pressure Test.>
8) Time lag test <Ref. to AT-34, Time Lag Test.>
9) Road test <Ref. to AT-31, Road Test.>
10) Shift characteristics <Ref. to AT-37, Transfer Clutch Pressure Test.>

2. Check List for Interview

A: CHECK

1. CHECK LIST NO. 1

Check the following items when problem has occurred.

NOTE:
Use copies of this page for interviewing customers.

Customer's name		Engine No.	
Date of sale		Fuel brand	
Date of repair		Odometer reading	km
Vin No.			miles
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others:		
Outdoor temperature	°C (°F)		
	❑ Hot ❑ Warm ❑ Cool ❑ Cold		
Place	❑ Highway ❑ Suburbs ❑ Inner city ❑ Uphill ❑ Downhill ❑ Rough road ❑ Others:		
Engine temperature	❑ Cold ❑ Warming-up ❑ After warming-up ❑ Any temperature ❑ Others:		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	❑ Not affected ❑ At starting ❑ While idling ❑ At racing ❑ While accelerating ❑ While cruising ❑ While decelerating ❑ While turning (RH/LH)		
Headlight	❑ ON/❑ OFF	Rear defogger	❑ ON/❑ OFF
Blower	❑ ON/❑ OFF	Radio	❑ ON/❑ OFF
A/C compressor	❑ ON/❑ OFF	CD/Cassette	❑ ON/❑ OFF
Cooling fan	❑ ON/❑ OFF	Car phone	❑ ON/❑ OFF
Front wiper	❑ ON/❑ OFF	CB	❑ ON/❑ OFF
Rear wiper	❑ ON/❑ OFF		

2. CHECK LIST NO. 2

Check the following items about the vehicle's state when MIL turns on.

NOTE:
Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. ❑ Yes/❑ No
❑ Low fuel warning light ❑ Charge indicator light ❑ AT diagnostics indicator light ❑ ABS warning light ❑ Engine oil pressure warning light
b) Fuel level
• Lack of gasoline: ❑ Yes/❑ No • Indicator position of fuel gauge:
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: ❑ Yes/❑ No
• What:
d) Intentional connecting or disconnecting of hoses: ❑ Yes/❑ No
• What:
e) Installing of parts other than genuine parts: ❑ Yes/❑ No
• What: • Where:
f) Occurrence of noise: ❑ Yes/❑ No
• From where: • What kind:
g) Occurrence of smell: ❑ Yes/❑ No
• From where: • What kind:
h) Intrusion of water into engine compartment or passenger compartment: ❑ Yes/❑ No
i) Troubles occurred
❑ Engine does not start. ❑ Engine stalls during idling. ❑ Engine stalls while driving. ❑ Engine speed decreases. ❑ Engine speed does not decrease. ❑ Rough idling ❑ Poor acceleration ❑ Back fire ❑ After fire ❑ No shift ❑ Excessive shift shock

3. General Description

A: CAUTION

1) Airbag system wiring harness is routed near the engine control module (ECM), main relay and fuel pump relay.

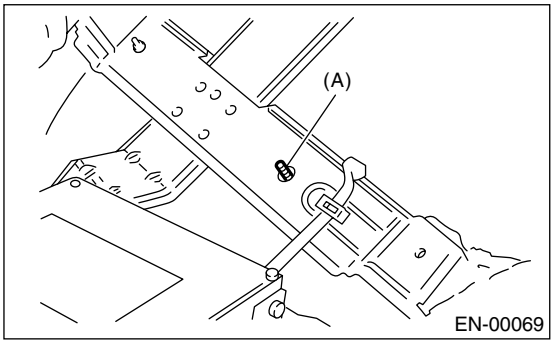
CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
• Be careful not to damage the airbag system wiring harness when servicing the engine control module (ECM), transmission control module (TCM), main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.
• The ECM will be destroyed instantly.
• The fuel injector and other part will be damaged in just a few minutes more.
3) Do not disconnect the battery cables while the engine is running.
• A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as ECM, etc.
4) Before disconnecting the connectors of each sensor and the ECM, be sure to turn the ignition switch to OFF.
5) Poor contact has been identified as a primary cause of this problem. To measure the voltage and/or resistance of individual sensors or all electrical control modules at the harness side connector, use a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.
6) Before removing the ECM from located position, disconnect two cables on battery.
• Otherwise, the ECM may be damaged.

CAUTION:
When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage on the fuel injection system.

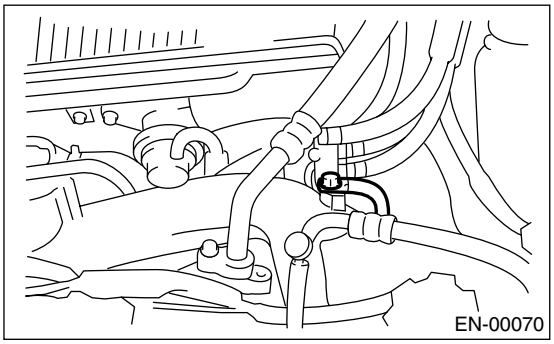
7) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

8) Use the ECM mounting stud bolt at the body head grounding points when measuring voltage and resistance inside the passenger compartment.

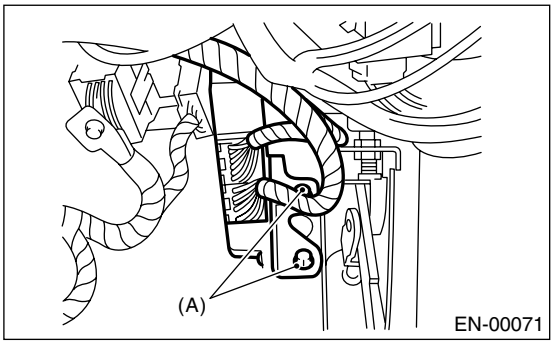


(A) Stud bolt

9) Use the engine grounding terminal or engine proper as the grounding point to the body, when measuring voltage and resistance in the engine compartment.



10) Use the TCM mounting stud bolts at the body head grounding point, when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

11) Every MFI-related part is a precision part. Do not drop them.
12) Observe the following cautions when installing a radio in MFI equipped models.

CAUTION:
• The antenna must be kept as far apart as possible from the control unit.

(The ECM is located under the steering column, inside of the instrument panel lower trim panel.)
• The antenna feeder must be placed as far apart as possible from the ECM and MFI harness.
• Carefully adjust the antenna for correct matching.
• When mounting a large power type radio, pay special attention to the three items above mentioned.
• Incorrect installation of the radio may affect the operation of the ECM.

13) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than 5 seconds to release pressure in the fuel system. If the engine starts during this operation, run it until it stops.
14) Problems in the electronic-controlled automatic transmission may be caused by failure of the engine, the electronic control system, the transmission proper, or by a combination of these. These three causes must be distinguished clearly when performing diagnostics.
15) Diagnostics should be conducted by rotating with simple, easy operations and proceeding to complicated, difficult operations. The most important thing in diagnostics is to understand the customer's complaint, and distinguish between the three causes.
16) On ABS vehicle, when performing driving test in jacked-up or lifted-up position, sometimes the warning light may be lit, but this is not a malfunction of the system. The reason for this is the speed difference between the front and rear wheels. After diagnosis of engine control system, perform the ABS memory clearance procedure of self-diagnosis system.

B: INSPECTION

Before performing diagnostics, check the following items which might affect engine problems:

1. BATTERY

1) Measure the battery voltage and specific gravity of electrolyte.

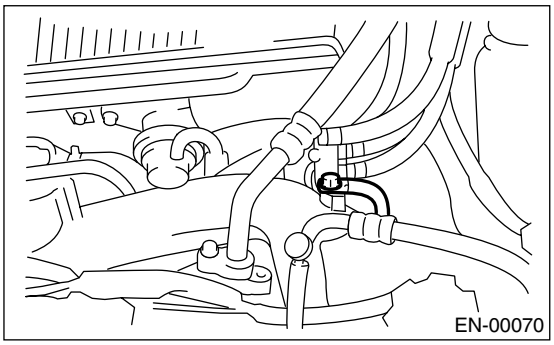
Standard voltage: 12 V

Specific gravity: Above 1.260

2) Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. ENGINE GROUNDING

Make sure the engine grounding terminal is properly connected to the engine.



C: NOTE

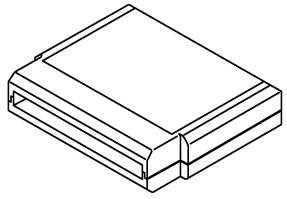
1. DESCRIPTION

• The on-board diagnostics (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. CHECK ENGINE malfunction indicator lamp (MIL) in the combination meter indicates occurrence of a fault or trouble.
• Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.
• The OBD system incorporated with the vehicles within this engine family complies with Section 1968.1, California Code of Regulations (OBD-II regulation). The OBD system monitors the components and the system malfunction listed in Engine Section which affects on emissions.
• When the system decides that a malfunction occurs, MIL illuminates. At the same time of the MIL illumination or blinking, a diagnostic trouble code (DTC) and a freeze frame engine conditions are stored into on-board computer.
• The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer when it detects a malfunction first.
• If the OBD system detects the various malfunctions including the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or misfire.
• When the malfunction does not occur again for three consecutive driving cycles, MIL is turned off, but DTC remains at on-board computer.
• The OBD-II system is capable of communication with a general scan tool (OBD-II general scan tool) formed by ISO 9141 CARB.
• The OBD-II diagnostics procedure is different from the usual diagnostics procedure. When troubleshooting OBD-II vehicles, connect Subaru Select Monitor or the OBD-II general scan tool to the vehicle.

2. ENGINE AND EMISSION CONTROL SYSTEM

• The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.
With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, depending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.
• Further, all the operating conditions of the engine are converted into electric signals, and this results in additional features of the system, such as large improved adaptability, easier addition of compensating element, etc.
The MFI system also has the following features:
- Reduced emission of harmful exhaust gases.
- Reduced in fuel consumption.
- Increased engine output.
- Superior acceleration and deceleration.
- Superior startability and warm-up performance in cold weather since compensation is made for coolant and intake air temperature.

D: PREPARATION TOOL

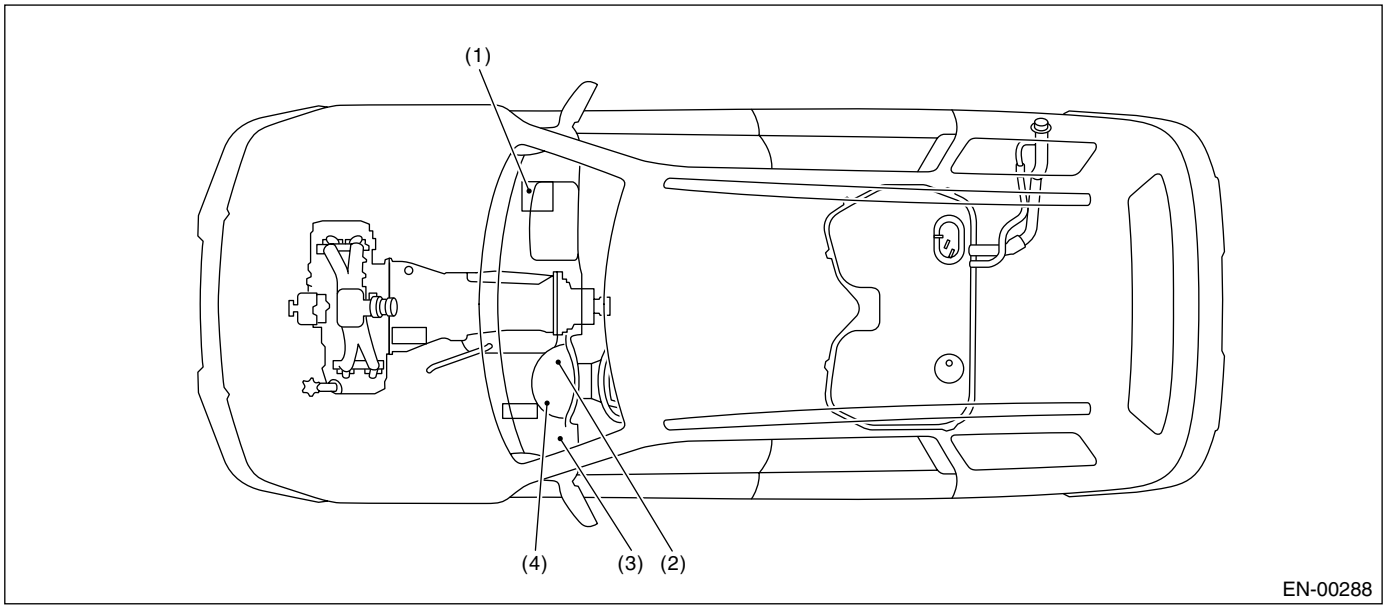
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA210	24082AA210	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

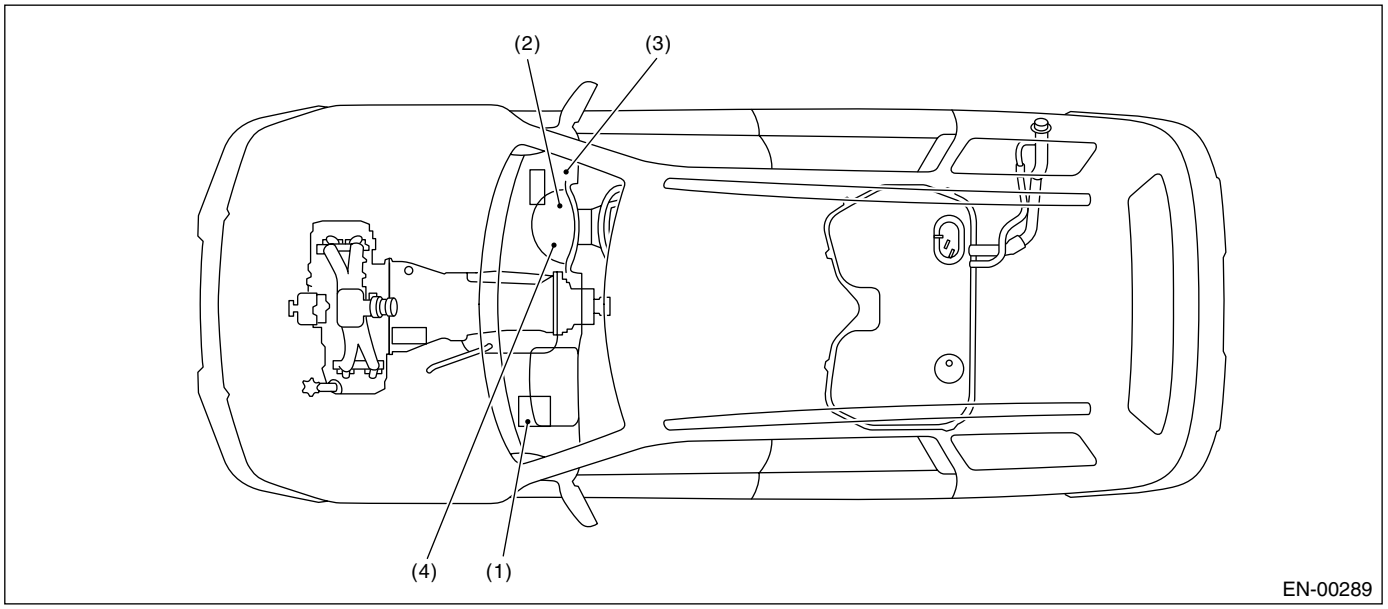
4. Electrical Components Location

A: LOCATION

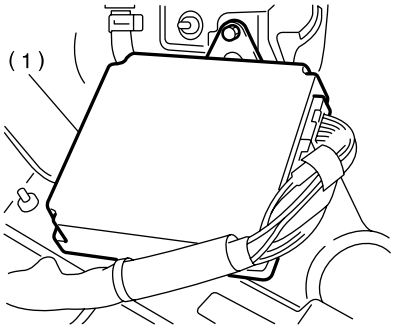
1. ENGINE

• Module

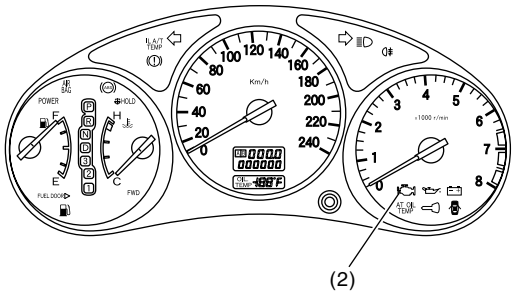




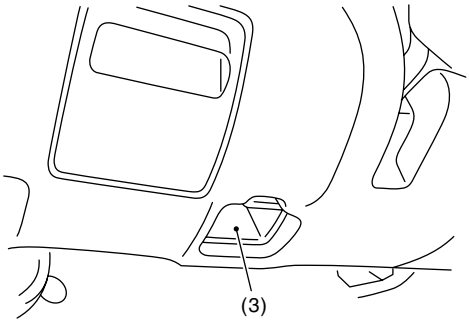
(1) Engine control module (ECM)
(2) CHECK ENGINE malfunction indicator lamp (MIL)
(3) Data link connector
(4) Test mode connector



EN-00156



EN-00290



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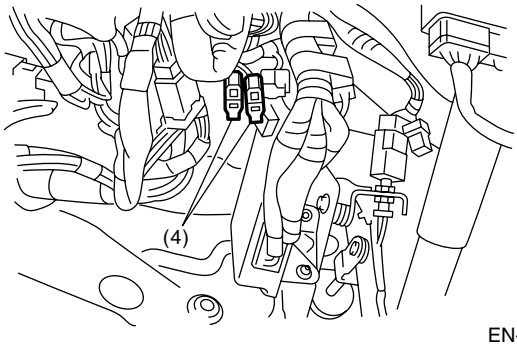
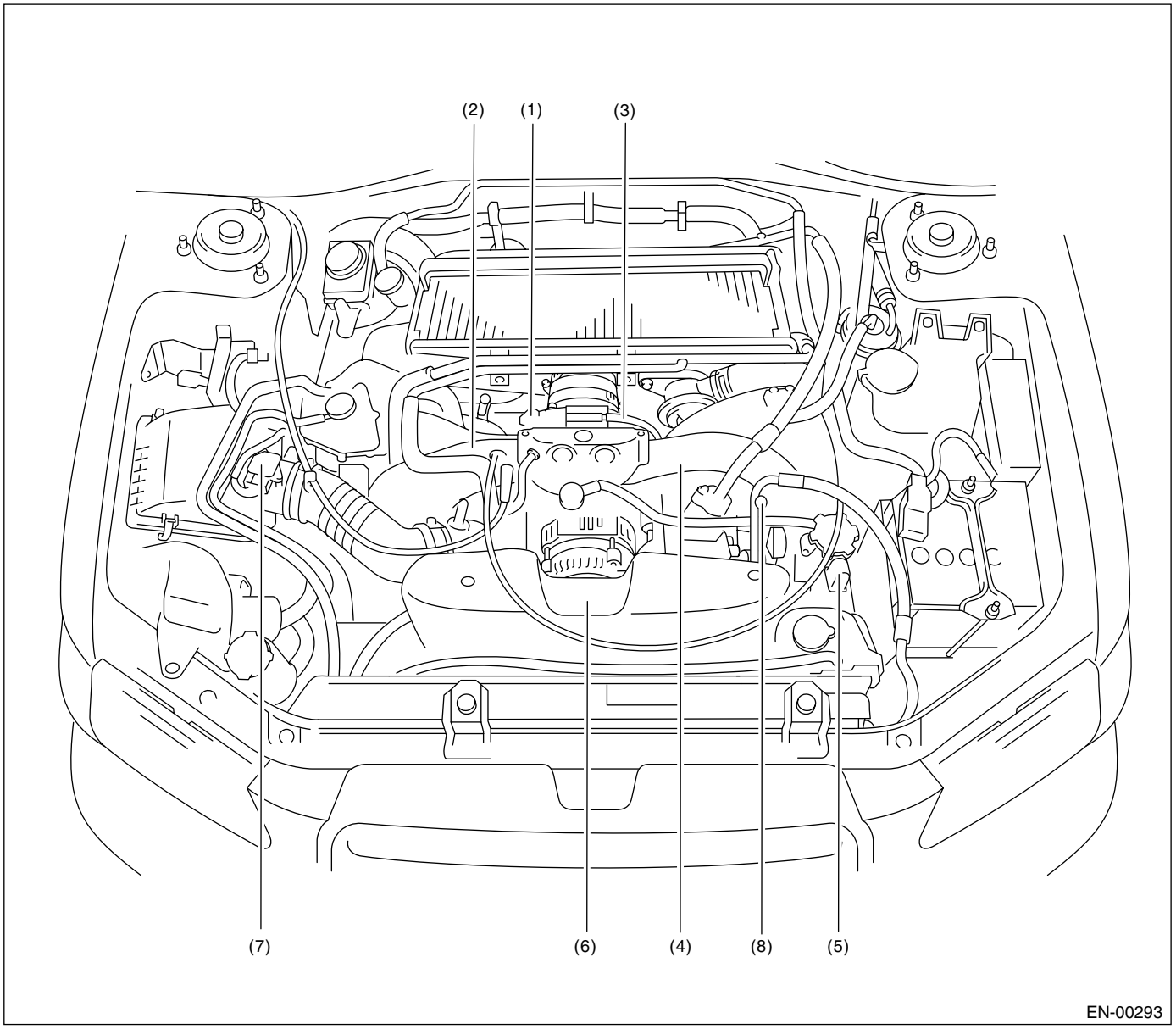
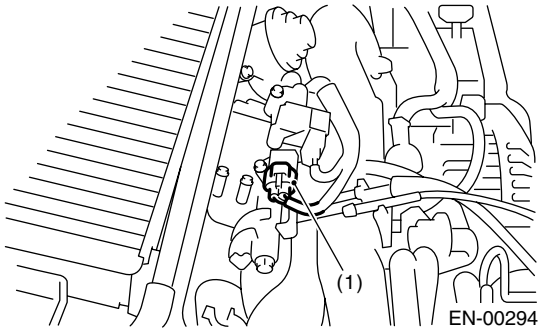


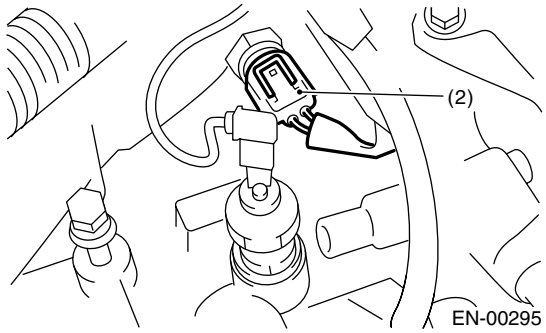
EN-00292

• Sensor



(1) Pressure sensor
(2) Engine coolant temperature sensor
(3) Throttle position sensor
(4) Knock sensor
(5) Camshaft position sensor
(6) Crankshaft position sensor
(7) Mass air flow and intake air temperature sensor
(8) Tumble generator valve position sensor


(1)
EN-00294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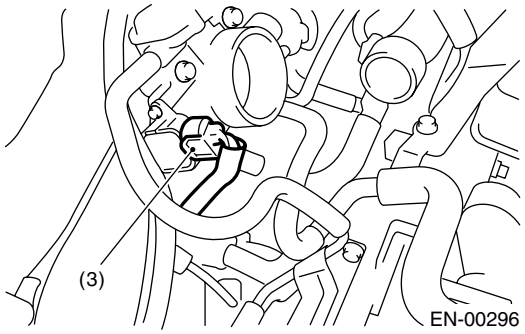
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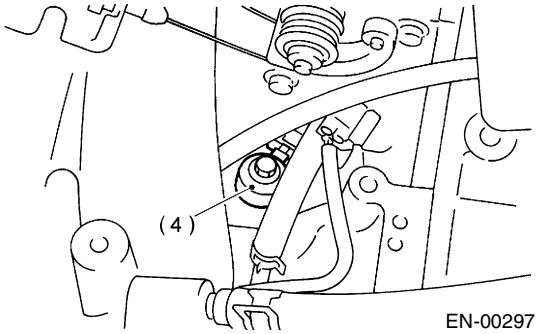
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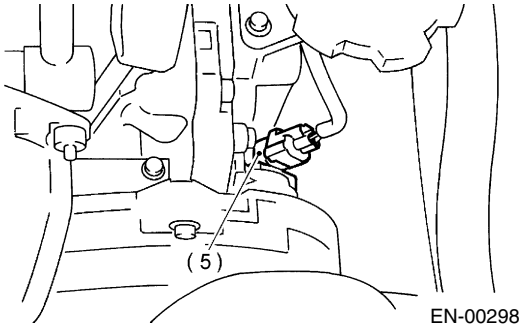
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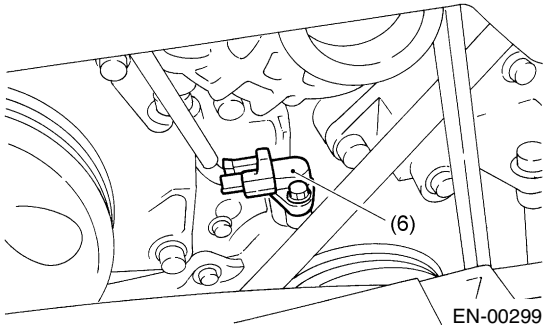
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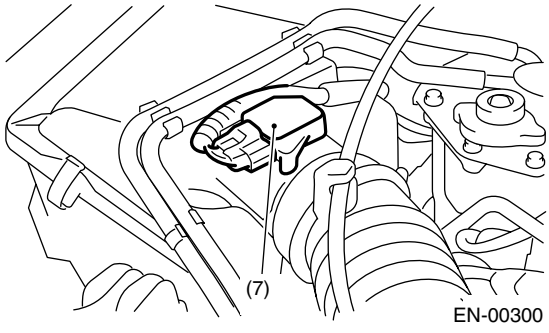
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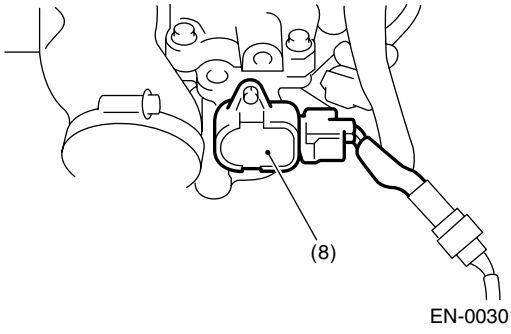
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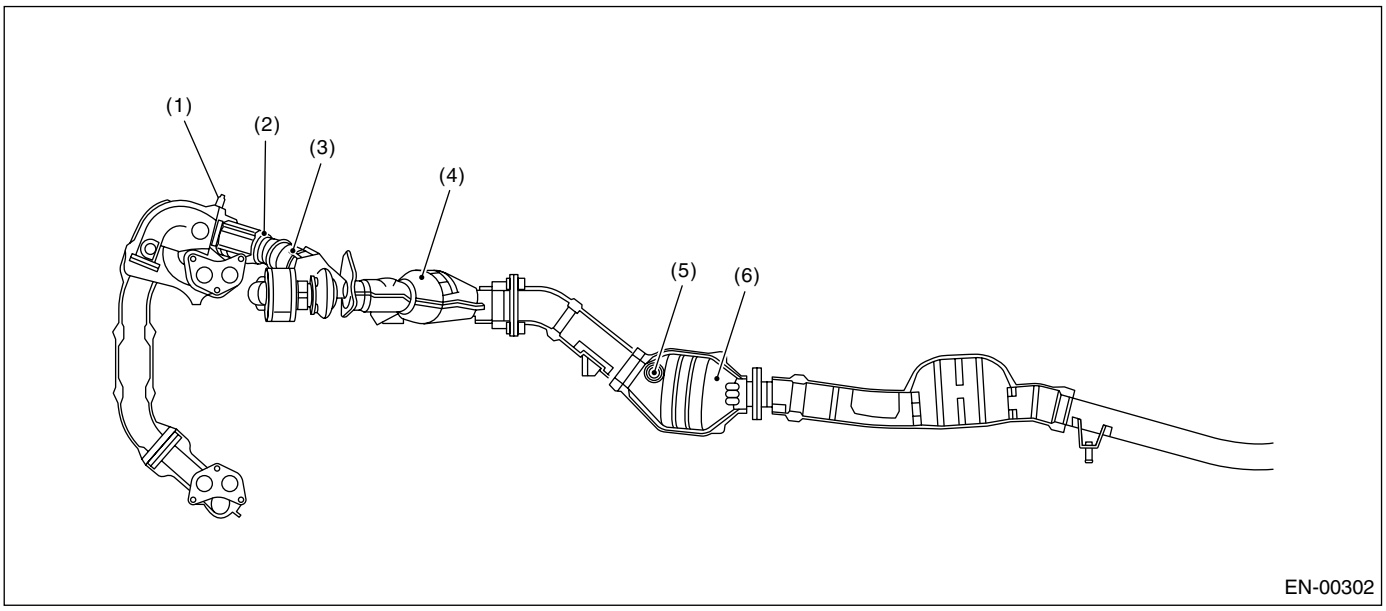
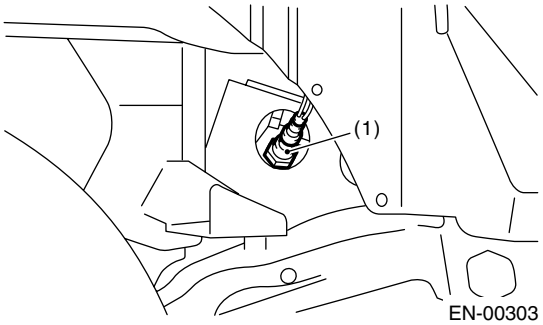
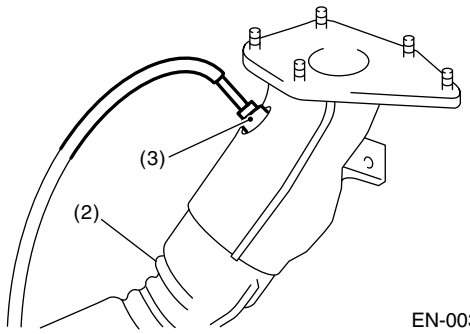
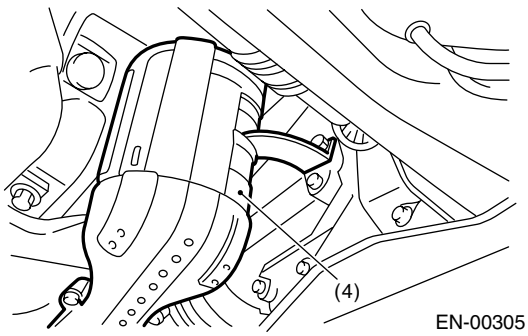
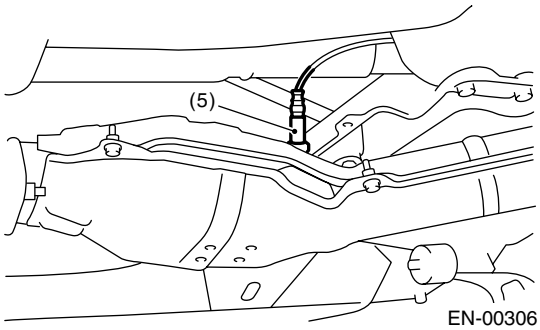


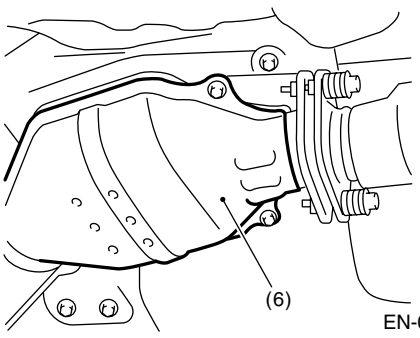
(1) Front oxygen (A/F) sensor
(2) Precatalytic converter
(3) Exhaust temperature sensor
(4) Front catalytic converter
(5) Rear oxygen sensor
(6) Rear catalytic converter

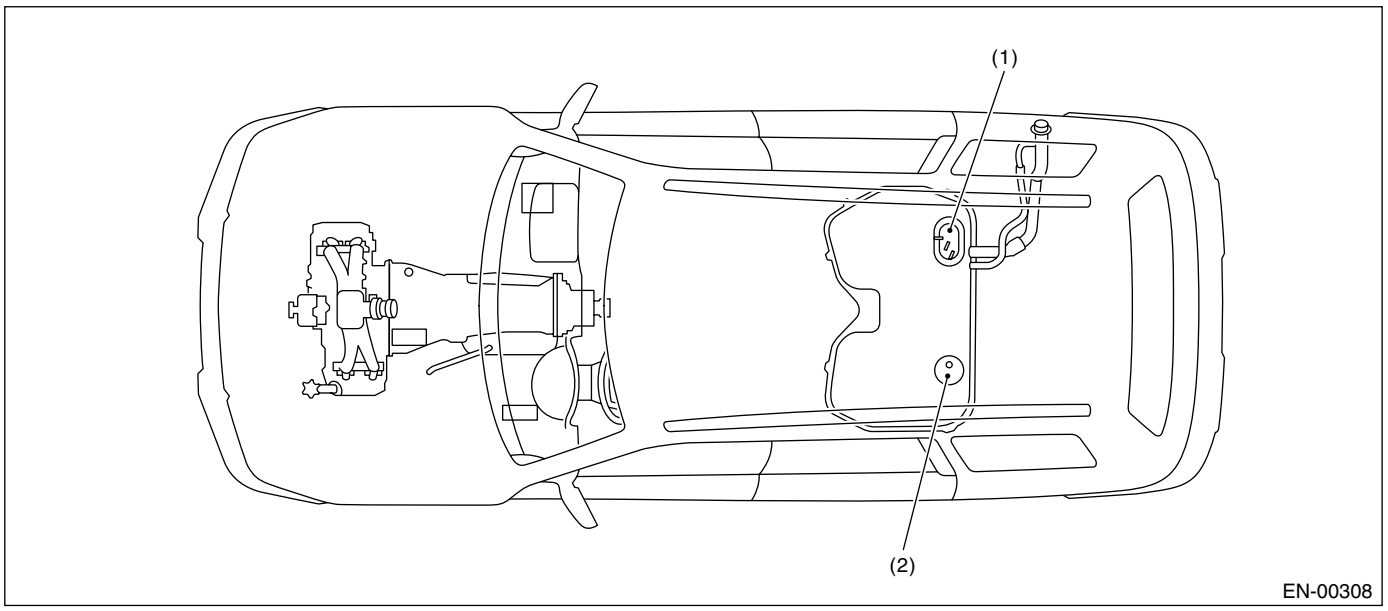


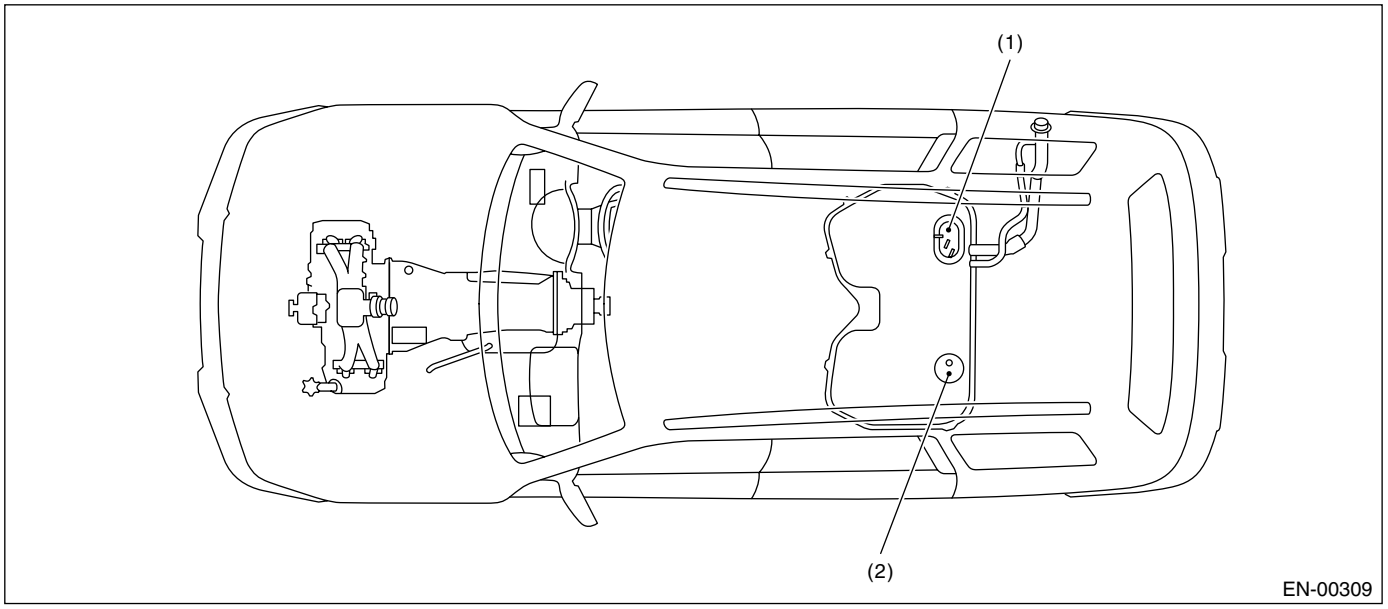




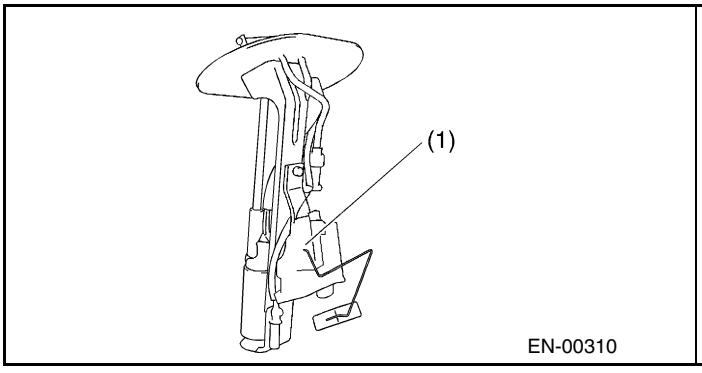


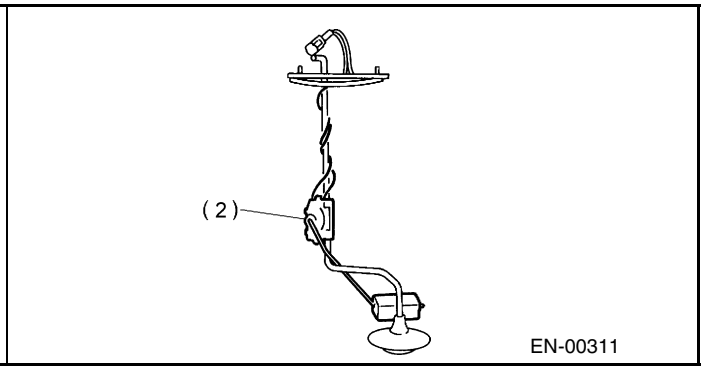




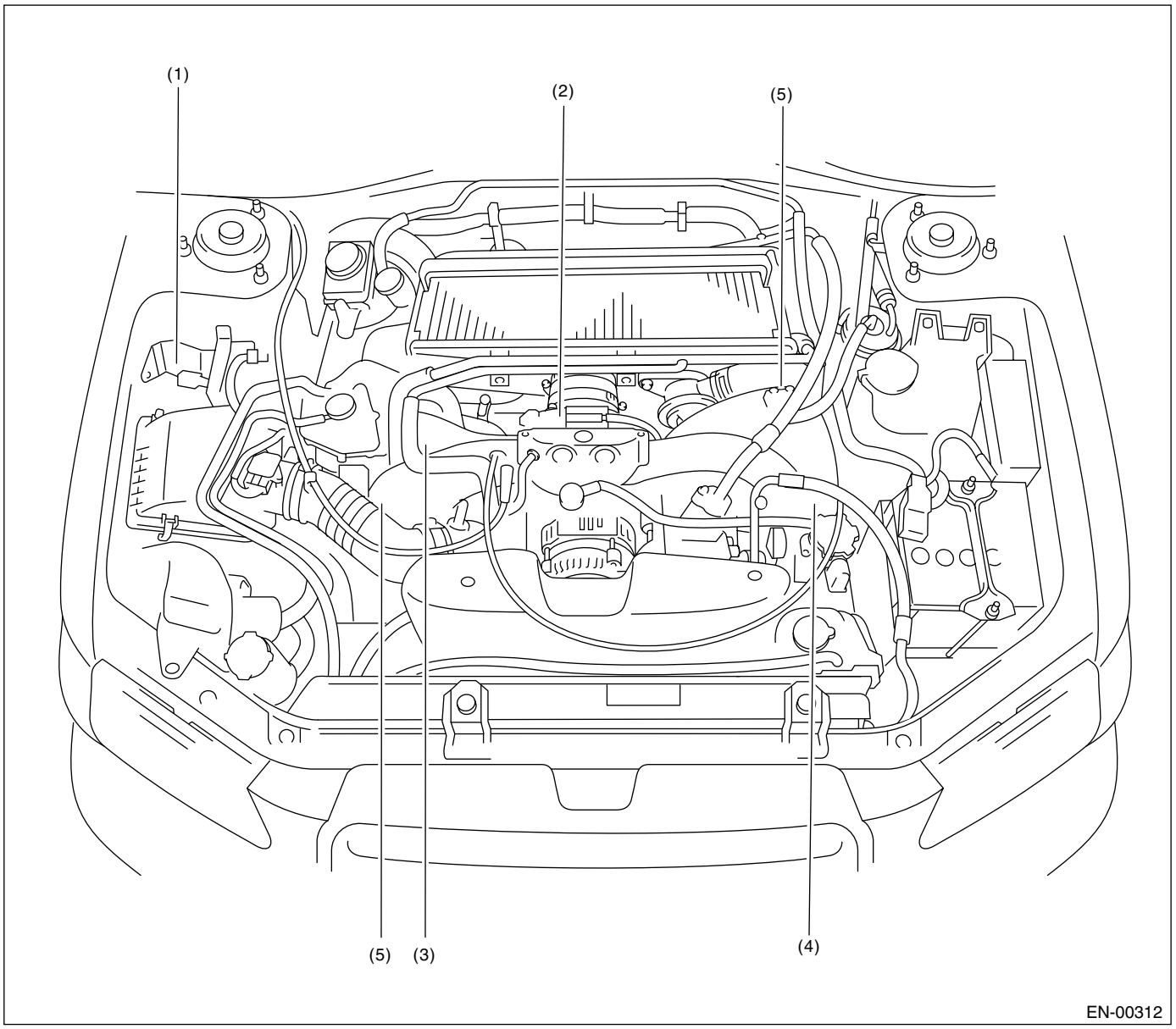


(1) Fuel level sensor (2) Fuel sub level sensor

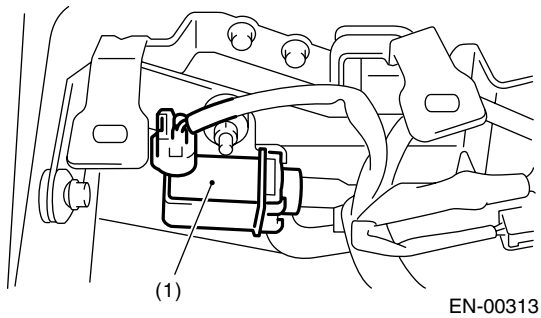




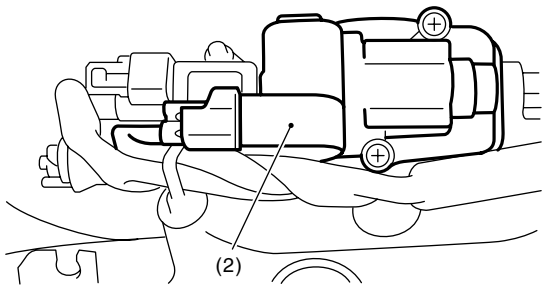
• Solenoid Valve, Actuator, Emission Control System Parts and Ignition System Parts



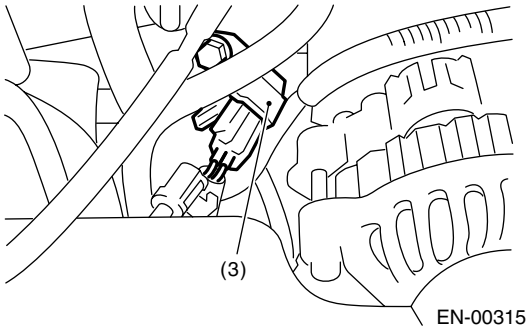
(1) Wastegate control solenoid valve
(2) Idle air control solenoid valve
(3) Purge control solenoid valve
(4) Ignition coil
(5) Tumble generator valve actuator



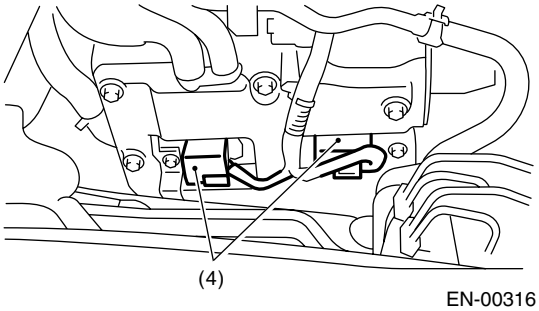
EN-00313



EN-00314



EN-00315



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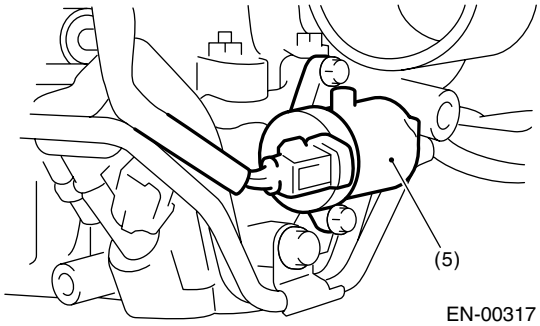

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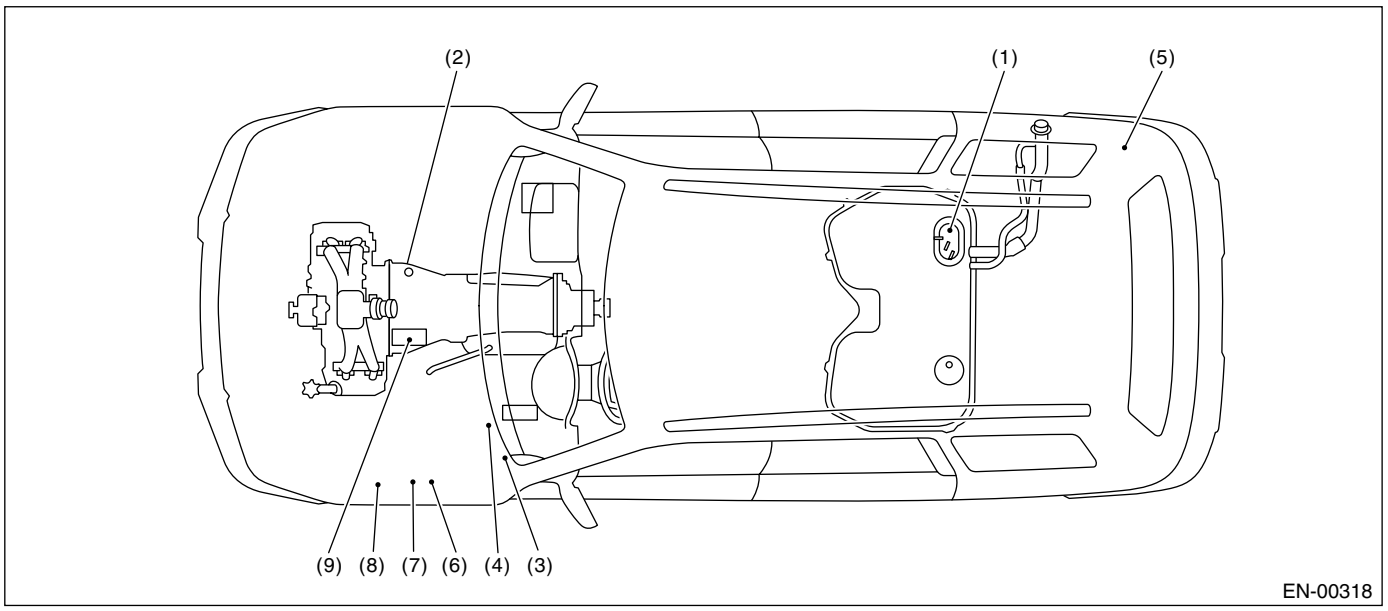
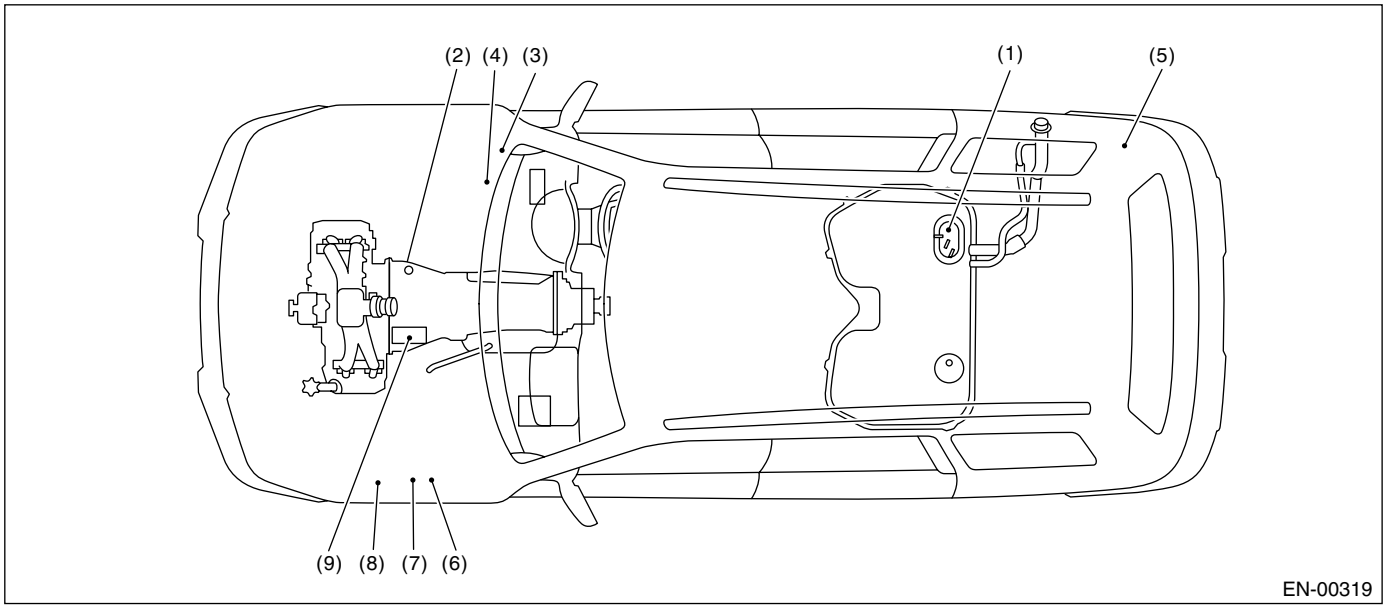
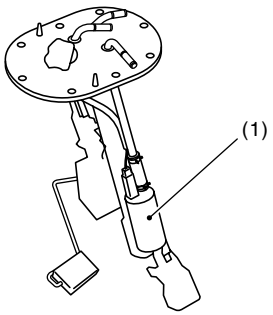




(1) Fuel pump
(2) Inhibitor switch
(3) Main relay
(4) Fuel pump relay
(5) Fuel pump controller
(6) Radiator fan relay 1
(7) Radiator fan relay 2
(8) Radiator fan mode relay
(9) Starter



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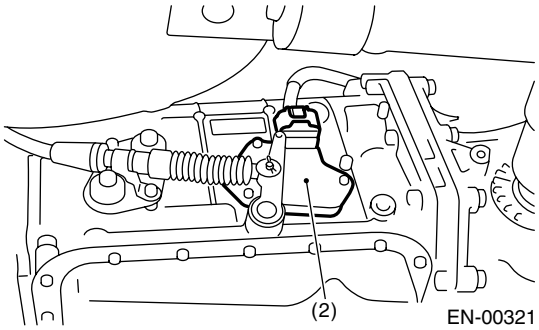

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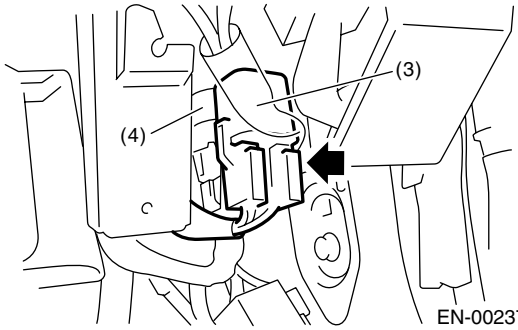

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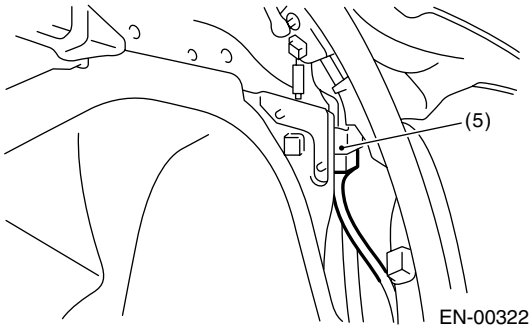
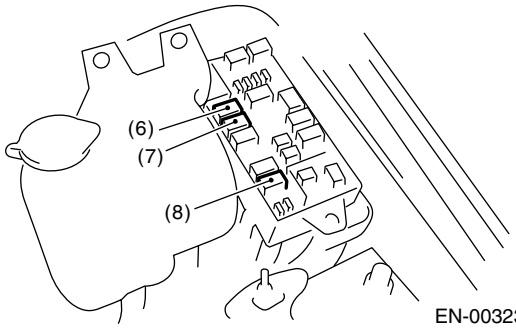
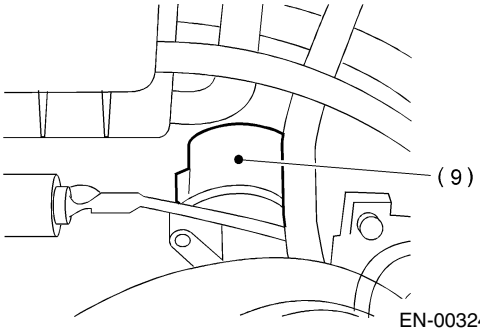


EN-00322



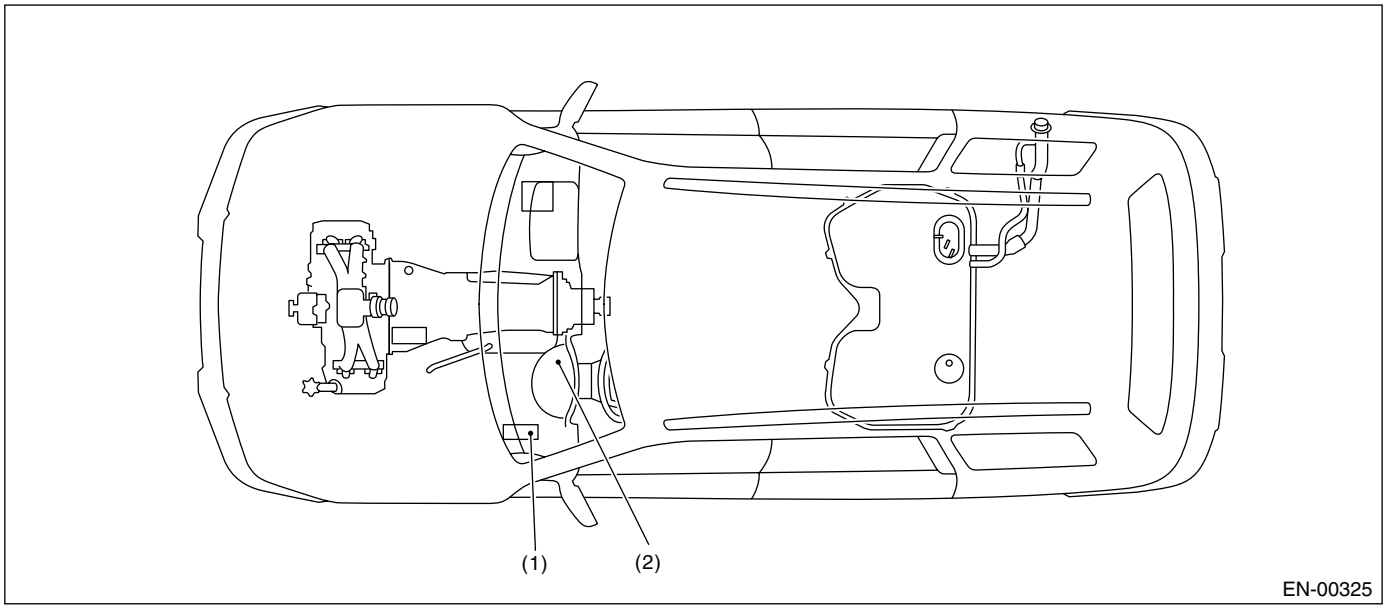
EN-00323

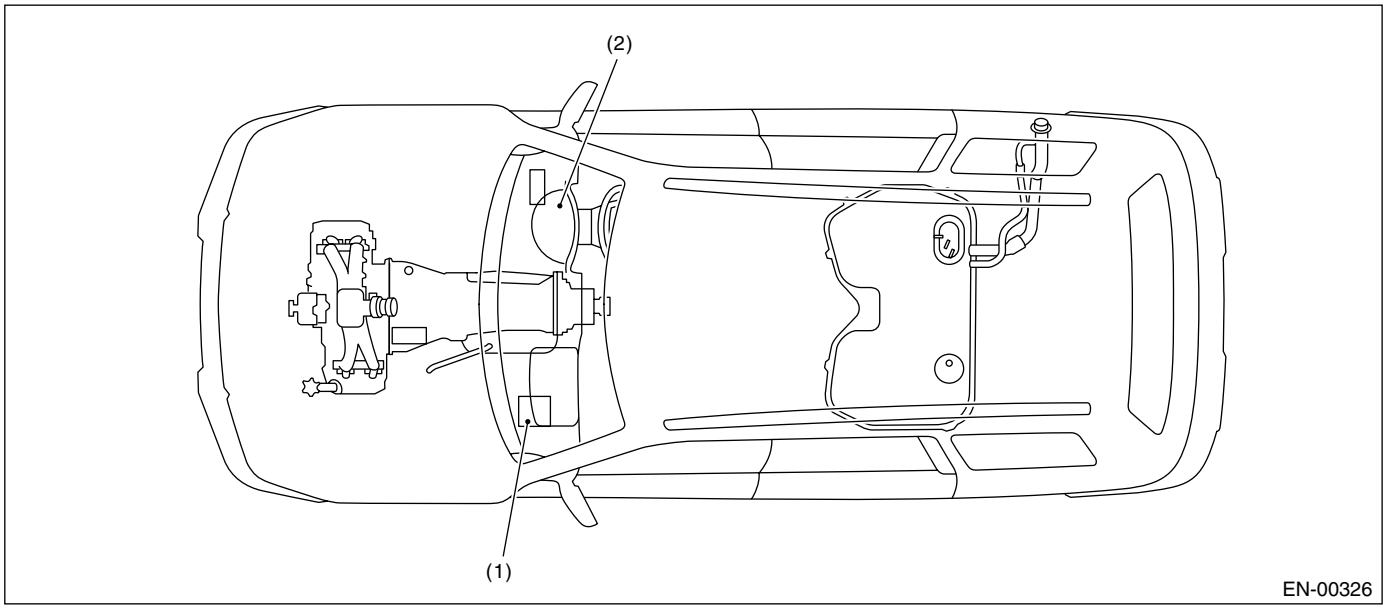


EN-00324

2. TRANSMISSION

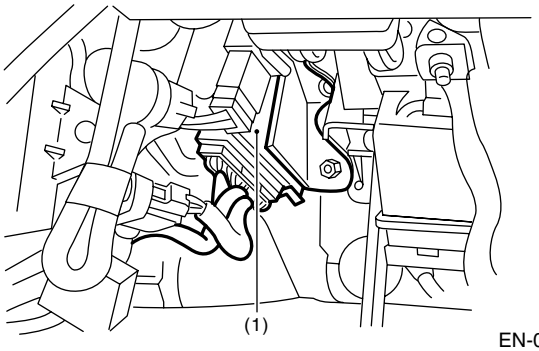
• Module



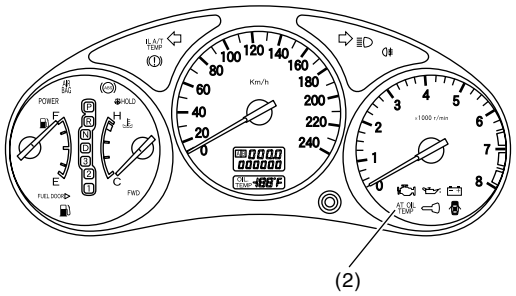


(1) Transmission control module (TCM) (for AT vehicles)

(2) AT diagnostic indicator light (for AT vehicles)

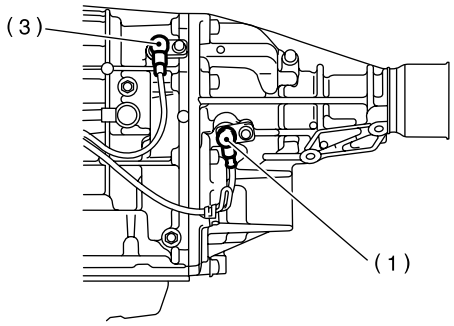


EN-00327

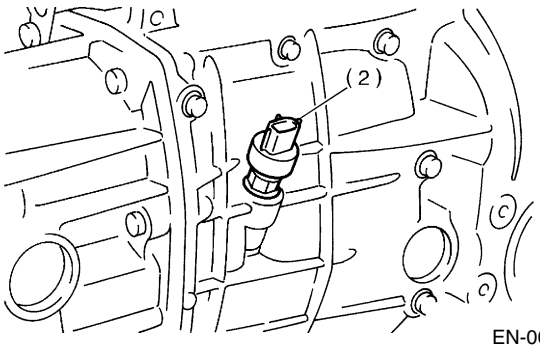


EN-00328

• Sensor



EN-00184



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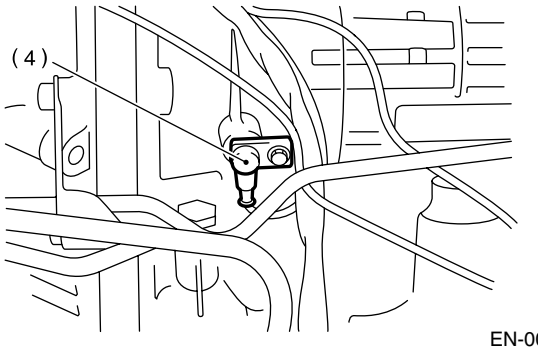
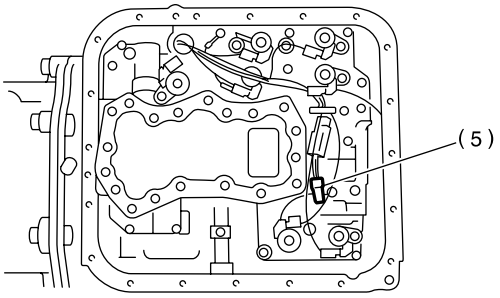
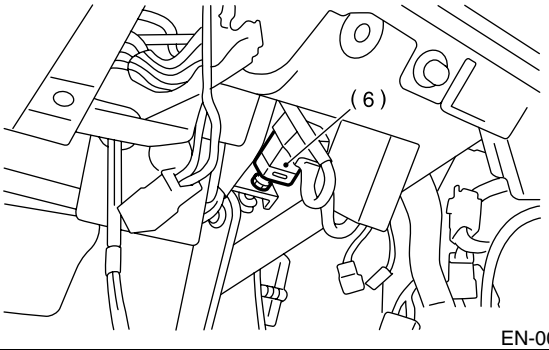


EN-00186



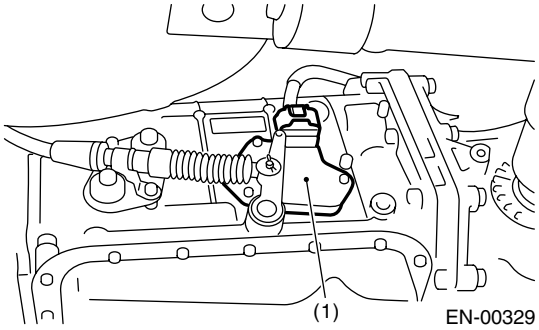
EN-00187

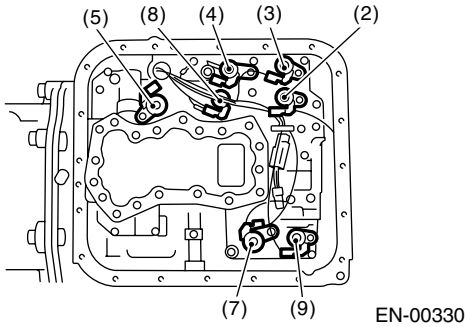


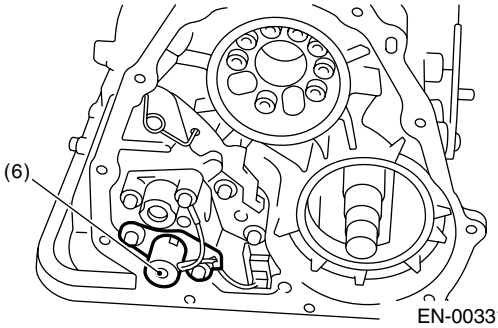
EN-00188

(1) Rear vehicle speed sensor (for AT vehicles)
(2) Front vehicle speed sensor (for MT vehicles)
(3) Front vehicle speed sensor (for AT vehicles)
(4) Torque converter turbine speed sensor (for AT vehicles)
(5) ATF temperature sensor (for AT vehicles)
(6) Brake light switch

• Solenoid Valve and Switch (AT Vehicles)

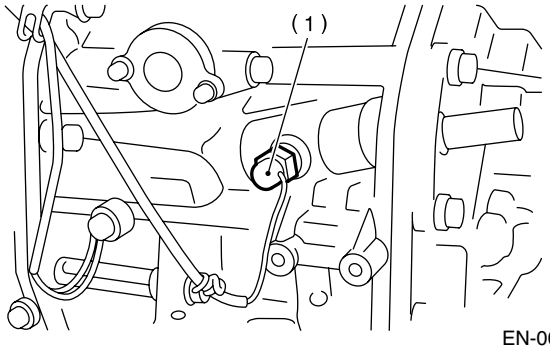






(1) Inhibitor switch
(2) Shift solenoid valve 1
(3) Shift solenoid valve 2
(4) Line pressure duty solenoid
(5) Lock-up duty solenoid
(6) Transfer duty solenoid
(7) 2-4 brake duty solenoid
(8) Low clutch timing solenoid valve
(9) 2-4 brake timing solenoid valve

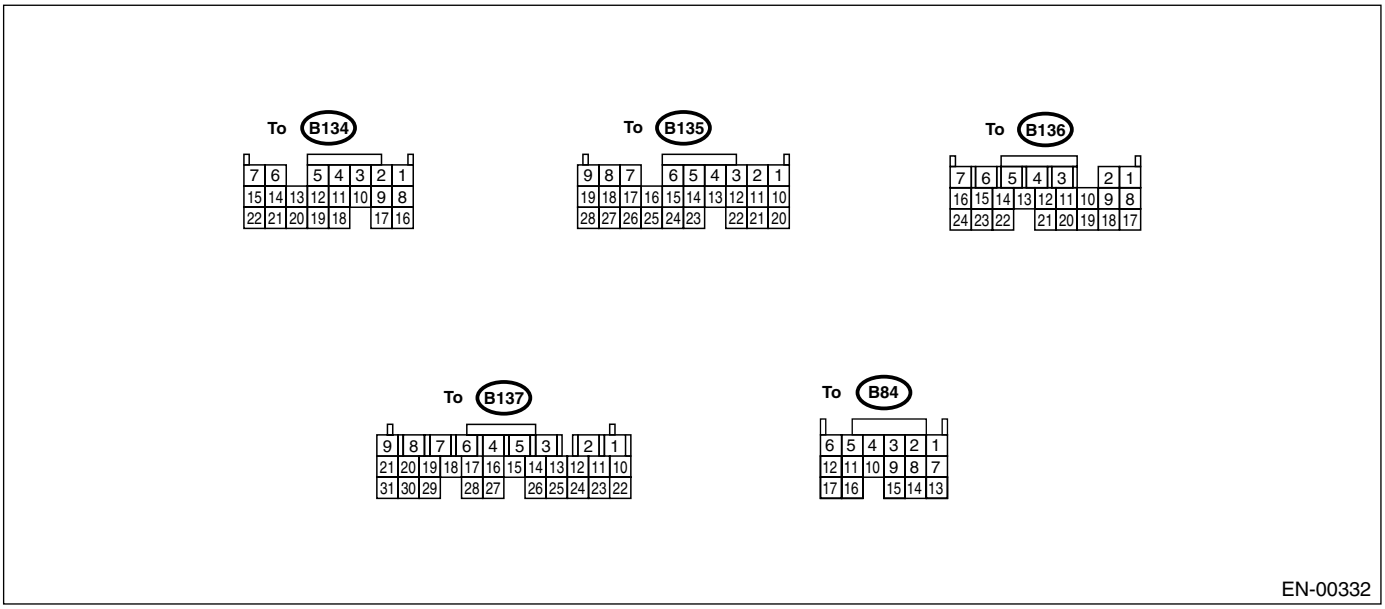
• Solenoid Valve and Switch (MT Vehicles)



(1) Neutral position switch

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Crankshaft position sensor	Signal (+)	B135	2	0	–7 — +7	Sensor output waveform
	Signal (–)	B135	11	0	0	—
	Shield	B135	21	0	0	—
Camshaft position sensor	Signal (+)	B135	1	0	–7 — +7	Sensor output waveform
	Signal (–)	B135	10	0	0	—
	Shield	B135	21	0	0	—
Throttle position sensor	Signal	B135	7	Fully closed: 0.2 — 1.0 Fully opened: 4.2 — 4.7		—
	Power supply	B135	9	5	5	—
	GND (sensor)	B135	19	0	0	—
Rear oxygen sensor	Signal	B135	17	0	0 — 0.9	—
	Shield	B135	26	0	0	—
	GND (sensor)	B135	19	0	0	—
Front oxygen (A/F) sensor heater	Signal 1	B137	5	0 — 1.0	0 — 1.0	—
	Signal 2	B137	4	0 — 1.0	0 — 1.0	—
Rear oxygen sensor heater signal		B136	13	0 — 1.0	0 — 1.0	—
Engine coolant temperature sensor	Signal	B135	18	1.0 — 1.4	1.0 — 1.4	After warm-up the engine.
	GND (sensor)	B135	19	0	0	After warm-up the engine.
Vehicle speed signal		B134	1	0 or 5	0 or 5	“5” and “0” are repeatedly displayed when vehicle is driven.

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Generator signal		B137	11	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 10 — 13	Waveform
Mass air flow sensor	Signal	B84	13	—	0.3 — 4.5	—
	Shield	B84	8	0	0	—
	GND	B84	7	0	0	—
Intake air temperature sensor signal		B135	27	—	—	—
Exhaust gas temperature sensor	Signal	B135	16	—	—	—
	GND (sensor)	B135	19	0	0	—
Tumble generator valve position sensor RH	Signal	B135	23	Fully closed: 0.2 — 1.0 Fully opened: 4.2 — 4.7		—
	Power supply	B135	9	5	5	—
	GND (sensor)	B135	19	0	0	—
Tumble generator valve position sensor LH	Signal	B135	13	Fully closed: 0.2 — 1.0 Fully opened: 4.2 — 4.7		—
	Power supply	B135	9	5	5	—
	GND (sensor)	B135	19	0	0	—
Tumble generator valve RH (open)		B84	4	0 or 5	0 or 5	—
Tumble generator valve RH (close)		B84	5	0 or 5	0 or 5	—
Tumble generator valve LH (open)		B84	10	0 or 5	0 or 5	—
Tumble generator valve LH (close)		B84	11	0 or 5	0 or 5	—
Wastegate control solenoid valve		B137	24	10 — 13	13 — 14	—
Starter switch		B134	16	0	0	Cranking: 8 — 14
A/C switch		B134	6	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch		B134	14	10 — 13	13 — 14	—
Neutral position switch		B134	8	ON: 12±0.5 OFF: 0		Switch is ON when gear is in neutral position.
Test mode connector		B134	5	5	5	When connected: 0
Knock sensor	Signal	B135	4	2.8	2.8	—
	Shield	B135	22	0	0	—
Back-up power supply		B137	10	10 — 13	13 — 14	Ignition switch “OFF”: 10 — 13
Control unit power supply		B137	2	10 — 13	13 — 14	—
		B137	3	10 — 13	13 — 14	—
Sensor power supply		B135	9	5	5	—
Line end check 1		B134	10	0	0	—
Ignition control	#1	B136	24	0	13 — 14	Waveform
	#2	B136	23	0	13 — 14	Waveform
	#3	B136	22	0	13 — 14	Waveform
	#4	B136	21	0	13 — 14	Waveform

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Fuel injector	#1	B137	1	10 — 13	1 — 14	Waveform
	#2	B136	6	10 — 13	1 — 14	Waveform
	#3	B136	5	10 — 13	1 — 14	Waveform
	#4	B136	4	10 — 13	1 — 14	Waveform
Idle air control solenoid valve	Signal	B136	10	0 or 13 — 14	0 or 13 — 14	Waveform
Fuel pump controller	Signal 1	B134	13	—	—	—
	Signal 2	B136	16	—	—	—
A/C relay control		B137	27	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 1 control		B137	17	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 2 control		B137	28	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	With A/C vehicles only
Malfunction indicator lamp		B137	15	—	—	Light “ON”: 1, or less Light “OFF”: 10 — 14
Engine speed output		B136	9	—	0 — 13, or more	Waveform
Purge control solenoid valve		B137	16	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
Pressure sensor	Signal	B135	8	1.7 — 2.4	1.1 — 1.6	—
	Power supply	B135	9	5	5	
	GND (sensor)	B135	19	0	0	
Fuel level sensor		B135	25	0.12 — 4.75	0.12 — 4.75	—
Small light switch		B134	17	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Blower fan switch		B134	9	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Rear defogger switch		B134	3	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Power steering oil pressure switch		B135	24	10 — 13	ON: 0 OFF: 13 — 14	—
Front oxygen (A/F) sensor signal (+)		B137	29	2.8 — 3.2	2.8 — 3.2	—
Front oxygen (A/F) sensor signal (–)		B137	19	2.4 — 2.7	2.4 — 2.7	—
Front oxygen (A/F) sensor shield		B137	18	0	0	—
SSM/GST communication line		B134	21	Less than 1 ←→ More than 4	Less than 1 ←→ More than 4	—
Torque control 1 signal		B134	19	More than 4	More than 4	—
Torque control 2 signal		B134	18	More than 4	More than 4	—
Torque control cut signal		B136	14	8	8	—
AT diagnosis input signal		B135	20	Less than 1 ←→ More than 4	Less than 1 ←→ More than 4	Waveform
AT load signal		B135	28	4.3 — 4.4	0.9 — 1.4	—
GND (sensors)		B135	19	0	0	—
GND (injectors)		B136	8	0	0	—
GND (ignition system)		B136	18	0	0	—

Content	Connector No.	Terminal No.	Signal (V)		Note
			Ignition SW ON (Engine OFF)	Engine ON (Idling)	
GND (power supply)	B136	17	0	0	—
	B134	22	0	0	—
GND (control systems)	B134	7	0	0	—
	B134	15	0	0	—
GND (oxygen sensor heater 1)	B137	9	0	0	—
GND (oxygen sensor heater 2)	B137	8	0	0	—

6. Engine Condition Data

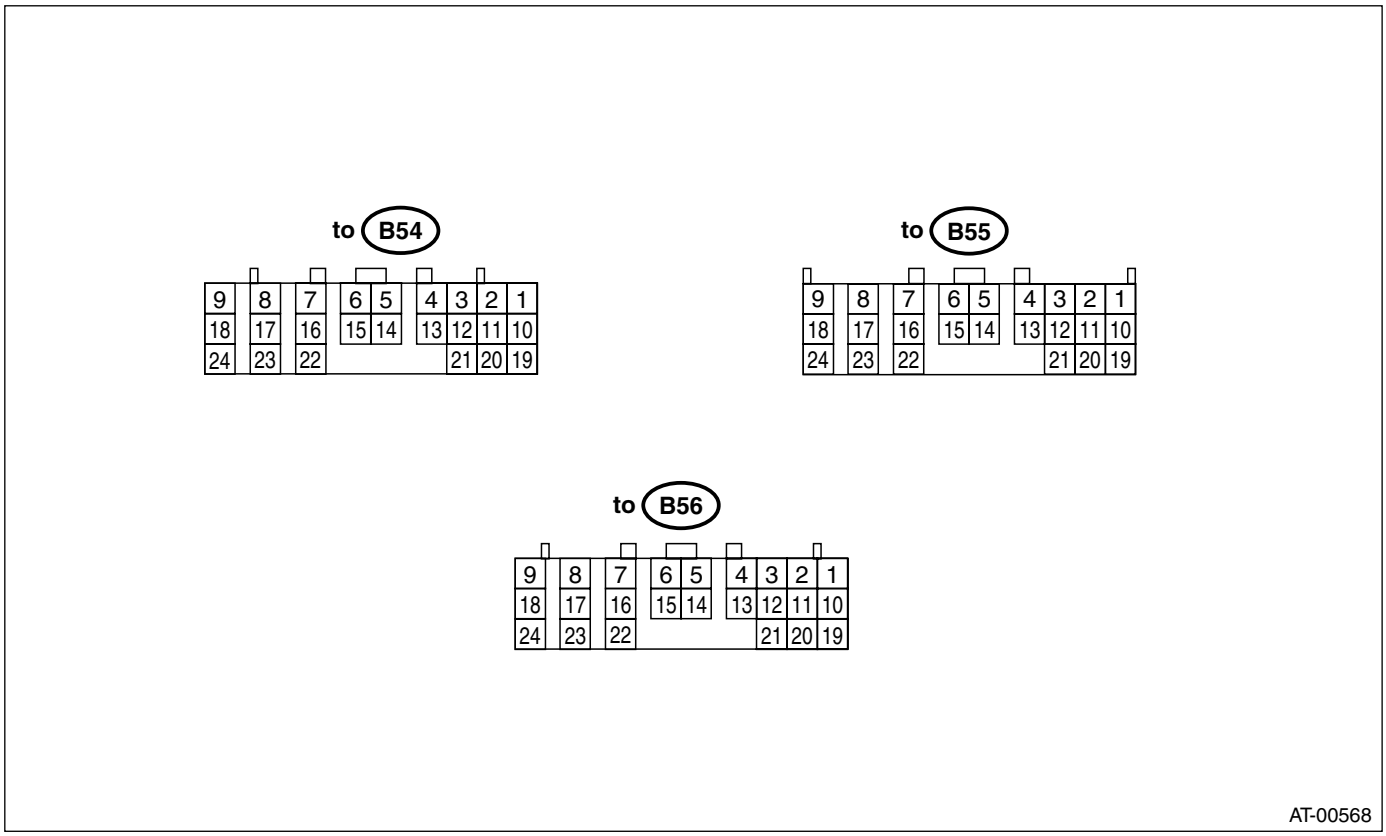
A: ELECTRICAL SPECIFICATION

Content	Specified data
Engine load	1.6 — 2.9 (%): Idling
	6.4 — 12.8 (%): 2,500 rpm racing

Measuring condition:
- After warm-up the engine.
- Gear position is in neutral position.
- A/C is turned to OFF.
- All accessory switches are turned to OFF.

7. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION



NOTE:
Check with ignition switch ON.

Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to chassis ground (Ω)
Back-up power supply	B56	1	Ignition switch OFF	10 — 13	—
Ignition power supply	B54	23	Ignition switch ON (with engine OFF)	10 — 13	—
	B54	24			

Check with ignition switch ON.						
Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to chassis ground (Ω)
Inhibitor switch	"P" range switch	B55	1	Select lever in "P" range	Less than 1	—
				Select lever in any other than "P" range (except "N" range)	More than 8	
	"N" range switch	B55	14	Select lever in "N" range	Less than 1	—
				Select lever in any other than "N" range (except "P" range)	More than 8	
	"R" range switch	B55	3	Select lever in "R" range	Less than 1	—
				Select lever in any other than "R" range	More than 8	
	"D" range switch	B55	4	Select lever in "D" range	Less than 1	—
				Select lever in any other than "D" range	More than 8	
	"3" range switch	B55	5	Select lever in "3" range	Less than 1	—
				Select lever in any other than "3" range	More than 8	
	"2" range switch	B55	6	Select lever in "2" range	Less than 1	—
				Select lever in any other than "2" range	More than 8	
	"1" range switch	B55	7	Select lever in "1" range	Less than 1	—
				Select lever in any other than "1" range	More than 8	
Brake switch		B55	12	Brake pedal depressed.	More than 10.5	—
				Brake pedal released.	Less than 1	
Kick-down switch		B55	11	Throttle fully opened.	Less than 1	—
				Throttle fully closed.	More than 6.5	
AT OIL TEMP warning light		B56	10	Light ON	Less than 1	—
				Light OFF	More than 9	
Throttle position sensor		B54	3	Throttle fully closed.	0.2 — 1.0	—
				Throttle fully open.	4.2 — 4.7	
Throttle position sensor power supply		B54	2	Ignition switch ON (with engine OFF)	4.8 — 5.3	—
ATF temperature sensor		B54	11	ATF temperature 20°C (68°F)	1.6 — 2.0	2.1 k — 2.9 k
				ATF temperature 80°C (176°F)	0.4 — 0.9	275 — 375
Rear vehicle speed sensor		B55	24	Vehicle stopped.	0	450 — 650
				Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Front vehicle speed sensor		B55	18	Vehicle stopped.	0	450 — 650
				Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Torque converter turbine speed sensor		B55	8	Engine idling after warm-up. (D range)	0	450 — 650
				Engine idling after warm-up. (N range)	More than 1 (AC range)	
Vehicle speed output signal		B56	17	Vehicle speed at most 10 km/h (6 MPH)	Less than 1← →More than 4	—

Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to chassis ground (Ω)
Engine speed signal	B55	17	Ignition switch ON (with engine OFF)	More than 10.5	—
			Ignition switch ON (with engine ON)	8 — 11	
Cruise set signal	B55	22	When cruise control is set. (SET lamp ON)	Less than 1	—
			When cruise control is not set. (SET lamp OFF)	More than 6.5	
Torque control signal 1	B56	5	Ignition switch ON (with engine ON)	More than 4	—
Torque control signal 2	B56	14	Ignition switch ON (with engine ON)	More than 4	—
Torque control cut signal	B55	10	Ignition switch ON	8	—
Intake manifold pressure signal (Non-turbo model)	B54	1	Engine idling after warm-up.	0.4 — 1.6	—
Mass air flow signal (Turbo model)	B54	1	Engine idling after warm-up.	0.9 — 1.4	—
Shift solenoid 1	B54	22	1st or 4th gear	More than 9	10 — 16
			2nd or 3rd gear	Less than 1	
Shift solenoid 2	B54	5	1st or 2nd gear	More than 9	10 — 16
			3rd or 4th gear	Less than 1	
Line pressure duty solenoid	B54	9	Ignition switch ON (with engine OFF) Throttle fully closed after warm-up.	1.5 — 4.0	2.0 — 4.5
			Ignition switch ON (with engine OFF) Throttle fully open after warm-up.	Less than 0.5	
Lock-up duty solenoid	B54	7	When lock up occurs.	More than 8.5	10 — 17
			When lock up is released.	Less than 0.5	
Transfer duty solenoid (Non-turbo model)	B54	6	Fuse on FWD switch	More than 8.5	10 — 17
			Fuse removed from FWD switch (with throttle fully open and with select lever in 1st gear).	Less than 0.5	
Transfer duty solenoid (Turbo model)	B54	6	Throttle fully closed.	More than 8.5	10 — 17
			Throttle fully open.	Less than 0.5	
2-4 brake duty solenoid	B54	18	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 5.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
2-4 brake timing solenoid	B54	16	1st gear	Less than 1	10 — 16
			3rd gear	More than 9	
Low clutch timing solenoid	B54	15	2nd gear	Less than 1	10 — 16
			4th gear	More than 9	
Hold switch	B55	16	Hold switch ON	Less than 1	—
			Hold switch OFF	More than 8	—
Power switch	B55	23	Power switch ON	Less than 1	—
			Power switch OFF	More than 10	—

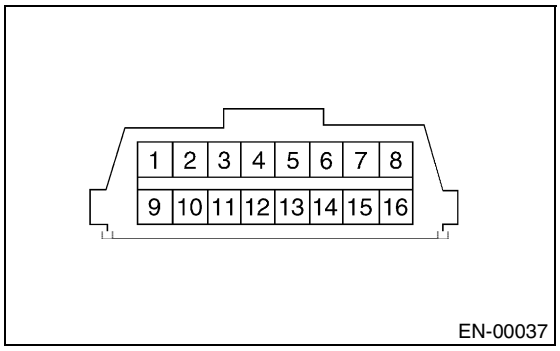
Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to chassis ground (Ω)
Power indicator light	B56	11	Light ON	Less than 1	—
			Light OFF	More than 9	—
FWD switch	B55	20	Fuse removed.	6 — 9.1	—
			Fuse installed.	Less than 1	—
FWD indicator light	B56	2	Fused ON FWD switch	Less than 1	—
			Fuse removed from FWD switch.	More than 9	—
ABS signal	B55	21	ABS switch ON	Less than 1	—
			ABS switch OFF	6.5 — 15	—
Sensor ground line 1	B54	20	—	0	Less than 1
Sensor ground line 2	B55	9	—	0	Less than 1
System ground line	B56	19	—	0	Less than 1
	B54	21			
Sensor ground line 3	B54	10	—	0	Less than 1
Sensor ground line 4	B54	19	—	0	Less than 1
AT diagnosis signal	B56	21	Ignition switch ON	Less than 1 ← → More than 4	—
Data link signal (Subaru Select Monitor)	B56	15	—	—	—

8. Data Link Connector

A: NOTE

1) This connector is used both for the OBD-II general scan tools and Subaru Select Monitor.
2) Terminal No. 4 to No. 6 of the data link connector is used for the Subaru Select Monitor signal.

CAUTION:
Do not connect any scan tools other than the OBD-II general scan tools and Subaru Select Monitor, because the circuit for Subaru Select Monitor may be damaged.



Terminal No.	Contents	Terminal No.	Contents
1	Power supply	9	Blank
2	Blank	10	K line of ISO 9141 CARB
3	Blank	11	Blank
4	Subaru Select Monitor signal (ECM to Subaru Select Monitor)*	12	Ground
5	Subaru Select Monitor signal (Subaru Select Monitor to ECM)*	13	Ground
6	Line end check signal 1	14	Blank
7	Blank	15	Blank
8	Line end check signal 2	16	Blank

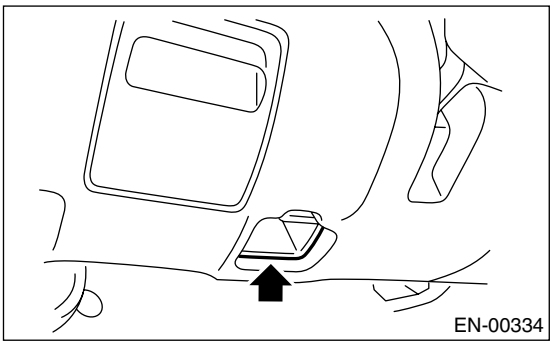
*: Circuit only for Subaru Select Monitor

9. OBD-II General Scan Tool

A: OPERATION

1. HOW TO USE OBD-II GENERAL SCAN TOOL

1) Prepare a general scan tool (OBD-II general scan tool) required by SAE J1978.
2) Open the cover and connect the OBD-II general scan tool to data link connector located in the lower portion of instrument panel (on the driver's side).



3) Using the OBD-II general scan tool, call up diagnostic trouble code(s) (DTC(s)) and freeze frame data.

OBD-II general scan tool functions consist of:
(1) MODE $01: Current powertrain diagnostic data
(2) MODE $02: Powertrain freeze frame data
(3) MODE $03: Emission-related powertrain diagnostic trouble codes
(4) MODE $04: Clear/Reset emission-related diagnostic information

Read out the data according to repair procedures. (For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual.)

NOTE:
For details concerning diagnostic trouble codes (DTCs), refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).>

2. MODE $01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refers to data denoting the current operating condition of analog input/output, digital input/output and/or the powertrain system.
A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
01	Number of emission-related powertrain trouble codes and MIL status	ON/OFF
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
0F	Intake air temperature	°C
10	Air flow rate from pressure sensor	g/sec
11	Throttle valve opening angle	%
13	Check whether oxygen sensor is installed.	—
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor—bank 2	V and %
24	A/F sensor 1 output voltage and short term fuel trim associated with A/F sensor 1	V and %
1C	On-board diagnosis system	—

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access generic OBD-II PIDs (MODE $01).

3. MODE $02 (POWERTRAIN FREEZE FRAME DATA)

Refers to data denoting the operating condition when trouble is sensed by the on-board diagnosis system. A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
02	Trouble code that caused CARB required freeze frame data storage	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access freeze frame data (MODE $02).

4. MODE $03 (EMISSION-RELATED POWERTRAIN DIAGNOSTIC TROUBLE CODE)

Refer to Read Diagnostic Trouble Code for information about data denoting emission-related powertrain diagnostic trouble codes. <Ref. to EN(TURBO)-41, Read Diagnostic Trouble Code.>

5. MODE $04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION)

Refers to the mode used to clear or reset emission-related diagnostic information (OBD-II trouble diagnostic information).

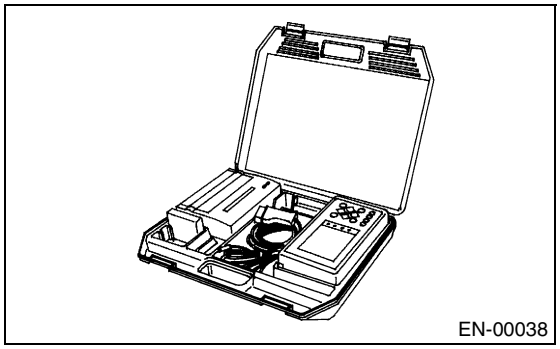
NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to clear or reset emission-related diagnostic information (MODE $04).

10.Subaru Select Monitor

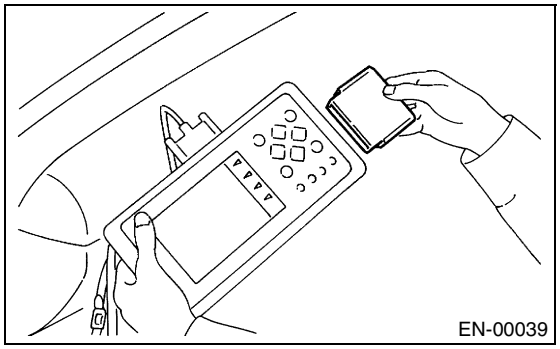
A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

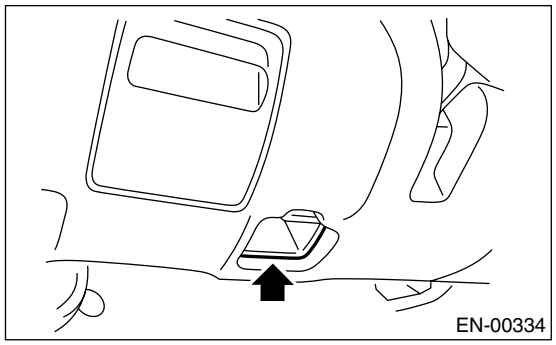
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(TURBO)-8, PREPARATION TOOL, General Description.>



2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(TURBO)-8, PREPARATION TOOL, General Description.>



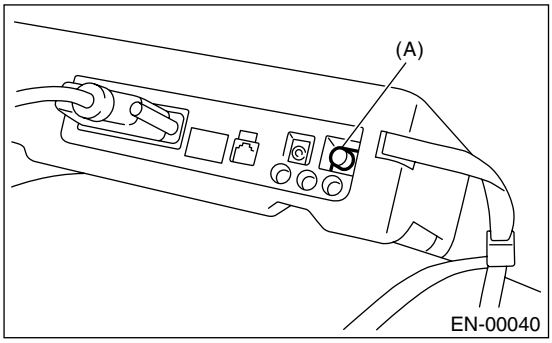
4) Connect the Subaru Select Monitor to data link connector.
(1) Data link connector located in the lower portion of instrument panel (on the driver's side).



(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

6) Using the Subaru Select Monitor, call up diagnostic trouble code(s) (DTC(s)) and various data, then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (NORMAL MODE)

Refer to Read Diagnostic Trouble Code for information about how to indicate DTC. <Ref. to EN(TURBO)-41, Read Diagnostic Trouble Code.>

3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (OBD MODE)

Refer to Read Diagnostic Trouble Code for information about how to indicate DTC. <Ref. to EN(TURBO)-41, Read Diagnostic Trouble Code.>

4. READ CURRENT DATA FOR ENGINE. (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press [YES] key.
5) On the «Data Display Menu» display screen, select the {Data Display} and press [YES] key.
6) Using the scroll key, move the display screen up or down until desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Vehicle speed signal	Vehicle Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Engine coolant temperature signal	Coolant Temp.	°C or °F
Ignition timing signal	Ignition Timing	deg
Throttle position signal	Throttle Opening Angle	%
Throttle position signal	Throttle Sensor Voltage	V
Injection pulse width	Fuel Injection #1 Pulse	ms
Idle air control signal	ISC Valve Duty Ratio	%
Alternator duty control signal	ALT Duty	%
Fuel pump duty control signal	Fuel Pump Duty	%
A/F sensor current	A/F Sensor #1 Current	mA
A/F sensor resistance	A/F Sensor #1 Resistance	Ω
Front oxygen (A/F) sensor output signal	A/F Sensor #1	—
Rear oxygen sensor output signal	Rear O_2 Sensor	V
Short term fuel trim	A/F Correction #1	%
Knock sensor signal	Knocking Correction	deg
Atmospheric absolute pressure signal	Atmosphere Pressure	mmHg or kPa or inHg or psi
Intake manifold relative pressure signal	Mani. Relative Pressure	mmHg or kPa or inHg or psi
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psi
A/F correction (short term fuel trim) by rear oxygen sensor	A/F Correction #3	%
Long term whole fuel trim	A/F Learning #1	%
Front oxygen (A/F) sensor heater current	A/F Heater Current 1	A
Rear oxygen sensor heater voltage	Rear O_2 Heater Voltage	V
Canister purge control solenoid valve duty ratio	CPC Valve Duty Ratio	%
Primary supercharged pressure control signal	Primary Control	%
Tumble generator valve position sensor signal (right side)	TGV Position Sensor R	V
Tumble generator valve position sensor signal (left side)	TGV Position Sensor L	V
Tumble generator valve drive signal	TGV Drive	OPEN or CLOSE
Fuel level signal	Fuel Level	V
Intake air temperature signal	Intake Air Temp.	°C or °F
Learned ignition timing	Learned Ignition Timing	deg
Mass air flow sensor signal	Mass Air Flow	g/s
Mass air flow sensor signal	Air Flow Sensor Voltage	V
Ignition switch signal	Ignition Switch	ON or OFF
Test mode connector signal	Test Mode Signal	ON or OFF
Neutral position switch signal	Neutral Position Switch	ON or OFF
Air conditioning switch signal	A/C Switch	ON or OFF
Air conditioning signal	A/C Compressor Signal	ON or OFF

Contents	Display	Unit of measure
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF
Fuel pump relay signal	Fuel Pump Relay	ON or OFF
Knocking signal	Knocking Signal	ON or OFF
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF
Power steering switch signal	P/S Switch	ON or OFF
Engine torque control signal #1	Torque Control Signal #1	ON or OFF
Engine torque control signal #2	Torque Control Signal #2	ON or OFF
Engine torque control permission signal	Torque Permission Signal	ON or OFF
Rear oxygen sensor rich signal	Rear O_2 Rich Signal	ON or OFF
Starter switch signal	Starter Switch	ON or OFF
Idle switch signal	Idle Switch	ON or OFF
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF
Rear defogger switch signal	Rear Defogger SW	ON or OFF
Blower fan switch signal	Blower Fan SW	ON or OFF
Small light switch signal	Light Switch	ON or OFF
Tumble generator valve output signal	TGV Output	ON or OFF
A/C middle pressure signal	A/C Mid Pressure Switch	ON or OFF

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

5. READ CURRENT DATA FOR ENGINE. (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press [YES] key.
5) On the «OBD Menu» display screen, select the {Current Data Display & Save} and press [YES] key.
6) On the «Data Display Menu» display screen, select the {Data Display} and press [YES] key.
7) Using the scroll key, move the display screen up or down until desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Number of diagnosis code	Number of Diagnosis Code	—
Malfunction indicator lamp status	MI (MIL)	Complete or incomplete
Monitoring test of misfire	Misfire monitoring	Complete or incomplete
Monitoring test of fuel system	Fuel system monitoring	Complete or incomplete
Monitoring test of comprehensive component	Component monitoring	Complete or incomplete
Test of catalyst	Catalyst Diagnosis	No support
Test of heated catalyst	Heated catalyst	No support
Test of evaporative emission purge control system	Evaporative purge system	No support
Test of secondary air system	Secondary air system	No support
Test of air conditioning system refrigerant	A/C system refrigerant	No support
Test of oxygen sensor	Oxygen sensor	Complete or incomplete
Test of oxygen sensor heater	O_2 Heater Diagnosis	Complete or incomplete
Test of EGR system	EGR system	No support
Air fuel ratio control system for bank 1	Fuel System for Bank 1	—
Engine load data	Calculated load value	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing advance for #1 cylinder	Ignition timing adv. #1	°
Intake air temperature signal	Intake Air Temp.	°C or °F
Intake air amount	Mass Air Flow	g/s
Throttle position signal	Throttle Opening Angle	%
A/F sensor equipment	A/F sensor	ON or OFF
Rear oxygen sensor output signal	Oxygen Sensor #12	V
Air fuel ratio correction by rear oxygen sensor	Short term fuel trim #12	%
On-board diagnostic system	OBD System	—

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

6. READ FREEZE FRAME DATA FOR ENGINE. (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press [YES] key.
5) On the «OBD Menu» display screen, select the {Freeze Frame Data} and press [YES] key.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Diagnostic trouble code (DTC) for freeze frame data	Freeze frame data	DTC
Air fuel ratio control system for bank 1	Fuel system for Bank1	ON or OFF
Engine load data	Engine Load	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

7. READ OXYGEN SENSOR MONITORING TEST RESULTS DATA FOR ENGINE. (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press [YES] key.
5) On the «OBD Menu» display screen, select the {O_2 Sensor Monitor} and press [YES] key.
6) On the «O_2 Sensor Select» display screen, select the {Bank 1-Sensor1} or {Bank 1-Sensor2} and press [YES] key.
• Bank 1-Sensor1 indicates the front oxygen or A/F sensor, and Bank 1-Sensor2 indicates the rear oxygen sensor.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Oxygen sensor for monitoring test	<O_2 Sensor Monitor (-------)>	—
Rich to lean oxygen sensor threshold voltage	Rich to lean sensor volt	V
Lean to rich oxygen sensor threshold voltage	Lean to rich sensor volt	V
Low oxygen sensor voltage for switch time calculation	Low sensor voltage	V
High oxygen sensor voltage for switch time calculation	High sensor voltage	V
Rich to lean oxygen sensor switch time	Rich to lean switch time	sec
Lean to rich oxygen sensor switch time	Lean to rich switch time	sec
Maximum oxygen sensor voltage for test cycle	Maximum sensor Voltage	V
Minimum oxygen sensor voltage for test cycle	Minimum sensor Voltage	V

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

8. LED OPERATION MODE FOR ENGINE

1) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press [YES] key.
5) On the «Data Display Menu» display screen, select the {Data & LED Display} and press [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Message	LED "ON" requirements
Ignition switch signal	Ignition Switch	ON or OFF	When ignition switch is turned to ON.
Test mode connector signal	Test Mode Signal	ON or OFF	When test mode connector is connected.
Neutral position switch signal	Neutral SW	ON or OFF	When neutral position signal is entered.
Air conditioning switch signal	A/C SW	ON or OFF	When air conditioning switch is turned ON.
Air conditioning relay signal	A/C Relay	ON or OFF	When air conditioning relay is in function.
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF	When radiator main fan relay is in function.
Knocking signal	Knocking Signal	ON or OFF	When knocking signal is entered.
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF	When radiator sub fan relay is in function.
Engine torque control signal #1	Torque Control Signal #1	ON or OFF	When engine torque control signal 1 is entered.
Engine torque control signal #2	Torque Control Signal #2	ON or OFF	When engine torque control signal 2 is entered.
Engine torque control permission signal	Torque Control Permit	ON or OFF	When engine torque control permission signal is entered.
Rear oxygen sensor rich signal	Rear O_2 Rich Signal	ON or OFF	When rear oxygen sensor mixture ratio is rich.
Starter switch signal	Starter Switch Signal	ON or OFF	When starter switch signal is entered.
Idle switch signal	Idle Switch Signal	ON or OFF	When idle switch signal is entered.
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF	When crankshaft position sensor signal is entered.
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF	When camshaft position sensor signal is entered.
Power steering switch signal	P/S SW	ON or OFF	When power steering switch is entered.
Rear defogger switch signal	Rear Defogger SW	ON or OFF	When rear defogger switch is turned ON.
Blower fan switch signal	Blower Fan SW	ON or OFF	When blower fan switch is turned ON.
Light switch signal	Light SW	ON or OFF	When small light switch is turned ON.
Tumble generator valve actuator signal	TGV Signal	ON or OFF	When TGV actuator signal is entered.
Tumble generator valve drive signal	TGV Drive	ON or OFF	When TGV moves and valve opens.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

9. READ CURRENT DATA FOR AT

1) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.
2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press [YES] key.
3) Press the [YES] key after displayed the information of transmission type.
4) On the «Transmission Diagnosis» display screen, select the {Current Data Display & Save} and press [YES] key.
5) On the «Data Display Menu» display screen, select the {Data Display} and press [YES] key.
6) Using the scroll key, move the display screen up or down until desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Rear vehicle speed sensor signal	Rear Wheel Speed	km/h or MPH
Front vehicle speed sensor signal	Front Wheel Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Automatic transmission fluid temperature signal	ATF Temp.	°C or °F
Mass air flow sensor signal	Air Flow Sensor Voltage	V
Throttle position signal	Throttle Sensor Voltage	V
Gear position	Gear Position	—
Line pressure control duty ratio	Line Pressure Duty Ratio	%
Lock up clutch control duty ratio	Lock Up Duty Ratio	%
Transfer clutch control duty ratio	Transfer Duty Ratio	%
Power supply for throttle position sensor	Throttle Sensor Power	V
Torque converter turbine speed signal	Turbine Revolution Speed	rpm
2-4 brake timing pressure control duty ratio	Brake Clutch Duty Ratio	%
Stop lamp switch signal	Stop Light Switch	ON or OFF
Anti lock brake system signal	ABS Signal	ON or OFF
Cruise control system signal	Cruise Control Signal	ON or OFF
Neutral/Parking range signal	N/P Range Signal	ON or OFF
Reverse range signal	R Range Signal	ON or OFF
Drive range signal	D Range Signal	ON or OFF
3rd range signal	3rd Range Signal	ON or OFF
2nd range signal	2nd Range Signal	ON or OFF
1st range signal	1st Range Signal	ON or OFF
Shift control solenoid A	Shift Solenoid #1	ON or OFF
Shift control solenoid B	Shift Solenoid #2	ON or OFF
Torque control output signal #1	Torque Control Signal #1	ON or OFF
Torque control output signal #2	Torque Control Signal #2	ON or OFF
Torque control cut signal	Torque Control Cut Sig.	ON or OFF
2-4 brake timing control solenoid valve	2-4 Brake Timing Sol.	ON or OFF
Low clutch timing control solenoid valve	Low Clutch Timing Sol.	ON or OFF
Automatic transmission diagnosis indicator lamp	Diagnosis Lamp	ON or OFF

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

11.Read Diagnostic Trouble Code

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press [YES] key.
5) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)} and press [YES] key.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press [YES] key.
5) On the «OBD Menu» display screen, select the {Diagnosis Code(s) Display} and press [YES] key.
6) Make sure that a diagnostic trouble code (DTC) is shown on the display screen.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning diagnostic trouble codes (DTCs), refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).>

3. OBD-II GENERAL SCAN TOOL

Refers to data denoting emission-related powertrain diagnostic trouble codes (DTCs).
For details concerning diagnostic trouble codes (DTCs), refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).>

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access emission-related powertrain diagnostic trouble codes (DTCs) (MODE $03).

12.Inspection Mode

A: OPERATION

Carry out trouble diagnosis shown in the following DTC table.
When performing trouble diagnosis which is not shown in the DTC table, refer to the next item Drive cycle.
<Ref. to EN(TURBO)-47, Drive Cycle.>

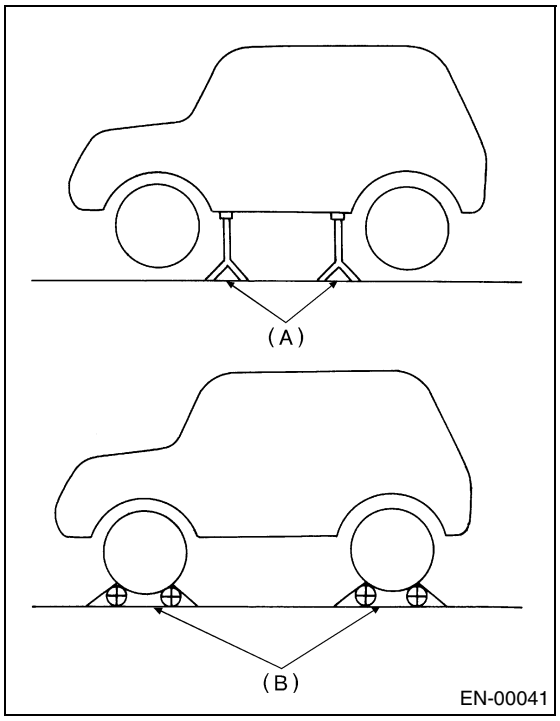
DTC No.	Item	Condition
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	—
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	—
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	—
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	—
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	—
P0068	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance	—
P0102	Mass or Volume Air Flow Circuit Low Input	—
P0103	Mass or Volume Air Flow Circuit High Input	—
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	—
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	—
P0112	Intake Air Temperature Circuit Low Input	—
P0113	Intake Air Temperature Circuit High Input	—
P0117	Engine Coolant Temperature Circuit Low Input	—
P0118	Engine Coolant Temperature Circuit High Input	—
P0122	Throttle/Pedal Position Sensor/Switch “A” Circuit Low Input	—
P0123	Throttle/Pedal Position Sensor/Switch “A” Circuit High Input	—
P0129	Atmospheric Pressure Sensor Circuit Range/Performance	—
P0130	O_2 Sensor Circuit (Bank 1 Sensor 1)	—
P0134	O_2 Sensor Circuit No ACTIvity Detected (Bank 1 Sensor 1)	—
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	—
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	—
P0171	System too Lean (Bank 1)	—
P0172	System too Rich (Bank 1)	—
P0230	Fuel Pump Primary Circuit	—
P0245	Turbo/Super Charger Wastegate Solenoid “A” Low	—
P0246	Turbo/Super Charger Wastegate Solenoid “A” High	—
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	—
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	—
P0335	Crankshaft Position Sensor “A” Circuit	—
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	—
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	—
P0341	Camshaft Position Sensor “A” Circuit Range/Performance (Bank 1 or Single Sensor)	—
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	—
P0462	Fuel Level Sensor Circuit Low Input	—
P0463	Fuel Level Sensor Circuit High Input	—
P0502	Vehicle Speed Sensor Circuit Low Input	—
P0503	Vehicle Speed Sensor Intermittent/Erratic/High	—
P0508	Idle Control System Circuit Low	—
P0509	Idle Control System Circuit High	—
P0512	Starter Switch Circuit High Input	—
P0518	Starter Switch Circuit Low Input	—
P0519	Idle Control System Malfunction (Fail-safe)	—

DTC No.	Item	Condition
P0558	Generator Circuit Low Input	—
P0559	Generator Circuit High Input	—
P0604	Internal Control Module Random Access Memory (RAM) Error	—
P0691	Cooling Fan 1 Control Circuit Low	—
P0692	Cooling Fan 1 Control Circuit High	—
P0851	Neutral Switch Input Circuit Low	—
P0852	Neutral Switch Input Circuit High	—
P0864	TCM Communication Circuit Range/Performance	—
P0865	AT Diagnosis Input Signal Circuit Low Input	—
P0866	AT Diagnosis Input Signal Circuit High Input	—
P1086	Tumble Generated Valve Position Sensor 2 Circuit Low	—
P1087	Tumble Generated Valve Position Sensor 2 Circuit High	—
P1088	Tumble Generated Valve Position Sensor 1 Circuit Low	—
P1089	Tumble Generated Valve Position Sensor 1 Circuit High	—
P1090	Tumble Generated Valve System 1 (Valve Open)	Engine coolant temperature is –5 — 5°C (–41 — 41°F) at engine start.
P1091	Tumble Generated Valve System 1 (Valve Close)	—
P1092	Tumble Generated Valve System 2 (Valve Open)	Engine coolant temperature is –5 — 5°C (–41 — 41°F) at engine start.
P1093	Tumble Generated Valve System 2 (Valve Close)	—
P1094	Tumble Generated Valve Signal 1 Circuit Malfunction (Open)	—
P1095	Tumble Generated Valve Signal 1 Circuit Malfunction (Short)	—
P1096	Tumble Generated Valve Signal 2 Circuit Malfunction (Open)	—
P1097	Tumble Generated Valve Signal 2 Circuit Malfunction (Short)	—
P1110	Atmospheric Pressure sensor circuit malfunction (Low input)	—
P1111	Atmospheric Pressure sensor circuit malfunction (High input)	—
P1134	A/F sensor Micro-computer problem	—
P1152	O_2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	—
P1153	O_2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	—
P1560	Back-up Voltage Circuit Malfunction	—

1. PREPARATION FOR THE INSPECTION MODE

1) Make sure that the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)] and the battery voltage is 12 V or more.
2) Raise the vehicle using a garage jack and place on safety stands or drive the vehicle onto free rollers.

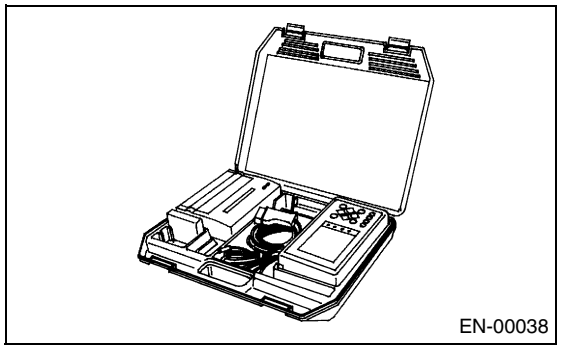
WARNING:
• Before raising the vehicle, ensure the parking brake is applied.
• Do not use a pantograph jack in place of a safety stand.
• Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
• Do not abruptly depress/release the clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause vehicle to jump off free rollers.
• In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the safety stands and the vehicle.
• Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



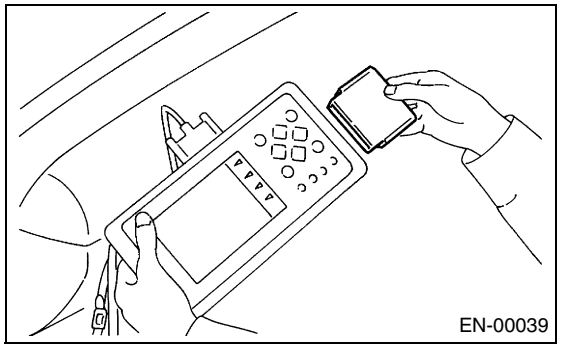
(A) Safety stand
(B) Free rollers

2. SUBARU SELECT MONITOR

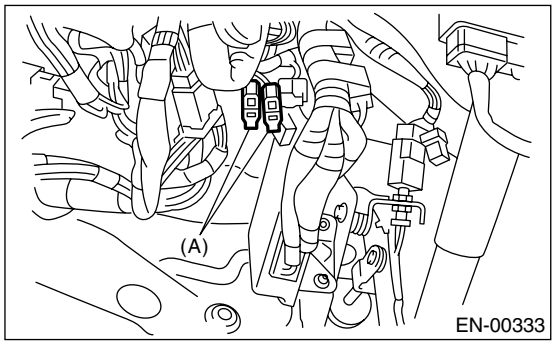
1) After performing the diagnostics and clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(TURBO)-49, Clear Memory Mode.>
2) Warm up the engine.
3) Prepare the Subaru Select Monitor kit. <Ref. to EN(TURBO)-8, PREPARATION TOOL, General Description.>



4) Connect the diagnosis cable to Subaru Select Monitor.
5) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(TURBO)-8, PREPARATION TOOL, General Description.>



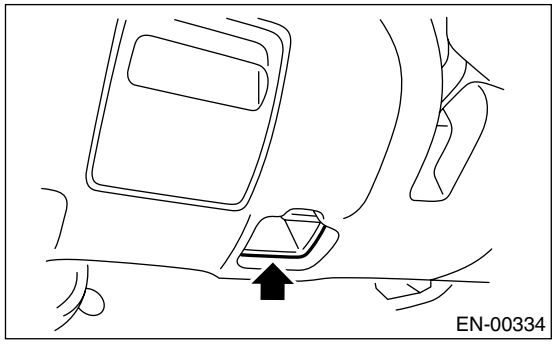
6) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).



(A) Test mode connector

7) Connect the Subaru Select Monitor to data link connector.

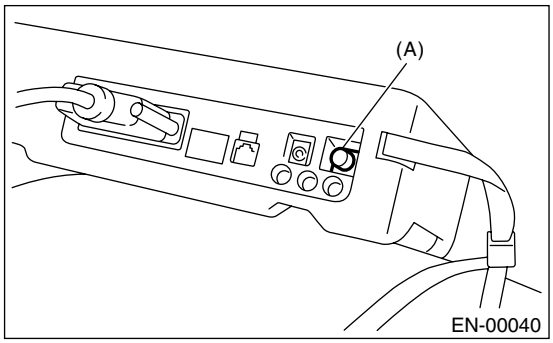
(1) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.

8) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

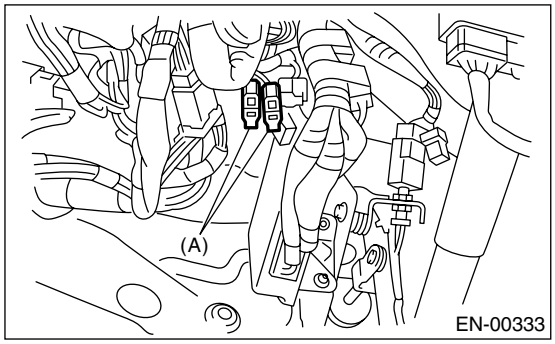
9) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
10) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
11) Press the [YES] key after displayed the information of engine type.
12) On the «Engine Diagnosis» display screen, select the {Dealer Check Mode Procedure} and press the [YES] key.
13) When the “Perform Inspection (Dealer Check) Mode?” is shown on the display screen, press the [YES] key.
14) Perform subsequent procedures as instructed on the display screen.

• If trouble still remains in the memory, the corresponding diagnostic trouble code (DTC) appears on the display screen.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning the diagnostic trouble codes (DTCs), refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).>
• Release the parking brake.
• The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

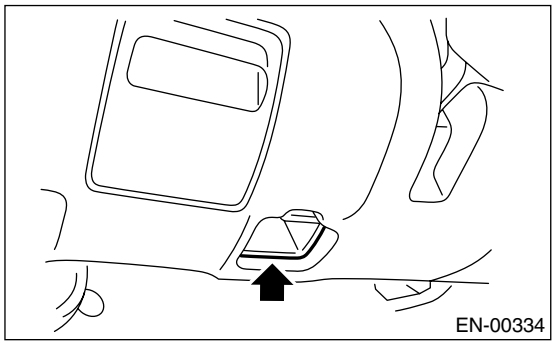
3. OBD-II GENERAL SCAN TOOL

1) After performing the diagnostics and clearing memory, check for any remaining unresolved trouble data: <Ref. to EN(TURBO)-49, Clear Memory Mode.>
2) Warm up the engine.
3) Connect the test mode connector (A) at the lower side of instrument panel (on the driver's side).



4) Connect the OBD-II general scan tool to its data link connector in the lower portion of instrument panel (on the driver's side).

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.



5) Start the engine.

NOTE:
• Ensure the selector lever is placed in “P” position before starting. (AT vehicles)
• Depress the clutch pedal when starting engine. (MT vehicles)

6) Using the selector lever or shift lever, turn the “P” position switch and “N” position switch to ON.
7) Depress the brake pedal to turn brake switch ON. (AT vehicles)
8) Keep the engine speed in 2,500 — 3,000 rpm range for 40 seconds.
9) Place the selector lever or shift lever in “D” position (AT vehicles) or “1st” gear (MT vehicles) and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:
• On AWD vehicles, release the parking brake.
• The speed difference between front and rear wheels may light ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

10) Using the OBD-II general scan tool, check for diagnostic trouble code(s) (DTC(s)) and record the result(s).

NOTE:
• For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.
• For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).>

13.Drive Cycle

A: OPERATION

There are three drive patterns for the trouble diagnosis. Driving in the specified pattern allows to diagnose malfunctioning items listed below. After the malfunctioning items listed below are repaired, always check whether they correctly resume their functions by driving in the required drive pattern.

1. PREPARATION FOR THE DRIVE CYCLE

1) Make sure that the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)], and battery voltage is 12V or more.
2) After performing the diagnostics and cleaning memory, check for any remaining unresolved trouble data. <Ref. to EN(TURBO)-49, Clear Memory Mode.>
3) Separate the test mode connector.

NOTE:
• Except for the water temperature specified items at starting, the diagnosis is carried out after engine warm up.
• Carry out the diagnosis which is marked * on DTC twice, then, after finishing first diagnosis, stop the engine and do second time at the same condition.

2. AFTER RUNNING 20 MINUTES AT 80 KM/H (50 MPH), IDLE ENGINE FOR 1 MINUTE.

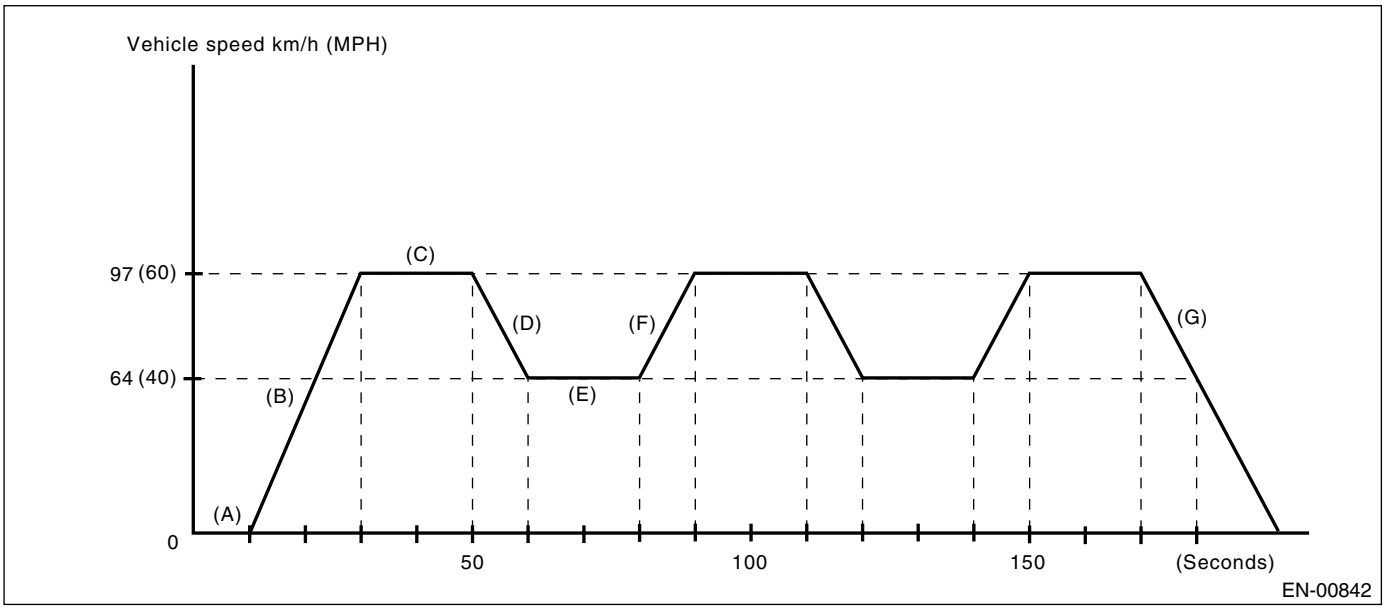
DTC No.	Item	Condition
*P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	Engine coolant temperature is less than 20°C (68°F) at engine start.
*P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	—
*P0420	Catalyst System Efficiency Below Threshold (Bank 1)	—
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	—
P0461	Fuel Level Sensor Circuit Range/Performance	—
P0545	Exhaust Gas Temperature Sensor Circuit Low-Bank1	—
P0546	Exhaust Gas Temperature Sensor Circuit High-Bank1	—
P1312	Exhaust Gas Temperature Sensor Malfunction	Engine coolant temperature is less than 30°C (86°F) at engine start.

3. IDLE FOR 10 MINUTES

NOTE:
Before the diagnosis, drive the vehicle at 10 km/h (6 MPH) or more.

DTC No.	Item	Condition
*P0483	Cooling fan function problem	—
*P0506	Idle control system RPM lower than expected	—
*P0507	Idle control system RPM higher than expected	—

4. DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN



(A) Idle engine for 10 seconds or more.
(B) Accelerate to 97 km/h (60 MPH) within 20 seconds.
(C) Drive vehicle at 97 km/h (60 MPH) for 20 seconds.
(D) Decelerate with fully closed throttle to 64 km/h (40 MPH).
(E) Drive vehicle at 64 km/h (40 MPH) for 20 seconds.
(F) Accelerate to 97 km/h (60 MPH) within 10 seconds.
(G) Stop vehicle with throttle fully closed.Stop vehicle with throttle fully closed.Stop vehicle with throttle fully closed.

DTC No.	Item	Condition
*P0121	Throttle position sensor circuit range/performance problem (high input)	—
*P0139	Rear oxygen sensor circuit slow response	—
*P0301	Cylinder 1 misfire detected	In some cases, diagnosis may complete at once.
*P0302	Cylinder 2 misfire detected	In some cases, diagnosis may complete at once.
*P0303	Cylinder 3 misfire detected	In some cases, diagnosis may complete at once.
*P0304	Cylinder 4 misfire detected	In some cases, diagnosis may complete at once.
*P0101	Mass or Volume Air Flow Circuit Range/Performance	—
P0244	Turbo/Super Charger Wastegate Solenoid “A” Range/Performance	—
P1301	Misfire Ditected (High Temperature Exhaust Gas)	—
P1544	Exhaust Gas Temperature Too High	—

14.Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {Clear Memory} and press [YES] key.
5) When the 'Done' and 'Turn Ignition Switch OFF' are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press [YES] key.
5) On the «OBD Menu» display screen, select the {4. Diagnosis Code(s) Cleared} and press [YES] key.
6) When the 'Clear Diagnostic Code?' is shown on the display screen, press [YES] key.
7) Turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

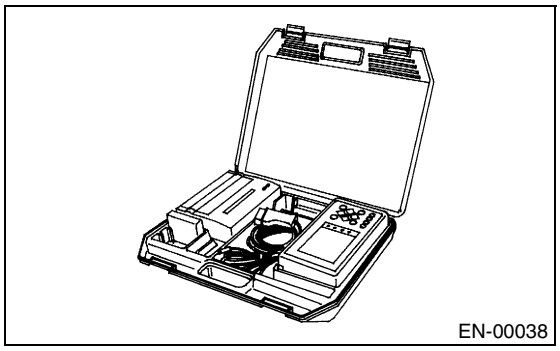
3. OBD-II GENERAL SCAN TOOL

For clear memory procedures using the OBD-II general scan tool, refer to the OBD-II General Scan Tool Instruction Manual.

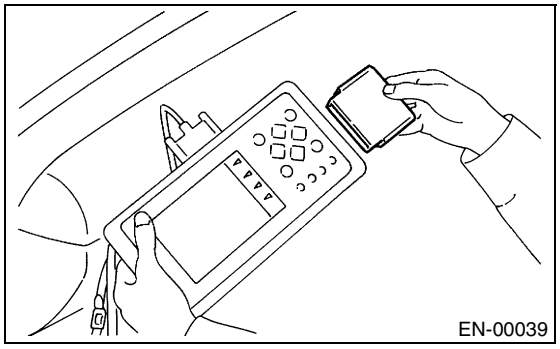
15.Compulsory Valve Operation Check Mode

A: OPERATION

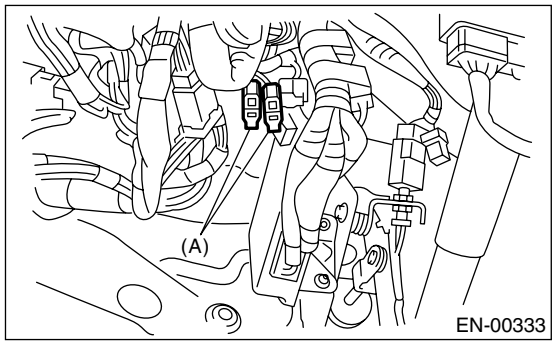
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(TURBO)-8, PREPARATION TOOL, General Description.>



2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(TURBO)-8, PREPARATION TOOL, General Description.>

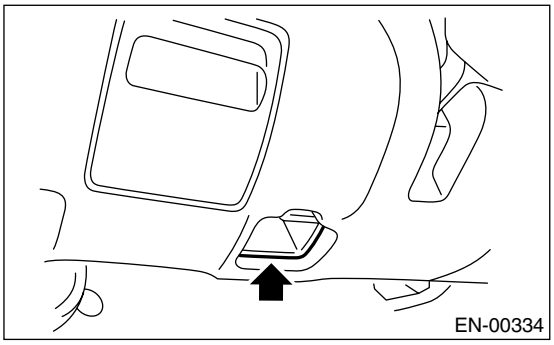


4) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).



5) Connect the Subaru Select Monitor to data link connector.

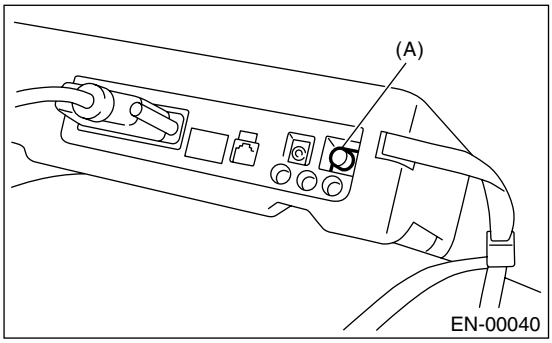
(1) Connect the Subaru Select Monitor to data link connector located in the lower portion of instrument panel (on the driver's side).



(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect scan tools except for the Subaru Select Monitor and OBD-II general scan tool.

6) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

7) On the «Main Menu» display screen, select the {2. Each System Check} and press [YES] key.
8) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
9) Press the [YES] key after displayed the information of engine type.
10) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode} and press [YES] key.
11) On the «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation} and press [YES] key.
12) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and press [YES] key.
13) Pressing the [NO] key completes the compulsory operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

- A list of the support data is shown in the following table.

Contents	Display
Compulsory fuel pump relay operation check	Fuel Pump Relay
Compulsory radiator fan relay operation check	Radiator Fan Relay
Compulsory air conditioning relay operation check	A/C Compressor Relay
Compulsory purge control solenoid valve operation check	CPC Solenoid Valve

NOTE:
- The following parts will be displayed but not functional because they are not installed on the vehicle.

Display
EGR Solenoid Valve
ASV Solenoid Valve
PCV Solenoid Valve
Vent Control Solenoid Valve
FICD Solenoid
Pressure Switching Sol. 1
Pressure Switching Sol. 2
AAI Solenoid Valve
Fuel Tank Sensor Control Valve

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

16.Engine Malfunction Indicator Lamp (MIL)

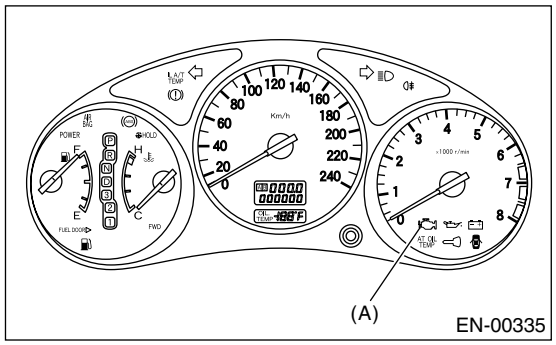
A: PROCEDURE

1. Activation of check engine malfunction indicator lamp (MIL). <Ref. to EN(TURBO)-53, ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL), Engine Malfunction Indicator Lamp (MIL).>
↓
2. Check that the engine malfunction indicator lamp (MIL) does not come on. <Ref. to EN(TURBO)-54, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>
↓
3. Check that the engine malfunction indicator lamp (MIL) does not go off. <Ref. to EN(TURBO)-56, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF., Engine Malfunction Indicator Lamp (MIL).>
↓
4. Check that the engine malfunction indicator lamp (MIL) does not blink at a cycle of 3 Hz. <Ref. to EN(TURBO)-57, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT BLINK AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MIL).>
↓
5. Check that the engine malfunction indicator lamp (MIL) remains blinking at a cycle of 3 Hz. <Ref. to EN(TURBO)-59, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) REMAINS BLINKING AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MIL).>

B: ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL)

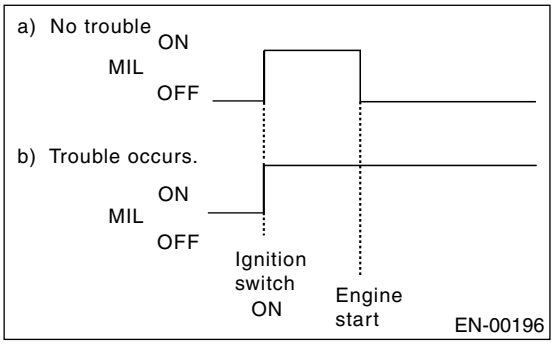
1) When the ignition switch is turned to ON (engine off), the CHECK ENGINE malfunction indicator lamp (MIL) in the combination meter illuminates.

NOTE:
If the MIL does not illuminate, perform diagnostics of the CHECK ENGINE light circuit or the combination meter circuit. <Ref. to EN(TURBO)-54, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>

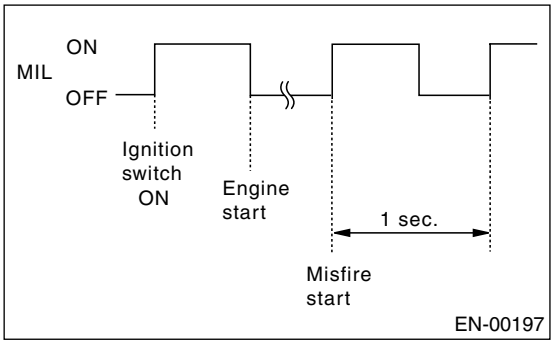


(A) CHECK ENGINE malfunction indicator lamp (MIL)

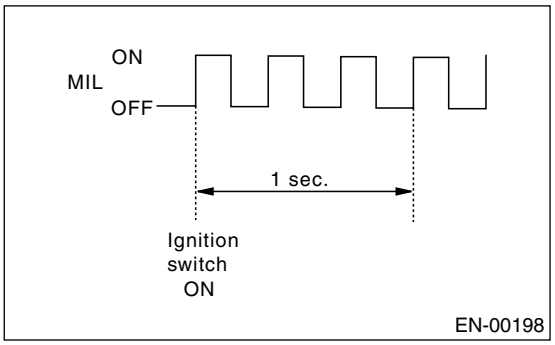
2) After starting the engine, the MIL goes out. If it does not, either the engine or the emission control system is malfunctioning.



3) If the diagnosis system senses a misfire which could damage the catalyzer, the MIL will blink at a cycle of 1 Hz.

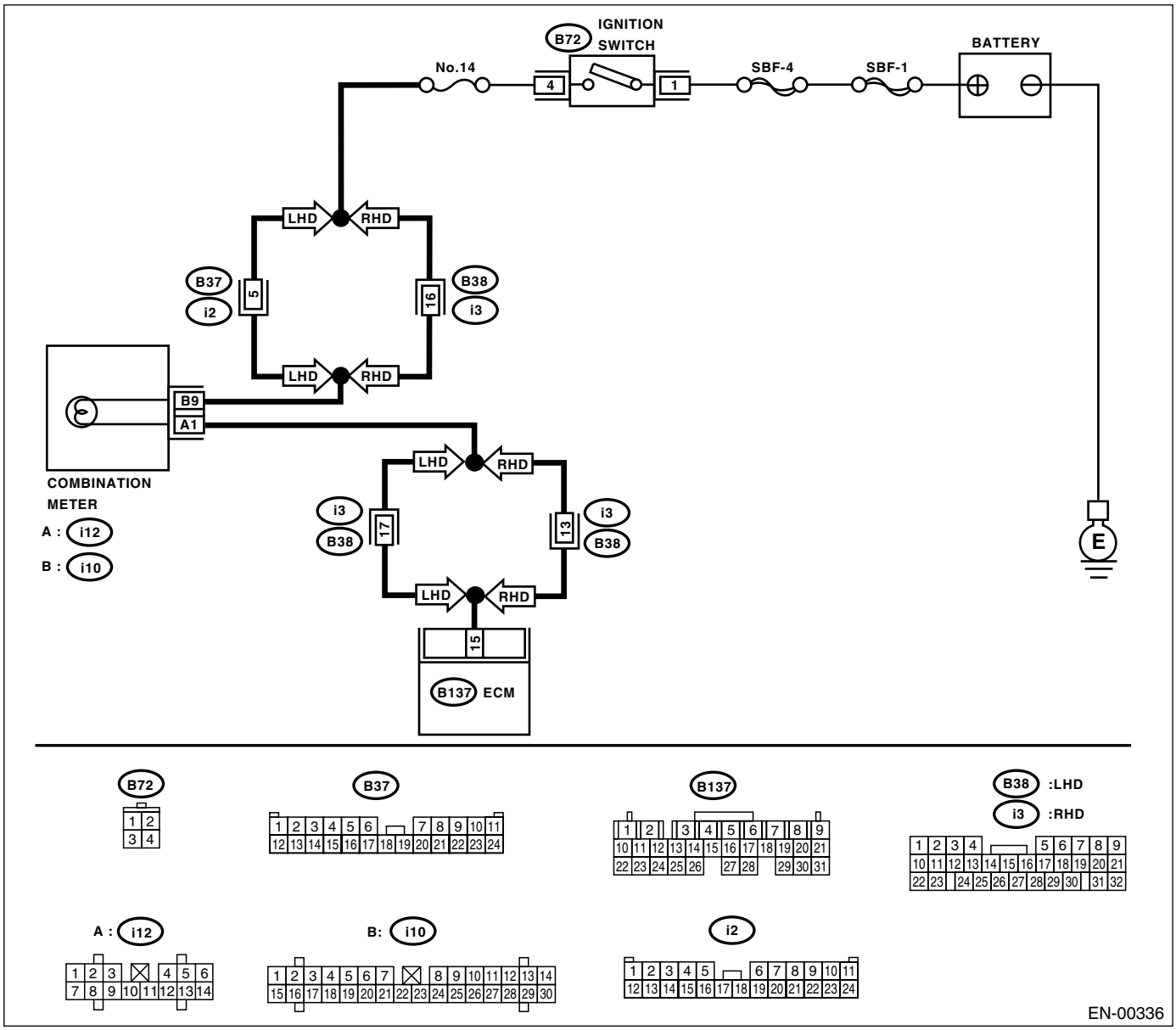


4) When the ignition switch is turned to ON (engine off) or to START with the test mode connector connected, the MIL blinks at a cycle of 3 Hz.



C: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON.

- **DIAGNOSIS:**
  - The CHECK ENGINE malfunction indicator lamp (MIL) circuit is open or shorted.
- **TROUBLE SYMPTOM:**
  - When the ignition switch is turned to ON (engine OFF), MIL does not come on.
- **WIRING DIAGRAM:**

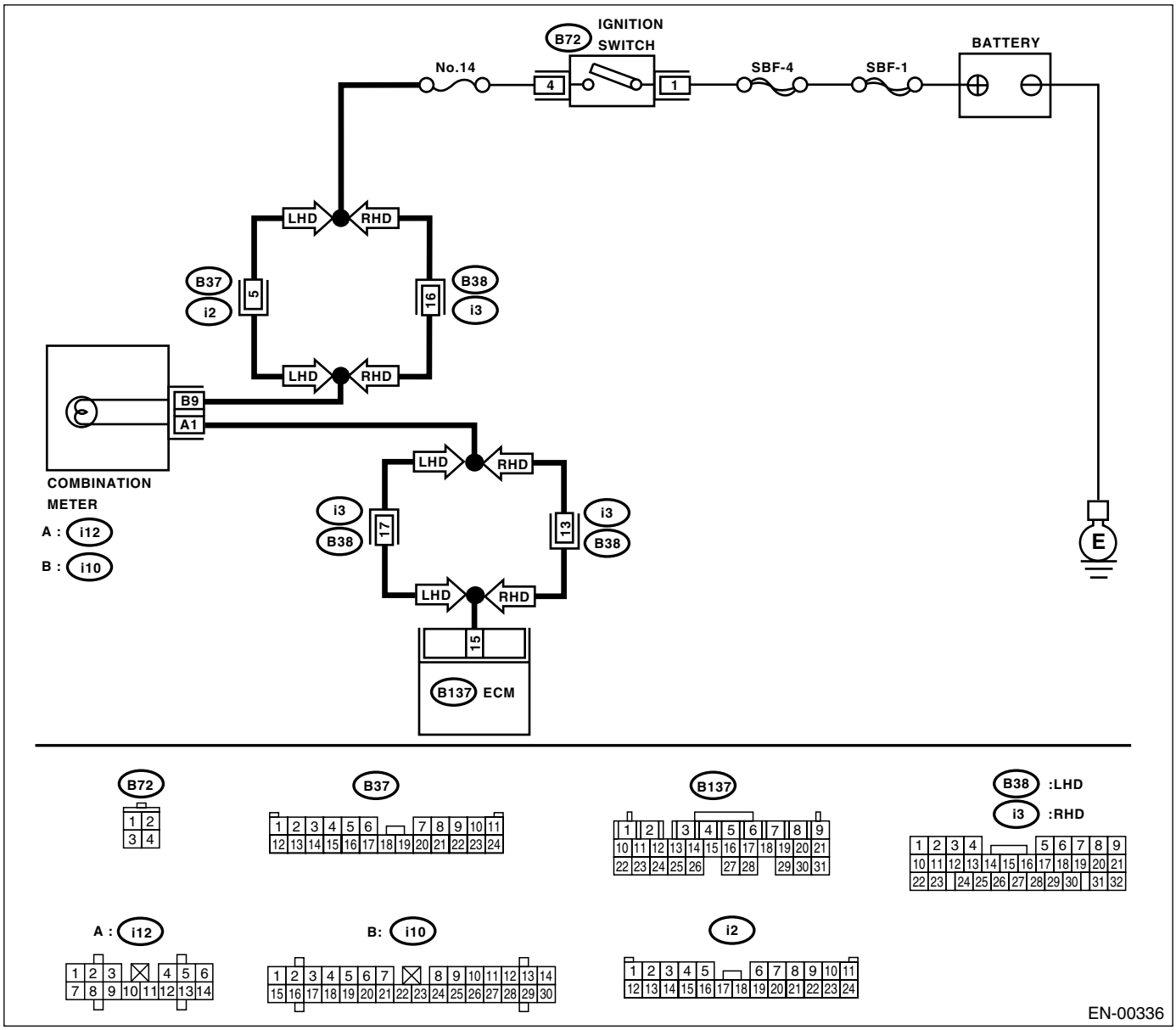


Step		Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 15 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **4.**	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK POOR CONTACT.** Does the MIL come on when shaking or pulling ECM connector and harness?	MIL illuminates.	Repair the poor contact in ECM connector.	Go to step **3.**
3	**CHECK ECM CONNECTOR.** Is the ECM connector correctly connected?	Connectors is correctly connected.	Replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>	Repair the connection of ECM connector.
4	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Remove the combination meter. <Ref. to IDI-12, Combination Meter Assembly.> 3)Disconnect the connector from ECM and combination meter. 4)Measure the resistance of harness between ECM and combination meter connector. ***Connector & terminal*** ***(B137) No. 15 — (i12) No. 1:*** Is the measured value less than specified value?	1 Ω	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connector
5	**CHECK POOR CONTACT.** Check poor contact in combination meter connector. Is there poor contact in combination meter connector?	Poor contact occurs.	Repair the poor contact in combination meter connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 9 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Replace the combination meter circuit board. <Ref. to IDI-12, Combination Meter Assembly.>	Check the following and repair if necessary. NOTE: • Blown out fuse (No. 14) • Open or short circuit in harness between fuse (No. 14) and battery terminal • Poor contact in ignition switch connector

D: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF.

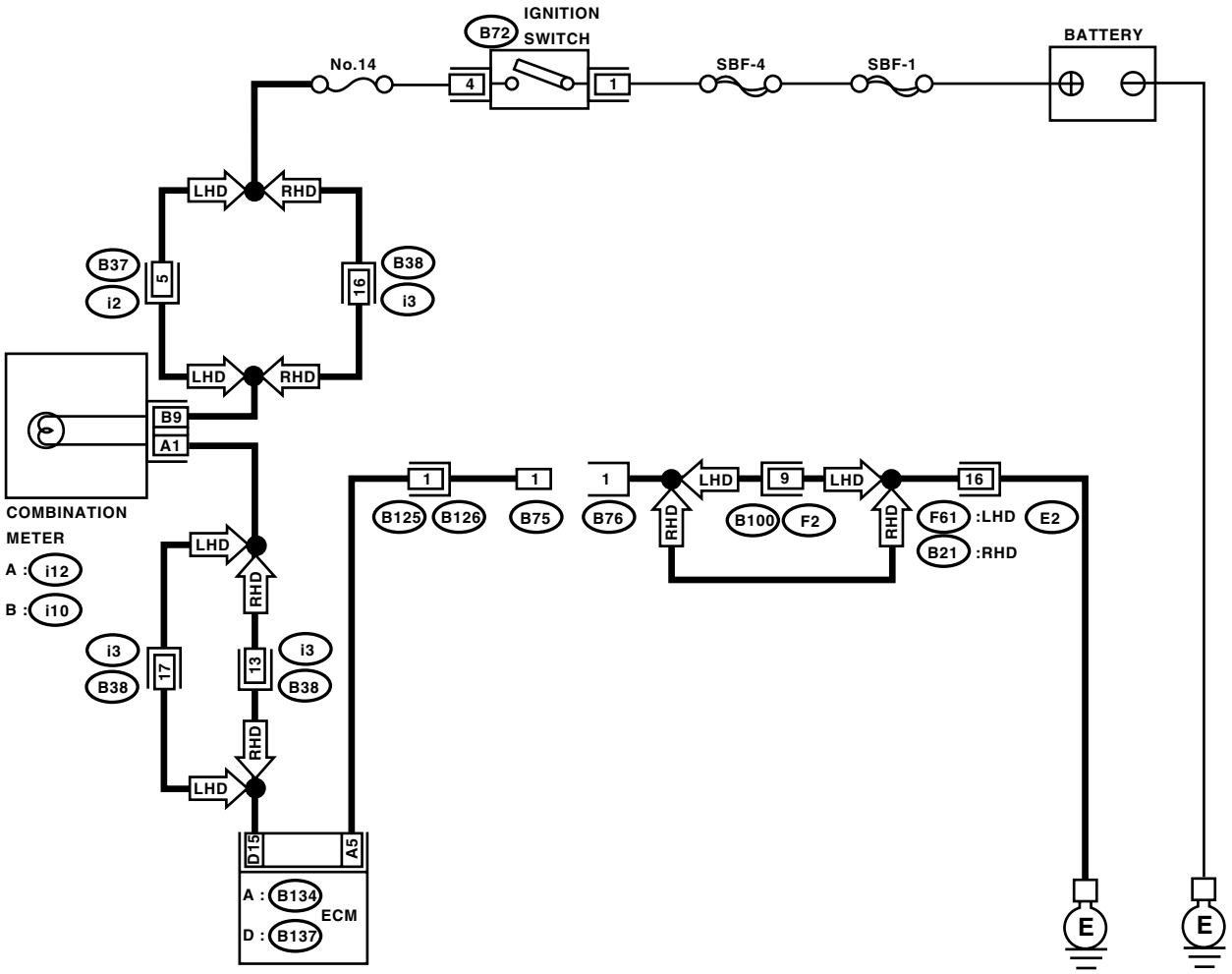
- **DIAGNOSIS:**
  - The CHECK ENGINE malfunction indicator lamp (MIL) circuit is shorted.
- **TROUBLE SYMPTOM:**
  - Although MIL comes on when engine runs, but trouble code is not shown on Subaru Select Monitor or OBD-II general scan tool display.
- **WIRING DIAGRAM:**

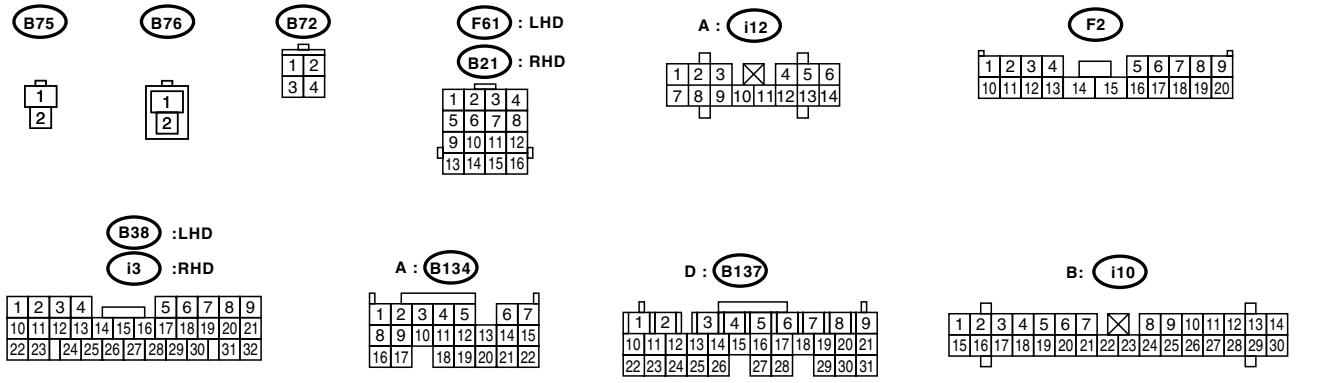


Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Turn the ignition switch to ON. Does the MIL come on?	MIL illuminates.	Repair the short circuit in harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>

E: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT BLINK AT A CYCLE OF 3 HZ.

- **DIAGNOSIS:**
  - The CHECK ENGINE malfunction indicator lamp (MIL) circuit is open or shorted.
  - Test mode connector circuit is open.
- **TROUBLE SYMPTOM:**
  - During inspection mode, MIL does not blink at a cycle of 3 Hz.
- **WIRING DIAGRAM:**





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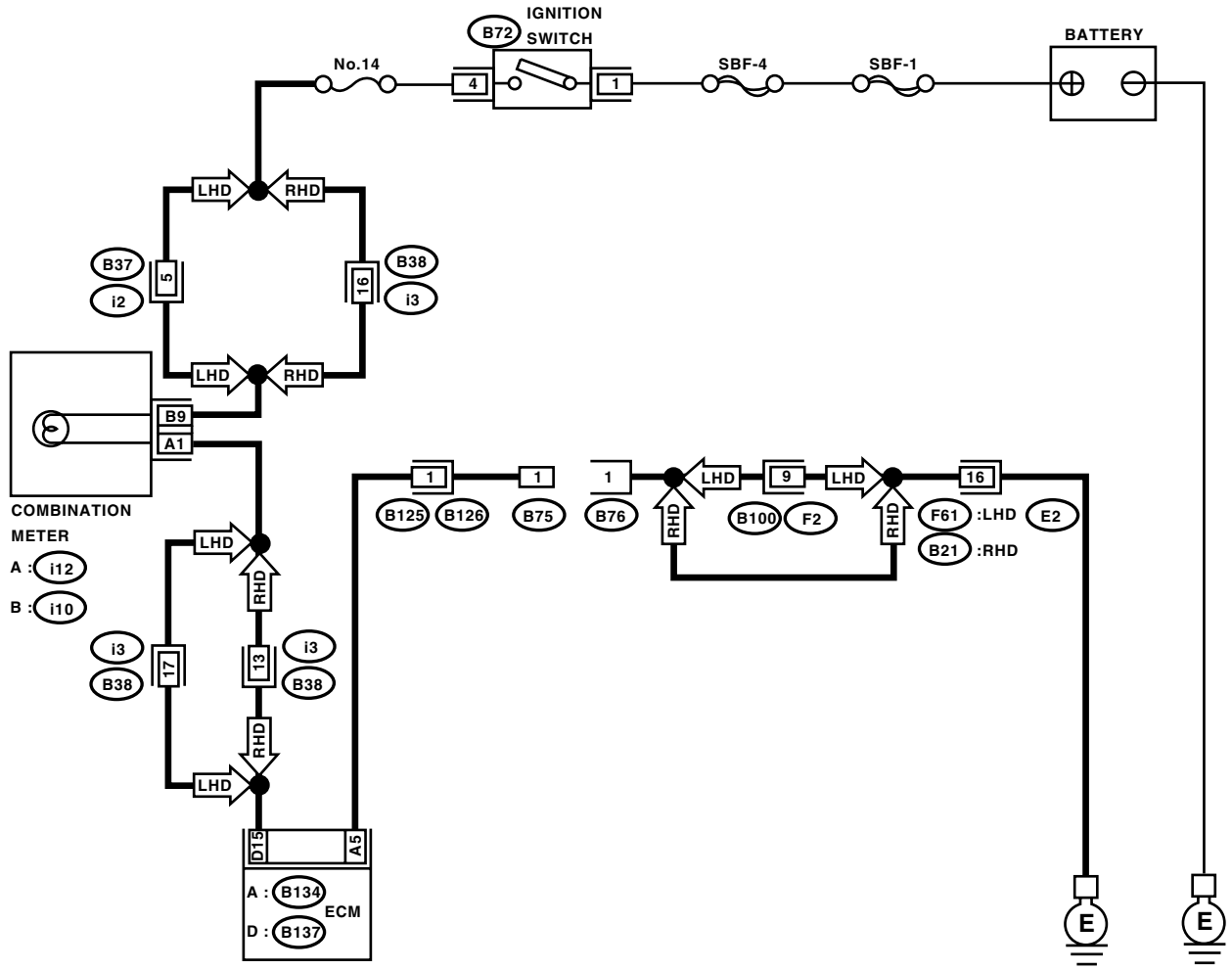
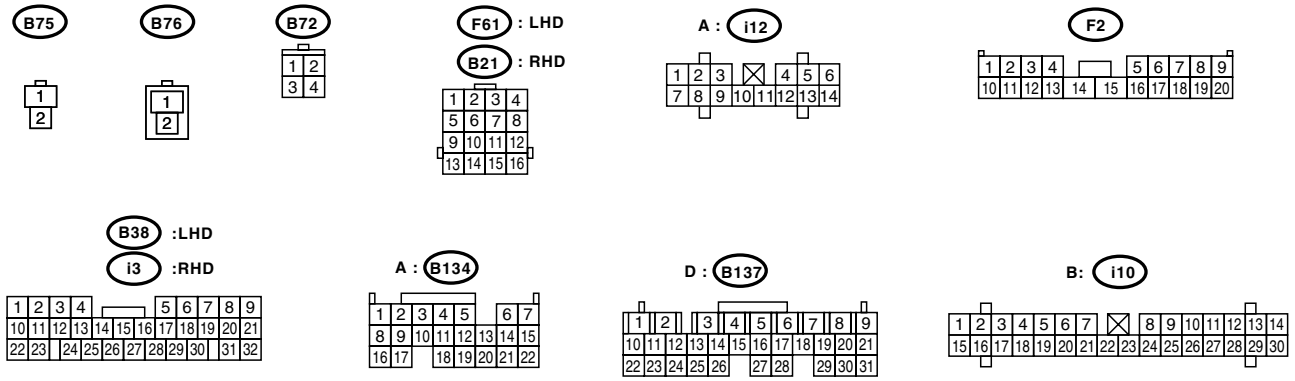
	Step	Check	Yes	No
1	**CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).** 1)Turn the ignition switch to OFF. 2)Disconnect the test mode connector. 3)Turn the ignition switch to ON. (engine OFF) Does the MIL come on?	MIL illuminates.	Go to step **2.**	Repair the MIL circuit. <Ref. to EN(TURBO)-54, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>
2	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Turn the ignition switch to ON. Does the MIL come on?	MIL illuminates.	Repair the ground short circuit in harness between combination meter and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between test mode connector and chassis ground. ***Connector & terminal*** ***(B76) No. 1 — Chassis ground:*** Is the measured value less than specified value?	1 Ω	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between test mode connector and chassis ground
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair the poor contact in ECM connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR.** 1)Connect the test mode connector. 2)Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 5 — Chassis ground:*** Is the measured value less than specified value?	1 Ω	Go to step **6.**	Repair the open circuit in harness between ECM and test mode connector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>

F: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) REMAINS BLINKING AT A CYCLE OF 3 HZ.

- **DIAGNOSIS:**
  - Test mode connector circuit is shorted.
- **TROUBLE SYMPTOM:**
  - MIL blinks at a cycle of 3 Hz when ignition switch is turned to ON.
- **WIRING DIAGRAM:**





EN-00337

	Step	Check	Yes	No
1	**CHECK TEST MODE CONNECTOR.** 1)Disconnect the test mode connector. 2)Turn the ignition switch to ON. Does the MIL flash on and off?	MIL illuminates.	Go to step **2.**	System is in good order. NOTE: MIL blinks at a cycle of 3 Hz when test mode connector is connected.
2	**CHECK HARNESS BETWEEN ECM CONNECTOR AND ENGINE GROUNDING TERMINAL.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 5 — Chassis ground:*** Is the measured value less than specified value?	5 Ω	Repair the short circuit in harness between ECM and test mode connector.	Replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>

17.Diagnostics for Engine Starting Failure

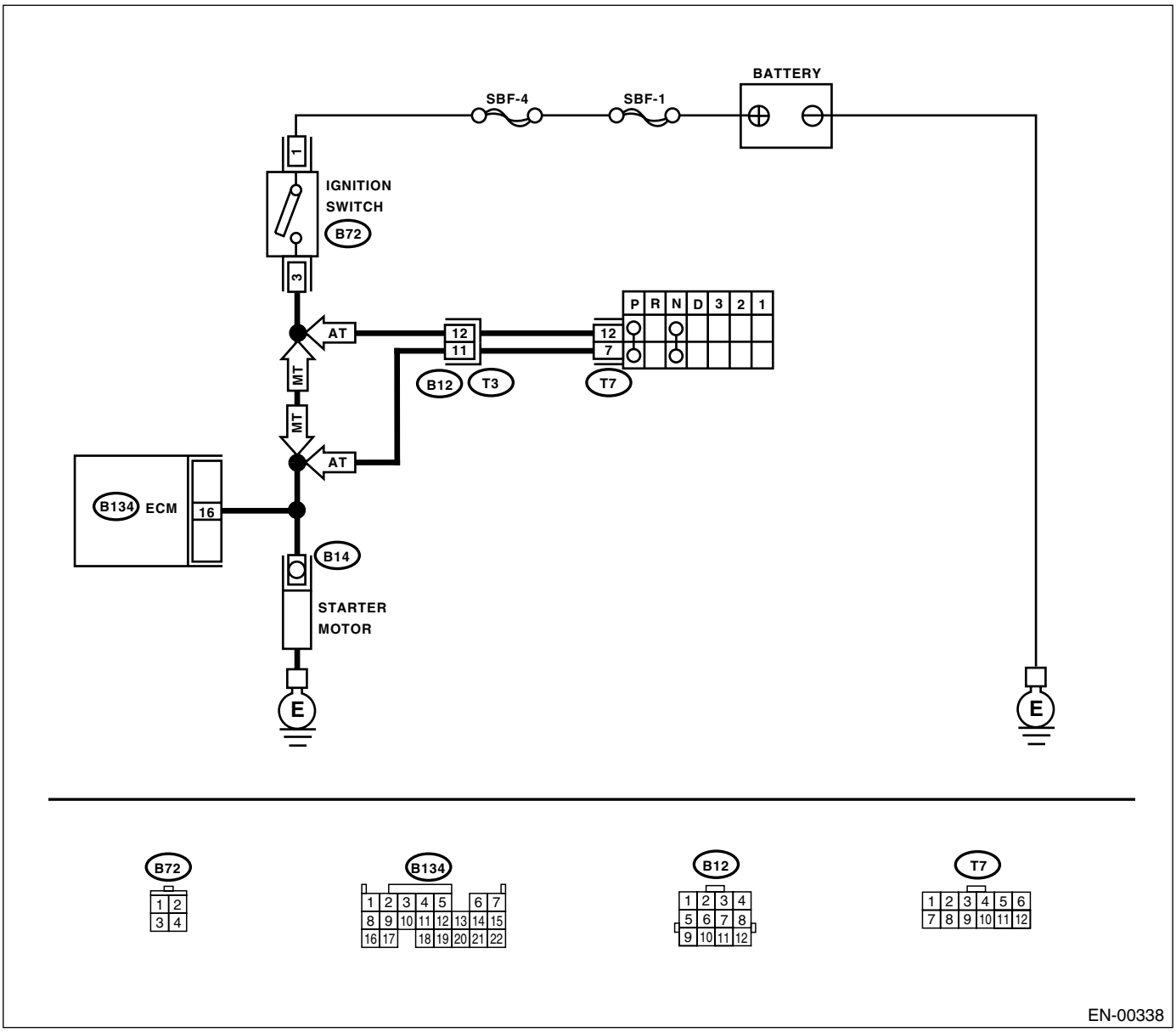
A: PROCEDURE

1. Inspection of starter motor circuit. <Ref. to EN(TURBO)-62, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
2. Inspection of ECM power supply and ground line. <Ref. to EN(TURBO)-64, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ignition control system. <Ref. to EN(TURBO)-68, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
4. Inspection of fuel pump circuit. <Ref. to EN(TURBO)-72, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel injector circuit. <Ref. to EN(TURBO)-74, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

B: STARTER MOTOR CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(TURBO)-49, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



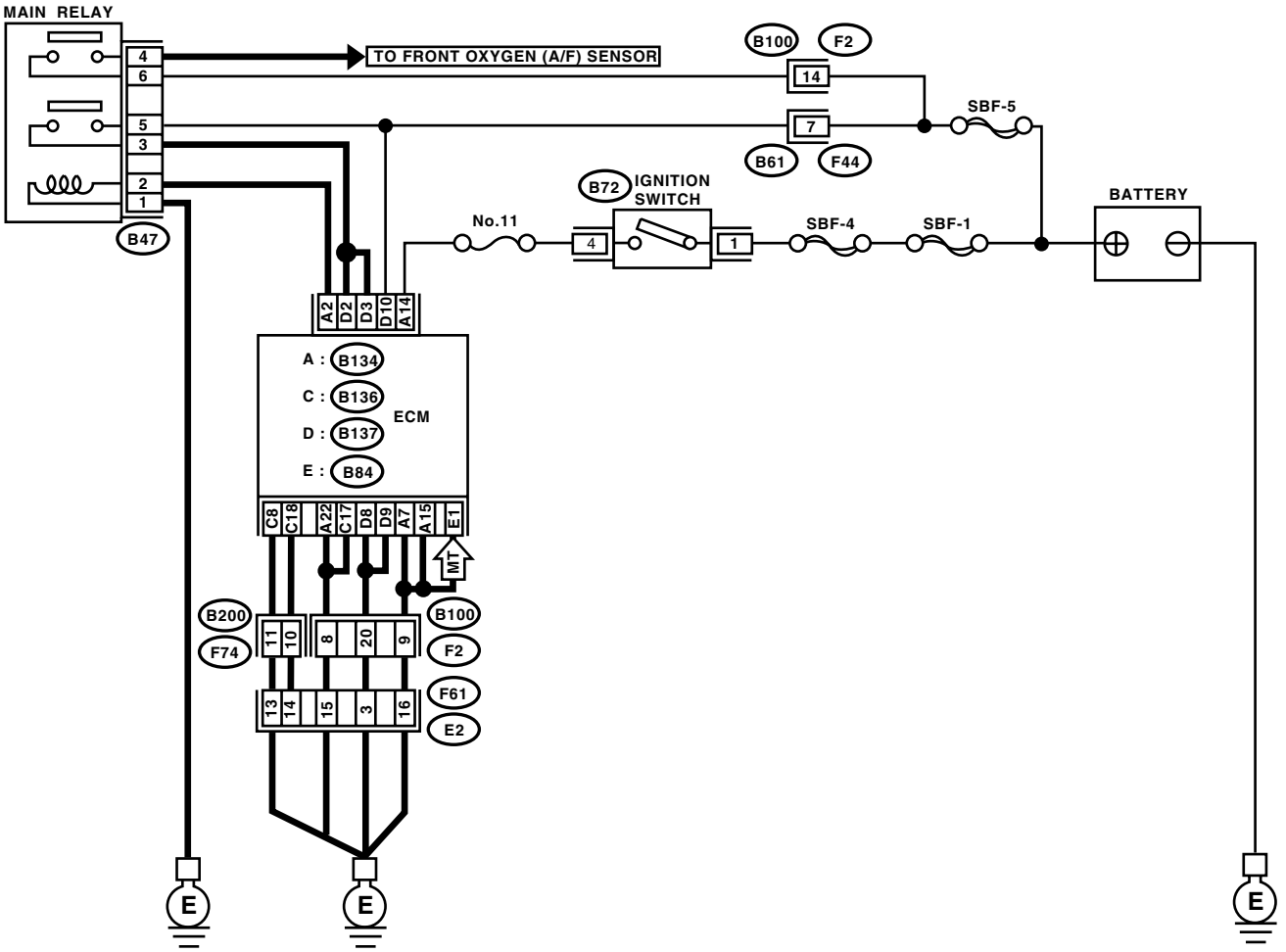
	Step	Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.** Does the starter motor operate when the switch starts?	Starter motor operates.	Go to step **2.**	Go to step **3.**
2	**CHECK DIAGNOSTIC TROUBLE CODE (DTC).** <Ref. to EN(TURBO)-41, OPERATION, Read Diagnostic Trouble Code.> Is the DTC displayed?	DTC is displayed.	Using the list of diagnostic trouble code (DTC), check the appropriate DTC. <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **3.**

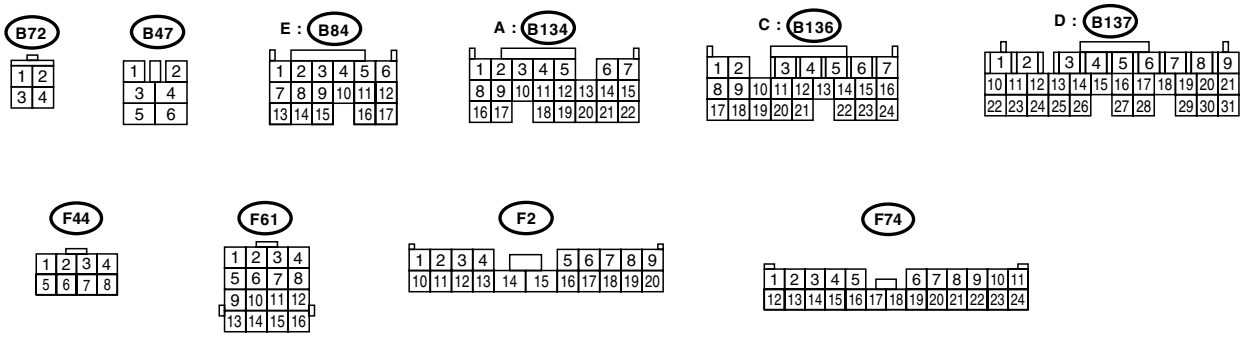
	Step	Check	Yes	No
3	**CHECK INPUT SIGNAL FOR STARTER MOTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from starter motor. 3)Turn the ignition switch to START. 4)Measure the power supply voltage between starter motor connector terminal and engine ground. ***Connector & terminal*** ***(B14) No. 1 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Go to step **4.**	Go to step **5.**
4	**CHECK GROUND CIRCUIT OF STARTER MOTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of ground cable between ground cable terminal and engine ground. Is the measured value less than specified value?	5 Ω	Check the starter motor. <Ref. to SC(SOHC)-6, Starter.>	Repair the open circuit of ground cable.
5	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1)Ignition the switch to OFF. 2)Disconnect the connector from ignition switch. 3)Measure the power supply voltage between ignition switch connector and chassis ground. ***Connector & terminal*** ***(B72) No. 1 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **6.**	Check the following, repair if necessary. • Fuse is blown out. • Open circuit in harness between ignition switch and battery.
6	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1)Connect the connector to ignition switch. 2)Turn the ignition switch to START. 3)Measure the voltage between ignition switch and chassis ground. ***Connector & terminal*** ***(B72) No. 3 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Repair the open circuit between ignition switch and starter motor circuit.	Go to step **7.**
7	**CHECK POOR CONTACT.** Check poor contact in ignition switch connector. Is there poor contact in ignition switch connector?	Poor contact occurs.	Repair the poor contact in ignition switch connector.	Replace the ignition switch.

C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(TURBO)-49, Clear Memory Mode.> and INSPECTION MODE. <Ref. to EN(TURBO)-42, Inspection Mode.>

- **WIRING DIAGRAM:**
- **LHD model**





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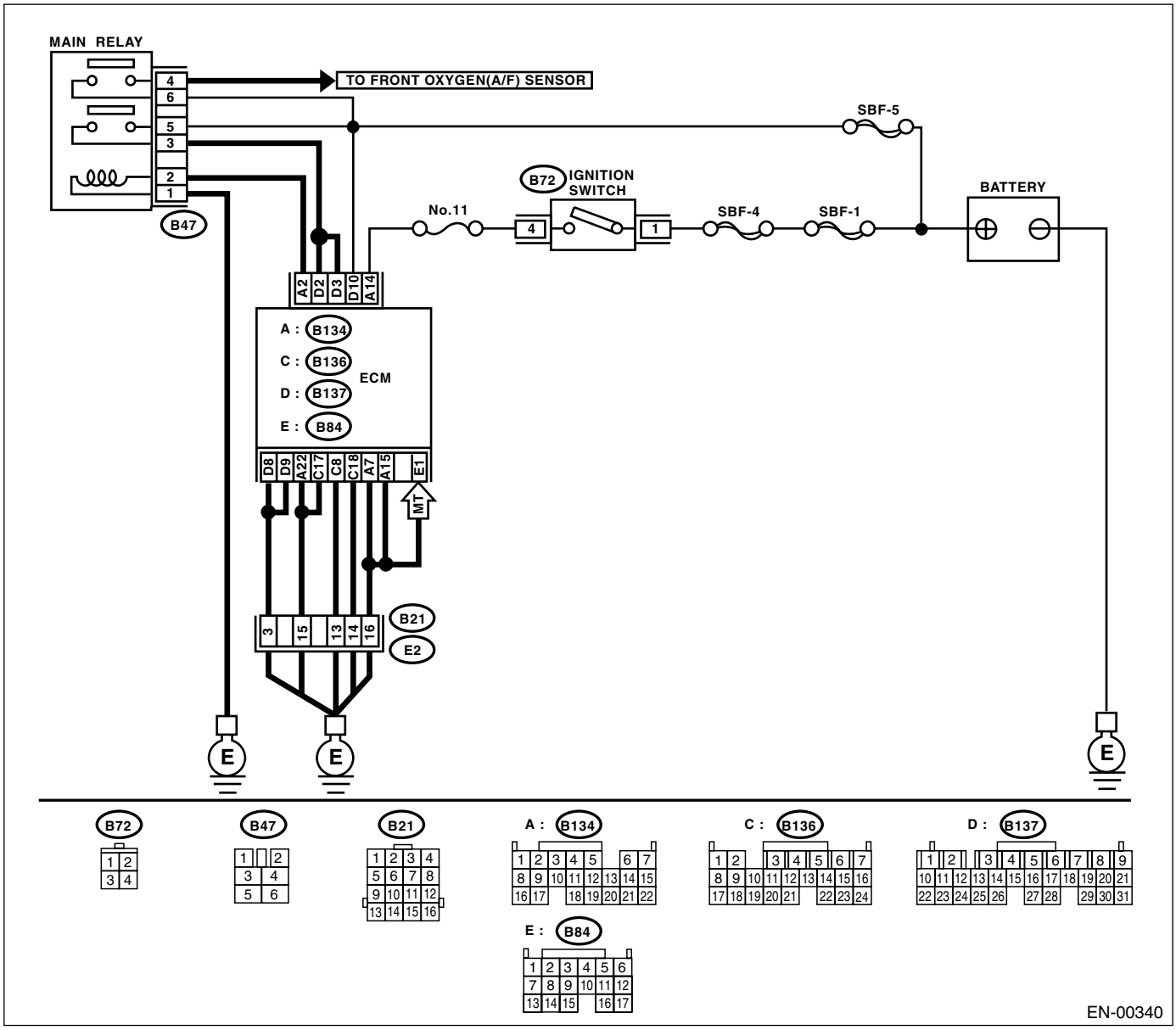
- **RHD model**



Step		Check	Yes	No
1	**CHECK MAIN RELAY.** 1)Turn the ignition switch to OFF. 2)Remove the main relay. 3)Connect the battery to main relay terminals No. 1 and No. 2. 4)Measure the resistance between main relay terminals. ***Terminals*** ***No. 3 — No. 5:*** ***No. 4 — No. 6:*** Is the measured value less than specified value?	10 Ω	Go to step **2.**	Replace the main relay.

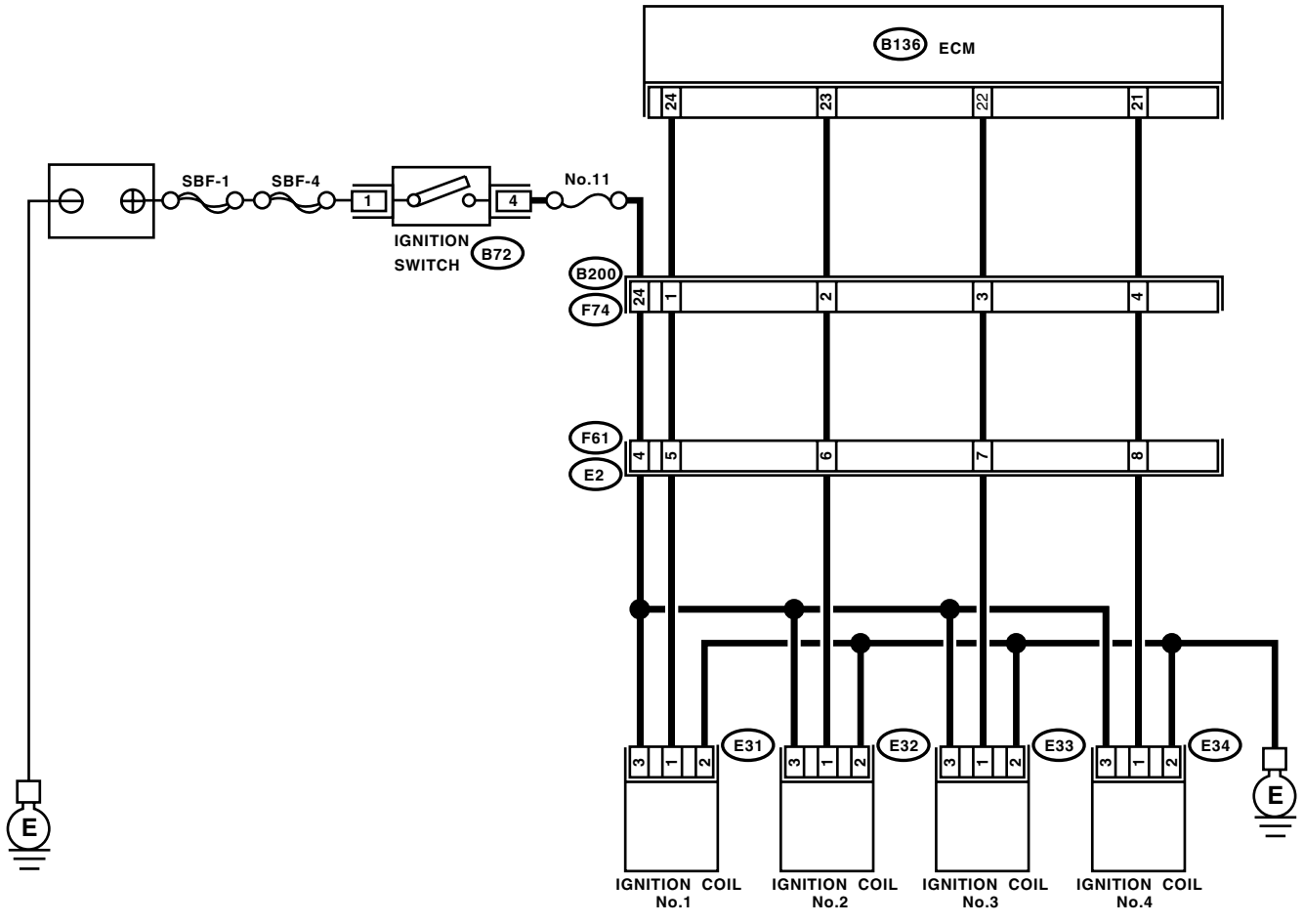
	Step	Check	Yes	No
2	**CHECK GROUND CIRCUIT OF ECM.** 1)Disconnect the connector from ECM. 2)Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 7 — Chassis ground:*** ***(B134) No. 15 — Chassis ground:*** ***(B134) No. 22 — Chassis ground:*** ***(B136) No. 8 — Chassis ground:*** ***(B136) No. 17 — Chassis ground:*** ***(B136) No. 18 — Chassis ground:*** ***(B137) No. 8 — Chassis ground:*** ***(B137) No. 9 — Chassis ground:*** ***(B84) No. 1 — Chassis ground:*** Is the measured value less than specified value?	5 Ω	Go to step **3.**	Repair the open circuit in harness between ECM connector and engine grounding terminal.
3	**CHECK INPUT VOLTAGE OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 10 (+) — Chassis ground (–):*** ***(B134) No. 14 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **4.**	Repair the open or ground short circuit of power supply circuit.
4	**CHECK HARNESS BETWEEN ECM AND MAIN RELAY CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 2 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **5.**	Repair the ground short circuit in harness between ECM connector and main relay connector, then replace ECM.
5	**CHECK OUTPUT VOLTAGE FROM ECM.** 1)Connect the connector to ECM. 2)Turn the ignition switch to ON. 3)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 2 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **6.**	Replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>
6	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Check the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 2 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **7.**	Repair the open circuit in harness between ECM connector and main relay connector.
7	**CHECK GROUND CIRCUIT OF MAIN RELAY.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 1 — Chassis ground:*** Is the measured value less than specified value?	5 Ω	Go to step **8.**	Repair the open circuit between main relay and chassis ground.

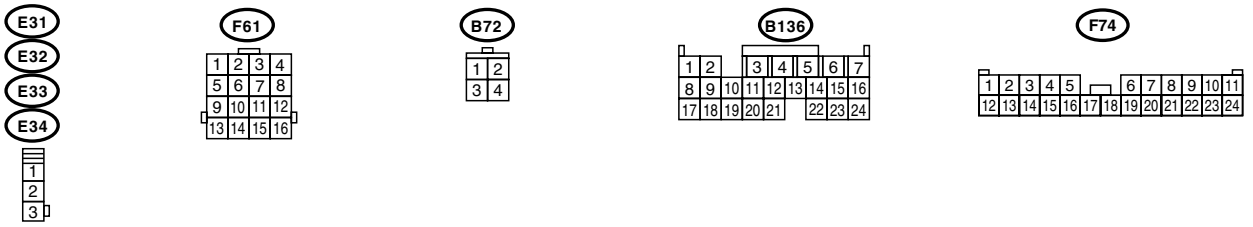
	Step	Check	Yes	No
8	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Measure the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 5 (+) — Chassis ground (–):*** ***(B47) No. 6 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **9.**	Repair the open or ground short circuit in harness of power supply circuit.
9	**CHECK INPUT VOLTAGE OF ECM.** 1)Connect the main relay connector. 2)Turn the ignition switch to ON. 3)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 2 (+) — Chassis ground (–):*** ***(B137) No. 3 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Check the ignition control system. <Ref. to EN(TURBO)-68, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair the open or ground short circuit in harness between ECM connector and main relay connector.

D: IGNITION CONTROL SYSTEM

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(TURBO)-49, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**
- **LHD model**





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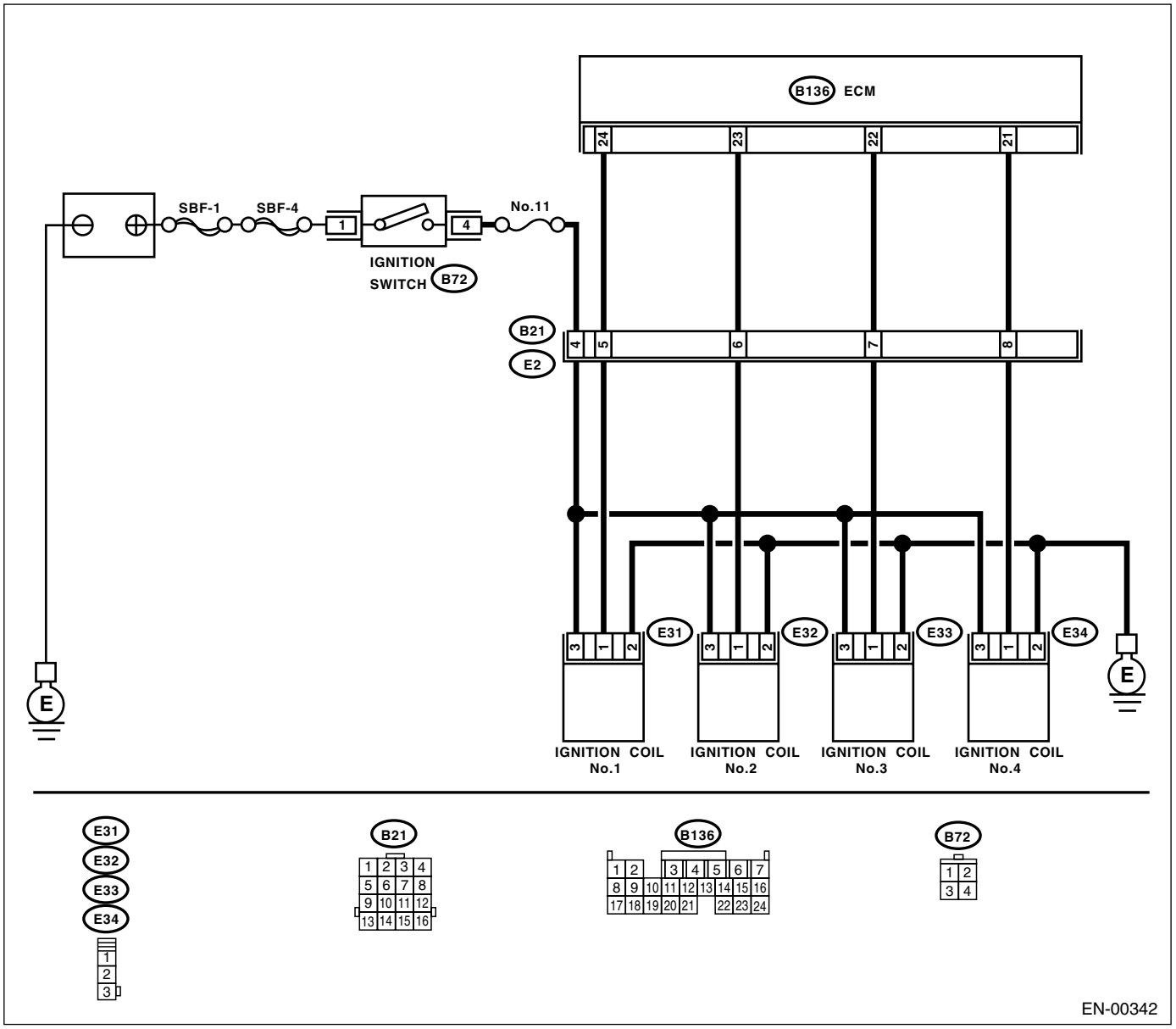
- **RHD model**



Step		Check	Yes	No
1	**CHECK SPARK PLUG CONDITION.** 1)Remove the spark plug. <Ref. to IG(TURBO)-6, INSTALLATION, Spark Plug.> 2)Check the spark plug condition. <Ref. to IG(TURBO)-6, INSPECTION, Spark Plug.> Is the spark plug's status OK?	Spark plug is OK.	Go to step **2.**	Replace the spark plug.
2	**CHECK IGNITION SYSTEM FOR SPARKS.** 1)Connect the spark plug to ignition coil. 2)Release the fuel pressure. <Ref. to FU(TURBO)-52, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.> 3)Contact the spark plug's thread portion on engine. 4)While opening the throttle valve fully, crank engine to check that spark occurs at each cylinder. Does spark occur at each cylinder?	Spark occurs.	Check the fuel pump system. <Ref. to EN(TURBO)-72, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **3.**

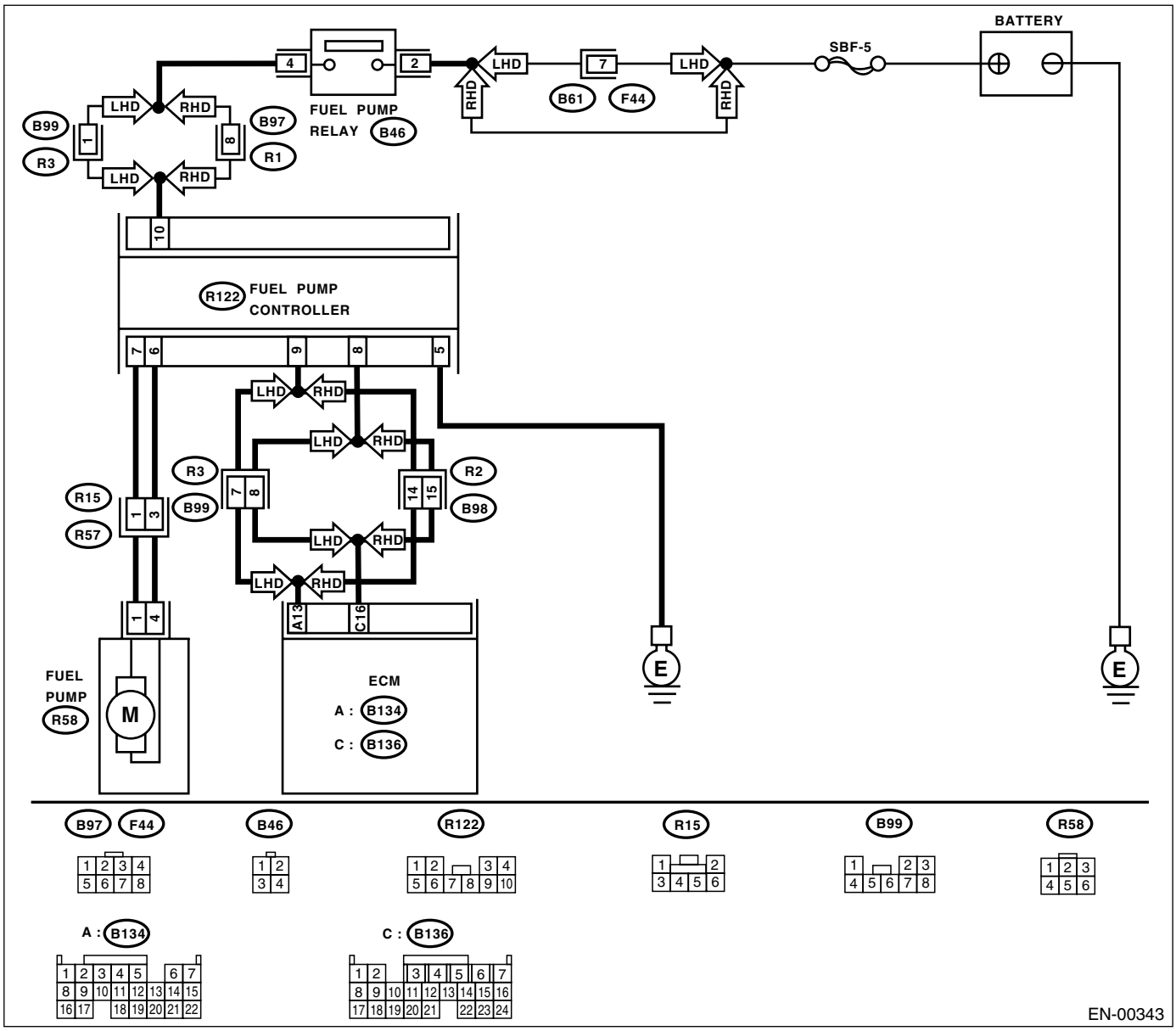
	Step	Check	Yes	No
3	**CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL & IGNITOR ASSEMBLY.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ignition coil & ignitor assembly. 3)Turn the ignition switch to ON. 4)Measure the power supply voltage between ignition coil & ignitor assembly connector and engine ground. ***Connector & terminal*** ***(E31) No. 3 (+) — Engine ground (–):*** ***(E32) No. 3 (+) — Engine ground (–):*** ***(E33) No. 3 (+) — Engine ground (–):*** ***(E34) No. 3 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ignition coil & ignitor assembly, and ignition switch connector • Poor contact in coupling connectors
4	**CHECK HARNESS OF IGNITION COIL & IGNITOR ASSEMBLY GROUND CIRCUIT.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ignition coil & ignitor assembly connector and engine ground. ***Connector & terminal*** ***(E31) No. 2 — Engine ground:*** ***(E32) No. 2 — Engine ground:*** ***(E33) No. 2 — Engine ground:*** ***(E34) No. 2 — Engine ground:*** Is the measured value less than specified value?	5 Ω	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ignition coil & ignitor assembly connector and engine grounding terminal
5	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Disconnect the connector from ignition coil & ignitor assembly. 4)Measure the resistance of harness between ECM and ignition coil & ignitor assembly connector. ***Connector & terminal*** ***(B136) No. 21 — (E34) No. 1:*** ***(B136) No. 22 — (E33) No. 1:*** ***(B136) No. 23 — (E32) No. 1:*** ***(B136) No. 24 — (E31) No. 1:*** Is the measured value less than specified value?	1 Ω	Go to step **6.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and ignition coil & ignitor assembly connector • Poor contact in coupling connector
6	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.** Measure the resistance of harness between ECM and engine ground. ***Connector & terminal:*** ***(B136) No. 21 — Engine ground:*** ***(B136) No. 22 — Engine ground:*** ***(B136) No. 23 — Engine ground:*** ***(B136) No. 24 — Engine ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **7.**	Repair the ground short circuit in harness between ECM and ignition coil & ignitor assembly connector.

	Step	Check	Yes	No
7	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair the poor contact in ECM connector.	Replace the ignition coil and ignitor assembly.

E: FUEL PUMP CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(TURBO)-49, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(TURBO)-42, Inspection Mode.> .

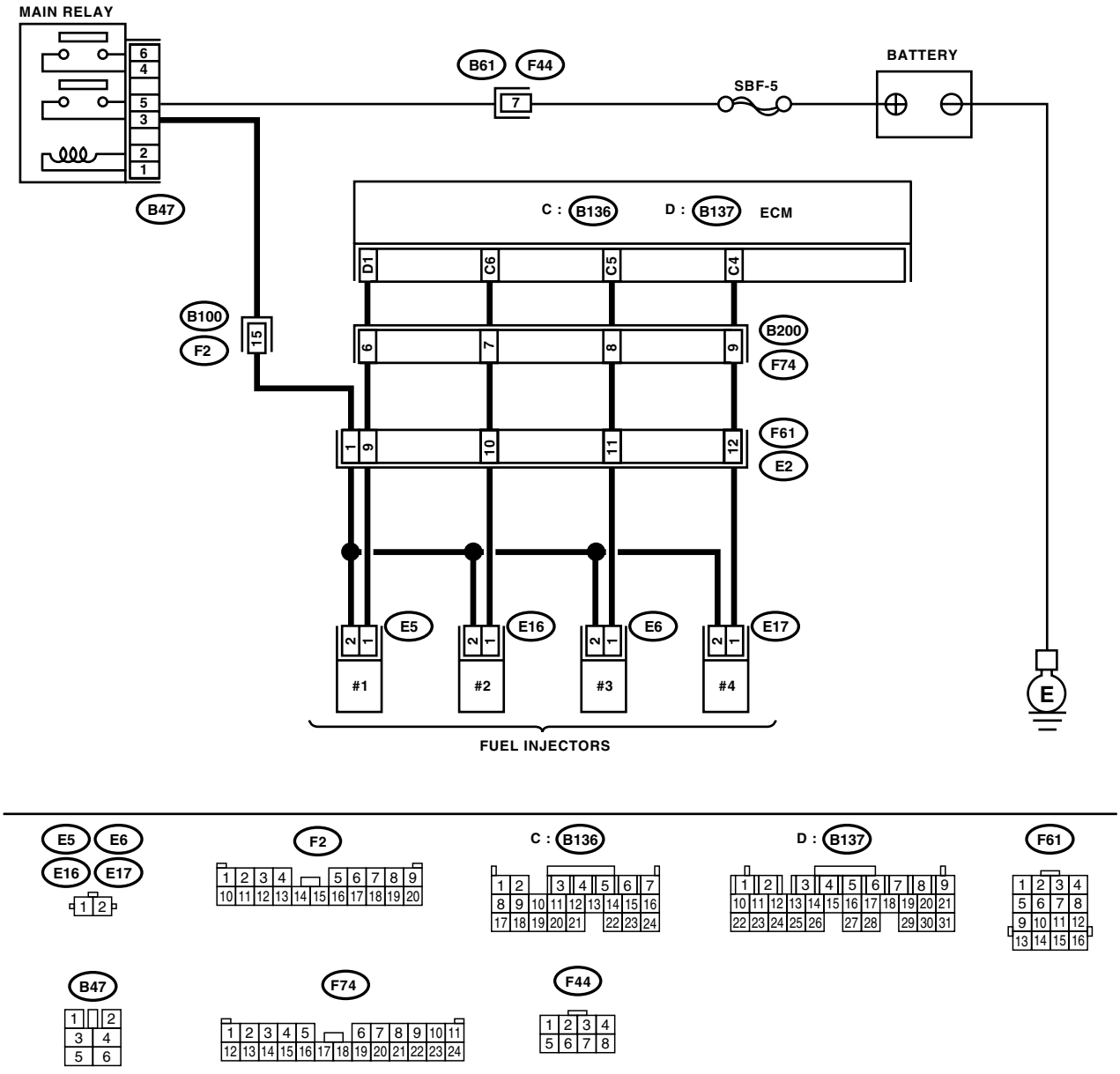
- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OPERATING SOUND OF FUEL PUMP.** Make sure that the fuel pump is in operation for 2 seconds when turning ignition switch to ON. NOTE: Fuel pump operation check can also be executed using the Subaru Select Monitor. For the procedure, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(TURBO)-50, Compulsory Valve Operation Check Mode.> Does the fuel pump produce “operating” sound?	“Operating” sound occurs.	Check the fuel injector circuit. <Ref. to EN(TURBO)-74, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Display the DTC. <Ref. to EN(TURBO)-41, OPERATION, Read Diagnostic Trouble Code.>

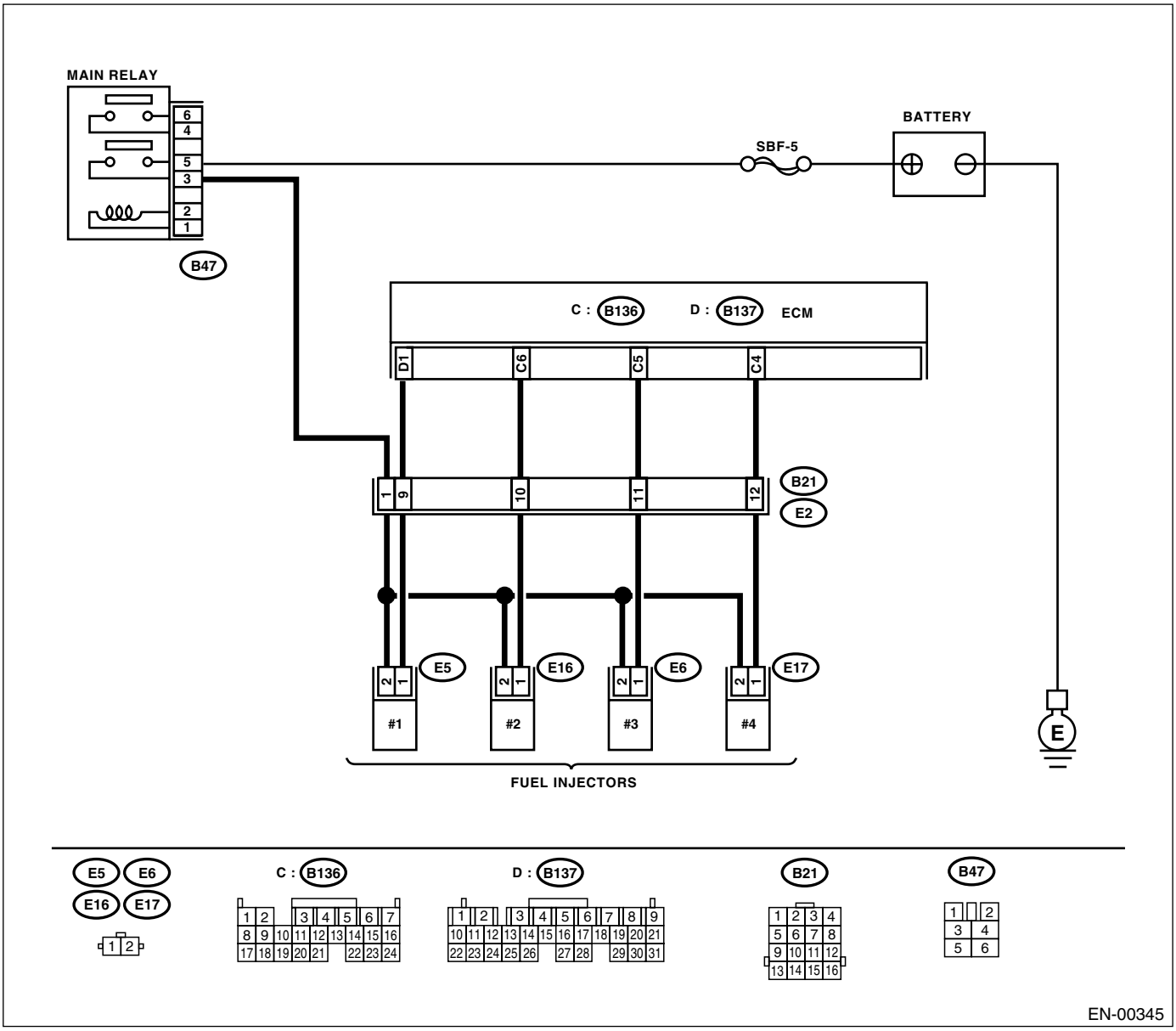
F: FUEL INJECTOR CIRCUIT

CAUTION:
- **Check or repair only faulty parts.**
- **After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(TURBO)-49, Clear Memory Mode.> and INSPECTION MODE. <Ref. to EN(TURBO)-42, Inspection Mode.>**
- **WIRING DIAGRAM:**
- **LHD model**



EN-00344

- **RHD model**



	Step	Check	Yes	No
1	**CHECK OPERATION OF EACH FUEL INJECTOR.** While cranking the engine, check that each fuel injector emits “operating” sound. Use a sound scope or attach a screwdriver to injector for this check. Does the fuel injector emit “operating” sound?	“Operating” sound occurs.	Check the fuel pressure. <Ref. to ME(TURBO)-28, INSPECTION, Fuel Pressure.>	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK POWER SUPPLY TO EACH FUEL INJECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from fuel injector. 3)Turn the ignition switch to ON. 4)Measure the power supply voltage between the fuel injector terminal and engine ground. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector • Poor contact in fuel injector connector
3	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** 1)Disconnect the connector from ECM. 2)Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B137) No. 1 — (E5) No. 1:*** ***(B136) No. 6 — (E16) No. 1:*** ***(B136) No. 5 — (E6) No. 1:*** ***(B136) No. 4 — (E6) No. 1:*** Is the measured value less than specified value?	1 Ω	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B137) No. 1 — Chassis ground:*** ***(B136) No. 6 — Chassis ground:*** ***(B136) No. 5 — Chassis ground:*** ***(B136) No. 4 — Chassis ground:*** Is the measured value less than specified value?	1 Ω	Repair the ground short circuit in harness between ECM and fuel injector connector.	Go to step **5.**
5	**CHECK EACH FUEL INJECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between each fuel injector terminals. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within specified value?	5 — 20 Ω	Go to step **6.**	Replace the faulty fuel injector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair the poor contact in ECM connector.	Inspection using “General Diagnostic Table”. <Ref. to EN(TURBO)-308, INSPECTION, General Diagnostic Table.>

18.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC No.	Item	Index
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to EN(TURBO)-84, DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to EN(TURBO)-86, DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to EN(TURBO)-89, DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to EN(TURBO)-91, DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to EN(TURBO)-94, DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0068	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance	<Ref. to EN(TURBO)-96, DTC P0068 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to EN(TURBO)-99, DTC P0101 — MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to EN(TURBO)-101, DTC P0102 — MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to EN(TURBO)-104, DTC P0103 — MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to EN(TURBO)-106, DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to EN(TURBO)-109, DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake Air Temperature Circuit Low Input	<Ref. to EN(TURBO)-112, DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake Air Temperature Circuit High Input	<Ref. to EN(TURBO)-114, DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to EN(TURBO)-117, DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine Coolant Temperature Circuit High Input	<Ref. to EN(TURBO)-119, DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0121	Throttle/Pedal Position Sensor/ Switch “A” Circuit Range/Performance	<Ref. to EN(TURBO)-122, DTC P0121 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0122	Throttle/Pedal Position Sensor/ Switch “A” Circuit Low Input	<Ref. to EN(TURBO)-124, DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P0123	Throttle/Pedal Position Sensor/ Switch “A” Circuit High Input	<Ref. to EN(TURBO)-128, DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to EN(TURBO)-131, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0129	Atmospheric Pressure Sensor Circuit Range/Performance	<Ref. to EN(TURBO)-132, DTC P0129 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0130	O_2 Sensor Circuit (Bank 1 Sensor 1)	<Ref. to EN(TURBO)-133, DTC P0130 — O_2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to EN(TURBO)-135, DTC P0133 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to EN(TURBO)-136, DTC P0134 — O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to EN(TURBO)-137, DTC P0137 — O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to EN(TURBO)-140, DTC P0138 — O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to EN(TURBO)-143, DTC P0139 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System too Lean (Bank 1)	<Ref. to EN(TURBO)-144, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System too Rich (Bank 1)	<Ref. to EN(TURBO)-145, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0230	Fuel Pump Primary Circuit	<Ref. to EN(TURBO)-148, DTC P0230 — FUEL PUMP PRIMARY CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0244	Turbo/Super Charger Wastegate Solenoid “A” Range/Performance	<Ref. to EN(TURBO)-151, DTC P0244 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0245	Turbo/Super Charger Wastegate Solenoid “A” Low	<Ref. to EN(TURBO)-153, DTC P0245 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0246	Turbo/Super Charger Wastegate Solenoid “A” High	<Ref. to EN(TURBO)-156, DTC P0246 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 misfire detected	<Ref. to EN(TURBO)-158, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 misfire detected	<Ref. to EN(TURBO)-158, DTC P0302 — CYLINDER 2 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 misfire detected	<Ref. to EN(TURBO)-158, DTC P0303 — CYLINDER 3 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 misfire detected	<Ref. to EN(TURBO)-159, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to EN(TURBO)-166, DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<Ref. to EN(TURBO)-168, DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to EN(TURBO)-170, DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	<Ref. to EN(TURBO)-172, DTC P0336 — Crankshaft Position Sensor “A” Circuit Range/Performance —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	<Ref. to EN(TURBO)-174, DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0341	Camshaft Position Sensor “A” Circuit Range/Performance (Bank 1 or Single Sensor)	<Ref. to EN(TURBO)-176, DTC P0341 — CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to EN(TURBO)-179, DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	<Ref. to EN(TURBO)-181, DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	<Ref. to EN(TURBO)-184, DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0461	Fuel Level Sensor Circuit Range/Performance	<Ref. to EN(TURBO)-186, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel level sensor circuit low input	<Ref. to EN(TURBO)-189, DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0463	Fuel level sensor circuit high input	<Ref. to EN(TURBO)-193, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Cooling Fan Rationality Check	<Ref. to EN(TURBO)-197, DTC P0483 — COOLING FAN RATIONALITY CHECK —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0502	Vehicle Speed Sensor Circuit Low Input	<Ref. to EN(TURBO)-200, DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0503	Vehicle Speed Sensor Intermittent/Erratic/High	<Ref. to EN(TURBO)-202, DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle Control System RPM Lower Than Expected	<Ref. to EN(TURBO)-204, DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0507	Idle Control System RPM Higher Than Expected	<Ref. to EN(TURBO)-206, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0508	Idle Control System Circuit Low	<Ref. to EN(TURBO)-208, DTC P0508 — IDLE CONTROL SYSTEM CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0509	Idle Control System Circuit High	<Ref. to EN(TURBO)-210, DTC P0509 — IDLE CONTROL SYSTEM CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

DTC No.	Item	Index
P0512	Starter switch circuit high input	<Ref. to EN(TURBO)-212, DTC P0512 — STARTER SWITCH CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0513	Incorrect Immobilizer Key	<Ref. to IM-20, DTC P0153 INCORRECT IMMOBILIZER KEY (USE OF UNREGISTERED KEY), Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P0518	Starter Switch Circuit Low Input	<Ref. to EN(TURBO)-214, DTC P0518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0519	Idle Control System Malfunction (Fail-safe)	<Ref. to EN(TURBO)-216, DTC P0519 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0545	Exhaust Gas Temperature Sensor Circuit Low-Bank1	<Ref. to EN(TURBO)-218, DTC P0545 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0546	Exhaust Gas Temperature Sensor Circuit High-Bank1	<Ref. to EN(TURBO)-220, DTC P0546 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0558	Generator Circuit Low Input	<Ref. to EN(TURBO)-223, DTC P0558 — GENERATOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0559	Generator Circuit High Input	<Ref. to EN(TURBO)-224, DTC P0559 — GENERATOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to EN(TURBO)-226, DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0691	Cooling Fan 1 Control Circuit Low	<Ref. to EN(TURBO)-229, DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0692	Cooling Fan 1 Control Circuit High	<Ref. to EN(TURBO)-233, DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0703	Torque Converter/Brake Switch “B” Circuit	<Ref. to EN(TURBO)-236, DTC P0703 — TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0705	Transmission Range Sensor Circuit (PRNDL Input)	<Ref. to AT-114, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>
P0710	Transmission Fluid Temperature Sensor Circuit	<Ref. to AT-43, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0715	Input/Turbine Speed Sensor Circuit	<Ref. to AT-59, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0720	Output Speed Sensor Circuit	<Ref. to AT-54, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0725	Engine Speed Input Circuit	<Ref. to AT-38, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0731	Gear 1 incorrect ratio	<Ref. to EN(TURBO)-238, DTC P0731 — GEAR 1 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0732	Gear 2 incorrect ratio	<Ref. to EN(TURBO)-238, DTC P0732 — GEAR 2 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0733	Gear 3 incorrect ratio	<Ref. to EN(TURBO)-238, DTC P0733 — GEAR 3 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0734	Gear 4 incorrect ratio	<Ref. to EN(TURBO)-239, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0741	Torque Converter Clutch Circuit Performance or Stuck Off	<Ref. to EN(TURBO)-240, DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0743	Torque Converter Clutch Circuit Electrical	<Ref. to AT-87, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P0748	Pressure Control Solenoid “A” Electrical	<Ref. to AT-79, DTC 75 LINE PRESSURE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0753	Shift Solenoid “A” Electrical	<Ref. to AT-66, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0758	Shift Solenoid “B” Electrical	<Ref. to AT-69, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0778	Pressure Control Solenoid “B” Electrical	<Ref. to AT-83, DTC 76 2-4 BRAKE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0785	Shift/Timing Solenoid	<Ref. to AT-75, DTC 74 2-4 BRAKE TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Neutral Switch Input Circuit Low	<Ref. to EN(TURBO)-242, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT VEHICLES) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or <Ref. to EN(TURBO)-244, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (MT VEHICLES) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Neutral Switch Input Circuit High	<Ref. to EN(TURBO)-247, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT VEHICLES) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or <Ref. to EN(TURBO)-250, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT VEHICLES) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0864	TCM Communication Circuit Range/Performance	<Ref. to EN(TURBO)-253, DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0865	AT Diagnosis Input Signal Circuit Low Input	<Ref. to EN(TURBO)-255, DTC P0865 — AT DIAGNOSIS INPUT SIGNAL CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0866	AT Diagnosis Input Signal Circuit High Input	<Ref. to EN(TURBO)-257, DTC P0866 — AT DIAGNOSIS INPUT SIGNAL CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1086	Tumble Generated Valve Position Sensor 2 Circuit Low	<Ref. to EN(TURBO)-259, DTC P1086 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1087	Tumble Generated Valve Position Sensor 2 Circuit High	<Ref. to EN(TURBO)-263, DTC P1087 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1088	Tumble Generated Valve Position Sensor 1 Circuit Low	<Ref. to EN(TURBO)-266, DTC P1088 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1089	Tumble Generated Valve Position Sensor 1 Circuit High	<Ref. to EN(TURBO)-270, DTC P1089 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1090	Tumble Generated Valve System 1 (Valve Open)	<Ref. to EN(TURBO)-273, DTC P1090 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1091	Tumble Generated Valve System 1 (Valve Close)	<Ref. to EN(TURBO)-273, DTC P1091 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1092	Tumble Generated Valve System 2 (Valve Open)	<Ref. to EN(TURBO)-274, DTC P1092 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1093	Tumble Generated Valve System 2 (Valve Close)	<Ref. to EN(TURBO)-274, DTC P1093 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1094	Tumble Generated Valve Signal 1 Circuit Malfunction (Open)	<Ref. to EN(TURBO)-275, DTC P1094 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P1095	Tumble Generated Valve Signal 1 Circuit Malfunction (Short)	<Ref. to EN(TURBO)-277, DTC P1095 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1096	Tumble Generated Valve Signal 2 Circuit Malfunction (Open)	<Ref. to EN(TURBO)-279, DTC P1096 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1097	Tumble Generated Valve Signal 2 Circuit Malfunction (Short)	<Ref. to EN(TURBO)-281, DTC P1097 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1110	Atmospheric Pressure sensor circuit malfunction (Low input)	<Ref. to EN(TURBO)-282, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1111	Atmospheric Pressure sensor circuit malfunction (High input)	<Ref. to EN(TURBO)-282, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1134	A/F sensor Micro-computer problem	<Ref. to EN(TURBO)-283, DTC P1134 — A/F SENSOR MICRO-COMPUTER PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1152	O_2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	<Ref. to EN(TURBO)-284, DTC P1152 — O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1153	O_2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to EN(TURBO)-286, DTC P1153 — O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1301	Misfire Ditected (High Temperature Exhaust Gas)	<Ref. to EN(TURBO)-289, DTC P1301 — MISFIRE DITECTED (HIGH TEMPERATURE EXHAUST GAS) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1312	Exhaust Gas Temperature Sensor Malfunction	<Ref. to EN(TURBO)-291, DTC P1312 — EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1544	Exhaust Gas Temperature Too High	<Ref. to EN(TURBO)-293, DTC P1544 — EXHAUST GAS TEMPERATURE TOO HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-up voltage circuit malfunction	<Ref. to EN(TURBO)-295, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1570	Antenna	<Ref. to IM-21, DTC P1570 ANTENNA, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1571	Reference code incompatibility	<Ref. to IM-15, DTC P1571 Reference Code Incompatibility, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1572	IMM circuit failure (except antenna circuit)	<Ref. to IM-16, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1574	Key communication failure	<Ref. to IM-19, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1576	EGI control module EEPROM	<Ref. to IM-20, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1577	IMM control module EEPROM	<Ref. to IM-20, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1698	Engine Torque Control Cut Signal Circuit Malfunction (Low Input)	<Ref. to EN(TURBO)-298, DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1699	Engine Torque Control Cut Signal Circuit Malfunction (High Input)	<Ref. to EN(TURBO)-300, DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1700	Throttle Position Sensor Circuit Malfunction for AT	<Ref. to AT-47, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P1701	Cruise Control Set Signal Circuit Malfunction for AT	<Ref. to EN(TURBO)-302, DTC P1701 — CRUISE CONTROL SET SIGNAL CIRCUIT MALFUNCTION FOR AUTOMATIC TRANSMISSION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1703	AT Low Clutch Timing Solenoid Valve Circuit Malfunction	<Ref. to AT-72, DTC 73 LOW CLUTCH TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1711	Engine Torque Control Signal #1 Circuit Malfunction	<Ref. to EN(TURBO)-304, DTC P1711 — ENGINE TORQUE CONTROL SIGNAL 1 CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1712	Engine Torque Control Signal #2 Circuit Malfunction	<Ref. to EN(TURBO)-306, DTC P1712 — ENGINE TORQUE CONTROL SIGNAL 2 CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

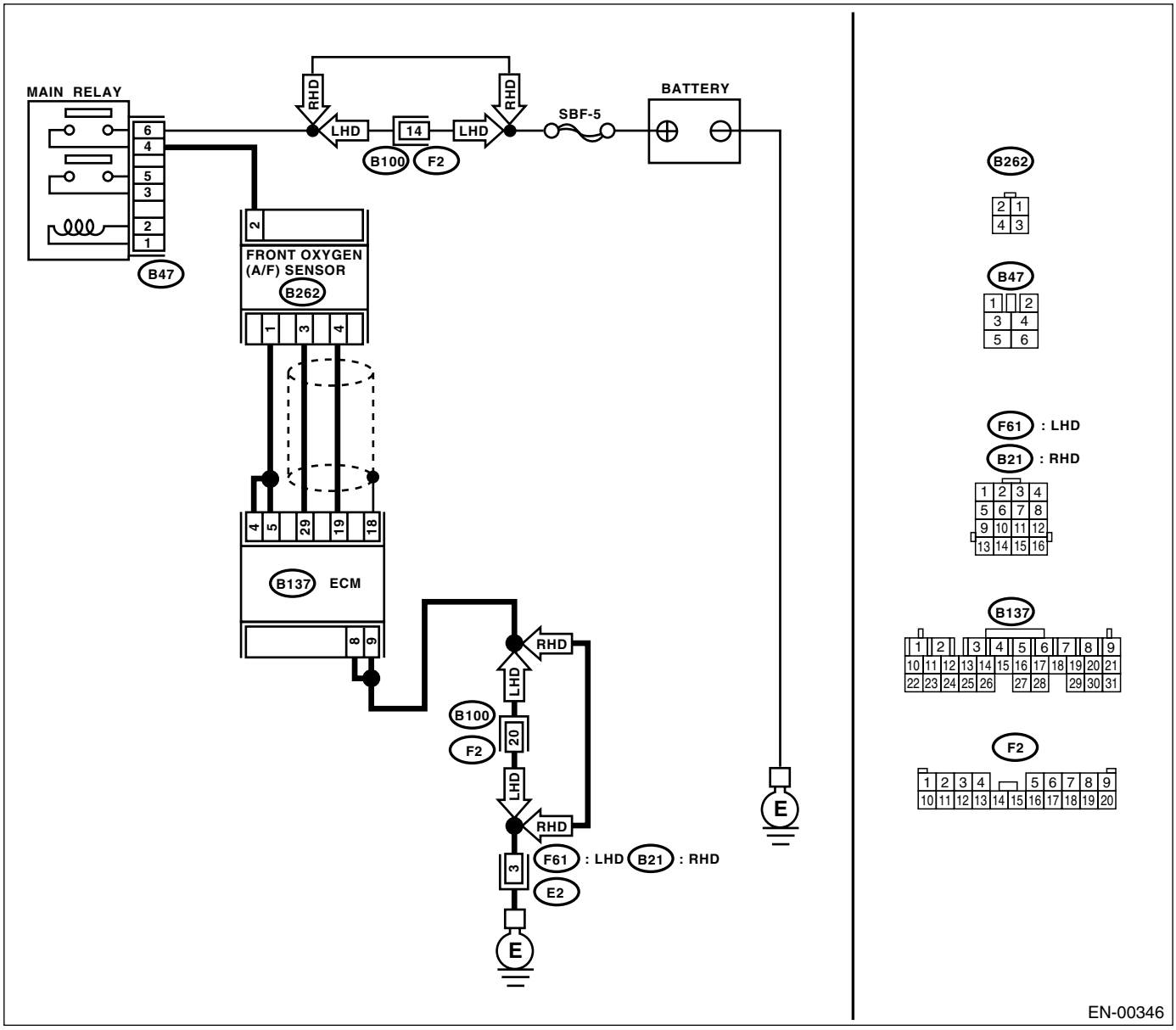
19.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



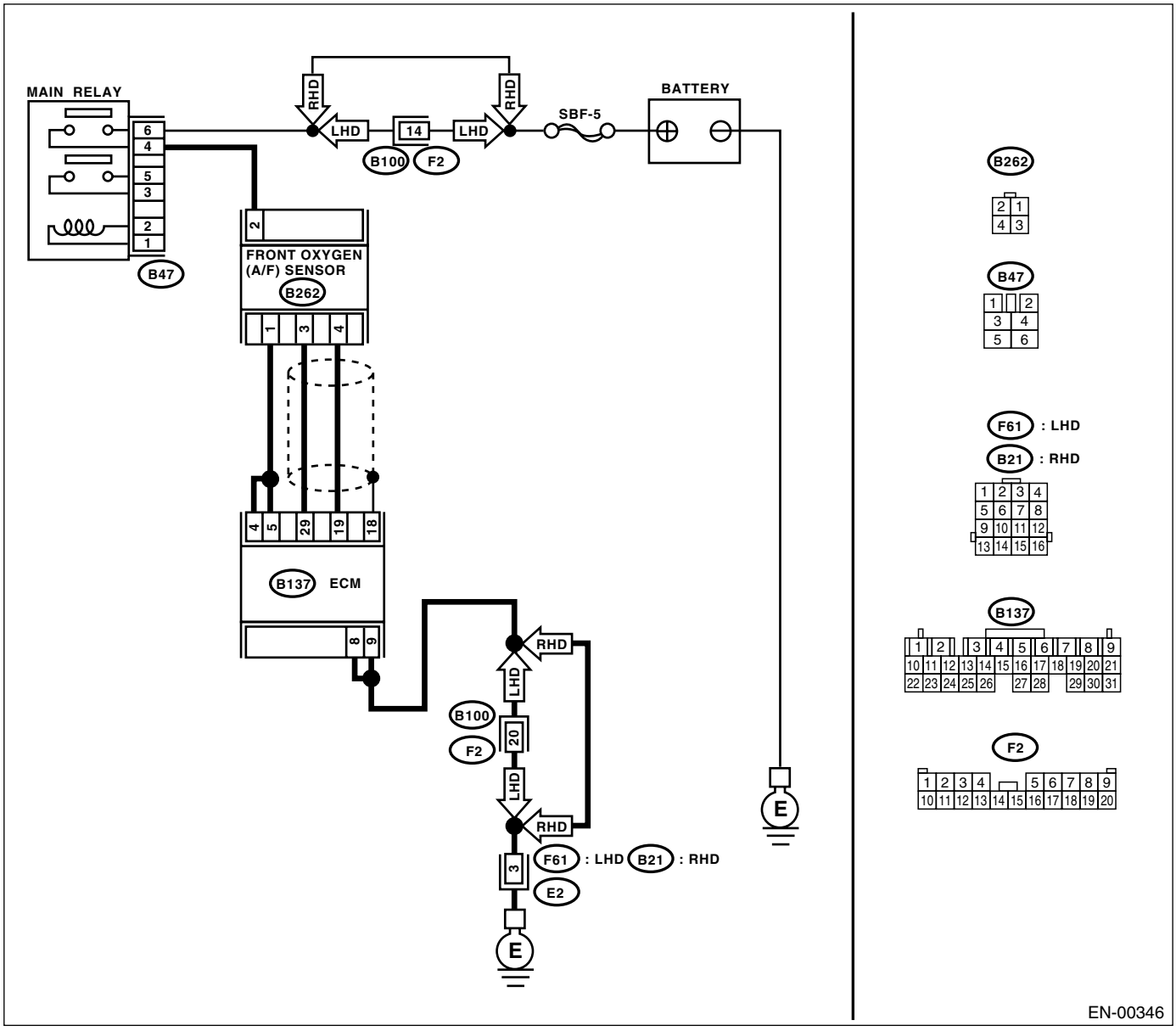
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1)Start the engine and warm-up engine. 2)Turn the ignition switch to OFF. 3)Disconnect the connectors from ECM and front oxygen (A/F) sensor. 4)Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 5 — (B262) No. 1:*** ***(B137) No. 4 — (B262) No. 1:*** Is the measured value less than specified value?	1 Ω	Go to step **2.**	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 19 — (B18) No. 4:*** ***(B137) No. 29 — (B18) No. 3:*** Is the measured value less than specified value?	1 Ω	Go to step **3.**	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between main relay and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B47) No. 4 — (B262) No. 2:*** Is the measured value less than specified value?	1 Ω	Go to step **4.**	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
4	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:*** Is the measured value less than specified value?	5 Ω	Go to step **5.**	Replace the front oxygen (A/F) sensor. <Ref. to FU(TURBO)-43, Front Oxygen (A/F) Sensor.>
5	**CHECK POOR CONTACT.** Check the poor contact in ECM and front oxygen (A/F) sensor connector. Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Poor contact occurs.	Repair the poor contact in ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(TURBO)-43, Front Oxygen (A/F) Sensor.>

B: DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from front oxygen (A/F) sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between front oxygen (A/F) sensor connector and engine ground. ***Connector & terminal*** ***(B262) No. 2 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Go to step **2.**	Repair the power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in main relay connector
2	**CHECK GROUND CIRCUIT OF ECM.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 8 — Chassis ground:*** ***(B137) No. 9 — Chassis ground:*** Is the measured value less than specified value?	5 Ω	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine ground cable • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or OBD-II general scan tool. Is the measured value more than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	0.2 A	Repair the poor contact in connector. NOTE: In this case, repair the following: • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Start and idle the engine. 2)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 4 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1.0 V	Go to step **6.**	Go to step **5.**

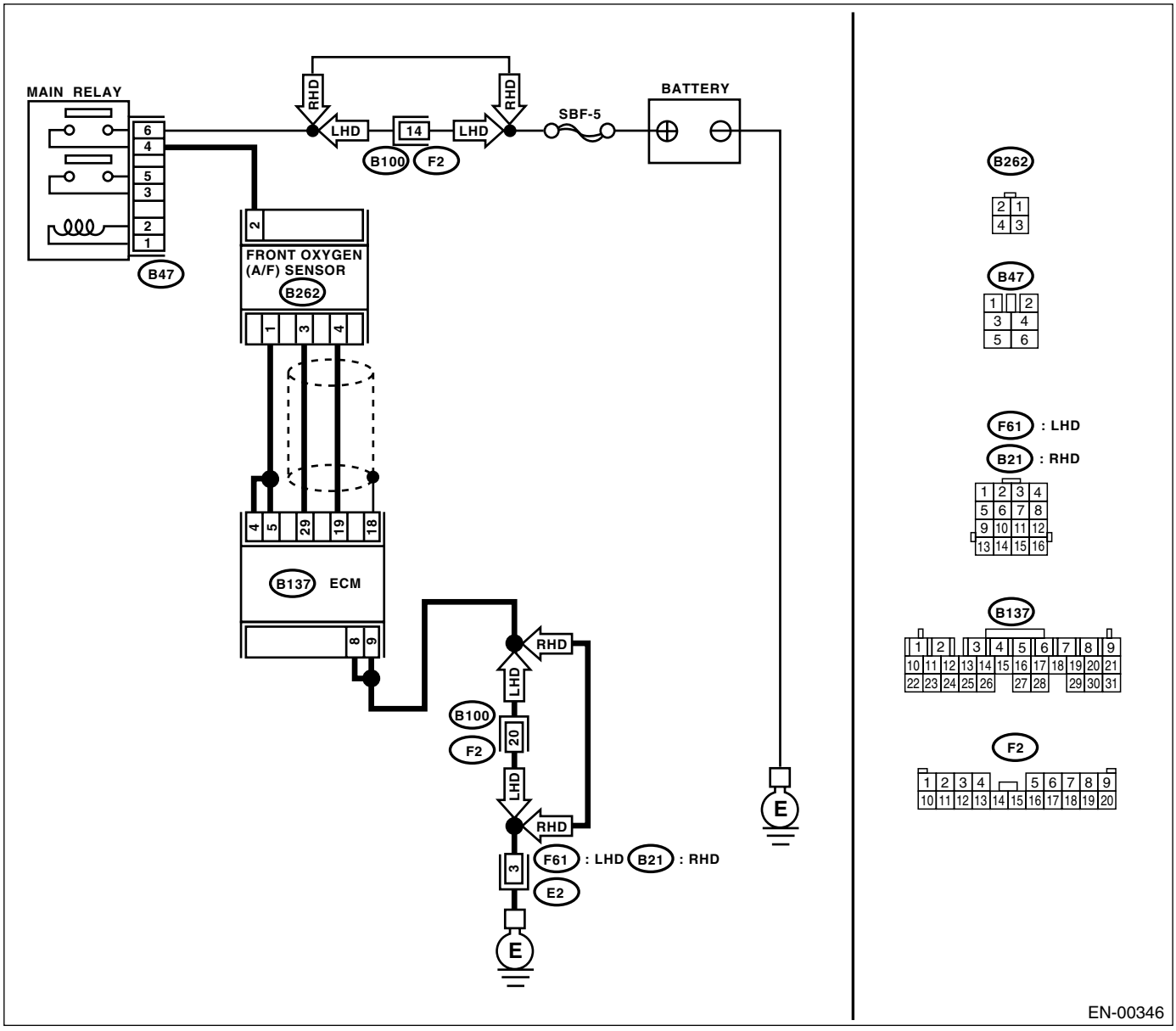
	Step	Check	Yes	No
5	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 4 (+) — Chassis ground (–):*** Shake the ECM harness and connector, while monitoring value of voltage meter. Is the voltage change less than specified value?	1.0 V	Repair the poor contact in ECM connector.	Go to step **6.**
6	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 5 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1.0 V	Go to step **8.**	Go to step **7.**
7	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 5 (+) — Chassis ground (–):*** Shake the ECM harness and connector, while monitoring value of voltage meter. Is the voltage change less than specified value?	1.0 V	Repair the poor contact in ECM connector.	Go to step **8.**
8	**CHECK FRONT OXYGEN (A/F) SENSOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:*** Is the measured value less than specified value?	10 Ω	Repair the harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Replace the front oxygen (A/F) sensor. <Ref. to FU(TURBO)-43, Front Oxygen (A/F) Sensor.>

C: DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



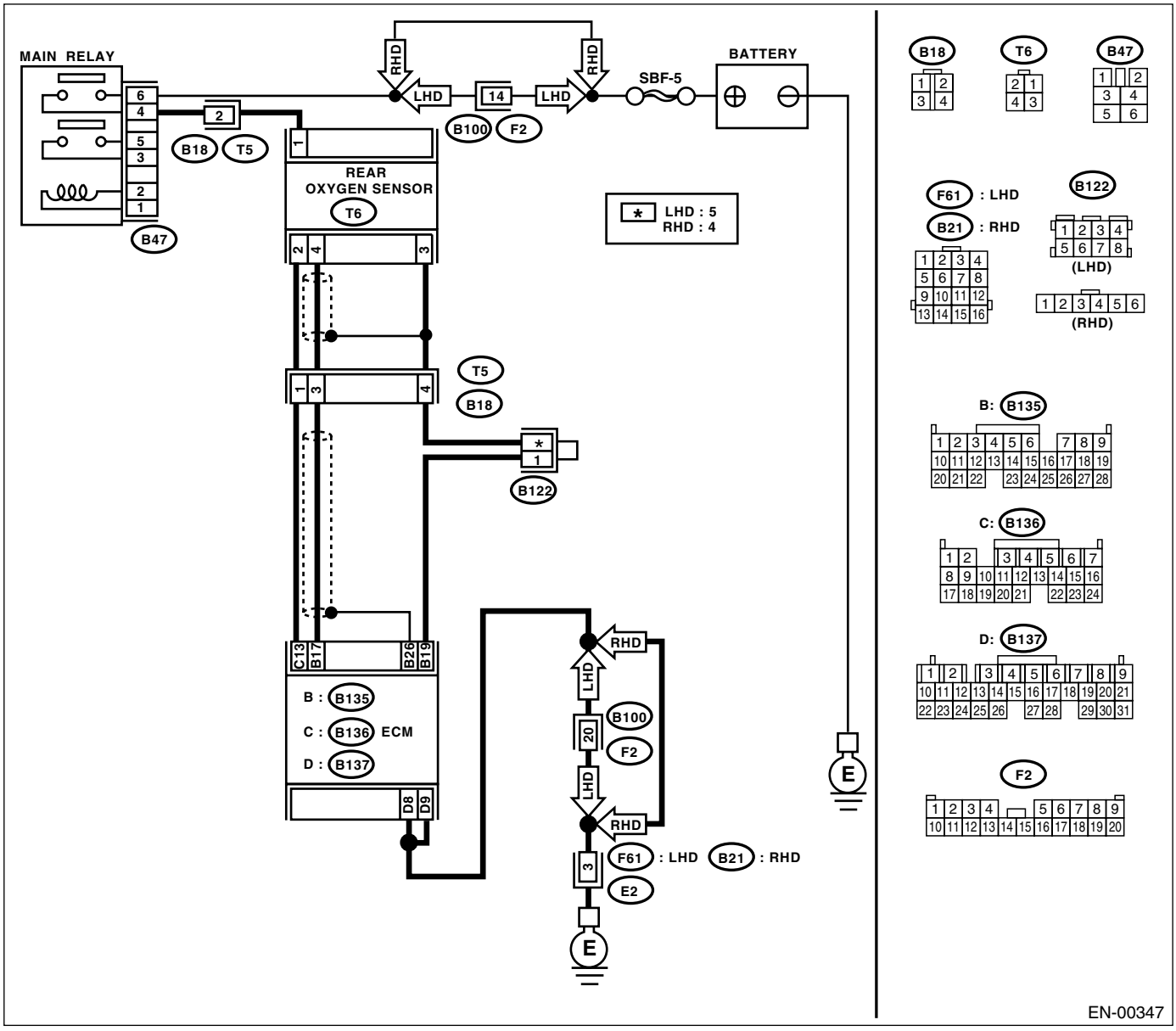
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 4 (+) — Chassis ground (–):*** ***(B137) No. 5 (+) — Chassis ground (–):*** Is the measured value more than specified value?	8 V	Go to step **3.**	Go to step **2.**
2	**CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.** 1)Turn the ignition switch to OFF. 2)Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3)Turn the ignition switch to ON. 4)Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. Is the measured value more than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	2.3 A	Replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>	END
3	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 4 (+) — Chassis ground (–):*** ***(B137) No. 5 (+) — Chassis ground (–):*** Shake the ECM harness and connector, while monitoring value of voltage meter. Is the voltage change more than specified value?	8 V	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END

D: DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF ECM.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 8 — Chassis ground:*** ***(B137) No. 9 — Chassis ground:*** Is the measured value less than specified value?	5 Ω	Go to step **2.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine ground cable • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of rear oxygen sensor heater current using Subaru Select Monitor or OBD-II general scan tool. Is the measured value more than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	0.2 A	Repair the connector. NOTE: In this case, repair the following: • Poor contact in rear oxygen sensor connector • Poor contact in rear oxygen sensor connecting harness connector • Poor contact in ECM connector	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Start and idle the engine. 2)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 13 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1.0 V	Go to step **6.**	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 13 (+) — Chassis ground (–):*** Shake the ECM harness and connector, while monitoring value of voltage meter. Is the voltage change less than specified value?	1.0 V	Repair the poor contact in ECM connector.	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from rear oxygen sensor. 3)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 13 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1.0 V	Replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>	Repair the battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>

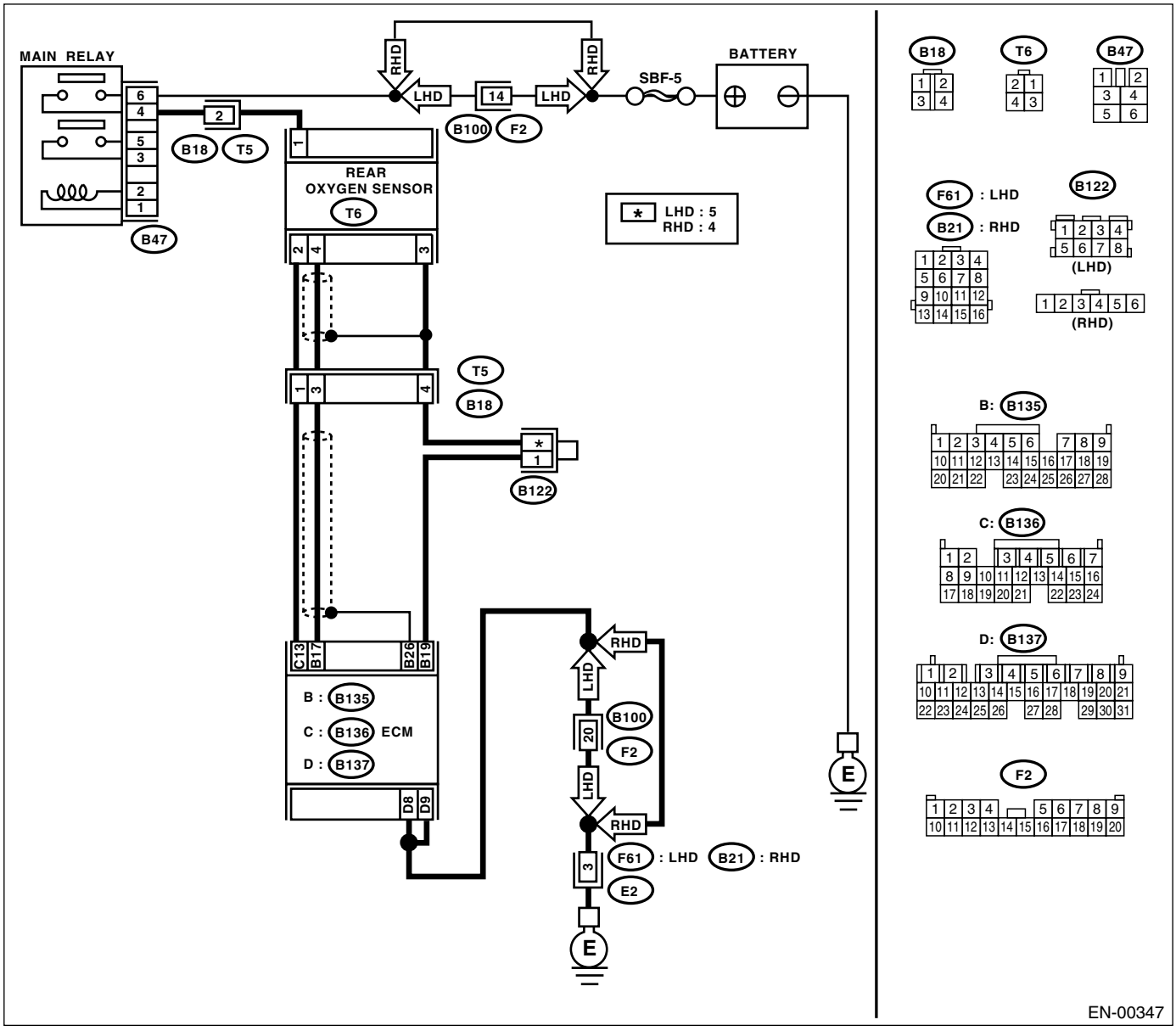
	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from rear oxygen sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between rear oxygen sensor connector and engine ground or chassis ground. ***Connector & terminal*** ***(T6) No. 1 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **7.**	Repair the power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and rear oxygen sensor connector • Poor contact in rear oxygen sensor connector • Poor contact in coupling connector
7	**CHECK REAR OXYGEN SENSOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between rear oxygen sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value less than specified value?	30 Ω	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Replace the rear oxygen sensor. <Ref. to FU(TURBO)-45, Rear Oxygen Sensor.>

E: DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



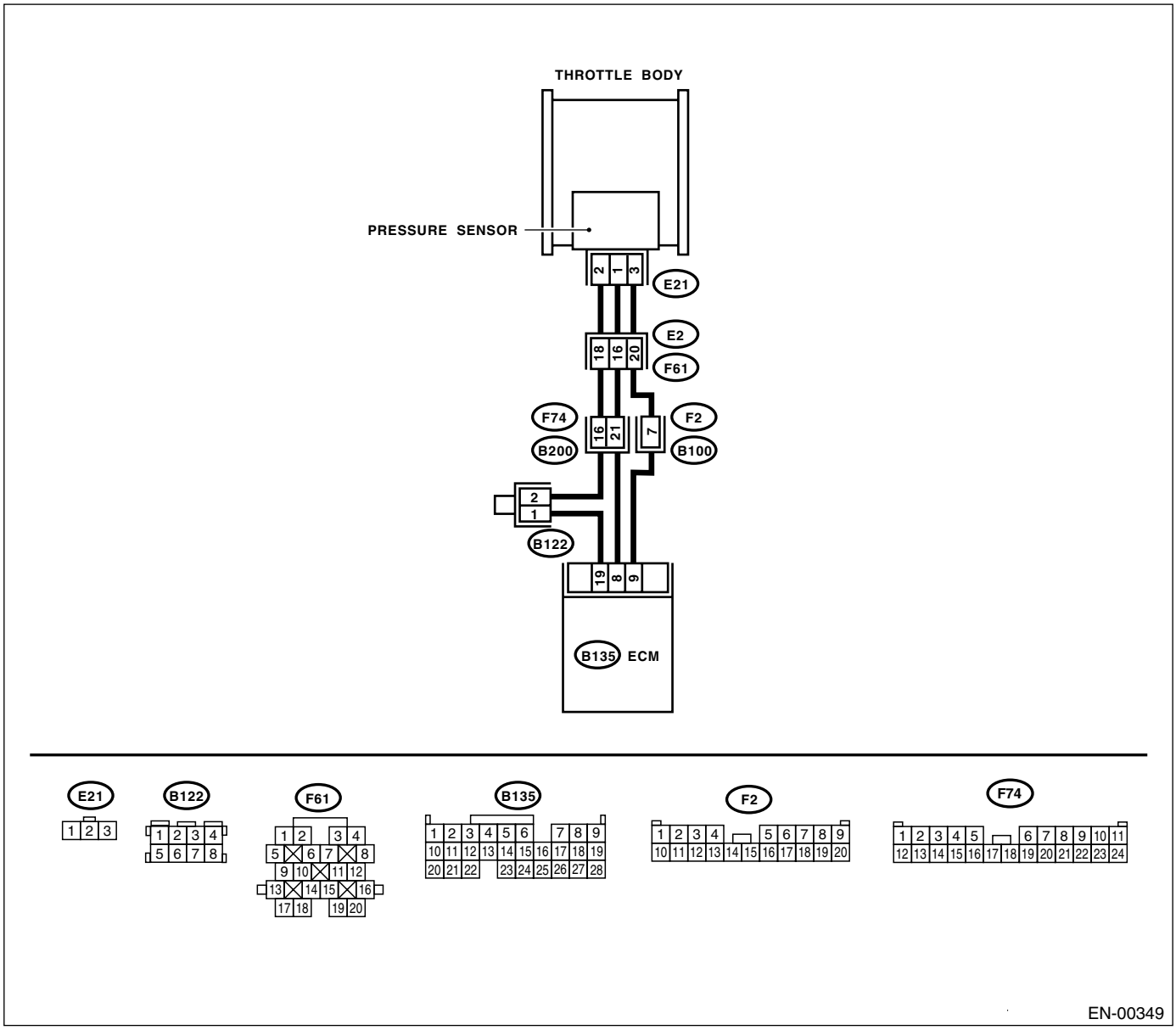
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to OFF. 2)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 13 (+) — Chassis ground (–):*** Is the measured value more than specified value?	8 V	Go to step **2.**	Go to step **3.**
2	**CHECK CURRENT DATA.** 1)Repair the battery short circuit in harness between ECM and rear oxygen sensor connector. 2)Turn the ignition switch to ON. 3)Read the data of rear oxygen sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. Is the measured value more than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	7 A	Replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>	END
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair the poor contact in ECM connector.	END

F: DTC P0068 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE —

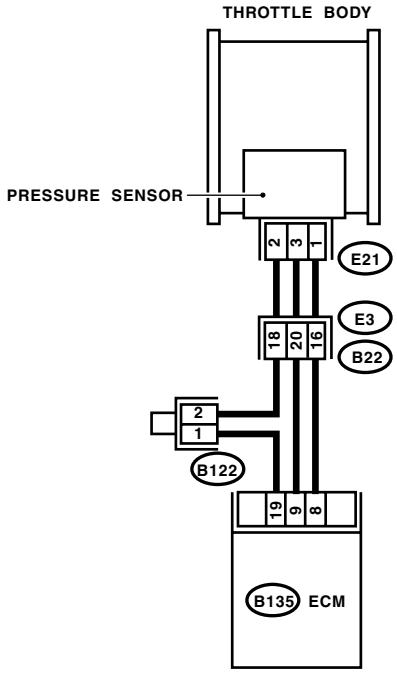
- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Failure of engine to start

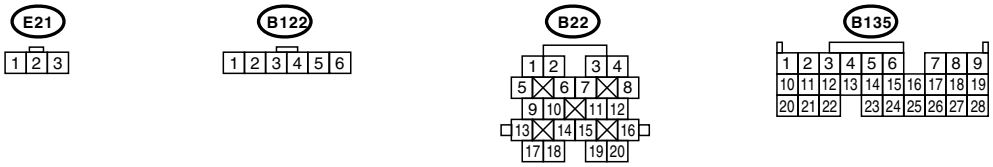
CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**
- **LHD model**



- **RHD model**





EN-00350

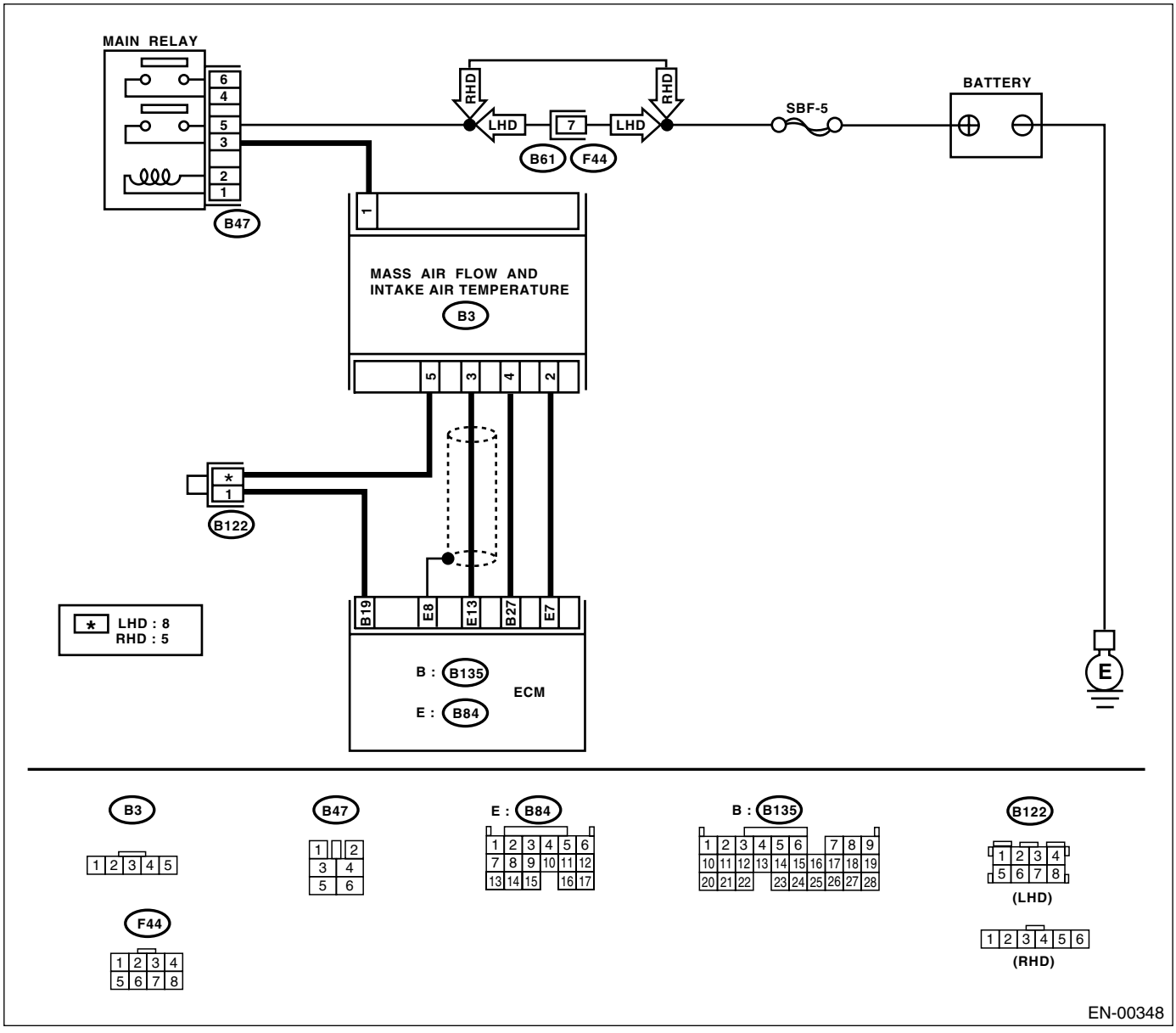
	Step	Check	Yes	No
1	**CHECK IDLE SWITCH SIGNAL.** 1)Turn the ignition switch to ON. 2)Operate the LED operation mode for engine using Subaru Select Monitor. Does the LED of {Idle Switch Signal} come on? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.>	LED illuminates.	Go to step **2.**	Check the throttle position sensor circuit. <Ref. to EN(TURBO)-122, DTC P0121 — THROTTLE/ PEDAL POSITION SENSOR/ SWITCH "A" CIRCUIT RANGE/ PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0106.
2	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC. "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0106.	Go to step **3.**
3	**CHECK CONDITION OF INTAKE MANIFOLD PRESSURE SENSOR.** Is the pressure sensor installation bolt tightened securely?	Bolt is tightened securely.	Go to step **4.**	Tighten the pressure sensor installation bolt securely.
4	**CHECK CONDITION OF THROTTLE BODY.** Is the throttle body installation bolt tightened securely?	Bolt is tightened securely.	Replace the pressure sensor. <Ref. to FU(TURBO)-34, Pressure Sensor.>	Tighten the throttle body installation bolt securely.

G: DTC P0101 — MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

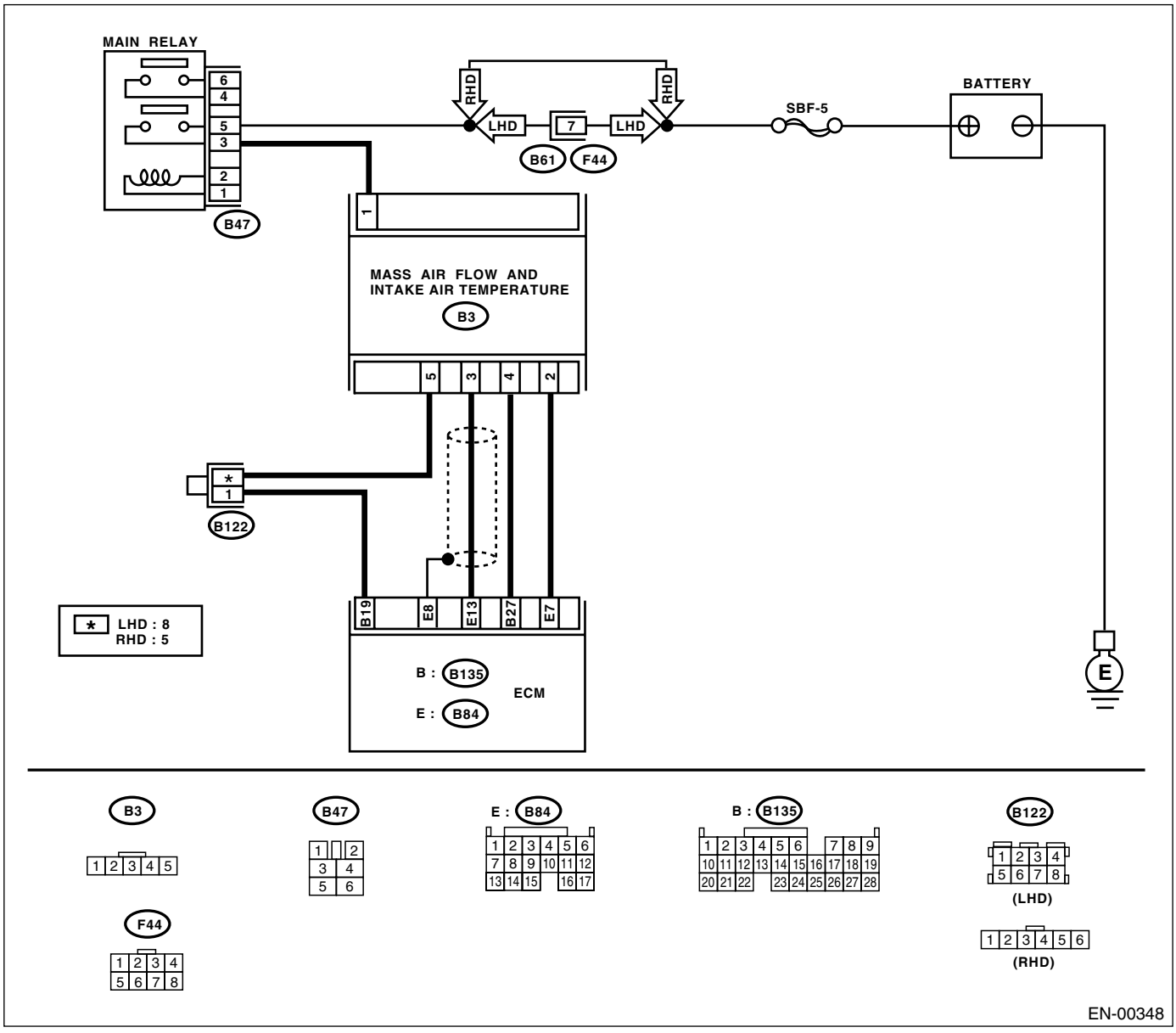
- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0101.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(TURBO)-33, Mass Air Flow and Intake Air Temperature Sensor.>

H: DTC P0102 — MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance
- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.** 1)Turn the ignition switch to OFF. 2)Connect the Subaru Select Monitor or OBD-II general scan tool to data link connector. 3)Turn the ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON. 4)Start the engine. 5)Read the mass air flow sensor voltage using Subaru Select Monitor or OBD-II general scan tool. Is the measured value within specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	0.2 — 4.7 V	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in the mass air flow sensor. NOTE: In this case, repair the following: • Open or ground short circuit in harness between mass air flow sensor and ECM connector • Poor contact in mass air flow sensor or ECM connector	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground while engine is idling. ***Connector & terminal*** ***(B84) No. 13 (+) — Chassis ground (–):*** Is the measured value less than specified value?	0.2 V	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR).** Measure the voltage between ECM connector and chassis ground while engine is idling. Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Is the voltage change more than specified value?	0.2 V	Repair the poor contact in ECM connector.	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from mass air flow sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between mass air flow sensor connector and chassis ground. ***Connector & terminal*** ***(B3) No. 1 (+) — Chassis ground (–):*** Is the measured value more than specified value?	5 V	Go to step **5.**	Repair the open circuit between mass air flow sensor and main relay.

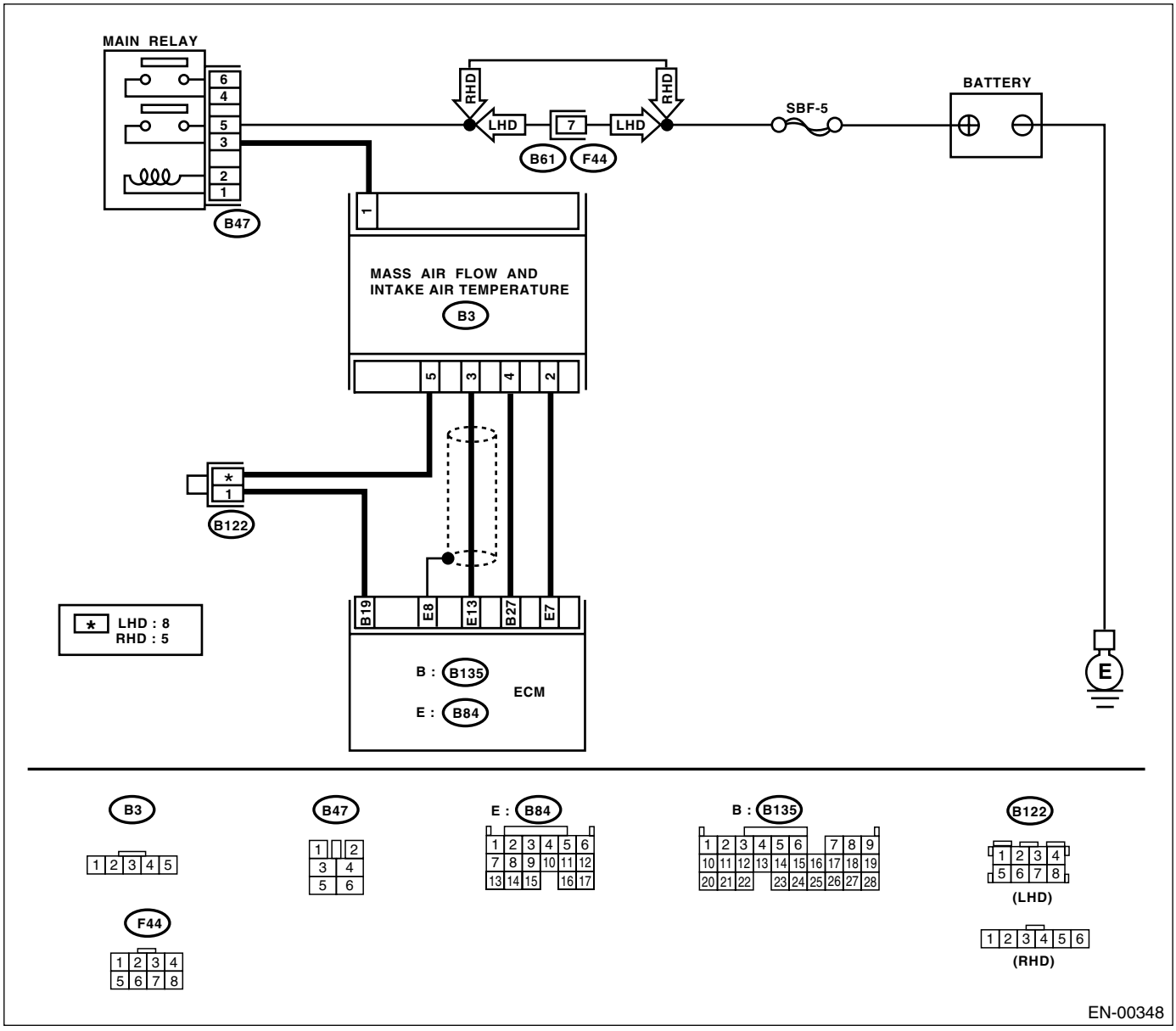
	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM and mass air flow sensor connector. ***Connector & terminal*** ***(B84) No. 13 — (B3) No. 3:*** ***(B84) No. 7 — (B3) No. 2:*** ***(B135) No. 19 — (B3) No. 5:*** Is the measured value less than specified value?	1 Ω	Go to step **6.**	Repair the open circuit between ECM and mass air flow sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 13 — Chassis ground:*** ***(B84) No. 7 — Chassis ground:*** ***(B135) No. 19 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **7.**	Repair the ground short circuit between ECM and mass air flow sensor connector.
7	**CHECK POOR CONTACT** Check poor contact in mass air flow sensor connector. Is there poor contact in mass air flow sensor connector?	Poor contact occurs.	Repair the poor contact in mass air flow sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(TURBO)-33, Mass Air Flow and Intake Air Temperature Sensor.>

I: DTC P0103 — MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



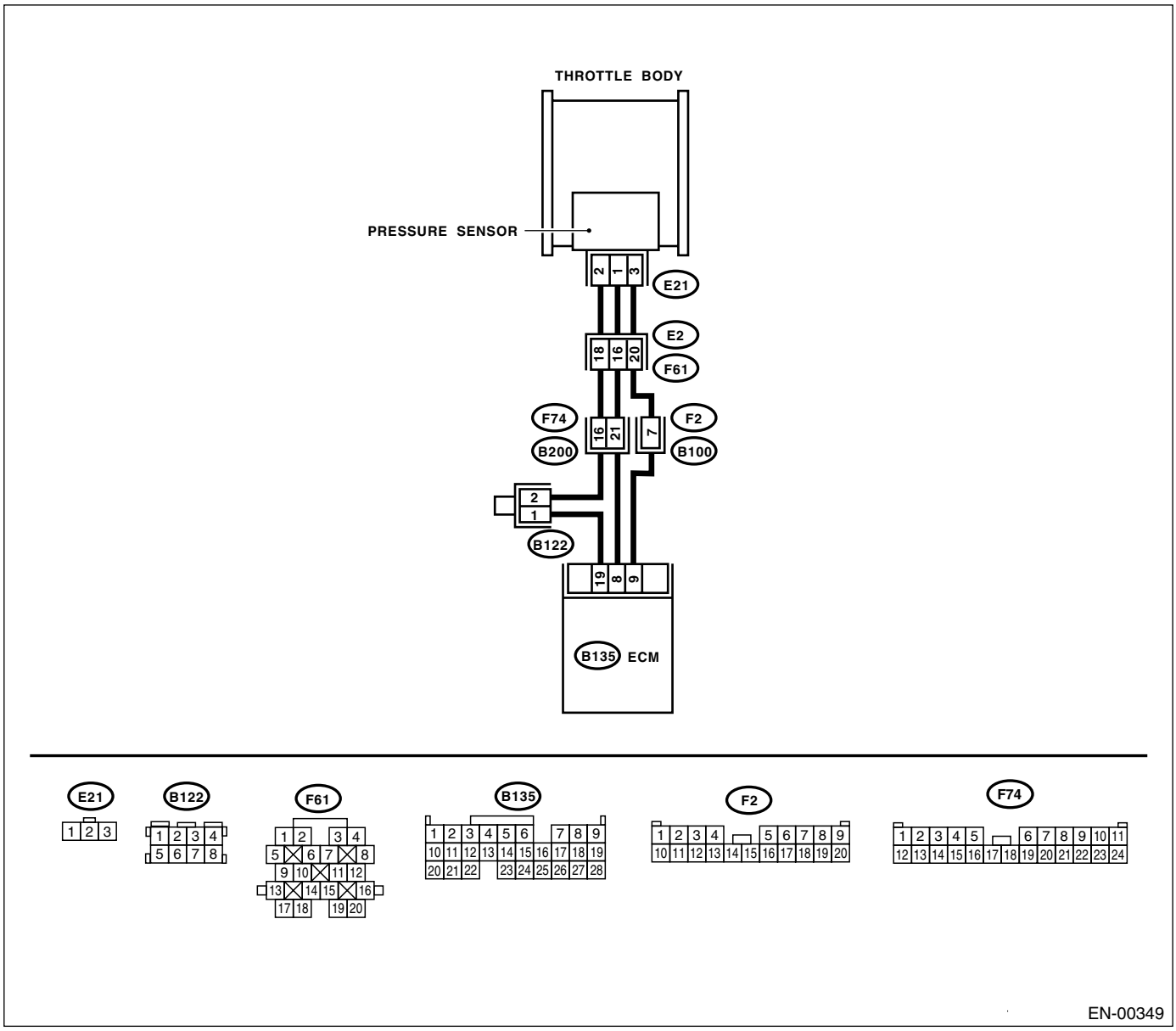
	Step	Check	Yes	No
1	**CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.** 1)Turn the ignition switch to OFF. 2)Connect the Subaru Select Monitor or OBD-II general scan tool to data link connector. 3)Turn the ignition switch to ON and Subaru Select Monitor or OBD-II general scan tool switch to ON. 4)Start the engine. 5)Read the mass air flow sensor voltage using Subaru Select Monitor or OBD-II general scan tool. Is the measured value within specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	0.2 — 4.7 V	Even if MIL lights up, the circuit has returned to a normal condition at this time.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from mass air flow sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between mass air flow sensor connector and chassis ground. ***Connector & terminal*** ***(B3) No. 3 (+) — Chassis ground (–):*** Is the measured value more than specified value?	5 V	Repair the battery short of harness between mass air flow sensor connector and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance between ECM connector and mass air flow sensor connector. ***Connector & terminal*** ***(B3) No. 2 — (B136) No. 7:*** Is the measured value less than specified value?	1 Ω	Replace the mass air flow sensor.<Ref. to FU(TURBO)-33, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the open harness between mass air flow sensor connector and ECM connector.

J: DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —

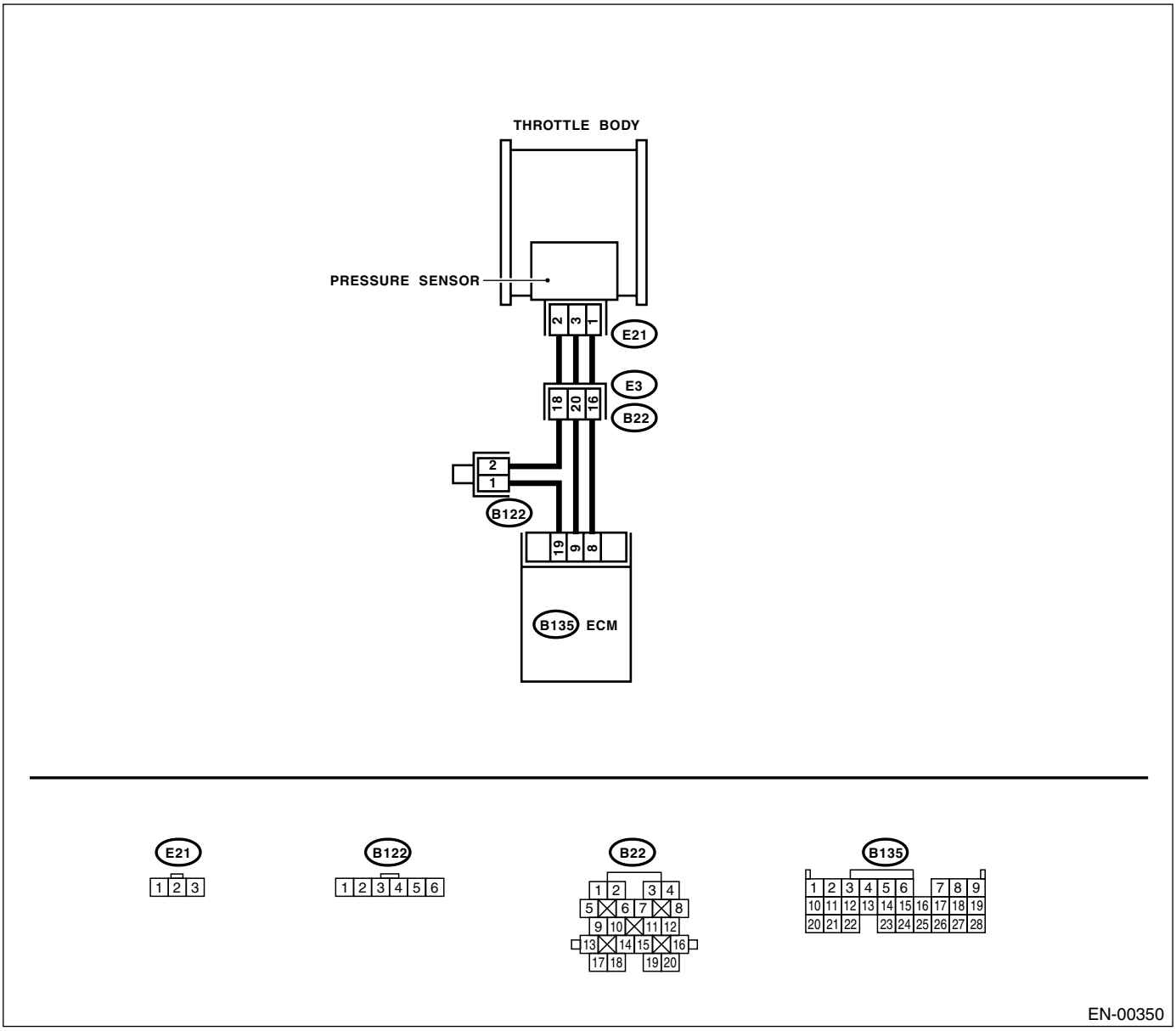
- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**
- **LHD model**



- **RHD model**



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4.5 V	Go to step **3.**	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):*** Shake the ECM harness and connector, while monitoring value of voltage meter. Is the voltage change more than specified value?	4.5 V	Repair the poor contact in ECM connector.	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

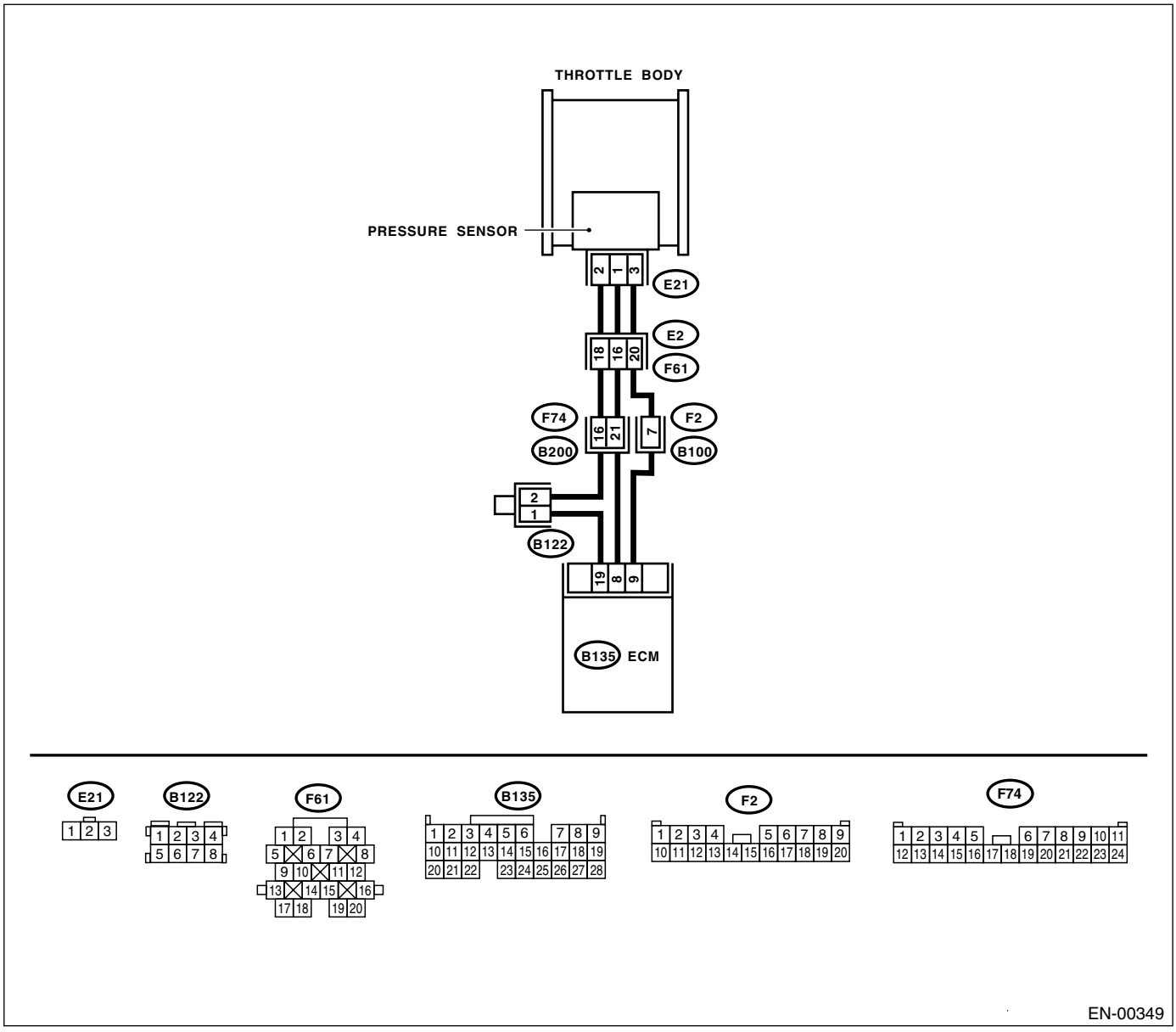
	Step	Check	Yes	No
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 8 (+) — Chassis ground (–):*** Is the measured value less than specified value?	0.7 V	Go to step **4.**	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from pressure sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (–):*** Is the measured value more than specified value?	4.5 V	Go to step **5.**	Repair the open circuit in harness between ECM and pressure sensor connector.
5	**CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM and intake manifold pressure sensor connector. ***Connector & terminal*** ***(B135) No. 19 — (E21) No. 2:*** Is the measured value less than specified value?	1 Ω	Go to step **6.**	Repair the open circuit in harness between ECM and pressure sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.** Measure the resistance of harness between intake manifold pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 1 — Engine ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **7.**	Repair the ground short circuit in harness between ECM and pressure sensor connector.
7	**CHECK POOR CONTACT.** Check poor contact in pressure sensor connector. Is there poor contact in pressure sensor connector?	Poor contact occurs.	Repair the poor contact in pressure sensor connector.	Replace the pressure sensor. <Ref. to FU(TURBO)-34, Pressure Sensor.>

K: DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —

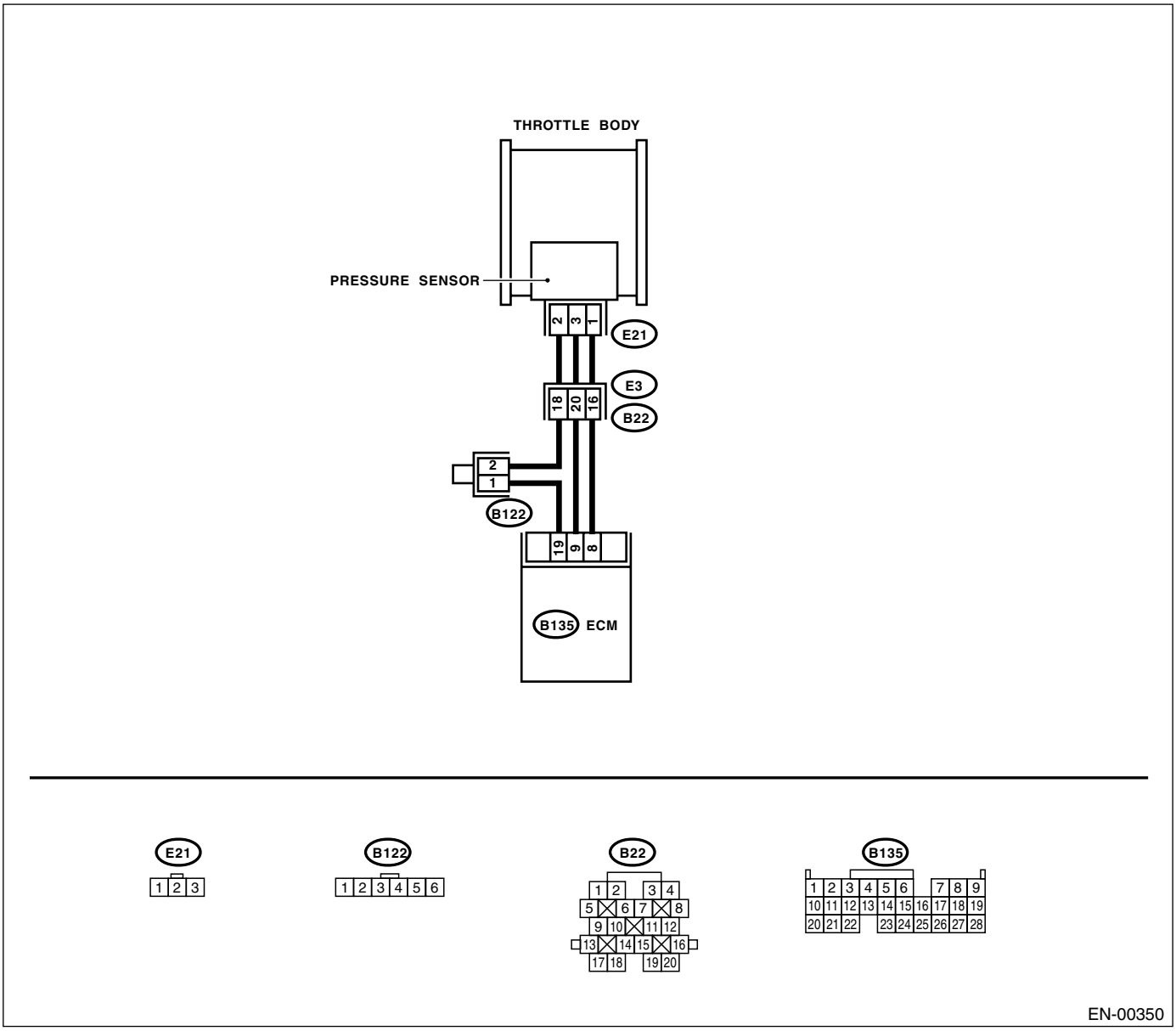
- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**
- **LHD model**



- **RHD model**



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4.5 V	Go to step **3.**	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):*** Shake the ECM harness and connector, while monitoring value of voltage meter. Is the voltage change more than specified value?	4.5 V	Repair the poor contact in ECM connector.	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

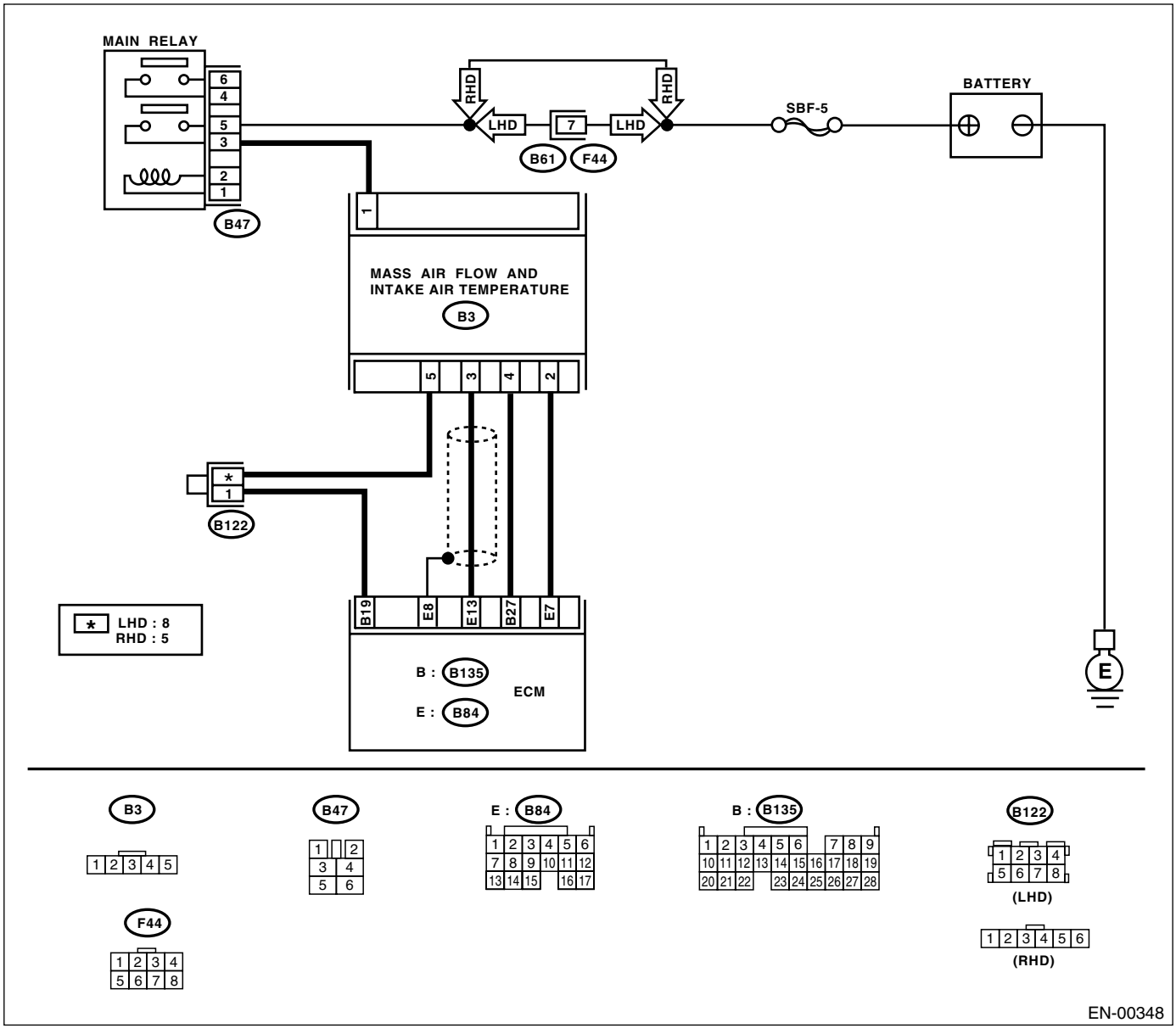
	Step	Check	Yes	No
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 8 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4.5 V	Go to step **4.**	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from pressure sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (–):*** Is the measured value more than specified value?	4.5 V	Go to step **5.**	Repair the open circuit in harness between ECM and pressure sensor connector.
5	**CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM and pressure sensor connector. ***Connector & terminal*** ***(B135) No. 8 — (E21) No. 1:*** Is the measured value less than specified value?	1 Ω	Go to step **6.**	Repair the open circuit in harness between ECM and pressure sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR.** Measure the resistance of harness between ECM and pressure sensor connector. ***Connector & terminal*** ***(B135) No. 19 — (E21) No. 2:*** Is the measured value less than specified value?	1 Ω	Go to step **7.**	Repair the open circuit in harness between ECM and pressure sensor connector.
7	**CHECK POOR CONTACT.** Check poor contact in pressure sensor connector. Is there poor contact in pressure sensor connector?	Poor contact occurs.	Repair the poor contact in pressure sensor connector.	Replace the intake manifold pressure sensor. <Ref. to FU(TURBO)-34, Pressure Sensor.>

L: DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



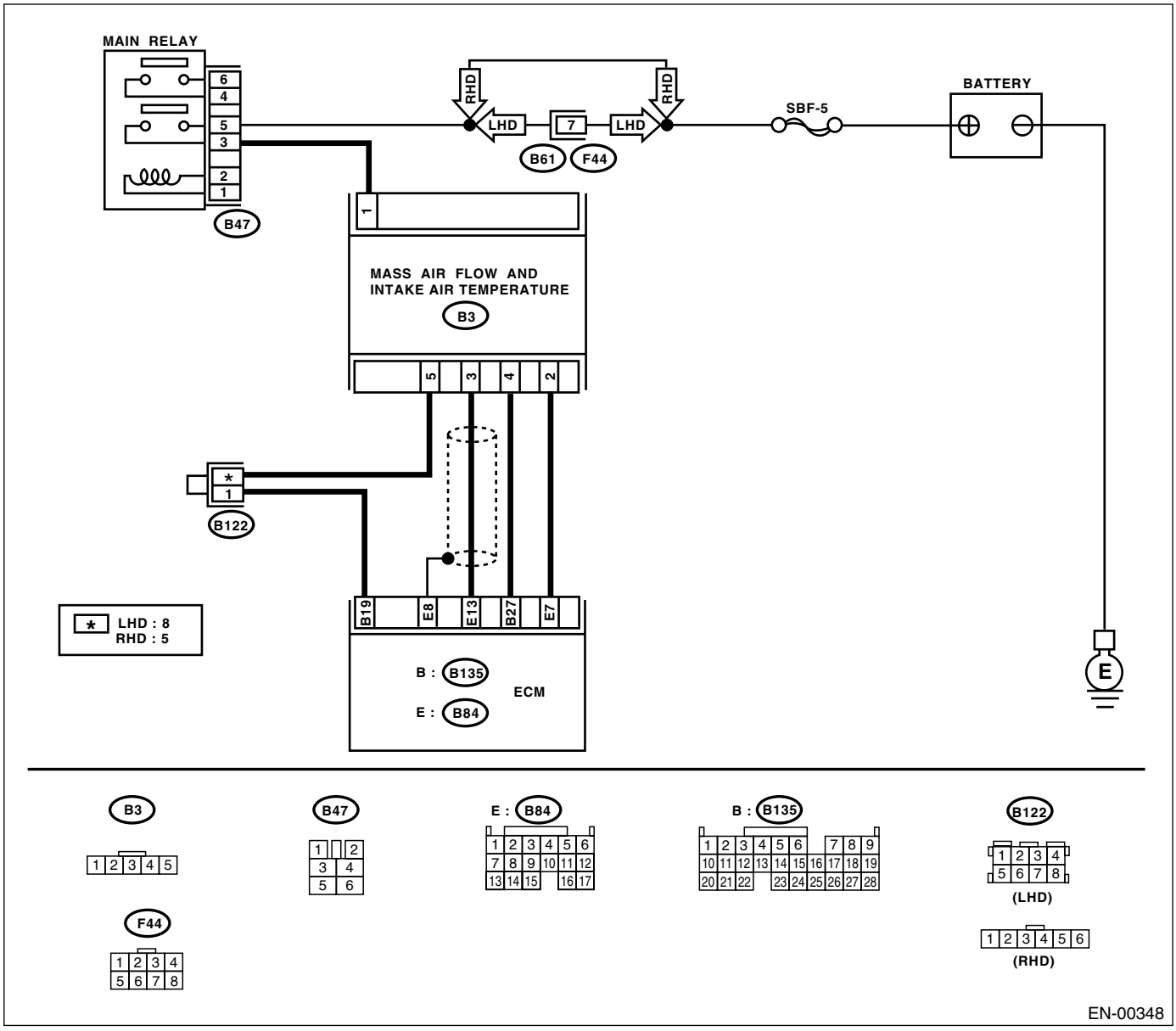
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. Is the measured value more than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	55°C (131°F)	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from mass air flow and intake air temperature sensor. 3)Turn the ignition switch to ON. 4)Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. Is the measured value less than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	–36°C (–97°F)	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(TURBO)-33, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the ground short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.

M: DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. Is the measured value less than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	–36°C (–97°F)	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from mass air flow and intake air temperature sensor. 3)Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between mass air flow and intake air temperature sensor and pressure sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (–):*** Is the measured value more than specified value?	4 V	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector

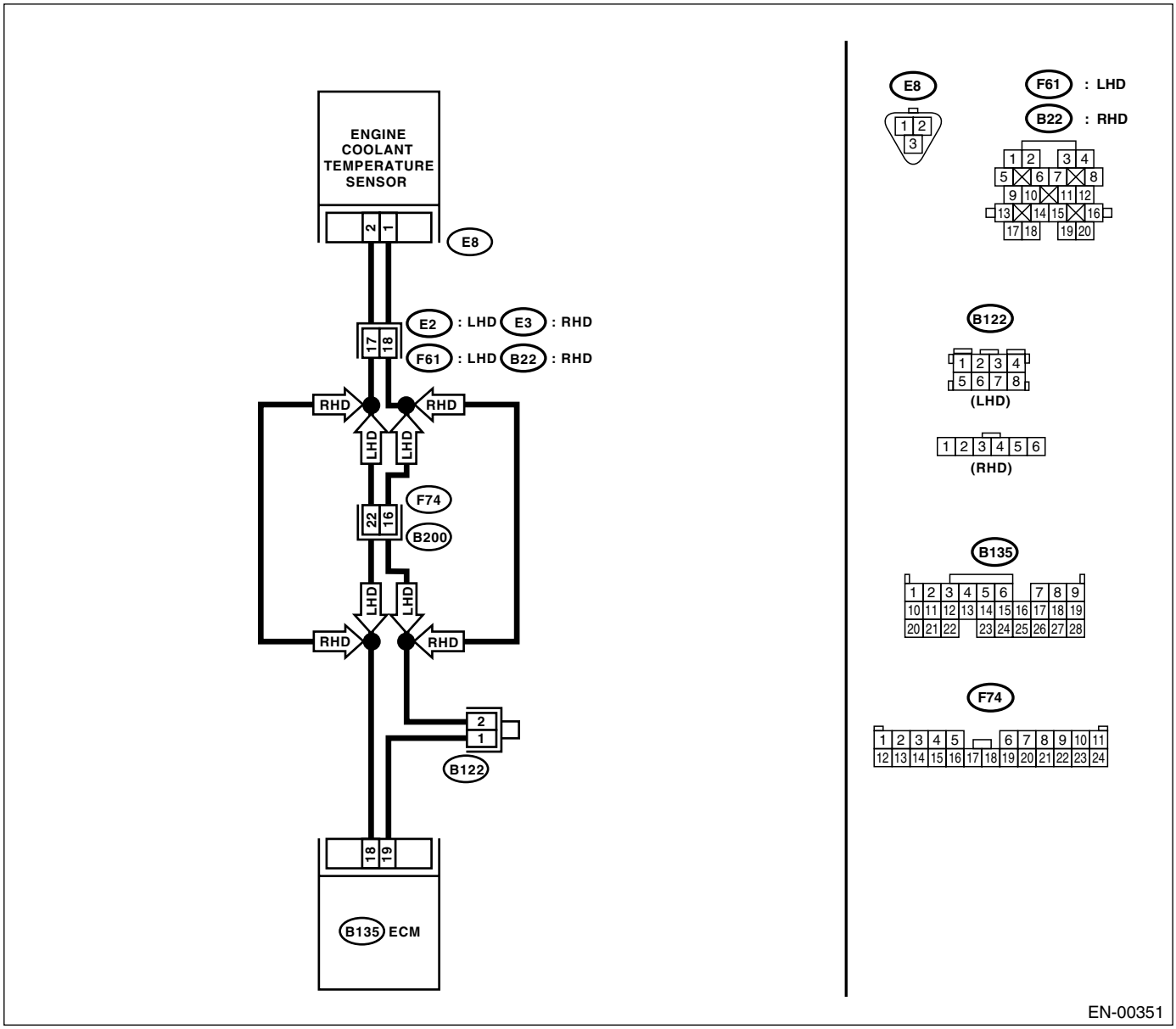
	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of harness between mass air flow and intake air temperature sensor and engine ground. ***Connector & terminal*** ***(B3) No. 5 — Engine ground:*** Is the measured value less than specified value?	5 Ω	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(TURBO)-33, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in ness between mass air flow and intake air temperature sensor and ECM connector • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector

N: DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Hard to start
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



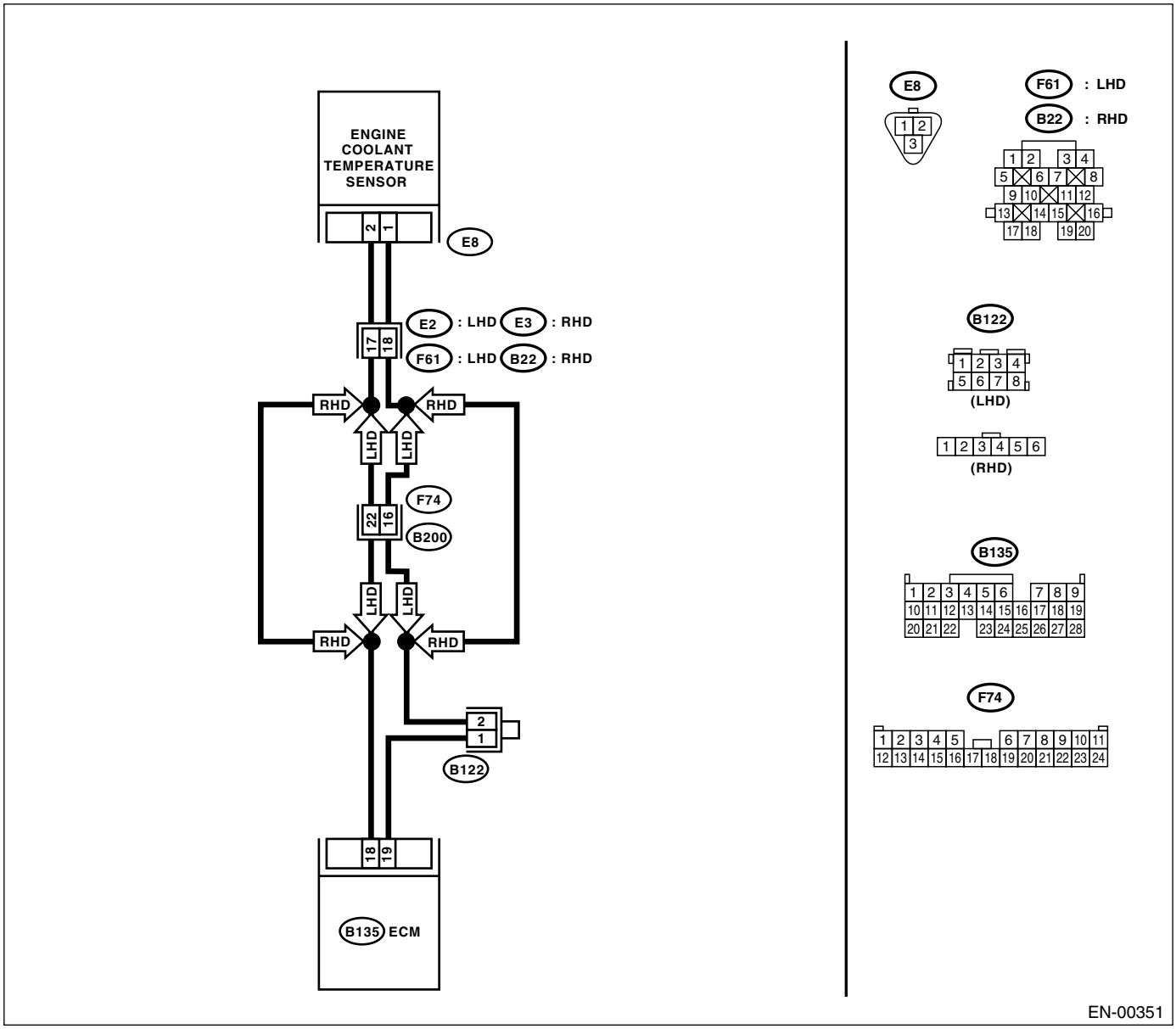
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value more than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	120°C (248°F)	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from engine coolant temperature sensor. 3)Turn the ignition switch to ON. 4)Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value less than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	–40°C (–40°F)	Replace the engine coolant temperature sensor. <Ref. to FU(TURBO)-28, Engine Coolant Temperature Sensor.>	Repair the ground short circuit in harness between engine coolant temperature sensor and ECM connector.

O: DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Hard to start
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value less than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	–40°C (–40°F)	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from engine coolant temperature sensor. 3)Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Repair the battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Repair the battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **4.**

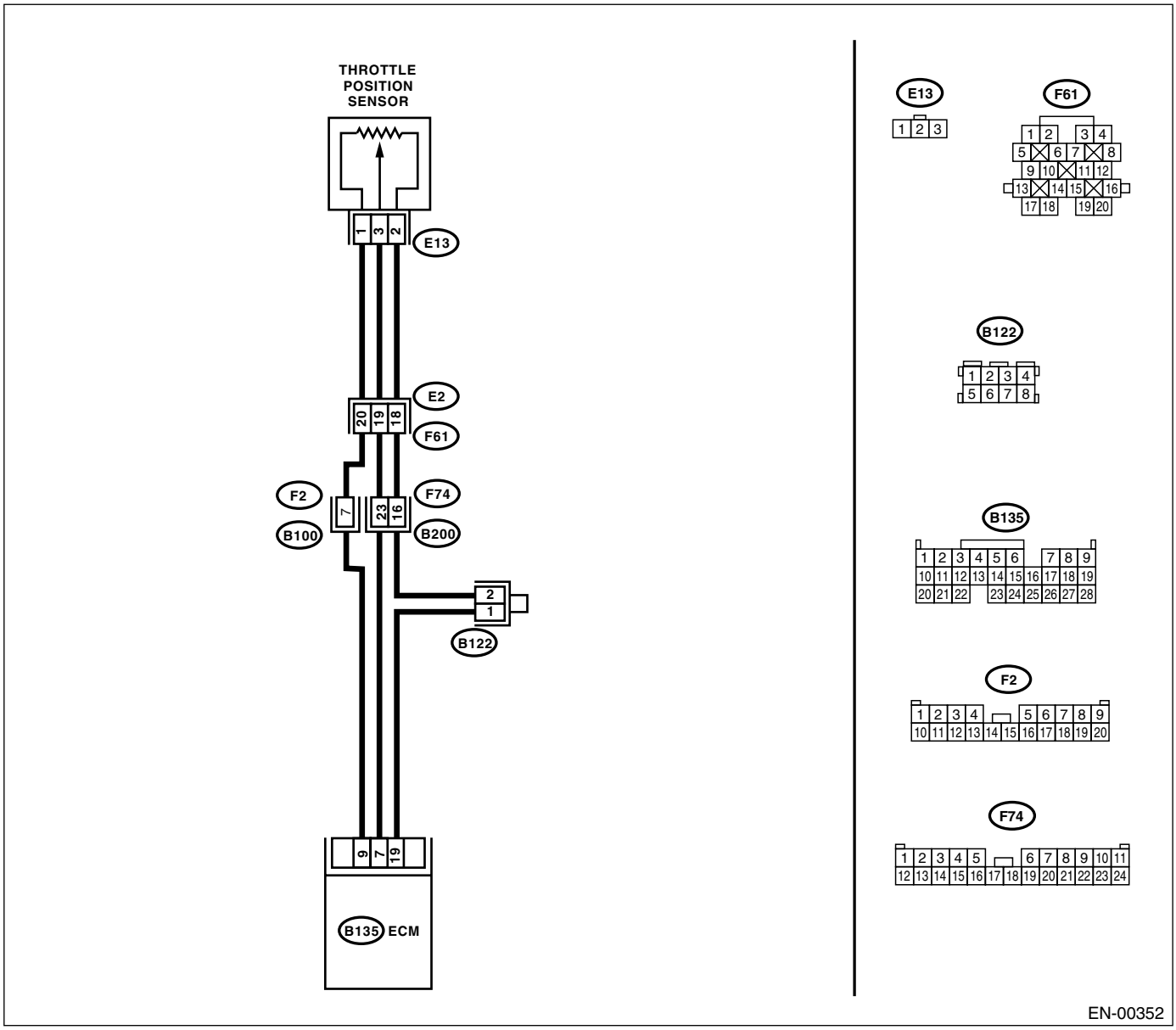
	Step	Check	Yes	No
4	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (–):*** Is the measured value more than specified value?	4 V	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
5	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of harness between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 — Engine ground:*** Is the measured value less than specified value?	5 Ω	Replace the engine coolant temperature sensor. <Ref. to FU(TURBO)-28, Engine Coolant Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

P: DTC P0121 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT RANGE/PERFORMANCE —

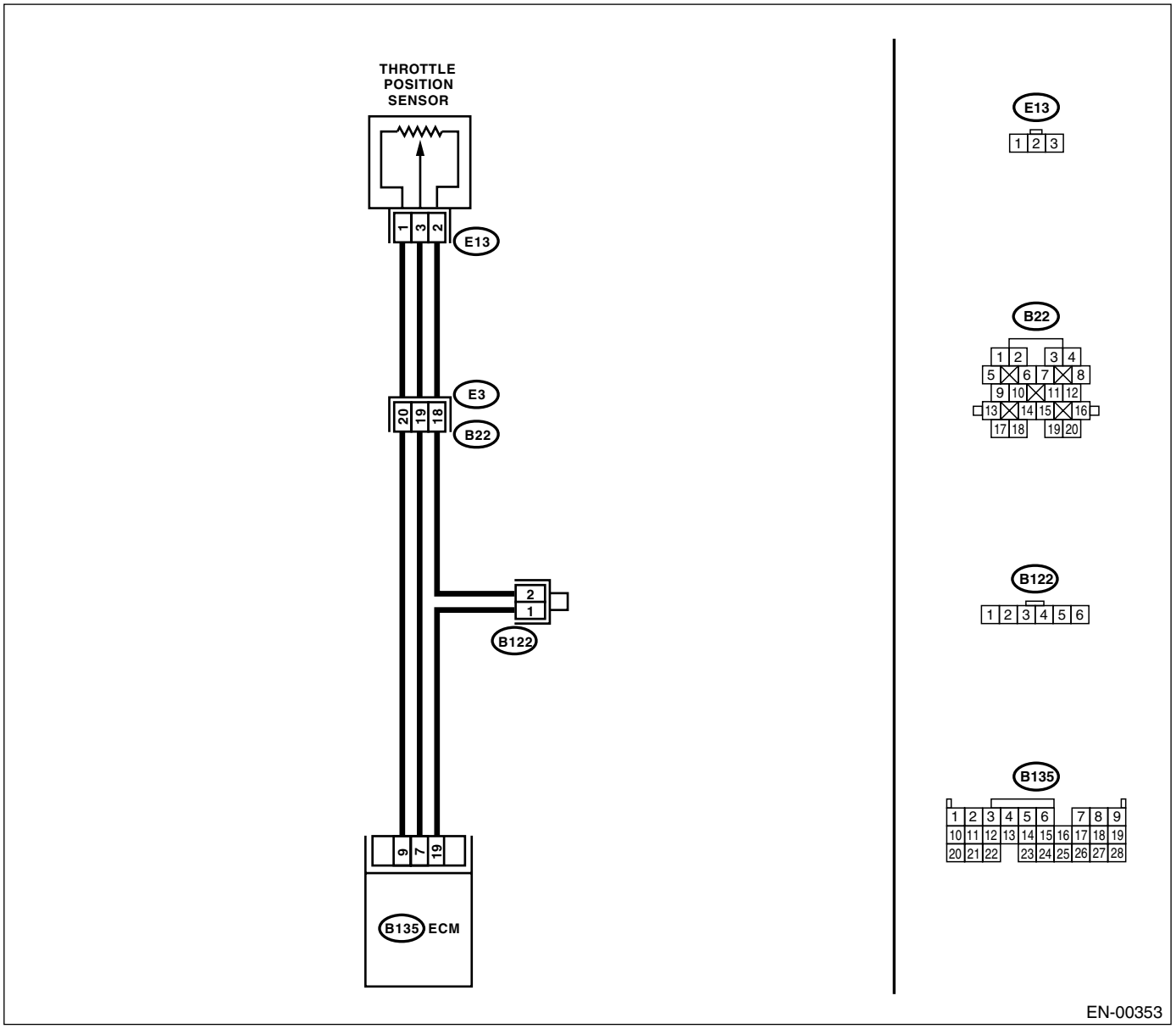
- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance
  - Fuel is cut.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**
- **LHD model**



- **RHD model**



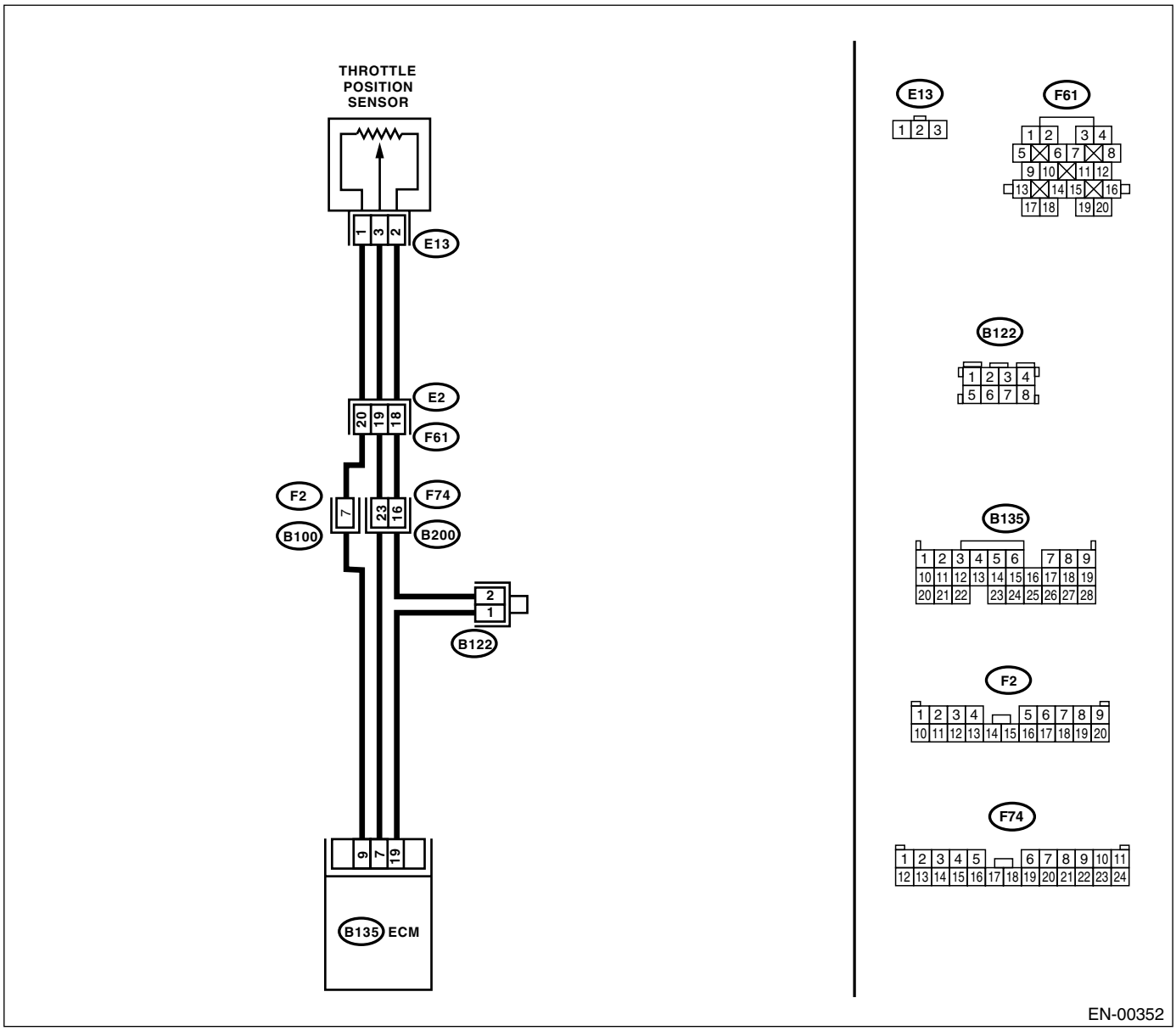
	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0121.	Replace the throttle position sensor. <Ref. to FU(TURBO)-32, Throttle Position Sensor.>

Q: DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —

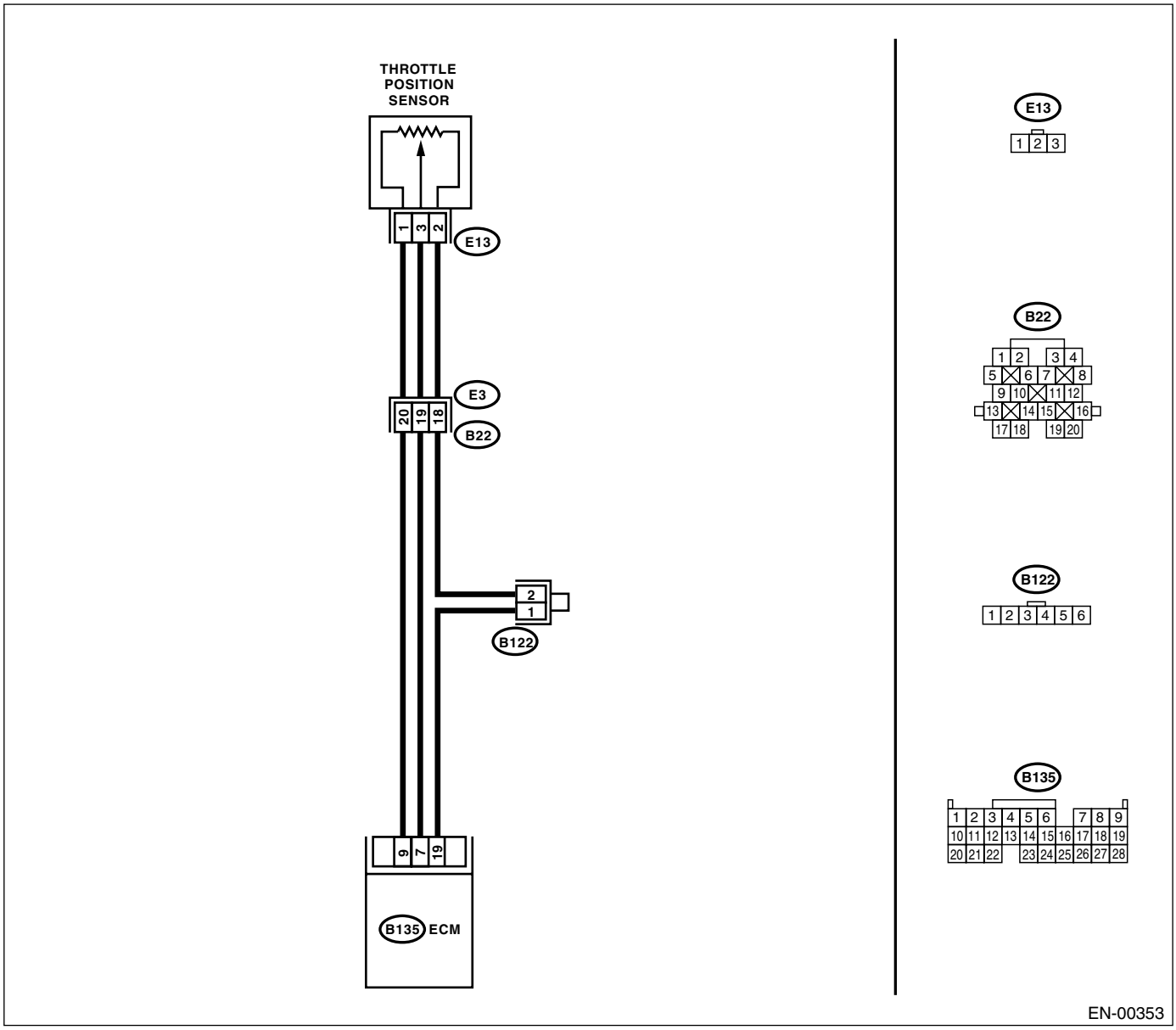
- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**
- **LHD model**



- **RHD model**


THROTTLE POSITION SENSOR
1
3
2
E13
E3
20
19
18
B22
2
1
B122
9
7
19
B135
ECM
E13
1 2 3
B22
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
B122
1 2 3 4 5 6
B135
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19
20 21 22 23 24 25 26 27 28
EN-00353

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value less than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	0.15 V	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground while throttle valve is fully closed. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4.5 V	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):*** Shake the ECM harness and connector, while monitoring value of voltage meter. Is the voltage change more than specified value?	4.5 V	Repair the poor contact in ECM connector.	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 7 (+) — Chassis ground (–):*** Is the measured value less than specified value?	0.15 V	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Measure the voltage between ECM connector and chassis ground. Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Is the voltage change more than specified value?	0.15 V	Repair the poor contact in ECM connector.	Go to step **6.**

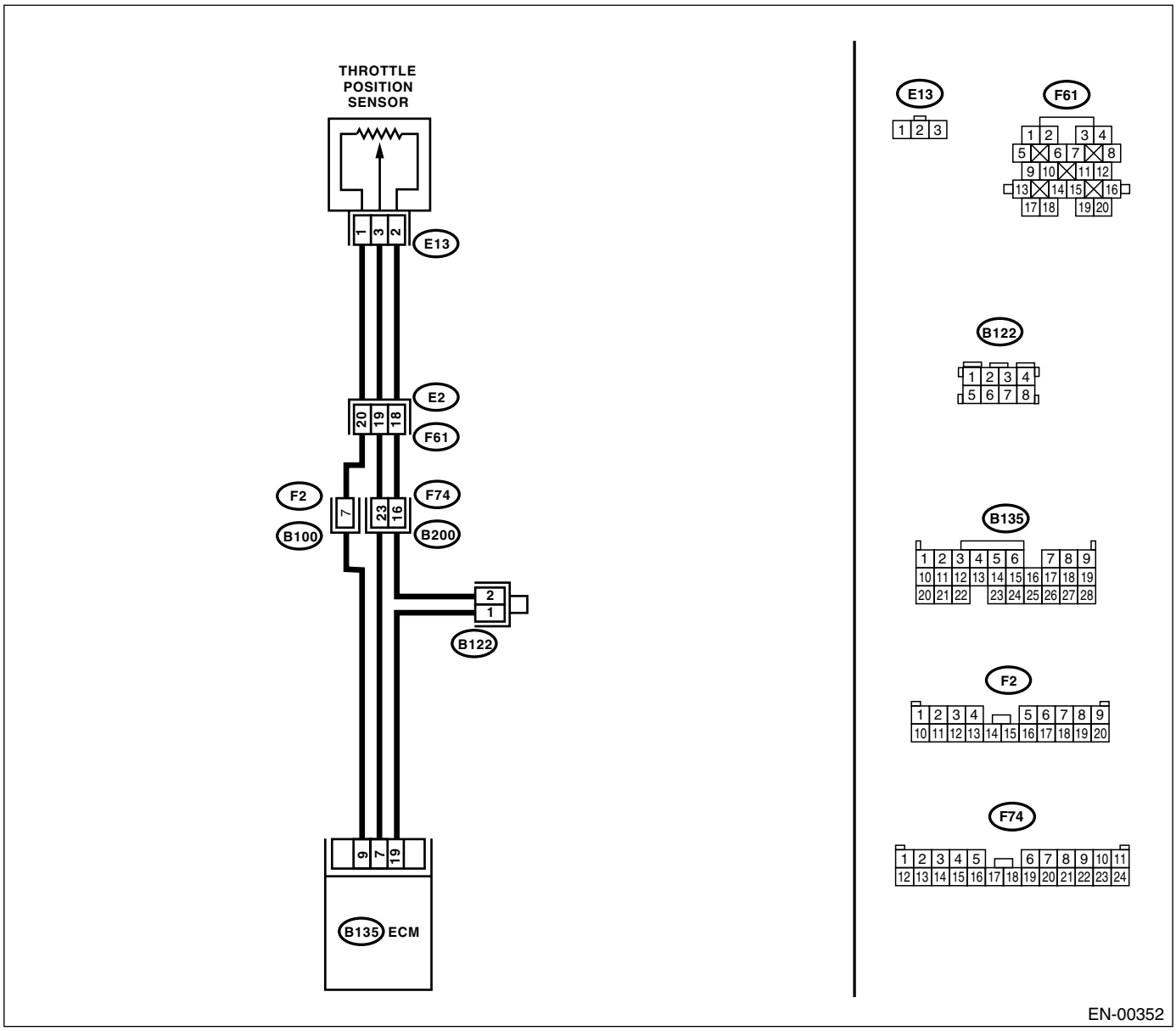
	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from throttle position sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 1 (+) — Engine ground (–):*** Is the measured value more than specified value?	4.5 V	Go to step **7.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
7	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of harness between ECM connector and throttle position sensor connector. ***Connector & terminal*** ***(B135) No. 7 — (E13) No. 3:*** Is the measured value less than specified value?	1 Ω	Go to step **8.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in ECM connector • Poor contact in throttle position sensor connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** Measure the resistance of harness between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 3 — Engine ground:*** Is the measured value less than specified value?	10 Ω	Repair the ground short circuit in harness between throttle position sensor and ECM connector.	Go to step **9.**
9	**CHECK POOR CONTACT.** Check poor contact in throttle position sensor connector. Is there poor contact in throttle position sensor connector?	Poor contact occurs.	Repair the poor contact in throttle position sensor connector.	Replace the throttle position sensor. <Ref. to FU(TURBO)-32, Throttle Position Sensor.>

R: DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT —

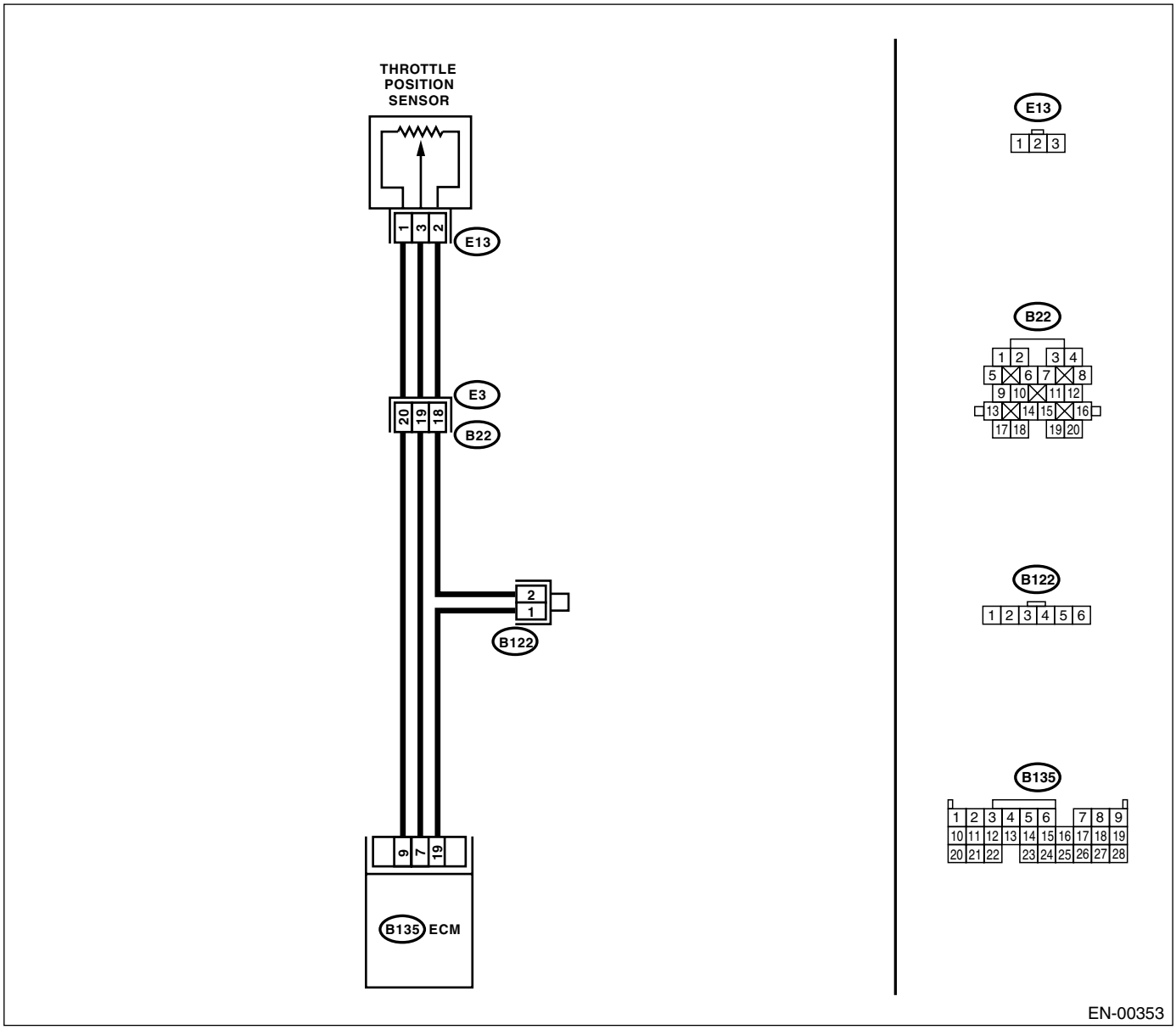
- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**
- **LHD model**



- **RHD model**


THROTTLE POSITION SENSOR
1
3
2
E13
E3
20
19
18
B22
2
1
B122
9
7
19
B135
ECM
E13
1 2 3
B22
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
B122
1 2 3 4 5 6
B135
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19
20 21 22 23 24 25 26 27 28
EN-00353

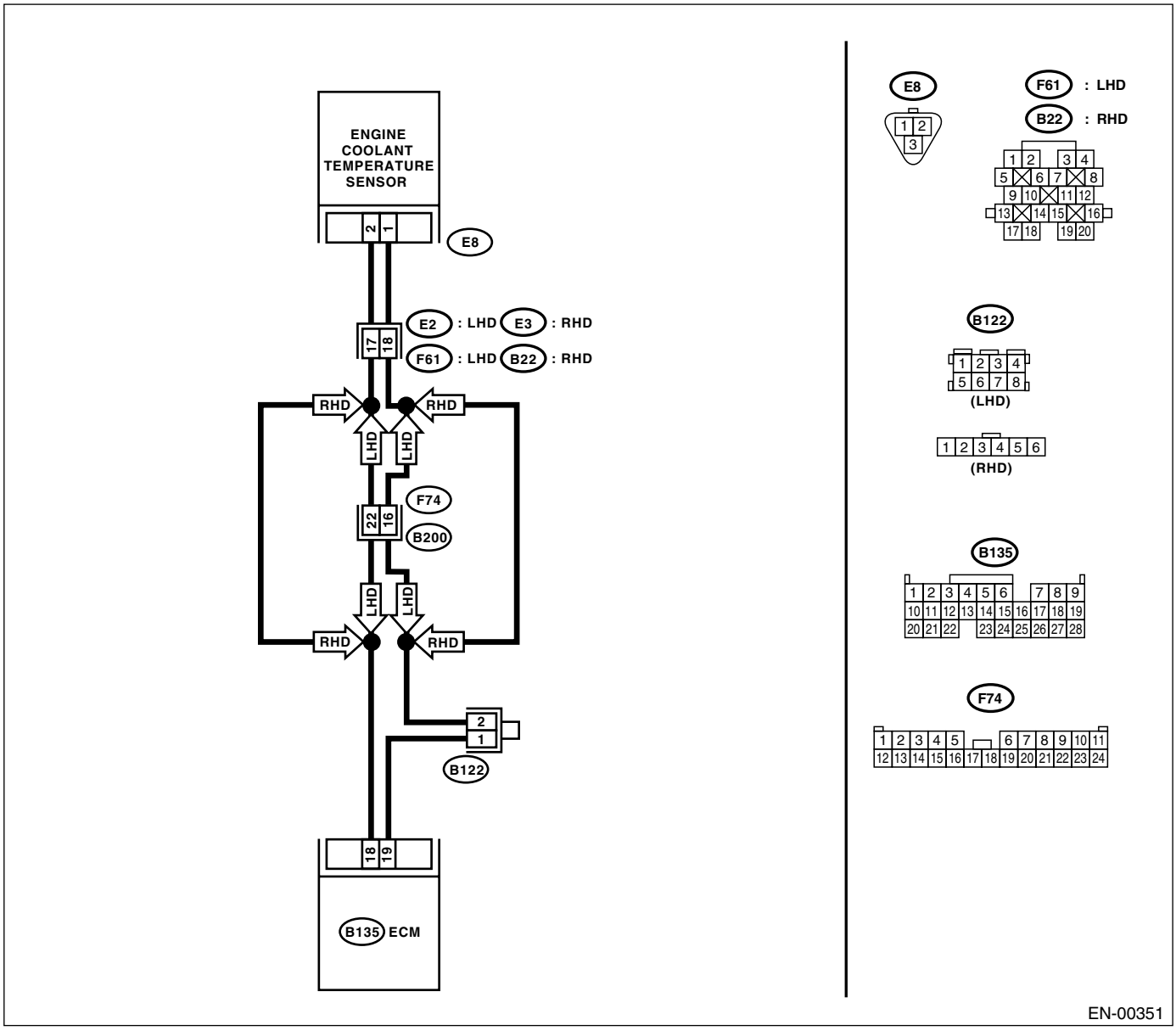
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value more than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	4.7 V	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from throttle position sensor. 3)Measure the resistance of harness between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 2 — Engine ground:*** Is the measured value less than specified value?	5 Ω	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
3	**CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 3 (+) — Engine ground (–):*** Is the measured value more than specified value?	4.7 V	Repair the battery short circuit in harness between throttle position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>	Replace the throttle position sensor. <Ref. to FU(TURBO)-32, Throttle Position Sensor.>

S: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine will not return to idling.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0125.	Go to step **2.**
2	**CHECK ENGINE COOLING SYSTEM.** NOTE: Check the following items. •Thermostat open stuck •Coolant level •Coolant freeze •Tire diameter Is there a fault in engine cooling system?	There is a fault.	Replace the thermostat. <Ref. to CO(SOHC)-25, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(TURBO)-28, Engine Coolant Temperature Sensor.>

T: DTC P0129 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

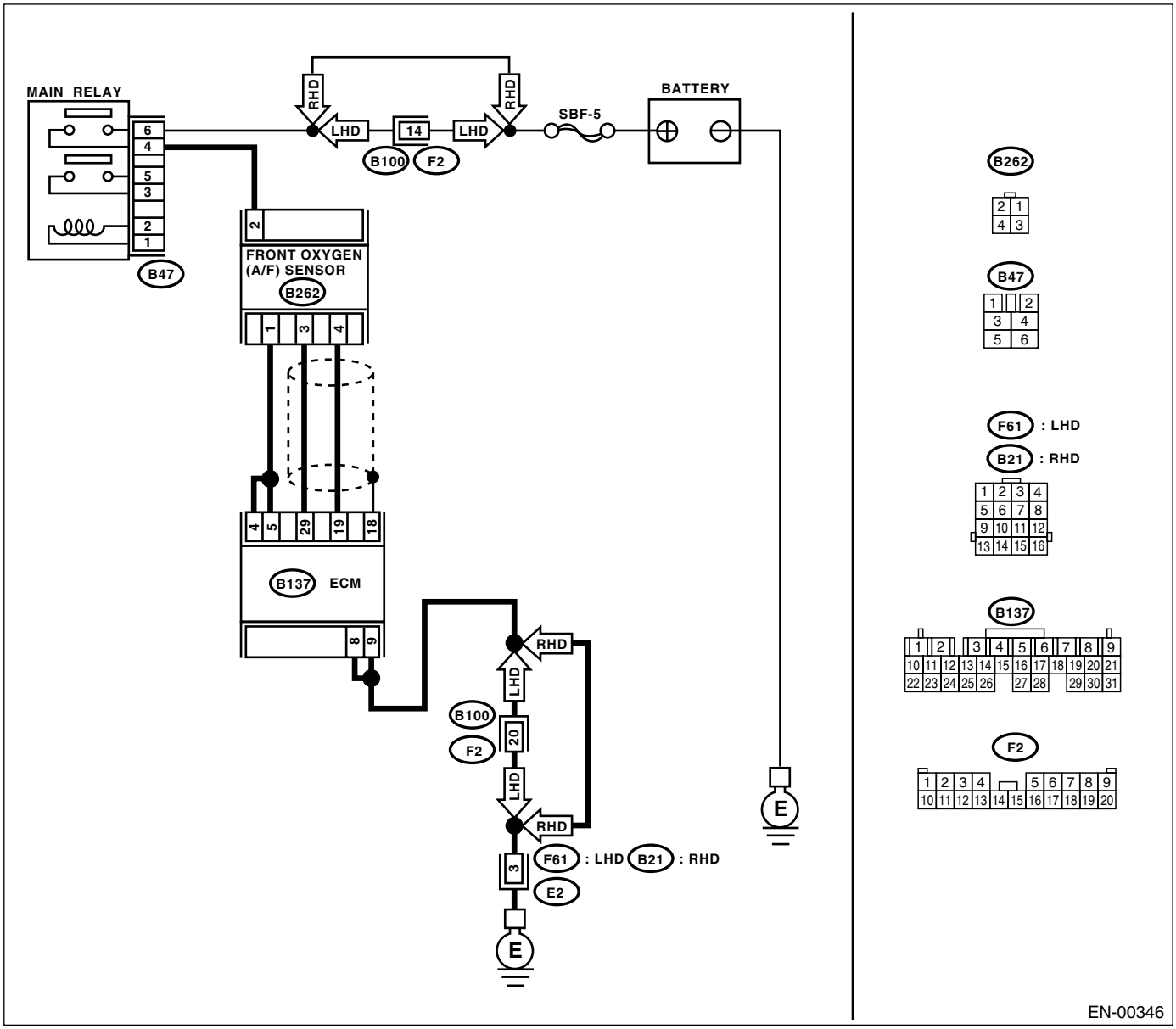
	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.	It is not necessary to inspect DTC P0129

U: DTC P0130 — O_2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



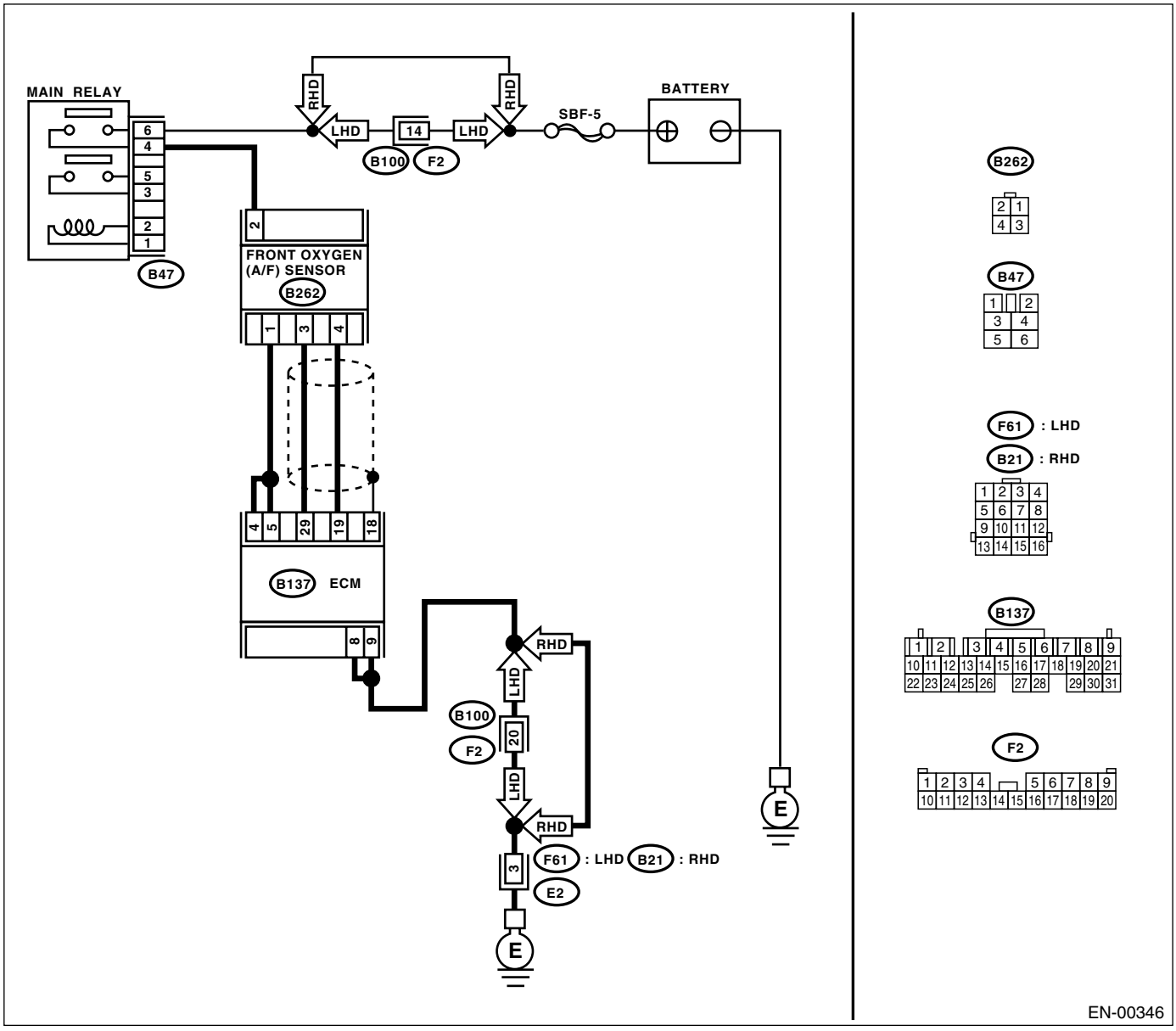
	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)".<Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FRONT (A/F) OXYGEN SENSOR DATA.** 1)Start the engine. 2)While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 70°C (158°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3)Read the data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value within specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	0.85 — 1.15 (In idling)	Go to step **3.**	Go to step **4.**
3	**CHECK REAR OXYGEN SENSOR SIGNAL.** 1)Race the engine at speeds from idling to 5,000 rpm for a total of 5 cycles. NOTE: To increase the engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approx. 5 seconds, and quickly release accelerator pedal to decrease engine speed. 2)Operate the LED operation mode for engine. Does the LED of {Rear O_2 Rich Signal} blink? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.>	LED illuminates.	Repair the poor contact in front oxygen (A/F) sensor and rear oxygen sensor connector.	Check the rear oxygen sensor circuit. <Ref. to FU(TURBO)-45, Rear Oxygen Sensor.>
4	**CHECK EXHAUST SYSTEM.** Check the exhaust system parts. NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness of front oxygen (A/F) sensor •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor Is there a fault in exhaust system?	There is a fault.	Repair or replace the faulty parts.	Replace the front oxygen (A/F) sensor. <Ref. to FU(TURBO)-43, Front Oxygen (A/F) Sensor.>

V: DTC P0133 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0133.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** NOTE: Check the following items. •Loose installation of front portion of exhaust pipe onto cylinder heads •Loose connection between front exhaust pipe and front catalytic converter •Damage of exhaust pipe resulting in a hole Is there a fault in exhaust system?	There is a fault.	Repair the exhaust system.	Replace the front oxygen (A/F) sensor. <Ref. to FU(TURBO)-43, Front Oxygen (A/F) Sensor.>

W: DTC P0134 — O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —

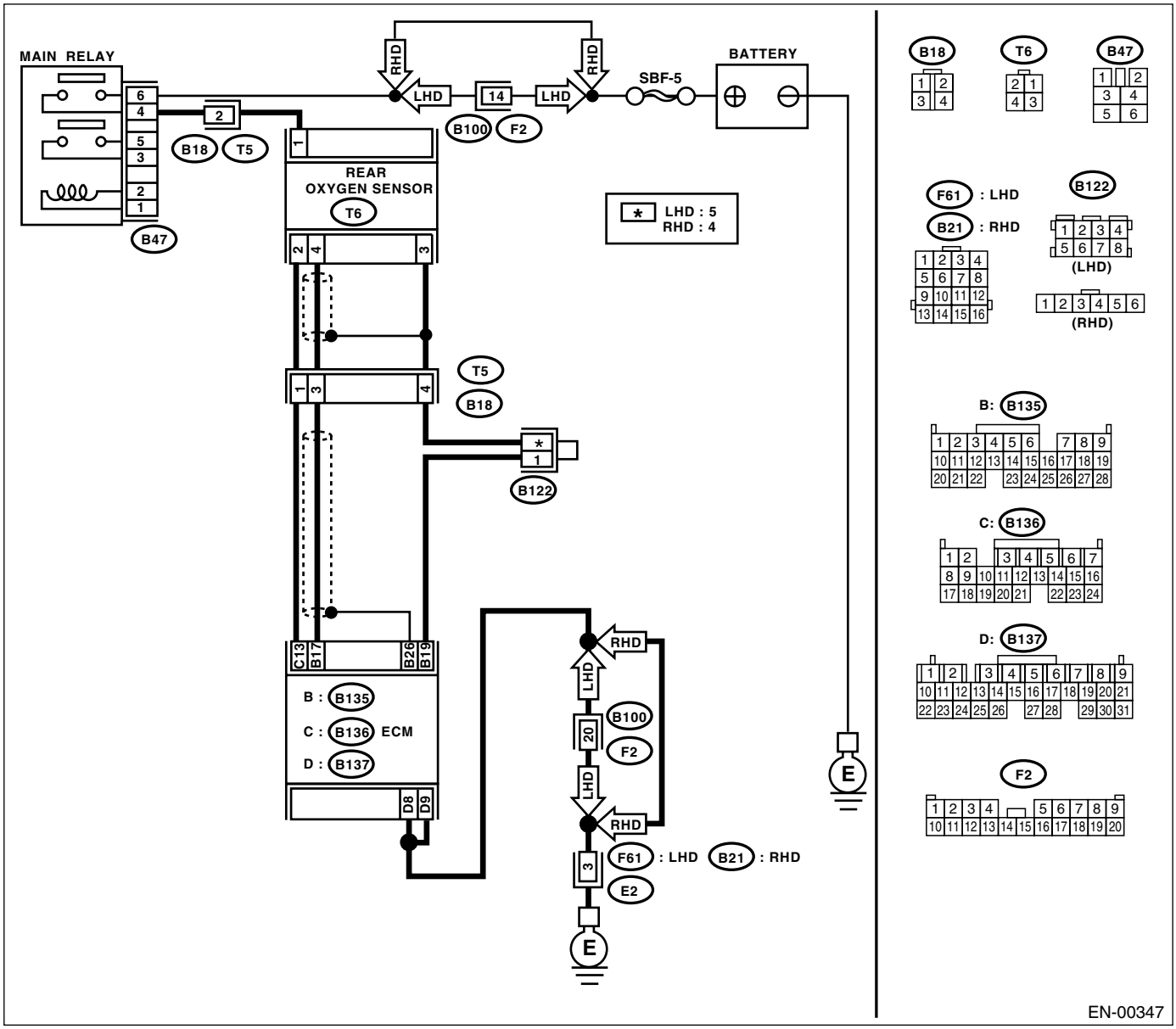
NOTE:
For the diagnostic procedure, refer to DTC P0130. <Ref. to EN(TURBO)-133, DTC P0130 — O_2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

X: DTC P0137 — O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Using the list of diagnostic trouble code (DTC), check the appropriate DTC. <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1)Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for 2 minutes. 2)Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. Does the value fluctuate? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Value fluctuates.	Go to step **6.**	Go to step **3.**
3	**CHECK REAR OXYGEN SENSOR DATA.** Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value within specified value?	0.2 — 0.4 V	Go to step **4.**	Replace the rear oxygen sensor. <Ref. to FU(TURBO)-45, Rear Oxygen Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and rear oxygen sensor. 3)Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 17 — (T6) No. 4:*** Is the measured value more than specified value?	3 Ω	Repair the open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from rear oxygen sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(T6) No. 4 (+) — Engine ground (–):*** Is the measured value more than specified value?	0.2 V	Replace the rear oxygen sensor. <Ref. to FU(TURBO)-45, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

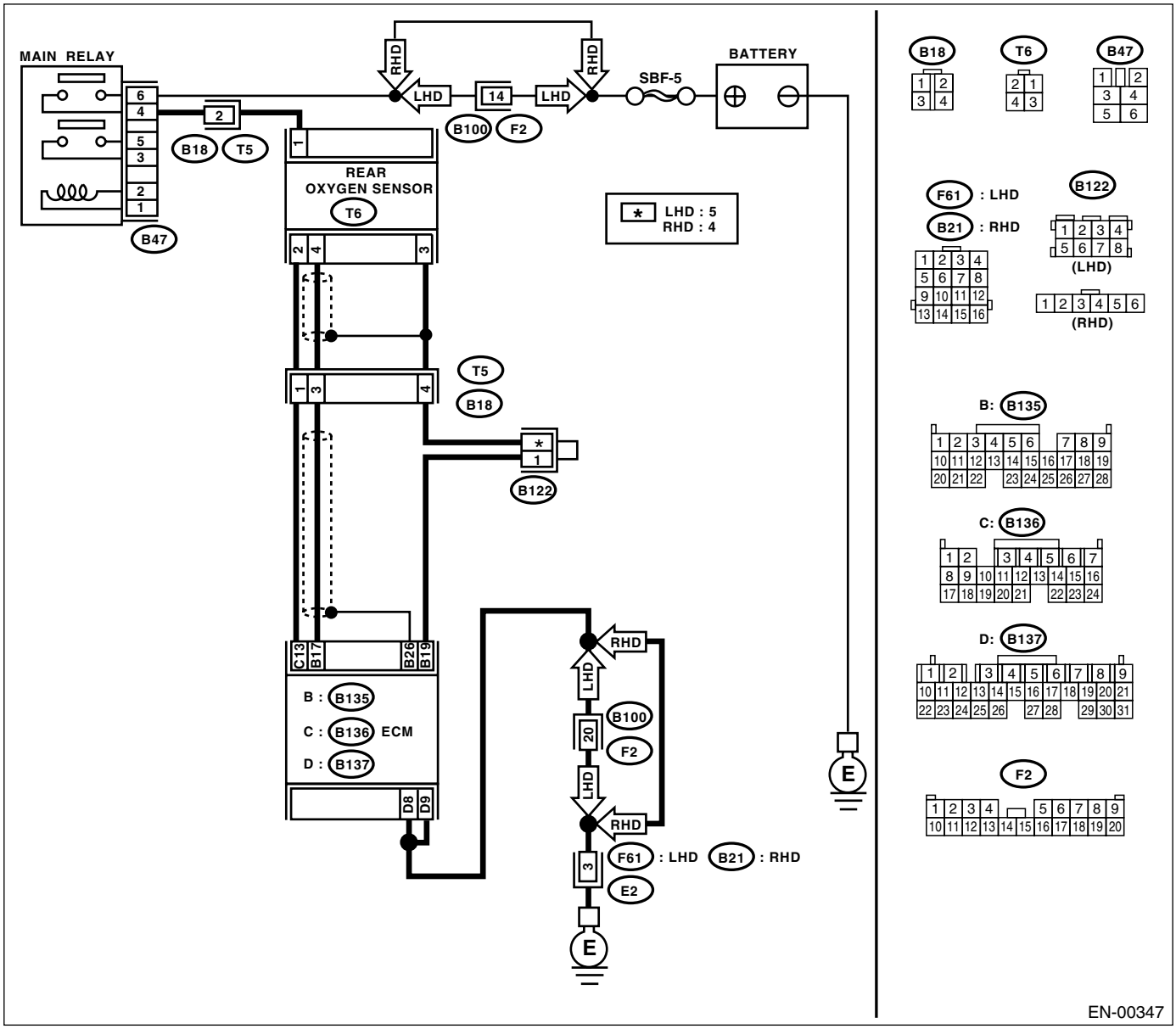
	Step	Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check the exhaust system parts. NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor Is there a fault in exhaust system?	There is a fault.	Repair or replace the faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(TURBO)-45, Rear Oxygen Sensor.>

Y: DTC P0138 — O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Using the list of diagnostic trouble code (DTC), check the appropriate DTC. <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1)Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for 2 minutes. 2)Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. Does the value fluctuate? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Value fluctuates.	Go to step **6.**	Go to step **3.**
3	**CHECK REAR OXYGEN SENSOR DATA.** Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value within specified value?	0.2 — 0.4 V	Go to step **4.**	Replace the rear oxygen sensor. <Ref. to FU(TURBO)-45, Rear Oxygen Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and rear oxygen sensor. 3)Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 17 — (T6) No. 4:*** Is the measured value more than specified value?	3 Ω	Repair the open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from rear oxygen sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(T6) No. 4 (+) — Engine ground (–):*** Is the measured value more than specified value?	0.2 V	Replace the rear oxygen sensor. <Ref. to FU(TURBO)-45, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

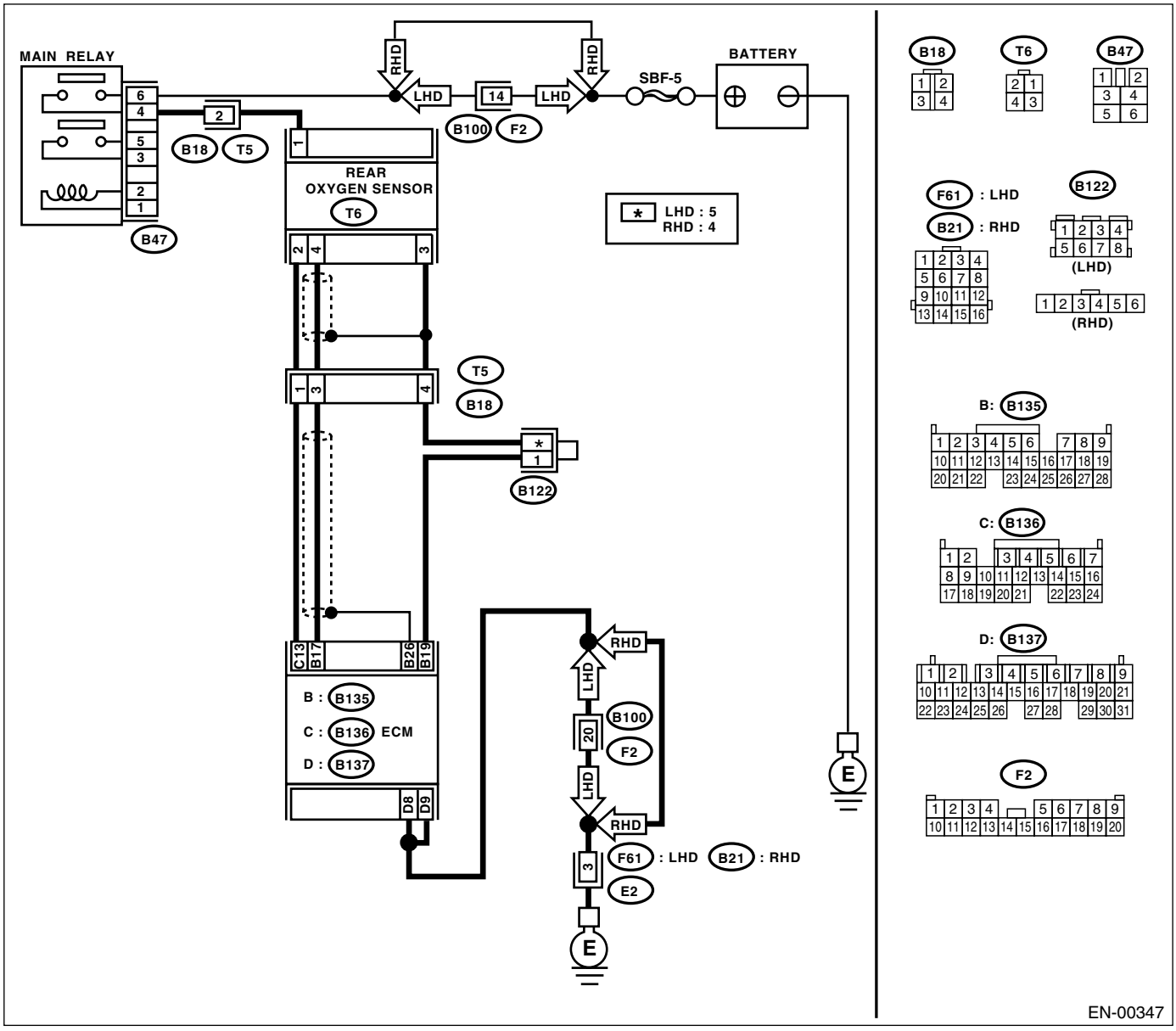
	Step	Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check the exhaust system parts. NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor Is there a fault in exhaust system?	There is a fault.	Repair or replace the faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(TURBO)-45, Rear Oxygen Sensor.>

Z: DTC P0139 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0139.	Replace the rear oxygen sensor. <Ref. to FU(TURBO)-45, Rear Oxygen Sensor.>

AA:DTC P0171 — SYSTEM TOO LEAN (BANK 1) —

NOTE:
For the diagnostic procedure, refer to DTC P0172. <Ref. to EN(TURBO)-145, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AB:DTC P0172 — SYSTEM TOO RICH (BANK 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.** Are there holes or loose bolts on exhaust system?	There are not holes or loose bolts.	Go to step **2.**	Repair the exhaust system.
2	**CHECK AIR INTAKE SYSTEM.** Are there holes, loose bolts or disconnection of hose on air intake system?	There are not holes or loose bolts.	Go to step **3.**	Repair the air intake system.
3	**CHECK FUEL PRESSURE.** **Warning:** **•Place "NO FIRE" signs near the working area.** **•Be careful not to spill fuel on the floor.** 1)Release the fuel pressure. (1) Disconnect the connector from fuel pump relay. (2) Start the engine and run it until it stalls. (3) After the engine stalls, crank it for 5 more seconds. (4) Turn the ignition switch to OFF. 2)Connect the connector to fuel pump relay. 3)Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4)Install the fuel filler cap. 5)Start the engine and idle while gear position is neutral. 6)Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. Is the measured value within specified value? **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	284 — 314 kPa (2.9 — 3.2 kg/cm^2, 41 — 46 psi)	Go to step **4.**	Repair the following items. Fuel pressure too high: • Clogged fuel return line or bent hose Fuel pressure too low: • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
4	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. Is the measured value within specified value? **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: •If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. •If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.	206 — 235 kPa (2.1 — 2.4 kg/cm^2, 30 — 34 psi)	Go to step **5.**	Repair the following items. Fuel pressure too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
5	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1)Start the engine and warm-up completely. 2)Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value more than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	60°C (140°F)	Go to step **6.**	Replace the engine coolant temperature sensor. <Ref. to FU(TURBO)-28, Engine Coolant Temperature Sensor.>
6	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE.** 1)Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2)Place the shift lever in neutral position. 3)Turn the A/C switch to OFF. 4)Turn all accessory switches to OFF. 5)Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value within specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Ignition ON: 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) Idling: 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)	Go to step **7.**	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(TURBO)-33, Mass Air Flow and Intake Air Temperature Sensor.>

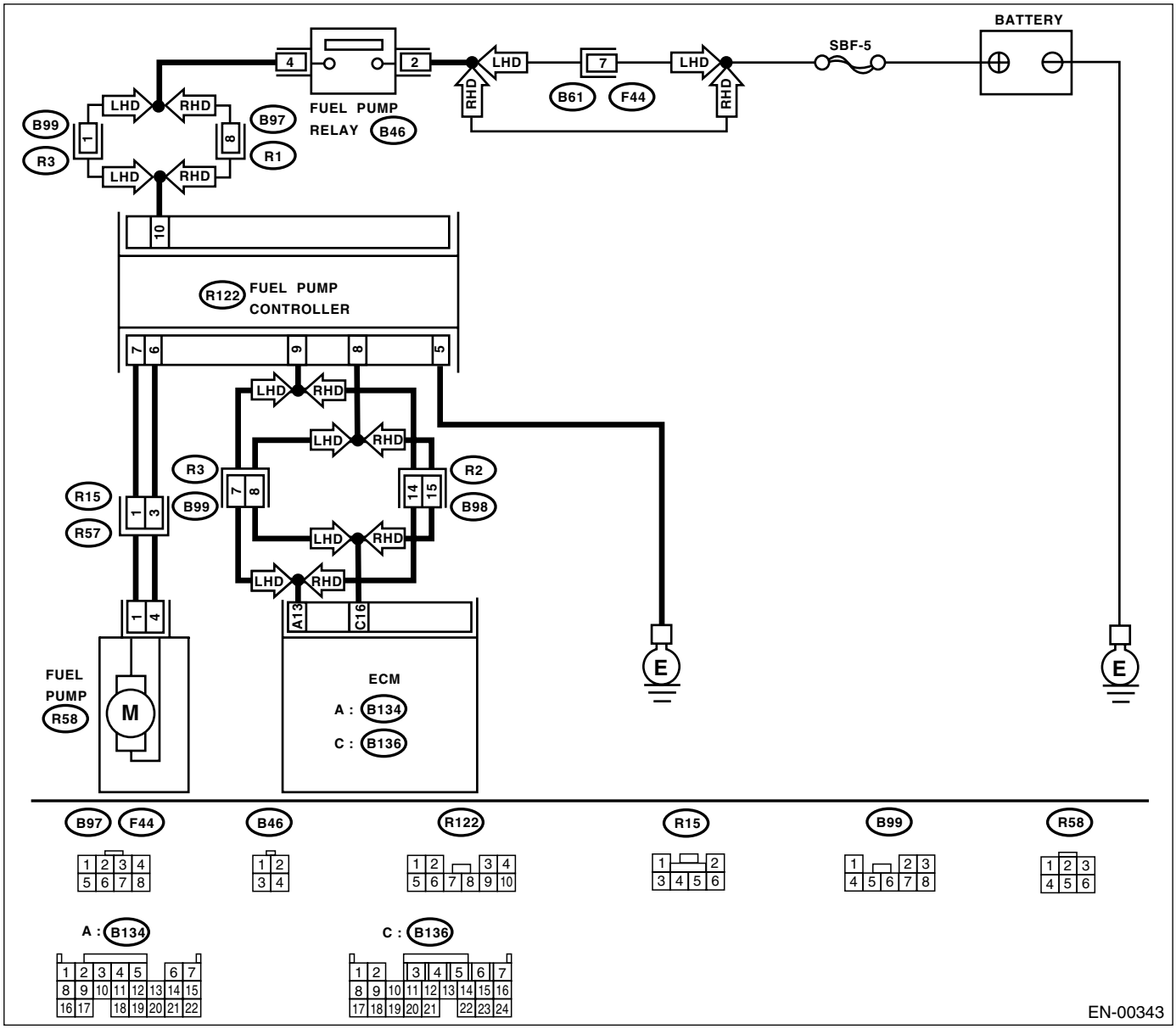
	Step	Check	Yes	No
7	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1)Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2)Place the shift lever in neutral position. 3)Turn the A/C switch to OFF. 4)Turn all accessory switches to OFF. 5)Open the front hood. 6)Measure the ambient temperature. 7)Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. Subtract ambient temperature from intake air temperature. Is the obtained value within specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	−10°C (14°F) — 50°C (122°F)	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(TURBO)-33, Mass Air Flow and Intake Air Temperature Sensor.>

AC:DTC P0230 — FUEL PUMP PRIMARY CIRCUIT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY CIRCUIT TO FUEL PUMP CONTROLLER.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from fuel pump controller. 3)Turn the ignition switch to ON. 4)Measure the voltage between fuel pump controller and chassis ground. ***Connector & terminal*** ***(R122) No. 10 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **2.**	Repair the power supply circuit. NOTE: In this case repair the following: • Open or ground short circuit in harness between fuel pump relay and fuel pump controller • Poor contact in fuel pump controller connector • Poor contact in fuel pump relay connector
2	**CHECK GROUND CIRCUIT OF FUEL PUMP CONTROLLER.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of harness between fuel pump controller and chassis ground. ***Connector & terminal*** ***(R122) No. 5 — Chassis ground:*** Is the measured value less than specified value?	5 Ω	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit between fuel pump controller and chassis ground • Poor contact in fuel pump controller connector
3	**CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND FUEL PUMP CONNECTOR.** 1)Disconnect the connector from fuel pump. 2)Measure the resistance of harness between fuel pump controller and fuel pump connector. ***Connector & terminal*** ***(R122) No. 7 — (R58) No. 1:*** ***(R122) No. 6 — (R58) No. 4:*** Is the measured value less than specified value?	1 Ω	Go to step **4.**	Repair the open circuit between fuel pump controller and fuel pump.
4	**CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND FUEL PUMP CONNECTOR.** Measure the resistance of harness between fuel pump controller and chassis ground. ***Connector & terminal*** ***(R122) No. 7 — Chassis ground:*** ***(R122) No. 6 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **5.**	Repair the ground short circuit between fuel pump controller and fuel pump.

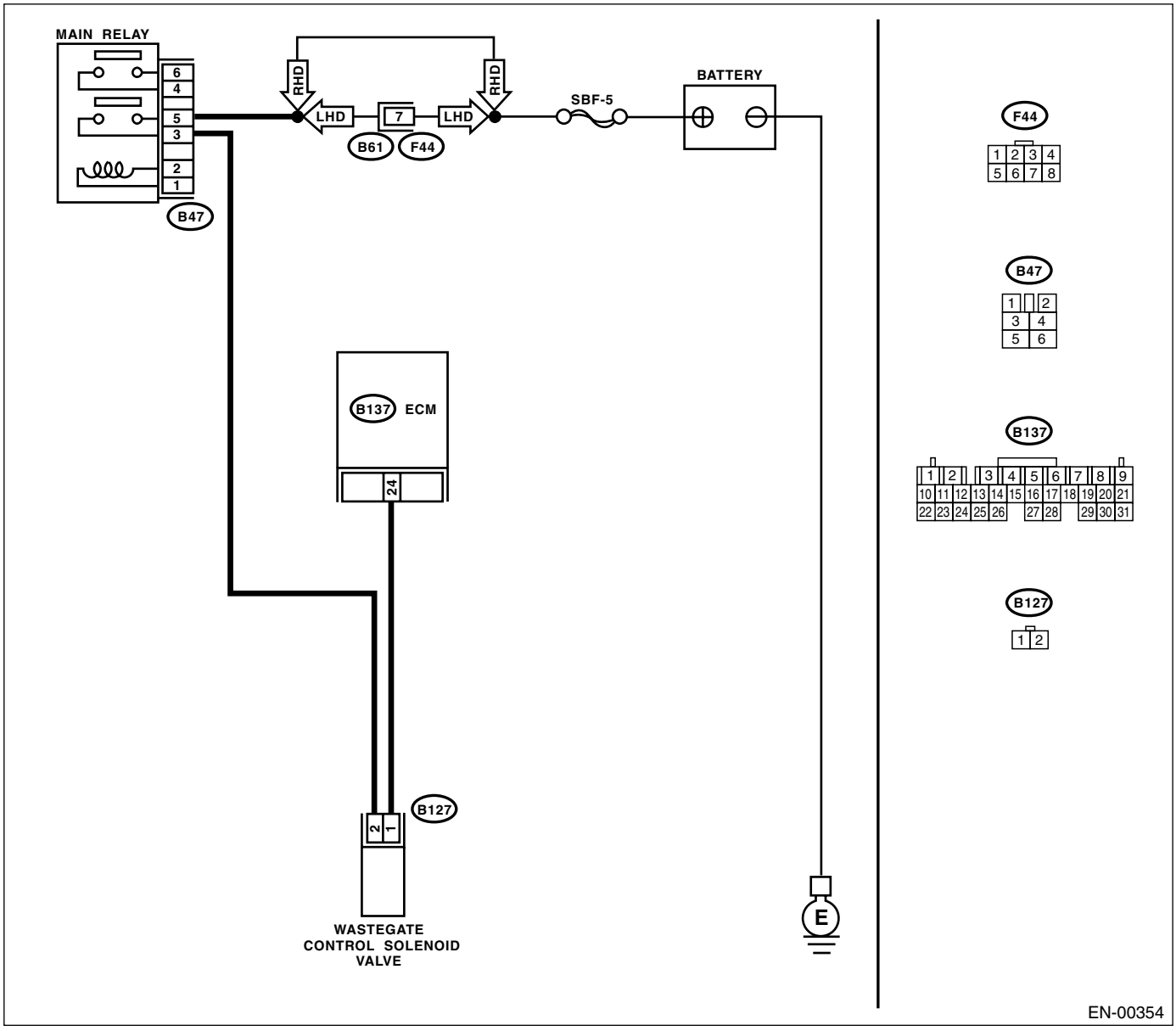
	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between fuel pump controller and ECM connector. ***Connector & terminal*** ***(R122) No. 9 — (B134) No. 13:*** ***(R122) No. 8 — (B136) No. 16:*** Is the measured value less than specified value?	1 Ω	Go to step **6.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit between fuel pump controller and ECM • Poor contact in fuel pump controller and ECM connector
6	**CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND ECM CONNECTOR.** Measure the resistance of harness between fuel pump controller and chassis ground. ***Connector & terminal*** ***(R122) No. 9 — Chassis ground:*** ***(R122) No. 8 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **7.**	Repair the ground short circuit between fuel pump controller and ECM.
7	**CHECK POOR CONTACT.** Check poor contact in ECM and fuel pump controller connector. Is there poor contact in ECM and fuel pump controller connector?	Poor contact occurs.	Repair the poor contact in ECM and fuel pump controller.	Replace the fuel pump controller. <Ref. to FU(TURBO)-51, Fuel Pump Controller.>

AD:DTC P0244 — TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



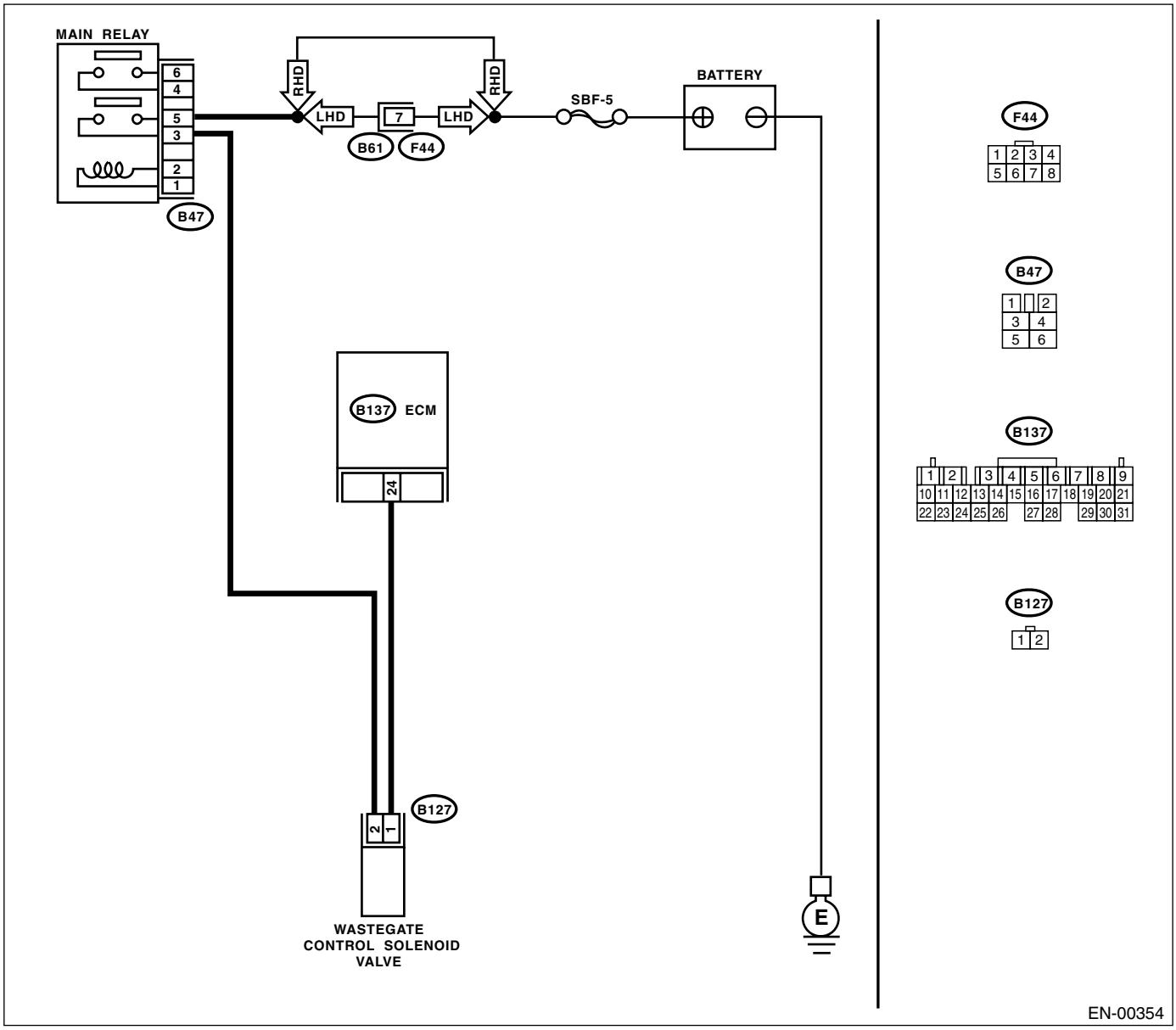
	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0244.	Replace the wastegate control solenoid valve. <Ref. to FU(TURBO)-42, Wastegate Control Solenoid Valve.>

AE:DTC P0245 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 24 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Even if MIL lights up, the circuit has returned to a normal condition at this time. Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Go to step **2.**
2	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from wastegate control solenoid valve and ECM. 3)Measure the resistance of harness between wastegate control solenoid valve connector and engine ground. ***Connector & terminal*** ***(B127) No. 1 — Engine ground:*** Is the measured value less than specified value?	10 Ω	Repair the ground short circuit in harness between ECM and wastegate control solenoid valve connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and wastegate control solenoid valve of harness connector. ***Connector & terminal*** ***(B137) No. 24 — (B127) No. 1:*** Is the measured value less than specified value?	1 Ω	Go to step **4.**	Repair the open circuit in harness between ECM and wastegate control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and wastegate control solenoid valve connector
4	**CHECK WASTEGATE CONTROL SOLENOID VALVE.** 1)Remove the wastegate control solenoid valve. 2)Measure the resistance between wastegate control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within specified value?	30 — 34 Ω	Go to step **5.**	Replace the wastegate control solenoid valve. <Ref. to FU(TURBO)-42, Wastegate Control Solenoid Valve.>

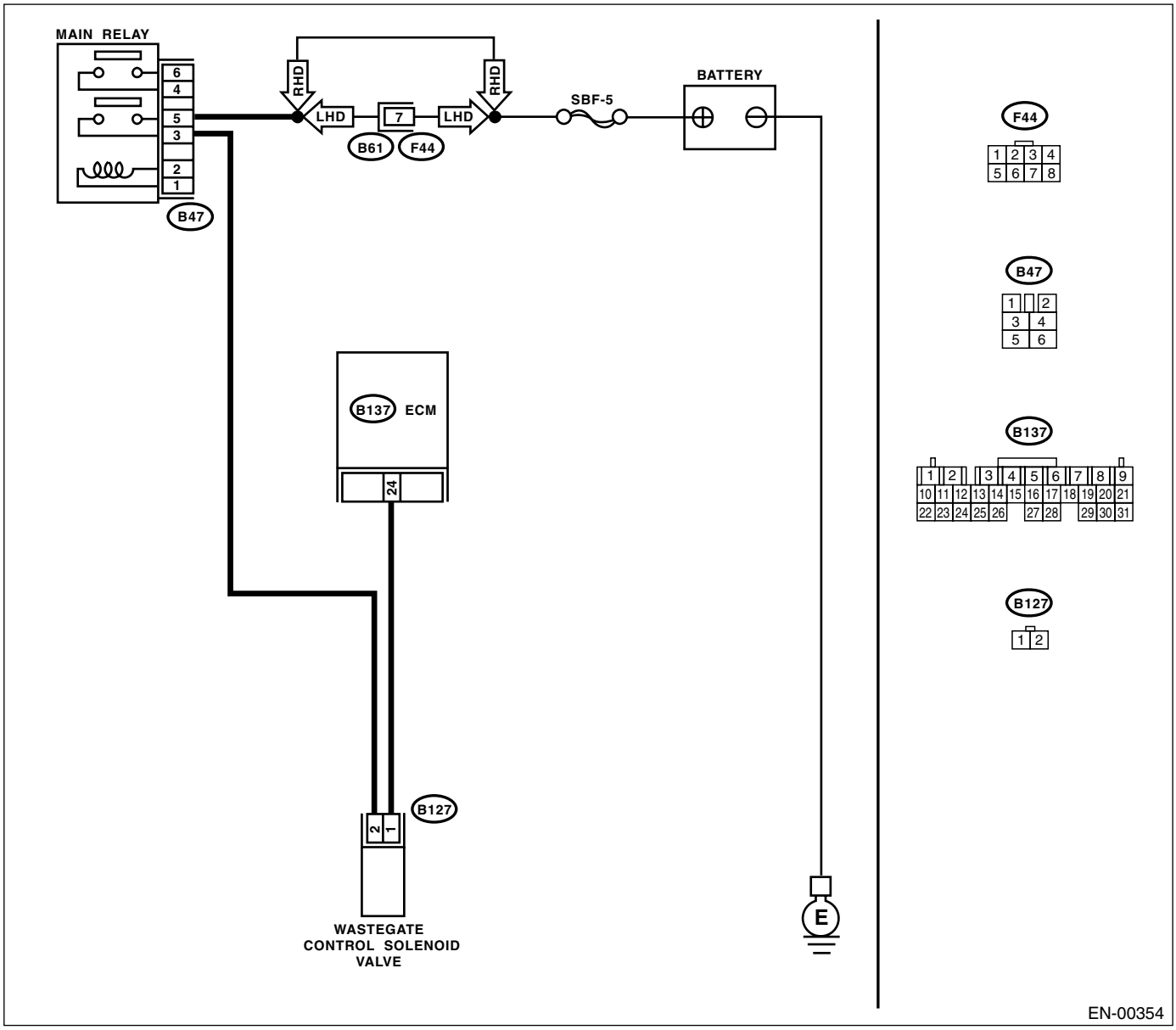
	Step	Check	Yes	No
5	**CHECK POWER SUPPLY TO WASTEGATE CONTROL SOLENOID VALVE.** 1)Turn the ignition switch to ON. 2)Measure the voltage between wastegate control solenoid valve and engine ground. ***Connector & terminal*** ***(B127) No. 2 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Go to step **6.**	Repair the open circuit in harness between main relay and wastegate control solenoid valve connector.
6	**CHECK POOR CONTACT.** Check poor contact in wastegate control solenoid valve connector. Is there poor contact in wastegate control solenoid valve connector?	Poor contact occurs.	Repair the poor contact in wastegate control solenoid valve connector.	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AF:DTC P0246 — TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 24 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **3.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>
3	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from wastegate control solenoid valve. 3)Turn the ignition switch to ON. 4)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 24 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Repair the battery short circuit in harness between ECM and wastegate control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>	Go to step **4.**
4	**CHECK WASTEGATE CONTROL SOLENOID VALVE.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between wastegate control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value less than specified value?	1 Ω	Replace the wastegate control solenoid valve <Ref. to FU(TURBO)-42, Wastegate Control Solenoid Valve.> and ECM <Ref. to FU(TURBO)-48, Engine Control Module.>	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>

AG:DTC P0301 — CYLINDER 1 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(TURBO)-159, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AH:DTC P0302 — CYLINDER 2 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(TURBO)-159, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AI: DTC P0303 — CYLINDER 3 MISFIRE DETECTED —

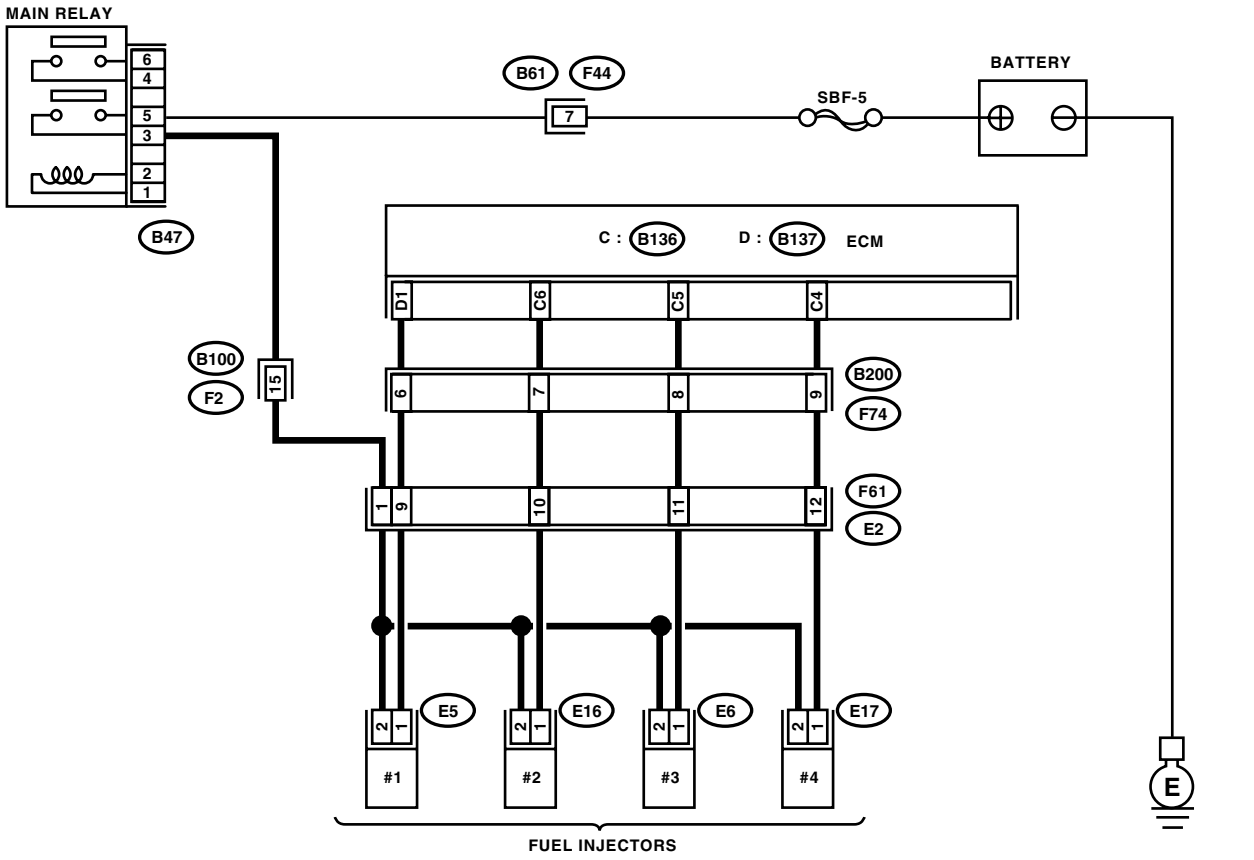
NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(TURBO)-159, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

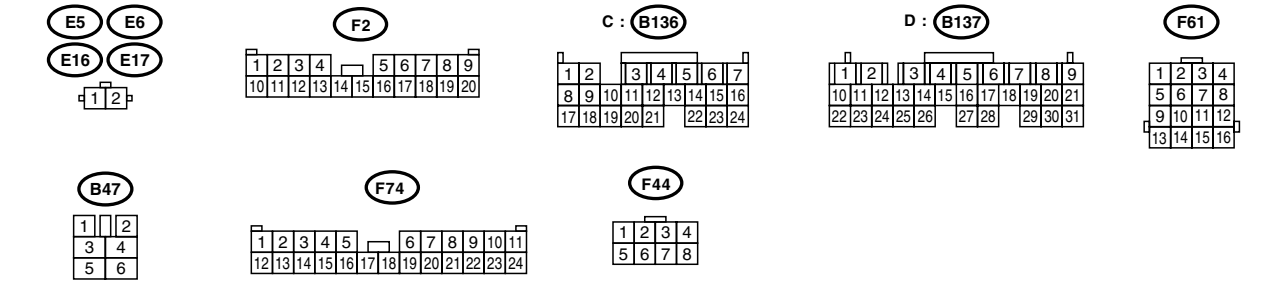
AJ:DTC P0304 — CYLINDER 4 MISFIRE DETECTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - Immediately at fault recognition (A misfire which could damage catalyst occurs.)
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Erroneous idling
  - Rough driving

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

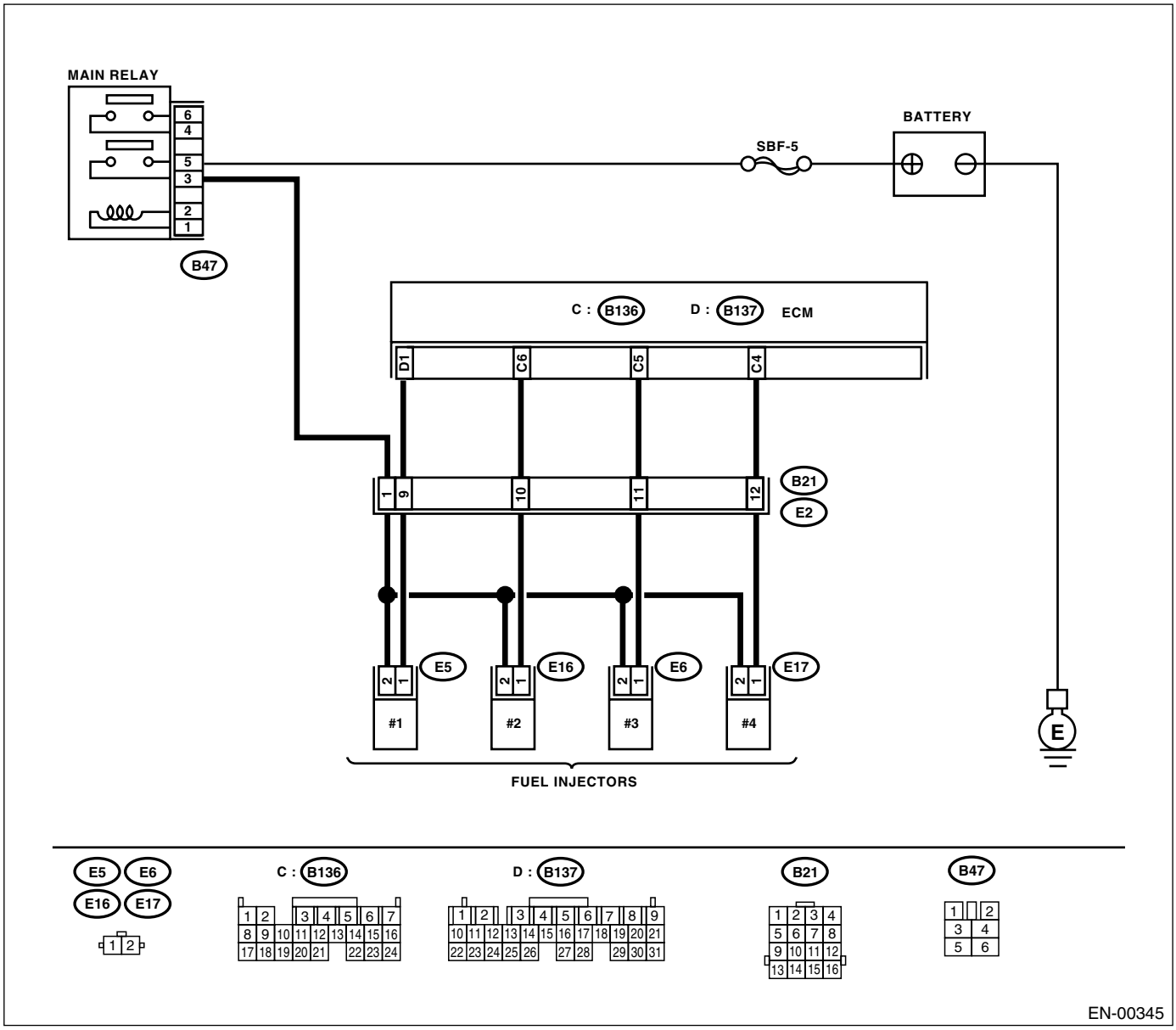
- **WIRING DIAGRAM:**
- **LHD model**





EN-00344

- **RHD model**



Step		Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B137) No. 1 (+) — Chassis ground (–):*** ***#2 (B136) No. 6 (+) — Chassis ground (–):*** ***#3 (B136) No. 5 (+) — Chassis ground (–):*** ***#4 (B136) No. 4 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **7.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from fuel injector on faulty cylinders. 3)Disconnect the connector from ECM. 4)Measure the resistance between ECM connector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 1 — Engine ground:*** ***#2 (E16) No. 1 — Engine ground:*** ***#3 (E6) No. 1 — Engine ground:*** ***#4 (E17) No. 1 — Engine ground:*** Is the measured value less than specified value?	10 Ω	Repair the ground short circuit in harness between fuel injector and ECM connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** Measure the resistance of harness connector between ECM connector and fuel injector on faulty cylinders. ***Connector & terminal*** ***#1 (B137) No. 1 — (E5) No. 1:*** ***#2 (B136) No. 6 — (E16) No. 1:*** ***#3 (B136) No. 5 — (E6) No. 1:*** ***#4 (B136) No. 4 — (E17) No. 1:*** Is the measured value less than specified value?	1 Ω	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
5	**CHECK FUEL INJECTOR.** Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within specified value?	5 — 20 Ω	Go to step **6.**	Replace the faulty fuel injector. <Ref. to FU(TURBO)-36, Fuel Injector.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY LINE.** 1)Turn the ignition switch to ON. 2)Measure the voltage between fuel injector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Repair the poor contact in all connectors in fuel injector circuit.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel injector connector on faulty cylinders • Poor contact in coupling connector • Poor contact in main relay connector • Poor contact in fuel injector connector on faulty cylinders
7	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from fuel injector on faulty cylinder. 3)Turn the ignition switch to ON. 4)Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B137) No. 1 (+) — Chassis ground (–):*** ***#2 (B136) No. 6 (+) — Chassis ground (–):*** ***#3 (B136) No. 5 (+) — Chassis ground (–):*** ***#4 (B136) No. 4 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Repair the battery short circuit in harness between ECM and fuel injector. After repair, replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>	Go to step **8.**
8	**CHECK FUEL INJECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value less than specified value?	1 Ω	Replace the faulty fuel injector <Ref. to FU(TURBO)-36, Fuel Injector.> and ECM <Ref. to FU(TURBO)-48, Engine Control Module.>	Go to step **9.**
9	**CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.** Is the camshaft position sensor or crankshaft position sensor loosely installed?	Camshaft position sensor or crankshaft position sensor is loosely installed.	Tighten the camshaft position sensor or crankshaft position sensor.	Go to step **10.**
10	**CHECK CRANKSHAFT SPROCKET.** Remove the timing belt cover. Is the crankshaft sprocket rusted or does it have broken teeth?	Crankshaft sprocket is rusted or it has broken teeth.	Replace the crankshaft sprocket. <Ref. to ME(TURBO)-57, Crankshaft Sprocket.>	Go to step **11.**

	Step	Check	Yes	No
11	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block. Is the timing belt dislocated from its proper position?	Timing belt is dislocated from its proper position.	Repair the installation condition of timing belt. <Ref. to ME(TURBO)-48, Timing Belt Assembly.>	Go to step **12.**
12	**CHECK FUEL LEVEL.** Is the fuel meter indication higher than the “Lower” level?	Fuel meter indication is higher than the “Lower” level.	Go to step **13.**	Replenish the fuel so fuel meter indication is higher than the “Lower” level. After replenishing fuel; Go to step **13.**
13	**CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).** 1)Clear the memory using Subaru Select Monitor. <Ref. to EN(TURBO)-49, Clear Memory Mode.> 2)Start the engine, and drive the vehicle more than 10 minutes. Is the MIL coming on or blinking?	MIL is coming on or blinking.	Go to step **15.**	Go to step **14.**
14	**CHECK CAUSE OF MISFIRE DIAGNOSED.** Was the cause of misfire diagnosed when the engine is running?	Cause of misfire was diagnosed.	Finish the diagnostics operation, if the engine has no abnormality.	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in ignition coil connector • Poor contact in fuel injector connector on faulty cylinders • Poor contact in ECM connector • Poor contact in coupling connector
15	**CHECK AIR INTAKE SYSTEM.** Is there a fault in air intake system?	There is a fault.	Repair the air intake system. NOTE: Check the following items: • Are there air leaks or air suction caused by loose or dislocated nuts and bolts? • Are there cracks or any disconnection of hoses?	Go to step **16.**

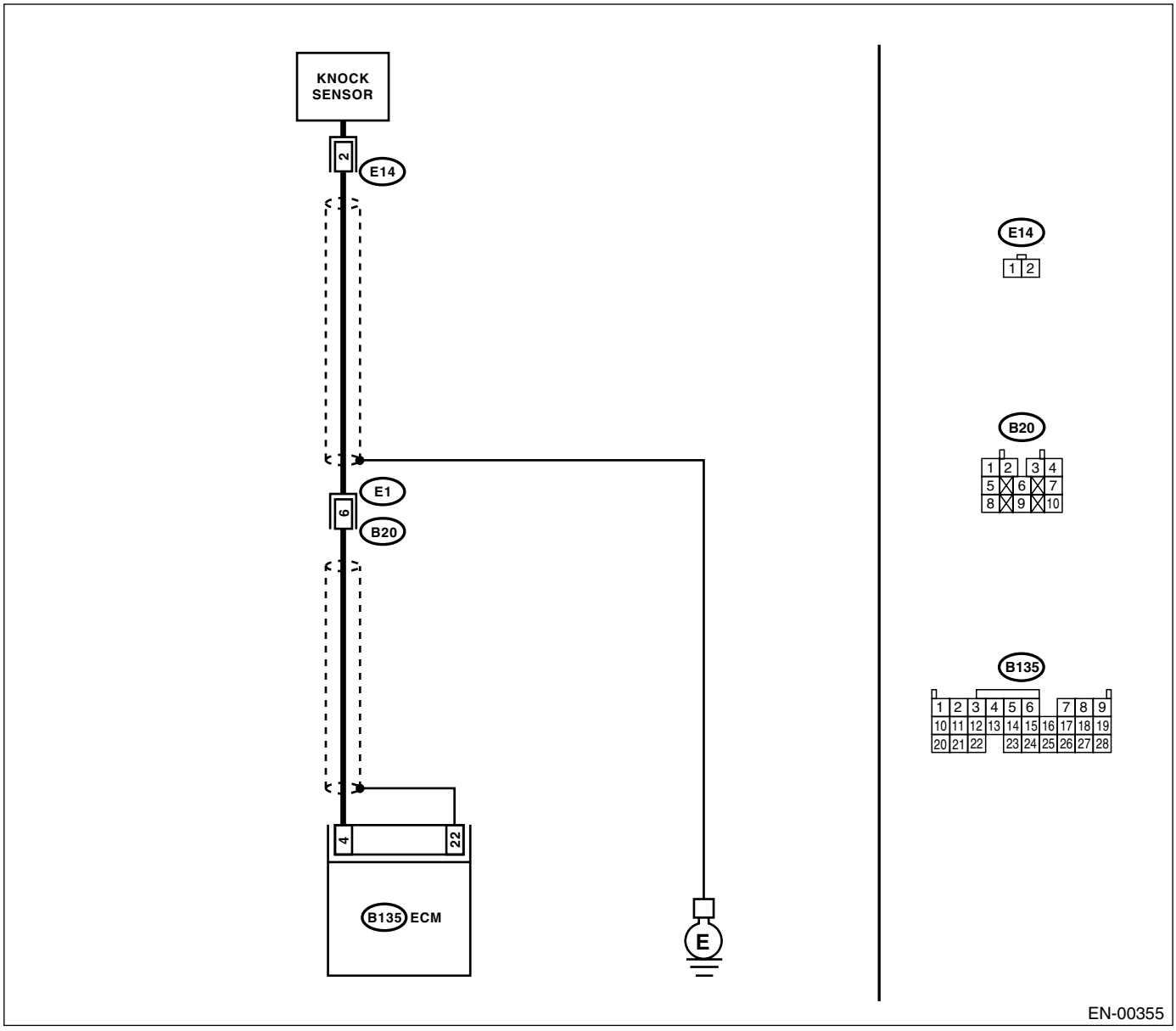
Step		Check	Yes	No
16	**CHECK CYLINDER** Is there a fault in that cylinder?	There is a fault.	Repair or replace the faulty parts. NOTE: Check the following items. • Spark plug • Fuel injector • Compression pressure	Go to DTC P0171 and P0172. <Ref. to EN(TURBO)-144, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AK:DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Poor driving performance
  - Knocking occurs.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



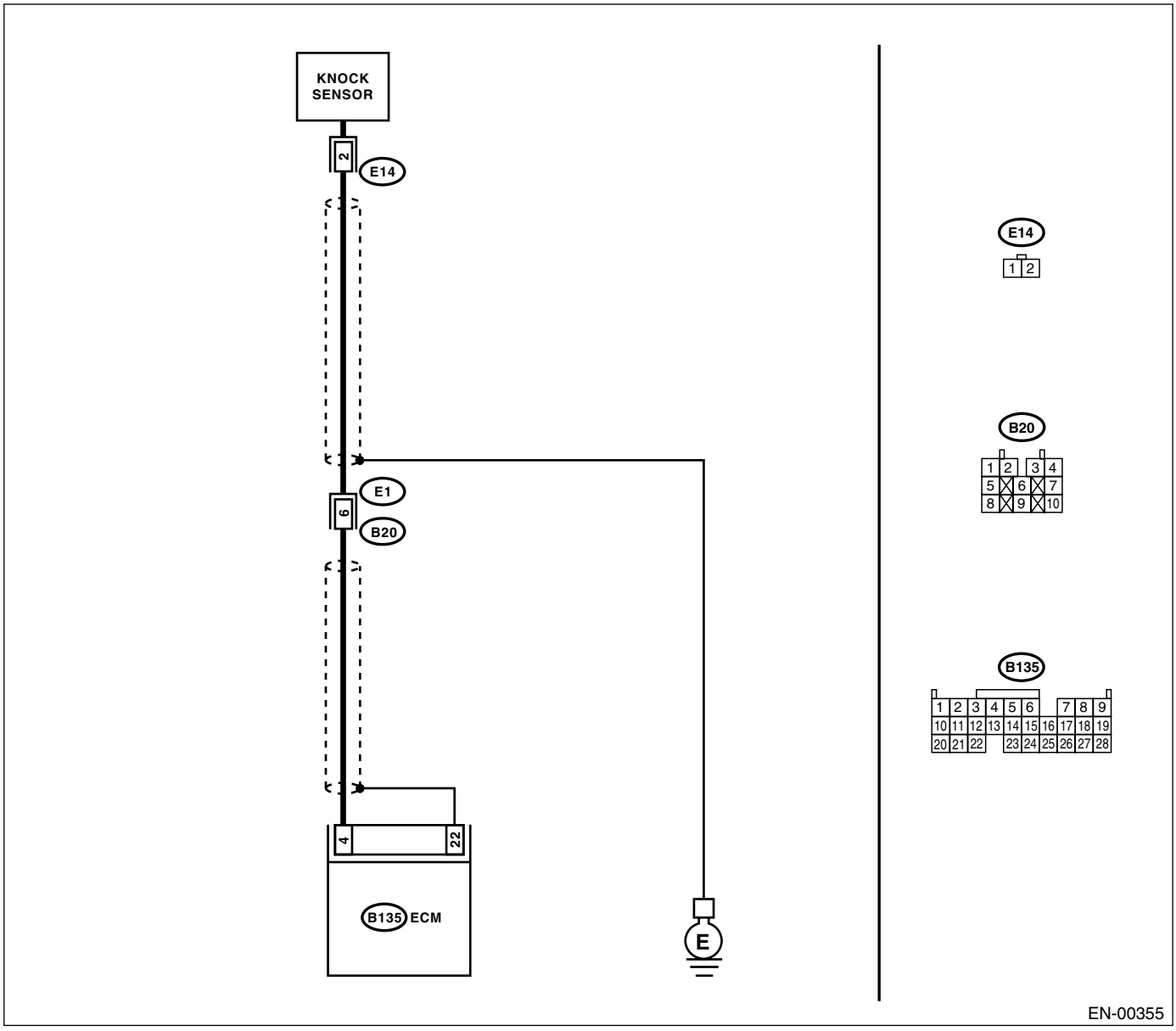
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance between ECM harness connector and chassis ground. ***Connector & terminal*** ***(B135) No. 4 — Chassis ground:*** Is the measured value more than specified value?	700 kΩ	Go to step **2.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector
2	**CHECK KNOCK SENSOR.** 1)Disconnect the connector from knock sensor. 2)Measure the resistance between knock sensor connector terminal and engine ground. ***Terminal*** ***No. 2 — Engine ground:*** Is the measured value more than specified value?	700 kΩ	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Poor contact in knock sensor connector • Poor contact in coupling connector
3	**CHECK CONDITION OF KNOCK SENSOR INSTALLATION.** Is the knock sensor installation bolt tightened securely?	Bolt is tightened securely.	Replace the knock sensor. <Ref. to FU(TURBO)-31, Knock Sensor.>	Tighten the knock sensor installation bolt securely.

AL:DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Poor driving performance
  - Knocking occurs.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



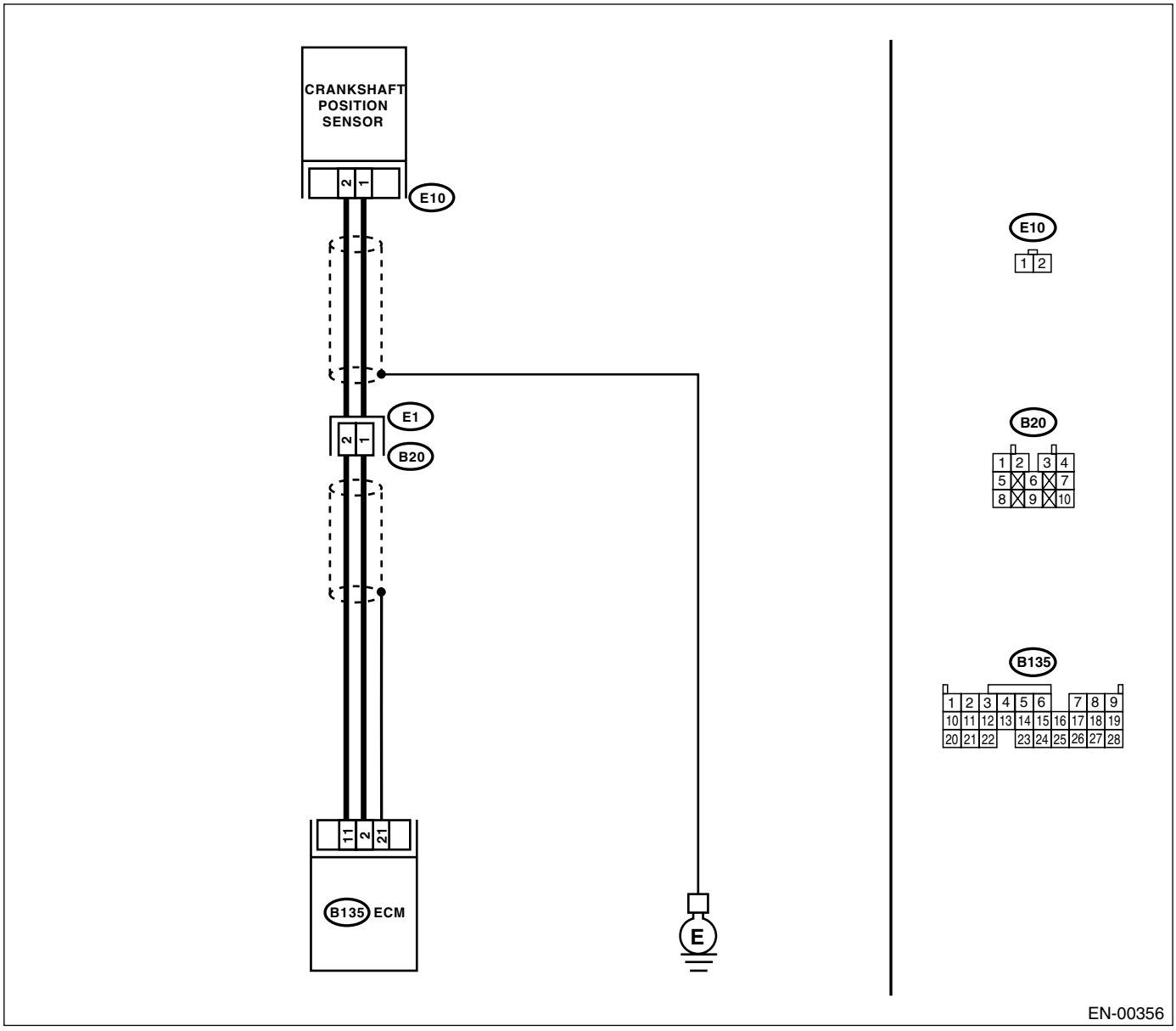
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 4 — Chassis ground:*** Is the measured value less than specified value?	400 kΩ	Go to step **2.**	Go to step **3.**
2	**CHECK KNOCK SENSOR.** 1)Disconnect the connector from knock sensor. 2)Measure the resistance between knock sensor connector terminal and engine ground. ***Terminal*** ***No. 2 — Engine ground:*** Is the measured value less than specified value?	400 kΩ	Replace the knock sensor. <Ref. to FU(TURBO)-31, Knock Sensor.>	Repair the ground short circuit in harness between knock sensor connector and ECM connector. NOTE: The harness between both connectors is shielded. Repair the short circuit of harness together with shield.
3	**CHECK INPUT SIGNAL FOR ECM.** 1)Connect the connectors to ECM and knock sensor. 2)Turn the ignition switch to ON. 3)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 4 (+) — Chassis ground (–):*** Is the measured value more than specified value?	2 V	Even if MIL lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in knock sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Repair the poor contact in ECM connector.

AM:DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



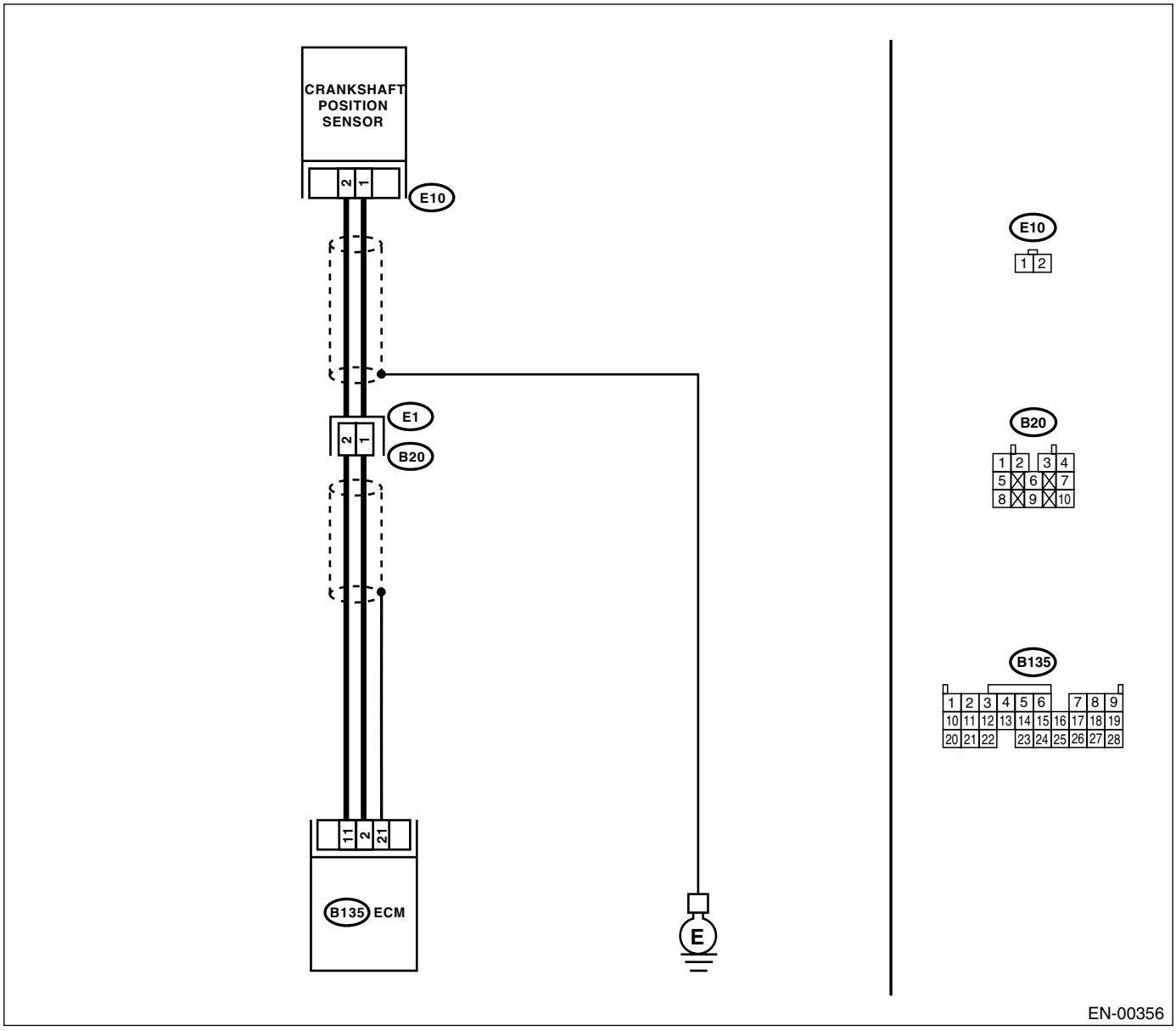
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from crankshaft position sensor. 3)Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:*** Is the measured value more than specified value?	100 kΩ	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector	Go to step **2.**
2	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:*** Is the measured value less than specified value?	10 Ω	Repair the ground short circuit in harness between crankshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.	Go to step **3.**
3	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 2 — Engine ground:*** Is the measured value less than specified value?	5 Ω	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
4	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.** Is the crankshaft position sensor installation bolt tightened securely?	Bolt is tightened securely.	Go to step **5.**	Tighten the crankshaft position sensor installation bolt securely.
5	**CHECK CRANKSHAFT POSITION SENSOR.** 1)Remove the crankshaft position sensor. 2)Measure the resistance between connector terminals of crankshaft position sensor. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within specified value?	1 — 4 kΩ	Repair the poor contact in crankshaft position sensor connector.	Replace the crankshaft position sensor. <Ref. to FU(TURBO)-29, Crankshaft Position Sensor.>

AN:DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/ PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



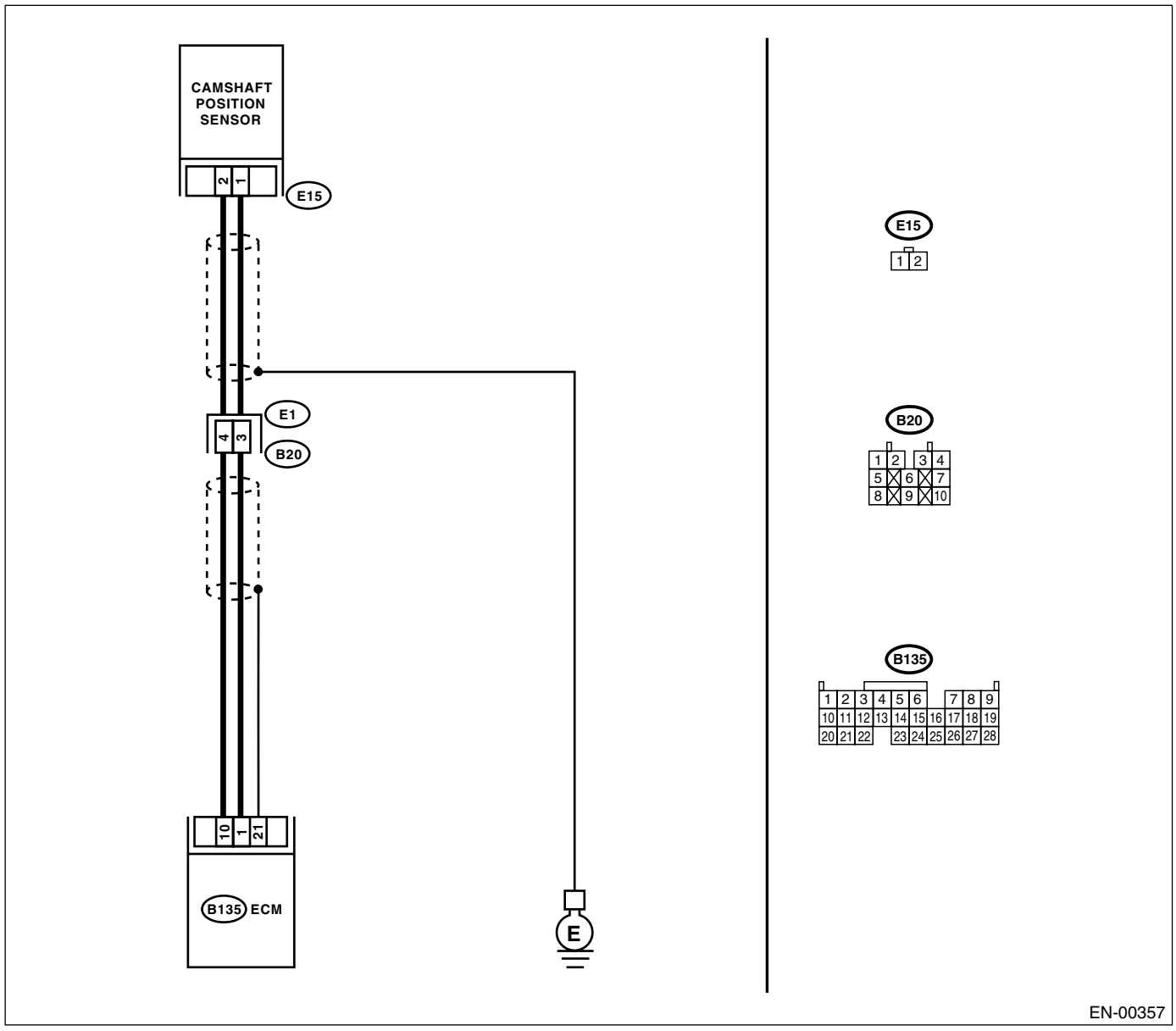
	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.** Turn the ignition switch to OFF. Is the crankshaft position sensor installation bolt tightened securely?	Bolt is tightened securely.	Go to step **3.**	Tighten the crankshaft position sensor installation bolt securely.
3	**CHECK CRANKSHAFT SPROCKET.** Remove the front belt cover. Are the crankshaft sprocket teeth cracked or damaged?	Crankshaft sprocket teeth are cracked or damaged.	Replace the crankshaft sprocket. <Ref. to FU(TURBO)-29, Crankshaft Position Sensor.>	Go to step **4.**
4	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block. Is the timing belt dislocated from its proper position?	Timing belt is dislocated from its proper position.	Repair the installation condition of timing belt. <Ref. to ME(TURBO)-48, Timing Belt Assembly.>	Replace the crankshaft position sensor. <Ref. to FU(TURBO)-29, Crankshaft Position Sensor.>

AO:DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



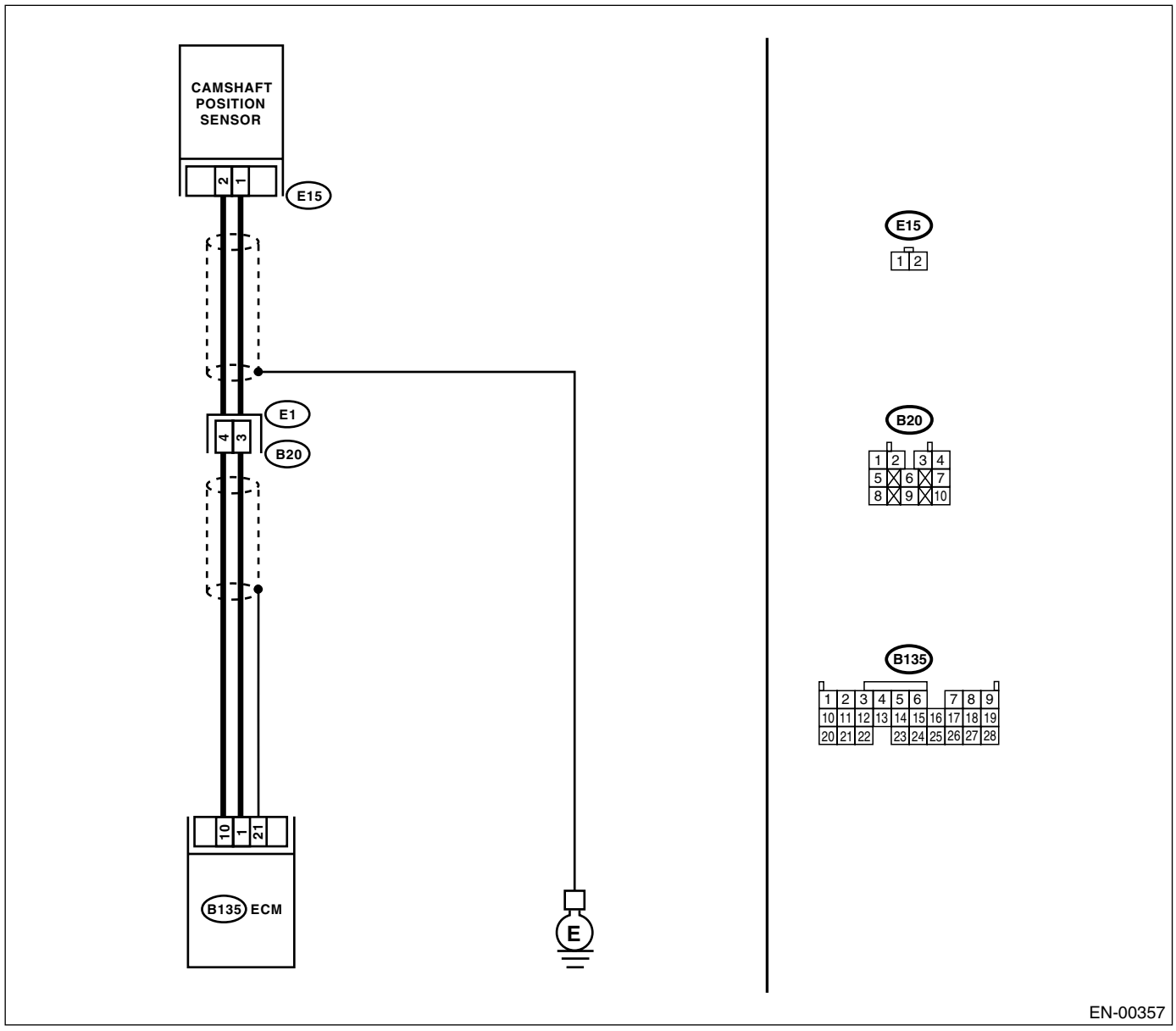
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from camshaft position sensor. 3)Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:*** Is the measured value more than specified value?	100 kΩ	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector	Go to step **2.**
2	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:*** Is the measured value less than specified value?	10 Ω	Repair the ground short circuit in harness between camshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair the ground short circuit in harness together with shield.	Go to step **3.**
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 2 — Engine ground:*** Is the measured value less than specified value?	5 Ω	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
4	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.** Is the camshaft position sensor installation bolt tightened securely?	Bolt is tightened securely.	Go to step **5.**	Tighten the camshaft position sensor installation bolt securely.
5	**CHECK CAMSHAFT POSITION SENSOR.** 1)Remove the camshaft position sensor. 2)Measure the resistance between connector terminals of camshaft position sensor. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within specified value?	1 — 4 kΩ	Repair the poor contact in camshaft position sensor connector.	Replace the camshaft position sensor. <Ref. to FU(TURBO)-30, Camshaft Position Sensor.>

AP:DTC P0341 — CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from camshaft position sensor. 3)Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:*** Is the measured value more than specified value?	100 kΩ	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector	Go to step **3.**
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:*** Is the measured value less than specified value?	10 Ω	Repair the ground short circuit in harness between camshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.	Go to step **4.**
4	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 2 — Engine ground:*** Is the measured value less than specified value?	5 Ω	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
5	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.** Is the camshaft position sensor installation bolt tightened securely?	Bolt is tightened securely.	Go to step **6.**	Tighten the camshaft position sensor installation bolt securely.

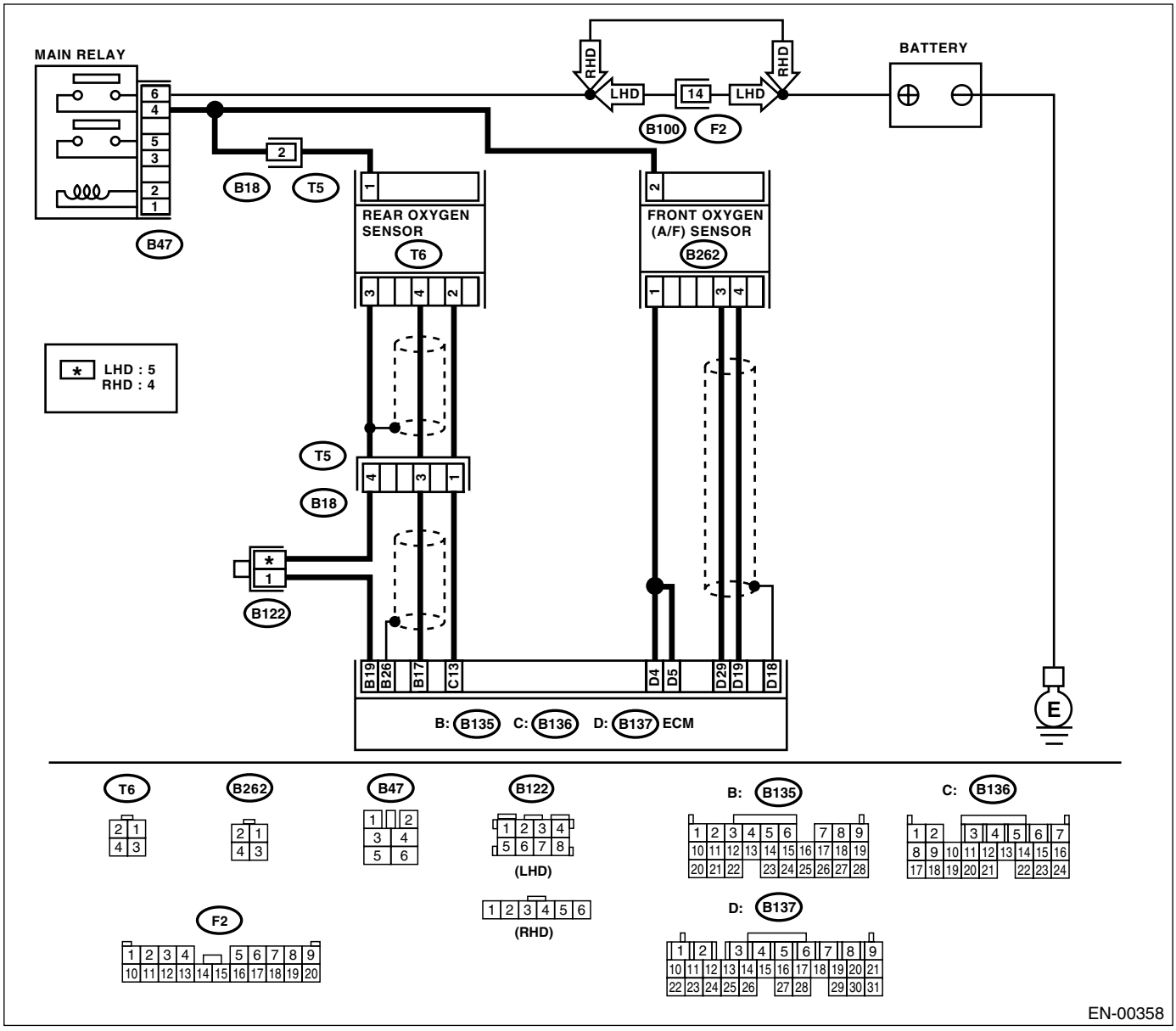
	Step	Check	Yes	No
6	**CHECK CAMSHAFT POSITION SENSOR.** 1)Remove the camshaft position sensor. 2)Measure the resistance between connector terminals of camshaft position sensor. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within specified value?	1 — 4 kΩ	Go to step **7.**	Replace the camshaft position sensor. <Ref. to FU(TURBO)-30, Camshaft Position Sensor.>
7	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.** Turn the ignition switch to OFF. Is the camshaft position sensor installation bolt tightened securely?	Bolt is tightened securely.	Go to step **8.**	Tighten the camshaft position sensor installation bolt securely.
8	**CHECK CAMSHAFT SPROCKET.** Remove the front belt cover. <Ref. to ME(SOHC)-45, Belt Cover.> Are the camshaft sprocket teeth cracked or damaged?	Camshaft sprocket teeth are cracked or damaged.	Replace the camshaft sprocket. <Ref. to ME(TURBO)-56, Camshaft Sprocket.>	Go to step **9.**
9	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the camshaft, and align alignment mark on camshaft sprocket with alignment mark on timing belt cover LH. Is the timing belt dislocated from its proper position?	Timing belt is dislocated from its proper position.	Repair the installation condition of timing belt. <Ref. to ME(TURBO)-48, Timing Belt Assembly.>	Replace the camshaft position sensor. <Ref. to FU(TURBO)-30, Camshaft Position Sensor.>

AQ:DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Idle mixture is out of specifications.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



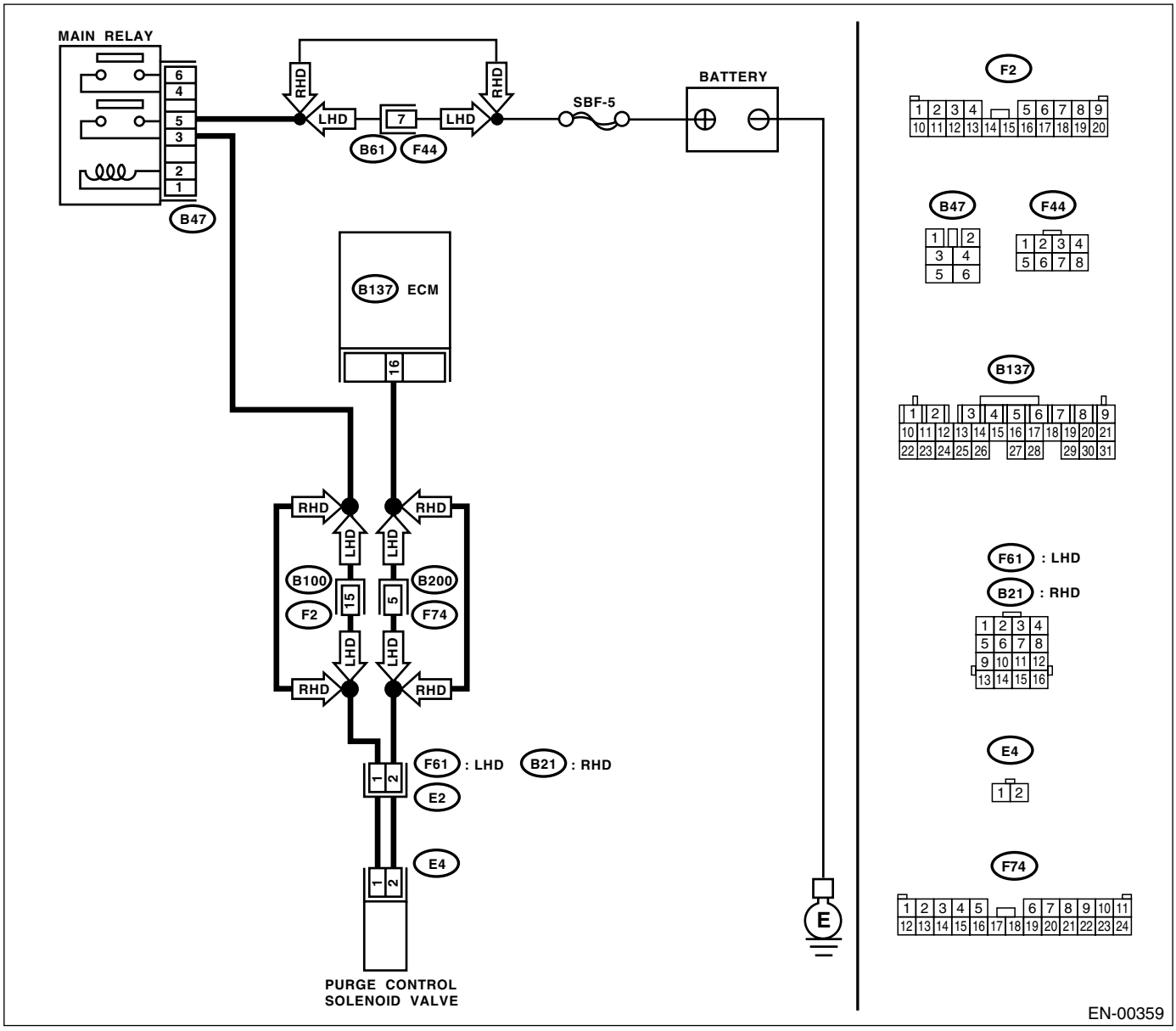
	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0420.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes. NOTE: Check the following positions. •Between cylinder head and front exhaust pipe •Between front exhaust pipe and front catalytic converter •Between front catalytic converter and rear catalytic converter Is there a fault in exhaust system?	There is a fault.	Repair or replace the exhaust system. <Ref. to EX(TURBO)-2, General Description.>	Go to step **3.**
3	**CHECK REAR CATALYTIC CONVERTER.** Separate the rear catalytic converter from rear exhaust pipe. Is there damage at rear face of rear catalyst?	There is damage.	Replace the front catalytic converter. <Ref. to EC(TURBO)-3, Front Catalytic Converter.> and rear catalytic converter <Ref. to EC(TURBO)-4, Rear Catalytic Converter.>	Go to step **4.**
4	**CHECK FRONT CATALYTIC CONVERTER.** Remove the front catalytic converter. Is there damage at rear face or front face of front catalyst?	There is damage.	Replace the front catalytic converter. <Ref. to EC(TURBO)-3, Front Catalytic Converter.>	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AR:DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 16 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Even if MIL lights up, the circuit has returned to a normal condition at this time. Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Go to step **2.**
2	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from purge control solenoid valve and ECM. 3)Measure the resistance of harness between purge control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E4) No. 2 — Engine ground:*** Is the measured value less than specified value?	10 Ω	Repair the ground short circuit in harness between ECM and purge control solenoid valve connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and purge control solenoid valve of harness connector. ***Connector & terminal*** ***(B137) No. 16 — (E4) No. 2:*** Is the measured value less than specified value?	1 Ω	Go to step **4.**	Repair the open circuit in harness between ECM and purge control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and purge control solenoid valve connector • Poor contact in coupling connector
4	**CHECK PURGE CONTROL SOLENOID VALVE.** 1)Remove the purge control solenoid valve. 2)Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within specified value?	10 — 100 Ω	Go to step **5.**	Replace the purge control solenoid valve. <Ref. to EC(TURBO)-7, Purge Control Solenoid Valve.>

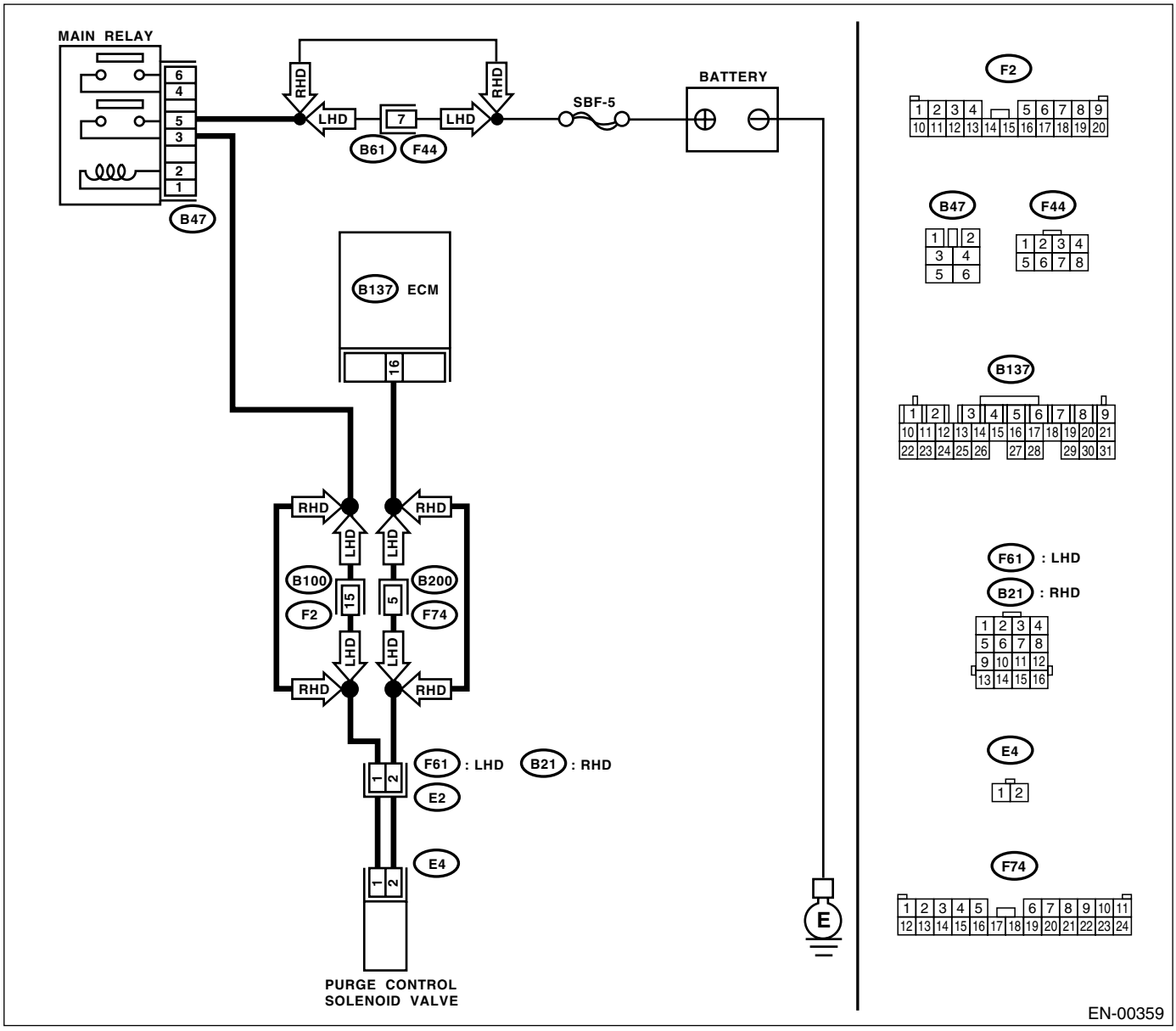
	Step	Check	Yes	No
5	**CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.** 1)Turn the ignition switch to ON. 2)Measure the voltage between purge control solenoid valve and engine ground. ***Connector & terminal*** ***(E4) No. 1 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Go to step **6.**	Repair the open circuit in harness between main relay and purge control solenoid valve connector.
6	**CHECK POOR CONTACT.** Check poor contact in purge control solenoid valve connector. Is there poor contact in purge control solenoid valve connector?	Poor contact occurs.	Repair the poor contact in purge control solenoid valve connector.	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AS:DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



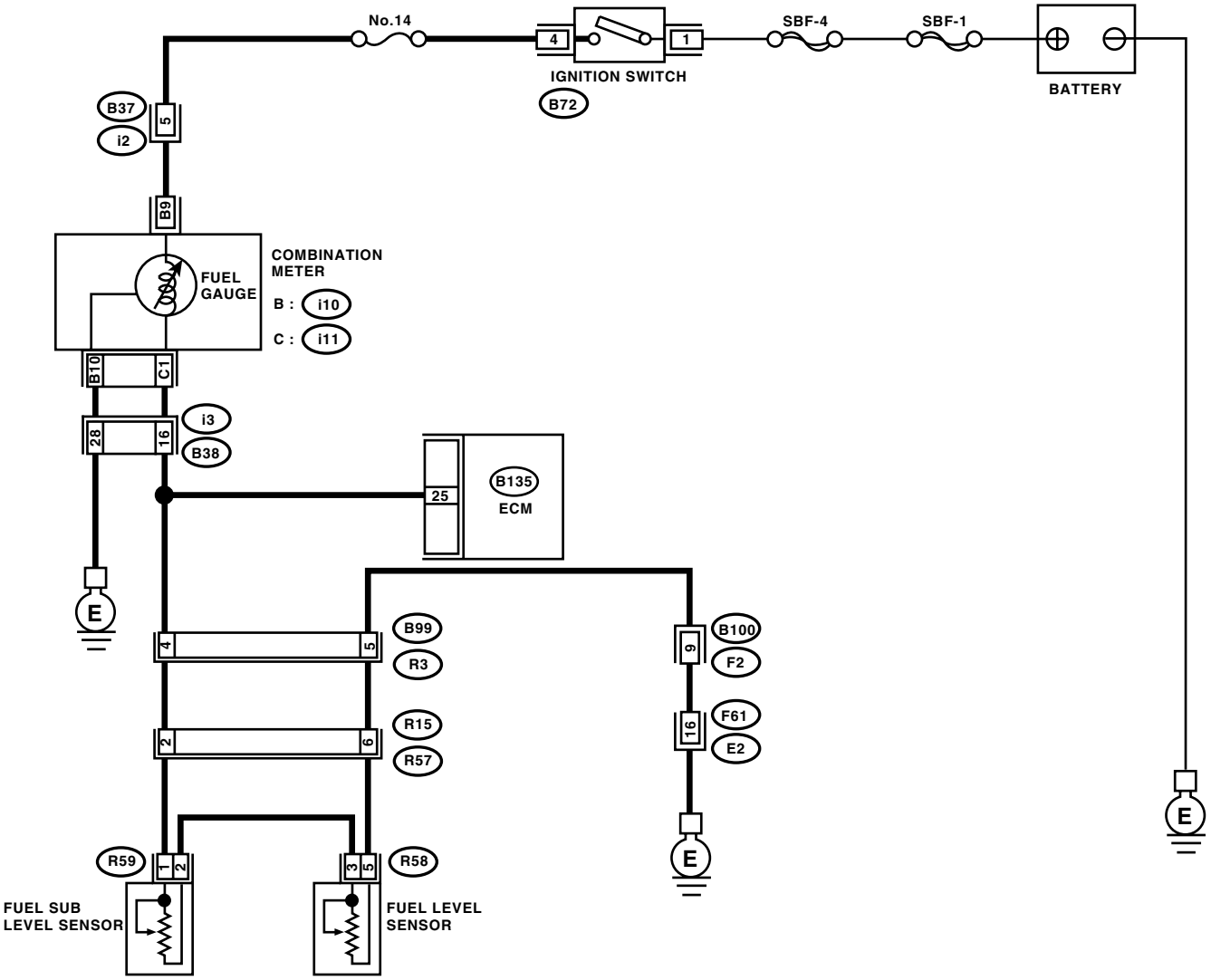
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to OFF. 2)Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3)Turn the ignition switch to ON. 4)While operating the purge control solenoid valve, measure the voltage between ECM and chassis ground. NOTE: Purge control solenoid valve operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(TURBO)-50, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B137) No. 16 (+) — Chassis ground (–):*** Is the measured value within specified value?	0 — 13 V	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 16 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **4.**	Go to step **3.**
3	**CHECK POOR CONTACT.** Check the poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>
4	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from purge control solenoid valve. 3)Turn the ignition switch to ON. 4)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 16 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Repair the battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>	Go to step **5.**
5	**CHECK PURGE CONTROL SOLENOID VALVE.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value less than specified value?	1 Ω	Replace the purge control solenoid valve <Ref. to EC(TURBO)-7, Purge Control Solenoid Valve.> and ECM <Ref. to FU(TURBO)-48, Engine Control Module.>	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>

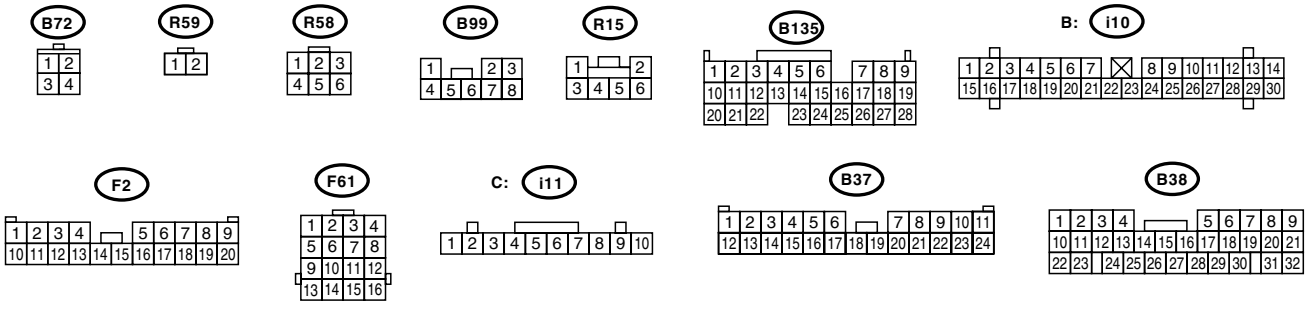
AT:DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

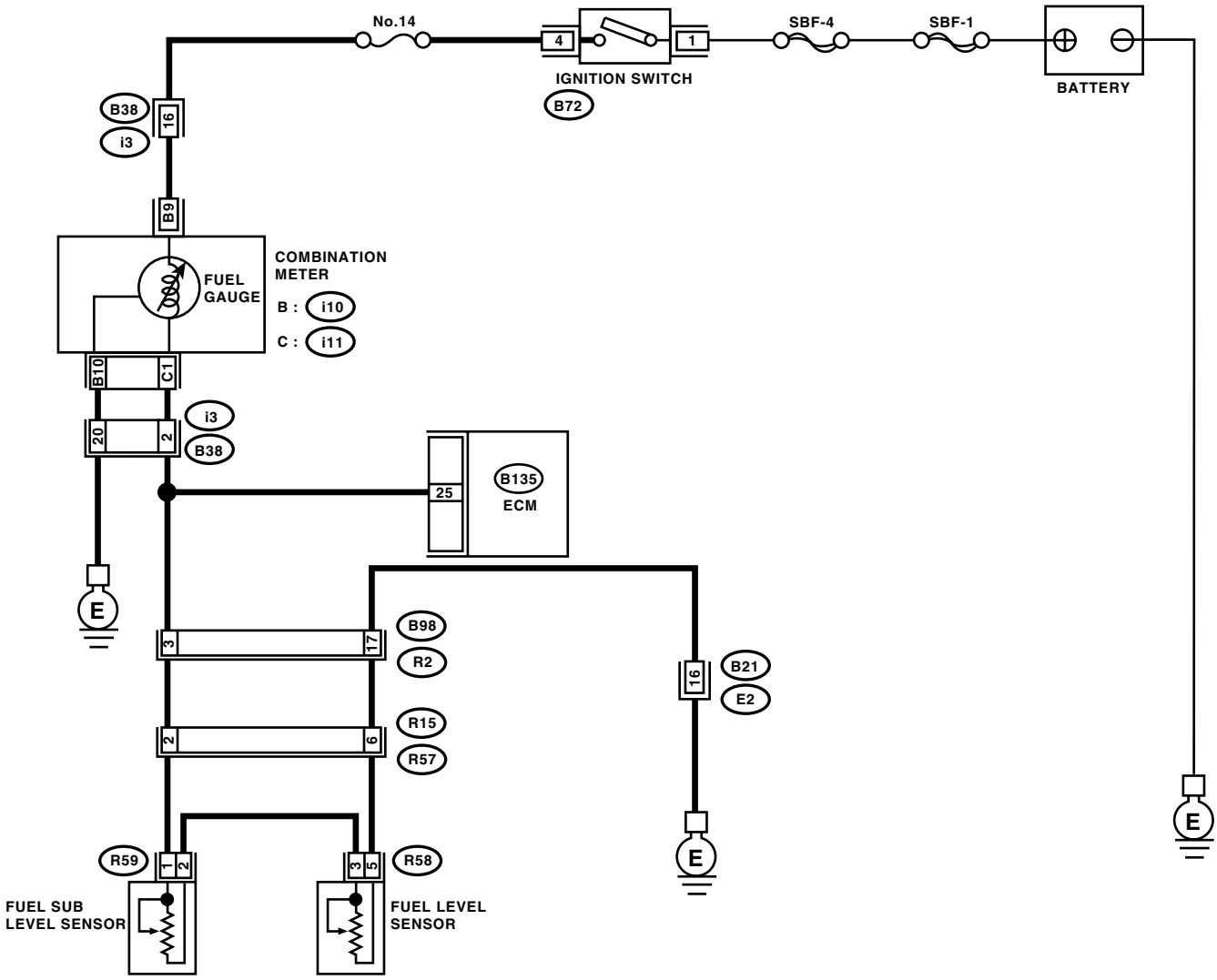
- **WIRING DIAGRAM:**
- **LHD model**

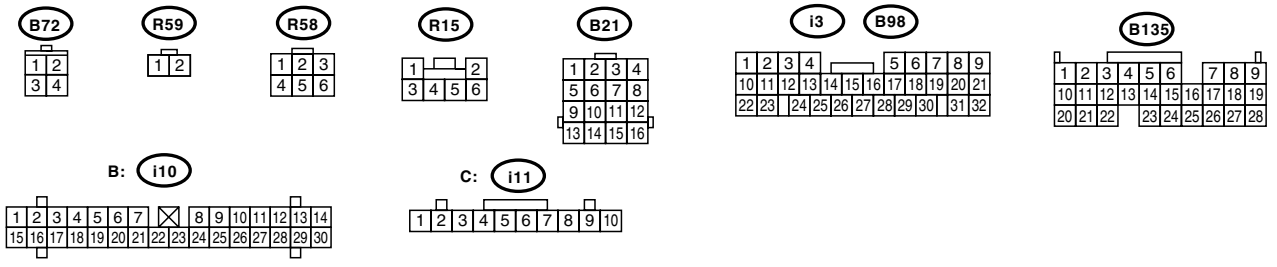




EN-00360

- **RHD model**





EN-00361

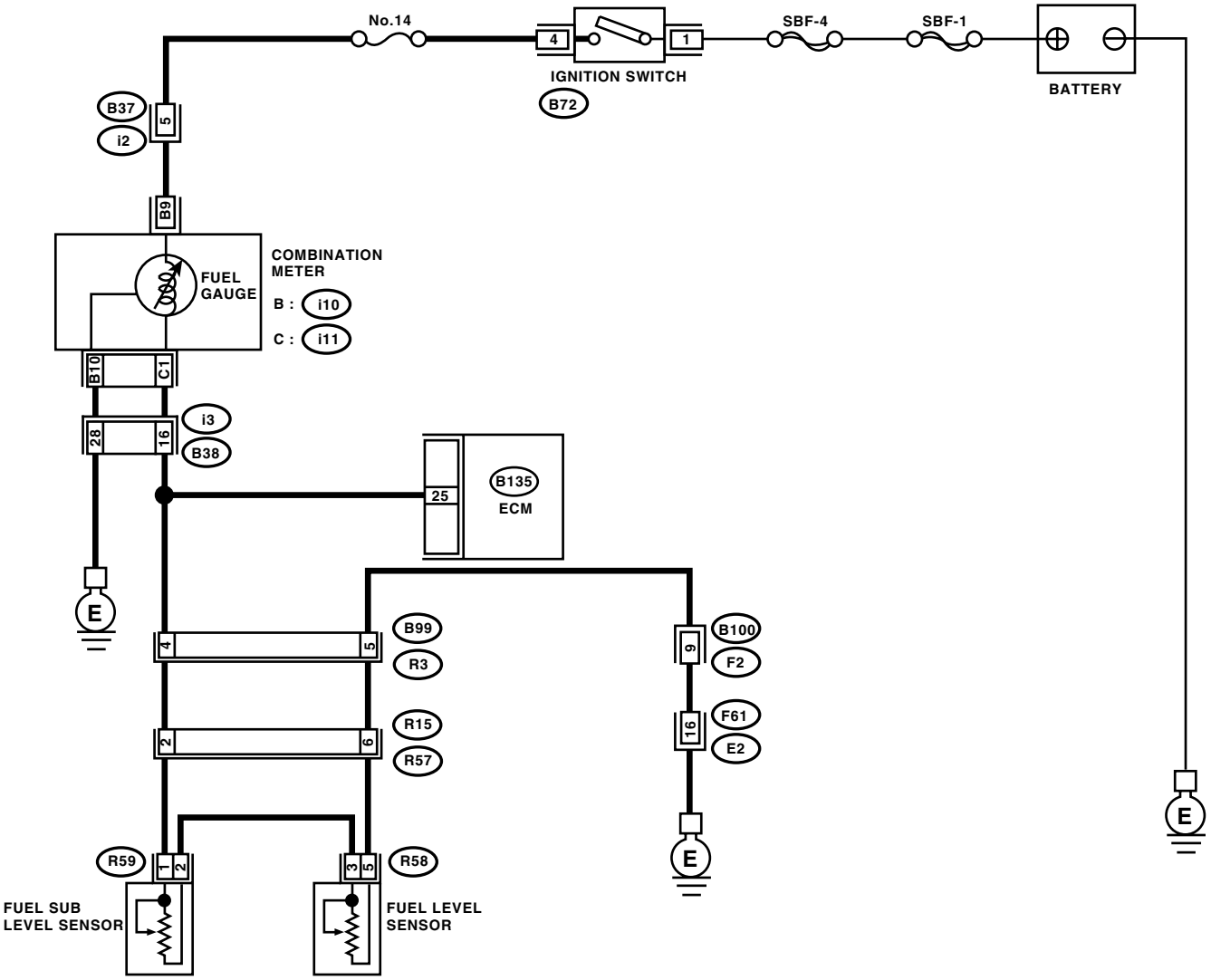
	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0461.	Replace the fuel level sensor. <Ref. to FU(TURBO)-61, Fuel Level Sensor.> and fuel sub level sensor <Ref. to FU(TURBO)-62, Fuel Sub Level Sensor.>

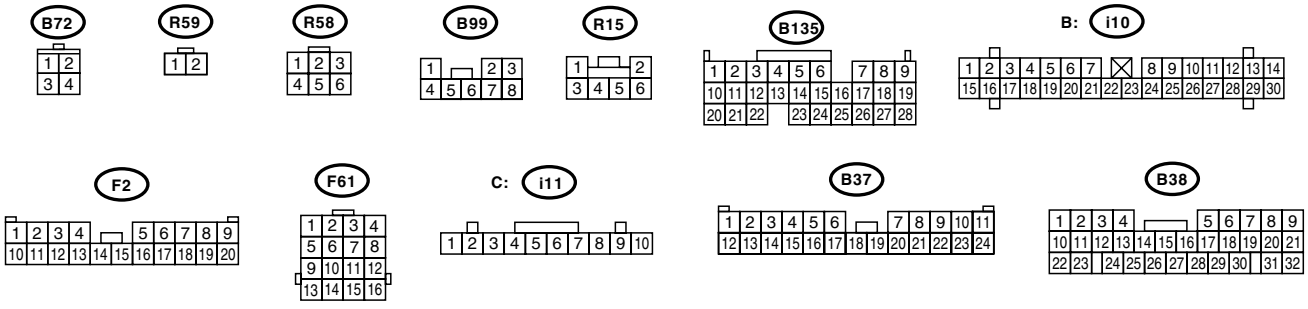
AU:DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

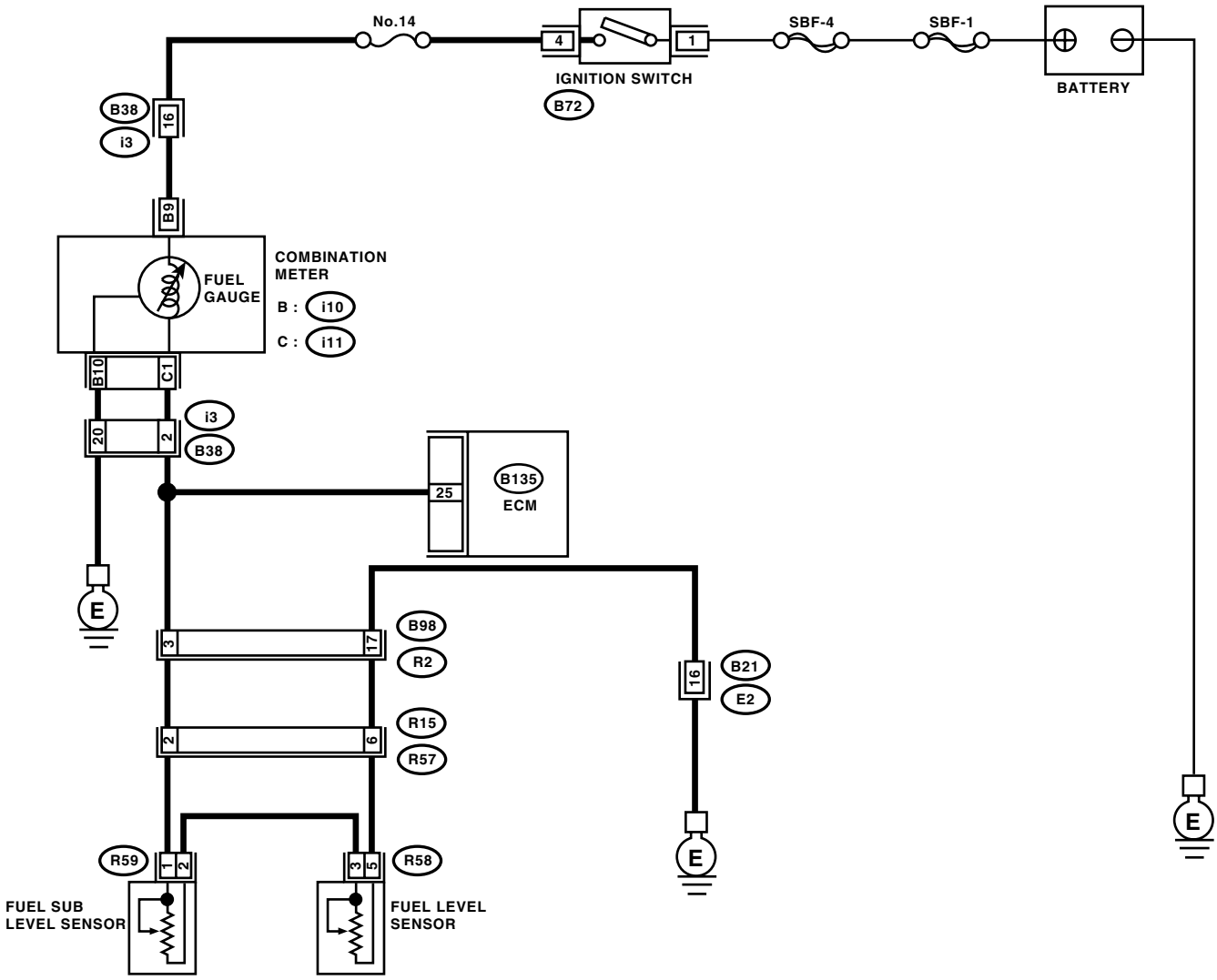
- **WIRING DIAGRAM:**
- **LHD model**

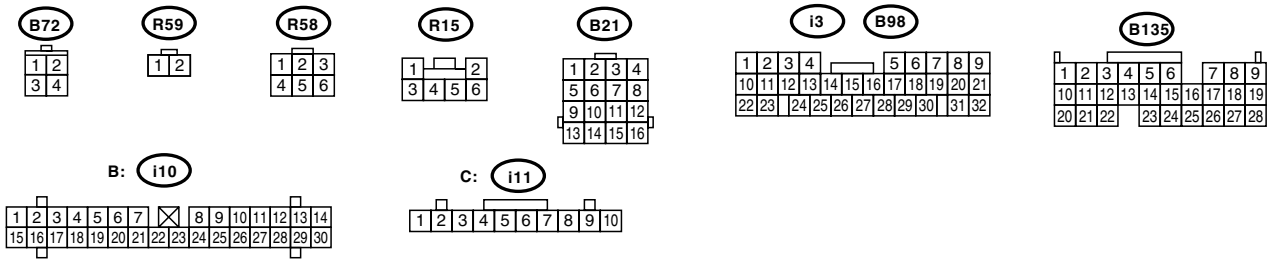




EN-00360

- **RHD model**





EN-00361

	Step	Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.** Does the speedometer and tachometer operate normally?	Speedometer and tachometer operate normally.	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>
2	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. (engine OFF) 2)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (–):*** Is the measured value less than specified value?	0.12 V	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read the data of fuel level sensor signal using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(TURBO)-34, Subaru Select Monitor.> Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Is the voltage change less than specified value?	0.12 V	Repair the poor contact in ECM connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in combination meter connector • Poor contact in ECM connector • Poor contact in coupling connectors
4	**CHECK INPUT VOLTAGE OF ECM.** 1)Turn the ignition switch to OFF. 2)Separate the fuel tank cord connector (R57) and rear wiring harness connector (R15). 3)Turn the ignition switch to ON. 4)Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (–):*** Is the measured value more than specified value?	0.12 V	Go to step **5.**	Go to step **6.**
5	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from connector (i10), (i11) and ECM connector. 3)Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 25 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **7.**	Repair the ground short circuit in harness between ECM and combination meter connector.

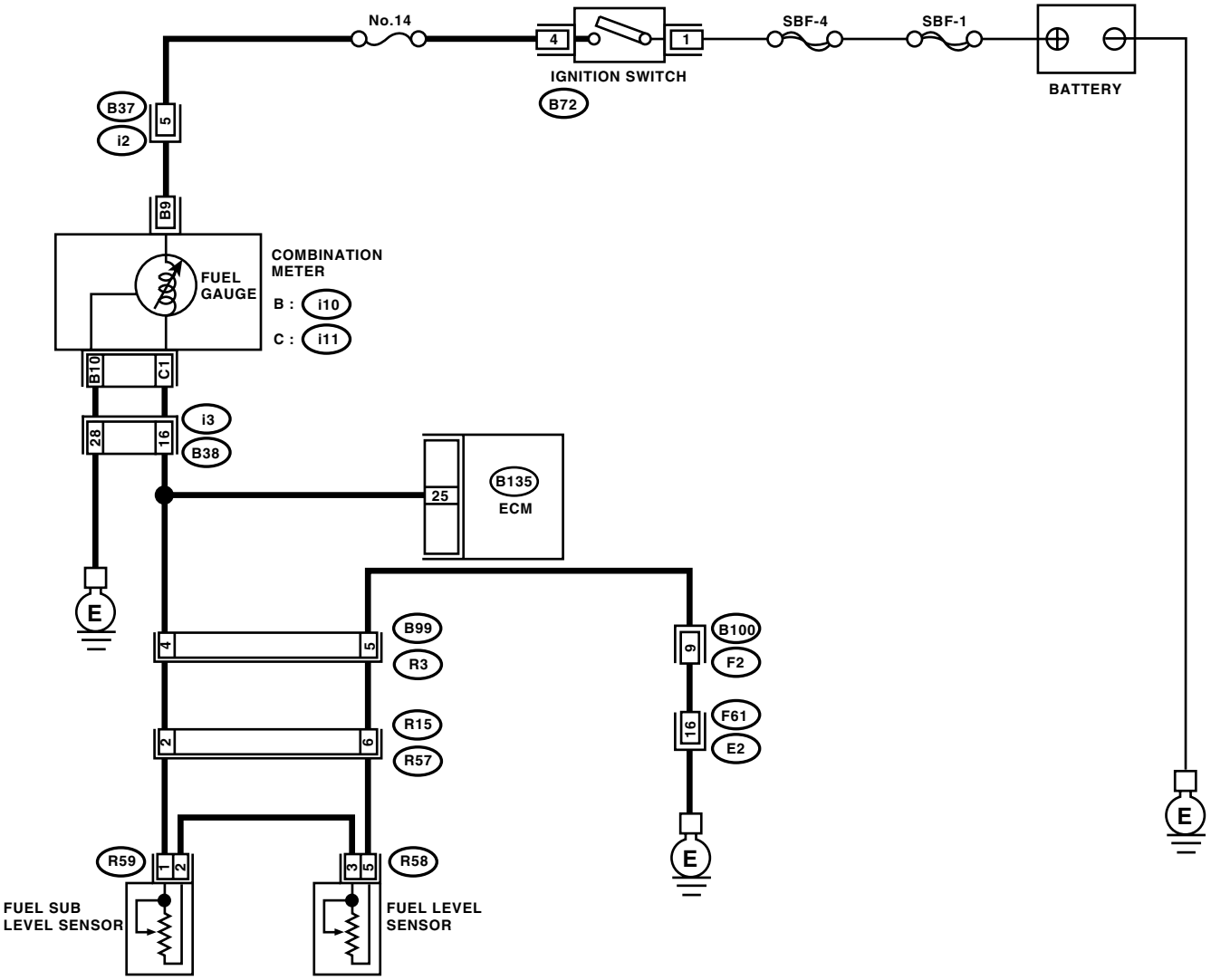
	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** Measure the resistance between ECM and combination meter connector. ***Connector & terminal*** ***(B135) No. 25 — (i12) No. 1:*** Is the measured value less than specified value?	10 Ω	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>	Repair the open circuit between ECM and combination meter connector. NOTE: In this case, repair the following: Poor contact in coupling connector
7	**CHECK FUEL TANK CORD.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from fuel sub level sensor. 3)Measure the resistance between fuel sub level sensor and chassis ground. ***Connector & terminal*** ***(R59) No. 1 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **8.**	Repair the ground short circuit in fuel tank cord.
8	**CHECK FUEL TANK CORD.** 1)Disconnect the connector from fuel pump assembly. 2)Measure the resistance between fuel pump assembly and chassis ground. ***Connector & terminal*** ***(R59) No. 2 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **9.**	Repair the ground short circuit in fuel tank cord.
9	**CHECK FUEL LEVEL SENSOR.** 1)Remove the fuel pump assembly. <Ref. to FU(TURBO)-59, Fuel Pump.> 2)Measure the resistance between fuel level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 3 — No. 5:*** Is the measured value within specified value?	0.5 — 2.5 Ω	Go to step **10.**	Replace the fuel level sensor.
10	**CHECK FUEL SUB LEVEL SENSOR.** 1)Remove the fuel sub level sensor. <Ref. to FU(TURBO)-62, Fuel Sub Level Sensor.> 2)Measure the resistance between fuel sub level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within specified value?	0.5 — 2.5 Ω	Repair the poor contact in harness between ECM and combination meter connector.	Replace the fuel sub level sensor.

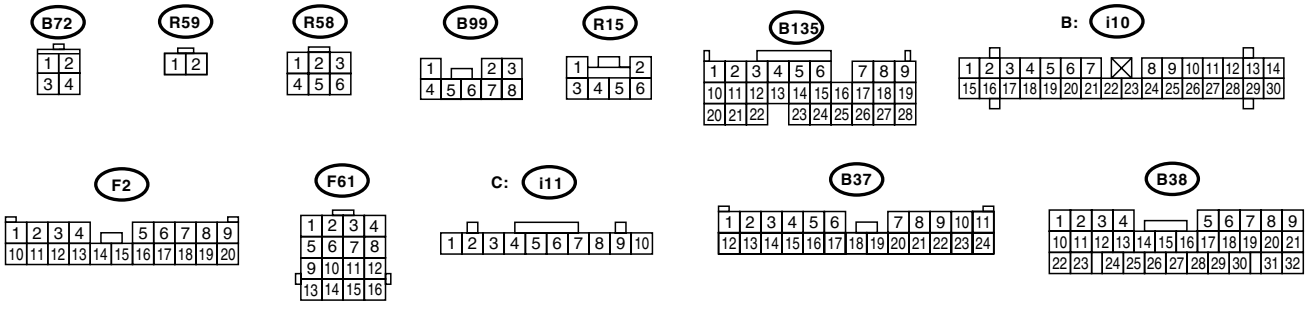
AV:DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

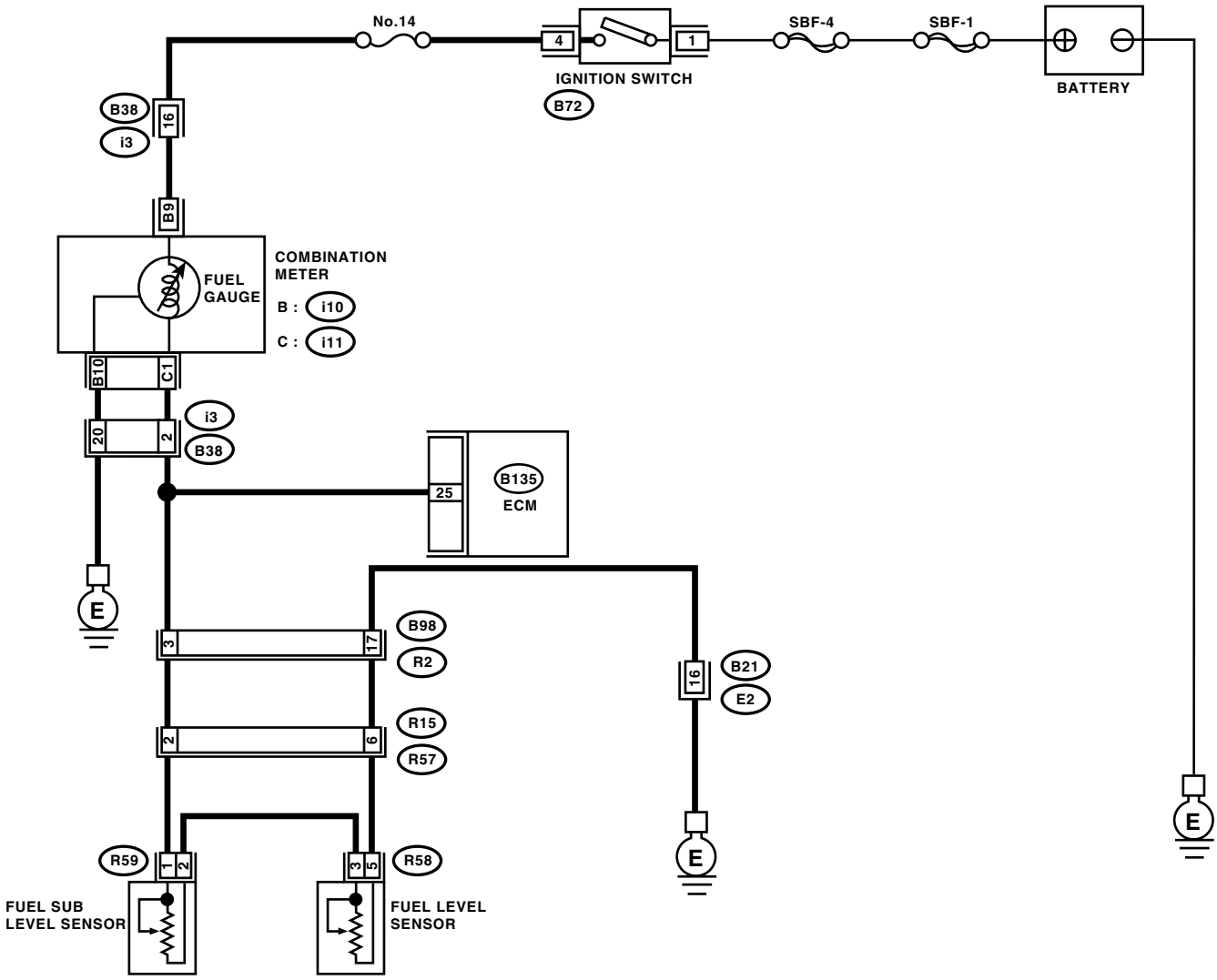
- **WIRING DIAGRAM:**
- **LHD model**

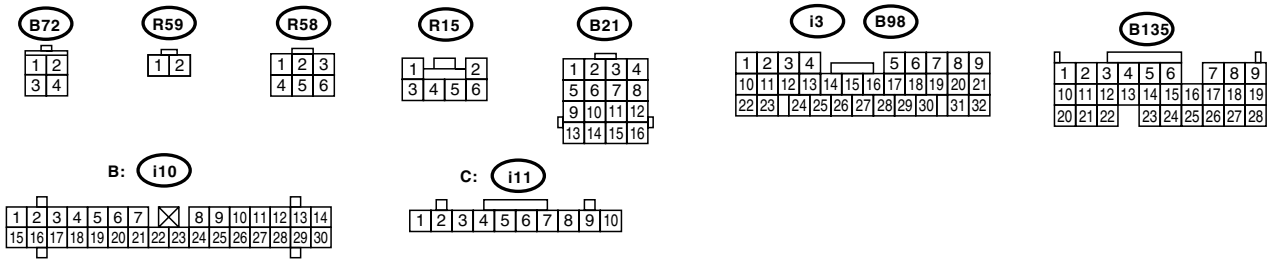




EN-00360

- **RHD model**





EN-00361

	Step	Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.** Does the speedometer and tachometer operate normally?	Speedometer and tachometer operate normally.	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>
2	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. (engine OFF) 2)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4.75 V	Go to step **3.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in fuel pump connector • Poor contact in coupling connector
3	**CHECK INPUT VOLTAGE OF ECM.** 1)Turn the ignition switch to OFF. 2)Disconnect the combination meter connector (i11) and ECM connector. 3)Turn the ignition switch to ON. 4)Measure the voltage of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4.75 V	Go to step **4.**	Repair the battery short circuit between ECM and combination meter connector.
4	**CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD.** 1)Turn the ignition switch to OFF. 2)Separate the fuel tank cord connector (R57) and rear wiring harness connector (R15). 3)Measure the resistance between ECM and fuel tank cord. ***Connector & terminal*** ***(B135) No. 25 — (R15) No. 2:*** Is the measured value less than specified value?	5 Ω	Go to step **5.**	Repair the open circuit between ECM and fuel tank cord.
5	**CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND.** Measure the resistance between fuel tank cord and chassis ground. ***Connector & terminal*** ***(R15) No. 6 — Chassis ground:*** Is the measured value less than specified value?	5 Ω	Go to step **6.**	Repair the open circuit between fuel tank cord and chassis ground. NOTE: In this case, repair the following: Poor contact in coupling connectors

	Step	Check	Yes	No
6	**CHECK FUEL TANK CORD.** 1)Disconnect the connector from fuel level sensor. 2)Measure the resistance between fuel level sensor and coupling connector. ***Connector & terminal*** ***(R57) No. 6 — (R58) No. 5:*** Is the measured value less than specified value?	10 Ω	Go to step **7.**	Repair the open circuit between coupling connector and fuel level sensor.
7	**CHECK FUEL TANK CORD.** 1)Disconnect the connector from fuel sub level sensor. 2)Measure the resistance between fuel level sensor and fuel sub level sensor. ***Connector & terminal*** ***(R58) No. 3 — (R59) No. 2:*** Is the measured value less than specified value?	10 Ω	Go to step **8.**	Repair the open circuit between fuel level sensor and fuel sub level sensor.
8	**CHECK FUEL TANK CORD.** Measure the resistance between fuel sub level sensor and coupling connector. ***Connector & terminal*** ***(R57) No. 2 — (R59) No. 1:*** Is the measured value less than specified value?	10 Ω	Go to step **9.**	Repair the open circuit between coupling connector and fuel sub level sensor.
9	**CHECK FUEL LEVEL SENSOR.** 1)Remove the fuel pump assembly. <Ref. to FU(TURBO)-59, Fuel Pump.> 2)While moving the fuel level sensor float up and down, measure the resistance between fuel level sensor terminals. ***Terminals*** ***No. 3 — No. 5:*** Is the measured value more than specified value?	53 Ω	Replace the fuel level sensor. <Ref. to FU(TURBO)-61, Fuel Level Sensor.>	Go to step **10.**
10	**CHECK FUEL SUB LEVEL SENSOR.** 1)Remove the fuel sub level sensor. <Ref. to FU(TURBO)-62, Fuel Sub Level Sensor.> 2)While moving the fuel sub level sensor float up and down, measure the resistance between fuel sub level sensor terminals. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value more than specified value?	45 Ω	Replace the fuel sub level sensor. <Ref. to FU(TURBO)-62, Fuel Sub Level Sensor.>	Replace the combination meter. <Ref. to IDI-12, Combination Meter Assembly.>

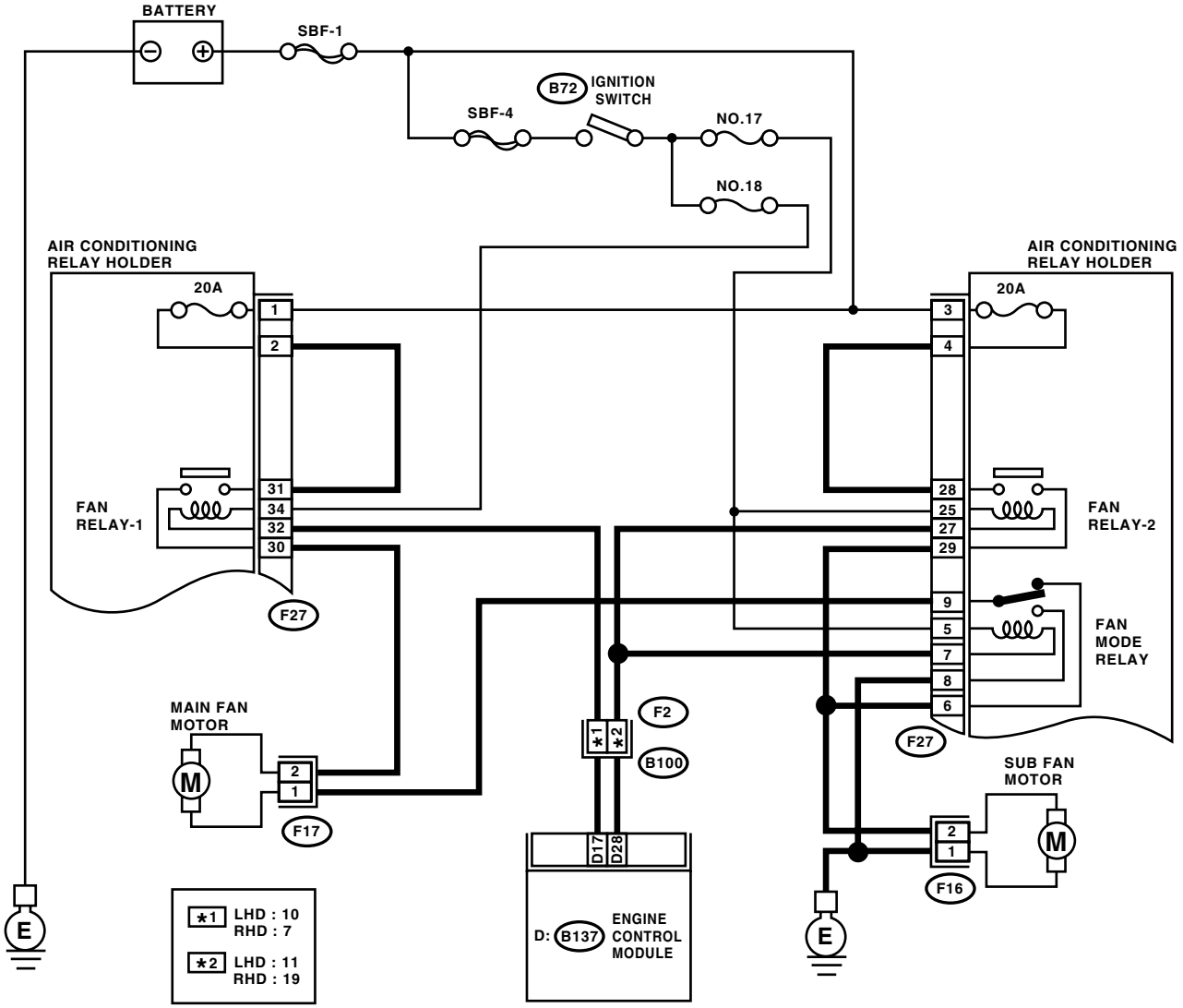
AW:DTC P0483 — COOLING FAN RATIONALITY CHECK —

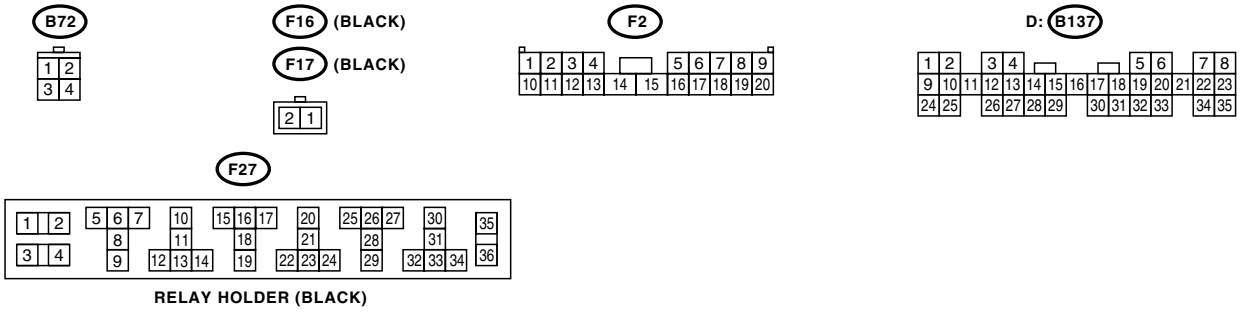
- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Occurrence of noise
  - Overheating

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

NOTE:
If the vehicle, with the engine idling, is placed very close to a wall or another vehicle, preventing normal cooling function, the OBD system may detect malfunction.

- **WIRING DIAGRAM:**





EN-00362

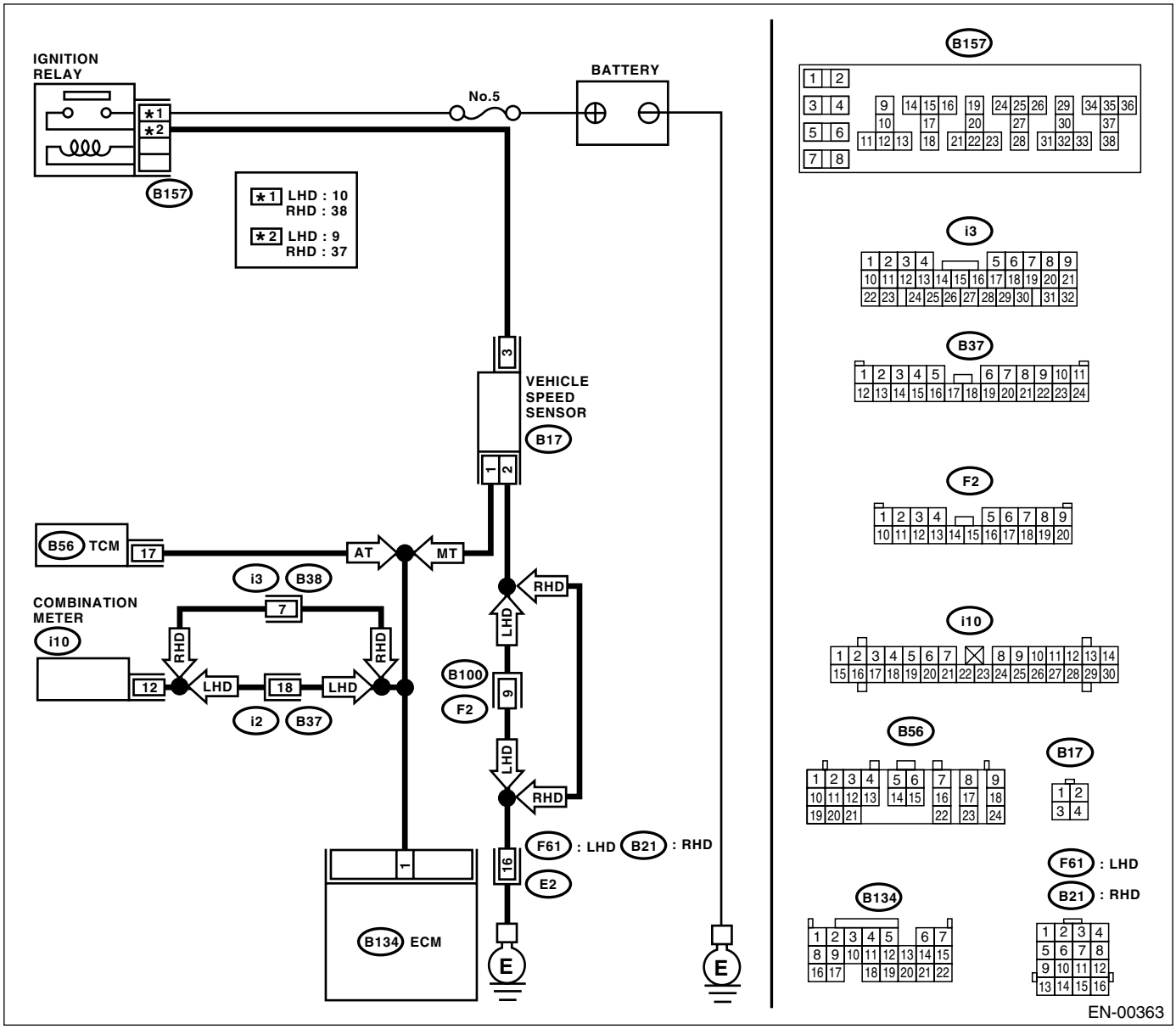
	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).>	Check the radiator fan, fan motor and thermostat. <Ref. to CO(SOHC)-34, Radiator Main Fan and Fan Motor.> and <Ref. to CO(SOHC)-40, Radiator Sub Fan and Fan Motor.> If thermostat is stuck, replace thermostat.

AX:DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK TRANSMISSION TYPE.** Is the transmission type AT?	Transmission type is AT.	Go to step **2.**	Go to step **4.**

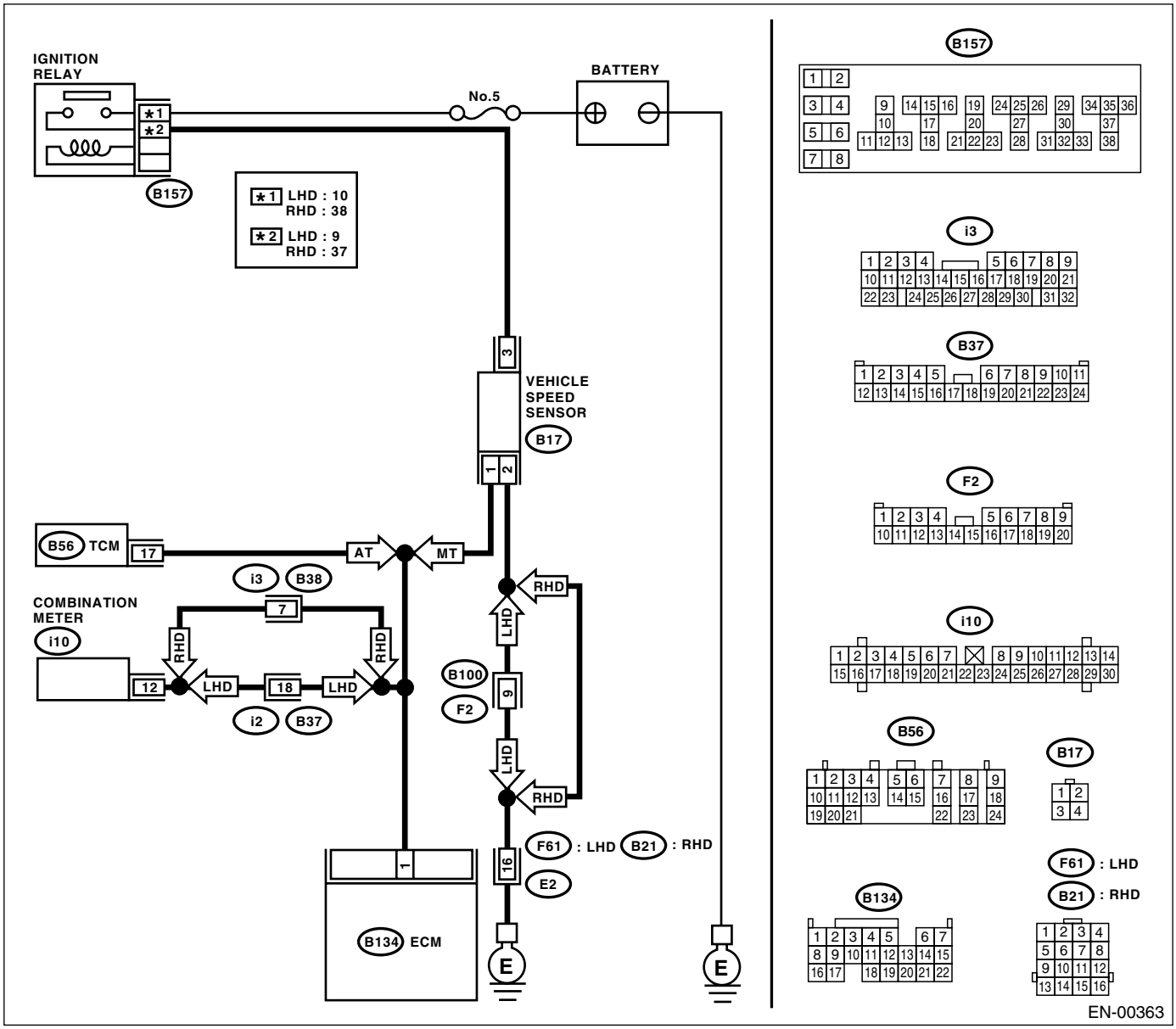
	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and TCM. 3)Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 17 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **3.**	Repair the ground short circuit in harness between ECM and TCM connector.
3	**CHECK POOR CONTACT** Check poor contact in TCM connector. Is there poor contact in TCM connector?	Poor contact occurs.	Repair poor contact in TCM connector.	Contact with your Subaru distributor service.
4	**CHECK HARENESS BETWEEN VEHICLE SPEED SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from vehicle speed sensor and ECM. 3)Measure the resistance of harness between vehicle speed sensor connector and chassis ground. ***Connector & terminal*** ***(B17) No. 1 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **5.**	Repair the ground short circuit in harness between vehicle speed sensor and ECM connector.
5	**CHECK POOR CONTACT** Check poor contact in the vehicle speed sensor connector. Is there poor contact in the vehicle speed sensor connector?	Poor contact occurs.	Repair poor contact in the vehicle speed sensor connector.	Replace the vehicle speed sensor. <Ref. to MT-46, Vehicle Speed Sensor.>

AY:DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK TRANSMISSION TYPE.** Is the transmission type AT?	Transmission type is AT.	Go to step **2.**	Go to step **3.**

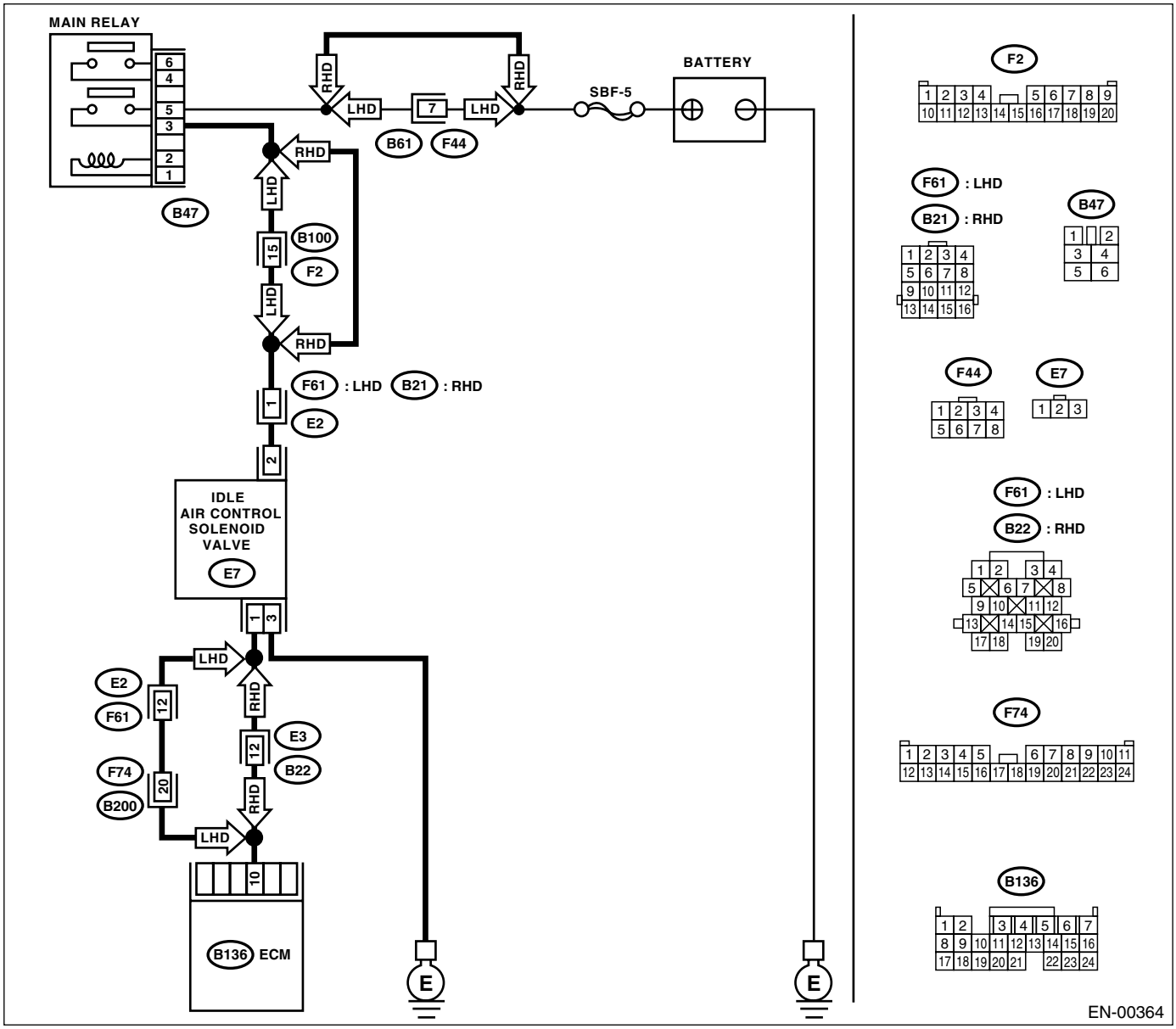
	Step	Check	Yes	No
2	**CHECK DTC P0720 ON DISPLAY.** Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0720?	DTC P0720 is indicated.	Check the front vehicle speed sensor signal circuit. <Ref. to AT-54, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK SPEEDOMETER OPERATION IN COMBINATION METER.** Does the speedometer operate normally?	Speedometer operates normally.	Go to step **4.**	Check the speedometer. <Ref. to IDI-15, Speedometer.>
4	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from combination meter. 3)Measure the resistance between ECM and combination meter. ***Connector & terminal*** ***(B134) No. 1 — (i10) No. 12:*** Is the measured value less than specified value?	10 Ω	Repair the poor contact in ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in ECM connector • Poor contact in combination meter connector • Poor contact in coupling connector

AZ:DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine is difficult to start.
  - Engine does not start.
  - Erroneous idling
  - Engine stalls.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



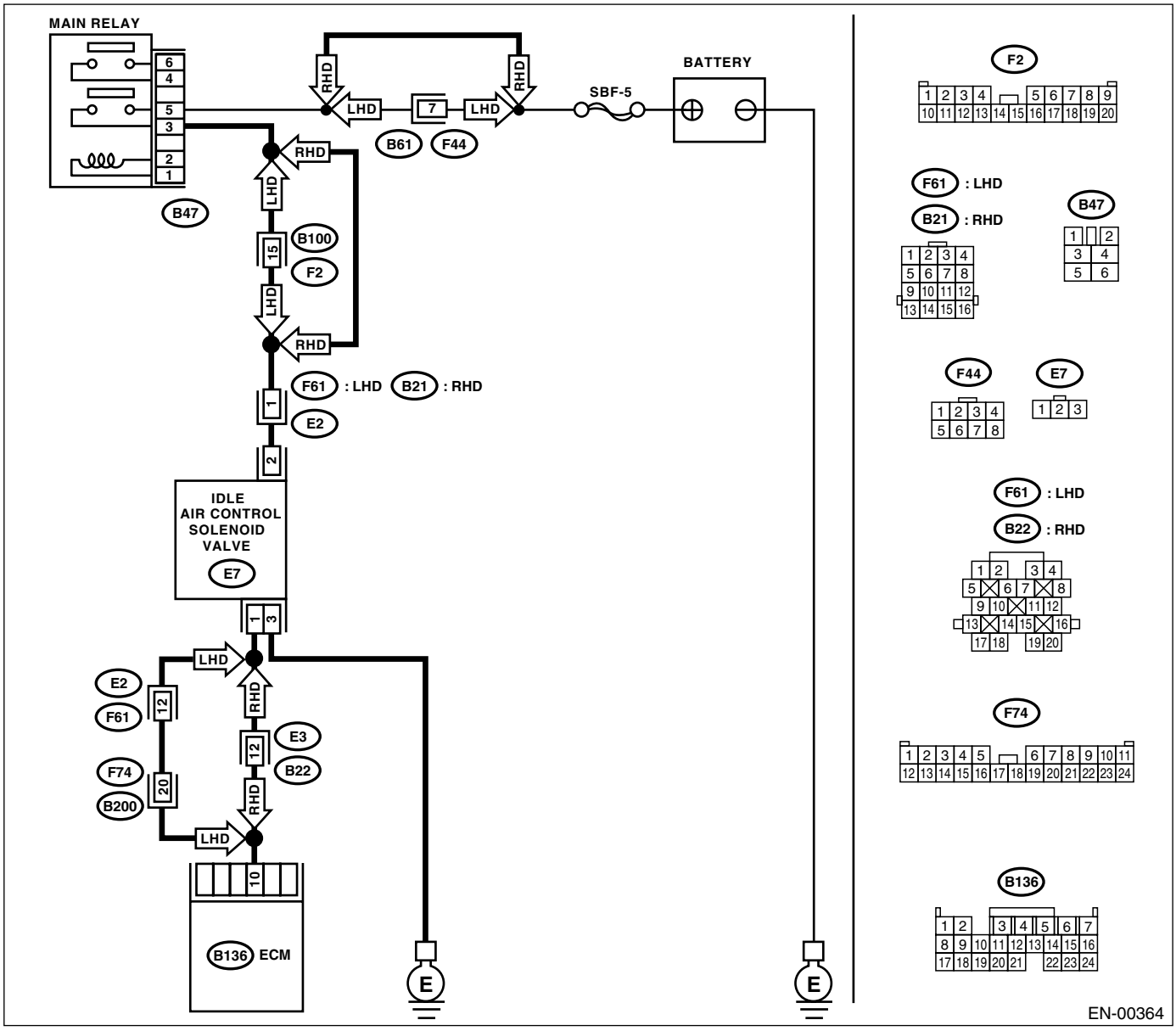
	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0506.	Go to step **2.**
2	**CHECK IDLE AIR CONTROL SOLENOID VALVE.** 1)Turn the ignition switch to OFF. 2)Remove the idle air control solenoid valve from throttle body. <Ref. to FU(TURBO)-35, REMOVAL, Idle Air Control Solenoid Valve.> 3)Using an air gun, force air into the idle air control solenoid valve by-pass air inlet. Confirm that forced air subsequently escapes from both main air passage and assist air passage. Does air flow out?	Air flows out.	Go to step **4.**	Replace the idle air control solenoid valve. <Ref. to FU(TURBO)-35, Idle Air Control Solenoid Valve.> After replace, Go to step **3.**
3	**CHECK IDLE AIR CONTROL SOLENOID VALVE DUTY RATIO.** 1)Turn the ignition switch to ON. 2)Start the engine, and warm-up the engine. 3)Turn all accessory switches to OFF. 4)Read the data of idle air control solenoid valve duty ratio using Subaru Select Monitor or OBD-II general scan tool. Is the measured value more than specified value? NOTE: •Subaru Select Monitor For detailed operation procedures, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	60 %	Go to step **4.**	END.
4	**CHECK BY-PASS AIR LINE.** 1)Turn the ignition switch to OFF. 2)Remove the idle air control solenoid valve from throttle body. <Ref. to FU(TURBO)-35, REMOVAL, Idle Air Control Solenoid Valve.> 3)Remove the throttle body to intake manifold. <Ref. to FU(TURBO)-13, REMOVAL, Throttle Body.> 4)Using an air gun, force air into the solenoid valve installation area and throttle valve interior. Confirm that forced air subsequently escapes from both these areas. Does air flow out?	Air flows out.	Replace the idle air control solenoid valve. <Ref. to FU(TURBO)-35, Idle Air Control Solenoid Valve.>	Replace the throttle body. <Ref. to FU(TURBO)-13, Throttle Body.>

BA:DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine keeps running at higher revolution than specified idling revolution.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



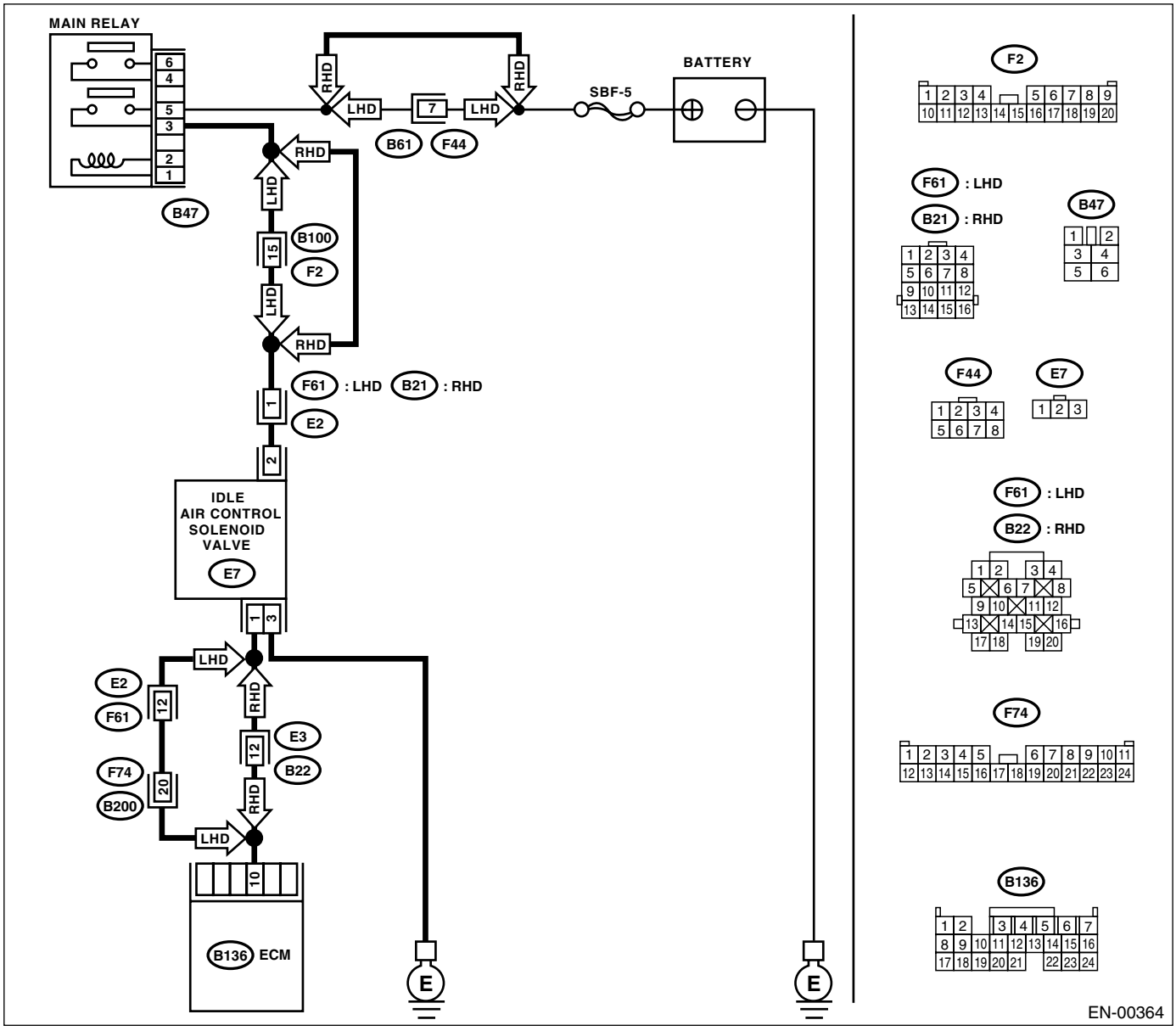
	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Go to step **2.**
2	**CHECK THROTTLE CABLE.** Does the throttle cable have play for adjustment?	Throttle cable has play.	Go to step **3.**	Adjust the throttle cable. <Ref. to SP(SOHC)-9, INSTALLATION, Accelerator Control Cable.>
3	**CHECK AIR INTAKE SYSTEM.** 1)Turn the ignition switch to ON. 2)Start the engine, and idle it. 3)Check the following items. •Loose installation of intake manifold, idle air control solenoid valve and throttle body •Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket •Disconnections of vacuum hoses Is there a fault in air intake system?	There is a fault.	Repair the air suction and leaks.	Replace the idle air control solenoid valve. <Ref. to FU(TURBO)-35, Idle Air Control Solenoid Valve.>

BB:DTC P0508 — IDLE CONTROL SYSTEM CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Engine breathing

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



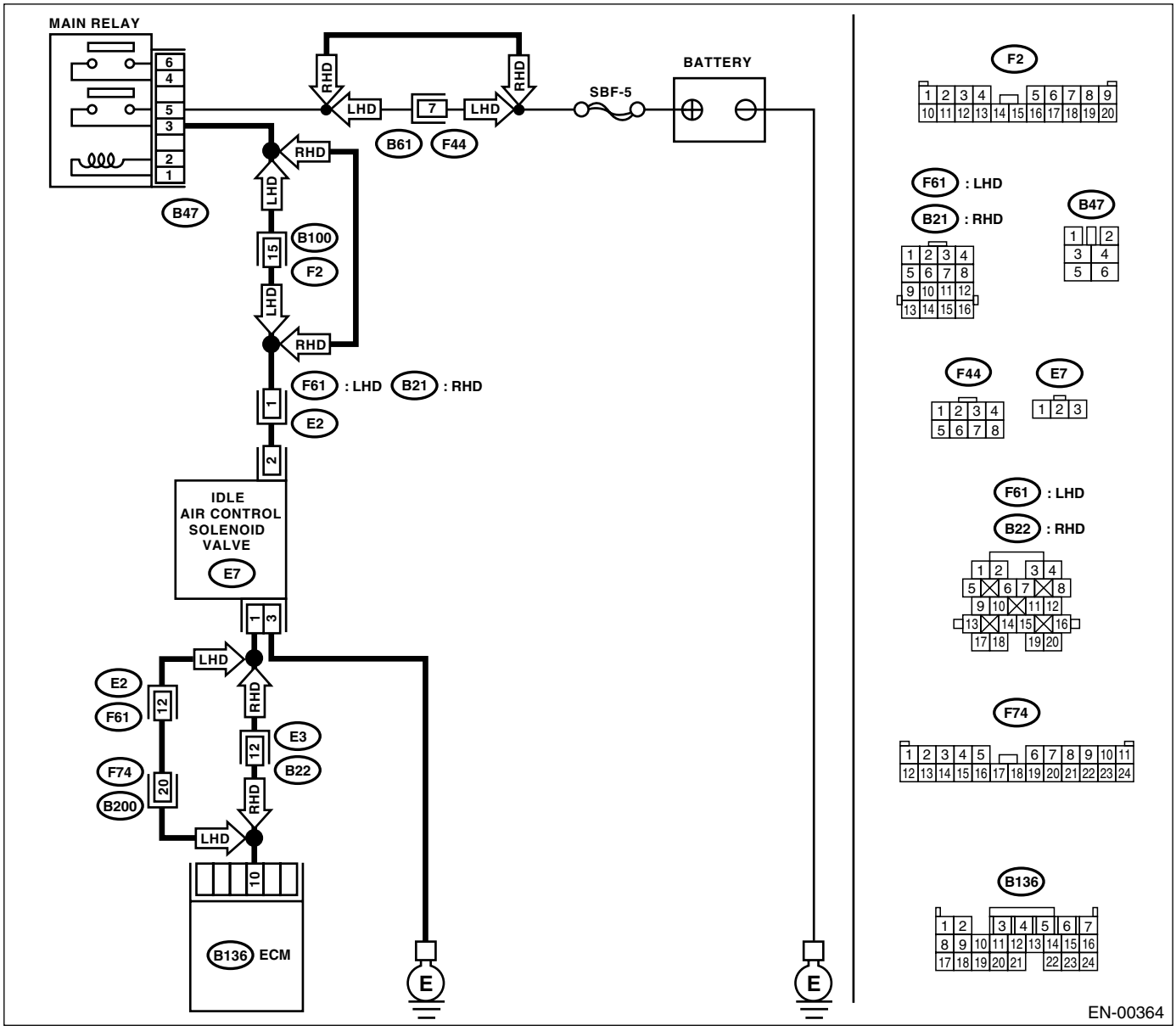
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 10 (+) — Chassis ground (–):*** Is the measured value more than specified value?	3 V	Repair the poor contact in ECM connector.	Go to step **2.**
2	**CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from idle air control solenoid valve. 3)Turn the ignition switch to ON. 4)Measure the voltage between idle air control solenoid valve and engine ground. ***Connector & terminal*** ***(E7) No. 2 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between idle air control solenoid valve and main relay connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM and idle air control solenoid valve connector. ***Connector & terminal*** ***(B136) No. 10 — (E7) No. 1:*** Is the measured value less than specified value?	1 Ω	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and idle air control solenoid valve connector • Poor contact in coupling connector
4	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 10 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	Repair the ground short circuit in harness between ECM and idle air control solenoid valve connector.	Go to step **5.**
5	**CHECK GROUND CIRCUIT OF IDLE AIR CONTROL SOLENOID VALVE.** Measure the resistance of harness between idle air control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E7) No. 3 — Engine ground:*** Is the measured value less than specified value?	5 Ω	Go to step **6.**	Repair the open circuit in harness between idle air control solenoid valve connector and engine ground cable.
6	**CHECK POOR CONTACT.** Check poor contact in ECM and idle air control solenoid valve connectors. Is there poor contact in ECM and idle air control solenoid valve connectors?	Poor contact occurs.	Repair the poor contact in ECM and idle air control solenoid valve connectors.	Replace the idle air control solenoid valve. <Ref. to FU(TURBO)-35, Idle Air Control Solenoid Valve.>

BC:DTC P0509 — IDLE CONTROL SYSTEM CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Engine breathing

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



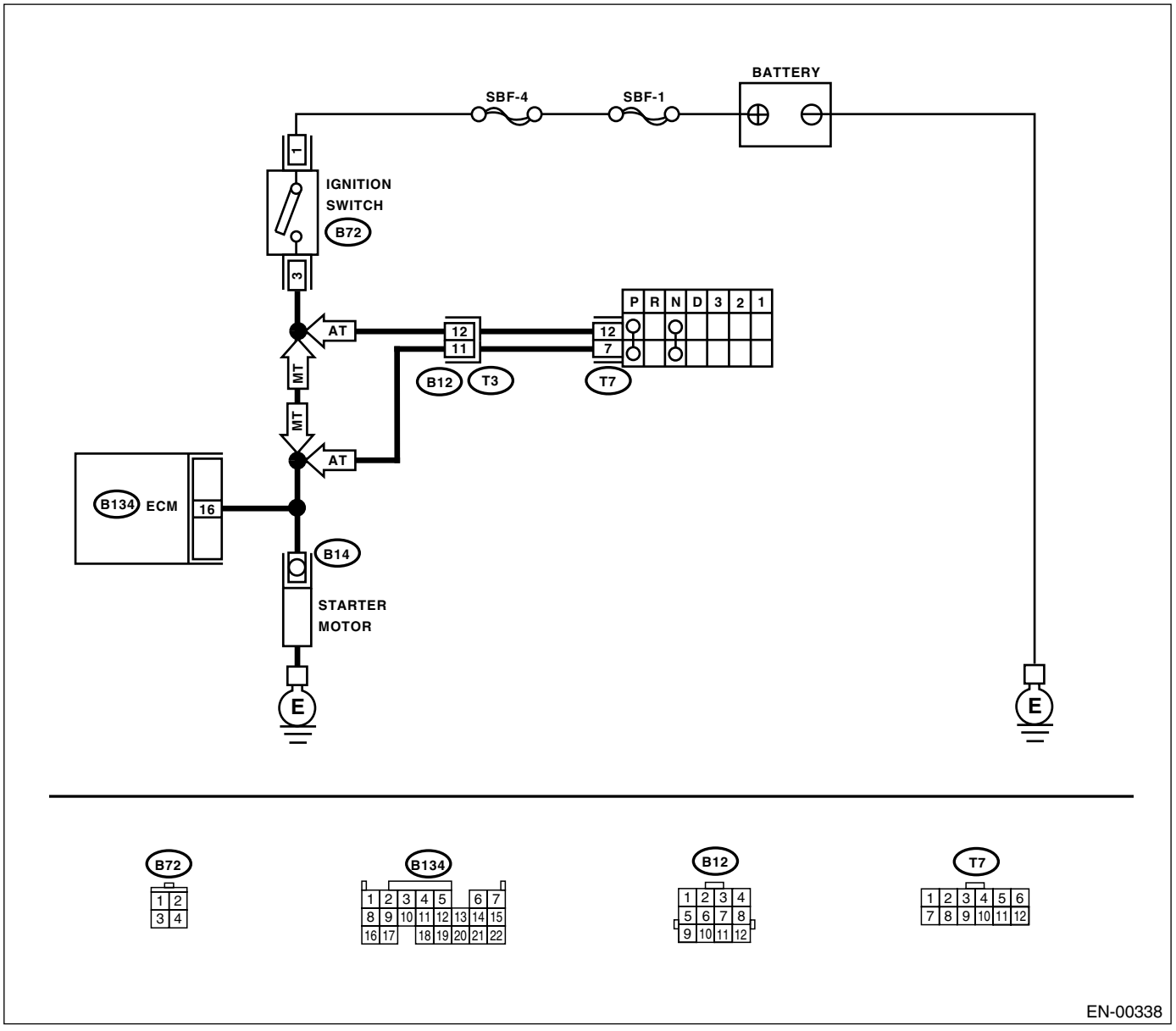
	Step	Check	Yes	No
1	**CHECK THROTTLE CABLE.** Does the throttle cable have play for adjustment?	Throttle cable has play.	Go to step **2.**	Adjust the throttle cable. <Ref. to SP(SOHC)-9, INSTALLATION, Accelerator Control Cable.>
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 10 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **3.**	Go to step **4.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from idle air control solenoid valve. 3)Turn the ignition switch to ON. 4)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 10 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Repair the battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>	Replace the idle air control solenoid valve. <Ref. to FU(TURBO)-35, Idle Air Control Solenoid Valve.> and ECM <Ref. to FU(TURBO)-48, Engine Control Module.>
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 10 (+) — Chassis ground (–):*** Shake the ECM harness and connector, while monitoring value of voltage meter. Is the voltage change more than specified value?	10 V	Repair the battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BD:DTC P0512 — STARTER SWITCH CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



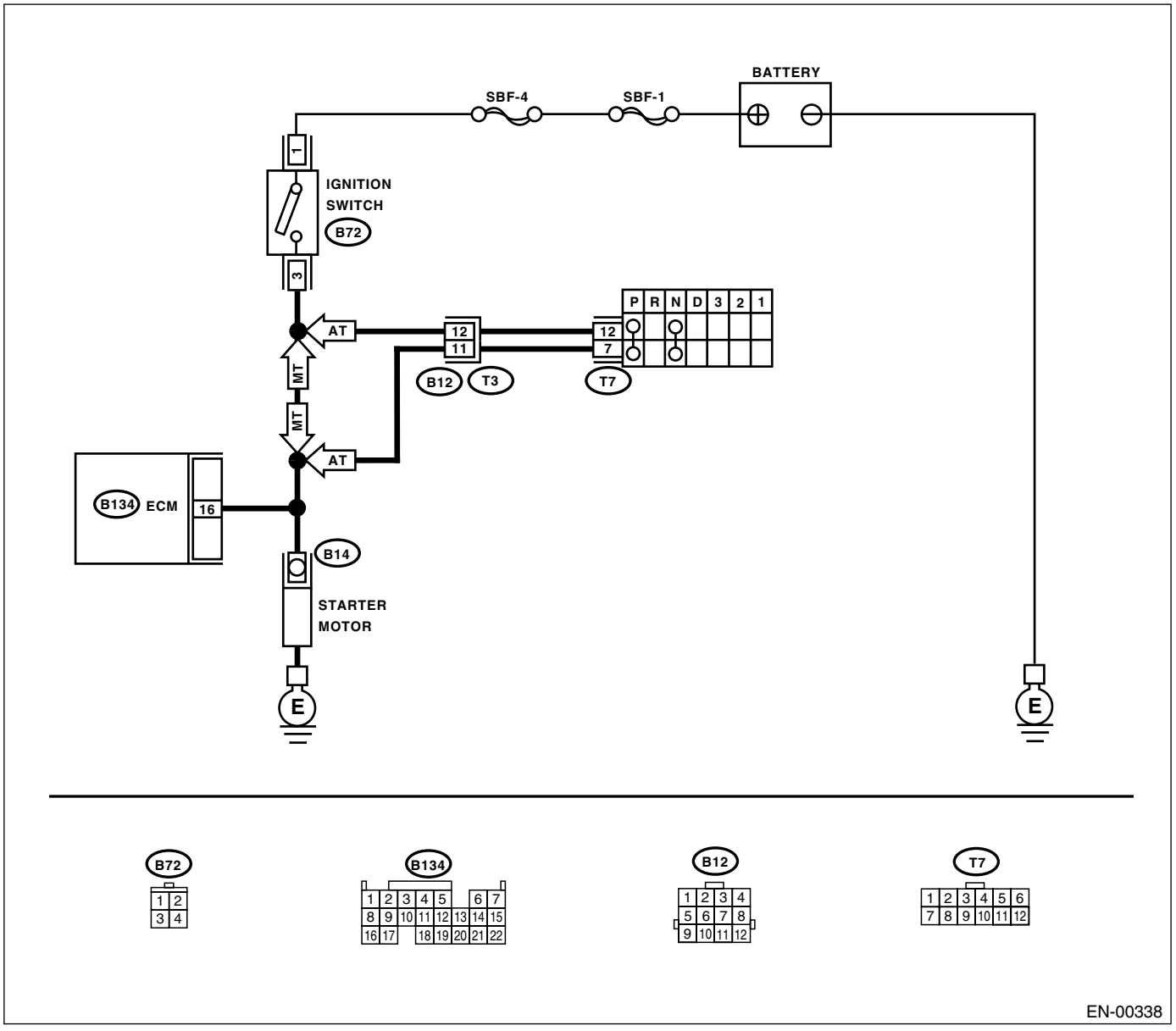
	Step	Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.** Does the starter motor operate when ignition switch is turned to ON?	Starter motor operates.	Repair the battery short circuit in starter motor circuit. After repair, replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>	Check the starter motor circuit. <Ref. to EN(TURBO)-62, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

BE:DTC P0518 — STARTER SWITCH CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



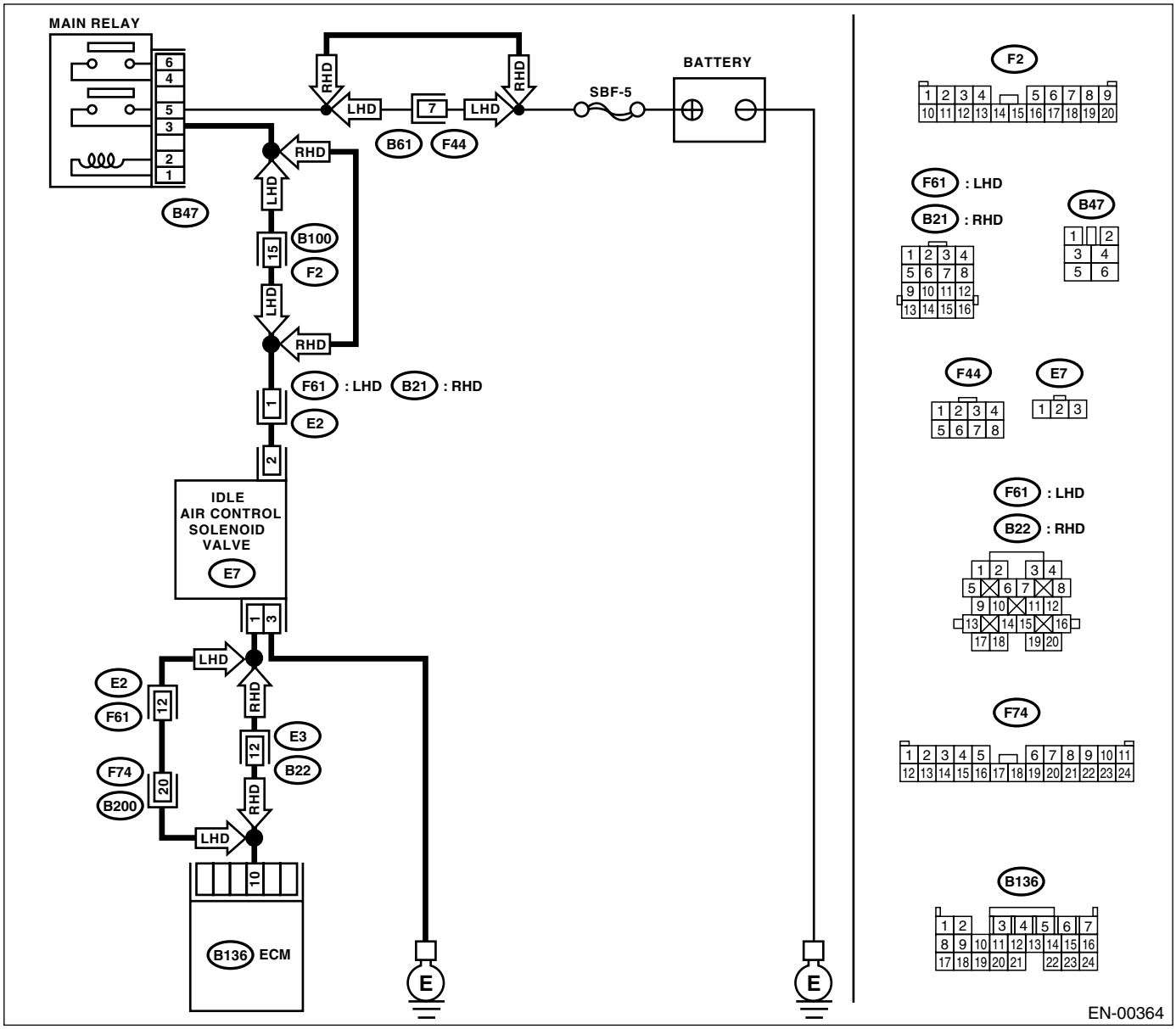
	Step	Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.** Does the starter motor operate when ignition switch is turned to START?	Starter motor operates.	Repair the harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between ECM and starter motor connector • Poor contact in ECM connector	Check the starter motor circuit. <Ref. to EN(TURBO)-62, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

BF:DTC P0519 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine keeps running at higher revolution than specified idling revolution.
  - Fuel is cut according to fail-safe function.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



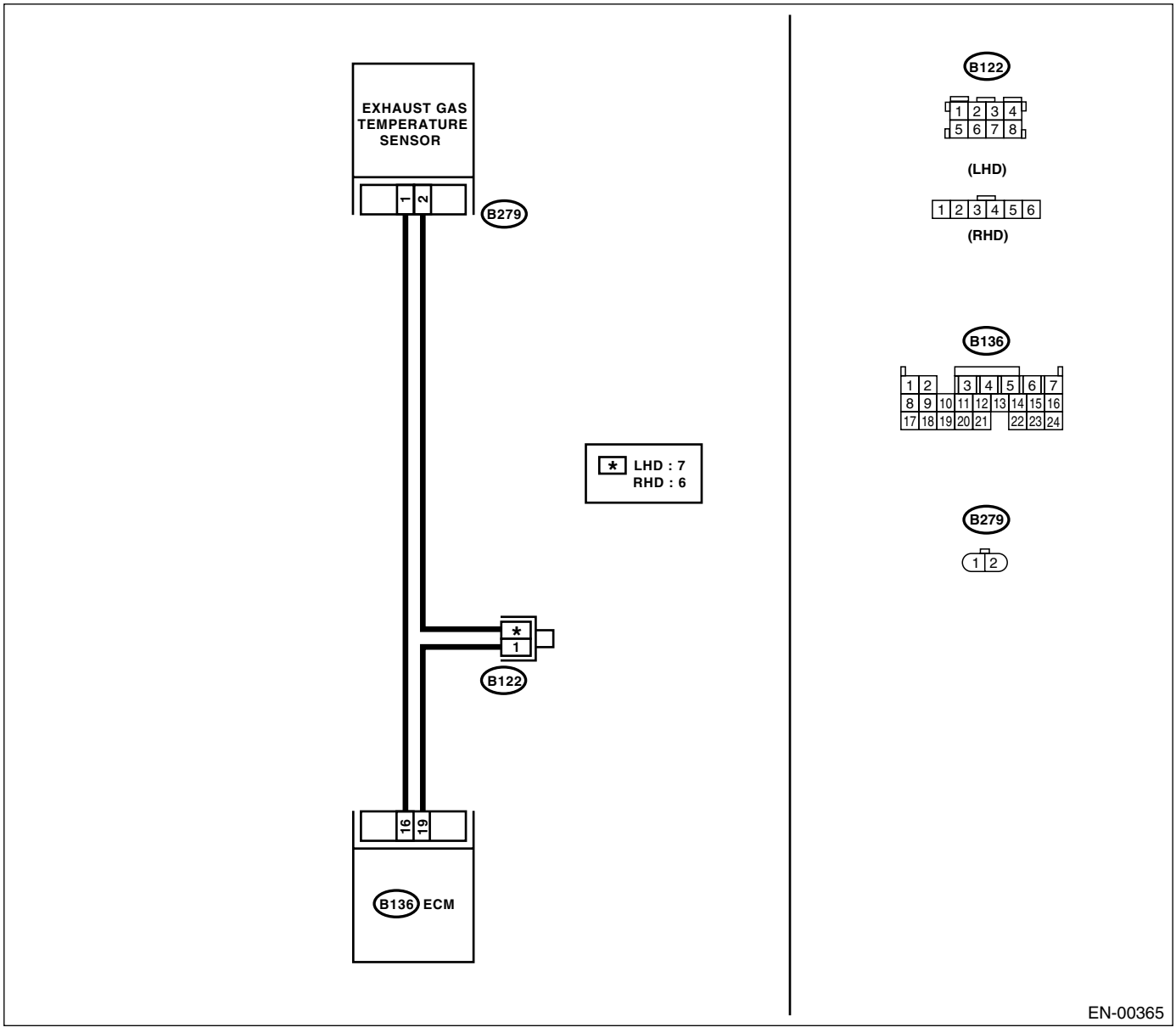
	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0519.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.** 1)Turn the ignition switch to ON. 2)Start the engine, and idle it. 3)Check the following items. •Loose installation of intake manifold, idle air control solenoid valve and throttle body •Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket •Disconnections of vacuum hoses Is there a fault in air intake system?	There is a fault.	Repair the air suction and leaks.	Go to step **3.**
3	**CHECK THROTTLE CABLE.** Does the throttle cable have play for adjustment?	Throttle cable has play.	Go to step **4.**	Adjust the throttle cable. <Ref. to SP(SOHC)-9, INSTALLATION, Accelerator Control Cable.>
4	**CHECK AIR BY-PASS LINE.** 1)Turn the ignition switch to OFF. 2)Remove the idle air control solenoid valve from throttle body. <Ref. to FU(TURBO)-35, Idle Air Control Solenoid Valve.> 3)Confirm that there are no foreign particles in by-pass air line. Are foreign particles in by-pass air line?	Foreign particles are in by-pass air line.	Remove the foreign particles from by-pass air line.	Replace the idle air control solenoid valve. <Ref. to FU(TURBO)-35, Idle Air Control Solenoid Valve.>

BG:DTC P0545 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Hard to start
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



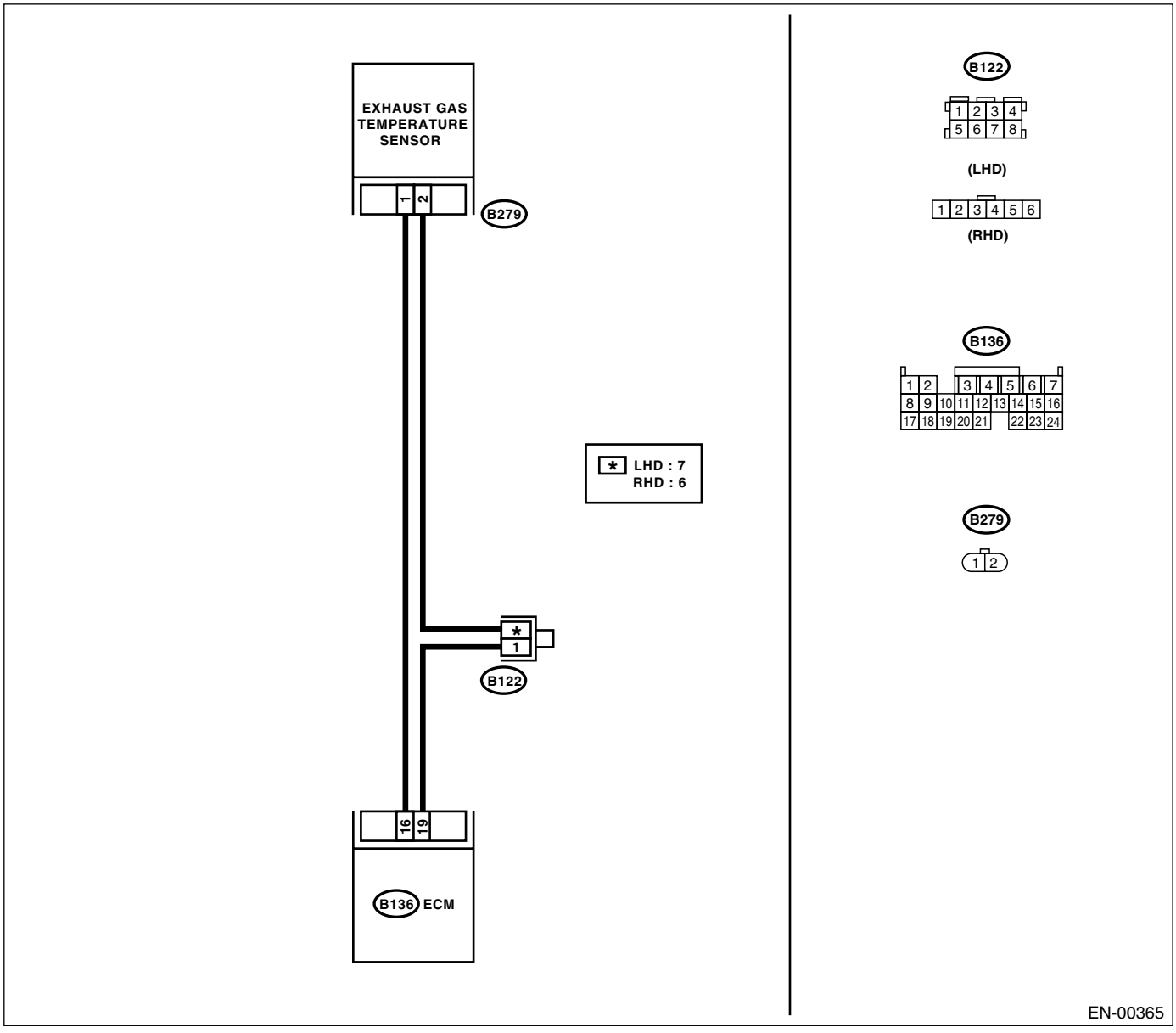
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of exhaust gas temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value more than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	1200°C (2192°F)	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in exhaust gas temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from exhaust gas temperature sensor. 3)Turn the ignition switch to ON. 4)Read the data of exhaust gas temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value less than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	372°C (702°F)	Replace the exhaust gas temperature sensor. <Ref. to FU(TURBO)-47, Exhaust Temperature Sensor.>	Repair the ground short circuit in harness between exhaust gas temperature sensor and ECM connector.

BH:DTC P0546 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Hard to start
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of exhaust gas temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value less than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	372°C (702°F)	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in exhaust gas temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from exhaust gas temperature sensor. 3)Measure the voltage between exhaust gas temperature sensor connector and engine ground. ***Connector & terminal*** ***(B279) No. 1 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Repair the battery short circuit in harness between ECM and exhaust gas temperature sensor connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between exhaust gas temperature sensor connector and engine ground. ***Connector & terminal*** ***(B279) No. 1 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Repair the battery short circuit in harness between ECM and exhaust gas temperature sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between exhaust gas temperature sensor connector and engine ground. ***Connector & terminal*** ***(B279) No. 1 (+) — Engine ground (–):*** Is the measured value more than specified value?	4 V	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and exhaust gas temperature sensor connector • Poor contact in exhaust gas temperature sensor connector • Poor contact in ECM connector • Poor contact in joint connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of harness between exhaust gas temperature sensor connector and engine ground. ***Connector & terminal*** ***(B279) No. 2 — Engine ground:*** Is the measured value less than specified value?	5 Ω	Replace the exhaust gas temperature sensor. <Ref. to FU(TURBO)-47, Exhaust Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and exhaust gas temperature sensor connector • Poor contact in exhaust gas temperature sensor connector • Poor contact in ECM connector • Poor contact in joint connector

BI: DTC P0558 — GENERATOR CIRCUIT LOW INPUT —

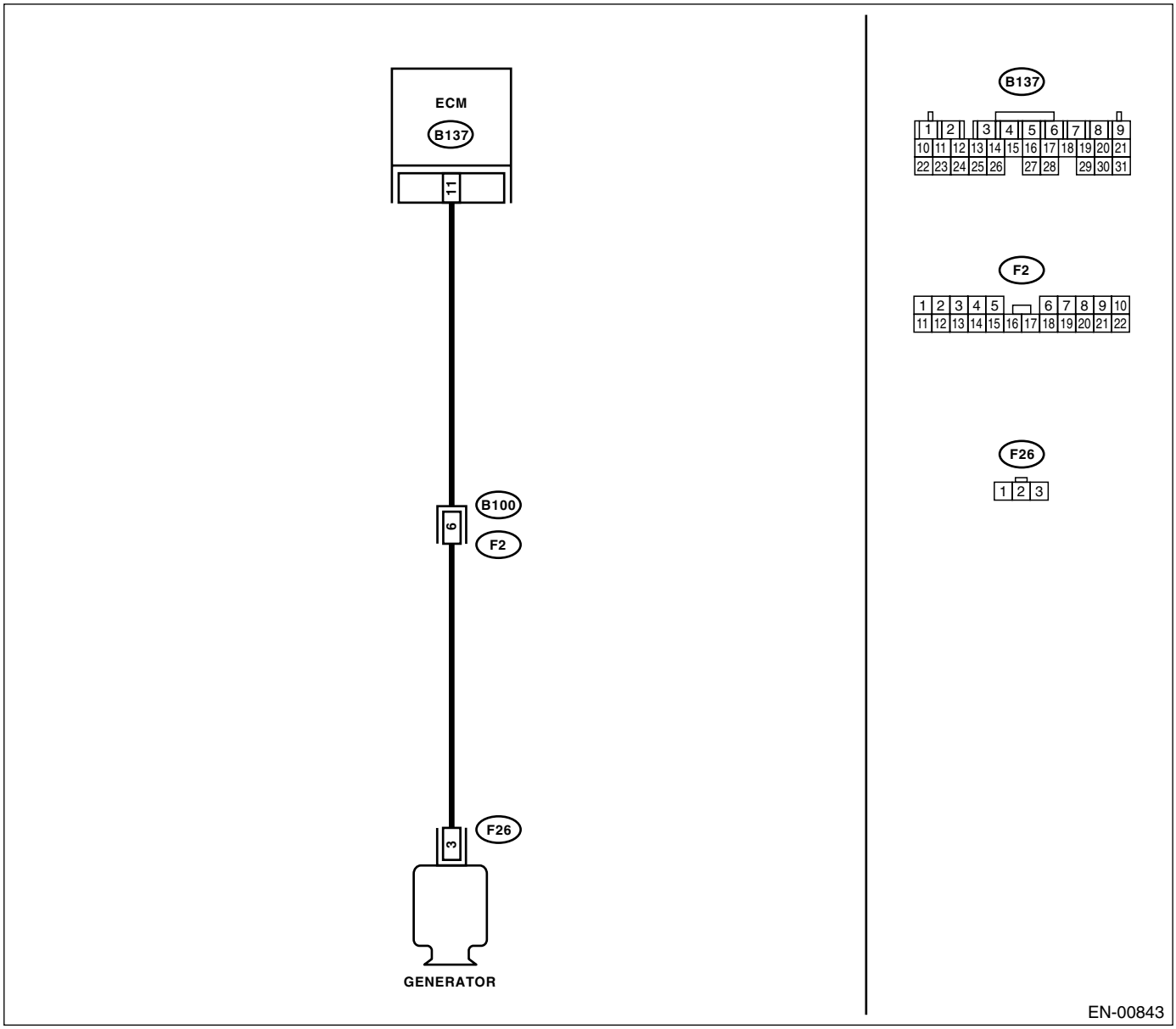
CAUTION:
For diagnostic procedure, refer to DTC P0559. <Ref. to EN(TURBO)-224, DTC P0559 — GENERATOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>.

BJ:DTC P0559 — GENERATOR CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



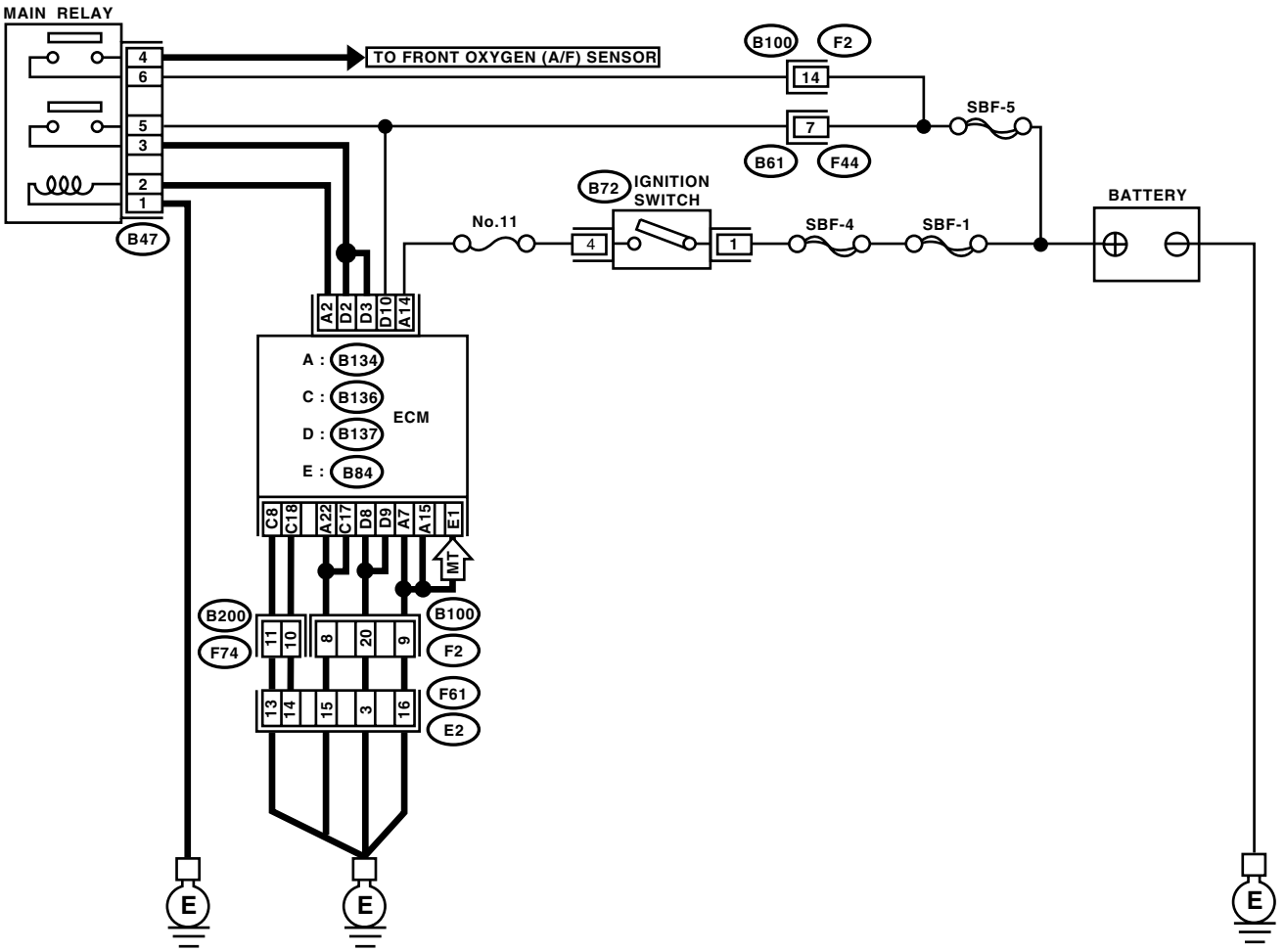
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN GENERATOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from generator and ECM. 3)Measure the resistance of harness between generator connector and engine ground. ***Connector & terminal*** ***(F26) No. 3 — Engine ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **2.**	Repair the ground short circuit in harness between ECM and purge control solenoid valve connector.
2	**CHECK HARNESS BETWEEN GENERATOR AND ECM CONNECTOR.** Measure the resistance of harness between ECM and generator of harness connector. ***Connector & terminal*** ***(B137) No. 11 — (F26) No. 3:*** Is the measured value less than specified value?	1 Ω	Repair poor contact in connector.	Repair the open circuit in harness between ECM and generator connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and generator connector • Poor contact in coupling connector

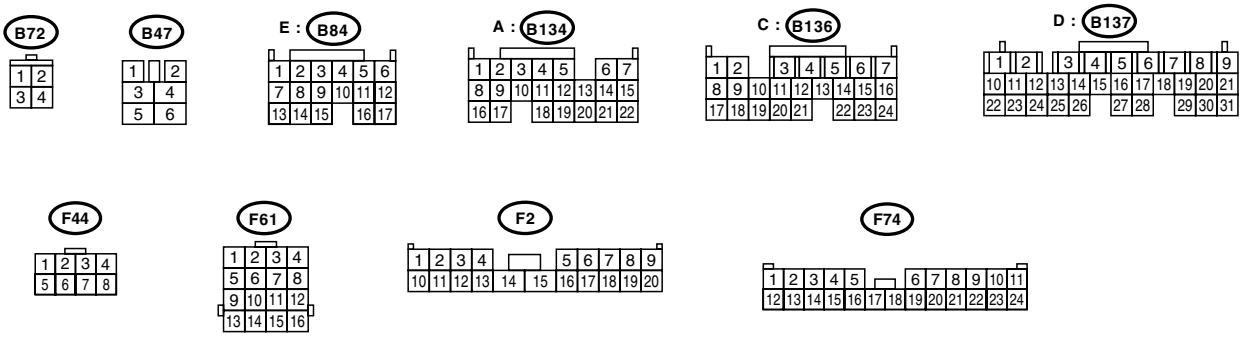
BK:DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine does not start.
  - Engine stalls.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

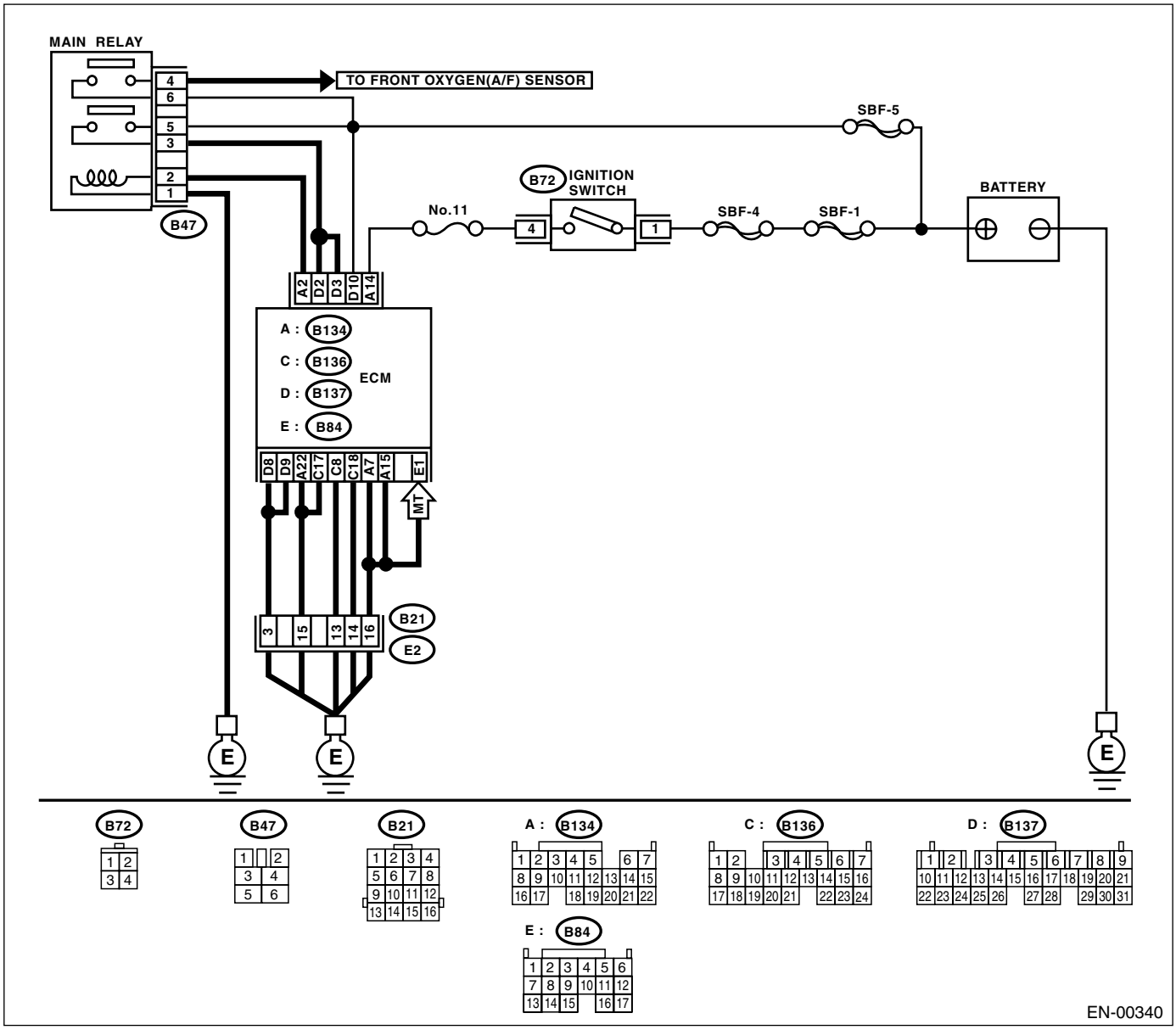
- **WIRING DIAGRAM:**
- **LHD model**





EN-00339

- **RHD model**



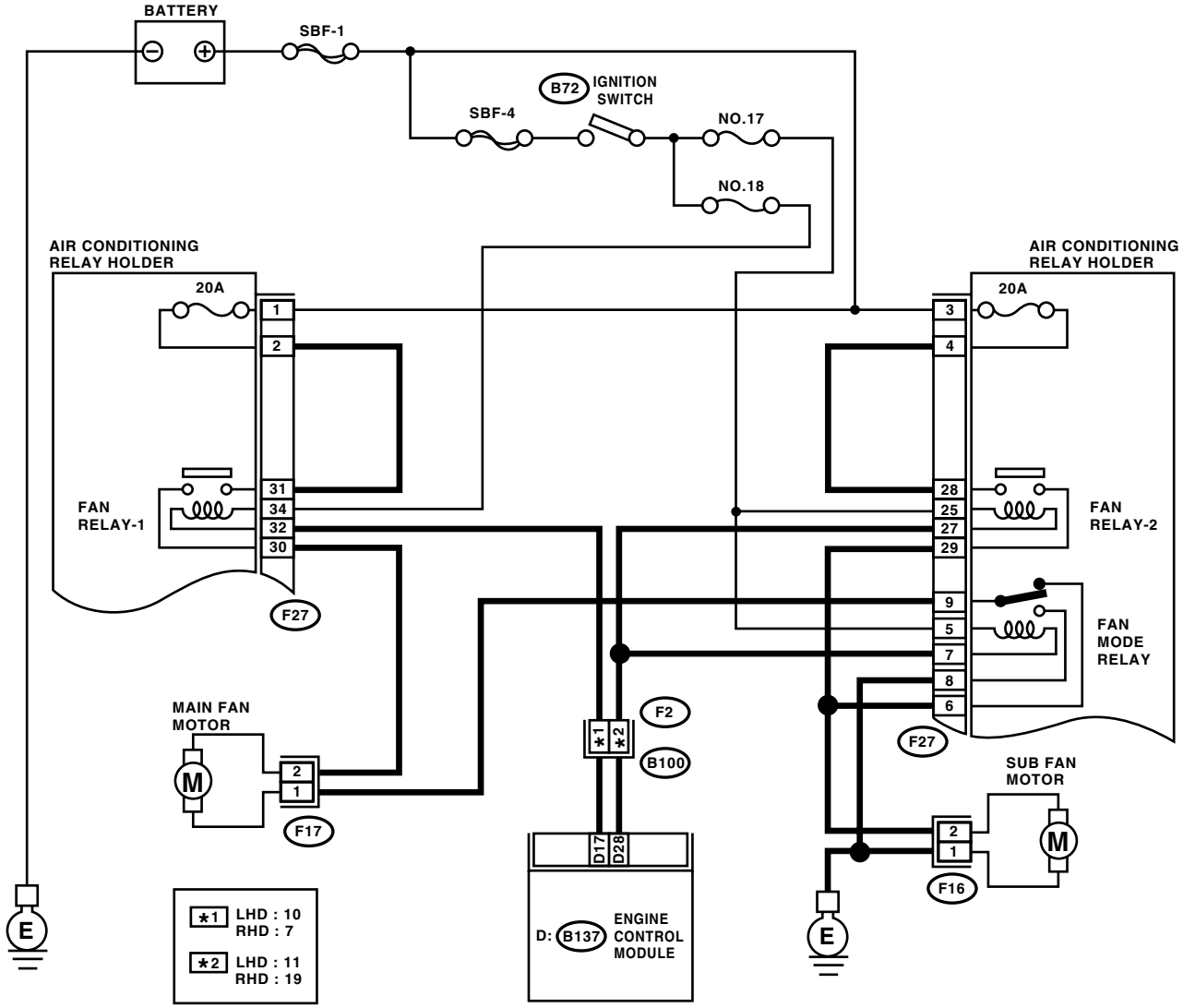
Step		Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0604?	DTC P0604 is indicated.	Replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>	A temporary poor contact.

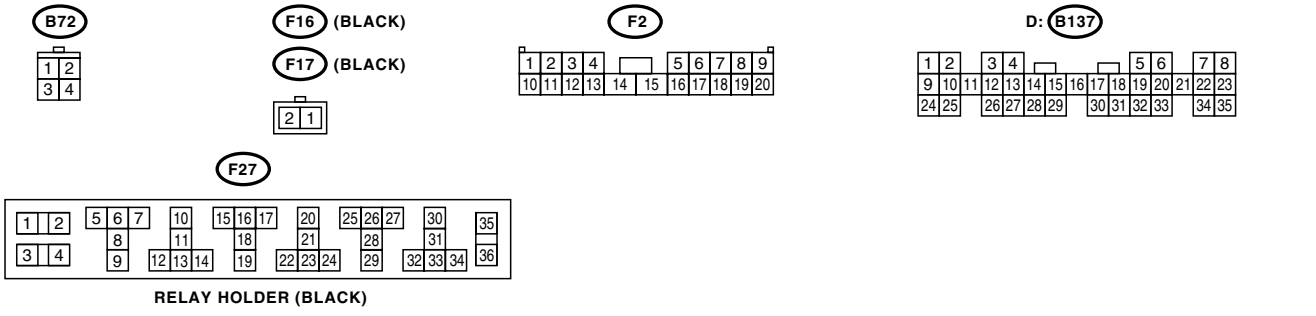
BL:DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Radiator fan does not operate properly.
  - Overheating

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-00362

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to OFF. 2)Connect the test mode connector. 3)Turn the ignition switch to ON. 4)While operating the radiator fan relay, measure voltage between ECM terminal and ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode".<Ref. to EN(TURBO)-34, Subaru Select Monitor.> ***Connector & terminal*** ***(B137) No. 17 (+) — Chassis ground (–):*** ***(B137) No. 28 (+) — Chassis ground (–):*** Is the change of measured value within specified value?	0 — 10 V	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK GROUND SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM. 3)Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 17 (+) — Chassis ground (–):*** ***(B137) No. 28 (+) — Chassis ground (–):*** Is the measured value less than specified value?	10 Ω	Repair ground short circuit in radiator fan relay control circuit.	Go to step **3.**
3	**CHECK POWER SUPPLY FOR RELAY.** 1)Remove the fan relay 1 and fan relay 2 from A/C relay holder. 2)Turn the ignition switch to ON. 3)Measure the voltage between fuse and relay box (F/B) connector and chassis ground. ***Connector & terminal*** ***(F27) No. 34 (+) — Chassis ground (–):*** ***(F27) No. 25 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **4.**	Repair open circuit in harness between ignition switch and fuse and relay box (F/B) connector.
4	**CHECK FAN RELAY 1.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between fan relay 1 terminals. ***Terminal*** ***No. 32 — No. 34:*** Is the measured value within specified value?	87 — 107 Ω	Go to step **5.**	Replace the fan relay 1.
5	**CHECK FAN RELAY 2.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between fan relay 2 terminals. ***Terminal*** ***No. 25 — No. 27:*** Is the measured value within specified value?	87 — 107 Ω	Go to step **6.**	Replace the fan relay 2.

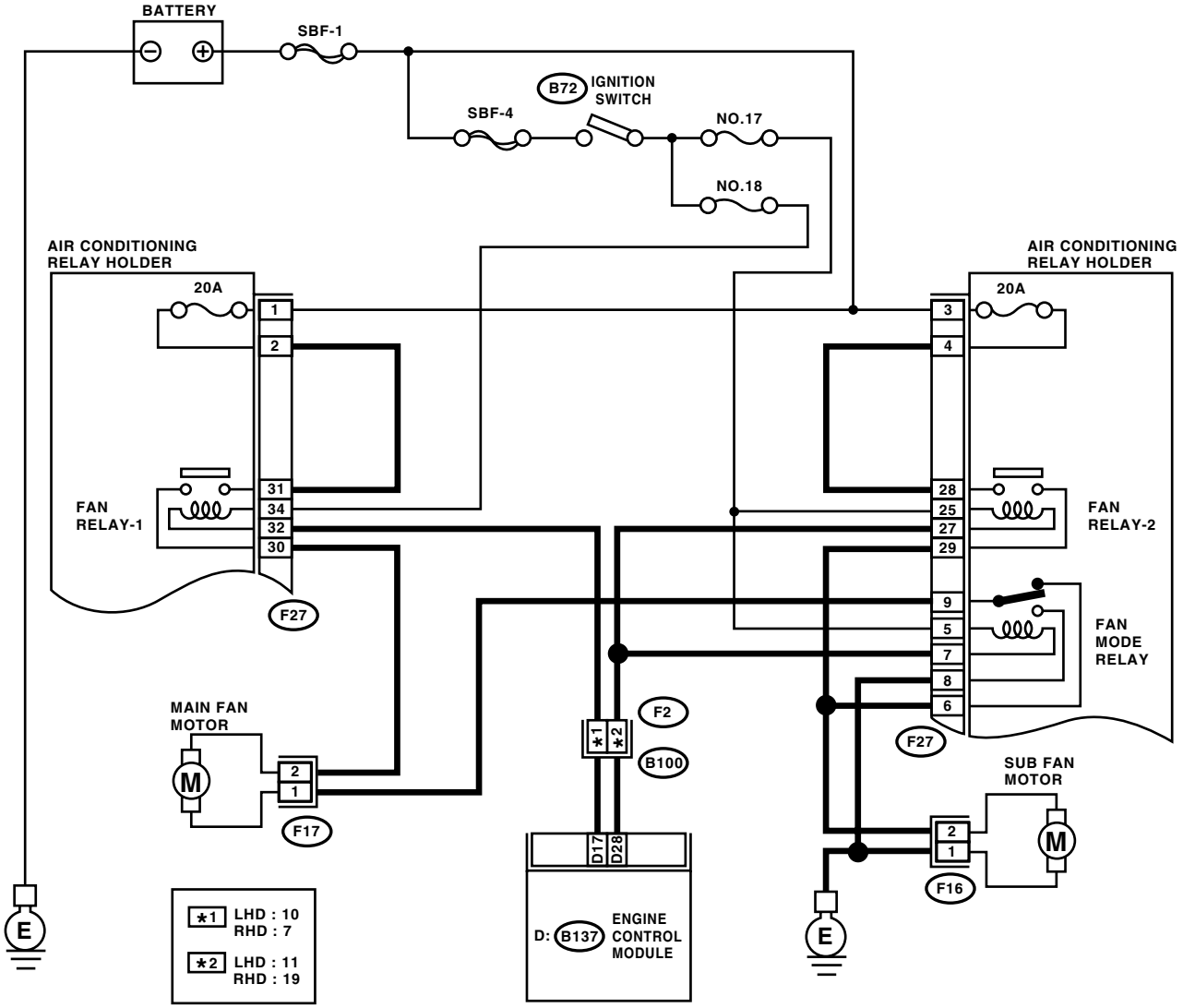
	Step	Check	Yes	No
6	**CHECK OPEN CIRCUIT IN FAN RELAY CONTROL CIRCUIT.** Measure the resistance of harness between ECM and fan relay connector. ***Connector & terminal*** ***(B137) No. 17 — (F27) No. 32:*** ***(B137) No. 28 — (F27) No. 27:*** Is the measured value less than specified value?	1 Ω	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fan relay connector • Poor contact in coupling connector
7	**CHECK POOR CONTACT.** Check poor contact in ECM or fan relay connector. Is there poor contact in ECM or fan relay connector?	Poor contact occurs.	Repair poor contact in ECM or fan relay connector.	Contact with SOA (distributor) service.

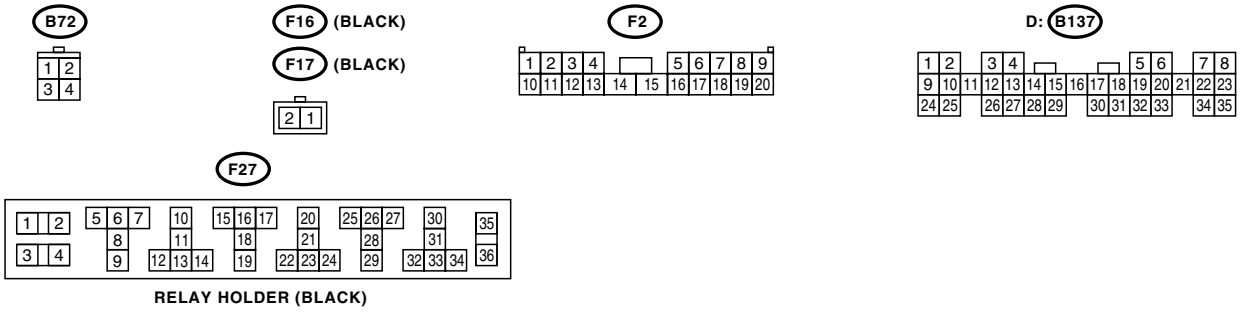
BM:DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Radiator fan does not operate properly.
  - Overheating

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, Operation.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**





EN-00362

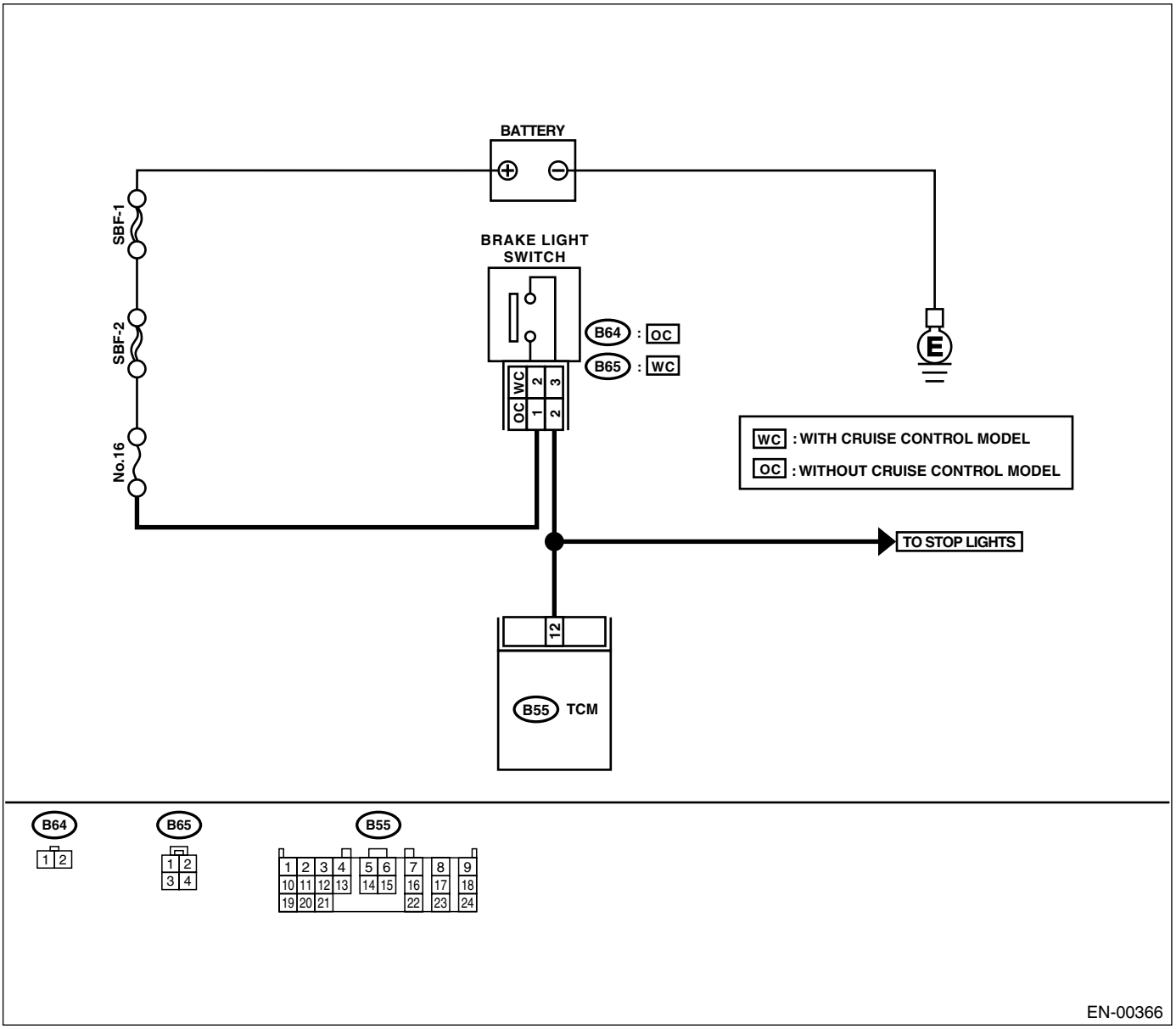
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to OFF. 2)Connect the test mode connector. 3)Turn the ignition switch to ON. 4)While operating the radiator fan relay, measure the voltage between ECM and chassis ground. NOTE: Radiator fan relay operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode".<Ref. to EN(TURBO)-50, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B137) No. 17 (+) — Chassis ground (–):*** ***(B137) No. 28 (+) — Chassis ground (–):*** Dose the measured value change within specified value?	0 — 10 V	Even if MIL lights up, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.	Go to step **2.**
2	**CHECK SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.** 1)Turn the ignition switch to OFF. 2)Remove the fan relay 1, fan relay 2 and fan mode relay. (with A/C models) 3)Disconnect the test mode connector. 4)Turn the ignition switch to ON. 5)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 17 (+) — Chassis ground (–):*** ***(B137) No. 28 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Repair the battery short circuit in radiator fan relay control circuit. After repair, replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>	Go to step **3.**
3	**CHECK FAN RELAY 1.** 1)Turn the ignition switch to OFF. 2)Remove the fan relay 1. 3)Measure the resistance between fan relay 1 terminals. ***Terminal*** ***No. 30 — No. 31:*** Is the measured value less than specified value?	1 Ω	Replace the fan relay 1 and ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>	Go to step **4.**
4	**CHECK FAN RELAY 2.** 1)Remove the fan relay 2. 2)Measure the resistance between fan relay 2 terminals. ***Terminal*** ***No. 28 — No. 29:*** Is the measured value less than specified value?	1 Ω	Replace the fan relay 2 and ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>

BN:DTC P0703 — TORQUE CONVERTER/BRAKE SWITCH "B" CIRCUIT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK OPERATION OF BRAKE LIGHT.** Does the brake light come on when depressing the brake pedal?	Brake light comes on.	Go to step **2.**	Repair or replace the brake light circuit.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR.** 1)Disconnect the connectors from TCM and brake light switch. 2)Measure the resistance of harness between TCM and brake light switch connector. ***Connector & terminal*** ***WITH CRUISE CONTROL MODEL*** ***(B55) No. 12 — (B65) No. 3:*** ***WITHOUT CRUISE CONTROL MODEL*** ***(B55) No. 12 — (B64) No. 2:*** Is the measured value less than specified value?	1 Ω	Go to step **3.**	Repair or replace the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between TCM and brake light switch connector • Poor contact in TCM connector • Poor contact in brake light switch connector
3	**CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 12 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **4.**	Repair the ground short circuit in harness between TCM and brake light switch connector.
4	**CHECK INPUT SIGNAL FOR TCM.** 1)Connect the connectors to TCM and brake light switch. 2)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 12 (+) — Chassis ground (–):*** Is the measured value less than specified value when releasing the brake pedal?	1 V	Go to step **5.**	Adjust or replace the brake light switch. <Ref. to LI-8, STOP LIGHT SWITCH, INSPECTION, Stop Light System.>
5	**CHECK INPUT SIGNAL FOR TCM.** Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 12 (+) — Chassis ground (–):*** Is the measured value more than specified value when depressing the brake pedal?	10 V	Go to step **6.**	Adjust or replace the brake light switch. <Ref. to LI-8, STOP LIGHT SWITCH, INSPECTION, Stop Light System.>
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector. Is there poor contact in TCM connector?	Poor contact occurs.	Repair the poor contact in TCM connector.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

BO:DTC P0731 — GEAR 1 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(TURBO)-239, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BP:DTC P0732 — GEAR 2 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(TURBO)-239, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BQ:DTC P0733 — GEAR 3 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(TURBO)-239, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BR:DTC P0734 — GEAR 4 INCORRECT RATIO —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Shift point too high or too low; engine brake not effective in “3” range; excessive shift shock; excessive tight corner “braking”

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.>.

- **WIRING DIAGRAM:**

	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK THROTTLE POSITION SENSOR CIRCUIT.** Check the throttle position sensor circuit. <Ref. to AT-47, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in throttle position sensor circuit?	There is a fault.	Repair or replace the throttle position sensor circuit.	Go to step **3.**
3	**CHECK FRONT VEHICLE SPEED SENSOR CIRCUIT.** Check the front vehicle speed sensor circuit. <Ref. to AT-54, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in front vehicle speed sensor circuit?	There is a fault.	Repair or replace the vehicle speed sensor 2 circuit.	Go to step **4.**
4	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT.** Check the torque converter turbine speed sensor circuit. <Ref. to AT-59, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in torque converter turbine speed sensor circuit?	There is a fault.	Repair or replace the torque converter turbine speed sensor circuit.	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in TCM connector. Is there poor contact in TCM connector?	Poor contact occurs.	Repair the poor contact in TCM connector.	Go to step **6.**
6	**CHECK MECHANICAL TROUBLE.** Check mechanical trouble in automatic transmission. Is there any mechanical trouble in automatic transmission?	There is trouble.	Repair or replace the automatic transmission. <Ref. to AT-31, INSPECTION, Road Test.>	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

BS:DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - No lock-up (after engine warm-up)
  - No shift or excessive tight corner “braking”

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK LOCK-UP DUTY SOLENOID CIRCUIT.** Check the lock-up duty solenoid circuit. <Ref. to AT-87, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in lock-up duty solenoid circuit?	There is a fault.	Repair or replace the lock-up duty solenoid circuit.	Go to step **3.**
3	**CHECK THROTTLE POSITION SENSOR CIRCUIT.** Check the throttle position sensor circuit. <Ref. to AT-47, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in throttle position sensor circuit?	There is a fault.	Repair or replace the throttle position sensor circuit.	Go to step **4.**
4	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT.** Check the torque converter turbine speed sensor circuit. <Ref. to AT-59, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in torque converter turbine speed sensor circuit?	There is a fault.	Repair or replace the torque converter turbine speed sensor circuit.	Go to step **5.**
5	**CHECK ENGINE SPEED INPUT CIRCUIT.** Check the engine speed input circuit. <Ref. to AT-38, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in engine speed input circuit?	There is a fault.	Repair or replace the engine speed input circuit.	Go to step **6.**

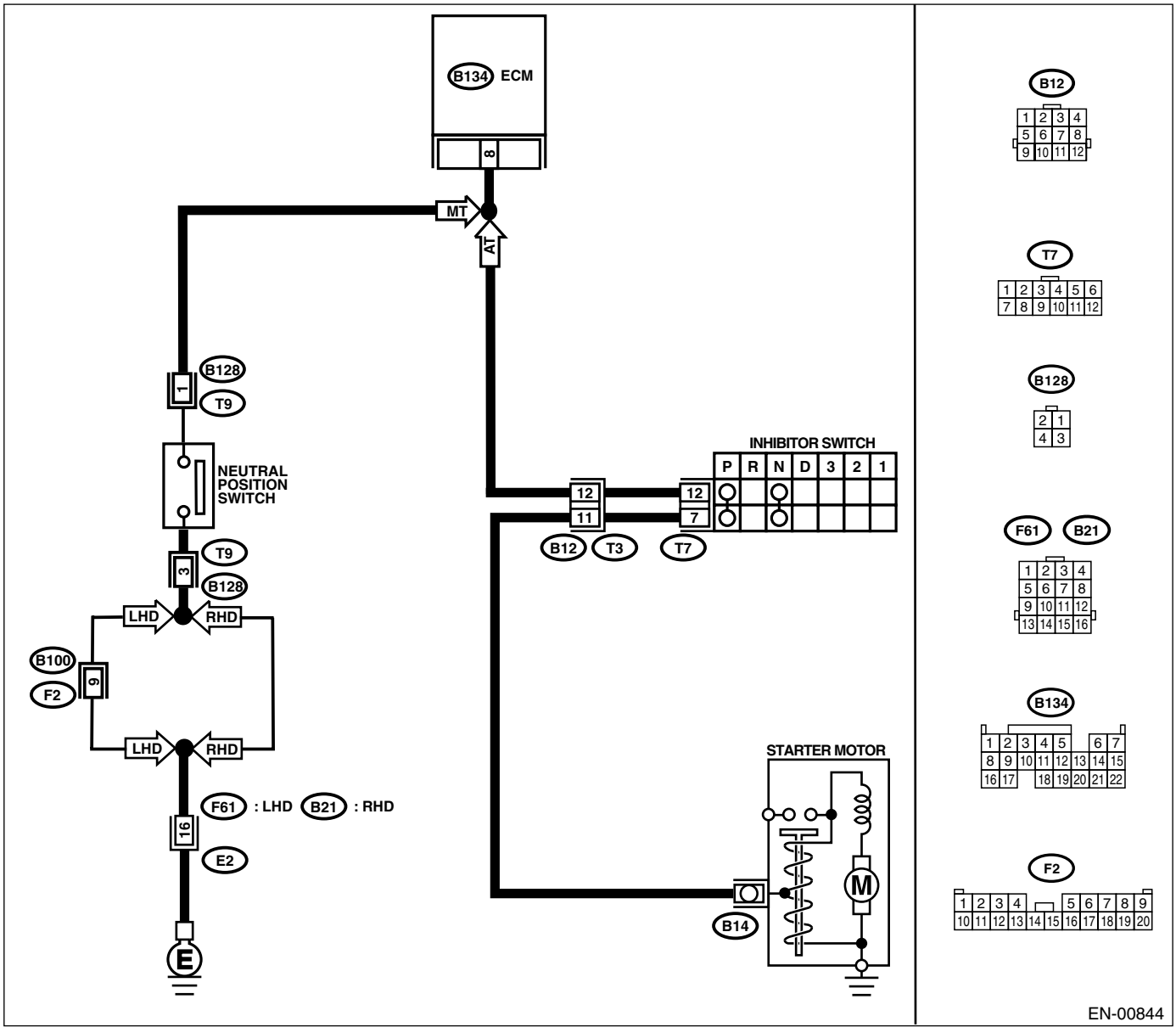
	Step	Check	Yes	No
6	**CHECK INHIBITOR SWITCH CIRCUIT.** Check the inhibitor switch circuit. <Ref. to AT-114, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).> Is there any trouble in inhibitor switch circuit?	There is a fault.	Repair or replace the inhibitor switch circuit.	Go to step **7.**
7	**CHECK BRAKE LIGHT SWITCH CIRCUIT.** Check the brake light switch circuit. <Ref. to AT-106, CHECK BRAKE SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).> Is there any trouble in brake light switch circuit?	There is a fault.	Repair or replace the brake light switch circuit.	Go to step **8.**
8	**CHECK ATF TEMPERATURE SENSOR CIRCUIT.** Check the ATF temperature sensor circuit. <Ref. to AT-43, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in ATF temperature sensor circuit?	There is a fault.	Repair or replace the ATF temperature sensor circuit.	Go to step **9.**
9	**CHECK POOR CONTACT.** Check poor contact in TCM connector. Is there poor contact in TCM connector?	Poor contact occurs.	Repair the poor contact in TCM connector.	Go to step **10.**
10	**CHECK MECHANICAL TROUBLE.** Check mechanical trouble in automatic transmission. Is there any mechanical trouble in automatic transmission?	There is trouble.	Repair or replace the automatic transmission. <Ref. to AT-31, INSPECTION, Road Test.>	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

BT:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT VEHICLES) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



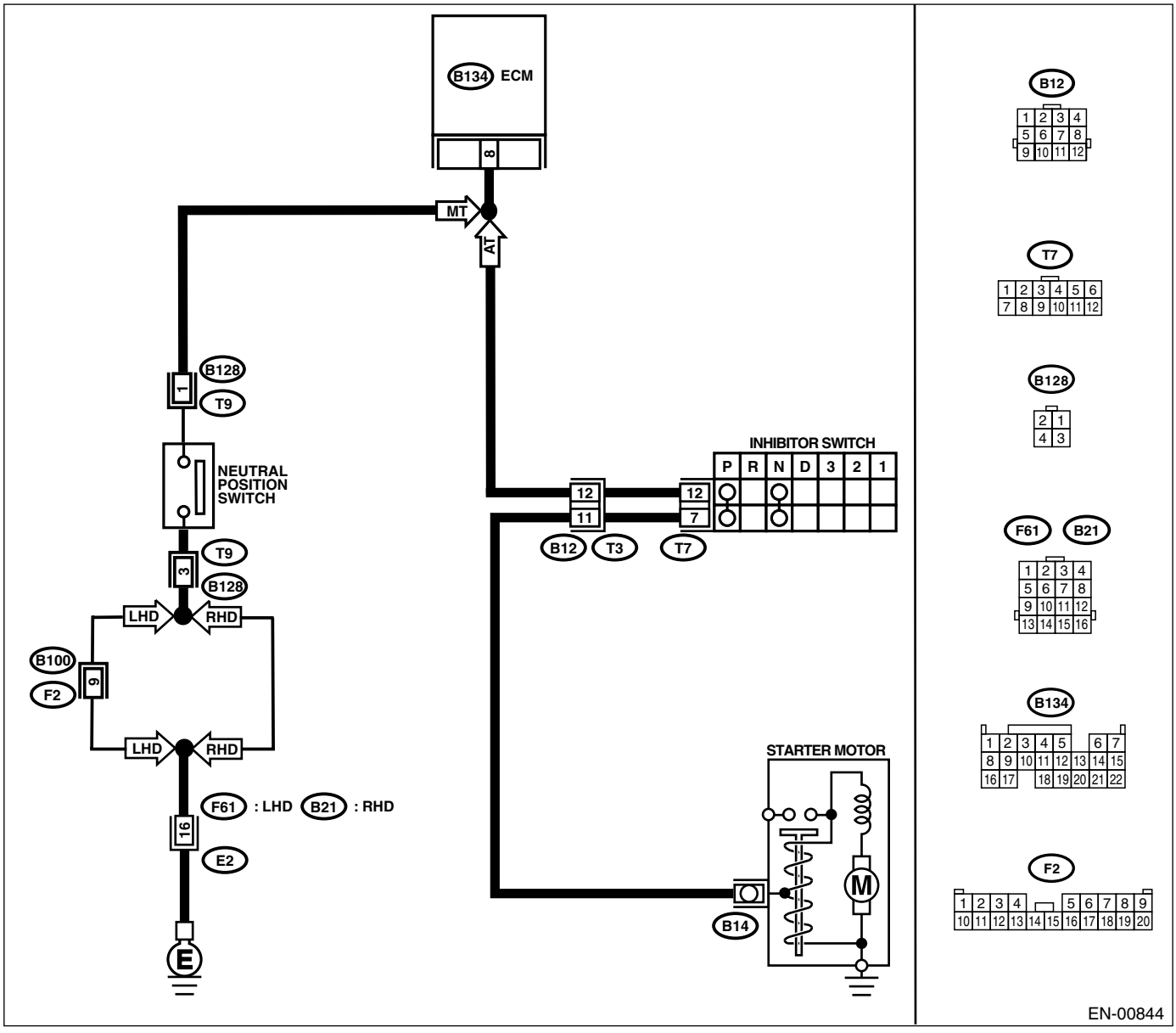
	Step	Check	Yes	No
1	**CHECK DTC P0705 ON DISPLAY.** Is DTC P0705 indicated?	DTC P0705 is indicated.	Inspect DTC P0705 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. 2)Place the select lever except for "N" and "P" positions. 3)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (–):*** Is the measured value within specified value?	4.5 — 5.5 V	Even if MIL lights up, the circuit has returned to a normal condition at this time.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and transmission harness connector (T3). 3)Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 8 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **4.**	Repair ground short circuit in harness between ECM and transmission harness connector.
4	**CHECK TRANSMISSION HARNESS CONNECTOR.** 1)Disconnect the connector from inhibitor switch. 2)Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(T3) No. 12 — Engine ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **5.**	Repair ground short circuit in harness between transmission harness and inhibitor switch connector.
5	**CHECK INHIBITOR SWITCH.** Measure the resistance between inhibitor switch connector the receptacle's terminals in selector lever except for "N" position. ***Terminals*** ***No. 7 — No. 12:*** Is the measured value more than specified value?	1 MΩ	Go to step **6.**	Replace the inhibitor switch. <Ref. to AT-48, Inhibitor Switch.>
6	**CHECK SELECTOR CABLE CONNECTION.** Is there any fault in selector cable connection to inhibitor switch?	There is a fault.	Repair selector cable connection. <Ref. to CS-10, INSPECTION, Select Cable.>	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BU:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (MT VEHICLES) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. 2)Place the shift lever in neutral. 3)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1)Place the shift lever in a position except for neutral. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair poor contact in ECM connector.	Contact with SOA (distributor) service.
4	**CHECK NEUTRAL POSITION SWITCH.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from transmission harness. 3)Place the shift lever in neutral. 4)Measure the resistance between transmission harness and connector terminals. ***Connector & terminal*** ***(T9) No. 1 — No. 3:*** Is the measured value more than specified value?	1 MΩ	Go to step **5.**	Repair short circuit in transmission harness or replace neutral position switch.
5	**CHECK NEUTRAL POSITION SWITCH.** 1)Place the shift lever in a position except for neutral. 2)Measure the resistance between transmission harness connector terminals. Is the measured value less than specified value?	1 Ω	Go to step **6.**	Repair short circuit in transmission harness or replace neutral position switch.
6	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **7.**	Repair ground short circuit in harness between ECM and transmission harness connector.
7	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** 1)Disconnect the connector from ECM. 2)Measure the resistance of harness between ECM and transmission harness connector. ***Connector & terminal*** ***(B134) No. 8 — (B128) No. 1:*** Is the measured value less than specified value?	1 Ω	Go to step **8.**	Repair open circuit in harness between ECM and transmission harness connector.

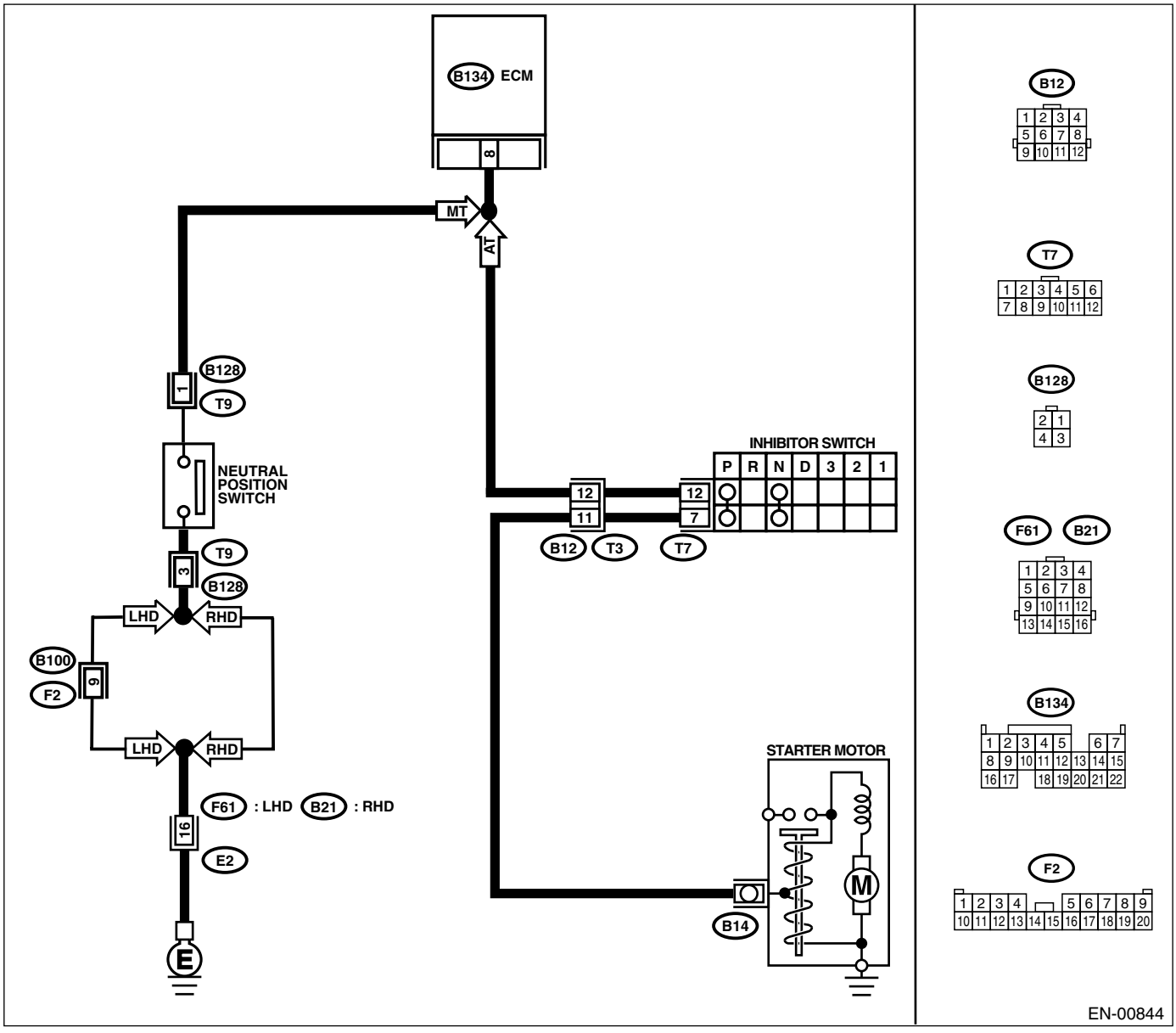
Step		Check	Yes	No
8	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(B128) No. 1 — Engine ground:*** Is the measured value less than specified value?	5 Ω	Go to step **9.**	Repair open circuit between transmission harness connector and engine ground terminal.
9	**CHECK POOR CONTACT.** Check poor contact in transmission harness connector. Is there poor contact in transmission harness connector?	Poor contact occurs.	Repair poor contact in transmission harness connector.	Contact with SOA (distributor) service.

BV:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT VEHICLES) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK DTC P0705 ON DISPLAY.** Is DTC P0705 indicated?	DTC P0705 is indicated.	Inspect DTC P0705 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground in selector lever "N" and "P" positions. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **3.**	Go to step **5.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground in selector lever except for "N" and "P" positions. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (–):*** Is the measured value within specified value?	4.5 — 5.5 V	Go to step **4.**	Go to step **5.**
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair poor contact in ECM connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Repair battery short circuit in harness between ECM and inhibitor switch connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and inhibitor switch. 3)Measure the resistance of harness between ECM and inhibitor switch connector. ***Connector & terminal*** ***(B134) No. 8 — (T7) No. 12:*** Is the measured value less than specified value?	1 Ω	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and inhibitor switch connector • Poor contact in coupling connector • Poor contact in inhibitor switch connector • Poor contact in ECM connector

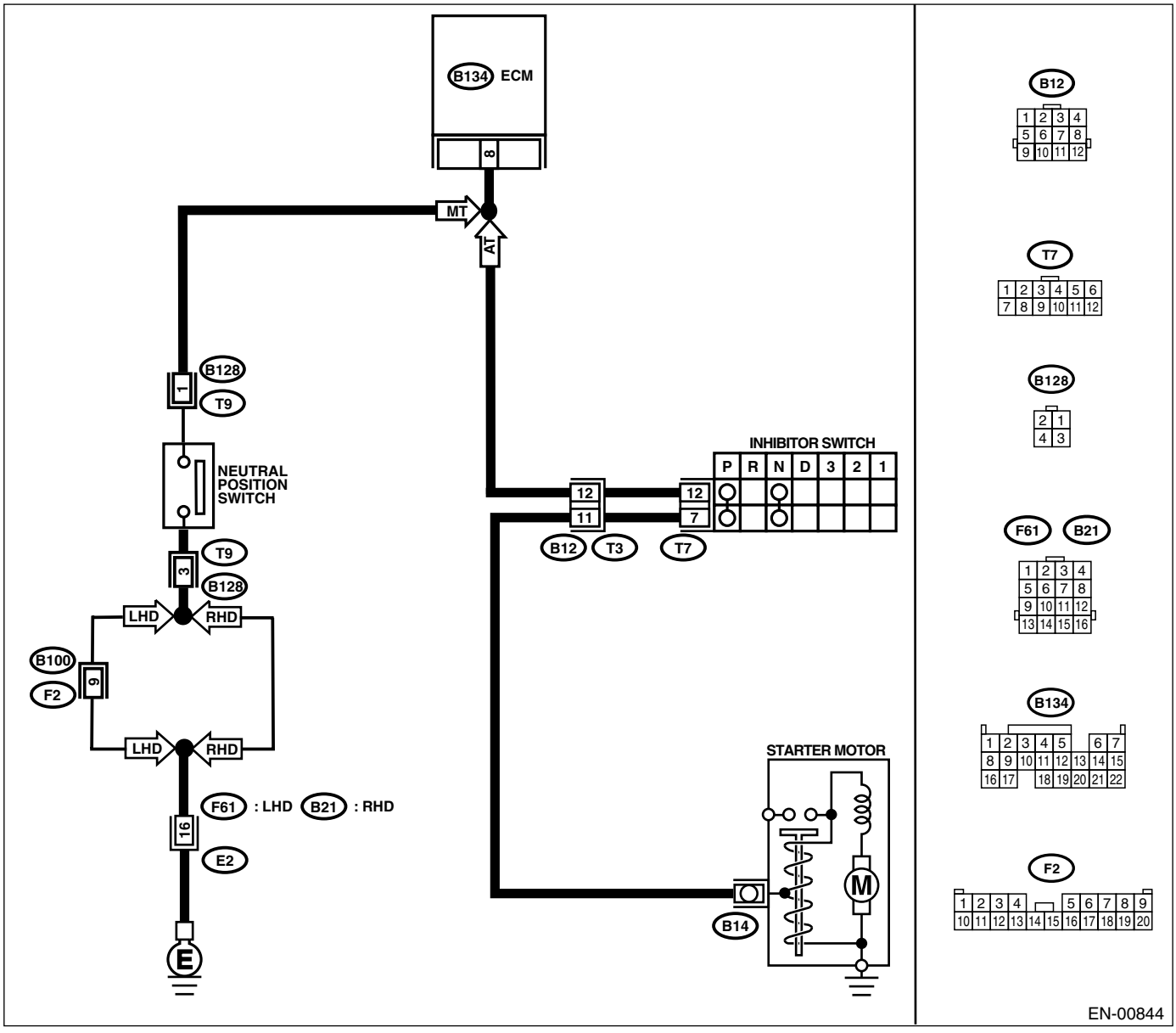
	Step	Check	Yes	No
7	**CHECK INHIBITOR SWITCH GROUND LINE.** Measure the resistance of harness between inhibitor switch connector and engine ground. ***Connector & terminal*** ***(T7) No. 7 — Engine ground:*** Is the measured value less than specified value?	5 Ω	Go to step **8.**	Repair open circuit in harness between inhibitor switch connector and starter motor ground line. NOTE: In this case, repair the following: • Open circuit in harness between inhibitor switch connector and starter motor ground line • Poor contact in starter motor connector • Poor contact in starter motor ground • Starter motor
8	**CHECK INHIBITOR SWITCH.** Measure the resistance between inhibitor switch connector receptacle's terminals in selector lever “N” and “P” positions. ***Terminals*** ***No. 7 — No. 12:*** Is the measured value less than specified value?	1 Ω	Go to step **9.**	Replace the inhibitor switch. <Ref. to AT-48, Inhibitor Switch.>
9	**CHECK SELECTOR CABLE CONNECTION.** Is there any fault in selector cable connection to inhibitor switch?	There is a fault.	Repair selector cable connection. <Ref. to CS-10, INSPECTION, Select Cable.>	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BW:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT VEHICLES) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. 2)Select the selector lever to except “N” range. 3)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1)Select the selector lever to “N” range. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair the poor contact in ECM connector.	Contact with your Subaru distributor service.
4	**CHECK INPUT SIGNAL FOR ECM.** 1)Disconnect ECM connector from ECM. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Repair the battery short circuit in harness between ECM and transmission connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and transmission harness connector (T9). 3)Measure the resistance of harness between ECM and neutral switch connector. ***Connector & terminal*** ***(B134) No. 8 — (B128) No. 1:*** Is the measured value less than specified value?	1 Ω	Go to step **6.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and transmission harness • Poor contact in transmission harness connector • Poor contact in ECM connector
6	**CHECK NEUTRAL POSITION SWITCH GROUND LINE.** Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(B128) No. 3 — Engine ground:*** Is the measured value less than specified value?	5 Ω	Go to step **7.**	Repair the open circuit in harness of neutral position switch ground line.

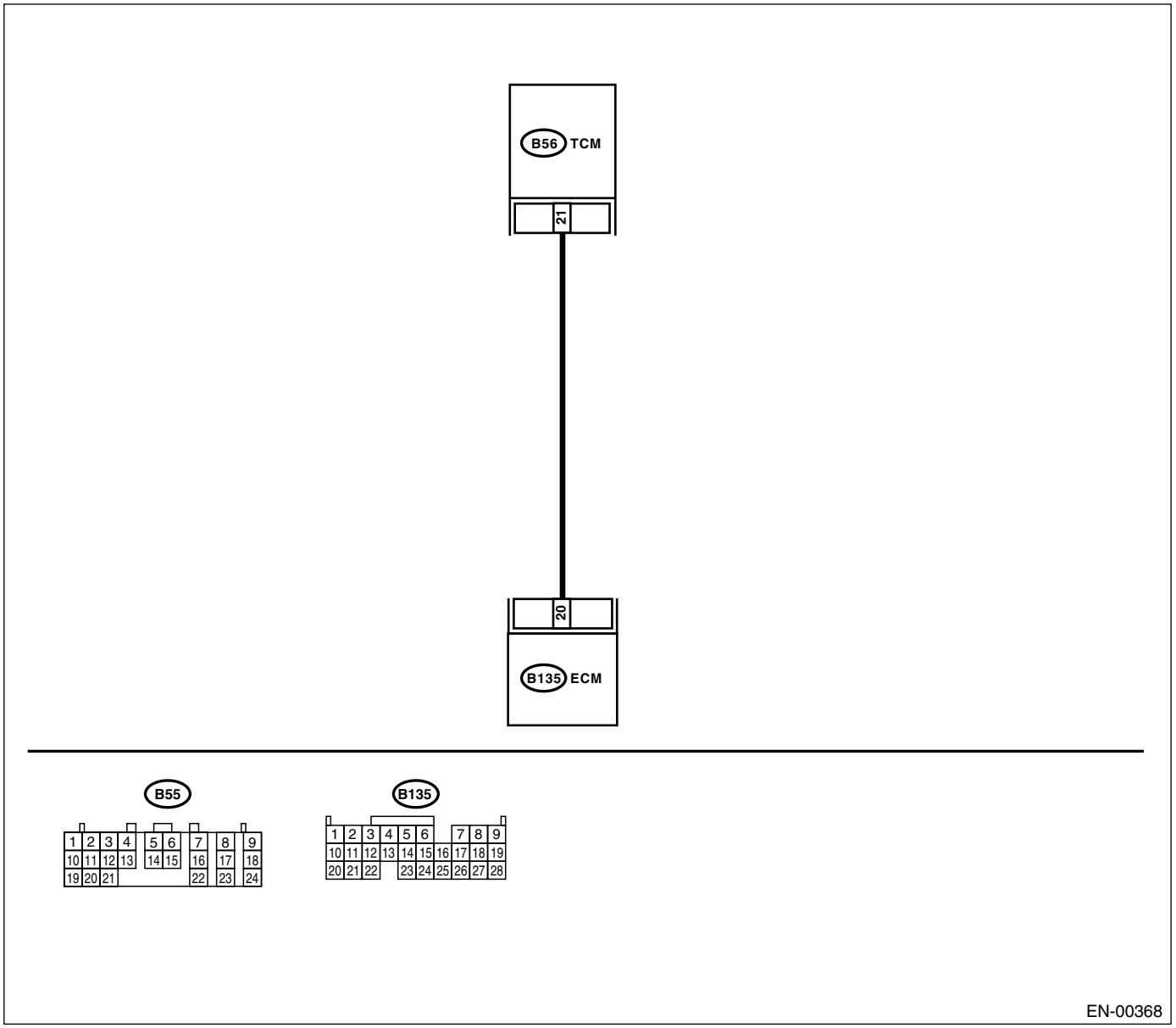
	Step	Check	Yes	No
7	**CHECK NEUTRAL POSITION SWITCH.** 1)Select the selector lever to except “N” range. 2)Measure the resistance between transmission harness connector receptacle’s terminals. ***Terminals*** ***No. 1 — No. 3:*** Is the measured value less than specified value?	1 Ω	Go to step **8.**	Replace the neutral position switch.
8	**CHECK POOR CONTACT.** Check poor contact in the transmission harness connector. Is there poor contact in the transmission harness connector?	Poor contact occurs.	Repair poor contact in transmission harness connector.	Contact with your Subaru distributor service.

BX:DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK DRIVING CONDITION.** 1)Start and warm-up the engine until the radiator fan makes one complete rotation. 2)Drive the vehicle. Is the AT shift control functioning properly?	AT shift control is functioning properly.	Go to step **2.**	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

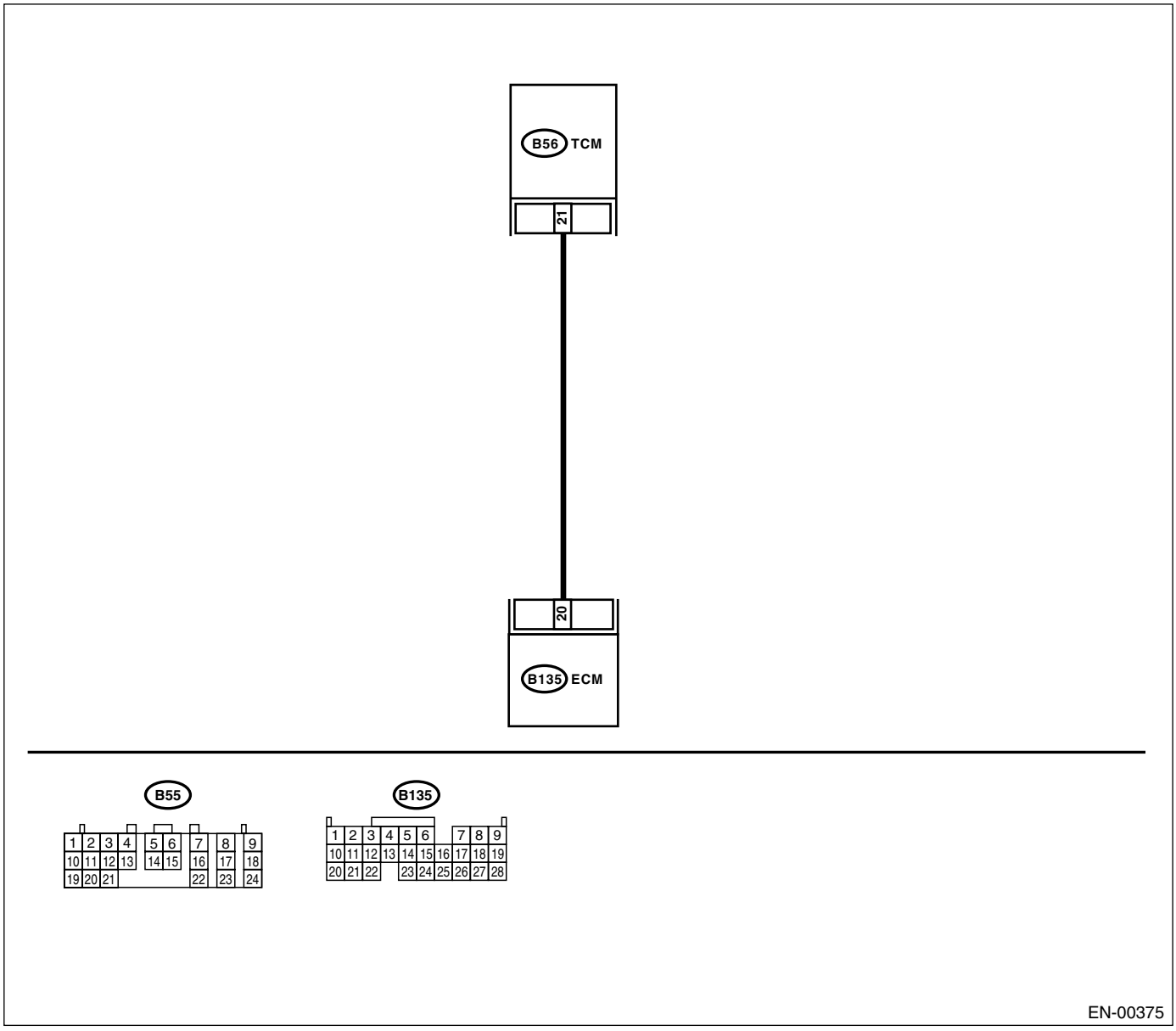
	Step	Check	Yes	No
2	**CHECK ACCESSORY.** Are car phone and/or CB installed on vehicle?	Car phone and/or CB are installed on vehicle.	Repair the grounding line of car phone or CB system.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

BY:DTC P0865 — AT DIAGNOSIS INPUT SIGNAL CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.>.

- **WIRING DIAGRAM:**



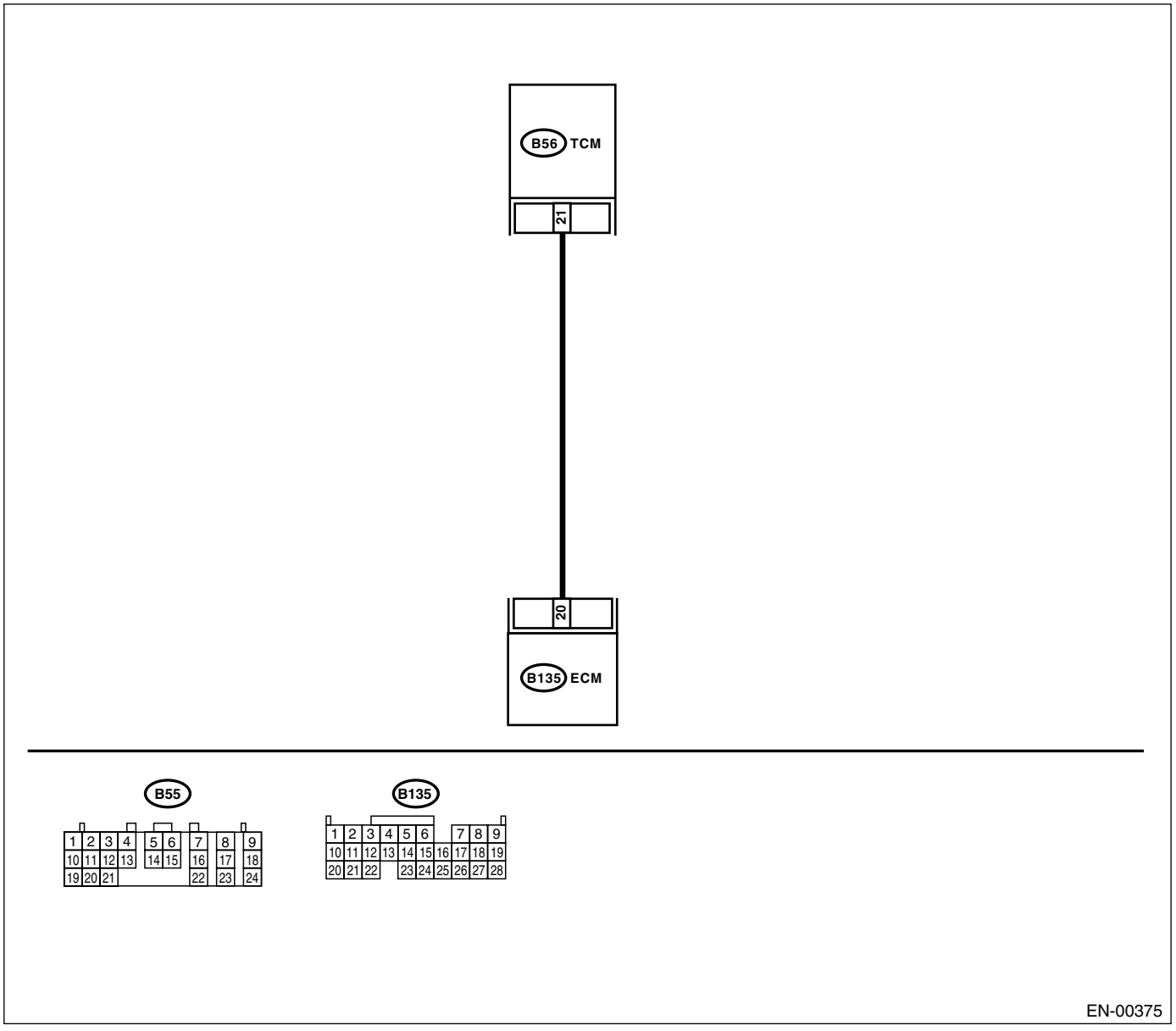
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. NOTE: In this case, repair the following: • Poor contact in ECM connector • Poor contact in TCM connector
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM and TCM. 3)Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 20 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	Repair the ground short circuit in harness between ECM and TCM connector.	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FOR ECM.** 1)Connect the connector to ECM. 2)Turn the ignition switch to ON. 3)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (–):*** Is the measured value more than specified value?	5 V	Go to step **4.**	Repair the poor contact in ECM connector.
4	**CHECK TROUBLE CODE FOR AUTOMATIC TRANSMISSION.** Read the DTC for automatic transmission. <Ref. to AT-20, Read Diagnostic Trouble Code (DTC).> Does the DTC appear for automatic transmission?	DTC appears for automatic transmission.	Inspect the DTC for automatic transmission. <Ref. to AT-38, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

BZ:DTC P0866 — AT DIAGNOSIS INPUT SIGNAL CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.>.

- **WIRING DIAGRAM:**



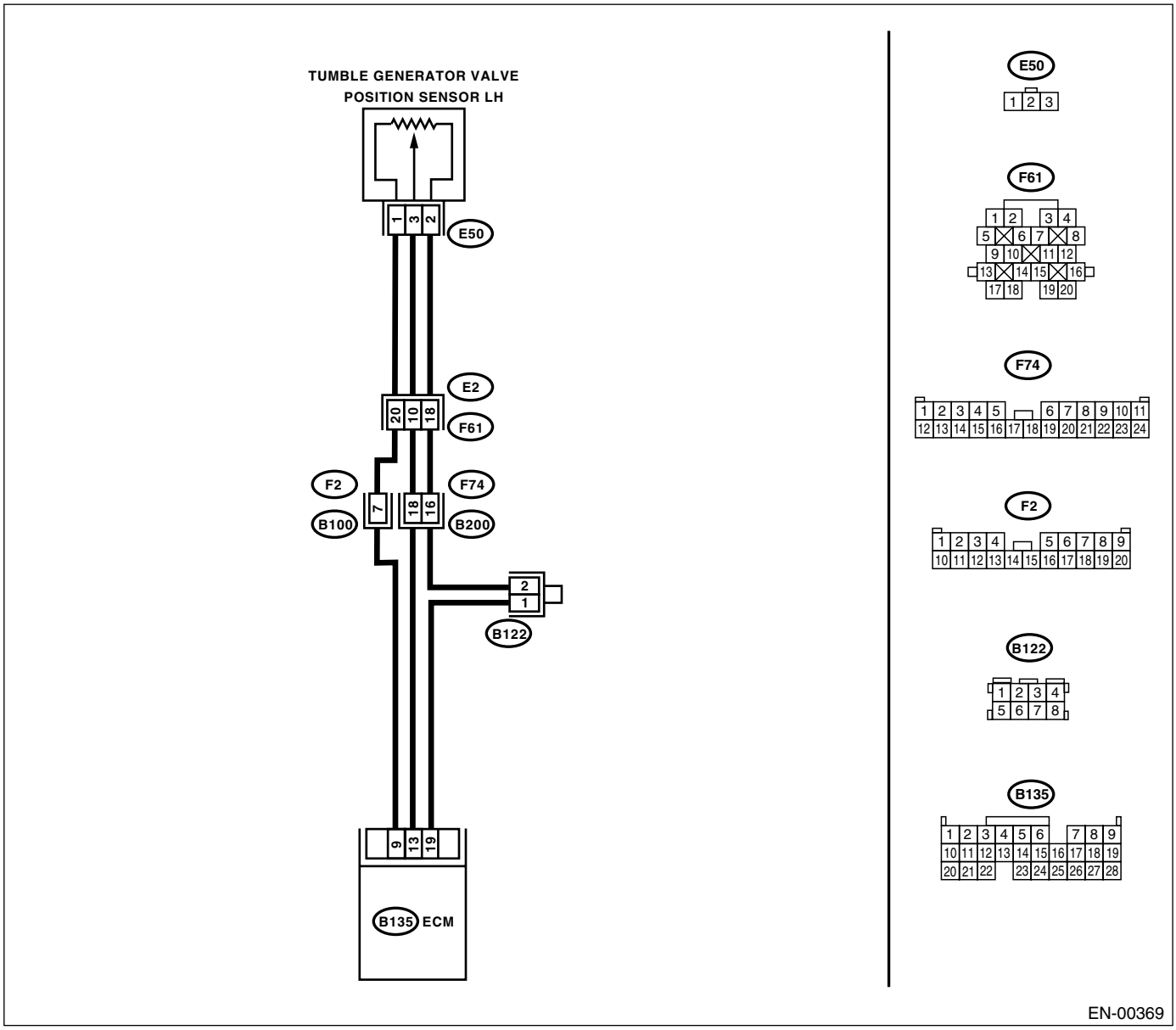
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Repair the battery short circuit in harness between ECM and TCM connector. After repair, replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4 V	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Repair the poor contact in ECM connector.	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (–):*** Does the voltage change from specified value while monitoring the value with voltage meter?	1 — 4 V	Even if MIL lights up, the circuit has returned to a normal condition at this time. NOTE: In this case, repair the following: • Poor contact in ECM connector • Poor contact in TCM connector	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B56) No. 20 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4 V	Go to step **6.**	Repair the open circuit in harness between ECM and TCM connector.
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector. Is there poor contact in TCM connector?	Poor contact occurs.	Repair the poor contact in TCM connector.	Check the TCM power supply line and grounding line.

CA: DTC P1086 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW —

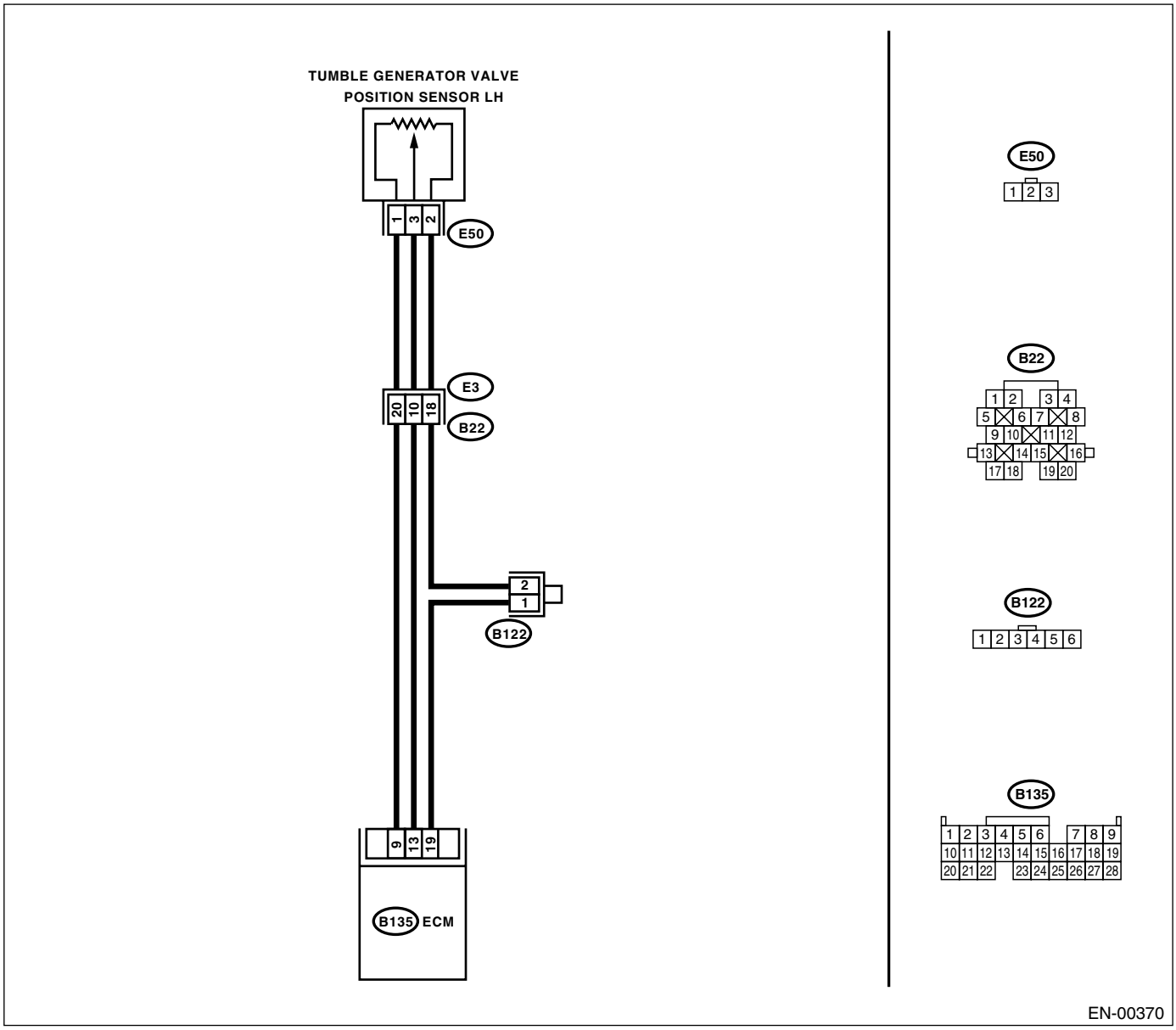
- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**
- **LHD model**



- **RHD model**


TUMBLE GENERATOR VALVE
POSITION SENSOR LH
1
3
2
E50
E3
20
10
18
B22
2
1
B122
9
13
19
B135
ECM
E50
1 2 3
B22
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
B122
1 2 3 4 5 6
B135
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19
20 21 22 23 24 25 26 27 28
EN-00370

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value less than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	0.1 V	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground while tumble generator valve is fully closed. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4.5 V	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):*** Shake the ECM harness and connector, while monitoring value of voltage meter. Is the voltage change more than specified value?	4.5 V	Repair the poor contact in ECM connector.	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 13 (+) — Chassis ground (–):*** Is the measured value less than specified value?	0.1 V	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Measure the voltage between ECM connector and chassis ground. Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Is the voltage change more than specified value?	0.1 V	Repair the poor contact in ECM connector.	Go to step **6.**

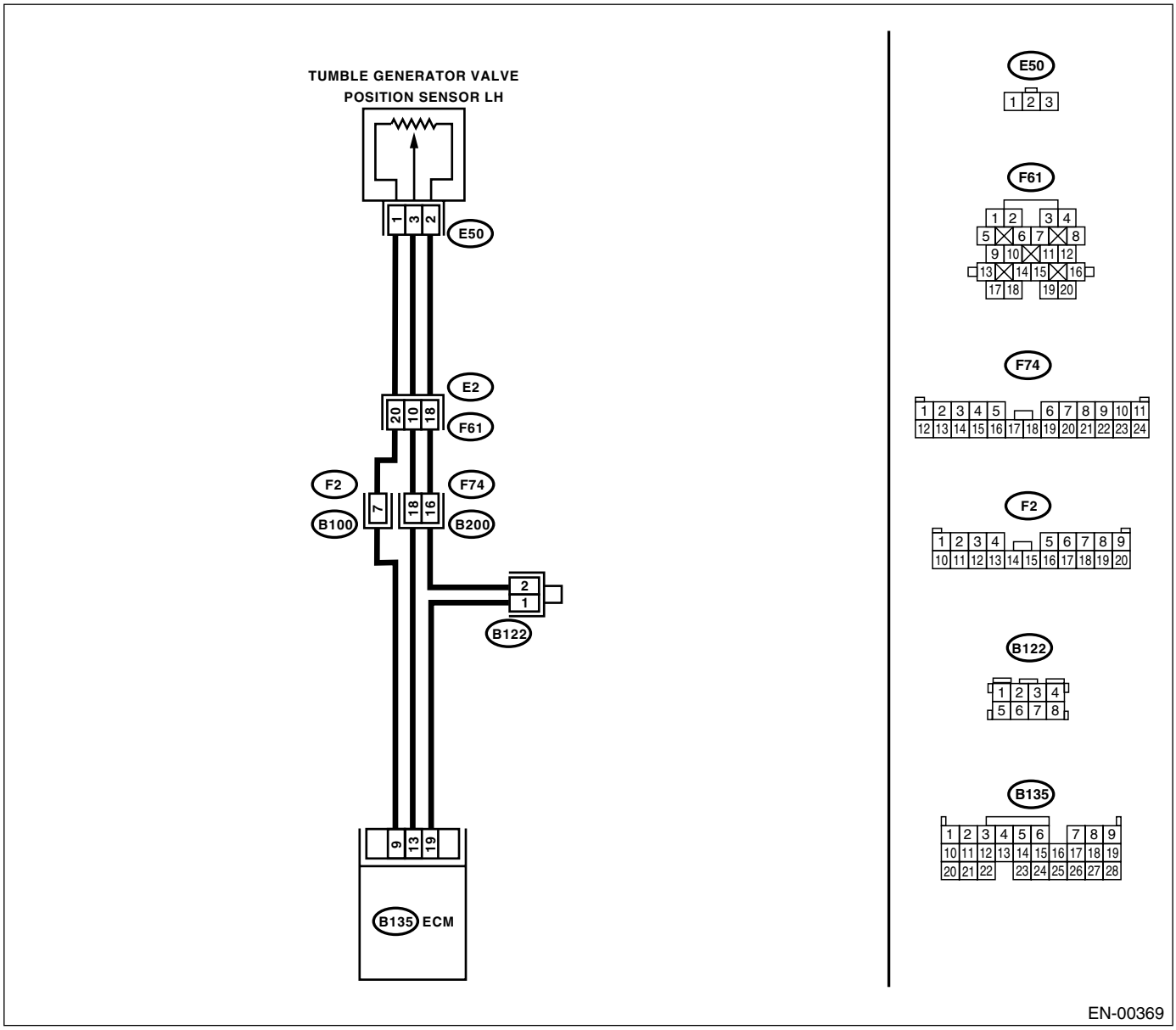
	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from tumble generator valve position sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 1 (+) — Engine ground (–):*** Is the measured value more than specified value?	4.5 V	Go to step **7.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
7	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector. ***Connector & terminal*** ***(B135) No. 13 — (E50) No. 3:*** Is the measured value less than specified value?	1 Ω	Go to step **8.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 3 — Engine ground:*** Is the measured value less than specified value?	10 Ω	Repair the ground short circuit in harness between tumble generator valve position sensor and ECM connector.	Go to step **9.**
9	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve position sensor connector. Is there poor contact in tumble generator valve position sensor connector?	Poor contact occurs.	Repair the poor contact in tumble generator valve position sensor connector.	Replace the tumble generator valve assembly. <Ref. to FU(TURBO)-40, Tumble Generator Valve Assembly.>

CB:DTC P1087 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH —

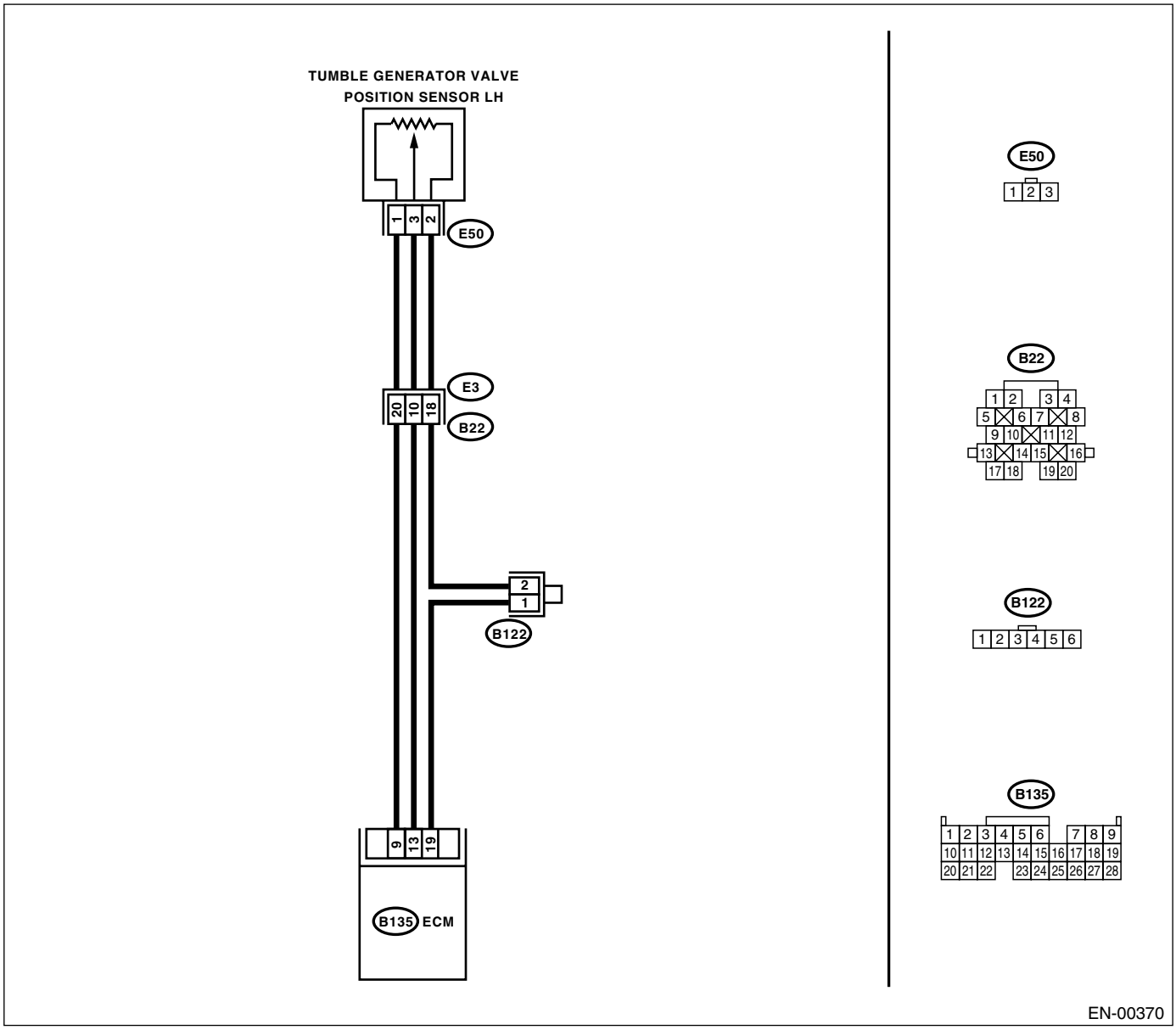
- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**
- **LHD model**



- **RHD model**


TUMBLE GENERATOR VALVE
POSITION SENSOR LH
1
3
2
E50
E3
20
10
18
B22
2
1
B122
9
13
19
B135
ECM
E50
1 2 3
B22
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
B122
1 2 3 4 5 6
B135
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19
20 21 22 23 24 25 26 27 28
EN-00370

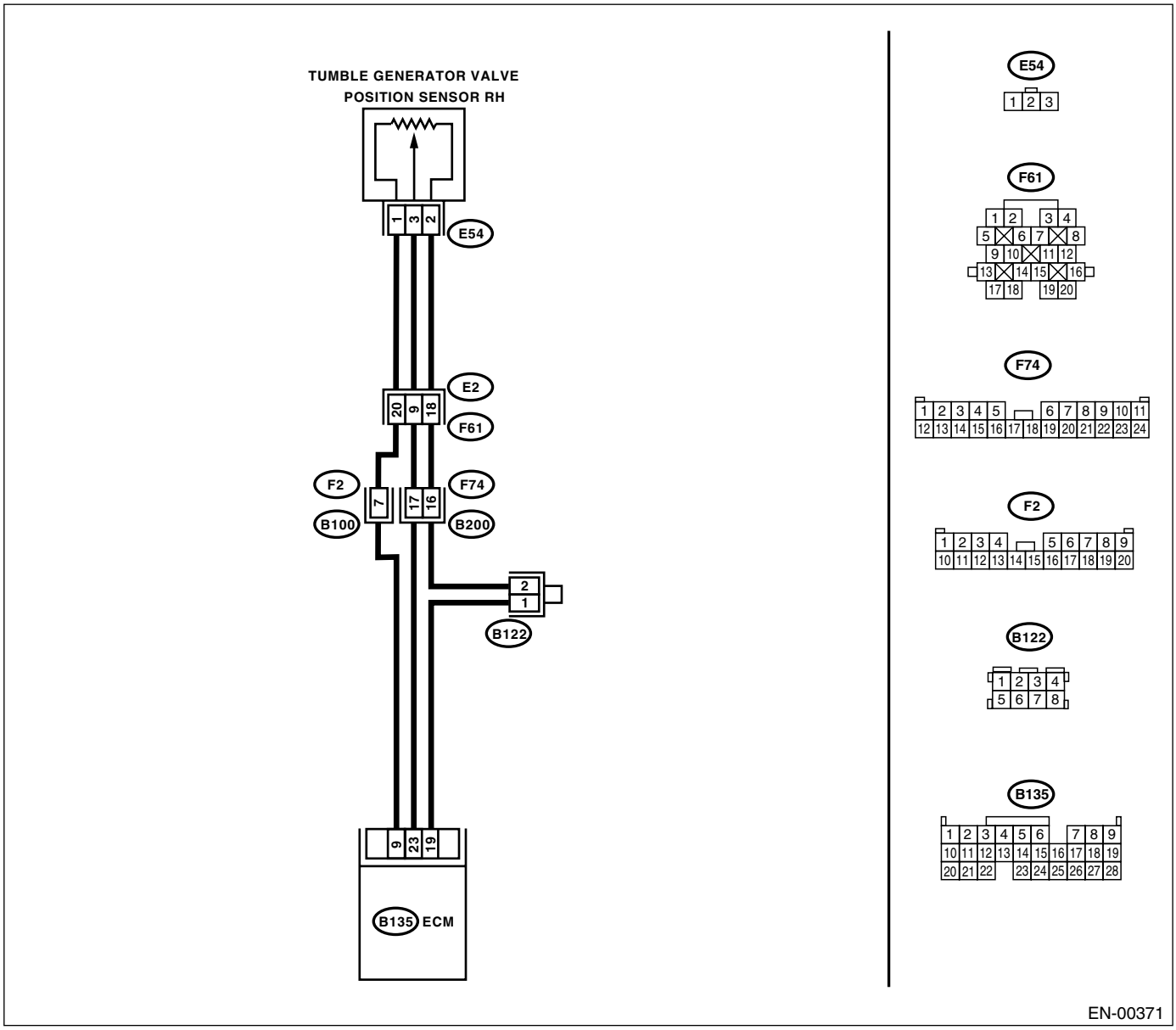
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value more than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	4.9 V	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from throttle position sensor. 3)Measure the resistance of harness between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 2 — Engine ground:*** Is the measured value less than specified value?	5 Ω	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
3	**CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 3 (+) — Engine ground (–):*** Is the measured value more than specified value?	4.9 V	Repair the battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>	Replace the tumble generator valve assembly. <Ref. to FU(TURBO)-40, Tumble Generator Valve Assembly.>

CC: DTC P1088 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW —

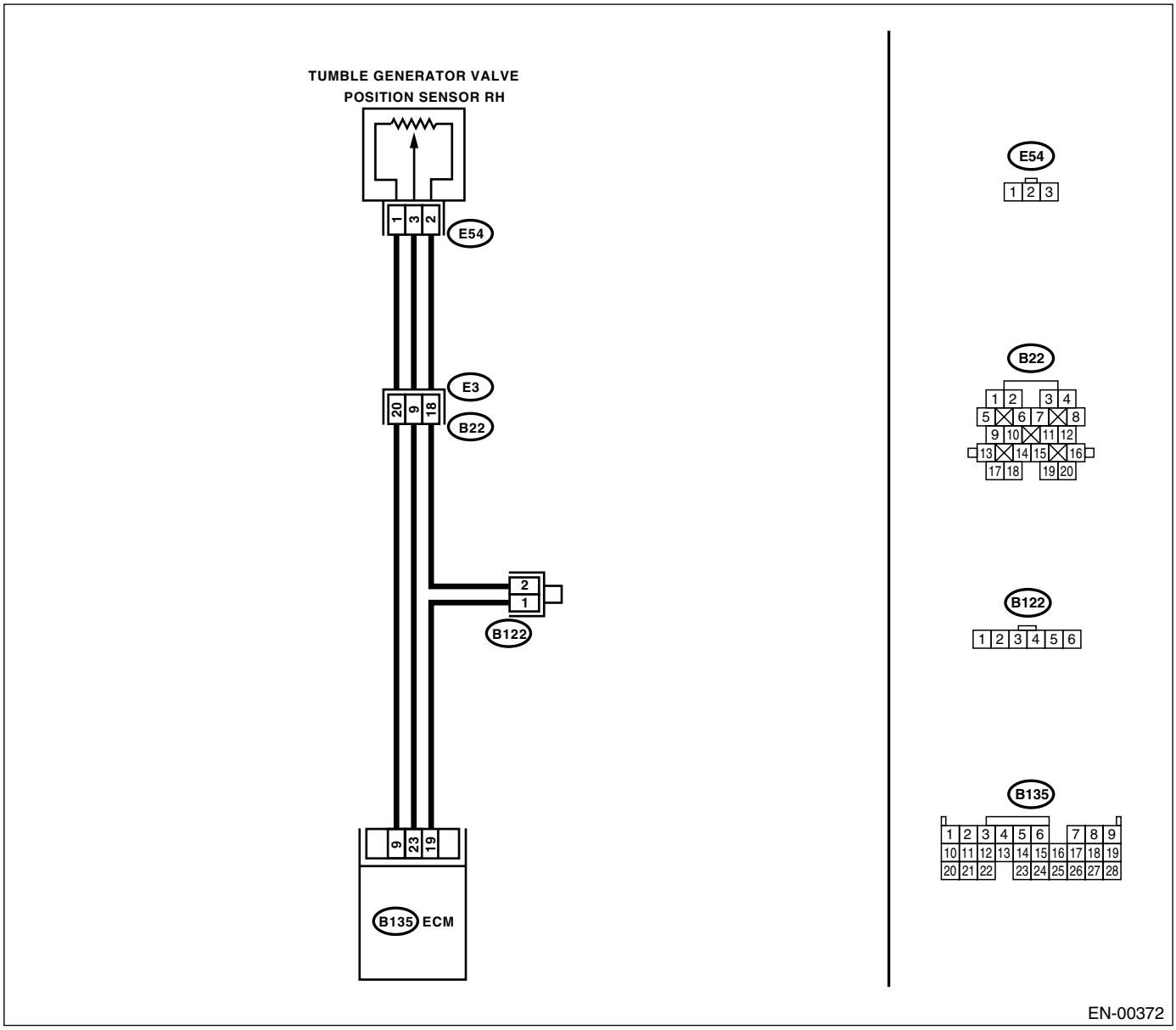
- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**
- **LHD model**



- **RHD model**


TUMBLE GENERATOR VALVE
POSITION SENSOR RH
1
3
2
E54
E3
20
9
18
B22
2
1
B122
9
23
19
B135
ECM
E54
1 2 3
B22
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
B122
1 2 3 4 5 6
B135
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19
20 21 22 23 24 25 26 27 28
EN-00372

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value less than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	0.1 V	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground while throttle valve is fully closed. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4.5 V	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):*** Shake the ECM harness and connector, while monitoring value of voltage meter. Is the voltage change more than specified value?	4.5 V	Repair the poor contact in ECM connector.	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 23 (+) — Chassis ground (–):*** Is the measured value less than specified value?	0.1 V	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Measure the voltage between ECM connector and chassis ground. Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Is the voltage change more than specified value?	0.1 V	Repair the poor contact in ECM connector.	Go to step **6.**

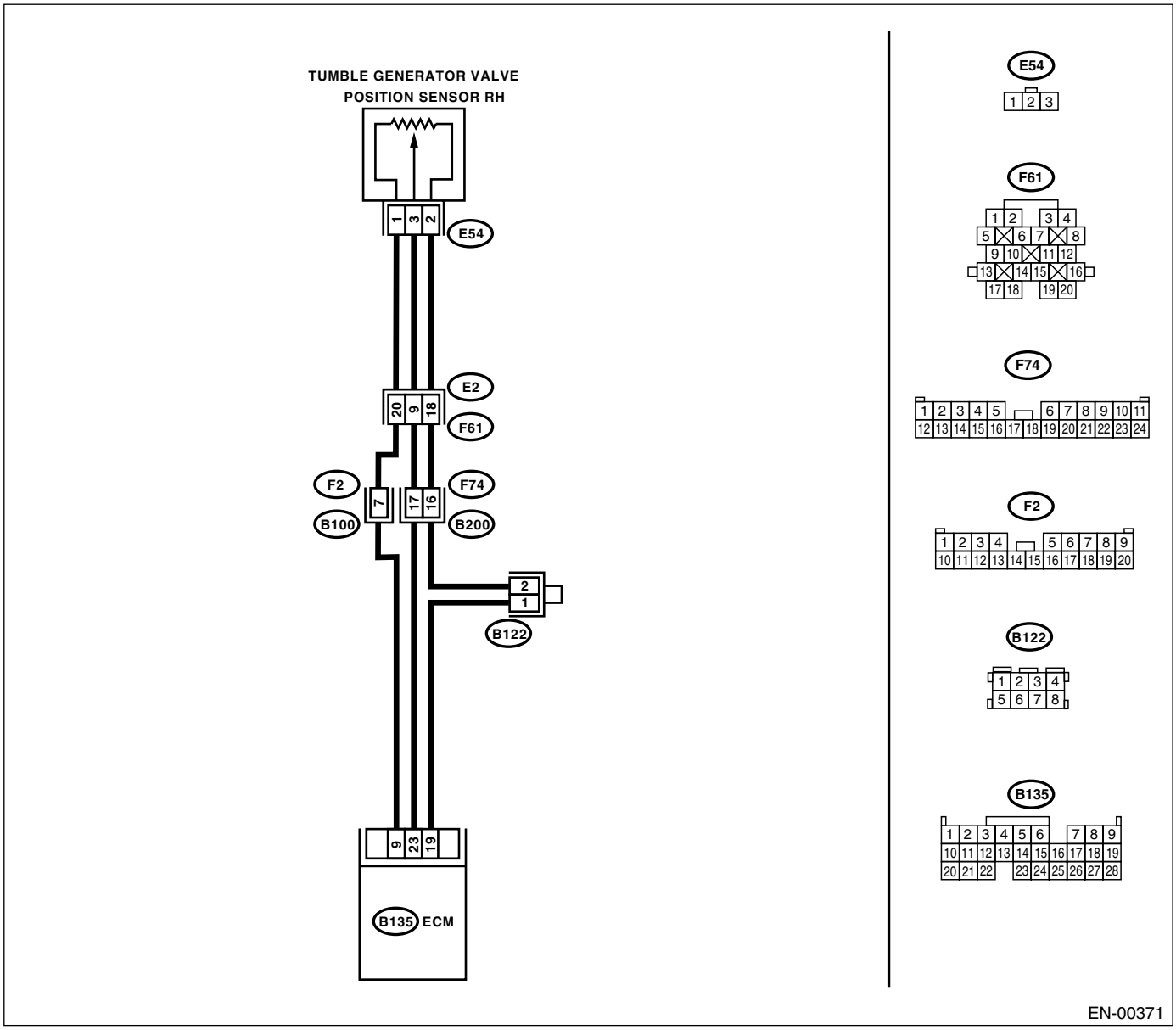
	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from throttle position sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 1 (+) — Engine ground (–):*** Is the measured value more than specified value?	4.5 V	Go to step **7.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
7	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of harness between ECM connector and throttle position sensor connector. ***Connector & terminal*** ***(B135) No. 23 — (E54) No. 3:*** Is the measured value less than specified value?	1 Ω	Go to step **8.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 3 — Engine ground:*** Is the measured value less than specified value?	10 Ω	Repair the ground short circuit in harness between tumble generator valve position sensor and ECM connector.	Go to step **9.**
9	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve position sensor connector. Is there poor contact in tumble generator valve position sensor connector?	Poor contact occurs.	Repair the poor contact in tumble generator valve position sensor connector.	Replace the tumble generator valve assembly. <Ref. to FU(TURBO)-40, Tumble Generator Valve Assembly.>

CD:DTC P1089 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH —

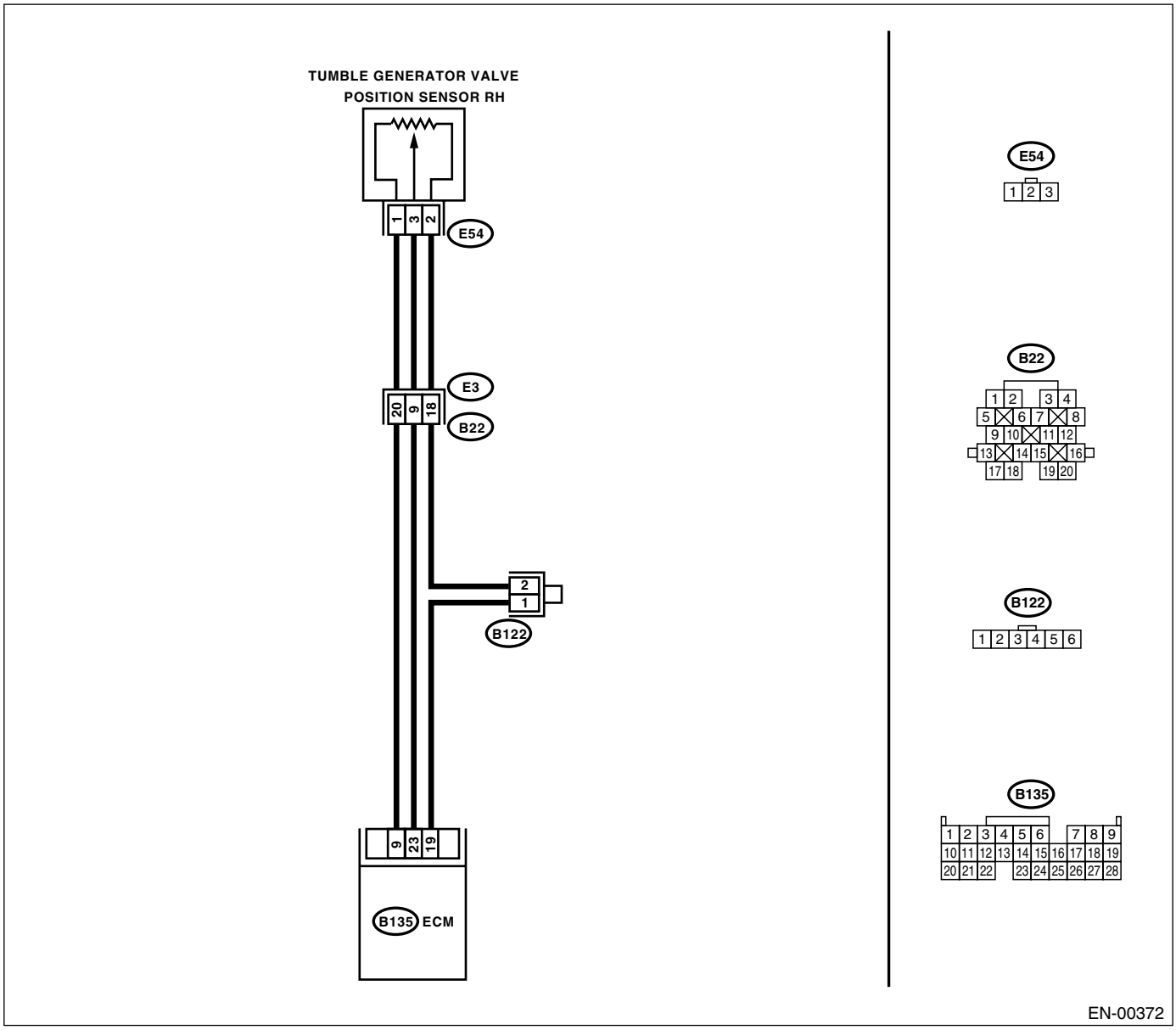
- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**
- **LHD model**



- **RHD model**


TUMBLE GENERATOR VALVE
POSITION SENSOR RH
1
3
2
E54
E3
20
9
18
B22
2
1
B122
9
23
19
B135
ECM
E54
1 2 3
B22
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
B122
1 2 3 4 5 6
B135
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19
20 21 22 23 24 25 26 27 28
EN-00372

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value more than specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	4.9 V	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from throttle position sensor. 3)Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 2 — Engine ground:*** Is the measured value less than specified value?	5 Ω	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
3	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 3 (+) — Engine ground (–):*** Is the measured value more than specified value?	4.9 V	Repair the battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>	Replace the tumble generator valve assembly. <Ref. to FU(TURBO)-40, Tumble Generator Valve Assembly.>

CE:DTC P1090 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)" <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE RH** 1)Remove the tumble generator valve assembly. 2)Check the tumble generator valve body. Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Tumble generator valve moves smoothly.	Replace the tumble generator valve assembly. <Ref. to FU(TURBO)-40, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

CF:DTC P1091 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)" <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE RH** 1)Remove the tumble generator valve assembly. 2)Check the tumble generator valve body. Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Tumble generator valve moves smoothly.	Replace the tumble generator valve assembly. <Ref. to FU(TURBO)-40, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

CG:DTC P1092 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)" <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE RH** 1)Remove the tumble generator valve assembly. 2)Check the tumble generator valve body. Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Tumble generator valve moves smoothly.	Replace the tumble generator valve assembly. <Ref. to FU(TURBO)-40, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

CH:DTC P1093 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

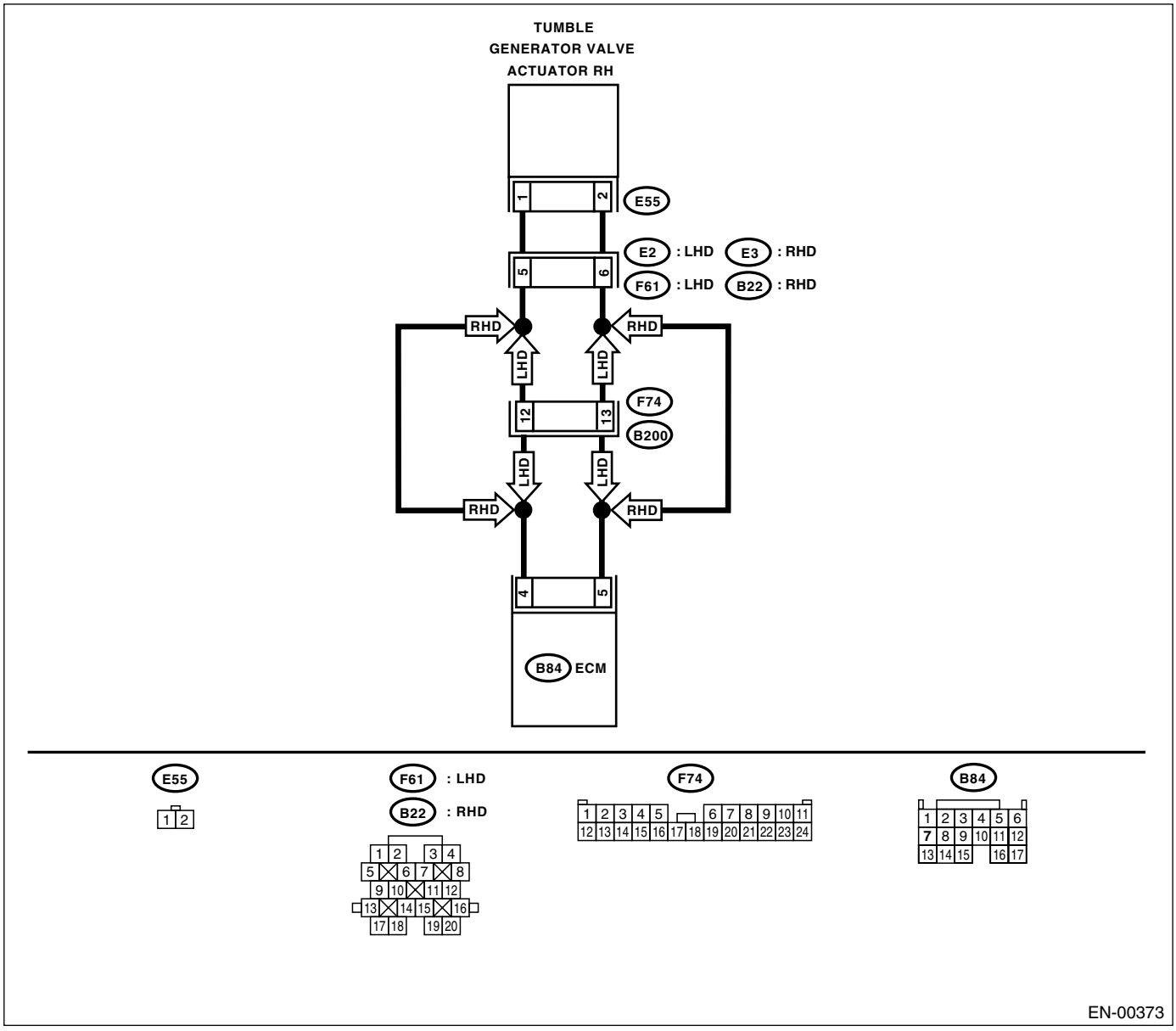
	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)" <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE RH** 1)Remove the tumble generator valve assembly. 2)Check the tumble generator valve body. Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Tumble generator valve moves smoothly.	Replace the tumble generator valve assembly. <Ref. to FU(TURBO)-40, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

CI: DTC P1094 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



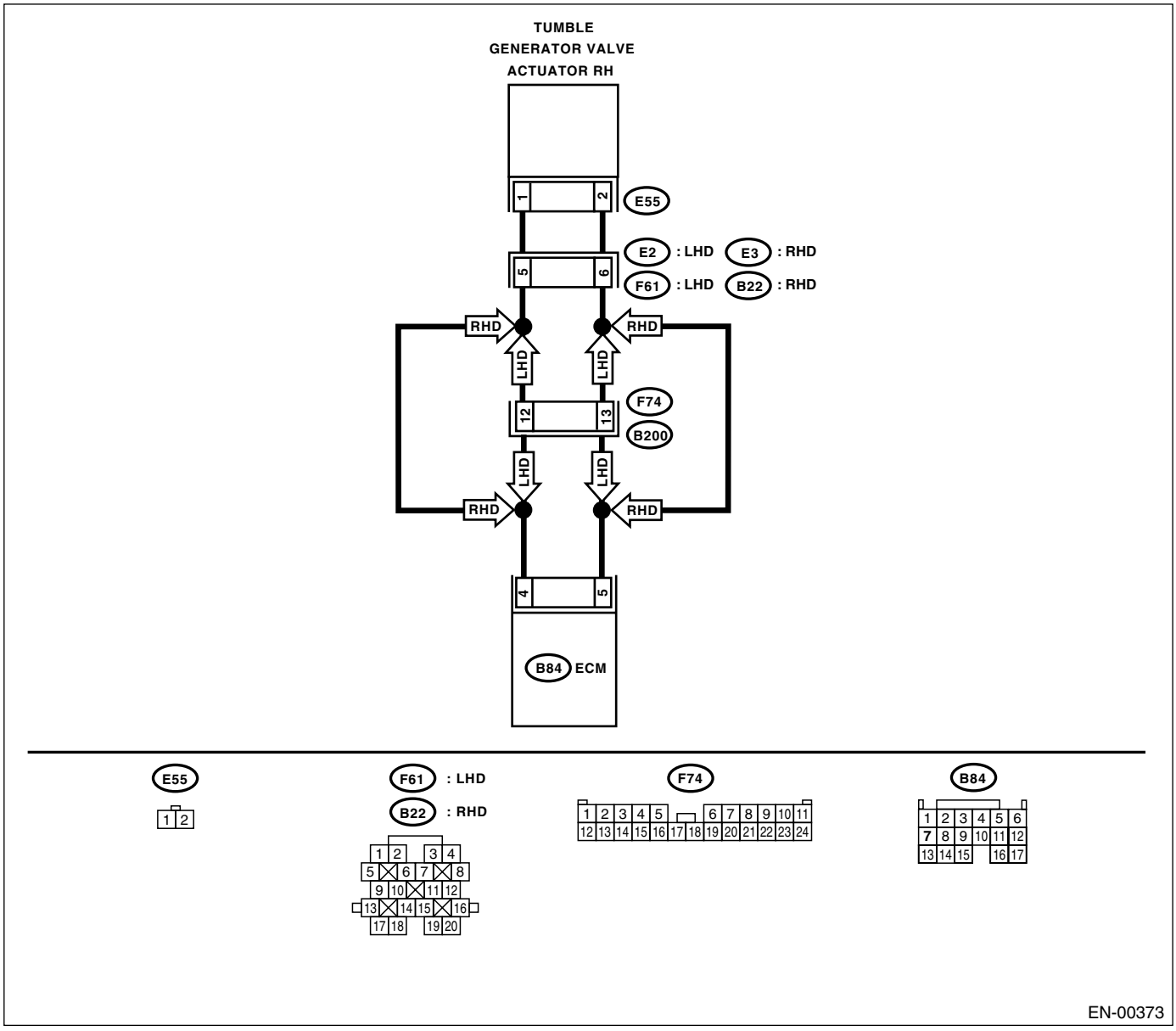
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from tumble generator valve and ECM connector. 3)Measure the resistance between tumble generator valve actuator and ECM connector. ***Connector & terminal*** ***(E55) No. 1 — (B84) No.4:*** ***(E55) No. 2 — (B84) No.5:*** Is the measured value less than specified value?	1 Ω	Go to step **2.**	Repair the open circuit between ECM and tumble generator valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and tumble generator valve actuator connector. • Poor contact in coupling connector.
2	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve actuator connector. Is there poor contact in tumble generator valve actuator connector?	Poor contact occurs.	Repair the poor contact in tumble generator valve actuator connector.	Replace the tumble generator valve assembly. <Ref. to FU(TURBO)-40, Tumble Generator Valve Assembly.>

CJ:DTC P1095 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



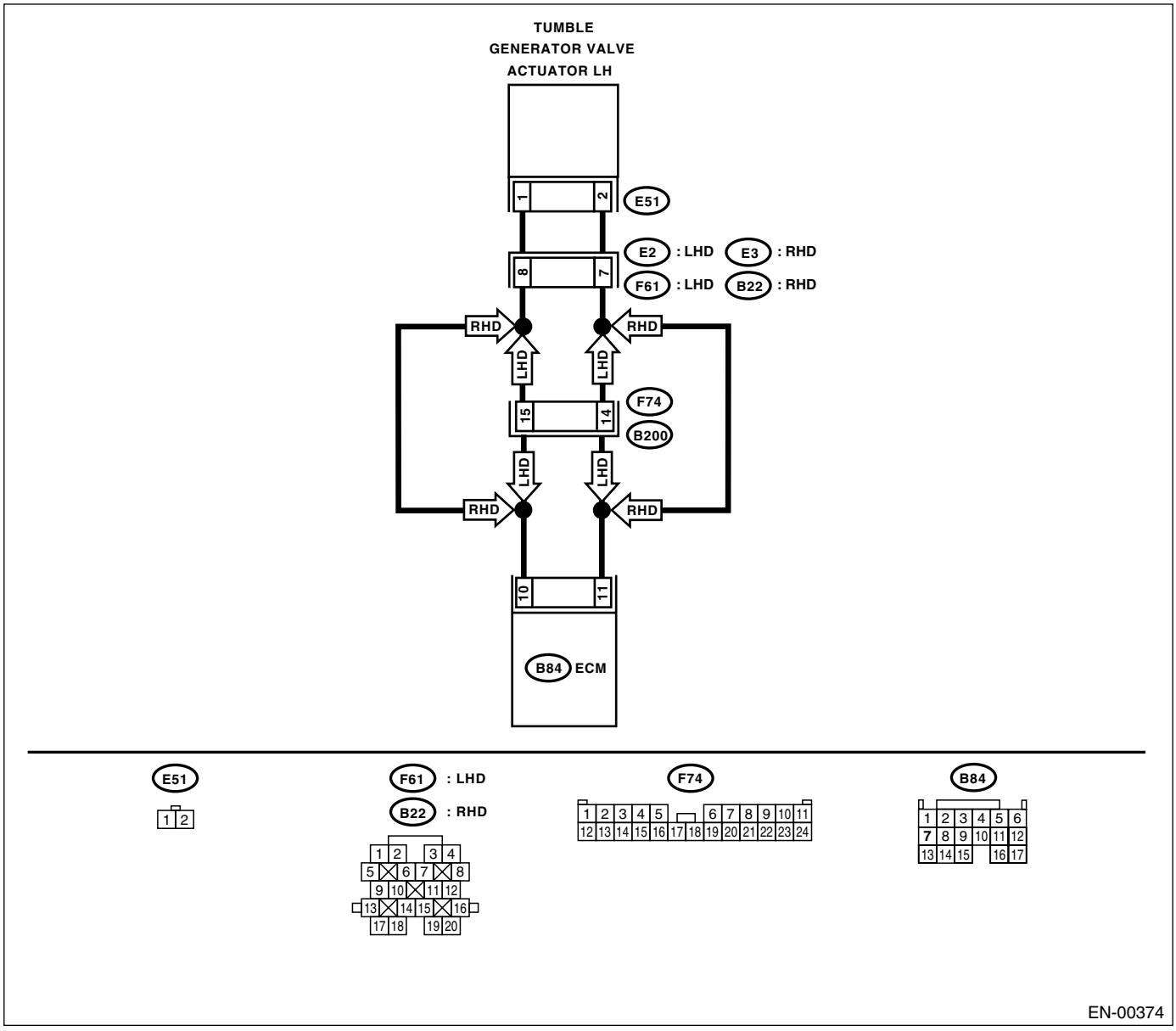
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from tumble generator valve connector. 3)Measure the voltage between tumble generator valve actuator and chassis ground. ***Connector & terminal*** ***(E55) No. 1 (+) — Chassis ground (–):*** ***(E55) No. 2 (+) — Chassis ground (–):*** Is the measured value less than specified value?	5 V	Replace the tumble generator valve assembly. <Ref. to FU(TURBO)-40, Tumble Generator Valve Assembly.>	Repair the battery short circuit between ECM and tumble generator valve actuator.

CK:DTC P1096 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



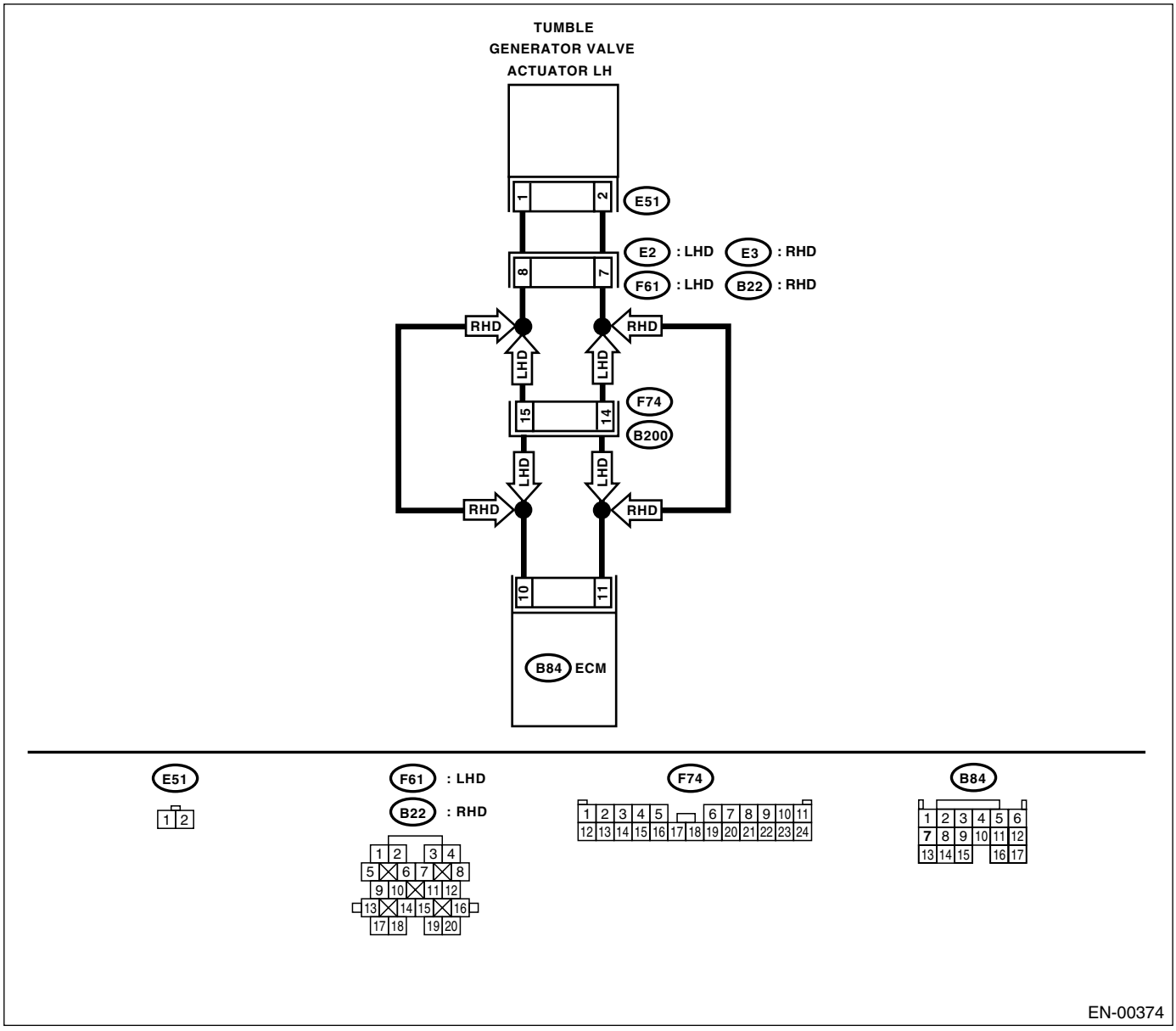
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from tumble generator valve and ECM connector. 3)Measure the resistance between tumble generator valve actuator and ECM connector. ***Connector & terminal*** ***(E51) No. 1 — (B84) No. 10:*** ***(E51) No. 2 — (B84) No. 11:*** Is the measured value less than specified value?	1 Ω	Go to step **2.**	Repair the open circuit between ECM and tumble generator valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and tumble generator valve actuator connector. • Poor contact in coupling connector.
2	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve actuator connector. Is there poor contact in tumble generator valve actuator connector?	Poor contact occurs.	Repair the poor contact in tumble generator valve actuator connector.	Replace the tumble generator valve assembly. <Ref. to FU(TURBO)-40, Tumble Generator Valve Assembly.>

CL:DTC P1097 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from tumble generator valve connector. 3)Measure the voltage between tumble generator valve actuator and chassis ground. ***Connector & terminal*** ***(E51) No. 1 (+) — Chassis ground (–):*** ***(E51) No. 2 (+) — Chassis ground (–):*** Is the measured value less than specified value?	5 V	Replace the tumble generator valve assembly. <Ref. to FU(TURBO)-40, Tumble Generator Valve Assembly.>	Repair the battery short circuit between ECM and tumble generator valve actuator.

CM:DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1110?	DTC P1110 is indicated.	Replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.	A temporary poor contact.

CN:DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

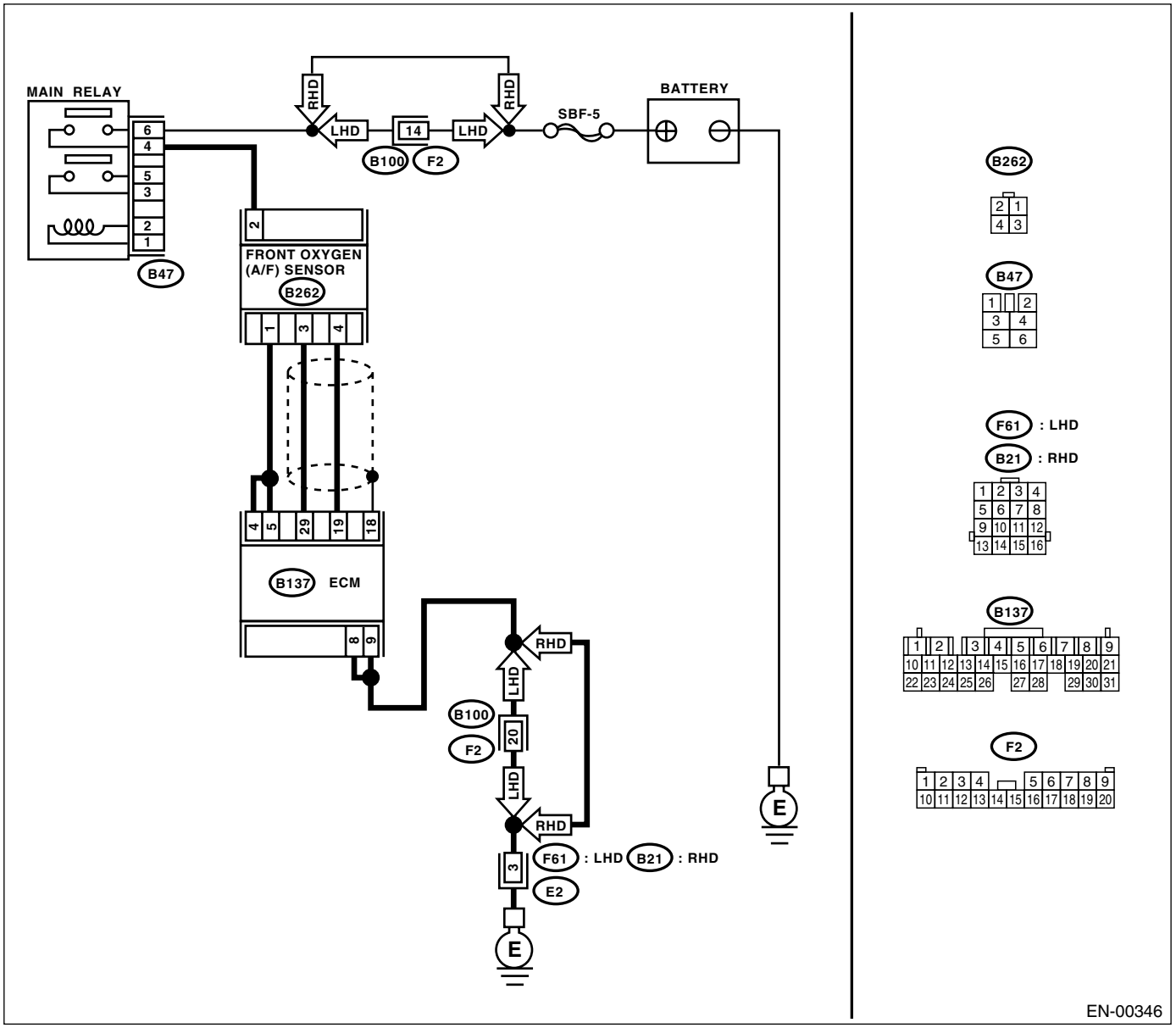
	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1111?	DTC P1111 is indicated.	Replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.	A temporary poor contact.

CO:DTC P1134 — A/F SENSOR MICRO-COMPUTER PROBLEM —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



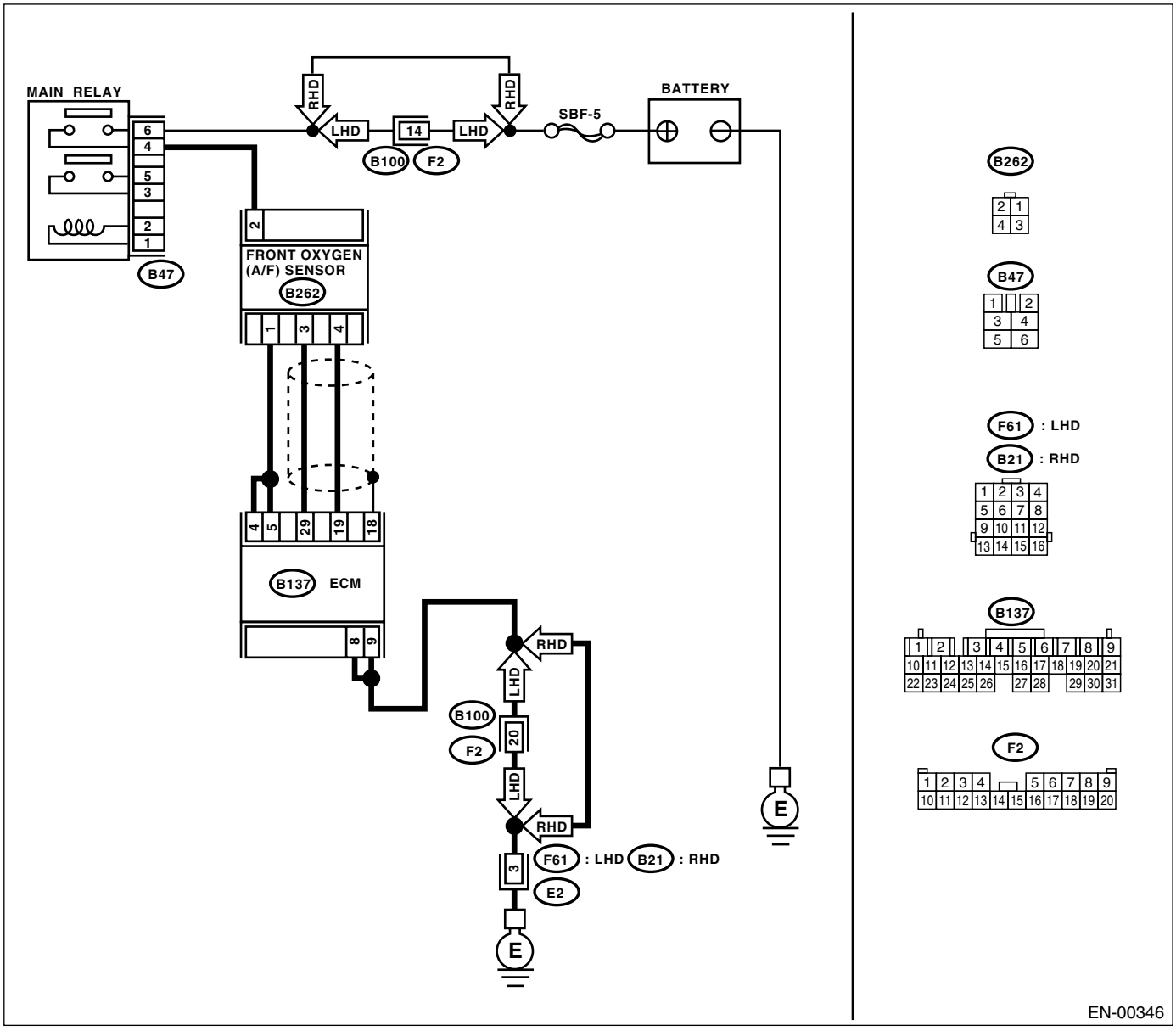
Step		Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1134?	DTC P1134 is indicated.	Replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>	A temporary poor contact.

CP: DTC P1152 — O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



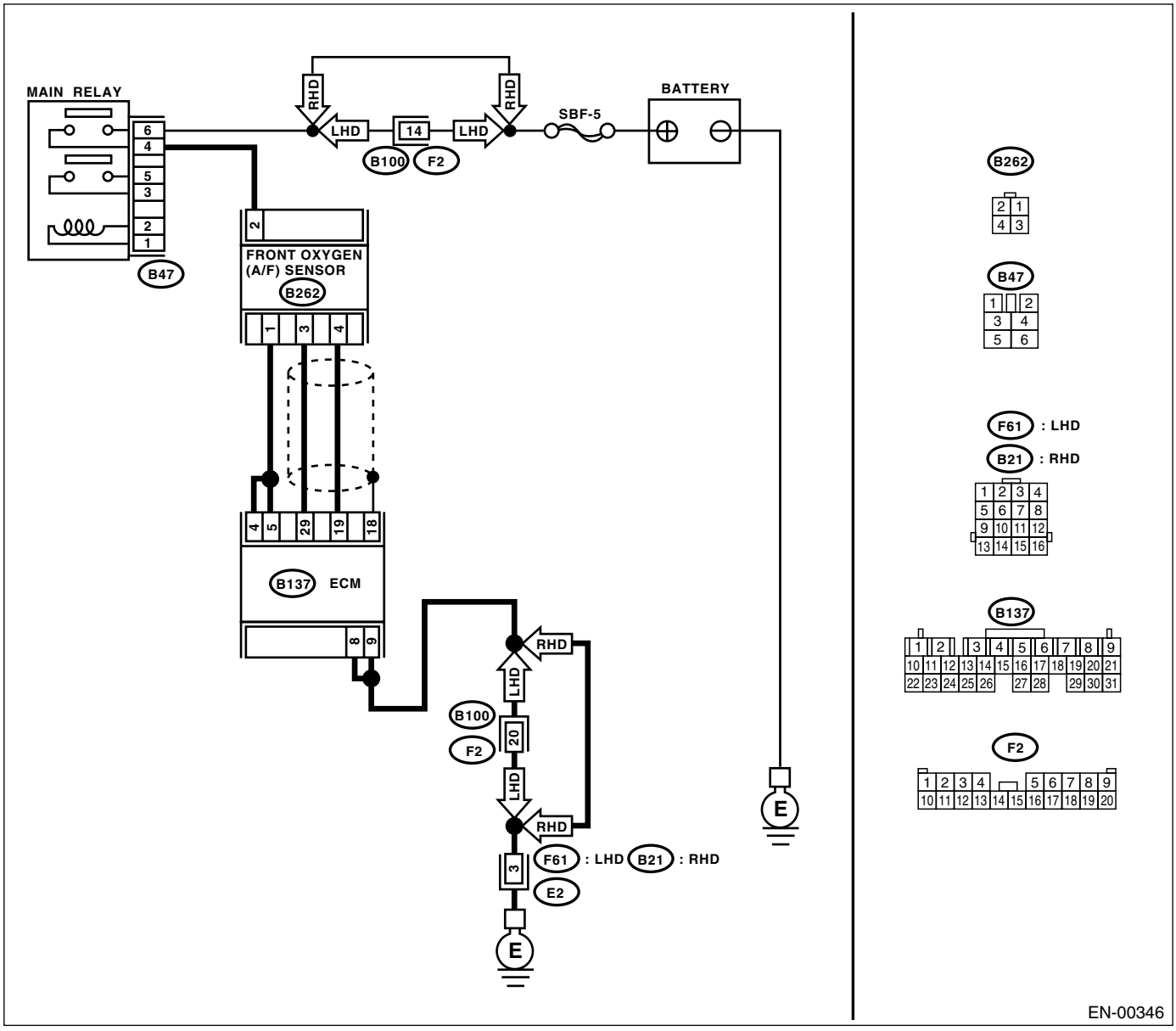
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3)Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 29 — (B262) No. 3:*** ***(B137) No. 19 — (B262) No. 4:*** Is the measured value less than specified value?	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
2	**CHECK POOR CONTACT.** Check poor contact in front oxygen (A/F) sensor connector. Is there poor contact in front oxygen (A/F) sensor connector?	Poor contact occurs.	Repair the poor contact in front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(TURBO)-43, Front Oxygen (A/F) Sensor.>

CQ: DTC P1153 — O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 19 — Chassis ground:*** Is the measured value more than specified value?	10 Ω	Go to step **2.**	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 29 — Chassis ground:*** Is the measured value more than specified value?	10 Ω	Go to step **3.**	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK OUTPUT SIGNAL FOR ECM.** 1)Connect the connector to ECM. 2)Turn the ignition switch to ON. 3)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4.5 V	Go to step **4.**	Go to step **5.**
4	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>	Repair the poor contact in ECM connector.
5	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 29 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4.95 V	Go to step **6.**	Replace the front oxygen (A/F) sensor. <Ref. to FU(TURBO)-43, Front Oxygen (A/F) Sensor.>

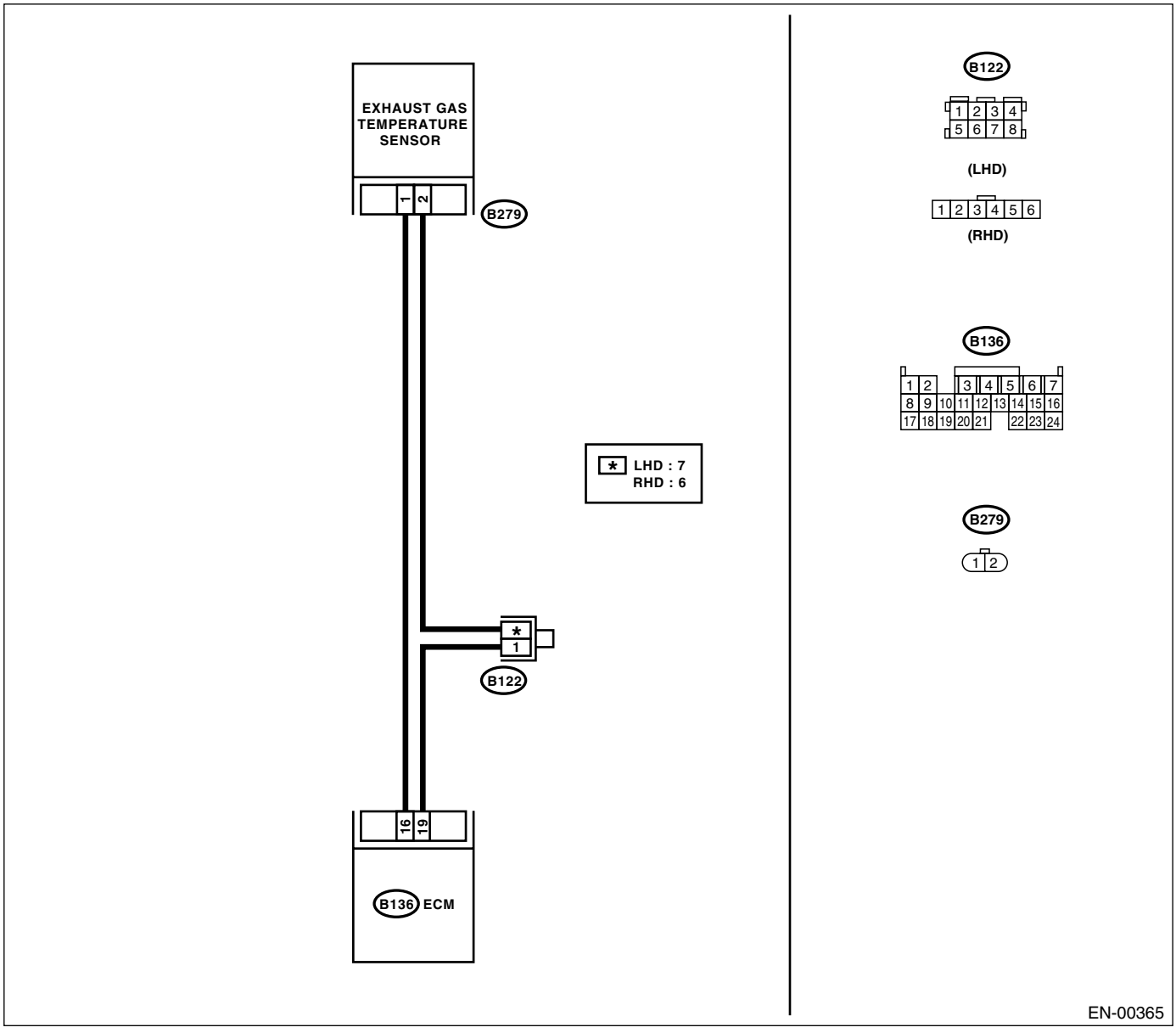
	Step	Check	Yes	No
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 29 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>	Repair the poor contact in ECM connector.

CR:DTC P1301 — MISFIRE DITECTED (HIGH TEMPERATURE EXHAUST GAS) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



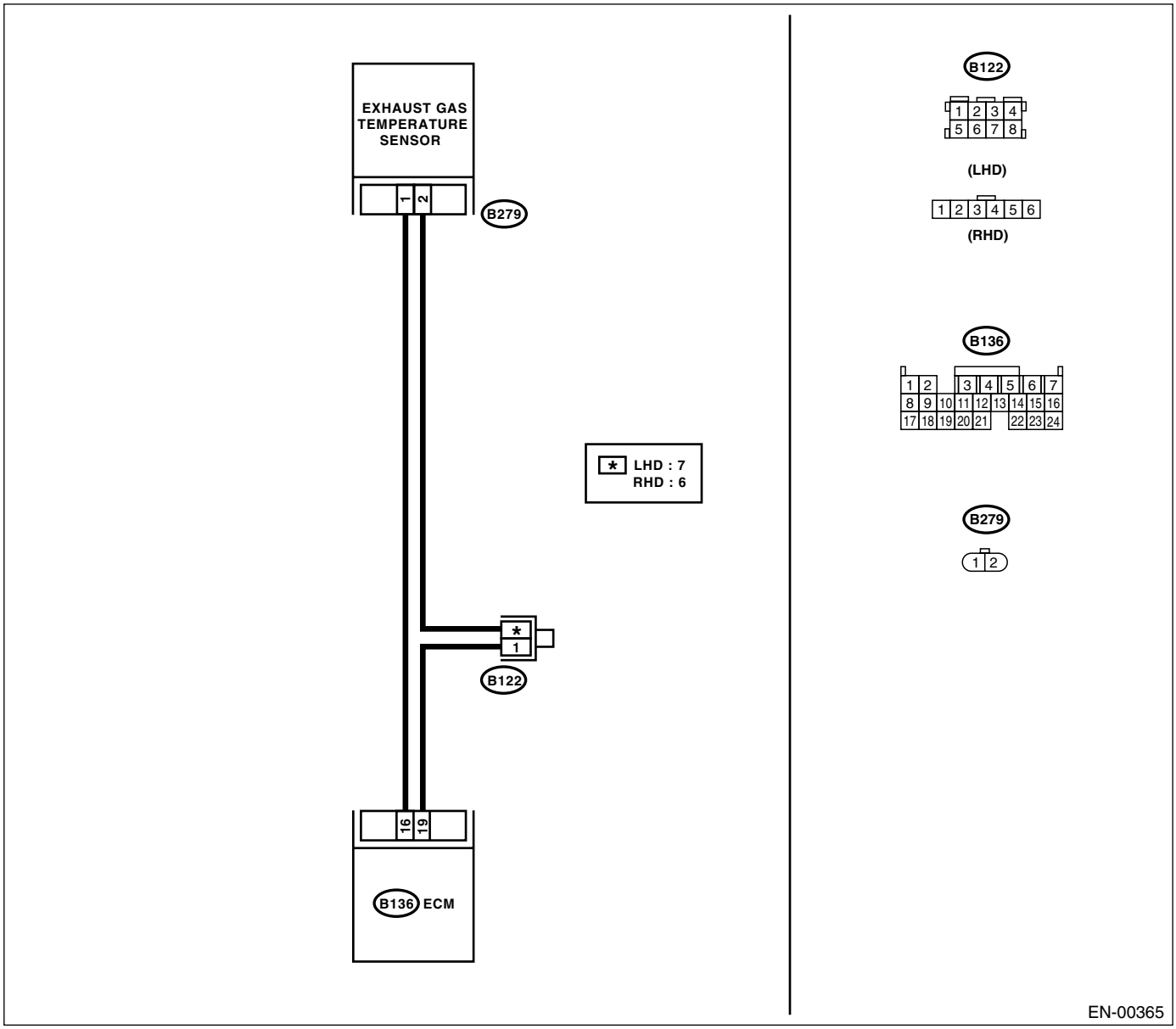
Step		Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC).** Conduct the troubleshooting for all DTC P0301, P0302, P0303 and P0304. <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).> Does failure for repair or replacement exist?	Failure for repair or replacement exists.	Repair or replace the failure, then replace precatalytic converter.	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

CS:DTC P1312 — EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



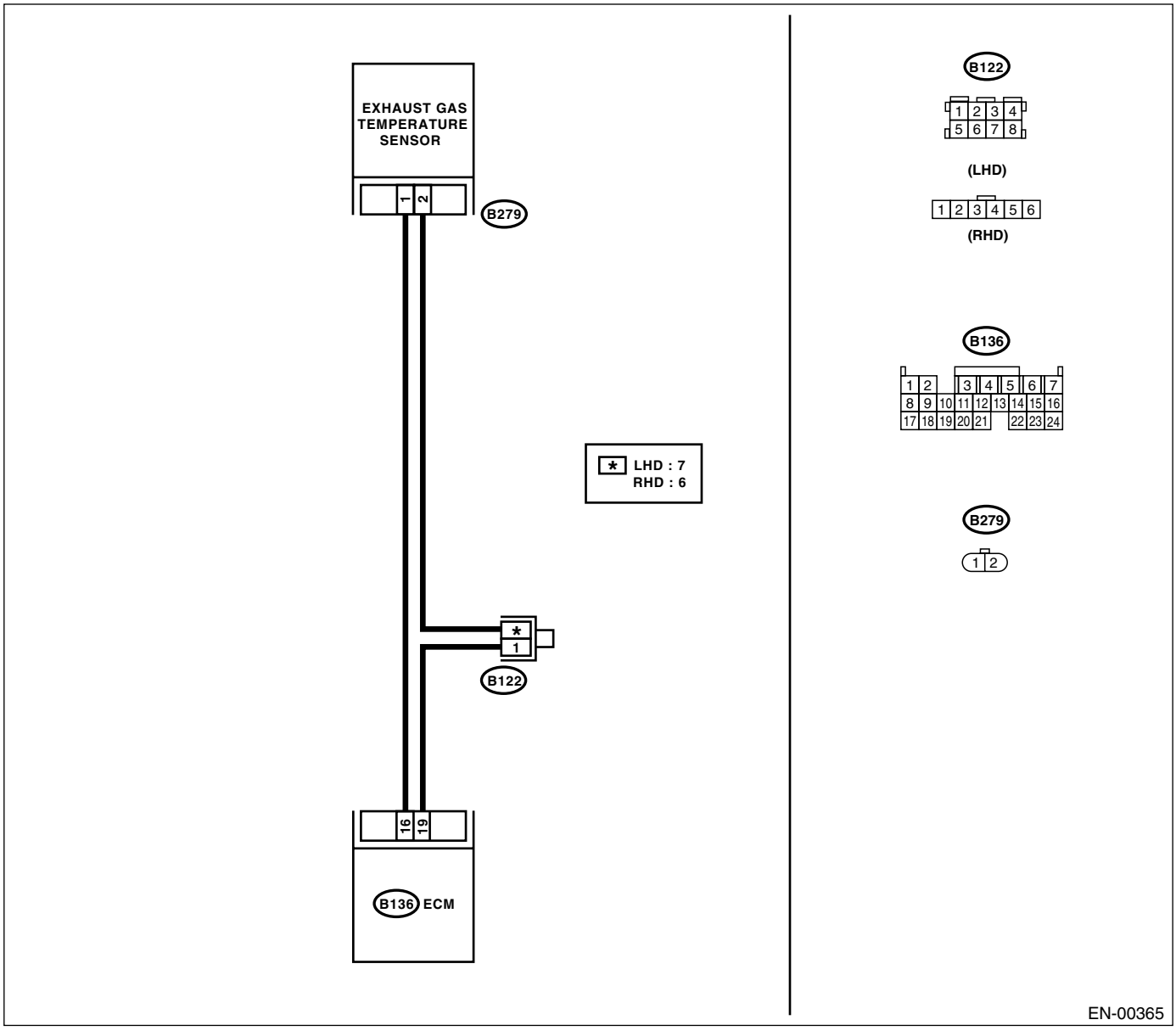
	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1312.	Replace the exhaust gas temperature sensor. <Ref. to FU(TURBO)-47, Exhaust Temperature Sensor.>

CT:DTC P1544 — EXHAUST GAS TEMPERATURE TOO HIGH —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



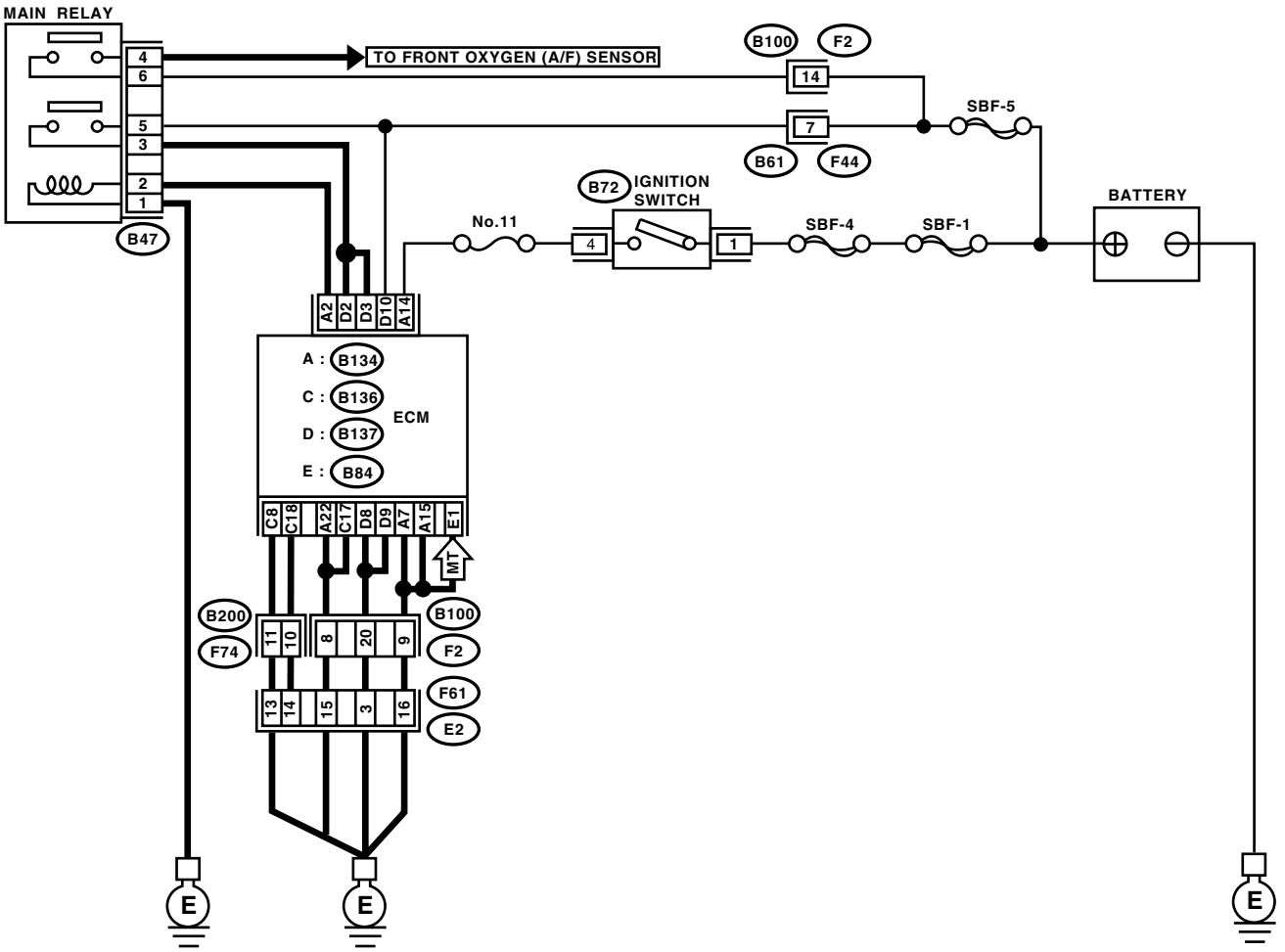
	Step	Check	Yes	No
1	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Is any other DTC displayed?	Other DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1544.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** Check the exhaust system parts. NOTE: Check the following items. •Loose installation of exhaust manifold •Cracks or hole of exhaust manifold •Loose installation of front oxygen (A/F) sensor Is there a fault in exhaust system?	There is a fault.	Repair or replace the failure, then replace precatalytic converter.	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

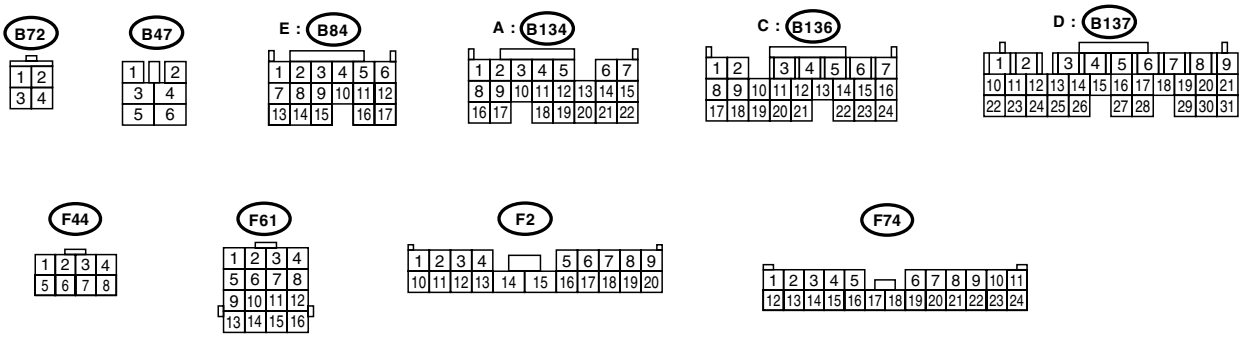
CU:DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

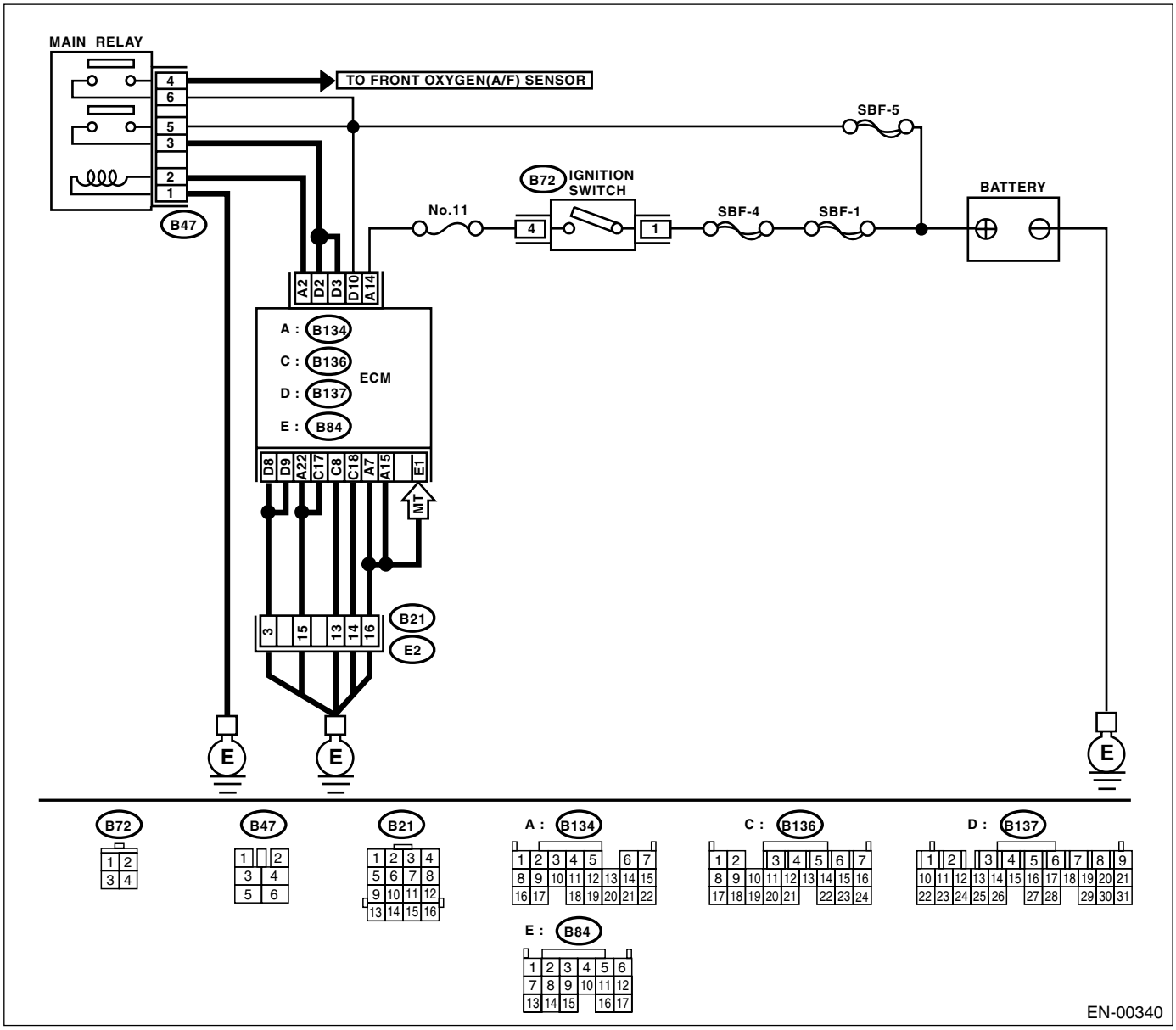
- **WIRING DIAGRAM:**
- **LHD model**





EN-00339

- **RHD model**



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to OFF. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 10 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Repair the poor contact in ECM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.** 1)Disconnect the connector from ECM. 2)Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 10 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	Repair the ground short circuit in harness between ECM connector and battery terminal.	Go to step **3.**

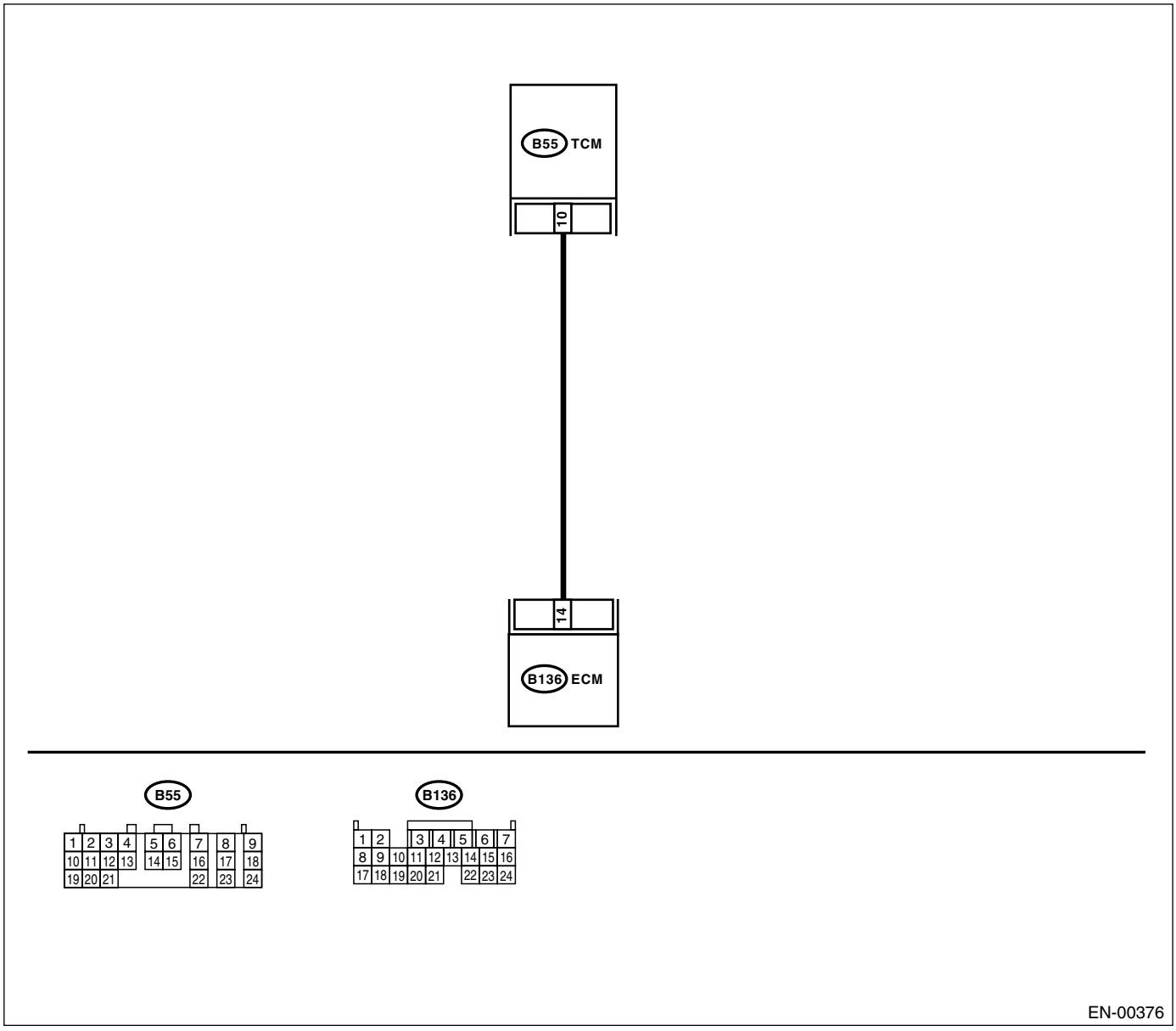
Step		Check	Yes	No
3	**CHECK FUSE SBF-5.** Is the fuse blown?	Fuse is blown out.	Replace the fuse.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and battery • Poor contact in ECM connector • Poor contact in battery terminal

CV:DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.>.

- **WIRING DIAGRAM:**



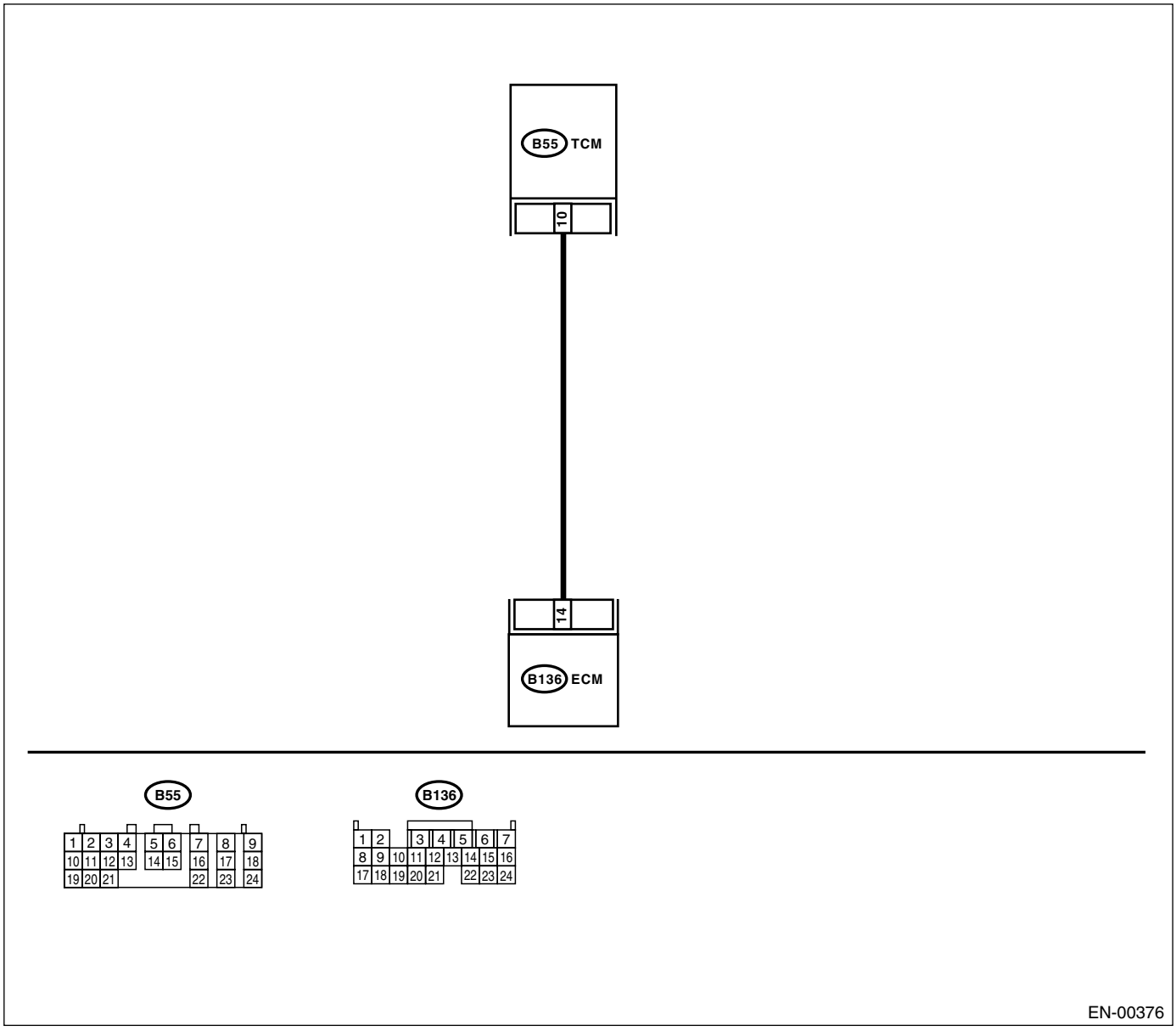
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Start the engine and warm-up engine. 2)Turn the ignition switch to OFF. 3)Turn the ignition switch to ON. 4)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 14 (+) — Chassis ground (–):*** Is the measured value more than specified value?	3 V	Repair the poor contact in ECM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and TCM. 3)Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 14 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	Repair the ground short circuit in harness between ECM and TCM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the resistance of harness between ECM and TCM connector. ***Connector & terminal*** ***(B136) No. 14 — (B55) No. 20:*** Is the measured value less than specified value?	1 Ω	Repair the poor contact in ECM or TCM connector.	Repair the open circuit in harness between ECM and TCM connector.

CW:DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.>.

- **WIRING DIAGRAM:**



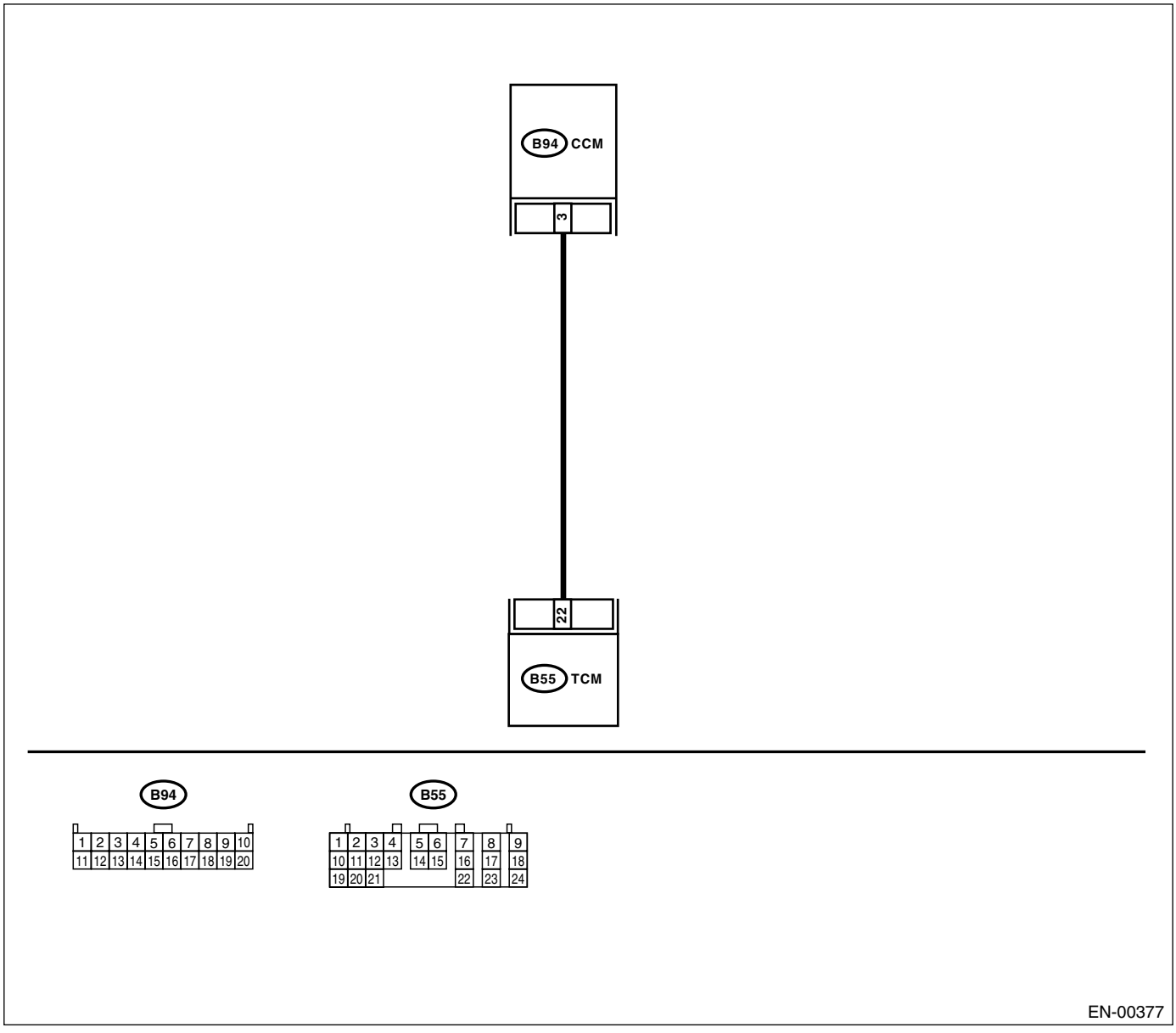
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Start the engine and warm-up engine. 2)Turn the ignition switch to OFF. 3)Disconnect the connector from TCM. 4)Turn the ignition switch to ON. 5)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 14 (+) — Chassis ground (–):*** Is the measured value less than specified value?	3 V	Go to step **2.**	Repair the battery short circuit in harness between ECM and TCM connector. After repair, replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 14 (+) — Chassis ground (–):*** Shake the ECM harness and connector, while monitoring value of voltage meter. Is the voltage change more than specified value?	10 V	Repair the battery short circuit in harness between ECM and TCM connector. After repair, replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

CX:DTC P1701 — CRUISE CONTROL SET SIGNAL CIRCUIT MALFUNCTION FOR AUTOMATIC TRANSMISSION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.>.

- **WIRING DIAGRAM:**



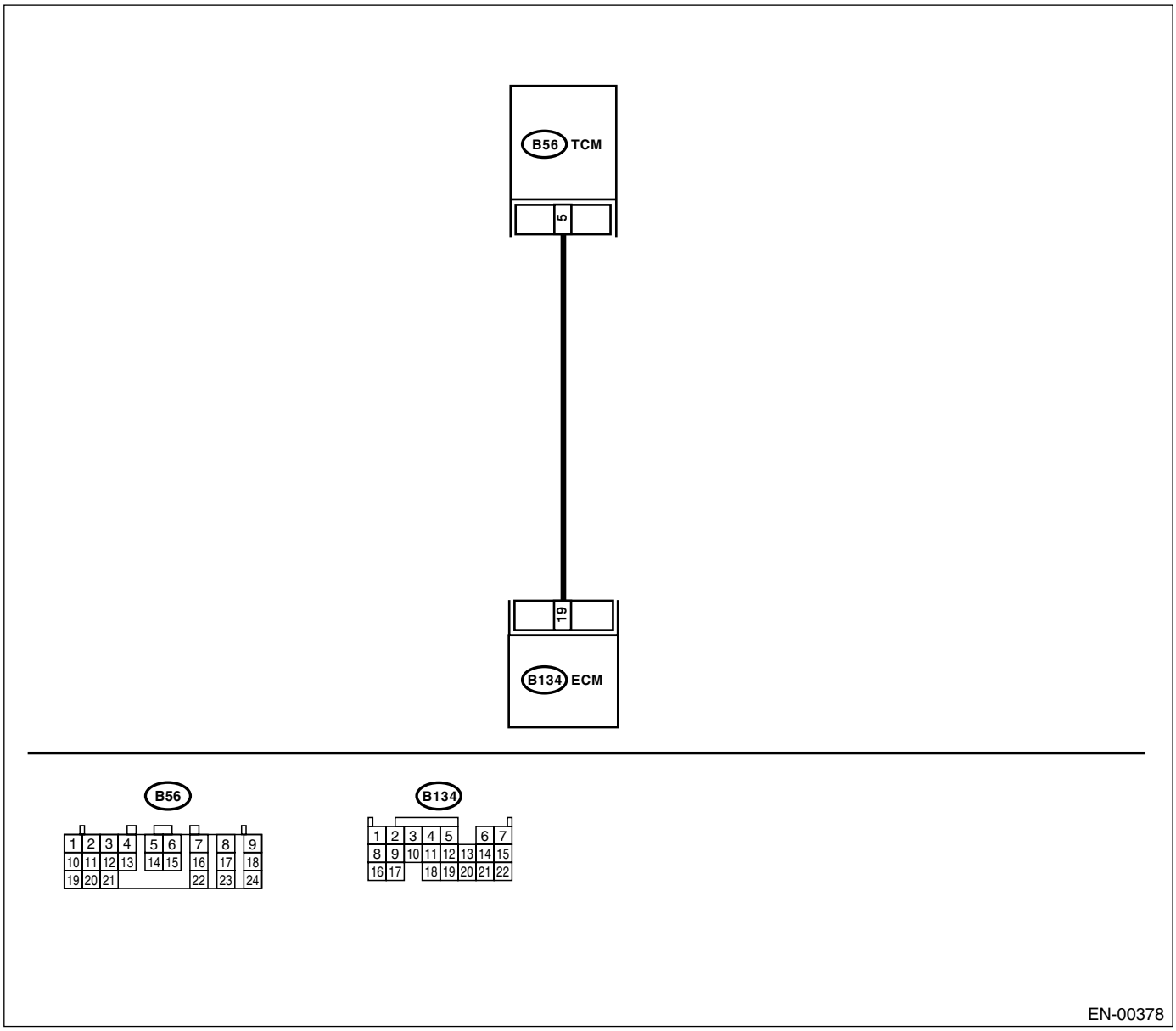
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from TCM and CCM. 3)Measure the resistance of harness between TCM and CCM connector. ***Connector & terminal*** ***(B55) No. 22 — (B94) No. 3:*** Is the measured value less than specified value?	1 Ω	Go to step **2.**	Repair the open circuit in harness between TCM and CCM connector.
2	**CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 22 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	Repair the short circuit in harness between TCM and CCM connector.	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR TCM.** 1)Connect the connector to TCM and CCM. 2)Lift-up the vehicle or set the vehicle on free rollers. **CAUTION:** **On AWD models, raise all wheels off ground.** 3)Start the engine. 4)Turn the cruise control main switch to ON. 5)Move the selector lever to “D” range and slowly increase vehicle speed to 50 km/h (31 MPH). 6)Turn the cruise control command switch to ON. 7)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 22 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **4.**	Check the cruise control command switch circuit. <Ref. to CC-8, INSPECTION, Cruise Control Command Switch.>
4	**CHECK POOR CONTACT.** Check poor contact in TCM connector. Is there poor contact in TCM connector?	Poor contact occurs.	Repair the poor contact in TCM connector.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

CY:DTC P1711 — ENGINE TORQUE CONTROL SIGNAL 1 CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Excessive shift shock

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.>.

- **WIRING DIAGRAM:**



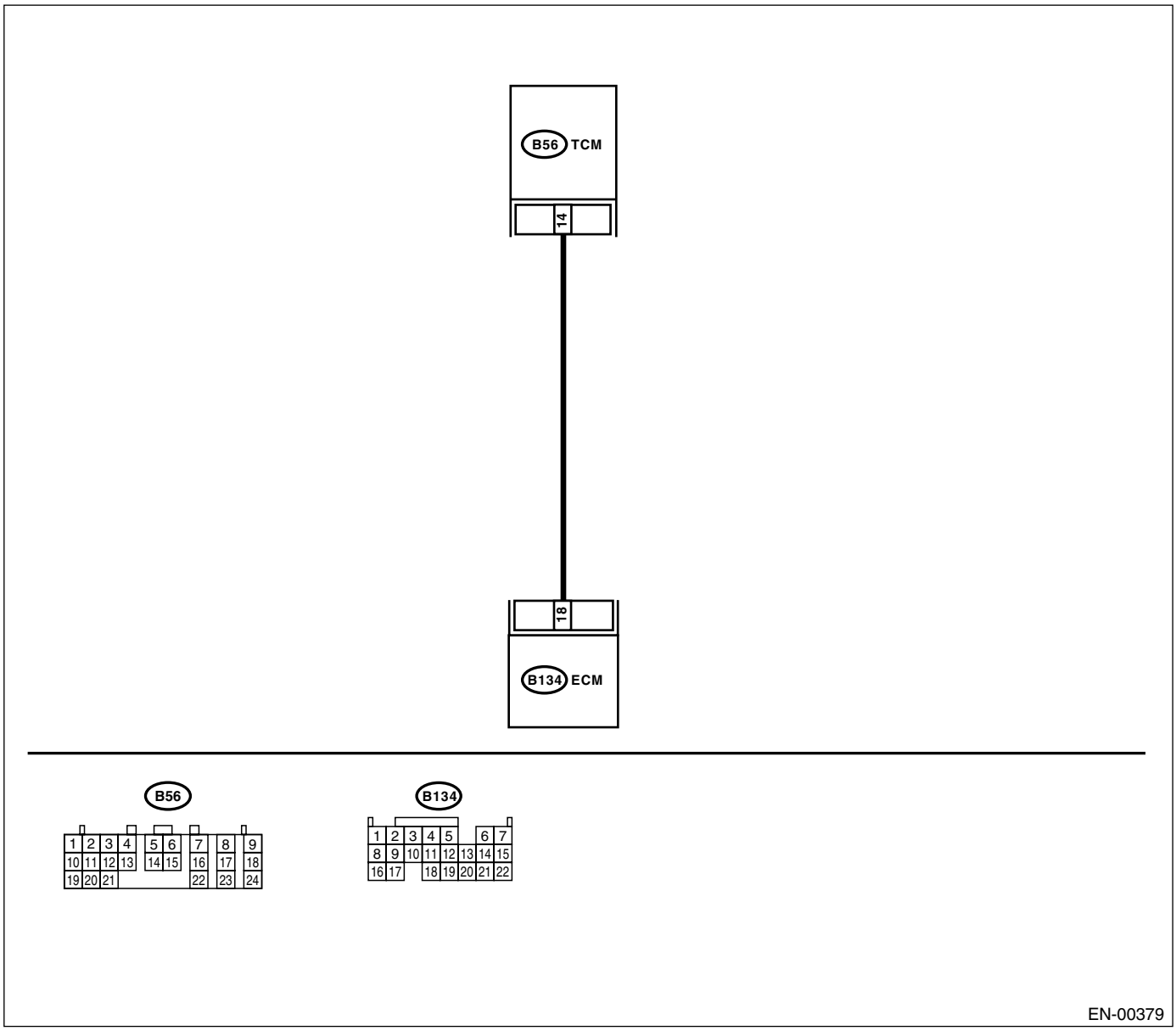
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4.5 V	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Repair the battery short circuit in harness between ECM and TCM connector.	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>
4	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and TCM. 3)Measure the resistance of harness between ECM and TCM connector. ***Connector & terminal*** ***(B134) No. 19 — (B56) No. 5:*** Is the measured value less than specified value?	1 Ω	Go to step **5.**	Repair the open circuit in harness between ECM and TCM connector.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	Repair the ground short circuit in harness between ECM and TCM connector.	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector. Is there poor contact in TCM connector?	Poor contact occurs.	Repair the poor contact in TCM connector.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

CZ:DTC P1712 — ENGINE TORQUE CONTROL SIGNAL 2 CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Excessive shift shock

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 18 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4.5 V	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 18 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Repair the battery short circuit in harness between ECM and TCM connector.	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	Poor contact occurs.	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(TURBO)-48, Engine Control Module.>
4	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and TCM. 3)Measure the resistance of harness between ECM and TCM connector. ***Connector & terminal*** ***(B134) No. 18 — (B56) No. 4:*** Is the measured value less than specified value?	1 Ω	Go to step **5.**	Repair the open circuit in harness between ECM and TCM connector.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 18 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	Repair the ground short circuit in harness between ECM and TCM connector.	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector. Is there poor contact in TCM connector?	Poor contact occurs.	Repair the poor contact in TCM connector.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

20.General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(TURBO)-91, Engine Trouble in General.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Idle air control solenoid valve 2) Pressure sensor 3) Mass air flow and intake temperature sensor 4) Ignition parts (*1) 5) Engine coolant temperature sensor (*2) 6) Crankshaft position sensor (*3) 7) Camshaft position sensor (*3) 8) Fuel injection parts (*4)
2. Rough idling	1) Idle air control solenoid valve 2) Pressure sensor 3) Mass air flow and intake temperature sensor 4) Engine coolant temperature sensor (*2) 5) Ignition parts (*1) 6) Air intake system (*5) 7) Fuel injection parts (*4) 8) Throttle position sensor 9) Crankshaft position sensor (*3) 10) Camshaft position sensor (*3) 11) Oxygen sensor 12) Fuel pump and fuel pump relay
3. Engine does not return to idle.	1) Idle air control solenoid valve 2) Engine coolant temperature sensor 3) Accelerator cable (*6) 4) Throttle position sensor 5) Pressure sensor 6) Mass air flow sensor
4. Poor acceleration	1) Pressure sensor 2) Mass air flow and intake temperature sensor 3) Throttle position sensor 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay 6) Engine coolant temperature sensor (*2) 7) Crankshaft position sensor (*3) 8) Camshaft position sensor (*3) 9) A/C switch and A/C cut relay 10) Engine torque control signal circuit 11) Ignition parts (*1)
5. Engine stalls or engine sags or hesitates at acceleration.	1) Pressure sensor 2) Mass air flow and intake temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Purge control solenoid valve 7) Fuel injection parts (*4) 8) Throttle position sensor 9) Fuel pump and fuel pump relay

Symptom	Problem parts
6. Surge	1) Pressure sensor 2) Mass air flow and intake temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Fuel injection parts (*4) 7) Throttle position sensor 8) Fuel pump and fuel pump relay
7. Spark knock	1) Pressure sensor 2) Mass air flow and intake temperature sensor 3) Engine coolant temperature sensor 4) Knock sensor 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay
8. After burning in exhaust system	1) Pressure sensor 2) Mass air flow and intake temperature sensor 3) Engine coolant temperature sensor (*2) 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay

*1: Check ignition coil & ignitor assembly and spark plug.
*2: Indicate the symptom occurring only in cold temperatures.
*3: Ensure the secure installation.
*4: Check fuel injector, fuel pressure regulator and fuel filter.
*5: Inspect air leak in air intake system.
*6: Adjust accelerator cable.

TRANSMISSION SECTION

CONTROL SYSTEMS	CS
AUTOMATIC TRANSMISSION	AT
AUTOMATIC TRANSMISSION (DIAGNOSTICS)	AT
MANUAL TRANSMISSION AND DIFFERENTIAL	MT
CLUTCH SYSTEM	CL

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FUJI HEAVY INDUSTRIES LTD. G8070GE4

CONTROL SYSTEMS

CS

Page

1. General Description 2
2. Select Lever 7
3. Select Cable 9
4. MT Gear Shift Lever 12
5. MT Drive Select Lever 18
6. Drive Select Cable 20
7. General Diagnostic 21

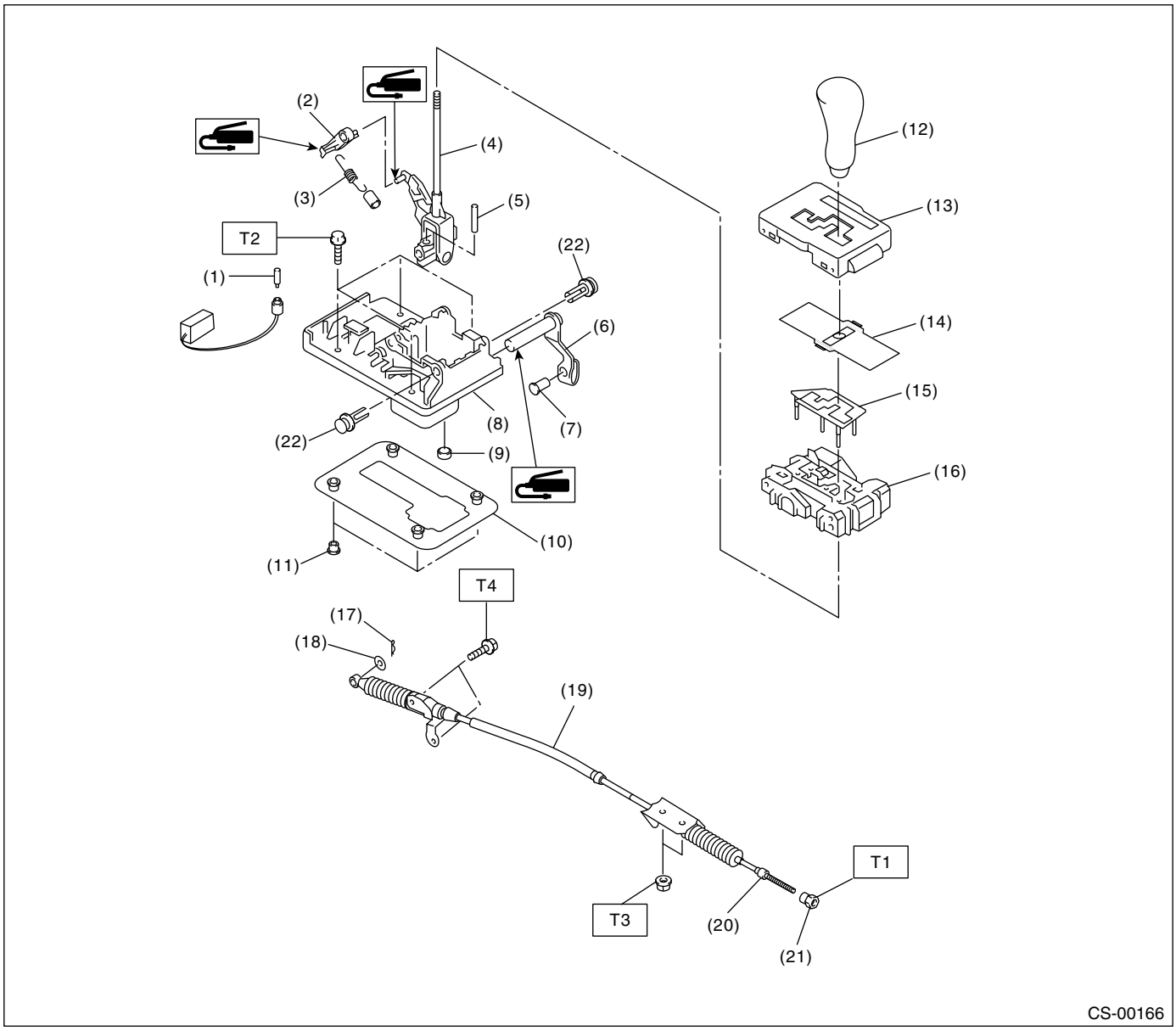
1. General Description

A: SPECIFICATIONS

Item		Specification
Vibration torque of rod against lever	N (kgf, lb)	3.7 (0.38, 0.83) or less

B: COMPONENT

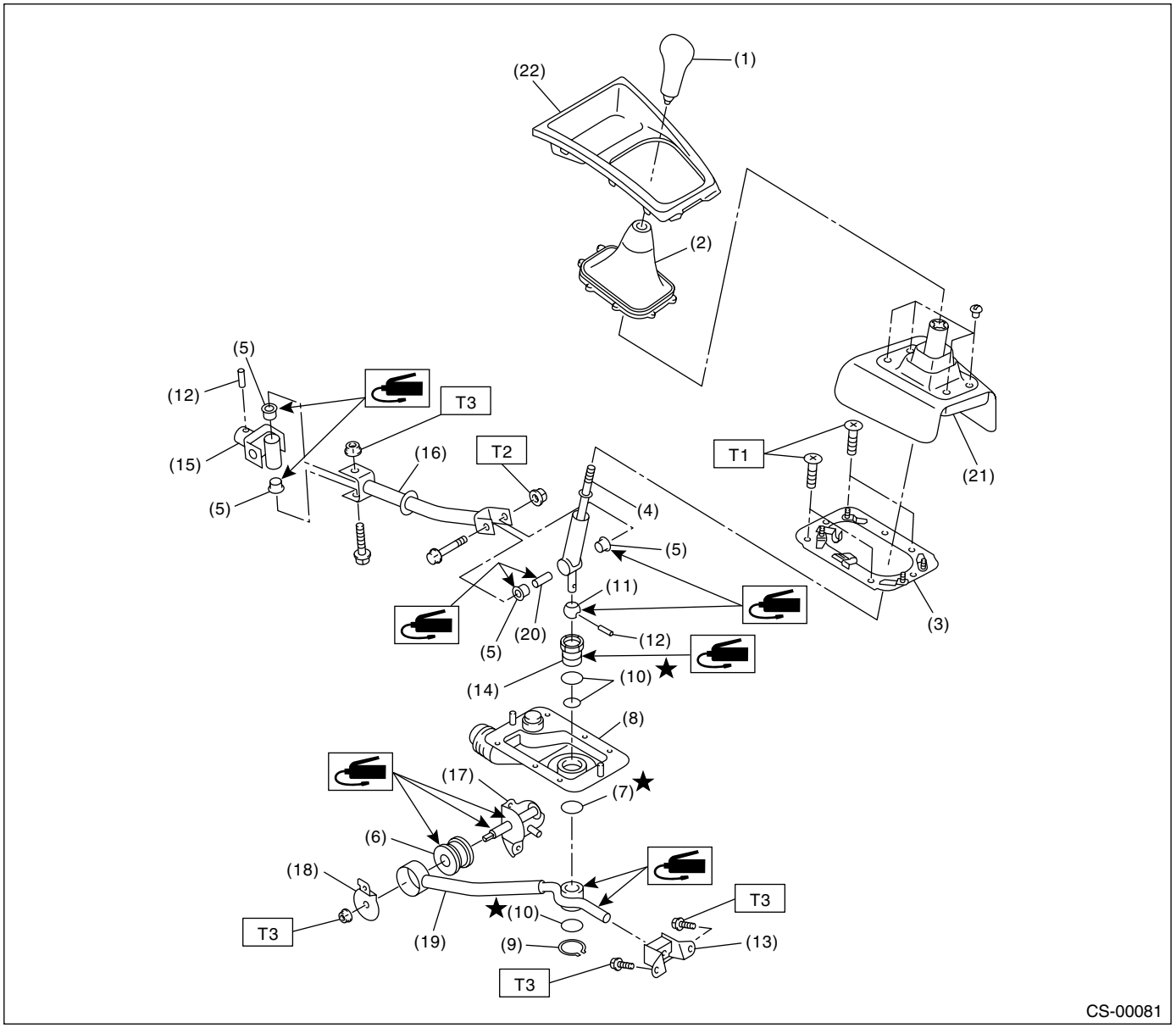
1. AT SELECT LEVER



(1) Bulb
(2) Detent arm
(3) Detent spring
(4) Lever
(5) Spring pin
(6) Arm COMPL
(7) Bush COMPL
(8) Base plate
(9) Grommet
(10) Packing
(11) Spacer
(12) Grip
(13) Indicator cover
(14) Blind
(15) Cushion plate
(16) Guide plate
(17) Snap pin
(18) Washer
(19) Select cable
(20) Nut B
(21) Nut A
(22) Clip

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 13 (1.3, 9.4)
T3: 18 (1.8, 13.0)
T4: 18 (1.8, 13.0)

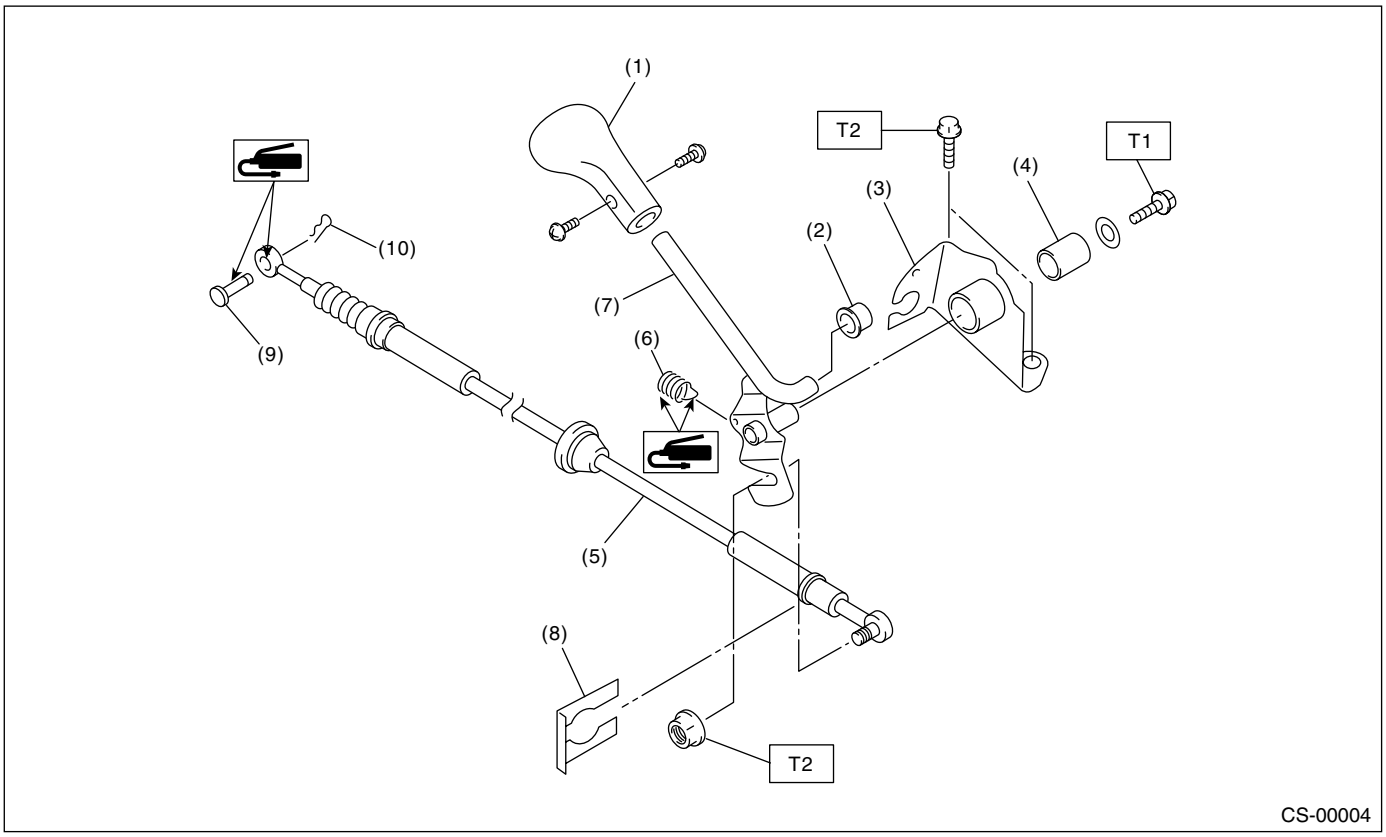
2. MT GEAR SHIFT LEVER



(1)	Gear shift knob	(10)	O-ring	(19)	Stay
(2)	Console boot	(11)	Bush A	(20)	Spacer
(3)	Plate COMPL	(12)	Spring pin	(21)	Boot and insulator ASSY
(4)	Lever	(13)	Cushion rubber	(22)	Front cover
(5)	Bush	(14)	Bush B		
(6)	Bush	(15)	Joint		
(7)	Lock wire	(16)	Rod		
(8)	Boot	(17)	Bracket		
(9)	Snap ring	(18)	Washer		

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 12 (1.2, 8.7)
T3: 18 (1.8, 13.0)

3. DRIVE SELECT LEVER



(1) Knob
(2) Cushion
(3) Plate COMPL
(4) Bush
(5) Cable
(6) Spring
(7) Lever COMPL
(8) Clip
(9) Clevis pin
(10) Snap pin

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.6 (0.16, 1.2)
T2: 18 (1.8, 13.0)

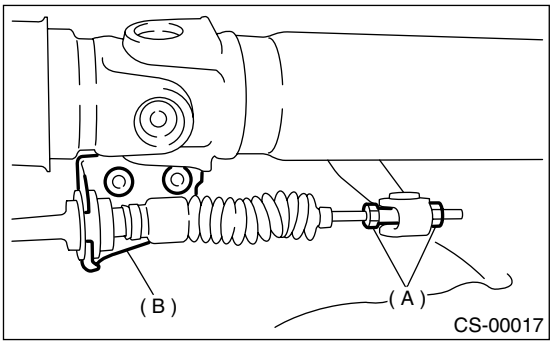
C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Apply grease onto sliding or revolution surfaces before installation.
• Before installing O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Before disconnecting electrical connectors, be sure to disconnect the ground cable from battery.

2. Select Lever

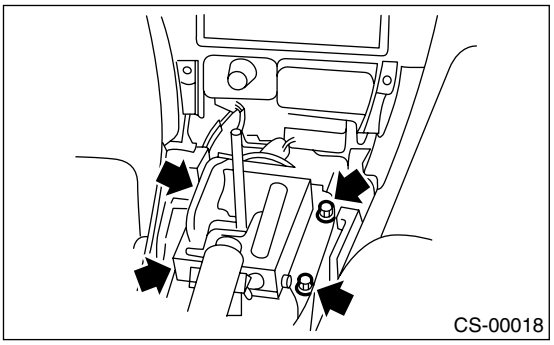
A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Move the select lever to “N” position.
4) Lift-up the vehicle.
5) Remove the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(SOHC)-11, REMOVAL, Rear Exhaust Pipe.>, <Ref. to EX(SOHC)-13, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(TURBO)-12, REMOVAL, Rear Exhaust Pipe.>, <Ref. to EX(TURBO)-14, REMOVAL, Muffler.>
6) Remove the heat shield cover. (If equipped)
7) Disconnect the cable from select lever, and then remove the cable bracket.



(A) Adjusting nuts
(B) Cable bracket

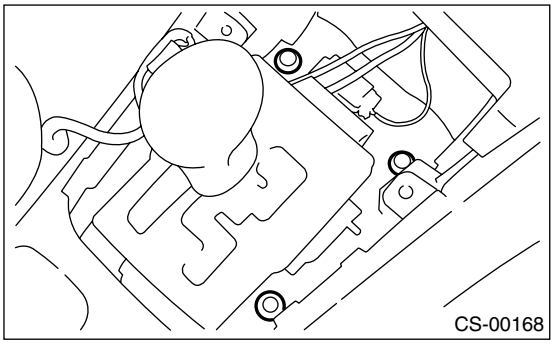
8) Lower the vehicle.
9) Remove the console box. <Ref. to EI-39, REMOVAL, Console Box.>
10) Disconnect the connectors, then remove the four bolts to take out the select lever assembly from body.



B: INSTALLATION

1) Mount the select lever onto the vehicle body.
2) Tighten the four select lever mounting bolts to the specified torque, then connect the connector.

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)



3) Install the console box. <Ref. to EI-39, INSTALLATION, Console Box.>
4) Set the location of select lever at “N” position.
5) Lift-up the vehicle.
6) Set the location of range select lever to “N” position.
7) Insert the thread portion of the other inner cable and into connector hole of the select lever, and fix the other outer cable end to bracket.

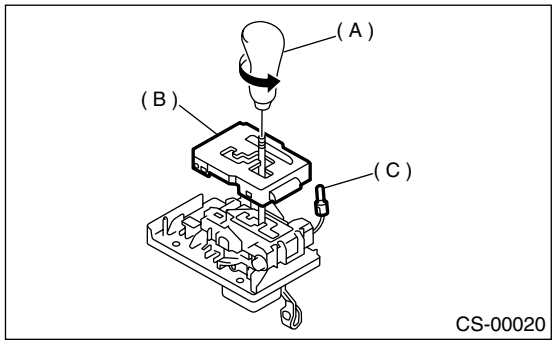
Tightening torque:
18 N·m (1.8kgf-m, 13.0 ft-lb)

8) Adjust the select cable position. <Ref. to CS-10, ADJUSTMENT, Select Cable.>
9) After completion of fitting, make sure that the select lever operates smoothly all across the operating range.
10) Install the heat shield cover. (If equipped)
11) Install the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(SOHC)-11, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX(SOHC)-13, INSTALLATION, Muffler.>
Turbo model
<Ref. to EX(TURBO)-12, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX(TURBO)-14, INSTALLATION, Muffler.>
12) Inspect the following items. If the following inspection reveals problems, adjust the select cable and inhibitor switch. <Ref. to CS-10, ADJUSTMENT, Select Cable.> and <Ref. to AT-48, ADJUSTMENT, Inhibitor Switch.>
(1) The engine starts operating when select lever is in position “P”, but not in other positions.
(2) The back-up light is lit when the select lever is in position “R”, but not in other positions.
(3) Select lever and indicator positions displayed are matched.

C: DISASSEMBLY

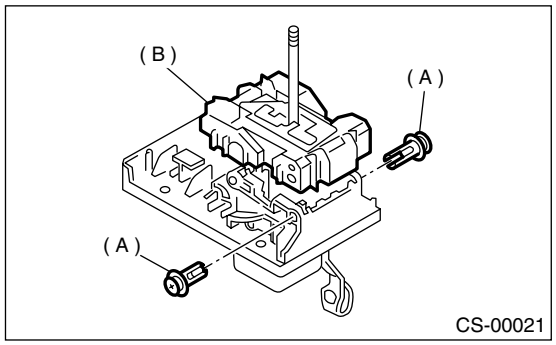
1) Remove the grip.
2) Remove the indicator light, and then remove the indicator cover.

NOTE:
Be careful not to break the indicator light during removal.



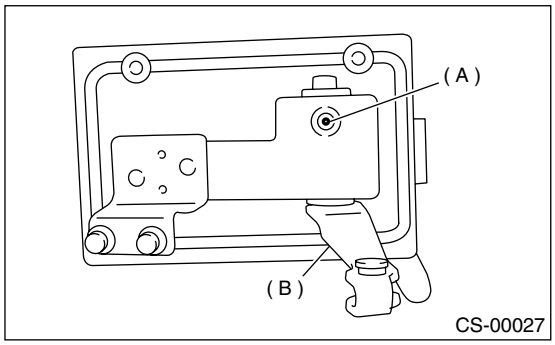
(A) Grip
(B) Indicator cover
(C) Indicator light

3) Remove the blind.
4) Remove the clips, and then remove the guide plate.



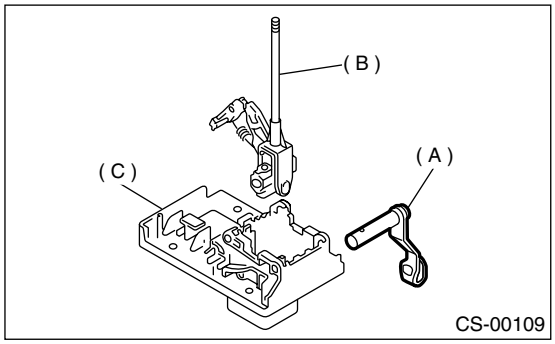
(A) Clips
(B) Guide plate

5) Remove the grommet, and then extract the spring pin.



(A) Spring pin
(B) Arm COMPL

6) Remove the arm COMPL, and then take away the select lever COMPL from base plate.



(A) Arm COMPL
(B) Select lever COMPL
(C) Base plate

D: ASSEMBLY

1) Clean all parts before assembly.
2) Apply grease [SUNLIGHT No. 2 (Part No. 003602010) or equivalent] to each parts. <Ref. to CS-3, AT Select Lever.>
3) Assembly is in the reverse order of disassembly.
4) After completion of fitting, transfer the select lever to range “P” — “1”, then check whether the indicator and select lever agree, whether the pointer and position mark agree and what the operating force is.

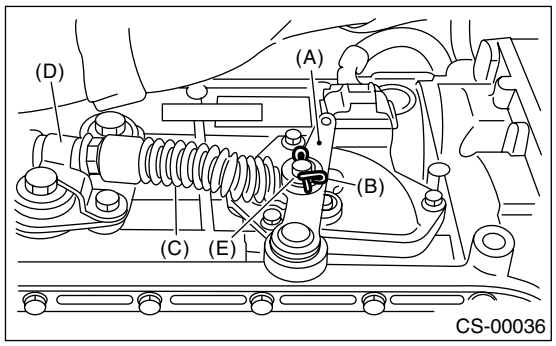
E: INSPECTION

1) Inspect the removed parts by comparing with new ones for deformation, damage and wear. Correct or replace if defective.
2) Confirm select lever COMPL for operating condition before assembly. It is operating normally if it moves smoothly.

3. Select Cable

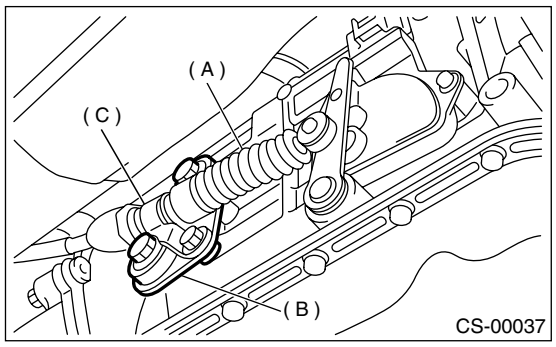
A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Prior to removal, set the lever to “N” position.
4) Lift-up the vehicle.
5) Remove the front and center exhaust pipe.
Non-turbo model
<Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.>
Turbo model
<Ref. to EX(TURBO)-7, REMOVAL, Center Exhaust Pipe.>
6) Remove the heat shield cover. (If equipped)
7) Remove the snap pin from range select lever.



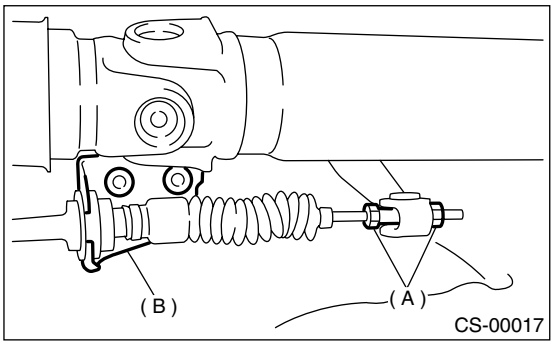
(A) Range select lever
(B) Snap pin
(C) Select cable
(D) Clamp
(E) Washer

8) Remove the plate assembly from transmission case.



(A) Select cable
(B) Plate ASSY
(C) Clamp

9) Disconnect the cable from select lever, and then remove the cable bracket.



(A) Adjusting nuts
(B) Cable bracket

10) Remove the select cable from plate assembly.

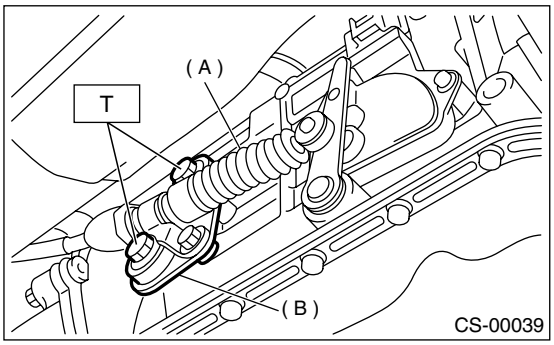
B: INSTALLATION

1) Install the select cable to plate assembly.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

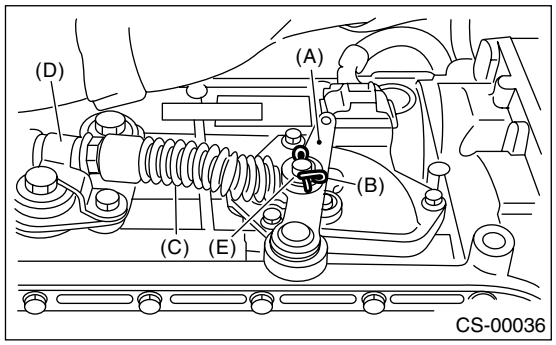
2) Install the select cable to range select lever.
3) Install the plate assembly to transmission.

Tightening torque:
T: 24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Select cable
(B) Plate ASSY

4) Install the snap pin to range select lever.



(A) Range select lever
(B) Snap pin
(C) Select cable
(D) Clamp
(E) Washer

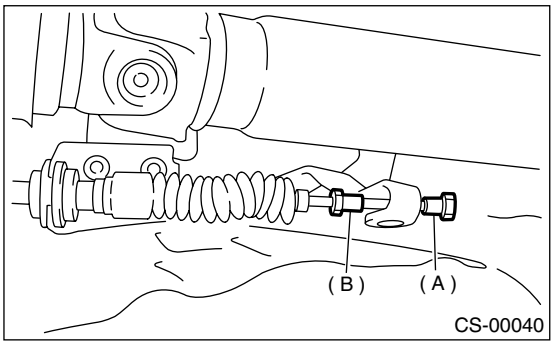
5) Move the select lever to “N” position, then adjust the select cable position. <Ref. to CS-10, ADJUSTMENT, Select Cable.>
6) Install the heat shield cover. (If equipped)
7) Install the front and center exhaust pipe.
Non-turbo model
<Ref. to EX(SOHC)-8, INSTALLATION, Front Exhaust Pipe.>
Turbo model
<Ref. to EX(TURBO)-8, INSTALLATION, Center Exhaust Pipe.>

C: INSPECTION

Check the removed cable and replace if damaged, rusty, or malfunctioning.
1) Check for smooth operation of the cable.
2) Check the inner cable for damage and rust.
3) Check the outer cable for damage, bends, and cracks.
4) Check the boot for damage, cracks, and deterioration.
5) Move the select lever from “P” position to “1” position. You should be able to feel the detentes in each position. If the detentes cannot be felt or the position pointer is improperly aligned, adjust the cable.

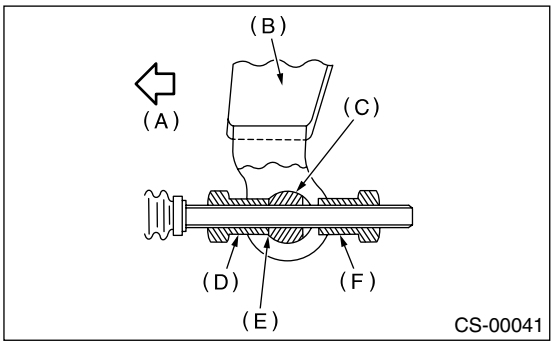
D: ADJUSTMENT

1) Set the vehicle on a lift.
2) Set the lever to “N” position.
3) Lift-up the vehicle.
4) Remove the rear exhaust pipe and muffler.
5) Remove the heat shield cover. (If equipped)
6) Loosen the adjusting nut on each side.



(A) Adjusting nut A
(B) Adjusting nut B

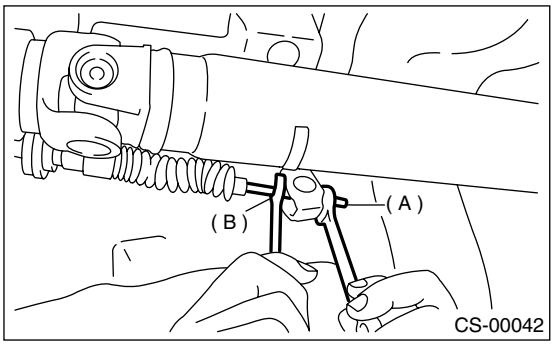
7) Turn the adjusting nut B until it lightly touches the connector.



(A) Front side
(B) Select lever
(C) Connector
(D) Adjusting nut B
(E) Contact point
(F) Adjusting nut A

8) While preventing the adjusting nut B from moving with a wrench, tighten the adjusting nut A.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



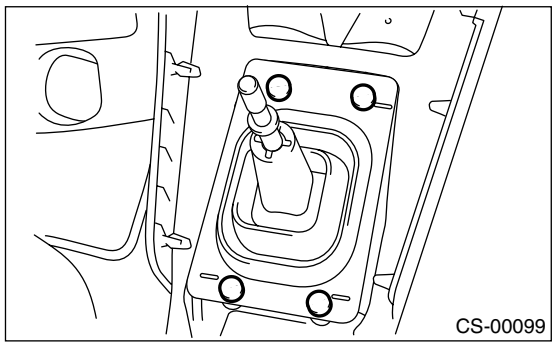
(A) Adjusting nut A
(B) Adjusting nut B

9) After completion of fitting, make sure that the select lever operates smoothly all across the operating range.
10) Install the removed parts in the reverse order of removal.

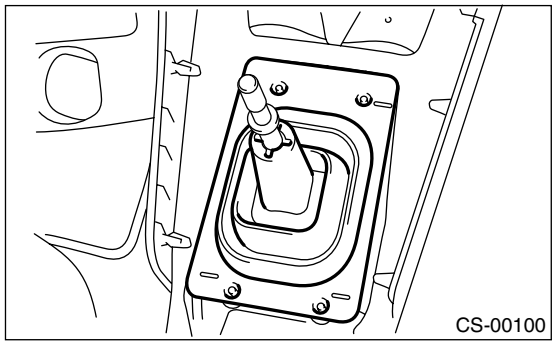
4. MT Gear Shift Lever

A: REMOVAL

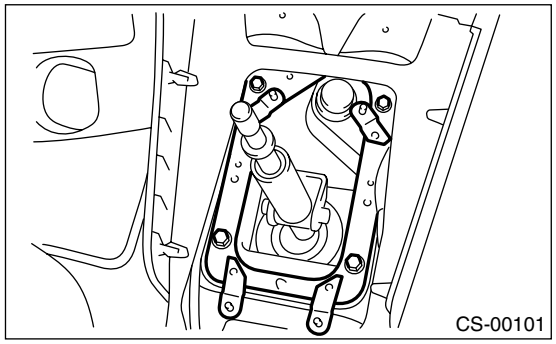
1) Set the vehicle on a lift.
2) Remove the gear shift knob.
3) Disconnect the ground cable from battery.
4) Remove the console box. <Ref. to EI-39, REMOVAL, Console Box.>
5) Remove the drive select cable. <Ref. to CS-20, REMOVAL, Drive Select Cable.>
6) Remove the clamp.



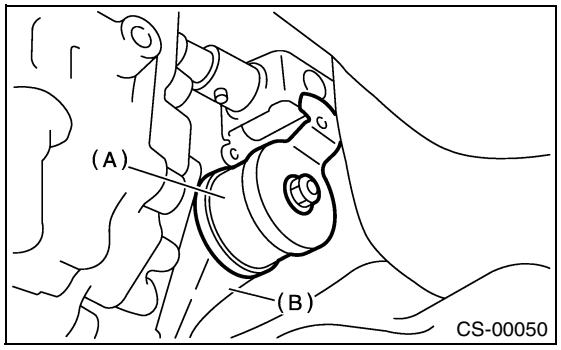
7) Remove the boot and insulator assembly.



8) Remove the drive select cable. <Ref. to CS-20, REMOVAL, Drive Select Cable.>
9) Remove the plate COMPL from body.

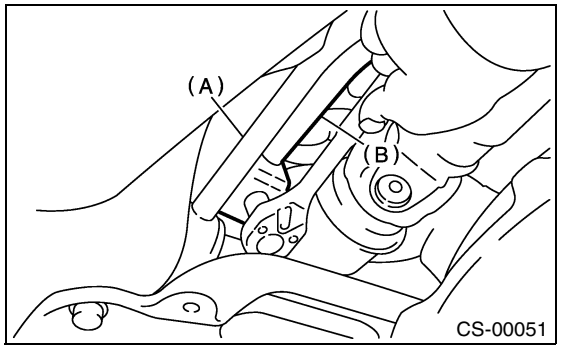


10) Lift-up the vehicle.
11) Remove the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(SOHC)-11, REMOVAL, Rear Exhaust Pipe.>, <Ref. to EX(SOHC)-13, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(TURBO)-12, REMOVAL, Rear Exhaust Pipe.>, <Ref. to EX(TURBO)-14, REMOVAL, Muffler.>
12) Remove the heat shield cover.
13) Remove the stay from transmission bracket.



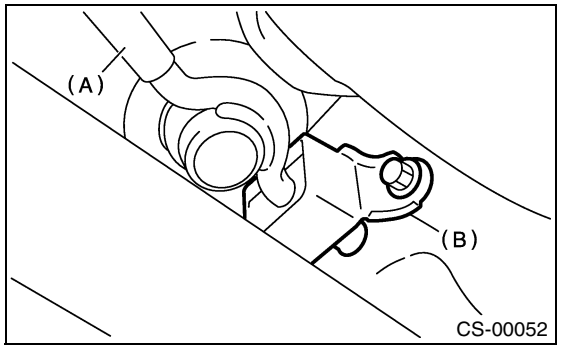
(A) Stay
(B) Transmission bracket

14) Remove the rod from joint.



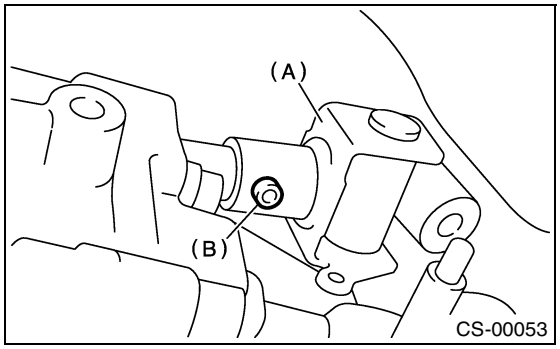
(A) Stay
(B) Rod

15) Remove the cushion rubber from body.



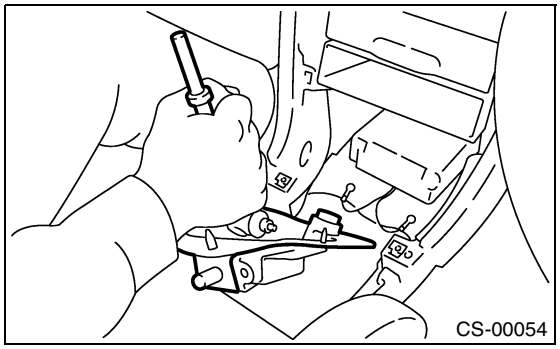
(A) Stay
(B) Cushion rubber

16) Remove the spring pin, and then extract the joint.



(A) Joint
(B) Spring pin

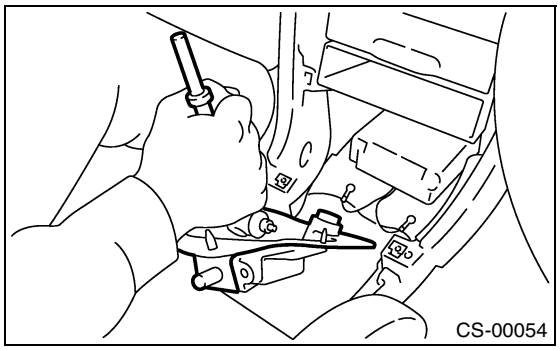
17) Lower the vehicle.
18) Remove the gear shift lever.



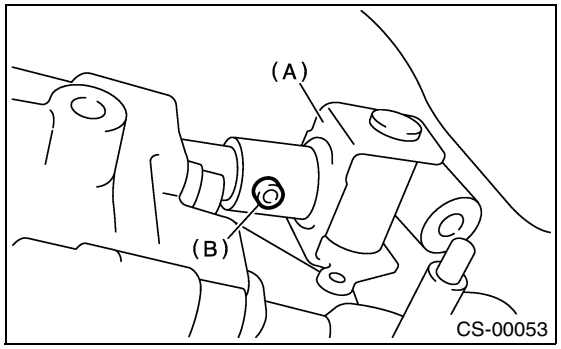
B: INSTALLATION

1) Insert the gear shift lever from room side.

NOTE:
After inserting the rod and stay, temporarily put them onto transmission mount.



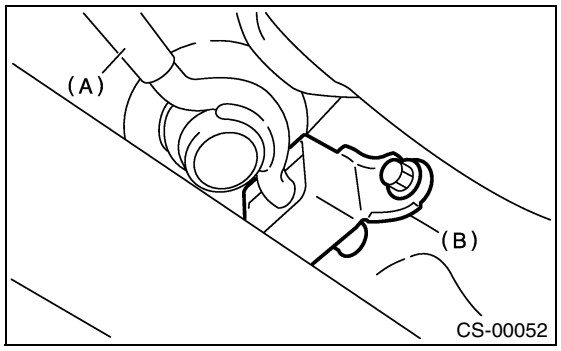
2) Install the joint to transmission and secure with the spring pin.



(A) Joint
(B) Spring pin

3) Lift-up the vehicle.
4) Install the joint to shifter arm.
5) Mount the cushion rubber on the body.

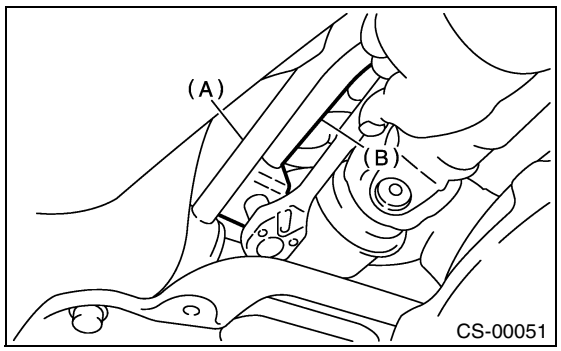
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



(A) Stay
(B) Cushion rubber

6) Connect the rod to the joint.

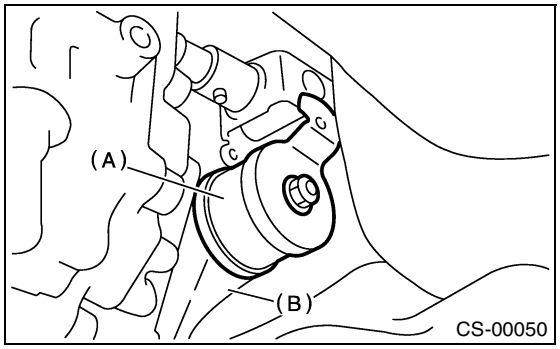
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



(A) Stay
(B) Rod

7) Connect the stay to transmission bracket.

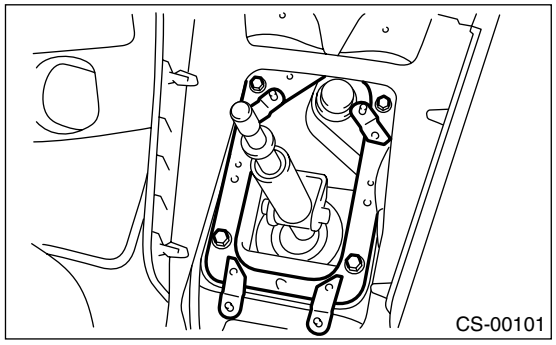
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



(A) Stay
(B) Transmission bracket

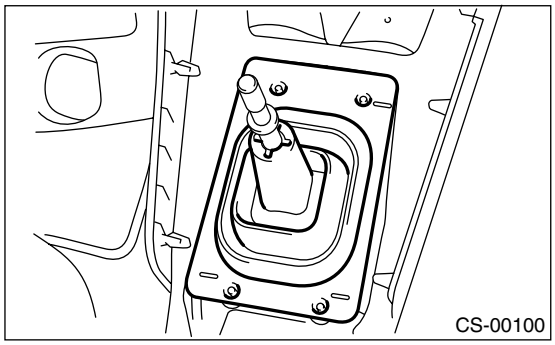
8) Install the heat shield cover. (If equipped)
9) Install the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(SOHC)-11, REMOVAL, Rear Exhaust Pipe.>, <Ref. to EX(SOHC)-13, INSTALLATION, Muffler.>
Turbo model
<Ref. to EX(TURBO)-12, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX(TURBO)-14, INSTALLATION, Muffler.>
10) Lower the vehicle.
11) Install the plate COMPL to body.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



12) Install the drive select cable. <Ref. to CS-20, INSTALLATION, Drive Select Cable.>

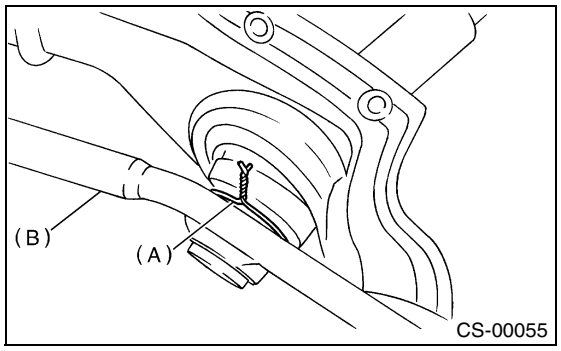
13) Install the boot and insulator assembly to vehicle in proper direction.



14) Install the clamp.
15) Install the drive select cable. (Dual-range model) <Ref. to CS-20, INSTALLATION, Drive Select Cable.>
16) Install the console box. <Ref. to EI-39, INSTALLATION, Console Box.>

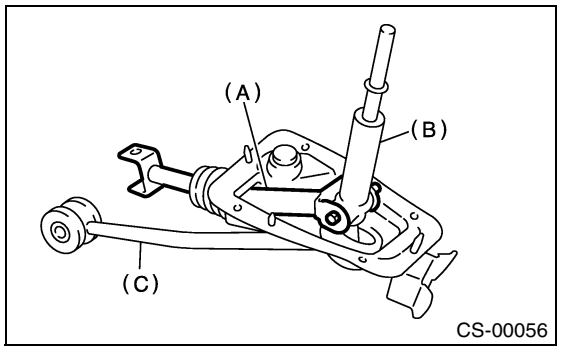
C: DISASSEMBLY

1) Disassemble the lock wire.



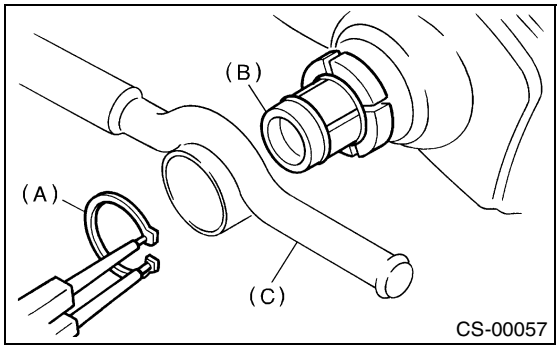
(A) Lock wire
(B) Stay

2) Remove the rod from lever.



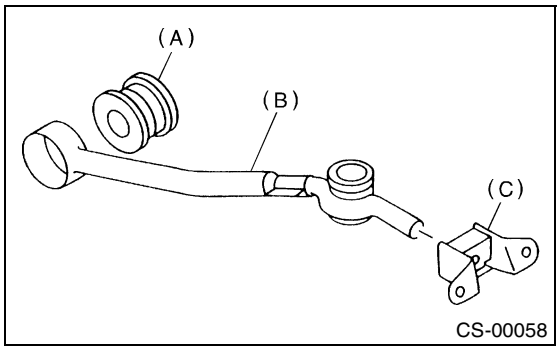
(A) Rod
(B) Lever
(C) Stay

3) Remove the snap ring from bush B, and then disconnect the stay.



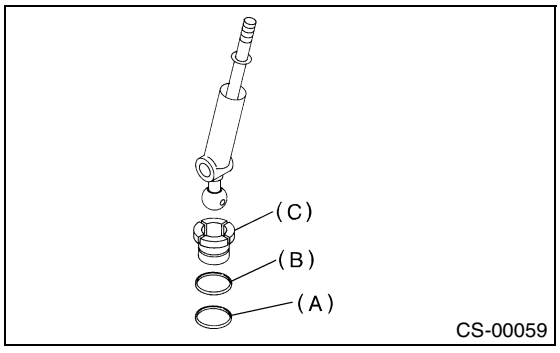
(A) Snap ring
(B) Bush B
(C) Stay

4) Remove the boot from gear shift lever.
5) Remove the bush and cushion rubber from stay.



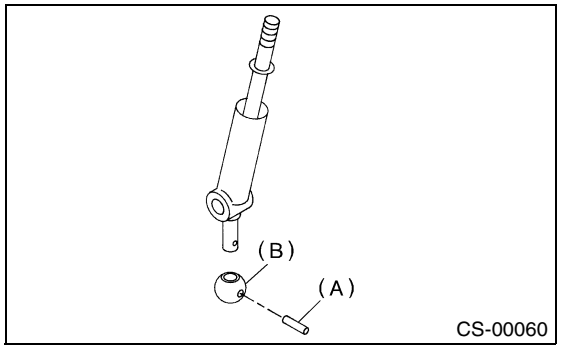
(A) Bush
(B) Stay
(C) Cushion rubber

6) Remove the O-ring, and then disconnect the bush B.



(A) O-ring
(B) O-ring
(C) Bush B

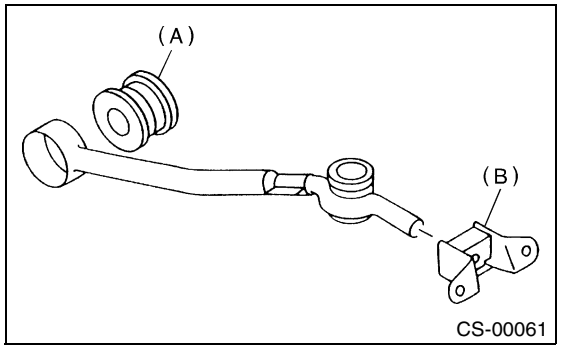
7) Draw out the spring pin, and then remove the bush A from gear shift lever.



(A) Spring pin
(B) Bush A

D: ASSEMBLY

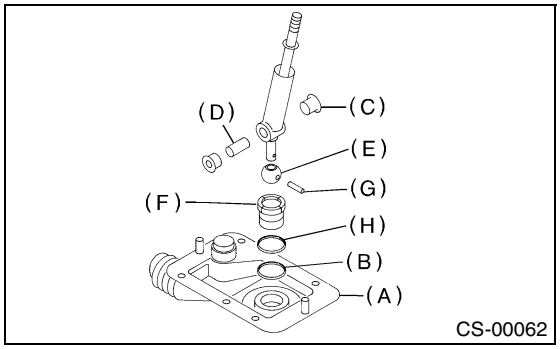
1) Clean all parts before assembly.
2) Mount the bush and cushion rubber on the stay.



(A) Bush
(B) Cushion rubber

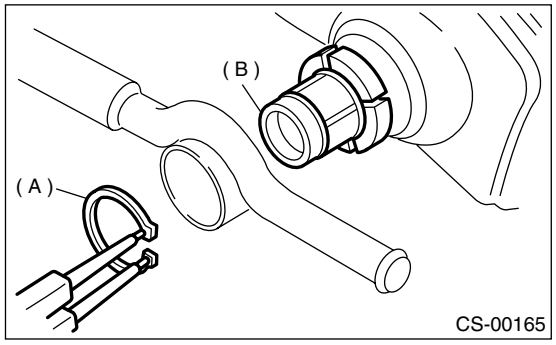
3) Mount each part; boot, O-ring, bush A, spacer, bush B, bush and spring pin on the gear shift lever.

NOTE:
• Always use new O-rings.
• Apply grease [SUNLIGHT No. 2 part (No. 003602010) or equivalent] to the inner and side surfaces of the bush when installing the spacer.



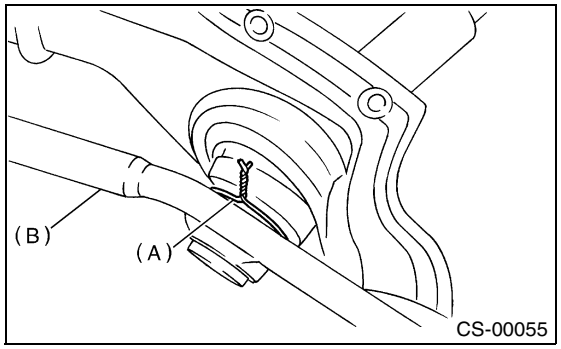
(A) Boot
(B) O-ring
(C) Bush
(D) Spacer
(E) Bush A
(F) Bush B
(G) Spring pin
(H) O-ring

4) Insert the gear shift lever into boot hole.
5) Install the stay to bush B and secure it with snap ring.



(A) Snap ring
(B) Bush B

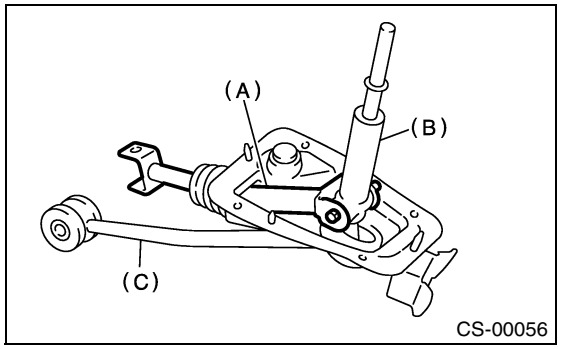
6) Tighten with a new lock wire to the extent that the boot will not come off.



(A) Lock wire
(B) Stay

7) Insert the rod into boot hole.
8) Connect the rod to gear shift lever.

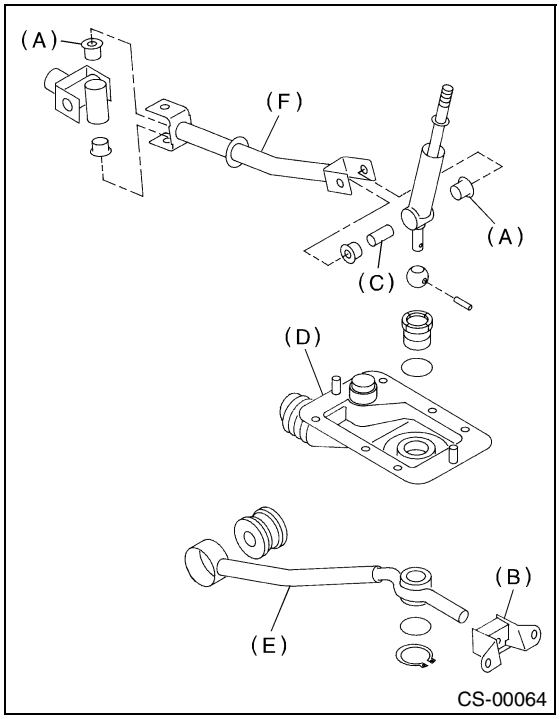
Tightening torque:
11.8 N·m (1.2 kgf-m, 8.7 ft-lb)



(A) Rod
(B) Lever
(C) Stay

E: INSPECTION

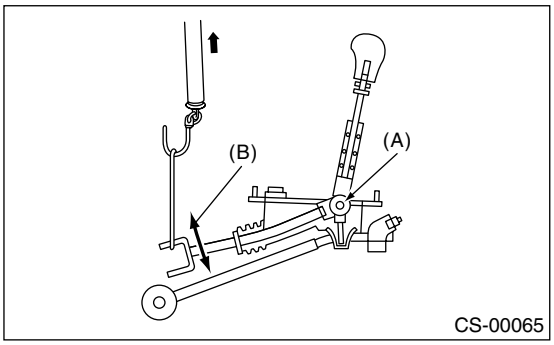
1) Check each part (bush, cushion rubber, spacer, boot, stay and rod, etc.) for deformation, damage and wear. Repair or replace any defective part. Determine defective parts by comparing with new parts.



(A) Bush
(B) Cushion rubber
(C) Spacer
(D) Boot
(E) Stay
(F) Rod

2) Check the swing torque of the rod in relation of gear shift lever.
If the torque exceeds specification, replace the bush or retighten nuts.

Swing torque:
3.7 N (0.38 kgf, 0.83 lb) or less



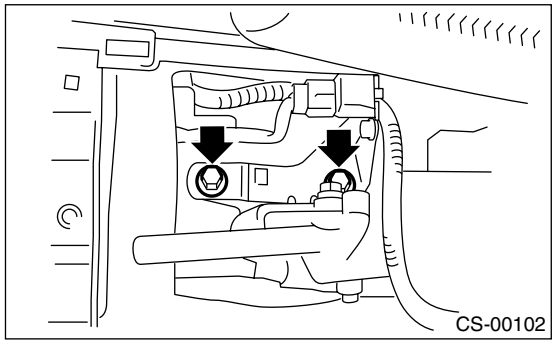
(A) Center of rotation
(B) Swing torque

3) Check that there is no excessive play and that parts move smoothly.

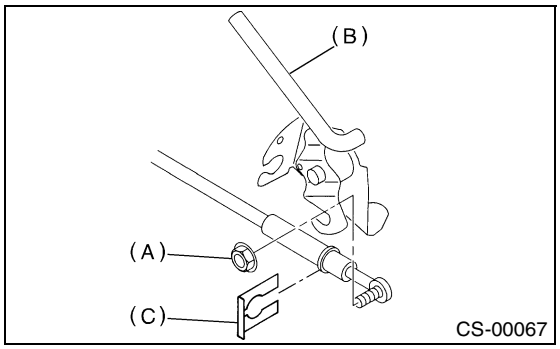
5. MT Drive Select Lever

A: REMOVAL

1) Apply parking brake and place chocks to hold the wheels.
2) Disconnect the ground cable from battery.
3) Set the drive select lever to HI position.
4) Remove the knob.
5) Remove the console box. <Ref. to EI-39, Console Box.>
6) Remove the bolt installing drive select lever assembly on body.



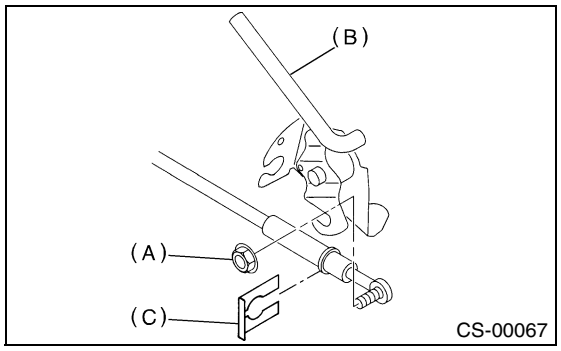
7) Remove the flange nut, clip and then disconnect the cable from lever assembly.



(A) Flange nut
(B) Lever COMPL
(C) Clip

B: INSTALLATION

1) Install the drive select cable to lever COMPL, and then fasten it with a clip.

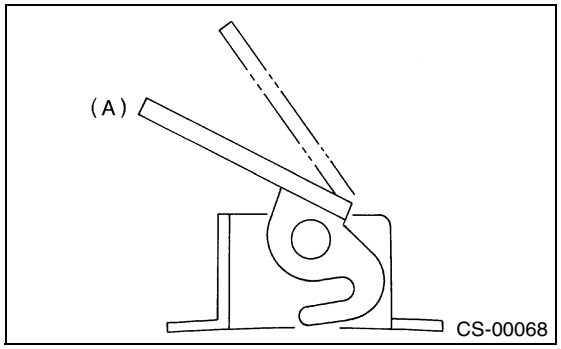


(A) Flange nut
(B) Lever COMPL
(C) Clip

2) Install the drive select lever.

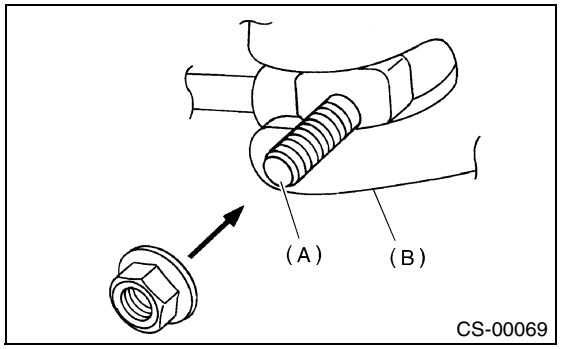
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

3) Set the drive select lever to HI position.



(A) HI position

4) Be sure to insert the cable eye end bolt into lever arm slit.



(A) Cable eye end bolt
(B) Lever arm

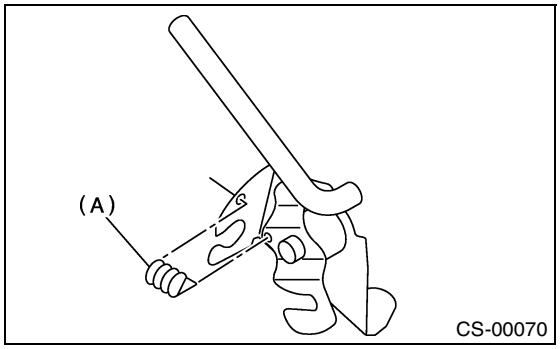
5) Tighten the nut where cable eye end bolt comes to a stop.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

6) Install in the reverse order of removal.

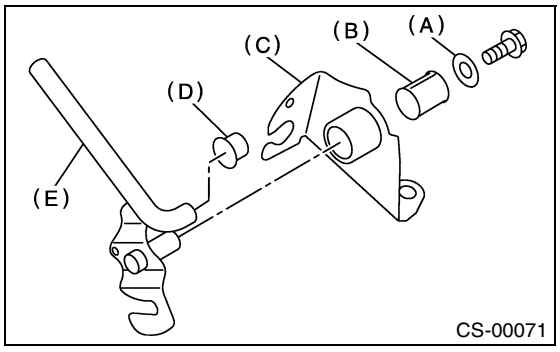
C: DISASSEMBLY

1) Remove the spring.



(A) Spring

2) Remove the lever, cushion and bush.



(A) Washer
(B) Bush
(C) Plate COMPL
(D) Cushion
(E) Lever COMPL

D: ASSEMBLY

1) Assemble in the reverse order of disassembly.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

2) Make sure the select lever moves smoothly.

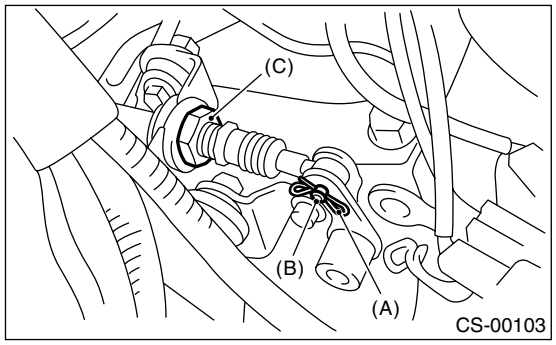
E: INSPECTION

1) Make sure the select lever moves smoothly. If it does not move smoothly, repair or replace it.
2) Make sure the drive select lever is not damaged. If it is damaged, repair or replace it.

6. Drive Select Cable

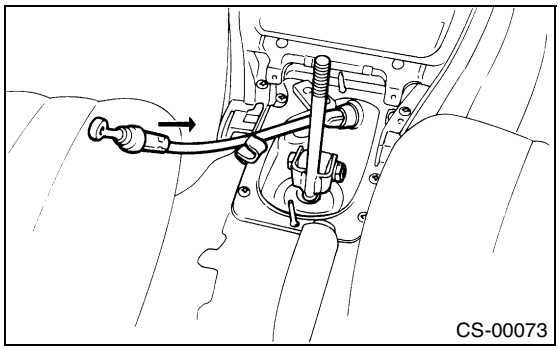
A: REMOVAL

1) Remove the drive select lever. <Ref. to CS-18, REMOVAL, MT Drive Select Lever.>
2) Remove the intake duct. <Ref. to IN(SOHC)-7, Air Intake Duct.>
3) Remove the air cleaner case. <Ref. to IN(SOHC)-6, Air Cleaner Case.>
4) Remove the snap pin and clevis pin.
5) Loosen the nut and disconnect the cable from cable bracket.



(A) Snap pin
(B) Clevis pin
(C) Nut

6) Disconnect the cable from transmission clamp.
7) Remove the cable from the under side of vehicle.



B: INSTALLATION

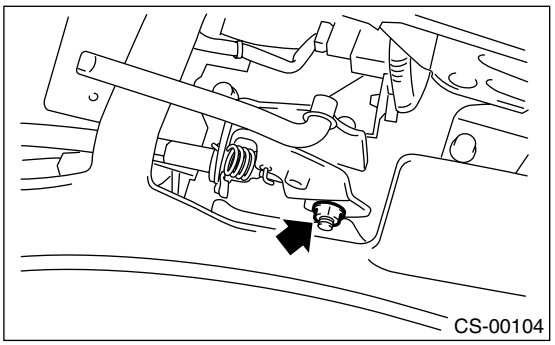
1) Install in the reverse order of removal.
2) Make sure the drive select lever operates properly.

C: INSPECTION

1) Make sure to shift the transmission to HI or LO position by moving the drive select lever. If it does not move, adjust the cable.<Ref. to CS-20, ADJUSTMENT, Drive Select Cable.>
2) Make sure the cable operates smoothly. If it catches or fails to work properly, repair or replace it.
3) Check the cable for damage.

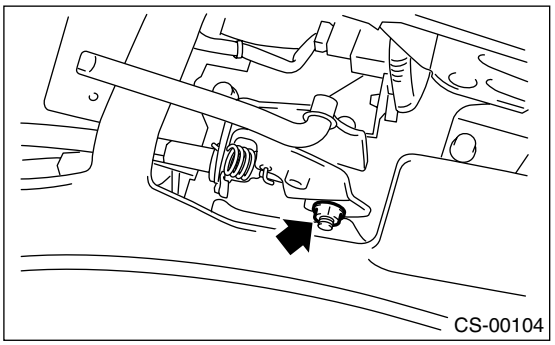
D: ADJUSTMENT

1) Set the drive select lever to HI position.
2) Remove the drive select lever knob.
3) Remove the console box. <Ref. to EI-39, Console Box.>
4) Loosen the nut.



5) Make sure the transmission is in HI position. If is not, pull on the cable to put transmission in HI position.
6) Tighten the nut in the location where cable end bolt stops naturally.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



7) Make sure to shift the transmission to HI or LO position by moving the drive select lever. If it does not move, readjust the cable.

7. General Diagnostic

A: INSPECTION

Symptom	Possible cause	Remedy
1. Select lever	(1) Starter does not run.	Adjust the select cable and inhibitor switch, or inspect circuit.
	(2) Back-up light does not light up.	Adjust the select cable and inhibitor switch, or inspect circuit.

AUTOMATIC TRANSMISSION

AT

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1. General Description

A: SPECIFICATIONS

1. TORQUE CONVERTER CLUTCH

Model	2.0 L Non-turbo	2.5 L	2.0 L Turbo
Type	Symmetric, 3 element, single stage, 2 phase torque converter		
Stall torque ratio	2.0 — 2.2	1.9 — 2.1	1.85 — 2.15
Nominal diameter	246 mm (9.69 in)		
Stall speed (at sea level)	2,000 — 2,500 rpm	2,100 — 2,600 rpm	2,600 — 3,300 rpm
One-way clutch	Sprague type one-way clutch		

2. OIL PUMP

Type	Pracoid constant-displacement pump	
Driving method	Driven by engine	
Number of teeth	Inner rotor	9
	Outer rotor	10

3. TRANSMISSION CONTROL ELEMENT

Type	4-forward, 1-reverse, double-row planetary gears
Multi-plate clutch	3 sets
Multi-plate brake	2 sets
One-way clutch (sprague type)	1 sets

4. TRANSMISSION GEAR RATIO

	Gear ratio
1st	2.785
2nd	1.545
3rd	1.000
4th	0.694
Rev	2.272

5. PLANETARY GEAR AND PLATE

Model	2.0 L Non-turbo	2.5 L	2.0 L Turbo
Tooth number of front sun gear	33		
Tooth number of front pinion	21		
Tooth number of front internal gear	75		
Tooth number of rear sun gear	42		
Tooth number of rear pinion	17		
Tooth number of rear internal gear	75		
Drive & driven plate number of high clutch	4		5
Drive & driven plate number of low clutch	4	6	7
Drive & driven plate number of reverse clutch	2		
Drive & driven plate number of 2-4 brake	3		4
Drive & driven plate number of low & reverse brake	4	6	7

6. SELECTOR POSITION

P (Park)	Transmission in neutral, output member immovable, and engine start possible
R (Reverse)	Transmission in reverse for backing
N (Neutral)	Transmission in neutral and engine start possible
D (Drive)	Automatic gear change 1st ←→ 2nd ←→ 3rd ←→ 4th
3 (3rd)	Automatic gear change 1st ←→ 2nd ←→ 3rd ← 4th
2 (2nd)	Automatic gear change 1st ←→ 2nd ← 3rd ← 4th
1 (1st)	1st gear locked (Deceleration possible 1st ← 2nd ← 3rd ← 4th)
Control method	Hydraulic remote control

7. HYDRAULIC CONTROL AND LUBRICATION

Type		Electronic/hydraulic control [Four forward speed changes by electrical signals of vehicle speed and accelerator (throttle) opening]
Fluid		Dexron III type Automatic transmission fluid
Fluid capacity	2.0 L Non-turbo model	8.4 — 8.7 ℓ (8.9 — 9.2 US qt, 7.4 — 7.7 Imp qt)
	2.5 L and 2.0 L Turbo model	9.3 — 9.6 ℓ (9.8 — 10.1 US qt, 8.2 — 8.4 Imp qt)
Lubrication system		Forced feed lubrication with oil pump
Oil		Automatic transmission fluid (above mentioned)

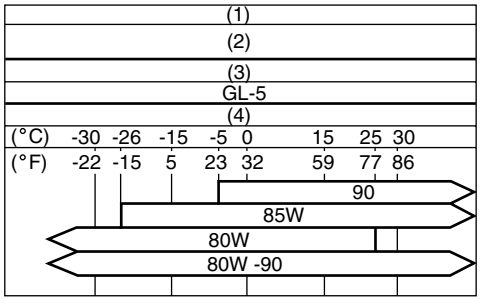
8. COOLING AND HARNESS

Cooling system	Liquid-cooled cooler incorporated in radiator
Inhibitor switch	12 poles
Transmission harness	20 poles

9. TRANSFER

Model	2.0 L Non-turbo	2.5 L	2.0 L Turbo
Transfer type	Multi-plate transfer (MPT)		
Drive & driven plate number of transfer clutch	4	5	6
Control method	Electronic, hydraulic type		
Lubricant	The same Automatic transmission fluid used in automatic transmission		
1st reduction gear ratio	1.000 (53/53)		

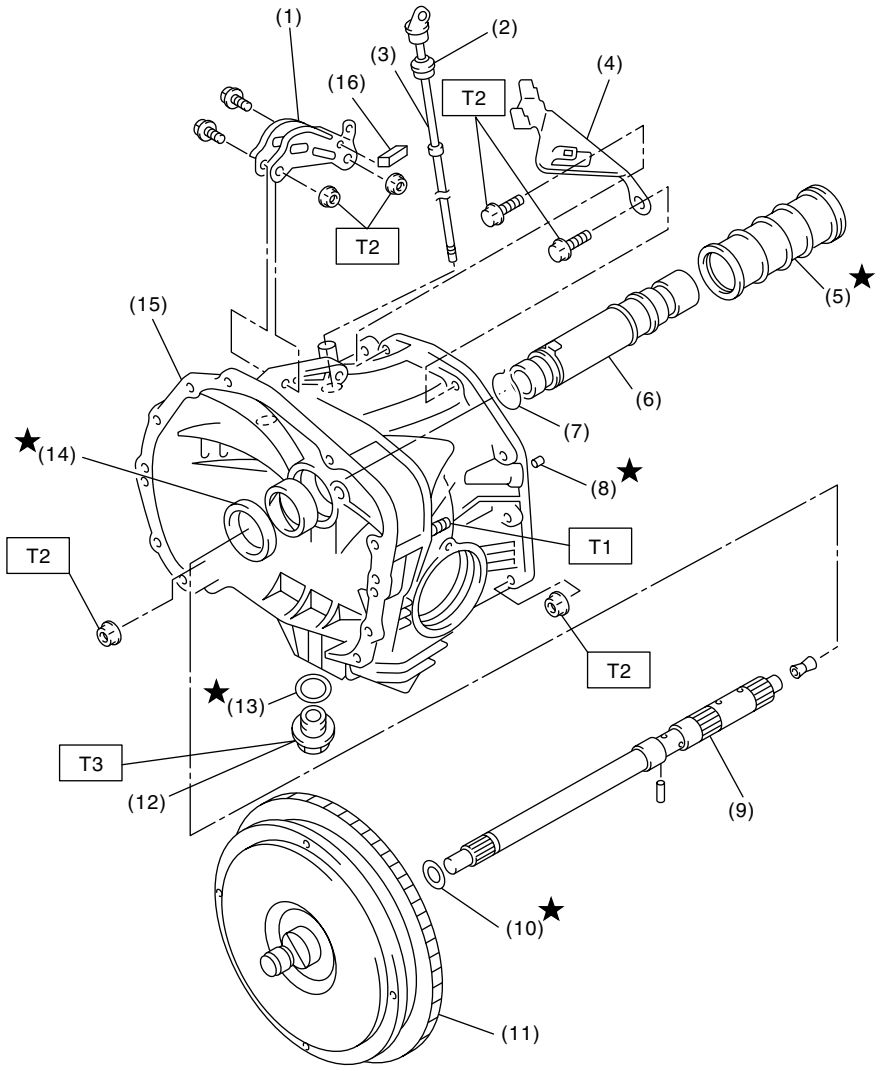
10.FINAL REDUCTION

Model	Turbo	Non-turbo
Front final gear ratio	4.111 (37/9)	4.444 (40/9)
Lubrication oil	 AT-00001	
Front differential oil capacity	1.1 — 1.3 ℓ (1.2 — 1.4 US qt, 1.0 — 1.1 Imp qt)	

(1) ITEM
(2) Front differential gear oil
(3) API Classification
(4) SAE viscosity No. and applicable temperature

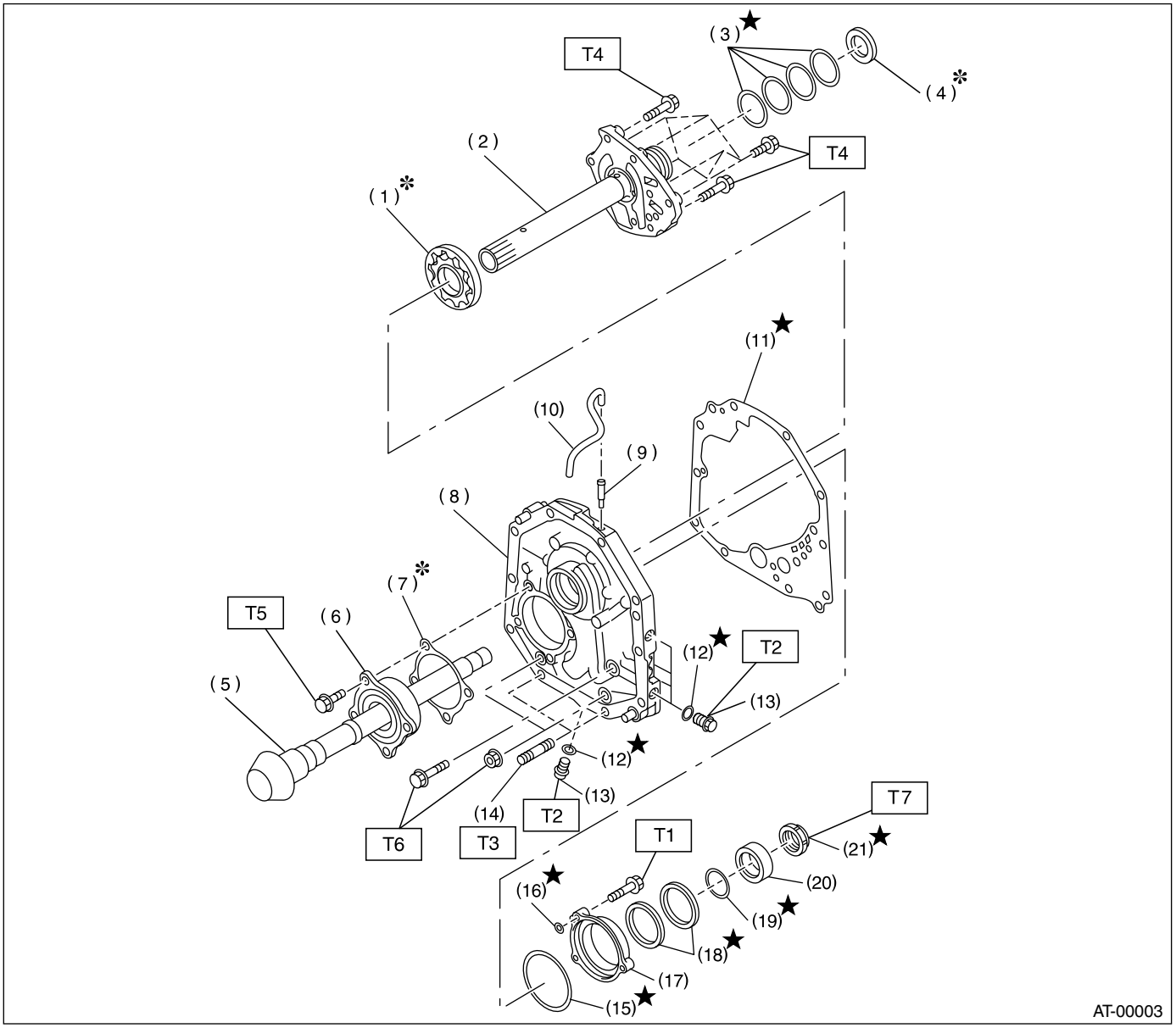
B: COMPONENT

1. TORQUE CONVERTER CLUTCH AND CASE



(1)	Pitching stopper bracket	(8)	Oil drain pipe	(15)	Torque converter clutch case
(2)	O-ring	(9)	Input shaft	(16)	Clip
(3)	Differential oil level gauge	(10)	O-ring		
(4)	Stay	(11)	Torque converter clutch ASSY	***Tightening torque: N·m (kgf-m, ft-lb)***	
(5)	Seal pipe	(12)	Drain plug	***T1:***	***18 (1.8, 13.0)***
(6)	Oil pump shaft	(13)	Gasket	***T2:***	***41 (4.2, 30.4)***
(7)	Clip	(14)	Oil seal	***T3:***	***44 (4.5, 32.5)***

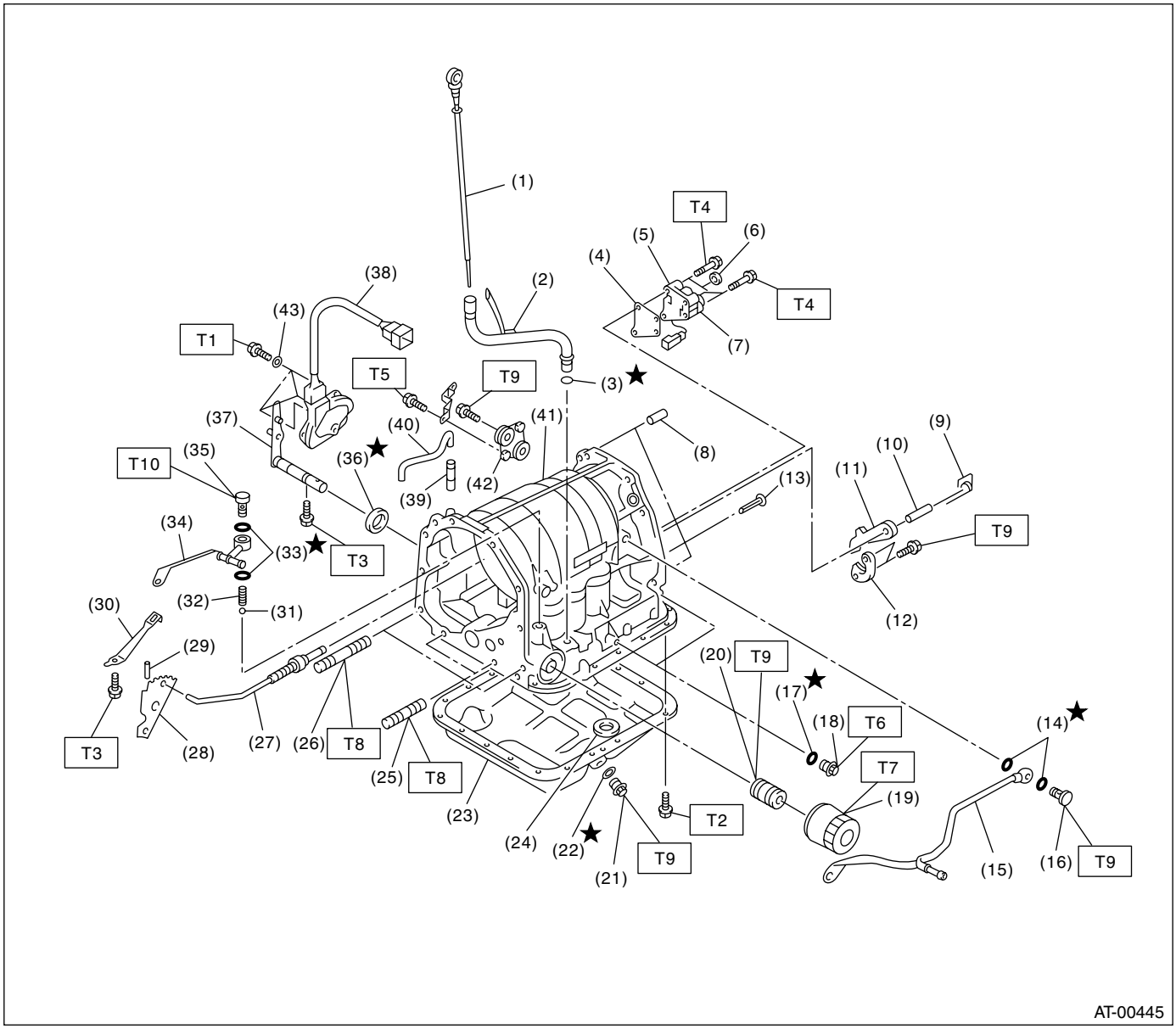
2. OIL PUMP



(1) Oil pump rotor
(2) Oil pump cover
(3) Seal ring
(4) Thrust needle bearing
(5) Drive pinion shaft
(6) Roller bearing
(7) Shim
(8) Oil pump housing
(9) Nipple
(10) Air breather hose
(11) Gasket
(12) O-ring
(13) Test plug
(14) Stud bolt
(15) O-ring
(16) O-ring
(17) Oil seal retainer
(18) Oil seal
(19) O-ring
(20) Drive pinion collar
(21) Lock nut

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7 (0.7, 5.1)
T2: 13 (1.3, 9.4)
T3: 18 (1.8, 13.0)
T4: 25 (2.5, 18.1)
T5: 40 (4.1, 30)
T6: 42 (4.3, 31)
T7: 116 (11.8, 85)

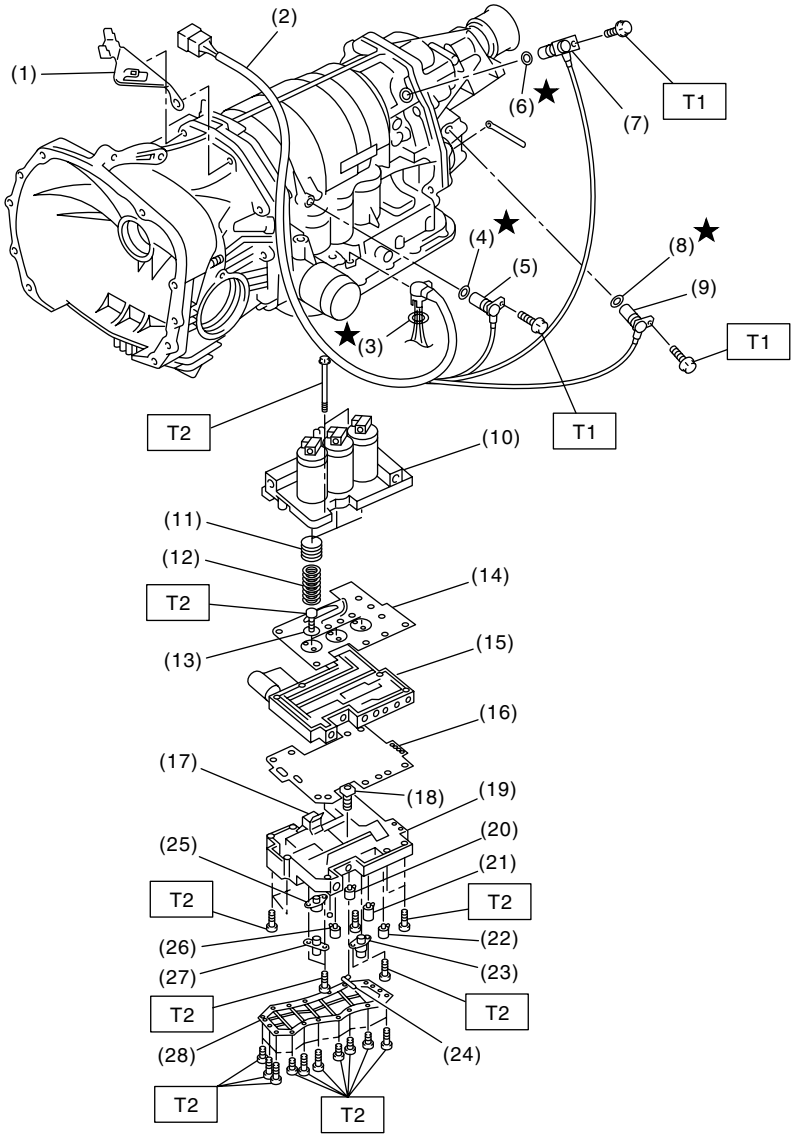
3. TRANSMISSION CASE AND CONTROL DEVICE



(1) ATF level gauge
(2) ATF charger pipe
(3) O-ring
(4) Transfer valve plate
(5) Transfer valve ASSY
(6) Transfer clutch seal
(7) Transfer duty solenoid
(8) Straight pin
(9) Return spring
(10) Shaft
(11) Parking pawl
(12) Parking support
(13) Inlet filter
(14) Gasket
(15) Inlet pipe
(16) Union screw
(17) O-ring
(18) Test plug
(19) Oil filter
(20) Oil filter stud bolt
(21) Drain plug
(22) Gasket
(23) Oil pan
(24) Magnet
(25) Stud bolt (Short)
(26) Stud bolt (Long)
(27) Parking rod
(28) Manual plate
(29) Spring pin
(30) Detention spring
(31) Ball
(32) Spring
(33) Gasket
(34) Outlet pipe
(35) Union screw
(22) Gasket
(36) Oil seal
(37) Select lever
(38) Inhibitor switch ASSY
(39) Nipple
(40) Air breather hose
(41) Transmission case
(42) Plate ASSY
(43) Washer

Tightening torque: N·m (kgf-m, ft-lb)
T1: 3.4 (0.35, 2.5)
T2: 5 (0.5, 3.6)
T3: 6 (0.6, 4)
T4: 8 (0.8, 6)
T5: 12 (1.2, 8.7)
T6: 13 (1.3, 10)
T7: 14 (1.4, 10)
T8: 18 (1.8, 13)
T9: 25 (2.6, 18)
T10: 44 (4.5, 32)

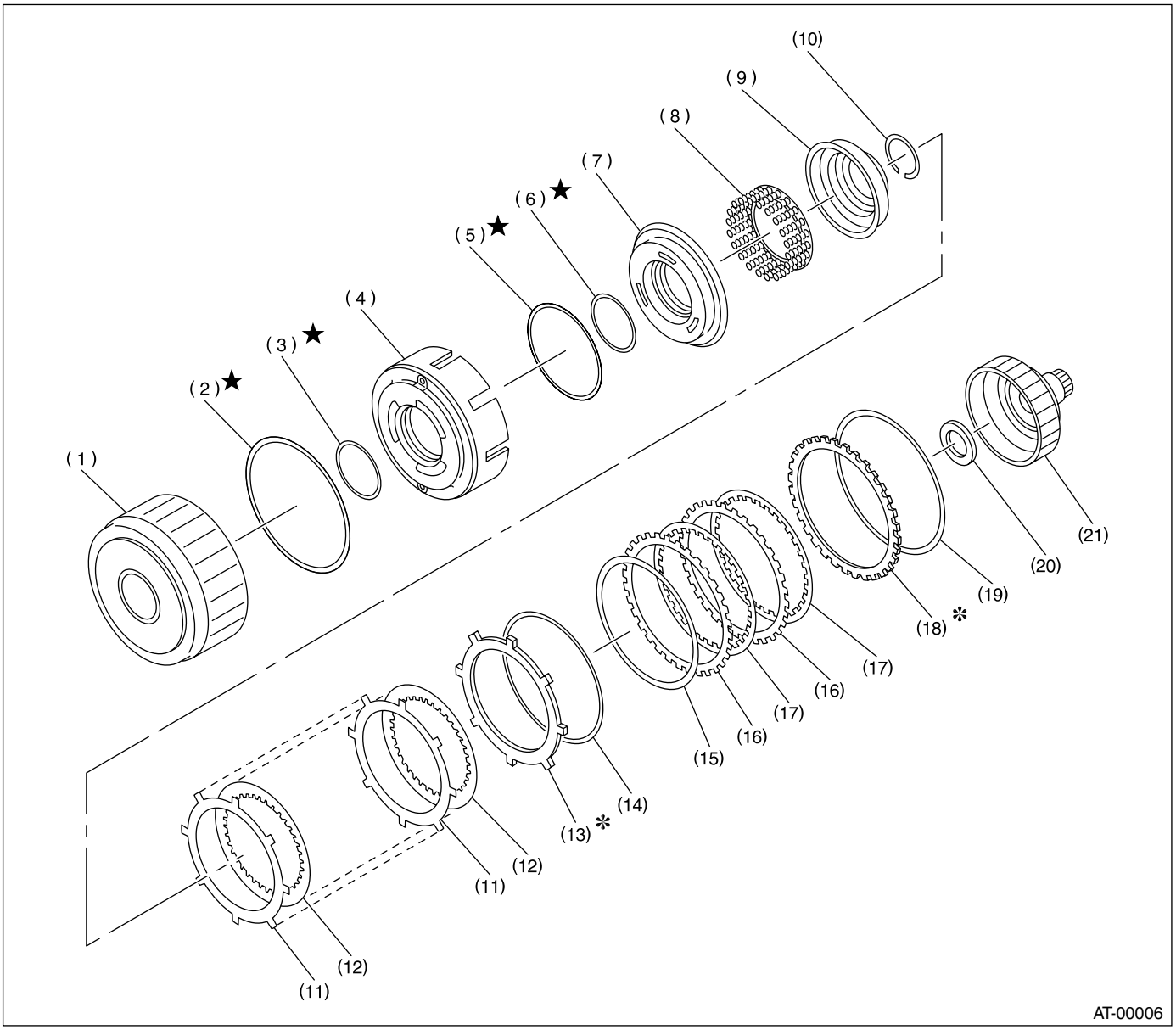
4. CONTROL VALVE AND HARNESS ROUTING



(1) Stay
(2) Transmission harness
(3) O-ring
(4) O-ring
(5) Torque converter turbine speed sensor
(6) O-ring
(7) Front vehicle speed sensor
(8) O-ring
(9) Rear vehicle speed sensor
(10) Upper valve body
(11) Accumulator piston
(12) Accumulator spring
(13) Side plate
(14) Separate plate
(15) Middle valve body
(16) Separate plate
(17) Fluid filter
(18) Fluid filter
(19) Lower valve body
(20) Shift solenoid 2
(21) Shift solenoid 1
(22) 2-4 brake timing solenoid
(23) 2-4 brake duty solenoid
(24) ATF temperature sensor
(25) Line pressure duty solenoid
(26) Low clutch timing solenoid
(27) Lock-up duty solenoid
(28) Oil strainer

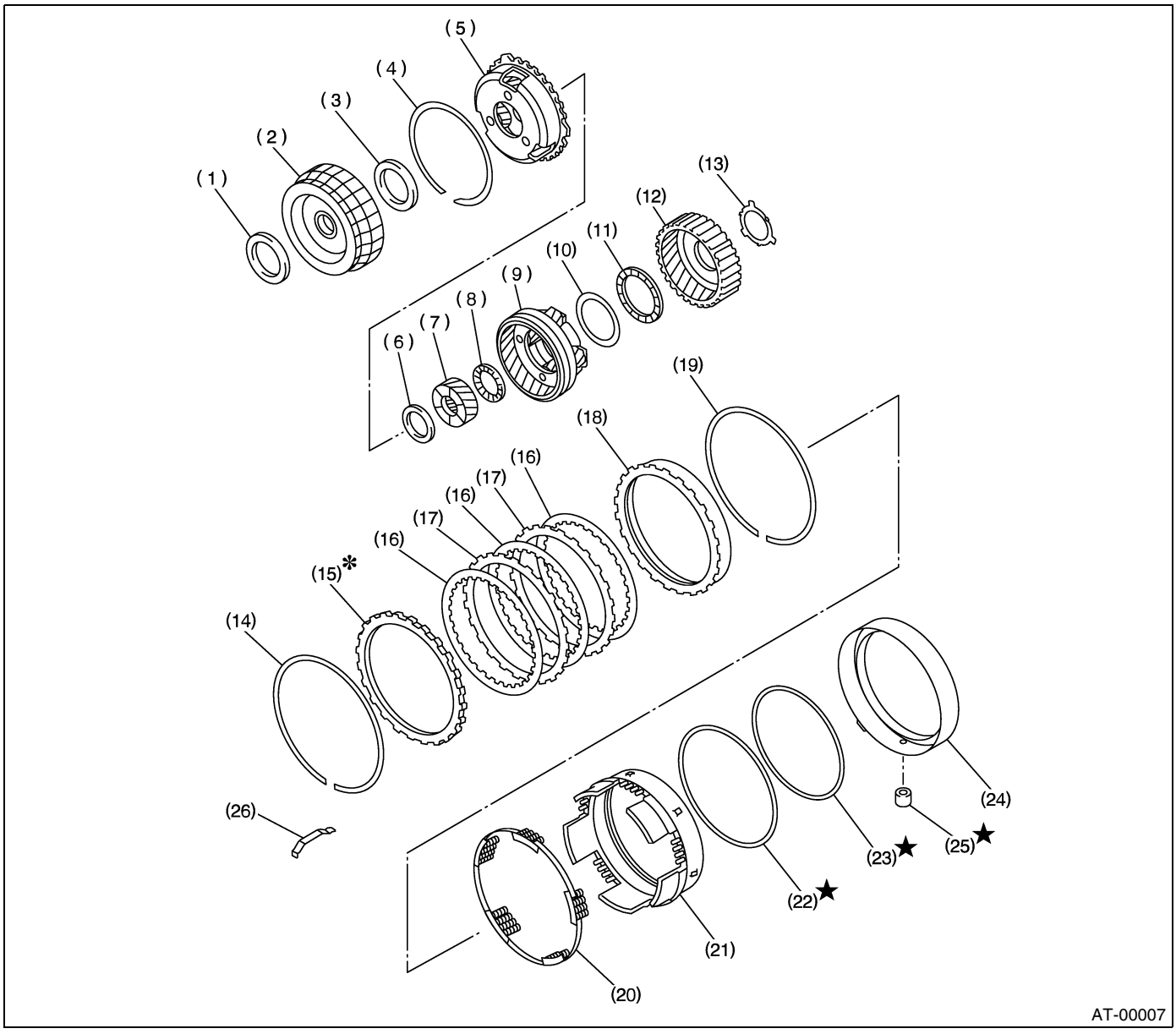
Tightening torque: N·m (kgf-m, ft-lb)
T1: 7 (0.7, 5.1)
T2: 8 (0.8, 5.8)

5. HIGH CLUTCH AND REVERSE CLUTCH



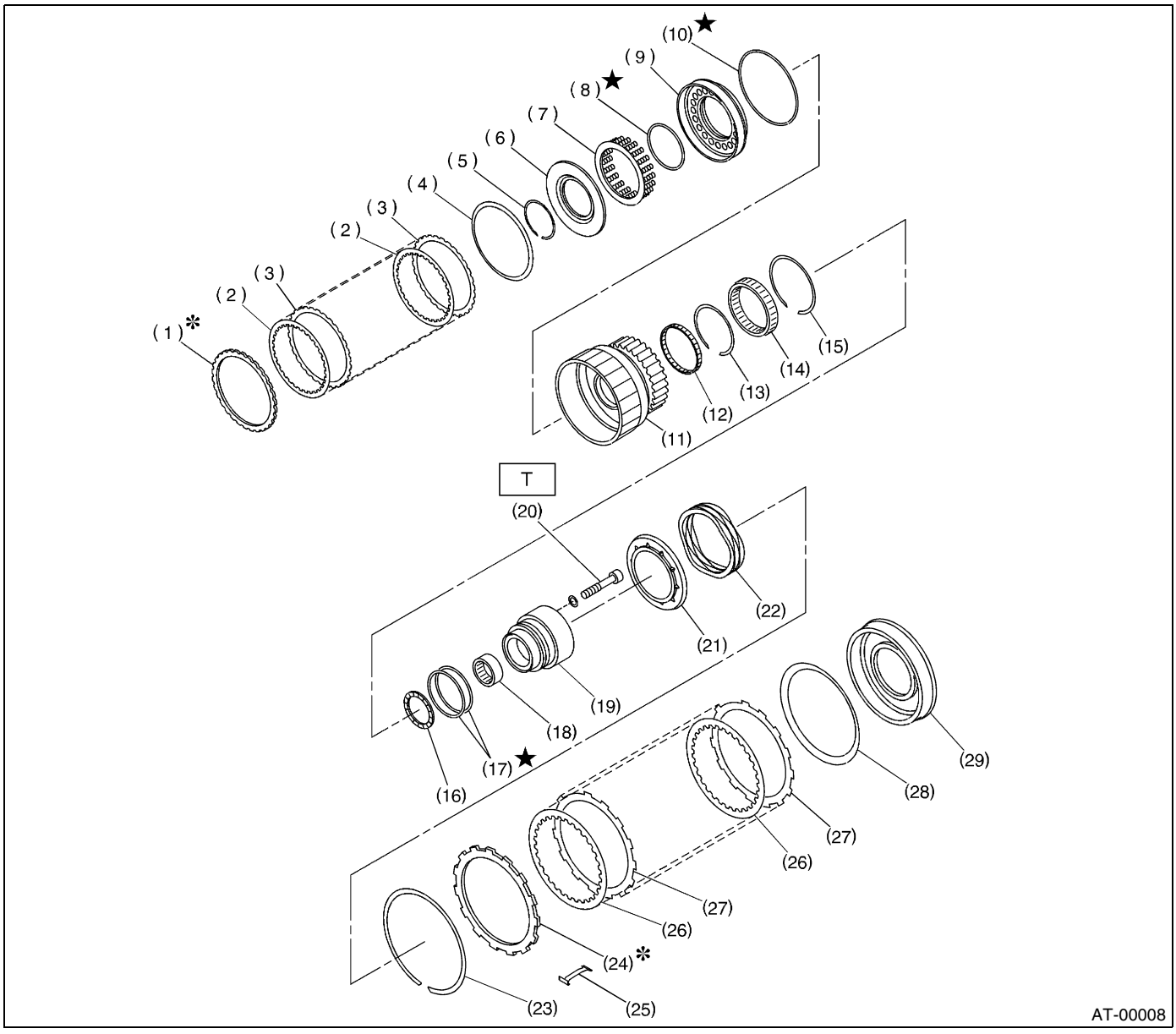
(1)	High clutch drum	(8)	Spring retainer	(15)	Dish plate
(2)	Lip seal	(9)	Cover	(16)	Driven plate
(3)	Lathe cut seal ring	(10)	Snap ring	(17)	Drive plate
(4)	Reverse clutch piston	(11)	Driven plate	(18)	Retaining plate
(5)	Lathe cut seal ring	(12)	Drive plate	(19)	Snap ring
(6)	Lathe cut seal ring	(13)	Retaining plate	(20)	Thrust needle bearing
(7)	High clutch piston	(14)	Snap ring	(21)	High clutch hub

6. PLANETARY GEAR AND 2-4 BRAKE



(1) Thrust needle bearing
(2) Front sun gear
(3) Thrust needle bearing
(4) Snap ring
(5) Front planetary carrier
(6) Thrust needle bearing
(7) Rear sun gear
(8) Thrust needle bearing
(9) Rear planetary carrier
(10) Washer
(11) Thrust needle bearing
(12) Rear internal gear
(13) Washer
(14) Snap ring
(15) Retaining plate
(16) Drive plate
(17) Driven plate
(18) Pressure rear plate
(19) Snap ring
(20) Spring retainer
(21) 2-4 brake piston
(22) Lathe cut seal ring
(23) Lathe cut seal ring
(24) 2-4 brake piston retainer
(25) 2-4 brake seal
(26) Leaf spring

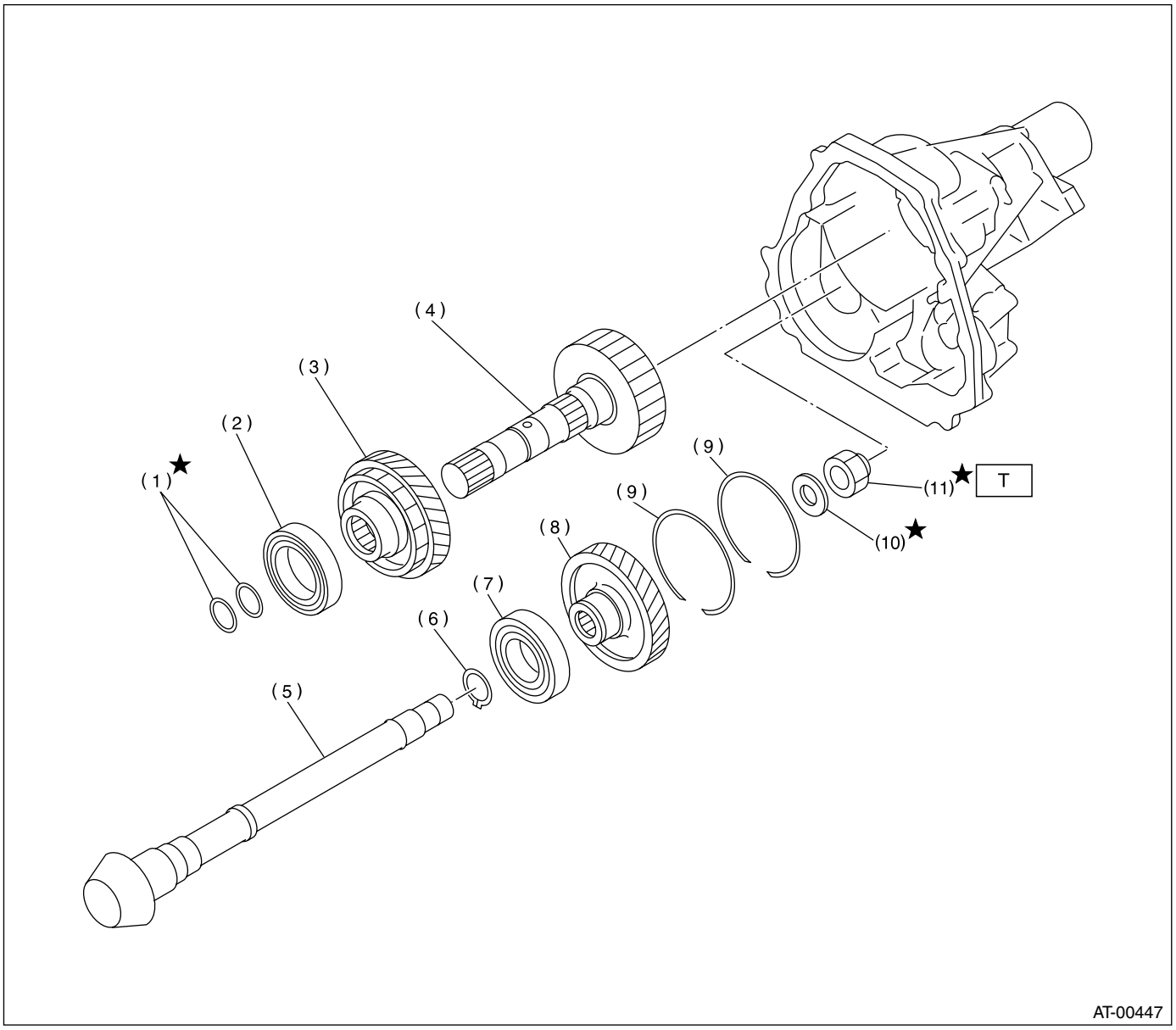
7. LOW CLUTCH AND LOW & REVERSE BRAKE



(1) Retaining plate
(2) Drive plate
(3) Driven plate
(4) Dish plate
(5) Snap ring
(6) Cover
(7) Spring retainer
(8) Lathe cut seal ring
(9) Low clutch piston
(10) Lathe cut seal ring
(11) Low clutch drum
(12) Needle bearing
(13) Inner snap ring
(14) One-way clutch
(15) Outer snap ring
(16) Thrust needle bearing
(17) Seal ring
(18) Needle bearing
(19) One-way clutch inner race
(20) Socket bolt
(21) Spring retainer
(22) Return spring
(23) Snap ring
(24) Retaining plate
(25) Leaf spring
(26) Drive plate
(27) Driven plate
(28) Dish plate
(29) Low and reverse brake piston

Tightening torque: N·m (kgf-m, ft-lb)
T: 25 (2.5, 18.1)

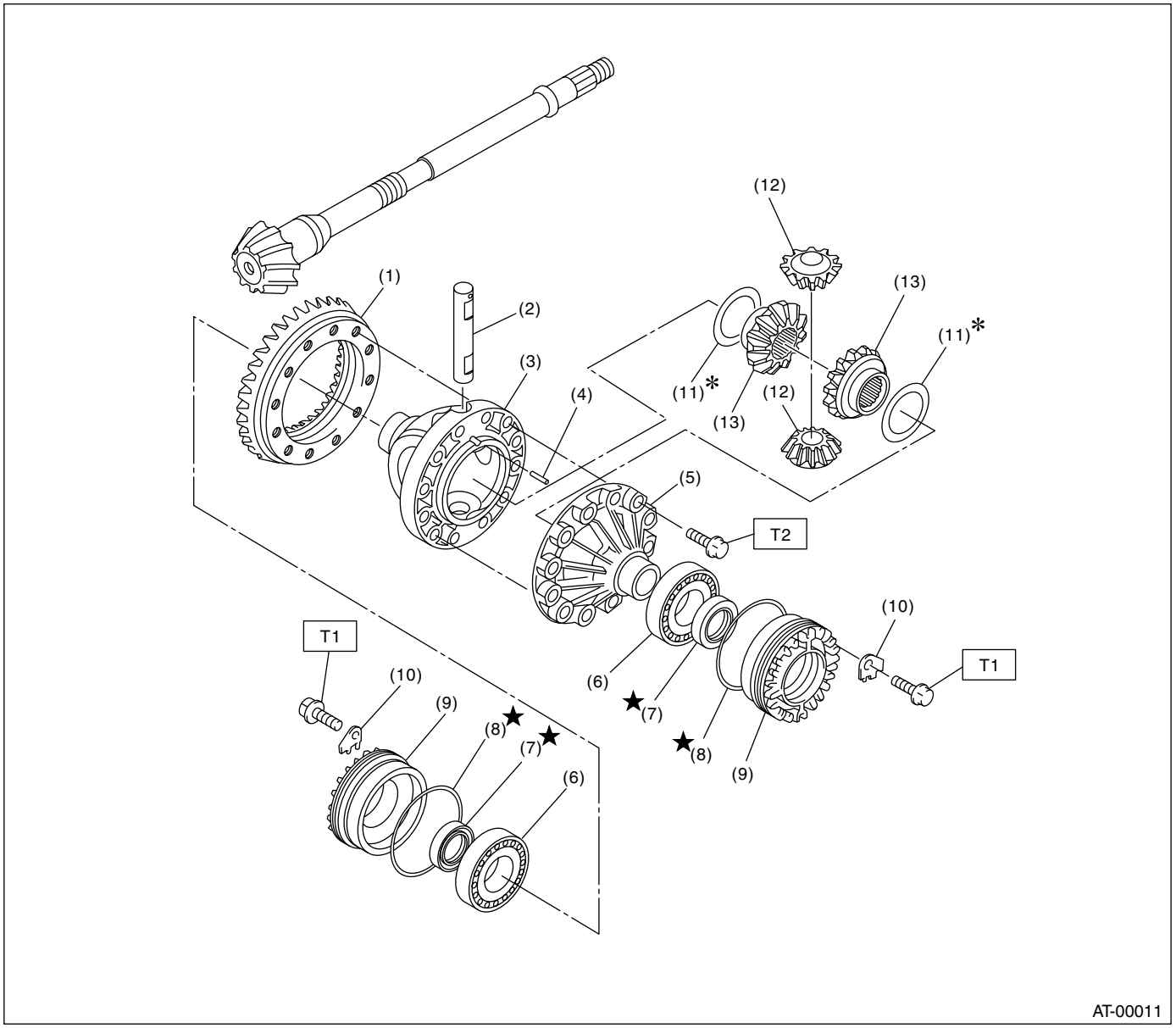
8. REDUCTION GEAR WITHOUT VTD



(1) Seal ring
(2) Ball bearing
(3) Reduction drive gear
(4) Reduction drive shaft
(5) Drive pinion shaft
(6) Snap ring
(7) Ball bearing
(8) Reduction driven gear
(9) Snap ring
(10) Washer
(11) Lock nut

Tightening torque: N·m (kgf-m, ft-lb)
T: 100 (10.2, 73.8)

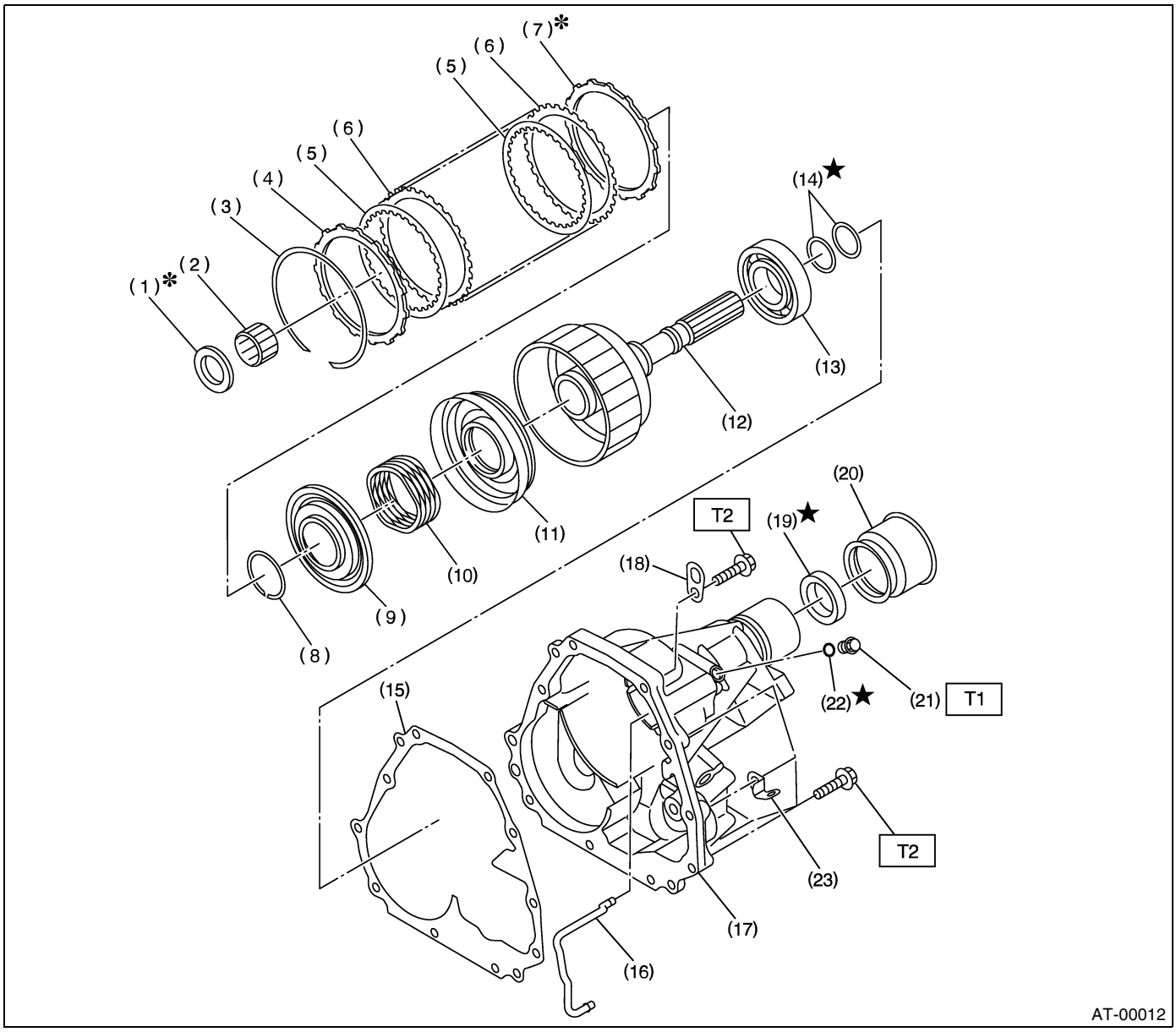
9. DIFFERENTIAL GEAR



(1) Crown gear
(2) Pinion shaft
(3) Differential case (RH)
(4) Straight pin
(5) Differential case (LH)
(6) Taper roller bearing
(7) Oil seal
(8) O-ring
(9) Differential side retainer
(10) Lock plate
(11) Washer
(12) Differential bevel pinion
(13) Differential bevel gear

Tightening torque: N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.1)
T2: 62 (6.3, 45.6)

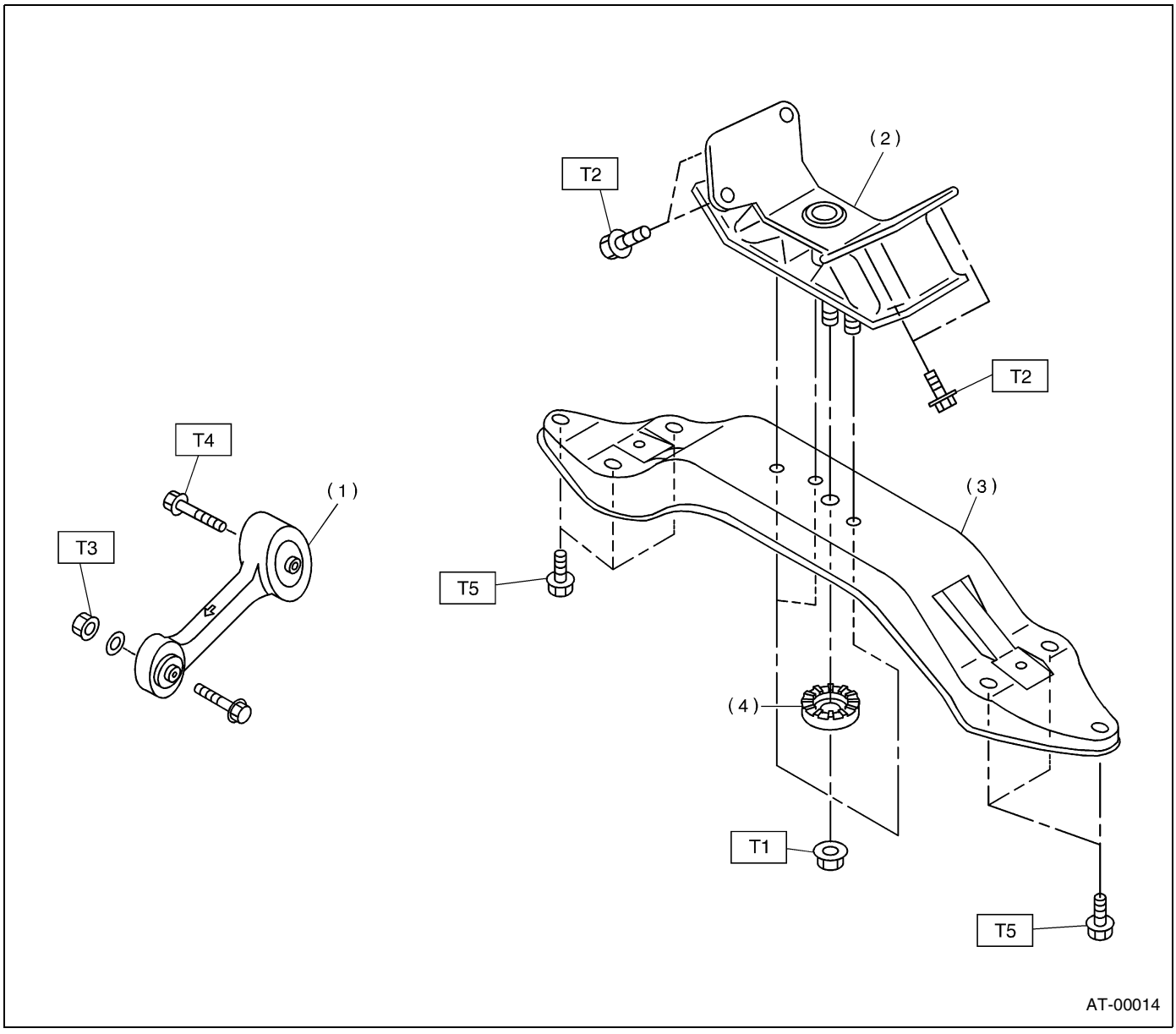
10.TRANSFER AND EXTENSION CASE



(1) Thrust needle bearing
(2) Needle bearing
(3) Snap ring
(4) Pressure plate
(5) Drive plate
(6) Driven plate
(7) Pressure plate
(8) Snap ring
(9) Transfer piston seal
(10) Return spring
(11) Transfer clutch piston
(12) Rear drive shaft
(13) Ball bearing
(14) Seal ring
(15) Gasket
(16) Transfer clutch pipe
(17) Extension case
(18) Transmission hanger
(19) Oil seal
(20) Dust cover
(21) Test plug
(22) O-ring
(23) Clip

Tightening torque: N·m (kgf-m, ft-lb)
T1: 13 (1.3, 9.4)
T2: 25 (2.5, 18.1)

11.TRANSMISSION MOUNTING



(1) Pitching stopper
(2) Rear cushion rubber
(3) Transmission rear crossmember
(4) Stopper

Tightening torque: N·m (kgf-m, ft-lb)
T1: 35 (3.6, 26)
T2: 39 (4.0, 29)
T3: 50 (5.1, 37)
T4: 58 (5.9, 43)
T5: 70 (7.1, 51)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation, and disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Until the oil pan is removed, do not place with the oil pan side facing up to prevent foreign matter from entering the valve body.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• When disassembling the case and other light alloy parts, use a plastic hammer to force it apart. Do not pry it apart with a screwdriver or other tool.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Use SUBARU genuine gear oil, grease etc. or the equivalent. Do not mix gear oil, grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Apply gear oil onto sliding or revolution surfaces before installation.
• Replace deformed or otherwise damaged snap rings with new ones.
• Before installing O-rings or oil seals, apply sufficient amount of ATF fluid to avoid damage and deformation.
• Be careful not to incorrectly install or fail to install O-rings, snap rings and other such parts.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Avoid damaging the mating surface of the case.
• Before applying sealant, completely remove the old seal.

D: PREPARATION TOOL

1. SPECIAL TOOLS

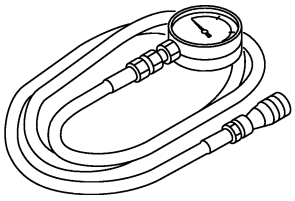
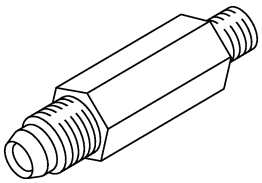
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498575400	498575400	OIL PRESSURE GAUGE ASSY	Used for measuring oil pressure.
 ST-498897200	498897200	ADAPTER	Used oil pump housing when measuring reverse clutch pressure and line pressure.

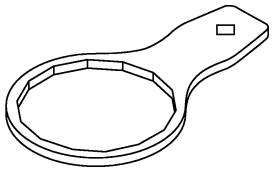
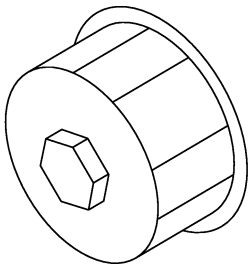
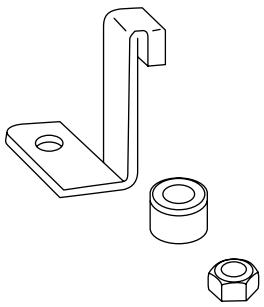
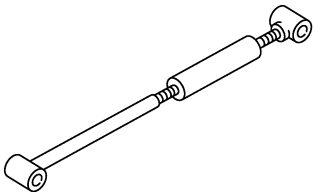
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498545400	498545400	FILTER WRENCH	Used for removing and installing ATF filter.
 ST18332AA000	18332AA000 <Newly adopted tool>	OIL FILTER WRENCH	• Used for removing and installing ATF filter. • Used as oil filter wrench for Turbo model.
 ST-498277200	498277200	STOPPER SET	Used for removing and installing automatic transmission assembly to engine.
 ST41099AA020	41099AA020	ENGINE SUPPORT	Used for supporting engine.

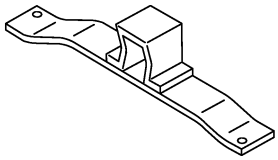
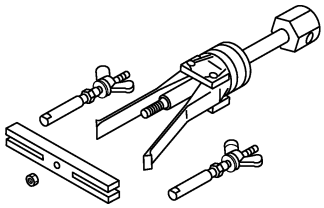
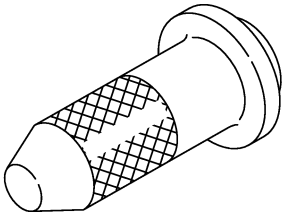
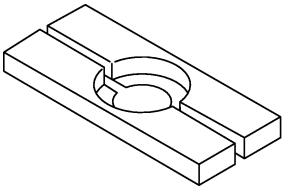
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST4199AA010	41099AA010	ENGINE SUPPORT BRACKET	Used for supporting engine.
 ST-398527700	398527700	PULLER ASSY	• Used for removing extension case roller bearing. • Used for removing extension oil seal. • Used for removing front differential side retainer bearing outer race. • Used for removing front differential side retainer bearing outer ball race.
 ST-498057300	498057300	INSTALLER	Used for installing extension oil seal.
 ST-498077000	498077000	REMOVER	Used for removing differential taper roller bearing.

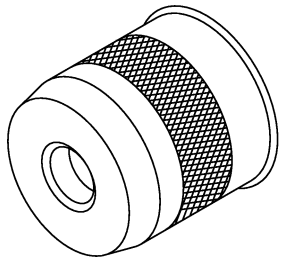
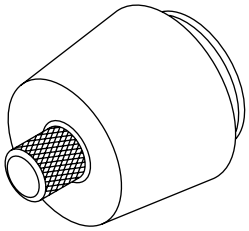
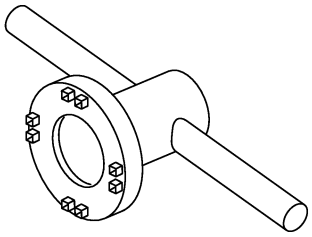
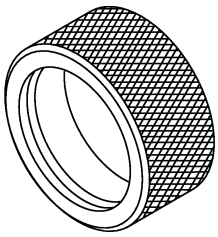
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499247400	499247400	INSTALLER	• Used for installing transfer outer snap ring. • Used with GUIDE (499257300).
 ST-499257300	499257300	SNAP RING OUTER GUIDE	• Used for installing transfer outer snap ring. • Used with INSTALLER (499247400).
 ST-499787000	499787000	WRENCH ASSY	Used for removing and installing differential side retainer.
 ST-398437700	398437700	DRIFT	Used for installing converter case oil seal.

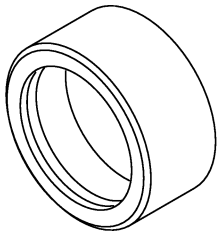
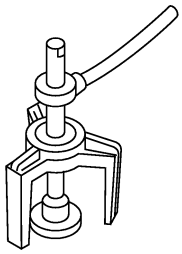
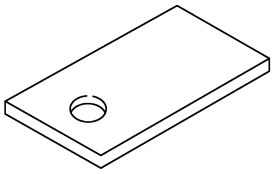
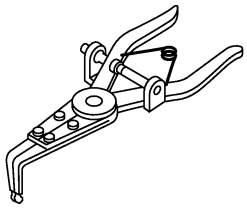
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398487700	398487700	INSTALLER	Used for installing taper roller bearing of front differential.
 ST-398673600	398673600	COMPRESSOR	Used for removing and installing clutch spring.
 ST-498255400	498255400	PLATE	Used for measuring backlash of hypoid gear.
 ST-399893600	399893600	PLIERS	Used for removing and installing clutch spring.

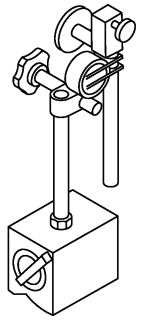
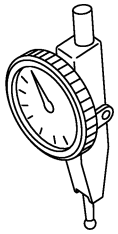
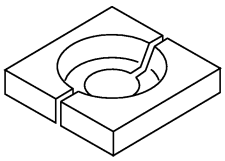
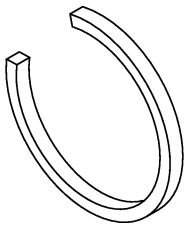
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498247001	498247001	MAGNET BASE	• Used for measuring gear backlash. • Used with DIAL GAUGE (498247100).
 ST-498247100	498247100	DIAL GAUGE	• Used for measuring gear backlash. • Used with MAGNET BASE (498247001).
 ST-498517000	498517000	REPLACER	Used for removing front roller bearing.
 ST-398623600	398623600	SEAT	Used for removing spring of transfer clutch piston.

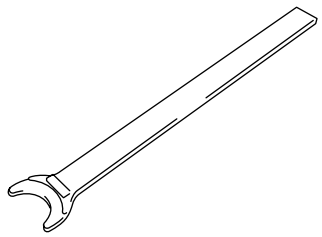
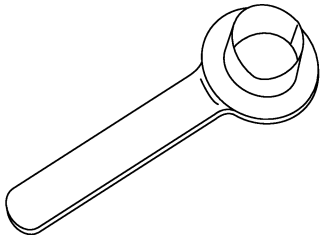
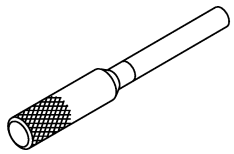
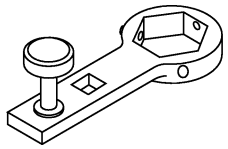
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28399SA000	28399SA000 <Newly adopted tool>	REMOVER	Used for removing axle shaft.
 ST28399SA010	28399SA010 <Newly adopted tool>	PROTECTOR	Used for installing axle shaft.
 ST-499267300	499267300	STOPPER PIN	Used for installing inhibitor switch.
 ST-499787700	499787700	WRENCH	Used for removing and installing drive pinion lock nut.

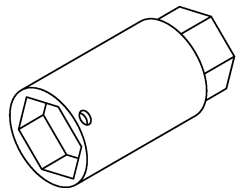
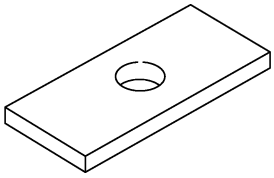
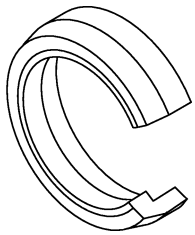
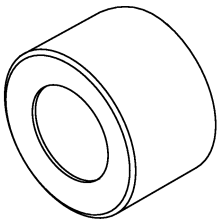
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499787500	499787500	ADAPTER	Used for removing and installing drive pinion lock nut.
 ST-398643600	398643600	GAUGE	Used for measuring total end play, extension end play and drive pinion height.
 ST-498627100	498627100	SEAT	Used for holding low clutch piston retainer spring when installing snap ring.
 ST-499577000	499577000	GAUGE	• Used for measuring the transmission case mating surface to the reduction gear end surface. • For without VTD.

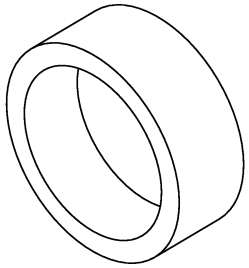
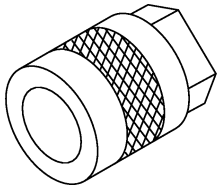
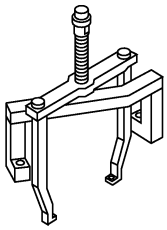
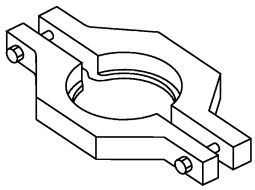
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398744300	398744300	GAUGE	• Used for measuring the transmission case mating surface to the multi-plate clutch end surface. • For with VTD.
 ST-499737000	499737000	PULLER	Used for removing reduction driven gear assembly.
 ST-499737100	499737100	PULLER SET	Used for removing reduction drive gear assembly.
 ST-498077600	498077600	REMOVER	Used for removing ball bearing.

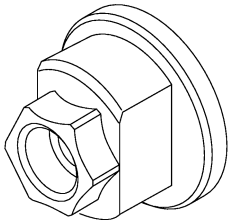
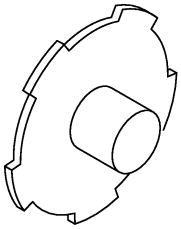
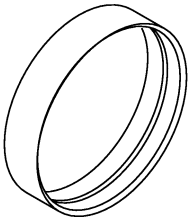
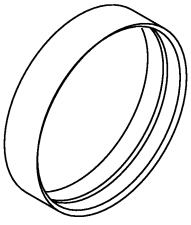
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498937110	498937110	HOLDER	Used for removing and installing drive pinion lock nut.
 ST-498677100	498677100	COMPRESSOR	Used for installing 2-4 brake snap ring.
 ST-498437000	498437000	HIGH CLUTCH PISTON GUIDE	Used for installing high clutch piston.
 ST-498437100	498437100	LOW CLUTCH PISTON GUIDE	Used for installing low clutch piston.

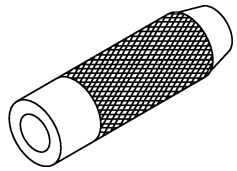
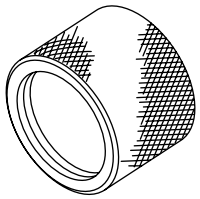
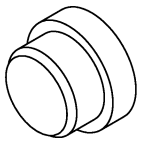
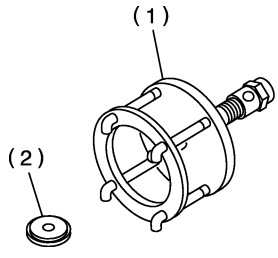
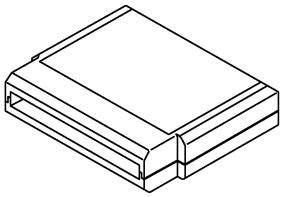
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899580100	899580100	INSTALLER	Used for press-fitting the ball bearing for transfer clutch.
 ST-18675AA000	18675AA000 <Newly adopted tool>	DIFERENTIAL OIL SEAL INSTALLER	Used for installing differential side retainer oil seal.
 ST-398497701	398497701	ADAPTER	Used for installing needle bearing.
 ST-899524100	899524100	PULLER SET	• Using the bolt only. (1) Bolt • Used with PULLER SET (499737100). • Used with PULLER (499737000). (1) Puller (2) Cap

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA210	24082AA210 <Newly adopted tool>	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA010	22771AA010	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.

2. GENERAL PURPOSE TOOLS

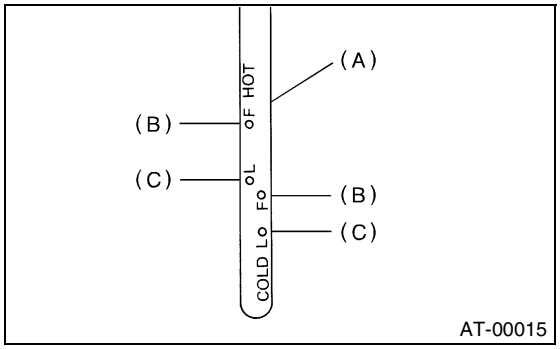
TOOL NAME	REMARKS
Depth gauge	Used for measuring transmission end play.
Thickness gauge	Used for measuring clearances of clutch, brake and oil pump.
Micro meter	Used for measuring thickness of drive pinion.
Spring balance	Used for measuring starting torque of drive pinion.
Circuit tester	Used for measuring resistance and voltage.

2. Automatic Transmission Fluid

A: INSPECTION

CAUTION:
The level of ATF varies with fluid temperature. Pay attention to the fluid temperature when checking ATF level.

1) Raise the ATF temperature by driving a distance of 5 to 10 km (3 to 6 miles). Otherwise, idle the engine to raise ATF temperature to 60 — 80 °C (140 — 176 °F) on Subaru Select Monitor. <Ref. to AT-18, READ CURRENT DATA, OPERATION, Subaru Select Monitor.>
2) Make sure the vehicle is level.
3) After selecting all positions (P, R, N, D, 3, 2, 1), set the select lever in "P" range. Measure the ATF level with the engine idling for one or two minutes.



(A) ATF level gauge
(B) Upper level
(C) Lower level

4) Make sure that ATF level is above the center of upper and lower marks.

NOTE:
When the transmission is hot, the level should be above the center of upper and lower marks, and when it is cold, the level should be found below the center of these two marks.

5) If the ATF level is below the center between upper and lower marks, add the recommended ATF until the ATF level is found above the center between upper and lower marks.

CAUTION:
- **Use care not to exceed the upper limit level.**
- **Remember that the addition of ATF to the upper limit mark when the transmission is cold will result in overfilling of ATF, causing a transmission failure.**

6) Check ATF level after raising ATF temperature to 60 — 80 °C (140 —176 °F) by running the vehicle or by idling the engine again.
7) Check the ATF for leaks.

Check for leaks in the transmission. If there are leaks, it is necessary to repair or replace gasket, oil seals, plugs or other parts.

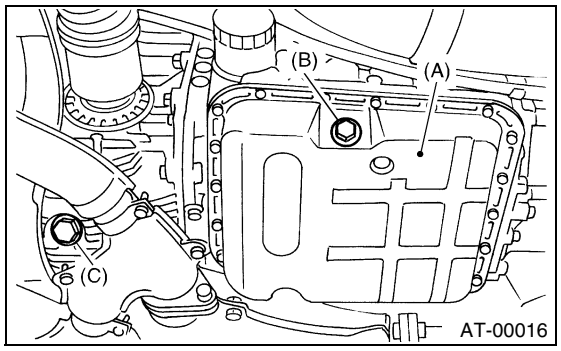
B: REPLACEMENT

1) Lift-up the vehicle.
2) Drain the ATF completely.

CAUTION:
Directly after the engine has been running, the ATF is hot. Be careful not to burn yourself.

3) Replace with a new gasket, and then tighten the ATF drain plug.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Oil pan
(B) Drain plug (ATF)
(C) Differential oil drain plug

4) Lower the vehicle.
5) Pour ATF into the oil charge pipe.

Recommended fluid:
Dexron III type automatic transmission fluid

Capacity:
Fill the same amount of fluid drained from drain plug hole.

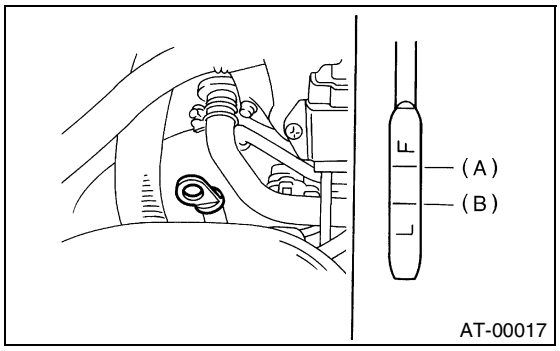
Capacity when transmission is overhauled:
2.0 L Non-turbo model
8.4 — 8.7 ℓ (8.9 — 9.2 US qt, 7.4 — 7.7 Imp qt)
2.0 L Except Non-turbo model
9.3 — 9.6 ℓ (9.8 — 10.1 US qt, 8.2 — 8.4 Imp qt)

6) Check the level and leaks of ATF.
<Ref. to AT-29, REPLACEMENT, Automatic Transmission Fluid.>

3. Differential Gear Oil

A: INSPECTION

1) Park the vehicle on a level surface.
2) Remove the oil level gauge and wipe it clean.
3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.
4) Remove it again and note the reading. If the differential gear oil level is below the “L” line, add oil to bring the level up to the “F” line.
5) To prevent overfilling the differential gear oil, do not add oil above the “F” line.



(A) Upper level
(B) Lower level

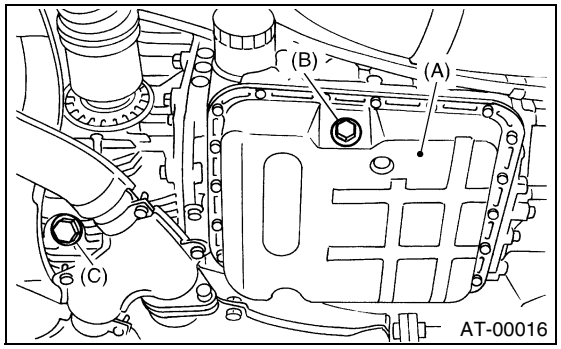
B: REPLACEMENT

1) Lift-up the vehicle.
2) Drain the differential gear oil completely.

CAUTION:
• Directly after the engine has been running, the differential gear oil is hot. Be careful not to burn yourself.
• Be careful not to spill the differential gear oil on exhaust pipe to prevent it from emitting smoke or fire. When the differential gear oil is spilled on exhaust pipe, wipe it away completely.

3) Replace the gasket with a new one, and then tighten the differential gear oil drain plug.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)



(A) Oil pan
(B) Drain plug
(C) Differential oil drain plug

4) Lower the vehicle.
5) Pour gear oil into the gauge hole.

Recommended fluid:
Use GL-5 (SAE: 80W — 90) or equivalent.

Gear oil capacity:
1.1 — 1.3 ℓ (1.2 — 1.4 US qt, 1.0 — 1.1 Imp qt)

6) Check the level of differential gear oil.
<Ref. to AT-30, INSPECTION, Differential Gear Oil.>

4. Road Test

A: INSPECTION

1. GENERAL PRECAUTION

Road tests should be conducted to properly diagnose the condition of the automatic transmission.

NOTE:
When performing the test, do not exceed posted speed limit.

2. D RANGE SHIFT FUNCTION

Check shifting between 1st ⇔ 2nd ⇔ 3rd ⇔ 4th while driving on normal city streets.

3. D RANGE SHIFT SHOCK

Check the shock level when shifting up during normal driving.

4. KICK-DOWN FUNCTION

Check the kick-down for each gear. Also check the kick-down shock level.

5. ENGINE BRAKE OPERATION

- Check the 3rd gear engine brake when shifting between D ⇔ 3rd range while driving in 4th gear of D range [50 to 60 km/h (31 to 37 MPH)].
- Check the 2nd gear engine brake when shifting between 3 ⇔ 2 range while driving in the 3 range 3rd gear [40 to 50 km/h (25 to 31 MPH)].
- Check the 1st gear engine brake when shifting between 2 ⇔1 range while driving in the 2 range 2nd gear [20 to 30 km/h (12 to 19 MPH)].

6. LOCK-UP FUNCTION

Check that rpm does not change sharply when the acclelerator pedal is lightly depressed when driving on flat roads at normal speed in the lock-up range.

7. P RANGE OPERATION

Stop the vehicle on an uphill grade of 5% or more and shift to “P” range. Check that the vehicle does not move when the parking brake is released.

8. UNUSUAL SOUNDS AND VIBRATION

Check for unusual sounds and vibration while driving and during shifting.

9. CLIMBING CONTROL FUNCTION

- Check that the gear remains in 3rd when going up a grade.
- Check that the gear remains in 3rd when applying the brakes while going down a grade.

10.TRANSFER CLUTCH

Check if the tight corner braking occurs when the vehicle is started with steering wheel held at fully turned position.

11.OIL LEAKS

After the driving test, inspect for oil leaks.

5. Stall Test

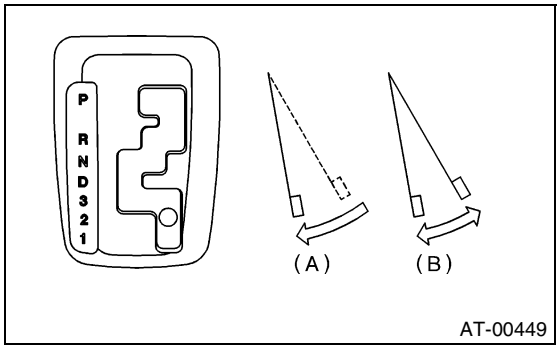
A: INSPECTION

1. GENERAL INFORMATION

The stall test is of extreme importance in diagnosing the condition of the automatic transmission and the engine. It should be conducted to measure the engine stall speeds in “R” and “2” ranges.
Purposes of the stall test:
1) To check the operation of the automatic transmission clutch.
2) To check the operation of the torque converter clutch.
3) To check the engine performance.

2. TEST METHODS

1) Preparations before the test:
   (1) Check that the throttle valve opens fully.
   (2) Check that the engine oil level is correct.
   (3) Check that the coolant level is correct.
   (4) Check that the ATF level is correct.
   (5) Check that the differential gear oil level is correct.
   (6) Increase ATF temperature to 50 to 80°C (122 to 176°F) by idling the engine for approx. 30 minutes (with select lever set to “N” or “P”).
2) Place the wheel chocks at the front and rear of all wheels and engage the parking brake.
3) Move the manual linkage to ensure it operates properly, and shift the select lever to the “2” range. And turn the hold switch on.
4) While forcibly depressing the foot brake pedal, gradually depress the accelerator pedal until the engine operates at full throttle.



(A) Brake pedal
(B) Accelerator pedal

5) When the engine speed is stabilized, record that speed quickly and release the accelerator pedal.
6) Shift the select lever to “N” range, and cool down the engine by idling it for more than one minute.
7) If the stall speed in “2” range is higher than specifications, low clutch slipping and 2-4 brake slipping may occur. To identify it, conduct the same test as above in “R” range.
8) Perform the stall tests with the select lever in “D” range.

NOTE:
• Do not continue the stall test for MORE THAN 5 SECONDS at a time (from closed throttle, fully open throttle to stall speed reading). Failure to follow this instruction causes the engine oil and ATF to deteriorate and the clutch and brake to be adversely affected.
Be sure to cool down the engine for at least 1 minute after each stall test with the select lever set in the “P” or “N” range and with the idle speed lower than 1,200 rpm.
• If the stall speed is higher than the specified range, attempt to finish the stall test in as short a time as possible, in order to prevent the automatic transmission from sustaining damage.

Stall speed (at sea level):
2.0 L Non-turbo model
2,000 — 2,500 rpm
2.0 L Turbo model
2,600 — 3,300 rpm
2.5 L model
2,100 — 2,600 rpm

3. EVALUATION

Stall speed (at sea level)	Position	Cause
Less than specifications	2 (Hold switch ON) R	• Throttle valve not fully open • Erroneous engine operation • Torque converter clutch's one-way clutch slipping
Greater than specifications	D	• Line pressure too low • Low clutch slipping • One-way clutch malfunction
	R	• Line pressure too low • Reverse clutch slipping • Low & reverse brake slipping
	2 (Hold switch ON)	• Line pressure too low • Low clutch slipping • 2-4 brake slipping • One-way clutch malfunction

6. Time Lag Test

A: INSPECTION

1. GENERAL INFORMATION

If the select 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 low clutch, reverse clutch, low & reverse brake and one-way clutch.

NOTE:
• Perform the test at normal operating fluid temperature 60 to 80°C (140 to 176°F).
• Be sure to allow a 1 minute interval between tests.
• Make three measurements and take the average value.

2. TEST METHODS

1) Fully apply the parking brake.
2) Start the engine.
Check the idling speed (A/C OFF).
3) Shift the select 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
4) In the same manner, measure the time lag for “N” → “R”.
Time lag: Less than 1.5 seconds

3. EVALUATION

1) If “N” → “D” time lag is longer than specified:
• Line pressure too low
• Low clutch worn
• One-way clutch not operating properly
2) If “N” → “R” time lag is longer than specified:
• Line pressure too low
• Reverse clutch worn
• Low & reverse brake worn

7. Line Pressure Test

A: MEASUREMENT

1. GENERAL INFORMATION

If the clutch or the brake shows a sign of slippage or shifting sensation is not correct, the line pressure should be checked.

• Excessive shocks during upshifting or shifting takes place at a higher point than under normal circumstances, may be due to the line pressure being too high.

• Slippage or inability to operate the vehicle may, in most cases, be due to loss of oil pressure for the operation of the clutch, brake or control valve.

1) Line pressure measurement (under no load)

NOTE:

• Before measuring the line pressure, jack-up all wheels.

• Maintain the temperature of ATF at approx. 50°C (122°F) during measurement.

(ATF will reach the above temperature after idling the engine for approx. 30 minutes with select lever in “N” or “P”.)

2) Line pressure measurement (under heavy load)

NOTE:

• Before measuring the line pressure, apply both foot and parking brakes with all wheels chocked (Same as for “stall” test conditions).

• Measure the line pressure when select lever is in “R”, “2” with engine under stall conditions.

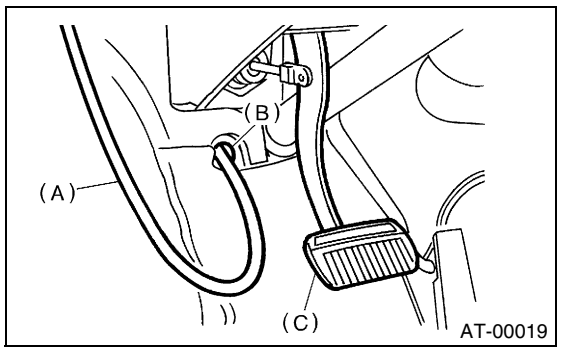
• Measure the line pressure within 5 seconds after shifting the select lever to each position. (If line pressure needs to be measured again, allow the engine to idle. Wait for at least 1 minute before measurement.)

• Maintain the temperature of ATF at approx. 50°C (122°F) during measurement (ATF will reach the above temperature after idling the engine for approx. 30 minutes with the select lever in “N” or “P”.)

2. TEST METHODS

1) Temporarily attach the ST to a suitable place in the driver's compartment, remove the blind plug located in front of the toe board and pass the hose of the ST to engine compartment.

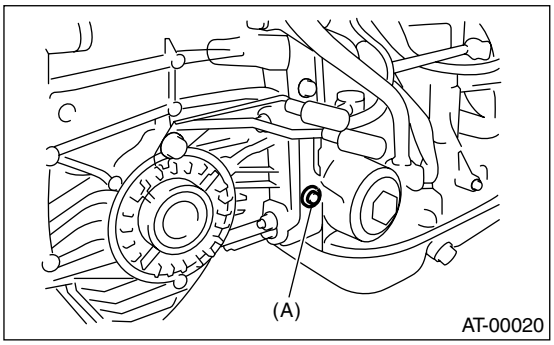
ST 498575400 OIL PRESSURE GAUGE ASSY



(A) Pressure gauge hose
(B) Hole in toe board (blank cap hole)
(C) Brake pedal

2) Remove the test plug and install the ST instead.

ST 498897200 OIL PRESSURE GAUGE ADAPTER



(A) Test plug

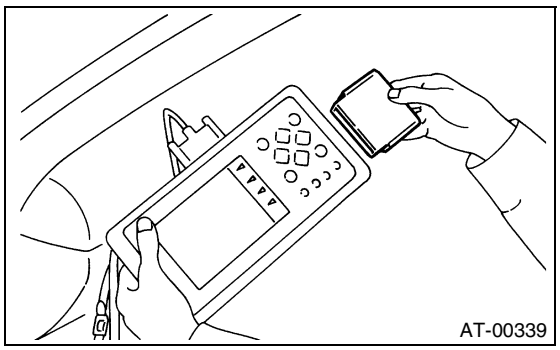
3) Connect the ST1 with ST2.

ST1 498897200 OIL PRESSURE GAUGE ADAPTER

ST2 498575400 OIL PRESSURE GAUGE ASSY

4) Check for duty ratio changes by opening and closing the throttle valve using Subaru Select Monitor.

(1) Insert the cartridge to Subaru Select Monitor. <Ref. to AT-17, PREPARATION TOOL, General Description.>



(2) Connect the Subaru Select Monitor to data link connector.

5) Check the line pressure in accordance with the following chart.

3. EVALUATION

Standard line pressure			
Range position	Line pressure duty ratio (%)	Throttle position	Line pressure kPa (kg/cm^2, psi)
2	5	Full open	1,128 — 1,304 (11.5 — 13.3, 164 — 189)
R	5	Full open	1,520 — 1,716 (15.5 — 17.5, 220 — 249)
D	95	Full closed	304 — 412 (3.1 — 4.2, 44 — 60)

8. Transfer Clutch Pressure Test

A: INSPECTION

1. TEST METHODS

Check the transfer clutch pressure in accordance with the following chart in the same manner as with line pressure. <Ref. to AT-35, Line Pressure Test.>

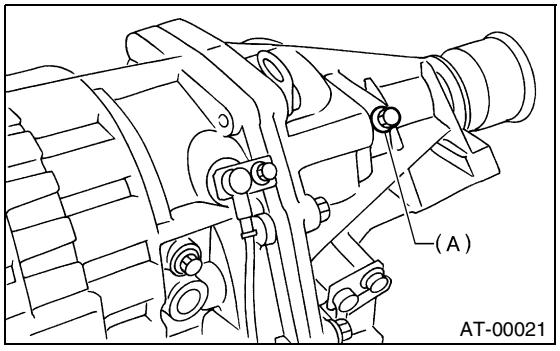
ST 498897700 OIL PRESSURE ADAPTER SET

ST 498575400 OIL PRESSURE GAUGE ASSY

AWD mode: “D” range

FWD mode: “P” range, engine speed 2,000 rpm

NOTE:
Before setting in FWD mode, install the spare fuse on FWD mode switch.



(A) Test plug

2. EVALUATION

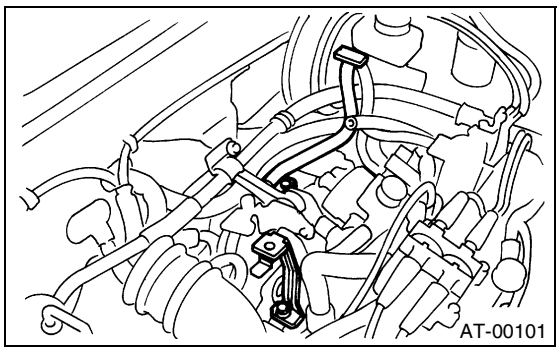
NOTE:
If oil pressure is not produced or if it does not change in the AWD mode, the transfer duty solenoid or transfer valve assembly may be malfunctioning. If oil pressure is produced in the FWD mode, the problem is similar to that in the AWD mode.

Standard transfer clutch pressure kPa (kg/cm^2, psi)			
ON Duty ratio (%)	Throttle position	AWD mode	FWD mode
5	Full open	932 — 1,089 (9.5 — 11.1, 135 — 158)	—
60	2/3 throttle	216 — 294 (2.2 — 3.0, 31 — 43)	—
95	Full closed	—	0 (0, 0)

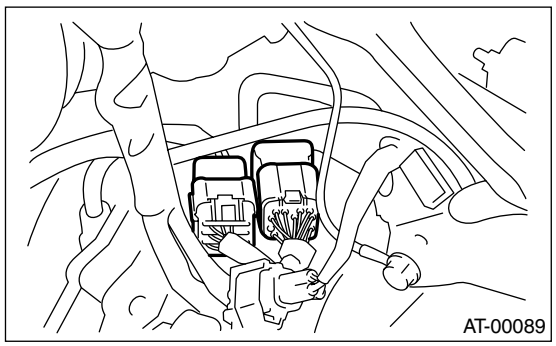
9. Automatic Transmission Assembly

A: REMOVAL

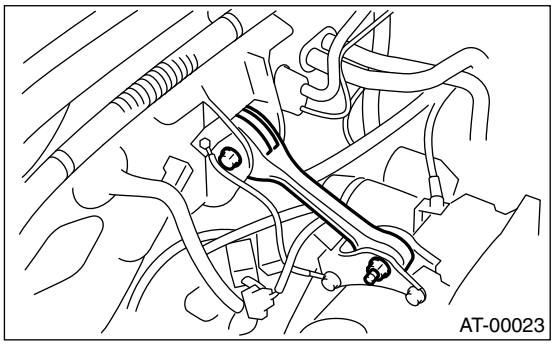
1) Set the vehicle on a lift.
2) Open the front hood fully, and support with stay.
3) Disconnect the ground cable from battery.
4) Remove the air intake duct. (Non-turbo model) <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
5) Remove the air cleaner case. (Non-turbo model) <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
6) Remove the air cleaner case stay.



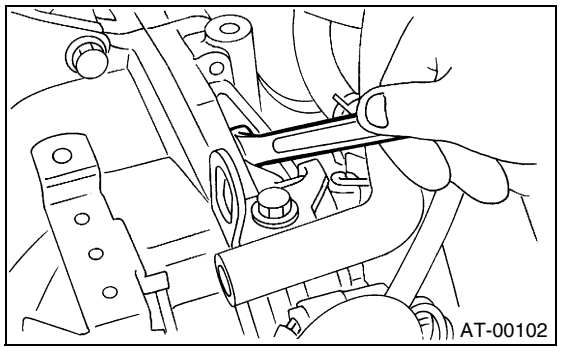
7) Remove the intercooler. (Turbo model)
8) Disconnect the following connectors.
   (1) Transmission harness connector



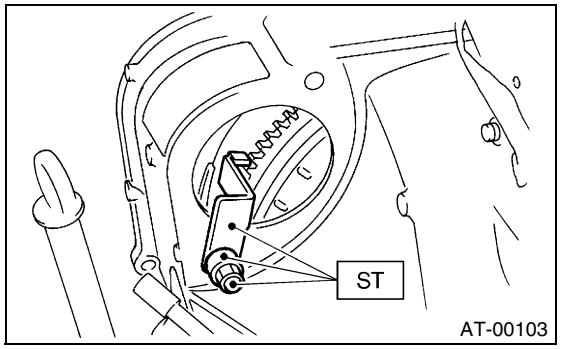
   (2) Transmission ground cable
9) Remove the starter.
<Ref. to SC(SOHC)-6, REMOVAL, Starter.>
10) Remove the pitching stopper.



11) Separate the torque converter clutch from drive plate.
   (1) Remove the service hole plug.
   (2) Remove the V-belt cover.
   (3) Remove the bolts which hold torque converter clutch to drive plate.
   (4) By inserting a wrench into crank pulley bolt, rotate the crank pulley to remove other bolts.



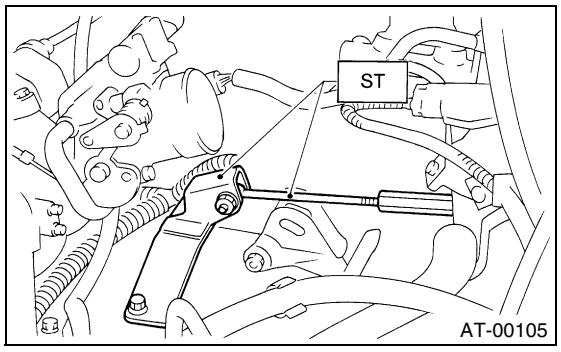
12) Install the ST to torque converter clutch case.
ST 498277200 STOPPER SET



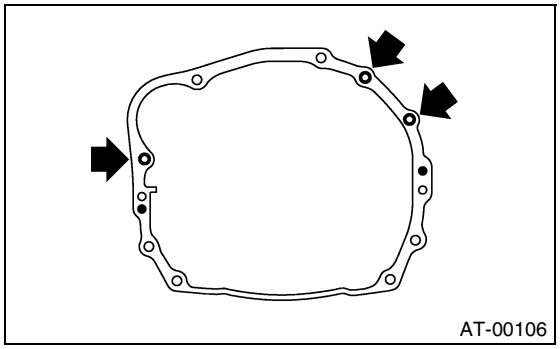
13) Set the ST.

NOTE:
Also the ENGINE SUPPORT BRACKET 41099AA010 can be used.

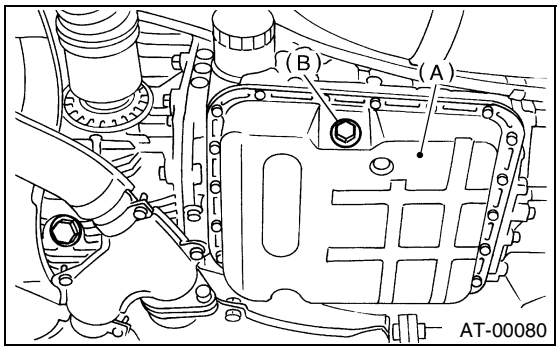
ST 41099AA020 ENGINE SUPPORT ASSY



14) Remove the bolt which holds right upper side of transmission to engine.



15) Lift-up the vehicle.
16) Remove the under cover.
17) Remove the front, center, rear exhaust pipe and muffler. (Non-turbo model) <Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(SOHC)-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-13, REMOVAL, Muffler.>
18) Remove the center, rear exhaust pipe and muffler. (Turbo model)
19) Remove the heat shield cover.
20) Remove the ATF drain plug to drain ATF.

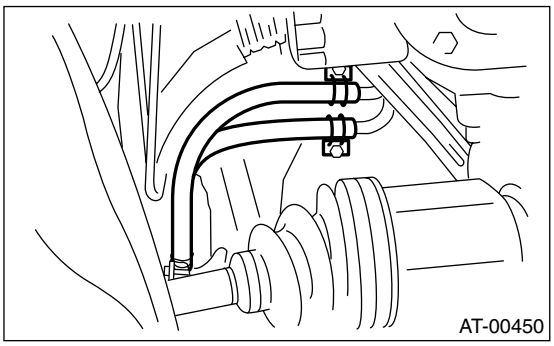


(A) Oil pan
(B) Drain plug

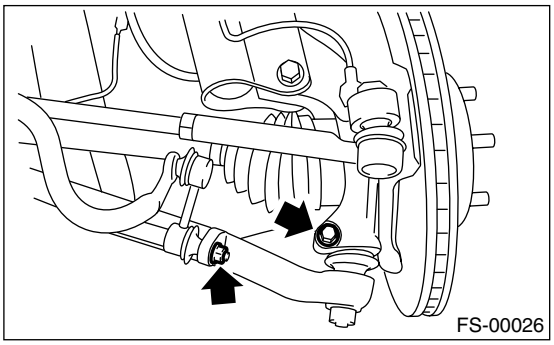
21) Drain the differential gear oil. <Ref. to AT-30, REPLACEMENT, Differential Gear Oil.>

22) Disconnect the ATF cooler hoses from pipes of transmission side, and remove the ATF level gauge guide.

NOTE:
Plug the opening to prevent entry of foreign particles into transmission fluid.

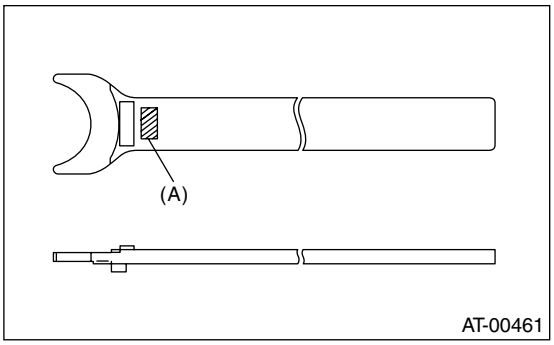


23) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
24) Remove the shift select cable. <Ref. to CS-9, REMOVAL, Select Cable.>
25) Disconnect the stabilizer link from transverse link.
26) Remove the bolt securing ball joint of transverse link to housing, and separate the transverse link from housing.



27) Pull the front drive shaft out of transmission.
(1) Face the “AT” letter stamped to transmission side.

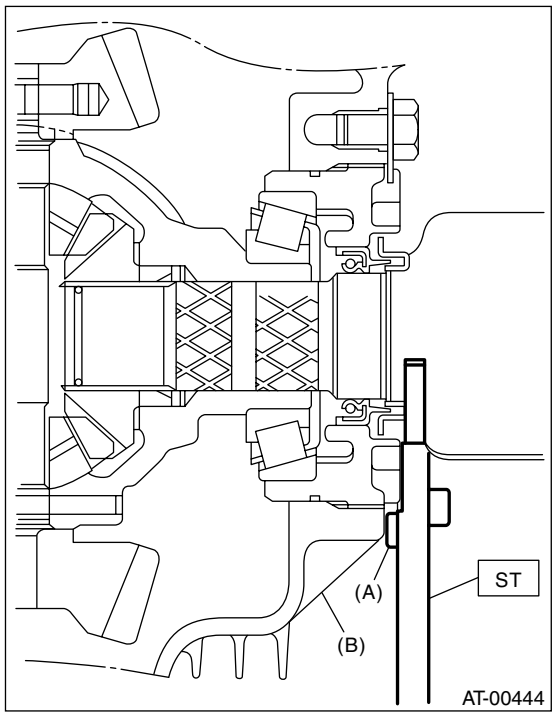
ST 28399SA000 DRIVE SHAFT REMOVER



(A) Letter “AT”

(2) Insert the ST between transmission and front drive shaft.

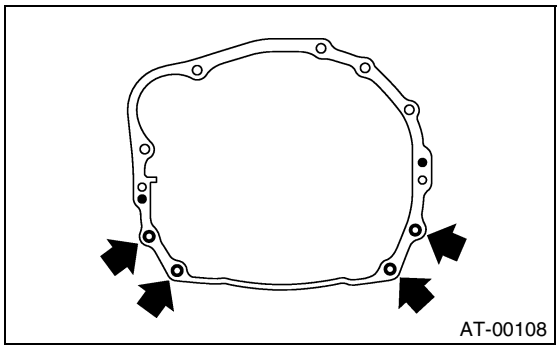
NOTE:
Put the projection of ST on torque converter clutch housing.
ST 28399SA000 DRIVE SHAFT REMOVER



(A) ST projection
(B) Torque converter clutch housing

(3) While holding the joint portion (AAR) of front drive shaft with your hand, push the housing outside to prevent AAR side of boot from stretching, and then remove the front drive shaft from transmission.

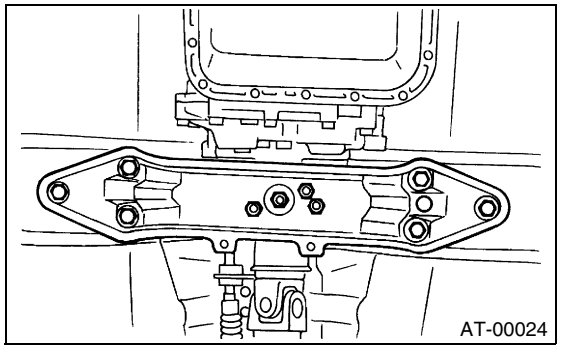
28) Remove the nuts which hold lower side of transmission to engine.



29) Place the transmission jack under transmission.

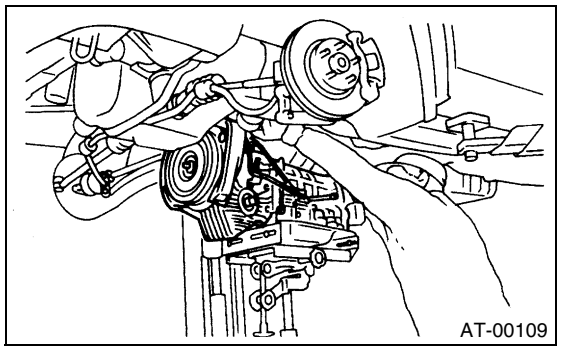
NOTE:
Make sure that the support plates of transmission jack do not touch the oil pan.

30) Remove the transmission rear crossmember from vehicle.



31) Remove the transmission.

CAUTION:
Move the transmission and torque converter as a unit away from engine.



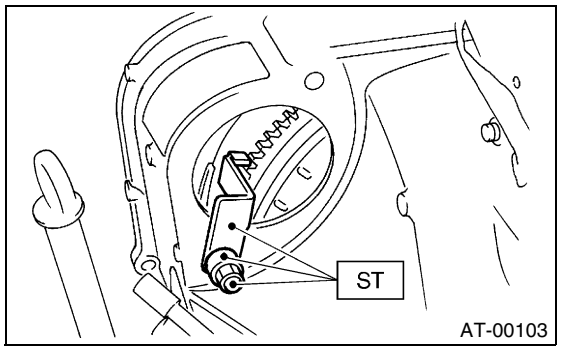
32) Separate the transmission assembly and rear cushion rubber.

B: INSTALLATION

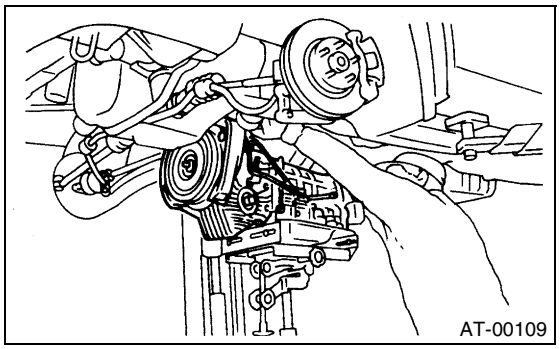
1) Replace the differential side oil seal with a new one.<Ref. to AT-47, Differential Side Retainer Oil Seal.>
2) Install the rear cushion rubber to transmission assembly.

Tightening torque:
39 N·m (4.0 kgf-m, 29 ft-lb)

3) Install the ST to torque converter clutch case.
ST 498277200 STOPPER SET

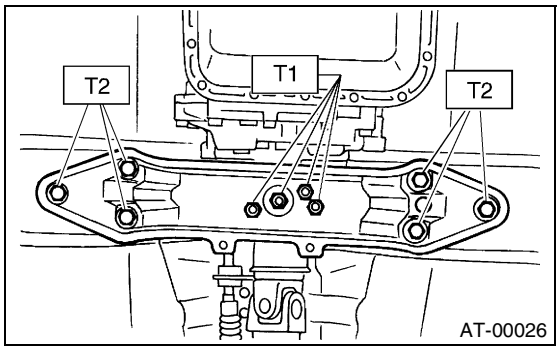


4) Install the transmission onto engine.
(1) Gradually raise the transmission with transmission jack.



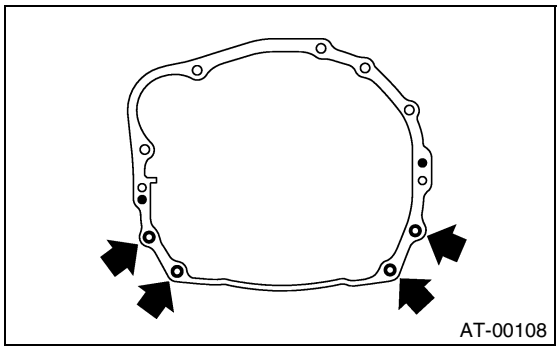
(2) Engage them at splines.
5) Install the transmission rear crossmember.

Tightening torque:
T1: 35 N·m (3.6 kgf-m, 26 ft-lb)
T2: 70 N·m (7.1 kgf-m, 51 ft-lb)



6) Take off the transmission jack.
7) Tighten the nuts and bolts which hold lower side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

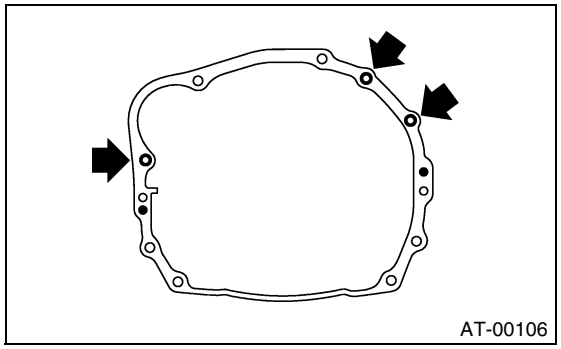


8) Lower the vehicle.
9) Connect the engine and transmission.
(1) Remove the ST from torque converter clutch case.

ST 498277200 STOPPER SET

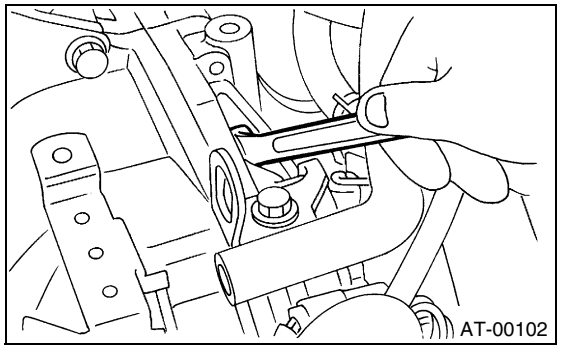
(2) Install the starter. <Ref. to SC(SOHC)-6, INSTALLATION, Starter.>
(3) Tighten the bolt which holds upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

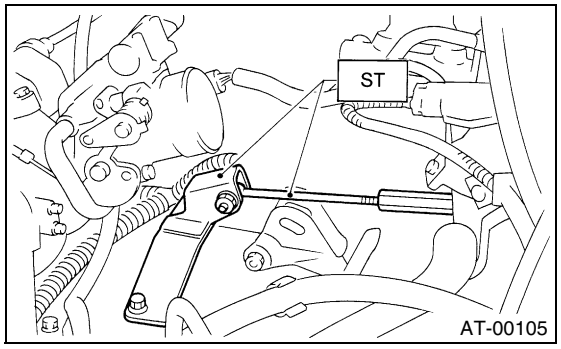


10) Install the torque converter clutch to drive plate.
(1) Tighten the bolts which hold torque converter clutch to drive plate.
(2) By inserting a wrench into the crank pulley bolt, rotate the crank pulley to tighten other bolts.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

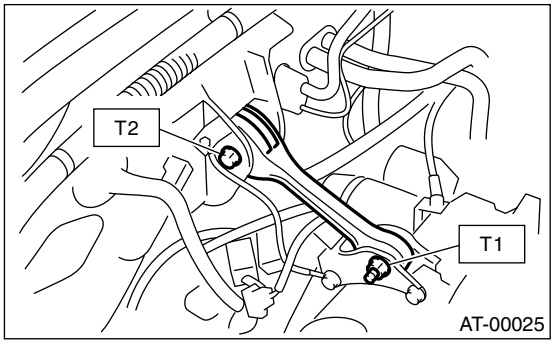


(3) Clog the plug onto service hole.
(4) Install the V-belt cover.
11) Remove the ST.

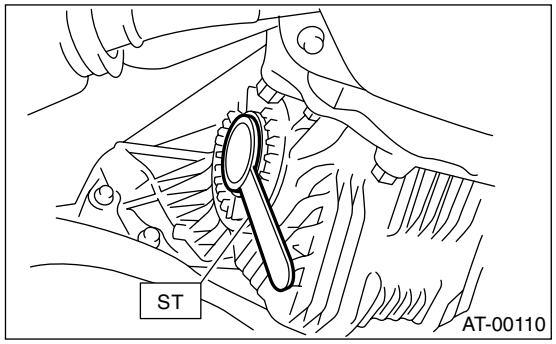


12) Install the pitching stopper.

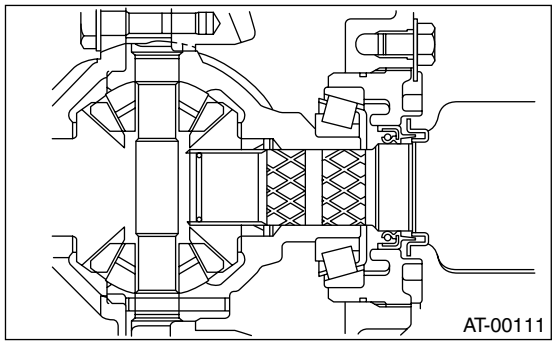
Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



13) Lift-up the vehicle.
14) Replace the front drive shaft circlip with a new one.
15) Apply a coat grease to the lip of oil seal.
16) Install the ST to side retainer.
ST 28399SA010 OIL SEAL PROTECTOR



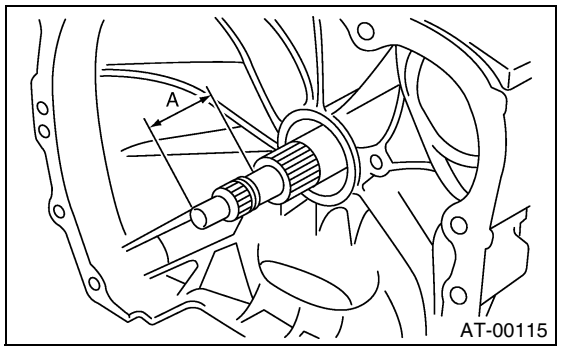
17) Insert the front drive shaft by aligning spline part of front drive shaft and spline part of differential bevel gear, and then remove the ST.
ST 28399SA010 OIL SEAL PROTECTOR
18) Insert the front drive shaft to transmission securely by pressing front housing.



19) Connect the ball joint into housing.

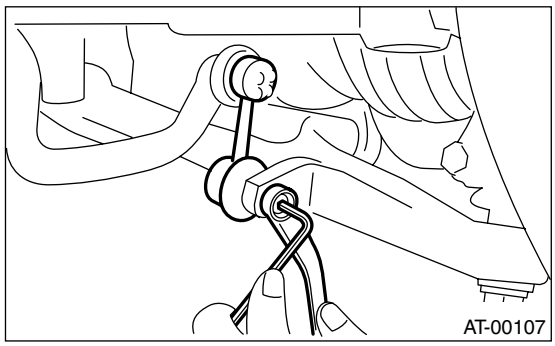
20) Tighten the installing bolts.

Tightening torque:
49 N·m (5.0 kgf-m, 36 ft-lb)

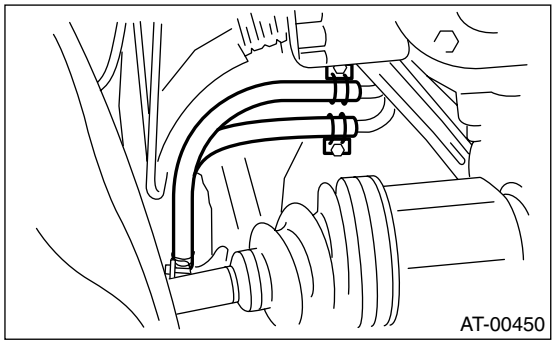


21) Install the stabilizer link from transverse link.

Tightening torque:
45 N·m (4.6 kgf-m, 33.2 ft-lb)



22) Install the shift select cable onto select lever. <Ref. to CS-9, INSTALLATION, Select Cable.>
23) Install the ATF level gauge guide and level gauge, and connect the ATF cooler hoses to pipe.



24) Install the propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>
25) Install the heat shield cover.

26) Install the rear exhaust pipe and muffler assembly.
Non-turbo model
<Ref. to EX(SOHC)-11, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-13, INSTALLATION, Muffler.>
Turbo model
<Ref. to EX(TURBO)-12, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(TURBO)-14, INSTALLATION, Muffler.>
27) Install the front and center exhaust pipe. (Non-turbo model) <Ref. to EX(SOHC)-8, INSTALLATION, Front Exhaust Pipe.>
28) Install the center exhaust pipe. (Turbo model) <Ref. to EX(TURBO)-8, INSTALLATION, Center Exhaust Pipe.>
29) Install the under cover.
30) Lower the vehicle.
31) Install the ATF level gauge.
32) Connect the following connectors.
(1) Transmission harness connectors
(2) Transmission ground cable
33) Install the air cleaner case stay. (Non-turbo model)

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)

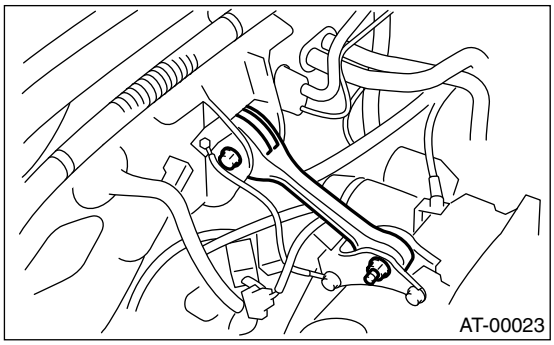
34) Install the air cleaner case and intake duct. (Non-turbo model) <Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.>, <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.>
35) Install the intercooler. (Turbo model) <Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>
36) Connect the battery ground cable to battery.
37) Fill ATF up to the middle of the “COLD” side on level gauge by using the gauge hole. <Ref. to AT-29, Automatic Transmission Fluid.>
38) Fill the differential gear oil through front differential gauge hole.<Ref. to AT-30, REPLACEMENT, Differential Gear Oil.>
39) Take off the vehicle from lift arms.
40) Check the ATF level. <Ref. to AT-29, Automatic Transmission Fluid.>
41) Check the select lever operation.
<Ref. to AT-48, INSPECTION, Inhibitor Switch.>
42) Check the level of differential gear oil.<Ref. to AT-30, INSPECTION, Differential Gear Oil.>
43) Check the vehicle on the road. <Ref. to AT-31, Road Test.>

10.Transmission Mounting System

A: REMOVAL

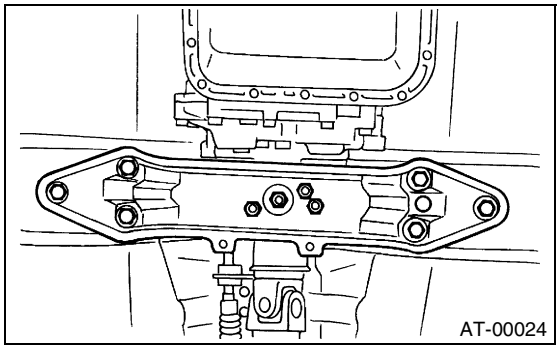
1. PITCHING STOPPER

1) Disconnect the ground cable from battery.
2) Remove the air cleaner case. (Non-turbo model) <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
3) Remove the intercooler. (Turbo model) <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
4) Remove the pitching stopper.



2. CROSSMEMBER AND CUSHION RUBBER

1) Disconnect the ground cable from battery.
2) Jack-up the vehicle and support it with sturdy racks.
3) Remove the front, center, rear exhaust pipes and muffler. (Non-turbo model) <Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(SOHC)-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-13, REMOVAL, Muffler.>
4) Remove the center, rear exhaust pipes and muffler. (Turbo model) <Ref. to EX(TURBO)-7, REMOVAL, Center Exhaust Pipe.>, <Ref. to EX(TURBO)-12, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(TURBO)-14, REMOVAL, Muffler.>
5) Remove the heat shield cover.
6) Set the transmission jack under the transmission. Make sure that the support plates of transmission jack don't touch the oil pan.
7) Remove the transmission rear crossmember.



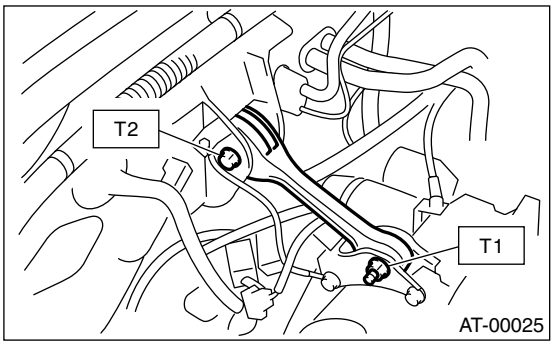
8) Remove the rear cushion rubber.

B: INSTALLATION

1. PITCHING STOPPER

1) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



2) Install the air cleaner case. (Non-turbo model) <Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.>
3) Install the intercooler. (Turbo model) <Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>

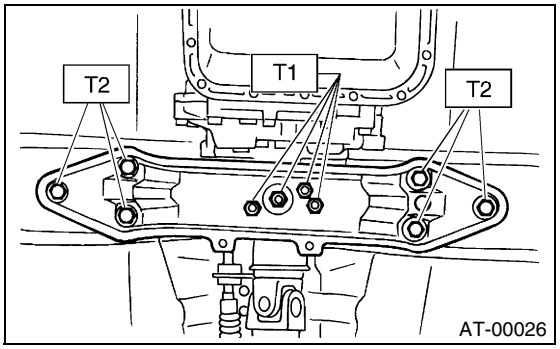
2. CROSSMEMBER AND CUSHION RUBBER

1) Install the rear cushion rubber.

Tightening torque:
39 N·m (4.0 kgf-m, 29 ft-lb)

2) Install the crossmember.

Tightening torque:
T1: 35 N·m (3.6 kgf-m, 26 ft-lb)
T2: 70 N·m (7.1 kgf-m, 51 ft-lb)



3) Remove the transmission jack.
4) Install the heat shield cover.
5) Install the front, center, rear exhaust pipes and the muffler. (Non-turbo model) <Ref. to EX(SOHC)-8, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(SOHC)-11, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-13, INSTALLATION, Muffler.>

6) Install the center, rear exhaust pipes and muffler. (Turbo model) <Ref. to EX(TURBO)-8, INSTALLATION, Center Exhaust Pipe.>, <Ref. to EX(TURBO)-12, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(TURBO)-14, INSTALLATION, Muffler.>

C: INSPECTION

Repair or replace parts if the results of the inspection below are not satisfactory.

1. PITCHING STOPPER

Make sure that the pitching stopper is not bent or damaged. Make sure that the rubber is not stiff, cracked, or otherwise damaged.

2. CROSSMEMBER AND CUSHION RUBBER

Make sure that the crossmember is not bent or damaged. Make sure that the cushion rubber is not stiff, cracked, or otherwise damaged.

11.Extension Case Oil Seal

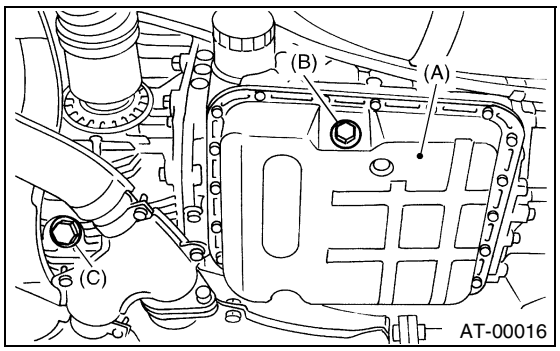
A: INSPECTION

Make sure the ATF does not leak from the joint of transmission or propeller shaft. If so, replace the oil seal. <Ref. to AT-46, REPLACEMENT, Extension Case Oil Seal.>

B: REPLACEMENT

1) Clean the transmission exterior.
2) Drain the ATF completely.
3) Replace the gasket with a new one, and then tighten the ATF drain plug.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Oil pan
(B) Drain plug
(C) Differential oil drain plug

4) Remove the rear exhaust pipe and muffler.
Non-turbo model:
<Ref. to EX(SOHC)-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-13, REMOVAL, Muffler.>
Turbo model:
<Ref. to EX(TURBO)-12, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(TURBO)-14, REMOVAL, Muffler.>
5) Remove the heat shield cover.
6) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
7) Using the ST, remove the oil seal.
ST 398527700 PULLER ASSY
8) Using the ST, install the oil seal.
ST 498057300 INSTALLER
9) Install the propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>
10) Install the heat shield cover.
11) Install the rear exhaust pipe and muffler.
Non-turbo model:
<Ref. to EX(SOHC)-11, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-13, INSTALLATION, Muffler.>
Turbo model:
<Ref. to EX(TURBO)-12, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(TURBO)-14, INSTALLATION, Muffler.>
12) Pour ATF and check the ATF level. <Ref. to AT-29, Automatic Transmission Fluid.>

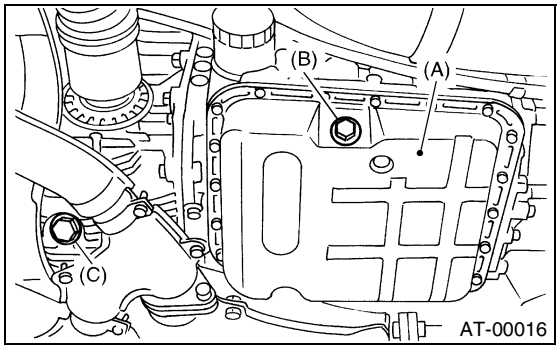
12.Differential Side Retainer Oil Seal

A: INSPECTION

Make sure the gear oil dose not leak from differential side retainer oil seal part.
If oil leaks, replace the oil seal.

B: REPLACEMENT

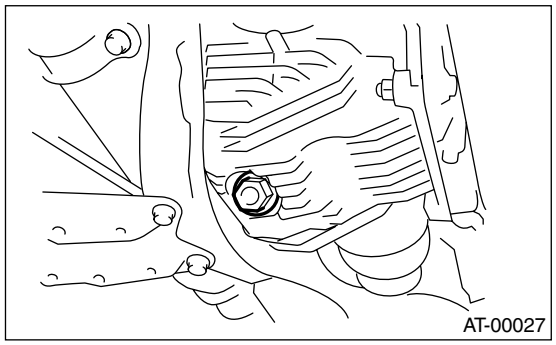
1) Lift-up the vehicle.
2) Remove the front exhaust pipe and center exhaust pipes. (Non-turbo model)
<Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.>
3) Remove the differential oil drain plug, and then drain the differential gear oil.



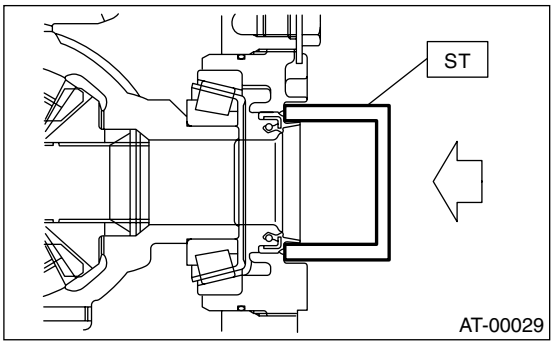
(A) Oil pan
(B) ATF drain plug
(C) Differential gear oil drain plug

4) Replace the gasket with a new one, and then tighten the differential oil drain plug.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)



5) Separate the front drive shaft from transmission.
<Ref. to DS-31, REMOVAL, Front Drive Shaft.>
6) Using a vinyl tape wrapped flat tip screwdriver, remove the differential side retainer oil seal.
7) Using the ST, install the differential side retainer oil seal tapping ST lightly with a hammer.
ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER



8) Apply a coat of oil to the oil seal lip.
9) Install the front drive shaft. <Ref. to DS-32, INSTALLATION, Front Drive Shaft.>
10) Lower the vehicle.
11) Fill the gear oil through gauge hole.

Recommend gear oil:
GL-5 (SAE: 80W — 90) or equivalent

Gear oil capacity:
1.1 — 1.3 ℓ (1.3 — 1.4 US qt, 1.0 — 1.1 Imp qt)

12) Check the gear oil level. <Ref. to AT-30, INSPECTION, Differential Gear Oil.>

13.Inhibitor Switch

A: INSPECTION

When the driving condition or starter motor operation is erroneous, first check the shift linkage for improper operation. If the shift linkage is functioning properly, check the inhibitor switch.

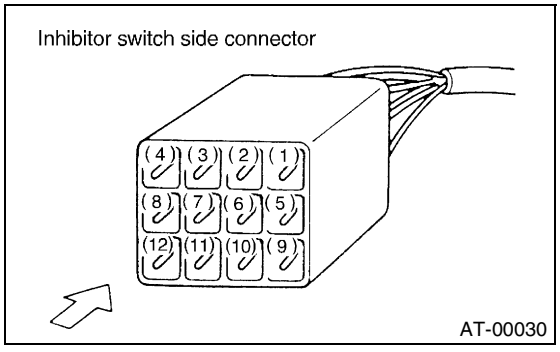
1) Disconnect the inhibitor switch connector.

2) Check continuity in inhibitor switch circuits with the select lever moved to each position.

Also check that continuity in ignition circuit does not exist when the select lever is in “R”, “D”, “3”, “2” and “1” ranges.

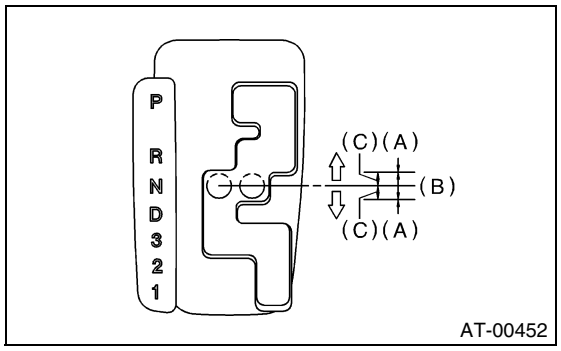
If the inhibitor switch is inoperative, check for poor contact of connector on transmission side.

	Position	Pin No.	Value
Signal sent to TCM	P	4 — 3	Less than 1Ω
	R	4 — 2	
	N	4 — 1	
	D	4 — 8	
	3	4 — 7	
	2	4 — 6	
	1	4 — 5	
Ignition circuit	P/N	12 — 11	
Back-up light circuit	R	10 — 9	



3) Check if there is continuity at equal points when the select lever is turned 1.5° in both directions from “N” range.

If there is continuity in one direction and the continuity in the other or if there is continuity at unequal points, adjust the inhibitor switch. <Ref. to AT-48, ADJUSTMENT, Inhibitor Switch.>



(A) Continuity does not exist.
(B) Continuity exists.
(C) 1.5°

4) Repeat the above checks. If there are abnormalities, adjust the select cable. <Ref. to CS-10, ADJUSTMENT, Select Cable.>

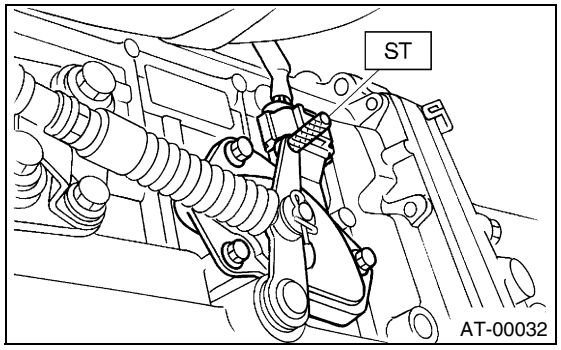
B: ADJUSTMENT

1) Shift the select lever to “N” range.

2) Loosen the three inhibitor switch securing bolts.

3) Insert the ST as vertical as possible into the holes in inhibitor switch lever and switch body.

ST 499267300 STOPPER PIN



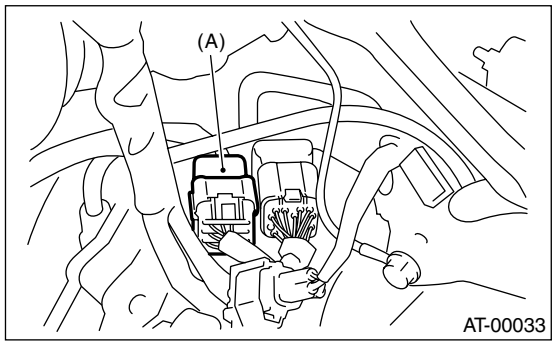
4) Tighten the three inhibitor switch bolts.

Tightening torque:
3.5 N·m (0.35 kgf-m, 2.5 ft-lb)

5) Repeat the above checks. If the inhibitor switch is determined to be “faulty”, replace it.

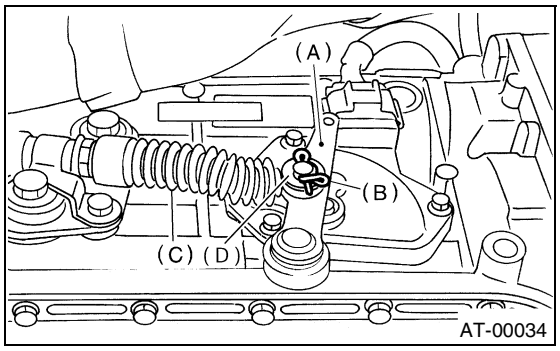
C: REMOVAL

1) Set the vehicle on a lift.
2) Move the select lever to “N” range.
3) Remove the air cleaner case. (Non-turbo model) <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
4) Remove the intercooler. (Turbo model) <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
5) Disconnect the inhibitor switch connector.



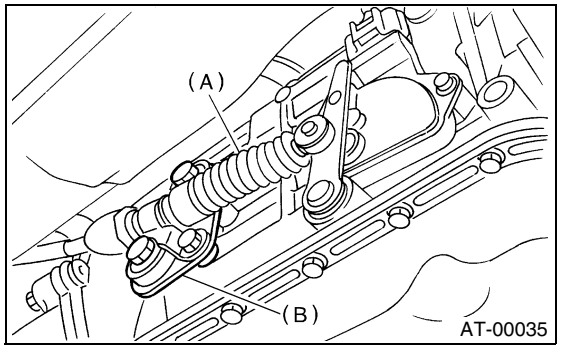
(A) Inhibitor switch

6) Remove the inhibitor switch connector from stay.
7) Lift-up the vehicle.
8) Remove the front and center exhaust pipes. (Non-turbo model)
<Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.>
9) Remove the center exhaust pipe. (Turbo model) <Ref. to EX(TURBO)-7, REMOVAL, Center Exhaust Pipe.>
10) Remove the snap pin and washer from range select lever.



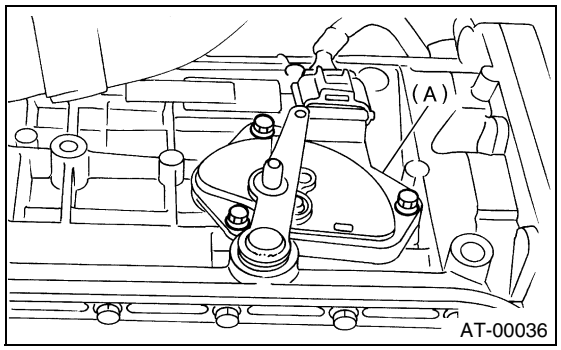
(A) Range select lever
(B) Snap pin
(C) Select cable
(D) Washer

11) Remove the plate assembly from transmission case.



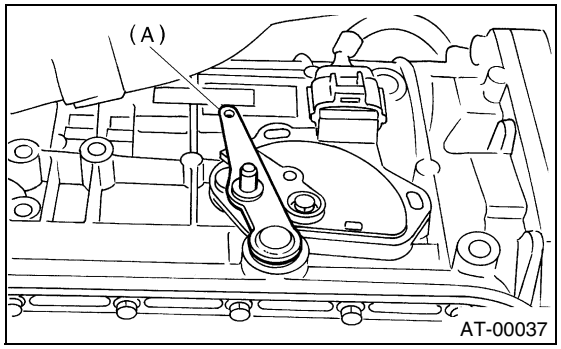
(A) Select cable
(B) Plate ASSY

12) Remove the bolts.



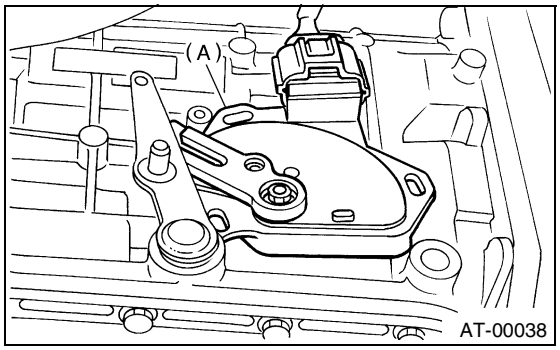
(A) Inhibitor switch

13) Move the range select lever to parking position (left side).



(A) Range select lever

14) Remove the inhibitor switch from transmission.

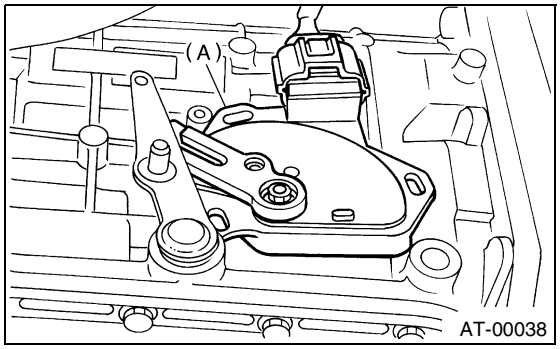


(A) Inhibitor switch

15) Disconnect the inhibitor switch harness connector from inhibitor switch.

D: INSTALLATION

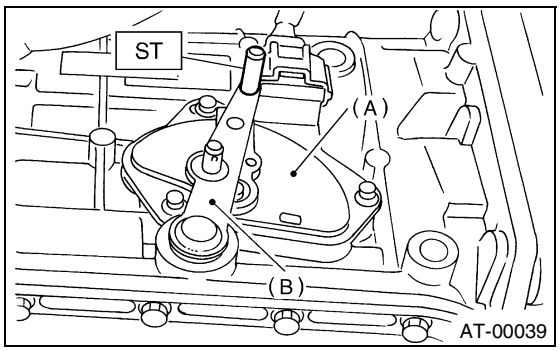
1) Connect the inhibitor switch harness connector to inhibitor switch.
2) Install the inhibitor switch to transmission case.



(A) Inhibitor switch

3) Move the range select lever to neutral position.
4) Place the inhibitor switch on specified position, and then tighten the bolts for inhibitor switch using ST.
ST 499267300 STOPPER PIN

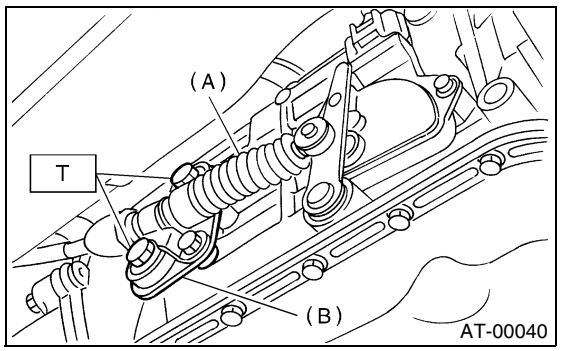
Tightening torque:
3.5 N·m (0.36 kgf-m, 2.6 ft-lb)



(A) Inhibitor switch
(B) Range select lever

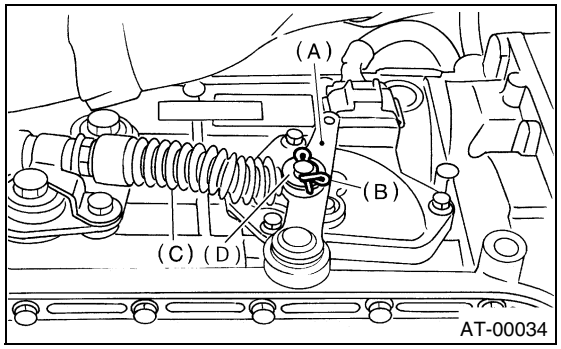
5) Install the select cable to range select lever.
6) Install the plate assembly to transmission.

Tightening torque:
T: 25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Select cable
(B) Plate ASSY

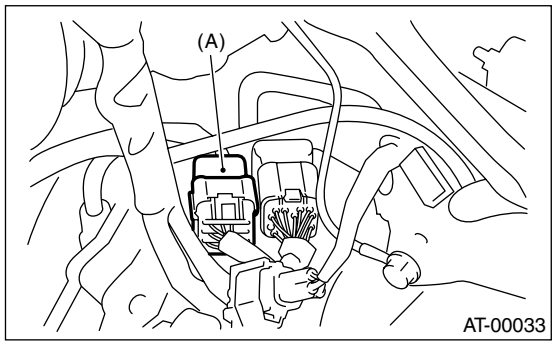
7) Install the washer and snap pin to range select lever.



(A) Range select lever
(B) Snap ring
(C) Select cable
(D) Washer

8) Install the front and center exhaust pipes. (Non-turbo model) <Ref. to EX(SOHC)-8, INSTALLATION, Front Exhaust Pipe.>
9) Install the center exhaust pipe. (Turbo model) <Ref. to EX(TURBO)-8, INSTALLATION, Center Exhaust Pipe.>
10) Lower the vehicle.
11) Install the inhibitor switch connector to stay.

12) Connect the inhibitor switch connector.



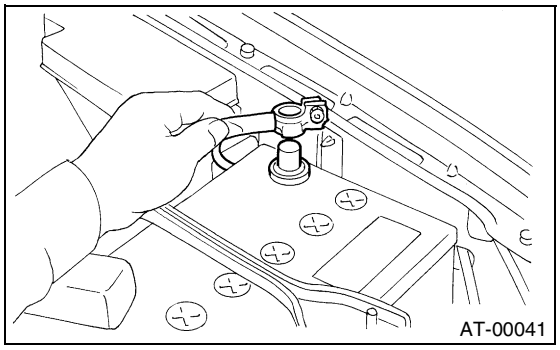
(A) Inhibitor switch

13) Install the air cleaner case. (Non-turbo model) <Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.>
14) Install the intercooler. (Turbo model) <Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>
15) Inspect the inhibitor switch. <Ref. to AT-48, INSPECTION, Inhibitor Switch.>

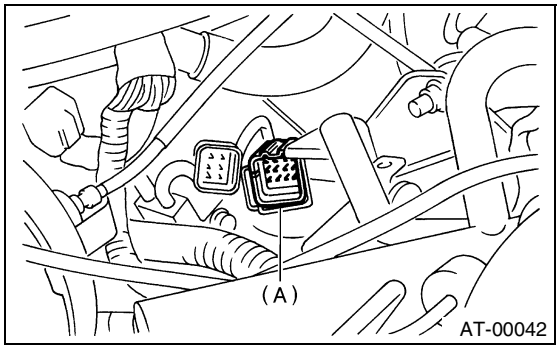
14.Front Vehicle Speed Sensor

A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



3) Remove the air cleaner case. (Non-turbo model) <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
4) Remove the intercooler. (Turbo model) <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
5) Disconnect the transmission connector.

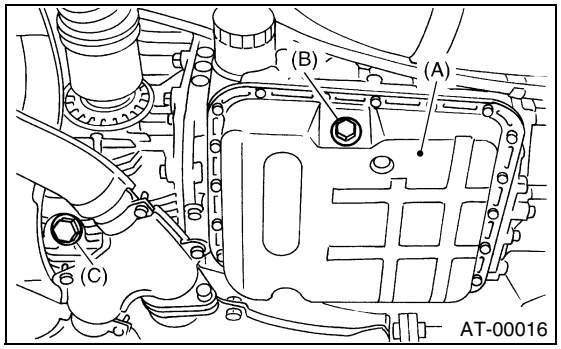


(A) Transmission connector

6) Remove the pitching stopper. <Ref. to AT-44, REMOVAL, Transmission Mounting System.>
7) Remove the transmission connector from stay.
8) Lift-up the vehicle.
9) Clean the transmission exterior.
10) Drain the ATF completely.

NOTE:
• Tighten the ATF drain plug after draining the ATF.
• Replace the gasket with a new one.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

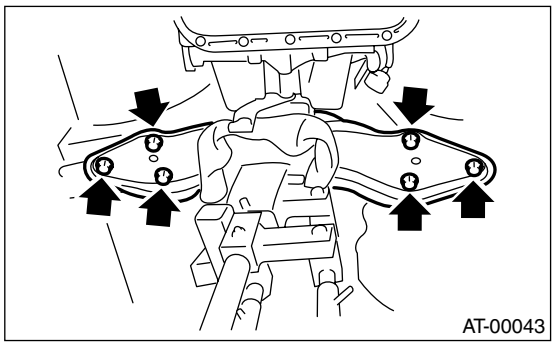


(A) Oil pan
(B) Drain plug
(C) Differential oil drain plug

11) Remove the front, center, exhaust pipes and muffler. (Non-turbo model)
<Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(SOHC)-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-13, REMOVAL, Muffler.>
12) Remove the center, rear exhaust pipes and muffler. (Turbo model) <Ref. to EX(TURBO)-7, REMOVAL, Center Exhaust Pipe.>, <Ref. to EX(TURBO)-12, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(TURBO)-14, REMOVAL, Muffler.>
13) Remove the shield cover.
14) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
15) Place the transmission jack under transmission.

NOTE:
Make sure that the support plates of transmission jack don't touch the crossmember.

16) Remove the transmission rear crossmember bolts.



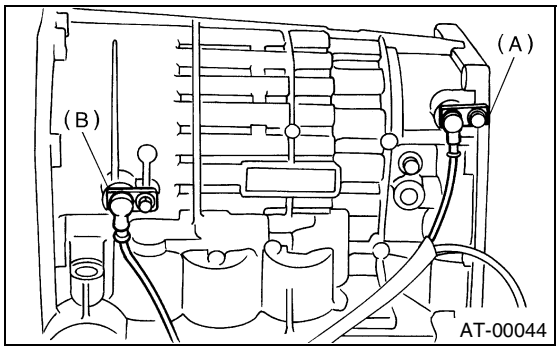
17) Lower the AT jack.

NOTE:
Do not separate the AT jack and transmission.

18) Remove the oil cooler inlet and outlet pipe.

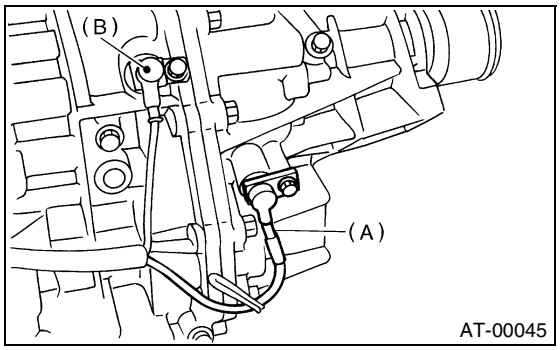
NOTE:
When removing the outlet pipe, be careful not to lose balls and springs used with retaining screws.

19) Remove the front torque converter turbine speed sensor.



(A) Front vehicle speed sensor
(B) Torque converter turbine speed sensor

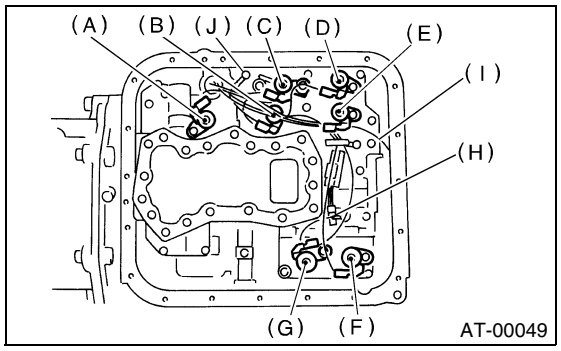
20) Remove the rear vehicle speed sensor.



(A) Rear vehicle speed sensor
(B) Front vehicle speed sensor

21) Remove the oil pan.

22) Disconnect the duty solenoids and ATF temperature sensor connectors. Remove the connectors from clip and disconnect the connectors.

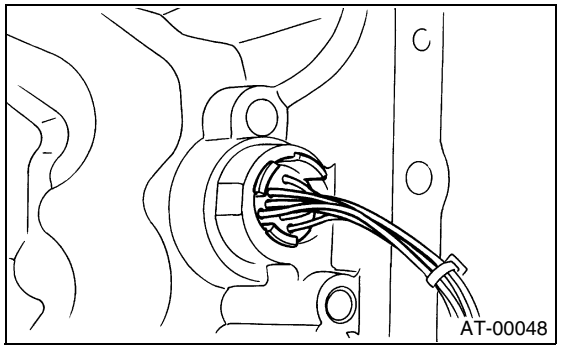


(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) ATF temperature sensor
(I) Transfer duty solenoid (Brown)
(J) Transmission ground

23) Remove the harness assembly.

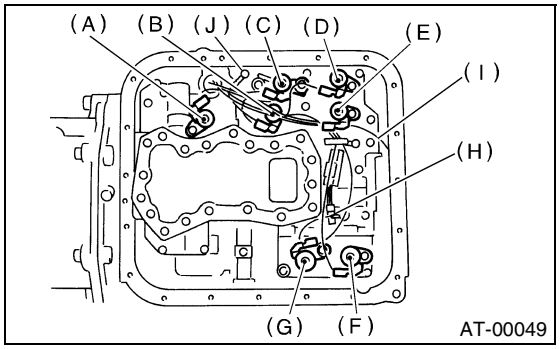
B: INSTALLATION

1) Pass the harness assembly through the hole in the transmission case.



2) Connect the harness connectors.
Connect the connectors of same color, and secure the connectors to valve body using clips.

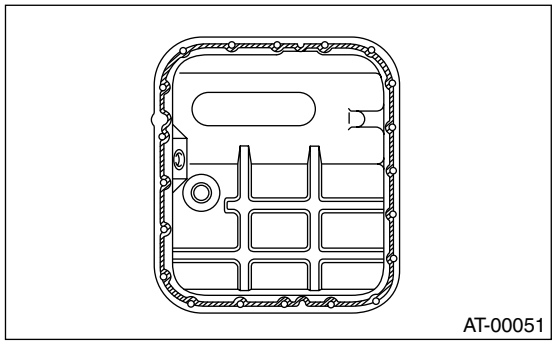
Tightening torque (Transmission ground cable)
8 N·m (0.8 kgf-m, 5.8 ft-lb)



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) ATF temperature sensor
(I) Transfer duty solenoid (Brown)
(J) Transmission ground

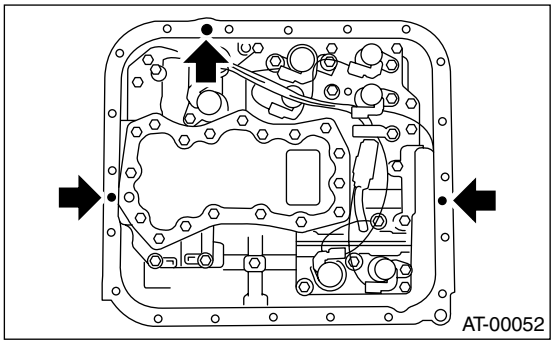
3) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Fluid packing:
THREE BOND 1217B (Part No. K0877YA020)



4) Apply liquid gasket fully to the three holes other than screw holes on transmission case.

Fluid packing:
THREE BOND 1217B (Part No. K0877YA020)



5) Install the oil pan.

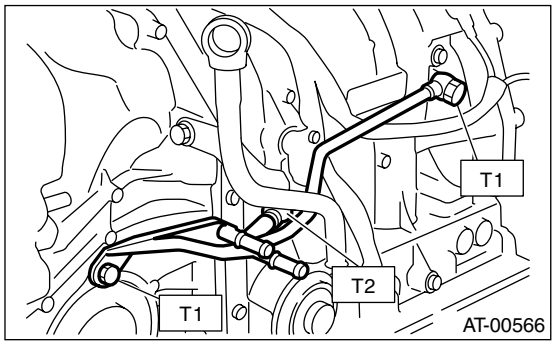
Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

6) Install the front and rear vehicle speed sensor, and also the torque converter turbine speed sensor, and then fasten the harness.

Tightening torque:
7 N·m (0.7 kgf-m, 5.1 ft-lb)

7) Install a new aluminum washer and oil cooler pipes.

Tightening torque:
T1: 25 N·m (2.5 kgf-m, 18.1 ft-lb)
T2: 44 N·m (4.5 kgf-m, 32.5 ft-lb)



8) Install the transmission rear crossmember bolts.

Tightening torque:
70 N·m (7.1 kgf-m, 51 ft-lb)

9) Install the propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>
10) Install the shield cover.
11) Install the front, center, rear exhaust pipes and muffler. (Non-turbo model)
<Ref. to EX(SOHC)-8, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(SOHC)-11, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-13, INSTALLATION, Muffler.>

12) Install the center, rear exhaust pipes and muffler. (Turbo model) <Ref. to EX(TURBO)-8, INSTALLATION, Center Exhaust Pipe.>, <Ref. to EX(TURBO)-12, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(TURBO)-14, INSTALLATION, Muffler.>
13) Lower the vehicle.
14) Install the transmission connector to the stay.
15) Install the pitching stopper. <Ref. to AT-44, INSTALLATION, Transmission Mounting System.>
16) Install the air cleaner case. (Non-turbo model) <Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.>
17) Install the intercooler. (Turbo model) <Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>

15.Rear Vehicle Speed Sensor

A: REMOVAL

When removing the rear vehicle speed sensor, refer to “Front Vehicle Speed Sensor.” <Ref. to AT-52, REMOVAL, Front Vehicle Speed Sensor.>

B: INSTALLATION

When installing the rear vehicle speed sensor, refer to “Front Vehicle Speed Sensor.” <Ref. to AT-53, INSTALLATION, Front Vehicle Speed Sensor.>

16. Torque Converter Turbine Speed Sensor

A: REMOVAL

When removing the torque converter turbine speed sensor, refer to “Front Vehicle Speed Sensor.” <Ref. to AT-52, REMOVAL, Front Vehicle Speed Sensor.>

B: INSTALLATION

When installing the torque converter turbine speed sensor, refer to “Front Vehicle Speed Sensor.” <Ref. to AT-53, INSTALLATION, Front Vehicle Speed Sensor.>

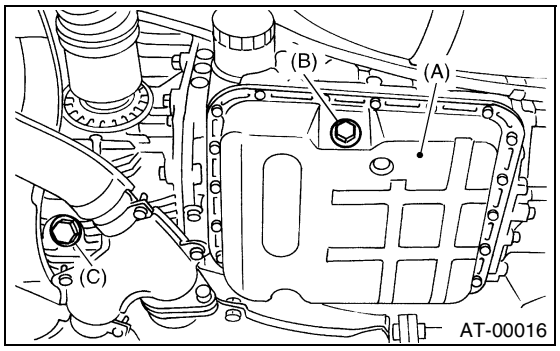
17.Control Valve Body

A: REMOVAL

1) Lift-up the vehicle.
2) Clean the transmission exterior.
3) Drain the ATF completely.

NOTE:
• Tighten the ATF drain plug after draining the ATF.
• Replace the gasket with a new one.

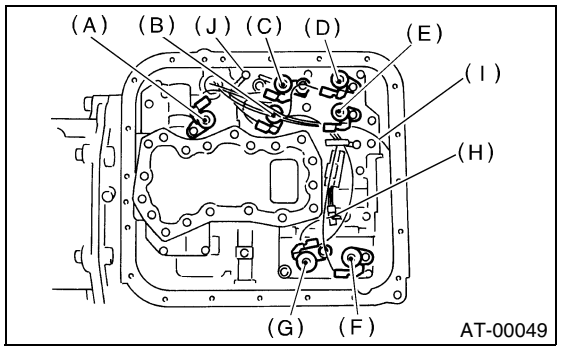
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Oil pan
(B) Drain plug
(C) Differential oil drain plug

4) Remove the oil pan.
5) Remove and clean the magnet.
6) Remove the old gasket on the oil pan and transmission case completely.

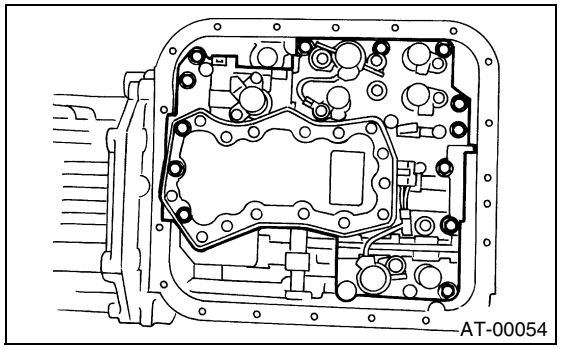
7) Disconnect the duty solenoids and ATF temperature sensor connectors. Remove the connectors from clip and disconnect the connectors.



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) ATF temperature sensor
(I) Transfer duty solenoid (Brown)
(J) Transmission ground

8) Remove the control valve.

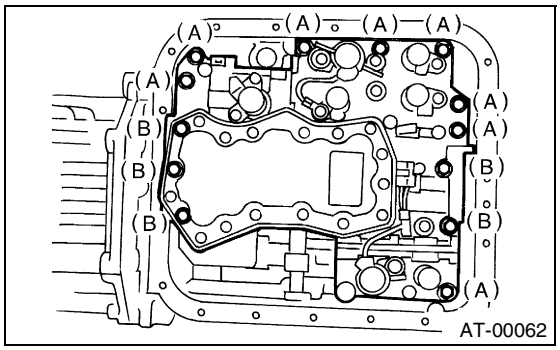
NOTE:
When removing the control valve body, be careful not to interfere with transfer duty solenoid wiring.



B: INSTALLATION

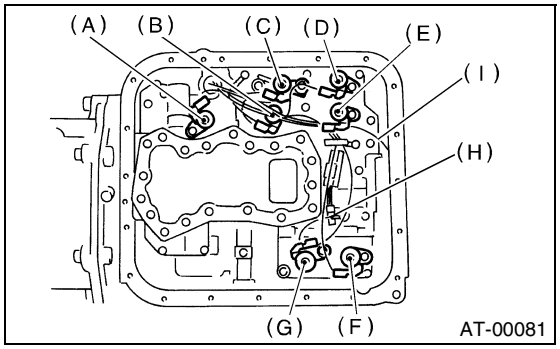
1) Set the range select lever in “N” range.
2) Install the control valve and ground connectors.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



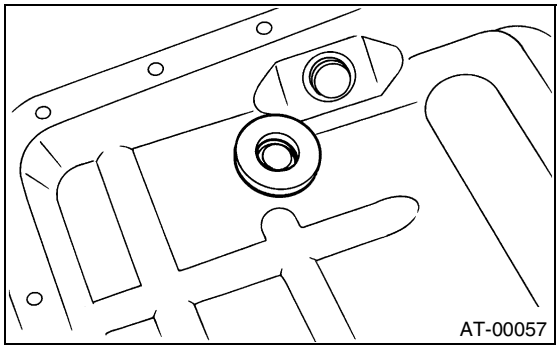
Bolt length mm (in)
(A) 30 (1.18)
(B) 55 (2.17)

3) Connect all connectors.



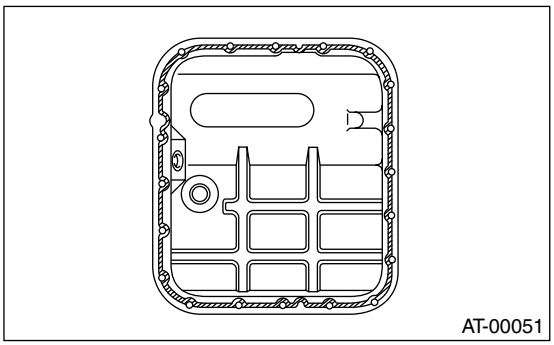
(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) ATF temperature sensor
(I) Transfer duty solenoid (Brown)

4) Attach the magnet at specified position.



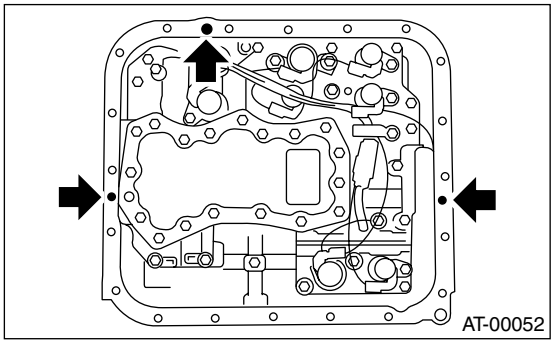
5) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Liquid gasket:
THREE BOND 1217B (Part No. K0877YA020)



6) Apply liquid gasket fully to three holes other than screw holes on transmission case.

Liquid gasket:
THREE BOND 1217B (Part No. K0877YA020)



7) Install the oil pan.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

8) Pour ATF into the oil charge pipe.

Recommended fluid:
Dexron III type automatic transmission fluid

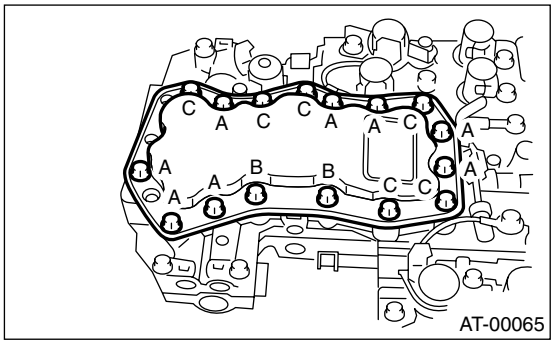
Fluid capacity:
Fill the same amount of fluid drained from drain plug hole.

9) Check the level of ATF.
<Ref. to AT-29, Automatic Transmission Fluid.>

C: DISASSEMBLY

1) Remove the oil strainer from lower control valve body.

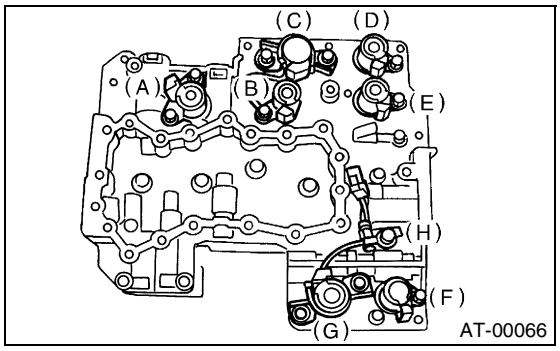
NOTE:
Arrange the removed bolts in good order to assemble in the same place as disassembly, because the bolts length are different.



(A) Short bolt
(B) Middle bolt
(C) Long bolt

2) Remove the duty solenoids, solenoids and sensor from the lower valve body.

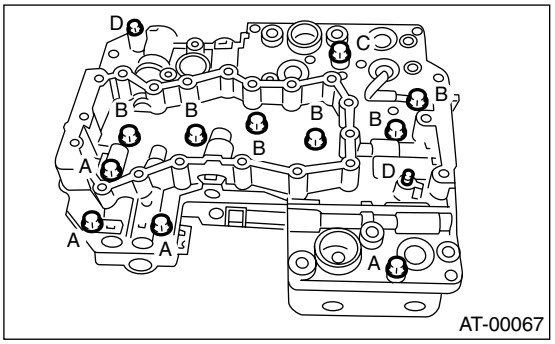
NOTE:
Arrange the removed bolts in good order to assemble in the same place as disassembly, because the bolts length are different.



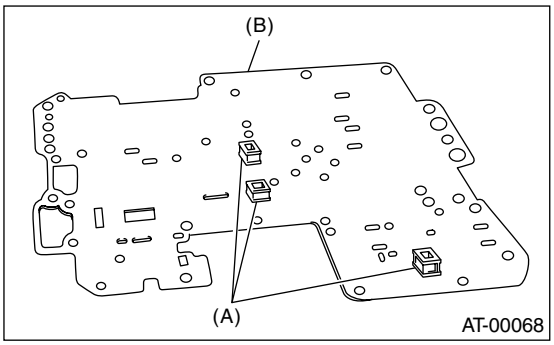
(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 1 (Yellow)
(E) Shift solenoid 2 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) ATF temperature sensor

3) Remove the upper-lower valve body tightening bolts.

NOTE:
Arrange the removed bolts in good order to assemble in the same place as disassembly, because the bolts length are different.

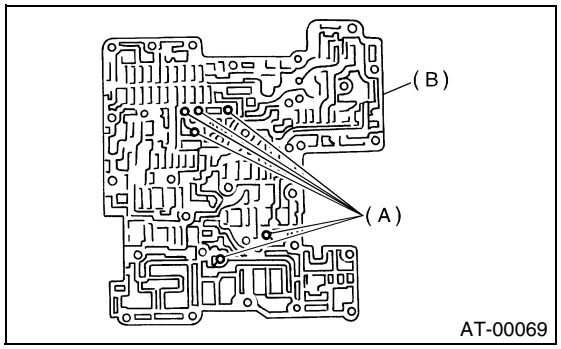


4) Remove the lower valve body.
5) Remove the oil filter and plate.



(A) Oil filter
(B) Plate

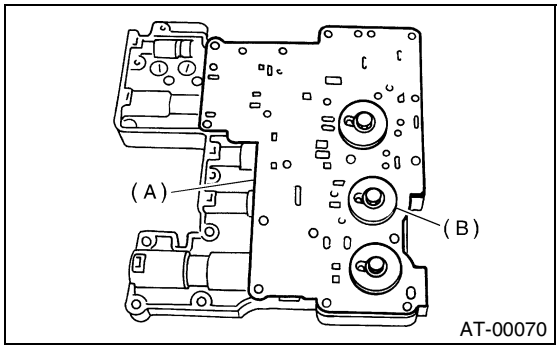
6) Remove the six steel balls from middle valve body.



(A) Steel ball
(B) Middle valve body

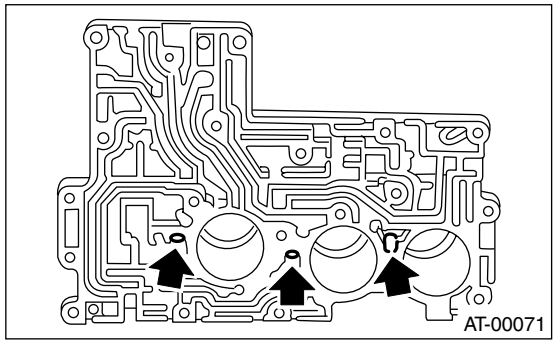
7) Remove the middle valve body.

8) Remove the upper separator plate from middle valve body.

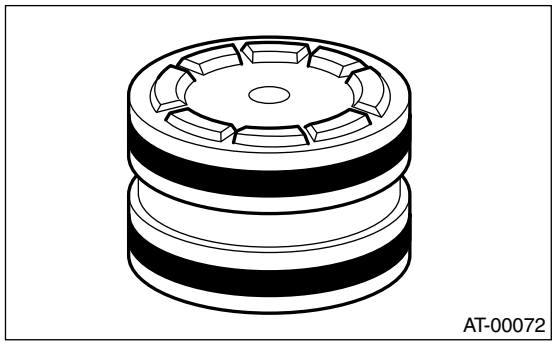


(A) Upper separator plate
(B) Side plate

9) Remove the valve springs and four steel balls from upper valve body.
10) Place a shop cloth to the piston removal hole.
11) Using an air compressor, apply air slowly to each piston hole and remove the pistons.

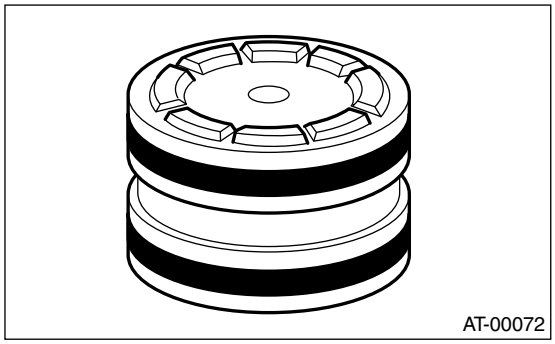


12) Remove the seal ring from piston.

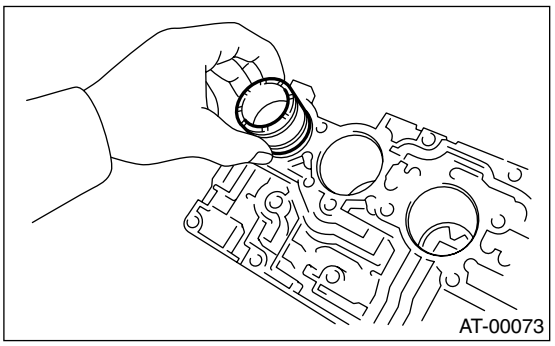


D: ASSEMBLY

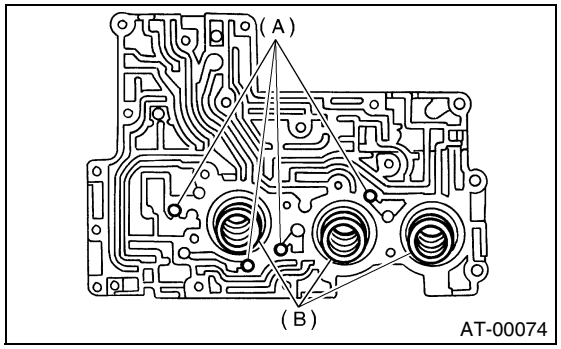
1) Install a new seal ring to piston.



2) Apply ATF to the seal ring.
3) Insert the piston fully into upper valve body.



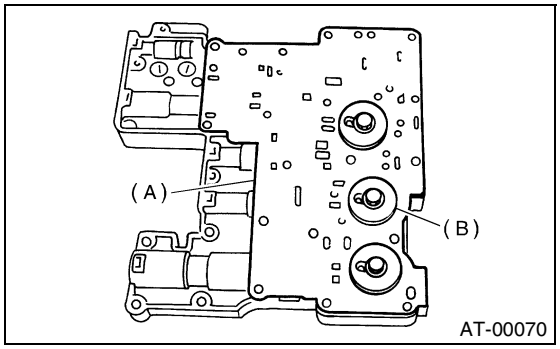
4) Install the spring and four steel balls to specified positions of upper valve body.



(A) Steel ball
(B) Spring

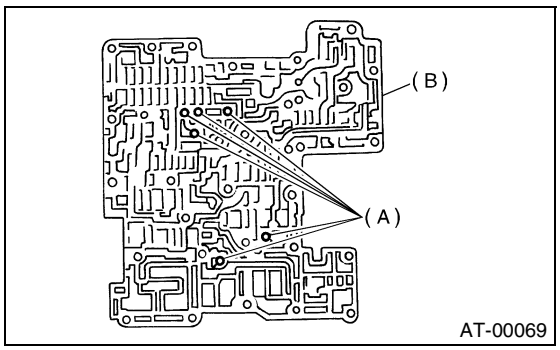
5) Align the hole in side plate with the hole in separator plate, and then install the support plate and upper separator plate to middle valve body.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



(A) Upper separator plate
(B) Side plate

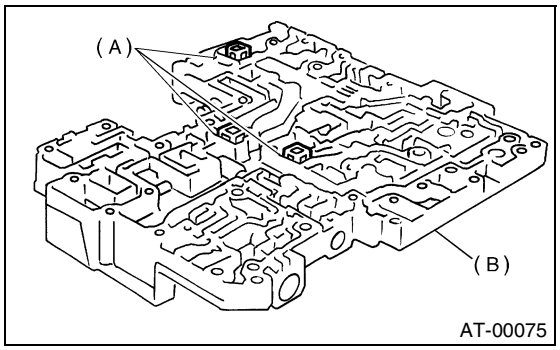
6) Insert the six steel balls in their proper positions to middle valve body.



(A) Steel ball
(B) Middle valve body

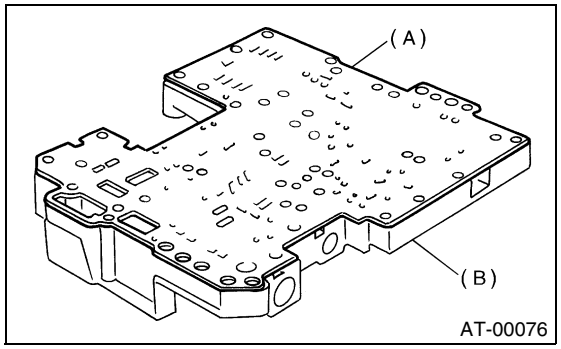
7) Install the three filters to lower valve body.

NOTE:
Pay attention to the location of filters.



(A) Strainer
(B) Lower valve body

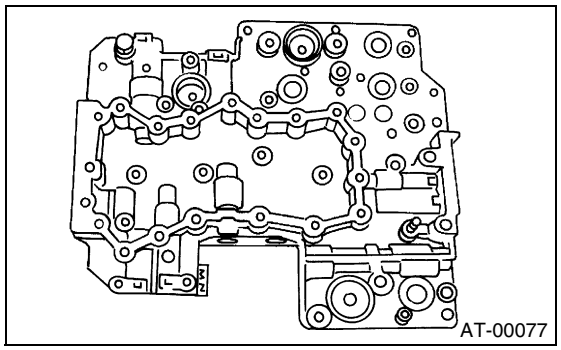
8) Install the lower separate plate to lower valve body.



(A) Lower separator plate
(B) Lower valve body

9) Temporarily assemble the valve body.

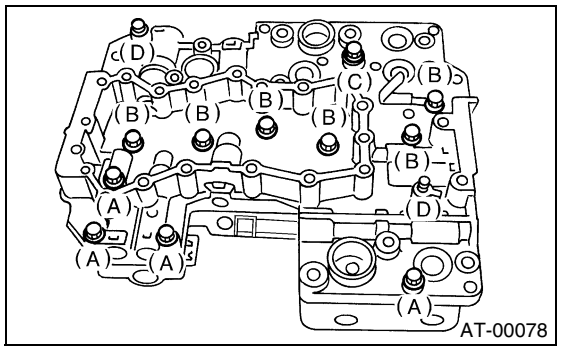
NOTE:
Be careful not to drop the middle valve body and upper body interior steel ball, or the lower body filter.



10) Tighten the bolts.

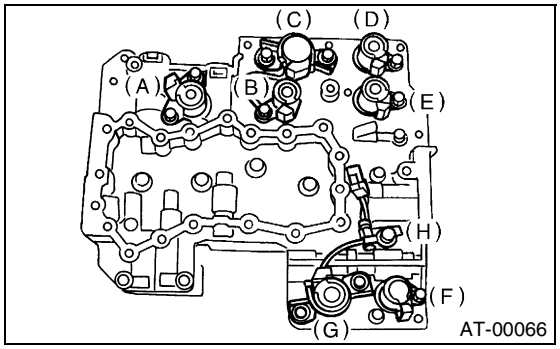
NOTE:
Install the bolts (D) from upper valve body side.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



Bolt length mm (in)
(A) 40 (1.57)
(B) 62 (2.44)
(C) 73 (2.87)
(D) 79 (3.11)

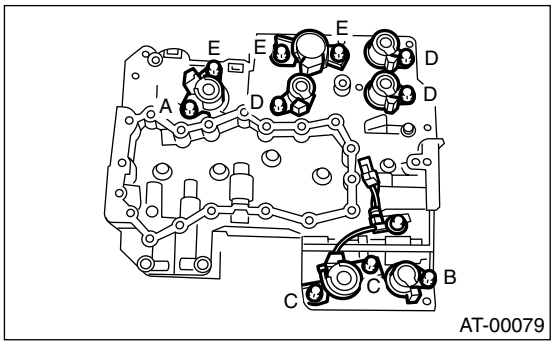
11) Install the sensor, solenoids and duty solenoids to specified positions.



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 1 (Yellow)
(E) Shift solenoid 2 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) ATF temperature sensor

12) Tighten the bolts and nuts.

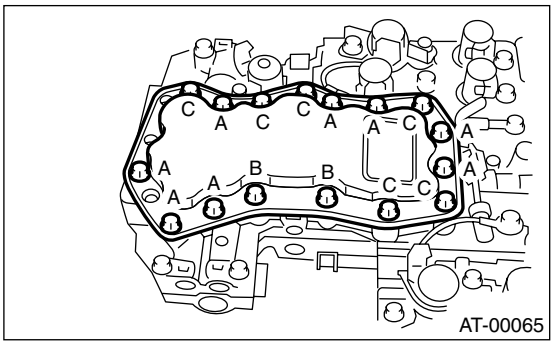
Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



Bolt length mm (in)
(A) 12 (0.47)
(B) 40 (1.57)
(C) 45 (1.77)
(D) 62 (2.44)
(E) 73 (2.87)

13) Install the oil strainer to lower valve body.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



Bolt length mm (in)
(A) 12 (0.47)
(B) 62 (2.44)
(C) 81 (3.19)

E: INSPECTION

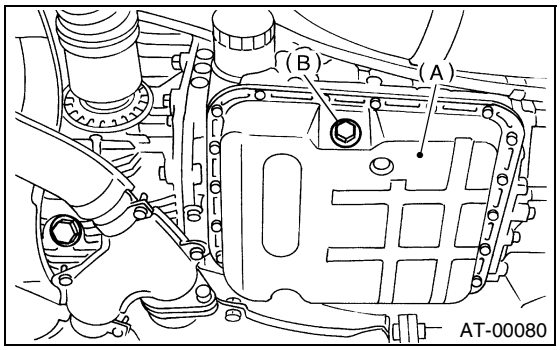
Make sure that each component is free of harmful gouges, cuts, or dust.

18.Shift Solenoids, Duty Solenoids and ATF Temperature Sensor

A: REMOVAL

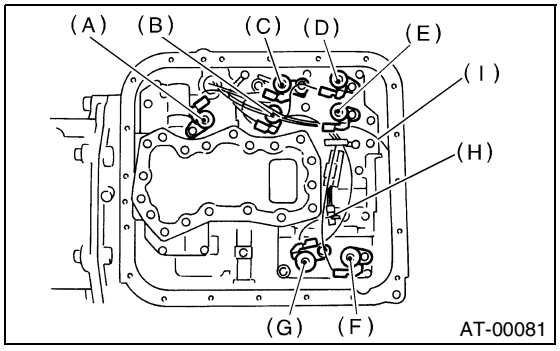
1) Lift-up the vehicle.
2) Clean the transmission exterior.
3) Replace the gasket with a new one, and tighten the drain plug.
4) Drain the ATF completely.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



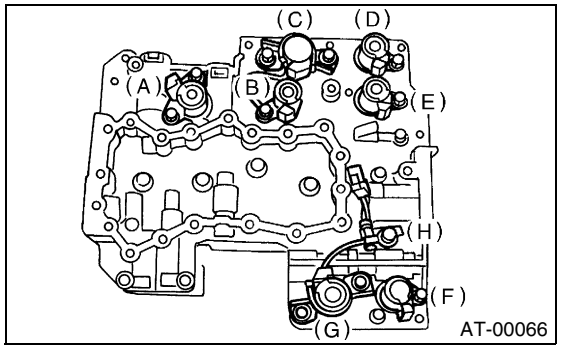
(A) Oil pan
(B) Drain plug

5) Remove the oil pan.
6) Disconnect the solenoid and sensor connectors. Remove the connectors from clip and disconnect the connectors.



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) ATF temperature sensor
(I) Transfer duty solenoid (Brown)

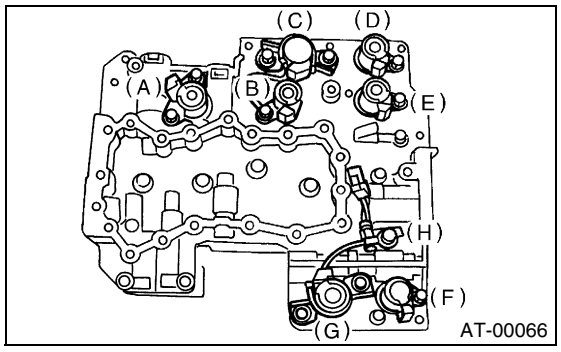
7) Remove the solenoids, duty solenoids and ATF temperature sensor.



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) ATF temperature sensor

B: INSTALLATION

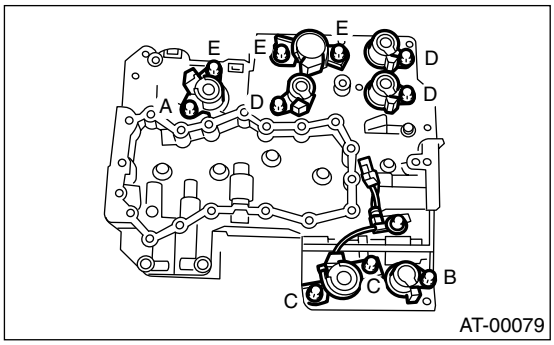
1) Insert the sensor, solenoid, duty solenoid to specified position.



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) ATF temperature sensor

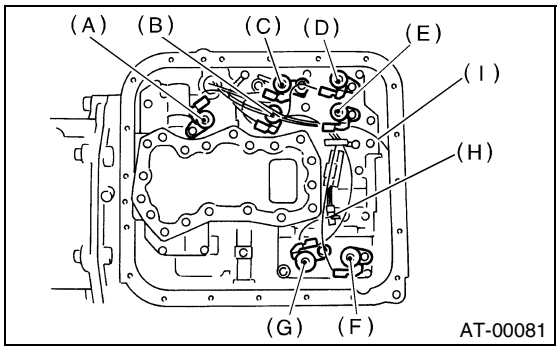
2) Tighten the bolts and nuts.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



Bolt length mm (in)
(A) 12 (0.47)
(B) 40 (1.57)
(C) 45 (1.77)
(D) 62 (2.44)
(E) 73 (2.87)

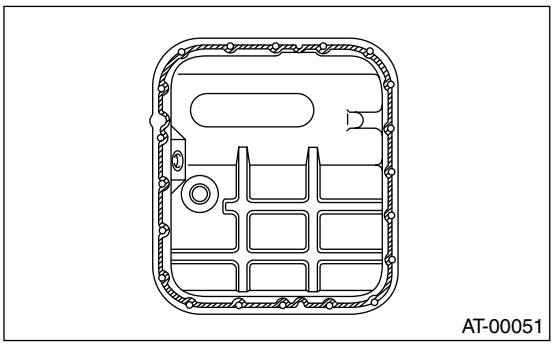
3) Connect the harness connectors.
Connect the connectors of same color, and secure the connectors to valve body using clips.



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) ATF temperature sensor
(I) Transfer duty solenoid (Brown)

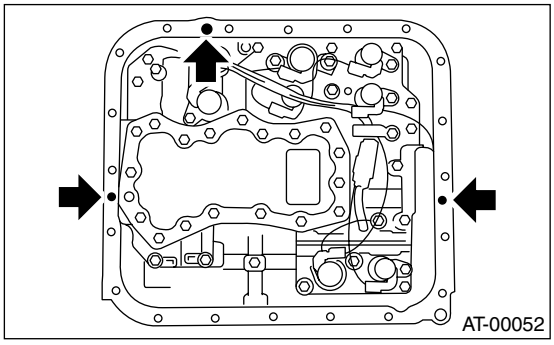
4) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Fluid packing:
THREE BOND 1217B (Part No. K0877YA020)



5) Apply liquid gasket fully to three holes other than screw holes on transmission case.

Fluid packing:
THREE BOND 1217B (Part No. K0877YA020)



6) Install the oil pan.

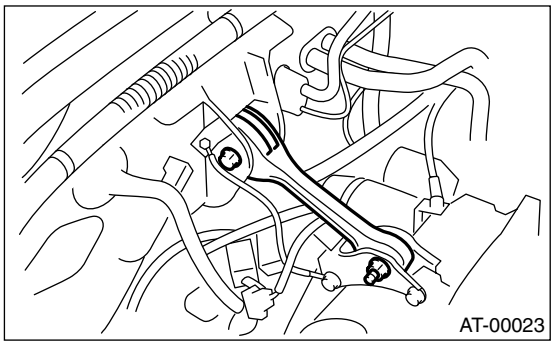
Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

7) Fill ATF up to the middle of the “COLD” side on level gauge by using the gauge hole. <Ref. to AT-29, Automatic Transmission Fluid.>
8) Check the ATF level. <Ref. to AT-29, Automatic Transmission Fluid.>

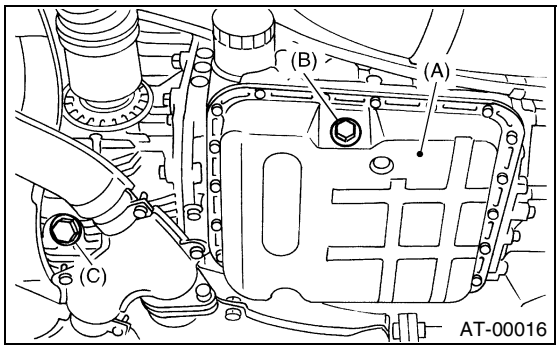
19.Transfer Duty Solenoid and Valve Body

A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Remove the air cleaner case. (Non-turbo model) <Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.>
4) Remove the intercooler. (Turbo model) <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
5) Remove the pitching stopper.

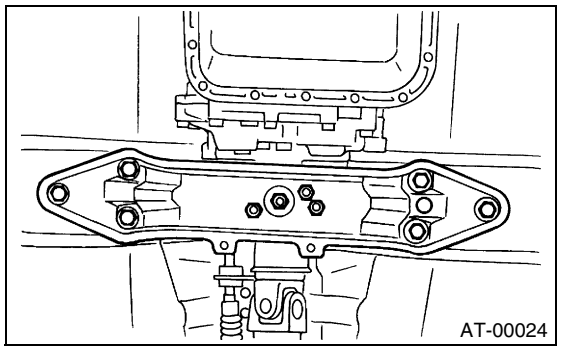


6) Remove the front exhaust pipe with center exhaust pipe. (Non-turbo model) <Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.>
7) Remove the rear exhaust pipe and muffler. (Non-turbo model) <Ref. to EX(SOHC)-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-13, REMOVAL, Muffler.>
8) Remove the center, rear exhaust pipes and muffler. (Turbo model) <Ref. to EX(TURBO)-7, REMOVAL, Center Exhaust Pipe.>, <Ref. to EX(TURBO)-12, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(TURBO)-14, REMOVAL, Muffler.>
9) Raise the vehicle and drain the ATF.

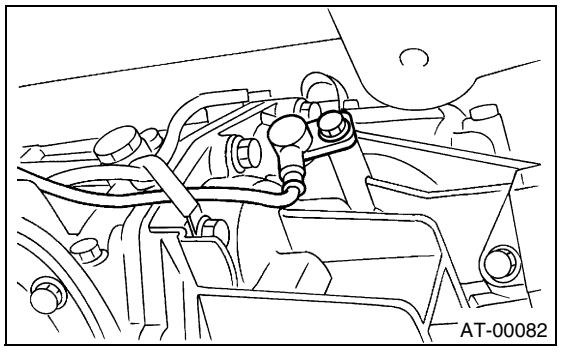


(A) Oil pan
(B) Drain plug
(C) Differential oil drain plug

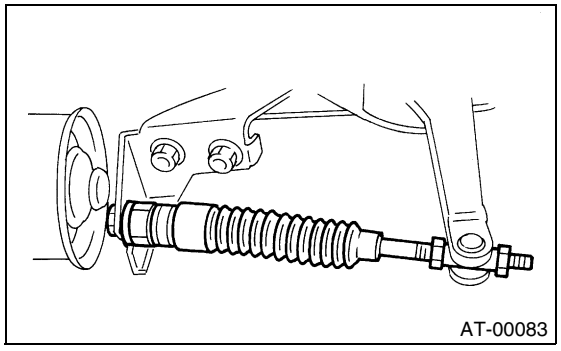
10) Remove the heat shield cover.
11) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
12) Remove the transmission rear crossmember.
(1) Support the transmission using a transmission jack and raise slightly.
(2) Remove the bolts and nuts as shown in the figure.



13) Remove the rear vehicle speed sensor.



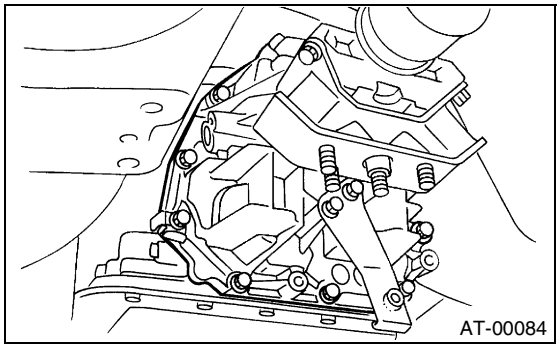
14) Remove the select cable nut.



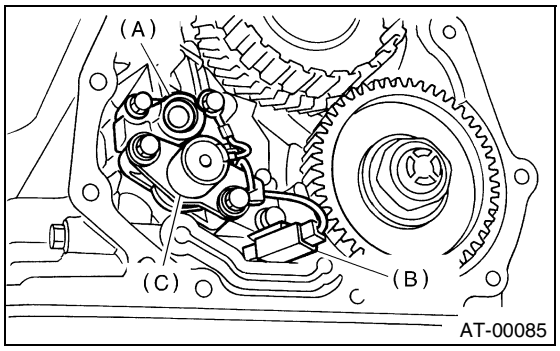
15) Move the gear select cable so that extension bolts can be removed.
16) Remove the bolts.

17) Remove the extension case.

NOTE:
Use a container to catch oil flowing from extension.



18) Disconnect the transfer duty solenoid connector.
19) Remove the transfer duty solenoid and transfer valve body.



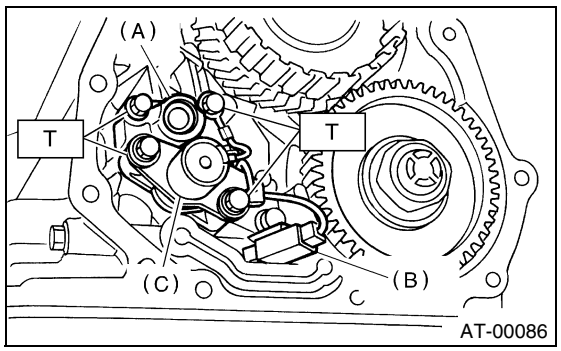
(A) Transfer valve body
(B) Transfer duty solenoid connector
(C) Transfer duty solenoid

B: INSTALLATION

1) Install the transfer duty solenoid and transfer valve body.
(1) Install the transfer duty solenoid and transfer valve body.

Tightening torque:
T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)

(2) Connect the transfer duty solenoid connector.



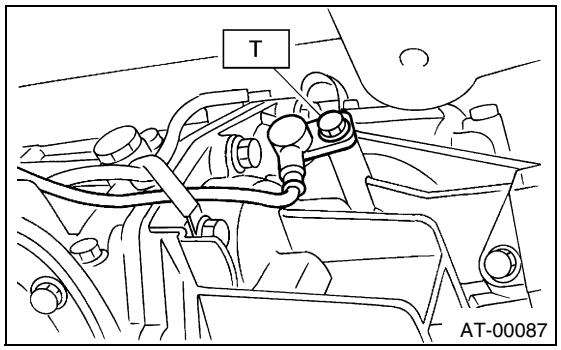
(A) Transfer valve body
(B) Transfer duty solenoid connector
(C) Transfer duty solenoid

2) Install a new gasket and the extension case to transmission case.
(1) Tighten eleven bolts.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

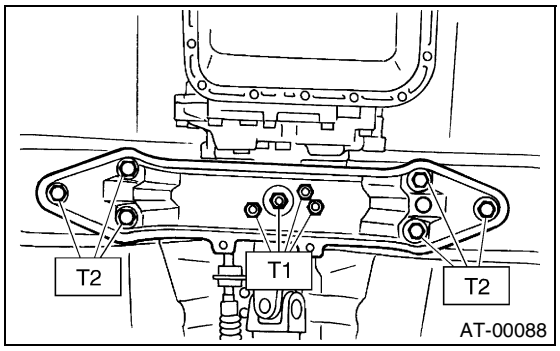
(2) Adjust the select cable. <Ref. to CS-10, ADJUSTMENT, Select Cable.>
3) Install the rear vehicle speed sensor.

Tightening torque:
T: 7 N·m (0.7 kgf-m, 5.1 ft-lb)

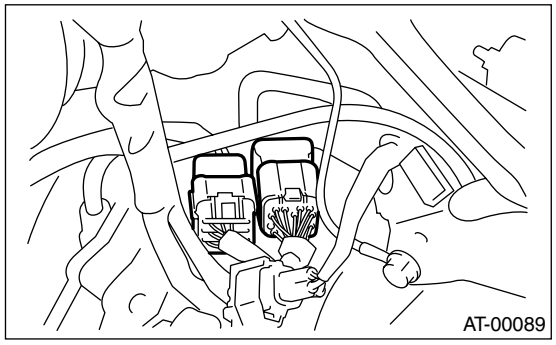


4) Install the transmission rear crossmember.
(1) Tighten the bolts.

Tightening torque:
T1: 35 N·m (3.6 kgf-m, 26 ft-lb)
T2: 70 N·m (7.1 kgf-m, 51 ft-lb)

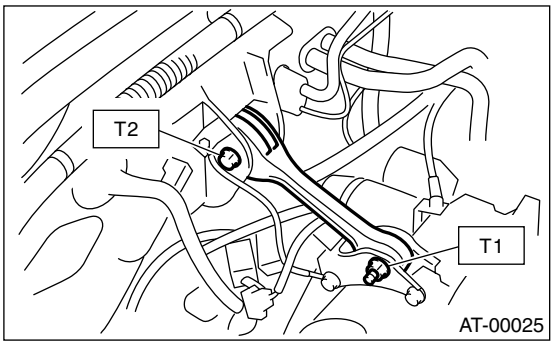


(2) Remove the transmission jack.
5) Install the propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>
6) Install the front, center rear exhaust pipe and muffler. (Non-turbo model) <Ref. to EX(SOHC)-8, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(SOHC)-11, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-13, INSTALLATION, Muffler.>
7) Install the center, rear exhaust pipes and muffler. (Turbo model) <Ref. to EX(TURBO)-8, INSTALLATION, Center Exhaust Pipe.>, <Ref. to EX(TURBO)-12, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(TURBO)-14, INSTALLATION, Muffler.>
8) Connect the transmission harness connector.



9) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



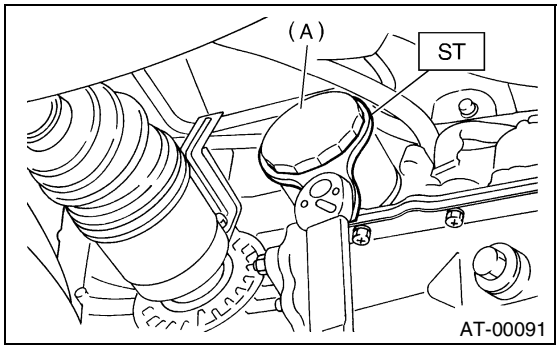
10) Install the air cleaner case. (Non-turbo model) <Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.>
11) Install the intercooler. (Turbo model) <Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>
12) Fill ATF up to the middle of the “COLD” side on level gauge by using the gauge hole. <Ref. to AT-29, Automatic Transmission Fluid.>
13) Check the ATF level. <Ref. to AT-29, Automatic Transmission Fluid.>

20.ATF Filter

A: REMOVAL

NOTE:
The ATF filter is maintenance free.

1) Lift-up the vehicle.
2) Using the ST, remove the ATF filter.
ST 498545400 OIL FILTER WRENCH
ST 18332AA000 OIL FILTER WRENCH



(A) ATF filter

B: INSTALLATION

1) Use a new ATF filter and apply a thin coat of ATF to the oil seal.
2) Install the ATF filter. Turn it by hand, being careful not to damage the oil seal.
3) Using the ST, tighten the ATF filter to transmission case.
ST 498545400 OIL FILTER WRENCH
ST 18332AA000 OIL FILTER WRENCH
• When using ST 18332AA000, tighten the ATF filter to 14 N·m (1.4 kgf-m, 10.1 ft-lb).
• When using ST 49854500, calculate the ATF filter torque specifications using the following formula.
$T2 = L2/(L1 + L2) \times T1$
T1: 14 N·m (1.4 kgf-m, 10.1 ft-lb)
[Required torque setting]
T2: Tightening torque
L1: ST length 0.078 m (3.07 in)
L2: Torque wrench length
Example:

Torque wrench length mm (in)	Tightening torque N·m (kgf-m, ft-lb)
100 (3.94)	7.7 (0.79, 5.7)
150 (5.91)	9.0 (0.92, 6.7)
200 (7.87)	10 (1.0, 7.2)

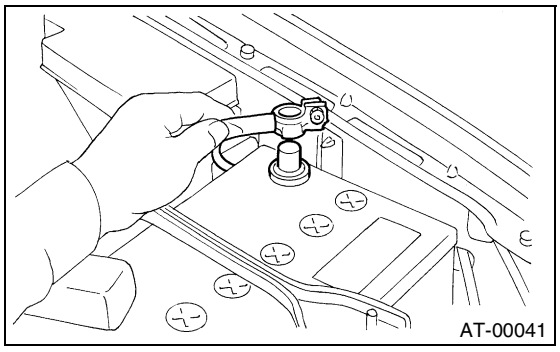
NOTE:
Align the ST with torque wrench while tightening ATF filter.

4) Add ATF.
5) Inspect the level of ATF. <Ref. to AT-29, Automatic Transmission Fluid.>

21.Transmission Control Module (TCM)

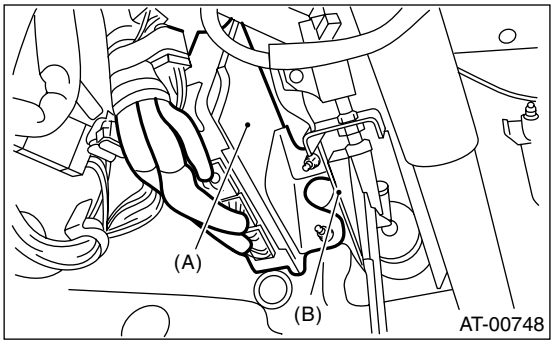
A: REMOVAL

1) Disconnect the ground cable from battery.



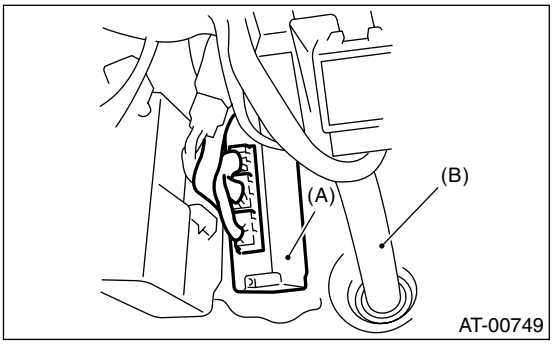
2) Remove the lower cover and then disconnect the connector.
3) Disconnect the connectors from transmission control module.

- LHD MODEL



(A) Transmission control module
(B) Brake pedal

- RHD MODEL



(A) Transmission control module
(B) Steering column

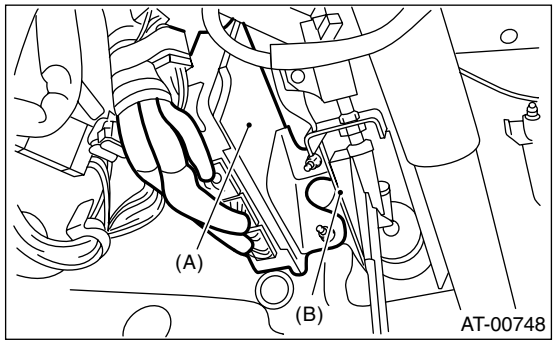
4) Remove the transmission control module.

B: INSTALLATION

1) Install the transmission control module.

- LHD MODEL

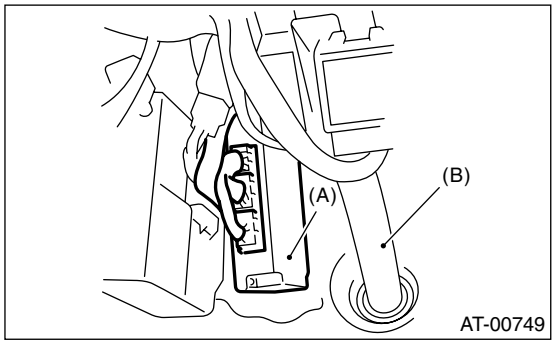
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Transmission control module
(B) Brake pedal

- RHD MODEL

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



(A) Transmission control module
(B) Steering column

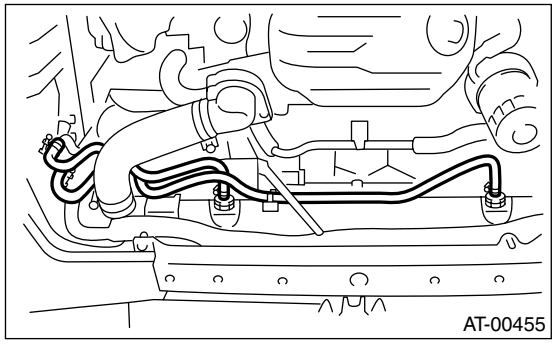
2) Connect the connectors to transmission control module.
3) Install in the reverse order of removal.

22.ATF Cooler Pipe and Hose

A: REMOVAL

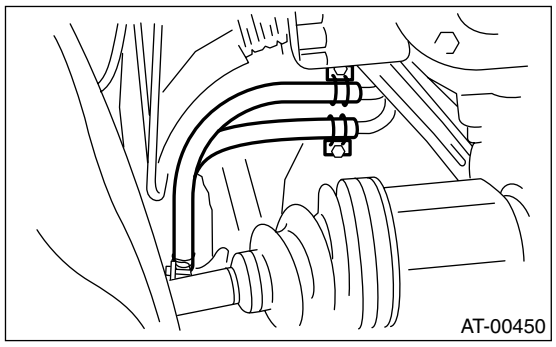
1) Set the vehicle on a lift.
2) Remove the battery and washer tank.
3) Disconnect the ATF cooler hose from radiator. (Turbo model)
   (1) Remove the radiator. <Ref. to CO(SOHC)-28, TURBO MODEL, REMOVAL, Radiator.>
   (2) Remove the radiator under cover.
   (3) Disconnect the ATF cooler hose from radiator.
4) Lift-up the vehicle.
5) Remove the under cover.
6) Disconnect the ATF cooler hose from radiator.

NOTE:
• Do not remove with a screwdriver or other pointed tools.
• When the hose is difficult to remove, wrap a shop cloth around the hose to protect it. Turn it with pliers, and then pull directly out with your hand.

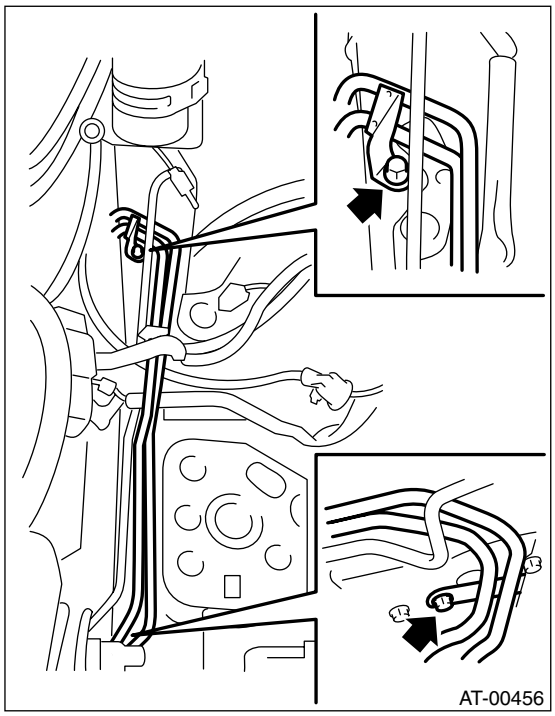

AT-00455

7) Disconnect the ATF cooler hoses from pipes.

NOTE:
• Do not remove with a screwdriver or other pointed tools.
• When the hose is difficult to remove, wrap a shop cloth around the hose to protect it. Turn it with pliers, and then pull directly out with your hand.

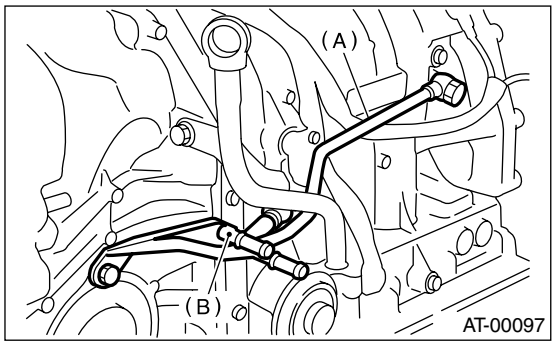

AT-00450

8) Disconnect the ATF cooler pipe from frame.


AT-00456

9) Disconnect the oil cooler inlet and outlet pipes.

NOTE:
When disconnecting the outlet pipe, be careful not to lose the ball and spring used with retaining screw.



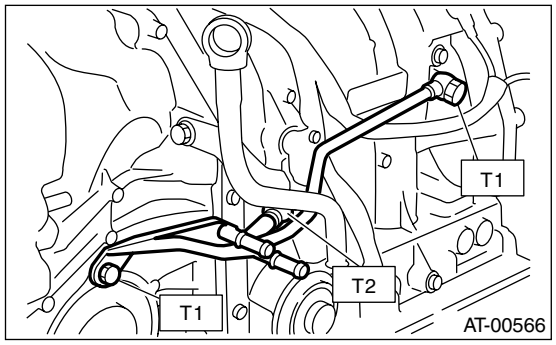
AT-00097

(A) Inlet pipe
(B) Outlet pipe

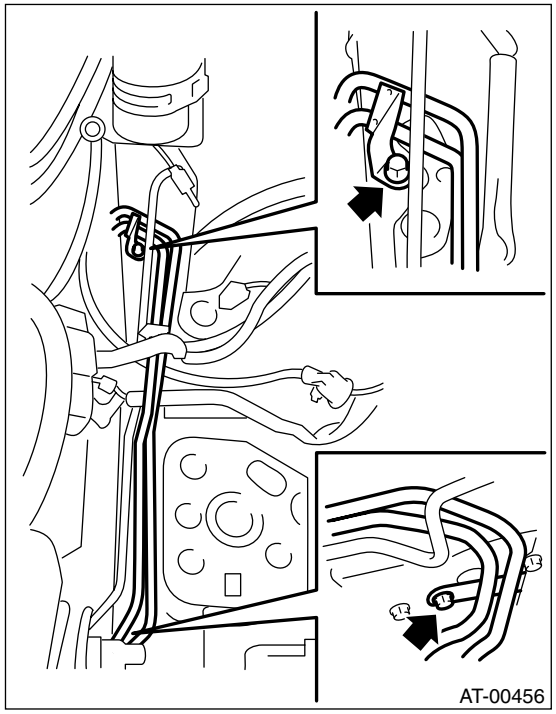
B: INSTALLATION

1) Install the oil cooler outlet and inlet pipes with new washer.

Tightening torque:
T1: 25 N·m (2.5 kgf-m, 18.1 ft-lb)
T2: 44 N·m (4.5 kgf-m, 32.5 ft-lb)

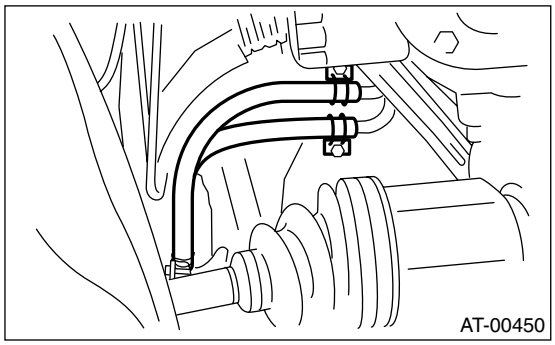


2) Install the ATF cooler pipe to frame.



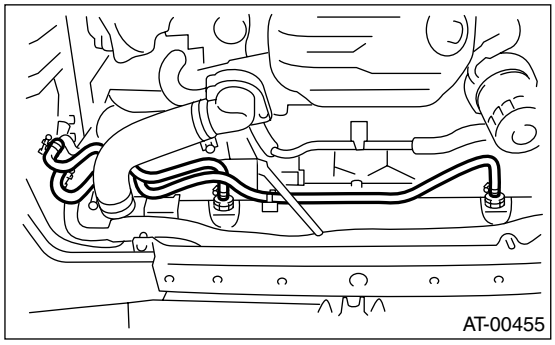
3) Connect the ATF cooler hose to pipe transmission side.

NOTE:
• Install so that the hose is not folded over, excessively bent, or twisted.
• Be careful to insert the hose to the specified position.



4) Connect the ATF cooler hose to the pipe of radiator side. (Non-turbo model)

NOTE:
• Install so that the hose is not folded over, excessively bent, or twisted.
• Be careful to insert the hose to the specified position.



5) Connect the ATF cooler hose to radiator. (Turbo model)
(1) Connect the ATF cooler hose to radiator.
(2) Install the radiator under cover.
(3) Install the radiator. <Ref. to CO(SOHC)-31, TURBO MODEL, INSTALLATION, Radiator.>
6) Install the under cover.
7) Install the battery and washer tank.
8) Fill ATF. <Ref. to AT-29, Automatic Transmission Fluid.>

NOTE:
Make sure there are no ATF leaks in joints between the transmission, radiator, pipes and hoses.

C: INSPECTION

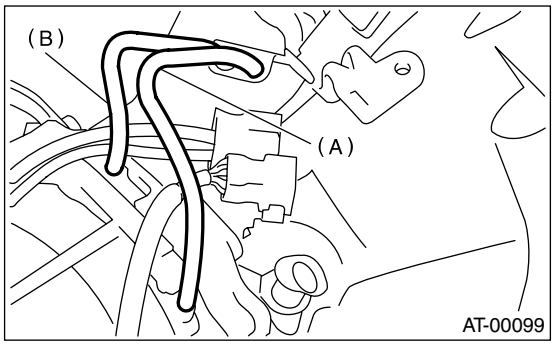
Repair or replace any defective hoses, pipes, clamps, and washers found from the inspection below.

1) Check for ATF leaks in joints between the transmission, radiator, pipes and hoses.
2) Check for deformed clamps.
3) Lightly bend the hose and check for cracks in the surface and other damage.
4) Pinch the hose with your fingers and check for poor elasticity. Also check for poor elasticity in the parts where the clamp was by pressing with your fingernail.
5) Check for peeling, cracks, and deformation at the tip of the hose.

23.Air Breather Hose

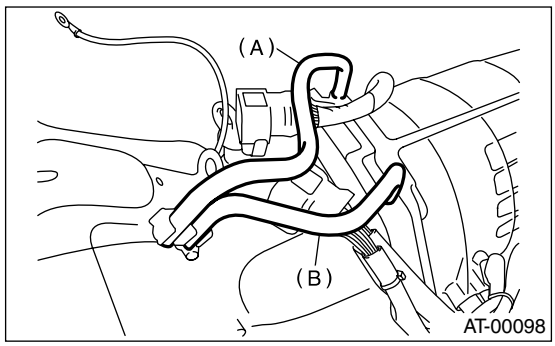
A: REMOVAL

1) Remove the air cleaner case. (Non-turbo model) <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
2) Remove the intercooler. (Turbo model) <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
3) Disconnect the air breather hoses.
• NON-TURBO MODEL



(A) Air breather hose (Transmission case)
(B) Air breather hose (Oil pump housing)

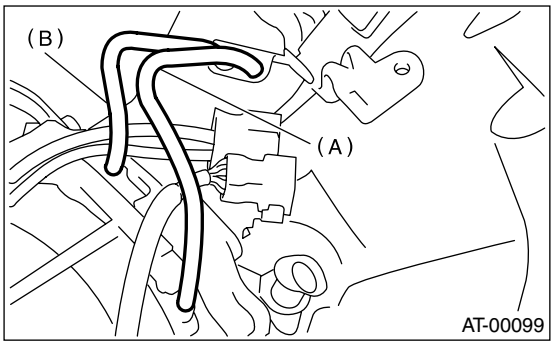
• TURBO MODEL



(A) Air breather hose (Transmission case)
(B) Air breather hose (Oil pump housing)

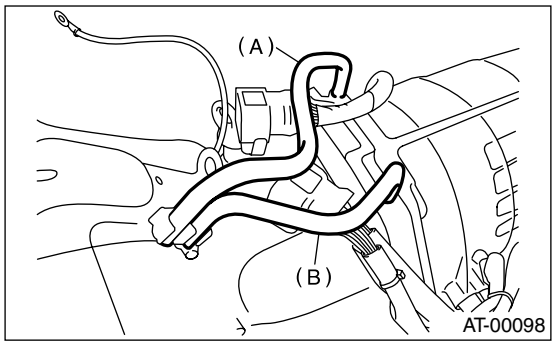
B: INSTALLATION

1) Install the air breather hoses.
• NON-TURBO MODEL



(A) Air breather hose (Transmission case)
(B) Air breather hose (Oil pump housing)

• TURBO MODEL



(A) Air breather hose (Transmission case)
(B) Air breather hose (Oil pump housing)

2) Install the air cleaner case. (Non-turbo model) <Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.>
3) Install the intercooler. (Turbo model) <Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>

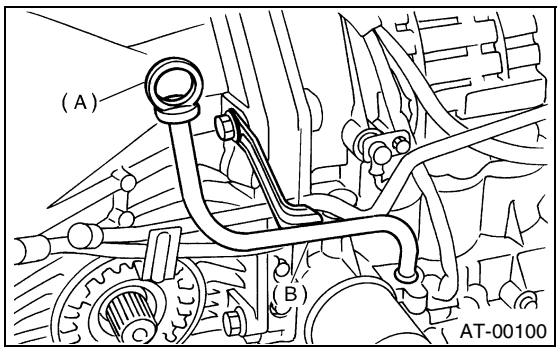
C: INSPECTION

Make sure the hose is not cracked or clogged.

24.Oil Charger Pipe

A: REMOVAL

1) Remove the air cleaner case. (Non-turbo model) <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
2) Remove the intercooler. (Turbo model) <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
3) Remove the oil charger pipe, and remove the O-ring from flange face.

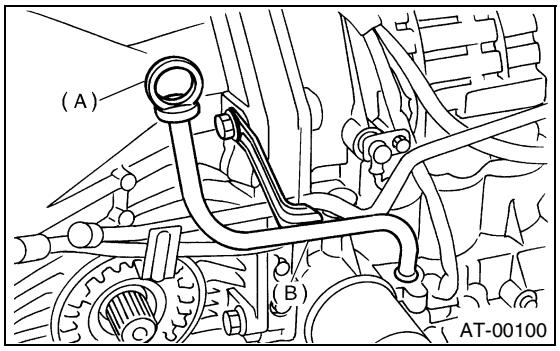


(A) Oil level gauge
(B) Oil charger pipe

B: INSTALLATION

1) Install the oil charger pipe with new O-ring.

Tightening torque:
41 N·m (4.2 kgf-m, 30.4 ft-lb)



(A) Oil level gauge
(B) Oil charger pipe

2) Install the air cleaner case. (Non-turbo model) <Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.>
3) Install the intercooler. (Turbo model) <Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>

C: INSPECTION

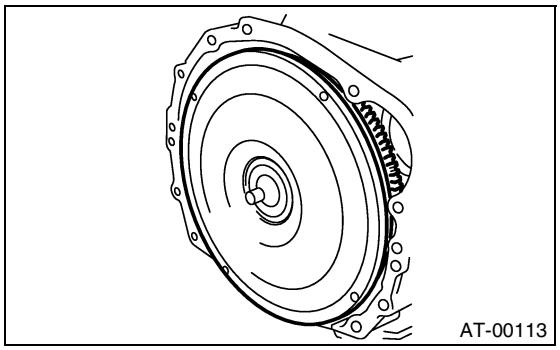
Make sure the oil charger pipe is not deformed or otherwise damaged.

25.Torque Converter Clutch Assembly

A: REMOVAL

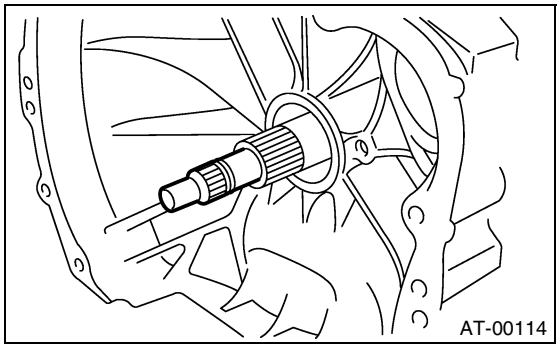
1) Remove the transmission assembly from vehicle. <Ref. to AT-38, REMOVAL, Automatic Transmission Assembly.>
2) Extract the torque converter clutch horizontally.

NOTE:
• Be careful not to scratch the bushing inside oil pump shaft.
• Note that oil pump shaft also comes out.



3) Remove the input shaft.

NOTE:
When the torque converter clutch assembly is removed, the input shaft will come out.

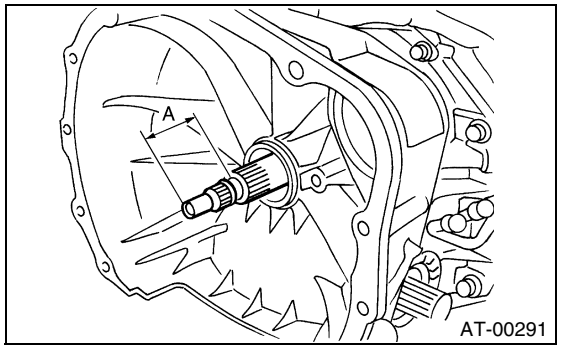


4) Extract the oil pump shaft from torque converter clutch.
5) Remove the clip from torque converter clutch.

B: INSTALLATION

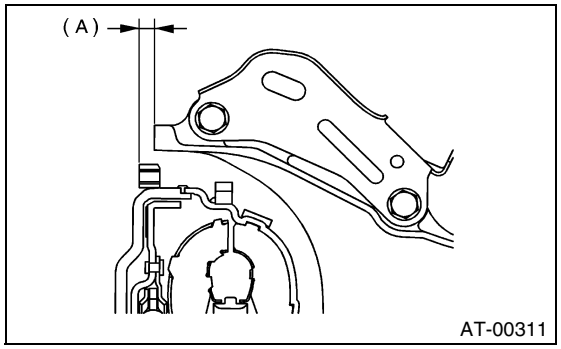
1) Install the clip to torque converter clutch.
2) Install the oil pump shaft to torque converter clutch, and then check the clip fits securely in its groove.
3) Insert the input shaft while turning lightly by hand.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



4) Holding the torque converter clutch assembly by hand, carefully install it to the torque converter clutch case. Be careful not to damage the bushing. Also avoid undue contact between the oil pump shaft bushing and stator shaft portion of the oil pump cover.
5) Rotate the shaft lightly by hand to engage the splines securely.

Dimension A:
Non-turbo model
–1.3 — –1.1 mm (–0.051 — –0.043 in)
Turbo model
2.7 — 2.9 mm (0.106 — 0.114 in)



(A) Dimension A

6) Install the transmission assembly to vehicle. <Ref. to AT-40, INSTALLATION, Automatic Transmission Assembly.>

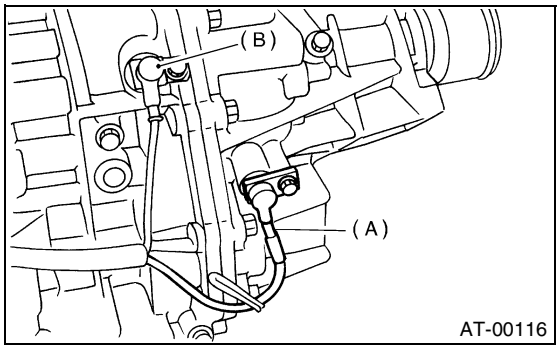
C: INSPECTION

Make sure the ring gear is not damaged and that protrusion on the edge of torque converter clutch is not deformed or otherwise damaged.

26.Extension Case

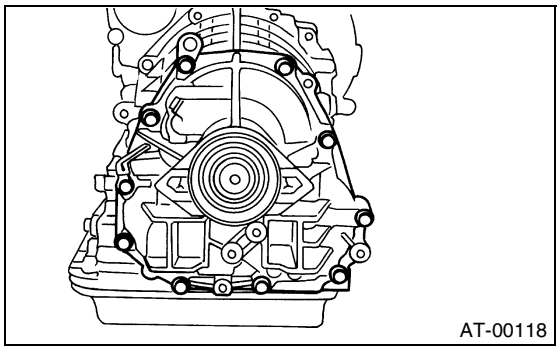
A: REMOVAL

1) Remove the transmission assembly. <Ref. to AT-38, REMOVAL, Automatic Transmission Assembly.>
2) Remove the rear vehicle speed sensor.



(A) Rear vehicle speed sensor
(B) Front vehicle speed sensor

3) Separate the transmission case and extension case sections.



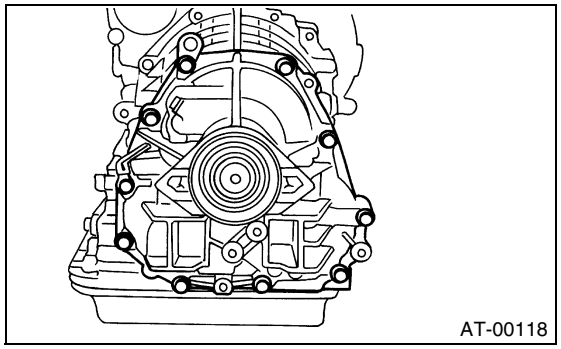
B: INSTALLATION

1) Attach the selected thrust needle bearing to the end surface of reduction drive gear with vaseline.

NOTE:
Install the thrust needle bearing in correct direction.

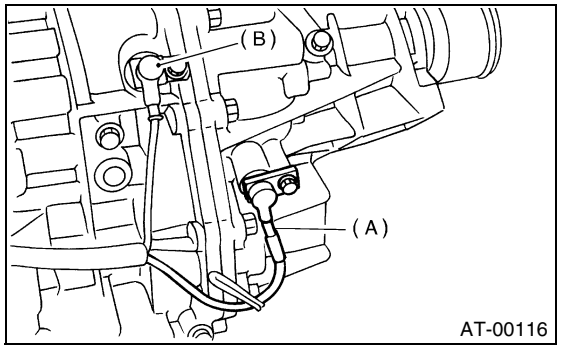
2) Install a new gasket.
3) Install the extension case to transmission case.
4) Tighten the bolts to secure extension case.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



5) Install the rear vehicle speed sensor.

Tightening torque:
7 N·m (0.7 kgf-m, 5.1 ft-lb)



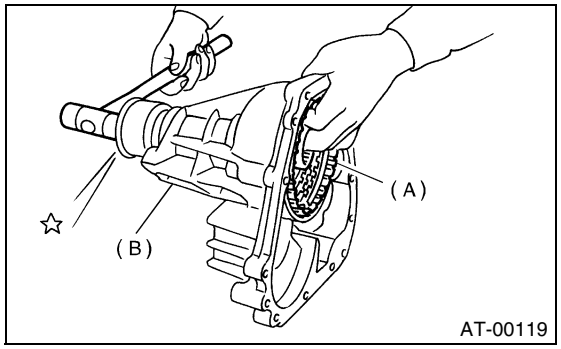
(A) Rear vehicle speed sensor
(B) Front vehicle speed sensor

6) Install the transmission assembly. <Ref. to AT-40, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

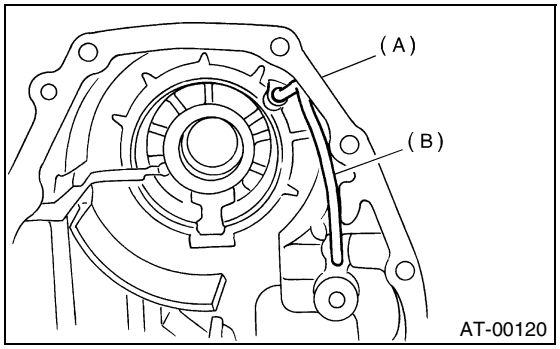
1) Take out the transfer clutch by lightly tapping the end of rear drive shaft.

NOTE:
Be careful not to damage the oil seal in extension.



(A) Extension case
(B) Transfer clutch

2) Remove the transmission clutch pipe without bending pipe.

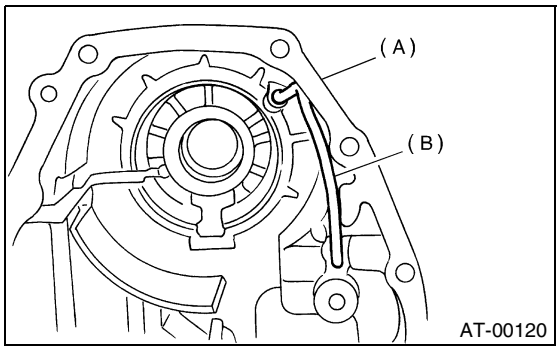


(A) Extension case
(B) Transfer clutch pipe

3) Remove the dust cover from extension case.
4) Remove the oil seal from extension case.

D: ASSEMBLY

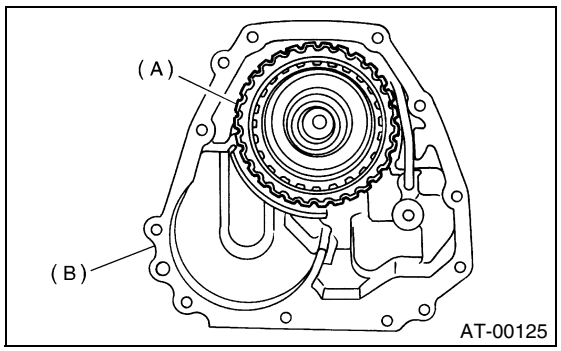
1) Using the ST and a press, press in a new oil seal.
ST 498057300 INSTALLER
2) Press in the dust cover.
3) Install the transfer clutch pipe to extension case without bending pipe.



(A) Extension case
(B) Transfer clutch pipe

4) Install the transfer clutch assembly to extension case.

NOTE:
- Be careful not to damage the seal rings.
- Insert the clutch assembly fully into position until the bearing shoulder bottoms.



(A) Transfer clutch
(B) Extension case

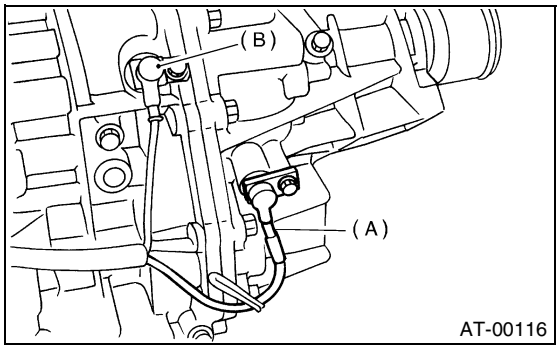
E: INSPECTION

- Use forced air to make sure the transfer pipe and extension case routes are not clogged and do not leak.
- Measure the extension end play and adjust it to within specifications. <Ref. to AT-83, ADJUSTMENT, Transfer Clutch.>

27.Transfer Clutch

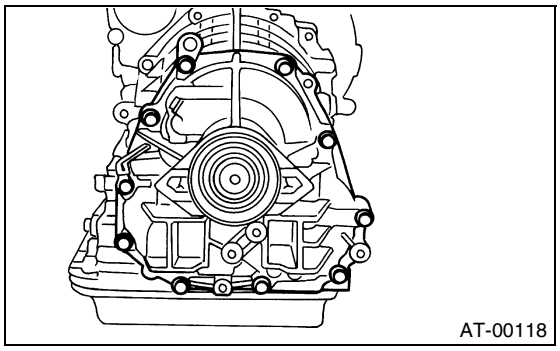
A: REMOVAL

1) Remove the transmission assembly from vehicle. <Ref. to AT-38, REMOVAL, Automatic Transmission Assembly.>
2) Remove the rear vehicle speed sensor.

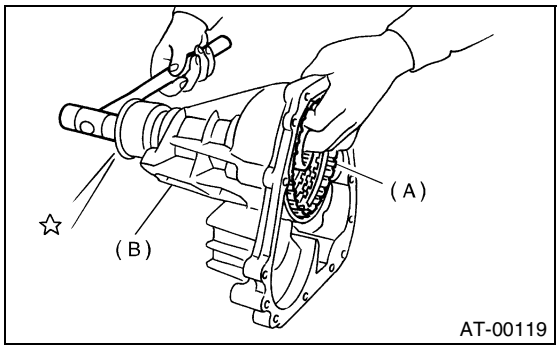


(A) Rear vehicle speed sensor
(B) Front vehicle speed sensor

3) Separate the transmission case and extension case sections.



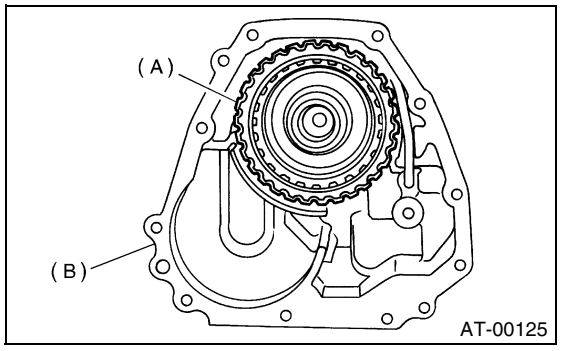
4) Take out the transfer clutch by lightly tapping the end of rear drive shaft.



(A) Transfer clutch
(B) Extension case

B: INSTALLATION

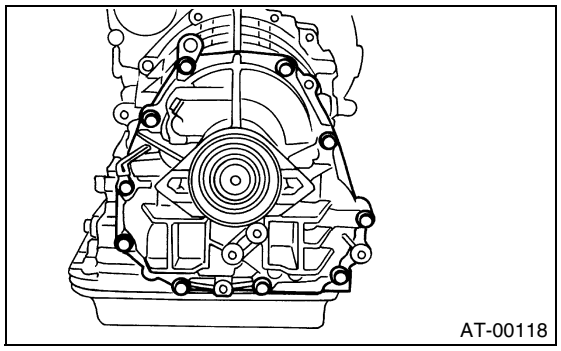
1) Select the thrust needle bearing.
2) Install the transfer clutch assembly to extension case.



(A) Transfer clutch
(B) Extension case

3) Tighten the bolts to secure extension case.

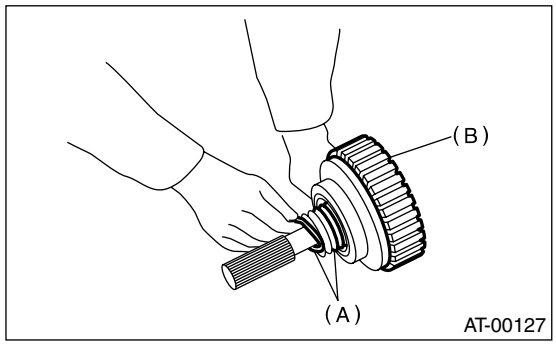
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



4) Install the transmission assembly to vehicle. <Ref. to AT-40, INSTALLATION, Automatic Transmission Assembly.>

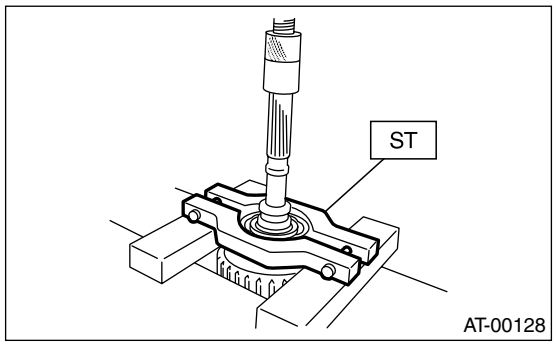
C: DISASSEMBLY

1) Remove the seal ring.

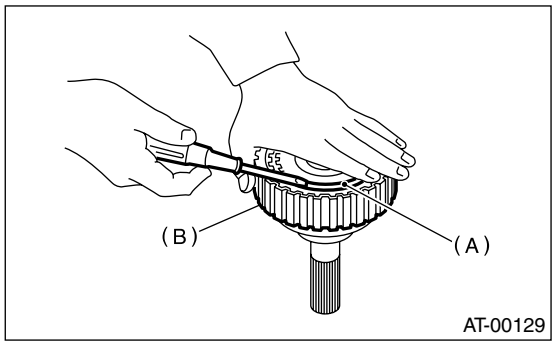


(A) Seal ring
(B) Transfer clutch

2) Using a press and ST, remove the ball bearing.
ST 498077600 REMOVER

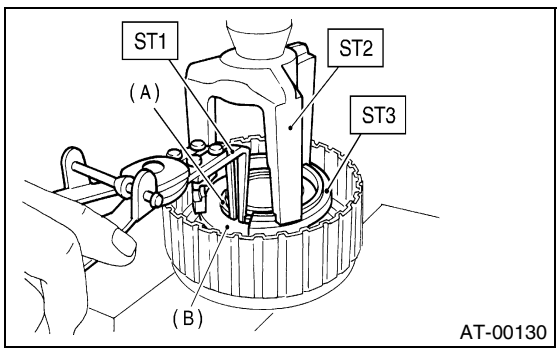


3) Remove the snap ring, and take out the pressure plate, drive plates and driven plates.



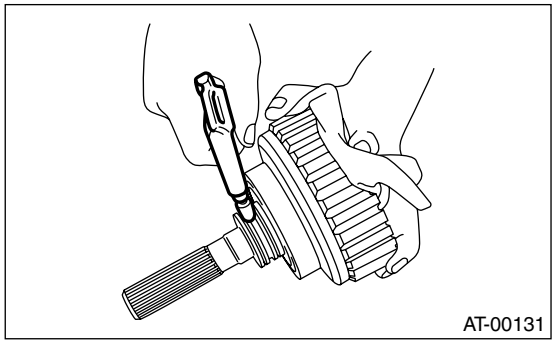
(A) Snap ring
(B) Transfer clutch

4) Remove the snap ring with ST1, ST2 and ST3, and take out the return spring and transfer clutch piston seal.
ST1 399893600 PLIERS
ST2 398673600 COMPRESSOR
ST3 398623600 SEAT



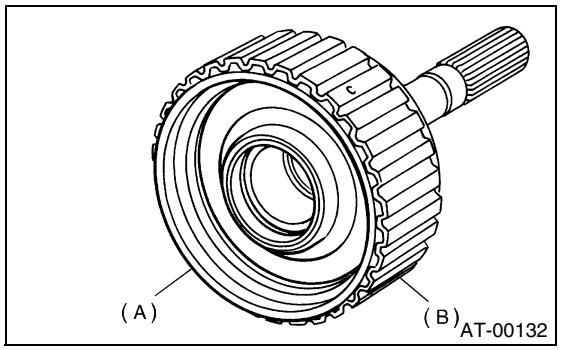
(A) Snap ring
(B) Transfer piston seal

5) Apply compressed air to rear drive shaft to remove the piston.



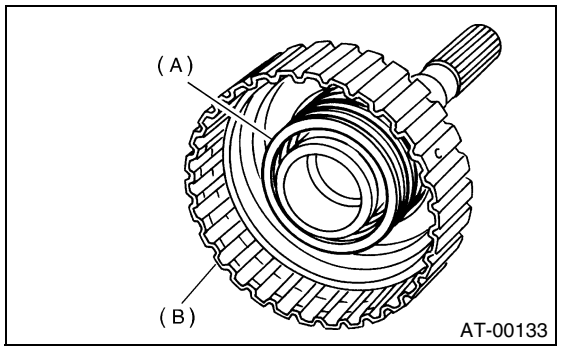
D: ASSEMBLY

1) Install the transfer clutch piston.



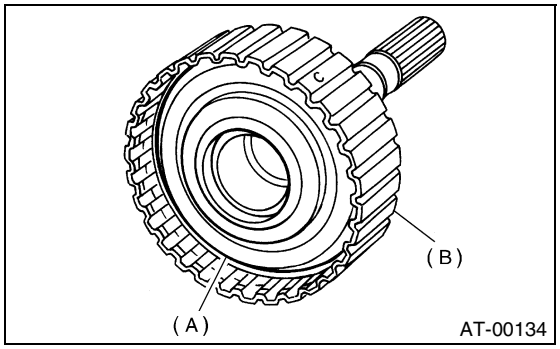
(A) Transfer clutch piston
(B) Rear drive shaft

2) Install the return spring to transfer piston.



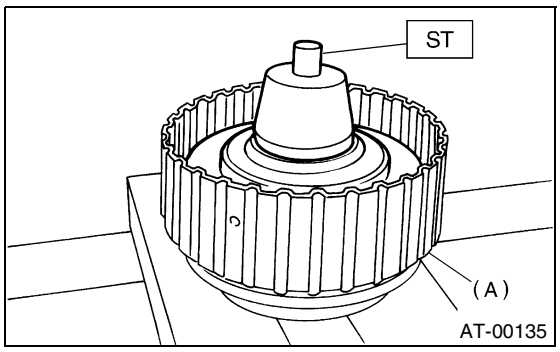
(A) Return spring
(B) Rear drive shaft

3) Install the transfer clutch piston seal.



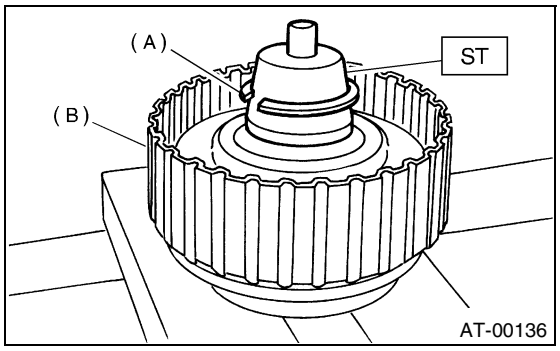
(A) Transfer clutch piston seal
(B) Rear drive shaft

4) Install the ST to rear drive shaft.
ST 499257300 SNAP RING OUTER GUIDE



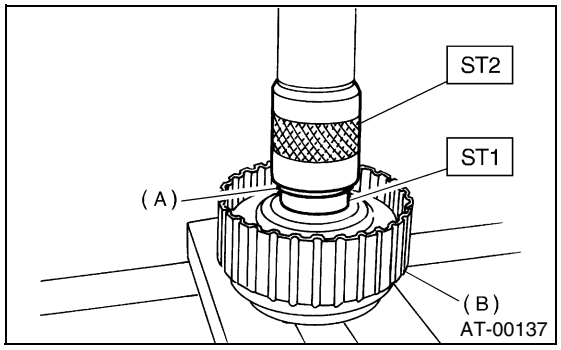
(A) Transfer clutch

5) Install the snap ring to ST.
ST 499257300 SNAP RING OUTER GUIDE



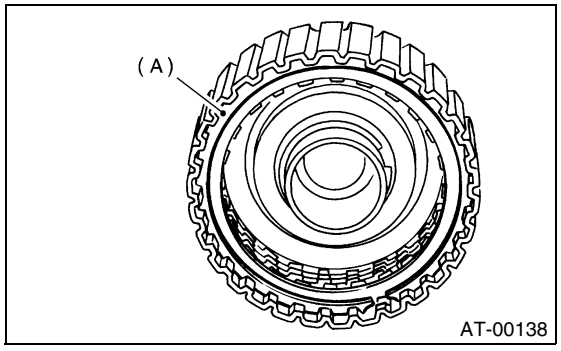
(A) Snap ring
(B) Transfer clutch

6) Using the ST1 and ST2, install the snap ring to rear drive shaft.
ST1 499257300 SNAP RING OUTER GUIDE
ST2 499247400 INSTALLER



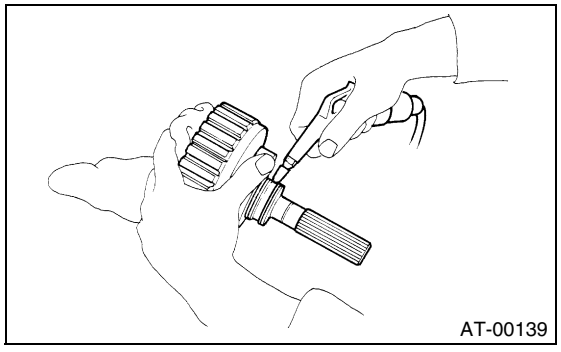
(A) Snap ring
(B) Transfer clutch

7) Install the driven plates, drive plates, pressure plate and snap ring.



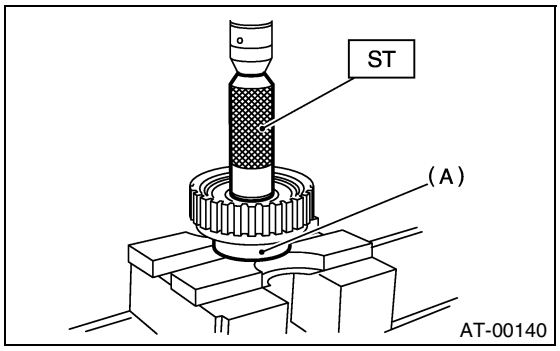
(A) Snap ring

8) Apply compressed air to see if the assembled parts move smoothly.



9) Check the clearance between snap ring and pressure plate. <Ref. to AT-82, INSPECTION, Transfer Clutch.>

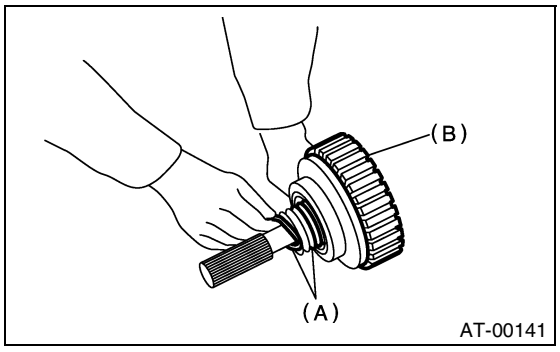
10) Press-fit a new ball bearing with ST.
ST 899580100 INSTALLER



(A) Ball bearing

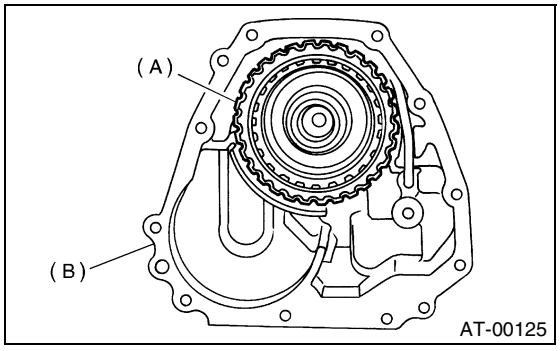
11) Coat a new seal ring with vaseline, and install it in the seal ring groove of shaft.

NOTE:
Do not expand the seal ring excessively when installing.



(A) Snap ring
(B) Transfer clutch

12) Install the transfer clutch assembly without damaging seal ring.



(A) Transfer clutch
(B) Extension case

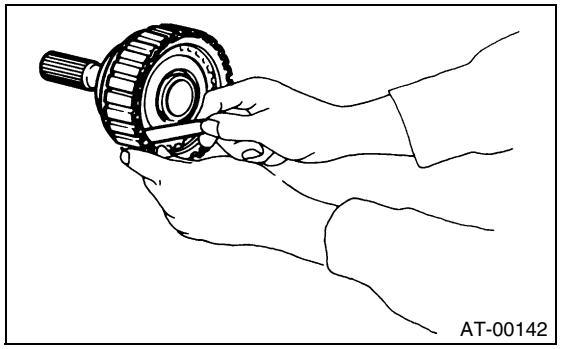
E: INSPECTION

- Check the drive plate facing for wear and damage.
- Check the snap ring for wear, the return spring for permanent set, breakage and deformation.
- Check the lathe cut ring for damage.
- Measure the extension end play and adjust it within specifications. <Ref. to AT-83, ADJUSTMENT, Transfer Clutch.>

1) Inspect the clearance between snap ring and pressure plate.
2) Before measuring the clearance, place the same thickness of shim on both sides to prevent pressure plate from tilting.
3) If the clearance is not within specification, adjust it by selecting a suitable pressure plate on the transfer clutch piston side.

Standard value:
0.7 — 1.1 mm (0.028 — 0.043 in)

Allowable limit:
1.6 mm (0.063 in)

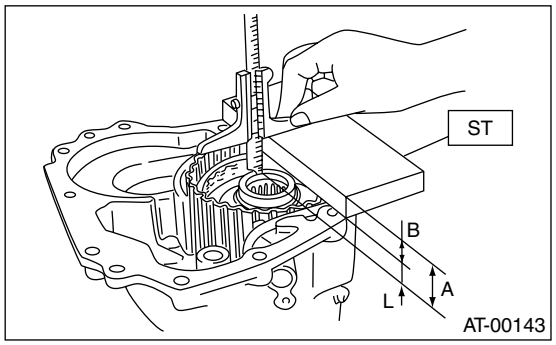


Available pressure plates	
Part No.	Thickness mm (in)
31593AA151	3.3 (0.130)
31593AA161	3.7 (0.146)
31593AA171	4.1 (0.161)
31593AA181	4.5 (0.177)

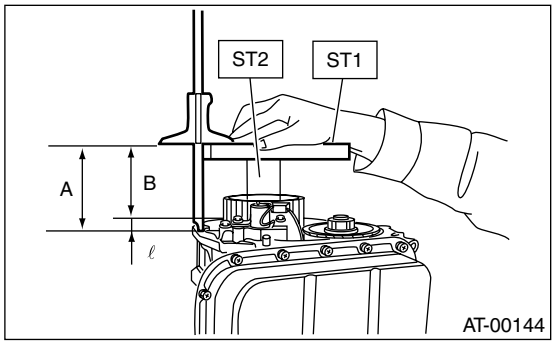
4) Check if the tight corner braking does not occur when the vehicle is started with steering wheel held at fully turned position. If the tight corner braking occurs, perform the following procedures.
(1) With the steering wheel held at fully turned position, drive the vehicle in “D” range and with vehicle speed at approx. 5 km/h (3 mph) in both clockwise and counterclockwise directions for approx. ten times each, while repeating acceleration and braking intermittently.
(2) If the tight corner braking still persists, drive the vehicle again in a circle for several laps.

F: ADJUSTMENT

1) Measure the distance “L” from end of extension case and rear drive shaft with ST.
ST 398643600 GAUGE
L = Measured value − 15 mm
(L = Measured value − 0.59 in)



A: Measured value
B: ST thickness [15 mm (0.59 in)]
L: Distance from the end of extension case to end of rear drive shaft
2) Measure the distance “ ℓ ” from the transmission case mating surface to the reduction drive gear end surface with ST1 and ST2.
ℓ = Measured value − 50 mm
(ℓ = Measured value − 1.97 in)
ST1 398643600 GAUGE
ST2 499577000 GAUGE



A: Measured value
B: ST thickness [50 mm (1.97 in)]
ℓ : Distance from the end of transmission case to end of reduction drive gear
3) Calculation equation:

NOTE:
Calculate “H”:
When the clearance is at 0.05 mm (0.0020 in) and 0.25 mm (0.0098 in), then select a suitable thrust needle bearing from the table.

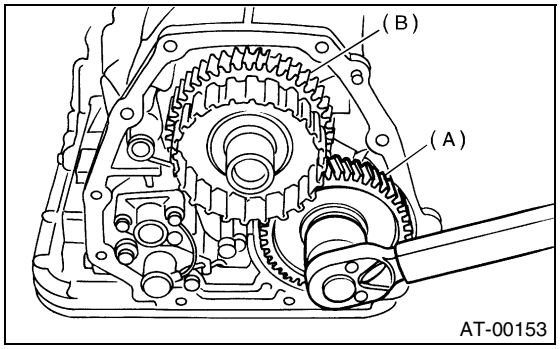
H = (L + 0.45 mm) − ℓ − T
[H = (L + 0.0177 in) − ℓ − T]
T: Thrust needle bearing thickness
L: Distance from the end of extension case to end of rear drive shaft
0.45 mm (0.0177 in): Gasket thickness
ℓ : Distance from the end of transmission case to end of reduction drive gear
H: Shim clearance
0.05 — 0.25 mm (0.0020 — 0.0098 in)
Example:
When, L = 18.60 mm (0.7323 in), ℓ = 15.05 mm (0.5925 in)
Calculation when the clearance is 0.05 mm (0.0020 in)
H = (18.60 + 0.45) − 15.05 − 0.05 = 3.95
[H = (0.7323 + 0.0177) − 0.5925 − 0.0020 = 0.1555]
Calculation when the clearance is 0.25 mm (0.0098 in)
H = (18.60 + 0.45) − 15.05 − 0.25 = 3.75
[H = (0.7323 + 0.0177) − 0.5925 − 0.0098 = 0.1476]
After calculation, the value of “H” becomes between 3.75 and 3.95, therefore select the bearing thickness of 3.8.

Thrust needle bearing	
Part No.	Thickness mm (in)
806536020	3.8 (0.150)
806535030	4.0 (0.157)
806535040	4.2 (0.165)
806535050	4.4 (0.173)
806535060	4.6 (0.181)
806535070	4.8 (0.189)
806535090	5.0 (0.197)

28.Reduction Driven Gear

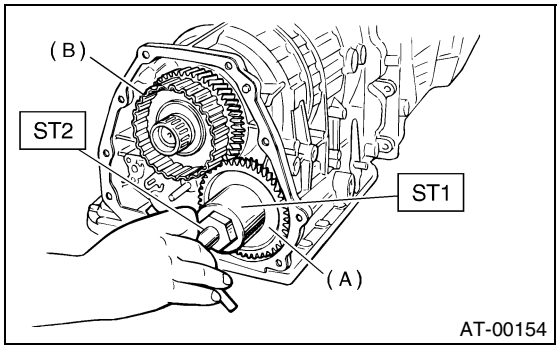
A: REMOVAL

1) Remove the transmission assembly from vehicle. <Ref. to AT-38, REMOVAL, Automatic Transmission Assembly.>
2) Remove the rear vehicle speed sensor, and separate the transmission case and extension case. <Ref. to AT-77, REMOVAL, Extension Case.>
3) Set the select lever to “P” range.
4) Straighten the staked portion, and remove the lock nut.



(A) Reduction driven gear
(B) Reduction drive gear

5) Using the ST1 and ST2, extract the reduction driven gear.
ST1 499737000 PULLER
ST2 899524100 PULLER SET

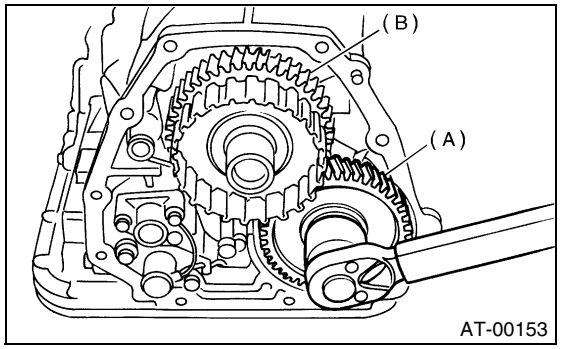


(A) Reduction driven gear
(B) Reduction drive gear

B: INSTALLATION

1) Set the select lever to “P” range.
2) Using a plastic hammer, install the reduction driven gear assembly and new washer, and tighten a new drive pinion lock nut.

Tightening torque:
100 N·m (10.2 kgf-m, 73.8 ft-lb)

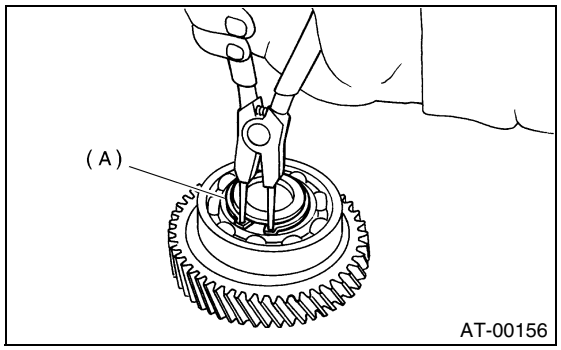


(A) Reduction driven gear
(B) Reduction drive gear

3) After tightening, stake the lock nut securely.
4) Combine the transmission case with extension case, and install the rear vehicle speed sensor. <Ref. to AT-77, Installation.>
5) Install the transmission assembly to vehicle. <Ref. to AT-40, INSTALLATION, Automatic Transmission Assembly.>

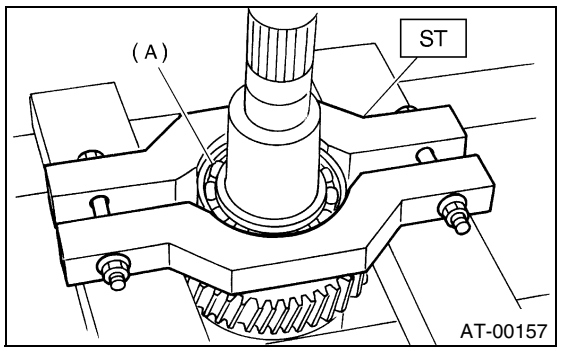
C: DISASSEMBLY

1) Remove the snap ring from reduction driven gear.



(A) Snap ring

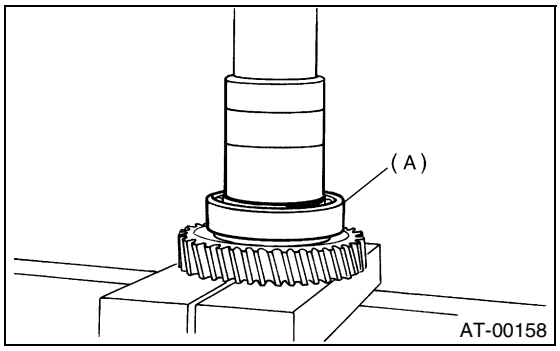
2) Using the ST, remove the ball bearing from reduction driven gear.
ST 498077600 REMOVER



(A) Ball bearing

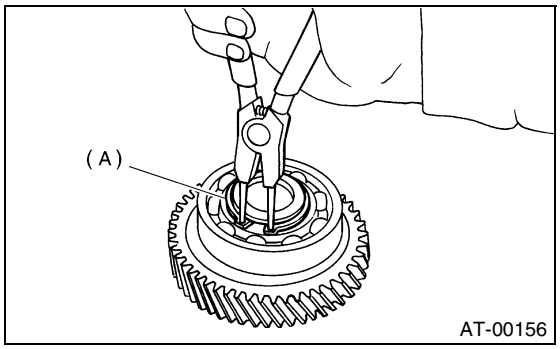
D: ASSEMBLY

1) Using a press, install a new ball bearing to reduction driven gear.



(A) Ball bearing

2) Install the snap ring to reduction driven gear.



(A) Snap ring

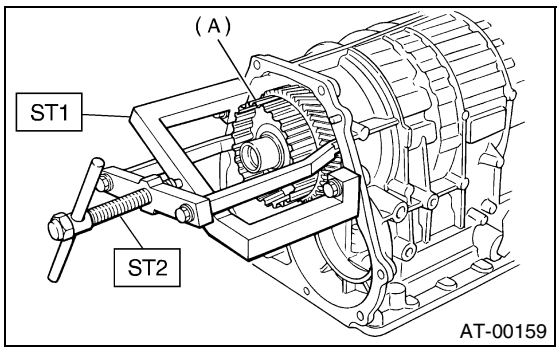
E: INSPECTION

Check the ball bearing and gear for dents or damage.

29.Reduction Drive Gear

A: REMOVAL

1) Remove the transmission assembly from vehicle. <Ref. to AT-38, REMOVAL, Automatic Transmission Assembly.>
2) Remove the rear vehicle speed sensor, and separate the transmission case and extension case. <Ref. to AT-77, REMOVAL, Extension Case.>
3) Remove the reduction driven gear. <Ref. to AT-84, REMOVAL, Reduction Driven Gear.>
4) Using ST, extract the reduction drive gear.
ST1 499737100 PULLER
ST2 899524100 PULLER SET

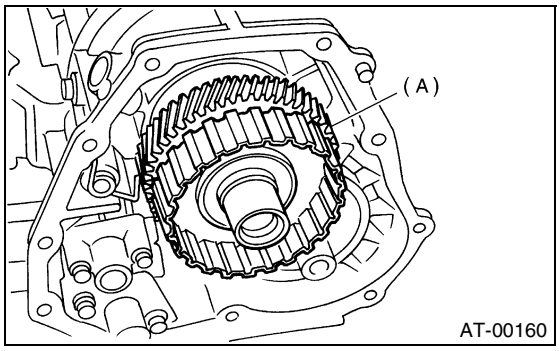


(A) Reduction drive gear

B: INSTALLATION

1) Install the reduction drive gear assembly.

NOTE:
Insert it fully into position until the bearing shoulder bottoms.

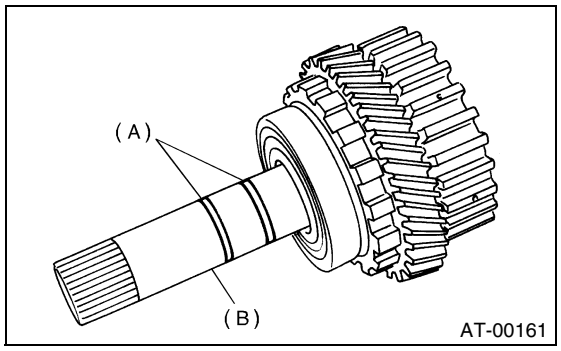


(A) Reduction drive gear

2) Install the reduction driven gear. <Ref. to AT-84, INSTALLATION, Reduction Driven Gear.>
3) Combine the transmission case with extension case, and install the rear vehicle speed sensor. <Ref. to AT-77, Installation.>
4) Install the transmission assembly to vehicle. <Ref. to AT-40, INSTALLATION, Automatic Transmission Assembly.>

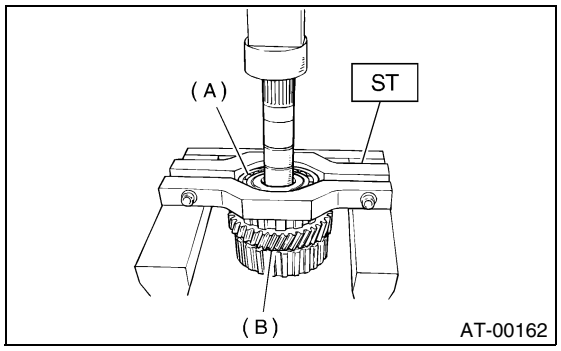
C: DISASSEMBLY

1) Take out the seal rings.



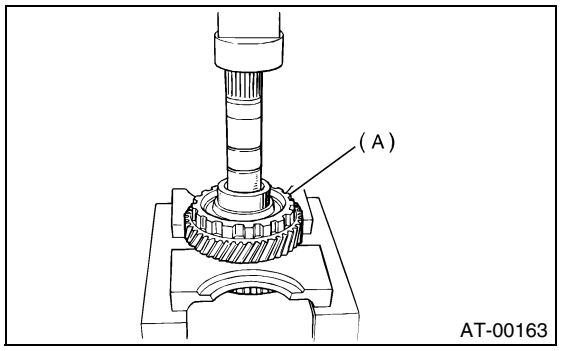
(A) Seal rings
(B) Reduction drive shaft

2) Using the ST, remove the ball bearing.
ST 498077600 REMOVER



(A) Ball bearing
(B) Reduction drive gear

3) Using a press, remove the reduction drive gear.

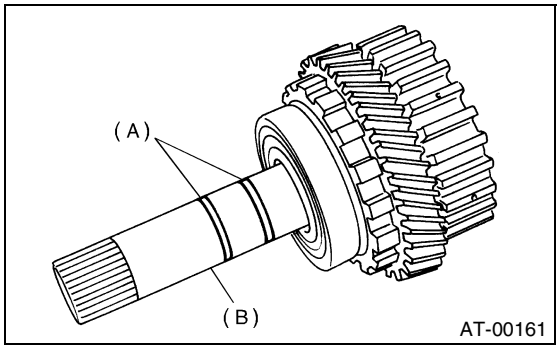


(A) Reduction drive gear

D: ASSEMBLY

1) Press-fit the reduction drive gear to shaft.
2) Press-fit the a new ball bearing to reduction drive gear.
3) Apply vaseline to the outer surface of seal ring and shaft groove.

4) Attach new seal rings.



(A) Seal rings
(B) Reduction drive shaft

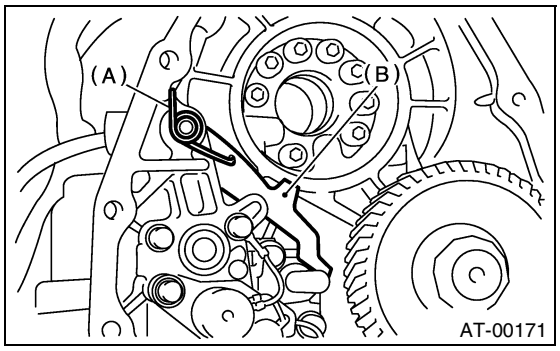
E: INSPECTION

- Rotate the bearing by hand, make sure it rotates smoothly.
- Make sure that each component is free of harmful gouges, cuts, or dust.
- Measure the extension end play and adjust it to within specifications.<Ref. to AT-83, ADJUSTMENT, Transfer Clutch.>

30.Parking Pawl

A: REMOVAL

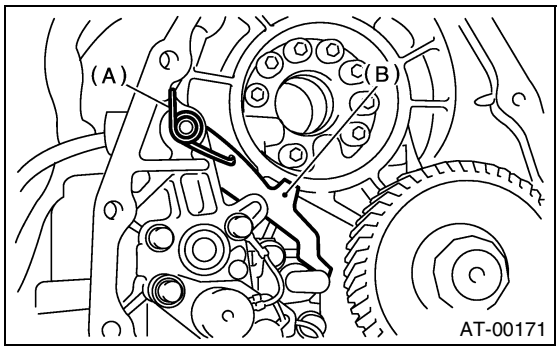
1) Remove the transmission assembly from vehicle. <Ref. to AT-38, REMOVAL, Automatic Transmission Assembly.>
2) Remove the rear vehicle speed sensor and separate the transmission case and extension case sections. <Ref. to AT-77, REMOVAL, Extension Case.>
3) Remove the reduction drive gear. <Ref. to AT-86, REMOVAL, Reduction Drive Gear.>
4) Remove the parking pawl, return spring and shaft.



(A) Return spring
(B) Parking pawl

B: INSTALLATION

1) Install the parking pawl, shaft and return spring.



(A) Return spring
(B) Parking pawl

2) Install the reduction drive gear. <Ref. to AT-86, INSTALLATION, Reduction Drive Gear.>
3) Install the rear vehicle speed sensor and extension case. <Ref. to AT-77, INSTALLATION, Extension Case.>
4) Install the transmission assembly to vehicle. <Ref. to AT-40, INSTALLATION, Automatic Transmission Assembly.>

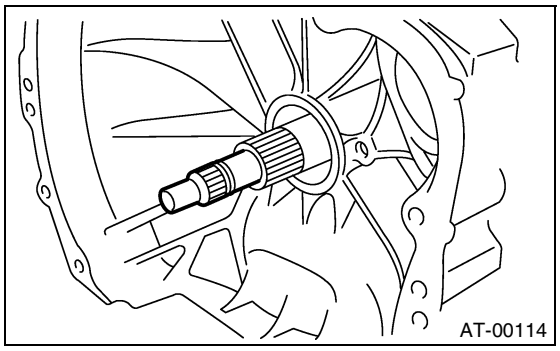
C: INSPECTION

Make sure that the tab of packing pole on the reduction gear is not worn or otherwise damaged.

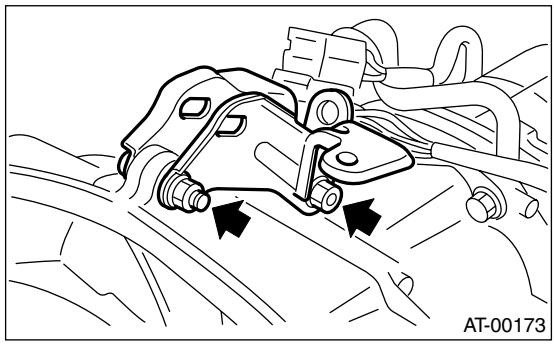
31.Torque Converter Clutch Case

A: REMOVAL

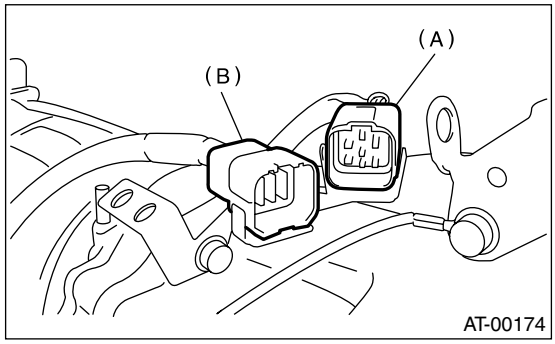
1) Remove the transmission assembly from vehicle. <Ref. to AT-38, REMOVAL, Automatic Transmission Assembly.>
2) Extract the torque converter clutch assembly. <Ref. to AT-76, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.



4) Remove the air breather hose. <Ref. to AT-74, REMOVAL, Air Breather Hose.>
5) Remove the pitching stopper bracket.



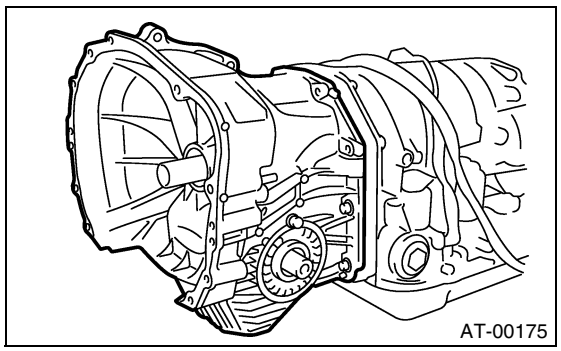
6) Lift-up the lever behind connector and disconnect it from stay.
7) Disconnect the inhibitor switch connector from stay.



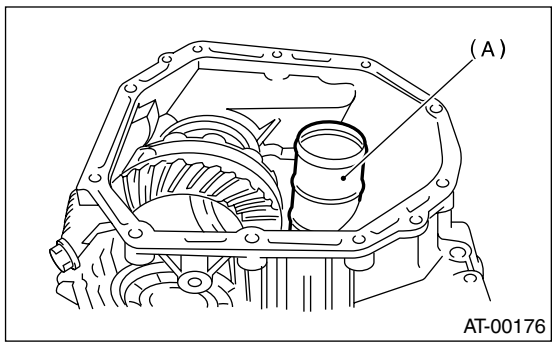
(A) Transmission harness
(B) Inhibitor switch harness

8) Remove the oil charger pipe. <Ref. to AT-75, REMOVAL, Oil Charger Pipe.>
9) Remove the oil cooler inlet and outlet pipes. <Ref. to AT-71, REMOVAL, ATF Cooler Pipe and Hose.>
10) Lightly tapping the torque converter clutch case with plastic hammer, separate the transmission case and torque converter clutch case.

NOTE:
• Be careful not to damage the oil seal and bushing inside the torque converter clutch case by oil pump cover.
• Be careful not to lose the rubber seal.



11) Remove the seal pipe if it is attached. (Reusing is not allowed.)



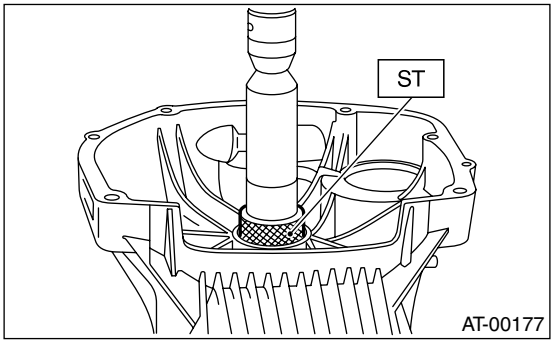
(A) Seal pipe

12) Remove the differential assembly. <Ref. to AT-103, REMOVAL, Front Differential.>
13) Remove the oil seal from torque converter clutch case.

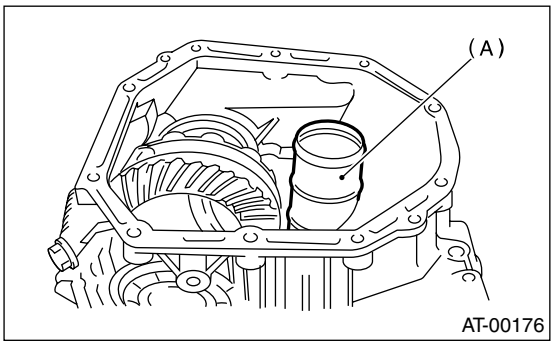
B: INSTALLATION

1) Check the appearance of each component and clean it.

2) Force-fit the oil seal to torque converter clutch case with ST.
ST 398437700 DRIFT

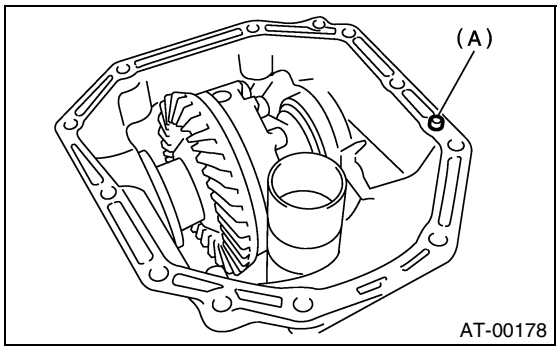


3) Install the differential assembly to torque converter clutch case. <Ref. to AT-103, INSTALLATION, Front Differential.>
4) Install the left and right side retainers. <Ref. to AT-107, ADJUSTMENT, Front Differential.>
5) Install a new seal pipe to torque converter clutch case.



(A) Seal pipe

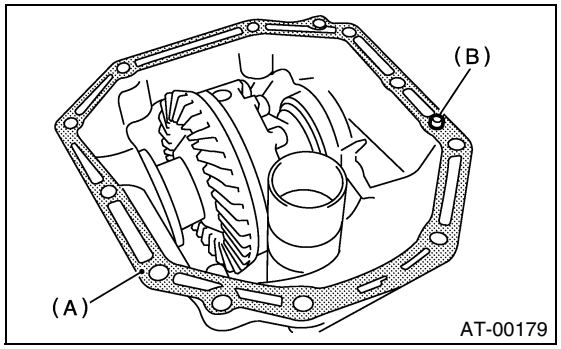
6) Install the rubber seal to torque converter clutch case.



(A) Rubber seal

7) Apply proper amount of liquid gasket to the entire torque converter clutch case mating surface.

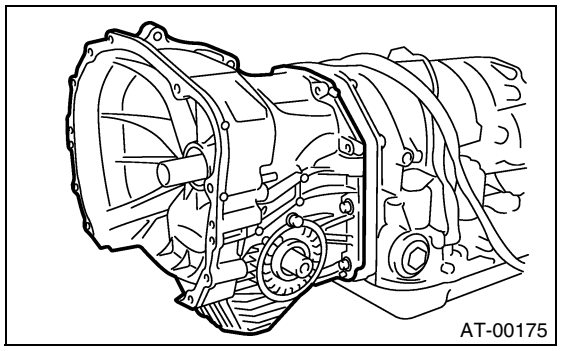
Liquid gasket:
THREE BOND 1215 (Part No. 004403007)



(A) THREE BOND 1215
(B) Rubber seal

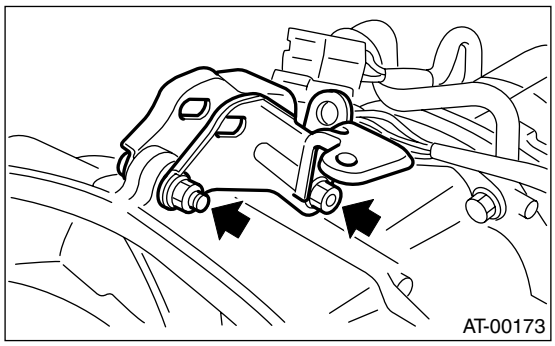
8) Install the torque converter clutch case assembly without damaging bush and oil seal and secure it with six bolts and four nuts.

Tightening torque:
41 N·m (4.2 kgf-m, 30.4 ft-lb)



9) Install the pitching stopper bracket and transmission ground cable.

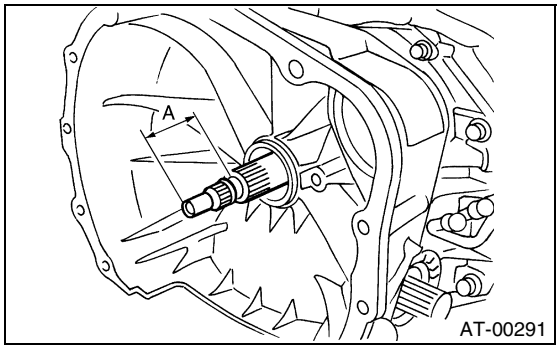
Tightening torque:
41 N·m (4.2 kgf-m, 30.4 ft-lb)



10) Insert the inhibitor switch and transmission connector into stay.
11) Install the air breather hose. <Ref. to AT-74, INSTALLATION, Air Breather Hose.>
12) Install the the oil cooler pipes. <Ref. to AT-72, INSTALLATION, ATF Cooler Pipe and Hose.>

13) Install the oil charger pipe with O-ring. <Ref. to AT-75, INSTALLATION, Oil Charger Pipe.>
14) Insert the input shaft while turning lightly by hand. At this time, not to damage the bushing.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



15) Install the torque converter clutch assembly. <Ref. to AT-76, INSTALLATION, Torque Converter Clutch Assembly.>
16) Install the transmission assembly to vehicle. <Ref. to AT-40, INSTALLATION, Automatic Transmission Assembly.>

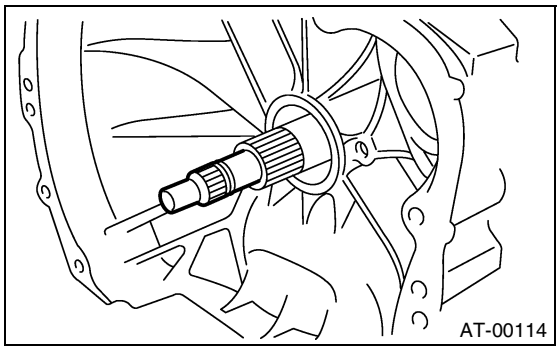
C: INSPECTION

Measure the backlash and adjust within specifications. <Ref. to AT-100, ADJUSTMENT, Drive Pinion Shaft.>

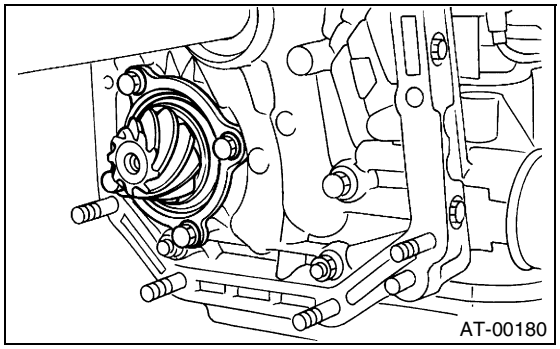
32.Oil Pump

A: REMOVAL

1) Remove the transmission assembly from vehicle. <Ref. to AT-38, REMOVAL, Automatic Transmission Assembly.>
2) Extract the torque converter clutch assembly. <Ref. to AT-76, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.

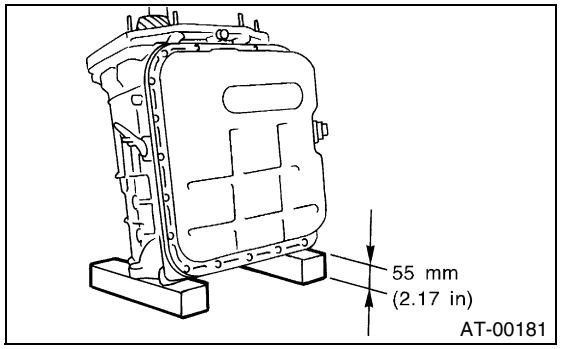


4) Lift-up the lever behind the transmission harness connector and disconnect it from stay.
5) Disconnect the inhibitor switch connector from stay.
6) Disconnect the air breather hose. <Ref. to AT-74, REMOVAL, Air Breather Hose.>
7) Remove the oil charger pipe. <Ref. to AT-75, REMOVAL, Oil Charger Pipe.>
8) Remove the oil cooler inlet and outlet pipes. <Ref. to AT-71, REMOVAL, ATF Cooler Pipe and Hose.>
9) Separate the torque converter clutch case and transmission case sections <Ref. to AT-89, REMOVAL, Torque Converter Clutch Case.>
10) Separate the transmission case and extension case sections. <Ref. to AT-77, REMOVAL, Extension Case.>
11) Remove the reduction driven gear. <Ref. to AT-84, REMOVAL, REMOVAL, Reduction Driven Gear.>
12) Loosen the taper roller bearing mounting bolts.

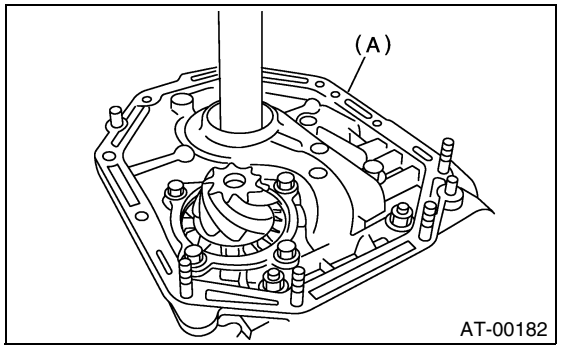


13) Place two wooden blocks on the workbench, and stand the transmission case with its rear end facing down.

NOTE:
• Be careful not to scratch the rear mating surface of transmission case.
• Note that the parking rod and drive pinion protrude from mating surface.

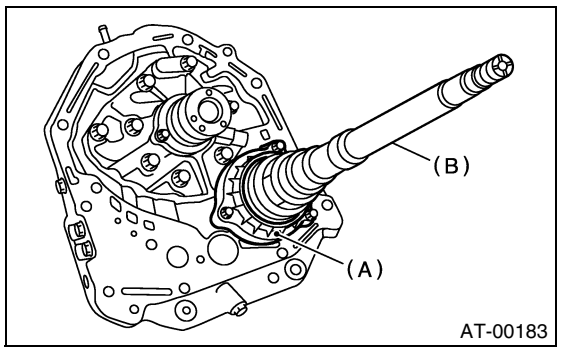


14) Remove the oil pump housing and adjusting thrust washer.



(A) Oil pump housing

15) Remove the oil seal retainer.
Also remove the O-ring and oil seal (air breather).



(A) Oil seal retainer
(B) Drive pinion shaft

16) Remove the O-rings from oil pump housing.
17) Remove the drive pinion assembly.

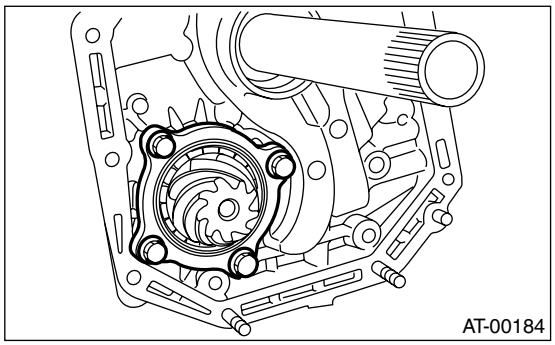
B: INSTALLATION

1) Assemble the drive pinion assembly to oil pump housing.

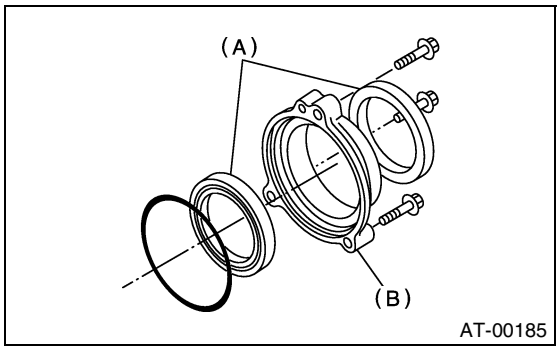
NOTE:
- Be careful not to bend the shims.
- Be careful not to force the pinion against housing bore.

2) Tighten the four bolts to secure roller bearing.

Tightening torque:
40 N·m (4.1 kgf-m, 30 ft-lb)

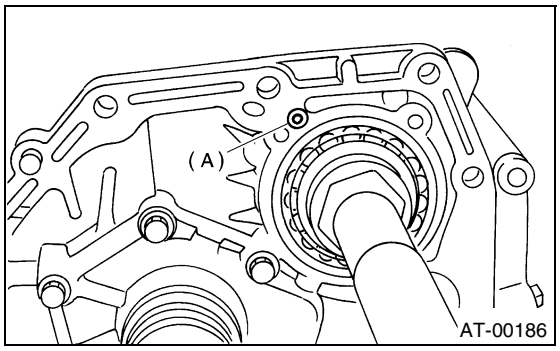


3) Paying attention to the orientation of oil seals, install two new oil seals to oil seal retainer using ST.
ST 499247300 INSTALLER



(A) Oil seal
(B) Oil seal retainer

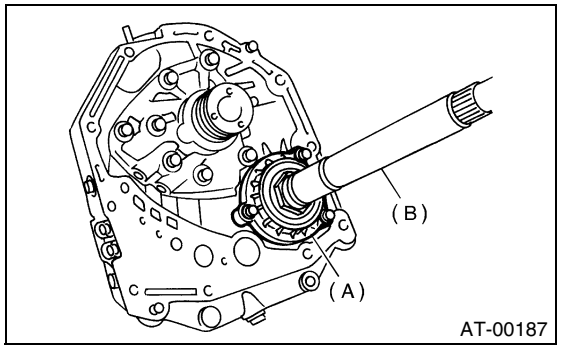
4) Attach a new O-ring to oil seal retainer with vaseline. Install the seal to oil pump housing bore.



(A) O-ring

5) Install the oil seal retainer taking care not to damage oil seal lips. Then secure it with three bolts.

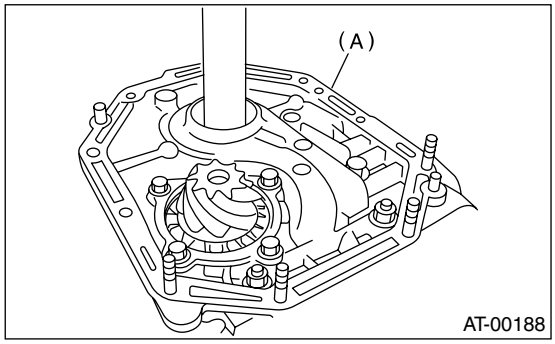
Tightening torque:
7 N·m (0.7 kgf-m, 5.1 ft-lb)



(A) Oil seal retainer
(B) Drive pinion shaft

6) Make sure the O-ring is fitted correctly in position.
7) Secure the housing with two nuts and bolt.

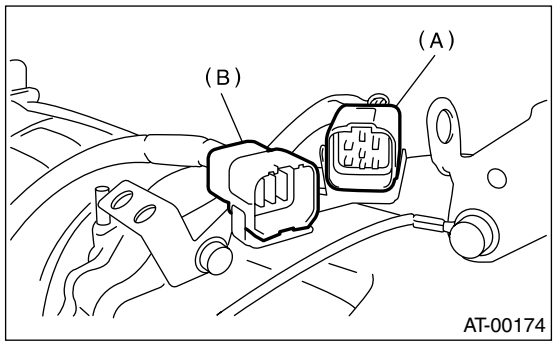
Tightening torque:
42 N·m (4.3 kgf-m, 31 ft-lb)



(A) Oil pump housing

8) Install the torque converter clutch case assembly to transmission case assembly. <Ref. to AT-76, INSTALLATION, Torque Converter Clutch Assembly.>
9) Install the reduction driven gear. <Ref. to AT-84, INSTALLATION, Reduction Driven Gear.>
10) Combine the extension case with transmission case, and install the vehicle speed sensor 1 (rear). <Ref. to AT-77, INSTALLATION, Extension Case.>

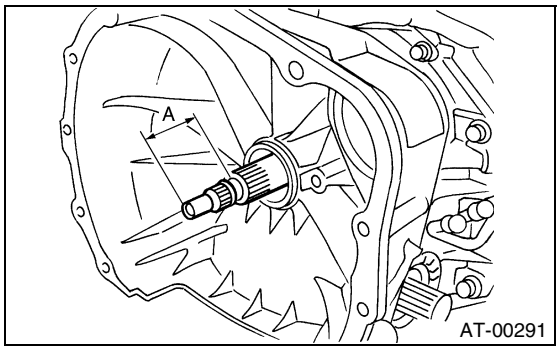
11) Insert inhibitor switch and transmission connector into stay.



(A) Transmission harness
(B) Inhibitor switch harness

12) Install the air breather hose. <Ref. to AT-74, INSTALLATION, Air Breather Hose.>
13) Install the oil cooler pipe. <Ref. to AT-72, INSTALLATION, ATF Cooler Pipe and Hose.>
14) Install the oil charger pipe with O-ring. <Ref. to AT-75, INSTALLATION, Oil Charger Pipe.>
15) Insert the input shaft while turning lightly by hand. At this time, not to damage the bushing.

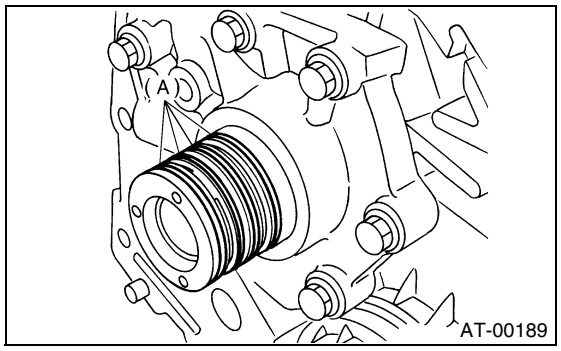
Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



16) Install the torque converter clutch assembly. <Ref. to AT-76, INSTALLATION, Torque Converter Clutch Assembly.>
17) Install the transmission assembly to vehicle. <Ref. to AT-40, INSTALLATION, Automatic Transmission Assembly.>

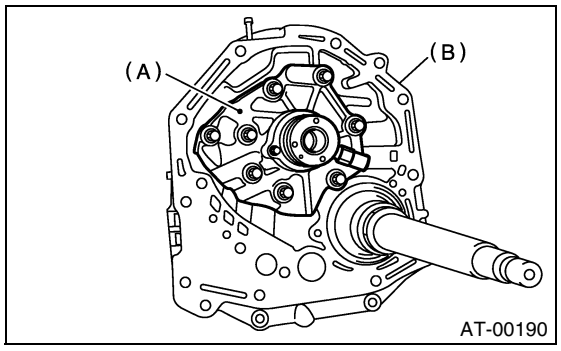
C: DISASSEMBLY

1) Remove the four seal rings.



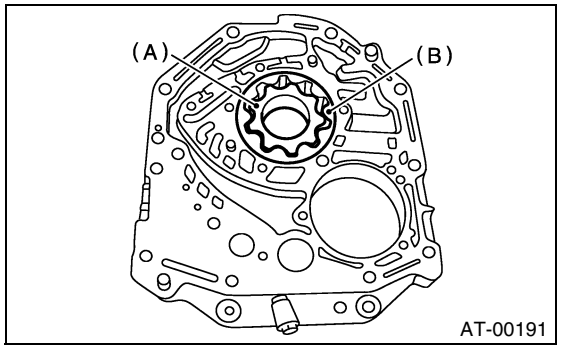
(A) Seal rings

2) Lightly tap the end of stator shaft to remove the cover.



(A) Oil pump cover
(B) Oil pump housing

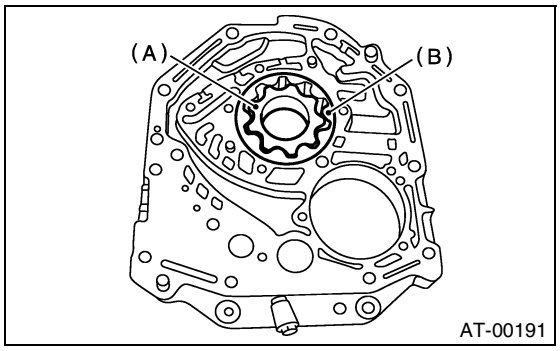
3) Remove the inner and outer rotor.



(A) Inner rotor
(B) Outer rotor

D: ASSEMBLY

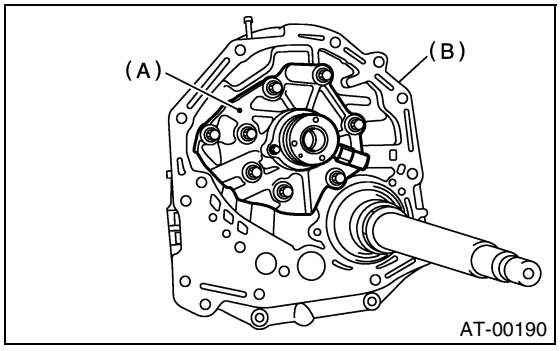
1) Install the oil pump rotor assembly to oil pump housing.



(A) Inner rotor
(B) Outer rotor

2) Align both pivots with the pivot holes of cover, and install the oil pump cover being careful not to apply undue force to pivots.

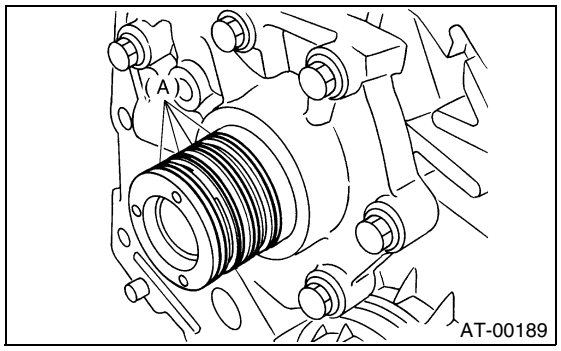
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Oil pump cover
(B) Oil pump housing

3) After assembling, turn the oil pump shaft to check for smooth rotation of rotor.

4) Install the oil seal retainer and new seal rings. After adjusting the drive pinion backlash and tooth contact. <Ref. to AT-96, ADJUSTMENT, Oil Pump.>

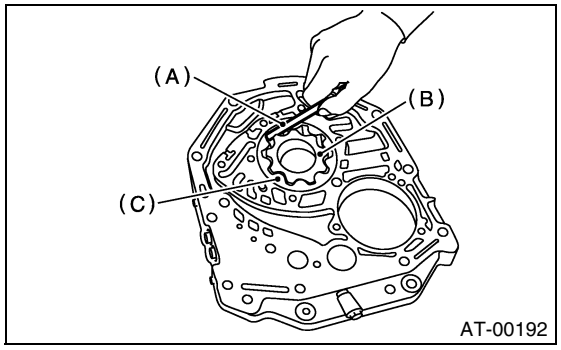


(A) Seal rings

E: INSPECTION

1) Check the seal ring and O-ring oil seal for breaks or damage.
2) Check other parts for dents or abnormalities.
3) Selection of oil pump rotor assembly
   (1) Tip clearance
   Install the inner rotor and outer rotor to oil pump. With the rotor gears facing each other, measure the crest-to-crest clearance.

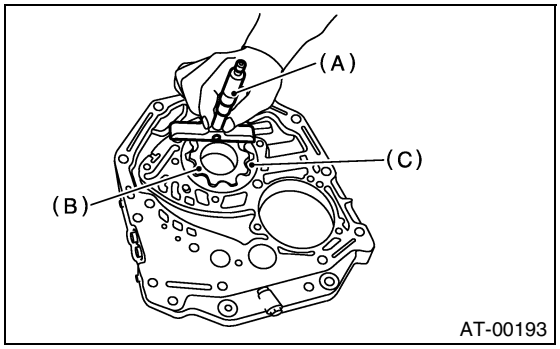
Tip clearance:
0.02 — 0.15 mm (0.0008 — 0.0059 in)



(A) Thickness gauge
(B) Inner rotor
(C) Outer rotor

(2) Side clearance
Set a depth gauge to oil pump housing, then measure oil pump housing-to-rotor clearances.

Side clearance:
0.02 — 0.04 mm (0.0008 — 0.0016 in)



(A) Depth gauge
(B) Inner rotor
(C) Outer rotor

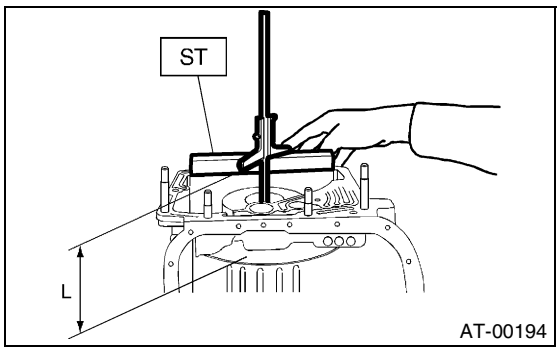
(3) If depth and/or side clearances are outside specifications, replace the rotor assembly.

Oil pump rotor assembly	
Part No.	Thickness mm (in)
15008AA060	11.37 — 11.38 (0.4476 — 0.4480)
15008AA070	11.38 — 11.39 (0.4480 — 0.4484)
15008AA080	11.39 — 11.40 (0.4484 — 0.4488)

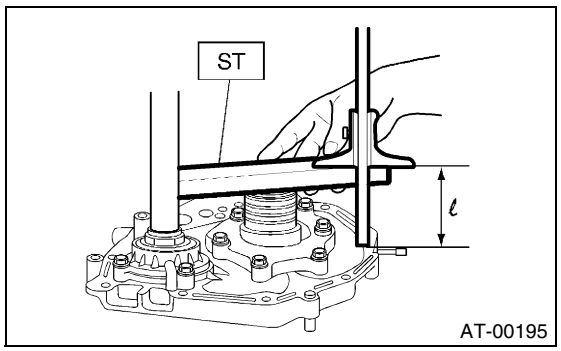
• Measure the total end play and adjust within specifications.<Ref. to AT-96, ADJUSTMENT, Oil Pump.>

F: ADJUSTMENT

1) Using the ST, measure the distance from transmission case mating surface to recessed portion of high clutch drum “L”.
ST 398643600 GAUGE

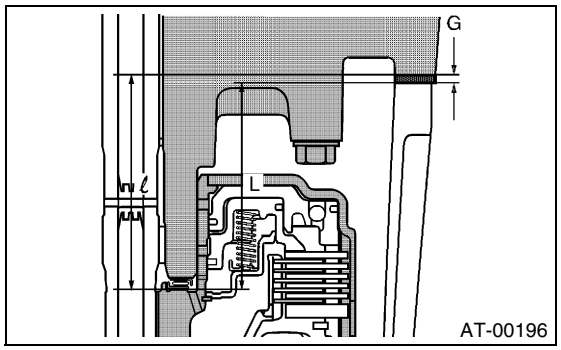


2) Using the ST, measure the distance from oil pump housing mating surface to top surface of oil pump cover with thrust needle bearing.
ST 398643600 GAUGE



3) Calculation of total end play
Select the suitable bearing race among those listed in this table so that the clearance C is in 0.25 to 0.55 mm (0.0098 to 0.0217 in) range.
$C = (L + G) - \ell$

C	Clearance between concave portion of high clutch and end of clutch drum support
L	Length from case mating surface to concave portion of high clutch
G	Gasket thickness [0.28 mm (0.0110 in)]
ℓ	Height from housing mating surface to upper surface of clutch drum support



Thrust needle bearing	
Part No.	Thickness mm (in)
806528050	4.1 (0.161)
806528060	4.3 (0.169)
806528070	4.5 (0.177)
806528080	4.7 (0.185)
806528090	4.9 (0.193)
806528100	5.1 (0.201)

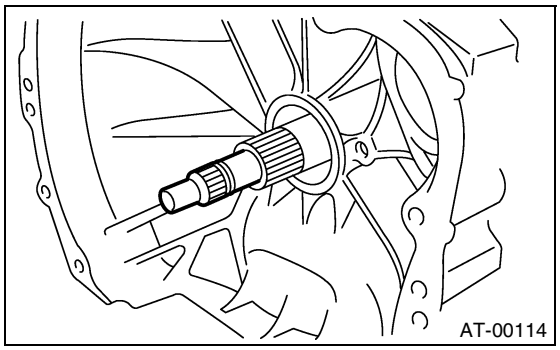
4) After completing end play adjustment, insert the bearing race in recess of high clutch. Attach the thrust needle bearing to oil pump cover with vaseline.

5) After correctly installing the new gasket to case mating surface, carefully install the oil pump housing assembly. Be careful to avoid hitting the drive pinion against inside of case.
6) Install both parts with dowel pins aligned. Make sure no clearance exists at mating surface.

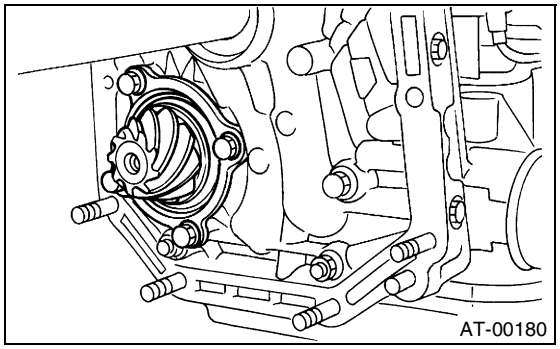
33.Drive Pinion Shaft

A: REMOVAL

1) Remove the transmission assembly from vehicle. <Ref. to AT-38, REMOVAL, Automatic Transmission Assembly.>
2) Extract the torque converter clutch assembly. <Ref. to AT-76, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.



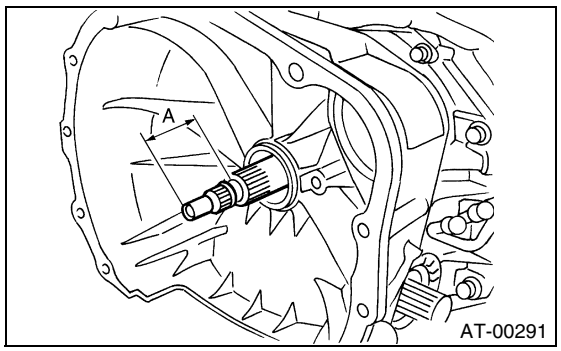
4) Lift-up the lever behind transmission harness connector and disconnect it from stay.
5) Disconnect the inhibitor switch connector from stay.
6) Disconnect the air breather hose. <Ref. to AT-74, REMOVAL, Air Breather Hose.>
7) Remove the oil charger pipe. <Ref. to AT-75, REMOVAL, Oil Charger Pipe.>
8) Remove the oil cooler inlet and outlet pipes. <Ref. to AT-71, REMOVAL, ATF Cooler Pipe and Hose.>
9) Separate the torque converter clutch case and transmission case sections <Ref. to AT-89, REMOVAL, Torque Converter Clutch Case.>
10) Separate the transmission case and extension case sections. <Ref. to AT-77, REMOVAL, Extension Case.>
11) Remove the reduction driven gear. <Ref. to AT-84, REMOVAL, Reduction Driven Gear.>
12) Separate the drive pinion shaft and oil pump housing <Ref. to AT-92, REMOVAL, Oil Pump.>



B: INSTALLATION

1) Assemble the drive pinion assembly to oil pump housing. <Ref. to AT-93, INSTALLATION, Oil Pump.>
2) Install the oil pump housing to transmission case. <Ref. to AT-93, INSTALLATION, Oil Pump.>
3) Combine the torque converter case with transmission case. <Ref. to AT-89, INSTALLATION, Torque Converter Clutch Case.>
4) Install the reduction driven gear. <Ref. to AT-84, INSTALLATION, Reduction Driven Gear.>
5) Combine the extension case with transmission case, and install the vehicle speed sensor 1 (rear). <Ref. to AT-77, INSTALLATION, Extension Case.>
6) Insert the inhibitor switch and transmission connector into stay.
7) Install the air breather hose. <Ref. to AT-74, INSTALLATION, Air Breather Hose.>
8) Install the oil cooler inlet and outlet pipes. <Ref. to AT-72, INSTALLATION, ATF Cooler Pipe and Hose.>
9) Install the oil charger pipe with O-ring. <Ref. to AT-75, INSTALLATION, Oil Charger Pipe.>
10) Insert the input shaft while turning lightly by hand. At this time, not to damage the bushing.

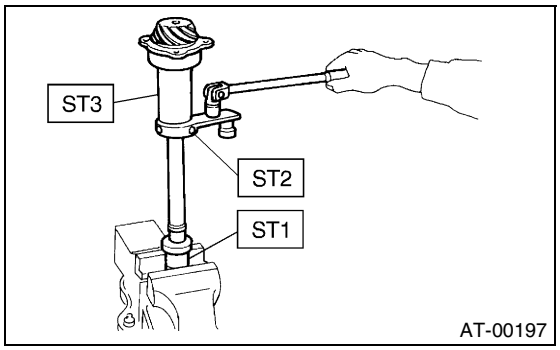
Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



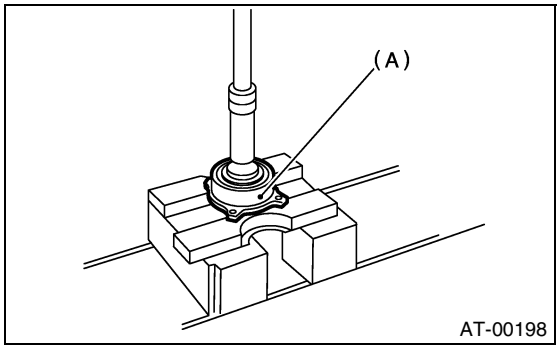
11) Install the torque converter clutch assembly. <Ref. to AT-76, INSTALLATION, Torque Converter Clutch Assembly.>
12) Install the transmission assembly to vehicle. <Ref. to AT-40, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

1) Straighten the staked portion of lock nut, and remove the lock nut while locking rear spline portion of shaft with ST1 and ST2. Then pull off the drive pinion collar.
ST1 498937110 HOLDER
ST2 499787700 WRENCH
ST3 499787500 ADAPTER

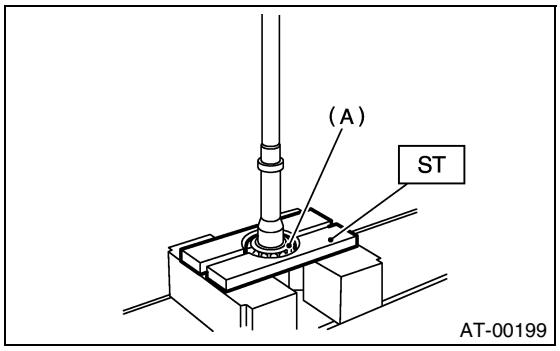


2) Remove the O-ring.
3) Using a press, separate the rear roller bearing and outer race from shaft.



(A) Outer race

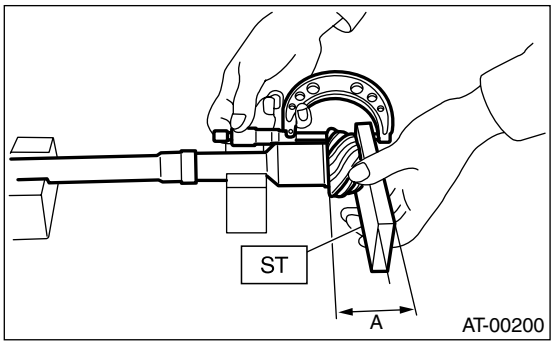
4) Using a press and ST, separate the front roller bearing from shaft.
ST 498517000 REPLACER



(A) Front roller bearing

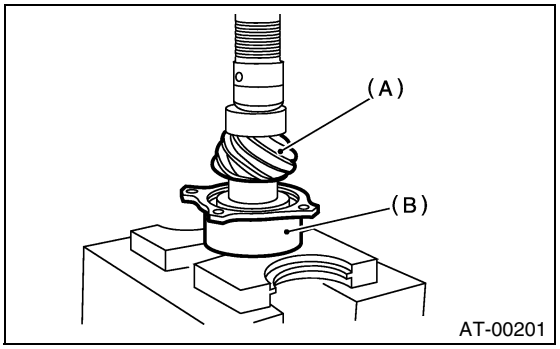
D: ASSEMBLY

1) Measure the dimension “A” of drive pinion shaft.
ST 398643600 GAUGE



2) Using a press, force-fit a new roller bearing in position.

NOTE:
If too much pressure is applied, the roller bearing will not turn easily.



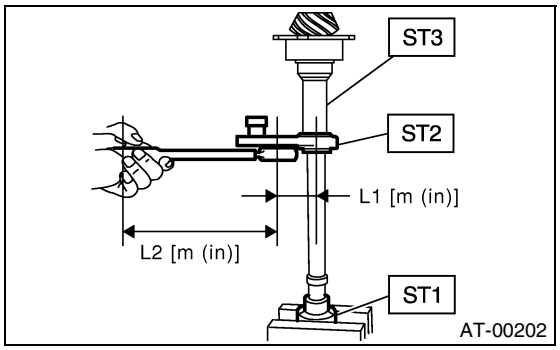
(A) Drive pinion shaft
(B) Roller bearing

3) After fitting a new O-ring to shaft, attach the drive pinion collar to shaft.
4) Install the lock washer to drive pinion shaft in proper direction.
5) Tighten a new lock nut with ST1, ST2 and ST3.
Calculate the lock washer and lock nut specifications using following formula.
$T2 = L2/(L1 + L2) \times T1$
T1: 116 N·m (11.8 kgf-m, 85.3 ft-lb)
[Required torque setting]
T2: Tightening torque
L1: ST2 length 0.072 m (2.83 in)
L2: Torque wrench length
Example:

Torque wrench length m (in)	Tightening torque N·m (kgf-m, ft-lb)
0.4 (15.75)	98 (10.0, 72)
0.45 (17.72)	100 (10.2, 73.8)
0.5 (19.69)	101 (10.3, 74.5)
0.55 (21.65)	102 (10.4, 75)

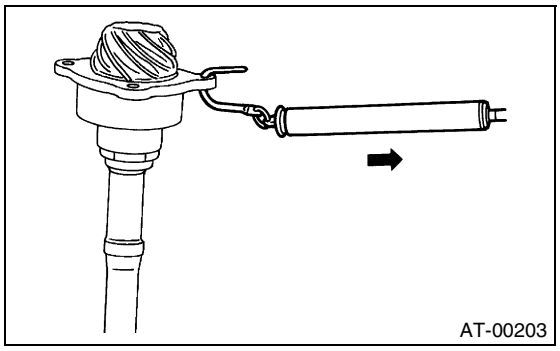
ST1 498937110 HOLDER
ST2 499787700 WRENCH
ST3 499787500 ADAPTER

NOTE:
Install the ST2 to torque wrench as straight as possible.

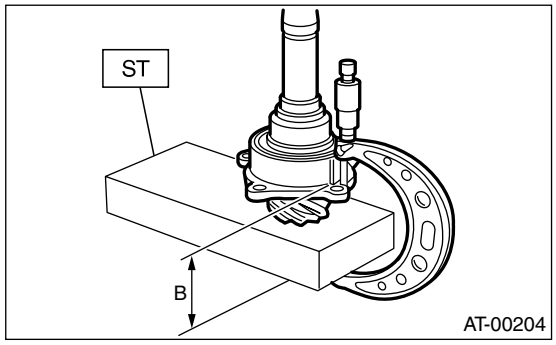


6) Measure the starting torque of bearing. Make sure the starting torque is within specified range. If out of allowable range, replace the roller bearing.

Starting torque:
7.6 — 38.1 N (0.776 — 3.88 kgf, 5.6 — 28.1 lb)



7) Stake the lock nut securely at two places.
8) Measure the dimension “B” of drive pinion shaft.
ST 398643600 GAUGE



9) The thickness “t” (mm) of drive pinion shim.

t = 6.5±0.0625 – (B – A)

10) Select three or less shims from following table.

Available drive pinion shims	
Part No.	Thickness mm (in)
31451AA050	0.150 (0.0059)
31451AA060	0.175 (0.0069)
31451AA070	0.200 (0.0079)
31451AA080	0.225 (0.0089)
31451AA090	0.250 (0.0098)
31451AA100	0.275 (0.0108)

E: INSPECTION

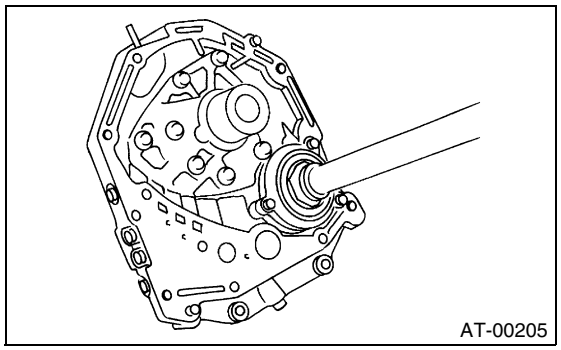
- Make sure that all component parts are free of harmful cuts, gouges and other faults.
- Adjust the teeth alignment. <Ref. to AT-100, ADJUSTMENT, Drive Pinion Shaft.>

F: ADJUSTMENT

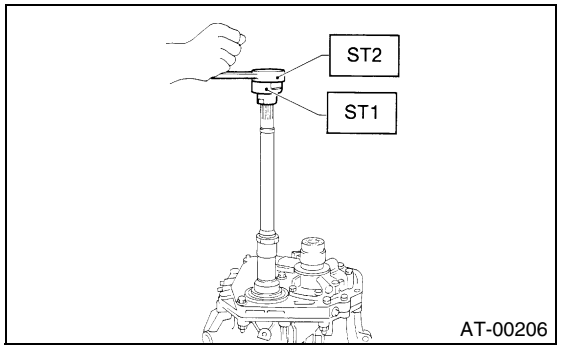
1) Thoroughly remove the liquid gasket from case mating surface beforehand.
2) Install the oil pump housing assembly to torque converter clutch case, and secure it evenly by tightening four bolts.

NOTE:
Use an old gasket or an aluminum washer so as not to damage the mating surface of housing.

Tightening torque:
41 N·m (4.2 kgf-m, 30.4 ft-lb)



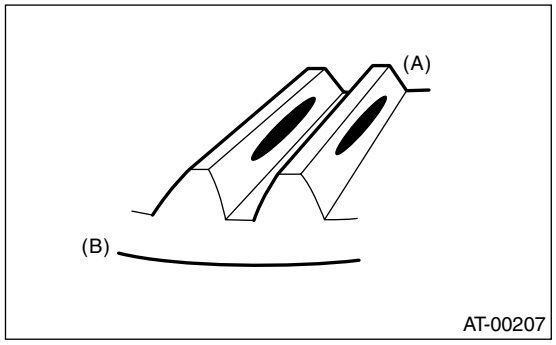
3) Rotate the drive pinion several times with ST1 and ST2.
ST1 498937110 HOLDER
ST2 499787700 WRENCH



4) Adjust the backlash between drive pinion and crown gear. <Ref. to AT-107, ADJUSTMENT, Front Differential.>
5) Apply red lead evenly to the surfaces of three or four teeth of crown gear. Rotate the drive pinion in forward and reverse directions several times. Then remove the oil pump housing, and check the tooth contact pattern.
If tooth contact is improper, readjust the backlash or shim thickness.<Ref. to AT-107, ADJUSTMENT, Front Differential.>

- Tooth contact

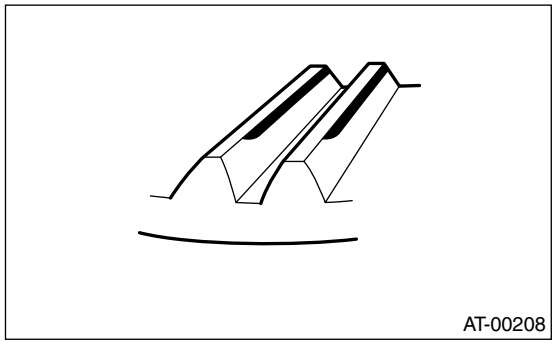
Checking item: Tooth contact pattern is slightly shifted toward toe side under no-load rotation. [When loaded, contact pattern moves toward heel.]



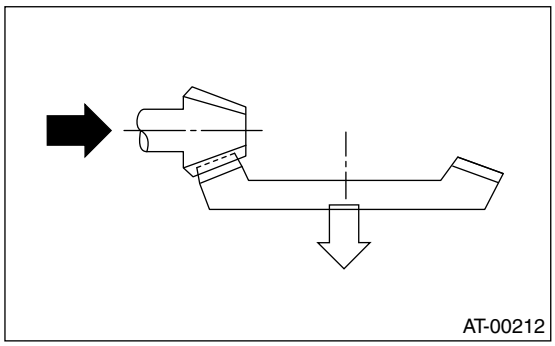
(A) Toe side
(B) Heel side

- Face contact

Checking item: Backlash is too large.
Contact pattern

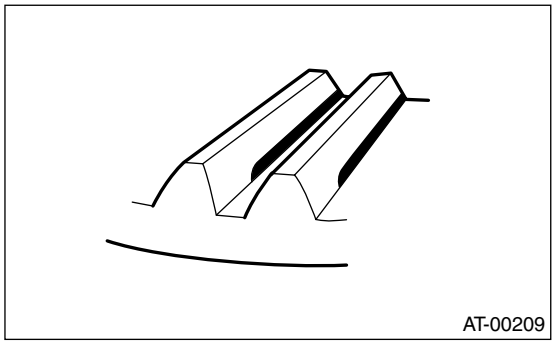


Corrective action: Increase the thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.

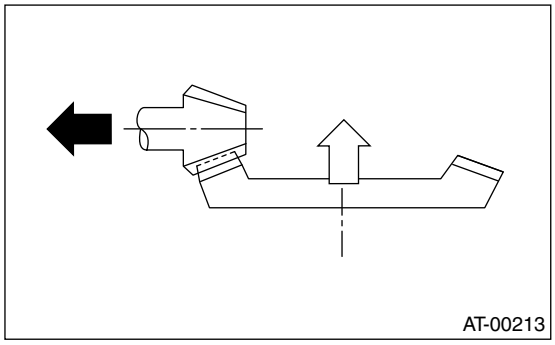


- Flank contact

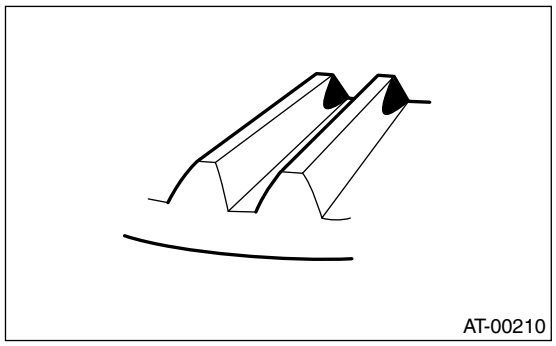
Checking item: Backlash is too small.
Contact pattern



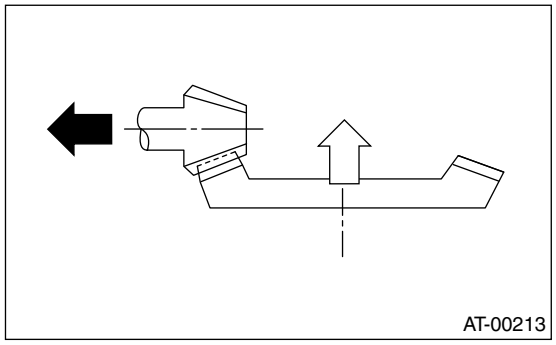
Corrective action: Reduce the thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.



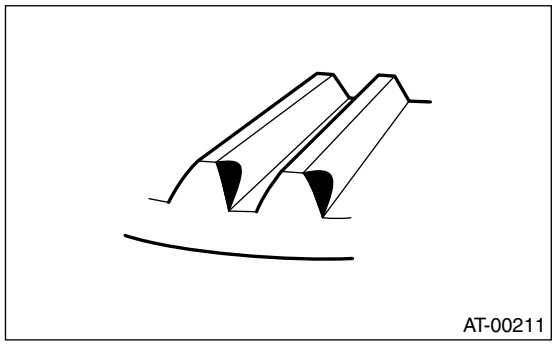
• Toe contact (Inside end contact)
Checking item: Contact areas is small.
Contact pattern



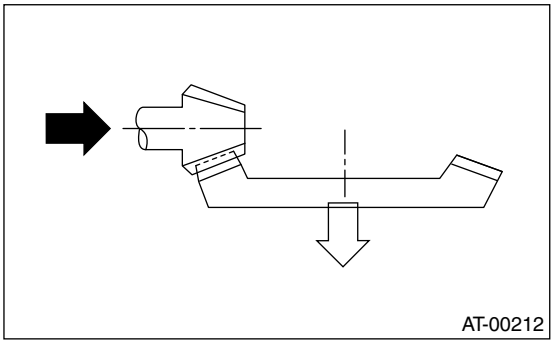
Corrective action: Increase the thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.



• Heel contact (Outside end contact)
Checking item: Contact areas is small.
Contact pattern

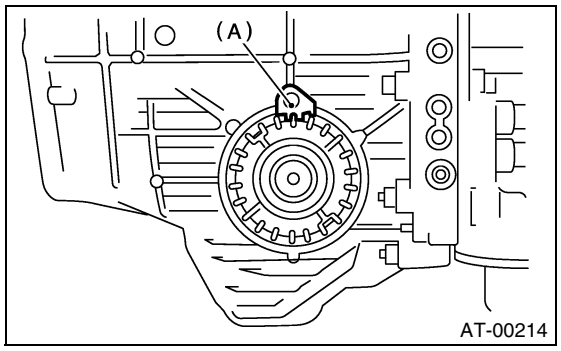


Corrective action: Reduce the thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.



6) If tooth contact is correct, mark the retainer position and loosen it. After fitting a new O-ring, screw in the retainer to marked position. Then tighten the lock plate to specified torque.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

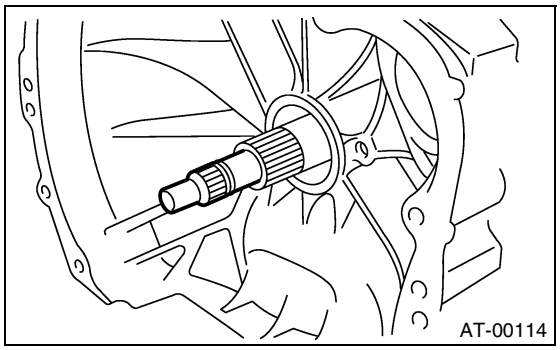


(A) Lock plate

34.Front Differential

A: REMOVAL

1) Remove the transmission assembly from vehicle. <Ref. to AT-38, REMOVAL, Automatic Transmission Assembly.>
2) Extract the torque converter clutch assembly. <Ref. to AT-76, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.



4) Disconnect the air breather hose. <Ref. to AT-74, REMOVAL, Air Breather Hose.>
5) Lift-up the lever behind transmission harness connector and disconnect it from stay.
6) Disconnect the inhibitor switch from stay.
7) Remove the oil charger pipe. <Ref. to AT-74, REMOVAL, Air Breather Hose.>
8) Remove the oil cooler inlet and outlet pipes. <Ref. to AT-71, REMOVAL, ATF Cooler Pipe and Hose.>
9) Separate the torque converter clutch case and transmission case.<Ref. to AT-89, REMOVAL, Torque Converter Clutch Case.>
10) Remove the seal pipe if it is attached.
11) Remove the differential side retainer with ST.

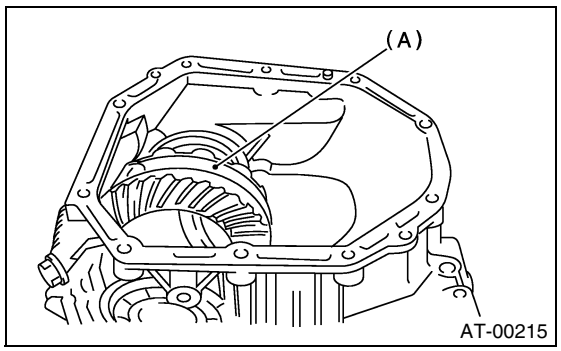
NOTE:
Hold the differential case assembly by hand to avoid damaging retainer mounting hole of torque converter clutch case.

ST 499787000 WRENCH ASSY

12) Remove the differential assembly without damaging installation part of retainer.

B: INSTALLATION

1) Install the differential assembly to case, paying special attention not to damage the inside of case (particularly, differential side retainer contact surface).



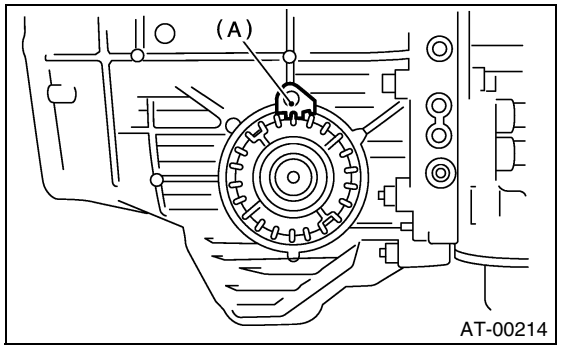
(A) Differential assembly

2) Remove the O-rings from left and right side retainer.
3) Using the ST, install the side retainers. <Ref. to AT-103, REMOVAL, Front Differential.>

ST 499787000 WRENCH ASSY

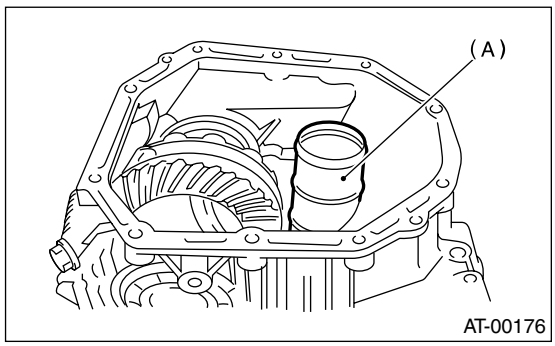
4) Install the lock plate.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



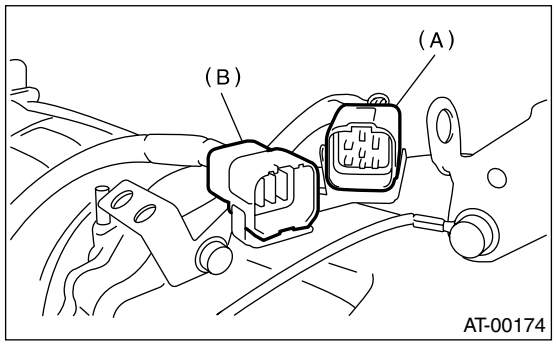
(A) Lock plate

5) Install the new seal pipe to torque converter clutch case.



(A) Seal pipe

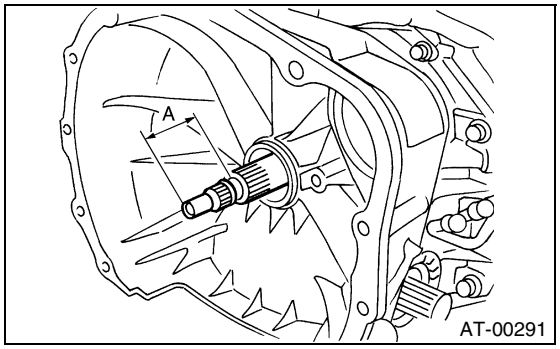
6) Install the torque converter clutch case to transmission case. <Ref. to AT-89, INSTALLATION, Torque Converter Clutch Case.>
7) Install the air breather hose.
8) Insert the inhibitor switch and transmission connector into stay.



(A) Transmission harness
(B) Inhibitor switch harness

9) Install the oil cooler pipes. <Ref. to AT-72, INSTALLATION, ATF Cooler Pipe and Hose.>
10) Install the oil charger pipe with O-ring <Ref. to AT-75, INSTALLATION, Oil Charger Pipe.>
11) Insert the input shaft while turning lightly by hand. At this time, not to damage the bushing.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)

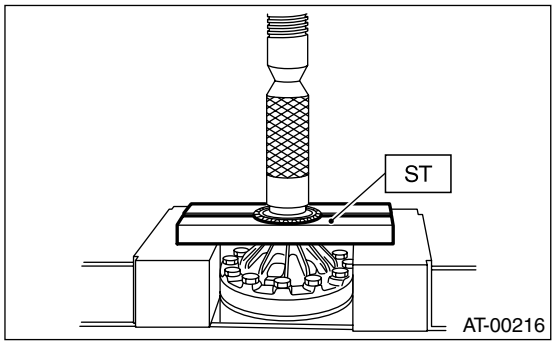


12) Install the torque converter clutch assembly. <Ref. to AT-76, INSTALLATION, Torque Converter Clutch Assembly.>
13) Install the transmission assembly to vehicle. <Ref. to AT-40, INSTALLATION, Automatic Transmission Assembly.>

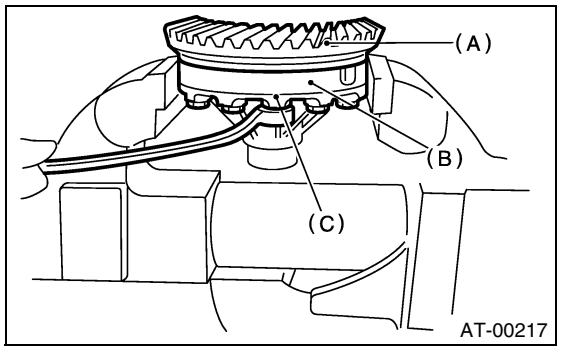
C: DISASSEMBLY

1. DIFFERENTIAL CASE ASSEMBLY

1) Using a press and ST, remove the taper roller bearing.
ST 498077000 REMOVER

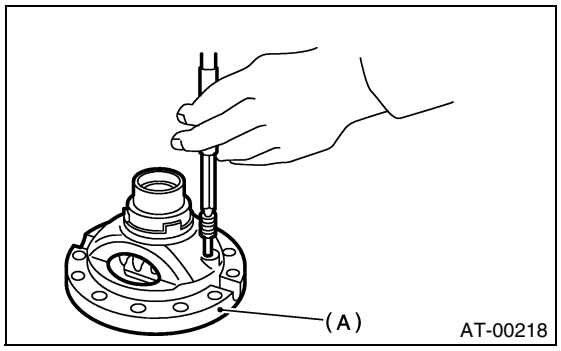


2) Secure the case in a vise and remove the crown gear tightening bolts, then separate the crown gear, case (RH) and case (LH).



(A) Crown gear
(B) Differential case (RH)
(C) Differential case (LH)

3) Pull out the straight pin and shaft, and remove the differential bevel gear, washer, and differential bevel pinion.

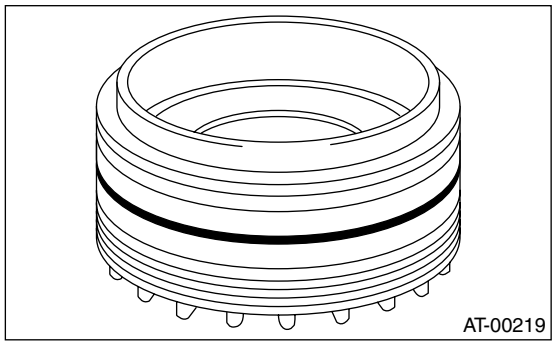


(A) Differential case (RH)

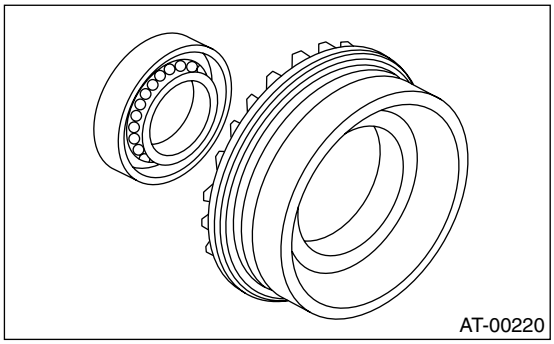
2. SIDE RETAINER

NOTE:
Remove and install the oil seal and O-ring after adjusting drive pinion backlash and tooth contact.

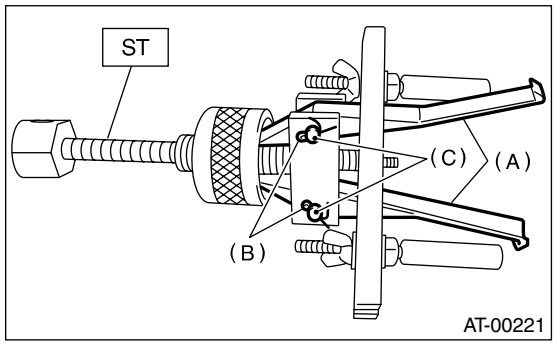
1) Remove the O-ring.



2) Remove the oil seal.

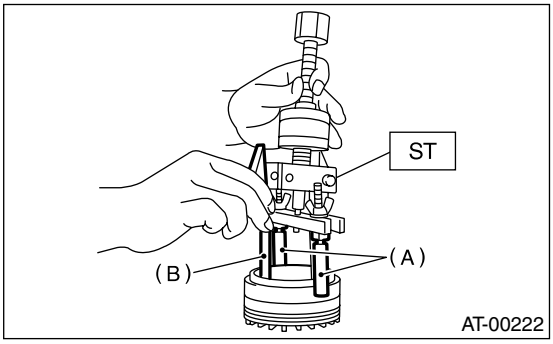


3) Take out either split pin, remove the claw.
ST 398527700 PULLER ASSY



(A) Claw
(B) Split pin
(C) Pin

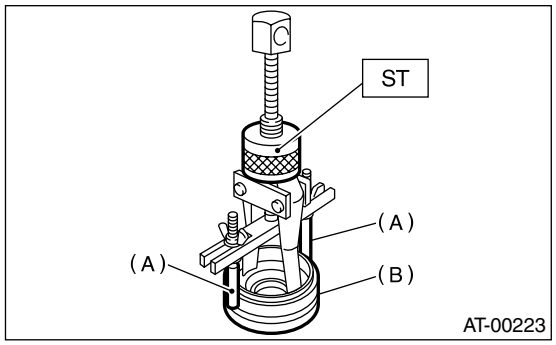
4) Securely attach the two claws to outer race, set ST to side retainer.
ST 398527700 PULLER ASSY



(A) Shaft
(B) Claw

5) Return the removed claw to original position, and install the pin and split pin.
6) Hold the shaft of ST to avoid removing from side retainer, and then remove the bearing outer race.
ST 398527700 PULLER ASSY

NOTE:
Replace the bearing inner and outer races as a single unit.



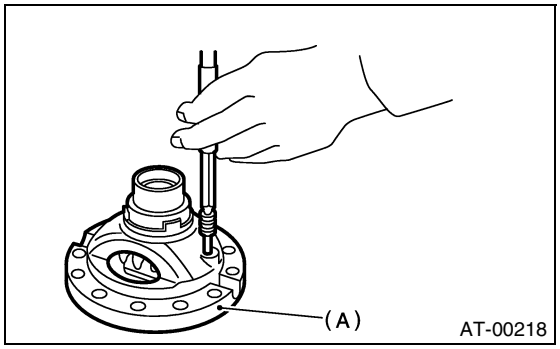
(A) Shaft
(B) Side retainer

D: ASSEMBLY

1. DIFFERENTIAL CASE ASSEMBLY

1) Install the washer, differential bevel gear and differential bevel pinion in differential case (RH). Insert pinion shaft.

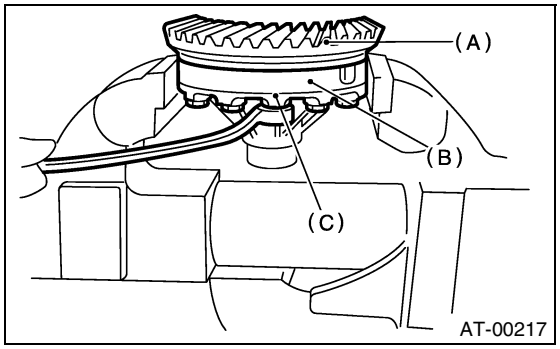
2) Install the straight pin from reverse direction.



(A) Differential case (RH)

3) Install the washer and differential bevel gear to differential case (LH). Then put the case over differential case (RH), and connect both cases.
4) Install the crown gear and secure it by tightening the bolt.

Standard tightening torque:
62 N·m (6.3 kgf-m, 45.6 ft-lb)



(A) Crown gear
(B) Differential case (RH)
(C) Differential case (LH)

5) Measurement of backlash (Selection of washer)
(1) Install the axle shaft (Subaru genuine part) to differential case.

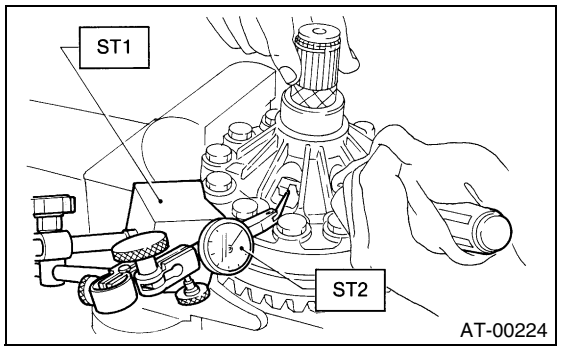
Part No. 38415AA070 AXLE SHAFT

(2) Measure the gear backlash with ST1 and ST2, and insert ST2 through the access window of case.

ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

NOTE:
• Measure the backlash by applying a pinion tooth between two bevel gear teeth.
• Fix the bevel pinion gear in place with a screwdriver or similar tool when measuring.

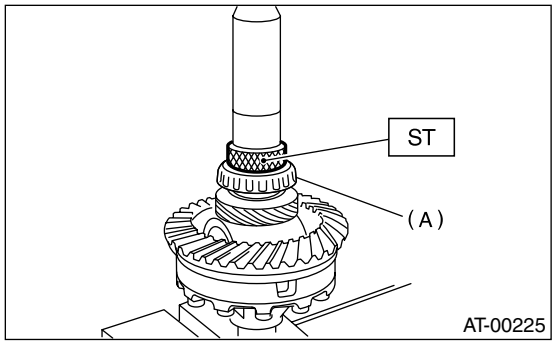
Standard value:
0.13 — 0.18 mm (0.0051 — 0.0071 in)



(3) If backlash is not as specified, select a washer from table below.

Washer	
Part No.	Thickness mm (in)
803038021	0.95 (0.037)
803038022	1.00 (0.039)
803038023	1.05 (0.041)

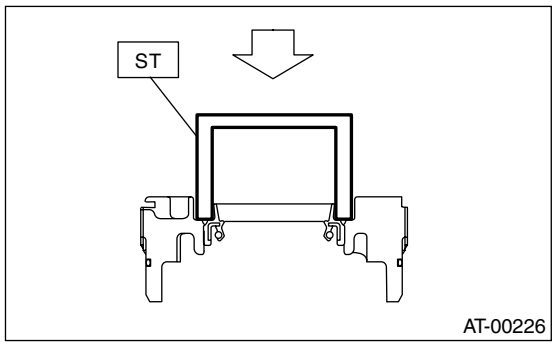
6) Using the ST, install the taper roller bearing.
ST 398437700 DRIFT



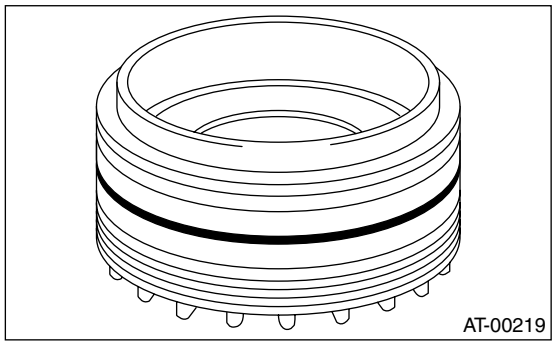
(A) Taper roller bearing

2. SIDE RETAINER

1) Install the bearing outer race to side retainer.
2) Using the ST and hammer, install a new oil seal.
ST 18675AA000 INSTALLER



3) Install a new O-ring.



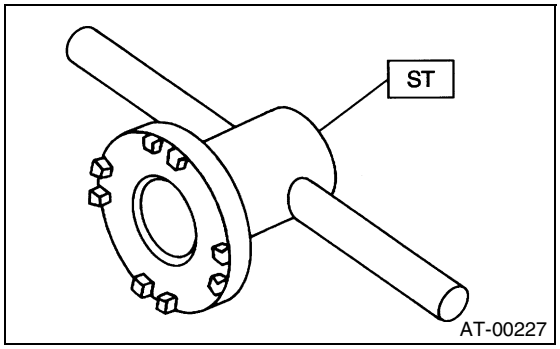
E: INSPECTION

• Check each component for harmful cuts, damage and other faults.
• Measure the backlash and adjust within specifications. <Ref. to AT-107, ADJUSTMENT, Front Differential.>

F: ADJUSTMENT

1) Using ST, screw in the retainer until light contact is felt.

NOTE:
Screw in the RH side slightly deeper than the LH side.
ST 499787000 WRENCH ASSY

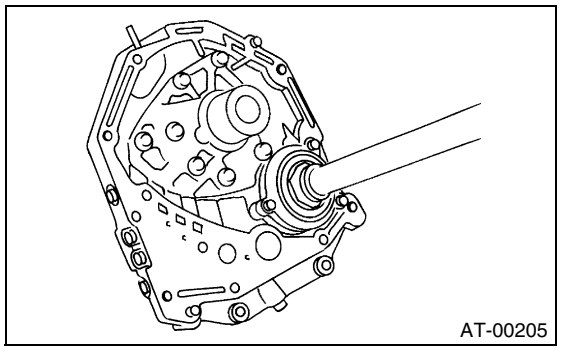


2) Remove the oil pump housing.

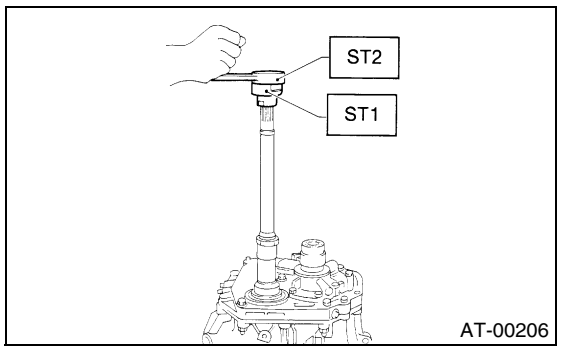
3) Thoroughly remove the liquid gasket from case mating surface beforehand.
4) Install the oil pump housing assembly to torque converter clutch case, and secure it evenly by tightening four bolts.

NOTE:
Use an old gasket or an aluminum washer so as not to damage the mating surface of housing.

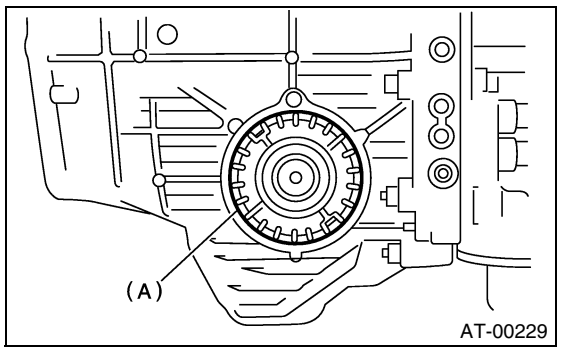
Tightening torque:
41 N·m (4.2 kgf-m, 30.4 ft-lb)



5) Rotate the drive pinion several times with ST1 and ST2.
ST1 498937110 HOLDER
ST2 499787700 WRENCH

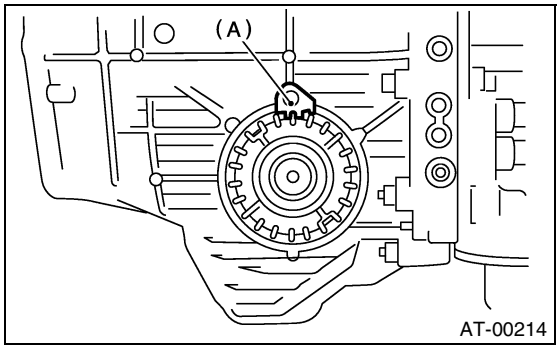


6) Tighten the LH retainer until contact is felt while rotating shaft. Then loosen the RH retainer. Keep tightening the LH retainer and loosening the RH retainer until pinion shaft can no longer be turned. This is the “zero” state.



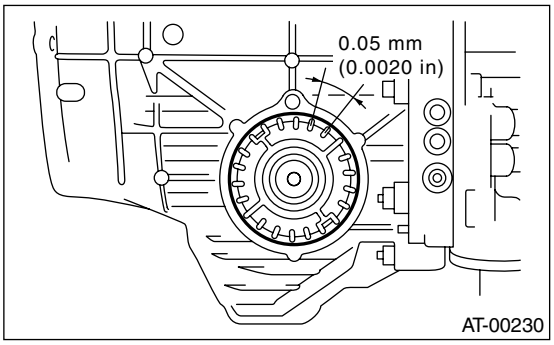
(A) Retainer

7) After the “zero” state is established, back off the LH retainer 3 notches and secure it with the lock plate. Then back off the RH retainer and retighten until it stops. Rotate the drive pinion a few times. Tighten the RH retainer 1-3/4 notches further. This sets the preload. Finally, secure the retainer with its lock plate.



(A) Lock plate

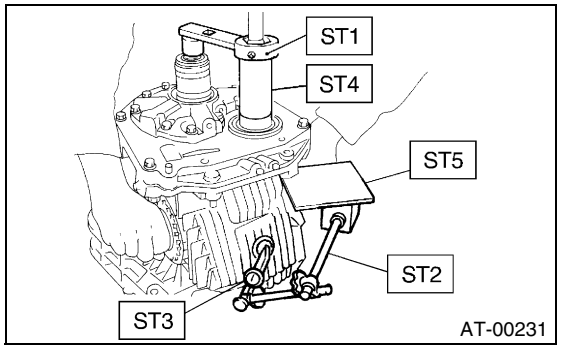
NOTE:
Turning the retainer by one tooth changes the backlash about 0.05 mm (0.0020 in).



8) Insert the axle shaft (Subaru genuine part) to both holes of side retainer.
Part No. 38415AA070 AXLE SHAFT

9) Turn the drive pinion several rotations with ST1 and check to see if the backlash is within the standard value with ST2, ST3, ST4 and ST5.
ST1 499787700 WRENCH
ST2 498247001 MAGNET BASE
ST3 498247100 DIAL GAUGE
ST4 499787500 ADAPTER
ST5 498255400 PLATE

Backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)

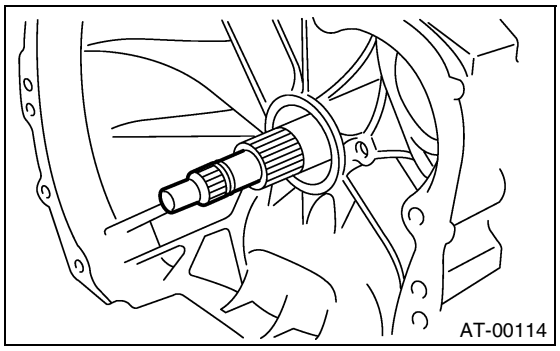


10) Adjust the tooth contact between front differential and drive shaft. <Ref. to AT-100, ADJUSTMENT, Drive Pinion Shaft.>

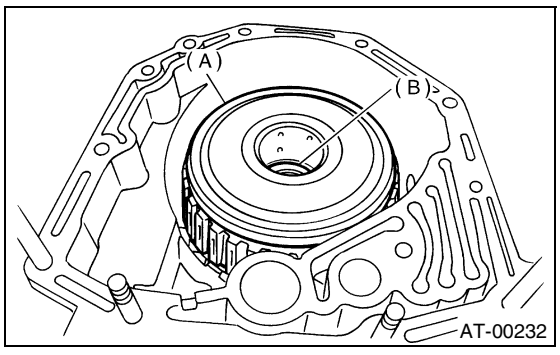
35.High Clutch and Reverse Clutch

A: REMOVAL

1) Remove the transmission assembly from vehicle. <Ref. to AT-38, REMOVAL, Automatic Transmission Assembly.>
2) Extract the torque converter clutch assembly. <Ref. to AT-76, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.

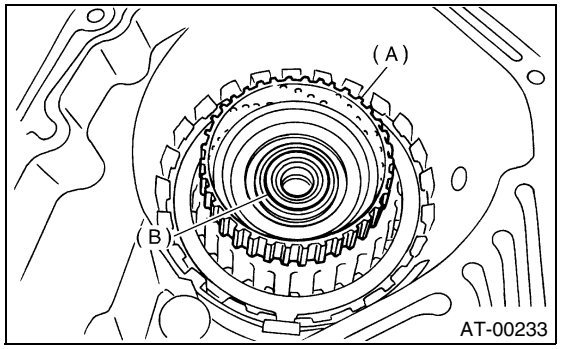


4) Lift-up the lever behind transmission harness connector and disconnect it from stay.
5) Disconnect the inhibitor switch connector from stay.
6) Disconnect the air breather hose.
7) Remove the oil charger pipe. <Ref. to AT-75, REMOVAL, Oil Charger Pipe.>
8) Remove the oil cooler inlet and outlet pipes. <Ref. to AT-71, REMOVAL, ATF Cooler Pipe and Hose.>
9) Separate the torque converter clutch case and transmission case. <Ref. to AT-89, REMOVAL, Torque Converter Clutch Case.>
10) Remove the oil pump housing.
<Ref. to AT-92, REMOVAL, Oil Pump.>
11) Take out the high clutch, thrust needle bearing and reverse clutch assembly.



(A) High clutch and reverse clutch assembly
(B) Thrust needle bearing

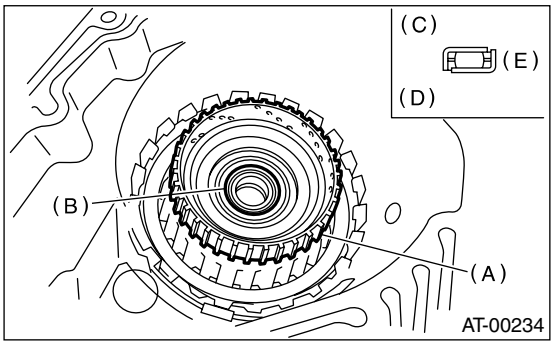
12) Take out the high clutch hub and thrust bearing.



(A) High clutch hub
(B) Thrust needle bearing

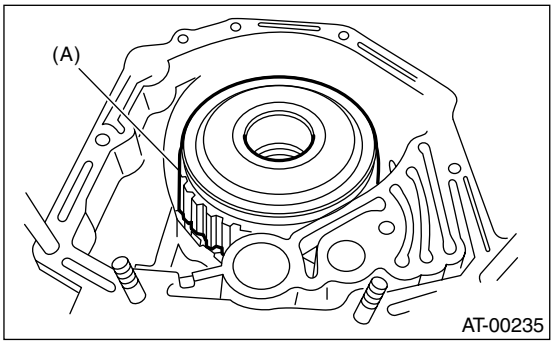
B: INSTALLATION

1) Apply the vaseline to thrust needle bearing.
2) Install the high clutch hub and thrust needle bearing.
Attach the thrust needle bearing to hub with vaseline and install the hub by correctly engaging the splines of front planetary carrier.



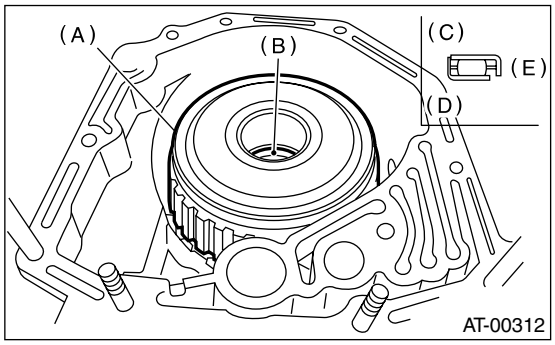
(A) High clutch hub
(B) Thrust needle bearing
(C) Upside
(D) Downside
(E) Outside

3) Install the high clutch assembly.



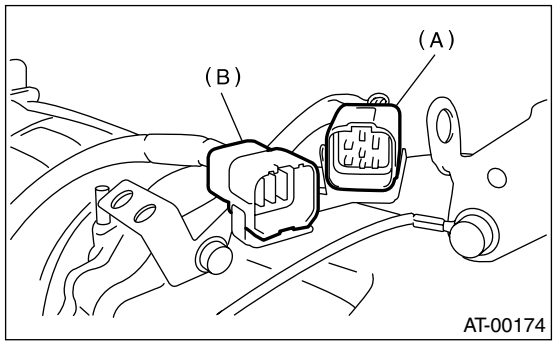
(A) High clutch and reverse clutch assembly

4) Adjust the total end play. <Ref. to AT-96, ADJUSTMENT, Oil Pump.>
5) Install the thrust needle bearing in proper direction.



(A) High clutch and reverse clutch ASSY
(B) Thrust needle bearing
(C) Up side
(D) Down side
(E) Outside

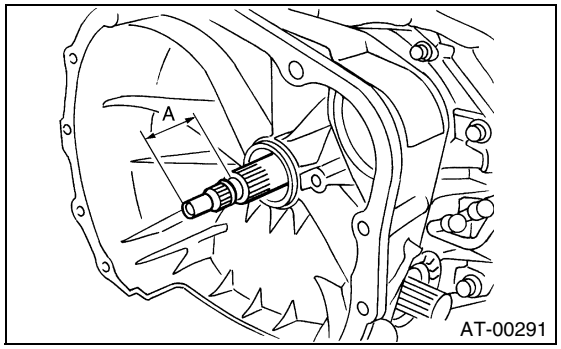
6) Install the oil pump housing assembly.
7) Install the torque converter clutch case assembly to transmission case assembly. <Ref. to AT-89, INSTALLATION, Torque Converter Clutch Case.>
8) Insert the inhibitor switch and transmission connector into stay.
9) Install the air breather hose. <Ref. to AT-74, INSTALLATION, Air Breather Hose.>



(A) Transmission harness
(B) Inhibitor switch harness

10) Install the oil cooler pipes. <Ref. to AT-72, INSTALLATION, ATF Cooler Pipe and Hose.>
11) Install the oil charger pipe with O-ring. <Ref. to AT-75, INSTALLATION, Oil Charger Pipe.>
12) Insert the input shaft while turning lightly by hand. At this time, not to damage the bushing.

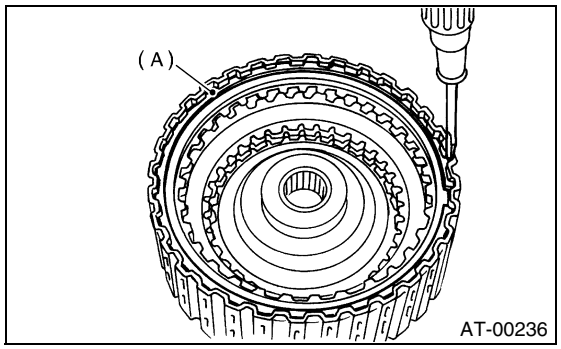
Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



13) Install the torque converter clutch assembly. <Ref. to AT-76, INSTALLATION, Torque Converter Clutch Assembly.>
14) Install the transmission assembly to vehicle. <Ref. to AT-40, INSTALLATION, Automatic Transmission Assembly.>

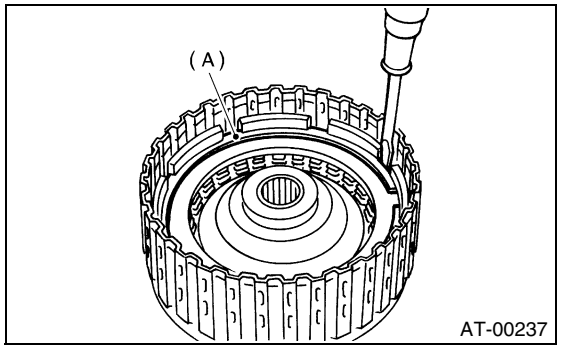
C: DISASSEMBLY

1) Remove the snap ring, and take out the retaining plate, drive plates, driven plates.



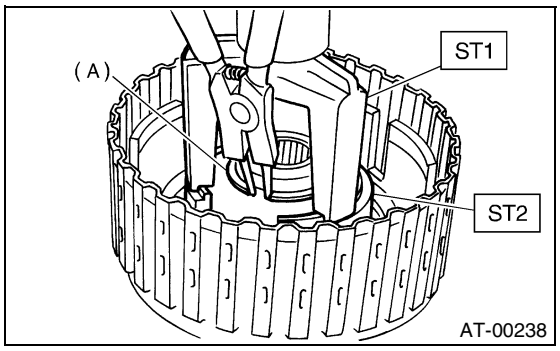
(A) Snap ring

2) Remove the snap ring, and take out the retaining plate, drive plates and driven plates.



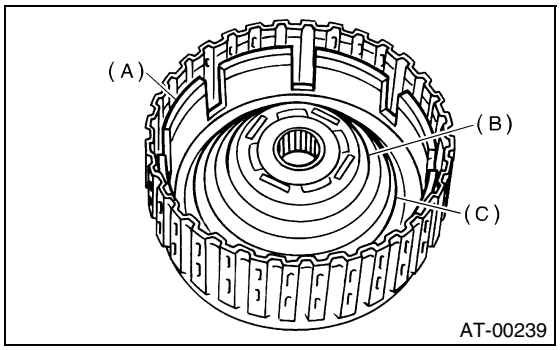
(A) Snap ring

3) Using the ST1 and ST2, remove the snap ring.
ST1 398673600 COMPRESSOR
ST2 498627100 SEAT



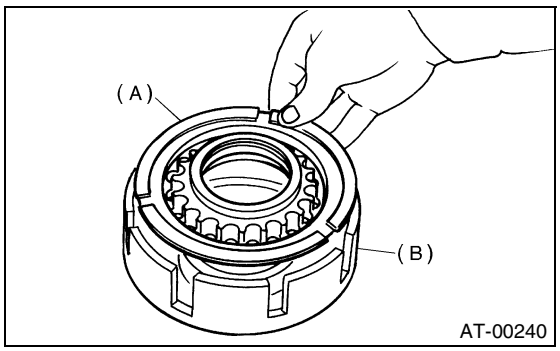
(A) Snap ring

4) Take out the clutch cover, spring retainer, high clutch piston and reverse clutch piston.



(A) Reverse clutch piston
(B) Cover
(C) Return spring

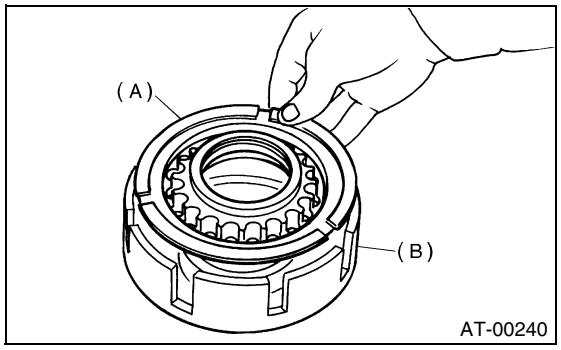
5) Remove the seal rings and lip seal from high clutch piston and reverse clutch piston.



(A) High clutch piston
(B) Reverse clutch piston

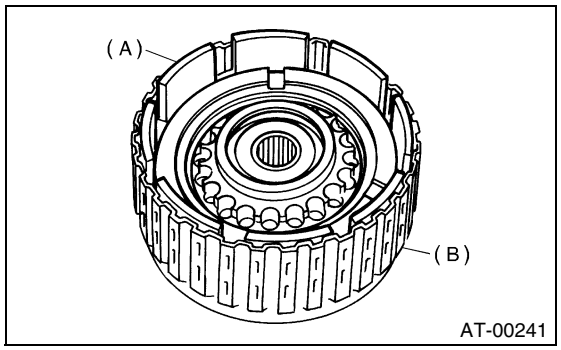
D: ASSEMBLY

1) Install the seal rings and lip seal to high clutch piston and reverse clutch piston.
2) Install the high clutch piston to reverse clutch piston.



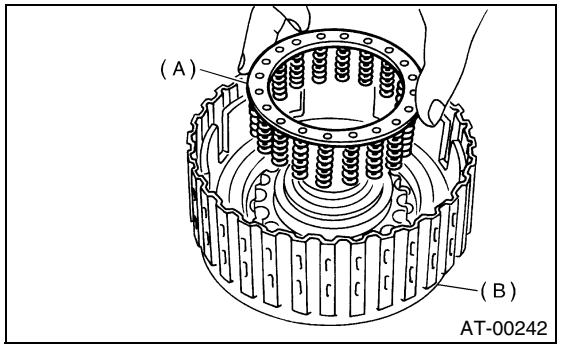
(A) High clutch piston
(B) Reverse clutch piston

3) Install the reverse clutch to high clutch drum.
Align the groove on the reverse clutch piston with the groove on high clutch drum during installation.



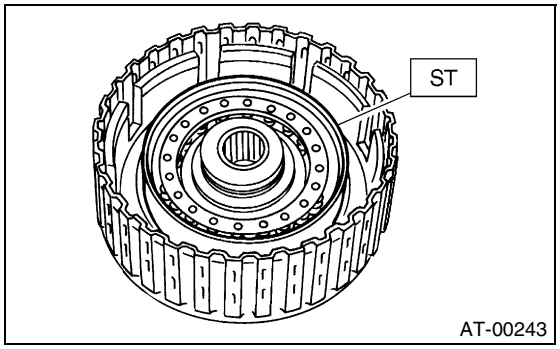
(A) Reverse clutch piston
(B) High clutch drum

4) Install the spring retainer to high clutch piston.

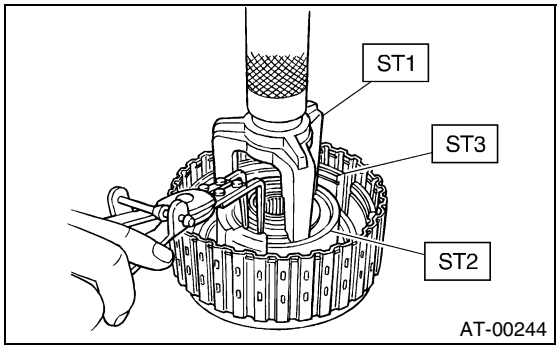


(A) Return spring
(B) High clutch drum

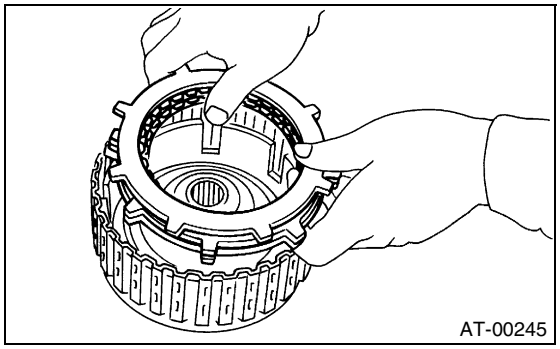
5) Install the ST to high clutch piston.
ST 498437000 HIGH CLUTCH PISTON GAUGE



6) Avoid tolding the high clutch piston seal, when installing the cover to high clutch piston.
7) Using the ST1 and ST2, install the snap ring.
ST1 398673600 COMPRESSOR
ST2 498627100 SEAT
ST3 498437000 HIGH CLUTCH PISTON GAUGE

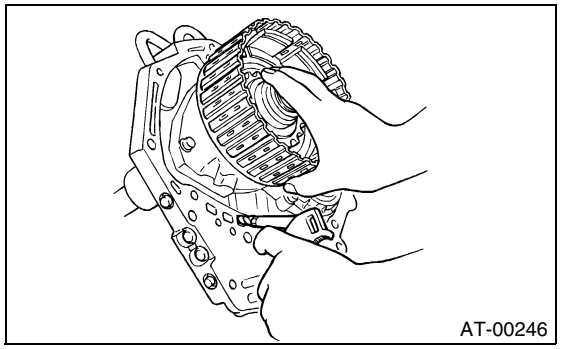


8) Install the thickest driven plate to piston side, and then install the driven plate, drive plate, retaining plate to high clutch drum.

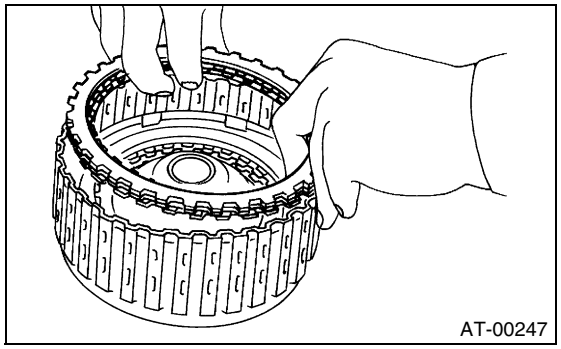


9) Install the snap ring to high clutch drum.

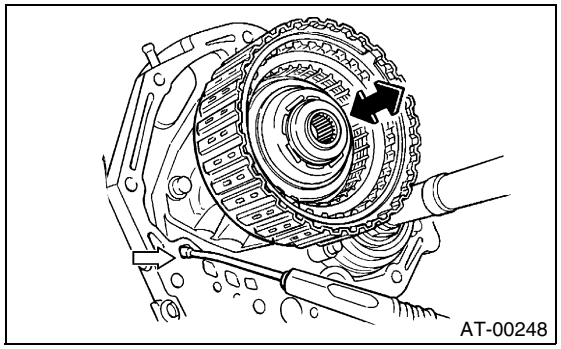
10) Apply compressed air intermittently to check for operation.



11) Measure the clearance between retaining plate and snap ring.<Ref. to AT-112, INSPECTION, High Clutch and Reverse Clutch.>
12) Install the driven plate, drive plate, retaining plate and snap ring.



13) Apply compressed air intermittently to check for operation.



14) Measure the clearance between retaining plate and snap ring.<Ref. to AT-112, INSPECTION, High Clutch and Reverse Clutch.>

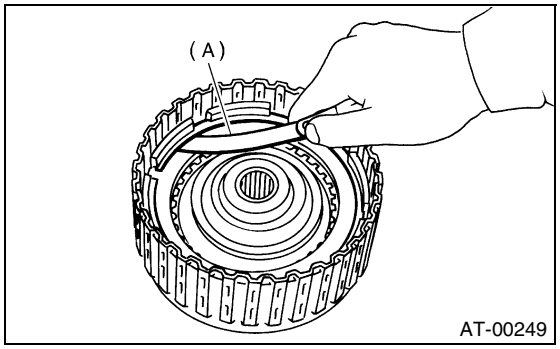
E: INSPECTION

1) Inspect the fllowing items.
- Drive plate facing for wear and damage
- Snap ring for wear, return spring for setting and breakage, and snap ring retainer for deformation
- Lip seal and lathe cut ring for damage
- Piston and drum check ball for operation
- Adjust total end play. <Ref. to AT-96, ADJUSTMENT, Oil Pump.>

2) Inspect the clearance between retaining plate and snap ring. (High clutch) At this time, do not press down the retaining plate.

Standard value:
0.8 — 1.1 mm (0.031 — 0.043 in)

Allowable limit:
1.5 mm (0.059 in)



(A) Thickness gauge

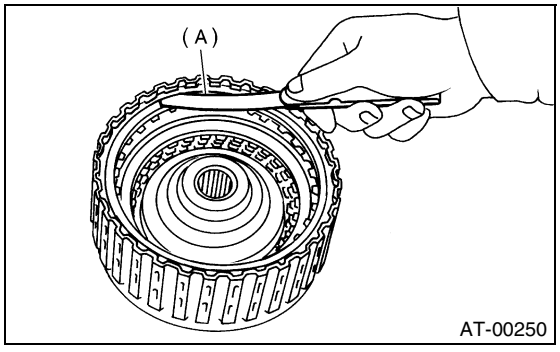
3) If the specified tolerance limits are exceeded, select a suitable high clutch retaining plate.

High clutch retaining plate	
Part No.	Thickness mm (in)
31567AA710	4.7 (0.185)
31567AA720	4.8 (0.189)
31567AA730	4.9 (0.193)
31567AA740	5.0 (0.197)
31567AA670	5.1 (0.201)
31567AA680	5.2 (0.205)
31567AA690	5.3 (0.209)
31567AA700	5.4 (0.213)

4) Inspect the clearance between retaining plate and snap ring. (Reverse clutch) At this time, do not press down the retaining plate.

Standard value:
0.5 — 0.8 mm (0.020 — 0.031 in)

Allowable limit:
1.2 mm (0.047 in)



(A) Thickness gauge

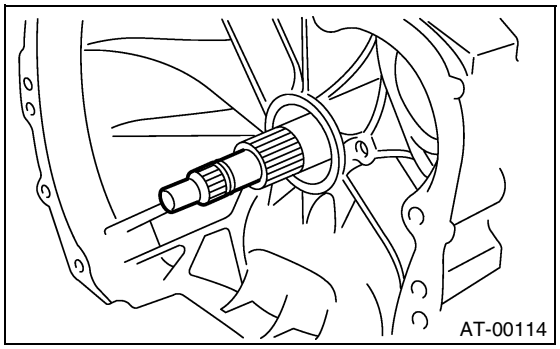
5) If the specified tolerance limits are exceeded, select a suitable high clutch retaining plate.

Reverse clutch retaining plates	
Part No.	Thickness mm (in)
31567AA910	4.0 (0.157)
31567AA920	4.2 (0.165)
31567AA930	4.4 (0.173)
31567AA940	4.6 (0.181)
31567AA950	4.8 (0.189)
31567AA960	5.0 (0.197)
31567AA970	5.2 (0.205)
31567AA980	5.4 (0.213)

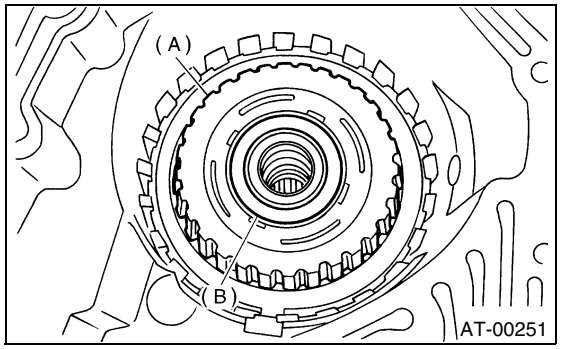
36.Planetary Gear and Low Clutch

A: REMOVAL

1) Remove the transmission assembly from vehicle. <Ref. to AT-38, REMOVAL, Automatic Transmission Assembly.>
2) Extract the torque converter clutch assembly. <Ref. to AT-76, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.



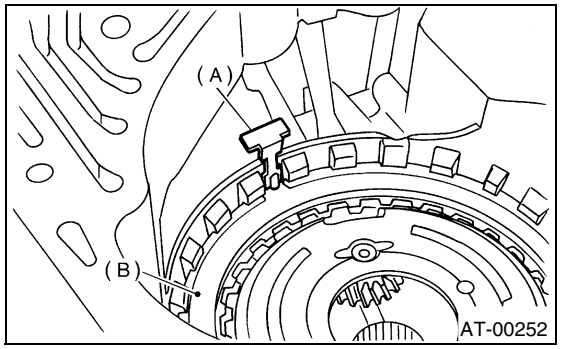
4) Disconnect the air breather hose. <Ref. to AT-74, REMOVAL, Air Breather Hose.>
5) Lift-up the lever behind transmission harness connector and disconnect from stay.
6) Disconnect the inhibitor switch connector from stay.
7) Remove the oil charger pipe, and remove the O-ring from flange face. Attach the O-ring to pipe. <Ref. to AT-75, REMOVAL, Oil Charger Pipe.>
8) Remove the oil cooler inlet and outlet pipes. <Ref. to AT-71, REMOVAL, ATF Cooler Pipe and Hose.>
9) Remove the rear vehicle speed sensor, and separate the transmission case and extension case. <Ref. to AT-77, REMOVAL, Extension Case.>
10) Remove the reduction driven gear. <Ref. to AT-84, REMOVAL, Reduction Driven Gear.>
11) Separate the torque converter clutch case and transmission case.<Ref. to AT-89, REMOVAL, Torque Converter Clutch Case.>
12) Remove the oil pump housing. <Ref. to AT-92, REMOVAL, Oil Pump.>
13) Take out the high clutch and reverse clutch assembly. <Ref. to AT-109, REMOVAL, High Clutch and Reverse Clutch.>
14) Take out the front sun gear and thrust bearing.



(A) Front sun gear
(B) Thrust needle bearing

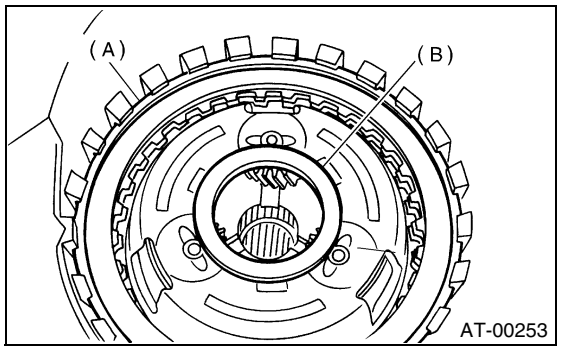
15) Pull out the leaf spring without folding.

NOTE:
Remove it while pressing down on the lower leaf spring.



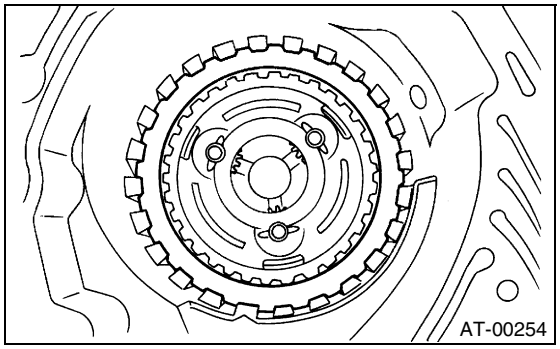
(A) Leaf spring
(B) Retaining plate

16) Remove the snap ring and thrust needle bearing.

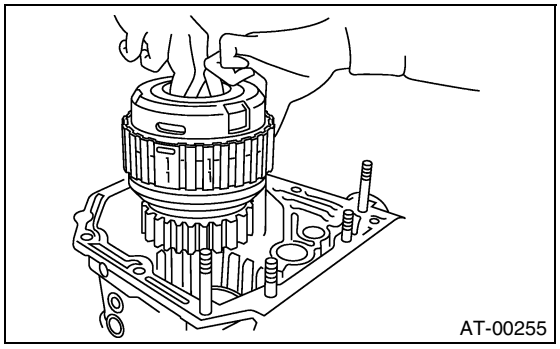


(A) Snap ring
(B) Thrust needle bearing

17) Take out the retaining plate, drive plate and driven plate of 2-4 brake.

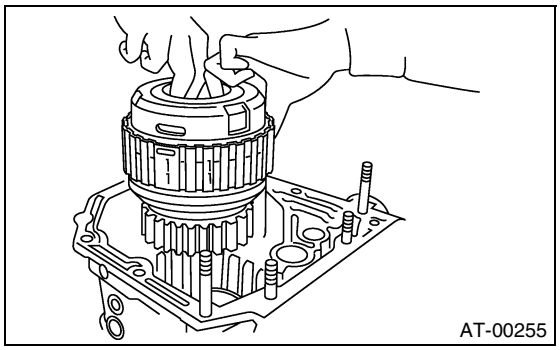


18) Take out the thrust needle bearing, planetary gear assembly and low clutch assembly.



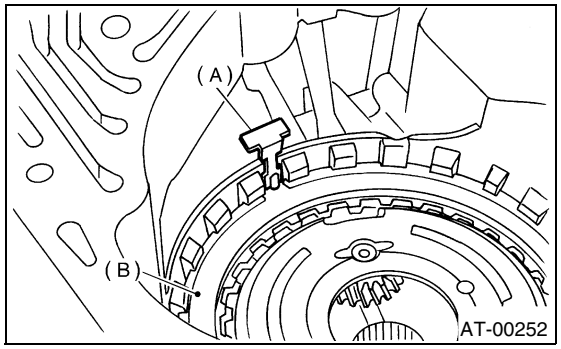
B: INSTALLATION

1) Install the planetary gear and low clutch assembly to transmission case.
Install carefully while rotating the low clutch and planetary gear assembly slowly paying special attention not to damage the seal ring.



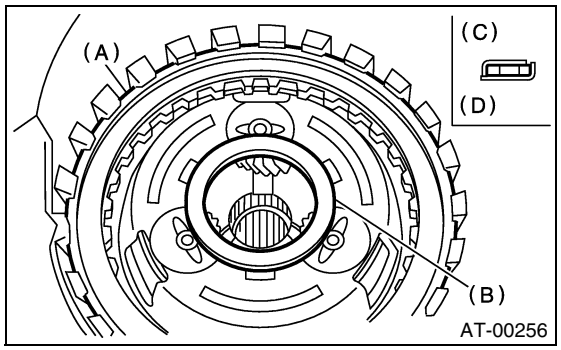
2) Install the pressure plate, driven plate, drive plate, retaining plate and snap ring.

3) Be careful not to mistake the location of leaf spring to be inserted.



(A) Leaf spring
(B) Retaining plate

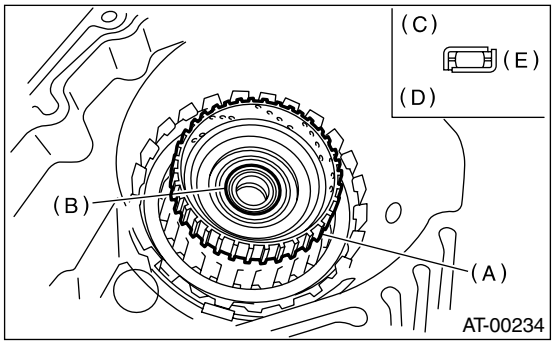
4) Install the thrust needle bearing in correct direction.



(A) Snap ring
(B) Thrust needle bearing
(C) Upside
(D) Downside

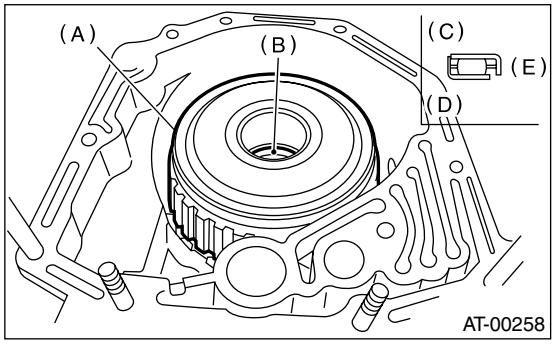
5) Install the front sun gear and thrust needle bearing.
6) Install the high clutch hub.
Attach the thrust needle bearing to hub with vaseline and install the hub by correctly engaging the splines of front planetary carrier.

7) Install the thrust needle bearing in proper direction.



(A) High clutch hub
(B) Thrust needle bearing
(C) Upside
(D) Downside
(E) Outside

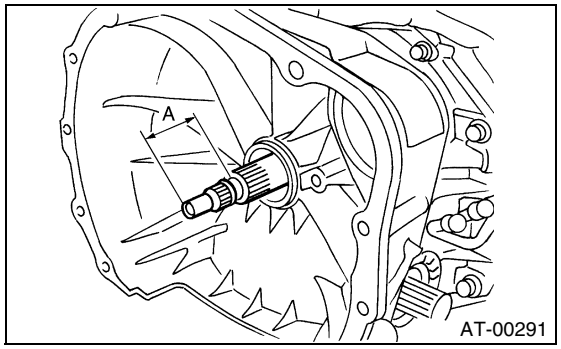
8) Install the high clutch assembly.
9) Install the thrust needle bearing in proper direction.



(A) High clutch and reverse clutch assembly
(B) Thrust needle bearing
(C) Upside
(D) Downside
(E) Outside

10) Install the oil pump housing assembly with new gasket.
11) Install the torque converter clutch case. <Ref. to AT-89, INSTALLATION, Torque Converter Clutch Case.>
12) Insert the inhibitor switch and transmission connector into stay.
13) Install the air breather hose. <Ref. to AT-74, INSTALLATION, Air Breather Hose.>
14) Install the oil cooler pipes. <Ref. to AT-72, INSTALLATION, ATF Cooler Pipe and Hose.>
15) Install the oil charger pipe with O-ring. <Ref. to AT-75, INSTALLATION, Oil Charger Pipe.>
16) Insert the input shaft while turning lightly by hand.

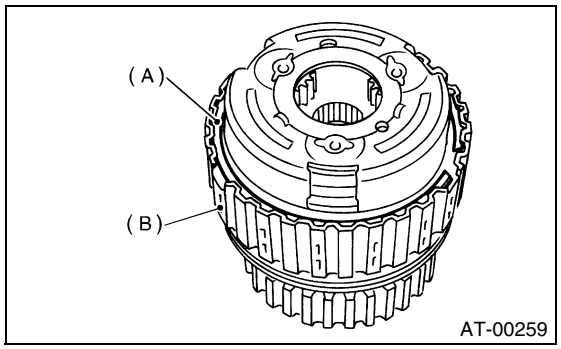
Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



17) Install the torque converter clutch assembly. <Ref. to AT-76, INSTALLATION, Torque Converter Clutch Assembly.>
18) Install the transmission assembly to vehicle. <Ref. to AT-40, INSTALLATION, Automatic Transmission Assembly.>

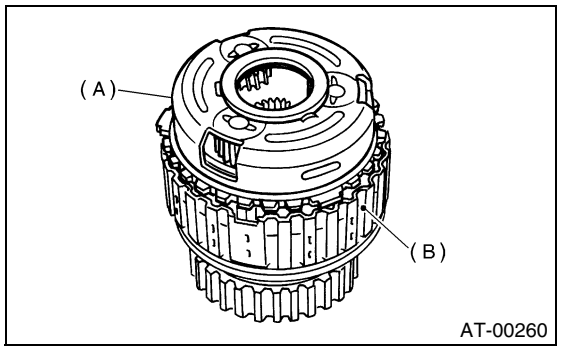
C: DISASSEMBLY

1) Remove snap ring from the low clutch drum.



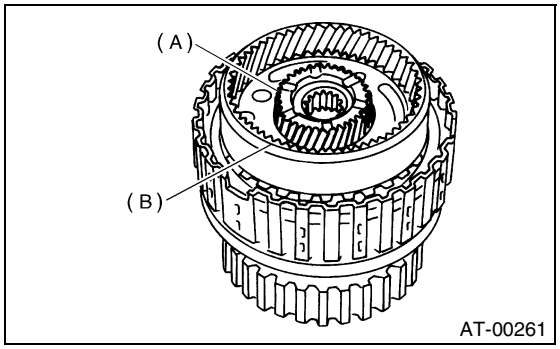
(A) Snap ring
(B) Low clutch drum

2) Take out the front planetary carrier.



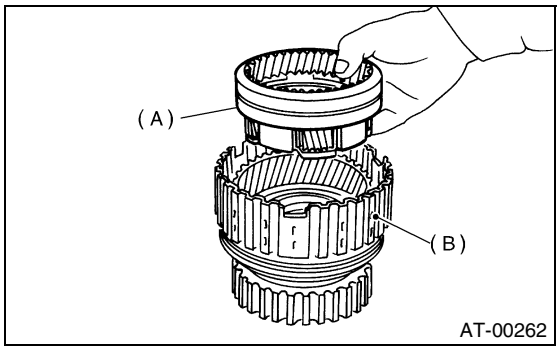
(A) Front planetary carrier
(B) Low clutch drum

3) Take out the rear sun gear.



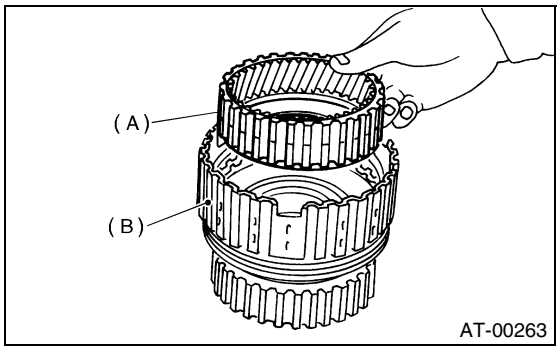
(A) Rear sun gear
(B) Rear planetary carrier

4) Take out the rear planetary carrier, washer and thrust needle bearing.



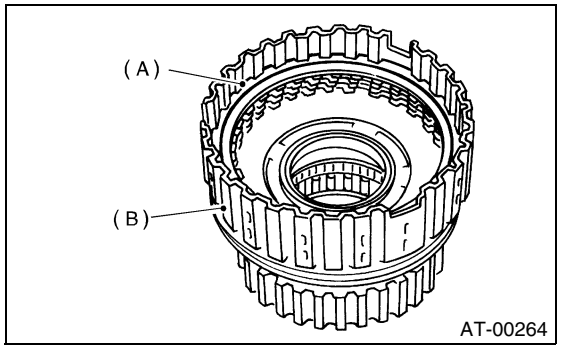
(A) Rear planetary carrier
(B) Low clutch drum

5) Take out the rear internal gear.



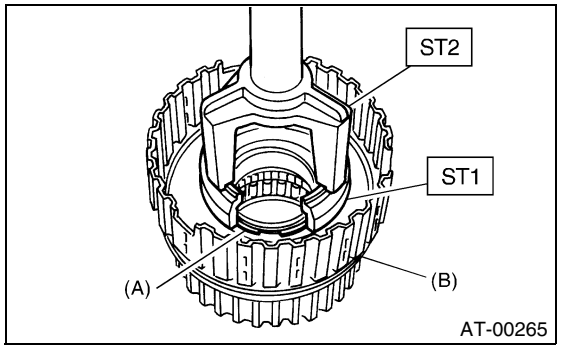
(A) Rear internal gear
(B) Low clutch drum

6) Remove the snap ring from low clutch drum.



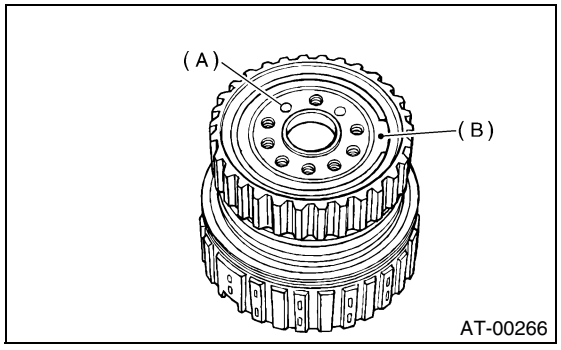
(A) Snap ring
(B) Low clutch drum

7) Compress the spring retainer, and remove the snap ring from low clutch drum, by using ST1 and ST2.
ST1 498627100 SEAT
ST2 398673600 COMPRESSOR



(A) Snap ring
(B) Low clutch drum

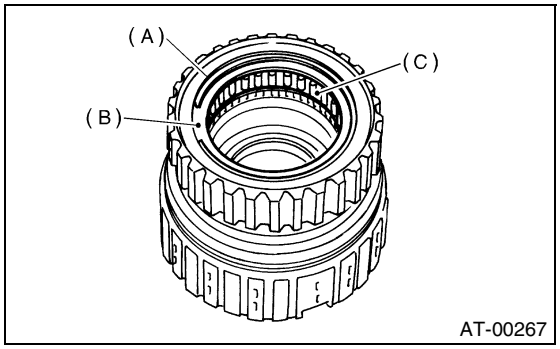
8) Remove the one-way clutch. <Ref. to AT-126, REMOVAL, One-way Clutch.>
9) Install the one-way clutch inner race to low clutch drum, and apply compressed air to remove the low clutch piston.



(A) Apply compressed air
(B) One-way clutch inner race

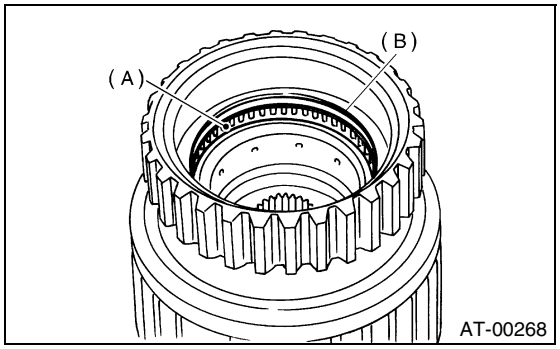
10) Remove the one-way clutch inner race.

11) Remove the one-way clutch after taking out the snap ring.



(A) Snap ring
(B) Plate
(C) One-way clutch

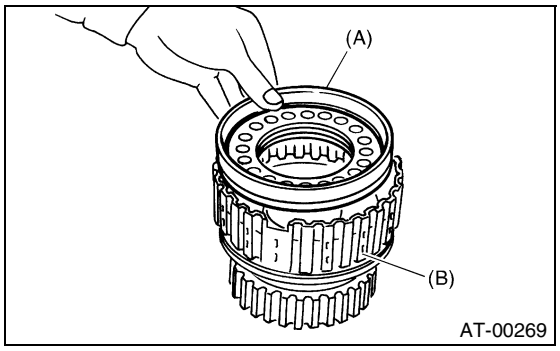
12) Remove the needle bearing after taking out the snap ring.



(A) Needle bearing
(B) Snap ring

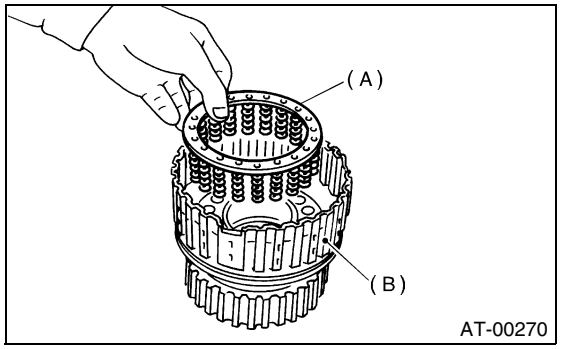
D: ASSEMBLY

1) Install the lathe cut seal ring to low clutch piston.
2) Fit the low clutch piston to low clutch drum.



(A) Low clutch piston
(B) Low clutch drum

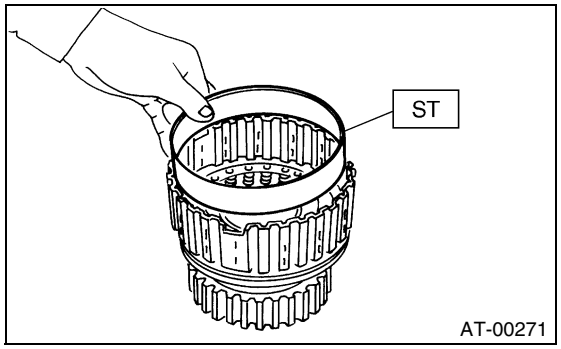
3) Install the spring retainer to low clutch piston.



(A) Spring retainer
(B) Low clutch drum

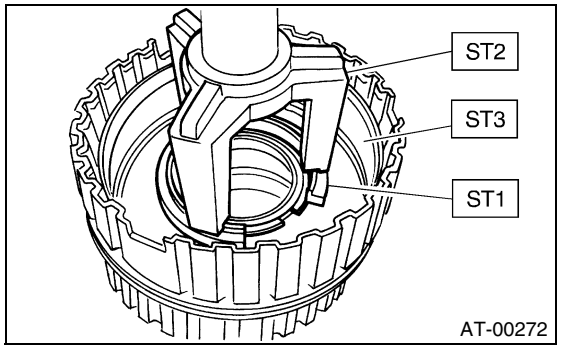
4) Install the ST to low clutch drum.

ST	498437100	LOW CLUTCH PISTON GUIDE

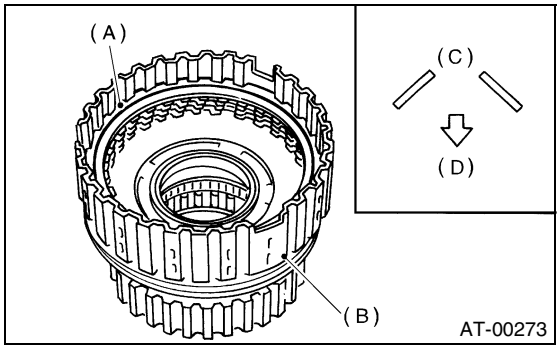


5) Set the cover on the piston with a press using ST1 and ST2, and attach the snap ring. At this time, be careful not to fold the cover seal during installation.

ST1	498627100	SEAT
ST2	398673600	COMPRESSOR
ST3	498437100	LOW CLUTCH PISTON GUIDE

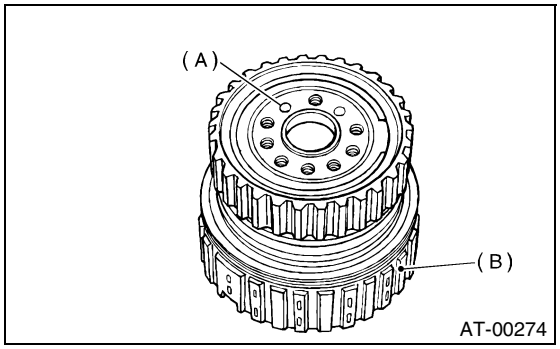


6) Install the dish plate, driven plates, drive plates, and retaining plate, and secure with the snap ring.



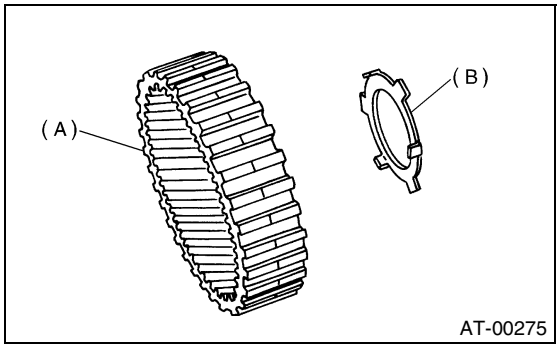
(A) Snap ring
(B) Low clutch drum
(C) Dish plate
(D) Low clutch piston side

7) Check the low clutch for operation.
(1) Remove the one-way clutch. <Ref. to AT-126, REMOVAL, One-way Clutch.>
(2) Set the one-way clutch inner race, and apply compressed air for checking.



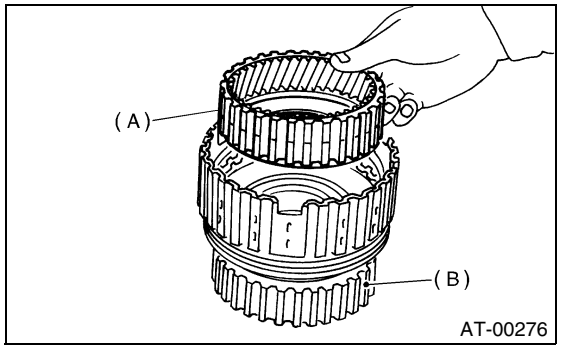
(A) Apply compressed air
(B) Low clutch drum

8) Checking low clutch clearance. <Ref. to AT-121, INSPECTION, Planetary Gear and Low Clutch.>
9) Install the washer to rear internal gear.



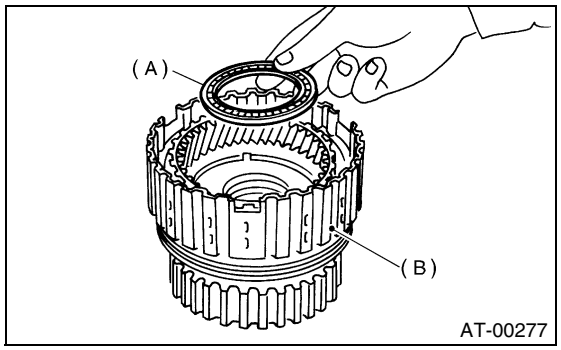
(A) Rear internal gear
(B) Washer

10) Install the rear internal gear.



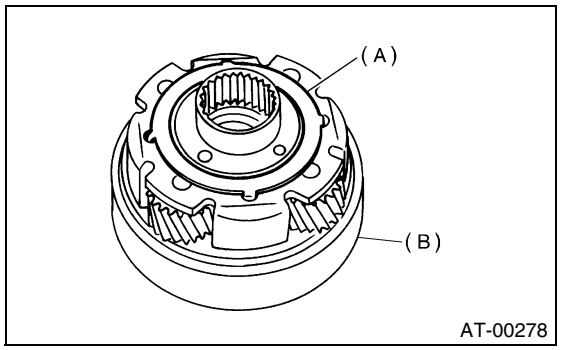
(A) Rear internal gear
(B) Low clutch drum

11) Install the thrust needle bearing in correct direction.



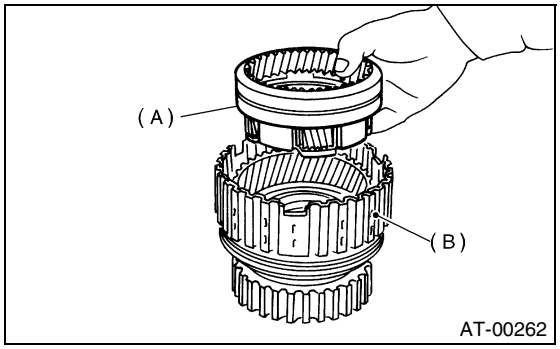
(A) Thrust needle bearing
(B) Low clutch drum

12) Install the washer by aligning protrusion of washer and hole of rear planetary carrier.



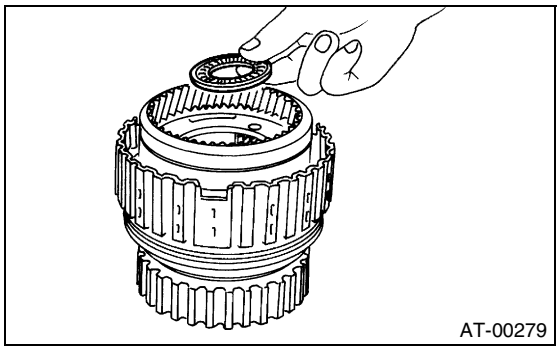
(A) Washer
(B) Rear planetary carrier

13) Install the rear planetary carrier to low clutch drum.

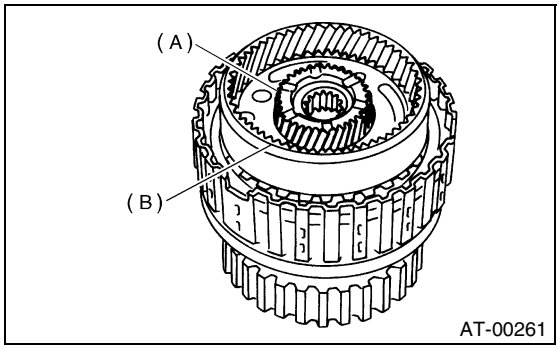


(A) Rear planetary carrier
(B) Low clutch drum

14) Install the thrust needle bearing in correct direction.

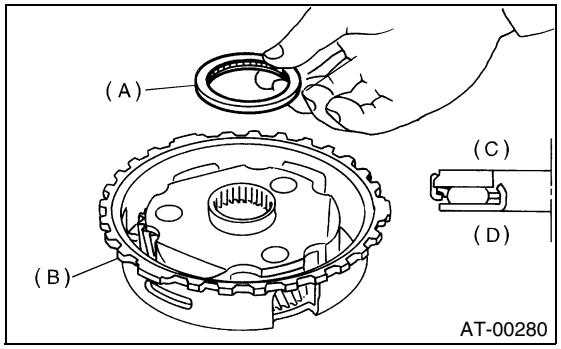


15) Install the rear sun gear in proper direction.



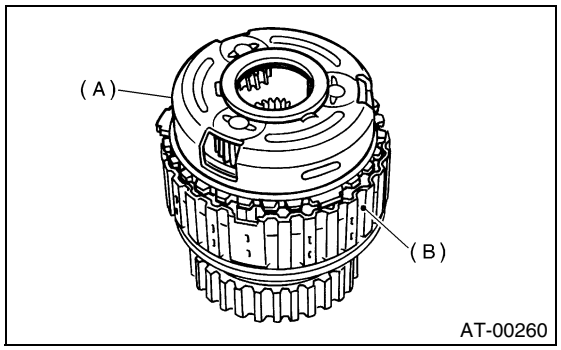
(A) Rear sun gear
(B) Rear planetary carrier

16) Install the thrust needle bearing in proper direction.



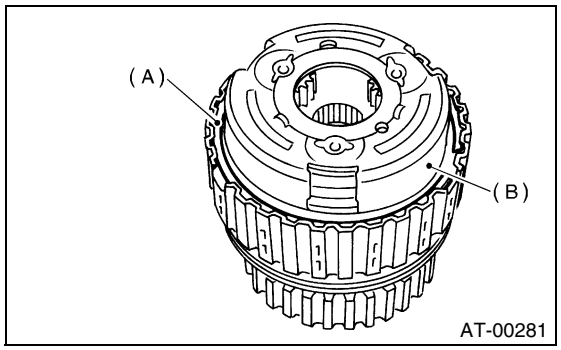
(A) Thrust needle bearing
(B) Front planetary carrier
(C) Rear sun gear side
(D) Front planetary carrier side

17) Install the front planetary carrier to low clutch drum.



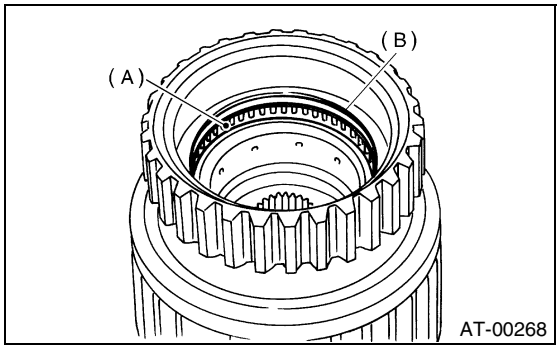
(A) Front planetary carrier
(B) Low clutch drum

18) Install the snap ring to low clutch drum.



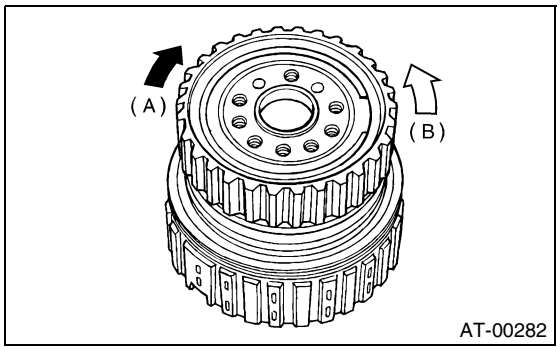
(A) Snap ring
(B) Front planetary carrier

19) Install the needle bearing, and secure with the snap ring.



(A) Needle bearing
(B) Snap ring

20) Install the one-way clutch, one-way clutch inner race and plate, and secure with the snap ring.
21) Set the inner race. Make sure that the forward clutch is free in clockwise direction and locked in counterclockwise direction, as viewed from front of the vehicle.



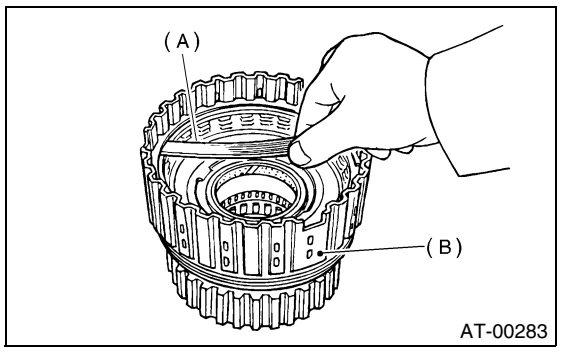
(A) Locked
(B) Free

E: INSPECTION

1) Inspect the fllowing items.
• Drive plate facing for wear and damage
• Snap ring for wear, return spring for breakage or setting, and spring retainer for deformation
• Lip seal and lathe cut seal ring for damage
• Piston check ball for operation
• Measure the total end play and adjust to within specifications.
<Ref. to AT-96, Adjustment.>
2) Place the same thickness of shim on both sides to prevent retaining plate from tilting.
3) Inspect clearance between retaining plate and operation of the low clutch.

Standard value:
0.7 — 1.1 mm (0.028 — 0.043 in)

Allowable limit:
1.6 mm (0.063 in)



(A) Thickness gauge
(B) Low clutch drum

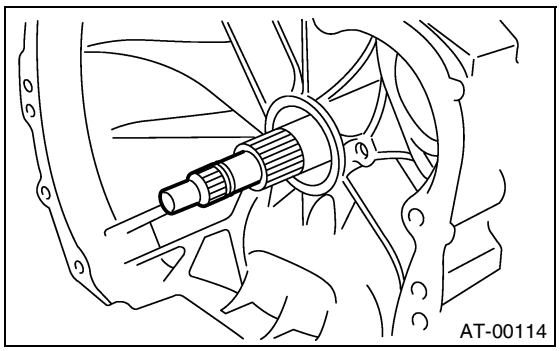
4) If the clearance is out of specified range, select a proper retaining plate so that the standard clearance can be obtained.

Available retaining plates	
Part No.	Thickness mm (in)
31567AA830	3.8 (0.150)
31567AA840	4.0 (0.157)
31567AA850	4.2 (0.165)
31567AA860	4.4 (0.173)
31567AA870	4.6 (0.181)

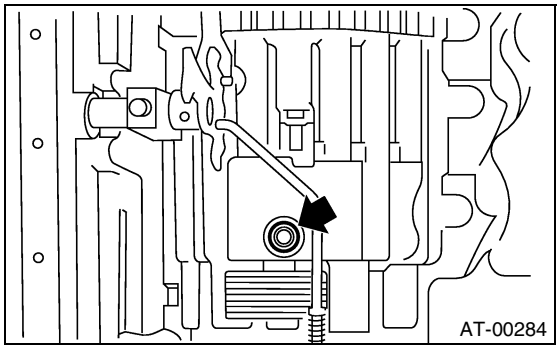
37.2-4 Brake

A: REMOVAL

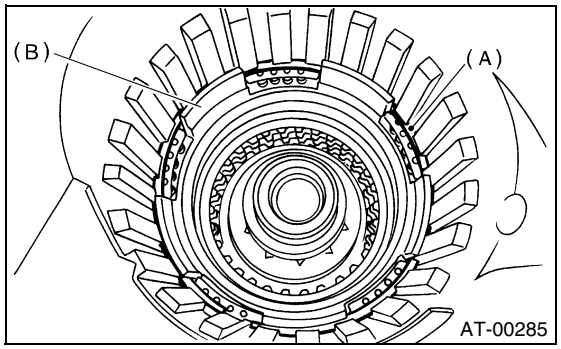
1) Remove the transmission assembly from vehicle. <Ref. to AT-38, REMOVAL, Automatic Transmission Assembly.>
2) Extract the torque converter clutch assembly. <Ref. to AT-76, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.



4) Disconnect the air breather hose. <Ref. to AT-74, REMOVAL, Air Breather Hose.>
5) Lift-up the lever behind transmission harness connector and disconnect it from stay.
6) Disconnect the inhibitor switch connector from stay.
7) Remove the oil charger pipe. <Ref. to AT-75, REMOVAL, Oil Charger Pipe.>
8) Remove the oil cooler inlet and outlet pipes with washers. <Ref. to AT-71, REMOVAL, ATF Cooler Pipe and Hose.>
9) Remove the rear vehicle speed sensor, and separate the transmission case and extension case. <Ref. to AT-77, REMOVAL, Extension Case.>
10) Remove the reduction driven gear. <Ref. to AT-84, REMOVAL, Reduction Driven Gear.>
11) Separate the torque converter clutch case and transmission case.<Ref. to AT-89, REMOVAL, Torque Converter Clutch Case.>
12) Remove the oil pan and control valve body. <Ref. to AT-58, REMOVAL, Control Valve Body.>
13) Remove the oil pump housing. <Ref. to AT-92, REMOVAL, Oil Pump.>
14) Remove the 2-4 brake seal.

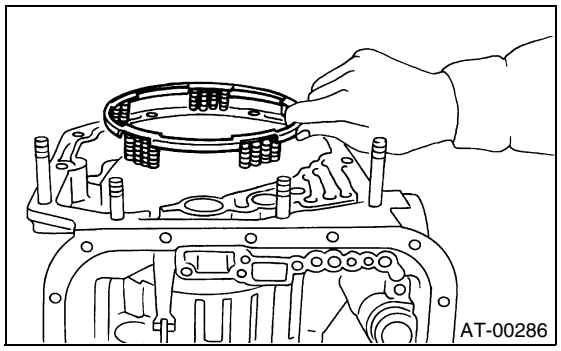


15) Take out the high clutch and reverse clutch assembly. <Ref. to AT-109, REMOVAL, High Clutch and Reverse Clutch.>
16) Take out the thrust needle bearing, planetary gear assembly and low clutch assembly. <Ref. to AT-114, REMOVAL, Planetary Gear and Low Clutch.>
17) Remove the snap ring.

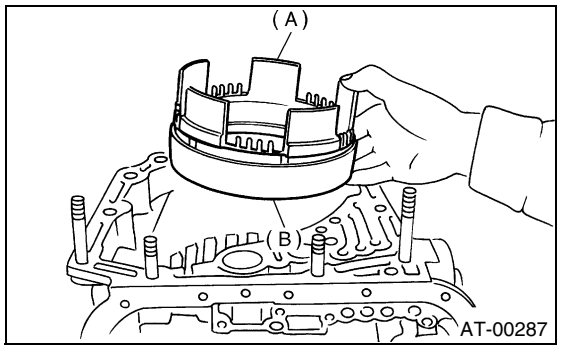


(A) Snap ring
(B) 2-4 brake piston

18) Take out the 2-4 brake return spring.

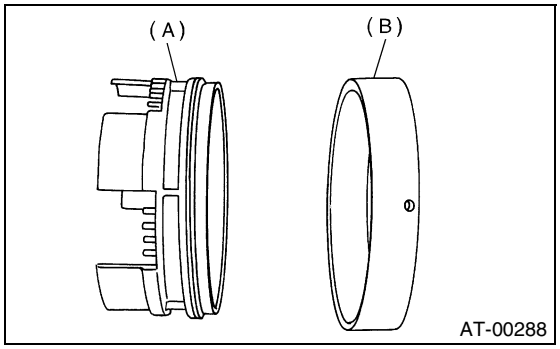


19) Remove the 2-4 brake piston and piston retainer without damaging.



(A) 2-4 brake piston
(B) 2-4 brake piston retainer

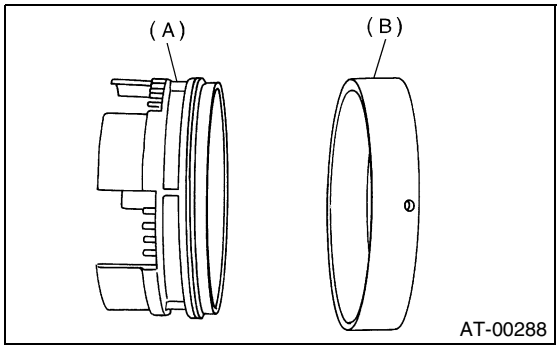
20) Separate the 2-4 brake piston and piston retainer.



(A) 2-4 brake piston
(B) 2-4 brake piston retainer

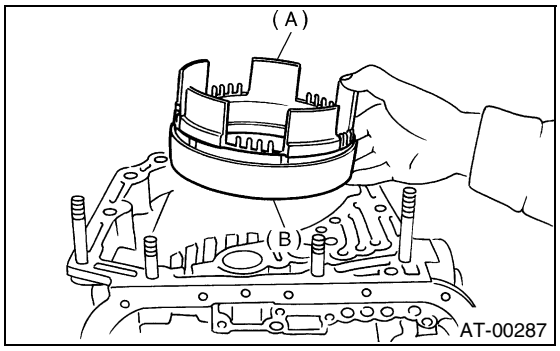
B: INSTALLATION

1) Install the 2-4 brake piston to 2-4 brake piston retainer.



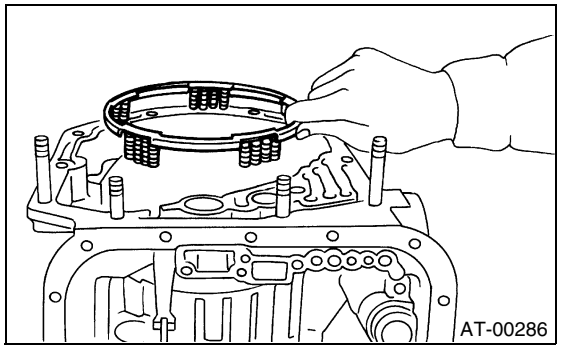
(A) 2-4 brake piston
(B) 2-4 brake piston retainer

2) Install the 2-4 brake piston and 2-4 brake retainer by aligning hole of 2-4 brake retainer and hole of transmission case.

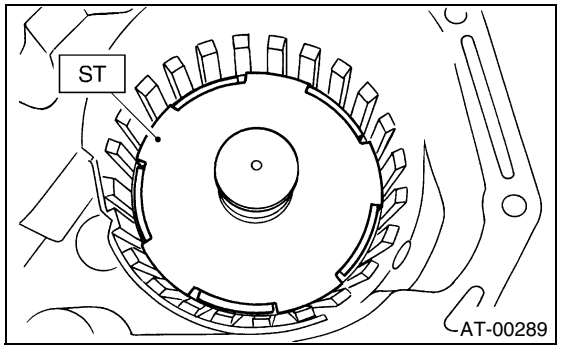


(A) 2-4 brake piston
(B) 2-4 brake piston retainer

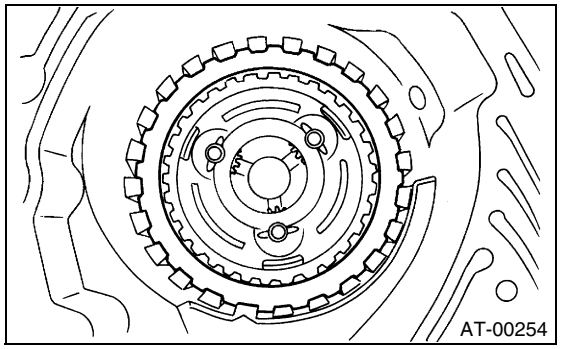
3) Install the 2-4 brake piston return spring to transmission case.



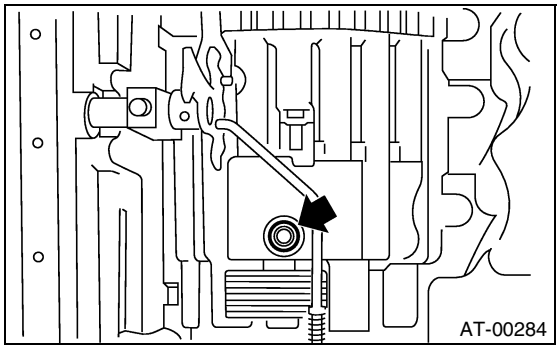
4) Position the snap ring in transmission. Using the ST, press the snap ring into place.
ST 498677100 COMPRESSOR



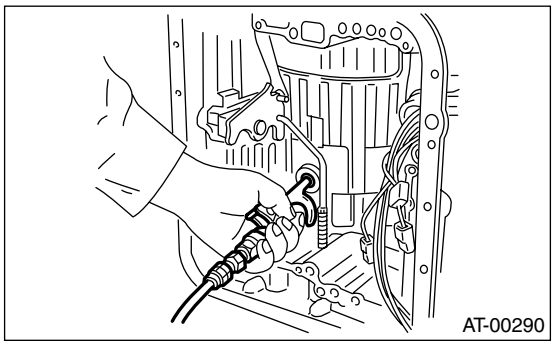
5) Install the planetary gear and low clutch assembly to transmission case.
Install carefully while rotating the low clutch and planetary gear assembly slowly paying special attention not to damage the seal ring. <Ref. to AT-115, INSTALLATION, Planetary Gear and Low Clutch.>
6) Install the pressure plate, drive plate, driven plate, retaining plate and snap ring.



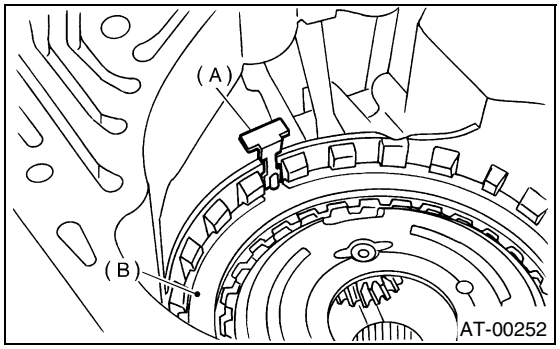
7) Install a new 2-4 brake oil seal to transmission case.



8) After all 2-4 brake component parts have been installed, blow in air intermittently and confirm the operation of the brake.

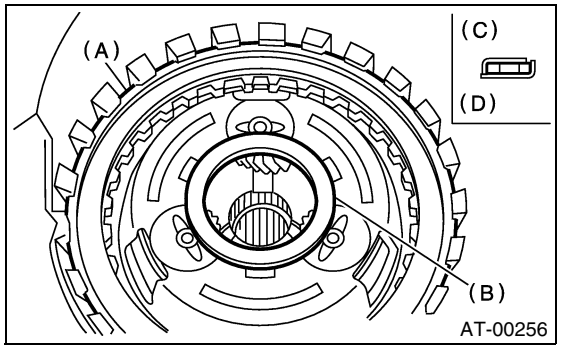


9) Check the clearance between the retaining plate and the snap ring.<Ref. to AT-125, INSPECTION, 2-4 Brake.>
10) Be careful not to mistake the location of the leaf spring to be inserted.



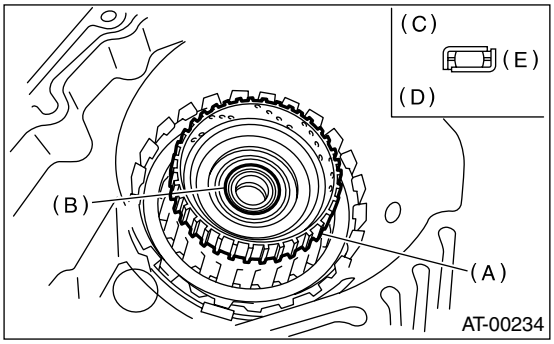
(A) Leaf spring
(B) Retaining plate

11) Install thrust needle bearing in the correct direction.



(A) Snap ring
(B) Thrust needle bearing
(C) Upside
(D) Downside

12) Install the front sun gear.
13) Install the thrust needle bearing in correct direction.

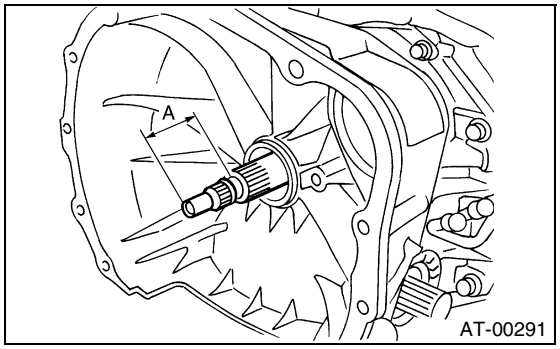


(A) High clutch hub
(B) Thrust needle bearing
(C) Upside
(D) Downside
(E) Outside

14) Install the high clutch assembly. <Ref. to AT-109, INSTALLATION, High Clutch and Reverse Clutch.>
15) Install the oil pump housing to transmission case. <Ref. to AT-93, INSTALLATION, Oil Pump.>
16) Install the control valve body and oil pan. <Ref. to AT-59, INSTALLATION, Control Valve Body.>
17) Install the torque converter clutch case assembly to the transmission case assembly. <Ref. to AT-89, INSTALLATION, Torque Converter Clutch Case.>
18) Insert the inhibitor switch and transmission connector into stay.
19) Install the air breather hose. <Ref. to AT-74, INSTALLATION, Air Breather Hose.>
20) Install the oil cooler pipes. <Ref. to AT-72, INSTALLATION, ATF Cooler Pipe and Hose.>

21) Install the oil charger pipe with O-ring. <Ref. to AT-75, INSTALLATION, Oil Charger Pipe.>
22) Insert the input shaft while turning lightly by hand.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



23) Install the torque converter clutch assembly. <Ref. to AT-76, INSTALLATION, Torque Converter Clutch Assembly.>
24) Install the transmission assembly to the vehicle. <Ref. to AT-40, INSTALLATION, Automatic Transmission Assembly.>

C: INSPECTION

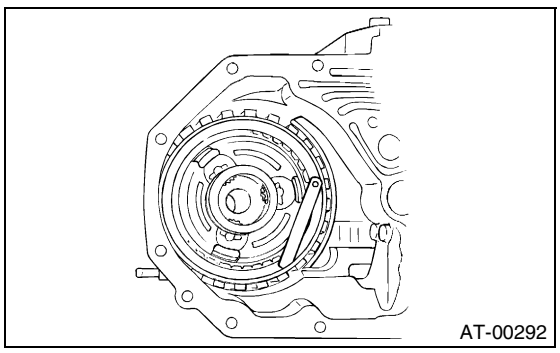
1) Inspect the following items.
- Drive plate facing for wear and damage
- Snap ring for wear and spring retainer for deformation
- Lip seal and lathe cut seal ring for damage
- Measure the total end play and adjust to within specifications.<Ref. to AT-96, ADJUSTMENT, Oil Pump.>

2) Inspect the clearance between the retaining plate and the snap ring.

NOTE:
Select a retaining plate with a suitable value from the following table, so that the clearance becomes the standard value.

Standard value:
0.8 — 1.2 mm (0.031 — 0.047 in)

Allowable limit:
1.5 mm (0.059 in)

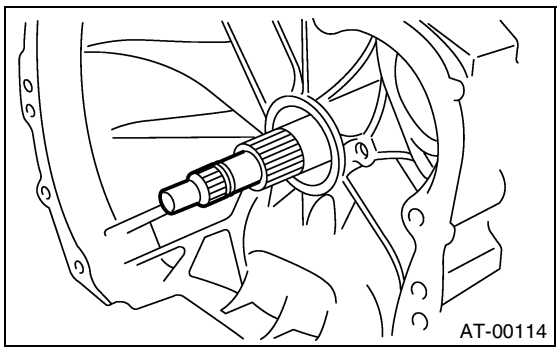


Available retaining plates	
Part No.	Thickness mm (in)
31567AA612	5.6 (0.220)
31567AA622	5.8 (0.228)
31567AA632	6.0 (0.236)
31567AA642	6.2 (0.244)
31567AA652	6.4 (0.252)
31567AA662	6.6 (0.260)

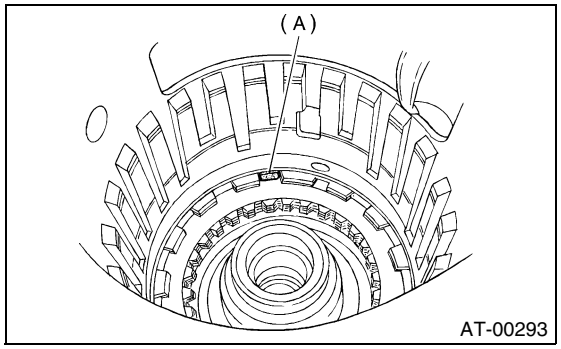
38.One-way Clutch

A: REMOVAL

1) Remove the transmission assembly from vehicle. <Ref. to AT-38, REMOVAL, Automatic Transmission Assembly.>
2) Extract the torque converter clutch assembly. <Ref. to AT-76, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.

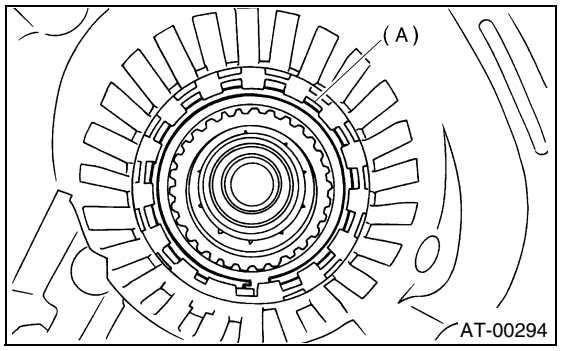


4) Disconnect the air breather hose. <Ref. to AT-74, REMOVAL, Air Breather Hose.>
5) Lift-up the lever behind transmission hernes connector and disconnect it from stay.
6) Disconnect the inhibitor switch connector from stay.
7) Remove the oil charger pipe. <Ref. to AT-75, REMOVAL, Oil Charger Pipe.>
8) Remove the oil cooler inlet and outlet pipes. <Ref. to AT-71, REMOVAL, ATF Cooler Pipe and Hose.>
9) Separate the torque converter clutch case and transmission case.<Ref. to AT-89, REMOVAL, Torque Converter Clutch Case.>
10) Separate the transmission case and extension case sections. <Ref. to AT-77, REMOVAL, Extension Case.>
11) Remove the reduction driven gear. <Ref. to AT-84, REMOVAL, Reduction Driven Gear.>
12) Remove the reduction drive gear. <Ref. to AT-84, REMOVAL, Reduction Driven Gear.>
13) Remove the control valve assembly. <Ref. to AT-58, REMOVAL, Control Valve Body.>
14) Remove the oil pump housing. <Ref. to AT-92, REMOVAL, Oil Pump.>
15) Take out the high clutch and reverse clutch assembly. <Ref. to AT-109, REMOVAL, High Clutch and Reverse Clutch.>
16) Take out the thrust needle bearing, planetary gear assembly. <Ref. to AT-114, REMOVAL, Planetary Gear and Low Clutch.>
17) Take out the 2-4 brake return spring, piston and piston retainer. <Ref. to AT-122, REMOVAL, 2-4 Brake.>
18) Pull out the leaf spring without folding.



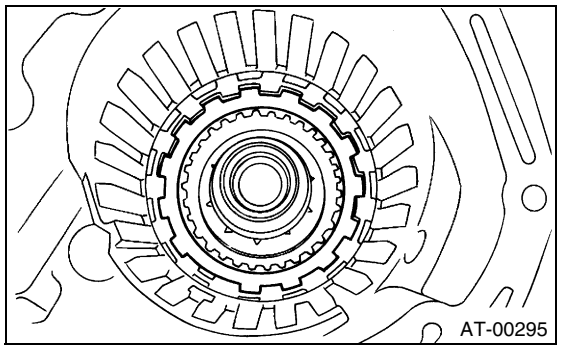
(A) Leaf spring

19) Remove the snap ring.

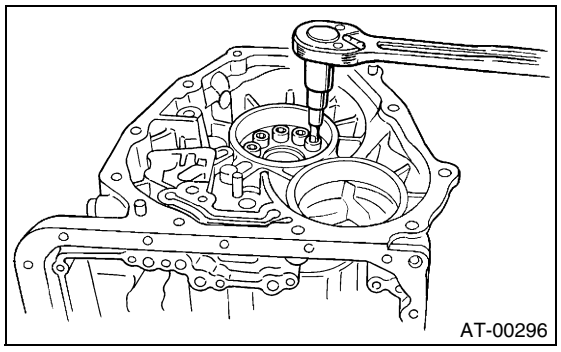


(A) Snap ring

20) Take out the retaining plate, drive plate, driven plate and dish plate.



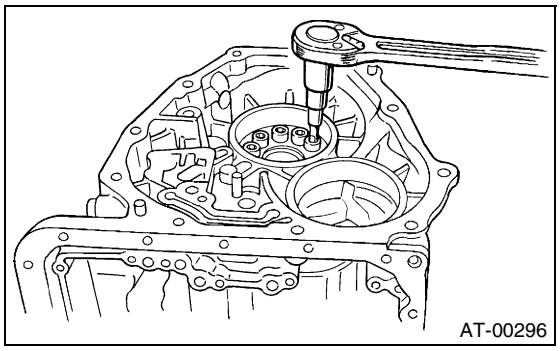
21) Turn the transmission case upside down, and then take out the socket bolts while holding the one-way clutch inner race with hand.



B: INSTALLATION

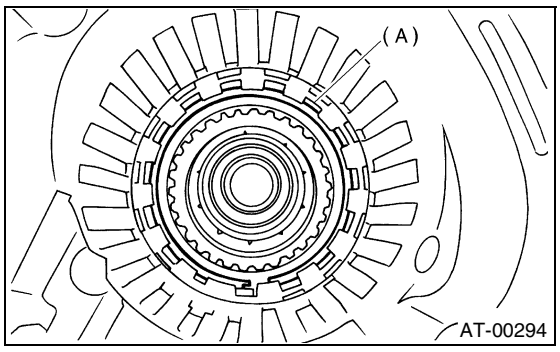
1) Install the one-way clutch inner race, spring retainer and return spring.
2) Tighten the socket head bolts evenly from rear side of transmission case.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



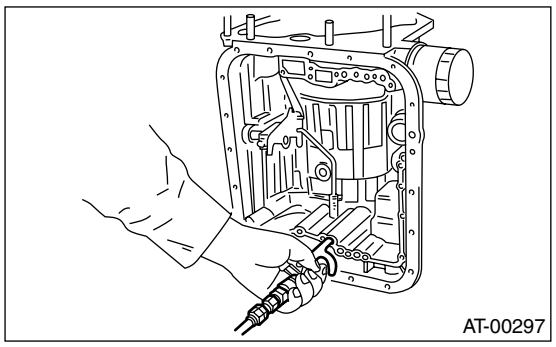
3) Place the transmission case with front facing up.
4) Install thrust needle bearing.
5) Installation of the low & reverse brake:
Install the dish plate, driven plates, drive plates, retaining plate, and secure with a snap ring.

NOTE:
Pay attention to the orientation of dish plate.



(A) Snap ring

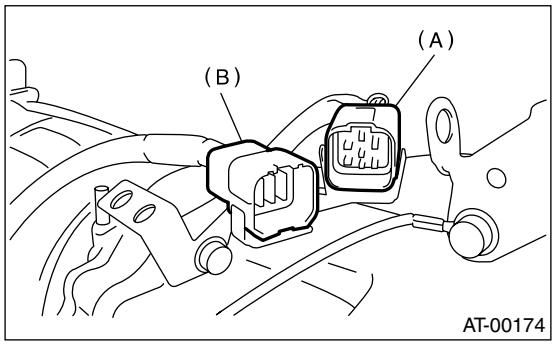
6) Apply compressed air intermittently to check for operation.



7) Check the clearance and select retaining plate. <Ref. to AT-132, INSPECTION, Low and Reverse Brake.>
8) Install the 2-4 brake. <Ref. to AT-123, INSTALLATION, 2-4 Brake.>
9) Install the planetary gear and low clutch assembly to transmission case.
Install carefully while rotating the low clutch and planetary gear assembly slowly paying special attention not to damage the seal ring. <Ref. to AT-115, INSTALLATION, Planetary Gear and Low Clutch.>
10) Install the high clutch assembly. <Ref. to AT-109, INSTALLATION, High Clutch and Reverse Clutch.>
11) Install the oil pump housing assembly. <Ref. to AT-93, INSTALLATION, Oil Pump.>
12) Install the control valve assembly and oil pan. <Ref. to AT-59, INSTALLATION, Control Valve Body.>
13) Install the torque converter clutch case assembly. <Ref. to AT-89, INSTALLATION, Torque Converter Clutch Case.>
14) Install the reduction drive gear.
15) Install the reduction driven gear.
<Ref. to AT-84, INSTALLATION, Reduction Driven Gear.>
16) Install the extension case to transmission case. <Ref. to AT-77, INSTALLATION, Extension Case.>
17) Install the rear vehicle speed sensor.

Tightening torque:
7 N·m (0.7 kgf-m, 5.1 ft-lb)

18) Insert the inhibitor switch and transmission connector into stay.

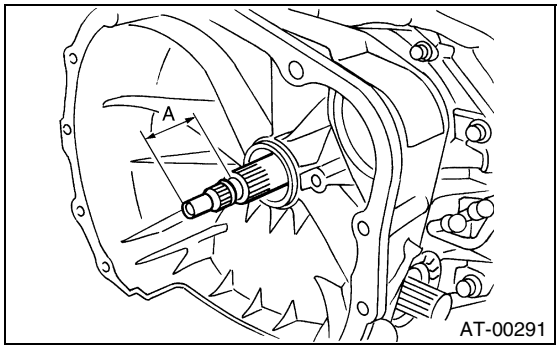


(A) Transmission harness
(B) Inhibitor switch harness

19) Install the air breather hose. <Ref. to AT-74, INSTALLATION, Air Breather Hose.>
20) Install the oil cooler pipes. <Ref. to AT-72, INSTALLATION, ATF Cooler Pipe and Hose.>
21) Install the oil charger pipe with O-ring. <Ref. to AT-75, INSTALLATION, Oil Charger Pipe.>

22) Insert the input shaft while turning lightly by hand. At this time, not to damage the bushing.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)

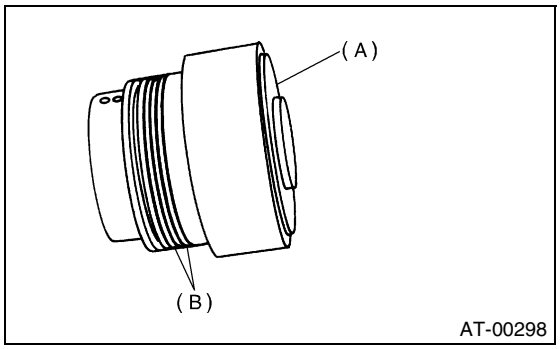


23) Install the torque converter clutch assembly. <Ref. to AT-76, INSTALLATION, Torque Converter Clutch Assembly.>
24) Install the tansmission assembly to vehicle. <Ref. to AT-40, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

1. ONE-WAY CLUTCH INNER RACE

1) Remove seal rings.

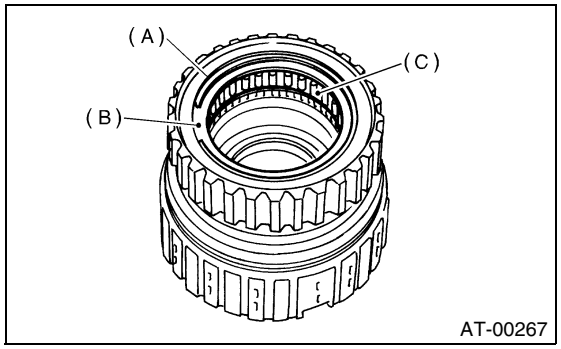


(A) One way clutch inner race
(B) Seal rings

2) Using the ST, remove the needle bearing.
ST 398527700 PULLER ASSY

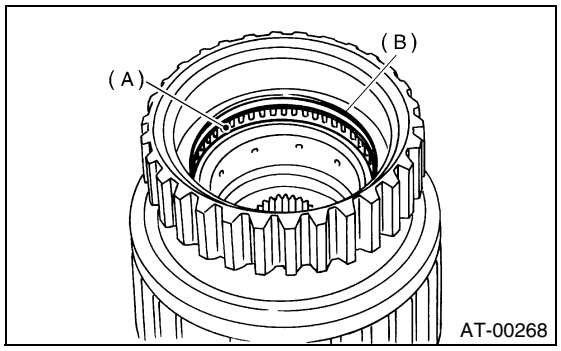
2. ONE-WAY CLUTCH OUTER RACE

1) Remove the one-way clutch after taking out the snap ring.



(A) Snap ring
(B) Plate
(C) One-way clutch

2) Remove the needle bearing after taking out the snap ring.

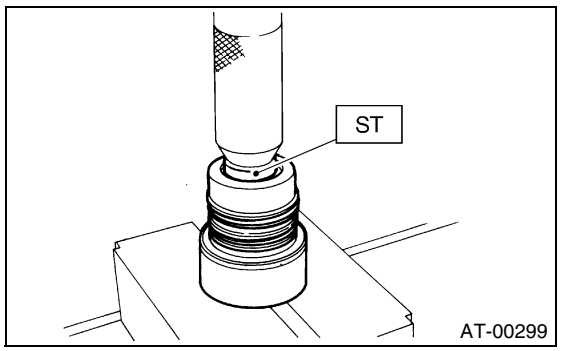


(A) Needle bearing
(B) Snap ring

D: ASSEMBLY

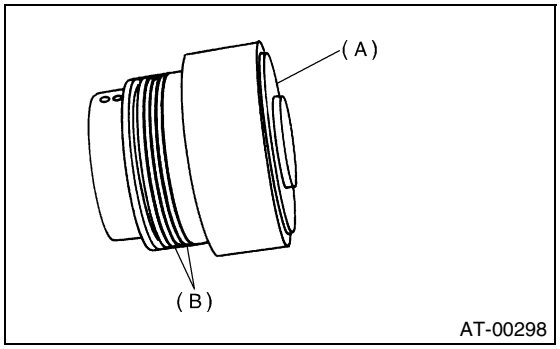
1. ONE-WAY CLUTCH INNER RACE

1) Using a press and ST, install the needle bearing to inner race.
ST 398497701 INSTALLER



2) Apply vaseline to the groove of inner race and to the seal ring.

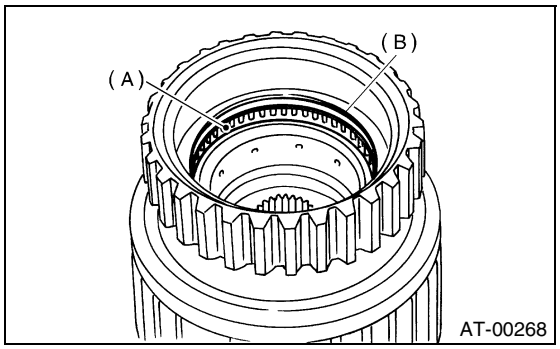
3) Install two seal rings to the one-way clutch inner race.



(A) One way clutch inner race
(B) Seal rings

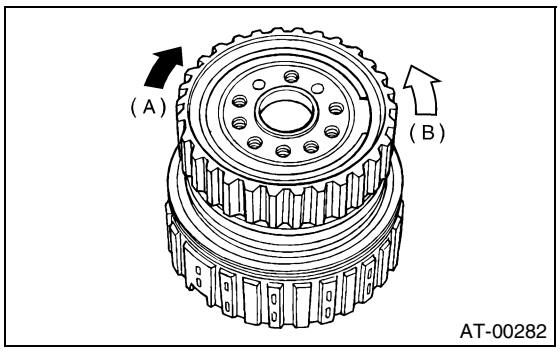
2. ONE-WAY CLUTCH OUTER RACE

1) Install the needle bearing, and secure with the snap ring.



(A) Needle bearing
(B) Snap ring

2) Install the one-way clutch, one-way clutch inner race and plate, and secure with the snap ring.
3) Set the inner race. Make sure that the forward clutch is free in clockwise direction and locked in counterclockwise direction, as viewed from front of the vehicle.



(A) Locked
(B) Free

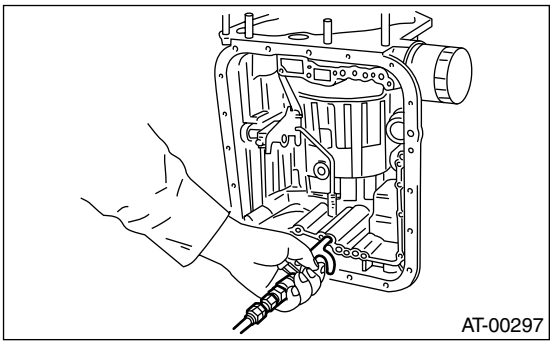
E: INSPECTION

- Make sure the snap ring is not worn and the seal rings are not damaged.
- Measure the total end play and adjust to within specifications.<Ref. to AT-96, ADJUSTMENT, Oil Pump.>

39.Low and Reverse Brake

A: REMOVAL

1) Remove the transmission assembly from vehicle. <Ref. to AT-38, REMOVAL, Automatic Transmission Assembly.>
2) Extract the torque converter clutch assembly. <Ref. to AT-76, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.
4) Disconnect the air breather hose. <Ref. to AT-74, REMOVAL, Air Breather Hose.>
5) Lift-up the lever behind transmission harness connector and disconnect it from stay.
6) Disconnect inhibitor switch connector from stay.
7) Remove the oil charger pipe. <Ref. to AT-75, REMOVAL, Oil Charger Pipe.>
8) Remove the oil cooler inlet and outlet pipes. <Ref. to AT-71, REMOVAL, ATF Cooler Pipe and Hose.>
9) Separate the torque converter clutch case and transmission case.<Ref. to AT-89, REMOVAL, Torque Converter Clutch Case.>
10) Separate the transmission case and extension case sections. <Ref. to AT-77, REMOVAL, Extension Case.>
11) Remove the reduction driven gear. <Ref. to AT-84, REMOVAL, Reduction Driven Gear.>
12) Remove the reduction drive gear. <Ref. to AT-86, REMOVAL, Reduction Drive Gear.>
13) Remove the oil pump housing. <Ref. to AT-92, REMOVAL, Oil Pump.>
14) Remove the control valve assembly. <Ref. to AT-58, REMOVAL, Control Valve Body.>
15) Take out the high clutch and reverse clutch assembly. <Ref. to AT-109, REMOVAL, High Clutch and Reverse Clutch.>
16) Take out the thrust needle bearing, planetary gear assembly. <Ref. to AT-114, REMOVAL, Planetary Gear and Low Clutch.>
17) Take out the 2-4 brake return spring, piston and piston retainer. <Ref. to AT-122, REMOVAL, 2-4 Brake.>
18) Remove the one-way clutch inner race. <Ref. to AT-126, REMOVAL, One-way Clutch.>
19) Take out the low & reverse piston by applying compressed air.

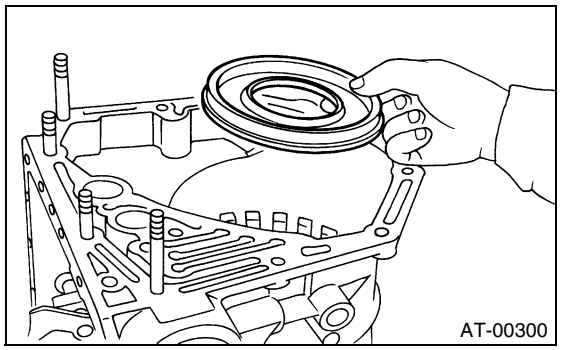


20) Take out the spring retainer, return spring and low & reverse piston.

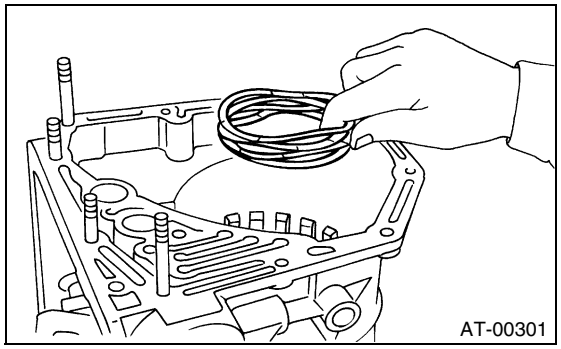
B: INSTALLATION

1) Install the low and reverse piston without tilting.

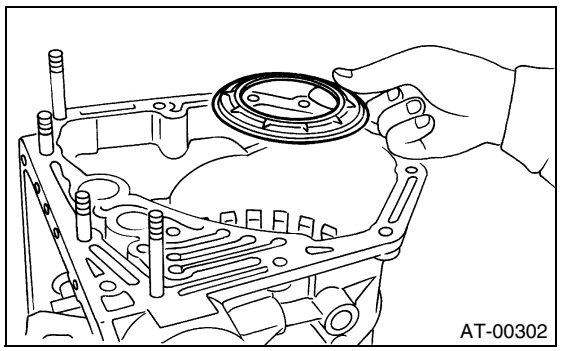
NOTE:
Be careful not to damage the lip seal.



2) Install the return spring.



3) Install the spring retainer.

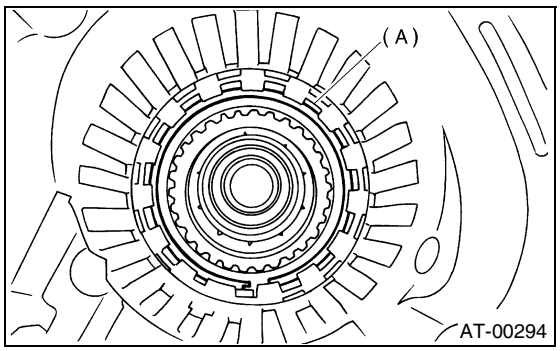


4) Install the one-way clutch inner race. <Ref. to AT-127, INSTALLATION, One-way Clutch.>
5) Install thrust needle bearing.

NOTE:
Place the transmission case with front facing up.

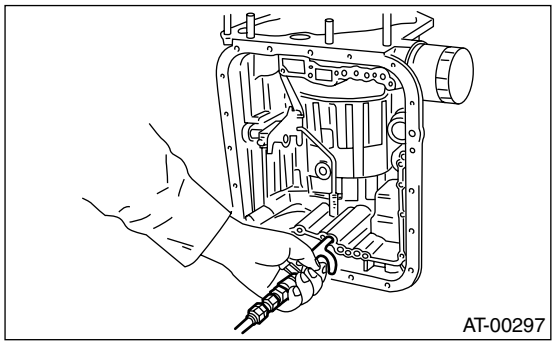
6) Installation of the low & reverse brake:
Install the dish plate, driven plates, drive plates, and a retaining plate, and secure with a snap ring.

NOTE:
Pay attention to the orientation of dish plate.

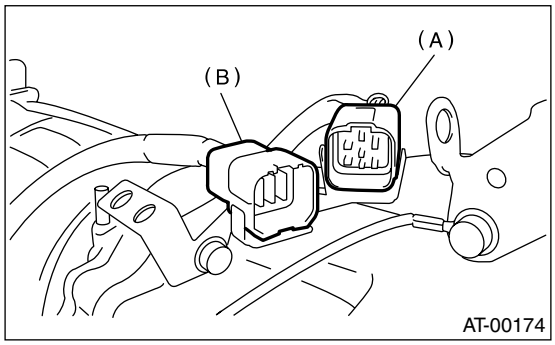


(A) Snap ring

7) Apply compressed air intermittently to check for operation.



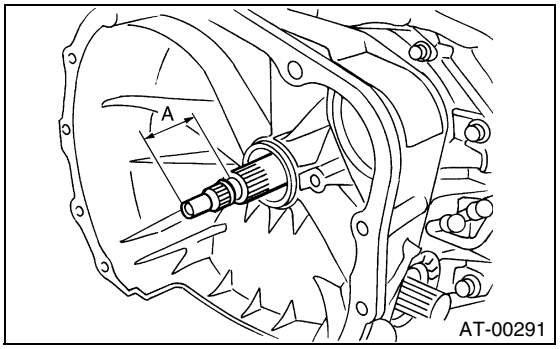
8) Check the clearance and select retaining plate. <Ref. to AT-132, INSPECTION, Low and Reverse Brake.>
9) Install the 2-4 brake piston, retainer and return spring to transmission case. <Ref. to AT-123, INSTALLATION, 2-4 Brake.>
10) Install the planetary gear and low clutch assembly to transmission case.
Install carefully while rotating the low clutch and planetary gear assembly slowly paying special attention not to damage the seal ring. <Ref. to AT-115, INSTALLATION, Planetary Gear and Low Clutch.>
11) Install the high clutch assembly. <Ref. to AT-109, INSTALLATION, High Clutch and Reverse Clutch.>
12) Install the oil pump housing assembly. <Ref. to AT-93, INSTALLATION, Oil Pump.>
13) Install the torque converter clutch case assembly to transmission case assembly. <Ref. to AT-89, INSTALLATION, Torque Converter Clutch Case.>
14) Install the reduction drive gear. <Ref. to AT-84, INSTALLATION, Reduction Driven Gear.>
15) Install reduction driven gear.
<Ref. to AT-84, INSTALLATION, Reduction Driven Gear.>
16) Install the extension case and rear vehicle speed sensor to transmission case. <Ref. to AT-77, INSTALLATION, Extension Case.>
17) Insert the inhibitor switch and transmission connector into stay.



(A) Transmission harness
(B) Inhibitor switch harness

18) Install the air breather hose. <Ref. to AT-74, INSTALLATION, Air Breather Hose.>
19) Install the oil cooler pipes. <Ref. to AT-72, INSTALLATION, ATF Cooler Pipe and Hose.>
20) Install the oil charger pipe with O-ring. <Ref. to AT-75, INSTALLATION, Oil Charger Pipe.>
21) Insert the input shaft while turning lightly by hand. At this time, not to damage the bushing.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



22) Install the torque converter clutch assembly. <Ref. to AT-76, INSTALLATION, Torque Converter Clutch Assembly.>
23) Install the transmission assembly to vehicle. <Ref. to AT-40, INSTALLATION, Automatic Transmission Assembly.>

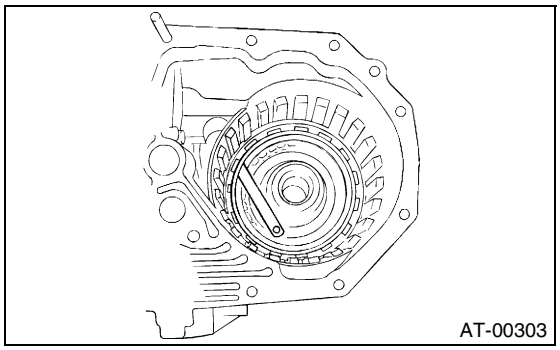
C: INSPECTION

Check for the following.
- Drive plate facing for wear or damage
- Snap ring for wear and spring retainer for deformation

1) Place the same thickness of shim on both sides to prevent retaining plate from tilting.
2) Inspect the clearance and select retaining plate.

Standard value:
0.7 — 1.2 mm (0.028 — 0.047 in)

Allowable limit:
2.2 mm (0.087 in)

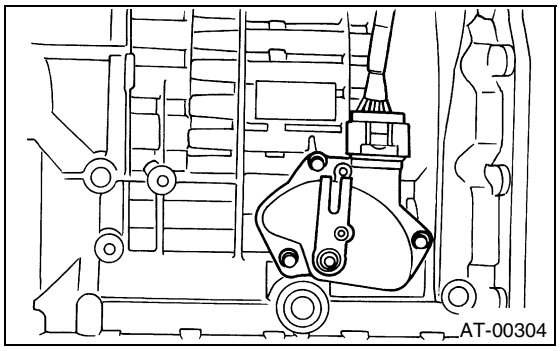


Available retaining plates	
Part No.	Thickness mm (in)
31667AA320	4.1 (0.161)
31667AA330	4.4 (0.173)
31667AA340	4.7 (0.185)
31667AA350	5.0 (0.197)
31667AA360	5.3 (0.209)
31667AA370	5.6 (0.220)
31667AA380	5.9 (0.232)

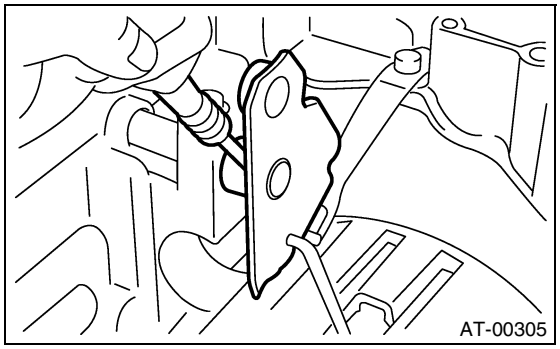
40.Transmission Control Device

A: REMOVAL

1) Remove the transmission assembly from vehicle. <Ref. to AT-38, REMOVAL, Automatic Transmission Assembly.>
2) Extract the torque converter clutch assembly. <Ref. to AT-76, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.
4) Lift-up the lever behind transmission harness connector and disconnect it from stay.
5) Disconnect the air breather hoses. <Ref. to AT-74, REMOVAL, Air Breather Hose.>
6) Disconnect the inhibitor switch connector from stay.
7) Wrap the vinyl tape around the nipple attached to the air breather hose.
8) Remove the pitching stopper bracket.
9) Remove the inhibitor switch.

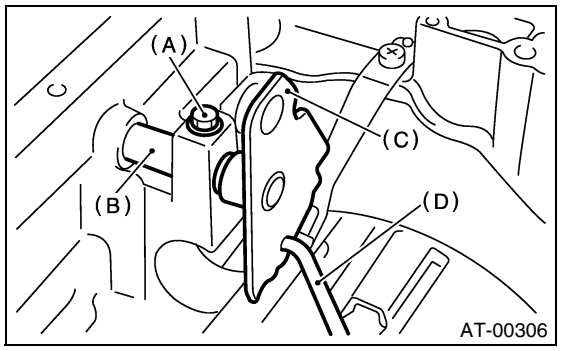


10) Remove the control valve body assembly. <Ref. to AT-58, REMOVAL, Control Valve Body.>
11) Pull off the straight pin of manual plate.



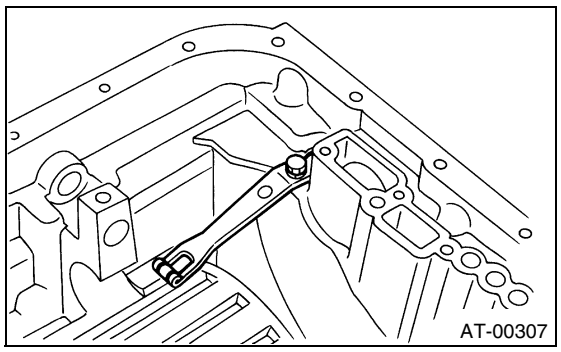
12) Remove the bolts securing select lever, then remove the select lever, manual plate and parking rod.

NOTE:
Be careful not to damage the lips of press-fitted oil seal in transmission case.



(A) Bolt
(B) Range select lever
(C) Manual plate
(D) Parking rod

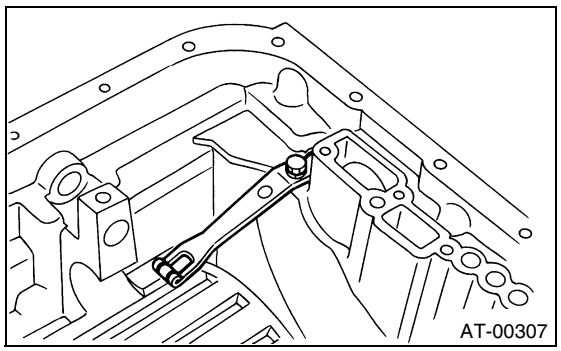
13) Remove the detention spring.



B: INSTALLATION

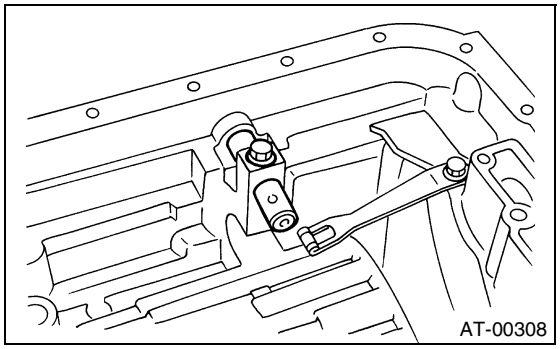
1) Install the detention spring to transmission case.

Tightening torque:
6 N·m (0.6 kgf-m, 4.3 ft-lb)

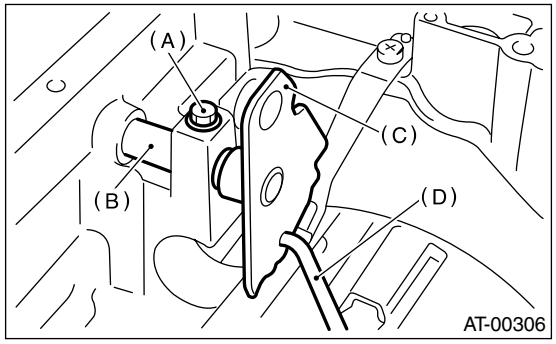


2) Insert the range select lever, and tighten the bolt.

Tightening torque:
6 N·m (0.6 kgf-m, 4.3 ft-lb)

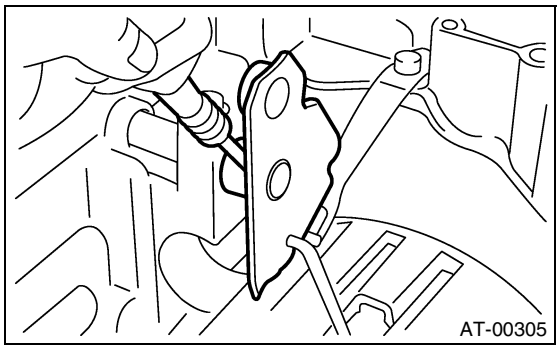


3) Insert the manual plate and parking rod.



(A) Bolt
(B) Range select lever
(C) Manual plate
(D) Parking rod

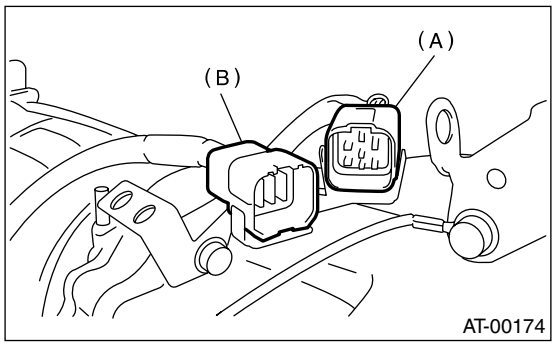
4) Insert the spring pin to manual plate.



5) Install the control valve assembly and oil pan. <Ref. to AT-59, INSTALLATION, Control Valve Body.>
6) Turn over the transmission case to its original position.
7) Install the pitching stopper bracket.

Tightening torque:
41 N·m (4.2 kgf-m, 30.4 ft-lb)

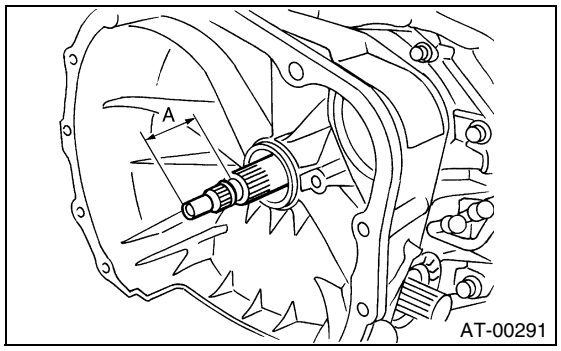
8) Install the inhibitor switch and adjust the inhibitor switch. <Ref. to AT-50, INSTALLATION, Inhibitor Switch.>
9) Insert the inhibitor switch and transmission connector into stay.



(A) Transmission harness
(B) Inhibitor switch harness

10) Install the air breather hose. <Ref. to AT-74, INSTALLATION, Air Breather Hose.>
11) Insert the input shaft while turning lightly by hand. At this time, not to damage the bushing.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



12) Install the torque converter clutch assembly. <Ref. to AT-76, INSTALLATION, Torque Converter Clutch Assembly.>
13) Install the transmission assembly to vehicle. <Ref. to AT-40, INSTALLATION, Automatic Transmission Assembly.>

C: INSPECTION

Make sure the manual lever and detention spring are not worn or otherwise damaged.

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

AT

Page

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9. Clear Memory Mode 23
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14. Diagnostic Procedure with Diagnostic Trouble Code (DTC) 38
15. Diagnostic Procedure for No-diagnostic Trouble Code (DTC) 100
16. Symptom Related Diagnostic 131

1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1)Ask the customer when and how trouble occurred using interview checklist. <Ref. to AT-4, Check List for Interview.> 2)Before performing the diagnosis, inspect following items which might influence the AT problems. •General inspection <Ref. to AT-5, INSPECTION, General Description.> •Oil leak •Stall speed test <Ref. to AT-32, Stall Test.> •Line pressure test <Ref. to AT-35, Line Pressure Test.> •Transfer clutch pressure test <Ref. to AT-37, Transfer Clutch Pressure Test.> •Time lag test <Ref. to AT-34, Time Lag Test.> •Road test <Ref. to AT-31, Road Test.> •Inhibitor switch <Ref. to AT-48, Inhibitor Switch.> Is the unit that might influence AT problem normal?	Unit is normal.	Go to step **2.**	Repair or replace each item.
2	**CHECK POWER INDICATOR LIGHT.** Turn the ignition switch to ON. Does the POWER indicator light illuminate?	POWER indicator light illuminates.	Go to step **4.**	Go to step **3.**
3	**CHECK POWER INDICATOR LIGHT.** 1)Turn the ignition switch to OFF. 2)Repair the POWER indicator light circuit or power supply and ground line circuit. <Ref. to AT-26, Diagnostic Procedure for POWER Indicator Light.> 3)Turn the ignition switch to ON. Is the POWER indicator light flashing?	POWER indicator light is flashing.	Go to step **4.**	Go to step **5.**
4	**CHECK INDICATION OF DIAGNOSTIC TROUBLE CODE (DTC).** Calling up the DTC. Without SUBARU SELECT MONITOR <Ref. to AT-20, WITHOUT SUBARU SELECT MONITOR, Read Diagnostic Trouble Code (DTC).> With SUBARU SELECT MONITOR <Ref. to AT-21, WITH SUBARU SELECT MONITOR, Read Diagnostic Trouble Code (DTC).> NOTE: If the communication function of select monitor cannot be executed normally, check the communication circuit. <Ref. to AT-34, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostic Procedure for Select Monitor Communication.> Is the DTC displayed?	DTC is displayed.	Go to step **6.** NOTE: Record all DTC.	Go to step **5.**

	Step	Check	Yes	No
5	**PERFORM THE GENERAL DIAGNOSTICS.** 1)Inspect using “Diagnostic Procedure for No-diagnostic trouble code (DTC)”.<Ref. to AT-100, Diagnostic Procedure for No-diagnostic Trouble Code (DTC).> 2)Inspect using “Symptom Related Diagnostic”. <Ref. to AT-131, Symptom Related Diagnostic.> 3)Perform the clear memory mode. Without SUBARU SELECT MONITOR <Ref. to AT-23, WITH SUBARU SELECT MONITOR, Clear Memory Mode.> With SUBARU SELECT MONITOR <Ref. to AT-23, WITHOUT SUBARU SELECT MONITOR, Clear Memory Mode.> 4)Perform the inspection mode. <Ref. to AT-22, Inspection Mode.> Calling up the DTC. Without SUBARU SELECT MONITOR <Ref. to AT-20, WITHOUT SUBARU SELECT MONITOR, Read Diagnostic Trouble Code (DTC).> With SUBARU SELECT MONITOR <Ref. to AT-21, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> Is the DTC displayed?	DTC is displayed.	Go to step **6.**	Complete the diagnosis.
6	**PERFORM THE DIAGNOSIS.** 1)Inspect using “Diagnostics Chart with Diagnostic Trouble Code (DTC)”.<Ref. to AT-38, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: For trouble code table, refer to “List of Diagnostic Trouble Code (DTC)”.<Ref. to AT-25, List of Diagnostic Trouble Code (DTC).> 2)Repair the trouble cause. 3)Perform the clear memory mode. Without SUBARU SELECT MONITOR <Ref. to AT-23, WITH SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> With SUBARU SELECT MONITOR <Ref. to AT-23, WITHOUT SUBARU SELECT MONITOR, Clear Memory Mode.> 4)Perform the inspection mode. <Ref. to AT-22, Inspection Mode.> 5)Calling up the DTC. Without SUBARU SELECT MONITOR <Ref. to AT-20, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> With SUBARU SELECT MONITOR <Ref. to AT-21, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> Is the DTC displayed?	DTC is displayed.	Inspect using “Diagnostics Chart with Diagnostic Connector”. <Ref. to AT-38, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnosis.

2. Check List for Interview

A: CHECK

Check the following items when problem has occurred.

NOTE:
Use copies of this page for interviewing customers.

Customer's name			
Data vehicle brought in			
Data of repair			
Trans. model	TRANSMISSION	VIN	
Odometer reading	km/h or mile		
Frequency	❑ Continuous ❑ Intermittent (times a day)		
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others ( )		
Place	❑ High ❑ Suburbs ❑ Inner city ❑ Uphill ❑ Rough road ❑ Others ( )		
Outdoor temperature	❑ Hot ❑ Warm ❑ Cool ❑ Cold		
Vehicle speed	km/h (MPH)		
Malfunction indicator lamp (MIL)	❑ Continuously lit	❑ Not lit	
Select lever position	❑ P ❑ R ❑ N ❑ D ❑ 3 ❑ 2 ❑ 1		
Driving condition	❑ Not affected ❑ At racing ❑ While decelerating	❑ At starting ❑ While accelerating ❑ While turning (❑ RH/❑ LH)	❑ While idling ❑ While cruising
POWER switch	❑ ON ❑ OFF		
HOLD switch	❑ ON ❑ OFF		
Symptoms	❑ No up-shift		
	❑ No down-shift		
	❑ No kick down		
	❑ Vehicle does not move (❑ Any position ❑ Particular position)		
	❑ Lock-up malfunction		
	❑ Noise or vibration		
	❑ Shift shock or slip		
	❑ Select lever does not move		
	❑ Others ( )		

3. General Description

A: CAUTION

• Supplemental Restraint System "Airbag"

The airbag system wiring harness is routed near the transmission control module (TCM).

CAUTION:

• All airbag system wiring harness and connectors are colored yellow. Do not use an electrical test equipment on these circuit.

• Be careful not to damage the airbag system wiring harness when performing diagnostics and servicing the TCM.

• Measurement

When measuring the voltage and resistance of ECM, TCM or each sensor, use a tapered pin with diameter of less than 0.64 mm (0.025 in) in order to avoid poor contact. Do not insert the pin more than 0.65 mm (0.256 in).

B: INSPECTION

1. BATTERY

Measure the battery voltage and specific gravity of electrolyte.

Standard voltage: 12V or more

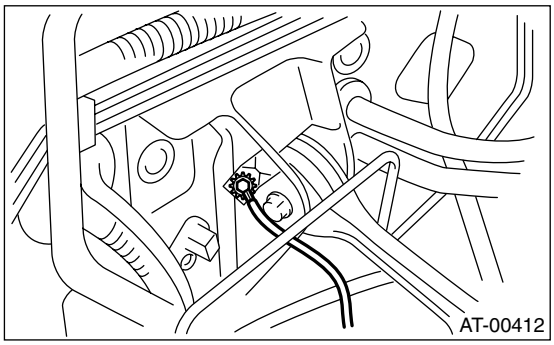
Specific gravity: Above 1.260

2. TRANSMISSION GROUND

Make sure that the ground terminal bolt is tightened securely.

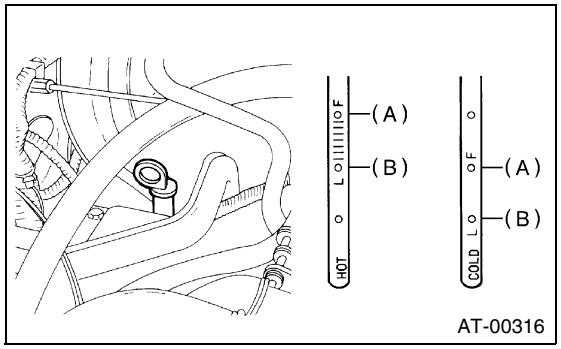
• Chassis side

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)



3. ATF LEVEL

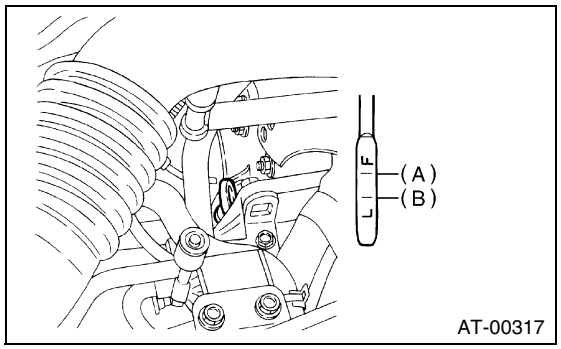
Make sure that ATF level is in the specification. <Ref. to AT-29, INSPECTION, Automatic Transmission Fluid.>



(A) Upper level
(B) Lower level

4. FRONT DIFFERENTIAL OIL LEVEL

Make sure that front differential oil level is in the specification. <Ref. to AT-30, INSPECTION, Differential Gear Oil.>

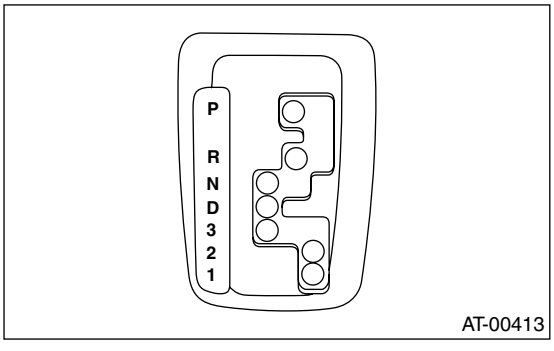


(A) Upper level
(B) Lower level

5. OPERATION OF SHIFT SELECT LEVER

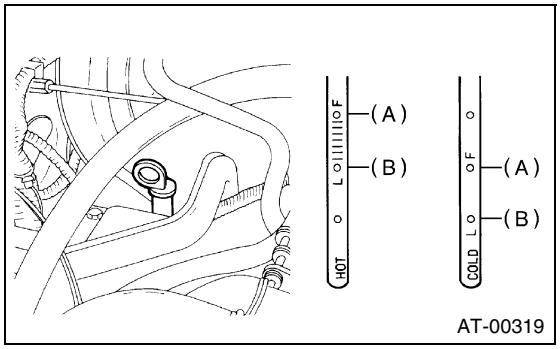
Make sure there is no abnormal noise, dragging or contact pattern in each select lever range.

WARNING:
Stop the engine while checking operation of selector lever.



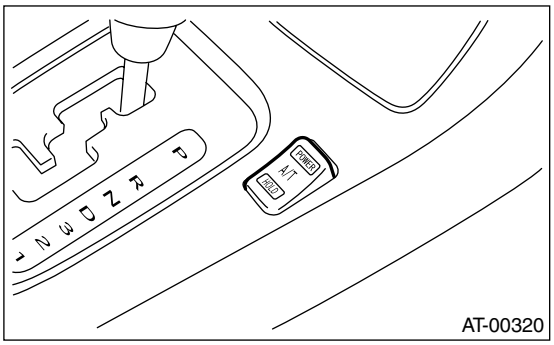
6. POWER SWITCH

Make sure that the POWER indicator light in combination meter comes ON, when turning the power switch to ON.



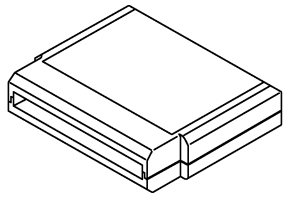
7. HOLD SWITCH

Make sure that the HOLD indicator light in combination meter comes ON, when turning the hold switch to ON.



C: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA210	24082AA210 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
ST222771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

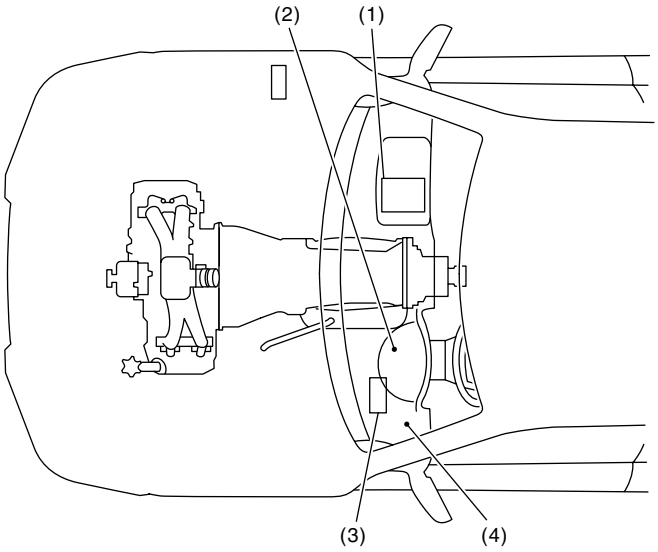
2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Oscilloscope	Used for measuring sensor.

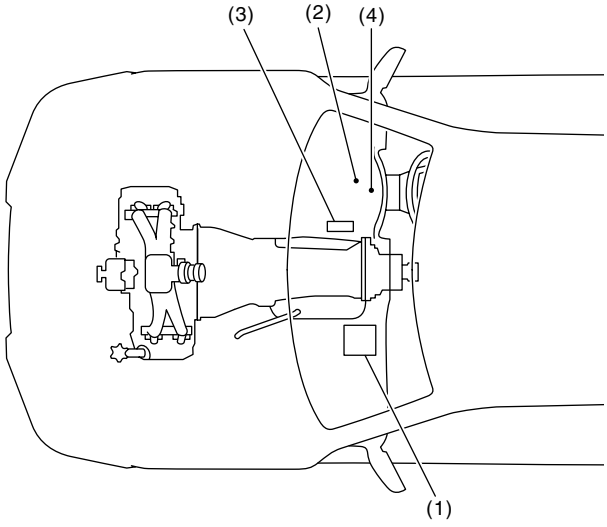
4. Electrical Components Location

A: LOCATION

1. CONTROL MODULE

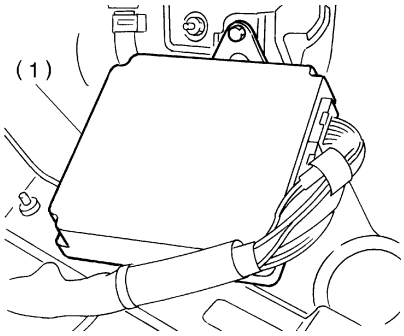


AT-00414

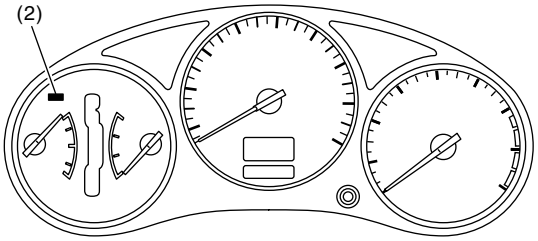


AT-00369

(1) Engine control module (ECM)
(2) POWER indicator light (AT diagnostic indicator light)
(3) Transmission control module (TCM)
(4) Data link connector

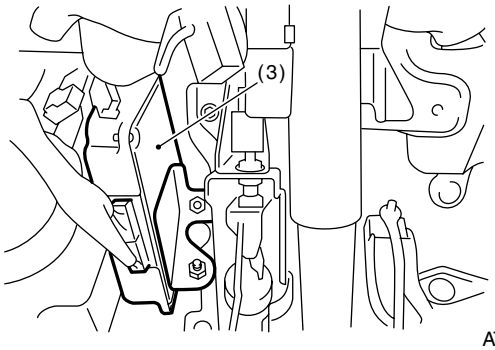


AT-00323



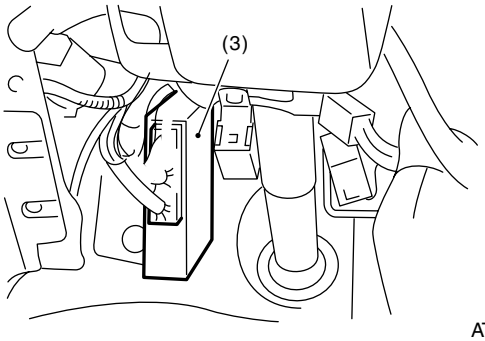
AT-00324

LHD

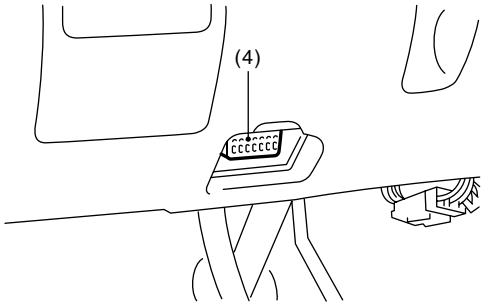


AT-00416

RHD

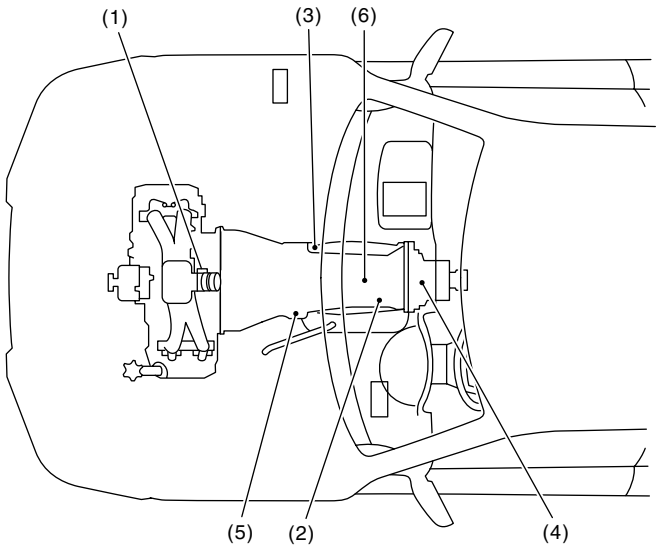


AT-00372



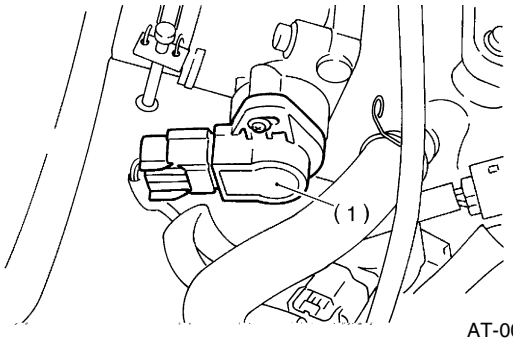
AT-00417

2. SENSOR

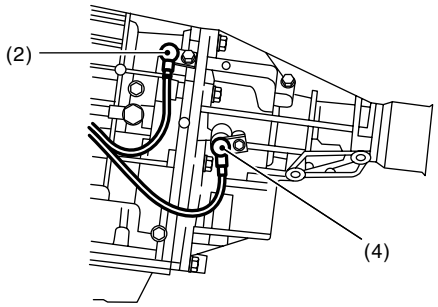


AT-00744

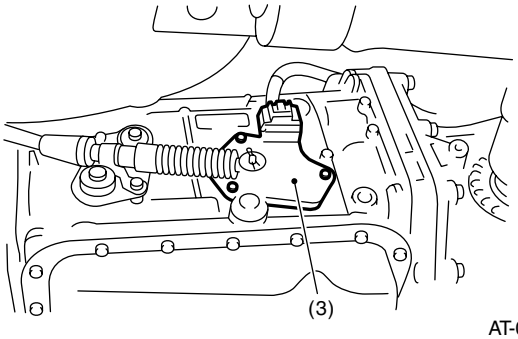
(1) Throttle position sensor
(2) Front vehicle speed sensor
(3) Inhibitor switch
(4) Rear vehicle speed sensor
(5) Torque converter turbine speed sensor
(6) ATF temperature sensor



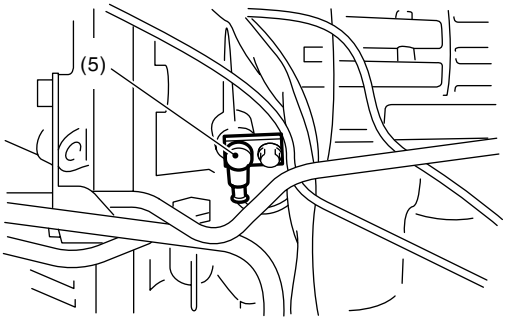
AT-00328



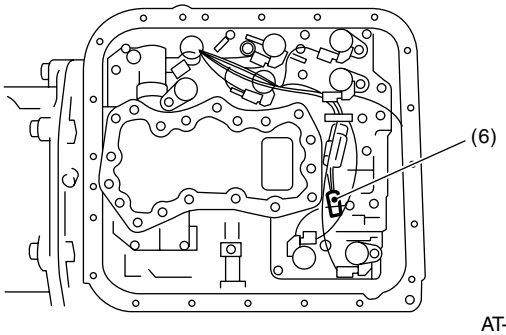
AT-00329



AT-00330

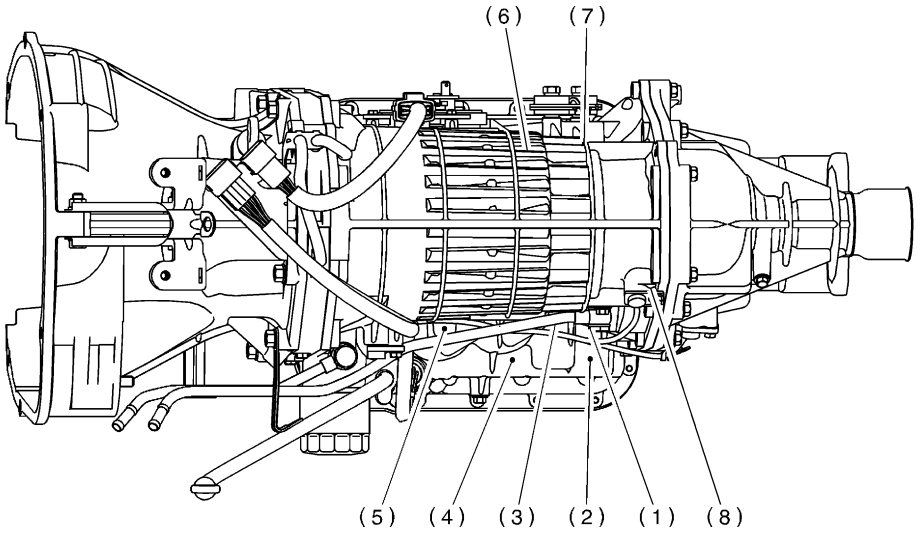


AT-00331



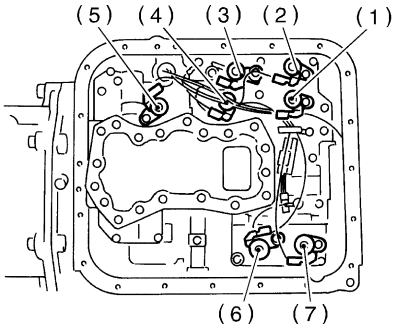
AT-00332

3. SOLENOID

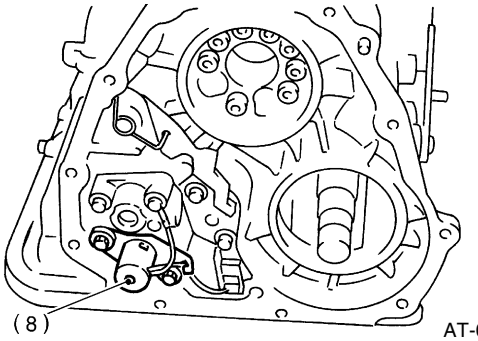


AT-00333

(1) Solenoid 1
(2) Solenoid 2
(3) Line pressure duty solenoid
(4) Low clutch timing solenoid
(5) Lock-up duty solenoid
(6) 2-4 brake duty solenoid
(7) 2-4 brake timing solenoid
(8) Transfer duty solenoid



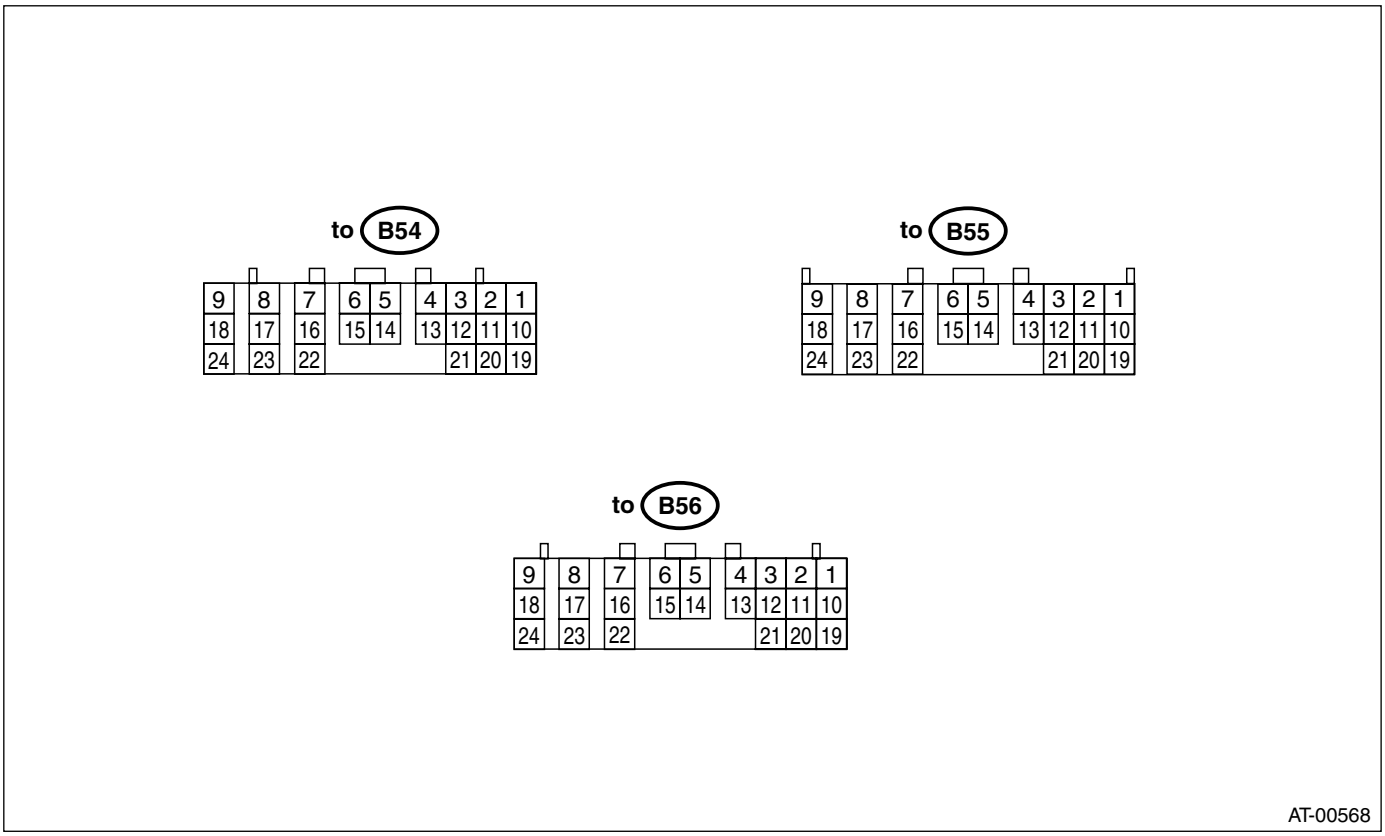
AT-00334



AT-00335

5. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION



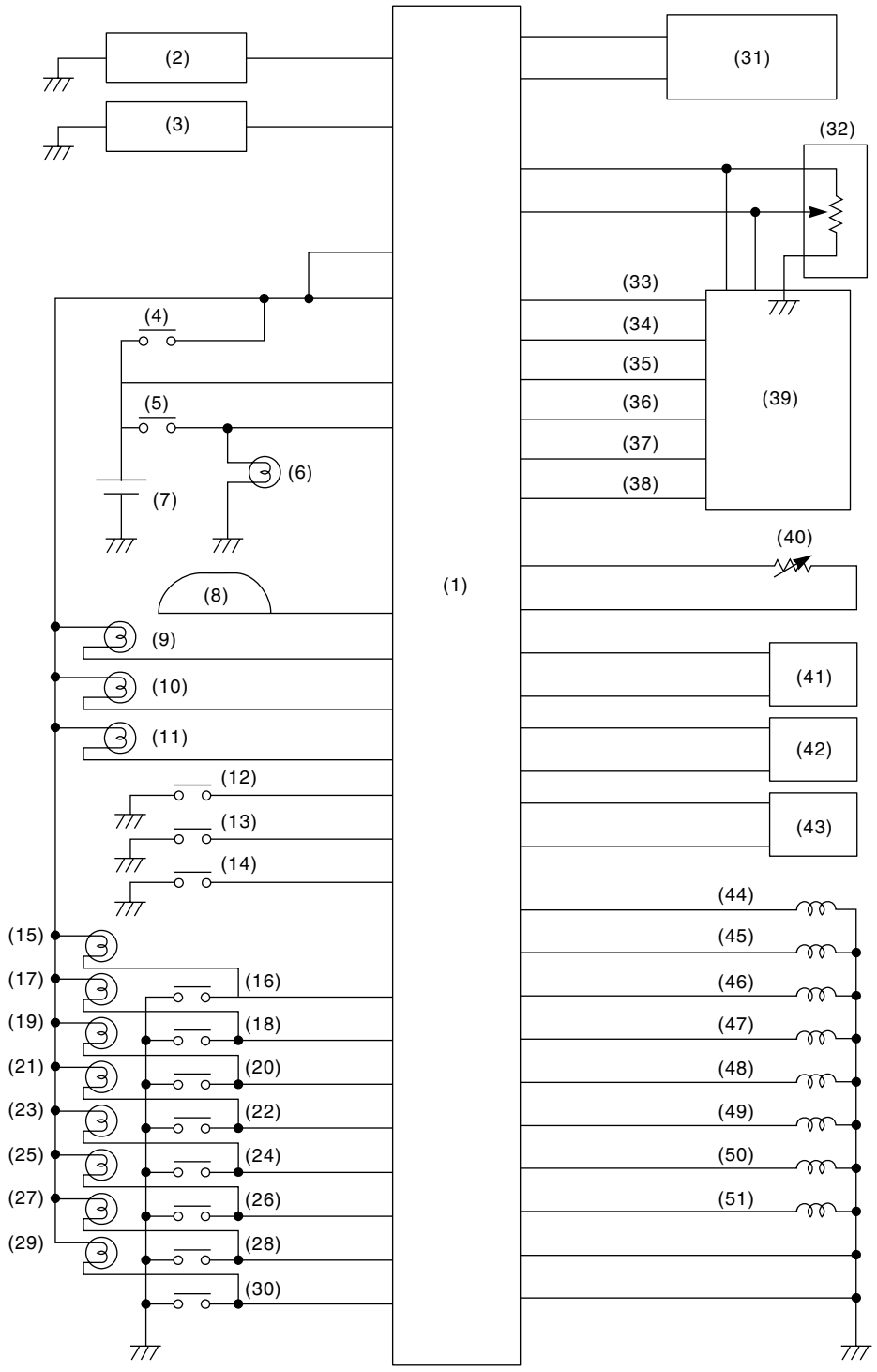
Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Back-up power supply	B56	1	Ignition switch OFF	10 — 13	—
Ignition power supply	B54	23	Ignition switch ON (with engine OFF)	10 — 13	—
	B54	24			

Check with ignition switch ON.						
Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Inhibitor switch	"P" range switch	B55	1	Select lever in "P" range	Less than 1	—
				Select lever in any other than "P" range (except "N" range)	More than 8	
	"N" range switch	B55	14	Select lever in "N" range	Less than 1	—
				Select lever in any other than "N" range (except "P" range)	More than 8	
	"R" range switch	B55	3	Select lever in "R" range	Less than 1	—
				Select lever in any other than "R" range	More than 8	
	"D" range switch	B55	4	Select lever in "D" range	Less than 1	—
				Select lever in any other than "D" range	More than 8	
	"3" range switch	B55	5	Select lever in "3" range	Less than 1	—
				Select lever in any other than "3" range	More than 8	
	"2" range switch	B55	6	Select lever in "2" range	Less than 1	—
				Select lever in any other than "2" range	More than 8	
	"1" range switch	B55	7	Select lever in "1" range	Less than 1	—
				Select lever in any other than "1" range	More than 8	
Brake switch		B55	12	Brake pedal depressed.	More than 10.5	—
				Brake pedal released.	Less than 1	
Kick-down switch		B55	11	Throttle fully opened.	Less than 1	—
				Throttle fully closed.	More than 6.5	
AT OIL TEMP warning light		B56	10	Light ON	Less than 1	—
				Light OFF	More than 9	
Throttle position sensor		B54	3	Throttle fully closed.	0.2 — 1.0	—
				Throttle fully open.	4.2 — 4.7	
Throttle position sensor power supply		B54	2	Ignition switch ON (with engine OFF)	4.8 — 5.3	—
ATF temperature sensor		B54	11	ATF temperature 20°C (68°F)	1.6 — 2.0	2.1 k — 2.9 k
				ATF temperature 80°C (176°F)	0.4 — 0.9	275 — 375
Rear vehicle speed sensor		B55	24	Vehicle stopped.	0	450 — 650
				Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Front vehicle speed sensor		B55	18	Vehicle stopped.	0	450 — 650
				Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Torque converter turbine speed sensor		B55	8	Engine idling after warm-up. (D range)	0	450 — 650
				Engine idling after warm-up. (N range)	More than 1 (AC range)	
Vehicle speed output signal		B56	17	Vehicle speed at most 10 km/h (6 MPH)	Less than 1← →More than 4	—

Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Engine speed signal	B55	17	Ignition switch ON (with engine OFF)	More than 10.5	—
			Ignition switch ON (with engine ON)	8 — 11	
Cruise set signal	B55	22	When cruise control is set. (SET lamp ON)	Less than 1	—
			When cruise control is not set. (SET lamp OFF)	More than 6.5	
Torque control signal 1	B56	5	Ignition switch ON (with engine ON)	More than 4	—
Torque control signal 2	B56	14	Ignition switch ON (with engine ON)	More than 4	—
Torque control cut signal	B55	10	Ignition switch ON	8	—
Intake manifold pressure signal (Non-turbo model)	B54	1	Engine idling after warm-up.	0.4 — 1.6	—
Mass air flow signal (Turbo model)	B54	1	Engine idling after warm-up.	0.9 — 1.4	—
Shift solenoid 1	B54	22	1st or 4th gear	More than 9	10 — 16
			2nd or 3rd gear	Less than 1	
Shift solenoid 2	B54	5	1st or 2nd gear	More than 9	10 — 16
			3rd or 4th gear	Less than 1	
Line pressure duty solenoid	B54	9	Ignition switch ON (with engine OFF) Throttle fully closed after warm-up.	1.5 — 4.0	2.0 — 4.5
			Ignition switch ON (with engine OFF) Throttle fully open after warm-up.	Less than 0.5	
Lock-up duty solenoid	B54	7	When lock up occurs.	More than 8.5	10 — 17
			When lock up is released.	Less than 0.5	
Transfer duty solenoid (Non-turbo model)	B54	6	Fuse on FWD switch	More than 8.5	10 — 17
			Fuse removed from FWD switch (with throttle fully open and with select lever in 1st gear).	Less than 0.5	
Transfer duty solenoid (Turbo model)	B54	6	Throttle fully closed.	More than 8.5	10 — 17
			Throttle fully open.	Less than 0.5	
2-4 brake duty solenoid	B54	18	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 5.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
2-4 brake timing solenoid	B54	16	1st gear	Less than 1	10 — 16
			3rd gear	More than 9	
Low clutch timing solenoid	B54	15	2nd gear	Less than 1	10 — 16
			4th gear	More than 9	
Hold switch	B55	16	Hold switch ON	Less than 1	—
			Hold switch OFF	More than 8	—
Power switch	B55	23	Power switch ON	Less than 1	—
			Power switch OFF	More than 10	—

Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Power indicator light	B56	11	Light ON	Less than 1	—
			Light OFF	More than 9	—
FWD switch	B55	20	Fuse removed.	6 — 9.1	—
			Fuse installed.	Less than 1	—
FWD indicator light	B56	2	Fused ON FWD switch	Less than 1	—
			Fuse removed from FWD switch.	More than 9	—
ABS signal	B55	21	ABS switch ON	Less than 1	—
			ABS switch OFF	6.5 — 15	—
Sensor ground line 1	B54	20	—	0	Less than 1
Sensor ground line 2	B55	9	—	0	Less than 1
System ground line	B56	19	—	0	Less than 1
	B54	21			
Sensor ground line 3	B54	10	—	0	Less than 1
Sensor ground line 4	B54	19	—	0	Less than 1
AT diagnosis signal	B56	21	Ignition switch ON	Less than 1 ← → More than 4	—
Data link signal (Subaru Select Monitor)	B56	15	—	—	—

B: SCHEMATIC



AT-00569

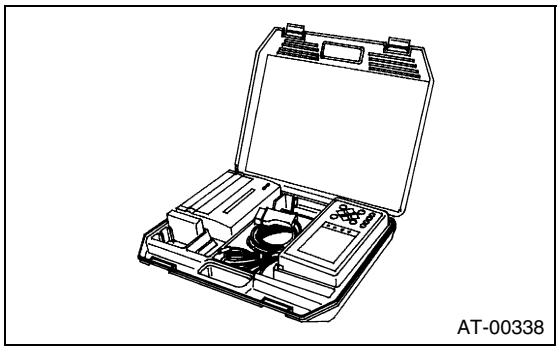
(1) Transmission control module
(2) Cruise control module
(3) ABS control module
(4) Ignition switch
(5) Brake switch
(6) Brake light
(7) Battery
(8) Combination meter (Speedometer circuit)
(9) AT OIL TEMP light
(10) FWD indicator light
(11) POWER indicator light
(12) FWD switch
(13) Power switch
(14) Kick-down switch
(15) Hold indicator light
(16) Hold switch
(17) “P” range indicator light
(18) “P” range switch
(19) “R” range indicator light
(20) “R” range switch
(21) “N” range indicator light
(22) “N” range switch
(23) “D” range indicator light
(24) “D” range switch
(25) “3” range indicator light
(26) “3” range switch
(27) “2” range indicator light
(28) “2” range switch
(29) “1” range indicator light
(30) “1” range switch
(31) Data link connector
(32) Throttle position sensor
(33) Engine speed signal
(34) Torque control cut signal
(35) Torque control signal 2
(36) Torque control signal 1
(37) Non-turbo model:
Intake manifold pressure signal
Turbo model:
Mass air flow signal
(38) AT diagnostics signal
(39) Engine control module
(40) ATF temperature sensor
(41) Torque converter turbine speed sensor
(42) Rear vehicle speed sensor
(43) Front vehicle speed sensor
(44) Shift solenoid 1
(45) Shift solenoid 2
(46) 2-4 brake timing solenoid
(47) Line pressure duty solenoid
(48) 2-4 brake duty solenoid
(49) Lock-up duty solenoid
(50) Low clutch timing solenoid
(51) Transfer duty solenoid

6. Subaru Select Monitor

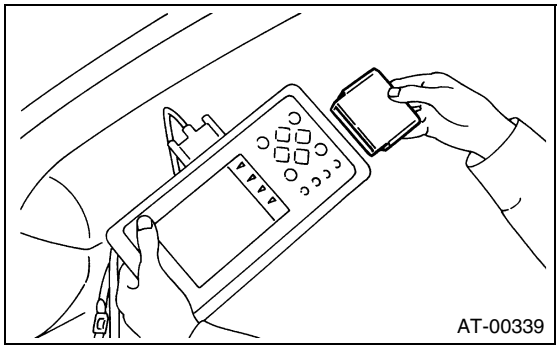
A: OPERATION

1. READ DIAGNOSTIC TROUBLE CODE

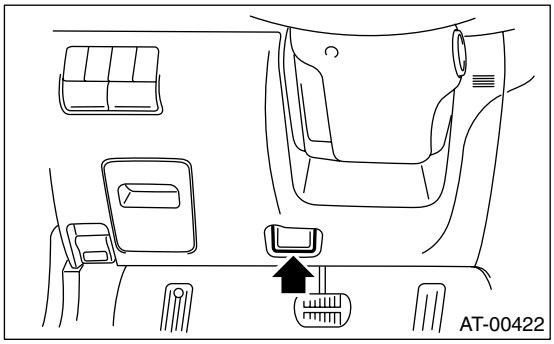
1) Prepare the Subaru Select Monitor kit.



2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to AT-6, PREPARATION TOOL, General Description.>



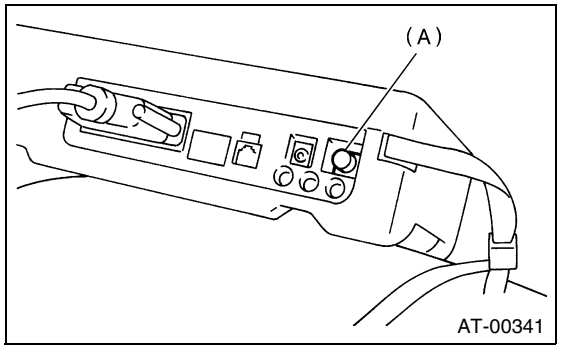
4) Connect the Subaru Select Monitor to data link connector.
   (1) Data link connector located in the lower portion of instrument panel (on driver's side).



   (2) Connect the diagnosis cable to data link connector.

NOTE:
Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

6) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.
7) On the «System Selection Menu» display screen, select the {Transmission Control System} and press [YES] key.
8) Press the [YES] key after displayed information of transmission type.
9) On the «Transmission Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press [YES] key.
10) On the «Diagnostic Code(s) Display» display screen, select the {Latest Diagnostic Code(s)} or {Memorized Diagnostic Code(s)} and press [YES] key.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning the diagnostic trouble codes (DTC), refer to the DIAGNOSTIC TROUBLE CODE LIST. <Ref. to AT-25, List of Diagnostic Trouble Code (DTC).>

2. READ CURRENT DATA

1) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.
2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press [YES] key.
3) Press the [YES] key after displayed information of transmission type.
4) On the «Transmission Diagnosis» display screen, select the {Current Data Display & Save} and press [YES] key.
5) On the «Data Display Menu» display screen, select the {Data Display} and press [YES] key.
6) Using the scroll key, move the display screen up or down until desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Rear vehicle speed sensor signal	Rear Wheel Speed	km/h or MPH
Front vehicle speed sensor signal	Front Wheel Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Automatic transmission fluid temperature signal	ATF Temp.	°C or °F
Throttle position signal	Throttle Sensor Voltage	V
Gear position	Gear Position	—
Line pressure control duty ratio	Line Pressure Duty Ratio	%
Lock up clutch control duty ratio	Lock Up Duty Ratio	%
Transfer clutch control duty ratio	Transfer Duty Ratio	%
Power supply for throttle position sensor	Throttle Sensor Power	V
Torque converter turbine speed signal	Turbine Revolution Speed	rpm
2-4 brake timing pressure control duty ratio	Brake Clutch Duty Ratio	%
Mass air flow sensor signal (Turbo model)	Air Flow Sensor Voltage	V
Intake manifold pressure sensor voltage (Non-turbo model)	Mani. Pressure Voltage	V
2 wheel drive switch signal	FWD Switch	ON or OFF
Stop lamp switch signal	Stop Light Switch	ON or OFF
Anti lock brake system signal	ABS Signal	ON or OFF
Cruise control system signal	Cruise Control Signal	ON or OFF
Parking range signal	P Range Signal	ON or OFF
Neutral range signal	N Range Signal	ON or OFF
Reverse range signal	R Range Signal	ON or OFF
Drive range signal	D Range Signal	ON or OFF
3rd range signal	3rd Range Signal	ON or OFF
2nd range signal	2nd Range Signal	ON or OFF
1st range signal	1st Range Signal	ON or OFF
Shift control solenoid A	Shift Solenoid #1	ON or OFF
Shift control solenoid B	Shift Solenoid #2	ON or OFF
Torque control output signal #1	Torque Control Signal 1	ON or OFF
Torque control output signal #2	Torque Control Signal 2	ON or OFF
Torque control cut signal	Torque Control Cut Sig.	ON or OFF
2-4 brake timing control solenoid valve	2-4 Brake Timing Sol.	ON or OFF
Low clutch timing control solenoid valve	Low Clutch Timing Sol.	ON or OFF
Automatic transmission diagnosis indicator lamp	Diagnosis Lamp	ON or OFF
Power mode switch signal	Power Mode Switch	ON or OFF
Hold mode switch signal	Hold Mode Switch	ON or OFF
Kick down switch signal	Kick Down Switch	ON or OFF
Automatic transmission fluid temperature lamp	ATF Temperature Lamp	ON or OFF

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

3. CLEAR MEMORY MODE

1) On the «Main Menu» display screen, select the {2. Each System Check} and press [YES] key.
2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press [YES] key.
3) Press the [YES] key after displayed information of transmission type.
4) On the «Transmission Diagnosis» display screen, select the {Clear Memory} and press [YES] key.
5) When the `Done' and `Turn Ignition Switch OFF' are shown on display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

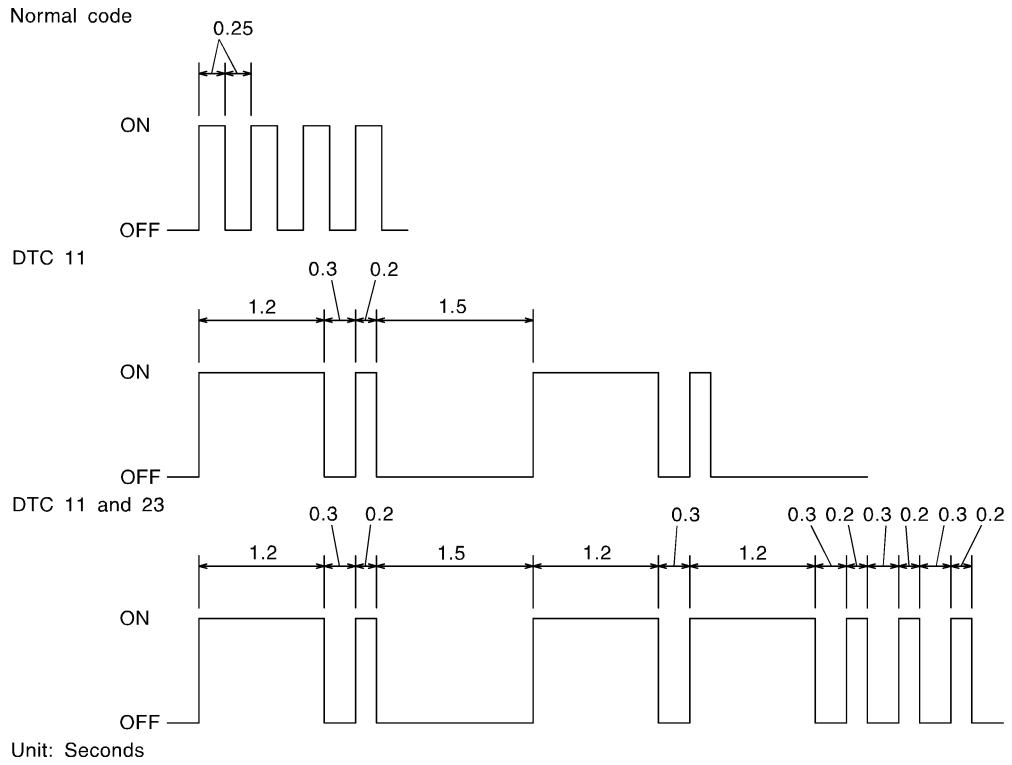
7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. WITHOUT SUBARU SELECT MONITOR

	Step	Check	Yes	No
1	**PERFORM READ DIAGNOSTIC TROUBLE CODE.** 1)Warm-up the engine. 2)Turn the ignition switch to OFF. 3)Turn the ignition switch to ON. 4)Start the engine. 5)Drive the vehicle at speeds greater than 20 km/h (12 MPH). 6)Stop the vehicle. 7)The brake pedal depressed and move select lever to 1 range. 8)Turn the ignition switch to OFF. 9)Turn the ignition switch to ON. 10)Move the select lever 2 range. 11)Move the select lever 1 range. 12)Move the select lever 2 range. 13)Move the select lever 3 range. 14)Move the select lever D range. Does the indicator light blink at 4 Hz intervals? NOTE: Blinks every 0.125 (1/8) seconds (until the ignition switch is turned OFF).	Indicator light blinks at 4 Hz intervals.	Repair the power supply and ground circuit.<Ref. to AT-31, CHECK POWER SUPPLY AND GROUND LINE, Diagnostic Procedure for POWER Indicator Light.>	Go to step **2.**
2	**CHECK INDICATOR LIGHT.** Does the indicator light blink at 2 Hz intervals? NOTE: Blinks every 0.25 (1/4) seconds (until ignition switch is turned to OFF).	Indicator light blinks at 2 Hz intervals.	The AT system is normal.	Go to step **3.**
3	**CHECK INDICATOR LIGHT.** Is the DTC output?	DTC is output.	Inspect the problem corresponding with DTC. NOTE: Record all DTCs.	Go to step **4.**
4	**CHECK INDICATOR LIGHT.** Does the indicator light remain illuminated?	Indicator light remains illuminating.	Repair the power indicator light circuit <Ref. to AT-26, Diagnostic Procedure for POWER Indicator Light.>, or Inspect inhibitor switch, wiring, TCM, etc.	Calling up the DTC again.

The power indicator light flashes the code corresponding to faulty part.
The long segment (1.2 sec on) indicates a “ten”, and the short segment (0.2 sec on) signifies a “one”.



2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to obtain and understand diagnostic trouble codes (DTC). <Ref. to AT-18, OPERATION, Subaru Select Monitor.>

8. Inspection Mode

A: OPERATION

Raise the vehicle using a garage jack and place on safety stands or drive the vehicle onto free rollers.

WARNING:

• Before raising the vehicle, ensure parking brake is applied.

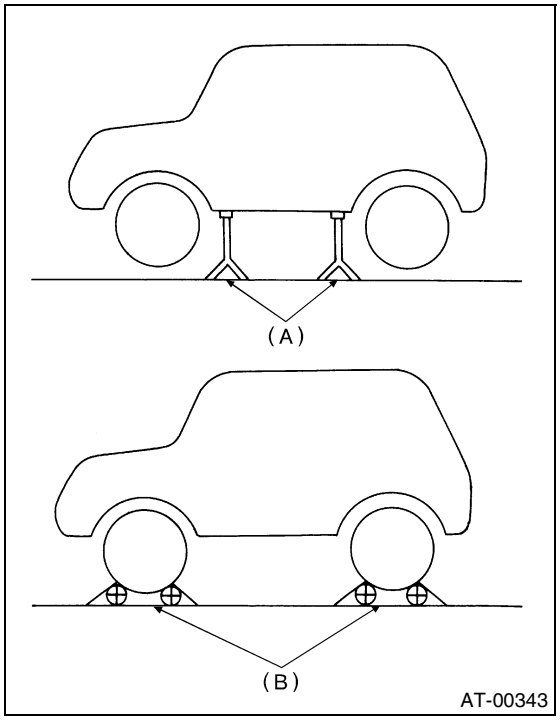
• Do not use a pantograph jack in place of a safety stand.

• Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.

• Do not abruptly depress/release the clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause vehicle to jump off free rollers.

• In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between safety stands and the vehicle.

• Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



(A) Safety stand
(B) Free rollers

9. Clear Memory Mode

A: OPERATION

1. WITHOUT SUBARU SELECT MONITOR

Current diagnostic trouble codes (DTC) shown on display are cleared by turning the ignition switch to OFF after conducting on-board diagnostics operation. Previous diagnostic trouble codes (DTC), however, cannot be cleared since they are stored in the TCM memory which is operating on back-up power supply. These diagnostic trouble codes (DTC) can be cleared by removing the specified fuse (located under light or left lower position of the instrument panel).

CLEAR MEMORY:

Removal of TCM connector (B56) (for at least two minute)

- The TCM connector (B56) is located in the line to memory back-up power supply of TCM. Removal of this connector clears the previous diagnostic trouble codes (DTC) stored in TCM memory.
- Be sure to remove the TCM connector (B56) for at least the specified length of time. Otherwise, the diagnostic trouble codes (DTC) may not be cleared.

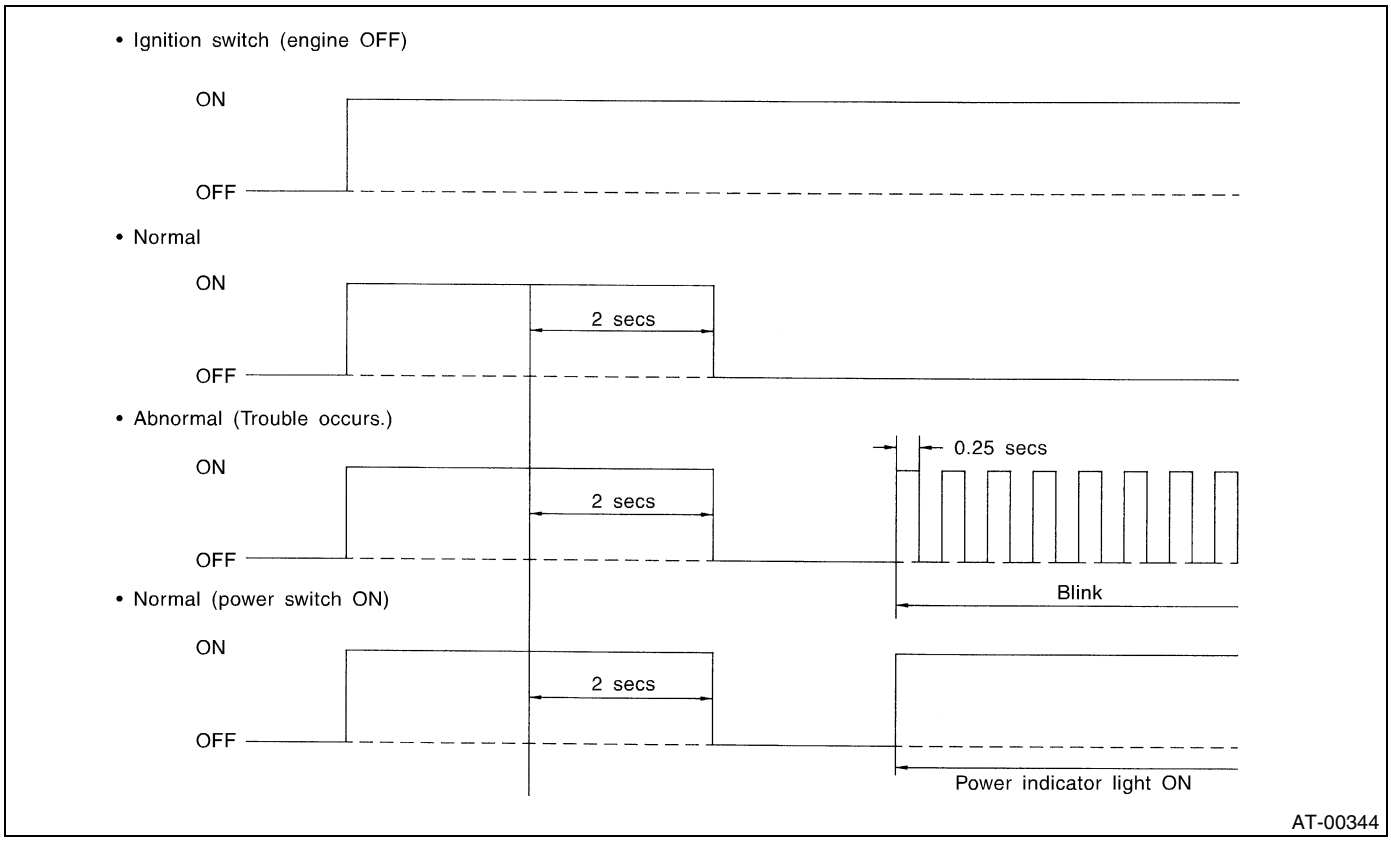
2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to clear trouble codes.
<Ref. to AT-19, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.>

10.POWER Indicator Light Display

A: INSPECTION

When any on-board diagnostics item is malfunctioning, the display on POWER indicator light blinks from the time malfunction is detected after starting the engine until ignition switch is turned to OFF. The malfunctioning part or unit can be determined by a diagnostic trouble code (DTC) during on-board diagnostics operation. Problems which occurred previously can also be identified through the memory function. If the POWER indicator does not show a problem (although a problem is occurring), the problem can be determined by checking the performance characteristics of each sensor using select monitor. The indicator signal is as shown in the figure.



11.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC No.	Item	Content of diagnosis	Index
11	Engine speed signal	Detects open or shorted input signal circuit.	<Ref. to AT-38, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
23	Mass air flow signal (Turbo model)	Detects open or shorted input signal circuit.	<Ref. to AT-41, DTC 23 MASS AIR FLOW SIGNAL (TURBO MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
27	ATF temperature sensor	Detects open or shorted input signal circuit.	<Ref. to AT-43, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
31	Throttle position sensor	Detects open or shorted input signal circuit.	<Ref. to AT-47, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
33	Front vehicle speed sensor	Detects open or shorted input signal circuit.	<Ref. to AT-54, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
36	Torque converter turbine speed sensor	Detects open or shorted input signal circuit.	<Ref. to AT-59, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
38	Torque control signal	Detects open or shorted input signal circuit.	<Ref. to AT-62, DTC 38 TORQUE CONTROL SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
45	Intake manifold pressure signal (Non-turbo model)	Detects open or shorted input signal circuit.	<Ref. to AT-64, DTC 45 INTAKE MANIFOLD PRESSURE SIGNAL (NON-TURBO MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
71	Shift solenoid 1	Detects open or shorted output signal circuit.	<Ref. to AT-66, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
72	Shift solenoid 2	Detects open or shorted output signal circuit.	<Ref. to AT-69, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
73	Low clutch timing solenoid	Detects open or shorted output signal circuit.	<Ref. to AT-72, DTC 73 LOW CLUTCH TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
74	2-4 brake timing solenoid	Detects open or shorted output signal circuit.	<Ref. to AT-75, DTC 74 2-4 BRAKE TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
75	Line pressure duty solenoid	Detects open or shorted output signal circuit.	<Ref. to AT-79, DTC 75 LINE PRESSURE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
76	2-4 brake duty solenoid	Detects open or shorted output signal circuit.	<Ref. to AT-83, DTC 76 2-4 BRAKE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
77	Lock-up duty solenoid	Detects open or shorted output signal circuit.	<Ref. to AT-87, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
79	Transfer duty solenoid	Detects open or shorted output signal circuit.	<Ref. to AT-92, DTC 79 TRANSFER DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
93	Rear vehicle speed sensor	Detects open or shorted input signal circuit.	<Ref. to AT-96, DTC 93 REAR VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

12.Diagnostic Procedure for POWER Indicator Light

A: POWER INDICATOR LIGHT DOES NOT COME ON OR GO OFF

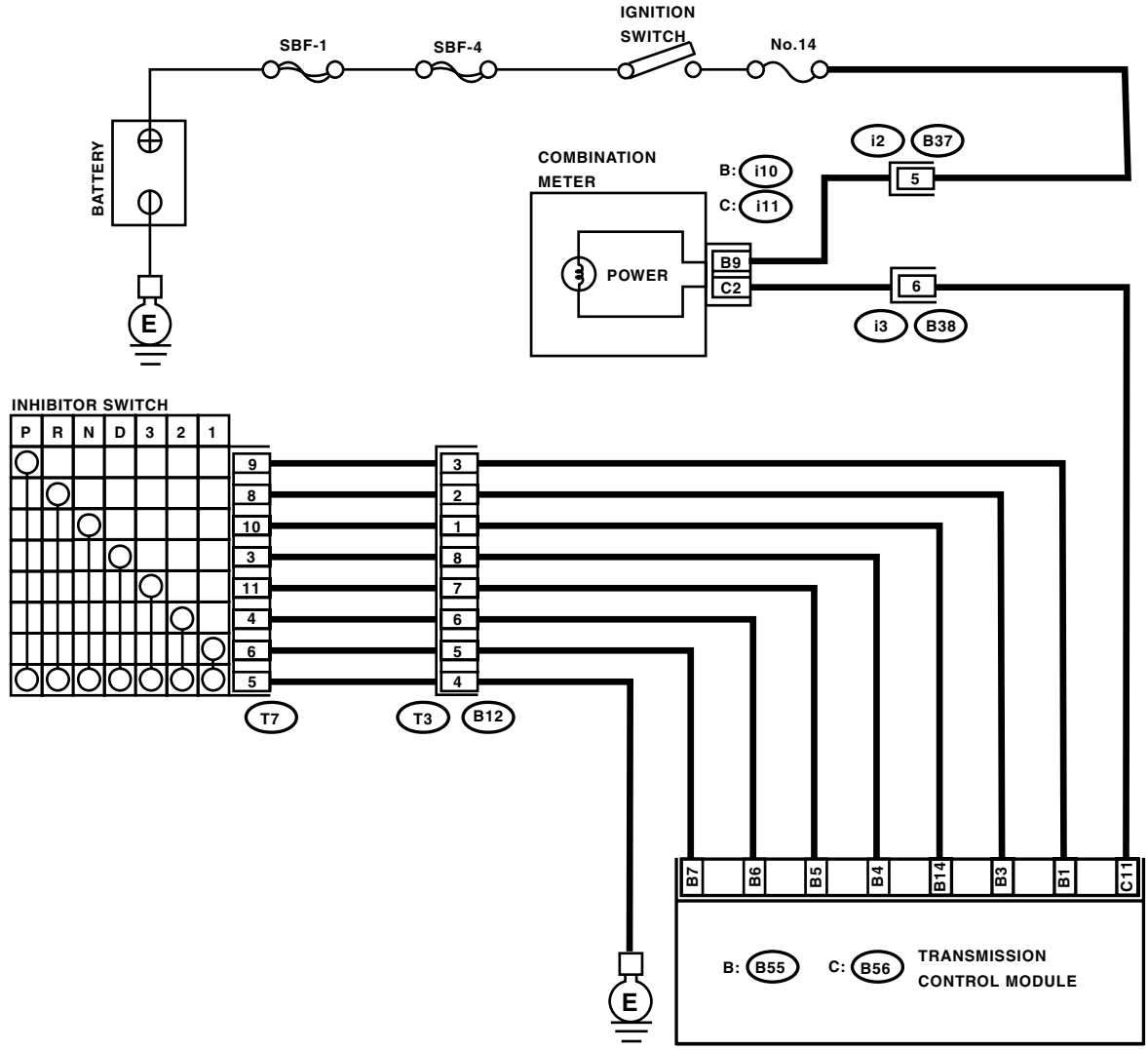
DIAGNOSIS:

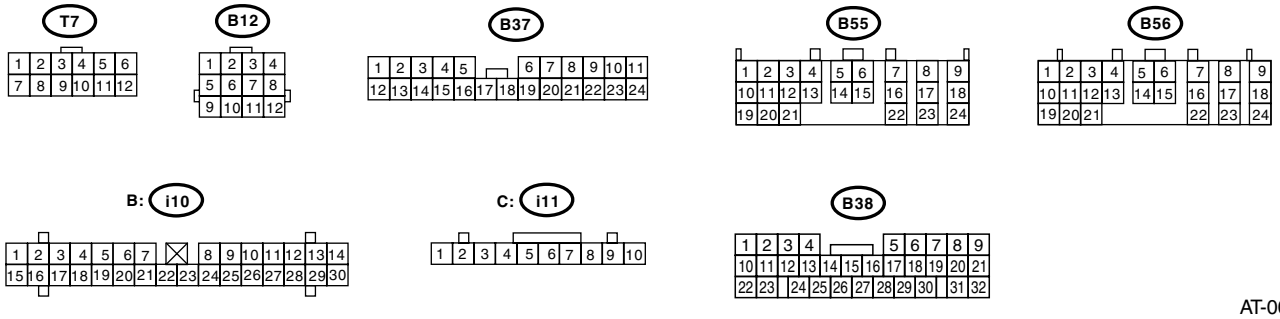
The POWER Indicator light circuit is open or shorted.

TROUBLE SYMPTOM:

- When the ignition switch is turned to ON (engine OFF), POWER indicator light does not illuminate.
- When the on-board diagnostics is performed, POWER indicator light remains illuminated.

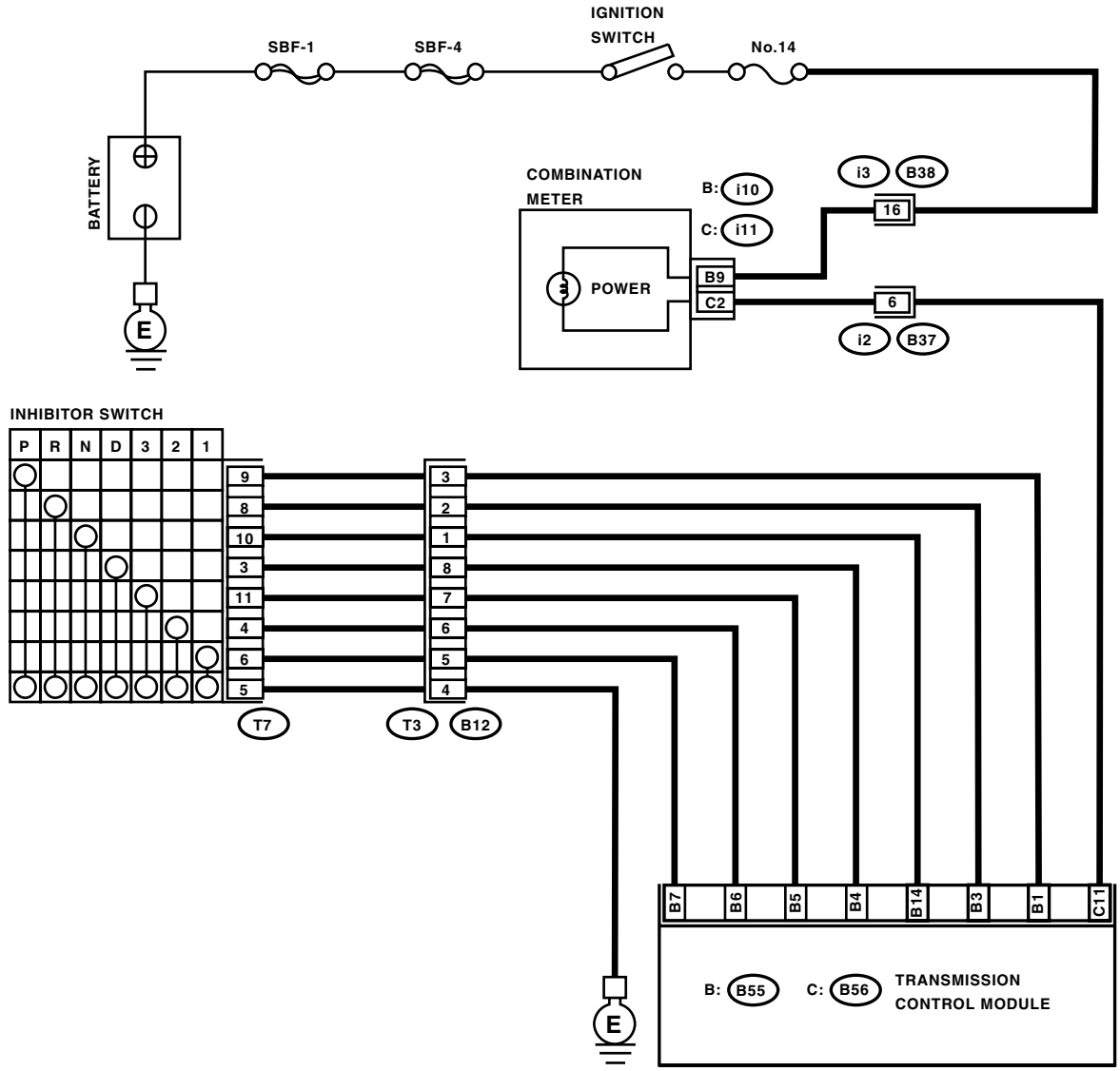
WIRING DIAGRAM:
LHD MODEL

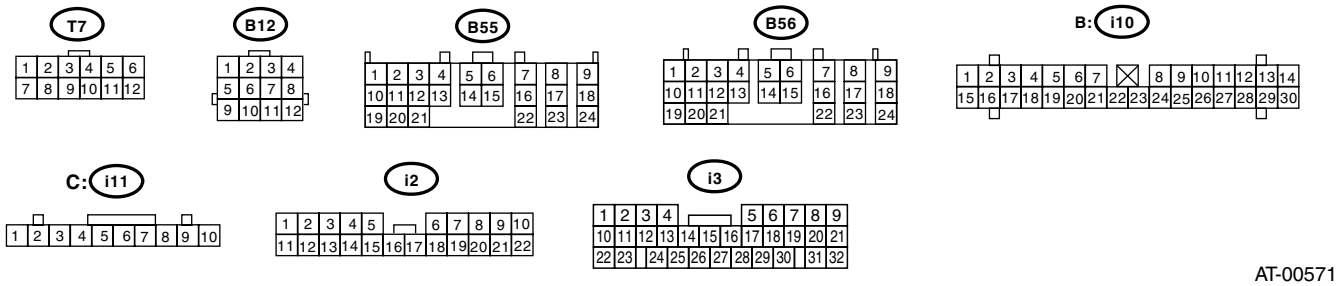




AT-00570

RHD MODEL





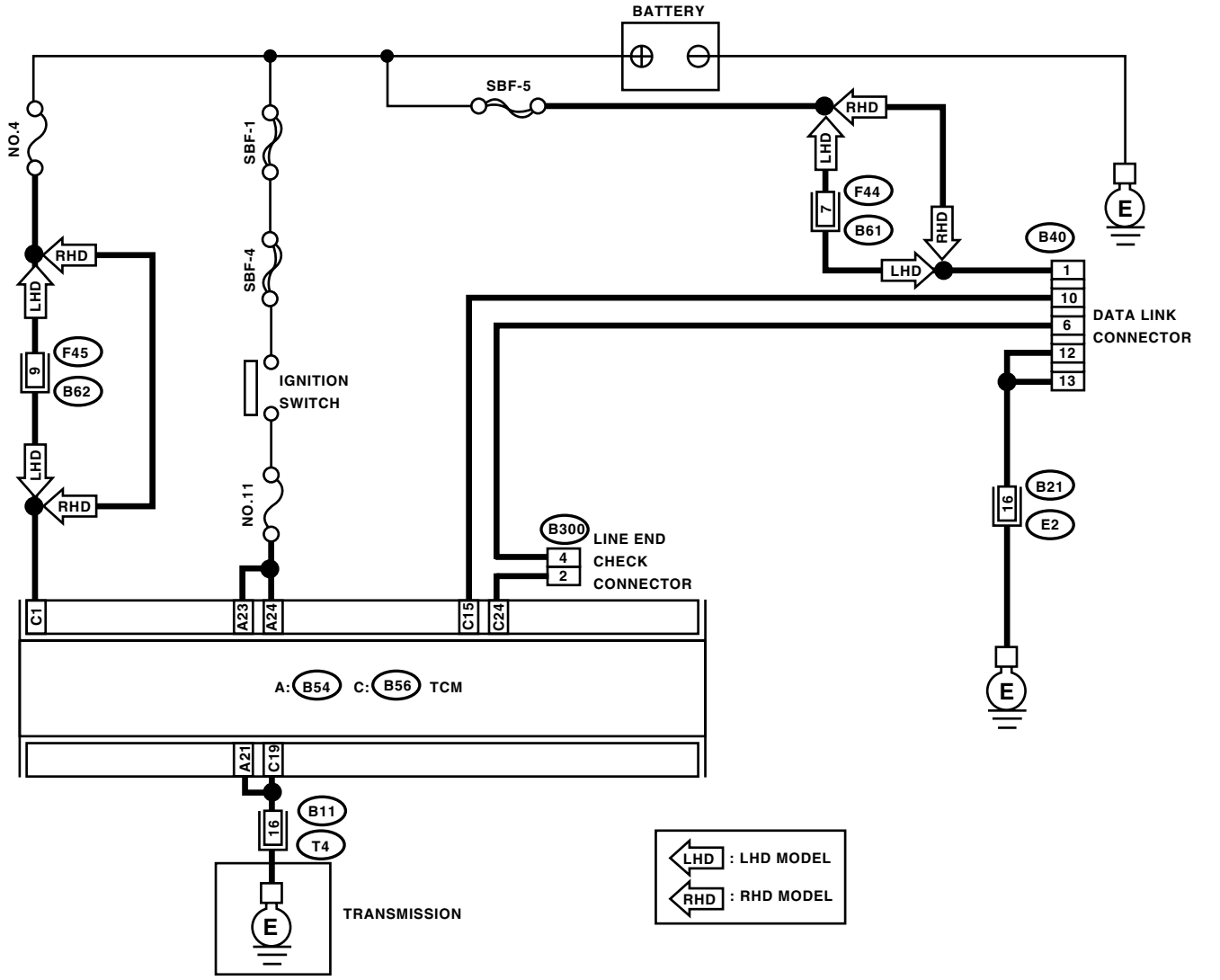
AT-00571

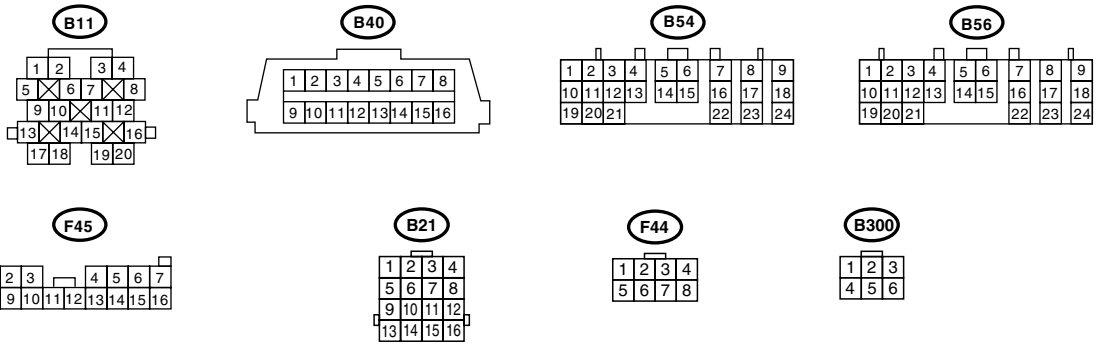
	Step	Check	Yes	No
1	**CHECK POWER INDICATOR LIGHT.** Turn the ignition switch to ON (engine OFF). Does the POWER indicator light illuminate?	POWER indicator light illuminates.	Go to step **3.**	Go to step **2.**
2	**CHECK POWER INDICATOR LIGHT.** 1)Turn the ignition switch to OFF. 2)Remove the combination meter. 3)Remove the POWER indicator light bulb from combination meter. Is the POWER indicator light bulb OK?	POWER indicator light bulb is OK.	Go to step **4.**	Replace the POWER indicator light bulb.
3	**CHECK POWER INDICATOR LIGHT.** Perform “Read Diagnostic Trouble Code (DTC)”. <Ref. to AT-20, Read Diagnostic Trouble Code (DTC).> Does the POWER indicator light blink?	POWER indicator light blinks.	A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM, inhibitor switch and combination meter.	Go to step **9.**
4	**CHECK FUSE (No. 14).** Remove the fuse (No. 14). Is the fuse (No. 14) blown out?	Fuse (No. 14) blown out.	Replace the fuse (No. 14). If replaced fuse (No. 14) is blown out easily, repair short circuit in harness between fuse (No. 14) and combination meter.	Go to step **5.**
5	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND IGNITION SWITCH.** 1)Turn the ignition switch to ON (engine OFF). 2)Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 9 (+) — Chassis ground (–):*** Is the measured value more than specified value?	9 V	Go to step **6.**	Repair the open circuit in harness between combination meter and battery.
6	**CHECK COMBINATION METER.** Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i11) No. 2 (+) — Chassis ground (–):*** Is the measured value less than specified value?	9 V	Repair the combination meter. <Ref. to IDI-12, Combination Meter Assembly.>	Go to step **7.**
7	**CHECK OPEN CIRCUIT OF HARNESS.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from combination meter connector. 3)Measure the resistance of harness between combination meter. ***Connector & terminal*** ***(B56) No. 11 — (i11) No. 2:*** Is the measured value less than specified value?	1 Ω	Go to step **8.**	Repair the open circuit in harness between TCM and combination meter, and poor contact in coupling connector.

	Step	Check	Yes	No
8	**CHECK INPUT SIGNAL FOR TCM.** 1)Connect the connector to TCM and combination meter. 2)Turn the ignition switch to ON (engine OFF). 3)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(i11) No. 2 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>
9	**CHECK INHIBITOR SWITCH.** 1)Connect the Subaru Select Monitor to data link connector. 2)Turn the ignition switch to ON. 3)Turn the Subaru Select Monitor to ON. 4)Read the data of range switch using Subaru Select Monitor. •Range switch is indicated in ON ⇔ OFF. When each range is selected, does the LED of Subaru Select Monitor light up?	LED lights up.	Go to step **10.**	Check the inhibitor switch circuit. <Ref. to AT-114, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>
10	**CHECK SHORT CIRCUIT OF HARNESS.** 1)Disconnect the connector from TCM. 2)Remove the combination meter. 3)Disconnect the connector from combination meter. 4)Measure the resistance of harness connector between TCM and chassis ground. ***Connector & terminal/specified resistance*** ***(B56) No. 11 — Chassis ground:*** Is the measured value less than specified value?	1 MΩ	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>	Repair the short circuit in harness between combination meter connector and TCM connector.

B: CHECK POWER SUPPLY AND GROUND LINE

WIRING DIAGRAM:





AT-00572

DIAGNOSTIC PROCEDURE FOR POWER INDICATOR LIGHT

	Step	Check	Yes	No
1	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF. Is there poor contact in battery terminal?	There is poor contact.	Repair or tighten the battery terminal.	Go to step **2.**
2	**CHECK POWER SUPPLY OF TCM.** 1)Disconnect the connector from TCM. 2)Turn the ignition switch to ON. 3)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 1 (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 13 V	Go to step **4.**	Go to step **3.**
3	**CHECK FUSE (NO. 4).** Remove the fuse (No. 4). Is the fuse (No. 4) blown out?	Fuse (No. 4) is blown out.	Replace the fuse (No. 4). If replaced fuse (No. 4) has blown out easily, repair short circuit in harness between fuse (No. 4) and TCM.	Repair the open circuit in harness between fuse (No. 4) and TCM, or fuse (No. 4) and battery, and poor contact in coupling connector.
4	**CHECK IGNITION POWER SUPPLY CIRCUIT.** 1)Turn the ignition switch to ON (engine OFF). 2)Measure the ignition power supply voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 23 (+) — Chassis ground (–):*** ***(B54) No. 24 (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 13 V	Go to step **6.**	Go to step **5.**
5	**CHECK FUSE (NO. 11).** Remove the fuse (No. 11). Is the fuse (No. 11) blown out?	Fuse (No. 11) is blown out.	Replace the fuse (No. 11). If replaced fuse (No. 11) has blown out easily, repair short circuit in harness between fuse (No. 11) and TCM.	Repair the open circuit in harness between fuse (No. 4) and TCM, or fuse (No. 4) and battery, and poor contact in coupling connector.
6	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from TCM and transmission. 3)Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B56) No. 19 — (B11) No. 16:*** ***(B54) No. 21 — (B11) No. 16:*** Is the measured value less than specified value?	1 Ω	Go to step **7.**	Repair the open circuit in harness between TCM, transmission harness connector, and poor contact in coupling connector.
7	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND TRANSMISSION GROUND.** Measure the resistance of harness between transmission and transmission ground. ***Connector & terminal*** ***(T4) No. 16 — Transmission ground:*** Is the measured value less than specified value?	1 Ω	Go to step **8.**	Repair the open circuit in harness between transmission and transmission ground.

	Step	Check	Yes	No
8	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in control module power supply, ground line and data link connector?	There is poor contact.	Repair the connector.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

13.Diagnostic Procedure for Select Monitor Communication

A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE

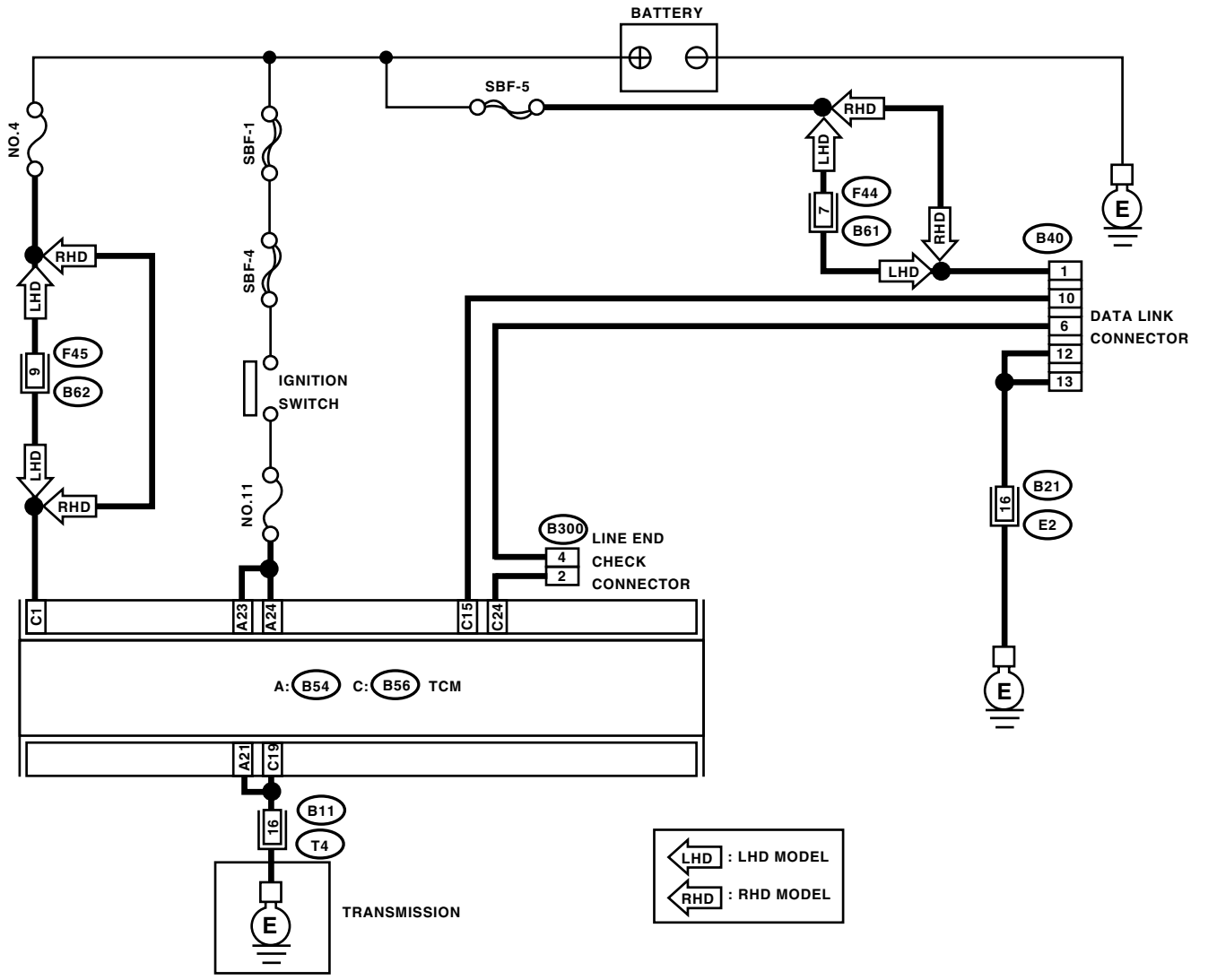
DIAGNOSIS:

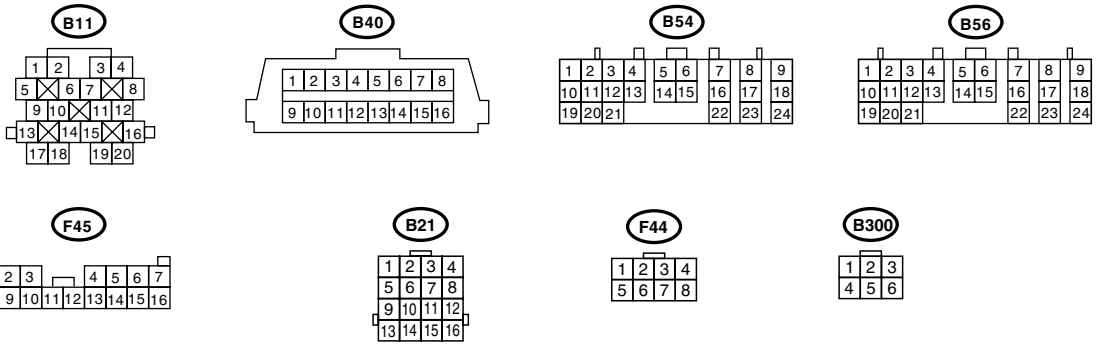
- Faulty harness connector

TROUBLE SYMPTOM:

- Select monitor communication failure

WIRING DIAGRAM:





AT-00572

	Step	Check	Yes	No
1	**CHECK SUBARU SELECT MONITOR POWER SUPPLY CIRCUIT.** Measure the voltage between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 1 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10V	Go to step **2.**	Repair the harness and connector between battery and data link connector, and poor contact in coupling connector.
2	**CHECK SUBARU SELECT MONITOR GROUND CIRCUIT.** Measure the resistance of harness between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 12 — Chassis ground:*** ***(B40) No. 13 — Chassis ground:*** Is the measured value less than specified value?	1Ω	Go to step **3.**	Repair the open circuit in harness between data link connector and ground terminal, and poor contact in coupling connector.
3	**CHECK COMMUNICATION OF SELECT MONITOR.** 1)Turn the ignition switch to ON. 2)Using the Subaru Select Monitor, check whether communication to engine systems can be executed normally. Are the name and year of system displayed on Subaru Select Monitor?	Name and year of system are displayed.	Go to step **8.**	Go to step **4.**
4	**CHECK COMMUNICATION OF SELECT MONITOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the TCM connector. 3)Check whether communication to engine systems can be executed normally. Are the name and year of system displayed on Subaru Select Monitor?	Name and year of system are displayed.	Go to step **6.**	Go to step **5.**
5	**CHECK COMMUNICATION OF SELECT MONITOR.** 1)Turn the ignition switch to OFF. 2)Connect the TCM connector. 3)Disconnect the ECM connector. 4)Check whether communication to transmission systems can be executed normally. Are the name and year of system displayed on Subaru Select Monitor?	Name and year of system are displayed.	Inspect the ECM.	Go to step **6.**
6	**CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the TCM, ECM, ABSCM&H/U, cruise control module and immobilizer control module connectors. 3)Measure the resistance between TCM connector and chassis ground. ***Connector & terminal*** ***(B40) No. 10 — Chassis ground:*** ***(B40) No. 6 — Chassis ground:*** Is the measured value more than specified value?	1 M Ω	Go to step **7.**	Repair the harness and connector between each control module and data link connector.

	Step	Check	Yes	No
7	**CHECK OUTPUT SIGNAL FOR TCM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B40) No. 10 (+) — Chassis ground (–):*** ***(B40) No. 6 (+) — Chassis ground (–):*** Is the measured value more than specified value?	1 V	Repair the harness and connector between each control module and data link connector.	Go to step **8.**
8	**CHECK HARNESS/CONNECTOR BETWEEN TCM AND DATA LINK CONNECTOR.** Measure the resistance between TCM connector and data link connector. ***Connector & terminal*** ***(B56) No. 15 — (B40) No. 10:*** Is the measured value less than specified value?	0.5 Ω	Go to step **9.**	Repair the harness and connector between TCM and data link connector.
9	**CHECK HARNESS/CONNECTOR BETWEEN TCM AND DATA LINK CONNECTOR.** Measure the resistance between TCM and data link connector. ***Connector & terminal*** ***(B56) No. 24 — (B40) No. 6:*** Is the measured value more than specified value?	1M Ω	Go to step **10.**	Repair the harness and connector between TCM and data link connector.
10	**CHECK INSTALLATION OF TCM CONNECTOR.** Turn the ignition switch to OFF. Is the TCM connector inserted into TCM?	Connector is inserted into TCM.	Go to step **11.**	Insert the TCM connector into TCM.
11	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in control module and data link connector?	There is poor contact.	Repair the poor contact.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

14.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC 11 ENGINE SPEED SIGNAL

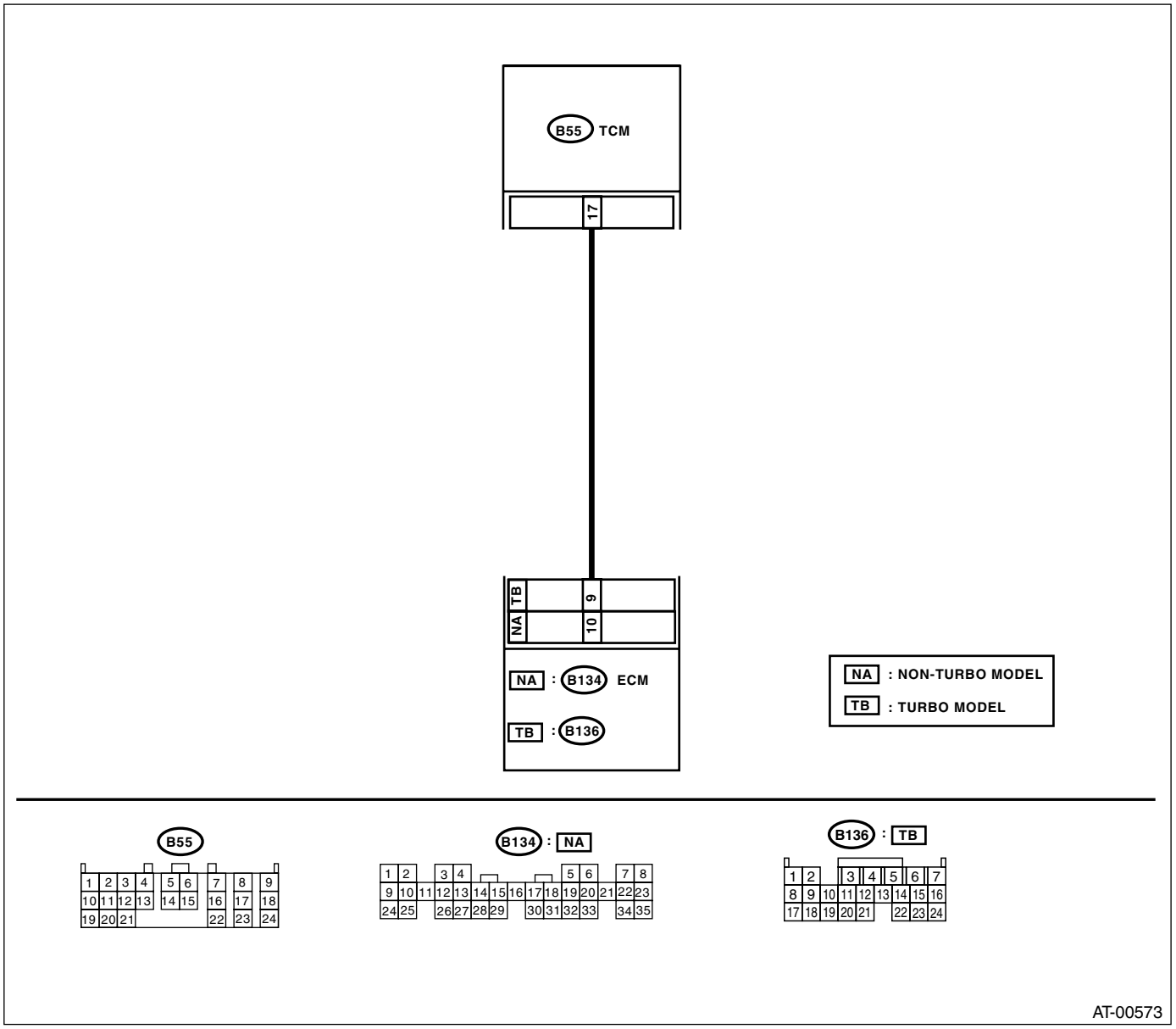
DIAGNOSIS:

The engine speed input signal circuit is open or shorted.

TROUBLE SYMPTOM:

- No lock-up (after engine warm-up).
- The POWER indicator light remains on when vehicle speed is “0”.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from TCM and ECM. 3)Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***Non-turbo model*** ***(B55) No. 17 — (B134) No. 10:*** ***Turbo model*** ***(B55) No. 17 — (B136) No. 9:*** Is the measured value less than specified value?	1 Ω	Go to step **2.**	Repair the open circuit in harness between TCM and ECM connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 17 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **3.**	Repair the short circuit in harness between TCM and ECM connector.
3	**PREPARE SUBARU SELECT MONITOR.** Do you have a Subaru Select Monitor?	Subaru Select Monitor is availabe.	Go to step **5.**	Go to step **4.**
4	**CHECK INPUT SIGNAL FOR TCM.** 1)Connect the connectors to TCM and ECM. 2)Turn the ignition switch to ON (engine OFF). 3)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 17 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10.5 V	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and ECM.	Go to step **6.**
5	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1)Connect the connectors to TCM and ECM. 2)Connect the Subaru Select Monitor to data link connector. 3)Start the engine and turn Subaru Select Monitor switch to ON. 4)Warm-up the engine until engine coolant temperature is above 80°C (176°F). 5)Idle the engine. 6)Read the data of engine speed using Subaru Select Monitor. •Display shows the engine speed signal value sent from ECM. Is the revolution value same as tachometer reading shown on combination meter?	The same revolution value is shown on tacometer and Subaru Select Monitor.	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and ECM.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK POOR CONTACT.** Is there poor contact in engine speed signal circuit?	There is poor contact.	Repair the poor contact.	Go to step **7.**
7	**CONFIRM DTC 11.** Replace the ECM with a new one. Does the DTC appear again, after memory has been cleared?	DTC 11 appears.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>	Replace the ECM.

B: DTC 23 MASS AIR FLOW SIGNAL (TURBO MODEL)

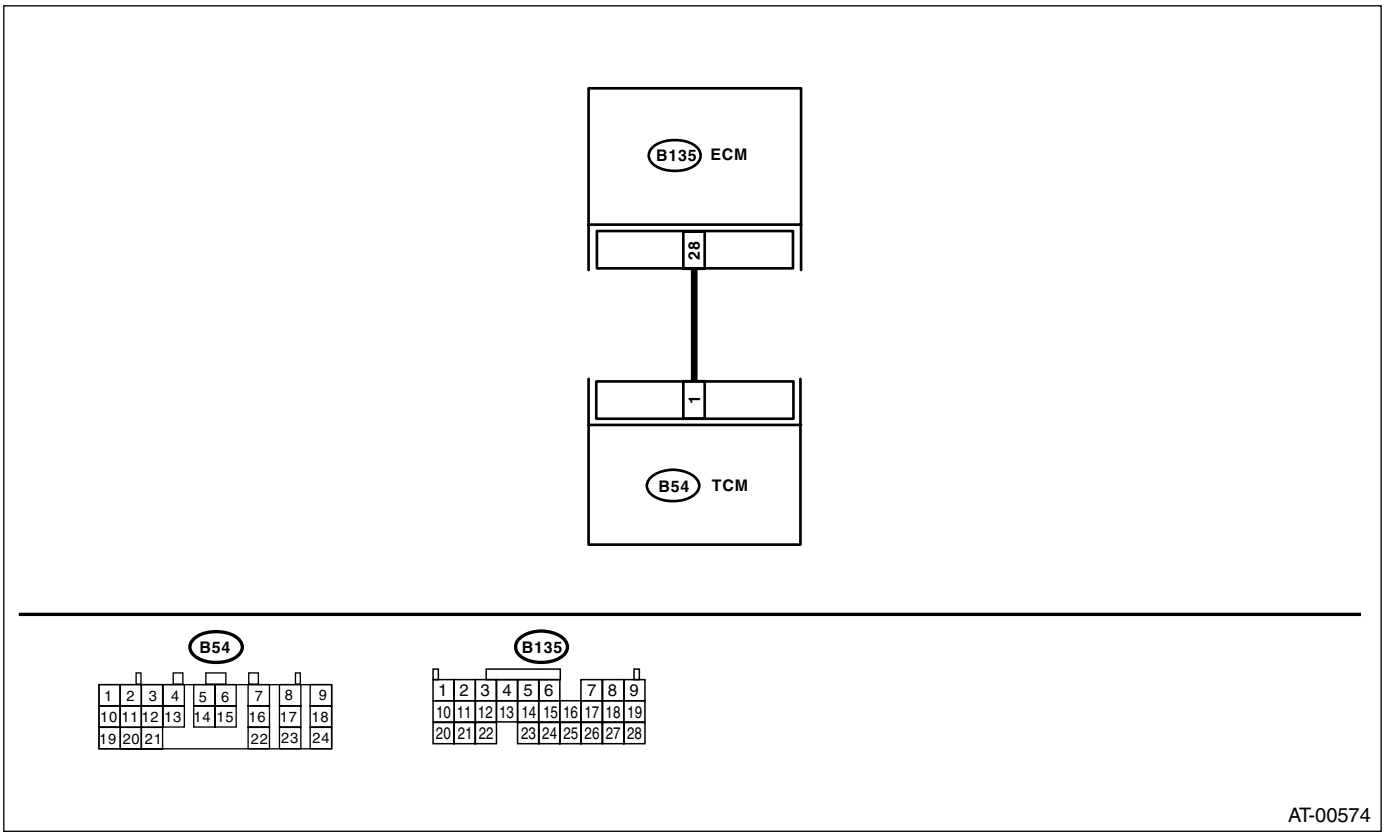
DIAGNOSIS:

The input signal circuit of TCM from ECM is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ENGINE GROUND TERMINALS AND GROUND CIRCUIT OF ECM.** <Ref. to AT-47, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble?	There are some troubles.	Repair the ground terminal and/or ground circuit of ECM.	Go to step **2.**
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from TCM and ECM. 3)Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***(B54) No. 1 — (B135) No. 28:*** Is the measured value less than specified value?	1 Ω	Go to step **3.**	Repair the open circuit in harness between TCM and ECM connector.

	Step	Check	Yes	No
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 1 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **4.**	Repair the short circuit in harness between TCM and ECM connector.
4	**PREPARE SUBARU SELECT MONITOR.** Do you have a Subaru Select Monitor?	Subaru Select Monitor is available.	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR TCM.** 1)Connect the connectors to TCM and ECM. 2)Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3)Idle the engine. 4)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 1 (+) — Chassis ground (–):*** Is the measured value within specified value?	0.9 — 1.4 V	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM and ECM.	Go to step **7.**
6	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1)Connect the connectors to TCM and ECM. 2)Connect the Subaru Select Monitor to data link connector. 3)Start the engine and turn the Subaru Select Monitor switch to ON. 4)Warm-up the engine until engine coolant temperature is above 80°C (176°F). 5)Idle the engine. 6)Read the data of mass air flow sensor signal using Subaru Select Monitor. •Display shows the mass air flow sensor signal value sent from ECM. Is the measured value within specified value?	0.9 — 1.4 V	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM and ECM.	Go to step **7.**
7	**CHECK POOR CONTACT.** Is there poor contact in intake manifold pressure signal circuit?	There is poor contact.	Repair the poor contact.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

C: DTC 27 ATF TEMPERATURE SENSOR

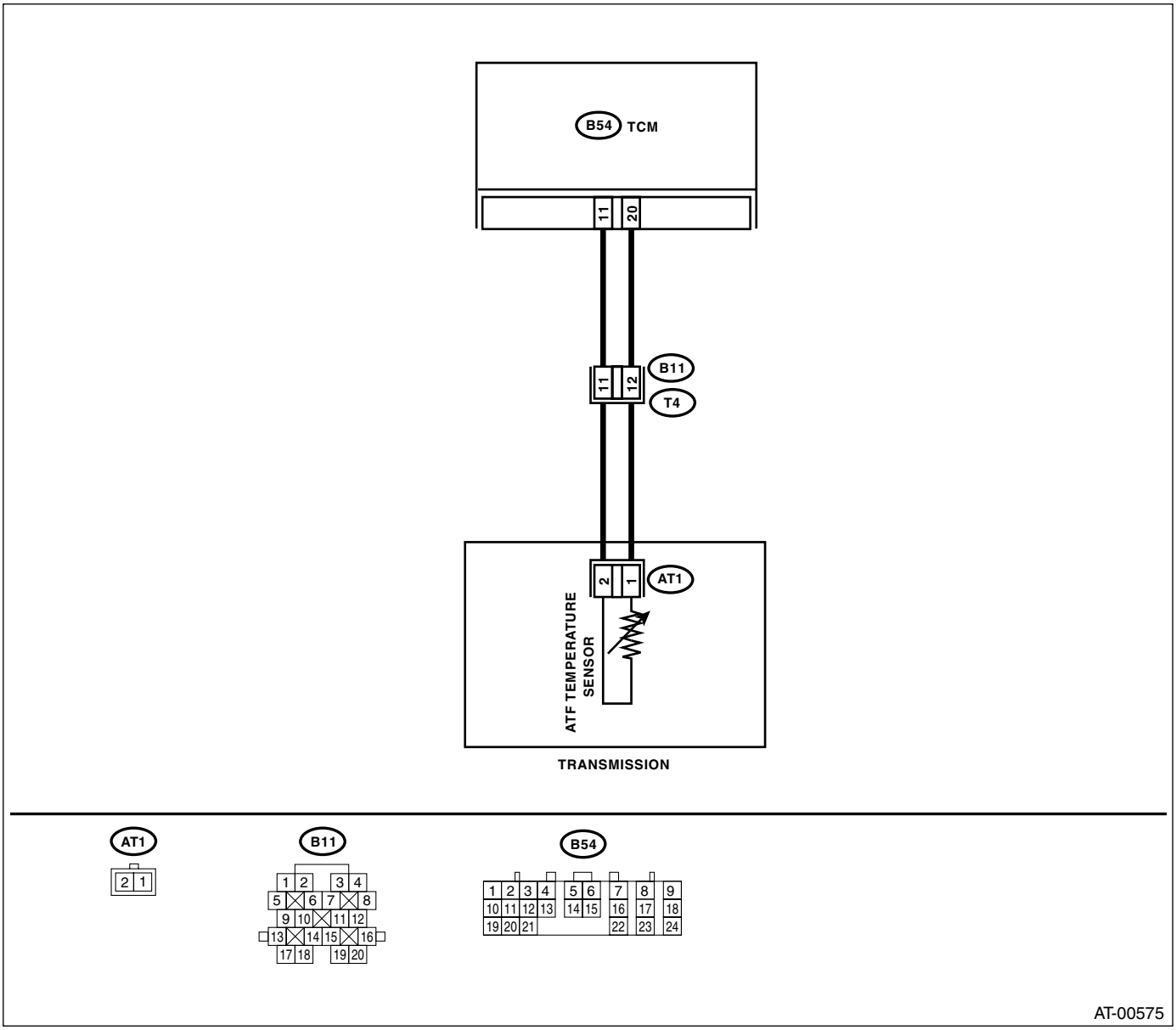
DIAGNOSIS:

The input signal circuit of TCM to ATF temperature sensor is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from transmission and TCM. 3)Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal (B54) No. 20 — (B11) No. 12:*** Is the measured value less than specified value?	1 Ω	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.

	Step	Check	Yes	No
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B54) No. 11 — (B11) No. 11:*** Is the measured value less than specified value?	1 Ω	Go to step **3.**	Repair the open circuit in harness between TCM and transmission connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 20 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **4.**	Repair the short circuit in harness between TCM and transmission connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 11 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **5.**	Repair the short circuit in harness between TCM and transmission connector.
5	**CHECK ATF TEMPERATURE SENSOR.** 1)Turn the ignition switch to OFF. 2)Connect the connectors to transmission and TCM. 3)Turn the ignition switch to ON and start engine. 4)Warm-up the transmission until ATF temperature reaches to 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 5)Disconnect the connector from transmission. 6)Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 11 — No. 12:*** Is the measured value within specified value?	275 — 375 Ω	Go to step **6.**	Go to step **11.**
6	**CHECK ATF TEMPERATURE SENSOR.** 1)Turn the ignition switch to ON (engine OFF). 2)Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 11 — No. 12:*** Does the resistance value increase while ATF temperature decreases?	Resistance value increases.	Go to step **7.**	Go to step **11.**
7	**PREPARE SUBARU SELECT MONITOR.** Do you have a Subaru Select Monitor?	Subaru Select Monitor is available.	Go to step **9.**	Go to step **8.**

	Step	Check	Yes	No
8	**CHECK INPUT SIGNAL FOR TCM.** 1)Connect the connector to transmission. 2)Warm-up the transmission until ATF temperature is about 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3)Measure the voltage between TCM connector terminal. ***Connector & terminal*** ***(B54) No. 11 (+) — No. 20 (–):*** Is the measured value within specified value?	0.4 — 0.9 V	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. Temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in ATF temperature sensor and transmission connector.	Go to step **10.**
9	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1)Connect the connector to transmission. 2)Turn the ignition switch to ON (engine OFF). Does the ATF temperature gradually decrease?	ATF temperature gradually decreases.	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. Temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in ATF temperature sensor and transmission connector.	Go to step **10.**
10	**CHECK POOR CONTACT.** Is there poor contact in ATF temperature sensor circuit?	There is poor contact.	Repair the poor contact.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>
11	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from transmission. 3)Remove the transmission connector from bracket. 4)Lift-up the vehicle and place safety stand. 5)Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 6)Remove the oil pan, and disconnect the connector from ATF temperature sensor connector. 7)Measure the resistance of harness between ATF temperature sensor and transmission connector. ***Connector & terminal*** ***(T4) No. 11 — (AT1) No. 2:*** Is the measured value less than specified value?	1 Ω	Go to step **12.**	Repair the open circuit in harness between ATF temperature sensor and transmission connector.

	Step	Check	Yes	No
12	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between ATF temperature sensor and transmission connector. ***Connector & terminal*** ***(T4) No. 12 — (AT1) No. 1:*** Is the measured value less than specified value?	1 Ω	Go to step **13.**	Repair the open circuit in harness between ATF temperature sensor and transmission connector.
13	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 11 — Transmission ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **14.**	Repair the short circuit in harness between ATF temperature sensor and transmission connector.
14	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 12 — Transmission ground:*** Is the measured value more than specified value?	1 MΩ	Replace the ATF temperature sensor. <Ref. to AT-64, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>	Repair the short circuit in harness between ATF temperature sensor and transmission connector.

D: DTC 31 THROTTLE POSITION SENSOR

DIAGNOSIS:

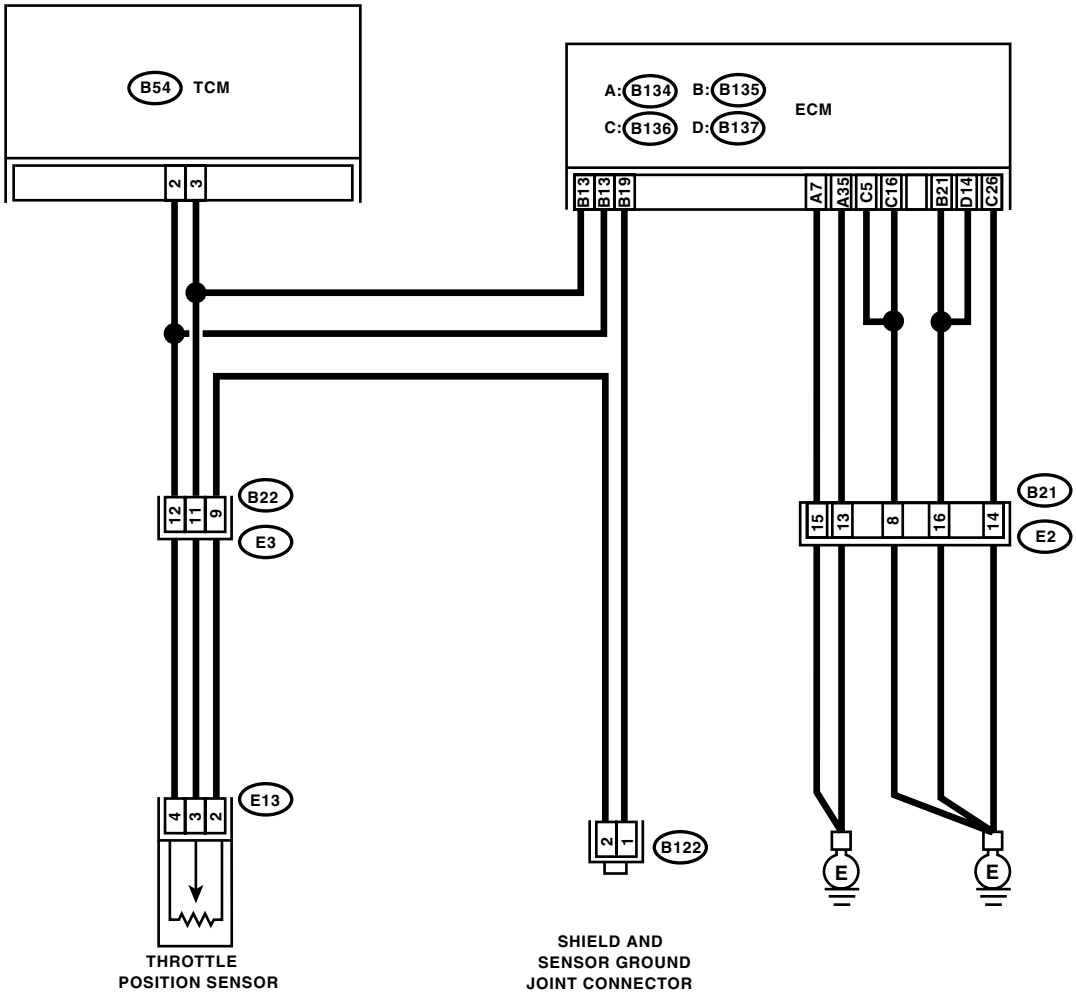
The input signal circuit of throttle position sensor is open or shorted.

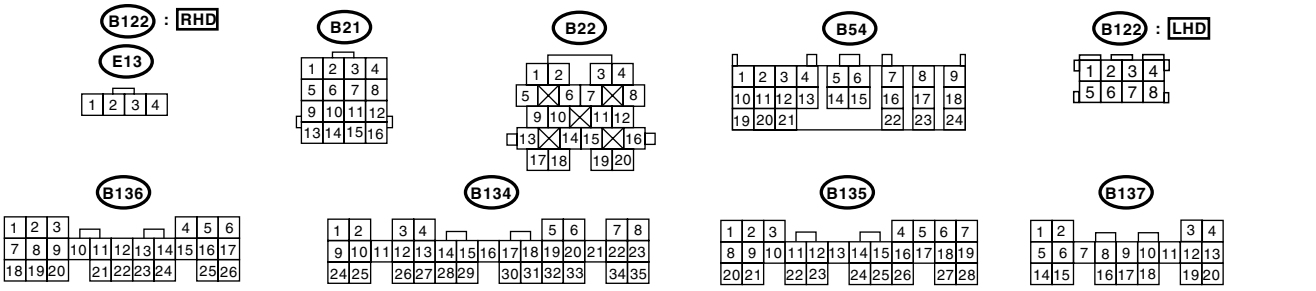
TROUBLE SYMPTOM:

Shift point too high or too low; excessive shift shock; excessive tight corner “braking”.

WIRING DIAGRAM:

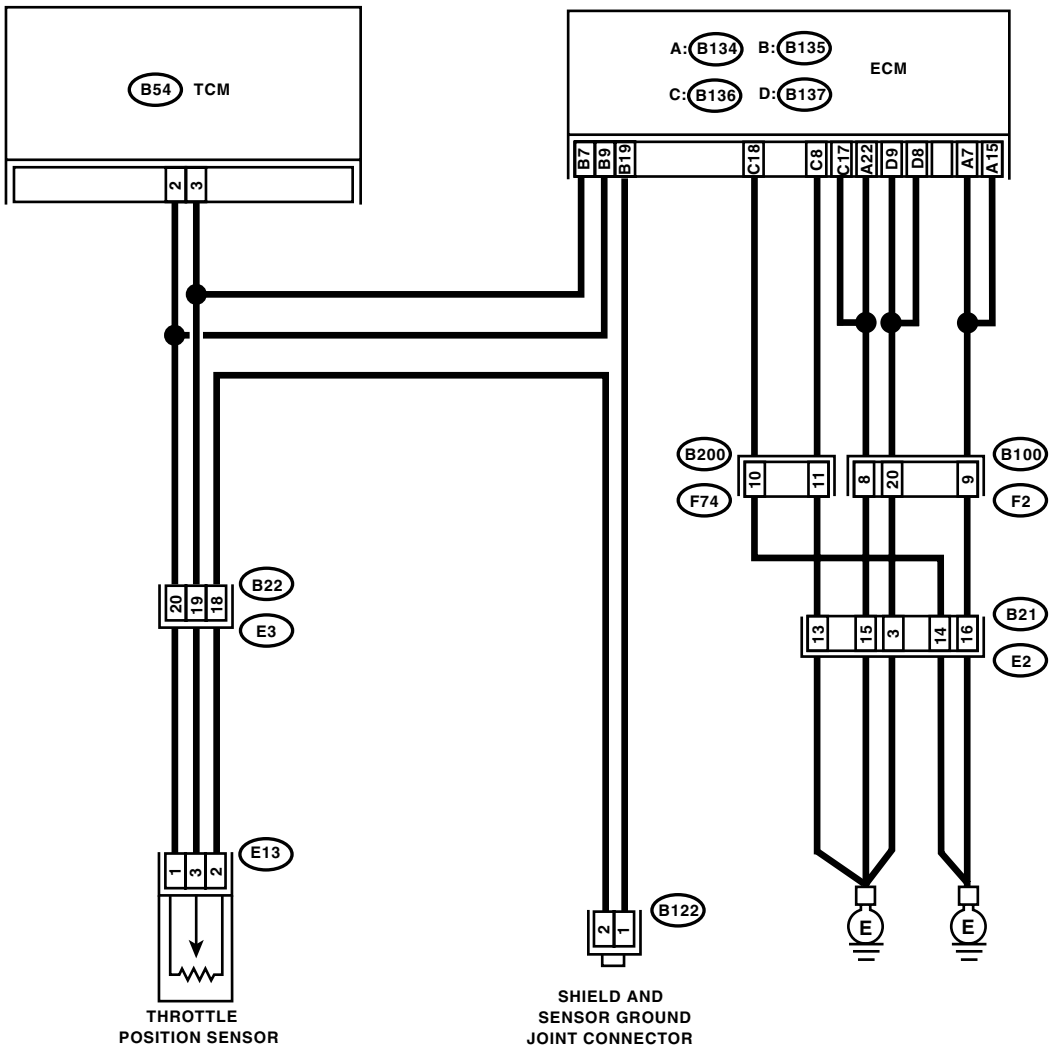
NON-TURBO MODEL

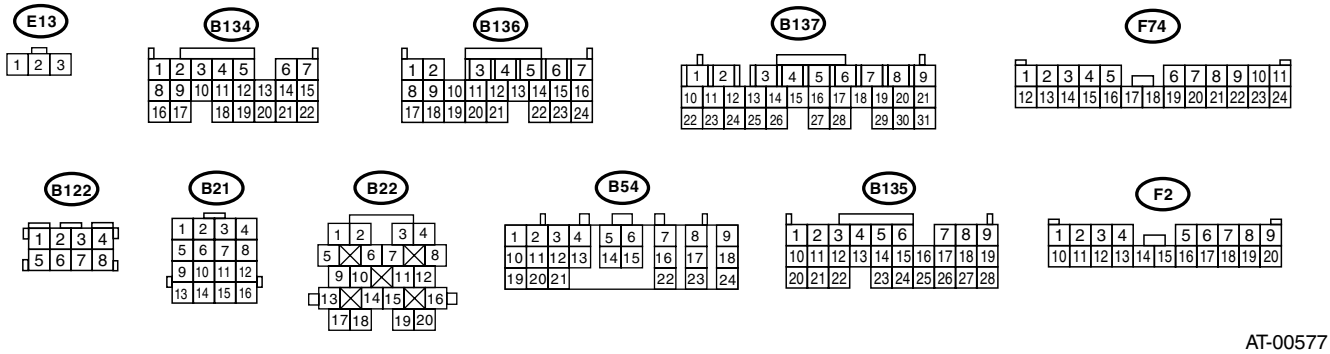




AT-00576

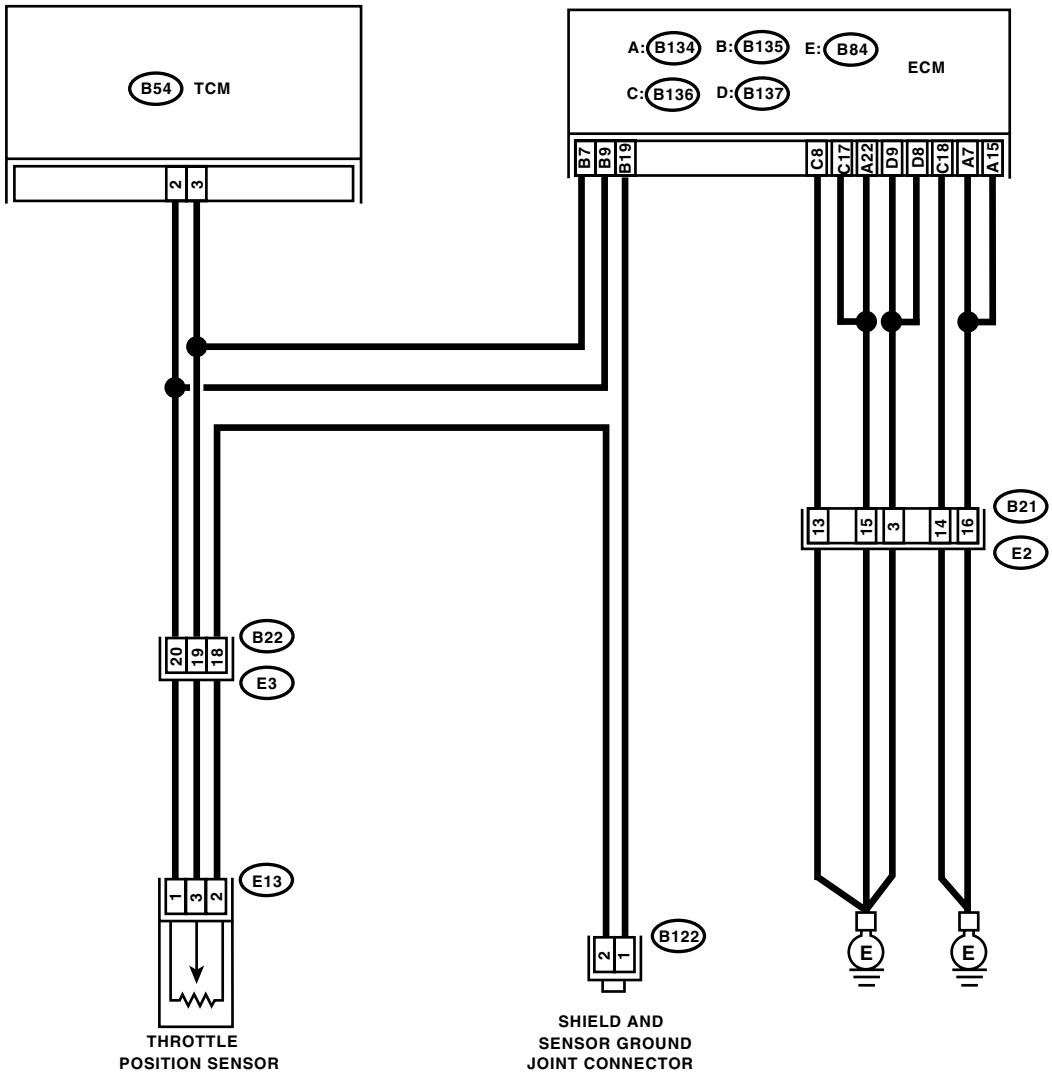
LHD TURBO MODEL

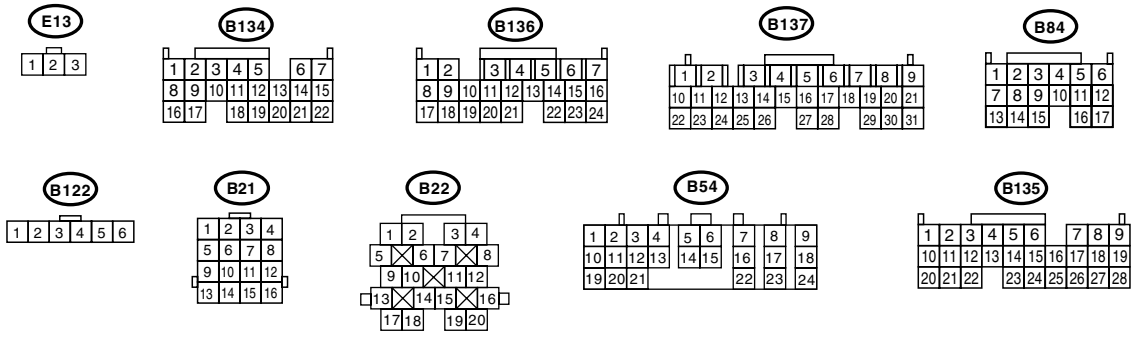




AT-00577

RHD TURBO MODEL





AT-00578

	Step	Check	Yes	No
1	**CHECK ENGINE GROUND TERMINALS.** Have engine ground terminals been tightened?	Engine ground terminals are tightened.	Go to step **2.**	Tighten the engine ground terminals.
2	**CHECK GROUND CIRCUIT OF ECM.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM and engine ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B134) No. 35 — Engine ground:*** ***(B134) No. 7 — Engine ground:*** ***(B136) No. 5 — Engine ground:*** ***(B136) No. 16 — Engine ground:*** ***(B136) No. 26 — Engine ground:*** ***(B137) No. 14 — Engine ground:*** ***(B135) No. 21 — Engine ground:*** ***TURBO MODEL*** ***(B134) No. 7 — Engine ground:*** ***(B134) No. 15 — Engine ground:*** ***(B134) No. 22 — Engine ground:*** ***(B136) No. 8 — Engine ground:*** ***(B136) No. 17 — Engine ground:*** ***(B136) No. 18 — Engine ground:*** ***(B137) No. 8 — Engine ground:*** ***(B137) No. 9 — Engine ground:*** Is the measured value less than specified value?	5 Ω	Go to step **3.**	Repair the open circuit in harness between ECM connector and engine grounding terminal.
3	**CHECK THROTTLE POSITION SENSOR.** 1)Disconnect the connector from throttle position sensor. 2)Measure the resistance between throttle position sensor connector receptacle's terminals. ***Terminals*** ***NON-TURBO MODEL*** ***No. 4 — No. 2:*** ***TURBO MODEL*** ***No. 1 — No. 2:*** Is the measured value within specified value?	3.0 — 4.2 kΩ	Go to step **4.**	Replace the throttle position sensor.
4	**CHECK THROTTLE POSITION SENSOR.** Measure the resistance between throttle position sensor connector receptacle's terminals. ***Terminals*** ***No. 2 — No. 3:*** Is the measured value within specified value?	0.35 — 0.5 kΩ	Go to step **5.**	Replace the throttle position sensor.
5	**CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR.** 1)Disconnect the connector from TCM. 2)Measure the resistance of harness between TCM and throttle position sensor connector. ***Connector & terminal*** ***(B55) No. 3 — (E13) No. 3:*** Is the measured value less than specified value?	1 Ω	Go to step **6.**	Repair the open circuit in harness between TCM and throttle position sensor connector, and poor contact in coupling connector.

	Step	Check	Yes	No
6	**CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR.** Measure the resistance of harness between TCM and throttle position sensor connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 2 — (E13) No. 4:*** ***TURBO MODEL*** ***(B54) No. 2 — (E12) No. 1:*** Is the measured value less than specified value?	1 Ω	Go to step **7.**	Repair the open circuit in harness between TCM and throttle position sensor connector, and poor contact in coupling connector.
7	**CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 3 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **8.**	Repair the short circuit in harness between TCM and throttle position sensor connector.
8	**CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 2 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **9.**	Repair the short circuit in harness between TCM and throttle position sensor connector.
9	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 3 — (B136) No. 17:*** ***TURBO MODEL*** ***(B54) No. 3 — (B135) No. 7:*** Is the measured value less than specified value?	1 Ω	Go to step **10.**	Repair the open circuit in harness between TCM and ECM connector.
10	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 2 — (B136) No. 15:*** ***TURBO MODEL*** ***(B54) No. 2 — (B135) No. 9:*** Is the measured value less than specified value?	1 Ω	Go to step **11.**	Repair the open circuit in harness between TCM and ECM connector.
11	**PREPARE SUBARU SELECT MONITOR.** Do you have a Subaru Select Monitor?	Subaru Select Monitor is available.	Go to step **14.**	Go to step **12.**

	Step	Check	Yes	No
12	**CHECK INPUT SIGNAL FOR TCM.** 1)Connect the connectors to TCM, throttle position sensor and ECM. 2)Turn the ignition switch to ON (engine OFF). 3)Close the throttle completely. 4)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 3 (+) — Chassis ground (–):*** Is the measured value within specified value?	0.2 — 1.0 V	Go to step **13.**	Go to step **18.**
13	**CHECK INPUT SIGNAL FOR TCM.** 1)Open the throttle completely. 2)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 3 (+) — Chassis ground (–):*** Is the measured value within specified value?	4.2 — 4.7 V	Go to step **16.**	Go to step **18.**
14	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1)Connect the connectors to TCM, throttle position sensor and ECM. 2)Connect the Subaru Select Monitor to data link connector. 3)Turn the ignition switch to ON (engine OFF). 4)Turn the Subaru Select Monitor switch to ON. 5)Throttle fully closed. 6)Read the data of throttle position sensor using Subaru Select Monitor. •Throttle position sensor input signal is indicated. Is the measured value within specified value?	0.2 — 1.0 V	Go to step **15.**	Go to step **18.**
15	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** Throttle fully open. NOTE: Must be changed correspondingly with the accelerator pedal operation (from “released” to “depressed” position). Is the measured value within specified value?	4.2 — 4.7 V	Go to step **18.**	Go to step **17.**
16	**CHECK INPUT SIGNAL FOR TCM (THROTTLE POSITION SENSOR POWER SUPPLY).** Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 2 (+) — Chassis ground (–):*** Is the measured value within specified value?	4.8 — 5.3 V	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in throttle position sensor circuit.	Go to step **18.**

	Step	Check	Yes	No
17	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR (THROTTLE POSITION SENSOR POWER SUPPLY).** Read the data of throttle position sensor power supply using Subaru Select Monitor. •Throttle position sensor power supply voltage is indicated. Is the measured value within specified value?	4.8 — 5.3 V	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in throttle position sensor circuit.	Go to step **18.**
18	**CHECK POOR CONTACT.** Is there poor contact in throttle position sensor circuit?	There is poor contact.	Repair the poor contact.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

E: DTC 33 FRONT VEHICLE SPEED SENSOR

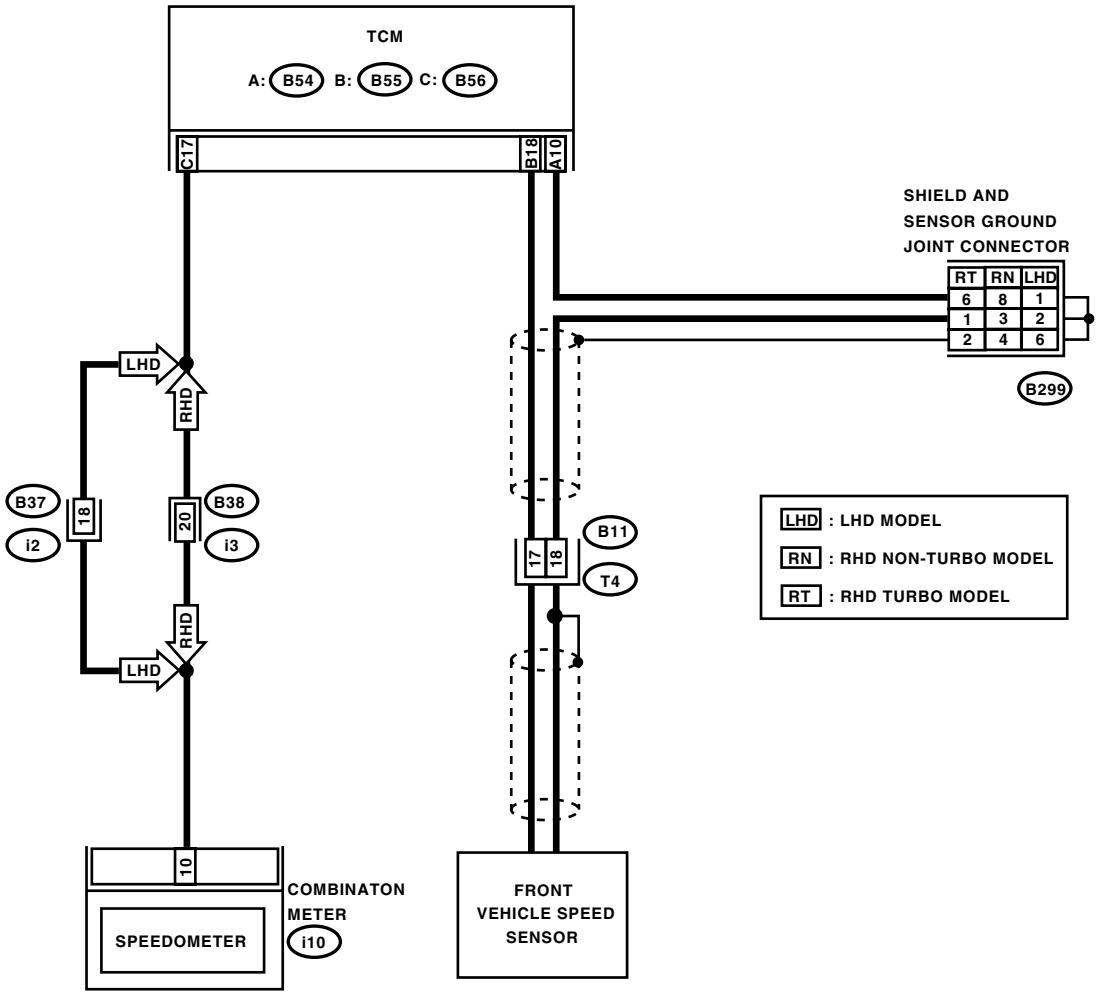
DIAGNOSIS:

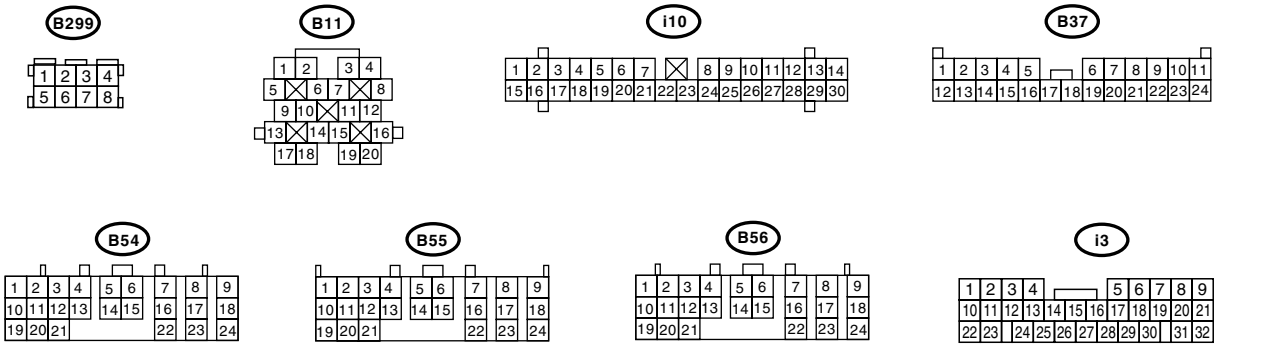
- The vehicle speed signal is abnormal.
- The circuit in combination meter is faulty.
- The harness connector between TCM and vehicle speed sensor is in short or open.

TROUBLE SYMPTOM:

- Erroneous idling.
- Engine stalls.
- Poor driving performance.

WIRING DIAGRAM:





AT-00579

	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from TCM and transmission. 3)Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 18 — (B11) No. 17:*** Is the measured value less than specified value?	1 Ω	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B54) No. 10 — (B11) No. 18:*** Is the measured value less than specified value?	1 Ω	Go to step **3.**	Repair the open circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B54) No. 10 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **4.**	Repair the short circuit in harness between TCM and transmission connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 18 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **5.**	Repair the short circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
5	**CHECK FRONT VEHICLE SPEED SENSOR.** Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 17 — No. 18:*** Is the measured value within specified value?	450 — 650 Ω	Go to step **6.**	Replace the front vehicle speed sensor. <Ref. to AT-52, Front Vehicle Speed Sensor.>
6	**PREPARE OSCILLOSCOPE.** Do you have an oscilloscope?	Oscilloscope is available.	Go to step **9.**	Go to step **7.**
7	**PREPARE SUBARU SELECT MONITOR.** Do you have a Subaru Select Monitor?	Subaru Select Monitor is available.	Go to step **10.**	Go to step **8.**

	Step	Check	Yes	No
8	**CHECK INPUT SIGNAL FOR TCM.** 1)Connect all connectors. 2)Lift-up or raise the vehicle and place safety stands. NOTE: Raise all wheels off floor. 3)Start the engine and set vehicle in 20 km/h (12 MPH) condition. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-23, Clear Memory Mode.> 4)Measure the voltage between TCM connector terminals. ***Connector & terminal*** ***(B55) No. 18 (+) — (B54) No. 10 (–):*** Is the measured value more than specified value?	AC 1 V	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact or harness may be the cause. Repair the harness or connector in the front vehicle speed sensor circuit.	Go to step **11.**
9	**CHECK FRONT VEHICLE SPEED SENSOR USING OSCILLOSCOPE.** 1)Connect all connectors. 2)Lift-up the vehicle and place safety stand. NOTE: Raise all wheels off ground. 3)Set the oscilloscope to TCM connector terminals. ***Connector & terminal*** ***Positive probe; (B55) No. 18*** ***Earth lead; (B54) No. 10*** 4)Start the engine, and drive the wheels slowly. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunctions. When AT control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system. <Ref. to ABS-23, Clear Memory Mode.> 5)Measure the signal voltage indicated on oscilloscope. Is the measured value more than specified value?	AC 4 V	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact or harness may be the cause. Repair the harness or connector in front vehicle speed sensor circuit.	Go to step **11.**

	Step	Check	Yes	No
10	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1)Connect all connectors. 2)Connect the Subaru Select Monitor to data link connector. 3)Lift-up or raise the vehicle and place safety stands. NOTE: Raise all wheels off floor. 4)Turn the ignition switch to ON and turn Subaru Select Monitor switch to ON. 5)Start the engine. 6)Read the data of vehicle speed using Subaru Select Monitor. •Compare the speedometer with Subaru Select Monitor indications. •Vehicle speed is indicated in “km/h” or “MPH”. 7)Slowly increase the vehicle speed to 60 km/h or 37 MPH. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-23, Clear Memory Mode.> Does the speedometer indication increase as Subaru Select Monitor data increases?	Speedometer indication also increases.	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor connector or harness may be the cause. Repair the harness or connector in front vehicle speed sensor circuit.	Go to step **11.**
11	**CHECK POOR CONTACT.** Is there poor contact in front vehicle speed sensor circuit?	There is poor contact.	Repair the poor contact.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

F: DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR

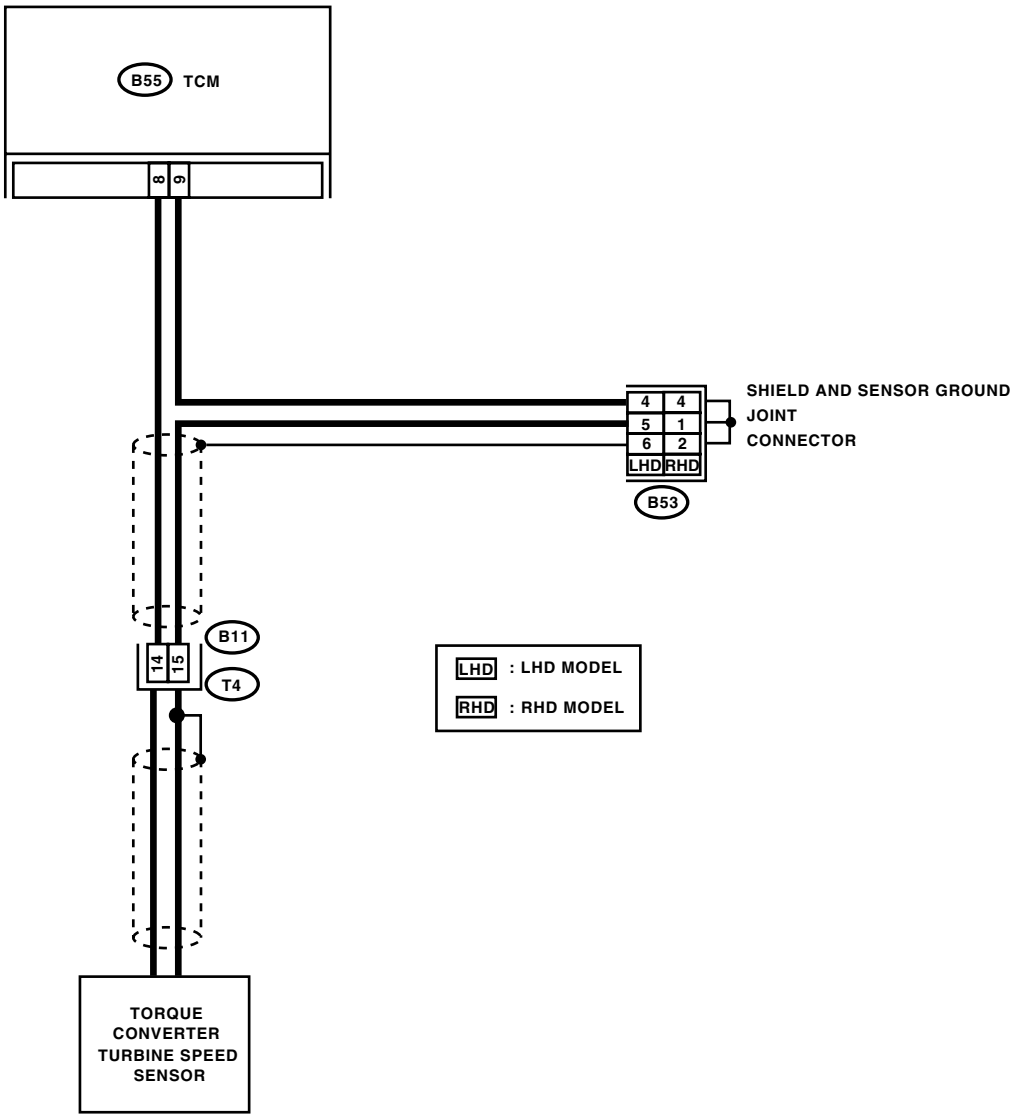
DIAGNOSIS:

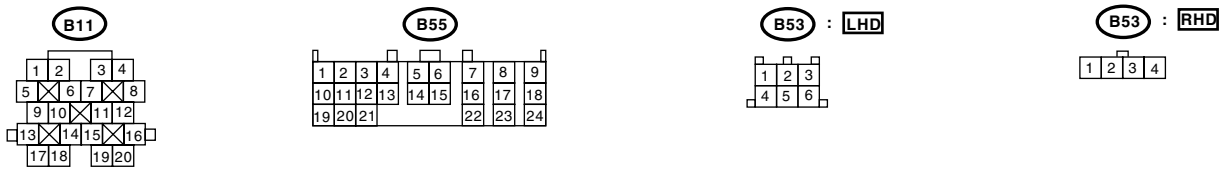
The input signal circuit of TCM is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:





AT-00580

	Step	Check	Yes	No
1	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from transmission. 3)Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 14 — No. 15:*** Is the measured value within specified value?	450 — 650 Ω	Go to step **2.**	Replace the turbine speed sensor. <Ref. to AT-57, Torque Converter Turbine Speed Sensor.>
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1)Disconnect the connector from TCM. 2)Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 8 — (B11) No. 14:*** Is the measured value less than specified value?	1 Ω	Go to step **3.**	Repair the open circuit in harness between TCM and transmission connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 9 — (B11) No. 15:*** Is the measured value less than specified value?	1 Ω	Go to step **4.**	Repair the open circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 9 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **5.**	Repair the short circuit in harness between TCM and transmission connector.
5	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 8 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **6.**	Repair the short circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
6	**PREPARE OSCILLOSCOPE.** Do you have an oscilloscope?	Oscilloscope is available.	Go to step **10.**	Go to step **7.**
7	**PREPARE SUBARU SELECT MONITOR.** Do you have a Subaru Select Monitor?	Subaru Select Monitor is available.	Go to step **9.**	Go to step **8.**

	Step	Check	Yes	No
8	**CHECK INPUT SIGNAL FOR TCM.** 1)Connect the connectors to TCM and transmission. 2)Start the engine and move select lever to “P” or “N” range. 3)Measure the voltage between TCM connector terminals. ***Connector & terminal*** ***(B55) No. 8 (+) — No. 9 (–):*** Is the measured value more than specified value?	AC 1 V	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**
9	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1)Connect the connectors to TCM and transmission. 2)Connect the Subaru Select Monitor to data link connector. 3)Turn the ignition switch to ON and turn Subaru Select Monitor switch to ON. 4)Start the engine. 5)Move the select lever to “P” or “N” range. 6)Read the data of turbine speed using Subaru Select Monitor. •Compare the tachometer with Subaru Select Monitor indications. Is the revolution value same as the tachometer reading shown on the combination meter?	The same revolution value is shown on tachometer and Subaru Select Monitor.	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**
10	**CHECK INPUT SIGNAL FOR TCM USING OSCILLOSCOPE.** 1)Connect the connectors to TCM and transmission. 2)Set the oscilloscope to TCM connector terminals. ***Connector & terminal*** ***Positive probe; (B55) No. 8*** ***Earth lead; (B55) No. 9*** 3)Start the engine and move select lever to “P” or “N” range. Is the measured value more than specified value?	AC 1 V	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**
11	**CHECK POOR CONTACT.** Is there poor contact in torque converter turbine speed sensor circuit?	There is poor contact.	Repair the poor contact.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

G: DTC 38 TORQUE CONTROL SIGNAL

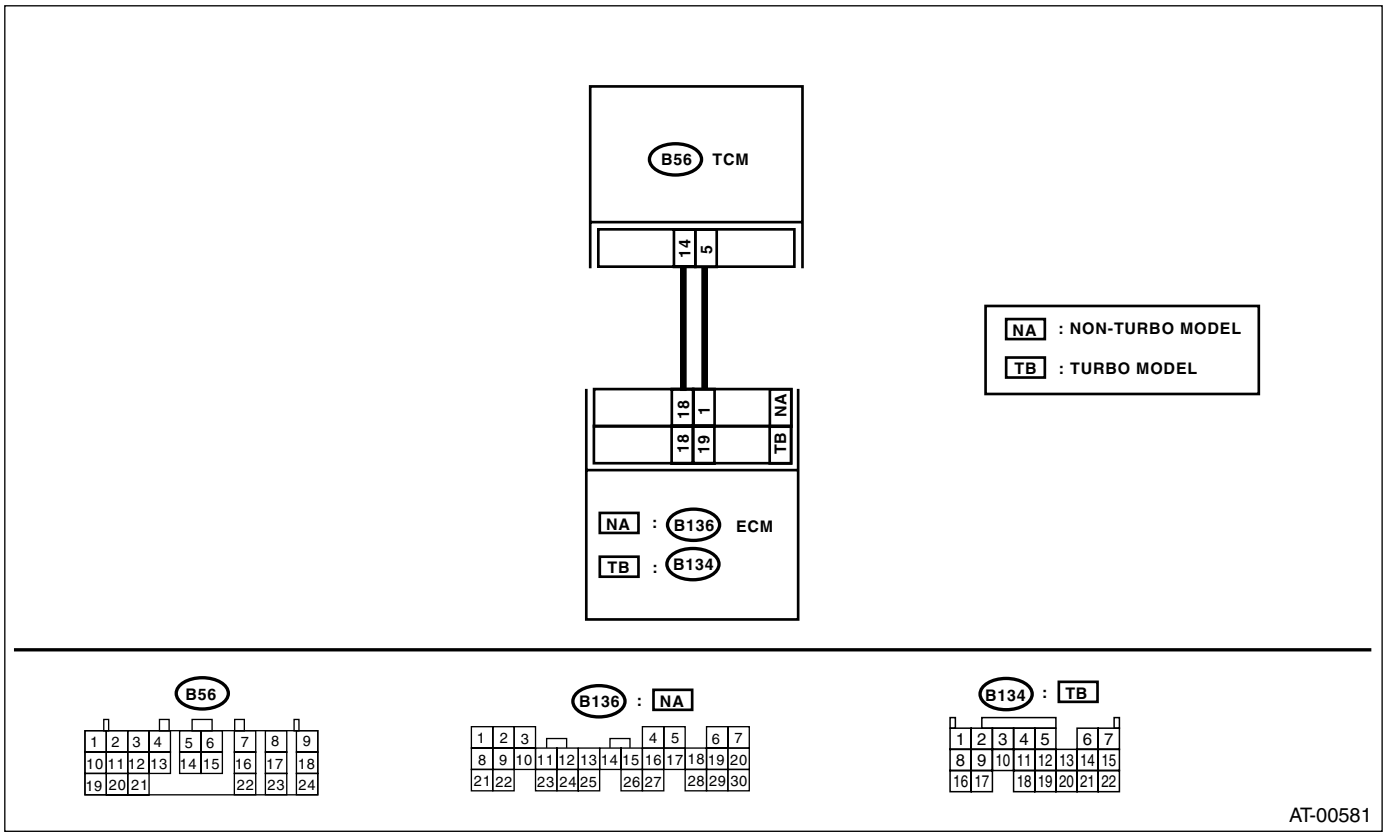
DIAGNOSIS:

- The signal circuit is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:

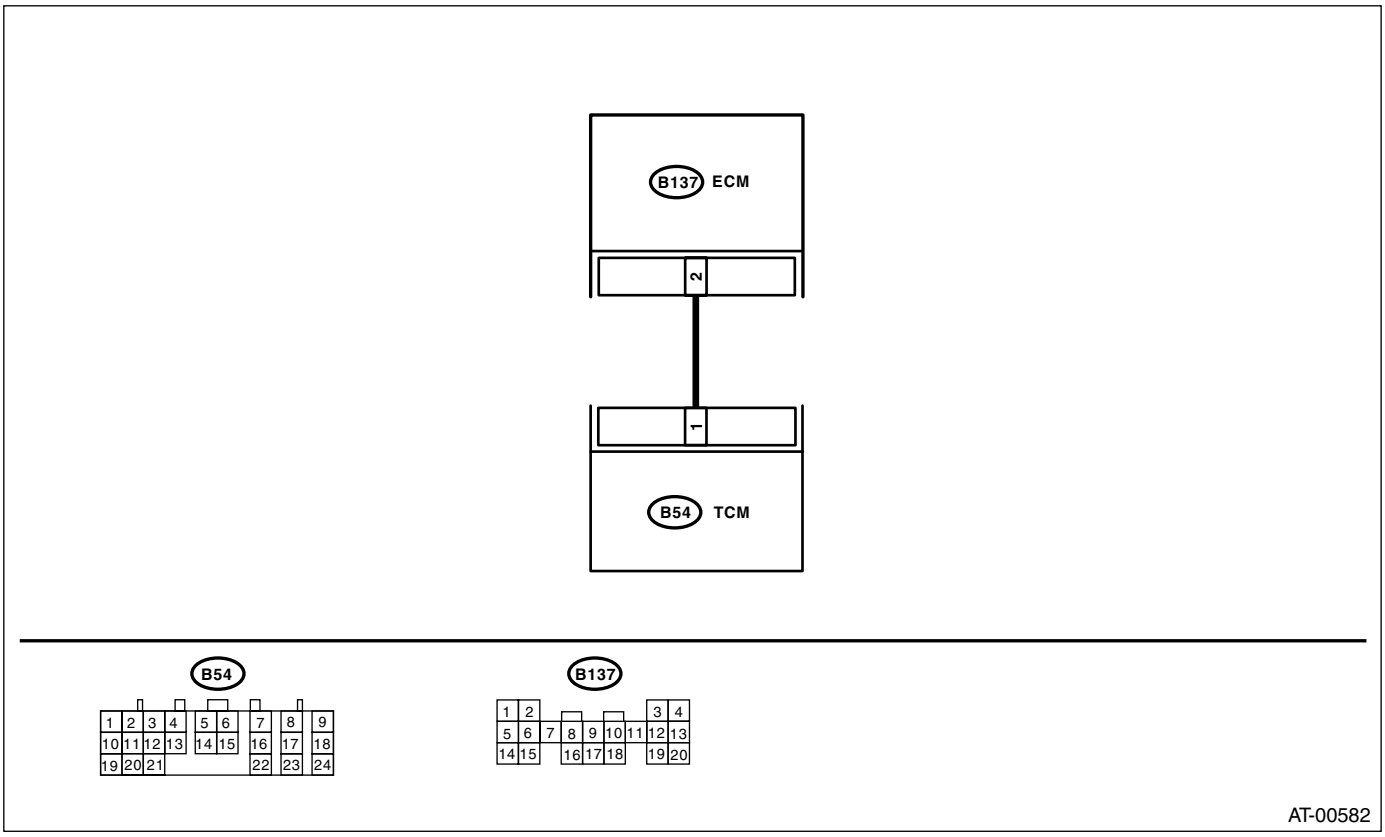


Step		Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from TCM and ECM. 3)Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B56) No. 14 — (B136) No. 1:*** ***(B56) No. 5 — (B136) No. 18:*** ***TURBO MODEL*** ***(B56) No. 14 — (B134) No. 18:*** ***(B56) No. 5 — (B134) No. 19:*** Is the measured value less than specified value?	1 Ω	Go to step **2.**	Repair the open circuit in harness between TCM and ECM connector.

	Step	Check	Yes	No
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 14 — Chassis ground:*** ***(B56) No. 5 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **3.**	Repair the short circuit in harness between TCM and ECM connector.
3	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1)Connect the connectors to TCM and ECM. 2)Turn the ignition switch to ON (engine OFF). 3)Measure the voltage between TCM connector terminals. ***Connector & terminal*** ***(B56) No. 14 (+) — Chassis ground (–):*** ***(B56) No. 5 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4.8 V	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and ECM.	Go to step **4.**
4	**CHECK POOR CONTACT.** Is there poor contact in torque control signal circuit?	There is poor contact.	Repair the poor contact.	Go to step **5.**
5	**CHECK GROUND LINE BETWEEN TRANSMISSION AND BODY.** Check installing condition of the ground line in transmission and body. Is there any dirt or rust at the ground line installing point?	There is dirt and rust.	Remove dirt and rust.	Go to step **6.**
6	**CHECK GROUND LINE BETWEEN TRANSMISSION AND BODY.** Check installing condition of the ground line in transmission and body. Is the tightening torque value the same as specified value?	13 N·m (1.3 kgf-m, 9.4 ft-lb)	Go to step **7.**	Tighten to the specified torque.
7	**CHECK GROUND LINE INSIDE TRANSMISSION.** 1)Drain the ATF and remove oil pan. 2)Check the tightening torque value of ground line installing bolt. Is the tightening torque value the same as specified value?	8 N·m (0.8 kgf-m, 5.8 ft-lb)	Go to step **9.**	Tighten to the specified torque.
8	**CHECK GROUND CIRCUIT OF ECM.** <Ref. to AT-47, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble?	There are some troubles.	Repair the ground terminal and/or ground circuit of ECM.	Go to step **9.**
9	**RECHECK OUTPUT SIGNAL EMITTED FROM TCM.** Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 14 (+) — Chassis ground (–):*** ***(B56) No. 5 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4 V	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>	Replace the ECM.

H: DTC 45 INTAKE MANIFOLD PRESSURE SIGNAL (NON-TURBO MODEL)

DIAGNOSIS:
The input signal circuit of TCM from ECM is open or shorted.
TROUBLE SYMPTOM:
Excessive shift shock.
WIRING DIAGRAM:

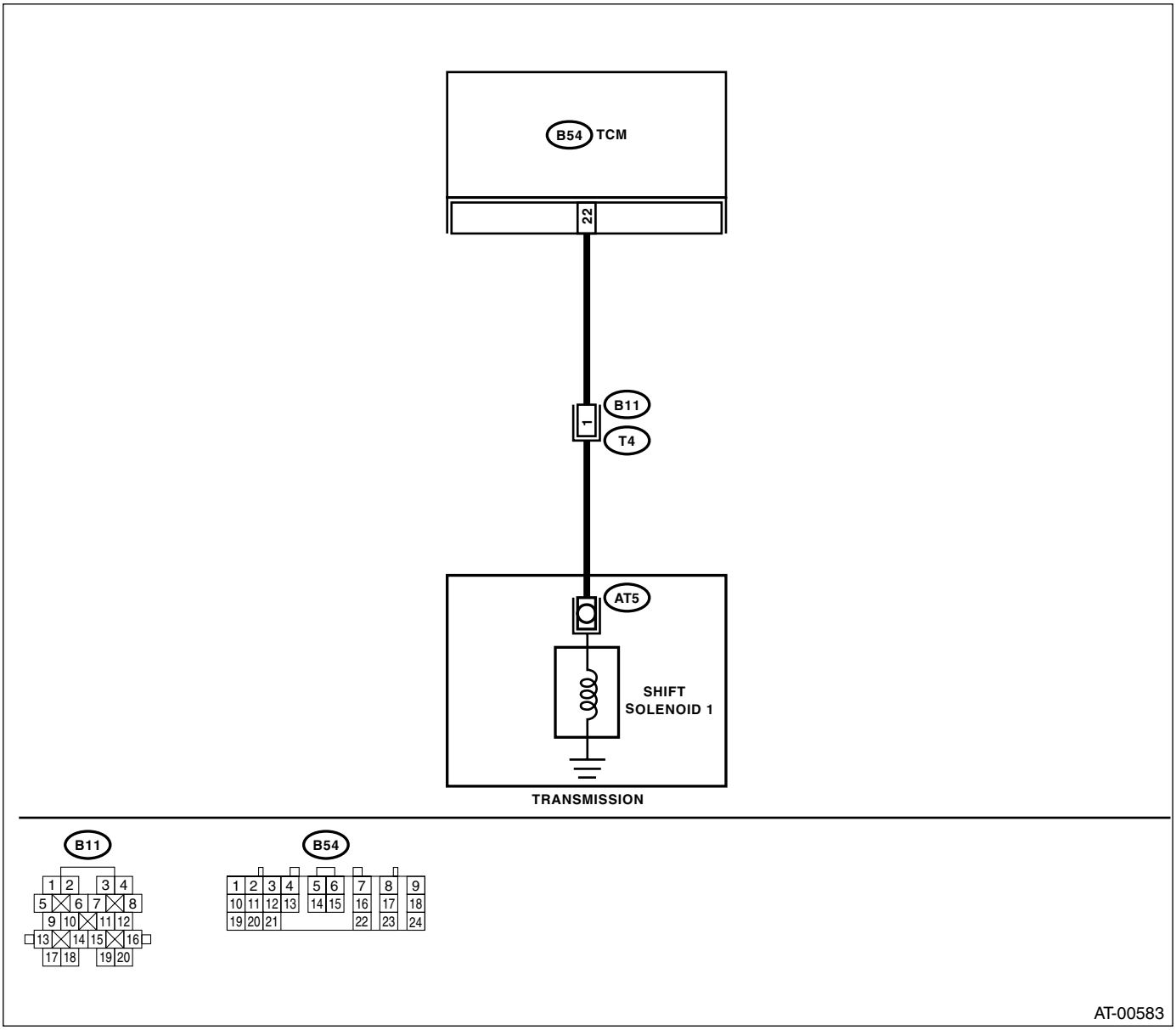


	Step	Check	Yes	No
1	**CHECK ENGINE GROUND TERMINALS AND GROUND CIRCUIT OF ECM** <Ref. to AT-47, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble?	There are some troubles.	Repair the ground terminal and/or ground circuit of ECM.	Go to step **2.**
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from TCM and ECM. 3)Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***(B54) No. 1 — (B137) No. 2:*** Is the measured value less than specified value?	1 Ω	Go to step **3.**	Repair the open circuit in harness between TCM and ECM connector.

	Step	Check	Yes	No
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 1 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **4.**	Repair the short circuit in harness between TCM and ECM connector.
4	**PREPARE SUBARU SELECT MONITOR.** Do you have a Subaru Select Monitor?	Subaru Select Monitor is available.	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR TCM.** 1)Connect the connectors to TCM and ECM. 2)Start the engine, and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3)Idle the engine. 4)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 1 (+) — Chassis ground (–):*** Is the measured value within specified value?	0.4 — 1.6 V	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and ECM.	Go to step **7.**
6	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1)Connect the connectors to TCM and ECM. 2)Connect the Subaru Select Monitor to data link connector. 3)Start the engine, and turn Subaru Select Monitor switch to ON. 4)Warm-up the engine until engine coolant temperature is above 80°C (176°F). 5)Idle the engine. 6)Read the data of intake manifold pressure signal using Subaru Select Monitor. •Display shows the intake manifold pressure signal value sent from ECM. Is the measured value within specified value?	0.4 — 1.6 V	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and ECM.	Go to step **7.**
7	**CHECK POOR CONTACT.** Is there poor contact in intake manifold pressure signal circuit?	There is poor contact.	Repair the poor contact.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

I: DTC 71 SHIFT SOLENOID 1

DIAGNOSIS:
The output signal circuit of shift solenoid 1 is open or shorted.
TROUBLE SYMPTOM:
Does not shift.
WIRING DIAGRAM:



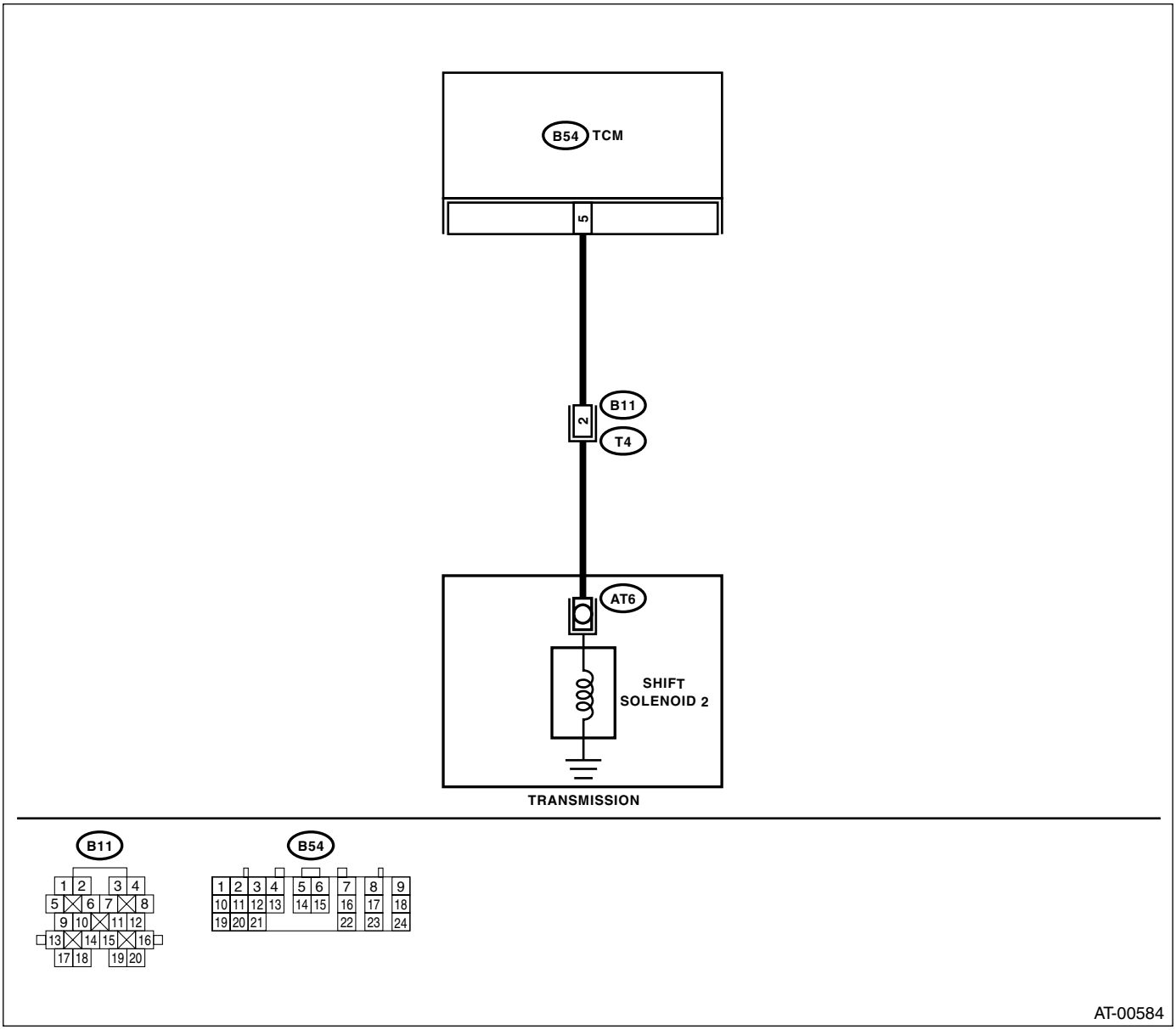
Step		Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from TCM and transmission. 3)Measure the resistance of harness between TCM and shift solenoid 1 connector. ***Connector & terminal*** ***(B54) No. 22 — (B11) No. 1:*** Is the measured value less than specified value?	1 Ω	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.

	Step	Check	Yes	No
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 22 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK SHIFT SOLENOID 1.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 1 — No. 16:*** Is the measured value within specified value?	10 — 16 Ω	Go to step **4.**	Go to step **7.**
4	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1)Connect the connectors to TCM and transmission. 2)Turn the ignition switch to ON (engine OFF). 3)Move the select lever to “D” range. 4)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 22 (+) — Chassis ground (–):*** Is the measured value more than specified value?	9V	Go to step **5.**	Go to step **6.**
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1)Turn the HOLD mode switch to ON. 2)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 22 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1V	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in TCM.	Go to step **6.**
6	**CHECK POOR CONTACT.** Is there poor contact in shift solenoid 1 circuit?	There is poor contact.	Repair poor contact.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

	Step	Check	Yes	No
7	**CHECK SHIFT SOLENOID 1 (IN TRANSMISSION).** 1)Remove the transmission connector from bracket. 2)Lift-up or raise the vehicle and support with safety stand. NOTE: Raise all wheels off ground. 3)Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 4)Remove the oil pan, and disconnect connector from shift solenoid 1. 5)Measure the resistance between shift solenoid 1 connector and transmission ground. ***Terminal*** ***No. 1 — Transmission ground:*** Is the measured value within specified value?	10 — 16 Ω	Go to step **8.**	Replace the shift solenoid 1. <Ref. to AT-64, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
8	**CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 1 AND TRANSMISSION.** Measure the resistance of harness between shift solenoid 1 and transmission connector. ***Connector & terminal*** ***(AT5) No. 1 — (T4) No. 1:*** Is the measured value less than specified value?	1 Ω	Go to step **9.**	Repair the open circuit in harness between shift solenoid 1 and transmission connector.
9	**CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 1 AND TRANSMISSION.** Measure the resistance of harness between shift solenoid 1 connector and transmission ground. ***Connector & terminal*** ***(T4) No. 1 — Transmission ground:*** Is the measured value more than specified value?	1 MΩ	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in shift solenoid 1 and transmission.	Repair the short circuit harness between shift solenoid 1 and transmission connector.

J: DTC 72 SHIFT SOLENOID 2

DIAGNOSIS:
The output signal circuit of shift solenoid 2 is open or shorted.
TROUBLE SYMPTOM:
Does not shift.
WIRING DIAGRAM:



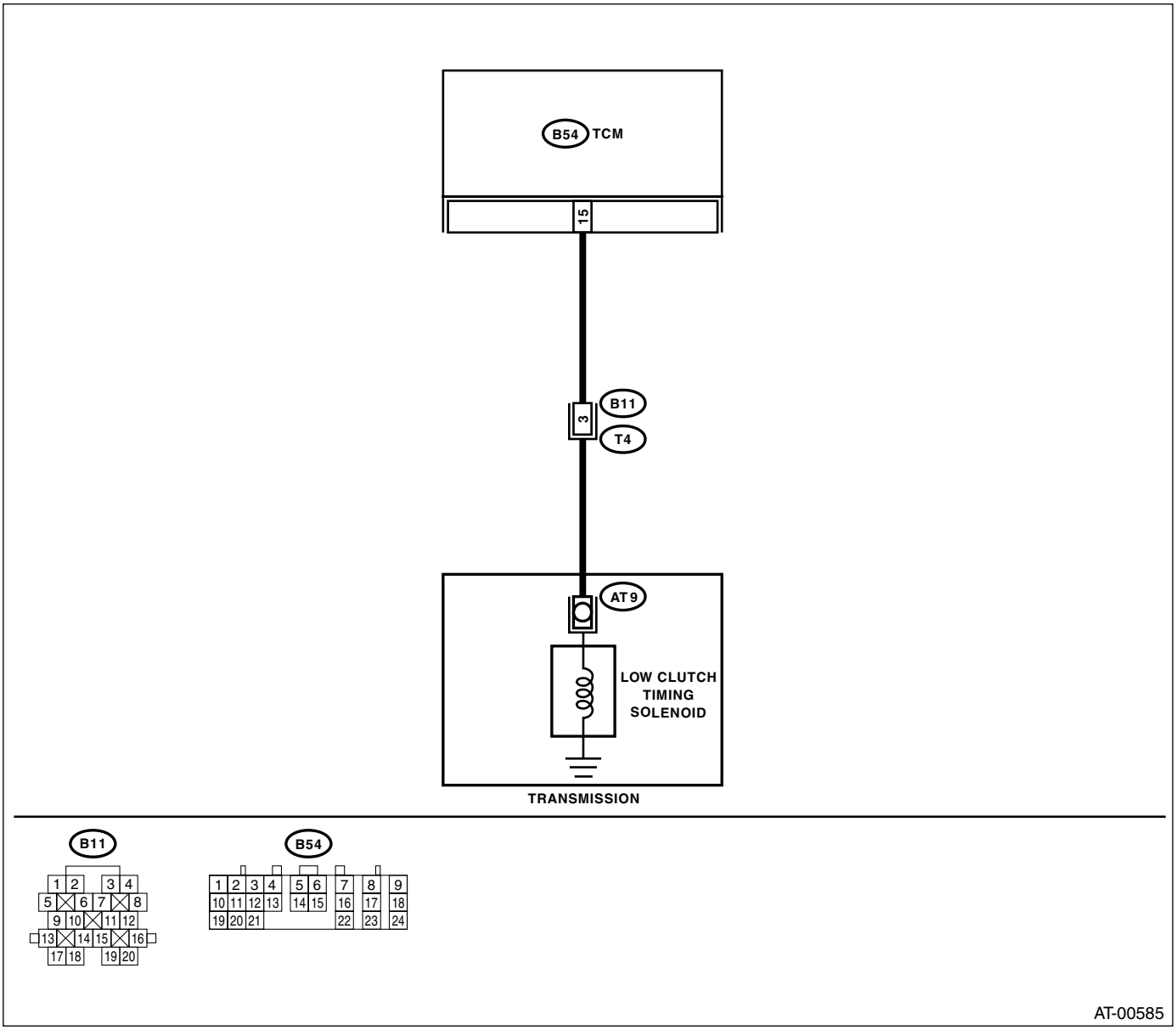
Step		Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from TCM and transmission. 3)Measure the resistance of harness between TCM and shift solenoid 2 connector. ***Connector & terminal*** ***(B54) No. 5 — (B11) No. 2:*** Is the measured value less than specified value?	1 Ω	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.

	Step	Check	Yes	No
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM connector and transmission ground. ***Connector & terminal*** ***(B54) No. 5 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK SHIFT SOLENOID 2.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 2 — No. 16:*** Is the measured value within specified value?	10 — 16 Ω	Go to step **4.**	Go to step **6.**
4	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1)Connect the connectors to TCM and transmission. 2)Lift-up or raise the vehicle and support with safety stand. NOTE: Raise all wheels off ground. 3)Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 4)Move the selector lever to “D” range, and slowly increase vehicle speed to 50 km/h (31 MPH). NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-23, Clear Memory Mode.> 5)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 5 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **5.**
5	**CHECK POOR CONTACT.** Is there poor contact in shift solenoid 2 circuit?	There is poor contact.	Repair the poor contact.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

	Step	Check	Yes	No
6	**CHECK SHIFT SOLENOID 2 (IN TRANSMISSION).** 1)Remove the transmission connector from bracket. 2)Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3)Remove the oil pan, and disconnect connector from shift solenoid 2. 4)Measure the resistance between shift solenoid 2 connector and transmission ground. ***Connector & terminal*** ***No. 1 — Transmission ground:*** Is the measured value within specified value?	10 — 16 Ω	Go to step **7.**	Replace the shift solenoid 2 assembly. <Ref. to AT-64, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
7	**CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 2 AND TRANSMISSION.** Measure the resistance of harness between shift solenoid 2 and transmission connector. ***Connector & terminal*** ***(AT6) No. 1 — (T4) No. 2:*** Is the measured value less than specified value?	1 Ω	Go to step **8.**	Repair the open circuit in harness between shift solenoid 2 and transmission connector.
8	**CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 2 AND TRANSMISSION.** Measure the resistance of harness between shift solenoid 2 connector and transmission ground. ***Connector & terminal*** ***(T4) No. 2 — Transmission ground:*** Is the measured value more than specified value?	1 MΩ	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in shift solenoid 2 and transmission.	Repair the short circuit harness between shift solenoid 2 and transmission connector.

K: DTC 73 LOW CLUTCH TIMING SOLENOID

DIAGNOSIS:
The output signal circuit of low clutch timing solenoid is open or shorted.
TROUBLE SYMPTOM:
Excessive shift shock.
WIRING DIAGRAM:



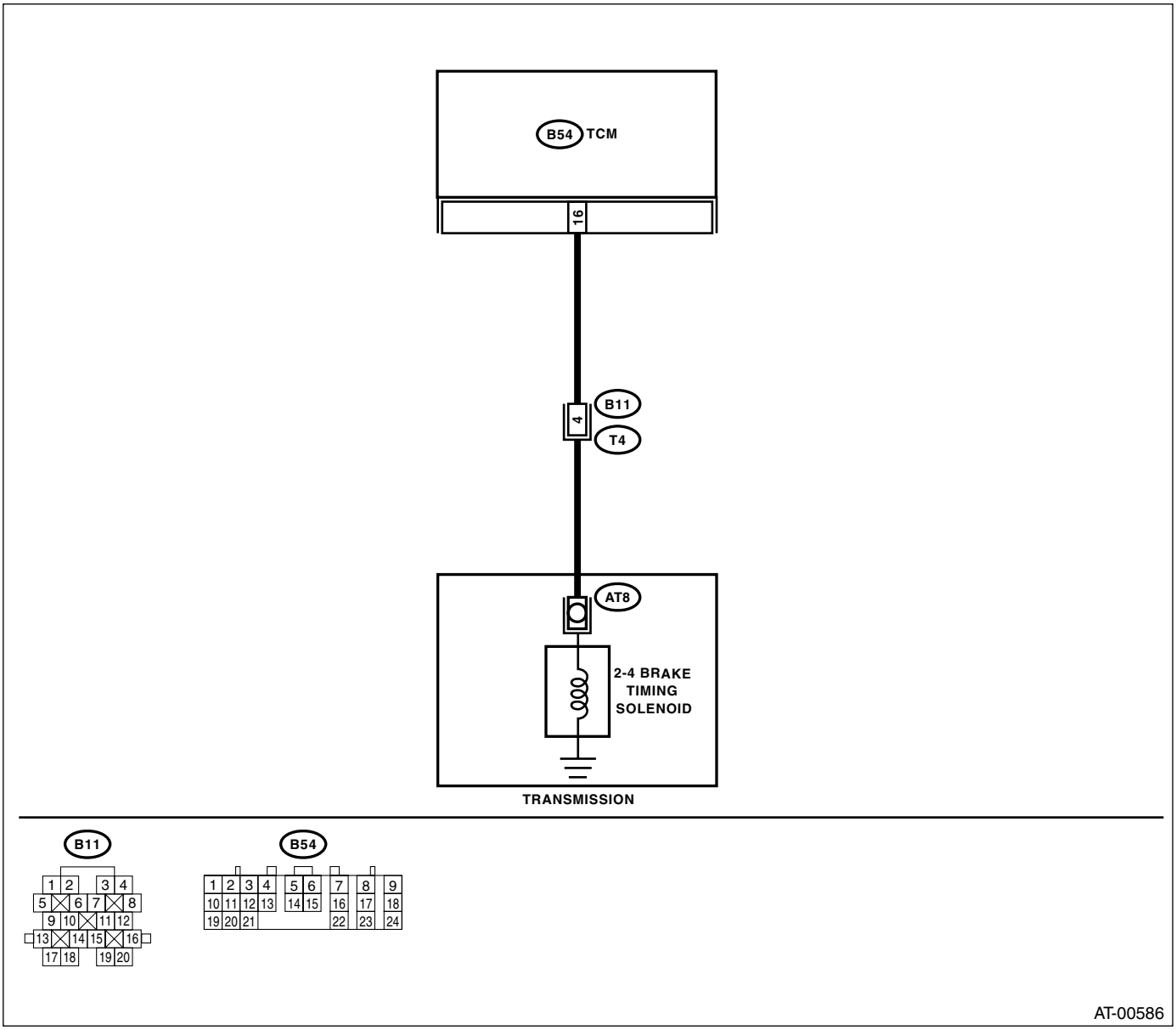
Step		Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from TCM and transmission. 3)Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B54) No. 15 — (B11) No. 3:*** Is the measured value less than specified value?	1 Ω	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.

	Step	Check	Yes	No
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM connector and transmission ground. ***Connector & terminal*** ***(B54) No. 15 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK LOW CLUTCH TIMING SOLENOID.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 3 — No. 16:*** Is the measured value within specified value?	10 — 16 Ω	Go to step **4.**	Go to step **7.**
4	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1)Connect the connectors to TCM and transmission. 2)Turn the ignition switch to ON (engine OFF). 3)Move the select lever to “D” range. 4)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 15 (+) — Chassis ground (–):*** Is the measured value more than specified value?	9 V	Go to step **5.**	Go to step **6.**
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1)Turn the HOLD mode switch to ON. 2)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 15 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in TCM and transmission.	Go to step **6.**
6	**CHECK POOR CONTACT.** Is there poor contact in low clutch timing solenoid circuit?	There is poor contact.	Repair the poor contact.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

	Step	Check	Yes	No
7	**CHECK LOW CLUTCH TIMING SOLENOID (IN TRANSMISSION).** 1)Remove the transmission connector from bracket. 2)Lift-up or raise the vehicle and support with safety stand. 3)Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 4)Remove the oil pan, and disconnect connector from low clutch timing solenoid. 5)Measure the resistance between low clutch timing solenoid connector and transmission ground. ***Terminal*** ***No. 1 — Transmission ground:*** Is the measured value within specified value?	10 — 16 Ω	Go to step **8.**	Replace the low clutch timing solenoid. <Ref. to AT-64, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
8	**CHECK HARNESS CONNECTOR BETWEEN LOW CLUTCH TIMING SOLENOID AND TRANSMISSION.** Measure the resistance of harness between low clutch timing solenoid and transmission connector. ***Connector & terminal*** ***(AT9) No. 1 — (T4) No. 3:*** Is the measured value less than specified value?	1 Ω	Go to step **9.**	Repair the open circuit in harness between low clutch timing solenoid and transmission connector.
9	**CHECK HARNESS CONNECTOR BETWEEN LOW CLUTCH TIMING SOLENOID AND TRANSMISSION.** Measure the resistance of harness between low clutch timing solenoid connector and transmission ground. ***Connector & terminal*** ***(T4) No. 3 — Transmission ground:*** Is the measured value more than specified value?	1 MΩ	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in low clutch timing solenoid and transmission.	Repair the short circuit harness between low clutch timing solenoid and transmission connector.

L: DTC 74 2-4 BRAKE TIMING SOLENOID

DIAGNOSIS:
The output signal circuit of 2-4 brake timing solenoid is open or shorted.
TROUBLE SYMPTOM:
Excessive shift shock.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from TCM and transmission. 3)Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B54) No. 16 — (B11) No. 4:*** Is the measured value less than specified value?	1 Ω	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.

	Step	Check	Yes	No
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 16 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK 2-4 BRAKE TIMING SOLENOID.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 4 — No. 16:*** Is the measured value within specified value?	10 — 16 Ω	Go to step **4.**	Go to step **7.**
4	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1)Connect the connectors to TCM and transmission. 2)Lift-up or raise the vehicle and support with safety stand. NOTE: Raise all wheels off ground. 3)Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 4)Move the selector lever to “1” range, and slowly increase vehicle speed to 10 km/h (6 MPH). NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-23, Clear Memory Mode.> 5)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 16 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **5.**	Go to step **6.**

	Step	Check	Yes	No
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1)Move the selector lever to "D" range, and slowly increase vehicle speed to 65 km/h (40 MPH). NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-23, Clear Memory Mode.> 2)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 16 (+) — Chassis ground (–):*** Is the measured value more than specified value?	9 V	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in transmission.	Go to step **6.**
6	**CHECK POOR CONTACT.** Is there poor contact in 2-4 brake timing solenoid circuit?	There is poor contact.	Repair the poor contact.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>
7	**CHECK 2-4 BRAKE TIMING SOLENOID (IN TRANSMISSION).** 1)Remove the transmission connector from bracket. 2)Lift-up or raise the vehicle and support with safety stand. 3)Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 4)Remove the oil pan, and disconnect connector from 2-4 brake timing solenoid. 5)Measure the resistance between 2-4 brake timing solenoid connector and transmission ground. ***Terminal*** ***No. 1 — Transmission ground:*** Is the measured value within specified value?	10 — 16 Ω	Go to step **8.**	Replace the 2-4 brake timing solenoid. <Ref. to AT-64, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
8	**CHECK HARNESS CONNECTOR BETWEEN 2-4 BRAKE TIMING SOLENOID AND TRANSMISSION.** Measure the resistance of harness between 2-4 brake timing solenoid and transmission connector. ***Connector & terminal*** ***(AT8) No. 1 — (T4) No. 4:*** Is the measured value less than specified value?	1 Ω	Go to step **9.**	Repair the open circuit in harness between 2-4 brake timing solenoid and transmission connector.

	Step	Check	Yes	No
9	**CHECK HARNESS CONNECTOR BETWEEN 2-4 BRAKE TIMING SOLENOID AND TRANSMISSION.** Measure the resistance of harness between 2-4 brake timing solenoid connector and transmission ground. ***Connector & terminal*** ***(T4) No. 4 — Transmission ground:*** Is the measured value more than specified value?	1 MΩ	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in 2-4 brake timing solenoid and transmission.	Repair the short circuit harness between 2-4 brake timing solenoid and transmission connector.

M: DTC 75 LINE PRESSURE DUTY SOLENOID

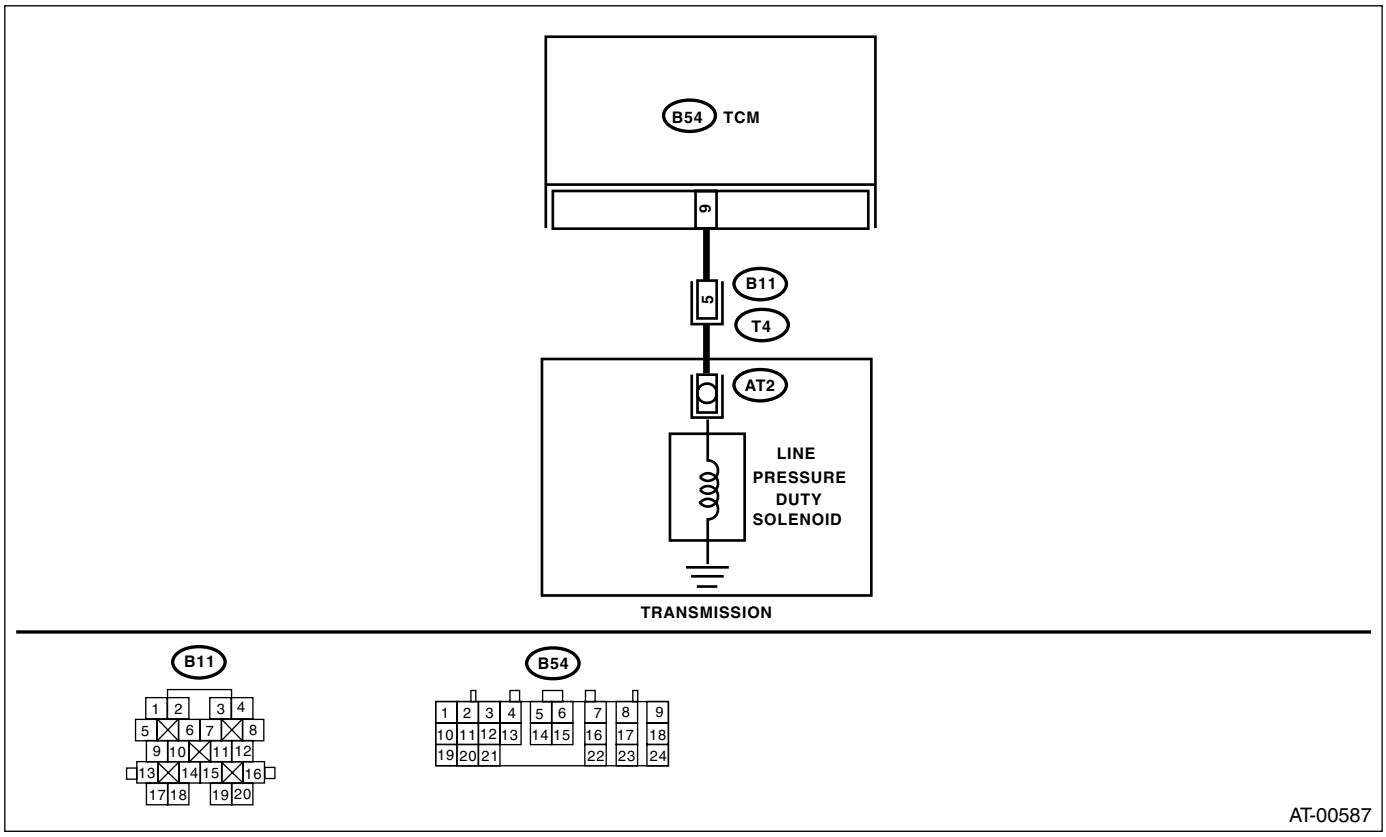
DIAGNOSIS:

The output signal circuit of line pressure duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from transmission and TCM. 3)Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B54) No. 9 — (B11) No. 5:*** Is the measured value less than specified value?	1 Ω	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND CHASSIS GROUND.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 9 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.

	Step	Check	Yes	No
3	**CHECK LINE PRESSURE DUTY SOLENOID.** Measure the resistance between transmission connector receptacle's terminals. ***Terminal*** ***(T4) No. 5 — No. 16:*** Is the measured value within specified value?	2.0 — 4.5 Ω	Go to step **4.**	Go to step **10.**
4	**PREPARE SUBARU SELECT MONITOR.** Do you have a Subaru Select Monitor?	Subaru Select Monitor is available.	Go to step **7.**	Go to step **5.**
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1)Connect all connectors. 2)Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3)Turn the ignition switch to ON (engine OFF). 4)Move the select lever to “N” range. 5)Fully close the throttle. 6)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 9 (+) — Chassis ground (–):*** Is the measured value within specified value?	1.5 — 5.0 V	Go to step **6.**	Go to step **9.**
6	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1)Fully open the throttle. 2)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 9 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in transmission.	Go to step **9.**

	Step	Check	Yes	No
7	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1)Connect the connectors to TCM and transmission. 2)Connect the Subaru Select Monitor to data link connector. 3)Start the engine and turn Subaru Select Monitor switch to ON. 4)Warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 5)Stop the engine and turn ignition switch to ON (engine OFF). 6)Move the select lever to "N" range. 7)Read the data of line pressure duty solenoid using Subaru Select Monitor. •Line pressure duty solenoid is indicated in "%". 8)Throttle is fully closed. Is the data of line pressure duty solenoid the same as specified value?	100 %	Go to step **8.**	Go to step **9.**
8	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1)Turn the ignition switch to ON (engine OFF). 2)Throttle is fully open. 3)Read the data of line pressure duty solenoid using Subaru Select Monitor. Is the data of line pressure duty solenoid the same as specified value?	25 %	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in transmission.	Go to step **9.**
9	**CHECK POOR CONTACT.** Is there poor contact in line pressure duty solenoid circuit?	There is poor contact.	Repair the poor contact.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>
10	**CHECK LINE PRESSURE DUTY SOLENOID (IN TRANSMISSION).** 1)Remove the transmission connector from bracket. 2)Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3)Remove the oil pan, and disconnect connector from line pressure duty solenoid. 4)Measure the resistance between line pressure duty solenoid connector and transmission ground. ***Terminal*** ***No. 1 — Transmission ground:*** Is the measured value within specified value?	2.0 — 4.5 Ω	Go to step **11.**	Replace the line pressure duty solenoid. <Ref. to AT-64, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>

	Step	Check	Yes	No
11	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LINE PRESSURE DUTY SOLENOID.** Measure the resistance of harness between line pressure duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 5 — (AT2) No. 1:*** Is the measured value less than specified value?	1 Ω	Go to step **12.**	Repair the open circuit in harness between line pressure duty solenoid and transmission connector.
12	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LINE PRESSURE DUTY SOLENOID.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 5 — Transmission ground:*** Is the measured value more than specified value?	1 MΩ	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in line pressure duty solenoid and transmission.	Repair the short circuit in harness between line pressure duty solenoid and transmission connector.

N: DTC 76 2-4 BRAKE DUTY SOLENOID

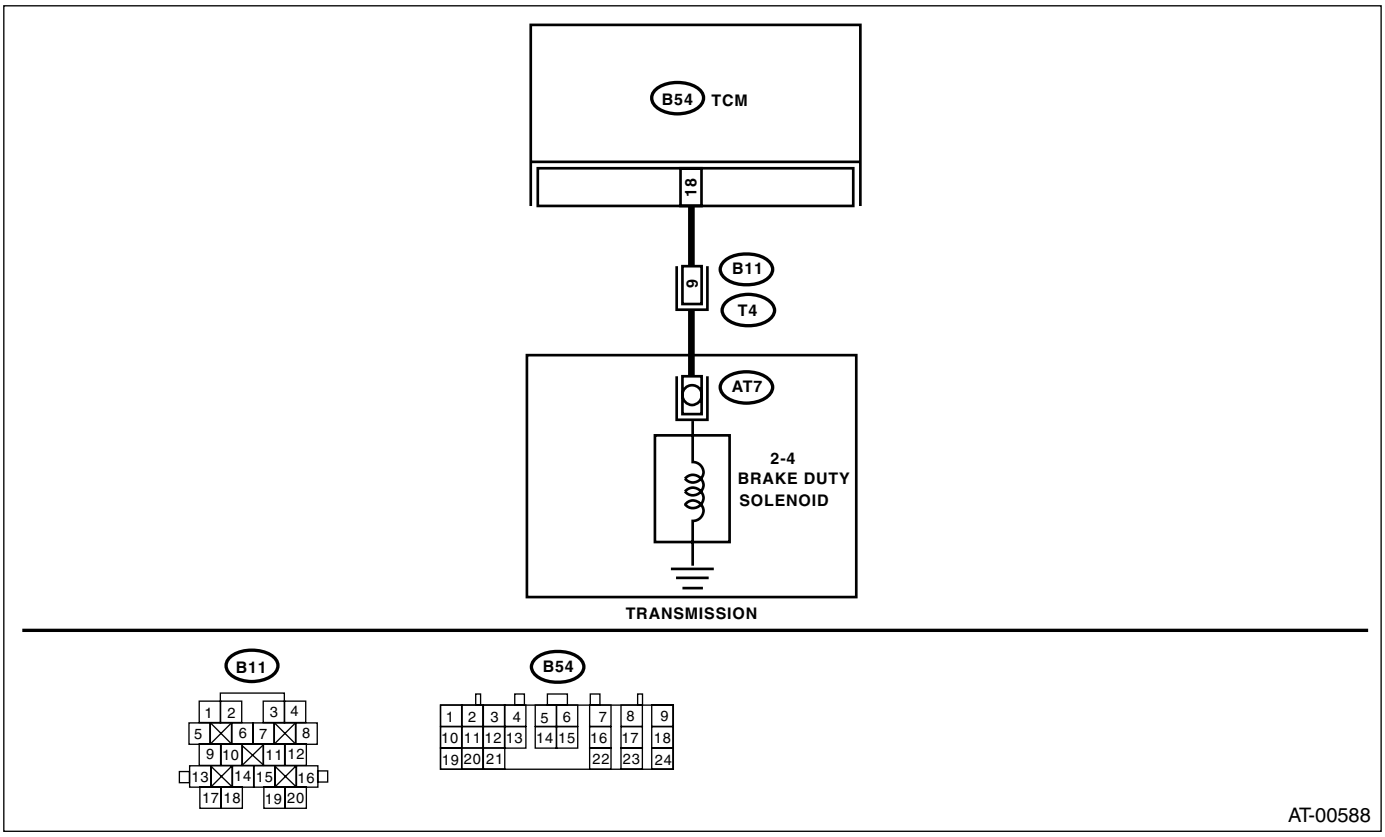
DIAGNOSIS:

The output signal circuit of 2-4 brake duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from transmission and TCM. 3)Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B54) No. 18 — (B11) No. 9:*** Is the measured value less than specified value?	1 Ω	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND CHASSIS GROUND.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 18 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.

	Step	Check	Yes	No
3	**CHECK 2-4 BRAKE DUTY SOLENOID.** Measure the resistance between transmission connector receptacle's terminals. ***Terminal*** ***(T4) No. 16 — No. 9:*** Is the measured value within specified value?	2.0 — 4.5 Ω	Go to step **4.**	Go to step **10.**
4	**PREPARE SUBARU SELECT MONITOR.** Do you have a Subaru Select Monitor?	Subaru Select Monitor is available.	Go to step **7.**	Go to step **5.**
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1)Connect all connectors. 2)Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3)Turn the ignition switch to ON (engine OFF). 4)Move the select lever to “N” range. 5)Fully close the throttle. 6)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 18 (+) — Chassis ground (–):*** Is the measured value within specified value?	1.5 — 5.0 V	Go to step **6.**	Go to step **9.**
6	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1)Fully open the throttle. 2)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 18 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **9.**

	Step	Check	Yes	No
7	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1)Connect all connectors. 2)Connect the Subaru Select Monitor to data link connector. 3)Start the engine and turn Subaru Select Monitor switch to ON. 4)Warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 5)Stop the engine and turn ignition switch to ON (engine OFF). 6)Move the select lever to "N" range. 7)Read the data of 2-4 brake duty solenoid using Subaru Select Monitor. •2-4 brake duty solenoid is indicated in "%". 8)Throttle is fully closed. Is the data of 2-4 brake duty solenoid the same as specified value?	100 %	Go to step **8.**	Go to step **9.**
8	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1)Turn the ignition switch to ON (engine OFF). 2)Throttle is fully open. 3)Read the data of 2-4 brake duty solenoid using Subaru Select Monitor. Is the data of 2-4 brake duty solenoid the same as specified value?	25 %	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **9.**
9	**CHECK POOR CONTACT.** Is there poor contact in 2-4 brake duty solenoid circuit?	There is poor contact.	Repair the poor contact.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>
10	**CHECK 2-4 BRAKE DUTY SOLENOID (IN TRANSMISSION).** 1)Remove the transmission connector from bracket. 2)Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3)Remove the oil pan, and disconnect connector from 2-4 brake duty solenoid. 4)Measure the resistance between 2-4 brake duty solenoid connector and transmission ground. ***Terminal*** ***No. 1 — Transmission ground:*** Is the measured value within specified value?	2.0 — 4.5 Ω	Go to step **11.**	Replace the 2-4 brake duty solenoid. <Ref. to AT-64, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>

	Step	Check	Yes	No
11	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND 2-4 BRAKE DUTY SOLENOID.** Measure the resistance of harness between 2-4 brake duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 9 — (AT7) No. 1:*** Is the measured value less than specified value?	1 Ω	Go to step **12.**	Repair the open circuit in harness between 2-4 brake duty solenoid and transmission connector.
12	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND 2-4 BRAKE DUTY SOLENOID.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 9 — Transmission ground:*** Is the measured value more than specified value?	1 MΩ	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in line pressure duty solenoid and transmission.	Repair the short circuit in harness between 2-4 brake duty solenoid and transmission connector.

O: DTC 77 LOCK-UP DUTY SOLENOID

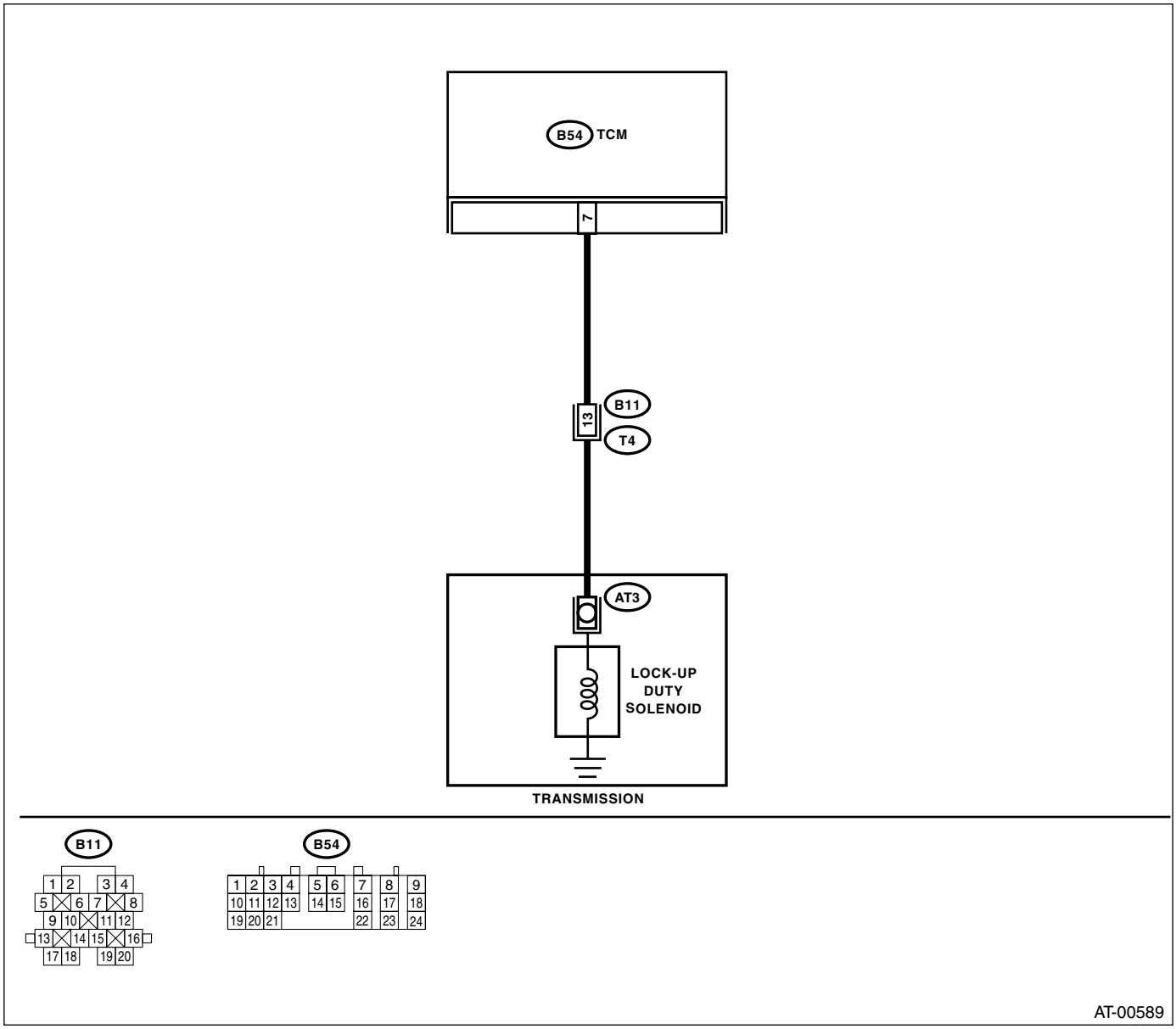
DIAGNOSIS:

The output signal circuit of lock-up duty solenoid is open or shorted.

TROUBLE SYMPTOM:

No “lock-up” (after engine warm-up).

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK DIAGNOSTIC TROUBLE CODE (DTC).** Do multiple DTCs appear in the on-board diagnostics test mode?	DTCs appear.	Go to another DTC.	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from TCM and transmission. 3)Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B54) No. 7 — (B11) No. 13:*** Is the measured value less than specified value?	1 Ω	Go to step **3.**	Repair the open circuit in harness between TCM and transmission connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness connector between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 7 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **4.**	Repair the short circuit in harness between TCM and transmission connector.
4	**CHECK LOCK-UP DUTY SOLENOID.** Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 13 — No. 16:*** Is the measured value within specified value?	10 — 17 Ω	Go to step **5.**	Go to step **11.**
5	**PREPARE SUBARU SELECT MONITOR.** Do you have a Subaru Select Monitor?	Subaru Select Monitor is available.	Go to step **8.**	Go to step **6.**
6	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1)Connect the connectors to TCM and transmission. 2)Lift-up the vehicle and place safety stand. NOTE: Raise all wheels off ground. 3)Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 4)Move the selector lever to “D” range and slowly increase vehicle speed to 75 km/h (47 MPH). Wheels will lock-up. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-23, Clear Memory Mode.> 5)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 7 (+) — Chassis ground (–):*** Is the measured value more than specified value?	8.5 V	Go to step **7.**	Go to step **10.**

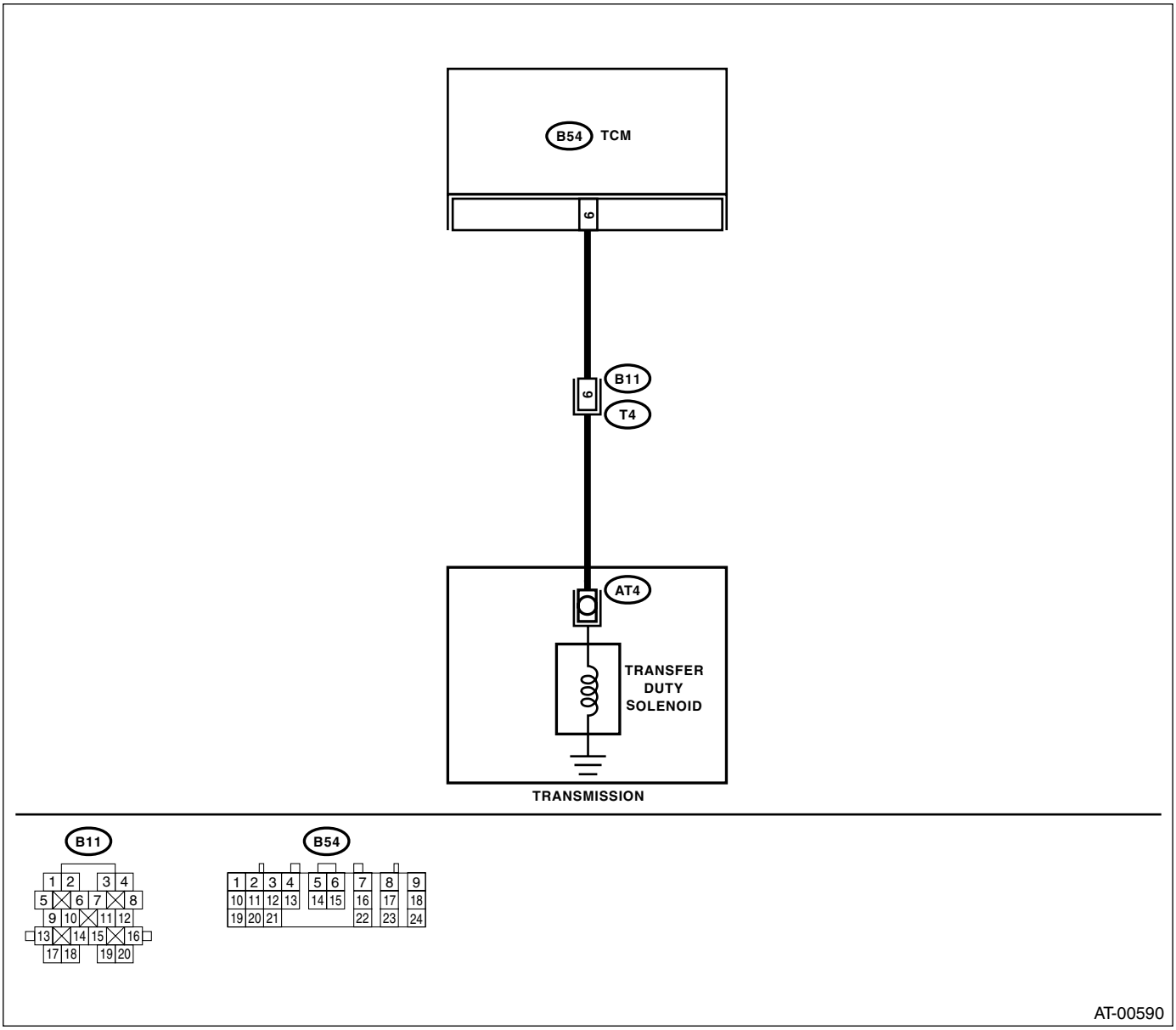
	Step	Check	Yes	No
7	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1)Return the engine to idling speed and move select lever to “N” range. 2)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 7 (+) — Chassis ground (–):*** Is the measured value less than specified value?	0.5 V	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **10.**
8	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1)Connect the connectors to TCM and transmission. 2)Lift-up the vehicle and place safety stand. NOTE: Raise all wheels off ground. 3)Connect the Subaru Select Monitor to data link connector. 4)Start the engine and turn Subaru Select Monitor switch to ON. 5)Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 6)Read the data of lock-up duty solenoid using Subaru Select Monitor. •Lock-up duty solenoid is indicated in “%”. 7)Move the selector lever to “D” range and slowly increase vehicle speed to 75 km/h (47 MPH). Wheels will lock-up. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-23, Clear Memory Mode.> Is the data of lock-up duty solenoid the same as specified value?	95 %	Go to step **9.**	Go to step **10.**

	Step	Check	Yes	No
9	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1)Return the engine to idling speed and move selector lever to “N” range. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-23, Clear Memory Mode.> 2)Read the data of lock-up duty solenoid using Subaru Select Monitor. Is the data of lock-up duty solenoid the same as specified value?	5 %	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **10.**
10	**CHECK POOR CONTACT.** Is there poor contact in lock-up duty solenoid circuit?	There is poor contact.	Repair poor contact.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>
11	**CHECK LOCK-UP DUTY SOLENOID (IN TRANSMISSION).** 1)Remove the transmission connector from bracket. 2)Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3)Remove the oil pan and disconnect connector from lock-up duty solenoid. 4)Measure the resistance between lock-up duty solenoid connector and transmission ground. ***Terminal*** ***No. 1 — Transmission ground:*** Is the measured value within specified value?	10 — 17 Ω	Go to step **12.**	Replace the lock-up duty solenoid. <Ref. to AT-64, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
12	**CHECK HARNESS CONNECTOR BETWEEN LOCK-UP DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between lock-up duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 13 — (AT3) No. 1:*** Is the measured value less than specified value?	1 Ω	Go to step **13.**	Repair the open circuit in harness between TCM and transmission connector.

	Step	Check	Yes	No
13	**CHECK HARNESS CONNECTOR BETWEEN LOCK-UP DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 13 — Transmission ground:*** Is the measured value more than specified value?	1 MΩ	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in lock-up duty solenoid and transmission.	Repair the short circuit in harness between lock-up duty solenoid and transmission connector.

P: DTC 79 TRANSFER DUTY SOLENOID

DIAGNOSIS:
The output signal circuit of transfer duty solenoid is open or shorted.
TROUBLE SYMPTOM:
Excessive “braking” in tight corners.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from TCM and transmission. 3)Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B54) No. 6 — (B11) No. 6:*** Is the measured value less than specified value?	1 Ω	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.

	Step	Check	Yes	No
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance harness connector between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 6 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK TRANSFER DUTY SOLENOID.** Measure the resistance between transmission connector and transmission terminals. ***Connector & terminal*** ***(T4) No. 6 — No. 16:*** Is the measured value within specified value?	10 — 17 Ω	Go to step **4.**	Go to step **10.**
4	**PREPARE SUBARU SELECT MONITOR.** Do you have a Subaru Select Monitor?	Subaru Select Monitor is available.	Go to step **7.**	Go to step **5.**
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1)Connect the connectors to TCM and transmission. 2)Turn the ignition switch to ON (engine OFF). 3)Throttle is fully closed. 4)Move the select lever to “P” position. 5)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 6 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **6.**	Go to step **9.**
6	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1)Move the select lever to “D” position. 2)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 6 (+) — Chassis ground (–):*** Is the measured value more than specified value?	8.5 V	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **9.**
7	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1)Connect the connectors to TCM and transmission. 2)Connect the Subaru Select Monitor to data link connector. 3)Turn the ignition switch to ON (engine OFF) and turn Subaru Select Monitor switch to ON. 4)Move the select lever to “D” range with throttle fully open (vehicle speed 0 km/h or 0 MPH). 5)Read data of transfer duty solenoid using Subaru Select Monitor. •Transfer duty solenoid is indicated in “%”. Is the data of transfer duty solenoid within specified value?	5 — 10 %	Go to step **8.**	Go to step **9.**

	Step	Check	Yes	No
8	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1)Move the select lever to "N" range with throttle fully closed (vehicle speed 0 km/h or 0 MPH). 2)Read the data of transfer duty solenoid using Subaru Select Monitor. •Transfer duty solenoid is indicated in "%". Is the data of transfer duty solenoid within specified value?	60 — 70 %	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **9.**
9	**CHECK POOR CONTACT.** Is there poor contact in transfer duty solenoid circuit?	There is poor contact.	Repair the poor contact.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>
10	**CHECK TRANSFER DUTY SOLENOID (IN TRANSMISSION).** 1)Lift-up the vehicle and place safety stand. NOTE: Raise all wheels off ground. 2)Drain the automatic transmission fluid. **CAUTION:** **Do not drain the automatic transmission fluid until it cools down.** 3)Remove the extension case and disconnect connector from transfer duty solenoid. 4)Measure the resistance between transfer duty solenoid connector and transmission ground. ***Connector & terminal*** ***(AT4) No. 1 — Transmission ground:*** Is the measured value within specified value?	10 — 17 Ω	Go to step **11.**	Replace the transfer duty solenoid.
11	**CHECK HARNESS CONNECTOR BETWEEN TRANSFER DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transfer duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 6 — (AT4) No. 1:*** Is the measured value less than specified value?	1 Ω	Go to step **12.**	Repair the open circuit in harness between transfer duty solenoid and transmission connector.

	Step	Check	Yes	No
12	**CHECK HARNESS CONNECTOR BETWEEN TRANSFER DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 6 — Transmission ground:*** Is the measured value more than specified value?	1 MΩ	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in transfer duty solenoid and transmission.	Repair the short circuit in harness between transfer duty solenoid and transmission connector.

Q: DTC 93 REAR VEHICLE SPEED SENSOR

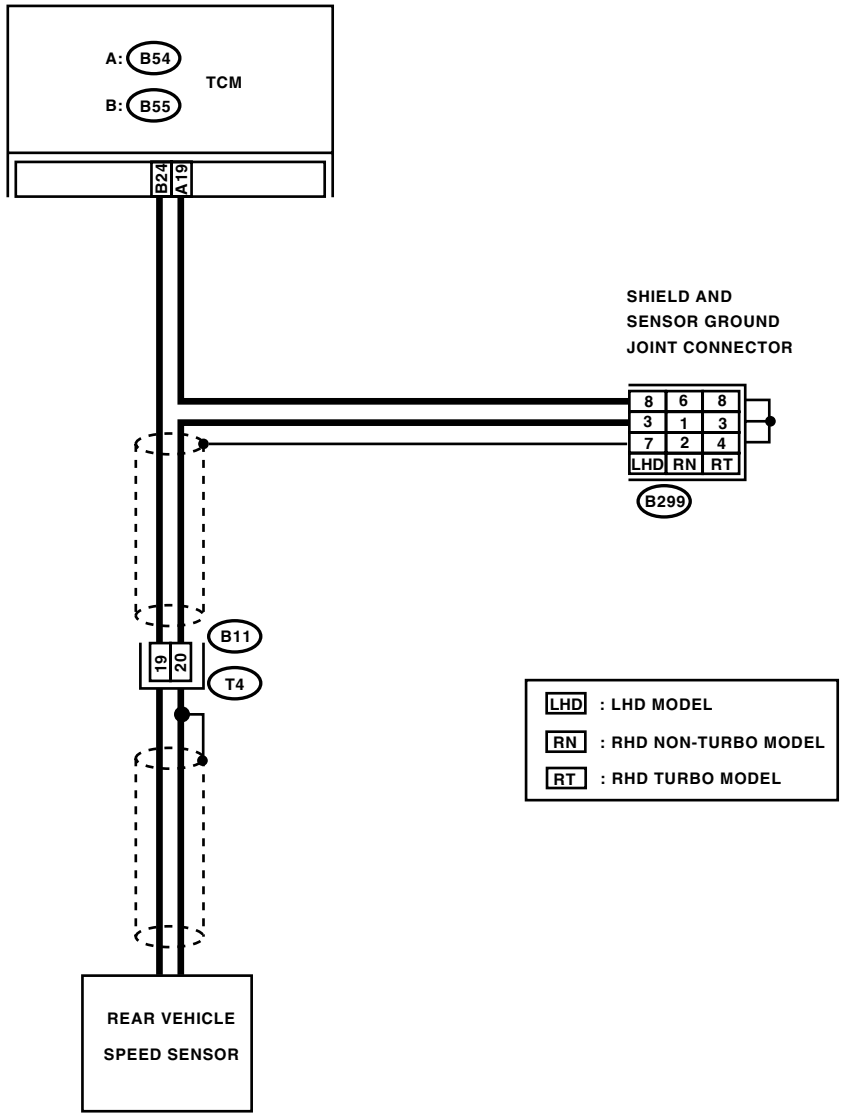
DIAGNOSIS:

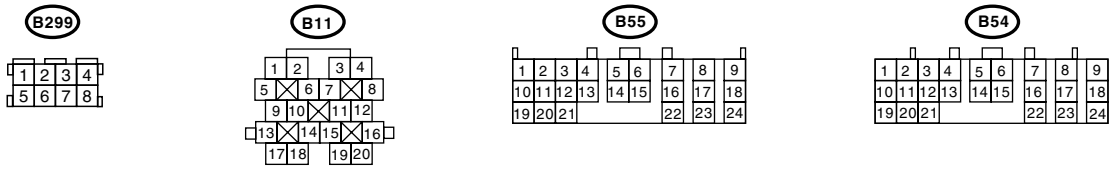
The input signal circuit of TCM is open or shorted.

TROUBLE SYMPTOM:

No lock-up or excessive tight corner “braking”.

WIRING DIAGRAM:





AT-00591

	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from TCM and transmission. 3)Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 24 — (B11) No. 19:*** Is the measured value less than specified value?	1 Ω	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B54) No. 19 — (B11) No. 20:*** Is the measured value less than specified value?	1 Ω	Go to step **3.**	Repair the open circuit in harness between TCM and transmission, and poor contact in coupling connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 24 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **4.**	Repair the short circuit in harness between TCM and transmission connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 19 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **5.**	Repair the short circuit in harness between TCM and transmission connector.
5	**CHECK REAR VEHICLE SPEED SENSOR.** Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 19 — No. 20:*** Is the measured value within specified value?	450 — 650 Ω	Go to step **6.**	Replace the rear vehicle speed sensor. <Ref. to AT-56, Rear Vehicle Speed Sensor.>
6	**PREPARE OSCILLOSCOPE.** Do you have an oscilloscope?	Oscilloscope is available.	Go to step **10.**	Go to step **7.**
7	**PREPARE SUBARU SELECT MONITOR.** Do you have a Subaru Select Monitor?	Subaru Select Monitor is available.	Go to step **9.**	Go to step **8.**

	Step	Check	Yes	No
8	**CHECK INPUT SIGNAL FOR TCM.** 1)Connect the connectors to TCM and transmission. 2)Lift-up or raise the vehicle and place safety stands. NOTE: Raise all wheels off floor. 3)Start the engine and set vehicle in 20 km/h (12 MPH) condition. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-23, Clear Memory Mode.> 4)Measure the voltage between TCM connector terminals. ***Connector & terminal*** ***(B55) No. 24 (+) — (B54) No. 19 (–):*** Is the measured value more than specified value?	AC 1 V	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**
9	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1)Connect the connectors to TCM and transmission. 2)Connect the Subaru Select Monitor to data link connector. 3)Lift-up or raise the vehicle and place safety stands. NOTE: Raise all wheels off floor. 4)Turn the ignition switch to ON and turn Subaru Select Monitor switch to ON. 5)Start the engine. 6)Read the data of vehicle speed using Subaru Select Monitor. •Compare the speedometer with Subaru Select Monitor indications. •Vehicle speed is indicated in “km/h” or “MPH”. 7)Slowly increase the vehicle speed to 60 km/h or 37 MPH. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-23, Clear Memory Mode.> Does the speedometer indication increase as the Subaru Select Monitor data increases?	Speedometer indication also increases.	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**

	Step	Check	Yes	No
10	**CHECK INPUT SIGNAL FOR TCM USING OSCILLOSCOPE.** 1)Connect the connectors to TCM and transmission. 2)Lift-up or raise the vehicle and place safety stands. NOTE: Raise all wheels off floor. 3)Set the oscilloscope to TCM connector terminals. ***Connector & terminal*** ***Positive probe: (B55) No. 24*** ***Ground lead: (B54) No. 19*** 4)Start the engine and set vehicle in 20 km/h (12 MPH) condition. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-23, Clear Memory Mode.> 5)Measure the signal voltage indicated on oscilloscope. Is the measured value more than specified value?	AC 1 V	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**
11	**CHECK POOR CONTACT.** Is there poor contact in rear vehicle speed sensor circuit?	There is poor contact.	Repair the poor contact.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

15.Diagnostic Procedure for No-diagnostic Trouble Code (DTC)

A: CHECK GEAR POSITION.

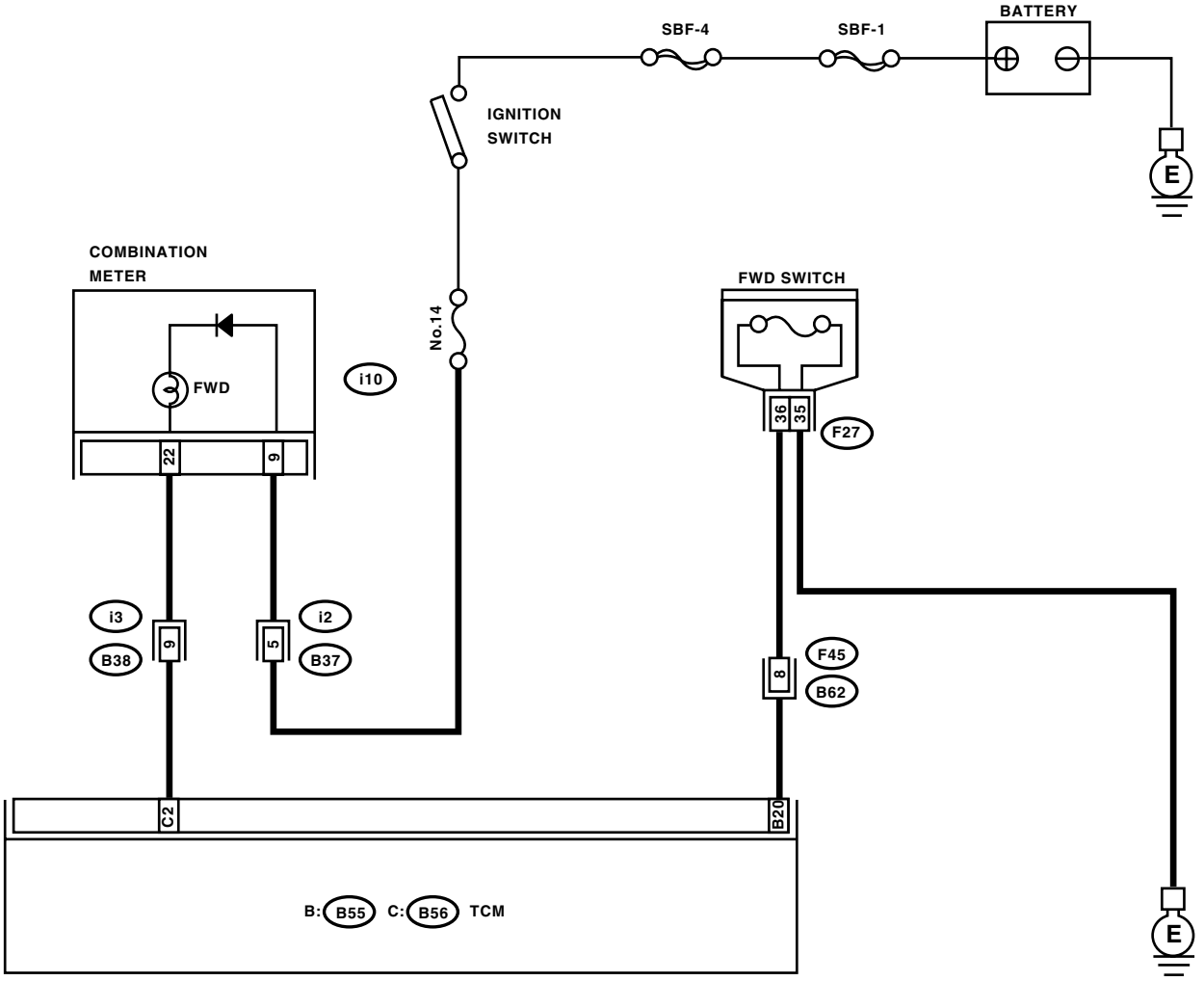
Step		Check	Yes	No
1	**CHECK GEAR POSITION.** 1)Lift-up the vehicle and place safety stand. NOTE: Raise all wheels off ground. 2)Start the engine. 3)Move the select lever to “D” range and drive vehicle. 4)Read the data of gear position using Subaru Select Monitor. •Gear position is indicated. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-23, Clear Memory Mode.> Does the transmission gear correspond to the gear which is shown on display?	Transmission gear correspond to the gear which is shown on display.	Go to step CHECK FWD SWITCH.<Ref. to AT-101, CHECK FWD SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	Check the shift solenoid 1 and shift solenoid 2 signal circuit. <Ref. to AT-66, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> and <Ref. to AT-69, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

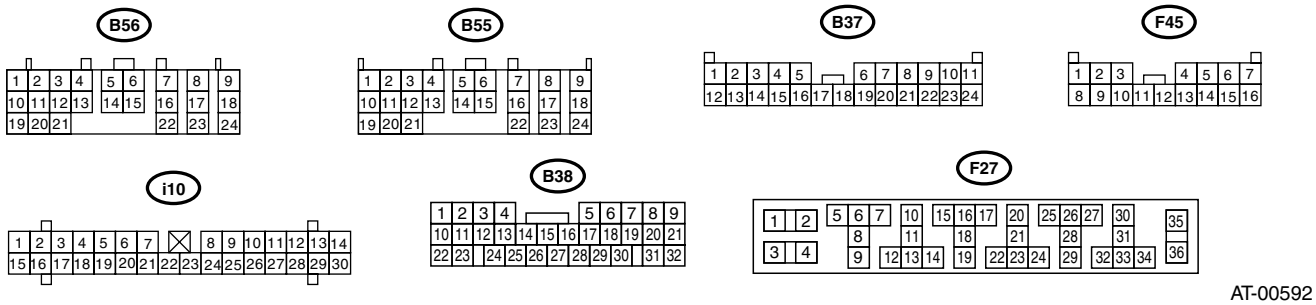
B: CHECK FWD SWITCH.

DIAGNOSIS:

- The LED does not come on even if FWD switch is ON.
- The FWD switch circuit is open or short.

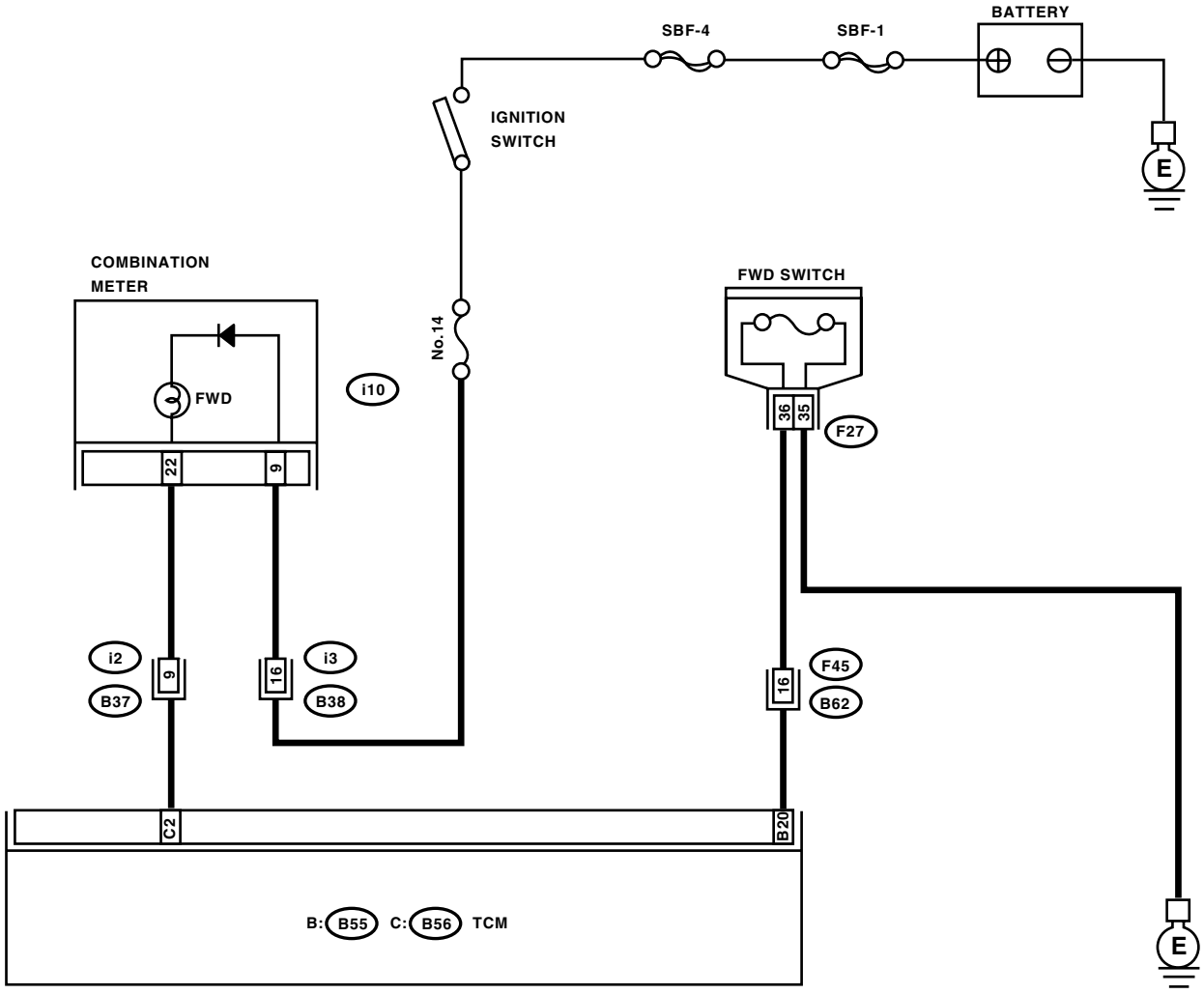
WIRING DIAGRAM:
LHD MODEL

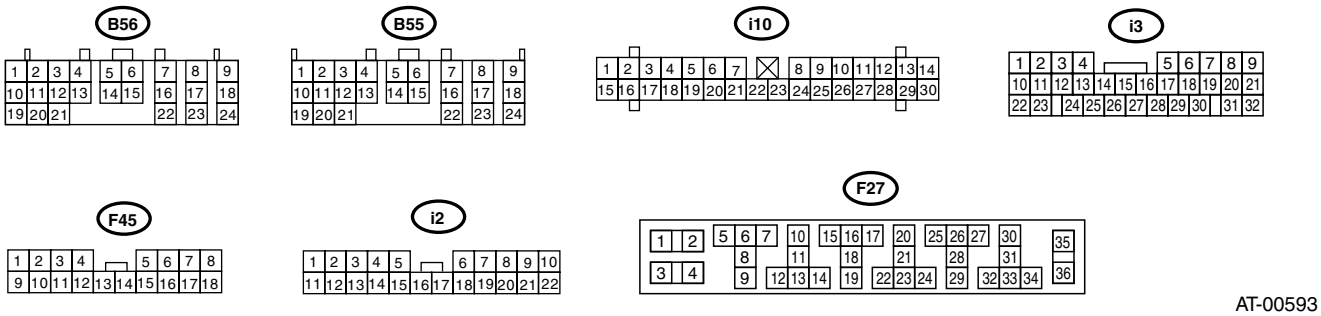




AT-00592

RHD MODEL





AT-00593

	Step	Check	Yes	No
1	**CHECK FWD SWITCH.** When the fuse is inserted to FWD switch, does LED light up?	LED lights up.	Go to step CHECK BRAKE SWITCH.<Ref. to AT-106, CHECK BRAKE SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FWD INDICATOR LIGHT.** 1)Turn the ignition switch to OFF. 2)Remove the combination meter. 3)Remove the FWD indicator light bulb from combination meter. Is the FWD indicator light bulb OK?	FWD indicator light bulb is OK.	Go to step **3.**	Replace the FWD indicator light bulb. <Ref. to IDI-12, Combination Meter Assembly.>
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND FWD SWITCH.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from TCM and FWD switch. 3)Measure the resistance of harness between TCM and FWD switch connector. ***Connector & terminal*** ***(B55) No. 20 — (F27) No. 36:*** Is the measured value less than specified value?	1 Ω	Go to step **5.**	Repair the open circuit in harness between TCM and FWD switch connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND FWD SWITCH.** Measure the resistance of harness connector between TCM and body to make sure that circuit does not short. ***Connector & terminal*** ***(B55) No. 20 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **6.**	Repair the short circuit in harness between TCM and FWD switch connector.
5	**CHECK HARNESS CONNECTOR BETWEEN FWD SWITCH AND CHASSIS GROUND.** Measure the resistance of harness between FWD switch and chassis ground. ***Connector & terminal*** ***(F27) No. 35— Chassis ground:*** Is the measured value less than specified value?	1 Ω	Go to step **4.**	Repair the open circuit in harness between FWD switch connector and chassis ground.
6	**CHECK INPUT SIGNAL FOR TCM.** 1)Turn the ignition switch to OFF. 2)Connect the connector to TCM and FWD switch. 3)Turn the ignition switch to ON. 4)Measure the signal voltage for TCM while installing the fuse to FWD switch connector. ***Connector & terminal*** ***(B55) No. 20 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **7.**	Go to step **11.**

	Step	Check	Yes	No
7	**CHECK INPUT SIGNAL FOR TCM.** Measure the signal voltage for TCM while removing the fuse from FWD switch connector. ***Connector & terminal*** ***(B55) No. 20 (+) — Chassis ground (–):*** Is the measured value within specified value?	6 — 9.1 V	Go to step **8.**	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>
8	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from TCM and combination meter. 3)Measure the resistance of harness between TCM and diagnosis connector. ***Connector & terminal*** ***(B56) No. 2 — (i11) No. 4:*** Is the measured value less than specified value?	1 Ω	Go to step **9.**	Repair the open circuit in harness between TCM and combination meter and poor contact in coupling connector.
9	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** Measure the resistance of harness connector between TCM and chassis ground to make sure that circuit does not short. ***Connector & terminal*** ***(B56) No. 2 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **10.**	Repair the short circuit in harness between TCM and combination meter connector.
10	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1)Turn the ignition switch to OFF. 2)Connect the connector to TCM and combination meter. 3)Turn the ignition switch to ON. 4)Measure the signal voltage for TCM while installing and removing the fuse to FWD switch connector. ***Connector & terminal*** ***(B56) No. 2 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **11.**	Go to step **12.**
11	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** Measure the signal voltage for TCM while removing the fuse from FWD switch connector. ***Connector & terminal*** ***(B56) No. 2 (+) — Chassis ground (–):*** Is the measured value within specified value?	6 — 9.1 V	Go to step **12.**	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>
12	**CHECK POOR CONTACT.** Is there poor contact in FWD switch circuit?	There is poor contact.	Repair the poor contact.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

C: CHECK BRAKE SWITCH.

	Step	Check	Yes	No
1	**CHECK BRAKE SWITCH.** When the brake pedal is depressed, does LED light up?	LED lights up.	Go to step CHECK ABS SWITCH. <Ref. to AT-106, CHECK ABS SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	Check the brake switch circuit. <Ref. to EN(SOHC)-212, DTC P0703 — TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

D: CHECK ABS SWITCH.

	Step	Check	Yes	No
1	**CHECK ABS SWITCH.** Does the LED of ABS switch light up?	LED lights up.	Check the ABS switch circuit. <Ref. to ABS-140, DTC 44 — ABS-AT CONTROL (NON CONTROLLED) —, Diagnostics Chart with Subaru Select Monitor.> and <Ref. to ABS-142, DTC 44 — ABS-AT CONTROL (CONTROLLED) —, Diagnostics Chart with Subaru Select Monitor.>	Go to step CHECK CRUISE CONTROL SWITCH. <Ref. to AT-106, CHECK CRUISE CONTROL SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>

E: CHECK CRUISE CONTROL SWITCH.

	Step	Check	Yes	No
1	**CHECK CRUISE CONTROL SWITCH.** When the cruise control is set, does LED light up?	LED lights up.	Go to step CHECK KICK-DOWN SWITCH. <Ref. to AT-107, CHECK KICK–DOWN SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	Check the cruise control. <Ref. to CC-27, Diagnostics Chart with Trouble Code.>

F: CHECK KICK–DOWN SWITCH.

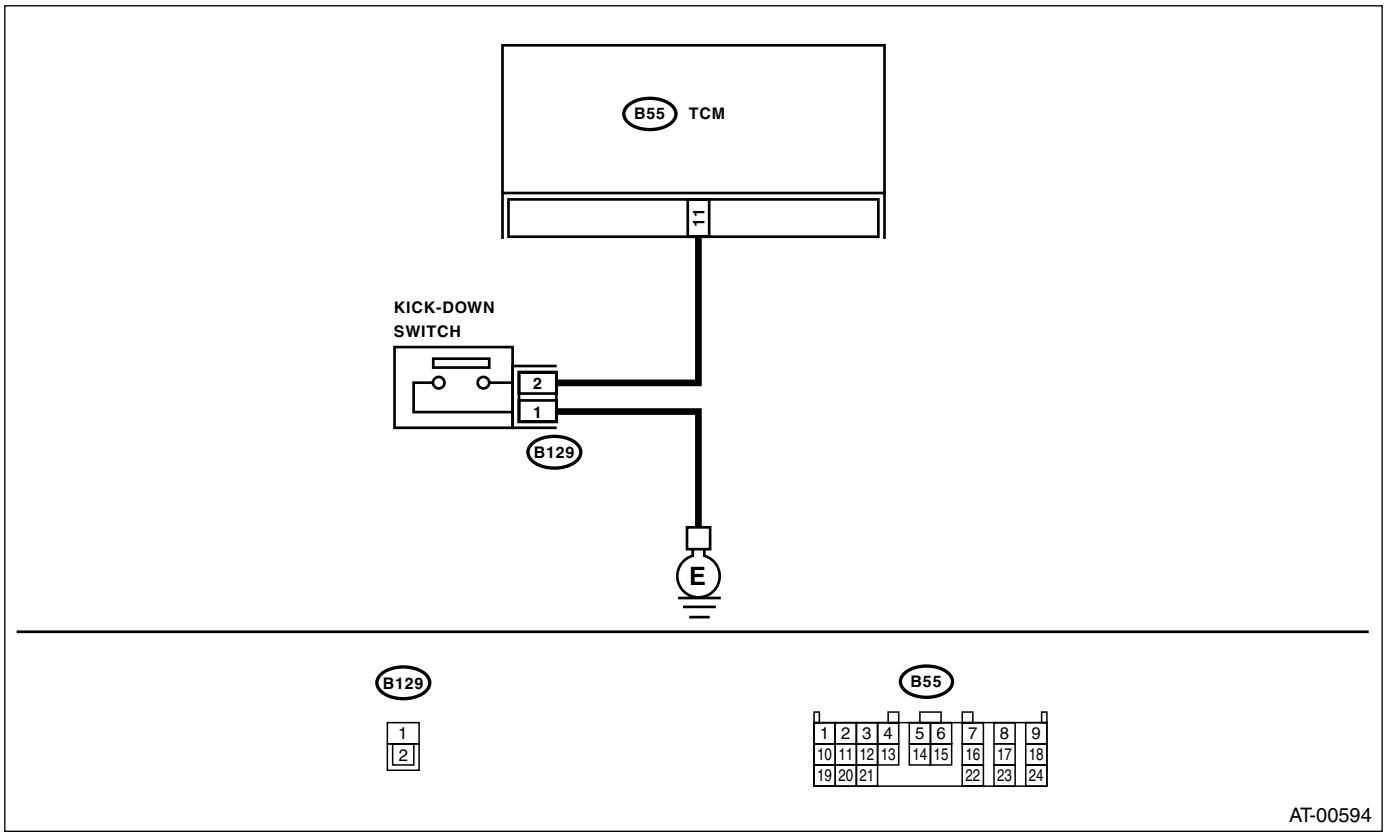
DIAGNOSIS:

• The kick-down switch is ON when the throttle is fully opened, but is OFF when the throttle is partially open or fully closed.

TROUBLE SYMPTOM:

No kick-down occurs (when the throttle is fully opened).

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK KICK-DOWN SWITCH OPERATION.** When the accelerator pedal is depressed, is "ON" displayed on Subaru Select Monitor?	"ON" is displayed.	Go to step CHECK POWER MODE SWITCH. <Ref. to AT-110, CHECK POWER MODE SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK KICK-DOWN SWITCH GROUND LINE.** 1)Disconnect the connector from kick-down switch. 2)Measure the resistance of harness connector between kick-down switch and chassis ground. ***Connector & terminal*** ***(B129) No. 1 — Chassis ground:*** Is the measured value less than specified value?	1 Ω	Go to step **3.**	Repair the open circuit in harness between kick-down switch and TCM.
3	**CHECK KICK-DOWN SWITCH.** Measure the resistance for kick-down switch when depressing the accelerator pedal. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value less than specified value?	1 Ω	Go to step **4.**	Replace the kick-down switch. <Ref. to SP(SOHC)-4, Accelerator Pedal.>
4	**CHECK KICK-DOWN SWITCH.** Measure the resistance for kick-down switch when pressing the accelerator pedal. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value more than specified value?	1 MΩ	Go to step **5.**	Replace the kick-down switch.
5	**CHECK HARNESS CONNECTOR BETWEEN TCM AND KICK-DOWN SWITCH.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from kick-down switch. 3)Measure the resistance of harness connector between TCM and kick-down switch. ***Connector & terminal*** ***(B55) No. 11 — (B129) No. 2:*** Is the measured value less than specified value?	1 Ω	Go to step **6.**	Repair the open circuit in harness between TCM and kick-down switch.
6	**CHECK HARNESS CONNECTOR BETWEEN TCM AND KICK-DOWN SWITCH.** Measure the resistance of harness connector between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 11 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **7.**	Repair the short circuit in harness between TCM and chassis ground.

	Step	Check	Yes	No
7	**CHECK INPUT SIGNAL FOR TCM.** 1)Turn the ignition switch to OFF. 2)Connect the connector to kick-down switch. 3)Turn the ignition switch to ON (engine OFF). 4)Measure the signal voltage for TCM when depressing the accelerator pedal. ***Connector & terminal*** ***(B55) No. 11 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **8.**	Go to step **9.**
8	**CHECK INPUT SIGNAL FOR TCM.** Measure the signal voltage for TCM when pressing the accelerator pedal. ***Connector & terminal*** ***(B55) No. 11 (+) — Chassis ground (–):*** Is the measured value more than specified value?	6.5 V	A temporary poor contact of the connector and harness may be the cause. Repair the harness and connector in TCM.	Go to step **9.**
9	**CHECK POOR CONTACT.** Is there poor contact in kick-down switch circuit?	There is poor contact.	Repair the poor contact.	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

G: CHECK POWER MODE SWITCH.

DIAGNOSIS:

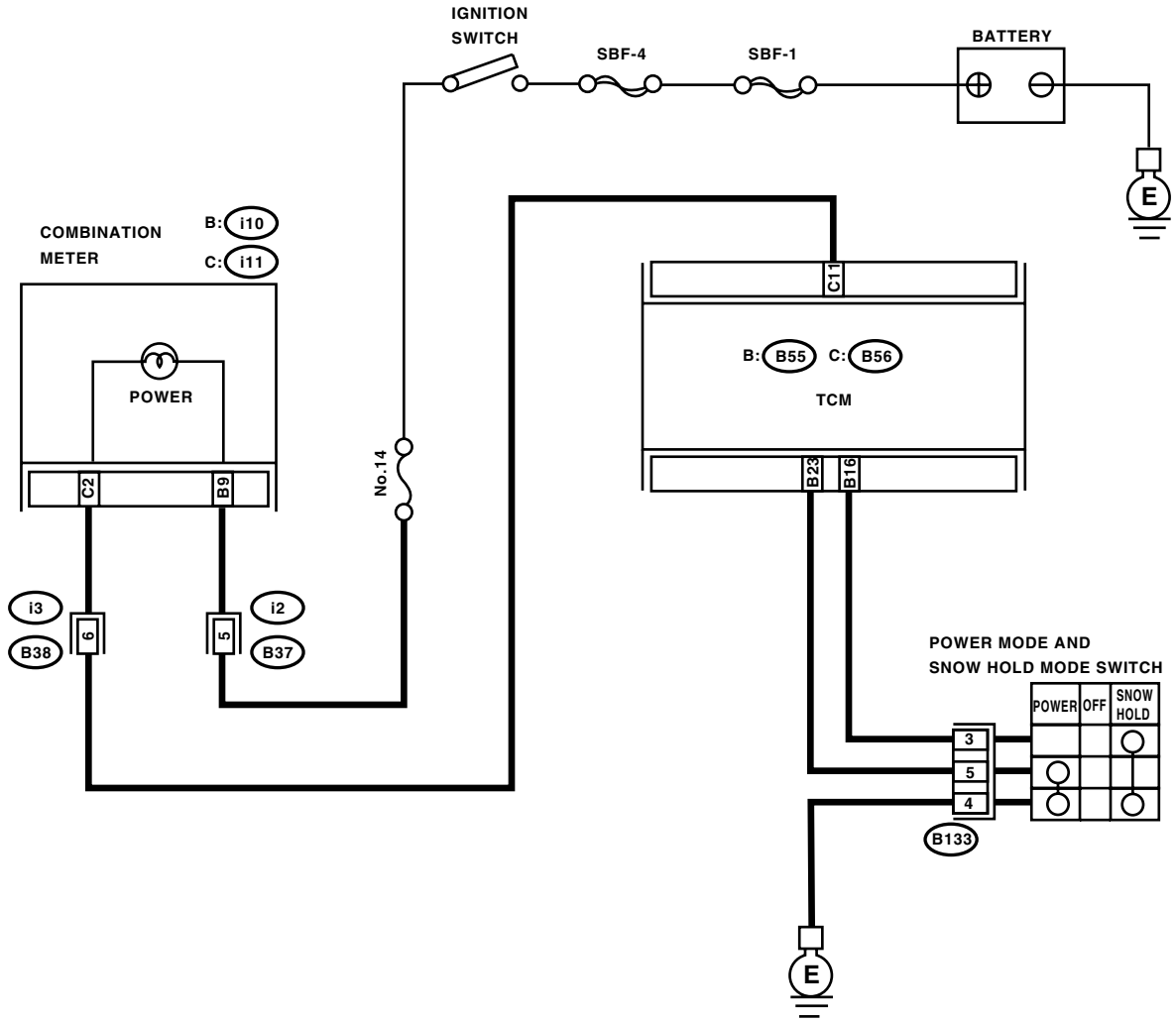
- The LED does not come on when power switch is ON.
- The power switch circuit is open or shorted.

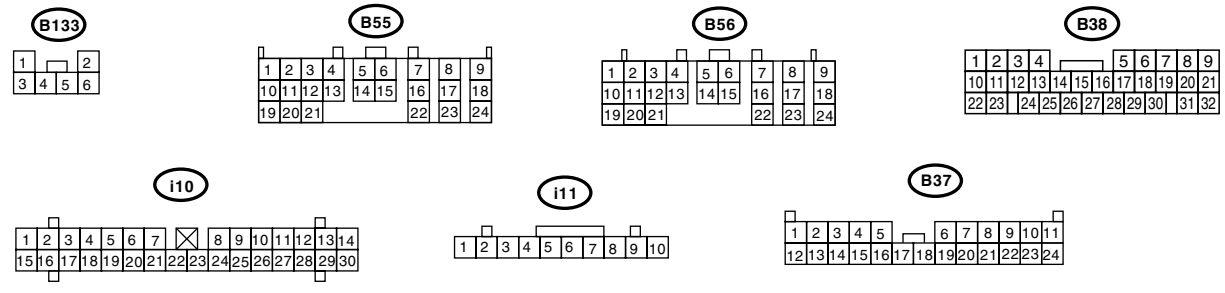
TROUBLE SYMPTOM:

No power mode occurs.

WIRING DIAGRAM:

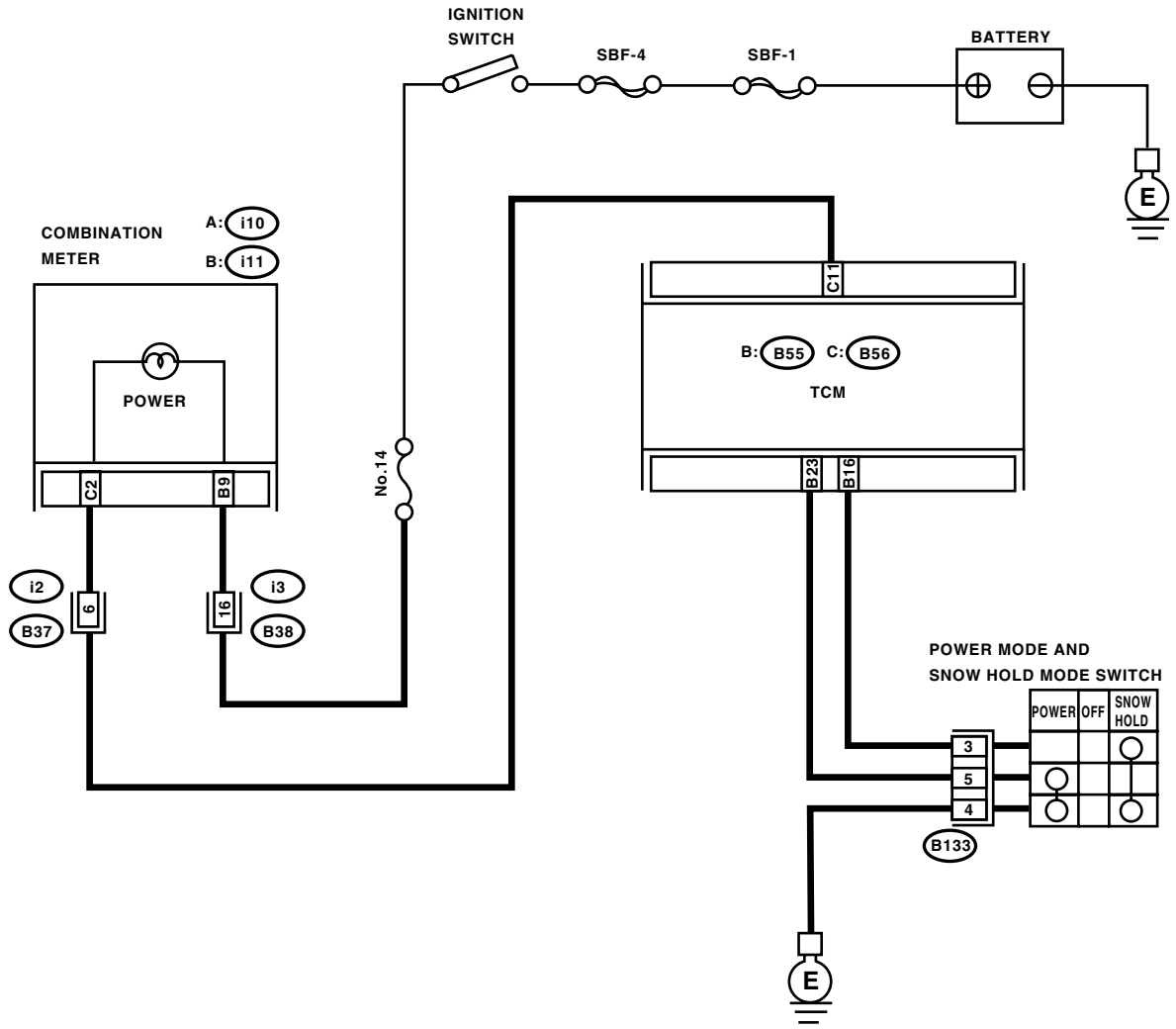
LHD MODEL

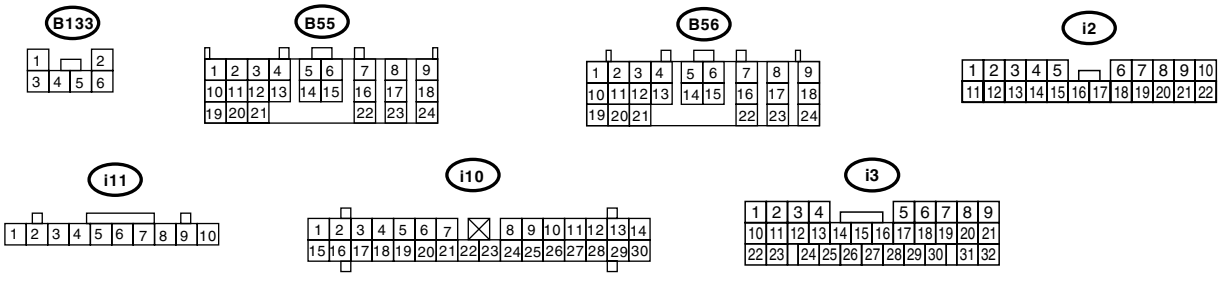




AT-00595

RHD MODEL





AT-00596

	Step	Check	Yes	No
1	**CHECK POWER SWITCH OPERATION.** When the power switch is turned to OFF, does LED light up?	LED lights up.	Go to step **5.**	Go to step **2.**
2	**CHECK POWER SWITCH OPERATION.** When the power switch is turned to ON, does LED light up?	LED lights up.	Go to step CHECK INHIBITOR SWITCH. <Ref. to AT-114, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK POWER INDICATOR LIGHT.** 1)Turn the ignition switch to OFF. 2)Remove the combination meter. 3)Remove the POWER indicator light bulb from combination meter. Is the POWER indicator light bulb OK?	POWER indicator light bulb is OK.	Go to step **4.**	Replace the POWER indicator light bulb. <Ref. to IDI-12, Combination Meter Assembly.>
4	**CHECK POWER SWITCH GROUND LINE.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from power switch. 3)Measure the resistance of harness connector between power switch and chassis ground. ***Connector & terminal*** ***(B133) No. 4 — Chassis ground:*** Is the measured value less than specified value?	1 Ω	Go to step **5.**	Repair the open circuit in harness between power switch and chassis ground.
5	**CHECK POWER SWITCH.** 1)Turn the power switch to ON. 2)Measure the resistance between terminals of power switch. ***Terminals*** ***No. 5 — No. 4:*** Is the measured value less than specified value?	1 Ω	Go to step **6.**	Repair the power switch.
6	**CHECK POWER SWITCH.** 1)Turn the power switch to OFF. 2)Measure the resistance between terminals of power switch. ***Terminals*** ***No. 5 — No. 4:*** Is the measured value more than specified value?	1 MΩ	Go to step **7.**	Repair the power switch.
7	**CHECK HARNESS CONNECTOR BETWEEN TCM AND POWER SWITCH.** Measure the resistance of harness connector between TCM and power switch. ***Connector & terminal*** ***(B55) No. 23 — (B133) No. 5:*** Is the measured value less than specified value?	1 Ω	Go to step **8.**	Repair the open circuit in harness between TCM and power switch connector.

	Step	Check	Yes	No
8	**CHECK HARNESS CONNECTOR BETWEEN TCM AND POWER SWITCH.** Measure the resistance of harness connector between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 23 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **9.**	Repair the short circuit in harness between TCM and power switch connector.
9	**CHECK INPUT SIGNAL FOR TCM.** 1)Connect the connectors to TCM and power switch. 2)Turn the ignition switch to ON (engine OFF). 3)Measure the signal voltage for TCM while turning power switch to OFF. ***Connector & terminal*** ***(B55) No. 23 — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **10.**	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>
10	**CHECK INPUT SIGNAL FOR TCM.** Measure the signal voltage for TCM while turning power switch to ON. ***Connector & terminal*** ***(B55) No. 23 — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **11.**	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>
11	**CHECK POOR CONTACT.** Is there poor contact?	There is poor contact.	Repair the poor contact.	A temporary poor contact of the connector or harness or connector in power switch circuit.

H: CHECK INHIBITOR SWITCH.

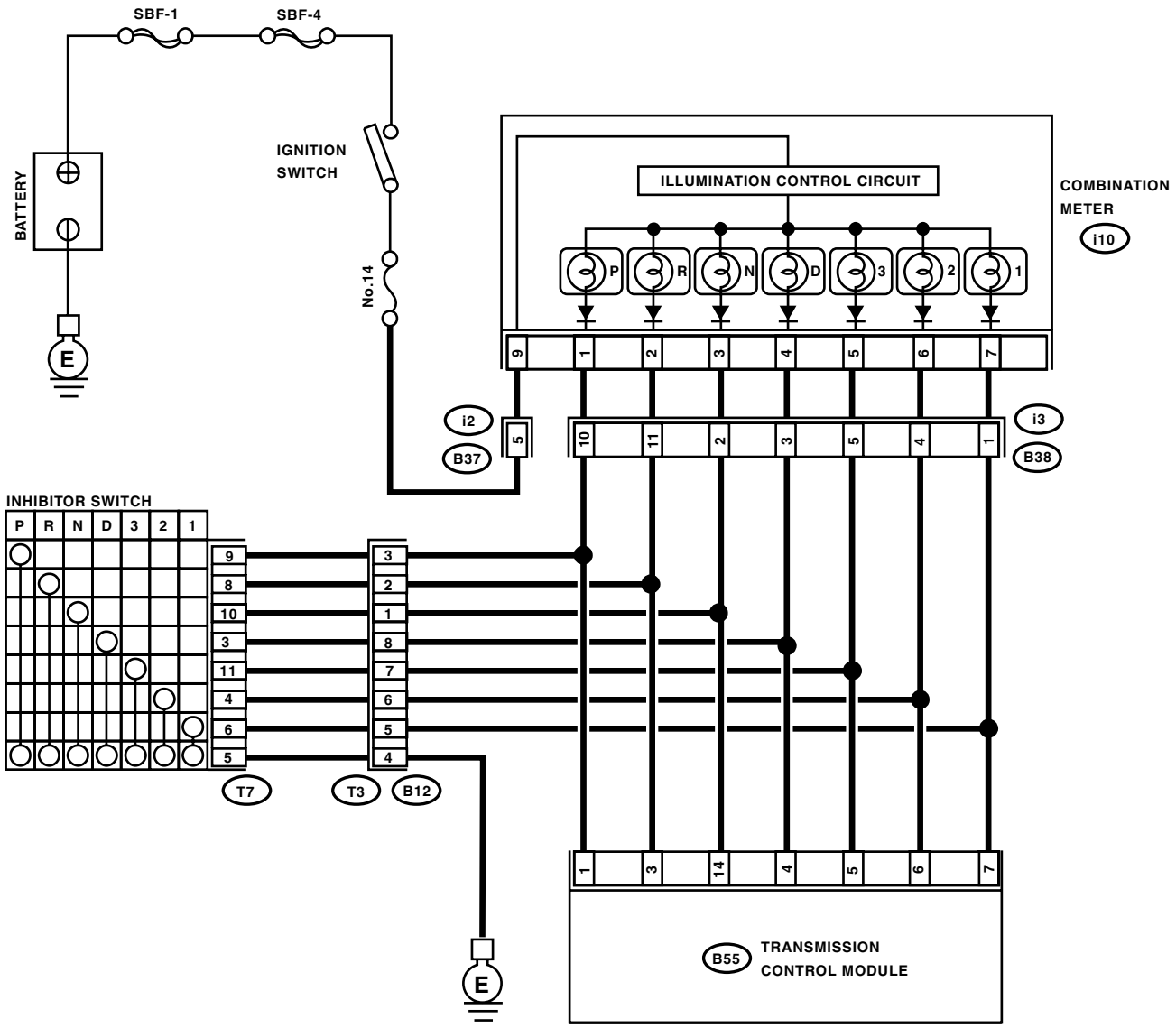
DIAGNOSIS:

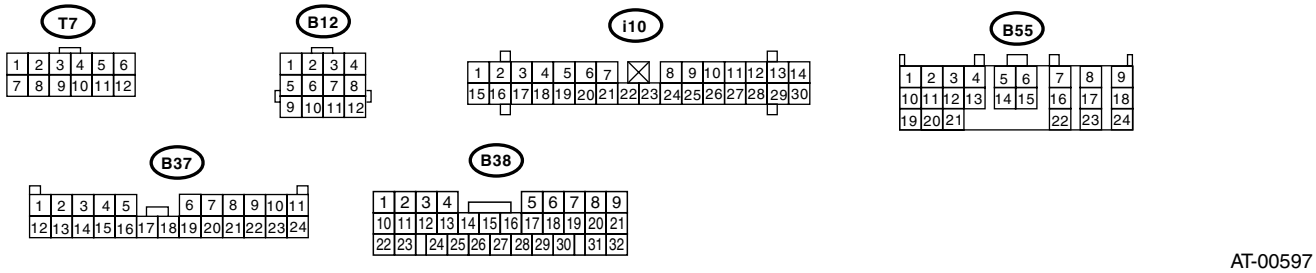
The input signal circuit of inhibitor switch is open or shorted.

TROUBLE SYMPTOM:

- Shift characteristics are erroneous.
- Engine brake is not effected when selector lever is in “3” range.
- Engine brake is not effected when selector lever is in “2” range.
- Engine brake is not effected when selector lever is in “1” range.

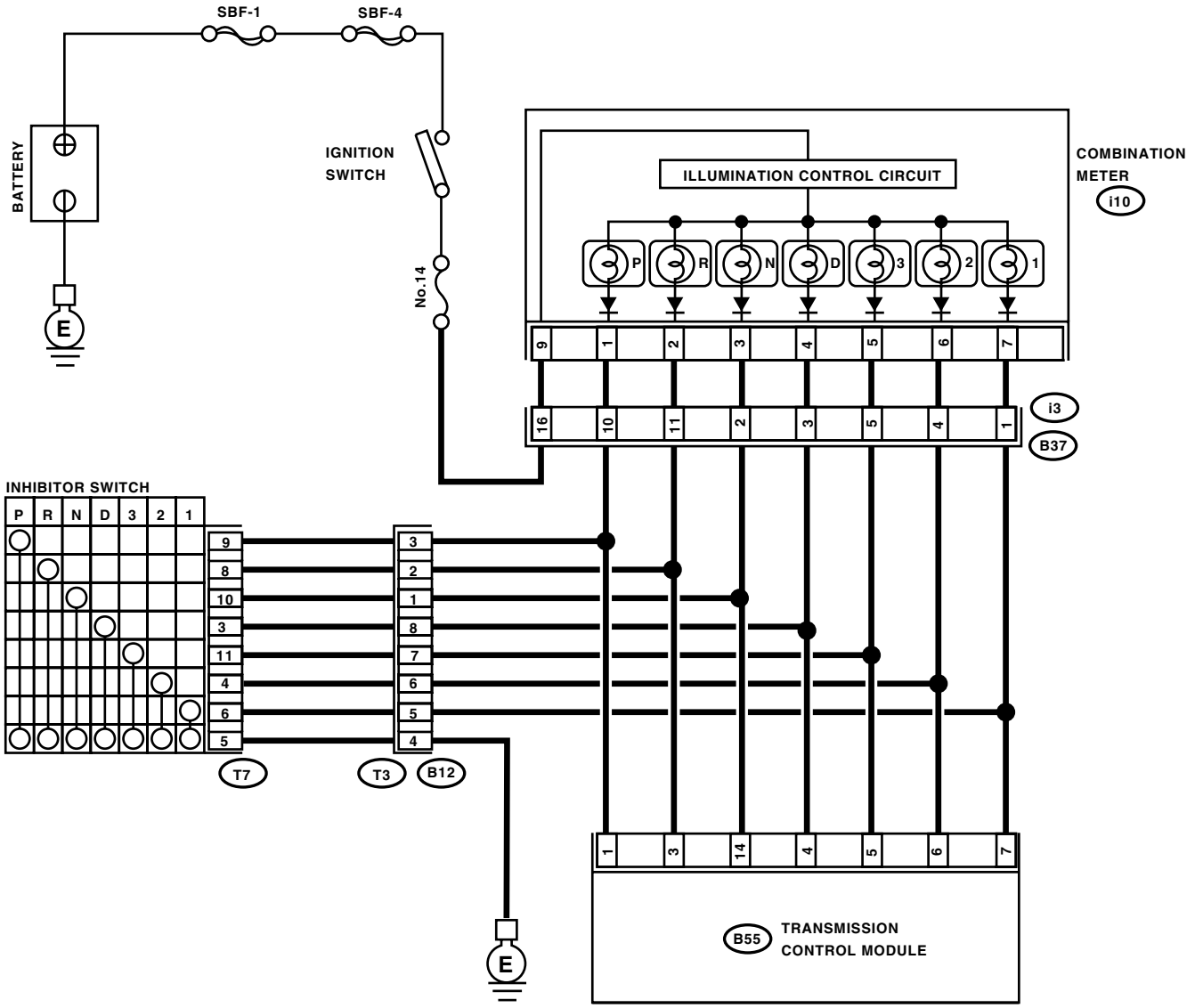
WIRING DIAGRAM:
LHD MODEL

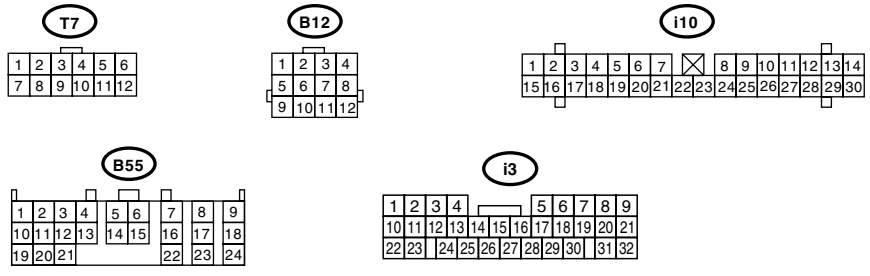




AT-00597

RHD MODEL





AT-00598

Step		Check	Yes	No
1	**CHECK "P" RANGE SWITCH.** When the "P" range is selected, does LED light up?	LED lights up.	Go to step **2.**	Go to step **22.**
2	**CHECK INDICATOR LIGHT.** Does the combination meter "P" range indicator illuminate?	"P" range indicator lights up.	Go to step **3.**	Go to step **26.**
3	**CHECK "P" RANGE SWITCH.** When the "R" range is selected, does "P" range LED light up?	LED lights up.	Go to step **28.**	Go to step **4.**
4	**CHECK "R" RANGE SWITCH.** When the "R" range is selected, does LED light up?	LED lights up.	Go to step **5.**	Go to step **29.**
5	**CHECK INDICATOR LIGHT.** Does the combination meter "R" range indicator illuminate?	"R" range indicator lights up.	Go to step **6.**	Go to step **32.**
6	**CHECK "R" RANGE SWITCH.** When the "N" range is selected, does "R" range LED light up?	LED lights up.	Go to step **34.**	Go to step **7.**
7	**CHECK "N" RANGE SWITCH.** When the "N" range is selected, does LED light up?	LED lights up.	Go to step **8.**	Go to step **35.**
8	**CHECK INDICATOR LIGHT.** Does the combination meter "N" range indicator illuminate?	"N" range indicator lights up.	Go to step **9.**	Go to step **38.**
9	**CHECK "N" RANGE SWITCH.** When the "D" range is selected, does "N" range LED light up?	LED lights up.	Go to step **40.**	Go to step **10.**
10	**CHECK "D" RANGE SWITCH.** When the "D" range is selected, does LED light up?	LED lights up.	Go to step **11.**	Go to step **41.**
11	**CHECK INDICATOR LIGHT.** Does the combination meter "D" range indicator illuminate?	"D" range indicator lights up.	Go to step **12.**	Go to step **44.**
12	**CHECK "D" RANGE SWITCH.** When the "3" range is selected, does "D" range LED light up?	LED lights up.	Go to step **46.**	Go to step **13.**
13	**CHECK "3" RANGE SWITCH.** When the "3" range is selected, does LED light up?	LED lights up.	Go to step **14.**	Go to step **47.**
14	**CHECK INDICATOR LIGHT.** Does the combination meter "3" range indicator illuminate?	"3" range indicator lights up.	Go to step **15.**	Go to step **50.**
15	**CHECK "3" RANGE SWITCH.** When the "2" range is selected, does "3" range LED light up?	LED lights up.	Go to step **52.**	Go to step **16.**
16	**CHECK "2" RANGE SWITCH.** When the "2" range is selected, does LED light up?	LED lights up.	Go to step **17.**	Go to step **53.**
17	**CHECK INDICATOR LIGHT.** Does the combination meter "2" range indicator illuminate?	"2" range indicator lights up.	Go to step **18.**	Go to step **56.**
18	**CHECK "2" RANGE SWITCH.** When the "1" range is selected, does "2" range LED light up?	LED lights up.	Go to step **58.**	Go to step **19.**
19	**CHECK "1" RANGE SWITCH.** When the "1" range is selected, does LED light up?	LED lights up.	Go to step **20.**	Go to step **59.**

	Step	Check	Yes	No
20	**CHECK INDICATOR LIGHT.** Does the combination meter "1" range indicator illuminate?	"1" range indicator lights up.	Go to step **21.**	Go to step **62.**
21	**CHECK "1" RANGE SWITCH.** When the "2" range is selected, does "1" range LED light UP?	LED lights up.	Go to step **64.**	Go to step CHECK HOLD SWITCH. <Ref. to AT-127, CHECK HOLD SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>
22	**CHECK HARNESS CONNECTOR BETWEEN INHIBITOR SWITCH AND CHASSIS GROUND.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from inhibitor switch. 3)Measure the resistance of harness between inhibitor switch and chassis ground. ***Connector & terminal*** ***(T7) No. 5 — Chassis ground:*** Is the measured value less than specified value?	1 Ω	Go to step **23.**	Repair the open circuit in harness between inhibitor switch connector and chassis ground, and poor contact in coupling connector.
23	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from TCM and inhibitor switch. 3)Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B55) No. 1 — (T7) No. 9*** Is the measured value less than specified value?	1 Ω	Go to step **24.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
24	**CHECK INPUT SIGNAL FOR TCM.** 1)Turn the ignition switch to OFF. 2)Connect the connector to TCM and inhibitor switch. 3)Turn the ignition switch to ON. 4)Move the select lever to "P" range. 5)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 1 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **25.**	Go to step **65.**
25	**CHECK INPUT SIGNAL FOR TCM.** 1)Move the select lever to any lenge except "P" range. 2)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 1 (+) — Chassis ground (–):*** Is the measured value more than specified value?	8 V	Go to step **65.**	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

	Step	Check	Yes	No
26	**CHECK "P" RANGE INDICATOR LIGHT BULB.** 1)Turn the ignition switch to OFF. 2)Remove the combination meter. 3)Remove the "P" range indicator light bulb from combination meter. Is the "P" range indicator light bulb OK?	"P" range indicator light bulb is OK.	Go to step **27.**	Replace the "P" range indicator light bulb. <Ref. to IDI-12, Combination Meter Assembly.>
27	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1)Disconnect the connectors from TCM and combination meter. 2)Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B55) No. 1 — (i10) No. 1:*** Is the measured value more than specified value?	1 Ω	Go to step **65.**	Repair the open circuit in harness between TCM connector and combination meter, and poor contact in coupling connector.
28	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from TCM, inhibitor switch and combination meter. 3)Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 1 — Chassis ground:*** Is the measured value less than specified value?	1 MΩ	Go to step **29.**	Repair the ground short circuit in "P" range circuit.
29	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from TCM and inhibitor switch. 3)Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B55) No. 3 — (T7) No. 8:*** Is the measured value less than specified value?	1 Ω	Go to step **30.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
30	**CHECK INPUT SIGNAL FOR TCM.** 1)Turn the ignition switch to OFF. 2)Connect the connector to TCM and inhibitor switch. 3)Turn the ignition switch to ON. 4)Move the select lever to "R" range. 5)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 3 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **31.**	Go to step **65.**

	Step	Check	Yes	No
31	**CHECK INPUT SIGNAL FOR TCM.** 1)Move the select lever to any lenge except “R” range. 2)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 3 (+) — Chassis ground (–):*** Is the measured value more than specified value?	8 V	Go to step **65.**	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>
32	**CHECK “R” RANGE INDICATOR LIGHT BULB.** 1)Turn the ignition switch to OFF. 2)Remove the combination meter. 3)Remove the “R” range indicator light bulb from combination meter. Is “R” range indicator light bulb OK?	“R” range indicator light bulb is OK.	Go to step **33.**	Replace the “R” range indicator light bulb. <Ref. to IDI-12, Combination Meter Assembly.>
33	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1)Disconnect the connectors from TCM and combination meter. 2)Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B55) No. 3 — (i10) No. 2:*** Is the measured value less than specified value?	1 Ω	Go to step **65.**	Repair the open circuit in harness between TCM connector and combination meter, and poor contact in TCM connector.
34	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from TCM, inhibitor switch and combination meter. 3)Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 3 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **35.**	Repair the ground short circuit in “R” range circuit.
35	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from TCM and inhibitor switch. 3)Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B55) No. 14 — (T7) No. 10:*** Is the measured value less than specified value?	1 Ω	Go to step **36.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.

	Step	Check	Yes	No
36	**CHECK INPUT SIGNAL FOR TCM.** 1)Turn the ignition switch to OFF. 2)Connect the connector to TCM and inhibitor switch. 3)Turn the ignition switch to ON. 4)Move the select lever to “N” range. 5)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 14 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **37.**	Go to step **65.**
37	**CHECK INPUT SIGNAL FOR TCM.** 1)Move the select lever to any lenge except “N” range. 2)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 14 (+) — Chassis ground (–):*** Is the measured value more than specified value?	8 V	Go to step **65.**	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>
38	**CHECK “N” RANGE INDICATOR LIGHT BULB.** 1)Turn the ignition switch to OFF. 2)Remove the combination meter. 3)Remove the “N” range indicator light bulb from combination meter. Is the “N” range indicator light bulb OK?	“N” range indicator light bulb is OK.	Go to step **39.**	Replace the “N” range indicator light bulb. <Ref. to IDI-12, Combination Meter Assembly.>
39	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1)Disconnect the connectors from TCM and combination meter. 2)Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B55) No. 14 — (i10) No. 3:*** Is the measured value less than specified value?	1 Ω	Go to step **65.**	Repair the open circuit in harness between TCM connector and combination meter, and poor contact in TCM connector.
40	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from TCM, inhibitor switch and combination meter. 3)Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 14 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **41.**	Repair the ground short circuit in “N” range circuit.

	Step	Check	Yes	No
41	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from TCM and inhibitor switch. 3)Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B55) No. 4 — (T7) No. 3:*** Is the measured value less than specified value?	1 Ω	Go to step **42.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
42	**CHECK INPUT SIGNAL FOR TCM.** 1)Turn the ignition switch to OFF. 2)Connect the connector to TCM and inhibitor switch. 3)Turn the ignition switch to ON. 4)Move the select lever to “D” range. 5)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 4 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **43.**	Go to step **65.**
43	**CHECK INPUT SIGNAL FOR TCM.** 1)Move the select lever to any lenge except “D” range. 2)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 4 (+) — Chassis ground (–):*** Is the measured value more than specified value?	8 V	Go to step **65.**	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>
44	**CHECK “D” RANGE INDICATOR LIGHT BULB.** 1)Turn the ignition switch to OFF. 2)Remove the combination meter. 3)Remove the “D” range indicator light bulb from combination meter. Is the “D” range indicator light bulb OK?	“D” range indicator light bulb is OK.	Go to step **45.**	Replace the “D” range indicator light bulb. <Ref. to IDI-12, Combination Meter Assembly.>
45	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1)Disconnect the connectors from TCM and combination meter. 2)Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B55) No. 4 — (i10) No. 11:*** Is the measured value less than specified value?	1 Ω	Go to step **65.**	Repair the open circuit in harness between TCM connector and combination meter, and TCM connector.

	Step	Check	Yes	No
46	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from TCM, inhibitor switch and combination meter. 3)Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 4 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **47.**	Repair the ground short circuit in "D" range circuit.
47	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from TCM and inhibitor switch. 3)Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B55) No. 5 — (T7) No. 11:*** Is the measured value less than specified value?	1 Ω	Go to step **48.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
48	**CHECK INPUT SIGNAL FOR TCM.** 1)Turn the ignition switch to OFF. 2)Connect the connector to TCM and inhibitor switch. 3)Turn the ignition switch to ON. 4)Move the select lever to "3" range. 5)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 5 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **49.**	Go to step **65.**
49	**CHECK INPUT SIGNAL FOR TCM.** 1)Move the select lever to any lenge except "3" range. 2)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 5 (+) — Chassis ground (–):*** Is the measured value more than specified value?	8 V	Go to step **65.**	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>
50	**CHECK "3" RANGE INDICATOR LIGHT BULB.** 1)Turn the ignition switch to OFF. 2)Remove the combination meter. 3)Remove the "3" range indicator light bulb from combination meter. Is the "3" range indicator light bulb OK?	"3" range indicator light bulb is OK.	Go to step **51.**	Replace the "3" range indicator light bulb. <Ref. to IDI-12, Combination Meter Assembly.>

	Step	Check	Yes	No
51	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1)Disconnect the connectors from TCM and combination meter. 2)Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B55) No. 5 — (i10) No. 5:*** Is the measured value more than specified value?	1 Ω	Go to step **65.**	Repair the open circuit in harness between TCM connector and combination meter, and poor contact in TCM connector.
52	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from TCM, inhibitor switch and combination meter. 3)Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 5 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **53.**	Repair the ground short circuit in "3" range circuit.
53	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from TCM and inhibitor switch. 3)Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B55) No. 6 — (T7) No. 4:*** Is the measured value less than specified value?	1 Ω	Go to step **54.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
54	**CHECK INPUT SIGNAL FOR TCM.** 1)Turn the ignition switch to OFF. 2)Connect the connector to TCM and inhibitor switch. 3)Turn the ignition switch to ON. 4)Move the select lever to "2" range. 5)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 6 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **55.**	Go to step **65.**
55	**CHECK INPUT SIGNAL FOR TCM.** 1)Move the select lever to any lenge except "2" range. 2)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 6 (+) — Chassis ground (–):*** Is the measured value more than specified value?	8 V	Go to step **65.**	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>

Step		Check	Yes	No
56	**CHECK "2" RANGE INDICATOR LIGHT BULB.** 1)Turn the ignition switch to OFF. 2)Remove the combination meter. 3)Remove the "2" range indicator light bulb from combination meter. Is the "2" range indicator light bulb OK?	"2" range indicator light bulb is OK.	Go to step **57.**	Replace the "2" range indicator light bulb. <Ref. to IDI-12, Combination Meter Assembly.>
57	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1)Disconnect the connectors from TCM and combination meter. 2)Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B55) No. 6 — (i10) No. 6:*** Is the measured value less than specified value?	1 Ω	Go to step **65.**	Repair the open circuit in harness between TCM and combination meter, and poor contact in TCM connector.
58	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from TCM, inhibitor switch and combination meter. 3)Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 6 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **59.**	Repair the ground short circuit in "2" range circuit.
59	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from TCM and inhibitor switch. 3)Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B55) No. 7 — (T7) No. 6:*** Is the measured value less than specified value?	1 Ω	Go to step **60.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
60	**CHECK INPUT SIGNAL FOR TCM.** 1)Turn the ignition switch to OFF. 2)Connect the connector to TCM and inhibitor switch. 3)Turn the ignition switch to ON. 4)Move the select lever to "1" range. 5)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 7 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **61.**	Go to step **65.**

	Step	Check	Yes	No
61	**CHECK INPUT SIGNAL FOR TCM.** 1)Move the select lever to any lenge except "1" range. 2)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 7 (+) — Chassis ground (–):*** Is the measured value more than specified value?	8 V	Go to step **65.**	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>
62	**CHECK "1" RANGE INDICATOR LIGHT BULB.** 1)Turn the ignition switch to OFF. 2)Remove the combination meter. 3)Remove the "1" range indicator light bulb from combination meter. Is the "1" range indicator light bulb OK?	"1" range indicator light bulb is OK.	Go to step **63.**	Replace the "1" range indicator light bulb. <Ref. to IDI-12, Combination Meter Assembly.>
63	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1)Disconnect the connectors from TCM and combination meter. 2)Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B55) No. 7 — (i10) No. 7:*** Is the measured value less than specified value?	1Ω	Go to step **65.**	Repair the open circuit in harness between TCM and combination meter, poor contact in TCM connector.
64	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from TCM, inhibitor switch and combination meter. 3)Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 7 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **65.**	Repair the ground short circuit in "1" range circuit.
65	**CHECK POOR CONTACT.** Is there poor contact in inhibitor switch circuit?	There is poor contact.	Repair the poor contact.	Adjust the inhibitor switch and select cable. <Ref. to AT-48, ADJUSTMENT, Inhibitor Switch.> and <Ref. to CS-9, Select Cable.>

I: CHECK HOLD SWITCH.

DIAGNOSIS:

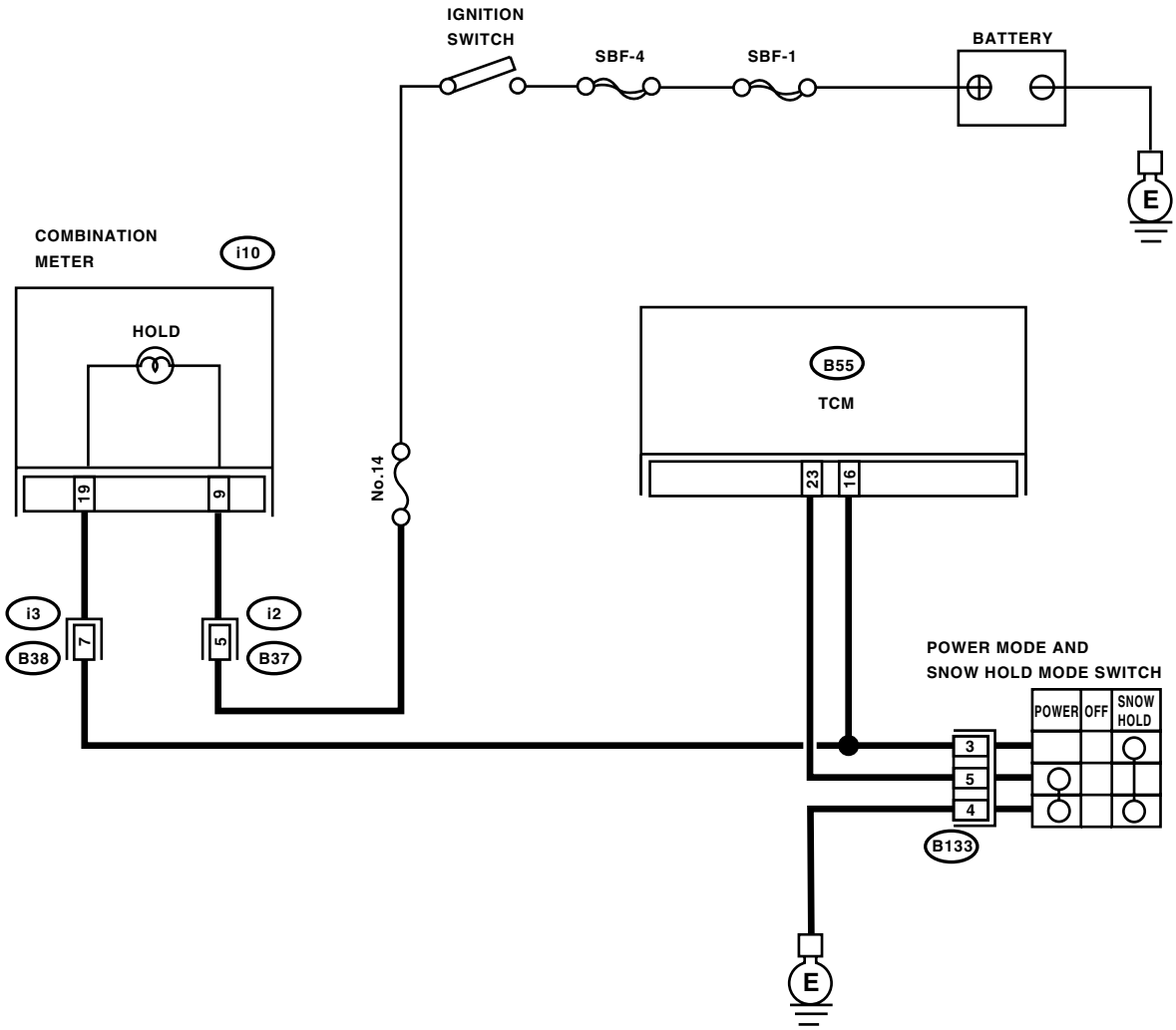
- The LED does not come on when hold switch is ON.
- The hold switch circuit is open or shorted.

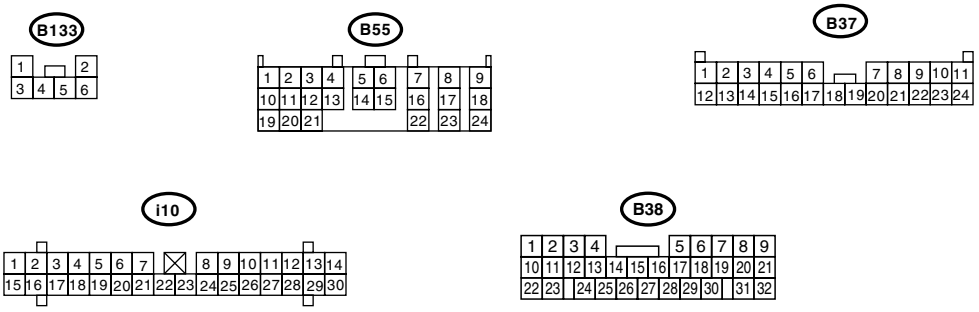
TROUBLE SYMPTOM:

- The 2nd gear is not held.
- Failure of vehicle to start in 2nd gear except 1st range.

WIRING DIAGRAM:

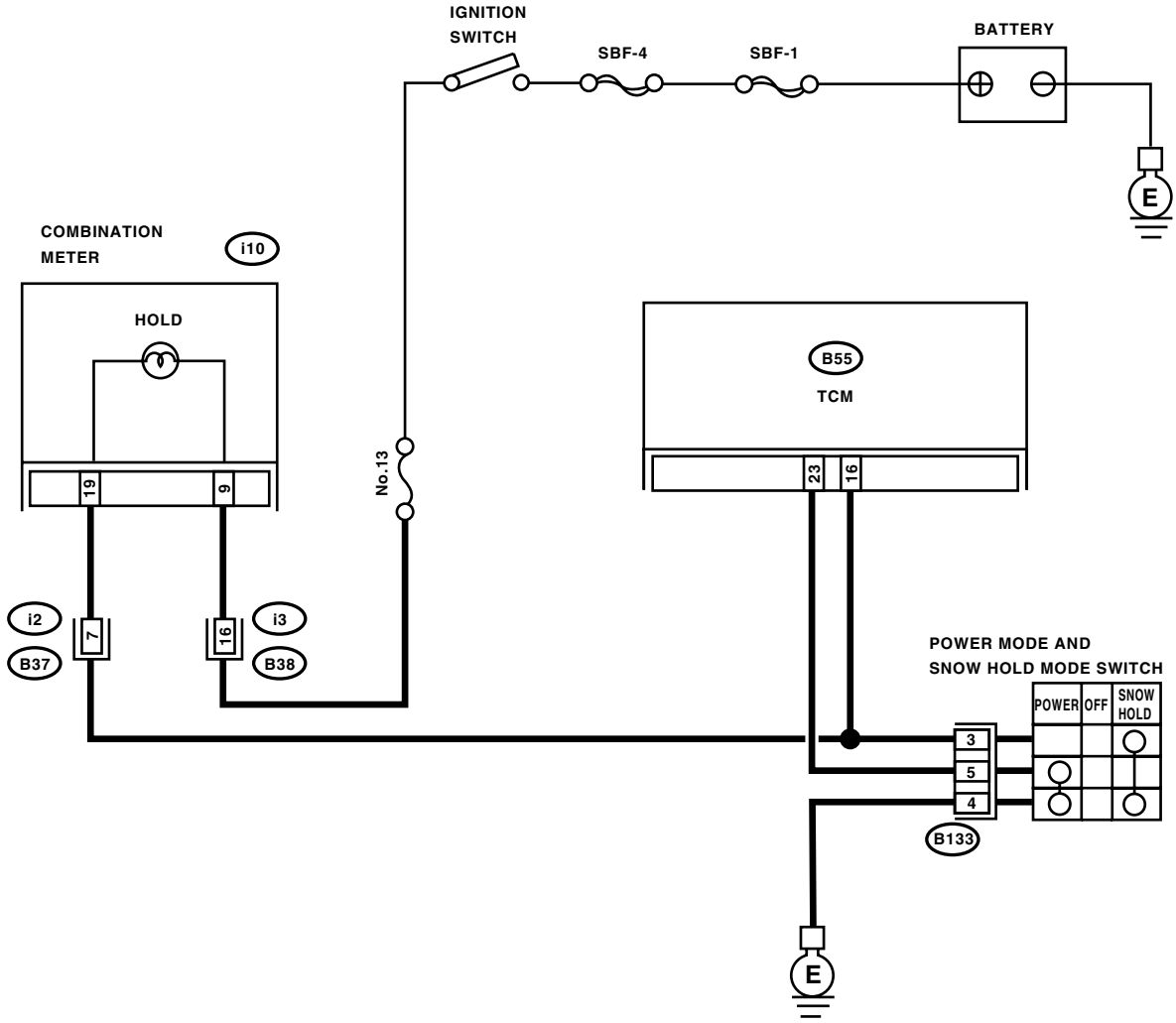
LHD MODEL

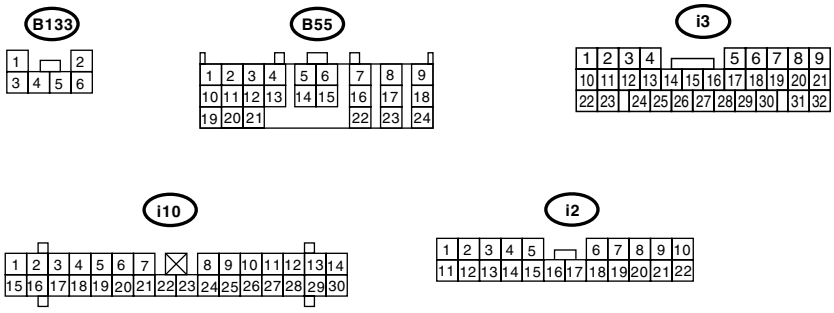




AT-00599

RHD MODEL





AT-00600

Step		Check	Yes	No
1	**CHECK HOLD SWITCH OPERATION.** When the hold switch is turned to OFF, does LED light up?	LED lights up.	Go to step **5.**	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK HOLD SWITCH OPERATION.** When the hold switch is turned to ON, does LED light up?	LED lights up.	Go to step Symptom Related Diagnostic. <Ref. to AT-131, Symptom Related Diagnostic.>	Go to step **3.**
3	**CHECK HOLD INDICATOR LIGHT.** 1)Turn the ignition switch to OFF. 2)Remove the combination meter. 3)Remove the HOLD indicator light bulb from combination meter. Is the HOLD indicator light bulb OK?	HOLD indicator light bulb is OK.	Go to step **4.**	Replace the HOLD indicator light bulb. <Ref. to IDI-12, Combination Meter Assembly.>
4	**CHECK HOLD SWITCH GROUND LINE.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from hold switch. 3)Measure the resistance of harness connector between hold switch and chassis ground. ***Connector & terminal*** ***(B133) No. 4 — Chassis ground:*** Is the measured value less than specified value?	1 Ω	Go to step **5.**	Repair the open circuit in harness between hold switch and chassis ground.
5	**CHECK HOLD SWITCH.** 1)Turn the hold switch to ON. 2)Measure the resistance between terminals of hold switch. ***Terminals*** ***No. 4 — No. 3:*** Is the measured value less than specified value?	1 Ω	Go to step **6.**	Repair the hold switch.
6	**CHECK HOLD SWITCH.** 1)Turn the hold switch to OFF. 2)Measure the resistance between terminals of hold switch. ***Terminals*** ***No. 4 — No. 3:*** Is the measured value more than specified value?	1 MΩ	Go to step **7.**	Repair the hold switch.
7	**CHECK HARNESS CONNECTOR BETWEEN TCM AND HOLD SWITCH.** 1)Disconnect the connector TCM and combination meter. 2)Measure the resistance of harness connector between TCM and hold switch. ***Connector & terminal*** ***(B55) No. 16 — (B133) No. 3:*** Is the measured value less than specified value?	1 Ω	Go to step **8.**	Repair the open circuit in harness between TCM and hold switch connector and poor contact in coupling connector.
8	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** Measure the resistance of harness connector TCM and combination meter. ***Connector & terminal*** ***(B55) No. 16 — (i10) No. 19:*** Is the measured value less than specified value?	1 Ω	Go to step **9.**	Repair the open circuit in harness between TCM and combination meter, and poor contact in coupling connector.

	Step	Check	Yes	No
9	**CHECK HARNESS CONNECTOR BETWEEN TCM AND HOLD SWITCH.** Measure the resistance of harness connector between TCM and chassis ground to make sure that circuit does not short. ***Connector & terminal*** ***(B55) No. 16 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **10.**	Repair the short circuit in harness between TCM and hold switch connector.
10	**CHECK INPUT SIGNAL FOR TCM.** 1)Connect the connectors to TCM and hold switch. 2)Turn the ignition switch to ON (engine OFF). 3)Measure the signal voltage for TCM while turning hold switch to OFF. ***Connector & terminal*** ***(B55) No. 16 (+) — Chassis ground (–):*** Is the measured value more than specified value?	8 V	Go to step **11.**	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>
11	**CHECK INPUT SIGNAL FOR TCM.** Measure the signal voltage for TCM while turning hold switch to ON. ***Connector & terminal*** ***(B55) No. 16 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **12.**	Replace the TCM. <Ref. to AT-70, Transmission Control Module (TCM).>
12	**CHECK POOR CONTACT.** Is there poor contact in hold switch circuit?	There is poor contact.	Repair the poor contact.	A temporary poor contact of the connector or harness or connector in hold switch circuit.

16.Symptom Related Diagnostic

A: INSPECTION

Symptom	Problem parts
Starter does not rotate when select lever is in “P” or “N” range; starter rotates when select lever is in “R”, “D”, “3” or “2” range.	• Inhibitor switch • Select cable • Select lever • Starter motor and harness
Abnormal noise when select lever is in “P” or “N” range.	• Strainer • Transfer duty solenoid • Oil pump • Drive plate • ATF level too high or too low
Hissing noise occurs during standing start.	• Strainer • ATF level too high or too low
Noise occurs while driving in “D1”.	• Final gear • Planetary gear • Reduction gear • Differential gear oil level too high or too low
Noise occurs while driving in “D2”.	
Noise occurs while driving in “D3”.	• Final gear • Low & reverse brake • Reduction gear • Differential gear oil level too high or too low
Noise occurs while driving in “D4”.	• Final gear • Low & reverse brake • Planetary gear • Reduction gear • Differential gear oil level too high or too low
Engine stalls while shifting from one range to another.	• Control valve • Lock-up damper • Engine performance • Input shaft
Vehicle moves when select lever is in “N” range.	• TCM • Low clutch
Shock occurs when select lever is moved from “N” to “D” range.	• TCM • Harness • Control valve • ATF deterioration
Excessive time lag occurs when select lever is moved from “N” to “D” range.	• Control valve • Low clutch • Line pressure duty solenoid • Seal ring • Front gasket transmission case
Shock occurs when select lever is moved from “N” to “R” range.	• TCM • Harness • Control valve • ATF deterioration
Excessive time lag occurs when select lever is moved from “N” to “R” range.	• Control valve • Low & reverse clutch • Reverse clutch • Line pressure duty solenoid • Seal ring • Front gasket transmission case
Vehicle does not start in any shift range (engine stalls).	• Parking brake mechanism • Planetary gear

Symptom	Problem parts
Vehicle does not start in any shift range (engine revving up).	• Strainer • Line pressure duty solenoid • Control valve • Drive pinion • Hypoid gear • Axle shaft • Differential gear • Oil pump • Input shaft • Output shaft • Planetary gear • Drive plate • ATF level too low • Front gasket transmission case
Vehicle does not start in “R” range only (engine revving up).	• Select cable • Select lever • Control valve • Low & reverse clutch • Reverse clutch
Vehicle does not start in “R” range only (engine stalls).	• Low clutch • 2-4 brake • Planetary gear • Parking brake mechanism
Vehicle does not start in “D”, “3” range only (engine revving up).	• Low clutch • One-way clutch
Vehicle does not start in “D”, “3” or “2” range only (engine revving up).	• Low clutch
Vehicle does not start in “D”, “3” or “2” range only (engine stalls).	• Reverse clutch
Vehicle starts in “R” range only (engine revving up).	• Control valve
Acceleration during standing starts is poor (high stall rpm).	• Control valve • Low clutch • Reverse clutch • ATF level too low • Front gasket transmission case • Differential gear oil level too high or too low
Acceleration during standing starts is poor (low stall rpm).	• Oil pump • Torque converter one-way clutch • Engine performance
Acceleration is poor when select lever is in “D”, “3” or “2” range (normal stall rpm).	• TCM • Control valve • High clutch • 2-4 brake • Planetary gear
Acceleration is poor when select lever is in “R” (normal stall rpm).	• Control valve • High clutch • 2-4 brake • Planetary gear
No shift occurs from 1st to 2nd gear.	• TCM • Rear vehicle speed sensor • Front vehicle speed sensor • Throttle position sensor • Shift solenoid 1 • Control valve • 2-4 brake
No shift occurs from 2nd to 3rd gear.	• TCM • Control valve • High clutch • Shift solenoid 2

Symptom	Problem parts
No shift occurs from 3rd to 4th gear.	• TCM • Shift solenoid 1 • ATF temperature sensor • Control valve • 2-4 brake
Engine brake is not effected when select lever is in “3” range.	• Inhibitor switch • TCM • Throttle position sensor • Control valve
Engine brake is not effected when select lever is in “3” or “2” range.	• Control valve
Engine brake is not effected when select lever is in “1” range.	• Control valve • Low & reverse brake
Shift characteristics are erroneous.	• Inhibitor switch • TCM • Front vehicle speed sensor • Rear vehicle speed sensor • Throttle position sensor • Control valve • Ground earth
No lock-up occurs.	• TCM • Throttle position sensor • ATF temperature sensor • Control valve • Lock-up facing • Engine speed signal
Parking brake is not effected.	• Select cable • Select lever • Parking mechanism
Shift lever cannot be moved or is hard to move from “P” range.	
ATF spurts out.	• ATF level too high
Differential oil spurts out.	• Differential gear oil too high
Differential oil level changes excessively.	• Seal pipe • Double oil seal
Odor is produced from ATF supply pipe.	• High clutch • 2-4 brake • Low & reverse clutch • Reverse clutch • Lock-up facing • ATF deterioration
Shock occurs from 1st to 2nd gear.	• TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake • ATF deterioration • Engine performance • 2-4 brake timing solenoid
Slippage occurs from 1st to 2nd gear.	• TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake • 2-4 brake timing solenoid • High clutch

Symptom	Problem parts
Shock occurs from 2nd to 3rd gear.	• TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • High clutch • 2-4 brake • ATF deterioration • Engine performance • 2-4 brake timing solenoid
Slippage occurs from 2nd to 3rd gear.	• TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • High clutch • 2-4 brake • 2-4 brake timing solenoid
Shock occurs from 3rd to 4th gear.	• TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake timing solenoid • 2-4 brake • ATF deterioration • Engine performance • Low clutch timing solenoid • Low clutch
Slippage occurs from 3rd to 4th gear.	• TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake • 2-4 brake timing solenoid
Shock occurs when select lever is moved from “3” to “2” range.	• TCM • Throttle position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake duty solenoid • 2-4 brake • ATF deterioration • 2-4 brake timing solenoid
Shock occurs when select lever is moved from “D” to “1” range.	• TCM • Throttle position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • ATF deterioration • 2-4 brake duty solenoid • 2-4 brake timing solenoid • Low clutch timing solenoid

Symptom	Problem parts
Shock occurs when select lever is moved from “2” to “1” range.	• TCM • Throttle position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • Low & reverse clutch • ATF deterioration • 2-4 brake duty solenoid • 2-4 brake timing solenoid • Low clutch timing solenoid
Shock occurs when accelerator pedal is released at medium speeds.	• TCM • Throttle position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • Lock-up damper • Engine performance • 2-4 brake duty solenoid • 2-4 brake timing solenoid • Low clutch timing solenoid
Vibration occurs during straight-forward operation.	• TCM • Lock-up duty solenoid • Lock-up facing • Lock-up damper • Hold switch
Vibration occurs during turns (tight corner “braking” phenomenon).	• TCM • Front vehicle speed sensor • Rear vehicle speed sensor • Throttle position sensor • ATF temperature sensor • Transfer clutch • Transfer valve • Transfer duty solenoid • ATF deterioration • Harness • Hold switch
Front wheel slippage occurs during standing starts.	• TCM • Front vehicle speed sensor • FWD switch • Throttle position sensor • ATF temperature sensor • Control valve • Transfer clutch • Transfer valve • Transfer pipe • Transfer duty solenoid
Vehicle is not set in FWD mode.	• TCM • FWD switch • Transfer clutch • Transfer valve • Transfer duty solenoid
Select lever is hard to move.	• Select cable • Select lever • Detente spring • Manual plate

Symptom	Problem parts
Select lever is too high to move (unreasonable resistance).	• Detente spring • Manual plate
Select lever slips out of operation during acceleration or while driving on rough terrain.	• Select cable • Select lever • Detente spring • Manual plate

MANUAL TRANSMISSION AND DIFFERENTIAL

MT

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1. General Description

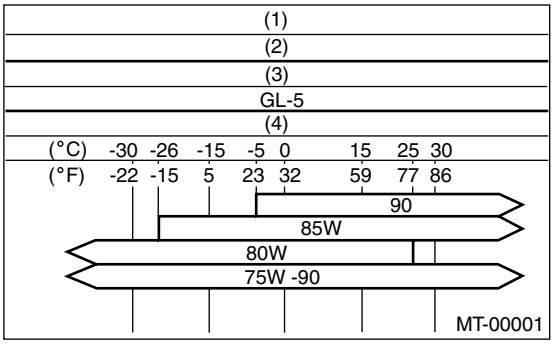
A: SPECIFICATIONS

1. MANUAL TRANSMISSION AND DIFFERENTIAL

Model			2.0L Non-turbo	2.5L	2.0L Turbo	
					Except Europe	Europe
Type			5×2-forward speeds with synchro-mesh and 2-reverse		5-forward speeds with synchromesh and 1-reverse	
Transmission gear ratio		1st	3.454		3.454	
		2nd	2.062		1.947	
		3rd	1.448		1.366	
		4th	1.088		0.972	
		5th	0.825	0.780	0.738	
		Reverse	3.333			
Auxiliary transmission gear ratio		High	1.000		—	
		Low	1.447	1.196	—	
Front reduction gear	Final	Type of gear	Hypoid			
		Gear ratio	4.111		4.444	
Rear reduction gear	Transfer	Type of gear	Helical			
		Gear ratio	1.000		1.000	1.081
	Final	Type of gear	Hypoid			
		Gear ratio	4.111		4.444	4.111
Front differential	Type and number of gear		Straight bevel gear (Bevel pinion: 2, Bevel gear: 2)			
Center differential	Type and number of gear		Straight bevel gear (Bevel pinion: 2, Bevel gear: 2 and viscous coupling)			
Transmission gear oil			GL-5			
Transmission oil capacity			4.0 ℓ (4.2 US qt, 3.5 Imp qt)		3.5 ℓ (3.7 US qt, 3.1 Imp qt)	3.9 ℓ (4.1 US qt, 3.4 Imp qt)

2. TRANSMISSION GEAR OIL

Recommended oil



(1) Item
(2) Transmission gear oil
(3) API classification
(4) SAE viscosity No. and applicable temperature

3. TRANSMISSION CASE ASSEMBLY

Drive pinion shim adjustment
Hypoid gear backlash
0.13 — 0.18 mm (0.0051 — 0.0071 in)

Drive pinion shim			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
32295AA031	0.150 (0.0059)	32295AA071	0.250 (0.0098)
32295AA041	0.175 (0.0069)	32295AA081	0.275 (0.0108)
32295AA051	0.200 (0.0079)	32295AA091	0.300 (0.0118)
32295AA061	0.225 (0.0089)	32295AA101	0.500 (0.0197)

Selection of main shaft rear plate

Main shaft rear plate		
Dimension “A” mm (in)	Part No.	Mark
4.00 — 4.13 (0.1575 — 0.1626)	32294AA041	1
3.87 — 3.99 (0.1524 — 0.1571)	32294AA051	2

Snap ring to counter washer clearance
0.05 — 0.35 mm (0.0020 — 0.0138 in)

Snap ring (Outer-19)	
Part No.	Thickness mm (in)
031319000	1.50 (0.0591)
805019010	1.72 (0.0677)

Input shaft holder adjustment

Dimension “D” mm (in)	Number of shim
52.50 — 53.11 (2.0669 — 2.0909)	—
52.00 — 52.49 (2.0472 — 2.0665)	1
51.26 — 51.99 (2.0181 — 2.0468)	2

4. DRIVE PINION ASSEMBLY

Preload adjustment of thrust bearing
Starting torque
0.3 — 0.8 N·m (0.03 — 0.08 kgf-m, 0.2 — 0.6 ft-lb)

Adjusting washer No. 1	
Part No.	Thickness mm (in)
803025051	3.925 (0.1545)
803025052	3.950 (0.1555)
803025053	3.975 (0.1565)
803025054	4.000 (0.1575)
803025055	4.025 (0.1585)
803025056	4.050 (0.1594)
803025057	4.075 (0.1604)

Adjusting washer No. 2	
Part No.	Thickness mm (in)
803025059	3.850 (0.1516)
803025054	4.000 (0.1575)
803025058	4.150 (0.1634)

5. INPUT SHAFT ASSEMBLY

Snap ring (Outer-28) to ball bearing clearance
0 — 0.12 mm (0 — 0.0047 in)

Snap ring (Outer-28)	
Part No.	Thickness mm (in)
805028050	2.48 (0.0976)
805028060	2.56 (0.1008)
805028070	2.64 (0.1039)

Snap ring (Inner-68) to bearing clearance
0 — 0.12 mm (0 — 0.0047 in)

Snap ring (Inner-68)	
Part No.	Thickness mm (in)
805168020	1.84 (0.0724)
805168030	1.92 (0.0756)
805168040	2.00 (0.0787)

6. MAIN SHAFT

Snap ring (Outer-25) to synchronizer hub clearance
0.060 — 0.100 mm (0.0024 — 0.0039 in)

Snap ring (Outer-25)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
805025051	2.42 (0.0953)	805025055	2.62 (0.1031)
805025052	2.47 (0.0972)	805025056	2.67 (0.1051)
805025053	2.52 (0.0992)	805025057	2.72 (0.1071)
805025054	2.57 (0.1012)	805025058	2.37 (0.0933)

7. REVERSE IDLER GEAR

Adjustment of reverse idler gear position
Reverse idler gear to transmission case (LH) wall clearance
6.0 — 7.5 mm (0.236 — 0.295 in)

Reverse shifter lever		
Part No.	Mark	Remarks
32820AA070	7	Further from case wall
32820AA080	8	Standard
32820AA090	9	Closer to the case wall

After installing a suitable reverse shifter lever, adjust the reverse idler gear to transmission case wall clearance to within 0 to 0.5 mm (0 to 0.020 in) using washers.

Washer (20.5 × 26 × t)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
803020151	0.4 (0.016)	803020154	1.9 (0.075)
803020152	1.1 (0.043)	803020155	2.3 (0.091)
803020153	1.5 (0.059)	—	—

8. SHIFTER FORK AND ROD

Select the suitable shifter forks so that both coupling sleeve and reverse driven gear are positioned in the center of their synchromesh mechanisms.
Rod end clearance
A: 1st-2nd — 3rd-4th
0.4 — 1.4 mm (0.016 — 0.055 in)
B: 3rd-4th — 5th
0.5 — 1.3 mm (0.020 — 0.051 in)

1st-2nd shifter fork		
Part No.	Mark	Remarks
32804AA060	1	Approach to 1st gear by 0.2 mm (0.008 in)
32804AA070	No mark	Standard
32804AA080	3	Approach to 2nd gear by 0.2 mm (0.008 in)

3rd-4th shifter fork		
Part No.	Mark	Remarks
32810AA061	1	Approach to 4th gear by 0.2 mm (0.008 in)
32810AA071	No mark	Standard
32810AA101	3	Approach to 3rd gear by 0.2 mm (0.008 in)

5th shifter fork (Non-turbo)		
Part No.	Mark	Remarks
32812AA201	7	Approach to 5th gear by 0.2 mm (0.008 in)
32812AA211	No mark	Standard
32812AA221	9	Become distant from 5th gear by 0.2 mm (0.008 in)

5th shifter fork (Turbo)		
Part No.	Mark	Remarks
32812AA231	7	Approach to 5th gear by 0.2 mm (0.008 in)
32812AA241	No mark	Standard
32812AA251	9	Become distant from 5th gear by 0.2 mm (0.008 in)

9. TRANSFER CASE OR REAR CASE

Neutral position adjustment

Adjustment shim	
Part No.	Thickness mm (in)
32190AA000	0.15 (0.0059)
32190AA010	0.30 (0.0118)

Reverse accent shaft		
Part No.	Mark	Remarks
32188AA090	X	Neutral position is closer to 1st.
32188AA100	Y	Standard
32188AA110	Z	Neutral position is closer to reverse gear.

Reverse check plate adjustment

Reverse check plate			
Part No.	Mark	Angle θ	Remarks
32189AA000	0	28°	Arm stops closer to 5th gear.
32189AA010	1	31°	Arm stops closer to 5th gear.
33189AA020	2	34°	Arm stops in the center.
32189AA030	3	37°	Arm stops closer to reverse gear.
32189AA040	4	40°	Arm stops closer to reverse gear.

10.EXTENSION ASSEMBLY

Thrust washer (50 × 61 × t) to taper roller bearing table outer race side clearance
0.2 — 0.3 mm T (0.0008 — 0.012 in T)

NOTE:
Be sure to set within the standard clearance.

Thrust washer (50 × 61 × t)	
Part No.	Thickness mm (in)
803050060	0.50 (0.0197)
803050061	0.55 (0.0217)
803050062	0.60 (0.0236)
803050063	0.65 (0.0256)
803050064	0.70 (0.0276)
803050065	0.75 (0.0295)
803050066	0.80 (0.0315)
803050067	0.85 (0.0335)
803050068	0.90 (0.0354)
803050069	0.95 (0.0374)
803050070	1.00 (0.0394)
803050071	1.05 (0.0413)
803050072	1.10 (0.0433)
803050073	1.15 (0.0453)
803050074	1.20 (0.0472)
803050075	1.25 (0.0492)
803050076	1.30 (0.0512)
803050077	1.35 (0.0531)
803050078	1.40 (0.0551)
803050079	1.45 (0.0571)

Thrust washer to center differential side clearance
0.15 — 0.35 mm (0.0059 — 0.0138 in)

Thrust washer	
Part No.	Thickness mm (in)
803036050	0.9 (0.035)
803036054	1.0 (0.039)
803036051	1.1 (0.043)
803036055	1.2 (0.047)
803036052	1.3 (0.051)
803036056	1.4 (0.055)
803036053	1.5 (0.059)
803036057	1.6 (0.063)
803036058	1.7 (0.067)

11.FRONT DIFFERENTIAL

Bevel gear to pinion backlash
0.13 — 0.18 mm (0.0051 — 0.0071 in)

Washer (38.1 × 50 × t)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
803038021	0.925 — 0.950 (0.0364 — 0.0374)	803038023	1.025 — 1.050 (0.0404 — 0.0413)
803038022	0.975 — 1.000 (0.0384 — 0.0394)	—	—

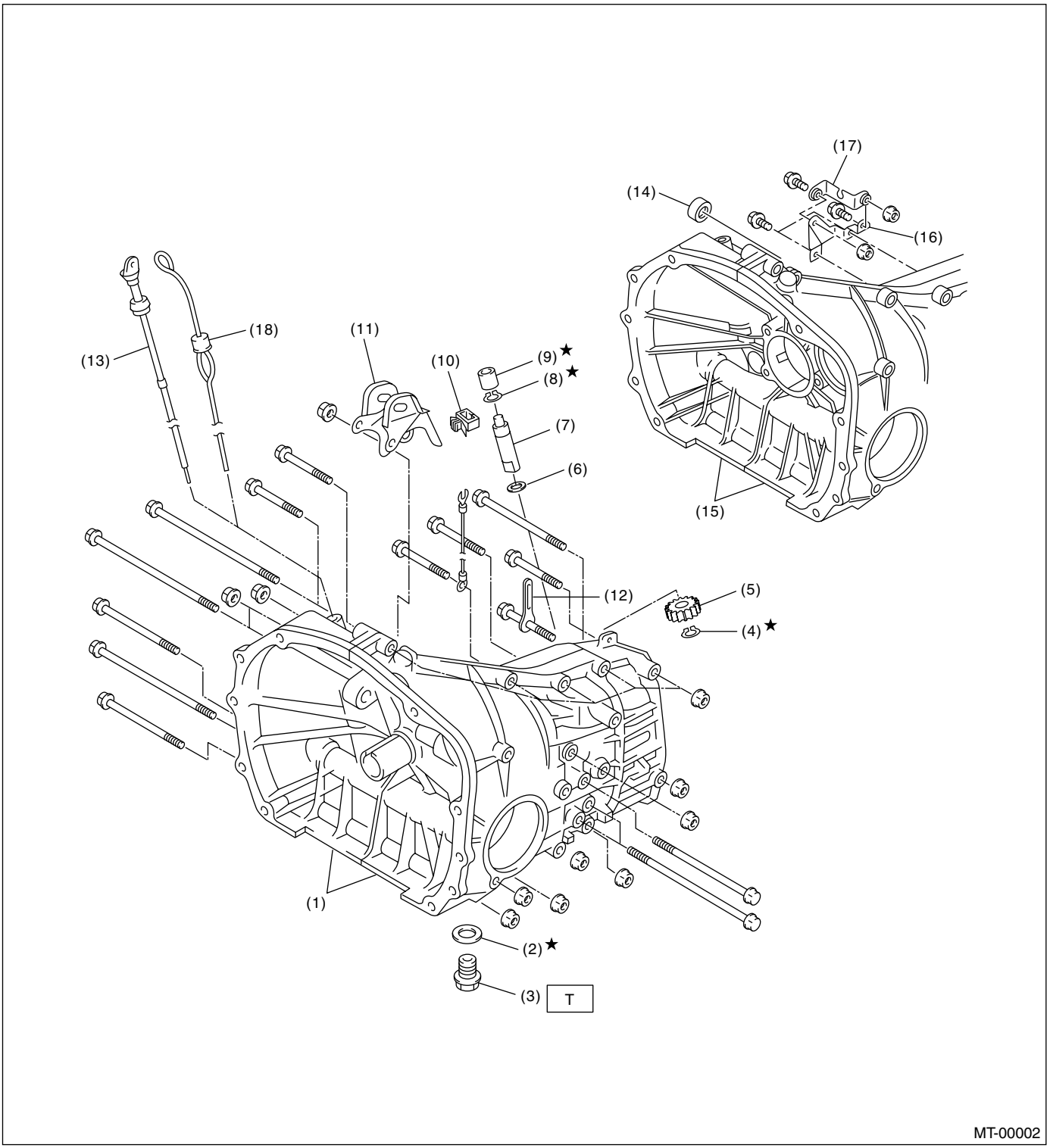
12.TRANSFER DRIVE GEAR

Snap ring (Outer-30) to ball bearing clearance
0.01 — 0.15 mm (0.0004 — 0.0059 in)

Snap ring (Outer-30)	
Part No.	Thickness mm (in)
805030041	1.53 (0.0602)
805030042	1.65 (0.0650)
805030043	1.77 (0.0697)

B: COMPONENT

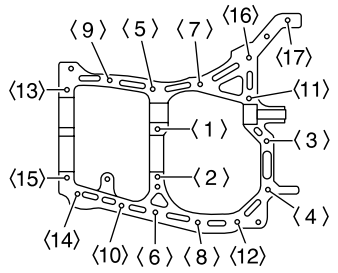
1. TRANSMISSION CASE



(1) Transmission case ASSY (Single-range)
(2) Gasket
(3) Drain plug
(4) Snap ring (Outer)
(5) Speedometer driven gear
(6) Washer
(7) Speedometer shaft
(8) Snap ring (Outer)
(9) Oil seal
(10) Clamp
(11) Pitching stopper bracket
(12) Clip
(13) Oil level gauge (Non-turbo model)
(14) Oil seal (Dual-range)
(15) Transmission case ASSY (Dual-range)
(16) High-low cable bracket A (Dual-range)
(17) High-low cable bracket B (Dual-range)
(18) Oil level gauge (Turbo model)

Tightening torque: N·m (kgf-m, ft-lb)
T: 44 (4.5, 32.5)

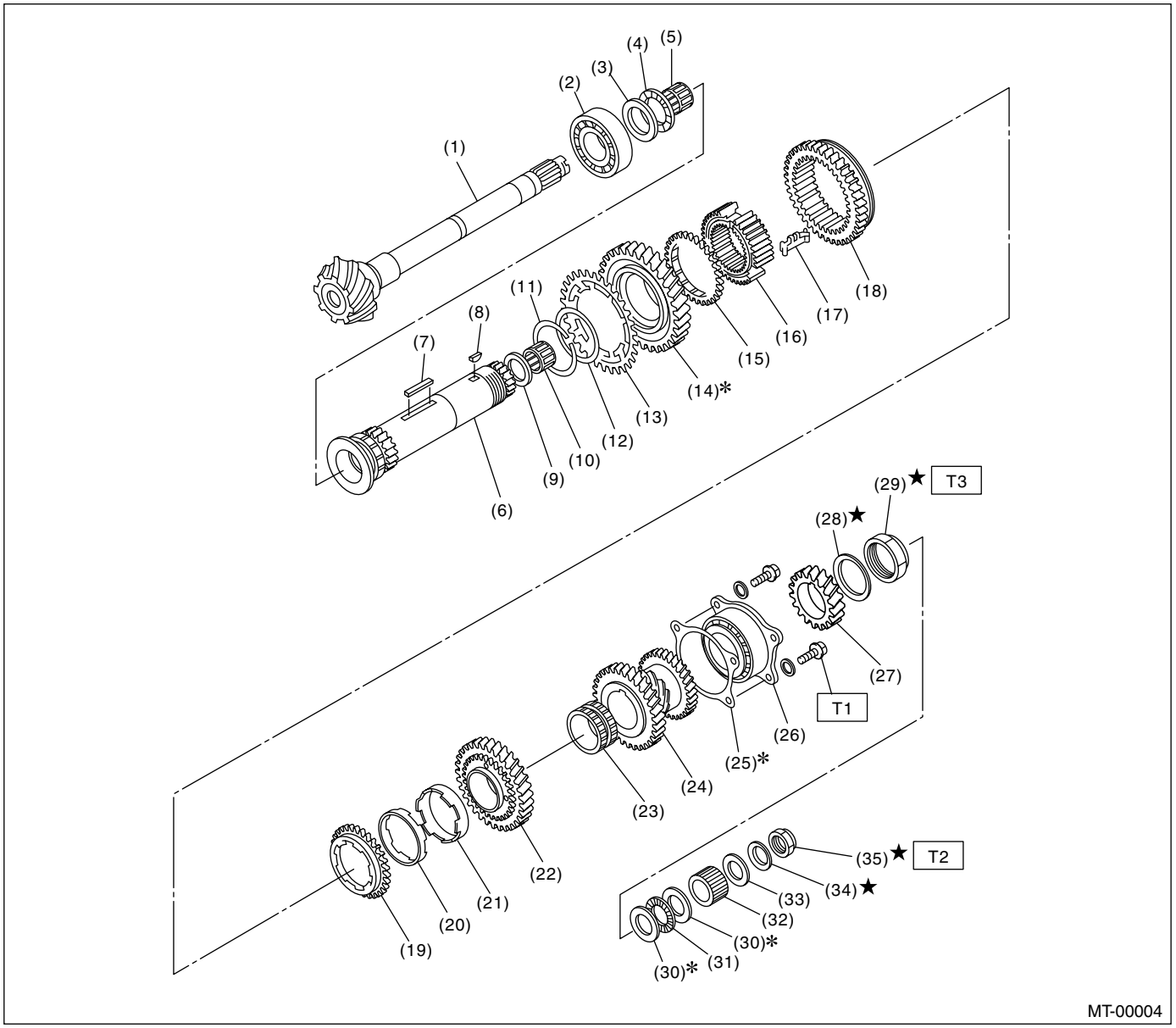
• Transmission case tightening torque



MT-00003

Bolt No.	Bolt size	Tightening torque: N·m (kgf-m, ft-lb)
<5> to <15>	8 mm	25 (2.5, 18.1)
<1> to <4> <16>, <17>	10 mm	39 (4.0, 28.9)

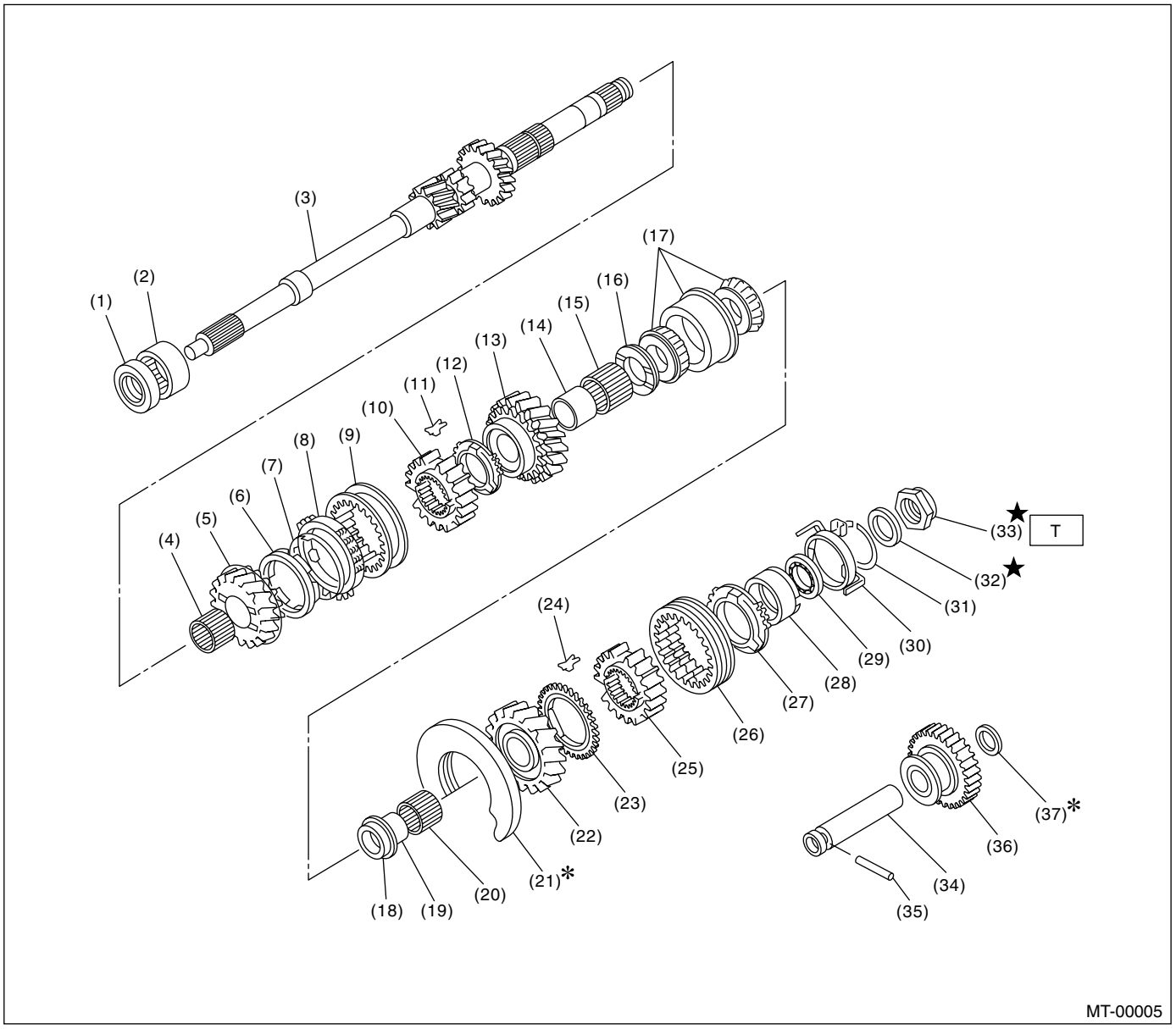
2. DRIVE PINION ASSEMBLY



(1) Drive pinion shaft
(2) Roller bearing
(3) Washer
(4) Thrust bearing
(5) Needle bearing
(6) Driven shaft
(7) Key
(8) Woodruff key
(9) Drive pinion collar
(10) Needle bearing
(11) Snap ring (Outer) (Non-turbo model)
(12) Washer (Non-turbo model)
(13) Sub gear (Non-turbo model)
(14) 1st driven gear
(15) Baulk ring
(16) 1st-2nd synchronizer hub
(17) Insert key
(18) Reverse driven gear
(19) Outer baulk ring
(20) Synchro cone
(21) Inner baulk ring
(22) 2nd driven gear
(23) 2nd driven gear bush
(24) 3rd-4th driven gear
(25) Driven pinion shim
(26) Roller bearing
(27) 5th driven gear
(28) Lock washer
(29) Lock nut
(30) Washer
(31) Thrust bearing
(32) Differential bevel gear sleeve
(33) Washer
(34) Lock washer
(35) Lock nut

Tightening torque: N·m (kgf-m, ft-lb)
T1: 30 (2.9, 21.0)
T2: 120 (12.2, 88.2)
T3: 260 (26.5, 192)

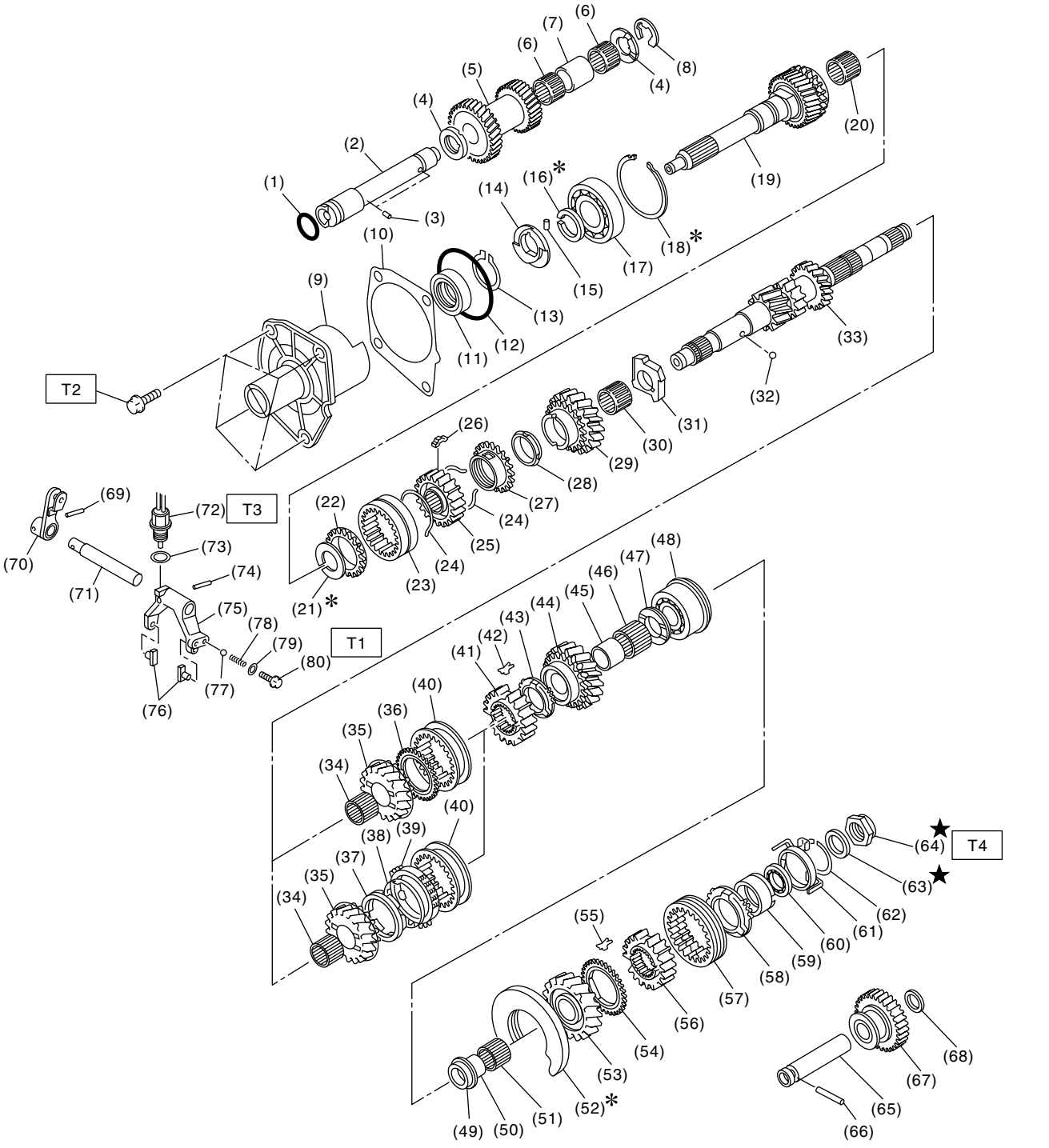
3. MAIN SHAFT ASSEMBLY (SINGLE RANGE)



(1) Oil seal
(2) Needle bearing
(3) Transmission main shaft
(4) Needle bearing
(5) 3rd drive gear
(6) Inner baulk ring
(7) 3rd synchro cone
(8) Outer baulk ring
(9) 3rd-4th coupling sleeve
(10) 3rd-4th synchronizer hub
(11) 3rd-4th shifting insert key
(12) 4th baulk ring
(13) 4th drive gear
(14) 4th needle bearing race
(15) Needle bearing
(16) 4th gear thrust washer
(17) Double taper roller bearing
(18) 5th gear thrust washer
(19) 5th needle bearing race
(20) Needle bearing
(21) Main shaft rear plate
(22) 5th drive gear
(23) 5th baulk ring
(24) 5th-Rev shifting insert key
(25) 5th-Rev synchronizer hub
(26) 5th-Rev coupling sleeve
(27) Rev baulk ring
(28) Rev synchro cone
(29) Ball bearing
(30) Synchro cone stopper
(31) Snap ring
(32) Lock washer
(33) Lock nut
(34) Reverse idler gear shaft
(35) Straight pin
(36) Reverse idler gear
(37) Washer

Tightening torque: N·m (kgf-m, ft-lb)
T: 120 (12.2, 88.2)

4. MAIN SHAFT ASSEMBLY (DUAL RANGE)

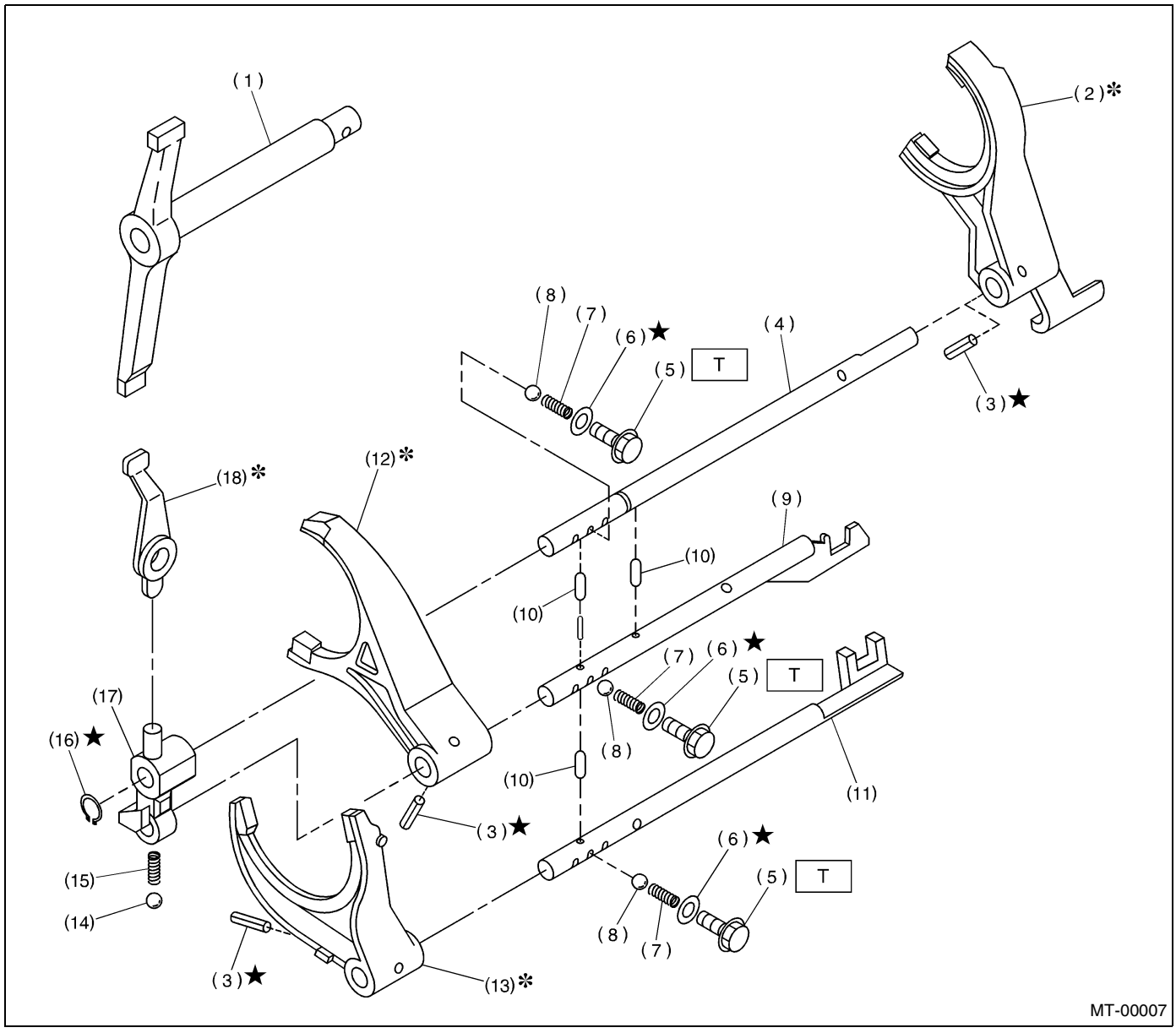


MT-00341

(1) O-ring
(2) High-low counter shaft
(3) Knock pin
(4) High-low counter washer
(5) Counter gear
(6) Needle bearing
(7) Counter gear collar
(8) Snap ring (Outer-19)
(9) Input shaft holder
(10) Input shaft shim
(11) Oil seal
(12) O-ring
(13) Snap ring (Outer-28)
(14) Oil squeeze
(15) Straight pin
(16) Snap ring (Outer-28)
(17) Ball bearing
(18) Snap ring (Inner-68)
(19) Input shaft
(20) Needle bearing
(21) Snap ring (Outer-25)
(22) High-low baulk ring
(23) High-low coupling sleeve
(24) High-low synchronizer spring
(25) High-low synchronizer hub
(26) Shifting insert key
(27) High-low baulk ring
(28) Friction damper
(29) Input low gear
(30) Needle bearing
(31) Input low gear spacer
(32) Ball
(33) Main shaft
(34) Needle bearing
(35) 3rd drive gear
(36) 3rd baulk ring (2.0L model)
(37) Inner baulk ring (2.5L model)
(38) 3rd synchro cone (2.5L model)
(39) Outer baulk ring (2.5L model)
(40) 3rd-4th coupling sleeve
(41) 3rd-4th synchronizer hub
(42) 3rd-4th shifting insert key
(43) 4th baulk ring
(44) 4th drive gear
(45) 4th needle bearing race
(46) Needle bearing
(47) 4th gear thrust washer
(48) Ball bearing
(49) 5th gear thrust washer
(50) 5th needle bearing race
(51) Needle bearing
(52) Main shaft rear plate
(53) 5th drive gear
(54) 5th baulk ring
(55) 5th-Rev shifting insert key
(56) 5th-Rev synchronizer hub
(57) 5th-Rev coupling sleeve
(58) Rev baulk ring
(59) Rev synchro cone
(60) Ball bearing
(61) Synchro cone stopper
(62) Snap ring
(63) Lock washer
(64) Lock nut
(65) Reverse idler gear shaft
(66) Straight pin
(67) Reverse idler gear
(68) Washer
(69) Straight pin
(70) High-low shifter lever
(71) High-low shifter shaft
(72) Low switch
(73) Gasket
(74) Straight pin
(75) High-low shifter fork
(76) High-low shifter piece
(77) Ball
(78) Spring
(79) Gasket
(80) Plug

Tightening torque: N·m (kgf-m, ft-lb)
T1: 9.75 (0.99, 7.2)
T2: 20 (2.0, 14.5)
T3: 25 (2.5, 18.1)
T4: 120 (12.2, 88.2)

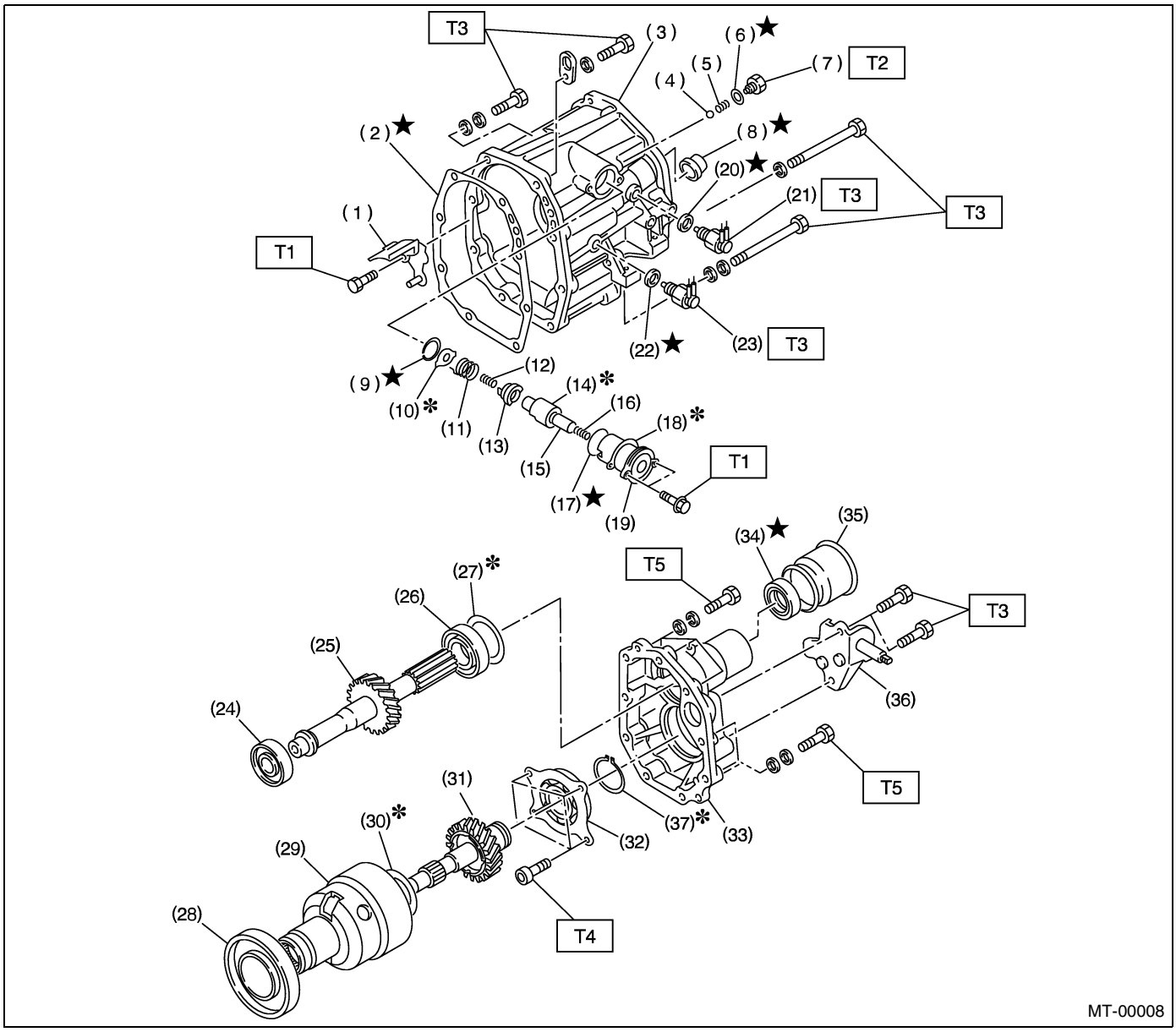
5. SHIFTER FORK AND SHIFTER ROD



(1) Shifter arm
(2) 5th shifter fork
(3) Straight pin
(4) Reverse fork rod
(5) Checking ball plug
(6) Gasket
(7) Checking ball spring
(8) Ball
(9) 3rd-4th fork rod
(10) Interlock plunger
(11) 1st-2nd fork rod
(12) 3rd-4th shifter fork
(13) 1st-2nd shifter fork
(14) Ball
(15) Spring
(16) Snap ring (Outer)
(17) Reverse fork rod arm
(18) Reverse shifter lever

Tightening torque: N·m (kgf-m, ft-lb)
T: 20 (2.0, 14.5)

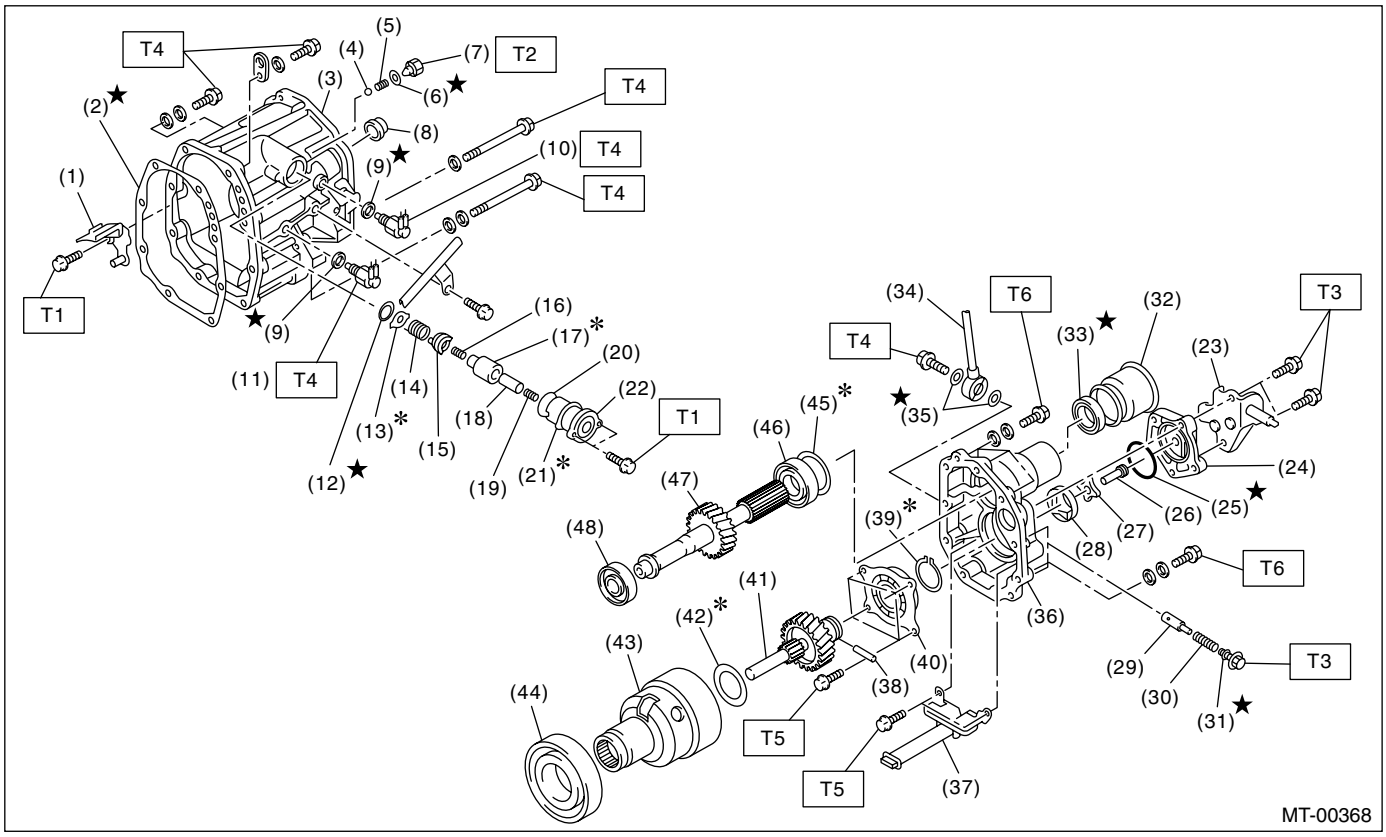
6. TRANSFER CASE AND EXTENSION (WITHOUT OIL PUMP)



(1) Oil guide
(2) Gasket
(3) Transfer case
(4) Ball
(5) Reverse accent spring
(6) Gasket
(7) Plug
(8) Oil seal
(9) Snap ring (Inner)
(10) Reverse check plate
(11) Reverse check spring
(12) Reverse return spring
(13) Reverse check cam
(14) Reverse accent shaft
(15) Return spring cap
(16) Return spring
(17) O-ring
(18) Adjusting select shim
(19) Reverse check sleeve
(20) Gasket
(21) Neutral switch
(22) Gasket
(23) Back-up light switch
(24) Roller bearing
(25) Transfer driven gear
(26) Roller bearing
(27) Adjusting washer
(28) Ball bearing
(29) Center differential
(30) Adjusting washer
(31) Transfer drive gear
(32) Ball bearing
(33) Extension case
(34) Oil seal
(35) Dust cover
(36) Shift bracket
(37) Snap ring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 9.75 (1.0, 7.2)
T3: 24.5 (2.5, 18.1)
T4: 26 (2.7, 20)
T5: 40 (4.1, 30)

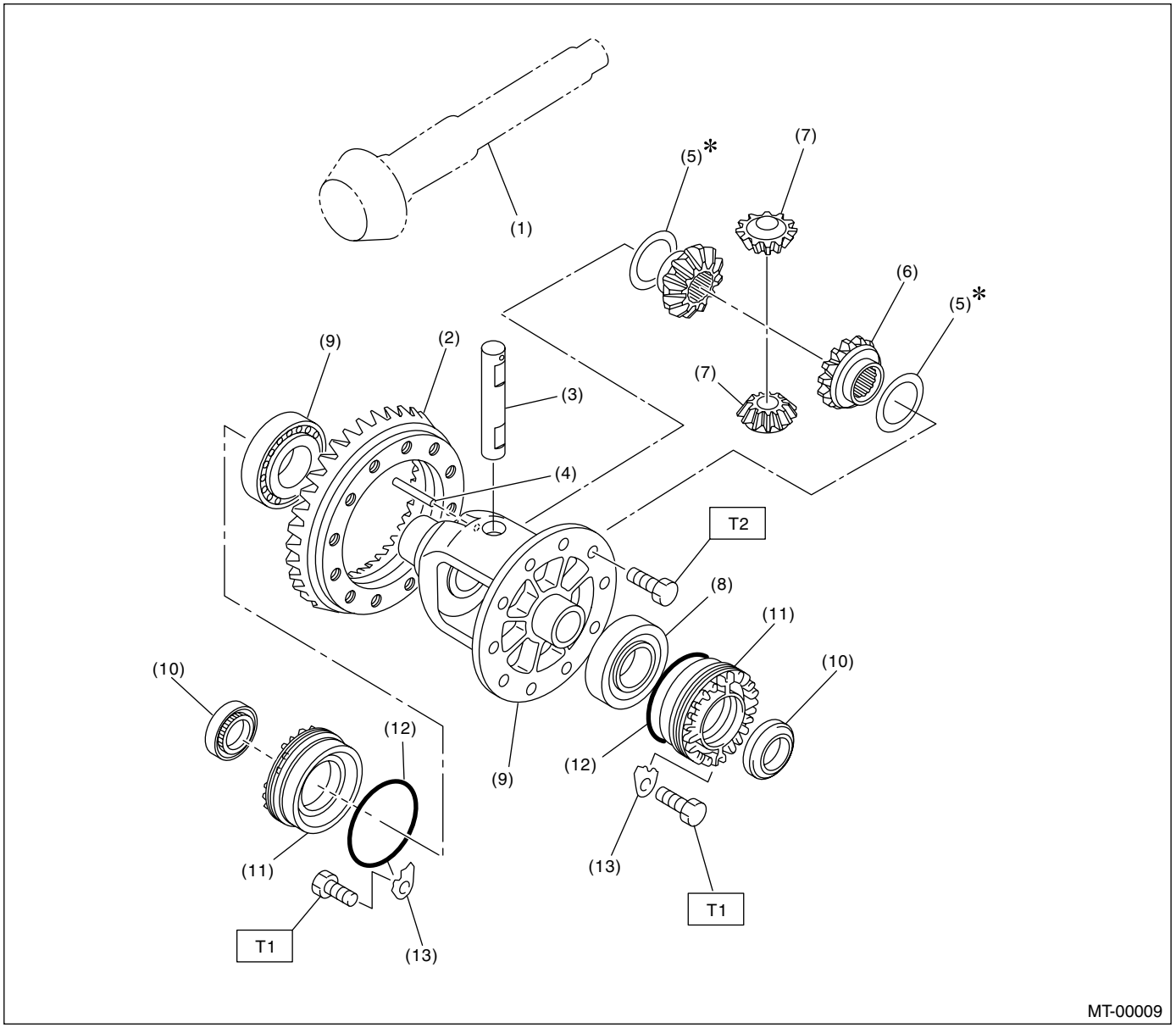
7. TRANSFER CASE AND EXTENSION (WITH OIL PUMP)



(1) Oil guide
(2) Gasket
(3) Transfer case
(4) Ball
(5) Reverse accent spring
(6) Gasket
(7) Plug
(8) Oil seal
(9) Gasket
(10) Neutral switch
(11) Back-up light switch
(12) Snap ring (Inner)
(13) Reverse check spring
(14) Reverse check spring
(15) Reverse check cam
(16) Return spring
(17) Reverse accent shaft
(18) Return spring cap
(19) Return spring
(20) O-ring
(21) Adjusting select shim
(22) Reverse check sleeve
(23) Shift bracket
(24) Oil pump cover
(25) O-ring
(26) Oil pump shaft
(27) Inner rotor
(28) Outer rotor
(29) Relief valve
(30) Return spring
(31) O-ring
(32) Dust cover
(33) Oil seal
(34) Outlet pipe
(35) Gasket
(36) Extension case
(37) Oil strainer
(38) Straight pin
(39) Snap ring
(40) Ball bearing
(41) Transfer drive gear
(42) Washer
(43) Center differential
(44) Ball bearing
(45) Adjusting washer
(46) Roller bearing
(47) Transfer driven gear
(48) Roller bearing

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 9.75 (1.0, 7.2)
T3: 12.75 (1.3, 9.4)
T4: 24.5 (2.5, 18.1)
T5: 26 (2.7, 20)
T6: 40 (4.1, 30)

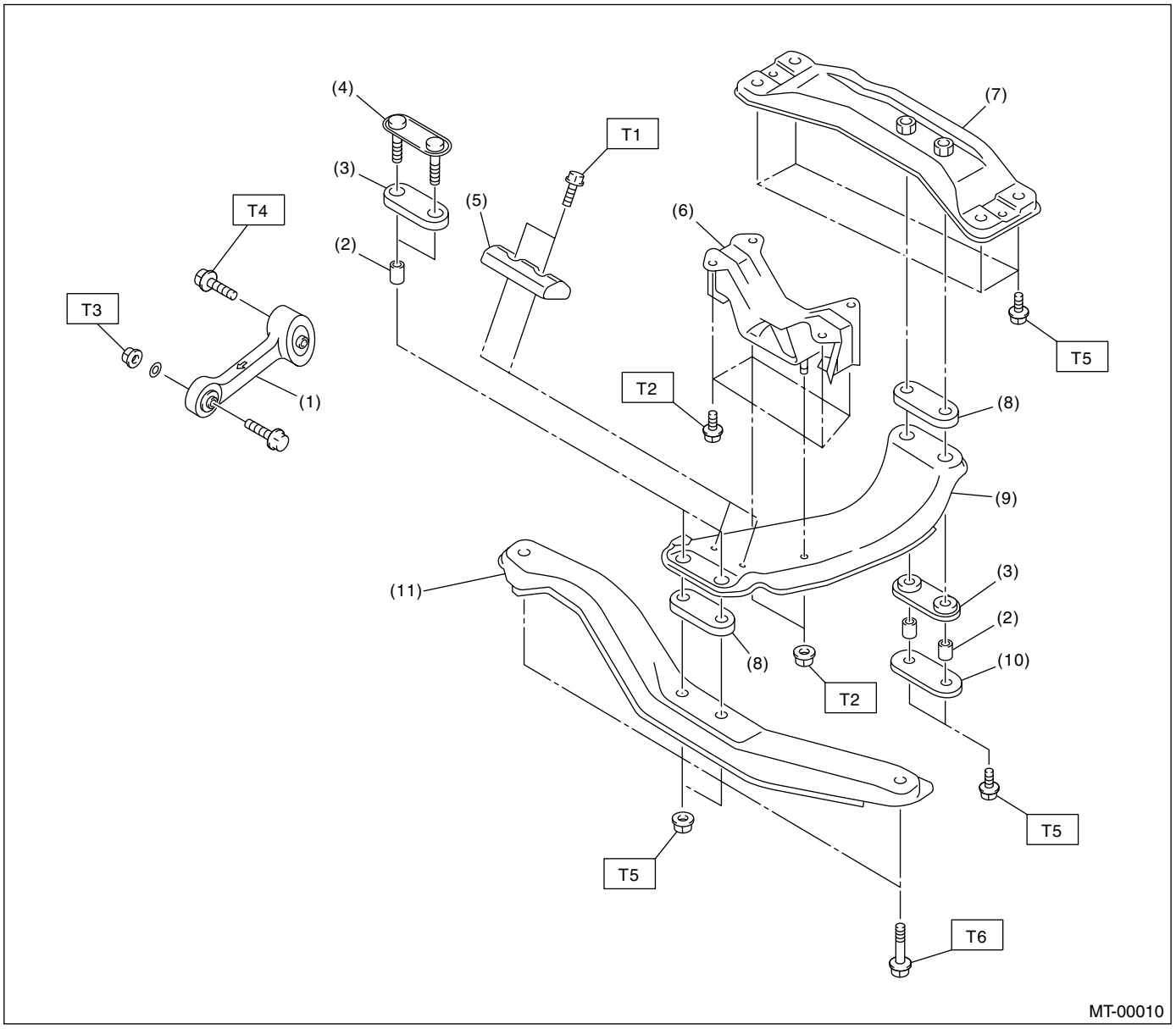
8. FRONT DIFFERENTIAL



(1) Drive pinion shaft
(2) Hypoid driven gear
(3) Pinion shaft
(4) Straight pin
(5) Washer
(6) Differential bevel gear
(7) Differential bevel pinion
(8) Roller bearing
(9) Differential case
(10) Oil seal
(11) Differential side retainer
(12) O-ring
(13) Retainer lock plate

Tightening torque: N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.1)
T2: 62 (6.3, 45.6)

9. TRANSMISSION MOUNTING



(1) Pitching stopper
(2) Spacer
(3) Cushion C
(4) Front plate
(5) Dynamic damper
(6) Rear cushion rubber
(7) Rear crossmember
(8) Cushion D
(9) Center crossmember
(10) Rear plate
(11) Front crossmember

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 35 (3.6, 26)
T3: 50 (5.1, 37)
T4: 58 (5.9, 43)
T5: 70 (7.1, 51)
T6: 140 (14.3, 103)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation, and disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• When disassembling the case and other light alloy parts, use a plastic hammer to force it apart. Do not pry it apart with a screwdriver or other tool.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Use SUBARU genuine gear oil, grease etc. or the equivalent. Do not mix gear oil, grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Apply gear oil onto sliding or revolution surfaces before installation.
• Replace deformed or otherwise damaged snap rings with new ones.
• Before installing O-rings or oil seals, apply sufficient amount of gear oil to avoid damage and deformation.
• Be careful not to incorrectly install or fail to install O-rings, snap rings and other such parts.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Avoid damaging the mating surface of the case.
• Before applying sealant, completely remove the old seal.

D: PREPARATION TOOL

1. SPECIAL TOOLS

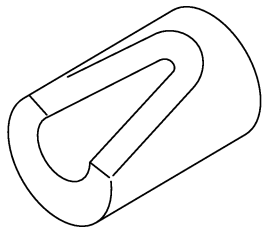
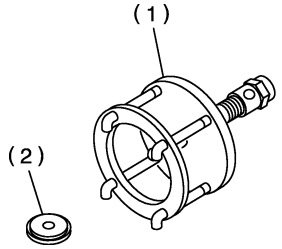
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-399411700	399411700	ACCENT BALL INSTALLER	Used for installing reverse shifter rail arm.
 ST-899524100	899524100	PULLER ASSY	Used for removing and installing roller bearing (Differential). (1) Puller (2) Cap

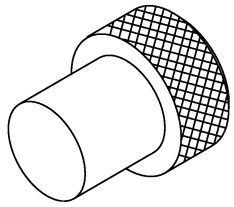
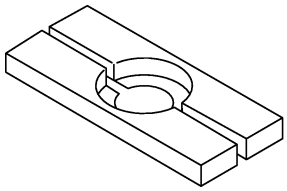
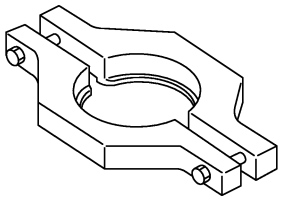
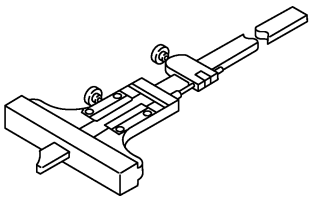
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-399780104	399780104	WEIGHT	Used for measuring preload on roller bearing.
 ST-498077000	498077000	REMOVER	Used for removing roller bearing of drive pinion shaft.
 ST-498077300	498077300	CENTER DIFFERENTIAL BEARING REMOVER	Used for removing the center differential cover ball bearing.
 ST-498147000	498147000	DEPTH GAUGE	Used for adjusting main shaft axial end play.

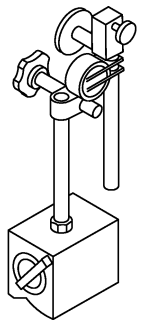
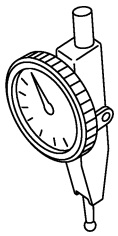
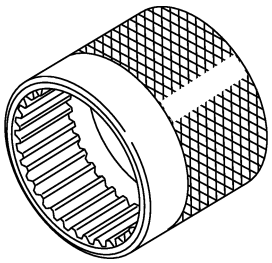
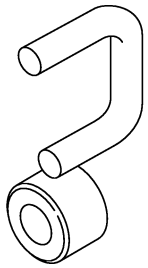
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498247001	498247001	MAGNET BASE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with DIAL GAUGE (498247100).
 ST-498247100	498247100	DIAL GAUGE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with MAGNET BASE (498247001).
 ST-498247400	498427400	STOPPER	Used for securing the drive pinion shaft assembly and driven gear assembly when removing the drive pinion shaft assembly lock nut.
 ST-498787100	498787100	MAIN SHAFT STOPPER	Used for removing and installing transmission main shaft lock nut.

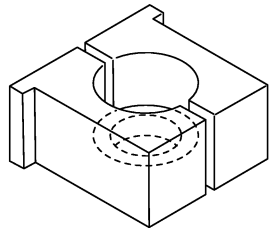
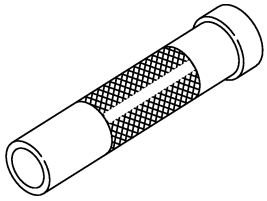
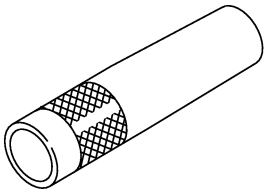
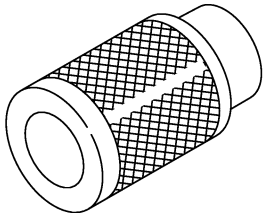
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498937000	498937000	TRANSMISSION HOLDER	Used for removing and installing transmission main shaft lock nut.
 ST-499277100	499277100	BUSH 1-2 INSTALLER	• Used for installing 1st driven gear thrust plate and 1st-2nd driven gear bush. • Used for installing roller bearing outer races to differential case.
 ST-499277200	499277200	INSTALLER	Used for press-fitting the 2nd driven gear, roller bearings, and 5th driven gear onto the driven shaft.
 ST-499757002	499757002	INSTALLER	• Used for installing snap ring (OUT 25), and ball bearing (25 x 26 x 17). • Used for installing bearing cone of transfer driven gear (extension core side).

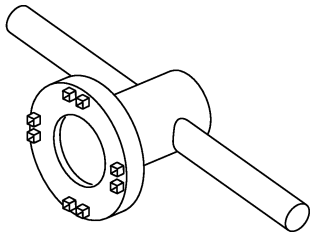
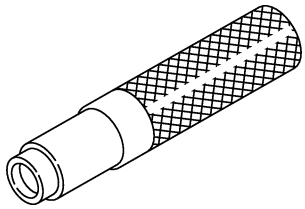
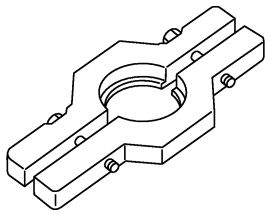
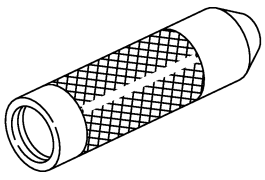
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499787000	499787000	WRENCH ASSY	Used for removing and installing differential side retainer.
 ST-499827000	499827000	PRESS	Used for installing speedometer oil seal when installing speedometer cable to transmission.
 ST-499857000	499857000	5TH DRIVEN GEAR REMOVER	Used for removing 5th driven gear.
 ST-499877000	499877000	RACE 4-5 INSTALLER	• Used for installing 4th needle bearing race and ball bearing onto transmission main shaft. • Used with REMOVER (899714110).

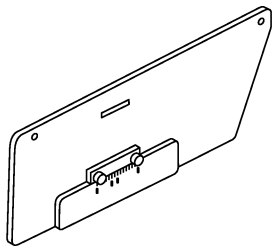
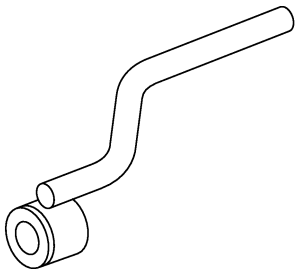
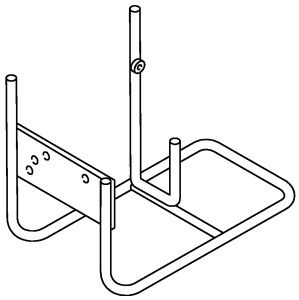
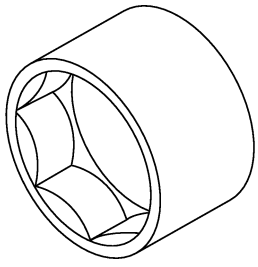
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499917500	499917500	DRIVE PINION GAUGE ASSY	Used for adjusting drive pinion shim.
 ST-499927100	499927100	HANDLE	Used for fitting transmission main shaft.
 ST-499937100	499937100	TRANSMISSION STAND SET	Stand used for transmission disassembly and assembly.
 ST-499987003	499987003	SOCKET WRENCH (35)	Used for removing and installing driven pinion lock nut and main shaft lock nut.

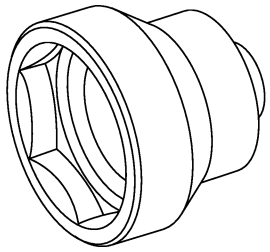
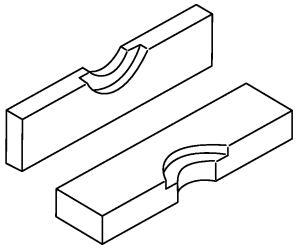
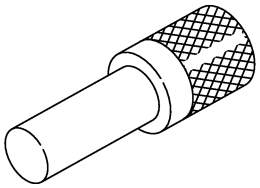
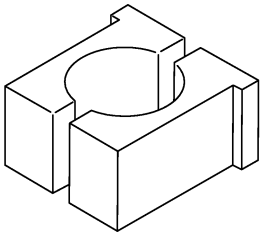
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499987300	499987300	SOCKET WRENCH (50)	Used for removing and installing driven gear assembly lock nut.
 ST-899714110	899714110	REMOVER	Used for fixing transmission main shaft, drive pinion, rear drive shaft.
 ST-899864100	899864100	REMOVER	Used for removing parts on transmission main shaft and drive pinion.
 ST-899884100	899884100	HOLDER	Used for tightening lock nut on sleeve.

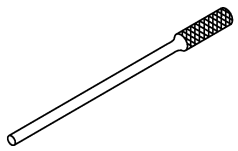
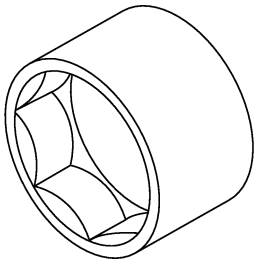
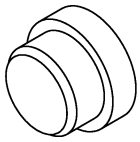
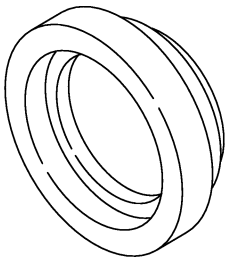
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899904100	899904100	REMOVER	Used for removing and installing straight pin.
 ST-899988608	899988608	SOCKET WRENCH (27)	Used for removing and installing drive pinion lock nut.
 ST-398497701	398497701	ADAPTER	• Used for installing roller bearing onto differential case. • Used with INSTALLER (499277100).
 ST-499587000	499587000	INSTALLER	Used for installing driven gears to driven shaft.

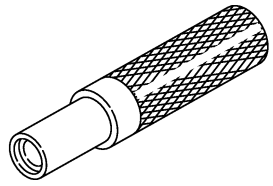
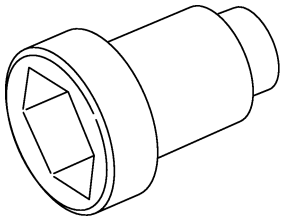
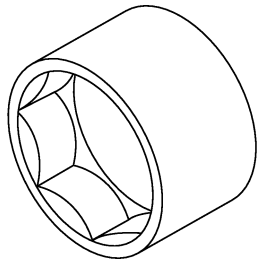
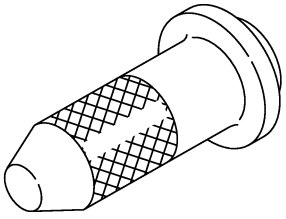
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899824100	899824100	PRESS	Used for installing speedometer shaft oil seal.
 ST-499987100	499987100	SOCKET WRENCH (35)	Used for removing and installing drive pinion lock nut.
 ST-899984103	899984103	SOCKET WRENCH (35)	Used for removing and installing drive pinion lock nut.
 ST-498057300	498057300	INSTALLER	Used for installing extension oil seal.

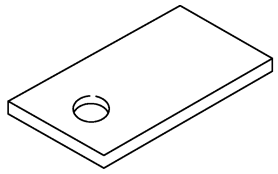
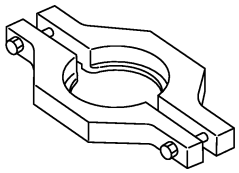
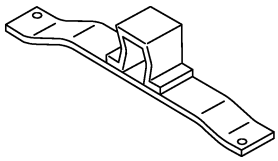
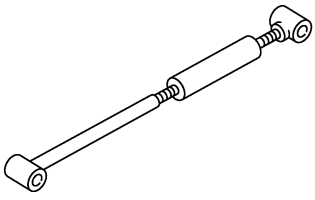
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498255400	498255400	PLATE	Used for measuring backlash.
 ST-498077400	498077400	SYNCHRONIZER CONE REMOVER	• Used for removing synchronizer cone of main shaft. • Used for removing 5th driven gear of drive pinion shaft.
 ST41099AA010	41099AA010	ENGINE SUPPORT BRACKET	Used for supporting engine.
 ST41099AA020	41099AA020	ENGINE SUPPORT	Used for supporting engine.

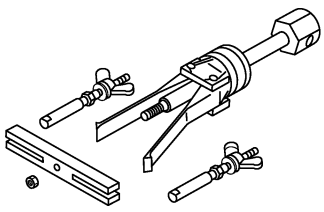
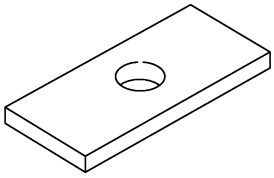
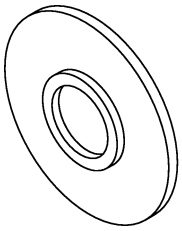
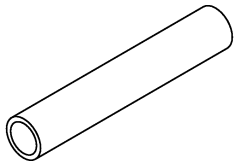
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398527700	398527700	PULLER ASSY	• Used for removing extension case oil seal. • Used for removing front differential side retainer oil seal.
 ST-398643600	398643600	GAUGE	Used for measuring total end play, extension end play and drive pinion height.
 ST-398177700	398177700	INSTALLER	• Used for installing bearing cone of transfer driven gear (transfer case side). • Used for installing ball bearing of transfer drive gear.
 ST-398507703	398507703	DUMMY COLLAR	• Used for installing input shaft holder oil seal. • For dual-range model.

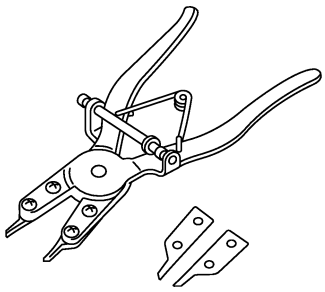
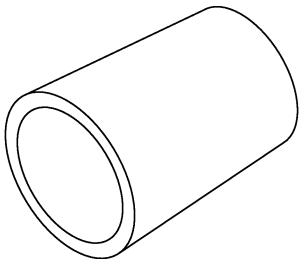
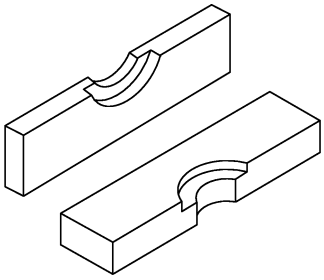
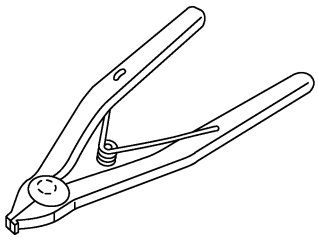
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398663600	398663600	PLIERS	• Used for removing and installing input shaft snap ring. • For dual-range model.
 ST-499757001	499757001	SNAP RING GUIDE	• Used for installing snap ring (OUT 25). • For dual-range model.
 ST-899858600	899858600	RETAINER	• Used for removing ball bearing. • For dual-range model.
 ST-899474100	899474100	EXPANDER	• Used for removing and installing snap ring. • For dual-range model.

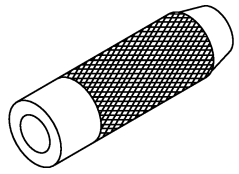
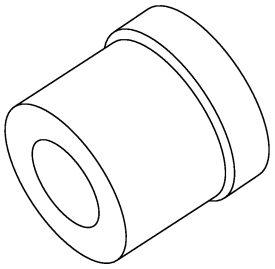
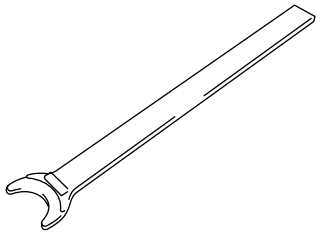
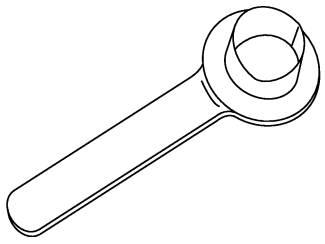
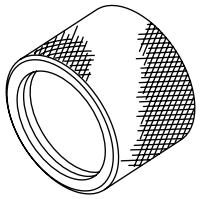
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899580100	899580100	INSTALLER	• Used when pressing ball bearings into input shaft. • For dual-range model.
 ST-399513600	399513600	INSTALLER	• Used when pressing ball bearings into input shaft. • For dual-range model.
 ST28399SA000	28399SA000 <Newly adopted tool>	FRONT DRIVE SHAFT REMOVER	Used for removing front drive shaft. (Commonly used for MT vehicles and AT vehicles)
 ST28399SA010	28399SA010 <Newly adopted tool>	FRONT DRIVE SHAFT OIL SEAL PROTECTOR	Used for protecting oil seal when installing front drive shaft.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18675AA000	18675AA000 <Newly adopted tool>	DIFFERENTIAL SIDE OIL SEAL INSTALLER	Used for installing differential side retainer oil seal.

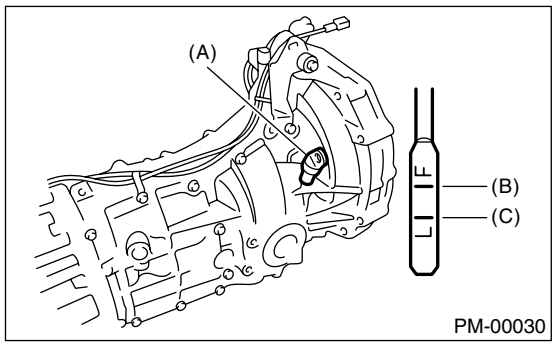
2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.

2. Transmission Gear Oil

A: INSPECTION

1) Park the vehicle on a level surface.
2) Turn the ignition switch to OFF, and wait until the engine cools.
3) Remove the oil level gauge and wipe it clean.
4) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper direction.
5) Pull out the oil level gauge again and check the oil level on it. If it is below the lower level, add oil through the oil level gauge hole to bring the level up to the upper level.



(A) Oil level gauge
(B) Upper level
(C) Lower level

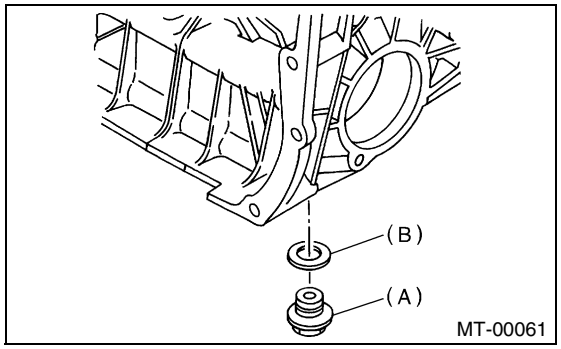
B: REPLACEMENT

1) Pull out the oil level gauge.
2) Lift-up the vehicle.
3) Drain the transmission gear oil completely.

CAUTION:
• Directly after the engine has been running, the transmission gear oil is hot. Be careful not to burn yourself.
• Be sure not to spill the transmission gear oil on exhaust pipe to prevent it from emitting smoke or firing. When the transmission gear oil is split on exhaust pipe, wipe it away completely.

4) Tighten the transmission gear oil drain plug using a new gasket.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)



(A) Drain plug
(B) Gasket

5) Lower the vehicle.
6) Pour gear oil into the gauge hole.

Recommended gear oil:
Use GL-5 (75 W — 90) or equivalent.

Gear oil capacity:

Single-range model;
Without oil pump
3.5 ℓ (3.7 US qt, 3.1 Imp qt)
With oil pump
3.9 ℓ (4.1 US qt, 3.4 Imp qt)

Dual-range model;
4.0 ℓ (4.2 US qt, 3.5 Imp qt)

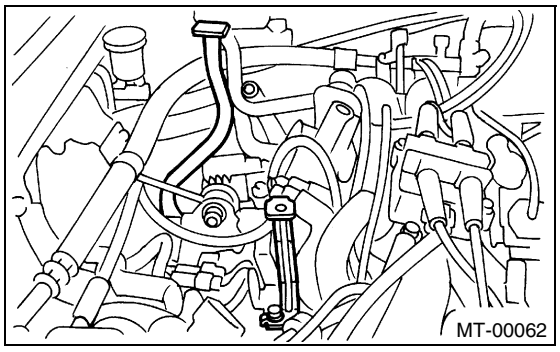
7) Measure the level of transmission gear oil, and then check the level within the specified range.

NOTE:
When inserting the level gauge into transmission gear, align the protrusion on the side of the top part of level gauge with the notch in the gauge hole.

3. Manual Transmission Assembly

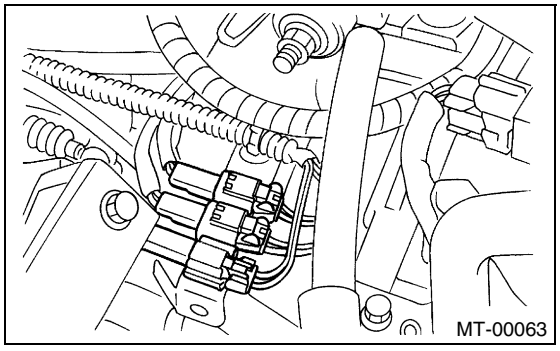
A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Drain the transmission gear oil completely.<Ref. to MT-31, REPLACEMENT, Transmission Gear Oil.>
4) Open the front hood fully, and support with stay.
5) Remove the air intake duct and air intake chamber. (Non-turbo model) <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
6) Remove the air cleaner case stay. (Non-turbo model)

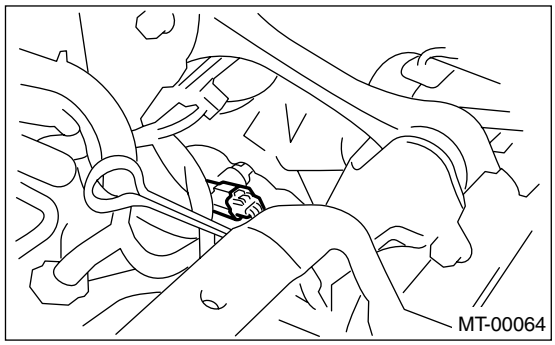

MT-00062

7) Remove the intercooler (Turbo model) <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
8) Disconnect the following connectors and transmission cable.
(1) Neutral position switch connector
(2) Back-up light switch connector
(3) High-low switch connector (Dual-range model)

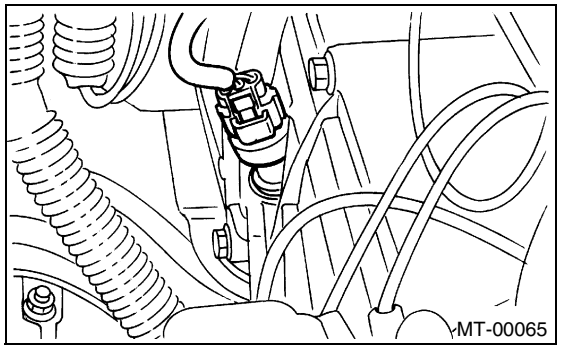
- NON-TURBO MODEL


MT-00063

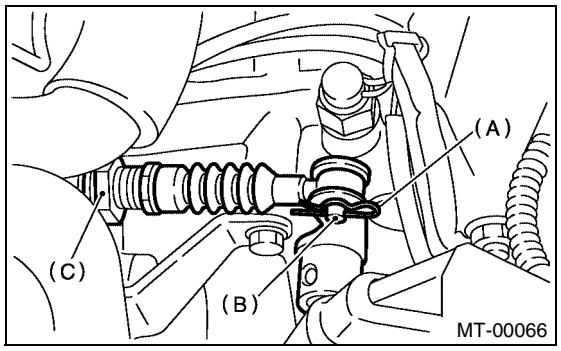
- TURBO MODEL


MT-00064

(4) Vehicle speed sensor


MT-00065

9) Remove the snap pin and pin from drive select cable.
10) Remove the drive select cable on transmission. (Dual-range model)

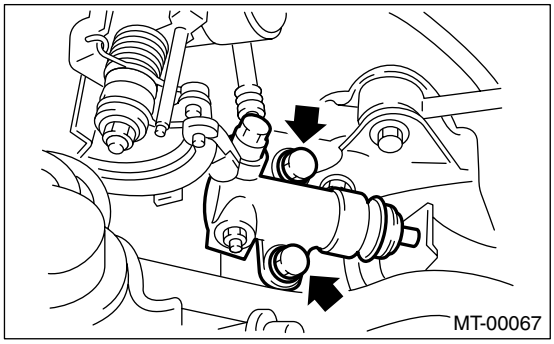


MT-00066

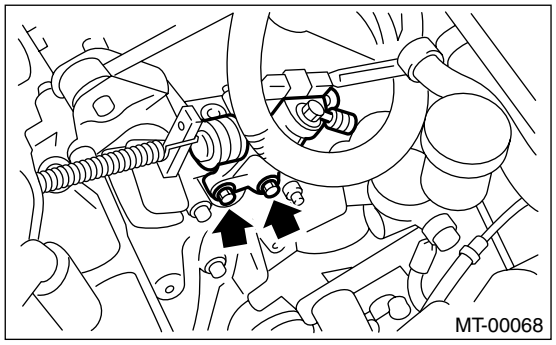
(A) Snap pin
(B) Clevis pin
(C) Drive select cable

11) Remove the starter. <Ref. to SC(SOHC)-6, REMOVAL, Starter.>

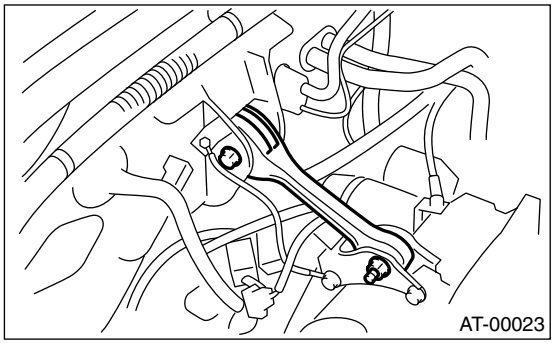
12) Remove the operating cylinder from transmission, and then hang it with wires.
• NON-TURBO MODEL



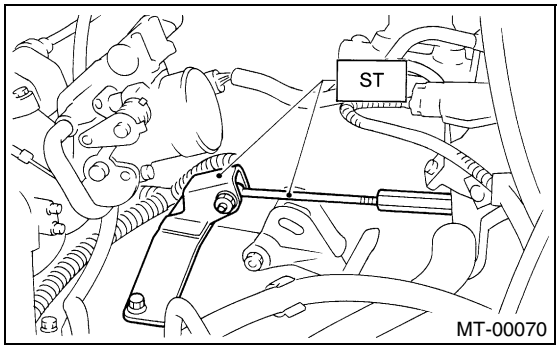
• TURBO MODEL



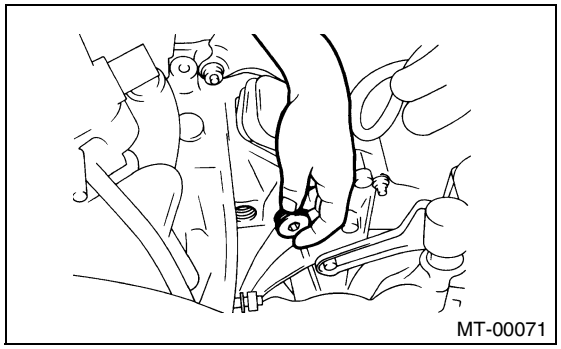
13) Remove the pitching stopper.



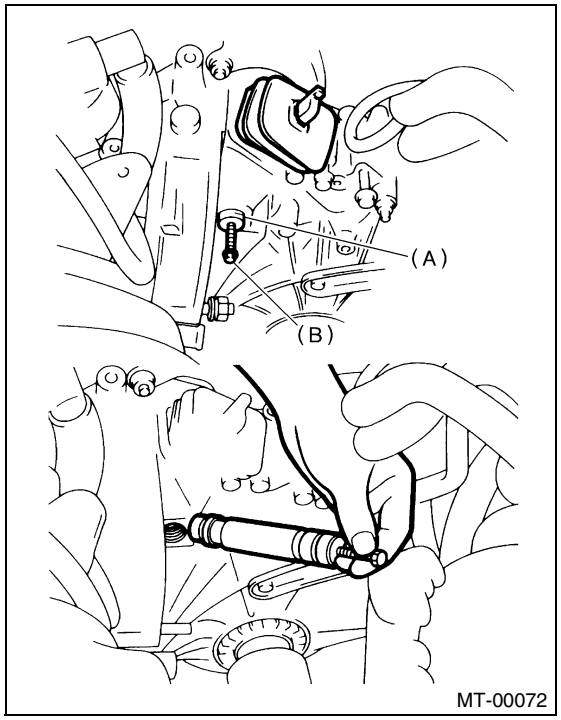
14) Set the ST.
ST 41099AA020 ENGINE SUPPORT ASSY



15) Separate the clutch release fork from release bearing. (Turbo model)
(1) Remove the clutch operating cylinder from transmission.
(2) Remove the plug using 10 mm hexagon wrench.



(3) Screw the 6 mm dia. bolt into release fork shaft, and remove it.

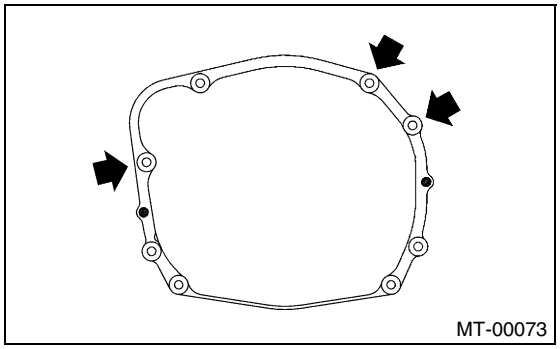


(A) Shaft
(B) Bolt

(4) Raise the release fork and unfasten the release bearing tabs to free release fork.

NOTE:
Step (4) is required to prevent interference with engine when removing the engine from transmission.

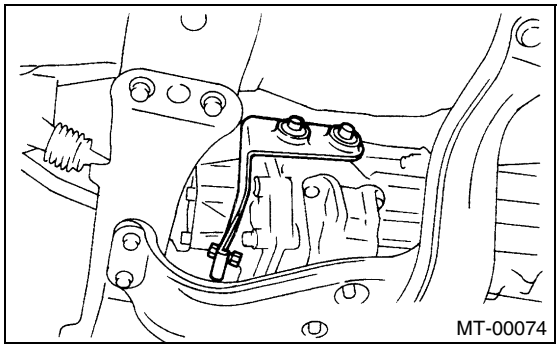
16) Remove the bolt which holds right upper side of transmission to engine.



17) Remove the front and center exhaust pipes. (Non-turbo model) <Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.>
18) Remove the center exhaust pipe. (Turbo model). <Ref. to EX(TURBO)-7, REMOVAL, Center Exhaust Pipe.>
19) Remove the rear exhaust pipe and muffler.

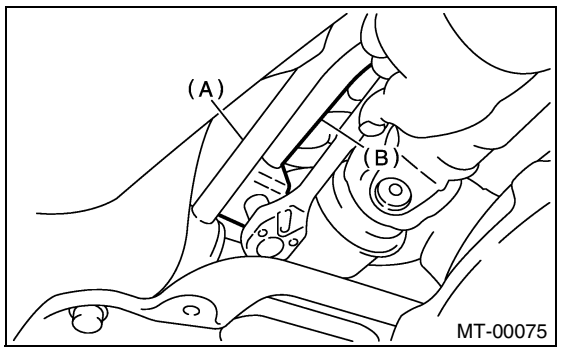
CAUTION:
When removing the exhaust pipes, be careful each exhaust pipe does not drop out.

20) Remove the heat shield cover. (Non-turbo model only)
21) Remove the hanger bracket from right side of transmission.



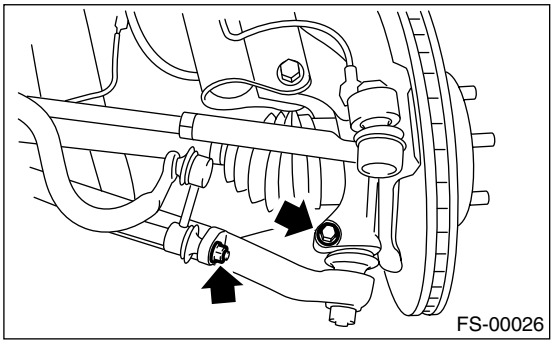
22) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>

23) Remove the gear shift rod and stay from transmission.
(1) Disconnect the stay from transmission.
(2) Disconnect the rod from transmission.



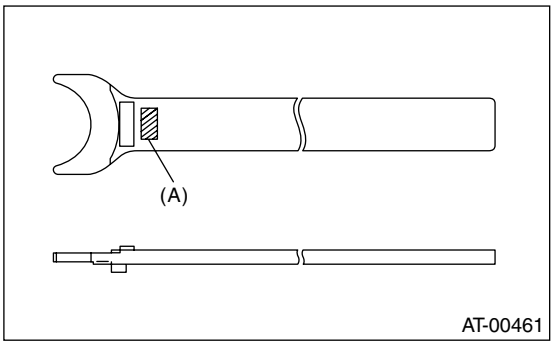
(A) Stay
(B) Rod

24) Disconnect the ATF cooler hose from transmission side oil cooler pipe. (with oil pump)
25) Disconnect the stabilizer link from transverse link.
26) Remove the bolts securing ball joint of transverse link to housing, and then separate the transverse link and housing.



27) Using the ST, remove the front drive shaft from side of transmission case.

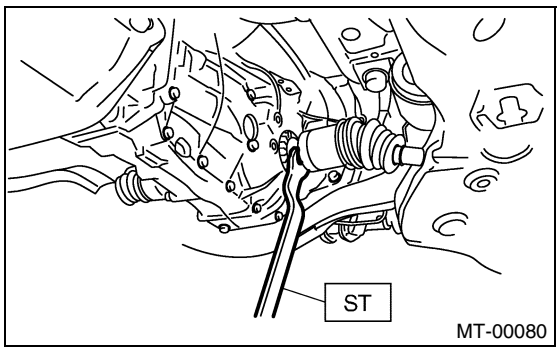
NOTE:
• Face the “MT” letter stamped on handle of ST to transmission.



(A) “MT” letter stamped

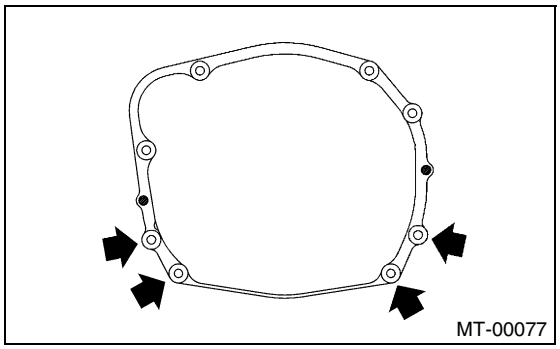
• Contact the portion of ST to transmission case.

ST 28399SA000 FRONT DRIVE SHAFT REMOVER

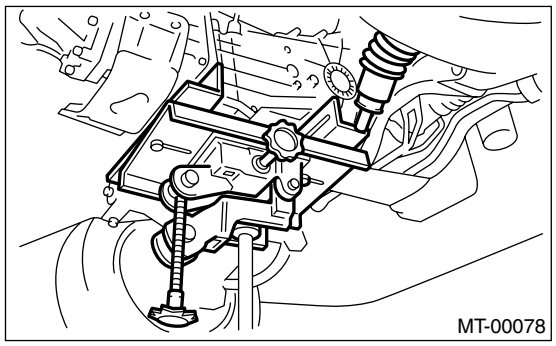


28) While holding the joint portion (AAR) of front drive shaft with your hand, push the housing outside to remove from transmission without stretching AAR side of boot.

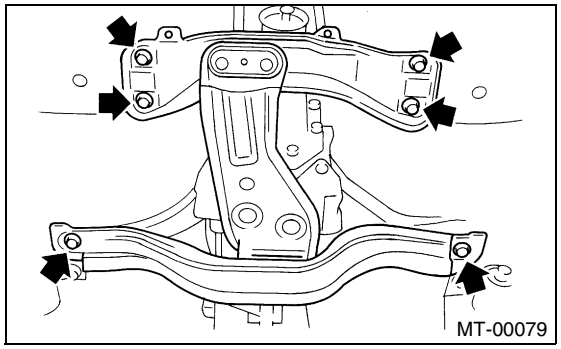
29) Remove the nuts which hold lower side of transmission to engine.



30) Place the transmission jack under transmission.



31) Remove the transmission rear crossmember from vehicle.



32) Remove the transmission.

NOTE:
Move the transmission jack toward rear until main shaft is withdrawn from clutch cover.

33) Separate the transmission assembly and rear cushion rubber.

B: INSTALLATION

1) Replace the differential side retainer oil seal. <Ref. to MT-42, REPLACEMENT, Differential Side Retainer Oil Seal.>

NOTE:
When pulling out the front drive shaft, always replace the differential side retainer oil seal.

2) Install the rear cushion rubber to transmission assembly.

Tightening torque:
35 N·m (3.57 kgf-m, 25.8 ft-lb)

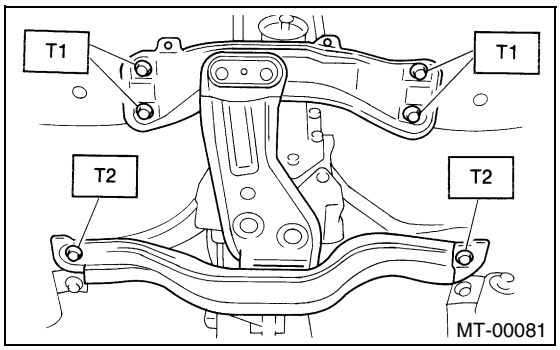
3) Install the clutch release lever and bearing onto transmission. (Turbo model) <Ref. to CL-23, INSTALLATION, Release Bearing and Lever.>

4) Install the transmission onto engine.
   (1) Gradually raise the transmission with transmission jack.
   (2) Engage them at splines.

NOTE:
Be careful not to strike the main shaft against clutch cover.

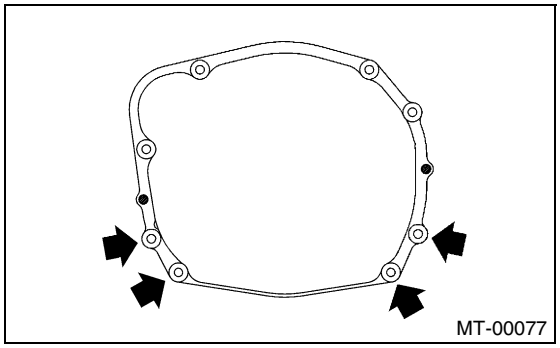
5) Install the transmission rear crossmember.

Tightening torque:
T1: 70 N·m (7.1 kgf-m, 51 ft-lb)
T2: 140 N·m (14.3 kgf-m, 103 ft-lb)



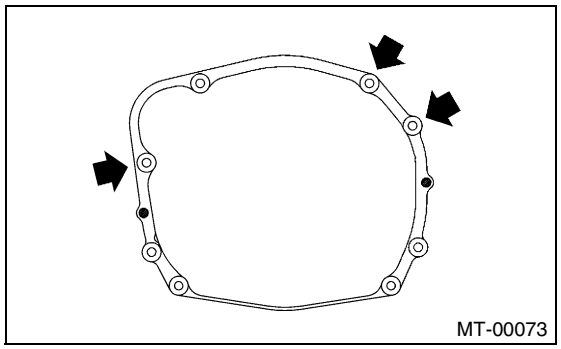
6) Take off the transmission jack.
7) Tighten the nuts which hold lower side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)

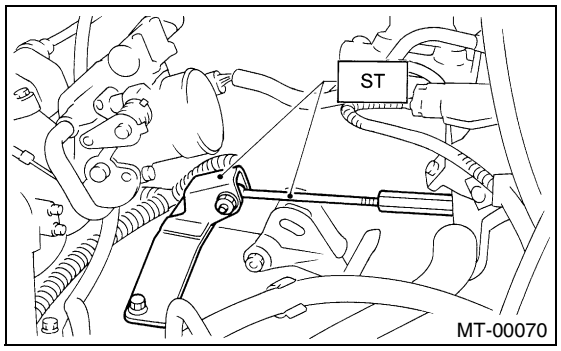


8) Connect the engine and transmission.
(1) Install the starter. <Ref. to SC(SOHC)-6, INSTALLATION, Starter.>
(2) Tighten the bolt which holds right upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)

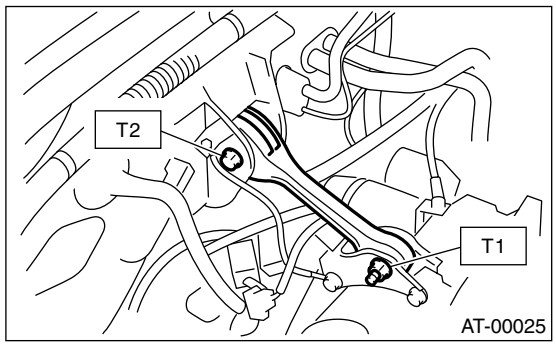


9) Remove the ST.



10) Install the pitching stopper.

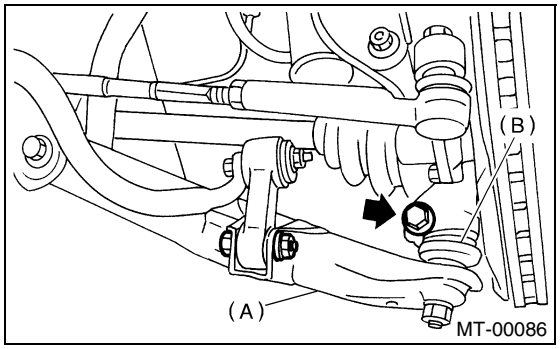
Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



11) Lift-up the vehicle.
12) Install the front drive shaft into transmission.
ST 28399SA010 FRONT DRIVE SHAFT OIL SEAL PROTECTOR

13) Install the ball joints of lower arm into knuckle arm of housing, and tighten the installing bolts.

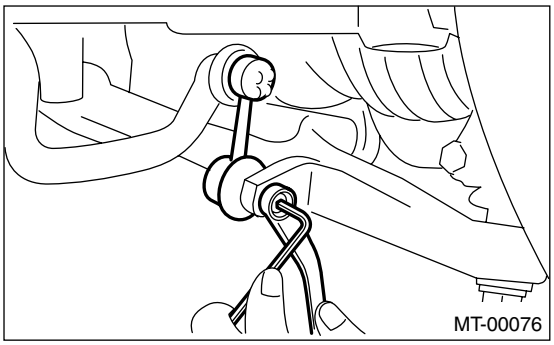
Tightening torque:
49 N·m (5.0 kgf-m, 36 ft-lb)



(A) Transverse link
(B) Ball joint

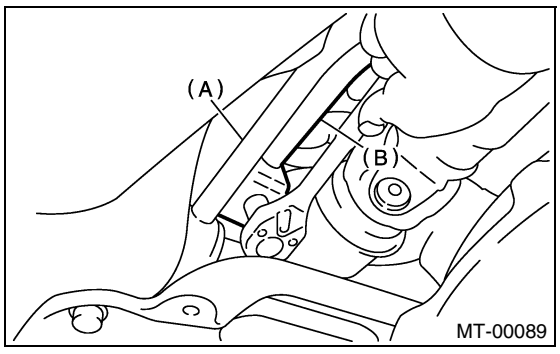
14) Install the stabilizer link from transverse link.

Tightening torque:
45 N·m (4.6 kgf-m, 33.2 ft-lb)



15) Install the gear shift rod and stay.
(1) Install the gear shift rod onto transmission.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

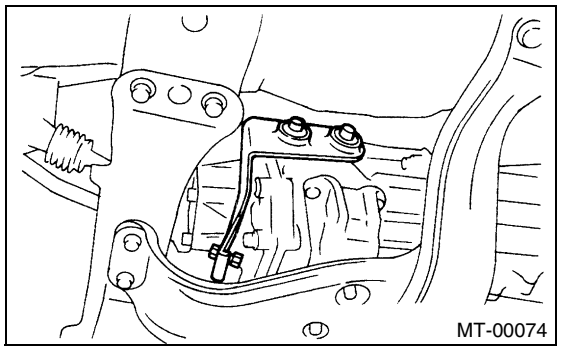


(A) Stay
(B) Rod

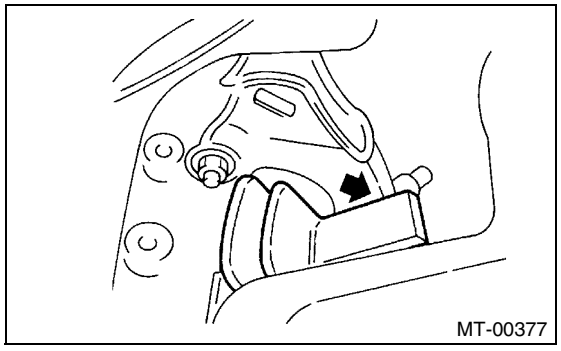
(2) Install the stay onto transmission.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

16) Install the propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>
17) Connect the cooler hose to oil pipe. (with oil pump)
18) Install the heat shield cover. (If equipped)
19) Install the hanger bracket on right side of transmission.



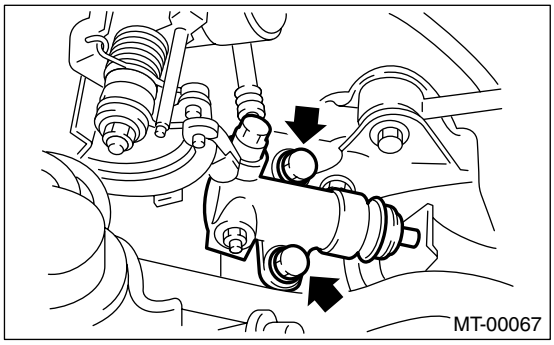
20) Install the rear exhaust pipe and muffler.
21) Install the front exhaust pipe and center exhaust pipe. (Non-turbo model) <Ref. to EX(SOHC)-8, INSTALLATION, Front Exhaust Pipe.>
22) Install the center exhaust pipe. (Turbo model) <Ref. to EX(TURBO)-8, INSTALLATION, Center Exhaust Pipe.>
23) Install the under cover.
24) Push clutch release lever to fit bearing into clutch cover.



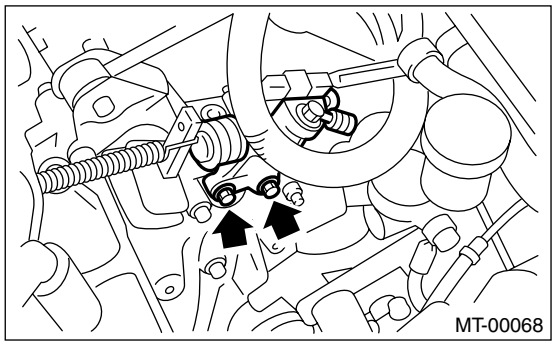
25) Install the operating cylinder.

Tightening torque:
37 N·m (3.8 kgf-m, 27.5 ft-lb)

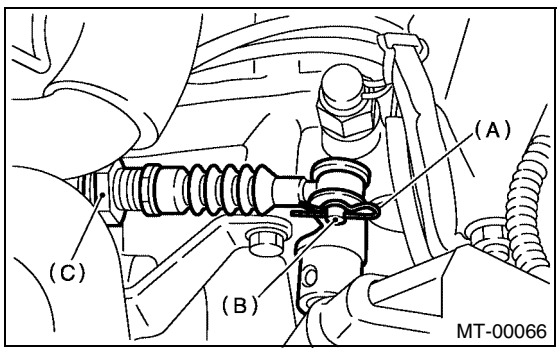
• NON-TURBO MODEL



• TURBO MODEL



26) Install the drive select cable on transmission. (Dual-range model)



(A) Snap pin
(B) Clevis pin
(C) Drive select cable

27) Connect the following connectors:
(1) Transmission ground cable

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

(2) Vehicle speed sensor connector
(3) Neutral position switch connector
(4) Back-up light switch connector
(5) High-low switch connector (Dual-range model)

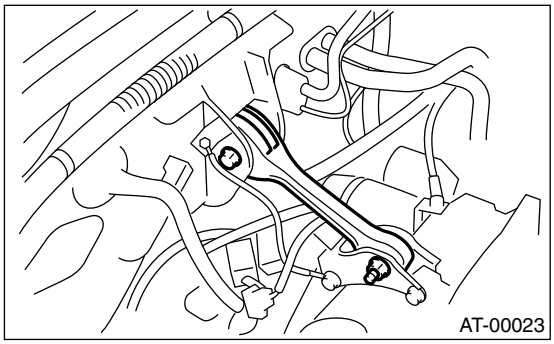
28) Install the air cleaner case stay.
29) Install the air cleaner case and duct. <Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.>
30) Install the intercooler.(TURBO MODEL) <Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>
31) Fill gear oil into the gauge hole.
<Ref. to MT-31, REPLACEMENT, Transmission Gear Oil.>
32) Connect the battery ground cable to battery.
33) Take off the vehicle from lift arms.

4. Transmission Mounting System

A: REMOVAL

1. PITCHING STOPPER

1) Disconnect the ground cable from battery.
2) Remove the air intake duct and cleaner case.
3) Remove the air intake duct (Non-turbo model). <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
4) Remove the air cleaner case (Non-turbo model). <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
5) Remove the intercooler (Turbo model). <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
6) Remove the pitching stopper.

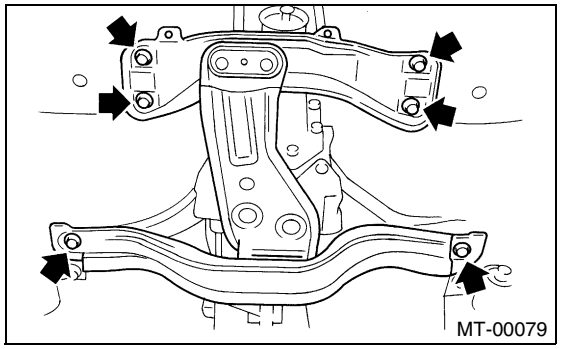


2. CROSSMEMBER AND CUSHION RUBBER

1) Disconnect the ground cable from battery.
2) Jack-up the vehicle and support it with sturdy racks.
3) Remove the front and center exhaust pipes. (Non-turbo model)
<Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.>
4) Remove the center exhaust pipe. (Turbo model) <Ref. to EX(TURBO)-7, REMOVAL, Center Exhaust Pipe.>
5) Remove the rear exhaust pipe and muffler.
6) Remove the heat shield cover. (If equipped)
7) Set the transmission jack under the transmission body.

CAUTION:
Always support the transmission case with a transmission jack.

8) Remove the rear crossmember.



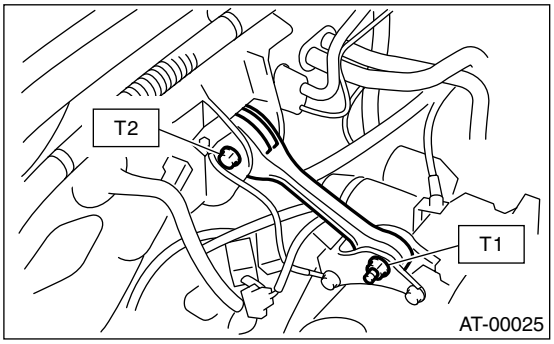
9) Remove the rear cushion rubber.

B: INSTALLATION

1. PITCHING STOPPER

1) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



2) Install the air intake duct and cleaner case. (Non-turbo model)
<Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.>
3) Install the intercooler. (Turbo model) <Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>
4) Connect the battery ground cable to battery.

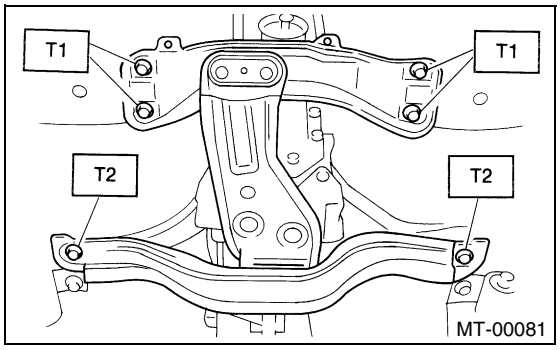
2. CROSSMEMBER AND CUSHION RUBBER

1) Install the rear cushion rubber.

Tightening torque:
35 N·m (3.6 kgf-m, 26 ft-lb)

2) Install the rear crossmember.

Tightening torque:
T1: 70 N·m (7.1 kgf-m, 51 ft-lb)
T2: 140 N·m (14.3 kgf-m, 103 ft-lb)



3) Remove the transmission jack.
4) Install the heat shield cover. (If equipped)
5) Install the front and center exhaust pipes. (Non-turbo model)
<Ref. to EX(SOHC)-8, INSTALLATION, Front Exhaust Pipe.>
6) Install the center exhaust pipe. (Turbo model) <Ref. to EX(TURBO)-8, INSTALLATION, Center Exhaust Pipe.>
7) Install the rear exhaust pipe and muffler.

C: INSPECTION

Repair or replace parts if the results of the inspection below are not satisfactory.

1. PITCHING STOPPER

Make sure that the pitching stopper is not bent or damaged. Make sure that the rubber is not stiff, cracked, or otherwise damaged.

2. CROSSMEMBER AND CUSHION RUBBER

Make sure that the crossmember is not bent or damaged. Make sure that the cushion rubber is not stiff, cracked, or otherwise damaged.

5. Oil Seal

A: INSPECTION

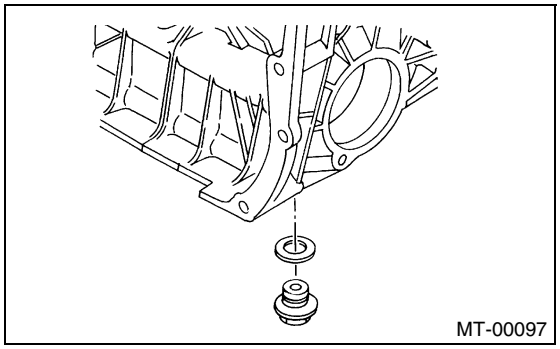
Check the oil seal portion for leakage. If leakage is found, replace the oil seal with a new one.

B: REPLACEMENT

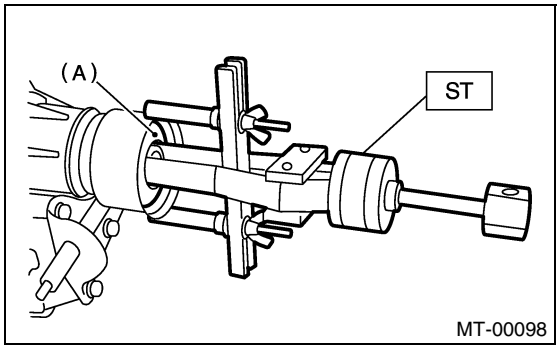
1) Clean the transmission exterior.
2) Drain the gear oil completely.
3) Tighten the drain plug after draining gear oil.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)

NOTE:
Use a new gasket.

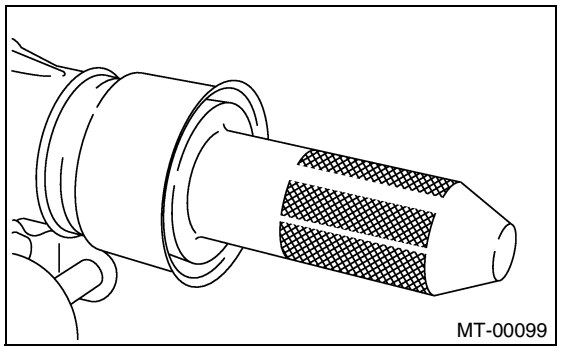


4) Remove the rear exhaust pipe and muffler.
5) Remove the heat shield cover. (If equipped)
6) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
7) Using the ST, remove the oil seal.
ST 398527700 PULLER ASSY



(A) Oil seal

8) Using the ST and hammer, install the oil seal.
ST 498057300 INSTALLER



9) Install the propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>
10) Install the heat shield cover.
11) Install the rear exhaust pipe and muffler.
12) Pour gear oil and check the oil level. <Ref. to MT-31, REPLACEMENT, Transmission Gear Oil.>

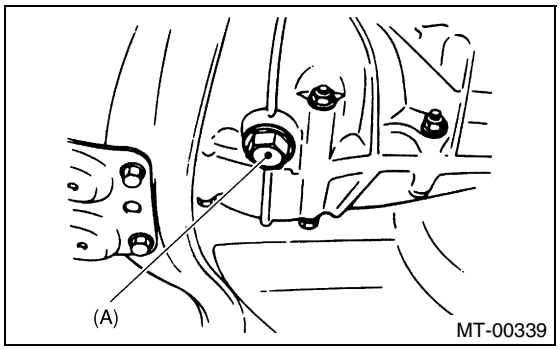
6. Differential Side Retainer Oil Seal

A: INSPECTION

Check the differential side retainer oil seal for leakage of gear oil. If oil leaks, replace the oil seal.

B: REPLACEMENT

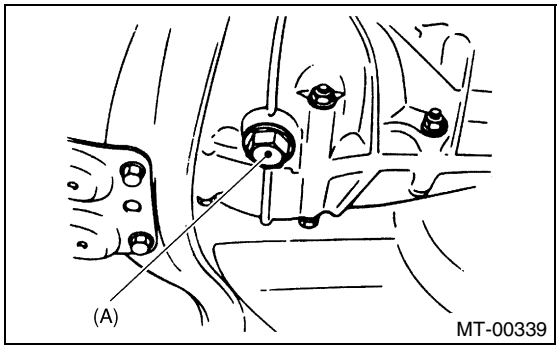
1) Lift-up the vehicle.
2) Drain the gear oil from oil drain plug.



(A) Drain plug

3) Replace the gasket with new one, and then tighten the differential oil drain plug.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)



(A) Drain plug

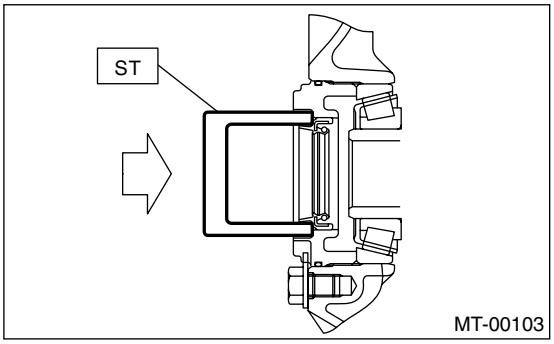
4) Remove the front and center exhaust pipe. (Non-turbo model) <Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.>
5) Separate the front drive shaft from transmission. <Ref. to DS-31, REMOVAL, Front Drive Shaft.>
6) Remove the differential side retainer oil seal.

NOTE:
• When pulling out the front drive shaft from transmission, always replace the differential side retainer oil seal.
• Differential side retainer oil seal can be pried off using a vinyl tape ,etc. wrapped flat tip screwdriver. However, make sure not to scratch the differential side retainer portion.

ST 398527700 Puller assembly can also be used for this operation.

7) Using the ST, install the differential side retainer oil seal tapping ST lightly with a hammer.
ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER

NOTE:
Be sure to apply oil to oil seal lip surface.



8) Install the front drive shaft. <Ref. to DS-32, INSTALLATION, Front Drive Shaft.>
ST 28399SA010 FRONT DRIVE SHAFT OIL SEAL PROTECTOR
9) Install the front and center exhaust pipe. (Non-turbo model) <Ref. to EX(SOHC)-8, INSTALLATION, Front Exhaust Pipe.>
10) Lower the vehicle.
11) Fill gear oil into the gauge hole. <Ref. to MT-31, REPLACEMENT, Transmission Gear Oil.>

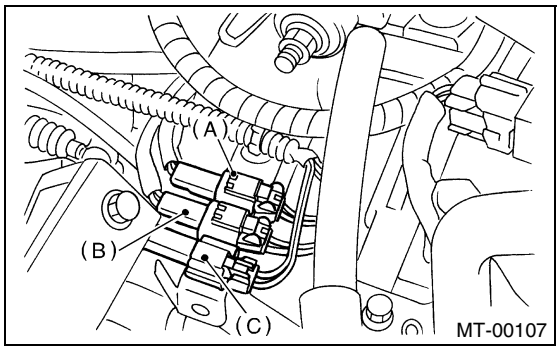
7. Switches and Harness

A: REMOVAL

1. BACK-UP LIGHT AND NEUTRAL POSITION SWITCH

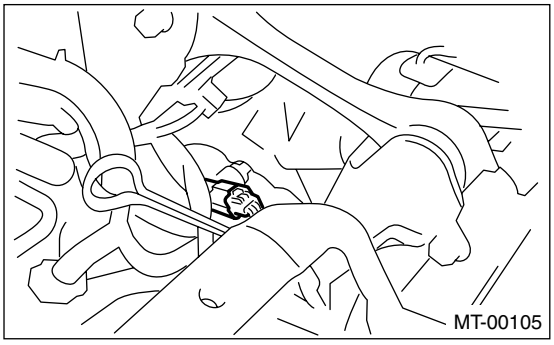
1) Disconnect the ground cable from battery.
2) Remove the air intake duct and cleaner case. (Non-turbo model) <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
3) Remove the intercooler (Turbo model). <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
4) Disconnect the connector of back-up light switch and neutral position switch.

- NON-TURBO MODEL

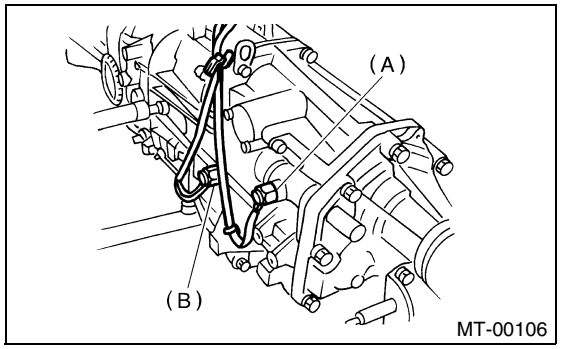


(A) Neutral switch (Brown)
(B) Back-up light switch (Gray)
(C) High-low switch (Black)

- TURBO MODEL



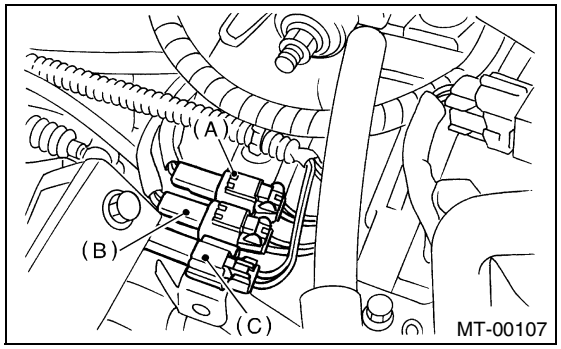
5) Lift-up the vehicle.
6) Remove the back-up light switch and neutral position switch with harness.



(A) Neutral switch (Brown connector)
(B) Back-up light switch (Gray connector)

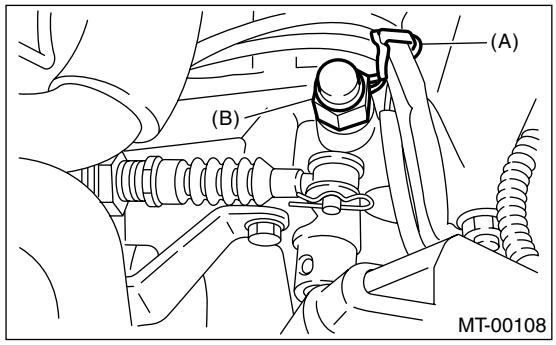
2. HIGH-LOW SWITCH

1) Disconnect the ground cable from battery.
2) Remove the air intake duct and cleaner case. <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
3) Disconnect the connector of high-low switch.



(A) Neutral switch (Brown)
(B) Back-up light switch (Gray)
(C) High-low switch (Black)

4) Remove the high-low switch cable from clamp.
5) Remove the high-low switch.



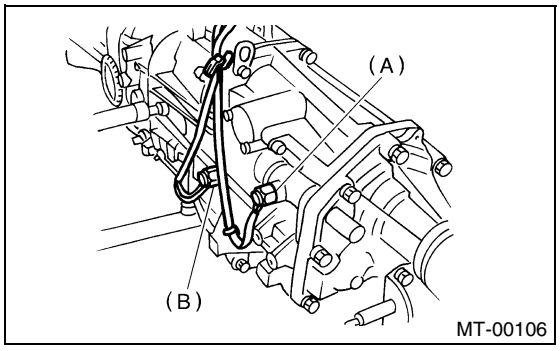
(A) Clamp
(B) High-low switch

B: INSTALLATION

1. BACK-UP LIGHT SWITCH AND NEUTRAL POSITION SWITCH

1) Install the back-up light switch and neutral position switch with harness.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Neutral switch
(B) Back-up light switch

2) Connect the connector of back-up light switch and neutral position switch.
3) Install the air intake duct and cleaner case. (Non-turbo model) <Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.>
4) Install the intercooler. (Turbo model)
<Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>
5) Connect the battery ground cable to battery.

2. HIGH-LOW SWITCH

1) Install the high-low switch.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

2) Install the high-low switch cable to clamp.
3) Connect the connector of high-low switch.
4) Install the air intake duct and cleaner case. <Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.>
5) Connect the battery ground cable to battery.

C: INSPECTION

1. BACK-UP LIGHT SWITCH

Inspect the back-up light switch. <Ref. to LI-7, INSPECTION, Back-up Light System.>

2. NEUTRAL POSITION SWITCH

1) Turn the ignition switch to OFF.
2) Disconnect the connector of neutral position switch.
3) Measure the resistance between neutral position switch terminals.

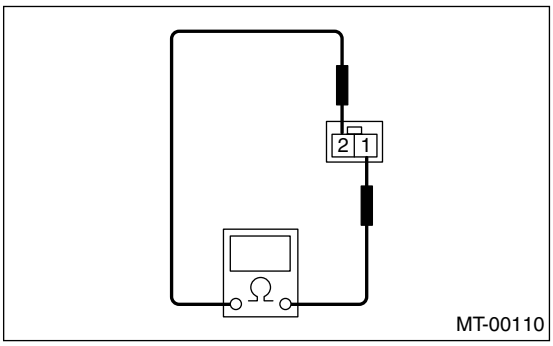
Non-turbo model:

Gear shift position	Terminal No.	Specified resistance
Neutral position	1 and 2	Less than 1 Ω
Other positions		More than 1 MΩ

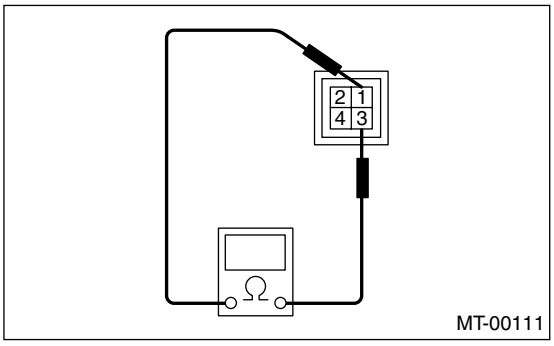
Turbo model:

Gear shift position	Terminal No.	Specified resistance
Neutral position	1 and 3	Less than 1 Ω
Other positions		More than 1 MΩ

- NON-TURBO MODEL



- TURBO MODEL

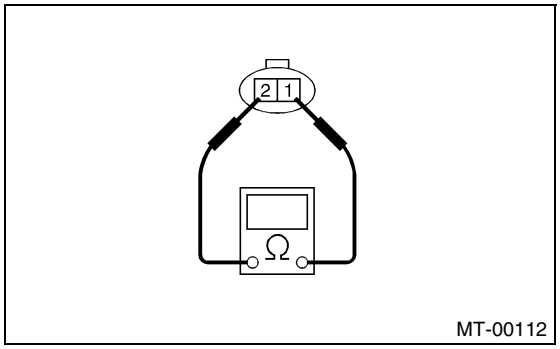


4) Replace the defective parts.

3. HIGH-LOW SWITCH

1) Turn the ignition switch to OFF.
2) Disconnect the connector high-low switch.
3) Measure the resistance between high-low switch terminals.

Gear shift position	Terminal No.	Specified resistance
LO position	1 and 2	Less than 1 Ω
HIGH position		More than 1 MΩ

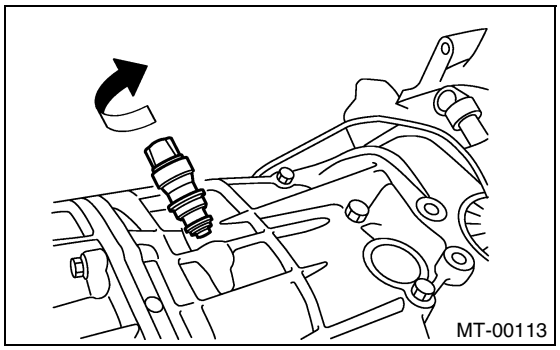


4) Replace the defective parts.

8. Vehicle Speed Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle.
3) Remove the front, center rear exhaust pipes and muffler.
4) Disconnect the connector from vehicle speed sensor.
5) Turn and remove the vehicle speed sensor.



B: INSTALLATION

NOTE:
• Discard the vehicle speed sensor and after removal, replace with a new one.
• Ensure the sensor mounting hole is clean and free of foreign matter.
• Align the tip end of key with key groove on end of speedometer shaft during installation.

1) Hand tighten the vehicle speed sensor.
2) Tighten the vehicle speed sensor using suitable tool.

Tightening torque:
5.9 N·m (0.6 kgf-m, 4.3 ft-lb)

3) Connect the connector to vehicle speed sensor.
4) Install the front, center exhaust pipes and muffler.
5) Lower the vehicle.
6) Connect the battery ground cable to battery.

C: INSPECTION

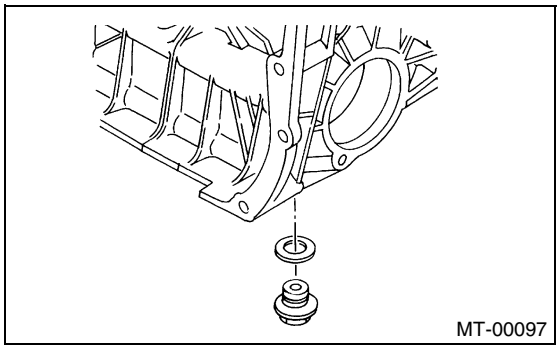
Inspect the vehicle speed sensor. <Ref. to IDI-6, CHECK VEHICLE SPEED SENSOR, INSPECTION, Combination Meter System.>

9. Preparation for Overhaul

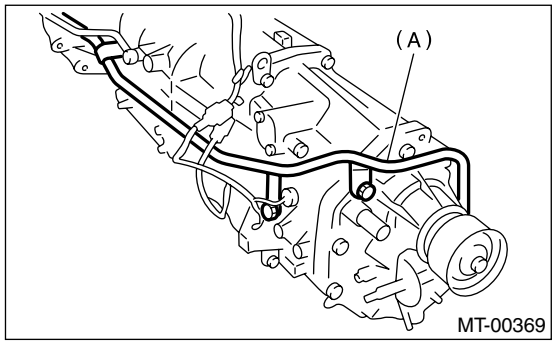
A: PROCEDURE

1) Clean oil, grease, dirt and dust from transmission.
2) Remove the drain plug to drain oil. After draining, retighten it as before.
3) Tighten the drain plug using new gasket.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)

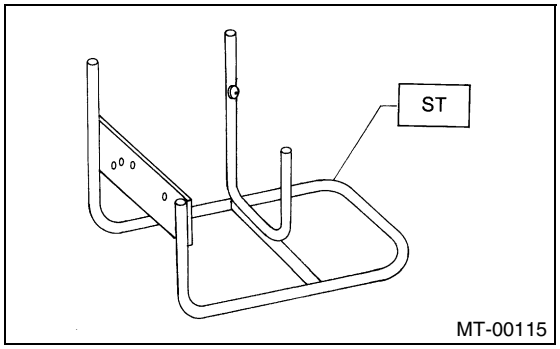


4) Remove the outlet pipe. (with oil pump)



(A) Outlet pipe

5) Attach the transmission to ST.
ST 499937100 TRANSMISSION STAND



6) Rotating parts should be coated with oil prior to assembly.
7) All disassembled parts, if to be reused, should be reinstalled in the original positions and directions.
8) Gaskets, lock washers and lock nut must be replaced with new ones.
9) Liquid gasket should be used where specified to prevent leakage.

10.Oil Pump

A: REMOVAL

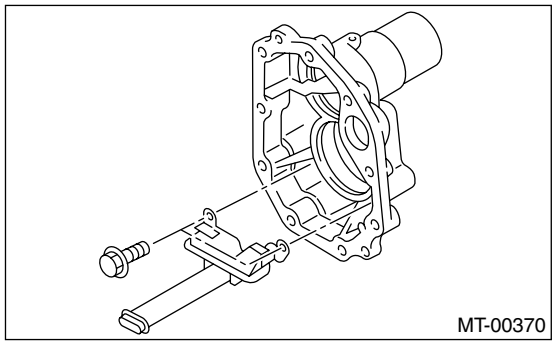
For extension case removal procedure, refer to “Transfer Case and Extension Case Assembly”. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>

B: INSTALLATION

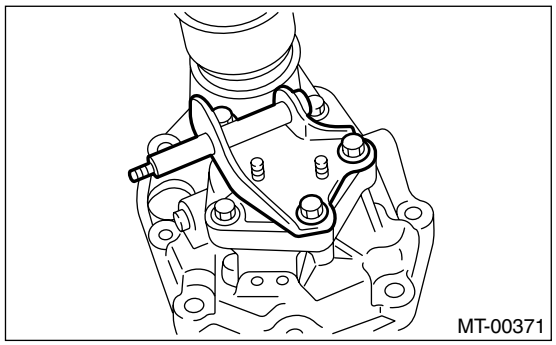
For extension case installation procedure, refer to “Transfer Case Pump and Extension Case Assembly”. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>

C: DISASSEMBLY

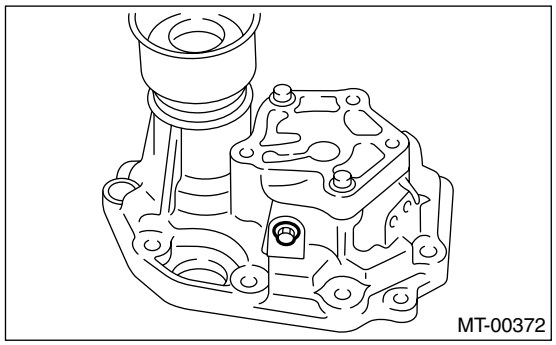
1) Remove the transfer drive gear assembly. <Ref. to MT-54, REMOVAL, Transfer Drive Gear.>
2) Remove the oil strainer from extension case.



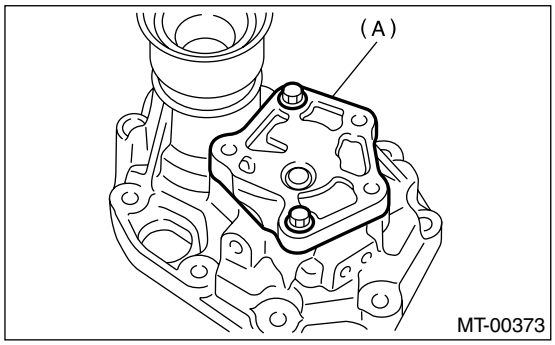
3) Remove the shift bracket.



4) Remove the relief valve from extension case.

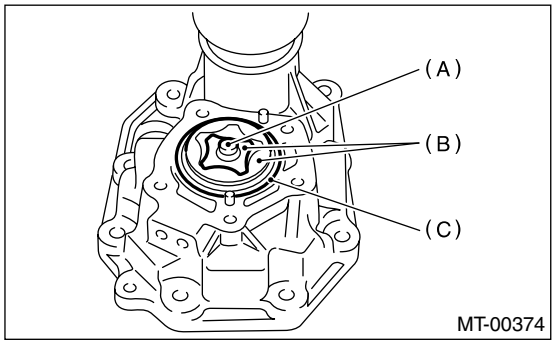


5) Remove the oil pump cover from extension.



(A) Oil pump cover

6) Remove the rotor assembly, oil pump shaft and O-ring.



(A) Oil pump shaft
(B) Rotor ASSY
(C) O-ring

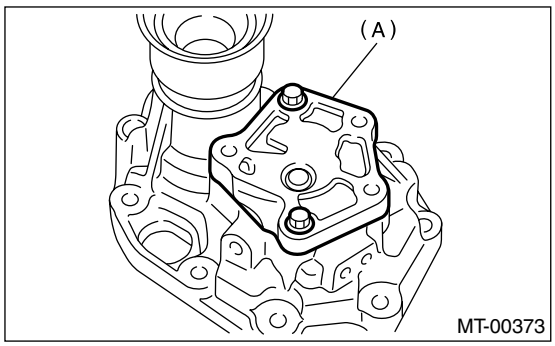
D: ASSEMBLY

1) Install the rotor assembly and oil pomp shaft to extension case.
2) Install a new O-ring to oil pump cover.

NOTE:
Apply a coat of gear oil to the O-ring.

3) Install the oil pump cover to extension case.

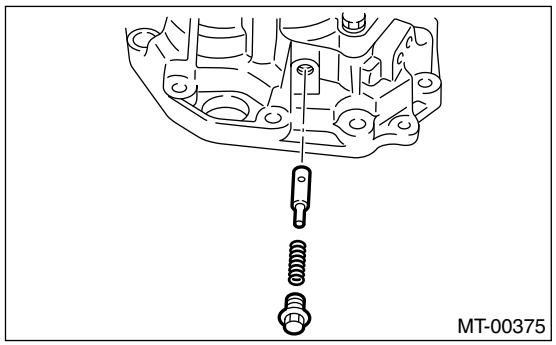
Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Oil pump cover

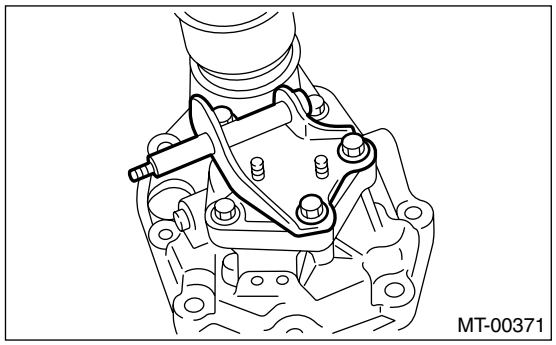
4) Install a new O-ring, relief valve and return spring to extension case.

Tightening torque:
12.75 N·m (1.3 kgf-m, 9.4 ft-lb)



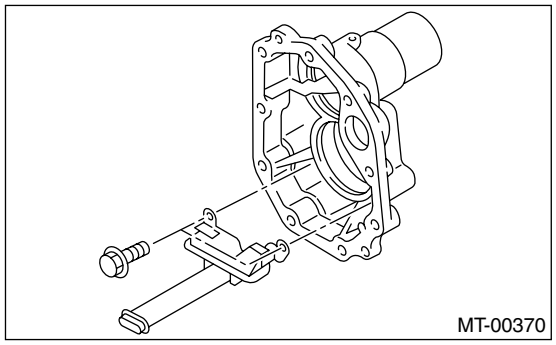
5) Install the shift bracket to extension case.

Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



6) Install the oil strainer to extension case.

Tightening torque:
26 N·m (2.7 kgf-m, 19 ft-lb)

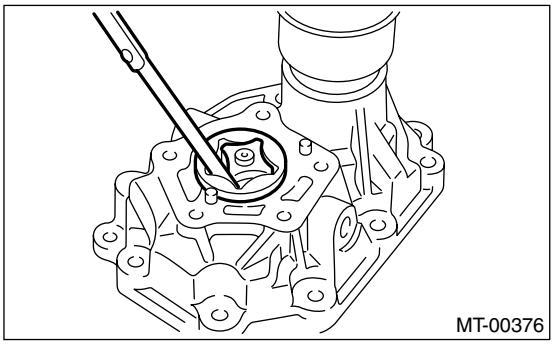


7) Install the transfer drive gear. <Ref. to MT-54, Installation.>

E: INSPECTION

Use a thickness gauge to measure the chip clearance of the rotor assembly. If the value exceeds standard, replace the rotor as an assembly.

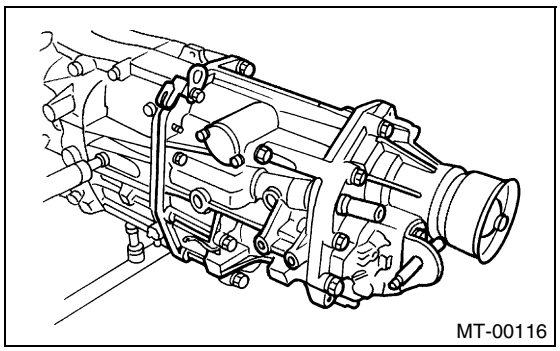
Chip clearance:
Less than 0.15 mm (0.0059 in)



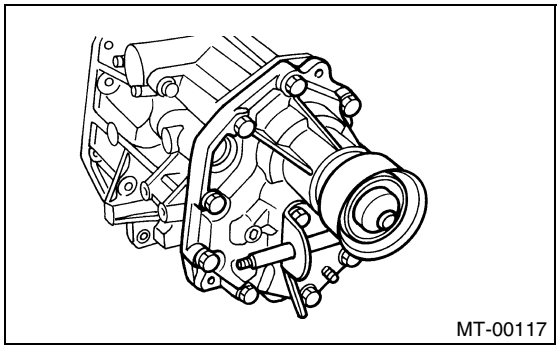
11.Transfer Case and Extension Case Assembly

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to MT-43, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly.

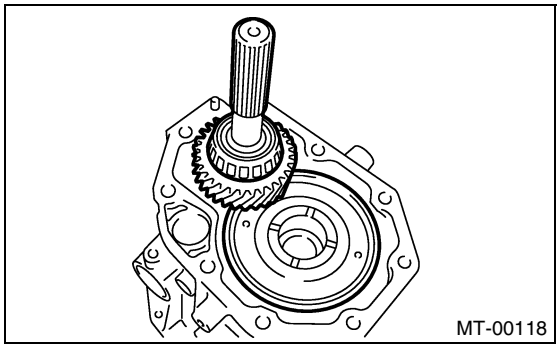

MT-00116

4) Remove the shifter arm.
5) Remove the extension case assembly.

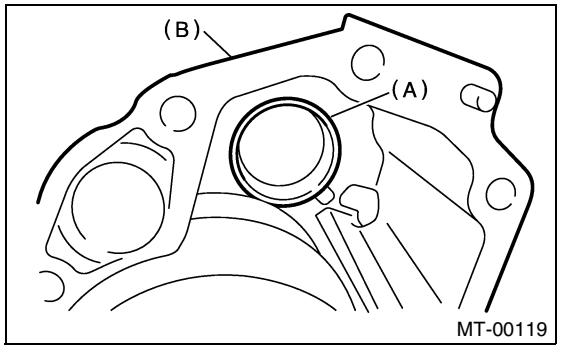

MT-00117

B: INSTALLATION

1) Install the center differential and transfer driven gear into transfer case.


MT-00118

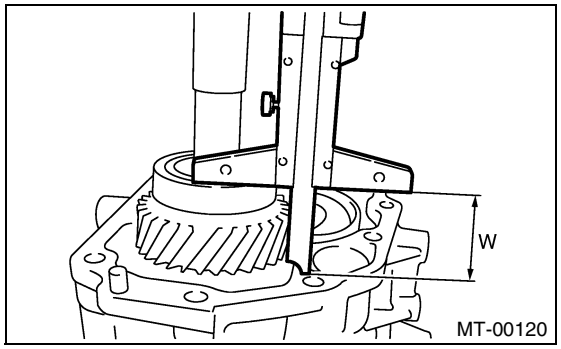
2) Remove the bearing cone from bearing of the transfer driven gear.



MT-00119

(A) Bearing cone (Extension case)
(B) Extension case

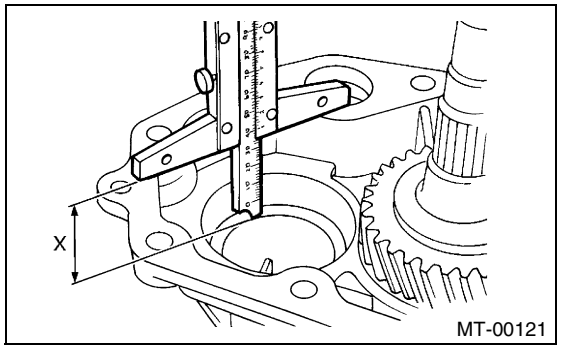
3) While pressing the bearing cone horizontally, turn the driven shaft ten rotations.
4) Measure the height “W” between transfer case and taper roller bearing on the transfer driven gear.



MT-00120

5) Measure the depth “X”.

NOTE:
Measure with bearing cone and thrust washer removed.



MT-00121

6) Calculate the space “t” using the following equation: t = X − W + 0.2 to 0.3 mm (0.008 to 0.012 in)

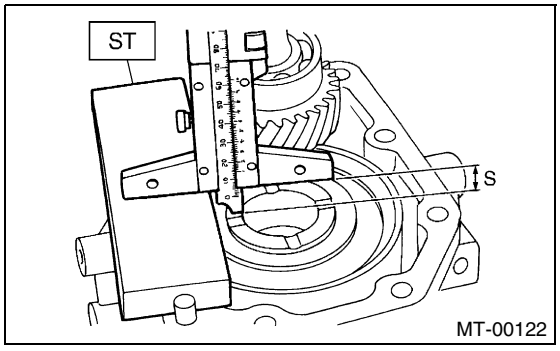
7) Select the nearest washer in the following table:

Standard clearance between thrust washer and taper roller bearing:
0.2 — 0.3 mm (0.008 — 0.012 in)

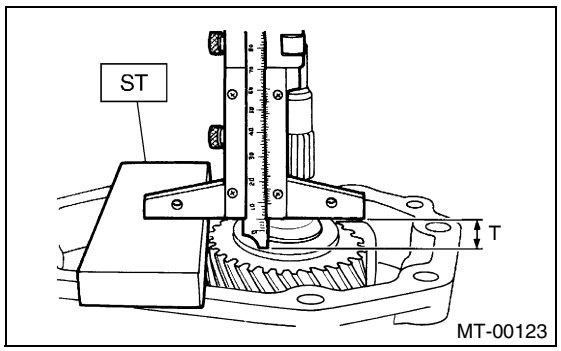
NOTE:
Ensure that the clearance is ranged within standard.

Thrust washer (50 × 61 × t)	
Part No.	Thickness mm (in)
803050060	0.50 (0.0197)
803050061	0.55 (0.0217)
803050062	0.60 (0.0236)
803050063	0.65 (0.0256)
803050064	0.70 (0.0276)
803050065	0.75 (0.0295)
803050066	0.80 (0.0315)
803050067	0.85 (0.0335)
803050068	0.90 (0.0354)
803050069	0.95 (0.0374)
803050070	1.00 (0.0394)
803050071	1.05 (0.0413)
803050072	1.10 (0.0433)
803050073	1.15 (0.0453)
803050074	1.20 (0.0472)
803050075	1.25 (0.0492)
803050076	1.30 (0.0512)
803050077	1.35 (0.0531)
803050078	1.40 (0.0551)
803050079	1.45 (0.0571)

8) Fit the thrust washers on transfer drive shaft.
9) Install the bearing cone into extension case.
10) Measure the depth “S” between transfer case and center differential.
ST 398643600 GAUGE



11) Measure the depth “T” between extension case and transfer drive gear.
ST 398643600 GAUGE



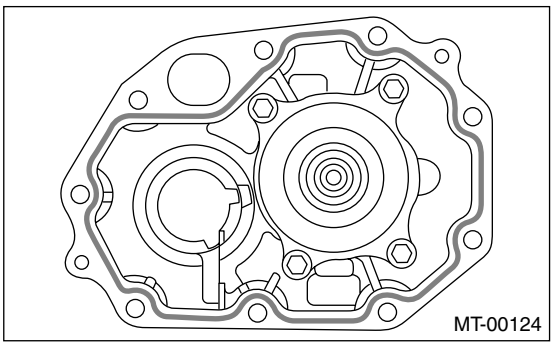
12) Calculate the space “U” using the following equation: U = S + T – 30 mm (1.18 in) [Thickness of ST]
13) Select the suitable washer in the following table:

Standard clearance:
0.15 — 0.35 mm (0.0059 — 0.0138 in)

Thrust washer	
Part No.	Thickness mm (in)
803036050	0.9 (0.035)
803036054	1.0 (0.039)
803036051	1.1 (0.043)
803036055	1.2 (0.047)
803036052	1.3 (0.051)
803036056	1.4 (0.055)
803036053	1.5 (0.059)
803036057	1.6 (0.063)
803036058	1.7 (0.067)

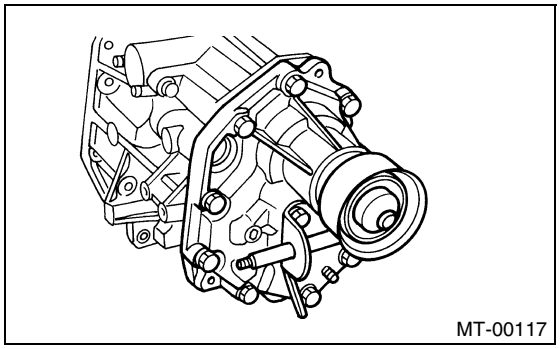
14) Fit the thrust washer on center differential.
15) Apply proper amount of liquid gasket to the transfer case mating surface.

Liquid gasket:
THREE BOND 1215 (Parts No. 004403007)

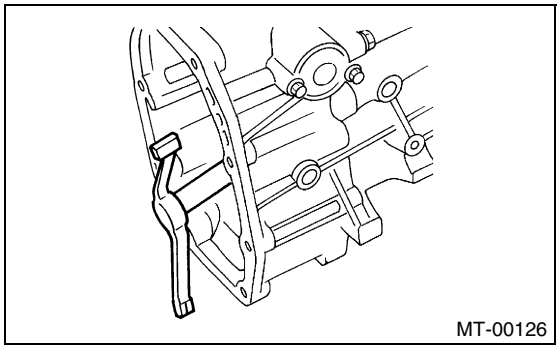


16) Install the extension assembly into transfer case.

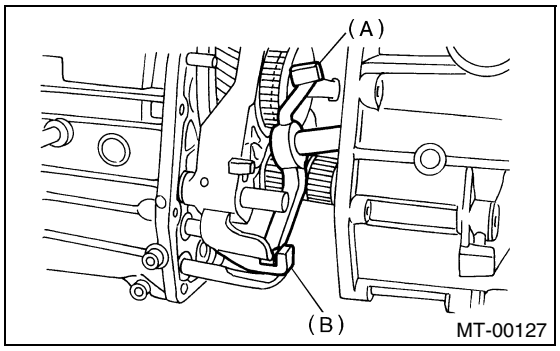
Tightening torque:
40 N·m (4.1 kgf-m, 30 ft-lb)


MT-00117

17) Install the shifter arm to transfer case.


MT-00126

18) Hang the shifter arm on 3rd-4th fork rod.

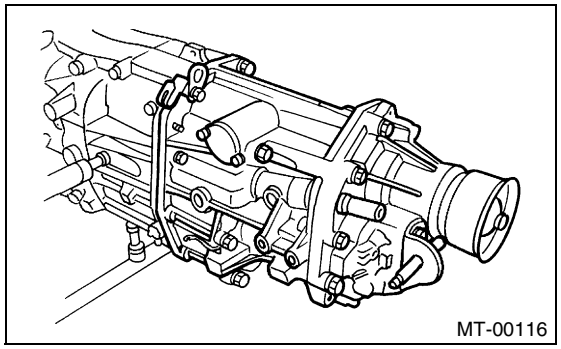


MT-00127

(A) Shifter arm
(B) 3rd-4th fork rod

19) Install the transfer case with extension case assembly to transmission case.

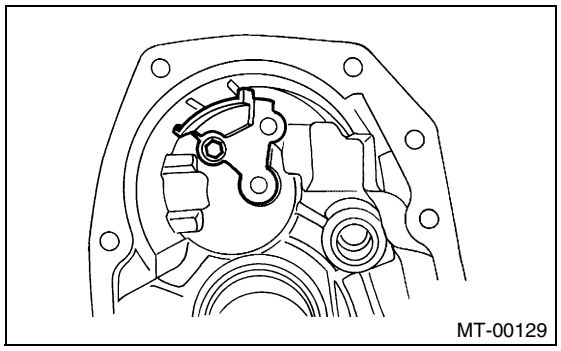
Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)


MT-00116

C: DISASSEMBLY

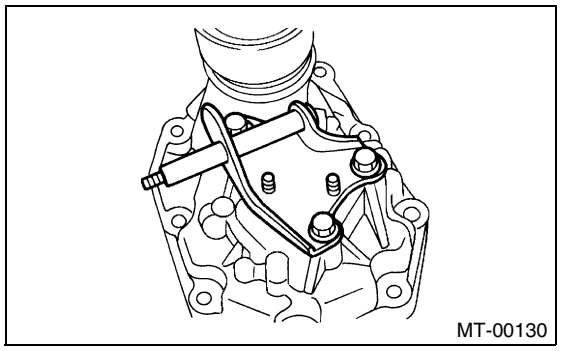
1. TRANSFER CASE

1) Remove the reverse check assembly. <Ref. to MT-59, REMOVAL, Reverse Check Sleeve.>
2) Remove the oil guide.


MT-00129

2. EXTENSION CASE

1) Remove the transfer drive gear assembly. <Ref. to MT-54, REMOVAL, Transfer Drive Gear.>
2) Remove the shift bracket.


MT-00130

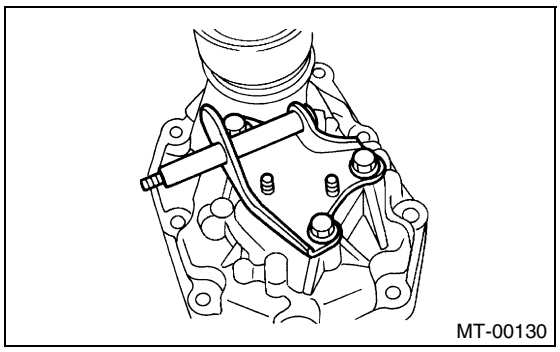
3) Remove the oil seal from extension case. <Ref. to MT-41, Oil Seal.>

D: ASSEMBLY

1. EXTENSION CASE

1) Using the ST, insert the new oil seal to extension case. <Ref. to MT-41, Oil Seal.>
2) Install the shift bracket to extension case.

Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)

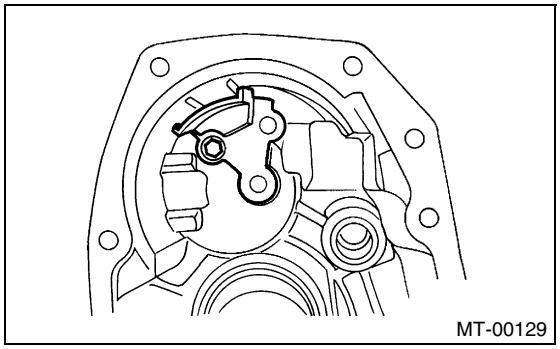

MT-00130

3) Install the transfer drive gear to extension case. <Ref. to MT-54, INSTALLATION, Transfer Drive Gear.>

2. TRANSFER CASE

1) Install the oil guide to transfer case.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

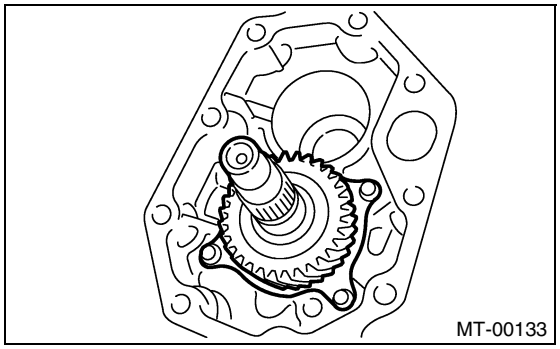

MT-00129

2) Install the reverse check sleeve assembly to transfer case. <Ref. to MT-59, INSTALLATION, Reverse Check Sleeve.>

12.Transfer Drive Gear

A: REMOVAL

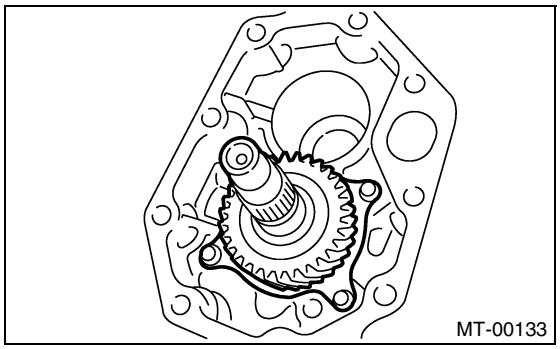
1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to MT-43, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the extension case assembly.
5) Remove the transfer driven gear.
6) Remove the transfer drive gear.



B: INSTALLATION

1) Install the transfer drive gear.

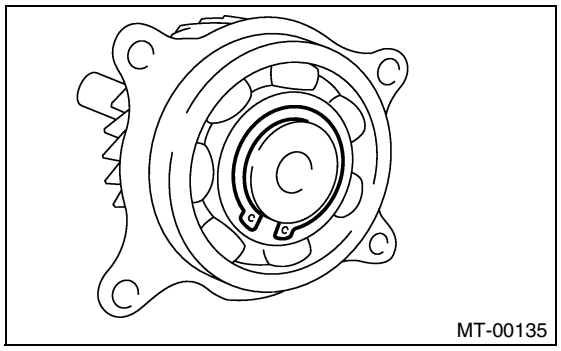
Tightening torque:
26 N·m (2.7 kgf-m, 20 ft-lb)



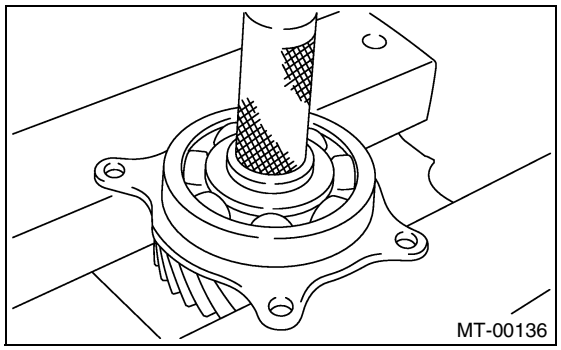
2) Install the transfer driven gear.
3) Install the extension case assembly.
4) Install the transfer case and extension case assembly. <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
5) Install the back-up light switch and neutral position switch. <Ref. to MT-44, INSTALLATION, Switches and Harness.>
6) Install the manual transmission assembly from vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

1) Remove the snap ring.



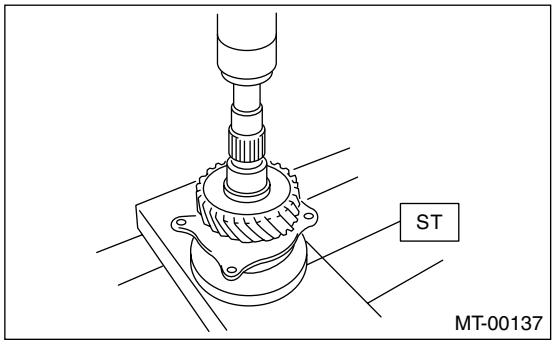
2) Remove the ball bearing.



D: ASSEMBLY

1) Set the ST applying to inner race of bearing and install to drive shaft.
ST 398177700 INSTALLER

NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton)



2) Install the snap ring on transfer drive shaft.
3) Check the clearance between snap ring and ball bearing. <Ref. to MT-55, INSPECTION, Transfer Drive Gear.>

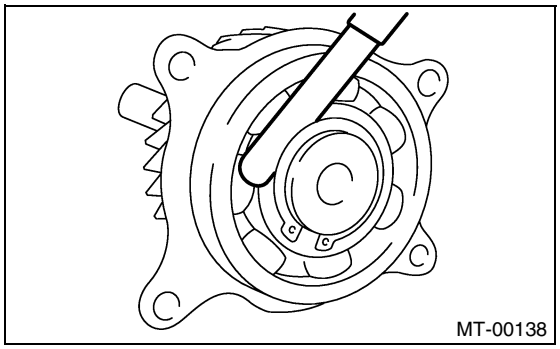
E: INSPECTION

1) Bearings
Replace the bearings in the following cases:
- Broken or rusty bearings
- Worn or damaged
- Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.

2) Drive gear
Replace the drive gear in the following cases:
- If their tooth surfaces and shaft are excessively broken or damaged.

3) Measure the clearance between snap ring and inner race of ball bearing with a thickness gauge.

Clearance:
0.01 — 0.15 mm (0.0004 — 0.0059 in)



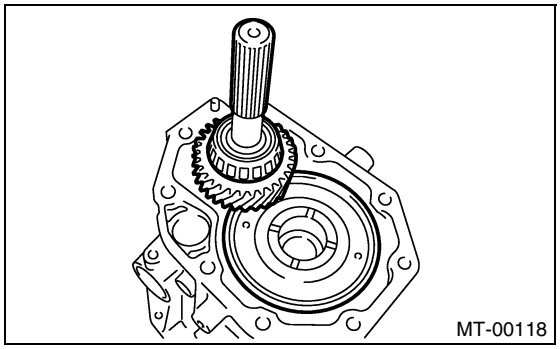
If the measurement is not within specification, select a suitable snap ring.

Snap ring (Outer-30)	
Part No.	Thickness mm (in)
805030041	1.53 (0.0602)
805030042	1.65 (0.0650)
805030043	1.77 (0.0697)

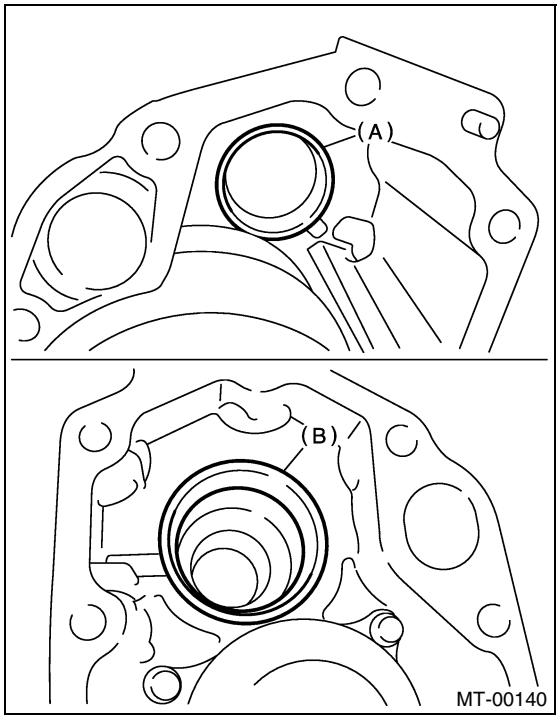
13.Transfer Driven Gear

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to MT-43, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the extension case assembly.
5) Remove the transfer driven gear.



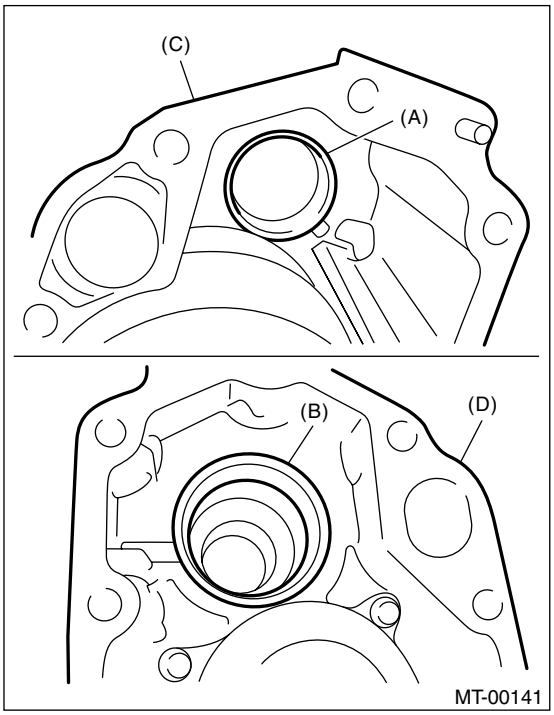
6) Remove the bearing outer race from extension case and transfer case.



(A) Bearing outer race (transfer case)
(B) Bearing outer race (extension case)

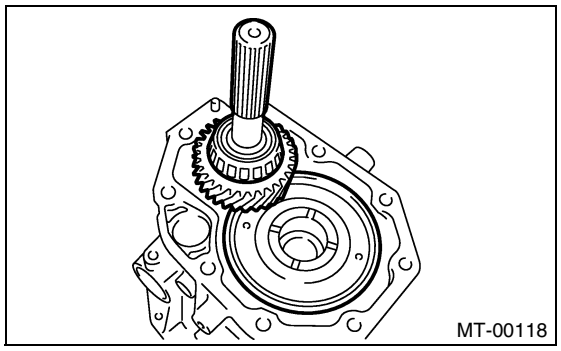
B: INSTALLATION

1) Install the bearing outer race to extension case and transfer case.



(A) Bearing outer race
(B) Bearing outer race
(C) Transfer case
(D) Extension case

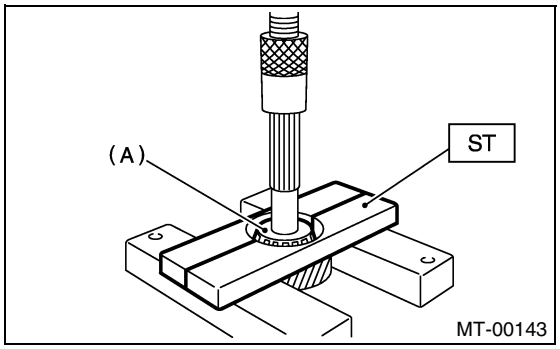
2) Install the transfer driven gear.



3) Install the transfer case and extension case assembly.<Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
4) Install the back-up light switch and neutral position switch. <Ref. to MT-44, INSTALLATION, Switches and Harness.>
5) Install the manual transmission assembly to vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

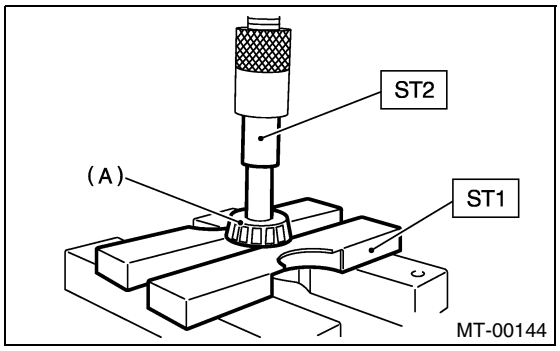
C: DISASSEMBLY

1) Using the ST, remove the roller bearing (extension case side).
ST 498077000 REMOVER



(A) Roller bearing

2) Using the ST1 and ST2, remove the roller bearing (transfer case side).
ST1 498077000 REMOVER
ST2 899864100 REMOVER

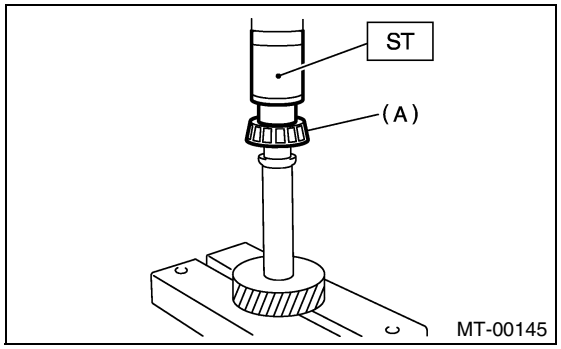


(A) Roller bearing

D: ASSEMBLY

1) Using the ST, install the roller bearing (extension case side).
ST1 398177700 INSTALLER
ST2 899864100 REMOVER

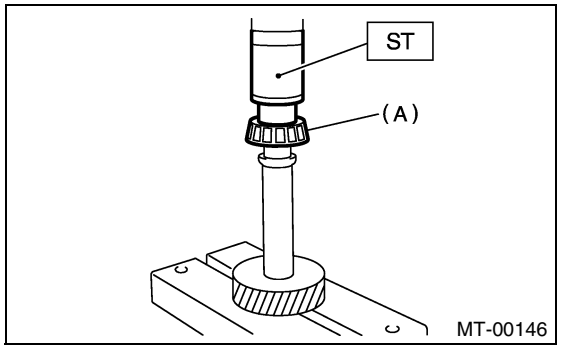
NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton)



(A) Roller bearing

2) Using the ST, install the roller bearing (transfer case side).
ST 499757002 INSTALLER

NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton)



(A) Roller bearing

E: INSPECTION

1) Bearings
Replace the bearings in the following cases:
- Broken or rusty bearings
- Worn or damaged
- Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.

2) Driven gear
Replace the drive gear in the following cases:
- If their tooth surfaces and shaft are excessively broken or damaged.

14.Center Differential

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly.<Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the extension case assembly. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the transfer driven gear. <Ref. to MT-56, REMOVAL, Transfer Driven Gear.>
5) Remove the center differential.

B: INSTALLATION

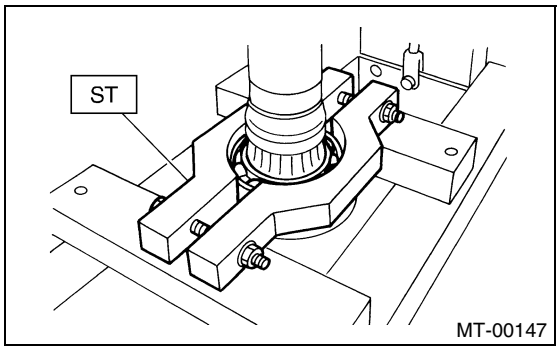
1) Install the center differential into transfer case.
2) Install the transfer driven gear. <Ref. to MT-56, INSTALLATION, Transfer Driven Gear.>
3) Install the extension case assembly. <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
4) Install the transfer case with extension case assembly. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
5) Install the back-up light switch and neutral position switch. <Ref. to MT-43, REMOVAL, Switches and Harness.>
6) Install the manual transmission assembly to vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

1) Remove the ball bearing using ST.

NOTE:
Do not reuse the ball bearing.

ST 498077300 CENTER DIFFERENTIAL BEARING REMOVER

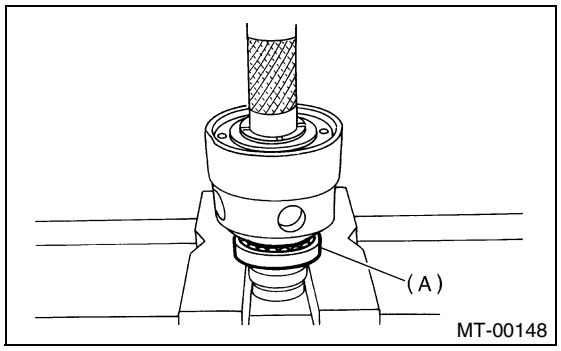


2) Do not disassemble the center differential except ball bearing part because it is a non-disassemble part.

D: ASSEMBLY

Install the ball bearing to center differential assembly.

NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).



(A) Ball bearing

E: INSPECTION

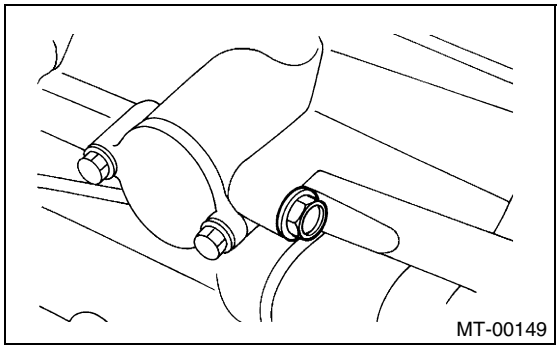
1) Bearings
Replace the bearings in the following cases:
- Broken or rusty bearings
- Worn or damaged
- Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.
- Bearings having other defects

2) Center differential
Replace the center differential assembly in the following case:
- Worn or damaged

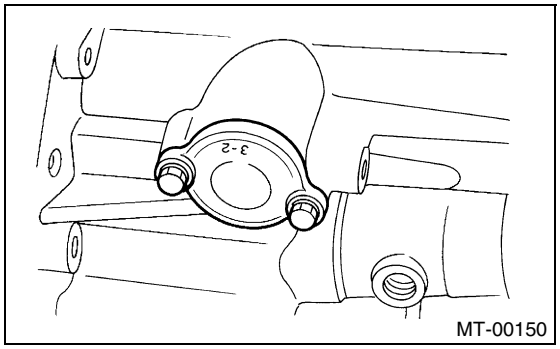
15.Reverse Check Sleeve

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the shifter arm.
4) Remove the plug, spring washer and reverse check ball.


MT-00149

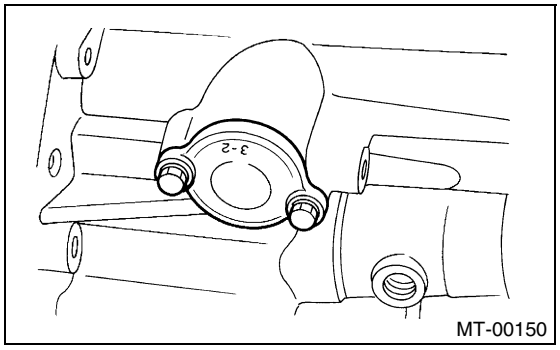
5) Remove the reverse check sleeve.


MT-00150

B: INSTALLATION

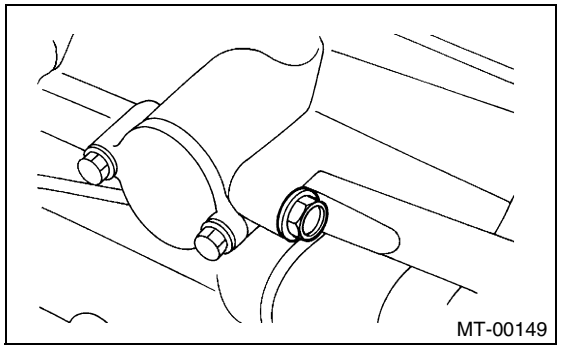
1) Install the reverse check sleeve.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)


MT-00150

2) Install the ball, spring, washer and plug to transfer case.

Tightening torque:
9.75 N·m (1.0 kgf-m, 7.2 ft-lb)

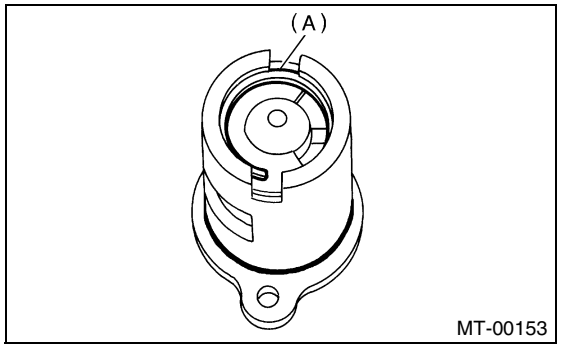

MT-00149

3) Install the shifter arm to transfer case assembly.
4) Install the transfer case with extension case assembly. <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
5) Install the manual transmission assembly to vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

1) Cover the reverse check sleeve with a rag, and remove the snap ring using a flat tip screwdriver.

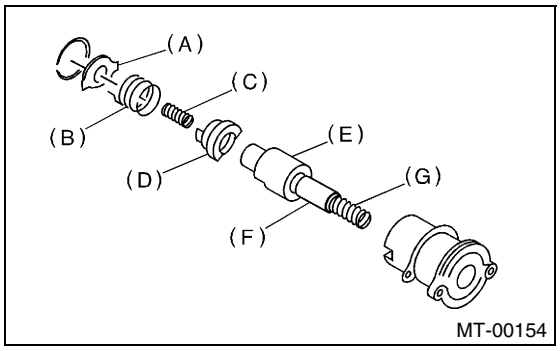
NOTE:
Replace the snap ring with a new one if deformed or weakened.



MT-00153

(A) Snap ring

2) Remove the reverse check plate, reverse check spring, reverse check cam, return spring (5th-Rev), reverse accent shaft, return spring cap and return spring (1st-2nd).



(A) Reverse check plate
(B) Reverse check spring
(C) Return spring (5th-Rev)
(D) Reverse check cam
(E) Reverse accent shaft
(F) Return spring cap
(G) Return spring (1st-2nd)

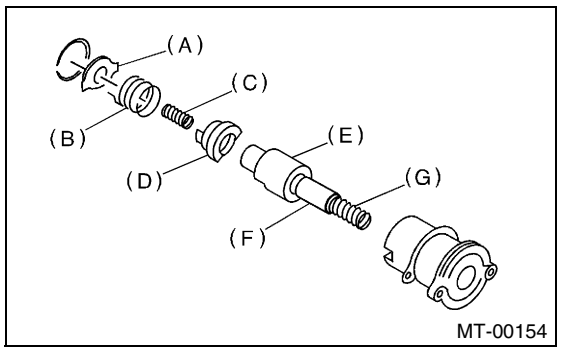
3) Remove the O-ring.

NOTE:
• Reverse check sleeve assembly uses an O-ring which should not be scratched.
• Be careful not to break the adjustment shim placed between reverse check sleeve assembly and case.

D: ASSEMBLY

1) Install the return spring (1st-2nd), return spring cap, reverse accent shaft, check cam, return spring and check spring onto reverse check sleeve.

NOTE:
Be sure the bent section of reverse check spring is positioned in the groove in check cam.

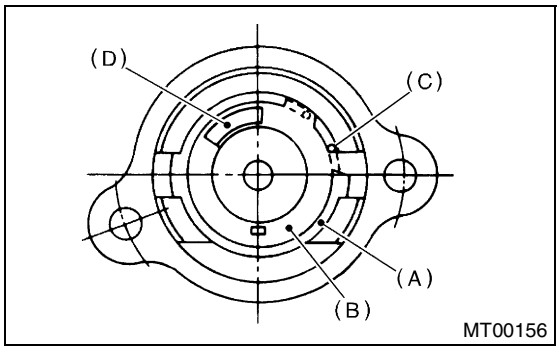


(A) Reverse check spring
(B) Reverse check cam
(C) Return spring (5th-Rev)
(D) Reverse accent shaft
(E) Return spring cap
(F) Return spring (1st-2nd)
(G) Reverse check sleeve

2) Hook the bent section of reverse check spring over reverse check plate.
3) Rotate the cam so that the protrusion of reverse check cam is at the opening in plate.
4) With the cam held in that position, install the plate onto reverse check sleeve and hold with snap ring.
5) Position a new O-ring in groove in sleeve.

E: INSPECTION

• Make sure the cutout section of reverse accent shaft is aligned with the opening in reverse check sleeve.
• Spin the cam by hand for smooth rotation.
• Move the cam and shaft all the way toward plate and release.
If the cam does not return properly, replace the reverse check spring; if shaft does not, check for scratches on the inner surface of sleeve. If sleeve is in good order, replace the spring.



(A) Snap ring
(B) Reverse check plate
(C) Check spring
(D) Check cam

• Select a suitable reverse accent shaft and reverse check plate.<Ref. to MT-61, ADJUSTMENT, Reverse Check Sleeve.>

F: ADJUSTMENT

1. NEUTRAL POSITION ADJUSTMENT

1) Shift the gear into 3rd gear position.
2) Shifter arm turns lightly toward the 1st/2nd gear side but heavily toward the reverse gear side because of the function of return spring, until arm contacts the stopper.
3) Make adjustment so that the heavy stroke (reverse side) is a little more than the light stroke (1st/2nd side).
4) To adjust, remove the bolts holding reverse check sleeve assembly to the case, move the sleeve assembly outward, and place adjustment shim (0 to 1 ea.) between sleeve assembly and case to adjust the clearance.
5) Be careful not to break the O-ring when placing shim(s).

NOTE:
• When the shim is removed, the neutral position will move closer to reverse; when shim is added, the neutral position will move closer to 1st gear.
• If the shims alone cannot adjust clearance, replace the reverse accent shaft and re-adjust.

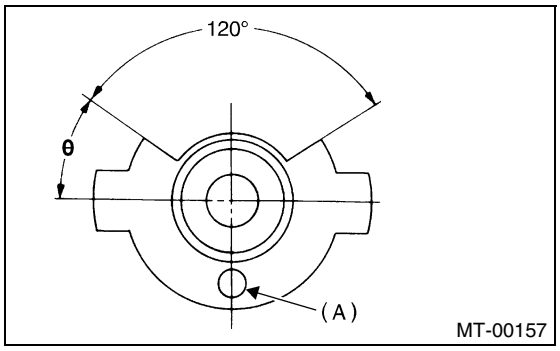
Adjustment shim	
Part No.	Thickness mm (in)
32190AA000	0.15 (0.0059)
32190AA010	0.30 (0.0118)

Reverse accent shaft		
Part No.	Mark	Remarks
32188AA090	3	Neutral position is closer to 1st gear.
32188AA100	0	Standard
32188AA110	1	Neutral position is closer to reverse gear.

2. REVERSE CHECK PLATE ADJUSTMENT

1) Shift the shifter arm to “5th” and then to reverse to see if reverse check mechanism operates properly.
2) Also check to see if the arm returns to neutral when released from reverse position. If the arm does not return properly, replace the reverse check plate.

Reverse check plate			
Part No.	(A): No.	Angle θ	Remarks
32189AA000	0	28°	Arm stops closer to 5th gear.
32189AA010	1	31°	Arm stops closer to 5th gear.
32189AA020	2	34°	Arm stops in the center.
32189AA030	3	37°	Arm stops closer to reverse gear.
32189AA040	4	40°	Arm stops closer to reverse gear.

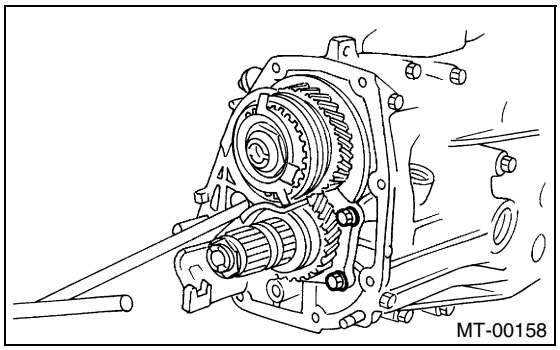


16.Transmission Case

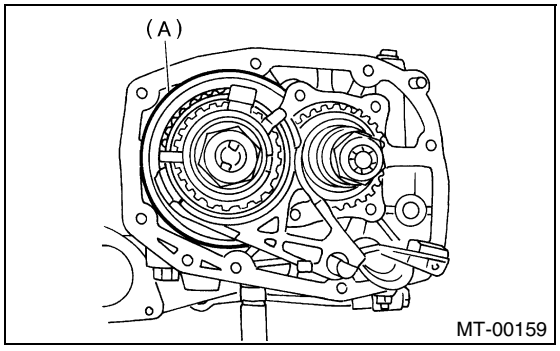
A: REMOVAL

1. SINGLE-RANGE

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the clutch release lever. <Ref. to CL-23, REMOVAL, Release Bearing and Lever.>
3) Remove the transfer case with extension case assembly. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the bearing mounting bolts.


MT-00158

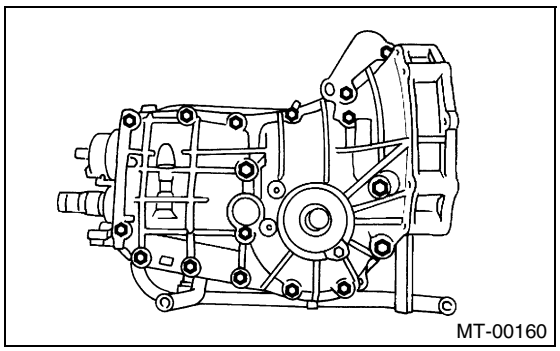
5) Remove the main shaft rear plate.



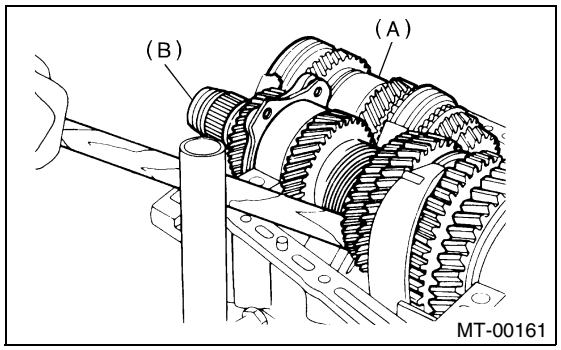
MT-00159

(A) Main shaft rear plate

6) Separate the transmission case into right and left cases by loosening the coupling bolts and nuts.


MT-00160

7) Using a hammer handle, etc. remove the drive pinion shaft assembly from left side transmission case, and then remove the main shaft assembly.

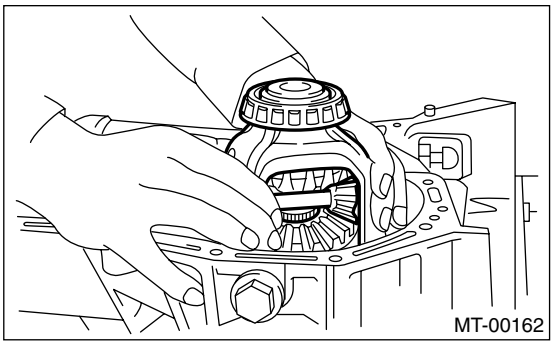


MT-00161

(A) Main shaft ASSY
(B) Drive pinion shaft ASSY

8) Remove the differential assembly.

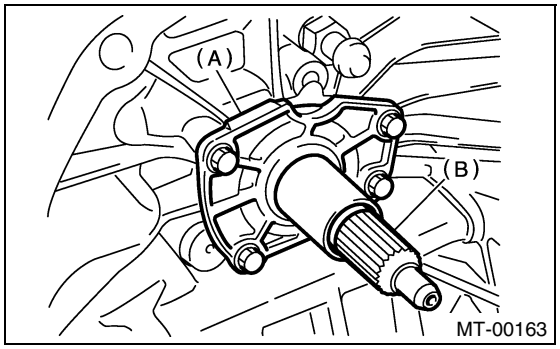
NOTE:
• Be careful not to confuse the right and left roller bearing outer races.
• Be careful not to damage the retainer oil seal.


MT-00162

2. DUAL-RANGE

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the clutch release lever. <Ref. to CL-23, REMOVAL, Release Bearing and Lever.>
3) Remove the transfer case with extension case assembly. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>

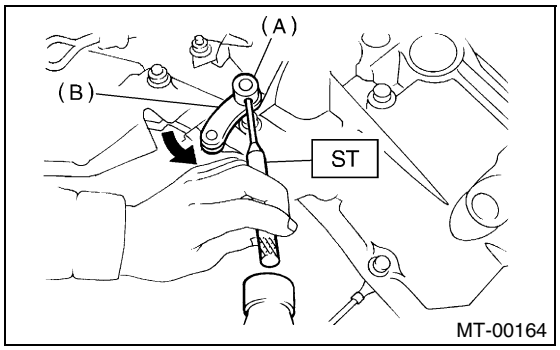
4) Remove the input shaft holder.



(A) Input shaft holder
(B) Input shaft

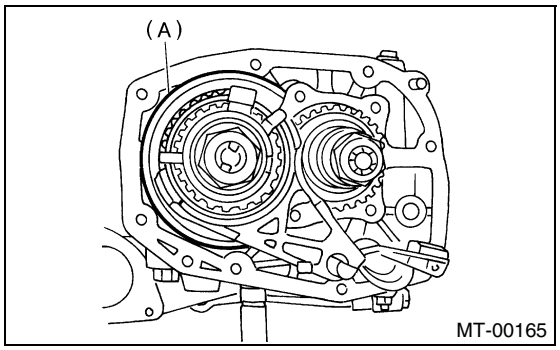
5) Remove the high-low switch. <Ref. to MT-43, REMOVAL, Switches and Harness.>
6) Using the ST, drive out the straight pin, and remove high-low shifter lever.
ST 398791700 STRAIGHT PIN REMOVER 2

NOTE:
When driving out the straight pin, remove it in the direction that it does not butt against transmission case.



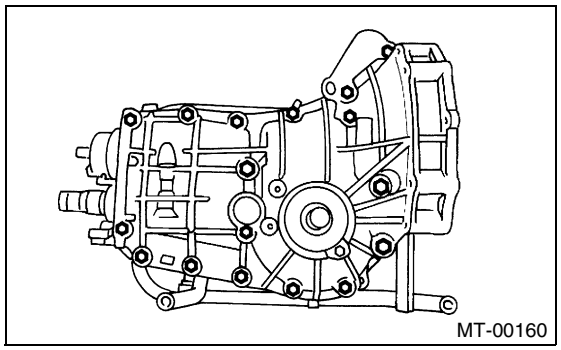
(A) Straight pin
(B) High-low shifter lever

7) Remove the main shaft rear plate.

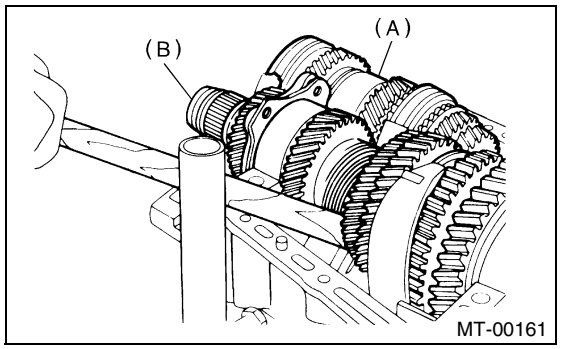


(A) Main shaft rear plate

8) Separate the transmission case into right and left cases by loosening the seventeen coupling bolts and nuts.



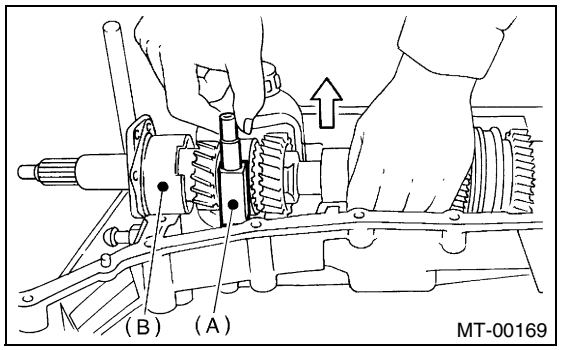
9) Using a hammer handle, etc. remove the drive pinion shaft assembly from left side transmission case, and then remove the main shaft assembly.



(A) Main shaft ASSY
(B) Drive pinion shaft ASSY

10) Removing high-low shifter fork:
Remove the high-low shifter fork together with high-low shifter shaft and washer.

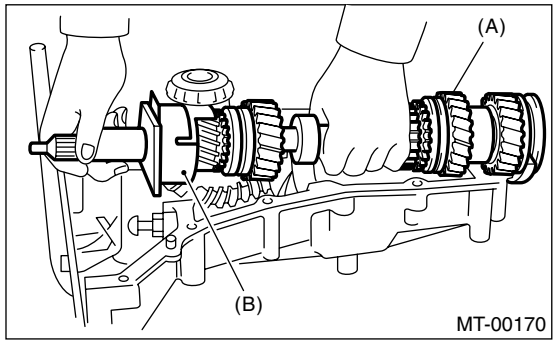
NOTE:
Be careful not to drop the two high-low shifter pieces.



(A) High-low shifter fork
(B) Input shaft ASSY

11) Remove the main shaft assembly and input shaft assembly.

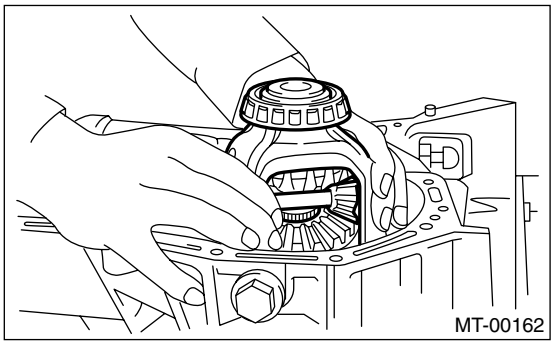
NOTE:
Be careful not to drop the input shaft and main shaft as they are separable.



(A) Main shaft ASSY
(B) Input shaft ASSY

12) Remove the differential assembly.

NOTE:
• Be careful not to confuse the right and left roller bearing outer races.
• Be careful not to damage the retainer oil seal.



B: INSTALLATION

1. SINGLE-RANGE

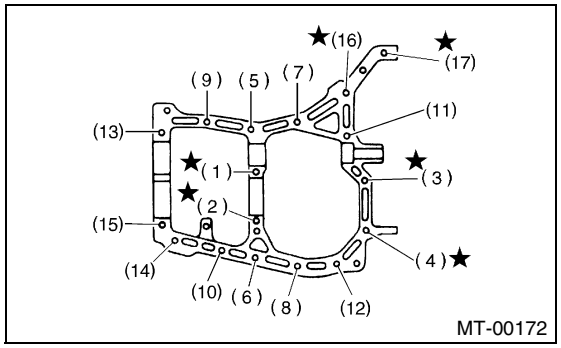
1) Wipe off grease, oil and dust on the mating surfaces of transmission cases with white gasoline.
2) Install the front differential assembly.
3) Install the main shaft assembly.
Install the needle bearing knock pin hole into transmission case knock pin.
4) Install the drive pinion shaft assembly.
Install the roller bearing knock pin hole into transmission case knock pin.
5) Apply liquid gasket, and then put the case right side and left side together.

Liquid gasket:
THREE BOND 1215 (Parts No. 004403007) or equivalent

6) Tighten the seventeen bolts with bracket, clip, etc. as shown in the figure.

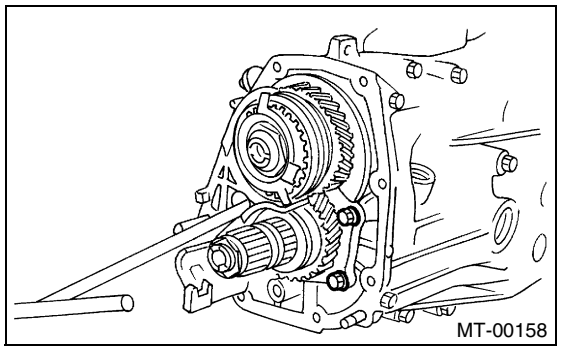
NOTE:
• Insert the bolts from bottom and tighten the nuts at top.
• Put the cases together so that drive pinion shim and input shaft holder shim are not caught up in between.
• Confirm that the speedometer gear is meshed.

Tightening torque:
8 mm bolt
25 N·m (2.5 kgf-m, 18.1 ft-lb)
★ 10 mm bolt
39 N·m (4.0 kgf-m, 28.9 ft-lb)

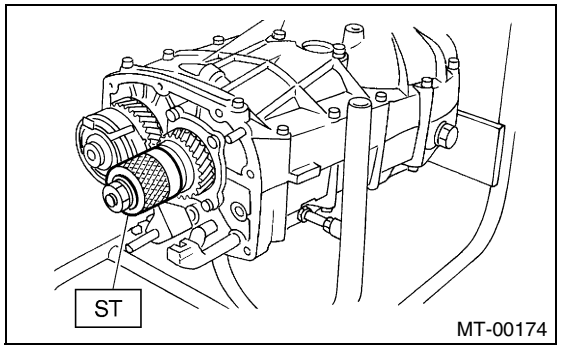


7) Tighten the ball bearing attachment bolts.

Tightening torque:
29 N·m (3.0 kgf-m, 21.7 ft-lb)

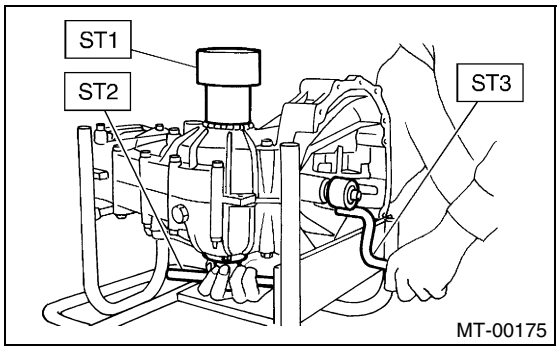


8) Using the ST, support the drive pinion assembly, and then adjust the backlash of hypoid gear and measure preload of roller bearing.
ST 498427100 STOPPER



9) Place the transmission with case left side facing downward and put ST1 on bearing cup.
10) Screw the retainer assembly into left case from the bottom with ST2. Fit the ST3 on transmission main shaft. Shift the gear into 4th or 5th and turn the shaft several times. Screw in the retainer while turning ST3 until a slight resistance is felt on ST2. This is the contact point of hypoid gear and drive pinion shaft. Repeat the above sequence several times to ensure the contact point.

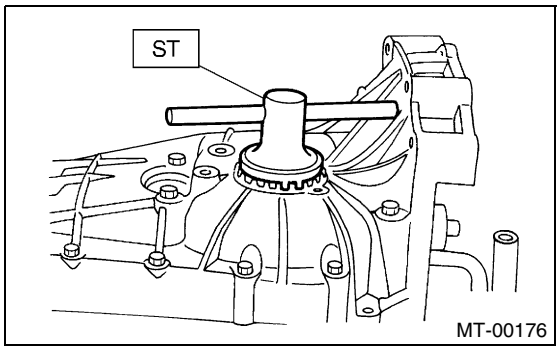
ST1 399780104 WEIGHT
ST2 499787000 WRENCH ASSY
ST3 499927100 HANDLE



11) Remove the weight and screw in the retainer without O-ring on upper side and stop at the point where slight resistance is felt.

NOTE:
At this point, the backlash between hypoid gear and drive pinion shaft is zero.

ST 499787000 WRENCH ASSY



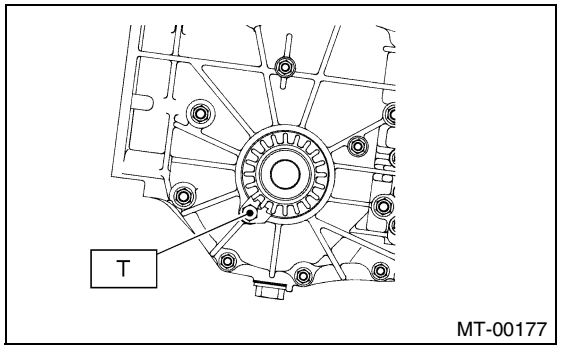
12) Fit the lock plate. Loosen the retainer on the lower side by 1-1/2 notches of lock plate and turn in the retainer on upper side by the same amount in order to obtain the backlash.

NOTE:
The notch on the lock plate moves by 1/2 notch if the plate is turned upside down.

13) Turn in the retainer on the upper side additionally by 1 notch in order to apply preload on taper roller bearing.
14) Tighten temporarily both the upper and lower lock plates and mark both holder and lock plate for later readjustment.
15) Turn the transmission main shaft several times while tapping around the retainer lightly with plastic hammer.
16) Inspect and adjust the backlash and tooth contact of hypoid gear. <Ref. to MT-98, INSPECTION, Front Differential Assembly.>
17) After checking the tooth contact of hypoid gears, remove the lock plate. Then loosen the retainer until the O-ring groove appears. Fit the O-ring into groove and tighten the retainer into the position where retainer has been tightened in.
Tighten the lock plate.

NOTE:
Carry out this job on both upper and lower retainers.

Tightening torque:
T: 25 N·m (2.5 kgf-m, 18.1 ft-lb)



18) Selecting of main shaft rear plate. <Ref. to MT-76, ADJUSTMENT, Main Shaft Assembly (Single-Range).>
19) Install the clutch release lever and bearing. <Ref. to CL-23, INSTALLATION, Release Bearing and Lever.>
20) Install the transfer case with extension case assembly. <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
21) Install the manual transmission assembly into the vehicle.<Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

2. DUAL-RANGE

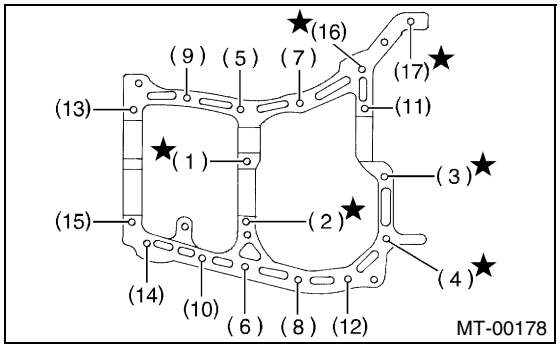
1) Wipe off grease, oil and dust on the mating surfaces of transmission cases with white gasoline.
2) Install the front differential assembly.
3) Install the main shaft assembly and input shaft assembly.
Connect the main shaft assembly and input the shaft assembly, and install needle bearing knock pin hole into transmission case knock pin.
4) Install the drive pinion shaft assembly.
Install the roller bearing knock pin hole into transmission case knock pin.
5) Apply liquid gasket, and then put the case right side and left side together.

Liquid gasket:
THREE BOND 1215 (Parts No. 004403007) or equivalent

6) Tighten the seventeen bolts with bracket, clip, etc. as shown in the figure.

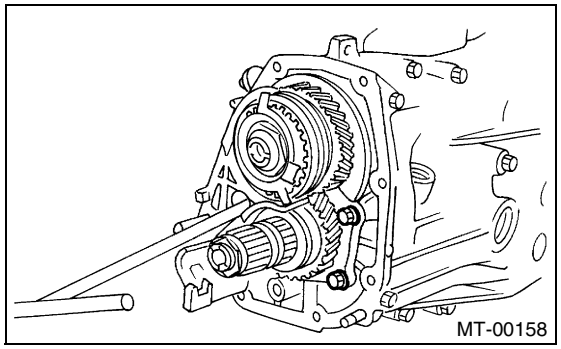
NOTE:
• Insert the bolts from bottom and tighten the nuts at top.
• Put the cases together so that the drive pinion shim and input shaft holder shim are not caught up in between.
• Confirm that the speedometer gear is meshed.

Tightening torque:
8 mm bolt
25 N·m (2.5 kgf-m, 18.1 ft-lb)
★ 10 mm bolt
39 N·m (4.0 kgf-m, 28.9 ft-lb)



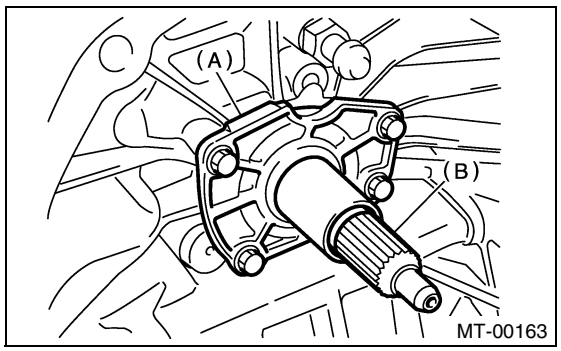
7) Tighten the ball bearing attachment bolts.

Tightening torque:
30 N·m (2.9 kgf-m, 21.0 ft-lb)



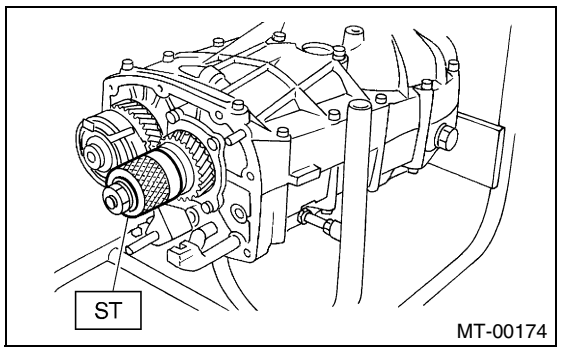
8) Tighten the input shaft holder attaching bolts.

Tightening torque:
20 N·m (2.0 kgf-m, 14.5 ft-lb)



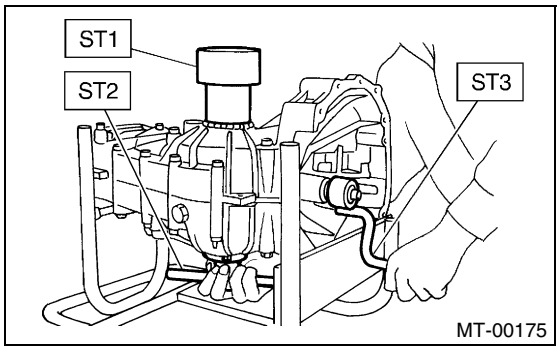
(A) Input shaft holder
(B) Input shaft

9) Using the ST, support the drive pinion assembly, and then adjust the backlash of hypoid gear and measure preload of roller bearing.
ST 498427100 STOPPER



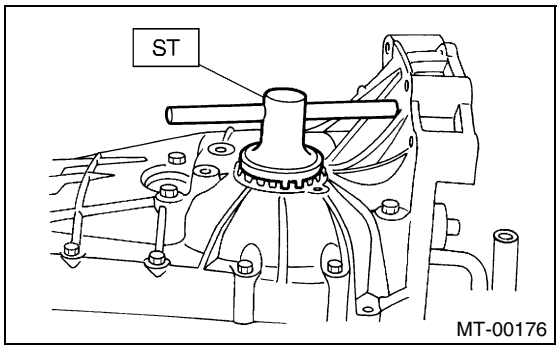
10) Place the transmission with case left side facing downward and put ST1 on bearing cup.
11) Screw the retainer assembly into left case from the bottom with ST2. Fit the ST3 on transmission main shaft. Shift the gear into 4th or 5th and turn the shaft several times. Screw in the retainer while turning ST3 until a slight resistance is felt on ST2.

This is the contact point of hypoid gear and drive pinion shaft. Repeat the above sequence several times to ensure the contact point.
ST1 399780104 WEIGHT
ST2 499787000 WRENCH ASSY
ST3 499927100 HANDLE



12) Remove the weight and screw in the retainer without O-ring on upper side and stop at the point where slight resistance is felt.

NOTE:
At this point, the backlash between hypoid gear and drive pinion shaft is zero.
ST 499787000 WRENCH ASSY



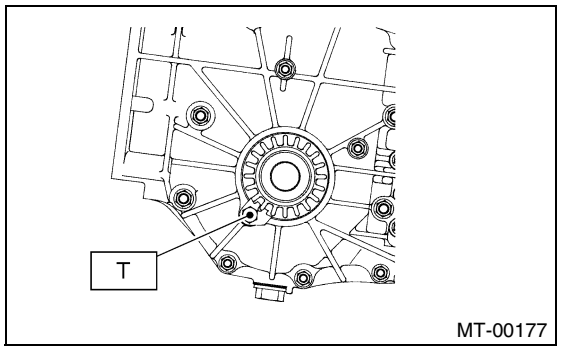
13) Fit the lock plate. Loosen the retainer on the lower side by 1-1/2 notches of lock plate and turn in the retainer on upper side by the same amount in order to obtain the backlash.

NOTE:
The notch on the lock plate moves by 1/2 notch if the plate is turned upside down.

14) Turn in the retainer on the upper side additionally by 1 notch in order to apply preload on taper roller bearing.
15) Tighten temporarily both the upper and lower lock plates and mark both holder and lock plate for later readjustment.
16) Turn the transmission main shaft several times while tapping around the retainer lightly with plastic hammer.
17) Inspect and adjust the backlash and tooth contact of hypoid gear. <Ref. to MT-98, INSPECTION, Front Differential Assembly.>
18) After checking the tooth contact of hypoid gears, remove the lock plate. Then loosen the retainer until the O-ring groove appears. Fit the O-ring into groove and tighten the retainer into the position where retainer has been tightened in.
Tighten the lock plate.

NOTE:
Carry out this job on both upper and lower retainers.

Tightening torque:
T: 24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



19) Selection of main shaft rear plate <Ref. to MT-76, ADJUSTMENT, Main Shaft Assembly (Single-Range).>
20) Install the transfer case with extension case assembly. <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
21) Install the clutch release lever and bearing. <Ref. to CL-23, INSTALLATION, Release Bearing and Lever.>
22) Install the manual transmission assembly into the vehicle.<Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

Check the transmission case for cracks, damage, and oil leaks.

17.Main Shaft Assembly (Single-Range)

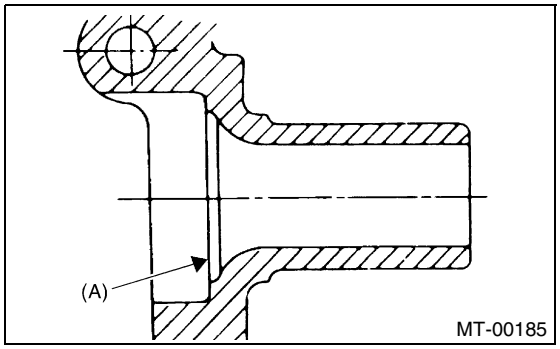
A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the transmission case. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the drive pinion shaft assembly. <Ref. to MT-87, REMOVAL, Drive Pinion Shaft Assembly.>
5) Remove the main shaft assembly.

B: INSTALLATION

1) Wrap the clutch splined section with vinyl tape to prevent damage to oil seal.
2) Apply grease (Unilube #2 or equivalent) to the sealing lip of oil seal.
3) Install the needle bearing and new oil seal onto the front of transmission main shaft assembly.
4) Install the needle bearing outer race knock pin hole into transmission case knock pin.

NOTE:
Align the end face of seal with surface (A) when installing oil seal.

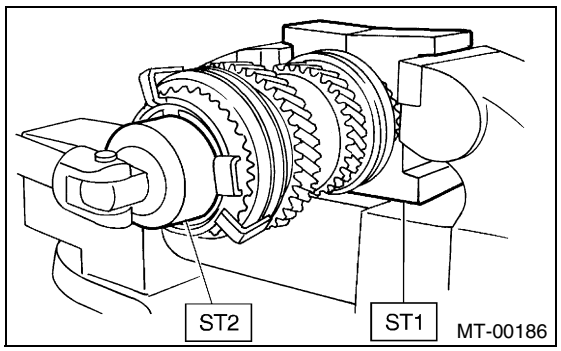


5) Install the drive pinion assembly. <Ref. to MT-87, INSTALLATION, Drive Pinion Shaft Assembly.>
6) Install the transmission case. <Ref. to MT-65, INSTALLATION, Transmission Case.>
7) Install the transfer case with extension case assembly. <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
8) Install the manual transmission assembly to vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

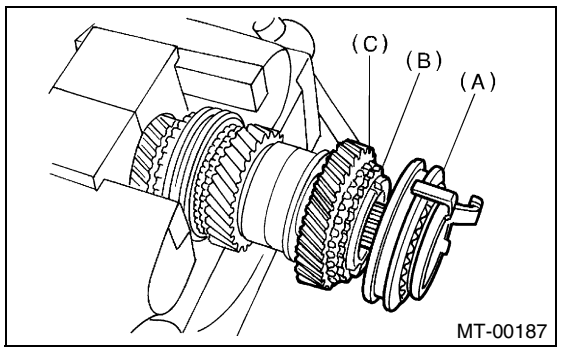
C: DISASSEMBLY

1) Put vinyl tape around the main shaft splines to protect oil seal from damage. Then pull out the oil seal and needle bearing by hand.
2) Remove the caulking before removing lock nut.
3) Remove the lock nut from transmission main shaft assembly.

ST1 498937000 TRANSMISSION HOLDER
ST2 499987003 SOCKET WRENCH (35)

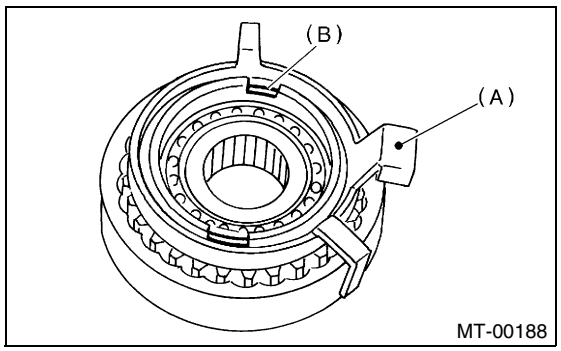


4) Remove the 5th-Rev sleeve and hub assembly, baulk ring, 5th drive gear and needle bearing.



(A) 5th-Rev sleeve and hub ASSY
(B) Baulk ring
(C) 5th drive gear

5) Remove the snap ring and synchro cone stopper from 5th-Rev sleeve and hub assembly.

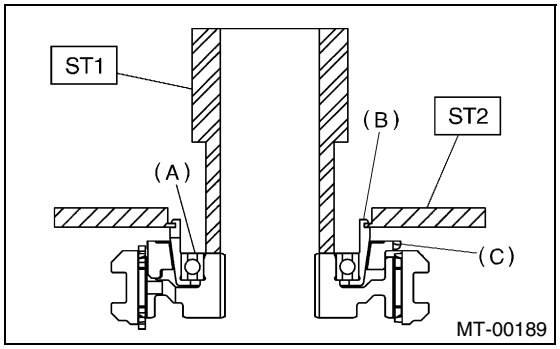


(A) Synchro cone stopper
(B) Snap ring

6) Using the ST1, ST2 and a press, remove the ball bearing, synchro cone and baulk ring (Rev).

NOTE:
Replace the sleeve and hub with new ones. Do not attempt to disassemble because they must engage at a specified point. If they should be disassembled, mark engagement point on splines beforehand.

ST1 499757002 INSTALLER
ST2 498077400 SYNCHRO CONE REMOVER

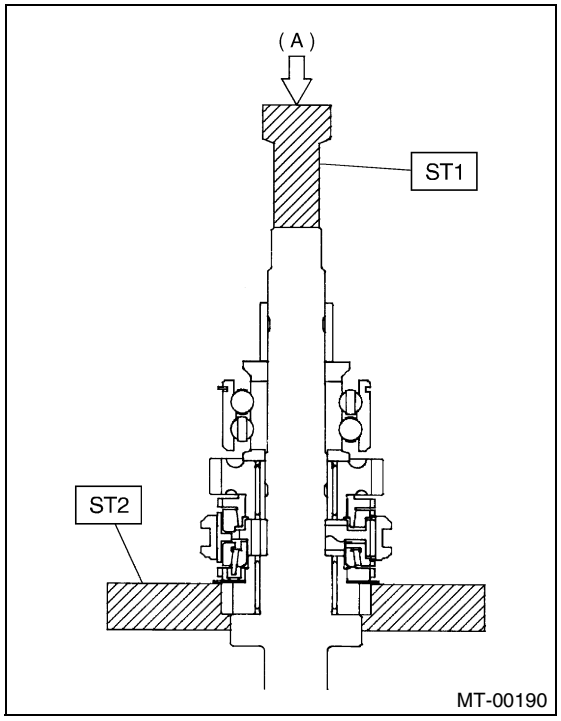


(A) Ball bearing
(B) Synchro cone
(C) Baulk ring

7) Using the ST1 and ST2, remove rest of the parts.

NOTE:
Replace the sleeve and hub with new ones. Do not attempt to disassemble because they must engage at a specified point. If they should be disassembled, mark engagement point on splines beforehand.

ST1 899864100 REMOVER
ST2 899714110 REMOVER

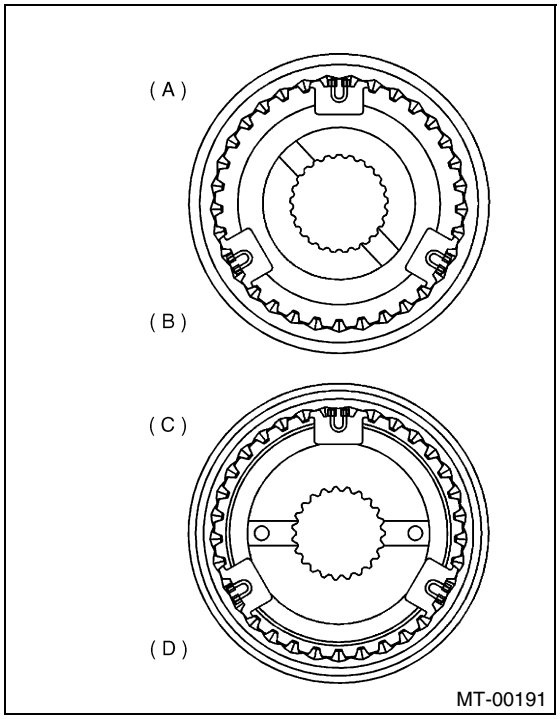


(A) Press

D: ASSEMBLY

1. NON-TURBO MODEL

1) Assemble when each sleeve and hub assembly are disassembled.
2) Position the open ends of spring 120° apart.

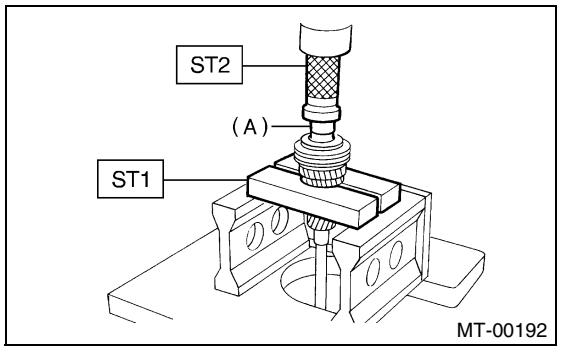


(A) 3rd-4th hub ASSY
(B) 3rd gear side
(C) 5th-Rev hub ASSY
(D) 5th gear side

3) Install the 3rd drive gear, baulk ring, sleeve and hub assembly for 3rd needle bearing on transmission main shaft.
4) Align the groove in baulk ring with shifting insert.
5) Install the 4th needle bearing race onto transmission main shaft using ST1, ST2 and a press.

NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

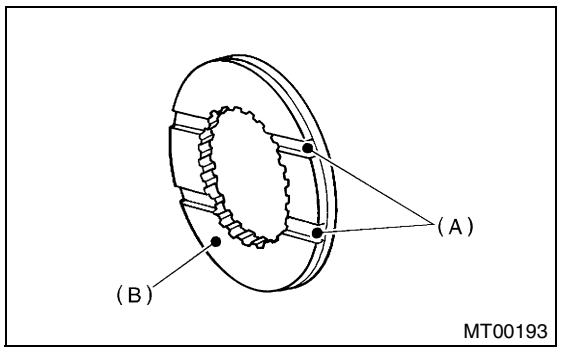
ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



(A) 4th needle bearing race

6) Install the baulk ring, needle bearing, 4th drive gear and 4th gear thrust washer to transmission main shaft.

NOTE:
Align the baulk ring and gear & hub assembly with key groove.

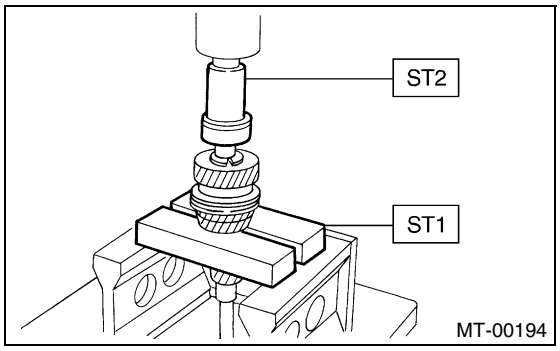


(A) Groove
(B) 4th gear side

7) Drive the new ball bearing onto the rear section of transmission main shaft using ST1, ST2 and a press.

NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

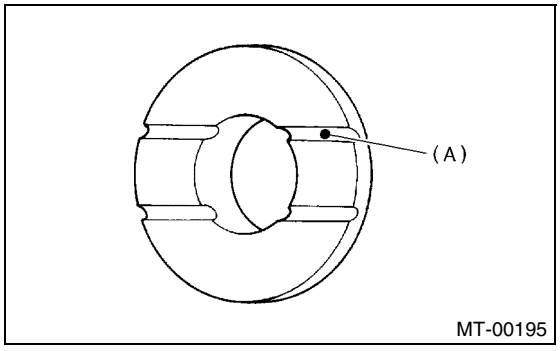
ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



8) Using the ST1 and ST2, install the 5th gear thrust washer and 5th needle bearing race onto the rear section of transmission main shaft.

NOTE:
- Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
- Face the thrust washer in correct direction.

ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



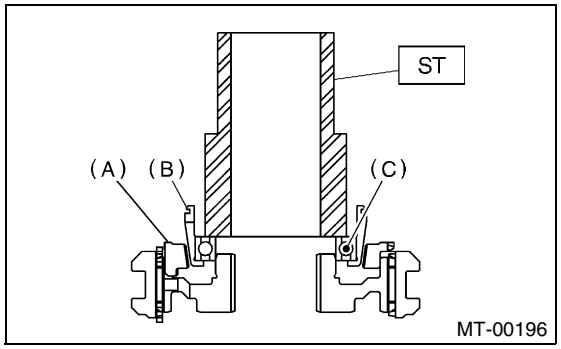
(A) Face this surface to 5th gear side.

9) Install the bearing onto synchro cone.
10) Install the baulk ring, synchro cone onto 5th-Rev sleeve and hub assembly and new ball bearing using ST and a press.

NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

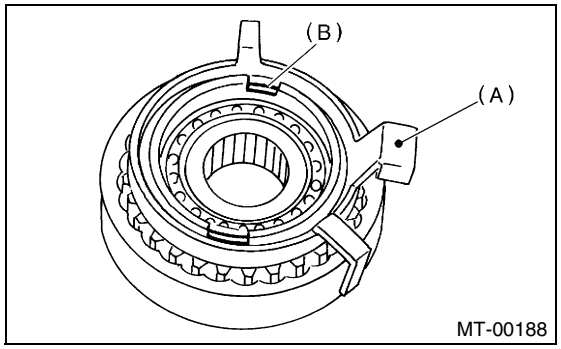
ST 499757002 INSTALLER

11) After press fitting, make sure the synchro cone rotates freely.



(A) Baulk ring
(B) Synchro cone
(C) Ball bearing

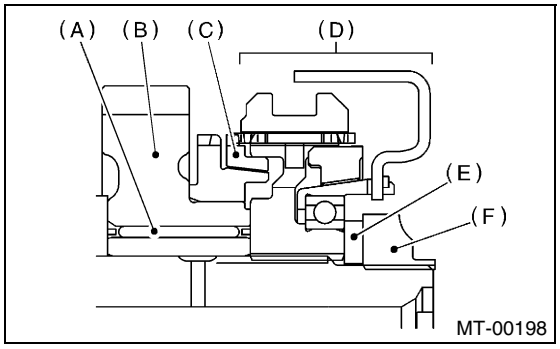
12) Install the synchro cone stopper and snap ring to 5th-Rev sleeve and hub assembly.



(A) Synchro cone stopper
(B) Snap ring

13) Install rest of the parts to rear section of transmission main shaft.

NOTE:
Align the groove in baulk ring with shifting insert.



(A) Needle bearing
(B) 5th drive gear
(C) Baulk ring
(D) 5th-Rev sleeve and hub ASSY
(E) Lock washer
(F) Lock nuts

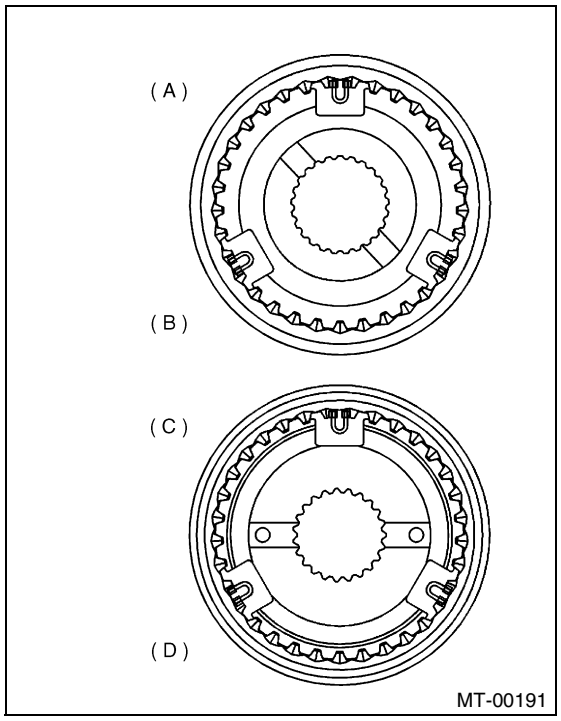
14) Tighten the lock nuts to the specified torque using ST1 and ST2.
15) Secure the lock nuts in two places after tightening.

ST1 499987003 SOCKET WRENCH
ST2 498937000 TRANSMISSION HOLDER

Tightening torque:
120 N·m (12.2 kgf-m, 88.2 ft-lb)

2. TURBO MODEL

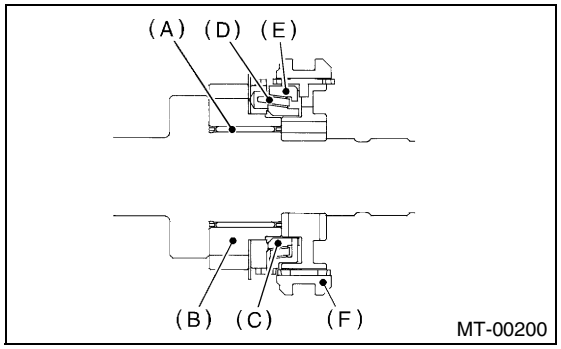
1) Assemble each sleeve and hub assembly.
2) Position the open ends of spring 120° apart.



(A) 3rd-4th hub ASSY
(B) 3rd gear side
(C) 5th-Rev hub ASSY
(D) 5th gear side

3) Install the 3rd drive gear, outer baulk ring, synchro cone, inner baulk ring, sleeve and hub assembly for 3rd needle bearing on transmission main shaft.

NOTE:
Align the groove in baulk ring with shifting insert.

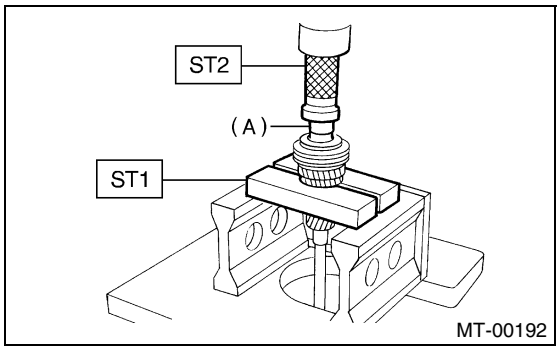


(A) 3rd needle bearing
(B) 3rd drive gear
(C) Inner baulk ring
(D) Synchro cone
(E) Outer baulk ring
(F) Sleeve and hub ASSY

4) Install the 4th needle bearing race onto transmission main shaft using ST1, ST2 and a press.

NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

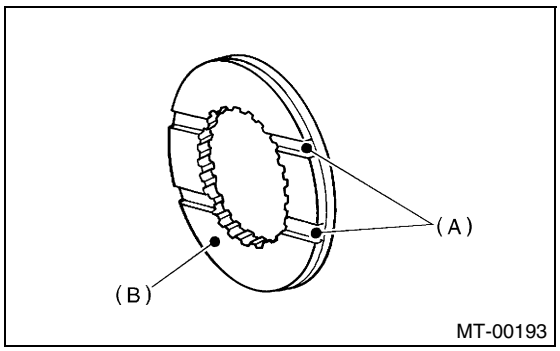
ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



(A) 4th needle bearing race

5) Install the baulk ring, needle bearing, 4th drive gear and 4th gear thrust washer to transmission main shaft.

NOTE:
Align the baulk ring and gear & hub assembly with key groove.

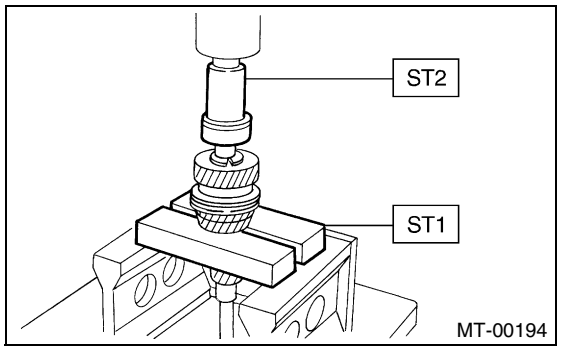


(A) Groove
(B) 4th gear side

6) Drive the ball bearing onto the rear section of transmission main shaft using ST1, ST2 and a press.

NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

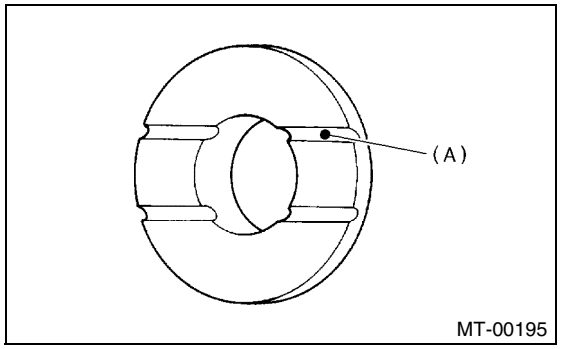
ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



7) Using the ST1 and ST2, install the 5th gear thrust washer and 5th needle bearing race onto the rear section of transmission main shaft.

NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER

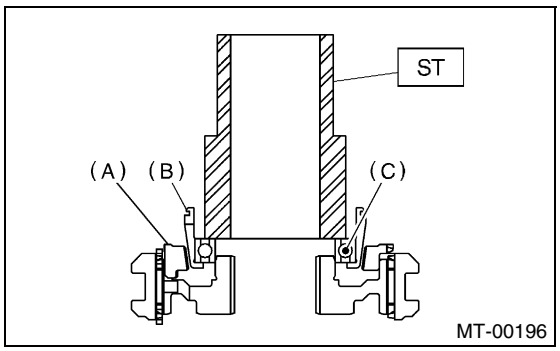


(A) Face this surface to 5th gear side.

8) Install the bearing onto synchro cone.
9) Install the baulk ring, synchro cone and new ball bearing. onto 5th-Rev sleeve and hub assembly using ST and a press.

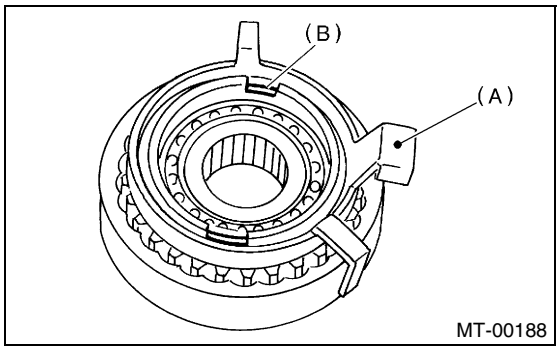
NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

10) After press fitting, make sure the synchro cone rotates freely.
ST 499757002 INSTALLER



(A) Baulk ring
(B) Synchro cone
(C) Ball bearing

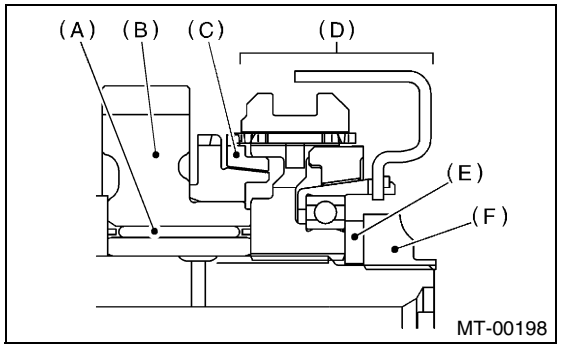
11) Install the synchro cone stopper and snap ring to 5th-Rev sleeve and hub assembly.



(A) Synchro cone stopper
(B) Snap ring

12) Install the rest parts to the rear section of transmission main shaft.

NOTE:
Align the groove in baulk ring with shifting insert.



(A) Needle bearing
(B) 5th drive gear
(C) Baulk ring
(D) 5th-Rev sleeve and hub ASSY
(E) Lock washer
(F) Lock nuts

13) Tighten the lock nuts to the specified torque using ST1 and ST2.
14) Secure the lock nuts in two places after tightening.
ST1 499987003 SOCKET WRENCH
ST2 498937000 TRANSMISSION HOLDER

Tightening torque:
120 N·m (12.2 kgf-m, 88.2 ft-lb)

E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.

1) Bearings

Replace the bearings in the following cases:

- Bearings whose balls, outer races and inner races are broken or rusty.
- Worn bearings
- Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.
- Bearings having other defects

2) Bushing (each gear)

Replace the bushing in the following cases:

- When the sliding surface is damaged or abnormally worn.
- When the inner wall is abnormally worn.

3) Gears

- Replace the gears with new ones if their tooth surfaces are broken, damaged, or excessively worn.
- Correct or replace if the cone that contacts the baulk ring is rough or damaged.
- Correct or replace if the inner surface or end face is damaged.

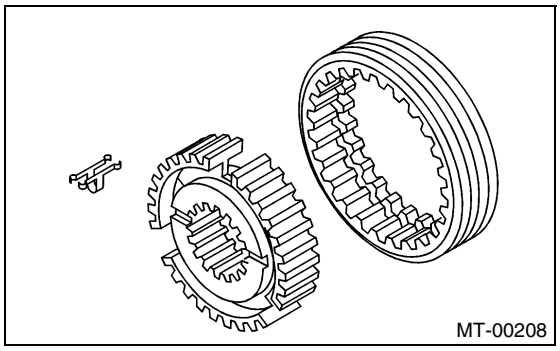
4) Baulk ring

Replace the ring in the following cases:

- When the inner surface and end face are damaged.
- When the ring inner surface is abnormally or partially worn down.
- When the contact surface of the synchronizer ring insert is scored or abnormally worn down.

5) Shifting insert key

Replace the insert if deformed, excessively worn, or defective in any way.



6) Oil seal

Replace the oil seal if the lip is deformed, hardened, damaged, worn, or defective in any way.

7) O-ring

Replace the O-ring if the sealing face is deformed, hardened, damaged, worn, or defective in any way.

8) Gearshift mechanism

Repair or replace the gearshift mechanism if excessively worn, bent, or defective in any way.

F: ADJUSTMENT

Selection of main shaft rear plate:

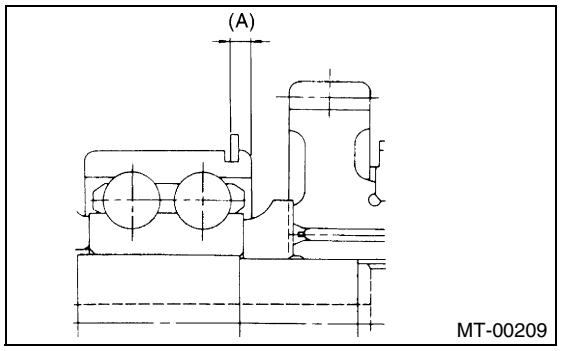
Using the ST, measure the amount (A) of ball bearing protrusion from transmission main case surface and select the proper plate in the following table:

NOTE:

Before measuring, tap the end of main shaft with a plastic hammer lightly in order to make the clearance zero between the main case surface and the moving flange of bearing.

ST 498147000 DEPTH GAUGE

Dimension (A) mm (in)	Part No.	Mark
4.00 — 4.13 (0.1575 — 0.1626)	32294AA041	1
3.87 — 3.99 (0.1524 — 0.1571)	32294AA051	2



18.Main Shaft Assembly (Dual-Range)

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the transmission case. <Ref. to MT-63, REMOVAL, Transmission Case.>
4) Remove the drive pinion shaft assembly. <Ref. to MT-87, REMOVAL, Drive Pinion Shaft Assembly.>
5) Remove the main shaft assembly and input shaft assembly.

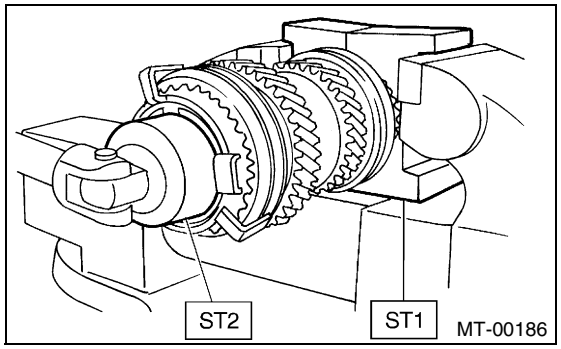
B: INSTALLATION

1) Install the needle bearing onto the front of transmission main shaft assembly.
2) Connect the main shaft assembly and input shaft assembly.
3) Install the needle bearing outer race knock pin hole into transmission case knock pin.
4) Install the drive pinion assembly. <Ref. to MT-87, INSTALLATION, Drive Pinion Shaft Assembly.>
5) Install the transmission case. <Ref. to MT-65, INSTALLATION, Transmission Case.>
6) Install the transfer case with extension case assembly. <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
7) Install the manual transmission assembly to vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

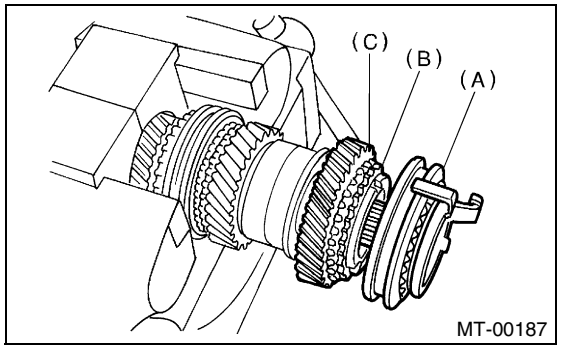
C: DISASSEMBLY

1) Put vinyl tape around the main shaft splines to protect oil seal from damage. Then pull out the oil seal and needle bearing by hand.
2) Remove caulking of the lock nut.
3) Remove the lock nut from transmission main shaft assembly.

ST1 498937000 TRANSMISSION HOLDER
ST2 499987003 SOCKET WRENCH (35)

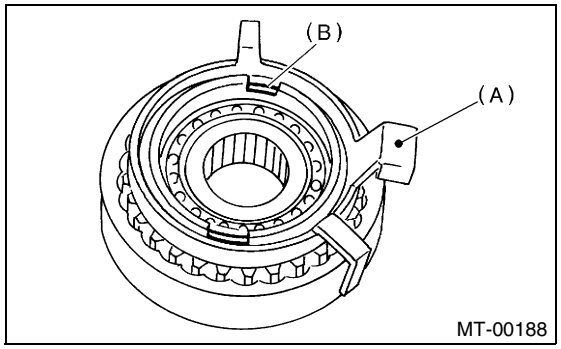


4) Remove the 5th-Rev sleeve and hub assembly, baulk ring, 5th drive gear and needle bearing.



(A) 5th-Rev sleeve and hub ASSY
(B) Baulk ring
(C) 5th drive gear

5) Remove the snap ring and synchro cone stopper from 5th-Rev sleeve and hub assembly.

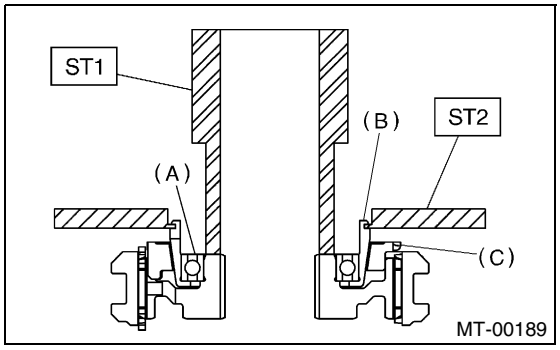


(A) Synchro cone stopper
(B) Snap ring

6) Using the ST1, ST2 and a press, remove the ball bearing, synchro cone and baulk ring (Rev).

NOTE:
• Replace the sleeve and hub with new ones. Do not attempt to disassemble because they must engage at a specified point. If they should be disassembled, mark engagement point on splines beforehand.
• Do not reuse the ball bearing.

ST1 499757002 INSTALLER
ST2 498077400 SYNCHRO CONE REMOVER

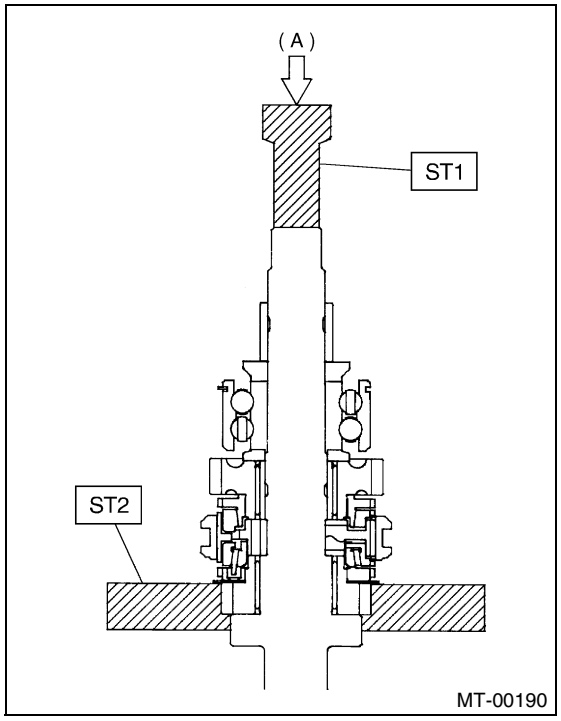


(A) Ball bearing
(B) Synchro cone
(C) Baulk ring

7) Using the ST1 and ST2, remove rest of the parts.

NOTE:
Replace the sleeve and hub with new ones. Do not attempt to disassemble because they must engage at a specified point. If they should be disassembled, marking engagement point on splines beforehand.

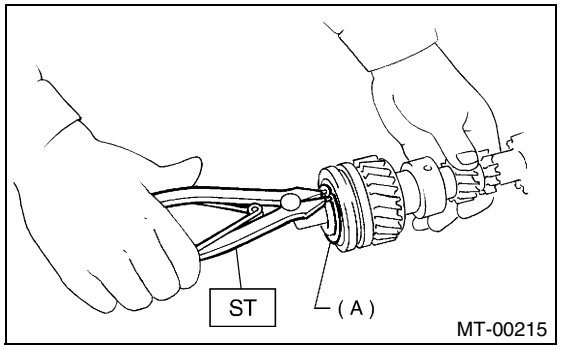
ST1 899864100 REMOVER
ST2 899714110 REMOVER



(A) Press

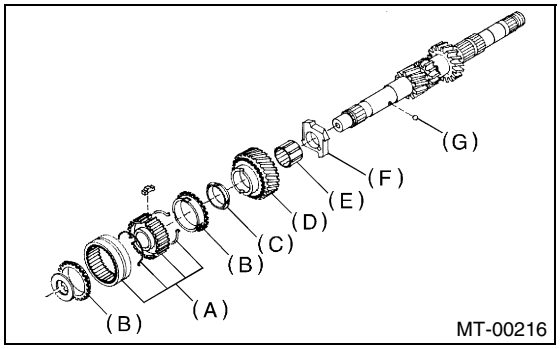
8) Remove the snap ring from main shaft.

ST 899474100 EXPANDER



(A) Snap ring

9) Remove rest of the parts.

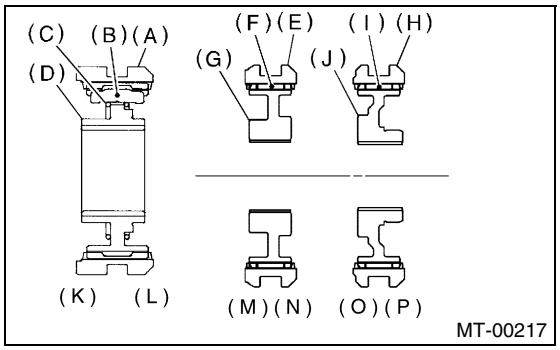


(A) Sleeve and hub ASSY
(B) High-low baulk ring
(C) Friction damper
(D) Low input gear
(E) Needle bearing
(F) Input low gear spacer
(G) Ball

D: ASSEMBLY

1) Assemble when each sleeve and hub assembly are disassembled.

NOTE:
Position the open ends of spring 120° apart.



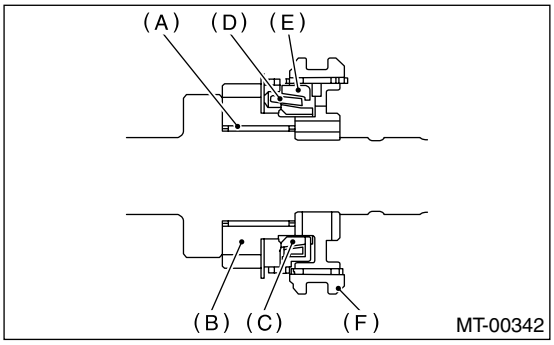
(A) High-low coupling sleeve
(B) Shifting insert
(C) High-low synchronizer spring
(D) High-low synchronizer hub
(E) Sleeve
(F) Insert key
(G) 3rd-4th synchronizer hub
(H) Sleeve
(I) Insert key
(J) 5th-Rev synchronizer hub
(K) High side
(L) Low side
(M) 3rd side
(N) 4th side
(O) 5th side
(P) Rev side

2) Install the 3rd drive gear, baulk ring, sleeve and hub assembly for 3rd-4th needle bearing on transmission main shaft. (2.0L model)

NOTE:
Align the groove in baulk ring with shifting insert.

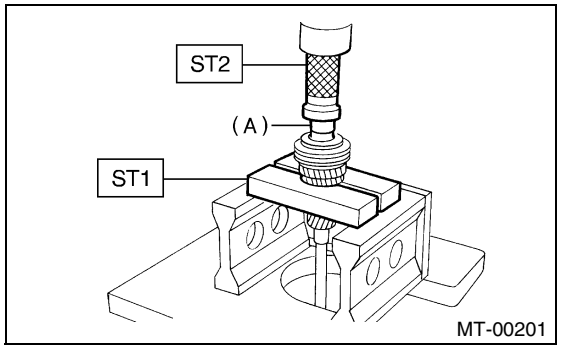
3) Install the 3rd drive gear, outer baulk ring, synchro cone, inner baulk ring, sleeve and hub assembly for 3rd needle bearing on transmission main shaft. (2.5L model)

NOTE:
Align the groove in baulk ring with shifting insert.



(A) 3rd needle bearing
(B) 3rd drive gear
(C) Inner baulk ring
(D) Synchro cone
(E) Outer baulk ring
(F) Sleeve and hub ASSY

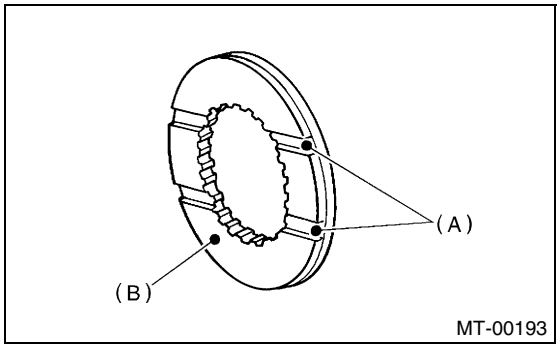
4) Install the 4th needle bearing race onto transmission main shaft using ST1, ST2 and a press.
ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



(A) 4th needle bearing race

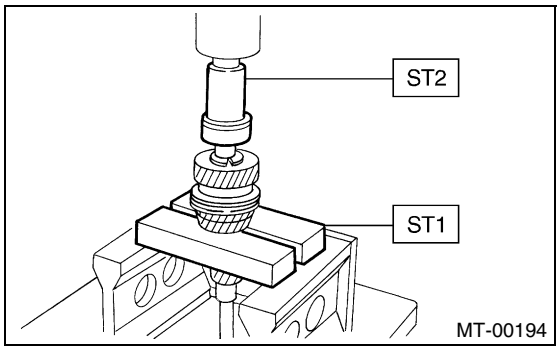
5) Install the baulk ring, needle bearing, 4th drive gear and 4th gear thrust washer to transmission main shaft.

NOTE:
Face the thrust washer in correct direction.



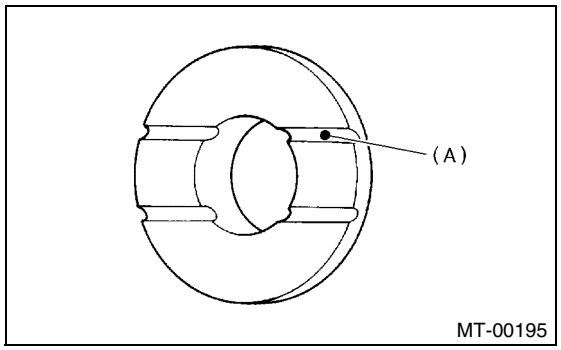
(A) Groove
(B) 4th gear side

6) Drive the ball bearing onto the rear section of transmission main shaft using ST1, ST2 and a press.
ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



7) Using the ST1 and ST2, install the 5th gear thrust washer and 5th needle bearing race onto the rear section of transmission main shaft.

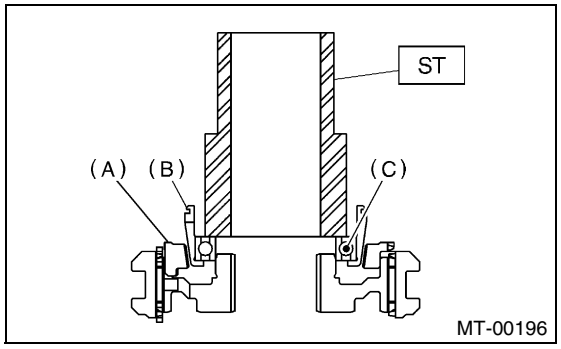
NOTE:
Face the thrust washer in correct direction.
ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



(A) Face this surface to 5th gear side.

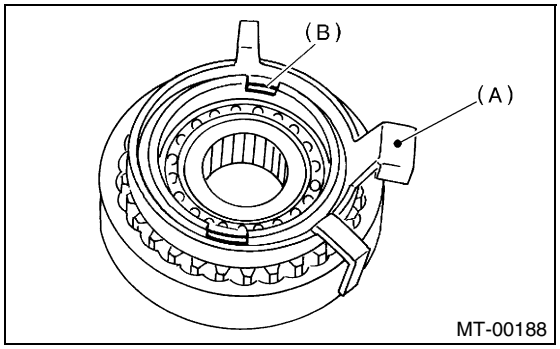
8) Install the bearing onto synchro cone.
9) Install the baulk ring and synchro cone onto 5th-Rev sleeve and hub assembly using ST and a press.

NOTE:
• Use a new ball bearing.
• After press fitting, make sure the synchro cone rotates freely.
ST 499757002 INSTALLER



(A) Baulk ring
(B) Synchro cone
(C) Ball bearing

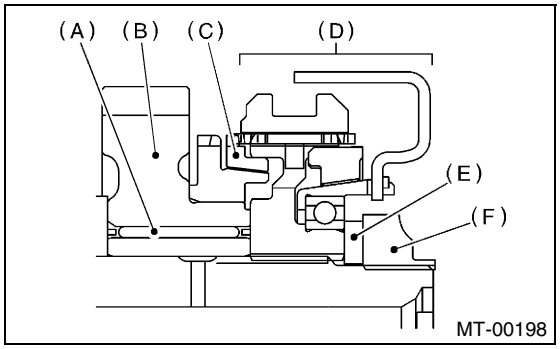
10) Install the synchro cone stopper and snap ring to 5th-Rev sleeve and hub assembly.



(A) Synchro cone stopper
(B) Snap ring

11) Install rest of the parts to the rear section of transmission main shaft.

NOTE:
Align the groove in baulk ring with shifting insert.



(A) Needle bearing
(B) 5th drive gear
(C) Baulk ring
(D) 5th-Rev sleeve and hub ASSY
(E) Lock washer
(F) Lock nuts

12) Tighten the lock nuts to the specified torque using ST1 and ST2.

NOTE:
Secure the lock nuts in two places after tightening.

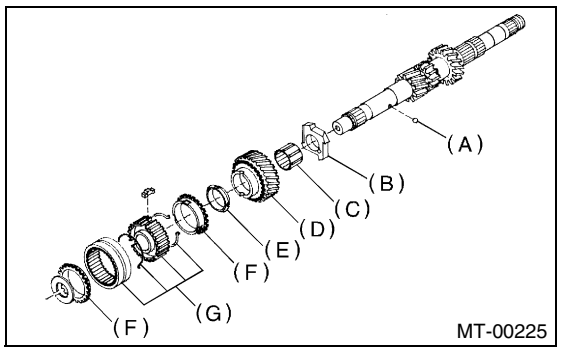
ST1 499987003 SOCKET WRENCH
ST2 498937000 TRANSMISSION HOLDER

Tightening torque:
120 N·m (12.2 kgf-m, 88.2 ft-lb)

13) Install the needle bearing on main shaft.

14) Install the parts to the front section of transmission main shaft.

NOTE:
- Be careful not to damage the graded section of transmission main shaft when installing the needle bearing.
- Face the grooved side toward input gear.
- Align the high-low baulk ring's groove with shifting insert.



(A) Ball
(B) Input low gear spacer
(C) Needle bearing
(D) Low input gear
(E) Friction damper
(F) High-low baulk ring
(G) Sleeve and hub ASSY

15) Install a new snap ring to the rod section of transmission main shaft using ST1 and ST2.

NOTE:
Select a suitable outer snap ring so that axial clearance between snap ring and hub is held within 0.060 to 0.100 mm (0.0024 to 0.0039 in).

ST1 499757002 INSTALLER
ST2 499757001 SNAP RING GUIDE

Snap ring	
Part No.	Thickness mm (in)
805025058	2.37 (0.0933)
805025051	2.42 (0.0953)
805025052	2.47 (0.0972)
805025053	2.52 (0.0992)
805025054	2.57 (0.1012)
805025055	2.62 (0.1031)
805025056	2.67 (0.1051)
805025057	2.72 (0.1071)

E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.

1) Bearings

Replace the bearings in the following cases:

- Bearings whose balls, outer races and inner races are broken or rusty.
- Worn bearings
- Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.
- Bearings having other defects

2) Bushing (each gear)

Replace the bushing in the following cases:

- When the sliding surface is damaged or abnormally worn.
- When the inner wall is abnormally worn.

3) Gears

- Replace the gears with new ones if their tooth surfaces are broken, damaged, or excessively worn.
- Correct or replace if the cone that contacts the baulk ring is rough or damaged.
- Correct or replace if the inner surface or end face is damaged.

4) Baulk ring

Replace the ring in the following cases:

- When the inner surface and end face are damaged.
- When the ring inner surface is abnormally or partially worn down.
- When the contact surface of the synchronizer ring insert is scored or abnormally worn down.

5) Shifting insert key

Replace the insert if deformed, excessively worn, or defective in any way.

6) Oil seal

Replace the oil seal if the lip is deformed, hardened, damaged, worn, or defective in any way.

7) O-ring

Replace the O-ring if the sealing face is deformed, hardened, damaged, worn, or defective in any way.

8) Gearshift mechanism

Repair or replace the gearshift mechanism if excessively worn, bent, or defective in any way.

F: ADJUSTMENT

Choose the main shaft rear plate. <Ref. to MT-76, ADJUSTMENT, Main Shaft Assembly (Single-Range).>

19.Input Shaft Assembly

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the transmission case. <Ref. to MT-63, REMOVAL, Transmission Case.>
4) Remove the drive pinion shaft assembly. <Ref. to MT-87, REMOVAL, Drive Pinion Shaft Assembly.>
5) Remove the main shaft assembly and input shaft assembly.

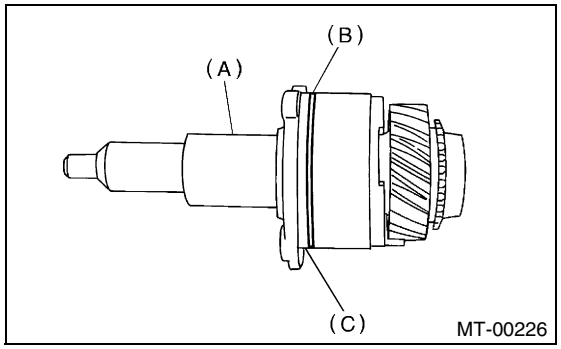
B: INSTALLATION

1) Install the needle bearing onto the front of transmission main shaft assembly.
2) Connect the main shaft assembly and input shaft assembly.
3) Install the needle bearing outer race knock pin hole into transmission case knock pin.
4) Install the drive pinion assembly. <Ref. to MT-87, INSTALLATION, Drive Pinion Shaft Assembly.>
5) Install the transmission case. <Ref. to MT-65, INSTALLATION, Transmission Case.>
6) Install the transfer case with extension case assembly. <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
7) Install the manual transmission assembly on vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

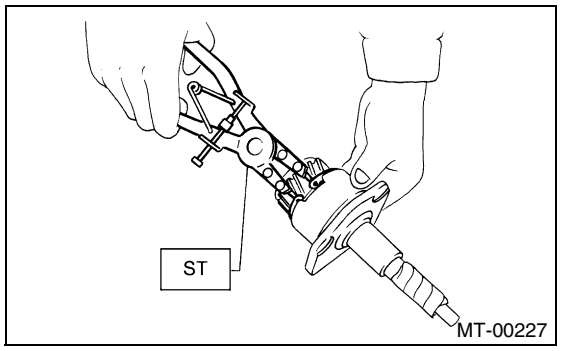
1) Remove the O-ring from input shaft holder. Also, remove the input shaft holder shim.

NOTE:
- Use a new O-ring.
- Number of shims used varies from none to two.

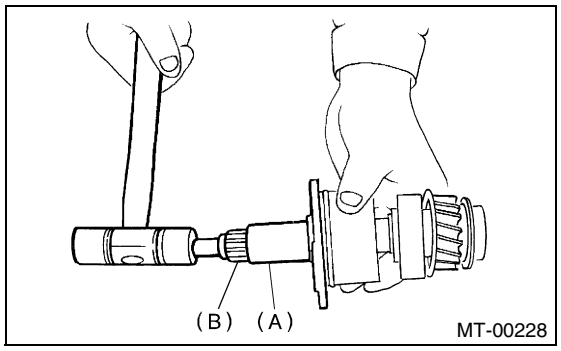


(A) Input shaft holder
(B) O-ring
(C) Input shaft holder shim

2) Put vinyl tape around the input shaft splines to protect oil seal from damage.
3) Remove the inner snap ring.
ST 398663600 PLIERS

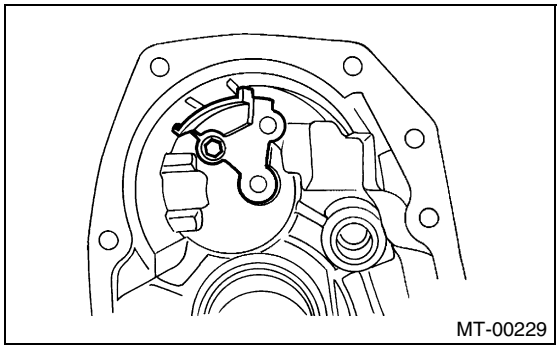


4) Hold the input shaft holder stationary and remove the input shaft by tapping its end with a plastic hammer.



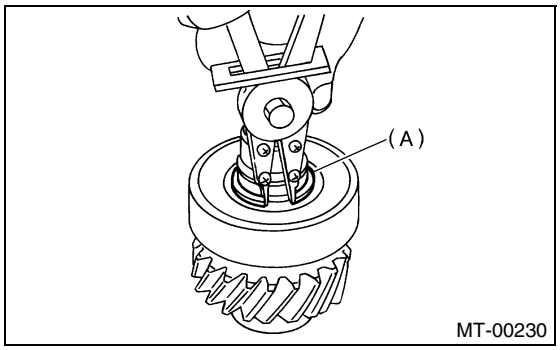
(A) Input shaft holder
(B) Input shaft

5) Remove the outer snap ring. Then remove the oil squeeze plate and straight pin.



(A) Snap ring
(B) Oil squeeze plate

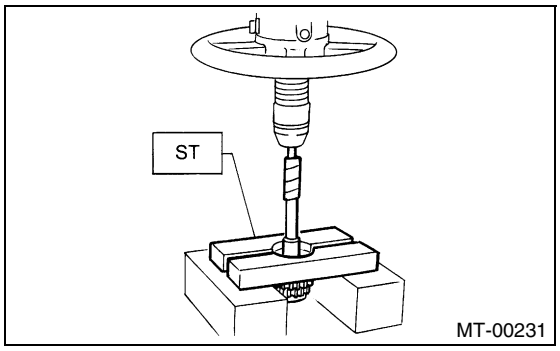
6) Remove the snap ring.



(A) Snap ring

7) Using a press and ST, remove the ball bearing.

NOTE:
Remove the inner snap ring before pressing.
ST 498077000 REMOVER

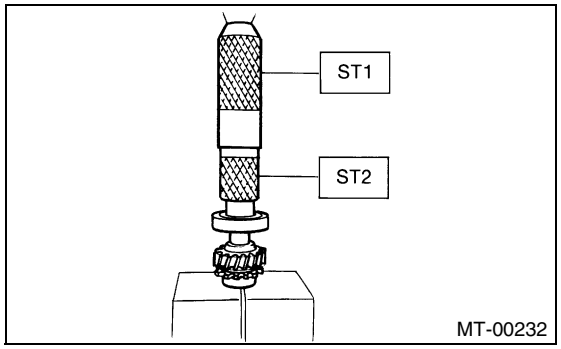


8) Remove the oil seal from input shaft holder.

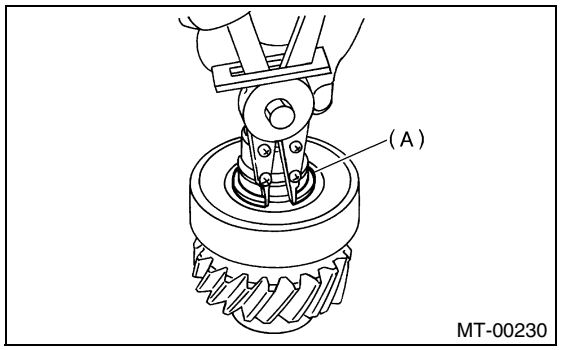
D: ASSEMBLY

1) Install the ball bearing onto input shaft.

NOTE:
Place the snap ring between input shaft gear and ball bearing beforehand. Use the table at 5) as a guide in selecting a suitable snap ring.
ST1 899580100 INSTALLER
ST2 399513600 INSTALLER



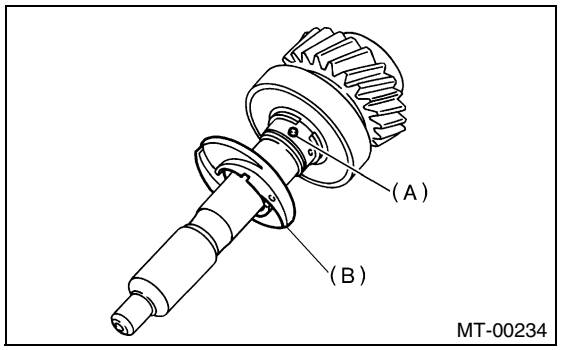
2) Install the snap ring on input shaft.



(A) Snap ring

3) Inspect the clearance between ball bearing and snap ring. <Ref. to MT-85, INSPECTION, Input Shaft Assembly.>

4) Install the straight pin and oil squeeze plate to input shaft.



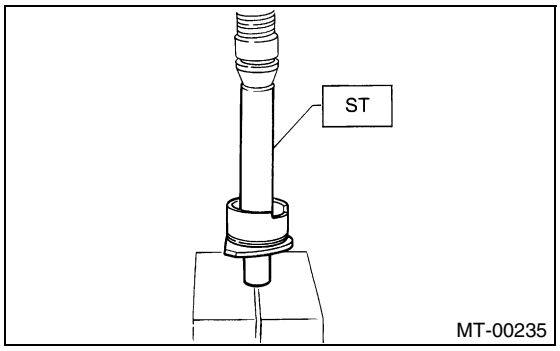
(A) Straight pin
(B) Oil squeeze plate

5) Install the snap ring.

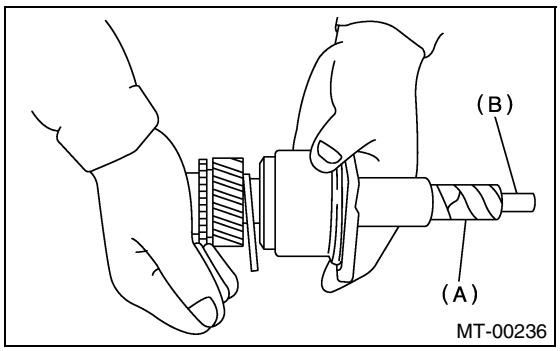
6) Drive the oil seal into input shaft holder.

NOTE:
Apply a coat of grease to sealing lips before installing oil seal.

ST 398507703 DUMMY COLLAR



7) Wind vinyl tape around the shaft splines and insert input shaft into holder by lightly tapping it by hand.

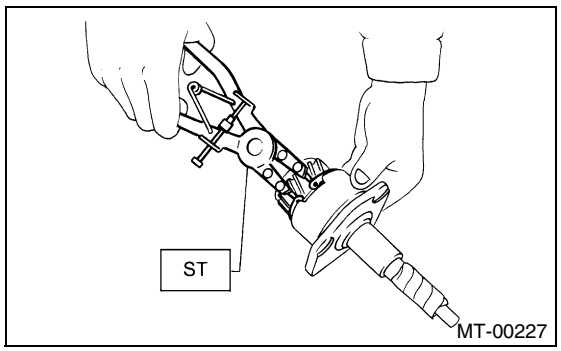


(A) Vinyl tape
(B) Input shaft

8) Install the snap ring to input shaft holder.

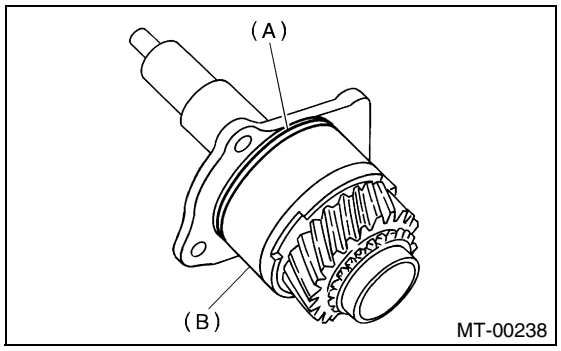
NOTE:
Select a suitable snap ring so that clearance between snap ring and bearing is held within 0 to 0.12 mm (0 to 0.0047 in).

ST 398663600 PLIERS



Snap ring	
Part No.	Thickness mm (in)
805168020	1.84 (0.0724)
805168030	1.92 (0.0756)
805168040	2.00 (0.0787)

9) Install the O-ring to input shaft holder.



(A) O-ring
(B) Input shaft holder

E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.

1) Bearings

Replace the bearings in the following cases:

- Bearings whose balls, outer races and inner races are broken or rusty.
- Worn bearings
- Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.
- Bearings having other defects

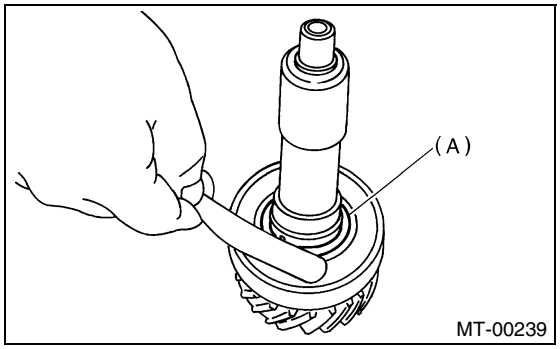
2) Bushing (each gear)

Replace the bushing in the following cases:

- When the sliding surface is damaged or abnormally worn.
- When the inner wall is abnormally worn.

3) Gears
• Replace the gears with new ones if their tooth surfaces are broken, damaged, or excessively worn.
• Correct or replace if the cone that contacts the baulk ring is rough or damaged.
• Correct or replace if the inner surface or end face is damaged.
4) Baulk ring
Replace the ring in the following cases:
• When the inner surface and end face are damaged.
• When the ring inner surface is abnormally or partially worn down.
• When the contact surface of the synchronizer ring insert is scored or abnormally worn down.
5) Shifting insert key
Replace the insert if deformed, excessively worn, or defective in any way.
6) Oil seal
Replace the oil seal if the lip is deformed, hardened, damaged, worn, or defective in any way.
7) O-ring
Replace the O-ring if the sealing face is deformed, hardened, damaged, worn, or defective in any way.
8) Gearshift mechanism
Repair or replace the gearshift mechanism if excessively worn, bent, or defective in any way.
9) Measure the clearance between snap ring and ball bearing using thickness gauge.

Clearance:
0 — 0.12 mm (0 — 0.0047 in)



(A) Snap ring

If the measurement is not within specification, select a suitable snap ring.

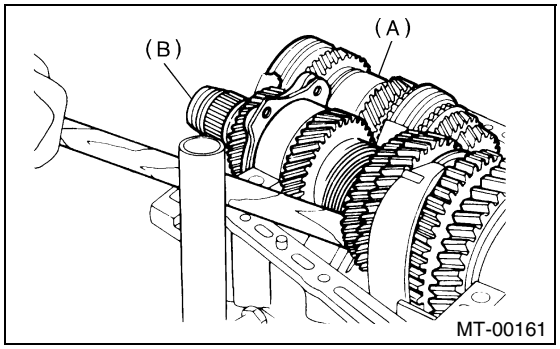
Snap ring	
Part No.	Thickness mm (in)
805028050	2.48 (0.0976)
805028060	2.56 (0.1008)
805028070	2.64 (0.1039)

20.Drive Pinion Shaft Assembly

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the transmission case. <Ref. to MT-63, REMOVAL, Transmission Case.>
4) Remove the drive pinion shaft assembly.

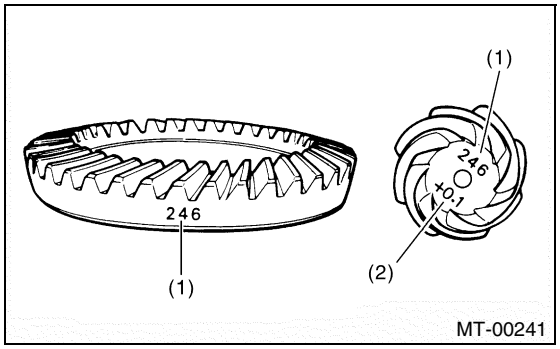
NOTE:
Use a hammer handle, etc. to remove if too tight.



(A) Main shaft assembly
(B) Drive pinion shaft assembly

B: INSTALLATION

1) Remove the differential assembly.
2) Alignment marks/numbers on hypoid gear set:
The upper number on driven pinion is the match number for combining it with hypoid driven gear. The lower number is for shim adjustment. If no lower number is shown, the value is zero. The number on hypoid driven gear indicates a number for combination with drive pinion.

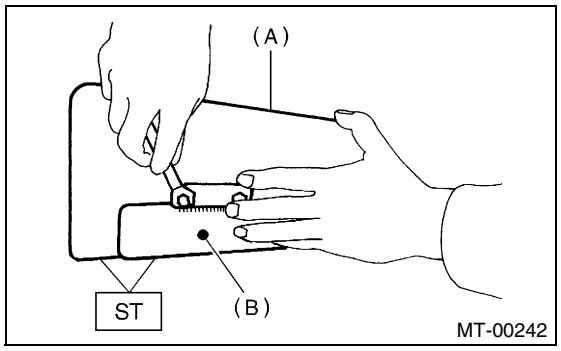


(A) Match number
(B) Shim adjust number

3) Place the drive pinion shaft assembly on right hand transmission main case without shim and tighten the bearing mounting bolts.
4) Inspection and adjustment of ST:

NOTE:
• Loosen the two bolts and adjust so that the scale indicates 0.5 correctly when the plate end and the scale end are on the same level.
• Tighten the two bolts.

ST 499917500 DRIVE PINION GAUGE ASSY



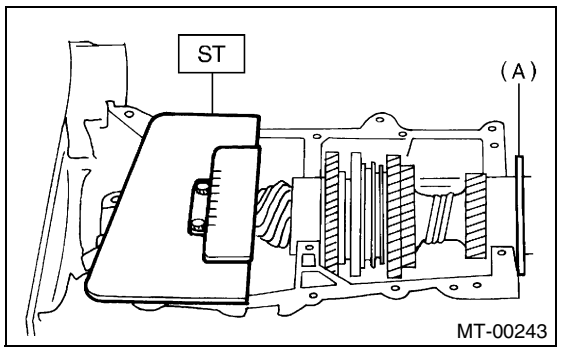
(A) Plate
(B) Scale

5) Position the ST by inserting the knock pin of ST into the knock hole in transmission case.

ST 499917500 DRIVE PINION GAUGE ASSY

6) Slide the drive pinion gauge scale with finger tip and read the value at the point where it matches with the end face of drive pinion.

ST 499917500 DRIVE PINION GAUGE ASSY



(A) Adjust clearance to zero without shim.

7) The thickness of shim shall be determined by adding the value indicated on drive pinion to the value indicated on ST. (Add if the number on drive pinion is prefixed by + and subtract if the number is prefixed by −.)

ST 499917500 DRIVE PINION GAUGE ASSY

8) Select one to three shims from the next table for the value determined as described above and take a shim thickness which is closest to the indicated value.

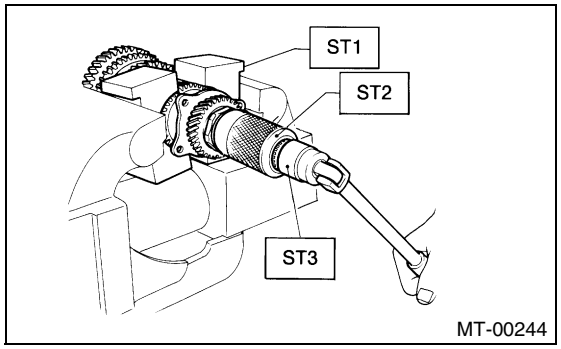
Drive pinion shim	
Part No.	Thickness mm (in)
32295AA031	0.150 (0.0059)
32295AA041	0.175 (0.0069)
32295AA051	0.200 (0.0079)
32295AA061	0.225 (0.0089)
32295AA071	0.250 (0.0098)
32295AA081	0.275 (0.0108)
32295AA091	0.300 (0.0118)
32295AA101	0.500 (0.0197)

9) Install the differential assembly. <Ref. to MT-95, INSTALLATION, Front Differential Assembly.>
10) Set the transmission main shaft assembly and drive pinion assembly in position. (So there is no clearance between the two when moved all the way to the front). Inspect the suitable 1st — 2nd, 3rd — 4th and 5th shifter fork so that coupling sleeve and reverse driven gear are positioned in the center of their synchronizing mechanisms. <Ref. to MT-92, INSPECTION, Drive Pinion Shaft Assembly.>
11) Install the transmission case. <Ref. to MT-65, INSTALLATION, Transmission Case.>
12) Install the transfer case with extension case assembly. <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
13) Install the manual transmission assembly to vehicle.<Ref. to MT-32, Manual Transmission Assembly.>

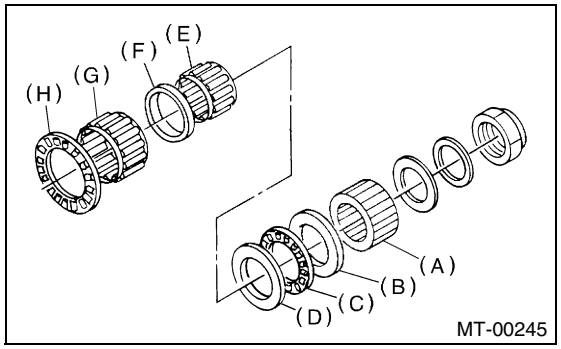
C: DISASSEMBLY

NOTE:
Attach a cloth to the end of driven shaft (on the frictional side of thrust needle bearing) during disassembly or reassembly to prevent damage.

1) Straighten the lock nut at staked portion. Remove the lock nut using ST1, ST2 and ST3.
ST1 899884100 HOLDER
ST2 498427100 STOPPER
ST3 899988608 SOCKET WRENCH (27)



2) Withdraw the drive pinion from driven shaft. Remove the differential bevel gear sleeve, adjusting washer No. 1, adjusting washer No. 2, thrust bearing, needle bearing, drive pinion collar, needle bearing and thrust bearing.

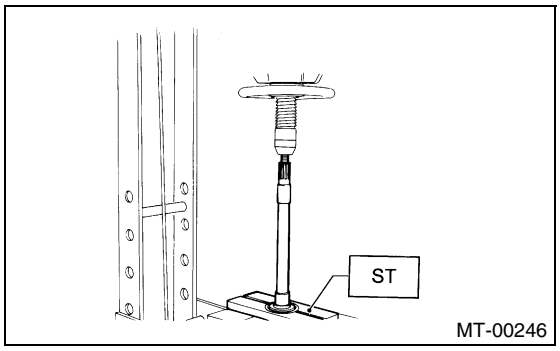


(A) Differential bevel gear sleeve
(B) Washer No. 1 ($25 \times 37.5 \times t$)
(C) Thrust bearing ($25 \times 37.5 \times 3$)
(D) Washer No. 2 ($25 \times 37.5 \times 4$)
(E) Needle bearing ($25 \times 30 \times 20$)
(F) Drive pinion collar
(G) Needle bearing ($30 \times 37 \times 23$)
(H) Thrust bearing ($33 \times 50 \times 3$)

3) Remove the roller bearing and washer using ST and press.

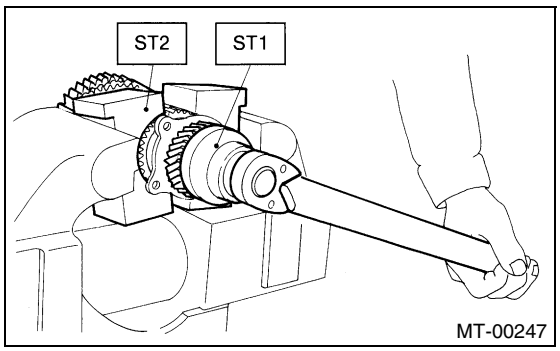
NOTE:
Do not reuse the roller bearing.

ST 498077000 REMOVER



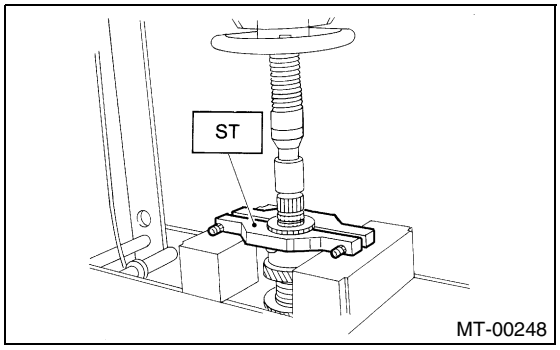
4) Straighten the lock nut at staked portion. Remove the lock nut using ST1 and ST2.

ST1 499987300 SOCKET WRENCH (50)
ST2 899884100 HOLDER



5) Remove the 5th driven gear using ST.

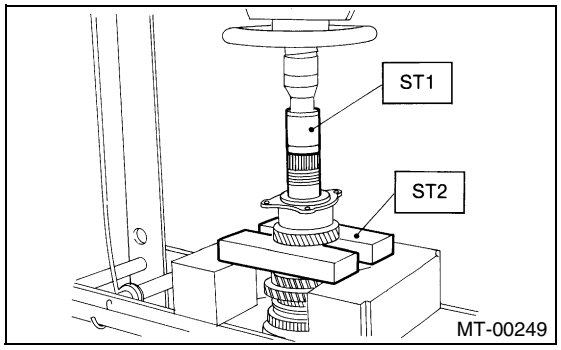
ST 499857000 5TH DRIVEN GEAR REMOVER



6) Remove the woodruff key.

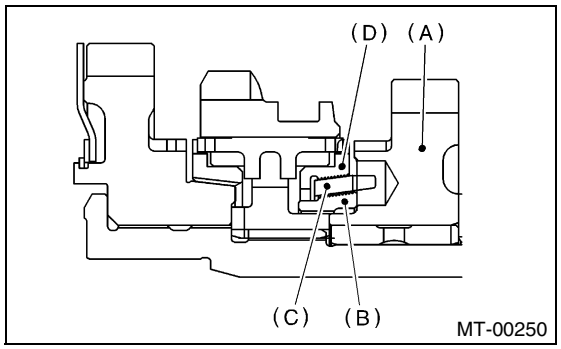
7) Remove the roller bearing, 3rd-4th driven gear using ST1 and ST2.

ST1 499757002 INSTALLER
ST2 899714110 REMOVER



8) Remove the key.

9) Remove the 2nd driven gear, inner baulk ring, synchro cone and outer baulk ring.

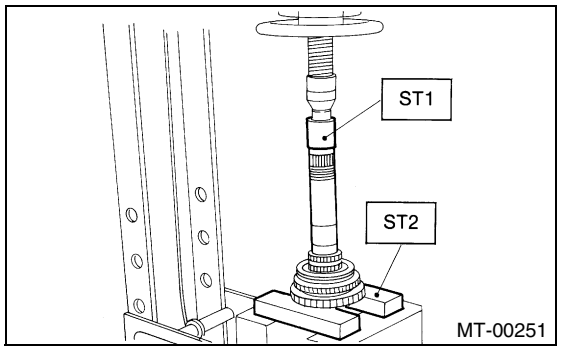


(A) 2nd driven gear
(B) Inner baulk ring
(C) Synchro cone
(D) Outer baulk ring

10) Remove the 1st driven gear, 2nd gear bushing, gear and hub using ST1 and ST2.

NOTE:
Replace the gear and hub if necessary. Do not attempt to disassemble if at all possible because they must engage at a specified point. If they should be disassembled, mark engagement point beforehand.

ST1 499757002 INSTALLER
ST2 899714110 REMOVER

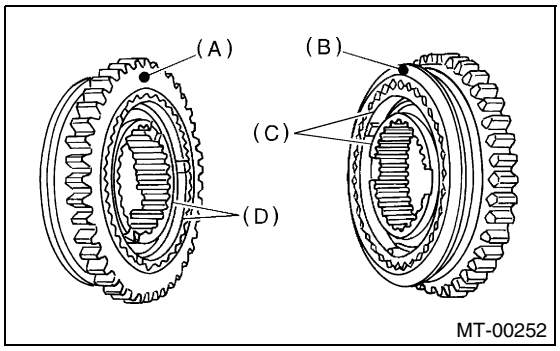


11) Remove the sub gear for 1st driven gear. (Non-turbo model only)

D: ASSEMBLY

1) Install the sleeve and assembly by matching alignment marks.

NOTE:
• Use a new gear and hub assembly, if gear or hub have been replaced.



(A) 1st gear side
(B) 2nd gear side
(C) Flush surface
(D) Stepped surface

2) Install the washer, snap ring and sub gear to 1st driven gear.
3) Install the 1st driven gear, 1st baulk ring, gear and hub assembly onto driven shaft.

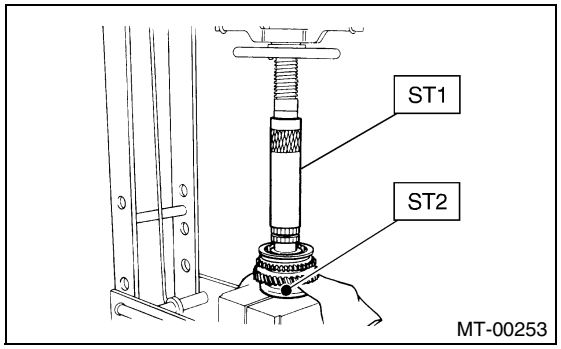
NOTE:
• Take care to install the gear and hub assembly in proper direction.
• Align the baulk ring and gear & hub assembly with key groove.

4) Install the 2nd driven gear bushing onto driven shaft using ST1, ST2 and press.

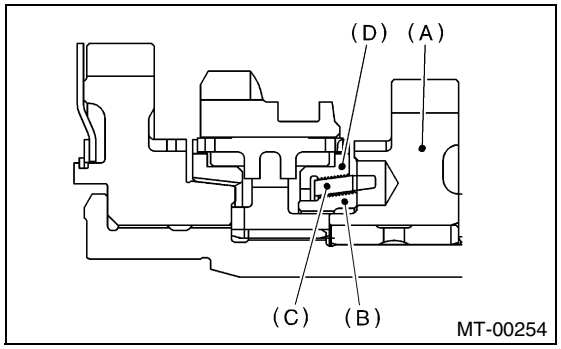
NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:
• Attach a cloth to the end of driven shaft to prevent damage.
• When press fitting, align the oil holes of shaft and bush.

ST1 499277200 INSTALLER
ST2 499587000 INSTALLER



5) Install the 2nd driven gear, inner baulk ring, synchro cone, outer baulk ring and insert onto driven shaft.

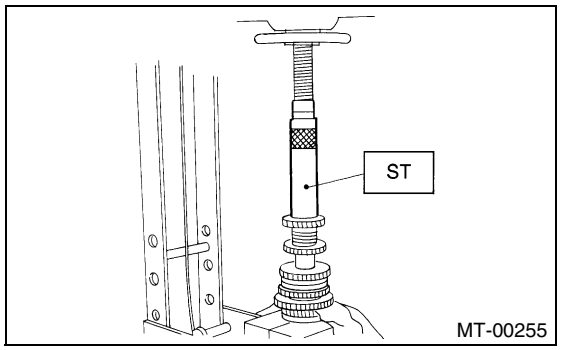


(A) 2nd driven gear
(B) Inner baulk ring
(C) Synchro cone
(D) Outer baulk ring

6) After installing the key on driven shaft, install the 3rd-4th driven gear using ST and press.

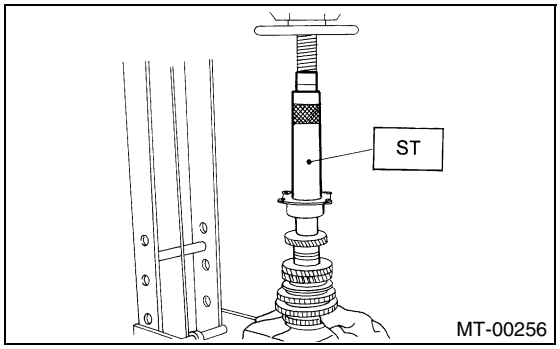
NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:
Align the groove in baulk ring with insert.
ST 499277200 INSTALLER



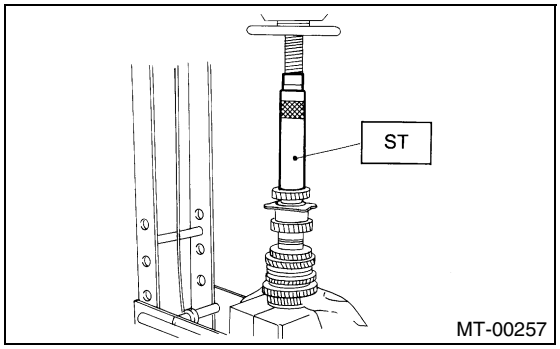
7) Install a set of roller bearings onto the driven shaft using ST and press.

NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
ST 499277200 INSTALLER



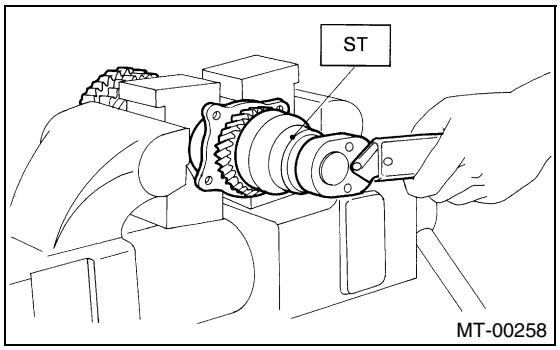
8) Position the woodruff key in groove on the rear of driven shaft. Install the 5th driven gear onto drive shaft using ST and press.

NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
ST 499277200 INSTALLER

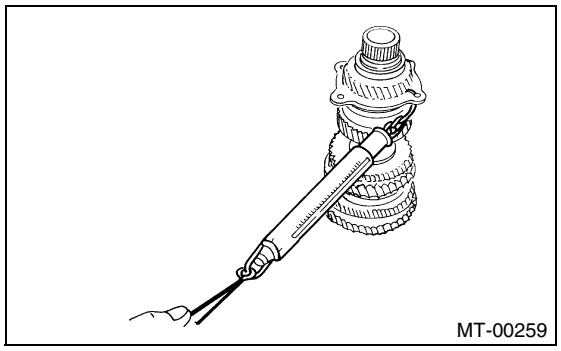


9) Install the lock washer. Install the lock nut and tighten to the specified torque using ST.
ST 499987300 SOCKET WRENCH (50)

Tightening torque:
260 N·m (26.5 kgf-m, 192 ft-lb)

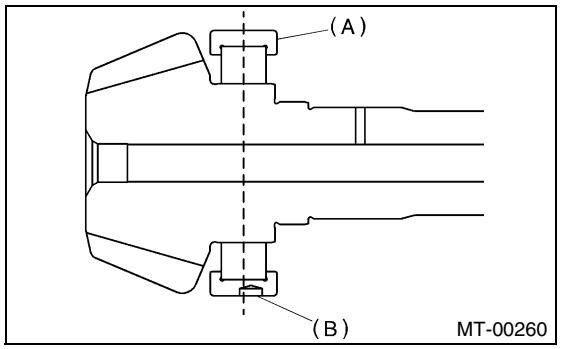


NOTE:
- Stake the lock nut at two points.
- Using the spring balancer, check that starting torque of roller bearing is 0.1 to 1.5 N (0.01 to 0.15 kgf, 0.02 to 0.33 ft).



10) Install the roller bearing onto drive pinion.

NOTE:
When installing the roller bearing, note its directions (front and rear) because the knock pin hole in outer race is offset.

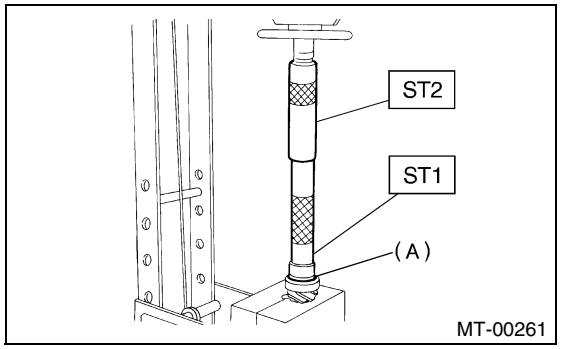


(A) Roller bearing
(B) Knock pin hole

11) Install the washer using ST1, ST2 and press.

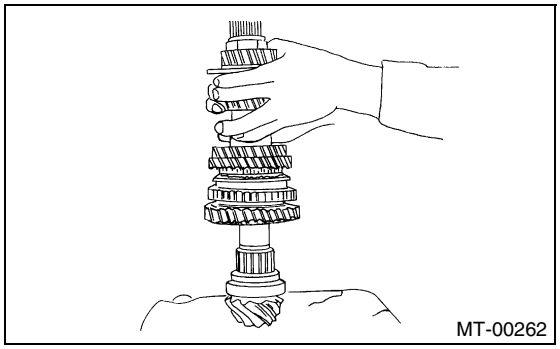
NOTE:
- Discard the old lock nuts, replace with new ones.
- Secure the lock nut in four places.

ST1 499277100 BUSH 1-2 INSTALLER
ST2 499277200 INSTALLER



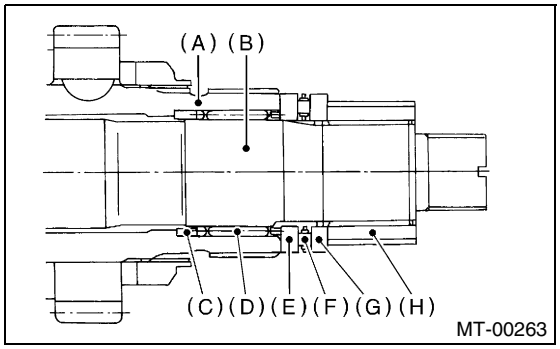
(A) Washer

12) Install the thrust bearing and needle bearing. Install the driven shaft assembly.



13) Install the drive pinion collar, needle bearing, adjusting washer No. 2, thrust bearing, adjusting washer No. 1 and differential bevel gear sleeve in that order.

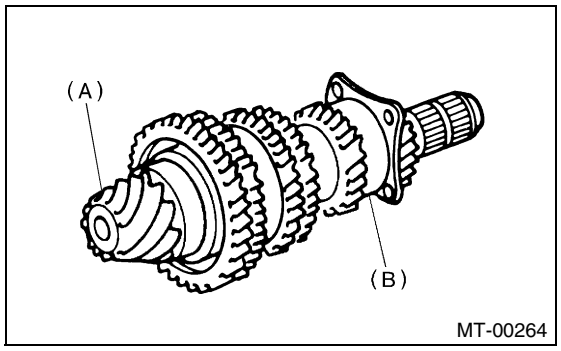
NOTE:
Be careful because the spacer must be installed in proper direction.



(A) Driven shaft
(B) Drive shaft
(C) Drive pinion collar
(D) Needle bearing (25 × 30 × 20)
(E) Washer No. 2 (25 × 36 × 4)
(F) Thrust bearing (25 × 37.5 × 3)
(G) Washer No. 1 (25 × 36 × t)
(H) Differential bevel gear sleeve

E: INSPECTION

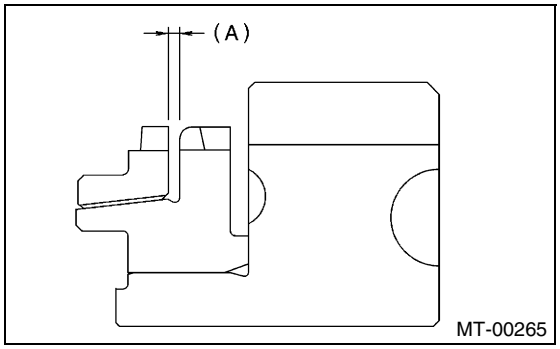
Disassembled parts should be washed clean first and then inspected carefully.
1) Bearings
Replace the bearings in the following cases:
• Bearings whose balls, outer races and inner races are broken or rusty.
• Worn bearings
• Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.
• The ball bearing on the rear side of the drive pinion shaft should be checked for smooth rotation before the drive pinion assembly is disassembled. In this case, because a preload is working on the bearing, its rotation feels like it is slightly dragging unlike the other bearings.



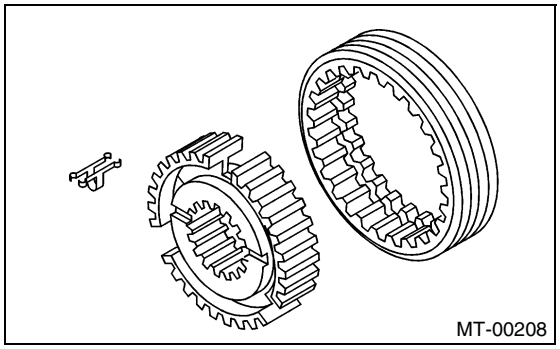
(A) Drive pinion shaft
(B) Ball bearing

• Bearings having other defects
2) Bushing (each gear)
Replace the bushing in the following cases:
• When the sliding surface is damaged or abnormally worn.
• When the inner wall is abnormally worn.
3) Gears
• Replace the gears with new ones if their tooth surfaces are broken, damaged, or excessively worn.
• Correct or replace if the cone that contacts the baulk ring is rough or damaged.
• Correct or replace if the inner surface or end face is damaged.
4) Baulk ring
Replace the ring in the following cases:
• When the inner surface and end face are damaged.
• When the ring inner surface is abnormally or partially worn down.
• If the gap between the end faces of the ring and the gear splined part is excessively small when the ring is pressed against the cone.

Clearance (A):
0.5 — 1.0 mm (0.020 — 0.040 in)



• When the contact surface of the synchronizer ring insert is scored or abnormally worn down.
5) Shifting insert key
Replace the insert if deformed, excessively worn, or defective in any way.

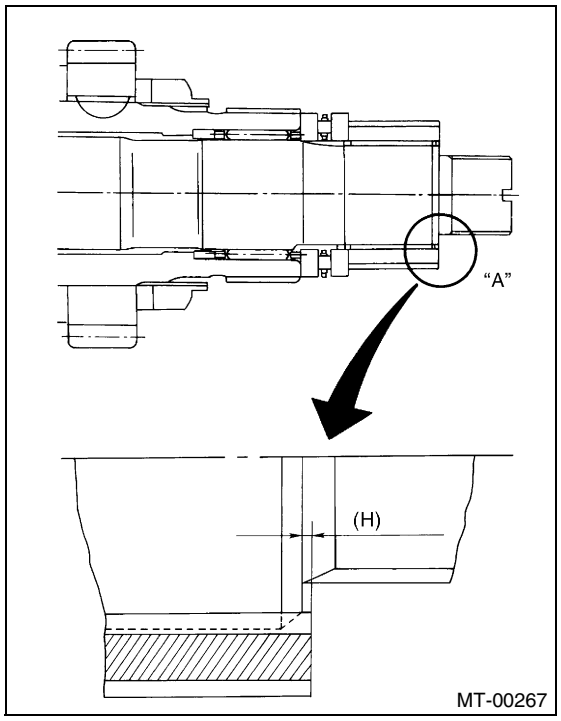


6) Oil seal
Replace the oil seal if the lip is deformed, hardened, damaged, worn, or defective in any way.
7) O-ring
Replace the O-ring if the sealing face is deformed, hardened, damaged, worn, or defective in any way.

F: ADJUSTMENT

1. THRUST BEARING PRELOAD

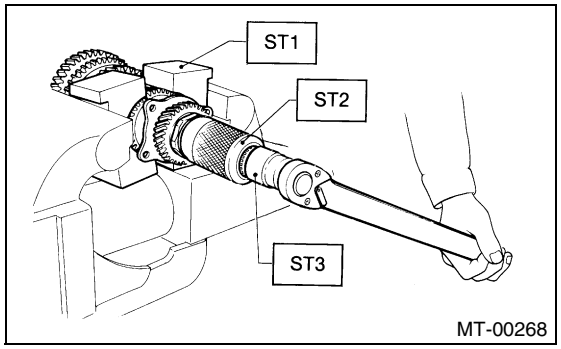
1) After completing the preceding steps 1) through 3), select the adjusting washer No. 1 so that dimension (H) is zero through visual check. Position the washer (18.3 × 30 × 4) and lock washer (18 × 30 × 2) and install the lock nut (18 × 13.5).



2) Using the ST1, ST2 and ST3, tighten the lock nut to specified torque.

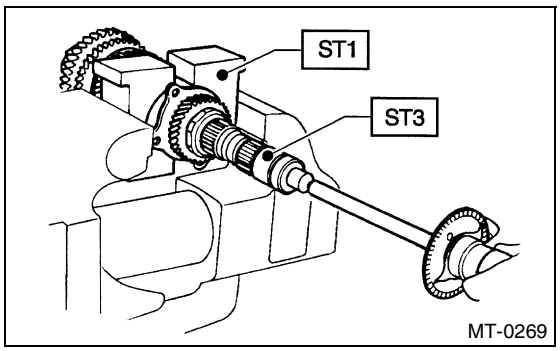
ST1	899884100	HOLDER
ST2	498427100	STOPPER
ST3	899988608	SOCKET WRENCH (27)

Tightening torque:
120 N·m (12.2 kgf-m, 88.2 ft-lb)

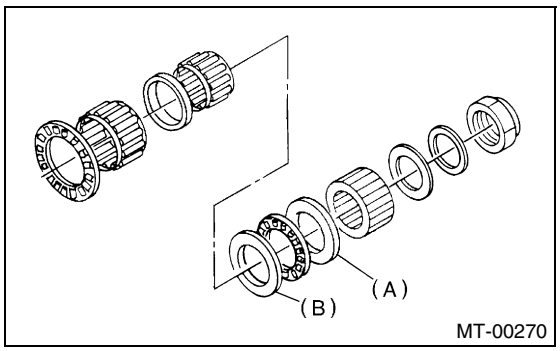


3) After removing the ST2, measure the starting torque using torque driver.
ST1 899884100 HOLDER
ST3 899988608 SOCKET WRENCH (27)

Starting torque:
0.3 — 0.8 N·m (0.03 — 0.08 kgf-m, 0.2 — 0.6 ft-lb)



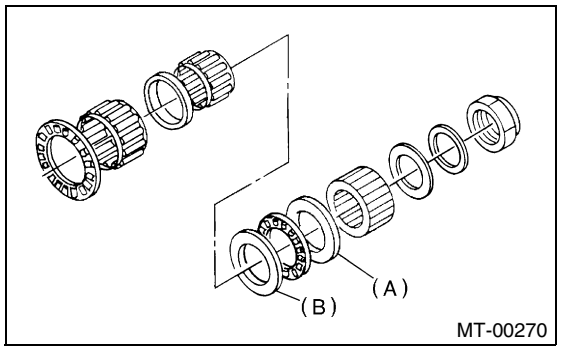
4) If the starting torque is not within specified limit, select a new adjusting washer No. 1 and recheck starting torque.



(A) Adjusting washer No.1
(B) Adjusting washer No.2

Adjusting washer No. 1	
Part No.	Thickness mm (in)
803025051	3.925 (0.1545)
803025052	3.950 (0.1555)
803025053	3.975 (0.1565)
803025054	4.000 (0.1575)
803025055	4.025 (0.1585)
803025056	4.050 (0.1594)
803025057	4.075 (0.1604)

5) If the specified starting torque range cannot be obtained when a No. 1 adjusting washer is used, then select a suitable No. 2 adjusting washer from those listed in the following table. Repeat steps 1) through 4) to adjust starting torque.



(A) Adjusting washer No. 1
(B) Adjusting washer No. 2

Starting torque	Dimension H	Washer No. 2
Low	Small	Select thicker one.
High	Large	Select thinner one.

Adjusting washer No. 2	
Part No.	Thickness mm (in)
803025059	3.850 (0.1516)
803025054	4.000 (0.1575)
803025058	4.150 (0.1634)

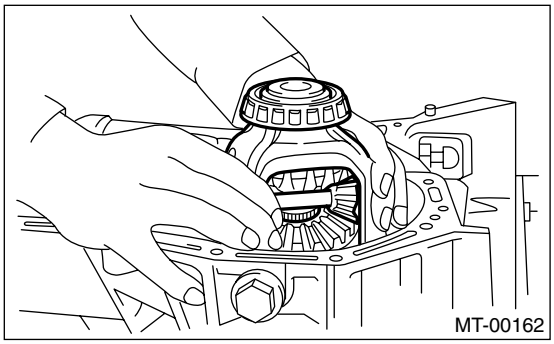
6) Recheck that the starting torque is within specified range, then clinch the lock nut at four positions.

21.Front Differential Assembly

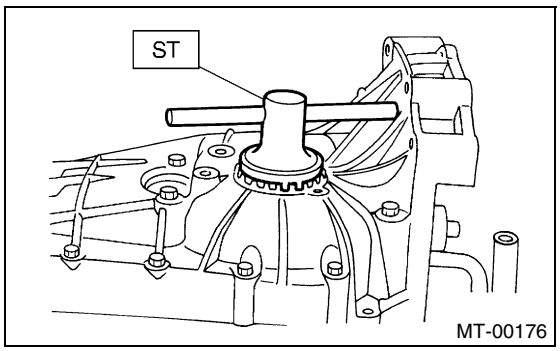
A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the transmission case. <Ref. to MT-63, REMOVAL, Transmission Case.>
4) Remove the drive pinion shaft assembly. <Ref. to MT-87, REMOVAL, Drive Pinion Shaft Assembly.>
5) Remove the main shaft assembly.
Single-range model
<Ref. to MT-69, REMOVAL, Main Shaft Assembly (Single-Range).>
Dual-range model
<Ref. to MT-77, REMOVAL, Main Shaft Assembly (Dual-Range).>
6) Remove the differential assembly.

NOTE:
Be careful not to confuse the right and left roller bearing outer races.



7) Remove the differential side retainers using ST.
ST 499787000 WRENCH ASSY



8) Remove the bearing outer race from transmission case.
ST 398527700 PULLER ASSY

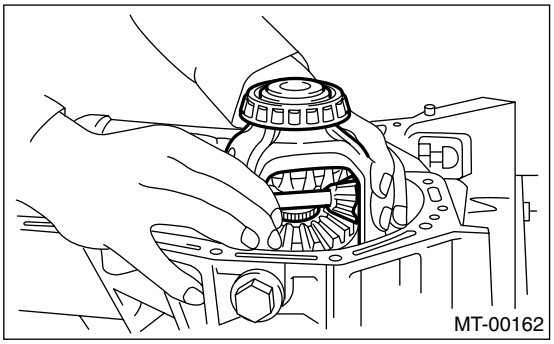
B: INSTALLATION

1) Insert the bearing outer race to transmission case.

NOTE:
Apply the transmission gear oil to outer surface of bearing outer race.

2) Install the differential side retainers using ST.
ST 499787000 WRENCH ASSY
3) Install the differential assembly.

NOTE:
Be careful not to fold the sealing lip of oil seal.

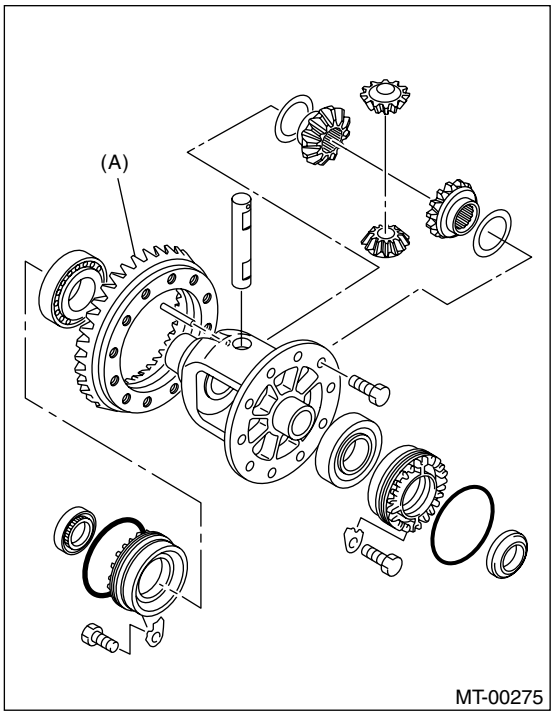


4) Install the main shaft assembly. <Ref. to MT-77, INSTALLATION, Main Shaft Assembly (Dual-Range).>
5) Install the drive pinion assembly. <Ref. to MT-87, INSTALLATION, Drive Pinion Shaft Assembly.>
6) Install the transmission case. <Ref. to MT-65, INSTALLATION, Transmission Case.>
7) Install the transfer case with extension case assembly. <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
8) Install the manual transmission assembly to vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

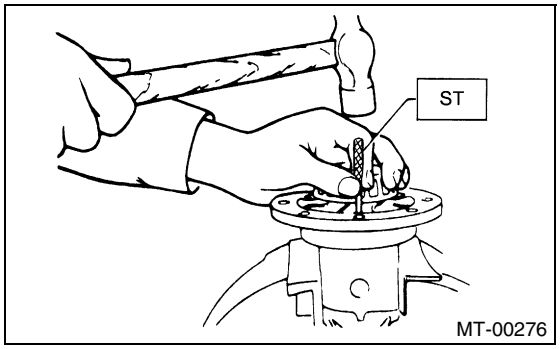
1. DIFFERENTIAL CASE ASSEMBLY

1) Loosen the twelve bolts and remove the hypoid driven gear.

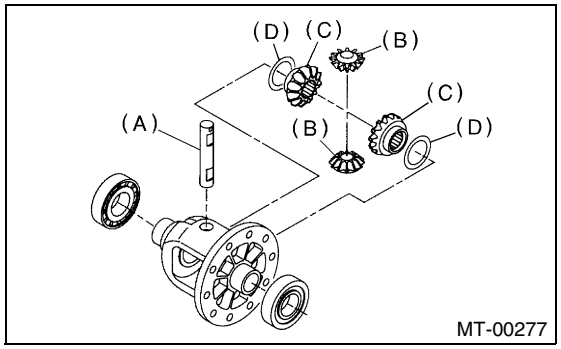


(A) Hypoid driven gear

2) Drive out the straight pin from differential assembly toward hypoid driven gear.
ST 899904100 REMOVER

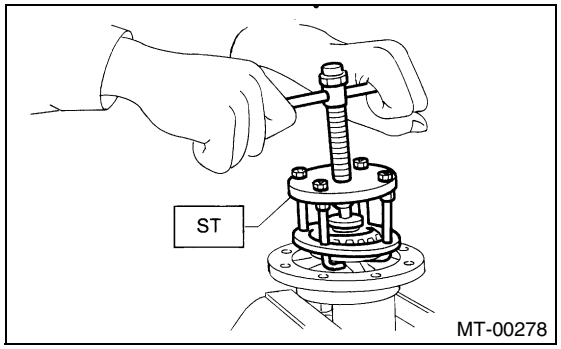


3) Pull out the pinion shaft, and remove the differential bevel pinion and gear and washer.



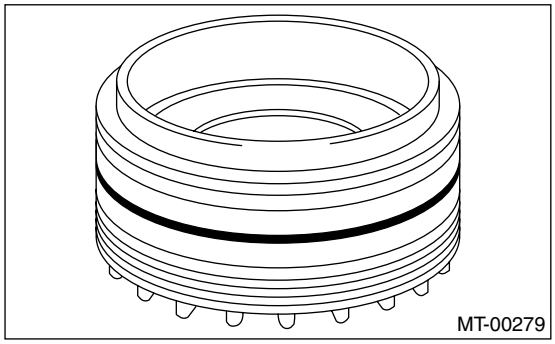
(A) Pinion shaft
(B) Bevel pinion
(C) Bevel gear
(D) Washer

4) Remove the roller bearing using ST.
ST 899524100 PULLER SET



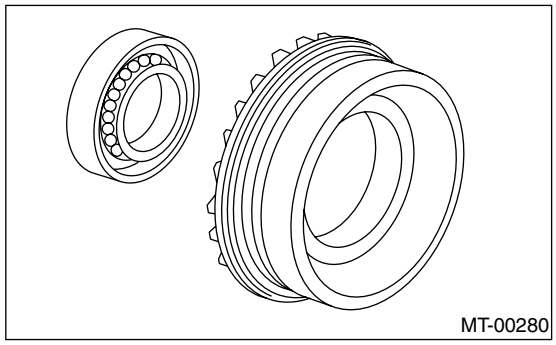
2. SIDE RETAINER

1) Remove the O-ring.



2) Remove the oil seal.

NOTE:
Remove the oil seal using a flat tip screwdriver.

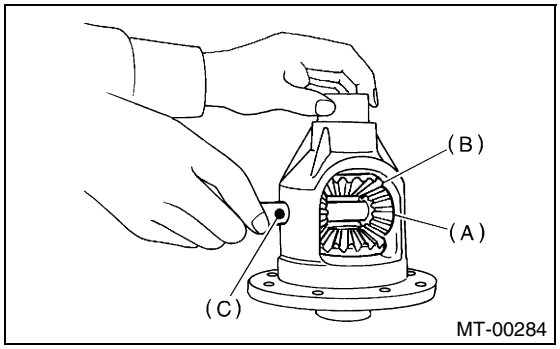


D: ASSEMBLY

1. DIFFERENTIAL CASE ASSEMBLY

1) Install the bevel gear and bevel pinion together with washers, and insert pinion shaft.

NOTE:
Face the chamfered side of washer toward gear.



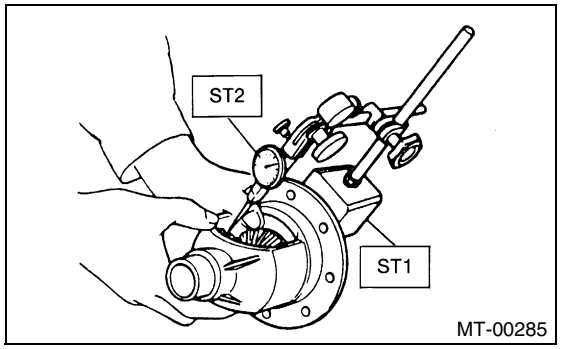
(A) Bevel pinion
(B) Bevel gear
(C) Pinion shaft

2) Measure the backlash between bevel gear and pinion. If it is not within specifications, install a suitable washer to adjust it. <Ref. to MT-100, ADJUSTMENT, Front Differential Assembly.>

NOTE:
Be sure the pinion gear tooth contacts adjacent gear teeth during measurement.

ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

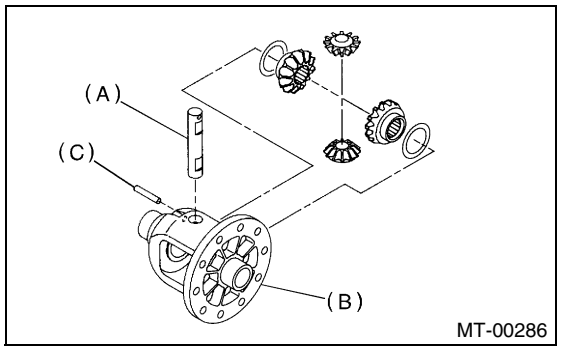
Standard backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)



3) Align the pinion shaft and differential case at their holes, and drive the straight pin into holes from the hypoid driven gear side, using ST.

NOTE:
Lock the straight pin after installing.

ST 899904100 REMOVER



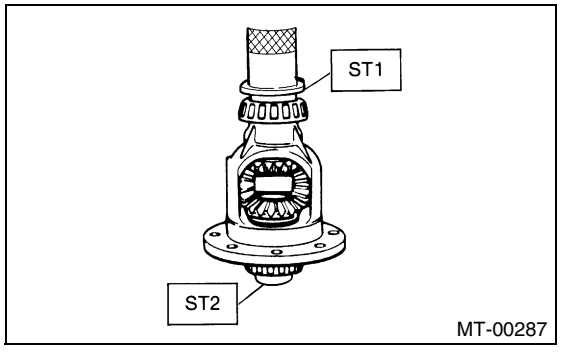
(A) Pinion shaft
(B) Differential case
(C) Straight pin

4) Install the roller bearing to differential case.

CAUTION:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

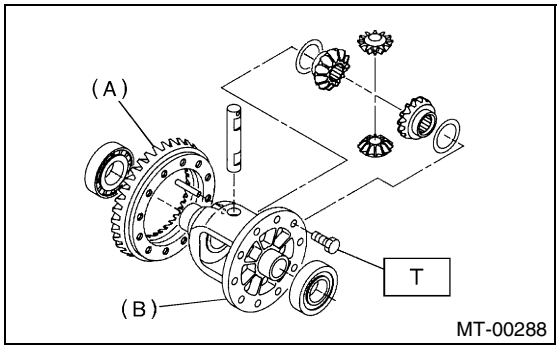
NOTE:
Be careful because the roller bearing outer races are used as a set.

ST1 499277100 BUSH 1-2 INSTALLER
ST2 398497701 ADAPTER



5) Install the hypoid driven gear to differential case using twelve bolts.

Tightening torque:
T: 62 N·m (6.3 kgf-m, 45.6 ft-lb)

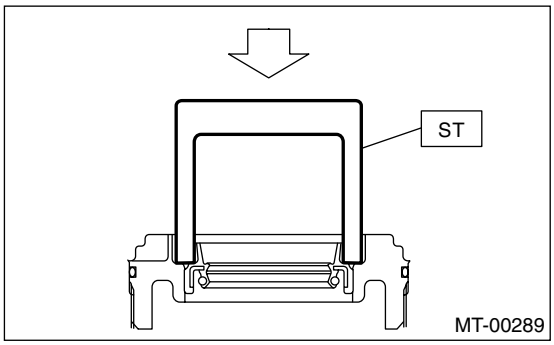


(A) Hypoid driven gear
(B) Differential case

2. SIDE RETAINER

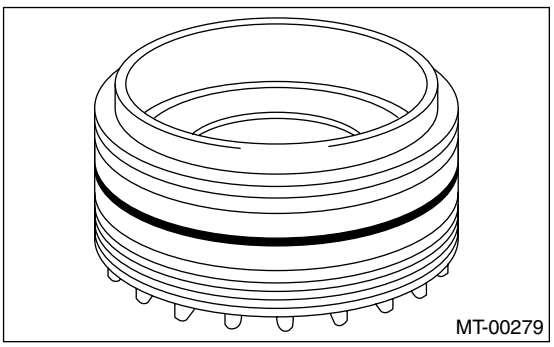
1) Install a new oil seal.
ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER

NOTE:
• When pressing fit the oil seal to side retainer, tap it to press fit using a plastic hammer.
• Do not use the press.



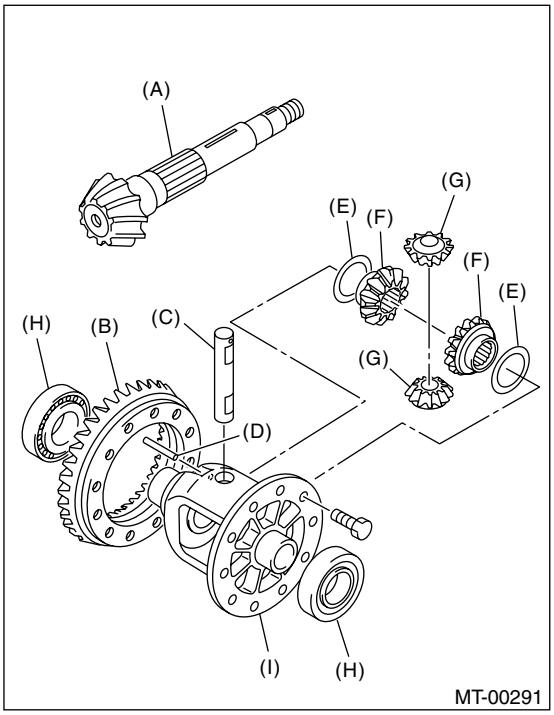
2) Install a new O-ring.

NOTE:
Do not stretch or damage the O-ring.



E: INSPECTION

Repair or replace the differential gear in the following cases:
• The hypoid drive gear and drive pinion shaft tooth surface are damaged, excessively worn, or seized.
• The roller bearing on the drive pinion shaft has a worn or damaged roller path.
• There is damage, wear, or seizure of the differential bevel pinion, differential bevel gear, washer, pinion shaft, and straight pin.
• The differential case has worn or damaged sliding surfaces.



(A) Drive pinion shaft
(B) Hypoid driven gear
(C) Pinion shaft
(D) Straight pin
(E) Washer
(F) Differential bevel gear
(G) Differential bevel pinion
(H) Roller bearing
(I) Differential case

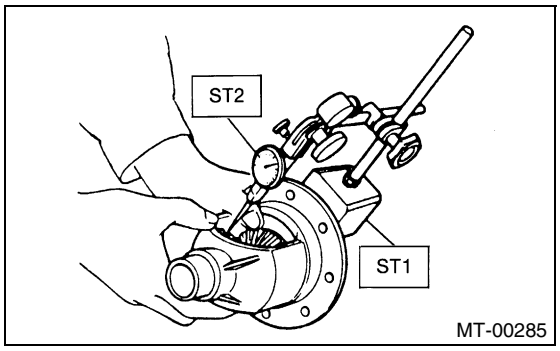
1. BEVEL PINION GEAR BACKLASH

Measure the backlash between bevel gear and pinion. If it is not within specifications, install a suitable washer to adjust it.

NOTE:
Be sure the pinion gear tooth contacts adjacent gear teeth during measurement.

ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

Standard backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)



2. HYPOID GEAR BACKLASH

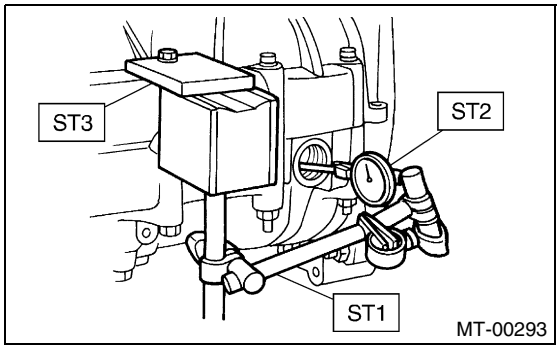
1) Set the ST1, ST2 and ST3. Insert the needle through transmission oil drain plug hole so that the needle comes in contact with the tooth surface at a right angle.

ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE
ST3 498255400 PLATE

2) Install the axle shaft (SUBARU Genuine Parts) to both sides, move it clockwise and counter clockwise to contact tooth, and then read the value of dial gauge runout.

Parts No. 38415AA100 AXEL SHAFT

Backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)

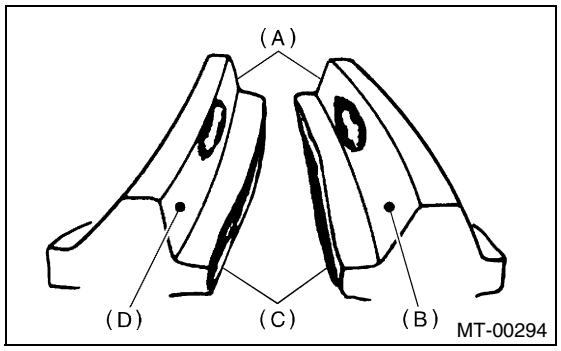


3) If the backlash is outside specified range, adjust it by turning the holder in right side case.

3. TOOTH CONTACT OF HYPOID GEAR

Check the tooth contact of hypoid gear as follows: Apply a uniform thin coat of red lead on both tooth surfaces of 3 or 4 teeth of the hypoid gear. Move the hypoid gear back and forth by turning the transmission main shaft until a definite contact pattern is developed on hypoid gear, and judge whether face contact is correct. If it is inaccurate, make adjustment. <Ref. to MT-100, ADJUSTMENT, Front Differential Assembly.>

- Tooth contact is correct.



(A) Toe
(B) Coast side
(C) Heel
(D) Drive side

F: ADJUSTMENT

1. BEVEL PINION GEAR BACKLASH

1) Disassemble the front differential. <Ref. to MT-95, REMOVAL, Front Differential Assembly.>
2) Select a different washer from the table and install.

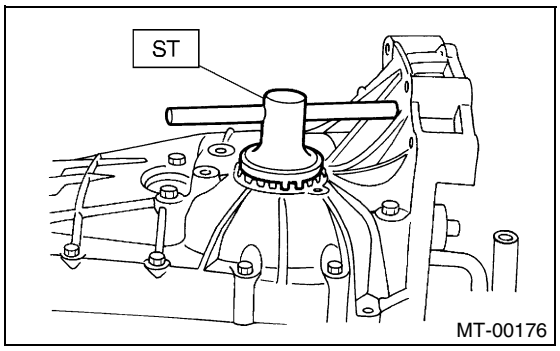
Washer	
Part No.	Thickness mm (in)
803038021	0.925 — 0.950 (0.0364 — 0.0374)
803038022	0.975 — 1.000 (0.0384 — 0.0394)
803038023	1.025 — 1.050 (0.0404 — 0.0413)

3) Adjust until the specified value is obtained.

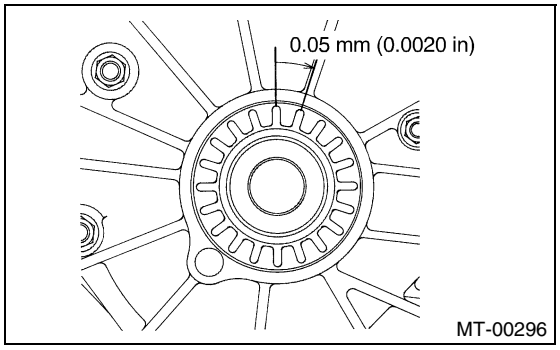
Standard backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)

2. HYPOID GEAR BACKLASH

Adjust backlash by turning the holder in right side case.
ST 499787000 WRENCH ASSY

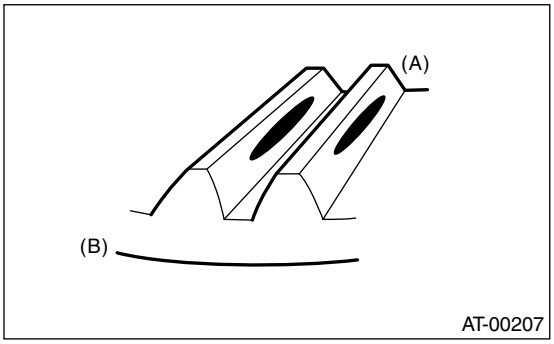


NOTE:
Each time holder rotates one tooth, backlash changes by 0.05 mm (0.0020 in).



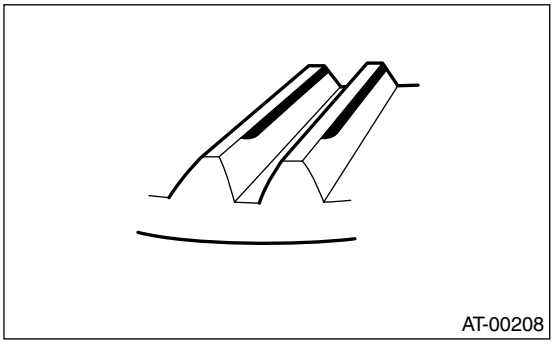
3. TOOTH CONTACT OF HYPOID GEAR

1) Adjust until the teeth contact is correct.
2) Check and adjust the teeth contact with following.
• Tooth contact
Checking item:Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. [When loaded, contact pattern moves toward heel.]

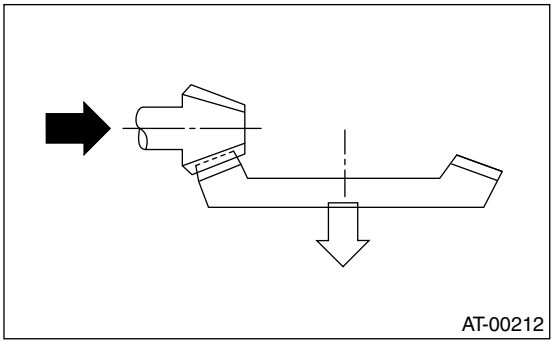


(A) Toe side
(B) Heel side

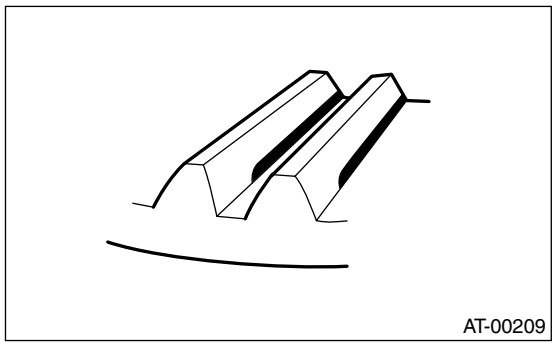
• Face contact
Checking item: Backlash is too large.
Contact pattern



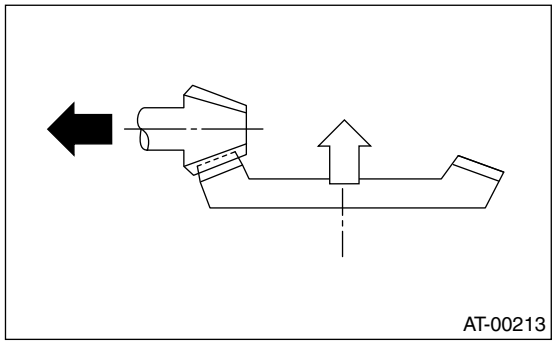
Corrective action: Reduce thickness of drive pinion shim in order to bring drive pinion close to crown gear.



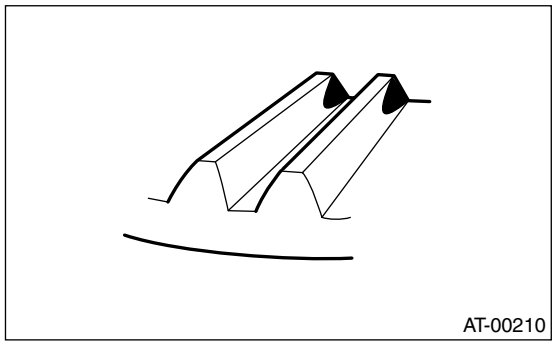
• Flank contact
Checking item: Backlash is too small.
Contact pattern



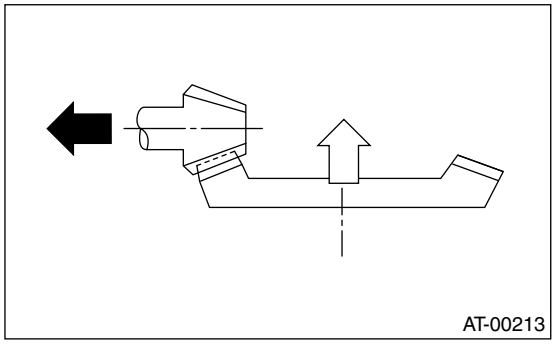
Corrective action: Increase thickness of drive pinion shim in order to move drive pinion away from crown gear.



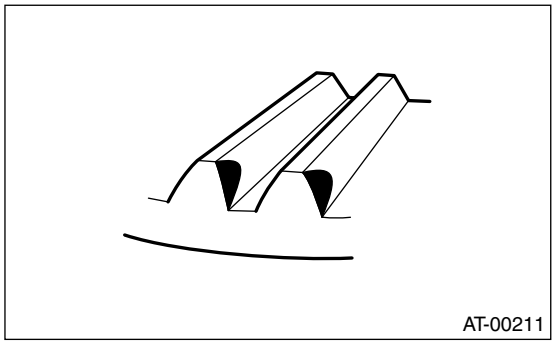
• Toe contact (Inside end contact)
Checking item: Contact areas is small.
Contact pattern



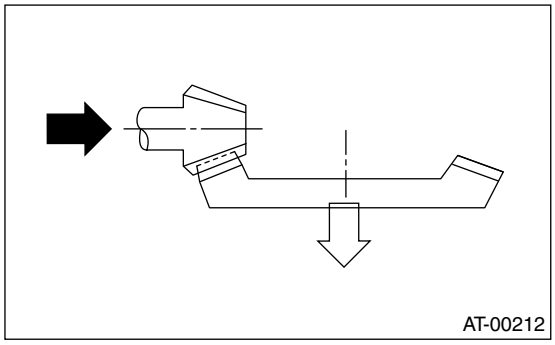
Corrective action: Increase thickness of drive pinion shim in order to bring drive pinion close to crown gear.



• Heel contact (Outside end contact)
Checking item: Contact areas is small.
Contact pattern



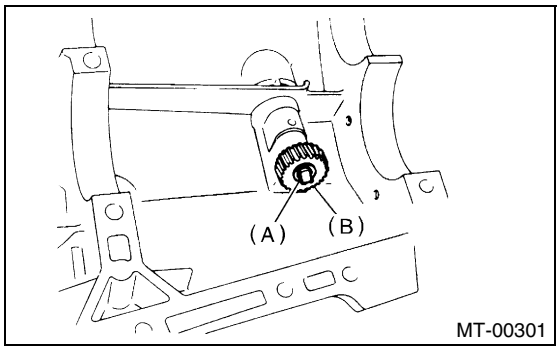
Corrective action: Reduce thickness of drive pinion shim in order to move drive pinion away from crown gear.



22.Speedometer Gear

A: REMOVAL

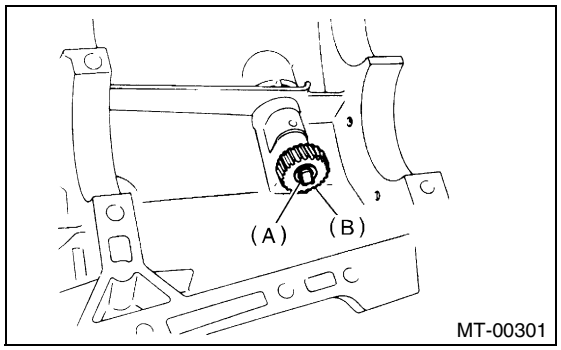
1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to MT-43, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the transmission case. <Ref. to MT-63, REMOVAL, Transmission Case.>
5) Remove the vehicle speed sensor. <Ref. to MT-46, REMOVAL, Vehicle Speed Sensor.>
6) Remove the outer snap ring and pull out speedometer driven gear. Next, remove the oil seal, speedometer shaft and washer.



(A) Outer snap ring
(B) Speedometer driven gear

B: INSTALLATION

1) Install the washer and speedometer shaft, and press fit the new oil seal with ST.
ST 899824100 or 499827000PRESS
2) Install the vehicle speed sensor. <Ref. to MT-46, INSTALLATION, Vehicle Speed Sensor.>
3) Install the speedometer driven gear and new snap ring.



(A) Outer snap ring
(B) Speedometer driven gear

4) Install the transmission case. <Ref. to MT-65, INSTALLATION, Transmission Case.>
5) Install the transfer case with extension case assembly. <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
6) Install the back-up light switch and neutral position switch. <Ref. to MT-44, INSTALLATION, Switches and Harness.>
7) Install the manual transmission assembly to vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

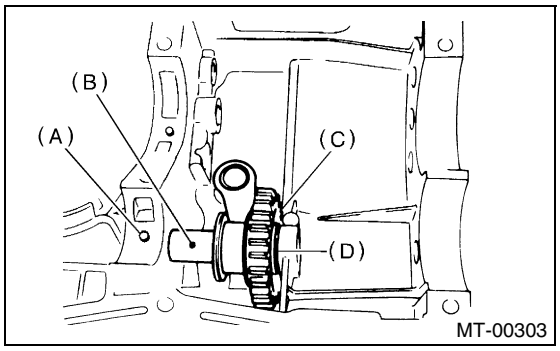
C: INSPECTION

Check the speedometer gear, oil seal and speedometer shaft for damage. Replace if damaged.

23.Reverse Idler Gear

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to MT-43, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the transmission case. <Ref. to MT-87, REMOVAL, Drive Pinion Shaft Assembly.>
5) Remove the drive pinion shaft assembly. <Ref. to MT-87, REMOVAL, Drive Pinion Shaft Assembly.>
6) Remove the main shaft assembly.
Single-range model
<Ref. to MT-69, REMOVAL, Main Shaft Assembly (Single-Range).>
Dual-range model
<Ref. to MT-77, REMOVAL, Main Shaft Assembly (Dual-Range).>
7) Remove the differential assembly. <Ref. to MT-95, REMOVAL, Front Differential Assembly.>
8) Remove the shifter forks and rods. <Ref. to MT-105, REMOVAL, Shifter Fork and Rod.>
9) Pull out the straight pin, and remove the idler gear shaft, reverse idler gear and washer.



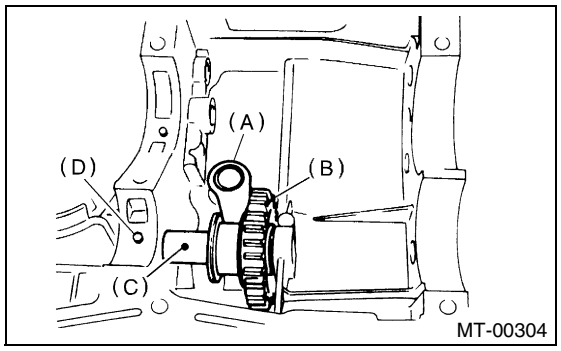
(A) Straight pin
(B) Idler gear shaft
(C) Idler gear
(D) Washer

10) Remove the reverse shifter lever.

B: INSTALLATION

1) Install the reverse shifter lever, reverse idler gear and reverse idler gear shaft, and secure with straight pin.

NOTE:
Be sure to install the reverse idler shaft from rear side.



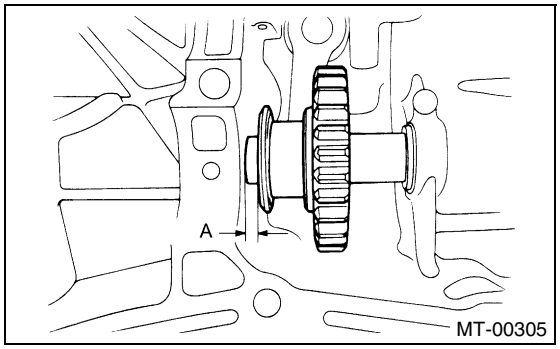
(A) Reverse shifter lever
(B) Reverse idler gear
(C) Reverse idler gear shaft
(D) Straight pin

2) Inspect and adjust the clearance between reverse idler gear and transmission case wall. <Ref. to MT-103, INSTALLATION, Reverse Idler Gear.> and <Ref. to MT-104, ADJUSTMENT, Reverse Idler Gear.>
3) Install the shifter forks and rods. <Ref. to MT-105, INSTALLATION, Shifter Fork and Rod.>
4) Install the differential assembly. <Ref. to MT-95, INSTALLATION, Front Differential Assembly.>
5) Install the main shaft assembly.
Single-range model
<Ref. to MT-69, INSTALLATION, Main Shaft Assembly (Single-Range).>
Dual-range model
<Ref. to MT-77, INSTALLATION, Main Shaft Assembly (Dual-Range).>
6) Install the drive pinion shaft assembly. <Ref. to MT-87, INSTALLATION, Drive Pinion Shaft Assembly.>
7) Install the transmission case. <Ref. to MT-65, INSTALLATION, Transmission Case.>
8) Install the transfer case with extension case assembly. <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
9) Install the back-up light switch and neutral position switch. <Ref. to MT-44, INSTALLATION, Switches and Harness.>
10) Install the manual transmission assembly to vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

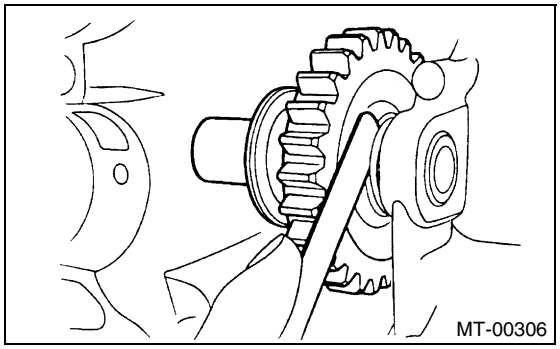
1) Move the reverse shifter rod toward the reverse side. Inspect the clearance between reverse idler gear and transmission case wall.
If out of specification, select the appropriate reverse shifter lever and adjust.

Clearance A:
6.0 — 7.5 mm (0.236 — 0.295 in)



2) After installing a suitable reverse shifter lever, shift into neutral. Inspect the clearance between reverse idler gear and transmission case wall.
If out of specification, select the appropriate washer and adjust.

Clearance:
0 — 0.5 mm (0 — 0.020 in)

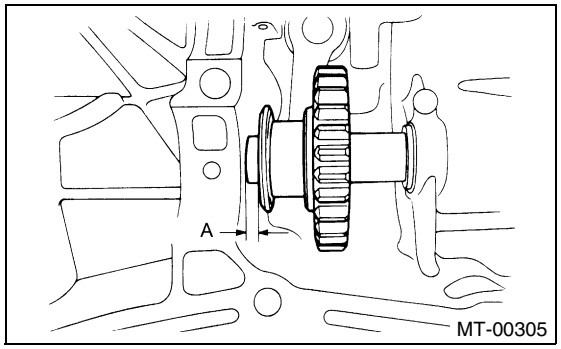


3) Check the reverse idler gear and shaft for damage. Replace if damaged.

D: ADJUSTMENT

1) Select the appropriate reverse shifter lever from the table below, and adjust until the gap between the reverse idler gear and transmission case wall is within specification.

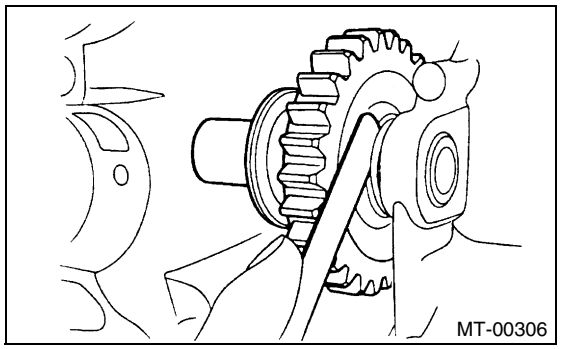
Clearance A:
6.0 — 7.5 mm (0.236 — 0.295 in)



Reverse shifter lever		
Part No.	Mark	Remarks
32820AA070	7	Further from case wall
32820AA080	8	Standard
32820AA090	9	Closer to case wall

2) Select the appropriate washer from the table below, and adjust until the gap between the reverse idler gear and transmission case wall is within specification.

Clearance:
0 — 0.5 mm (0 — 0.020 in)

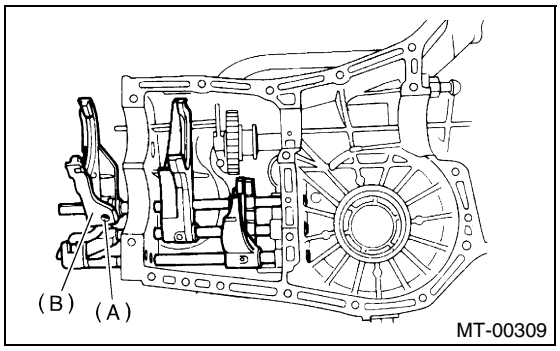


Washer	
Part No.	Thickness mm (in)
803020151	0.4 (0.016)
803020152	1.1 (0.043)
803020153	1.5 (0.059)
803020154	1.9 (0.075)
803020155	2.3 (0.091)

24.Shifter Fork and Rod

A: REMOVAL

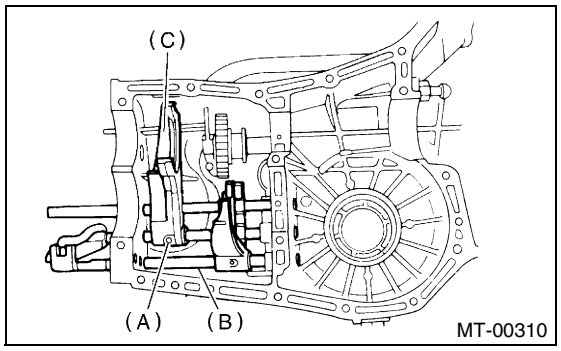
1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to MT-43, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the transmission case. <Ref. to MT-63, REMOVAL, Transmission Case.>
5) Remove the drive pinion shaft assembly. <Ref. to MT-87, REMOVAL, Drive Pinion Shaft Assembly.>
6) Remove the main shaft assembly.
Single-range model
<Ref. to MT-69, REMOVAL, Main Shaft Assembly (Single-Range).>
Dual-range model
<Ref. to MT-77, REMOVAL, Main Shaft Assembly (Dual-Range).>
7) Remove the differential assembly. <Ref. to MT-95, REMOVAL, Front Differential Assembly.>
8) Drive out the straight pin with ST, and 5th shifter fork.
ST 398791700 STRAIGHT PIN REMOVER



(A) Straight pin
(B) 5th shifter fork

9) Remove the plugs, springs and checking balls.
10) Drive out the straight pin, and pull out 3-4 fork rod and shifter fork.

NOTE:
When removing the rod, keep other rods in neutral.



(A) Straight pin
(B) 3-4 fork rod
(C) Shifter fork

11) Drive out the straight pin, and pull out 1-2 fork rod and shifter fork.
12) Remove the outer snap ring, and pull out the reverse shifter rod arm from reverse fork rod. Then take out the ball, spring and interlock plunger from rod.
And then remove the rod.

NOTE:
When pulling out the reverse shifter rod arm, be careful not to let the ball pop out of arm.

13) Remove the reverse shifter lever.

B: INSTALLATION

1) Apply grease to plunger.
ST 399411700 ACCENT BALL INSTALLER
2) Install the reverse arm fork spring, ball and interlock plunger to reverse fork rod arm. Insert the reverse fork rod into hole in reverse fork rod arm, and hold it with outer snap ring using ST.
3) Position the ball, spring and new gasket in reverse shifter rod hole, on left side transmission case, and tighten the checking ball plug.
4) Install the 1-2 fork rod into 1-2 shifter fork via the hole on the rear of transmission case.
5) Align the holes in rod and fork, and new drive straight pin into these holes using ST.

NOTE:
- Set other rods to neutral.
- Make sure the interlock plunger is on the 3-4 fork rod side.

ST 398791700 STRAIGHT PIN REMOVER
6) Apply a coat of grease to plunger.
7) Install the interlock plunger onto 3-4 fork rod.
8) Install the 3-4 fork rod into 3-4 shifter fork via the hole on the rear of transmission case.

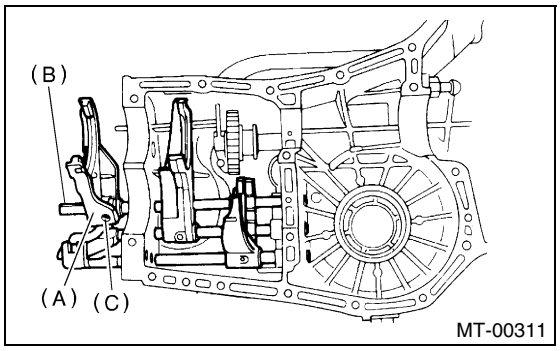
9) Align the holes in rod and fork, and new drive straight pin into these holes.

NOTE:
- Set the reverse fork rod to neutral.
- Make sure the interlock plunger (installing before) is on the reverse fork rod side.

ST 398791700 STRAIGHT PIN REMOVER

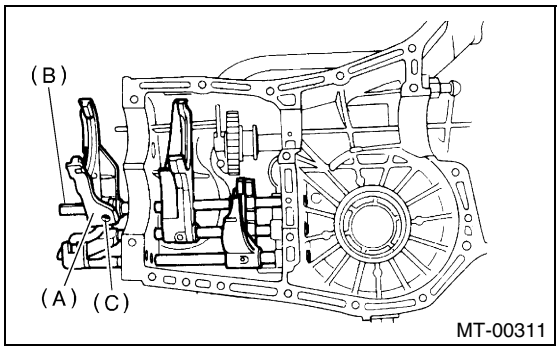
10) Install the 5th shifter fork onto the rear of reverse fork rod. Align holes in the two parts and new drive straight pin into place.

ST 398791700 STRAIGHT PIN REMOVER



(A) 5th shifter fork
(B) Reverse fork rod
(C) Straight pin

11) Position the balls, checking ball springs and new gaskets into 3-4 and 1-2 rod holes, and install plugs.



(A) 5th shifter fork
(B) Reverse fork rod
(C) Straight pin

12) Install the differential assembly. <Ref. to MT-95, INSTALLATION, Front Differential Assembly.>

13) Install the main shaft assembly.
Single-range model
<Ref. to MT-69, INSTALLATION, Main Shaft Assembly (Single-Range).>
Dual-range model
<Ref. to MT-77, INSTALLATION, Main Shaft Assembly (Dual-Range).>

14) Install the drive pinion shaft assembly. <Ref. to MT-87, INSTALLATION, Drive Pinion Shaft Assembly.>

15) Install the transmission case. <Ref. to MT-65, INSTALLATION, Transmission Case.>

16) Install the transfer case with extension case assembly. <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>

17) Install the back-up light switch and neutral position switch. <Ref. to MT-44, INSTALLATION, Switches and Harness.>

18) Install the manual transmission assembly to vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

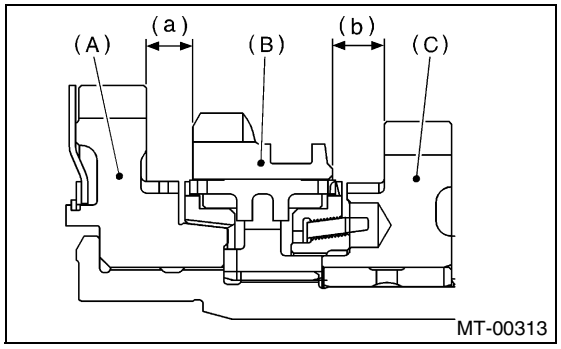
C: INSPECTION

1) Check the shift shaft and shift rod for damage. Replace if damaged.

2) Gearshift mechanism:
Repair or replace the gearshift mechanism if excessively worn, bent, or defective in any way.

3) Inspect the clearance between 1st, 2nd driven gear and reverse driven gear. If any clearance is not within specifications, replace the shifter fork as required.

Clearance (a) and (b):
9.5 mm (0.374 in)



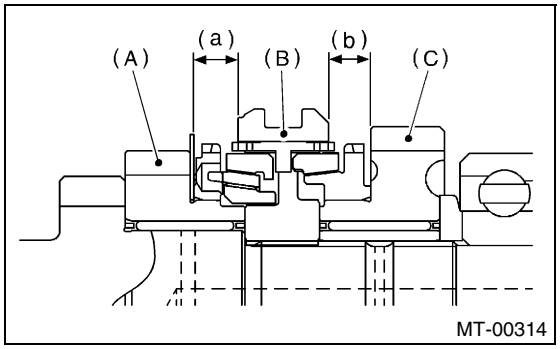
(A) 1st driven gear
(B) Reverse driven gear
(C) 2nd driven gear

1st-2nd shifter fork		
Part No.	Mark	Remarks
32804AA060	1	Approach to 1st gear by 0.2 mm (0.008 in).

1st-2nd shifter fork		
Part No.	Mark	Remarks
32804AA070	—	Standard
32804AA080	3	Become close from 2nd gear by 0.2 mm (0.008 in).

4) Inspect the clearance between 3rd, 4th drive gear and coupling sleeve. If any clearance is not within specifications, replace the shifter fork as required.

Clearance (a) and (b):
9.3 mm (0.366 in)

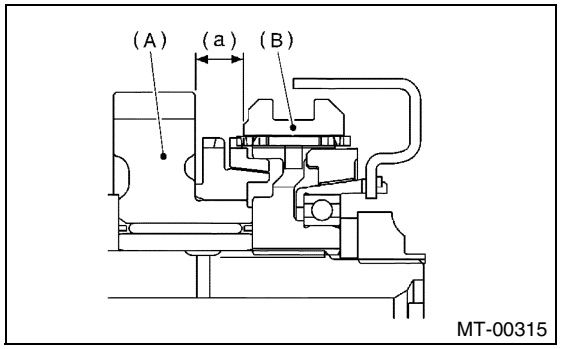


(A) 3rd drive gear
(B) Coupling sleeve
(C) 4th drive gear

3rd-4th shifter fork		
Part No.	Mark	Remarks
32810AA061	1	Approach to 4th gear by 0.2 mm (0.008 in).
32810AA071	—	Standard
32810AA101	3	Become close from 3rd gear by 0.2 mm (0.008 in).

5) Inspect the clearance between 5th drive gear and coupling sleeve. If any clearance is not within specifications, replace the shifter fork as required.

Clearance (a):
9.3 mm (0.366 in)



(A) 5th drive gear
(B) Coupling sleeve

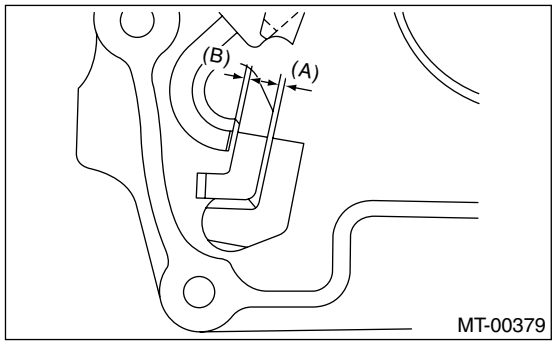
5th shifter fork (Non-turbo)		
Part No.	Mark	Remarks
32812AA201	7	Approach to 5th gear by 0.2 mm (0.008 in).
32812AA211	—	Standard
32812AA221	9	Become distant from 5th gear by 0.2 mm (0.008 in).

5th shifter fork (Turbo)		
Part No.	Mark	Remarks
32812AA231	7	Approach to 5th gear by 0.2 mm (0.008 in).
32812AA241	—	Standard
32812AA251	9	Become distant from 5th gear by 0.2 mm (0.008 in).

6) Inspect the rod end clearances (A) and (B). If any clearance is not within specifications, replace the rod or fork as required.

Clearance (A):
1st — 2nd to 3rd — 4th:
0.4 — 1.4 mm (0.016 — 0.055 in)

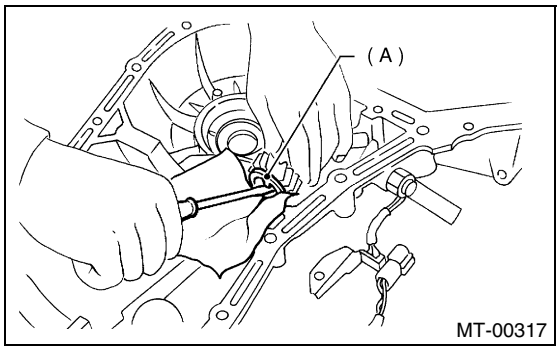
Clearance (B):
3rd — 4th to 5th:
0.5 — 1.3 mm (0.020 — 0.051 in)



25.Counter Gear

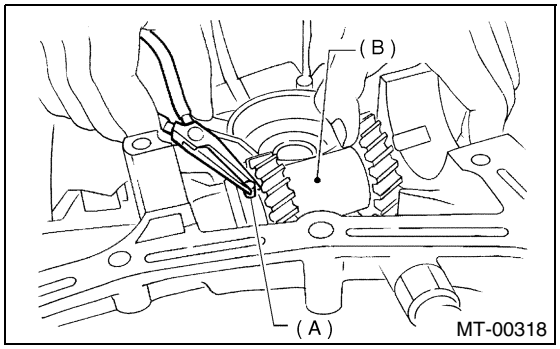
A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the transmission case. <Ref. to MT-63, REMOVAL, Transmission Case.>
4) Move the counter gear shaft until it touches transmission case, and remove the snap ring with a suitable tool.



(A) Snap ring

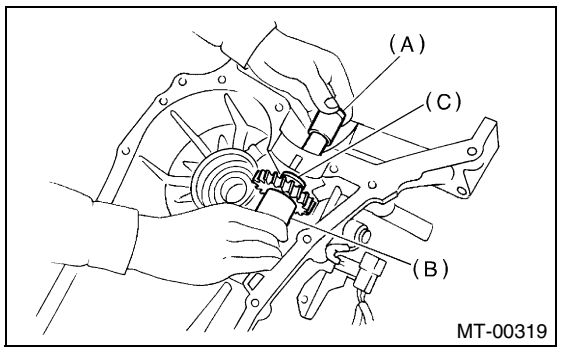
5) Slide the washer at rear of high-low counter shaft, and remove the straight pin from counter shaft.



(A) Straight pin
(B) Counter gear

6) Remove the counter shaft from transmission case, taking care not to drop the counter gear and two washers.

NOTE:
- Be careful not to damage the O-ring.
- Be careful not to drop the straight pin on front side.
- Be careful not to drop the two needle bearings and collar contained in counter gear.



(A) Counter shaft
(B) Counter gear
(C) Washers

B: INSTALLATION

1) Install the O-ring and straight pin onto counter gear shaft.
2) Install the following parts in main case (Right-side), and push the shaft perfectly into case.
- Counter gear shaft
- Two counter gear washers
- Two needle bearings
- Counter gear collar
- Counter gear
- Straight pin
- Snap ring

3) Install the transmission case. <Ref. to MT-65, INSTALLATION, Transmission Case.>
4) Install the transfer case with extension case assembly. <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
5) Install the manual transmission assembly on vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

NOTE:
- Make sure that the cut-out end surface of counter gear shaft does not protrude above the end surface of the case.
- Position the cut-out portion of counter gear shaft as shown in the figure.

C: INSPECTION

1) After installing the snap ring, measure the clearance between snap ring and counter washer.

Clearance:
0.05 — 0.35 mm (0.0020 — 0.0138 in)

2) If the clearance is out of measured value, select a snap ring and install to put clearance within measured value. <Ref. to MT-110, ADJUSTMENT, Counter Gear.>

D: ADJUSTMENT

Selection of snap ring:
If the measurement is not within specification, select suitable snap ring.

Snap ring	
Part No.	Thickness mm (in)
031319000	1.50 (0.0591)
805019010	1.72 (0.0677)

26.General Diagnostic

A: INSPECTION

1. MANUAL TRANSMISSION

Symptom	Possible cause	Remedy
1. Gears are difficult to intermesh. NOTE: The cause for difficulty in shifting gears can be classified into two kinds: one is malfunction of the gear shift system and the other is malfunction of the transmission. However, if the operation is heavy and engagement of the gears is difficult, defective clutch disengagement may also be responsible. Check whether the clutch is correctly functioning, before checking the gear shift system and transmission.	(a) Worn, damaged or burred chamfer of internal spline of sleeve and reverse driven gear	Replace.
	(b) Worn, damaged or burred chamfer of spline of gears	Replace.
	(c) Worn or scratched bushings	Replace.
	(d) Incorrect contact between synchronizer ring and gear cone or wear	Correct or replace.
2. Gear slips out. • Gear slips out when coasting on rough road. • Gear slips out during acceleration.	(a) Defective pitching stopper adjustment	Adjust.
	(b) Loose engine mounting bolts	Tighten or replace.
	(c) Worn fork shifter, broken shifter fork rail spring	Replace.
	(d) Worn or damaged ball bearing	Replace.
	(e) Excessive clearance between splines of synchronizer hub and synchronizer sleeve	Replace.
	(f) Worn tooth step of synchronizer hub (responsible for slip-out of 3rd gear)	Replace.
	(g) Worn 1st driven gear, needle bearing and race	Replace.
	(h) Worn 2nd driven gear, needle bearing and race	Replace.
	(i) Worn 3rd drive gear and bushing	Replace.
	(j) Worn 4th drive gear and bushing	Replace.
	(k) Worn reverse idler gear and bushing	Replace.
3. Unusual noise comes from transmission. NOTE: If an unusual noise is heard when the vehicle is parked with its engine idling and if the noise ceases when the clutch is disengaged, it may be considered that the noise comes from the transmission.	(a) Insufficient or improper lubrication	Lubricate or replace with specified oil.
	(b) Worn or damaged gears and bearings NOTE: If the trouble is only wear of the tooth surfaces, merely a high roaring noise will occur at high speeds, but if any part is broken, rhythmical knocking sound will be heard even at low speeds.	Replace.

2. DIFFERENTIAL

Symptom	Possible cause	Remedy
1. Broken differential (case, gear, bearing, etc.) NOTE: Abnormal noise will develop and finally it will become impossible to continue to run due to broken pieces obstructing the gear revolution.	(a) Insufficient or improper oil	Disassemble the differential and replace broken components and at the same time check other components for any trouble, and replace if necessary.
	(b) Use of vehicle under severe conditions such as excessive load and improper use of clutch	Readjust the bearing preload and backlash and face contact of gears.
	(c) Improper adjustment of taper roller bearing	Adjust.
	(d) Improper adjustment of drive pinion and hypoid driven gear	Adjust.
	(e) Excessive backlash due to worn differential side gear, washer or differential pinion vehicle under severe operating conditions.	Add recommended oil to specified level. Do not use the vehicle under severe operating conditions.
	(f) Loose hypoid driven gear clamping bolts	Tighten.
2. Differential and hypoid gear noises Troubles of the differential and hypoid gear always appear as noise problems. Therefore noise is the first indication of the trouble. However noises from the engine, muffler, tire, exhaust gas, bearing, body, etc. are easily mistaken for the differential noise. Pay special attention to the hypoid gear noise because it is easily confused with other gear noises. There are the following four kinds of noises. • Gear noise when driving: If noise increases as vehicle speed increases it may be due to insufficient gear oil, incorrect gear engagement, damaged gears, etc. • Gear noise when coasting: Damaged gears due to maladjusted bearings and incorrect shim adjustment • Bearing noise when driving or when coasting: Cracked, broken or damaged bearings • Noise which mainly occurs when turning: Unusual noise from differential side gear, differential pinion, differential pinion shaft, etc.	(a) Insufficient oil	Lubricate.
	(b) Improper adjustment of hypoid driven gear and drive pinion	Check tooth contact.
	(c) Worn teeth of hypoid driven gear and drive pinion	Replace as a set. Readjust the bearing preload.
	(d) Loose roller bearing	Readjust the hypoid driven gear to drive pinion backlash and check tooth contact.
	(e) Distorted hypoid driven gear or differential case	Replace.
	(f) Worn washer and differential pinion shaft	Replace.

CLUTCH SYSTEM

CL

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1. General Description

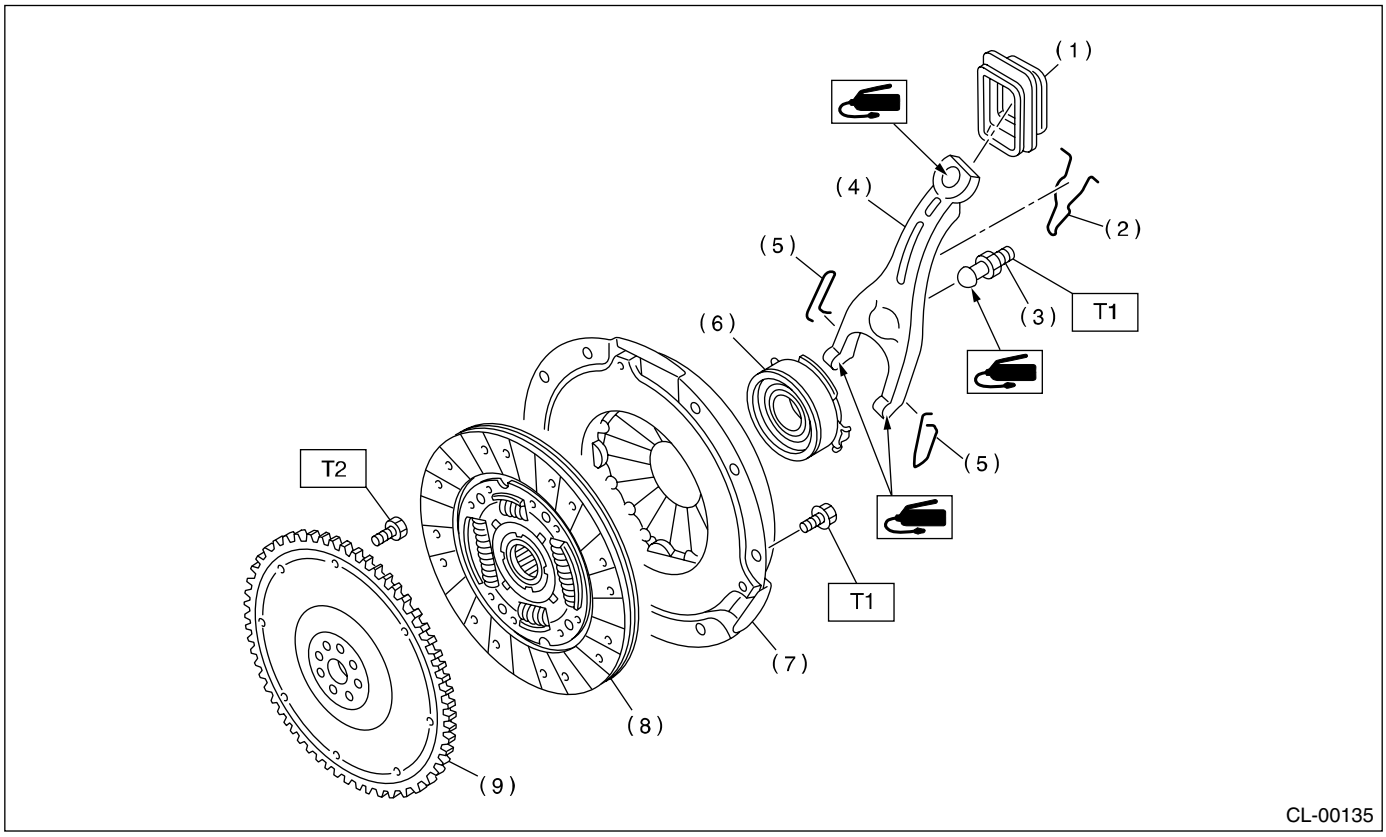
A: SPECIFICATIONS

Model				2.0 L NON-TURBO, 2.5 L LHD	2.0 L TURBO	2.5 L RHD
Clutch cover	Type			Push type	Pull type	Push type
	Diaphragm set load		kgf (lb)	580 (1,279)	700 (1,543)	565 (1,246)
Clutch disc	Facing material			Woven (Non asbestos)		
	O.D. × I.D. × thickness	mm (in)	Flywheel side	225 × 150 × 3.5 (8.86 × 5.91 × 0.138)	230 × 155 × 3.5 (9.06 × 6.10 × 0.138)	228.6 × 155 × 2.95 (9.00 × 6.10 × 0.116)
			Pressure plate side		230 × 155 × 3.2 (9.06 × 6.10 × 0.126)	
	Spline O.D.		mm (in)	25.2 (0.992), (No. of teeth: 24)		
Clutch release lever ratio				1.6	1.7	1.6
Release bearing				Grease-packed self-aligning		
Clutch pedal	Full stroke		mm (in)	130 — 135 (5.12 — 5.31)		
	Free play		mm (in)	4 — 12 (0.16 — 0.47)	3 — 13 (0.12 — 0.51)	4 — 12 (0.16 — 0.47)
Clutch disc	Depth of rivet head mm (in)	Standard		1.3 — 1.9 (0.051 — 0.075)		
		Limit of sinking		0.3 (0.012)		
	Limit for run out		mm (in)	0.8 (0.031) at R = 110 (4.33)		1.0 (0.039) at R = 110 (4.33)

I.D.: Inner diameter
O.D.: Outer diameter

B: COMPONENT

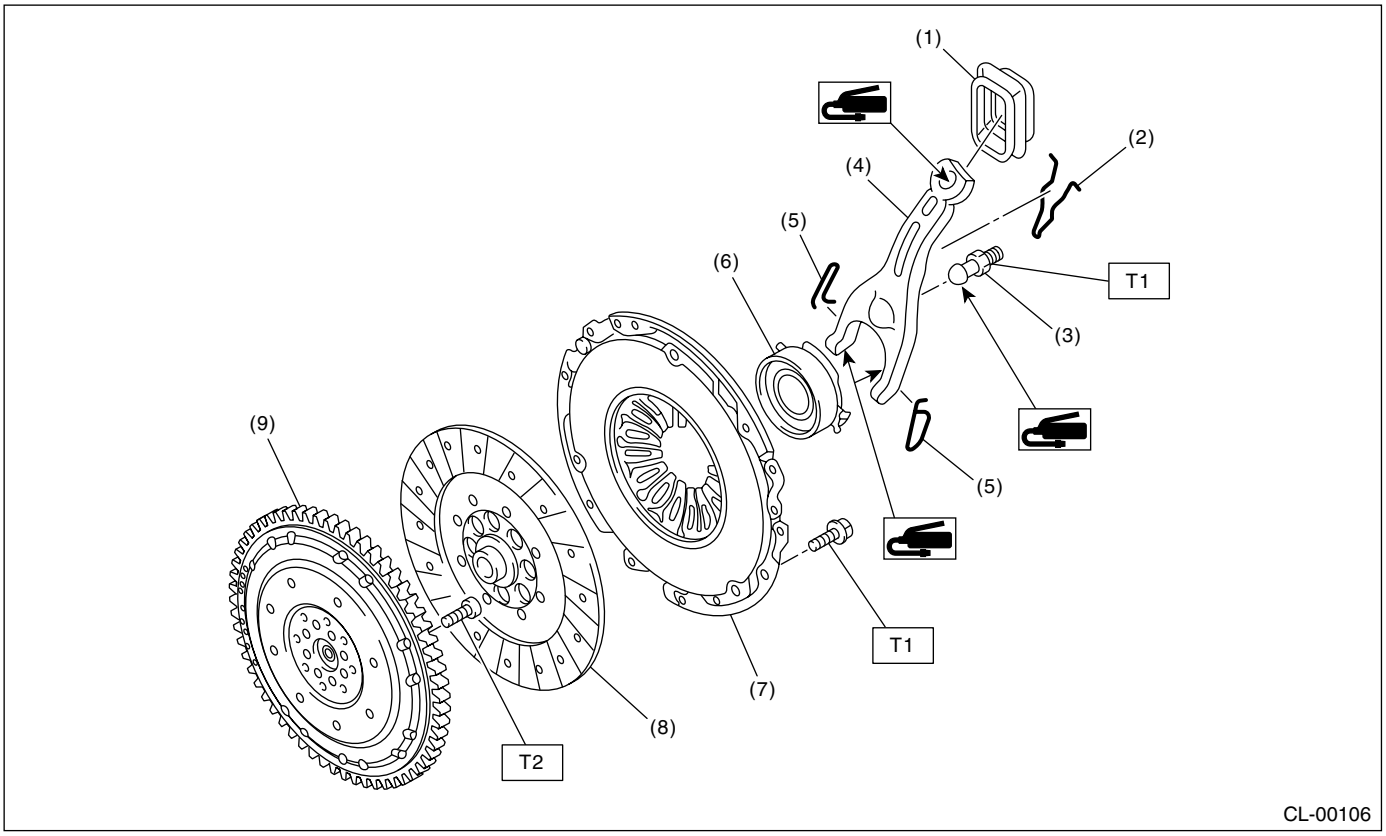
1. CLUTCH ASSEMBLY (2.0 L NON-TURBO MODEL AND LHD 2.5 L MODEL)



(1) Clutch release lever sealing
(2) Retainer spring
(3) Pivot
(4) Clutch release lever
(5) Clip
(6) Clutch release bearing
(7) Clutch cover
(8) Clutch disc
(9) Flywheel

Tightening torque: N·m (kgf-m, ft-lb)
T1: 16 (1.6, 11.6)
T2: 72 (7.3, 52.8)

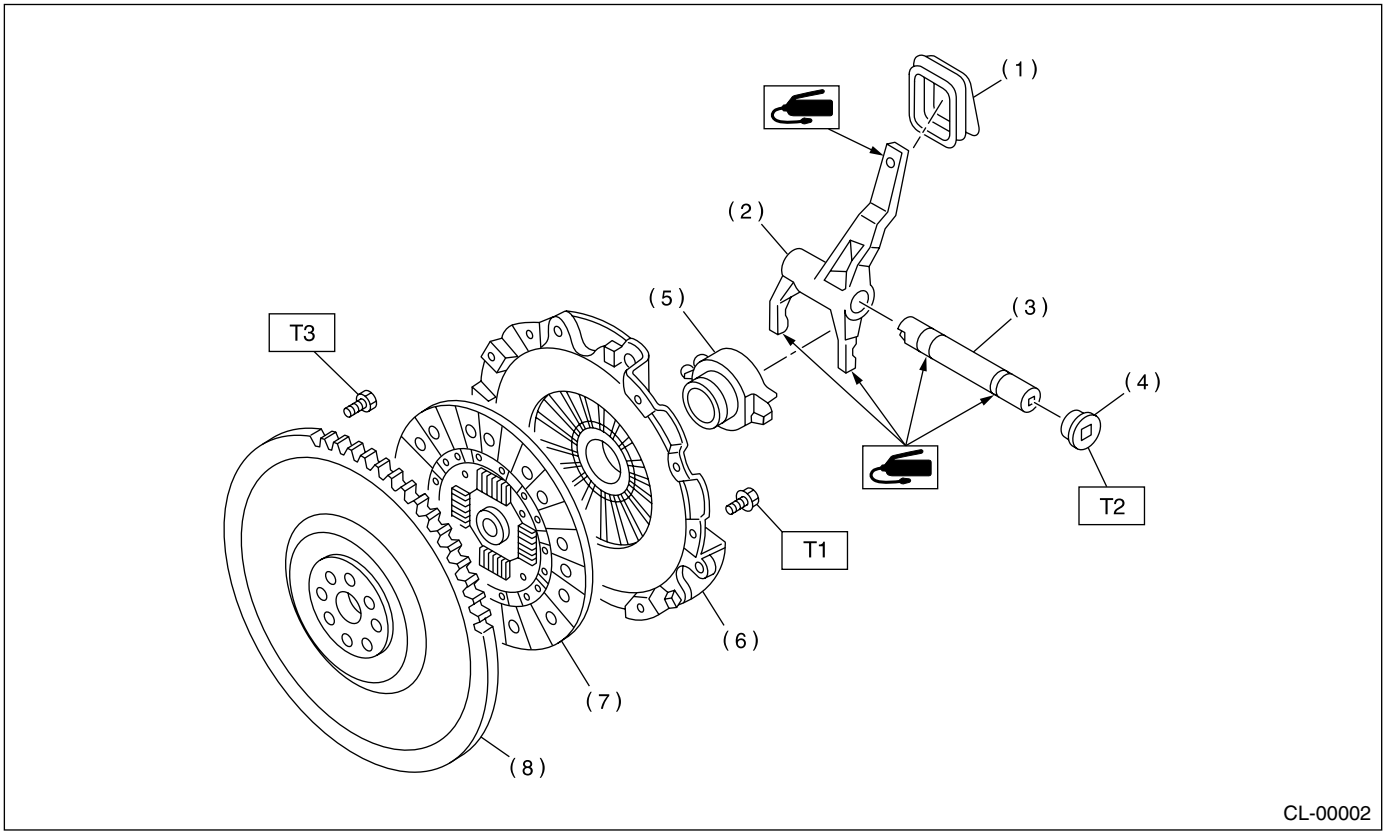
2. CLUTCH ASSEMBLY (RHD 2.5 L MODEL)



(1) Clutch release lever seal
(2) Retainer spring
(3) Pivot
(4) Release lever
(5) Clip
(6) Release bearing
(7) Clutch cover
(8) Clutch disc
(9) Double mass flywheel

Tightening torque: N·m (kgf-m, ft-lb)
T1: 15.7 (1.6, 11.6)
T2: 72 (7.3, 52.8)

3. CLUTCH ASSEMBLY (2.0 L TURBO MODEL)

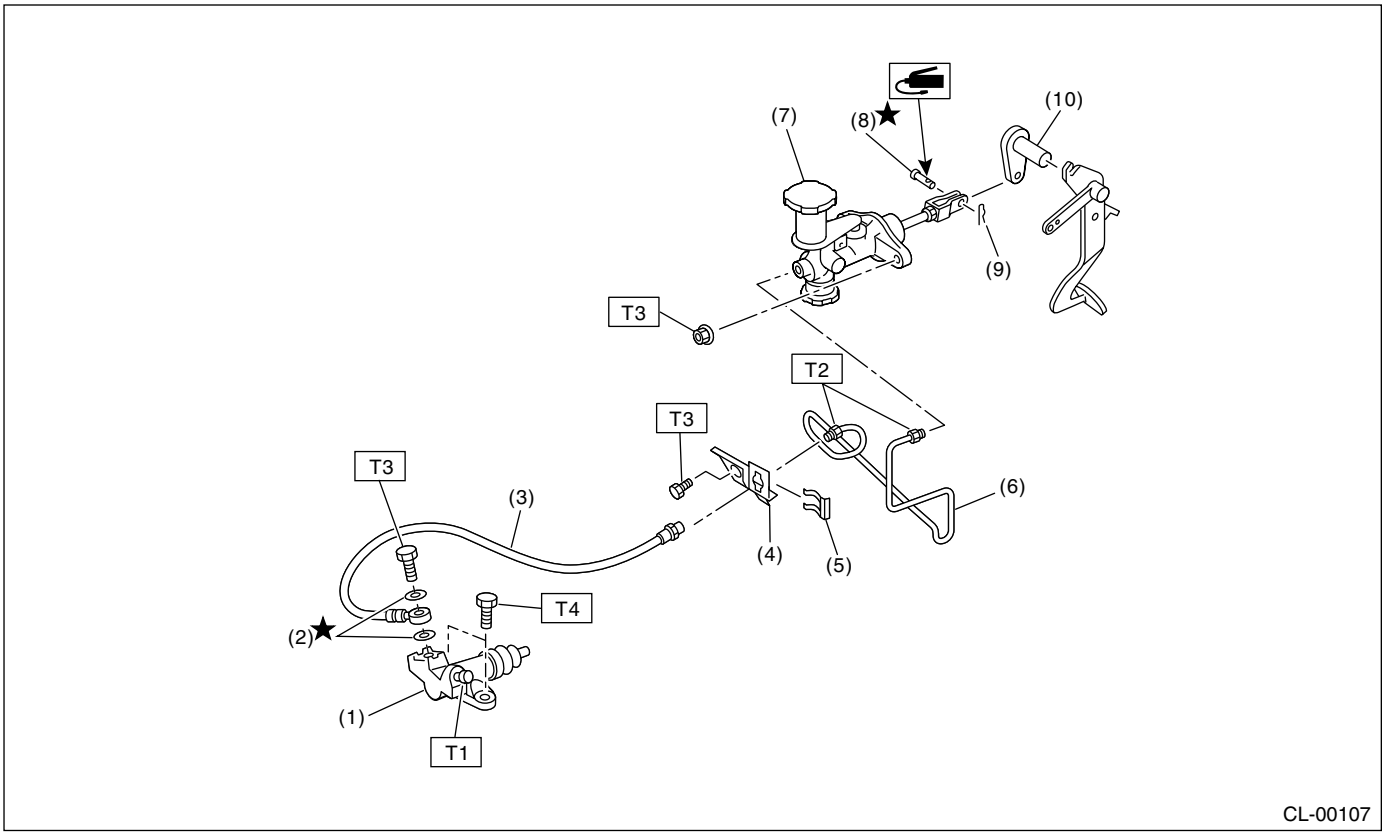


(1) Clutch release lever sealing
(2) Clutch release lever
(3) Clutch release lever shaft
(4) Plug
(5) Clutch release bearing
(6) Clutch cover
(7) Clutch disc
(8) Flywheel

Tightening torque: N·m (kgf-m, ft-lb)
T1: 16 (1.6, 11.6)
T2: 44 (4.5, 32.5)
T3: 72 (7.3, 52.8)

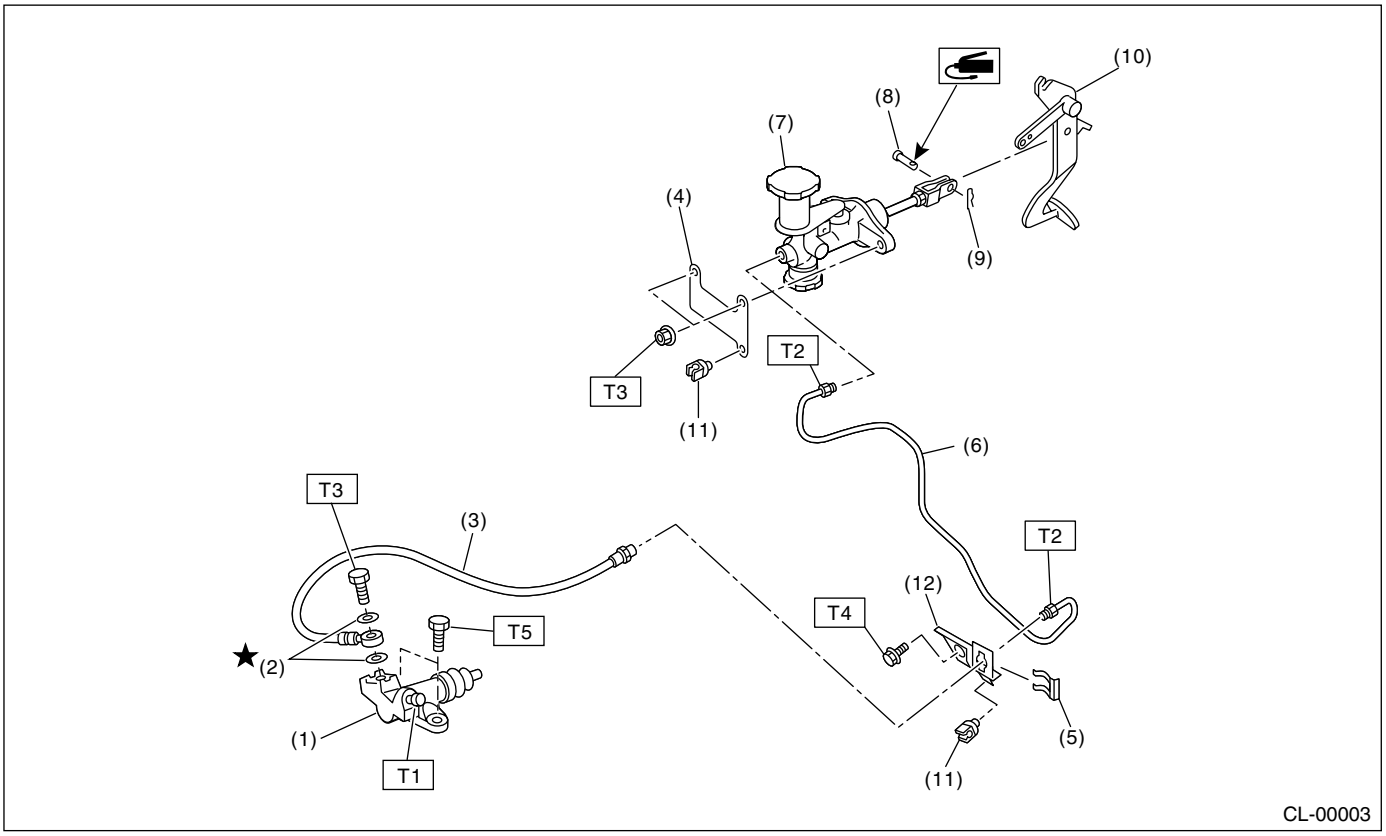
4. CLUTCH PIPE AND HOSE (NON-TURBO MODEL)

• LHD MODEL



(1)	Operating cylinder	(6)	Pipe	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	Gasket	(7)	Master cylinder ASSY	***T1: 8 (0.8, 5.8)***
(3)	Clutch hose	(8)	Clevis pin	***T2: 15 (1.5, 10.8)***
(4)	Bracket	(9)	Snap pin	***T3: 18 (1.8, 13.0)***
(5)	Clip	(10)	Lever	***T4: 37 (3.8, 27.5)***

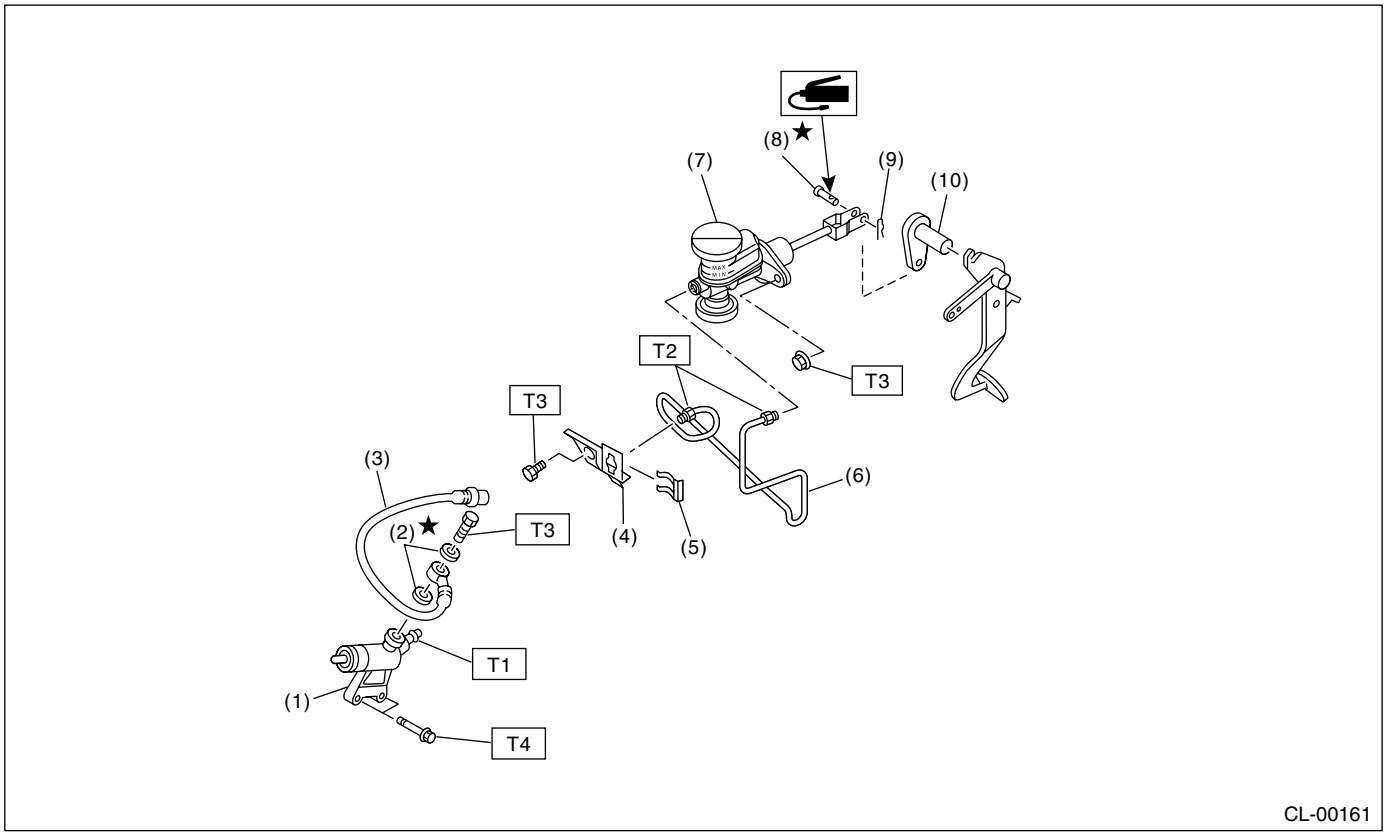
• RHD MODEL



(1)	Operating cylinder	(7)	Master cylinder ASSY	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	Gasket	(8)	Clevis pin	***T1: 8 (0.8, 5.8)***
(3)	Clutch hose	(9)	Snap pin	***T2: 15 (1.5, 10.8)***
(4)	Bracket	(10)	Pedal	***T3: 18 (1.8, 13.0)***
(5)	Clamp	(11)	Clip	***T4: 25 (2.5, 18.1)***
(6)	Clutch pipe	(12)	Bracket	***T5: 37 (3.8, 27.5)***

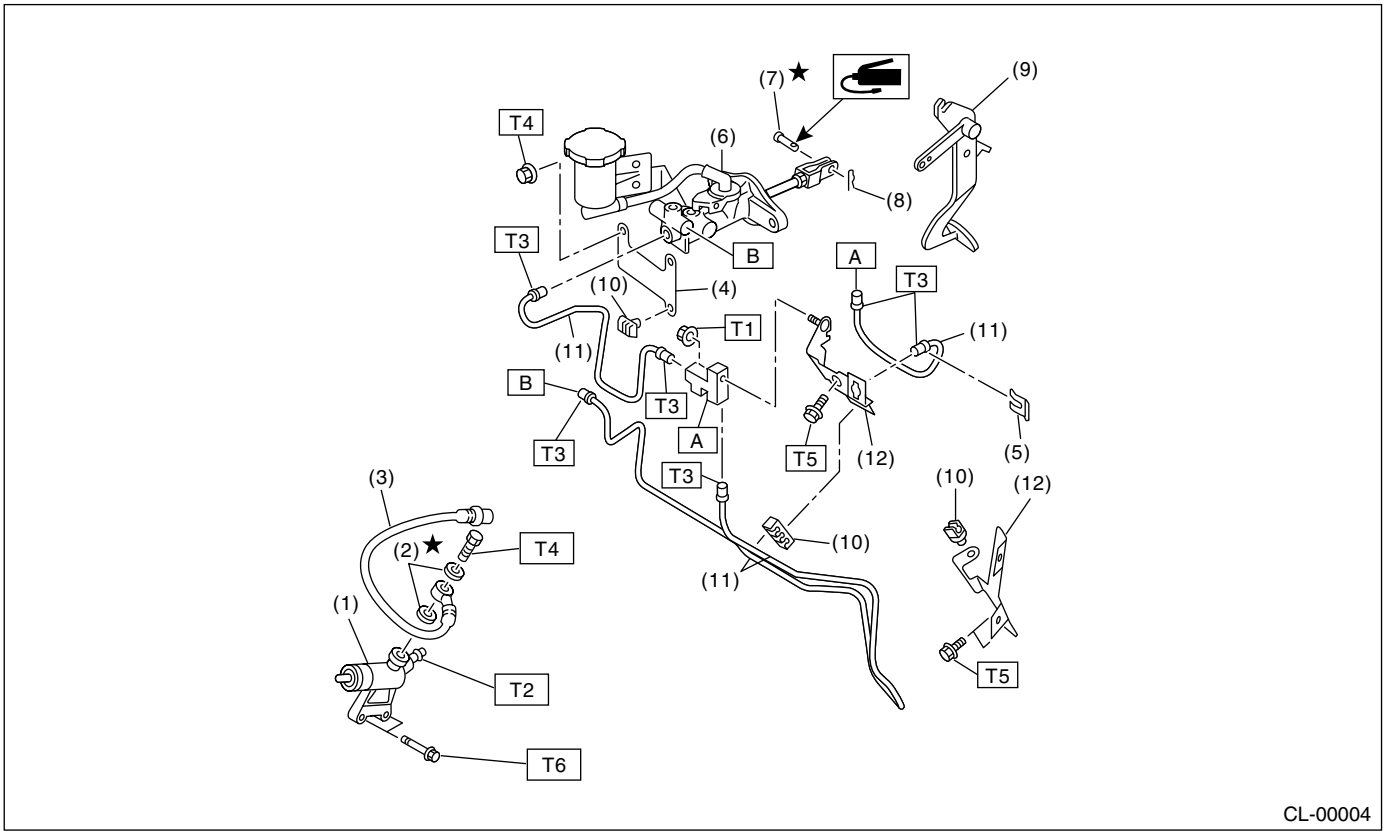
5. CLUTCH PIPE AND HOSE (TURBO MODEL)

• LHD MODEL



(1)	Operating cylinder	(6)	Pipe	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	Gasket	(7)	Master cylinder ASSY	***T1: 8 (0.8, 5.8)***
(3)	Clutch hose	(8)	Clevis pin	***T2: 15 (1.5, 10.8)***
(4)	Bracket	(9)	Snap pin	***T3: 18 (1.8, 13.0)***
(5)	Clip	(10)	Lever	***T4: 37 (3.8, 27.5)***

• RHD MODEL

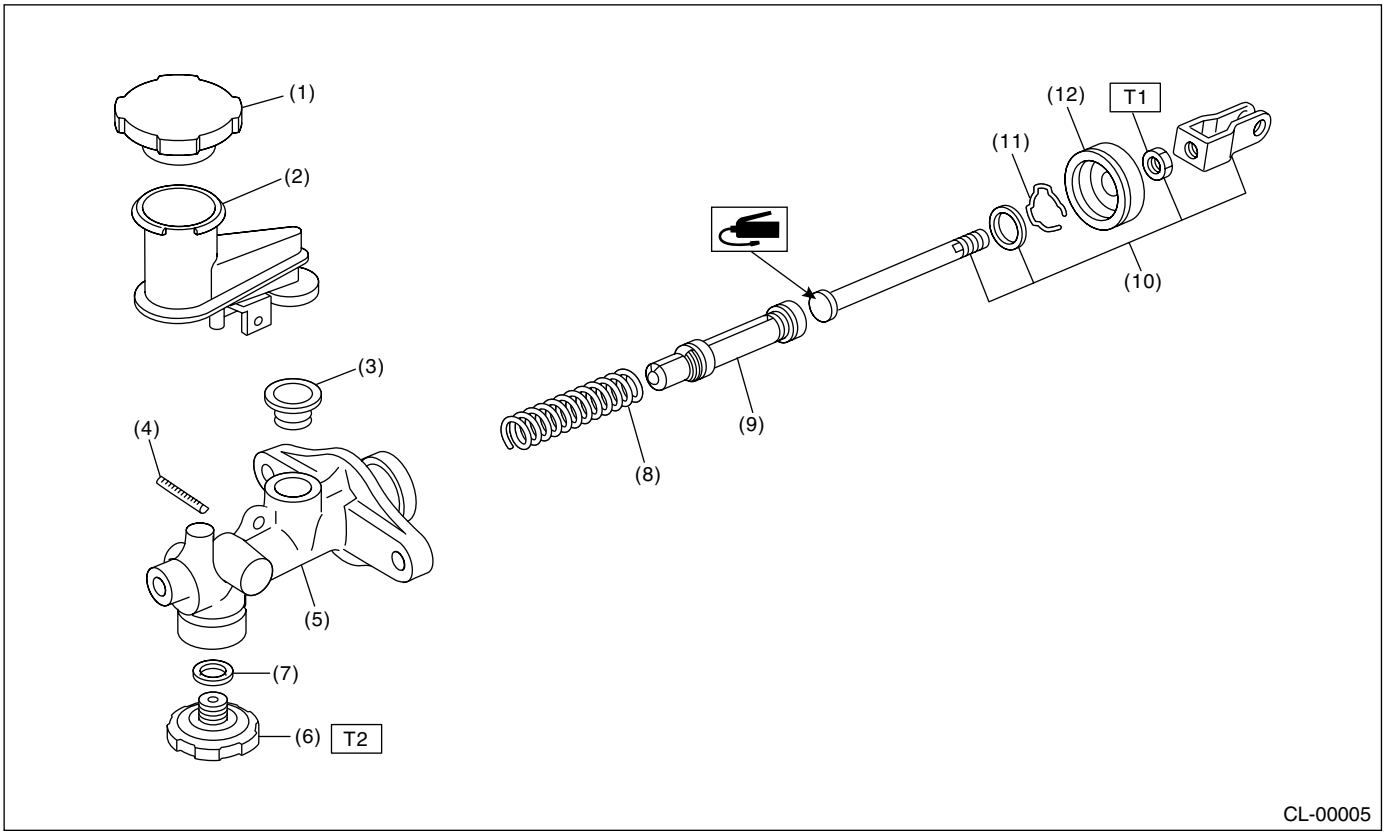


(1)	Operating cylinder	(7)	Clevis pin
(2)	Gasket	(8)	Snap pin
(3)	Clutch hose	(9)	Pedal
(4)	Bracket	(10)	Clip
(5)	Clamp	(11)	Clutch pipe
(6)	Master cylinder ASSY	(12)	Bracket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.53)
T2: 8 (0.8, 5.8)
T3: 15 (1.5, 10.8)
T4: 18 (1.8, 13.0)
T5: 25 (2.5, 18.1)
T6: 37 (3.8, 27.5)

6. MASTER CYLINDER

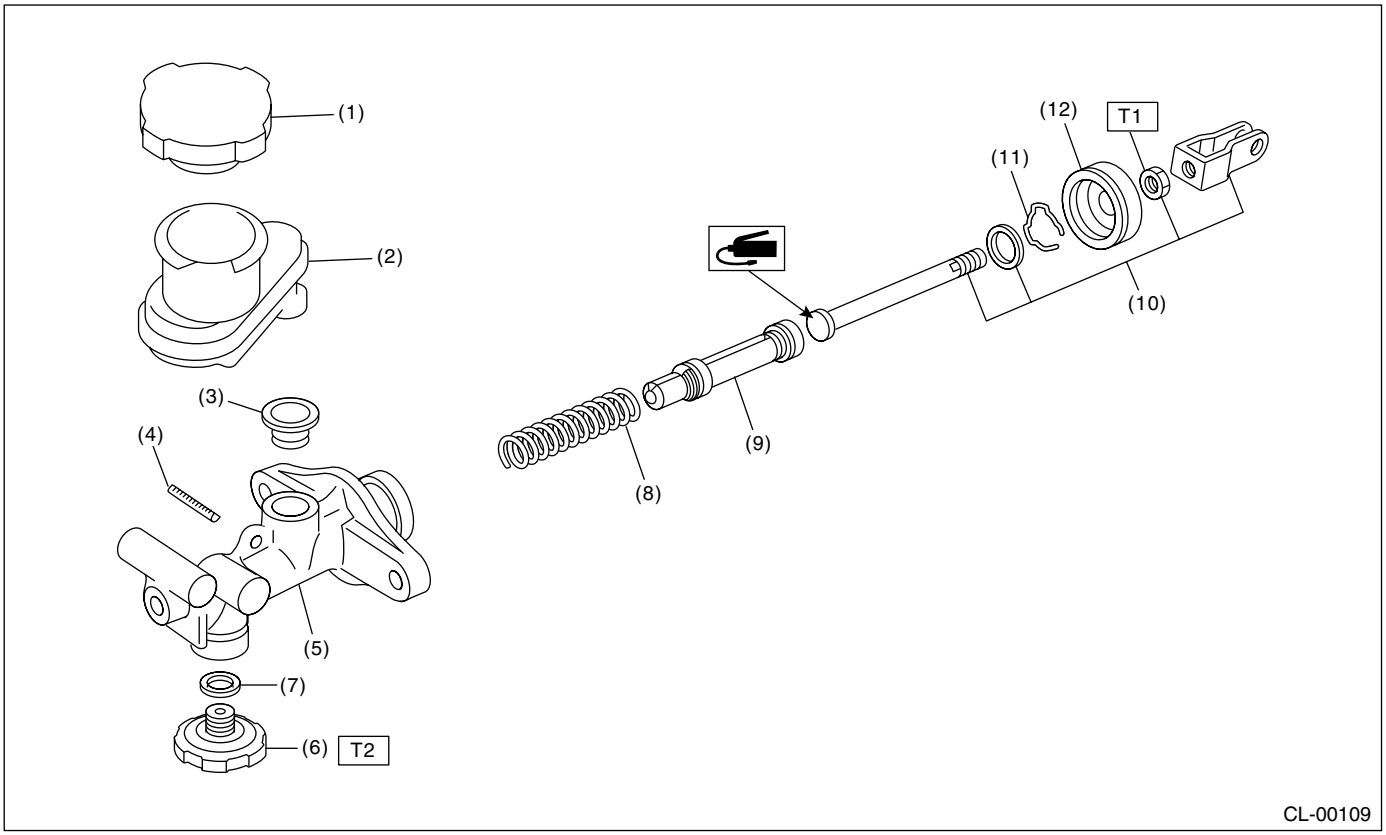
• NON-TURBO MODEL



(1)	Reservoir cap	(7)	Gasket
(2)	Reservoir tank	(8)	Return spring
(3)	Oil seal	(9)	Piston
(4)	Straight pin	(10)	Push rod
(5)	Master cylinder	(11)	Piston stop ring
(6)	Clutch damper	(12)	Cylinder boot

Tightening torque: N·m (kgf-m, ft-lb)
T1: 10 (1.0, 7)
T2: 46.6 (4.75, 34.4)

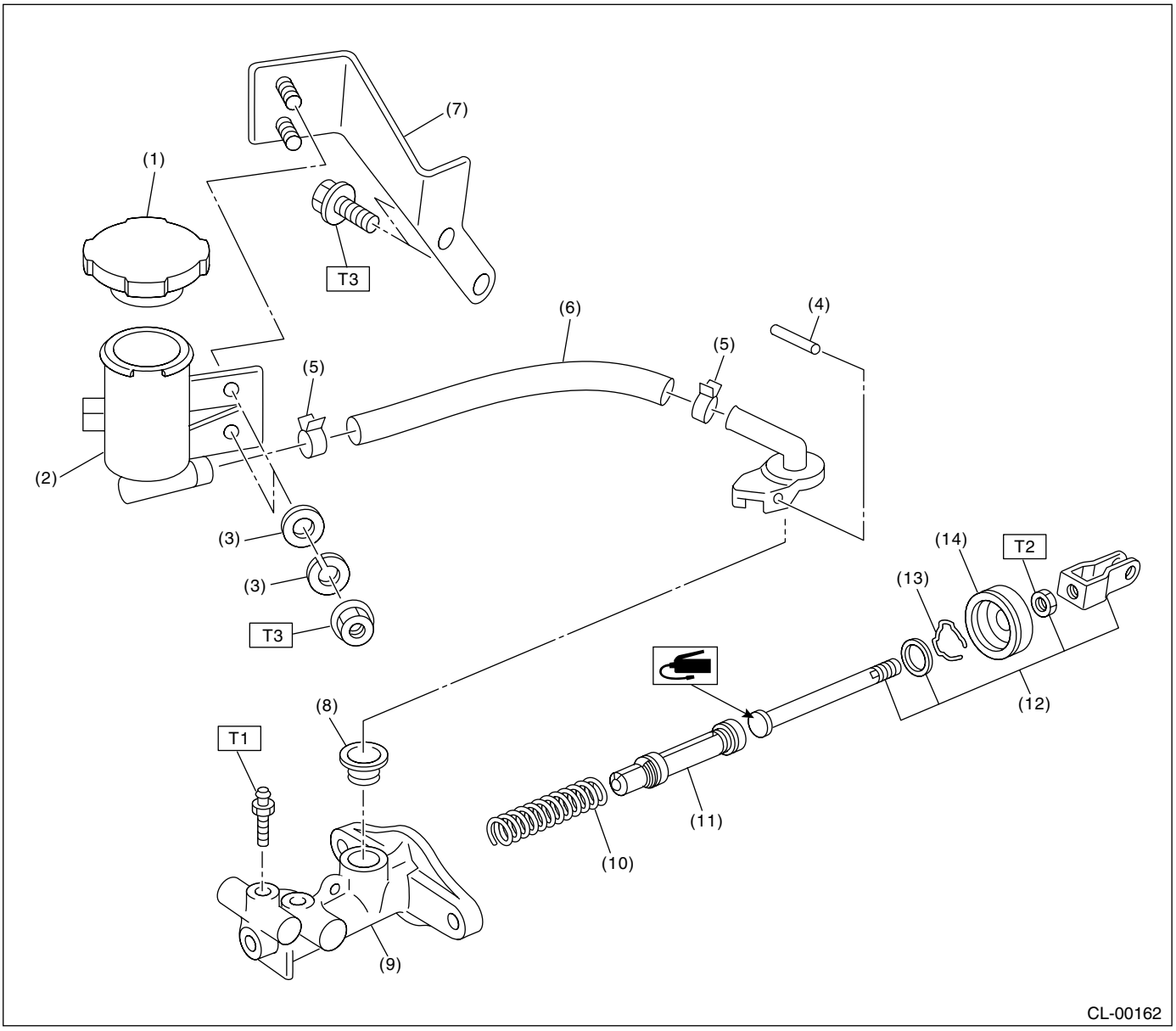
• LHD TURBO MODEL



(1)	Reservoir cap	(7)	Gasket
(2)	Reservoir tank	(8)	Return spring
(3)	Oil seal	(9)	Piston
(4)	Straight pin	(10)	Push rod
(5)	Master cylinder	(11)	Piston stop ring
(6)	Clutch damper	(12)	Cylinder boot

Tightening torque: N·m (kgf-m, ft-lb)
T1: 10 (1.0, 7)
T2: 46.6 (4.75, 34.4)

• RHD TURBO MODEL

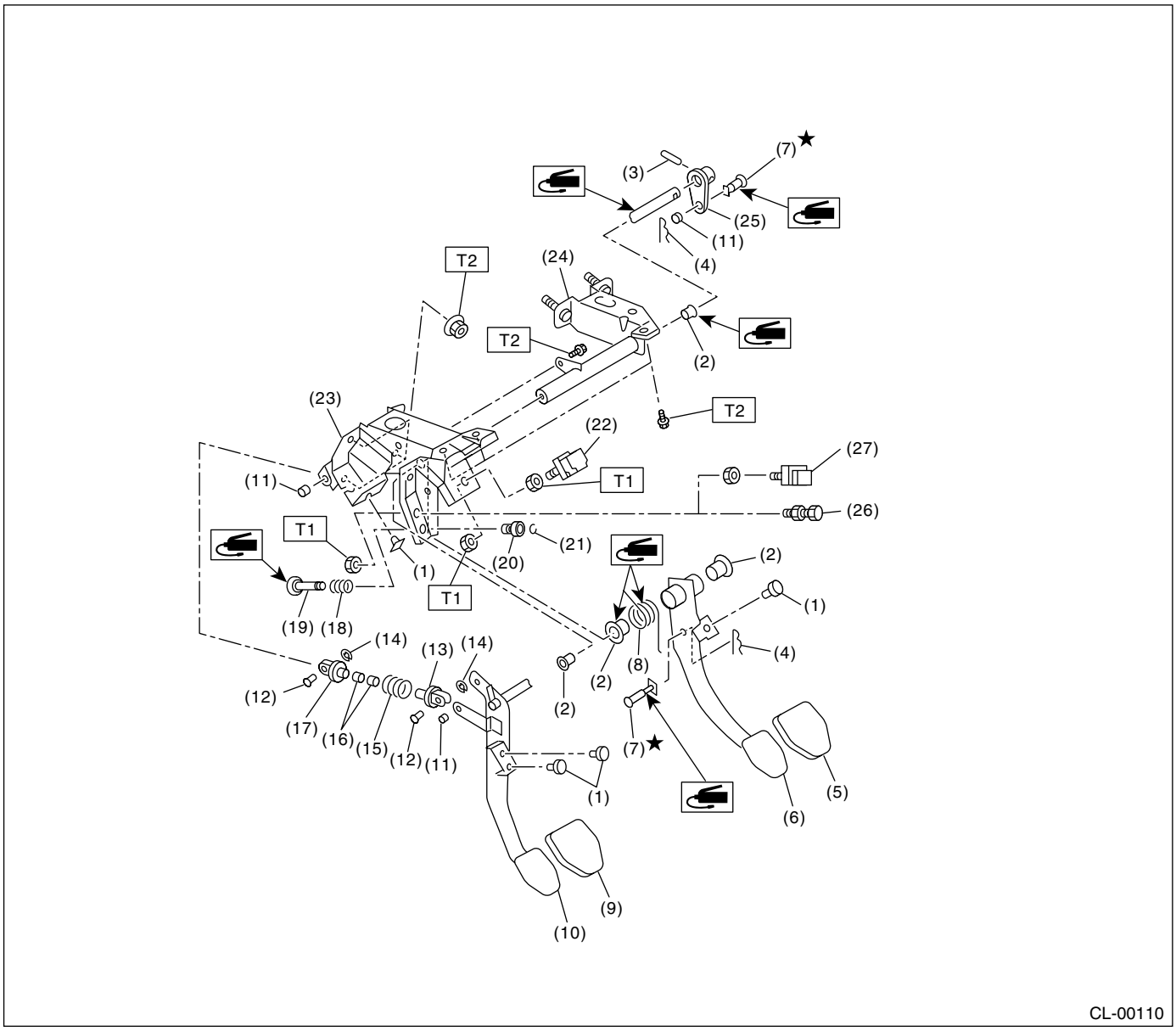


(1)	Reservoir cap	(8)	Oil seal
(2)	Reservoir tank	(9)	Master cylinder
(3)	Washer	(10)	Return spring
(4)	Straight pin	(11)	Piston
(5)	Clip	(12)	Push rod
(6)	Hose	(13)	Piston stop ring
(7)	Reservoir tank bracket	(14)	Cylinder boot

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 10 (1.0, 7)
T3: 18 (1.8, 13.0)

7. CLUTCH PEDAL

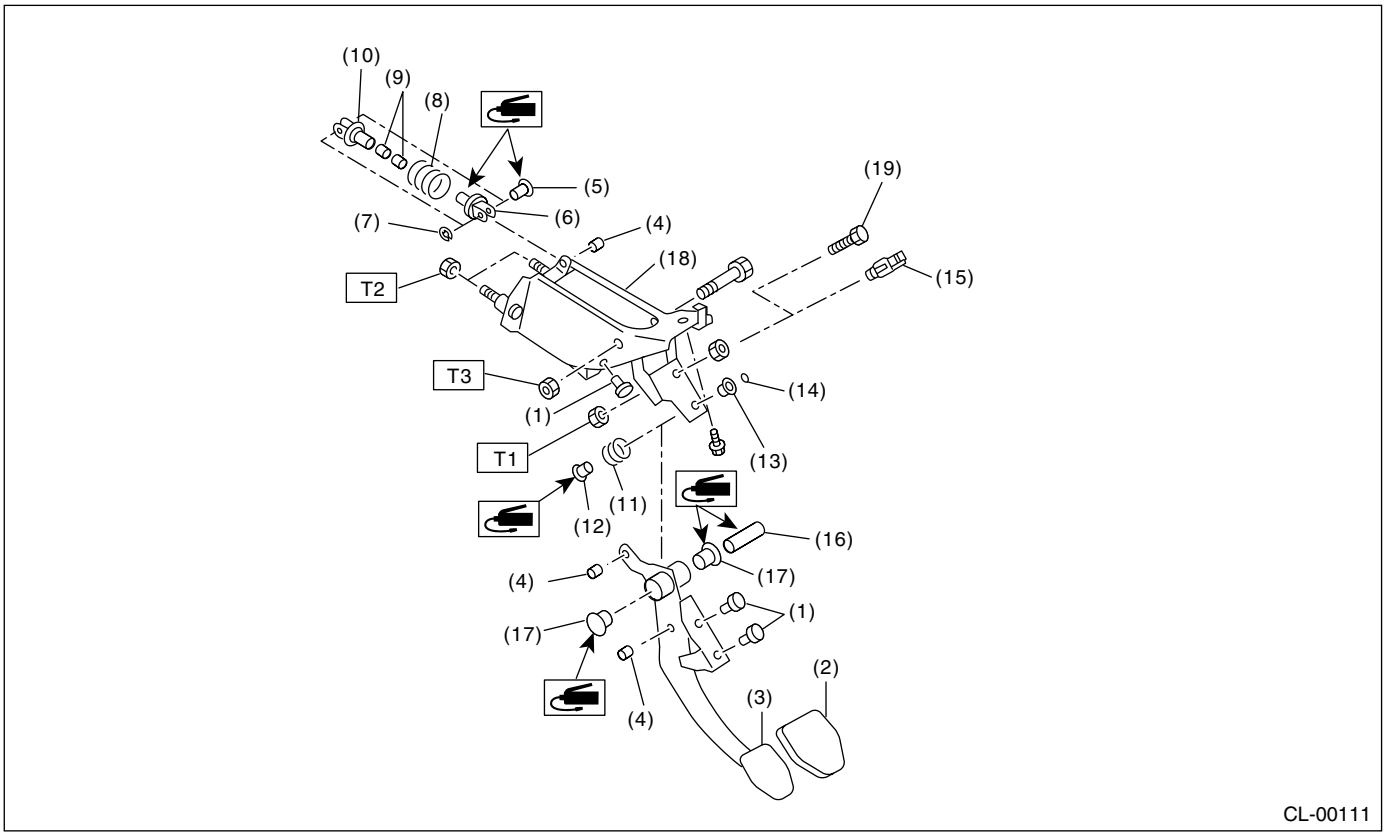
• LHD MODEL



(1) Stopper
(2) Bushing
(3) Spring pin
(4) Snap pin
(5) Brake pedal pad
(6) Brake pedal
(7) Clevis pin
(8) Brake pedal spring
(9) Clutch pedal pad
(10) Clutch pedal
(11) Bushing C
(12) Clutch clevis pin
(13) Assist rod A
(14) Clip
(15) Assist spring
(16) Assist bushing
(17) Assist rod B
(18) Spring A
(19) Rod
(20) Bushing B
(21) Clip
(22) Stop light switch
(23) Pedal bracket
(24) Clutch master cylinder bracket
(25) Lever
(26) Adjusting bolt
(27) Clutch switch (with cruise control system)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)

• RHD MODEL



(1) Stopper
(2) Clutch pedal pad
(3) Clutch pedal
(4) Bushing
(5) Clutch clevis pin
(6) Assist rod A
(7) Clip
(8) Assist spring
(9) Assist bushing
(10) Assist rod B
(11) Spring A
(12) Rod S
(13) Bushing B
(14) Clip
(15) Clutch switch (With cruise control)
(16) Spacer
(17) Bushing
(18) Clutch pedal bracket
(19) Adjusting bolt

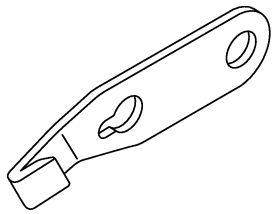
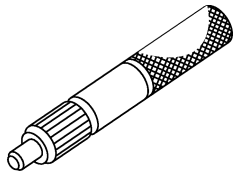
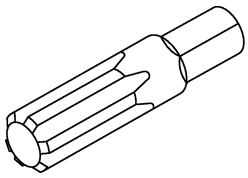
Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)
T3: 30 (3.1, 22.4)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Use SUBARU genuine fluid, grease etc. or the equivalent. Do not mix fluid, grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Apply grease onto sliding or revolution surfaces before installation.
• Before installing O-rings or snap rings, apply sufficient amount of fluid to avoid damage and deformation.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Keep fluid away from the vehicle body. If any fluid contacts the vehicle body, immediately flush the area with water.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening tightening bolt, etc.
 ST-499747100	499747100	CLUTCH DISC GUIDE	Used when installing clutch disc to flywheel.
 ST499057000	499057000	TORX PLUS	• Used for removing flywheel (Dual mass flywheel type). • For RHD 2.5 L model.

2. GENERAL PURPOSE TOOLS

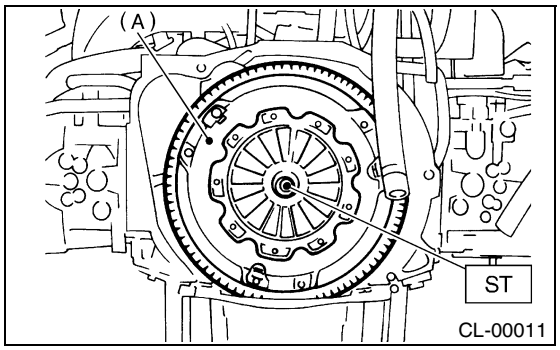
TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Dial Gauge	Used for measuring clutch disk run-out.

2. Clutch Disc and Cover

A: REMOVAL

1. EXCEPT RHD 2.5 L MODEL

1) Remove the transmission assembly from vehicle body. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
2) Install the ST on flywheel.
ST 499747100 CRANKSHAFT STOPPER



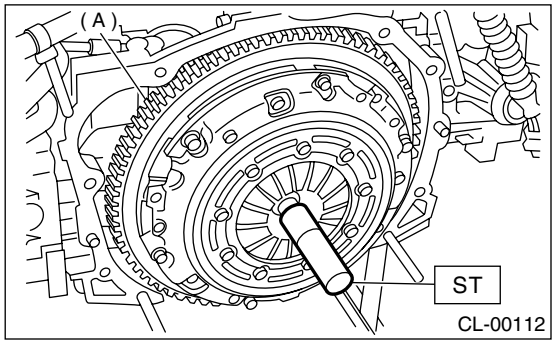
(A) Clutch cover

3) Remove the clutch cover and clutch disc.

NOTE:
• Take care not to allow oil on the clutch disc facing.
• Do not disassemble either the clutch cover or clutch disc.

2. RHD 2.5 L MODEL

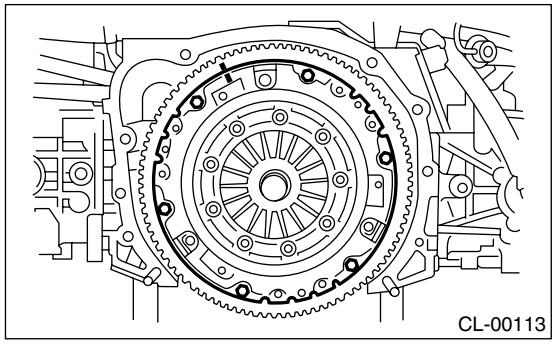
1) Remove the transmission assembly from vehicle body. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
2) Insert the ST on flywheel.
ST 499747100 CLUTCH DISC GUIDE



(A) Dual mass flywheel

3) Remove the clutch cover and clutch disc.

NOTE:
• Take care not to allow oil on the clutch disc facing.
• Do not disassemble either the clutch cover or clutch disc.
• Put matching marks to the flywheel and clutch cover before removing the clutch cover.

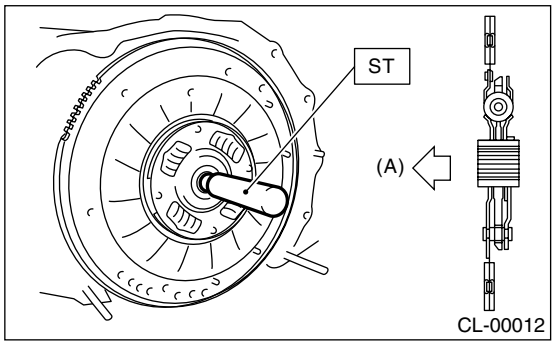


B: INSTALLATION

1. EXCEPT RHD 2.5 L MODEL

1) Insert the ST into clutch disc and install them on the flywheel by inserting the ST end into pilot bearing.

NOTE:
When installing the clutch disc, be careful to its direction.
ST 499747100 CLUTCH DISC GUIDE

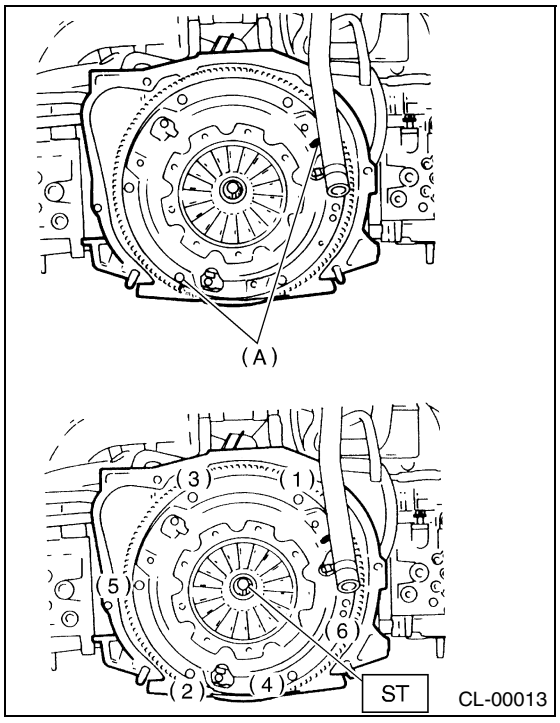


(A) Flywheel side

2) Position “0” marks on clutch cover and flywheel 120° apart, and then tighten the clutch cover installation bolts diagonally.

NOTE:
• “0” marks indicate the directions of residual unbalance.
• Temporarily tighten the bolts by hand. Each bolt should be tightened to the specified torque in a crisscross fashion.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



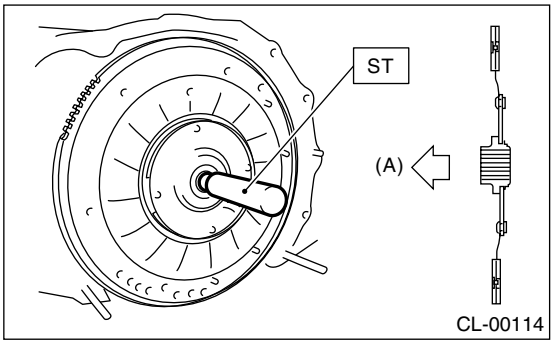
(A) “0” marks

3) Remove the ST.
ST 499747100 CLUTCH DISC GUIDE
4) Install the transmission assembly. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

2. RHD 2.5 L MODEL

1) Insert the ST into clutch disc and install them on the flywheel by inserting the ST end into pilot bearing.

NOTE:
When installing the clutch disc, be careful to its direction.
ST 499747100 CLUTCH DISC GUIDE

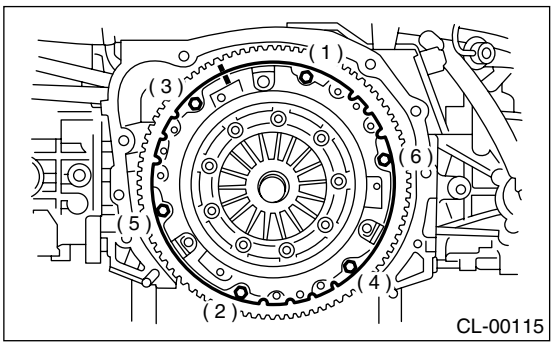


(A) Flywheel side

2) Install the clutch cover on flywheel and tighten the bolts to specified torque.

NOTE:
• Align matching marks.
• Note the front and rear of the clutch disc when installing.
• Tighten the clutch cover installing bolts gradually. Each bolt should be tightened to the specified torque in a crisscross fashion.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



3) Remove the ST.
ST 499747100 CLUTCH DISC GUIDE

C: INSPECTION

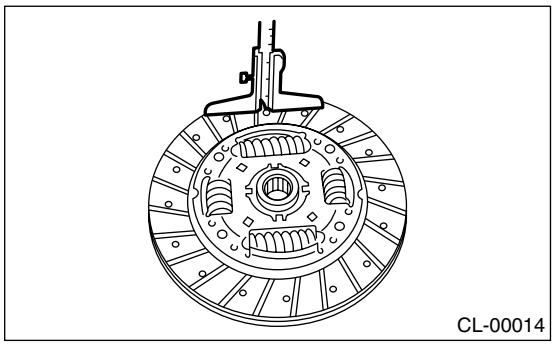
1. CLUTCH DISC

1) Facing wear
Measure the depth of rivet head from the surface of facing. Replace if facings are worn locally or worn down to less than the specified value.

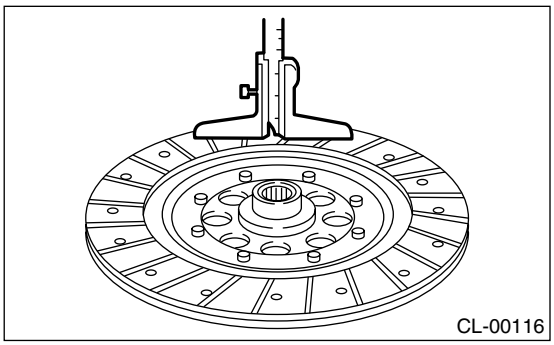
Depth of rivet head:
Limit of sinking
0.3 mm (0.012 in)

NOTE:
Do not wash the clutch disc with any cleaning fluid.

- EXCEPT RHD 2.5 L MODEL

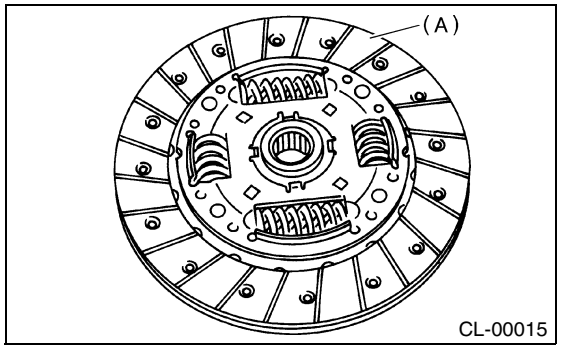


- RHD 2.5 L MODEL



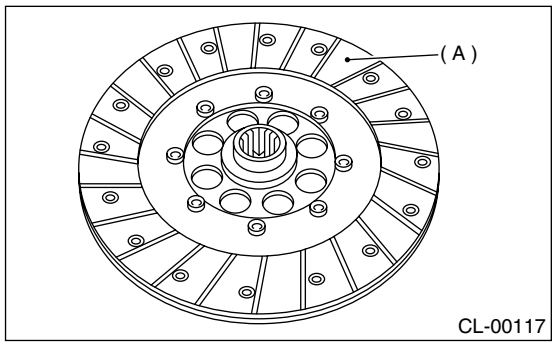
2) Hardened facing
Correct by using emery paper or replace.
3) Oil soakage on facing
Replace the clutch disc and inspect the transmission front oil seal, transmission case mating surface, engine rear oil seal and other points for oil leakage.

- EXCEPT RHD 2.5 L MODEL



(A) Clutch facing

- RHD 2.5 L MODEL

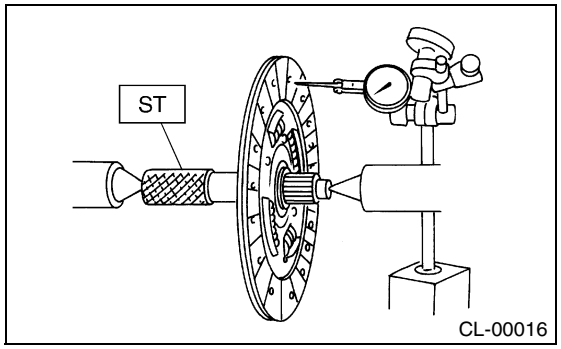


(A) Clutch facing

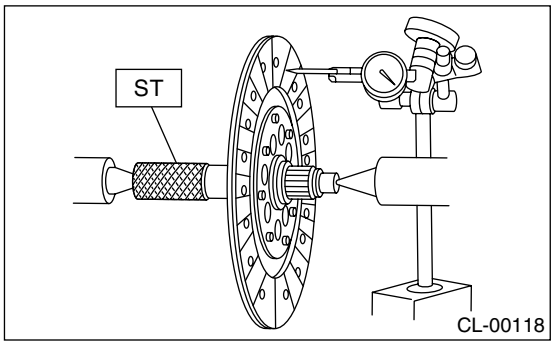
4) Run out on facing
If run out exceeds the specified value at the outer circumference of facing, repair or replace.
ST 499747100 CLUTCH DISC GUIDE

Limit for run out:
2.0 L model and LHD 2.5 L model:
0.8 (0.031 in) mm at R = 110 mm (4.33 in)
RHD 2.5 L model:
1.0 (0.039 in) mm at R = 110 mm (4.33 in)
Turbo model:
0.8 (0.031 in) mm at R = 110 mm (4.33 in)

- EXCEPT RHD 2.5 L MODEL

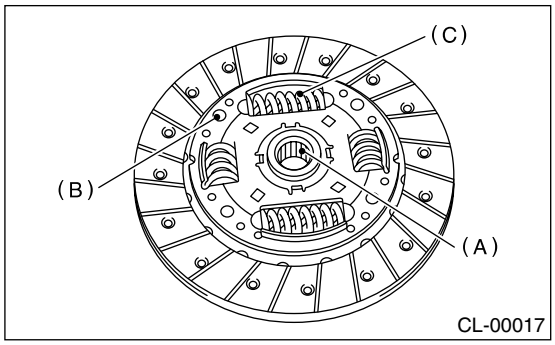


• RHD 2.5 L MODEL



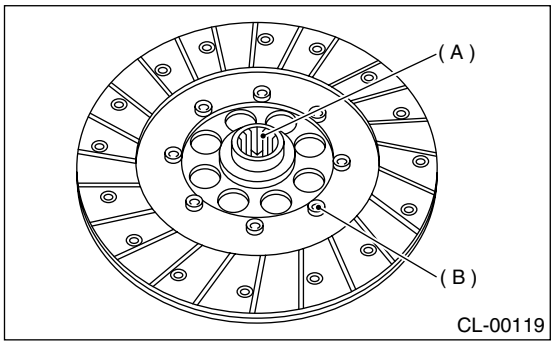
5) Worn spline, loose rivets and torsion spring failure
Replace defective parts.

• EXCEPT RHD 2.5 L MODEL



(A) Spline
(B) Rivet
(C) Torsion spring

• RHD 2.5 L MODEL



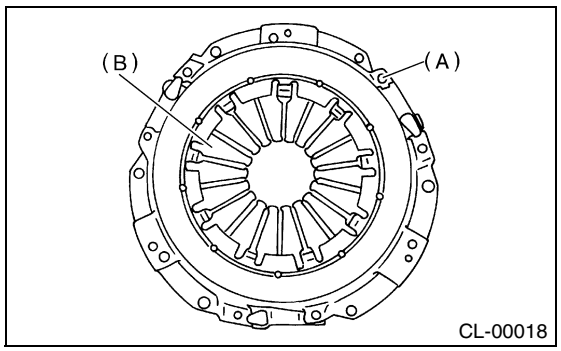
(A) Spline
(B) Rivet

2. CLUTCH COVER

NOTE:
Visually check for the following items without disassembling, and replace or repair if defective.

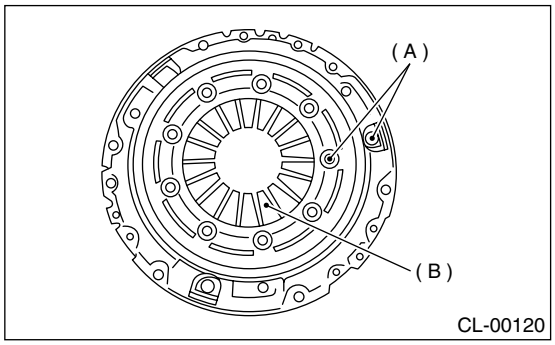
1) Loose thrust rivet.
2) Damaged or worn bearing contact area at center of diaphragm spring.

• EXCEPT RHD 2.5 L MODEL



(A) Thrust rivet
(B) Diaphragm spring

• RHD 2.5 L MODEL



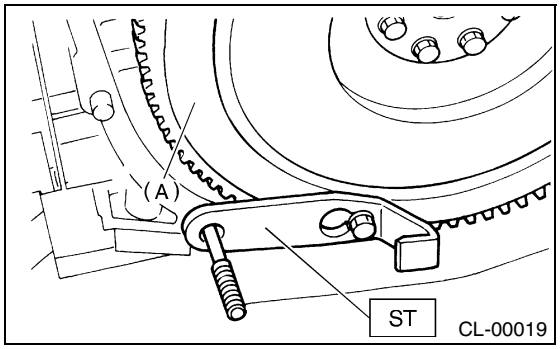
(A) Rivet
(B) Diaphragm spring

3. Flywheel

A: REMOVAL

1. EXCEPT RHD 2.5 L MODEL

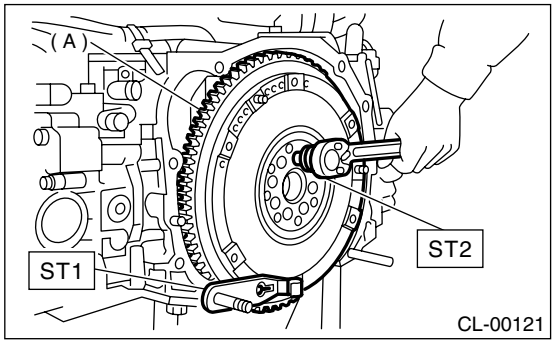
1) Remove the transmission assembly. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the clutch cover and clutch disc. <Ref. to CL-17, REMOVAL, Clutch Disc and Cover.>
3) Using the ST, remove the flywheel.
ST 498497100 CRANKSHAFT STOPPER



(A) Flywheel

2. RHD 2.5 L MODEL

1) Remove the transmission assembly. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the clutch cover and clutch disc. <Ref. to CL-17, REMOVAL, Clutch Disc and Cover.>
3) Remove the flywheel using ST1 and ST2.
ST1 498497100 CRANKSHAFT STOPPER
ST2 499057000 TORX PLUS

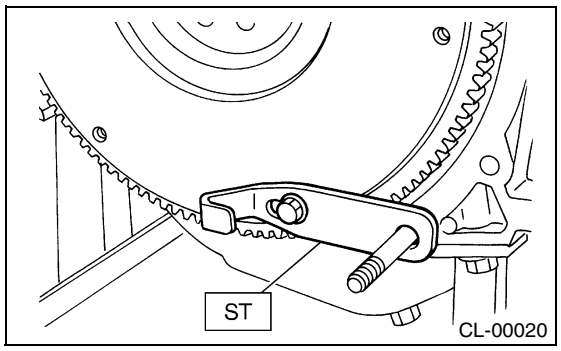


(A) Flywheel

B: INSTALLATION

1. EXCEPT RHD 2.5 L MODEL

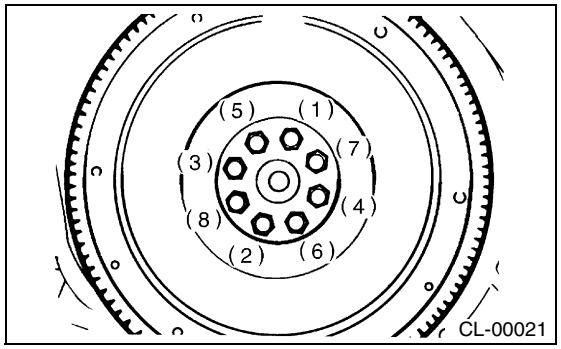
1) Install the flywheel and ST.
ST 498497100 CRANKSHAFT STOPPER



2) Tighten the flywheel attaching bolts to the specified torque.

NOTE:
Tighten the flywheel installing bolts gradually. Each bolt should be tightened to the specified torque in a crisscross fashion.

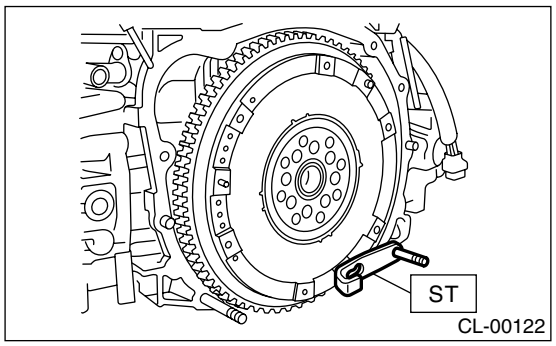
Tightening torque:
72 N·m (7.3 kgf-m, 52.8 ft-lb)



3) Install the clutch disc and cover. <Ref. to CL-17, INSTALLATION, Clutch Disc and Cover.>
4) Install the transmission assembly. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

2. RHD 2.5 L MODEL

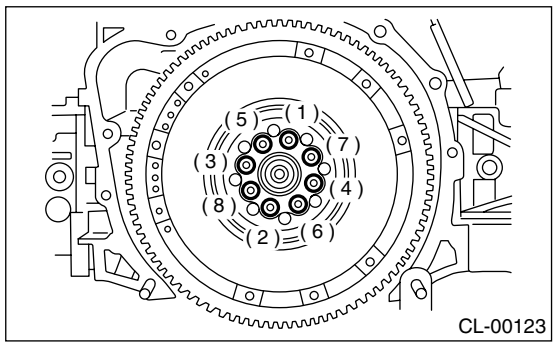
1) Install the flywheel and ST.
ST 498497100 CRANKSHAFT STOPPER



2) Tighten the flywheel attaching bolts to the specified torque.
ST 499057000 TORX PLUS

NOTE:
Tighten the flywheel installing bolts gradually. Each bolt should be tightened to the specified torque in a crisscross fashion.

Tightening torque:
72 N·m (7.3 kgf-m, 52.8 ft-lb)

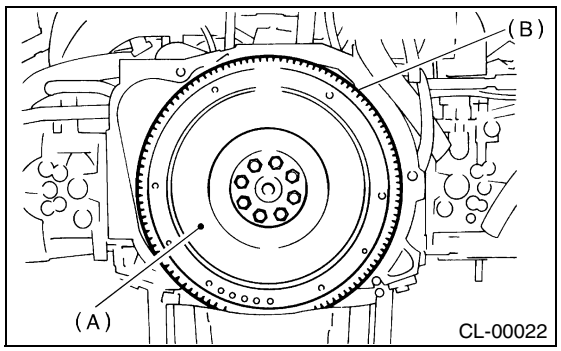


3) Install the clutch disc and cover. <Ref. to CL-18, RHD 2.5 L MODEL, INSTALLATION, Clutch Disc and Cover.>
4) Install the transmission assembly. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

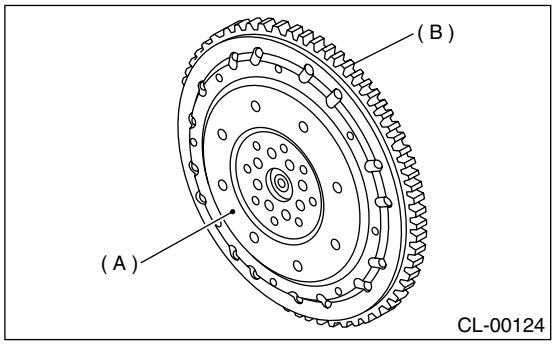
CAUTION:
Since this bearing is grease sealed and is of a non-lubrication type, do not wash with gasoline or any solvent.

1) Damage of facing and ring gear
If defective, replace the flywheel.
- EXCEPT RHD 2.5 L MODEL



(A) Flywheel
(B) Ring gear

- RHD 2.5 L MODEL



(A) Flywheel
(B) Ring gear

2) Smoothness of rotation
Rotate the ball bearing applying pressure in thrust direction.
3) If noise or excessive play is noted, replace the flywheel.

4. Release Bearing and Lever

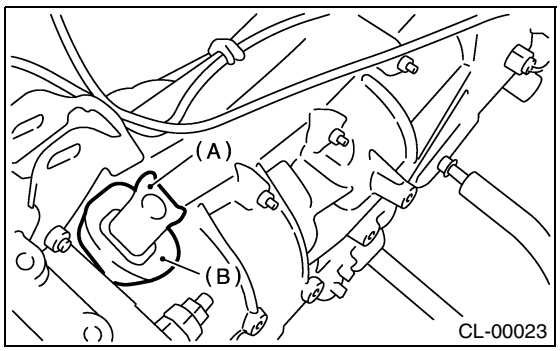
A: REMOVAL

1. NON-TURBO MODEL

1) Remove the transmission assembly from vehicle body. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the two clips from clutch release lever and remove the release bearing.

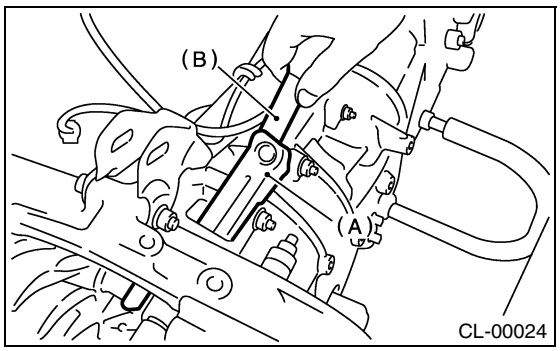
CAUTION:
Be careful not to deform clips.

3) Remove the release lever seal.



(A) Clutch release lever
(B) Release lever seal

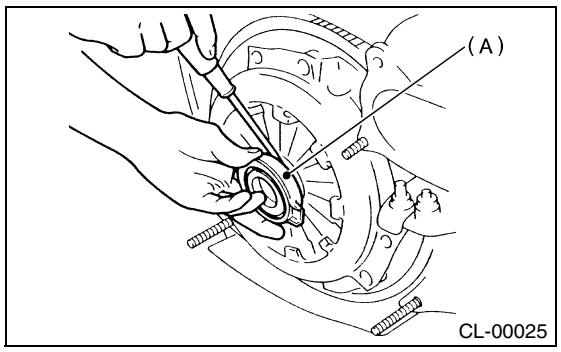
4) Remove the release lever retainer spring from release lever pivot with a screwdriver by accessing it through clutch housing release lever hole. Then remove the release lever.



(A) Clutch release lever
(B) Screwdriver

2. TURBO MODEL

1) Remove the transmission assembly from vehicle body. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the clutch release lever from transmission.
3) Put the clutch release bearing in engine side.
4) Remove the clutch release bearing from the clutch cover using flat tip screwdriver.



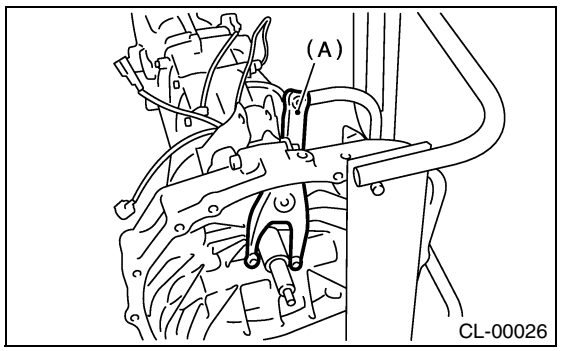
(A) Clutch release bearing

B: INSTALLATION

1. NON-TURBO MODEL

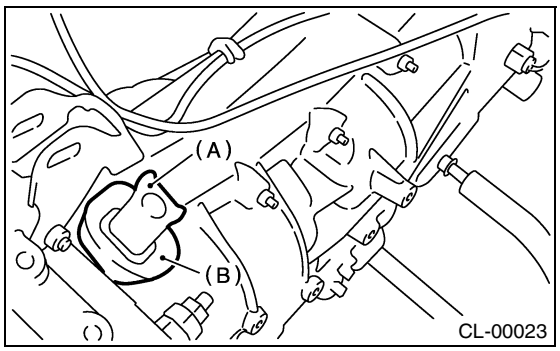
1) Before assembly, lubricate the following points with a coat of grease.
- Contact surface of lever and pivot
- Contact surface of lever and bearing
- Transmission main shaft spline (Use grease containing molybdenum disulfide.)
- Contact surface of lever and operating cylinder

2) While pushing the fork to pivot and twisting it to both sides, fit the retainer spring onto the constricted portion of pivot.
Apply grease (SUNLIGHT 2: P/N 003602010) to the contact point of release lever and operating cylinder.
3) Confirm that the retainer spring is securely fitted by observing it through the main case hole.



(A) Release lever

4) Install the release bearing and fasten it with two clips.
5) Install the release lever seal.

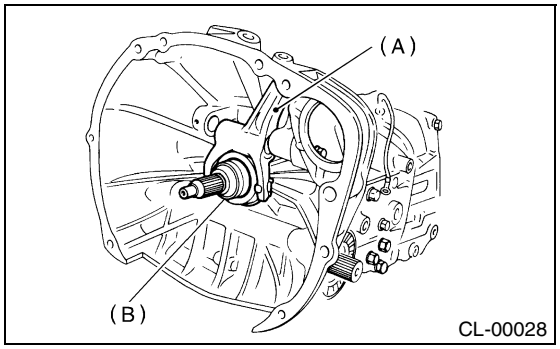


(A) Release lever
(B) Release lever seal

6) Verify that the bearing moves smoothly with operating release fork.
7) Install the transmission assembly. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

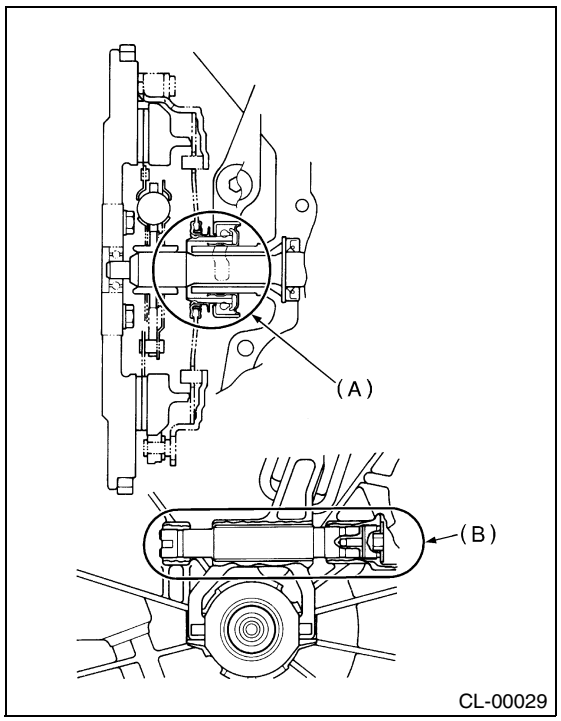
2. TURBO MODEL

1) Install the release bearing on transmission.
2) Insert the release fork into release bearing tab.



(A) Release fork
(B) Release bearing

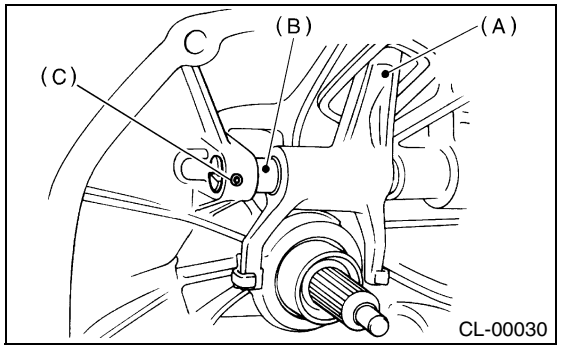
3) Apply grease to the specified points:
- Spline FX2200 (Part No. 000040901)
- Shaft SUNLIGHT 2 (Part No. 003602010)



(A) Spline (FX2200)
(B) Shaft (SUNLIGHT 2)

4) Insert the release fork shaft into release fork.

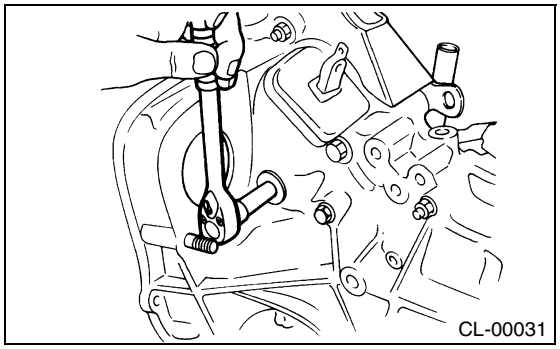
NOTE:
Make sure the cutout portion of release fork shaft contacts spring pin.



(A) Release fork
(B) Release shaft
(C) Spring pin

5) Tighten the plug.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)



6) Move the release fork to ensure that release bearing and release fork move smoothly.
7) Install the transmission assembly. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

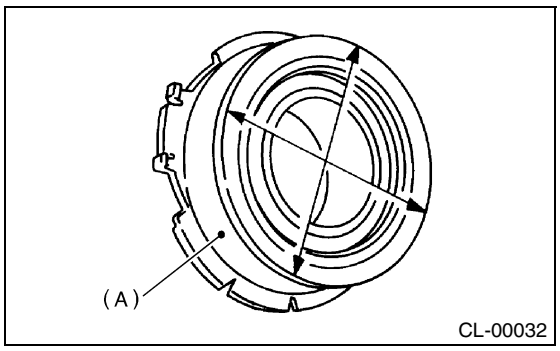
C: INSPECTION

1. RELEASE BEARING

CAUTION:
Since this bearing is grease sealed and is of a non-lubrication type, do not wash with gasoline or any solvent when servicing the clutch.

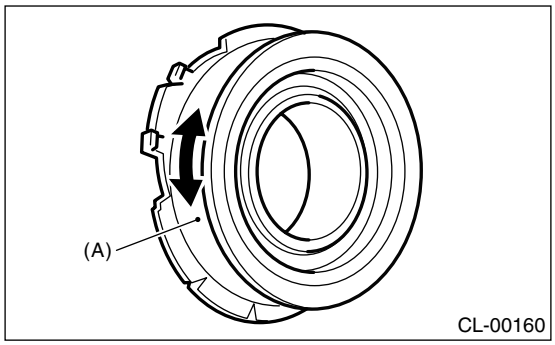
1) Check the bearing for smooth movement by applying force in the radial direction.

Radial direction stroke:
1.6 mm (0.063 in)



(A) Bearing case

2) Check the bearing for smooth rotation by applying pressure in the thrust direction.

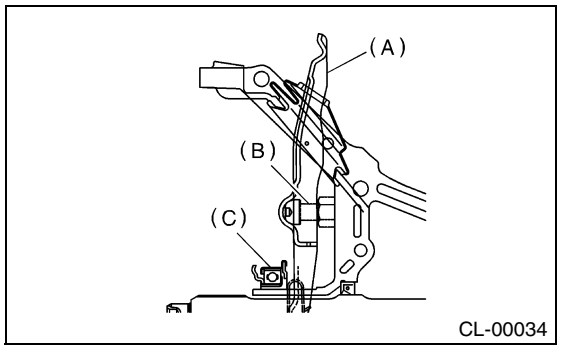


(A) Bearing case

3) Check wear and damage of the bearing case surface contacting with lever.

2. RELEASE LEVER

1) Check the lever pivot portion and the point of contact with release bearing case for wear.



(A) Clutch release lever
(B) Pivot
(C) Clutch release bearing

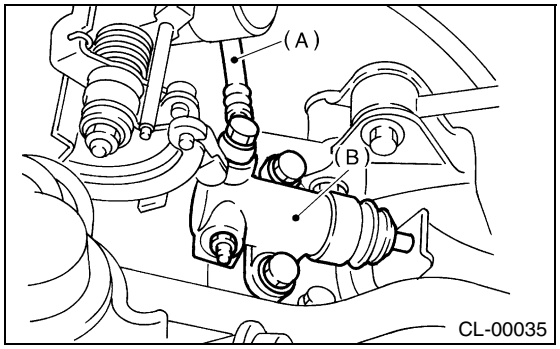
5. Operating Cylinder

A: REMOVAL

1) Remove the air cleaner case and air intake chamber (Non-turbo model). <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
2) Remove the intercooler (Turbo model). <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
3) Remove the clutch hose from operating cylinder.

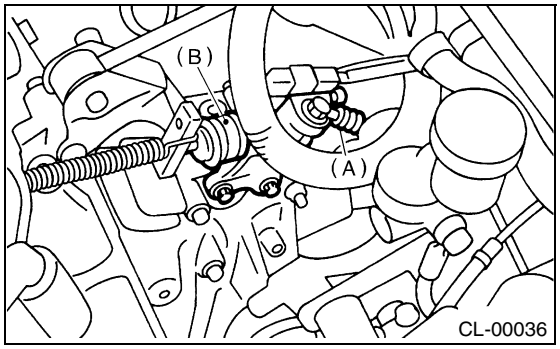
NOTE:
Cover the hose joint to prevent clutch fluid from flowing out.

- NON-TURBO MODEL



(A) Clutch hose
(B) Operating cylinder

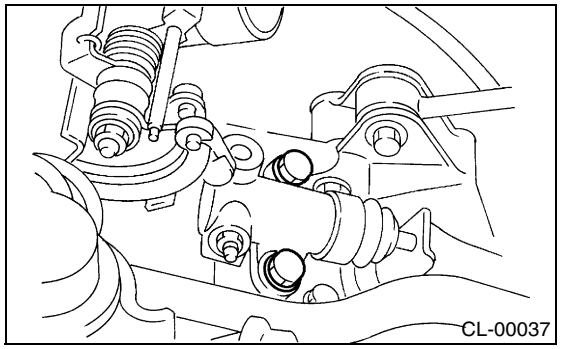
- TURBO MODEL



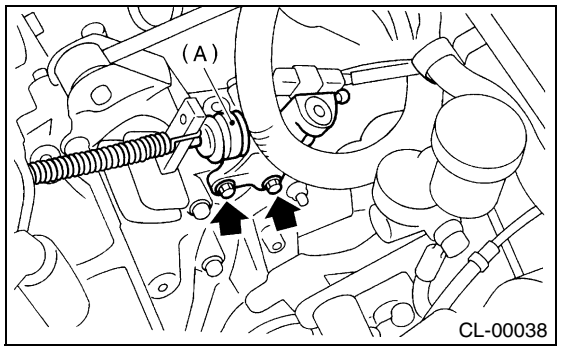
(A) Clutch hose
(B) Operating cylinder

4) Remove the operating cylinder from transmission.

- NON-TURBO MODEL



- TURBO MODEL



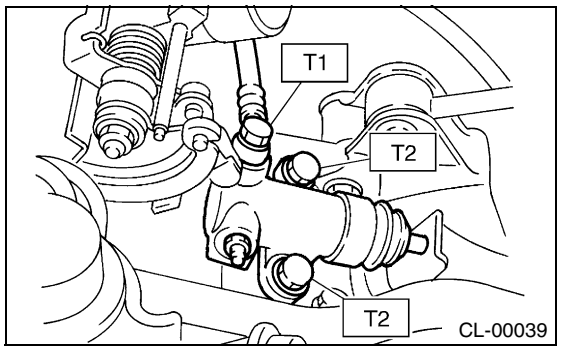
(A) Operating cylinder

B: INSTALLATION

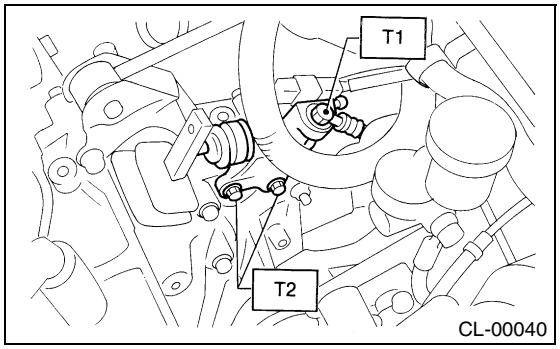
1) Apply grease (SUNLIGHT 2: P/N 003602010) to the contact point of the release lever and operating cylinder.
2) Install in the reverse order of removal.
Before installing the operating cylinder, apply grease (SUNLIGHT 2: P/N 003602010) to contact point of the release lever and operating cylinder.

Tightening torque:
T1: 18 N·m (1.8 kgf-m, 13.0 ft-lb)
T2: 37 N·m (3.8 kgf-m, 27.5 ft-lb)

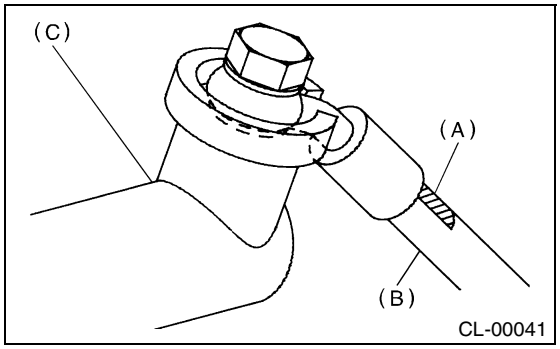
- NON-TURBO MODEL



• TURBO MODEL



NOTE:
• Be sure to install the clutch hose with the mark side facing upward.
• Be careful not to twist the clutch hose during installation.



(A) Marking
(B) Clutch hose
(C) Operating cylinder

3) After bleeding air from the operating cylinder, ensure that clutch operates properly.
<Ref. to CL-35, Clutch Fluid Air Bleeding.>

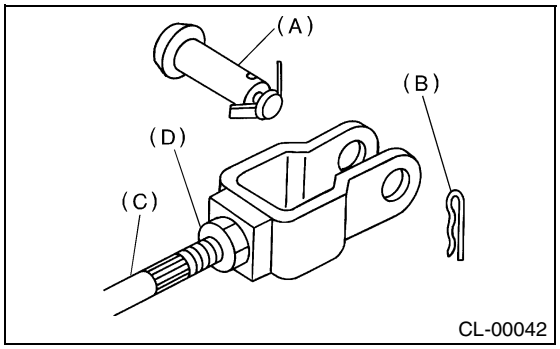
C: INSPECTION

1) Check the operating cylinder for damage. If operating cylinder is damaged, replace it.
2) Check the operating cylinder for fluid leakage or damage on boot. If any leakage or damage is found, replace the operating cylinder.

6. Master Cylinder

A: REMOVAL

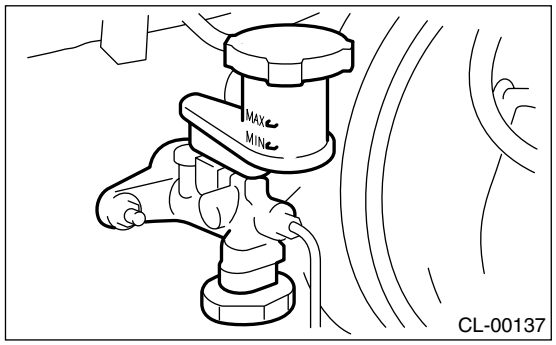
1) Thoroughly drain the brake fluid from reservoir tank.
2) Remove the snap pin, clevis pin and separate the push rod of master cylinder from clutch pedal.



(A) Clevis pin
(B) Snap pin
(C) Push rod
(D) Push rod lock nut

3) Remove the air cleaner case and air intake chamber (Non-turbo model). <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
4) Remove the intercooler (Turbo model). <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
5) Remove the clutch pipe from master cylinder.
6) Remove the master cylinder with reservoir tank.

CAUTION:
Be extremely careful not to spill brake fluid. Brake fluid spilt on the vehicle body will harm the paint surface; wipe it off quickly if spilt.

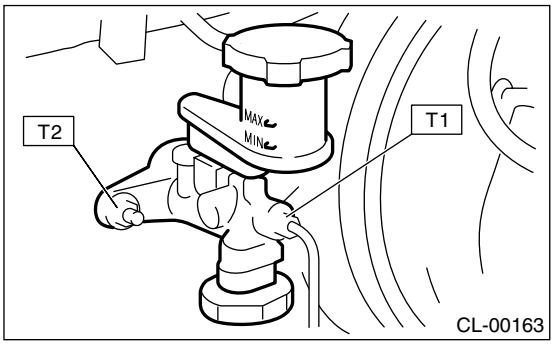


B: INSTALLATION

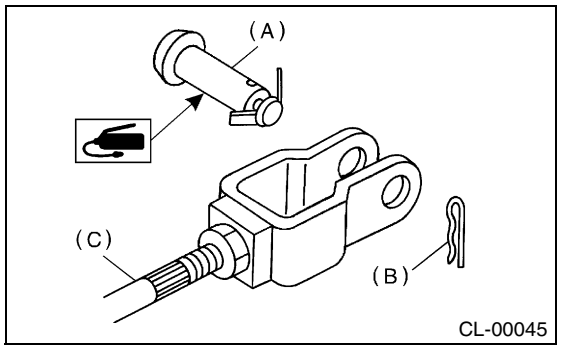
1) Install the master cylinder to body, and install the clutch pipe to master cylinder.

NOTE:
Check that the pipe is routed properly.

Tightening torque:
T1: 15 N·m (1.5 kgf-m, 10.8 ft-lb)
T2: 18 N·m (1.8 kgf-m, 13.0 ft-lb)



2) Apply a coat of grease to the clevis pin.
3) Connect the push rod of master cylinder to clutch pedal, and install the clevis pin and snap pin.



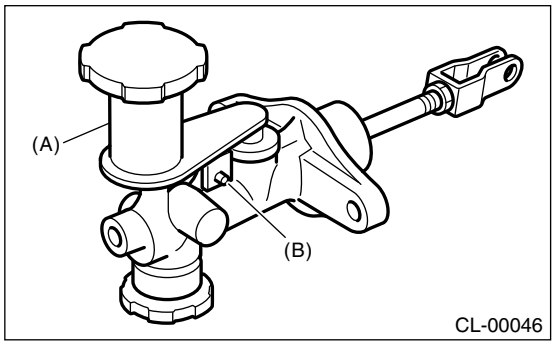
(A) Clevis pin
(B) Snap pin
(C) Push rod

4) After bleeding air from the system, ensure that clutch operates properly. <Ref. to CL-35, Clutch Fluid Air Bleeding.>
5) Install the air cleaner case and air intake chamber (Non-turbo model). <Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.>
6) Install the intercooler (Turbo model). <Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>

C: DISASSEMBLY

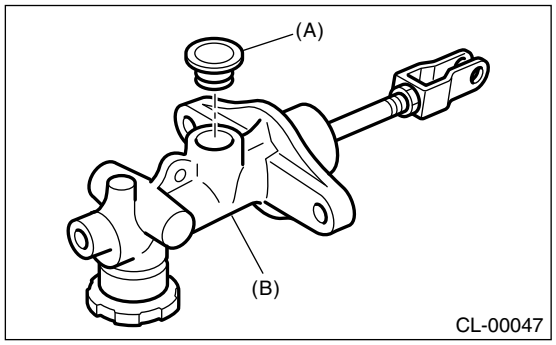
1. EXCEPT RHD TURBO MODEL

1) Remove the straight pin and reservoir tank.



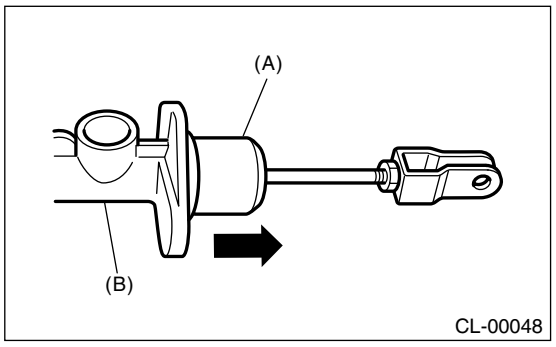
(A) Reservoir tank
(B) Straight pin

2) Remove the oil seal.



(A) Oil seal
(B) Master cylinder

3) Move the cylinder boot backward.



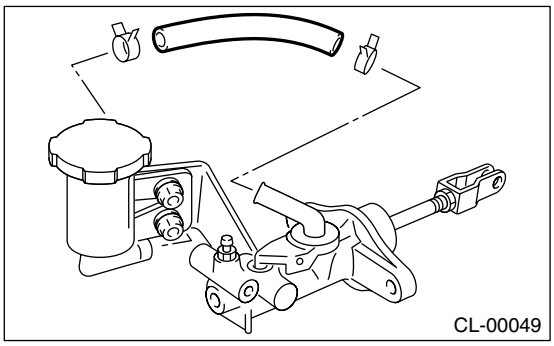
(A) Cylinder boot
(B) Master cylinder

4) Remove the stop ring.

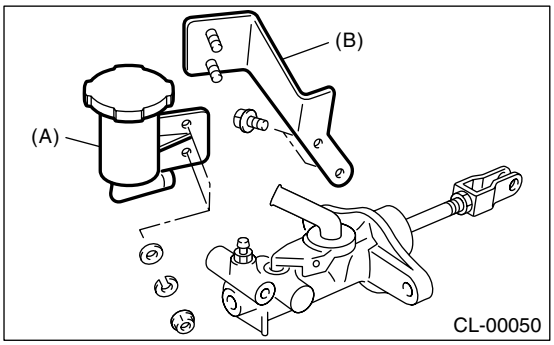
CAUTION:
Be careful when removing the snap ring to prevent the rod, washer, piston and return spring from flying out.

2. RHD TURBO MODEL

1) Remove the hose.

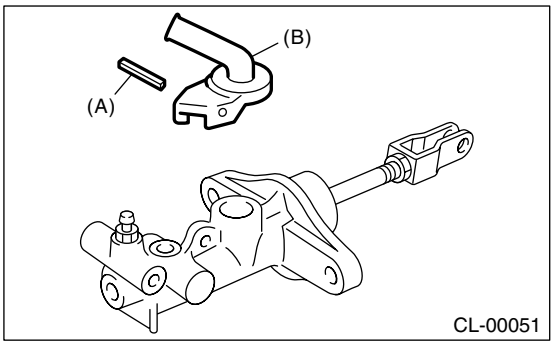


2) Remove the reservoir tank and bracket.



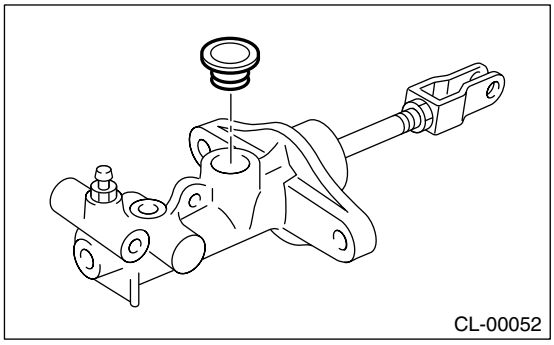
(A) Reservoir tank
(B) Bracket

3) Remove the straight pin and adapter.

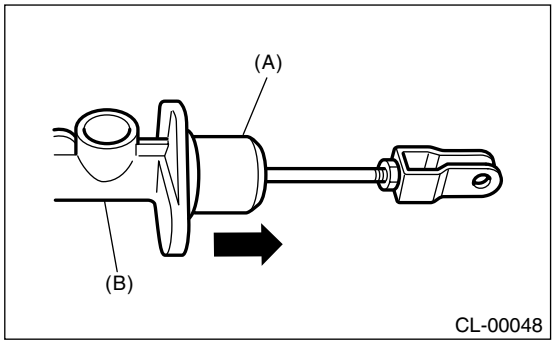


(A) Straight pin
(B) Adapter

4) Remove the oil seal.



5) Move the cylinder boot backward.



(A) Cylinder boot
(B) Master cylinder

6) Remove the stop ring.

CAUTION:
Be careful when removing the snap ring to prevent the rod, washer, piston and return spring from flying out.

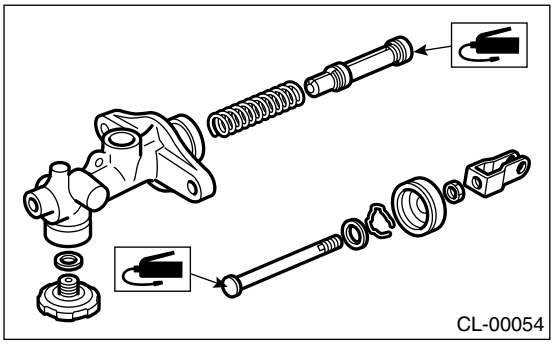
7) Remove the air bleeder.

D: ASSEMBLY

1. EXCEPT RHD TURBO MODEL

1) Apply a coat of grease to the contacting surfaces of the push rod and piston before installation.

Grease:
SILICONE GREASE G40M (Part No. 004404003)



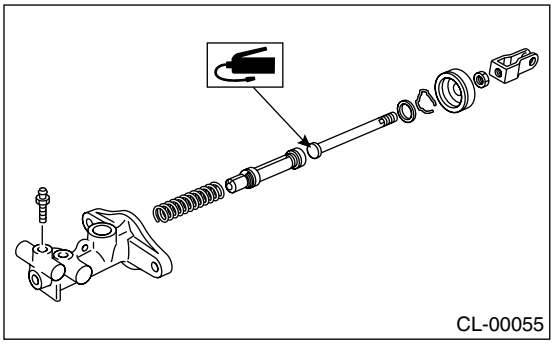
2) To assemble the master cylinder, reverse the sequence of disassembly procedure.

Tightening torque:
10 N·m (1.0 kgf-m, 7 ft-lb)

2. RHD TURBO MODEL

1) Apply a coat of grease to the contacting surfaces of the push rod and piston before installation.

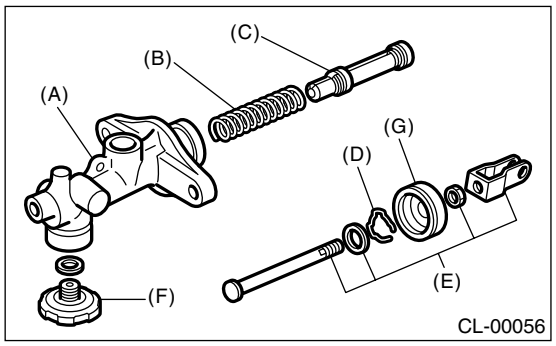
Grease:
SILICONE GREASE G40M (Part No. 004404003)



2) Assemble in the reverse order of disassemble.

E: INSPECTION

If any damage, deformation, wear, swelling, rust or other faults are found on the cylinder, piston, push rod, fluid reservoir, return spring, gasket, cylinder boot and hose replace the faulty part.



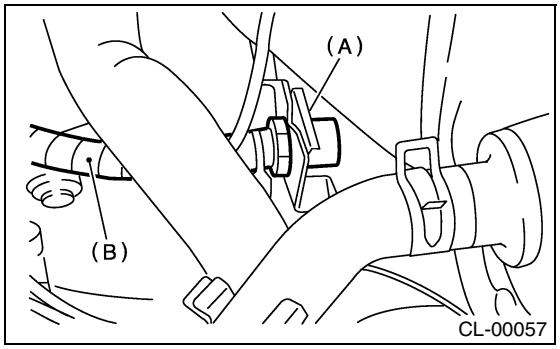
(A) Master cylinder body
(B) Return spring
(C) Piston
(D) Stop ring
(E) Rod ASSY
(F) Clutch damper
(G) Cylinder boot

7. Clutch Pipe and Hose

A: REMOVAL

1. EXCEPT RHD TURBO MODEL

1) Remove the air cleaner case and air intake chamber.
2) Drain the clutch fluid. <Ref. to CL-34, Clutch Fluid.>
3) Remove the clutch pipe from the clutch hose and master cylinder.
4) Pull out the clamp, then remove the clutch hose from bracket.

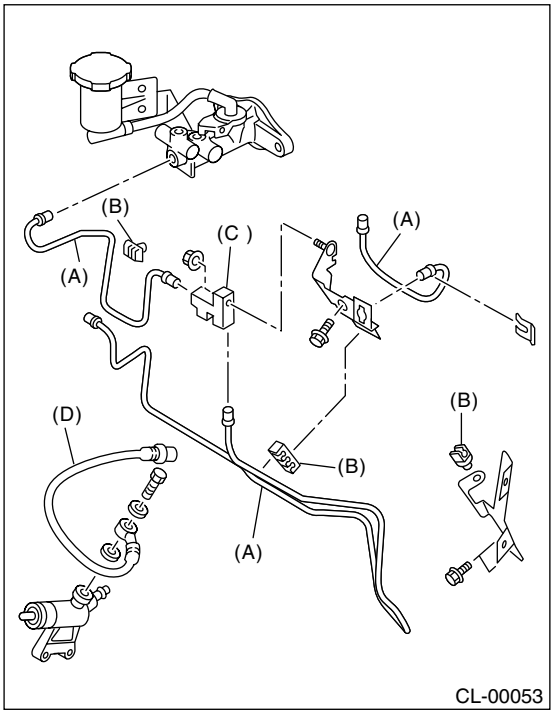


(A) Clamp
(B) Clutch hose

5) Remove the hose from operating cylinder.
6) Remove the bracket.

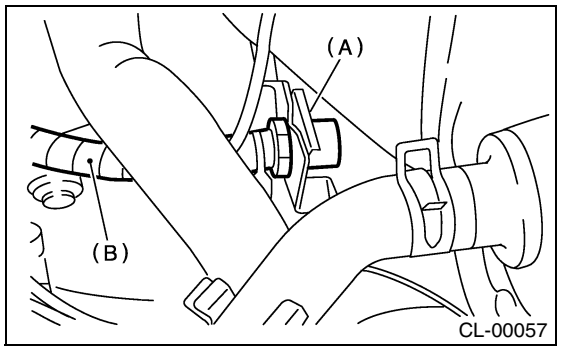
2. RHD TURBO MODEL

1) Remove the intercooler. <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
2) Drain the clutch fluid. <Ref. to CL-34, Clutch Fluid.>
3) Remove the clutch pipe from the master cylinder, connector and clutch hose.



(A) Clutch pipe
(B) Clip
(C) Connector
(D) Clutch hose

4) Pull out the clamp, then remove the clutch hose from bracket.



(A) Clamp
(B) Clutch hose

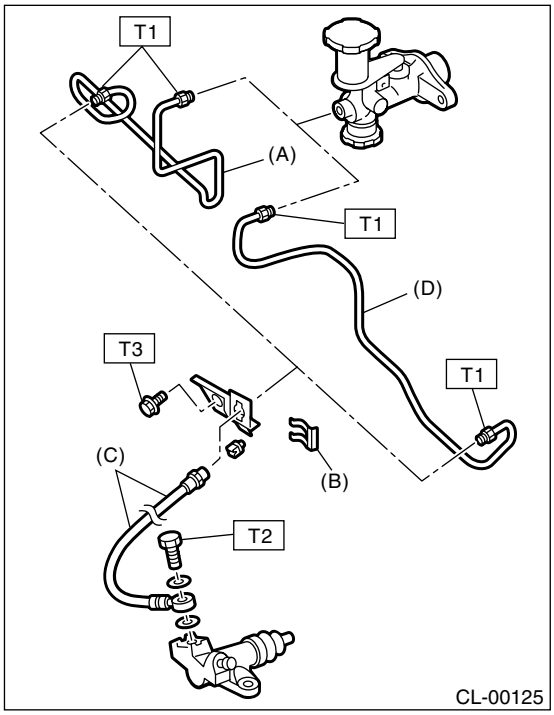
5) Remove the hose from operating cylinder.
6) Remove the bracket.

B: INSTALLATION

1. EXCEPT RHD TURBO MODEL

Install in the reverse order of removal.

Tightening torque:
T1: 15 N·m (1.5 kgf-m, 10.8 ft-lb)
T2: 18 N·m (1.8 kgf-m, 13.0 ft-lb)
T3: 25 N·m (2.5 kgf-m, 18.1 ft-lb)

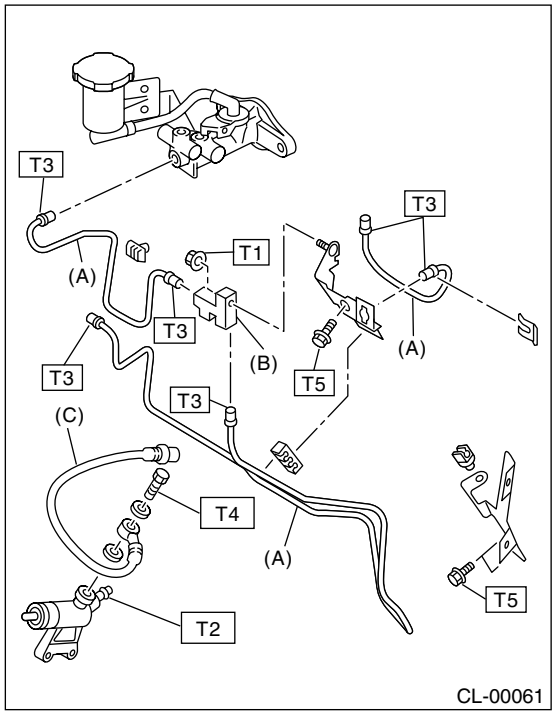


(A) Clutch pipe (LHD model)
(B) Clip
(C) Clutch hose
(D) Clutch pipe (RHD model)

2. RHD TURBO MODEL

Install in the reverse order of removal.

Tightening torque:
T1: 7.5 N·m (0.76 kgf-m, 5.53 ft-lb)
T2: 8 N·m (0.8 kgf-m, 5.8 ft-lb)
T3: 15 N·m (1.5 kgf-m, 10.8 ft-lb)
T4: 18 N·m (1.8 kgf-m, 13.0 ft-lb)
T5: 25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Clutch pipe
(B) Connector
(C) Clutch hose

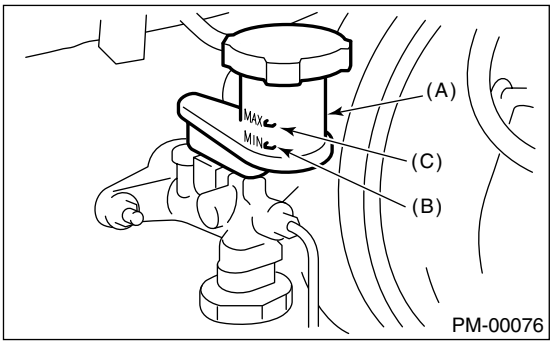
C: INSPECTION

Check the pipes and hoses for cracks, breakage, or damage. Check the joints for fluid leakage. If any cracks, breakage, damage, or leakage is found, repair or replace the applicable pipe or hose.

8. Clutch Fluid

A: INSPECTION

1) Park the vehicle on a level surface.
2) Inspect the fluid level using scale on the outside of the reservoir tank. If the level is below “MIN”, add fluid to bring it up to “MAX”, and also inspect for leakage.



(A) Reservoir tank
(B) MIN level
(C) MAX level

B: REPLACEMENT

CAUTION:
• The FMVSS No. 116, fresh DOT3 or 4 brake fluid must be used.
• Cover the bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
• Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.

NOTE:
• For convenience and safety, it is advisable to have two men working.

1) Remove the air cleaner case and air chamber.
2) Either jack-up the vehicle and place a safety stand under it, or lift-up the vehicle.
3) Draw out the brake fluid from reservoir tank with syringe.
4) Refill the reservoir tank with new recommended brake fluid.

Recommended brake fluid:
FMVSS No. 116, fresh DOT3 or 4 brake fluid

5) Drain fluid in the same method as air bleeding.
6) Refill the brake fluid before reservoir tank becomes empty, and drain contaminated fluid again.
7) Repeat the above procedure until the contaminated fluid is completely drained.

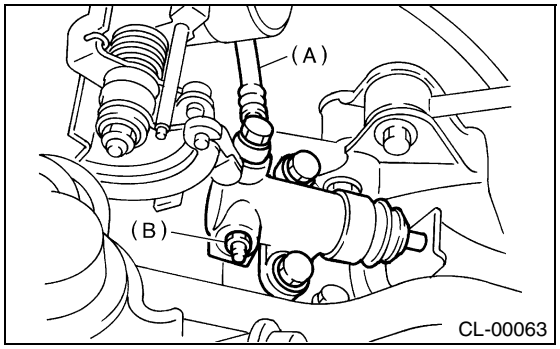
9. Clutch Fluid Air Bleeding

A: PROCEDURE

1. NON-TURBO MODEL

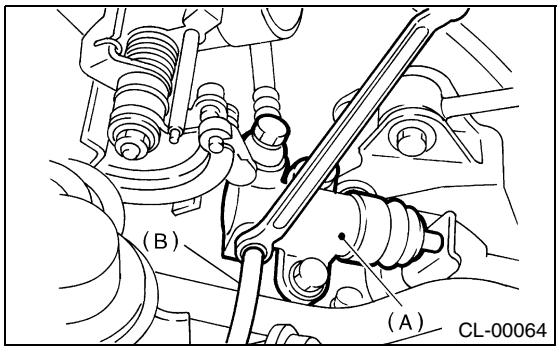
NOTE:
Bleed air from the oil line with help of co-worker.

1) Remove the air cleaner case and air intake chamber. <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
2) Fit one end of a vinyl tube into the air bleeder of operating cylinder and put the other end into a brake fluid container.



(A) Clutch hose
(B) Air bleeder

3) Slowly depress the clutch pedal and keep it depressed. Then open the air bleeder to discharge air together with the fluid.
Release the air bleeder for 1 or 2 seconds. Next, with the bleeder closed, slowly release the clutch pedal.



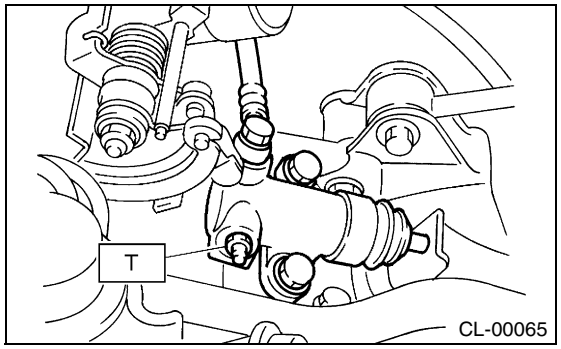
(A) Operating cylinder
(B) Vinyl tube

4) Repeat these steps until there are no more air bubbles in the vinyl tube.

CAUTION:
Cover the bleeder with waste cloth when loosening it, to prevent brake fluid from being splashed over surrounding parts.

5) Tighten the air bleeder.

Tightening torque:
T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)

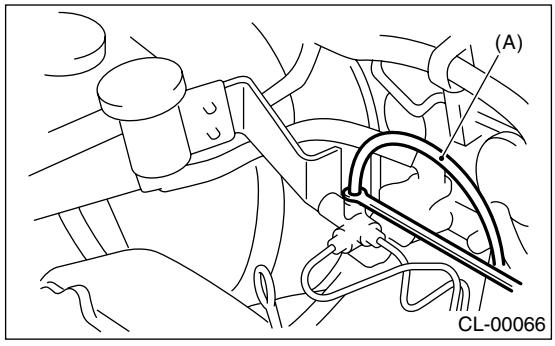


6) After depressing the clutch pedal, make sure that there are no leaks evident in the entire system.
7) After bleeding air from the system, ensure that clutch operates properly.

2. TURBO MODEL

NOTE:
Bleed air from the oil line with help of co-worker.

1) Remove the intercooler. <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
2) Fit one end of a vinyl tube into the air bleeder of master cylinder and put the air bleeder of other end into a brake fluid container. (RHD turbo model)
3) Slowly depress the clutch pedal and keep it depressed. Then open the air bleeder to discharge air together with the fluid. Release the air bleeder for 1 or 2 seconds. Next, with the bleeder closed, slowly release the clutch pedal. (RHD turbo model)



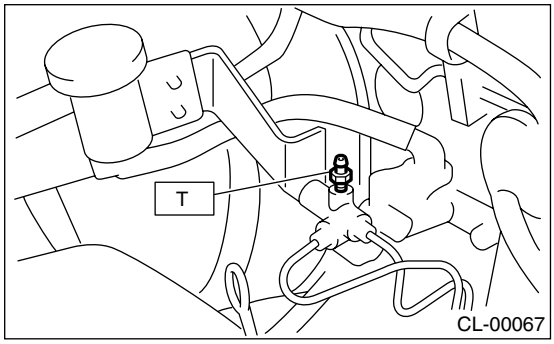
(A) Vinyl tube

4) Repeat these steps until there are no more air bubbles in the vinyl tube.

CAUTION:
Cover the bleeder with waste cloth when loosening to prevent brake fluid from being splashed over surrounding parts.

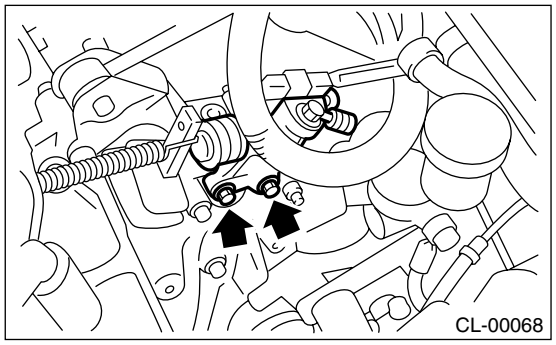
5) Tighten the air bleeder. (RHD turbo model)

Tightening torque:
T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)

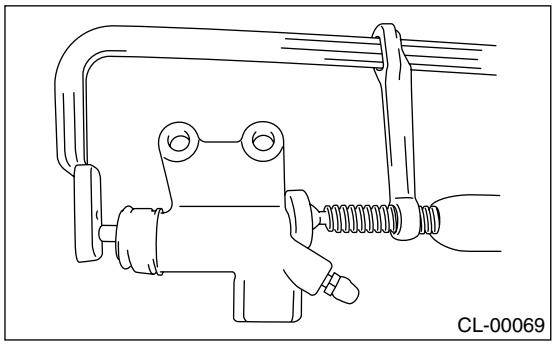


6) Remove the operating cylinder.

NOTE:
Do not remove the clutch hose.



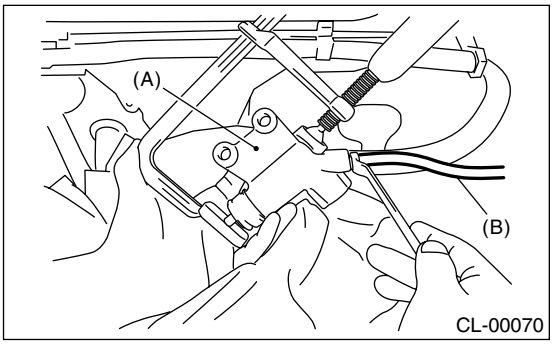
7) Fix the piston with clamp to avoid the piston from jumping out.



8) Fit one end of a vinyl tube into the air bleeder of operating cylinder and put the other end into a brake fluid container.

9) Slowly depress the clutch pedal and keep it depressed. Then open the air bleeder to discharge air together with the fluid.
Release the air bleeder for 1 or 2 seconds. Next, with the bleeder closed, slowly release the clutch pedal.

NOTE:
Set the air breather screw part higher than tip of operating cylinder when performing this procedure.



(A) Operating cylinder
(B) Vinyl tube

10) Repeat these steps until there are no more air bubbles in the vinyl tube.

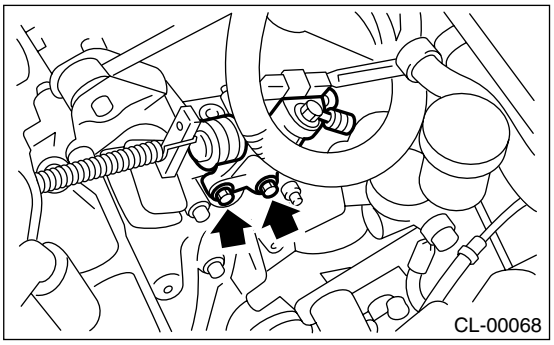
CAUTION:
Cover the bleeder with waste cloth when loosening it, to prevent brake fluid from being splashed over surrounding parts.

11) Tighten the air bleeder.

Tightening torque:
T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)

12) Install the operating cylinder.

Tightening torque:
T: 37 N·m (3.8 kgf-m, 27.5 ft-lb)



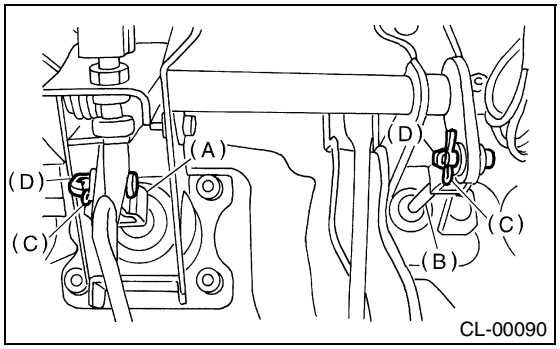
13) After depressing the clutch pedal, make sure that there are no leaks evident in the entire system.
14) After bleeding air from the system, ensure that clutch operates properly.
15) Install the intercooler. <Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>

10.Clutch Pedal

A: REMOVAL

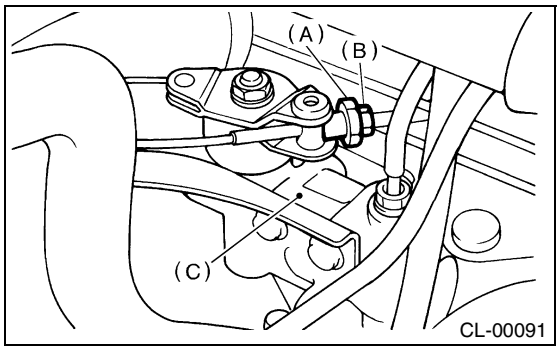
1. LHD MODEL

1) Remove the steering column. <Ref. to PS-26, REMOVAL, Tilt Steering Column.>
2) Disconnect the connectors from stop light and clutch switches.
3) Remove the snap pins which secure lever to push rod and operating rod.
4) Remove the clevis pins which secure lever to push rod and operating rod.



(A) Operating rod
(B) Push rod
(C) Snap pin
(D) Clevis pin

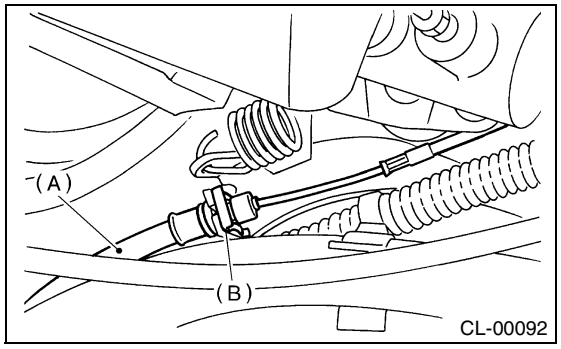
5) Remove the accelerator pedal. <Ref. to SP(SOHC)-4, REMOVAL, Accelerator Pedal.>
6) Remove the air cleaner case and intake duct. (Non-turbo model) <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
7) Remove the intercooler. (Turbo model) <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
8) Remove the PHV adjusting nut and lock nut. (With hill holder)



(A) Adjusting nut
(B) Lock nut
(C) PHV

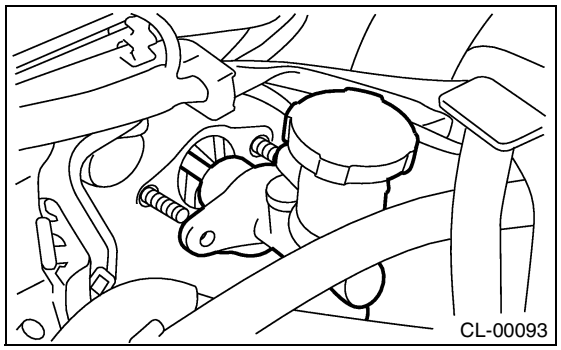
9) Remove the cable clamp, and disconnect the PHV cable from PHV. (With hill holder)

CAUTION:
Carefully protect the boot and inner cable from damage when disconnecting the PHV cable.



(A) PHV cable
(B) Clamp

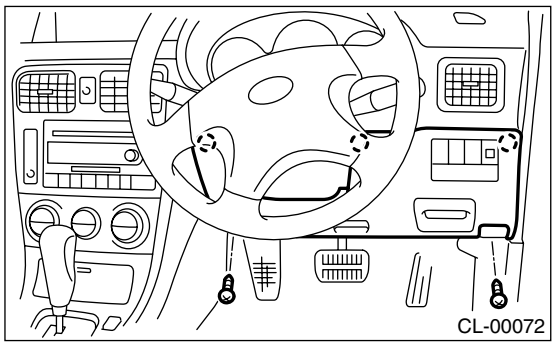
10) Remove the nut which secures clutch master cylinder.



11) Remove the bolts and nuts which secure brake and clutch pedals, and remove the pedal assembly.

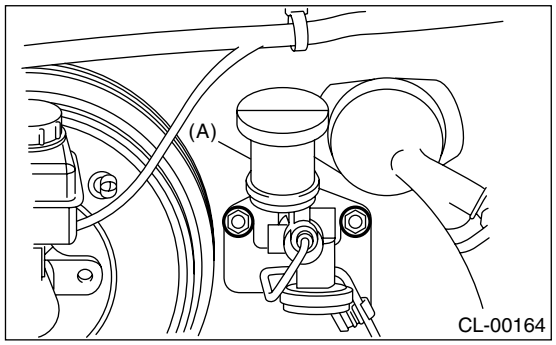
2. RHD MODEL

1) Disconnect the ground cable from battery.
2) Loosen the screws and clips, and then remove the lower cover.



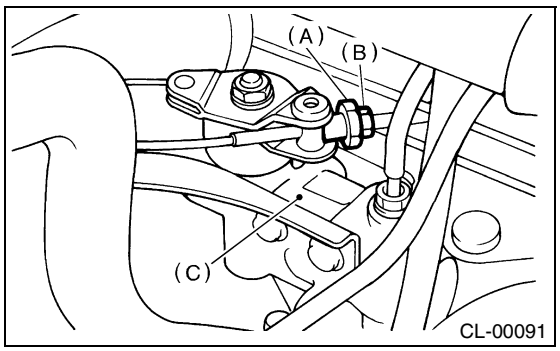
3) Disconnect the clutch switch connector. (with cruise control system)
4) Remove the snap pin connecting clutch pedal and clutch master cylinder rod, and then pull the clevis pin out.

5) Remove the clutch master cylinder mounting nut.



(A) Master cylinder

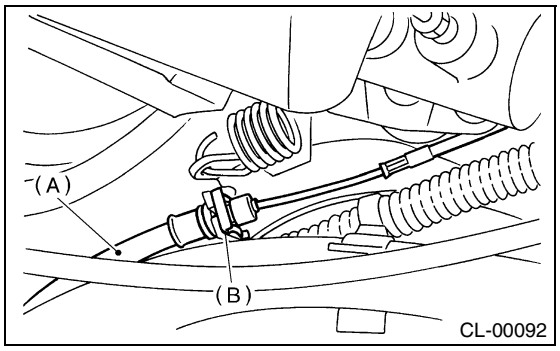
6) Remove the PHV adjusting nut and the lock nut. (with hill holder)



(A) Adjusting nut
(B) Lock nut
(C) PHV

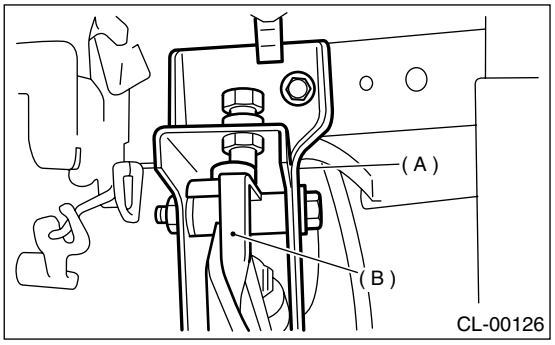
7) Remove the cable clamp, and disconnect the PHV cable from PHV. (with hill holder)

CAUTION:
Carefully protect the boot and inner cable from damage when disconnecting the PHV cable.



(A) PHV cable
(B) Clamp

8) Remove the clutch pedal bracket.



(A) Clutch pedal bracket
(B) Clutch pedal

B: INSTALLATION

1) Install the clutch pedal bracket.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

2) Install the clutch master cylinder mounting nut.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

3) Insert the new clevis pin to assist rod A, and then install the snap pin.

NOTE:
Apply a coat of grease to the clevis pin.

4) Adjust the stroke amount of clutch pedal. <Ref. to CL-40, ADJUSTMENT, Clutch Pedal.>

5) Adjust the hill holder (with hill holder). <Ref. to BR-57, ADJUSTMENT, Hill Holder.>

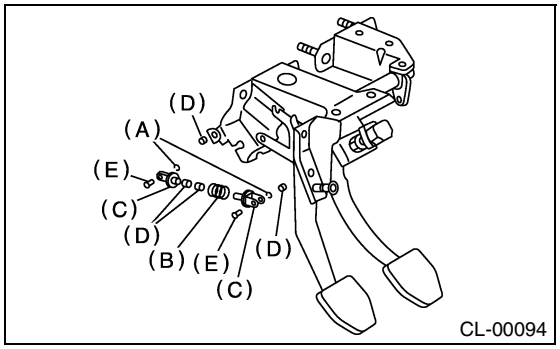
6) Connect the clutch switch connector. (with cruise control system)

7) Install the instrument panel lower cover.

C: DISASSEMBLY

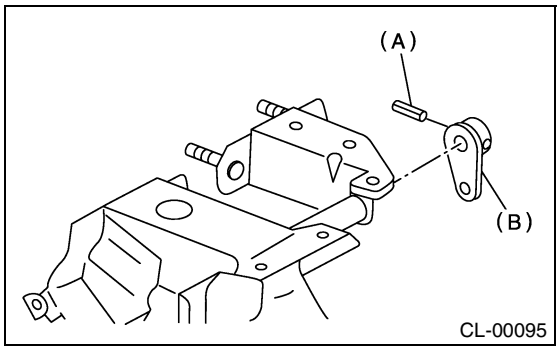
1. LHD MODEL

1) Remove the clips, assist spring, rod and bushing.



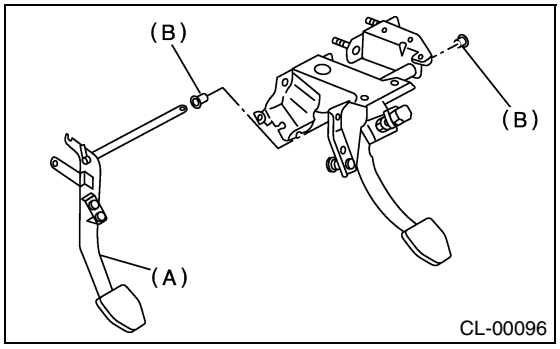
(A) Clip
(B) Assist spring
(C) Assist rod
(D) Bushing
(E) Clevis pin

2) Remove the spring pin and lever.



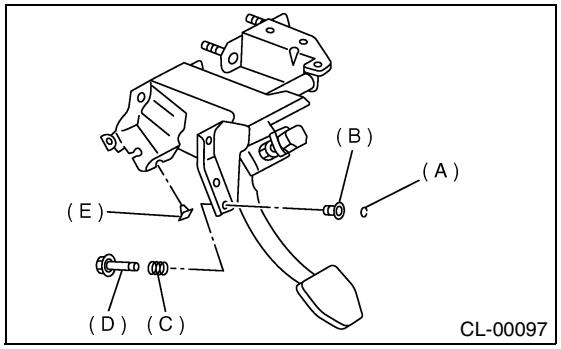
(A) Pin
(B) Lever

3) Remove the clutch pedal and bushings.



(A) Clutch pedal
(B) Bushing

4) Remove the stopper, clip, rod S, and then remove the spring and bushing S.

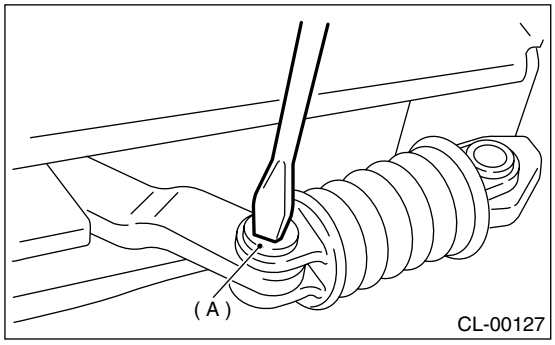


(A) Clip
(B) Bushing S
(C) Spring S
(D) Rod S
(E) Stopper

5) Remove the stoppers from clutch pedal.
6) Remove the clutch pedal pad.

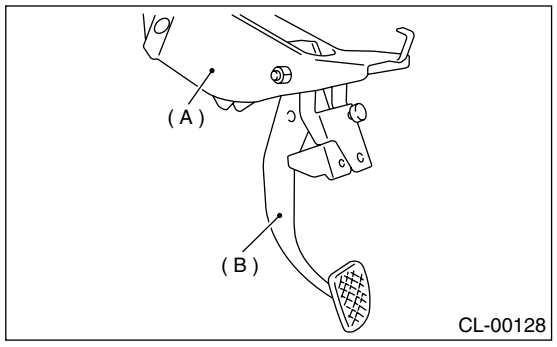
2. RHD MODEL

1) Remove the clutch switch. (With cruise control)
2) Remove the clip, then pull out the clevis pin.



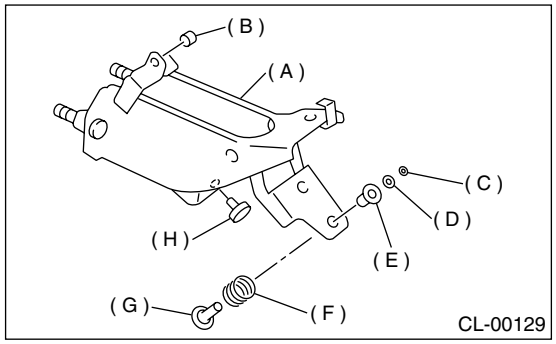
(A) Clevis pin

3) Remove the assist rod, spring and bushing.
4) Remove the clutch pedal from clutch pedal bracket.



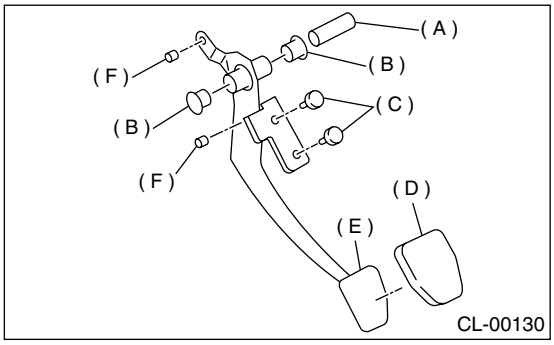
(A) Clutch pedal bracket
(B) Clutch pedal

5) Remove the following parts (B to H) from clutch pedal bracket (A) as shown in the figure.



(A) Clutch pedal bracket
(B) Bushing C
(C) Clip
(D) O-ring
(E) Bushing S
(F) Spring S
(G) Rod S
(H) Bushing

6) Remove the spacer, bushing and pedal pad from clutch pedal.



(A) Spacer
(B) Bushing
(C) Bushing
(D) Pedal pad
(E) Clutch pedal
(F) Bushing C

D: ASSEMBLY

1) Attach the stopper, etc. to pedal bracket temporarily.
2) Clean inside of bores of clutch pedal and brake pedal, apply grease, and set bushings into bores.
3) Align bores of pedal bracket, clutch pedal and brake pedal, attach the brake pedal return spring, assist rods, spring, and bushing.

NOTE:
Clean up inside of bushings and apply grease before installing the spacer.

4) Install the hill holder cable to clutch pedal.

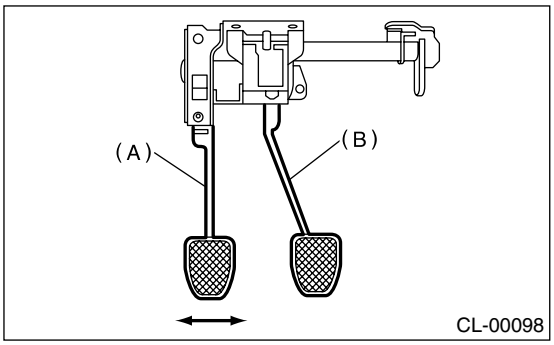
E: INSPECTION

1. CLUTCH PEDAL

Move the clutch pedal pads in the lateral direction with a force of approx. 10 N (1 kgf, 2 lb) to ensure pedal deflection is in specified range.

NOTE:
If excessive deflection is noted, replace the bushings with new ones.

Deflection of clutch pedal:
Service limit
2.0 mm (0.079 in) or less



(A) Clutch pedal
(B) Brake pedal

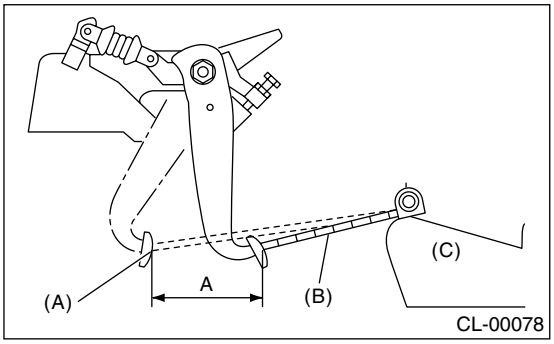
F: ADJUSTMENT

1. LHD MODEL

1) Measure the full stroke amount of clutch pedal.

NOTE:
• Measure the length between seat cushion front end and center portion of clutch pedal.
• Slide the seat at seventh notch from first notch.

Specified clutch pedal full stroke: A
130 — 135 mm (5.12 — 5.31 in)

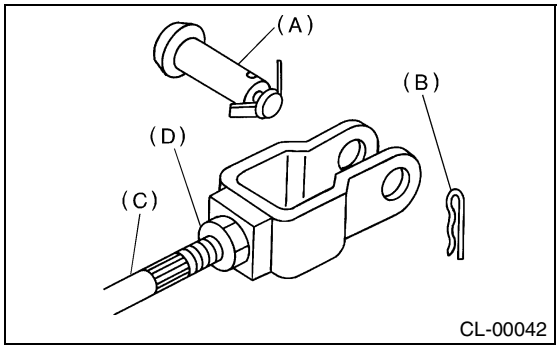


(A) Clutch (Full stroke condition)
(B) Scale
(C) Seat

2) If not as specified, loosen the clutch stopper nut to adjust it.

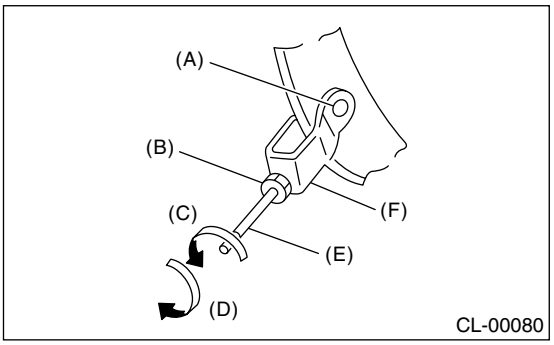
Tightening torque (Clutch stopper nut):
8 N·m (0.8 kgf-m, 5.8 ft-lb)

3) Loosen the push rod lock nut.



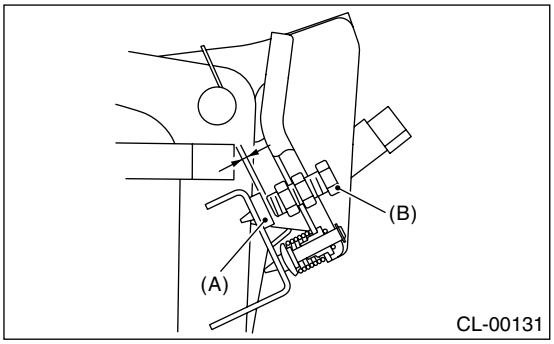
(A) Clevis pin
(B) Snap pin
(C) Push rod
(D) Push rod lock nut

4) Turn the push rod to adjust.
(1) Ensure that the clutch pedal contacts stopper bolt, when releasing the clutch pedal.
(2) Ensure that the clutch pedal contacts clutch pedal bracket stopper, when fully depressing the clutch pedal.



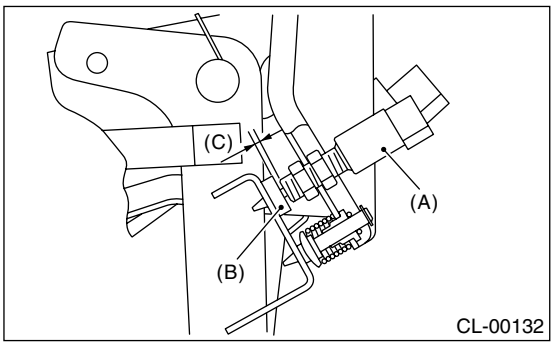
(A) Clevis hole
(B) Push rod lock nut
(C) Lengthening direction
(D) Shortening direction
(E) Push rod
(F) U shaped bracket

5) Turn the push rod clockwise to shorten until clearance is made at stopper bolt or clutch switch.
- Without cruise control



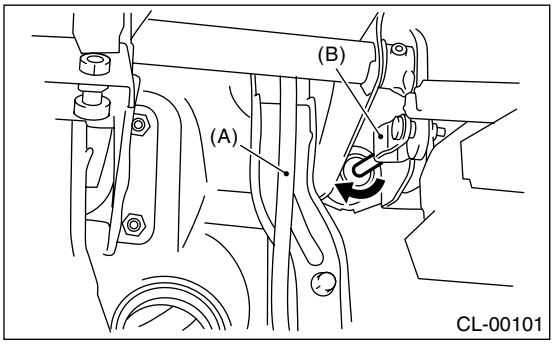
(A) Stopper
(B) Stopper bolt

- With cruise control



(A) Clutch switch
(B) Stopper

6) Turn the push rod counter clockwise to lengthen until clutch pedal contacts to stopper bolt.
7) Turn the push rod further 270° counterclockwise to lengthen (arrow direction as shown in the figure).



(A) Accelerator pedal
(B) Clevis

8) Move the clevis pin in lateral direction to ensure it moves smoothly.

9) Tighten the push rod lock nut.

Tightening torque :
10 N·m (1.0 kgf-m, 7.2 ft-lb)

10) Measure the full stroke amount of clutch pedal again.

Specified clutch pedal full stroke: A
130 — 135 mm (5.12 — 5.31 in)

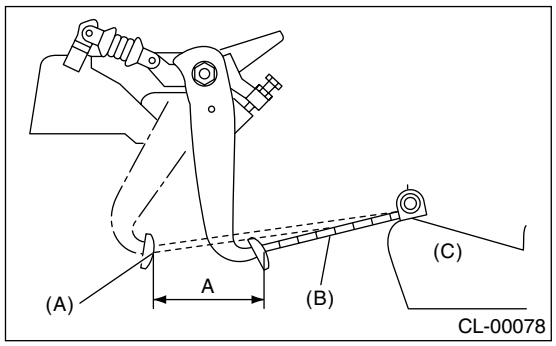
11) Install the clutch switch. <Ref. to CL-44, INSTALLATION, Clutch Switch.>

2. RHD MODEL

1) Measure the full stroke amount of clutch pedal.

NOTE:
• Measure the length between seat cushion front end and center portion of clutch pedal.
• Slide the seat at seventh notch from first notch.

Specified clutch pedal full stroke: A
125 — 130 mm (4.92 — 5.12 in)



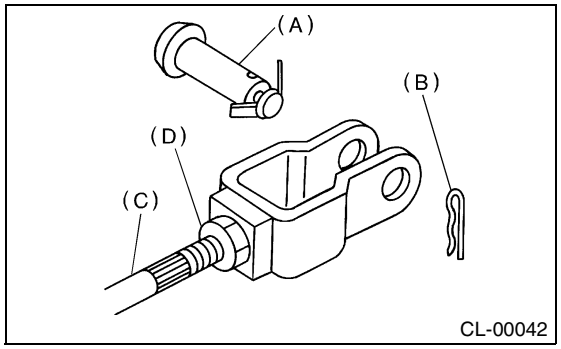
(A) Clutch (Full stroke condition)
(B) Scale
(C) Seat

2) If not as specified, loosen the clutch stopper nut to adjust it.

Tightening torque (Clutch stopper nut):
8 N·m (0.8 kgf-m, 5.8 ft-lb)

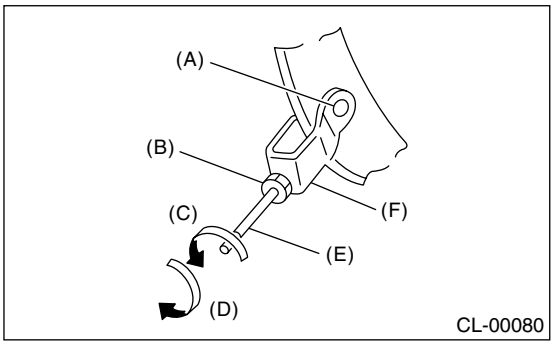
3) If the stroke amount can not be adjusted by stopper nut, remove the clutch switch. <Ref. to CL-44, REMOVAL, Clutch Switch.>

4) Loosen the push rod lock nut.



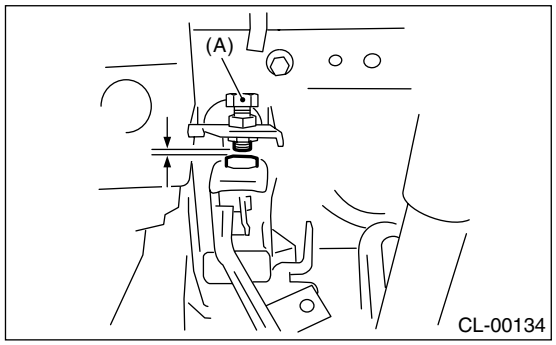
(A) Clevis pin
(B) Snap pin
(C) Push rod
(D) Push rod lock nut

5) Turn the push rod to adjust.
(1) Ensure that the clutch pedal contacts stopper bolt, when releasing the clutch pedal.
(2) Ensure that the clutch pedal contacts clutch pedal bracket stopper, when fully depressing the clutch pedal.



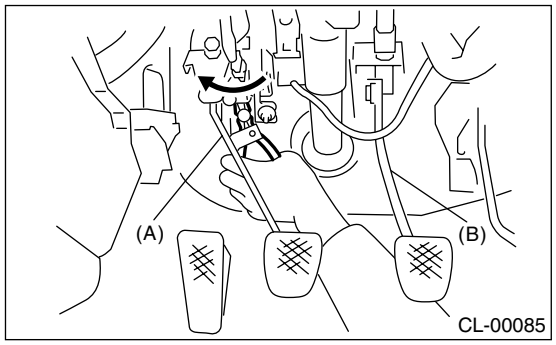
(A) Clevis hole
(B) Push rod lock nut
(C) Lengthening direction
(D) Shortening direction
(E) Push rod
(F) U shaped bracket

6) Turn the push rod clockwise to shorten until clearance is made at stopper bolt or clutch switch.



(A) Stopper bolt

7) Turn the push rod counter clockwise to lengthen until clutch pedal contacts to stopper bolt.
8) Turn the push rod further 270° counterclockwise to lengthen (arrow direction as shown in the figure).



(A) Clutch pedal
(B) Brake pedal

9) Move the clevis pin in lateral direction to ensure it moves smoothly.
10) Tighten the push rod lock nut.

Tightening torque :
10 N·m (1.0 kgf-m, 7.2 ft-lb)

11) Measure the full stroke amount of clutch pedal again.

Specified clutch pedal full stroke: A
125 — 130 mm (4.92 — 5.12 in)

12) Install the clutch switch. <Ref. to CL-44, INSTALLATION, Clutch Switch.>

11.Clutch Switch

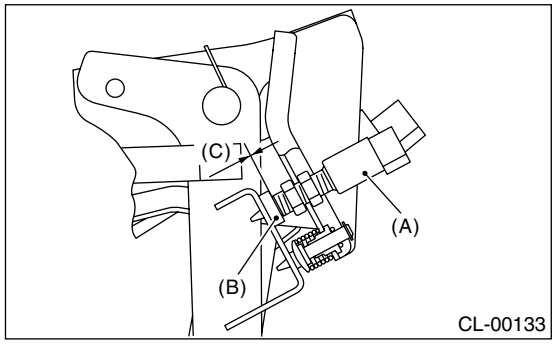
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover.
3) Disconnect the connector from clutch start switch.
4) Remove the clutch start switch.

B: INSTALLATION

1) Install the clutch switch and clutch pedal stopper so that the gap between them is 0 mm (0 in).

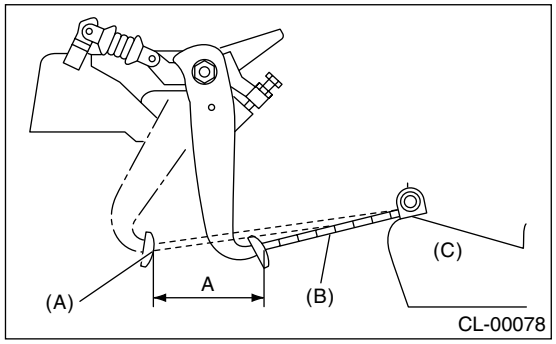
Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



(A) Clutch switch
(B) Stopper
(C) 0 mm (0 in)

2) Measure stroke of clutch pedal.

Specified clutch pedal full stroke: A
130 — 135 mm (5.12 — 5.31 in)



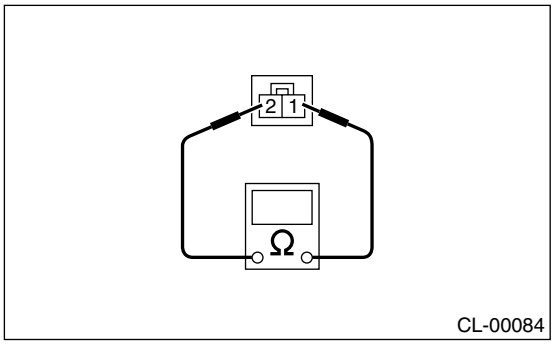
3) If the clutch pedal stroke is out of specification, adjust the stroke. <Ref. to CL-40, ADJUSTMENT, Clutch Pedal.>
4) Connect clutch switch connector.

C: INSPECTION

Check the clutch switch continuity. If continuity is not as specified, replace the switch.
(1) Disconnect the clutch switch connector.
(2) Measure the resistance between 1 and 2 of switch terminal.

Terminals/Specified resistance
When clutch pedal depressed:
1 — 2/Less than 1 Ω

Terminals/Specified resistance
When clutch pedal not depressed:
1 — 2/More than 1 MΩ



D: ADJUSTMENT

Refer to “ADJUSTMENT” for clutch pedal. <Ref. to CL-40, ADJUSTMENT, Clutch Pedal.>

12.General Diagnostic Table

A: INSPECTION

1. CLUTCH

Symptom	Possible cause	Corrective
1. Clutch slippage. It is hard to perceive clutch slippage in the early stage, but pay attention to the following symptoms • Engine speed up when shifting. • High speed driving is impossible; especially rapid acceleration impossible and vehicle speed does not increase in proportion to an increase in engine speed. • Power falls, particularly when ascending a slope, and there is a smell of burning of the clutch facing. • Method of testing: Put the vehicle in stationary condition with parking brake fully applied. Disengage the clutch and shift the transmission gear into the first. Gradually allow the clutch to engage while gradually increasing the engine speed. The clutch function is satisfactory if the engine stalls. However, the clutch is slipping if the vehicle does not start off and the engine does not stall.	(a) Clutch facing smeared by oil	Replace.
	(b) Worn clutch facing	Replace.
	(c) Deteriorated diaphragm spring	Replace.
	(d) Distorted pressure plate or flywheel	Correct or replace.
	(e) Defective release bearing holder	Correct or replace.
2. Clutch drags. As a symptom of this trouble, a harsh scratching noise develops and control becomes quite difficult when shifting gears. The symptom becomes more apparent when shifting into the first gear. However, because much trouble of this sort is due to defective synchronization mechanism, carry out the test as described after. • Method of testing: <Ref. to CL-46, DIAGNOSTIC DIAGRAM OF CLUTCH DRAG, INSPECTION, General Diagnostic Table.> It may be judged as insufficient disengagement of clutch if any noise occurs during this test.	(a) Worn or rusty clutch disc hub spline	Replace the clutch disc.
	(b) Excessive deflection of clutch disc facing	Replace.
	(c) Malfunction of crankshaft pilot bearing	Replace.
	(d) Cracked clutch disc facing	Replace.
	(e) Stuck clutch disc (smeared by oil or water)	Replace.
3. Clutch chatters. Clutch chattering is an unpleasant vibration to the whole body when the vehicle is just started with clutch partially engaged.	(a) Adhesion of oil on the facing	Replace the clutch disc.
	(b) Weak or broken torsion spring	Replace the clutch disc.
	(c) Defective facing contact or excessive disc worn	Replace the clutch disc defection.
	(d) Warped pressure plate or flywheel	Correct or replace.
	(e) Loose disc rivets	Replace the clutch disc.
	(f) Loose engine mounting	Retighten or replace the mounting.
	(g) Improper adjustment of pitching stopper	Adjustment.

Symptom	Possible cause	Corrective
4. Noisy clutch Examine whether the noise is generated when the clutch is disengaged, engaged, or partially engaged.	(a) Broken, worn or unlubricated release bearing	Replace the release bearing.
	(b) Insufficient lubrication of pilot bearing	Replace.
	(c) Loose clutch disc hub	Replace the clutch disc.
	(d) Loose torsion spring retainer	Replace the clutch disc.
	(e) Deteriorated or broken torsion spring	Replace the clutch disc.
5. Clutch grabs. When starting the vehicle with the clutch partially engaged, the clutch engages suddenly and the vehicle jumps instead of making a smooth start.	(a) Grease or oil on facing	Replace the clutch disc.
	(b) Deteriorated cushioning spring	Replace the clutch disc.
	(c) Worn or rusted spline of clutch disc or main shaft	Take off rust, apply grease or replace the clutch disc or main shaft.
	(d) Deteriorated or broken torsion spring	Replace the clutch disc.
	(e) Loose engine mounting	Retighten or replace the mounting.
	(f) Deteriorated diaphragm spring	Replace.

2. CLUTCH PEDAL

Trouble	Corrective action
Insufficient pedal play	Adjust pedal play.
Clutch pedal free play insufficient	Adjust pedal free play.
Excessively worn and damaged pedal shaft and/or bushing	Replace the bushing and/or shaft with a new one.

3. DIAGNOSTIC DIAGRAM OF CLUTCH DRAG

	Step	Value	Yes	No
1	**CHECK GEAR NOISE.** 1)Start the engine. 2)Disengage the clutch and shift quickly from neutral to reverse in idling condition. Is there any abnormal noise from the transmission gear?	There is abnormal noise from transmission gear.	Go to step **2.**	Clutch is normal.
2	**CHECK GEAR NOISE.** Disengage the clutch at idle and shift from neutral to reverse within 0.5 — 1.0 seconds. Is there any abnormal noise from the transmission gear?	There is abnormal noise from transmission gear.	Go to step **3.**	Defective transmission or excessive clutch drag torque. Inspect the pilot bearing, clutch disc, transmission and clutch disc hub spline.
3	**CHECK GEAR NOISE.** 1)Disengage the clutch at idle and shift from neutral to reverse within 0.5 — 1.0 seconds. 2)With the clutch disengaged, shift from N to R, R to N several times. Is there any abnormal noise from the transmission gear?	There is abnormal noise from transmission gear.	Defect in clutch disengaging. Inspect the clutch disc, clutch cover, clutch release, and clutch pedal free play.	Clutch and flywheel seizure. Inspect the clutch disc, spline of clutch disc hub.

CHASSIS SECTION

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FRONT SUSPENSION	FS
REAR SUSPENSION	RS
WHEEL AND TIRE SYSTEM	WT
DIFFERENTIALS	DI
TRANSFER CASE	TC
DRIVE SHAFT SYSTEM	DS
ABS	ABS
ABS (DIAGNOSTICS)	ABS
BRAKE	BR
PARKING BRAKE	PB
POWER ASSISTED SYSTEM (POWER STEERING)	PS

FRONT SUSPENSION

FS

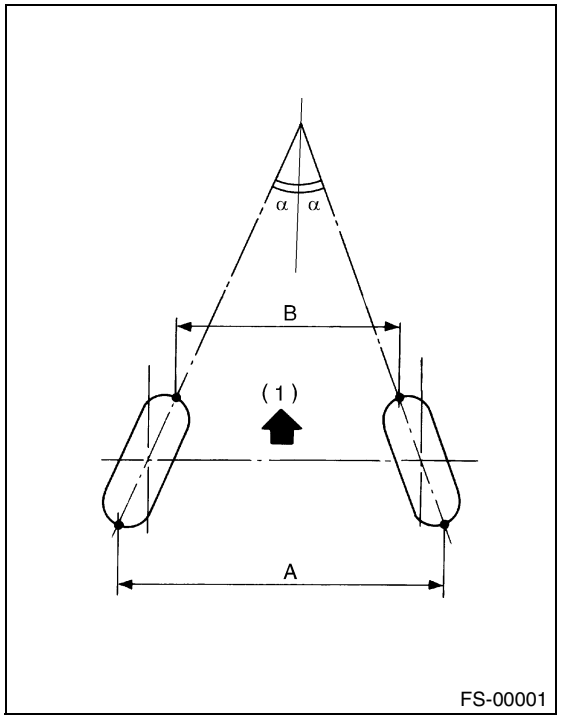
		Page
1.	General Description	2
2.	Wheel Alignment	7
3.	Front Transverse Link	16
4.	Front Ball Joint	18
5.	Front Strut	19
6.	Front Stabilizer	23
7.	Front Crossmember	24
8.	Sub Frame	25
9.	General Diagnostic Table	26

1. General Description

A: SPECIFICATIONS

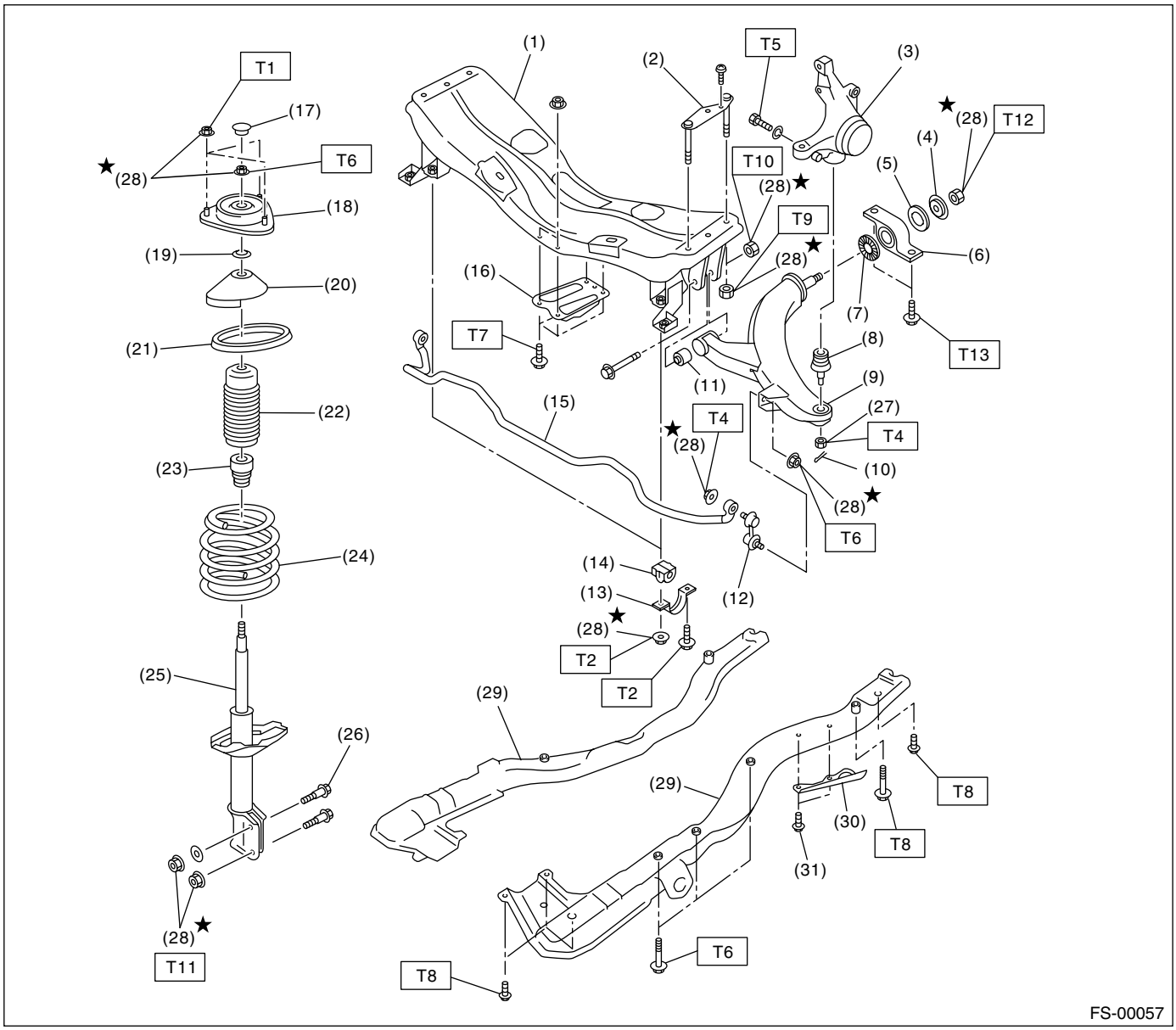
Item		Non-turbo	Turbo
Front	Camber (Tolerance: ±0°45′)	–0°25′	
	Caster (Reference)	3°03′	
	Toe-in	0±3 mm (0±0.12 in) Each toe angle: 0°±0°07′30″	
	Kingpin angle (Reference)	13°12′	
	Wheel arch height (Tolerance: $^{+12}/_{-24}$ mm ($^{+0.47}/_{-0.94}$ in)	437 mm (17.20 in)	
	Diameter of stabilizer	21 mm (0.83 in)	
Rear	Camber (Tolerance: ±0°45′)	–0°50′	–0°55′
	Toe-in	2±3 mm (0.079±0.118 in) Each toe angle: 0°05′±0°07′30″	
	Thrust angle	0°±30′	
	Wheel arch height (Tolerance: $^{+12}/_{-24}$ mm ($^{+0.47}/_{-0.94}$ in)	440 mm (17.32 in)	435 mm (17.13 in)
	Diameter of stabilizer	17 mm (0.67 in)	

NOTE:
- Front and rear toe-ins and front camber can be adjusted. If toe-in or camber tolerance exceeds specifications, adjust toe-in and camber to the middle value of specification.
- The other items indicated in the specification table cannot be adjusted. If the other items exceeds specifications, check suspension parts and connections for deformities; replace with new ones as required.



(1) Front
A – B = Positive: Toe-in, Negative: Toe-out
α = Each toe angle

B: COMPONENT


T1
(17)
(28)
T6
(18)
(19)
(20)
(21)
(22)
(23)
(24)
(25)
(26)
(28)
T11
(1)
(2)
T5
(3)
(28)
T12
(4)
(5)
T10
(28)
T9
(6)
(16)
(28)
(7)
T7
(8)
T13
(11)
(9)
(15)
T4
(27)
(28)
T4
(10)
(28)
T6
(14)
(13)
(12)
(28)
T2
T2
(29)
(29)
T8
(30)
T8
(31)
T6
T8
FS-00057

(1) Front crossmember
(2) Bolt ASSY
(3) Housing
(4) Washer
(5) Stopper rubber (Rear)
(6) Rear bushing
(7) Stopper rubber (Front)
(8) Ball joint
(9) Transverse link
(10) Cotter pin
(11) Front bushing
(12) Stabilizer link
(13) Clamp
(14) Bushing
(15) Stabilizer
(16) Jack up plate
(17) Dust seal
(18) Strut mount
(19) Spacer
(20) Upper spring seat
(21) Rubber seat
(22) Dust cover
(23) Helper
(24) Coil spring
(25) Damper strut
(26) Adjusting bolt
(27) Castle nut
(28) Self-locking nut
(29) Sub frame
(30) Cover
(31) Clip

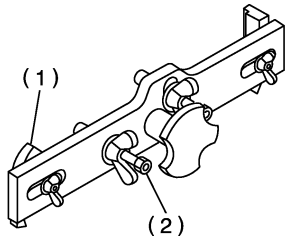
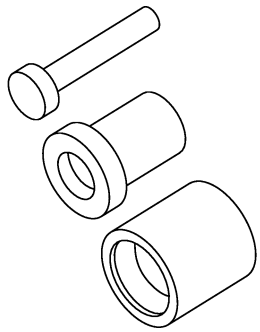
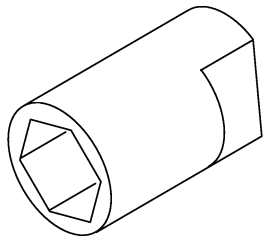
Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*20 (2.0, 14.5)*
T2:	*25 (2.5, 18.1)*
T3:	*40 (4.1, 30) (Further tighten the bolts within 60°)*
T4:	*45 (4.6, 33)*
T5:	*50 (5.1, 37)*
T6:	*55 (5.6, 41)*
T7:	*70 (7.1, 51.6)*
T8:	*71 (7.2, 52)*
T9:	*100 (10.2, 74)*
T10:	*125 (12.7, 92.3)*
T11:	*175 (17.8, 129)*
T12:	*190 (19.4, 140)*
T13:	*250 (25.5, 184)*

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927380001	927380001	ADAPTER	Used as an adapter for camber & caster gauge when measuring camber and caster. (1) 28199AC000 PLATE (2) 28199AC010 BOLT
 ST-927680000	927680000	INSTALLER & REMOVER SET	Used for replacing transverse link bushing.
 ST-927760000	927760000	STRUT MOUNT SOCKET	Used for disassembling and assembling strut and shock mount.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Alignment gauge	Used for wheel alignment measurement.
Turning radius gauge	Used for wheel alignment measurement.
Toe-in gauge	Used for toe-in measurement.
Dial gauge	Used for damper strut measurement.
Coil spring compressor	Used for strut disassembly/assembly.

2. Wheel Alignment

A: INSPECTION

Check the following items before taking wheel alignment measurement.
Check items before taking wheel alignment measurement:

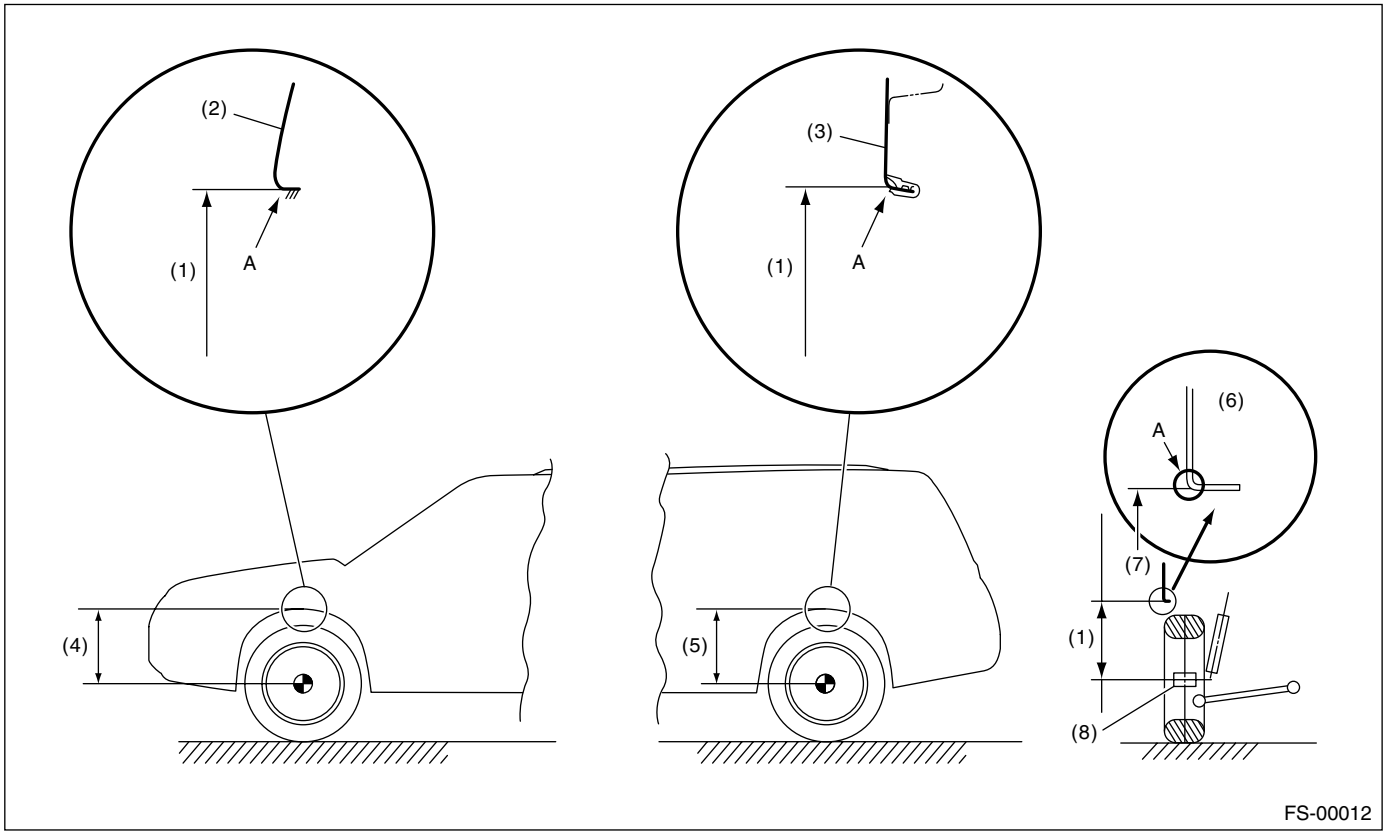
- tire air pressure
- unbalanced right and left tire wear, size difference
- tire run-out
- ball joint excessive play, wear
- tie rod end excessive play, wear
- wheel bearing excessive play
- right and left wheel base imbalance
- steering link part deformed, excessive play
- suspension part deformed, excessive play

Check, adjust and/or measure the wheel alignment in accordance with procedures indicated in the figure:

Wheel arch height (Front and rear) <Ref. to FS-8, WHEEL ARCH HEIGHT, INSPECTION, Wheel Alignment.>
↓
Camber (Front and rear) <Ref. to FS-9, CAMBER, INSPECTION, Wheel Alignment.>
↓
Caster (Front) <Ref. to FS-10, CASTER, INSPECTION, Wheel Alignment.>
↓
Steering angle <Ref. to FS-11, STEERING ANGLE, INSPECTION, Wheel Alignment.>
↓
Front wheel toe-in <Ref. to FS-11, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>
↓
Rear wheel toe-in <Ref. to FS-12, REAR WHEEL TOE-IN, INSPECTION, Wheel Alignment.>
↓
Thrust angle <Ref. to FS-14, THRUST ANGLE, INSPECTION, Wheel Alignment.>

1. WHEEL ARCH HEIGHT

1) Set the vehicle on a level surface.
2) Set the vehicle to “curb weight” conditions. (Empty luggage compartment, install spare tire, jack, service tools, and top up fuel tank.)
3) Set the steering wheel in a straight line, then remove the vehicle straight ahead more than 5 m (16 ft) to settle the suspension.
4) Suspend the thread from wheel arch (point “A” in figure below) to determine a point directly above center of wheel.
5) Measure the distance between measuring point “A” and center of wheel.



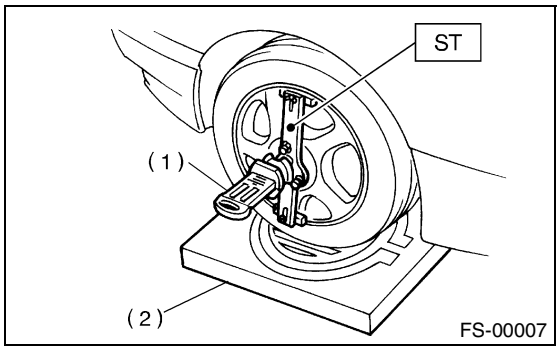
(1) Wheel arch height
(2) Front fender
(3) Rear quarter
(4) Front wheel arch height
(5) Rear wheel arch height
(6) Flange bend line
(7) Measuring point
(8) End of spindle

	Specified wheel arch height	
	Front	Rear
Turbo	437 $^{+12}/_{-24}$ mm (17.20 $^{+0.47}/_{-0.94}$ in)	435 $^{+12}/_{-24}$ mm (17.13 $^{+0.47}/_{-0.94}$ in)
Non-Turbo		440 $^{+12}/_{-24}$ mm (17.32 $^{+0.47}/_{-0.94}$ in)

2. CAMBER

• Inspection

1) Place the front wheel on turning radius gauge. Make sure ground contacting surfaces of front and rear wheels are set at the same height.
2) Set the ST into the center of wheel, and then install the wheel alignment gauge.
ST 927380001 ADAPTER



(1) Alignment gauge
(2) Turning radius gauge

3) Follow the wheel alignment gauge operation manual to measure camber angle.

NOTE:
Refer to the “SPECIFICATIONS” for camber values.
Front: <Ref. to FS-2, SPECIFICATIONS, General Description.>
Rear: <Ref. to RS-2, SPECIFICATIONS, General Description.>

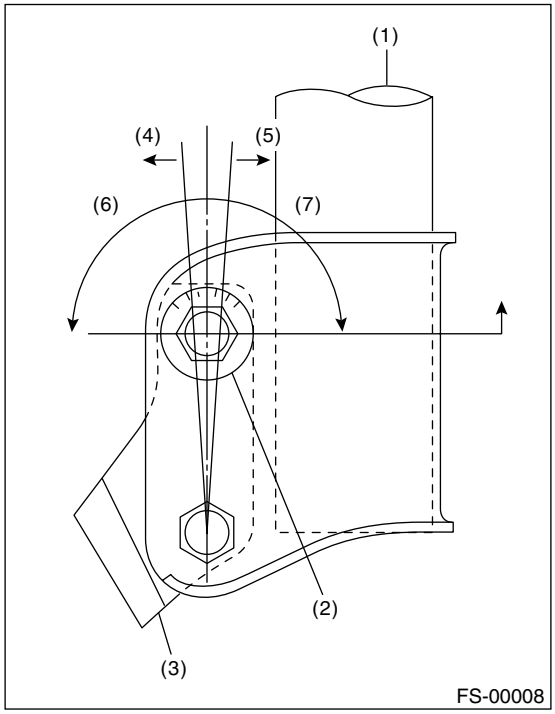
• Front Camber Adjustment

1) Loosen the two self-locking nuts located at lower front portion of strut.

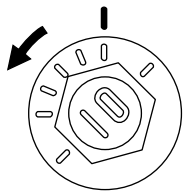
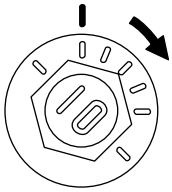
NOTE:
When adjusting bolt needs to be loosened or tightened, hold its head with a wrench and turn self-locking nut.

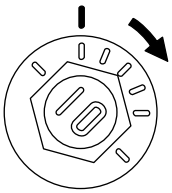
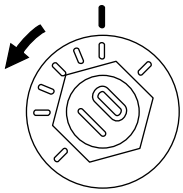
2) Turn the camber adjusting bolt so that camber is set at the specification.

NOTE:
Moving the adjusting bolt by one scale graduation changes camber by approx. 0°10′.



(1) Strut
(2) Adjusting bolt
(3) Housing
(4) Outer
(5) Inner
(6) Camber is increased.
(7) Camber is decreased.

Camber is increased.	
Rotate camber adjusting bolt LH counterclockwise.	Rotate camber adjusting bolt RH clockwise.
 FS-00009	 FS-00010

Camber is decreased	
Rotate camber adjusting bolt LH clockwise.	Rotate camber adjusting bolt RH counterclockwise.
 FS-00010	 FS-00009

3) Tighten new two self-locking nuts.

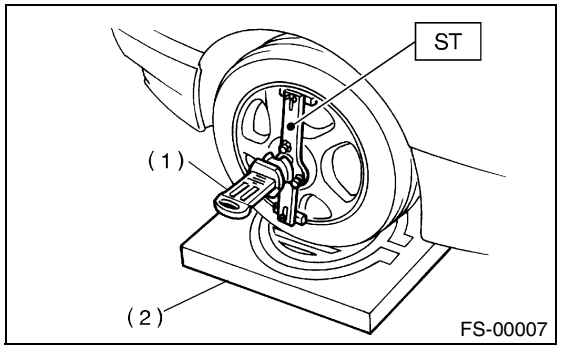
Tightening torque:
175 N·m (17.8 kgf-m, 129 ft-lb)

3. CASTER

• Inspection

1) Place the front wheel on turning radius gauge. Make sure ground contacting surfaces of front and rear wheels are set at the same height.

2) Set the ST into the center of wheel, and then install the wheel alignment gauge.
ST 927380001 ADAPTER



(1) Alignment gauge
(2) Turning radius gauge

3) Follow the wheel alignment gauge operation manual to measure caster angle.

NOTE:
Refer to the “SPECIFICATIONS” for caster values. <Ref. to FS-2, SPECIFICATIONS, General Description.>

4. STEERING ANGLE

• Inspection

1) Place the vehicle on a turning radius gauge.
2) While depressing the brake pedal, turn the steering wheel fully to the right and left. With the steering wheel held at each fully turned position, measure both the inner and outer wheel steering angle.

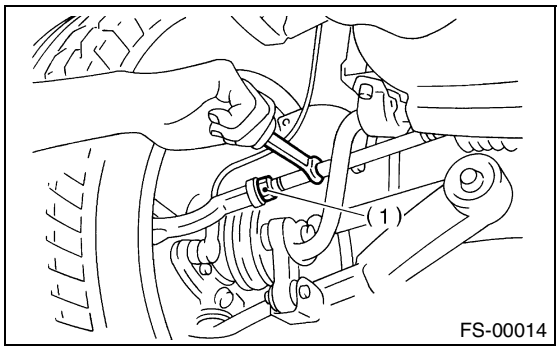
Steering angle:

Inner wheel	***36°24′±1°30′***
Outer wheel	***32°±1°30′***

• Adjustment

1) Turn the tie-rod to adjust steering angle of both inner and outer wheels.
2) Check the toe-in.

NOTE:
Correct the boot if it is twisted.



(1) Lock nut

5. FRONT WHEEL TOE-IN

• Inspection

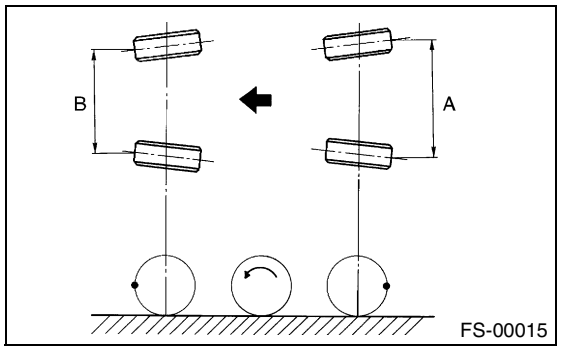
Toe-in:
0±3 mm (0±0.12 in)

1) Set the toe-in gauge to rear sides of right and left front tires at height correspanding to center of spindle.
2) Mark eath right and left tires at height correspanding to center of spindle and measure the distance "A" between marks.
3) Move the vehicle forward to rotate wheels 180°.

NOTE:
Whenever rotating the wheels, drive the vehicle forward.

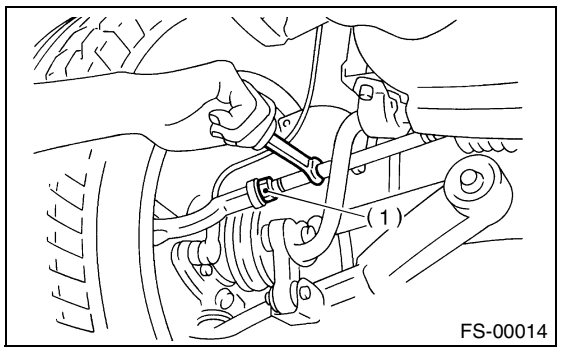
4) Measure the distance "B" between right and left marks. Toe-in can then be obtained by the following equation:

A – B = Toe-in



• Adjustment

1) Make sure that the right and left steering angles are within specified value.
2) Loosen the right and left side steering tie-rods lock nuts.
3) Turn the right and left tie rods equal amounts until the toe-in is at the specification.
Both the right and left tie-rods are right-hand threaded. To increase toe-in, turn both tie-rods clockwise equal amounts (as viewed from inside of the vehicle).



(1) Lock nut

4) Tighten the tie-rod lock nut.

Tightening torque:
85 N·m (8.7 kgf-m, 62.9 ft-lb)

NOTE:
Correct the tie-rod boot, if it is twisted.

6. REAR WHEEL TOE-IN

• Inspection

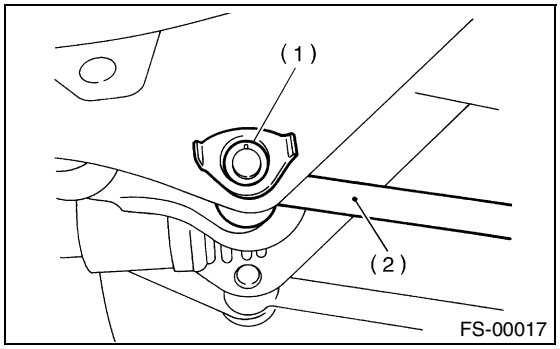
Toe-in:
2±3 mm (0.079±0.118 in)

For rear toe-in inspection procedure, refer to FRONT WHEEL TOE-IN procedure. <Ref. to FS-11, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

• Adjustment

1) Loosen the self-locking nut on inner side of link rear.

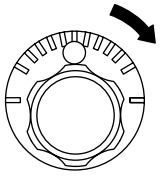
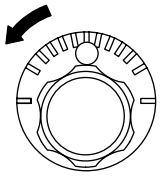
NOTE:
When loosening or tightening the adjusting bolt, hold the bolt head and turn self-locking nut.

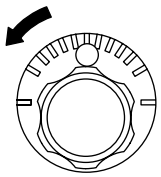
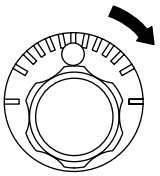


(1) Adjusting bolt
(2) Link rear

2) Turn the adjusting bolt head until toe-in is at the specification.

NOTE:
When right and left wheels are adjusted for toe-in at the same time, the movement of one scale graduation changes toe-in by approx. 1.5 mm (0.6 in).

Toe-in is increased.	
Rotate camber adjusting bolt LH clockwise.	Rotate camber adjusting bolt RH counterclockwise.
 FS-00018	 FS-00019

Toe-in is decreased.	
Rotate camber adjusting bolt LH counterclockwise.	Rotate camber adjusting bolt RH clockwise.
 FS-00019	 FS-00018

3) Tighten a new self-locking nut.

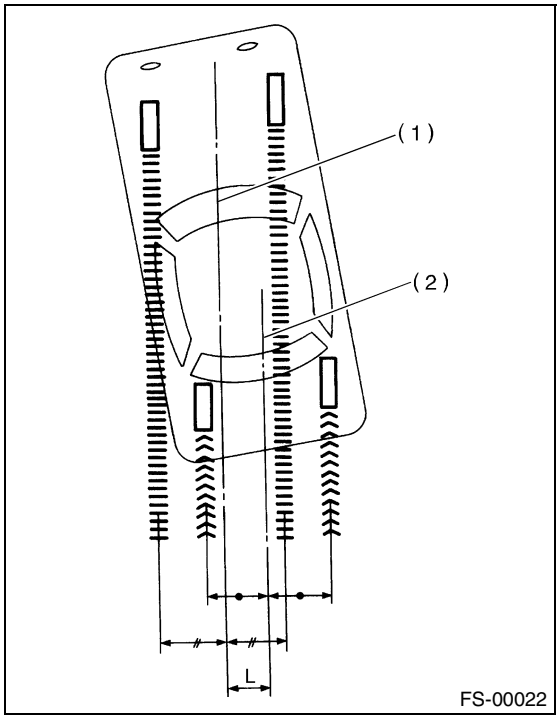
Tightening torque:
100 N·m (10.2 kgf-m, 74 ft-lb)

7. THRUST ANGLE

• Inspection

1) Position the vehicle on a level surface.
2) Move the vehicle 3 to 4 m (10 to 13 ft) directly forward.
3) Determine the center lines of front axle loci and rear axle loci.
4) Measure the distance “L” between center line of loci of the axles.

Thrust angle:
Less than 30′ when “L” is less than 22 mm (0.9 in).

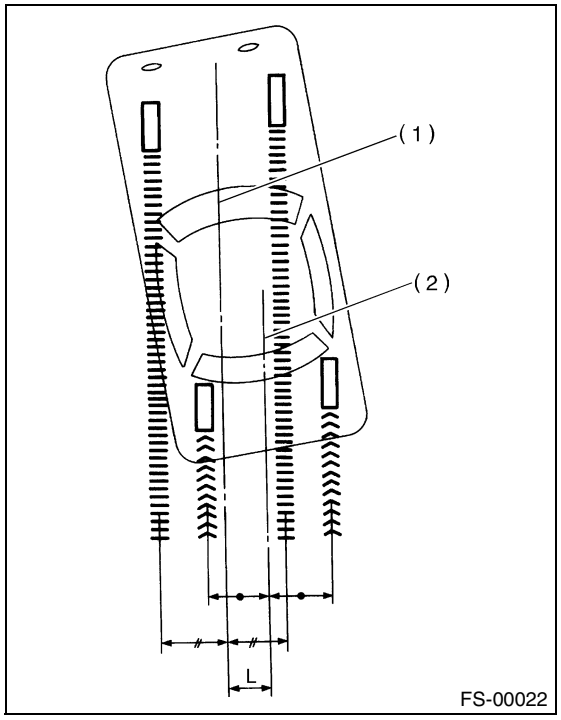


(1) Center line of loci (front axle)
(2) Center line of loci (rear axle)

• Adjustment

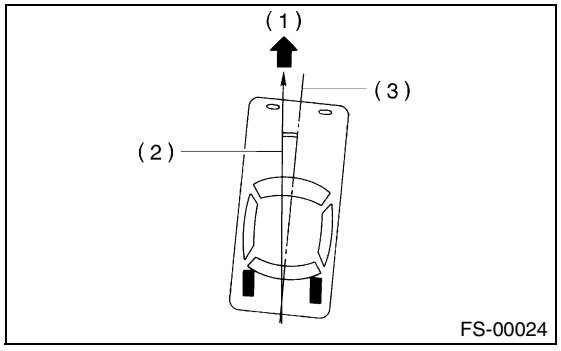
1) Make the thrust angle adjustments by turning toe-in adjusting bolts of rear suspension equally in the same direction.
2) When one rear wheel is adjusted in a toe-in direction, adjust the other rear wheel equally in toe-out direction, in order to make thrust angle adjustment.
3) When the right and left adjusting bolts are turned incrementally by one graduation in the same direction, the thrust angle will change approx. 16′ [“L” is almost equal to 12 mm (0.472 in)].

Thrust angle:
0°±30′



(1) Center line of loci (front axle)
(2) Center line of loci (rear axle)

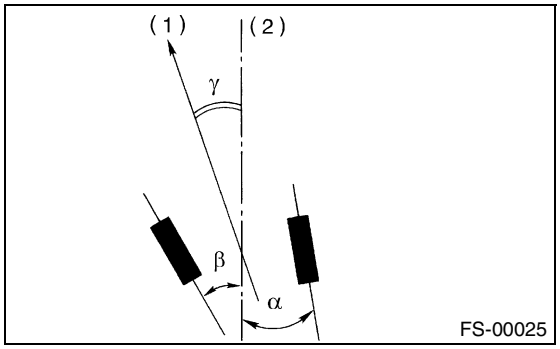
NOTE:
Thrust angle refers to a mean value of right and left rear wheel toe angles in relation to the vehicle body center line. Vehicle is driven straight in the thrust angle direction while swinging in the oblique direction depending on the degree of the mean thrust angle.



(1) Front
(2) Thrust angle
(3) Body center line

Thrust angle: $\gamma = (\alpha - \beta)/2$

α: Right rear wheel toe-in angle
β: Left rear wheel toe-in angle
Here, use only positive toe-in values from each wheel to substitute for α and β in the equation.

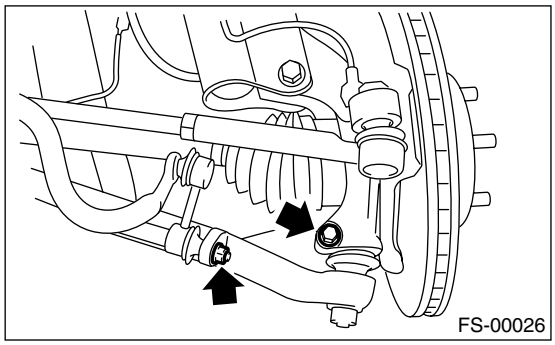


(1) Front
(2) Body center line

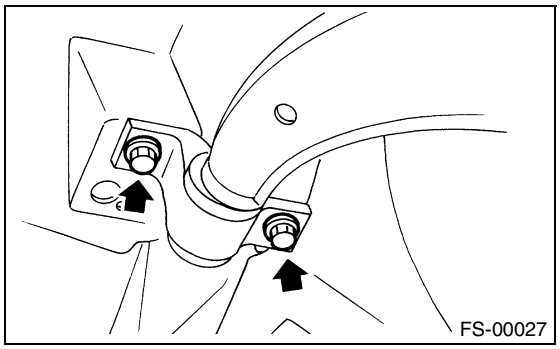
3. Front Transverse Link

A: REMOVAL

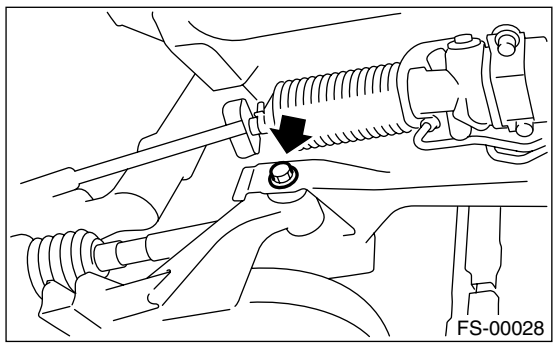
1) Set the vehicle on the lift.
2) Lift-up the vehicle and remove the wheel.
3) Remove the sub frame.
4) Disconnect the stabilizer link from transverse link.
5) Remove the bolt securing ball joint of transverse link to housing.



6) Remove the nut (do not remove bolt) securing transverse link to crossmember.
7) Remove the two bolts securing bushing bracket of transverse link to the vehicle body at rear bushing location.



8) Extract the ball joint from housing.
9) Remove the bolt securing transverse link to crossmember, and then extract the transverse link from crossmember.

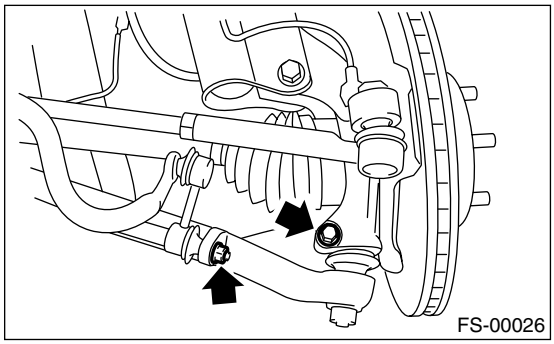


B: INSTALLATION

1) Temporarily tighten the two bolts used to secure rear bushing of transverse link to body.

NOTE:
These bolts should be tightened to such an extent that they can still move back and forth in the oblong shaped hole in the bracket (which holds the bushing).

2) Install the bolts used to connect transverse link to crossmember and temporarily tighten with a new self-locking nut.
3) Insert the ball joint into housing.
4) Connect the stabilizer link to transverse link, and temporarily tighten a new self-locking nut.



5) Tighten the following points in the order shown below when wheels are in full contact with the ground and vehicle is curb weight.
(1) Transverse link and stabilizer

Tightening torque:
45 N·m (4.6 kgf-m, 33 ft-lb)

(2) Transverse link and crossmember

Tightening torque:
125 N·m (12.7 kgf-m, 92.3 ft-lb)

(3) Transverse link rear bushing and body

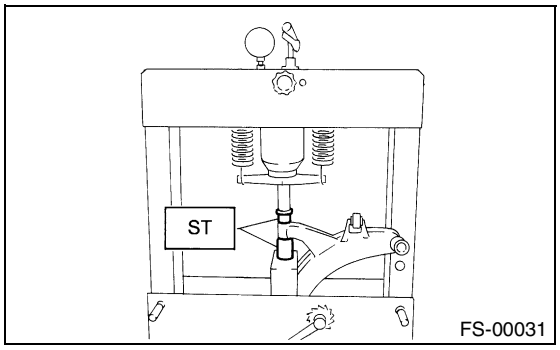
Tightening torque:
100 N·m (10.2 kgf-m, 74 ft-lb)

6) Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

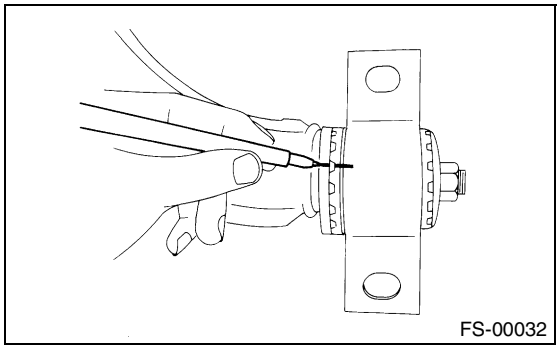
1. FRONT BUSHING

Using the ST, press the front bushing out of place.
ST 927680000 INSTALLER & REMOVER SET



2. REAR BUSHING

1) Scribe an aligning mark on the transverse link and rear bushing.
2) Loosen the nut and remove rear bushing.

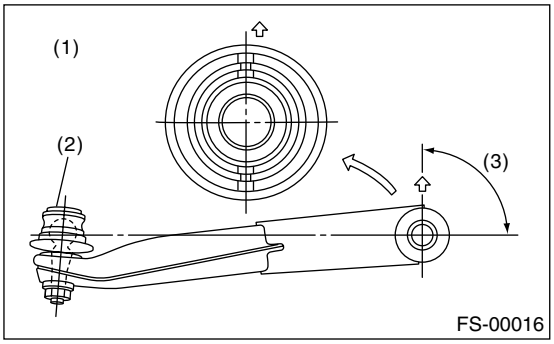


D: ASSEMBLY

1. FRONT BUSHING

Assemble in the reverse order of disassembly.

CAUTION:
Install the front bushing in correct direction, as shown in the figure.



(1) Face bushing toward center of ball joint
(2) Ball joint
(2) 90°±3°

2. REAR BUSHING

1) Install the rear bushing to transverse link and align aligning marks scribed on the two.
2) Tighten a new self-locking nut.

NOTE:
While holding the rear bushing so as not to change position of aligning marks, tighten the self-locking nut.

Tightening torque:
190 N·m (19.4 kgf-m, 140 ft-lb)

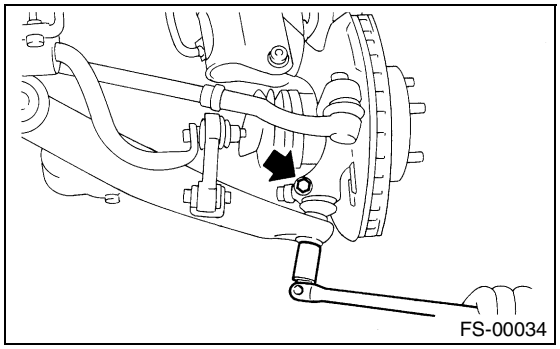
E: INSPECTION

1) Check the transverse link for wear, damage and cracks, and correct or replace if defective.
2) Check the bushings for cracks, fatigue or damage.
3) Check the rear bushing for oil leaks.

4. Front Ball Joint

A: REMOVAL

1) Remove the wheel.
2) Pull out the cotter pin from ball stud, remove the castle nut, and extract the ball stud from transverse link.
3) Remove the bolt securing ball joint to housing.



4) Extract the ball joint from housing.

B: INSTALLATION

1) Install the ball joint onto housing.

Tightening torque (Bolt):
50 N·m (5.1 kgf-m, 37 ft-lb)

CAUTION:
Do not apply grease to tapered portion of ball stud.

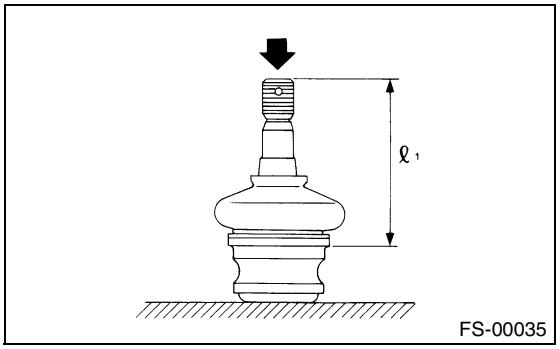
2) Connect the ball joint to transverse link.

Tightening torque (Castle nut):
40 N·m (4.1 kgf-m, 30 ft-lb)

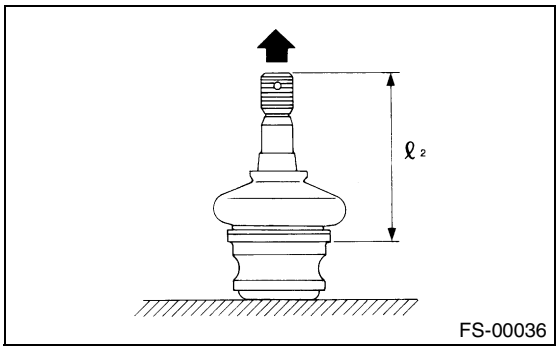
3) Retighten the castle nut further within 60° until a slot in castle nut is aligned with the hole in ball stud end, then insert a new cotter pin and bend it around castle nut.
4) Install the front wheel.

C: INSPECTION

1) Measure the play of ball joint by the following procedures. Replace with a new one when the play exceeds specified value.
(1) With 686 N (70 kgf, 154 lb) loaded in direction shown in the figure, measure the dimension ℓ_1.



(2) With 686 N (70 kgf, 154 lb) loaded in opposite direction shown in the figure, measure the dimension ℓ_2.



(3) Calculate plays from the following formula.
$S = \ell_2 - \ell_1$
(4) When plays are larger than the following value, replace with a new one.

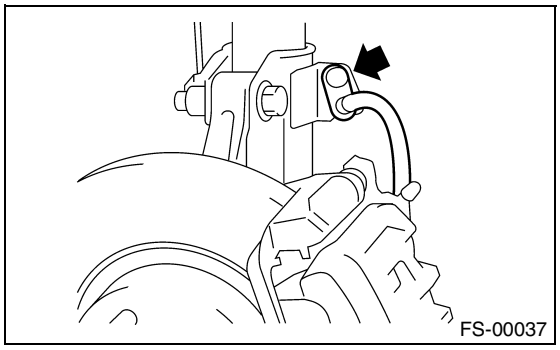
FRONT BALL JOINT
Specified play for replacement: S
Less than 0.3 mm (0.012 in)

2) When the play is smaller than specified value, visually inspect the dust cover.
If the dust cover is damaged, replace with a new ball joint.
3) The ball joint and cover that have been removed must be checked for wear, damage or cracks, and any defective part must be replaced.

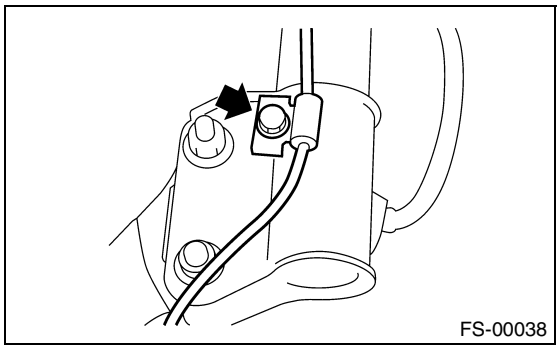
5. Front Strut

A: REMOVAL

1) Remove the wheel.
2) Remove the bolt securing brake hose from strut.



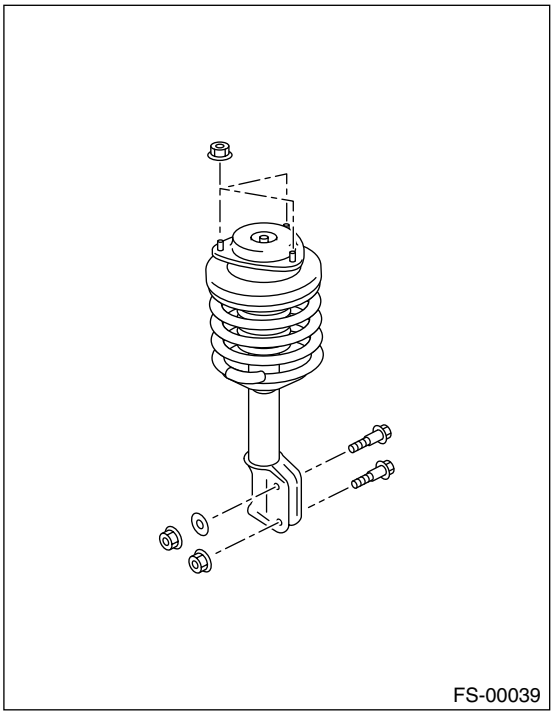
3) Scribe an alignment mark on the camber adjusting bolt which secures strut to housing.
4) Remove the bolt securing ABS sensor harness.



5) Remove the two bolts securing housing to strut.

NOTE:
While holding the head of adjusting bolt, loosen self-locking nut.

6) Remove the three nuts securing strut mount to body.



B: INSTALLATION

1) Install the strut mount at upper side of strut to body, and then tighten with nuts.

Tightening torque:
20 N·m (2.0 kgf-m, 14.5 ft-lb)

2) Position the aligning mark on camber adjustment bolt with aligning mark on lower side of strut. Install the strut to housing with a new self-locking nut.

NOTE:
While holding the head of adjusting bolt, tighten self-locking nut.

Tightening torque:
175 N·m (17.8 kgf-m, 129 ft-lb)

3) Install the ABS sensor harness to strut.

Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)

4) Install the bolts which secure brake hose to strut.

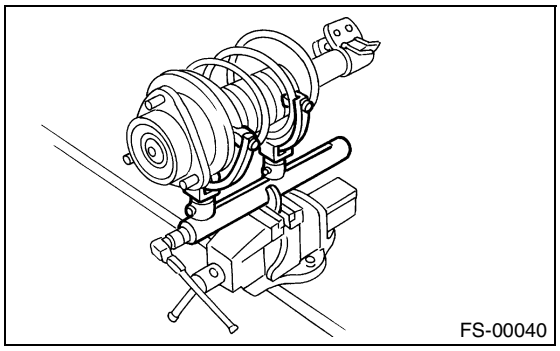
Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)

5) Install the wheels.

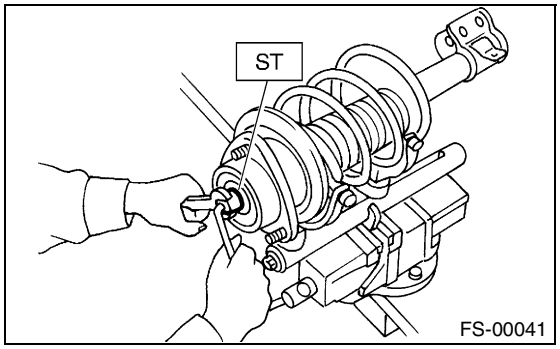
NOTE:
Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

1) Using a coil spring compressor, compress the coil spring.



2) Using the ST, remove the self-locking nut.
ST 927760000 STRUT MOUNT SOCKET



3) Remove the strut mount, upper spring seat and rubber seat from strut.
4) Gradually decreasing the compression force of compressor, and then remove the coil spring.
5) Remove the dust cover and helper spring.

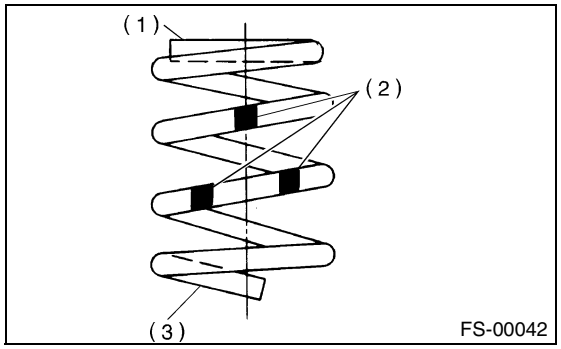
D: ASSEMBLY

1) Before installing the coil spring, strut mount, etc., on the strut, check for the presence of air in the damping force generating mechanism of the strut since air prevents proper damping force from being produced.
2) Checking for the presence of air
   (1) Place the strut vertically with piston rod facing up.
   (2) Move the piston rod to center of its entire stroke.
   (3) While holding the piston rod end with fingertips, move the rod up and down.
   (4) If the piston rod moves at least 10 mm (0.39 in) in the former step, purge air from the strut.
3) Air purging procedure
   (1) Place the strut vertically with piston rod facing up.
   (2) Fully extend the piston rod.
   (3) With the piston rod fully extended, place the piston rod side down. The strut must stand vertically.
   (4) Fully contract the piston rod.
   (5) Repeat three or four times from the first step.

NOTE:
After completely purging air from the strut, be sure to place the strut with piston rod facing up. If it is laid down, check for entry of air in the strut as outlined under “Checking for the presence of air”.

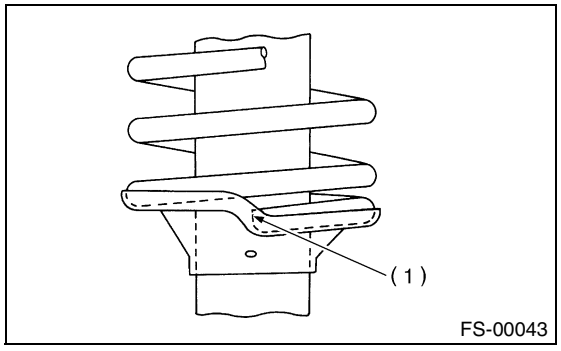
4) Using a coil spring compressor, compress the coil spring.

NOTE:
Make sure that the installing direction of coil spring is as shown in the figure.



(1) Flat (top side)
(2) Identification paint
(3) Inclined (bottom side)

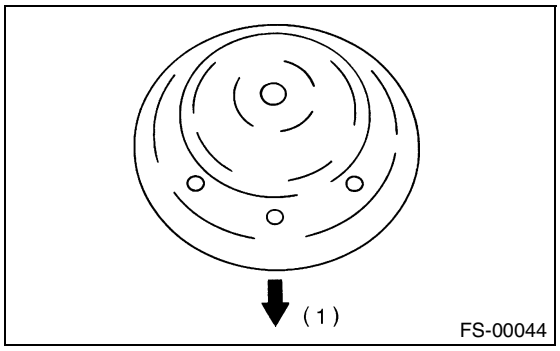
5) Set the coil spring correctly so that its end face fits well into the spring seat as shown in the figure.



(1) Coil spring end face

6) Install the helper and dust cover to the piston rod.
7) Pull the piston rod fully upward, and install the rubber seat and spring seat.

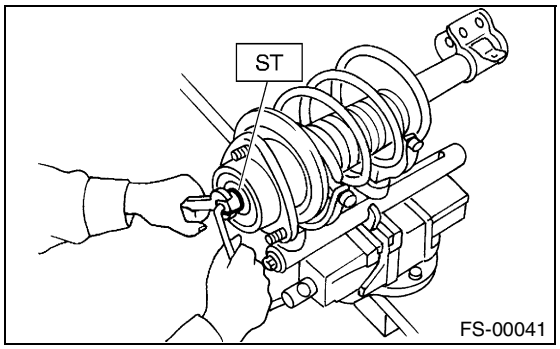
NOTE:
Ensure that upper spring seat is positioned as shown in the figure.



(1) Outside of body

8) Install the strut mount to the piston rod, and then tighten a new self-locking nut temporarily.
9) Using a hexagon wrench to prevent strut rod from turning, tighten the self-locking nut with ST.
ST 927760000 STRUT MOUNT SOCKET

Tightening torque:
55 N·m (5.6 kgf-m, 41 ft-lb)



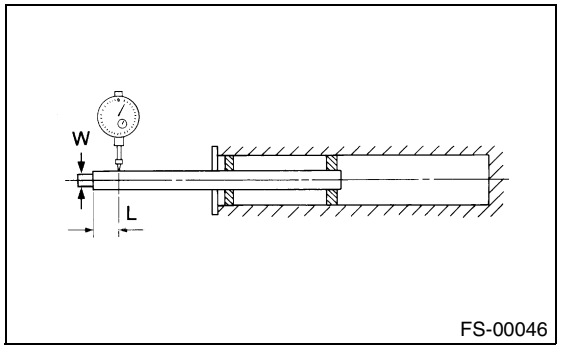
10) Loosen the coil spring carefully.

E: INSPECTION

Check the disassembled parts for cracks, damage and wear, and replace with new parts if defective.

1. DAMPER STRUT

1) Check for oil leakage.
2) Move the piston rod up and down to check that it operates smoothly without any binding.
3) Play of piston rod
• Measure the play as follows:
Fix outer shell and fully extend the rod. Set a dial gauge at the end of rod: L [10 mm (0.39 in)], then apply a force of W [20 N (2 kgf, 4 lb)] to threaded portion. With the force of 20 N (2 kgf, 4 lb) applied, read dial gauge indication: P_1. Apply a force of 20 N (2 kgf, 4 lb) in the opposite direction of “W”, then read dial gauge indication: P_2.



Limit of play ($P_1 + P_2$) :
0.8 mm (0.031 in)

If the play is greater than limit, replace the strut.

2. STRUT MOUNT

Check the rubber part for creep, cracks and deterioration, and replace it with a new one if defective.

3. DUST COVER

If any cracks or damage are found, replace it with a new one.

4. COIL SPRING

One having permanent strain should be replaced with a new one. When the vehicle posture is uneven, although there are no considerable reasons like tire puncture, uneven loading, etc., check the coil spring for its free length referring to specifications, cracks, etc., and replace it with a new one if defective.

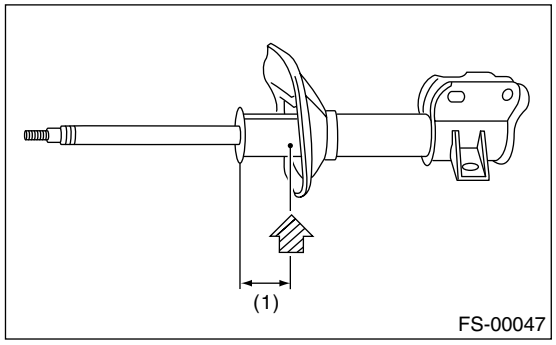
5. HELPER

Replace it with a new one if cracked or damaged.

F: DISPOSAL

CAUTION:
• Before handling gas filled struts, be sure to wear goggles to protect eyes from gas, oil and/or filings.
• Do not disassemble the strut damper or place into a fire.
• Drill holes before disposing of gas filled struts.

1) Place the gas filled strut on a flat and level surface with piston rod fully extended.
2) Using a 2 to 3 mm (0.08 to 0.12 in) dia. drill, make holes in areas shown in the figure.

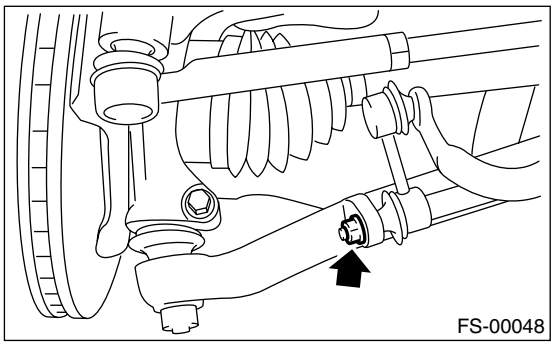


(1) 40 mm (1.57 in)

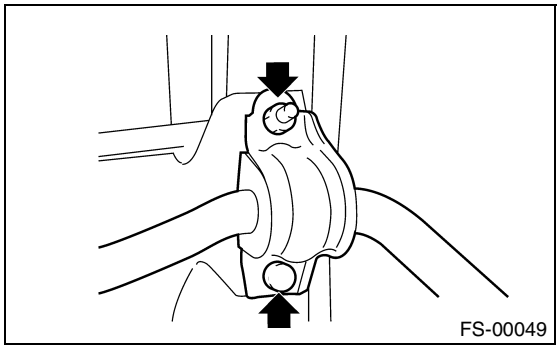
6. Front Stabilizer

A: REMOVAL

1) Jack up the front part of the vehicle and support it with safety stands (rigid racks).
2) Remove the jack up plate from lower part of crossmember.
3) Remove the sub frame.<Ref. to FS-25, REMOVAL, Sub Frame.>
4) Remove the nut which secures stabilizer link to front transverse link.



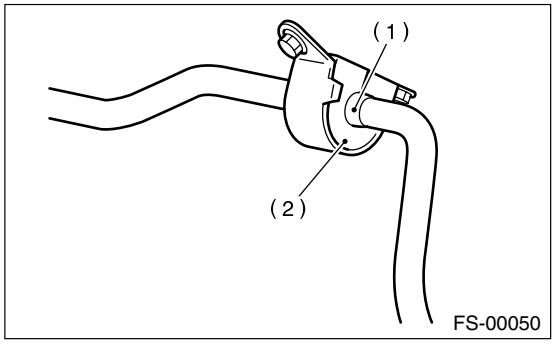
5) Remove the bolt and nut which secure stabilizer to crossmember.



B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
• Install the bushing (on front crossmember side) while aligning it with paint mark on stabilizer.
• Ensure that bushing and stabilizer have the same identification colors when installing.



(1) Mark stamped on stabilizer
(2) Bushing identification color

2) Always tighten the rubber bushing location when wheels are in full contact with the ground and vehicle is curb weight.

Tightening torque:
Jack up plate to crossmember:
70 N·m (7.1 kgf-m, 51.6 ft-lb)
Stabilizer link to front transverse link:
45 N·m (4.6 kgf-m, 33 ft-lb)
Stabilizer to crossmember:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

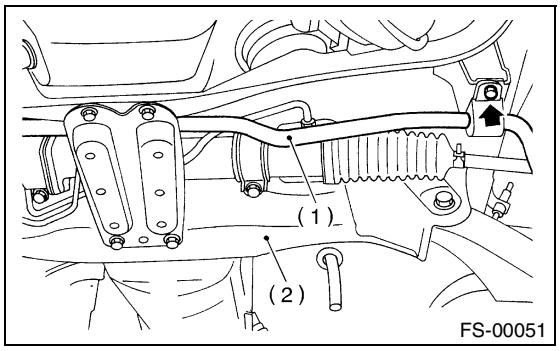
C: INSPECTION

1) Check the bushing for cracks, fatigue or damage.
2) Check the stabilizer link for deformities or damage.

7. Front Crossmember

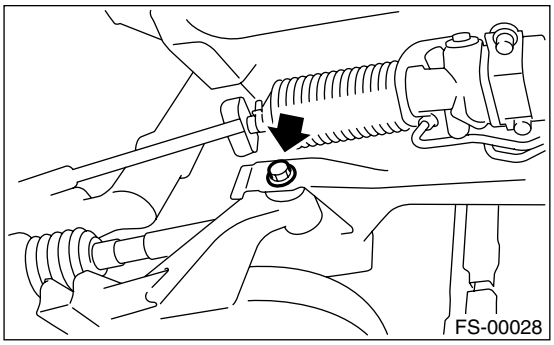
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and then remove the front tires and wheels.
3) Remove the sub frame.
4) Remove both the stabilizer and jack up plate.



(1) Front stabilizer
(2) Front crossmember

5) Disconnect the tie-rod end from housing.
6) Remove the front exhaust pipe.
7) Remove the front transverse link from front crossmember and body.



8) Remove the nuts attaching engine mount cushion rubber to crossmember.
9) Remove the steering universal joint.
10) Disconnect the power steering pipe from steering gear box.
11) Lift the engine by approx. 10 mm (0.39 in) by using chain block.
12) Support the crossmember with a jack, remove nuts securing crossmember to body and lower the crossmember gradually along with steering gearbox.

CAUTION:
When removing the crossmember downward, be careful that tie-rod end does not interfere with SFJ boot.

B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
Always tighten the rubber bushing when wheels are in full contact with the ground and vehicle is curb weight.

Tightening torque:
Transverse link bushing to crossmember:
100 N·m (10.2 kgf-m, 74 ft-lb)
Stabilizer to bushing:
25 N·m (2.5 kgf-m, 18.1 ft-lb)
Tie-rod end to housing:
27.0 N·m (2.75 kgf-m, 19.9 ft-lb)
Front cushion rubber to crossmember:
85 N·m (8.7 kgf-m, 62.7 ft-lb)
Universal joint to pinion shaft:
24 N·m (2.4 kgf-m, 17.4 ft-lb)
Crossmember to body:
100 N·m (10.2 kgf-m, 74 ft-lb)

2) Purge air from the power steering system.

NOTE:
Check the wheel alignment and adjust if necessary.

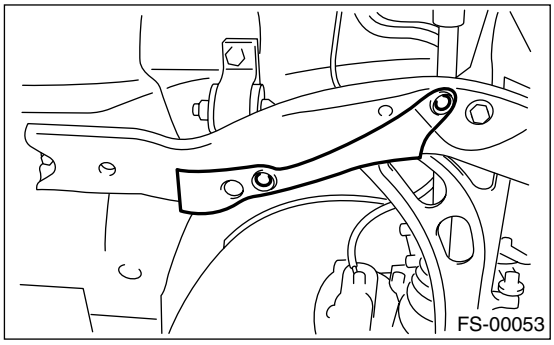
C: INSPECTION

Check the crossmember for wear, damage and cracks, and correct or replace if defective.

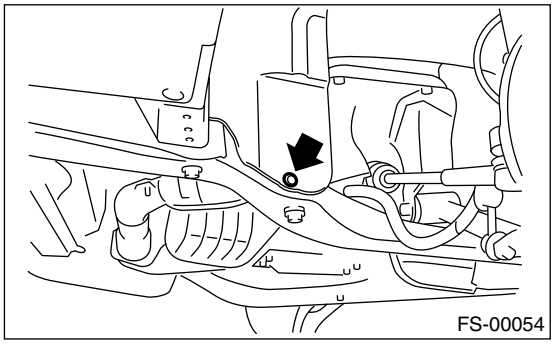
8. Sub Frame

A: REMOVAL

1) Lift-up the vehicle.
2) Remove the under cover.
3) Remove the bolt cover.

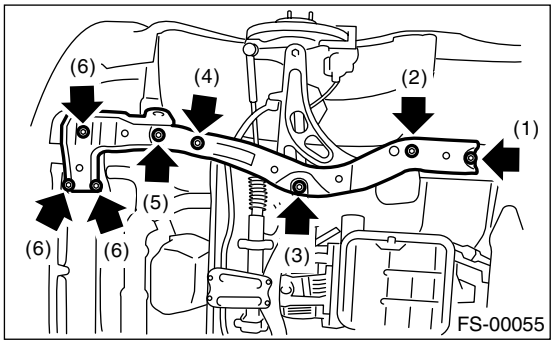


4) Remove the clip.



5) Remove the sub frame.

NOTE:
Loosen bolt (1) and leave a few threads caught, then remove the bolts in the order of (2), (3), (4), (5), and (6).

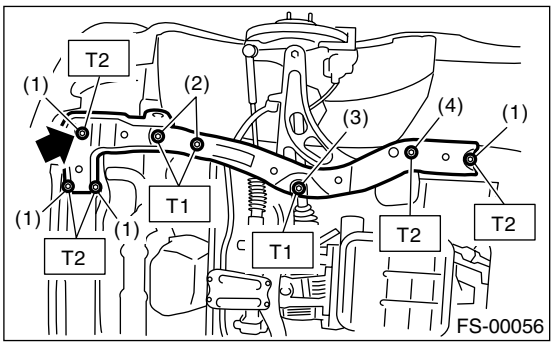


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace the M12 bolt with a new one.

Tightening torque:
T1: 55 N·m (5.6 kgf-m, 41 ft-lb)
T2: 71 N·m (7.2 kgf-m, 52 ft-lb)

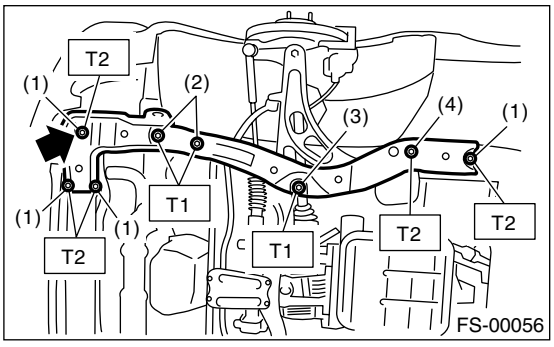


(1) M10 × 30 bolt
(2) M12 × 87 bolt (with wax)
(3) M12 × 65 bolt (with wax)
(4) M10 × 90 bolt

C: INSPECTION

1) Check that there is no damage and distortion at the sub frame.
2) Check that the bolts are tightened with the specified torque. If there is looseness, tighten to the specified torque.

Tightening torque:
T1: 55 N·m (5.6 kgf-m, 41 ft-lb)
T2: 71 N·m (7.2 kgf-m, 52 ft-lb)



(1) M10 × 30 bolt
(2) M12 × 87 bolt (with wax)
(3) M12 × 65 bolt (with wax)
(4) M10 × 90 bolt

9. General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

Possible causes	Countermeasures
(1) Permanent distortion or breakage of coil spring	Replace.
(2) Unsmooth operation of damper strut and/or shock absorber	Replace.
(3) Installation of wrong strut and/or shock absorber	Replace with proper parts.
(4) Installation of wrong coil spring	Replace with proper parts.

2. POOR RIDE COMFORT

1) Large rebound shock
2) Rocking of the vehicle continues too long after running over bump and/or hump.
3) Large shock in bumping

Possible causes	Countermeasures
(1) Breakage of coil spring	Replace.
(2) Overinflation pressure of tire	Adjust.
(3) Improper wheel arch height	Adjust or replace the coil springs with new ones.
(4) Fault in operation of damper strut and/or shock absorber	Replace.
(5) Damage or deformation of strut mount and/or shock absorber mount	Replace.
(6) Unsuitable installation (maximum and/or minimum length) of damper strut and/or shock absorber.	Replace with proper parts.
(7) Deformation or damage of bushing	Replace.
(8) Deformation or damage of helper in strut assembly and/or shock absorber	Replace.
(9) Oil leakage of damper strut and/or shock absorber	Replace.

3. NOISE

Possible causes	Countermeasures
(1) Wear or damage of damper strut and/or shock absorber component parts	Replace.
(2) Loosening of suspension link installing bolt	Retighten to the specified torque.
(3) Deformation or loss of bushing	Replace.
(4) Unsuitability of maximum and/or minimum length of damper strut and/or shock absorber	Replace with proper parts.
(5) Breakage of coil spring	Replace.
(6) Wear or damage of ball joint	Replace.
(7) Deformation of stabilizer clamp	Replace.

REAR SUSPENSION

RS

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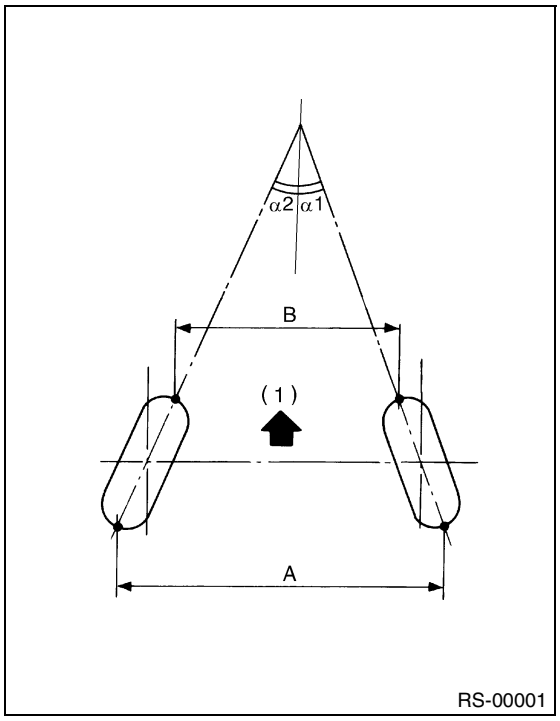
2.	Wheel Alignment	9
3.	Rear Stabilizer	10
4.	Rear Trailing Link	11
5.	Rear Strut	15
6.	Lateral link	16
7.	Rear Crossmember	19
8.	General Diagnostic Table	20

1. General Description

A: SPECIFICATIONS

Item	Non-turbo	Turbo
Camber (tolerance: ±0°45′)	–0°50′	–0°55′
Toe-in	2±3 mm (0.079±0.118 in) Each toe-in angle: 0°05′±0°07′30″	
Wheel arch height (tolerance: $^{+12}/_{-24}$ mm ($^{+0.47}/_{-0.94}$ in)	440 mm (17.32 in)	435 mm (17.13 in)
Thrust angle	0°±30′	
Diameter of stabilizer	17 mm (0.67 in)	

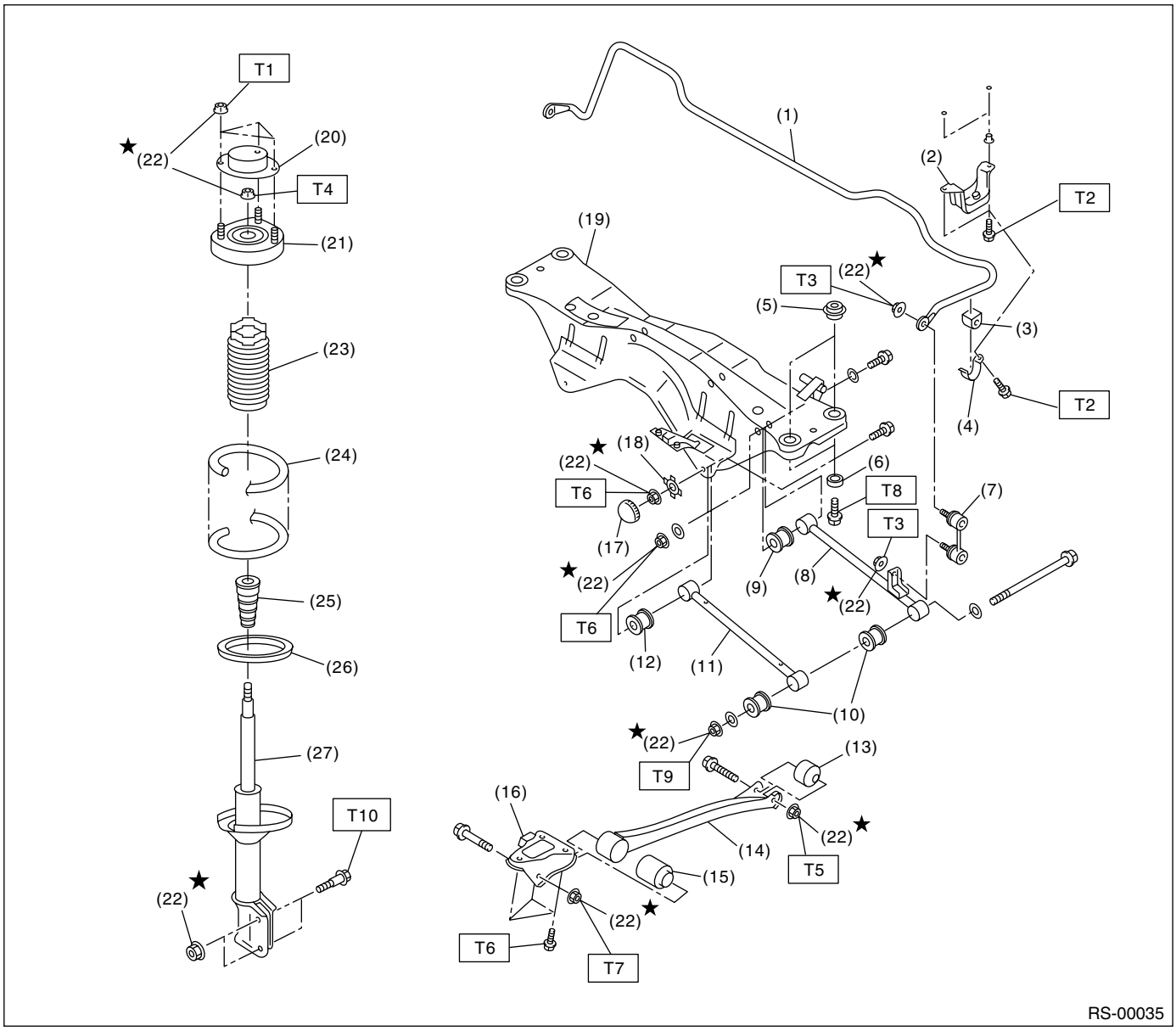
NOTE:
• Front and rear toe-ins and front camber can be adjusted. If toe-in or camber tolerance exceeds specifications, adjust toe-in and camber to the middle value of specification.
• The other items indicated in the specification table cannot be adjusted. If the other items exceeds specifications, check suspension parts and connections for deformities; replace with new ones as required.



(1) Front
A – B = Positive: Toe-in, Negative: Toe-out
α1, α2: Each toe-in angle

B: COMPONENT

1. REAR SUSPENSION



(1) Stabilizer
(2) Stabilizer bracket
(3) Stabilizer bushing
(4) Clamp
(5) Floating bushing
(6) Stopper
(7) Stabilizer link
(8) Rear lateral link
(9) Bushing (C)
(10) Bushing (A)
(11) Front lateral link
(12) Bushing (B)
(13) Trailing link rear bushing
(14) Trailing link
(15) Trailing link front bushing
(16) Trailing link bracket
(17) Cap (Protection)
(18) Washer
(19) Rear crossmember
(20) Strut mount cap
(21) Strut mount
(22) Self-locking nut
(23) Dust cover
(24) Coil spring
(25) Helper
(26) Rubber seat lower
(27) Damper strut

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*20 (2.0, 14.5)*
T2:	*25 (2.5, 18.1)*
T3:	*45 (4.6, 33.2)*
T4:	*60 (6.1, 44)*
T5:	*90 (9.2, 66)*
T6:	*100 (10.2, 74)*
T7:	*115 (11.7, 85)*
T8:	*130 (13.3, 96)*
T9:	*140 (14.3, 103)*
T10:	*200 (20.4, 148)*

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Before disposing shock absorbers, be sure to bleed gas completely. Also, do not throw away in fire.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

D: PREPARATION TOOL

1. SPECIAL TOOLS

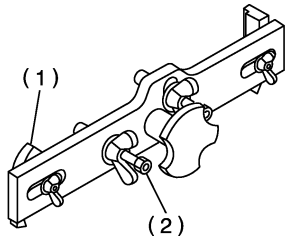
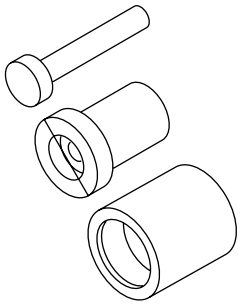
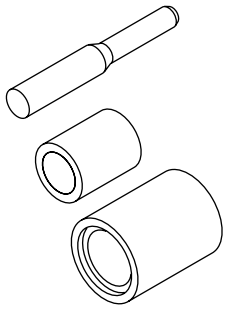
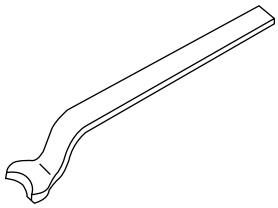
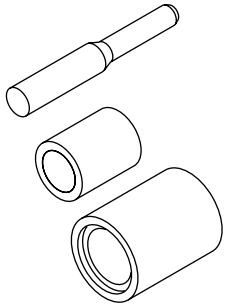
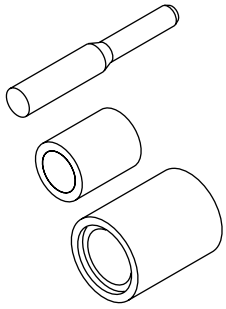
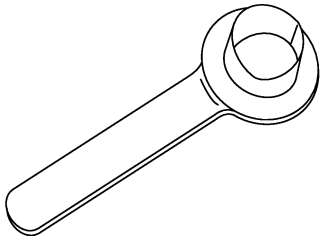
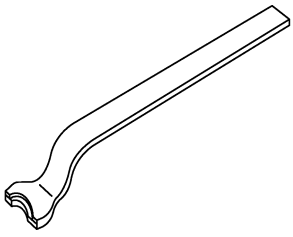
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927380001	927380001	ADAPTER	Used as an adapter for camber & caster gauge when measuring camber and caster. (1) 28199AC000 PLATE (2) 28199AC010 BOLT
 ST-927720000	927720000	INSTALLER & REMOVER	Used for replacing front bushing.
 ST-927730000	927730000	INSTALLER & REMOVER	Used for replacing rear bushing.
 ST28099PA100	28099PA100	REMOVER	Used for removing DOJ.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927700000	927700000	INSTALLER & REMOVER	Used for replacing lateral link bushing.
 ST-927690000	927690000	INSTALLER & REMOVER	Used for replacing lateral link bushing.
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing rear drive shaft into rear differential. • For protecting oil seal.
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	Used for removing rear drive shaft from rear differential.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Alignment gauge	Used for wheel alignment measurement.
Turning radius gauge	Used for wheel alignment measurement.
Toe-in gauge	Used for toe-in measurement.
Transmission jack	Used for suspension removal/installation.
Bearing puller	Used for removing bushings.
Coil spring compressor	Used for strut disassembly/assembly.

2. Wheel Alignment

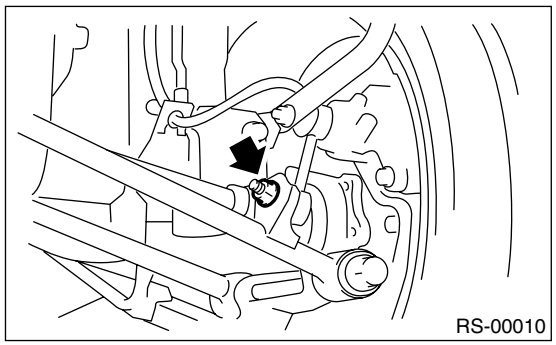
A: INSPECTION

NOTE:
Measure and adjust the front and rear wheel alignment together. Follow the procedure in “FS” section “Wheel Alignment” for measurement and/or adjustment of wheel alignment. <Ref. to FS-7, INSPECTION, Wheel Alignment.>

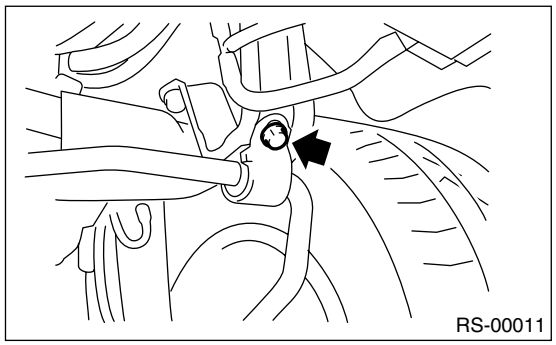
3. Rear Stabilizer

A: REMOVAL

1) Jack-up the rear part of the vehicle, support it with safety stands (rigid racks).
2) Remove the nut which secures stabilizer link to rear lateral link.



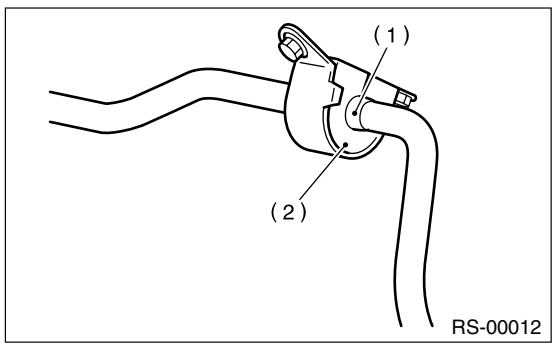
3) Remove the bolt which secures stabilizer to stabilizer bracket.



B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
• Install the bushing while aligning it with paint mark on stabilizer.
• Ensure that bushing and stabilizer have the same identification colors when installing.



(1) Mark stamped on stabilizer
(2) Bushing identification color

2) Always tighten the rubber bushing location when wheels are in full contact with the ground and vehicle is curb weight.

Tightening torque:
Stabilizer link to rear lateral link
45 N·m (4.6 kgf-m, 33.2 ft-lb)
Stabilizer to stabilizer bracket
25 N·m (2.5 kgf-m, 18.1 ft-lb)

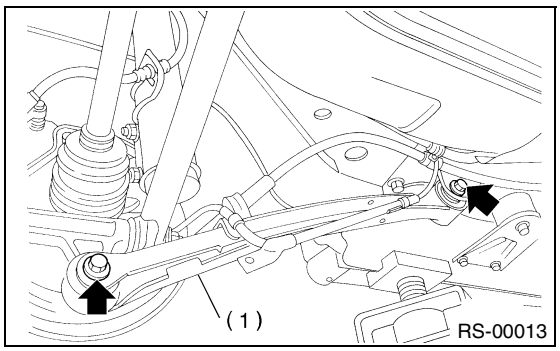
C: INSPECTION

1) Check the bushing for cracks, fatigue or damage.
2) Check the stabilizer link for deformities or damage.

4. Rear Trailing Link

A: REMOVAL

1) Loosen the rear wheel nuts.
2) Jack-up the vehicle, support it with safety stands (rigid racks), and then remove the rear wheels.
3) Remove both the rear parking brake clamp and ABS sensor harness.
4) Remove the bolt which secures trailing link to trailing link bracket.



(1) Trailing link

5) Remove the bolt which secures trailing link to rear housing.

B: INSTALLATION

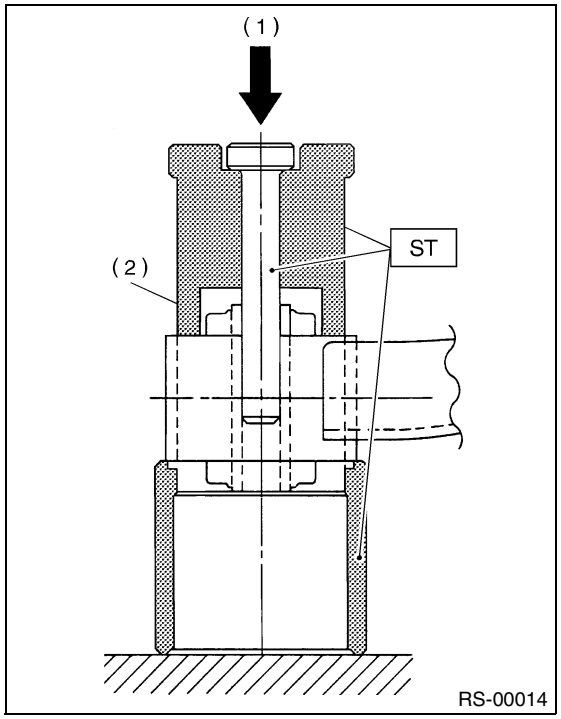
1) Install in the reverse order of removal.
2) Always tighten the rubber bushing location when wheels are in full contact with the ground and vehicle is at curb weight condition.

NOTE:
Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

1. FRONT BUSHING

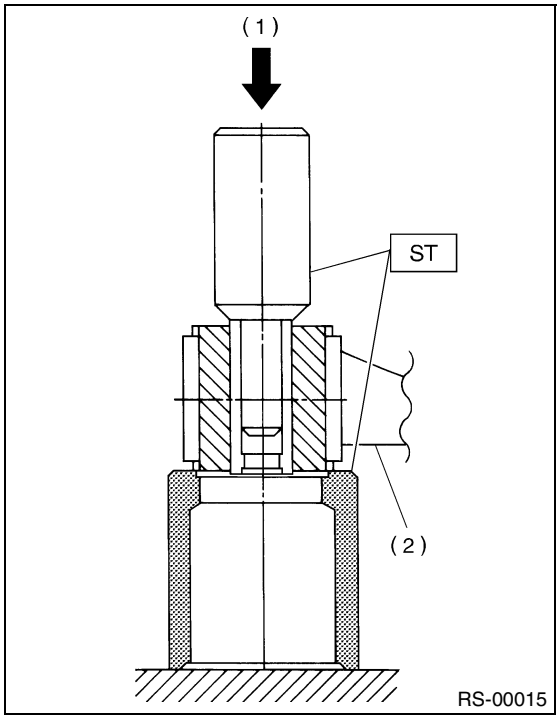
Using the ST, press the front bushing out of place.
ST 927720000 INSTALLER & REMOVER SET



(1) Press
(2) Trailing link

2. REAR BUSHING

1) Remove the housing. <Ref. to DS-23, REMOVAL, Rear Axle.>
2) Using the ST, press the rear bushing out of place.
ST 927730000 INSTALLER & REMOVER SET



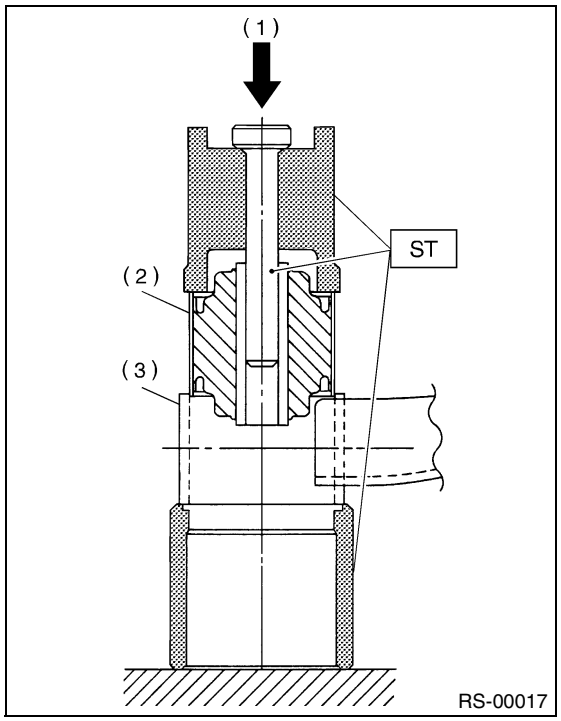
(1) Press
(2) Housing

D: ASSEMBLY

1. FRONT BUSHING

Using the ST, press the bushing into trailing link.
ST 927720000 INSTALLER & REMOVER SET

CAUTION:
Turn the ST plunger upside down and press it until the plunger end surface contacts trailing link end surface.



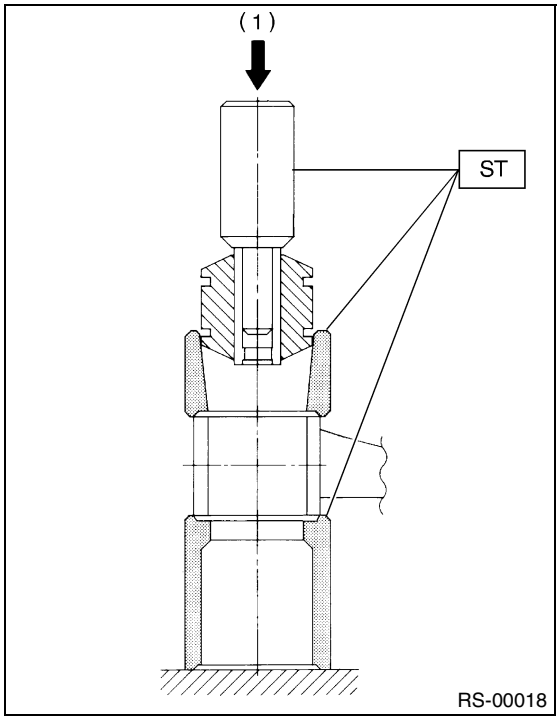
(1) Press
(2) Front bushing
(3) Trailing link

2. REAR BUSHING

1) Using the ST, press the bushing into trailing link.
ST 927730000 INSTALLER & REMOVER SET

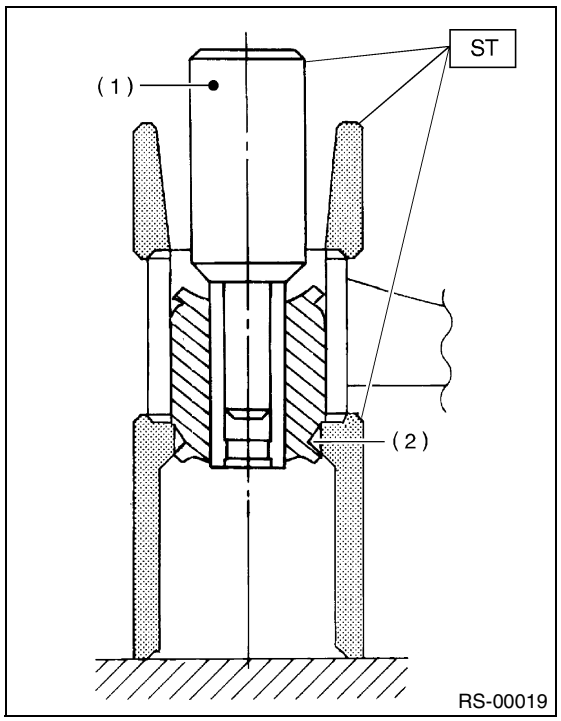
NOTE:
If it is difficult to press the bushing into trailing link, apply water-diluted TIRE LUBE to the inner surface of ST as a lubricant.

Specified lubricant:
TIRE LUBE: water = 1 : 3



(1) Press

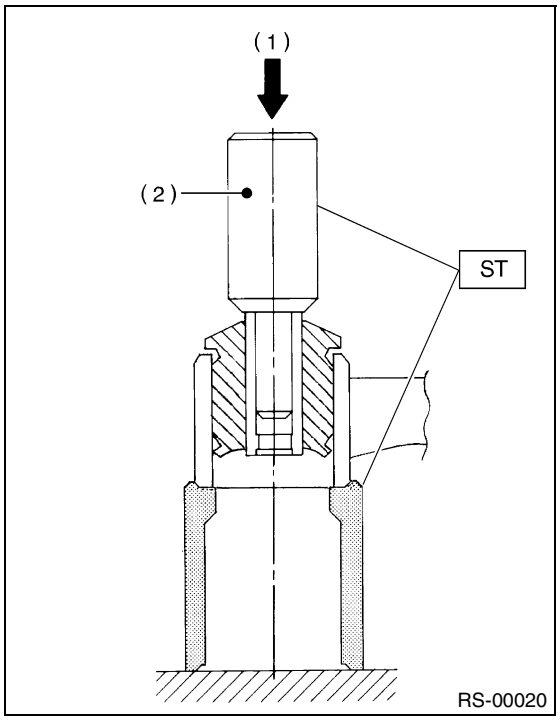
2) Press the ST plunger until bushing flange protrudes beyond trailing link.
ST 927730000 INSTALLER & REMOVER SET



(1) Plunger
(2) Flange

3) Turn the trailing link upside down. Press the ST plunger in the opposite direction that outlines in the former procedure until bushing is correctly positioned in trailing link.

ST 927730000 INSTALLER & REMOVER SET



(1) Press
(2) Plunger

4) Install the housing. <Ref. to DS-26, INSTALLATION, Rear Axle.>

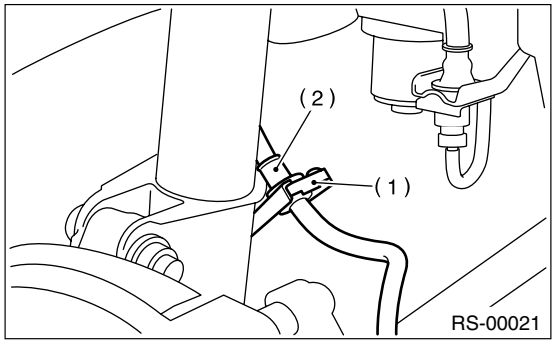
E: INSPECTION

Check the trailing links for bends, corrosion or damage.

5. Rear Strut

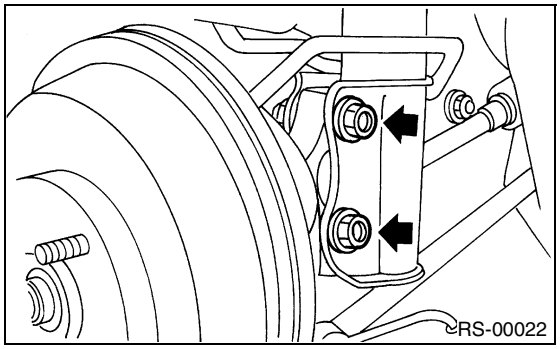
A: REMOVAL

1) Remove the strut cap of quarter trim.
2) Loosen the rear wheel nuts.
3) Jack-up the vehicle, support it with safety stands (rigid racks) and remove rear wheels.
4) Remove the brake hose clip, and then remove the brake hose from rear strut.



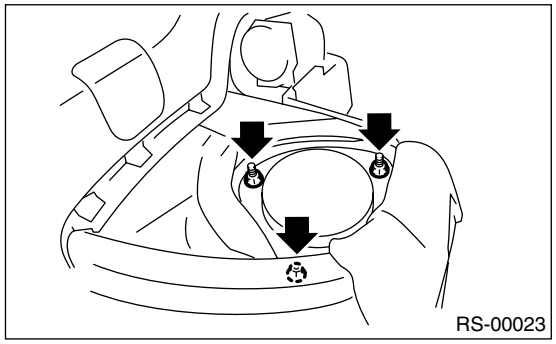
(1) Brake hose clip
(2) Brake hose

5) Remove the bolts which secure rear strut to housing.



CAUTION:
Do not subject the brake hose and ABS sensor harness to excessive tension.

6) Remove the nuts securing strut mount to body.



B: INSTALLATION

1) Secure the strut mount to body with a new self-locking nut.
Tighten the self-locking nut used to secure strut mount to vehicle body.

Tightening torque:
20 N·m (2.0 kgf-m, 14.5 ft-lb)

2) Secure the rear strut to housing with a new self-locking nut.

Tightening torque:
200 N·m (20.4 kgf-m, 148 ft-lb)

3) Install the brake hose to lower side of strut, then insert brake hose clip.
4) Lower the vehicle and tighten wheel nut.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

5) Install the strut cap to rear quarter trim.

NOTE:
Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

For disassembly of rear strut, refer to procedures outlined under front strut as a guide. <Ref. to FS-20, DISASSEMBLY, Front Strut.>

D: ASSEMBLY

Refer to Front Strut as a guide for assembly procedures.
<Ref. to FS-20, ASSEMBLY, Front Strut.>

E: INSPECTION

Refer to Front Strut as a guide for inspection procedures.
<Ref. to FS-21, INSPECTION, Front Strut.>

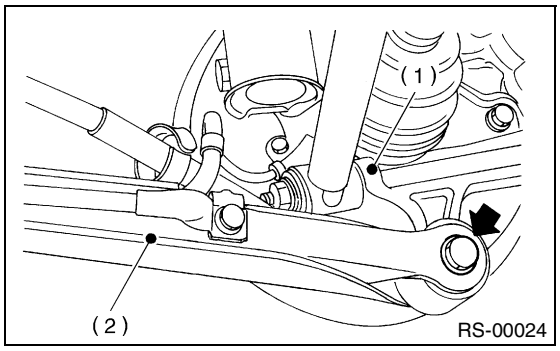
F: DISPOSAL

Refer to Front Strut as a guide for disposal procedures. <Ref. to FS-22, DISPOSAL, Front Strut.>

6. Lateral link

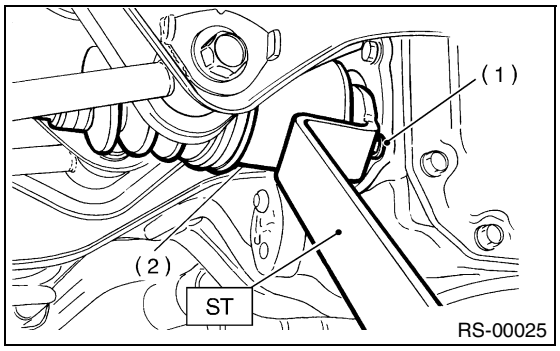
A: REMOVAL

1) Loosen the wheel nuts. Lift-up the vehicle and remove wheel.
2) Remove the stabilizers.
3) Remove the ABS sensor harness from trailing link.
4) Remove the bolt securing trailing link to housing.



(1) Rear housing
(2) Trailing link

5) Remove the bolts which secure lateral link assembly to rear housing.
6) Remove the DOJ from rear differential using ST.
ST 28099PA100 DRIVE SHAFT REMOVER



(1) Bolt
(2) DOJ

CAUTION:
Be careful not to damage the side bearing retainer. Always use bolt shown in the figure, as supporting point for ST during removal.
7) Scribe an alignment mark on the rear lateral link adjusting bolt and crossmember.
8) Remove the bolts securing front and rear lateral links to crossmember, detach lateral links.

NOTE:
To loosen the adjusting bolt, always loosen the nut while holding head of adjusting bolt.

B: INSTALLATION

Install in the reverse order of removal. Observe the following instructions.
• Installation of DOJ to differential: <Ref. to DS-38, INSTALLATION, Rear Drive Shaft.>
• Always tighten the rubber bushing location when wheels are in full contact with the ground and vehicle is curb weight.
• Tighten the nut while holding bolt head when installing adjusting bolt.
• Replace the self-locking nut and DOJ circlip with new ones.

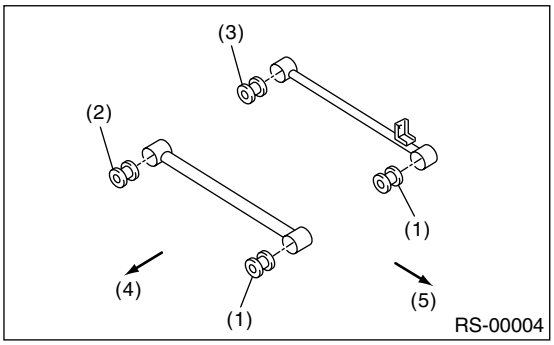
CAUTION:
Using the ST, do not allow the DOJ splines to damage side oil seal.
ST 28099PA090 OIL SEAL PROTECTOR

NOTE:
Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

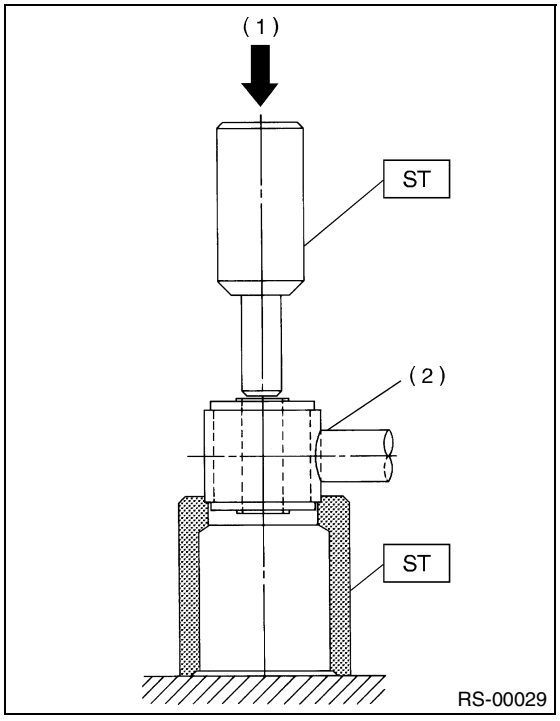
1) Using the following table as a guide, verify the type of bushings.
2) Select the ST according to type of bushings used.

Bushing	ST: INSTALLER & REMOVER SET
Bushing A	927700000
Bushing B	927690000
Bushing C	927700000



(1) Bushing A
(2) Bushing B
(3) Bushing C
(4) Front
(5) Outside of body

3) Using the ST, press the bushing out of place.



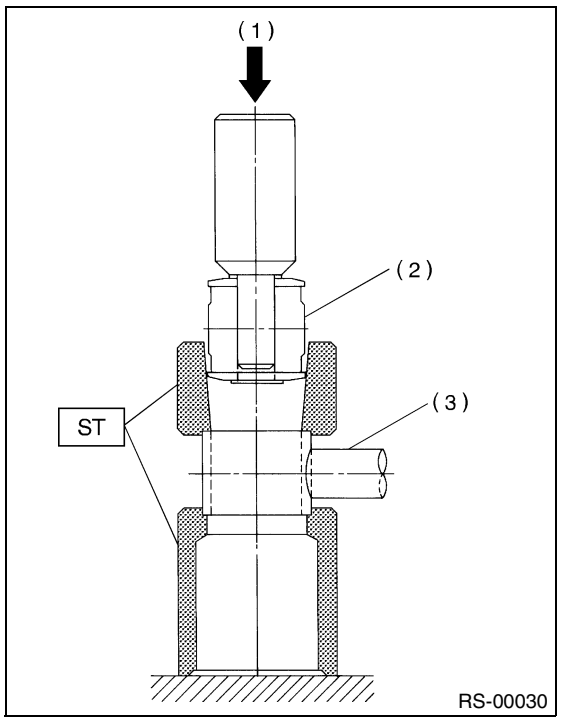
(1) Press
(2) Lateral link

D: ASSEMBLY

1) Using the same ST as that used during disassembly.
2) If it is difficult to press the bushing into trailing link, apply water-diluted TIRE LUBE to the inner surface of ST as a lubricant.

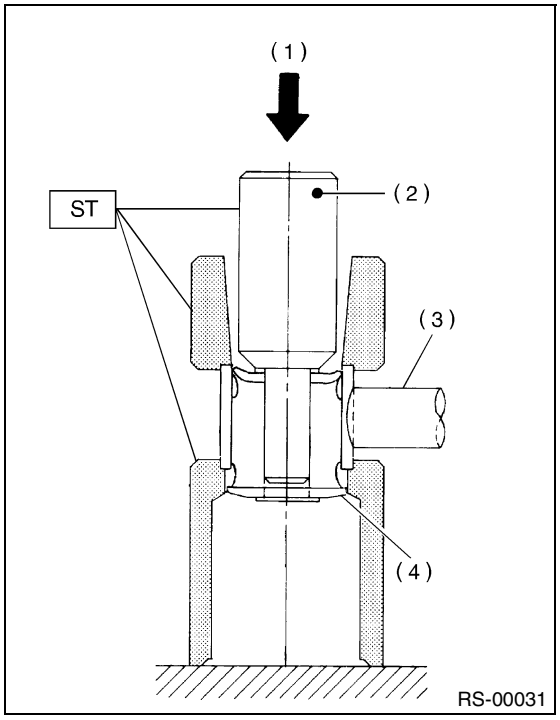
Specified lubricant:
TIRE LUBE: water = 1 : 3

3) Using the ST, press the bushing into place.



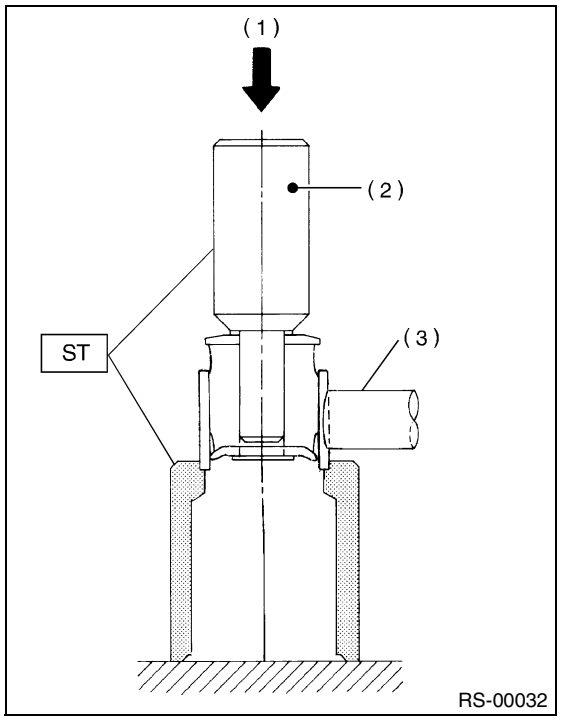
(1) Press
(2) Bushing
(3) Lateral link

4) Press the ST plunger until bushing flange protrudes beyond lateral link.



(1) Press
(2) Plunger
(3) Lateral link
(4) Flange

5) Turn the lateral link upside down. Press the ST plunger in opposite direction that outlined in the former procedure until bushing is correctly positioned in trailing link.



(1) Press
(2) Plunger
(3) Lateral link

E: INSPECTION

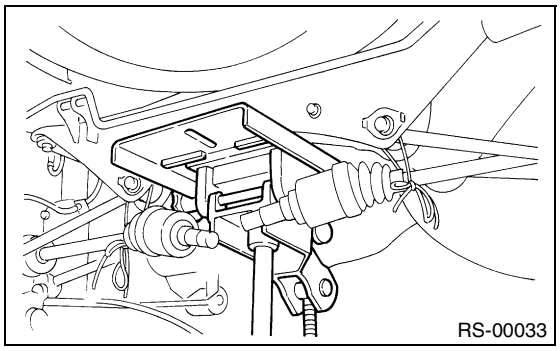
Visually check the lateral links for damage or bends.

7. Rear Crossmember

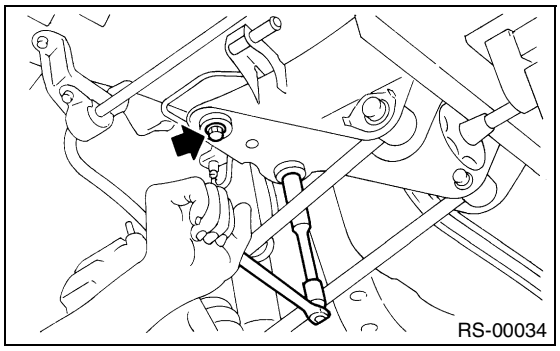
A: REMOVAL

CAUTION:
Do not subject the ABS sensor harness to excessive tension.

1) Separate the front exhaust pipe and rear exhaust pipe.
2) Remove the rear exhaust pipe and muffler.
3) Remove the rear differential.
<Ref. to DI-24, REMOVAL, Rear Differential for T-type.>
4) Place the transmission jack under rear crossmember.


RS-00033

5) Remove the bolts securing crossmember to vehicle body, and then remove the crossmember.


RS-00034

6) Scribe an alignment mark on the rear lateral link cam bolt and crossmember.
7) Remove the front and rear lateral links by loosening nuts.

B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
• Discard the loosened self-locking nut and replace it with a new one.
• Always tighten the nut (not adjusting bolt), when tightening adjusting bolt.

2) For installation and tightening torque of rear differential;
<Ref. to DI-26, INSTALLATION, Rear Differential for T-type.>
3) Always tighten the rubber bushing when wheels are in full contact with the ground and vehicle is curb weight.

NOTE:
Check the wheel alignment and adjust if necessary.

C: INSPECTION

Check the removed parts for wear, damage and cracks, and correct or replace if defective.

8. General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

Possible causes	Countermeasures
(1) Permanent distortion or breakage of coil spring	Replace.
(2) Unsmooth operation of damper strut and/or shock absorber	Replace.
(3) Installation of wrong strut and/or shock absorber	Replace with proper parts.
(4) Installation of wrong coil spring	Replace with proper parts.

2. POOR RIDE COMFORT

1) Large rebound shock
2) Rocking of the vehicle continues too long after running over bump and/or hump.
3) Large shock in bumping

Possible causes	Countermeasures
(1) Breakage of coil spring	Replace.
(2) Overinflation pressure of tire	Adjust.
(3) Improper wheel arch height	Adjust or replace the coil springs with new ones.
(4) Fault in operation of damper strut and/or shock absorber	Replace.
(5) Damage or deformation of strut mount and/or shock absorber mount	Replace.
(6) Unsuitable installation (maximum and/or minimum length) of damper strut and/or shock absorber	Replace with proper parts.
(7) Deformation or damage of bushing	Replace.
(8) Deformation or damage of helper in strut assembly and/or shock absorber	Replace.
(9) Oil leakage of damper strut and/or shock absorber	Replace.

3. NOISE

Possible causes	Countermeasures
(1) Wear or damage of damper strut and/or shock absorber component parts	Replace.
(2) Loosening of suspension link installing bolt	Retighten to the specified torque.
(3) Deformation or loss of bushing	Replace.
(4) Unsuitability of maximum and/or minimum length of damper strut and/or shock absorber	Replace with proper parts.
(5) Breakage of coil spring	Replace.
(6) Wear or damage of ball joint	Replace.
(7) Deformation of stabilizer clamp	Replace.

WHEEL AND TIRE SYSTEM

WT

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5. Wheel Balancing 7
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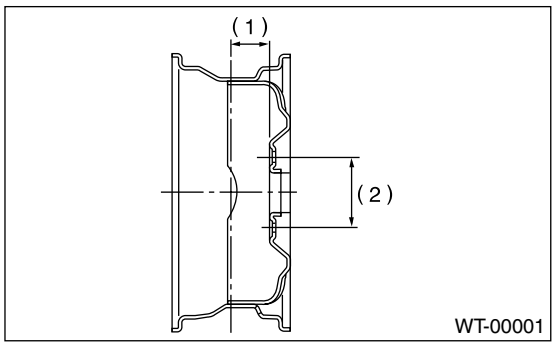
1. General Description

A: SPECIFICATIONS



(1) Offset
(2) P.C.D.

	Grade	Tire size	Rim size	Rim offset mm (in)	P.C.D. mm (in)
Front and rear	2.0X	205/70 R15	15 × 6J (Steel)	48 (1.89)	100 (3.94)
			15 × 6JJ (Aluminum)		
	2.0XT	215/60 R16	16 × 6 1/2JJ (Aluminum)		
	2.5X (Saudi Arabia)		16 × 6 1/2J (Steel)		
			16 × 6 1/2JJ (Aluminum)		
	2.5X (Australia)	P215/60 R16	16 × 6 1/2J (Steel)		
			16 × 6 1/2JJ (Aluminum)		

	Grade	Tire size	Tire inflation pressure kPa (kg/cm^2, psi)	
			Light load	Full load
Front and rear	2.0X	205/70 R15	Fr: 200 (2.0, 29) Rr: 190 (1.9, 28)	Fr: 200 (2.0, 29) Rr: 250 (2.5, 36)
	2.0XT, 2.5X	215/60 R16		
	2.5X (Australia)	P215/60 R16		

NOTE:
• The vihecle is equipped with spare tire as same size as front and rear tire.
• At trailer towing, rear inflation pressure is 280 kPa (2.8 kg/cm^2, 41 psi).

1. SERVICE DATA

Item	Axial runout	Radial runout
Steel wheel	1.5 mm (0.059 in)	
Aluminum wheel	1.0 mm (0.039 in)	

2. ADJUSTING PARTS

Wheel balancing	Standard	Service limit
Dynamic unbalance	Less than 5 g (0.18 oz)	

Balance weight part number (For steel wheel)	Weight
28101TC000	5 g (0.18 oz)
28101SA060	10 g (0.35 oz)
28101SA070	15 g (0.53 oz)
28101SA080	20 g (0.71 oz)
28101SA090	25 g (0.88 oz)
723141340	30 g (1.06 oz)
723141350	35 g (1.23 oz)
723141360	40 g (1.41 oz)
723141370	45 g (1.59 oz)
723241380	50 g (1.76 oz)
723241580	55 g (1.94 oz)
723241590	60 g (2.12 oz)

Balance weight part number (For aluminum wheel)	Weight
28101SA000	5 g (0.18 oz)
28101SA010	10 g (0.35 oz)
28101SA020	15 g (0.53 oz)
28101SA030	20 g (0.71 oz)
28101SA040	25 g (0.88 oz)
23141GA512	30 g (1.06 oz)
23141GA522	35 g (1.23 oz)
23141GA532	40 g (1.41 oz)
23141GA542	45 g (1.59 oz)
23141GA552	50 g (1.76 oz)
—	55 g (1.94 oz)
23141GA572	60 g (2.12 oz)

B: PREPARATION TOOL

1. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Air pressure gauge	Used for measuring tire air pressure.
Dial gauge	Used for measuring wheel runout.

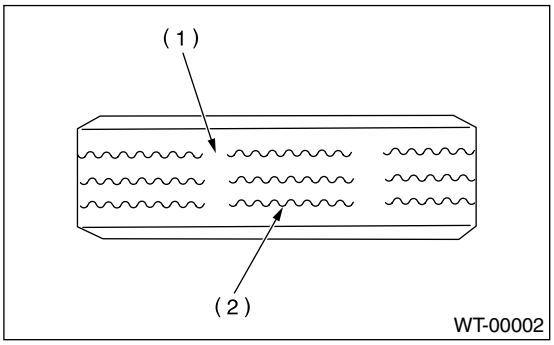
2. Tire

A: INSPECTION

1) Take stone, glass, nail etc. off the tread groove.
2) Replace the tire:

CAUTION:
When replacing a tire, make sure to use only the same size, construction and load range as originally installed.

(1) When large crack on the side wall, damage or crack on tread is found.
(2) When the “tread wear indicator” appears as a solid band across the tread.

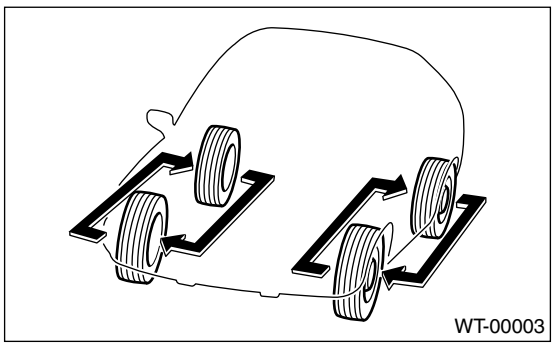


(1) Tread wear indicator
(2) Tire tread

3) When a crack on tire valve is found, replace the tire valve.

1. TIRE ROTATION

Rotate tires periodically (10,000 km/6,200 miles) as shown in the figure, in order to prevent them from uneven wear and to prolong their life.



3. Steel Wheel

A: REMOVAL

1) Apply parking brake, and position the select lever to “P” or “LOW”.
2) Set shop jacks or a lift to the specified point, and support the vehicle with its wheels slightly contacting the floor.
3) Loosen the wheel nuts.
4) Raise the vehicle until its wheels take off the ground using a jack or a lift.
5) Remove the wheel nuts and wheels.

NOTE:
• While removing the wheels, prevent hub bolts from damage.
• Place the wheels with their outer sides facing upward to prevent wheels from damage.

B: INSTALLATION

1) Remove dirt on the mating surface of wheel and brake rotor.
2) Attach the wheel to hub by aligning the wheel bolt hole with hub bolt.
3) Temporarily attach the wheel nuts to hub bolts. (In the case of aluminum wheel, use SUBARU genuine wheel nut for aluminum wheel.)
4) Manually tighten the nuts making sure the wheel hub hole is aligned correctly to guide portion of hub.
5) Tighten the wheel nuts in a diagonal selection to specified torque. Use a wheel nut wrench.

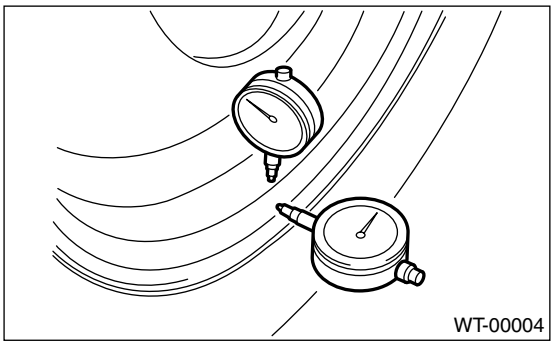
Wheel nut tightening torque:
90 N·m (9.1 kgf-m, 65.7 ft-lb)

CAUTION:
• Tighten the wheel nuts in two or three steps by gradually increasing the torque and working diagonally, until the specified torque is reached. For drum brake models, excess tightening of wheel nuts may cause wheels to “judder”.
• Do not depress the wrench with foot; Always use both hands when tightening.
• Make sure the bolt, nut and nut seating surface of the wheel are free from oils.

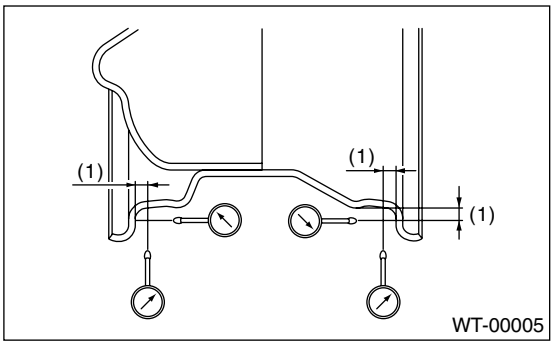
6) If a wheel is removed for replacement or for repair of a puncture, retighten the wheel nuts to the specified torque after running 1,000 km (600 miles).

C: INSPECTION

1) Deformation or damage on the rim can cause air leakage. Check the rim flange for deformation, crack, or damage, and repair or replace as necessary.
2) Jack-up the vehicle until wheels clear the floor.
3) Slowly rotate the wheel to check rim “runout” using a dial gauge.



Axial runout limit	Radial runout limit
1.5 mm (0.059 in)	



(1) Approx. 7 mm (0.28 in)

4) If the rim runout exceeds specifications, remove the tire from rim and check runout while attaching dial gauge to positions shown in the figure.
5) If measured runout still exceeds specifications, replace the wheel.

4. Aluminum Wheel

A: REMOVAL

Refer to Steel Wheel for removal procedure of aluminum wheels. <Ref. to WT-5, REMOVAL, Steel Wheel.>

B: INSTALLATION

Refer to Steel Wheel for installation procedure of aluminum wheels.<Ref. to WT-5, INSTALLATION, Steel Wheel.>

C: INSPECTION

Refer to Steel Wheel for inspection procedure of aluminum wheels. <Ref. to WT-5, INSPECTION, Steel Wheel.>

Rim runout:

Axial runout limit	Radial runout limit
1.0 mm (0.039 in)	

D: CAUTION

Aluminum wheels are easily scratched. To maintain their appearance and safety, do the following:
1) Do not damage the aluminum wheels during removal, installation, wheel balancing, etc. After removing the aluminum wheels, place them on a rubber mat, etc.
2) While the vehicle is being driven, be careful not to ride over sharp obstacles or allow the aluminum wheels to contact the shoulder of the road.
3) When installing a tire chain, be sure to install it properly not to have slack; otherwise it may hit the wheel while driving.
4) When washing the aluminum wheel, use neutral synthetic detergent and water. Avoid using the cleanser including abrasive, hard brushes or an automatic car washer.

5. Wheel Balancing

A: REPLACEMENT

1) Remove the balance weights.
2) Using dynamic balancing, measure the wheel balance.
3) Select a weight close to the value measured by dynamic balancing.

Balance weight part number (For steel wheel)	Weight
28101TC000	5 g (0.18 oz)
28101SA060	10 g (0.35 oz)
28101SA070	15 g (0.53 oz)
28101SA080	20 g (0.71 oz)
28101SA090	25 g (0.88 oz)
723141340	30 g (1.06 oz)
723141350	35 g (1.23 oz)
723141360	40 g (1.41 oz)
723141370	45 g (1.59 oz)
723241380	50 g (1.76 oz)
723241580	55 g (1.94 oz)
723241590	60 g (2.12 oz)

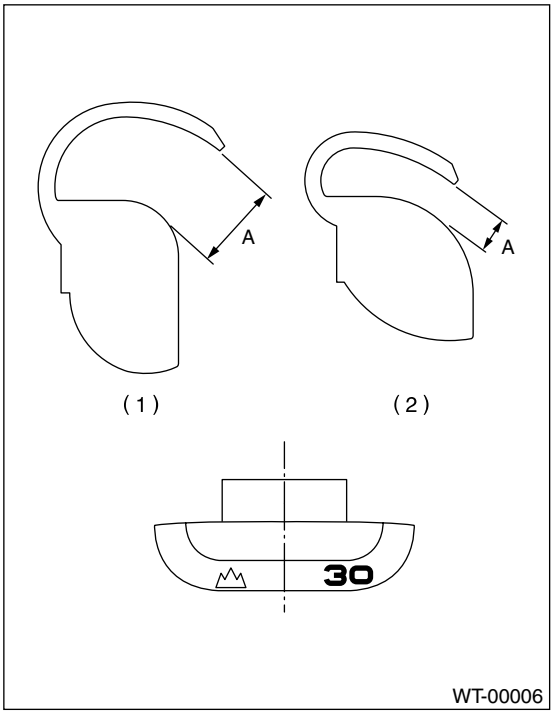
Balance weight part number (For aluminum wheel)	Weight
28101SA000	5 g (0.18 oz)
28101SA010	10 g (0.35 oz)
28101SA020	15 g (0.53 oz)
28101SA030	20 g (0.71 oz)
28101SA040	25 g (0.88 oz)
23141GA512	30 g (1.06 oz)
23141GA522	35 g (1.23 oz)
23141GA532	40 g (1.41 oz)
23141GA542	45 g (1.59 oz)
23141GA552	50 g (1.76 oz)
—	55 g (1.94 oz)
23141GA572	60 g (2.12 oz)

4) Install the selected weight to the point designated by dynamic balancing.
5) Using dynamic balancing, measure the wheel balance again. Check that the wheel balance is correctly adjusted.

B: INSPECTION

1) Proper wheel balance may be lost if the tire is repaired or if it wears. Check the tire for dynamic balance, and repair as necessary.
2) To check for dynamic balance, use a dynamic balancer. Drive in the balance weight on both the top and rear sides of the rim.
3) Some types of balancer can cause damage to the wheel. Use an appropriate balancer when adjusting the wheel balance.
4) Use genuine balance weights.

NOTE:
• 55 g (1.94 oz) weight used with the aluminum wheel is not available.
• Balance weights are available for use with any of 14- to 16-inch wheels.



(1) Weight for aluminum wheel
(2) Weight for steel wheel

Service limit: A
Weight for steel wheel;
5 g (0.18 oz) — 25 g (0.88 oz) 2.0 mm (0.08 in)
30 g (1.06 oz) or more 1.8 mm (0.07)
Weight for aluminum wheel;
5 g (0.18 oz) — 25 g (0.88 oz) 5.0 mm (0.20 in)
30 g (1.06 oz) or more 4.5 mm (0.177 in)

6. General Diagnostics Table

A: INSPECTION

Symptom	Possible cause	Remedy
Front wheel shimmy	• Worn or improperly inflated of tire.	Replace
	• Wheel is out of balance.	Adjustment
Abnormal tire wear	• Improperly inflated of tire.	Replace
Sways/pitches	• Worn or improperly inflated of tire.	Replace
Wander/pulls	• Worn or improperly inflated of tire.	Replace

DIFFERENTIALS

DI

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1. General Description

A: SPECIFICATIONS

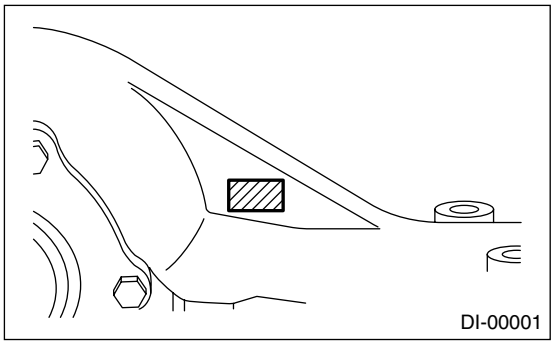
When replacing a rear differential assembly, select the correct one according to the following table.

NOTE:

Using the different rear differential assembly causes the drive line and tires to “drag” or emit abnormal noise.

Model	2.0L Non-turbo		2.0L Turbo				2.5L	
			MT		AT			
	MT	AT	Europe	Except Europe	Europe	Except Europe	MT	AT
Rear differential type	VA-type with LSD		T-type with LSD					
LSD type	Viscous coupling							
Identification	XR	XS	HP	CF	HP	JP		CF
Type of gear	Hypoid gear							
Gear ratio	4.111	4.444	4.111	4.444	4.111			4.444
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)							
Rear differential gear oil	GL-5							

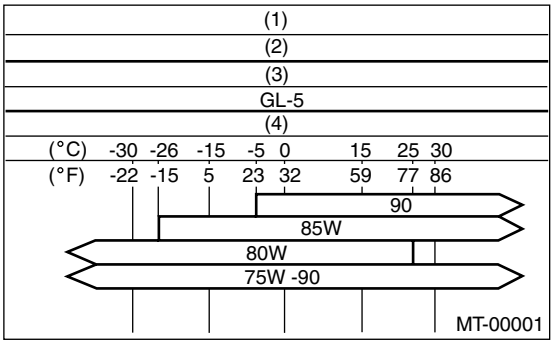
• Identification



• Rear differential gear oil

Recommended oil

CAUTION:
Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.



(1) Item
(2) Differential gear oil
(3) API Classification
(4) SAE Viscosity No. and Application Temperature

1. SERVICE DATA

Front and rear bearing preload at companion flange bolt hole N (kgf, lb)	New bearing	T-type	19 — 26 (1.9 — 2.6, 4.3 — 5.8)
		VA-type	12.7 — 32.4 (1.3 — 3.3, 2.9 — 7.3)
	Used bearing	T-type	8 — 16 (0.8 — 1.6, 1.8 — 3.6)
Side bearing standard width mm (in)			20.00 (0.7874)
Crown gear to drive pinion backlash mm (in)		T-type	0.10 — 0.20 (0.0039 — 0.0079)
		VA-type	0.10 — 0.15 (0.0039 — 0.0059)
Crown gear runout on its back surface mm (in)			Less than 0.05 (0.0020)

2. ADJUSTING PARTS

- **T-type**

Front and rear bearing preload at companion flange bolt hole N (kgf, lb)	New bearing	19 — 26 (1.9 — 2.6, 4.3 — 5.8)
	Used bearing	8 — 16 (0.8 — 1.6, 1.8 — 3.6)
Preload adjusting spacer	Part No.	Length mm (in)
	383695201	56.2 (2.213)
	383695202	56.4 (2.220)
	383695203	56.6 (2.228)
	383695204	56.8 (2.236)
	383695205	57.0 (2.244)
	383695206	57.2 (2.252)
Preload adjusting washer	Part No.	Length mm (in)
	383705200	2.59 (0.1020)
	383715200	2.57 (0.1012)
	383725200	2.55 (0.1004)
	383735200	2.53 (0.0996)
	383745200	2.51 (0.0988)
	383755200	2.49 (0.0980)
	383765200	2.47 (0.0972)
	383775200	2.45 (0.0965)
	383785200	2.43 (0.0957)
	383795200	2.41 (0.0949)
	383805200	2.39 (0.0941)
	383815200	2.37 (0.0933)
	383825200	2.35 (0.0925)
	383835200	2.33 (0.0917)
	383845200	2.31 (0.0909)

Pinion height adjusting shim	Part No.	Thickness mm (in)
	383495200	3.09 (0.1217)
	383505200	3.12 (0.1228)
	383515200	3.15 (0.1240)
	383525200	3.18 (0.1252)
	383535200	3.21 (0.1264)
	383545200	3.24 (0.1276)
	383555200	3.27 (0.1287)
	383565200	3.30 (0.1299)
	383575200	3.33 (0.1311)
	383585200	3.36 (0.1323)
	383595200	3.39 (0.1335)
	383605200	3.42 (0.1346)
	383615200	3.45 (0.1358)
	383625200	3.48 (0.1370)
	383635200	3.51 (0.1382)
	383645200	3.54 (0.1394)
	383655200	3.57 (0.1406)
	383665200	3.60 (0.1417)
	383675200	3.63 (0.1429)
	383685200	3.66 (0.1441)
Side bearing standard width mm (in)	—	20.00 (0.7874)
Side bearing retainer shim	Part No.	Thickness mm (in)
	383475201	0.20 (0.0079)
	383475202	0.25 (0.0098)
	383475203	0.30 (0.0118)
	383475204	0.40 (0.0157)
	383475205	0.50 (0.0197)
Crown gear to drive pinion backlash	Limit mm (in)	0.10 — 0.20 (0.0039 — 0.0079)
Crown gear runout on its back surface		0.05 (0.0020)

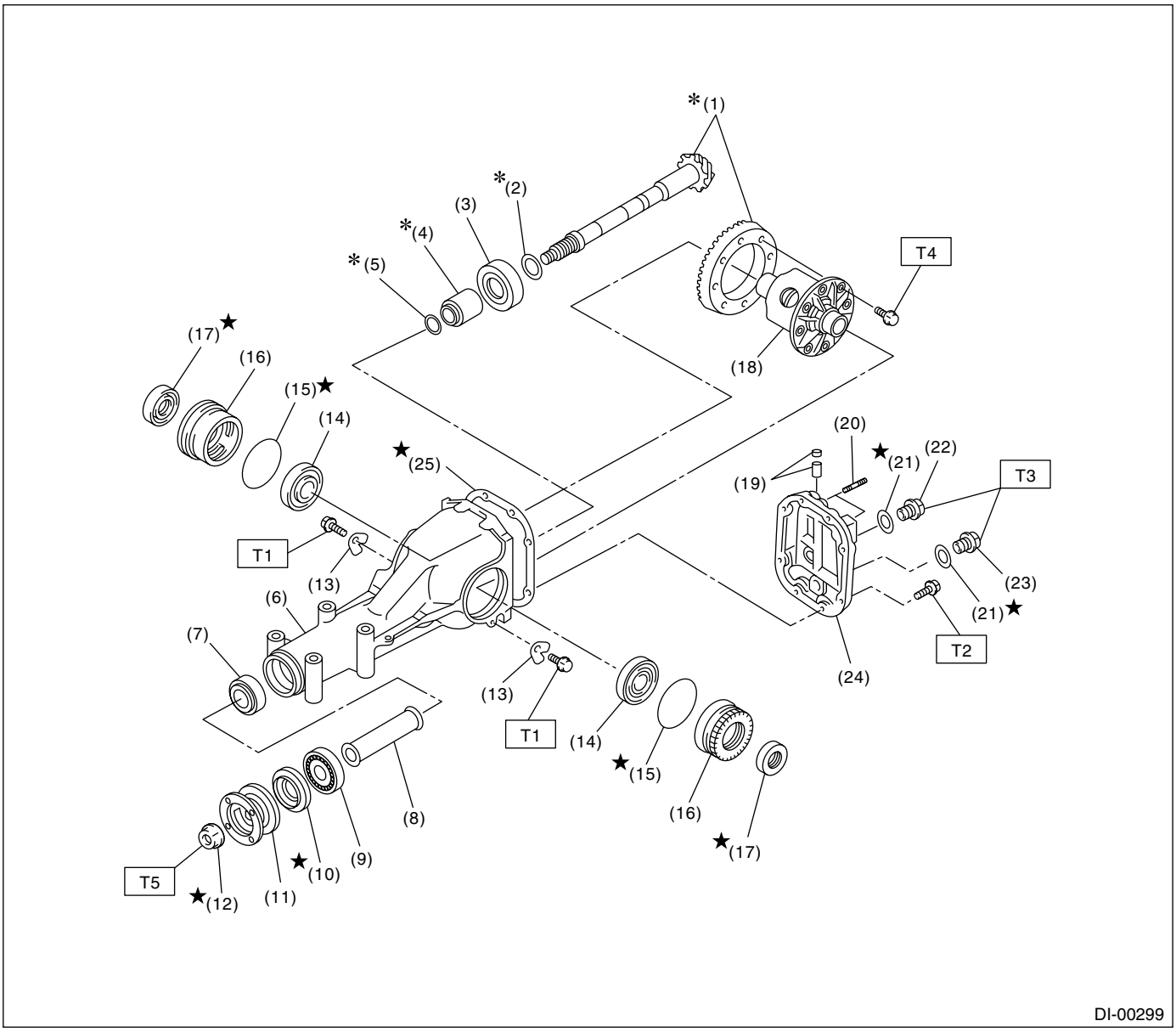
• VA-type

Front and rear bearing preload at companion flange bolt hole	New bearing	12.7 — 32.4 N (1.3 — 3.3 kgf, 2.9 — 7.3 lb)
Preload adjusting spacer	Part No.	Length mm (in)
	32288AA040	52.3 (2.059)
	32288AA050	52.5 (2.067)
	31454AA100	52.6 (2.071)
	32288AA060	52.7 (2.075)
	31454AA110	52.8 (2.079)
	32288AA070	52.9 (2.083)
	31454AA120	53.0 (2.087)
	32288AA080	53.1 (2.091)
	32288AA090	53.3 (2.098)

Preload adjusting washer	Part No.	Thickness mm (in)
	38336AA000	1.500 (0.0591)
	38336AA120	1.513 (0.0596)
	38336AA010	1.525 (0.0600)
	38336AA130	1.538 (0.0606)
	38336AA020	1.550 (0.0610)
	38336AA140	1.563 (0.0615)
	38336AA030	1.575 (0.0620)
	38336AA150	1.588 (0.0625)
	38336AA040	1.600 (0.0630)
	38336AA160	1.613 (0.0635)
	38336AA050	1.625 (0.0640)
	38336AA170	1.638 (0.0645)
	38336AA060	1.650 (0.0650)
	38336AA180	1.663 (0.0655)
	38336AA070	1.675 (0.0659)
	38336AA190	1.688 (0.0665)
	38336AA080	1.700 (0.0669)
	38336AA200	1.713 (0.0674)
	38336AA090	1.725 (0.0679)
	38336AA210	1.738 (0.0684)
	38336AA100	1.750 (0.0689)
	38336AA220	1.763 (0.0694)
	38336AA110	1.775 (0.0699)
Pinion height adjusting shim	Part No.	Thickness mm (in)
	32295AA200	0.150 (0.0059)
	32295AA210	0.175 (0.0069)
	32295AA220	0.200 (0.0079)
	32295AA230	0.225 (0.0089)
	32295AA240	0.250 (0.0098)
	32295AA250	0.275 (0.0108)
Side gear thrust washer mm (in)	803135011	0.925 — 0.950 (0.0364 — 0.0374)
	803135012	0.950 — 0.975 (0.0374 — 0.0384)
	803135013	0.975 — 1.000 (0.0384 — 0.0394)
	803135014	1.000 — 1.025 (0.0394 — 0.0404)
	803135015	1.025 — 1.050 (0.0404 — 0.0413)
Crown gear to drive pinion backlash	Limit mm (in)	0.10 — 0.15 (0.0039 — 0.0059)
Crown gear runout on its back surface		0.05 (0.0020)

B: COMPONENT

1. REAR DIFFERENTIAL FOR VA-TYPE

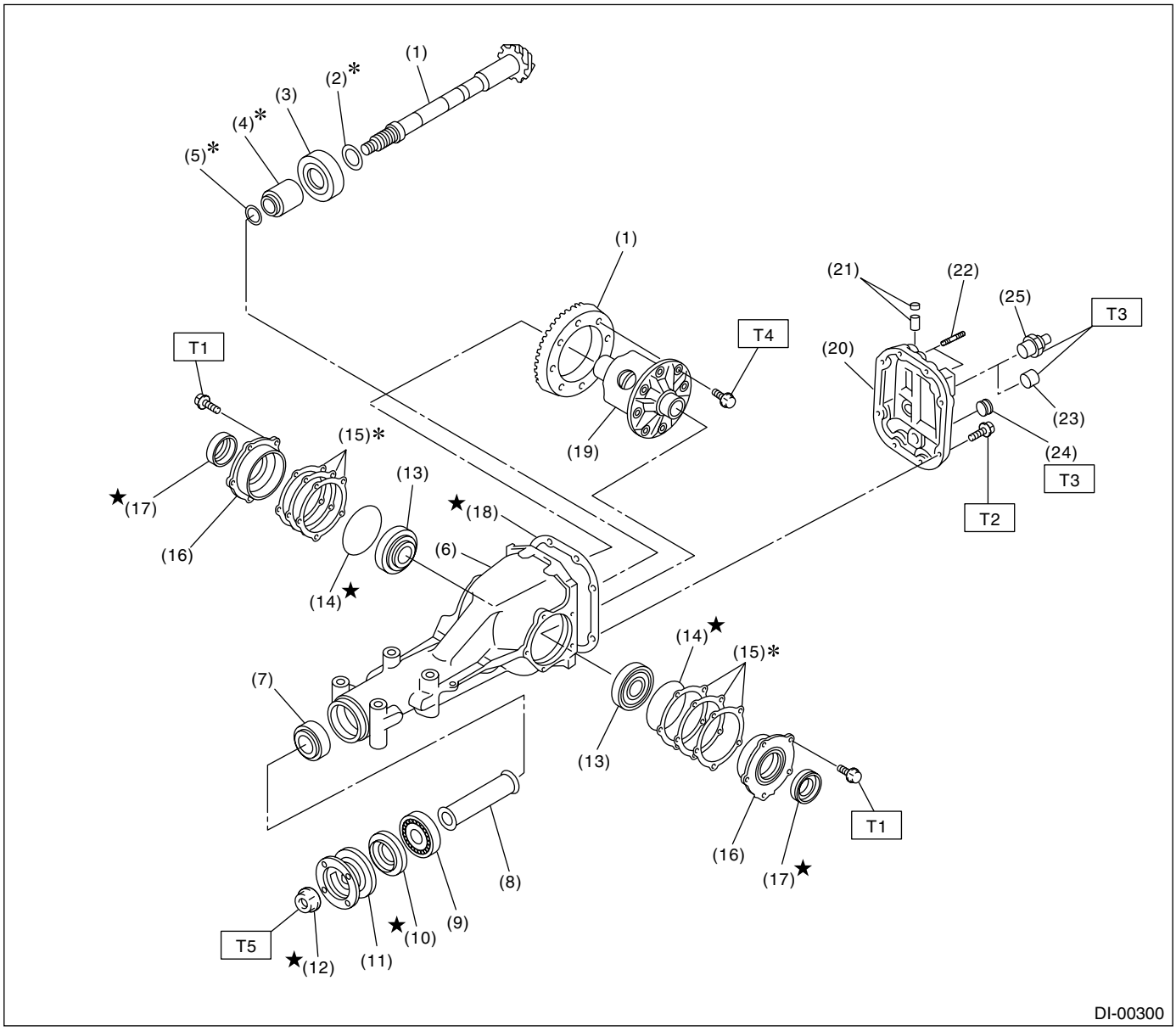


DI-00299

(1) Pinion crown gear and drive pinion set
(2) Pinion height adjusting shim
(3) Rear bearing
(4) Bearing preload adjusting spacer
(5) Bearing preload adjusting washer
(6) Differential carrier
(7) Front bearing
(8) Collar
(9) Pilot bearing
(10) Front oil seal
(11) Companion flange
(12) Self-locking nut
(13) Lock plate
(14) Side bearing
(15) O-ring
(16) Axle shaft holder
(17) Side oil seal
(18) Differential case
(19) Air breather cap
(20) Stud bolt
(21) Gasket
(22) Oil filler plug
(23) Oil drain plug
(24) Rear cover
(25) Gasket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.1)
T2: 25 (2.5, 18.1)
T3: 34 (3.5, 25.3)
T4: 62 (6.3, 45.6)
T5: 188 (19.2, 139)

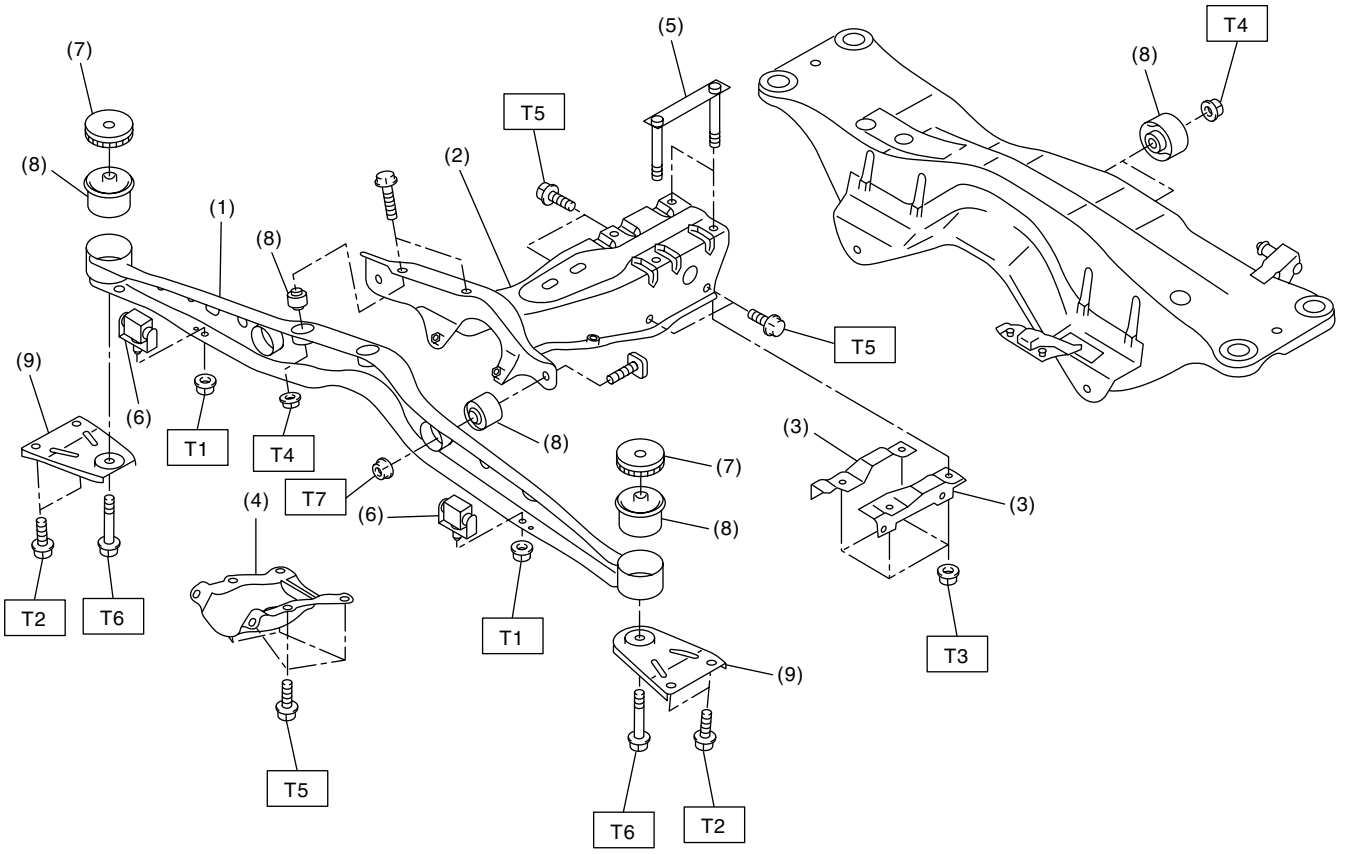
2. REAR DIFFERENTIAL FOR T-TYPE



(1) Pinion crown gear and drive pinion set
(2) Pinion height adjusting shim
(3) Rear bearing
(4) Bearing preload adjusting spacer
(5) Bearing preload adjusting washer
(6) Differential carrier
(7) Front bearing
(8) Collar
(9) Pilot bearing
(10) Front oil seal
(11) Companion flange
(12) Self-locking nut
(13) Side bearing
(14) O-ring
(15) Side bearing retainer shim
(16) Side bearing retainer
(17) Side oil seal
(18) Gasket
(19) Differential case (Viscous coupling type)
(20) Rear cover
(21) Air breather cap
(22) Stud bolt
(23) Oil filler plug (without oil temperature sensor)
(24) Oil drain plug
(25) Oil filler plug (with oil temperature sensor)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 10.5 (1.07, 7.7)
T2: 29 (3.0, 21.7)
T3: 49 (5.0, 36.2)
T4: 103 (10.5, 75.9)
T5: 181 (18.5, 134)

3. REAR DIFFERENTIAL MOUNTING SYSTEM



(1) Front differential member
(2) Differential bracket
(3) Differential mount lower bracket
(4) Differential mounting front cover
(5) Plate
(6) Dynamic damper (Non-turbo model only)
(7) Stopper
(8) Bushing
(9) Differential mount bracket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 20 (2.0, 14.5)
T2: 33 (3.4, 24.3)
T3: 65 (6.6, 47.7)
T4: 70 (7.1, 51.6)
T5: 90 (9.2, 66.4)
T6: 100 (10.2, 73.8)
T7: 135 (13.8, 97.6)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Use SUBARU genuine gear oil, grease etc. or the equivalent. Do not mix gear oil, grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Apply gear oil onto sliding or revolution surfaces before installation.
• Before installing O-rings or snap rings, apply sufficient amount of gear oil to avoid damage and deformation.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Avoid damaging the mating face of the case.

D: PREPARATION TOOL

1. SPECIAL TOOLS

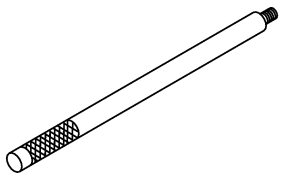
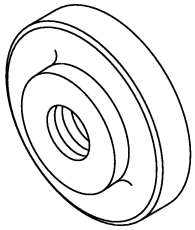
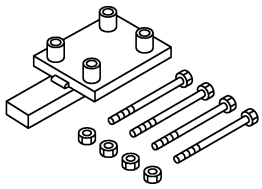
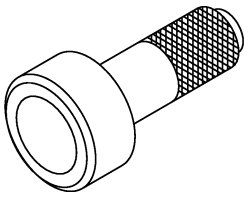
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398477701	398477701	HANDLE	Used for installing front and rear bearing cone.
 ST-398477702	398477702	DRIFT	Used press-fitting the bearing cone of differential carrier (front).
 ST-398217700	398217700	ATTACHMENT SET	Stand for rear differential carrier disassembly and assembly.
 ST-498447120	498447120	INSTALLER	Used for installing front oil seal.

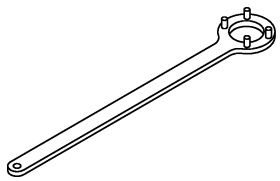
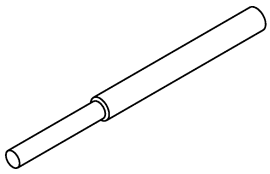
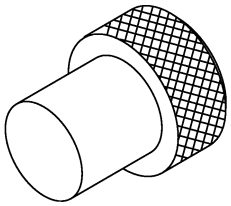
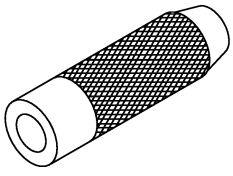
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498427200	498427200	FLANGE WRENCH	Used for stopping rotation of companion flange when loosening and tightening self-lock nut.
 ST-398467700	398467700	DRIFT	Used for removing pinion, pilot bearing and front bearing cone.
 ST-399780104	399780104	WEIGHT	Used for installing front bearing cone, pilot bearing companion flange.
 ST-899580100	899580100	INSTALLER	Used for press-fitting the front bearing cone, pilot bearing.

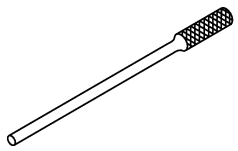
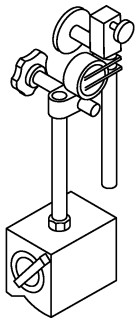
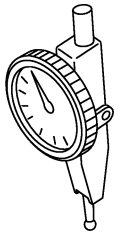
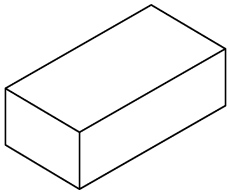
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899904100	899904100	STRAIGHT PIN REMOVER	Used for driving out differential pinion shaft lock pin.
 ST-498247001	498247001	MAGNET BASE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with DIAL GAUGE (498247100).
 ST-498247100	498247100	DIAL GAUGE	• Used measuring backlash between side gear and pinion, hypoid gear. • Used with MAGNET BASE (498247001).
 ST-398507704	398507704	BLOCK	Used for adjusting pinion height and preload.

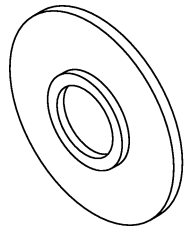
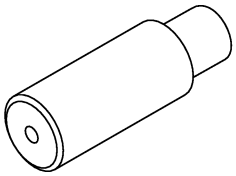
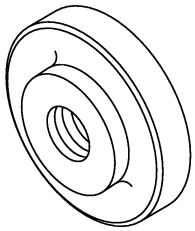
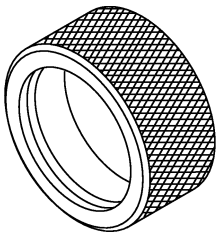
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398177700	398177700	INSTALLER	• Used for installing rear bearing cone. • For T-type.
 ST-398457700	398457700	ATTACHMENT	• Used for removing side bearing retainer. • For T-type.
 ST-398477703	398477703	DRIFT2	• Used for press-fitting the bearing race (rear) of differential carrier. • For T-type.
 ST-398437700	398437700	DRIFT	• Used for installing side oil seal. • For T-type.

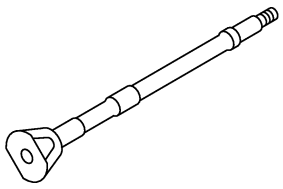
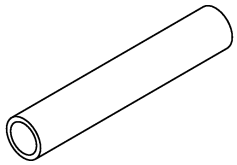
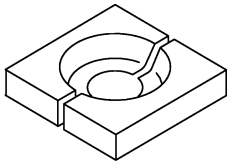
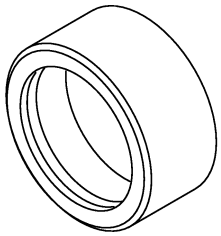
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398507702	398507702	DUMMY SHAFT	• Used for adjusting pinion height and preload. • For T-type.
 ST-398507703	398507703	DUMMY COLLAR	• Used for adjusting pinion height and preload. • For T-type.
 ST-398517700	398517700	REPLACER	• Used for removing rear bearing cone. • For T-type.
 ST-398487700	398487700	DRIFT	• Used for press-fitting the side bearing cone. • For T-type.

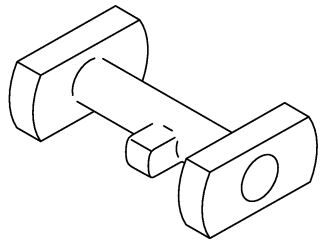
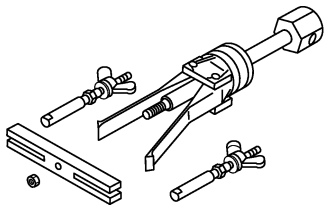
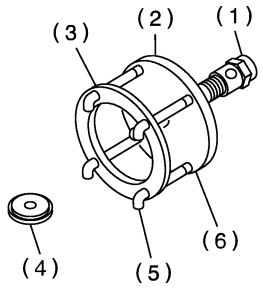
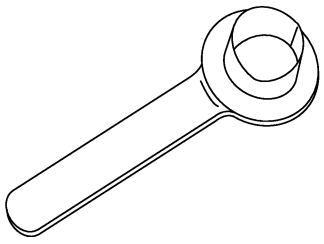
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398507701	398507701	DIFFERENTIAL CARRIER GAUGE	• Used for adjusting pinion height. • For T-type.
 ST-398527700	398527700	PULLEY ASSY	• Used for removing front oil seal. • Used for removing side bearing cup. (T-type)
 ST-399527700	399527700	PULLER SET	• Used for extracting side bearing cone. (1) BOLT (899521412) (2) PULLER (399527702) (3) HOLDER (399527703) (4) ADAPTER (398497701) (5) BOLT (899520107) (6) NUT (021008000) • For T-type.
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing rear drive shaft into rear differential. • For protecting oil seal.

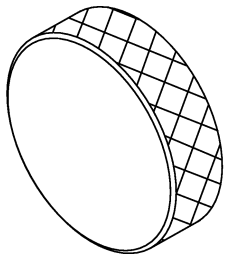
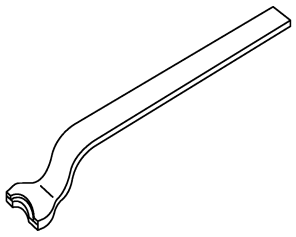
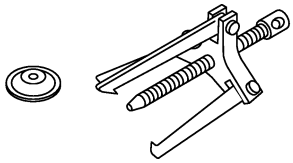
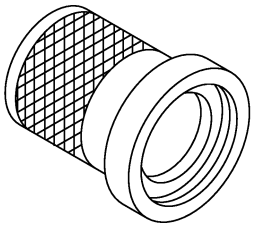
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398237700	398237700	GAUGE	• Used for installing side bearing. • For T-type.
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	• Used for removing rear drive shaft from rear differential. • For T-type.
 ST-399703600	399703600	PULLEY ASSY	• Used for removing companion flange
 ST-899874100	899874100	INSTALLER	• Used for installing companion flange.

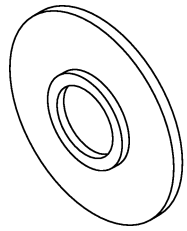
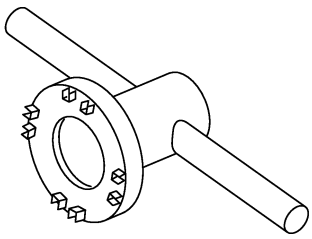
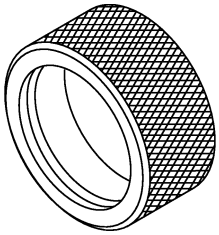
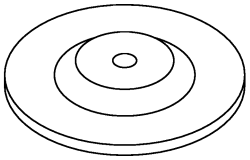
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498175500	498175500	INSTALLER	• Used for installing rear bearing cone. • For VA-type.
 ST-499785500	499785500	OIL SEAL HOLDER WRENCH	• Used for removing and installing side oil seal holder. • For VA-type.
 ST-498447100	498447100	INSTALLER	• Used for installing oil seal. • For VA-type.
 ST-399520105	399520105	SEAT	• Used for removing side bearing cone. • Used with PULLER SET (899524100). • For VA-type.

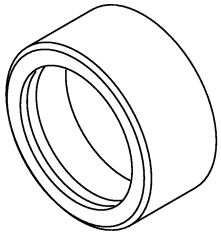
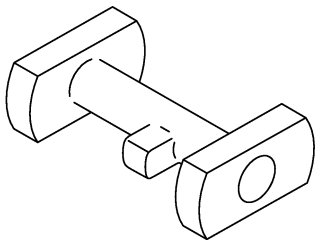
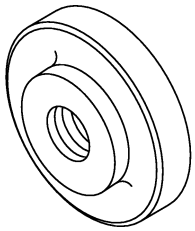
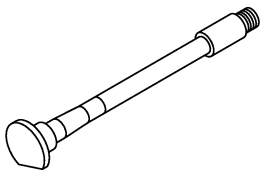
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498485400	498485400	DRIFT	• Used for installing side bearing cone. • For VA-type.
 ST-498505501	498505501	DIFFERENTIAL CARRIER GAUGE	• Used for adjusting pinion height. • For VA-type.
 ST-498447110	498447110	DRIFT	• Used for press-fitting the bearing race (front) of differential carrier. • For VA-type.
 ST-498447150	498447150	DUMMY SHAFT	• Used for adjusting pinion height and pre-load. • For VA-type.

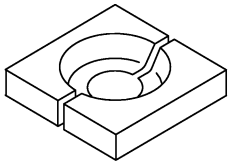
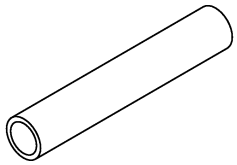
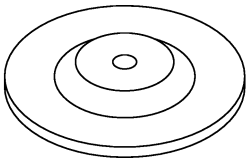
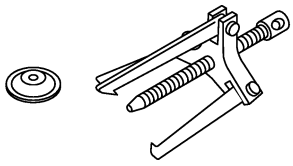
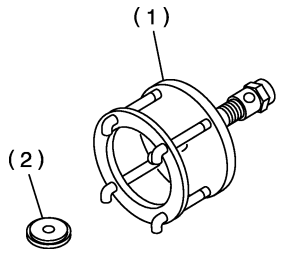
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498517700	498515500	REPLACER	• Used for removing rear bearing cone. • For VA-type.
 ST-32285AA000	32285AA000	DUMMY COLLAR	• Used for adjusting pinion height and pre-load. • For VA-type.
 ST-499705404	499705404	SEAT	• Used for removing side bearing race. • Used with PULLER ASSY (499705401). • For VA-type.
 ST-499705401	499705401	PULLER ASSY	• Used for removing side bearing race. • Used with SEAT (499705404). • For VA-type.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899524100	899524100	PULLER SET	• Used for removing side bearing cone of differential. • For VA-type. (1) Puller (2) Cap

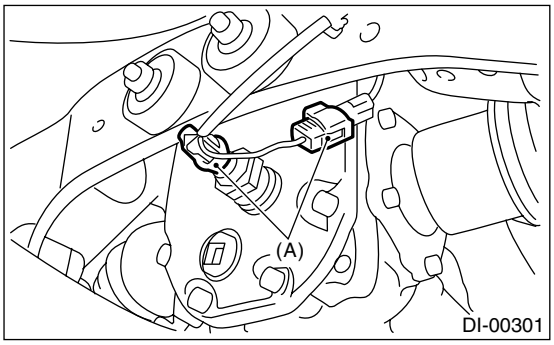
2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Transmission jack	Used for assembly/disassembly of rear differential.
Puller	Used for removal of side bearing retainer. (T-type)
Thickness gauge	Used for measuring clearance.
Tire lever	Used for removal of rear drive shaft. (VA-type)

2. Differential Gear Oil

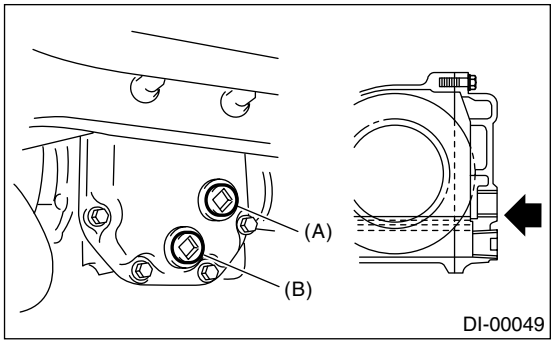
A: INSPECTION

1) Disconnect the oil temperature sensor connector (Turbo model for Europe).



(A) Connector

2) Remove the filler plug or oil temperature sensor, and then check the gear oil. If it is contaminated or deteriorated, replace the gear oil. <Ref. to DI-21, REPLACEMENT, Differential Gear Oil.>
3) Check the gear oil level is up to the bottom part of filler bolt or oil temperature sensor. If the level is low, refill up to the bottom of filler bolt.



(A) Filler plug
(B) Drain plug

4) After the inspection, tighten the filler plug or oil temperature sensor.

NOTE:
- Apply fluid packing to the drain plug for T-type.
- Use a new aluminum gasket for VA-type.

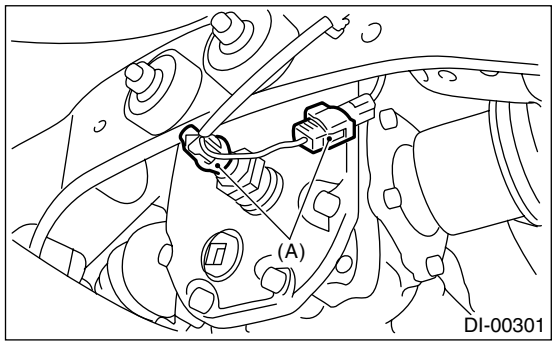
Fluid packing:
THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:
T-type
49 N·m (5.0 kgf-m, 36.2 ft-lb)
VA-type
34 N·m (3.5 kgf-m, 25.3 ft-lb)

5) Connect the connector to oil temperature sensor. (Turbo model for Europe)

B: REPLACEMENT

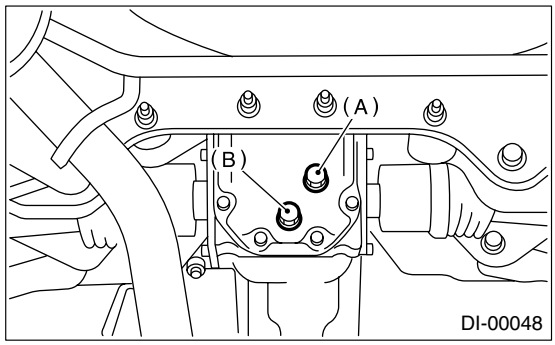
1) Jack-up the vehicle and support it with sturdy racks.
2) Disconnect the oil temperature sensor connector (Turbo model for Europe).



(A) Connector

3) Remove the oil drain plug and filler plug or oil temperature sensor, and drain the gear oil.

CAUTION:
Be careful not to burn your hands, because gear oil becomes extremely hot after running.



(A) Filler plug
(B) Drain plug

4) Tighten the oil drain plug.

NOTE:
- Apply fluid packing to the drain plug for T-type.
- Use a new aluminum gasket for VA-type.

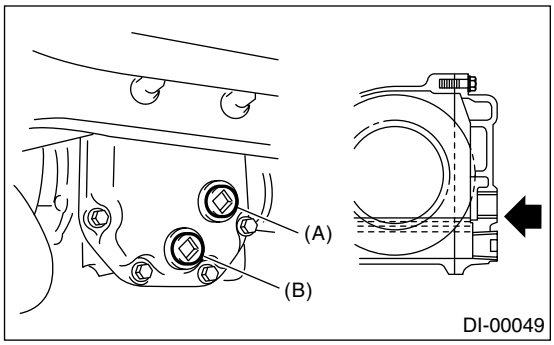
Fluid packing:
THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:
T-type
49 N·m (5.0 kgf-m, 36.2 ft-lb)
VA-type
34 N·m (3.5 kgf-m, 25.3 ft-lb)

5) Fill the differential carrier with gear oil to the upper plug level.

NOTE:
Carefully refill oil while watching the level. Excess or insufficient oil must be avoided.

Oil capacity:
0.8 ℓ (0.8 US qt, 0.7 Imp qt)



(A) Filler plug
(B) Drain plug

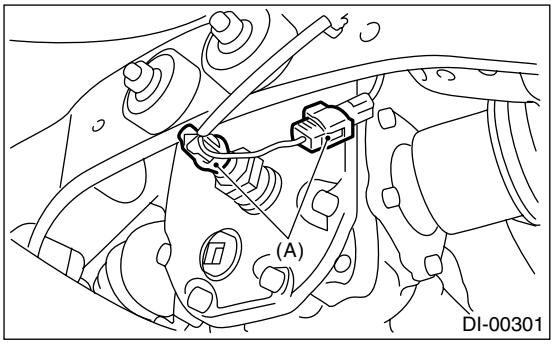
6) Install the filler plug or oil temperature sensor.

NOTE:
• Apply fluid packing to the filler plug or oil temperature sensor for T-type.
• Use a new aluminum gasket for VA-type.

Fluid packing:
THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:
T-type
49 N·m (5.0 kgf-m, 36.2 ft-lb)
VA-type
34 N·m (3.5 kgf-m, 25.3 ft-lb)

7) Connect the oil temperature sensor connector (Turbo model for Europe).



(A) Connector

3. Front Differential

A: NOTE

1. AT MODEL

For front differential of AUTOMATIC TRANSMISSION, refer to “AT” section. <Ref. to AT-103, Front Differential.>

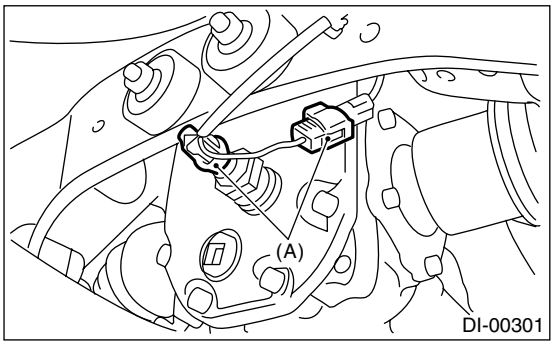
2. MT MODEL

For front differential of manual transmission, refer to “MT” section. <Ref. to MT-95, Front Differential Assembly.>

4. Rear Differential for T-type

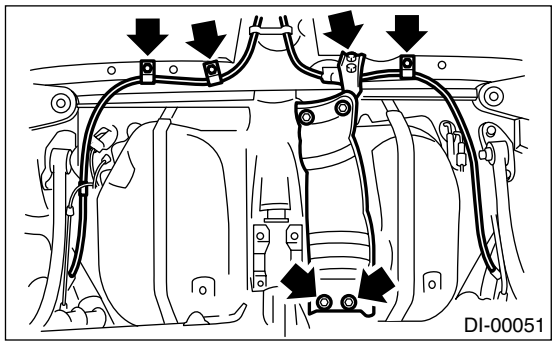
A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Move the select lever or gear shift lever to “N”.
4) Release the parking brake.
5) Loosen the wheel nuts.
6) Jack-up the vehicle and support it with sturdy racks.
7) Remove the wheels.
8) Disconnect the connector from oil temperature sensor. (Turbo model for Europe)



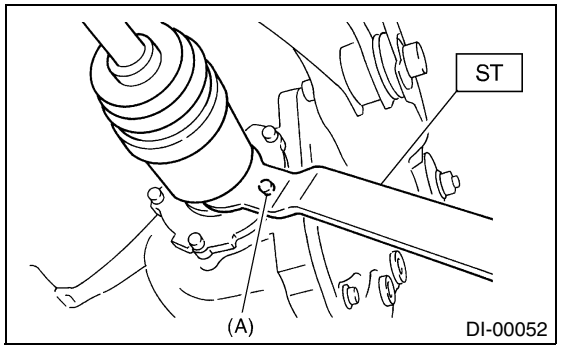
(A) Connector

9) Remove the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(SOHC)-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-13, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(TURBO)-12, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(TURBO)-14, REMOVAL, Muffler.>
10) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
11) Remove the clamps and bracket of parking brake cable.



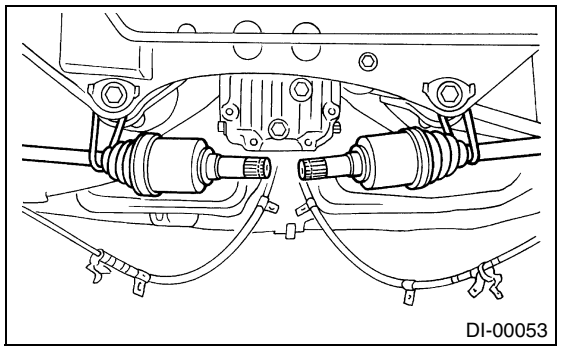
12) Remove the DOJ of rear drive shaft from rear differential using ST. <Ref. to DI-56, REPLACEMENT, Rear Differential Side Oil Seal.>

ST 28099PA100 DRIVE SHAFT REMOVER

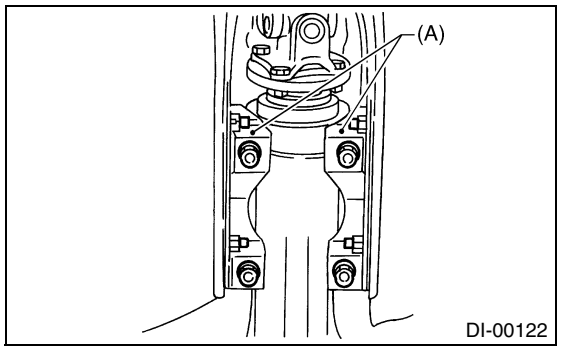


(A) Bolt

13) Secure the rear drive shaft to rear crossmember using wire.

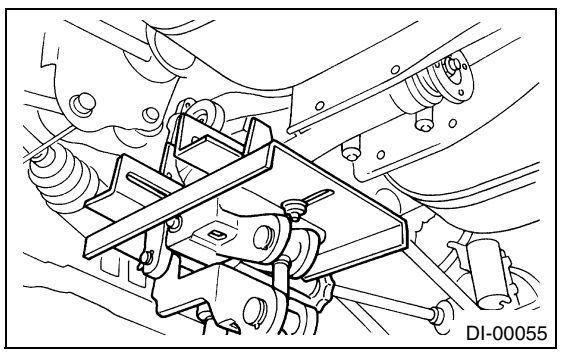


14) Remove the lower differential bracket.

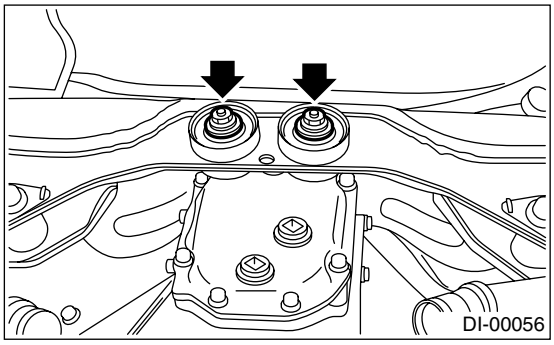


(A) Lower differential bracket

15) Support the rear differential with transmission jack.

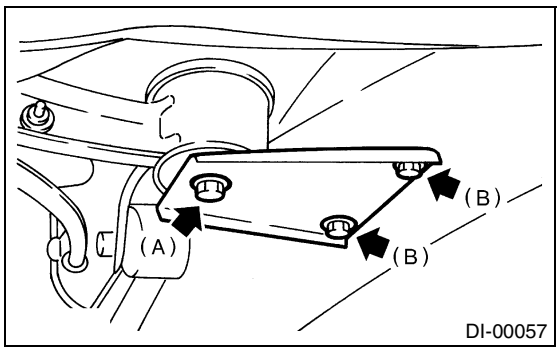


16) Remove the self-locking nuts and bolts.



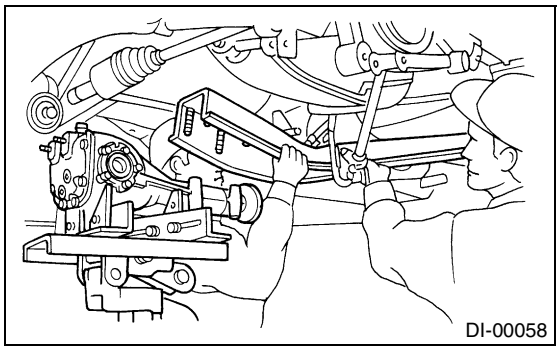
17) Remove the bolts which secure rear differential front member to body.
Loosen the bolt A first, then remove the bolts B.

NOTE:
Support the front member with use of a helper to prevent it from dropping.

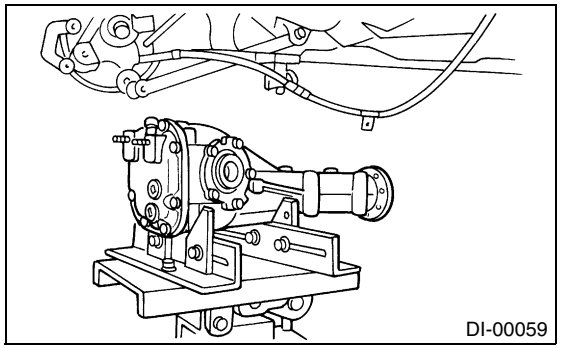


(A) Bolt A
(B) Bolt B

18) Remove the bolt A.
19) While slowly lowering the transmission jack, move the rear differential forward and remove front member and rear differential from body.



20) Remove the rear differential from front member.



B: INSTALLATION

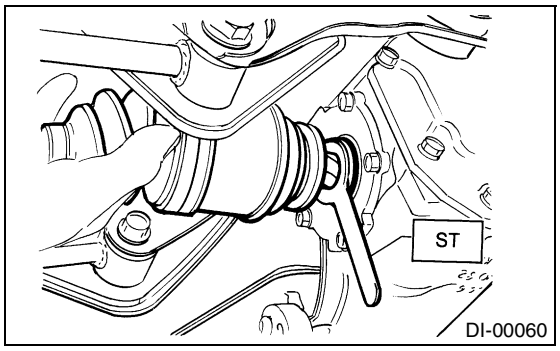
Install in the reverse order of removal.

1) Position the front member on body by passing it under the parking brake cable and securing to rear differential.

NOTE:
When installing the rear differential front member, do not confuse the installation sequence of the upper and lower stoppers.

2) Install the DOJ of drive shaft into rear differential. <Ref. to DI-56, REPLACEMENT, Rear Differential Side Oil Seal.>

ST 28099PA090 SIDE OIL SEAL PROTECTOR



3) Installing procedure hereafter is in the reverse order of removal.

4) After installation, fill the differential carrier with gear oil to the filler plug level. <Ref. to DI-21, Differential Gear Oil.>

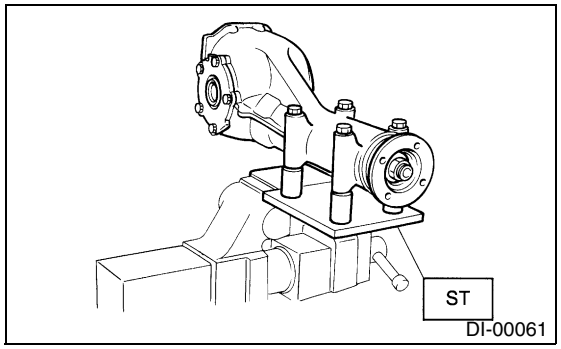
C: DISASSEMBLY

To detect the real cause of trouble, inspect the following items before disassembling.

- Tooth contact of crown gear and pinion, and backlash
- Runout of crown gear at its back surface
- Turning resistance of drive pinion

1) Set the ST on vise and install the differential assembly to ST.

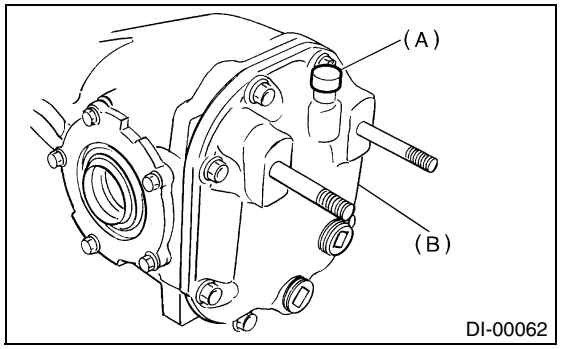
ST 398217700 ATTACHMENT



2) Drain the gear oil by removing the plug.

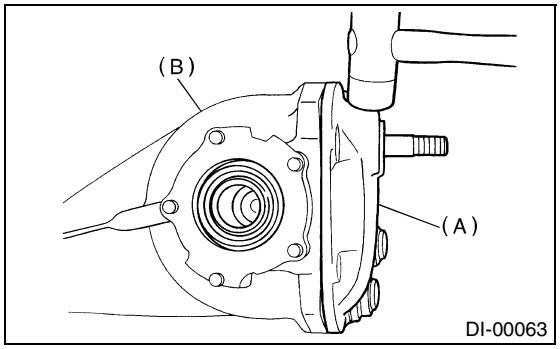
3) Remove the air breather cap.

NOTE:
- Do not attempt to remove the air breather cap unless necessary.
- When removing the air breather cap, replace the air breather cap with a new one.



(A) Air breather cap
(B) Rear cover

4) Remove the bolts, and then remove the rear cover.

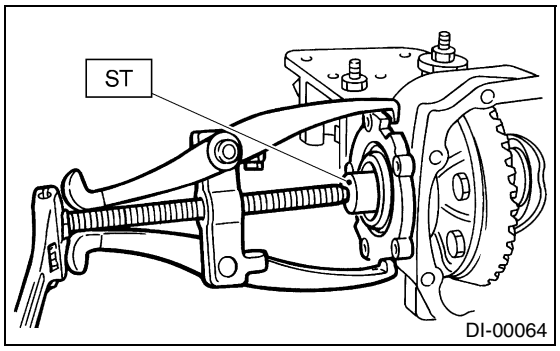


(A) Rear cover
(B) Differential carrier

5) Make right and left side bearing retainers in order to identify them at reassembly. Remove the side bearing retainer attaching bolts, set the ST to differential case, and extract right and left side bearing retainers with a puller.

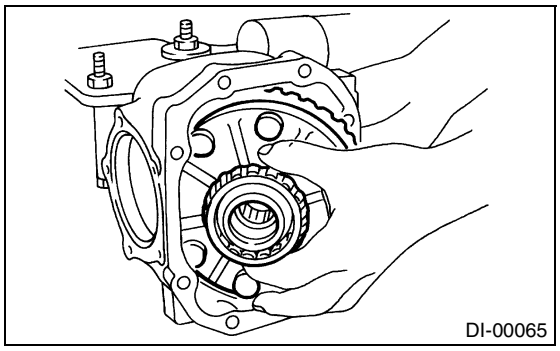
NOTE:
Each shim, which is installed to adjust the side bearing preload, should be kept together with its mating retainer.

ST 398457700 ATTACHMENT



6) Pull out the differential case assembly from differential carrier.

NOTE:
Be careful not to hit the teeth against the case.

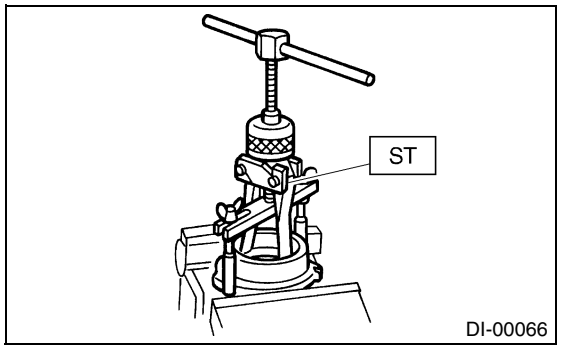


7) Remove the O-ring from side bearing retainer.

8) Remove the oil seal from side bearing retainer. <Ref. to DI-56, REPLACEMENT, Rear Differential Side Oil Seal.>

9) Pull the bearing cup from side bearing retainer using ST.

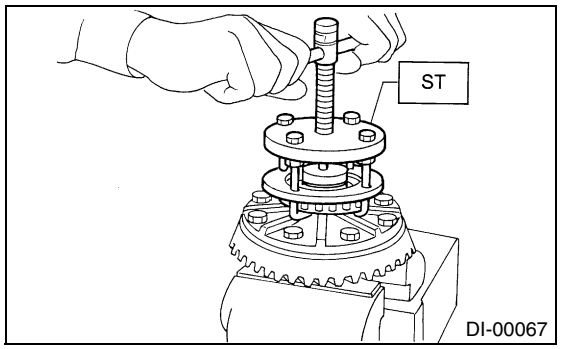
ST 398527700 PULLER ASSY



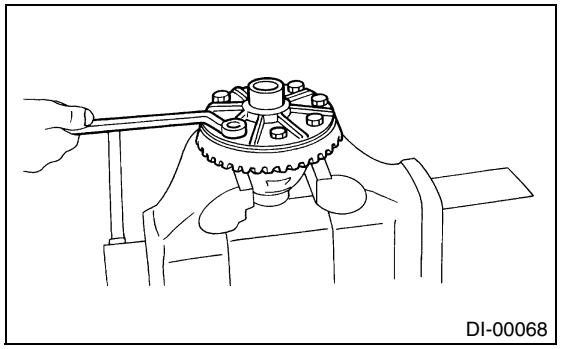
10) Extract the bearing cone with ST.

NOTE:
• Set the puller so that its claws catch the edge of bearing cone.
• Never mix up the right and left hand bearing races and cones.

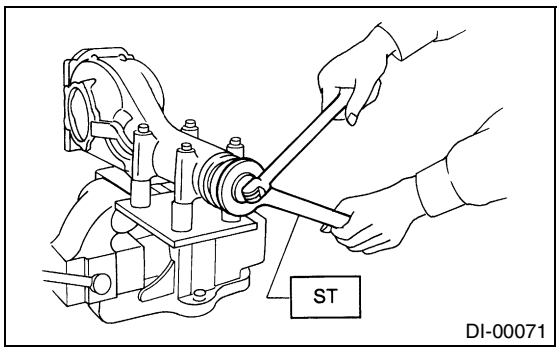
ST 399527700 PULLER SET



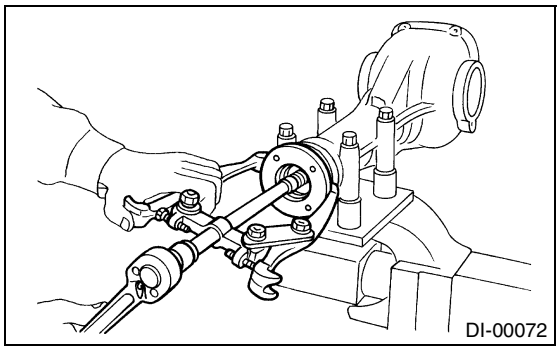
11) Remove the crown gear by loosening the crown gear bolts.



12) Hold the companion flange with ST and remove the drive pinion nut.
ST 498427200 FLANGE WRENCH

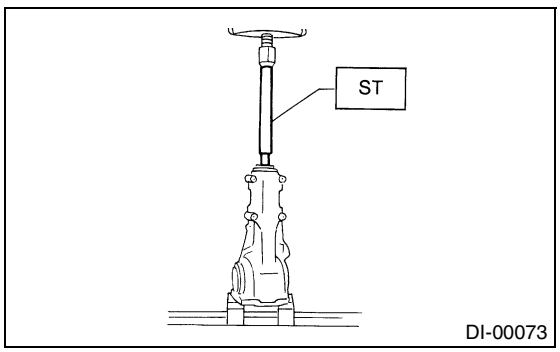


13) Extract the companion flange with a puller.



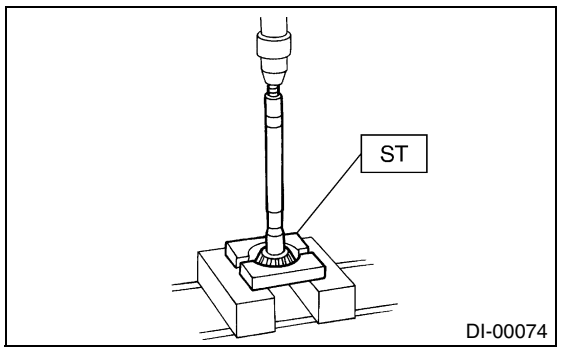
14) Press the end of drive pinion shaft and extract it together with the rear bearing cone, preload adjusting spacer and washer.

NOTE:
Hold the drive pinion so as not to drop it.
ST 398467700 DRIFT

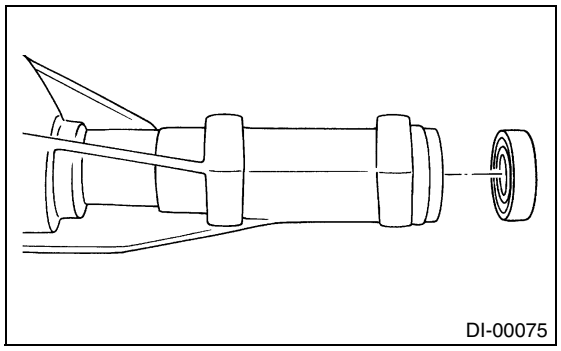


15) Remove the rear bearing cone from drive pinion by supporting the cone with ST.

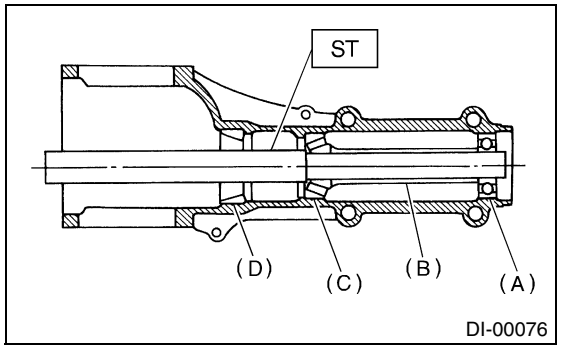
NOTE:
Place the replacer so that its center-recessed side faces the pinion gear.
ST 398517700 REPLACER



16) Remove the front oil seal from differential carrier using ST.
ST 398527700 PULLER ASSY

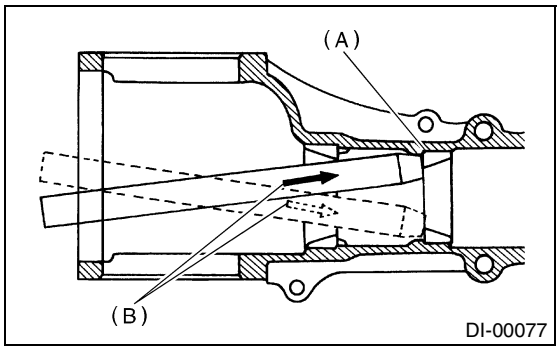


17) Remove the pilot bearing together with front bearing cone using ST.
ST 398467700 DRIFT



(A) Pilot bearing
(B) Spacer
(C) Front bearing
(D) Rear bearing cup

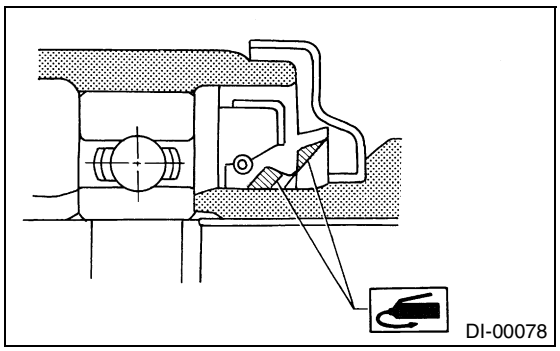
18) When replacing the bearings, hit out the front bearing cup and rear bearing cup in this order out of case by using a brass bar.



(A) 2 cutouts along diagonal lines
(B) Hit out alternately with brass bar.

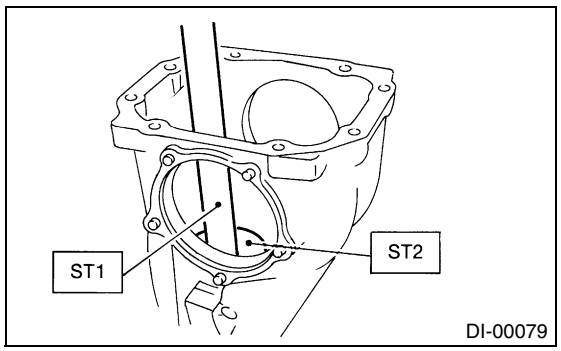
D: ASSEMBLY

NOTE:
• Assemble in the reverse order of disassembling.
• Check and adjust each part during assembly.
• Keep the shims and washers in order, so that they are not improperly installed.
• Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
• Apply gear oil when installing the bearings and thrust washers.
• Be careful not to mix up the right and left hand races of the bearings.
• Use a new O-ring and gasket.
• Replace the oil seal with a new one at every disassembly. Apply chassis grease between the lips when installing the oil seal.



1) Adjusting preload for front and rear bearings
Adjust the bearing preload with spacer and washer between front and rear bearings. Pinion height adjusting washer are not affected by this adjustment. The adjustment must be carried out without oil seal inserted.

(1) Press the rear bearing race (rear) into differential carrier using ST1 and ST2.
ST1 398477701 HANDLE
ST2 398477703 DRIFT 2

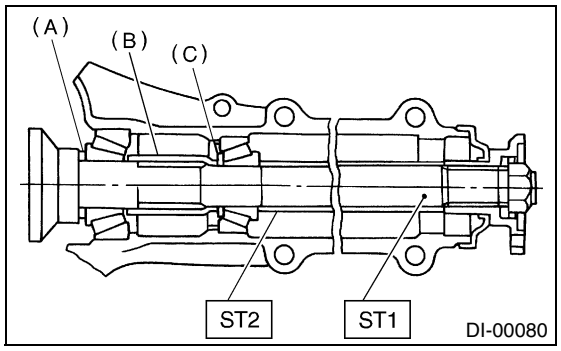


(2) Using ST1 and ST2, install the rear bearing race (front) to differential carrier.
ST1 398477701 HANDLE
ST2 398477702 DRIFT

(3) Insert the ST1 into carrier with pinion height adjusting washer and rear bearing cone fitted onto it.

NOTE:
• If tooth contact is normal in the inspection before disassembling, verify that the washer is not deformed, and then re-use the used washer.
• Use a new rear bearing cone.

(4) Then install the preload adjusting spacer and washer, front bearing cone, ST2, companion flange, and washer and drive pinion nut.
ST1 398507702 DUMMY SHAFT
ST2 398507703 DUMMY COLLAR



(A) Pinion height adjusting shim
(B) Preload adjusting spacer
(C) Preload adjusting washer

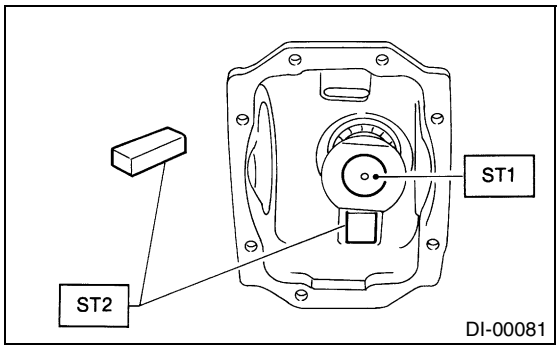
(5) Turn the ST1 with hand to make it seated, and tighten the drive pinion nut while measuring the preload with spring balance. Select the preload adjusting washer and spacer so that the specified preload is obtained when nut is tightened to the specified torque.

NOTE:
Use a new lock nut.

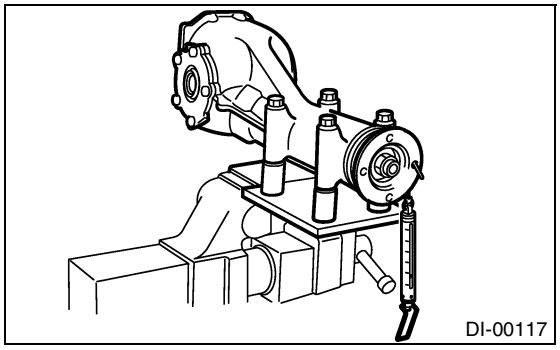
NOTE:
- Be careful not to give excessive preload.
- When tightening the drive pinion nut, lock ST1 with ST2 as shown in the figure.

ST1 398507704 BLOCK
ST2 398507702 DUMMY SHAFT

Tightening torque:
181 N·m (18.5 kgf-m, 134 ft-lb)



Front and rear bearing preload
For new bearing: 19 — 26 N (1.9 — 2.6 kgf, 4.3 — 5.8 lb) at companion flange bolt hole
For used bearing: 8 — 16 N (0.8 — 1.6 kgf, 1.8 — 3.6 lb) at companion flange bolt hole



	Part No.	Thickness mm (in)
Preload adjusting washer	383705200	2.59 (0.1020)
	383715200	2.57 (0.1012)
	383725200	2.55 (0.1004)
	383735200	2.53 (0.0996)
	383745200	2.51 (0.0988)
	383755200	2.49 (0.0980)
	383765200	2.47 (0.0972)
	383775200	2.45 (0.0965)
	383785200	2.43 (0.0957)
	383795200	2.41 (0.0949)
	383805200	2.39 (0.0941)
	383815200	2.37 (0.0933)
	383825200	2.35 (0.0925)
	383835200	2.33 (0.0917)
	383845200	2.31 (0.0909)
	Part No.	Length mm (in)
Preload adjusting spacer	383695201	56.2 (2.213)
	383695202	56.4 (2.220)
	383695203	56.6 (2.228)
	383695204	56.8 (2.236)
	383695205	57.0 (2.244)
	383695206	57.2 (2.252)

2) Adjusting drive pinion height
Adjust the drive pinion height with shim installed between the rear bearing cone and back of pinion gear.

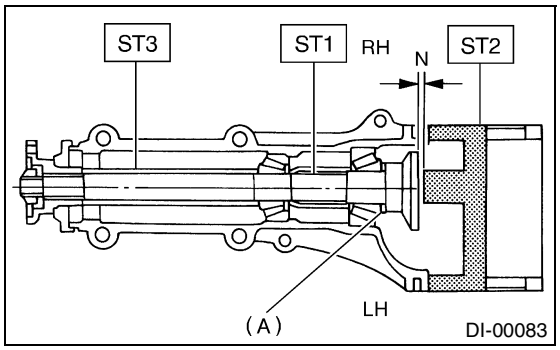
(1) Do not remove the ST1, ST2 and ST3 out of position after adjusting pinion bearing preload in previous step.

Front and rear bearing preload
For new bearing: 19 — 26 N (1.9 — 2.6 kgf, 4.3 — 5.8 lb) at companion flange bolt hole
For used bearing: 8 — 16 N (0.8 — 1.6 kgf, 1.8 — 3.6 lb) at companion flange bolt hole

Adjusting preload for front and rear bearings

NOTE:
At this time, install a pinion height adjusting shim which is temporarily selected or the same as that used before. Measure and record the thickness.

ST1 398507702 DUMMY SHAFT
ST2 398507701 DIFFERENTIAL CARRIER GAUGE
ST3 398507703 DUMMY COLLAR

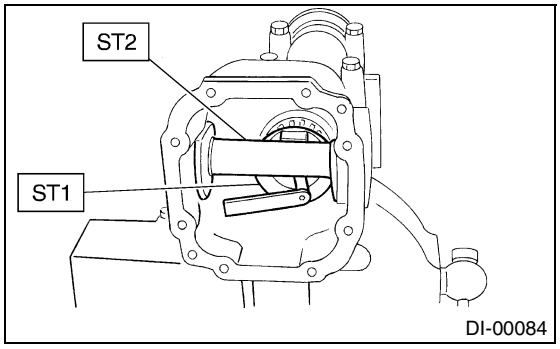


(A) Pinion height adjusting shim

(2) Measure the clearance N between the end of ST2 and end surface of ST1 by using a thickness gauge.

NOTE:
Make sure there is no clearance between the case and ST2.

ST1 398507702 DUMMY SHAFT
ST2 398507701 DIFFERENTIAL CARRIER GAUGE



(3) Obtain the thickness of pinion height adjusting shim to be inserted from the following formula, and replace the temporarily installed shim with this one.

$T = To + N - (H \times 0.01) - 0.20$ mm (0.0079 in)

NOTE:
Use copies of this page.

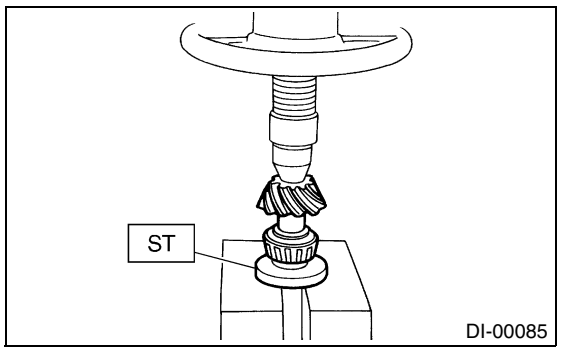
T	Thickness of pinion height adjusting shim mm (in)	
To	Thickness of shim temporarily inserted mm (in)	
N	Reading of thickness gauge mm (in)	
H	Figure marked on drive pinion head	
Memo:		

(Example of calculation)
To = 2.20 + 1.20 = 3.40 mm
N = 0.23 mm H = + 1,
T = 3.40 + 0.23 − 0.01 − 0.20 = 3.42
Result: Thickness = 3.42 mm
Therefore use the shim 383605200.

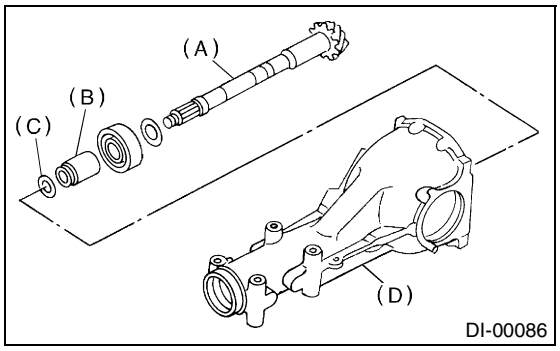
Pinion height adjusting shim	
Part No.	Thickness mm (in)
383495200	3.09 (0.1217)
383505200	3.12 (0.1228)
383515200	3.15 (0.1240)
383525200	3.18 (0.1252)
383535200	3.21 (0.1264)
383545200	3.24 (0.1276)
383555200	3.27 (0.1287)
383565200	3.30 (0.1299)
383575200	3.33 (0.1311)
383585200	3.36 (0.1323)
383595200	3.39 (0.1335)
383605200	3.42 (0.1346)
383615200	3.45 (0.1358)
383625200	3.48 (0.1370)
383635200	3.51 (0.1382)
383645200	3.54 (0.1394)
383655200	3.57 (0.1406)
383665200	3.60 (0.1417)
383675200	3.63 (0.1429)
383685200	3.66 (0.1441)

3) Install the selected pinion height adjusting shim on drive pinion, and press the rear bearing cone into position with ST.

ST 398177700 INSTALLER

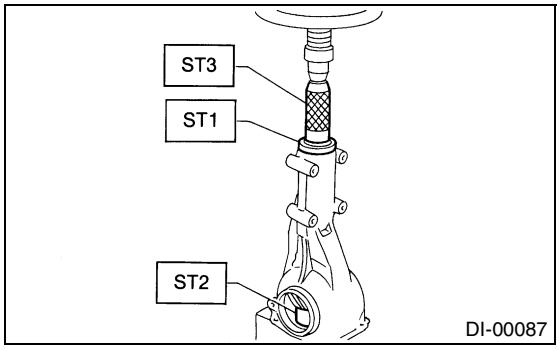


4) Insert the drive pinion into differential carrier, install the previously selected bearing preload adjusting spacer and washer.

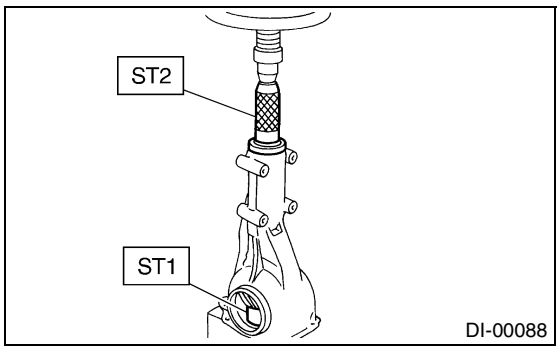


(A) Drive pinion
(B) Bearing adjusting spacer
(C) Washer
(D) Differential carrier

5) Press-fit the front bearing cone into case with ST1, ST2 and ST3.
ST1 398507703 DUMMY COLLAR
ST2 399780104 WEIGHT
ST3 899580100 INSTALLER



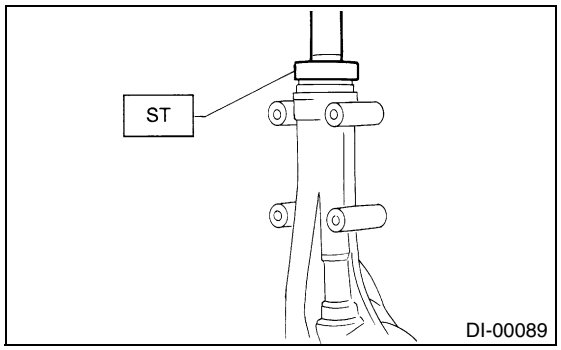
6) Insert the spacer, then press-fit the pilot bearing with ST1 and ST2.
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER



7) Fit a new oil seal with ST.

NOTE:
• Press-fit until the end of oil seal is 1 mm (0.04 in) inward from end of carrier.
• Apply grease between the oil seal lips.

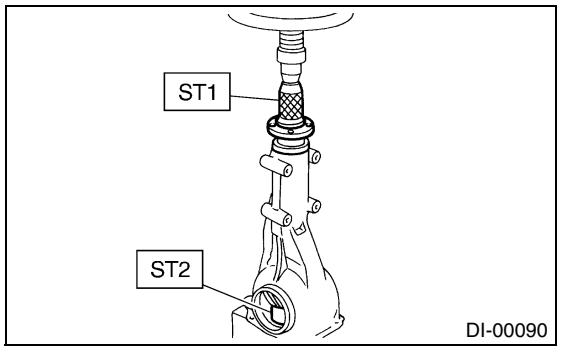
ST 498447120 INSTALLER



8) Press-fit the companion flange with ST1 and ST2.

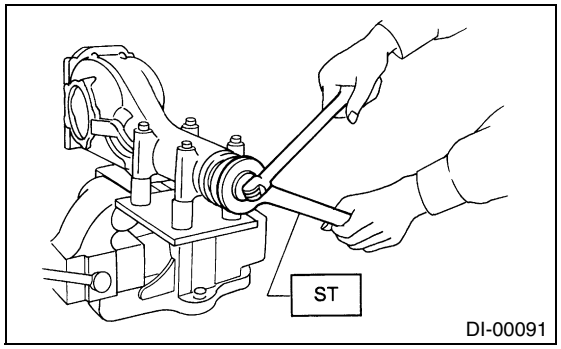
NOTE:
Be careful not to damage the bearing.

ST1 899874100 INSTALLER
ST2 399780104 WEIGHT



9) Install a new self-locking nut. Then tighten it with the ST.
ST 498427200 FLANGE WRENCH

Tightening torque:
181 N·m (18.5 kgf-m, 134 ft-lb)



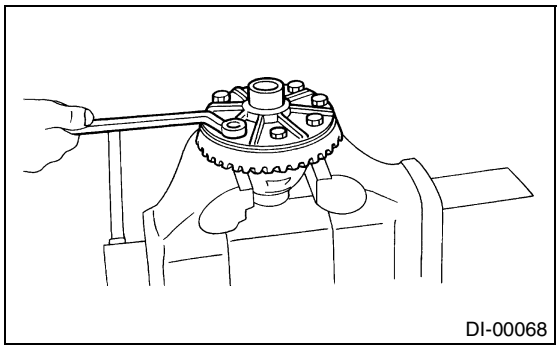
10) Install the crown gear on differential case.

NOTE:
Before installing the bolts, apply Lock Tite to bolt threads.

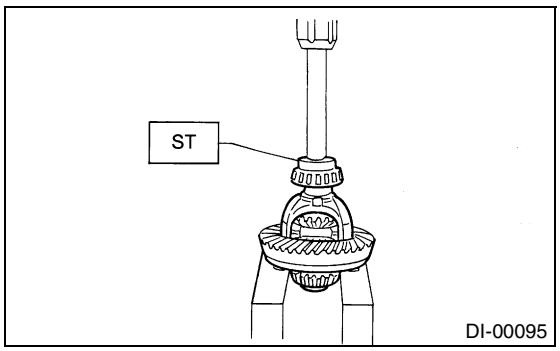
Lock Tite:
THREE BOND 1324 (Part No. 004403042) or equivalent

NOTE:
Tighten diagonally while tapping the bolt heads.

Tightening torque:
103 N·m (10.5 kgf-m, 75.9 ft-lb)


DI-00068

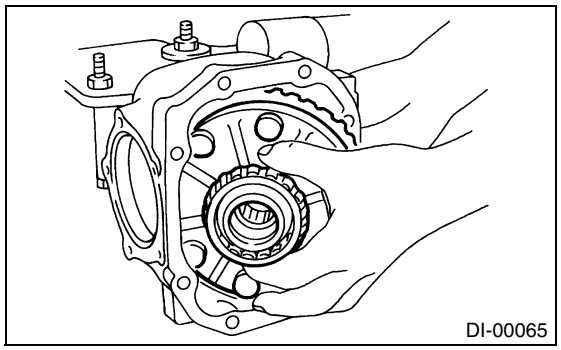
11) Press the side bearing onto differential case with ST.
ST 398237700 DRIFT



DI-00095

12) Press the side bearing cone into side bearing retainer using ST.
ST 398487700 DRIFT

13) Adjusting side bearing retainer shims
(1) The driven gear backlash and side bearing preload can be determined by the side bearing retainer shim thickness.
(2) Install the differential case assembly into differential carrier in the reverse order of disassembly.

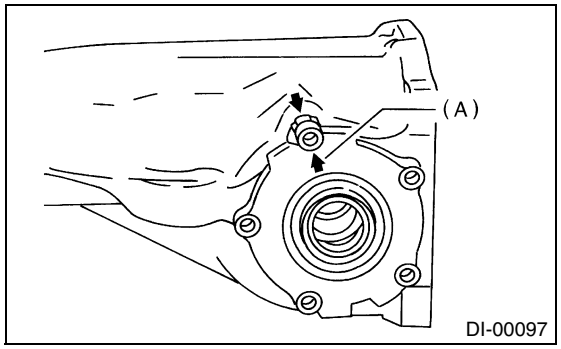

DI-00065

(3) Install the side retainer shims to the right and left retainers from which they were removed.

NOTE:
• Replace the broken or corroded side retainer shim with a new one of same thickness.

Side bearing retainer shim	
Part No.	Thickness mm (in)
383475201	0.20 (0.0079)
383475202	0.25 (0.0098)
383475203	0.30 (0.0118)
383475204	0.40 (0.0157)
383475205	0.50 (0.0197)

(4) Align the arrow mark on differential carrier with the mark on side retainer during installation.

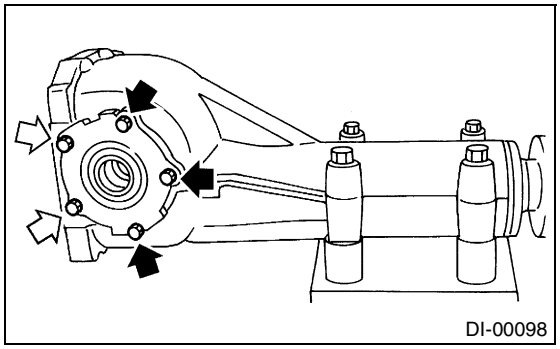


DI-00097

(A) Arrow mark

(5) Tighten the side bearing retainer bolts.

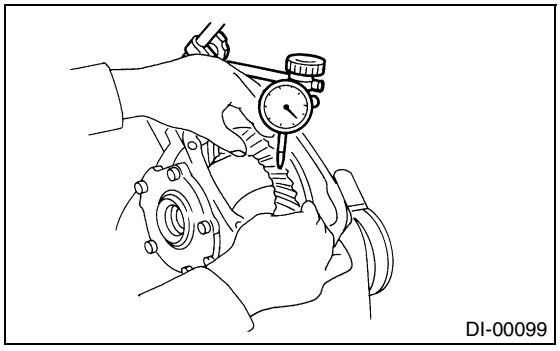
Tightening torque:
10.5 N·m (1.07 kgf-m, 7.7 ft-lb)


DI-00098

(6) Measure the crown gear-to-drive pinion backlash. Set the magnet base on differential carrier. Align the contact point of dial gauge with tooth face of crown gear, and move the crown gear while holding drive pinion still. Read the value indicated on dial gauge.
If the backlash is not within specification, adjust the side bearing retainer shim as follows.

• When backlash is more than 0.2 mm (0.0079 in): Reduce shim thickness of behind crown gear, and increase shim thickness of crown gear side.
• When backlash is less than 0.1 mm (0.0039 in): Increase shim thickness of behind crown gear, and reduce shim thickness of crown gear side.

Backlash:
0.10 — 0.20 mm (0.0039 — 0.0079 in)

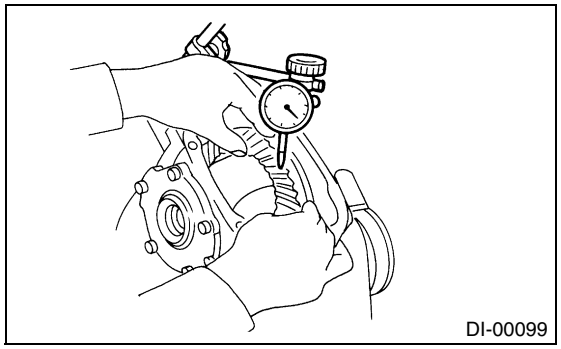

DI-00099

(7) At the same time, measure the turning resistance increase of drive pinion. Compared with the resistance when differential case is not installed, if the total preload is not within specification, adjust the thickness of side bearing retainer shims, increasing/reducing by an even amount at a time.

Turning resistance increase:
2.9 — 10.8 N (0.3 — 1.1 kgf, 0.7 — 2.4 lb)

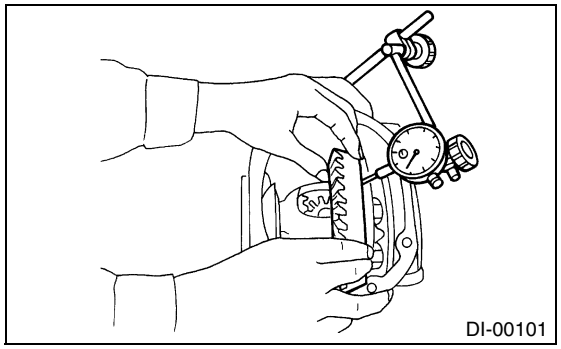
14) Re-check the crown gear-to-pinion backlash.

Backlash:
0.10 — 0.20 mm (0.0039 — 0.0079 in)


DI-00099

15) Check the crown gear runout on its back surface, and make sure that pinion and crown gear rotate smoothly.

Limit of runout:
Less than 0.05 mm (0.0020 in)


DI-00101

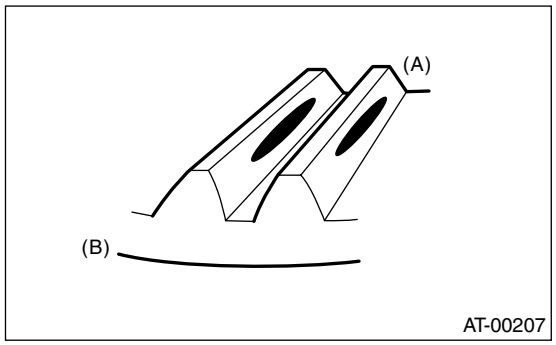
16) Checking and adjusting tooth contact of crown gear

(1) Apply an even coat of red lead on both sides of three or four teeth on the crown gear. Check the contact pattern after rotating the crown gear several revolutions back and forth until a definite contact pattern appears on the crown gear.
(2) When the contact pattern is incorrect, readjust according to the instructions given in “TOOTH CONTACT PATTERN”.

NOTE:
Be sure to wipe off red lead completely after adjustment is completed.

• Correct tooth contact

Checking item: Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. (When loaded, contact pattern moves toward heel)

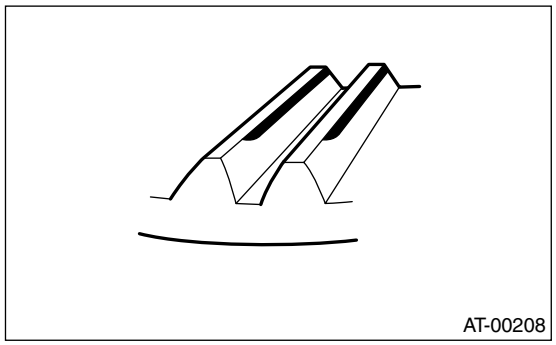


(A) Toe side
(B) Heel side

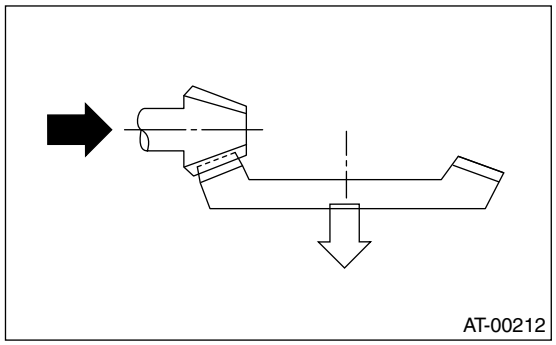
• Face contact

Checking item: Backlash is too large.

Contact pattern



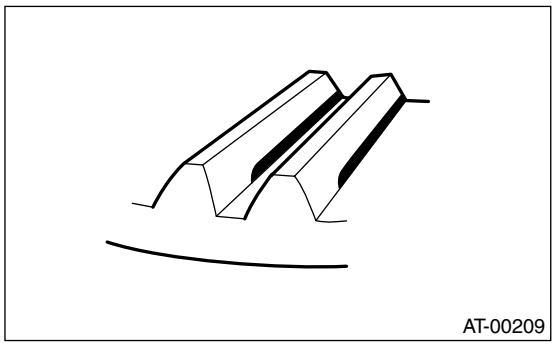
Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.



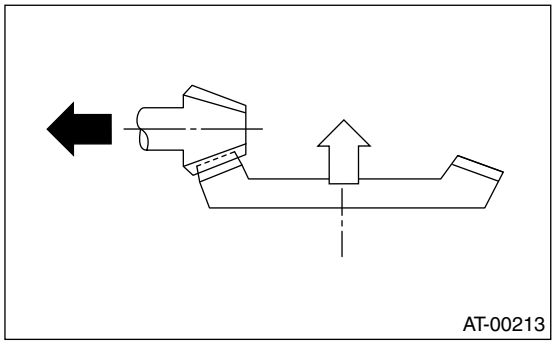
• Flank contact

Checking item: Backlash is too small.

Contact pattern



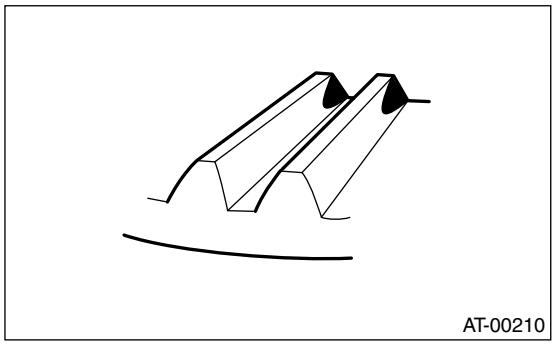
Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.



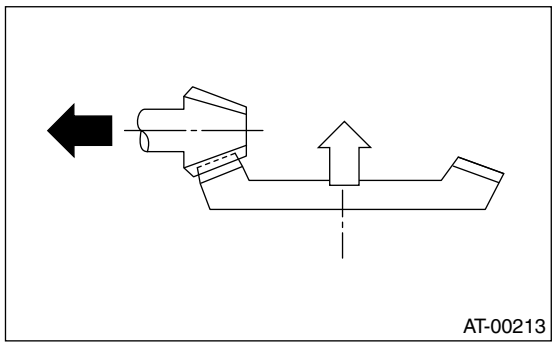
• Toe contact (Inside end contact)

Checking item: Contact area is small.

Contact pattern



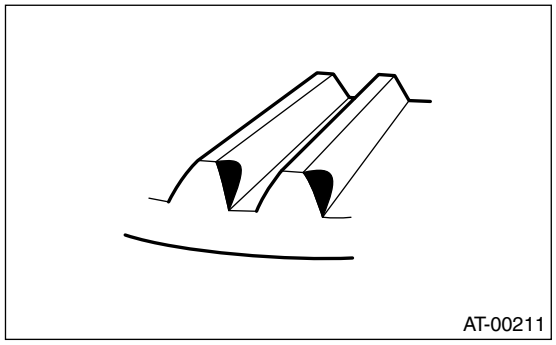
Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.



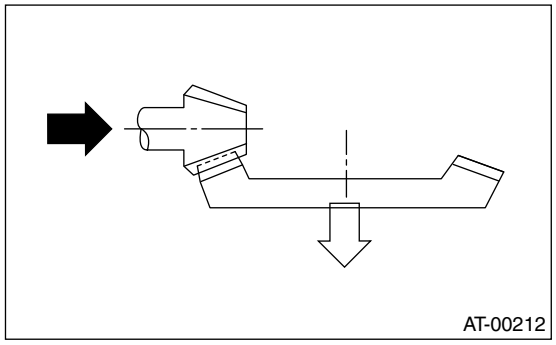
- Heel contact (Outside end contact)

Checking item: Contact area is small.

Contact pattern



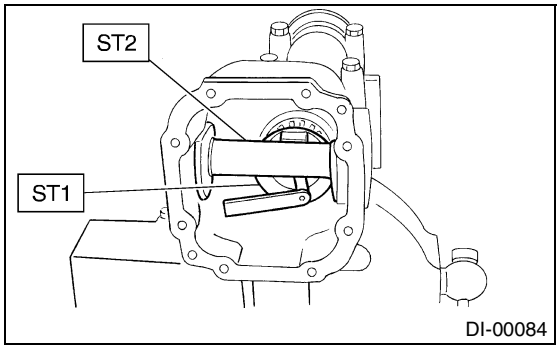
Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.



17) If proper tooth contact is not obtained, once again adjust the drive pinion height by changing RH and LH side bearing retainer shims and the hypoid gear backlash.

(1) Drive pinion height

ST1	398507702	DUMMY SHAFT
ST2	398507701	DIFFERENTIAL CARRIER GAUGE



T = To + N – (H x 0.01) – 0.20 (mm)

Where:

T = Thickness of pinion height adjusting shim (mm)

To = Thickness of shim temporarily inserted (mm)

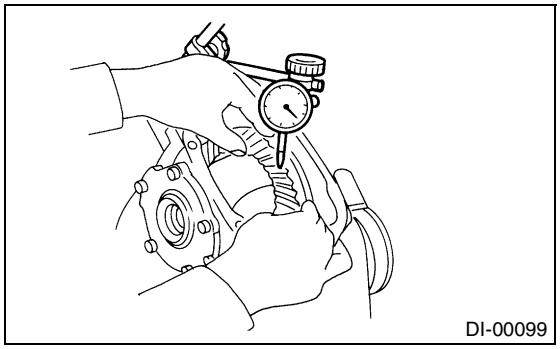
N = Reading of thickness gauge (mm)

H = Figure marked on drive pinion head

(2) Hypoid gear backlash

Backlash:

0.10 — 0.20 mm (0.0039 — 0.0079 in)

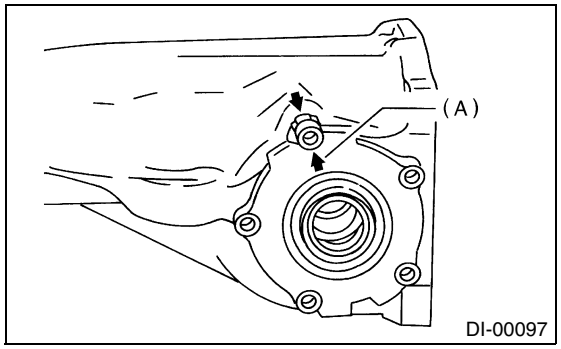


18) Remove the right and left side bearing retainers.

19) Install the right and left side bearing retainer, O-rings and side bearing retainer shims.

20) Install the oil seals to the right and left side bearing retainers.

21) Align the arrow mark on differential carrier with the mark on side retainer during installation.



(A) Arrow mark

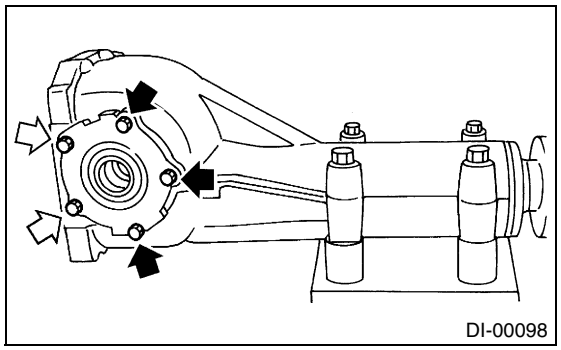
22) Tighten the side bearing retainer bolts.

Lock Tite:

THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:

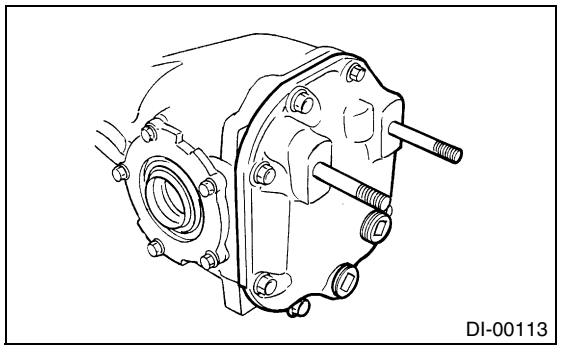
10.5 N·m (1.07 kgf-m, 7.7 ft-lb)



23) Install the new gasket and rear cover and tighten the bolts to specified torque.

Tightening torque:

29 N·m (3.0 kgf-m, 21.7 ft-lb)



E: INSPECTION

Wash all the disassembled parts clean, and examine them for wear, damage, or other defects. Repair or replace defective parts as necessary.

1) Crown gear and drive pinion

• If abnormal tooth contact is evident, find out the cause and adjust to give correct tooth contact at assembly. Replace the gear if excessively worn or incapable of adjustment.

• If crack, score, or seizure is evident, replace as a set. Slight damage of tooth can be corrected by oil stone or the like.

2) Bearing

Replace if seizure, peeling, wear, rust, dragging during rotation, abnormal noise or other defect is evident.

3) Oil seal

Replace if deformed or damaged, and at every disassembling.

4) Differential carrier

Replace if the bearing bores are worn or damaged.

5) Differential case

Replace if its sliding surfaces are worn or cracked.

6) Companion flange

Replace if the oil seal lip contacting surfaces have flaws.

7) Rear differential oil temperature sensor (Turbo model for Europe).

If the results of the following inspections are not satisfactory, replace rear differential temperature sensor.

(1) At room temperature, check for continuity between the sensor terminal and body.

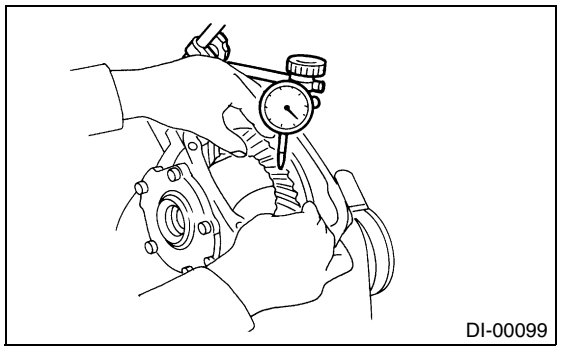
(2) Soak the sensor in oil, then raise the oil temperature. Check that the continuity is cut off when the oil temperature is between 144°C (291°F) and 156°C (313°F). Then, check that the continuity resumes by the time the oil temperature drops to 135°C (275°F).

1. CROWN GEAR BACKLASH

Using a dial gauge, check the backlash of the crown gear.

Crown gear backlash:
0.1 — 0.2 mm (0.004 — 0.008 in)

If the crown gear backlash is not within the specification, adjust the side bearing preload or repair if necessary.

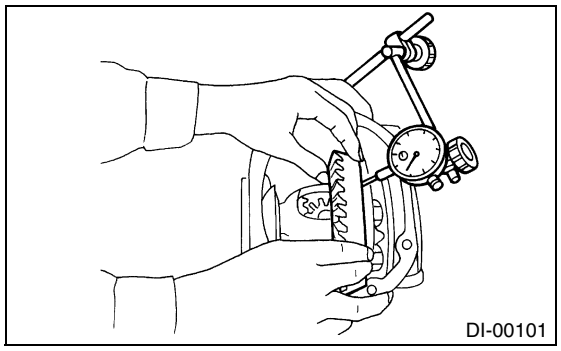


2. CROWN GEAR RUNOUT

Using a dial gauge, check the crown gear runout.

Crown gear runout:
Less than 0.05 mm (0.0020 in)

If the crown gear runout exceeds 0.05 mm (0.0020 in), replace the crown gear.



3. TOOTH CONTACT BETWEEN CROWN GEAR AND DRIVE PINION

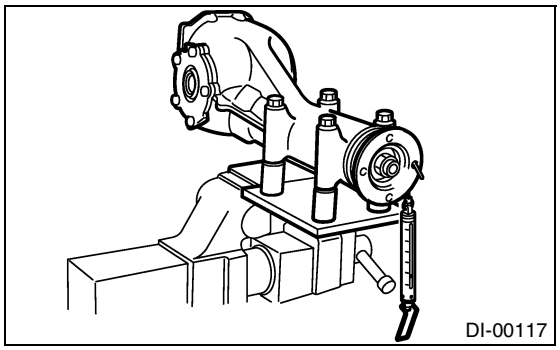
Inspect the tooth contact between crown gear and driven pinion. <Ref. to DI-29, ASSEMBLY, Rear Differential for T-type.>

4. TOTAL PRELOAD

Using a gauge, check the turning resistance increase.

Turning resistance increase:
2.9 — 10.8 N (0.3 — 1.1 kgf, 0.7 — 2.4 lb)

If the turning resistance increase is not within the specification, adjust the side bearing retainer shims.



F: ADJUSTMENT

1. CROWN GEAR BACKLASH

Adjust the crown gear backlash. <Ref. to DI-29, ASSEMBLY, Rear Differential for T-type.>

2. TOOTH CONTACT BETWEEN CROWN GEAR AND DRIVE PINION

Adjust the tooth contact between crown gear and drive pinion gear. <Ref. to DI-29, ASSEMBLY, Rear Differential for T-type.>

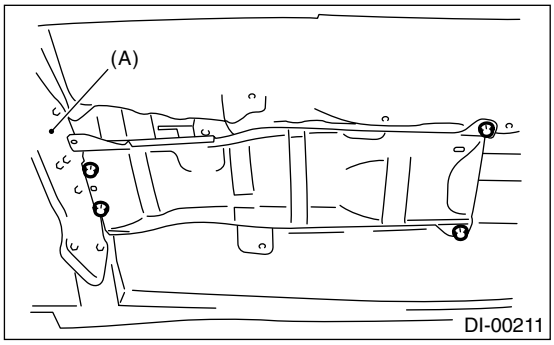
3. TOTAL PRELOAD

Adjust the side bearing shim. <Ref. to DI-29, ASSEMBLY, Rear Differential for T-type.>

5. Rear Differential for VA-type

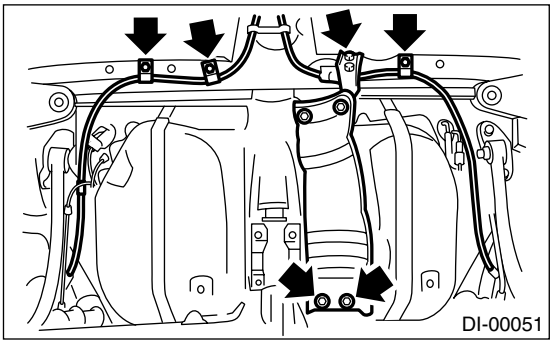
A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Move the select lever or gear shift lever to “N”.
4) Release the parking brake.
5) Loosen the wheel nuts.
6) Jack-up the vehicle and support it with sturdy racks.
7) Remove the wheels.
8) Remove the rear exhaust pipe and muffler. <Ref. to EX(SOHC)-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-13, REMOVAL, Muffler.>
9) Remove the heat shield cover. (if equipped)

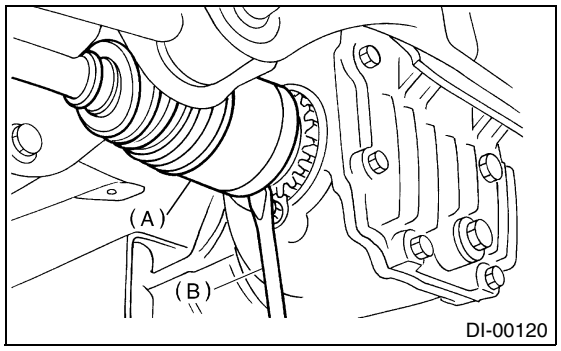


(A) Transmission mounting

10) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
11) Remove the clamps and bracket of parking brake cable.

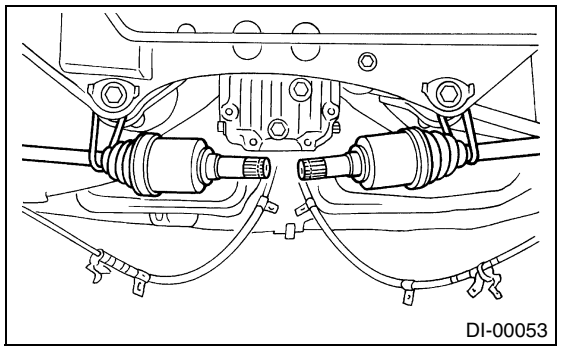


12) Remove the DOJ of rear drive shaft from rear differential.<Ref. to DI-56, REPLACEMENT, Rear Differential Side Oil Seal.>

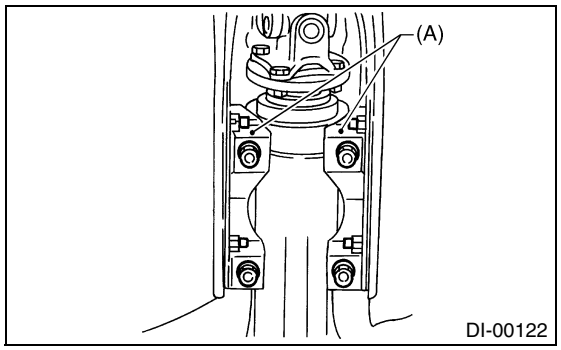


(A) DOJ
(B) Tire lever

13) Secure the rear drive shaft to rear crossmember using wire.

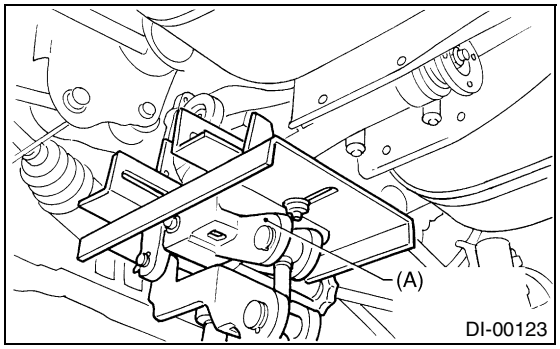


14) Remove the lower differential bracket.



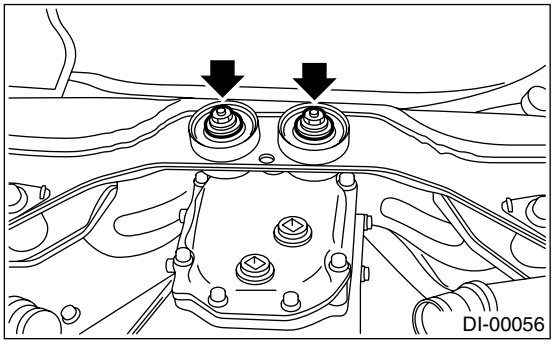
(A) Lower differential bracket

15) Support the rear differential with transmission jack.



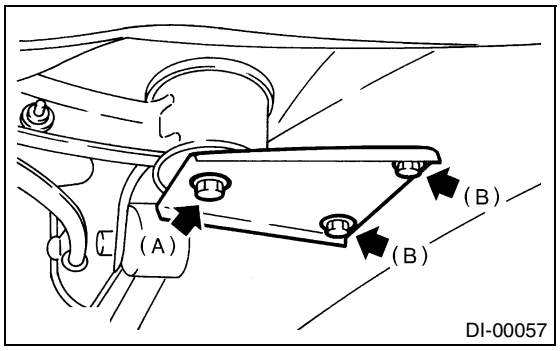
(A) Transmission jack

16) Remove the self-locking nuts and bolts.



17) Remove the bolts which secure rear differential front member to bolts B.

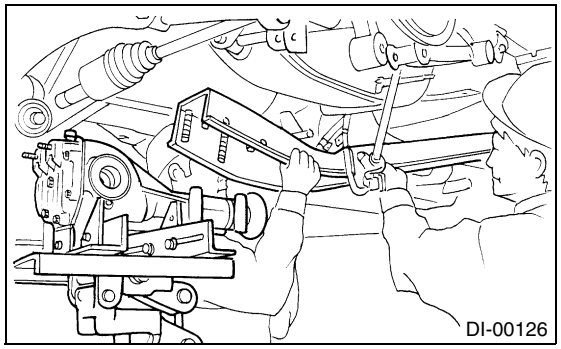
NOTE:
Support the front member with use of a helper to prevent it from dropping.



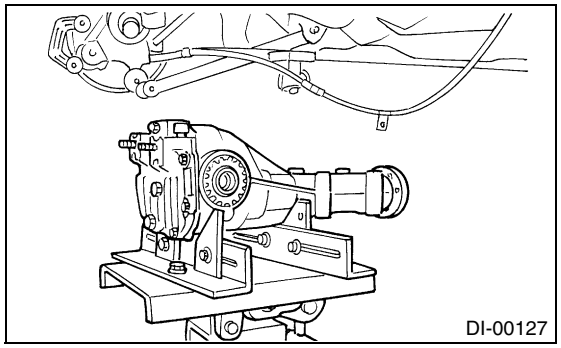
(A) Bolt A
(B) Bolt B

18) Remove the bolt A.
19) While slowly lowering the transmission jack, move the rear differential forward and remove bolts from front member.

20) Remove the front member from body.



21) Remove the rear differential from front member.



B: INSTALLATION

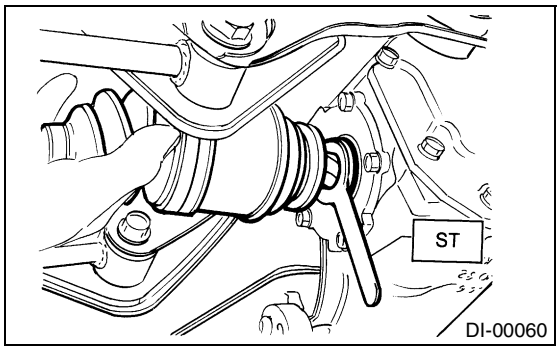
Install in the reverse order of removal.

1) Position the front member on body by passing it under the parking brake cable and securing to rear differential.

NOTE:
When installing the rear differential front member, do not confuse the installation sequence of the upper and lower stoppers.

2) Install the DOJ of rear drive shaft into rear differential. <Ref. to DI-56, REPLACEMENT, Rear Differential Side Oil Seal.>

ST 28099PA090 SIDE OIL SEAL PROTECTOR



3) Install in the reverse order of removal.

4) After installation, fill the differential carrier with gear oil to the upper plug level. <Ref. to DI-23, Front Differential.>

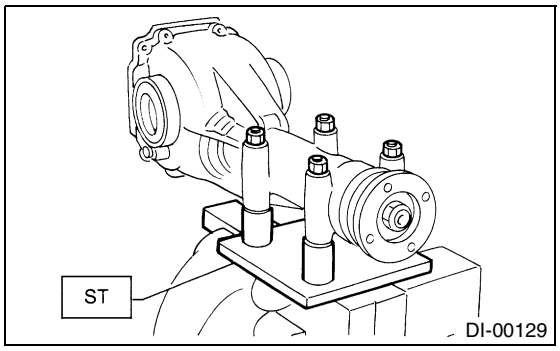
C: DISASSEMBLY

To detect the real cause of trouble, inspect the following items before disassembling.

- Tooth contact of crown gear and pinion, and backlash
- Turning resistance of drive pinion

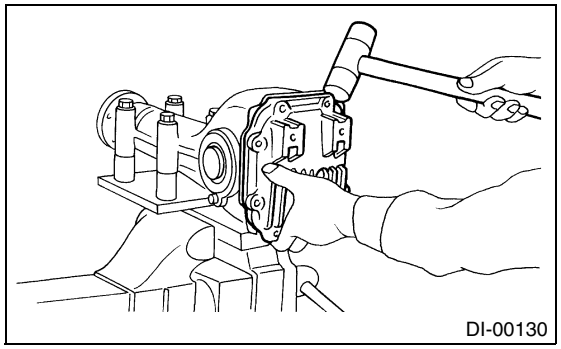
1) Set the ST on vise and install the differential assembly to ST.

ST 398217700 ATTACHMENT



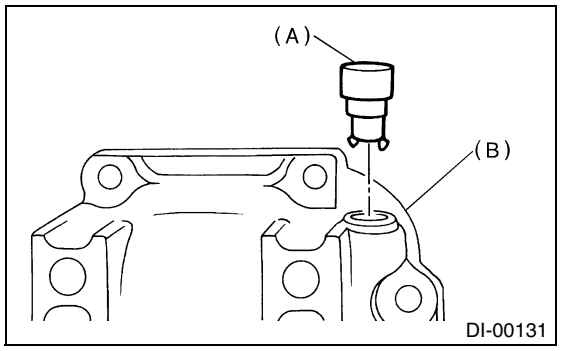
2) Drain the gear oil by removing the plug.

3) Remove the rear cover by loosening the retaining bolts.



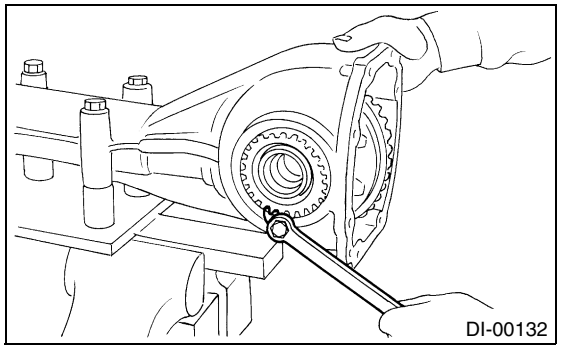
4) Replace the air breather cap.

NOTE:
Do not attempt to replace the air breather cap unless necessary.

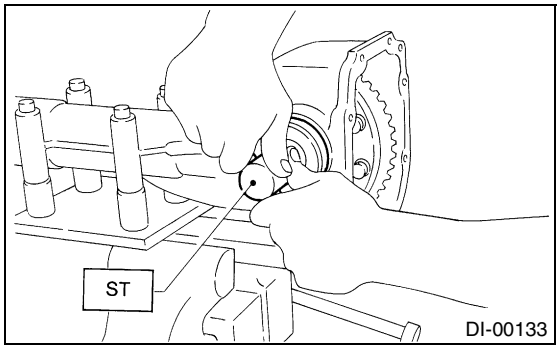


(A) Air breather cap
(B) Rear cover

5) Remove the right and left lock plates.

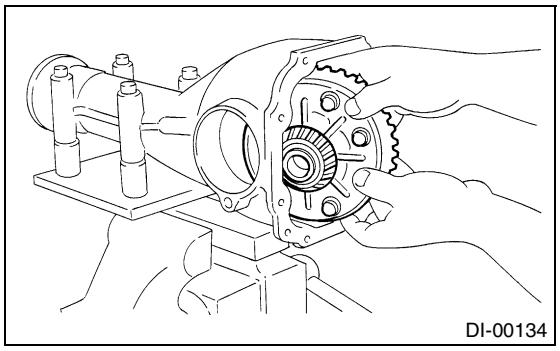


6) Remove the right and left holders with ST.
ST 399780111 OIL SEAL HOLDER WRENCH

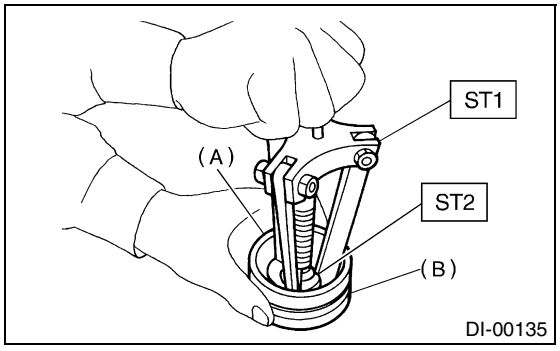


7) Pull out the differential assembly from differential case.

NOTE:
Be careful not to hit the teeth against the case.

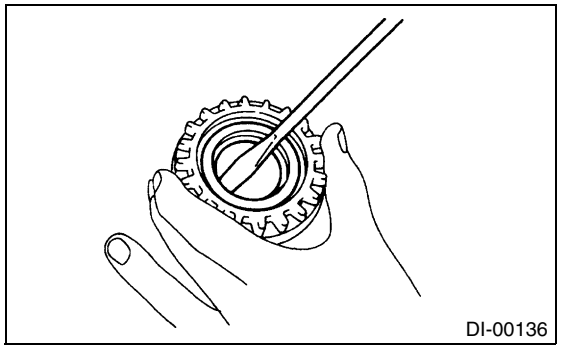


8) Remove the bearing race from right and left holders with ST1 and ST2.
ST1 499705401 PULLER ASSY
ST2 499705404 SEAT



(A) Bearing race
(B) Holder

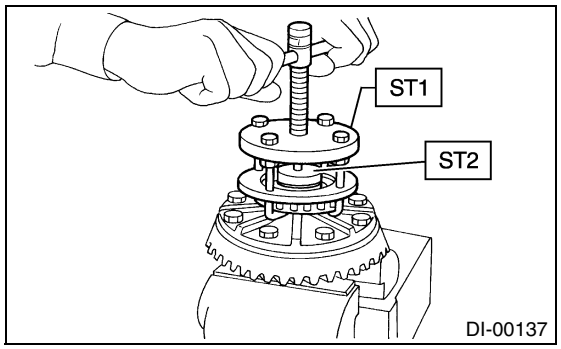
9) Remove the oil seal from right and left holders using screwdriver.



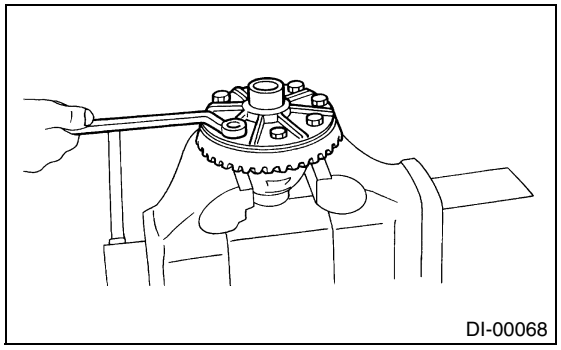
10) Extract the bearing cone with ST1 and ST2.

NOTE:
• Do not attempt to disassemble the parts unless necessary.
• Set the Puller so that its claws catch the edge of bearing cone.
• Never mix up the right and left hand bearing races and cones.

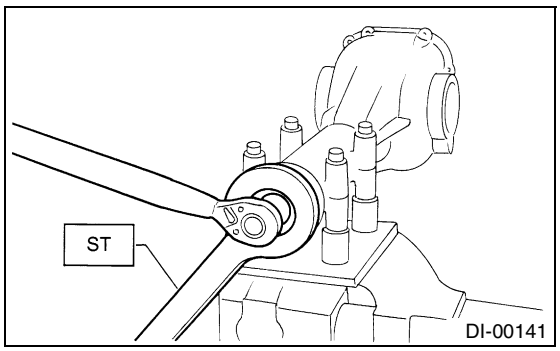
ST1 899524100 PULLER SET
ST2 399520105 SEAT



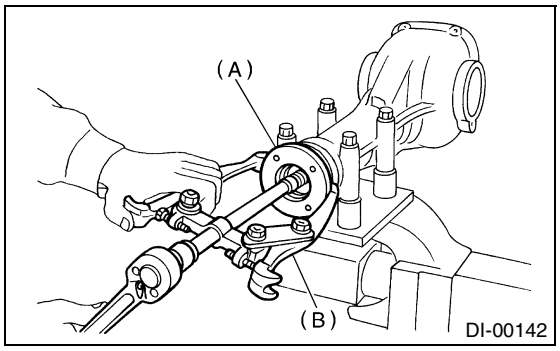
11) Remove the crown gear by loosening the crown gear bolts.



12) Hold the companion flange with ST and remove the self-locking nut.
ST 498427200 FLANGE WRENCH



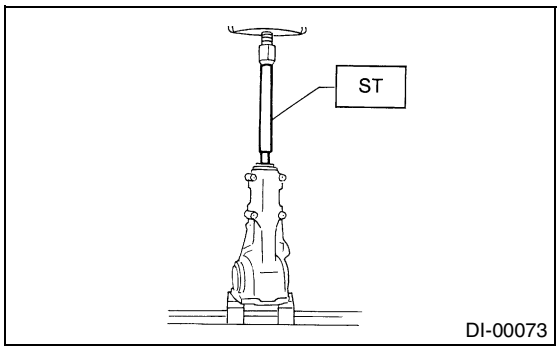
13) Extract the companion flange with a puller.



(A) Companion
(B) Puller

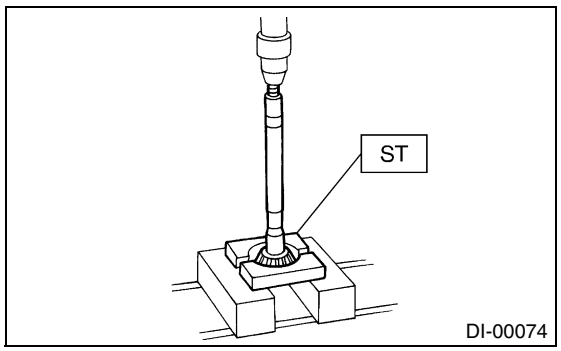
14) Press the end of drive pinion shaft and extract it together with the rear bearing cone, preload adjusting spacer and washer.

NOTE:
Hold the drive pinion so as not to drop it.
ST 398467700 DRIFT

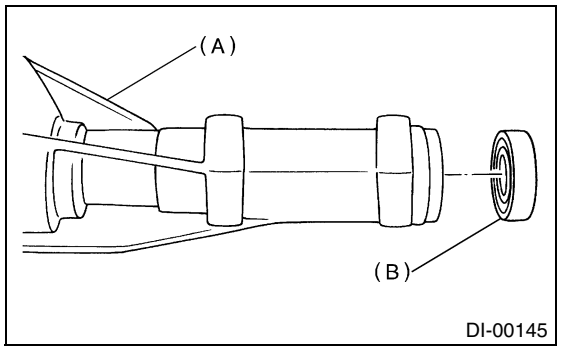


15) Remove the rear bearing cone from drive pinion by supporting the cone with ST.

NOTE:
Place the replacer so that its center-recessed side faces the pinion gear.
ST 498515500 REAR REPLACER

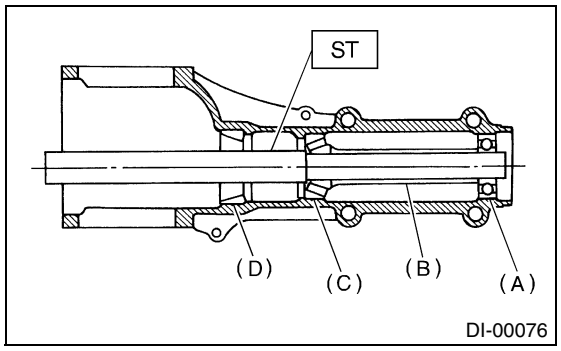


16) Remove the front oil seal from differential carrier using ST.
ST 398527700 PULLER SET



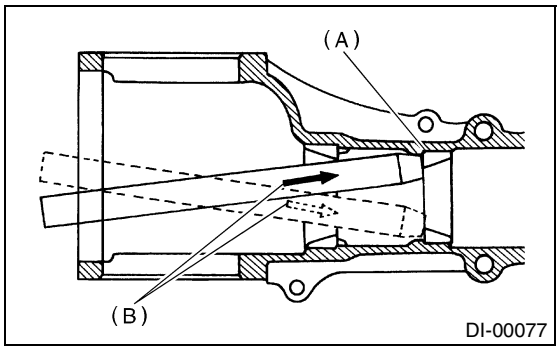
(A) Differential carrier
(B) Front oil seal

17) Remove the pilot bearing together with front bearing cone and spacer using ST.
ST 398467700 DRIFT



(A) Pilot bearing
(B) Spacer
(C) Front bearing
(D) Rear bearing cup

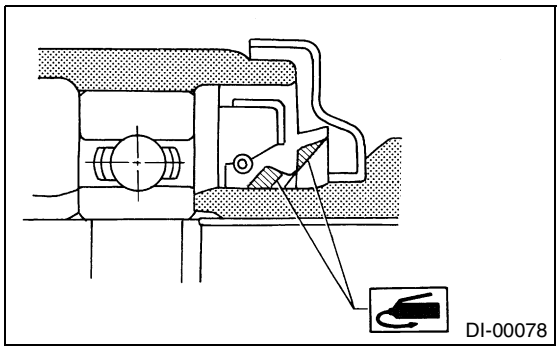
18) When replacing the bearings, tap the front bearing cup and rear bearing cup in this order out of case by using a brass bar.



(A) 2 cutouts along diagonal lines
(B) Tap alternately with brass bar.

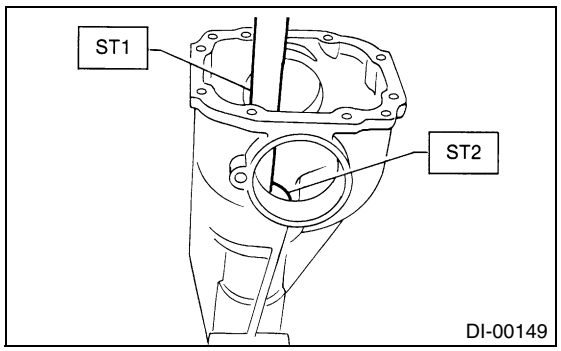
D: ASSEMBLY

NOTE:
Precautions for assembling
- Assemble in the reverse order of disassembly.
- Use a new gasket.
- Check and adjust each part during assembly.
- Keep the shims and washers in order, so that they are not improperly installed.
- Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
- Apply gear oil when installing the bearings and thrust washers.
- Be careful not to mix up the right and left hand races of the bearings.
- Replace the oil seal with a new one at every disassembly. Apply chassis grease between the lips when installing the oil seal.
- Be careful to install the differential oil seal to proper side.



1) Adjust preload for front and rear bearings.
Adjust the bearing preload with spacer and washer between front and rear bearings. Pinion height adjusting washer are not affected by this adjustment. The adjustment must be carried out without oil seal inserted.

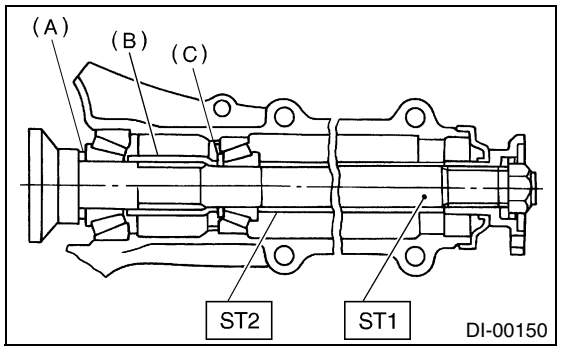
(1) Press the rear bearing race into differential carrier using ST1 and ST2.
ST1 398477701 HANDLE
ST2 398477702 DRIFT



(2) Insert the ST1 into case with pinion height adjusting shim and rear bearing cone fitted onto it.

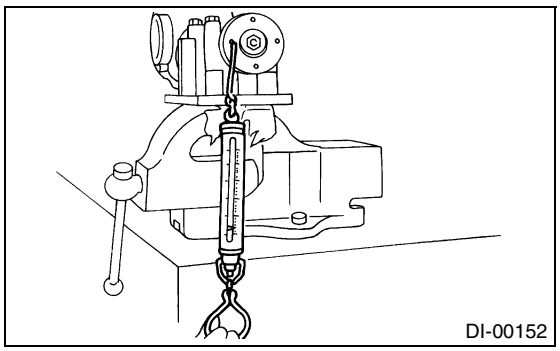
NOTE:
- If the tooth contact (drive pinion, driven gear) is not wrong at inspection before disassembly, re-use the used washer after confirming that the washer is not damaged.
- Use a new rear bearing cone.

(3) Then install the preload adjusting spacer and washer, front bearing cone, ST2, companion flange, and washer and self-locking nut.
ST1 498447150 DUMMY SHAFT
ST2 32285AA000 DUMMY COLLAR



(A) Pinion height adjusting shim
(B) Preload adjusting spacer
(C) Preload adjusting washer

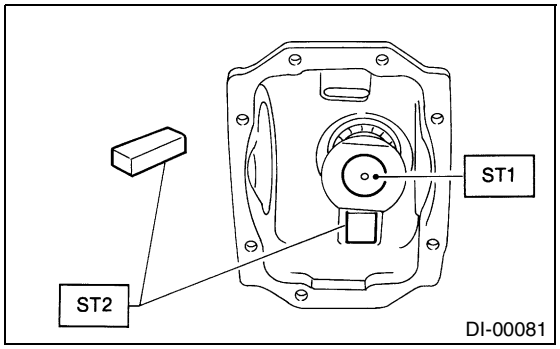
(4) Turn the ST1 with hand to make it seated, and tighten the drive pinion nut while measuring the preload with spring balance. Select the preload adjusting washer and spacer so that the specified preload is obtained when nut is tightened to the specified torque.



NOTE:
- Use a new self-locking nut.
- Be careful not to give excessive preload.
- Measure the preload in direction of tangent to flange.
- When tightening the drive pinion nut, lock ST1 with ST2 as shown in the figure.

ST1 398507704 BLOCK
ST2 498447150 DUMMY SHAFT

Tightening torque:
188 N·m (19.2 kgf-m, 139 ft-lb)



Front and rear bearing preload
For new bearing: 12.7 — 32.2 N (1.3 — 3.3 kgf, 2.9 — 7.3 lb) at companion flange bolt hole

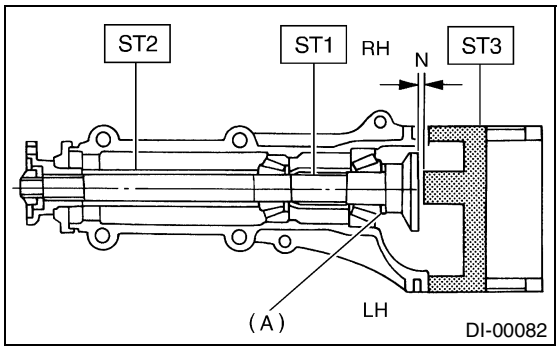
	Part No.	Thickness mm (in)
Preload adjusting washer	38336AA000	1.500 (0.0591)
	38336AA120	1.513 (0.0596)
	38336AA010	1.525 (0.0600)
	38336AA130	1.538 (0.0606)
	38336AA020	1.550 (0.0610)
	38336AA140	1.563 (0.0615)
	38336AA030	1.575 (0.0620)
	38336AA150	1.588 (0.0625)
	38336AA040	1.600 (0.0630)
	38336AA160	1.613 (0.0635)
	38336AA050	1.625 (0.0640)
	38336AA170	1.638 (0.0645)
	38336AA060	1.650 (0.0650)
	38336AA180	1.663 (0.0655)
	38336AA070	1.675 (0.0659)
	38336AA190	1.688 (0.0665)
	38336AA080	1.700 (0.0669)
	38336AA200	1.713 (0.0674)
	38336AA090	1.725 (0.0679)
	38336AA210	1.738 (0.0684)
	38336AA100	1.750 (0.0689)
	38336AA220	1.763 (0.0694)
	38336AA110	1.775 (0.0699)
	Part No.	Length mm (in)
Preload adjusting spacer	32288AA040	52.3 (2.059)
	32288AA050	52.5 (2.067)
	31454AA100	52.6 (2.071)
	32288AA060	52.7 (2.075)
	31454AA110	52.8 (2.079)
	32288AA070	52.9 (2.083)
	31454AA120	53.0 (2.087)
	32288AA080	53.1 (2.091)
	32288AA090	53.3 (2.098)

2) Adjusting drive pinion height
Adjust the drive pinion height with shim installed between the rear bearing cone and back of pinion gear.

(1) Do not remove the ST1, ST2 and ST3 out of position after adjusting pinion bearing preload in previous step.

NOTE:
At this time, install the pinion height adjusting shim which is temporarily selected or same as that used before.

ST1 498447150 DUMMY SHAFT
ST2 32285AA000 DUMMY COLLAR
ST3 498505501 DIFFERENTIAL CARRIER GAUGE

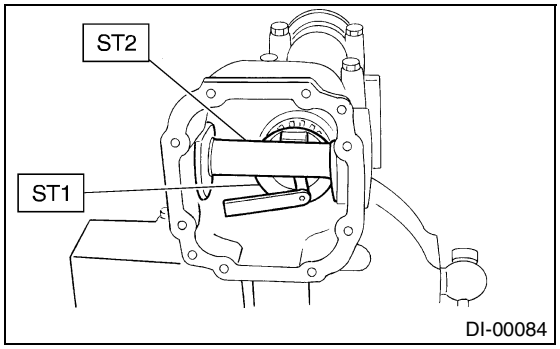


(A) Pinion height adjusting shim

(2) Measure the clearance N between the end of ST3 and end surface of ST1 by using a thickness gauge.

NOTE:
Make sure there is no clearance between the case and ST3.

ST1 498447150 DUMMY SHAFT
ST2 498505501 DIFFERENTIAL CARRIER GAUGE



(3) Obtain the thickness of pinion height adjusting washer to be inserted from the following formula, and replace the temporarily installed shim with this one.

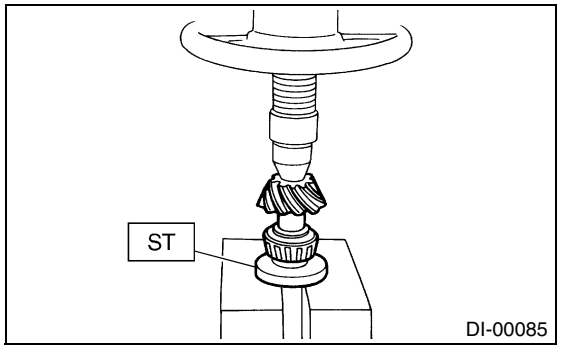
NOTE:
Use 1 to 3 shims as required for adjustment.

T = To + N − 0.05 (mm)
where
T = Thickness of pinion height adjusting shim (mm)
To = Thickness of shim originally installed (mm)
N = Reading of thickness gauge (mm)
H = Figure marked on drive pinion head
(Example of calculation)
To = 0.15 mm
N = 0.1 mm
T = 0.15 + 0.1 − 0.05 = 0.2 mm
Result: Thickness = 0.2 mm
Therefore use the 32295AA220.

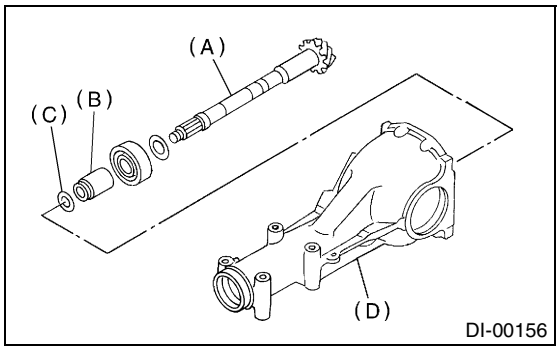
Pinion height adjusting shim	
Part No.	Thickness mm (in)
32295AA200	0.150 (0.0059)
32295AA210	0.175 (0.0069)
32295AA220	0.200 (0.0079)
32295AA230	0.225 (0.0089)
32295AA240	0.250 (0.0098)
32295AA250	0.275 (0.0108)

3) Install the selected pinion height adjusting shim on drive pinion, and press the rear bearing cone into position with ST.

ST 498175500 INSTALLER

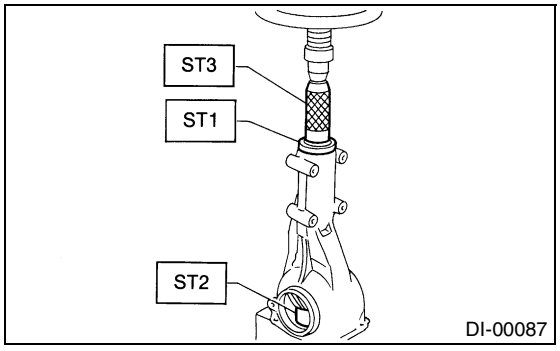


4) Insert the drive pinion into differential carrier, install the previously selected bearing preload adjusting spacer and washer.

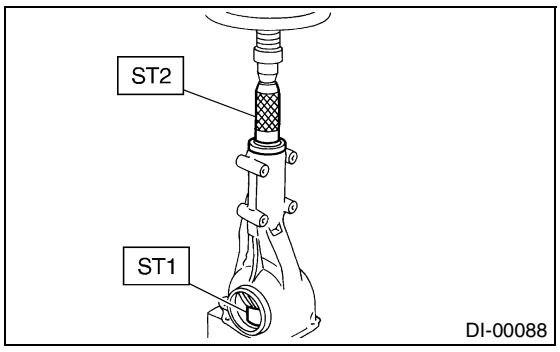


(A) Drive pinion
(B) Bearing preload adjusting spacer
(C) Bearing preload adjusting washer
(D) Differential carrier

5) Press-fit the front bearing cone into carrier with ST1, ST2 and ST3.
ST1 32285AA000 DUMMY COLLAR
ST2 399780104 WEIGHT
ST3 899580100 INSTALLER



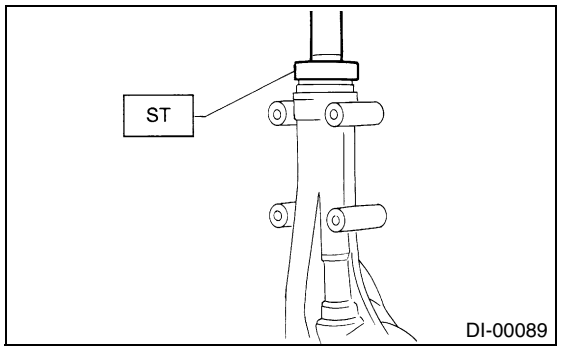
6) Insert the spacer, then press-fit the pilot bearing with ST1 and ST2.
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER



7) Fit a new oil seal with ST.

NOTE:
• Press-fit until the end of oil seal is 1 mm (0.04 in) inward from end of carrier.
• Apply grease between the oil seal lips.

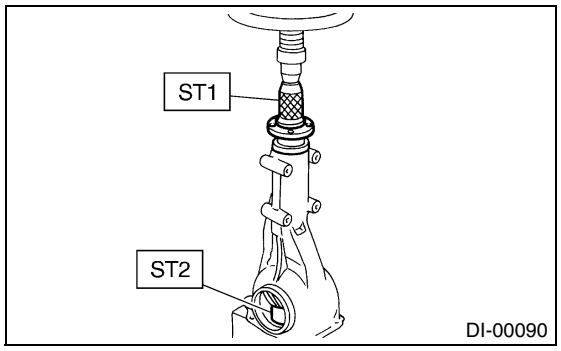
ST 498447120 INSTALLER



8) Press-fit the companion flange with ST1 and ST2.

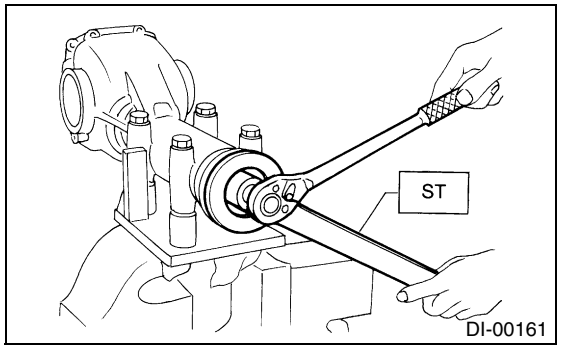
NOTE:
Be careful not to damage the bearing.

ST1 899874100 INSTALLER
ST2 399780104 WEIGHT



9) Install the self-locking nut. Then tighten it with the ST.
ST 498427200 FLANGE WRENCH

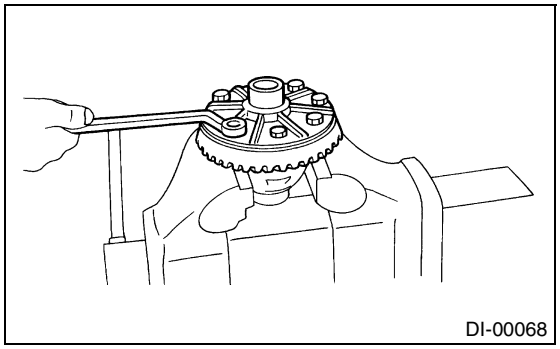
Tightening torque:
188 N·m (19.2 kgf-m, 139 ft-lb)



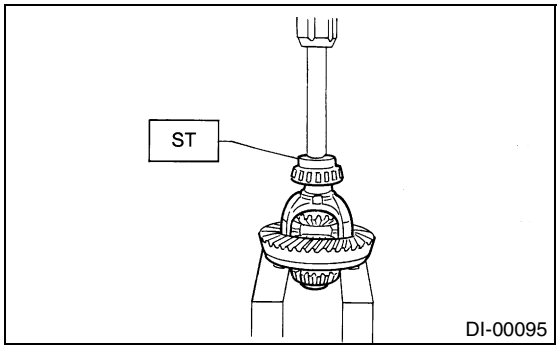
10) Install the crown gear on differential case.

NOTE:
Tighten diagonally while tapping the bolt heads.

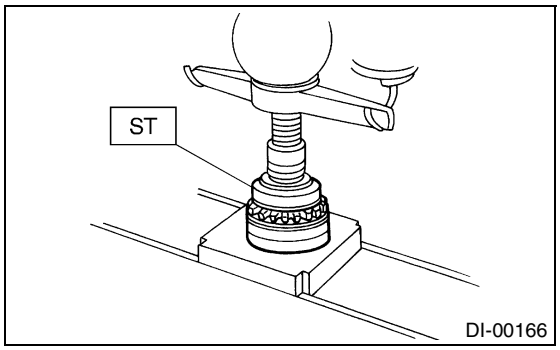
Tightening torque:
62 N·m (6.3 kgf-m, 45.6 ft-lb)



11) Press the side bearing cone onto differential case with ST.
ST 498485400 DRIFT

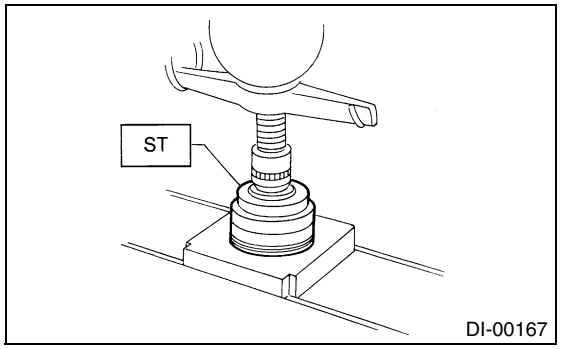


12) Assemble holders.
(1) Install the oil seal into right and left holders.
ST 498447100 INSTALLER

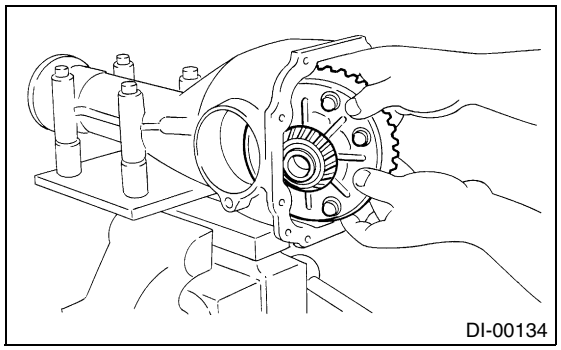


(2) Install the bearing race into right and left holders.
ST 398477702BEARING OUTER RACE DRIFT

CAUTION:
Make sure that the oil seal, bearing outer race and cone are properly assembled.

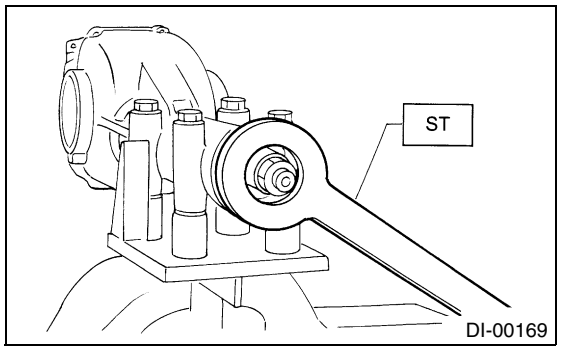


(3) Install the differential case assembly into differential carrier in the reverse order of disassembly.



(4) Temporarily tighten the side holders.

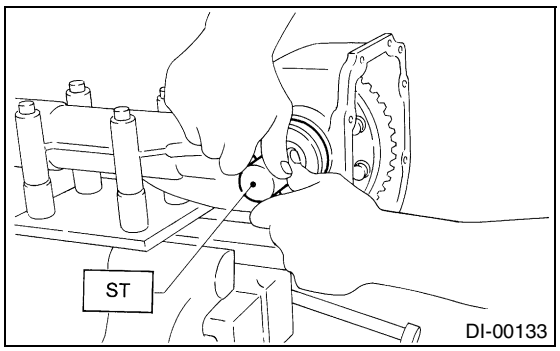
13) Perform the backlash adjustment of pinion crown gear set and preload adjustment of differential side bearing.
(1) Turn the drive pinion with ST for better fitting of differential side bearing.
ST 498427200 FLANGE WRENCH



(2) Screw in the side (left-side) holder until light contact is made with ST.

ST 399780111OIL SEAL HOLDER WRENCH

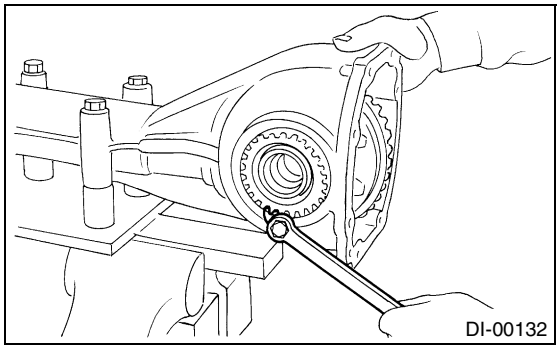
NOTE:
• Be careful to install the differential oil seal to proper side.
• Do not install the O-ring.



(3) Back off the driven gear side holder approx. 1 1/2 teeth of holder, and tighten the opposite side holder by approx. 2 teeth (approx. 1 1/2 + 1/2 teeth). [Back off amount of driven gear side holder (approx. 1 1/2 teeth) + 1/2 tooth.] This + 2 tooth gives preload.

(4) Temporarily tighten the lock plate.

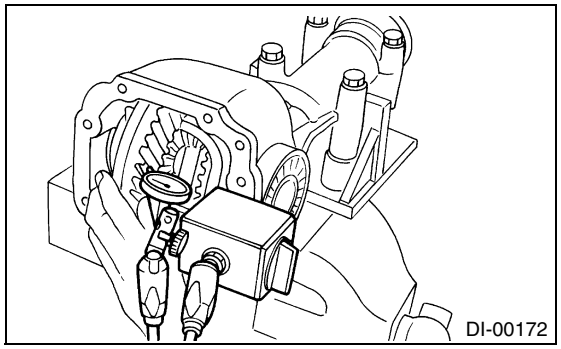
NOTE:
If the positions of lock plate and tooth are not aligned, turn over the lock plate to displace the holder 1/2 tooth.



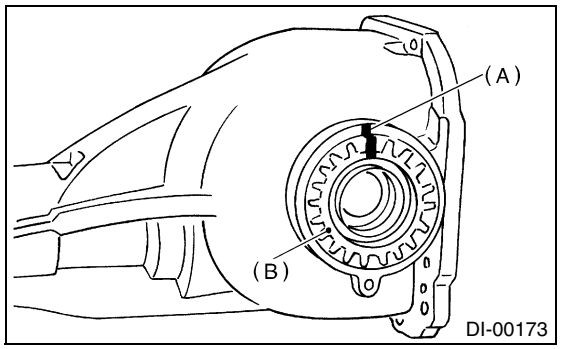
(5) Measure the crown gear-to-drive pinion backlash. Set the magnet base on differential carrier. Align the contact point of dial gauge with tooth face of crown gear, and move the crown gear while holding drive pinion still. Read the value indicated on dial gauge.

NOTE:
If measured backlash is not within specified range, repeat the procedures for pinion crown gear set backlash adjustment and differential side bearing preload adjustment.

Backlash:
0.10 — 0.15 mm (0.0039 — 0.0059 in)



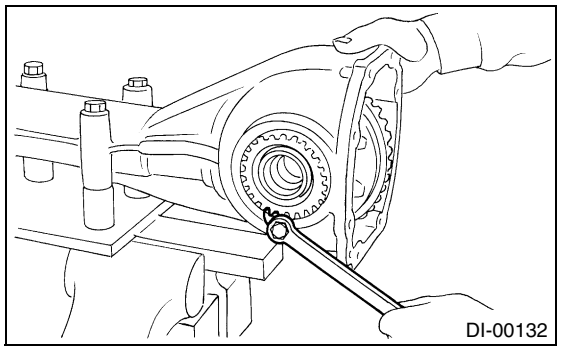
14) Draw a matching mark on both differential carrier and holder. Remove the holder one side at a time.
Replace in the original position after inserting an O-ring and applying grease to threaded portion.



(A) Matching mark
(B) Holder

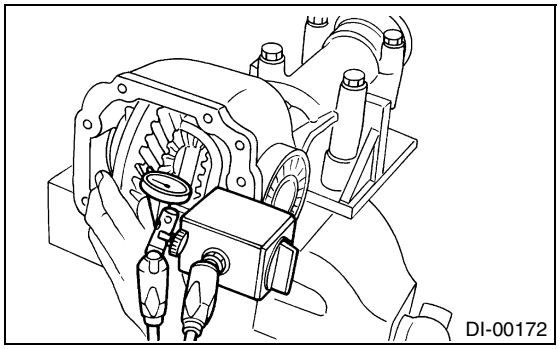
15) Tighten the bolt of lock plate to specified torque.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



16) Re-check the crown gear-to-pinion backlash.

Backlash:
0.10 — 0.15 mm (0.0039 — 0.0059 in)

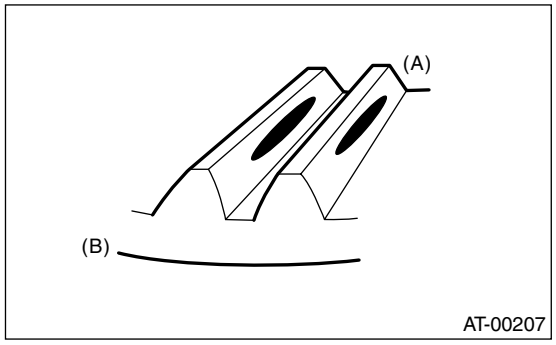


17) Checking and adjusting tooth contact of crown gear.
(1) Apply an even coat of red lead on both sides of three or four teeth on the crown gear. Check the contact pattern after rotating the crown gear several revolutions back and forth until a definite contact pattern appears on the crown gear.
(2) When the contact pattern is incorrect, readjust according to the instructions given in "TOOTH CONTACT PATTERN".

NOTE:
Be sure to wipe off red lead completely after adjustment is completed.

- Correct tooth contact

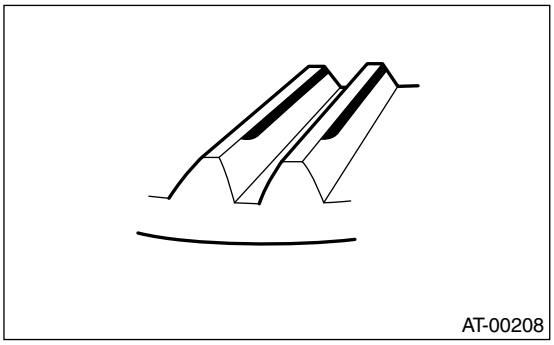
Checking item: Tooth contact pattern is slightly shifted toward to under no-load rotation. (When loaded, contact pattern moves toward heel.)



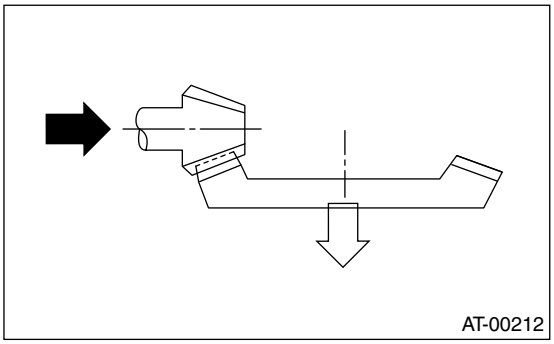
(A) Toe side
(B) Heel side

- Face contact

Checking item: Backlash is too large.
Contact pattern

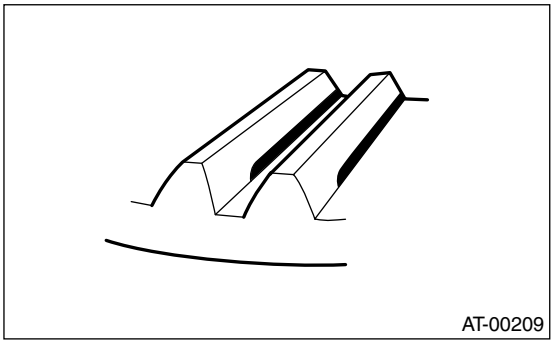


Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.

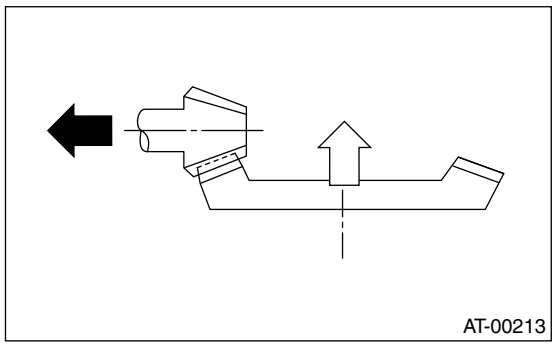


- Flank contact

Checking item: Backlash is too small.
Contact pattern

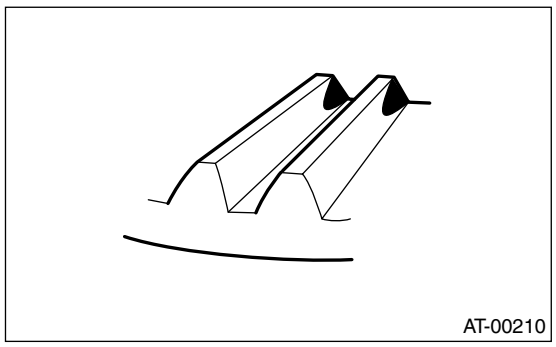


Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.

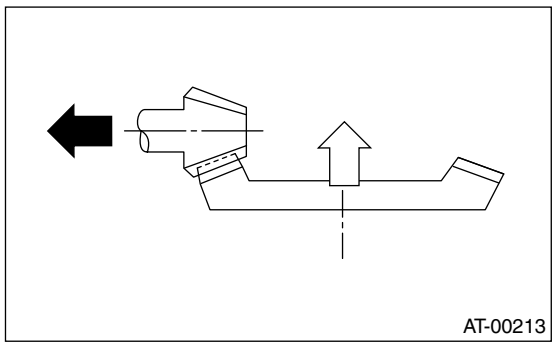


- Toe contact (Inside end contact)

Checking item: Contact area is small.
Contact pattern

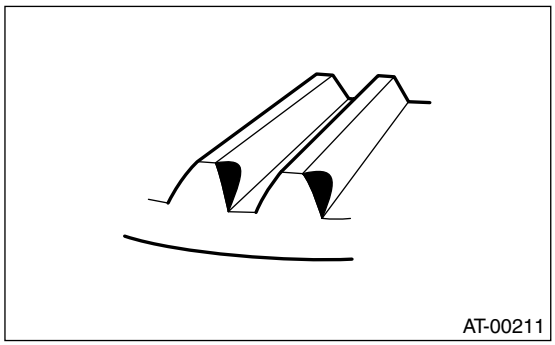


Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.

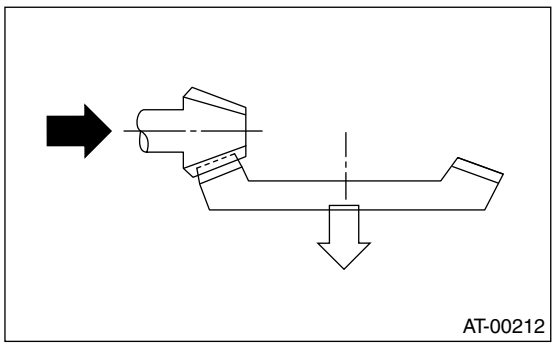


- Heel contact (Outside end contact)

Checking item: Contact area is small.
Contact pattern

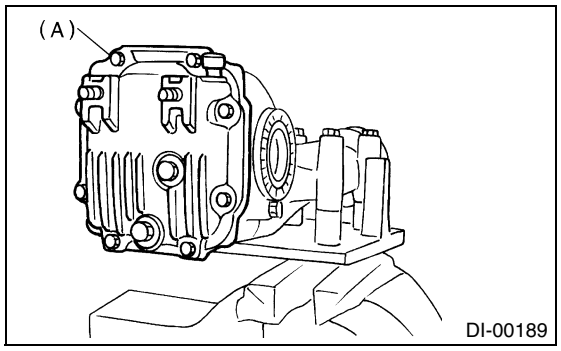


Corrective action: Increase thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.



18) If proper tooth contact is not obtained, once again adjust the drive pinion height and the differential side bearing preload (already mentioned) and the hypoid gear backlash.
19) Install a new gasket and rear cover to differential carrier, and tighten the bolts to specified torque.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Rear cover

E: INSPECTION

Wash all the disassembled parts clean, and examine them for wear, damage, or other defects. Repair or replace defective parts as necessary.
1) Crown gear and drive pinion

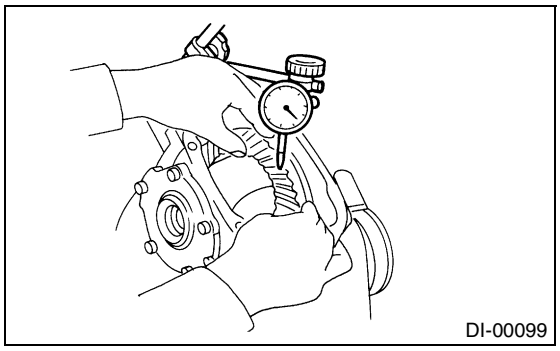
• If abnormal tooth contact is evident, find out the cause and adjust to give correct tooth contact at assembly. Replace the gear if excessively worn or incapable of adjustment.
• If crack, score, or seizure is evident, replace as a set. Slight damage of tooth can be corrected by oil stone or the like.
2) Bearing
Replace if seizure, peeling, wear, rust, dragging during rotation, abnormal noise or other defect is evident.
3) Oil seal
Replace if deformed or damaged, and at every disassembling.
4) Differential carrier
Replace if the bearing bores are worn or damaged.
5) Differential case
Replace if its sliding surfaces are worn or cracked.
6) Companion flange
Replace if the oil seal lip contacting surfaces have flaws.

1. CROWN GEAR BACKLASH

Using a dial gauge, check the backlash of the crown gear.

Crown gear backlash:
0.10 — 0.15 mm (0.0039 — 0.0059 in)

If the crown gear backlash is not within the specification, adjust the side bearing preload or repair if necessary.



2. TOOTH CONTACT BETWEEN CROWN GEAR AND DRIVE PINION

Inspect the tooth contact between crown gear and drive pinion.
<Ref. to DI-45, ASSEMBLY, Rear Differential for VA-type.>

F: ADJUSTMENT

1. CROWN GEAR BACKLASH

Adjust the crown gear backlash. <Ref. to DI-45, ASSEMBLY, Rear Differential for VA-type.>

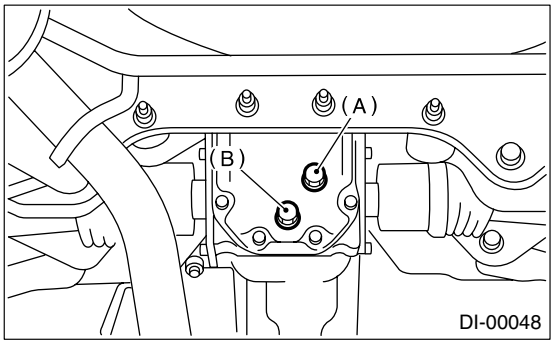
2. TOOTH CONTACT BETWEEN CROWN GEAR AND DRIVE PINION

Adjust the tooth contact between crown gear and drive pinion gear. <Ref. to DI-45, ASSEMBLY, Rear Differential for VA-type.>

6. Rear Differential Front Oil Seal

A: REPLACEMENT

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Move the select lever or gear shift lever to “N”.
4) Release the parking brake.
5) Remove the oil drain plug, and drain the gear oil.



(A) Filler plug
(B) Drain plug

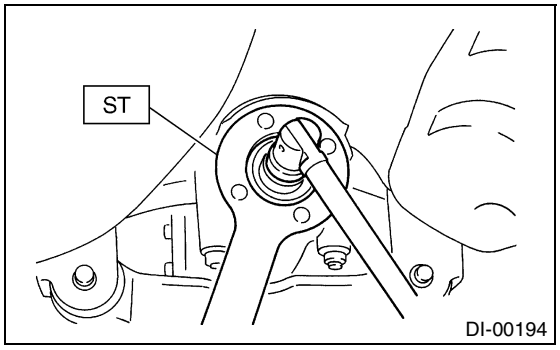
6) Install the oil drain plug.

NOTE:
- Apply fluid packing to the drain plug for T-type.
- Use a new aluminum gasket for VA-type.

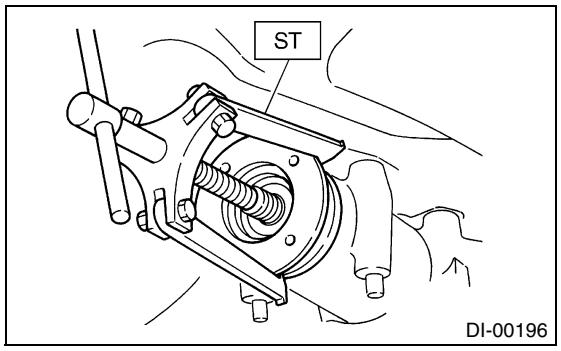
Fluid packing:
THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:
T-type
49 N·m (5.0 kgf-m, 36.2 ft-lb)
VA-type
34 N·m (3.5 kgf-m, 25.3 ft-lb)

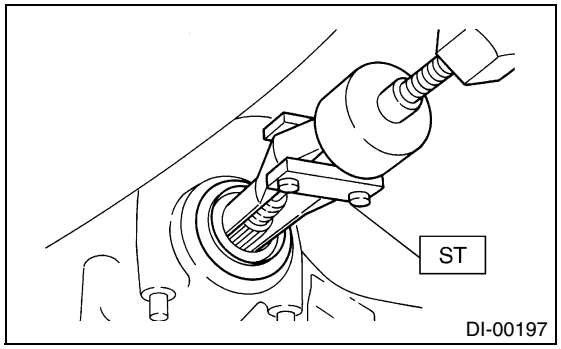
7) Jack-up the rear wheels and support the vehicle body with sturdy racks.
8) Remove the rear exhaust pipe and muffler.
9) Remove the propeller shaft from body. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
10) Remove the self-locking nut while holding the companion flange with ST.
ST 498427200 FLANGE WRENCH



11) Extract the companion flange using ST.
ST 399703600 PULLEY ASSY

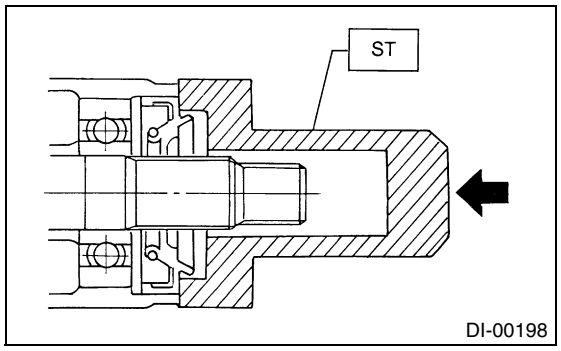


12) Remove the oil seal using ST.
ST 398527700 PULLER ASSY



13) Fit a new oil seal using ST.

NOTE:
Apply oil to the outer surface of oil seal.
ST 498447120 INSTALLER



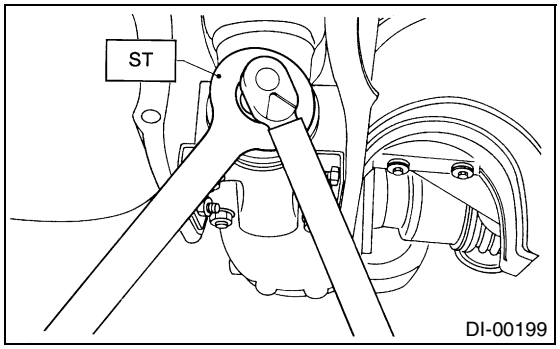
14) Install the companion flange.

NOTE:
Use a plastic hammer to install the companion flange.

15) Tighten the self-locking nut within the specified torque range so that the turning resistance of companion flange becomes the same as that before replacing oil seal.
ST 498427200 FLANGE WRENCH

NOTE:
Use a new self-locking nut.

Tightening torque:
181 N·m (18.5 kgf-m, 134 ft-lb)



16) Hereafter, reassemble in the reverse order of disassembly.

7. Rear Differential Side Oil Seal

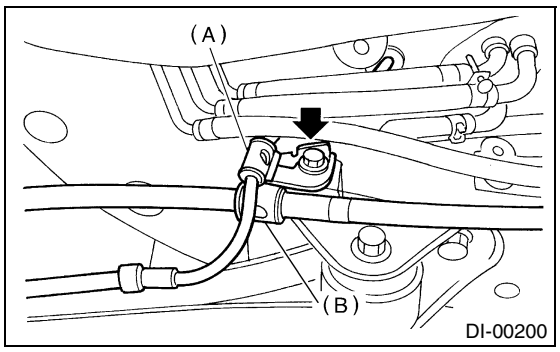
A: INSPECTION

Make sure that there is no oil leakage from side oil seal.
If there is any oil leakage, replace the oil seal.

B: REPLACEMENT

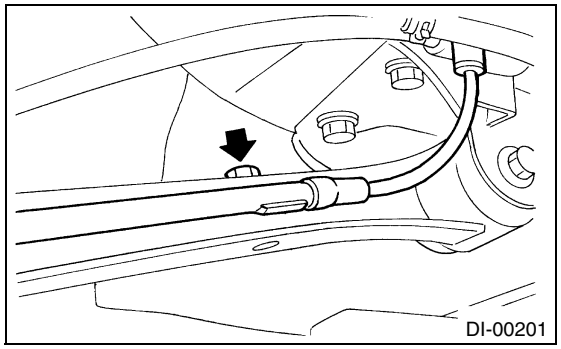
1. T-TYPE

1) Disconnect the ground cable from battery.
2) Move the select lever or gear shift lever to “N”.
3) Release the parking brake.
4) Loosen both wheel nuts.
5) Jack-up the vehicle and support it with rigid racks.
6) Remove the wheels.
7) Remove the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(SOHC)-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-13, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(TURBO)-12, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(TURBO)-14, REMOVAL, Muffler.>
8) Remove the DOJ of rear drive shaft from rear differential.
(1) Remove the ABS sensor cable clamp and parking brake cable clamp from bracket.

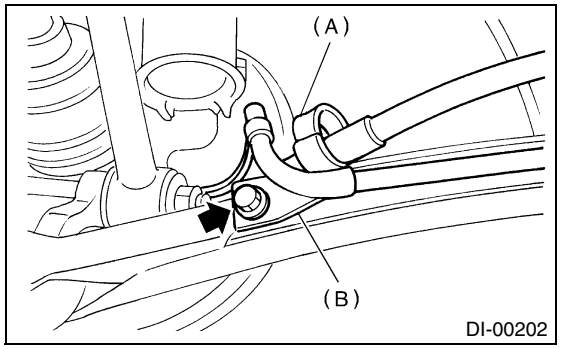


(A) ABS sensor cable clamp
(B) Parking brake cable clamp

(2) Remove the ABS sensor cable clamp from trailing link.

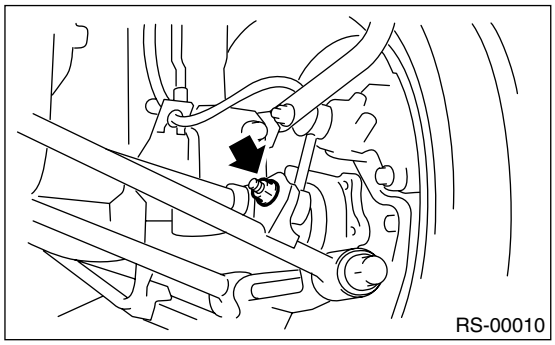


(3) Remove the ABS sensor cable clamp and parking brake cable guide from trailing link.

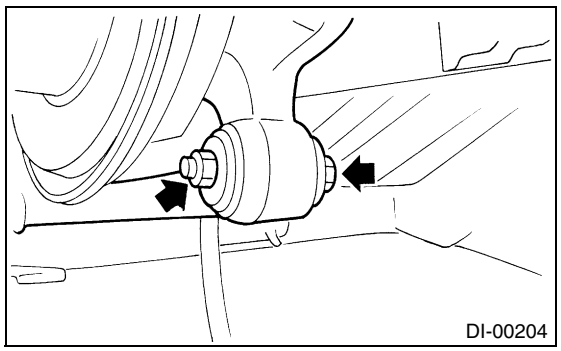


(A) Parking brake cable guide
(B) ABS sensor cable clamp

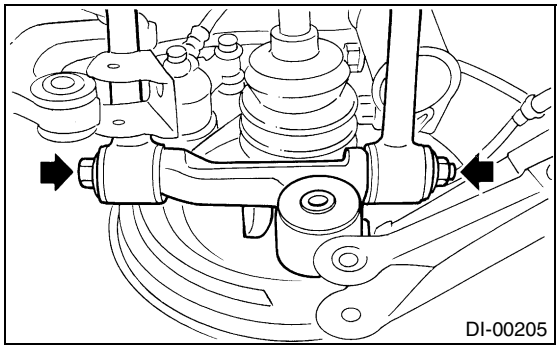
(4) Remove the rear stabilizer link.



(5) Remove the bolts which secure trailing link to housing.



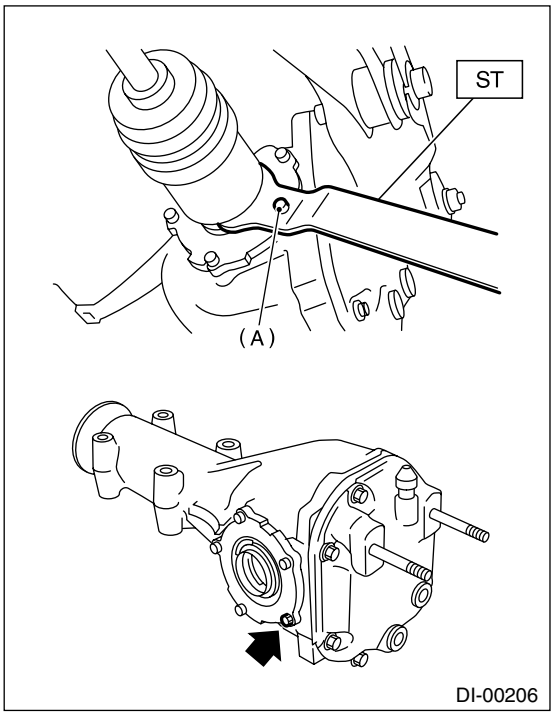
(6) Remove the bolts which secure front and rear lateral link to rear housing.



(7) Remove the DOJ from the rear differential by using ST.

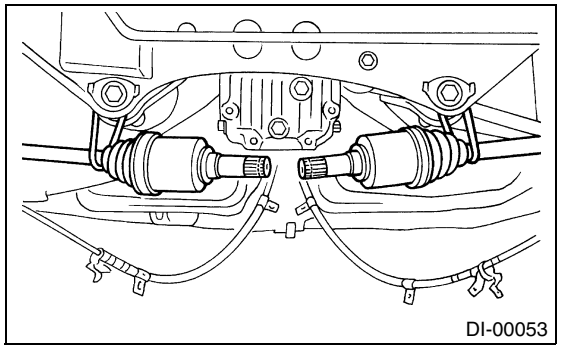
NOTE:
When removing the DOJ from rear differential, fit ST to the bolts as shown in the figure so as not to damage the side bearing retainer.

ST 28099PA100 DRIVE SHAFT REMOVER



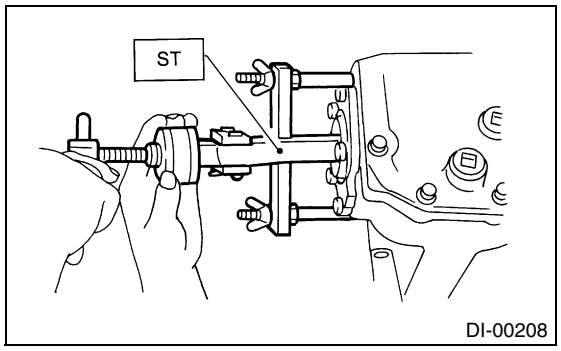
(A) Bolt

9) Remove the rear drive shaft to the rear cross-member using wire.



10) Using the ST, remove the oil seal.

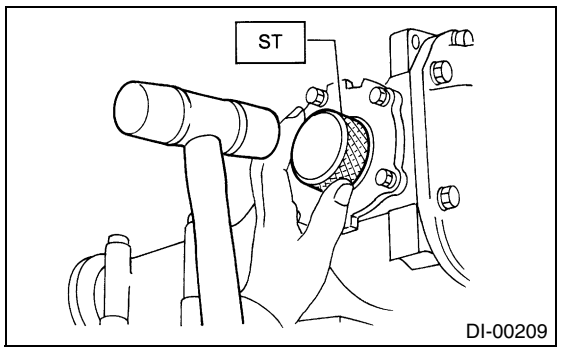
ST 398527700 PULLER ASSY



11) Drive in a new side oil seal using ST.

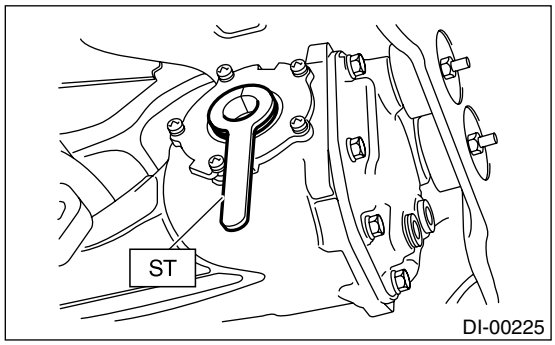
NOTE:
Apply chassis grease between the oil seal lips.

ST 398437700 DRIFT



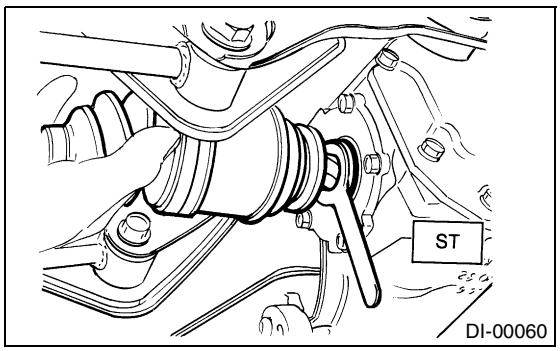
12) Insert the DOJ into rear differential.
(1) Install the ST to rear differential.

ST 28099PA090 SIDE OIL SEAL PROTECTOR



(2) Install the spline shaft until the spline portion is inside the side oil seal using ST.

ST 28099PA090 SIDE OIL SEAL PROTECTOR



(3) Remove the ST.

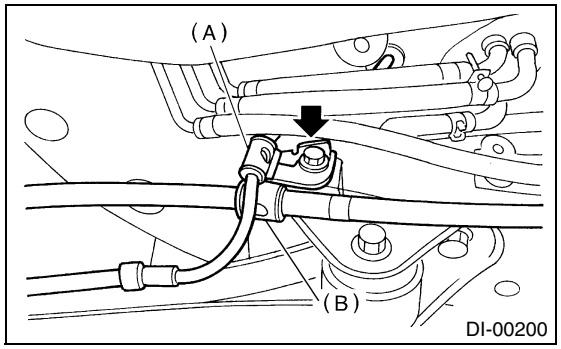
ST 28099PA090 SIDE OIL SEAL PROTECTOR

13) Hereafter, reassemble in the reverse order of disassembly.

2. VA-TYPE

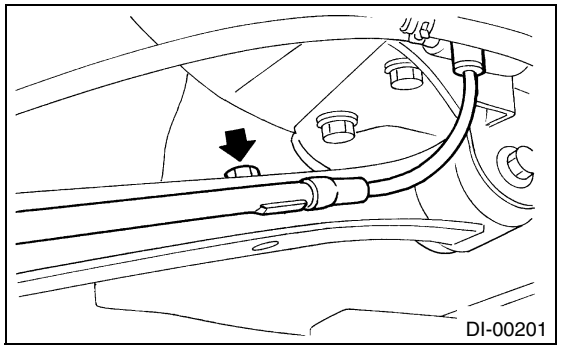
1) Disconnect the ground cable from battery.
2) Move the select lever or gear shift lever to “N”.
3) Release the parking brake.
4) Loosen both wheel nuts.
5) Jack-up the vehicle and support it with rigid racks.
6) Remove the wheels.
7) Remove the rear exhaust pipe and muffler.
<Ref. to EX(SOHC)-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-13, REMOVAL, Muffler.>
8) Remove the DOJ of rear drive shaft from rear differential.

(1) Remove the ABS sensor cable clamp and parking brake cable clamp from bracket.

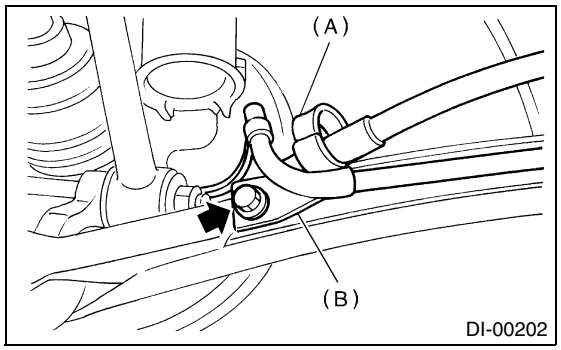


(A) ABS sensor cable clamp
(B) Parking brake cable clamp

(2) Remove the ABS sensor cable clamp from trailing link.

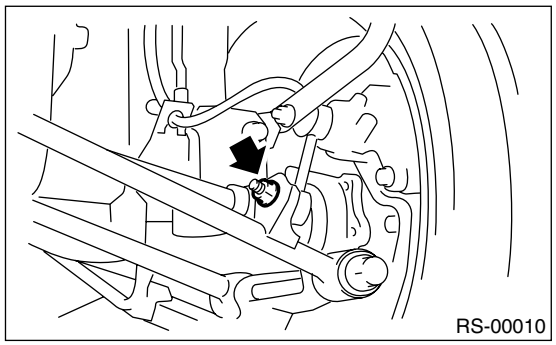


(3) Remove the ABS sensor cable clamp and parking brake cable guide from trailing link.

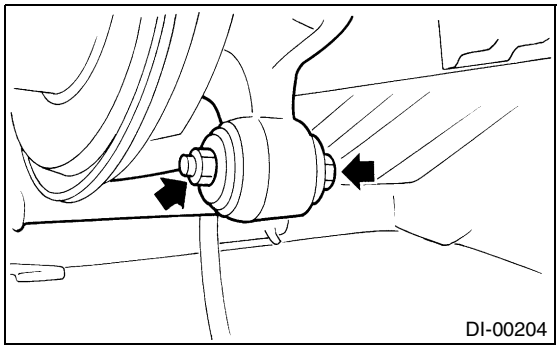


(A) Parking brake cable guide
(B) ABS sensor cable clamp

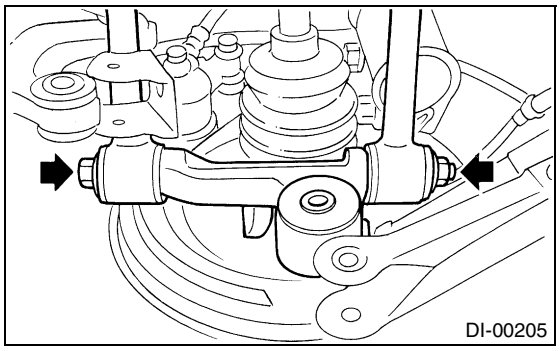
(4) Remove the rear stabilizer link.



(5) Remove the bolts which secure trailing link to housing.



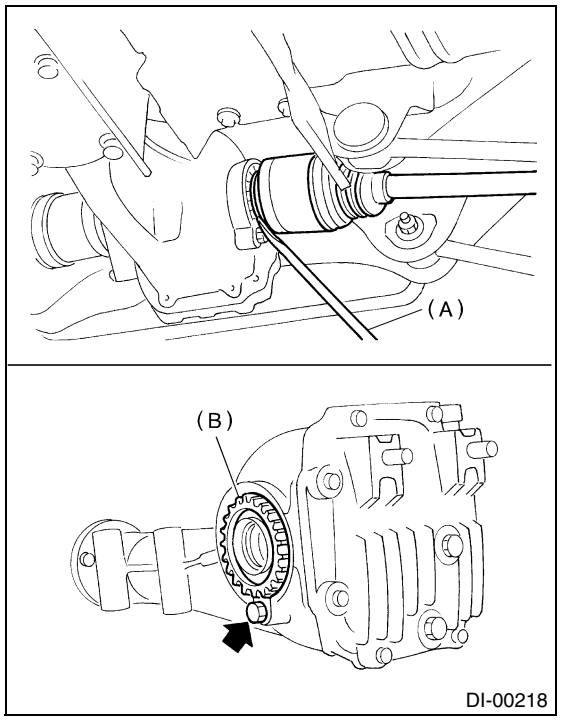
(6) Remove the bolts which secure front and rear lateral link to rear housing.



(7) Remove the DOJ from the rear differential using tire lever.

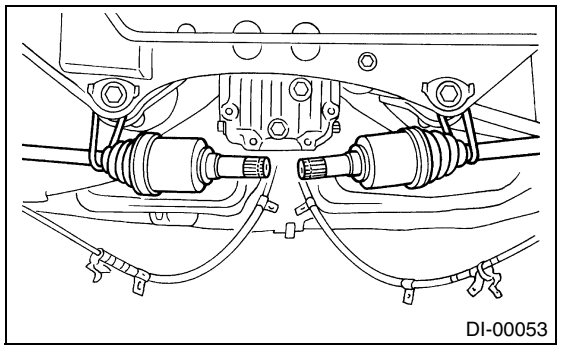
NOTE:
When removing the DOJ from rear differential, fit tire lever to the bolt as shown in the figure so as not to damage the axle shaft holder.

NOTE:
The side spline shaft circlip comes out together with the shaft.

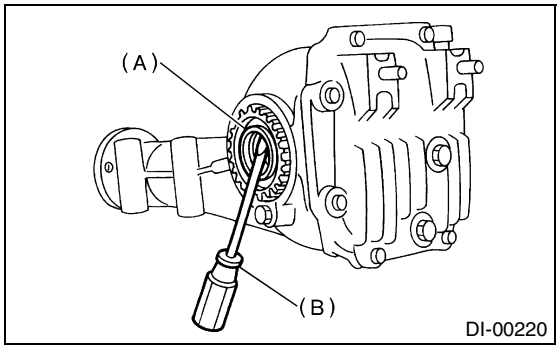


(A) Tire lever
(B) Axle shaft holder

9) Secure the rear drive shaft to rear crossmember using wire.



10) Remove the oil seal with screwdriver.

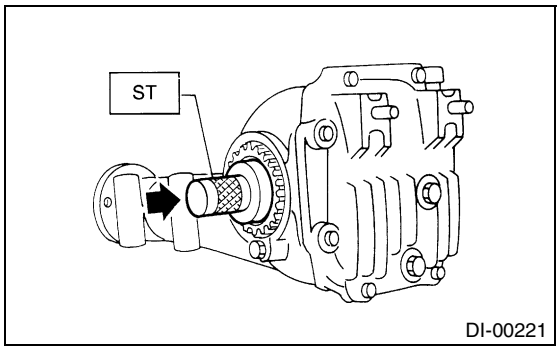


(A) Side oil seal
(B) Screwdriver

11) Drive in a new side oil seal using ST.

NOTE:
Apply chassis grease between the oil seal lips.

ST 498447100 OIL SEAL INSTALLER

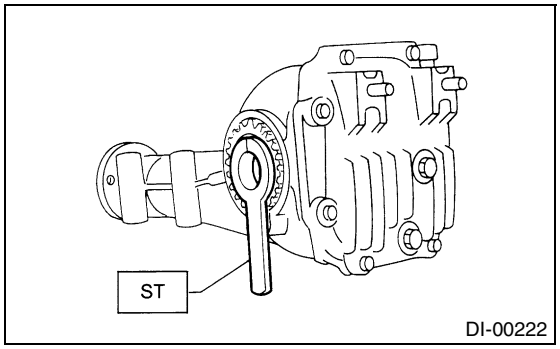


12) Insert the DOJ into rear differential.

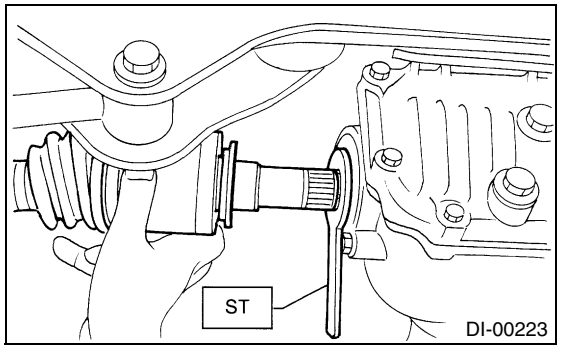
NOTE:
Before inserting, replace the circlip at the end of spline shaft with a new one.

(1) Install the ST to rear differential.

ST 28099PA090 SIDE OIL SEAL PROTECTOR



(2) Install the spline shaft until the spline portion is inside the side oil seal.

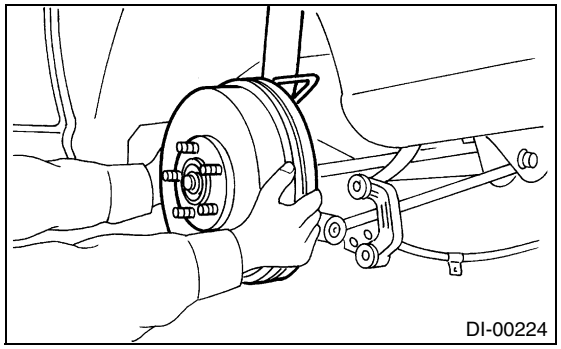


(3) Remove the ST.

ST 28099PA090 SIDE OIL SEAL PROTECTOR

(4) Completely insert the DOJ into rear differential by pressing rear housing.

NOTE:
Make sure that the oil seal lip is not folded over inward.



13) Hereafter, reassemble in the reverse order of disassembly.

8. Rear Differential Member

A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Move the selector lever or gear shift lever to “N”.
4) Release the parking brake.
5) Loosen the wheel nuts.
6) Jack-up the vehicle and support it with study racks.
7) Remove the wheels.
8) Remove the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(SOHC)-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-13, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(TURBO)-12, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(TURBO)-14, REMOVAL, Muffler.>
9) Remove the rear differential front member.

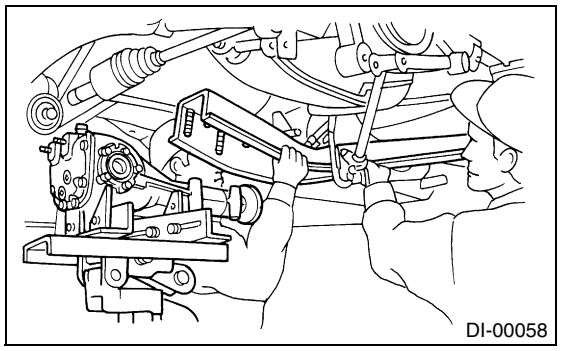
NOTE:
When removing the rear differential front member, work the removal procedure as rear differential.
T-type
<Ref. to DI-24, REMOVAL, Rear Differential for T-type.>
VA-type
<Ref. to DI-40, REMOVAL, Rear Differential for VA-type.>

10) Remove the differential rear member.

B: INSTALLATION

Install in the reverse order of removal.
1) Position the front member on body by passing it under the parking brake cable and securing to rear differential.

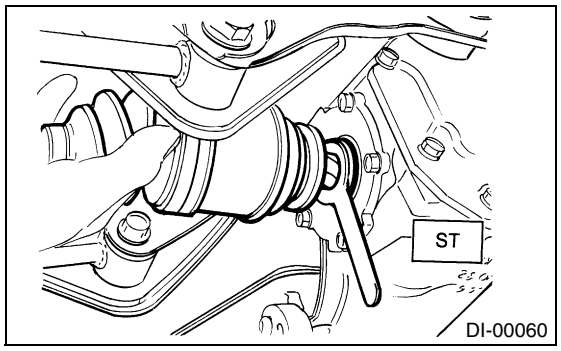
NOTE:
When installing the rear differential front member, do not confuse the installation sequence of the stopper.



2) Insert the DOJ of rear drive shaft into rear differential.<Ref. to DI-56, REPLACEMENT, Rear Differential Side Oil Seal.>

NOTE:
Before inserting, replace the differential side oil seal with a new one.

ST 28099PA090 SIDE OIL SEAL PROTECTOR

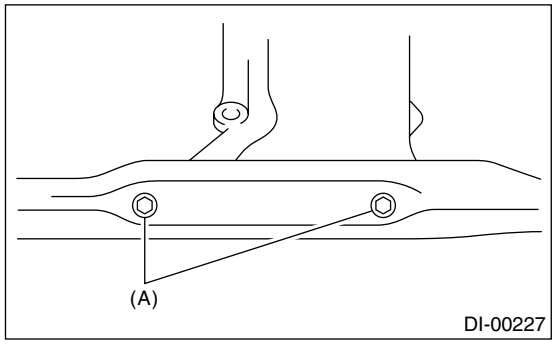


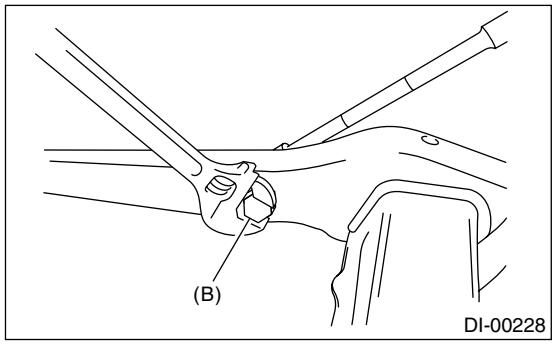
3) Hereafter, install in the reverse order of removal.

C: DISASSEMBLY

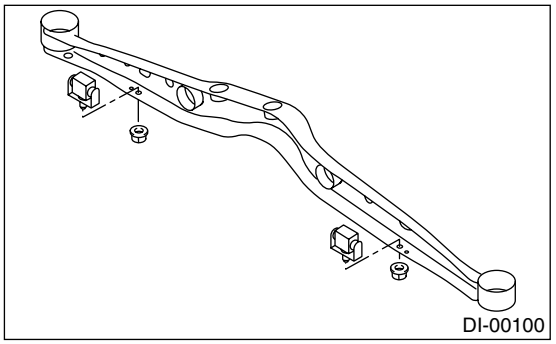
NOTE:
Clean the rear differential member before disassembly.

1) Remove the bolt A and B which connect front differential member and differential mounting bracket.





2) Remove the dynamic damper from front differential member. (Non-turbo model)

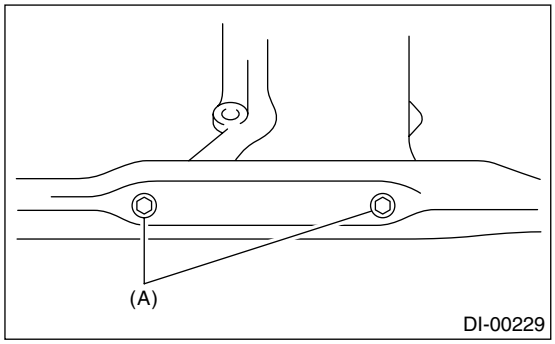


D: ASSEMBLY

1) Install the dynamic damper to front differential member. (Non-turbo model)

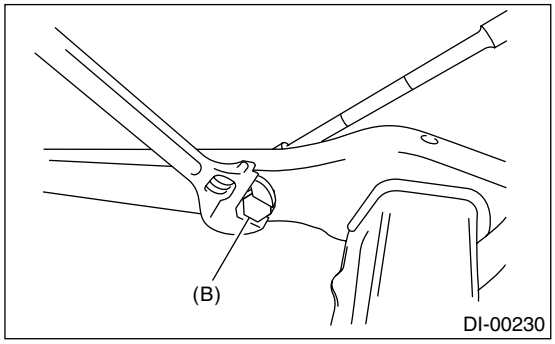
Tightening torque:
20 N·m (2.0 kgf-m, 14.5 ft-lb)

2) Temporarily tighten the connecting bolt (A) which secures front differential to differential mount.



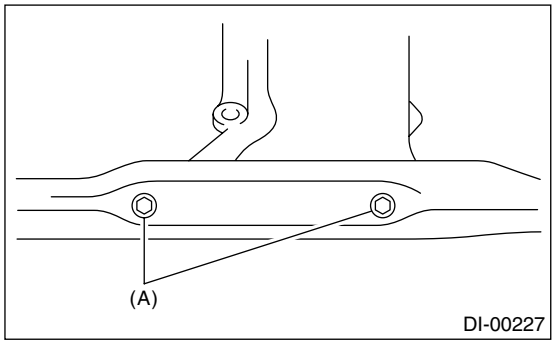
3) Tighten the nut of connecting bolt (B).

Tightening torque:
125 N·m (12.7 kgf-m, 92.2 ft-lb)



4) Tighten the nut of connecting bolt (A).

Tightening torque:
70 N·m (7.1 kgf-m, 51.6 ft-lb)



E: INSPECTION

1) Check the rear differential member for damage, bend, or corrosion.
If damage, bend, or corrosion is excessive, replace the rear differential member.
2) Check the bushings of rear differential member for cracking, hardening, or damage.
If cracking, hardening, or damage is excessive, replace the rear differential member.

9. General Diagnostic Table

A: INSPECTION

Symptom or trouble	Possible cause	Remedy
1. Oil leakage	(1) Worn, scratched, or incorrectly seated front or side oil seal. Scored, battered, or excessively worn sliding surface of companion flange.	Repair or replace.
	(2) Clogged or damaged air breather.	Clean, repair or replace.
	(3) Loose bolts on side retainer or incorrectly fitted O-ring.	Tighten the bolts to specified torque. Replace the O-ring.
	(4) Loose rear cover attaching bolts or damaged gasket.	Tighten the bolts to specified torque. Replace the gasket and apply liquid packing.
	(5) Loose oil filler or drain plug.	Retighten and apply liquid packing.
	(6) Wear, damage or incorrectly fitting for side retainer and oil seal.	Repair or replace.
2. Seizure NOTE: Seized or damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.	(1) Insufficient backlash for hypoid gear.	Readjust or replace.
	(2) Excessive preload for side, rear, or front bearing.	Readjust or replace.
	(3) Insufficient or improper oil used.	Replace the seized part and fill with specified oil to specified level.
3. Damage NOTE: Damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.	(1) Improper backlash for hypoid gear.	Replace.
	(2) Insufficient or excessive preload for side, rear, or front bearing.	Readjust or replace.
	(3) Excessive backlash for differential gear.	Replace the gear or thrust washer.
	(4) Loose bolts and nuts such as crown gear bolt.	Retighten.
	(5) Damage due to overloading.	Replace.
4. Noises when starting or shifting gears NOTE: Noises may be caused by differential assembly, universal joint, wheel bearing, etc. Find out what is actually making noise before disassembly.	(1) Excessive backlash for hypoid gear.	Readjust.
	(2) Excessive backlash for differential gear.	Replace the gear or thrust washer.
	(3) Insufficient preload for front or rear bearing.	Readjust.
	(4) Loose drive pinion nut.	Tighten to specified torque.
	(5) Loose bolts and nuts such as side bearing retainer attaching bolt.	Tighten to specified torque.
5. Noises when cornering	(1) Damaged differential gear.	Replace.
	(2) Excessive wear or damage of thrust washer.	Replace.
	(3) Broken pinion mate shaft.	Replace.
	(4) Seized or damaged side bearing.	Replace.

Symptom or trouble	Possible cause	Remedy
6. Gear noises NOTE: Since noises from engine, muffler, transmission, propeller shaft, wheel bearings, tires, and body are sometimes mistaken for noises from differential assembly, be careful in checking them. Inspection methods to locate noises include coasting, accelerating, cruising, and jacking-up all four wheels. Perform these inspections according to condition of trouble. When listening to noises, shift gears into four wheel drive and fourth speed position, trying to pick up only differential noise.	(1) Improper tooth contact of hypoid gear.	Readjust or replace the hypoid gear set.
	(2) Improper backlash for hypoid gear.	Readjust.
	(3) Scored or chipped teeth of hypoid gear.	Replace the hypoid gear set.
	(4) Seized hypoid gear.	Replace the hypoid gear set.
	(5) Improper preload for front or rear bearings.	Readjust.
	(6) Seized, scored, or chipped front or rear bearing.	Replace.
	(7) Seized, scored, or chipped side bearing.	Replace.
	(8) Vibrating differential carrier.	Replace.

TRANSFER CASE

TC

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2.	Transfer Case and Extension for MT	3
3.	Transfer Clutch and Extension for AT	4
4.	Oil Seal	5
5.	Transfer Drive Gear (MT)	6
6.	Transfer Driven Gear (MT)	7
7.	Reduction Drive Gear without VTD	8
8.	Reduction Driven Gear without VTD	9
9.	Center Differential	10
10.	Oil Pump	11
11.	Transfer Clutch Pressure Test	12
12.	Transfer Duty Solenoid and Valve Body	13

1. General Description

A: NOTE

For general description, refer to “AT” or “MT” section.
AT model:
<Ref. to AT-2, General Description.>
MT model:
<Ref. to MT-2, General Description.>

2. Transfer Case and Extension for MT

A: NOTE

For removal, installation and inspection work, refer to “MT” section. <Ref. to MT-50, Transfer Case and Extension Case Assembly.>

3. Transfer Clutch and Extension for AT

A: NOTE

For removal, installation and inspection work, refer to “AT” section. <Ref. to AT-79, Transfer Clutch.>, <Ref. to AT-77, Extension Case.>

4. Oil Seal

A: NOTE

For removal, installation and inspection work, refer to “AT” or “MT” section.
AT model:
<Ref. to AT-46, Extension Case Oil Seal.>
MT model:
<Ref. to MT-41, Oil Seal.>

5. Transfer Drive Gear (MT)

A: NOTE

For removal, installation and inspection work, refer to “MT” section. <Ref. to MT-54, Transfer Drive Gear.>

6. Transfer Driven Gear (MT)

A: NOTE

For removal, installation and inspection work, refer to “MT” section. <Ref. to MT-56, Transfer Driven Gear.>

7. Reduction Drive Gear without VTD

A: NOTE

For removal, installation and inspection work, refer to “AT” section. <Ref. to AT-86, Reduction Drive Gear.>.

8. Reduction Driven Gear without VTD

A: NOTE

For removal, installation and inspection work, refer to “AT” section. <Ref. to AT-84, Reduction Driven Gear.>

9. Center Differential

A: NOTE

For removal, installation and inspection work, refer to “MT” section. <Ref. to MT-58, Center Differential.>

10.Oil Pump

A: NOTE

For removal, installation and inspection work, refer to “MT” section. <Ref. to MT-48, Oil Pump.>

11.Transfer Clutch Pressure Test

A: NOTE

For inspection work, refer to “AT” section. <Ref. to AT-37, Transfer Clutch Pressure Test.>

12. Transfer Duty Solenoid and Valve Body

A: NOTE

For removal, installation and inspection work, refer to “AT” section. <Ref. to AT-64, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>

DRIVE SHAFT SYSTEM

DS

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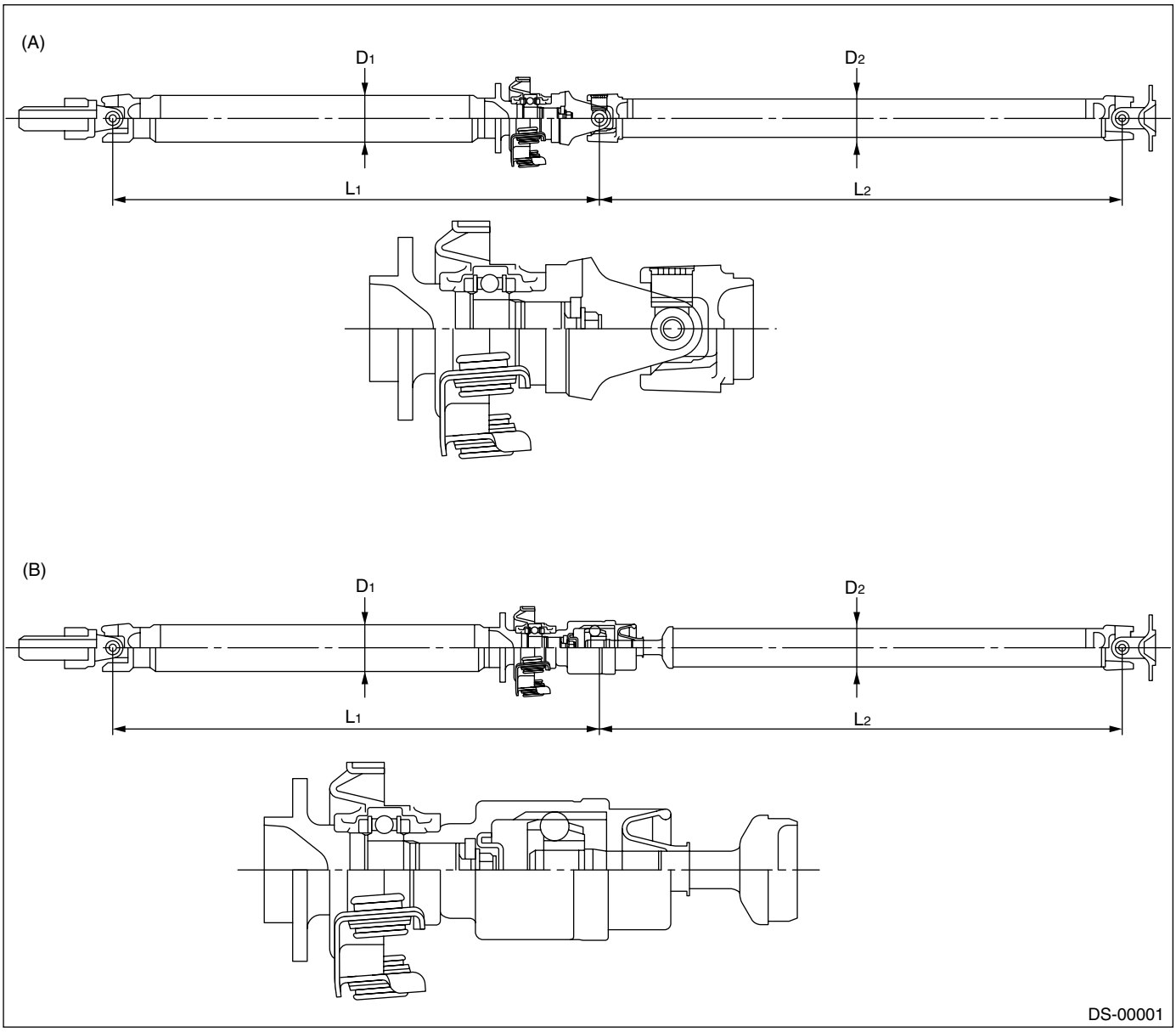
1. General Description

A: SPECIFICATIONS

1. PROPELLER SHAFT

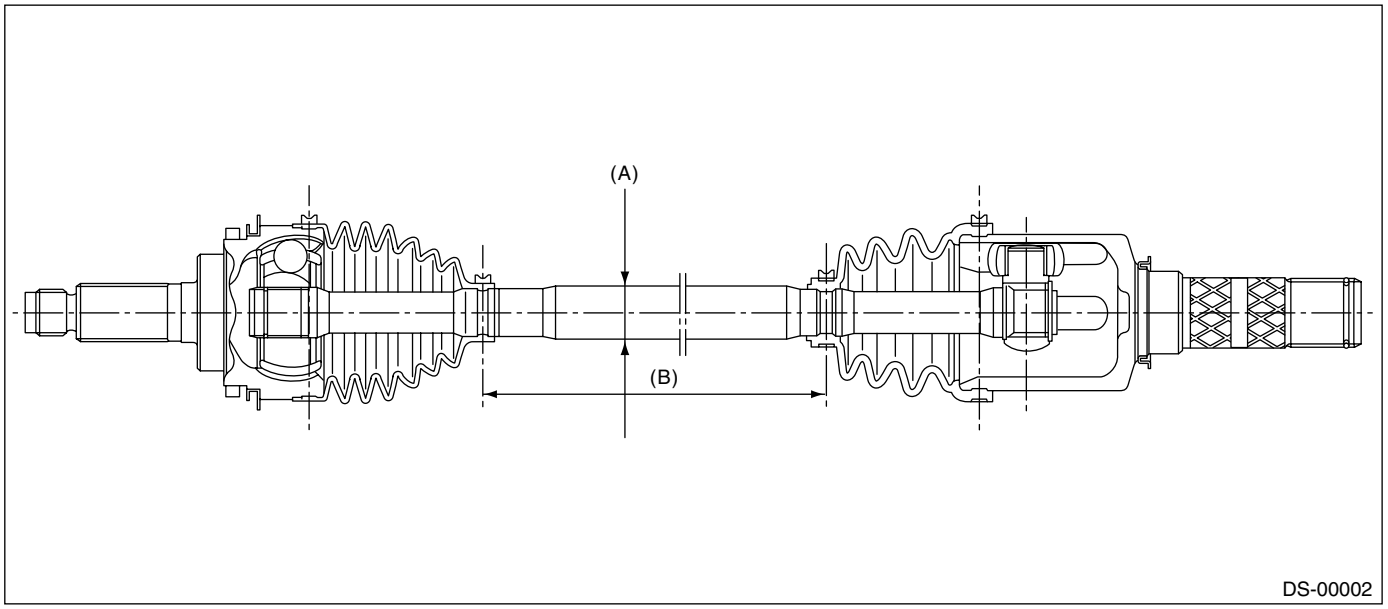
Propeller shaft type			DOJ type	3UJ type
Front propeller shaft Joint-to-joint length: L_1	mm (in)		580 (22.83)	644 (25.35)
Rear propeller shaft Joint-to-joint length: L_2		mm (in)	712 (28.03)	707 (27.83)
Outside diameter of tube:	mm (in)	D_1	63.5 (2.500)	
		D_2	57.0 (2.244)	



(A) 3UJ type (B) DOJ type

2. FRONT DRIVE SHAFT ASSEMBLY

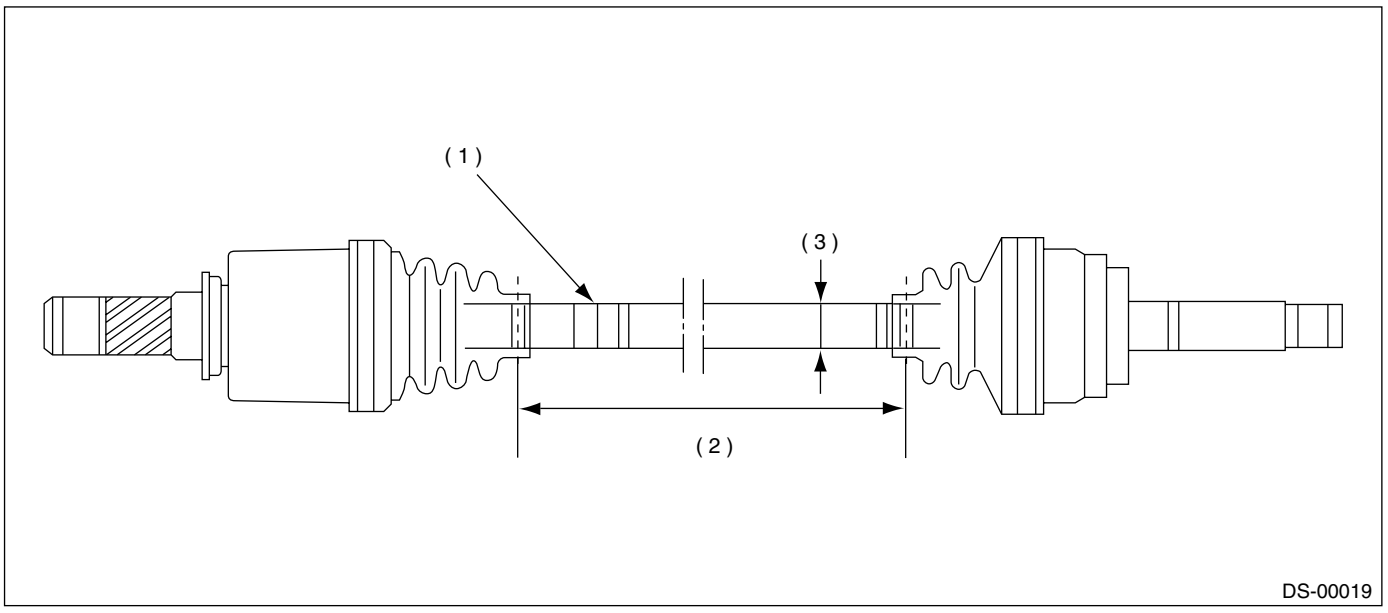
Size	Model	Identification color of shaft	L1 mm (in)	ϕ D mm (in)
AC2300/AAR2300i	Non-turbo AT, Turbo AT	—	513 (20.2)	24.9 (0.98)
AC2300/AAR2300i	Non-turbo MT	Yellow	513 (20.2)	28 (1.10)
AC2300/AAR2600i	Turbo MT	Pink	511.4 (20.13)	24.9 (0.98)



(A) L1 mm (in) (B) ϕ D mm (in)

3. REAR DRIVE SHAFT ASSEMBLY

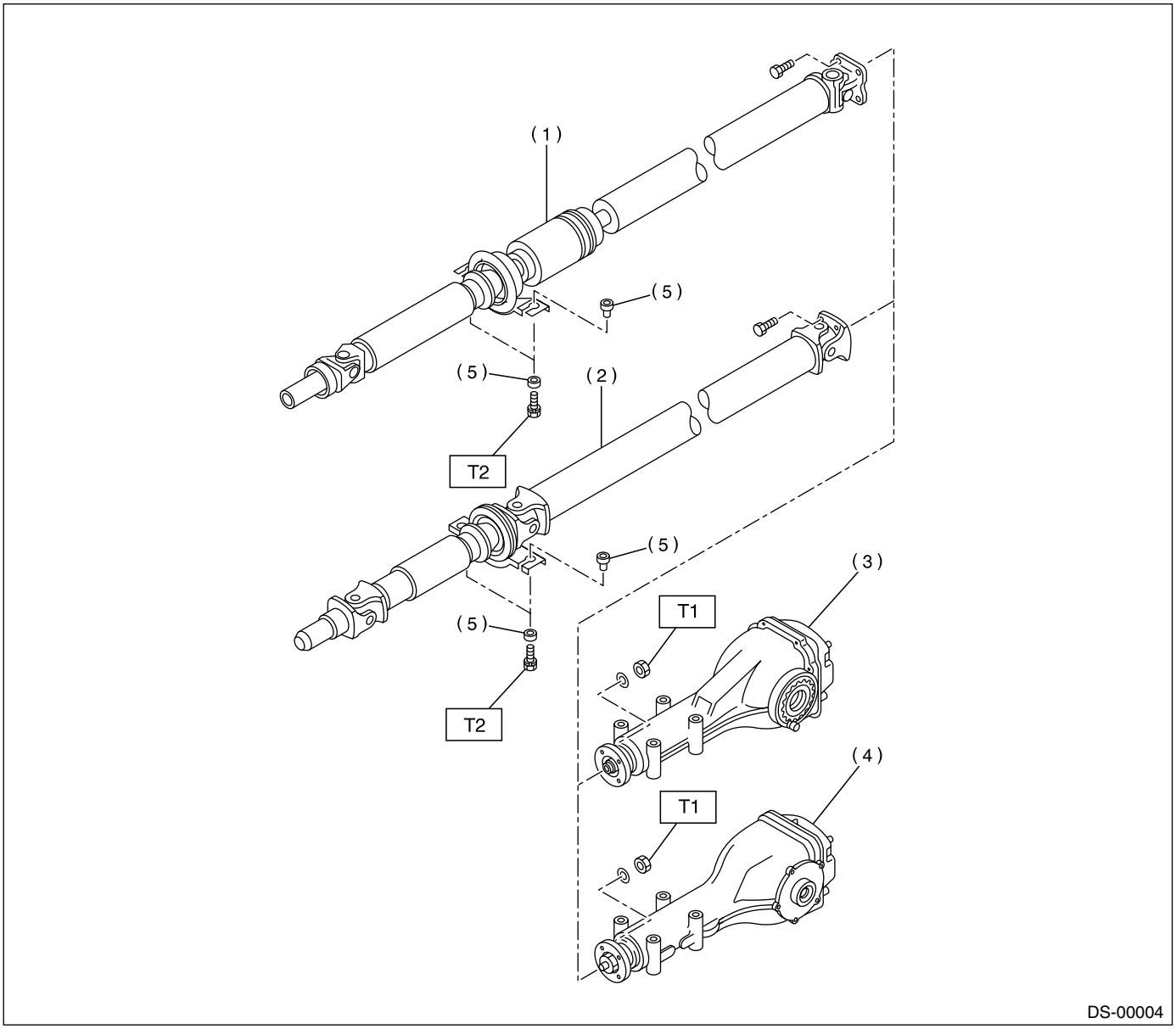
Size	Model	No. of identification groove on shaft	L1 mm (in)	ϕ D mm (in)
EBJ82/DOJ82 R160RH	Turbo MT&AT	2	363 (14.2)	24 (0.9)
BJ79/DOJ79 R152R/L	Non-turbo MT&AT	3	363 (14.2)	24 (0.9)
EBJ82/DOJ82 R160LH	Turbo MT&AT	1	353 (13.9)	24 (0.9)



(1) Identification groove (2) L1 mm (in) (3) ϕ D mm (in)

B: COMPONENT

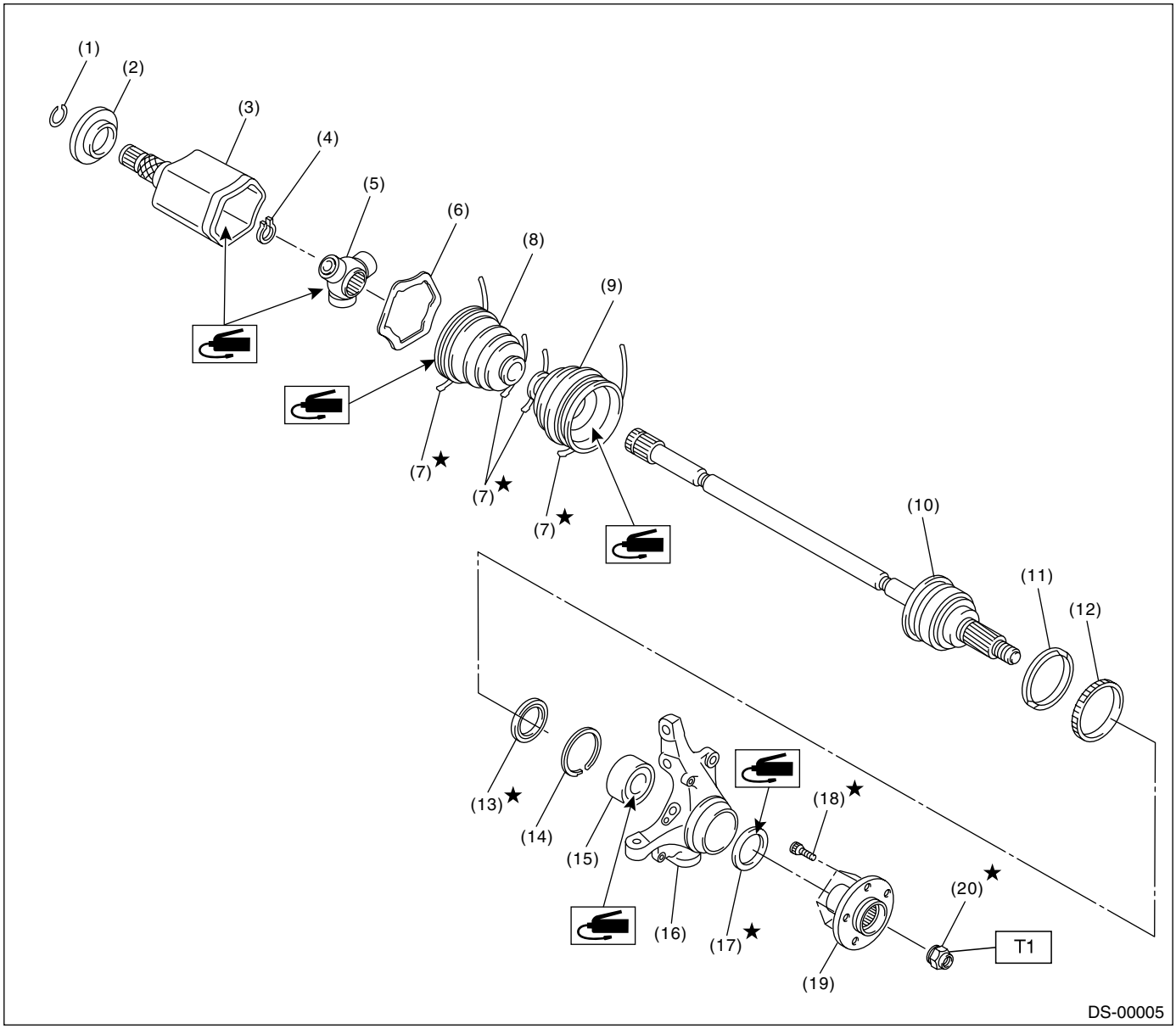
1. PROPELLER SHAFT



(1) Propeller shaft (DOJ type)
(2) Propeller shaft (3UJ type)
(3) Rear differential (VA-type)
(4) Rear differential (T-type)
(5) Bush

Tightening torque: N·m (kgf-m, ft-lb)
T1: 31 (3.2, 23.1)
T2: 52 (5.3, 38.3)

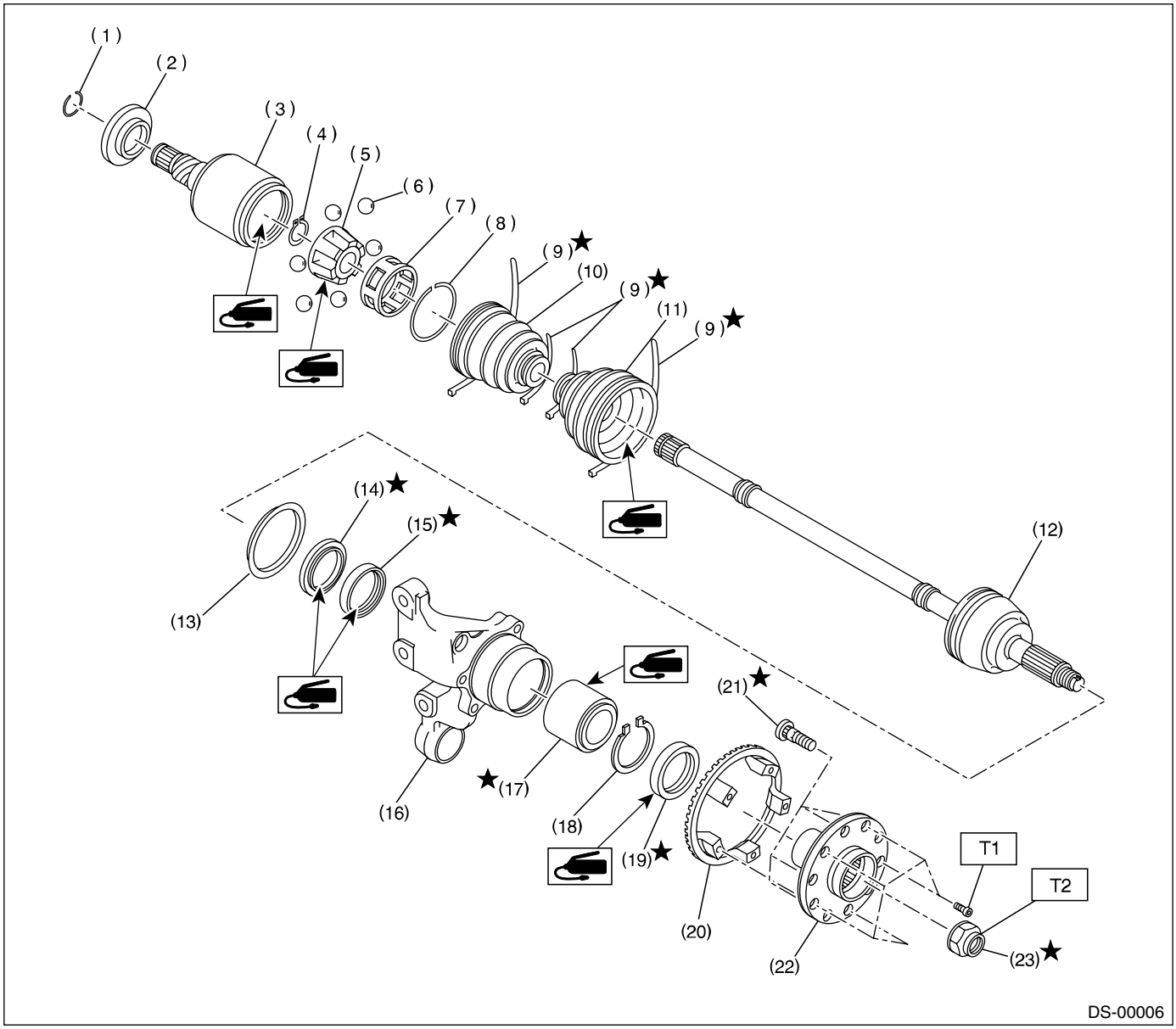
2. FRONT AXLE



(1) Spring pin
(2) Baffle plate (SFJ)
(3) Outer race (SFJ)
(4) Snap ring
(5) Trunnion
(6) Retainer
(7) Boot band
(8) Boot (AARi)
(9) Boot (AC)
(10) AC ASSY
(11) Tone whee
(12) Baffle plate
(13) Oil seal (IN)
(14) Snap ring
(15) Bearing
(16) Housing
(17) Oil seal (OUT)
(18) Hub bolt
(19) Hub
(20) Axle nut

Tightening torque: N·m (kgf-m, ft-lb)
T: 190 (19.4, 140)

3. REAR AXLE



(1) Circlip
(2) Baffle plate (DOJ)
(3) Outer race (DOJ)
(4) Snap ring
(5) Inner race
(6) Ball
(7) Cage
(8) Circlip
(9) Boot band
(10) Boot (DOJ)
(11) Boot
(12) BJ ASSY
(13) Baffle plate
(14) Oil seal (IN. No. 2)
(15) Oil seal (IN. No. 3)
(16) Housing
(17) Bearing
(18) Snap ring
(19) Oil seal (OUT)
(20) Tone wheel
(21) Hub bolt
(22) Hub
(23) Axle nut

Tightening torque: N·m (kgf-m, ft-lb)
T1: 13 (1.3, 9.4)
T2: 190 (19.4, 140)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Apply grease onto sliding or revolution surfaces before installation.
- Before installing snap rings, apply sufficient amount of grease to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

D: PREPARATION TOOL

1. SPECIAL TOOLS

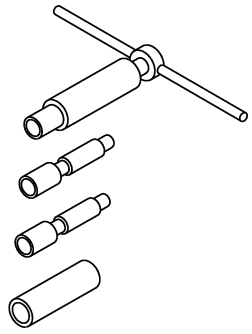
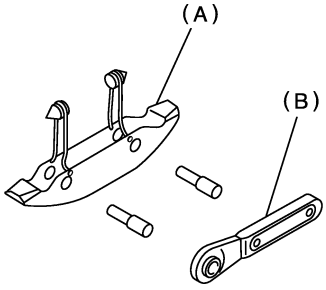
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-922431000	922431000	AXLE SHAFT INSTALLER	• Used for installing axle shaft into housing. • Used with ADAPTER (927390000).
 ST-925091000	925091000	BAND TIGHTENING TOOL	• Used for tightening boot band. (A) Jig for band (B) Ratchet wrench

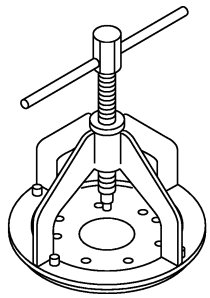
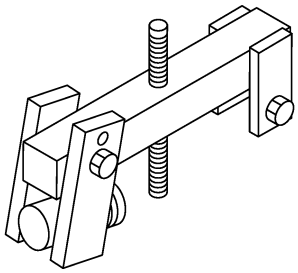
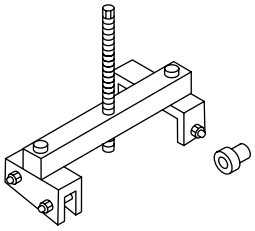
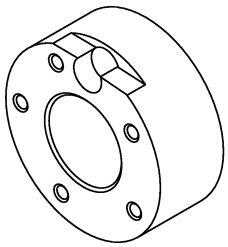
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-926470000	926470000	AXLE SHAFT PULLER	Used for removing axle shaft.
 ST-927060000	927060000	HUB REMOVER	• Used for removing front hub. • Used with HUB STAND (927080000).
 ST-927420000	927420000	HUB REMOVER	• Used for removing rear hub. • Used with HUB STAND (927080000).
 ST-927080000	927080000	HUB STAND	Used for disassembling and assembling hub bolt in hub.

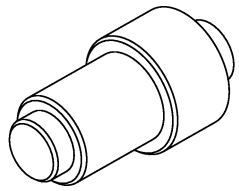
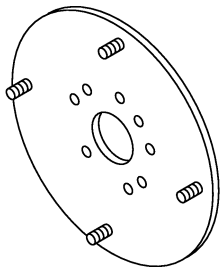
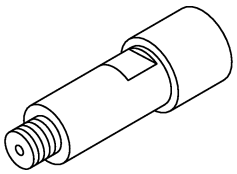
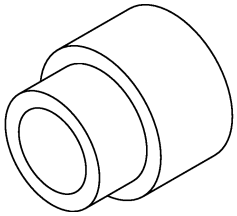
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927100000	927100000	BEARING PULLER	• Used for disassembling and assembling front housing bearing. • Used with HOUSING STAND (927400000).
 ST-927140000	927140000	AXLE SHAFT PULLER PLATE	Same as plate 2 included in AXLE SHAFT PULLER (926470000).
 ST-927390000	927390000	ADAPTER	Used as an adapter for AXLE SHAFT INSTALLER (922431000).
 ST-927400000	927400000	HOUSING STAND	• Used for disassembling and assembling front housing bearing. • Used with BEARING PULLER (927100000).

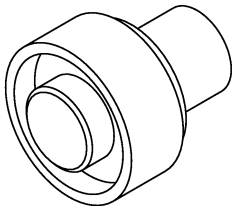
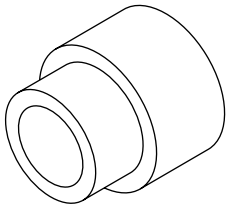
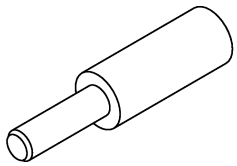
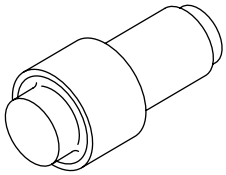
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927410000	927410000	OIL SEAL INSTALLER	• Used for installing oil seal into front housing. • Used with HOUSING STAND (927400000).
 ST-927430000	927430000	HOUSING STAND	• Used for disassembling and assembling rear housing bearing. • Used with BEARING PULLER (927440000).
 ST-927120000	927120000	HUB INSTALLER	Used for installing hub.
 ST-927440000	927440000	BEARING REMOVER	• Used for disassembling and assembling rear wheel bearing. • Used with HOUSING STAND (927430000).

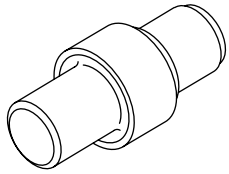
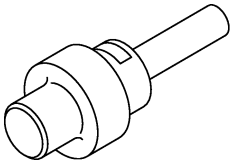
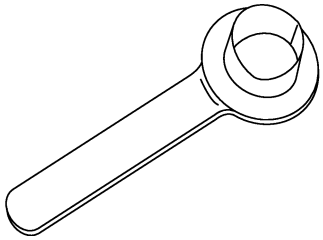
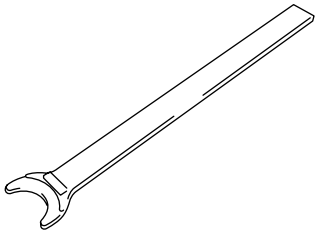
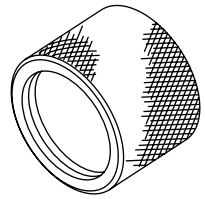
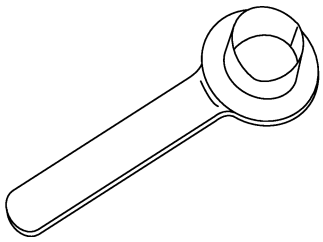
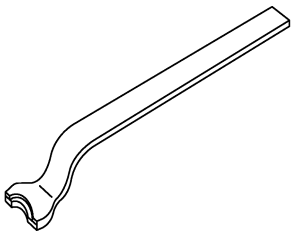
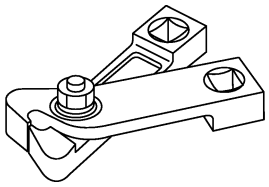
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927460000	927460000	OIL SEAL INSTALLER	• Used for installing outer oil seal. • Used with HOUSING STAND (927430000).
 ST-927450000	927450000	HUB INSTALLER	• Used for pressing hub bearing into hub. • Used with HUB STAND (927080000).
 ST28399SA010	28399SA010	OIL SEAL PROTECTOR	• Used for installing front drive shaft into front differential. • For protecting oil seal.
 ST28399SA000	28399SA000	DRIVE SHAFT REMOVER	Used for removing front drive shaft from front differential.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18675AA000	18675AA000	DIFFERENTIAL SIDE OIL SEAL INSTALLER	Used for installing differential side retainer oil seal.
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing rear drive shaft into rear differential. • For protecting oil seal.
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	Used for removing rear drive shaft from rear differential.
 ST28099AC000	28099AC000	BOOT BAND PLIERS	Used for tightening front BJ boot band.

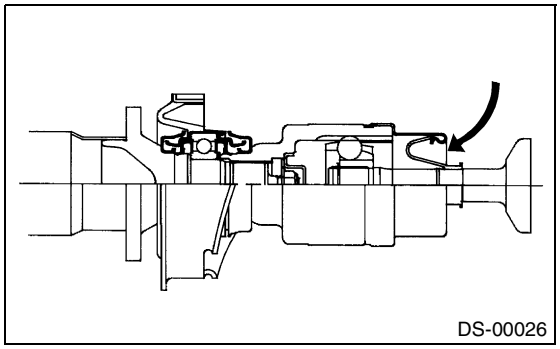
2. GENERAL PURPOSE TOOLS

TOOL NAME	REMERKS
Puller	Used for removing ball joint from knuckle arm.
Dial gauge	Used for inspecting propeller shaft run-out.
Snap ring pliers	Used for installing and removing snap ring.

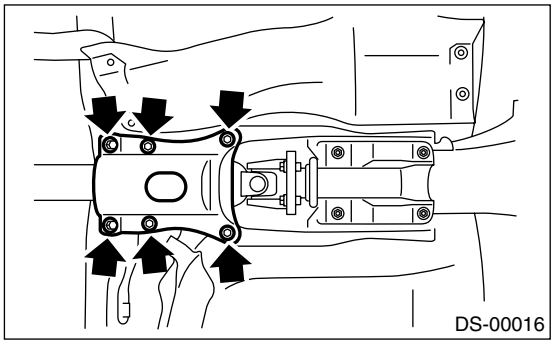
2. Propeller Shaft

A: REMOVAL

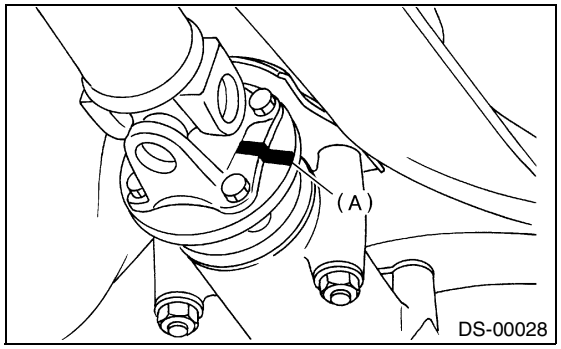
NOTE:
• Before removing the propeller shaft, wrap the metal parts with a cloth or rubber material.
• In case of DOJ type, before removing the propeller shaft, wrap the metal parts (installed at the rubber boot of center DOJ) with a cloth or rubber material, as shown in the figure. Rubber boot may be damaged due to interference with adjacent metal parts while bending the DOJ during removal.



1) Disconnect the ground cable from battery.
2) Move the select lever or gear shift lever to “N”.
3) Release the parking brake.
4) Jack-up the vehicle and support it with sturdy racks.
5) Remove the center exhaust pipes.
6) Remove the rear exhaust pipe and muffler.
7) Remove the differential mount front cover.

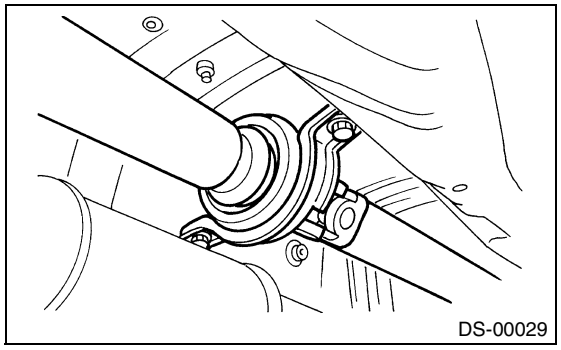


8) Make matching marks on affected parts before removal.



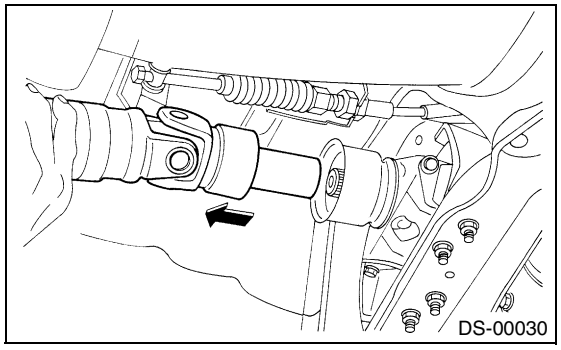
(A) Matching mark

9) Remove the three bolts which hold propeller shaft to rear differential.
10) Remove the remaining bolt.
11) Remove the two bolts which hold center bearing to vehicle body.



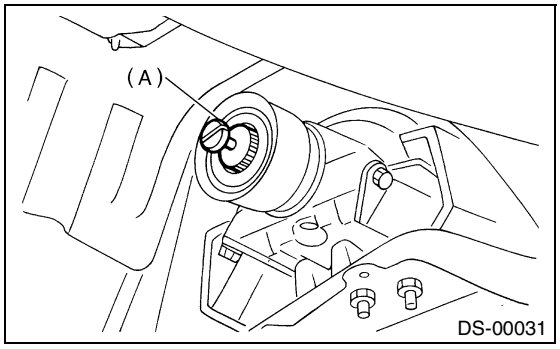
12) Remove the propeller shaft from transmission.

CAUTION:
• Be careful not to damage the oil seals and frictional surface of sleeve yoke.
• Cover the center exhaust pipe with a cloth to keep off any ATF or oil spilled from transmission when removing the propeller shaft.



13) Install the extension cap to transmission.

NOTE:
If the extension cap is not available, place a vinyl bag over opening and fasten with string to prevent gear oil or ATF from leaking.

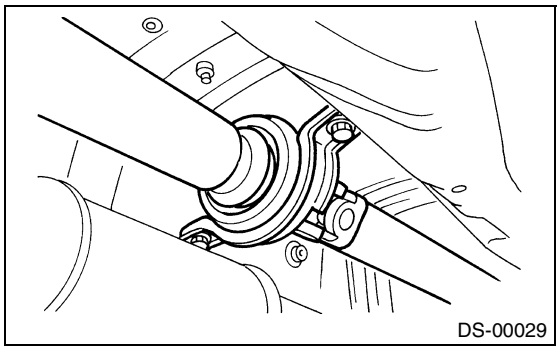


(A) Extension cap

B: INSTALLATION

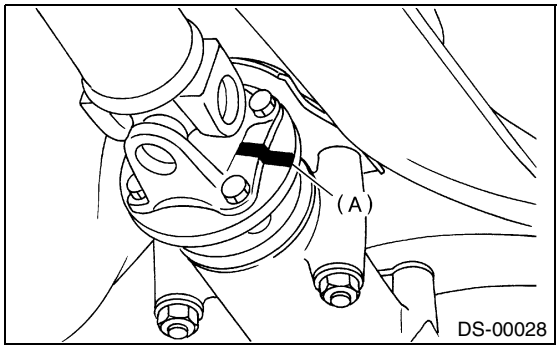
1) Insert the sleeve yoke into transmission, and then attach the center bearing to body.

Tightening torque:
52 N·m (5.3 kgf-m, 38.3 ft-lb)



2) Align the matching marks, and then connect the flange yoke and rear differential.

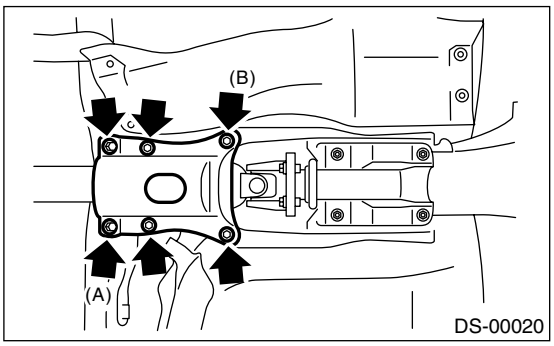
Tightening torque:
31 N·m (3.2 kgf-m, 23.1 ft-lb)



(A) Matching mark

3) Using new bolts, install the differential mount front cover.
(1) Temporarily tighten the bolt (A) while pushing cover forward.
(2) Tighten the bolt (B) to specified torque.
(3) Tighten the bolt (A) to specified torque.
(4) Tighten the remaining bolts to specified torque.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)



4) Install the center exhaust pipes.
5) Install the rear exhaust pipe and muffler.

C: INSPECTION

NOTE:
Do not disassemble the propeller shaft. Check the following and replace if necessary.

1) Tube surfaces for dents or cracks
2) Splines for deformation or abnormal wear
3) Joints for non-smooth operation or abnormal noise
4) Center bearing for free play, noise or non-smooth operation
5) Oil seals for abnormal wear or damage
6) Center bearing for breakage

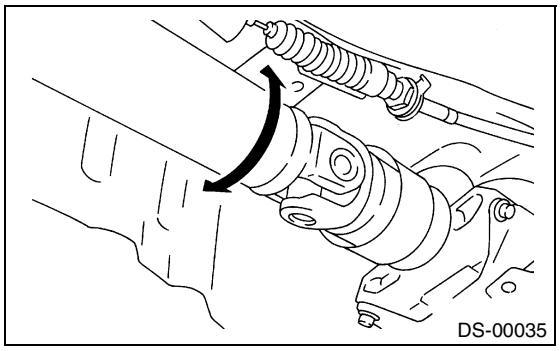
Check the following points with propeller shaft installed in vehicle.

1. JOINTS AND CONNECTIONS

1) Remove the center exhaust pipes.
2) Remove the heat shield cover.
3) Check for any looseness of the yoke flange mounting bolts which connect to rear differential and center bearing bracket mounting bolts.

2. SPLINES AND BEARING LOCATIONS

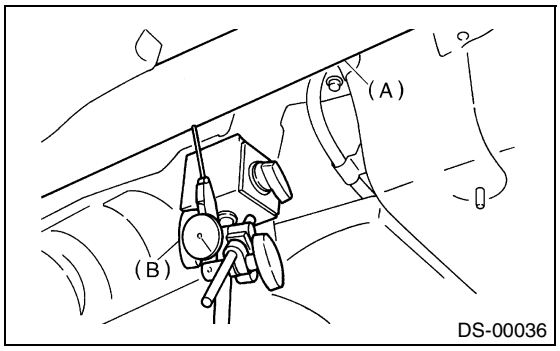
1) Remove the center exhaust pipes.
2) Remove the rear exhaust pipe and muffler.
3) Remove the heat shield cover.
4) Turn the propeller shaft by hand to see if abnormal free play exists at splines. Also move the yokes to see if abnormal free play exists at spiders and bearings.



3. RUNOUT OF PROPELLER SHAFT

1) Remove the center exhaust pipes.
2) Remove the rear exhaust pipe and muffler.
3) Remove the heat shield cover.
4) Set the dial gauge with its indicator stem at center of propeller shaft tube.
5) Turn the propeller shaft slowly by hands to check for "runout" of propeller shaft.

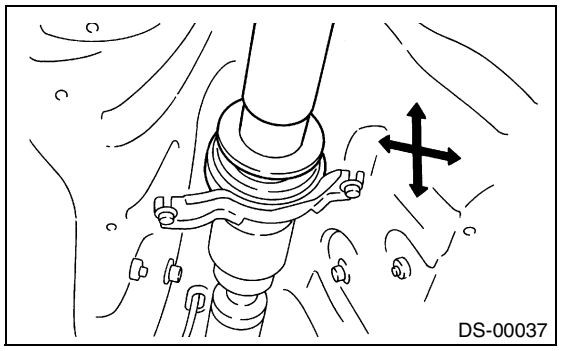
Runout:
Limit 0.6 mm (0.024 in)



(A) Propeller shaft
(B) Dial gauge

4. CENTER BEARING FREE PLAY

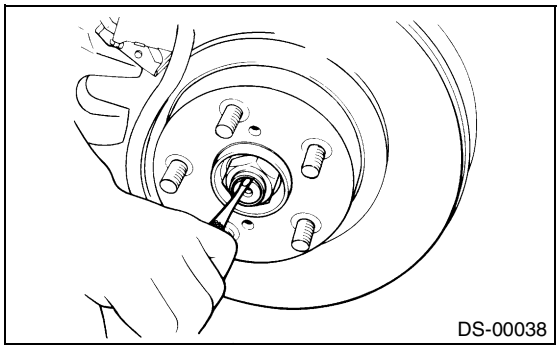
1) Remove the front and center exhaust pipes.
2) Remove the rear exhaust pipe and muffler.
3) Remove the heat shield cover.
4) Move the propeller shaft near center bearing up and down, and left and right with your hand to check for any abnormal bearing free play.



3. Front Axle

A: REMOVAL

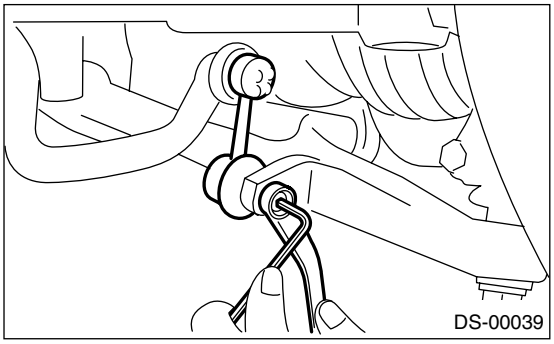
1) Lift-up the vehicle and remove the front wheels.
2) Unlock the axle nut.



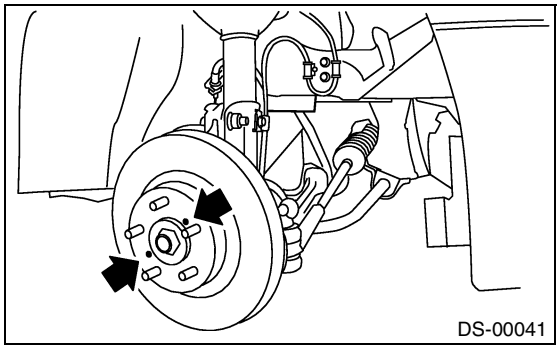
3) Remove the axle nut using a socket wrench.

CAUTION:
Remove the axle nut with vehicle weight not applied on axle. Failure to follow this rule may damage the wheel bearings.

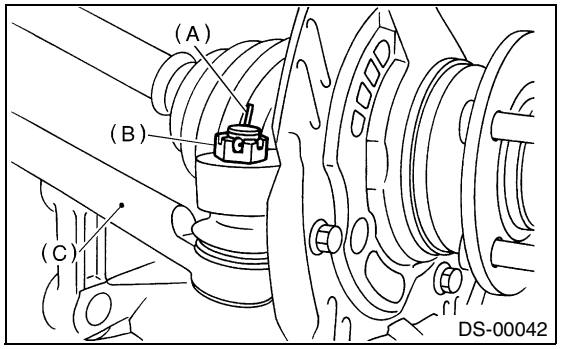
4) Remove the stabilizer link.



5) Remove the disc brake caliper from housing, and suspend it from strut using a wire.
6) Remove the disc rotor from hub.
If the disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in screw hole on the rotor.

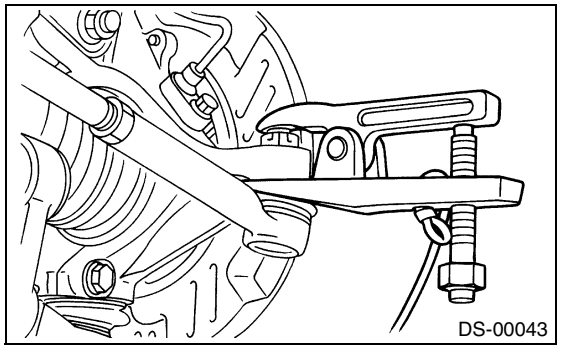


7) Remove the cotter pin and castle nut which secure tie-rod end to housing knuckle arm.

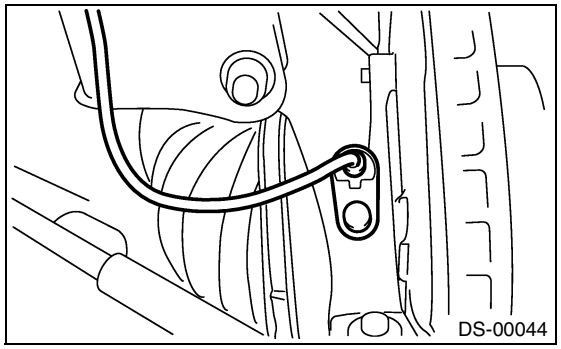


(A) Cotter pin
(B) Castle nut
(C) Tie-rod

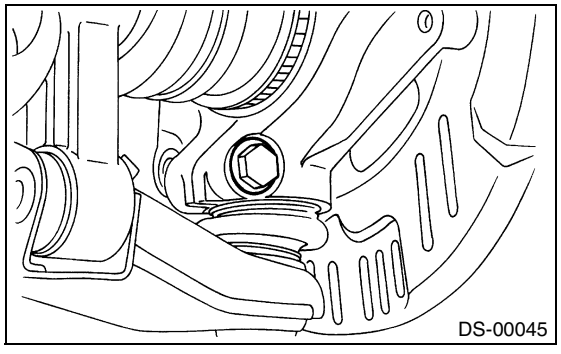
8) Using a puller, remove the tie-rod ball joint from knuckle arm.



9) Remove the ABS sensor assembly and harness.



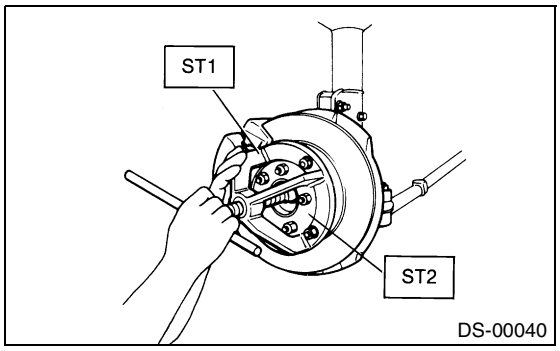
10) Remove the transverse link ball joint from housing.



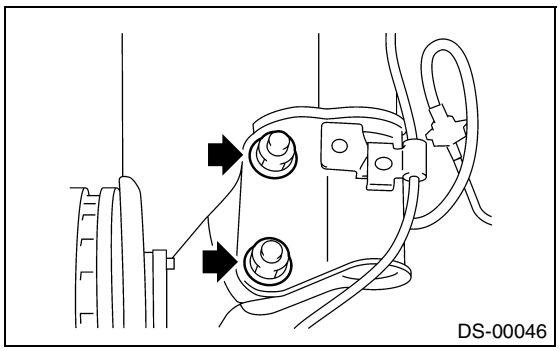
11) Remove the front drive shaft assembly from hub. If it is hard to remove, use the STs.

ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE

CAUTION:
• Be sure to replace the differential side retainer oil seal at transmission side with a new one when removing front drive shaft .
• Suspend the front drive shaft to vehicle body using a wire.



12) After scribing an alignment mark on the camber adjusting bolt head, remove the bolts which connect housing and strut, and disconnect housing from strut.



B: INSTALLATION

1) Temporarily tighten the front axle to front strut.
2) Insert the front drive shaft into front axle.
3) Temporarily tighten the axle nut.
4) Install the transverse link ball joint to housing.

Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)

5) While aligning the alignment mark on the camber adjusting bolt head, tighten the housing and strut using a new self-locking nut.

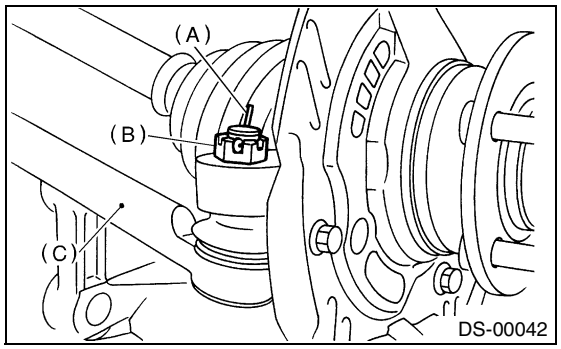
Tightening torque:
175 N·m (17.8 kgf-m, 129 ft-lb)

6) Connect the tie-rod end ball joint to the knuckle arm with a castle nut.

Tightening torque:
27.0 N·m (2.75 kgf-m, 19.9 ft-lb)

CAUTION:
When connecting, do not hit the cap at bottom of tie-rod with hammer.

7) Tighten the castle nut to the specified torque and tighten further within 60° until pin hole is aligned with the slot in nut. Bend the cotter pin to lock.



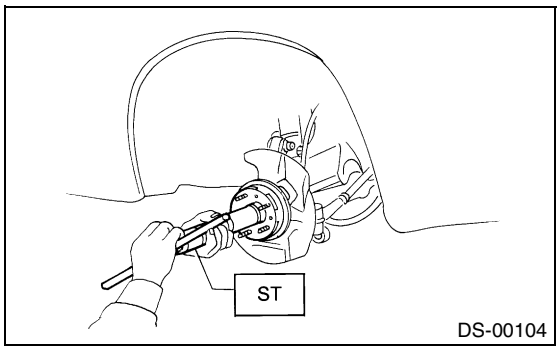
(A) Cotter pin
(B) Castle nut
(C) Tie-rod

8) Install the disc rotor on hub.
9) Install the disc brake caliper on housing.

Tightening torque:
80 N·m (8.2 kgf-m, 59 ft-lb)

10) Connect the stabilizer link.

11) Using the ST1 and ST2, pull the front drive shaft into place.
ST1 922431000 AXLE SHAFT INSTALLER
ST2 92739000 ADAPTER

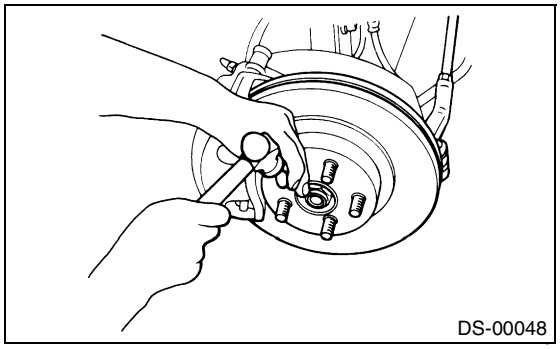


12) While depressing the brake pedal, tighten a new axle nut to the specified torque and lock it securely.

Tightening torque:
190 N·m (19.4 kgf-m, 140 ft-lb)

CAUTION:
Be sure to tighten the axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.

13) After tightening the axle nut, lock it securely.



14) Install the ABS sensor on housing.

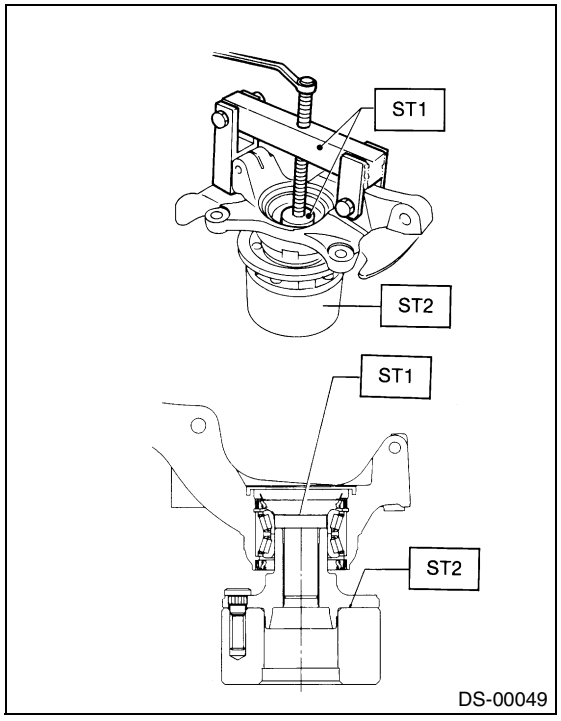
Tightening torque:
32 N·m (3.3 kgf-m, 23.9 ft-lb)

15) Install the wheel and tighten wheel nuts to specified torque.

Tightening torque:
88 N·m (9 kgf-m, 65 ft-lb)

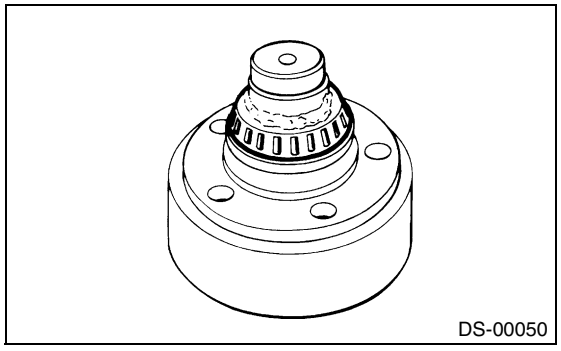
C: DISASSEMBLY

1) Using the ST1, support the housing and hub securely.
2) Attach the ST2 to housing and drive hub out.
ST1 927060000 HUB REMOVER
ST2 927080000 HUB STAND

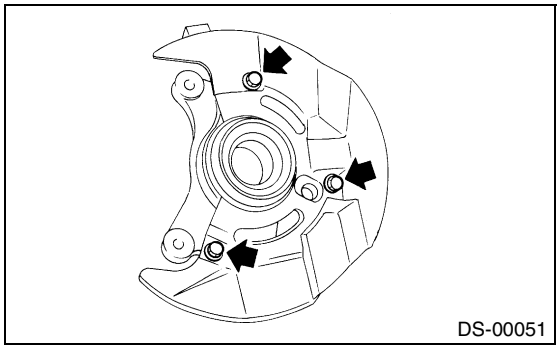


If inner bearing race remains in the hub, remove it with a suitable tool (commercially available).

NOTE:
Be careful not to scratch the polished area of hub.

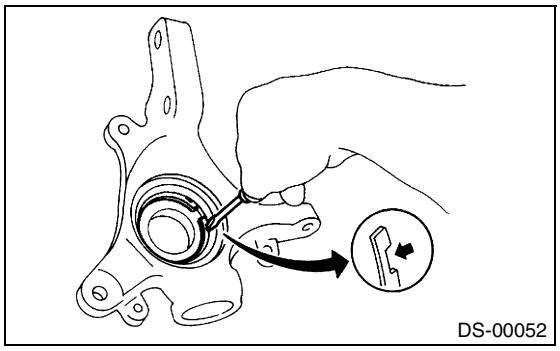


3) Remove the disc cover from housing.

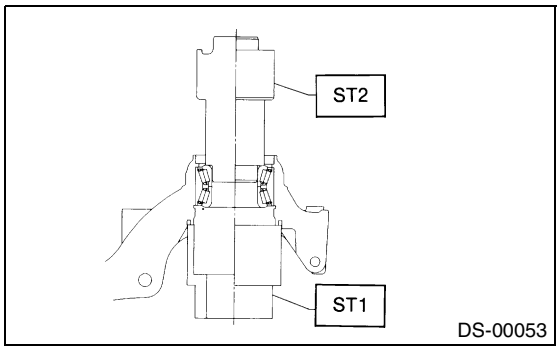


4) Using a standard screwdriver, remove the outer and inner oil seals.
5) Using a flat tip screwdriver, remove the snap ring.

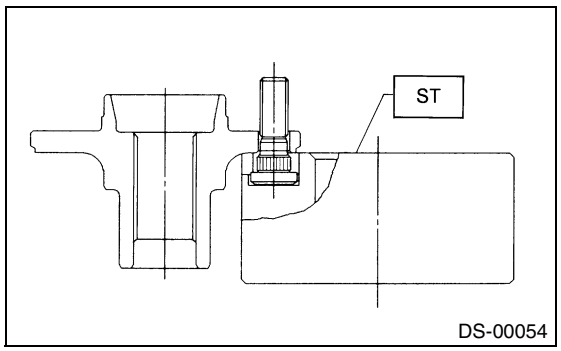
NOTE:
Be careful not to damage the housing at removal.



6) Using the ST1, support the housing securely.
7) Using the ST2, hold the inner race to drive out outer race of bearing.
ST1 927400000 HOUSING STAND
ST2 927100000 BEARING PULLER



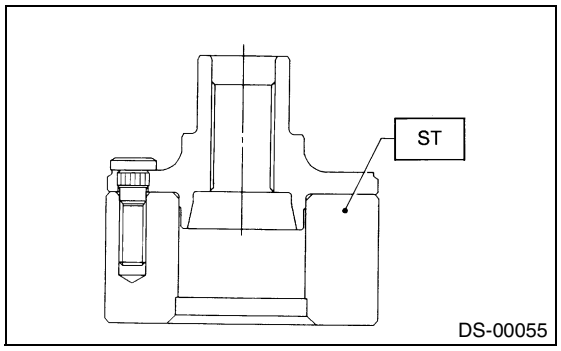
8) Using the ST and a hydraulic press, drive the hub bolts out.
ST 927080000 HUB STAND



D: ASSEMBLY

NOTE:
When the hub is to be removed from housing, replace the bearing set and oil seal with new ones.

1) Attach the hub to ST securely.
ST 927080000 HUB STAND



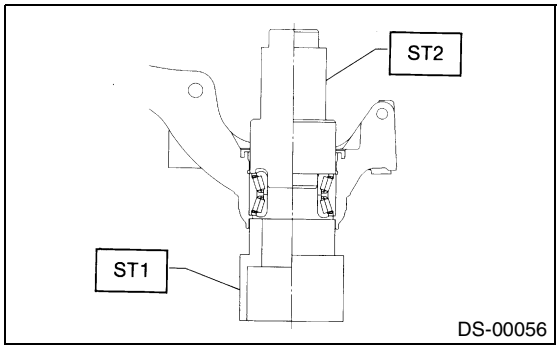
2) Using a hydraulic press, press new hub bolts untill their seating surfaces contact hub.

NOTE:
Use 12 mm (0.47 in) dia. holes in HUB STAND to prevent bolts from tilting.

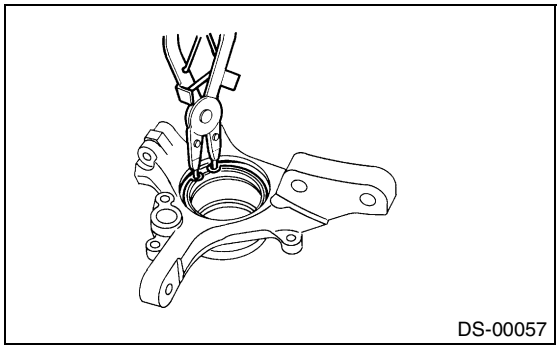
3) Clean dust or foreign particles from inside the housing.

4) Using the ST1 and ST2, press a new bearing into place.
ST1 927400000 HOUSING STAND
ST2 927100000 BEARING PULLER

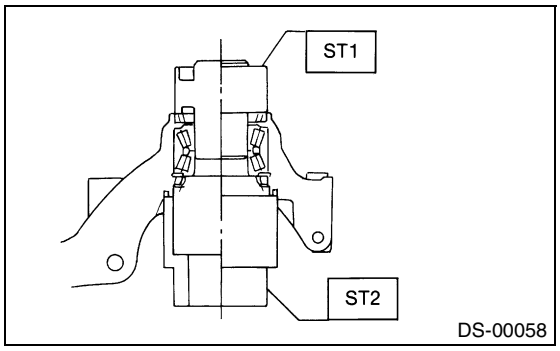
NOTE:
• Always press the outer race when installing bearing.
• Be careful not to remove the plastic lock from inner race when installing bearing.



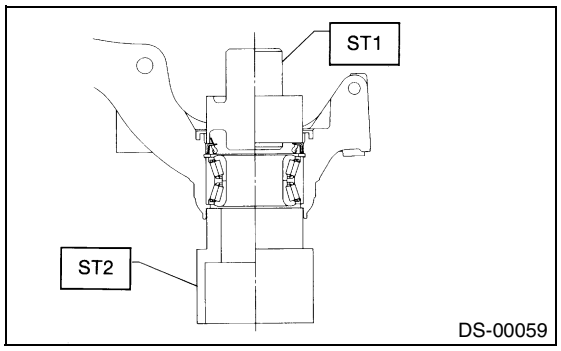
5) Using pliers, install the snap ring firmly.



6) Using the ST1 and ST2, press the outer oil seal until it contacts the bottom of housing.
ST1 927410000 OIL SEAL INSTALLER
ST2 927400000 HOUSING STAND



7) Using the ST1 and ST2, press the inner oil seal until it contacts circlip.
ST1 927410000 OIL SEAL INSTALLER
ST2 927400000 HOUSING STAND



8) Invert the ST and housing.
ST 927400000 HOUSING STAND
9) Apply sufficient grease to the oil seal lip.

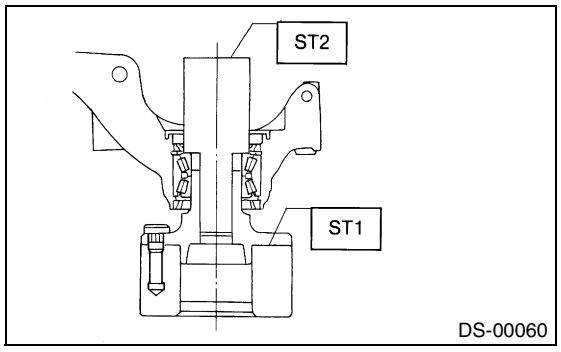
Specified grease:
SHELL 6459N

NOTE:
• If specified grease is not available, remove the bearing grease and apply Auto Rex A instead.
• Do not mix different types of grease.

10) Install the disc cover to housing with three bolts.

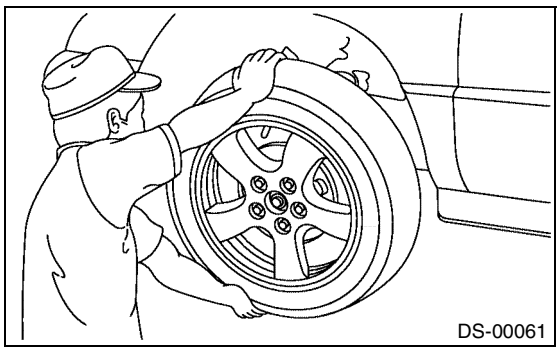
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

11) Attach the hub to ST1 securely.
12) Clean dust or foreign particles from the polished surface of hub.
13) Using the ST2, press the bearing into hub by driving inner race.
ST1 927080000 HUB STAND
ST2 927120000 HUB INSTALLER



E: INSPECTION

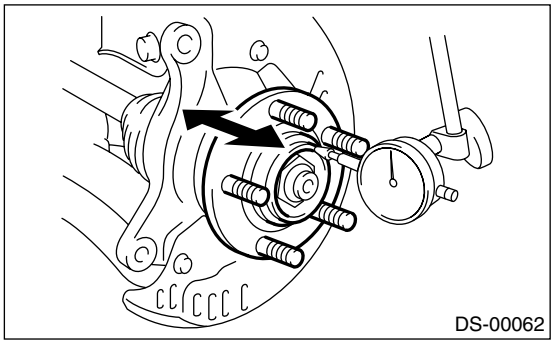
1) Moving the front tire up and down by hand, check that there is no backlash in the bearing, and check that the wheel rotates smoothly.



2) Inspect the lean of axis direction using a dial gauge. Replace the hub bearing if the load range exceed the limitation.

Limit:

Maximum: 0.05mm (0.0020 in)



4. Rear Axle

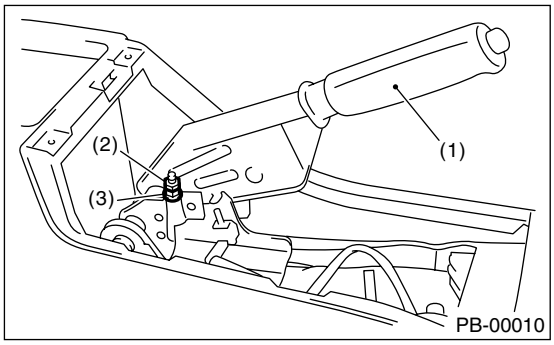
A: REMOVAL

1. DISC BRAKE

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and remove the rear wheel.
3) Unlock the axle nut.
4) Remove the axle nut using a socket wrench with brake pedal depressed.

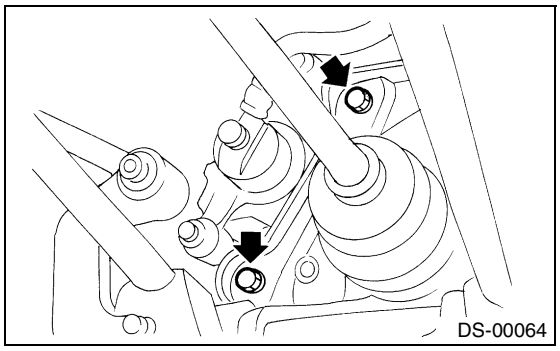
CAUTION:
Remove the axle nut with vehicle weight not applied on axle. Failure to follow this rule may damage the wheel bearings.

5) Return the parking brake lever and loosen adjusting nut.



(1) Parking brake lever
(2) Lock nut
(3) Adjusting nut

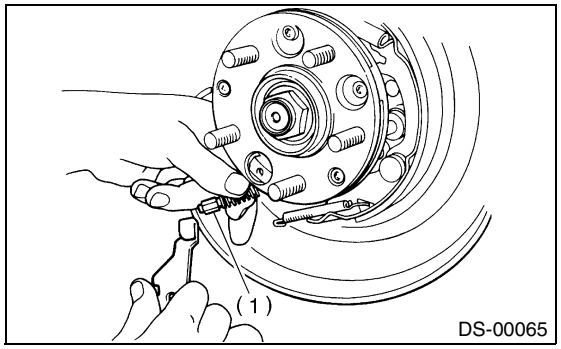
6) Remove the disc brake caliper from back plate, and suspend it from strut using a piece of wire.



7) Remove the disc rotor from hub.

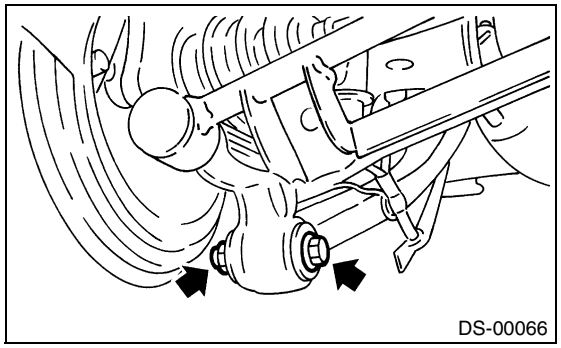
NOTE:
If the disc rotor seizes up within hub, drive it out by installing an 8-mm bolt into bolt hole in disc rotor.

8) Disconnect the parking brake cable end.

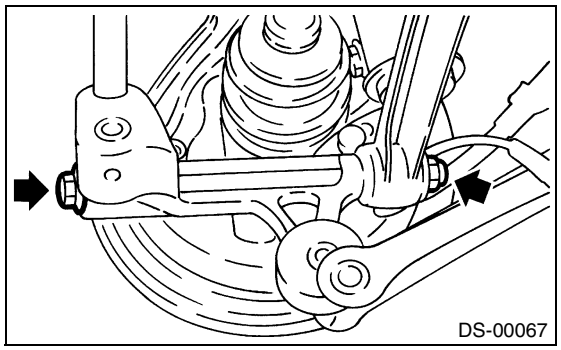


(1) Cable end

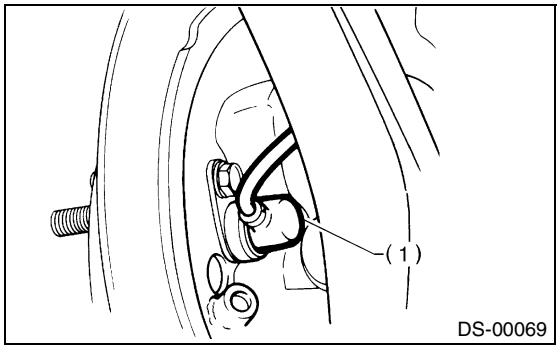
9) Disconnect the rear stabilizer from rear lateral link.
10) Remove the bolts which secure trailing link assembly to rear housing.



11) Remove the bolts which secure lateral assembly to rear housing.



12) Remove the rear ABS sensor from back plate.

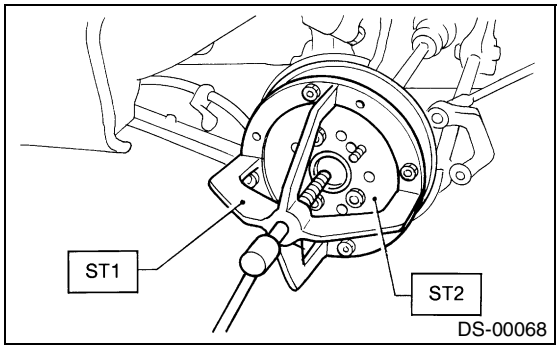


(1) ABS sensor

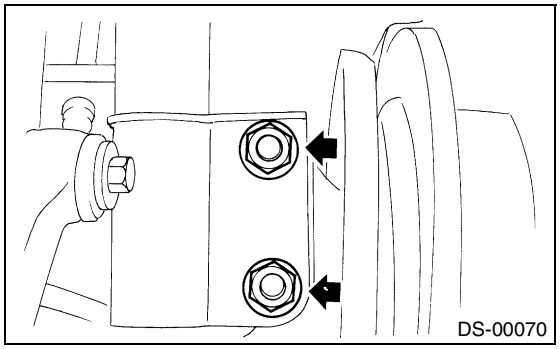
13) Disengage the BJ from housing splines, and then remove the rear drive shaft assembly.
If it is hard to remove, use the STs.

ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE

NOTE:
• Be careful not to damage the oil seal lip when removing rear drive shaft.
• When the rear drive shaft is to be replaced, also replace the inner oil seal with a new one.



14) Remove the bolts which secure rear housing to strut, and separate the two.

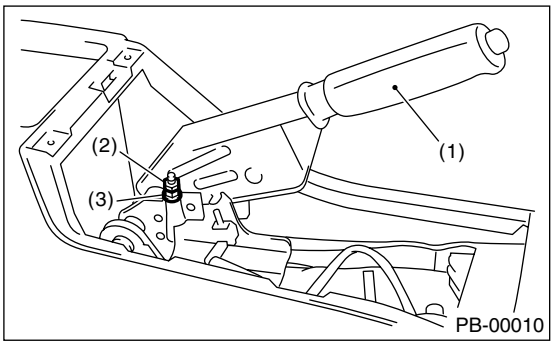


2. DRUM BRAKE

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and remove rear wheel cap and wheels.
3) Unlock the axle nut.
4) Remove the axle nut using a socket wrench.

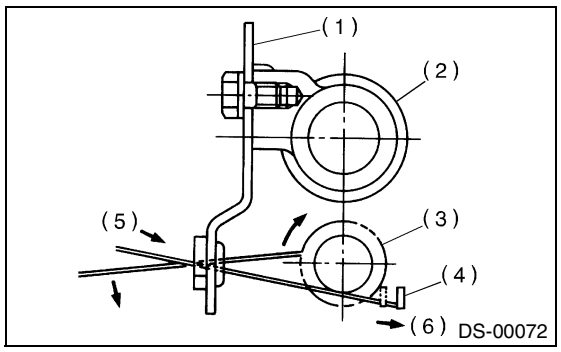
CAUTION:
Failure to follow this rule may damage the wheel bearings.

5) Return the parking brake lever and loosen adjusting nut.



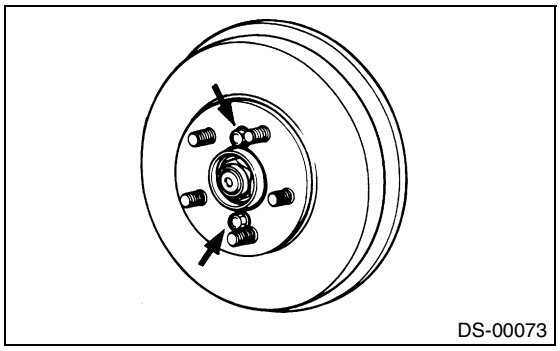
(1) Parking brake lever
(2) Lock nut
(3) Adjusting nut

6) Remove the brake drum from hub.
7) If it is difficult to remove the brake drum, remove the adjusting hole cover from back plate, and then turn the adjusting screw using a flat tip screwdriver until brake shoe separates from the drum.

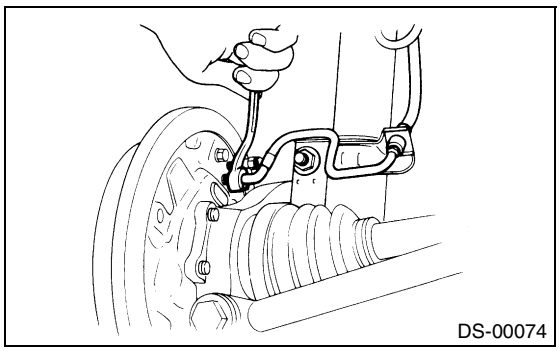


(1) Back plate
(2) Wheel cylinder
(3) Adjuster ASSY pawls
(4) Adjusting lever
(5) Tightening direction
(6) Push

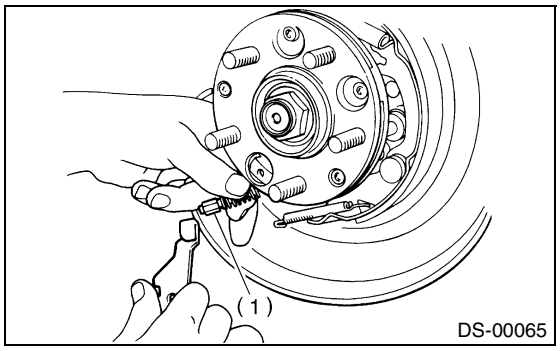
NOTE:
If the brake drum is difficult to remove, drive it out by installing two 8-mm bolts into bolt hole in brake drum.



8) Using a flare-nut wrench, disconnect the brake hose from wheel cylinder. Cover the open end of wheel cylinder to prevent entry of foreign particles.

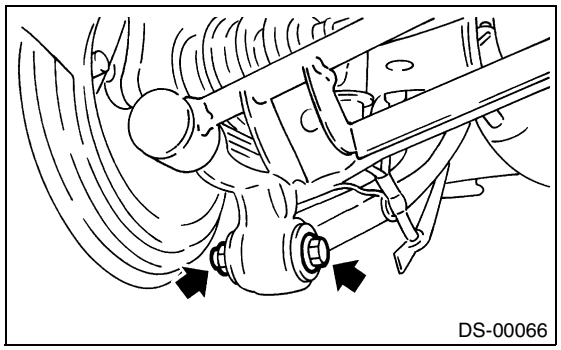


9) Cover the open end of brake pipe with vinyl sheet or equivalent to prevent brake fluid from spilling.
10) Disconnect the parking brake cable end.

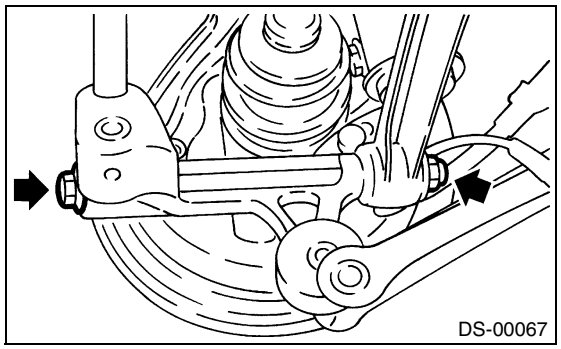


(1) Cable end

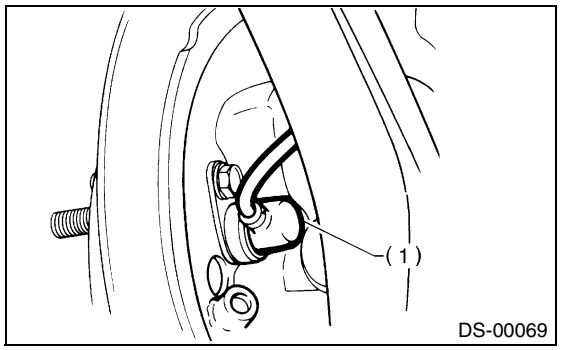
11) Disconnect the rear stabilizer from rear lateral link. Remove the bolts which secure trailing link assembly to rear housing.



12) Remove the bolts which secure lateral link assembly to rear housing.



13) Remove the rear ABS sensor from back plate.

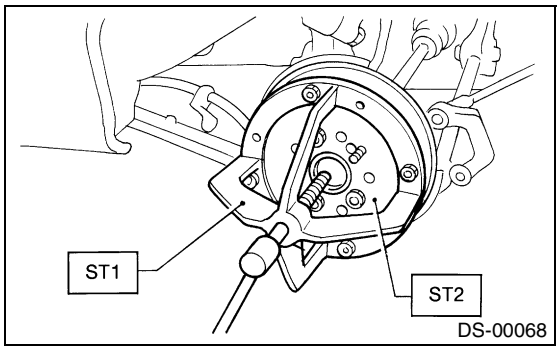


(1) ABS sensor

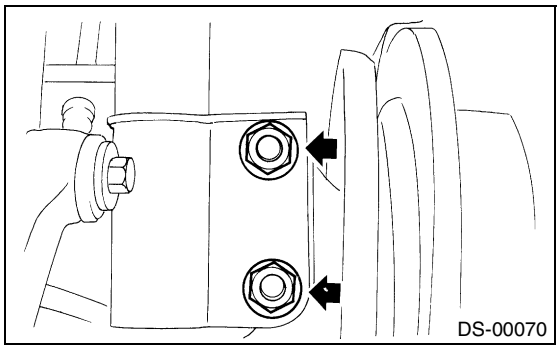
14) Disengage the BJ from housing splines, and remove the rear drive shaft assembly.
If it is hard to remove, use the STs.

ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE

CAUTION:
• Be careful not to damage the oil seal lip when removing rear drive shaft.
• When the rear drive shaft is to be replaced, also replace the inner oil seal with a new one.



15) Remove the bolts which secure rear housing to strut, and separate the two.



B: INSTALLATION

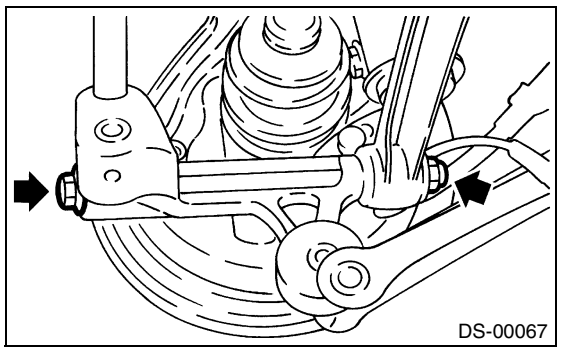
1. DISC BRAKE

1) Temporarily tighten the rear axle to strut.
2) Insert the rear drive shaft into rear axle.

NOTE:
Be careful not to damage the inner oil seal lip.

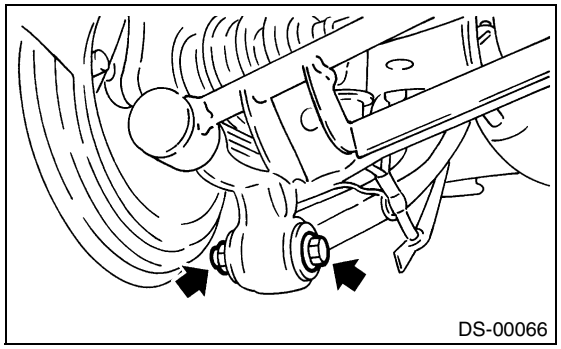
3) Temporarily tighten the axle nut.
4) Using a new self-locking nut, install the rear housing assembly and lateral link assembly.

Tightening torque:
137 N·m (14 kgf-m, 101 ft-lb)



5) Using a new self-locking nut, install the rear housing assembly and trailingl link assembly.

Tightening torque:
113 N·m (11.5 kgf-m, 83 ft-lb)



6) Tighten the rear housing assembly and strut assembly using a new self-locking nut.

Tightening torque:
196 N·m (20 kgf-m, 145 ft-lb)

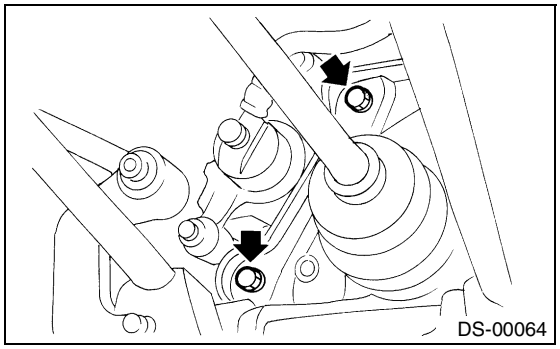
7) Using a new self-locking nut, install the rear stabilizer and rear lateral link.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)

8) Connect the parking brake cable to parking brake.
9) Install the disc rotor on rear housing assembly.

10) Install the disc brake caliper on back plate.

Tightening torque:
52 N·m (5.3 kgf-m, 38.3 ft-lb)

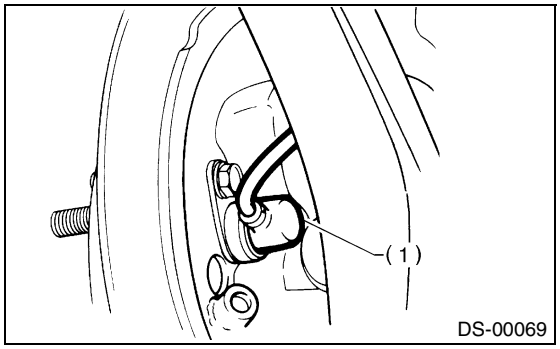


11) Adjust the parking brake lever stroke by turning adjuster.
12) Move the brake lever back to apply brakes. While depressing the brake pedal, tighten axle nut using a socket wrench. Lock the axle nut after tightening.

Tightening torque:
186 N·m (19 kgf-m, 137 ft-lb)

CAUTION:
Do not overtighten it as this may damage the wheel bearing.

13) Install rear ABS sensor.



(1) ABS sensor

14) Install the wheel, and then tighten the wheel nuts to specified torque.

Tightening torque:
88 N·m (9.0 kgf-m, 65 ft-lb)

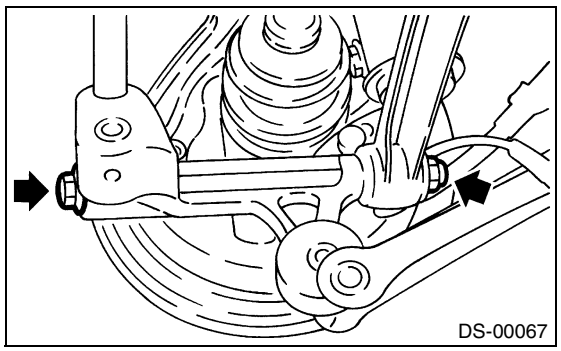
2. DRUM BRAKE

1) Temporarily tighten the rear axle to strut.
2) Insert the rear drive shaft to rear axle.

NOTE:
Be careful not to damage the inner oil seal lip.

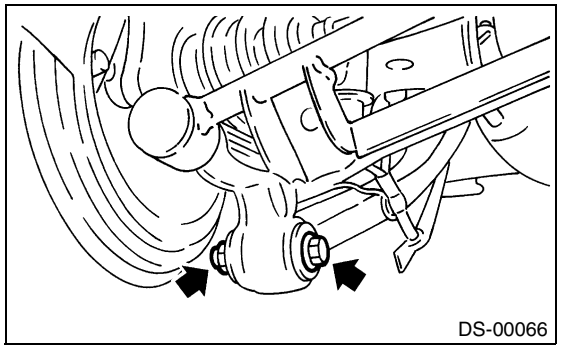
3) Temporarily tighten the axle nut.
4) Using a new self-locking nut, install the rear housing assembly and lateral link assembly.

Tightening torque:
137 N·m (14 kgf-m, 101 ft-lb)



5) Using a new self-locking nut, install the rear housing assembly and trailingl link assembly.

Tightening torque:
113 N·m (11.5 kgf-m, 83 ft-lb)



6) Tighten the rear housing assembly and strut assembly using a new self-locking nut.

Tightening torque:
196 N·m (20 kgf-m, 145 ft-lb)

7) Using a new self-locking nut, install the rear stabilizer and rear lateral link.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)

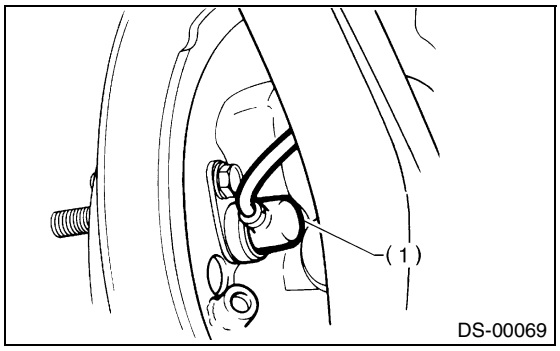
8) Connect the parking brake cable to parking brake.
9) Clean the brake pipe connection. Using a flare-nut wrench, connect the brake pipe to wheel cylinder.
10) Connect the parking brake cable to lever.
11) Install the brake drum on rear housing assembly.

12) Bleed the air from brake system. <Ref. to BR-43, REPLACEMENT, Brake Fluid.>
13) Adjust the parking brake lever stroke by turning adjuster.
14) Move the brake lever back to apply brakes. While depressing the brake pedal, tighten axle nut using a socket wrench. Lock the axle nut after tightening.

Tightening torque:
186 N·m (19 kgf-m, 137 ft-lb)

CAUTION:
Do not overtighten it as this may damage the wheel bearing.

15) Connect the rear ABS sensor to back plate.



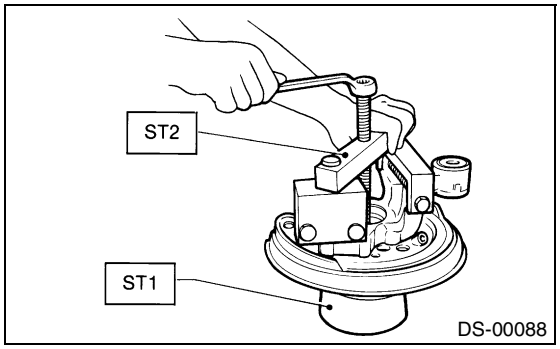
(1) ABS sensor

16) Install the wheel, and then tighten the wheel nuts to specified torque.

Tightening torque:
88 N·m (9.0 kgf-m, 65 ft-lb)

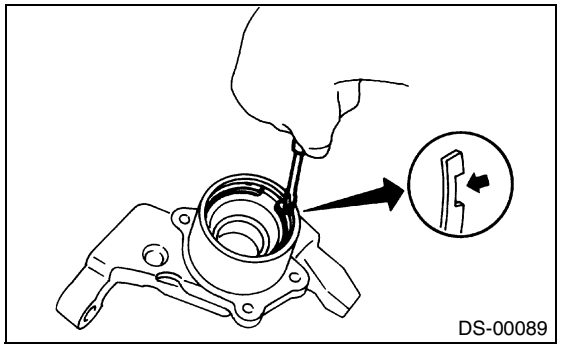
C: DISASSEMBLY

1) Using the ST1 and ST2, remove the hub from rear housing.
ST1 927080000 HUB STAND
ST2 927420000 HUB REMOVER

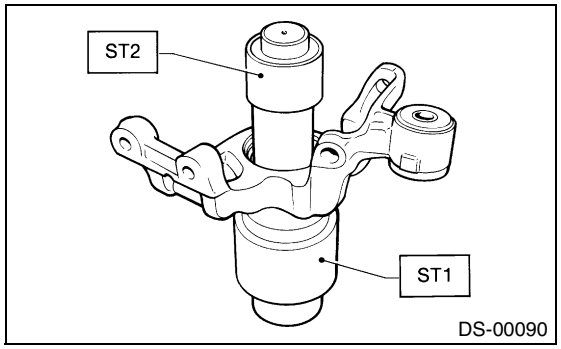


2) Remove the back plate from rear housing.
3) Using a standard screwdriver, remove the outer and inner oil seals.
4) Using a flat tip screwdriver, remove the snap ring.

NOTE:
Be careful not to damage the housing at removal.

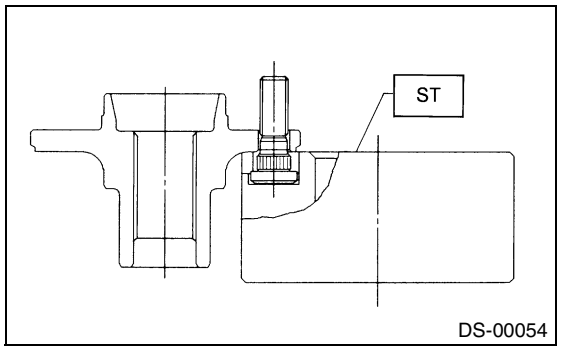


5) Using the ST1 and ST2, remove the bearing by pressing inner race.
ST1 927430000 HOUSING STAND
ST2 927440000 BEARING REMOVER



6) Remove the tone wheel bolts, and then remove the tone wheel from hub (only vehicle equipped with ABS).
7) Using the ST, press the hub bolt out.
ST 927080000 HUB STAND

CAUTION:
Be careful not to hammer the hub bolts. This may deform the hub.



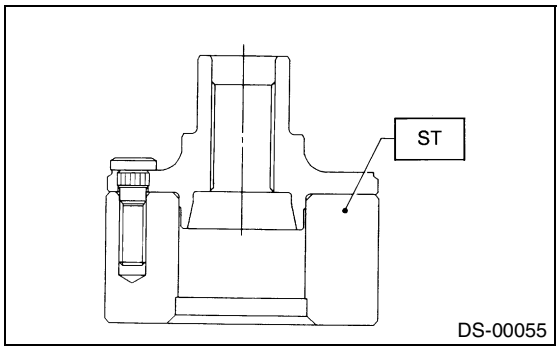
D: ASSEMBLY

NOTE:
When the hub is to be removed from housing, replace the bearing set and oil seal with new ones.

1) Using the ST, press the new hub bolt into place.

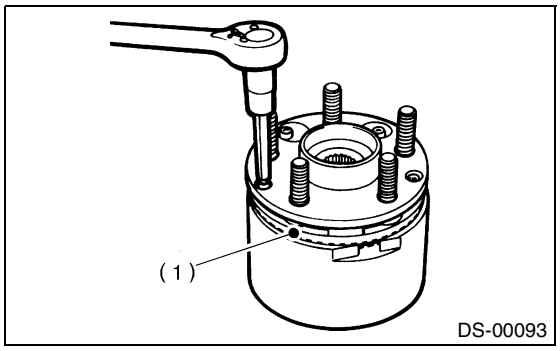
NOTE:
- Ensure the hub bolt closely contacts hub.
- Use a 12 mm (0.47 in) hole in the ST to prevent the hub bolt from tilting during installation.

ST 927080000 HUB STAND



2) Remove foreign particles (dust, rust, etc.) from mating surfaces of the hub tone wheel, and then install the tone wheel to hub (only vehicle equipped with ABS).

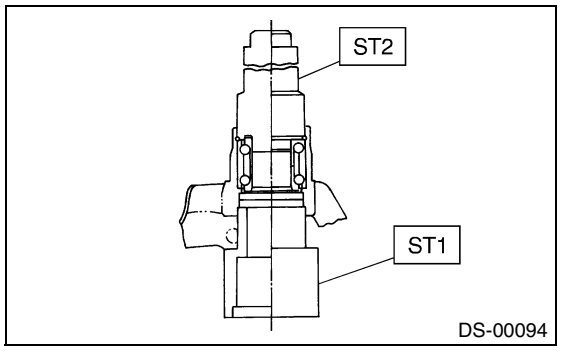
NOTE:
- Ensure the tone wheel closely contacts hub.
- Be careful not to damage the tone wheel teeth.



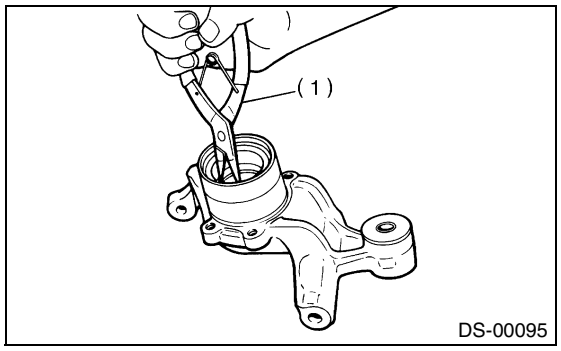
(1) Tone wheel

3) Clean the housing interior completely. Using the ST1 and ST2, press the bearing into housing.
ST1 927430000 HOUSING STAND
ST2 927440000 BEARING REMOVER

NOTE:
- Always press the outer race when installing bearing.
- Be careful not to remove the plastic lock from inner race when installing bearing.

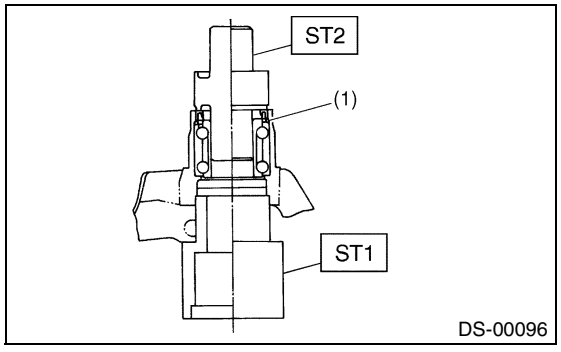


4) Using pliers, install the snap ring firmly.



(1) Pliers

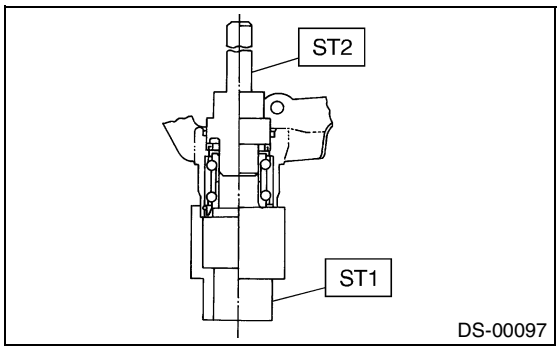
5) Using the ST1 and ST2, press the outer oil seal unit it comes in contact with snap ring.
ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER



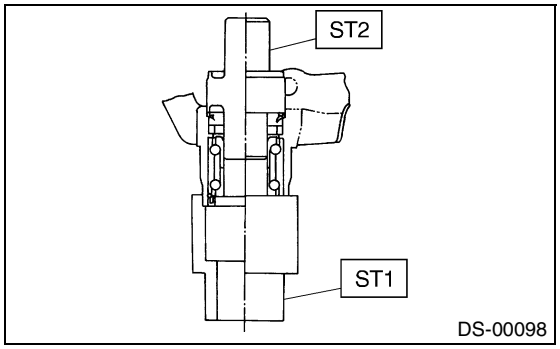
(1) Snap ring

6) Invert both ST1 and housing.

7) Using the ST2, press the inner oil seal into housing until it touches bottom.
ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER



8) Using the ST1 and ST2, press the sub seal into place.
ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER



9) Apply sufficient grease to oil seal lip.

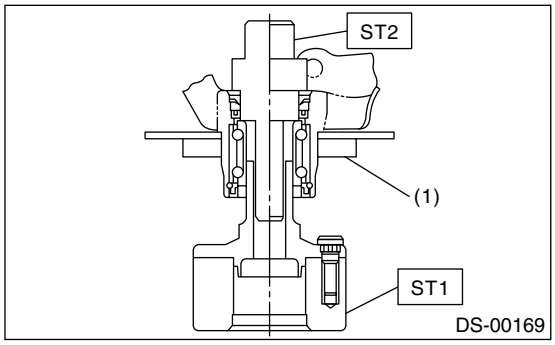
Specified grease:
SHELL 6459N

NOTE:
• If specified grease is not available, remove the bearing grease and apply Auto Rex A instead.
• Do not mix different types of grease.

10) Install the back plate to rear housing.

Tightening torque:
52 N·m (5.3 kgf-m, 38.3 ft-lb)

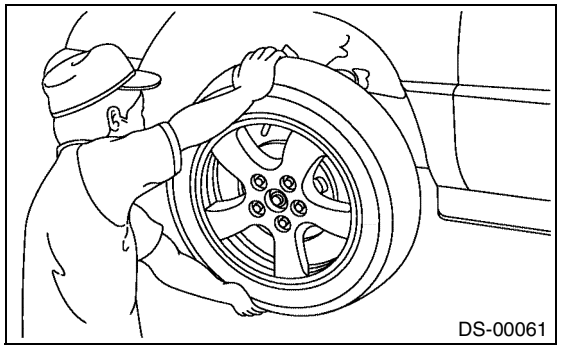
11) Using the ST1 and ST2, press the bearing into hub.
ST1 927080000 HUB STAND
ST2 927450000 HUB INSTALLER



(1) Back plate

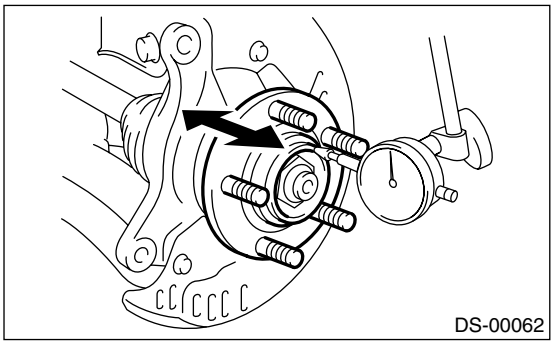
E: INSPECTION

1) Moving the front tire up and down by hand, check that there is no backlash in the bearing, and check that the wheel rotates smoothly.



2) Inspect the lean of axis direction using a dial gauge. Replace the hub bearing if the load range exceed the limitation.

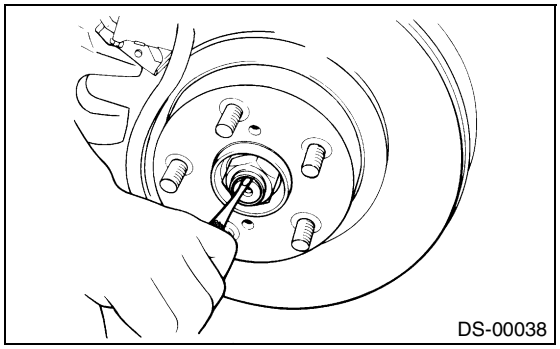
Limit:
Maximum: 0.05mm (0.00020 in)



5. Front Drive Shaft

A: REMOVAL

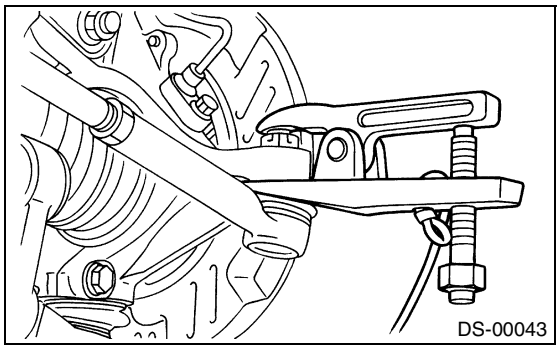
1) Lift-up the vehicle, and then remove the front wheels.
2) Drain the transmission oil.
3) Unlock the axle nut.



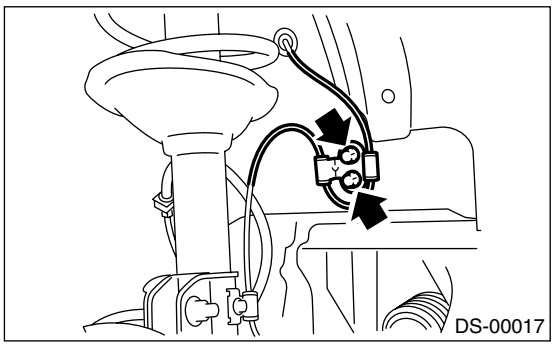
4) Remove the axle nut using a socket wrench with brake pedal depressed.

CAUTION:
Remove the axle nut with vehicle weight not applied on axle.

5) Remove the cotter pin and castle nut. Remove the tie-rod end using a puller.

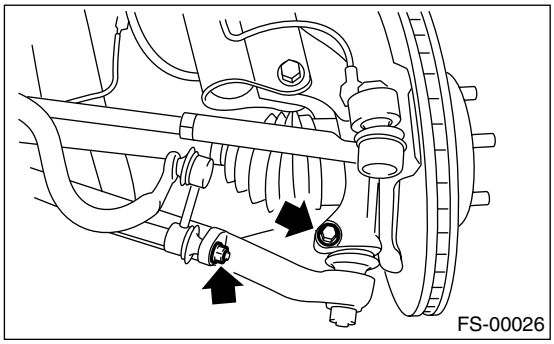


6) Remove the ABS sensor bracket.



7) Remove the front stabilizer link from transverse link.

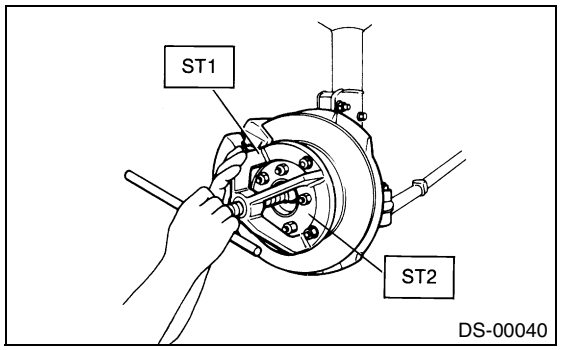
8) Remove the bolt securing ball joint, and then remove the transverse link from front housing.



9) Remove the front drive shaft from front axle. If it is hard to remove, remove the brake disk rotor using the ST1 and ST2.

ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE

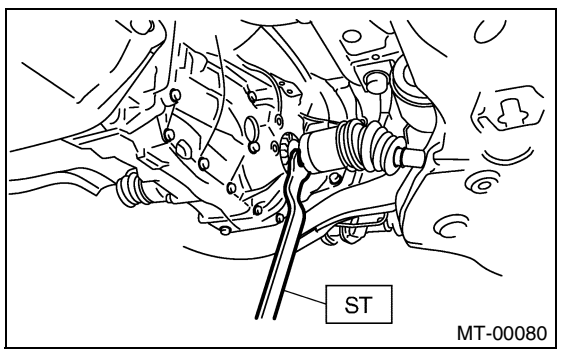
CAUTION:
- **Do not hammer the drive shaft when removing.**
- **Do not damage the oil seal and tone wheel.**



10) Remove the front drive shaft from transmission using ST.

ST	28399SA000	DRIVE SHAFT REMOVER

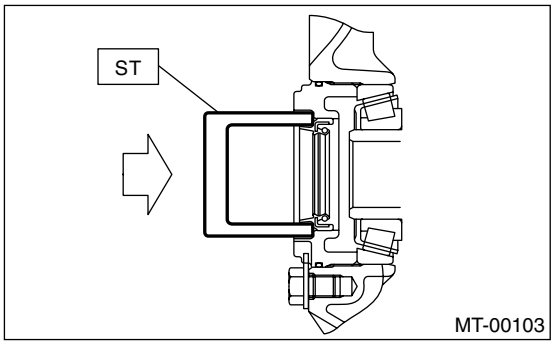
NOTE:
- ST usage is different depending on type of transmission equipped.
- For AT vehicles, face the “AT” letter stamped on ST to transmission side. For MT vehicles, face the “MT” letter stamped on ST to transmission side.
- Do not contact the ST to holder area.



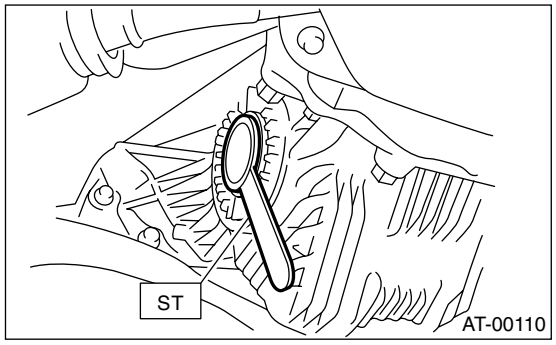
B: INSTALLATION

1) Using the ST, replace the differential side retainer oil seal with a new one.
ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER

NOTE:
Be sure to replace the oil seal with a new one when removing drive shaft.



2) Insert the front drive shaft into front axle.
3) Temporarily tighten the axle nut.
4) Install the front drive shaft to transmission using ST.
ST 28399SA010 OIL SEAL PROTECTOR

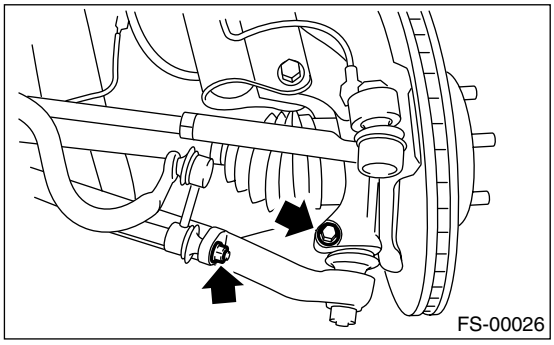


5) Install the ball joint to front axle.

Tightening torque (self-locking nut):
50 N·m (5.1 kgf-m, 37 ft-lb)

6) Install the stabilizer link.

Tightening torque (self-locking nut):
45 N·m (4.6 kgf-m, 33 ft-lb)

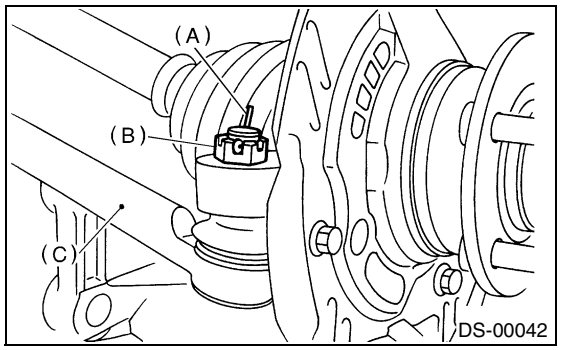


7) Install the tie-rod end.

Tightening torque (self-locking nut):
27 N·m (2.75 kgf-m, 19.9 ft-lb)

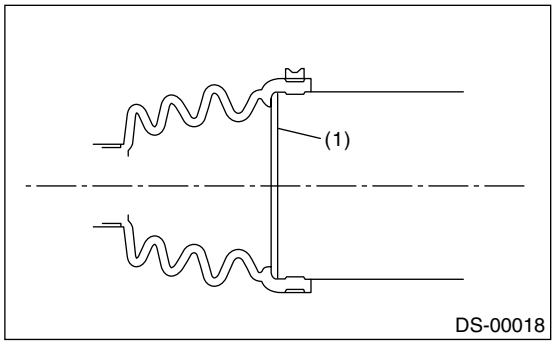
CAUTION:
When connecting, do not hit the cap at bottom of tie-rod with hammer.

8) Tighten the castle nut to the specified torque and tighten further within 60° until pin hole is aligned with the slot in nut. Bend the cotter pin to lock.



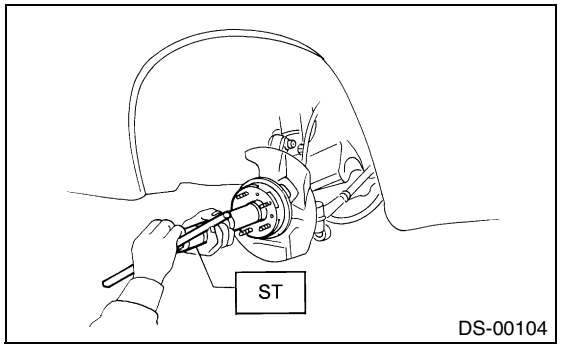
(A) Cotter pin
(B) Castle nut
(C) Tie-rod end

9) Make sure the AARi retainer is in proper position.



(1) Retainer

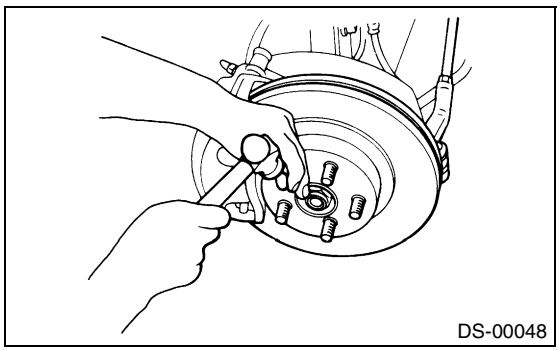
10) Using the ST1 and ST2, pull the front drive shaft into place.
ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADAPTER



11) Tighten a new axle nut to the specified torque with brake pedal depressed.

Tightening torque:
186 N·m (19 kgf-m, 137 ft-lb)

12) Lock the axle nut.


DS-00048

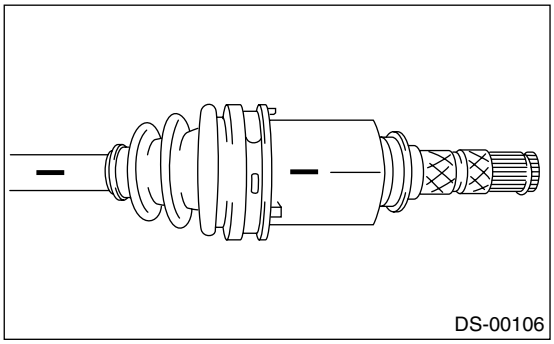
13) Install the ABS sensor bracket.

Tightening torque:
32 N·m (3.3 kgf-m, 24 ft-lb)

14) Add the transmission oil.
15) Install the wheel.

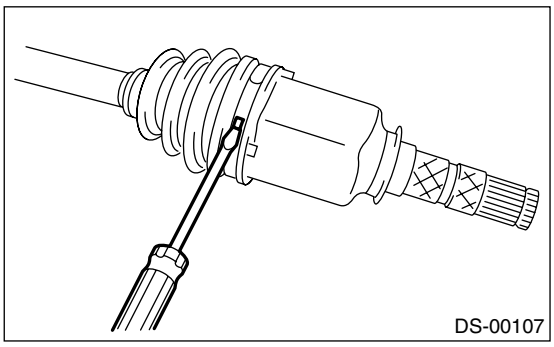
C: DISASSEMBLY

1) Place alignment marks on the shaft and outer race.

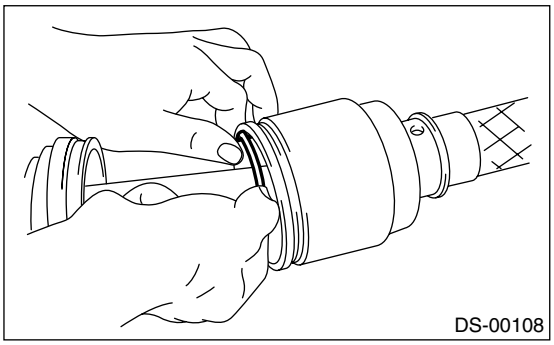

DS-00106

2) Remove the AAR boot band and boot.

NOTE:
Be careful not to damage the boot.


DS-00107

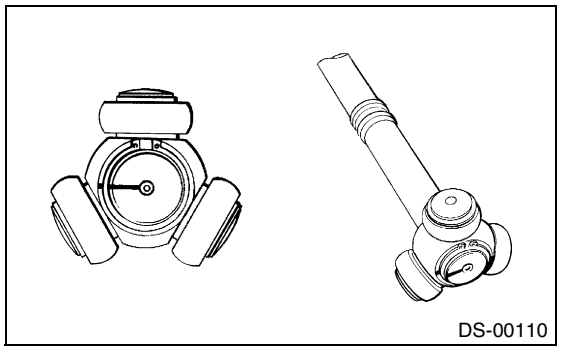
3) Remove the retainer from AAR outer race.


DS-00108

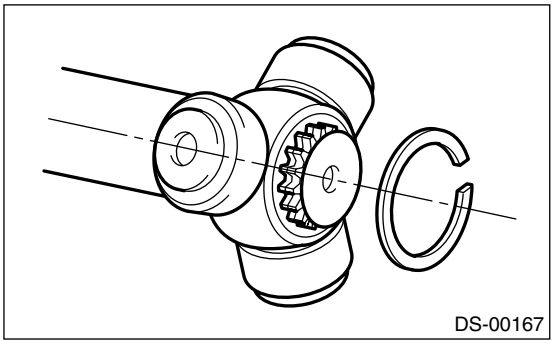
4) Remove the AAR outer race from shaft assembly.
5) Wipe off the grease.

NOTE:
The grease is a special grease. Do not confuse with other greases.

6) Place an alignment mark on the trunnion and shaft.


DS-00110

7) Remove the snap ring and trunnion.


DS-00167

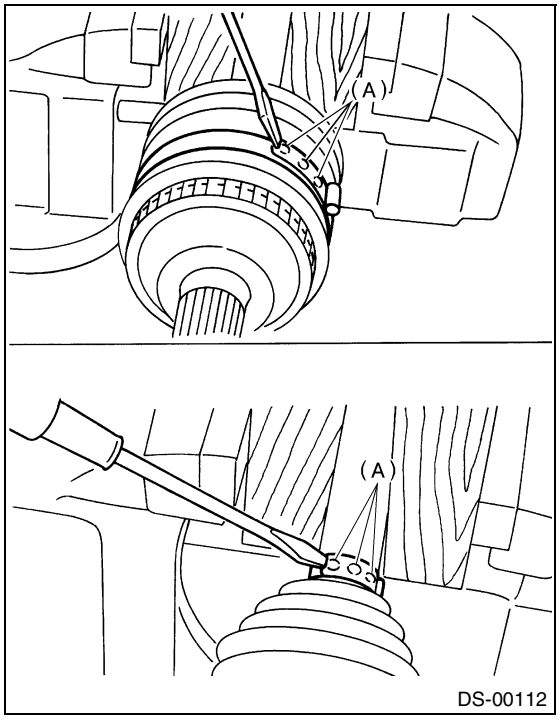
8) Remove the spider.

NOTE:
Be sure to wrap the shaft splines with vinyl tape to prevent boot from scratches.

9) Remove the AAR boot.
10) Place the drive shaft in a vise between wooden blocks.

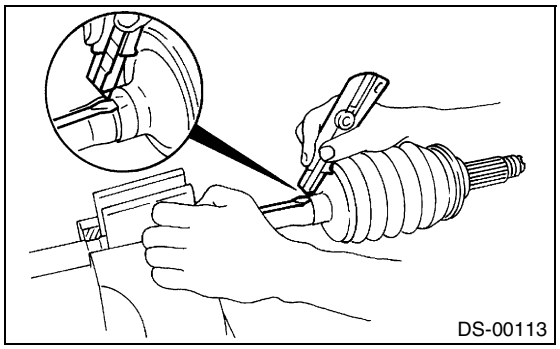
NOTE:
Do not place the drive shaft directly in the vise; use wooden block.

11) Raise the boot band claws by means of screwdriver and hammer.



(A) Boot band claws

12) Cut and remove the boot.



13) Hit the AC joint inner race with hammer to remove AC joint from shaft.

D: ASSEMBLY

NOTE:
Use specified grease.

AC side:
HTBJ GREASE (Part No. 28395SA010)

AAR side:
ONE LUBER C GREASE (Part No. 28395SA000)

1) Place the AC boot and small boot band on AC side of shaft.

NOTE:
Be sure to wrap the shaft splines with vinyl tape to prevent boot from scratches.

2) Place the drive shaft in a vise.

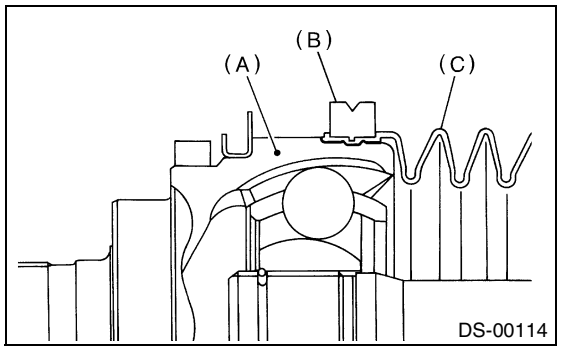
NOTE:
Do not place the drive shaft directly in the vise; use wooden blocks.

3) Apply a coat of specified grease [80 to 85 g (2.82 to 3.0 oz)] to AC.

4) Apply an even coat of specified grease [20 to 30 g (0.71 to 1.06 oz)] to the entire inner surface of boot. Also apply grease to the shaft.

NOTE:
The inside of the larger end of AC boot and boot groove shall be cleaned so as to be free from grease and other substances.

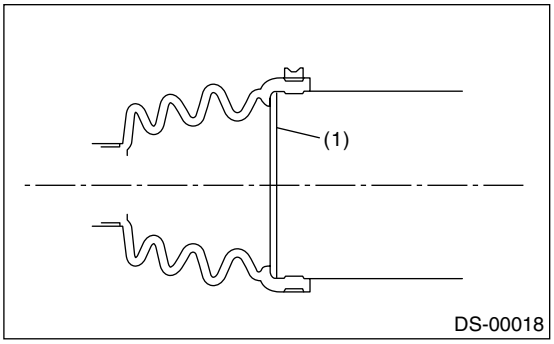
5) Install the boot projecting portion to AC groove.



(A) AC
(B) Large boot band
(C) Boot

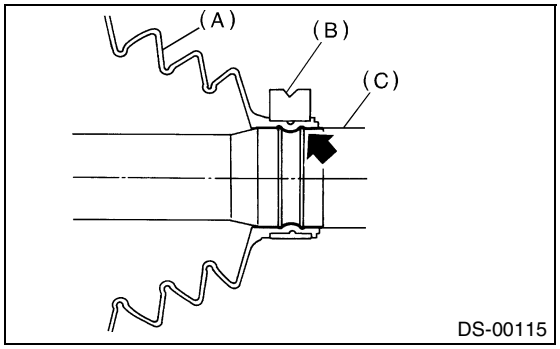
6) Set the large boot band in place.

NOTE:
Make sure to recognize the position of retainer.



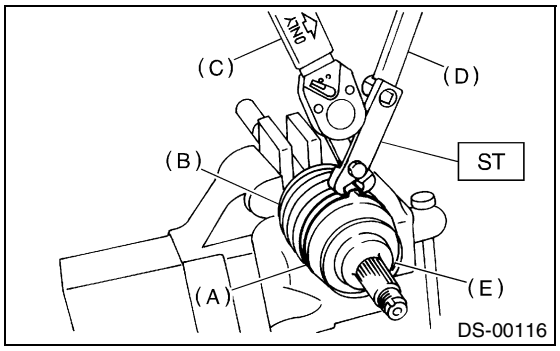
(1) Retainer

7) Install the boot projecting portion to shaft groove.



(A) Boot
(B) Small boot band
(C) Shaft

8) Tighten the boot bands using ST, torque wrench and socket flex handle.
ST 28099AC000 BOOT BAND PLIER

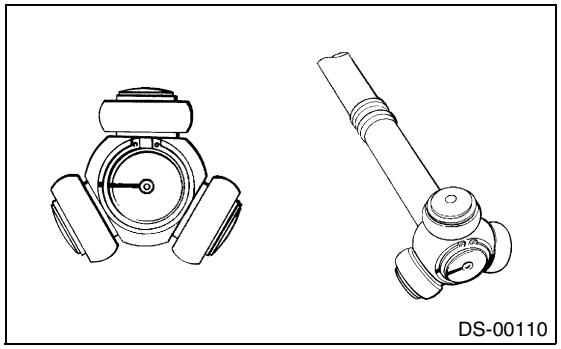


(A) Large boot band
(B) Boot
(C) Torque wrench
(D) Socket flex handle
(E) AC

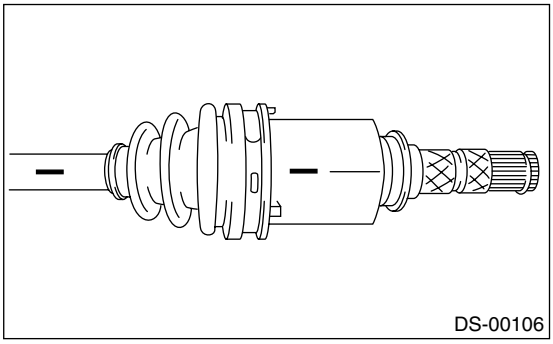
Caulking portion clearance of boot band:
Large boot band
1.3 mm (0.051 in) or more
Small boot band
1.3 mm (0.051 in) or more

9) Fit the AAR boot and retainer to shaft, and then position to center of shaft.

10) Align the alignment marks, and then install the trunnion on shaft.



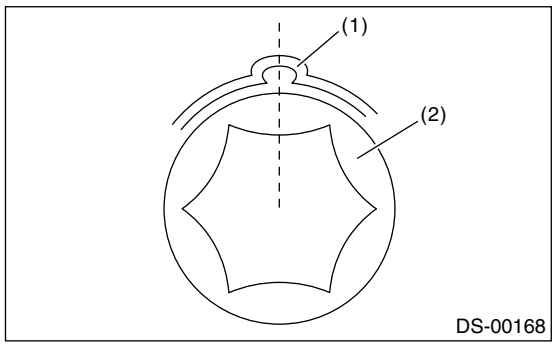
11) Fill 100 to 110 g (3.53 to 3.88 oz) of specified grease into the interior of AAR outer race.
12) Apply a coat of specified grease to the free ring and trunnion.
13) Align the alignment marks on shaft and outer race, and then install the outer race.



14) Apply an even coat of the specified grease 30 to 40 g (1.06 to 1.41 oz) to the entire inner surface of boot.
15) Install the AAR boot taking care not to twist it.

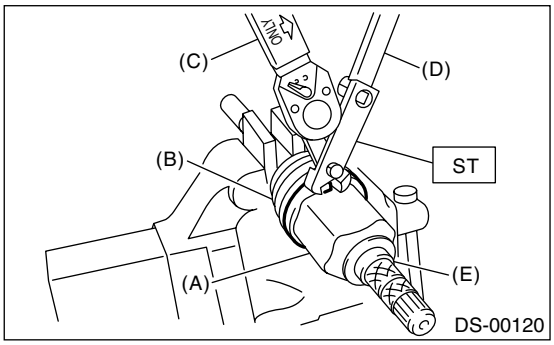
NOTE:
• The inside of the larger end of AAR boot and boot groove shall be cleaned so as to be free from grease and other substances.
• When installing the AAR boot, position the outer race of AAR at center of its travel.

16) Install a new large boot band and small boot band in specified position. Install the caulking part of large boot band and boot as shown in the figure.



(A) Caulking part of boot band
(B) Boot

17) Using the ST, torque wrench and socket flex handle, tighten the boot band.
ST 28099AC000 BOOT BAND PLIERS



(A) Large boot band
(B) Boot
(C) Torque wrench
(D) Socket flex handle
(E) AAR

Caulking portion clearance of boot band:
Large boot band
1 mm (0.04 in) or less
Small boot band
1 mm (0.04 in) or less

18) Extend and retract the AAR to provide equal grease coating.

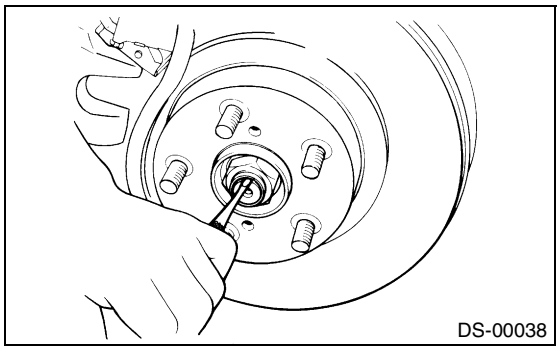
E: INSPECTION

Check the removed parts for damage, wear, corrosion etc. If faulty, repair or replace.
1) AAR
Check seizure, corrosion, damage and excessive play.
2) Shaft
Check excessive bending, twisting, damage and wear.
3) AC
Check seizure, corrosion, damage and excessive play.
4) Boot
Check for wear, warping, breakage or scratches.
5) Grease
Check for discoloration or fluidity.

6. Rear Drive Shaft

A: REMOVAL

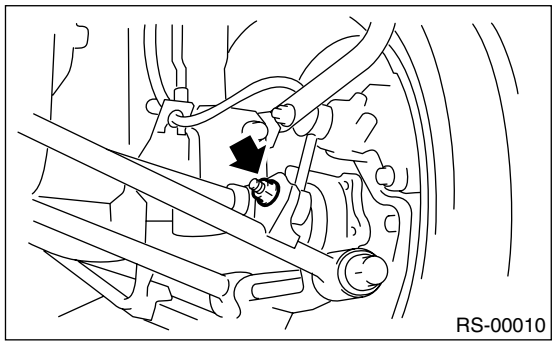
1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and remove the rear wheel.
3) Unlock the axle nut.



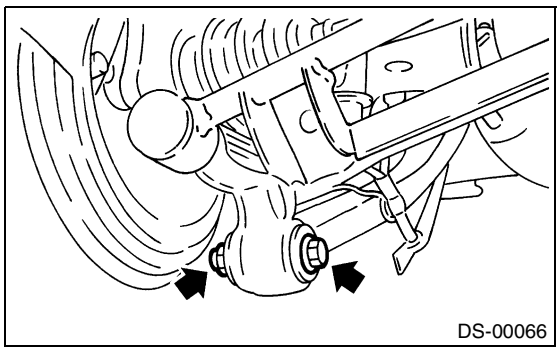
4) Remove the axle nut using a socket wrench with brake pedal depressed.

CAUTION:
Remove the axle nut with vehicle weight not applied on axle.

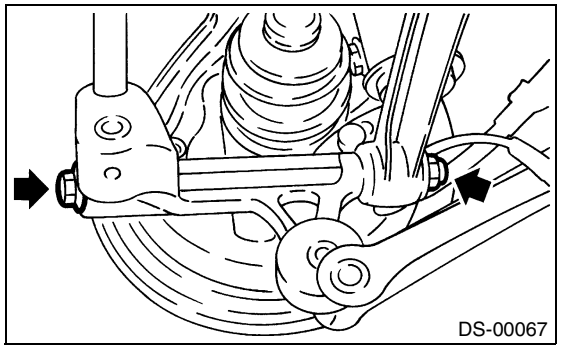
5) Disconnect the stabilizer link.



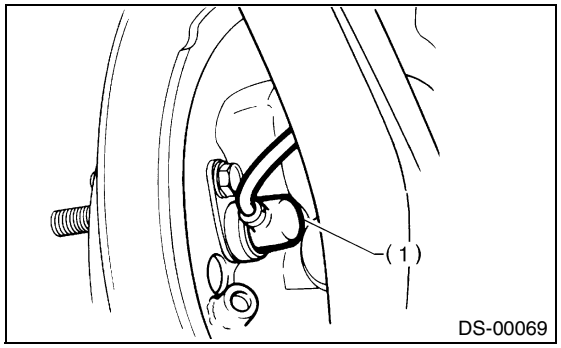
6) Remove the bolt which secures trailing link to housing.



7) Remove the bolts which secure front lateral link and rear lateral link to housing.



8) Remove the rear ABS sensor from back plate.

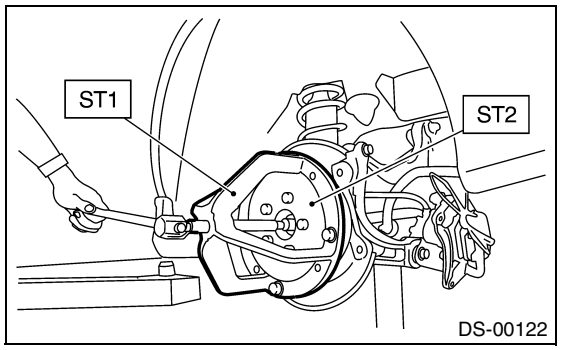


(1) ABS sensor

9) Remove the rear drive shaft from rear axle. If it is hard to remove, remove the brake disk rotor using the ST1 and ST2.

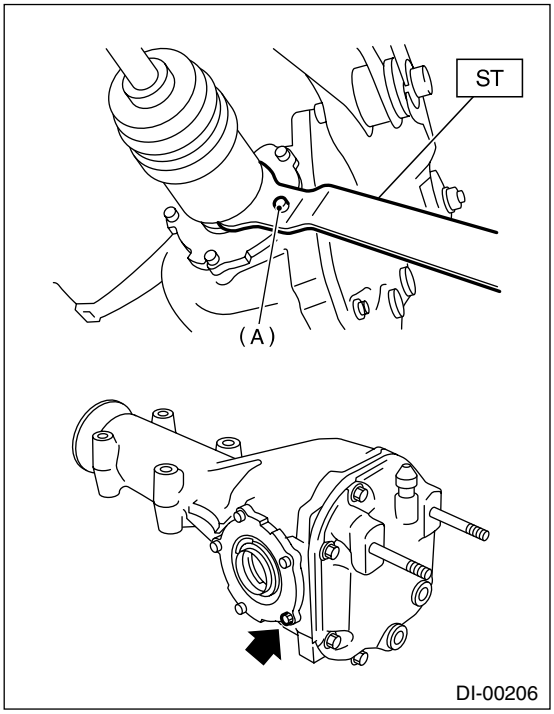
ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE

CAUTION:
- **Do not hammer the drive shaft when removing.**
- **Do not damage the oil seal and tone wheel.**



10) Remove the rear drive shaft from rear differential using ST.
ST 208099PA100 DRIVE SHAFT REMOVER

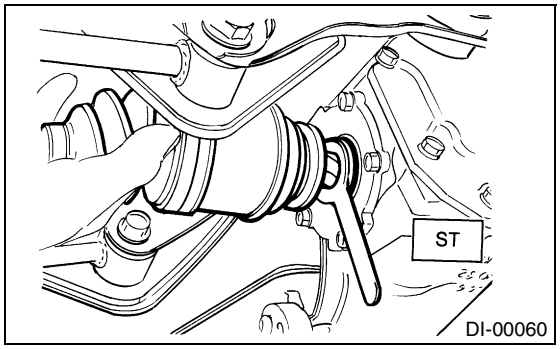
NOTE:
Fit ST to the bolt (A) as shown in the figure to avoid damage on the side bearing retainer.



(A) Bolt

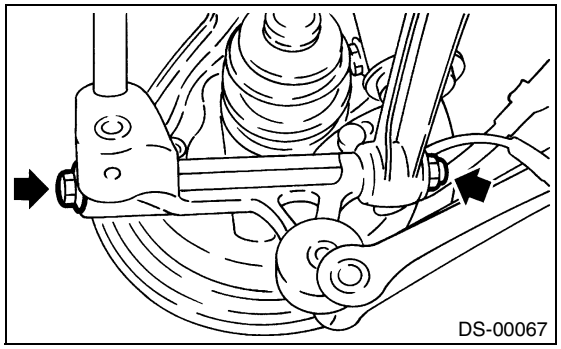
B: INSTALLATION

1) Insert the rear drive shaft into rear axle.
2) Temporarily tighten the axle nut.
3) Install the rear drive shaft to rear differential using ST.
ST 28099PA090 OIL SEAL PROTECTOR



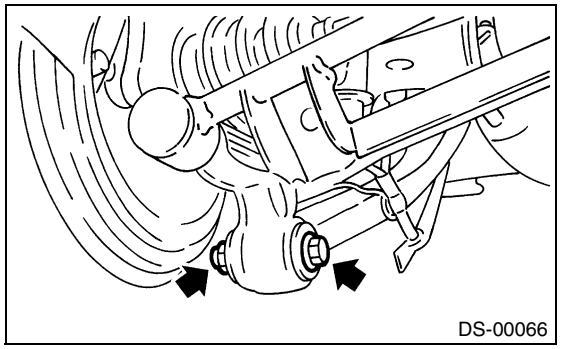
4) Attach the front lateral link and rear lateral link to housing using a new self-locking nuts.

Tightening torque:
137 N·m (14 kgf-m, 101 ft-lb)



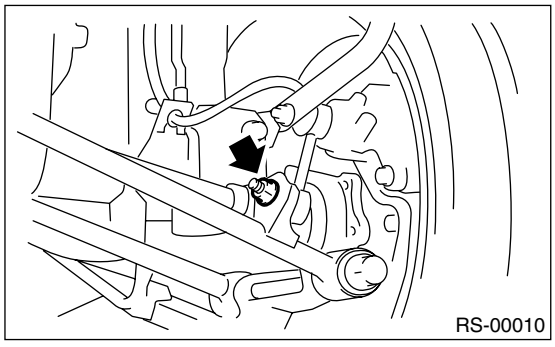
5) Attach the trailing link to housing using a new self-locking nut.

Tightening torque:
113 N·m (11.5 kgf-m, 83 ft-lb)



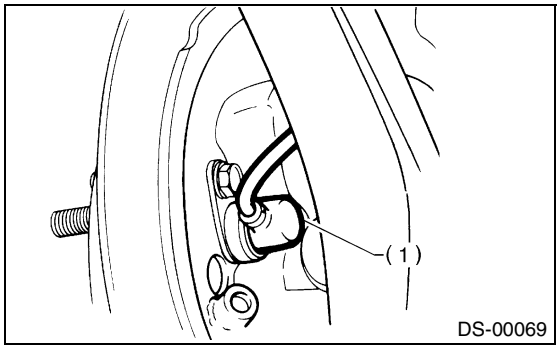
6) Install the stabilizer link.

Tightening torque:
45 N·m (4.6 kgf-m, 33 ft-lb)



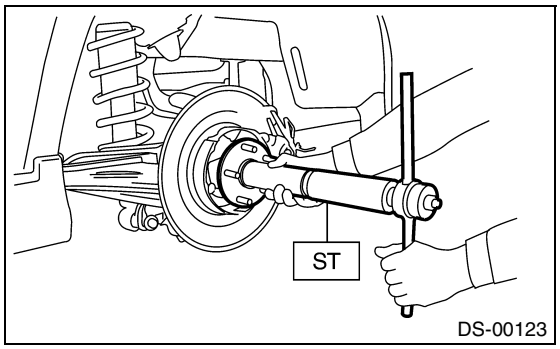
7) Install the ABS sensor.

Tightening torque:
32 N·m (3.3 kgf-m, 24 ft-lb)



(A) ABS sensor

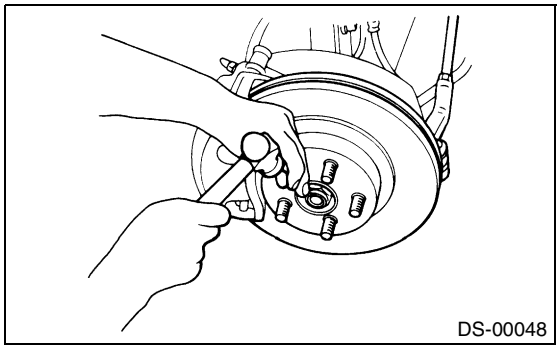
8) Using the ST1 and ST2, pull the rear drive shaft into place.
ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADAPTER



9) Tighten a new axle nut to the specified torque with brake pedal depressed.

Tightening torque:
186 N·m (19 kgf-m, 137 ft-lb)

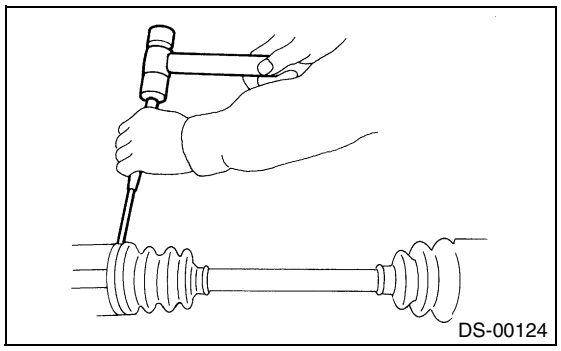
10) Lock the axle nut.



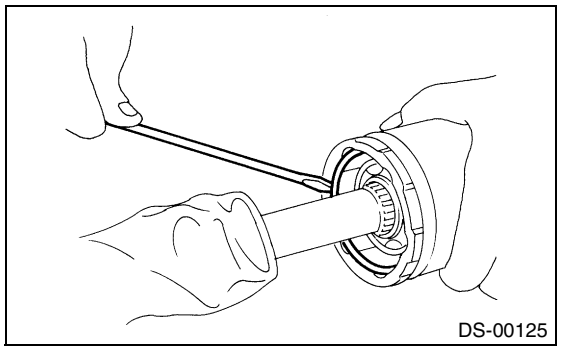
11) Install the wheel.

C: DISASSEMBLY

1) Straighten the bent claw of larger end of DOJ boot.
2) Loosen the band by means of screwdriver or pliers with care of not damaging boot.



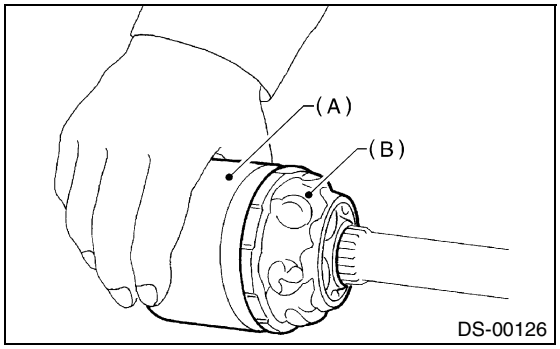
3) Remove the boot band on the small end of DOJ boot in the same manner.
4) Remove the larger end of DOJ boot from DOJ outer race.
5) Pry and remove the round circlip located at neck of DOJ outer race with a screwdriver.



6) Take out the DOJ outer race from shaft assembly.

7) Wipe off the grease, and then take out the balls.

NOTE:
• The grease is a special grease (grease for constant velocity joint). Do not confuse with other greases.
• Disassemble with exercising care not to lose balls (6 pcs).



(A) Outer race
(B) Grease

8) To remove the cage from inner race, turn the cage by a half pitch to the track groove of inner race and shift the cage.
9) Remove the snap ring, which fixes inner race to shaft, by using pliers.
10) Take out the DOJ inner race.
11) Take off the DOJ cage from shaft and remove DOJ boot.
12) Wrap the shaft splines with vinyl tape.
13) Remove the BJ boot in same procedure as DOJ boot.
14) Thus, disassembly of axle is completed, but the BJ is unable to be disassembled.

D: ASSEMBLY

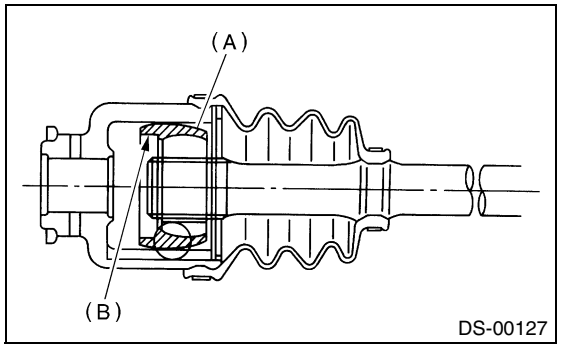
NOTE:
Use specified grease.

BJ side:
Molylex No. 2 (Part No. 723223010)

DOJ side:
VU-3A702 (Yellow) (Part No. 23223GA050)

1) Install the BJ boot in specified position, and fill it with 60 to 70 g (2.12 to 2.47 oz) of specified grease.
2) Place the DOJ boot at the center of shaft.
3) Wrap the shaft splines with vinyl tape.
4) Insert the DOJ cage onto shaft.

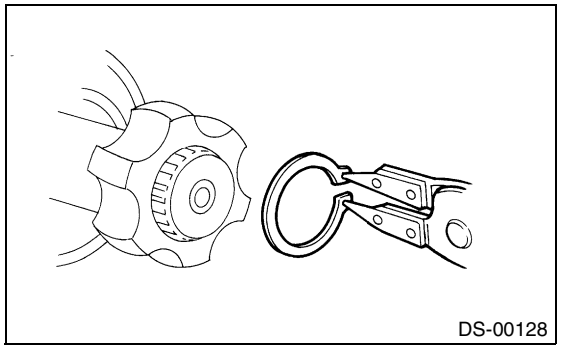
NOTE:
Insert the cage with cut-out portion facing the shaft end, since the cage has an orientation.



(A) Cage
(B) Cut-out portion

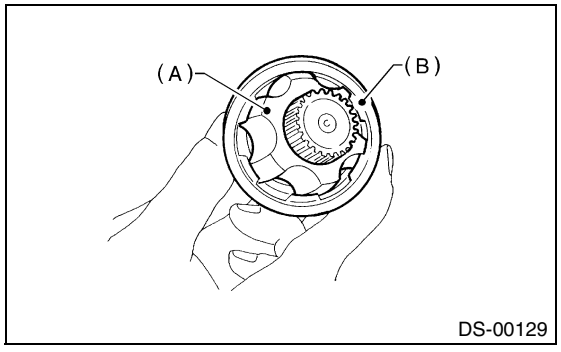
5) Install the DOJ inner race on shaft and fit snap ring with pliers.

NOTE:
Confirm that the snap ring is completely fitted in shaft groove.



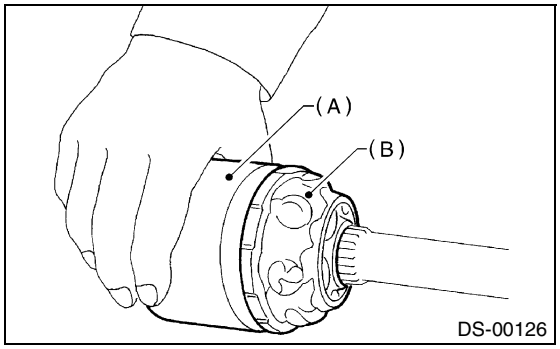
6) Install the cage, which was previously fitted, to inner race fixed upon shaft.

NOTE:
Fit the cage with protruded part aligned with the track on inner race, and then turn by a half pitch.



(A) Inner race
(B) Cage

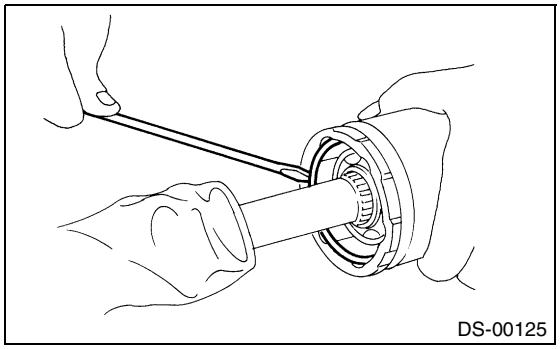
7) Fill 80 to 90 g (2.82 to 3.17 oz) of specified grease into the interior of DOJ outer race.
8) Apply a coat of specified grease to the cage pocket and six balls.
9) Insert six balls into the cage pocket.
10) Align the outer race track and ball positions and place in the part where shaft, inner race, cage and balls are previously installed, and then fit outer race.



(A) Outer race
(B) Grease

11) Install the circlip in the groove on DOJ outer race.

NOTE:
• Assure that the balls, cage and inner race are completely fitted in the outer race of DOJ.
• Exercise care not to place the matched position of circlip in the ball groove of outer race.
• Pull the shaft lightly and assure that the circlip is completely fitted in the groove.



12) Apply an even coat of the specified grease [20 to 30 g (0.71 to 1.06 oz)] to the entire inner surface of boot. Also apply grease to shaft.
13) Install the DOJ boot taking care not to twist it.

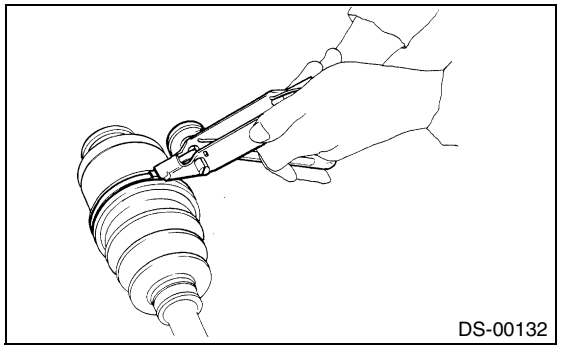
NOTE:
• The inside of the larger end of DOJ boot and boot groove shall be cleaned so as to be free from grease and other substances.
• When installing the DOJ boot, position the outer race of DOJ at center of its travel.

14) Put a new band through the clip and wind twice in alignment with band groove of boot.
15) Pinch the end of band with pliers. Hold the clip and tighten securely.

NOTE:
When tightening the boot, exercise care so that air within the boot is appropriate.

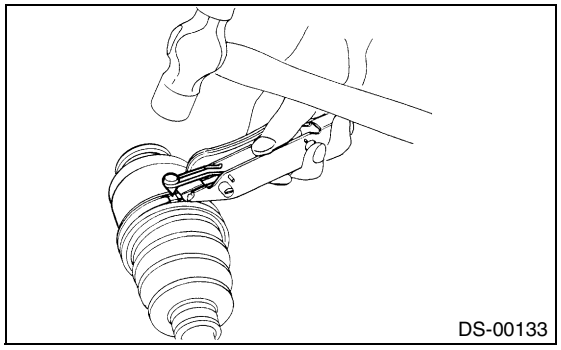
16) Tighten the band by using ST.
ST 925091000 BAND TIGHTENING TOOL

NOTE:
Tighten the band until it cannot be moved by hand.



17) Tap on the clip with the punch provided at the end of ST.
ST 925091000 BAND TIGHTENING TOOL

NOTE:
Tap to an extent that the boot underneath is not damaged.



18) Cut off the band with an allowance of about 10 mm (0.39 in) left from the clip and bend this allowance over the clip.

NOTE:
Be careful so that the end of the band is in close contact with clip.

19) Fix up the boot on BJ in the same manner.
20) Extend and retract the DOJ to provide equal grease coating.

E: INSPECTION

Check the removed parts for damage, wear, corrosion etc. If faulty, repair or replace.
1) DOJ (Double Offset Joint)
Check seizure, corrosion, damage, wear and excessive play.
2) Shaft
Check excessive bending, twisting, damage and wear.
3) BJ (Bell Joint)
Check seizure, corrosion, damage and excessive play.
4) Boot
Check for wear, warping, breakage or scratches.
5) Grease
Check for discoloration or fluidity.

7. General Diagnostic Table

A: INSPECTION

NOTE:
Vibration while cruising may be caused by an unbalanced tire, improper tire inflation pressure, improper wheel alignment, etc.

Symptom	Possible cause	Remedy
1. Vibration of propeller shaft NOTE: Vibration is caused by propeller shaft during operation and is transferred to vehicle body. Generally vibration increase in proportion to vehicle speed.	(1) Worn or damaged universal joint.	Replace.
	(2) Unbalanced propeller shaft due to bend or dent.	Replace.
	(3) Loose installation of propeller shaft.	Retighten.
	(4) Worn or damaged center bearing and damaged center mounting rubber.	Replace.
2. Tapping when starting and noise while cruising, caused by propeller shaft.	(1) Worn or damaged universal joint.	Replace.
	(2) Worn spline of sleeve yoke.	Replace.
	(3) Loose installation of propeller shaft.	Retighten.
	(4) Loose installation of joint.	Replace.
	(5) Worn or damaged center bearing and damaged center mounting rubber.	Replace.

ABS

Page

1. General Description 2
2. ABS Control Module and Hydraulic Control Unit (ABSCM&H/U) 7
3. ABS Sequence Control 11
4. Front ABS Sensor 14
5. Rear ABS Sensor 17
6. Front Tone Wheel 20
7. Rear Tone Wheel 21
8. G Sensor 22

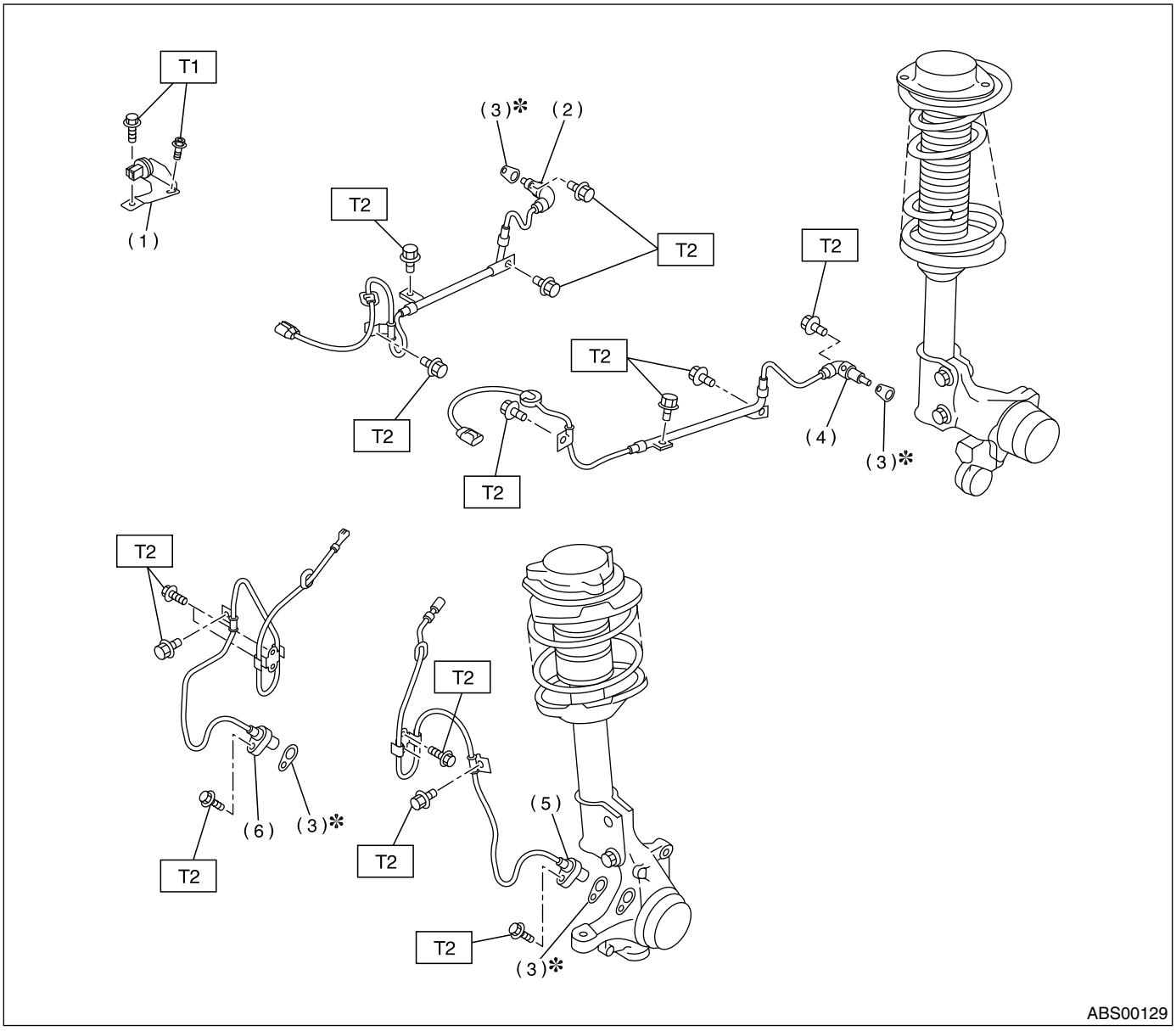
1. General Description

A: SPECIFICATIONS

Item				Standard or remarks
ABS sensor	ABS sensor gap		Front	0.3 — 0.8 mm (0.012 — 0.031 in)
			Rear	0.7 — 1.2 mm (0.028 — 0.047 in)
	ABS sensor resistance		Front	1.25±0.25 kΩ
			Rear	1.15±0.115 kΩ
	Marks of the harness	Front	RH	Light blue
			LH	Brown
		Rear	RH	White
			LH	Yellow
G sensor	G sensor voltage			2.3±0.2 V
ABS control module and hydraulic control unit (ABSCM&H/U) marks			AT vehicles	CO
			MT vehicles	CP

B: COMPONENT

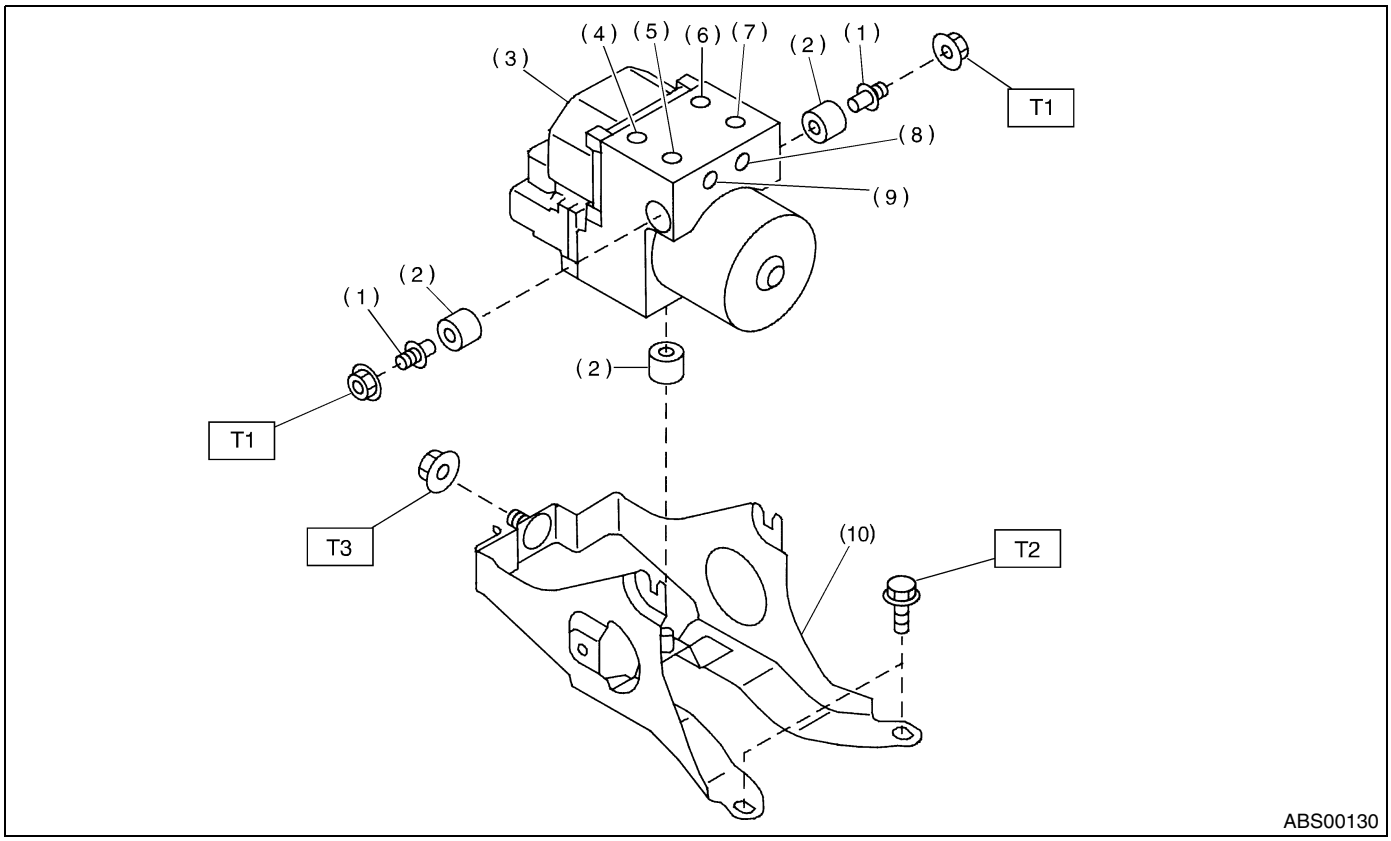
1. SENSOR



(1) G sensor
(2) Rear ABS sensor RH
(3) ABS spacer
(4) Rear ABS sensor LH
(5) Front ABS sensor LH
(6) Front ABS sensor RH

Tightening torque: N·m (kgf-m, ft-lb)
T1: 18 (1.8, 13.0)
T2: 33 (3.4, 24.6)

2. ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)



(1) Stud bolt
(2) Damper
(3) ABS control module and hydraulic control unit
(4) Front-LH outlet
(5) Secondary inlet
(6) Front-RH outlet
(7) Primary inlet
(8) Rear-LH outlet
(9) Rear-RH outlet
(10) Bracket

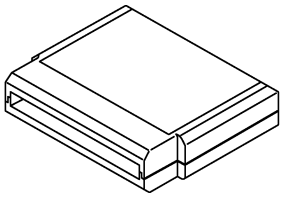
Tightening torque: N·m (kgf-m, ft-lb)
T1: 18 (1.8, 13.0)
T2: 33 (3.4, 24.6)
T3: 38 (3.8, 27.5)

C: CAUTION

- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA210	24082AA210	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and ampere.
Pressure gauge	Used for measuring oil pressure.
Oscilloscope	Used for measuring sensor.

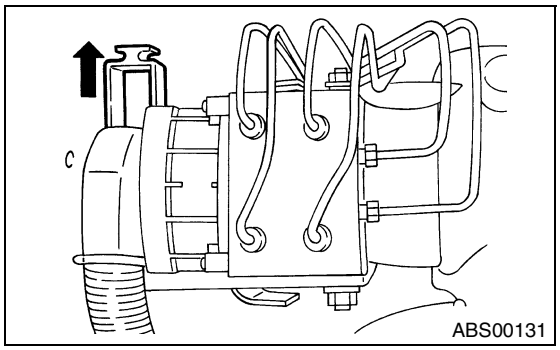
2. ABS Control Module and Hydraulic Control Unit (ABSCM&H/U)

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the air intake duct from engine compartment to facilitate removal of ABSCM&H/U.
3) Use an air gun to get rid of water around the ABSCM&H/U.

NOTE:
Contact will be insufficient if the terminal gets wet.

4) Remove the ground cable from ABSCM&H/U.
5) Pull off the lock of ABSCM&H/U connector to remove it.



6) Disconnect the connector from ABSCM&H/U.

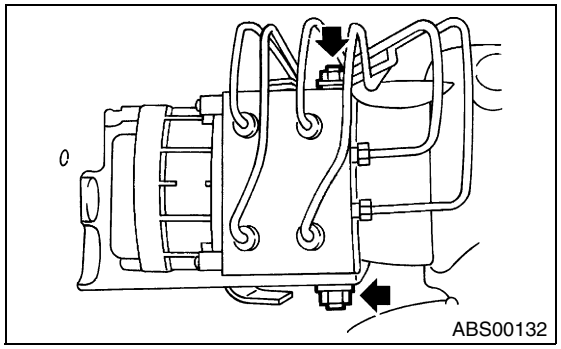
CAUTION:
Do not pull the harness when disconnecting the connector.

7) Unlock the cable clip.
8) Disconnect the brake pipes from ABSCM&H/U.
9) Wrap the brake pipes with vinyl bag to avoid spilling brake fluid on vehicle body.

CAUTION:
• Brake fluid spilt on the vehicle body will harm the painted surface; wash away quickly with water if spilt.

10) Remove the ABSCM&H/U from engine compartment.

CAUTION:
• ABSCM&H/U cannot be disassembled. Do not attempt to loosen bolts and nuts.
• Do not drop or bump the ABSCM&H/U.
• Do not turn the ABSCM&H/U upside down or place it on its side.
• Be careful to prevent foreign particles from getting into ABSCM&H/U.
• Do not let water get into the connector.



B: INSTALLATION

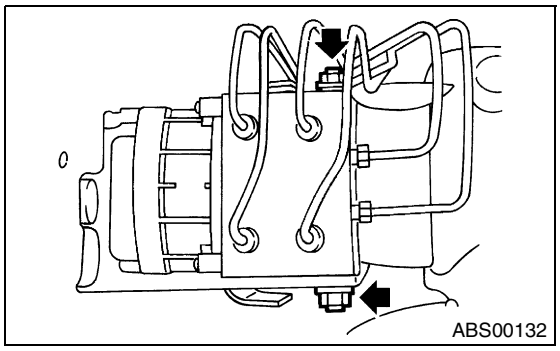
1) Install the ABSCM&H/U bracket.

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)

2) Apply a coat of grease (Nippeco LT or GB) to the bracket attaching bolt.
3) Align the width across flat portion of ABSCM&H/U side stud bolt with the bolt hole groove on bracket, and then install the ABSCM&H/U.

NOTE:
Confirm the specification mark of ABSCM&H/U.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



4) Connect the brake pipes to their correct ABSCM&H/U connections.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

5) Using the cable clip, secure the ABSCM&H/U harness to bracket.
6) Connect the connector to ABSCM&H/U.

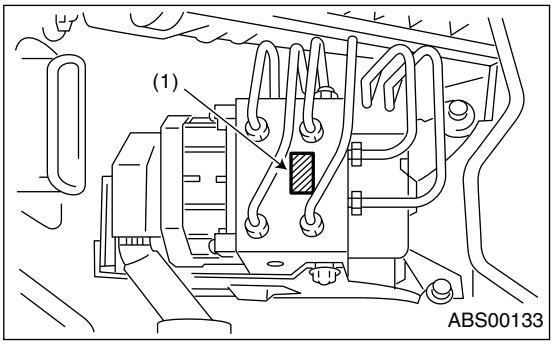
NOTE:
• Be sure to remove all foreign matter from inside of the connector before connecting.
• Ensure that the ABSCM&H/U connector is securely locked.

7) Connect the ground cable to ABSCM&H/U, and then apply grease.
8) Install the air intake duct.
9) Bleed air from the brake system.

C: INSPECTION

1) Check the connected and fixed condition of connector.
2) Check specifications of the mark with ABSCM&H/U.

Mark	Model
CO	AT vehicles
CP	MT vehicles



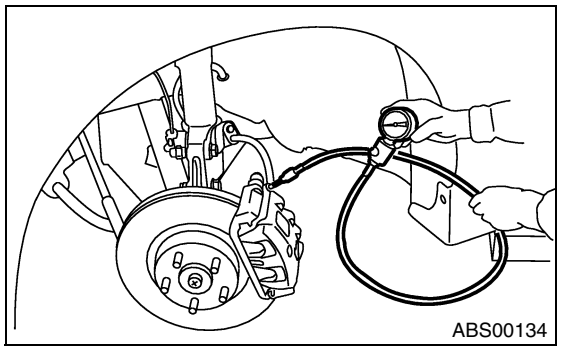
(1) Mark

1. CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE

1) Lift-up the vehicle and remove the wheels.
2) Disconnect the air bleeder screws from the FL and FR caliper bodies.
3) Connect two pressure gauges to the FL and FR caliper bodies.

CAUTION:
• Pressure gauges used exclusively for brake fluid must be used.
• Do not employ pressure gauge previously used for transmission since the piston seal is expanded which may lead to malfunction of the brake.

NOTE:
Wrap sealing tape around the pressure gauge.



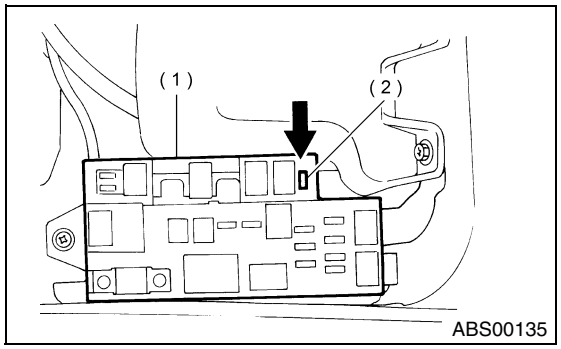
4) Bleed air from the pressure gauges.
5) Perform the ABS sequence control.
<Ref. to ABS-11, ABS Sequence Control.>
6) When the hydraulic unit begins to work, and first the FL side performs decompression, holding, and compression, and then the FR side performs decompression, holding, and compression.
7) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets the standard values. Also check if any irregular brake pedal tightness is felt.

	Front wheel	Rear wheel
Initial value	3,500 kPa (35 kgf/cm^2, 498 psi)	3,500 kPa (35 kgf/cm^2, 498 psi)
Decompressed	500 kPa (5 kgf/cm^2, 71 psi) or less	500 kPa (5 kgf/cm^2, 71 psi) or less
Compressed	3,500 kPa (35 kgf/cm^2, 498 psi) or more	3,500 kPa (35 kgf/cm^2, 498 psi) or more

8) Remove the pressure gauges from FL and FR caliper bodies.
9) Remove the air bleeder screws from the RL and RR caliper bodies.
10) Connect the air bleeder screws to the FL and FR caliper bodies.
11) Connect two pressure gauges to the RL and RR caliper bodies.
12) Bleed air from the pressure gauges and the FL and FR caliper bodies.
13) Perform the ABS sequence control. <Ref. to ABS-11, ABS Sequence Control.>
14) When the hydraulic unit begins to work, at first the RR side performs decompression, holding, and compression, and then the RL side performs decompression, holding, and compression.
15) Read values indicated on the pressure gauges and check if they meet the standard value.
16) After checking, remove the pressure gauges from caliper bodies.
17) Connect the air bleeder screws to RL and RR caliper bodies.
18) Bleed air from the brake line.

2. CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER

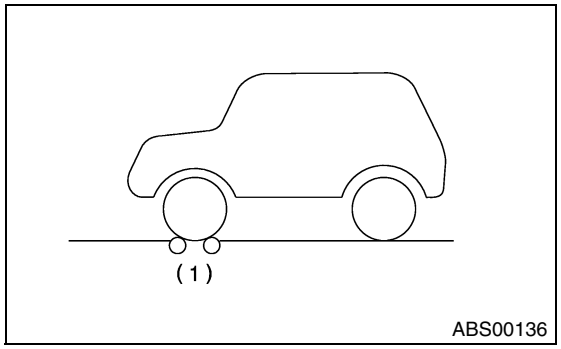
1) In the case of AWD AT vehicles, install a spare fuse with the FWD connector in the main fuse box to simulate FWD vehicles.

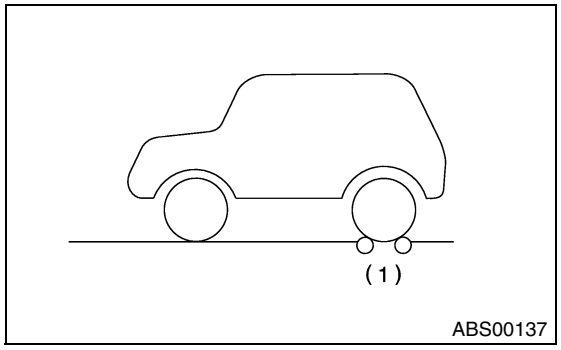


(1) Main fuse box
(2) FWD connector

NOTE:
AWD circuit of MT vehicles can not be disabled because viscous coupling is used inside center differential.

2) Prepare for operating the ABS sequence control.
<Ref. to ABS-11, ABS Sequence Control.>
3) Set the front wheels or rear wheels on the brake tester and set the select lever's position at "N" range.





(1) Brake tester

4) Operate the brake tester.
5) Perform the ABS sequence control.

<Ref. to ABS-11, ABS Sequence Control.>

6) Hydraulic unit begins to work; and check the following working sequence.

(1) The FL wheel performs decompression, holding, and compression in sequence, and subsequently the FR wheel repeats the cycle.

(2) The RR wheel performs decompression, holding, and compression in sequence, and subsequently the RL wheel repeats the cycle.

7) Read values indicated on the brake tester and check if the fluctuation of values, when decompressed and compressed, meet the standard values.

	Front wheel	Rear wheel
Initial value	1,000 N (100 kgf, 221 lb)	1,000 N (100 kgf, 221 lb)
Decompressed	500 N (50 kgf, 110 lb) or less	500 N (50 kgf, 110 lb) or less
Compressed	1,000 N (100 kgf, 221 lb) or more	1,000 N (100 kgf, 221 lb) or more

8) After checking, also check if any irregular brake pedal tightness is felt.

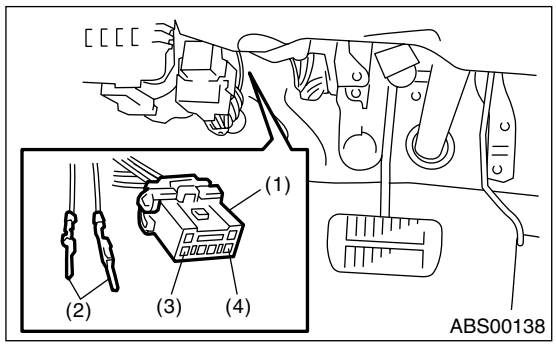
3. ABS Sequence Control

A: OPERATION

1) Under the ABS sequence control, after the hydraulic unit solenoid valve is driven, the operation of the hydraulic unit can be checked by means of the brake tester or pressure gauge.
2) ABS sequence control can be started by diagnosis connector or Subaru Select Monitor.

1. ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR

1) Turn the ignition switch to OFF.
2) Connect the diagnosis terminal to terminal No. 6 of the diagnosis connector beside driver's seat.



(1) Diagnosis connector
(2) Diagnosis terminals
(3) Terminal No. 3
(4) Terminal No. 6

3) Turn the ignition switch to ON.
4) Confirm that start code (code 11) is only displayed.
5) Turn the ignition switch to OFF.
6) Connect the diagnosis terminals to terminals No. 6 and No. 3 of the diagnosis connector.
7) Set the speed of all wheels at 4 km/h (2 MPH) or less.
8) Turn the ignition switch to ON.
9) Within 0.5 seconds after the ABS warning light goes out, depress the brake pedal and hold it depressed.

NOTE:
• Engine must not operate.

CAUTION:
Do not depress the clutch pedal in case of vehicle with hill holder.

10) After completion of ABS sequence control, turn the ignition switch to OFF.

2. ABS SEQUENCE CONTROL WITH SUBARU SELECT MONITOR

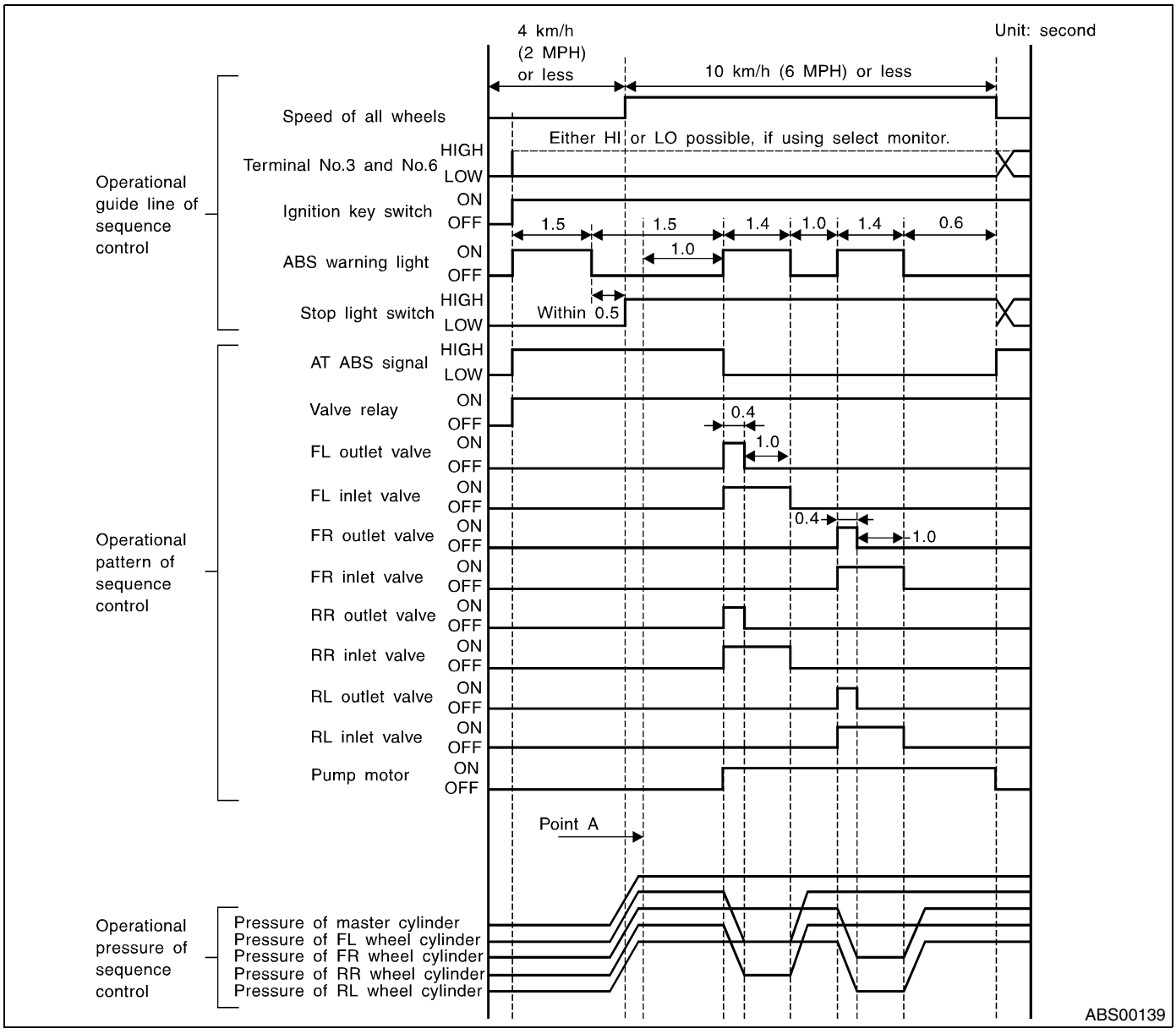
NOTE:
• In the event of any trouble, the sequence control may not be operative. In such a case, activate the sequence control, referring to “ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR”.
<Ref. to ABS-11, ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR, ABS Sequence Control.>
• When the diagnosis terminal is connected to the diagnosis connector, the sequence control will not operate.

1) Connect the Subaru Select Monitor to data link connector under driver’s seat instrument panel lower cover.
2) Turn the ignition switch to ON.
3) Turn the Subaru Select Monitor switch to ON.
4) Put the Subaru Select Monitor to “BRAKE CONTROL” mode.
5) When “Function check sequence” is selected, ‘ABS sequence control’ will start.
6) When the message “Press Brake Pedal Firmly” is displayed, perform the followings.
(1) When using the brake tester, depress the brake pedal with braking force of 1,000 N (100 kgf, 221 lb).
(2) When using the pressure gauge, depress the brake pedal so as to make the pressure gauge indicate 3,500 kPa (35 kg/cm^2, 498 psi).

CAUTION:
Do not depress the clutch pedal in case of vehicle with hill holder.

7) When the message “Press YES” is displayed, press the YES key.
8) The braking system in operation is displayed on Subaru Select Monitor.

3. CONDITIONS FOR ABS SEQUENCE CONTROL



NOTE:
When the Subaru Select Monitor is used, control operation starts at point A. The patterns from IGN key ON to the point A show that operation is started by diagnosis connector. (However, the brake light switch must be ON before point A.)

B: SPECIFICATION

1. CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL

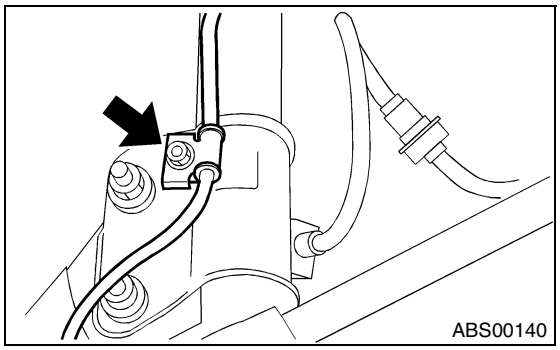
When the following conditions develop, the ABS sequence control stops and ABS operation is returned to the normal control mode.

1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
2) When terminal No. 3 or No. 6 are separated from diagnosis terminals. (When the Subaru Select Monitor is not used.)
3) When the brake pedal is released during sequence control and the braking lamp switch is set to off.
4) When the brake pedal is depressed after ignition key is turned to ON, and before ABS warning light goes out. (When the Subaru Select Monitor is not used.)
5) When the brake pedal is not depressed after ignition key is turned to ON, and within 0.5 seconds after ABS warning light goes out. (When the Subaru Select Monitor is not used.)
6) After completion of the sequence control.
7) When malfunction is detected. (When the Subaru Select Monitor is used.)

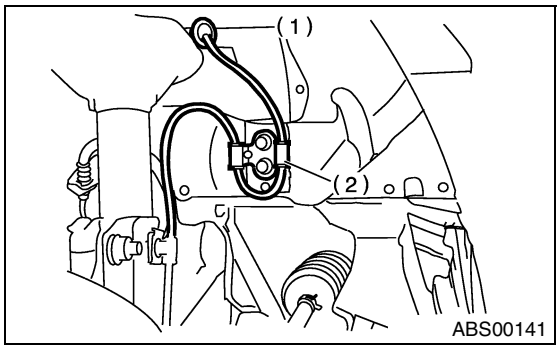
4. Front ABS Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Disconnect the front ABS sensor connector located next to the front strut mounting house in engine compartment. Pull the connector out from grommet hole to tire side.
3) Remove the bolts which secure sensor harness to strut.



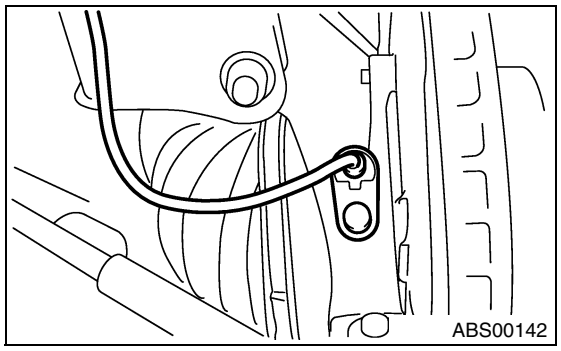
4) Remove the bolts which secure sensor harness to body.



(1) To front ABS sensor connector
(2) Bracket

5) Remove the bolts which secure front ABS sensor to housing, and remove the front ABS sensor.

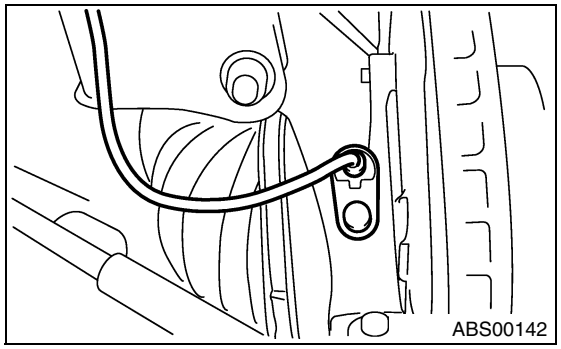
CAUTION:
• Be careful not to damage the pole piece located at tip of the sensor and teeth faces during removal.
• Do not pull the sensor harness during removal.



B: INSTALLATION

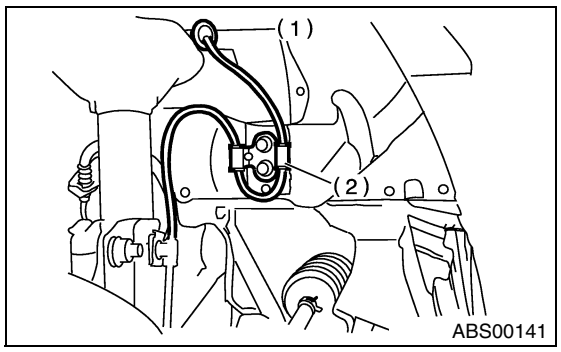
1) Temporarily install the front ABS sensor on housing.

CAUTION:
Be careful not to strike the ABS sensor's pole piece against tone wheel and adjacent metal parts during installation.



2) Install the front ABS sensor on strut and wheel apron bracket.

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)

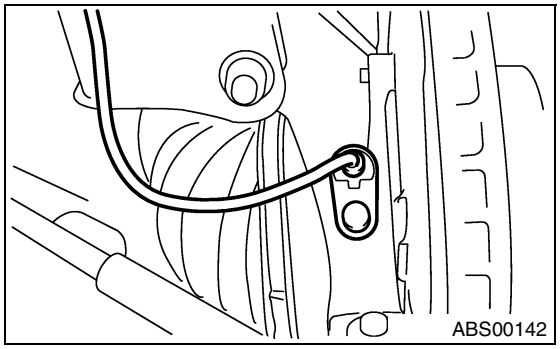


(1) To front ABS sensor connector
(2) Bracket

3) Check the ABS sensor gap. <Ref. to ABS-15, SENSOR GAP, INSPECTION, Front ABS Sensor.> After standard clearance is obtained, tighten the ABS sensor on housing to specified torque.
If the clearance is outside specification, readjust using spacer (Part No. 26755AA000).

ABS sensor standard clearance:
0.3 — 0.8 mm (0.012 — 0.031 in)

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)



NOTE:
• Check the marks on the harness and make sure that no kink exists.
• Make sure that the harness is not pulled and does not contact to suspension or body when steering wheel is turned.

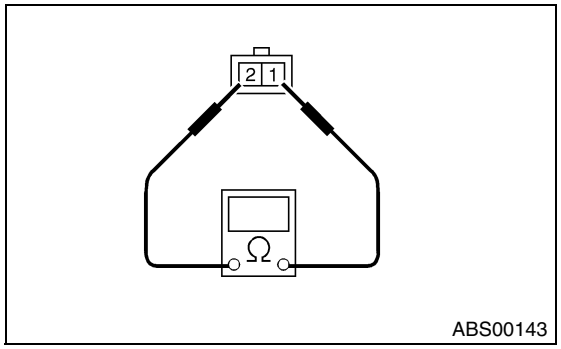
RH: Light blue
LH: Brown

4) After confirmation of the ABS sensor clearance, connect the connector to ABS sensor.
5) Connect the battery ground cable to battery.

C: INSPECTION

1. ABS SENSOR

1) Check the pole piece of ABS sensor for foreign particles or damage. If necessary, clean the pole piece or replace ABS sensor.
2) Measure the ABS sensor resistance.
If the resistance is outside standard value, replace the ABS sensor with a new one.

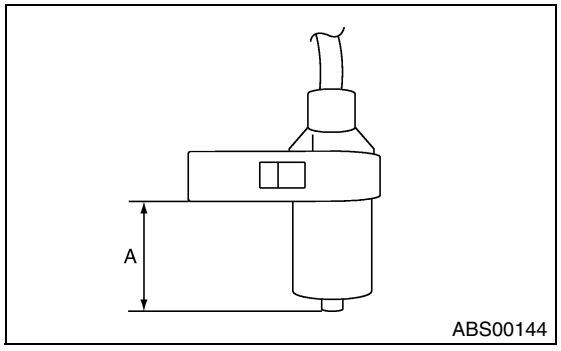


Terminal No.	Standard
1 and 2	1.25±0.25 kΩ

NOTE:
Check the ABS sensor cable for discontinuity. If necessary, replace with a new one.

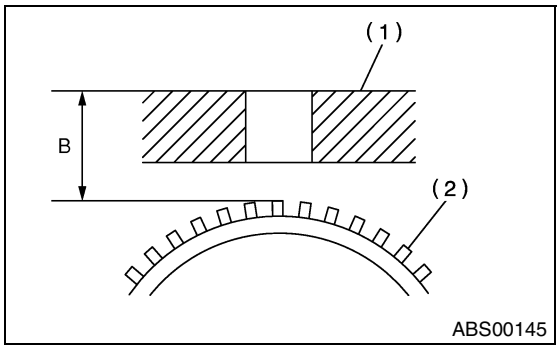
2. SENSOR GAP

1) Measure the distance “A” between ABS sensor surface and sensor pole face.



2) Measure the distance “B” between surface where the front axle housing meets the ABS sensor, and the tone wheel.

NOTE:
Measure so that the gauge touches the tone wheel teeth top.



(1) Axle housing
(2) Tone wheel

3) Find the gap between the ABS sensor pole face and the surface of the tone wheel teeth by putting the measured values in the formula below and calculating.

ABS sensor clearance = B – A

ABS sensor standard clearance:
0.3 — 0.8 mm (0.012 — 0.031 in)

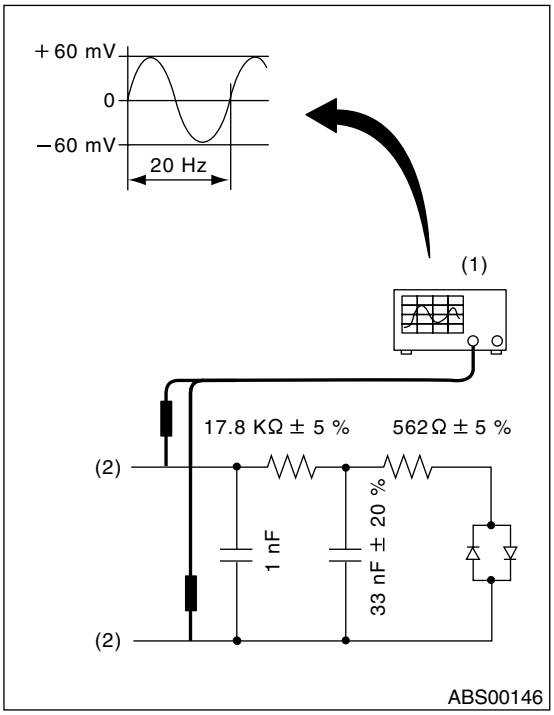
NOTE:
If the clearance is outside specification, readjust using spacer (Part No. 26755AA000).

3. OUTPUT VOLTAGE

Output voltage can be checked by the following method. Install the resistor and condenser, then rotate the wheel about 2.75 km/h (2 MPH) or equivalent.

Output voltage specification:
0.12 to 1 V (at 20 Hz)

NOTE:
Regarding terminal No., please refer to item 1. ABS SENSOR.<Ref. to ABS-15, ABS SENSOR, INSPECTION, Front ABS Sensor.>



(1) Oscilloscope
(2) Terminal

D: ADJUSTMENT

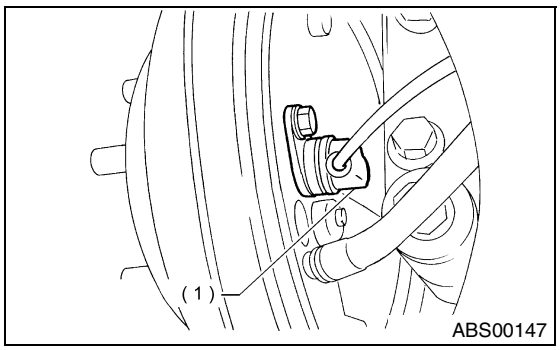
Adjust the gap using spacer (Part No. 26755A000).

5. Rear ABS Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle.
3) Remove the rear seat and disconnect the rear ABS sensor connector. Pull the connector out from grommet hole to under floor.
4) Remove the rear sensor harness bracket from the rear trailing link and bracket.
5) Remove the rear ABS sensor from back plate.

CAUTION:
• Be careful not to damage the pole piece located at tip of the sensor and teeth faces during removal.
• Do not pull the sensor harness during removal.



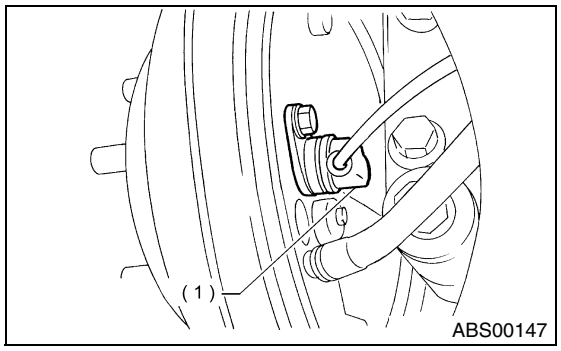
(1) Rear ABS sensor

6) Remove the rear tone wheel while removing the hub from housing and hub assembly. <Ref. to DS-23, REMOVAL, Rear Axle.>

B: INSTALLATION

1) Install the rear tone wheel on hub, then rear housing on hub. <Ref. to DS-29, ASSEMBLY, Rear Axle.>
2) Temporarily install the rear ABS sensor on back plate.

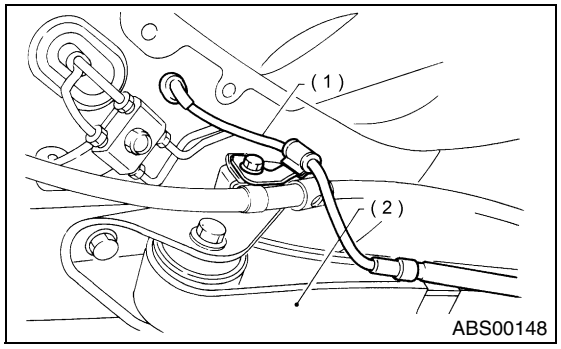
CAUTION:
Be careful not to strike the ABS sensor's pole piece against tone wheel and adjacent metal parts during installation.



(1) Rear ABS sensor

3) Install the rear drive shaft to rear housing and rear differential spindle. <Ref. to DS-26, INSTALLATION, Rear Axle.>
4) Install the rear sensor harness on rear trailing link.

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)



(1) Rear sensor harness
(2) Trailing link

5) Check the ABS sensor gap. <Ref. to ABS-18, SENSOR GAP, INSPECTION, Rear ABS Sensor.> After standard clearance is obtained, tighten the ABS sensor on back plate to specified torque.
If the clearance is outside specification, readjust using spacer (Part No. 26755AA000).

ABS sensor standard clearance:
0.7 — 1.2 mm (0.028 — 0.047 in)

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)

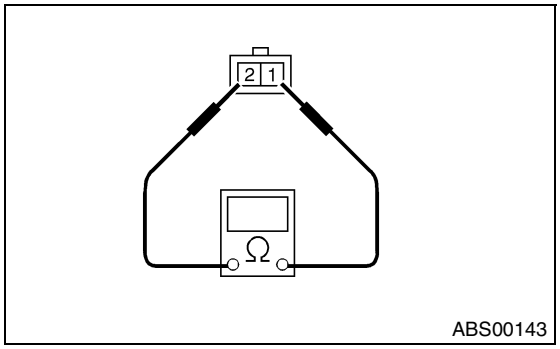
NOTE:
Check the marks on the harness and make sure that no kink exists. (RH: white, LH: yellow)

6) After confirmation of the ABS sensor clearance, connect the connector to ABS sensor.
7) Connect the battery ground cable to battery.

C: INSPECTION

1. ABS SENSOR

1) Check the pole piece of ABS sensor for foreign particles or damage. If necessary, clean the pole piece or replace ABS sensor.
2) Measure the ABS sensor resistance.
If resistance is outside the standard value, replace the ABS sensor with a new one.



Terminal No.	Standard
1 and 2	1.15±0.115 kΩ

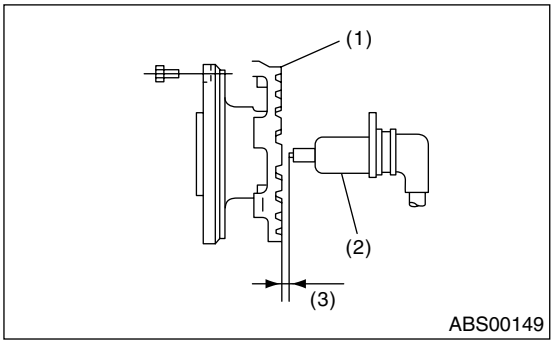
NOTE:
Check the ABS sensor cable for discontinuity. If necessary, replace with a new one.

2. SENSOR GAP

Measure clearance between tone wheel and ABS sensor at whole periphery.

NOTE:
• If clearance is narrow, adjust by using spacer (Part No. 26755AA000).
• If clearance is wide, check the outputted voltage then replace the ABS sensor or tone wheel if the outputted voltage is outside specification.

ABS sensor clearance:
0.7 — 1.2 mm (0.028 — 0.047 in)



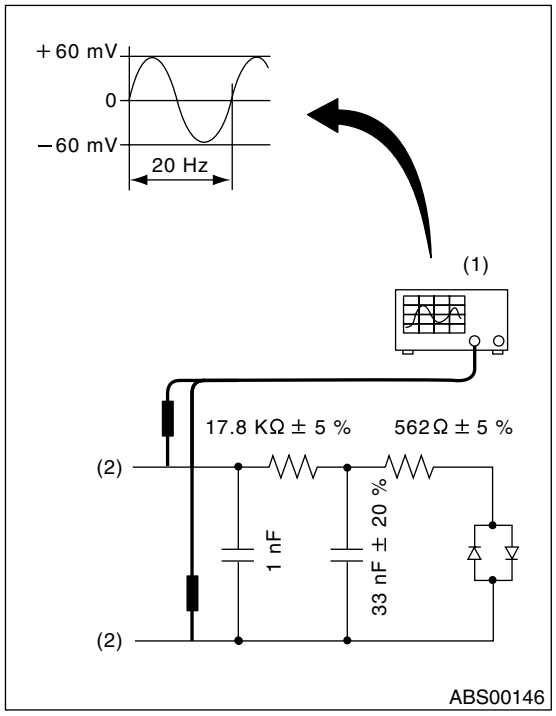
(1) Tone wheel
(2) ABS sensor
(3) Sensor gap

3. OUTPUT VOLTAGE

Output voltage can be checked by the following method. Install the resistor and condenser, then rotate the wheel about 2.75 km/h (2 MPH) or equivalent.

Output voltage specification:
0.12 — 1 V (at 20 Hz)

NOTE:
Regarding terminal No., please refer to item 1. ABS SENSOR. <Ref. to ABS-18, ABS SENSOR, INSPECTION, Rear ABS Sensor.>



(1) Oscilloscope
(2) Terminal

D: ADJUSTMENT

Adjust the gap using spacer (Part No. 26755AA000).

6. Front Tone Wheel

A: REMOVAL

Refer to Front Drive Shaft, because front tone wheel is integrated with front drive shaft. <Ref. to DS-31, REMOVAL, Front Drive Shaft.>

B: INSTALLATION

Refer to Front Drive Shaft, because front tone wheel is integrated with front drive shaft. <Ref. to DS-32, INSTALLATION, Front Drive Shaft.>

C: INSPECTION

Visually check the tone wheel's teeth (44 pieces) for cracks or dents. If necessary, replace the tone wheel with a new one.

NOTE:
Replace the BJ assembly with a new one as a single unit if there are any defects found on tone wheel is unitized with BJ assembly of drive shaft.

7. Rear Tone Wheel

A: REMOVAL

Refer to Rear Axle, because the rear tone wheel is installed to rear hub. <Ref. to DS-23, REMOVAL, Rear Axle.>

B: INSTALLATION

Refer to Rear Axle, because the rear tone wheel is installed to rear hub. <Ref. to DS-26, INSTALLATION, Rear Axle.>

C: INSPECTION

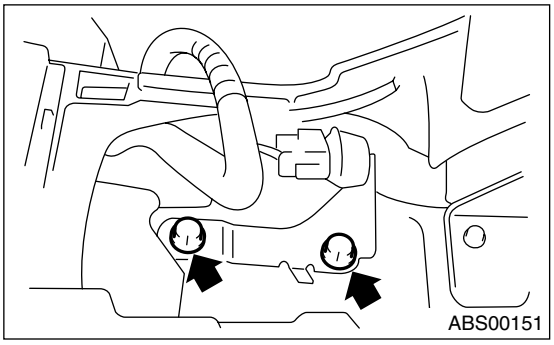
Visually check the tone wheel's teeth (44 pieces) for cracks or dents. If necessary, replace the tone wheel with a new one.

8. G Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the console cover.
<Ref. to EI-39, Console Box.>
3) Disconnect the connector from G sensor.
4) Remove the G sensor from body.

CAUTION:
- **Do not drop or bump the G sensor.**
- **G sensor and the bracket are integrated into one unit. Therefore, do not disassemble it.**



B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
Do not drop or bump the G sensor.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

C: INSPECTION

	Step	Value	Yes	No
1	**DO YOU HAVE SUBARU SELECT MONITOR?**	—	Go to step **5.**	Go to step **2.**
2	**CHECK G SENSOR.** 1)Turn the ignition switch to OFF. 2)Remove the G sensor from vehicle. 3)Connect the connector to G sensor. 4)Turn the ignition switch to ON. 5)Measure the voltage between G sensor connector terminals. ***Connector & terminal:*** ***(B292) No. 2 (+) — No. 3 (–)*** Is the voltage as specified when G sensor is horizontal?	2.1 — 2.5 V	Go to step **3.**	Replace the G sensor.
3	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal:*** ***(B292) No. 2 (+) — No. 3 (–)*** Is the voltage as specified when G sensor is inclined forwards to 90°?	3.7 — 4.1 V	Go to step **4.**	Replace the G sensor.
4	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal:*** ***(B292) No. 2 (+) — No. 3 (–)*** Is the voltage as specified when G sensor is inclined backwards to 90°?	0.5 — 0.9 V	G sensor is normal.	Replace the G sensor.
5	**CHECK G SENSOR.** 1)Turn the ignition switch to OFF. 2)Connect the Subaru Select Monitor connector to data link connector. 3)Turn the Subaru Select Monitor into {BRAKE CONTROL} mode. 4)Set the display in the {Current Data Display & Save} mode. 5)Read the G sensor output voltage. Is the indicated reading as specified when the vehicle is in horizontal position?	2.1 — 2.5 V	Go to step **6.**	Replace the G sensor.
6	**CHECK G SENSOR.** 1)Remove the console box. 2)Remove the G sensor from vehicle. (Do not disconnect the connector.) 3)Read the Subaru Select Monitor display. Is the voltage as specified when G sensor is inclined forwards to 90°?	3.7 — 4.1 V	Go to step **7.**	Replace the G sensor.
7	**CHECK G SENSOR.** Read the Subaru Select Monitor display. Is the voltage as specified when G sensor is inclined backwards to 90°?	0.5 — 0.9 V	G sensor is normal.	Replace the G sensor.

ABS (DIAGNOSTICS)

ABS

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1. Basic Diagnostic Procedure

A: PROCEDURE

1. WITHOUT SUBARU SELECT MONITOR

CAUTION:
Remove foreign matter (dust, water, etc.) from the ABSCM&H/U connector during removal and installation.

NOTE:
- To check the harness for broken wires or short circuits, shake it while holding it or the connector.
- When the ABS warning light illuminates, read and record the diagnostic trouble code (DTC) indicated by ABS warning light.

	Step	Value	Yes	No
1	**CHECK PRE-INSPECTION.** 1)Ask the customer when and how trouble occurred using interview checklist. <Ref. to ABS-6, Check List for Interview.> 2)Before performing diagnosis, inspect the unit which might influence ABS problem. <Ref. to ABS-10, INSPECTION, General Description.> Is the unit that might influence the ABS problem normal?	Unit is normal.	Go to step **2.**	Repair or replace each unit.
2	**CHECK INDICATION OF DIAGNOSTIC TROUBLE CODE (DTC).** Calling up the DTC. <Ref. to ABS-21, Read Diagnostic Trouble Code (DTC).> Is the ABS warning light normal?	ABS warning light is normal.	Go to step **3.**	Inspect using diagnostic chart for ABS warning light failure.<Ref. to ABS-29, Diagnostics Chart with Diagnosis Connector.> NOTE: Call up DTC again after inspecting ABS warning light. <Ref. to ABS-21, Read Diagnostic Trouble Code (DTC).>
3	**CHECK DIAGNOSTIC TROUBLE CODE (DTC).** Record all DTCs. Is only the start code issued?	Only the start code is issued.	Go to step **4.**	Go to step **5.**
4	**PERFORM THE GENERAL DIAGNOSTICS.** 1)Inspect using “General Diagnostics Table”. <Ref. to ABS-175, General Diagnostics Table.> 2)Perform the clear memory mode. <Ref. to ABS-23, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 3)Perform the inspection mode. <Ref. to ABS-22, Inspection Mode.> Calling up the DTC. <Ref. to ABS-21, Read Diagnostic Trouble Code (DTC).> Is only the start code issued?	Only the start code is issued.	Complete the diagnosis.	Go to step **5.**

Step		Value	Yes	No
5	**PERFORM THE DIAGNOSIS.** 1)Repair trouble cause. NOTE: For DTC list, refer to “List of Diagnostics Trouble Code (DTC)”.<Ref. to ABS-25, WITHOUT SUBARU SELECT MONITOR, LIST, List of Diagnostics Trouble Code (DTC).> 2)Perform the clear memory mode. <Ref. to ABS-23, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 3)Perform the inspection mode. <Ref. to ABS-22, Inspection Mode.> 4)Calling up the DTC. <Ref. to ABS-21, Read Diagnostic Trouble Code (DTC).> Is only the start code issued?	Only the start code is issued.	Complete the diagnosis.	Repeat the step5 until only start code is issued.

2. WITH SUBARU SELECT MONITOR

CAUTION:
Remove foreign matter (dust, water, etc.) from the ABSCM&H/U connector during removal and installation.

NOTE:
- To check the harness for broken wires or short circuits, shake it while holding it or the connector.
- Check list for interview. <Ref. to ABS-6, Check List for Interview.>

	Step	Value	Yes	No
1	**CHECK PRE-INSPECTION.** 1)Ask the customer when and how trouble occurred using interview checklist. <Ref. to ABS-6, Check List for Interview.> 2)Before performing diagnosis, inspect the unit which might influence the ABS problem. <Ref. to ABS-10, INSPECTION, General Description.> Is the unit that might influence the ABS problem normal?	Unit is normal.	Go to step **2.**	Repair or replace each unit.
2	**CHECK INDICATION OF DIAGNOSTIC TROUBLE CODE (DTC) DISPLAY.** 1)Turn the ignition switch to OFF. 2)Connect the SUBARU SELECT MONITOR to data link connector. 3)Turn the ignition switch to ON and SUBARU SELECT MONITOR to ON. NOTE: If the communication function of select monitor cannot be executed normally, check communication circuit. <Ref. to ABS-95, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostics Chart with Subaru Select Monitor.> 4)Read the DTC. <Ref. to ABS-19, READ CURRENT DATA, OPERATION, Subaru Select Monitor.> 5)Record all DTCs and frame data. Is DTC displayed?	DTC is not displayed.	Go to step **3.**	Go to step **4.**
3	**PERFORM THE GENERAL DIAGNOSTICS.** 1)Inspect using “General Diagnostics Table”. <Ref. to ABS-175, General Diagnostics Table.> 2)Perform the clear memory mode. <Ref. to ABS-19, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 3)Perform the inspection mode. <Ref. to ABS-22, Inspection Mode.> 4)Calling up the DTC. <Ref. to ABS-18, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.> Check DTC is not displayed. Is the ABS warning light turned off?	ABS warning light is turned off.	Complete the diagnosis.	Go to step **4.**

	Step	Value	Yes	No
4	**PERFORM THE DIAGNOSIS.** 1)For DTC list, refer to “List of Diagnostics Trouble Code (DTC)”.<Ref. to ABS-27, WITH SUBARU SELECT MONITOR, LIST, List of Diagnostics Trouble Code (DTC).> 2)Repair trouble cause. 3)Perform the clear memory mode. <Ref. to ABS-19, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 4)Perform the inspection mode. <Ref. to ABS-22, Inspection Mode.> 5)Calling up the DTC. <Ref. to ABS-18, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.> Check DTC is not displayed. Is the ABS warning light turned off?	ABS warning light is turned off.	Complete the diagnosis.	Inspect using “Diagnostics Chart with Subaru Select Monitor”. <Ref. to ABS-95, Diagnostics Chart with Subaru Select Monitor.>

2. Check List for Interview

A: CHECK

Check the following items about the vehicle's state.

1. STATE OF ABS WARNING LIGHT

ABS warning light comes on.	❑ Always ❑ Sometimes ❑ Only once ❑ Does not come on • When / how long does it come on?:		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ On after starting (Engine is running) ❑ On after starting (Engine is stop)		
Timing	❑ Immediately after ignition is ON. ❑ Immediately after ignition starts.		
	❑ When advancing	km/h to	km/h
		MPH to	MPH
	❑ While traveling at a constant speed	km/h	MPH
	❑ When decelerating	km/h to	km/h
		MPH to	MPH
	❑When turning to right	Steering angle :	deg
		Steering time :	sec
	❑ When turning to left	Steering angle :	deg
		Steering time :	sec
	❑ When moving other electrical parts		
	• Parts name : • Operating condition :		

2. STATE OF BRAKE WARNING LIGHT

Brake warning light comes on.	❑ Always ❑ Sometimes ❑ Only once ❑ Does not come on ❑ When parking brake lever is pulled ❑ When parking brake lever is released • When / how long does it come on?:
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ On after starting (Engine is running) ❑ On after starting (Engine is stop)

Timing	❑ Immediately after ignition is ON. ❑ Immediately after ignition starts.		
	❑ When advancing		km/h to km/h
			MPH to MPH
	❑ While traveling at a constant speed	km/h	MPH
	❑ When decelerating		km/h to km/h
			MPH to MPH
	❑When turning to right	Steering angle :	deg
		Steering time :	sec
	❑ When turning to left	Steering angle :	deg
		Steering time :	sec
	❑ When moving other electrical parts		
	• Parts name : • Operating condition :		

3. SYMPTOMS

ABS operating condition	❑ Performs no work.		
	❑ Operates only when abruptly applying brakes.	Vehicle speed :	km/h
			MPH
	• How to step on brake pedal :		
	a) Operating time :		sec
	b) Operating noise : ❑ Produce / ❑ Does not produce		
	• What kind of noise?	❑ Knock ❑ Gong gong ❑ Bong ❑ Buzz ❑ Gong gong buzz ❑ Others :	
	c) Reaction force of brake pedal		
		❑ Stick ❑ Press down once with a clunk ❑ Press and released ❑ Others :	

CHECK LIST FOR INTERVIEW

Behavior of vehicle	a) Directional stability cannot be obtained or steering refuses to work when applying brakes : ❑ Yes / ❑ No	
	• When :	❑ Vehicle turns to right ❑ Vehicle turns to left ❑ Spins ❑ Others :
	b) Directional stability cannot be obtained or steering refuses to work when accelerating : ❑ Yes / ❑ No	
	• When :	❑ Vehicle turns to right ❑ Vehicle turns to left ❑ Spins ❑ Others :
	c) Brakes out of order : ❑ Yes / ❑ No	
	• What :	❑ Braking distance is long ❑ Brakes lock or drag ❑ Pedal stroke is long ❑ Pedal sticks ❑ Others :
	d) Poor acceleration : ❑ Yes / ❑ No	
	• What :	❑ Fails to accelerate ❑ Engine stalls ❑ Others :
	e) Occurrence of vibration : ❑ Yes / ❑ No	
	• Where • What kind :	
	f) Occurrence of abnormal noise : ❑ Yes / ❑ No	
	• Where • What kind :	
	g) Occurrence of other phenomena : ❑ Yes / ❑ No	
	• What kind :	

4. CONDITIONS UNDER WHICH TROUBLE OCCURS

Environment	a) Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others :
	b) Ambient temperature	°F (°C)
	c) Road	❑ Urban area ❑ Suburbs ❑ Highway ❑ General road ❑ Ascending slope ❑ Descending slope ❑ Paved road ❑ Gravel road ❑ Muddy road ❑ Sandy place ❑ Others :
	d) Road surface	❑ Dry ❑ Wet ❑ New-fallen snow ❑ Compressed snow ❑ Frozen slope ❑ Others :
Condition	a) Brakes	Deceleration : g
		❑ Continuous / ❑ Intermittent
	b) Accelerator	Acceleration : g
		❑ Continuous / ❑ Intermittent
	c) Vehicle speed	km/h | MPH
		❑ Advancing ❑ Accelerating ❑ Reducing speed ❑ Low speed ❑ Turning ❑ Others :
	d) Tire inflation pressure	Front RH tire : kPa
		Front LH tire : kPa
		Rear RH tire : kPa
		Rear LH tire : kPa
	e) Degree of wear	Front RH tire :
		Front LH tire :
		Rear RH tire :
		Rear LH tire :
	f) Genuine parts are used. : ❑ Yes / ❑ No	
	g) Chain is passed around tires. : ❑ Yes / ❑ No	
	h) T tire is used. : ❑ Yes / ❑ No	
	i) Condition of suspension alignment :	
	j) Loading state :	
	k) Repair parts are used. : ❑ Yes / ❑ No	
	• What :	
	l) Others :	

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the ABS sensor, ABS control module and hydraulic control unit.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
• Be careful not to damage the airbag system wiring harness when servicing the ABS sensor, ABS control module and hydraulic control unit.

B: INSPECTION

Before performing diagnostics, check the following items which might affect ABS problems:

1. BATTERY

Measure the battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V, or more

Specific gravity: Above 1.260

2. BRAKE FLUID

1) Check the brake fluid level.
2) Check the brake fluid leakage.

3. HYDRAULIC UNIT

Check the hydraulic unit.
• With brake tester <Ref. to ABS-9, CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
• Without brake tester <Ref. to ABS-8, CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

4. BRAKE DRAG

Check for brake drag.

5. BRAKE PAD AND ROTOR

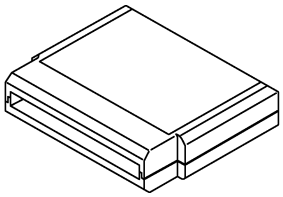
Check the brake pad and rotor.
• Front <Ref. to BR-19, INSPECTION, Front Brake Pad.> and <Ref. to BR-20, INSPECTION, Front Disc Rotor.>
• Rear <Ref. to BR-24, INSPECTION, Rear Brake Pad.> and <Ref. to BR-25, INSPECTION, Rear Disc Rotor.> or <Ref. to BR-30, INSPECTION, Rear Drum Brake Shoe.> and <Ref. to BR-31, INSPECTION, Rear Drum Brake Drum.>

6. TIRE

Check the tire specifications, tire wear and air pressure. <Ref. to WT-2, SPECIFICATIONS, General Description.>

C: PREPARATION TOOL

1. SPECIAL TOOLS

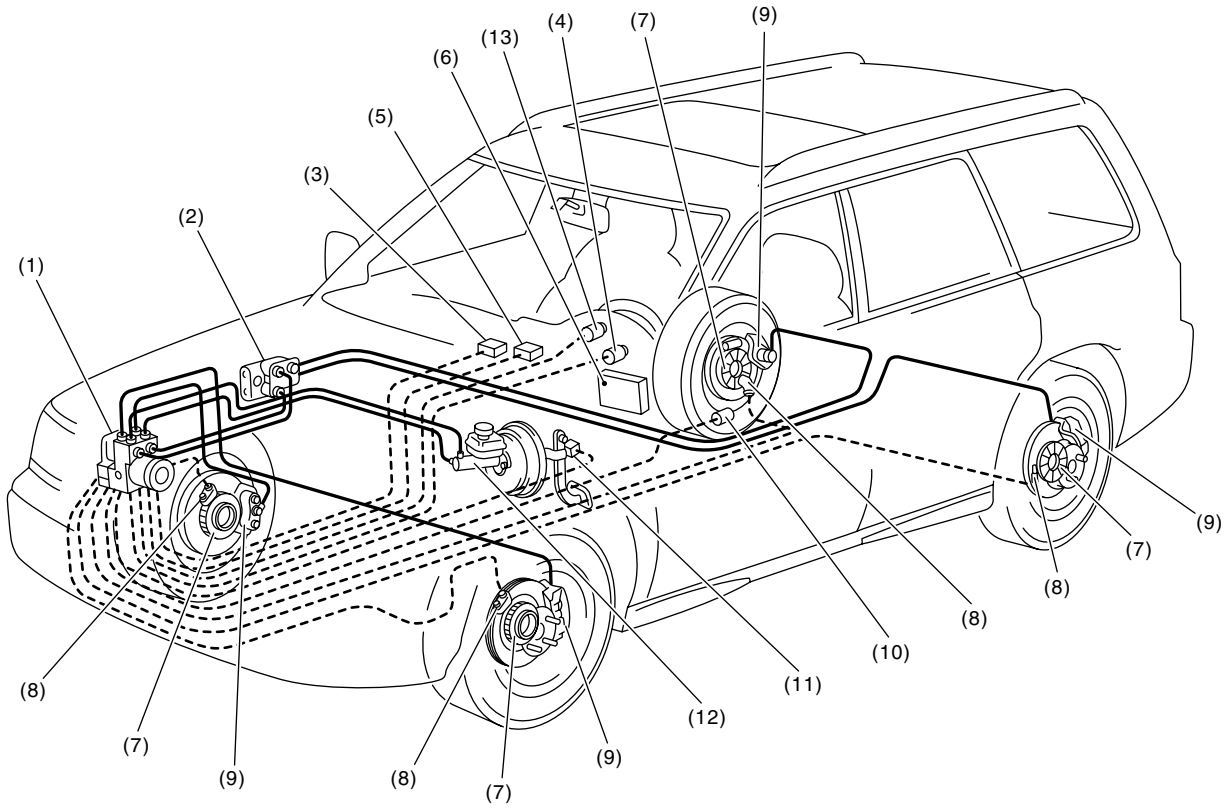
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA210	24082AA210	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.

2. GENERAL PURPOSE TOOLS

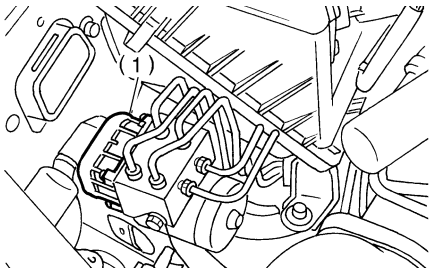
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and ampere.
Oscilloscope	Used for measuring sensor.

4. Electrical Components Location

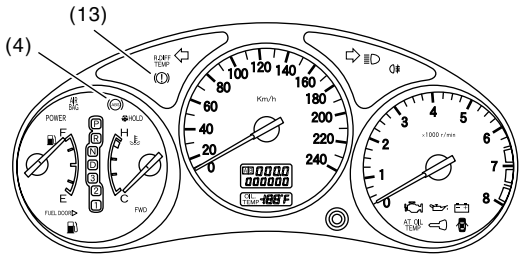
A: LOCATION



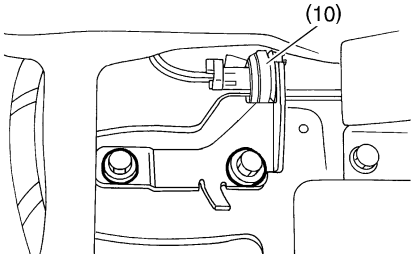
(1)	ABS control module and hydraulic control unit (ABSCM&H/U)	(6)	Transmission control module (AT vehicles only)	(11)	Stop light switch
(2)	Proportioning valve (without EBD)	(7)	Tone wheel	(12)	Master cylinder
(3)	Diagnosis connector	(8)	ABS sensor	(13)	Brake warning light
(4)	ABS warning light	(9)	Wheel cylinder		
(5)	Data link connector (for Subaru Select Monitor)	(10)	G sensor		



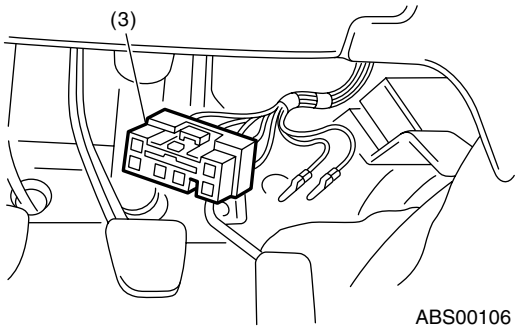
ABS00101



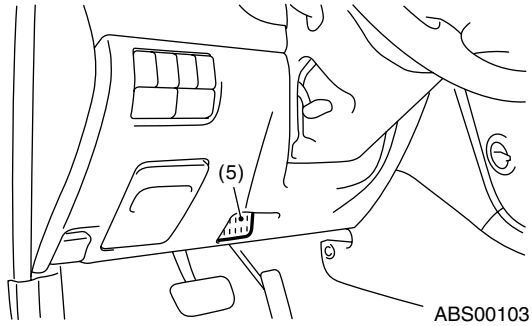
ABS00177



ABS00102

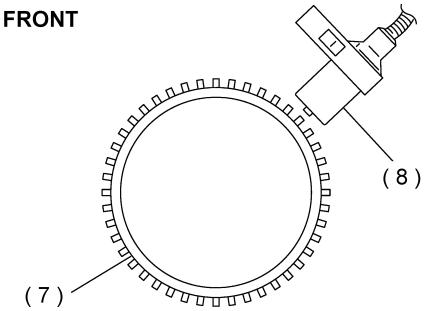


ABS00106



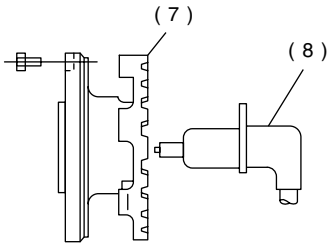
ABS00103

FRONT



ABS00107

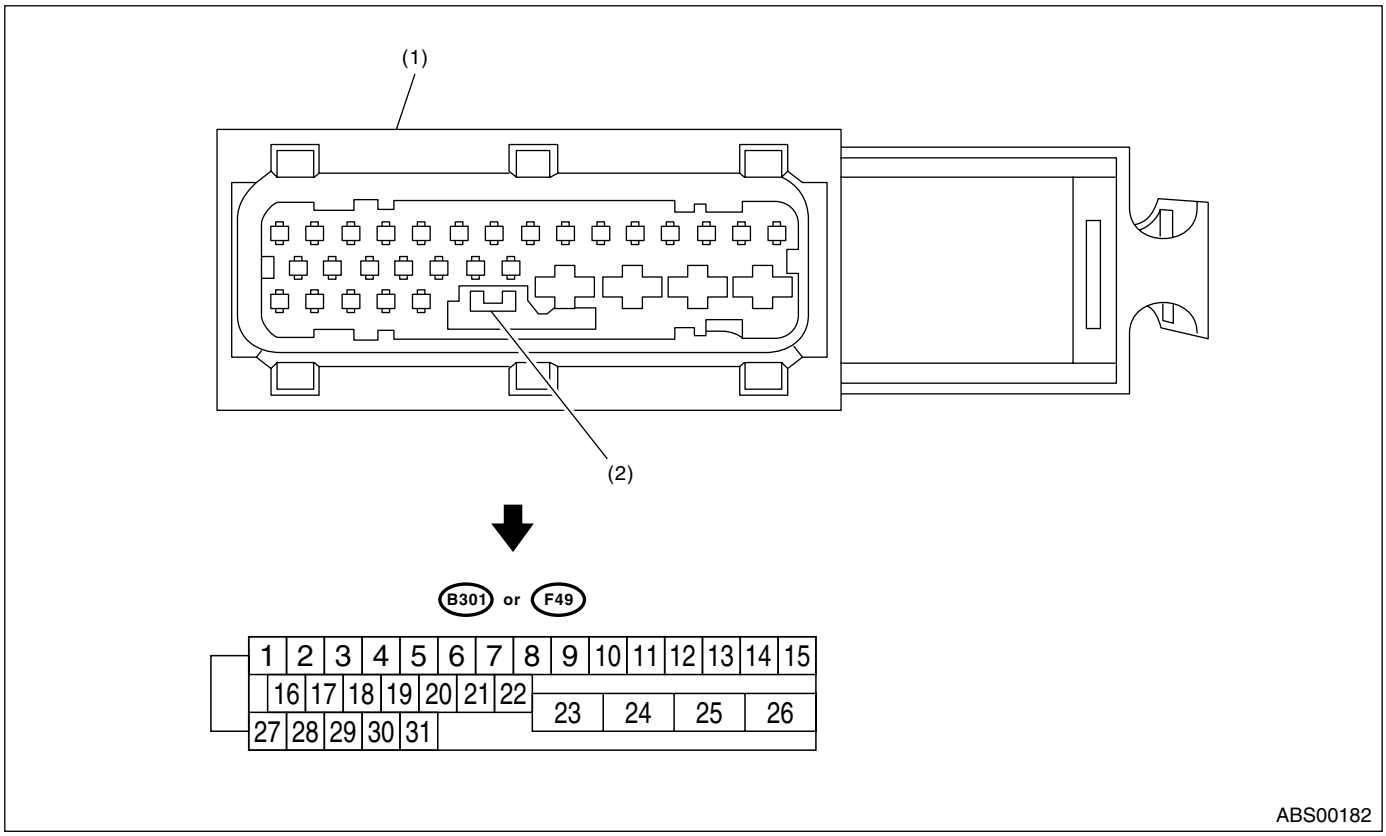
REAR



ABS00104

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



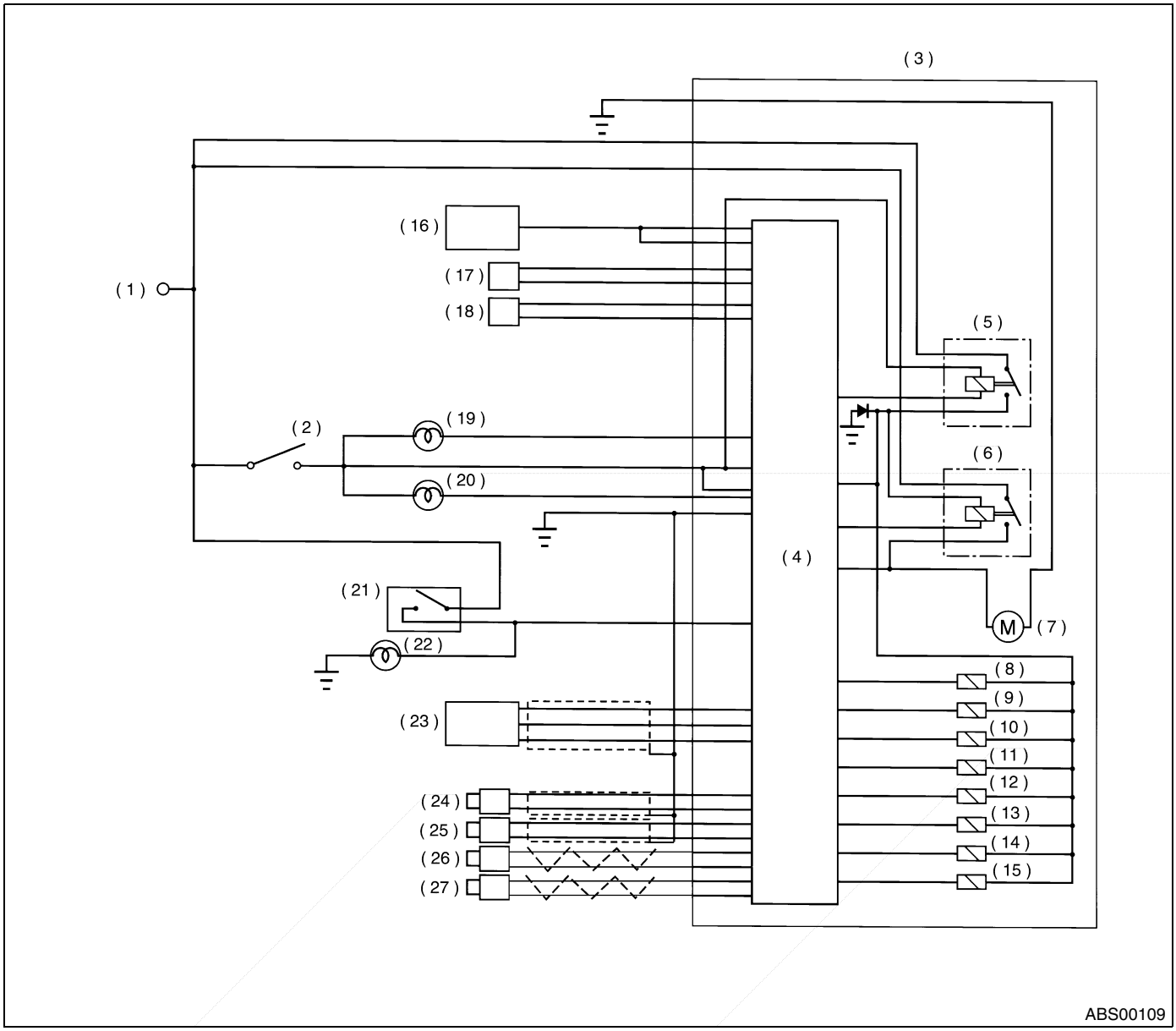
(1) ABS control module and hydraulic control unit connector
(2) Connector switch

NOTE:
• The terminal numbers in ABS control module and hydraulic control unit connector are as shown in the figure.
• When the connector is removed from ABSCM&H/U, the connector switch closes the circuit between terminal No. 22 and No. 23. The ABS warning light illuminates.

Contents		Terminal No. (+) — (–)	Input/Output signal Measured value and measuring conditions
ABS sensor*2 (Wheel speed sensor)	Front left wheel	9 — 10	0.12 — 1 V (When it is 20 Hz.)
	Front right wheel	11 — 12	
	Rear left wheel	7 — 8	
	Rear right wheel	14 — 15	
Valve relay power supply*1		24 — 23	10 — 15 V
Motor relay power supply*1		25 — 23	10 — 15 V
G sensor*2	Power supply	30 — 28	4.75 — 5.25 V
	Ground	28	—
	Output	6 — 28	2.1 — 2.5 V when vehicle is in horizontal position.
Stop light switch*1		2 — 23	Less than 1.5 V when the stop light is OFF and, 10 — 15 V when the stop light is ON.
ABS warning light*2		22 — 23	Less than 1.5 V within 1.5 seconds immediately after ignition switch has been turned to ON, and 10 — 15 V after 1.5 seconds has elapsed.
Brake warning light*2 (EBD warning light)		21 — 23	Less than 1.5 V within 1.5 seconds immediately after ignition switch has been turned to ON, and 10 — 15 V after 1.5 seconds has elapsed.
AT ABS signal (AT vehicles only)		31 — 23	Less than 1.5 V when the ABS control still operates and more than 5.5 V when ABS does not operate.
ABS operation signal monitor		3 — 23	Less than 1.5 V when the ABS control still operates and more than 5.5 V when ABS does not operate.
Select monitor*2	Data is received.	20 — 23	Less than 1.5 V when no data is received.
	Data is sent.	5 — 23	4.75 — 5.25 V when no data is sent.
ABS diagnosis connector	Terminal No. 3	29 — 23	10 — 15 V when ignition switch is ON.
	Terminal No. 6	4 — 23	10 — 15 V when ignition switch is ON.
Power supply*1		1 — 23	10 — 15 V when ignition switch is ON.
Grounding line		23	—
Grounding line		26	—

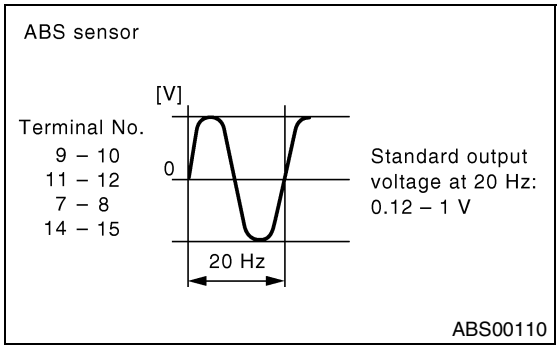
*1: Measure the I/O signal voltage after removing the connector from the ABSCM&H/U terminal.
*2: Measure the I/O signal voltage at connector (B98), (B37) ,(B38), (F48) or (F103).

B: SCHEMATIC



(1) Battery
(2) IGN
(3) ABS control module and hydraulic control unit (ABSCM&H/U)
(4) ABS control module area
(5) Valve relay
(6) Motor relay
(7) Motor
(8) Front inlet solenoid valve LH
(9) Front outlet solenoid valve LH
(10) Front inlet solenoid valve RH
(11) Front outlet solenoid valve RH
(12) Rear inlet solenoid valve LH
(13) Rear outlet solenoid valve LH
(14) Rear inlet solenoid valve RH
(15) Rear outlet solenoid valve RH
(16) Transmission control module (AT vehicles only)
(17) Diagnosis connector
(18) Data link connector
(19) Brake warning light
(20) ABS warning light
(21) Stop light switch
(22) Stop light
(23) G sensor
(24) Front ABS sensor LH
(25) Front ABS sensor RH
(26) Rear ABS sensor LH
(27) Rear ABS sensor RH

C: WAVEFORM

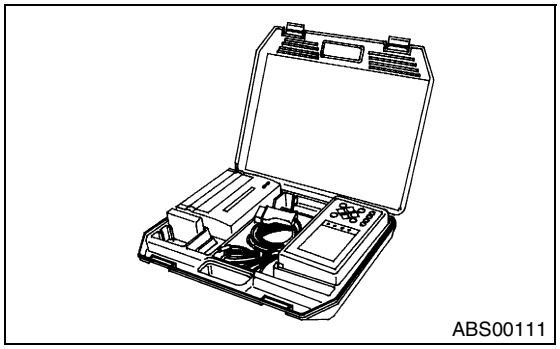

ABS sensor
[V]
Terminal No.
9 – 10
11 – 12
7 – 8
14 – 15
0
20 Hz
Standard output voltage at 20 Hz: 0.12 – 1 V
ABS00110

6. Subaru Select Monitor

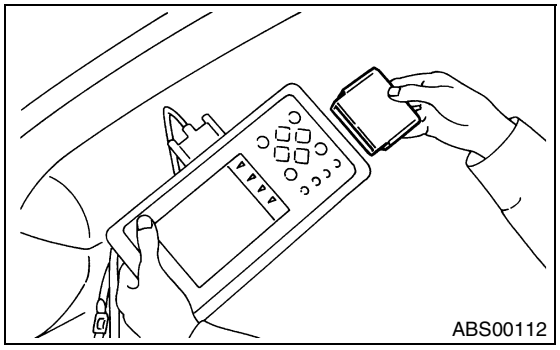
A: OPERATION

1. READ DIAGNOSTIC TROUBLE CODE (DTC)

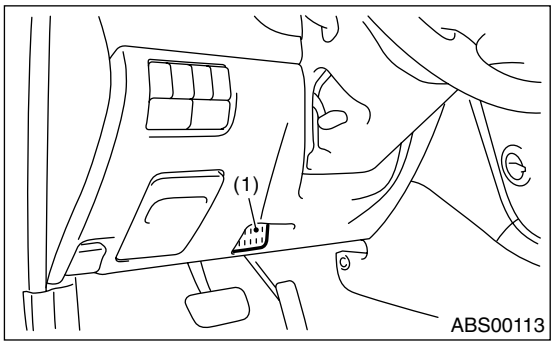
1) Prepare the Subaru Select Monitor kit.



2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to ABS-11, SPECIAL TOOLS, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.
(1) Data link connector located in the lower portion of instrument panel (on the driver's side).

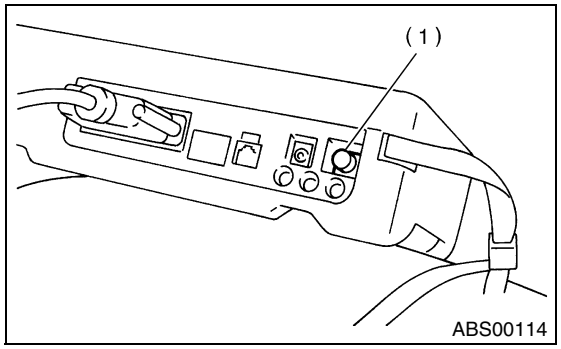


(1) Data link connector

(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(1) Power switch

6) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.
7) On the «System Selection Menu» display screen, select the {Brake Control System} and press [YES] key.
8) Press the [YES] key after displayed information of engine type.
9) On the «ABS Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press [YES] key.
10) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)} and press [YES] key.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning the DTC, refer to the LIST OF DIAGNOSTICS TROUBLE CODE (DTC). <Ref. to ABS-25, List of Diagnostics Trouble Code (DTC).>
• A maximum of 3 DTCs are displayed in order of occurrence.
• If a particular DTC is not properly stored in memory (due to a drop in ABSCM&H/U power supply, etc.) when a problem occurs, the DTC, followed by a question mark “?”, appears on the Subaru Select Monitor display. This shows it may be an unreliable reading.

Display screen	Contents to be monitored
Latest	The most recent DTC appears on select monitor display.
Old	The second most recent DTC appears on select monitor display.
Older	The third most recent DTC appears on select monitor display.
Reference	DTC issued after elapse of a specified period of time.

2. READ CURRENT DATA

1) On the «Main Menu» display screen, select the {Each System Check} and press «YES» key.
2) On the «System Selection Menu» display screen, select the {Brake Control System} and press «YES» key.
3) Press the «YES» key after displayed the information of ABS type.
4) On the «Brake Control Diagnosis» display screen, select the {Current Data Display & Save} and press «YES» key.
5) On the «Data Display Menu» display screen, select the {Data Display} and press «YES» key.
6) Using the scroll key, move the display screen up or down until desired data is shown.
• A list of the support data is shown in the following table.

Display screen	Contents to be monitored	Unit of measure
FR Wheel Speed	Wheel speed detected by Front ABS sensor RH is displayed	km/h or MPH
FL Wheel Speed	Wheel speed detected by Front ABS sensor LH is displayed	km/h or MPH
RR Wheel Speed	Wheel speed detected by Rear ABS sensor RH is displayed	km/h or MPH
RL Wheel Speed	Wheel speed detected by Rear ABS sensor LH is displayed	km/h or MPH
Stop Light Switch	Stop light switch signal	ON or OFF
Stop Light Switch	Stop light switch monitor voltage is displayed.	V
G sensor output Signal	Voltage equivalent to vehicle acceleration detected by analog G sensor is displayed.	V
Valve Relay Signal	Valve Relay Signal	ON or OFF
Motor Relay Signal	Motor Relay Signal	ON or OFF
ABS Signal to TCM	ABS operation signal from ABS control module to TCM	ON or OFF
ABS Warning Lamp	ON operation of ABS warning light is displayed.	ON or OFF
EBD warning light	ON operation of EBD warning light is displayed.	ON or OFF
Motor Relay Monitor	Operating condition of motor relay is displayed.	ON or OFF
Valve Relay Monitor	Operating condition of the valve relay is displayed.	ON or OFF
CCM Signal	ABS operation signal from ABS control module to TCM	ON or OFF

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

3. CLEAR MEMORY MODE

1) On the «Main Menu» display screen, select the {2. Each System Check} and press «YES» key.
2) On the «System Select Menu» display screen, select the {Brake System} and press «YES» key.
3) Press the «YES» key after displayed the information of engine type.
4) On the «Brake Control Diagnosis» display screen, select the {Clear Memory} and press «YES» key.

Display screen	Contents to be monitored
Clear memory?	Function of clearing DTC and freeze frame data.

5) When the “Done” and “turn ignition switch to OFF” are shown on display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

4. ABS SEQUENCE CONTROL

Display screen	Contents to be monitored	Index No.
ABS sequence control	Perform ABS sequence control by operating valve and pump motor sequentially.	<Ref. to ABS-11, ABS Sequence Control.>

5. FREEZE FRAME DATA

NOTE:
• Data stored at the time of trouble occurrence is shown on display.
• Each time trouble occurs, the latest information is stored in the freeze frame data in memory.
• Freeze frame data will be memorized maximum to three.
• If freeze frame data is not properly stored in memory (due to a drop in ABSCM power supply, etc.), a DTC, preceded by a question mark "?", appears on the select monitor display. This shows it may be an unreliable reading.

Display screen	Contents to be monitored
FR wheel speed	Wheel speed detected by Front ABS sensor RH is displayed in km/h or mile/h.
FL wheel speed	Wheel speed detected by Front ABS sensor LH is displayed in km/h or mile/h.
RR wheel speed	Wheel speed detected by Rear ABS sensor RH is displayed in km/h or mile/h.
RL wheel speed	Wheel speed detected by Rear ABS sensor LH is displayed in km/h or mile/h.
ABSCM power voltage	Power (in volts) supplied to ABSCM& H/U appears on the select monitor display.
G sensor output voltage	Voltage equivalent to vehicle acceleration detected by analog G sensor is displayed.
Motor relay monitor	Motor relay operation monitor signal
Stop light switch	Stop light switch signal
ABS signal to TCM	ABS operation signal from ABS control module to TCM
ABS-AT control	ABS operation signal from ABS control module to TCM
ABS operation signal	ABS operation signal
Condition of malfunction	Displays if the malfunction has occurred to ABS only, or to ABS and EBD.

6. ANALOG DATA ARE DISPLAYED

Display screen	Contents to be monitored
FR wheel speed	Wheel speed detected by Front ABS sensor RH is displayed in km/h or mile/h.
FL wheel speed	Wheel speed detected by Front ABS sensor LH is displayed in km/h or mile/h.
RR wheel speed	Wheel speed detected by Rear ABS sensor RH is displayed in km/h or mile/h.
RL wheel speed	Wheel speed detected by Rear ABS sensor LH is displayed in km/h or mile/h.
Stop light switch	Stop light switch monitor voltage is displayed.
G sensor output voltage	Refers to vehicle acceleration detecting by analog G sensor. It appears on the select monitor display in volts.

7. ON/OFF DATA ARE DISPLAYED

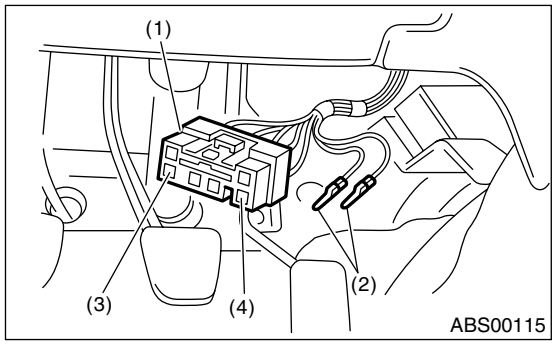
Display screen	Contents to be monitored
Stop light switch	Stop light switch signal
Valve relay signal	Valve relay signal
Motor relay signal	Motor relay signal
ABS signal to TCM	ABS operation signal from ABS control module to TCM
ABS warning light	ABS warning light
Valve relay monitor	Valve relay operation monitor signal
Motor relay monitor	Motor relay operation monitor signal
CCM signal	ABS operation signal from ABS control module to TCM

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. WITHOUT SUBARU SELECT MONITOR

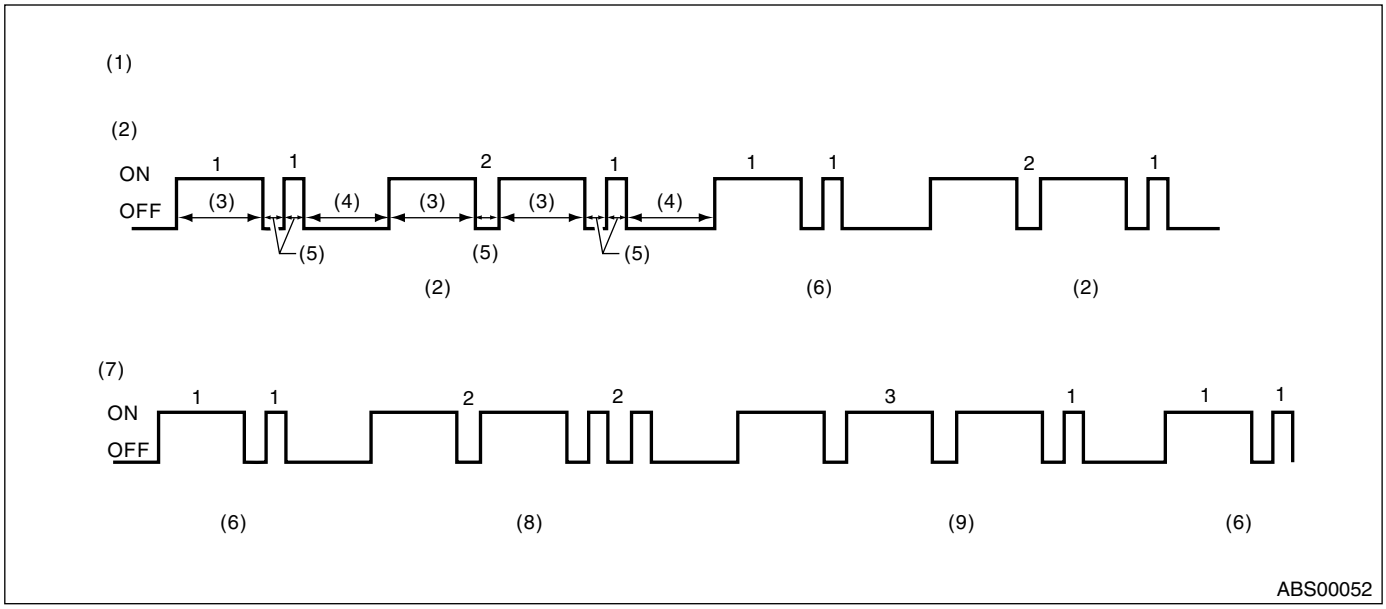
1) Take out the diagnosis connector from side of driver's seat.



(1) Diagnosis connector
(2) Diagnosis terminal
(3) Terminal No. 3
(4) Terminal No. 6

2) Turn the ignition switch to OFF.
3) Connect the diagnosis connector terminal 6 to diagnosis terminal.
4) Turn the ignition switch to ON.
5) ABS warning light is set in the diagnostic mode and blinks to identify DTC.
6) After the start code (11) is shown, the DTCs will be shown in order of the last information first.
These repeat for a maximum of 3 minutes.

NOTE:
• When there are no DTCs in memory, only the start code (11) is shown.
• When on-board diagnosis of the ABS control module detects a problem, the information (up to a maximum of three) will be stored in EEP ROM as a DTC. When there are more than three, the most recent three will be stored. (Stored codes will stay in memory until they are cleared.)



(1) Example of DTC indication
(2) DTC: 21
(3) 1.2 sec.
(4) 1.0 sec.
(5) 0.3 sec.
(6) Start code
(7) DTC: 22, 31
(8) DTC: 22
(9) DTC: 31

2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to obtain and understand DTCs. <Ref. to ABS-18, Subaru Select Monitor.>

8. Inspection Mode

A: OPERATION

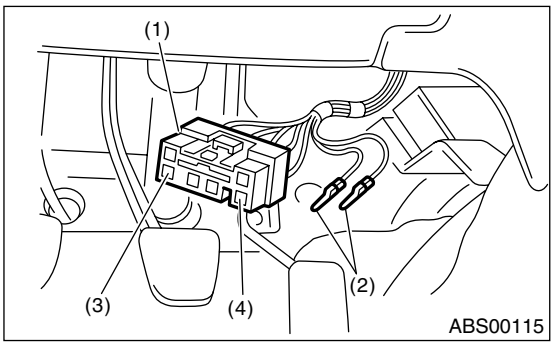
Reproduce the condition under which the problem has occurred as much as possible.
Drive the vehicle at a speed more than 40 km/h (25 MPH) for at least 1 minute.

9. Clear Memory Mode

A: OPERATION

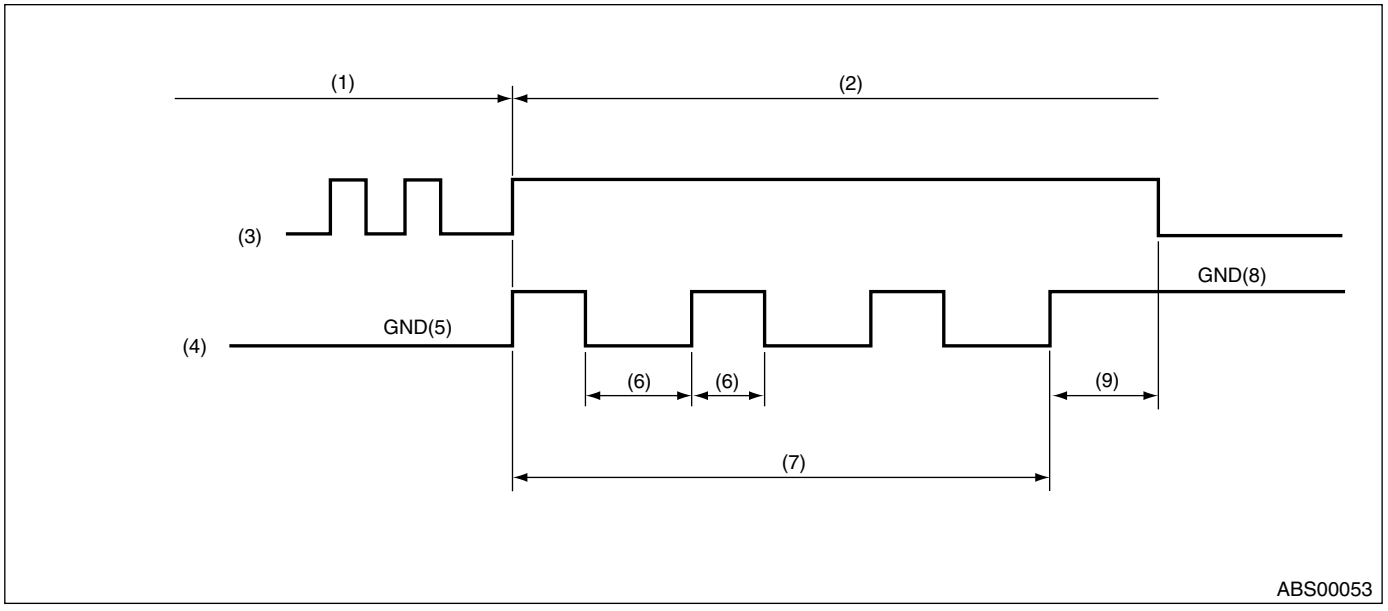
1. WITHOUT SUBARU SELECT MONITOR

1) After calling up a DTC, disconnect the diagnosis connector terminal 6 from diagnosis terminal.



(1) Diagnosis connector
(2) Diagnosis terminal
(3) Terminal No. 3
(4) Terminal No. 6

2) Repeat 3 times within approx. 12 seconds; connecting and disconnecting terminal 6 and diagnosis terminal for at least 0.2 seconds each time.



(1) Diagnostic trouble code (DTC) indication mode
(2) Memory erase mode
(3) ABS warning lamp
(4) Terminal No.8
(5) Low level
(6) 0.2 sec. or more
(7) 12 sec. or less
(8) Open (high level)
(9) 1.5 sec.

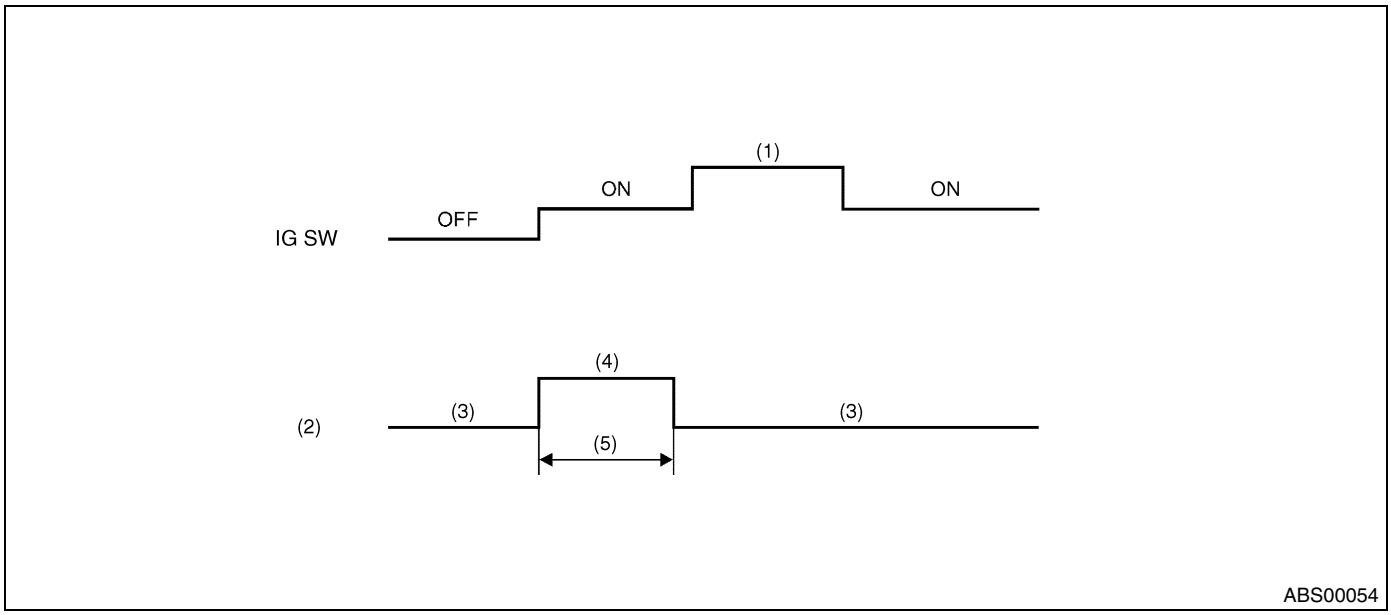
NOTE:
After the diagnostics is completed, make sure to clear memory. Make sure only start code (11) is shown after memory is cleared.

2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to clear DTC. <Ref. to ABS-18, Subaru Select Monitor.>

10.ABS Warning Light Illumination Pattern

A: INSPECTION



(1) START
(2) ABS warning light
(3) Goes out
(4) Illuminates
(5) 1.5 sec.

1) When the ABS warning light does not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.
2) When the ABS warning light remains constantly OFF, repair the ABS warning light circuit or diagnosis circuit. <Ref. to ABS-29, Diagnostics Chart with Diagnosis Connector.>

NOTE:
Even though the ABS warning light does not go out 1.5 seconds after it illuminates, the ABS system operates normally when the warning light goes out while driving at approx. 12 km/h (7 MPH). However, the Anti-lock brakes do not work while ABS warning light is illuminated.

11.List of Diagnostics Trouble Code (DTC)

A: LIST

1. WITHOUT SUBARU SELECT MONITOR

DTC No.	Contents of diagnosis		Index No.
11	Start code • DTC is shown after start code. • Only start code is shown in normal condition.		—
21	Abnormal ABS sensor (Open circuit or input voltage too high)	Front ABS sensor RH	<Ref. to ABS-44, DTC 21 — ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT RH) —, Diagnostics Chart with Diagnosis Connector.>
23		Front ABS sensor LH	<Ref. to ABS-44, DTC 23 — ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT LH) —, Diagnostics Chart with Diagnosis Connector.>
25		Rear ABS sensor RH	<Ref. to ABS-44, DTC 25 — ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR RH) —, Diagnostics Chart with Diagnosis Connector.>
27		Rear ABS sensor LH	<Ref. to ABS-45, DTC 27 — ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>
22	Abnormal ABS sensor (Abnormal ABS sensor signal)	Front ABS sensor RH	<Ref. to ABS-52, DTC 22 — ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (FRONT RH) —, Diagnostics Chart with Diagnosis Connector.>
24		Front ABS sensor LH	<Ref. to ABS-52, DTC 24 — ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (FRONT LH) —, Diagnostics Chart with Diagnosis Connector.>
26		Rear ABS sensor RH	<Ref. to ABS-52, DTC 26 — ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR RH) —, Diagnostics Chart with Diagnosis Connector.>
28		Rear ABS sensor LH	<Ref. to ABS-53, DTC 28 — ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>
29		Any one of four	<Ref. to ABS-60, DTC 29 — ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (ANY ONE OF FOUR) —, Diagnostics Chart with Diagnosis Connector.>

DTC No.	Contents of diagnosis		Index No.
31	Abnormal solenoid valve circuit(s) in ABS control module and hydraulic unit	Front inlet valve RH	<Ref. to ABS-66, DTC 31 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH) —, Diagnostics Chart with Diagnosis Connector.>
32		Front outlet valve RH	<Ref. to ABS-70, DTC 32 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH) —, Diagnostics Chart with Diagnosis Connector.>
33		Front inlet valve LH	<Ref. to ABS-66, DTC 33 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH) —, Diagnostics Chart with Diagnosis Connector.>
34		Front outlet valve LH	<Ref. to ABS-70, DTC 34 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH) —, Diagnostics Chart with Diagnosis Connector.>
35		Rear inlet valve RH	<Ref. to ABS-66, DTC 35 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH) —, Diagnostics Chart with Diagnosis Connector.>
36		Rear outlet valve RH	<Ref. to ABS-70, DTC 36 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH) —, Diagnostics Chart with Diagnosis Connector.>
37		Rear inlet valve LH	<Ref. to ABS-67, DTC 37 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>
38		Rear outlet valve LH	<Ref. to ABS-71, DTC 38 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>
41	Abnormal ABS control module		<Ref. to ABS-74, DTC 41 — ABNORMAL ABS CONTROL MODULE —, Diagnostics Chart with Diagnosis Connector.>
42	Source voltage is abnormal.		<Ref. to ABS-76, DTC 42 — SOURCE VOLTAGE IS ABNORMAL. —, Diagnostics Chart with Diagnosis Connector.>
44	A combination of AT control abnormal		<Ref. to ABS-79, DTC 44 — A COMBINATION OF AT CONTROL ABNORMAL —, Diagnostics Chart with Diagnosis Connector.>
51	Abnormal valve relay		<Ref. to ABS-82, DTC 51 — ABNORMAL VALVE RELAY —, Diagnostics Chart with Diagnosis Connector.>
52	Abnormal motor and/or motor relay		<Ref. to ABS-85, DTC 52 — ABNORMAL MOTOR AND/OR MOTOR RELAY —, Diagnostics Chart with Diagnosis Connector.>
54	Abnormal stop light switch		<Ref. to ABS-88, DTC 54 — ABNORMAL STOP LIGHT SWITCH —, Diagnostics Chart with Diagnosis Connector.>
56	Abnormal G sensor output voltage		<Ref. to ABS-90, DTC 56 — ABNORMAL G SENSOR OUTPUT VOLTAGE —, Diagnostics Chart with Diagnosis Connector.>

2. WITH SUBARU SELECT MONITOR

DTC No.	Sub code No.	Display screen	Contents of diagnosis	Index No.
—	—	Communication for initializing impossible	Select monitor communication failure	<Ref. to ABS-95, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostics Chart with Subaru Select Monitor.>
—	—	No trouble code	Although no trouble code appears on the select monitor display, the ABS warning light remains on.	<Ref. to ABS-98, NO TROUBLE CODE, Diagnostics Chart with Subaru Select Monitor.>
21	4A02	Open or short circuit in Front ABS sensor RH circuit	Open or short circuit in Front ABS sensor RH circuit	<Ref. to ABS-102, DTC 21 — OPEN OR SHORT CIRCUIT IN FRONT RIGHT ABS SENSOR CIRCUIT —, Diagnostics Chart with Subaru Select Monitor.>
22	48C5, 4945 48E5, 4845 4905, 4885	Front ABS sensor RH abnormal signal	Front ABS sensor RH abnormal signal	<Ref. to ABS-110, DTC 22 — FRONT RIGHT ABNORMAL ABS SENSOR SIGNAL —, Diagnostics Chart with Subaru Select Monitor.>
23	4202	Open or short circuit in Front ABS sensor LH circuit	Open or short circuit in Front ABS sensor LH circuit	<Ref. to ABS-102, DTC 23 — OPEN OR SHORT CIRCUIT IN FRONT LEFT ABS SENSOR CIRCUIT —, Diagnostics Chart with Subaru Select Monitor.>
24	40C5, 4145 40E5, 4045 4105, 4085	Front ABS sensor LH abnormal signal	Front ABS sensor LH abnormal signal	<Ref. to ABS-110, DTC 24 — FRONT LEFT ABNORMAL ABS SENSOR SIGNAL —, Diagnostics Chart with Subaru Select Monitor.>
25	4602	Open or short circuit in Rear ABS sensor RH circuit	Open or short circuit in Rear ABS sensor RH circuit	<Ref. to ABS-102, DTC 25 — OPEN OR SHORT CIRCUIT IN REAR RIGHT ABS SENSOR CIRCUIT —, Diagnostics Chart with Subaru Select Monitor.>
26	44C5, 4545 44E5, 4445 4505, 4485	Rear ABS sensor RH abnormal signal	Rear ABS sensor RH abnormal signal	<Ref. to ABS-110, DTC 26 — REAR RIGHT ABNORMAL ABS SENSOR SIGNAL —, Diagnostics Chart with Subaru Select Monitor.>
27	4E02	Open or short circuit in Rear ABS sensor LH circuit	Open or short circuit in Rear ABS sensor LH circuit	<Ref. to ABS-103, DTC 27 — OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT —, Diagnostics Chart with Subaru Select Monitor.>
28	4CC5, 4D45 4CE5, 4C45 4D05, 4C85	Rear ABS sensor LH abnormal signal	Rear ABS sensor LH abnormal signal	<Ref. to ABS-111, DTC 28 — REAR LEFT ABNORMAL ABS SENSOR SIGNAL —, Diagnostics Chart with Subaru Select Monitor.>
29	5080 50C0	Abnormal ABS sensor signal on any one of four sensor	Abnormal ABS sensor signal on any one of four	<Ref. to ABS-118, DTC 29 — ABNORMAL ABS SENSOR SIGNAL ON ANY ONE OF FOUR SENSOR —, Diagnostics Chart with Subaru Select Monitor.>
31	3200	Front inlet valve RH malfunction	Front inlet valve RH malfunction	<Ref. to ABS-124, DTC 31 — FRONT RIGHT INLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>
32	3600	Front outlet valve RH malfunction	Front outlet valve RH malfunction	<Ref. to ABS-128, DTC 32 — FRONT RIGHT OUTLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>
33	2200	Front inlet valve LH malfunction	Front inlet valve LH malfunction	<Ref. to ABS-124, DTC 33 — FRONT LEFT INLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>
34	2600	Front outlet valve LH malfunction	Front outlet valve LH malfunction	<Ref. to ABS-128, DTC 34 — FRONT LEFT OUTLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>
35	2A00	Rear inlet valve RH malfunction	Rear inlet valve RH malfunction	<Ref. to ABS-124, DTC 35 — REAR RIGHT INLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>
36	2E00	Rear outlet valve RH malfunction	Rear outlet valve RH malfunction	<Ref. to ABS-128, DTC 36 — REAR RIGHT OUTLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>

LIST OF DIAGNOSTICS TROUBLE CODE (DTC)

DTC No.	Sub code No.	Display screen	Contents of diagnosis	Index No.
37	3A00	Rear inlet valve LH malfunction	Rear inlet valve LH malfunction	<Ref. to ABS-125, DTC 37 — REAR LEFT INLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>
38	3E00	Rear outlet valve LH malfunction	Rear outlet valve LH malfunction	<Ref. to ABS-129, DTC 38 — REAR LEFT OUTLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>
41	02A0, 0040, 0020, 02C0, 00E0, 0340, 0140, 0160, 0280, 0080, 0300	ABS control module malfunction	ABS control module and hydraulic control unit malfunction	<Ref. to ABS-132, DTC 41 — ABS CONTROL MODULE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>
42	5A00	Power supply voltage too low	Power supply voltage too low	<Ref. to ABS-134, DTC 42 — POWER SUPPLY VOLTAGE TOO LOW —, Diagnostics Chart with Subaru Select Monitor.>
42	5A80	Power supply voltage too high	Power supply voltage too high	<Ref. to ABS-137, DTC 42 — POWER SUPPLY VOLTAGE TOO HIGH —, Diagnostics Chart with Subaru Select Monitor.>
44	1600	ABS-AT control (Non Controlled)	ABS-AT control (Non Controlled)	<Ref. to ABS-140, DTC 44 — ABS-AT CONTROL (NON CONTROLLED) —, Diagnostics Chart with Subaru Select Monitor.>
44	1500	ABS-AT control (Controlled)	ABS-AT control (Controlled)	<Ref. to ABS-142, DTC 44 — ABS-AT CONTROL (CONTROLLED) —, Diagnostics Chart with Subaru Select Monitor.>
51	0C80 0EA0	Valve relay malfunction	Valve relay malfunction	<Ref. to ABS-144, DTC 51 — VALVE RELAY MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>
51	0C40	Valve relay ON failure	Valve relay ON failure	<Ref. to ABS-147, DTC 51 — VALVE RELAY ON FAILURE —, Diagnostics Chart with Subaru Select Monitor.>
52	10A1	Open circuit in motor relay circuit	Open circuit in motor relay circuit	<Ref. to ABS-149, DTC 52 — OPEN CIRCUIT IN MOTOR RELAY CIRCUIT —, Diagnostics Chart with Subaru Select Monitor.>
52	10E1	Motor relay ON failure	Motor relay ON failure	<Ref. to ABS-151, DTC 52 — MOTOR RELAY ON FAILURE —, Diagnostics Chart with Subaru Select Monitor.>
52	10C1	Motor malfunction	Motor malfunction	<Ref. to ABS-153, DTC 52 — MOTOR MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>
54	5600	Stop light switch signal circuit malfunction	Stop light switch signal circuit malfunction	<Ref. to ABS-156, DTC 54 — STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>
56	7600	Open or short circuit in G sensor circuit	Open or short circuit in G sensor circuit	<Ref. to ABS-158, DTC 56 — OPEN OR SHORT CIRCUIT IN G SENSOR CIRCUIT —, Diagnostics Chart with Subaru Select Monitor.>
56	7580	Battery short in G sensor circuit	Battery short in G sensor circuit	<Ref. to ABS-162, DTC 56 — BATTERY SHORT IN G SENSOR CIRCUIT —, Diagnostics Chart with Subaru Select Monitor.>
56	7540	Abnormal G sensor high μ output	Abnormal G sensor high μ output	<Ref. to ABS-167, DTC 56 — Abnormal G Sensor High μ Output —, Diagnostics Chart with Subaru Select Monitor.>
56	7500	Detection of G sensor stick	Detection of G sensor stick	<Ref. to ABS-171, DTC 56 — DETECTION OF G SENSOR STICK —, Diagnostics Chart with Subaru Select Monitor.>

NOTE:
High μ means high friction coefficient against road surface.

12.Diagnostics Chart with Diagnosis Connector

A: ABS WARNING LIGHT DOES NOT COME ON.

DIAGNOSIS:

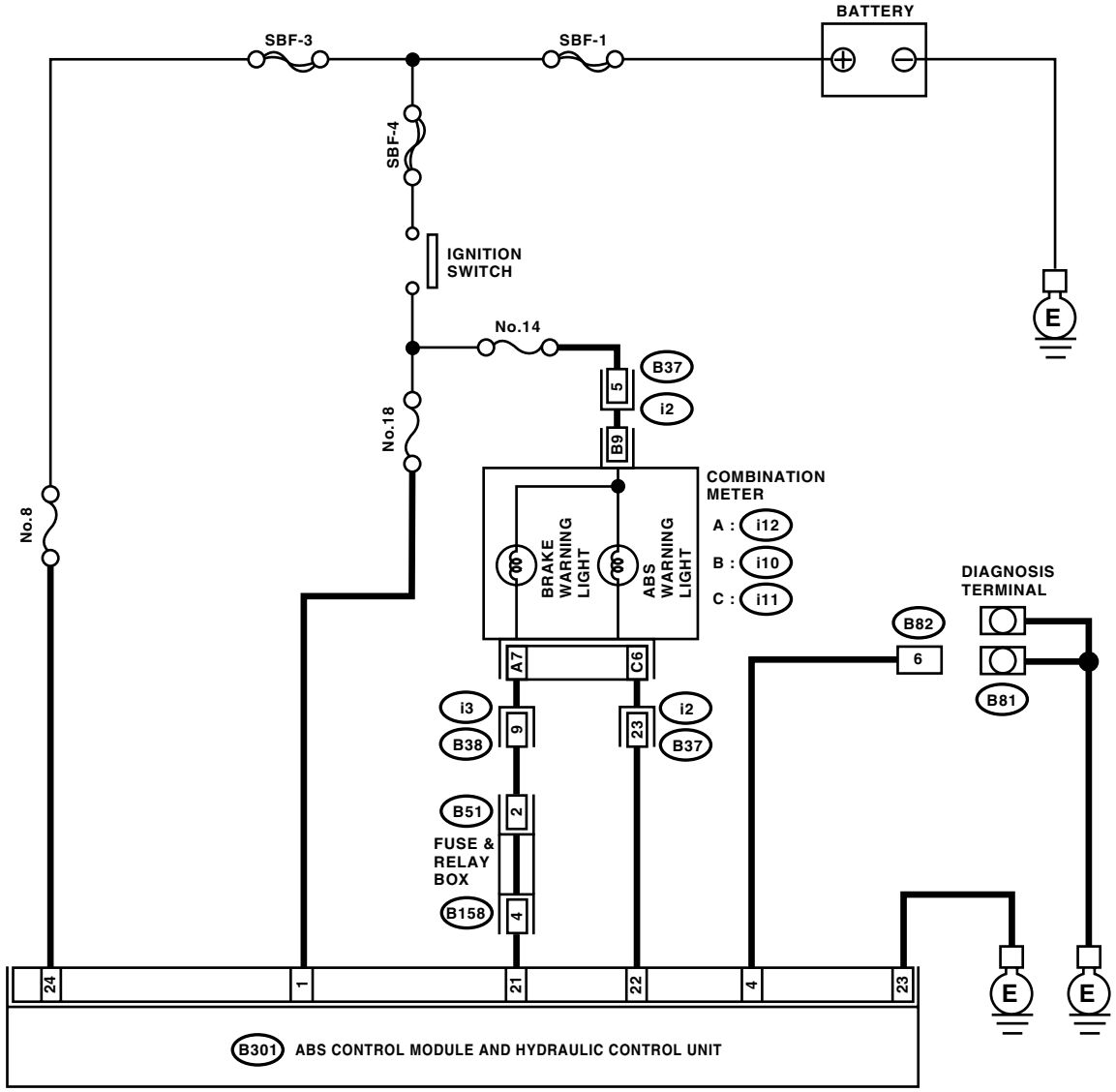
- ABS warning light circuit is open or shorted.

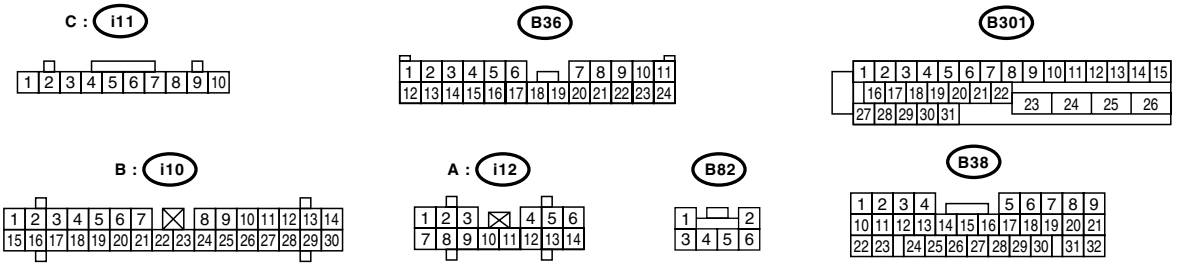
TROUBLE SYMPTOM:

- When the ignition switch is turned to ON (engine OFF), ABS warning light does not come on.

WIRING DIAGRAM:

LHD MODEL

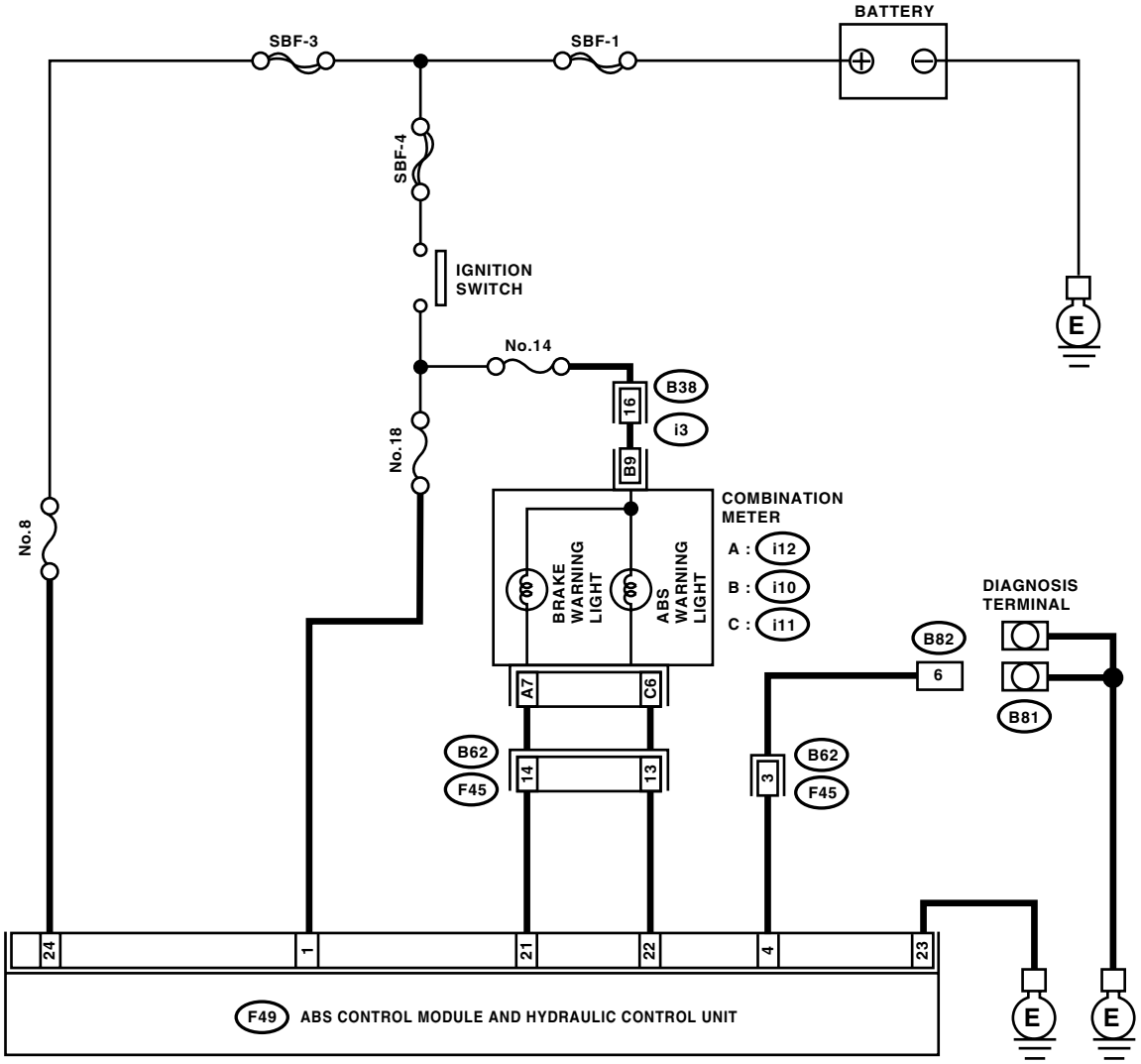


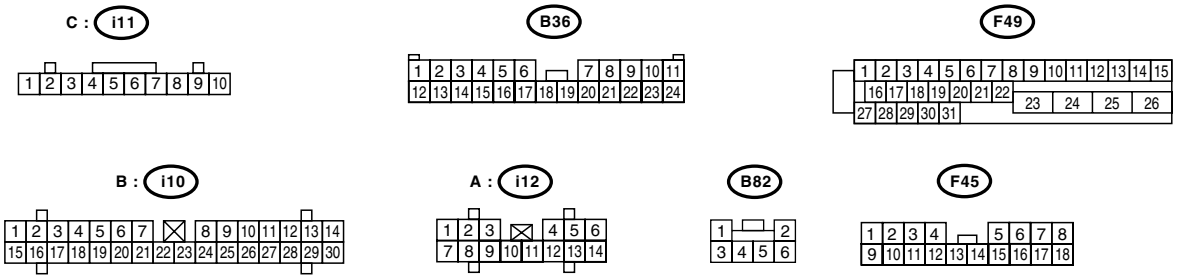


ABS00199

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

RHD MODEL





ABS00204

	Step	Value	Yes	No
1	**CHECK IF OTHER WARNING LIGHTS TURN ON.** Turn the ignition switch to ON (engine OFF). Are other warning lights turned on?	Other warning lights are turned on.	Go to step **2.**	Repair the combination meter. <Ref. to IDI-12, Combination Meter Assembly.>

	Step	Value	Yes	No
2	**CHECK ABS AND BRAKE WARNING LIGHT BULB.** 1)Turn the ignition switch to OFF. 2)Remove the combination meter. 3)Remove the ABS warning light and brake warning light. Is the ABS warning light bulb open?	Valves are not blown out.	Go to step **3.**	Replace the ABS and brake warning light bulb. <Ref. to IDI-12, Combination Meter Assembly.>
3	**CHECK BATTERY SHORT OF ABS AND BRAKE WARNING LIGHT HARNESS.** 1)Disconnect the connector (i2) or (B62) from connector (B37) or (F45). 2)Measure the voltage between connector (i2) or (B62) and chassis ground. ***Connector & terminal*** ***LHD: (i2) No. 23 (+) — Chassis ground (–):*** ***RHD: (B62) No. 13 (+) — Chassis ground (–):*** Is the measured value less than specified value?	3 V	Go to step **4.**	Repair the warning light harness.
4	**CHECK BATTERY SHORT OF ABS AND BRAKE WARNING LIGHT HARNESS.** 1)Turn the ignition switch to ON. 2)Measure the voltage between connector (i2) or (B62) and chassis ground. ***Connector & terminal*** ***LHD: (i2) No. 23 (+) — Chassis ground (–):*** ***RHD: (B62) No. 13 (+) — Chassis ground (–):*** Is the measured value less than specified value?	3 V	Go to step **5.**	Repair the warning light harness.
5	**CHECK WIRING HARNESS.** 1)Turn the ignition switch to OFF. 2)Install the combination meter. 3)Turn the ignition switch to ON. 4)Measure the voltage between connector (i2) or (B62) and chassis ground. ***Connector & terminal*** ***LHD: (i2) No. 23 (+) — Chassis ground (–):*** ***RHD: (B62) No. 13 (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 15 V	Go to step **6.**	Repair the wiring harness.
6	**CHECK BATTERY SHORT OF ABS AND BRAKE WARNING LIGHT HARNESS.** 1)Turn the ignition switch to OFF. 2)Measure the voltage between connector (B37) or (F45) and chassis ground. ***Connector & terminal*** ***LHD: (B37) No. 23 (+) — Chassis ground (–):*** ***RHD: (F45) No. 13 (+) — Chassis ground (–):*** Is the measured value less than specified value?	3 V	Go to step **7.**	Repair the wiring harness.

	Step	Value	Yes	No
7	**CHECK BATTERY SHORT OF ABS AND BRAKE WARNING LIGHT HARNESS.** 1)Turn the ignition switch to ON. 2)Measure the voltage between connector (B37) or (F45) and chassis ground. ***Connector & terminal*** ***LHD: (B37) No. 23 (+) — Chassis ground (–):*** ***RHD: (F45) No. 13 (+) — Chassis ground (–):*** Is the measured value less than specified value?	3 V	Go to step **8.**	Repair the wiring harness.
8	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 23 — Chassis ground:*** ***RHD: (F49) No. 23 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **9.**	Repair the ABSCM&H/U ground harness.
9	**CHECK WIRING HARNESS.** Measure the resistance between connector (B37) or (F45) and chassis ground. ***Connector & terminal*** ***LHD: (B37) No. 23 — Chassis ground:*** ***RHD: (F45) No. 13 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **10.**	Repair the harness/connector.
10	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF. Is there poor contact in connectors between combination meter and ABSCM&H/U?	There is no poor contact.	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Repair the connector.

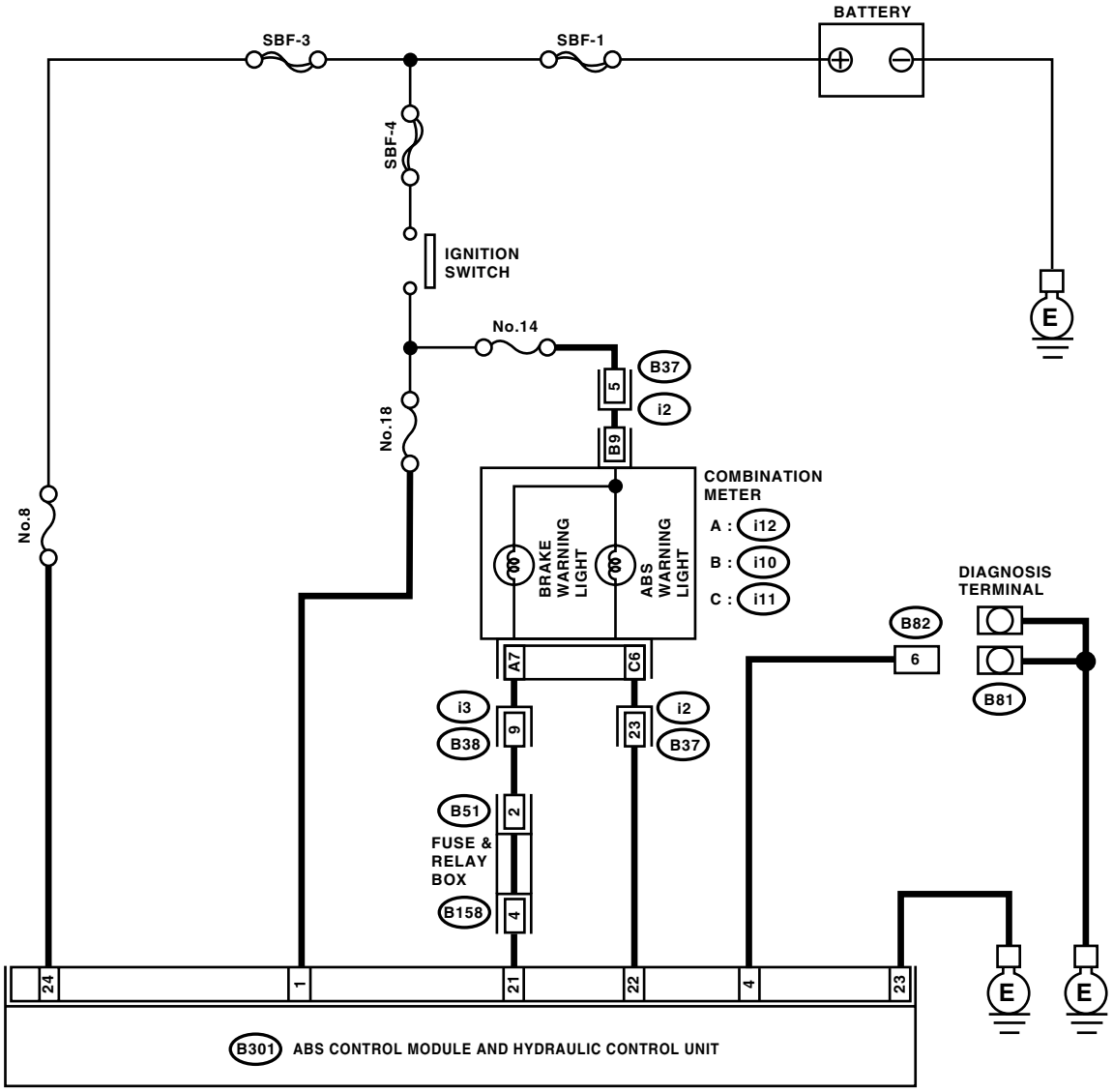
B: ABS WARNING LIGHT DOES NOT GO OFF.

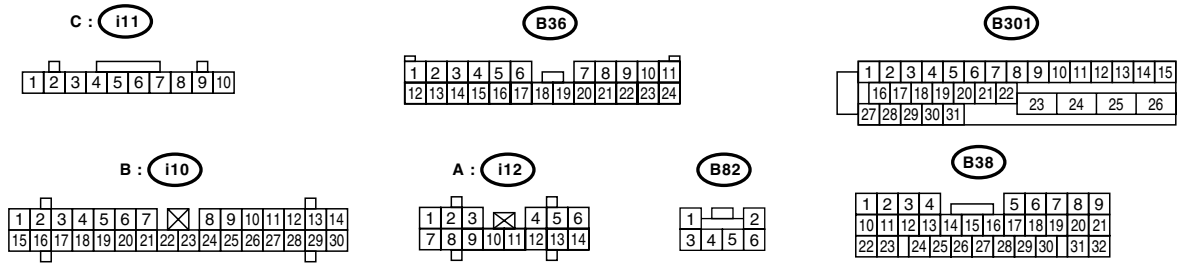
TROUBLE SYMPTOM:

- When starting the engine and while ABS warning light is kept ON.

WIRING DIAGRAM:

LHD MODEL

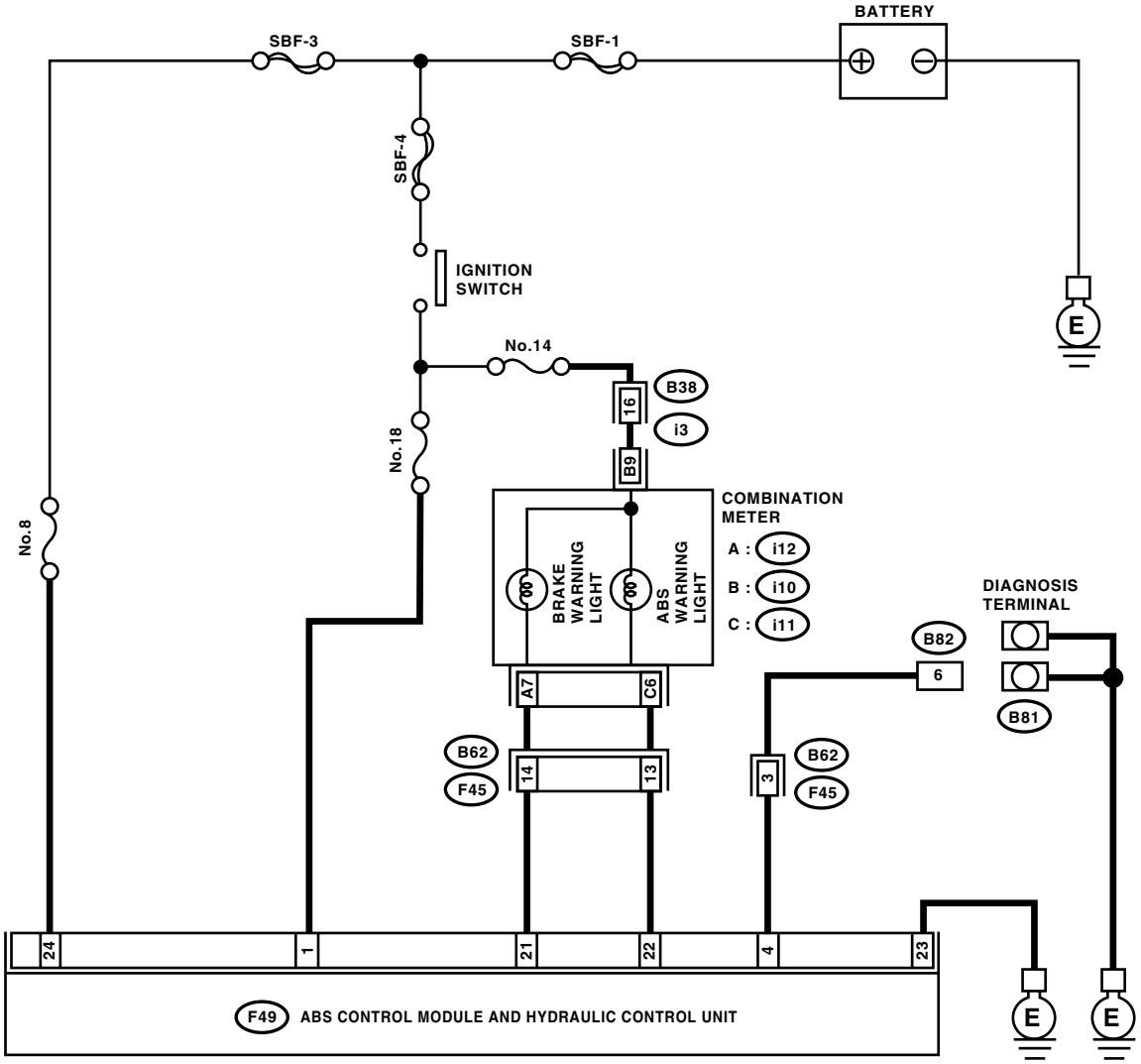


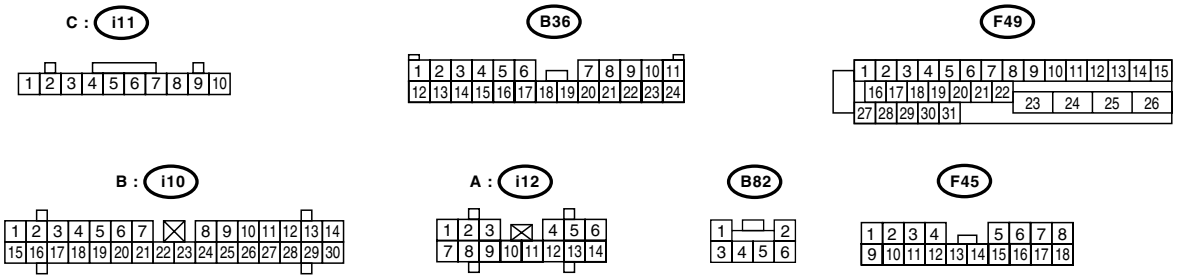


ABS00199

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

RHD MODEL





ABS00204

Step		Value	Yes	No
1	**CHECK INSTALLATION OF ABSCM&H/U CONNECTOR.** Turn the ignition switch to OFF. Is the ABSCM&H/U connector inserted into ABSCM until the clamp locks onto it?	Connector is inserted securely.	Go to step **2.**	Insert the ABSCM&H/U connector into ABSCM&H/U until the clamp locks onto it.

	Step	Value	Yes	No
2	**CHECK DIAGNOSIS TERMINAL.** Measure the resistance between diagnosis terminals (B81) and chassis ground. ***Terminals*** ***Diagnosis terminal (A) — Chassis ground:*** ***Diagnosis terminal (B) — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **3.**	Repair the diagnosis terminal harness.
3	**CHECK DIAGNOSIS LINE.** 1)Connect the diagnosis terminal (B81) to diagnosis connector (B82) No. 6. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 4 — Chassis ground:*** ***RHD: (F49) No. 4 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **4.**	Repair the harness connector between ABSCM&H/U and diagnosis connector.
4	**CHECK GENERATOR.** 1)Start the engine. 2)Idle the engine. 3)Measure the voltage between generator and chassis ground. ***Terminal*** ***Generator B terminal (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 15 V	Go to step **5.**	Repair the generator. <Ref. to SC(SOHC)-15, Generator.>
5	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF. Is there poor contact at battery terminal?	There is no poor contact.	Go to step **6.**	Repair or tighten the battery terminal.
6	**CHECK POWER SUPPLY OF ABSCM.** 1)Start the engine. 2)Idle the engine. 3)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 1 (+) — Chassis ground (–):*** ***RHD: (F49) No. 1 (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 15 V	Go to step **7.**	Repair the ABSCM&H/U power supply circuit.
7	**CHECK WIRING HARNESS.** 1)Disconnect the connector (i2) or (B62) from connector (B37) or (F45). 2)Turn ignition switch to ON. Does the ABS warning light turn on?	ABS warning light does not turn on.	Go to step **8.**	Repair the front or body wiring harness.
8	**CHECK PROJECTION AT ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Check for damage at the ABSCM&H/U terminal. Is there damage on terminal?	There is no damage on terminal.	Go to step **9.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

	Step	Value	Yes	No
9	**CHECK ABSCM&H/U.** Measure the resistance between ABSCM&H/U terminals. ***Terminal*** ***No. 22 — No. 23:*** Is the measured value more than specified value?	1 MΩ	Go to step **10.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
10	**CHECK WIRING HARNESS.** Measure the resistance between connector (B37) or (F45) and chassis ground. ***Connector & terminal*** ***LHD: (B37) No. 23 — Chassis ground:*** ***RHD: (F45) No. 13 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **11.**	Repair the harness.
11	**CHECK WIRING HARNESS.** 1)Connect the connector to ABSCM&H/U. 2)Measure the resistance between connector (B37) or (F45) and chassis ground. ***Connector & terminal*** ***LHD: (B37) No. 23 — Chassis ground:*** ***RHD: (F45) No. 13 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **12.**	Repair the harness.
12	**CHECK POOR CONTACT IN ABSCM&H/U CONNECTOR.** Is there poor contact in ABSCM&H/U connector?	There is no poor contact.	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Repair the connector.

C: ABS AND BRAKE WARNING LIGHT DO NOT GO OFF.

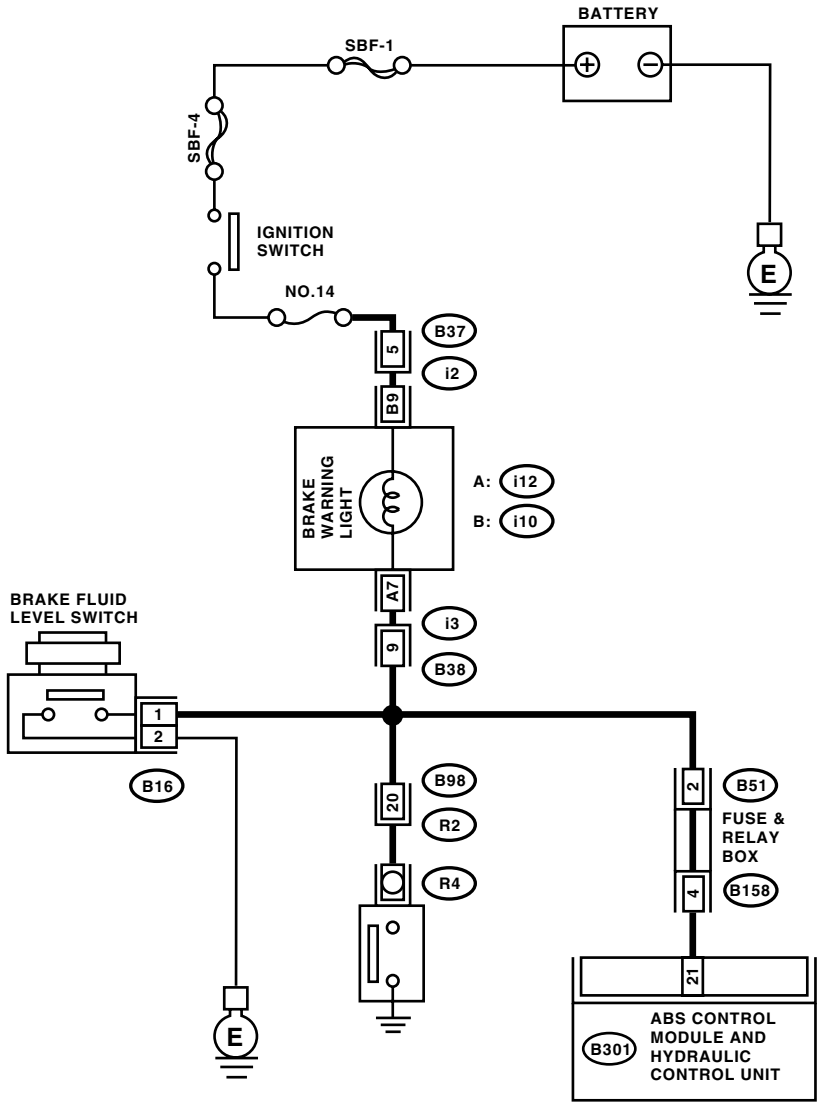
DIAGNOSIS:

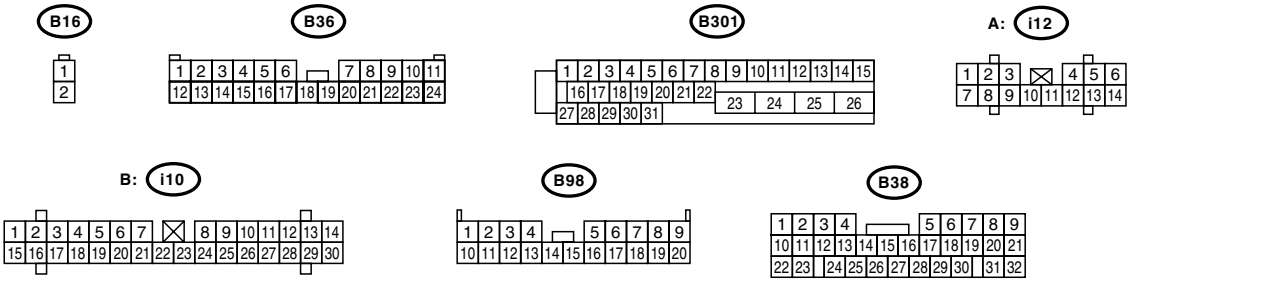
- ABS warning light circuit is open or shorted.
- Brake warning light circuit is shorted.
- Faulty sensor/connector

TROUBLE SYMPTOM:

- When starting the engine, ABS warning light is kept ON.
- After starting the engine, brake warning light is kept ON, even if the parking brake lever has been released.

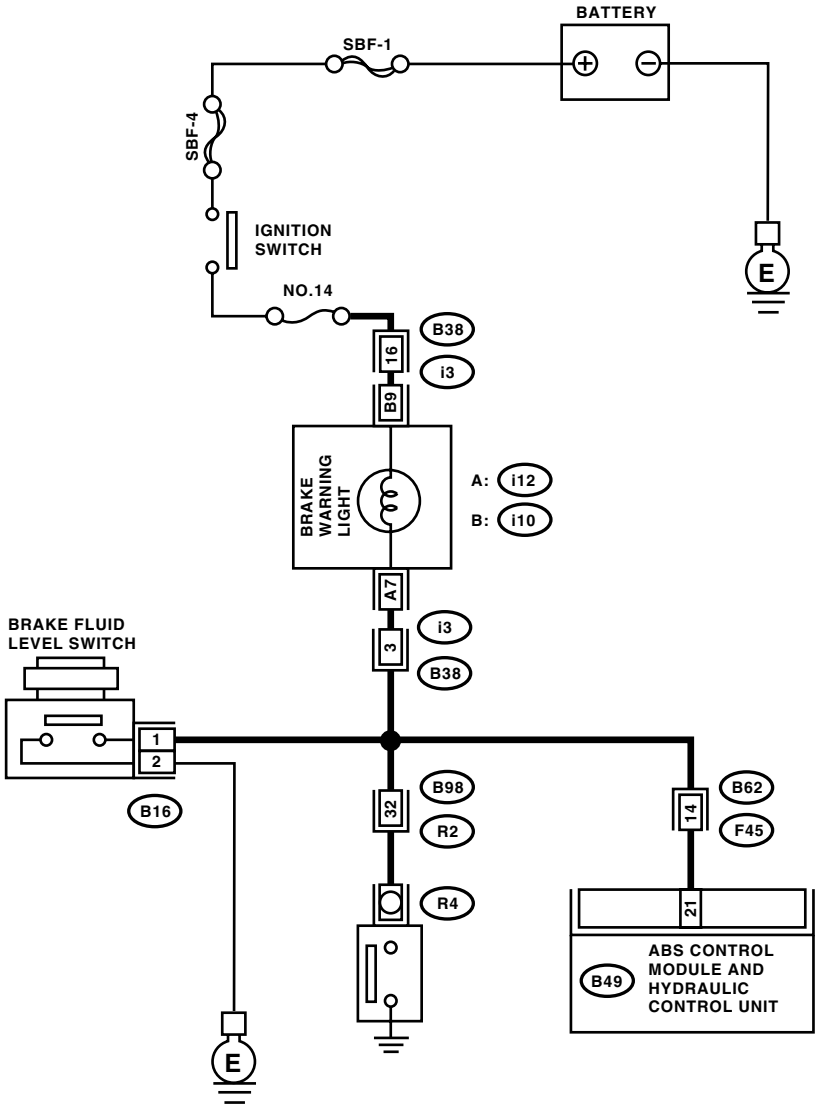
WIRING DIAGRAM:
LHD MODEL

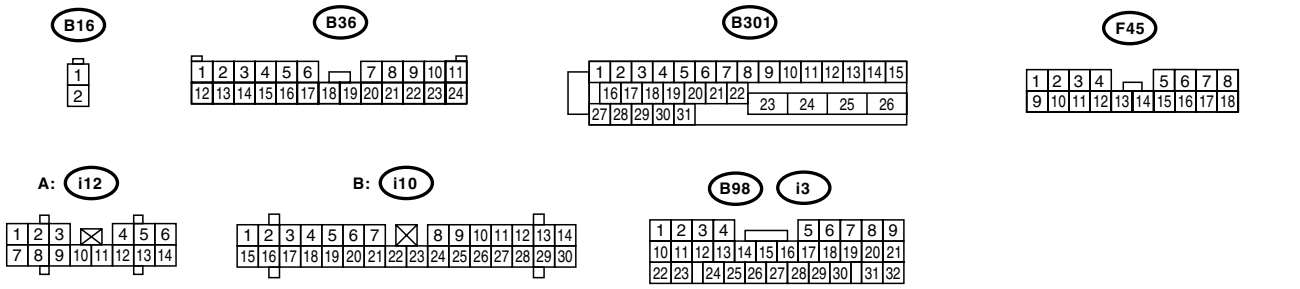




ABS00209

RHD MODEL





ABS00214

	Step	Value	Yes	No
1	**CHECK BRAKE FLUID AMOUNT.** Check the amount of brake fluid in reservoir tank of master cylinder. Is the brake fluid amount within specified value?	Brake fluid amount is between "MAX" line and "MIN" line.	Go to step **2.**	Fill the brake fluid to specified amount.

	Step	Value	Yes	No
2	**CHECK BRAKE FLUID LEVEL SWITCH.** 1)Disconnect the level switch connector (B16) from master cylinder. 2)Measure the resistance of master cylinder terminals. ***Terminals*** ***No.1 — No.2:*** Is the measured value more than specified value?	1 MΩ	Go to step **3.**	Replace the master cylinder.
3	**CHECK PARKING BRAKE SWITCH.** 1)Disconnect the connector (R4) from parking brake switch. 2)Release the parking brake switch. 3)Measure the resistance between parking brake switch terminal and chassis ground. Is the measured value more than specified value?	1 MΩ	Go to step **4.**	Replace the parking brake switch.
4	**CHECK GROUND SHORT OF HARNESS.** 1)Disconnect the connector form ABSCM & H/U. 2)Disconnect the connector (i12) from combination meter. 3)Turn the ignition switch to ON. Does the brake warning light go off?	Brake warning light goes off.	Go to step **5.**	Repair the harness.
5	**CHECK POOR CONTACT IN ABSCM & H/U.** Is there poor contact in ABSCM & H/U connector?	There is no poor contact.	Replace the ABSCM & H/U.<Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Repair the connector.

D: TROUBLE CODE DOES NOT APPEAR.

DIAGNOSIS:

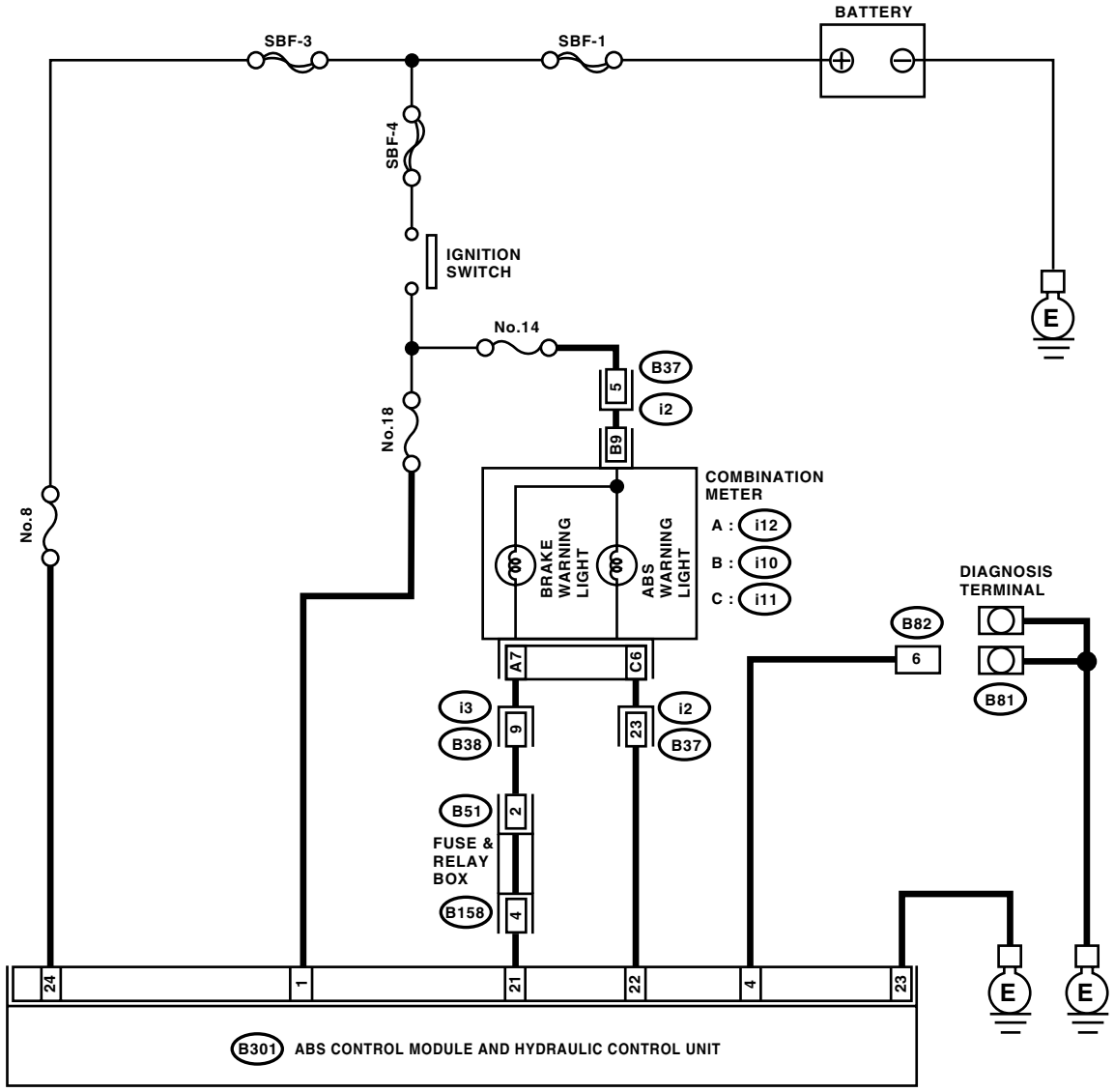
- Diagnosis circuit is open.

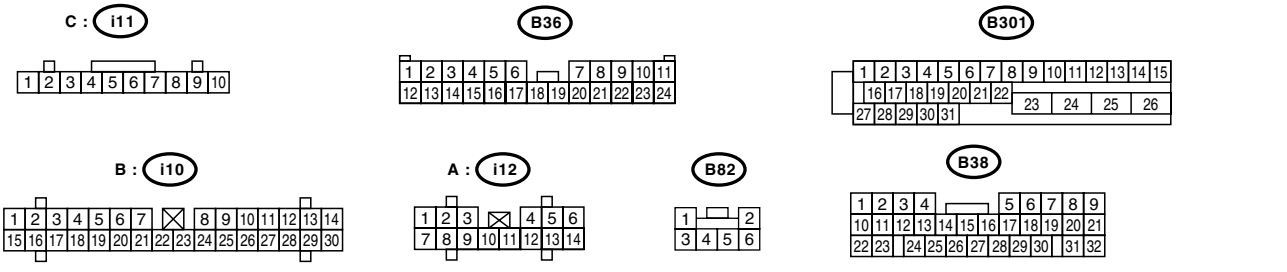
TROUBLE SYMPTOM:

- The ABS warning light turns on or off normally but the start code cannot be read out in diagnostic mode.

WIRING DIAGRAM:

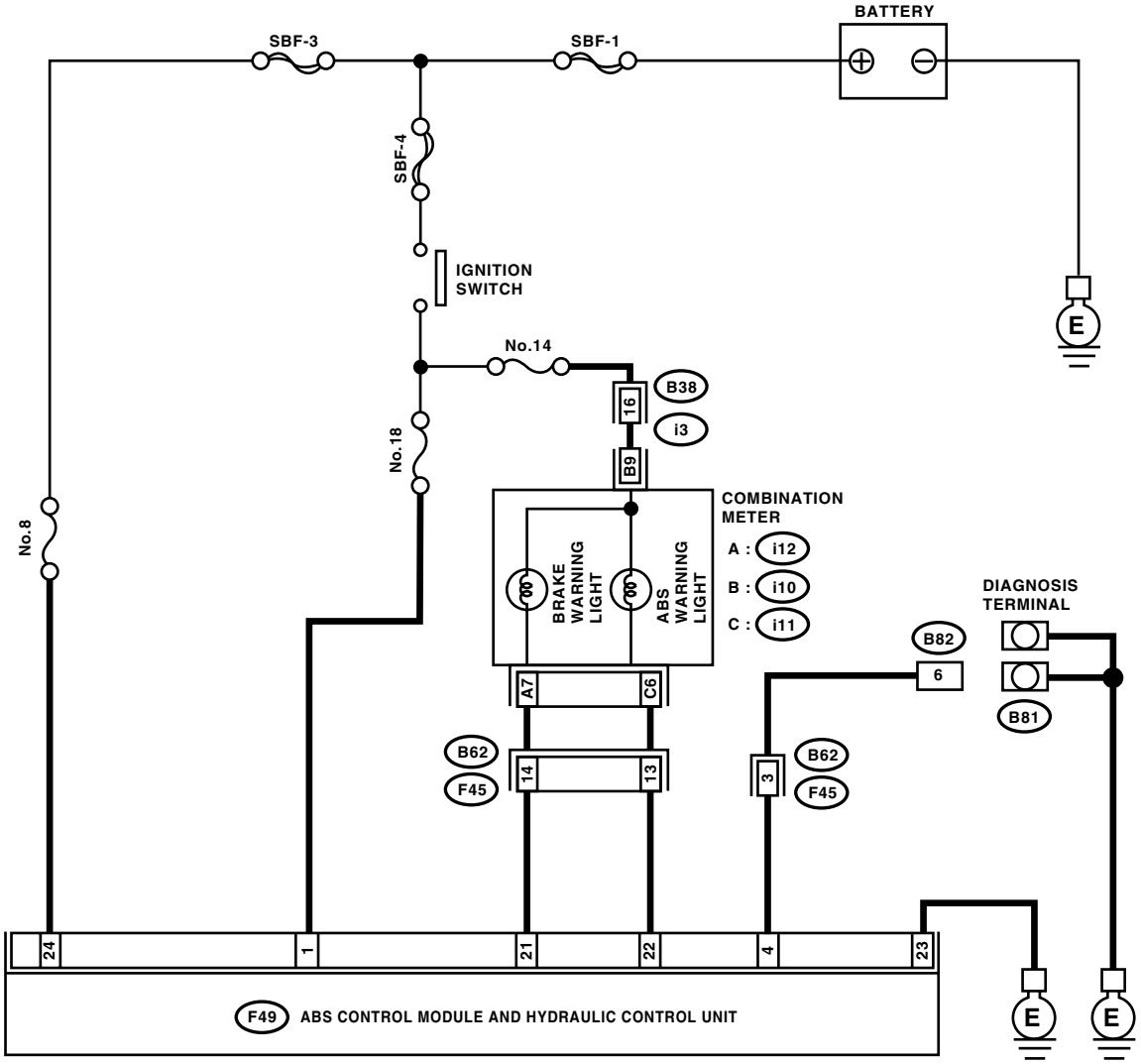
LHD MODEL

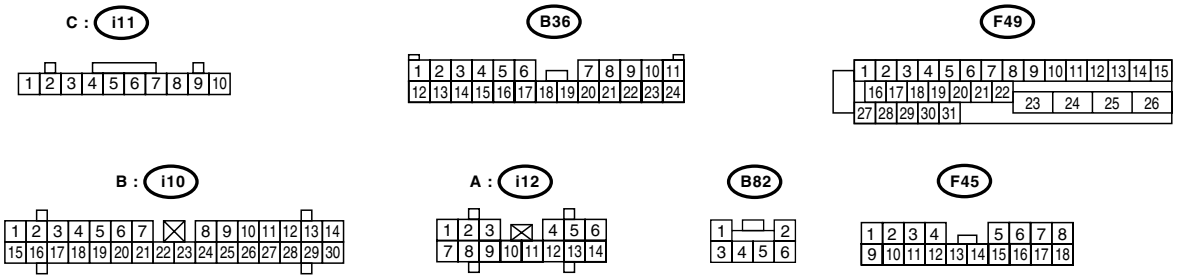




ABS00199

RHD MODEL





ABS00204

	Step	Value	Yes	No
1	**CHECK DIAGNOSIS TERMINAL.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between diagnosis terminals (B81) and chassis ground. ***Terminals*** ***Diagnosis terminal (A) — Chassis ground:*** ***Diagnosis terminal (B) — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **2.**	Repair the diagnosis terminal harness.
2	**CHECK DIAGNOSIS LINE.** 1)Connect the diagnosis terminal (B81) to diagnosis connector (B82) No. 6. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 4 — Chassis ground:*** ***RHD: (F49) No. 4 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **3.**	Repair the harness connector between ABSCM&H/U and diagnosis connector.
3	**CHECK POOR CONTACT IN ABSCM&H/U CONNECTOR.** Is there poor contact in ABSCM&H/U connector?	There is no poor contact.	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Repair the connector.

E: DTC 21 — ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT RH) —

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-45, DTC 27 — ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

F: DTC 23 — ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT LH) —

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-45, DTC 27 — ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

G: DTC 25 — ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR RH) —

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-45, DTC 27 — ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

H: DTC 27 — ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH) —

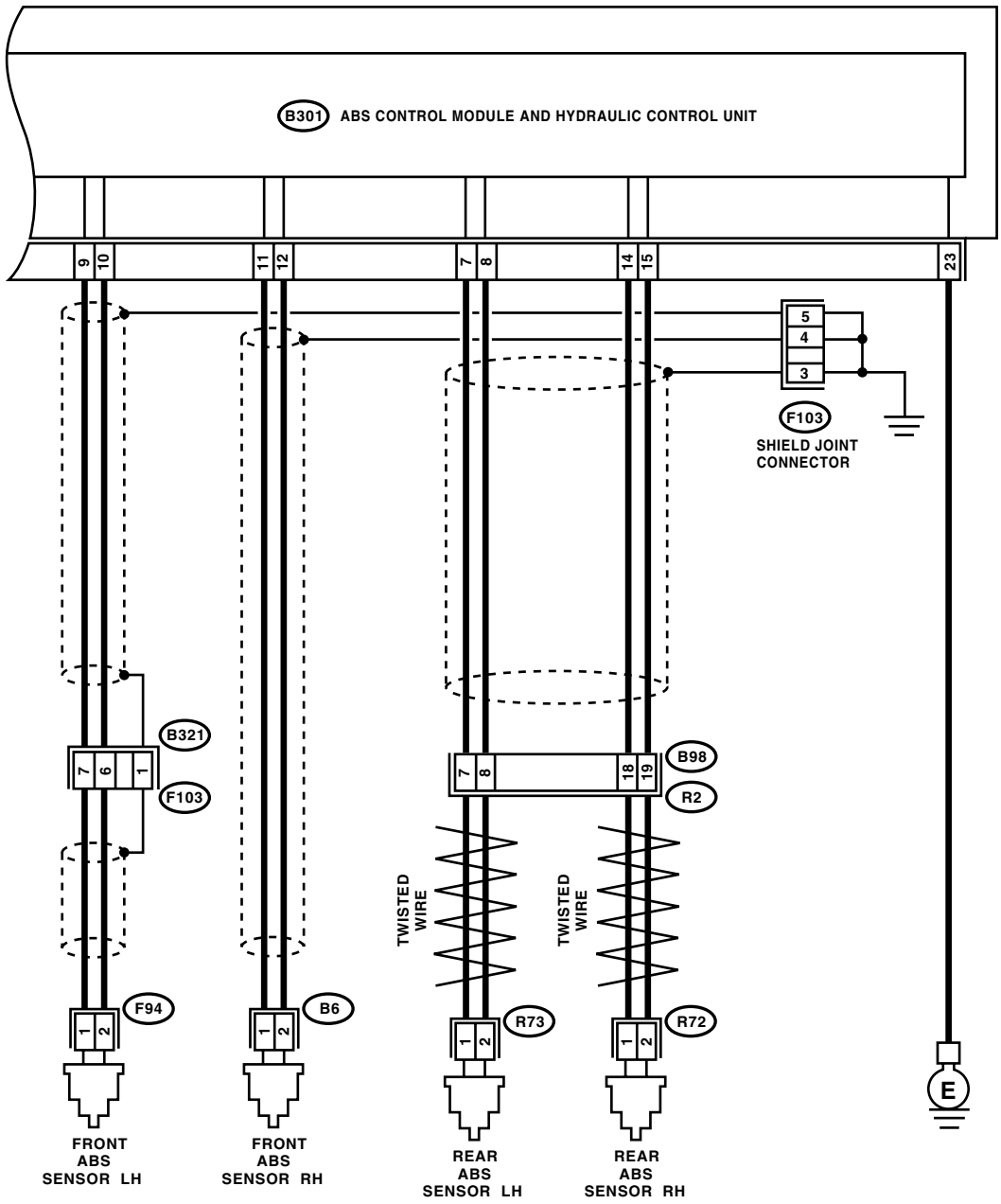
DIAGNOSIS:

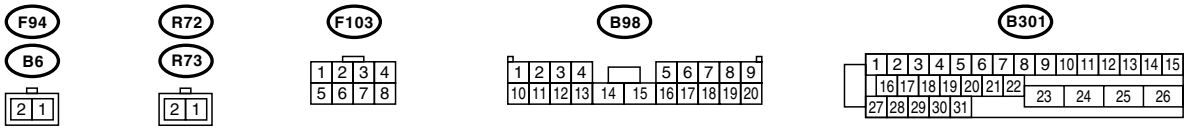
- Faulty ABS sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

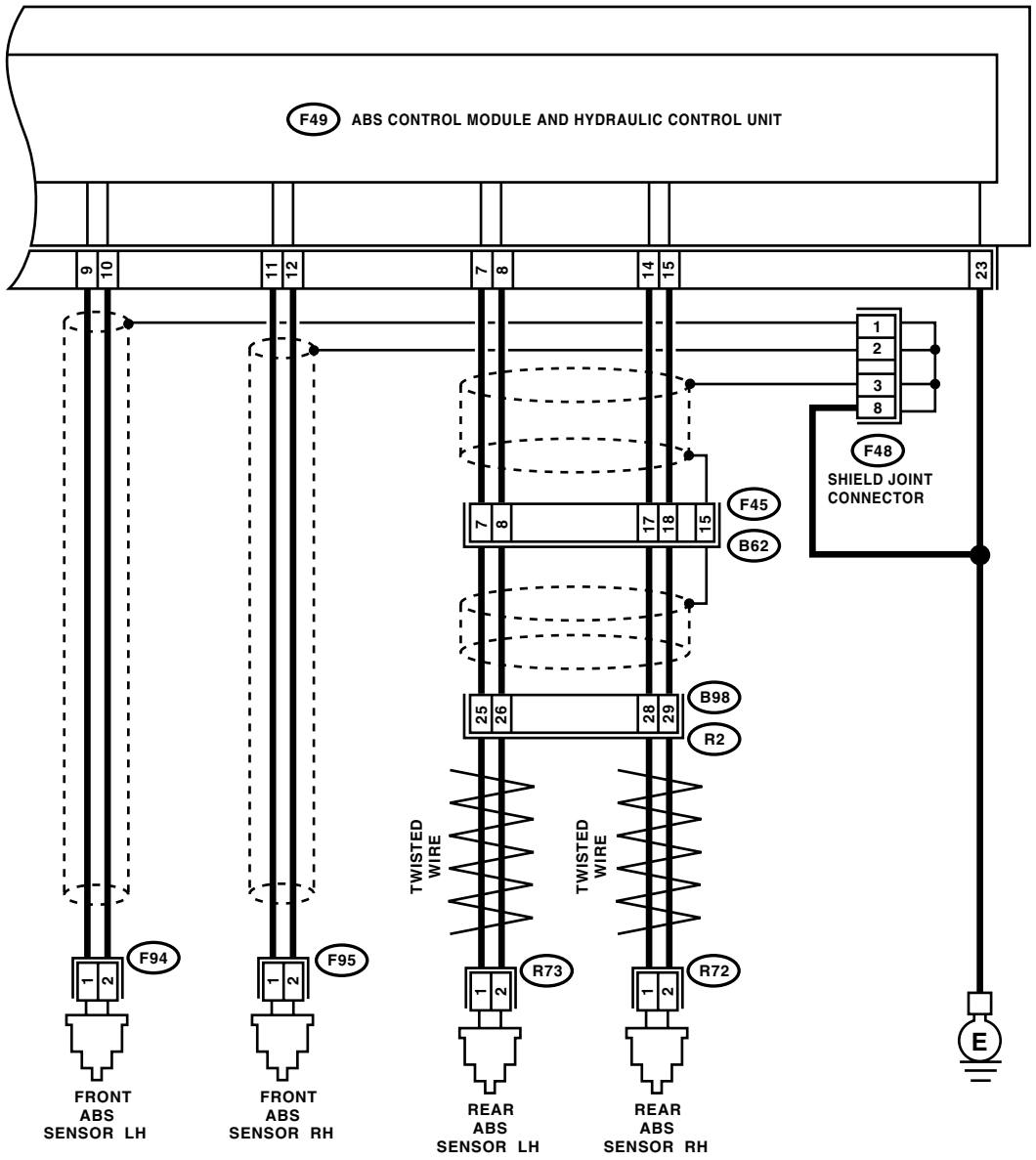
WIRING DIAGRAM:
LHD MODEL

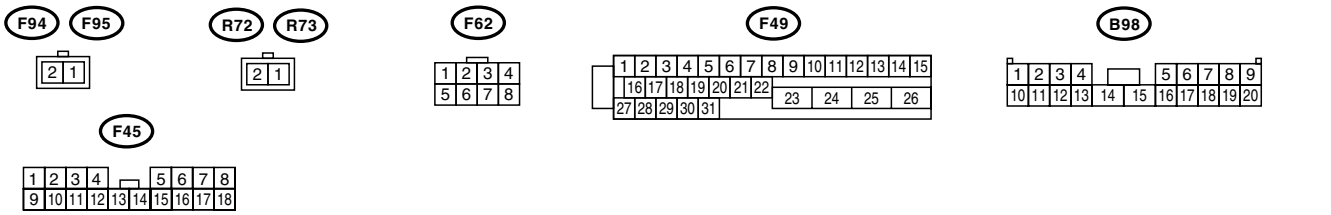




ABS00219

RHD MODEL





ABS00224

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK ABS SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABS sensor. 3)Measure the resistance of ABS sensor connector terminals while shaking the harness lightly. ***Terminal*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:*** Is the measured value within specified value?	Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step **2.**	Replace the ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.>
2	**CHECK BATTERY SHORT OF ABS SENSOR.** 1)Disconnect the connector from ABSCM&H/U. 2)Measure the voltage between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **3.**	Replace the ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.>
3	**CHECK BATTERY SHORT OF ABS SENSOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **4.**	Replace the ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.>
4	**CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS SENSOR.** 1)Turn the ignition switch to OFF. 2)Connect the connector to ABS sensor. 3)Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***DTC 21*** ***LHD: (B301) No. 11 — No. 12:*** ***RHD: (F49) No. 11 — No. 12:*** ***DTC 23*** ***LHD:(B301) No. 9 — No. 10:*** ***RHD: (F49) No. 9 — No. 10:*** ***DTC 25*** ***LHD:(B301) No. 14 — No. 15:*** ***RHD: (F49) No. 14 — No. 15:*** ***DTC 27*** ***LHD:(B301) No. 7 — No. 8:*** ***RHD: (F49) No. 7 — No. 8:*** Is the measured value within specified value?	Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step **5.**	Repair the harness/connector between ABSCM&H/U and ABS sensor.

	Step	Value	Yes	No
5	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 21*** ***LHD:(B301) No. 11 (+) — Chassis ground (–):*** ***RHD: (F49) No. 11 (+) — Chassis ground (–):*** ***DTC 23*** ***LHD: (B301) No. 9 (+) — Chassis ground (–):*** ***RHD: (F49) No. 9 (+) — Chassis ground (–):*** ***DTC 25*** ***LHD:(B301) No. 14 (+) — Chassis ground (–):*** ***RHD: (F49) No. 14 (+) — Chassis ground (–):*** ***DTC 27*** ***LHD: (B301) No. 7 (+) — Chassis ground (–):*** ***RHD: (F49) No. 7 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **6.**	Repair the harness between ABSCM&H/U and ABS sensor.
6	**CHECK BATTERY SHORT OF HARNESS.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 21*** ***LHD:(B301) No. 11 (+) — Chassis ground (–):*** ***RHD: (F49) No. 11 (+) — Chassis ground (–):*** ***DTC 23*** ***LHD: (B301) No. 9 (+) — Chassis ground (–):*** ***RHD: (F49) No. 9 (+) — Chassis ground (–):*** ***DTC 25*** ***LHD:(B301) No. 14 (+) — Chassis ground (–):*** ***RHD: (F49) No. 14 (+) — Chassis ground (–):*** ***DTC 27*** ***LHD: (B301) No. 7 (+) — Chassis ground (–):*** ***RHD: (F49) No. 7 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **7.**	Repair the harness between ABSCM&H/U and ABS sensor.
7	**CHECK INSTALLATION OF ABS SENSOR.** Turn the ignition switch to OFF. Are the ABS sensor installation bolts tightened securely?	33 N·m (3.4 kgf-m, 24.6 ft-lb)	Go to step **8.**	Tighten the ABS sensor installation bolts securely.

	Step	Value	Yes	No
8	**CHECK ABS SENSOR GAP.** Measure the tone wheel to ABS sensor piece gap over entire perimeter of the wheel. Is the measured value within specified value?	Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **9.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
9	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout. Is the measured value less than specified value?	0.05 mm (0.0020 in)	Go to step **10.**	Replace the tone wheel. Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>
10	**CHECK GROUND SHORT OF ABS SENSOR.** 1)Turn the ignition switch to ON. 2)Measure the resistance between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **11.**	Replace the ABS sensor and ABSCM&H/U. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.> and <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
11	**CHECK GROUND SHORT OF HARNESS.** 1)Turn the ignition switch to OFF. 2)Connect the connector to ABS sensor. 3)Measure the resistance between ABSCM&H/U connector terminal and chassis ground. ***Connector & terminal*** ***DTC 21*** ***LHD: (B301) No. 11 — Chassis ground:*** ***RHD: No. 11 — Chassis ground:*** ***DTC 23*** ***LHD: (B301) No. 9 — Chassis ground:*** ***RHD: No. 9 — Chassis ground:*** ***DTC 25*** ***LHD: (B301) No. 14 — Chassis ground:*** ***RHD: No. 14 — Chassis ground:*** ***DTC 27*** ***LHD: (B301) No. 7 — Chassis ground:*** ***RHD: No. 7 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **12.**	Repair the harness between ABSCM&H/U and ABS sensor. Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
12	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	There is no poor contact.	Go to step **13.**	Repair the connector.

	Step	Value	Yes	No
13	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in current diagnosis still being output?	Same DTC is not output.	Go to step **14.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
14	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact. NOTE: Check the harness and connectors between ABSCM&H/U and ABS sensor.	Proceed with the diagnosis corresponding to the DTC.

I: DTC 22 — ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (FRONT RH) —

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-53, DTC 28 — ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

J: DTC 24 — ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (FRONT LH) —

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-53, DTC 28 — ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

K: DTC 26 — ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR RH) —

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-53, DTC 28 — ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

L: DTC 28 — ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR LH) —

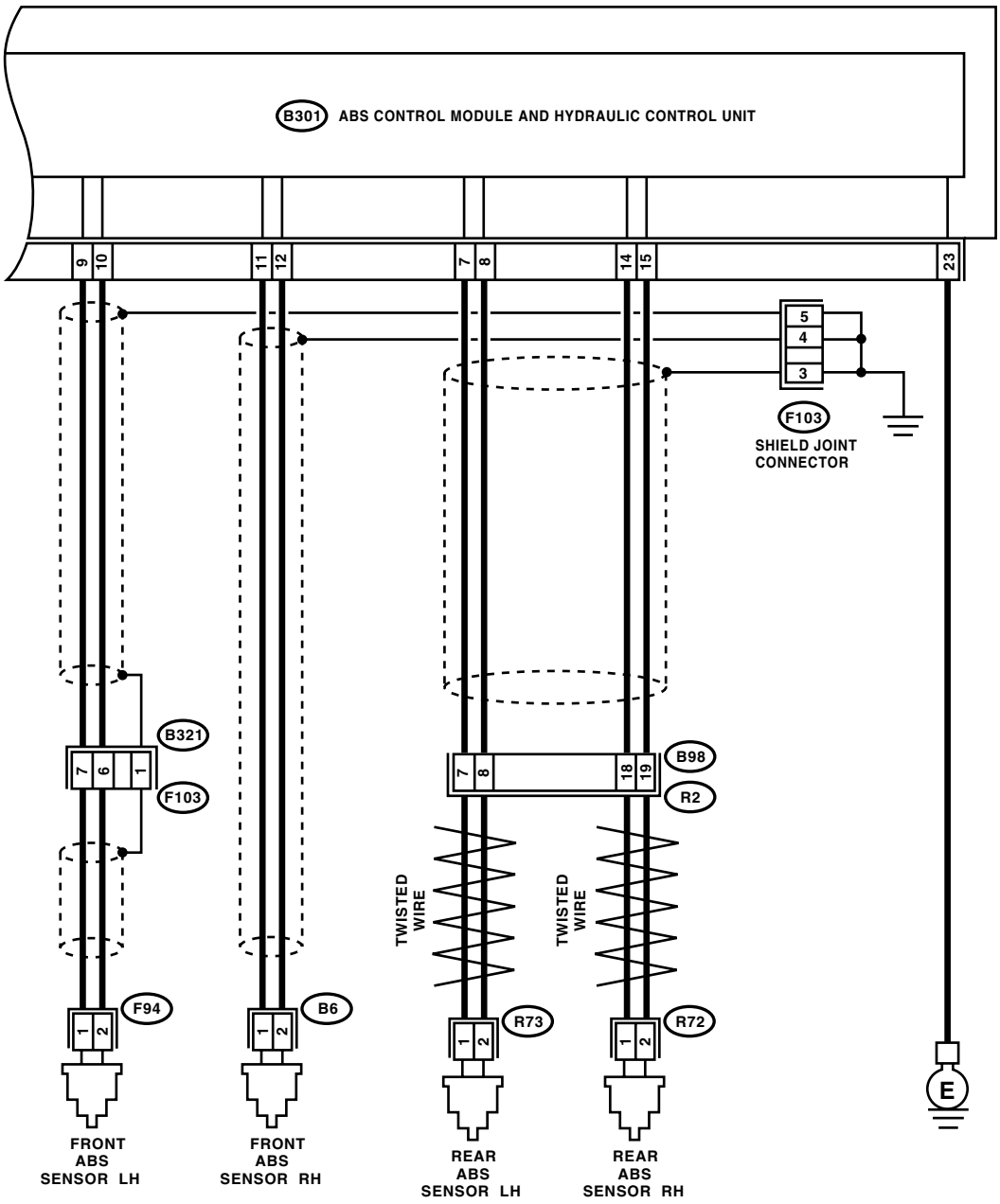
DIAGNOSIS:

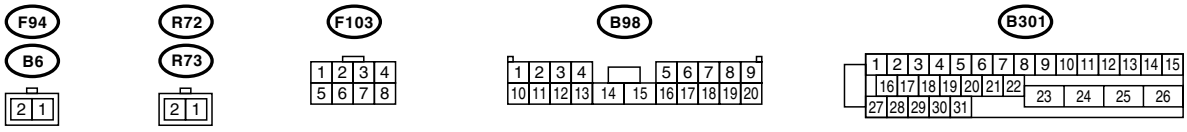
- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

TROUBLE SYMPTOM:

- ABS does not operate.

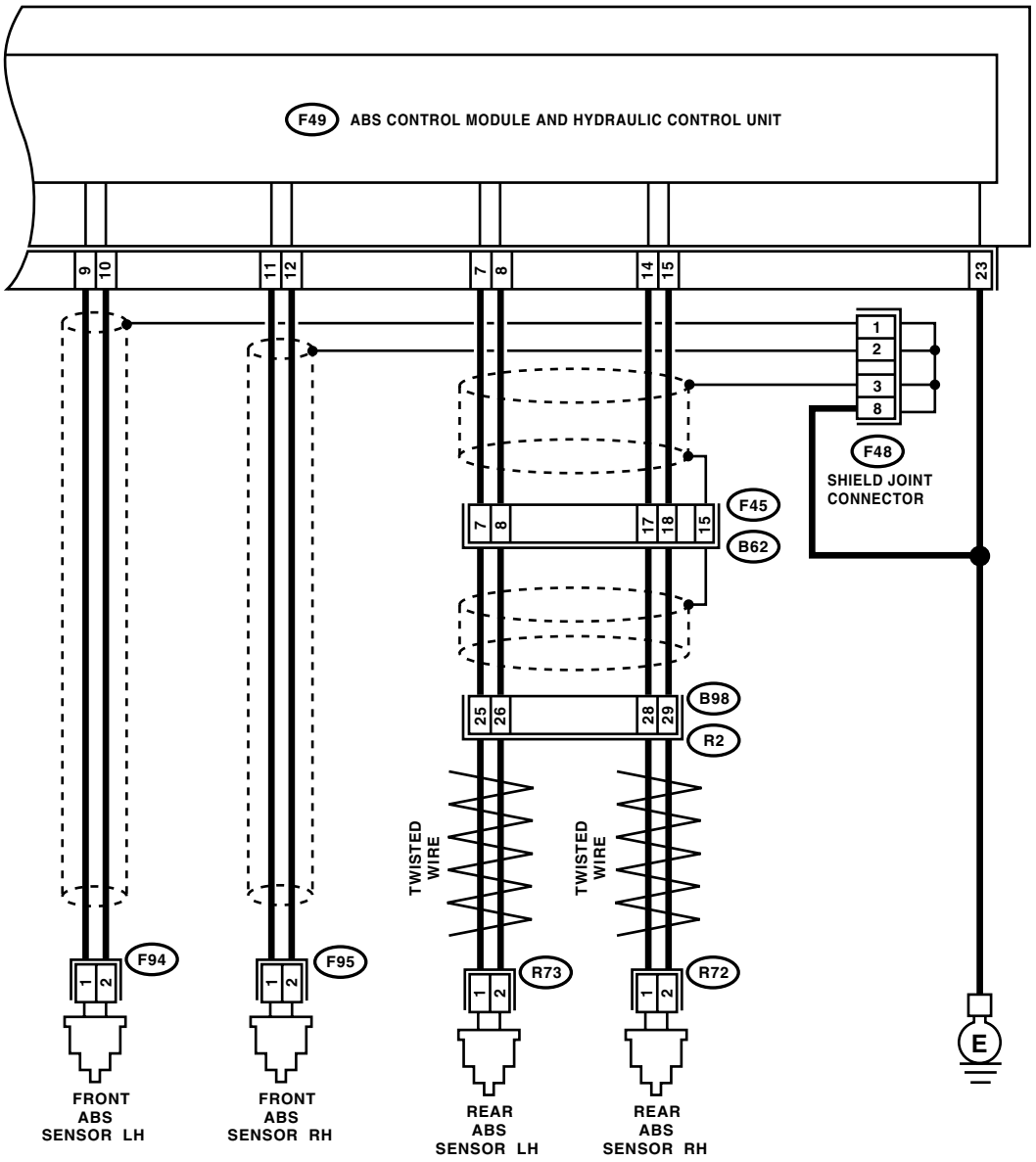
WIRING DIAGRAM:
LHD MODEL

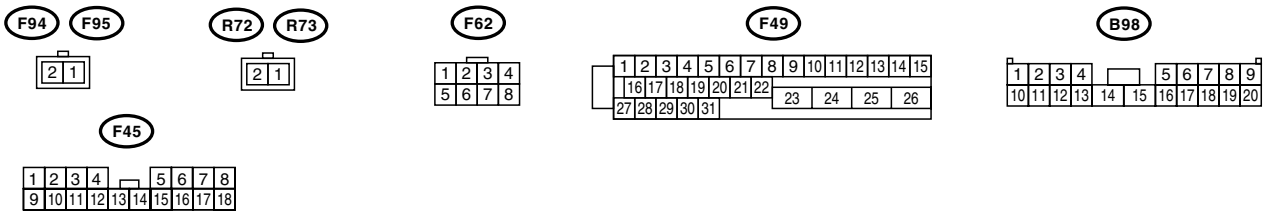




ABS00219

RHD MODEL





ABS00224

	Step	Value	Yes	No
1	**CHECK INSTALLATION OF ABS SENSOR.** Turn the ignition switch to OFF. Are the ABS sensor installation bolts tightened securely?	33 N·m (3.4 kgf-m, 24.6 ft-lb)	Go to step **2.**	Tighten the ABS sensor installation bolts securely.

	Step	Value	Yes	No
2	**CHECK ABS SENSOR GAP.** Measure the tone wheel to ABS sensor piece gap over entire perimeter of the wheel. Is the measured value within specified value?	Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **3.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If the spacer cannot correct gap, replace worn sensor or worn tone wheel.
3	**PREPARE OSCILLOSCOPE.** Is an oscilloscope available?	Oscilloscope is available.	Go to step **4.**	Go to step **5.**
4	**CHECK ABS SENSOR SIGNAL.** 1)Raise all four wheels off ground. 2)Turn the ignition switch to OFF. 3)Connect the oscilloscope to the connector. 4)Turn the ignition switch to ON. 5)Rotate the wheels and measure voltage at specified frequency. <Ref. to ABS-17, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the ABS control module sometimes stores DTC 29 or DTC 56. ***Connector & terminal*** ***DTC 22*** ***LHD: (B6) No. 1 (+) — No. 2 (–):*** ***RHD: (F95) No. 1 (+) — No. 2 (–):*** ***DTC 24*** ***LHD: (F103) No. 1 (+) — No. 2 (–):*** ***RHD: (F94) No. 1 (+) — No. 2 (–):*** ***DTC 26*** ***LHD: (B98) No. 18 (+) — No. 19 (–):*** ***RHD: (B98) No. 28 (+) — No. 29 (–):*** ***DTC 28*** ***LHD: (B98) No. 7 (+) — No. 8 (–):*** ***RHD: (B98) No. 25 (+) — No. 26 (–):*** Is the measured value as specified value?	Oscilloscope pattern is smooth, as shown in the figure.	Go to step **8.**	Go to step **7.**
5	**CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.** Remove the disc rotor or drum from hub in accordance with DTC. Is the ABS sensor piece or the tone wheel contaminated by dirt or other foreign matter?	ABS sensor piece or tone wheel is not contaminated.	Go to step **6.**	Thoroughly remove dirt or other foreign matter.
6	**CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.** Are there broken or damaged in the ABS sensor piece or the tone wheel?	There are no broken or damaged in the ABS sensor piece or tone wheel.	Go to step **7.**	Replace the ABS sensor or tone wheel. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.> and Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>

	Step	Value	Yes	No
7	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout. Is the measured value less than specified value?	0.05 mm (0.0020 in)	Go to step **8.**	Replace the tone wheel. Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>
8	**CHECK RESISTANCE OF ABS SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABS sensor. 3)Measure the resistance between ABS sensor connector terminals while shaking the harness lightly. ***Terminal*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:*** Is the measured value within specified value?	Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step **9.**	Replace the ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.>
9	**CHECK GROUND SHORT OF ABS SENSOR.** Measure the resistance between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **10.**	Replace the ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.>
10	**CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS SENSOR.** 1)Connect the connector to ABS sensor. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance at ABSCM&H/U connector terminals. ***Connector & terminal*** ***DTC 22*** ***LHD: (B301) No. 11 — No. 12:*** ***RHD: (F49) No. 11 — No. 12:*** ***DTC 24*** ***LHD: (B301) No. 9 — No. 10:*** ***RHD: (F49) No. 9 — No. 10:*** ***DTC 26*** ***LHD: (B301) No. 14 — No. 15:*** ***RHD: (F49) No. 14 — No. 15:*** ***DTC 28*** ***LHD: (B301) No. 7 — No. 8:*** ***RHD: (F49) No. 7 — No. 8:*** Is the measured value within specified value?	Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step **11.**	Repair the harness/connector between ABSCM&H/U and ABS sensor.

	Step	Value	Yes	No
11	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 22*** ***LHD: (B301) No. 11 — Chassis ground:*** ***RHD: (F49) No. 11 — Chassis ground:*** ***DTC 24*** ***LHD: (B301) No. 9 — Chassis ground:*** ***RHD: (F49) No. 9 — Chassis ground:*** ***DTC 26*** ***LHD: (B301) No. 14 — Chassis ground:*** ***RHD: (F49) No. 14 — Chassis ground:*** ***DTC 28*** ***LHD: (B301) No. 7 — Chassis ground:*** ***RHD: (F49) No. 7 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **12.**	Repair the harness/connector between ABSCM&H/U and ABS sensor.
12	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** Measure the resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(B301) No. 23 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **13.**	Repair the ABSCM&H/U ground harness.
13	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	There is no poor contact.	Go to step **14.**	Repair the connector.
14	**CHECK SOURCES OF SIGNAL NOISE.** Is the car telephone or wireless transmitter properly installed?	Correctly installed.	Go to step **15.**	Properly install the car telephone or wireless transmitter.
15	**CHECK SOURCES OF SIGNAL NOISE.** Are noise sources (such as an antenna) installed near the sensor harness?	Not installed.	Go to step **16.**	Install the noise sources apart from sensor harness.
16	**CHECK SHIELD CIRCUIT.** 1)Disconnect the connectors (B303) and (F62). 2)Measure the resistance between shield connector and chassis ground. ***Connector & terminal*** ***DTC 22*** ***LHD: (F103) No. 4 — Chassis ground:*** ***RHD: (F48) No. 2 — Chassis ground:*** ***DTC 24*** ***LHD: (F103) No. 5 — Chassis ground:*** ***RHD: (F48) No. 1 — Chassis ground:*** ***DTC 26*** ***LHD: (F103) No. 3 — Chassis ground:*** ***RHD: (F48) No. 3 — Chassis ground:*** ***DTC 28*** ***LHD: (F103) No. 3 — Chassis ground:*** ***RHD: (F48) No. 3 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **17.**	Repair the shield harness.

	Step	Value	Yes	No
17	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in current diagnosis still being output?	Same DTC is not output.	Go to step **18.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
18	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary noise interference. NOTE: Although the ABS warning light remains illuminating at this point, this is a normal condition. Vehicle must be driven at approx. 12 km/h (7.46 MPH) or faster to turn off ABS warning light. Make sure that the ABS warning light goes off after driving vehicle.	Proceed with the diagnosis corresponding to DTC.

M: DTC 29 — ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (ANY ONE OF FOUR) —

DIAGNOSIS:

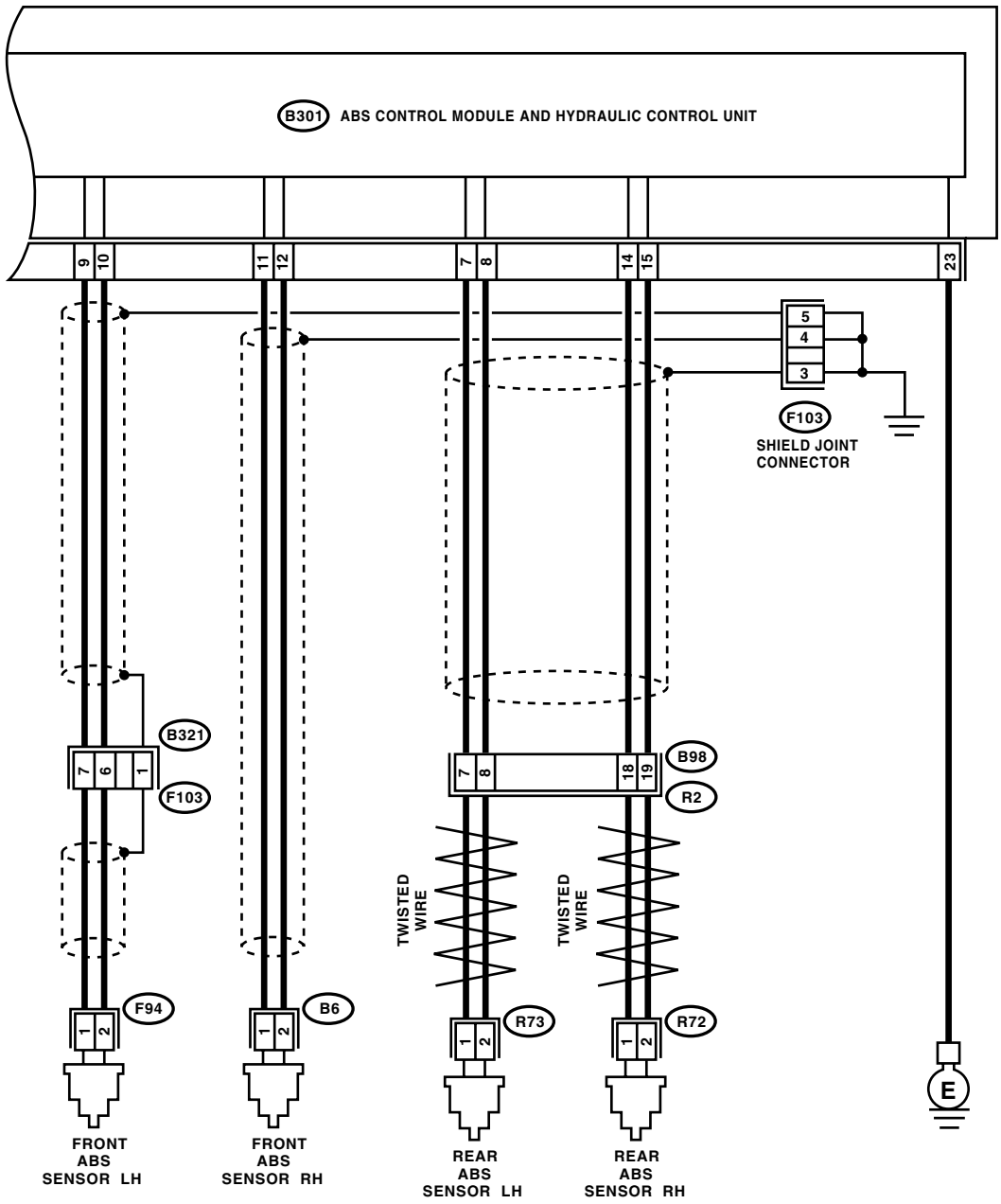
- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Wheels turning freely for a long time

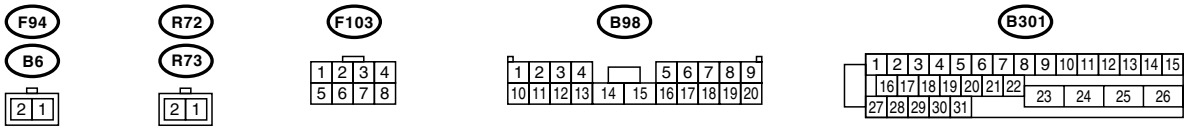
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:
In addition to the ABS warning light, brake warning light illuminates.

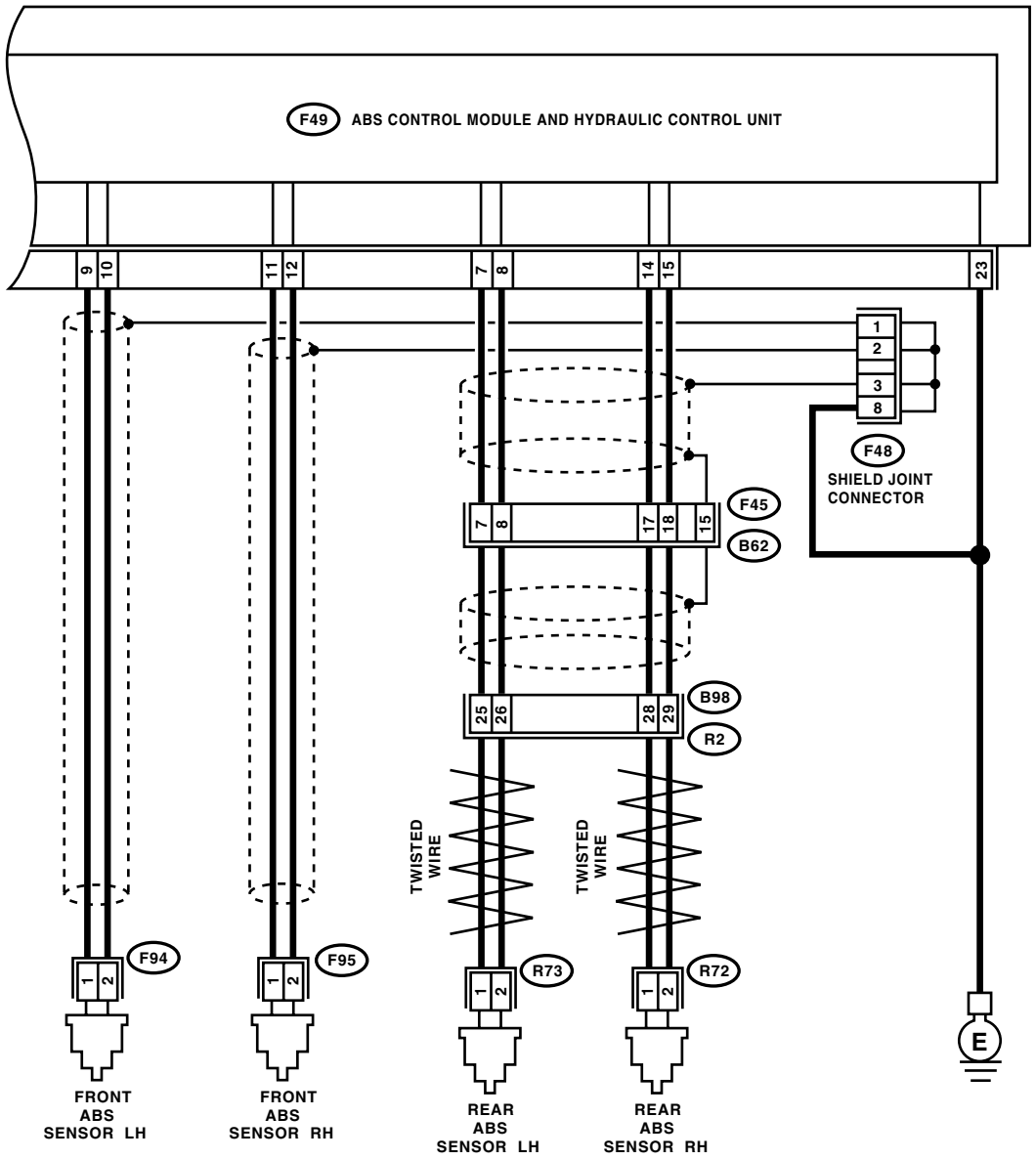
WIRING DIAGRAM:
LHD MODEL

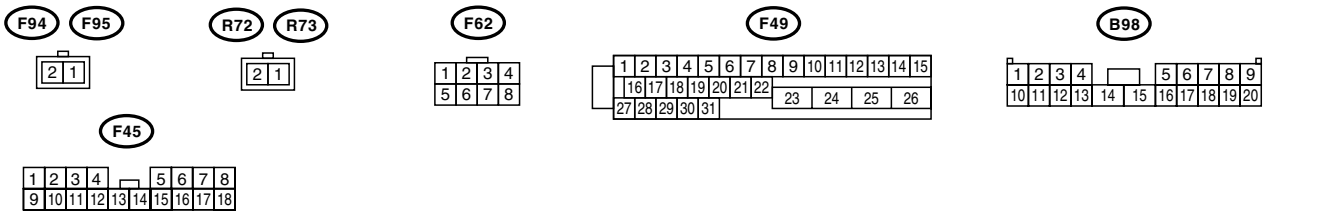




ABS00219

RHD MODEL





ABS00224

	Step	Value	Yes	No
1	**CHECK IF THE WHEELS HAVE TURNED FREELY FOR A LONG TIME.** Check if the wheels have been turned freely for more than 1 minute, such as when vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface.	Wheels have not been turned freely.	Go to step **2.**	The ABS is normal. Erase the DTC. NOTE: When the wheels turn freely for a long time, such as when the vehicle is towed or jacked-up, or when steering wheel is continuously turned all the way, this DTC may sometimes occur.
2	**CHECK TIRE SPECIFICATIONS.** Turn the ignition switch to OFF. Are the tire specifications correct?	Tire specifications are correct.	Go to step **3.**	Replace the tire.
3	**CHECK WEAR OF TIRE.** Is the tire worn excessively?	Tire is not worn excessively.	Go to step **4.**	Replace tire.
4	**CHECK TIRE PRESSURE.** Is the tire pressure correct?	Tire pressure is correct.	Go to step **5.**	Adjust tire pressure.
5	**CHECK INSTALLATION OF ABS SENSOR.** Are the ABS sensor installation bolts tightened securely?	33 N·m (3.4 kgf-m, 24.6 ft-lb)	Go to step **6.**	Tighten the ABS sensor installation bolts securely.
6	**CHECK ABS SENSOR GAP.** Measure the tone wheel to ABS sensor piece gap over entire perimeter of the wheel. Is the measured value within specified value?	Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **7.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If the spacer cannot correct gap, replace worn sensor or worn tone wheel.
7	**PREPARE OSCILLOSCOPE.** Is an oscilloscope available?	Oscilloscope is available.	Go to step **8.**	Go to step **9.**

	Step	Value	Yes	No
8	**CHECK ABS SENSOR SIGNAL.** 1)Raise all four wheels off ground. 2)Turn the ignition switch to OFF. 3)Connect the oscilloscope to the connector. 4)Turn the ignition switch to ON. 5)Rotate the wheels and measure voltage at specified frequency. <Ref. to ABS-17, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the ABSCM&H/U sometimes stores the DTC 29. ***Connector & terminal*** ***Front RH*** ***LHD: (B6) No. 1 (+) — No. 2 (–):*** ***RHD: (F95) No. 1 (+) — No. 2 (–):*** ***Front LH*** ***LHD: (F94) No. 1 (+) — No. 2 (–):*** ***RHD: (F94) No. 1 (+) — No. 2 (–):*** ***Rear RH*** ***LHD: (B98) No. 18 (+) — No. 19 (–):*** ***RHD: (B98) No. 28 (+) — No. 29 (–):*** ***Rear LH*** ***LHD: (B98) No. 7 (+) — No. 8 (–):*** ***RHD: (B98) No. 25 (+) — No. 26 (–):*** Is the measured value as specified value?	Oscilloscope pattern is smooth, as shown in the figure.	Go to step **12.**	Go to step **9.**
9	**CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.** Remove the disc rotor or drum from hub. Is the ABS sensor piece or the tone wheel contaminated by dirt or other foreign matter?	ABS sensor piece or tone wheel is not contaminated.	Go to step **10.**	Thoroughly remove dirt or other foreign matter.
10	**CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.** Are there broken or damaged teeth in the ABS sensor piece or the tone wheel?	There are no broken or damaged in the ABS sensor piece or tone wheel.	Go to step **11.**	Replace the ABS sensor or tone wheel. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.> and Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>
11	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout. Is the measured value less than specified value?	0.05 mm (0.0020 in)	Go to step **12.**	Replace the tone wheel. Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>

	Step	Value	Yes	No
12	**CHECK ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Connect all connectors. 3)Erase the memory. 4)Perform the inspection mode. 5)Read out the DTC. Is the same DTC as in current diagnosis still being output?	Same DTC is not output.	Go to step **13.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

N: DTC 31 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH) —

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-67, DTC 37 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

O: DTC 33 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH) —

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-67, DTC 37 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

P: DTC 35 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH) —

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-67, DTC 37 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

Q: DTC 37 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —

DIAGNOSIS:

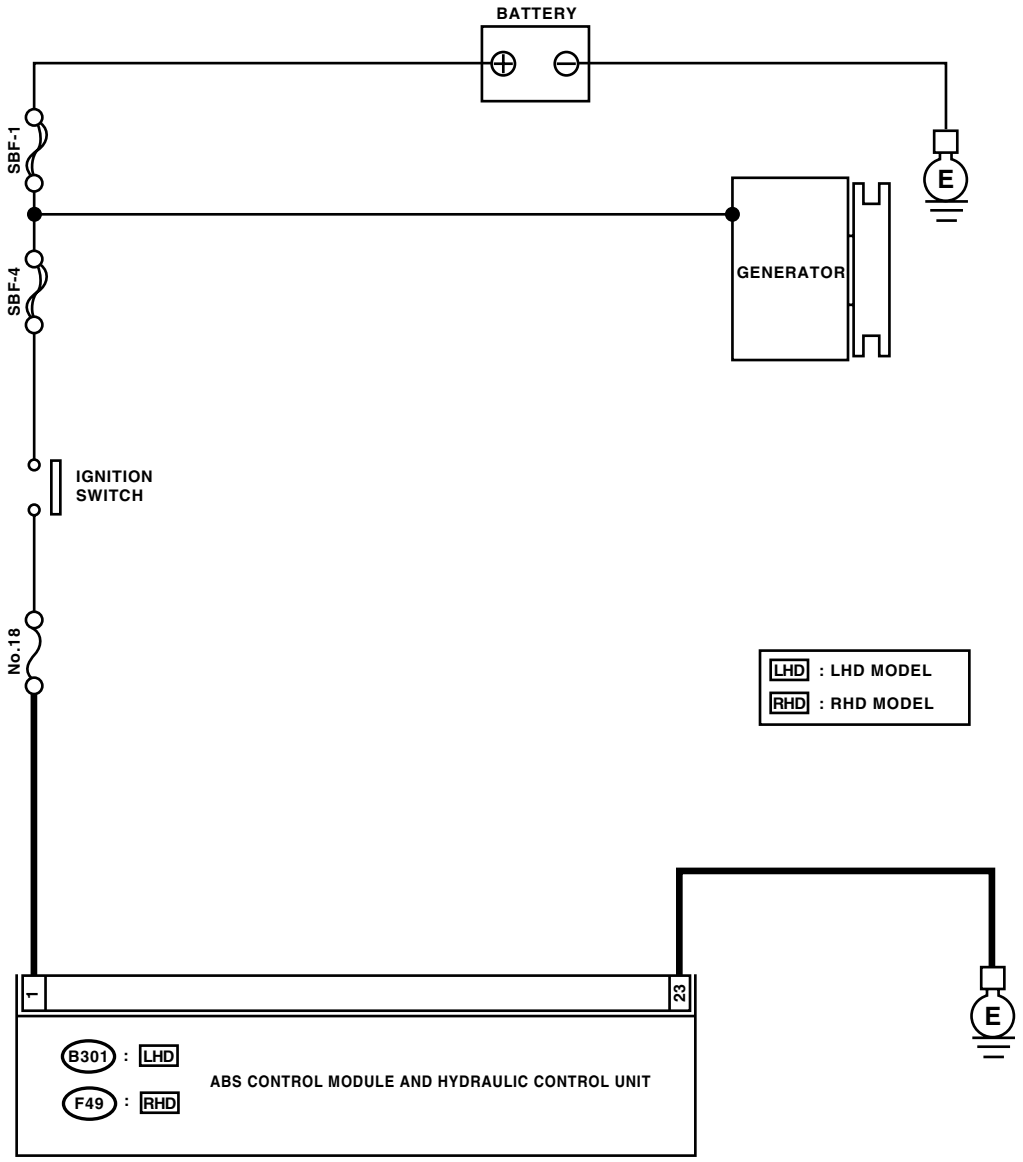
- Faulty harness/connector
- Faulty inlet solenoid valve in ABSCM&H/U

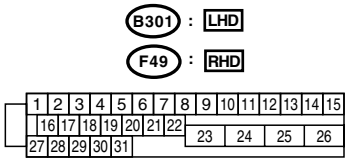
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:
In addition to the ABS warning light, brake warning light illuminates.

WIRING DIAGRAM:





ABS00229

	Step	Value	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Run the engine at idle. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 1 (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 15 V	Go to step **2.**	Repair the harness connector between ABS relay and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 23 — Chassis ground:*** ***RHD: (F49) No. 23 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **4.**	Repair the connector.
4	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in the current diagnosis still being output?	Same DTC is not output.	Go to step **5.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
5	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

R: DTC 32 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH) —

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-71, DTC 38 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

S: DTC 34 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH) —

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-71, DTC 38 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

T: DTC 36 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH) —

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-71, DTC 38 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

U: DTC 38 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —

DIAGNOSIS:

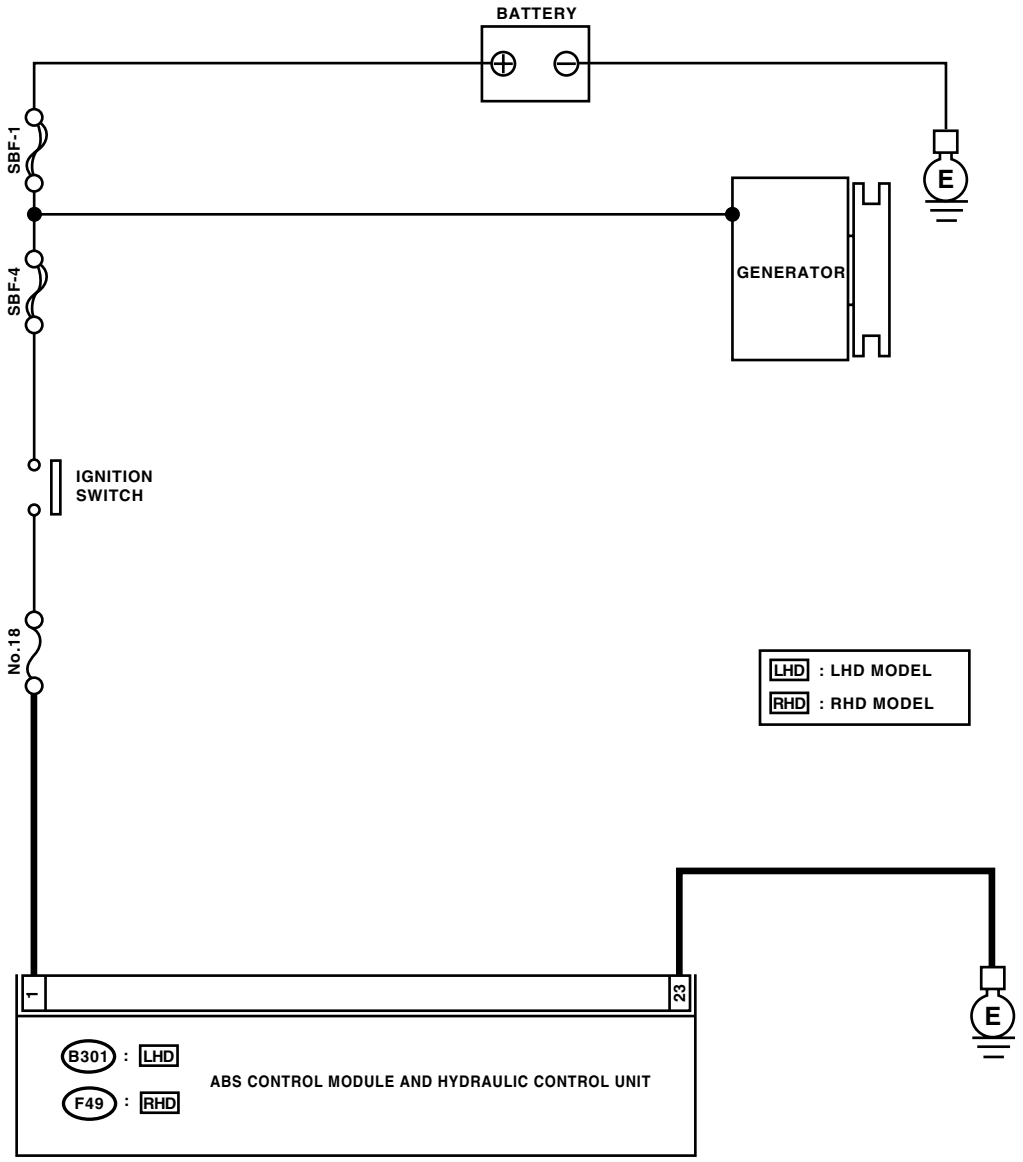
- Faulty harness/connector
- Faulty outlet solenoid valve in ABSCM&H/U

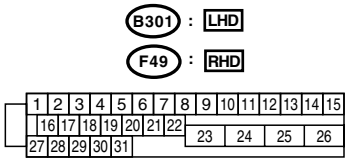
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:
In addition to the ABS warning light, brake warning light illuminates.

WIRING DIAGRAM:





ABS00229

	Step	Value	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Run the engine at idle. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 1 (+) — Chassis ground (–):*** ***RHD: (F49) No. 1 (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 15 V	Go to step **2.**	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 23 — Chassis ground:*** ***RHD: (F49) No. 23 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **4.**	Repair the connector.
4	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in the current diagnosis still being output?	Same DTC is not output.	Go to step **5.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
5	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

V: DTC 41
— ABNORMAL ABS CONTROL MODULE —

DIAGNOSIS:

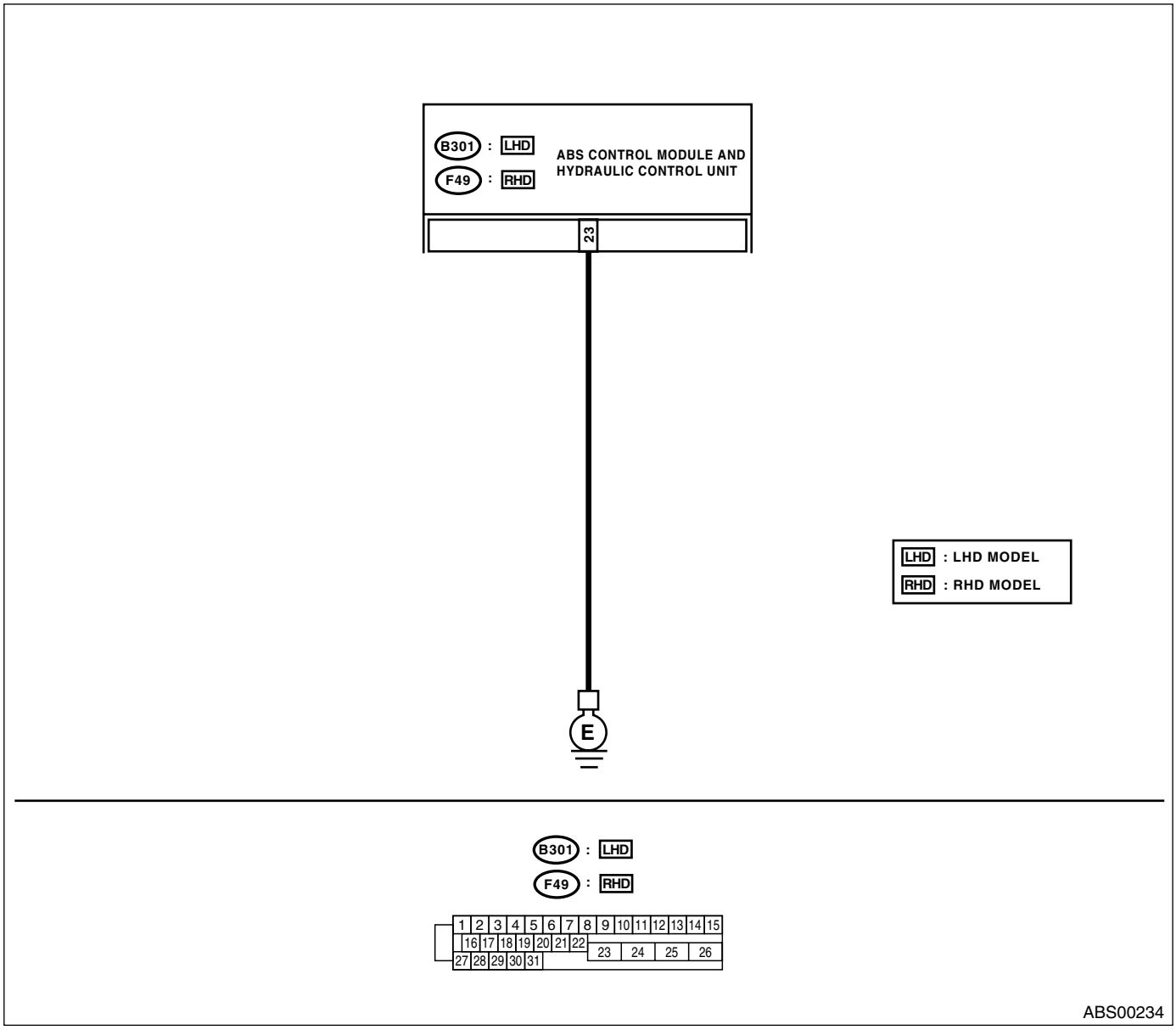
- Faulty ABSCM&H/U.

TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:
In addition to the ABS warning light, brake warning light illuminates.

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 23 — Chassis ground:*** ***RHD: (F49) No. 23 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **2.**	Repair the ABSCM&H/U ground harness.
2	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between battery, ignition switch and ABSCM&H/U?	There is no poor contact.	Go to step **3.**	Repair the connector.
3	**CHECK SOURCES OF SIGNAL NOISE.** Is the car telephone or the wireless transmitter properly installed?	Correctly installed.	Go to step **4.**	Properly install the car telephone or wireless transmitter.
4	**CHECK SOURCES OF SIGNAL NOISE.** Are noise sources (such as an antenna) installed near the sensor harness?	Not installed.	Go to step **5.**	Install the noise sources apart from the sensor harness.
5	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in current diagnosis still being output?	Same DTC is not output.	Go to step **6.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

W: DTC 42
— SOURCE VOLTAGE IS ABNORMAL. —

DIAGNOSIS:

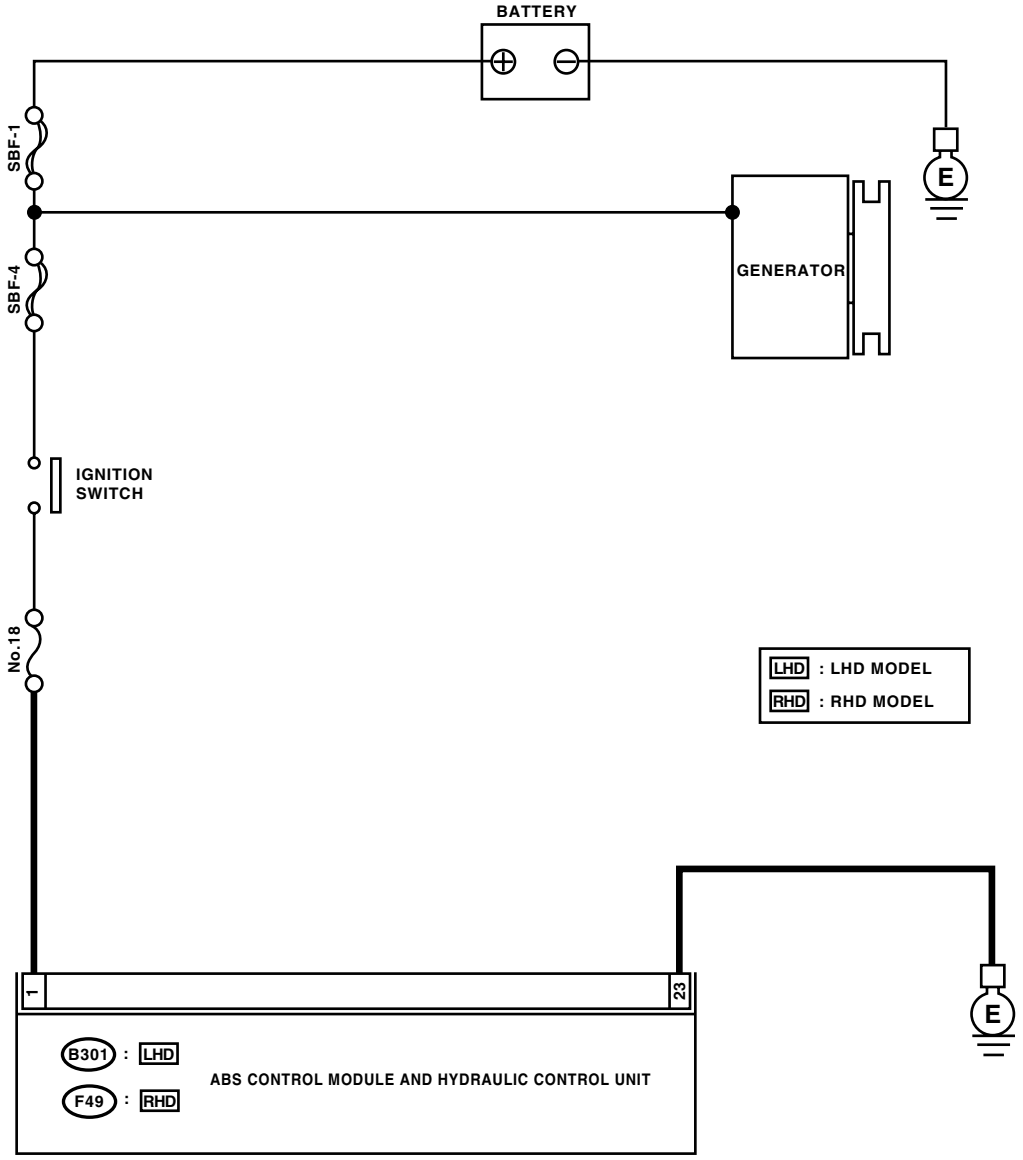
- Power source voltage of the ABSCM&H/U is low or high.

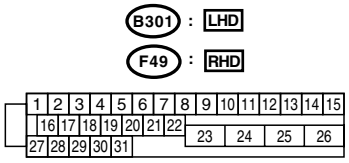
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:
In addition to the ABS warning light, brake warning light illuminates temporarily. Both warning lights go off on the recovery of voltage.

WIRING DIAGRAM:





ABS00229

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK GENERATOR.** 1)Start the engine. 2)Idle after warm-up. 3)Measure the voltage between generator B terminal and chassis ground. ***Terminal*** ***Generator B terminal (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 17 V	Go to step **2.**	Repair the generator. <Ref. to SC(SOHC)-15, Generator.>
2	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF. Are the positive and negative battery terminals tightly clamped?	Tightly clamped.	Go to step **3.**	Tighten the clamp of terminal.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1)Disconnect the connector from ABSCM&H/U. 2)Run the engine at idle. 3)Operate the electric load applying devices, such as the headlight, A/C, and defogger. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 1 (+) — Chassis ground (–):*** ***RHD: (F49) No. 1 (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 17 V	Go to step **4.**	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
4	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 23 — Chassis ground:*** ***RHD: (F49) No. 23 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **5.**	Repair the ABSCM&H/U ground harness.
5	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **6.**	Repair the connector.
6	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in current diagnosis still being output?	Same DTC is not output.	Go to step **7.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

X: DTC 44
— A COMBINATION OF AT CONTROL ABNORMAL —

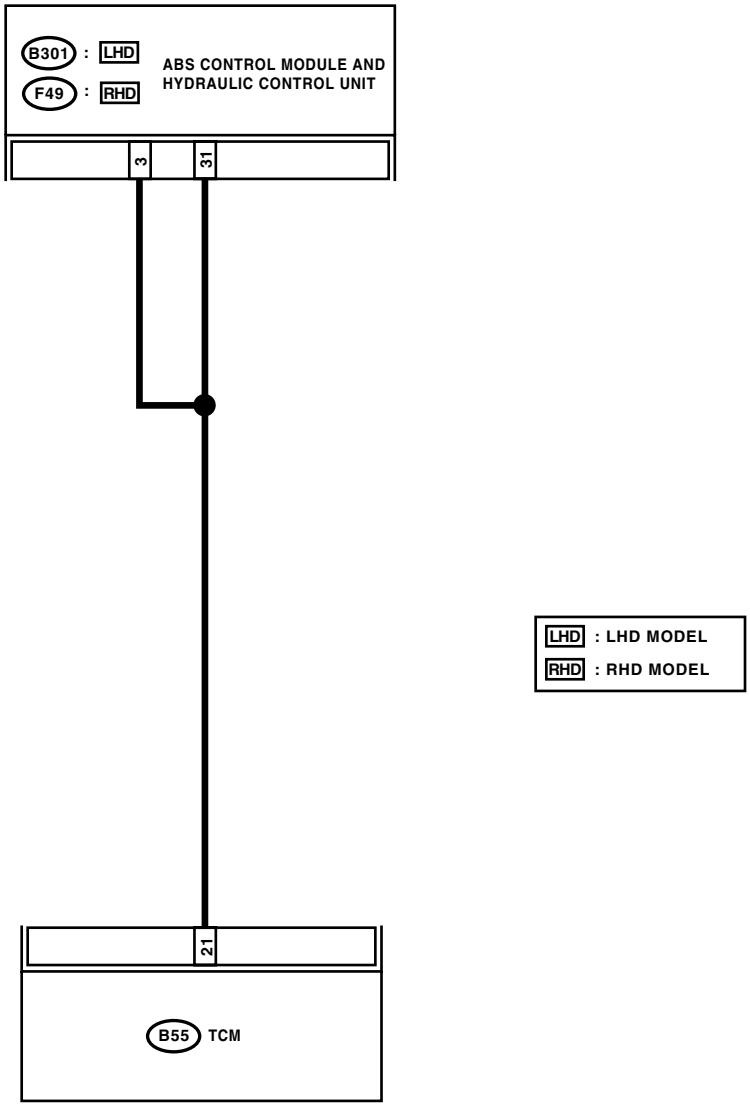
DIAGNOSIS:

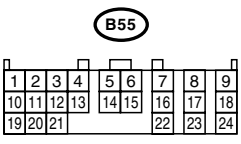
- Combination of AT control faults

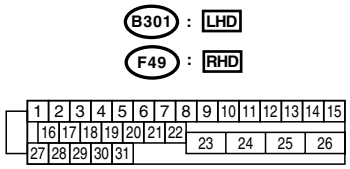
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:







ABS00239

	Step	Value	Yes	No
1	**CHECK SPECIFICATIONS OF THE ABSCM&H/U.** Check specifications of the mark to on ABSCM&H/U. ***CO: AT*** ***CD: MT*** Specifications between vehicle and ABSCM&H/U are matched?	Specifications are matched.	Go to step **2.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2	**CHECK GROUND SHORT OF HARNESS.** 1)Turn the ignition switch to OFF. 2)Disconnect all connectors from TCM. 3)Disconnect the connector from ABSCM&H/U. 4)Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 3 — Chassis ground:*** ***RHD: (F49) No. 3 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **3.**	Repair the harness between TCM and ABSCM&H/U.
3	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 3 (+) — Chassis ground (–):*** ***RHD: (F49) No. 3 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **4.**	Repair the harness between TCM and ABSCM&H/U.
4	**CHECK BATTERY SHORT OF HARNESS.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 3 (+) — Chassis ground (–):*** ***RHD: (F49) No. 3 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **5.**	Repair the harness between TCM and ABSCM&H/U.
5	**CHECK TCM.** 1)Turn the ignition switch to OFF. 2)Connect all connectors to TCM. 3)Turn the ignition switch to ON. 4)Measure the voltage between TCM connector terminal and chassis ground. ***Connector & terminal*** ***(B55) No. 21 (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 15 V	Go to step **7.**	Go to step **6.**
6	**CHECK AT.** Is the AT functioning normally?	AT functioning normally.	Replace the TCM.	Repair the AT.

	Step	Value	Yes	No
7	**CHECK OPEN CIRCUIT OF HARNESS.** Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD:*** ***(B301) No. 3 (+) — Chassis ground (–):*** ***(B301) No. 31 (+) — Chassis ground (–):*** ***RHD:*** ***(F49) No. 3 (+) — Chassis ground (–):*** ***(F49) No. 31 (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 15 V	Go to step **8.**	Repair the harness/connector between TCM and ABSCM&H/U.
8	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between TCM and ABSCM&H/U?	There is no poor contact.	Go to step **9.**	Repair the connector.
9	**CHECK ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Connect all connectors. 3)Erase the memory. 4)Perform the inspection mode. 5)Read out the DTC. Is the same DTC as in the current diagnosis still being output?	Same DTC is not output.	Go to step **10.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
10	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

Y: DTC 51
— ABNORMAL VALVE RELAY —

DIAGNOSIS:

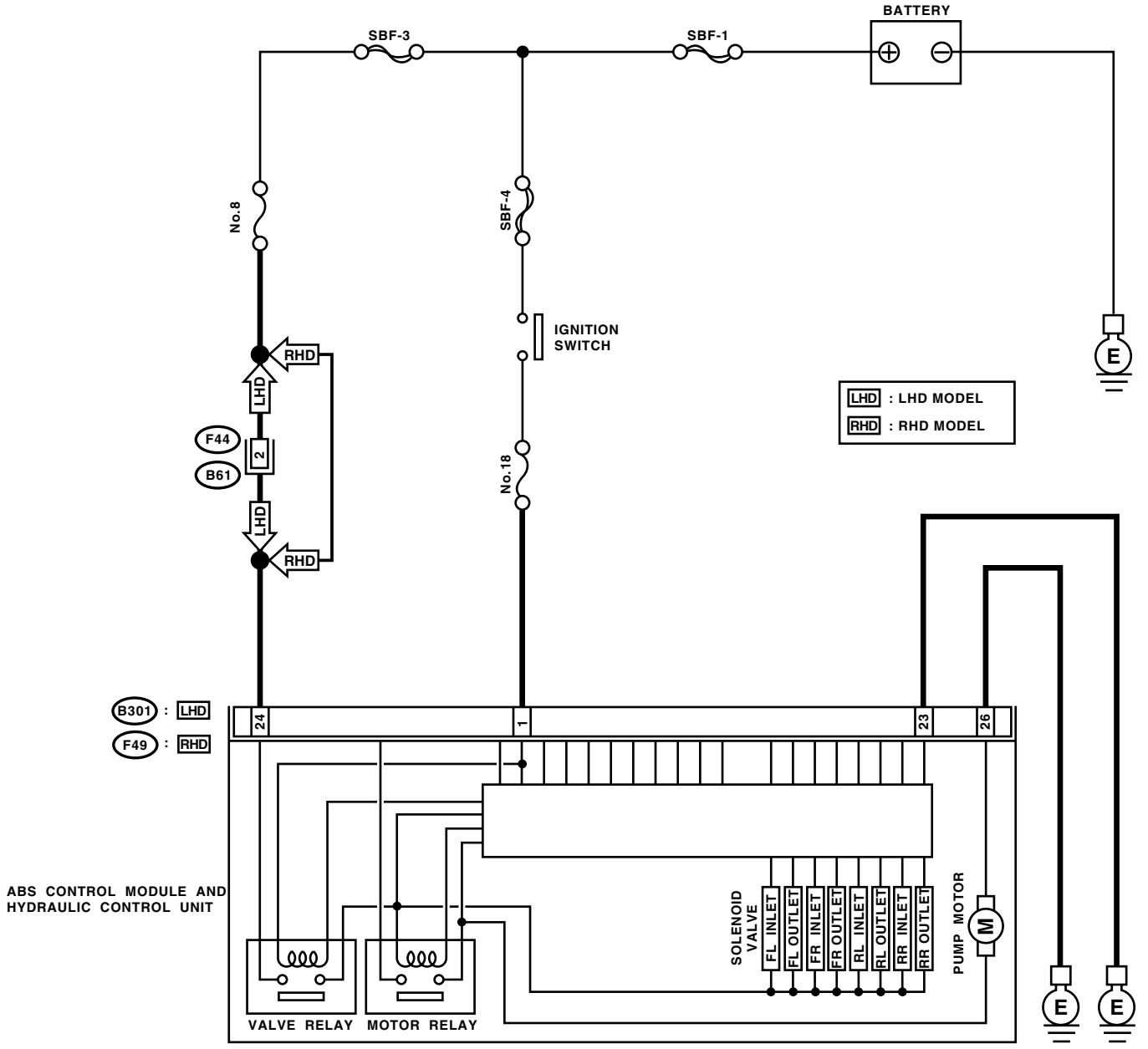
- Faulty valve relay

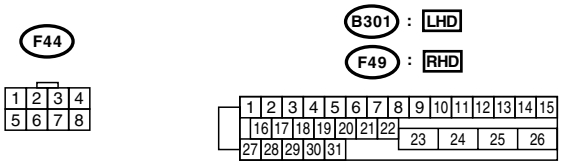
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate in some malfunctions.

NOTE:
In addition to the ABS warning light, brake warning light illuminates, if the EBD does not operate.

WIRING DIAGRAM:





ABS00244

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Value	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Run the engine at idle. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD:*** ***(B301) No. 1 (+) — Chassis ground (–):*** ***(B301) No. 24 (+) — Chassis ground (–):*** ***RHD:*** ***(F49) No. 1 (+) — Chassis ground (–):*** ***(B301) No. 24 (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 15 V	Go to step **2.**	Repair the harness connector between battery, ABS relay and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 23 — Chassis ground:*** ***RHD: (F49) No. 23 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK VALVE RELAY IN ABSCM&H/U.** Measure the resistance between ABSCM&H/U and terminals. ***Terminals*** ***No. 23 — No. 24:*** Is the measured value more than specified value?	1 MΩ	Go to step **4.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **5.**	Repair the connector.
5	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in the current diagnosis still being output?	Same DTC is not output.	Go to step **6.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

Z: DTC 52
— ABNORMAL MOTOR AND/OR MOTOR RELAY —

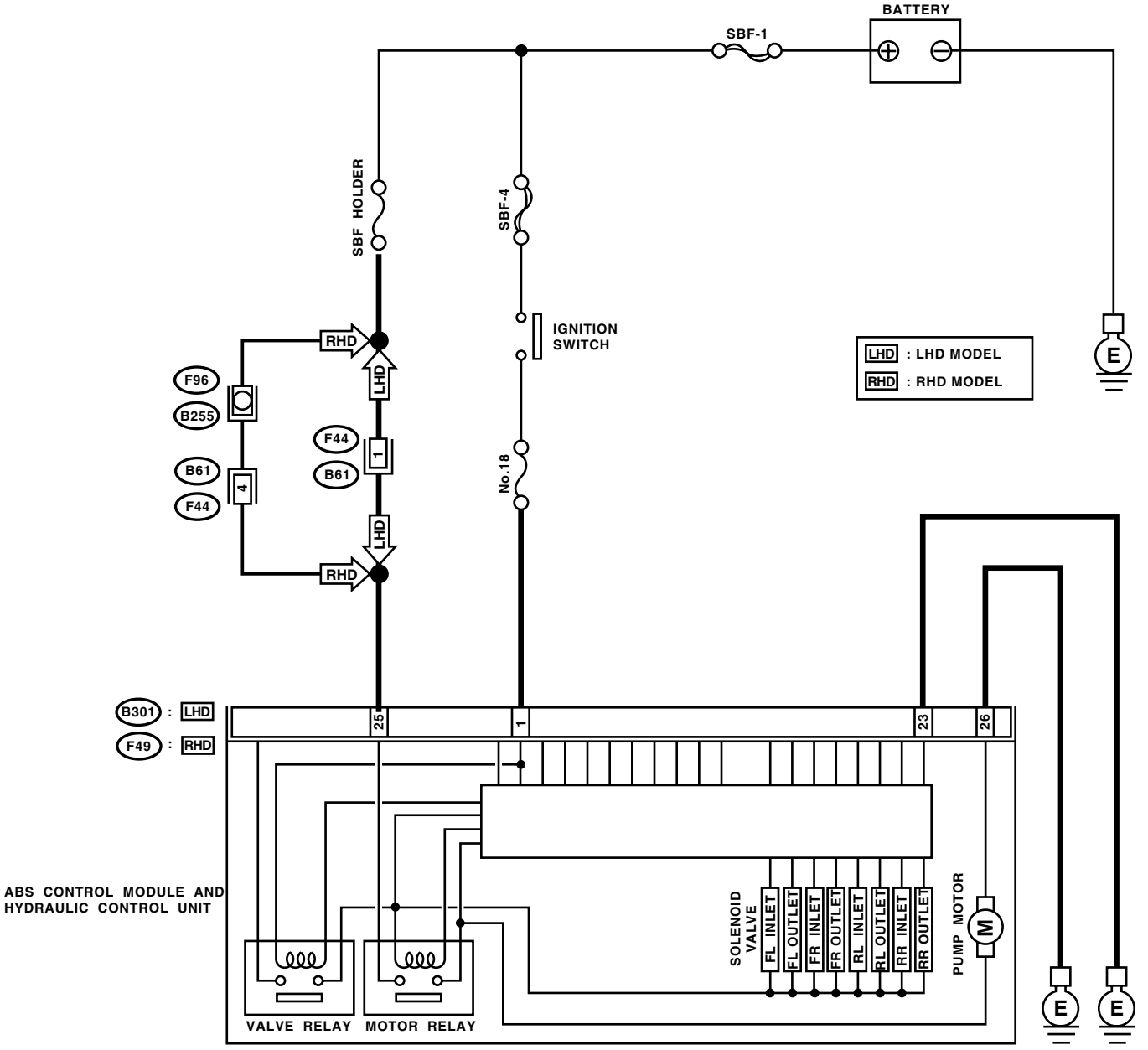
DIAGNOSIS:

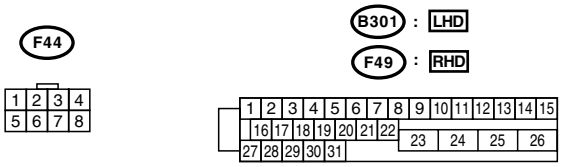
- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00249

	Step	Value	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Turn the ignition switch to ON. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 25 (+) — Chassis ground (–):*** ***RHD: (F49) No. 25 (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 15 V	Go to step **2.**	Repair the harness/connector between battery and ABSCM&H/U and check fuse SBF-holder.
2	**CHECK GROUND CIRCUIT OF MOTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 26 — Chassis ground:*** ***RHD: (F49) No. 26 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1)Run the engine at idle. 2)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 1 (+) — Chassis ground (–):*** ***RHD: (F49) No. 1 (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 15 V	Go to step **4.**	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
4	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 23 — Chassis ground:*** ***RHD: (F49) No. 23 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **5.**	Repair the ABSCM&H/U ground harness.
5	**CHECK MOTOR OPERATION.** Operate the sequence control. <Ref. to ABS-11, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate the sequence control. Can motor revolution noise (buzz) be heard when carrying out the sequence control?	Motor revolution noise (buzz) can be heard.	Go to step **6.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF. Is there poor contact in connector between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **7.**	Repair the connector.

	Step	Value	Yes	No
7	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in the current diagnosis still being output?	Same DTC is not output.	Go to step **8.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
8	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact. NOTE: Although the ABS warning light remains illuminating at this point, this is a normal condition. Vehicle must be driven at approx. 12 km/h (7.46 MPH) or faster to turn off ABS warning light. Make sure that the ABS warning light goes off after driving vehicle.	Proceed with the diagnosis corresponding to DTC.

AA:DTC 54
— ABNORMAL STOP LIGHT SWITCH —

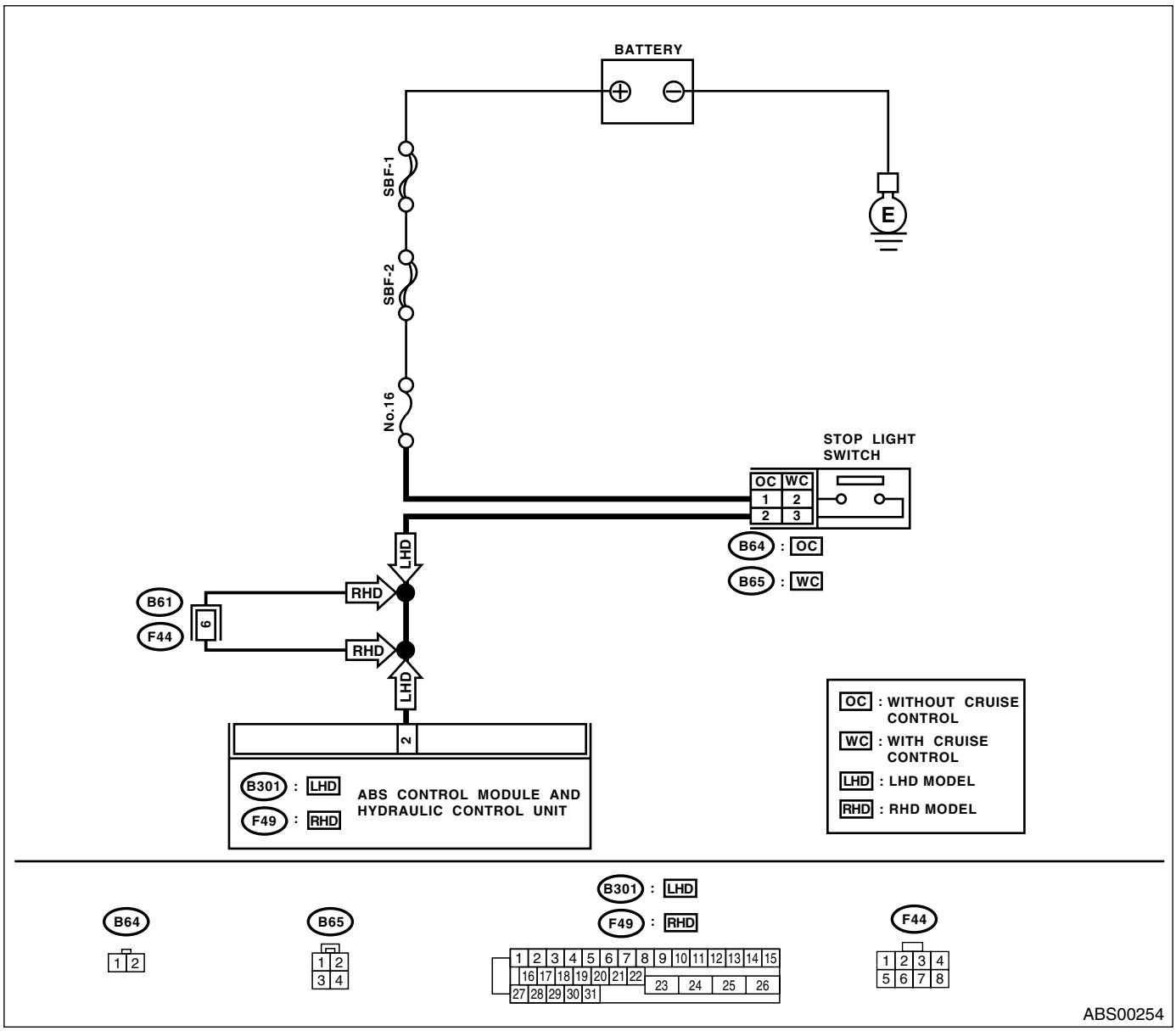
DIAGNOSIS:

- Faulty stop light switch

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK STOP LIGHTS COME ON.** Depress the brake pedal. Do the stop lights come on?	Stop lights come on.	Go to step **2.**	Repair the stop lights circuit.

	Step	Value	Yes	No
2	**CHECK OPEN CIRCUIT IN HARNESS.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Depress the brake pedal. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 2 (+) — Chassis ground (–):*** ***RHD: (F49) No. 2 (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 15 V	Go to step **3.**	Repair the harness between stop light switch and ABSCM&H/U.
3	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connector between stop light switch and ABSCM&H/U?	There is no poor contact.	Go to step **4.**	Repair the connector.
4	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in the current diagnosis still being output?	Same DTC is not output.	Go to step **5.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
5	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

AB:DTC 56
— ABNORMAL G SENSOR OUTPUT VOLTAGE —

DIAGNOSIS:

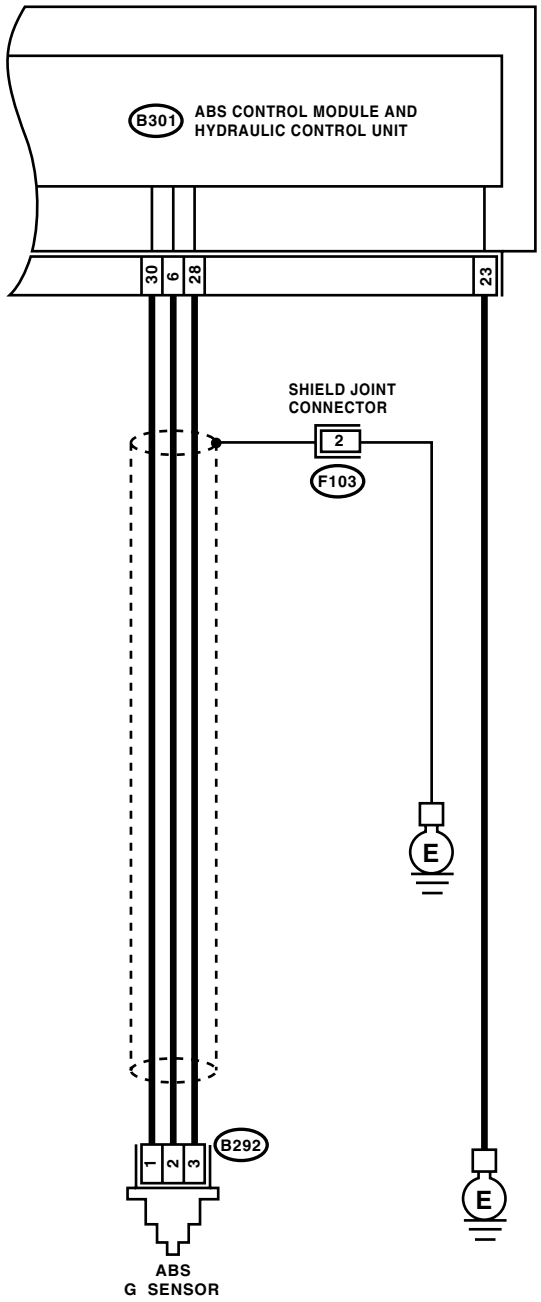
- Faulty G sensor output voltage

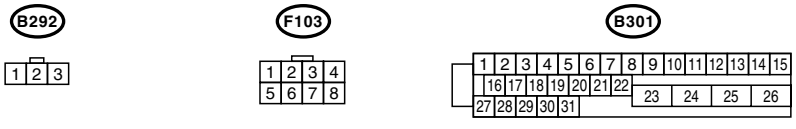
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:

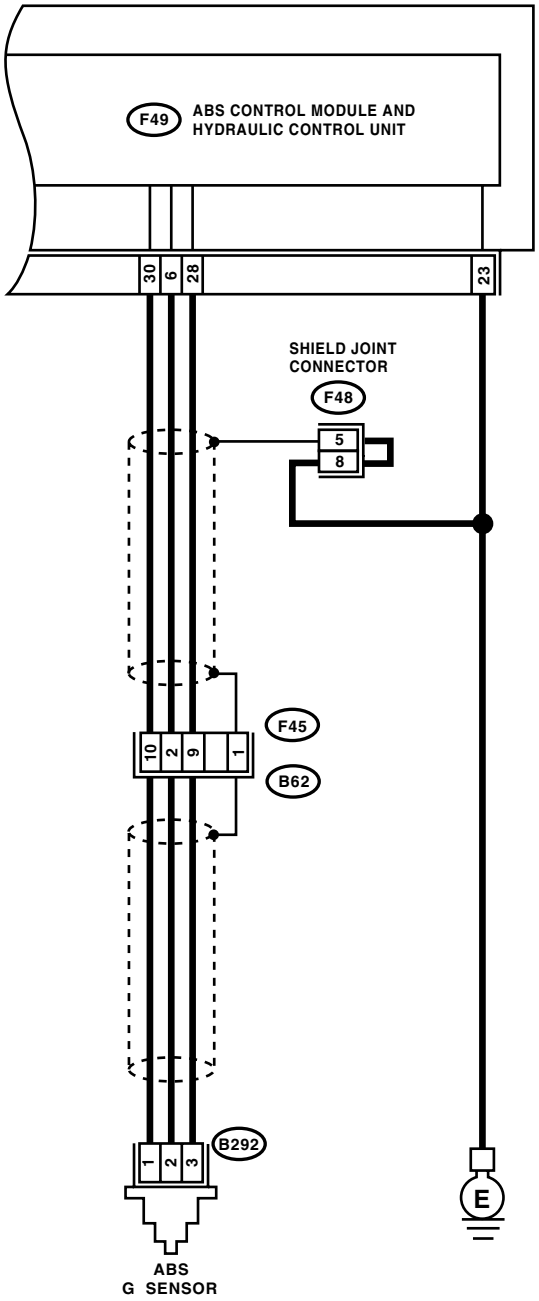
LHD MODEL

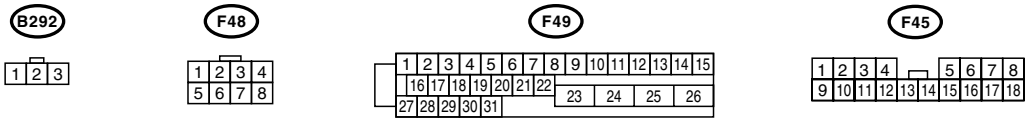




ABS00259

RHD MODEL





ABS00264

Step		Value	Yes	No
1	**CHECK ALL FOUR WHEELS FOR FREE TURNING.** Have the wheels been turned freely such as when the vehicle is lifted up, or operated on a free roller or rolling road?	Wheels have not been turned freely.	Go to step **2.**	The ABS is normal. Erase the DTC.

	Step	Value	Yes	No
2	**CHECK SPECIFICATIONS OF ABSCM&H/U.** Check the specifications of the mark to the ABSCM&H/U. ***CO: AT*** ***CP: MT*** Does the vehicle specification and ABSCM&H/U specification match?	Specifications are matched.	Go to step **3.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
3	**CHECK INPUT VOLTAGE OF G SENSOR.** 1)Turn the ignition switch to OFF. 2)Remove the console box. 3)Remove the G sensor from vehicle. (Do not disconnect the connector.) 4)Turn the ignition switch to ON. 5)Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 1 (+) — No. 3 (–):*** Is the measured value within specified value?	4.75 — 5.25 V	Go to step **4.**	Repair the harness/connector between G sensor and ABSCM&H/U.
4	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***LHD: (B301) No. 6 — No. 28:*** ***RHD: (F49) No. 6 — No. 28:*** Is the measured value within specified value?	5.0 — 5.6 kΩ	Go to step **5.**	Repair the harness/connector between G sensor and ABSCM&H/U.
5	**CHECK GROUND SHORT IN G SENSOR OUTPUT HARNESS.** 1)Disconnect the connector from G sensor. 2)Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 6 — Chassis ground:*** ***RHD: (F49) No. 6 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **6.**	Repair the harness between G sensor and ABSCM&H/U.
6	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 6 (+) — Chassis ground (–):*** ***RHD: (F49) No. 6 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **7.**	Repair the harness between G sensor and ABSCM&H/U.

	Step	Value	Yes	No
7	**CHECK BATTERY SHORT OF HARNESS.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 6 (+) — Chassis ground (–):*** ***RHD: (F49) No. 6 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **8.**	Repair the harness between G sensor and ABSCM&H/U.
8	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 28 — Chassis ground:*** ***RHD: (F49) No. 28 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **9.**	Repair the harness between G sensor and ABSCM&H/U. Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
9	**CHECK G SENSOR.** 1)Turn the ignition switch to OFF. 2)Remove the G sensor from vehicle. 3)Connect the connector to G sensor. 4)Connect the connector to ABSCM&H/U. 5)Turn the ignition switch to ON. 6)Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):*** Is the measured value within specified value when G sensor is horizontal?	2.1 — 2.4 V	Go to step **10.**	Replace the G sensor. <Ref. to ABS-22, G Sensor.>
10	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):*** Is the measured value within specified value when G sensor is inclined forwards to 90°?	3.7 — 4.1 V	Go to step **11.**	Replace the G sensor. <Ref. to ABS-22, G Sensor.>
11	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):*** Is the measured value within specified value when G sensor is inclined backwards to 90°?	0.5 — 0.9 V	Go to step **12.**	Replace the G sensor. <Ref. to ABS-22, G Sensor.>
12	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connector between ABSCM&H/U and G sensor?	There is no poor contact.	Go to step **13.**	Repair the connector.
13	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the DTC. Is the same DTC as in the current diagnosis still being output?	Same DTC is not output.	Go to step **14.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

Step		Value	Yes	No
14	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

13.Diagnostics Chart with Subaru Select Monitor

A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE

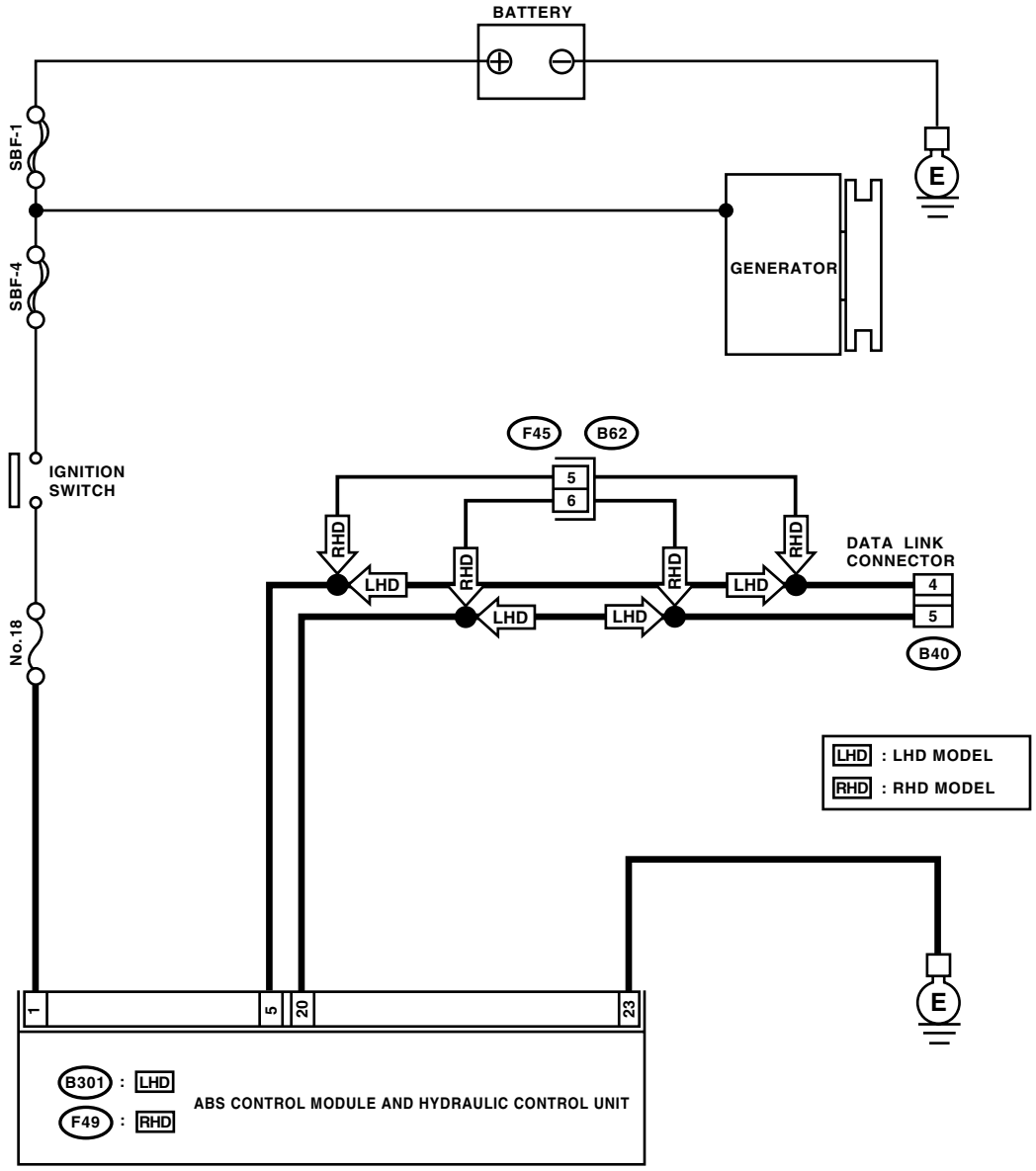
DIAGNOSIS:

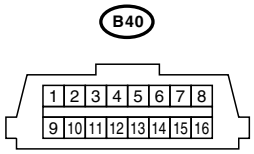
- Faulty harness connector

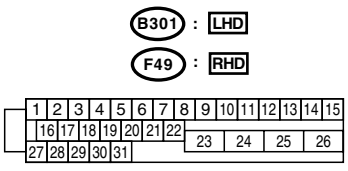
TROUBLE SYMPTOM:

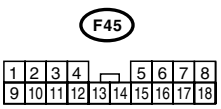
- ABS warning light remains on.

WIRING DIAGRAM:









ABS00269

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK IGNITION SWITCH.** Is the ignition switch turned to ON?	Ignition switch is turned to ON.	Go to step **2.**	Turn the ignition switch to ON, and select ABS mode using select monitor.
2	**CHECK BATTERY.** 1)Turn the ignition switch to OFF. 2)Measure the battery voltage. Is the measured value more than specified value?	11 V	Go to step **3.**	Charge or replace the battery.
3	**CHECK BATTERY TERMINAL.** Is there poor contact at battery terminal?	There is no poor contact.	Go to step **4.**	Repair or tighten the battery terminal.
4	**CHECK COMMUNICATION OF SELECT MONITOR.** 1)Turn the ignition switch to ON. 2)Using the select monitor, check whether communication to other system can be executed normally. Are the name and year of system displayed on select monitor?	System name and model year are displayed.	Go to step **7.**	Go to step **5.**
5	**CHECK COMMUNICATION OF SELECT MONITOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the ABSCM&H/U connector. 3)Turn the ignition switch to ON. 4)Check whether communication to other systems can be executed normally. Are the name and year of system displayed on select monitor?	System name and model year are displayed.	Go to step **7.**	Go to step **6.**
6	**CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the ABSCM&H/U, cruise control module and immobilizer control module connectors. 3)Measure the resistance between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 5 — Chassis ground:*** ***(B40) No. 4 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **7.**	Repair the harness and connector between each control module and data link connector.
7	**CHECK OUTPUT SIGNAL FOR ABSCM&H/U.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(B40) No. 5 (+) — Chassis ground (–):*** ***(B40) No. 4 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **8.**	Repair the harness and connector between each control module and data link connector.

	Step	Value	Yes	No
8	**CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND DATA LINK CONNECTOR.** Measure the resistance between ABSCM&H/U connector and data link connector. ***Connector & terminal*** ***LHD:*** ***(B301) No. 20 — (B40) No. 5:*** ***(B301) No. 5 — (B40) No. 4:*** ***RHD:*** ***(F49) No. 20 — (B40) No. 5:*** ***(F49) No. 5 — (B40) No. 4:*** Is the measured value less than specified value?	0.5 Ω	Go to step **9.**	Repair the harness and connector between ABSCM&H/U and data link connector.
9	**CHECK INSTALLATION OF ABSCM&H/U CONNECTOR.** Turn the ignition switch to OFF. Is the ABSCM&H/U connector inserted into ABSCM&H/U until the clamp locks onto it?	Correctly installed.	Go to step **10.**	Insert the ABSCM&H/U connector into ABSCM&H/U.
10	**CHECK POWER SUPPLY CIRCUIT.** 1)Turn the ignition switch to ON (engine OFF). 2)Measure the ignition power supply voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 1 (+) — Chassis ground (–):*** ***RHD: (F49) No. 1 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **11.**	Repair the open circuit in harness between ABSCM&H/U and battery.
11	**CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND CHASSIS GROUND.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U and transmission. 3)Measure the resistance of harness between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 23 — Chassis ground:*** ***RHD: (F49) No. 23 — Chassis ground:*** Is the measured value less than specified value?	1 Ω	Go to step **12.**	Repair the open circuit in harness between ABSCM&H/U and inhibitor side connector, and poor contact in coupling connector.
12	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in control module power supply, ground line and data link connector?	There is no poor contact.	Repair the connector.	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

B: NO TROUBLE CODE

DIAGNOSIS:

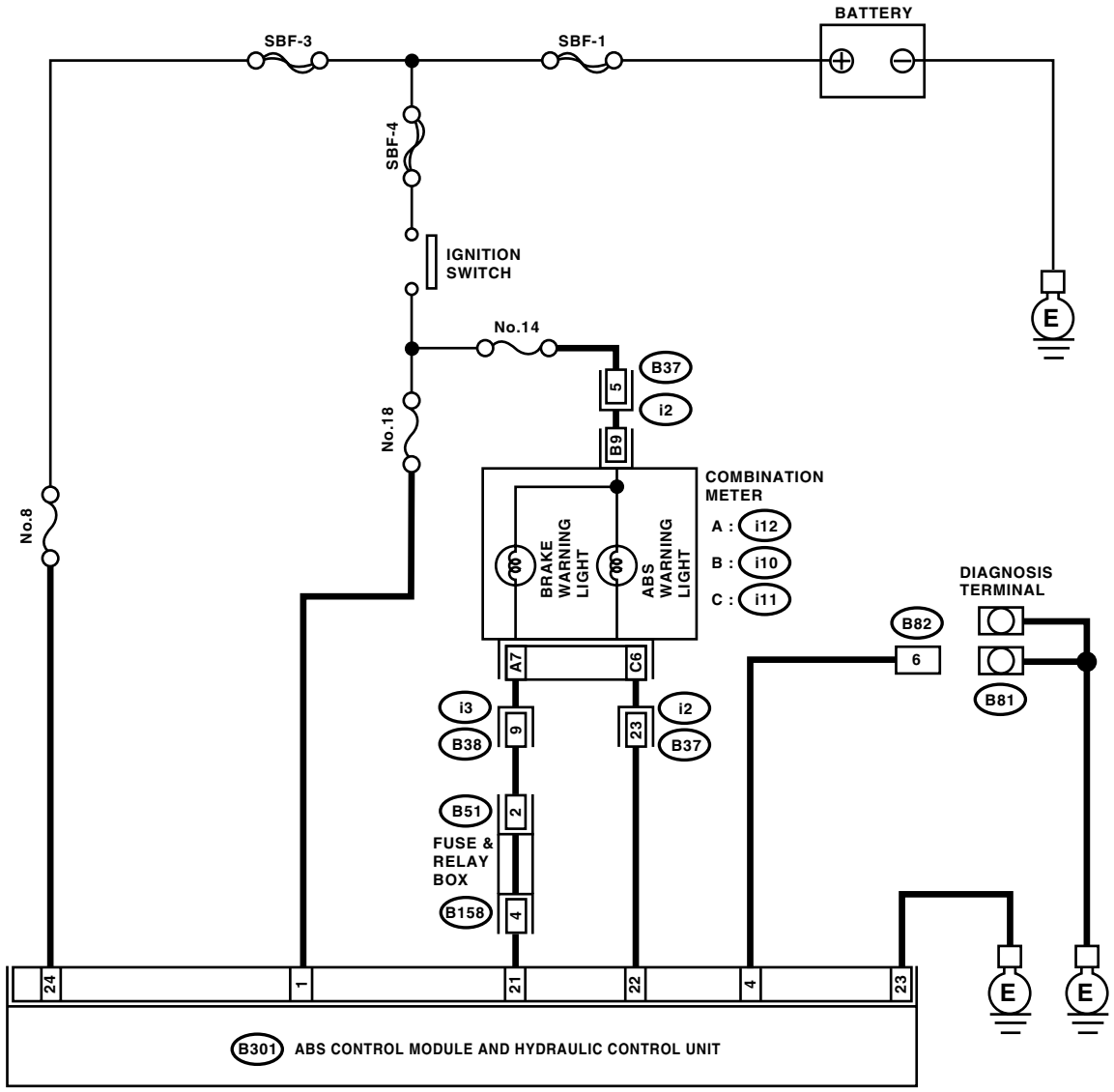
- ABS warning light circuit is shorted.

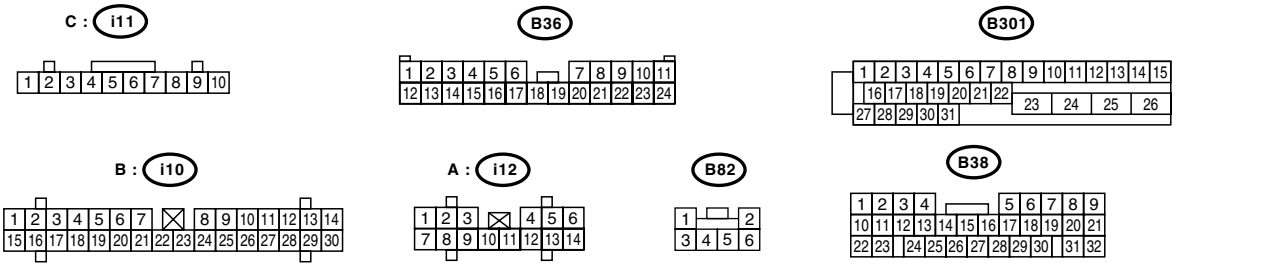
TROUBLE SYMPTOM:

- ABS warning light remains on.
- NO TROUBLE CODE displayed on the select monitor.

NOTE:
When the ABS warning light is OFF and “NO TROUBLE CODE” is displayed on select monitor, the system is in normal condition.

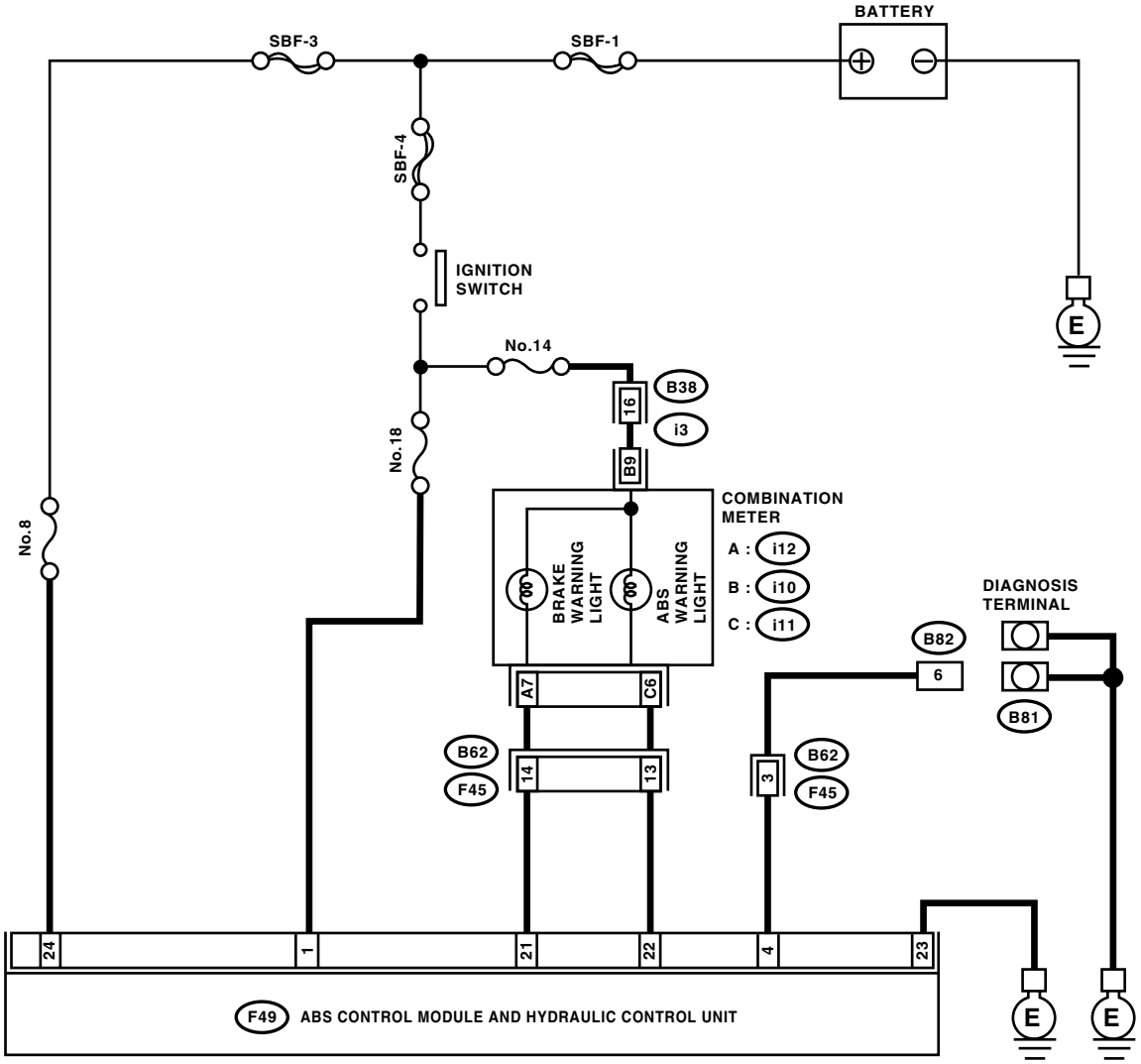
WIRING DIAGRAM:
LHD MODEL

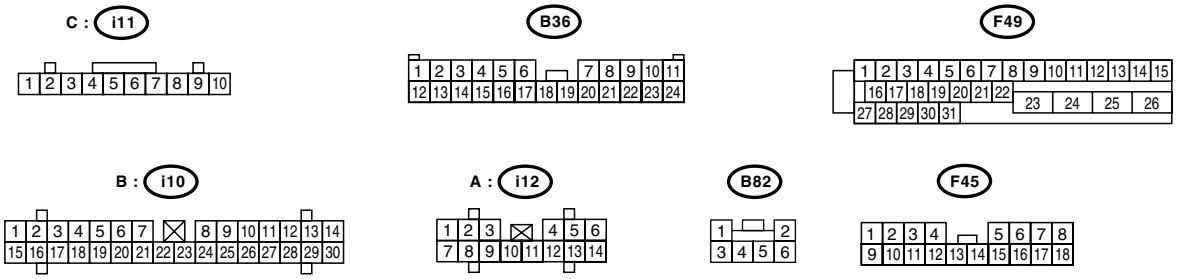




ABS00199

RHD MODEL





ABS00204

	Step	Value	Yes	No
1	**CHECK WIRING HARNESS.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector (i2) or (B62) from connector (B37) or (F45). 3)Turn ignition switch to ON. Does the ABS warning light turn on?	ABS warning light does not turn on.	Go to step **2.**	Repair the front wiring harness.

	Step	Value	Yes	No
2	**CHECK PROJECTION AT ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Check for broken at the ABSCM&H/U.	Terminal is not broken.	Go to step **3.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
3	**CHECK ABSCM&H/U.** Measure the resistance between ABSCM&H/U terminals. ***Terminals*** ***No. 22 — No. 23:*** Is the measured value more than specified value?	1 MΩ	Go to step **4.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	**CHECK WIRING HARNESS.** Measure the resistance between connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 22 — Chassis ground:*** ***RHD: (F49) No. 22 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **5.**	Repair the harness.
5	**CHECK WIRING HARNESS.** 1)Connect the connector to ABSCM&H/U. 2)Measure the resistance between connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 22 — Chassis ground:*** ***RHD: (F49) No. 22 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **6.**	Repair the harness.
6	**CHECK POOR CONTACT IN ABSCM&H/U CONNECTOR.** Is there poor contact in ABSCM&H/U connector?	There is no poor contact.	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Repair the connector.

C: DTC 21
— OPEN OR SHORT CIRCUIT IN FRONT RIGHT ABS SENSOR CIRCUIT —

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-103, DTC 27 — OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT —, Diagnostics Chart with Subaru Select Monitor.>

D: DTC 23
— OPEN OR SHORT CIRCUIT IN FRONT LEFT ABS SENSOR CIRCUIT —

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-103, DTC 27 — OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT —, Diagnostics Chart with Subaru Select Monitor.>

E: DTC 25
— OPEN OR SHORT CIRCUIT IN REAR RIGHT ABS SENSOR CIRCUIT —

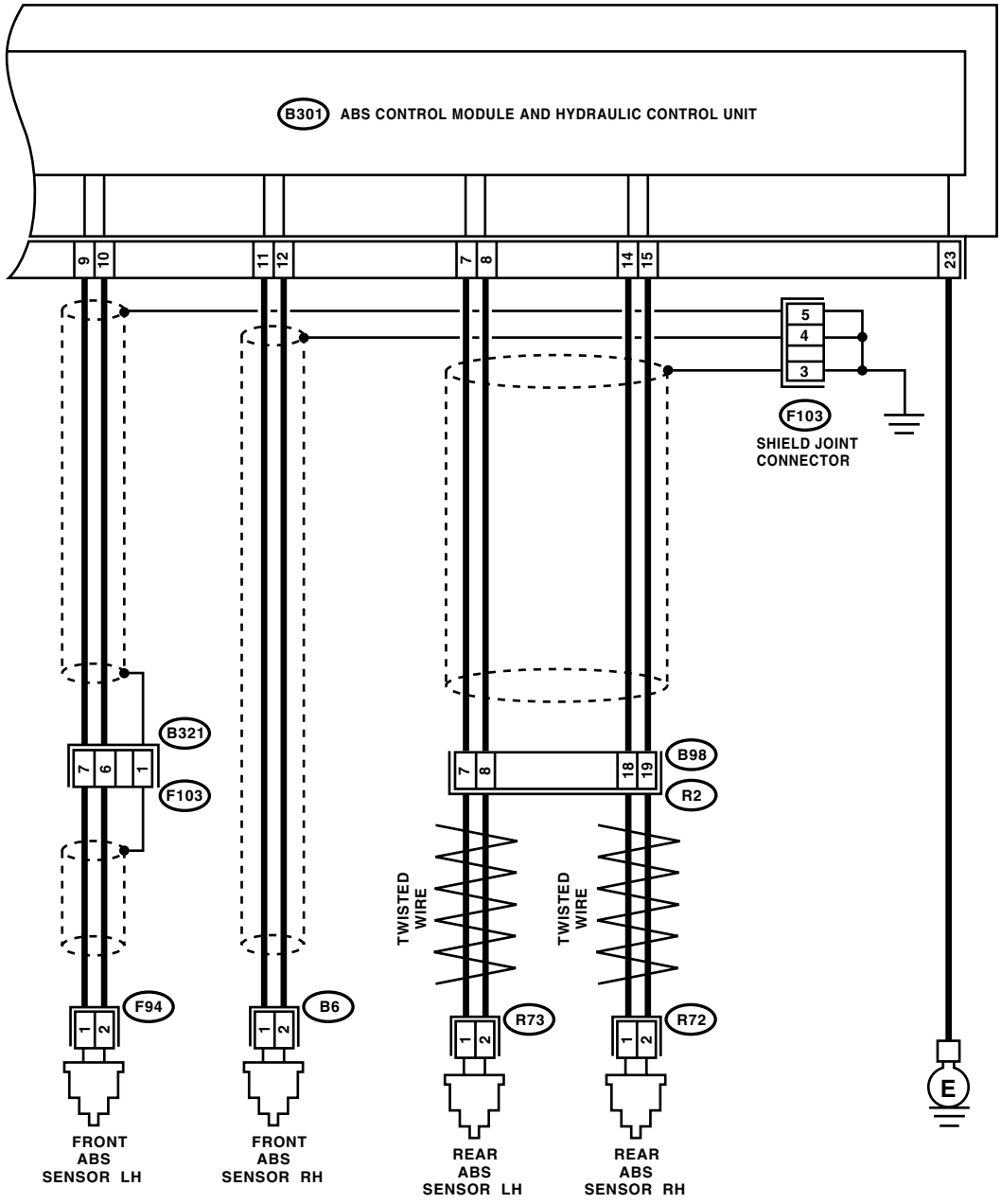
NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-103, DTC 27 — OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT —, Diagnostics Chart with Subaru Select Monitor.>

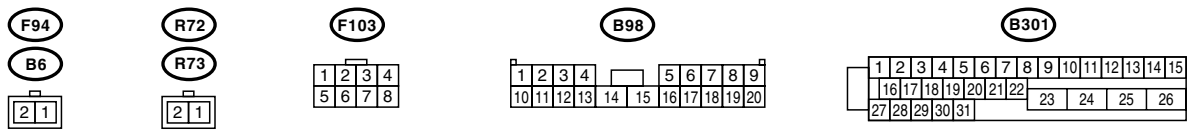
F: DTC 27
— OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT —

DIAGNOSIS:
- Faulty ABS sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:
- ABS does not operate.

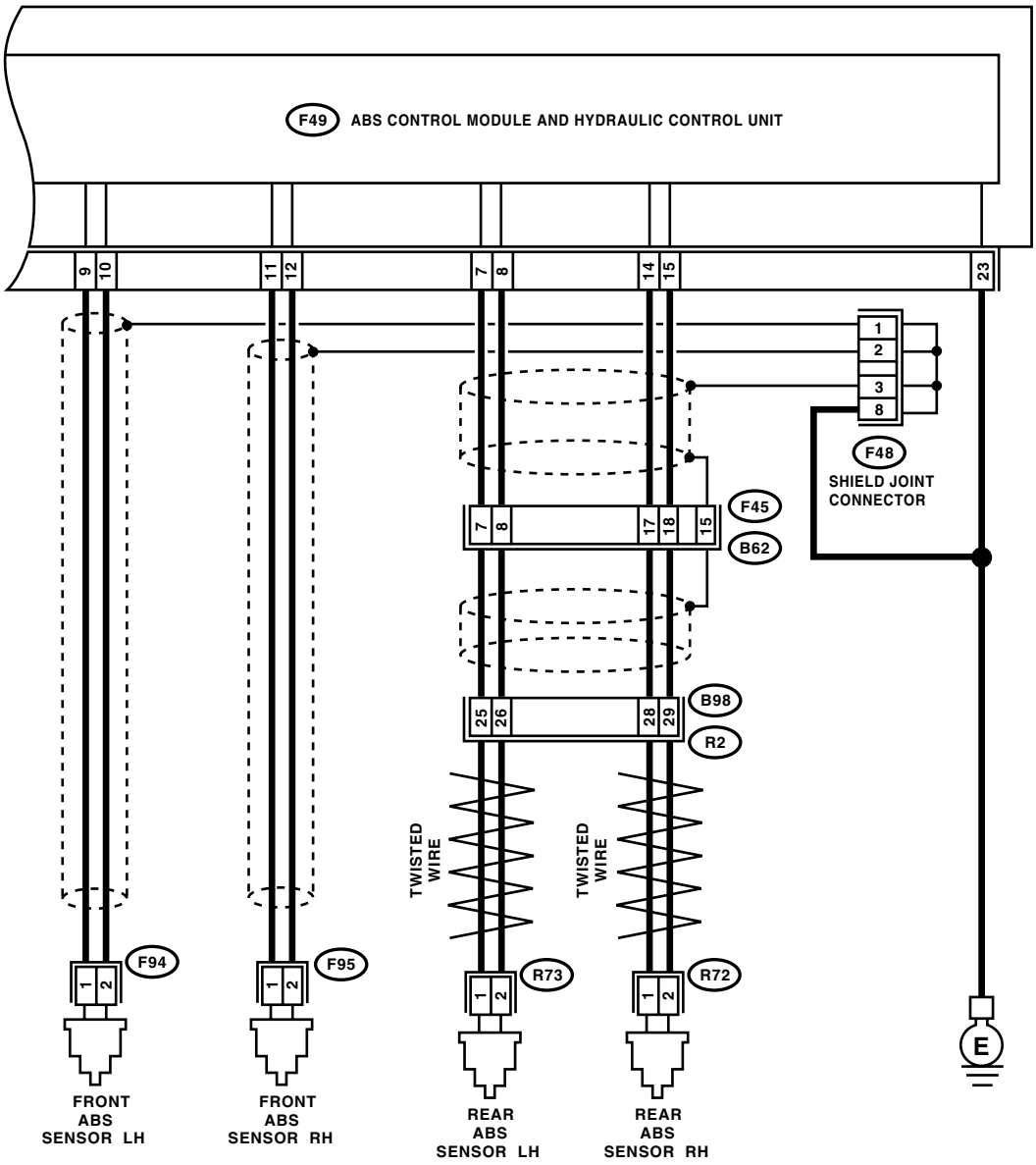
WIRING DIAGRAM:
LHD MODEL

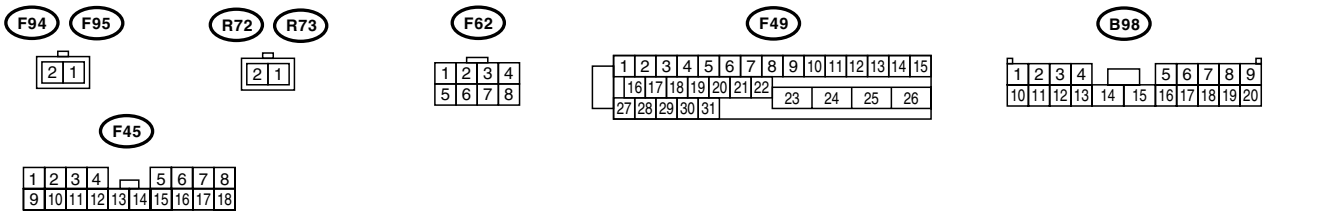




ABS00219

RHD MODEL





ABS00224

	Step	Value	Yes	No
1	**CHECK OUTPUT OF ABS SENSOR USING SELECT MONITOR.** 1)Select “Current data display & Save” on the select monitor. 2)Read the ABS sensor output corresponding to faulty system in the select monitor data display mode. Does the speed indicated on display change in response to speedometer reading during acceleration/deceleration when the steering wheel is in straight-ahead position?	Speed indicated on display changes.	Go to step **2.**	Go to step **8.**
2	**CHECK INSTALLATION OF ABS SENSOR.** Are the ABS sensor installation bolts tightened securely?	33 N·m (3.4 kgf-m, 24.6 ft-lb)	Go to step **3.**	Tighten the ABS sensor installation bolts securely.
3	**CHECK ABS SENSOR GAP.** Measure the tone wheel to ABS sensor piece gap over entire perimeter of the wheel. Is the measured value within specified value?	Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **4.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
4	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout. Is the measured value less than specified value?	0.05 mm (0.0020 in)	Go to step **5.**	Replace the tone wheel. Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>
5	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF. Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	There is no poor contact.	Go to step **6.**	Repair the connector.
6	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in the current diagnosis still being output?	Same DTC is not output.	Go to step **7.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact. NOTE: Check the harness and connectors between ABSCM&H/U and ABS sensor.	Proceed with the diagnosis corresponding to DTC.

	Step	Value	Yes	No
8	**CHECK ABS SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABS sensor. 3)Measure the resistance of ABS sensor connector terminals while shaking the harness lightly. ***Terminal*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:*** Is the measured value within specified value?	Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step **9.**	Replace the ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.>
9	**CHECK BATTERY SHORT OF ABS SENSOR.** 1)Disconnect the connector from ABSCM&H/U. 2)Measure the voltage between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **10.**	Replace the ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.>
10	**CHECK BATTERY SHORT OF ABS SENSOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **11.**	Replace the ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.>
11	**CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS SENSOR.** 1)Turn the ignition switch to OFF. 2)Connect the connector to ABS sensor. 3)Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***DTC 21*** ***LHD: (B301) No. 11 — No. 12:*** ***RHD: (F49) No. 11 — No. 12:*** ***DTC 23*** ***LHD: (B301) No. 9 — No. 10:*** ***RHD: (F49) No. 9 — No. 10:*** ***DTC 25*** ***LHD: (B301) No. 14 — No. 15:*** ***RHD: (F49) No. 14 — No. 15:*** ***DTC 27*** ***LHD: (B301) No. 7 — No. 8:*** ***RHD: (F49) No. 7 — No. 8:*** Is the measured value within specified value?	Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step **12.**	Repair the harness/connector between ABSCM&H/U and ABS sensor.

	Step	Value	Yes	No
12	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 21*** ***LHD: (B301) No. 11 (+) — Chassis ground (–):*** ***RHD: (F49) No. 11 (+) — Chassis ground (–):*** ***DTC 23*** ***LHD: (B301) No. 9 (+) — Chassis ground (–):*** ***RHD: (F49) No. 9 (+) — Chassis ground (–):*** ***DTC 25*** ***LHD: (B301) No. 14 (+) — Chassis ground (–):*** ***RHD: (F49) No. 14 (+) — Chassis ground (–):*** ***DTC 27*** ***LHD: (B301) No. 7 (+) — Chassis ground (–):*** ***RHD: (F49) No. 7 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **13.**	Repair the harness between ABSCM&H/U and ABS sensor.
13	**CHECK BATTERY SHORT OF HARNESS.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 21*** ***LHD: (B301) No. 11 (+) — Chassis ground (–):*** ***RHD: (F49) No. 11 (+) — Chassis ground (–):*** ***DTC 23*** ***LHD: (B301) No. 9 (+) — Chassis ground (–):*** ***RHD: (F49) No. 9 (+) — Chassis ground (–):*** ***DTC 25*** ***LHD: (B301) No. 14 (+) — Chassis ground (–):*** ***RHD: (F49) No. 14 (+) — Chassis ground (–):*** ***DTC 27*** ***LHD: (B301) No. 7 (+) — Chassis ground (–):*** ***RHD: (F49) No. 7 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **14.**	Repair the harness between ABSCM&H/U and ABS sensor.
14	**CHECK INSTALLATION OF ABS SENSOR.** Are the ABS sensor installation bolts tightened securely?	33 N·m (3.4 kgf-m, 24.6 ft-lb)	Go to step **15.**	Tighten the ABS sensor installation bolts securely.

	Step	Value	Yes	No
15	**CHECK ABS SENSOR GAP.** Measure the tone wheel to ABS sensor piece gap over entire perimeter of the wheel. Is the measured value within specified value?	Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **16.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
16	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout. Is the measured value within specified value?	0.05 mm (0.0020 in)	Go to step **17.**	Replace the tone wheel. Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>
17	**CHECK GROUND SHORT OF ABS SENSOR.** 1)Turn the ignition switch to ON. 2)Measure the resistance between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **18.**	Replace the ABS sensor and ABSCM&H/U. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.> and <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
18	**CHECK GROUND SHORT OF HARNESS.** 1)Turn the ignition switch to OFF. 2)Connect the connector to ABS sensor. 3)Measure the resistance between ABSCM&H/U connector terminal and chassis ground. ***Connector & terminal*** ***DTC 21*** ***LHD: (B301) No. 11 — Chassis ground:*** ***RHD: (F49) No. 11 — Chassis ground:*** ***DTC 23*** ***LHD: (B301) No. 9 — Chassis ground:*** ***RHD: (F49) No. 9 — Chassis ground:*** ***DTC 25*** ***LHD: (B301) No. 14 — Chassis ground:*** ***RHD: (F49) No. 14 — Chassis ground:*** ***DTC 27*** ***LHD: (B301) No. 7 — Chassis ground:*** ***RHD: (F49) No. 7 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **19.**	Repair the harness between ABSCM&H/U and ABS sensor. And replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
19	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	There is no poor contact.	Go to step **20.**	Repair the connector.

	Step	Value	Yes	No
20	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in current diagnosis still being output?	Same DTC is not output.	Go to step **21.**	Replace the ABSCM&H/U.
21	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact. NOTE: Check the harness and connectors between ABSCM&H/U and ABS sensor.	Proceed with the diagnosis corresponding to DTC.

G: DTC 22 — FRONT RIGHT ABNORMAL ABS SENSOR SIGNAL —

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-111, DTC 28 — REAR LEFT ABNORMAL ABS SENSOR SIGNAL —, Diagnostics Chart with Subaru Select Monitor.>

H: DTC 24 — FRONT LEFT ABNORMAL ABS SENSOR SIGNAL —

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-111, DTC 28 — REAR LEFT ABNORMAL ABS SENSOR SIGNAL —, Diagnostics Chart with Subaru Select Monitor.>

I: DTC 26 — REAR RIGHT ABNORMAL ABS SENSOR SIGNAL —

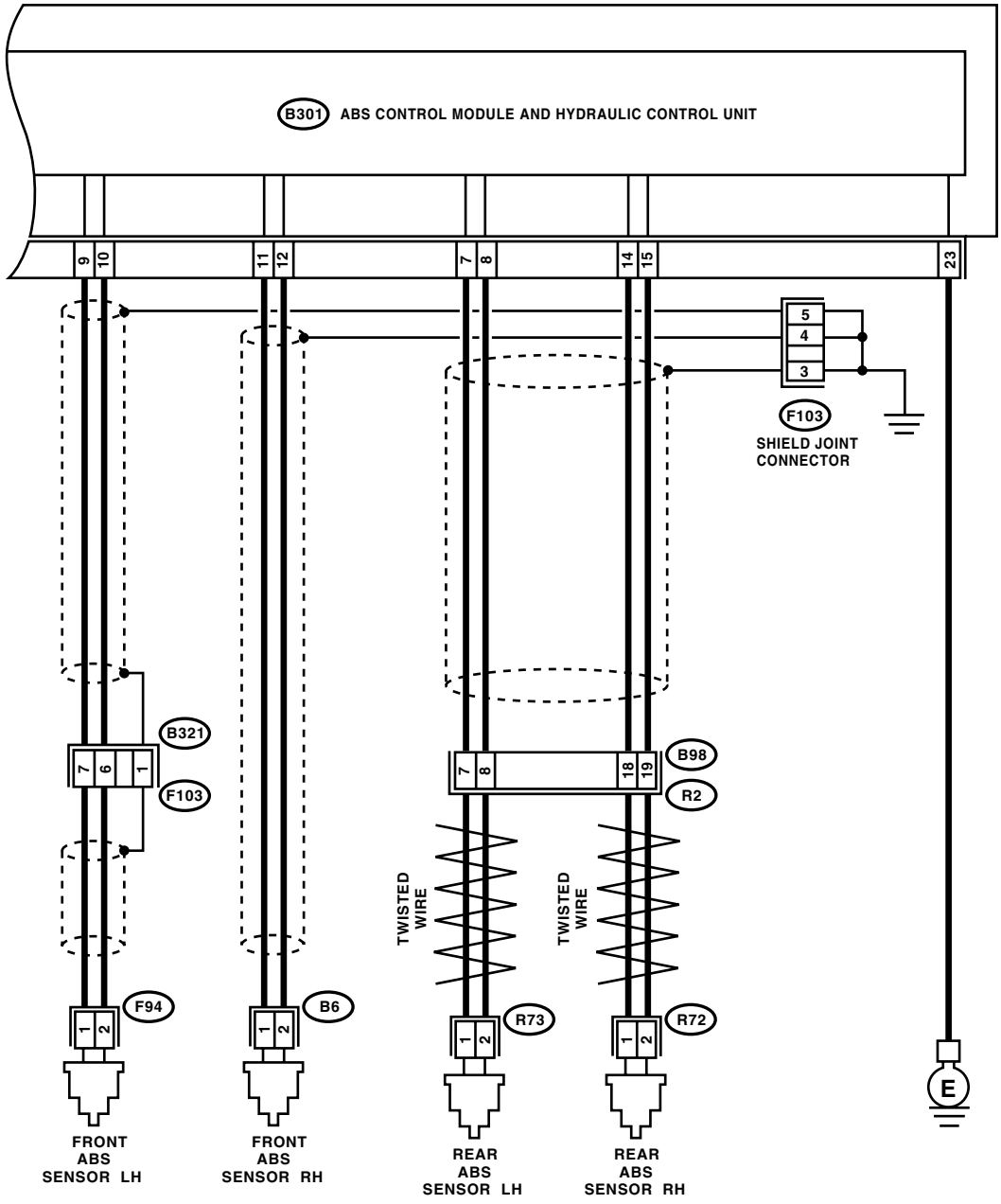
NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-111, DTC 28 — REAR LEFT ABNORMAL ABS SENSOR SIGNAL —, Diagnostics Chart with Subaru Select Monitor.>

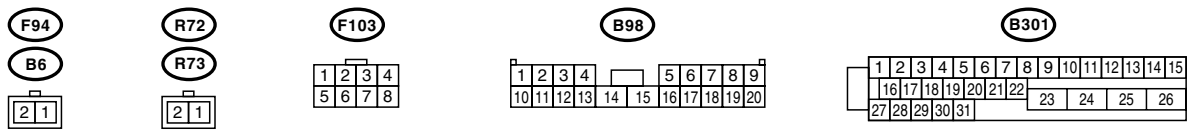
J: DTC 28
— REAR LEFT ABNORMAL ABS SENSOR SIGNAL —

DIAGNOSIS:
- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

TROUBLE SYMPTOM:
- ABS does not operate.

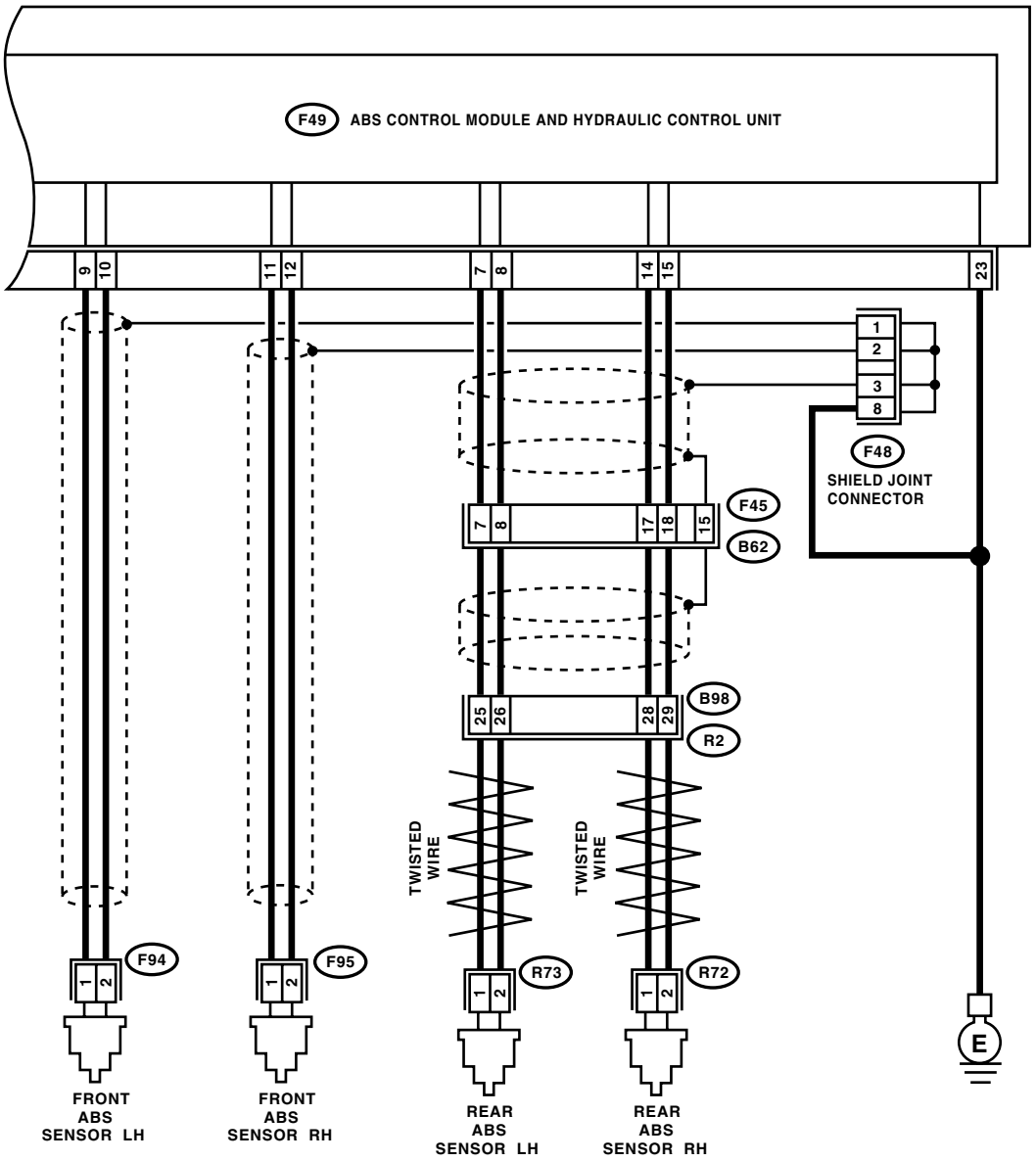
WIRING DIAGRAM:
LHD MODEL

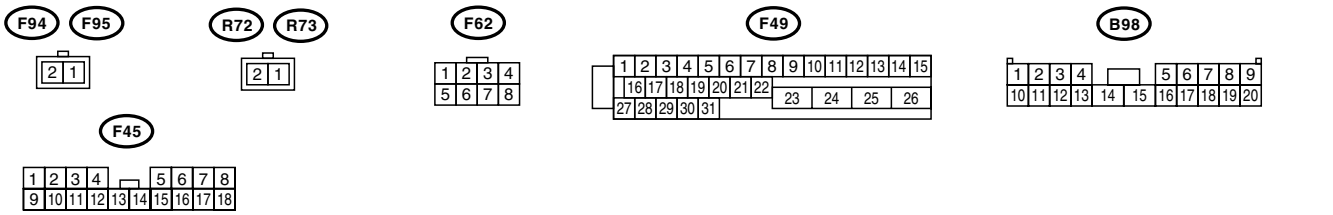




ABS00219

RHD MODEL





ABS00224

	Step	Value	Yes	No
1	**CHECK OUTPUT OF ABS SENSOR USING SELECT MONITOR.** 1)Select “Current data display & Save” on the select monitor. 2)Read the ABS sensor output corresponding to faulty system in the select monitor data display mode. Does the speed indicated on display change in response to speedometer reading during acceleration/deceleration when the steering wheel is in straight-ahead position?	Speed indicate on display changes.	Go to step **2.**	Go to step **8.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF. Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	There is no poor contact.	Go to step **3.**	Repair the connector.
3	**CHECK SOURCES OF SIGNAL NOISE.** Is the car telephone or wireless transmitter properly installed?	Correctly installed.	Go to step **4.**	Properly install the car telephone or wireless transmitter.
4	**CHECK SOURCES OF SIGNAL NOISE.** Are noise sources (such as an antenna) installed near the sensor harness?	Not installed.	Go to step **5.**	Install the noise sources apart from sensor harness.
5	**CHECK SHIELD CIRCUIT.** 1)Turn the ignition switch to OFF. 2)Connect all connectors. 3)Measure the resistance between shield connector and chassis ground. ***Connector & terminal*** ***DTC 22*** ***LHD: (F103) No. 4 — Chassis ground:*** ***RHD: (F48) No. 2 — Chassis ground:*** ***DTC 24*** ***LHD: (F103) No. 5 — Chassis ground:*** ***RHD: (F48) No. 1 — Chassis ground:*** ***DTC 26*** ***LHD: (F103) No. 3 — Chassis ground:*** ***RHD: (F48) No. 3 — Chassis ground:*** ***DTC 28*** ***LHD: (F103) No. 3 — Chassis ground:*** ***RHD: (F48) No. 3 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **6.**	Repair the shield harness.
6	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in the current diagnosis still being output?	Same DTC is not output.	Go to step **7.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary noise interference.	Proceed with the diagnosis corresponding to DTC.
8	**CHECK INSTALLATION OF ABS SENSOR.** Are the ABS sensor installation bolts tightened securely?	33 N·m (3.4 kgf-m, 24.6 ft-lb)	Go to step **9.**	Tighten the ABS sensor installation bolts securely.

	Step	Value	Yes	No
9	**CHECK ABS SENSOR GAP.** Measure the tone wheel to ABS sensor piece gap over entire perimeter of wheel. Is the measured value within specified value?	Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **10.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
10	**PREPARE OSCILLOSCOPE.** Is an oscilloscope available?	Oscilloscope is available.	Go to step **11.**	Go to step **12.**
11	**CHECK ABS SENSOR SIGNAL.** 1)Raise all four wheels off ground. 2)Turn the ignition switch to OFF. 3)Connect the oscilloscope to the connector. 4)Turn the ignition switch to ON. 5)Rotate the wheels and measure voltage at specified frequency. <Ref. to ABS-17, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the ABSCM&H/U sometimes stores DTC 29 or DTC 56. ***Connector 0& terminal*** ***DTC 22*** ***LHD: (B6) No. 1 (+) — No. 2 (–):*** ***RHD: (F95) No. 1 (+) — No. 2 (–):*** ***DTC 24*** ***LHD: (F94) No. 1 (+) — No. 2 (–):*** ***RHD: (F94) No. 1 (+) — No. 2 (–):*** ***DTC 26*** ***LHD: (B98) No. 18 (+) — No. 19 (–):*** ***RHD: (B98) No. 28 (+) — No. 29 (–):*** ***DTC 28*** ***LHD: (B98) No. 7 (+) — No. 8 (–):*** ***RHD: (B98) No. 25 (+) — No. 26 (–):*** Is the measured value as same as specified value?	Oscilloscope pattern is smooth, as shown in the figure.	Go to step **15.**	Go to step **12.**
12	**CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.** Remove the disc rotor or drum from hub in accordance with DTC. Is the ABS sensor piece or tone wheel contaminated by dirt or other foreign matter?	ABS sensor piece or tone wheel is not contaminated.	Go to step **13.**	Thoroughly remove dirt or other foreign matter.
13	**CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.** Are there broken or damaged in the ABS sensor piece or tone wheel?	There are no broken or damaged in the ABS sensor piece or tone wheel.	Go to step **14.**	Replace the ABS sensor or tone wheel. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.> and Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>

	Step	Value	Yes	No
14	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout. Is the measured value less than specified value?	0.05 mm (0.0020 in)	Go to step **15.**	Replace the tone wheel. Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>
15	**CHECK RESISTANCE OF ABS SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABS sensor. 3)Measure the resistance between ABS sensor connector terminals while shaking the harness lightly. ***Terminal*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:*** Is the measured value within specified value?	Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step **16.**	Replace the ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.>
16	**CHECK GROUND SHORT OF ABS SENSOR.** Measure the resistance between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **17.**	Replace the ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.>
17	**CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS SENSOR.** 1)Connect the connector to ABS sensor. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance at ABSCM&H/U connector terminals. ***Connector & terminal*** ***DTC 22*** ***LHD: (B301) No. 11 — No. 12:*** ***RHD: (F49) No. 11 — No. 12:*** ***DTC 24*** ***LHD: (B301) No. 9 — No. 10:*** ***RHD: (F49) No. 9 — No. 10:*** ***DTC 26*** ***LHD: (B301) No. 14 — No. 15:*** ***RHD: (F49) No. 14 — No. 15:*** ***DTC 28*** ***LHD: (B301) No. 7 — No. 8:*** ***RHD: (F49) No. 7 — No. 8:*** Is the measured value within specified value?	Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step **18.**	Repair the harness/connector between ABSCM&H/U and ABS sensor.

	Step	Value	Yes	No
18	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 22*** ***LHD: (B301) No. 11 — Chassis ground:*** ***RHD: (F49) No. 11 — Chassis ground:*** ***DTC 24*** ***LHD: (B301) No. 9 — Chassis ground:*** ***RHD: (F49) No. 9 — Chassis ground:*** ***DTC 26*** ***LHD: (B301) No. 14 — Chassis ground:*** ***RHD: (F49) No. 14 — Chassis ground:*** ***DTC 28*** ***LHD: (B301) No. 7 — Chassis ground:*** ***RHD: (F49) No. 7 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **19.**	Repair the harness/connector between ABSCM&H/U and ABS sensor.
19	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** Measure the resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 23 — Chassis ground:*** ***RHD: (F49) No. 23 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **20.**	Repair the ABSCM&H/U ground harness.
20	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	There is no poor contact.	Go to step **21.**	Repair the connector.
21	**CHECK SOURCES OF SIGNAL NOISE.** Is the car telephone or the wireless transmitter properly installed?	Correctly installed.	Go to step **22.**	Properly install the car telephone or wireless transmitter.
22	**CHECK SOURCES OF SIGNAL NOISE.** Are noise sources (such as an antenna) installed near the sensor harness?	Not installed	Go to step **23.**	Install the noise sources apart from sensor harness.
23	**CHECK SHIELD CIRCUIT.** 1)Connect all connectors. 2)Measure the resistance between shield connector and chassis ground. ***Connector & terminal*** ***DTC 22*** ***LHD: (F103) No. 4 — Chassis ground:*** ***RHD: (F48) No. 2 — Chassis ground:*** ***DTC 24*** ***LHD: (F103) No. 5 — Chassis ground:*** ***RHD: (F48) No. 1 — Chassis ground:*** ***DTC 26*** ***LHD: (F103) No. 3 — Chassis ground:*** ***RHD: (F48) No. 3 — Chassis ground:*** ***DTC 28*** ***LHD: (F103) No. 3 — Chassis ground:*** ***RHD: (F48) No. 3 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **24.**	Repair the shield harness.

	Step	Value	Yes	No
24	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in the current diagnosis still being output?	Same DTC is not output.	Go to step **25.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
25	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary noise interference. NOTE: Although the ABS warning light remains illuminating at this point, this is a normal condition. Vehicle must be driven at approx. 12 km/h (7.46 MPH) or faster to turn off ABS warning light. Make sure that the ABS warning light goes off after driving vehicle.	Proceed with the diagnosis corresponding to DTC.

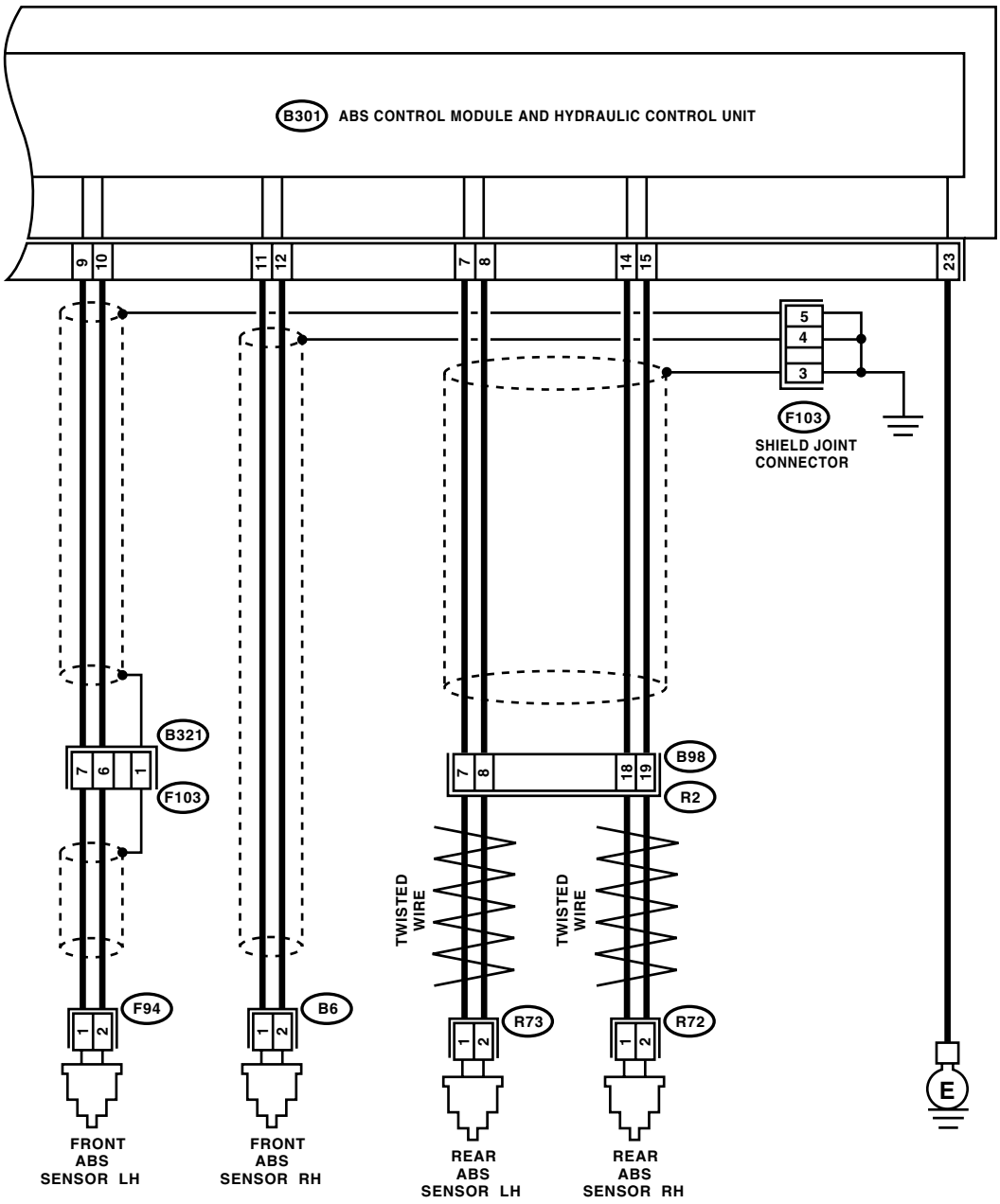
K: DTC 29
— ABNORMAL ABS SENSOR SIGNAL ON ANY ONE OF FOUR SENSOR —

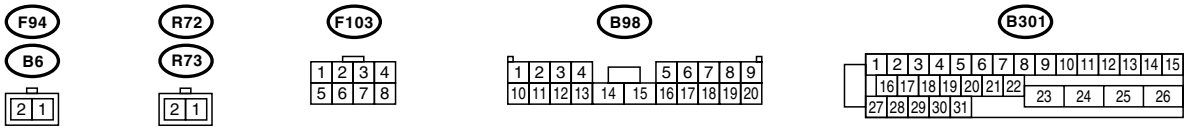
DIAGNOSIS:
- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Wheels turning freely for a long time

TROUBLE SYMPTOM:
- ABS does not operate.
- EBD does not operate.

NOTE:
In addition to the ABS warning light, brake warning light illuminates.

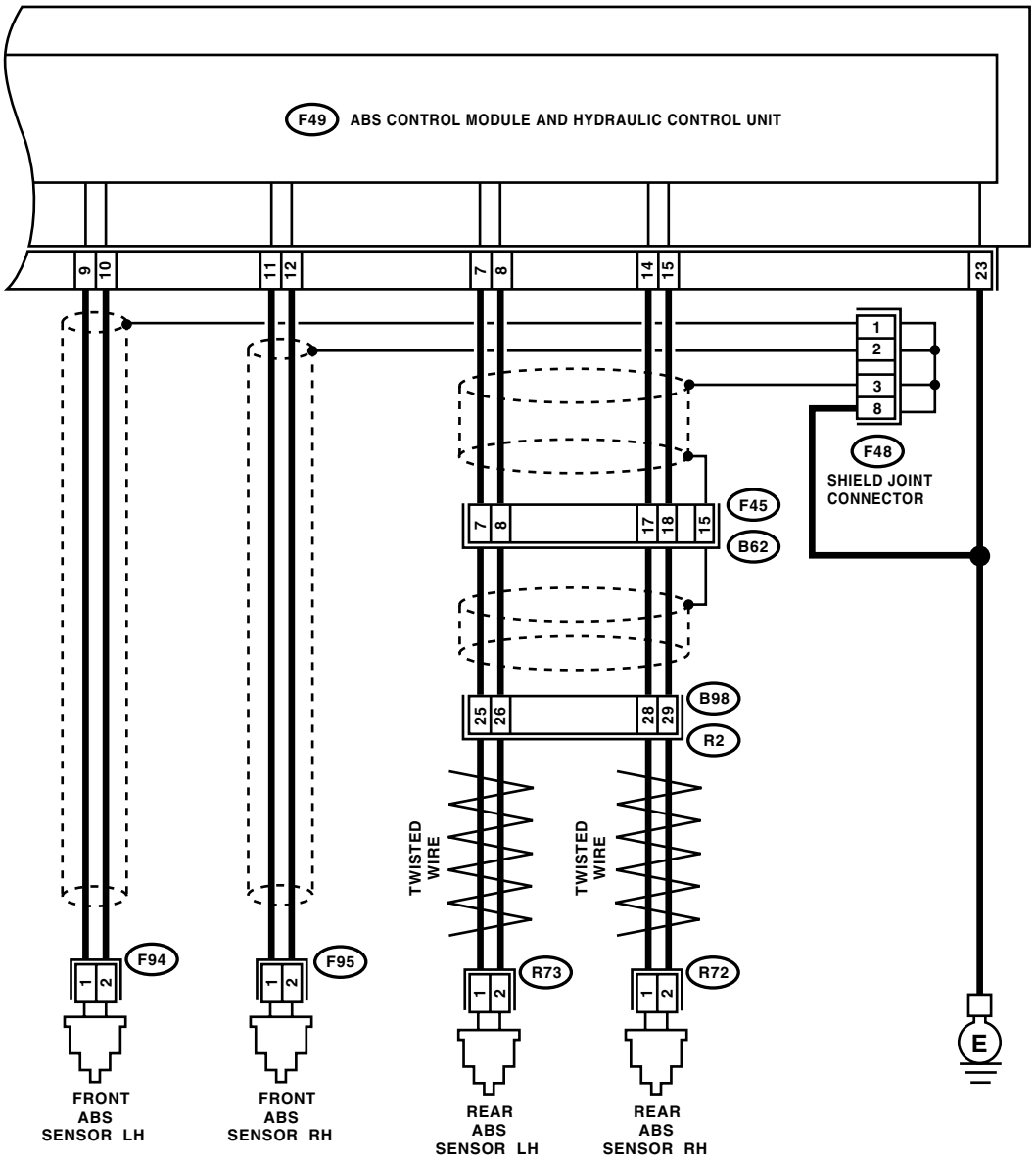
WIRING DIAGRAM:
LHD MODEL

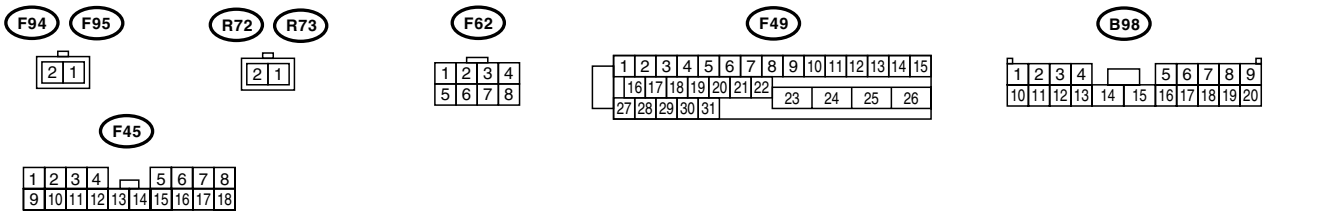




ABS00219

RHD MODEL





ABS00224

	Step	Value	Yes	No
1	**CHECK IF THE WHEELS HAVE TURNED FREELY FOR A LONG TIME.** Check if the wheels have been turned freely for more than one minute, such as when vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface.	Wheels have not been turned freely.	Go to step **2.**	The ABS is normal. Erase the DTC. NOTE: When the wheels turn freely for a long time, such as when vehicle is towed or jacked-up, or when steering wheel is continuously turned all way, this trouble code may sometimes occur.
2	**CHECK TIRE SPECIFICATIONS.** Turn the ignition switch to OFF. Are the tire specifications correct?	Tire specifications are correct.	Go to step **3.**	Replace the tire.
3	**CHECK WEAR OF TIRE.** Is the tire worn excessively?	Tire is not worn excessively.	Go to step **4.**	Replace the tire.
4	**CHECK TIRE PRESSURE.** Is the tire pressure correct?	Tire pressure is correct.	Go to step **5.**	Adjust the tire pressure.
5	**CHECK INSTALLATION OF ABS SENSOR.** Are the ABS sensor installation bolts tightened securely?	33 N·m (3.4 kgf-m, 24.6 ft-lb)	Go to step **6.**	Tighten the ABS sensor installation bolts securely.
6	**CHECK ABS SENSOR GAP.** Measure the tone wheel to ABS sensor piece gap over entire perimeter of the wheel. Is the measured value within specified value?	Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **7.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
7	**PREPARE OSCILLOSCOPE.** Is an oscilloscope available?	Oscilloscope is available.	Go to step **8.**	Go to step **9.**

	Step	Value	Yes	No
8	**CHECK ABS SENSOR SIGNAL.** 1)Raise all four wheels off ground. 2)Turn the ignition switch to OFF. 3)Connect the oscilloscope to connector (B6), (B99) or (F94) in accordance with DTC. 4)Turn the ignition switch to ON. 5)Rotate the wheels and measure voltage at specified frequency. <Ref. to ABS-17, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, ABSCM& H/U sometimes stores the DTC 29. ***Connector & terminal*** ***Front RH*** ***LHD: (B6) No. 1 (+) — No. 2 (–):*** ***RHD: (F95) No. 1 (+) — No. 2 (–):*** ***Front LH*** ***LHD: (F94) No. 1 (+) — No. 2 (–):*** ***RHD: (F94) No. 1 (+) — No. 2 (–):*** ***Rear RH*** ***LHD: (B98) No. 18 (+) — No. 19 (–):*** ***RHD: (B98) No. 28 (+) — No. 29 (–):*** ***Rear LH*** ***LHD: (B98) No. 7 (+) — No. 8 (–):*** ***RHD: (B98) No. 25 (+) — No. 26 (–):*** Is the measured value as specified value?	Oscilloscope pattern is smooth, as shown in the figure.	Go to step **12.**	Go to step **9.**
9	**CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.** Remove the disc rotor or drum from hub. Is the ABS sensor piece or tone wheel contaminated by dirt or other foreign matter?	ABS sensor piece or tone wheel is not contaminated.	Go to step **10.**	Thoroughly remove dirt or other foreign matter.
10	**CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.** Are there broken or damaged teeth in the ABS sensor piece or tone wheel?	There are no broken or damaged in the ABS sensor piece or tone wheel.	Go to step **11.**	Replace the ABS sensor or tone wheel. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.> and Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>
11	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout. Is the measured value less than specified value?	0.05 mm (0.0020 in)	Go to step **12.**	Replace the tone wheel. Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>

	Step	Value	Yes	No
12	**CHECK ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Connect all connectors. 3)Erase the memory. 4)Perform the inspection mode. 5)Read out the DTC. Is the same DTC as in the current diagnosis still being output?	Same DTC is not output.	Go to step **13.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

L: DTC 31
— FRONT RIGHT INLET VALVE MALFUNCTION —

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-125, DTC 37 — REAR LEFT INLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>

M: DTC 33
— FRONT LEFT INLET VALVE MALFUNCTION —

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-125, DTC 37 — REAR LEFT INLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>

N: DTC 35
— REAR RIGHT INLET VALVE MALFUNCTION —

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-125, DTC 37 — REAR LEFT INLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>

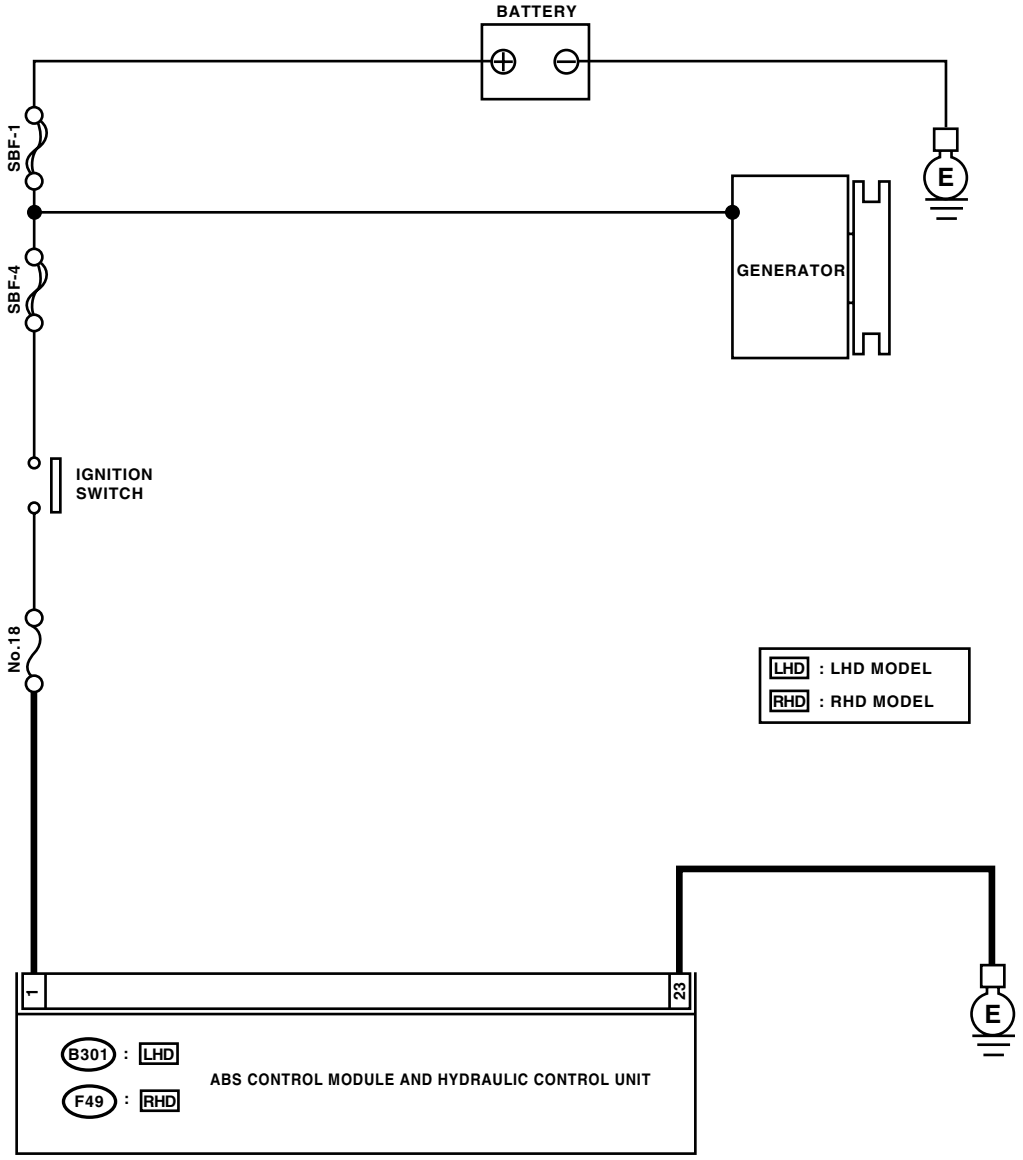
O: DTC 37
— REAR LEFT INLET VALVE MALFUNCTION —

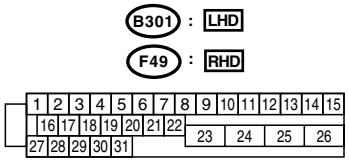
DIAGNOSIS:
- Faulty harness/connector
- Faulty inlet solenoid valve

TROUBLE SYMPTOM:
- ABS does not operate.
- EBD does not operate.

NOTE:
In addition to the ABS warning light, brake warning light illuminates.

WIRING DIAGRAM:





ABS00229

	Step	Value	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Run the engine at idle. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 1 (+) — Chassis ground (–):*** ***RHD: (F49) No. 1 (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 15 V	Go to step **2.**	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 23 — Chassis ground:*** ***RHD: (F49) No. 23 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **4.**	Repair the connector.
4	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in the current diagnosis still being output?	Same DTC is not output.	Go to step **5.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
5	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

P: DTC 32
— FRONT RIGHT OUTLET VALVE MALFUNCTION —

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-129, DTC 38 — REAR LEFT OUTLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>

Q: DTC 34
— FRONT LEFT OUTLET VALVE MALFUNCTION —

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-129, DTC 38 — REAR LEFT OUTLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>

R: DTC 36
— REAR RIGHT OUTLET VALVE MALFUNCTION —

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-129, DTC 38 — REAR LEFT OUTLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>

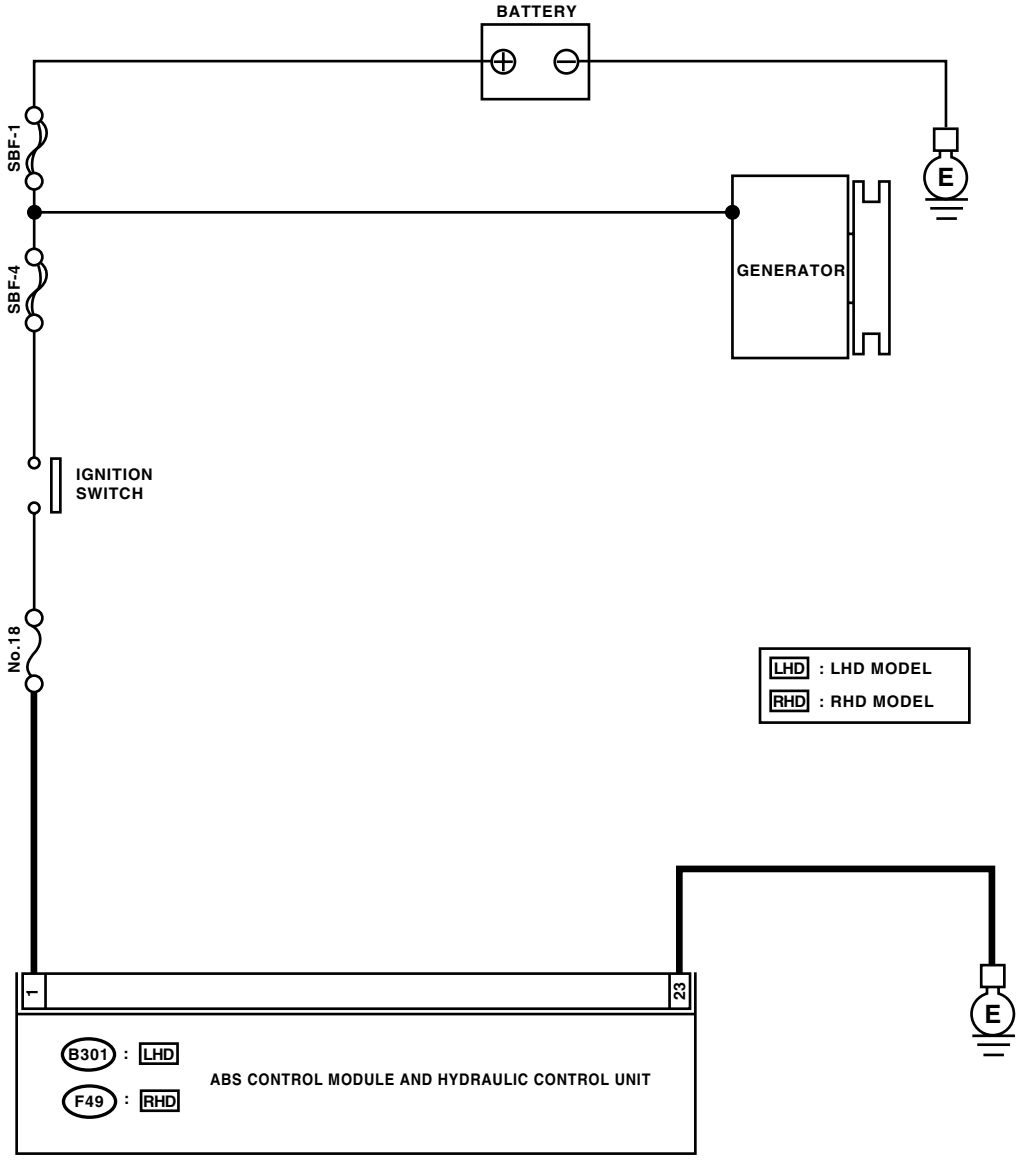
S: DTC 38
— REAR LEFT OUTLET VALVE MALFUNCTION —

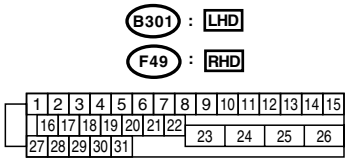
DIAGNOSIS:
- Faulty harness/connector
- Faulty outlet solenoid valve

TROUBLE SYMPTOM:
- ABS does not operate.
- EBD does not operate.

NOTE:
In addition to the ABS warning light, brake warning light illuminates.

WIRING DIAGRAM:





ABS00229

	Step	Value	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Run the engine at idle. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 1 (+) — Chassis ground (–):*** ***RHD: (F49) No. 1 (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 15 V	Go to step **2.**	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 23 — Chassis ground:*** ***RHD: (F49) No. 23 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **4.**	Repair the connector.
4	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in the current diagnosis still being output?	Same DTC is not output.	Go to step **5.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
5	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

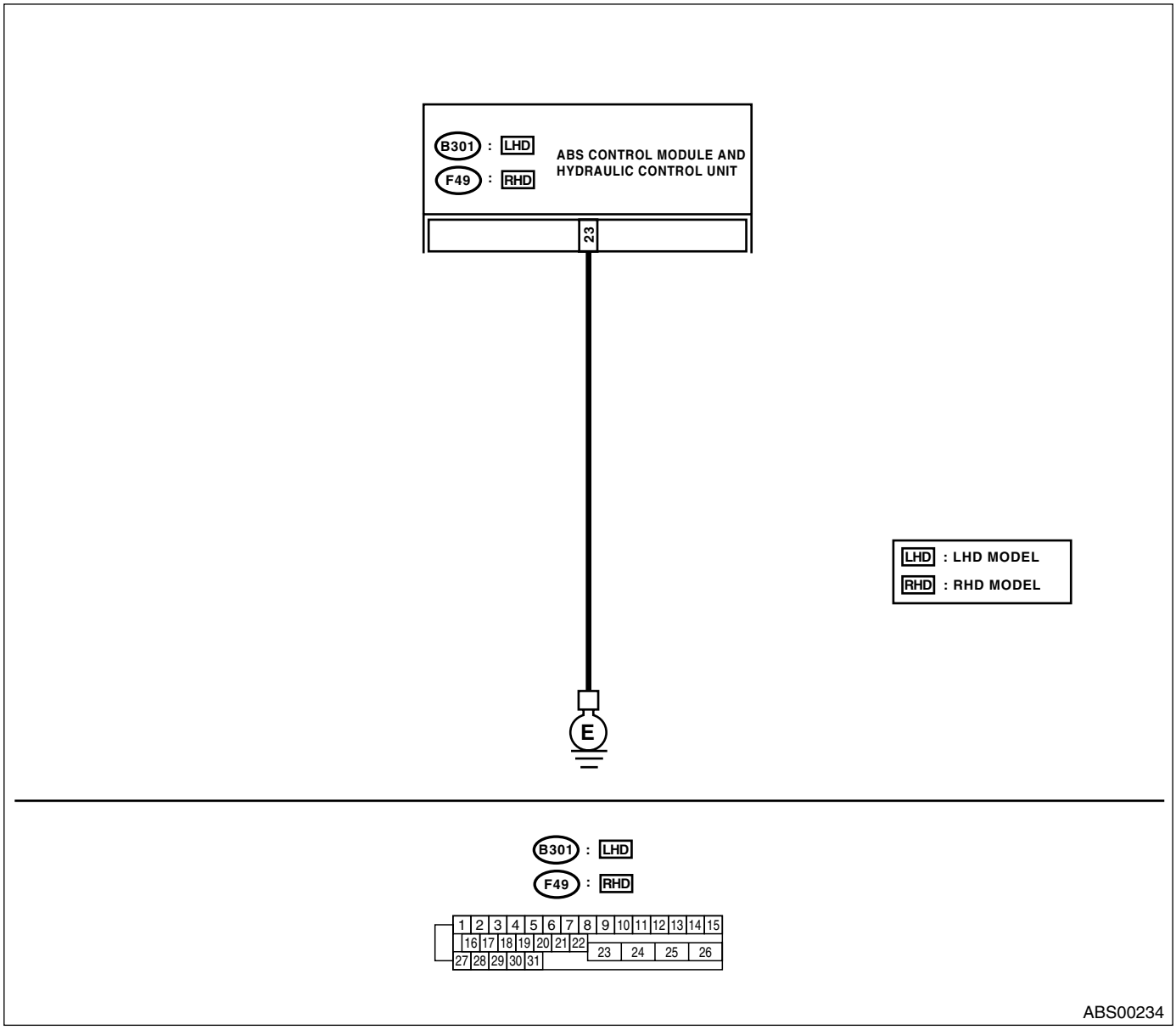
T: DTC 41
— ABS CONTROL MODULE MALFUNCTION —

DIAGNOSIS:
- Faulty ABSCM&H/U

TROUBLE SYMPTOM:
- ABS does not operate.
- EBD does not operate.

NOTE:
In addition to the ABS warning light, brake warning light illuminates.

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 23 — Chassis ground:*** ***RHD: (F49) No. 23 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **2.**	Repair the ABSCM&H/U ground harness.
2	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between battery, ignition switch and ABSCM&H/U?	There is no poor contact.	Go to step **3.**	Repair the connector.
3	**CHECK SOURCES OF SIGNAL NOISE.** Is the car telephone or wireless transmitter properly installed?	Correctly installed.	Go to step **4.**	Properly install the car telephone or wireless transmitter.
4	**CHECK SOURCES OF SIGNAL NOISE.** Are noise sources (such as an antenna) installed near the sensor harness?	Not installed.	Go to step **5.**	Install the noise sources apart from sensor harness.
5	**CHECK ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Connect all connectors. 3)Erase the memory. 4)Perform the inspection mode. 5)Read out the DTC. Is the same DTC as in current diagnosis still being output?	Same DTC is not output.	Go to step **6.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

U: DTC 42
— POWER SUPPLY VOLTAGE TOO LOW —

DIAGNOSIS:

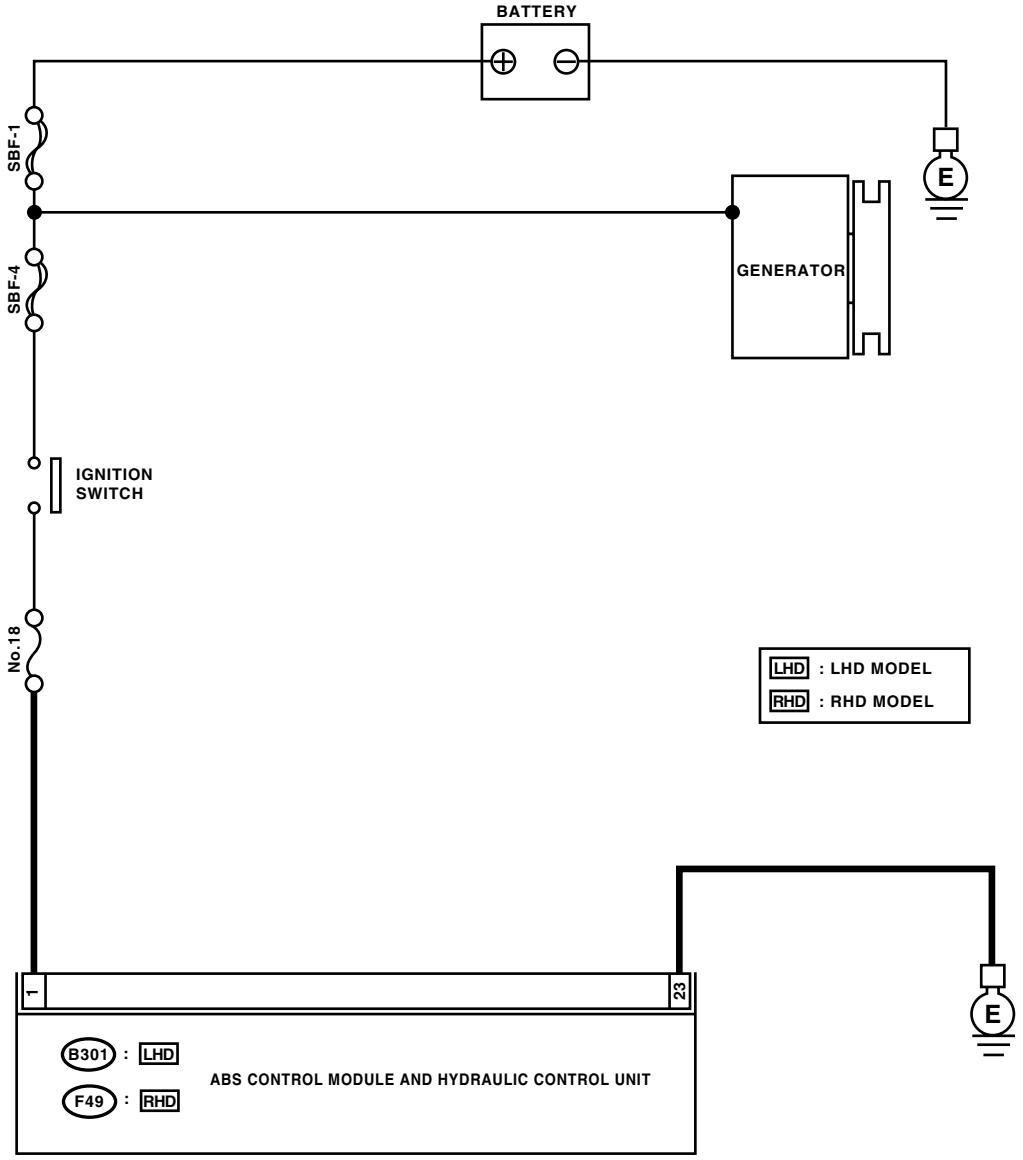
- Power source voltage of the ABSCM&H/U is low.

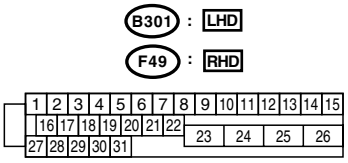
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:
In addition to the ABS warning light, brake warning light illuminates temporarily. Both warning lights go off on the recovery of voltage.

WIRING DIAGRAM:





ABS00229

	Step	Value	Yes	No
1	**CHECK GENERATOR.** 1)Start the engine. 2)Idle after warm-up. 3)Measure the voltage between generator B terminal and chassis ground. ***Terminal*** ***Generator B terminal (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 15 V	Go to step **2.**	Repair the generator. <Ref. to SC(SOHC)-15, Generator.>
2	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF. Are the positive and negative battery terminals tightly clamped?	Tightly clamped.	Go to step **3.**	Tighten the clamp of terminal.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1)Disconnect the connector from ABSCM&H/U. 2)Run the engine at idle. 3)Operate the electric load applying devices, such as the headlight, A/C, and defogger. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 1 (+) — Chassis ground (–):*** ***RHD: (F49) No. 1 (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 15 V	Go to step **4.**	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
4	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 23 — Chassis ground:*** ***RHD: (F49) No. 23 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **5.**	Repair the ABSCM&H/U ground harness.
5	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **6.**	Repair the connector.
6	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in the current diagnosis still being output?	Same DTC is not output.	Go to step **7.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

V: DTC 42
— POWER SUPPLY VOLTAGE TOO HIGH —

DIAGNOSIS:

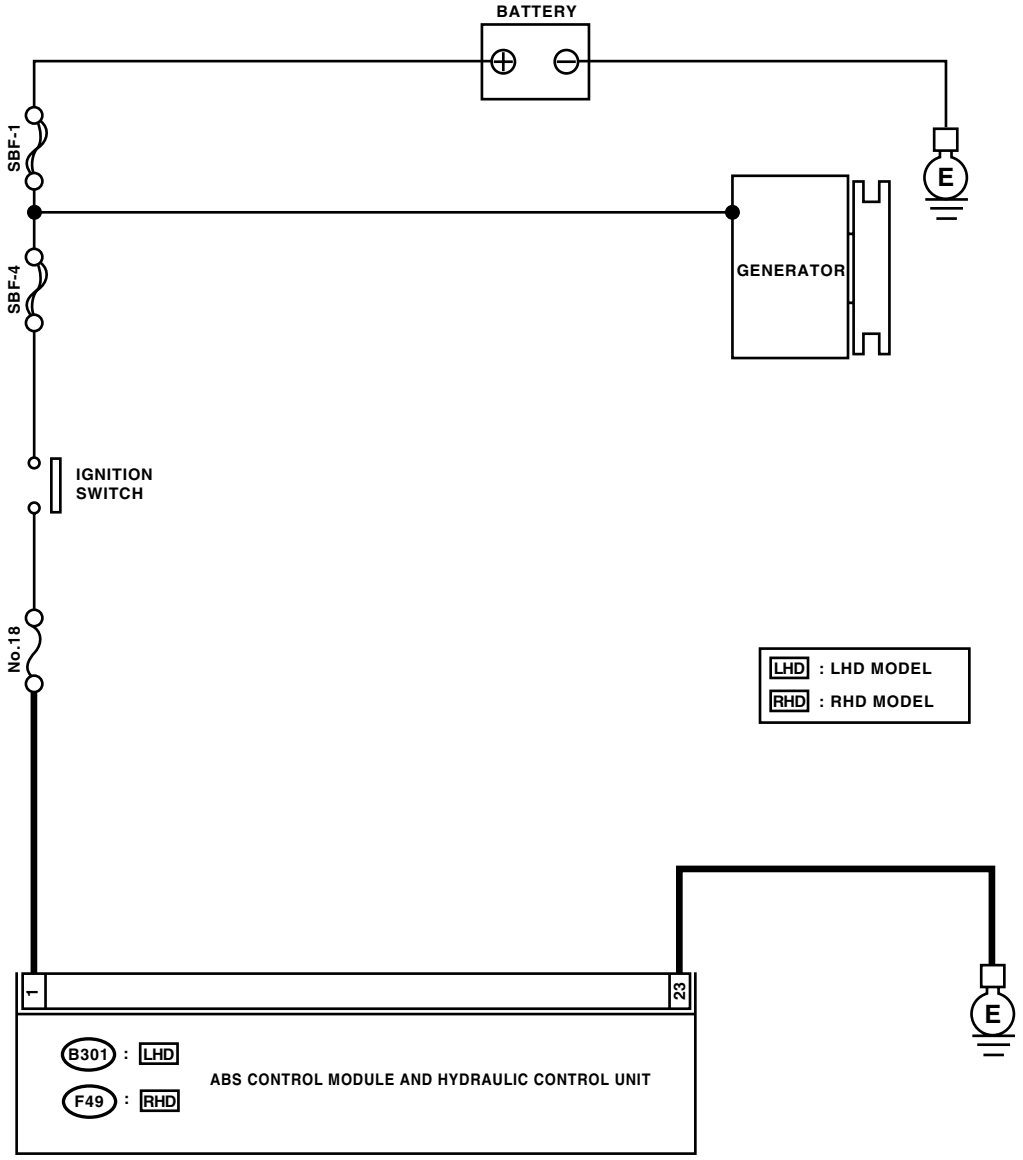
- Power source voltage of the ABSCM&H/U is high.

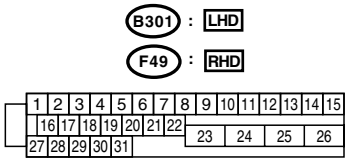
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:
In addition to the ABS warning light, brake warning light illuminates temporarily. Both warning lights go off on the recovery of voltage.

WIRING DIAGRAM:





ABS00229

	Step	Value	Yes	No
1	**CHECK GENERATOR.** 1)Start the engine. 2)Idle after warm-up. 3)Measure the voltage between generator B terminal and chassis ground. ***Terminal*** ***Generator B terminal (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 17 V	Go to step **2.**	Repair the generator. <Ref. to SC(SOHC)-15, Generator.>
2	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF. Are the positive and negative battery terminals tightly clamped?	Tightly clamped.	Go to step **3.**	Tighten the clamp of terminal.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1)Disconnect the connector from ABSCM&H/U. 2)Run the engine at idle. 3)Operate the electric load applying devices, such as the headlight, A/C, and defogger. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 1 (+) — Chassis ground (–):*** ***RHD: (F49) No. 1 (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 17 V	Go to step **4.**	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
4	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 23 — Chassis ground:*** ***RHD: (F49) No. 23 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **5.**	Repair the ABSCM&H/U ground harness.
5	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **6.**	Repair the connector.
6	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in the current diagnosis still being output?	Same DTC is not output.	Go to step **7.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

W: DTC 44
— ABS-AT CONTROL (NON CONTROLLED) —

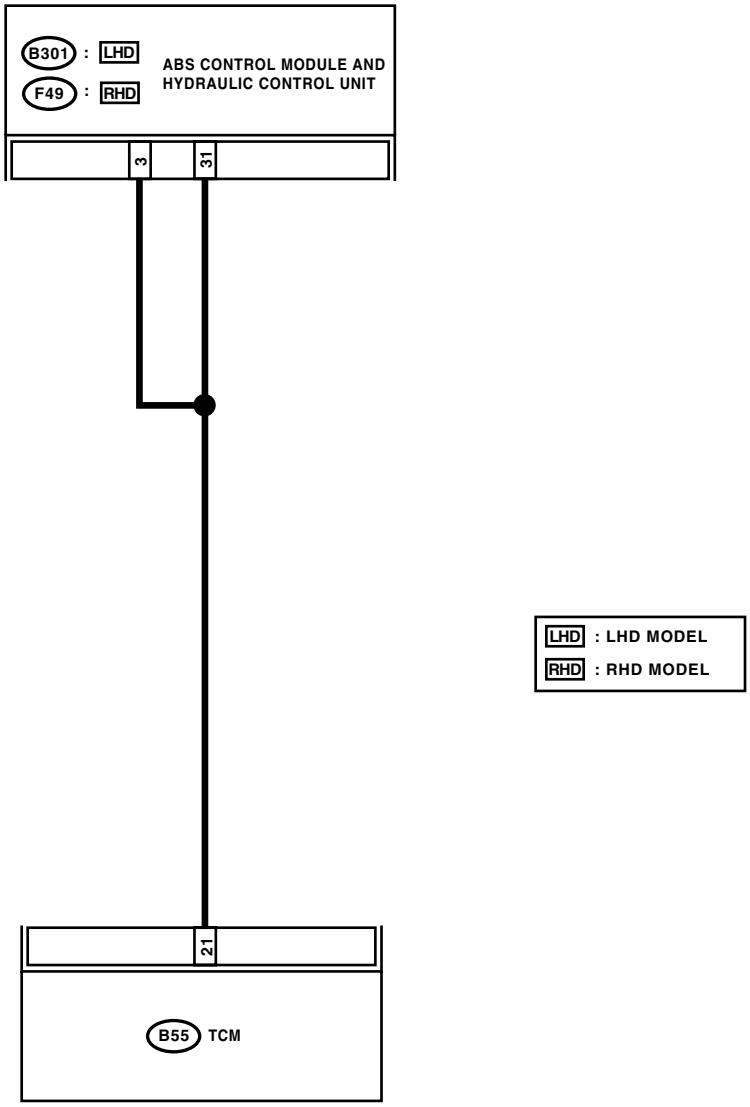
DIAGNOSIS:

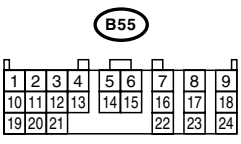
- Combination of AT control faults

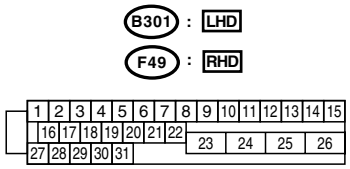
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:







ABS00239

	Step	Value	Yes	No
1	**CHECK SPECIFICATIONS OF THE ABSCM&H/U.** Check specifications of the mark on the ABSCM&H/U. ***CO: AT*** ***CP: MT*** Does the vehicle specification and ABSCM&H/U specification match?	Specifications are match.	Go to step **2.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2	**CHECK GROUND SHORT OF HARNESS.** 1)Turn the ignition switch to OFF. 2)Disconnect the two connectors from TCM. 3)Disconnect the connector from ABSCM&H/U. 4)Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 3 — Chassis ground:*** ***RHD: (F49) No. 3 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **3.**	Repair the harness between TCM and ABSCM&H/U.
3	**CHECK TCM.** 1)Connect all connectors to TCM. 2)Turn the ignition switch to ON. 3)Measure the voltage between TCM connector terminal and chassis ground. ***Connector & terminal*** ***(B55) No. 21 (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 15 V	Go to step **5.**	Go to step **4.**
4	**CHECK AT.** Is the AT functioning normally?	AT functioning normally.	Replace the TCM.	Repair the AT.
5	**CHECK OPEN CIRCUIT OF HARNESS.** Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD:*** ***(B301) No. 3 (+) — Chassis ground (–):*** ***(B301) No. 31 (+) — Chassis ground (–):*** ***RHD:*** ***(F49) No. 3 (+) — Chassis ground (–):*** ***(F49) No. 31 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **6.**	Repair the harness/connector between TCM and ABSCM&H/U.
6	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between TCM and ABSCM&H/U?	There is no poor contact.	Go to step **7.**	Repair the connector.
7	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in the current diagnosis still being output?	Same DTC is not output.	Go to step **8.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
8	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

X: DTC 44
— ABS-AT CONTROL (CONTROLLED) —

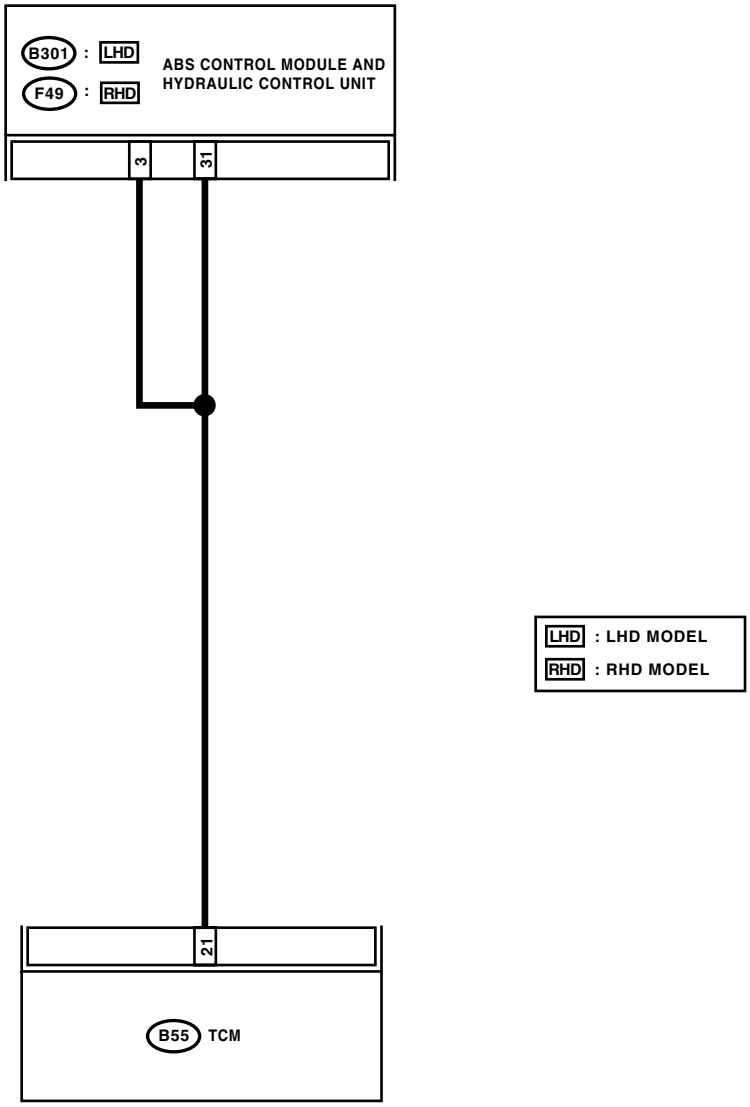
DIAGNOSIS:

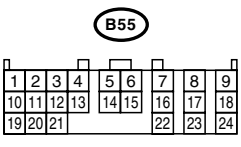
- Combination of AT control faults

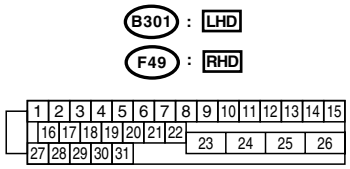
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:







ABS00239

	Step	Value	Yes	No
1	**CHECK BATTERY SHORT OF HARNESS.** 1)Turn the ignition switch to OFF. 2)Disconnect all connectors from TCM. 3)Disconnect the connector from ABSCM&H/U. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 3 (+) — Chassis ground (–):*** ***RHD: (F49) No. 3 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **2.**	Repair the harness between TCM and ABSCM&H/U.
2	**CHECK BATTERY SHORT OF HARNESS.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 3 (+) — Chassis ground (–):*** ***RHD: (F49) No. 3 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **3.**	Repair the harness between TCM and ABSCM&H/U.
3	**CHECK OPEN CIRCUIT OF HARNESS.** 1)Turn the ignition switch to OFF. 2)Connect all connectors to TCM. 3)Turn the ignition switch to ON. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD:*** ***(B301) No. 3 (+) — Chassis ground (–):*** ***(B301) No. 31 (+) — Chassis ground (–):*** ***RHD:*** ***(F49) No. 3 (+) — Chassis ground (–):*** ***(F49) No. 31 (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 13 V	Go to step **4.**	Repair the harness/connector between TCM and ABSCM&H/U.
4	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF. Is there poor contact in connectors between TCM and ABSCM&H/U?	There is no poor contact.	Go to step **5.**	Repair the connector.
5	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in current diagnosis still being output?	Same DTC is not output.	Go to step **6.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

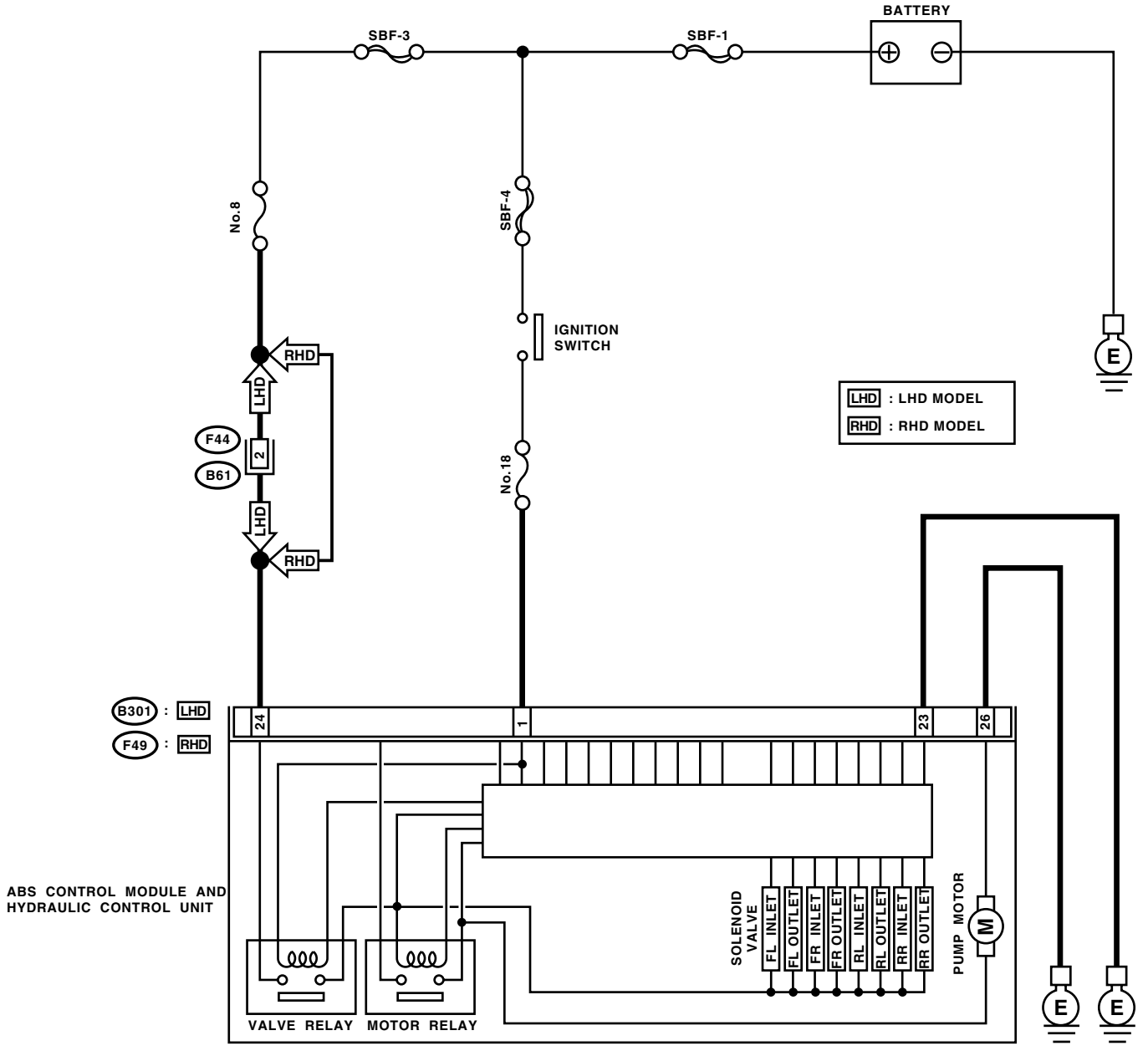
Y: DTC 51
— VALVE RELAY MALFUNCTION —

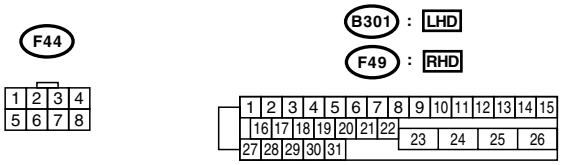
DIAGNOSIS:
- Faulty valve relay

TROUBLE SYMPTOM:
- ABS does not operate.
- EBD does not operate.

NOTE:
In addition to the ABS warning light, brake warning light illuminates.

WIRING DIAGRAM:





ABS00244

	Step	Value	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Run the engine at idle. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD:*** ***(B301) No. 1 (+) — Chassis ground (–):*** ***(B301) No. 24 (+) — Chassis ground (–):*** ***RHD:*** ***(F49) No. 1 (+) — Chassis ground (–):*** ***(F49) No. 24 (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 15 V	Go to step **2.**	Repair the harness connector between battery and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 23 — Chassis ground:*** ***RHD: (F49) No. 23 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **4.**	Repair the connector.
4	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in current diagnosis still being output?	Same DTC is not output.	Go to step **5.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
5	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

Z: DTC 51
— VALVE RELAY ON FAILURE —

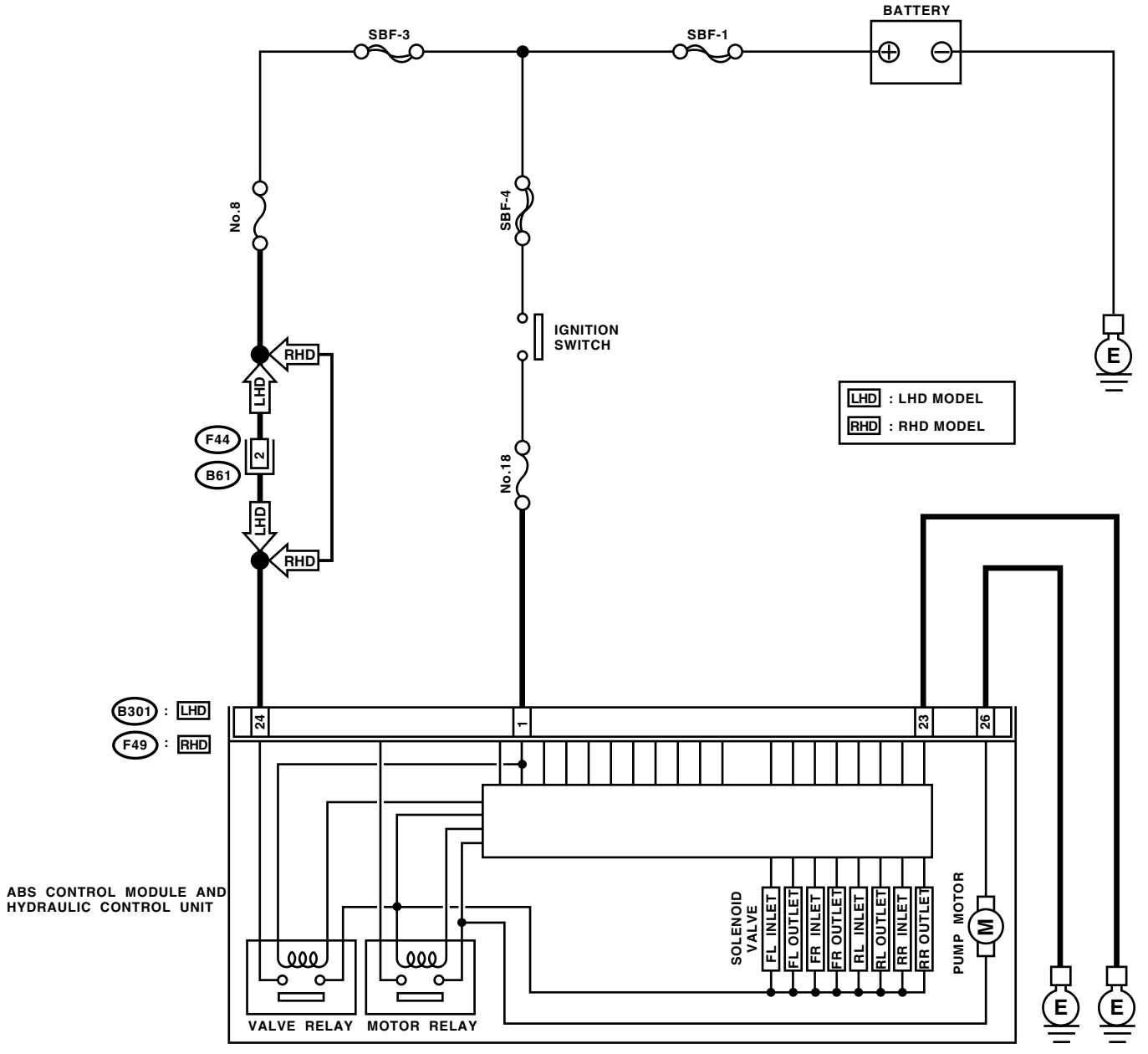
DIAGNOSIS:

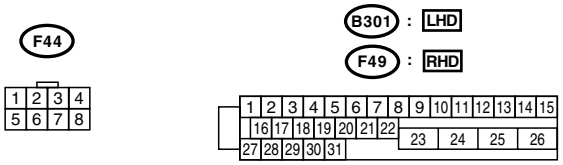
- Faulty valve relay

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00244

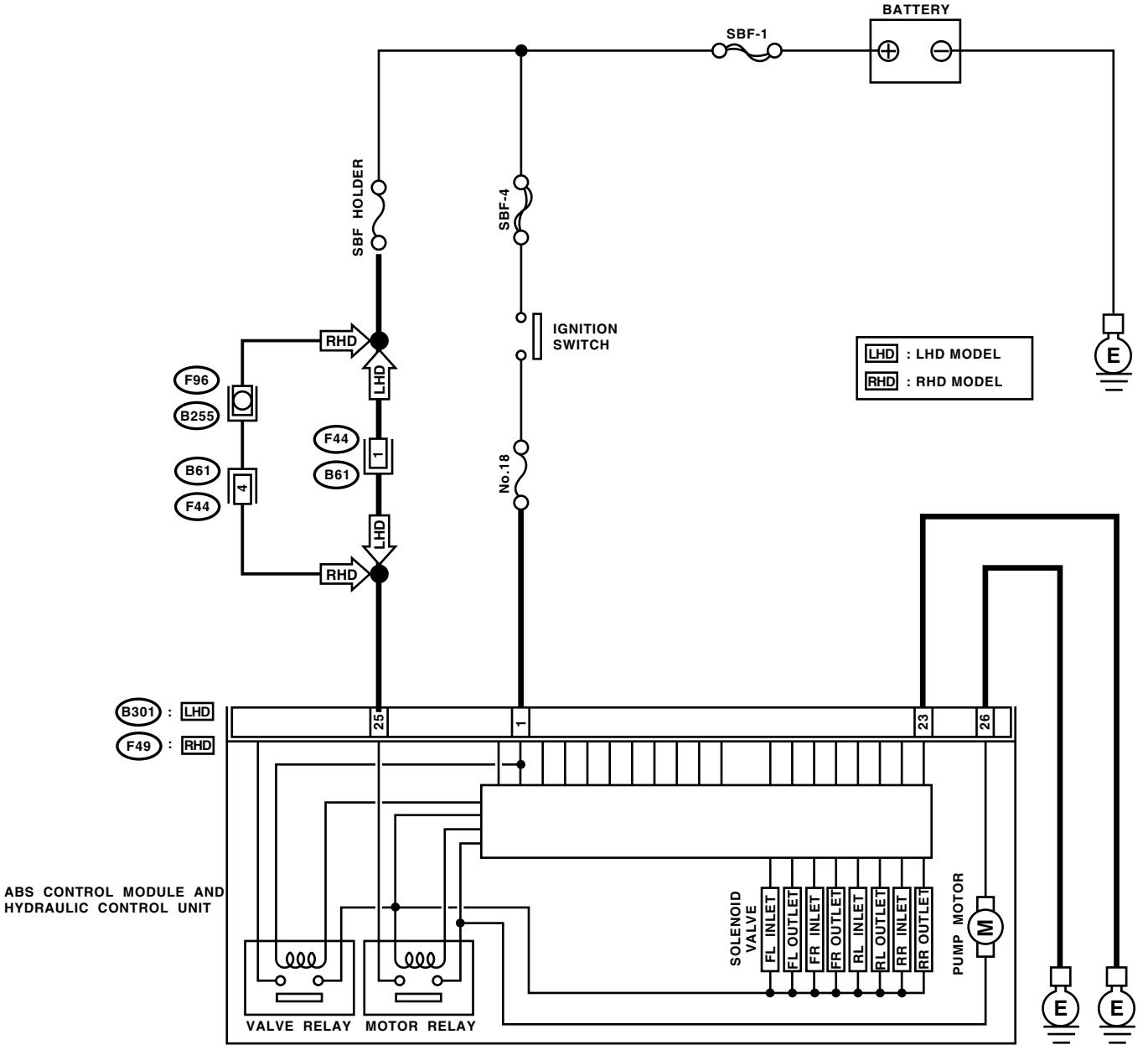
	Step	Value	Yes	No
1	**CHECK VALVE RELAY IN ABSCM&H/U.** 1)Disconnect the connector from ABSCM&H/U. 2)Measure the resistance between ABSCM&H/U terminals. ***Terminals*** ***No. 23 — No. 24:*** Is the measured value more than specified value?	1 MΩ	Go to step **2.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **3.**	Repair the connector.
3	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in current diagnosis still being output?	Same DTC is not output.	Go to step **4.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

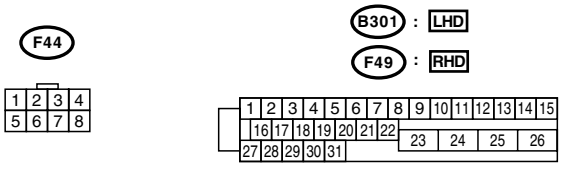
AA:DTC 52
— OPEN CIRCUIT IN MOTOR RELAY CIRCUIT —

DIAGNOSIS:
- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:





ABS00249

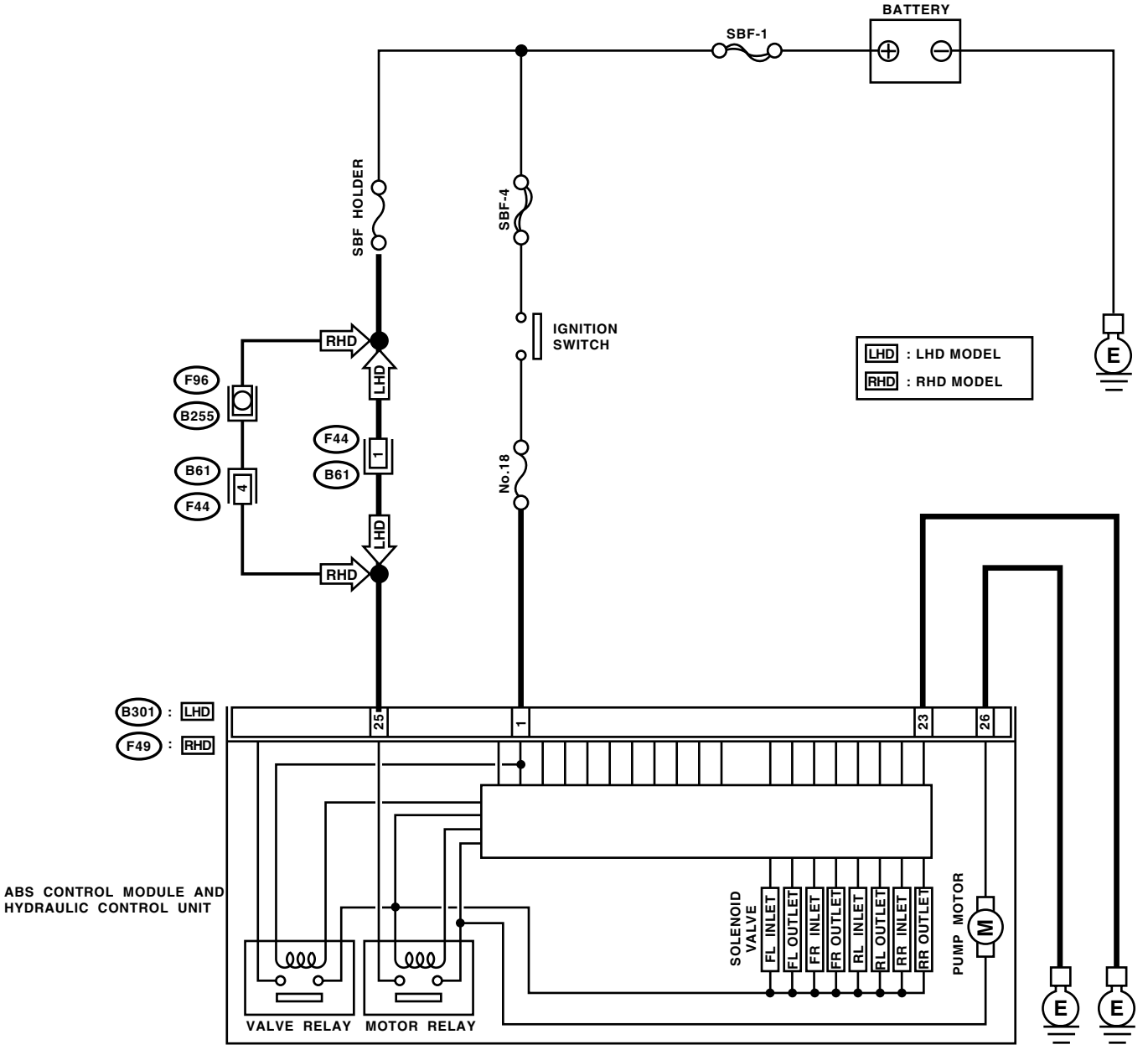
	Step	Value	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Turn the ignition switch to ON. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 25 (+) — Chassis ground (–):*** ***RHD: (F49) No. 25 (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 13 V	Go to step **2.**	Repair the harness/connector between battery and ABSCM&H/U and check fuse SBF8.
2	**CHECK GROUND CIRCUIT OF MOTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 26 — Chassis ground:*** ***RHD: (F49) No. 26 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK MOTOR OPERATION.** Operate the sequence control. <Ref. to ABS-11, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate sequence control. Can motor revolution noise (buzz) be heard when carrying out the check sequence?	Motor revolution noise (buzz) can be heard.	Go to step **4.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF. Is there poor contact in connector between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **5.**	Repair the connector.
5	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in current diagnosis still being output?	Same DTC is not output.	Go to step **6.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

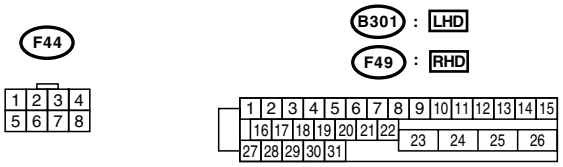
AB:DTC 52
— MOTOR RELAY ON FAILURE —

DIAGNOSIS:
- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:





ABS00249

	Step	Value	Yes	No
1	**CHECK MOTOR RELAY IN ABSCM&H/U.** 1)Disconnect the connector from ABSCM&H/U. 2)Measure the resistance between ABSCM&H/U terminals. ***Terminals*** ***No. 25 — No. 26:*** Is the measured value more than specified value?	1 MΩ	Go to step **2.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2	**CHECK MOTOR OPERATION.** Operate the sequence control. <Ref. to ABS-11, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate sequence control. Can motor revolution noise (buzz) be heard when carrying out the sequence control?	Motor revolution noise (buzz) can be heard.	Go to step **3.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
3	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF. Is there poor contact in connector between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **4.**	Repair the connector.
4	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in current diagnosis still being output?	Same DTC is not output.	Go to step **5.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
5	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact. NOTE: Although the ABS warning light remains illuminating at this point, this is a normal condition. Vehicle must be driven at approx. 12 km/h (7.46 MPH) or faster to turn off ABS warning light. Make sure that the ABS warning light goes off after driving vehicle.	Proceed with the diagnosis corresponding to DTC.

AC:DTC 52
— MOTOR MALFUNCTION —

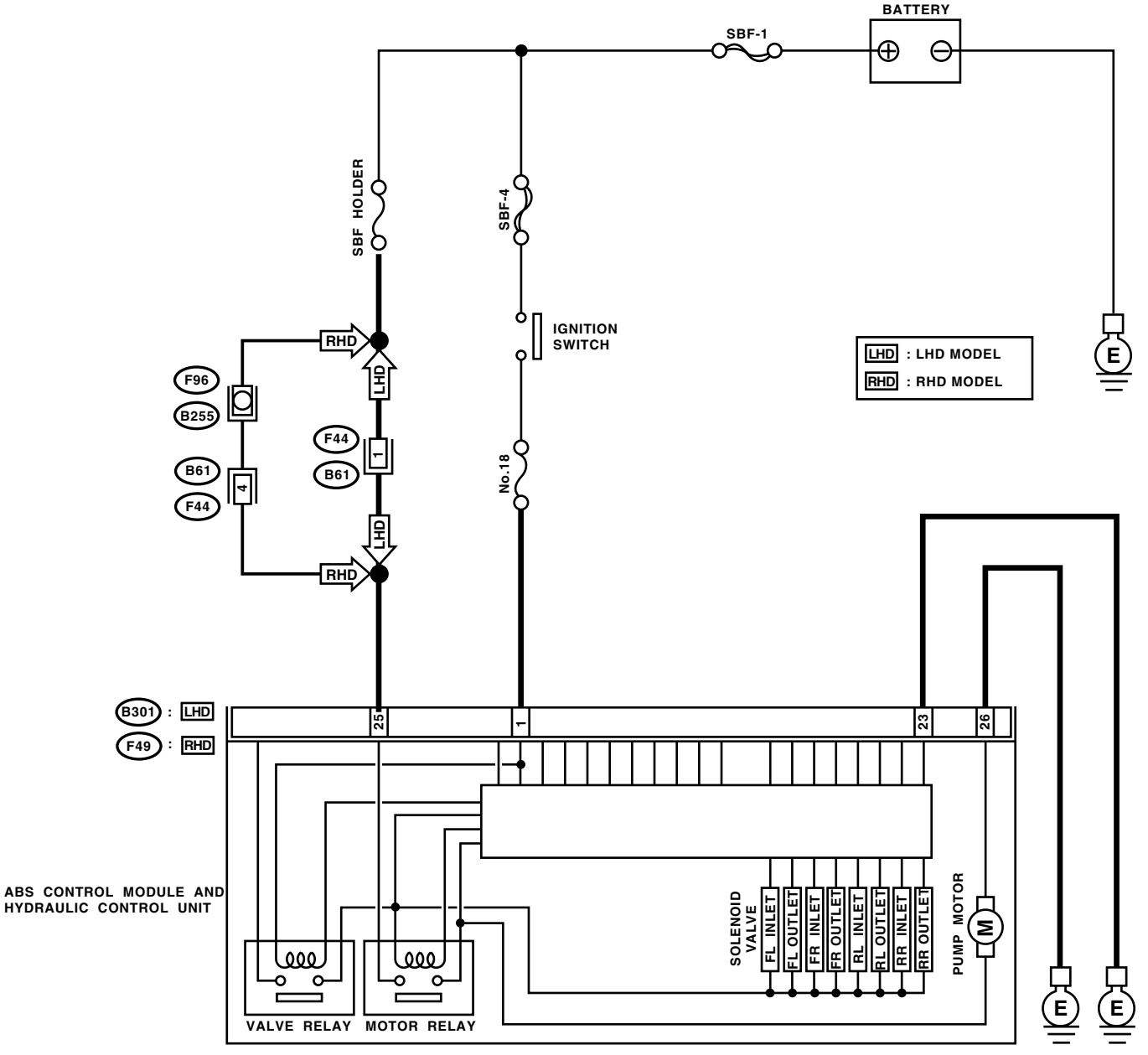
DIAGNOSIS:

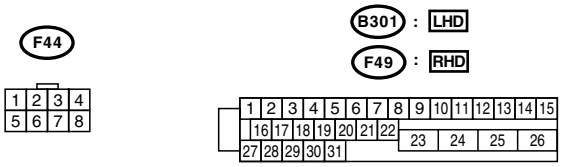
- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00249

	Step	Value	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Turn the ignition switch to ON. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 25 (+) — Chassis ground (–):*** ***RHD: (F49) No. 25 (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 13 V	Go to step **2.**	Repair the harness/connector between battery and ABSCM&H/U and check fuse SBF8.
2	**CHECK GROUND CIRCUIT OF MOTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 26 — Chassis ground:*** ***RHD: (F49) No. 26 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1)Run the engine at idle. 2)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 1 (+) — Chassis ground (–):*** ***RHD: (F49) No. 1 (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 15 V	Go to step **4.**	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
4	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 23 — Chassis ground:*** ***RHD: (F49) No. 23 — Chassis ground:*** Is the measured value less than specified value?	0.5 Ω	Go to step **5.**	Repair the ABSCM&H/U ground harness.
5	**CHECK MOTOR OPERATION.** Operate the sequence control. <Ref. to ABS-11, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate sequence control. Can motor revolution noise (buzz) be heard when carrying out the sequence control?	Motor revolution noise (buzz) can be heard.	Go to step **6.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF. Is there poor contact in connector between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step **7.**	Repair the connector.

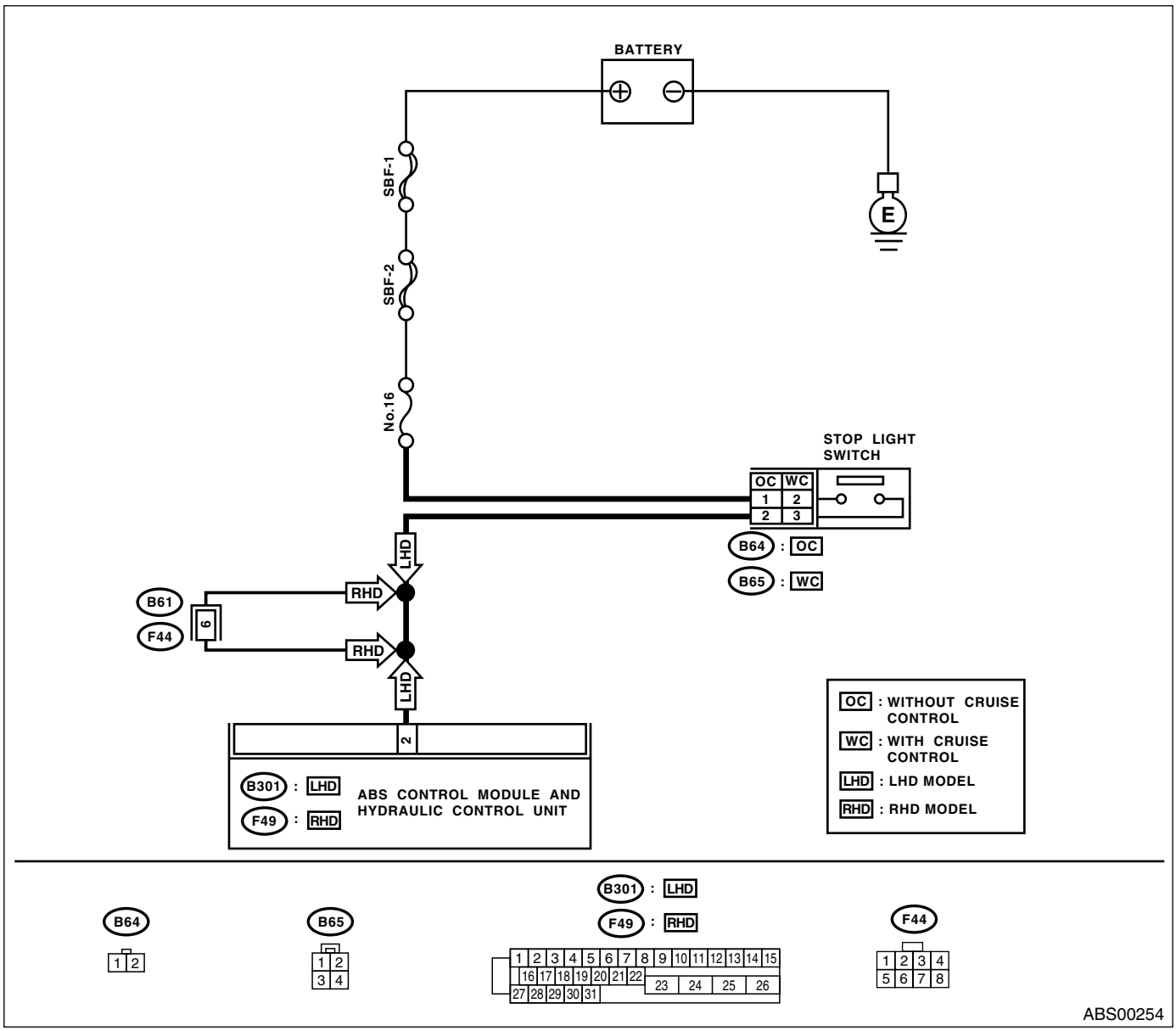
	Step	Value	Yes	No
7	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in current diagnosis still being output?	Same DTC is not output.	Go to step **8.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
8	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

AD:DTC 54
— STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION —

DIAGNOSIS:
- Faulty stop light switch

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:



Step		Value	Yes	No
1	**CHECK OUTPUT OF STOP LIGHT SWITCH USING SELECT MONITOR.** 1)Select “Current data display & Save” on the select monitor. 2)Release the brake pedal. 3)Read the stop light switch output in select monitor data display. Is the reading indicated on monitor display less than specified value?	1.5 V	Go to step **2.**	Go to step **3.**

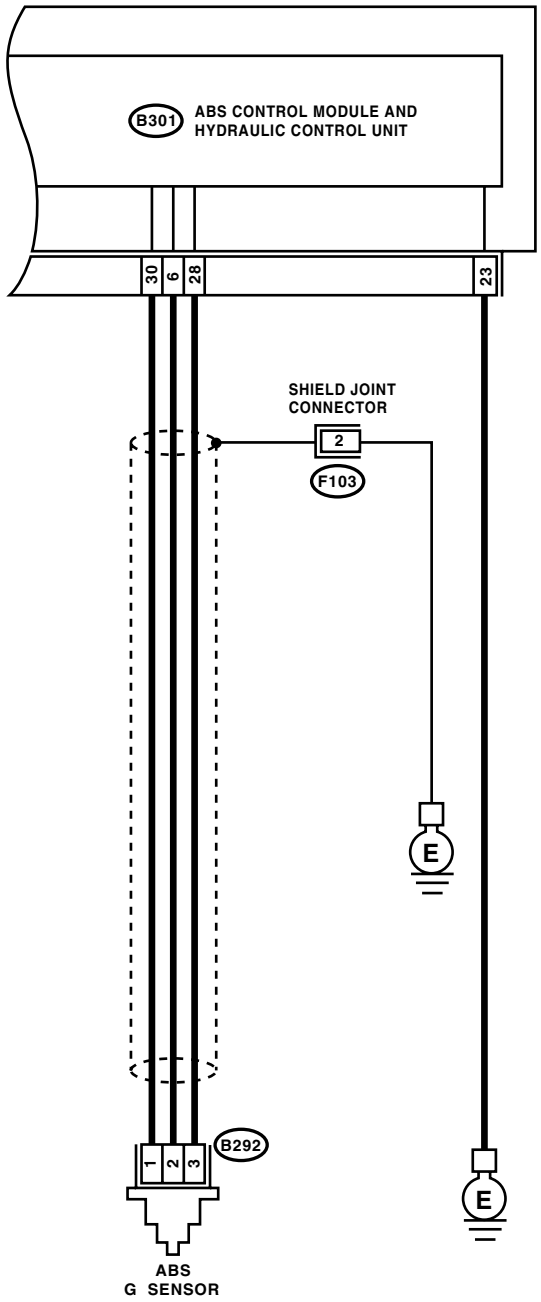
	Step	Value	Yes	No
2	**CHECK OUTPUT OF STOP LIGHT SWITCH USING SELECT MONITOR.** 1)Depress the brake pedal. 2)Read the stop light switch output in select monitor data display. Is the reading indicated on monitor display within specified value?	10 — 15 V	Go to step **5.**	Go to step **3.**
3	**CHECK IF STOP LIGHTS COME ON.** Depress the brake pedal. Do the stop lights turn on?	Stop lights turn on.	Go to step **4.**	Repair the stop lights circuit.
4	**CHECK OPEN CIRCUIT IN HARNESS.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Depress the brake pedal. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 2 (+) — Chassis ground (–):*** ***RHD: (F49) No. 2 (+) — Chassis ground (–):*** Is the measured value within specified value?	10 — 15 V	Go to step **5.**	Repair the harness between stop light switch and ABSCM&H/U connector.
5	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connector between stop light switch and ABSCM&H/U?	There is no poor contact.	Go to step **6.**	Repair the connector.
6	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in current diagnosis still being output?	Same DTC is not output.	Go to step **7.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

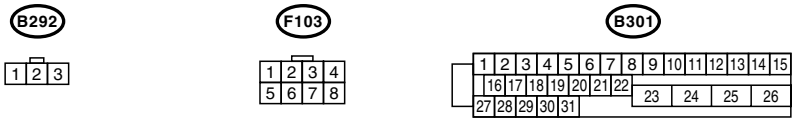
AE:DTC 56
— OPEN OR SHORT CIRCUIT IN G SENSOR CIRCUIT —

DIAGNOSIS:
- Faulty G sensor output voltage

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:
LHD MODEL





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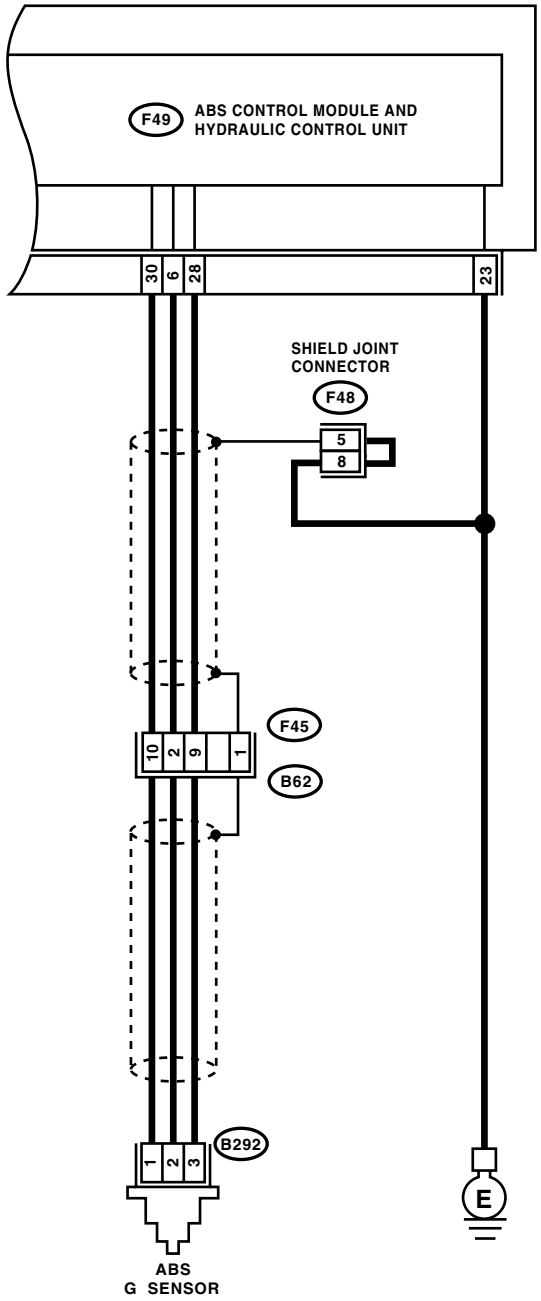
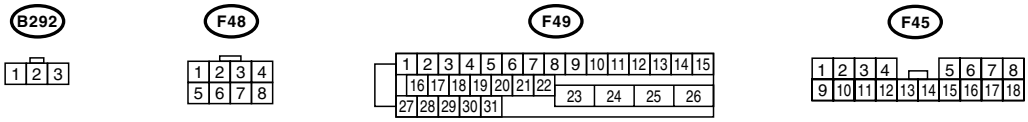
RHD MODEL





ABS00264

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.** 1)Select “Current data display & Save” on the select monitor. 2)Read the G sensor output in select monitor data display. Is the G sensor output on monitor display within specified value when G sensor is in horizontal position?	2.1 — 2.5 V	Go to step **2.**	Go to step **5.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connector between ABSCM&H/U and G sensor?	There is no poor contact.	Go to step **3.**	Repair the connector.
3	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in the current diagnosis still being output?	Same DTC is not output.	Go to step **4.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.
5	**CHECK INPUT VOLTAGE OF G SENSOR.** 1)Turn the ignition switch to OFF. 2)Remove the console box. 3)Remove the G sensor from vehicle. (Do not disconnect connector.) 4)Turn the ignition switch to ON. 5)Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 1 (+) — No. 3 (–):*** Is the measured value within specified value?	4.75 — 5.25 V	Go to step **6.**	Repair the harness/connector between G sensor and ABSCM&H/U.
6	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***LHD: (B301) No. 6 — No. 28:*** ***RHD: (F49) No. 6 — No. 28:*** Is the measured value within specified value?	5.0 — 5.6 kΩ	Go to step **7.**	Repair the harness/connector between G sensor and ABSCM&H/U.
7	**CHECK GROUND SHORT IN G SENSOR OUTPUT HARNESS.** 1)Disconnect the connector from G sensor. 2)Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 6 — Chassis ground:*** ***RHD: (F49) No. 6 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **8.**	Repair the harness between G sensor and ABSCM&H/U.

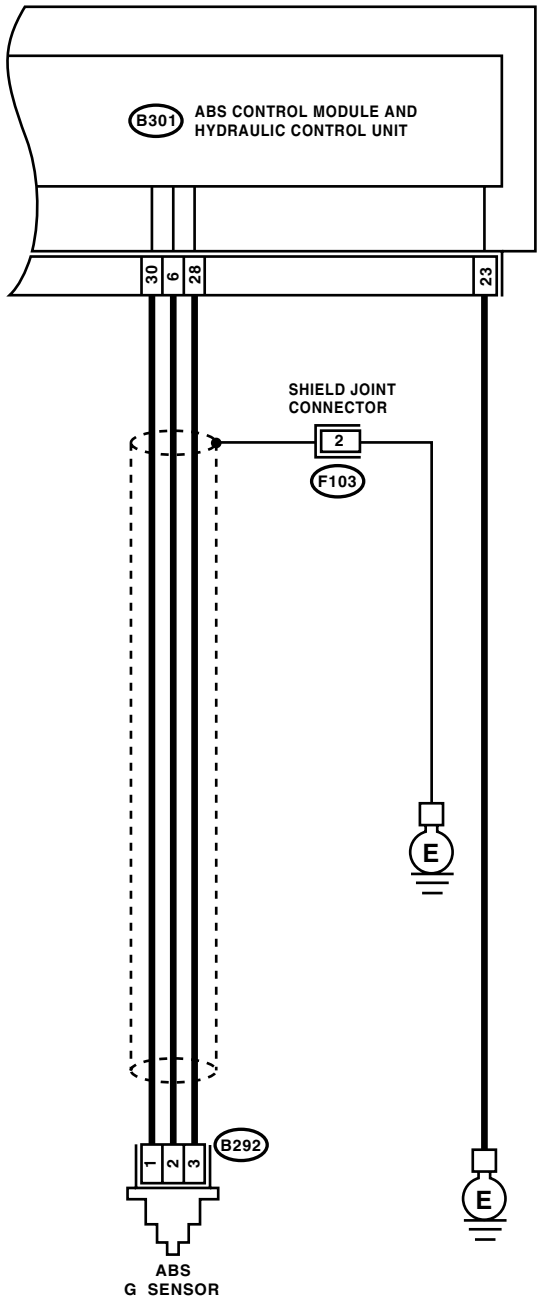
	Step	Value	Yes	No
8	**CHECK G SENSOR.** 1)Connect the connector to G sensor. 2)Connect the connector to ABSCM&H/U. 3)Turn the ignition switch to ON. 4)Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):*** Is the measured value within specified value when G sensor is in horizontal position?	2.1 — 2.5 V	Go to step **9.**	Replace the G sensor. <Ref. to ABS-22, G Sensor.>
9	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):*** Is the measured value within specified value when G sensor is inclined forwards to 90°?	3.7 — 4.1 V	Go to step **10.**	Replace the G sensor. <Ref. to ABS-22, G Sensor.>
10	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):*** Is the measured value within specified value when G sensor is inclined backwards to 90°?	0.5 — 0.9 V	Go to step **11.**	Replace the G sensor. <Ref. to ABS-22, G Sensor.>
11	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF. Is there poor contact in connector between ABSCM&H/U and G sensor?	There is no poor contact.	Go to step **12.**	Repair the connector.
12	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in current diagnosis still being output?	Same DTC is not output.	Go to step **13.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

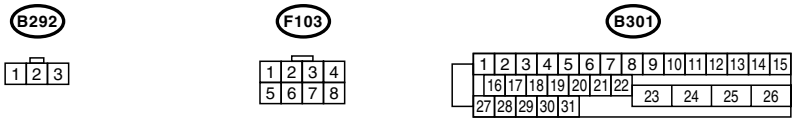
AF:DTC 56
— BATTERY SHORT IN G SENSOR CIRCUIT —

DIAGNOSIS:
- Faulty G sensor output voltage

TROUBLE SYMPTOM:
- ABS does not operate.

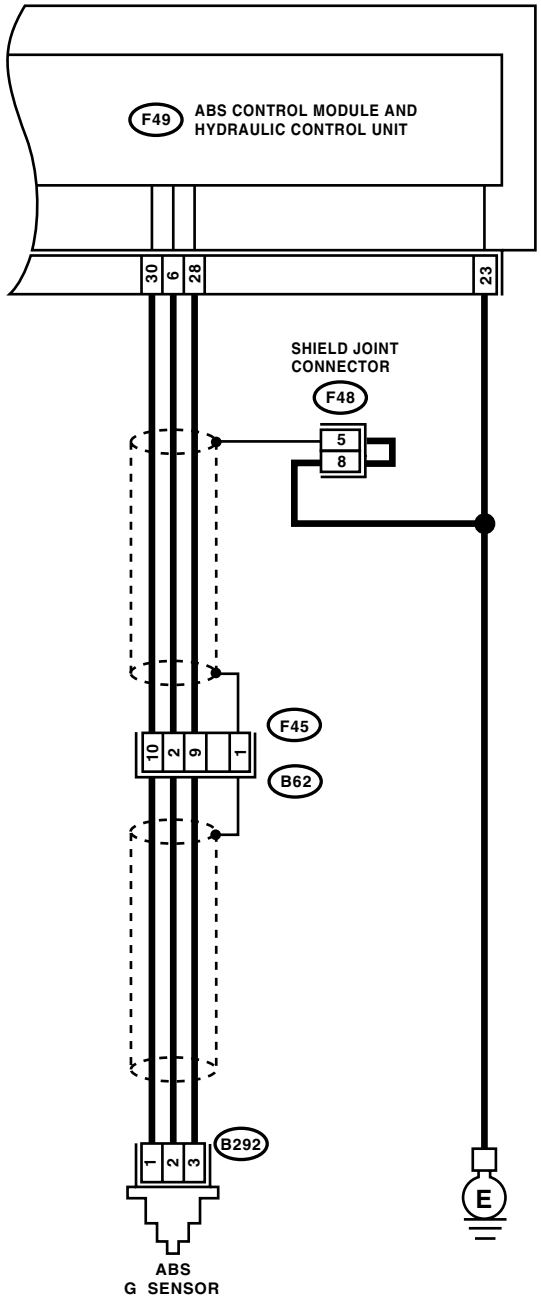
WIRING DIAGRAM:
LHD MODEL

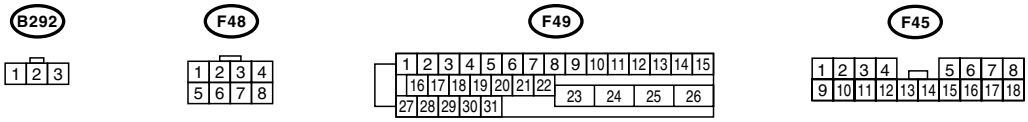




ABS00259

RHD MODEL





ABS00264

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Value	Yes	No
1	**CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.** 1)Select “Current data display & Save” on the select monitor. 2)Read the G sensor output in select monitor data display. Is the measured value within specified value when G sensor is in horizontal position?	2.1 — 2.5 V	Go to step **2.**	Go to step **5.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connector between ABSCM&H/U and G sensor?	There is no poor contact.	Go to step **3.**	Repair the connector.
3	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in current diagnosis still being output?	Same DTC is not output.	Go to step **4.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.
5	**CHECK FREEZE FRAME DATA.** 1)Select “Freeze frame data” on the select monitor. 2)Read front right wheel speed on the select monitor display. Is the front right wheel speed on monitor display 0 km/h (0 MPH)?	Monitor is displayed 0 km/h (0 MPH).	Go to step **6.**	Go to step **16.**
6	**CHECK FREEZE FRAME DATA.** Read front left wheel speed on the select monitor display. Is the front left wheel speed on monitor display 0 km/h (0 MPH)?	Monitor is displayed 0 km/h (0 MPH).	Go to step **7.**	Go to step **16.**
7	**CHECK FREEZE FRAME DATA.** Read rear right wheel speed on the select monitor display. Is the rear right wheel speed on monitor display 0 km/h (0 MPH)?	Monitor is displayed 0 km/h (0 MPH).	Go to step **8.**	Go to step **16.**
8	**CHECK FREEZE FRAME DATA.** Read rear left wheel speed on the select monitor display. Is the rear left wheel speed on monitor display 0 km/h (0 MPH)?	Monitor is displayed 0 km/h (0 MPH).	Go to step **9.**	Go to step **16.**
9	**CHECK FREEZE FRAME DATA.** Read G sensor output on the select monitor display. Is the G sensor output on monitor display more than specified value?	3.65 V	Go to step **10.**	Go to step **16.**
10	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***LHD: (B301) No. 6 — No. 28:*** ***RHD: (F49) No. 6 — No. 28:*** Is the measured value within specified value?	4.3 — 4.9 kΩ	Go to step **11.**	Repair the harness/connector between G sensor and ABSCM&H/U.

	Step	Value	Yes	No
11	**CHECK BATTERY SHORT OF HARNESS.** 1)Turn the ignition switch to OFF. 2)Remove the console box. 3)Disconnect the connector from G sensor. 4)Disconnect the connector from ABSCM&H/U. 5)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 6 (+) — Chassis ground (–):*** ***RHD: (F49) No. 6 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **12.**	Repair the harness between G sensor and ABSCM&H/U.
12	**CHECK BATTERY SHORT OF HARNESS.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 6 (+) — Chassis ground (–):*** ***RHD: (F49) No. 6 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Go to step **13.**	Repair the harness between G sensor and ABSCM&H/U.
13	**CHECK POOR CONTACT IN CONNECTORS.** Is there poor contact in connector between ABSCM&H/U and G sensor?	There is no poor contact.	Go to step **14.**	Repair the connector.
14	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in current diagnosis still being output?	Same DTC is not output.	Go to step **15.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
15	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.
16	**CHECK INPUT VOLTAGE OF G SENSOR.** 1)Turn the ignition switch to OFF. 2)Remove the console box. 3)Remove the G sensor from vehicle. (Do not disconnect connector.) 4)Turn the ignition switch to ON. 5)Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 1 (+) — No. 3 (–):*** Is the measured value within specified value?	4.75 — 5.25 V	Go to step **17.**	Repair the harness/connector between G sensor and ABSCM&H/U.

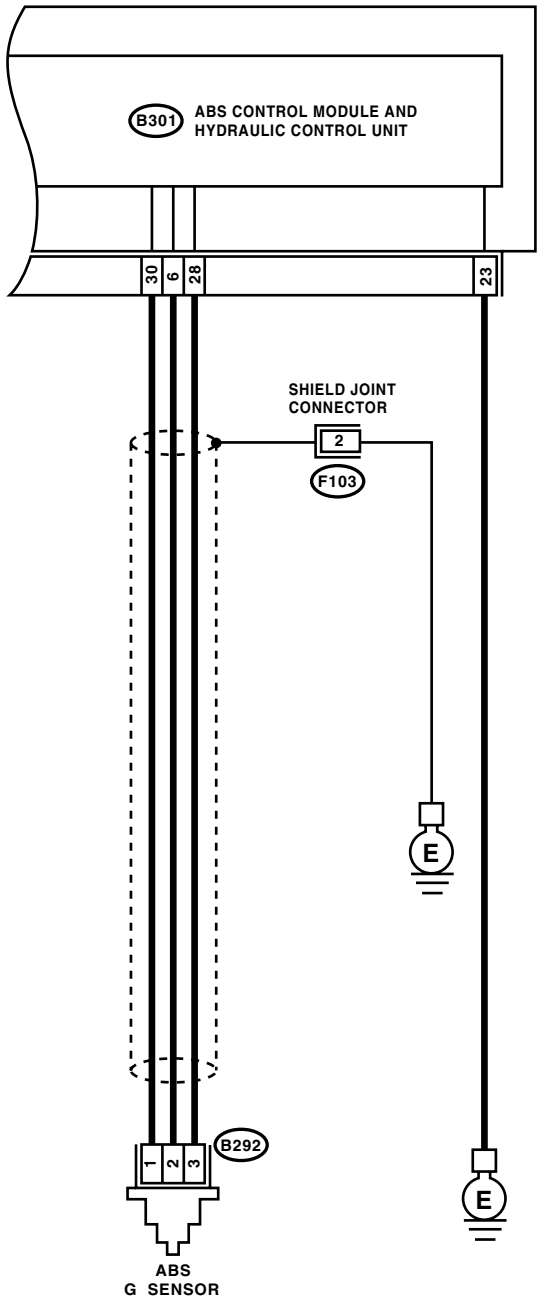
	Step	Value	Yes	No
17	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***LHD: (B301) No. 6 — No. 28:*** ***RHD: (F49) No. 6 — No. 28:*** Is the measured value within specified value?	5.0 — 5.6 kΩ	Go to step **18.**	Repair the harness/connector between G sensor and ABSCM&H/U.
18	**CHECK G SENSOR.** 1)Connect the connector to G sensor. 2)Connect the connector to ABSCM&H/U. 3)Turn the ignition switch to ON. 4)Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):*** Is the measured value within specified value when G sensor is in horizontal position?	2.1 — 2.5 V	Go to step **19.**	Replace the G sensor. <Ref. to ABS-22, G Sensor.>
19	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):*** Is the measured value within specified value when G sensor is inclined forwards to 90°?	3.7 — 4.1 V	Go to step **20.**	Replace the G sensor. <Ref. to ABS-22, G Sensor.>
20	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):*** Is the measured value within specified value when G sensor is inclined backwards to 90°?	0.5 — 0.9 V	Go to step **21.**	Replace the G sensor. <Ref. to ABS-22, G Sensor.>
21	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF. Is there poor contact in connector between ABSCM&H/U and G sensor?	There is no poor contact.	Go to step **22.**	Repair the connector.
22	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in current diagnosis still being output?	Same DTC is not output.	Go to step **23.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
23	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

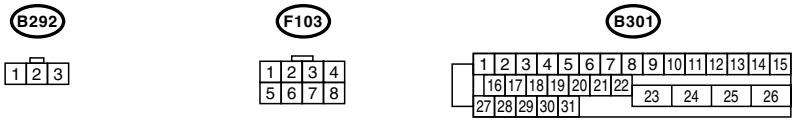
AG:DTC 56
— ABNORMAL G SENSOR HIGH μ OUTPUT —

DIAGNOSIS:
- Faulty G sensor output voltage

TROUBLE SYMPTOM:
- ABS does not operate.

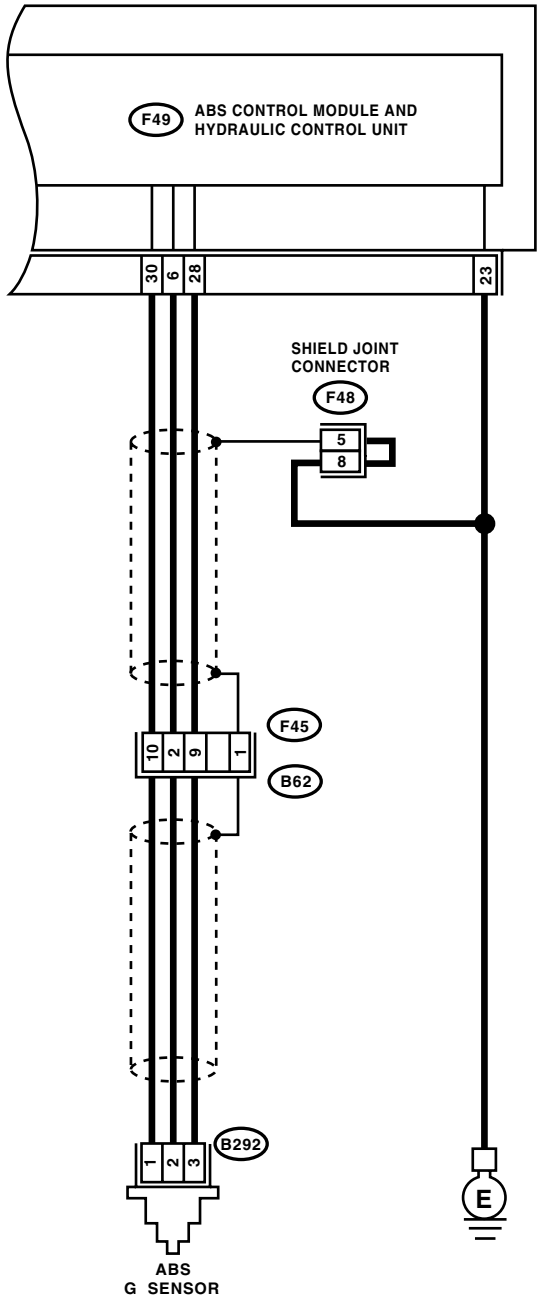
WIRING DIAGRAM:
LHD MODEL

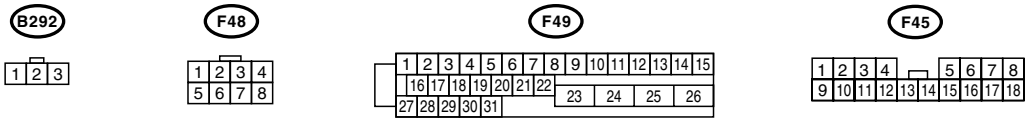




ABS00259

RHD MODEL





ABS00264

	Step	Value	Yes	No
1	**CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.** 1)Select “Current data display & Save” on the select monitor. 2)Read G sensor output on the select monitor display. Is the measured value within specified value when G sensor is in horizontal position?	2.1 — 2.5 V	Go to step **2.**	Go to step **6.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF. Is there poor contact in connector between ABSCM&H/U and G sensor?	There is no poor contact.	Go to step **3.**	Repair the connector.
3	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in current diagnosis still being output?	Same DTC is not output.	Go to step **4.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.
5	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***LHD: (B301) No. 6 — No. 28:*** ***RHD: (F49) No. 6 — No. 28:*** Is the measured value within specified value?	5.0 — 5.6 kΩ	Go to step **6.**	Repair the harness/connector between G sensor and ABSCM&H/U.
6	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD: (B301) No. 28 — Chassis ground:*** ***RHD: (F49) No. 28 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **7.**	Repair the harness between G sensor and ABSCM&H/U. Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7	**CHECK G SENSOR.** 1)Remove the console box. 2)Remove the G sensor from vehicle. 3)Connect the connector to G sensor. 4)Connect the connector to ABSCM&H/U. 5)Turn the ignition switch to ON. 6)Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):*** Is the measured value within specified value when G sensor is in horizontal position?	2.1 — 2.5 V	Go to step **8.**	Replace the G sensor. <Ref. to ABS-22, G Sensor.>

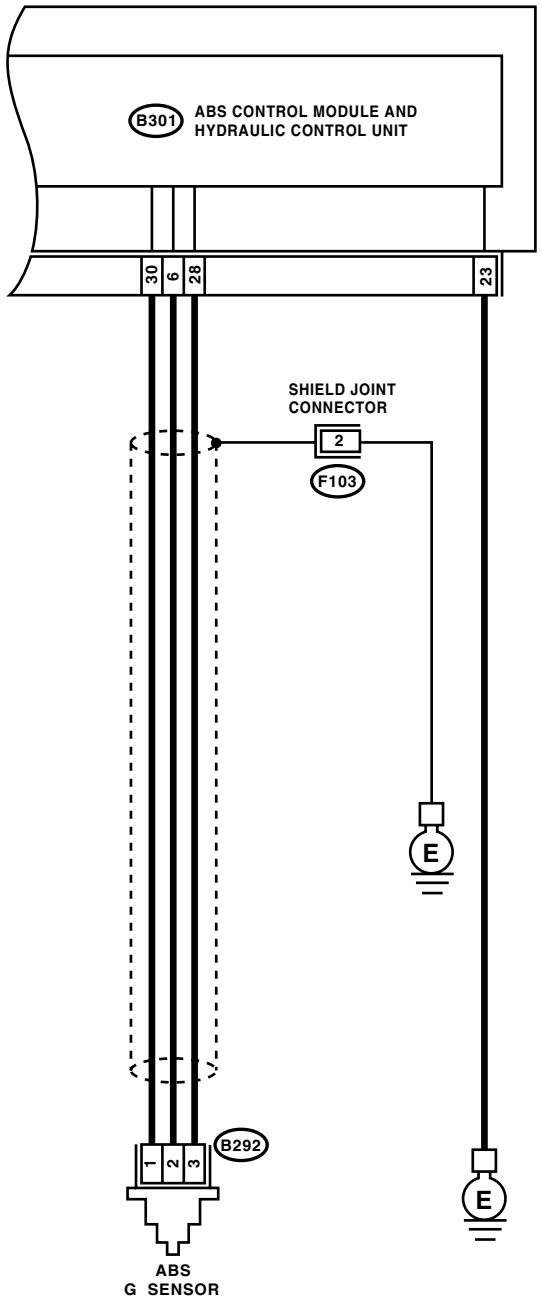
	Step	Value	Yes	No
8	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal (B292) No. 2 (+) — No. 3 (–):*** Is the measured value within specified value when G sensor is inclined forwards to 90°?	3.7 — 4.1 V	Go to step **9.**	Replace the G sensor. <Ref. to ABS-22, G Sensor.>
9	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal (B292) No. 2 (+) — No. 3 (–):*** Is the measured value within specified value when G sensor is inclined backwards to 90°?	0.5 — 0.9 V	Go to step **10.**	Replace the G sensor. <Ref. to ABS-22, G Sensor.>
10	**CHECK ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Connect all connectors. 3)Erase the memory. 4)Perform the inspection mode. 5)Read out the DTC. Is the same DTC as in current diagnosis still being output?	Same DTC is not output.	Go to step **11.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
11	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

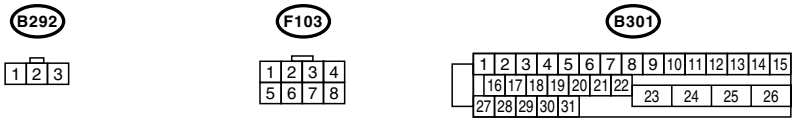
AH:DTC 56
— DETECTION OF G SENSOR STICK —

DIAGNOSIS:
- Faulty G sensor output voltage

TROUBLE SYMPTOM:
- ABS does not operate.

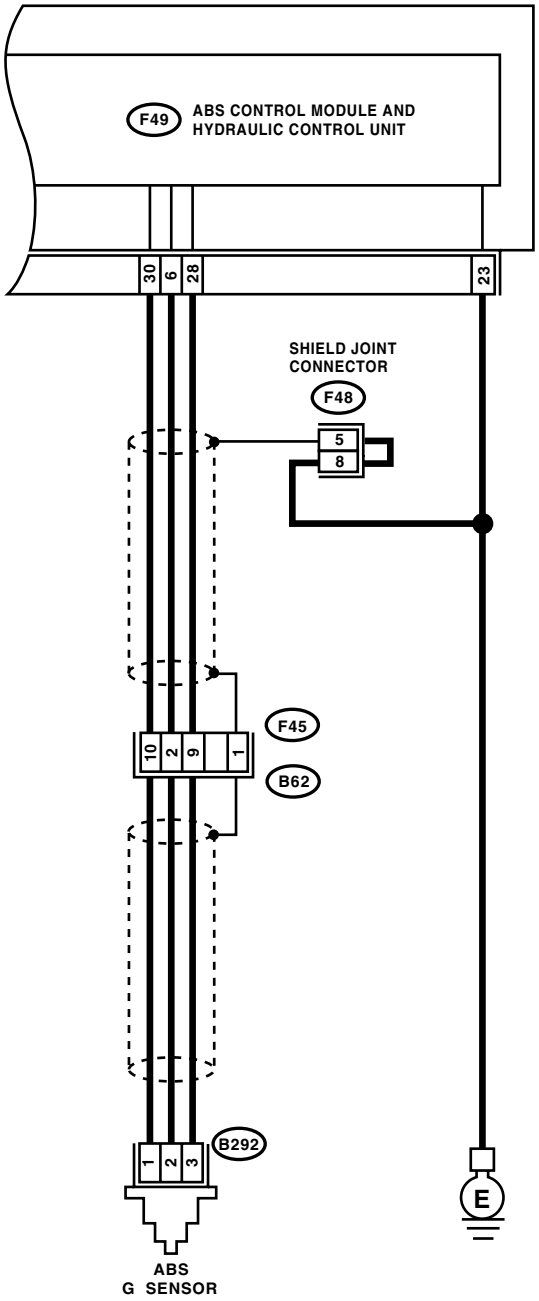
WIRING DIAGRAM:
LHD MODEL

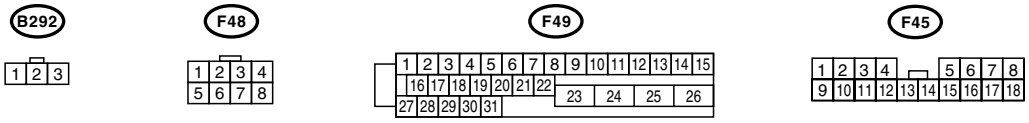




ABS00259

RHD MODEL





ABS00264

Step		Value	Yes	No
1	**CHECK ALL FOUR WHEELS FOR FREE TURNING.** Have the wheels been turned freely such as when vehicle is lifted up, or operated on a rolling road?	Wheels have not been turned freely.	Go to step **2.**	The ABS is normal. Erase the DTC.

	Step	Value	Yes	No
2	**CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.** 1)Select “Current data display & Save” on the select monitor. 2)Read the select monitor display. Is the G sensor output on monitor display within specified value when the vehicle is in horizontal position?	2.1 — 2.5 V	Go to step **3.**	Go to step **8.**
3	**CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.** 1)Turn the ignition switch to OFF. 2)Remove the console box. 3)Remove the G sensor from vehicle. (Do not disconnect the connector.) 4)Turn the ignition switch to ON. 5)Select “Current data display & Save” on the select monitor. 6)Read the select monitor display. Is the measured value within specified value when G sensor is inclined forwards to 90°?	3.7 — 4.1 V	Go to step **4.**	Replace the G sensor. <Ref. to ABS-22, G Sensor.>
4	**CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.** Read the select monitor display. Is the measured value within specified value when G sensor is inclined backwards to 90°?	0.5 — 0.9 V	Go to step **5.**	Replace the G sensor. <Ref. to ABS-22, G Sensor.>
5	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF. Is there poor contact in connector between ABSCM&H/U and G sensor?	There is no poor contact.	Go to step **6.**	Repair the connector.
6	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC. Is the same DTC as in current diagnosis still being output?	Same DTC is not output.	Go to step **7.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.
8	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***LHD: (B301) No. 6 — No. 28:*** ***RHD: (F49) No. 6 — No. 28:*** Is the measured value within specified value?	5.0 — 5.6 kΩ	Go to step **9.**	Repair the harness/connector between G sensor and ABSCM&H/U.

	Step	Value	Yes	No
9	**CHECK G SENSOR.** 1)Remove the console box. 2)Remove the G sensor from vehicle. 3)Connect the connector to G sensor. 4)Connect the connector to ABSCM&H/U. 5)Turn the ignition switch to ON. 6)Measure the voltage between G sensor connector terminals. ***Connector & terminal (B292) No. 2 (+) — No. 3 (–):*** Is the measured value within specified value when G sensor is in horizontal position?	2.1 — 2.5 V	Go to step **10.**	Replace the G sensor. <Ref. to ABS-22, G Sensor.>
10	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal (B292) No. 2 (+) — No. 3 (–):*** Is the measured value within specified value when G sensor is inclined forwards to 90°?	3.7 — 4.1 V	Go to step **11.**	Replace the G sensor. <Ref. to ABS-22, G Sensor.>
11	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal (B292) No. 2 (+) — No. 3 (–):*** Is the measured value within specified value when G sensor is inclined backwards to 90°?	0.5 — 0.9 V	Go to step **12.**	Replace the G sensor. <Ref. to ABS-22, G Sensor.>
12	**CHECK ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Connect all connectors. 3)Erase the memory. 4)Perform the inspection mode. 5)Read out the DTC. Is the same DTC as in current diagnosis still being output?	Same DTC is not output.	Go to step **13.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.** Are other DTCs being output?	Other DTC is not output.	A temporary poor contact.	Proceed with the diagnosis corresponding to DTC.

14.General Diagnostics Table

A: INSPECTION

Symptom		Probable faulty units/parts
Vehicle instability during braking	Vehicle pulls to either side.	• ABSCM&H/U (solenoid valve) • ABS sensor • Brake (caliper & piston, pads) • Wheel alignment • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections • Road surface (uneven, camber)
	Vehicle spins.	• ABSCM&H/U (solenoid valve) • ABS sensor • Brake (pads) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections
Poor braking	Long braking/stopping distance	• ABSCM&H/U (solenoid valve) • Brake (pads) • Air in brake line • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections
	Wheel locks.	• ABSCM&H/U (solenoid valve, motor) • ABS sensor • Incorrect wiring or piping connections
	Brake dragging	• ABSCM&H/U (solenoid valve) • ABS sensor • Master cylinder • Brake (caliper & piston) • Parking brake • Axle & wheels • Brake pedal play
	Long brake pedal stroke	• Air in brake line • Brake pedal play
	Vehicle pitching	• Suspension play or fatigue (reduced damping) • Incorrect wiring or piping connections • Road surface (uneven)
	Unstable or uneven braking	• ABSCM&H/U (solenoid valve) • ABS sensor • Brake (caliper & piston, pads) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections • Road surface (uneven)
Vibration and/or noise (while driving on slippery roads)	Excessive pedal vibration	• Incorrect wiring or piping connections • Road surface (uneven)
	Noise from ABSCM&H/U	• ABSCM&H/U (mount bushing) • ABS sensor • Brake piping
	Noise from front of vehicle	• ABSCM&H/U (mount bushing) • ABS sensor • Master cylinder • Brake (caliper & piston, pads, rotor) • Brake piping • Brake booster & check valve • Suspension play or fatigue
	Noise from rear of vehicle	• ABS sensor • Brake (caliper & piston, pads, rotor) • Parking brake • Brake piping • Suspension play or fatigue

BRAKE

BR

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1. General Description

A: SPECIFICATIONS

Front disc brake	Model	2.0X	2.5X (LHD)	2.0XT	2.5X (RHD)
	Type	Disc (Floating type, ventilated)			
	Effective disc diameter	228 mm (8.98 in)			
	Disc thickness × Outer diameter	24 × 277 mm (0.94 × 10.91 in)	24 × 294 mm (0.94 × 11.57 in)		
	Effective cylinder diameter	42.8 mm (1.685 in) × 2			
	Pad dimensions (length × width × thickness)	105.5 × 50.5 × 11.0 mm (4.154 × 1.988 × 0.433 in)			
	Clearance adjustment	Automatic adjustment			
Rear disc brake	Type	—		Disc (Floating type)	
	Effective disc diameter	—		230 mm (9.06 in)	
	Disc thickness × Outer diameter	—		10 × 266 mm (0.39 × 10.47 in)	
	Effective cylinder diameter	—		38.1 mm (1.500 in)	
	Pad dimensions (length × width × thickness)	—		82.4 × 33.7 × 9.0 mm (3.244 × 1.327 × 0.354 in)	
	Clearance adjustment	—		Automatic adjustment	
Rear drum brake	Type	Drum (Leading-Trailing type)		—	
	Effective drum diameter	228.6 mm (9 in)		—	
	Effective cylinder diameter	17.5 mm (0.689 in)		—	
	Lining dimensions (length × width × thickness)	219.4 × 35.0 × 4.1 mm (8.64 × 1.378 × 0.161 in)		—	
	Clearance adjustment	Automatic adjustment		—	
Master cylinder	Type	Tandem			
	Effective diameter	26.99 mm (1-1/16 in)			2.54 mm (1 in)
	Reservoir type	Sealed type			
	Brake fluid reservoir capacity	205 cm^3 (12.51 cu in)			
Brake booster	Type	Vacuum suspended			
	Effective diameter	“8 + 9” tandem type			
Proportioning valve	Split point	1,961 kPa (20 kg/cm^2, 285 psi)		—	
	Reducing ratio	0.3		—	
Brake line		Dual circuit system			
Brake fluid **CAUTION:** **• Avoid mixing brake fluid of different brands to prevent the fluid performance from degrading.** **• When brake fluid is supplemented, be careful not to allow any dust into the reservoir.** **• Use fresh DOT3 or 4 brake fluid when replacing or refilling the fluid.**		FMVSS No. 116, DOT3 or DOT4			

[ ] : ABS equipped vehicle.

NOTE:
Refer to “PB section” for parking brake SPECIFICATIONS. <Ref. to PB-2, SPECIFICATIONS, General Description.>

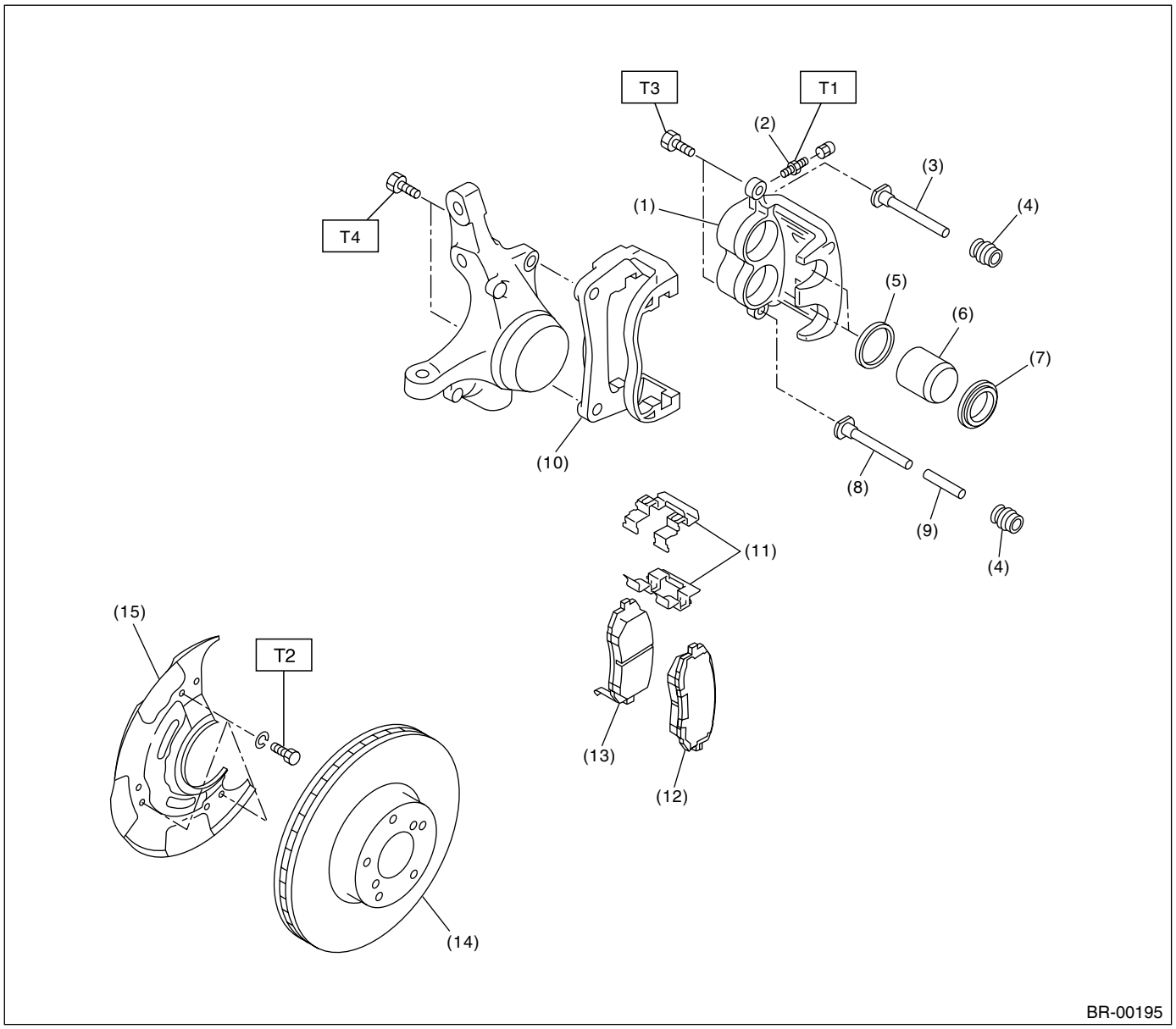
ITEM		STANDARD	SERVICE LIMIT
Front brake	Pad thickness	11 mm (0.43 in)	1.5 mm (0.059 in)
	Disc thickness	24 mm (0.94 in)	22 mm (0.87 in)
	Disc runout	—	0.075 mm (0.0030 in)
Rear brake (Disc type)	Pad thickness	9 mm (0.354 in)	1.5 mm (0.059 in)
	Disc thickness	10 mm (0.39 in)	8.5 mm (0.335 in)
	Disc runout	—	0.07 mm (0.0028 in)
Rear brake (Drum type)	Inside diameter	228.6 mm (9 in)	230.6 mm (9.08 in)
	Lining thickness	4.1 mm (0.161 in)	1.5 mm (0.059 in)
Rear brake (Disc type parking)	Inside diameter	170 mm (6.69 in)	171 mm (6.73 in)
	Lining thickness	3.2 mm (0.126 in)	1.5 mm (0.059 in)
Parking brake	Lever stroke	7 to 8 notches/196 N (20 kgf, 44 lb)	

		Brake pedal force	Fluid pressure	
			Europe · General	Australia
Brake booster	Brake fluid pressure without engine running	147 N (15 kgf, 33 lb)	571 kPa (6 kg/cm^2, 85 psi)	648 kPa (7 kg/cm^2, 94 psi)
		294 N (30 kgf, 66 lb)	1,523 kPa (16 kg/cm^2, 228 psi)	1,715 kPa (17 kg/cm^2, 249 psi)
	Brake fluid pressure with engine running and vacuum at 66.7 kPa (500 mmHg, 19.69 inHg)	147 N (15 kgf, 33 lb)	5,805 kPa (59 kg/cm^2, 839 psi)	6,468 kPa (66 kg/cm^2, 938 psi)
		294 N (30 kgf, 66 lb)	9,123 kPa (93 kg/cm^2, 1,322 psi)	10,240 kPa (104 kg/cm^2, 1,485 psi)

Brake pedal	Free play	0.5 — 2 mm (0.02 — 0.08 in) [Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lb).]

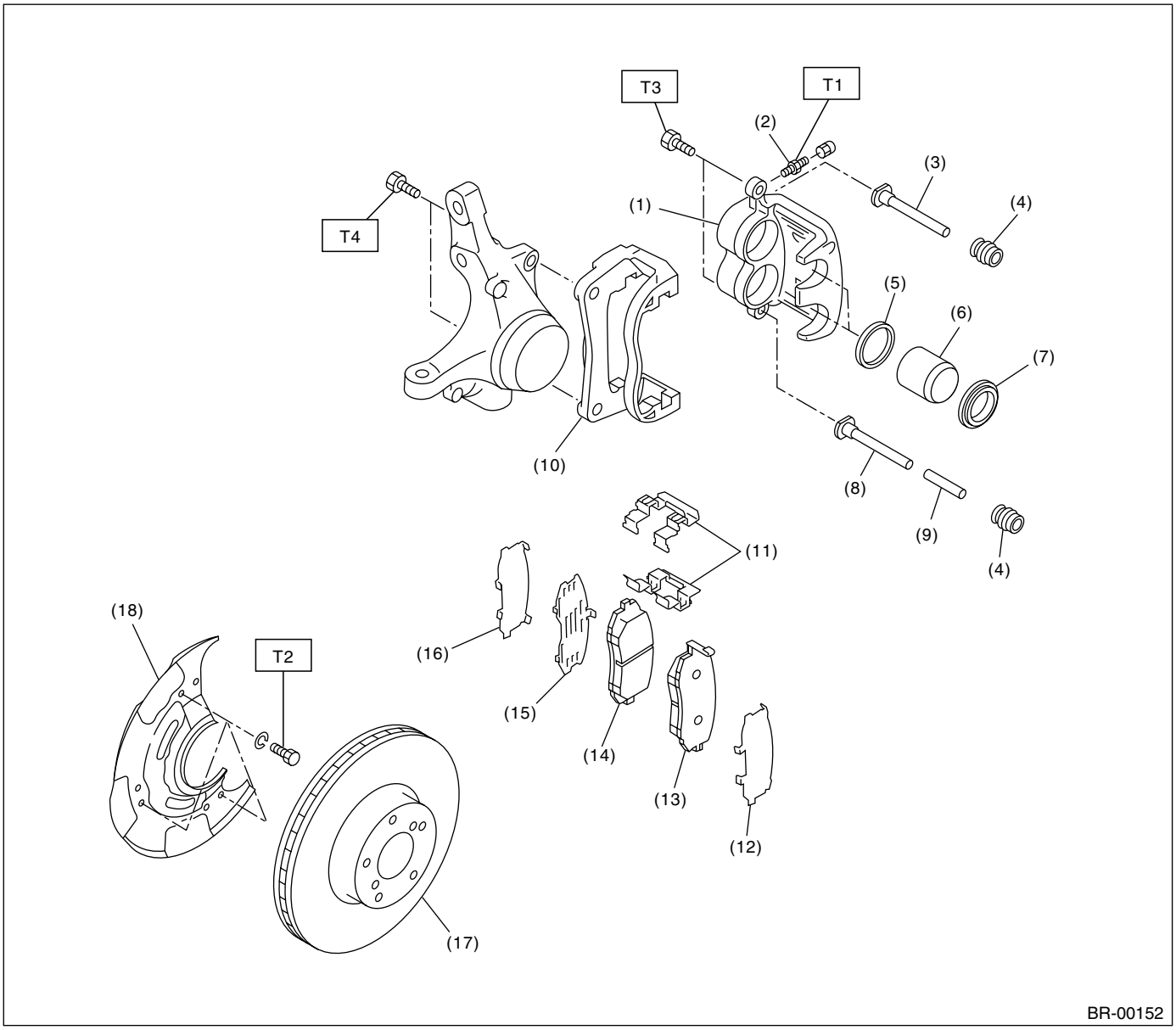
B: COMPONENT

1. FRONT DISC BRAKE (EUROPE · GENERAL MODEL)



(1)	Caliper body	(8)	Lock pin (Yellow)	(15)	Disc cover
(2)	Air bleeder screw	(9)	Bushing		
(3)	Guide pin (Green)	(10)	Support	***Tightening torque: N·m (kgf-m, ft-lb)***	
(4)	Pin boot	(11)	Pad clip	***T1:***	***8 (0.8, 5.8)***
(5)	Piston seal	(12)	Pad (Outside)	***T2:***	***18 (1.8, 13.0)***
(6)	Piston	(13)	Pad (Inside)	***T3:***	***37 (3.8, 27.5)***
(7)	Piston boot	(14)	Disc rotor	***T4:***	***80 (8.2, 59)***

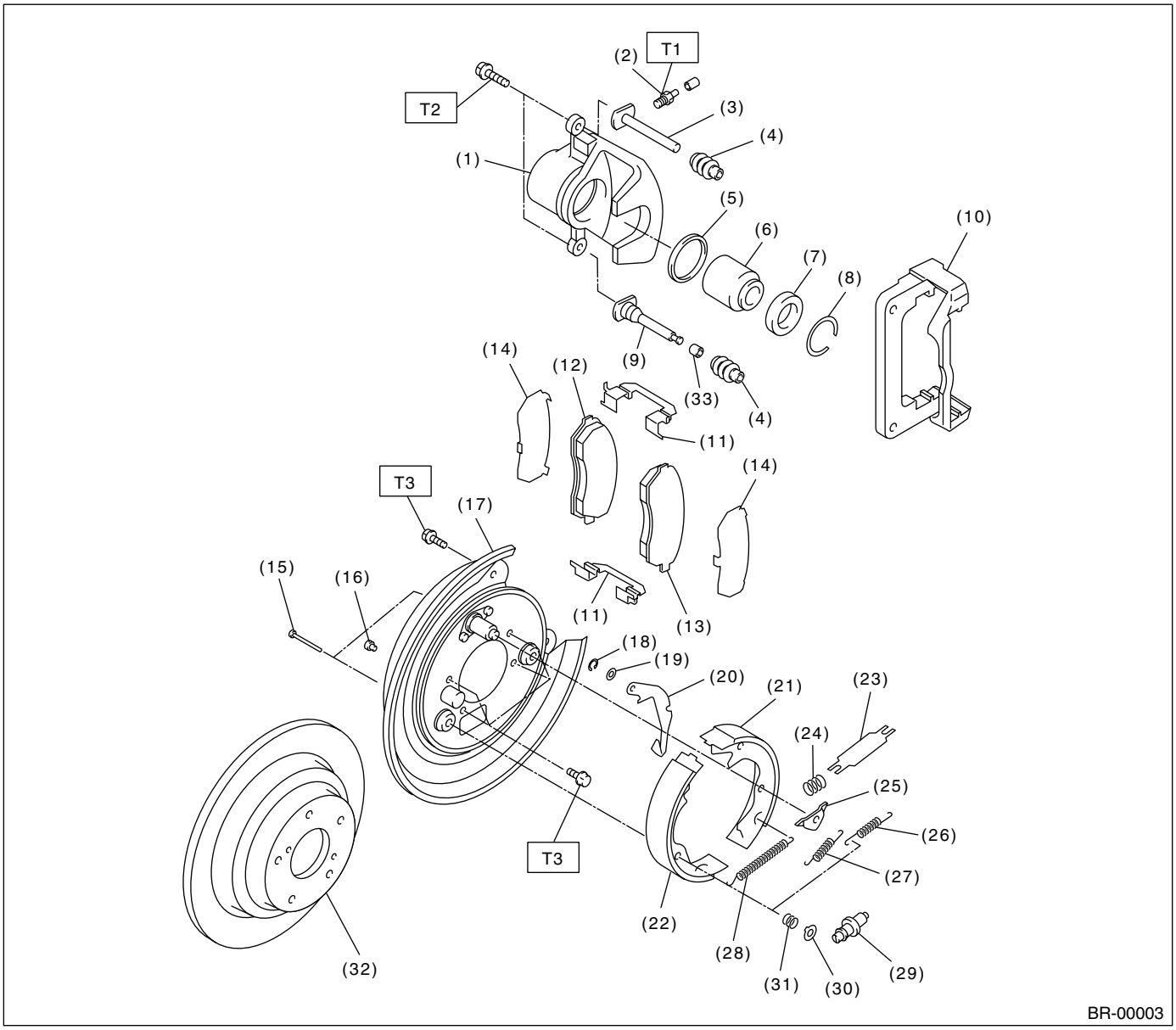
2. FRONT DISC BRAKE (AUSTRALIA MODEL)



(1) Caliper body
(2) Air bleeder screw
(3) Guide pin (Green)
(4) Pin boot
(5) Piston seal
(6) Piston
(7) Piston boot
(8) Lock pin (Yellow)
(9) Bushing
(10) Support
(11) Pad clip
(12) Outer shim
(13) Pad (Outside)
(14) Pad (Inside)
(15) Rubber coat shim
(16) Inner shim
(17) Disc rotor
(18) Disc cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)
T3: 37 (3.8, 27.5)
T4: 80 (8.2, 59)

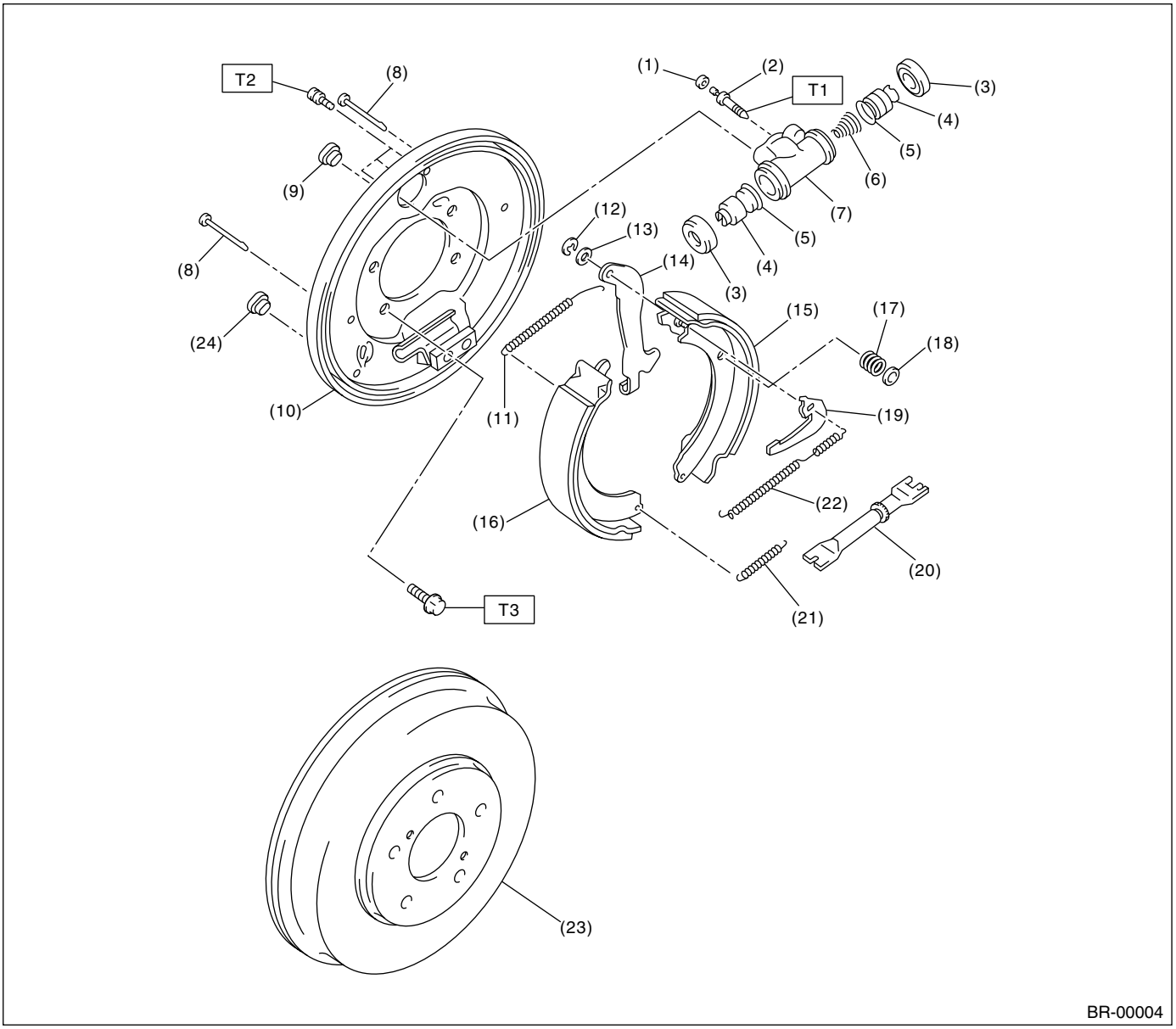
3. REAR DISC BRAKE



(1) Caliper body
(2) Air bleeder screw
(3) Guide pin (Green)
(4) Pin boot
(5) Piston seal
(6) Piston
(7) Piston boot
(8) Boot ring
(9) Lock pin (Yellow)
(10) Support
(11) Pad clip
(12) Inner pad
(13) Outer pad
(14) Shim
(15) Shoe hold-down pin
(16) Cover
(17) Back plate
(18) Retainer
(19) Spring washer
(20) Parking brake lever
(21) Parking brake shoe (Secondary)
(22) Parking brake shoe (Primary)
(23) Strut
(24) Strut shoe spring
(25) Shoe guide plate
(26) Secondary shoe return spring
(27) Primary shoe return spring
(28) Adjusting spring
(29) Adjuster
(30) Shoe hold-down cup
(31) Shoe hold-down spring
(32) Disc rotor
(33) Bushing

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 37 (3.8, 27.5)
T3: 52 (5.3, 38.3)

4. REAR DRUM BRAKE

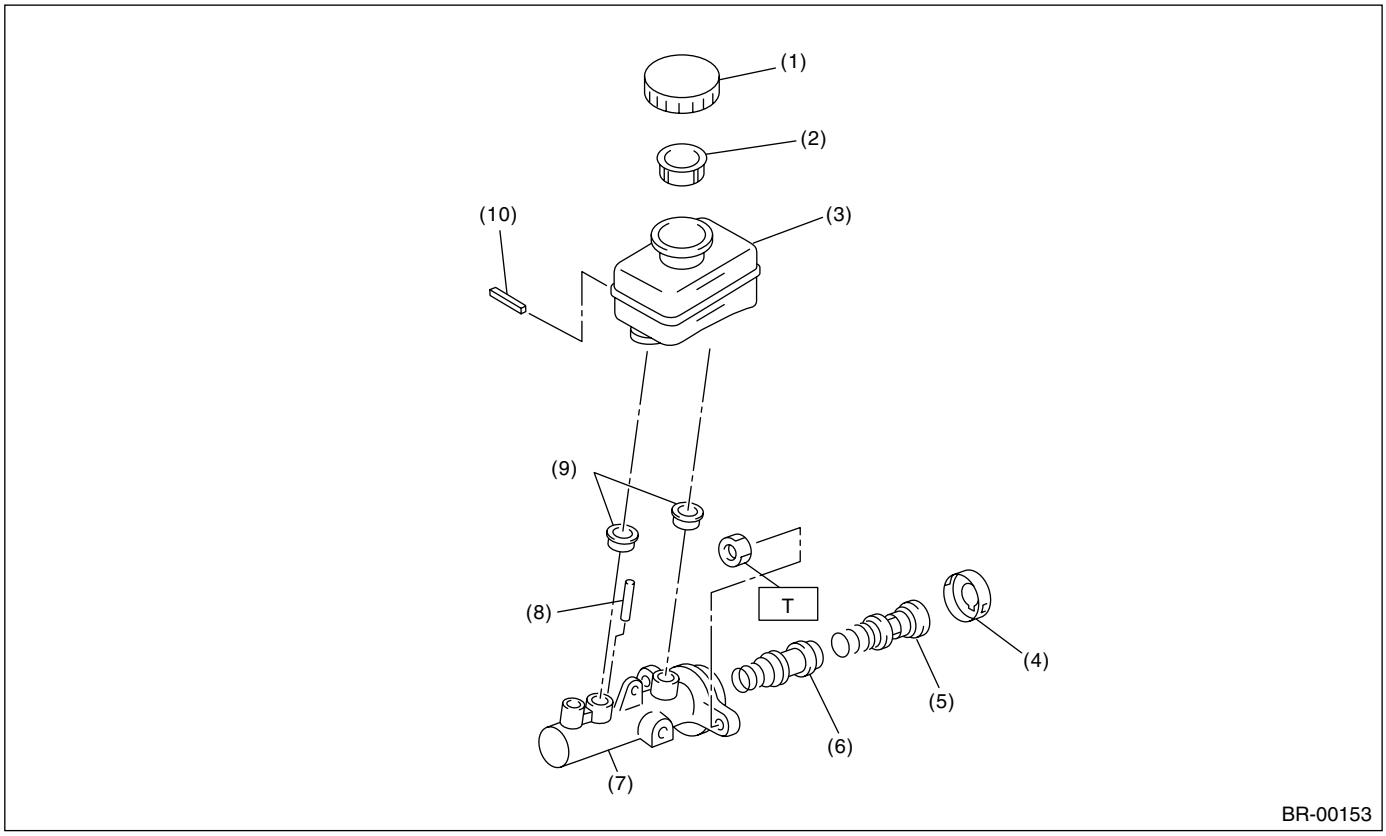


(1) Air bleeder cap
(2) Air bleeder screw
(3) Boot
(4) Piston
(5) Cup
(6) Spring
(7) Wheel cylinder body
(8) Pin
(9) Plug
(10) Back plate
(11) Upper shoe return spring
(12) Retainer
(13) Washer
(14) Parking brake lever
(15) Brake shoe (Trailing)
(16) Brake shoe (Leading)
(17) Shoe hold-down spring
(18) Cup
(19) Adjusting lever
(20) Adjuster
(21) Lower shoe return spring
(22) Adjusting spring
(23) Drum
(24) Plug

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 10 (1.0, 7.2)
T3: 52 (5.3, 38.3)

5. MASTER CYLINDER

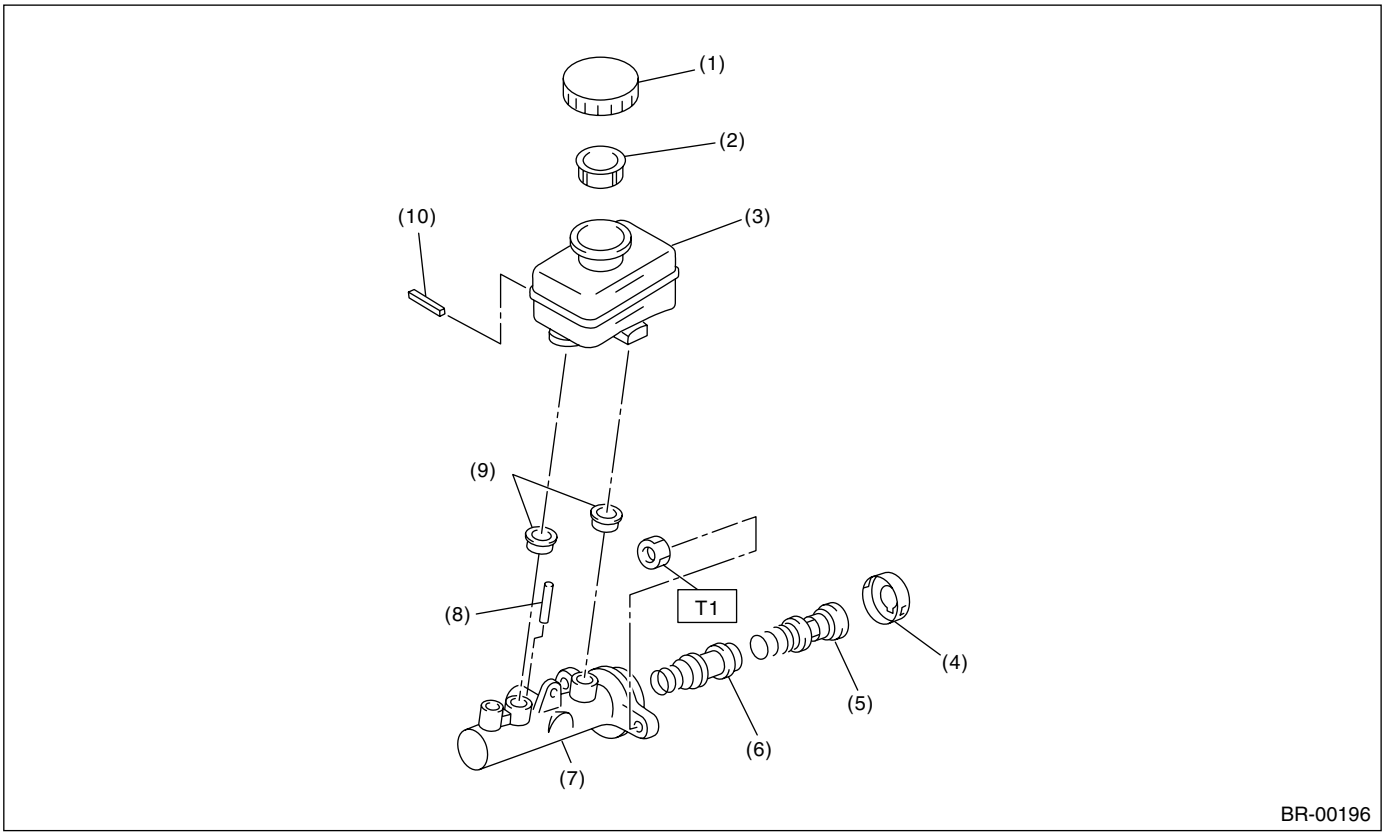
• LHD MODEL



(1)	Cap	(6)	Secondary piston
(2)	Filter	(7)	Cylinder body
(3)	Reservoir tank	(8)	Cylinder pin
(4)	Piston retainer	(9)	Seal
(5)	Primary piston	(10)	Pin

Tightening torque: N·m (kgf-m, ft-lb)
T1: 14 (1.4, 10.1)

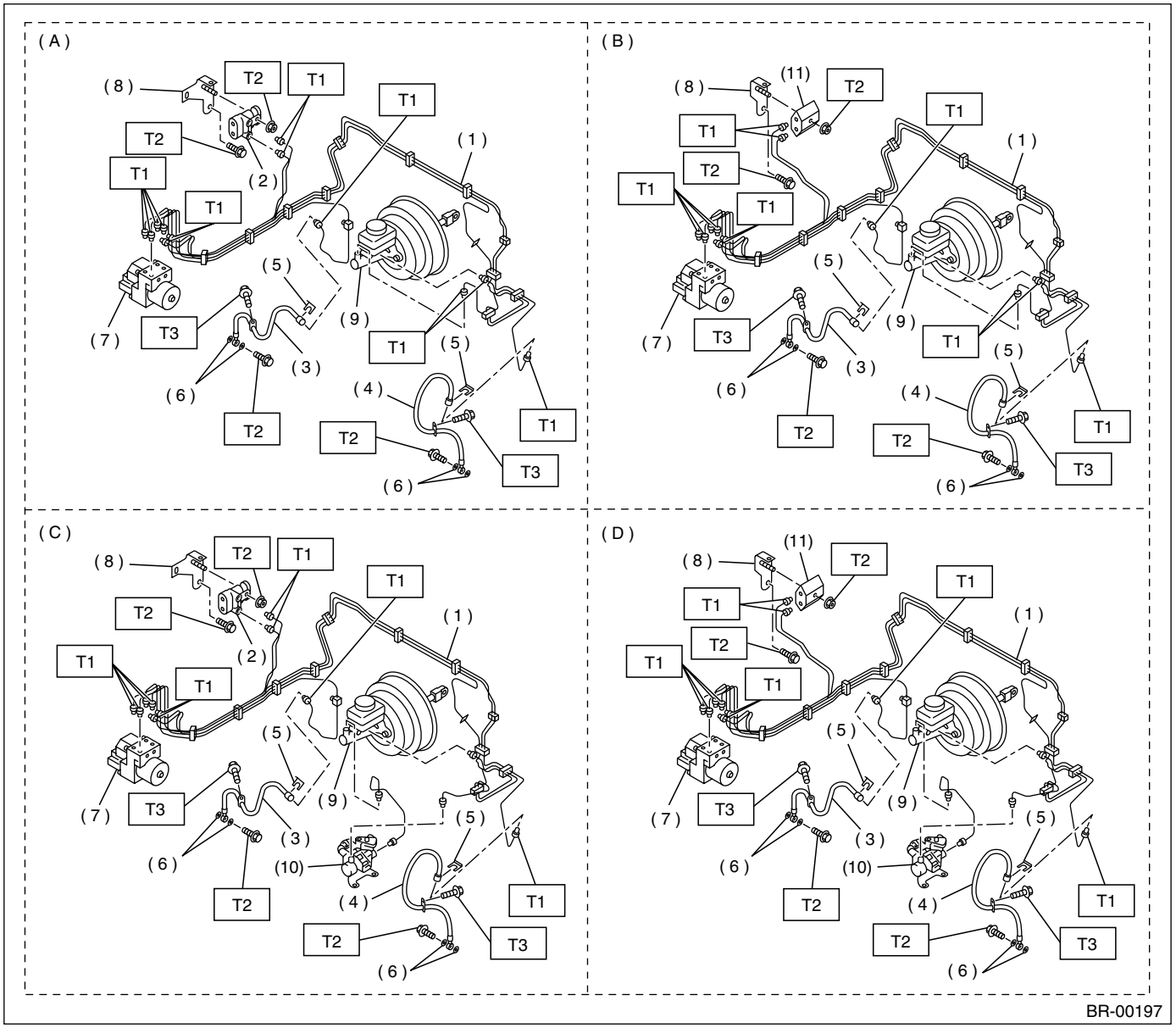
• RHD MODEL



(1) Cap
(2) Filter
(3) Reservoir tank
(4) Piston retainer
(5) Primary piston
(6) Secondary piston
(7) Cylinder body
(8) Cylinder pin
(9) Seal
(10) Pin

Tightening torque: N·m (kgf-m, ft-lb)
T1: 14 (1.4, 10.1)

6. FRONT BRAKE PIPES AND HOSE FOR LHD MODEL

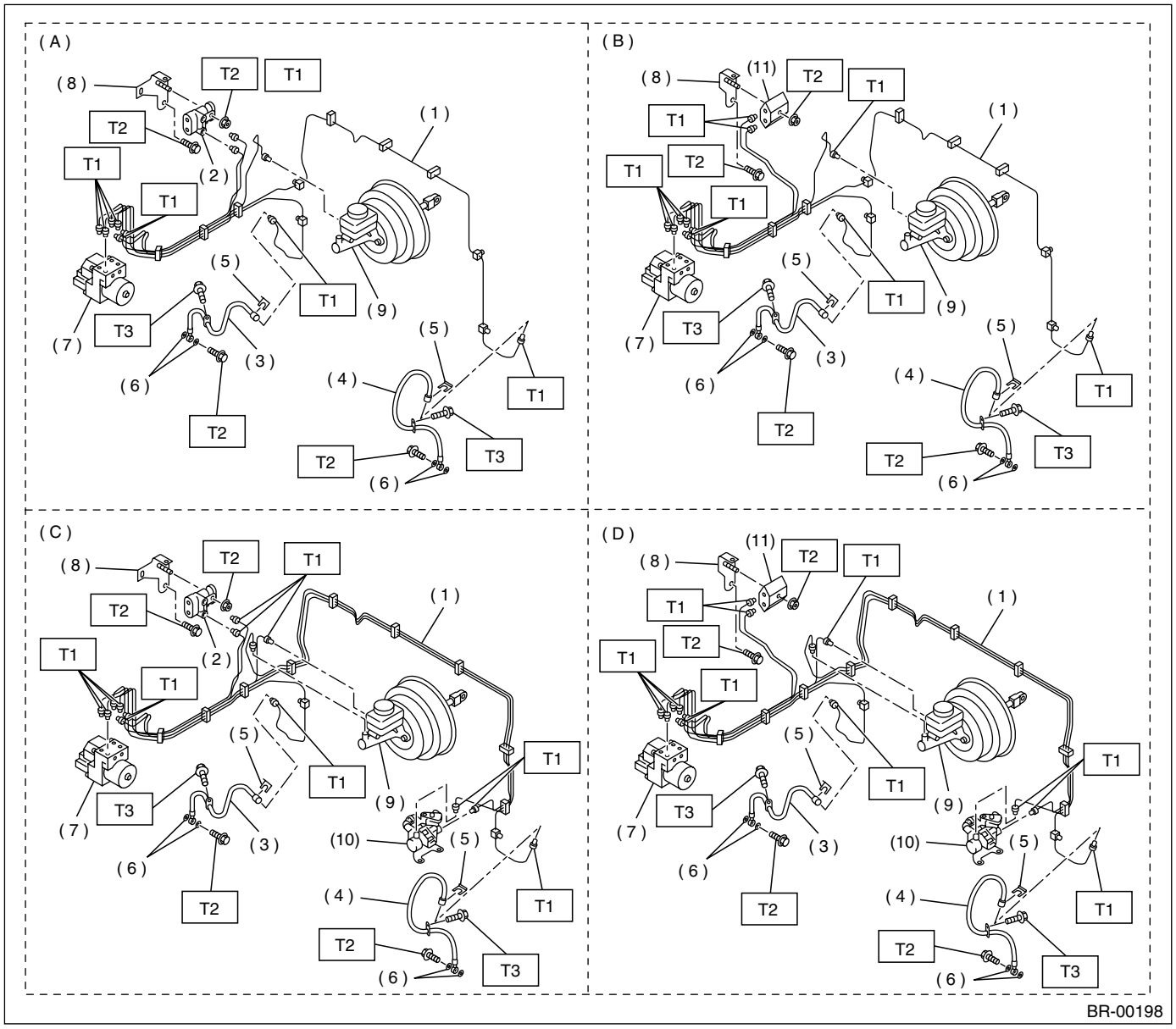


(A) Rear drum brake model
(B) Rear disk brake model
(C) Rear drum brake model (With hill holder)
(D) Rear disc brake model (With hill holder)

(1) Front brake pipe assembly
(2) Proportioning valve
(3) Front brake hose RH
(4) Front brake hose LH
(5) Clamp
(6) Gasket
(7) ABS control module and hydraulic control unit
(8) Bracket
(9) Master cylinder
(10) Hill holder
(11) Two-way connector

Tightening torque: N·m (kgf-m, ft-lb)
T1: 15 (1.5, 10.8)
T2: 18 (1.8, 13.0)
T3: 32 (3.3, 23.6)

7. FRONT BRAKE PIPES AND HOSE FOR RHD MODEL

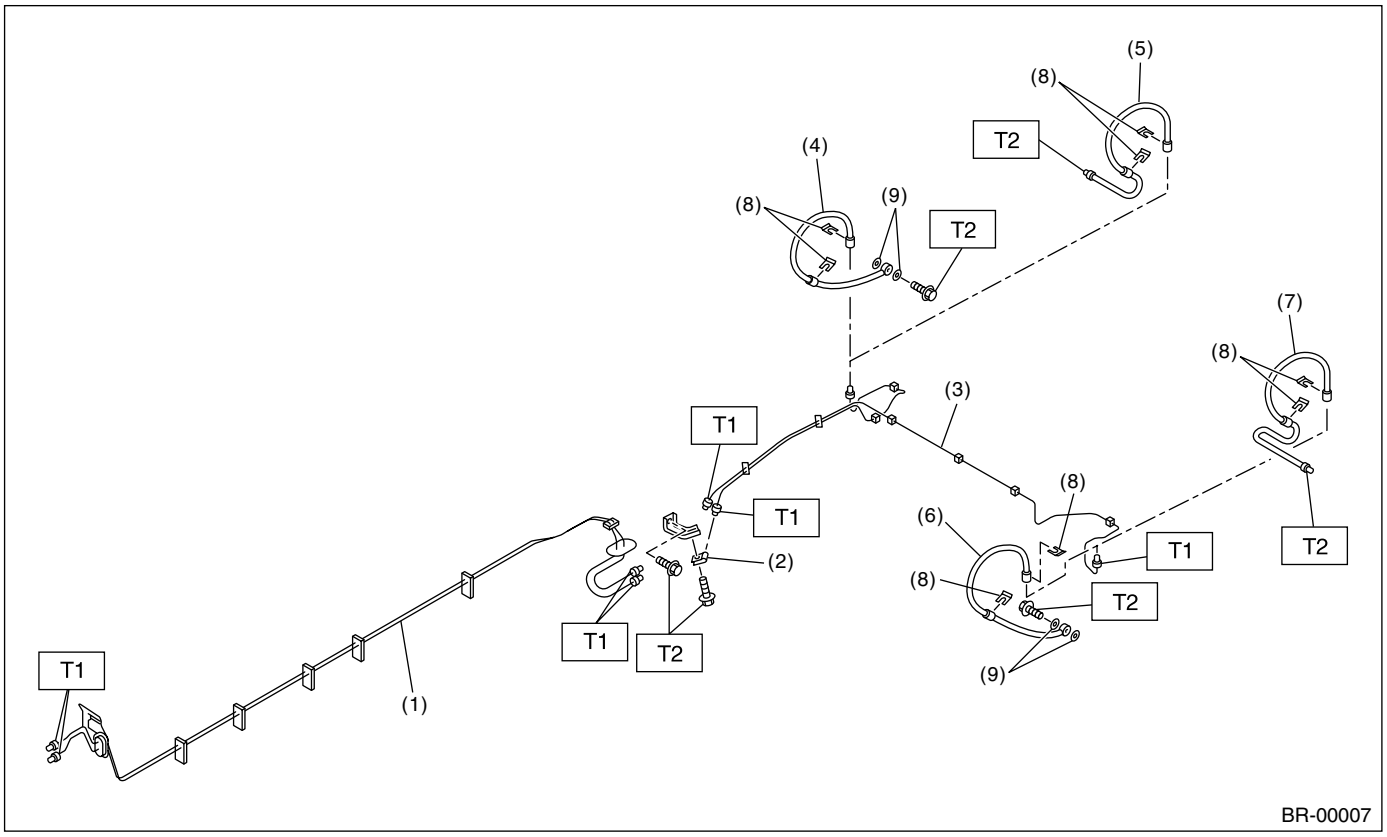


(A) Rear drum brake model
(B) Rear disk brake model
(C) Rear drum brake model (With hill holder)
(D) Rear disc brake model (With hill holder)

(1) Front brake pipe assembly
(2) Proportioning valve
(3) Front brake hose RH
(4) Front brake hose LH
(5) Clamp
(6) Gasket
(7) ABS control module and hydraulic control unit
(8) Bracket
(9) Master cylinder
(10) Hill holder
(11) Two-way connector

Tightening torque: N·m (kgf-m, ft-lb)
T1: 15 (1.5, 10.8)
T2: 18 (1.8, 13.0)
T3: 32 (3.3, 23.6)

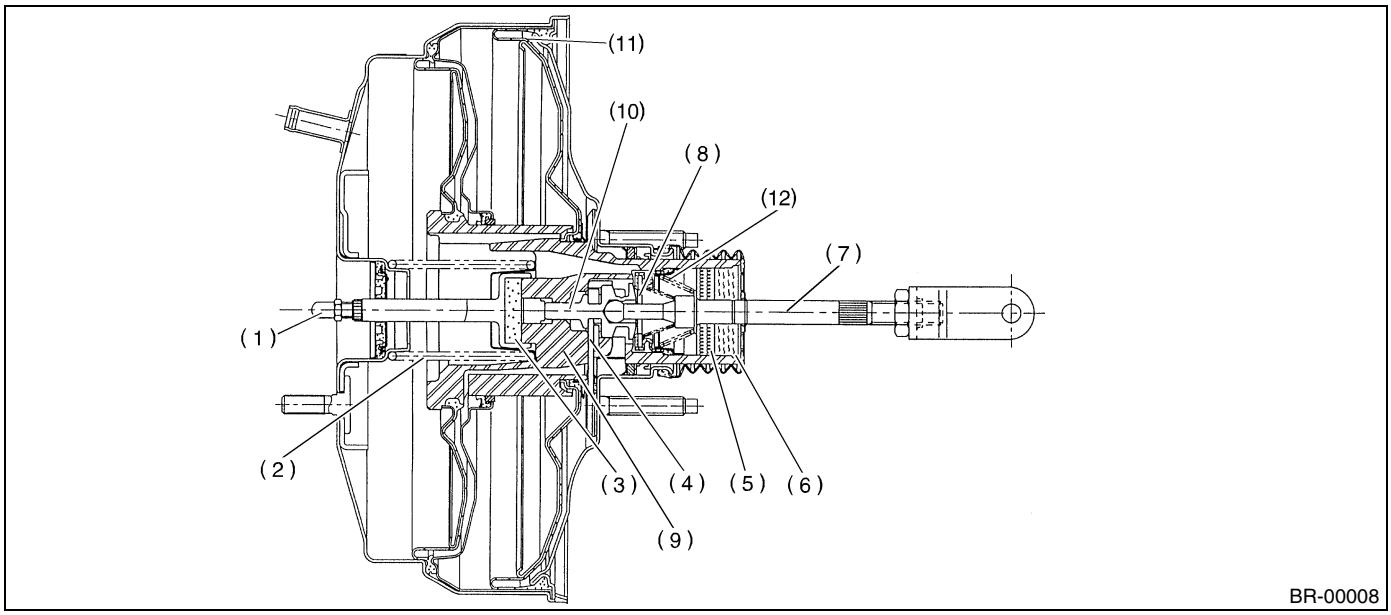
8. CENTER AND REAR BRAKE PIPES AND HOSES



(1) Center brake pipe assembly
(2) Two-way connector
(3) Rear brake pipe assembly
(4) Rear brake hose RH (Disc brake model)
(5) Rear brake hose RH (Drum brake model)
(6) Rear brake hose LH (Disc brake model)
(7) Rear brake hose LH (Drum brake model)
(8) Clamp
(9) Gasket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 15 (1.5, 10.8)
T2: 18 (1.8, 13.0)

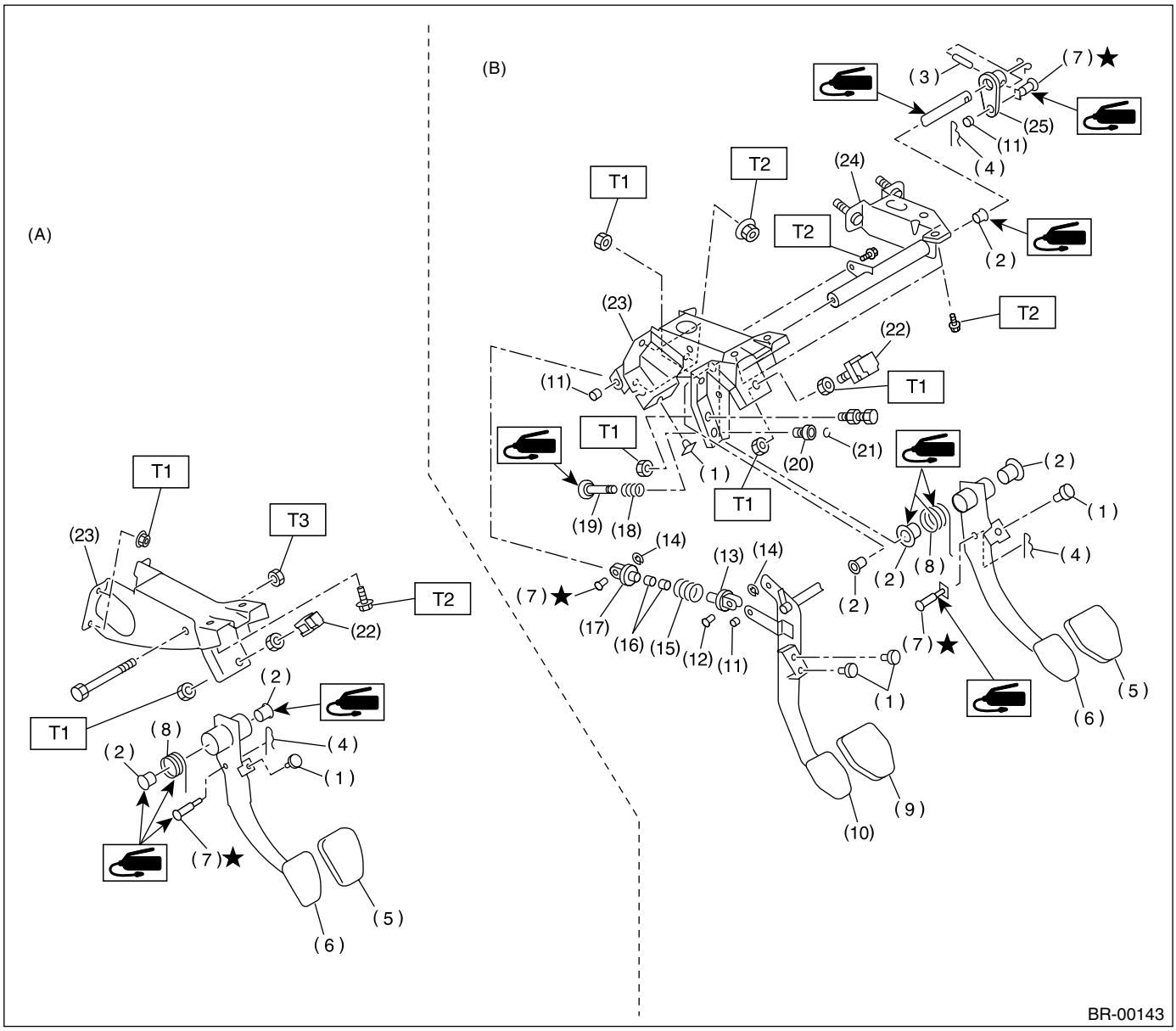
9. BRAKE BOOSTER



(1) Push rod
(2) Return spring
(3) Reaction disc
(4) Key
(5) Filter
(6) Silencer
(7) Operating rod
(8) Poppet valve
(9) Valve body
(10) Plunger valve
(11) Diaphragm plate
(12) Valve return spring

10.BRAKE PEDAL

• LHD MODEL

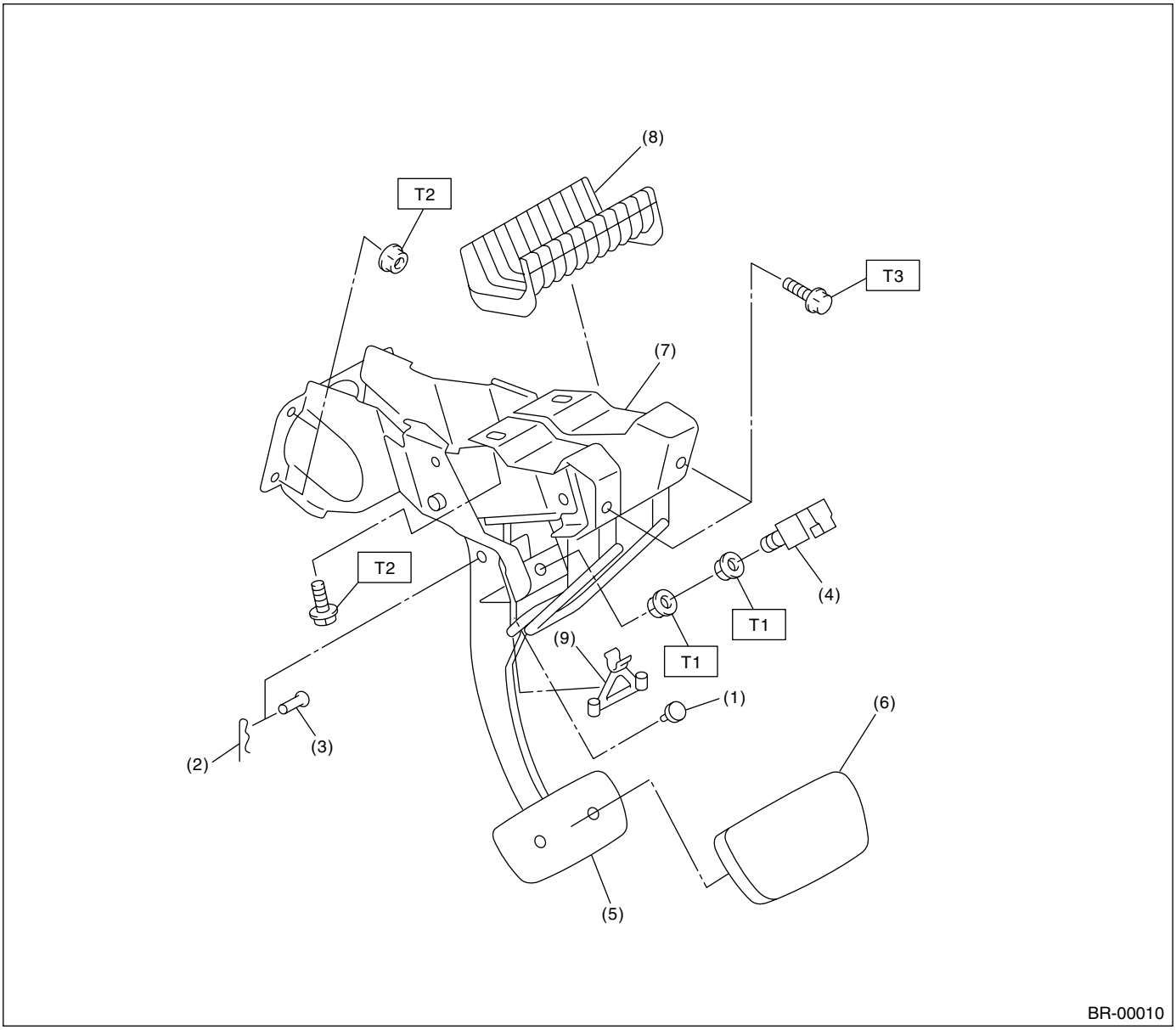


(A) AT vehicles only
(B) MT vehicles only

(1) Stopper
(2) Bushing
(3) Spring pin
(4) Snap pin
(5) Brake pedal pad
(6) Brake pedal
(7) Clevis pin
(8) Brake pedal spring
(9) Clutch pedal pad
(10) Clutch pedal
(11) Bushing C
(12) Clutch clevis pin
(13) Assist rod A
(14) Clip
(15) Assist spring
(16) Assist bushing
(17) Assist rod B
(18) Spring S
(19) Rod S
(20) Bushing S
(21) Clip
(22) Stop light switch
(23) Pedal bracket
(24) Clutch master cylinder bracket
(25) Lever

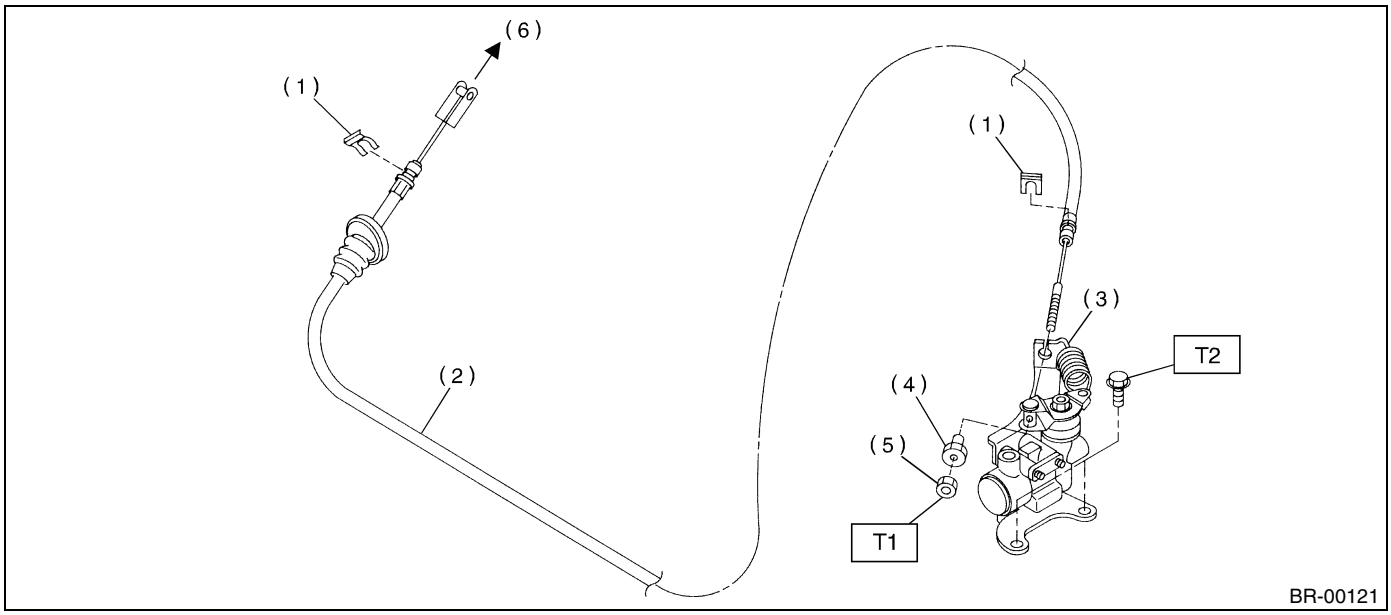
Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)
T3: 30 (3.1, 22.4)

• RHD MODEL



(1)	Stopper	(6)	Brake pedal pad	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	Snap pin	(7)	Brake pedal bracket ASSY	***T1: 8 (0.8, 5.8)***
(3)	Clevis pin	(8)	Cover	***T2: 18 (1.8, 13.0)***
(4)	Stop light switch	(9)	Protector	***T3: 33 (3.3, 24.3)***
(5)	Brake pedal			

11.HILL HOLDER



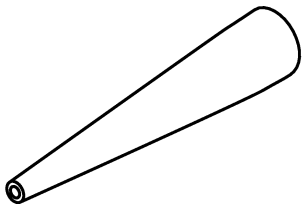
(1)	Clamp	(4)	Adjusting nut	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	PHV cable	(5)	Lock nut	***T1: 3.5 (0.35, 2.5)***
(3)	PHV (Pressure hold valve)	(6)	To clutch pedal	***T2: 18 (1.8, 13.0)***

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Apply grease onto sliding or revolution surfaces before installation.
• Before installing O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Do not put fluid on body. If the body is tainted, wash away with water.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-926460000	926460000	WHEEL CYLINDER 3/4″ ADAPTER	Used for installing cup onto wheel cylinder piston (Size 3/4 in).

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
SNAP RING PLIERS	Used for removing and installing snap ring.

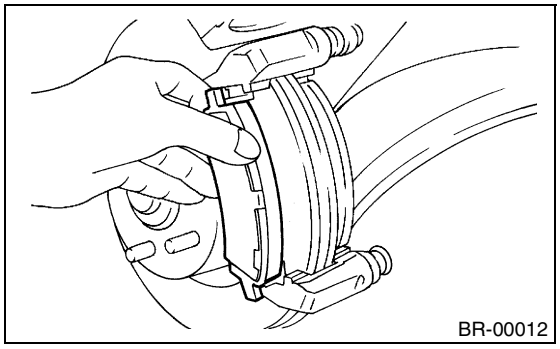
2. Front Brake Pad

A: REMOVAL

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Jack-up the vehicle, and then remove the front wheel.
4) Remove the lower caliper bolt.
5) Raise the caliper body upward and support it.

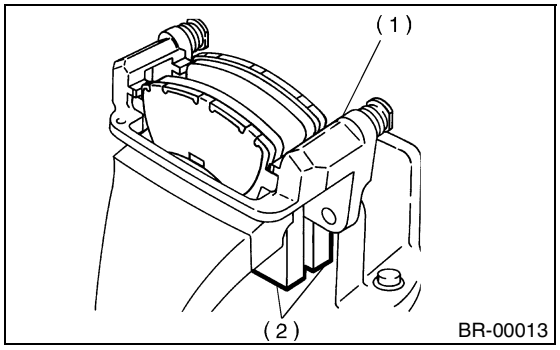
NOTE:
Do not disconnect the brake hose from caliper body.

6) Remove the pad.



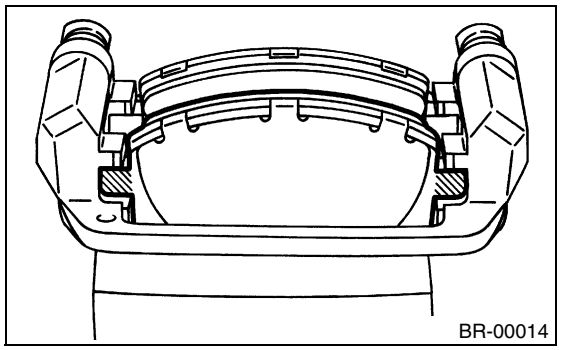
NOTE:
If the brake pad is difficult to remove, proceed as follows:

(1) Remove the caliper body from support.
(2) Remove the support.
(3) Place a support in a vise between wooden blocks.



(1) Support
(2) Wooden blocks

(4) Attach a rod of less than 12 mm (0.47 in) dia. to the shaded area of brake pad, and strike the rod with a hammer to drive brake pad out of place.



B: INSTALLATION

1) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.
2) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between inner pad and rubber coat shim. (Australia model only)

NOTE:
• Do not apply grease between outer pad and outer shim. (Australia model only)
• Do not confuse the inner shim and outer shim when installing. (Australia model only)

CAUTION:
Replace the pad if there is oil or grease on it.

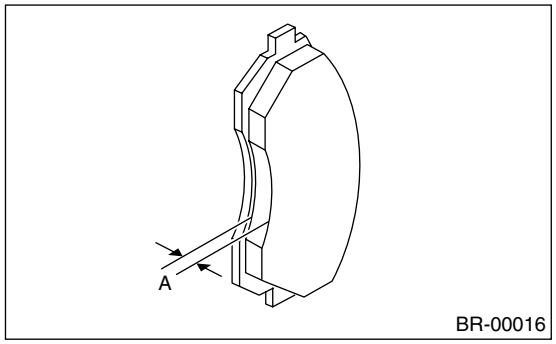
3) Install the pads on support.
4) Install the caliper body on support.

Tightening torque:
37 N·m (3.8 kgf-m, 27.5 ft-lb)

NOTE:
If it is difficult to push the piston during pad replacement, loosen the air bleeder to facilitate work.

C: INSPECTION

Check the pad thickness A.



Pad thickness	Standard value	11 mm (0.43 in)
	Wear limit	1.5 mm (0.06 in)

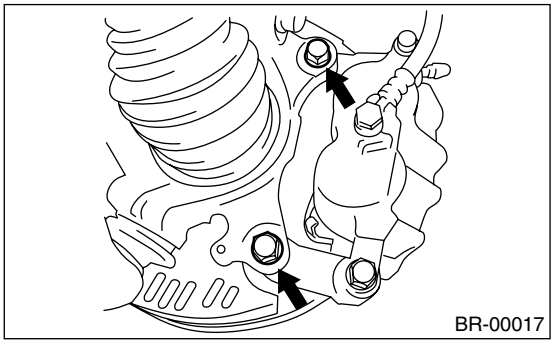
NOTE:

- Always replace the pads for both right and left wheels at the same time.
- Also replace the pad clips if they are twisted or worn.
- A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
- Replace the pad if there is oil or grease on it.

3. Front Disc Rotor

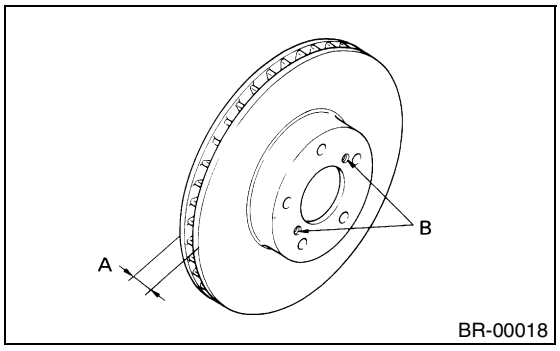
A: REMOVAL

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Jack-up the vehicle, and then remove the front wheel.
4) Remove the caliper body and support from housing, and suspend it from strut using a wire.



5) Remove the disc rotor.

NOTE:
If the disc rotor seizes up within the hub, drive the disc rotor out by installing an 8-mm bolt in holes (B) on rotor.



6) Clean mud and foreign particles from the caliper body assembly and support.

B: INSTALLATION

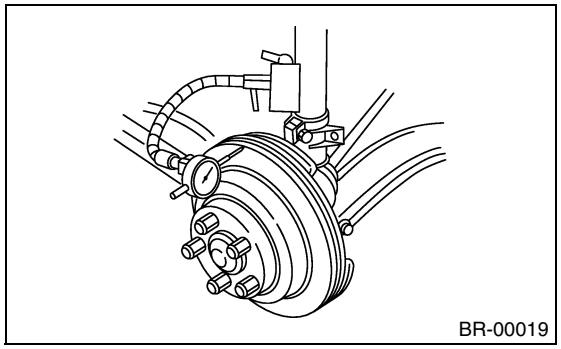
1) Install the disc rotor.
2) Install the caliper body and support to housing.

Tightening torque:
80 N·m (8.2 kgf-m, 59 ft-lb)

3) Install the wheel.

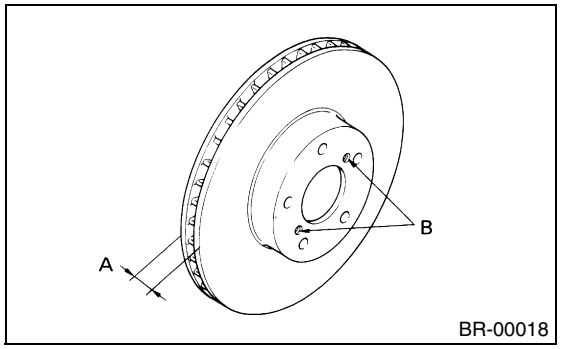
C: INSPECTION

1) Check bearing axial end play and hub runout before disc rotor runout limit inspection.<Ref. to DS-22, INSPECTION, Front Axle.>
2) Secure the disc rotor by tightening five wheel nuts.
3) Set a dial gauge 10 mm (0.39 in) inward of rotor outer perimeter. Turn the disc rotor to check runout. If the disc rotor runout is above specified value, replace the disc rotor.



Disc rotor runout limit:
0.075 mm (0.0030 in)

4) Set a micrometer 10 mm (0.39 in) inward of the rotor outer perimeter, and then measure the disc rotor thickness. If the thickness of disc rotor is outside the service limit, replace the disc rotor.



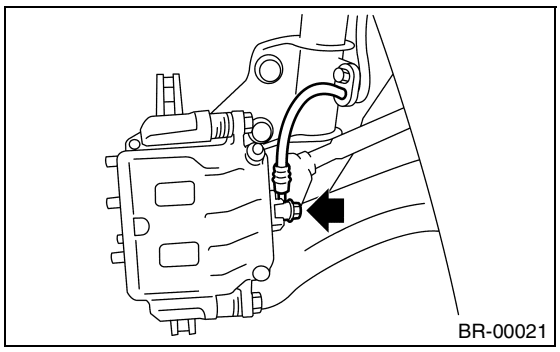
		Standard value	Service limit	Disc outer dia.
Disc rotor thickness A	15″	24 mm (0.94 in)	22 mm (0.87 in)	277 mm (10.91 in)
	16″	24 mm (0.94 in)	22 mm (0.87 in)	294 mm (11.57 in)

4. Front Disc Brake Assembly

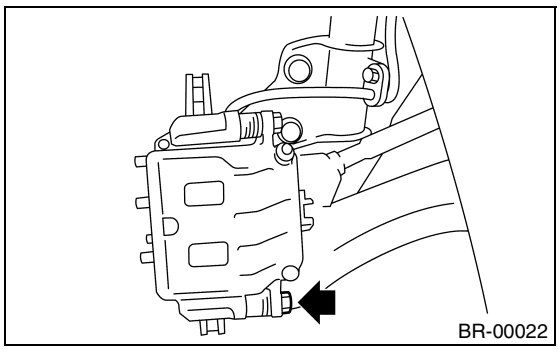
A: REMOVAL

CAUTION:
Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Jack-up the vehicle, and then remove the front wheel.
4) Remove the union bolt, and then disconnect the brake hose from caliper body assembly.

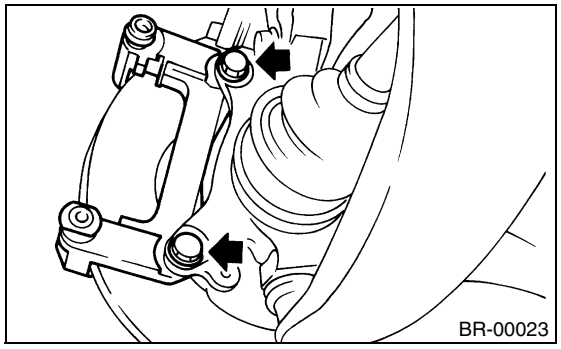


5) Remove the bolt securing lock pin to caliper body.



6) Raise the caliper body and move it toward vehicle center to separate it from support.
7) Remove the support from housing.

NOTE:
Remove the support only when replacing it or the rotor. It need not be removed when servicing the caliper body assembly.



8) Clean mud and foreign particles from the caliper body assembly and support.

B: INSTALLATION

1) Install the support on housing.

Tightening torque:
80 N·m (8.2 kgf-m, 59 ft-lb)

2) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.
3) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between inner pad and rubber coat shim. (Australia model only)

NOTE:
• Do not apply grease between outer pad and outer shim. (Australia model only)
• Do not confuse the inner shim and outer shim when installing. (Australia model only)

4) Install the pads on support.
5) Install the caliper body on support.

Tightening torque:
37 N·m (3.8 kgf-m, 27.5 ft-lb)

6) Replace the brake hose gaskets with new ones, and then connect the brake hose.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

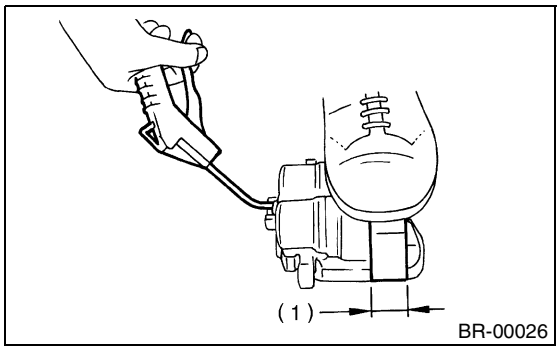
7) Bleed air from the brake system.

C: DISASSEMBLY

1) Clean mud and foreign particles from the caliper body assembly and support.

CAUTION:
Be careful not to allow foreign particles to enter inlet (at brake hose connector).

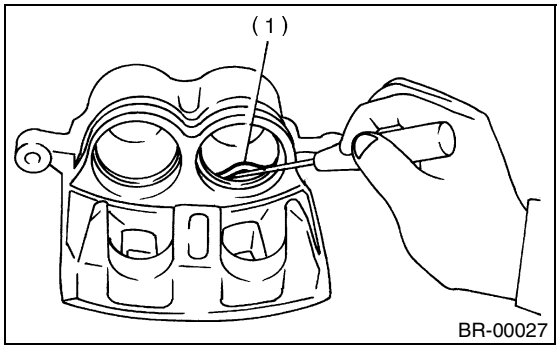
2) Remove the boot from piston end.
3) Place a wooden block as shown in the figure to prevent damage to the piston. Gradually supply compressed air via inlet of the brake hose to force piston out.



(1) Place a 30 mm (1.18 in) wide wooden block here.

4) Remove the piston seal from caliper body cylinder.

CAUTION:
Be careful not to scratch the inner surface of cylinder and piston seal groove.



(1) Piston seal

5) Remove the lock pin boot and guide pin boot.

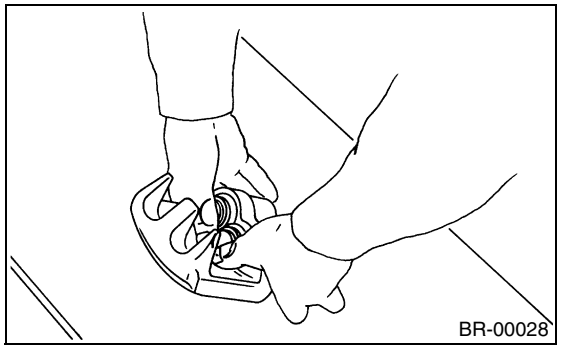
D: ASSEMBLY

1) Clean the caliper body interior using brake fluid.
2) Apply a coat of brake fluid to the piston seal and fit piston seal in groove on caliper body.
3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
4) Apply a coat of specified grease to the boot and fit in groove on ends of cylinder and piston.

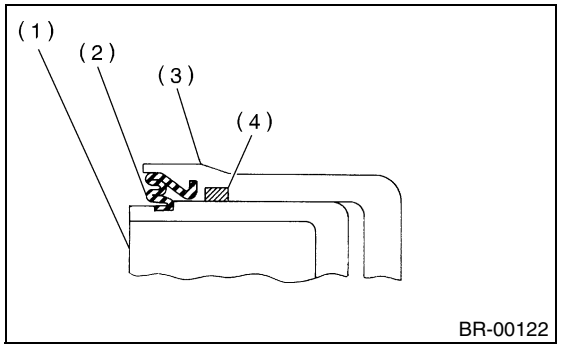
Grease:
NIGLUBE RX-2 (Part No. K0779GA102)

5) Insert the piston into cylinder.

CAUTION:
Do not force the piston into cylinder.



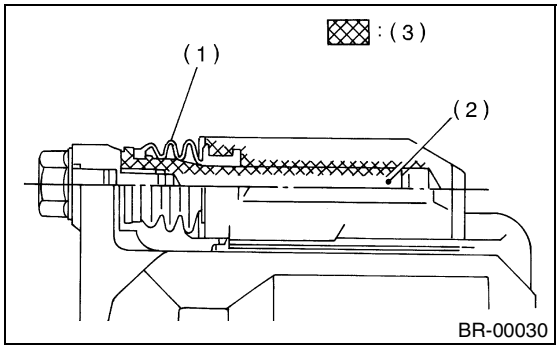
6) Position the boot in grooves on cylinder and piston.



(1) Piston
(2) Piston boot
(3) Caliper body
(4) Piston seal

7) Apply a coat of specified grease to the lock pin and guide pin, outer surface, cylinder inner surface, and boot grooves.

Grease:
NIGLUBE RX-2 (Part No. K0779GA102)



(1) Pin boot
(2) Lock pin or guide pin
(3) Apply grease.

8) Install the lock pin boot and guide pin boot on support.

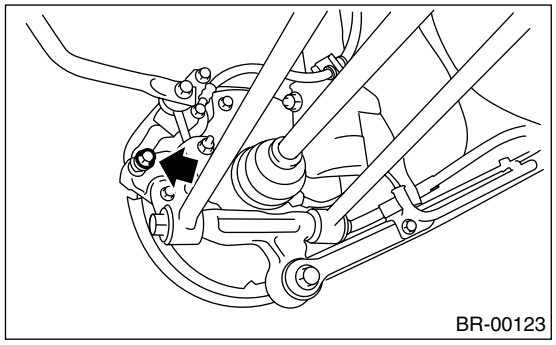
E: INSPECTION

1) Repair or replace the faulty parts.
2) Check the caliper body and piston for uneven wear, damage or rust.
3) Check the rubber parts for damage or deterioration.

5. Rear Brake Pad

A: REMOVAL

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Jack-up the vehicle, and then remove the rear wheel.
4) Remove the lower caliper bolt.

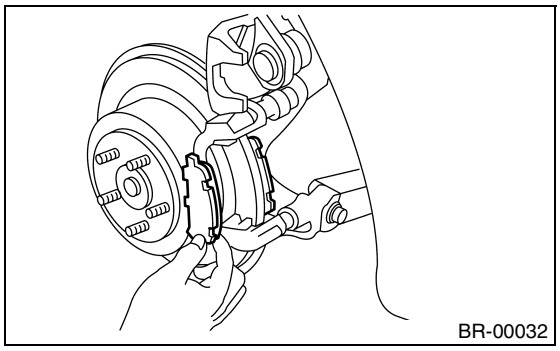


5) Raise the caliper body upward and support it.

NOTE:
Do not disconnect the brake hose from caliper body.

6) Remove the pad.

NOTE:
If the brake pad is difficult to remove, use the same procedure as for front disc brake pad.
<Ref. to BR-18, REMOVAL, Front Brake Pad.>



B: INSTALLATION

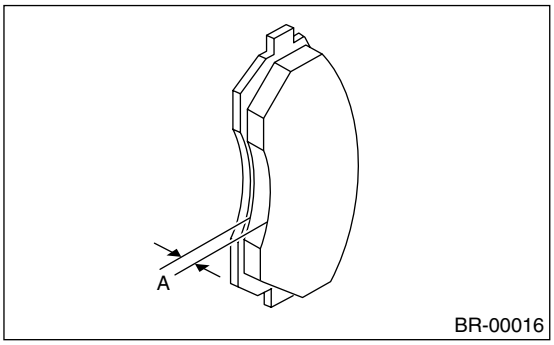
1) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.
2) Install the pad on support.
3) Install the caliper body on support.

Tightening torque:
37 N·m (3.8 kgf-m, 27.5 ft-lb)

NOTE:
If it is difficult to push the piston during pad replacement, loosen air bleeder to facilitate work.

C: INSPECTION

Check pad thickness A.



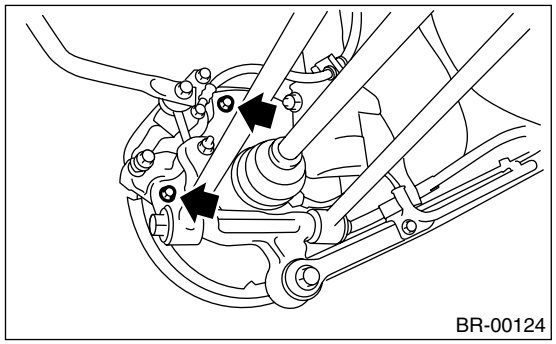
Pad thickness	Standard value	9 mm (0.354 in)
	Wear limit	1.5 mm (0.059 in)

NOTE:
• Always replace the pads for both right and left wheels at the same time.
• Also replace the pad clips if they are twisted or worn.
• A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
• Replace the pad if there is oil or grease on it.

6. Rear Disc Rotor

A: REMOVAL

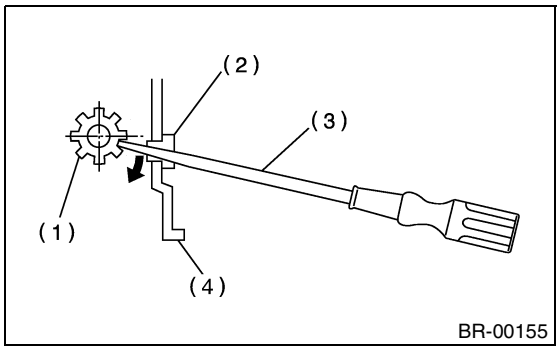
1) Lift-up the vehicle, and then remove the wheels.
2) Remove the two mounting bolts, and then remove the disc brake assembly.



3) Suspend the disc brake assembly so that hose is not stretched.
4) Pull down and release the parking brake.
5) Remove the disc rotor.

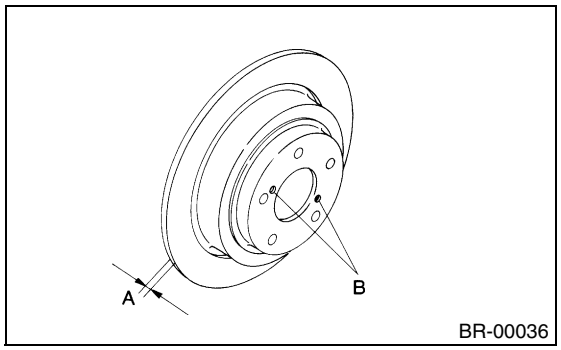
NOTE:
If the disc rotor is difficult to remove try following two methods in order.

(1) Turn the adjusting screw using a flat tip screwdriver until brake shoe gets away enough from the disc rotor.



(1) Adjusting screw
(2) Cover
(3) Flat tip screwdriver
(4) Back plate

(2) If the disc rotor seizes up within hub, drive the disc rotor out by installing an 8-mm bolt in holes B on rotor.

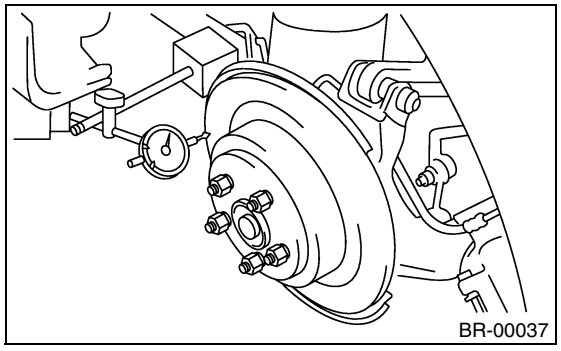


B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust the parking brake. <Ref. to PB-10, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

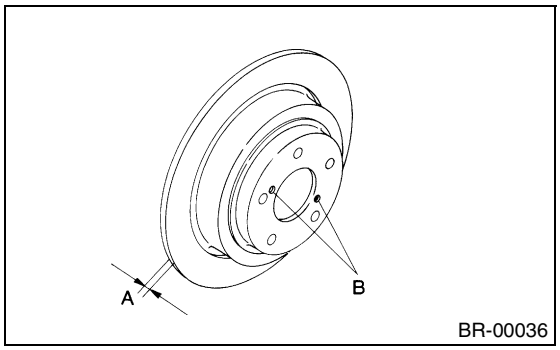
C: INSPECTION

1) Check bearing axial end play and hub runout before disc rotor runout limit inspection. <Ref. to DS-30, INSPECTION, Rear Axle.>
2) Secure the disc rotor by tightening five wheel nuts.
3) Set a dial gauge 10 mm (0.39 in) inward of rotor outer perimeter. Turn the disc rotor to check runout. If the disc rotor runout is above specified value, replace the disc rotor.



Disc rotor runout limit:
0.070mm (0.0027 in)

4) Set a micrometer 10 mm (0.39 in) inward of the rotor outer perimeter, and then measure the disc rotor thickness. If the thickness of disc rotor is outside the service limit, replace the disc rotor.



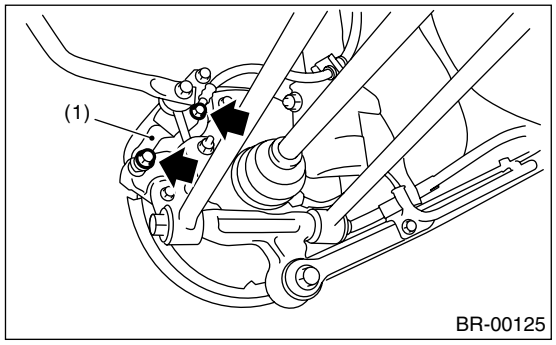
Disc rotor thickness: A
Standard value
10 mm (0.39 in)
Service limit
8.5 mm (0.335 in)

7. Rear Disc Brake Assembly

A: REMOVAL

CAUTION:
Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the wheels.
4) Disconnect the brake hose from caliper body assembly.
5) Remove the bolt securing lock pin to caliper body.



(1) Caliper body

6) Raise the caliper body and move it toward vehicle center to separate it from support.
7) Remove the support from housing.

NOTE:
Remove the support only when replacing it or the rotor. It need not be removed when servicing the caliper body assembly.

8) Clean mud and foreign particles from the caliper body assembly and support.

CAUTION:
Be careful not to allow foreign particles to enter inlet (at brake hose connector).

B: INSTALLATION

1) Install the disc rotor on hub.
2) Install the support on housing.

Tightening torque:
52 N·m (5.3 kgf-m, 38.3 ft-lb)

3) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.
4) Install the pads on support.
5) Install the caliper body on support.

Tightening torque:
37 N·m (3.8 kgf-m, 27.5 ft-lb)

6) Replace the brake hose gaskets with new ones, and then connect the brake hose.

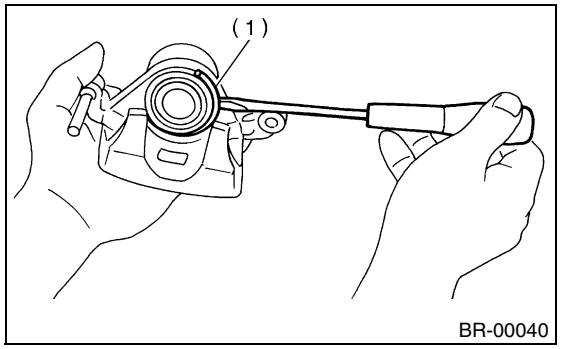
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

CAUTION:
The brake hose must be connected without any twist.

7) Bleed air from the brake system.

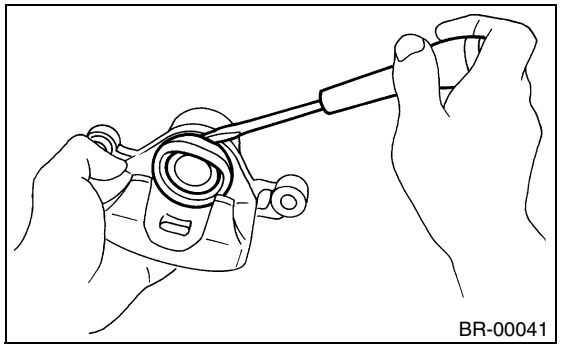
C: DISASSEMBLY

1) Remove the boot ring.

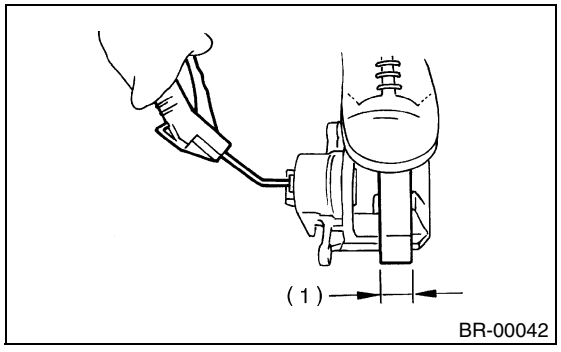


(1) Boot ring

2) Remove the piston boot.



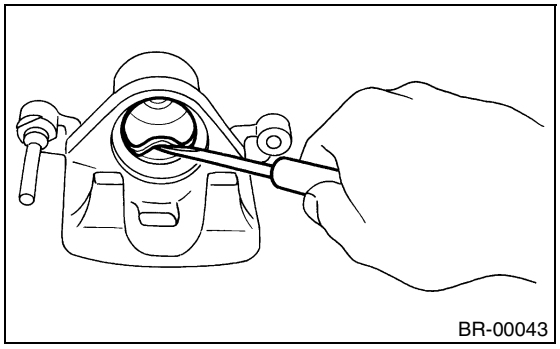
3) Place a wooden block as shown in the figure to prevent damage to the piston. Gradually supply compressed air via inlet of the brake hose to force piston out.



(1) Place a 30 mm (1.18 in) wide wooden block here.

4) Remove the piston seal from caliper body cylinder.

CAUTION:
Be careful not to scratch the inner surface of cylinder and piston seal groove.



5) Remove the lock pin sleeve and boot from caliper body.
6) Remove the guide pin boot.

D: 14 INCH TYPE

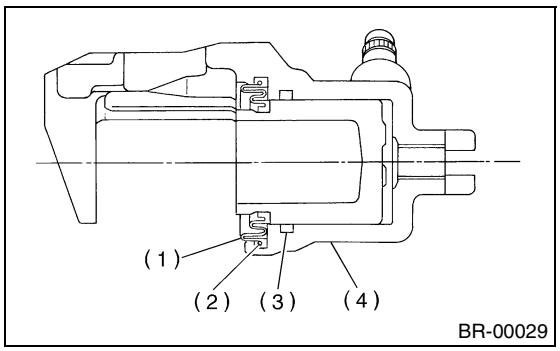
1) Clean the caliper body interior using brake fluid.
2) Apply a coat of brake fluid to the piston seal and fit piston seal in groove on caliper body.
3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
4) Insert the piston into cylinder.

CAUTION:
Do not force piston into cylinder.

5) Apply a coat of specified grease to the boot and fit in groove on ends of cylinder and piston.

Grease:
NIGLUBE RX-2 (Part No. K0779GA102)

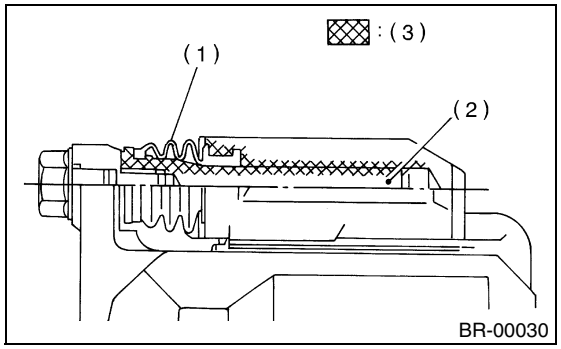
6) Install the piston boot to caliper body, and attach boot ring.



(1) Piston boot
(2) Boot ring
(3) Piston seal
(4) Caliper body

7) Apply a coat of specified grease to the guide pin, outer surface, sleeve outer surface, cylinder inner surface, and boot grooves.

Grease:
NIGLUBE RX-2 (Part No. K0779GA102)



(1) Pin boot
(2) Lock pin or guide pin
(3) Apply grease.

8) Install the guide pin boot on support.
9) Install the lock pin boot on support and insert lock pin sleeve into place.

E: INSPECTION

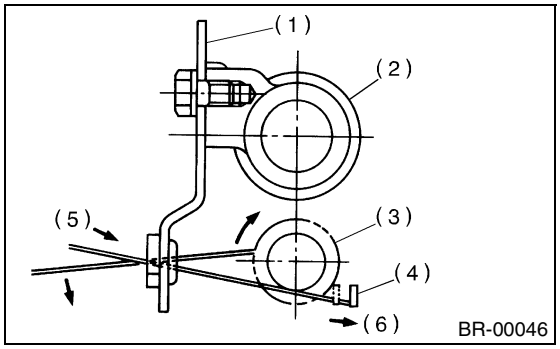
1) Repair or replace the faulty parts.
2) Check the caliper body and piston for uneven wear, damage or rust.
3) Check the rubber parts for damage or deterioration.

8. Rear Drum Brake Shoe

A: REMOVAL

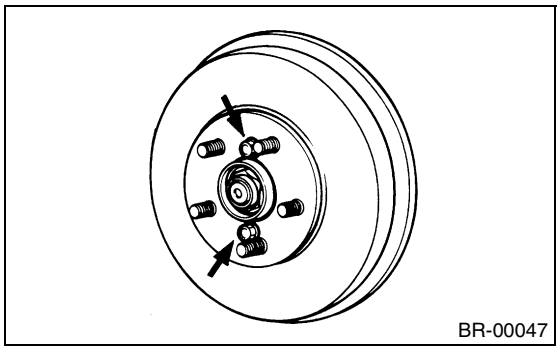
1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the wheels.
4) Release the parking brake.
5) Remove the brake drum from brake assembly.

NOTE:
• If it is difficult to remove the brake drum, remove the adjusting hole cover from back plate, and then turn adjuster assembly pawls using a flat tip screwdriver until brake shoe separates from the drum.

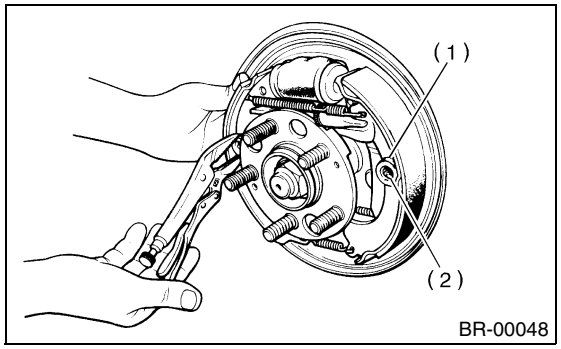


(1) Back plate
(2) Wheel cylinder
(3) Adjuster ASSY pawls
(4) Adjusting lever
(5) Tightening direction
(6) Push.

• If the brake drum is difficult to remove, drive it out by installing an 8-mm bolt into bolt hole in brake drum.

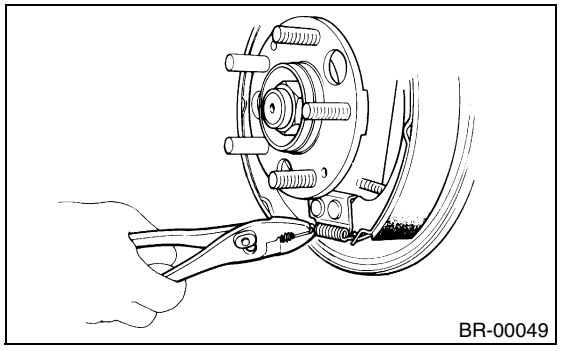


6) Hold the hold-down pin by securing rear of back plate with your hand.



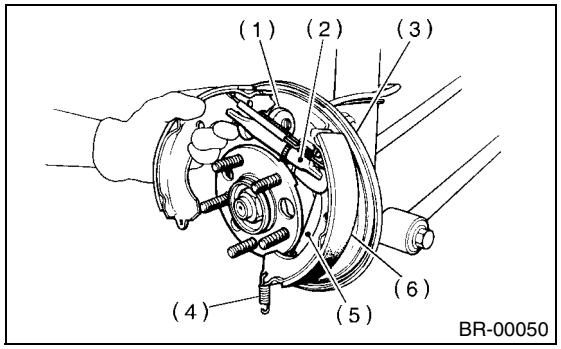
(1) Hold-down cup
(2) Hold-down pin

7) Disconnect the hold-down cup from hold-down pin by rotating hold-down cup.
8) Disconnect the lower shoe return spring from shoes.



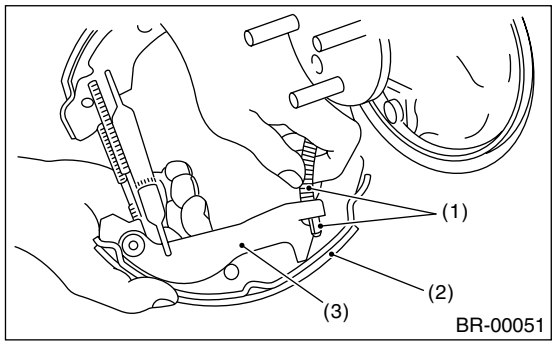
9) Remove the shoes one by one from back plate with adjuster.

CAUTION:
Be careful not to bend the parking brake cable excessively when removing brake shoes.



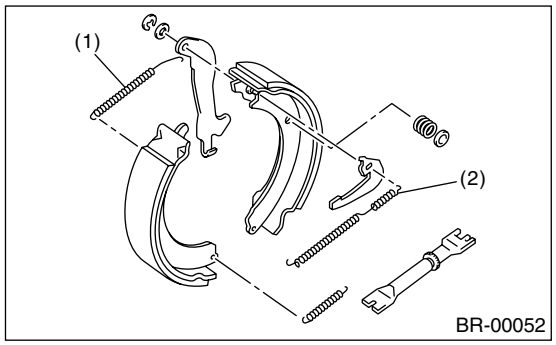
(1) Wheel cylinder
(2) Adjuster
(3) Back plate
(4) Lower shoe return spring
(5) Parking lever
(6) Trailing shoe

10) Disconnect the parking brake cable from parking lever.



(1) Parking brake cable
(2) Trailing shoe
(3) Parking brake lever

11) Remove the upper shoe return spring and adjusting spring from brake shoe.

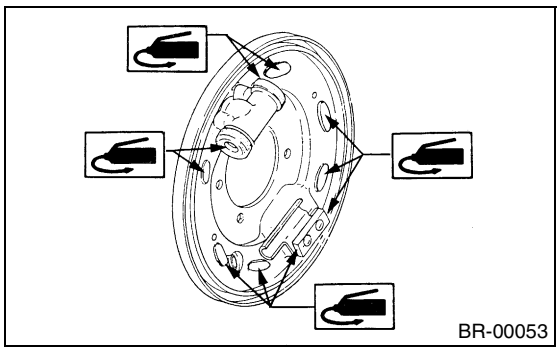


(1) Upper shoe return spring
(2) Adjusting spring

B: INSTALLATION

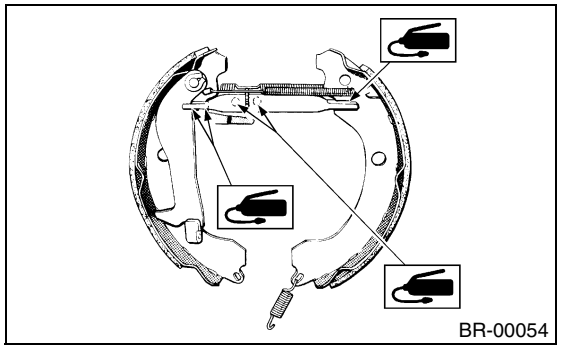
1) Clean the back plate and wheel cylinder.
2) Apply grease to portions indicated by arrows in the figure.

Brake grease:
Dow Corning Molykote No. 7439 (Part No. 003602001)

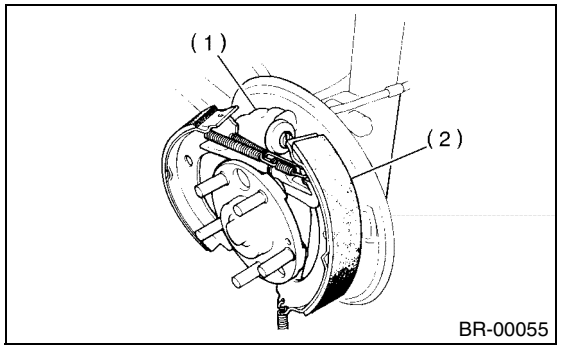


3) Apply grease to the adjusting screw and both ends of adjuster.

Brake grease:
Dow Corning Molykote No. 7439 (Part No. 003602001)



4) Connect the upper shoe return spring to shoes.
5) Connect the parking brake cable to parking lever.
6) While positioning the shoes (one at a time) in groove on wheel cylinder, secure the shoes.



(1) Wheel cylinder
(2) Shoe (Trailing)

7) Fix the shoes by connecting hold-down cup to hold-down pin.
8) Connect the lower shoe return spring.
9) Set the outside diameter of brake shoes less than 0.5 to 0.8 mm (0.020 to 0.031 in) in comparison with inside diameter of brake drum.

C: INSPECTION

1) Measure the lining thickness. If the thickness of lining is outside the service limit, replace the shoes.

Lining thickness:
Standard 4.1 mm (0.161 in)
Service limit 1.5 mm (0.059 in)

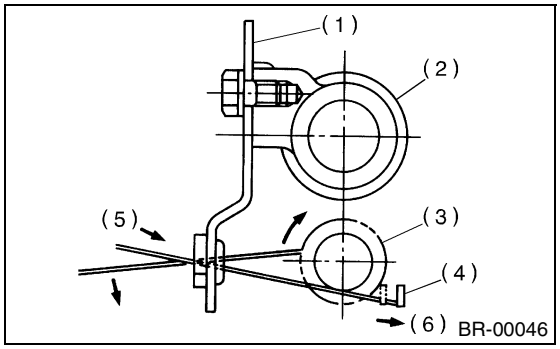
2) If the deformation or wear of back plate, shoe, etc. are notable, replace them.
3) When the shoe return spring tension is excessively weakened, replace it, taking care to identify the upper and lower springs.

9. Rear Drum Brake Drum

A: REMOVAL

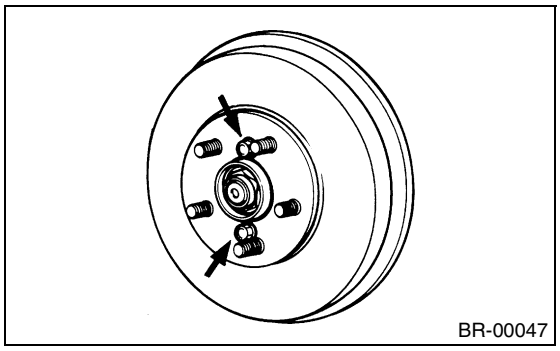
1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the wheels.
4) Release the parking brake.
5) Remove the brake drum from brake assembly.

NOTE:
• If it is difficult to remove the brake drum, remove the adjusting hole cover from back plate, and then turn the adjuster assembly pawls using a flat tip screwdriver until brake shoe separates from drum.



(1) Back plate
(2) Wheel cylinder
(3) Adjuster ASSY pawls
(4) Adjusting lever
(5) Tightening direction
(6) Push.

• If the brake drum is difficult to remove, drive it out by installing an 8-mm bolt into bolt hole in the brake drum.



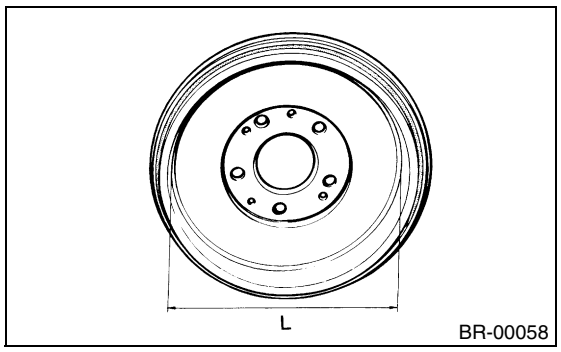
B: INSTALLATION

Set the outside diameter of brake shoes less than 0.5 to 0.8 mm (0.020 to 0.031 in) in comparison with inside diameter of brake drum.

C: INSPECTION

1) If the inside surface of brake drum is streaked, correct the surface. And, if it is unevenly worn, taperingly streaked, or the outside surface of brake drum is damaged, correct or replace it.
2) Measure the drum inner diameter. If the inner diameter of drum is outside the service limit, replace the drum.

Drum inner diameter: "L"
Standard 228.6 mm (9 in)
Service limit 230.6 mm (9.08 in)

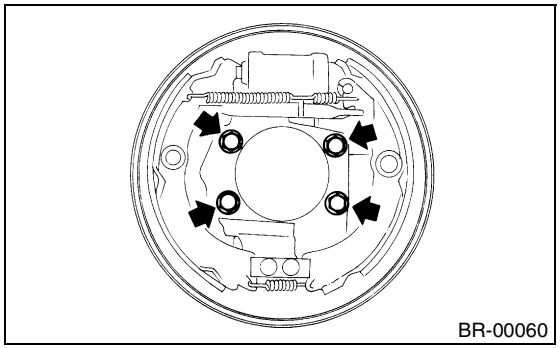


10.Rear Drum Brake Assembly

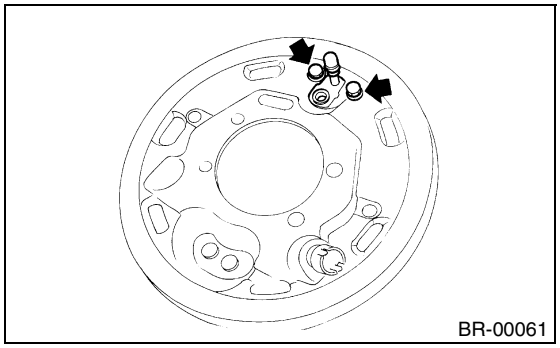
A: REMOVAL

CAUTION:
Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the wheels.
4) Release the parking brake.
5) Remove the brake drum from brake assembly. <Ref. to BR-31, REMOVAL, Rear Drum Brake Drum.>
6) Remove the brake shoe. <Ref. to BR-29, REMOVAL, Rear Drum Brake Shoe.>
7) Disconnect the brake hose. <Ref. to BR-47, REAR BRAKE HOSE (DRUM BRAKE), REMOVAL, Brake Hose.>
8) Remove the hub. <Ref. to DS-23, REMOVAL, Rear Axle.>
9) Disconnect the ABS sensor from back plate.
10) Remove the brake assembly.


BR-00060

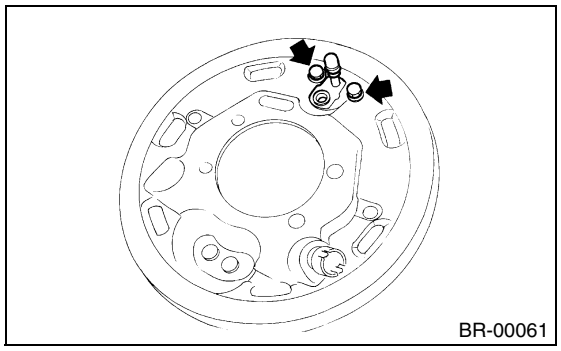
11) Remove the bolts installing wheel cylinder on back plate, and remove it.


BR-00061

B: INSTALLATION

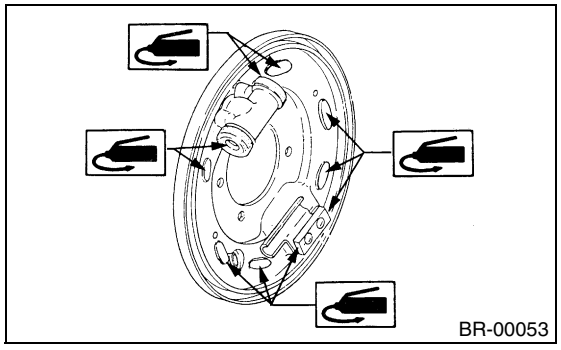
1) Clean the back plate and wheel cylinder.
2) Install the wheel cylinder on back plate, and tighten bolts.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)


BR-00061

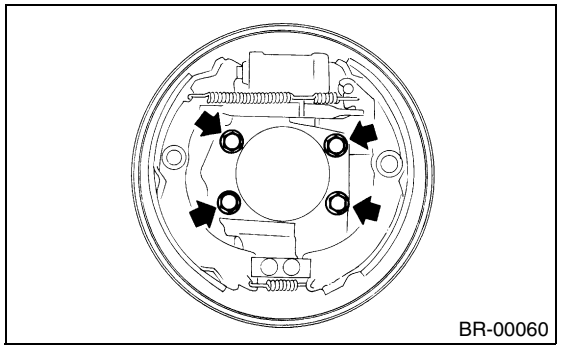
3) Apply grease to the portions indicated by arrows in the figure.

Brake grease:
Dow Corning Molykote No. 7439 (Part No. 003602001)


BR-00053

4) Install the brake assembly on housing, and tighten the bolts to install back plate.

Tightening torque:
52 N·m (5.3 kgf-m, 38.3 ft-lb)


BR-00060

5) Install the hub. <Ref. to DS-26, INSTALLATION, Rear Axle.>

6) Connect the brake hose, and tighten the brake hose flange nut.

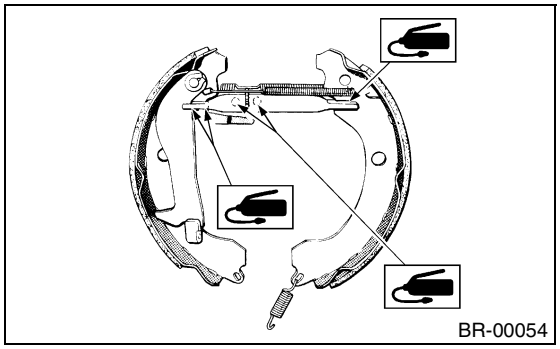
Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

7) Connect the ABS sensor to back plate.

Tightening torque:
32 N·m (3.3 kgf-m, 24 ft-lb)

8) Apply grease to the adjusting screw and both ends of adjuster.

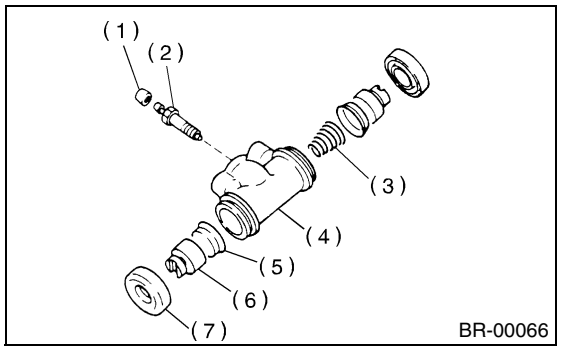
Brake grease:
Dow Corning Molykote No. 7439 (Part No. 003602001)



9) Install the brake shoe. <Ref. to BR-30, INSTALLATION, Rear Drum Brake Shoe.>
10) Install the brake drum. <Ref. to BR-31, INSTALLATION, Rear Drum Brake Drum.>
11) After installing the brake assembly, bleed air from the brake line. <Ref. to BR-45, Air Bleeding.>

C: DISASSEMBLY

1) Remove the right and left dust boots from wheel cylinder.



(1) Bleeder cap
(2) Bleeder screw
(3) Spring
(4) Cylinder
(5) Cup
(6) Piston
(7) Boot

2) Remove the piston, cup, spring and air bleeder screw and cap.

D: ASSEMBLY

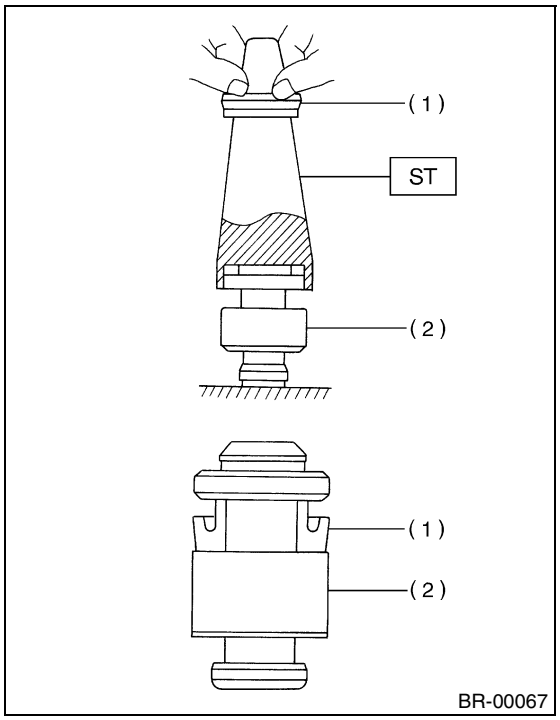
1) Clean all parts in brake fluid. Check and replace the faulty parts.
- Cup and boot for damage or fatigue
- Cylinder, piston and spring or damage or rust formation

2) Assemble in the reverse order of disassembly.
(1) When installing the cup, use ST, apply brake fluid to the frictional surface for smooth installation and pay attention to cup direction.
(2) STs are available in different sizes.

CAUTION:
When replacing the repair kit, make sure that the sizes of cylinder and cup are same as those which were replaced.

ST: ADAPTER	
Applicable size	Part No.
19 mm (3/4 in)	926460000

CAUTION:
While assembling, be careful to prevent any metal chip, dust or dirt from entering the wheel cylinder.

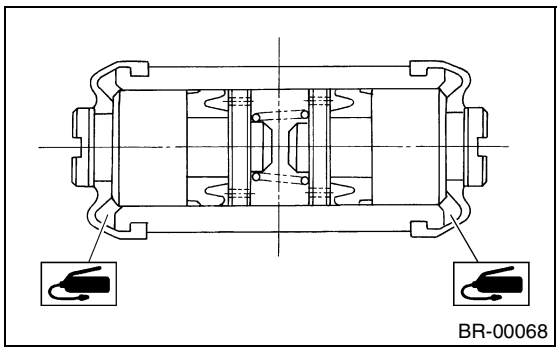


(1) Cup
(2) Piston

3) Apply rubber grease to the boot inside as shown in the figure.

CAUTION:
Never use brake grease.

Grease:
NIGLUBE RX-2 (Part No. K0779GA102)



E: INSPECTION

1) If the deformation or wear of back plate, shoe, etc. are notable, replace them.

11.Master Cylinder

A: REMOVAL

CAUTION:
Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

1) Thoroughly drain brake fluid from reservoir tank.
2) Disconnect the fluid level indicator harness connector.
3) Remove the brake pipes from master cylinder.
4) Remove the master cylinder mounting nuts, and take out master cylinder from brake booster.

B: INSTALLATION

1) To install the master cylinder to body, reverse the sequence of removal procedure.

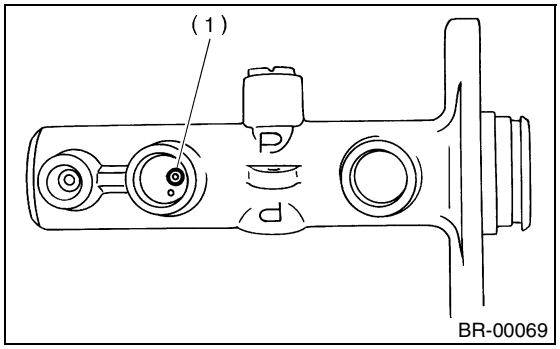
Tightening torque:
Master cylinder mounting nut
14 N·m (1.4 kgf-m, 10.1 ft-lb)
Piping flare nut
15 N·m (1.5 kgf-m, 10.8 ft-lb)

CAUTION:
Be sure to use recommended brake fluid.

2) Bleed air from the brake system. <Ref. to BR-45, PROCEDURE, Air Bleeding.>

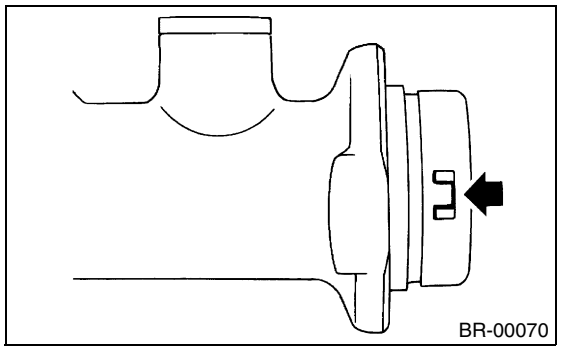
C: DISASSEMBLY

1) Remove mud and dirt from the surface of brake master cylinder.
2) Secure the master cylinder on a vise.
3) Remove the pin which secures reservoir tank to master cylinder, and then remove the reservoir tank and grommet.
4) Remove the cylinder pin with magnetic pick-up tool while pushing in primary piston by screwdriver which wrapped with tape.



(1) Cylinder pin (straight pin)

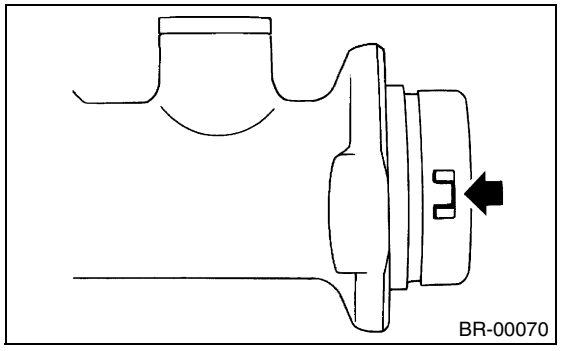
5) Pry up the pawl and remove piston retainer. Hold piston retainer tight, because the piston may jump out from master cylinder.



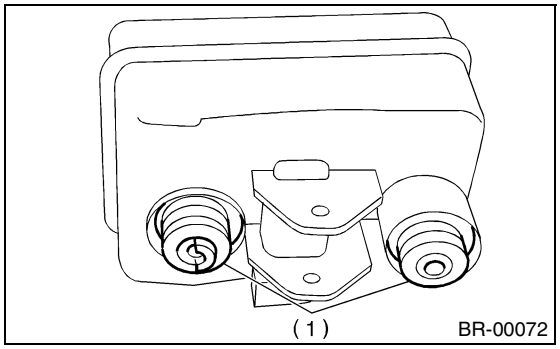
6) Extract the primary piston assembly and secondary piston assembly straight out, while taking care not to scratch the inner surface of cylinder.
7) Use brake fluid to wash the inside wall of cylinder, and piston assembly. If any damage, deformation, wear, rust, and other faults are found, replace the faulty part.

D: ASSEMBLY

1) Apply recommended brake fluid to the inside wall of cylinder, and to outer surface of the piston assembly.
2) Ensure that the inside wall of cylinder, and piston assembly are free from dirt when assembling. Install the primary piston assembly and secondary piston assembly, while taking care not to damage, scratch, or dent the cylinder inside wall, and piston assembly.
3) Install the cylinder pin while pushing in primary piston by screwdriver which wrapped with tape.
4) Install the piston retainer, and then secure it by pressing the pawl.



5) Install the seal to reservoir tank.



(1) Seal

6) Install the reservoir tank to master cylinder and secure with pin.

E: INSPECTION

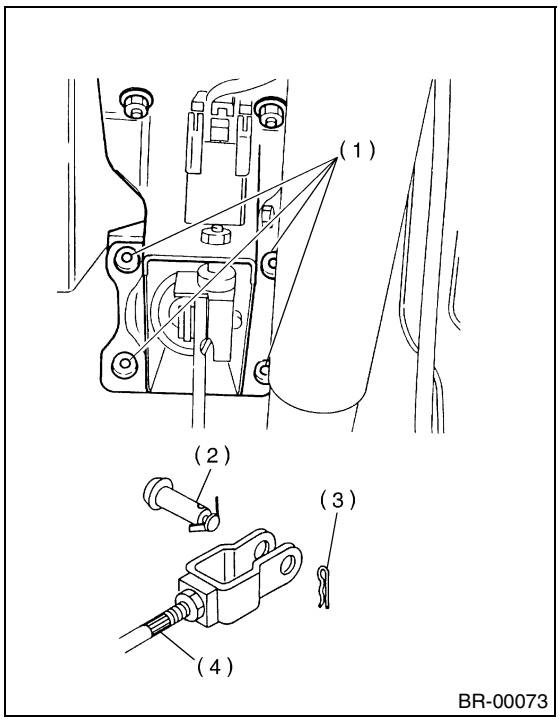
If any damage, deformation, wear, swelling, rust, and other faults are found on the primary piston assembly, secondary piston assembly, supply the valve stopper, or gasket, replace the faulty part.

NOTE:
• The primary and secondary pistons must be replaced as complete assemblies.
• The service limit of clearance between each piston and the master cylinder inner dia. is 0.11 mm (0.0043 in).

12.Brake Booster

A: REMOVAL

1) Remove or disconnect the following parts at engine compartment.
   (1) Disconnect the connector for brake fluid level indicator.
   (2) Remove the brake pipes from master cylinder.
   (3) Remove the master cylinder installing nuts.
   (4) Disconnect the vacuum hose from brake booster.
2) Remove the following parts from pedal bracket.
   (1) Snap pin and clevis pin
   (2) Four brake booster installing nuts

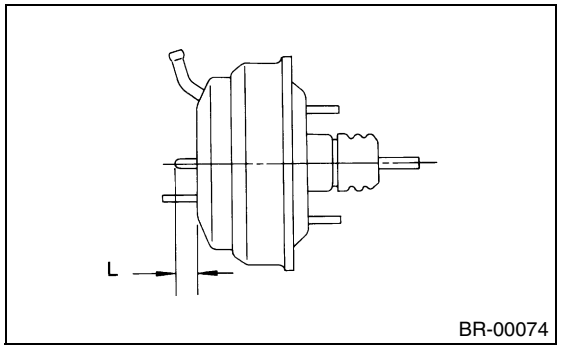


(1) Nuts
(2) Clevis pin
(3) Snap pin
(4) Operating rod

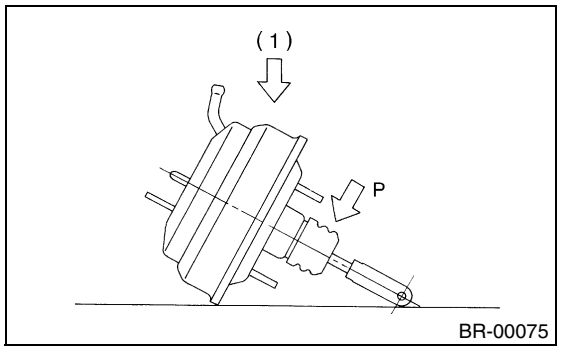
3) Remove the brake booster while shunning brake pipes.

NOTE:
• Be careful not to drop the brake booster. The brake booster should be discarded if it has been dropped.
• Use special care when handling the operating rod.
If excessive force is applied to the operating rod, sufficient to cause a change in the angle in excess of ±3°, it may result in damage to the power piston cylinder.
• Use care when placing the brake booster on floor.
• Do not change the push rod length. If it has been changed, reset the projected length “L” to standard length.

Standard L
LHD model: 10.05 mm (0.40 in)
RHD model: 10.4 mm (0.41 in)



CAUTION:
If external force is applied from above when the brake booster is placed in this position, the resin portion as indicated by “P”, may be damaged.



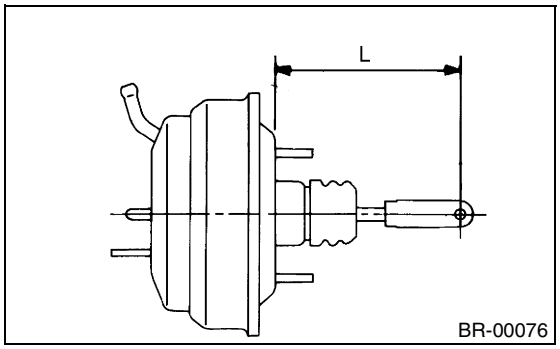
(1) Force

B: INSTALLATION

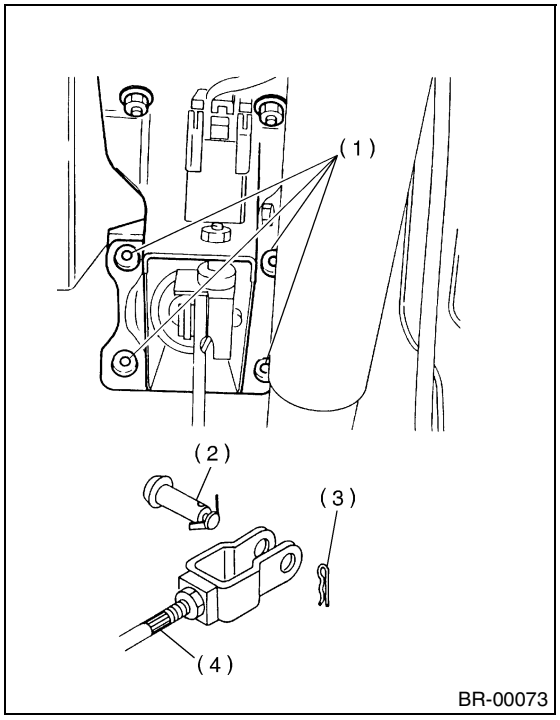
1) Adjust the operating rod of brake booster.

Standard L
LHD model: 144.6 mm (5.69 in)
RHD model: 173.2 mm (6.82 in)

If it is not within specified value, adjust it by adjusting the brake booster operating rod.

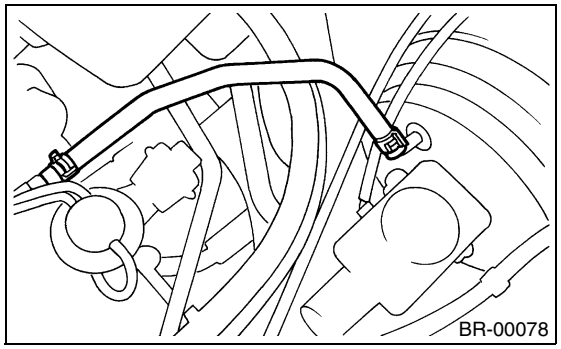


2) Mount the brake booster in position.
3) Connect the operating rod to brake pedal with clevis pin and snap pin.



(1) Nuts
(2) Clevis pin
(3) Snap pin
(4) Operating rod

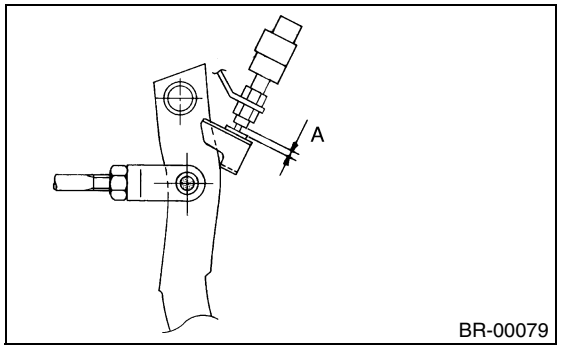
4) Connect the vacuum hose to brake booster.



5) Mount the master cylinder onto brake booster.
6) Connect the brake pipes to master cylinder.
7) Connect the electric connector for brake fluid level indicator.
8) Measure the clearance between threaded end of stop light switch and stopper.If it is not within specified value, adjust it by adjusting the position of stop light switch. <Ref. to BR-55, ADJUSTMENT, Stop Light Switch.>
If it is not within specified value, adjust it by adjusting the position of stop light switch.

CAUTION:
Be careful not to rotate the stop light switch.

Stop light switch clearance: A
0.3 mm (0.012 in)



9) Apply grease to operating rod connecting pin to prevent it from wearing.
10) Bleed air from the brake system.

Tightening torque (Air bleeder screw):
8 N·m (0.8 kgf-m, 5.8 ft-lb)

11) Conduct road tests to ensure brakes do not drag.

C: INSPECTION

1. OPERATION CHECK (WITHOUT GAUGES)

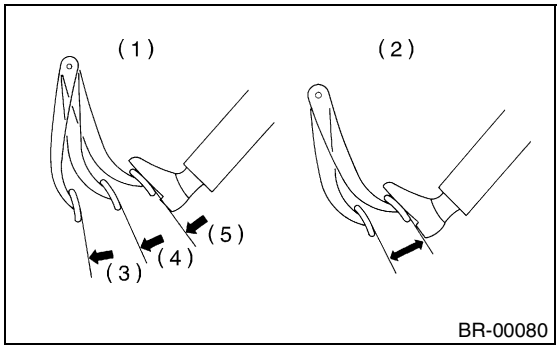
CAUTION:
When checking operation, be sure to securely apply the hand brake.

• Checking without gauges

This method cannot determine the exact portion which has failed, but it can provide a rough understanding of the nature of failure if checking is conducted in accordance with the following procedures.

• Air tightness check

Start the engine, and run it for 1 to 2 minutes, then turn it off. Depress the brake pedal several times applying same pedal force as that used in ordinary braking operations. The pedal stroke should be greatest on 1st depression, and it should become smaller with each successive depression. If no change occurs in the pedal height while in a depressed state, the brake booster is faulty.

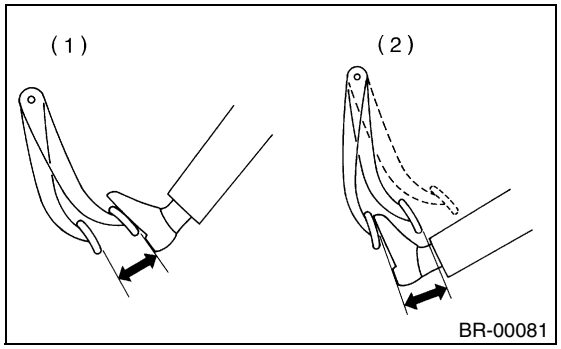


(1) OK
(2) NOT OK
(3) 1st
(4) 2nd
(5) 3rd

NOTE:
• In the event of defective operation, inspect the condition of check valve and vacuum hose.
• Replace them if faulty and conduct the test again.
• If no improvement is observed, check precisely with gauges.

• Operation check

1) With the engine off, depress the brake pedal several times applying same pedal force and make sure that pedal height does not vary with each depression of pedal.



(1) When engine is stopped
(2) When engine is started

2) With the brake pedal depressed, start the engine.
3) As the engine starts, the brake pedal should move slightly toward the floor. If no change occurs in the pedal height, the brake booster is faulty.

NOTE:
If faulty, check precisely with gauges.

• Loaded air tightness check

Depress the brake pedal while engine is running, and turn off the engine while pedal is still depressed. Keep the pedal depressed for 30 seconds; if no change occurs in the pedal height, the brake booster is functioning normally; if the pedal height increases, it is faulty.

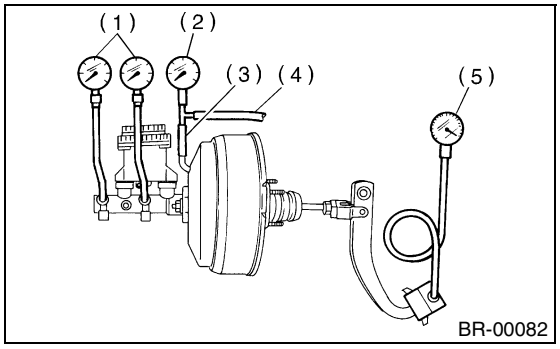
NOTE:
If faulty, check precisely with gauges.

2. OPERATION CHECK (WITH GAUGES)

CAUTION:
When checking operation, be sure to securely apply the hand brake.

• Checking with gauges

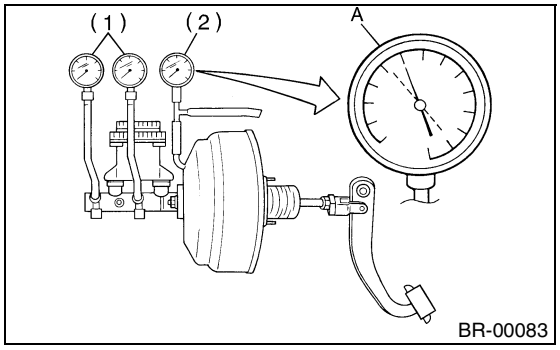
Connect gauges as shown in the figure. After bleeding air from pressure gauges, proceed to each check.



(1) Pressure gauge
(2) Vacuum gauge
(3) Adapter hose
(4) Vacuum hose
(5) Pedal force gauge

• Air tightness check

1) Start the engine and keep it running until a vacuum of 66.7 kPa (500 mmHg, 19.69 inHg) = point A is indicated on vacuum gauge. Do not depress the brake pedal.



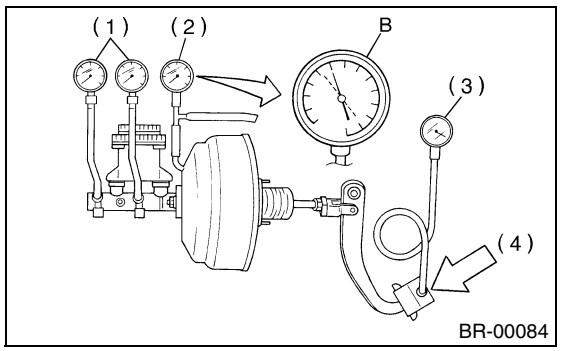
(1) Pressure gauge
(2) Vacuum gauge

2) Stop the engine and watch the gauge. If the vacuum drop range is less than 3.3 kPa (25 mmHg, 0.98 inHg) within 15 seconds after stopping engine, the brake booster is functioning properly.
If defective, the cause may be one of those listed below.

- Check valve malfunction
- Leak from vacuum hose
- Leak from the shell jointed portion or stud bolt welded portion
- Damaged diaphragm
- Leak from valve body seal and bearing portion
- Leak from plate and seal assembly portion
- Leak from poppet valve assembly portion

• Loaded air tightness check

1) Start the engine and depress brake pedal with pedal force of 196 N (20 kgf, 44 lb). Keep the engine running until a vacuum of 66.7 kPa (500 mmHg, 19.69 inHg) = point B is indicated on vacuum gauge while the pedal is still depressed.



(1) Pressure gauge
(2) Vacuum gauge
(3) Pedal force gauge
(4) Depress

2) Stop the engine and watch vacuum gauge.
If the vacuum drop range is less than 3.3 kPa (25 mmHg, 0.98 inHg) within 15 seconds after stopping engine, the brake booster is functioning properly.
If defective, refer to “AIR TIGHTNESS CHECK”. <Ref. to BR-39, INSPECTION, Brake Booster.>
3) If any fault is found on brake booster, replace the brake booster with a new one.

• Lack of boosting action check

Turn off the engine, and set the vacuum gauge reading at “0”. Then, check the fluid pressure when brake pedal is depressed. The pressure must be greater than the standard value listed.

	Brake pedal force	147 N (15 kgf, 33 lb)	294 N (30 kgf, 66 lb)
Europe · General	Fluid pressure	571 kPa (6 kg/cm^2, 85 psi)	1,523 kPa (16 kg/cm^2, 228 psi)
Australia		648 kPa (7 kg/cm^2, 94 psi)	1,715 kPa (17 kg/cm^2, 249 psi)

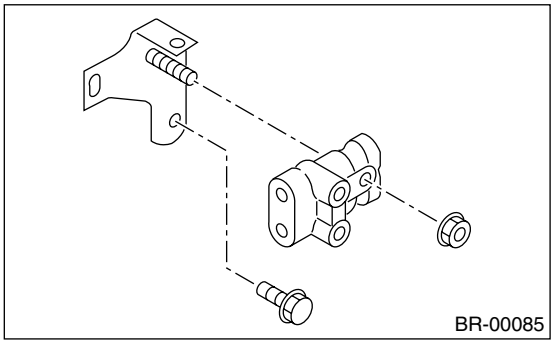
• Boosting action check

Set the vacuum gauge reading at 66.7 kPa (500 mmHg, 19.69 inHg) by running engine. Then, check the fluid pressure when brake pedal is depressed. The pressure must be greater than the standard value listed.

	Brake pedal force	147 N (15 kgf, 33 lb)	294 N (30 kgf, 66 lb)
Europe · General	Fluid pressure	8,025 kPa (82 kg/cm^2, 1,164 psi)	9,123 kPa (93 kg/cm^2, 1,372 psi)
Australia		6,468 kPa (66 kg/cm^2, 938 psi)	10,240 kPa (104 kg/cm^2, 1,485 psi)

13.Proportioning Valve

A: REMOVAL



1) Remove the brake pipe from proportioning valve at four places.
2) Remove the proportioning valve from its bracket.

NOTE:
Do not disassemble or adjust the proportioning valve. (The proportioning valve must be replaced as an assembly.)

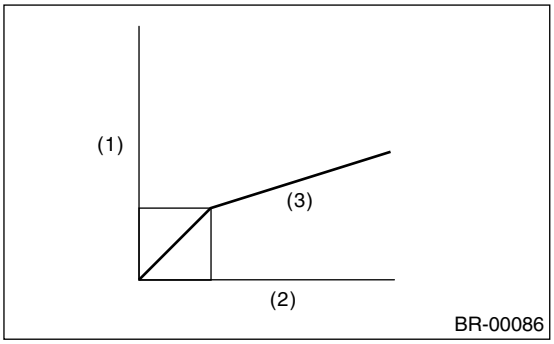
B: INSTALLATION

1) Install the proportioning valve to bracket.
2) Connect the brake pipes correctly to proportioning valve.
3) Bleed air, then check each joint of the brake pipe for oil leaks.

Tightening torque:
Proportioning valve to brake pipe flare nut:
15 N·m (1.5 kgf-m, 10.8 ft-lb)
Proportioning valve to bracket
18 N·m (1.8 kgf-m, 13.0 ft-lb)

C: INSPECTION

1) Install the oil pressure gauges to measure the master cylinder fluid pressure (front wheel brake fluid pressure) and rear wheel cylinder fluid pressure.
2) Bleed air from the oil pressure gauges.
3) Check the master cylinder fluid pressure and rear wheel cylinder fluid pressure.
The standard values are shown in the figure.



(1) Rear wheel cylinder fluid pressure: P_3
(2) Master cylinder fluid pressure: P_2
(3) When both circuits are normal

4) For the oil pressure in case of split point, refer to “SPECIFICATIONS”. <Ref. to BR-2, SPECIFICATIONS, General Description.>

14.Brake Fluid

A: INSPECTION

1) Check that the brake fluid level remains between “MIN” and “MAX”. If out of the specified range, refill or drain fluid. If the fluid level becomes close to “MIN”, refill the fluid.
2) Check the fluid for discoloration. If the fluid color has excessively changed, drain the fluid and refill with new fluid.

B: REPLACEMENT

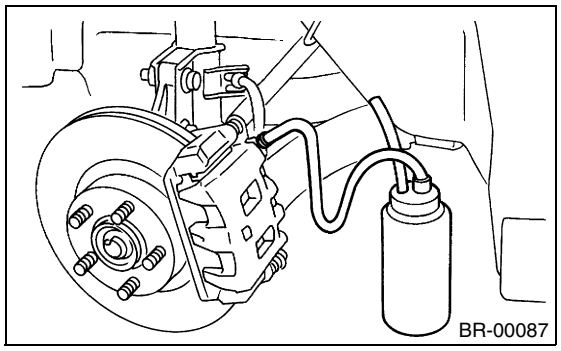
CAUTION:
• To always maintain the brake fluid characteristics, replace the brake fluid according to maintenance schedule or earlier than that when used in severe condition.
• The FMVSS No. 116, fresh DOT3 or 4 brake fluid must be used.
• Cover the bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
• Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.
• Avoid mixing different brands of brake fluid to prevent degrading the quality of fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.

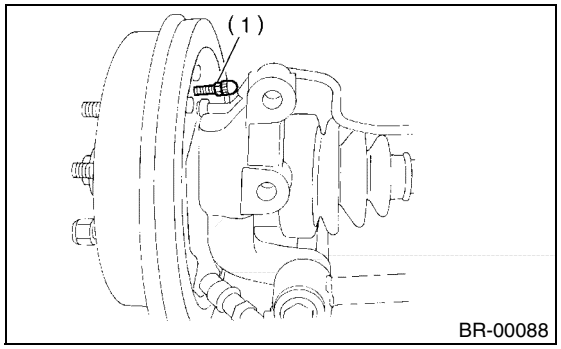
NOTE:
• During bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
• The brake pedal operating must be very slow.
• For convenience and safety, two people should do the work.
• The amount of brake fluid required is approx. 500 mℓ (16.9 US fl oz, 17.6 Imp fl oz) for total brake system.

1) Either jack-up the vehicle and place a safety stand under it, or left up vehicle.
2) Remove both front and rear wheels.
3) Draw out the brake fluid from master cylinder with syringe.
4) Refill the reservoir tank with recommended brake fluid.

Recommended brake fluid:
FMVSS No. 116, fresh DOT3 or 4 brake fluid

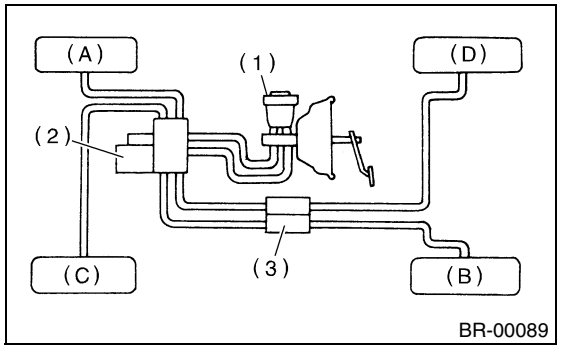
5) Install one end of a vinyl tube onto the air bleeder and insert the other end of the tube into a container to collect the brake fluid.





(1) Air bleeder screw

CAUTION:
Brake fluid replacement sequence; (A) Front right → (B) Rear left → (C) Front left → (D) Rear right



(1) Master cylinder
(2) Hydraulic unit
(3) Proportioning valve

6) Instruct your co-worker to depress the brake pedal slowly two or three times and then hold it depressed.
7) Loosen the bleeder screw approx. 1/4 turn until a small amount of brake fluid drains into container, and then quickly tighten the screw.

8) Release the brake pedal slowly. Repeat steps 6) through 8) until there are no air bubbles in the drained brake fluid and new fluid flows through vinyl tube.

NOTE:
Add brake fluid as necessary while performing air bleed operation, in order to prevent the tank from running short of brake fluid.

9) After completing the bleeding operation, hold brake pedal depressed and tighten screw and install bleeder cap.

Tightening torque (Bleeder screw):
8 N·m (0.8 kgf-m, 5.8 ft-lb)

10) Bleed air from each wheel cylinder using the same procedures as described in steps 6) through 8) above.

11) Depress the brake pedal with a force of approx. 294N (30kg, 66lb) and hold it there for approx. 20 seconds. At this time check for mix in air and pedal height change. Visually inspect the bleeder screws and brake pipe joints to make sure that there is no fluid leakage.

12) Install the wheels, and drive the vehicle for a short distance between 2 to 3 km (1 to 2 miles) to make sure that brakes are operating properly.

15.Air Bleeding

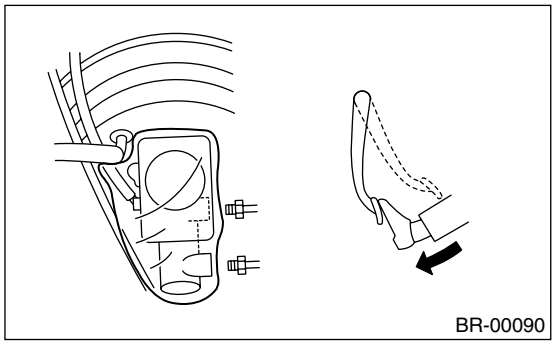
A: PROCEDURE

CAUTION:
• The FMVSS No. 116, fresh DOT3 or 4 brake fluid must be used.
• Cover the bleeder with waste cloth when loosening it to prevent brake fluid from being splashed over surrounding parts.
• Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.
• Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.

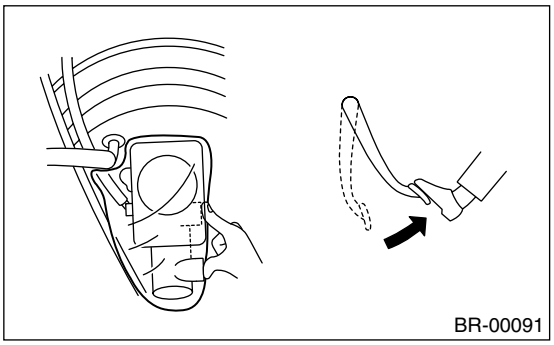
1. MASTER CYLINDER

NOTE:
• If the master cylinder is disassembled or reservoir tank is empty, bleed the master cylinder.
• During the bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
• The brake pedal operating must be very slow.
• For convenience and safety, two people should do the work.

1) Loosen the wheel nuts, jack-up the vehicle, support it with safety stands, and remove the wheel.
2) Disconnect the brake line at primary and secondary sides.
3) Put a plastic bag cover on master cylinder.
4) Carefully depress and hold the brake pedal.


BR-00090

5) Close the outlet plug with your finger, and release the brake pedal.


BR-00091

6) Repeat step4) and 5) until the brake fluid is completey bled from outlet plug.
7) Remove the plastic bag.
8) Install the brake pipes to master cylinder.

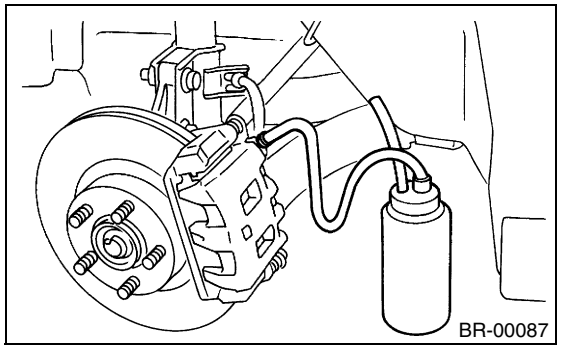
Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

9) Bleed air from the brake line. <Ref. to BR-45, BRAKE LINE, PROCEDURE, Air Bleeding.>

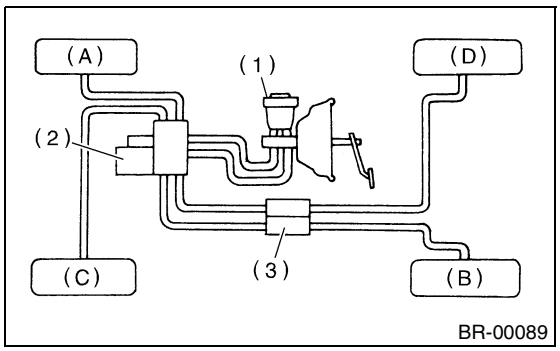
2. BRAKE LINE

NOTE:
• During the bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
• The brake pedal operating must be very slow.
• For convenience and safety, two people should do the work.

1) Make sure that there is no leak from the joints and connections of brake system.
2) Fit one end of vinyl tube into the air bleeder and put the other end into a brake fluid container.


BR-00087

CAUTION:
Brake fluid replacement sequence; (A) Front right → (B) Rear left → (C) Front left → (D) Rear right



(1) Master cylinder
(2) Hydraulic unit
(3) Proportioning valve

3) Slowly depress the brake pedal and keep it depressed. Then, open the air bleeder to discharge air together with the fluid.
Release the air bleeder for 1 to 2 seconds.
Next, with the bleeder closed, slowly release the brake pedal.
Repeat these steps until there are no more air bubbles in the vinyl tube.
Allow 3 to 4 seconds between two brake pedal operations.

CAUTION:
Cover the bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.

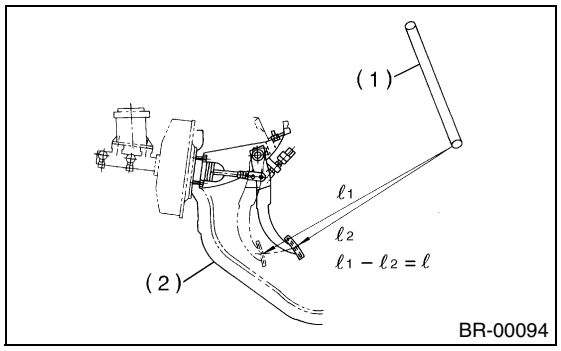
NOTE:
The brake pedal operating must be very slow.

4) Tighten the air bleeder securely when no air bubbles are visible.

Air bleeder tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

5) Perform these steps for the brakes connecting to secondary chamber of master cylinder, first, and then for the ones connecting to primary chamber. With all procedures completed, fully depress the brake pedal and keep it in that position for approx. 20 seconds to make sure that there is no leak evident in the entire system.

6) Check the pedal stroke.
While the engine is idling, depress the brake pedal with a 490 N (50 kgf, 110 lb) load and measure the distance between brake pedal and steering wheel. With the brake pedal released, measure the distance between pedal and steering wheel again. The difference between the two measurements must not be more than specified.



(1) Steering wheel
(2) Toe board

Specified pedal stroke
Europe · General model:
90 mm (3.54 in)
Australia model:
105 mm (4.13 in)
When depressing brake pedal with a 490 N (50 kgf, 110 lbf) load.

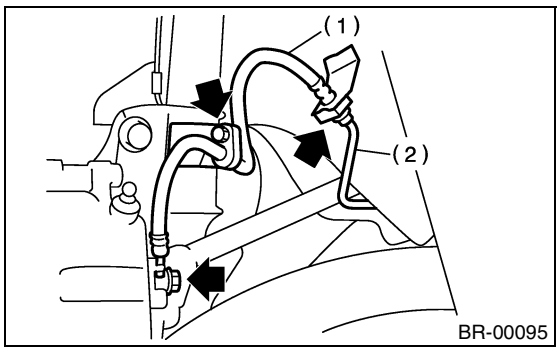
7) If the distance is more than the specifications, there is a possibility that air is in the brake line. Bleed the brake line until pedal stroke meets the specification.
8) Operate the hydraulic control unit in the sequence control mode. <Ref. to ABS-11, ABS Sequence Control.>
9) Recheck the brake stroke.
10) If the distance is more than specifications, there is a possibility air is in the inside of hydraulic unit. Repeat above steps 2) to 9) above until pedal stroke meets the specification.
11) Add brake fluid to the required level (MAX. level) of reservoir tank.
12) As a final step, test run the vehicle at low speed and apply brakes relatively hard 2 to 3 times to ensure that brakes provide normal braking action on all four wheels without dragging and uneven braking.

16.Brake Hose

A: REMOVAL

1. FRONT BRAKE HOSE

1) Separate the brake pipe from brake hose.
(Always use the flare nut wrench and be careful not to deform the flare nut.)
2) Pull out the clamp to remove brake hose.
3) Remove the bolt at strut and union bolt.



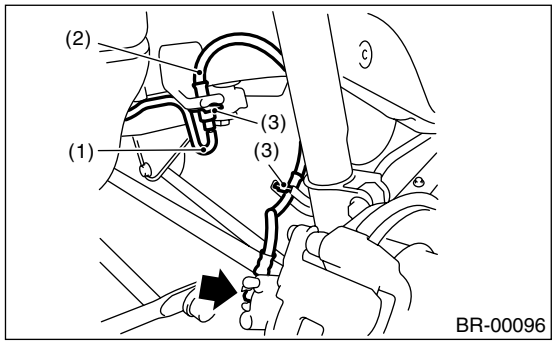
(1) Brake hose
(2) Brake pipe

2. REAR BRAKE HOSE (DISC BRAKE)

1) Separate the brake pipe from brake hose.

NOTE:
Always use the flare nut wrench and be careful not to deform the flare nut.

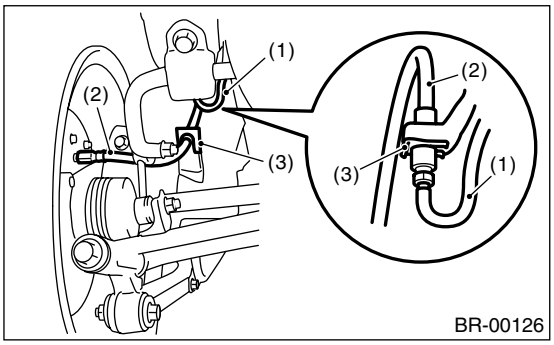
2) Remove the clamp and union bolt.



(1) Brake pipe
(2) Brake hose
(3) Brake hose clamp

3. REAR BRAKE HOSE (DRUM BRAKE)

1) Separate the brake pipe from brake hose using a flare nut wrench.
2) Remove two clamps.
3) Separate the brake hose from weel cylinder.



(1) Brake pipe
(2) Brake hose
(3) Brake hose clamp

B: INSTALLATION

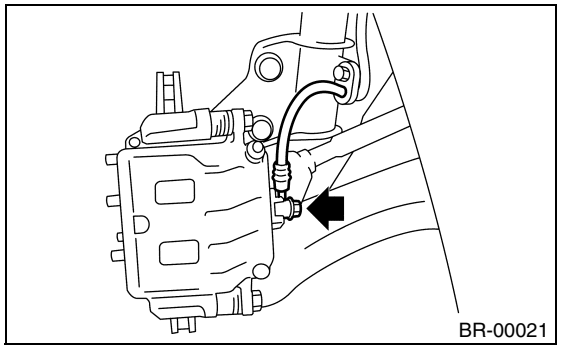
1. FRONT BRAKE HOSE

1) Secure the brake hose to strut.

Tightening torque (Union bolt):
32 N·m (3.3 kgf-m, 23.6 ft-lb)

2) Install the brake hose to caliper using a new gasket.

Tightening torque (Union bolt):
18 N·m (1.8 kgf-m, 13.0 ft-lb)



3) Position the disc in straight-forward direction and route brake hose through hole in bracket on wheel apron side.

CAUTION:
Be sure brake hose is not twisted.

4) Temporarily tighten the flare nut to connect brake pipe and hose.
5) Fix the brake hose with clamp at wheel apron bracket.
6) While holding the hexagonal part of brake hose fitting with a wrench, tighten the flare nut to the specified torque.

Tightening torque (Brake pipe flare nut):
15 N·m (1.5 kgf-m, 10.8 ft-lb)

7) Bleed air from the brake system.

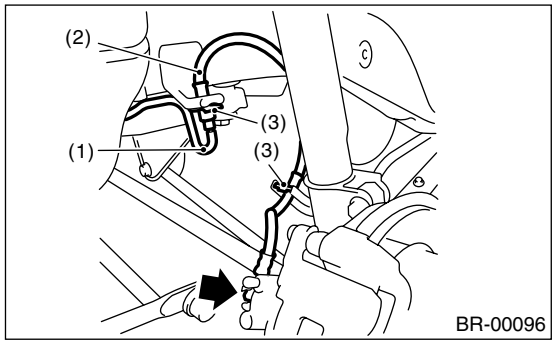
2. REAR BRAKE HOSE (DISC BRAKE)

1) Pass the brake hose through hole of bracket, and lightly tighten the flare nut to connect brake pipe.
2) Insert the clamp upward to fix brake hose.
3) Install the brake hose to caliper using a new gasket.

Tightening torque (Brake pipe flare nut):
18 N·m (1.8 kgf-m, 13.0 ft-lb)

4) While holding the hexagonal part of brake hose fitting with a wrench, tighten the flare nut to the specified torque.

Tightening torque (Brake pipe flare nut):
15 N·m (1.5 kgf-m, 10.8 ft-lb)



(1) Brake pipe
(2) Brake hose
(3) Brake hose clamp

5) Bleed air from the brake system.

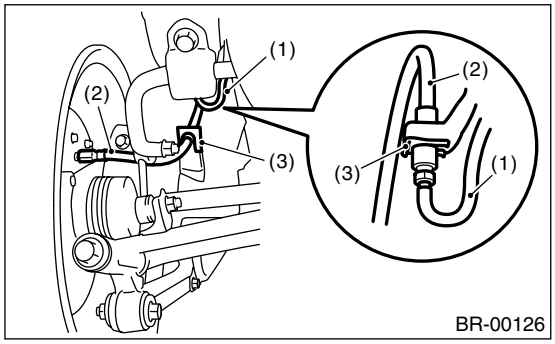
3. REAR BRAKE HOSE (DRUM BRAKE)

1) Install the brake hose to wheel cylinder.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

2) Secure the brake hose to bracket on strut using a clamp.
3) Connect the brake hose through hole in bracket on body.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)



(1) Brake pipe
(2) Brake hose
(3) Brake hose clamp

4) Bleed air from the brake system.

C: INSPECTION

Ensure there are no cracks, breakage, or damage on the hoses. Check the joints for fluid leakage. If any cracks, breakage, damage or leakage is found, repair or replace the hose.

17.Brake Pipe

A: REMOVAL

NOTE:
Airbag system wiring harness is routed near the center brake pipe.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the center brake pipe.
• When removing the brake pipe, make sure that it is not bent.

B: INSTALLATION

NOTE:
Airbag system wiring harness is routed near the center brake pipe.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the center brake pipe.
• When installing the brake pipe, make sure that it is not bent.
• After installing the brake pipe and hose, bleed the air.
• After installing the brake hose, make sure that it does not touch the tire or suspension assembly, etc.

Brake pipe tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

C: INSPECTION

Ensure there are no cracks, breakage, or damage on pipes. Check the joints for fluid leakage. If any cracks, breakage, damage or leakage is found, repair or replace the pipe.

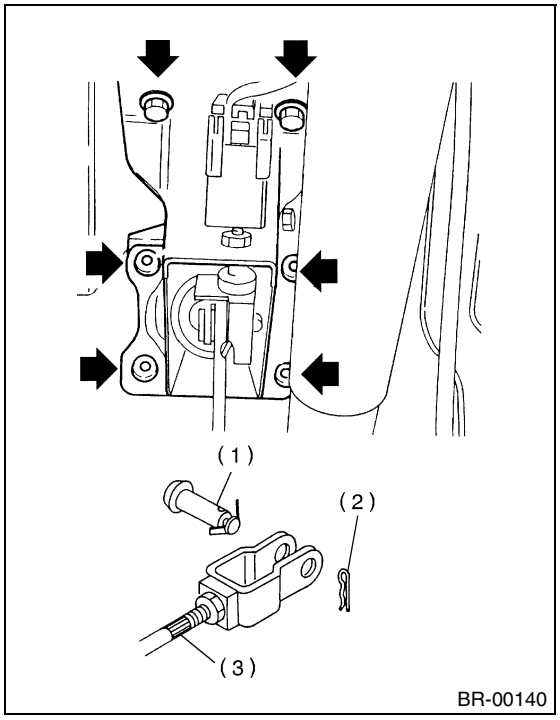
NOTE:
Use a mirror when inspecting low-visible part or back side.

18.Brake Pedal

A: REMOVAL

1. LHD AT VEHICLES

1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover from instrument panel.
3) Remove the clevis pin which secures brake pedal to brake booster operating rod. Also disconnect the stop light switch connector.
4) Remove the four bolts and four nuts which secure the brake pedal to pedal.

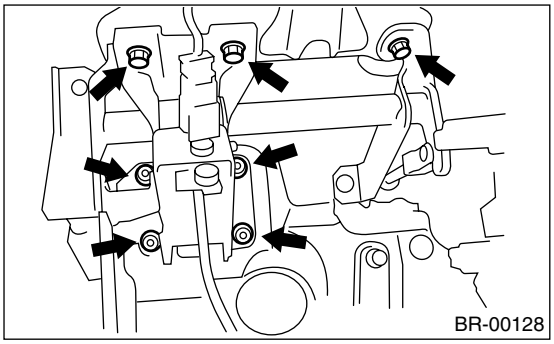


(1) Clevis pin
(2) Snap pin
(3) Operating rod

2. LHD MT VEHICLES

1) Remove the steering bolts.
2) Raise the vehicle on hoist and remove the two bolts which secure steering unit to underside of body.
3) Lower the vehicle to floor.
4) Remove the instrument panel lower cover from instrument panel.
5) Disconnect the following parts from pedal bracket.
- Operating rod of brake booster
- Electrical connectors (for stop light switch, etc.)

6) Remove the clevis pin which secures lever to push rod.
7) Remove the nut which secures clutch master cylinder.
8) Remove the steering assembly.
9) Remove the accelerator pedal.
10) Remove the bolts and nuts which secure pedal bracket.

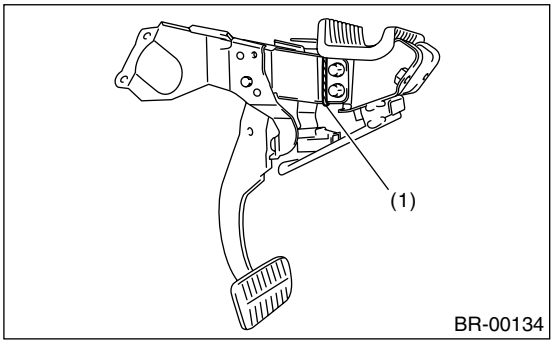


3. RHD MODEL

NOTE:
Brake pedal bracket is non-disassemble part. However the removal is necessary for replacement, refer to the following.

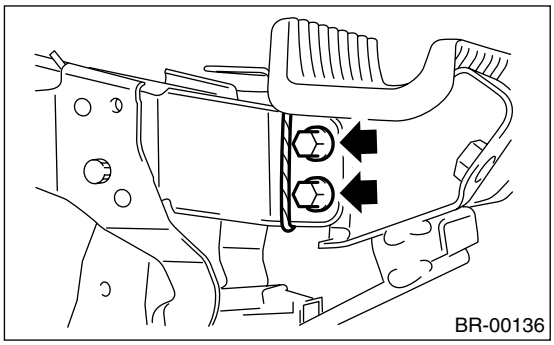
1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover from instrument panel.
3) Hold the brake pedal bracket (front side) using wires.

NOTE:
- To avoid the dislocation of brake pedal axis when the bracket opens, hold the bracket with using wires.
- Be sure not to over tighten the wires.

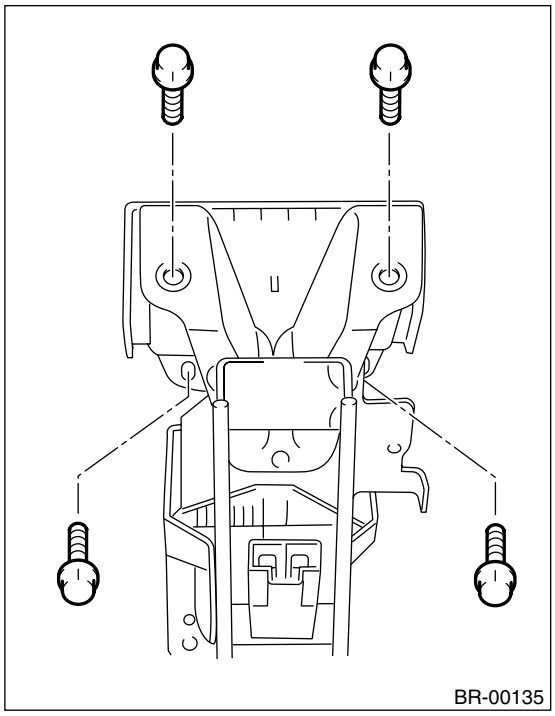


(1) Wires

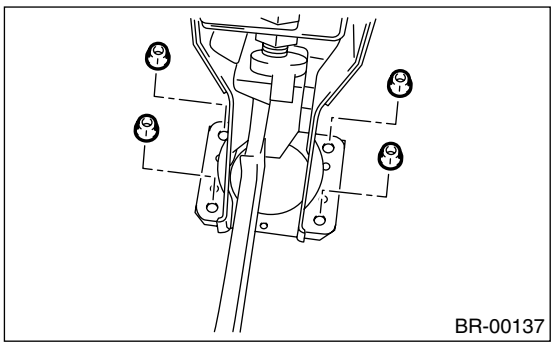
4) Remove the bolts which securing RH and LH side of brake pedal bracket (front side).


BR-00136

5) Remove the four bolts which securing brake pedal bracket (rear side).


BR-00135

6) Remove the nuts which securing brake pedal bracket (front side).


BR-00137

7) Remove the brake pedal.

NOTE:
During the removal of pedal, do not pry the bracket.

B: INSTALLATION

1) Install in the reverse order of removal.

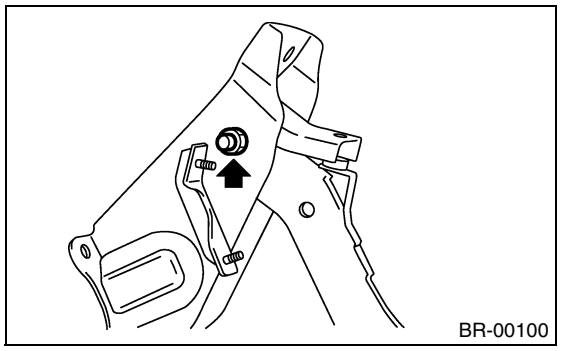
CAUTION:
• If the cable clamp is damaged, replace it with a new one.
• Never fail to cover the outer cable end with boot.
• Be careful not to kink the accelerator cable.
• Always use new clevis pins.

2) Adjust the clutch pedal. <Ref. to CL-40, ADJUSTMENT, Clutch Pedal.>
3) Inspect the brake pedal after installation. <Ref. to BR-53, INSPECTION, Brake Pedal.>

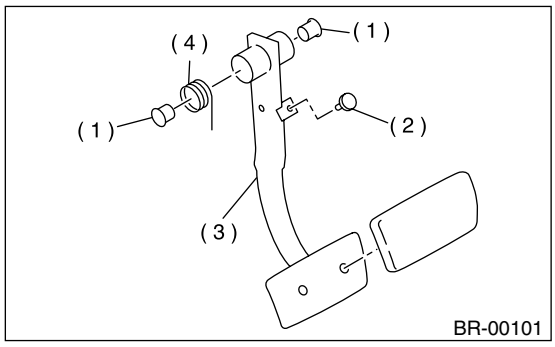
C: DISASSEMBLY

1. LHD AT VEHICLES

1) Remove the brake switch.
2) Unbolt, and then remove the brake pedal.


BR-00100

3) Remove the bushing, spacer and spring.



BR-00101

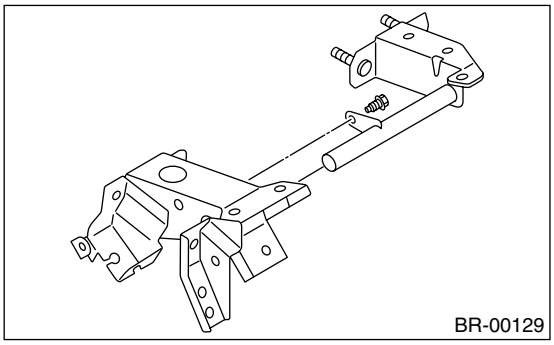
(1) Bushing
(2) Stopper
(3) Brake pedal
(4) Brake pedal spring

4) Remove the brake pedal pad.

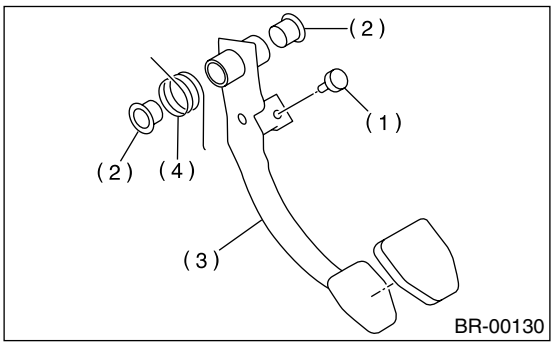
2. LHD MT VEHICLES

1) Remove the brake switch. <Ref. to BR-54, REMOVAL, Stop Light Switch.>
2) Remove the clutch pedal. <Ref. to CL-39, DISASSEMBLY, Clutch Pedal.>

3) Remove the clutch master cylinder bracket.



4) Remove the bushing, spring and stopper.



(1) Stopper
(2) Bushing
(3) Brake pedal
(4) Brake pedal spring

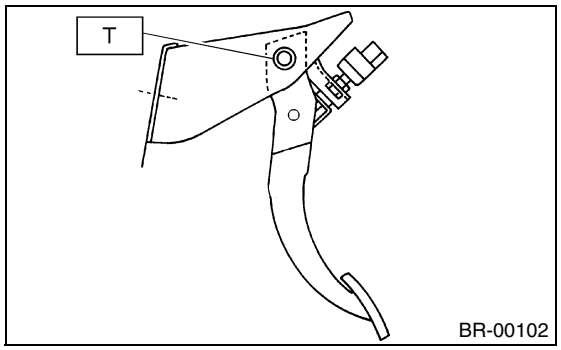
5) Remove the brake pedal pad.

D: ASSEMBLY

1) Attach the stop light switch, etc. to pedal bracket temporarily.
2) Clean the inside of bores of clutch pedal and brake pedal, apply grease, and set the bushings into bores.
3) Align bores of the pedal bracket, clutch pedal and brake pedal, attach the brake pedal return spring and clutch pedal effort reducing spring (vehicle with hill holder), and then install the pedal bolt.

NOTE:
Clean up the inside of bushings and apply grease before installing spacer.

Tightening torque:
T: 30 N·m (3.1 kgf-m, 22.4 ft-lb)



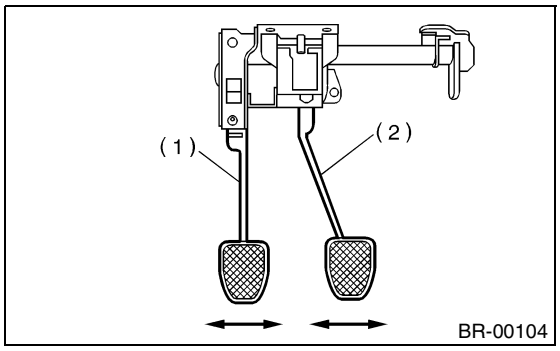
4) After installing the brake pedal to vehicle, adjust the stop light position. <Ref. to BR-55, ADJUSTMENT, Stop Light Switch.>

E: INSPECTION

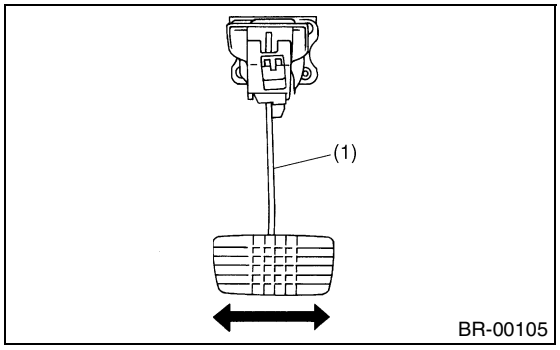
1) Move the brake and clutch pedal pads in the lateral direction with a force of approx. 10 N (1 kgf, 2 lb) to ensure pedal deflection is in specified range.

CAUTION:
If excessive deflection is noted, replace the bushings with new ones.

Deflection of brake and clutch pedal:
Service limit
±2 mm (0.079 in) or less



(1) Clutch pedal
(2) Brake pedal

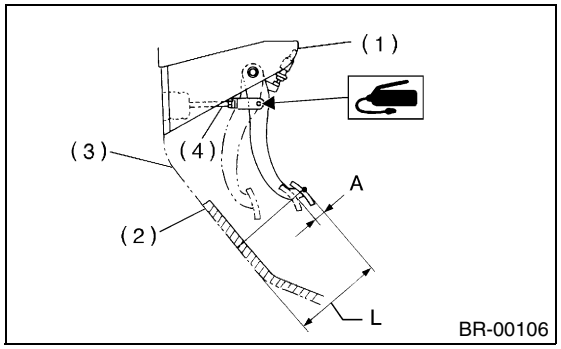


(1) Brake pedal

2) Check the position of pedal pad.

Pedal height: L
148 mm (5.83 in)

Brake pedal free play: A
0.5 — 2 mm (0.02 — 0.08 in) [Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lbf).]



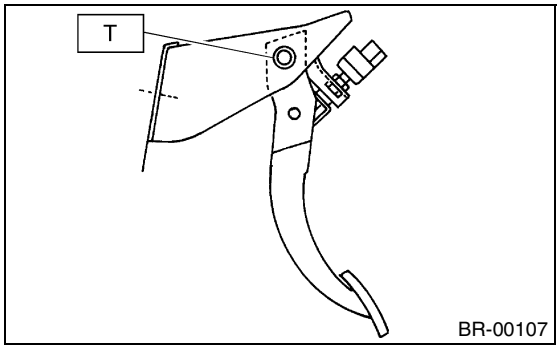
(1) Stop light switch
(2) Mat
(3) Toe board
(4) Brake booster operating rod

3) If it is not within specified value, adjust it by adjusting the brake booster operating rod length.

19.Stop Light Switch

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Disconnect the stop light switch connector.
3) Loosen nuts, and unscrew stop light switch to remove.

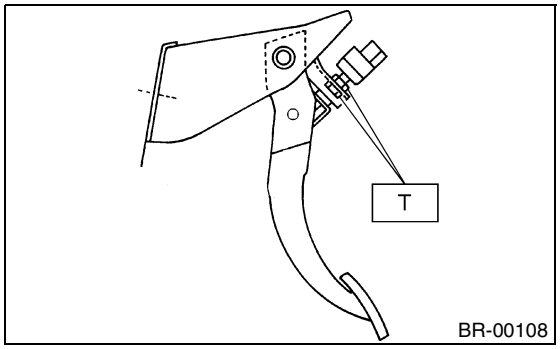


(1) Stop light switch

B: INSTALLATION

1) Screw the stop light switch onto a bracket and secure it temporarily with a nut.
2) Adjust the stop light switch position, and then tighten the nut. <Ref. to BR-55, ADJUSTMENT, Stop Light Switch.>

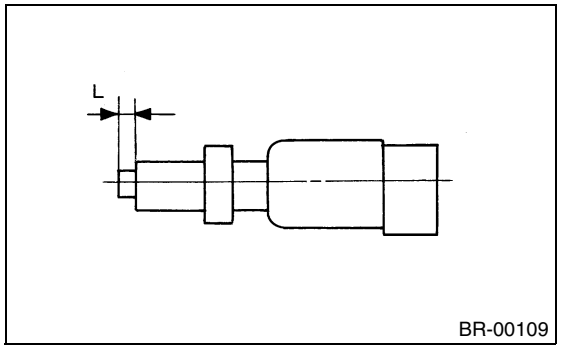
Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



C: INSPECTION

1) If the stop light switch does not operate properly (or if it does not stop at the specified position), replace with a new one.

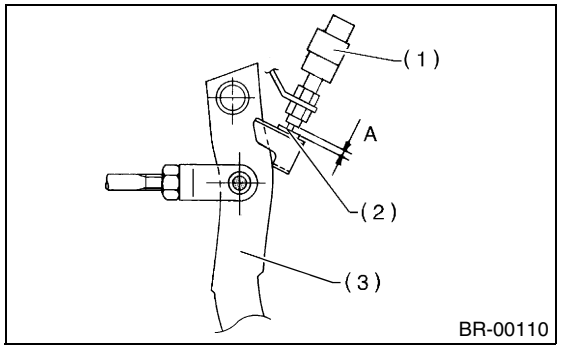
Specified position: L
2 mm (0.079 in)



2) Measure the clearance between threaded end of stop light switch and stopper.

CAUTION:
Be careful not to rotate stop light switch.

Stop light switch clearance: A
0.3 mm (0.012 in)



(1) Stop light switch
(2) Stopper
(3) Brake pedal

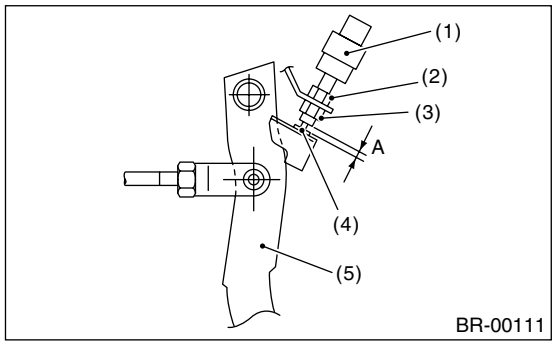
3) If it is not within specified value, adjust it by adjusting position of stop light switch.

CAUTION:
Be careful not to rotate the stop light switch.

D: ADJUSTMENT

Loosen the lock nut, and adjust the stop light switch position until the clearance between threaded end of stop light switch and stopper (A) becomes 0.3mm (0.012in). Then, tighten the lock nut.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



(1) Stop light switch
(2) Lock nut A
(3) Lock nut B
(4) Stopper
(5) Brake pedal

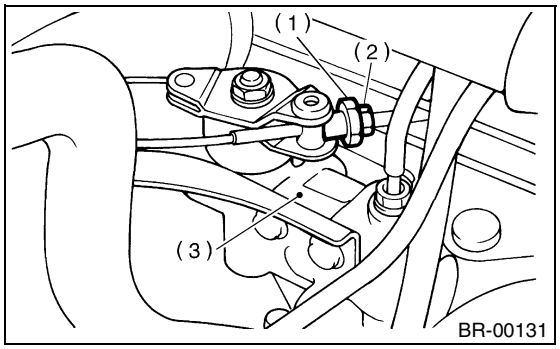
NOTE:
Tighten the lock nut (B) until the clearance between threaded end of stop light switch and stopper becomes 0mm (0in). Hold the stop light switch to prevent turning, and then loosen the lock nut (B) approx. 60 degrees. The clearance will become 0.3mm (0.012in).

20.Hill Holder

A: REMOVAL

1. PHV (PRESSURE HOLD VALVE)

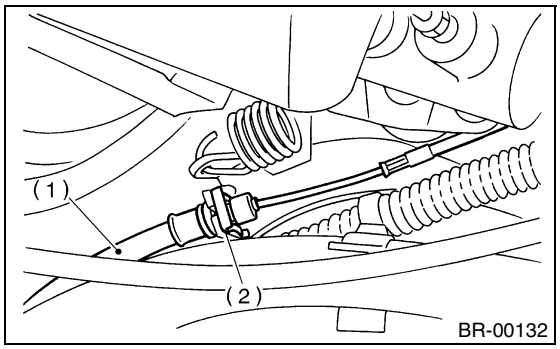
1) Drain the brake fluid from reservoir of master cylinder.
2) Remove the adjusting nut and lock nut.



(1) Adjusting nut
(2) Lock nut
(3) PHV

3) Remove the cable clamp, and disconnect the PHV cable from PHV.

CAUTION:
Carefully protect the boots and inner cable from damage when disconnecting PHV cable.



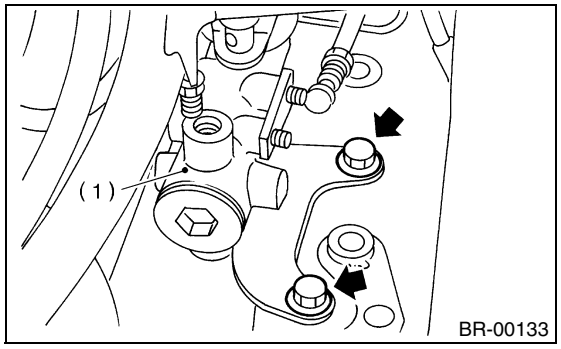
(1) PHV cable
(2) Clamp

4) Disconnect the brake pipes from PHV.

CAUTION:
• Pay attention not to drop the brake fluid onto body painting since it may dissolve paint.
• Pay attention not to damage hexagonal head of the flare nut by using pipe wrench without fail.

5) Detach the PHV along with support from side frame.

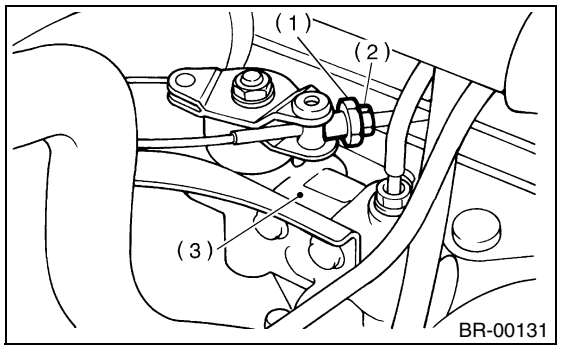
CAUTION:
Exercise utmost care to prevent foreign matter from entering into the PHV when removing it.



(1) PHV

2. PHV CABLE

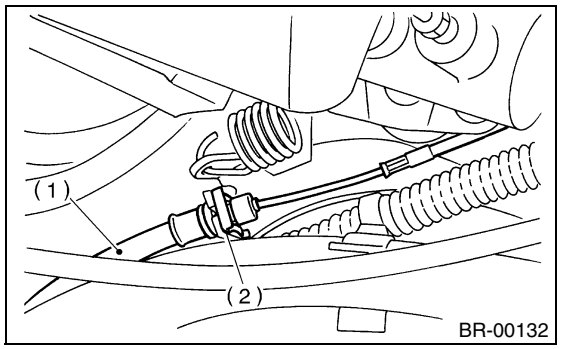
1) Remove the adjusting nut and lock nut.



(1) Adjusting nut
(2) Lock nut
(3) PHV

2) Remove the cable clamp, and disconnect PHV cable from PHV.

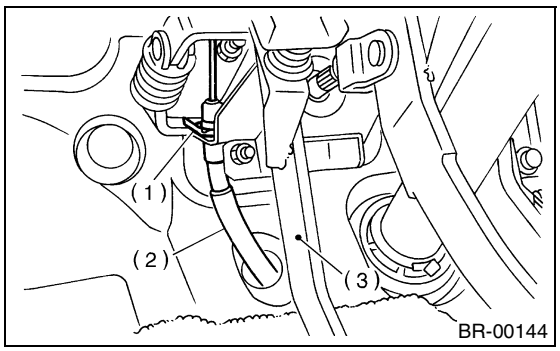
CAUTION:
Carefully protect the boot and inner cable from damage when disconnecting PHV cable.



(1) PHV cable
(2) Clamp

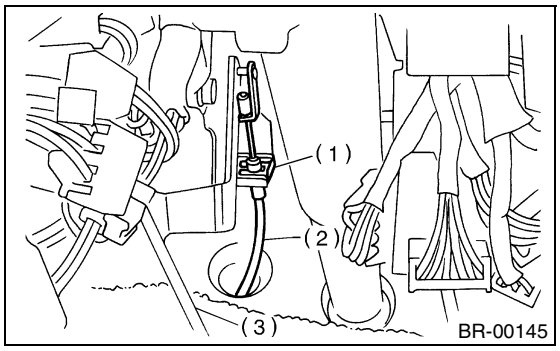
3) Remove the cable clamp from clutch pedal bracket.

• LHD MODEL



(1) Clamp
(2) PHV cable
(3) Clutch pedal

• RHD MODEL



(1) Clamp
(2) PHV cable
(3) Clutch pedal

4) Remove the PHV cable.

B: INSPECTION

Check up removed parts as follows, and replace defective ones.

1) Check if the boots of PHV cable are damaged or degraded, the inner cable is damaged or corroded.
2) Check if the return spring is worn out, damaged or corroded.
3) Confirm that rolling sound of the ball is heard with PHV inclined and lever rotates smoothly.

CAUTION:
Never disassemble the PHV. Replace entire PHV assembly if necessary.

C: INSTALLATION

1. PHV (PRESSURE HOLD VALVE)

1) Install the PHV onto side frame.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

2) Connect the brake pipes to PHV.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

CAUTION:
Confirm that the brake pipes are not deformed and/or damaged. Replace them with new ones if necessary.

3) Install the PHV cable to PHV.

CAUTION:
• If the cable clamp (and clips) is damaged, replace it with a new one.
• Avoid sharp bending of PHV cable as it may cause breakage.

4) Connect the PHV cable with clips.
5) Apply grease to the following points.
• Hook portion of return spring
• Cable end portion of lever

Grease:
SUNLIGHT 2 (Part No. 003602010)

6) Be sure to bleed air from the brake system.
7) Adjust the PHV cable. <Ref. to BR-57, PHV CABLE, INSTALLATION, Hill Holder.>

CAUTION:
After replacing the PHV cable with new one, operate the clutch pedal about 30 times as a running-in operation prior to adjustment.

2. PHV CABLE

1) Install the PHV cable in the reverse order of removal.

CAUTION:
• If the cable clamp is damaged, replace it with a new one.
• Avoid sharp bending of PHV cable as it may cause breakage.

2) Apply grease to the following points.
• Hook portion of return spring
• Cable end portion of lever

Grease:
SUNLIGHT 2 (Part No. 003602010)

3) Adjust the PHV cable. <Ref. to BR-57, ADJUSTMENT, Hill Holder.>

CAUTION:
After replacing the PHV cable with new one, operate the clutch pedal about 30 times as a running-in operation prior to adjustment.

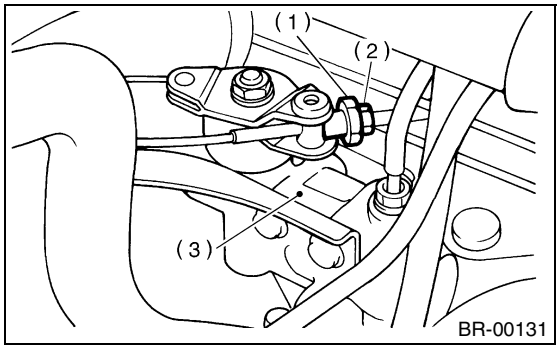
D: ADJUSTMENT

Confirm stopping and starting performances by activating the hill holder on an uphill road of 3° or higher inclination.

1) If the vehicle does not stop;
Tighten the adjusting nut of PHV cable.

2) If the vehicle does not start properly;
• Case A — When the hill holder is released later than engagement of clutch pedal (Engine tends to stall.):
Loosen adjusting nut gradually until smooth starting is enabled.
• Case B — When the hill holder is released earlier than engagement of clutch pedal (Vehicle slips down slightly.):
Tighten the adjusting nut so that hill holder is released later than engagement of clutch pedal (status in Case A). Then make adjustment the same as in Case A.

CAUTION:
Whenever turning the adjusting nut, prevent the PHV cable from revolving.



(1) Adjusting nut
(2) Lock nut
(3) PHV

3) Tighten the lock nut.

Tightening torque:
3.5 N·m (0.35 kgf-m, 2.5 ft-lb)

21.General Diagnostics

A: INSPECTION

	Trouble and possible cause	Corrective action
1. Insufficient braking	(1) Fluid leakage from the hydraulic mechanism	Repair or replace (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose).
	(2) Entry of air into the hydraulic mechanism	Bleed the air.
	(3) Excessively wide shoe clearance	Adjust the clearance.
	(4) Wear, deteriorated surface material, adhering water or fluid on the lining	Replace, grind or clean.
	(5) Improper operation of master cylinder, disc caliper, brake booster or check valve	Correct or replace.
2. Unstable or uneven braking	(1) Fluid on the lining, drum or rotor	Eliminate cause of fluid leakage, clean, or replace.
	(2) Drum or rotor eccentricity	Correct or replace the drum or rotor.
	(3) Worn brake drum, or damage to the drum caused by sand	Correct by grinding, or replace.
	(4) Improper lining contact, deteriorated surface material, improper inferior material, or wear	Correct by grinding, or replace.
	(5) Deformed back plate	Correct or replace.
	(6) Improper tire inflation	Inflate to correct pressure.
	(7) Disordered wheel alignment	Adjust alignment.
	(8) Loosened back plate or the support installing bolts	Retighten.
	(9) Loosened wheel bearing	Retighten to normal tightening torque or replace.
	(10) Trouble in the hydraulic system	Replace the cylinder, brake pipe or hose.
	(11) Uneven effect of the parking brake	Check, adjust, or replace the rear brake and cable system.
3. Excessive pedal stroke	(1) Entry of air into the hydraulic mechanism	Bleed the air.
	(2) Excessive play in the master cylinder push rod	Adjust.
	(3) Fluid leakage from the hydraulic mechanism	Repair or replace (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose).
	(4) Improperly adjusted shoe clearance	Adjust.
	(5) Improper lining contact or worn lining	Correct or replace.
4. Brake dragging or improper brake return	(1) Insufficient pedal play	Adjust play.
	(2) Improper master cylinder return	Clean or replace the cylinder.
	(3) Clogged hydraulic system	Replace.
	(4) Improper return or adjustment of parking brake	Correct or adjust.
	(5) Weakened spring tension or breakage of shoe return spring	Replace the spring.
	(6) Excessively narrow shoe clearance	Adjust the clearance.
	(7) Improper disc caliper operation	Correct or replace.
	(8) Wheel bearing faulty	Replace the wheel bearing.
5. Brake noise (1) (creak sound)	(1) Hardened or deteriorated lining	Replace the shoe assembly or pad.
	(2) Worn lining	Replace the shoe assembly or pad.
	(3) Loosened back plate or the support installing bolts	Retighten.
	(4) Loose wheel bearing	Retighten to normal tightening torque.
	(5) Dirty drum or rotor	Clean the drum or rotor, or clean and replace the brake assembly.
6. Brake noise (2) (hissing sound)	(1) Worn lining	Replace the shoe assembly or pad.
	(2) Improper installed shoe or pad	Correct or replace the shoe assembly or pad.
	(3) Loose or bent drum or rotor	Retighten or replace.

	Trouble and possible cause	Corrective action
7. Brake noise (3) (click sound)	In the case of the disc brake:	
	(1) Excessively worn pad or the support	Replace the pad or the support.
	In the case of the drum brake:	
	(1) Excessively worn shoe ridge	Replace the back plate.
	(2) Lack of oil on the shoe ridge surface and anchor	Add more grease.

PARKING BRAKE

PB

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3. Parking Brake Cable 7
4. Parking Brake Assembly (Rear Disc Brake) 8
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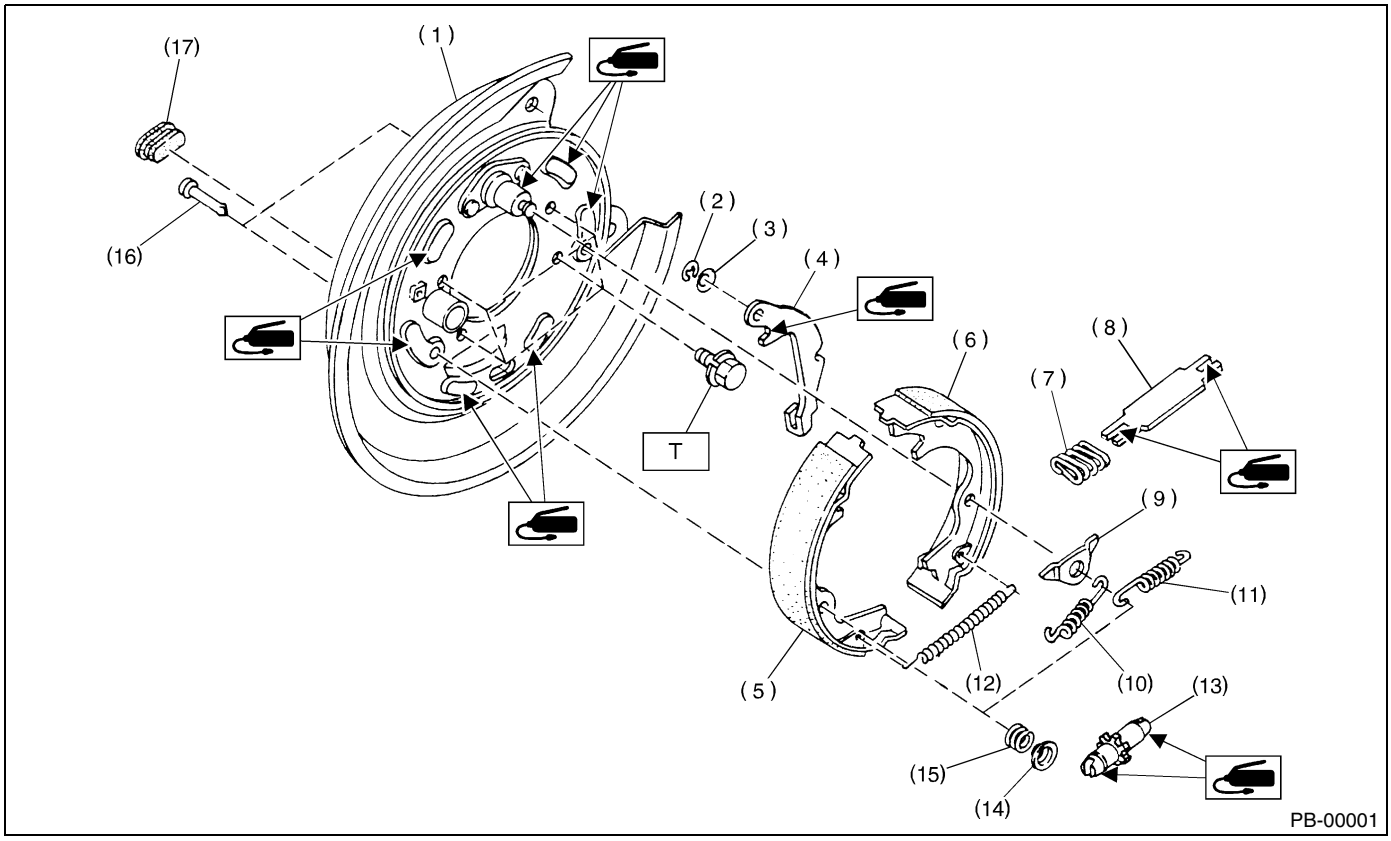
1. General Description

A: SPECIFICATIONS

Model		Rear drum brake	Rear disc brake
Type		Mechanical on rear brakes, drum in disc	
Effective drum diameter	mm (in)	228.6 (9)	170 (6.69)
Lining dimensions (length × width × thickness)	mm (in)	219.4 × 35.0 × 4.1 (8.64 × 1.378 × 0.161)	163.1 × 30.0 × 3.2 (6.42 × 1.181 × 0.126)
Clearance adjustment		Automatic adjustment	Manual adjustment
Lever stroke	notches/N (kgf, lb)	7 to 8/196 (20, 44)	

B: COMPONENT

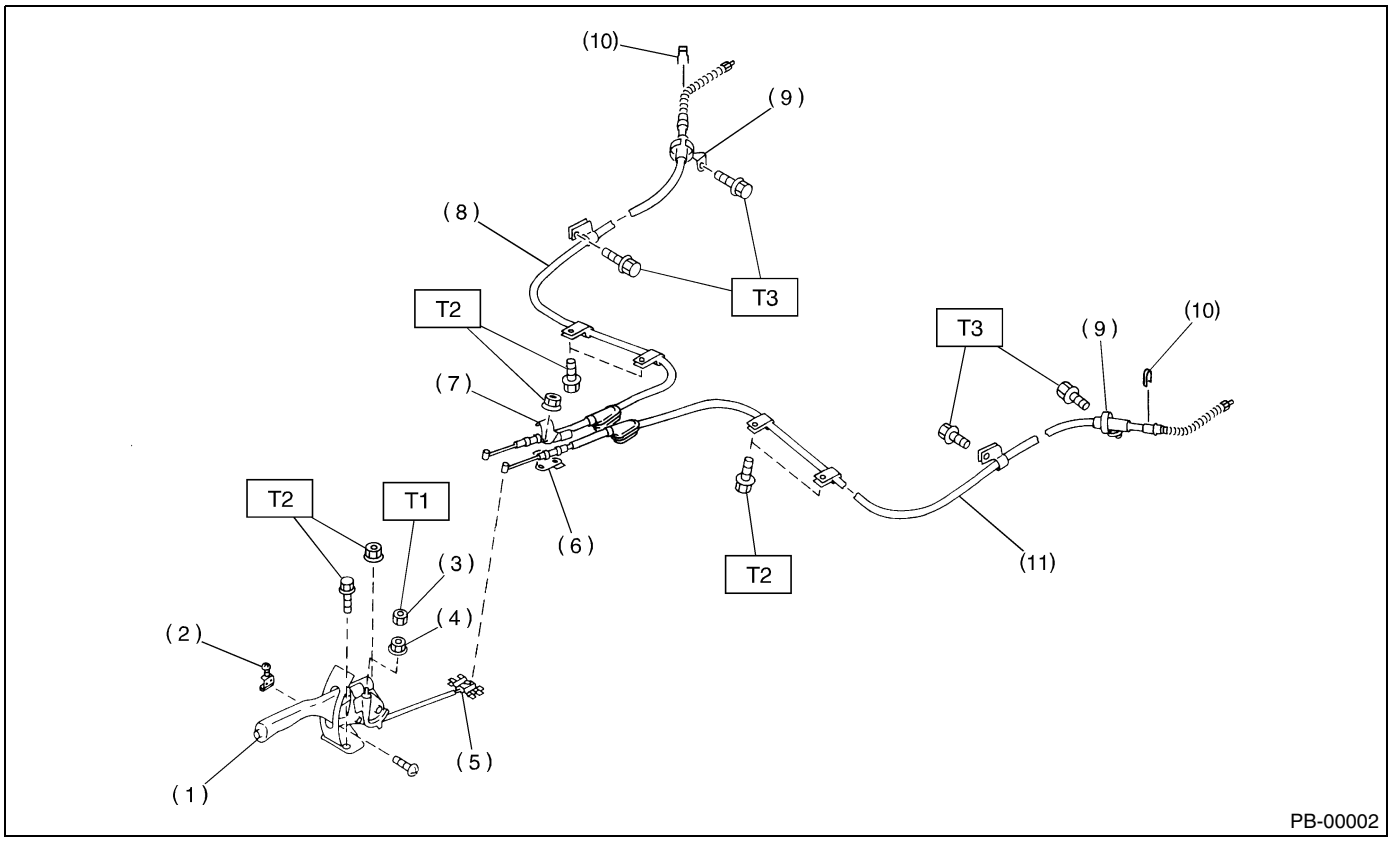
1. PARKING BRAKE (REAR DISC BRAKE)



(1) Back plate
(2) Retainer
(3) Spring washer
(4) Lever
(5) Parking brake shoe (Primary)
(6) Parking brake shoe (Secondary)
(7) Strut spring
(8) Strut
(9) Shoe guide plate
(10) Primary return spring
(11) Secondary return spring
(12) Adjusting spring
(13) Adjuster
(14) Shoe hold-down cup
(15) Shoe hold-down spring
(16) Shoe hold-down pin
(17) Adjusting hole cover

Tightening torque: N·m (kgf-m, ft-lb)
T: 53 (5.4, 39.1)

2. PARKING BRAKE CABLE



(1) Parking brake lever
(2) Parking brake switch
(3) Lock nut
(4) Adjusting nut
(5) Equalizer
(6) Bracket
(7) Clamp
(8) Parking brake cable RH
(9) Cable guide
(10) Clamp (Rear disc brake model only)
(11) Parking brake cable LH

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5.9 (0.6, 4.3)
T2: 18 (1.8, 13.0)
T3: 32 (3.3, 23.6)

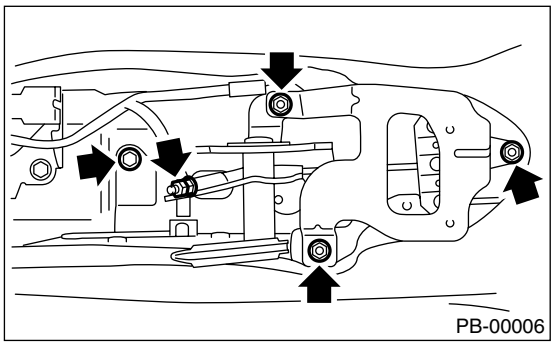
C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Keep grease etc. away from parking brake shoes.

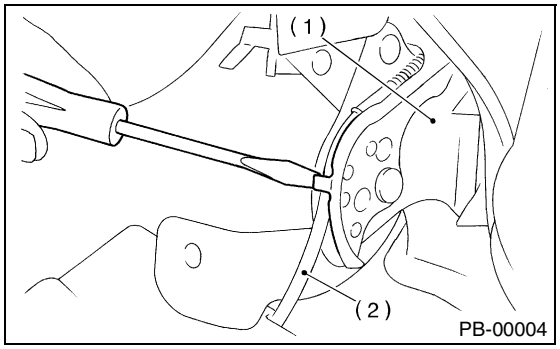
2. Parking Brake Lever

A: REMOVAL

1) Lift-up the vehicle.
2) Remove the rear tire and wheel.
3) Remove the rear seat cushion.
4) Remove the console box.
5) Loosen the parking cable adjusting nut and console bracket.
6) Disconnect the connector of parking brake switch.
7) Remove the parking brake lever.



8) Unbend the parking brake lever pawls and remove cable.



(1) Parking brake lever
(2) Cable

B: INSTALLATION

1) Install in the reverse order of removal.

Tightening torque:
Parking brake lever;
18 N·m (1.8 kgf-m, 13.0 ft-lb)
Adjusting nut;
5.9 N·m (0.6 kgf-m, 4.3 ft-lb)

2) Be sure to adjust the lever stroke. <Ref. to PB-6, ADJUSTMENT, Parking Brake Lever.>

C: INSPECTION

While pulling the parking brake lever upward, count the notches.

Lever stroke:
7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)

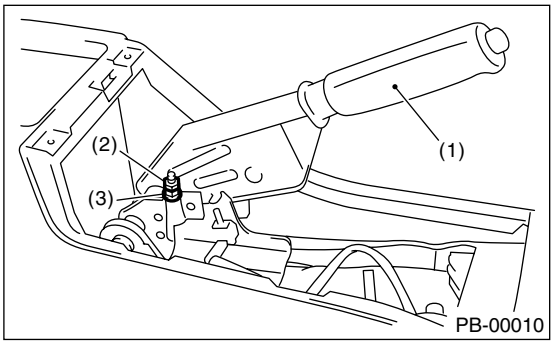
If not as specified, adjust the parking brake. <Ref. to PB-10, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

D: ADJUSTMENT

1) Remove the console cover.
2) Forcibly pull the parking brake lever 3 to 5 times.
3) Adjust the parking brake lever by turning adjuster until parking brake lever stroke is set at 7 to 8 notches with operating force of 196 N (20 kgf, 44 lb).
4) Tighten the lock nut.

Lever stroke:
7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)

Tightening torque (Lock nut):
5.9 N·m (0.6 kgf-m, 4.3 ft-lb)



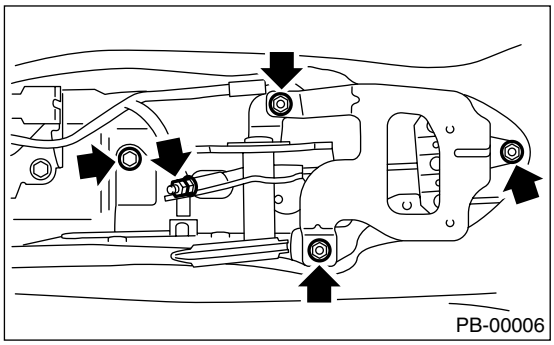
(1) Parking brake lever
(2) Lock nut
(3) Adjusting nut

5) Install the console cover.

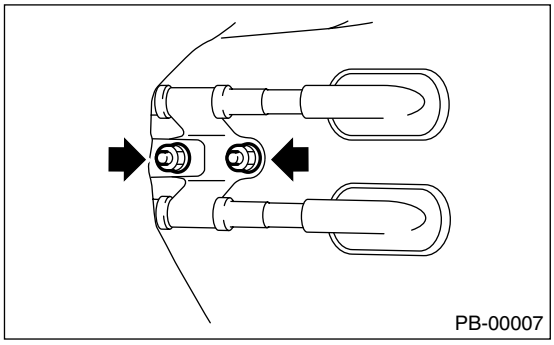
3. Parking Brake Cable

A: REMOVAL

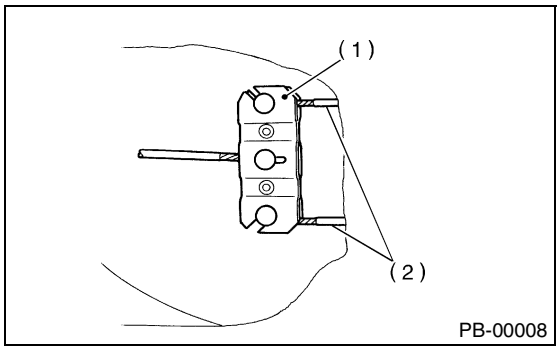
1) Lift-up the vehicle.
2) Remove the rear tires and wheels.
3) Remove the rear seat cushion.
4) Remove the console box.
5) Loosen the parking cable adjusting nut and console bracket.
6) Remove the parking brake lever.



7) Roll up the floor mat and remove clamps.

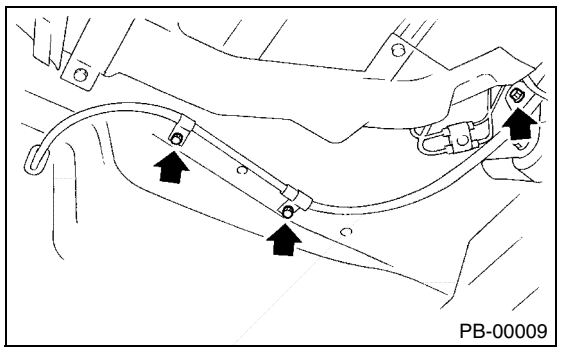


8) Remove the equalizer cover.
9) Remove the inner cable end from equalizer.



(1) Equalizer
(2) Inner cable end

10) Remove the parking brake cable from rear brake.
Disc brake
<Ref. to PB-8, REMOVAL, Parking Brake Assembly (Rear Disc Brake).>
Drum brake
<Ref. to BR-32, Rear Drum Brake Assembly.>
11) Remove the clamp from rear brake.
12) Remove the bolt and bracket from trailing link bracket.
13) Remove the bolt and clamp from rear floor.



14) Detach the grommet from rear floor.
15) Remove the cable assembly from cabin by forcibly pulling it backward.
16) Detach the parking brake cable from cable guide at rear trailing link.

B: INSTALLATION

1) Install the (new) parking brake assembly in the reverse order of removal.

NOTE:
Be sure to pass the cable through cable guide inside the tunnel.

2) Be sure to adjust the lever stroke. <Ref. to PB-6, ADJUSTMENT, Parking Brake Lever.>

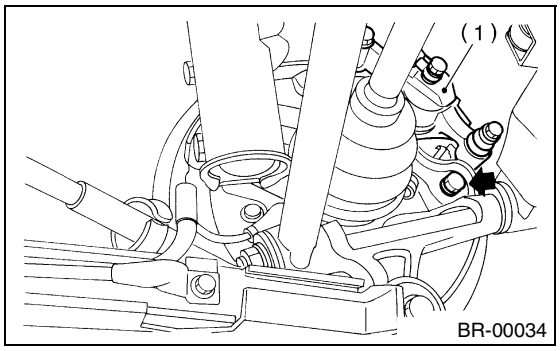
C: INSPECTION

Check the removed cable and replace if damaged, rusty, or malfunctioning.
1) Check for smooth operation of the cable.
2) Check the inner cable for damage and rust.
3) Check the outer cable for damage, bends, and cracks.
4) Check the boot for damage, cracks, and deterioration.

4. Parking Brake Assembly (Rear Disc Brake)

A: REMOVAL

1) Pull down and release the parking brake.
2) Remove the two mounting bolts and remove the brake caliper assembly.

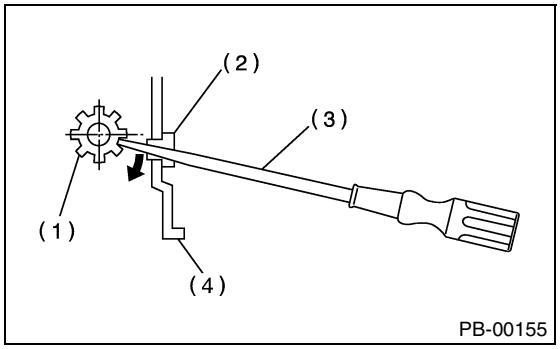


(1) Brake caliper assembly

3) Suspend the brake caliper assembly so that the hose is not stretched.
4) Remove the disc rotor.

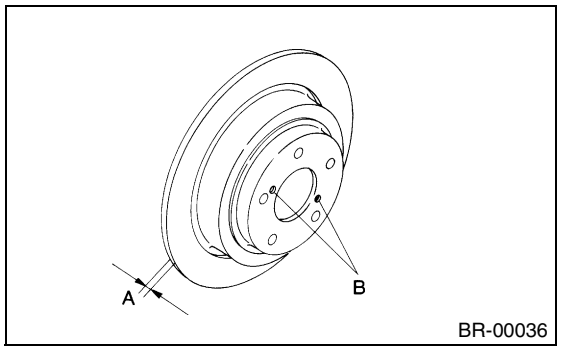
NOTE:
If the disc rotor is difficult to remove, try the following two methods in order.

(1) Turn the adjusting screw using a flat tip screwdriver until brake shoe gets away enough from the disc rotor.

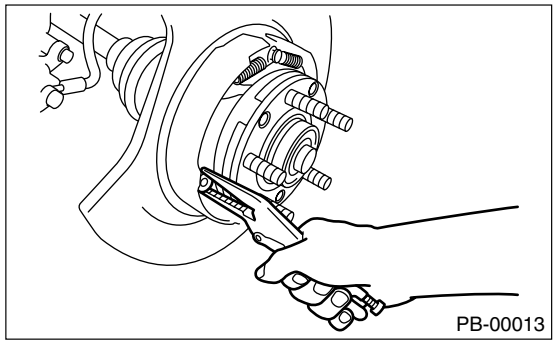


(1) Adjusting screw
(2) Adjusting hole cover (rubber)
(3) Flat tip screwdriver
(4) Back plate

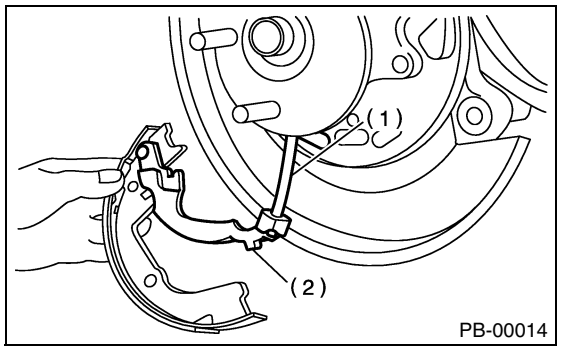
(2) If the disc rotor seizes up within hub, drive the disc rotor out by installing two 8-mm bolt in holes B on rotor.



5) Remove the shoe return spring from parking brake assembly.
6) Remove the front shoe hold down spring and pin with pliers.



7) Remove the strut and strut spring.
8) Remove the adjuster assembly from parking brake assembly.
9) Remove the brake shoe.
10) Remove the rear shoe hold-down spring and pin with pliers.
11) Remove the parking brake cable from parking brake lever.



(1) Parking brake cable
(2) Parking brake lever

12) Using a standard screwdriver, raise the retainer. Remove the parking brake lever and washer from brake shoe.

B: INSTALLATION

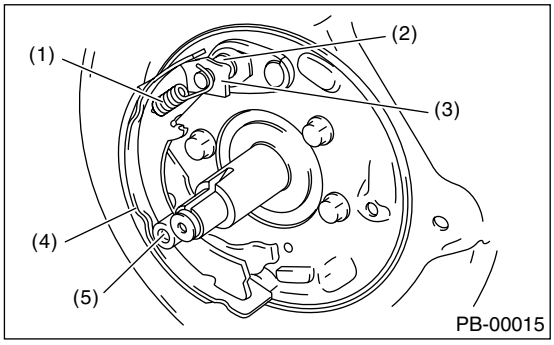
CAUTION:
Be sure the lining surface is free from oil and grease contamination.

1) Apply brake grease to the following places.

Brake grease:
Brake Grease (Part No. 003602002)

- Six contact surfaces of shoe rim and back plate packing
- Contact surface of shoe wave and anchor pin
- Contact surface of lever and strut
- Contact surface of shoe wave and adjuster assembly
- Contact surface of shoe wave and strut
- Contact surface of lever and shoe wave

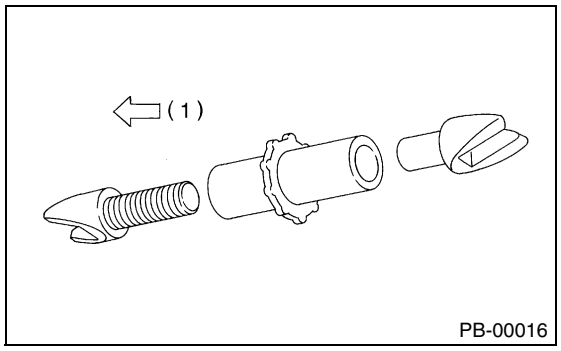
2) Insert the primary side brake shoe into anchor pin groove.
3) Secure the brake shoe with shoe hold-down pin and cup.
4) Install the plate to anchor pin, and then assemble the primary return spring to anchor pin.



(1) Primary return spring
(2) Anchor pin
(3) Plate
(4) Primary shoe
(5) Shoe hold-down pin & cup

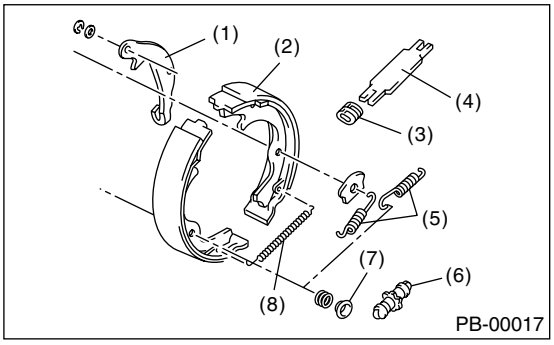
5) Install the parking brake cable to parking brake lever.
6) Assemble the strut and adjuster, and then secure the secondary side brake shoe with shoe hold-down pin & cup.

NOTE:
- Install the strut spring of both right and left wheel facing vehicle front.
- Install the adjuster assembly with screw on left side.



(1) Left

7) Install the secondary return spring and adjusting spring.



(1) Lever
(2) Secondary brake shoe
(3) Strut spring
(4) Strut
(5) Secondary return spring
(6) Adjuster
(7) Hold-down cup
(8) Adjusting spring

8) Adjust the parking brakes. <Ref. to PB-10, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>
9) Drive the vehicle for parking brake lining “break-in”.
(1) Drive the vehicle at about 35 km/h (22 MPH).
(2) With the parking brake release button pushed in, pull the parking brake lever gently.
(3) Drive the vehicle for about 200 meter (0.12 mile) in this condition.
(4) Wait 5 to 10 minutes for the parking brake to cool down. Repeat this procedure once more.
(5) After breaking-in, re-adjust the parking brakes.

C: INSPECTION

1) Measure the brake disc rotor inside diameter. If the disc is scored or worn, replace the brake disc rotor.

Disc rotor inside diameter:
Standard
170 mm (6.69 in)
Service limit
171 mm (6.73 in)

2) Measure the lining thickness. If it exceeds the limit, replace the shoe assembly.

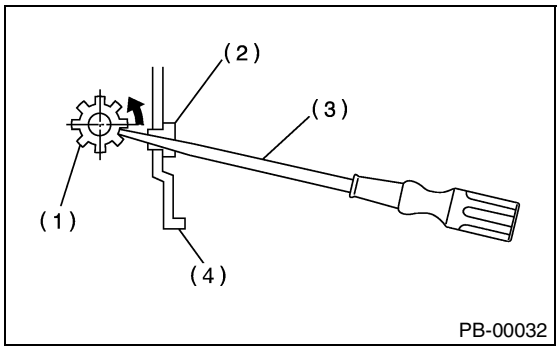
Lining thickness:
Standard
3.2 mm (0.126 in)
Service limit
1.5 mm (0.059 in)

NOTE:
Replace the right and left brake shoe at the same time.

D: ADJUSTMENT

1. SHOE CLEARANCE

1) Remove the adjusting hole cover from back plate.
2) Turn the adjusting screw using a flat tip screwdriver until brake shoe is in close contact with disc rotor.

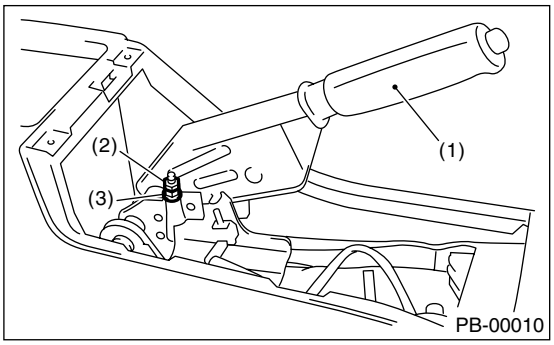


(1) Adjusting screw
(2) Adjusting hold cover (rubber)
(3) Flat tip screwdriver
(4) Back plate

3) Turn back (downward) the adjusting screw 3 or 4 notches.
4) Install the adjusting hole cover to back plate.

2. LEVER STROKE

1) Remove the console box lid.
2) Forcibly pull the parking brake lever 3 to 5 times.
3) Adjust the parking brake lever by turning adjuster until parking brake lever stroke is set at 7 to 8 notches with operating force of 196 N (20 kgf, 44 lb).



(1) Parking brake lever
(2) Lock nut
(3) Adjusting nut

4) Tighten the lock nut.
5) Install the console box lid.

Lever stroke:
7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)

Tightening torque (Lock nut):
5.9 N·m (0.6 kgf-m, 4.3 ft-lb)

5. General Diagnostic Table

A: INSPECTION

Symptom	Possible cause	Remedy
Brake drag	• Parking brake lever is maladjusted.	• Adjustment.
	• Parking brake cable does not move.	• Repair or replace.
	• Parking brake shoe clearance is maladjusted.	• Adjustment.
	• Return spring is faulty.	• Replace.
Noise from brake	• Return spring is faulty.	• Replace.
	• Shoe hold-down spring is faulty.	• Replace.

POWER ASSISTED SYSTEM (POWER STEERING)

PS

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1. General Description

A: SPECIFICATIONS

Item			Designation
Whole system	Minimum turning diameter m (ft)		10.6 (34.8)
	Steering angle (Inside-Outside)		36° 25′ — 32° 00′
	Steering wheel diameter mm (in)		385 (15.16)
	Maximum rotation		3.0
Gearbox	Type		Rack and pinion, Integral
	Backlash		0 (Automatically adjustable)
	Valve (Power steering system)		Rotary valve
Pump (Power steering system)	Type		Vane pump
	Oil tank		Installed on body
	Output cm^3 (cu in)/rev.		7.2 (0.439)
	Relief pressure kPa (kg/cm^2, psi)		7,360 — 8,050 (75 — 82, 1,067 — 1,166)
	Hydraulic fluid control		Dropping in response to increased engine revolutions
	Hydraulic fluid ℓ (US qt, Imp qt)/min		1,000 rpm: 7 (7.4, 6.2) 3,000 rpm: 5 (5.3, 4.4)
	Range of revolution rpm		595 — 8,925
	Revolving direction		Clockwise (Viewed from pulley side)
Working fluid (Power steering system)	Name		ATF DEXRON III or equivalent
	Capacity ℓ (US qt, Imp qt)	Oil tank	0.3 (0.3, 0.3)
		Total	0.7 (0.7, 0.6)

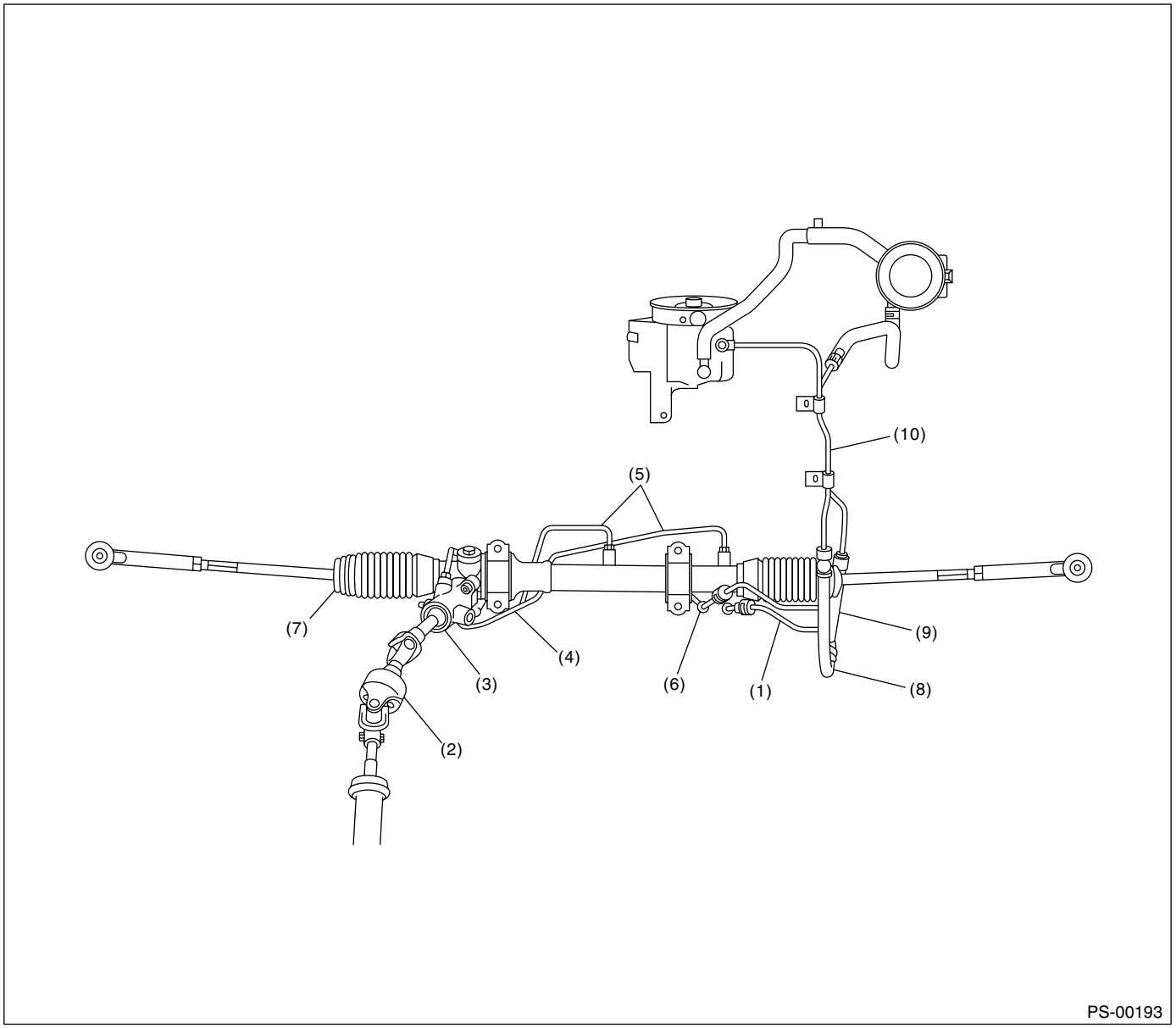
Model				LHD	RHD
Steering wheel	Free play		mm (in)	17 (0.67)	
Turning angle	Inner tire & wheel			32°25′±1°30′	
	Outer tire & wheel			32°00′±1°30′	
Steering shaft	Clearance between steering wheel and column cover		mm (in)	3.0 (0.118)	
Steering gear-box (Power steering system)	Sliding resistance		N (kgf, lb)	400 (41, 90) or less	
	Rack shaft play in radial direction	Right-turn steering	mm (in)	0.19 (0.0075) or less	Horizontal movement: 0.19 (0.0075) or less Vertical movement: 0.3 (0.012) or less
		Left-turn steering	mm (in)	Horizontal movement: 0.15 (0.0059) or less Vertical movement: 0.3 (0.012) or less	0.19 (0.0075) or less
	Input shaft play	In radial direction	mm (in)	0.18 (0.0071) or less	
		In axial direction	mm (in)	0.5 (0.020) or less	
	Turning resistance		N (kgf, lb)	Maximum allowable value: Less than 10.5 N (1.1 kgf, 2.4 lb) Difference between right and left sliding resistance: Less than 20 %	
Oil pump (Power steering system)	Pulley shaft	Radial play	mm (in)	0.4 (0.016) or less	
		Axial play	mm (in)	0.9 (0.035) or less	
	Pulley	Ditch deflection	mm (in)	1.0 (0.039) or less	
		Resistance to rotation	N (kgf, lb)	9.22 (0.94, 2.07) or less	
	Regular pressure		kPa (kg/cm^2, psi)	981 (10, 142) or less	
Steering wheel effort (Power steering system)	At standstill with engine idling on a concrete road		N (kgf, lb)	31.4 (3.2, 7.1) or less	
	At standstill with engine stalled on a concrete road		N (kgf, lb)	294.2 (30, 66.2) or less	

Recommended power steering fluid	Manufacturer
ATF DEXRON III or equivalent	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

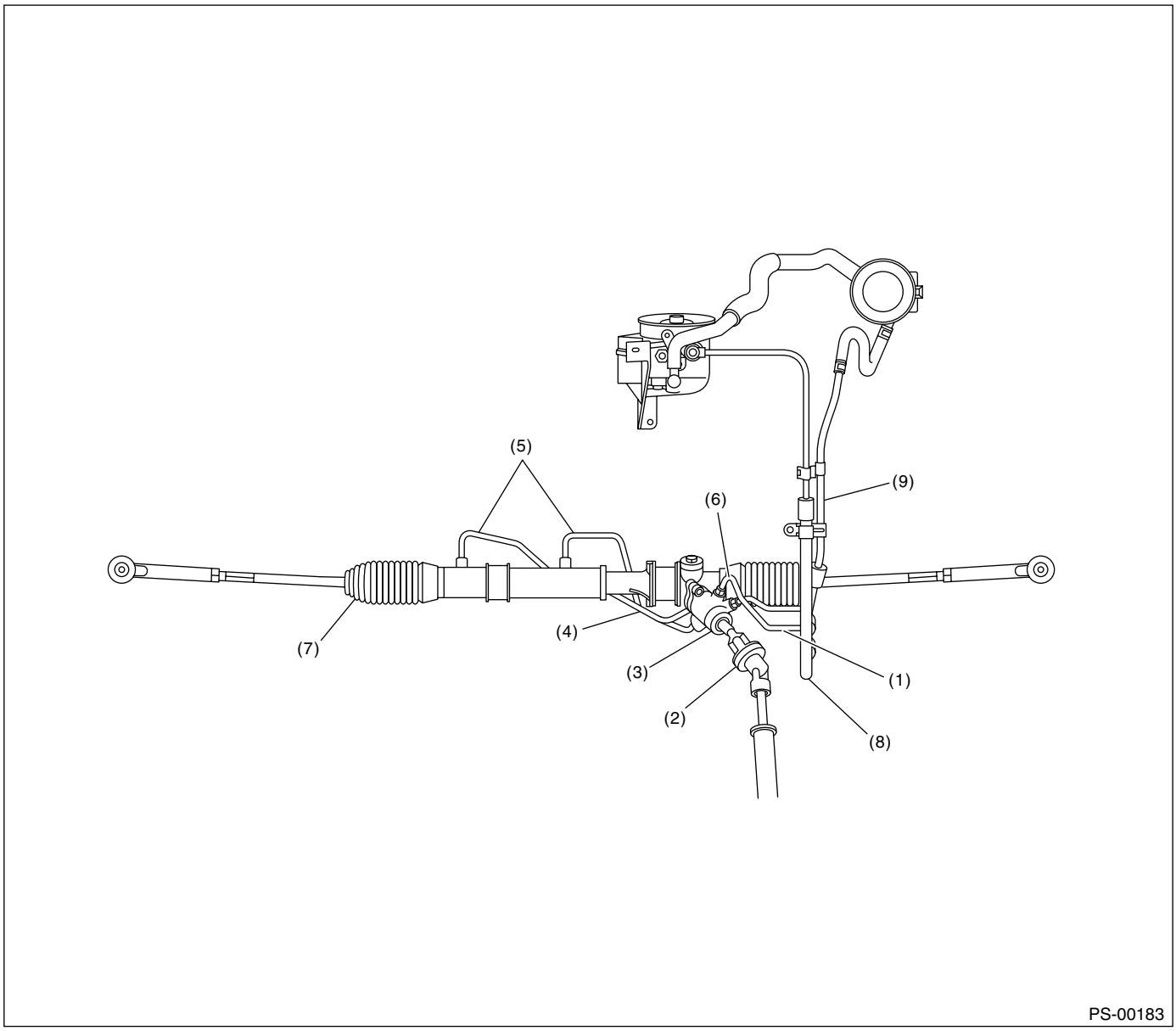
CAUTION:
This table lists various clearances that must be correctly adjusted to ensure the normal vehicle driving without interfering noise, or any other faults.

Location	Minimum allowance
(1) Crossmember — Pipe	5 mm (0.20 in)
(2) DOJ — Shaft or joint	14 mm (0.55 in)
(3) DOJ — Valve housing	11 mm (0.43 in)
(4) Pipe — Pipe	2 mm (0.08 in)
(5) Stabilizer — Pipe	5 mm (0.20 in)
(6) Exhaust pipe — Pipe	11 mm (0.43 in)
(7) Exhaust pipe — Gearbox bolt	15 mm (0.59 in)
(8) Side frame — Hose A and B	10 mm (0.39 in)
(9) Cruise control pump — Hose A and B	15 mm (0.59 in)
(10) Pipe portion of hose A — Pipe portion of hose B	1.5 mm (0.059 in)

• LHD MOEL

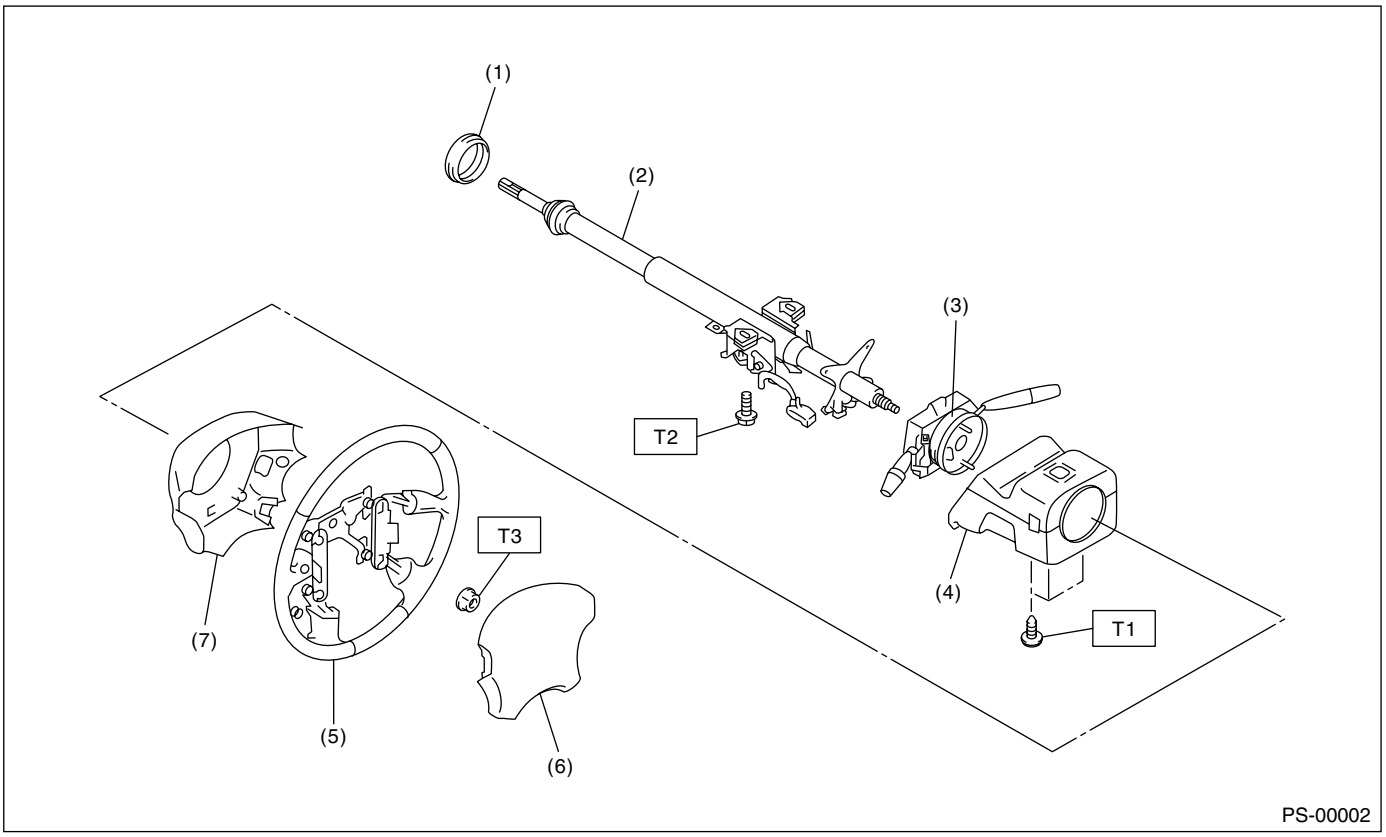


• RHD MODEL



B: COMPONENT

1. STEERING WHEEL AND COLUMN

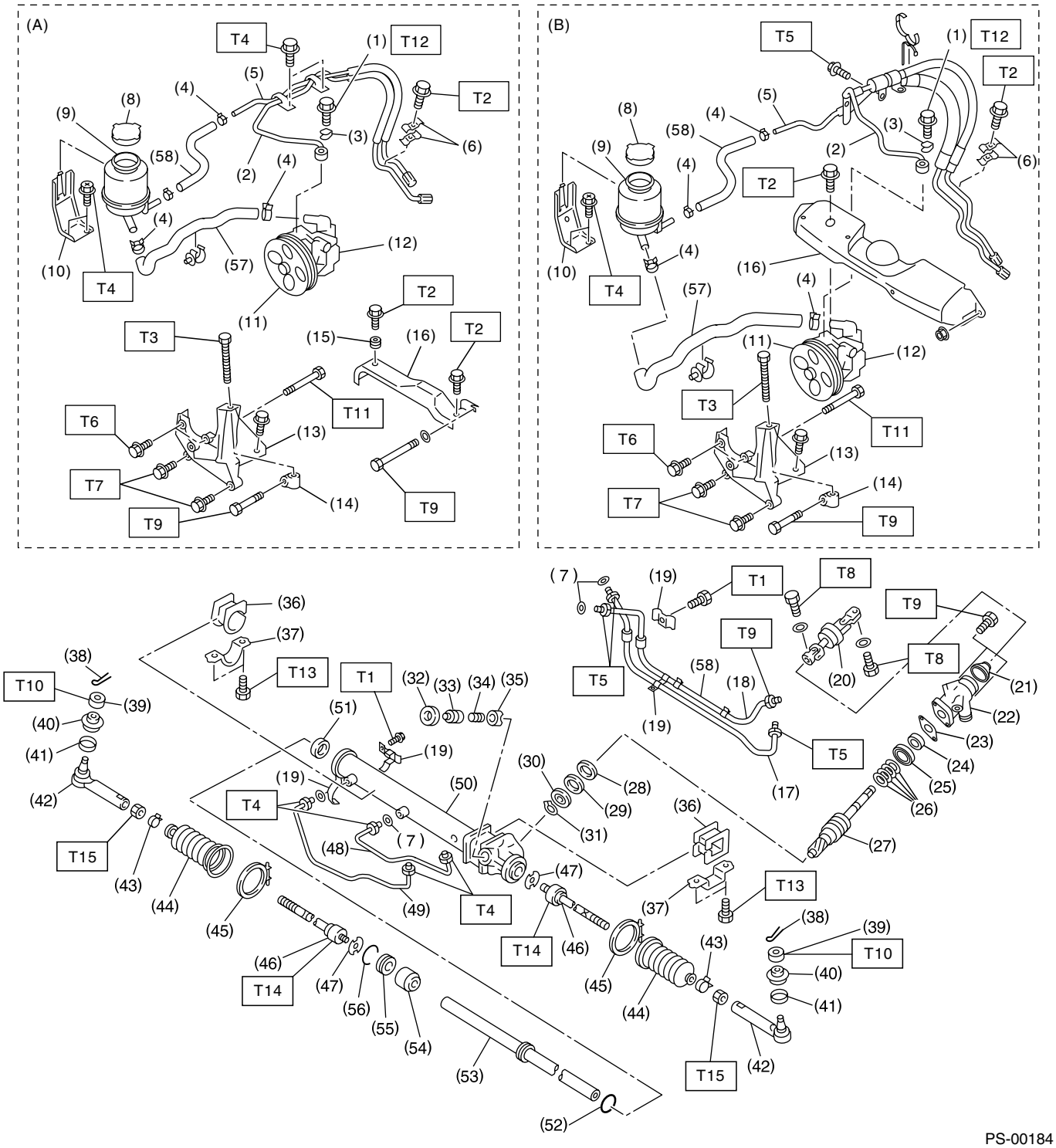


(1) Bushing
(2) Steering shaft
(3) Steering roll connector
(4) Column cover
(5) Steering wheel
(6) Airbag module
(7) Lower steering wheel cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.2 (0.12, 0.9)
T2: 25 (2.5, 18.1)
T3: 45 (4.6, 33.2)

2. POWER ASSISTED SYSTEM

• LHD MODEL

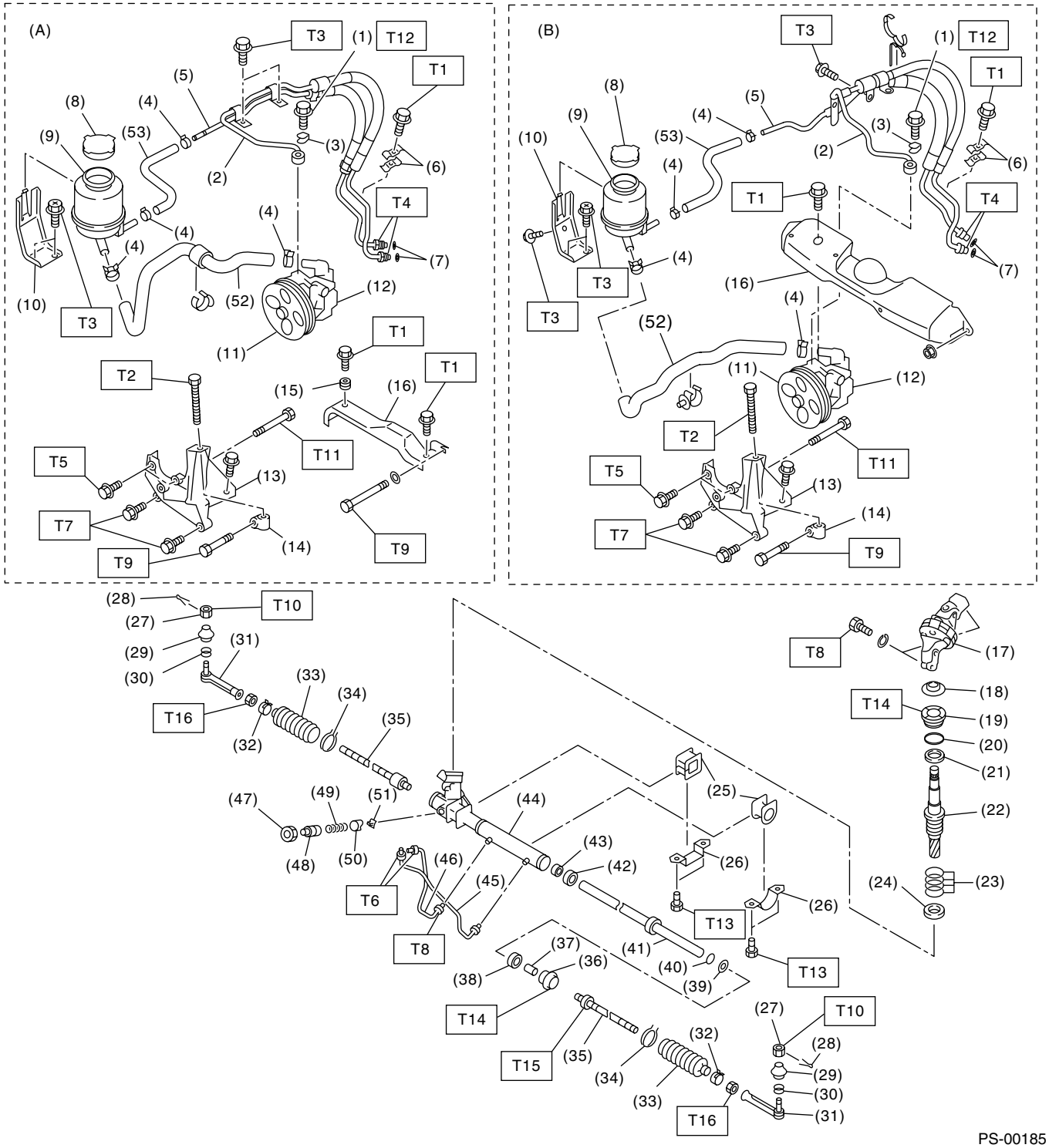


(A) NON-TURBO MODEL
(B) TURBO MODEL

(1) Eye bolt
(2) Pipe C
(3) Gasket
(4) Clip
(5) Pipe D
(6) Clamp E
(7) O-ring
(8) Cap
(9) Reservoir tank
(10) Reservoir tank bracket
(11) Pulley
(12) Oil pump
(13) Bracket
(14) Belt tension nut
(15) Bush
(16) Belt cover
(17) Pipe E
(18) Pipe F
(19) Clamp plate
(20) Universal joint
(21) Dust seal
(22) Valve housing
(23) Gasket
(24) Oil seal
(25) Ball bearing
(26) Seal ring
(27) Pinion and valve ASSY
(28) Oil seal
(29) Back-up washer
(30) Ball bearing
(31) Snap ring
(32) Lock nut
(33) Adjusting screw
(34) Spring
(35) Sleeve
(36) Adapter
(37) Clamp
(38) Cotter pin
(39) Castle nut
(40) Dust cover
(41) Clip
(42) Tie-rod end
(43) Clip
(44) Boot
(45) Band
(46) Tie-rod
(47) Lock washer
(48) Pipe B
(49) Pipe A
(50) Steering body
(51) Oil seal
(52) Piston ring
(53) Rack
(54) Rack bushing
(55) Rack stopper
(56) Circlip
(57) Suction hose
(58) Hose

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	***6 (0.6, 4.3)***
T2:	***7.4 (0.75, 5.4)***
T3:	***8 (0.8, 5.8)***
T4:	***13 (1.3, 9.4)***
T5:	***15 (1.5, 10.8)***
T6:	***15.7 (1.6, 11.6)***
T7:	***22 (2.2, 15.9)***
T8:	***24 (2.4, 17.4)***
T9:	***25 (2.5, 18.1)***
T10:	***27 (2.75, 19.9)***
T11:	***37.3 (3.8, 27.5)***
T12:	***39 (4.0, 28.9)***
T13:	***59 (6.0, 43.4)***
T14:	***78 (8.0, 57.9)***
T15:	***83 (8.5, 61.5)***

• RHD MODEL



(A) NON-TURBO MODEL
(B) TURBO MODEL

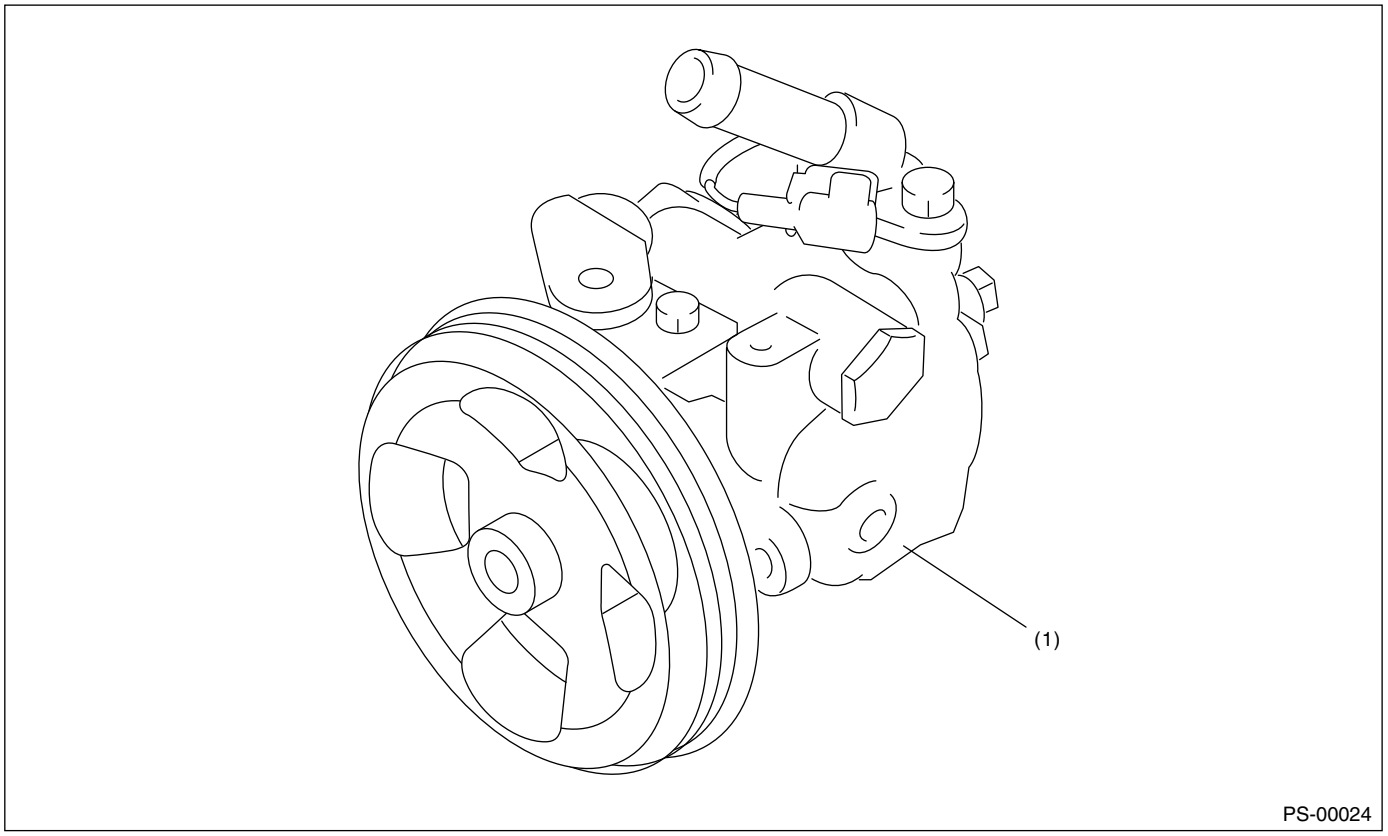
(1) Eye bolt
(2) Pipe C
(3) Gasket
(4) Clip
(5) Pipe D
(6) Clamp E
(7) O-ring
(8) Cap
(9) Reservoir tank
(10) Reservoir tank bracket
(11) Pulley
(12) Oil pump
(13) Bracket
(14) Belt tension nut
(15) Bush
(16) Belt cover
(17) Universal joint
(18) Dust cover
(19) Plug
(20) O-ring
(21) Oil seal
(22) Pinion
(23) Seal ring
(24) Oil seal
(25) Adapter
(26) Clamp
(27) Castle nut
(28) Cotter pin
(29) Dust seal
(30) Clip
(31) Tie-rod end
(32) Clip
(33) Boot
(34) Wire
(35) Tie-rod
(36) Holder
(37) Bush
(38) Oil seal
(39) Oil seal
(40) O-ring
(41) Rack
(42) Oil seal
(43) Back-up washer
(44) Steering body
(45) Pipe A
(46) Pipe B
(47) Lock nut
(48) Adjusting screw
(49) Spring
(50) Sleeve
(51) Seat pad
(52) Suction hose
(53) Return hose

Tightening torque: N·m (kgf-m, ft-lb)

T1:	***7.4 (0.75, 5.4)***
T2:	***8 (0.8, 5.8)***
T3:	***13 (1.3, 9.4)***
T4:	***15 (1.5, 10.8)***
T5:	***15.7 (1.6, 11.6)***
T6:	***20 (2.0, 14.5)***
T7:	***22 (2.2, 15.9)***
T8:	***24 (2.4, 17.4)***
T9:	***25 (2.5, 18.1)***
T10:	***27 (2.75, 19.9)***
T11:	***37.3 (3.8, 27.5)***
T12:	***39 (4.0, 28.9)***
T13:	***60 (6.1, 44.1)***
T14:	***64 (6.5, 47.0)***
T15:	***90 (9.0, 65.1)***
T16:	***85 (8.6, 62.2)***

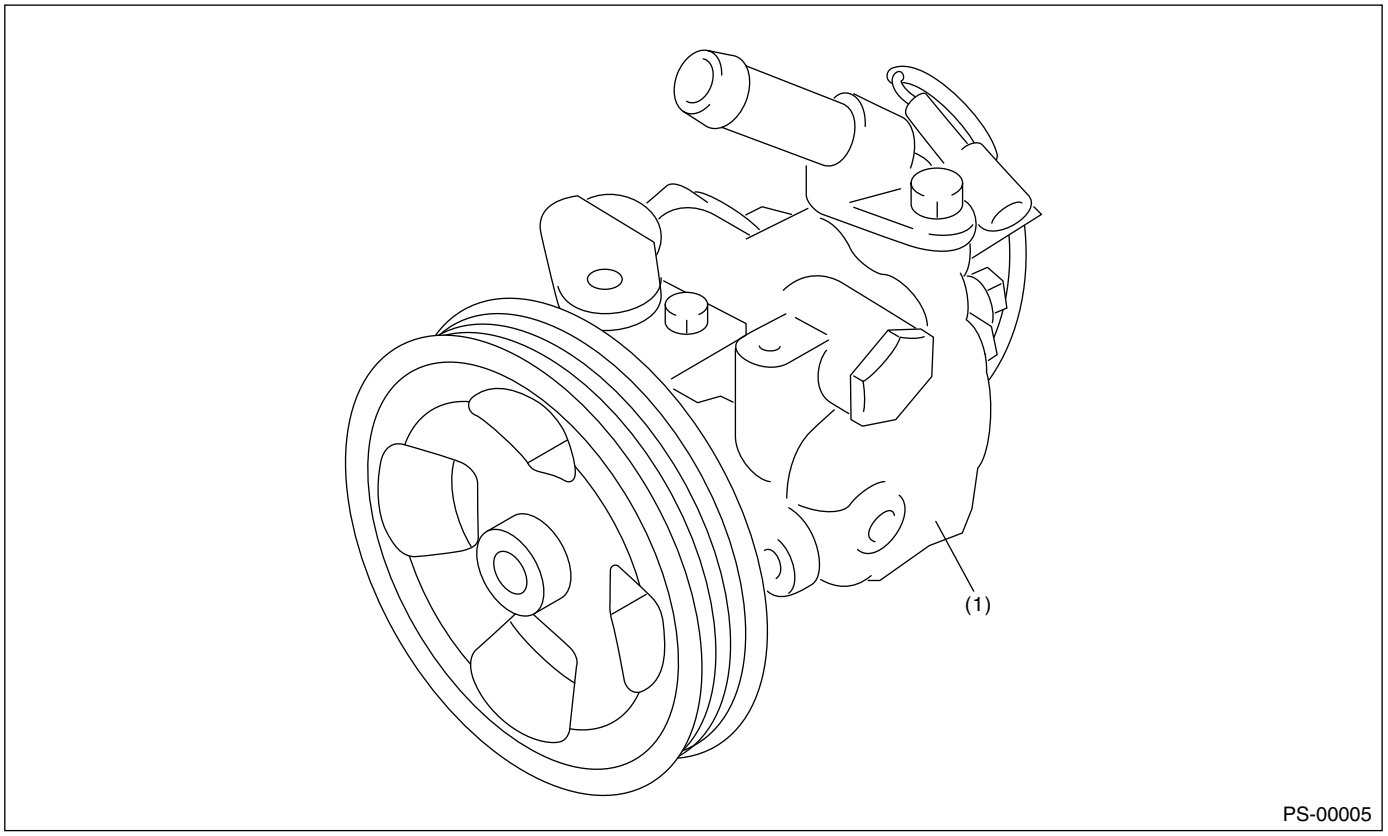
3. OIL PUMP

• NON-TURBO MODEL



(1) Oil pump ASSY

• TURBO MODEL



(1) Oil pump ASSY

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Use SUBARU genuine power steering fluid, grease etc. or the equivalent. Do not mix steering fluid, grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

D: PREPARATION TOOL

1. SPECIAL TOOLS

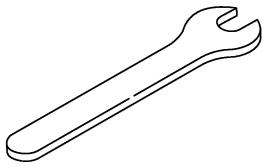
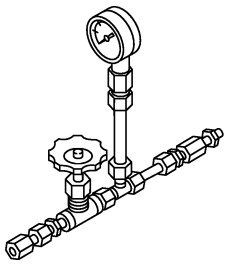
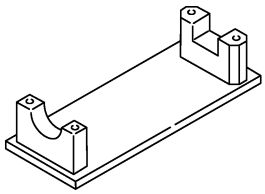
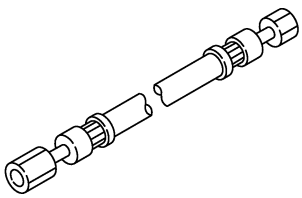
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925700000	925700000	WRENCH	• Used for removing and installing tie-rod. • Apply this tool to rack.
 ST-925711000	925711000	PRESSURE GAUGE	Used for measuring oil pump pressure.
 ST-926200000	926200000	STAND	Used when inspecting characteristic of gearbox assembly and disassembling it.
 ST34099AC010	34099AC010	ADAPTER HOSE A	Used with PRESSURE GAUGE (925711000).

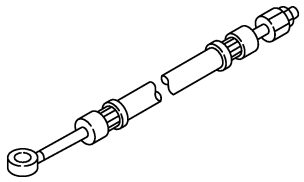
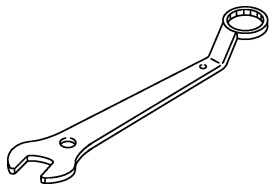
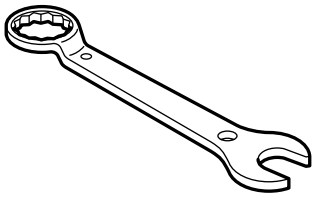
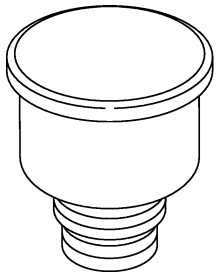
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34099AC020	34099AC020	ADAPTER HOSE B	Used with PRESSURE GAUGE (925711000).
 ST926230000	926230000	SPANNER	For the lock nut when adjusting backlash of gear-box.
 ST34099PA100	34099PA100	SPANNER	Measurement of rotating resistance of gear-box assembly.
 ST34199AE040	34199AE040	OIL CHARGE GUIDE	Used for charging power steering fluid.

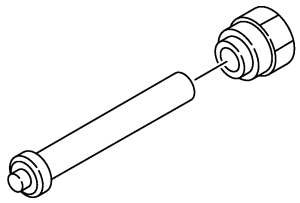
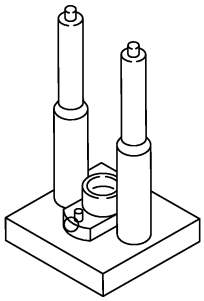
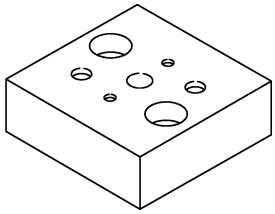
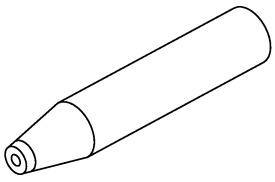
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-926420000	926420000	PLUG	When oil leaks from pinion side of gearbox assembly, remove pipe B from valve housing, attach this tool and check oil leaking points.
 ST-926370000	926370000	INSTALLER A	• Used for installing valve assembly into valve housing assembly. • Used with STAND BASE (34099FA100). • For LHD model.
 ST34099FA100	34099FA100	STAND BASE	• Used for assembling power steering gearbox. • For LHD model.
 ST-926390001	926390001	COVER & REMOVER ASSY	• Used for assembling rack assembly. • For LHD model.

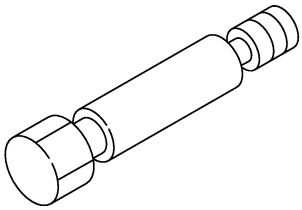
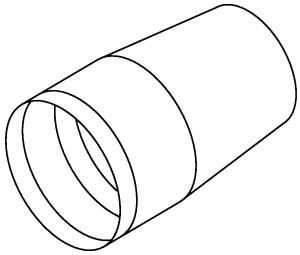
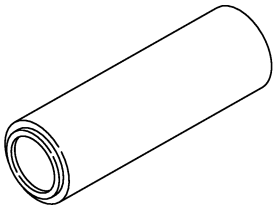
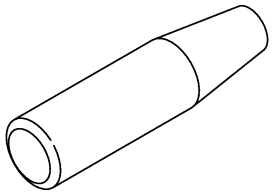
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-926400000	926400000	GUIDE	• Right side of rack when installing rack bush. • Used with GUIDE (927660000). • For LHD model.
 ST-927660000	927660000	GUIDE	• Right side of rack when installing rack bush. • Used with GUIDE (926400000). • For LHD model.
 ST-927620000	927620000	INSTALLER B	• Used for installing oil seal of valve housing. • Used with INSTALLER A (926360000).
 ST-926360000	926360000	INSTALLER A	• Used as a guide to install oil seal. • Used with INSTALLER B (927620000).

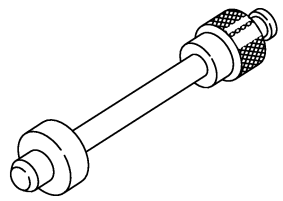
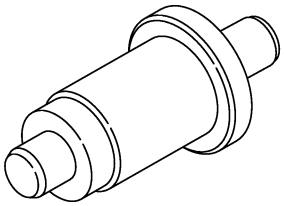
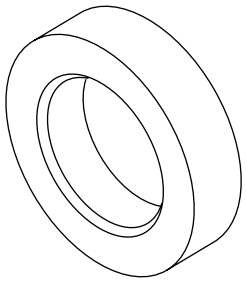
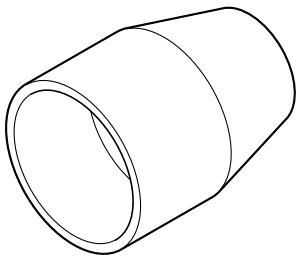
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34099FA110	34099FA110	INSTALLER	Used for installing oil seal.
 ST34099FA120	34099FA120	INSTALLER AND REMOVER SEAL	• Used for installing valve housing oil seal. • Used with INSTALLER SEAL. (34099FA130) • Used for installing valve housing ball bearing. • Used for removing oil seal and ball bearing from valve housing.
 ST34099FA130	34099FA130	INSTALLER SEAL	• Used for installing valve housing oil seal. • Used with INSTALLER AND REMOVER SEAL (34099FA120).
 ST-926250000	926250000	GUIDE	• Used for installing holder ASSY into rack housing. • For RHD model.

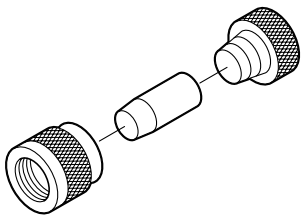
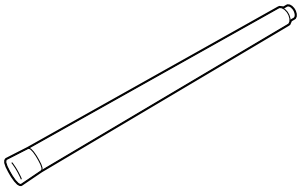
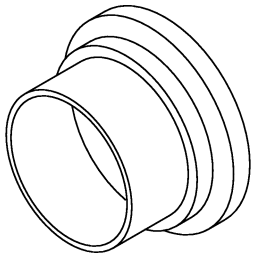
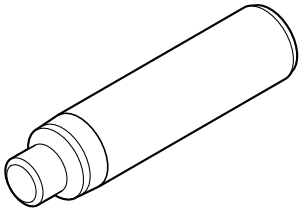
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927490000	927490000	INSTALLER A, B, C	• Used for installing oil seal into rack assembly. • For RHD model.
 ST-927580000	927580000	REMOVER	• Used for removing back-up ring and oil seal. • For RHD model.
 ST34199AE000	34199AE000	GUIDE	• Used for installing rack and seal into housing assembly. • For RHD model.
 ST34099FA030	34099FA030	INSTALLER & REMOVER	• Used for removing and installing rack oil seal (outer & inner). • For RHD model.

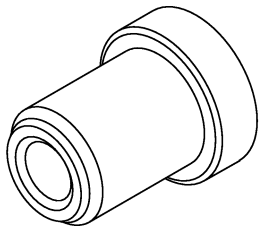
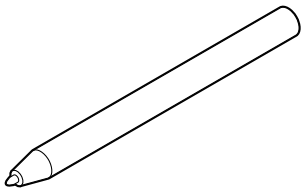
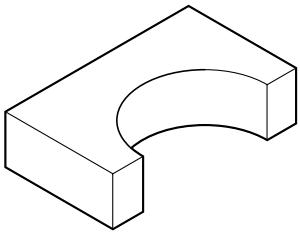
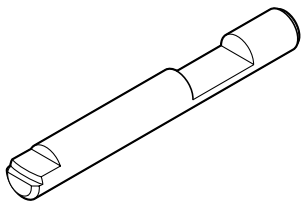
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AE010	34199AE010	INSTALLER	• Used for installing rack oil seal (outer). • For RHD model.
 ST34099FA060	34099FA060	PUNCH HOLDER	• Used for caulking. • For RHD model.
 ST34099FA070	34099FA070	BASE	• Used for supporting housing assembly. • For RHD model.
 ST34099FA080	34099FA080	PUNCH	• Used for removing caulking. • For RHD model.

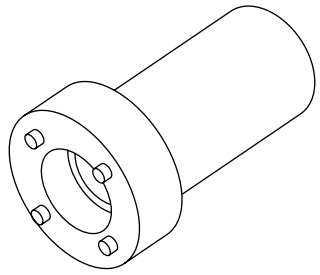
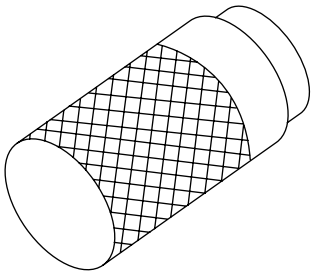
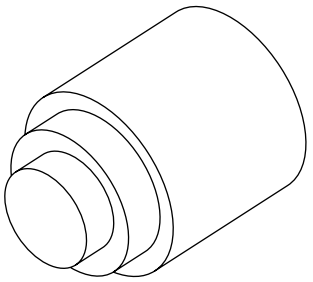
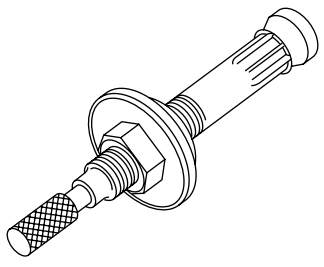
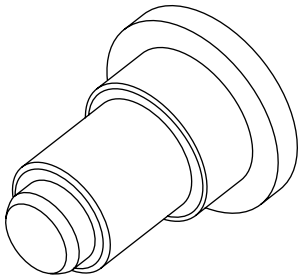
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AE090	34199AE090	PLUG WRENCH	• Used for removing plug. • For RHD model.
 ST34199AE100	34199AE100	PLUG OIL SEAL REMOVER	• Used for removing plug oil seal. • For RHD model.
 ST34199AE110	34199AE110	PLUG OIL SEAL INSTALLER	• Used for installing plug oil seal. • For RHD model.
 ST34199AE120	34199AE120	GEARBOX OIL SEAL REMOVER	• Used for removing gearbox oil seal. • For RHD model.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AE130	34199AE130	GEARBOX OIL SEAL INSTALLER	• Used for installing gearbox oil seal. • For RHD model.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Spring scale	Used for measuring tightening torque.
Snap ring pliers	Used for removing and installing snap ring.
Dial gauge	Used for measuring steering gearbox.

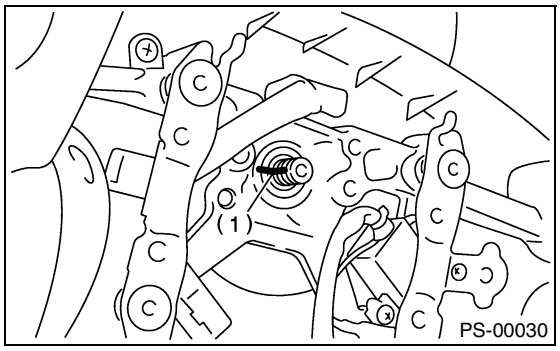
2. Steering Wheel

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Set the tires to straight-ahead position.
3) Remove the airbag module.<Ref. to AB-15, REMOVAL, Driver's Airbag Module.>

WARNING:
Always refer to "AirBag System" before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

4) Make matching marks on the steering wheel and steering shaft.



(1) Matching mark

5) Remove the steering wheel nut, and then draw out the steering wheel from shaft using steering puller.

B: INSTALLATION

WARNING:
Always refer to "AirBag System" before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

1) Align the center of roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>
2) Install in the reverse order of removal.

NOTE:
Align matching marks on the steering wheel and steering shaft.

Tightening torque:
45 N·m (4.6 kgf-m, 33.2 ft-lb)

Column cover-to-steering wheel clearance:
2 — 4 mm (0.08 — 0.16 in)

CAUTION:
Insert the roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage.

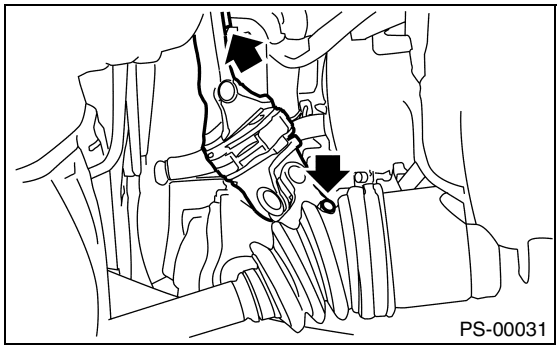
C: INSPECTION

1) Check the steering wheel for deformation. If the deformation is excessive, replace steering wheel.
2) Check the splines on steering wheel for damage. If the damage is excessive, replace steering wheel.

3. Universal Joint

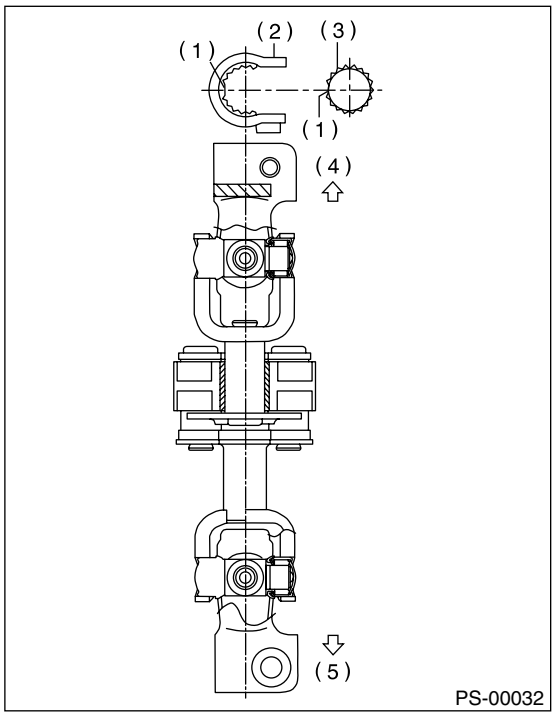
A: REMOVAL

1) Remove the steering wheel. <Ref. to PS-23, REMOVAL, Steering Wheel.>
2) Make matching mark on the universal joint.
3) Remove the universal joint bolts, and then remove the universal joint.



B: INSTALLATION

1) Align the cutout at serrated section of the column shaft and yoke, and then insert the universal joint into column shaft.



(1) Cutout
(2) Yoke
(3) Column shaft
(4) Column shaft side
(5) Gearbox side

2) Align the matching marks, and then insert the universal joint to serrated section of gear box assembly.
3) Tighten the bolt.

Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

CAUTION:
Excessively large tightening torque of the universal joint bolts may lead to heavy steering wheel operation.

Standard clearance between gearbox to DOJ:
Over 14 mm (0.55 in)

4) Align the center of roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>
5) Install the steering wheel and airbag module. <Ref. to PS-23, INSTALLATION, Steering Wheel.>

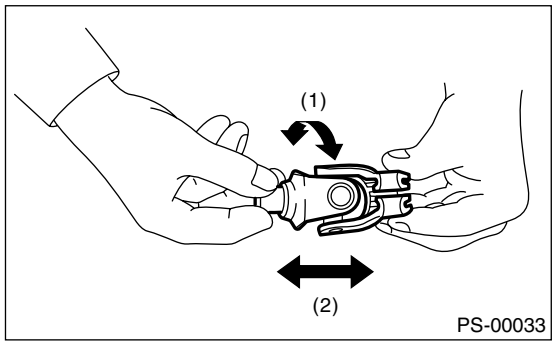
WARNING:
Always refer to "AirBag System" before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

C: INSPECTION

Check for wear, damage, or any other faults. If necessary, replace.

Service limit:

Universal joint play; 0 mm (0 in)
Maximum swing torque; 0.3 N (0.03 kgf, 0.07 lb)

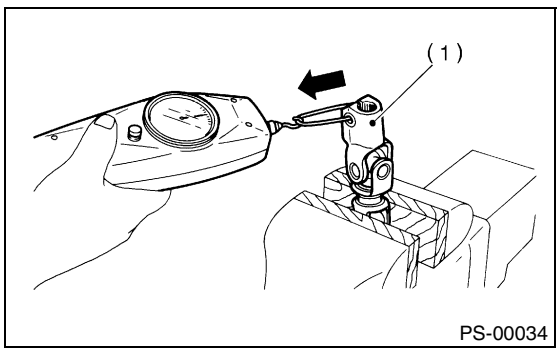


(1) Swing torque
(2) Play

Measurement of folding torque of universal joint is as shown in the figures.

Service limit:

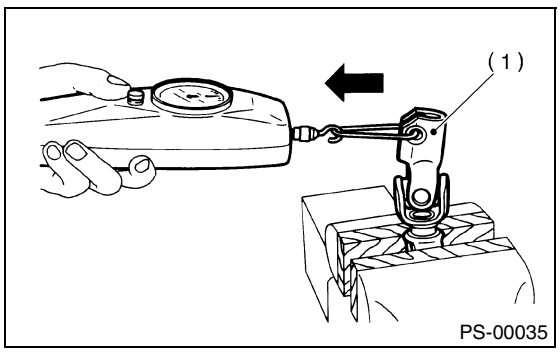
Maximum load; 3.8 N (0.39 kgf, 0.86 lb) or less



(1) Yoke (gearbox side)

Service limit:

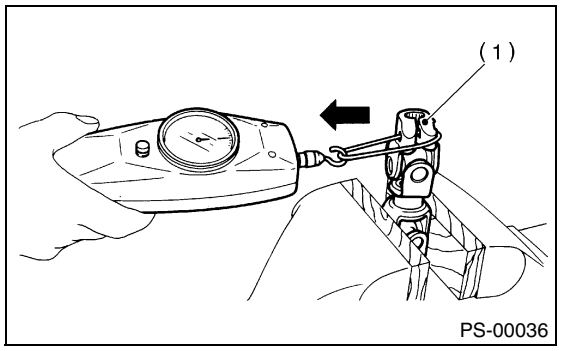
Maximum load; 3.8 N (0.39 kgf, 0.86 lb) or less



(1) Yoke (gearbox side)

Service limit:

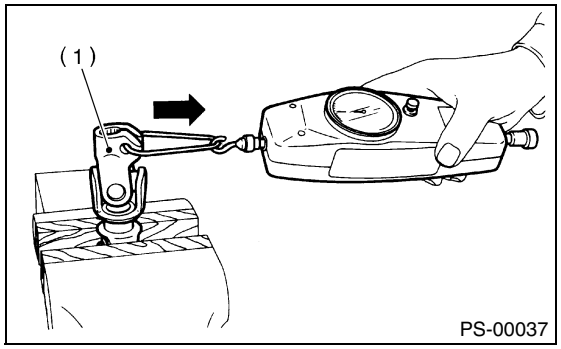
Maximum load; 7.3 N (0.74 kgf, 1.64 lb) or less



(1) Yoke (Steering column side)

Service limit:

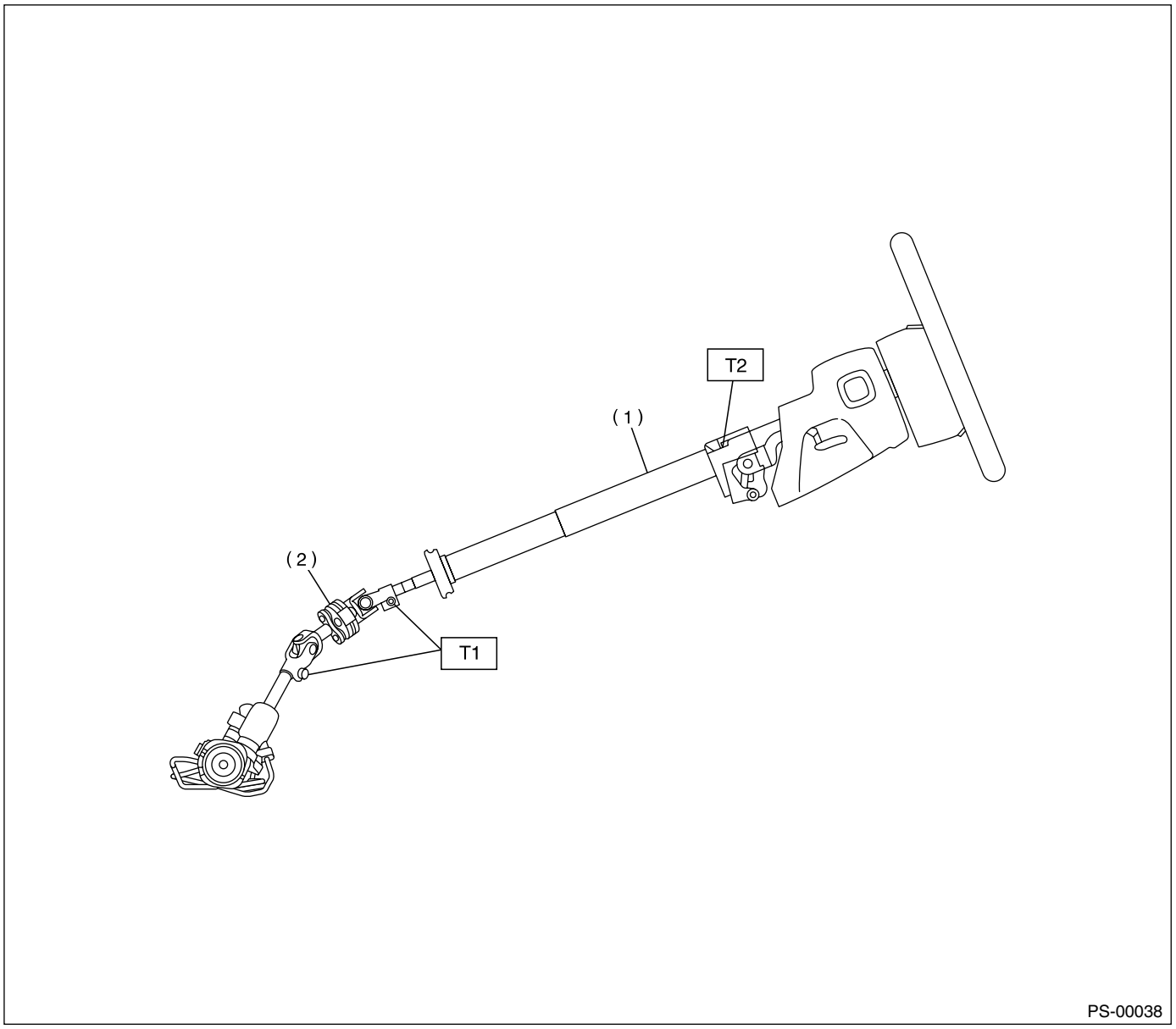
Maximum load; 7.3 N (0.74 kgf, 1.64 lb) or less



(1) Yoke (Steering column side)

4. Tilt Steering Column

A: REMOVAL



(1) Tilt steering column
(2) Universal joint

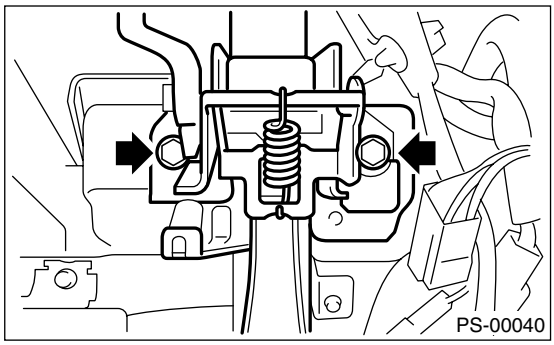
Tightening torque: N·m (kgf-m, ft-lb)
T1: 24 (2.4, 17.4)
T2: 25 (2.5, 18.1)

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Remove the airbag module. <Ref. to AB-15, REMOVAL, Driver's Airbag Module.>

WARNING:
Always refer to "AirBag System" before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

4) Remove the steering wheel. <Ref. to PS-23, REMOVAL, Steering Wheel.>
5) Remove the universal joint. <Ref. to PS-24, REMOVAL, Universal Joint.>
6) Remove the trim panel under instrument panel.
7) Remove the steering column lower cover.
8) Remove all connectors from steering column.

9) Remove the two bolts under instrument panel securing steering column.

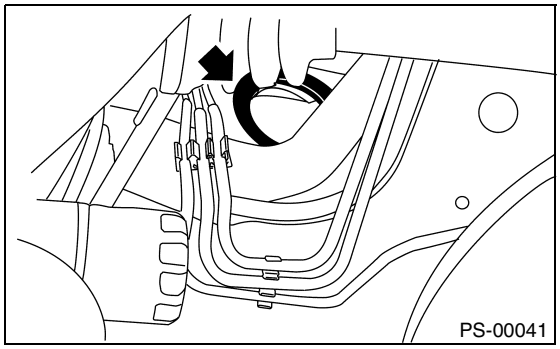


10) Pull out the steering shaft assembly from hole on toe board.

CAUTION:
• Be sure to remove the universal joint before removing steering shaft assembly installing bolts when removing steering shaft assembly or when lowering it for servicing of other parts.
• Do not loosen the tilt lever when the steering column is not secured to the vehicle.

B: INSTALLATION

1) Set the grommet to toe board.



2) Insert the end of steering shaft into toe board grommet.
3) With the tilt lever secured, tighten the steering shaft mounting bolts under instrument panel.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

4) Connect all connectors under instrument panel.
5) Connect the airbag system connector at harness spool.

NOTE:
Make sure to apply double lock.

6) Install the lower column cover with tilt lever held in the lowered position.
7) Install the universal joint. <Ref. to PS-24, INSTALLATION, Universal Joint.>
8) Align center of roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>
9) Install the steering wheel. <Ref. to PS-23, INSTALLATION, Steering Wheel.>

CAUTION:
Insert the roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage.

10) Install the airbag module to steering wheel.

WARNING:
Always refer to "AirBag System" before performing the service operation. <Ref. to AB-3, CAUTION, General Description.>

C: DISASSEMBLY

Remove the two screws securing upper steering column covers, and two screws securing combination switch, and then remove the related parts.

D: ASSEMBLY

1) Insert the combination switch to upper column shaft, and then install the upper column cover. Then route the ignition key harness and combination switch harness between column cover mounting bosses.

Tightening torque:
1.2 N·m (0.12 kgf-m, 0.9 ft-lb)

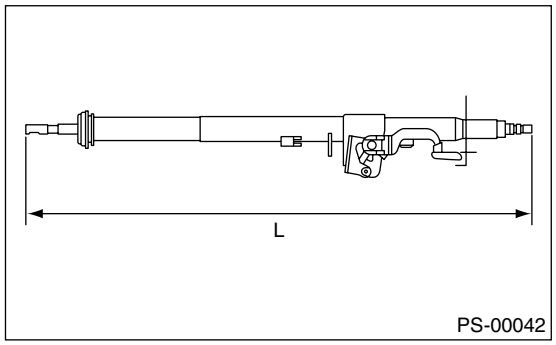
CAUTION:
Do not overtorque the screw.

E: INSPECTION

1. BASIC INSPECTION

Measure overall length of the steering column. If not as specified, replace.

Standard value:
Overall length L
815.6±1.5 mm (32.11±0.059 in)



2. AIRBAG MODEL INSPECTION

WARNING:
For airbag model inspection procedures, refer to "AirBag System". <Ref. to AB-3, CAUTION, General Description.>

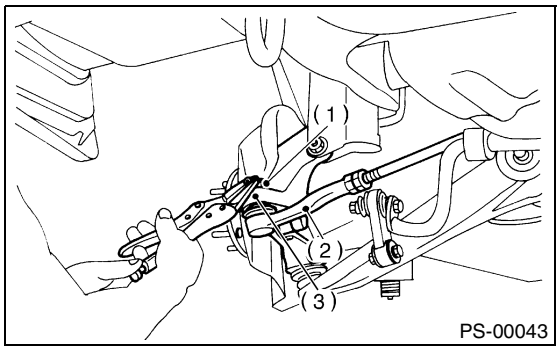
5. Steering Gearbox [LHD MODEL]

A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Loosen the front wheel nut.
4) Lift-up the vehicle, and then remove the front wheels.
5) Remove the under cover.
6) Remove the sub frame. <Ref. to FS-25, REMOVAL, Sub Frame.>
7) Remove the front exhaust pipe assembly. (Non-turbo model)
<Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.>

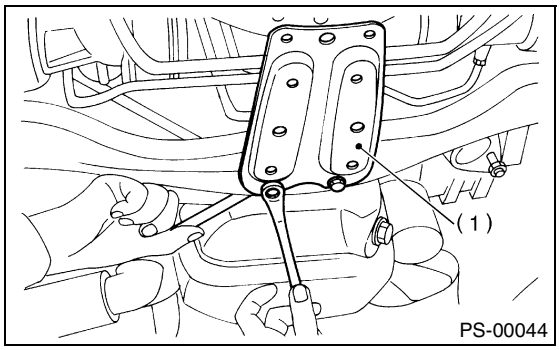
WARNING:
Be careful, the exhaust pipe is hot.

8) Using a puller, remove the tie-rod end from knuckle arm after pulling off cotter pin and removing castle nut.



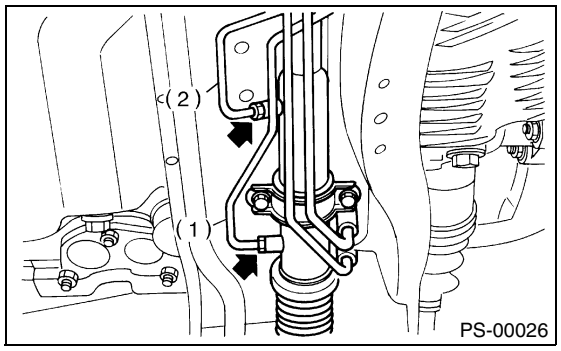
(1) Castle nut
(2) Tie-rod end
(3) Knuckle arm

9) Remove the jack-up plate and front stabilizer.



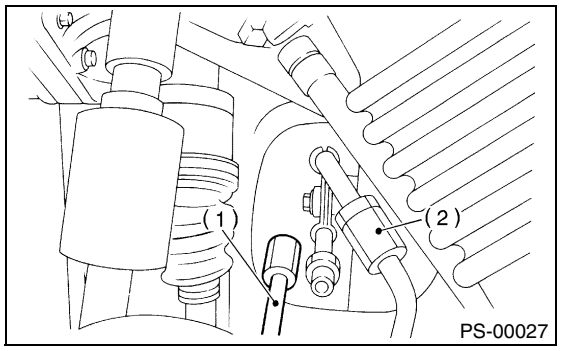
(1) Jack-up plate

10) Remove the one pipe joint at center of gearbox, and connect vinyl hose to pipe and joint. Discharge fluid by turning the steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.



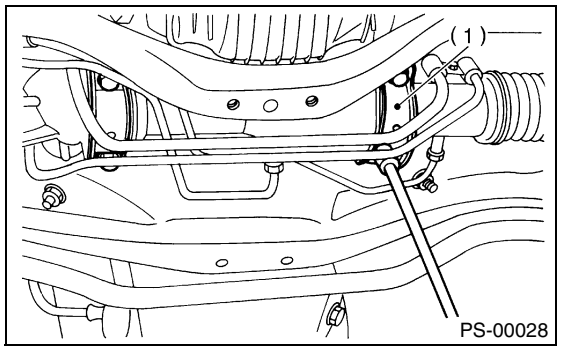
(1) Pipe A
(2) Pipe B

11) Remove the universal joint. <Ref. to PS-24, REMOVAL, Universal Joint.>
12) Disconnect the lower pipe C from gear box first, and upper pipe D second.



(1) Pipe C
(2) Pipe D

13) Remove the clamp bolts securing gearbox to crossmember, and then remove the gearbox.

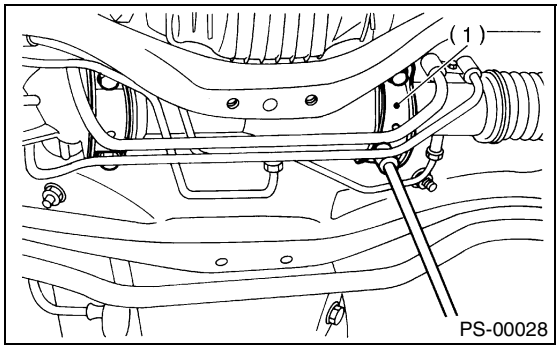


(1) Clamp

B: INSTALLATION

1) Insert the gearbox into crossmember, being careful not to damage the gearbox boot.
2) Tighten the gearbox to crossmember bracket via clamp with bolt to specified torque.

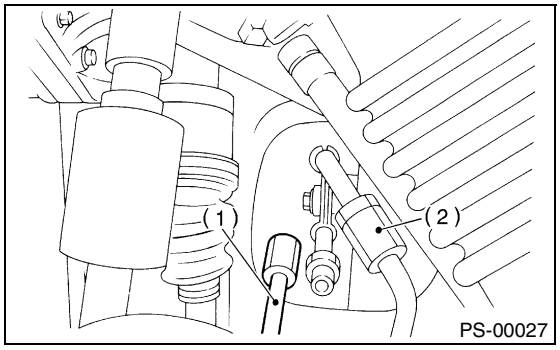
Tightening torque:
59 N·m (6.0 kgf-m, 43.4 ft-lb)



(1) Clamp

3) Connect the pipe D first to gear box, and pipe C second.

Tightening torque:
T: 15 N·m (1.5 kgf-m, 10.8 ft-lb)



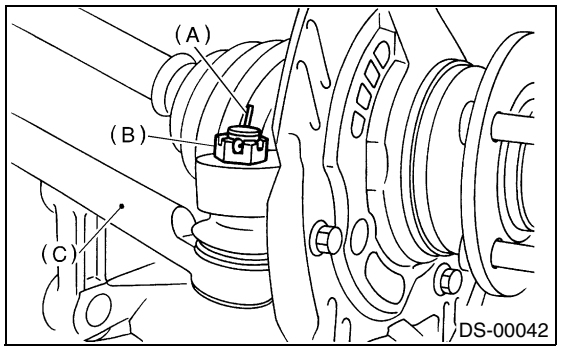
(1) Pipe C
(2) Pipe D

4) Install the universal joint. <Ref. to PS-24, INSTALLATION, Universal Joint.>
5) Connect the tie-rod end and knuckle arm, and tighten with castle nut.

Castle nut tightening torque:
27 N·m (2.75 kgf-m, 19.9 ft-lb)

CAUTION:
When connecting, do not hit the cap at bottom of tie-rod end with hammer.

6) After tightening the castle nut to specified torque, tighten it further within 60° until cotter pin hole is aligned with the slot in nut, and then bend the cotter pin to lock.



(A) Cotter pin
(B) Castle nut
(C) Tie-rod end

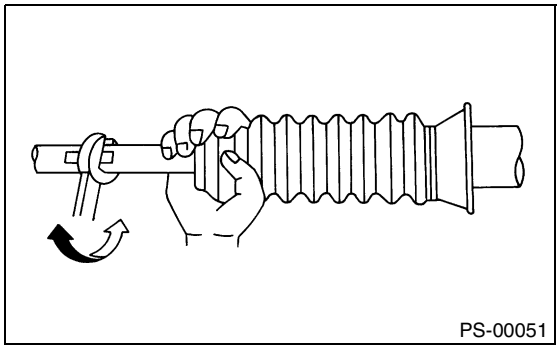
7) Install the front stabilizer to vehicle. <Ref. to FS-23, INSTALLATION, Front Stabilizer.>
8) Install the front exhaust pipe assembly.
9) Install the sub frame. <Ref. to FS-25, INSTALLATION, Sub Frame.>
10) Install the under cover. <Ref. to EI-22, INSTALLATION, Front Under Cover.>
11) Align the center of roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>
12) Install the steering wheel. <Ref. to PS-23, INSTALLATION, Steering Wheel.>
13) Install the tires.
14) Tighten the wheel nuts to specified torque.

Tightening torque:
90 N·m (9.1 kgf-m, 65.8 ft-lb)

15) Connect the battery ground cable to battery.
16) Pour fluid into the oil tank, and bleed air. <Ref. to PS-89, Power Steering Fluid.>
17) Check for fluid leaks.
18) Install the jack-up plate.
19) Lower the vehicle.
20) Check the fluid level in oil tank.
21) After adjusting the toe-in and steering angle, tighten the lock nut on tie-rod end.

Tightening torque:
83 N·m (8.5 kgf-m, 61.5 ft-lb)

NOTE:
When adjusting the toe-in, hold boot as shown to prevent it from being rotated or twisted. If twisted, straighten it.



C: DISASSEMBLY

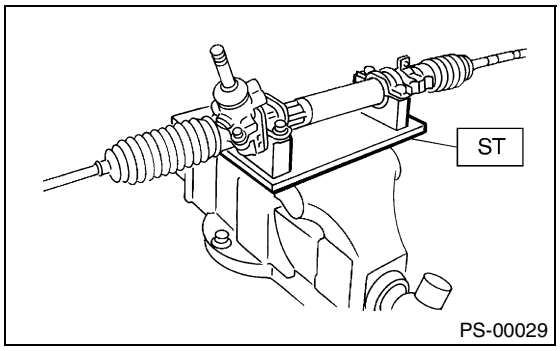
1. RACK HOUSING ASSEMBLY

1) Disconnect the four pipes from gearbox.

NOTE:
Remove the pipes E and F as a single unit being fixed at clamp plate.

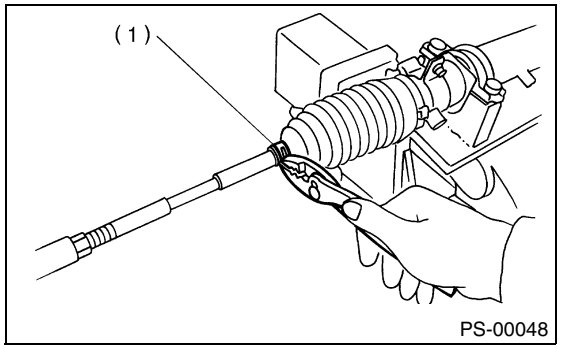
2) Secure the gearbox removed from vehicle in vice using ST.
ST 926200000 STAND

CAUTION:
Secure the gearbox in a vise using ST as shown. Do not attempt to secure it without this ST.



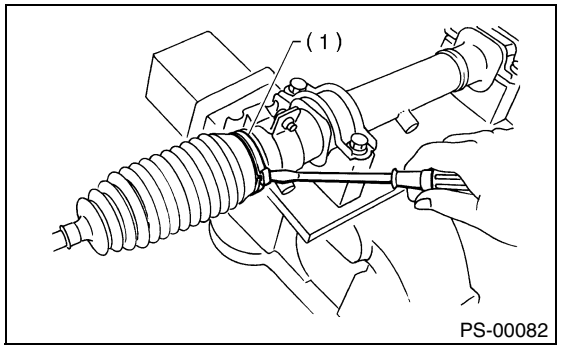
3) Remove the tie-rod end and lock nut from gearbox.

4) Remove the small clip from boot using pliers, and then move the boot to tie-rod end side.



(1) Clip

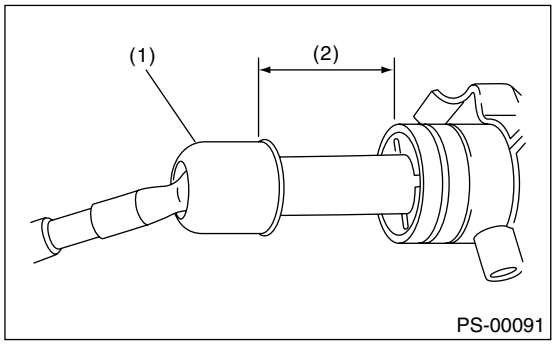
5) Using a flat tip screwdriver, remove the band from boot.



(1) Band

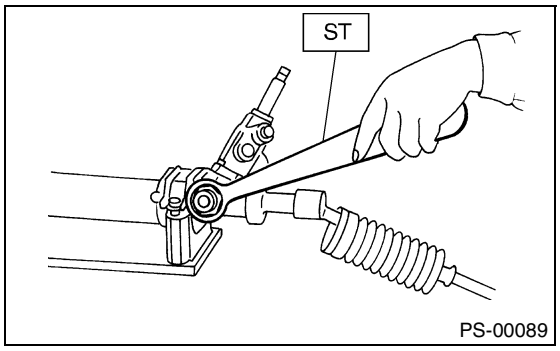
6) Extend the rack approx. 40 mm (1.57 in) out. Unlock the lock washer on both side of tie-rod end using a flat tip screwdriver.

CAUTION:
Be careful not to scratch the rack surface as oil leaks may result.

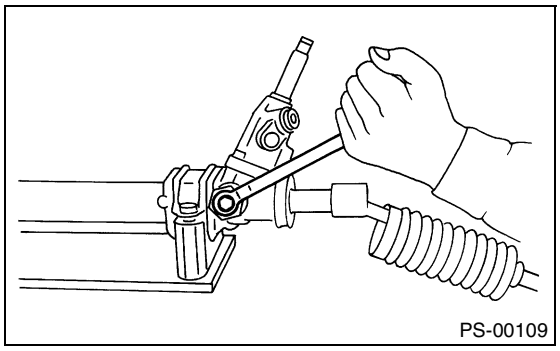


(1) Lock washer
(2) Approx. 40 mm (1.57 in)

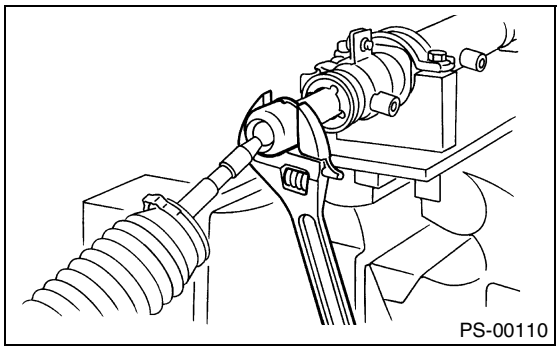
7) Using the ST, loosen the lock nut.
ST 926230000 SPANNER



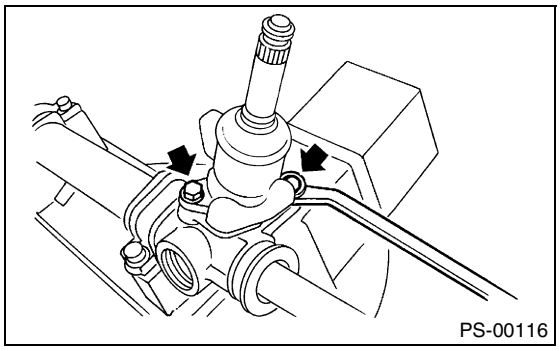
8) Tighten the adjusting screw until it no longer tightens.



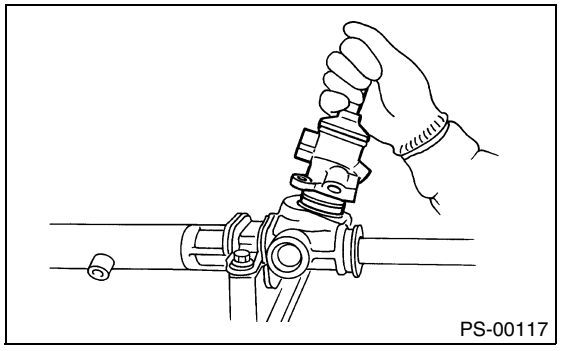
9) Using a wrench [32 mm (1.26 in) width across flats] or adjustable wrench, remove the tie-rod.



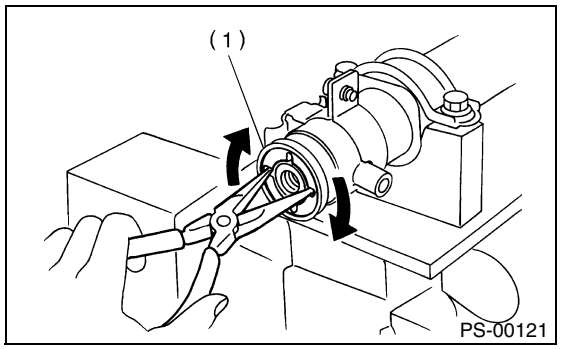
10) Loosen the adjusting screw, and then remove the spring and sleeve.
11) Remove the two bolts securing valve assembly.



12) Carefully draw out the input shaft, and then remove the valve assembly.



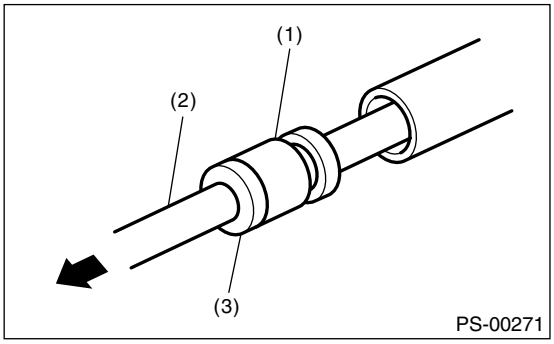
13) Using a sharp pointed pliers, rotate the rack stopper in direction of the arrow until end of the circlip comes out of stopper. Rotate the circlip in opposite direction and pull it out.



(1) Rack stopper

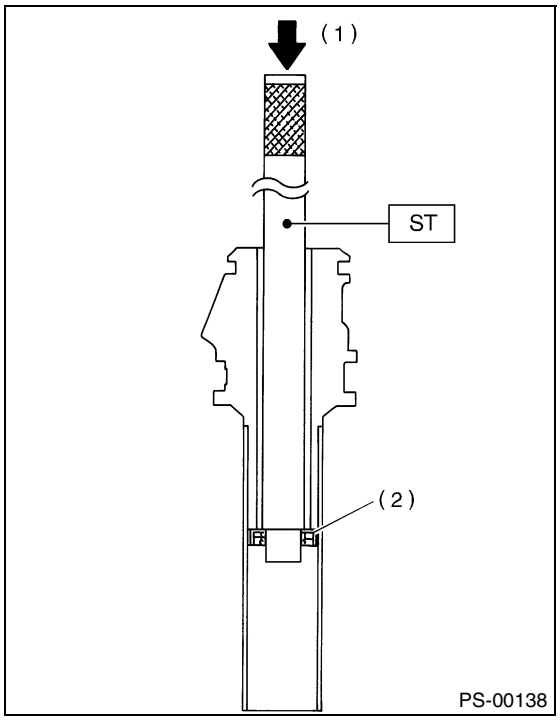
14) Pull the rack assembly from cylinder side, and draw out the rack bushing and rack stopper together with the rack assembly.

CAUTION:
Be careful not to contact the rack to inner wall of cylinder when drawing out. Any scratch on the cylinder inner wall will cause oil leakage.



(1) Rack bushing
(2) Rack assembly
(3) Rack stopper

15) Remove the rack bushing and rack stopper from rack assembly.
16) Remove the oil seal from rack.
17) Insert the ST from pinion housing side, and then remove the oil seal using a press.
ST 34099FA110 INSTALLER



(1) Press
(2) Oil seal

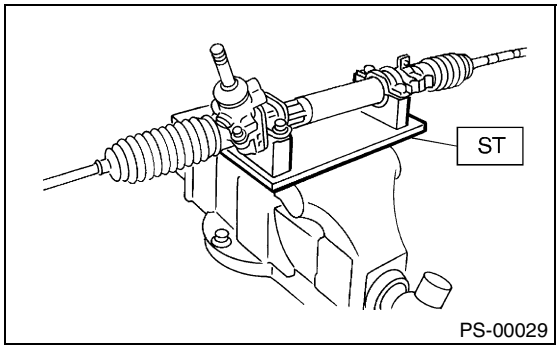
2. CONTROL VALVE

1) Disconnect the four pipes from gearbox.

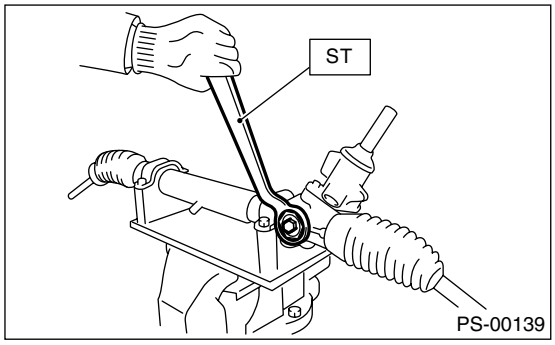
NOTE:
Remove the pipes E and F as a single unit being fixed at clamp plate.

2) Secure the gearbox removed from the vehicle in vise using ST.
ST 926200000 STAND

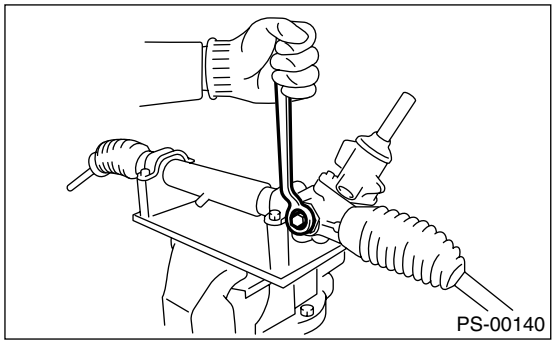
CAUTION:
Secure the gearbox in a vise using ST as shown. Do not attempt to secure it without this ST.



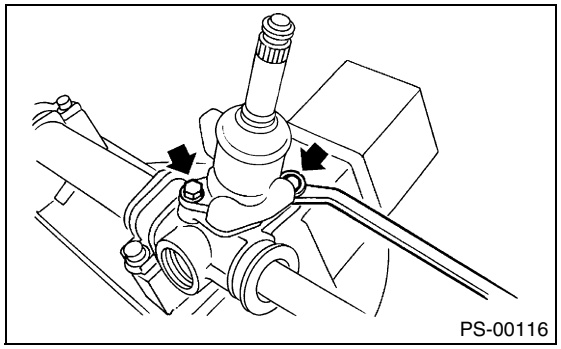
3) Using the ST, loosen the lock nut.
ST 926230000 SPANNER



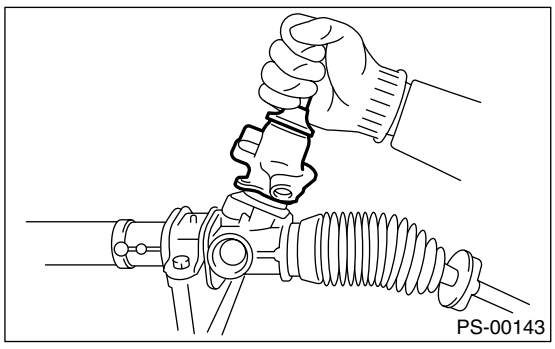
4) Tighten the adjusting screw until it no longer tightens.



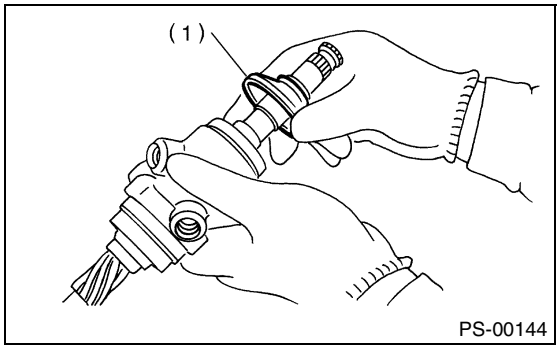
5) Loosen the adjusting screw, and then remove the spring and sleeve.
6) Remove the two bolts securing valve assembly.



7) Carefully draw out the input shaft, and then remove the valve assembly.

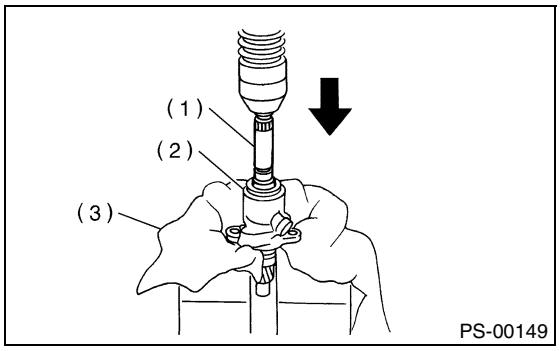


8) Slide the dust cover out.



(1) Dust cover

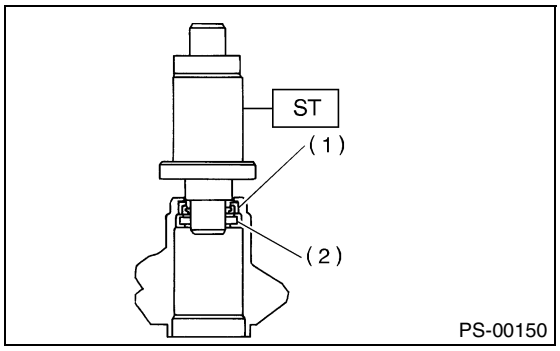
9) Using a press remove the pinion and valve assembly from valve housing.



(1) Valve assembly
(2) Valve housing
(3) Cloth

10) Using the ST and press, remove the dust seal, oil seal and special bearing from valve housing.
ST 34099FA120 INSTALLER & REMOVER SEAL

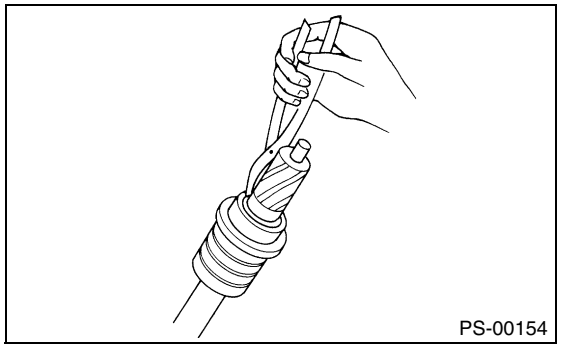
CAUTION:
• Do not apply force to the end surface of valve housing.
• Do not reuse the oil seal after removal.



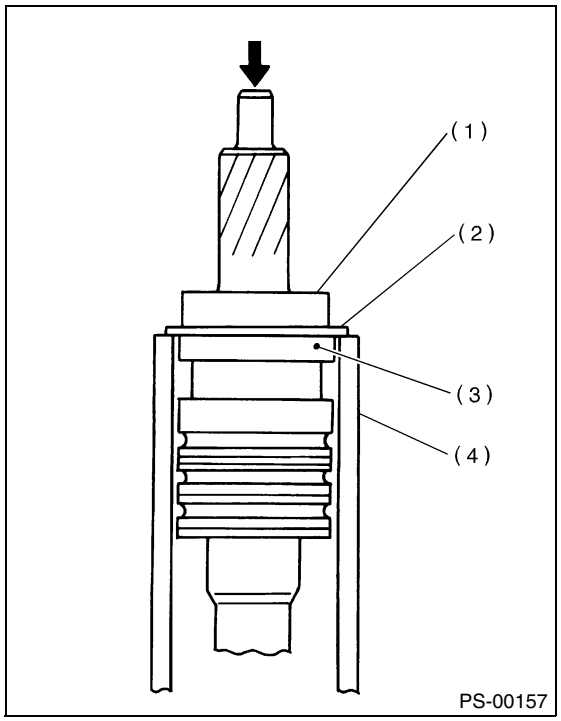
(1) Oil seal
(2) Special bearing

11) Remove the snap ring using snap ring pliers.

CAUTION:
Be careful not to scratch the pinion and valve assembly.



12) Press out the bearing together with the back up washer using pipe of I.D. 38.5 to 39.5 mm (1.516 to 1.555 in) and press.



(1) Bearing
(2) Backing washer
(3) Oil seal
(4) Pipe

13) Remove the oil seal.

D: ASSEMBLY

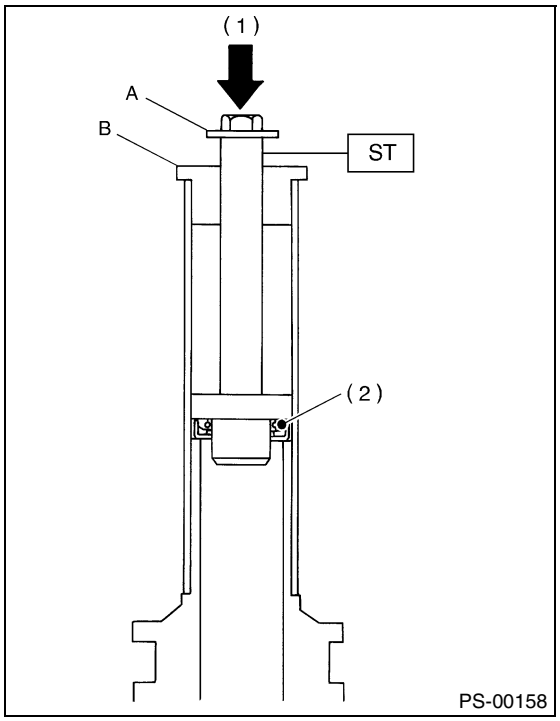
1. RACK HOUSING ASSEMBLY

CAUTION:
Use only SUBARU genuine grease for the gearbox.

Specified grease for gearbox:
VALIANT GREASE M2 (Part No. 003608001)

1) Apply power steering fluid to a new oil seal.
2) Install the oil seal in correct position as shown in the figure. Push the oil seal using a press until portion A of ST contacts face of B.
ST 34099FA110 INSTALLER

CAUTION:
Be careful not to damage or scratch the cylinder inner wall.

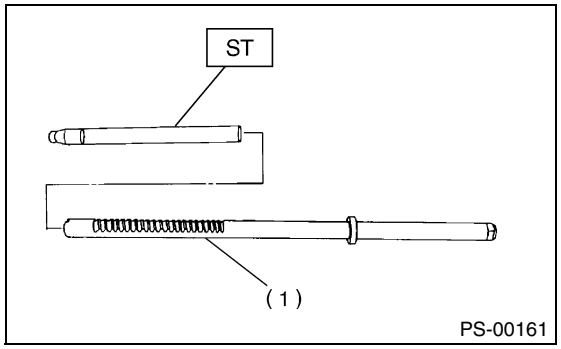


(1) Press
(2) Oil seal

3) Fix the rack housing in vise using ST.
ST 926200000 STAND

CAUTION:
• When fixing the rack housing in vise, be sure to use this special tool. Do not fix rack housing in vise using pad such as aluminum plates, etc.
• When using the old rack housing, be sure to clean and remove rust before assembling. Check pinion housing bushing carefully.

4) Fit the ST over toothed portion of rack assembly, and check for binding or unsmooth insertion. If any deformation is noted on flats at the end of rack, shape by using file, and wash with cleaning fluid.
ST 926390001 COVER & REMOVER



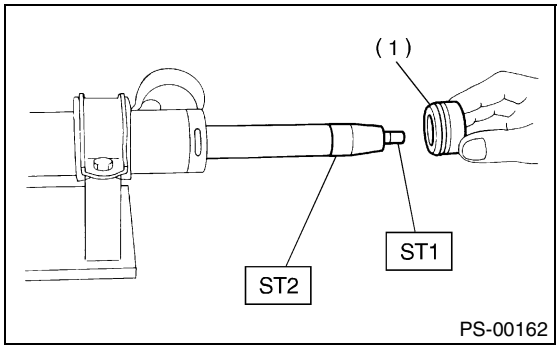
(1) Rack assembly

5) Apply genuine grease to the teeth of thoroughly washed rack assembly, and then fit the ST over the toothed portion.

CAUTION:
• Be careful not to block the air passage with grease. Remove excessive grease.
• After fitting cover, check the air passage hole for clogging. If clogged, open by removing grease from the hole.

6) Before inserting the rack assembly, apply a coat of specified power steering fluid to the surfaces of ST and rack piston.
7) Insert the rack assembly into rack housing from cylinder side, and then remove the ST after it has passed completely through oil seal.
8) Fit the ST1 and ST2 over the end of rack, and then install a new rack bushing.
ST1 926400000 GUIDE
ST2 927660000 GUIDE

CAUTION:
• If burrs or nicks are found on this guide and rack shaft portion, remove by filing.
• Dip the rack bushing in specified power steering fluid before installing, and pay attention not to damage O-ring and oil seal.

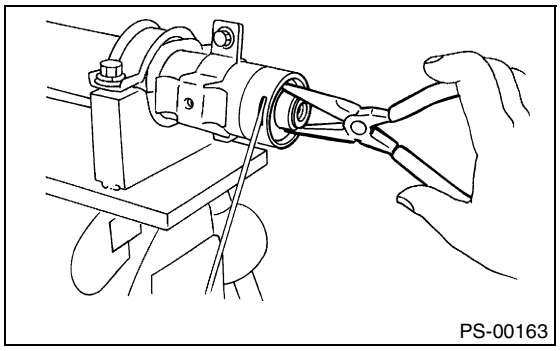


(1) Rack bushing assembly

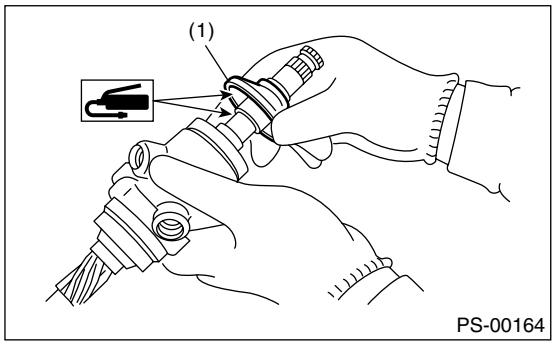
9) Insert the rack stopper into the cylinder tube until internal groove (on cylinder side) is aligned with external groove (on rack stopper). Turn the rack stopper with ST so that the rack stopper hole is seen through cylinder slits.
10) Insert the rack stopper into the rack housing, and then wrap a new circlip using a sharp pointed pliers to secure the rack stopper in position.

CAUTION:
Be careful not to scratch the rack while winding circlip.

NOTE:
Rotate the wrench another 90 to 180° after end of circlip has been wrapped in.

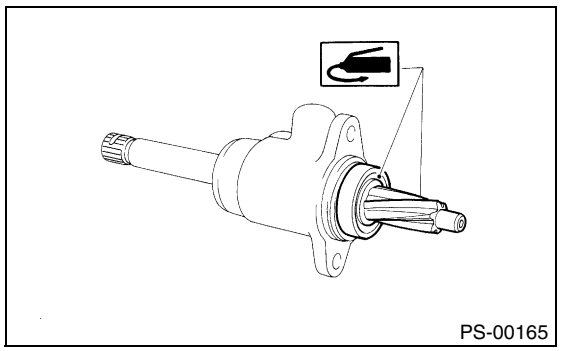


11) Apply genuine grease to dust cover, and then install the dust cover to valve assembly.

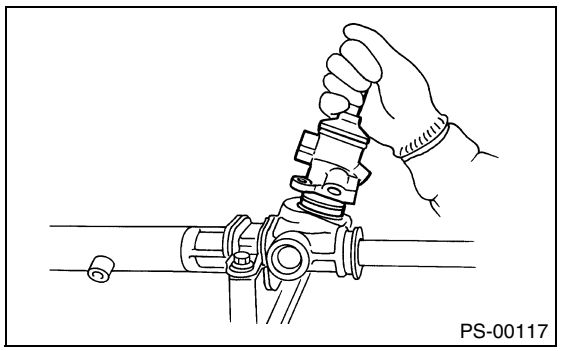


(1) Dust cover

12) Apply genuine grease to the pinion gear and bearing of valve assembly.



13) Install a new gasket on valve assembly. Insert the valve assembly into place while facing rack teeth toward pinion.



14) Tighten the bolts alternately to secure valve assembly.

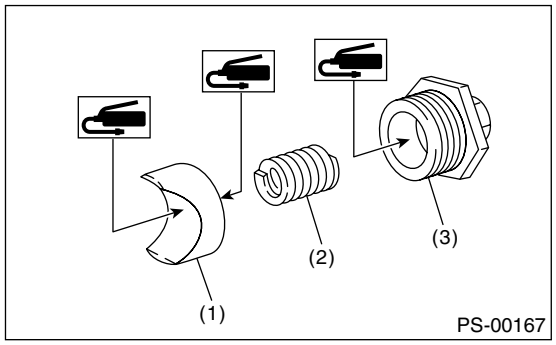
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

CAUTION:
Be sure to alternately tighten the bolts.

15) Temporarily install the rack, and then operate it from lock to lock two or three times to make it fit in. Remove the grease blocking air vent hole.

CAUTION:
If operating the rack from lock to lock without installing tie-rod, it may damage the oil seal. Always install the tie-rods LH and RH.

16) Apply a coat of grease to the sliding surface of sleeve and seating surface of spring, and then insert sleeve into steering body.
Charge the adjusting screw with grease, and then insert the spring into adjusting screw and install on steering body.



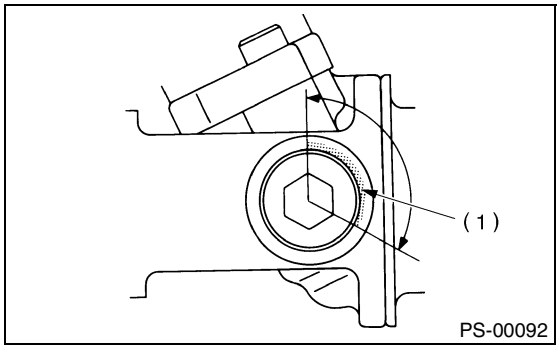
(1) Sleeve
(2) Spring
(3) Adjusting screw

17) Tighten the adjusting screw to specified torque.

Tightening torque:
First step; 7.4 N·m (0.75 kgf-m, 5.4 ft-lb)
Second step; Back off 25°.

18) Remove the tie-rod.
19) Verify that play is within specified value. <Ref. to PS-44, SERVICE LIMIT, INSPECTION, Steering Gearbox [LHD MODEL].>
20) Loosen the adjusting screw, and then apply liquid gasket to at least 1/3 of the entire perimeter of adjusting screw thread.

Liquid gasket:
THREE BOND 1141



(1) Apply liquid gasket to at least 1/3 of entire perimeter.

21) Tighten the adjusting screw to specified torque.

Tightening torque:
First step; 7.4 N·m (0.75 kgf-m, 5.4 ft-lb)
Second step; Back off 25°.

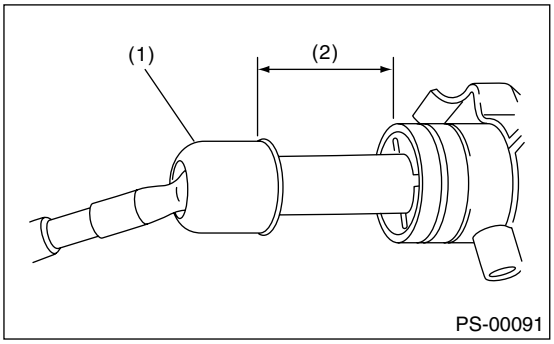
22) Install the lock nut. While holding the adjusting screw with a wrench, tighten lock nut using ST.
ST 926230000 SPANNER

Tightening torque (Lock nut):
39 N·m (4.0 kgf-m, 28.9 ft-lb)

NOTE:
Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.

23) Extend the rack approx. 40 mm (1.57 in) beyond side of steering body.
24) Install the tie-rod and a new lock washer into rack.

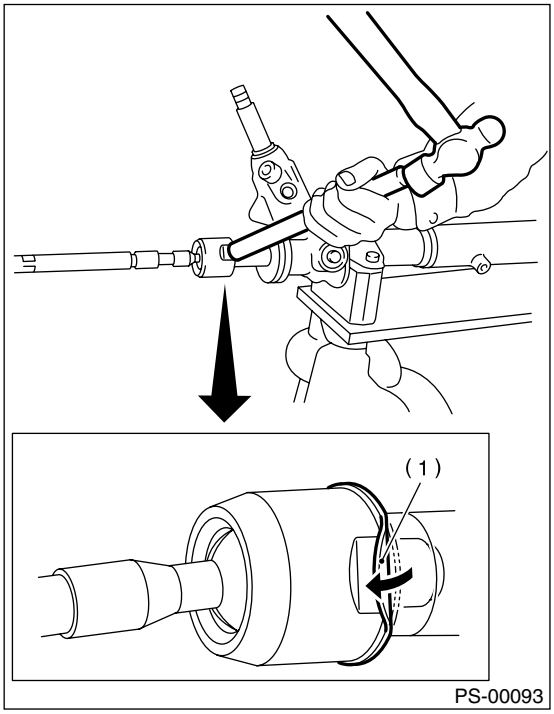
Tightening torque:
78 N·m (8.0 kgf-m, 57.9 ft-lb)



(1) Tie-rod
(2) Approx. 40 mm (1.57 in)

25) Bend the lock washer.

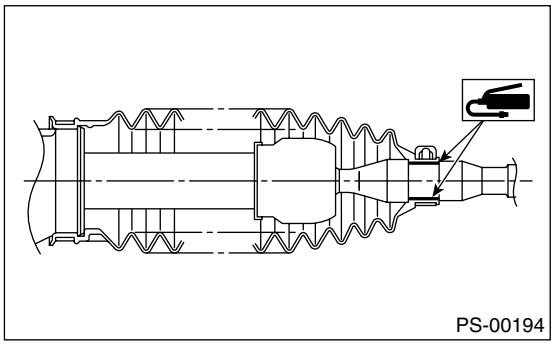
CAUTION:
Be careful not to scratch the rack when bending lock washer.



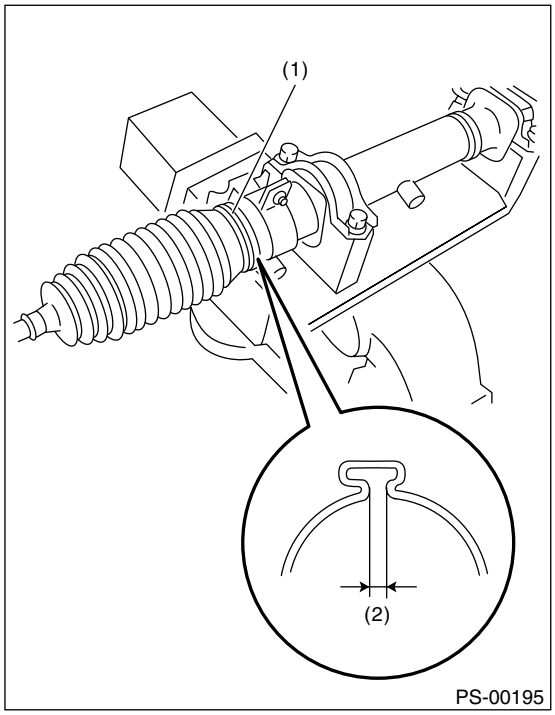
(1) Lock washer

26) Apply a coat of grease to the tie-rod groove, and then install the boot to housing.

NOTE:
Make sure that the boot is installed without unusual inflation or deflation.

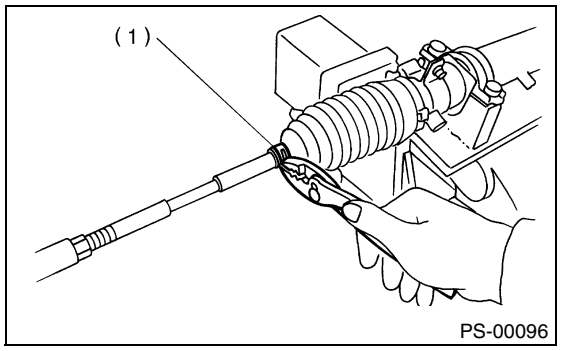


27) Install a new boot band. Using band clamp pliers, caulk the boot band until caulking part clearance is 2 mm (0.079 in) or less.



(1) Boot band
(2) 2 mm (0.079 in) or less

28) Fix the boot end with clip (small).

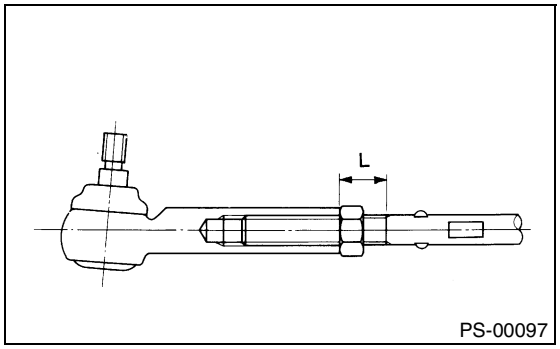


(1) Clip

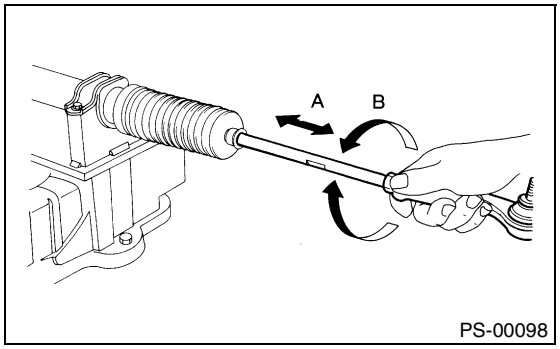
29) After installing, check the boot end is positioned into groove on tie-rod.

30) If the tie-rod end was removed, screw in the lock nut and tie-rod end to screwed portion of tie-rod, and then tighten the lock nut temporarily in a position as shown in the figure.

Installed tie-rod length: L
31.2 mm (1.23 in)



31) Inspect the gearbox as follows:
"A" Holding the tie-rod end, repeat lock to lock two or three times as quickly as possible.
"B" Holding the tie-rod end, turn it slowly at a radius one or two times as large as possible.
After all, make sure that the boot is installed in specified position without deflation.



32) Remove the gearbox from ST.
ST 926200000 STAND
33) Install the four pipes on gearbox.
(1) Connect the pipe A and B to four pipe joints of gearbox.

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

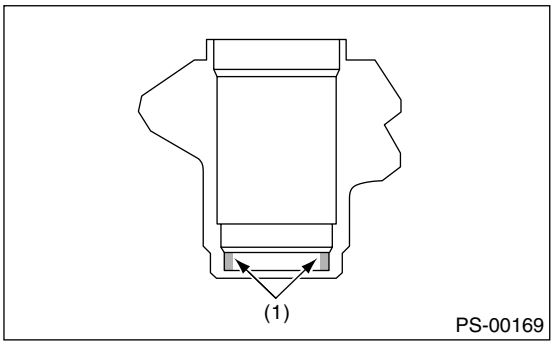
(2) Connect the pipe E and F to gearbox.

Tightening torque:
Pipe E: 15 N·m (1.5 kgf-m, 10.8 ft-lb)
Pipe F: 25 N·m (2.5 kgf-m, 18.1 ft-lb)

2. CONTROL VALVE ASSEMBLY

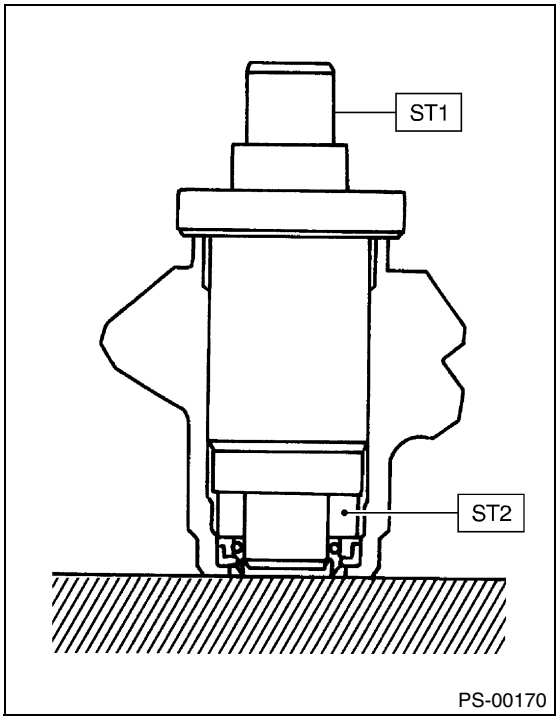
Specified steering grease:
VALIANT GREASE M2 (Part No. 003608001)

1) Clean all parts and tools before reassembling.
2) Apply a coat of specified power steering fluid to the inner wall of valve housing.

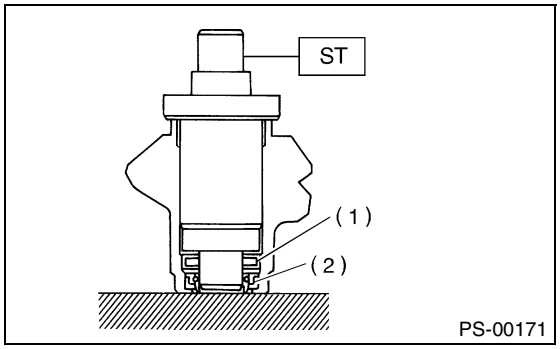


(1) Apply fluid.

3) Attach the ST2 to ST1.
ST1 34099FA120 INSTALLER & REMOVER SEAL
ST2 34099FA130 INSTALLER SEAL
4) To avoid scratching the oil seal, apply a coat of grease to the contact surface of installer and oil seal.
5) Verify the oil seal direction.
Attach the oil seal to installer and position in valve housing before pressing into place.
6) Press the oil seal into place using a press.



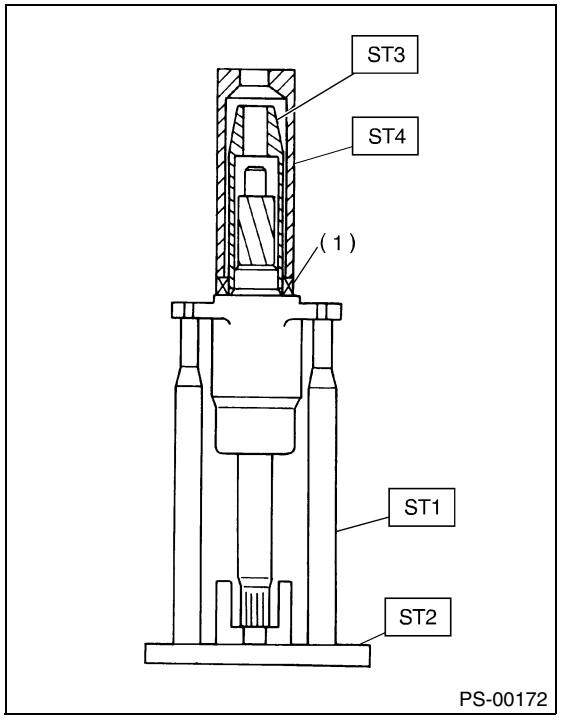
7) Attach the bearing to ST, and then position in value housing. Using the ST and press, install the special bearing in valve housing.
ST 34099FA120 INSTALLER & REMOVER SEAL



(1) Special bearing
(2) Oil seal

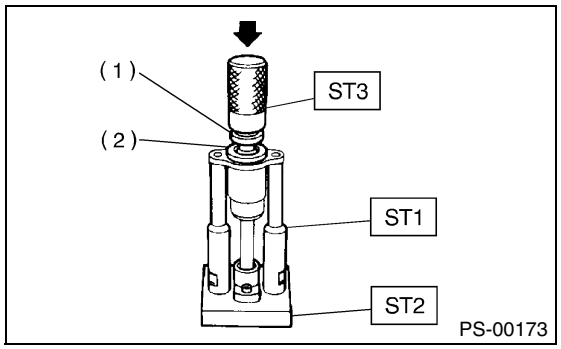
8) Put vinyl tape around the pinion shaft splines to protect oil seal from damage.
9) Fit the pinion and valve assembly into valve housing.
10) Secure the valve assembly to ST1 and ST2.
ST1 926370000 INSTALLER A
ST2 34099FA100 STAND BASE
11) Apply specified power steering fluid to oil seal and ST3.

12) Install the ST3 to pinion, and then insert the oil seal. Press the oil seal using a press until ST4 contacts face end of valve housing.
ST3 926360000 INSTALLER A
ST4 927620000 INSTALLER B



(1) Oil seal

13) Remove the ST3, and then fit the backing washer.
14) Force-fit the ball bearing using ST3.
ST1 926370000 INSTALLER A
ST2 34099FA100 STAND BASE
ST3 927640000 INSTALLER B



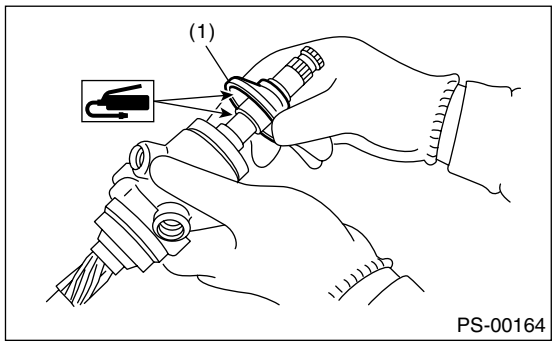
(1) Ball bearing
(2) Backing washer

NOTE:
Be careful not to tilt the ball bearing during installation.

15) Install the snap ring using snap ring pliers.

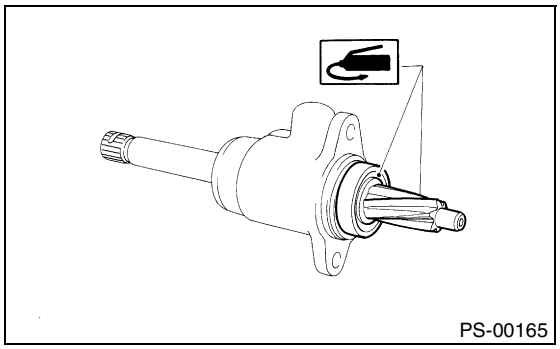
NOTE:
Rotate the snap ring to check for proper installation.

16) Apply the specified grease to dust cover.
17) Install the dust cover on valve assembly.

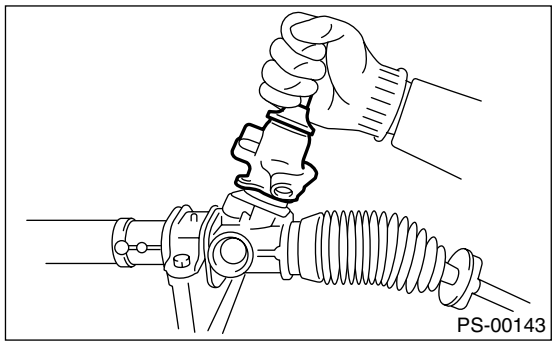


(1) Dust cover

18) Apply genuine grease to the pinion gear and bearing of valve assembly.



19) Install a new gasket on valve assembly. Insert the valve assembly into place while facing rack teeth toward pinion.

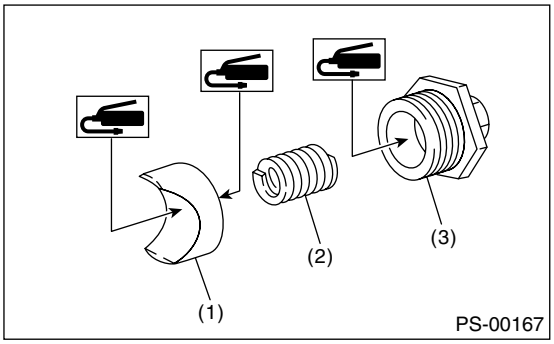


20) Tighten the bolts alternately to secure valve assembly.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

CAUTION:
Be sure to alternately tighten the bolts.

21) Apply a coat of grease to the sliding surface of sleeve and seating surface of spring, and then insert sleeve into steering body.
Charge the adjusting screw with grease, and then insert the spring into adjusting screw and install on steering body.



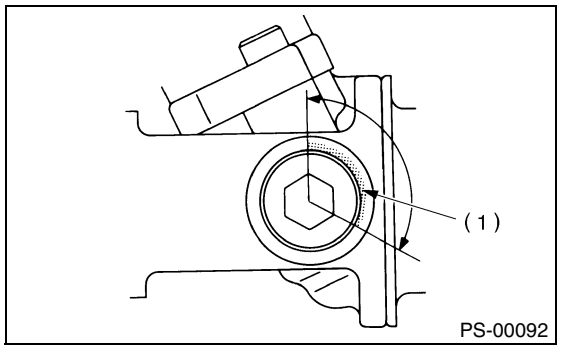
(1) Sleeve
(2) Spring
(3) Adjusting screw

22) Tighten the adjusting screw to specified torque.

Tightening torque:
First step; 7.4 N·m (0.75 kgf-m, 5.4 ft-lb)
Second step; Back off 25°.

23) Verify that play is within specified value. <Ref. to PS-44, SERVICE LIMIT, INSPECTION, Steering Gearbox [LHD MODEL].>
24) Loosen the adjusting screw, and then apply liquid gasket to at least 1/3 of the entire perimeter of adjusting screw thread.

Liquid gasket:
THREE BOND 1141



(1) Apply liquid gasket to at least 1/3 of entire perimeter.

25) Tighten the adjusting screw to specified torque.

Tightening torque:
First step; 7.4 N·m (0.75 kgf-m, 5.4 ft-lb)
Second step; Back off 25°.

26) Install the lock nut. While holding the adjusting screw with a wrench, tighten lock nut using ST.
ST 926230000 SPANNER

Tightening torque (Lock nut):
39 N·m (4.0 kgf-m, 28.9 ft-lb)

NOTE:
Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.

27) Remove the gearbox from ST.
28) Install the four pipes on gearbox.
(1) Connect the pipe A and B to the gearbox.

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

(2) Connect the pipe E and F to gearbox.

Tightening torque:
Pipe E: 15 N·m (1.5 kgf-m, 10.8 ft-lb)
Pipe F: 25 N·m (2.5 kgf-m, 18.1 ft-lb)

E: INSPECTION

1. BASIC INSPECTION

1) Clean all disassembled parts, and check for wear, damage, or any other faults, then repair or replace as necessary.
2) When disassembling, check the inside of gearbox for water. If any water is found, carefully check the boot for damage, input shaft dust seal, adjusting screw and boot clips for poor sealing. If faulty, replace with new parts.

No.	Parts	Inspection	Corrective action
1	Input shaft	(1) Bend of input shaft (2) Damage on serration	If the bend or damage is excessive, replace the entire gearbox.
2	Dust seal	(1) Crack or damage (2) Wear	If the outer wall slips, the lip is worn out or damage is found, replace it with a new one.
3	Rack and pinion	Poor mating of rack with pinion	(1) Adjust the backlash properly. By measuring the turning torque of gearbox and sliding resistance of rack, check if rack and pinion engage uniformly and smoothly with each other. (Refer to “Service limit”.) (2) Keeping the rack pulled out all the way so that all teeth emerge, check teeth for damage. Even if abnormality is found in either (1) or (2), replace the entire gearbox.
4	Gearbox unit	(1) Bend of rack shaft (2) Bend of cylinder portion (3) Crack or damage on cast iron portion	Replace the gearbox with a new one.
		(4) Wear or damage on rack bush	If the free play of rack shaft in radial direction is out of the specified range, replace the gearbox with a new one. (Refer to “Service limit”.)
		(5) Wear on input shaft bearing	If the free plays of input shaft in radial and axial directions are out of the specified ranges, replace the gearbox with a new one. (Refer to “Service limit”.)
5	Boot	Crack, damage or deterioration	Replace.
6	Tie-rod	(1) Looseness of ball joint (2) Bend of tie-rod	Replace.
7	Tie-rod end	Damage or deterioration on dust seal	Replace.
8	Adjusting screw spring	Deterioration	Replace.
9	Boot clip	Deterioration	Replace.
10	Sleeve	Damage	Replace.
11	Pipes	(1) Damage to flared surface (2) Damage to flare nut (3) Damage to pipe	Replace.

2. SERVICE LIMIT

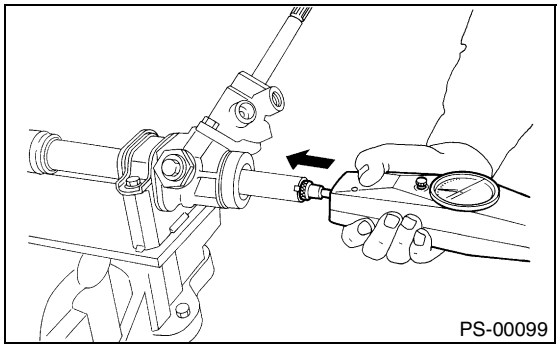
Make a measurement as follows. If it exceeds the specified service limit, adjust or replace.

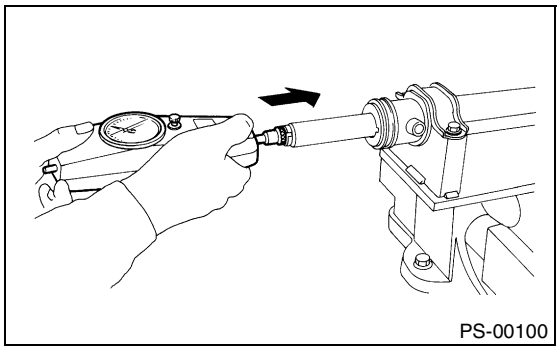
NOTE:
When making a measurement, vise the gearbox by using ST. Never vise the gearbox by inserting aluminum plates, etc. between vise and gearbox.

ST 926200000 STAND

Sliding resistance of rack shaft:

Service limit
400 N (41 kgf, 90 lb) or less


PS-00099

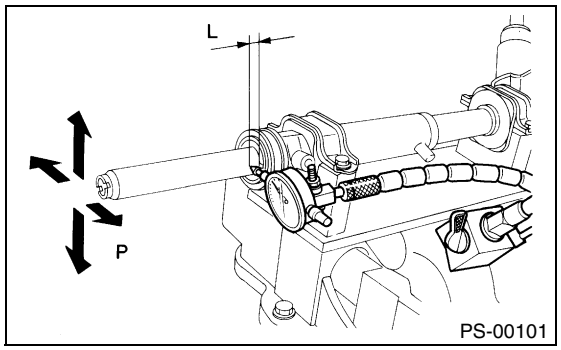

PS-00100

3. RACK SHAFT PLAY IN RADIAL DIRECTION

Right-turn steering:

Service limit
0.19 mm (0.0075 in) or less

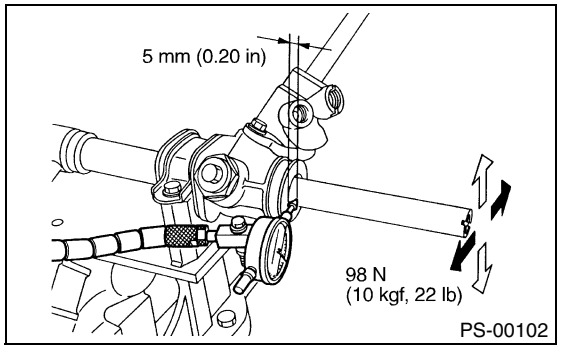
On condition
L: 5 mm (0.20 in)
P: 122.6 N (12.5 kgf, 27.6 lb)



PS-00101

Left-turn steering:

Service limit
Direction ⇦⇨
0.3 mm (0.012 in) or less
Direction ⬅➡
0.15 mm (0.0059 in) or less



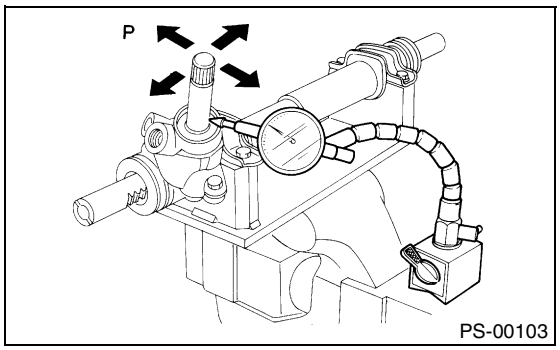
PS-00102

4. INPUT SHAFT PLAY

In radial direction:

Service limit
0.18 mm (0.0071 in) or less

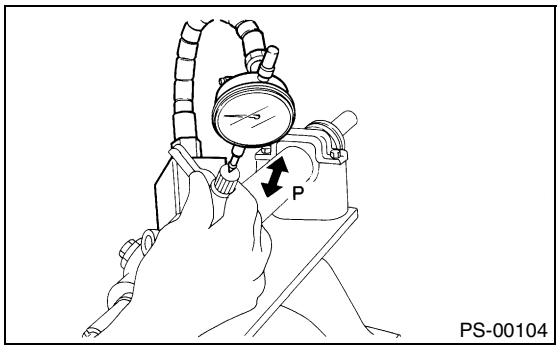
On condition
P: 98 N (10 kgf, 22 lb)



In axial direction:

Service limit
0.5 mm (0.020 in) or less

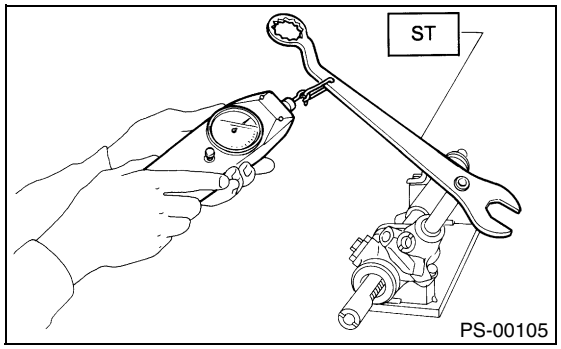
On condition
P: 20 — 49 N (2 — 5 kgf, 4 — 11 lb)



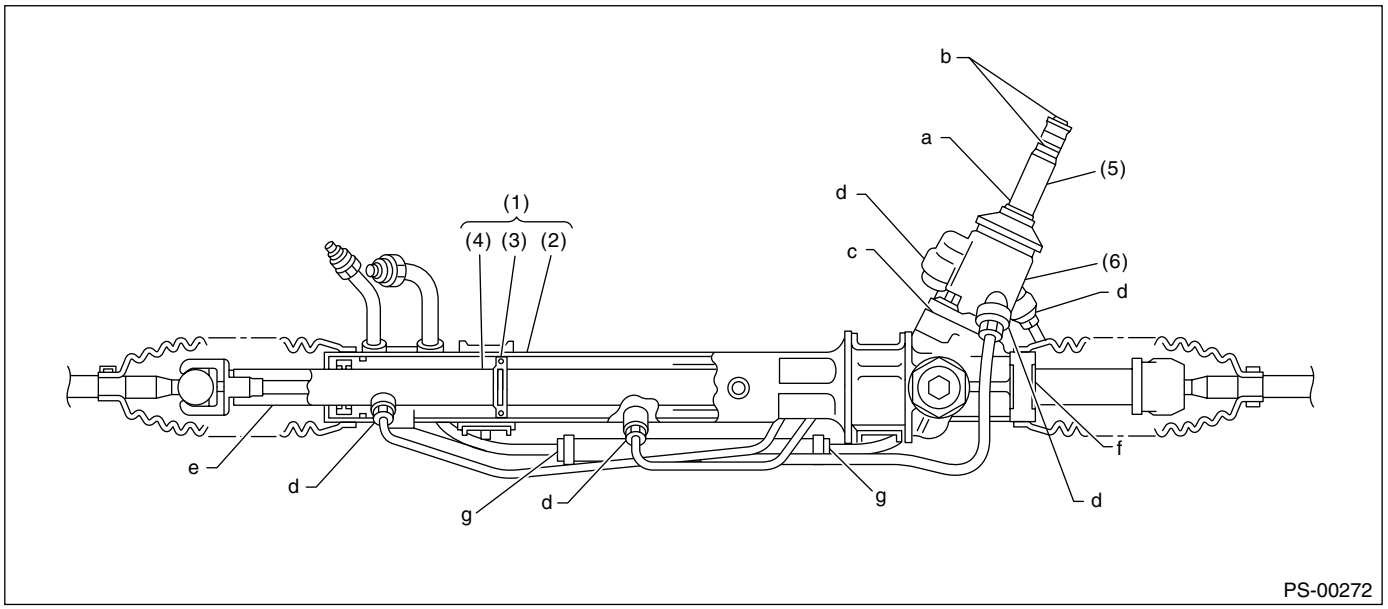
5. TURNING RESISTANCE OF GEARBOX

Using the ST, measure the gearbox turning resistance.
ST 34099PA100 SPANNER

Service limit
Maximum allowable resistance
10.5 N (1.1 kgf, 2.4 lb) or less
Difference between right and left turning resistance: Less than 20 %



6. OIL LEAKING



(1) Power cylinder
(2) Cylinder
(3) Rack piston
(4) Rack axle
(5) Input shaft
(6) Valve housing

1) Even if the location of the leak can be easily found by observing the leaking condition, it is necessary to thoroughly remove the fluid from the suspected portion and turn the steering wheel from lock to lock about thirty to forty times with engine running, then make comparison of the suspected portion between immediately after and several hours after this operation.
2) Inspect leakage from “a”
The oil seal is damaged. Replace the valve assembly with a new one.
3) Inspect leakage from “b”
The torsion bar O-ring is damaged. Replace the valve assembly with a new one.
4) Inspect leakage from “c”
The oil seal is damaged. Replace the valve assembly or oil seal with a new one.
5) Inspect leakage from “d”
The pipe is damaged. Replace the faulty pipe or O-ring.
6) Inspect leakage from “g”
The hose is damaged. Replace the hose with a new one.
7) If leak is other than a, b, c, d, or g, and if oil is leaking from the gearbox, move the right and left boots toward tie-rod end side, respectively, with the gearbox mounted to the vehicle, and remove fluid from the surrounding portions. Then, turn the steering wheel from lock to lock thirty to forty times with the engine running, then make comparison of the leaked portion immediately after and several hours after this operation.
(1) Leakage from “e”
The cylinder seal is damaged. Replace the rack bush with a new one.
(2) Leakage from “f”
There are two possible causes. Take the following step first. Remove the pipe assembly B from the valve housing, and close the circuit with ST.
ST 926420000 PLUG
Turn the steering wheel from lock to lock thirty to forty times with the engine running, then make comparison of the leaked portion between immediately after and several hours after this operation.
- If leakage from “f” is noted again:

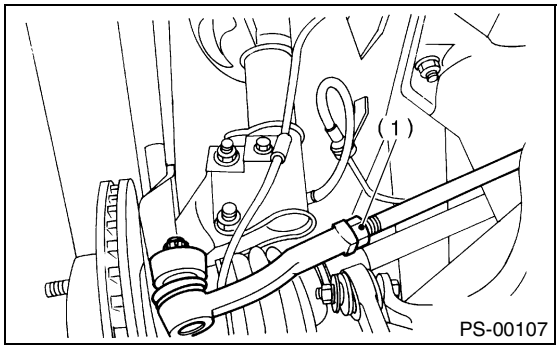
The oil seal of pinion and valve assembly is damaged. Replace the pinion and valve assembly with a new one. Or replace the oil seal and parts that are damaged during disassembly with new ones.
- If oil stops leaking from “f”:

The oil seal of rack housing is damaged. Replace the oil seal and the parts that are damaged during disassembly with new ones.

F: ADJUSTMENT

1) Adjust the front toe. <Ref. to FS-11, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

Standard of front toe:
IN 3 — OUT 3 mm (IN 0.12 — OUT 0.12 in)



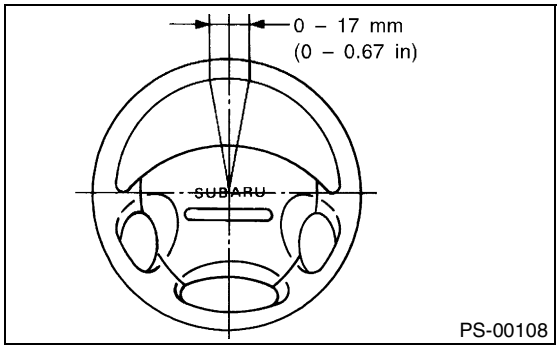
(1) Lock nut

2) Adjust the steering angle of wheels.

Standard of steering angle:

Inner wheel	**32°25' ± 1°30'**
Outer wheel	**32°00' ± 1°30'**

3) If the steering wheel spokes are not horizontal when wheels are set in the straight ahead position, and error is more than 5° on the periphery of steering wheel, correctly re-install the steering wheel.



4) If the steering wheel spokes are not horizontal with vehicle set in the straight ahead position after this adjustment, correct it by turning the right and left tie-rods in opposite direction by same angle.

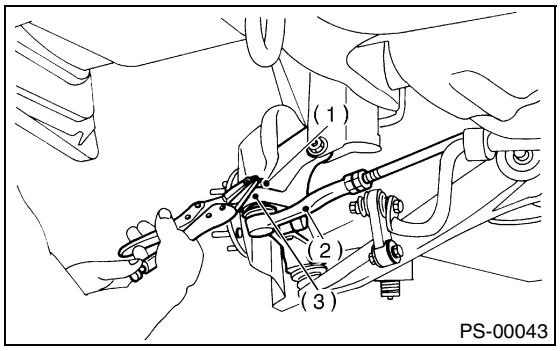
6. Steering Gearbox [RHD MODEL]

A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Loosen the front wheel nut.
4) Lift-up the vehicle, and then remove the front wheels.
5) Remove the under cover.
6) Remove the sub frame.
7) Remove the front exhaust pipe assembly. (Non-turbo model) <Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.>

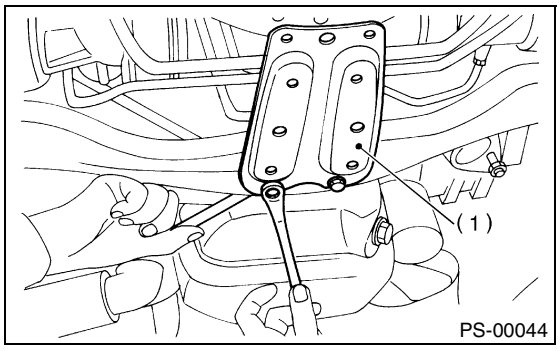
WARNING:
Be careful, the exhaust pipe is hot.

8) Using a puller, remove the tie-rod end from knuckle arm after pulling off cotter pin and removing castle nut.



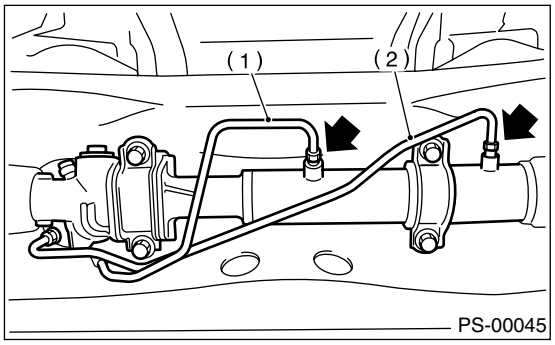
(1) Castle nut
(2) Tie-rod end
(3) Knuckle arm

9) Remove the jack-up plate and front stabilizer.



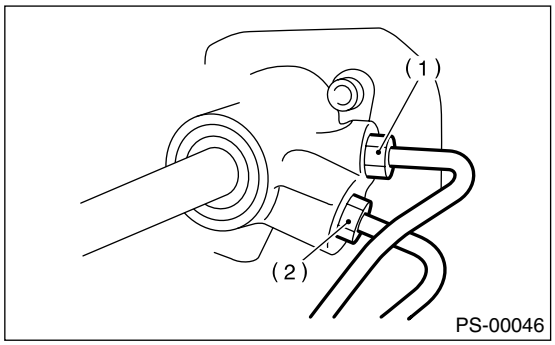
(1) Jack-up plate

10) Remove the one pipe joint at center of gearbox, and connect vinyl hose to pipe and joint. Discharge fluid by turning the steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.



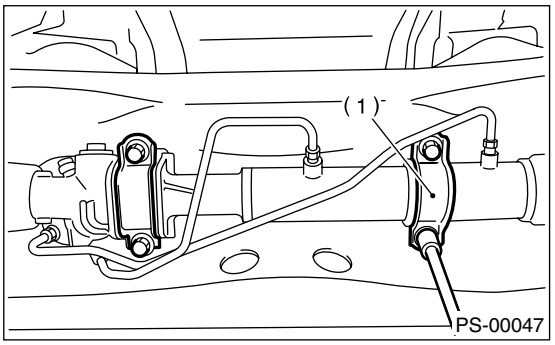
(1) Pipe A
(2) Pipe B

11) Remove the universal joint. <Ref. to PS-24, REMOVAL, Universal Joint.>
12) Disconnect the lower pipe C from gear box first, and upper pipe D second.



(1) Pipe C
(2) Pipe D

13) Remove the clamp bolts securing gearbox to crossmember, and then remove the gearbox.

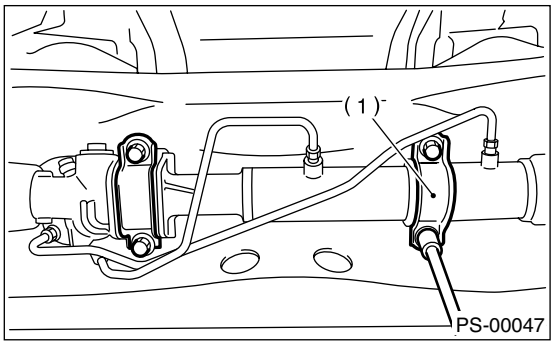


(1) Clamp

B: INSTALLATION

1) Insert the gearbox into crossmember, being careful not to damage the gearbox boot.
2) Tighten the gearbox to crossmember bracket via clamp with bolt to specified torque.

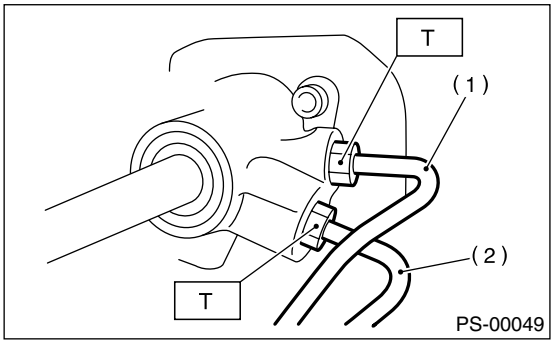
Tightening torque:
60 N·m (6.1 kgf-m, 44.1 ft-lb)



(1) Clamp

3) Connect the pipe D first to gear box, and pipe C second.

Tightening torque:
T: 15 N·m (1.5 kgf-m, 10.8 ft-lb)



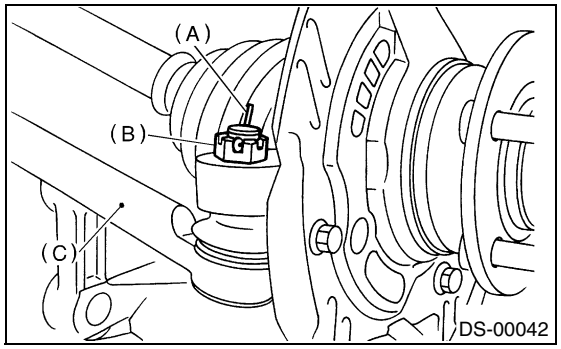
(1) Pipe C
(2) Pipe D

4) Install the universal joint. <Ref. to PS-24, INSTALLATION, Universal Joint.>

5) Connect the tie-rod end and knuckle arm, and tighten with castle nut. Fit the cotter pin into nut, and then bend the pin to lock.

Castle nut tightening torque:
27 N·m (2.75 kgf-m, 19.9 ft-lb)

CAUTION:
• Tighten to the specified tightening torque, and tighten further within 60° until cotter pin hole is aligned with slot in the nut.
• When connecting, do not hit the cap at bottom of tie-rod end with hammer.



(A) Cotter pin
(B) Castle nut
(C) Tie-rod

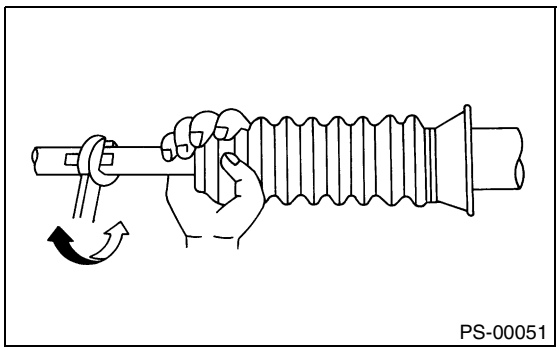
6) Install the front stabilizer to vehicle.
7) Install the front exhaust pipe assembly.
8) Install the sub frame.
9) Install the under cover.
10) Align the center of roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>
11) Install the steering wheel. <Ref. to PS-23, INSTALLATION, Steering Wheel.>
12) Install the tires.
13) Tighten the wheel nuts to specified torque.

Tightening torque:
90 N·m (9.1 kgf-m, 65.8 ft-lb)

14) Connect the battery ground cable to battery.
15) Pour fluid into the oil tank, and bleed air. <Ref. to PS-89, Power Steering Fluid.>
16) Check for fluid leaks.
17) Install the jack-up plate.
18) Lower the vehicle.
19) Check the fluid level in oil tank.
20) After adjusting the toe-in and steering angle, tighten the lock nut on tie-rod end.

Tightening torque:
83 N·m (8.5 kgf-m, 61.5 ft-lb)

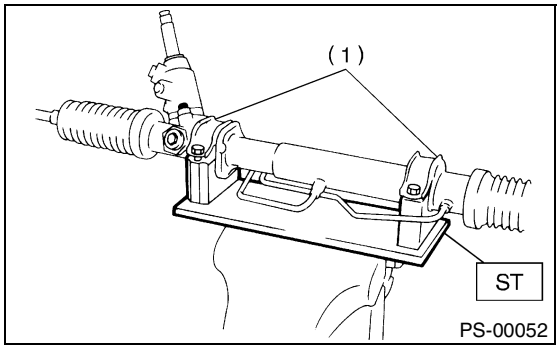
NOTE:
When adjusting the toe-in, hold boot as shown to prevent it from being rotated or twisted. If twisted, straighten it.



C: DISASSEMBLY

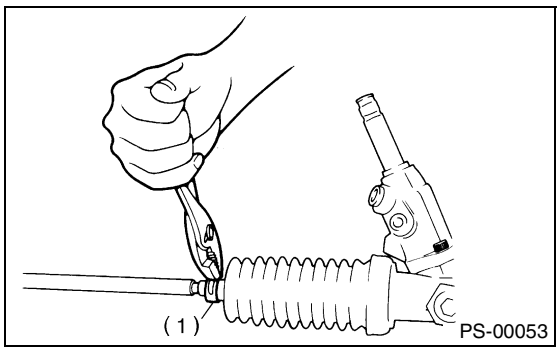
1) Secure the gearbox removed from vehicle in vise using the ST.
ST 926200000 STAND

CAUTION:
Secure the gearbox assembly in a vise using the ST as shown. Do not attempt to secure it without this ST.



(1) Clamp

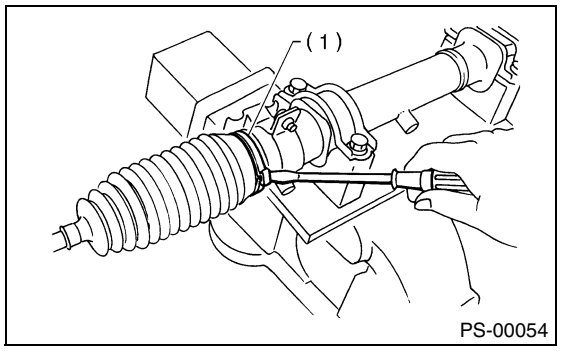
2) Remove the tie-rod end and lock nut from gearbox.
3) Remove the clip on outside of boot using pliers, and then slide the boot to tie-rod end side.



(1) Clip

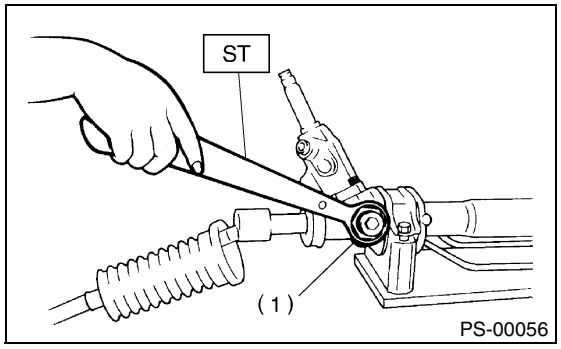
4) Using flat tip screwdriver, remove the band from boot.

NOTE:
Check the boot for crack, damage or deterioration. Replace the boot with a new one if necessary.



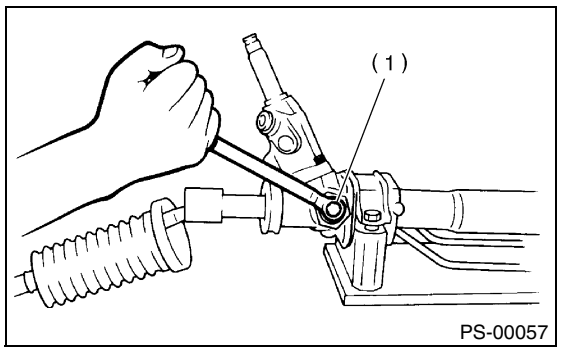
(1) Band

5) Using the ST, loosen lock nut.
ST 926230000 SPANNER



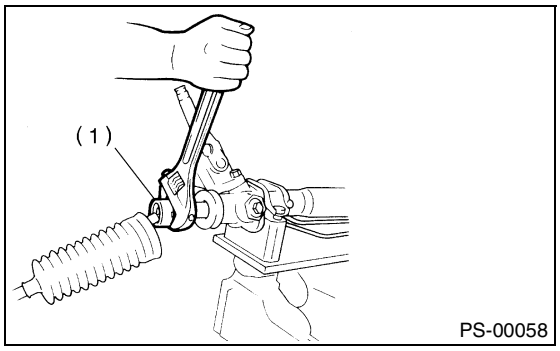
(1) Lock nut

6) Tighten the adjusting screw until it no longer tightens.



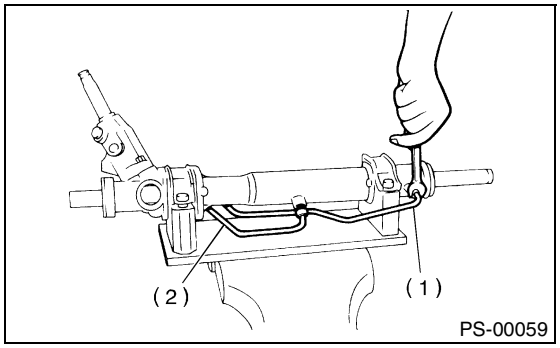
(1) Adjusting screw

7) Using a wrench (32 mm width across flats) or adjustable wrench with cinching boot, remove the tie-rod.



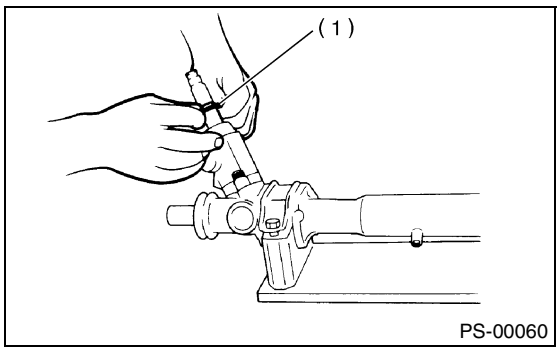
(1) Tie-rod

8) Loosen the adjusting screw, and then remove the spring and sleeve.
9) Disconnect the pipes A and B from steering body and control valve housing.



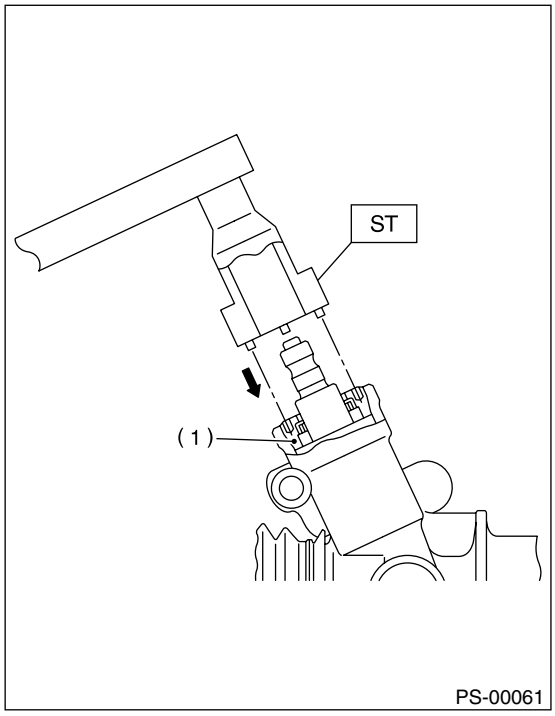
(1) Pipe A
(2) Pipe B

10) Clean the dirt of input shaft. Remove the dust cover taking care not to scratch the housing or input shaft and allow foreign matter to enter gear box interior.



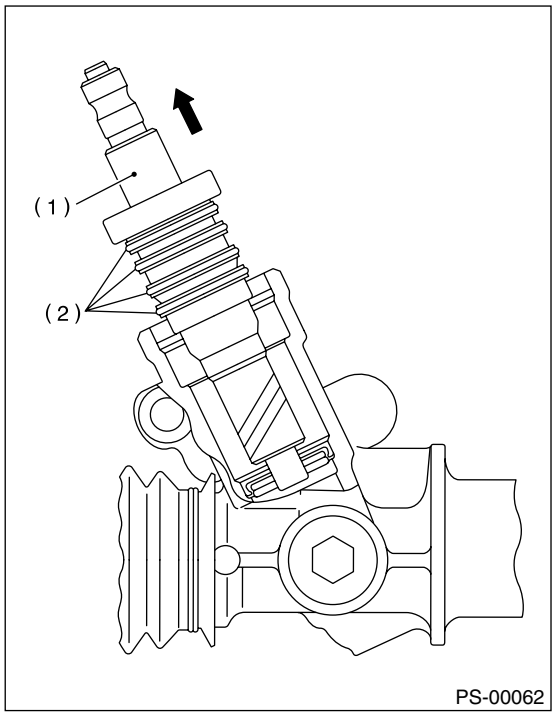
(1) Dust cover

11) Align the ST pin to plug hole to install. Rotate the ST counterclockwise to remove plug.
ST 34199AE090 PLUG WRENCH



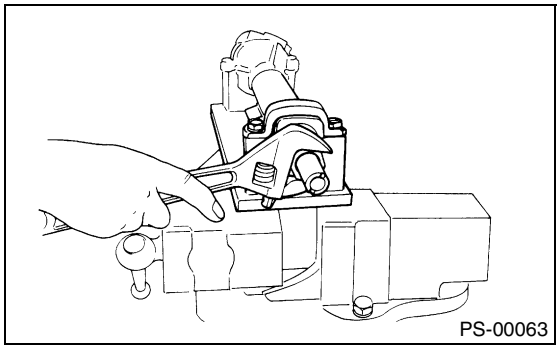
(1) Plug

12) Remove the valve assembly taking care not to scratch seal ring and valve housing inner surface.



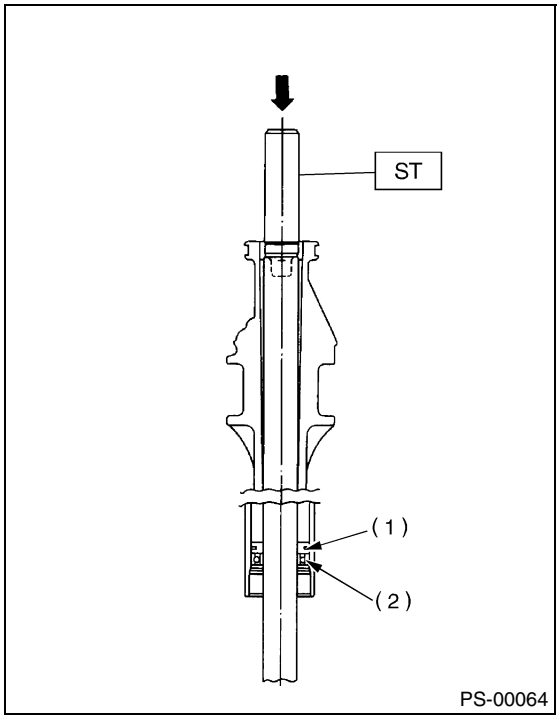
(1) Valve ASSY
(2) Seal ring

13) Remove the holder using a wrench (32mm width across flats) or adjustable wrench.



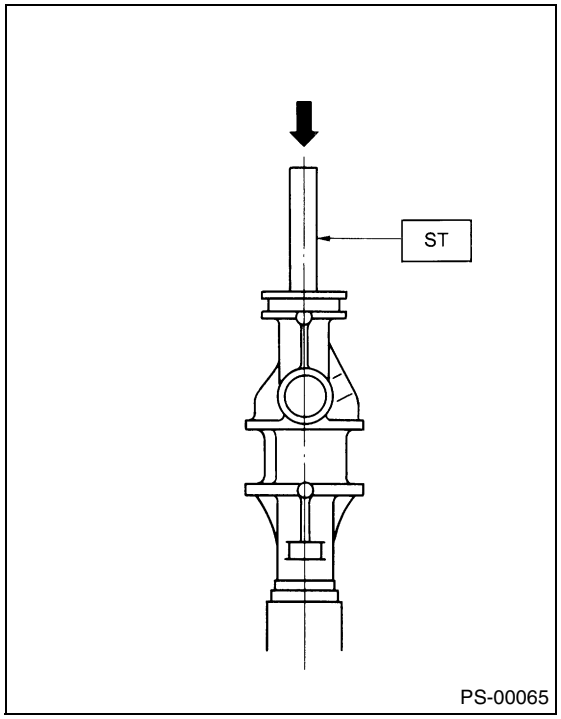
14) Install the ST on valve side of rack and press outer side oil seal out taking care not to contact rack with steering body inner surface.
ST 34099FA030 INSTALLER & REMOVER

NOTE:
Block the pipe connection of steering body to prevent fluid from flowing out.

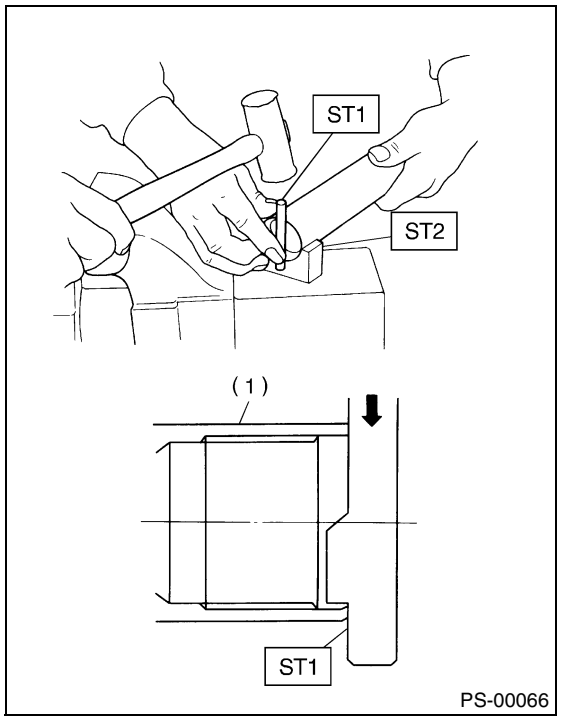


(1) Rack piston
(2) Outer side oil seal

15) Insert the ST from valve side and press back-up ring and oil seal out.
ST 927580000 REMOVER

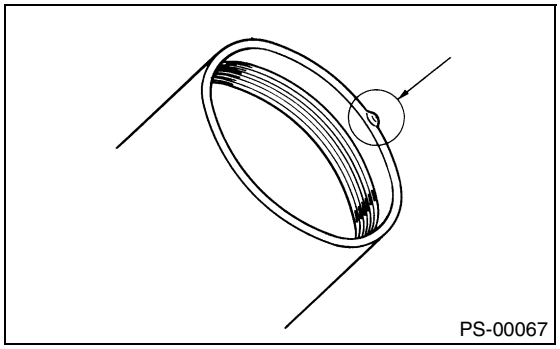


16) Using the ST1 and ST2, repair the cylinder's clinched sections.
ST1 34099FA080 PUNCH
ST2 34099FA070 BASE



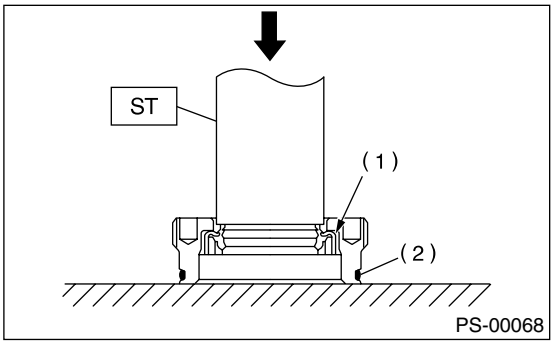
(1) Cylinder

17) If the cylinder edge is deformed in a convex shape, repair using an oil stone.



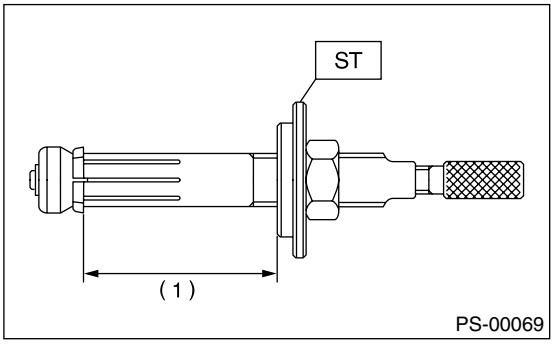
18) Remove the oil seal using ST and press from plug.
ST 34199AE100 PLUG OIL SEAL REMOVER

NOTE:
Do not apply force on the plug edge surface.



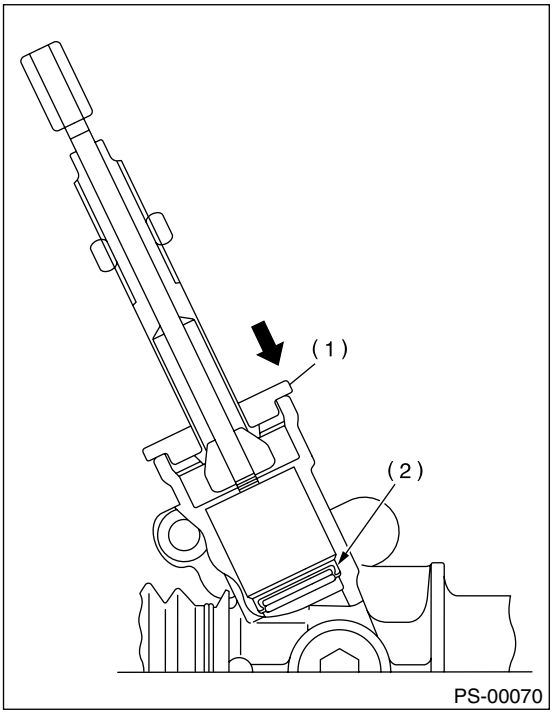
(1) Oil seal
(2) O-ring

19) Set the ST on drawing dimension.
ST 34199AE120 GEARBOX OIL SEAL REMOVER



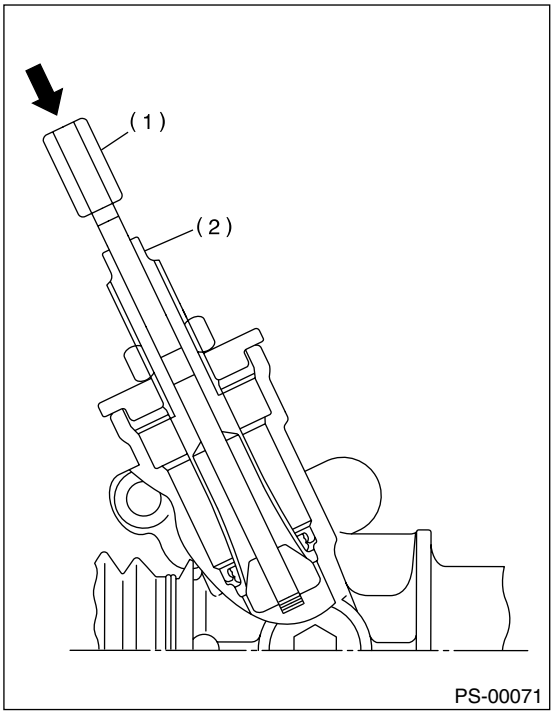
(1) 70 mm (2.76 in)

20) Set the stopper to gear box, and then insert the tip of ST to gear box.



(1) Stopper
(2) Oil seal

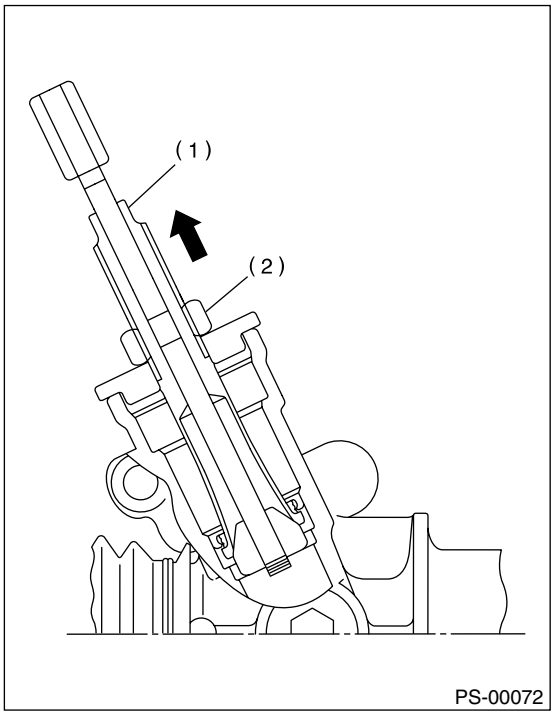
21) By fixing the 2-surface width, press in by rotating the rod and attach to oil seal.



(1) Rod
(2) 2-surface width

22) While fixing the 2-surface width, pull out the oil seal by rotating nut.

CAUTION:
Take care not to scratch the gear box inner surface.



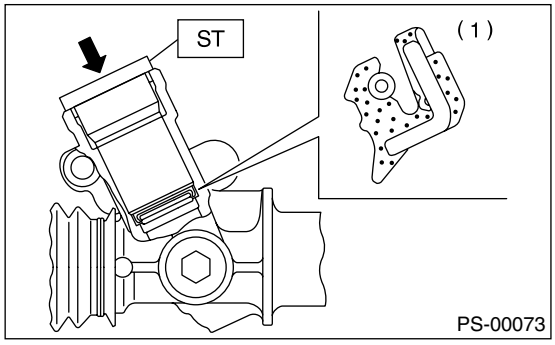
(1) 2-surface width
(2) Nut

D: ASSEMBLY

1) Apply a coat of grease to inside and outside of new oil seal.

Specified steering grease:
VALIANT GREASE M2 (Part No. 003608001)

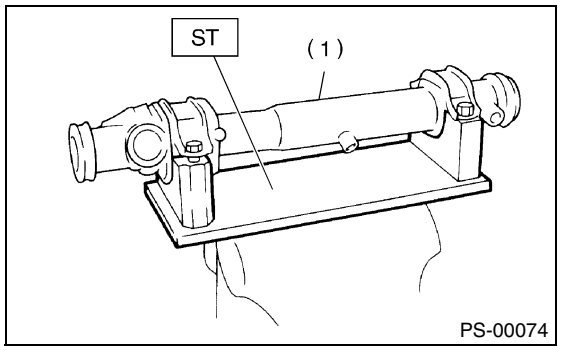
2) Verify the oil seal direction and installation position. Using the ST and press, press fit the oil seal to gear box.
ST 34199AE130 GEARBOX OIL SEAL INSTALLER



(1) Oil seal

3) Attach the steering body to ST as shown in the figure. Apply a coat of grease to needle bearing.
ST 926200000 STAND

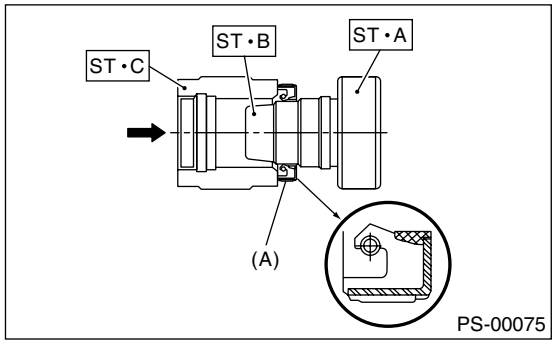
CAUTION:
Ensure the needle bearing is free from defects. If it is faulty, replace the steering body with a new one.



(1) Steering body

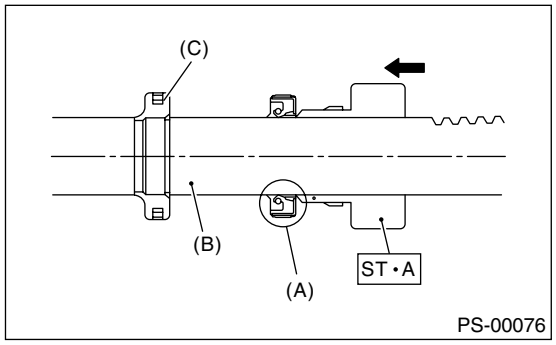
4) Using the ST·B and ST·C, attach the oil seal to ST·A.
ST 927490000 INSTALLER; A, B, C

NOTE:
Face the oil seal in direction shown in the figure.



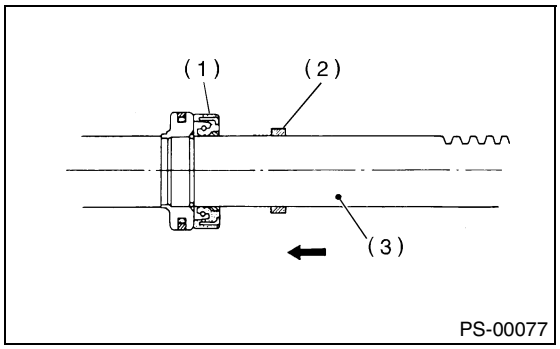
(A) Oil seal

5) Insert the ST·A with oil seal assembled, through gear side of rack. Remove the oil seal from ST·A near piston, and then remove the ST·A from rack.



(A) Oil seal
(B) Rack
(C) Piston

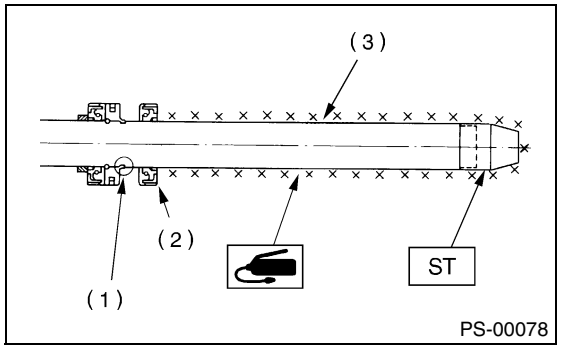
6) Install the back-up ring from gear side of rack.



(1) Oil seal
(2) Back-up ring
(3) Rack

7) Install the ST on rack and equally apply a thin coat of grease to the rack and ST, then install the oil seal.
ST 926250000 GUIDE

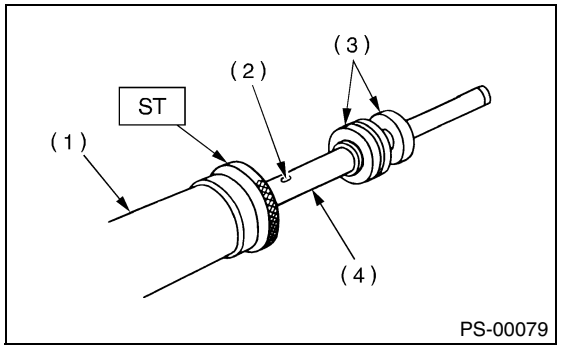
CAUTION:
Be careful not to scratch the oil seal lips with piston's inner ring section.



(1) Rack piston inner ring
(2) Outer side oil seal
(3) Rack

8) Apply a coat of grease to the grooves in rack, sliding surface of sleeve and sealing surface of piston. Install the ST on end of steering body cylinder. Then insert the rack into steering body from cylinder side.
ST 34199AE000 GUIDE (Oil seal)

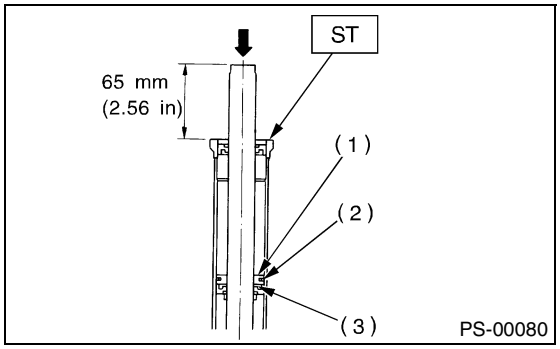
CAUTION:
Do not allow grease to block the air vent hole on rack.



(1) Cylinder side of steering body
(2) Air vent hole
(3) Oil seal
(4) Rack

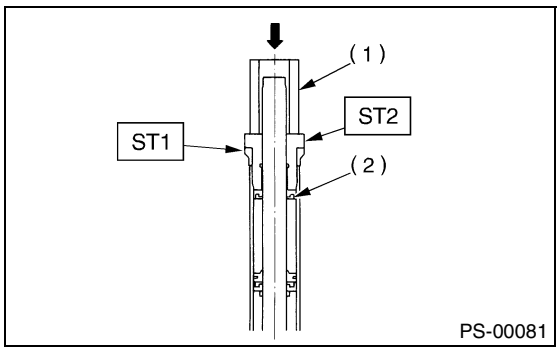
9) Using the press, slowly press the inner side oil seal until distance between ST and end of rack is 65 mm (2.56 in).
ST 34199AE000 GUIDE (Oil seal)

CAUTION:
Ensure the ST's inner wall is free of scratches. Otherwise, it may damage the oil seal during installation.



(1) Rack piston
(2) Inner side oil seal
(3) Back-up ring

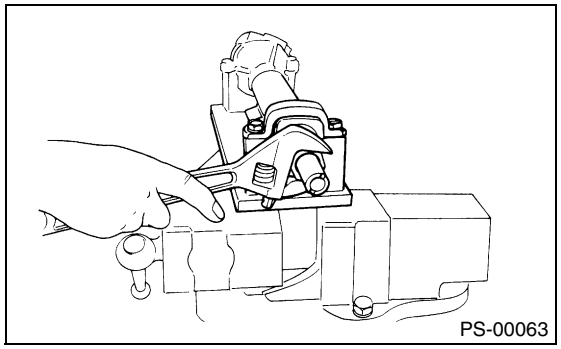
10) Pass the ST2 and pipe through rack and press outer side oil seal until ST1 is in contact with ST2 using press.
ST1 34199AE000 GUIDE (Oil seal)
ST2 34199AE010 INSTALLER (Oil seal)



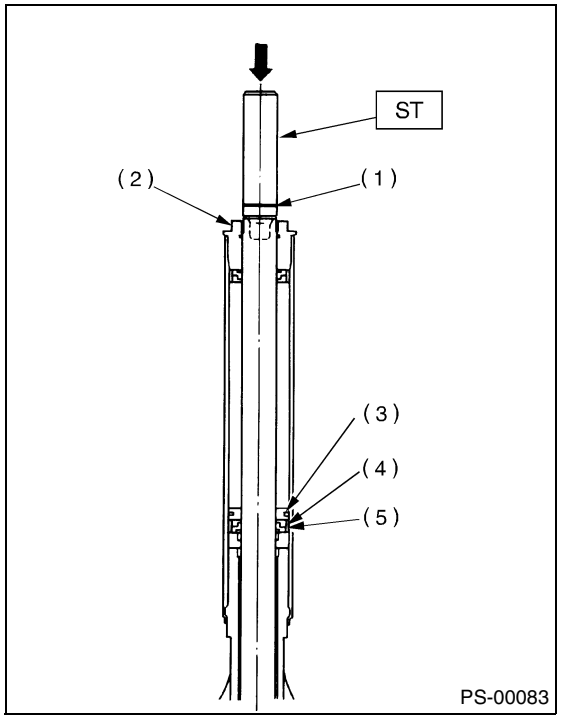
(1) Pipe
(2) Outer side oil seal

11) Install a new holder to cylinder side of steering body.

Tightening torque:
64 N·m (6.5 kgf-m, 47.0 ft-lb)



12) Using a press, press the ST until its groove is aligned with end of holder.
ST 34099FA030 INSTALLER & REMOVER

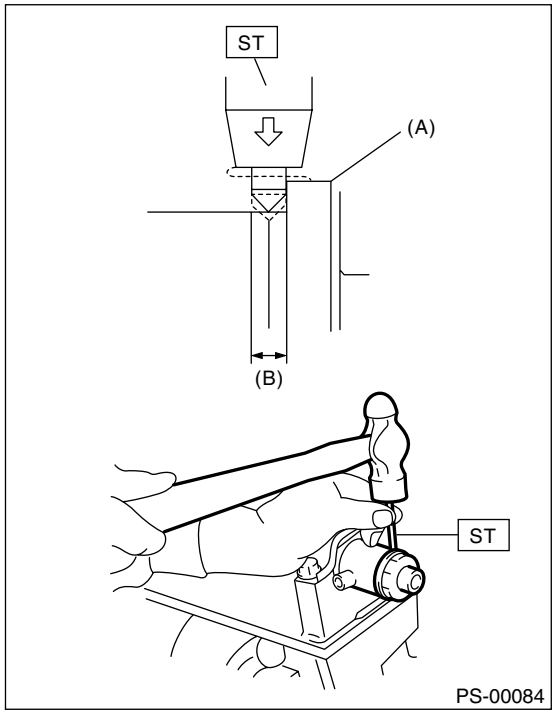


(1) Installer guide
(2) Holder
(3) Rack piston
(4) Oil seal
(5) Back-up ring

13) Using the ST, clinch steering body cylinder at a point less than 3 mm (0.12 in) from holder.

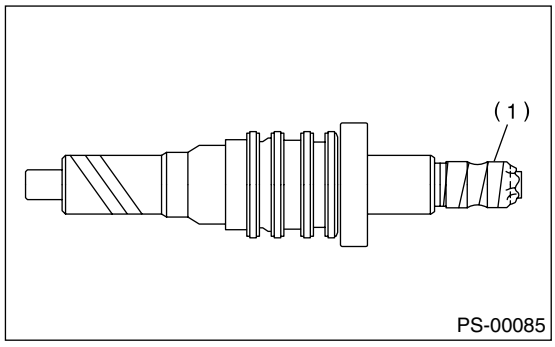
CAUTION:
Be careful not to deform the holder.

ST 34099FA060 PUNCH HOLDER



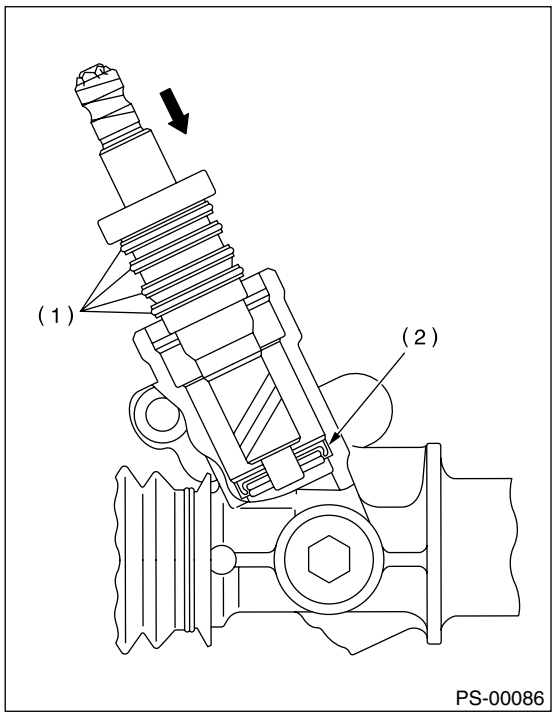
(A) Holder
(B) 3 mm (0.1 in)

14) Roll the vinyl tape on serration part of valve assembly, and then apply grease on the tape surface.



(1) Vinyl tape

15) Apply a coat of grease on the gear teeth of valve assembly, and then attach the valve assembly taking care not to scratch oil seal and seal ring.

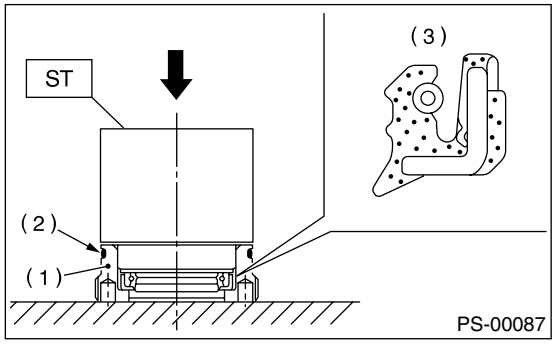


(1) Seal ring
(2) Oil seal

16) Apply grease on the oil seal circumference, and then press into the plug using ST and a press. Replace the plug circumference O-rings with new ones.

ST 34199AE110 PLUG OIL SEAL INSTALLER

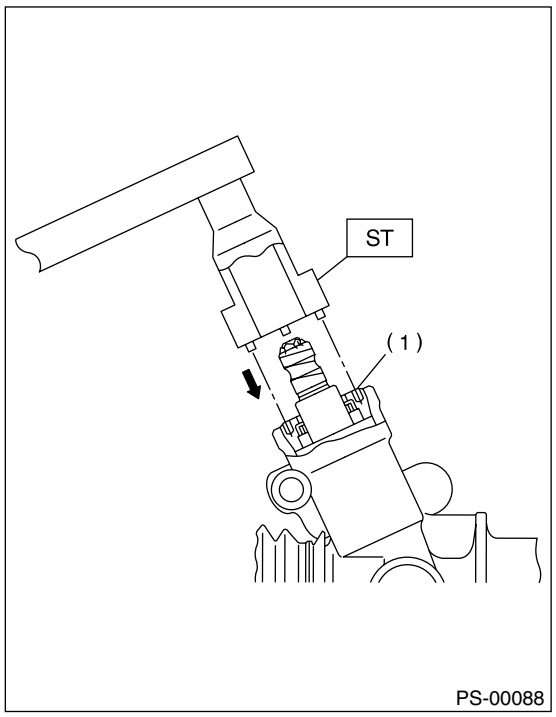
CAUTION:
Pay attention to the oil seal direction, and attaching position.



(1) Plug
(2) O-ring
(3) Oil seal

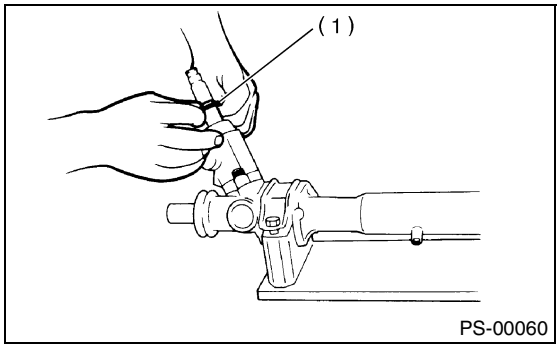
17) Using the ST, install plug.
ST 34199AE090 PLUG WRENCH

Tightening torque:
64 N·m (6.5 kgf-m, 47.0 ft-lb)



(1) Plug

18) Install the dust cover. Remove the vinyl tape.

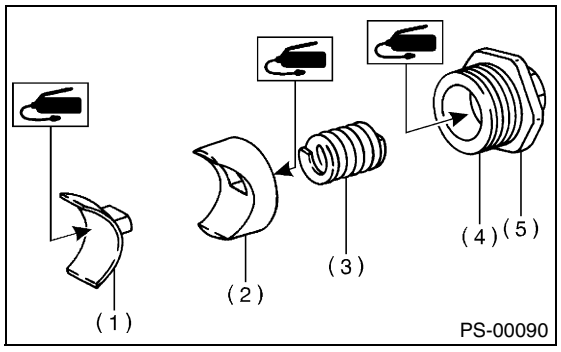


(1) Dust cover

19) Temporarily install the rack, and then operate it from lock to lock two or three times to make it fit in. Remove the grease blocking air vent hole.

CAUTION:
If operating the rack from lock to lock without installing tie-rod, it may damage the oil seal. Always install the tie-rods LH and RH.

20) Apply a coat of grease to the sliding surface of seat pad, sleeve and seating surface of spring, and then insert sleeve into steering body.
Charge the adjusting screw with grease, and then insert the spring into adjusting screw and install on steering body.



(1) Seat pad
(2) Sleeve
(3) Spring
(4) Adjusting screw
(5) Lock nut

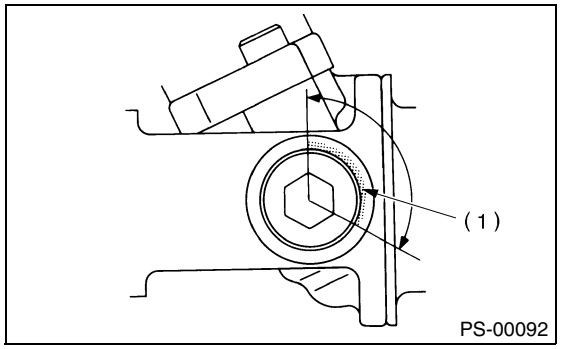
21) Tighten the adjusting screw to specified torque.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

NOTE:
Tighten to the specified tightening torque, and then loosen by 25°.

22) Remove the tie-rod.
23) Verify that play is within specified value. <Ref. to PS-62, SERVICE LIMIT, INSPECTION, Steering Gearbox [RHD MODEL].>
24) Loosen the adjusting screw, and then apply liquid gasket to at least 1/3 of the entire perimeter of adjusting screw thread.

Liquid gasket:
THREE BOND 1141



(1) Apply liquid gasket to at least 1/3 of entire perimeter.

25) Tighten the adjusting screw.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

NOTE:
Tighten to the specified tightening torque, and then loosen by 25°.

26) Install the lock nut. While holding the adjusting screw with a wrench, tighten lock nut using ST.
ST 926230000 SPANNER

Tightening torque (Lock nut):
39 N·m (4.0 kgf-m, 28.9 ft-lb)

NOTE:
Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.

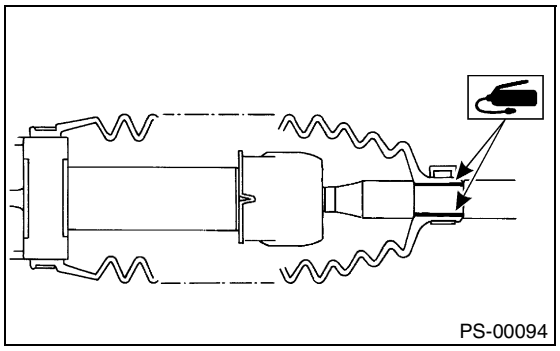
27) Install the tie-rod into rack.

Tightening torque:
90 N·m (9.0 kgf-m, 65.1 ft-lb)

NOTE:
Check the mating face of rack and tie-rod for foriegn material, dirt, dust and etc.
If required, clean the mating face.

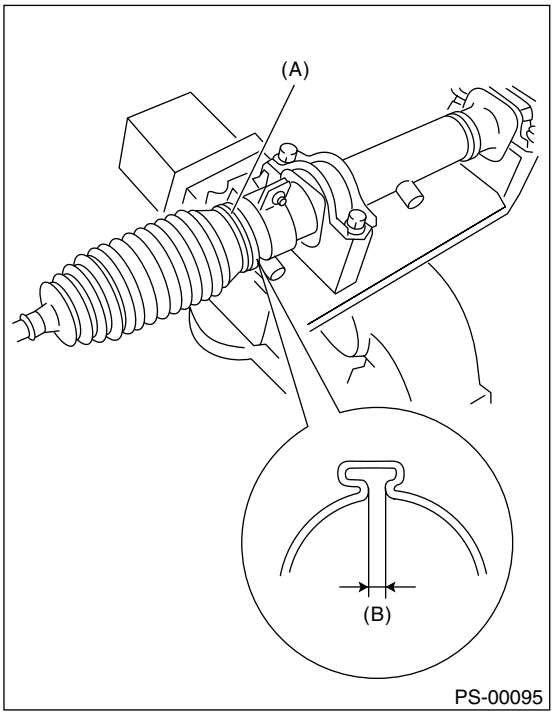
28) Apply a coat of grease to the tie-rod groove, and then install the boot to housing.

NOTE:
Make sure that the boot is installed without unusual inflation or deflation.



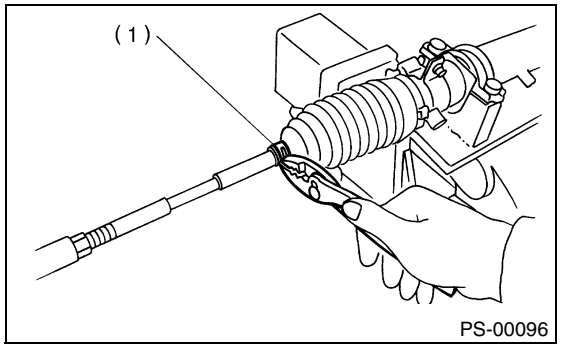
29) Caulk the boot so the space inside boot band caulking portion becomes 2 mm (0.08 in) or less.

NOTE:
Use a new boot band.



(A) Boot band
(B) Less than 2mm (0.08 in)

30) Fix the boot end with clip (small).

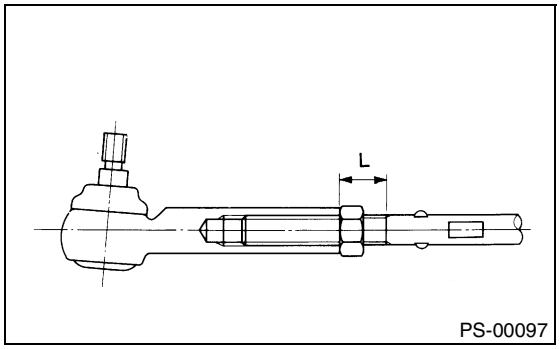


(1) Clip

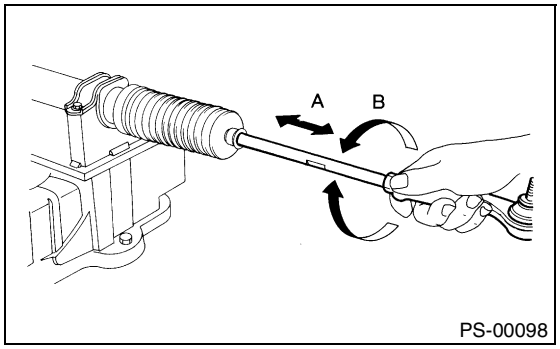
31) After installing, check the boot end is positioned into groove on tie-rod.

32) If the tie-rod end was removed, screw in the lock nut and tie-rod end to screwed portion of tie-rod, and then tighten the lock nut temporarily in a position as shown in the figure.

Installed tie-rod length: L
31.2 mm (1.23 in)



33) Inspect the gearbox as follows:
"A" Holding the tie-rod end, repeat lock to lock two or three times as quickly as possible.
"B" Holding the tie-rod end, turn it slowly at a radius one or two times as large as possible.
After all, make sure that the boot is installed in specified position without deflation.



34) Remove the gearbox from ST.
ST 926200000 STAND

E: INSPECTION

1. BASIC INSPECTION

1) Clean all disassembled parts, and check for wear, damage, or any other faults, then repair or replace as necessary.
2) When disassembling, check the inside of gearbox for water. If any water is found, carefully check the boot for damage, input shaft dust seal, adjusting screw and boot clips for poor sealing. If faulty, replace with new parts.

No.	Parts	Inspection	Corrective action
1	Input shaft	(1) Bend of input shaft (2) Damage on serration	If the bend or damage is excessive, replace the entire gearbox.
2	Dust seal	(1) Crack or damage (2) Wear	If the outer wall slips, lip is worn out or damage is found, replace it with a new one.
3	Rack and pinion	Poor mating of rack with pinion	(1) Adjust the backlash properly. By measuring the turning torque of gearbox and sliding resistance of rack, check if rack and pinion engage uniformly and smoothly with each other. (Refer to “Service limit”.) (2) Keeping the rack pulled out all the way so that all teeth emerge, check teeth for damage. Even if abnormality is found in either (1) or (2), replace the entire gearbox.
4	Gearbox unit	(1) Bend of rack shaft (2) Bend of cylinder portion (3) Crack or damage on cast iron portion	Replace the gearbox with a new one.
		(4) Wear or damage on rack bush	If the free play of rack shaft in radial direction is out of the specified range, replace the gearbox with a new one. (Refer to “Service limit”.)
		(5) Wear on input shaft bearing	If the free plays of input shaft in radial and axial directions are out of the specified ranges, replace the gearbox with a new one. (Refer to “Service limit”.)
5	Boot	Crack, damage or deterioration	Replace with a new one.
6	Tie-rod	(1) Looseness of ball joint (2) Bend of tie-rod	Replace with a new one.
7	Tie-rod end	Damage or deterioration on dust seal	Replace with a new one.
8	Adjusting screw spring	Deterioration	Replace with a new one.
9	Boot clip	Deterioration	Replace with a new one.
10	Sleeve	Damage	Replace with a new one.
11	Pipes	(1) Damage to flared surface (2) Damage to flare nut (3) Damage to pipe	Replace with a new one.

2. SERVICE LIMIT

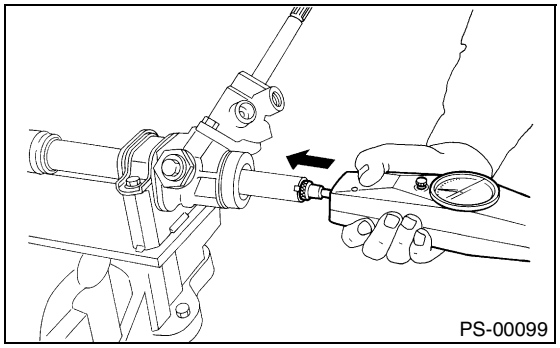
Make a measurement as follows. If it exceeds the specified service limit, adjust or replace.

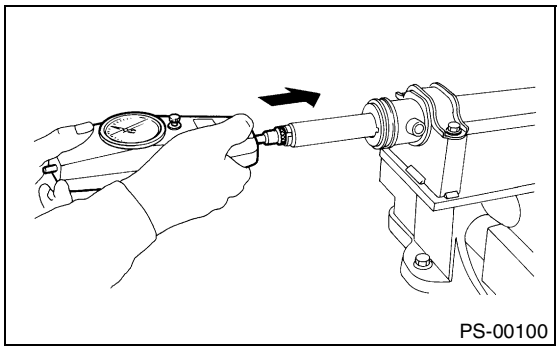
NOTE:
When making a measurement, vise gearbox by using ST. Never vise the gearbox by inserting aluminum plates, etc. between vise and gearbox.

ST 926200000 STAND

Sliding resistance of rack shaft:

Service limit
400 N (41 kgf, 90 lb) or less



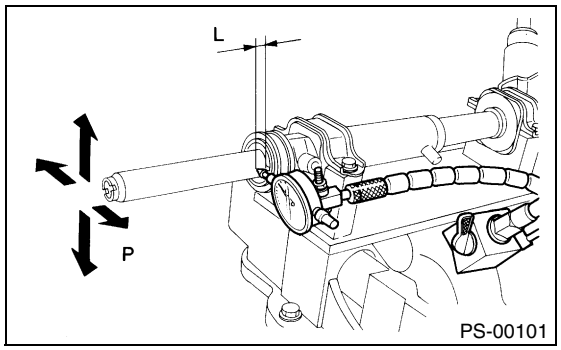


3. RACK SHAFT PLAY IN RADIAL DIRECTION

Left-turn steering:

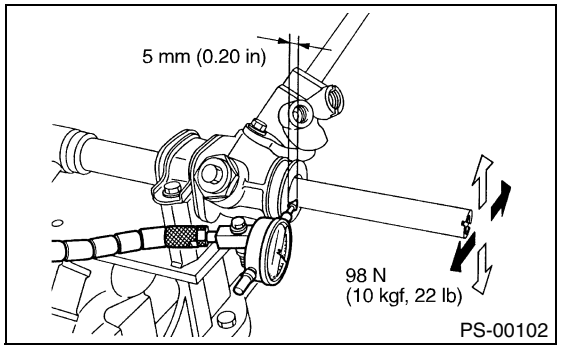
Service limit
0.19 mm (0.0075 in) or less

On condition
L: 5 mm (0.20 in)
P: 98 N (10 kgf, 22 lb)



Right-turn steering:

Service limit
Direction ⇦⇨
0.3 mm (0.012 in) or less
Direction ⬅➡
0.19 mm (0.0075 in) or less

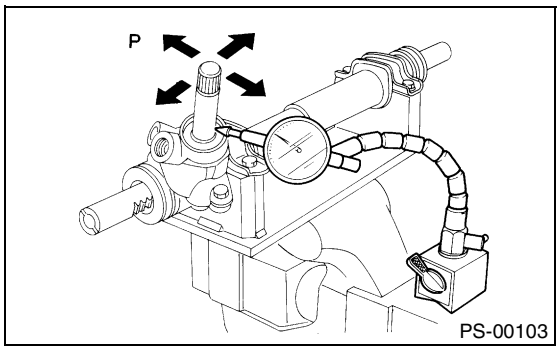


4. INPUT SHAFT PLAY

In radial direction:

Service limit
0.18 mm (0.0071 in) or less

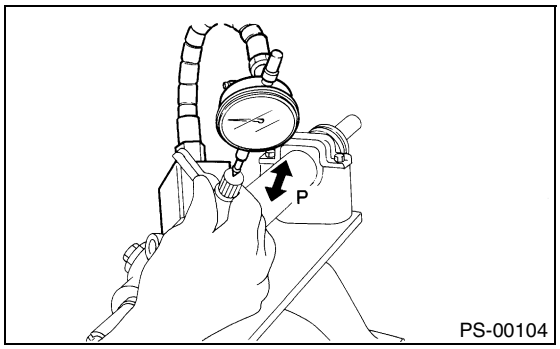
On condition
P: 98 N (10 kgf, 22 lb)



In axial direction:

Service limit
0.5 mm (0.020 in) or less

On condition
P: 20 — 49 N (2 — 5 kgf, 4 — 11 lb)

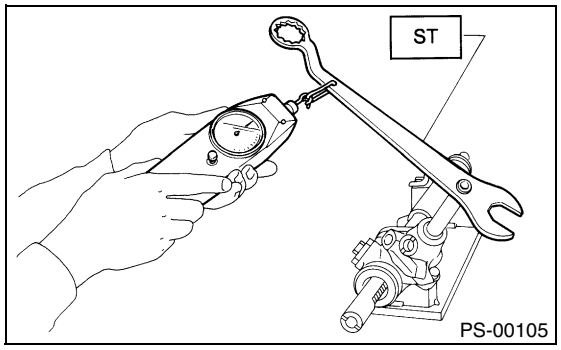


5. TURNING RESISTANCE OF GEARBOX

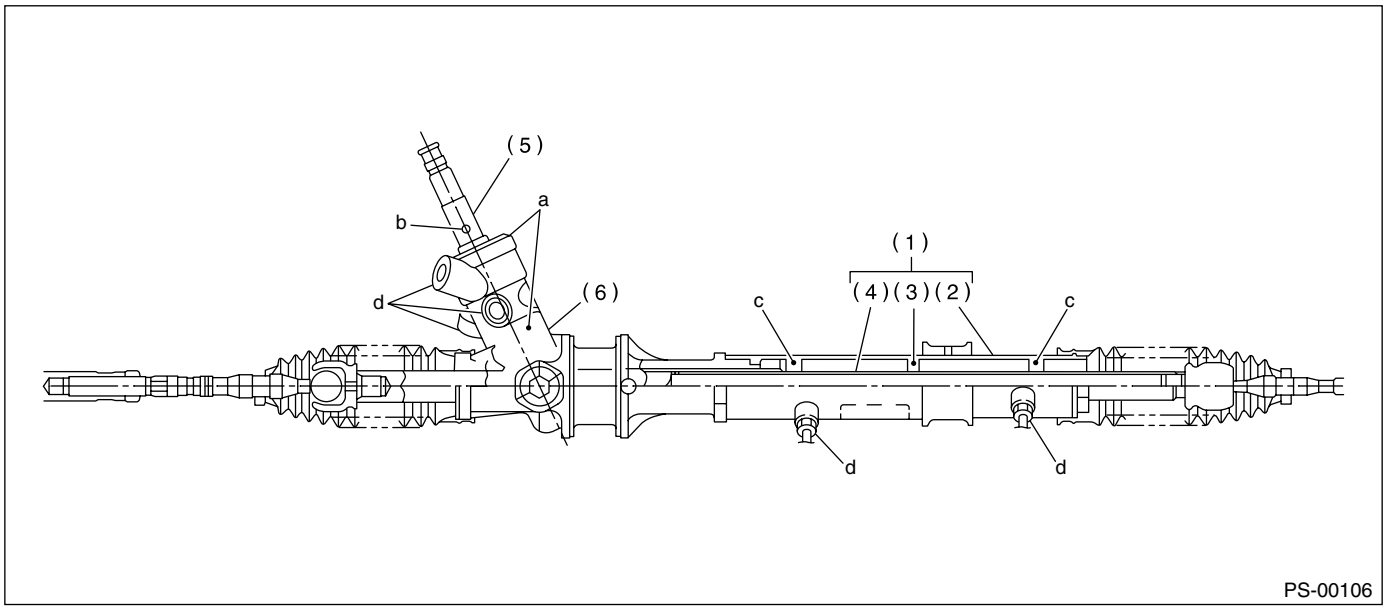
Using the ST, measure gearbox turning resistance.
ST 34099PA100 SPANNER

Service limit
Maximum allowable resistance
10.5 N (1.1 kgf, 2.4 lb) or less

Difference between right and left turning resistance:
Less than 20%



6. OIL LEAKING



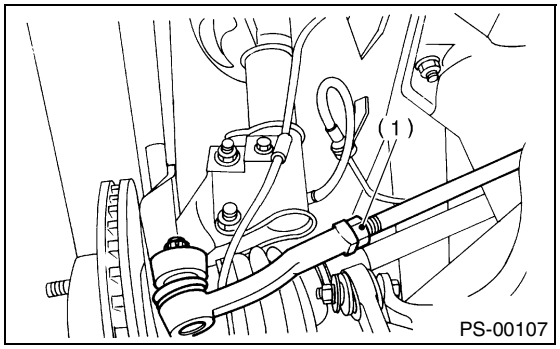
(1) Power cylinder
(2) Cylinder
(3) Rack piston
(4) Rack
(5) Input shaft
(6) Valve housing

1) Even if the location of leak can be easily found by observing leaking condition, it is necessary to thoroughly remove the oil from suspected portion and turn steering wheel from lock to lock about thirty to forty times with engine running, then reinspect the suspected portion between immediately after and several hours after this operation.
2) Inspect leakage from “a”
The oil seal is damaged. Replace the valve assembly with a new one.
3) Inspect leakage from “b”
The torsion bar O-ring is damaged. Replace the valve assembly with a new one.
4) Inspect leakage from “c”
The oil seal is damaged. Replace the oil seal with a new one.
5) Inspect leakage from “d”
The pipe is damaged. Replace the faulty pipe or O-ring with a new one.

F: ADJUSTMENT

1) Adjust the front toe. <Ref. to FS-11, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

Standard of front toe:
IN 3 — OUT 1 mm (IN 0.12 — OUT 0.039 in)



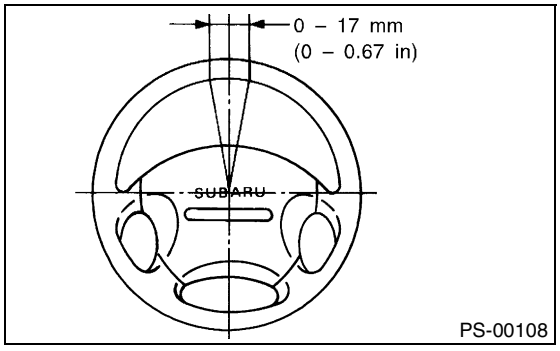
(1) Lock nut

2) Adjust the steering angle of wheels. <Ref. to FS-11, STEERING ANGLE, INSPECTION, Wheel Alignment.>

Standard of steering angle:

Inner wheel	**32°25'±1°30'**
Outer wheel	**32°00'±1°30'**

3) If the steering wheel spokes are not horizontal when wheels are set in the straight ahead position, and error is more than 5° on the periphery of steering wheel, correctly re-install the steering wheel.

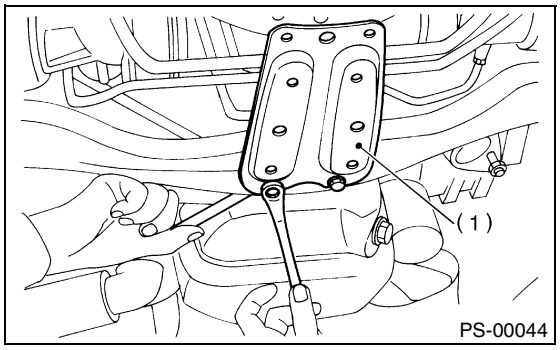


4) If the steering wheel spokes are not horizontal with vehicle set in the straight ahead position after this adjustment, correct it by turning the right and left tie-rods in the opposite direction each other by the same angle.

7. Pipe Assembly [LHD MODEL]

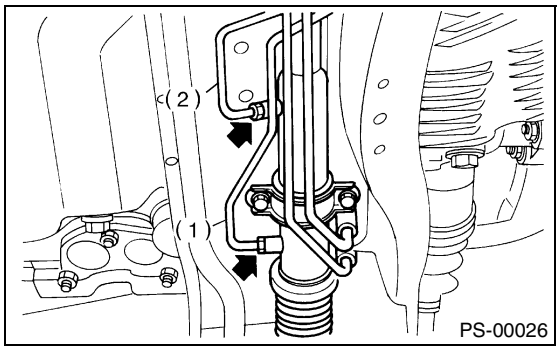
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and then remove the jack-up plate.



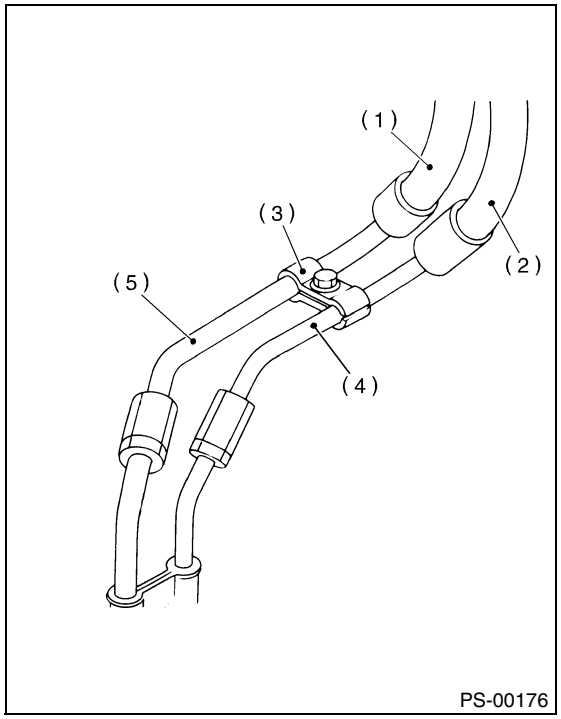
(1) Jack-up plate

3) Remove the one pipe joint at the center of gear-box, and then connect the vinyl hose to pipe and joint. Discharge fluid by turning steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.



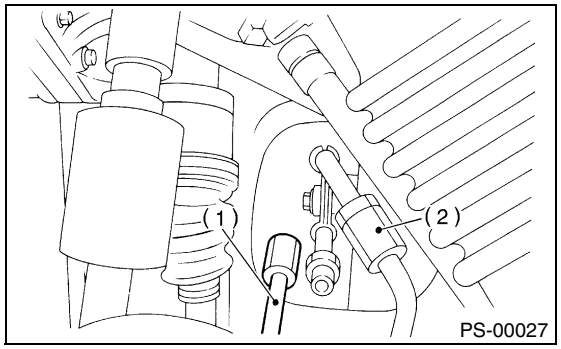
(1) Pipe A
(2) Pipe B

4) Remove the clamp E from pipes C and D.



(1) Return hose
(2) Pressure hose
(3) Clamp E
(4) Pipe C
(5) Pipe D

5) Disconnect the pipe C and D from gear box.

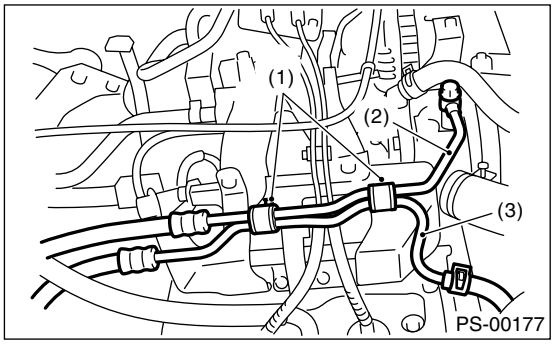


(1) Pipe C
(2) Pipe D

6) NON-TURBO MODEL
(1) Remove the air intake duct. <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
(2) Remove the bolt A.
(3) Disconnect the pipe C from oil pump. Disconnect the pipe D from return hose.

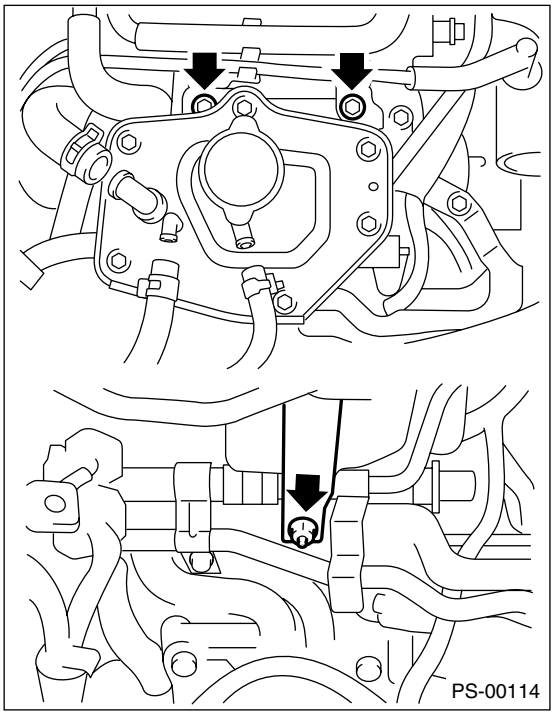
CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.

• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



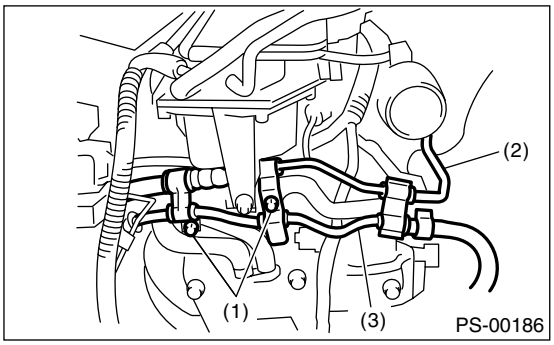
(1) Bolt A
(2) Pipe C
(3) Pipe D

7) TURBO MODEL:
(1) Remove the air cleaner. <Ref. to IN(TURBO)-7, REMOVAL, Air Cleaner.>
(2) Remove the coolant filler tank.



(3) Remove the two bolts fixing pipe C and D.
(4) Disconnect the pipe C from oil pump. Disconnect the pipe D from return hose.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.
• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



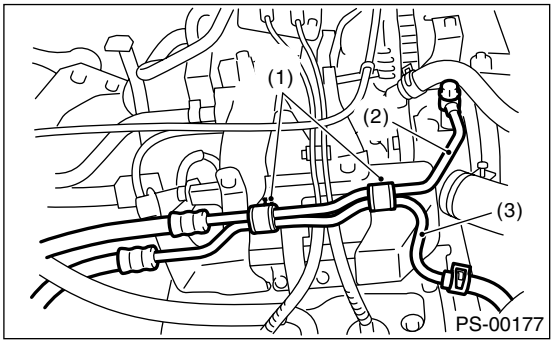
(1) Bolt
(2) Pipe C
(3) Pipe D

B: INSTALLATION

1) Temporarily tighten the two bolts fixing pipe C and D. (bolt A)

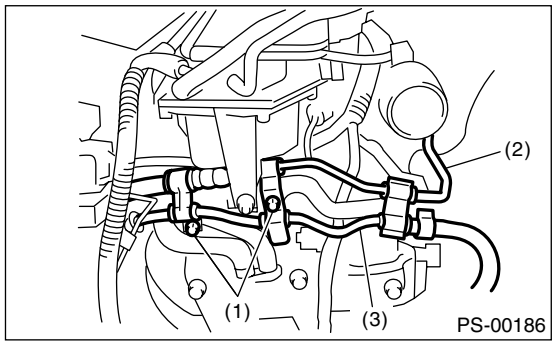
NOTE:
Visually check that the hose between tank and pipe D is free from bending or twisting.

• NON-TURBO MODEL



(1) Bolt A
(2) Pipe C
(3) Pipe D

• TURBO MODEL



(1) Bolt A
(2) Pipe C
(3) Pipe D

(1) Connect the pipe D to oil tank.
(2) Using a new gasket, connect the pipe C to oil pump.

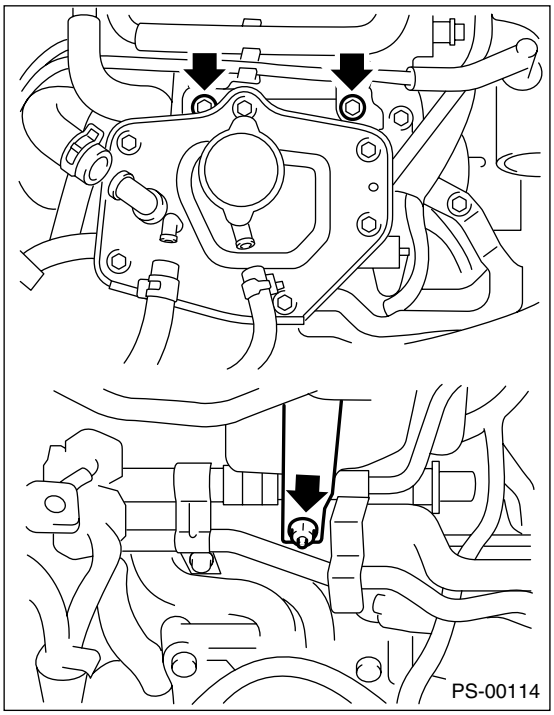
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

(3) Tighten the two bolts fixing pipe C and D. (bolt A)

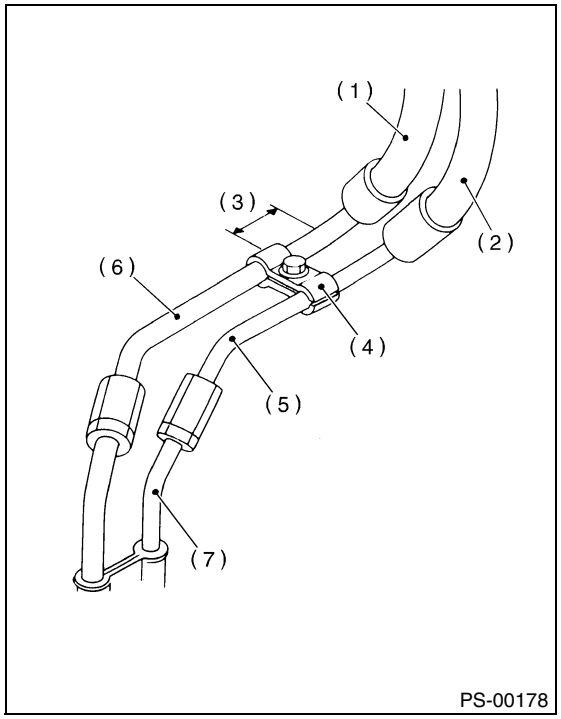
Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

2) Install the coolant filler tank. (Turbo model)

Tightening torque:
T1: 19 N·m (1.9 kgf-m, 13.7 ft-lb)
T2: 21 N·m (2.1 kgf-m, 15.2 ft-lb)



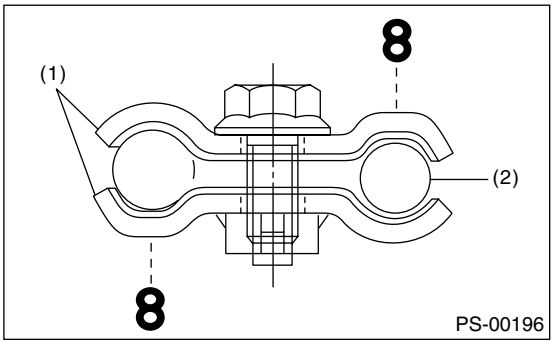
3) Temporarily connect the pipe C and D to gear box.



(1) Return hose
(2) Pressure hose
(3) Approx. 30 mm (1.18 in)
(4) Clamp E
(5) Pipe C
(6) Pipe D
(7) Pipe (Gear box side)

4) Temporarily install the clamp E on pipes C and D.

NOTE:
Ensure the letter “8” on each clamp are diagonally opposite each other as shown in the figure.



(1) Clamp E
(2) Pipe C

5) Tighten the clamp E firmly.

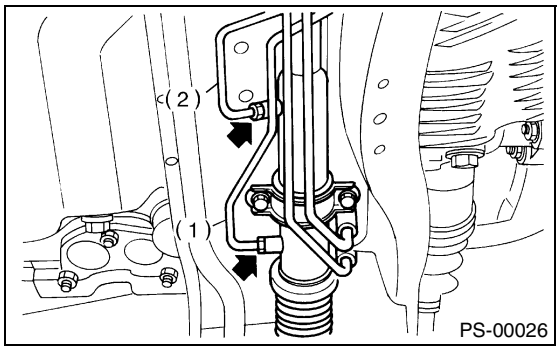
Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

6) Tighten the joint nut.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

7) Connect the pipes A and B to four pipe joints of gearbox. Connect the upper pipe B first, and lower pipe A second.

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

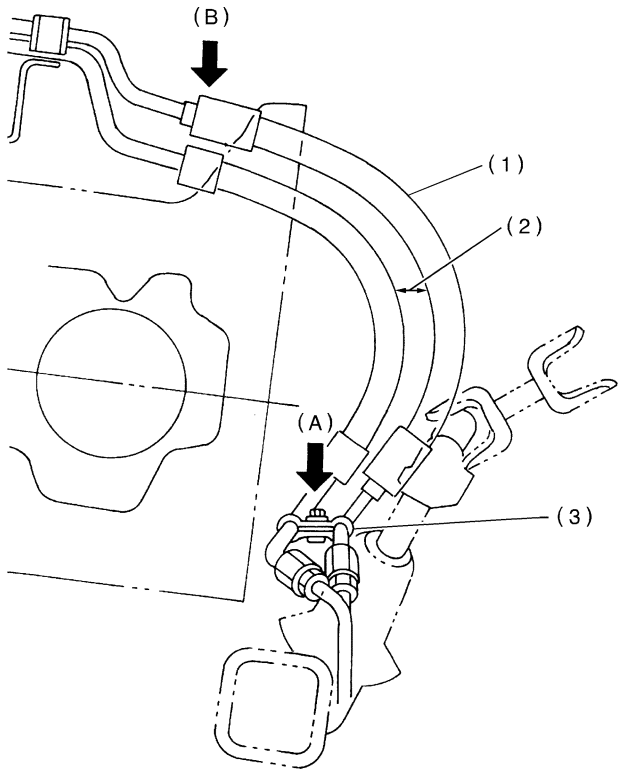


(1) Pipe A
(2) Pipe B

8) Install the jack-up plate.
9) Install the air intake duct. <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.>
10) Install the air intake duct, air cleaner upper cover and air intake boot. <Ref. to IN(TURBO)-7, INSTALLATION, Air Cleaner.> and <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.>
11) Connect the battery ground cable to battery.

12) Feed the specified fluid.

CAUTION:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.



PS-00179

(1) High pressure hose
(2) No interference is allowed between hoses.
(3) Clearance between crossmember and pipe: 3 — 8 mm (0.12 — 0.31 in)

13) Finally check clearance between pipes and/or hoses, as shown above.

Pipe-to-crossmember clearance:
10 mm (0.39 in) or more.

If cruise control actuator-to-power steering hose clearance is less than 10 mm (0.39 in), move the portion (A) secured by clamp to other portion, or bend portion (B) to adjust.

C: INSPECTION

Check all disassembled parts for wear, damage or other abnormalities. Repair or replace faulty parts as required.

Part name	Inspection	Remedy
Pipe	• O-ring fitting surface for damage • Nut for damage • Pipe for damage	Replace with a new one.
Clamp	• Clamps for weak clamping force	Replace with a new one.
Hose	• Flared surface for damage • Flare nut for damage • Outer surface for cracks • Outer surface for wear • Clip for damage • End coupling or adapter for degradation	Replace with a new one.

CAUTION:

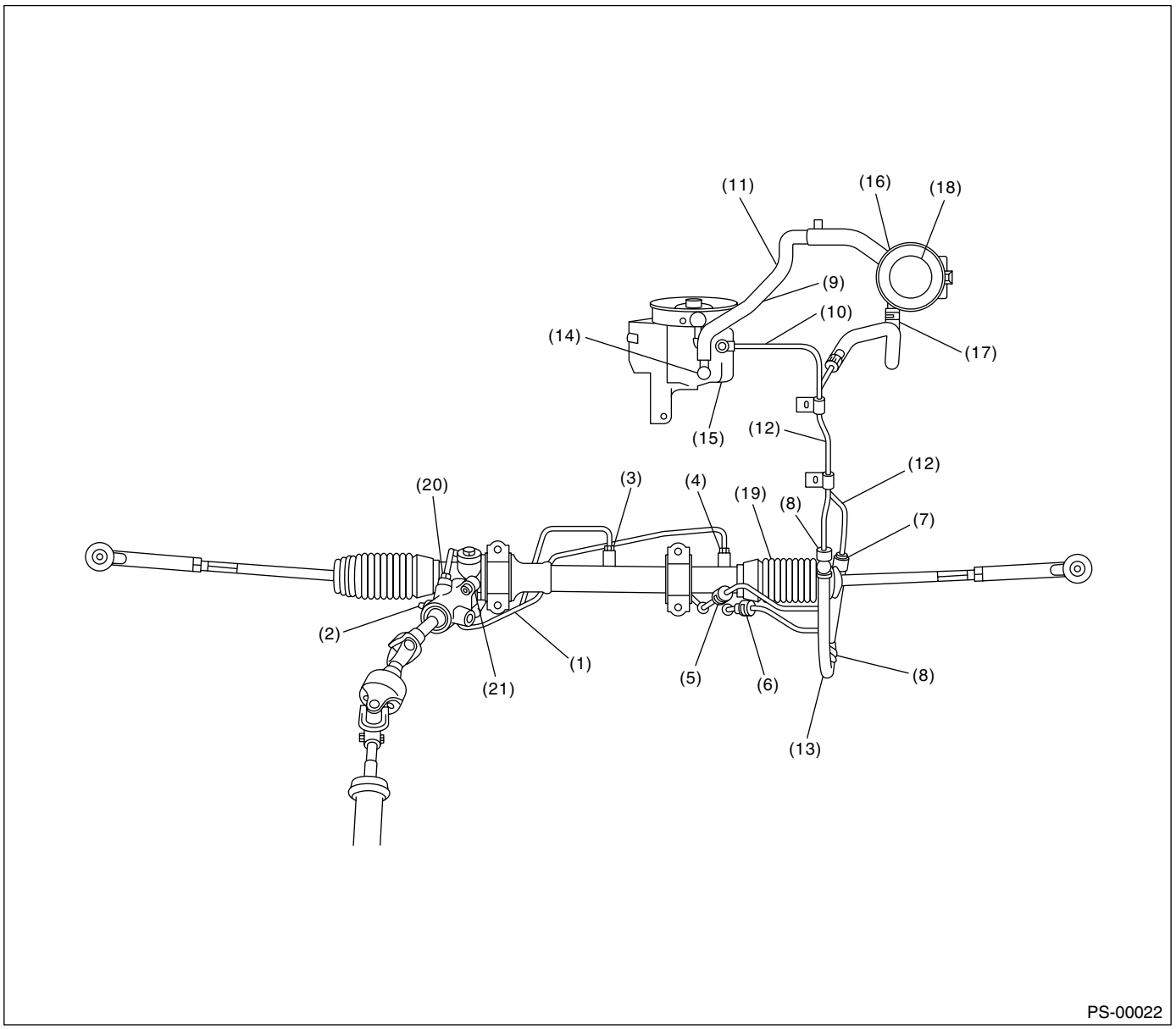
Although the surface layer materials of rubber hoses have excellent weathering resistance, heat resistance and resistance for low temperature brittleness, they are likely to be damaged chemically by brake fluid, battery electrolyte, engine oil and automatic transmission fluid and their service lives are to be very shortened. It is very important to keep the hoses free from before mentioned fluids and to wipe out immediately when the hoses are adhered with the fluids.

Since the resistances for heat or low temperature brittleness are gradually declining according to time accumulation of hot or cold conditions for the hoses and their service lives are shortening accordingly, it is necessary to perform the careful inspection frequently when the vehicle is used in hot weather areas, cold weather area and a driving condition in which many steering operations are required in short time.

Particularly, continuous work of relief valve over 5 seconds causes to reduce service lives of the hoses, the oil pump, the fluid, etc. due to over heat.

Trouble	Possible cause	Corrective action
Pressure hose burst	Excessive holding time of relief status	Instruct the customers.
	Malfunction of relief valve	Replace the oil pump.
	Poor cold characteristic of fluid	Replace the fluid.
Forced out return hose	Poor connection	Correct.
	Poor holding of clip	Retighten.
	Poor cold characteristic of fluid	Replace the fluid.
Fluid bleeding out of hose slightly	Wrong layout, tensioned	Replace the hose.
	Excessive play of engine due to deterioration of engine mounting rubber	Replace the defective parts.
	Improper stop position of pitching stopper	Replace the defective parts.
Crack on hose	Excessive holding time of relief status	Replace. Instruct customer.
	Excessive tightening torque for return hose clip	Replace.
	Power steering fluid, brake fluid, engine oil, electrolyte adhere on the hose surface	Replace. Pay attention on service work.
	Too many times use in extremely cold weather	Replace. Instruct the customers.

NOTE:
It is likely that although one judges fluid leakage, there is actually no leakage. This is because the fluid spilt during the last maintenance was not completely wiped off. Be sure to wipe off spilt fluid thoroughly after maintenance.

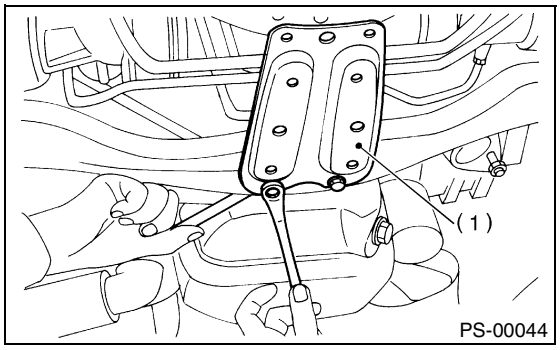


Fluid leaking area	Possible cause	Corrective action
Leakage from connecting portions of pipes and hoses, numbered with (1) through (10) in figure	Insufficient tightening of flare nut, catching dirt or the like, damage to flare or flare nut or eye bolt	Loosen and retighten, if ineffective, replace.
	Poor insertion of hose, poor clamping	Retighten or replace the clamp.
	Damaged O-ring or gasket	Replace the O-ring or gasket pipe or hose with new one, if ineffective, replace gearbox also.
Leakage from hose (11), (12) and (13) in figure	Crack or damage in hose	Replace with a new one.
	Crack or damage in hose hardware	Replace with a new one.
Leakage from surrounding of cast iron portion of oil pump (14) and (15) in figure	Damaged O-ring	Replace the oil pump.
	Damaged gasket	Replace the oil pump.
Leakage from oil tank (16) and (17) in figure	Crack in oil tank	Replace the oil tank.
Leakage from filler neck (18)	Damaged cap packing	Replace the cap.
	Crack in root of filler neck	Replace the oil tank.
	High fluid level	Adjust the fluid level.
Leakage from surrounding of power cylinder of gearbox (19) in figure	Damaged oil seal	Replace the oil seal.
Leakage from control valve of gear-box (20) and (21) in figure	Damaged packing or oil seal	Replace the problem parts.
	Damage in control valve	Replace the control valve.

8. Pipe Assembly [RHD MODEL]

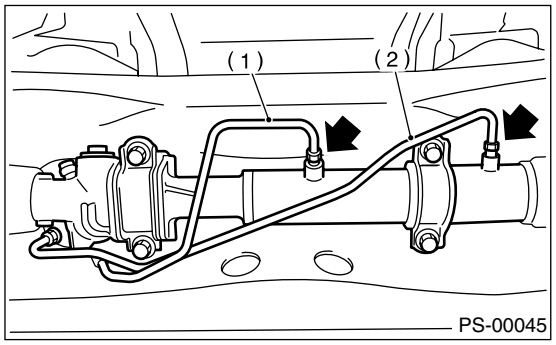
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and then remove the jack-up plate.



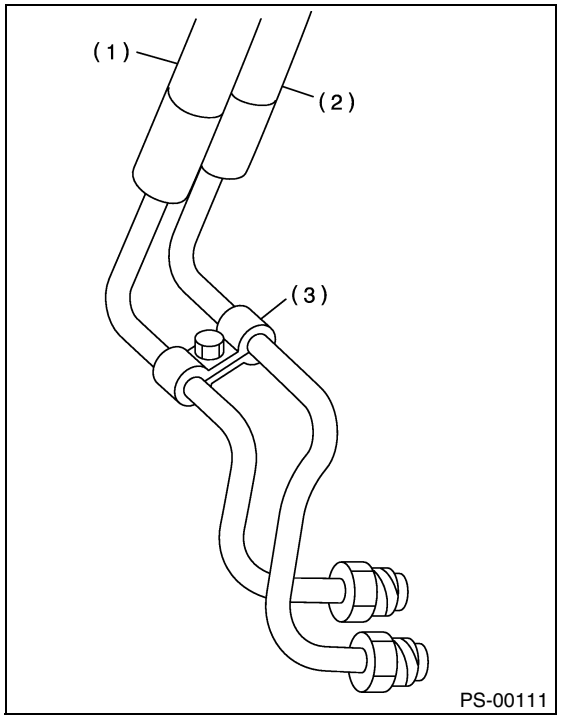
(1) Jack-up plate

3) Remove the one pipe joint at the center of gear-box, and then connect the vinyl hose to pipe and joint. Discharge fluid by turning steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.



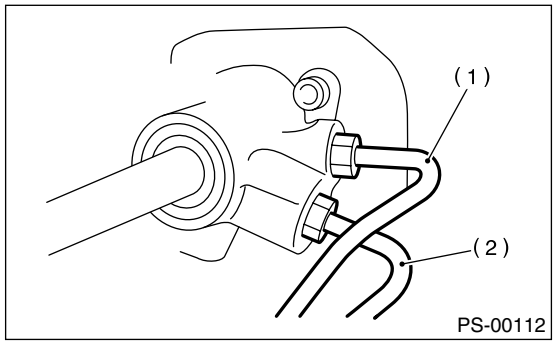
(1) Pipe A
(2) Pipe B

4) Remove the clamp E from pipes C and D.



(1) Return hose
(2) Pressure hose
(3) Clamp E

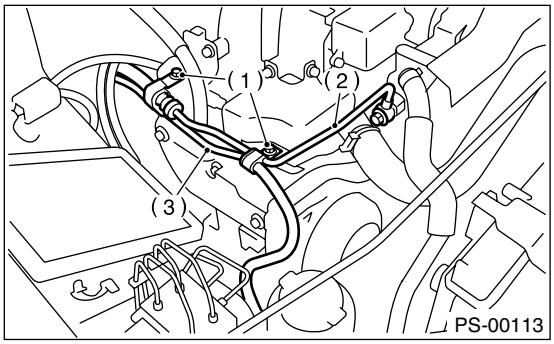
5) Disconnect the pipe C and D from gear box.



(1) Pipe C
(2) Pipe D

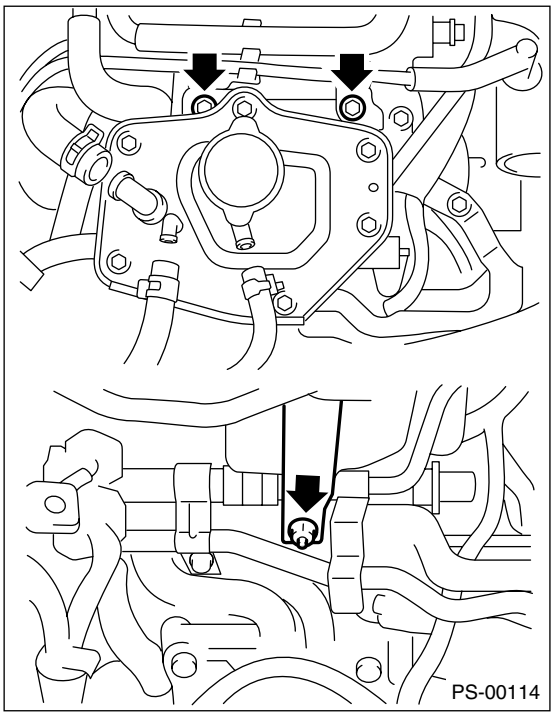
6) Non-turbo model:
(1) Remove the air cleaner.
(2) Remove the bolt A.
(3) Disconnect the pipe C from oil pump. Disconnect the pipe D from return hose.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.
• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



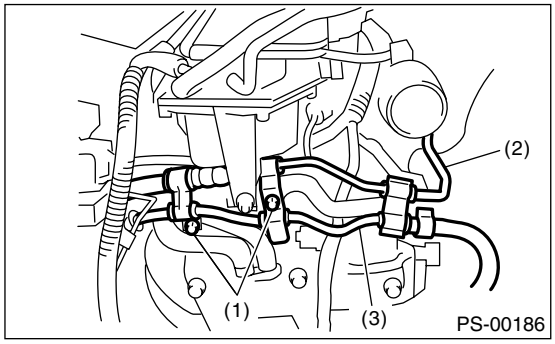
(1) Bolt A
(2) Pipe C
(3) Pipe D

7) Turbo model:
(1) Remove the air cleaner. <Ref. to IN(TURBO)-7, REMOVAL, Air Cleaner.>
(2) Remove the coolant filler tank.



(3) Remove the two bolts fixing pipe C and D.
(4) Disconnect the pipe C from oil pump. Disconnect pipe D from return hose.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.
• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



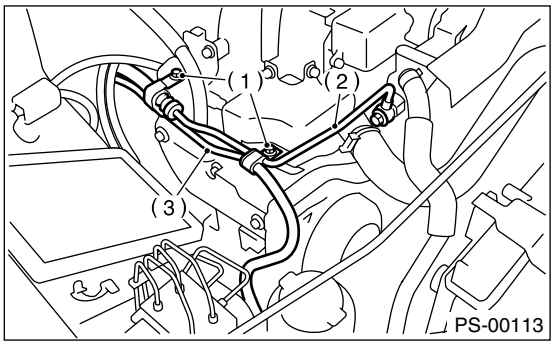
(1) Bolt
(2) Pipe C
(3) Pipe D

B: INSTALLATION

1) Temporarily tighten the two bolts fixing pipe C and D. (bolt A for Non-turbo model.)

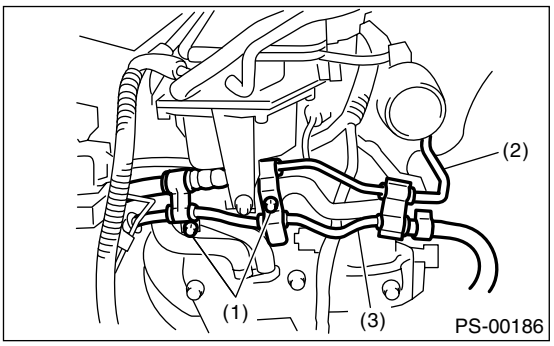
NOTE:
Visually check that the hose between tank and pipe D is free from bending or twisting.

- NON-TURBO MODEL



(1) Bolt A
(2) Pipe C
(3) Pipe D

- TURBO MODEL



(1) Bolt
(2) Pipe C
(3) Pipe D

(1) Connect the pipe D to oil tank.
(2) Using a new gasket, connect the pipe C to oil pump.

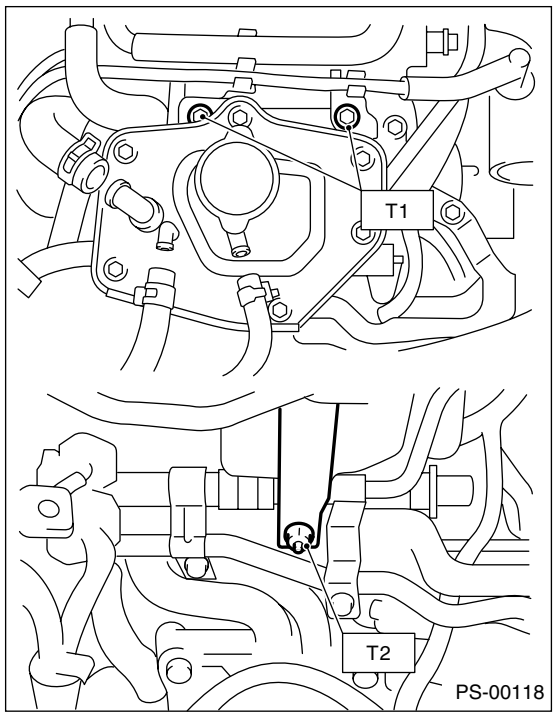
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

(3) Tighten the two bolts fixing pipe C and D. (bolt A for Non-turbo model.)

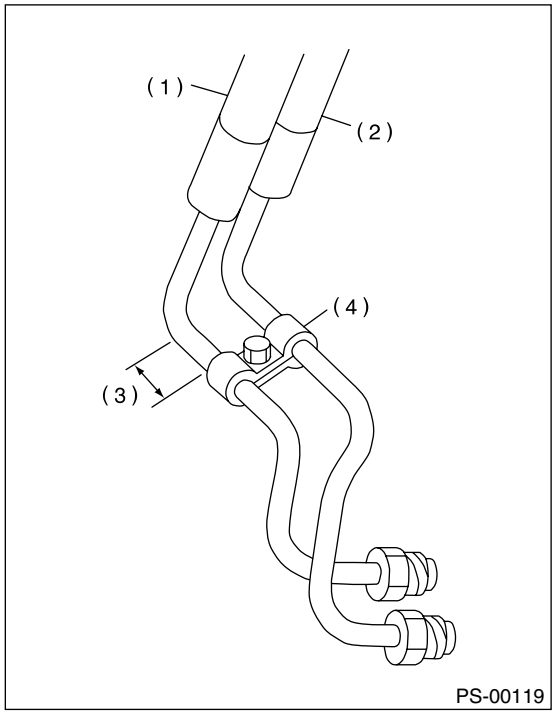
Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

2) Install the coolant filler tank. (Turbo model)

Tightening torque:
T1: 19 N·m (1.9 kgf-m, 13.7 ft-lb)
T2: 21 N·m (2.1 kgf-m, 15.2 ft-lb)



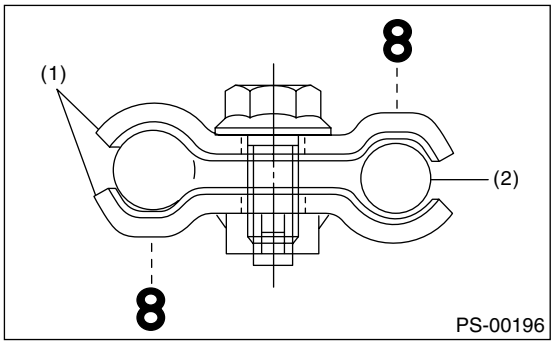
3) Temporarily connect the pipe C and D to gear box.



(1) Return hose
(2) Pressure hose
(3) Approx. 30 mm (1.18 in)
(4) Clamp E

4) Temporarily install the clamp E on pipes C and D.

NOTE:
Ensure the letter “8” on each clamp are diagonally opposite each other as shown in the figure.



(1) Clamp E
(2) Pipe C

5) Tighten the clamp E firmly.

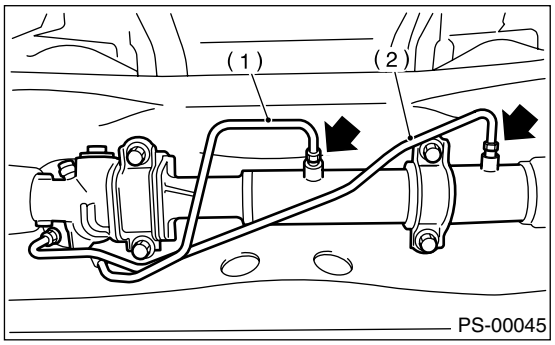
Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

6) Tighten the joint nut.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

7) Connect the pipes A and B to four pipe joints of gearbox. Connect the upper pipe B first, and lower pipe A second.

Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

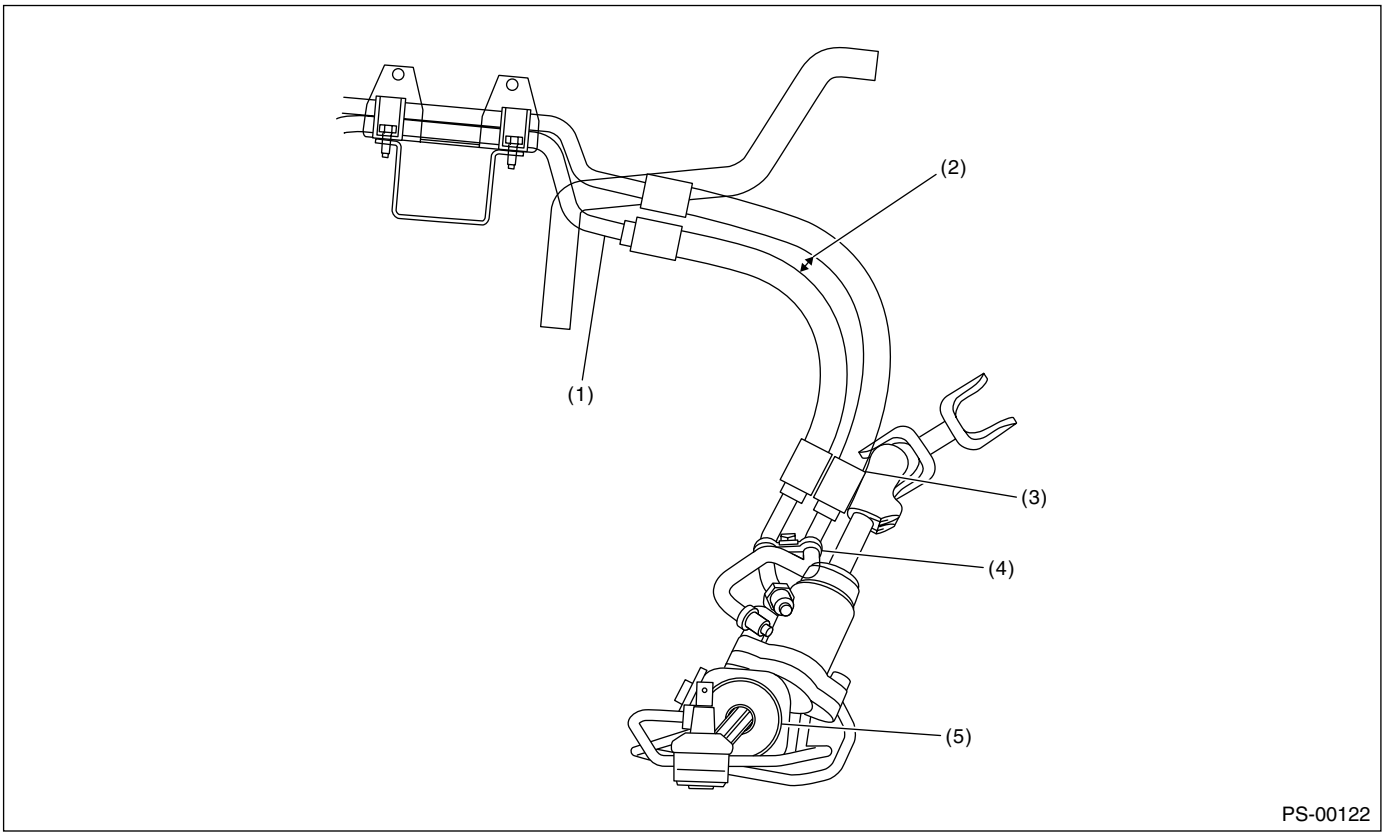


(1) Pipe A
(2) Pipe B

8) Install the jack-up plate.
9) Install the air intake duct, air cleaner upper cover and air intake boot. <Ref. to IN(TURBO)-7, INSTALLATION, Air Cleaner.> and <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
10) Connect the battery ground cable to battery.

11) Feed the specified fluid.

CAUTION:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.



(1)	Clearance between blow-by hose and pipe: 3 — 5 mm (0.12 — 0.20 in)	(3)	Clearance between side frame and hose: 15 mm (0.59 in) or more	(5)	Steering gearbox
(2)	No interference is allowed between hoses.	(4)	Clearance between crossmember and pipe: 5 — 13 mm (0.20 — 0.51 in)		

12) Finally check clearance between pipes and/or hoses, as shown above.

Pipe-to-crossmember clearance:
10 mm (0.39 in) or more.

C: INSPECTION

Check all disassembled parts for wear, damage or other abnormalities. Repair or replace faulty parts as required.

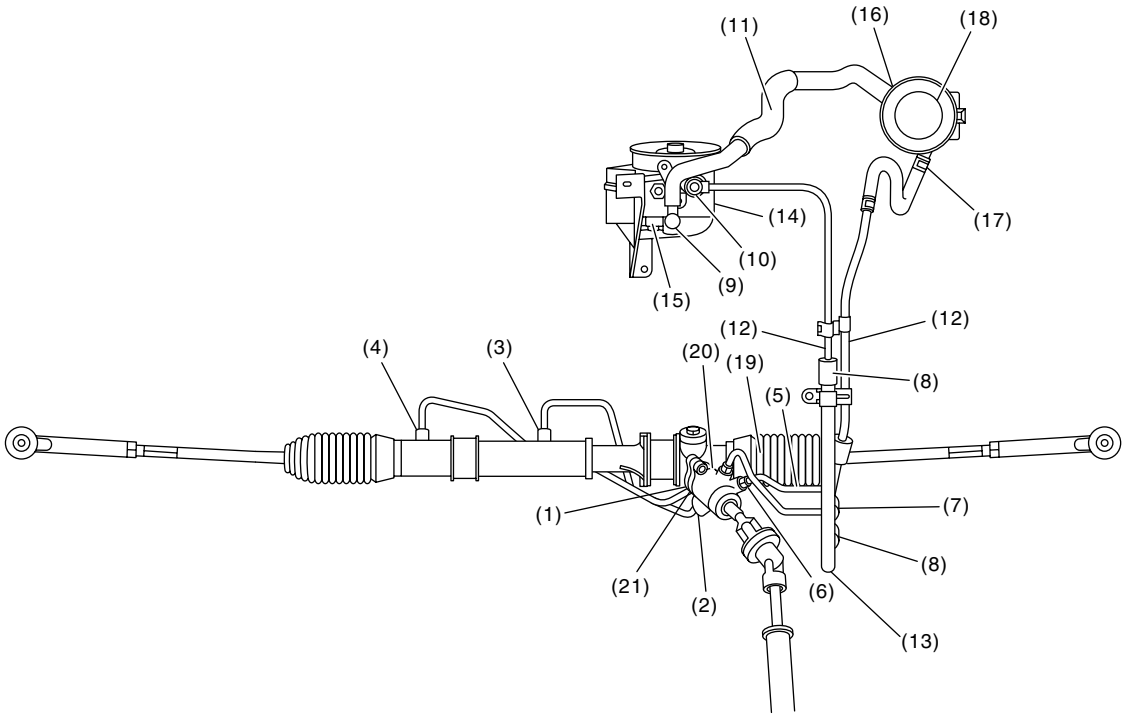
Part name	Inspection	Remedy
Pipe	• O-ring fitting surface for damage • Nut for damage • Pipe for damage	Replace with a new one.
Clamp	• Clamps for weak clamping force	Replace with a new one.
Hose	• Flared surface for damage • Flare nut for damage • Outer surface for cracks • Outer surface for wear • Clip for damage • End coupling or adapter for degradation	Replace with a new one.

CAUTION:
Although the surface layer materials of rubber hoses have excellent weathering resistance, heat resistance and resistance for low temperature brittleness, they are likely to be damaged chemically by brake fluid, battery electrolyte, engine oil and automatic transmission fluid and their service lives are to be very shortened. It is very important to keep the hoses free from before mentioned fluids and to wipe out immediately when the hoses are adhered with the fluids.
Since the resistances for heat or low temperature brittleness are gradually declining according to time accumulation of hot or cold conditions for the hoses and their service lives are shortening accordingly, it is necessary to perform the careful inspection frequently when the vehicle is used in hot weather areas, cold weather area and a driving condition in which many steering operations are required in short time.
Particularly, continuous work of relief valve over 5 seconds causes to reduce service lives of the hoses, the oil pump, the fluid, etc. due to over heat.

Trouble	Possible cause	Corrective action
Pressure hose burst	Excessive holding time of relief status	Instruct the customers.
	Malfunction of relief valve	Replace the oil pump.
	Poor cold characteristic of fluid	Replace the fluid.
Forced out return hose	Poor connection	Correct.
	Poor holding of clip	Retighten.
	Poor cold characteristic of fluid	Replace the fluid.
Fluid bleeding out of hose slightly	Wrong layout, tensioned	Replace the hose.
	Excessive play of engine due to deterioration of engine mounting rubber	Replace the defective parts.
	Improper stop position of pitching stopper	Replace the defective parts.
Crack on hose	Excessive holding time of relief status	Replace. Instruct customer.
	Excessive tightening torque for return hose clip	Replace.
	Power steering fluid, brake fluid, engine oil, electrolyte adhere on the hose surface	Replace. Pay attention on service work.
	Too many times use in extremely cold weather	Replace. Instruct the customers.

NOTE:
It is likely that although one judges fluid leakage, there is actually no leakage. This is because the fluid spilt during the last maintenance was not completely wiped off. Be sure to wipe off spilt fluid thoroughly after maintenance.

PIPE ASSEMBLY [RHD MODEL]

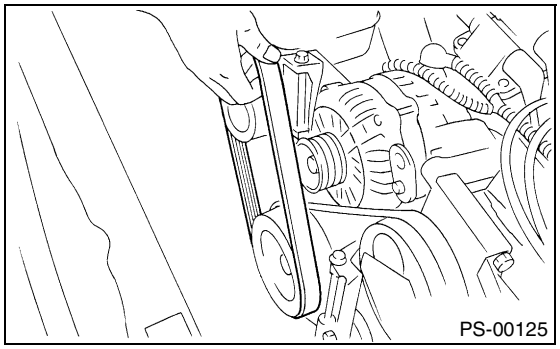


Fluid leaking area	Possible cause	Corrective action
Leakage from connecting portions of pipes and hoses, numbered with (1) through (10) in figure	Insufficient tightening of flare nut, catching dirt or the like, damage to flare or flare nut or eye bolt	Loosen and retighten, if ineffective, replace.
	Poor insertion of hose, poor clamping	Retighten or replace the clamp.
	Damaged O-ring or gasket	Replace the O-ring or gasket pipe or hose with new one, if ineffective, replace gearbox also.
Leakage from hose (11), (12) and (13) and oilcooler (22) in figure	Crack or damage in hose	Replace with a new one.
	Crack or damage in hose hardware	Replace with a new one.
Leakage from surrounding of cast iron portion of oil pump (14) and (15) in figure	Damaged O-ring	Replace the oil pump.
	Damaged gasket	Replace the oil pump.
Leakage from oil tank (16) and (17) in figure	Crack in oil tank	Replace the oil tank.
Leakage from filler neck (18)	Damaged cap packing	Replace the cap.
	Crack in root of filler neck	Replace the oil tank.
	High fluid level	Adjust the fluid level.
Leakage from surrounding of power cylinder of gearbox (19) in figure	Damaged oil seal	Replace the oil seal.
Leakage from control valve of gear-box (20) and (21) in figure	Damaged packing or oil seal	Replace the problem parts.
	Damage in control valve	Replace the control valve.

9. Oil Pump

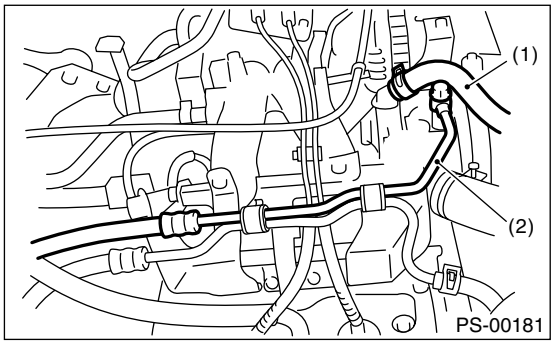
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the pulley belt cover.
3) Loosen the belt tension adjusting bolt and generator securing bolt, and then remove the power steering pump drive V-belt.



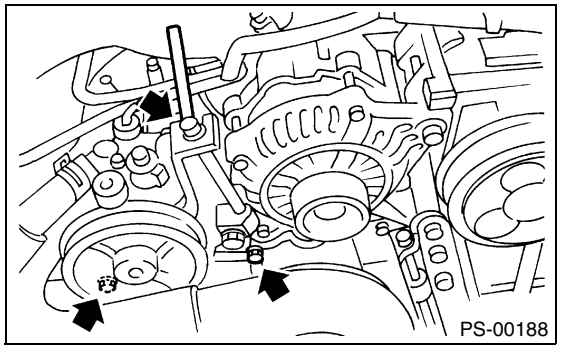
4) Disconnect the connector from power steering pump switch.
5) Disconnect the pipe C and suction hose from oil pump.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.
• To prevent foreign matter from entering the hose, cover the open ends of them with a clean cloth.



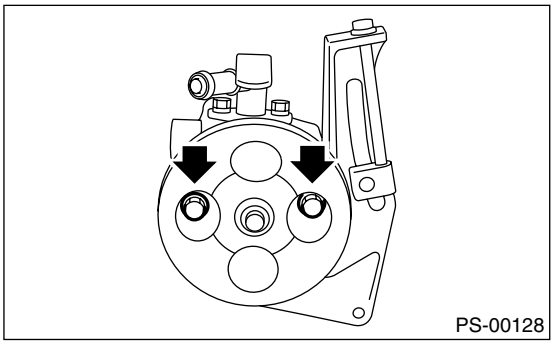
(1) Suction hose
(2) Pipe C

6) Remove the bolts which install power steering pump bracket.

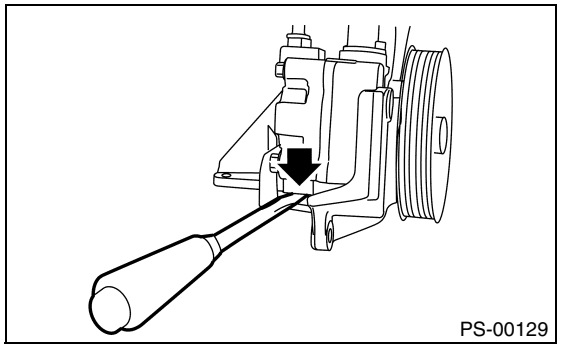


7) Place the oil pump bracket in a vise, remove the two bolts from front side of oil pump.

CAUTION:
Do not place the oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.



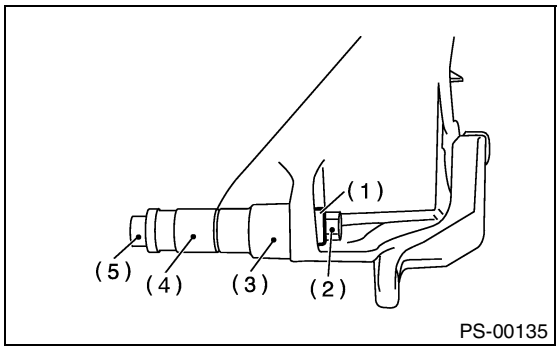
8) Remove the bolt from the rear side of oil pump.
9) Disassemble the oil pump and bracket by inserting a flat tip screwdriver as shown in the figure.



B: INSTALLATION

1) Install the oil pump to bracket.
(1) Place the oil pump bracket in a vise. Tighten the bushing using a 12.7 mm (1/2″) type 14 and 21 mm box wrench until it is in contact with the oil pump mounting surface.

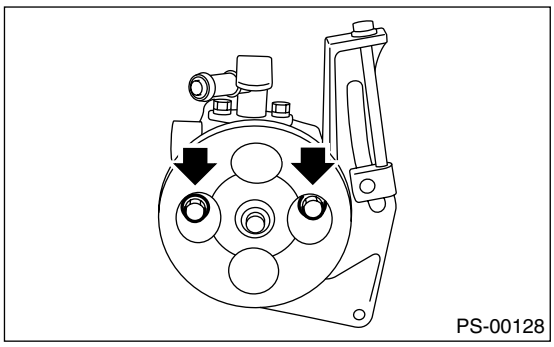
CAUTION:
Do not place the oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.



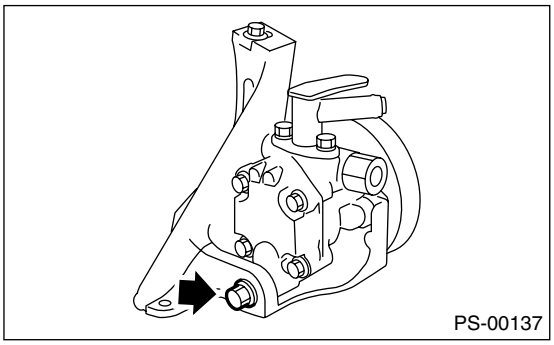
(1) Bush
(2) Nut
(3) 21 mm
(4) 14 mm
(5) Bolt

(2) Tighten the bolt which installs oil pump to bracket.

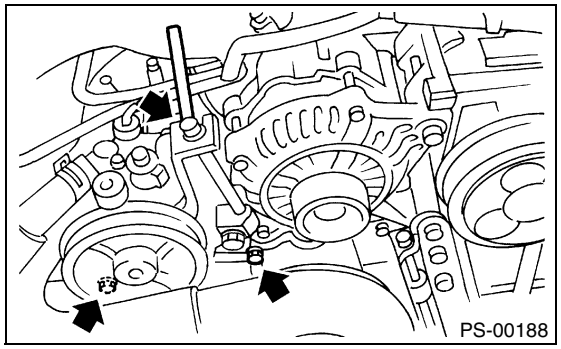
Tightening torque:
15.7 (1.6 kgf-m, 11.6 ft-lb)



Tightening torque:
37.3 (3.8 kgf-m, 27.5 ft-lb)



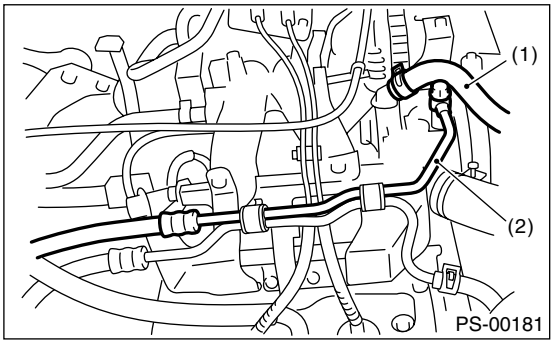
2) Tighten the bolt which installs power steering pump bracket.



3) Interconnect the pipe C and suction hose.

Tightening torque:
Eye bolt
39 N·m (4.0 kgf-m, 28.9 ft-lb)

CAUTION:
If a hose is twisted at this step, the hose may come into contact with some other parts.



(1) Suction hose
(2) Pipe C

4) Connect the connector to power steering pump switch.
5) Install the pulley belt to oil pump.
6) Tighten the oil pump pulley nut to the specified torque.

Tightening torque:
52 N·m (5.3 kgf-m, 38 ft-lb)

7) Check the pulley belt tension. <Ref. to ME(SO-HC)-42, INSPECTION, V-belt.>
8) Tighten the bolt of belt tension.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

9) Install the pulley belt cover.
10) Connect the battery ground cable to battery.
11) Feed the specified power steering fluid. <Ref. to PS-89, Power Steering Fluid.>

CAUTION:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

C: INSPECTION

1. BASIC INSPECTION

Perform the following inspection procedures and repair or replace defective parts.

No.	Parts	Inspection	Corrective action
1	Oil pump (Exterior)	(1) Crack, damage or oil leakage	Replace the oil pump with a new one.
		(2) Play of pulley shaft	Measure the radial play and axial play. If any of these exceeds the service limit, replace the oil pump with a new one.
2	Pulley	(1) Damage	Replace it with a new one.
		(2) Bend	Measure the V ditch deflection. If it exceeds the service limit, replace the pulley with a new one.
3	Oil pump (Interior)	(1) Defect or burning of vane pump	Check the resistance to rotation of pulley. If it is past the service limit, replace the oil pump with a new one.
		(2) Bend in the shaft or damage to bearing	Oil pump emits a noise that is markedly different in tone and loudness from a sound of a new oil pump when turning with a string put around its pulley, replace the oil pump with a new one.
4	O-ring	Crack or deterioration	Replace it with a new one.
5	Bracket	Crack	Replace it with a new one.

2. SERVICE LIMIT

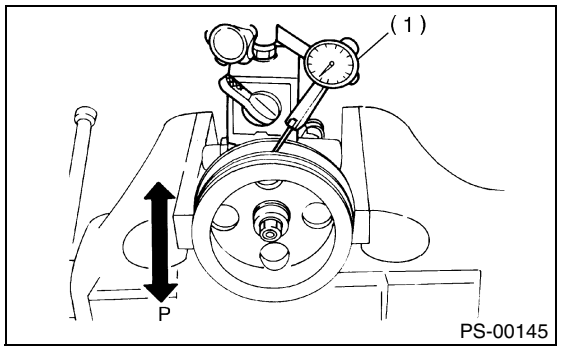
Make a measurement as follows. If it exceeds the specified service limit, replace the parts with new ones.

CAUTION:
• Fix the oil pump on a vise to make a measurement. At this time, hold the oil pump with least possible force between two wood pieces.
• Do not set outside of flow control valve or pulley on a vise; otherwise outside or pulley might be deformed. Select properly sized wood pieces.

1) Play of the pulley shaft

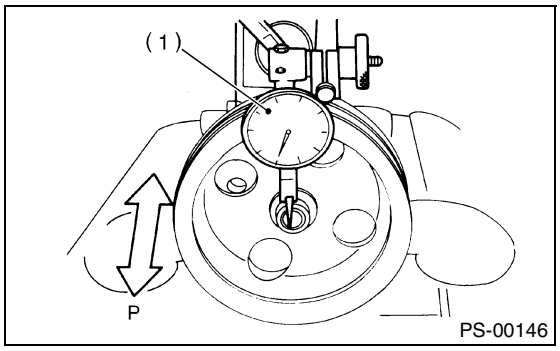
Condition:
When applying the force of 9.8 N (1.0 kgf, 2.2 lb)

Service limit:
Radial play (Direction ⟷)
0.4 mm (0.016 in) or less



(1) Dial indicator

Axial play (Direction ⇔)
0.9 mm (0.035 in) or less

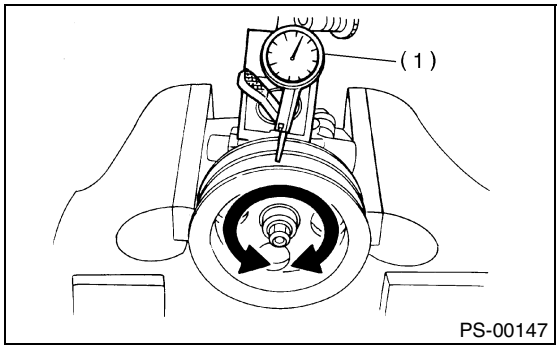


(1) Dial indicator

2) Ditch deflection of pulley

Service limit:
1.0 mm (0.039 in) or less

NOTE:
Read the value for one surface of V ditch, and then the value for another off the dial.

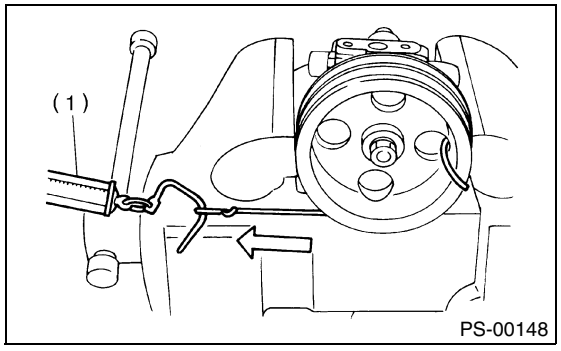


(1) Dial indicator

3) Resistance to rotation of pulley

Service limit:
Maximum load; 9.22 N (0.94 kgf, 2.07 lb) or less

NOTE:
• A rather higher value may be indicated when pulley starts turning.
• Measure the load during rotation and make a judgment.



(1) Spring balance

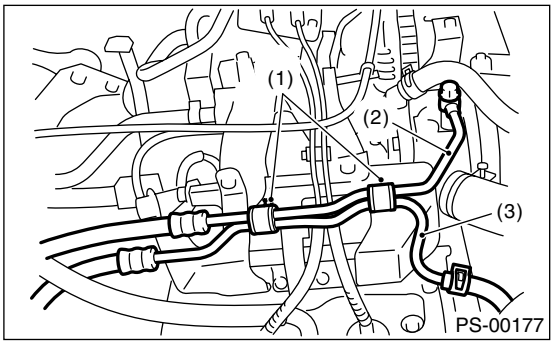
3. HYDRAULIC PRESSURE

NOTE:
• Be sure to complete all items aforementioned in “INSPECTION”, prior to measuring hydraulic pressure. Otherwise, pressure can not be measured correctly. <Ref. to PS-90, INSPECTION, General Diagnostic Table.>
• Do not leave the valve of pressure gauge closed or hold the steering wheel at stop end for 5 seconds or more in any case, as the oil pump may be damaged due to long keep of these conditions.
• Put a cotton cloth waste at a place where fluid drops before the pressure gauge is installed. Wipe off split fluid thoroughly after the measurement.

1) REGULAR PRESSURE MEASUREMENT
(1) Connect the ST1, ST2 and ST3.

ST1 92511000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A

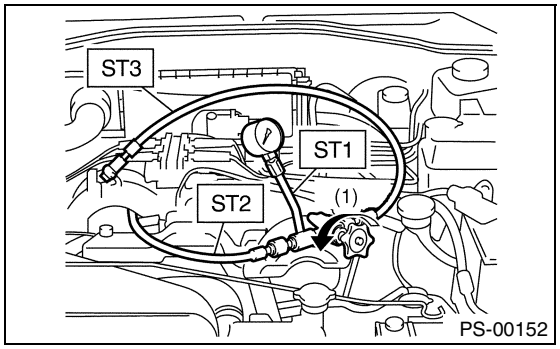
(2) Remove the air intake duct.
(3) Disconnect the pipe C from the pump.
(4) Using the gasket (Part No. 34621AC021) and bolt (Part No. 34620AC010), install the ST2 to the pump instead of pipe C.



(1) Bolt A
(2) Pipe C
(3) Pipe D

(5) Install the ST3 to end of pipe C removed from pump.
(6) Replenish power steering fluid up to the specified level.
(7) Open the valve, and start the engine.
(8) Measure the regular pressure.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A

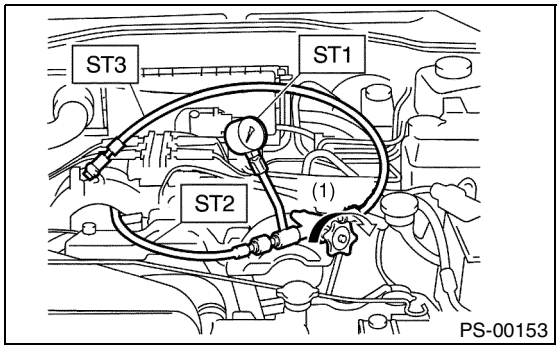


Service limit:
981 kPa (10 kg/cm^2, 142 psi) or less

(9) If it is not within the specified value, replace the troubled part caused by the following symptoms; pipe or hose clogged, leaks from fluid line, and mix of foreign objects in fluid line.

2) Measure the relief pressure.
(1) Using the STs, measure the relief pressure.
(2) Close the valve.
(3) Measure the relief pressure.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A

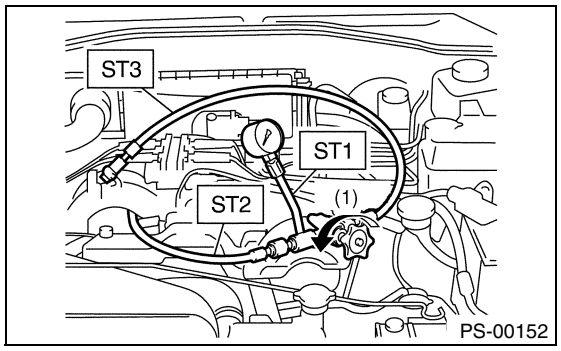


Service limit:
7,360 — 8,050 kPa
(75 — 82 kg/cm^2, 1,067 — 1,166 psi)

(4) If it is not within the specified value, replace the oil pump.

3) Measure the working pressure.
(1) Using the STs, measure the working pressure.
(2) Open the valve.
(3) Measure the working pressure of control valve by turning wheel from stop to stop.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



Service limit:
7,360 — 8,050 kPa
(75 — 82 kg/cm^2, 1,067 — 1,166 psi)

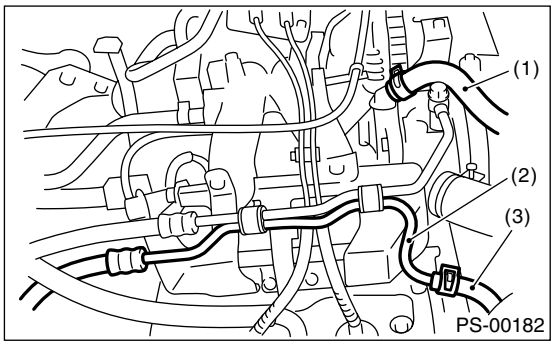
(4) If it is within the specified value, measure the steering effort. <Ref. to PS-93, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.> If it is not within specified value, replace the control valve itself or control valve and pinion as a single unit with new ones.

10.Reservoir Tank

A: REMOVAL

1) Remove the air intake duct. <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
2) Drain fluid from the reservoir tank.
3) Disconnect the pipe D from return hose and suction hose from oil pump.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.
• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.

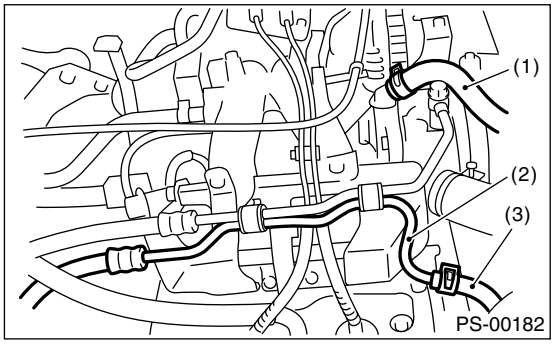


(1) Suction hose
(2) Pipe D
(3) Return hose

4) Remove the reservoir tank from bracket by pulling it upwards.

B: INSTALLATION

1) Install the reservoir tank to bracket.
2) Connect the pipes D to return hose and suction hose to oil pump.



(1) Suction hose
(2) Pipe D
(3) Return hose

3) Feed the specified power steering fluid. <Ref. to PS-89, Power Steering Fluid.>

C: INSPECTION

Check the reservoir tank for cracks, breakage, or damage. If any cracks, breakage, or damage is found, replace the reservoir tank.

11.Power Steering Fluid

A: SPECIFICATION

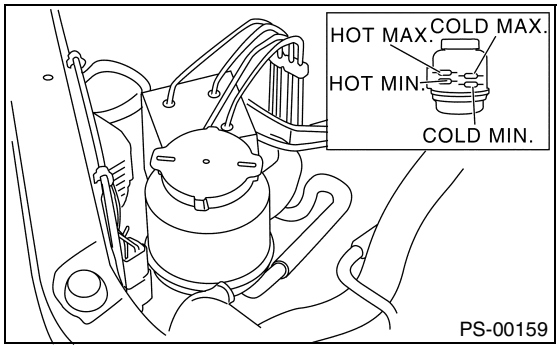
Recommended power steering fluid	Manufacturer
DEXRON III or equivalent	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

B: INSPECTION

1) Check the power steering fluid for deterioration or contamination. If the fluid is highly deteriorated or contaminated, drain it and refill with new fluid.
2) Check the joints and units for oil leakage. If any oil leaks are found, repair or replace the applicable part.
3) Inspect the fluid level on flat and level surface with engine “OFF” by indicator of reservoir tank.
If the level is at MIN. point or below, add fluid to keep the level in the specified range of the indicator. If at MAX. point or above, drain fluid by using a syringe or the like.

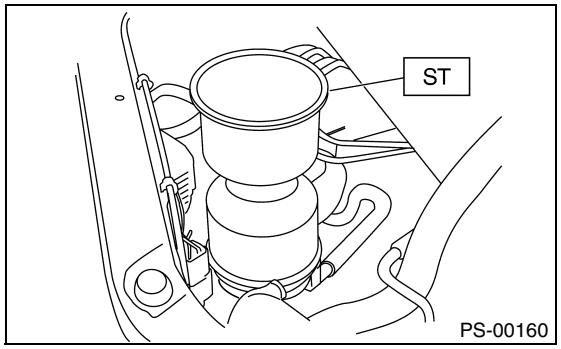
(1) Check at power steering fluid temperature 20°C (68°F); read the fluid level on the “COLD” side.

(2) Check at power steering fluid temperature 80°C (176°F); read the fluid level on the “HOT” side.



C: REPLACEMENT

1) Lift up the vehicle.
2) Remove the jack up plate.
3) Remove the pipe joint in center of gear box, and then install the vinyl hose to pipe and joint. Drain the fluid while turning steering wheel.
4) Set the ST on top of reservoir tank and fill it about half way with the specified fluid.
ST 34199AE040 OIL CHARGE



5) Continue to turn the steering wheel slowly from lock to lock until bubbles stop appearing on oil surface while keeping the fluid at that level.
6) If turning the steering wheel in low fluid level condition, air will be sucked in pipe. In this case, leave it about half an hour and then do the step 5) again.
7) Lift up the vehicle, start the engine and let it idle.
8) Continue to turn the steering wheel slowly from lock to lock again until bubbles stop appearing on oil surface while keeping the fluid at that level.
It is normal that bubbles stop appearing after three times turning of steering wheel from lock to lock.
9) In case the bubbles do not stop appearing in the tank, leave it about half an hour and then do the step 4) all over again.
10) Lower the vehicle, and then idle the engine.
11) Continue to turn the steering wheel from lock to lock until bubbles stop appearing and change of the fluid level is within 3 mm (0.12 in).
12) In case the following happens, leave it about half an hour and then do step 8) to 11) again.

(1) The fluid level changes over 3 mm (0.12 in).

(2) Bubbles remain on the upper surface of the fluid.

(3) Grinding noise is generated from oil pump.

13) Check the fluid leakage after turning steering wheel from lock to lock with engine running.

12.General Diagnostic Table

A: INSPECTION

Trouble	Possible cause	Corrective action
• Heavy steering effort in all ranges • Heavy steering effort at stand still • Steering wheel surges when turning.	1. Pulley belt • Unequal length of pulley belts • Adhesion of oil and grease • Loose or damage of pulley belt • Poor uniformity of pulley belt cross section • Pulley belt touches to pulley bottom • Poor revolution of pulleys (except oil pump pulley) • Poor revolution of oil pump pulley	Adjust or replace.
	2. Tire and wheel • Improper tires out of specification • Improper wheels out of specification • Tires not properly inflated*1	Replace or reinflate.
	3. Fluid • Low fluid level • Aeration • Dust mix • Deterioration of fluid • Poor warming-up of fluid *2	Refill, bleed air, replace or instruct the customer.
	4. Idling speed • Lower idling speed • Excessive drop of idling speed at start or at turning steering wheel *3	Adjust or instruct the customer.
	5. Measure hydraulic pressure.<Ref. to PS-85, INSPECTION, Oil Pump.>	Replace the problem parts.
	6. Measure steering effort.<Ref. to PS-90, INSPECTION, General Diagnostic Table.>	Adjust or replace.
• Vehicle leads to one side or the other. • Poor return of steering wheel to center • Steering wheel surges when turning.	1. Fluid line • Folded hose • Flattened pipe	Reform or replace.
	2. Tire and wheel • Flat tire • Mix use of different tires • Mix use of different wheels • Abnormal wear of tire • Unbalance of remained grooves • Unbalance of tire pressure	Fix or replace.
	3. Front alignment • Improper or unbalance caster • Improper or unbalance toe-in • Loose connection of suspension	Adjust or retighten.
	4. Others • Damaged joint assembly • Unbalanced height • One-sided weight	Replace, adjust or instruct the customer.
	5. Measure steering effort.<Ref. to PS-90, INSPECTION, General Diagnostic Table.>	Adjust or replace.

*1 If tires and/or wheels are wider, the load to power steering system is the more. Accordingly, in a condition, for example before fluid warms-up, relief valve may work before maximum turning angle. In this case, steering effort may be heavy. When measured hydraulic pressure is normal, there is no abnormal thing.
*2 In cold weather, steering effort may be heavy due to increased flow resistance of cold fluid. After warming-up engine, turn steering wheel from stop to stop several times to warm-up fluid. Then if steering effort reduces normally, there is no abnormal thing.
*3 In cold weather or with insufficient warm-up of engine, steering effort may be heavy due to excessive drop of idling when turning steering wheel. In this case, it is recommended to start the vehicle with increasing engine speed than usual. Then if steering effort reduces normally, there is no abnormal thing.

1. NOISE AND VIBRATION

CAUTION:
Don't keep the relief valve operated over 5 seconds at any time or inner parts of the oil pump may be damaged due to rapid increase of fluid temperature.

NOTE:
• Grinding noise may be heard immediately after the engine start in extremely cold condition. In this case, if the noise goes off during warm-up there is no abnormal function in the system. This is due to the fluid characteristic in extremely cold condition.
• Oil pump makes whine or growl noise slightly due to its mechanism. Even if the noise can be heard when steering wheel is turned at stand still there is no abnormal function in the system provided that the noise eliminates when the vehicle is running.
• When turning the steering wheel with service brake and/or parking brake applied, the noise is generated by creaking between disk and pads. However this does not indicate abnormal function in system.
• There may be a little vibration around the steering devices when turning steering wheel at standstill, even though the component parts have no defects.
Hydraulic systems are likely to generate this kind of vibration as well as working noise and fluid noise because of combined conditions, i.e., road surface and tire surface, engine speed and turning speed of steering wheel, fluid temperature and braking condition.
This phenomena does not indicate there is some abnormal function in the system.
The vibration can be known when steering wheel is turned repeatedly at various speeds from slow to rapid step by step with parking brake applied on concrete road and in "D" range for automatic transmission vehicle.

Trouble	Possible cause	Corrective action
Hiss noise (continuous) While engine is running.	Relief valve emits operating sound when steering wheel is completely turned in either direction. (Don't keep this condition over 5 seconds.)	Normal
	Relief valve emits operating sound when steering wheel is not turned. This means that the relief valve is faulty.	Defective Replace the oil pump.
Rattling noise (intermittent) While engine is running.	Interference with adjacent parts	Check the clearance. Correct if necessary. <Ref. to PS-71, INSPECTION, Pipe Assembly [LHD MODEL].>
	Loosened installation of oil pump, oil tank, pump bracket, gearbox or crossmember	Retighten.
	Loosened installation of oil pump pulley or other pulley(s)	Retighten.
	Loosened linkage or play of steering or suspension Loosened tightening of joint or steering column	Retighten or replace.
	Sound generates from the inside of gearbox or oil pump.	Replace the faulty parts of gearbox or oil pump.
Knocking When turning steering wheel in both direction with small angle repeatedly at engine ON or OFF.	Excessive backlash Loosened lock nut for adjusting backlash	Adjust and retighten.
	Loosened tightening or play of tie-rod, or tie-rod end	Retighten or replace.
Grinding noise (continuous) While engine is running.	Vane pump aeration	Inspect and retighten the fluid line connection. Refill fluid and vent air.
	Vane pump seizing	Replace the oil pump.
	Pulley bearing seizing of oil pump	Replace the oil pump.
	Folded hose, flat pipe	Replace.
Squeal, squeak (intermittent or continuous) While engine is running.	Maladjustment of pulley belt Damaged or charged pulley belt Unequal length of pulley belts	Adjust or replace. (Replace two belts as a set.)
	Run out or soilage of V-groove surface of oil pump pulley	Clean or replace.

Trouble	Possible cause	Corrective action
Sizzling noise (continuous) While engine is running.	Fluid aeration	Fix the wrong part causing aeration. Replace the fluid and vent air.
	Damaged pipe of gearbox	Replace the pipe.
	Abnormal inside of hose or pipe Flat hose or pipe	Rectify or replace.
	Abnormal inside of oil tank	Replace.
	Removed oil tank cap	Install the cap.
Whistle (continuous) While engine is running.	Abnormal pipe of gearbox or abnormal inside of hose	Replace the faulty parts of gearbox or hose.
Whine or growl (continuous or intermittent) While engine is running with/ without steering turned.	Loosened installation of oil pump, oil pump bracket	Retighten.
	Abnormal inside of oil pump, hose	Replace the oil pump, hose, if the noise can be heard when running as well as stand still.
	Torque converter growl, air conditioner compression growl	Remove the power steering pulley belt and confirm.
Creaking noise (intermittent) While engine is running with steering turned.	Abnormal inside of gearbox	Replace the faulty parts of gearbox.
	Abnormal bearing for steering shaft	Apply grease or replace.
	Generates when turning steering wheel with brake (service or parking) applied.	If the noise goes off when brake is released, it is normal.
Vibration While engine is running with/ without steering turned.	Too low engine speed	Adjust and instruct customers.
	Vane pump aeration	Fix the wrong part. Vent air.
	Damaged valve in oil pump, gearbox	Replace the oil pump, faulty parts of gearbox.
	Looseness of play of steering, suspension parts	Retighten.

2. MEASUREMENT OF STEERING EFFORT

	Step	Value	Yes	No
1	**CHECK STEERING EFFORT.** 1)Stop the vehicle on a concrete road. 2)Start the engine. 3)Idle the engine. 4)Install the spring scale on the steering wheel. 5)Pull the spring scale at an right angle to steering wheel, and measure both right and left steering wheel effort. 6)Is the steering effort less than specified value? NOTE: When turning the steering more quickly than necessary from a direction to the other direction at an engine speed over 2,000 rpm, steering effort may be heavy. This is caused by flow characteristic of oil pump and is not a problem.	29.4 N (3.0 kgf, 6.6 lb)	Go to step **2.**	Adjust the backlash.
2	**CHECK STEERING EFFORT.** 1)Stop the engine. 2)Pull the spring scale at an right angle to the steering wheel, and measure both right and left steering wheel effort. 3)Is the steering effort less than specified value?	314 N (35 kgf, 77 lb)	Go to step **3.**	Perform adjustment.
3	**CHECK STEERING WHEEL EFFORT.** 1)Remove the universal joint. 2)Measure the steering wheel effort. 3)Is the maximum steering effort less than specified value?	2.26 N (0.23 kgf, 0.51 lb)	Go to step **4.**	Check, adjust and replace if necessary.
4	**CHECK STEERING WHEEL EFFORT.** 1)Measure the steering wheel effort. 2)Is the fluctuation width less than specified value?	1.08 N (0.11 kgf, 0.24 lb)	Go to step **5.**	Check, adjust and replace if necessary.
5	**CHECK UNIVERSAL JOINT.** 1)Measure the folding torque of the joint (yoke of steering column side). <Ref. to PS-25, INSPECTION, Universal Joint.> 2)Is the folding torque less than specified value?	7.3 N (0.74 kgf, 1.64 lb)	Go to step **6.**	Replace with new one.
6	**CHECK UNIVERSAL JOINT.** 1)Measure the folding torque of the joint (yoke of gearbox side). <Ref. to PS-25, INSPECTION, Universal Joint.> 2)Is the folding torque less than specified value?	3.8 N (0.39 kgf, 0.86 lb)	Go to step **7.**	Replace with new one.
7	**CHECK FRONT WHEEL.** Are the front wheels for unsteady revolution or rattling and brake for dragging?	It is normal.	Go to step **8.**	Inspect, readjust and replace if necessary.
8	**CHECK TIE-ROD ENDS.** 1)Remove the tie-rod ends. 2)Are the tie-rod ends of suspension for unsteady revolution or rattling?	It is normal.	Go to step **9.**	Inspect and replace if necessary.
9	**CHECK BALL JOINT.** Are the ball joints of suspension for unsteady revolution or rattling?	It is normal.	Go to step **10.**	Inspect and replace if necessary.

	Step	Value	Yes	No
10	**CHECK GEARBOX.** 1)Measure the rotating of gearbox. <Ref. to PS-45, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox [LHD MODEL].> 2)Is the rotating resistance of gear box specified value?	Rotation resistance is 10.5 N (1.1 kgf, 2.4 lb). Difference between clockwise and counterclockwise is 20%.	Go to step **11.**	Readjust the backlash, and if ineffective, replace the faulty parts.
11	**CHECK GEARBOX.** 1)Measure the sliding of gearbox. <Ref. to PS-44, SERVICE LIMIT, INSPECTION, Steering Gearbox [LHD MODEL].> 2)Is the sliding resistance of gear box less than specified value?	Rotation resistance is 400 N (41 kgf, 90 lb). Difference between right and left is 20%.	Steering effort is normal.	Readjust the backlash, and if ineffective, replace the faulty parts.

BODY SECTION

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)	AC
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)	AC
AIRBAG SYSTEM	AB
AIRBAG SYSTEM (DIAGNOSTICS)	AB
SEAT BELT SYSTEM	SB
LIGHTING SYSTEM	LI
WIPER AND WASHER SYSTEMS	WW
ENTERTAINMENT	ET
COMMUNICATION SYSTEM	COM
GLASS/WINDOWS/MIRRORS	GW
BODY STRUCTURE	BS
INSTRUMENTATION/DRIVER INFO	IDI
SEATS	SE
SECURITY AND LOCKS	SL
IMMOBILIZER (DIAGNOSTICS)	IM
SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)	SR
EXTERIOR/INTERIOR TRIM	EI

BODY SECTION

EXTERIOR BODY PANELS	EB
CRUISE CONTROL SYSTEM	CC
CRUISE CONTROL SYSTEM (DIAGNOSTICS)	CC

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

AC

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1. General Description

A: SPECIFICATIONS

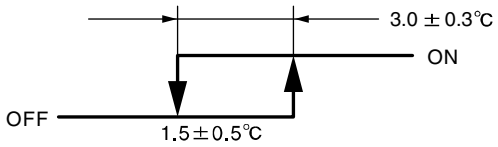
1. HEATER SYSTEM

Item		Specifications	Condition
Heating capacity		5.0 kW (4,300 kcal/h, 17,062 BTU/h) or more	• Mode selector switch: HEAT • Temperature control switch: FULL HOT • Temperature difference between hot water and inlet air: 65°C (149°F) • Hot water flow rate: 360 ℓ (95.1 US gal, 79.2 Imp gal)/h
Air flow rate		280 m^3 (9,888 cu ft)/h	Heat mode (FRESH), FULL HOT at 12.5 V
Max air flow rate		480 m^3 (16,951 cu ft)/h	• Temperature control switch: FULL COLD • Blower fan speed: 4th position • Mode selector switch: RECIRC
Heater core size (height × length × width)		134.1 × 224.3 × 32 mm (5.28 × 8.83 × 1.26 in)	—
Blower motor	Type	Auto A/C (Brushless motor) 230 W or less	12.5 V
		Manual A/C (Cylinder motor) 260 W or less	12.5 V
	Fan type and size (diameter × width)	Sirocco fan type 150 × 75 mm (5.91 × 2.95 in)	—

2. A/C SYSTEM

• AUTO A/C MODEL

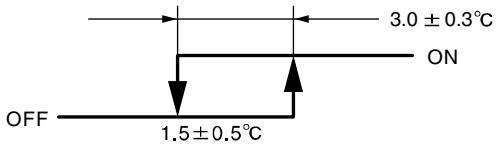
Item		Specifications
Type of air conditioner		Reheat air-mix type
Cooling capacity		5.1 kW (4,386 kcal/h, 17,403 BTU/h)
Refrigerant		HFC-134a (CH_2FCF_3) [0.6±0.05 kg (1.32±0.11 lb)]
Compressor	Type	Vane rotary, fix volume (DKV-14G)
	Discharge	140 cm^3 (8.54 cu in)/rev
	Max. permissible speed	7,000 rpm
Magnet clutch	Type	Dry, single-disc type
	Power consumption	38 W (DC 12 V, 25°C)
	Type of belt	V-Ribbed 4 PK
	Pulley dia. (effective dia.)	125 mm (4.92 in)
	Pulley ratio	1.064
Condenser	Type	Corrugated fin (Sub cool type)
	Core face area	0.234 m^2 (2.52 sq ft)
	Core thickness	16 mm (0.63 in)
	Radiation area	5.6 m^2 (62.28 sq ft)
Receiver drier	Effective inner capacity	220 cm^3 (13.42 cu in)
Expansion valve	Type	External equalizing
Evaporator	Type	Single tank
	Dimensions (W × H × T)	176.5 × 266 × 60 mm (6.95 × 10.47 × 2.36 in)
Blower fan	Fan type	Sirocco fan
	Outer diameter × width	150 × 75 mm (5.91 × 2.95 in)
	Power consumption	230 W at 12.5 V
Condenser fan (Sub fan)	Motor type	Magnet
	Power consumption	70 W at 12 V
	Fan outer diameter	320 mm (12.6 in)
Radiator fan (Main fan)	Motor type	Magnet
	Power consumption	70 W at 12 V
	Fan outer diameter	320 mm (12.6 in)
Idling speed (A/C ON)		800±100 rpm

<table>
<tr><th colspan="3">Item</th><th>Specifications</th></tr>
<tr><td rowspan="6">Triple switch
(Pressure switch)</td><td rowspan="2">Low-pressure switch operating pressure</td><td>ON → OFF</td><td>177±25 kPa
(1.80±0.25 kg/cm^2, 25.60±3.56 psi)</td></tr>
<tr><td>OFF → ON</td><td>206±30 kPa
(2.10±0.31 kg/cm^2, 29.86±4.41 psi)</td></tr>
<tr><td rowspan="2">High-pressure switch operating pressure</td><td>ON → OFF</td><td>2,940±200 kPa
(29.98±2.03 kg/cm^2, 426.32±28.87 psi)</td></tr>
<tr><td>DIFF</td><td>590±200 kPa
(6.02±2.03 kg/cm^2, 85.6±28.87 psi)</td></tr>
<tr><td rowspan="2">Middle pressure switch operating pressure</td><td>ON → OFF</td><td>1370±120 kPa
(13.97±1.22 kg/cm^2, 198.65±17.35 psi)</td></tr>
<tr><td>OFF → ON</td><td>1,770±100 kPa
(18.05±1.02 kg/cm^2, 256.81±14.50 psi)</td></tr>
<tr><td colspan="2">Thermo control amplifier working temperature
(Evaporator outlet air)</td><td colspan="2"> 

AC-00082</td></tr>
</table>

• MANUAL A/C MODEL

Item		Specifications
Type of air conditioner		Reheat air-mix type
Cooling capacity		5.1 kW (4,386 kcal/h, 17,403 BTU/h)
Refrigerant		HFC-134a (CH_2FCF_3) [600±50 g (1.32±0.11 lb)]
Compressor	Type	Vane rotary, fix volume (DKV-14G)
	Discharge	140 cm^3 (8.54 cu in)/rev
	Max. permissible speed	7,000 rpm
Magnet clutch	Type	Dry, single-disc type
	Power consumption	38 W (DC12 V, 25°C)
	Type of belt	V-Ribbed 4 PK
	Pulley dia. (effective dia.)	125 mm (4.92 in)
	Pulley ratio	1.064
Condenser	Type	Corrugated fin (Sub cool type)
	Core face area	0.234 m^2 (2.52 sq ft)
	Core thickness	16 mm (0.63 in)
	Radiation area	5.6 m^2 (6.26 sq ft)
Receiver drier	Effective inner capacity	220 cm^3 (13.42 cu in)
Expansion valve	Type	External equalizing
Evaporator	Type	Single tank
	Dimensions (W × H × T)	176.5 × 266 × 60 mm (6.95 × 10.47 × 2.36 in)
Blower fan	Fan type	Sirocco fan
	Outer diameter × width	150 × 75 mm (5.91 × 2.95 in)
	Power consumption	260 W or less at 12.5 V
Condenser fan (Sub fan)	Motor type	Magnet
	Power consumption	70 W at 12 V
	Fan outer diameter	320 mm (12.6 in)
Radiator fan (Main fan)	Motor type	Magnet
	Power consumption	70 W at 12 V
	Fan outer diameter	320 mm (12.6 in)
Idling speed (A/C ON)	MPFI model	800±100 rpm

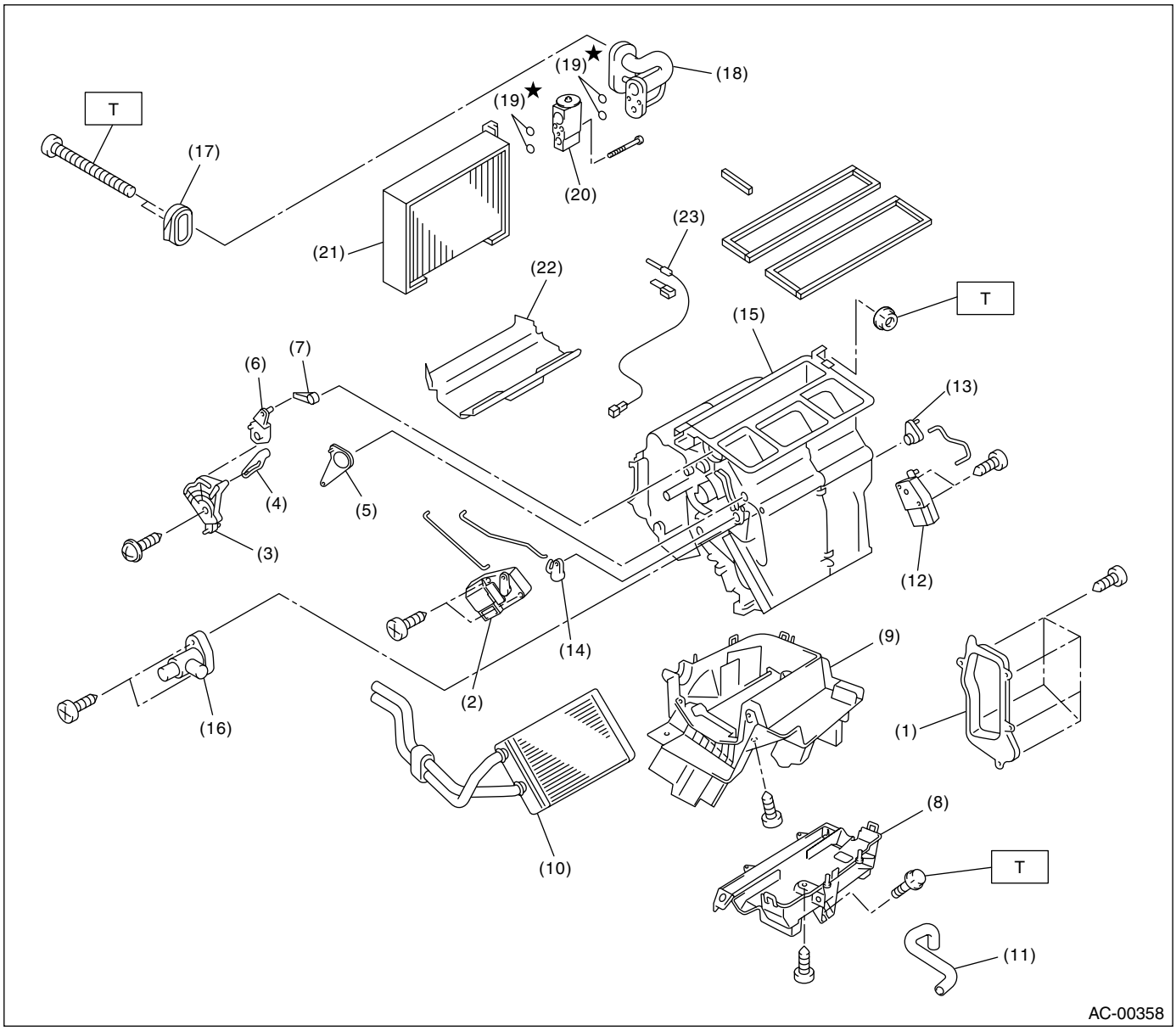
<table>
<tr><th colspan="3">Item</th><th>Specifications</th></tr>
<tr><td rowspan="6">Triple switch
(Pressure switch)</td><td rowspan="2">Low-pressure switch operating pressure</td><td>ON → OFF</td><td>177±25 kPa
(1.80±0.25 kg/cm^2, 25.60±3.56 psi)</td></tr>
<tr><td>OFF → ON</td><td>206±31 kPa
(2.10±0.31 kg/cm^2, 29.86±4.41 psi)</td></tr>
<tr><td rowspan="2">High-pressure switch operating pressure</td><td>ON → OFF</td><td>2,940±200 kPa
(29.98±2.03 kg/cm^2, 426.32±28.87 psi)</td></tr>
<tr><td>DIFF</td><td>590±200 kPa
(6.02±2.03 kg/cm^2, 85.6±28.87 psi)</td></tr>
<tr><td rowspan="2">Middle pressure switch operating pressure</td><td>ON → OFF</td><td>1,370±120 kPa
(13.97±1.22 kg/cm^2, 198.65±17.35 psi)</td></tr>
<tr><td>OFF → ON</td><td>1,770±100 kPa
(18.05±1.02 kg/cm^2, 256.81±14.50 psi)</td></tr>
<tr><td colspan="2">Thermo control amplifier working temperature
(Evaporator outlet air)</td><td colspan="2"> 

AC-00082</td></tr>
</table>

B: COMPONENT

1. HEATER COOLING UNIT

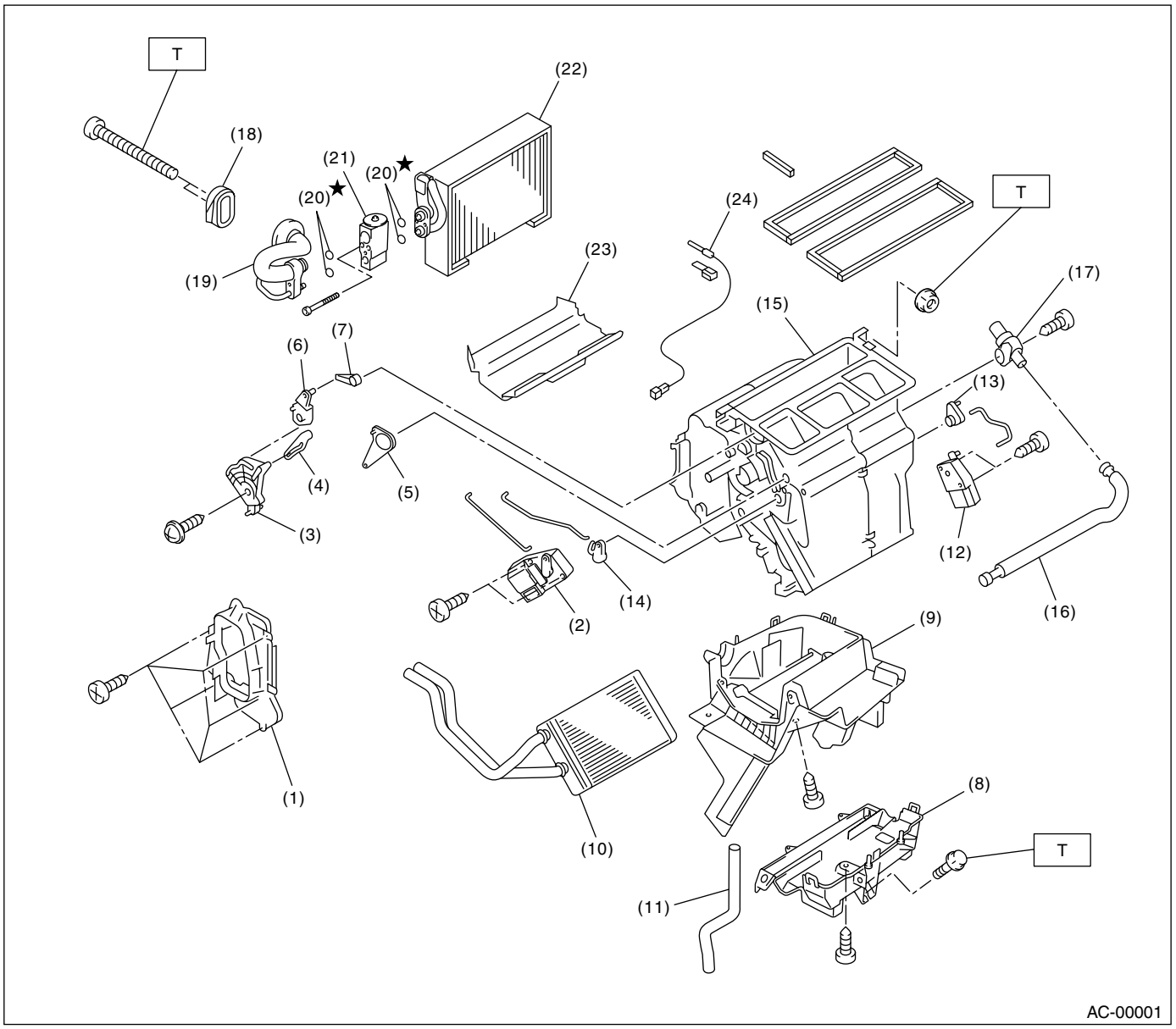
• LHD MODEL WITH AUTO A/C



(1) Evaporator cover
(2) Mode actuator
(3) Mode main lever
(4) Vent door lever
(5) Foot door lever
(6) Mode actuator link
(7) Defroster lever
(8) Foot duct
(9) Lower case
(10) Heater core
(11) Drain hose
(12) Mix actuator
(13) Mix door lever
(14) Foot door lever (B)
(15) Upper case
(16) Aspirator
(17) Packing
(18) Cooling unit pipe
(19) O-ring
(20) Expansion valve
(21) Evaporator
(22) Evaporator lining
(23) Evaporator sensor

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

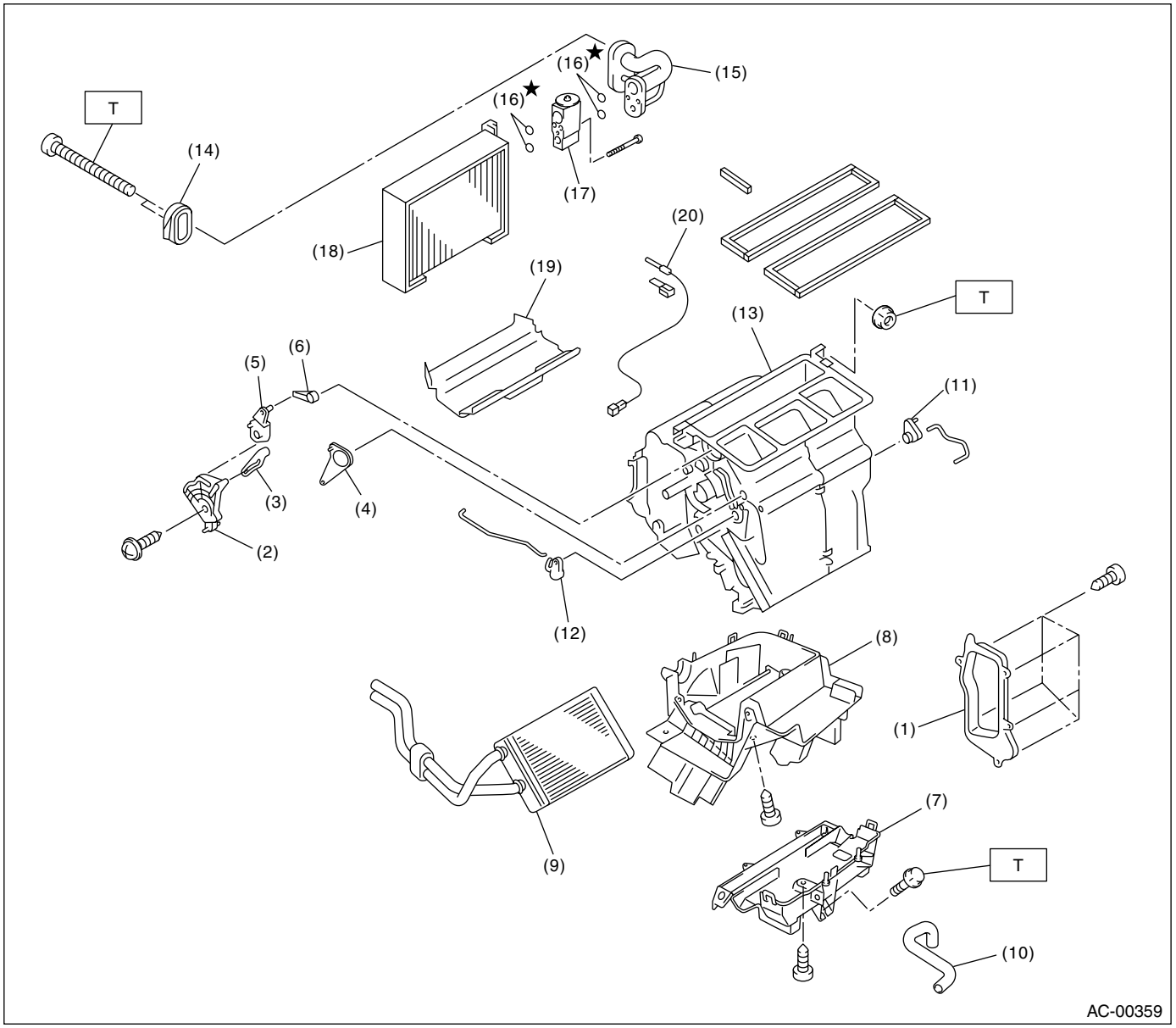
• RHD MODEL WITH AUTO A/C



(1) Evaporator cover
(2) Mode actuator
(3) Mode main lever
(4) Vent door lever
(5) Foot door lever (A)
(6) Mode actuator link
(7) Defroster lever
(8) Foot duct
(9) Lower case
(10) Heater core
(11) Drain hose
(12) Mix actuator
(13) Mix door lever
(14) Foot door lever (B)
(15) Upper case
(16) Aspirator hose
(17) Aspirator
(18) Packing
(19) Cooling unit pipe
(20) O-ring
(21) Expansion valve
(22) Evaporator
(23) Evaporator lining
(24) Evaporator sensor

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

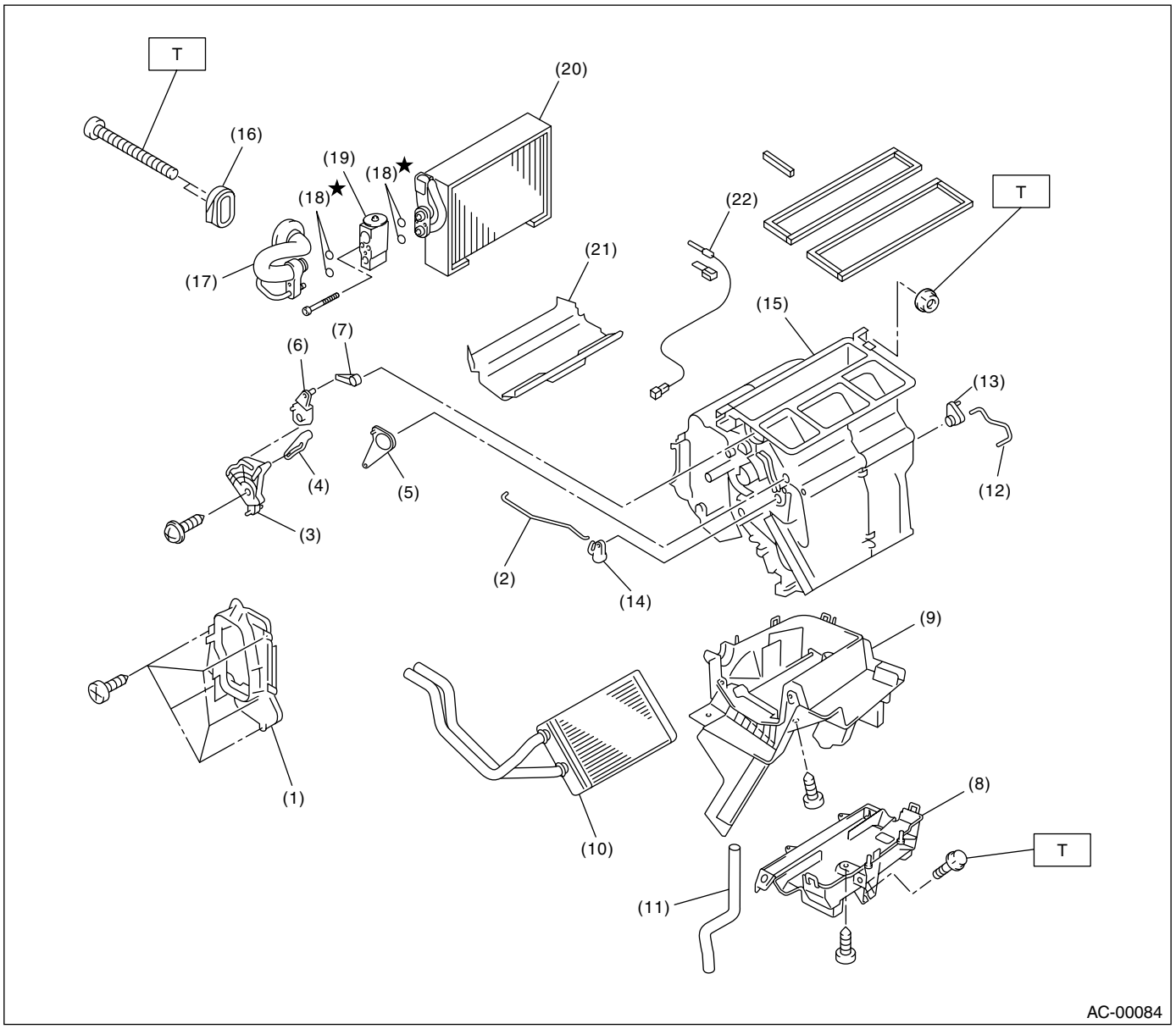
• LHD MODEL WITH MANUAL A/C



(1) Evaporator cover
(2) Mode main lever
(3) Vent door lever
(4) Foot door lever
(5) Mode actuator link
(6) Defroster lever
(7) Foot duct
(8) Lower case
(9) Heater core
(10) Drain hose
(11) Mix actuator lever
(12) Foot door lever
(13) Upper case
(14) Packing
(15) Cooling unit pipe
(16) O-ring
(17) Expansion valve
(18) Evaporator
(19) Evaporator lining
(20) Evaporator sensor

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

• RHD MODEL WITH MANUAL A/C

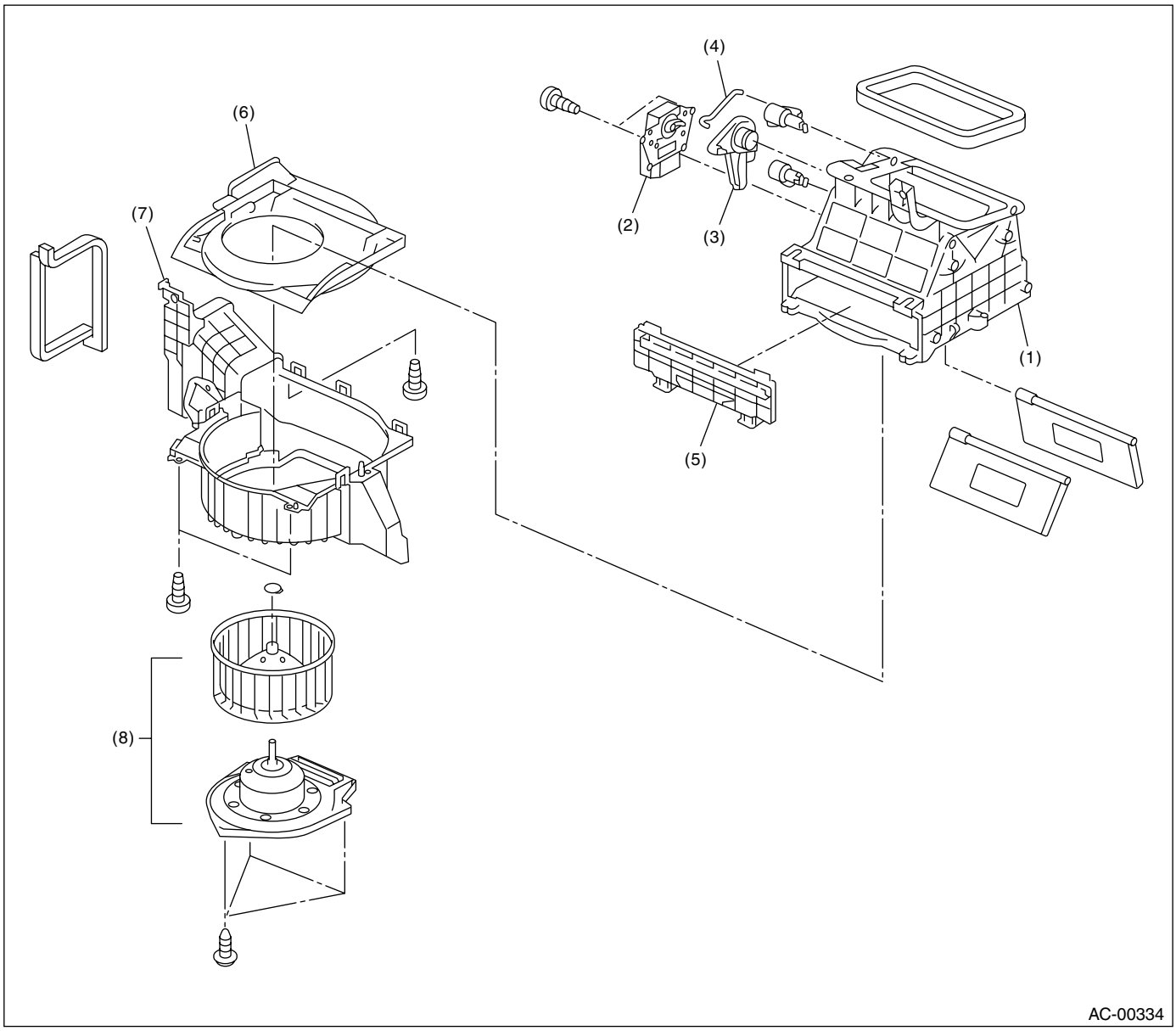


(1) Evaporator cover
(2) Side rod
(3) Mode actuator lever
(4) Vent door lever
(5) Foot door lever
(6) Mode actuator link
(7) Defroster lever
(8) Foot duct
(9) Lower case
(10) Heater core
(11) Drain hose
(12) Mix actuator rod
(13) Mix actuator lever
(14) Foot door lever
(15) Upper case
(16) Packing
(17) Cooling unit pipe
(18) O-ring
(19) Expansion valve
(20) Evaporator
(21) Evaporator lining
(22) Evaporator sensor

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

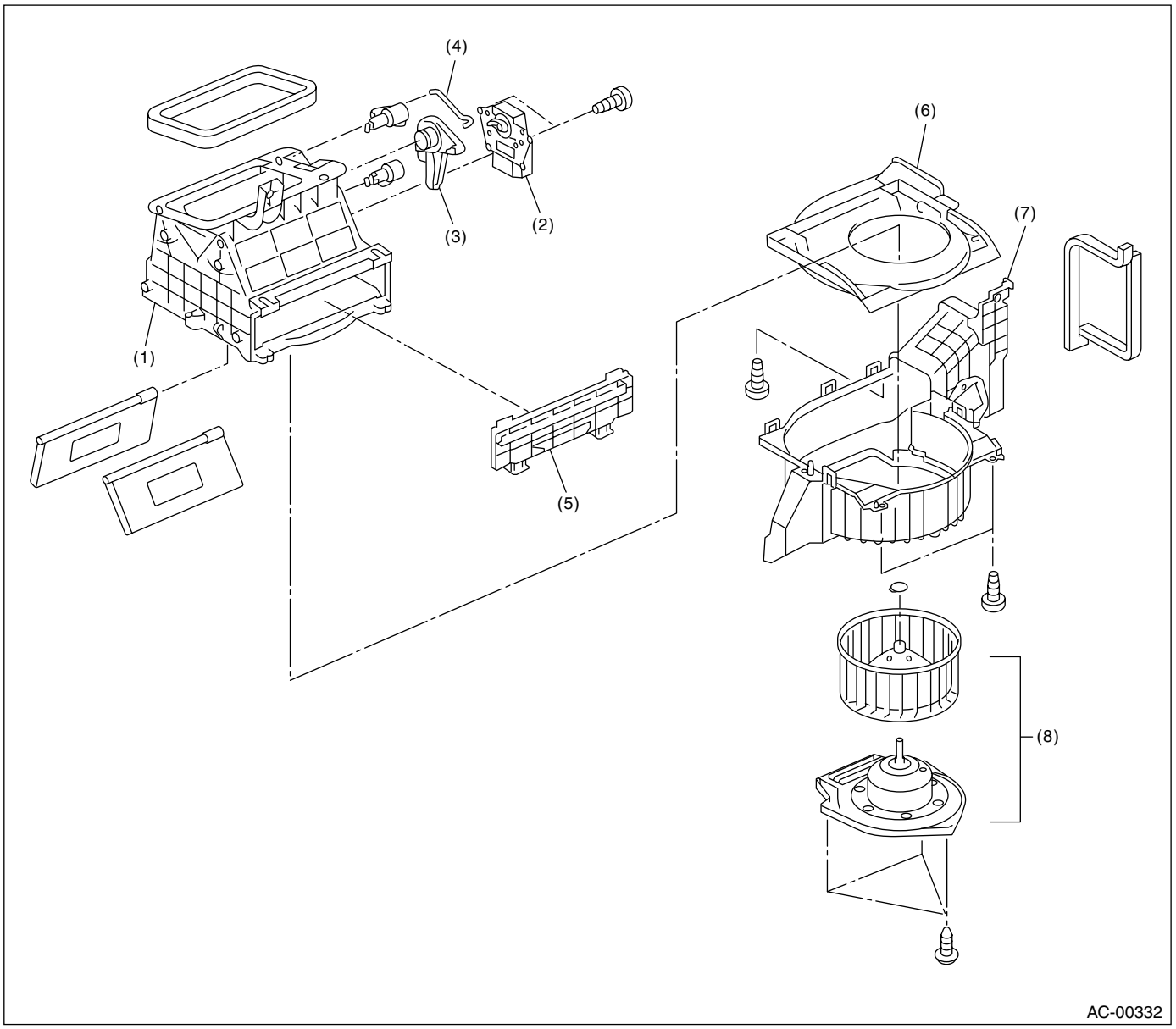
2. BLOWER MOTOR UNIT

• LHD MODEL WITH AUTO A/C



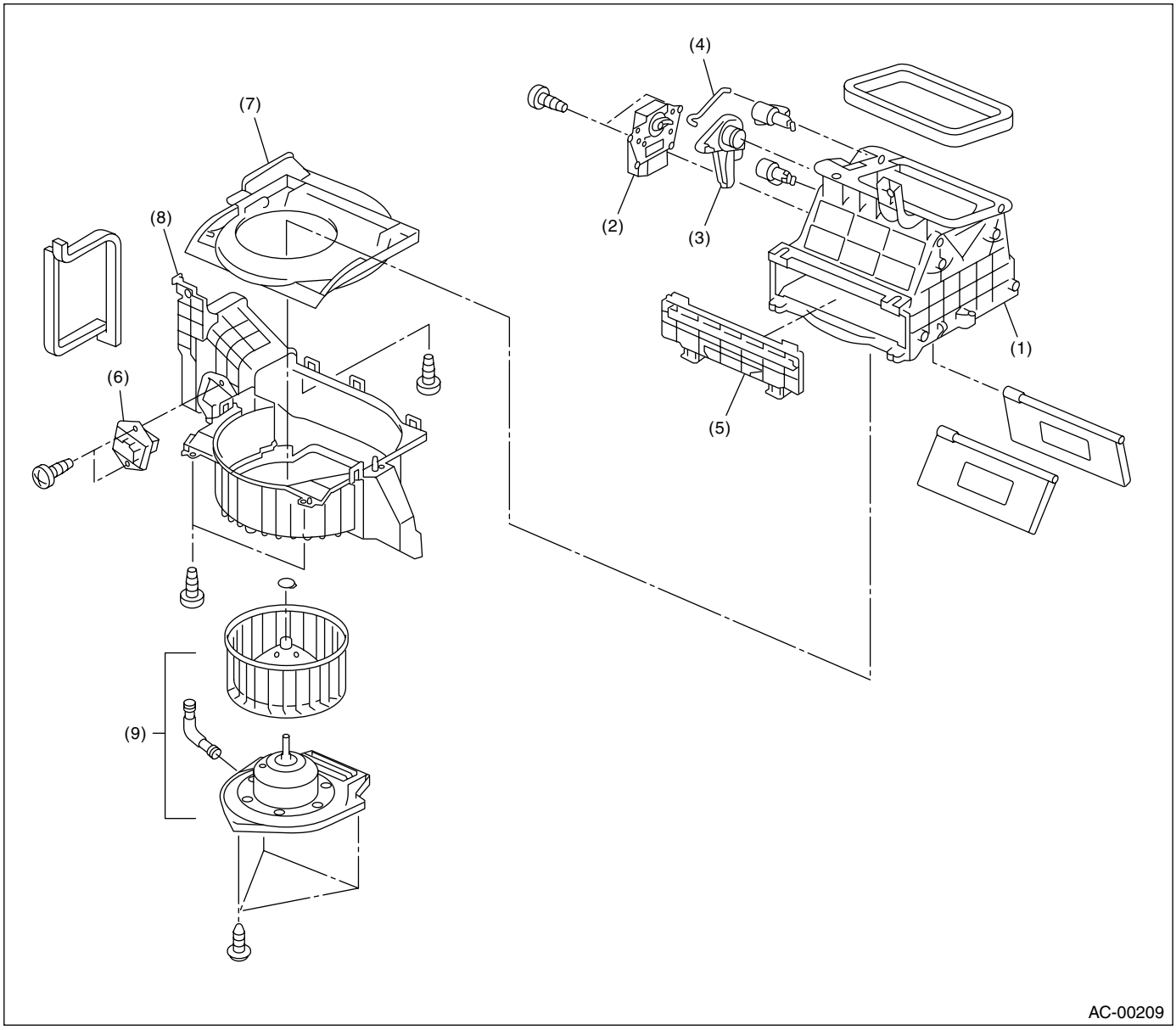
(1) Upper case
(2) Air inlet select actuator
(3) Air inlet select link
(4) Link lever
(5) Filter cover
(6) Cover
(7) Lower case
(8) Blower motor ASSY

• RHD MODEL WITH AUTO A/C



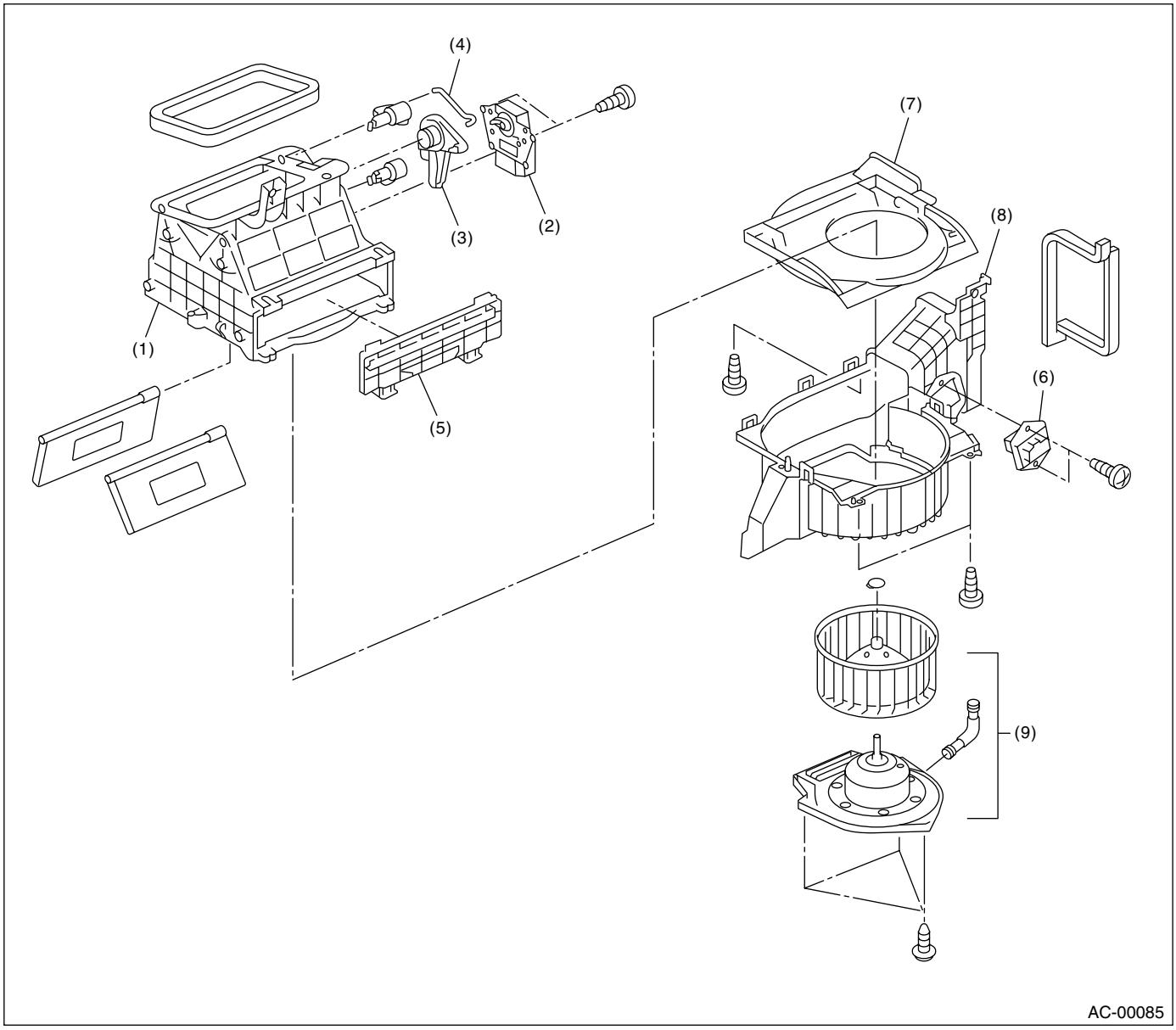
(1) Upper case
(2) Air inlet select actuator
(3) Air inlet select link
(4) Link lever
(5) Filter cover
(6) Cover
(7) Lower case
(8) Blower motor assembly

• LHD MODEL WITH MANUAL A/C



(1)	Upper case	(4)	Link rod	(7)	Cover
(2)	Air inlet select actuator	(5)	Filter cover	(8)	Lower case
(3)	Air inlet select link	(6)	Blower resistor	(9)	Blower motor ASSY

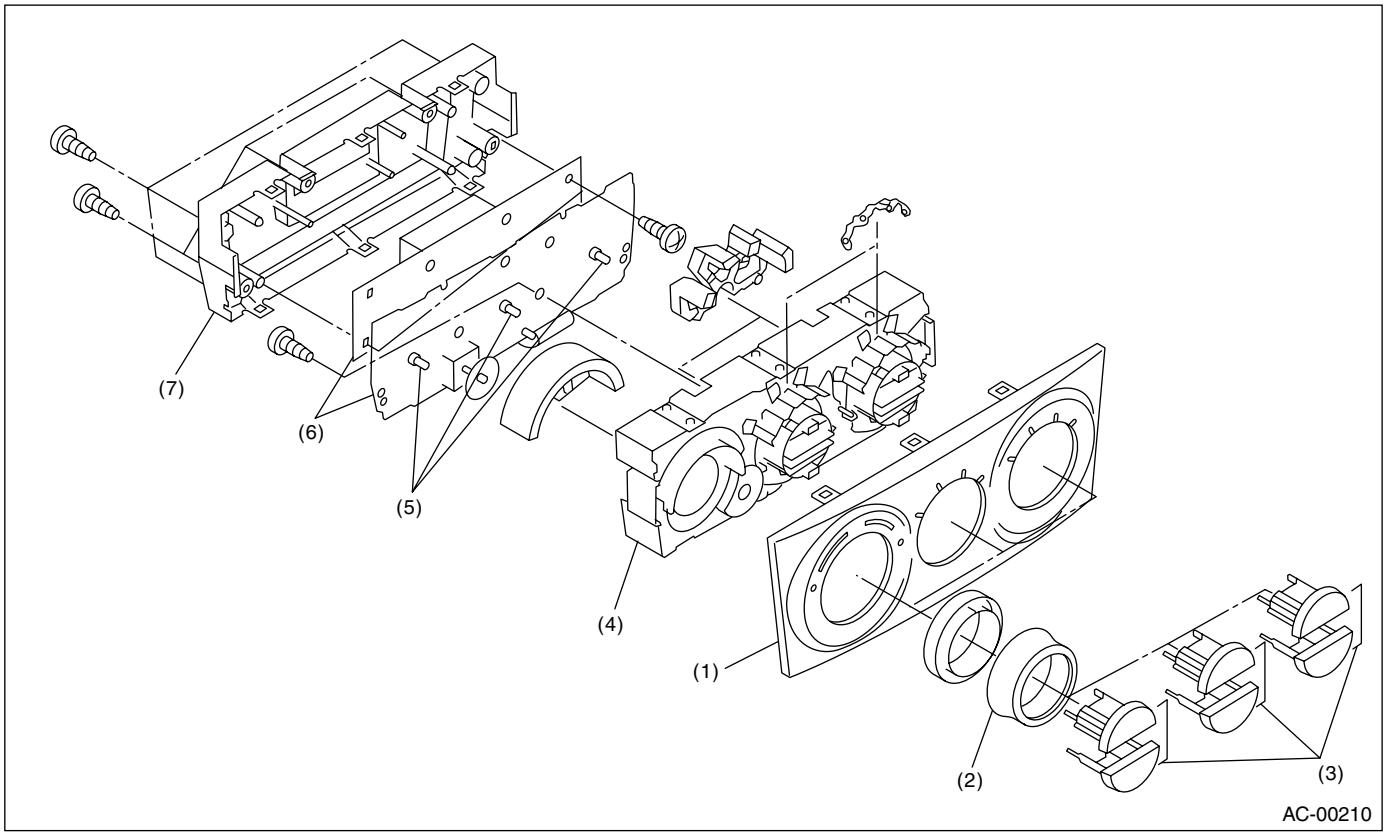
• RHD MODEL WITH MANUAL A/C



(1) Upper case
(2) Air inlet select actuator
(3) Air inlet select lever
(4) Air inlet select link
(5) Filter cover
(6) Blower resister
(7) Cover
(8) Lower case
(9) Blower motor assembly

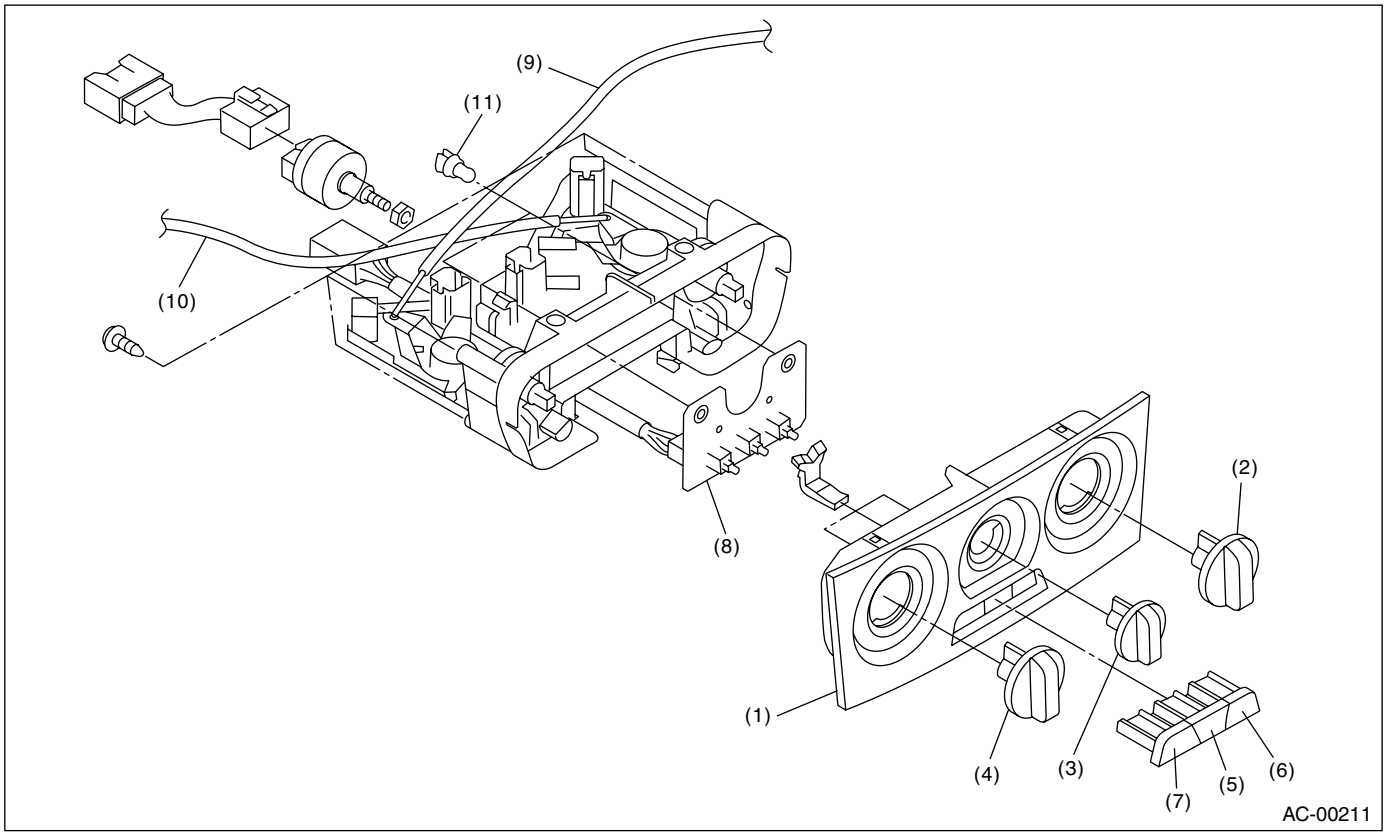
3. CONTROL UNIT

• AUTO A/C MODEL



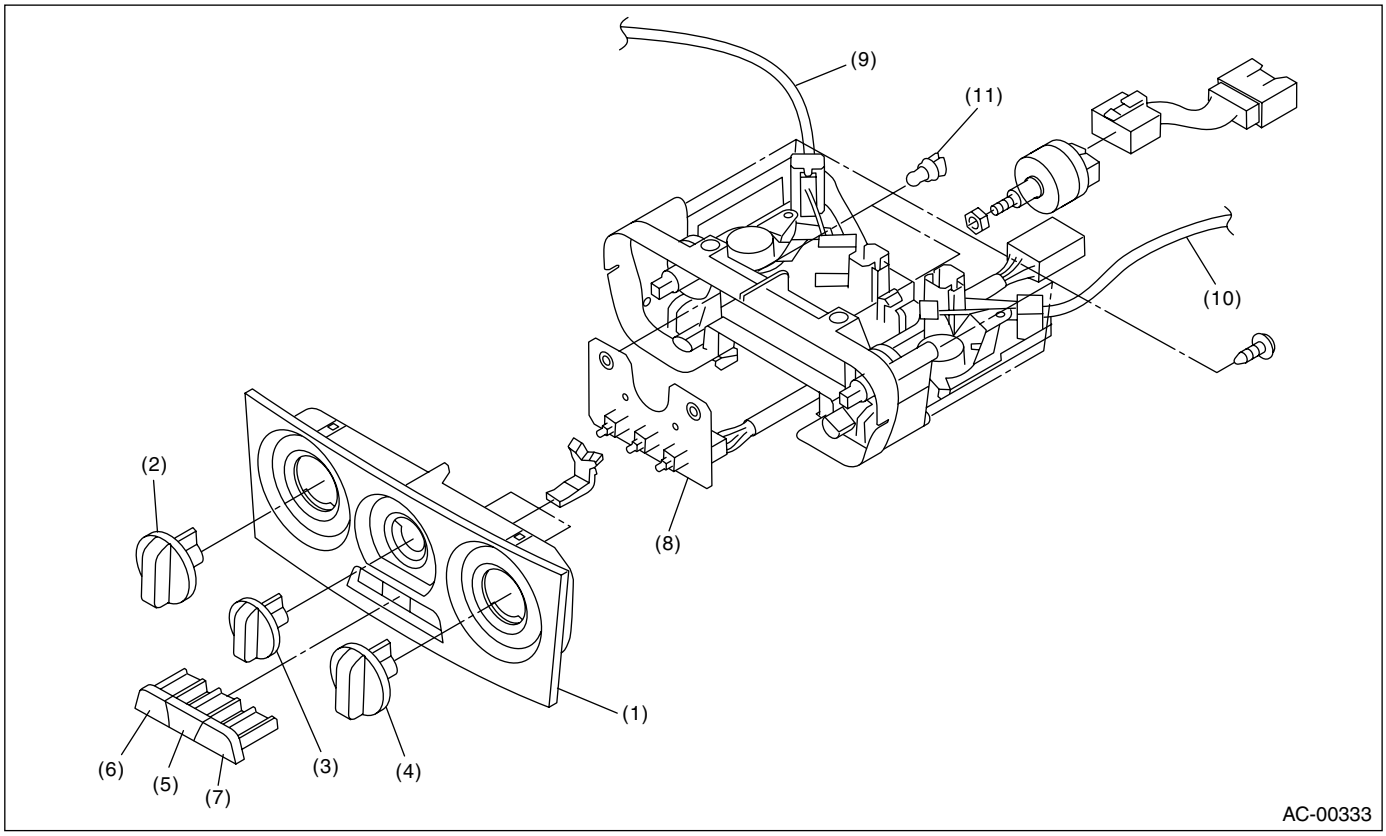
(1) Panel
(2) Control dial
(3) Switch
(4) Control case (front)
(5) Bulb
(6) Control unit circuit
(7) Control case (rear)

• LHD MODEL WITH MANUAL A/C



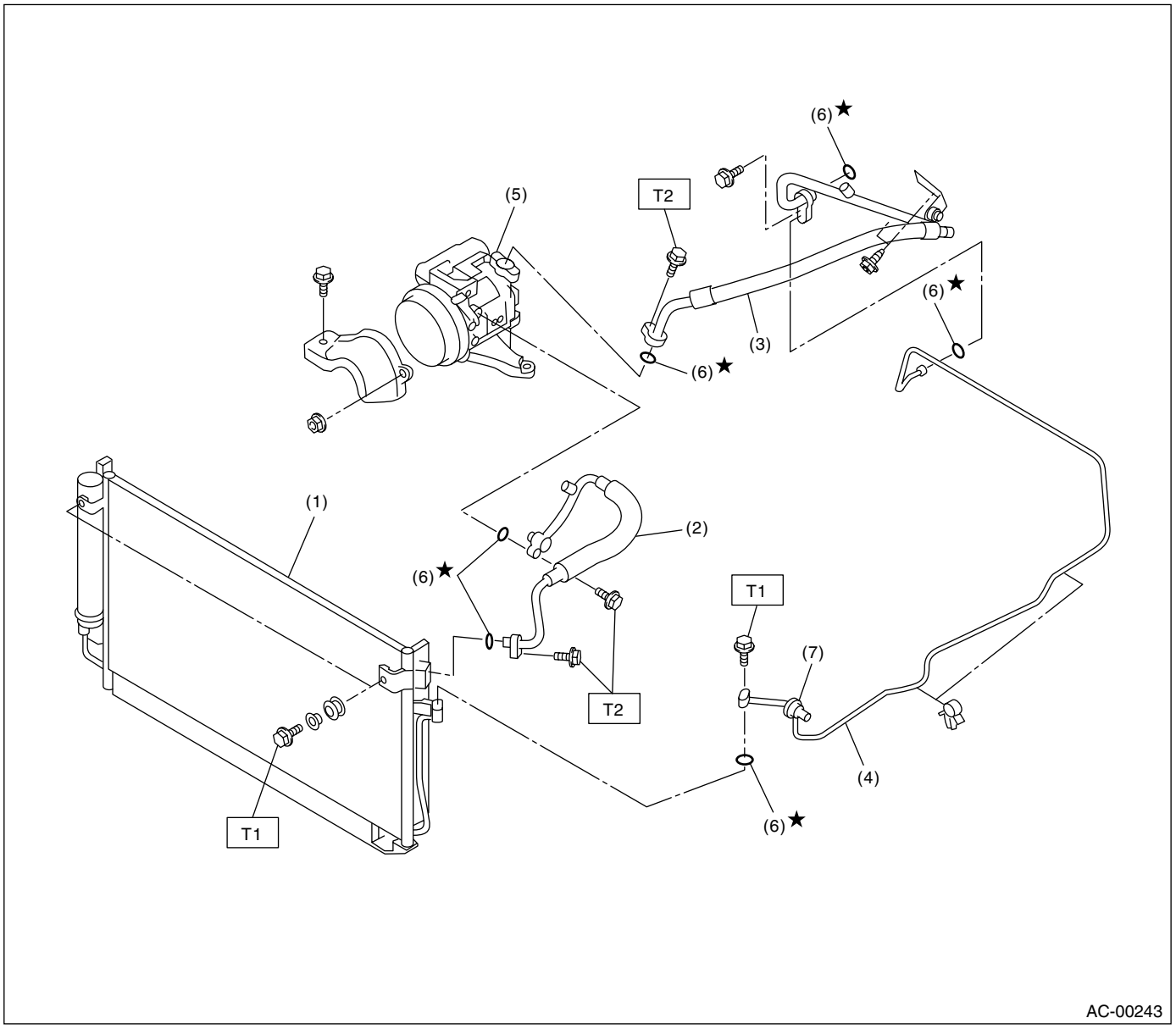
(1) Panel
(2) Mode control dial
(3) Fan dial
(4) Temperature control dial
(5) A/C button
(6) Rear defogger button
(7) Air inlet select button
(8) Switch circuit board
(9) Temperature control cable
(10) Mode control cable
(11) Bulb

• RHD MODEL WITH MANUAL A/C



(1) Panel
(2) Mode control dial
(3) Fan dial
(4) Temperature control dial
(5) A/C switch
(6) Rear defogger switch
(7) Air inlet select switch
(8) Switch circuit board
(9) Mode control cable
(10) Temperature control cable
(11) Bulb

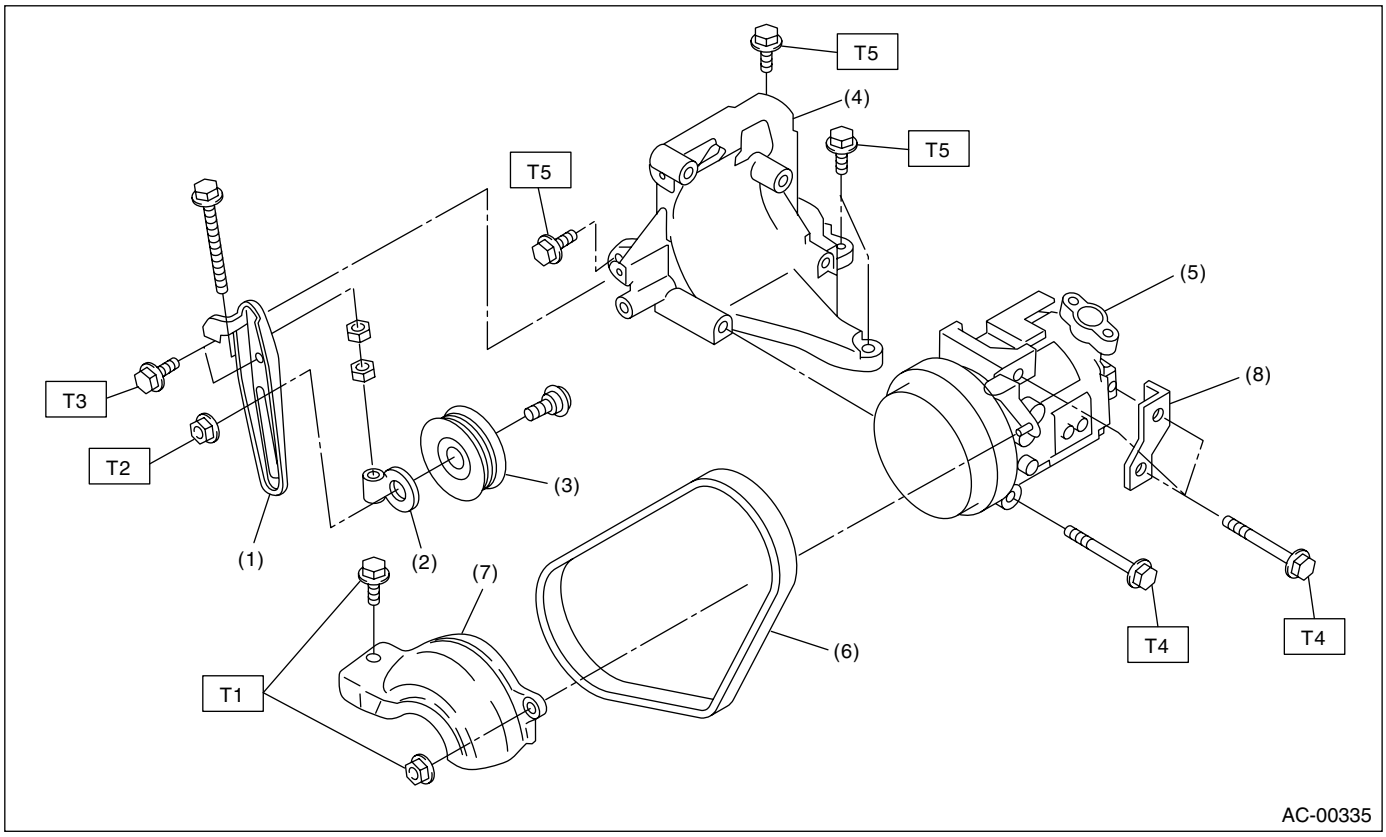
4. AIR CONDITIONING UNIT



(1) Condenser
(2) Hose (High-pressure)
(3) Hose (Low-pressure)
(4) Pipe
(5) Compressor
(6) O-ring
(7) Triple pressure switch

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.4 (0.75, 5.4)
T2: 15 (1.5, 10.8)

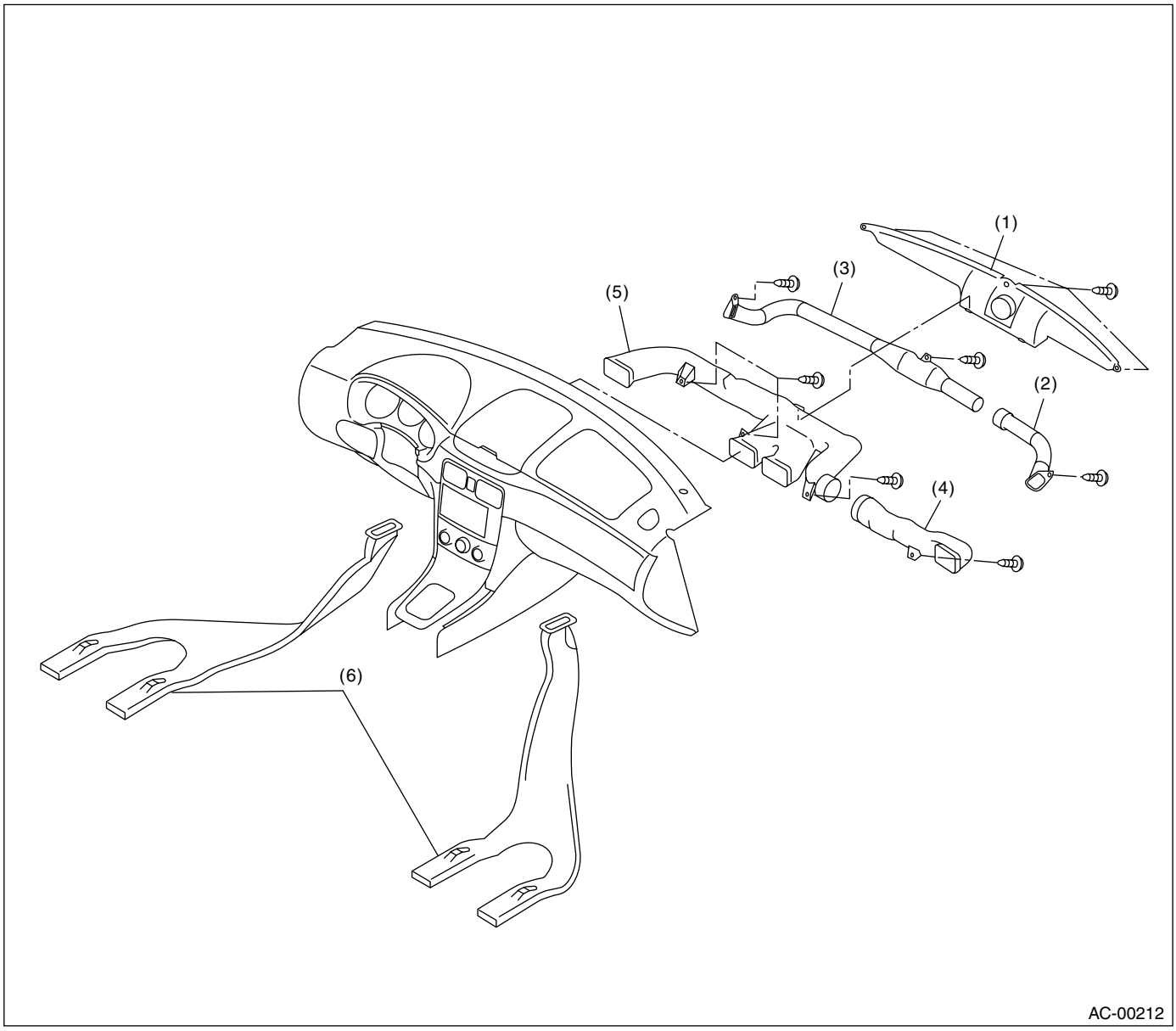
5. COMPRESSOR



(1) Idler pulley bracket
(2) Idler pulley adjuster
(3) Idler pulley
(4) Compressor bracket
(5) Compressor
(6) V-belt
(7) Compressor belt cover (Non-turbo model)
(8) Compressor stay

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.0 (0.40, 2.95)
T2: 22.6 (2.3, 16.6)
T3: 23.0 (2.35, 17.0)
T4: 28.9 (2.95, 21.3)
T5: 35 (3.6, 26)

6. HEATER DUCT

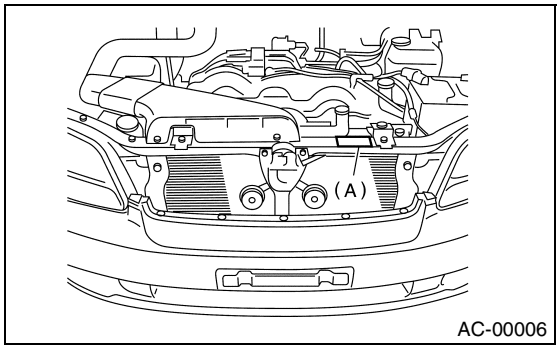


(1) Front defroster nozzle
(2) Side defroster duct (RH)
(3) Side defroster duct (LH)
(4) Side ventilation duct (RH)
(5) Side ventilation duct (LH)
(6) Rear heater duct

C: CAUTION

1. HFC-134A A/C SYSTEM

• Unlike the old conventional HFC-12 system components, the cooling system components for the HFC-134a system such as the refrigerant and compressor oil are incompatible.
• Vehicles with the HFC-134a system can be identified by the label “A” attached to the vehicle.
Before maintenance, check which A/C system is installed in the vehicle.



2. COMPRESSOR OIL

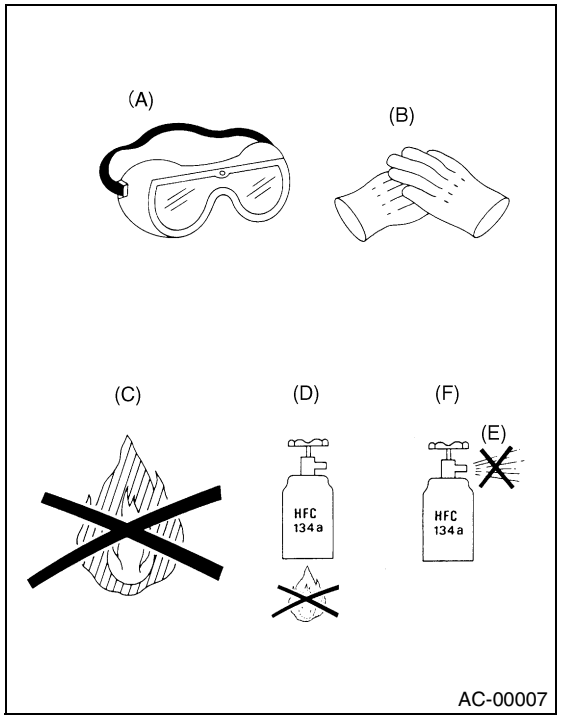
• HFC-134a compressor oil has no compatibility with that for R12 system.
• Use only the manufacturer-authorized compressor oil for the HFC-134a system; only use ZXL200PG.
• Do not mix multiple compressor oils.
If HFC-12 compressor oil is used in a HFC-134a A/C system, the compressor may become stuck due to poor lubrication, or the refrigerant may leak due to swelling of rubber parts.
On the other hand, if HFC-134a compressor oil is used in a HFC-12 A/C system, the durability of the A/C system will be lowered.
• HFC-134a compressor oil is very hygroscopic. When replacing or installing/removing A/C parts, immediately isolate the oil from the atmosphere using a plug or tape. In order to avoid moisture, store the oil in a container with its cap tightly closed.

3. REFRIGERANT

• The HFC-12 refrigerant cannot be used in the HFC-134a A/C system. The HFC-134a refrigerant, also, cannot be used in the HFC-12 A/C system.
• If an incorrect or no refrigerant is used, poor lubrication will result and the compressor itself may be damaged.

4. HANDLING OF REFRIGERANT

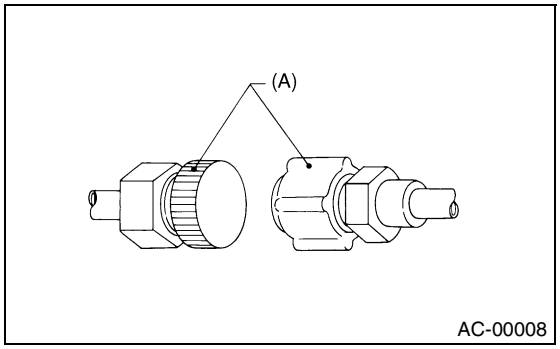
• The refrigerant boils at approx. –30°C (–22°F). When handling it, be sure to wear safety goggles and protective gloves. Direct contact of the refrigerant with skin may cause frostbite.
If the refrigerant gets into your eye, avoid rubbing your eyes with your hands. Wash your eye with plenty of water, and receive medical treatment from an eye doctor.
• Do not heat a service can. If a service can is directly heated, or put into boiling water, the inside pressure will become extremely high. This may cause the can to explode. If a service can must be warmed up, use hot water in 40°C (104°F) max.
• Do not drop or impact a service can. (Observe the precautions and operation procedure described on the refrigerant can.)
• When the engine is running, do not open the high-pressure valve of the manifold gauge. The high-pressure gas will back-flow resulting in an explosion of the can.
• Provide good ventilation and do not work in a closed area.
• In order to prevent global warning, avoid releasing HFC-134a into the atmosphere. Using a refrigerant recovery system, discharge and reuse it.



(A) Goggles
(B) Gloves
(C) Avoid open flame
(D) No direct heat on container
(E) Do not discharge
(F) Loosen

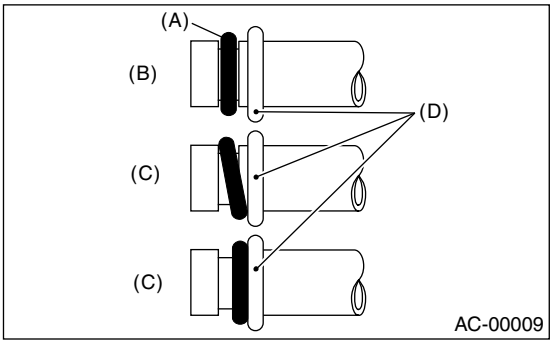
5. O-RING CONNECTIONS

- Use new O-rings.
- In order to keep the O-rings free of lint which will cause a refrigerant gas leak, perform operations without gloves and shop towels.
- Apply the compressor oil to the O-rings to avoid sticking, then install them.
- Use a torque wrench to tighten the O-ring fittings: Over-tightening will damage the O-ring and tube end distortion.
- If the operation is interrupted before completing a pipe connection, recap the tubes, components, and fittings with a plug or tape to prevent contamination from entering.



(A) Seal

- Visually check the surfaces and mating surfaces of O-rings, threads, and connecting points. If a failure is found, replace the applicable parts.
- Install the O-rings at right angle to the tube beards.

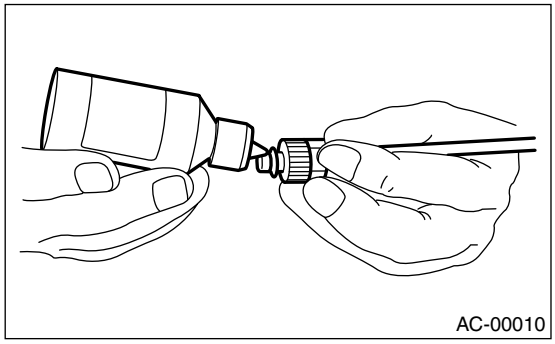


(A) O-ring
(B) OK
(C) NG
(D) Bead

- Use the oil specified in the service manual to lubricate the O-rings.

Apply the oil to the top and sides of the O-rings before installation.

Apply the oil to the area including the O-rings and tube beads.

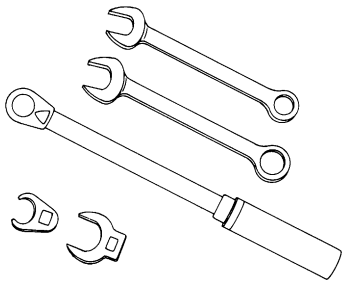
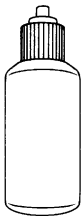
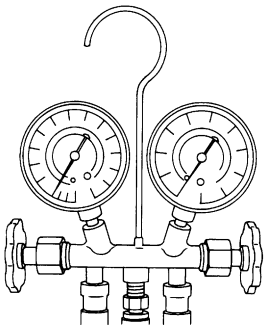
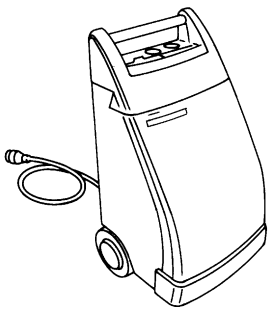
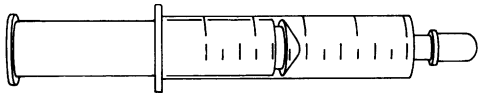


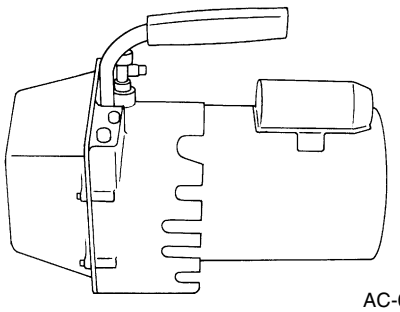
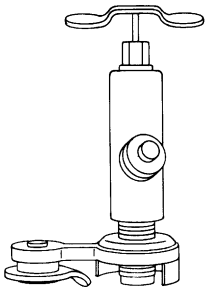
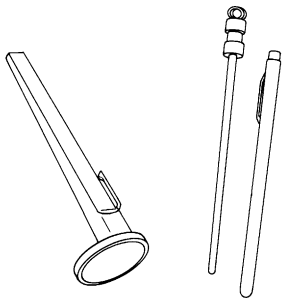
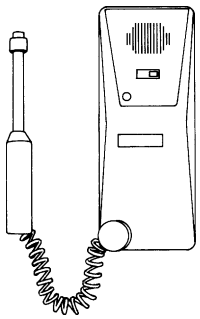
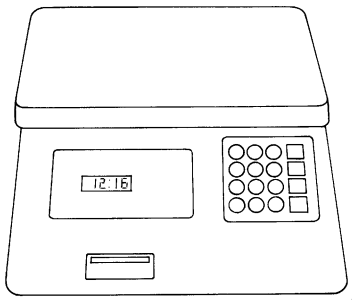
- After tightening, use a clean shop towel to remove excess oil from the connections and any oil which may have run on the vehicle body or other parts.
- If any leakage is suspected after tightening, do not retighten the connections, Disconnect the connections, remove the O-rings, and check the O-rings, threads, and connections.

D: PREPARATION TOOL

CAUTION:
When working on vehicles with the HFC-134a system, only use HFC-134a specified tools and parts. Do not mix with CFC-12 tools and parts. If HFC-134a and CFC-12 refrigerant or compressor oil is mixed, poor lubrication will result and the compressor itself may be destroyed.
In order to help prevent mixing HFC-134a and CFC-12 parts and liquid, the tool and screw type and the type of service valves used are different. The gas leak detectors for the HFC-134a and CFC-12 systems must also not be interchanged.

	HFC-134a	CFC-12
Tool & screw type	Millimeter size	Inch size
Valve type	Quick joint type	Screw-in type

Description	Tools and Equipment
 AC-00213	Wrench Various **WRENCHES** will be required to service any A/C system. A 7 to 40 N·m (0.7 to 4.1 kgf-m, 5 to 30 ft-lb) torque wrench with various crow-foot wrenches will be needed. Open end or flare nut wrenches will be needed for back-up on the tube and hose fittings.
 AC-00012	Applicator bottle A small **APPLICATOR BOTTLE** is recommended to apply refrigerant oil to the various parts. They can be obtained at a hardware or drug store.
 AC-00013	Manifold gauge set A **MANIFOLD GAUGE SET** (with hoses) can be obtained from either a commercial refrigeration supply house or from an auto shop equipment supplier.
 AC-00014	Refrigerant recovery system A **REFRIGERANT RECOVERY SYSTEM** is used for the recovery and reuse of A/C system refrigerant after contaminants and moisture have been removed from the refrigerant.
 AC-00015	Syringe A graduated plastic **SYRINGE** will be needed to add oil back into the system. The syringe can be found at a pharmacy or drug store.

Description	Tools and Equipment
 AC-00016	Vacuum pump A **VACUUM PUMP** (in good working condition) is necessary, and may be obtained from either a commercial refrigeration supply house or an automotive equipment supplier.
 AC-00017	Can tap A **CAN TAP** for the 397 g (14 oz) can is available from an auto supply store.
 AC-00018	Thermometer Pocket **THERMOMETERS** are available from either industrial hardware store or commercial refrigeration supply houses.
 AC-00019	Electronic leak detector An **ELECTRONIC LEAK DETECTOR** can be obtained from either a specialty tool supply or an A/C equipment supplier.
 AC-00020	Weight scale A **WEIGHT SCALE** such as an electronic charging scale or a bathroom scale with digital display will be needed if a 13.6 kg (30 lb) refrigerant container is used.

2. Refrigerant Pressure with Manifold Gauge Set

A: OPERATION

1) Place the vehicle in the shade and draftless condition.
2) Connect the manifold gauge set.
3) Open the front windows and close all doors.
4) Open the hood.
5) Increase the engine to 1,500 rpm.
6) Turn ON the A/C switch.
7) Turn the temperature control switch to MAX COOL.
8) Put in RECIRC position.
9) Turn the blower control switch to HI.
10) Read the gauge.

Standard:
Low pressure: 127 — 196 kPa (1.3 — 2.0 kg/cm^2, 18 — 28 psi)
High pressure: 1,471 — 1,667 kPa (15 — 17 kg/cm^2, 213 — 242 psi)
Ambient temperature: 30 — 35 °C (86 — 95 °F)

B: INSPECTION

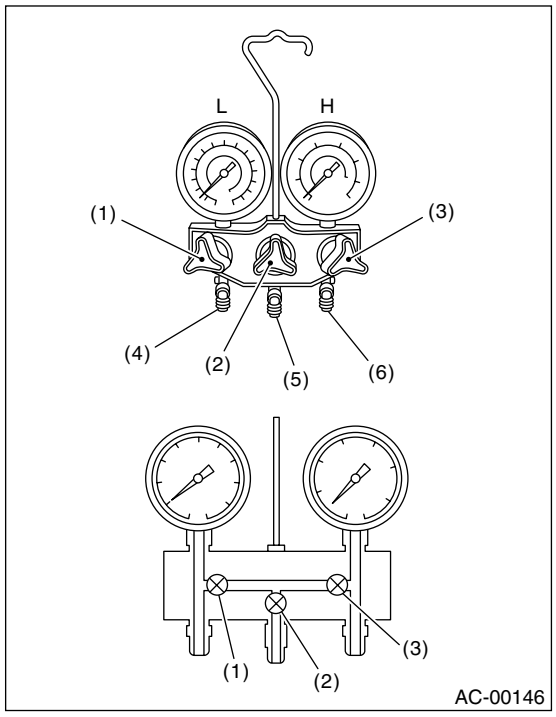
Symptom	Probable cause	Repair order
High-pressure side is unusually high.	• Defective condenser fan motor • Clogged condenser fin • Too much refrigerant • Air inside the system • Defective receiver dryer	• Replace the fan motor. • Clean the condenser fin. • Discharge refrigerant. • Replace the receiver dryer. • After reevacuating the receiver dryer, charge appropriate amount of refrigerant.
High-pressure side is unusually low.	• Defective compressor • Not enough refrigerant • Clogged expansion valve • Expansion valve frozen temporarily by moisture	• Replace the compressor. • Check for leaks. • Replace the expansion valve. • Fully evacuate the expansion valve.
Low-pressure side is unusually high.	• Defective compressor • Defective expansion valve • Too much refrigerant	• Replace the compressor. • Replace the expansion valve. • Discharge refigerant.
Low-pressure side is unusually low.	• Not enough refrigerant • Clogged expansion valve • Expansion valve frozen temporarily by moisture • Saturated receiver dryer	• Check for leaks. • Replace the expansion valve. • Replace the receiver dryer.

3. Refrigerant Recovery Procedure

A: OPERATION

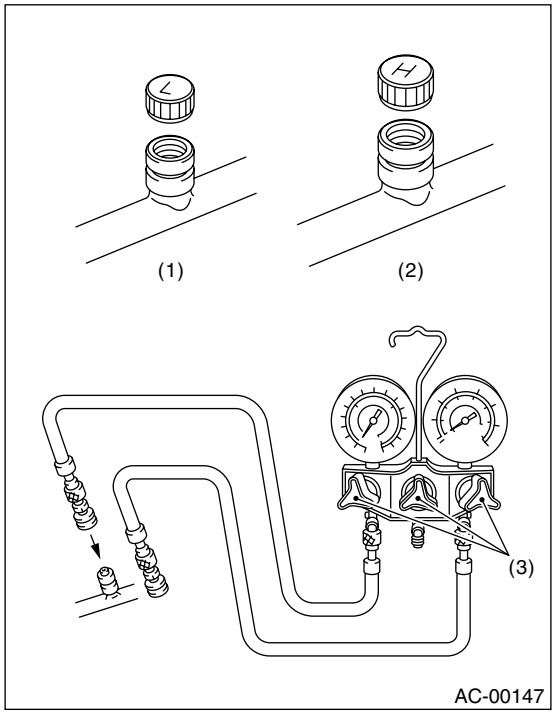
CAUTION:
• During operation, be sure to wear safety goggles and protective gloves.
• Connect the refrigerant recovery system with the manifold gauge set to discharge the refrigerant from the A/C system and reuse it.
• When reusing the discharged refrigerant, keep service cans on hand. Because the discharge rate with the recovery system is approx. 90%, service cans are necessary to charge the refrigerant.
• Follow the detailed operation procedure described in the operation manual attached to the refrigerant recovery system.

1) Perform the compressor oil return operation. <Ref. to AC-32, OPERATION, Compressor Oil.>
2) Stop the engine.
3) Make sure the valves on low-/high-pressure sides of manifold gauge set are fully closed.



L: Low-pressure gauge
H: High-pressure gauge
(1) Low-pressure valve
(2) Vacuum pump valve
(3) High-pressure valve
(4) For low-pressure
(5) For vacuum pump
(6) For high-pressure

4) Install the low-/high-pressure hoses to the service ports on the low-/high-pressure sides of the vehicle respectively.



(1) Low service port
(2) High service port
(3) Close

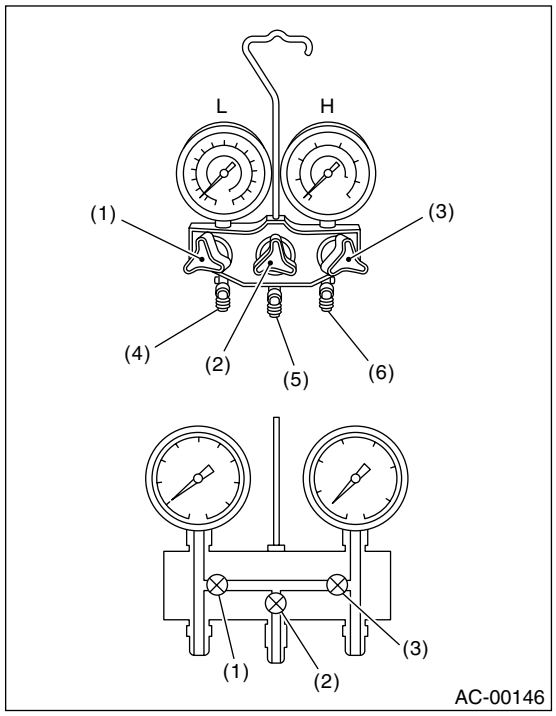
5) Connect the center hose to the refrigerant recovery system.
6) Follow the operation manual to activate the refrigerant recovery system.

4. Refrigerant Charging Procedure

A: OPERATION

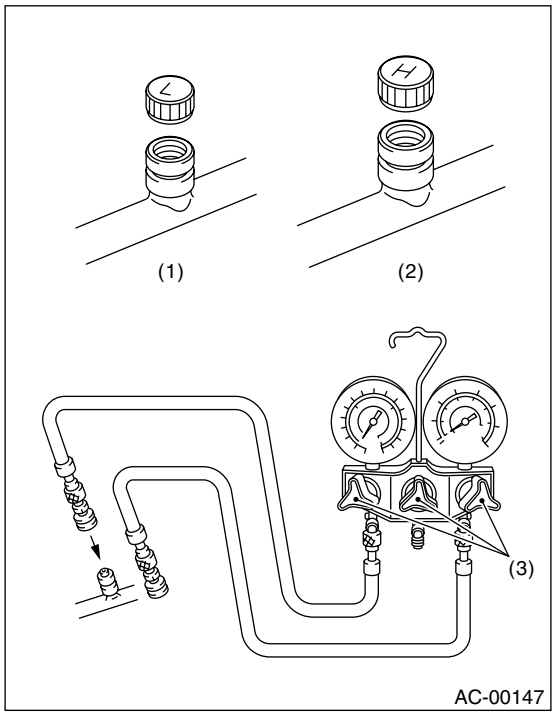
CAUTION:
• During operation, be sure to wear safety goggles and protective gloves.
• If air is mixed in refrigeration cycle, poor cooling may result, and also if moisture is mixed in refrigeration cycle, clogging (freezing) or rust may result.
Before charging the refrigerant, evacuate the system using vacuum pump to remove air and moisture in the system. Moisture can be evaporated and removed easily even at normal temperature, if the system is evacuated using vacuum pump.

1) Close all valves of manifold gauge.



L: Low-pressure gauge
H: High-pressure gauge
(1) Low-pressure valve
(2) Vacuum pump valve
(3) High-pressure valve
(4) For low-pressure
(5) For vacuum pump
(6) For high-pressure

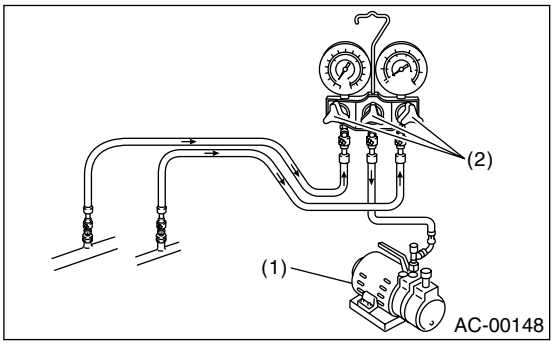
2) Install the low-/high-pressure hoses to corresponding service ports on vehicle.



(1) Low service port
(2) High service port
(3) Close

CAUTION:
Be sure that the hoses are securely connected.

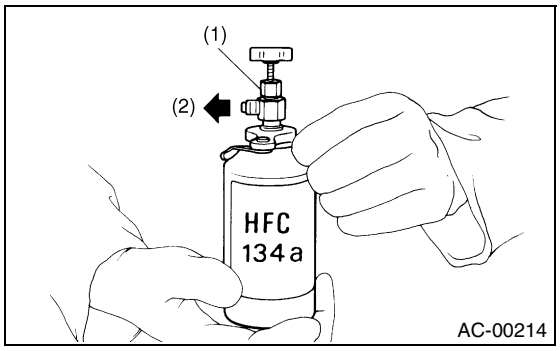
3) Connect the center hose of manifold gauge with vacuum pump.
4) Activate the vacuum pump and then open the valves on low-/high-pressure sides.



(1) Vacuum pump
(2) Open

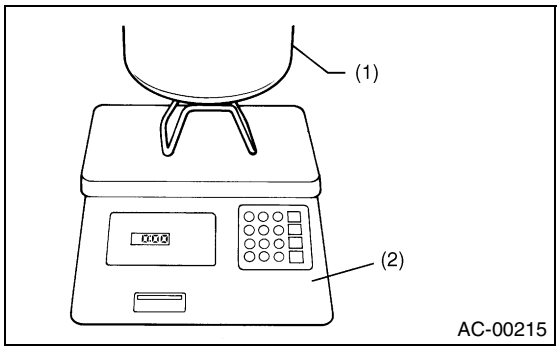
CAUTION:
Be sure to evacuate the system using vacuum pump.

5) After at least 5 minutes of evacuation, if the low-pressure gauge reading shows 100.0 kPa (750 mmHg, 29.5 inHg) or higher, close the valves on center hose to stop the vacuum pump.
6) Leave it at least 5 to 10 minutes after closing the valves on low-/high-pressure sides, and then check the low-pressure gauge reading for any changes. When the gauge reading changes, this is a sign of leakage. Check the pipe or hose connector points, and repair if necessary. Repeat the procedure from 1) after repairing the faulty part.
7) If there are no leaks, further evacuate the system 20 to 30 minutes.
8) Close all valves and stop the vacuum pump.
9) Following the can tap operation manual instructions, install it to refrigerant can.



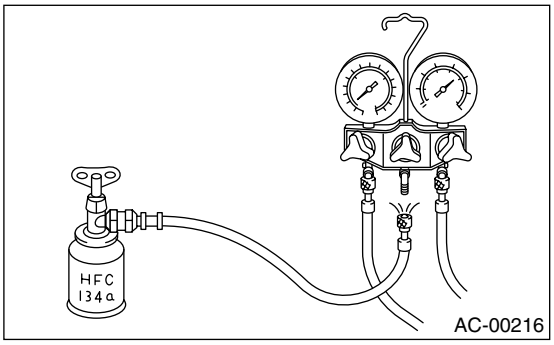
(1) Tap valve
(2) Connect to center hose

10) Disconnect the vacuum pump from center hose, and connect the hose to tap valve.
11) When a refrigerant recovery container is used, measure the refrigerant amount in use using a weighting scale before connecting to center hose.

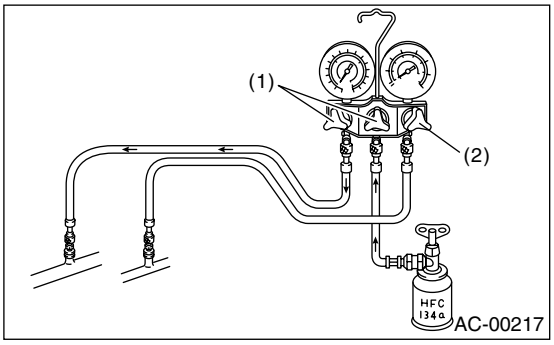


(1) Refrigerant recovery container
(2) Weighting scale

12) Open the valve on HFC-134a source.
13) Loosen the center hose connection on manifold gauge (if applicable, press a purge valve on manifold gauge) only for a couple of seconds to allow the air in the center hose to escape by the refrigerant.



14) Make sure that the high-pressure valve of manifold gauge is closed, and then open the low-pressure side valve only to charge the refrigerant.



(1) Open
(2) Close

CAUTION:
Do not open the high-pressure valve. Be sure to open the low-pressure valve.

15) Close the low-pressure valve when the low-pressure gauge reading reaches 200 kPa (1,500 mmHg, 59.1 inHg).
16) Using a leak tester, check the system for refrigerant leaks.
17) After confirming that there are no leaks with the leak test, charge the required amount of refrigerant.
18) If the HFC-134a source is empty, close the low-pressure valve and then close the valve on can tap before replacing the empty source. Restart charging operation after replacing the HFC-134a source with a new one and purging.
19) Close the low-pressure valve if the charge rate of refrigerant becomes worse.
20) Confirm that both the low-/high-pressure valves are closed. Start the engine with A/C switch OFF.

21) Quickly repeat A/C switch ON-OFF cycles a few times to prevent initial compressor damage.
22) Set up the vehicle to the following status:
- A/C switch ON
- Engine running at 1,500 rpm
- Blower speed setting to “Hi”
- Temperature setting to “MAX COOL”
- Air inlet setting to “RECIRC”
- Window open

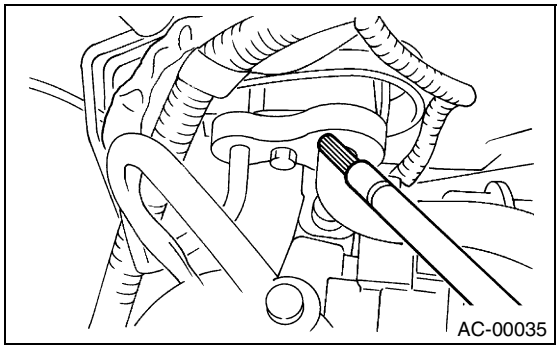
23) Open the low-pressure valve and charge the specified amount of refrigerant.
24) Close all valves and disconnect the hoses from service port after charging the refrigerant.
25) Install the cap to service port.

5. Refrigerant Leak Check

A: INSPECTION

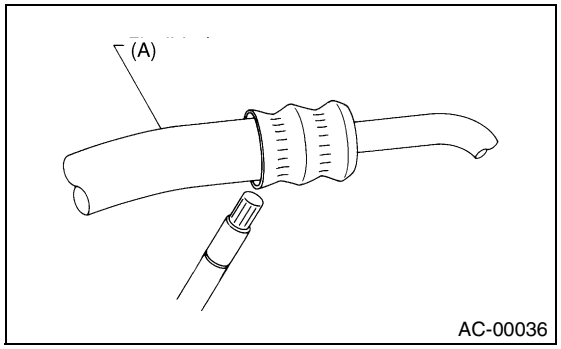
1) Operate the A/C system for approx. 10 minutes, and confirm that the high-pressure side shows at least 690 kPa (7.03 kg/cm^2, 100 psi). Then stop the engine to start the leak test.
2) Starting from the connection between the high-pressure pipe and evaporator, check the system for leaks along the high-pressure side through the compressor. The following items must be checked thoroughly.
3) Check the joint and seam between the pressure switch (triple pressure switch) and high-pressure pipe.
4) Check the connections between the condenser and pipes, and welded joints on the condenser.
The leak tester may detect the oil on the condenser fins as a leak.
5) Check the joint between the compressor and hoses.
6) Check the machined area of compressor and other joints on the compressor.
7) Check the compressor shaft seal at the area near the center of compressor clutch pulley.
Some shaft seals show a slight amount of leakage about 28 g (1.0 oz) per year. This is not a problem.
8) Starting from the connection between the low-pressure pipe and evaporator, check the system for leakage along the low-pressure side through the compressor. The following items must be checked thoroughly.

- Connection between two parts
- Connection between the pipe and plate



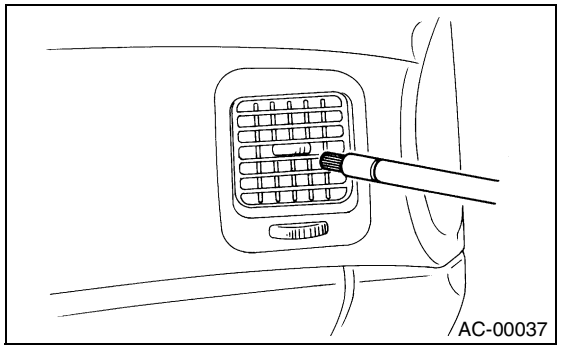
9) Visually check the rubber area of the flexible hose for cracks.
Check the entire length of the flexible hose, especially the connection with the metal hose end.

CAUTION:
Carefully check the external surface of hoses and tubes at approx. 25 mm (0.98 in) per second.



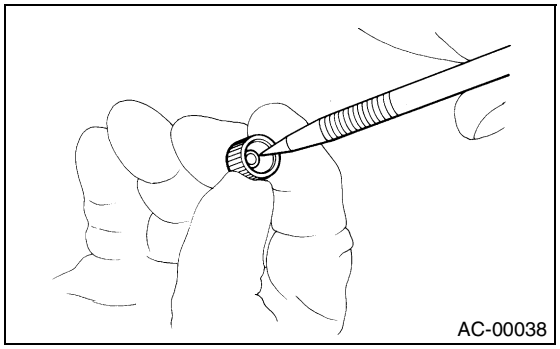
(A) Flexible hose

10) Disconnect the drain hose from the heater case, and check the hose end for at least 10 seconds.
After the test is finished, reconnect the drain hose.
11) Turn the ignition key to ON position, and run the blower at high speed for 1 minute. Stop the blower to check the ventilation grille on the instrument panel. While moving the tester closer to the grille, run the blower for 1 or 2 seconds, then stop it. Check the grille at that point for at least 10 seconds.



12) Check the valve in the service port.

13) Visually check the rubber seal in the service port cap.



6. Compressor Oil

A: OPERATION

NOTE:
Before making repairs, conduct the oil return operation to return the compressor oil in circulation with the refrigerant to the compressor.

1) Increase engine to 1,500 rpm.
2) Turn ON the A/C switch.
3) Turn the temperature control switch to MAX COOL.
4) Put in RECIRC position.
5) Turn the blower control switch to HI.
6) Leave in this condition for 10 minutes.

B: REPLACEMENT

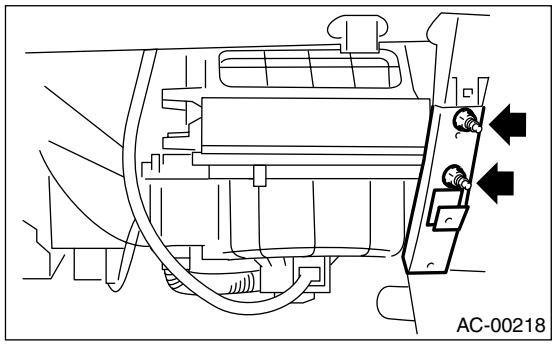
NOTE:
• If a component is replaced, add an appropriate amount of compressor oil.
• When replacing the compressor, the new compressor will already have the specified amount of oil in it. Install the new compressor after removing the same amount of oil that is remaining in the compressor removed.

Replacement parts	Amount of oil replenishment
Evaporator	Approx. 50 cm^3 (1.7 US fl oz, 1.8 Imp fl oz)
Condenser	Approx. 30 cm^3 (1.0 US fl oz, 1.1 Imp fl oz)
Hose	Approx. 10 cm^3 (0.4 US fl oz, 0.4 Imp fl oz)
Receiver dryer	Approx. 10 cm^3 (0.4 US fl oz, 0.4 Imp fl oz)

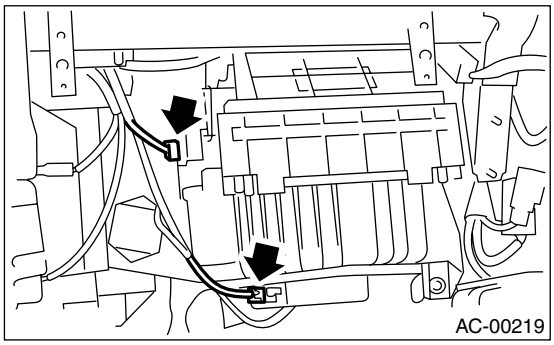
7. Blower Motor Unit Assembly

A: REMOVAL

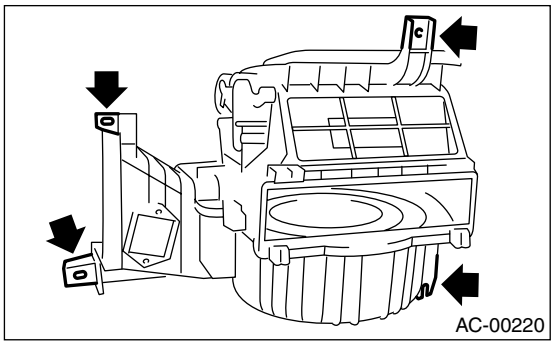
1) Disconnect the ground cable from battery.
2) Remove the glove box. <Ref. to EI-37, REMOVAL, Glove Box.>
3) Loosen the nut to remove the support beam stay.



4) Disconnect the connectors of blower motor and intake actuator resistor.



5) Loosen the bolt and nut to remove blower motor unit assembly.



B: INSTALLATION

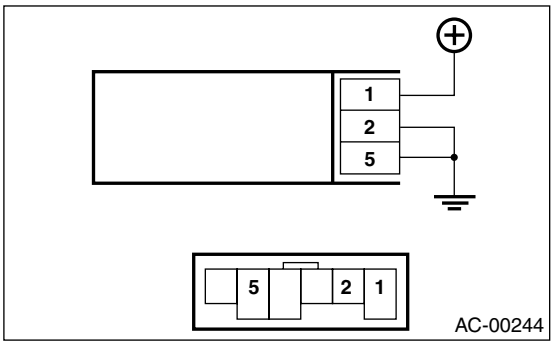
Install in the reverse order of removal.

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to AC-7, HEATER COOLING UNIT, COMPONENT, General Description.> and <Ref. to AC-11, BLOWER MOTOR UNIT, COMPONENT, General Description.>

C: INSPECTION

Inspection of Auto A/C Brush-less Motor Operation

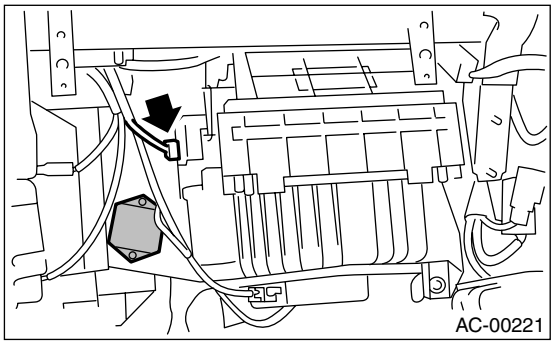
Connect the motor connector terminal 5 from the battery to the positive (+) lead and terminal 2 and 1 at the same type to the negative (–) lead. Make sure the motor runs smoothly.



8. Blower Resistor (Manual A/C Model)

A: REMOVAL

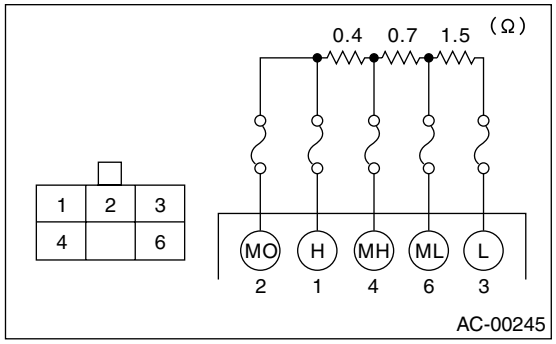
1) Remove the glove box. <Ref. to EI-37, REMOVAL, Glove Box.>
2) Disconnect the blower resistor connector.
3) Loosen the two screws to remove blower resistor.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION



Measure the blower resistor resistance.

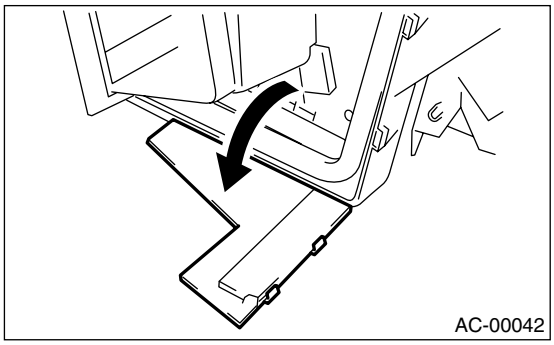
Terminal No.	Standard
3 and 6	Approx. 0.4 Ω
3 and 4	Approx. 1.1 Ω
2 and 1	Approx. 2.6 Ω

If NG, replace the blower resistor.

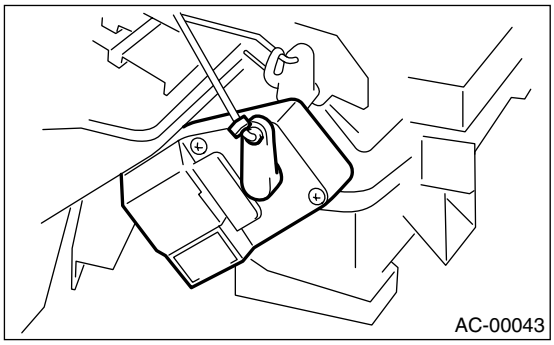
9. Heater Core

A: REMOVAL

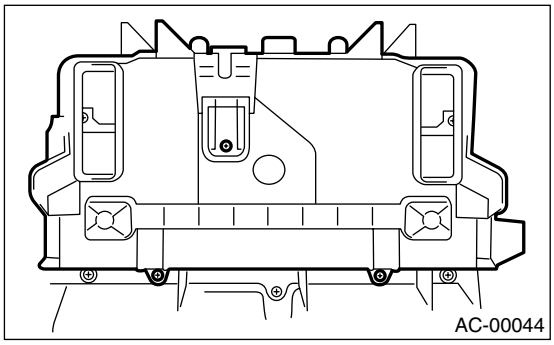
1) Remove the heater cooling unit. <Ref. to AC-41, REMOVAL, Heater Cooling Unit.>
2) Open the heater core pipe cover. (RHD model)



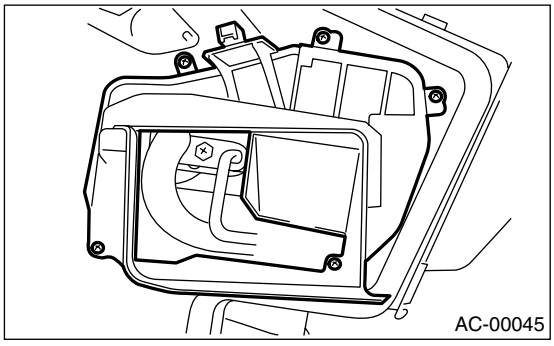
3) Loosen the screws to remove mode actuator.



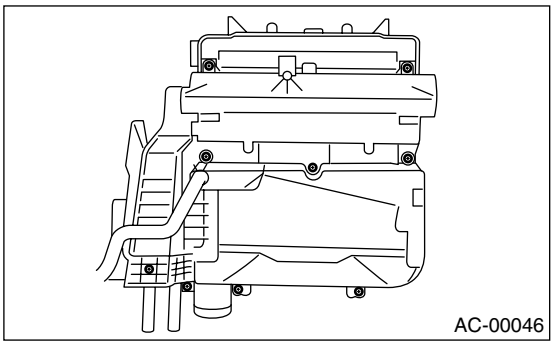
4) Loosen the screws to remove foot duct.



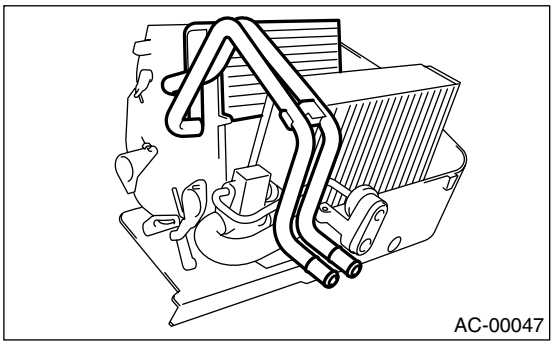
5) Loosen the screws to remove evaporator cover.



6) Loosen the screws to remove lower case.



7) Remove the heater core.



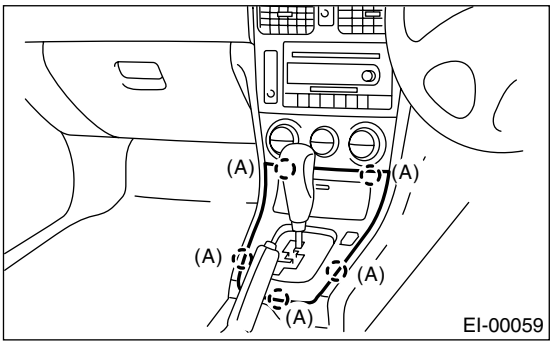
B: INSTALLATION

Install in the reverse order of removal.

10.Control Unit

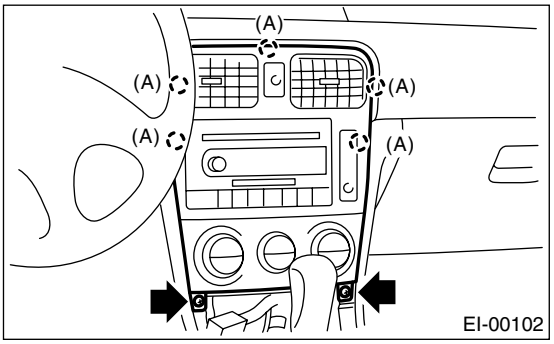
A: REMOVAL

1) Disconnect the ground cable from battery.
2) In case of manual A/C, remove the mode cable and air-mix cable from links of heater unit.
3) Remove the front cover.



(A) Hook

4) Remove the center console panel.



(A) Clip

5) Loosen the screws on rear side of center console panel, and then remove the control unit.

B: INSTALLATION

Install in the reverse order of removal.

11.Compressor

A: INSPECTION

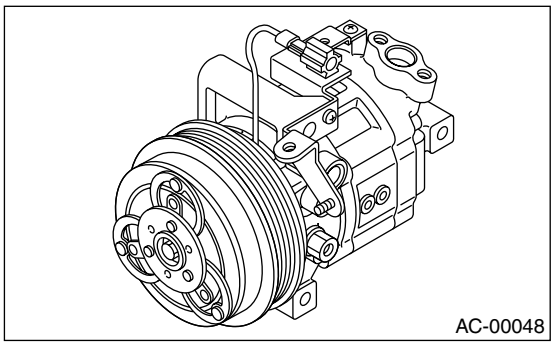
1. MAGNETIC CLUTCH CLEARANCE

1) Check the clearance of the entire circumference around the drive plate and pulley.

Standard:
0.3 — 0.6 mm (0.0118 — 0.0236 in)

2. MAGNETIC CLUTCH OPERATION

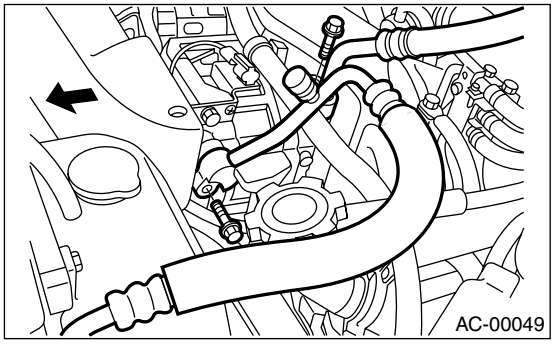
1) Disconnect the compressor connector.
2) Connect the battery positive (+) terminal to the No.3 terminal of the compressor connector.


AC-00048

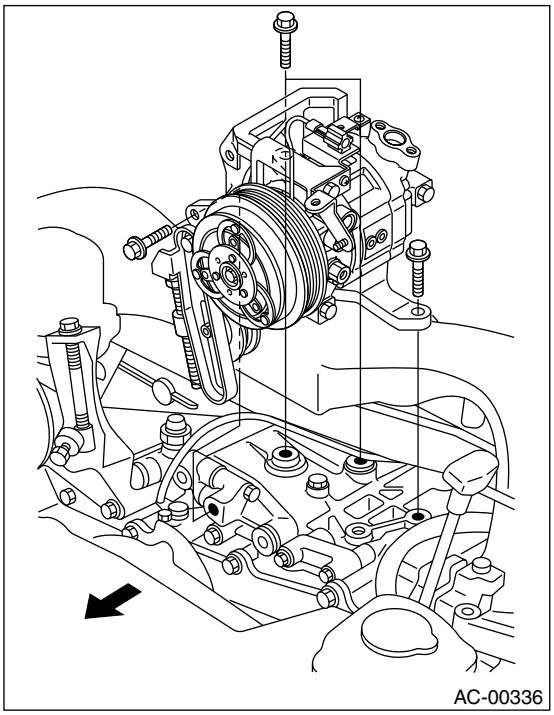
3) Make sure the magnet clutch engages.
If NG, replace the compressor.

B: REMOVAL

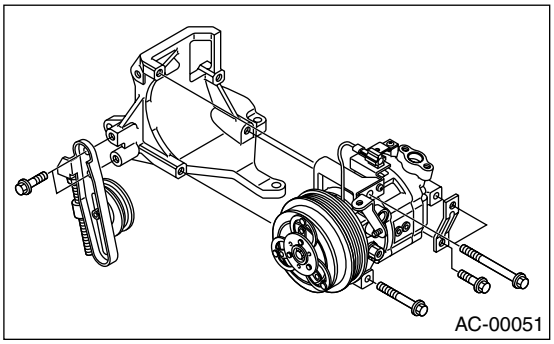
1) Perform the compressor oil return operation. <Ref. to AC-32, OPERATION, Compressor Oil.>
2) Turn the A/C switch OFF and stop the engine.
3) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-26, OPERATION, Refrigerant Recovery Procedure.>
4) Disconnect the ground cable from battery.
5) Remove the V-belt. <Ref. to ME(SOHC)-41, REMOVAL, V-belt.>
6) Remove the generator. <Ref. to SC(SOHC)-15, REMOVAL, Generator.>
7) Remove the low-pressure hose and high-pressure hose.


AC-00049

8) Disconnect the compressor harness from body harness.
9) Loosen the bolts to remove compressor bracket.


AC-00336

10) Remove the bolts and then separate compressor and bracket.


AC-00051

C: INSTALLATION

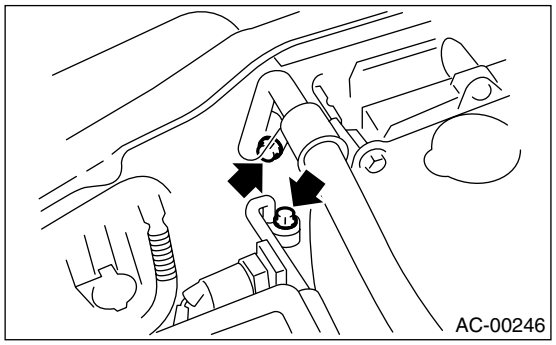
1) Install in the reverse order of removal.
2) Replace the O-rings on low-/high-pressure hoses with new ones, then apply compressor oil.
3) When replacing compressor, adjust amount of compressor oil. <Ref. to AC-32, OPERATION, Compressor Oil.>
4) Charge refrigerant. <Ref. to AC-27, OPERATION, Refrigerant Charging Procedure.>

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to AC-18, AIR CONDITIONING UNIT, COMPONENT, General Description.> and <Ref. to AC-19, COMPRESSOR, COMPONENT, General Description.>

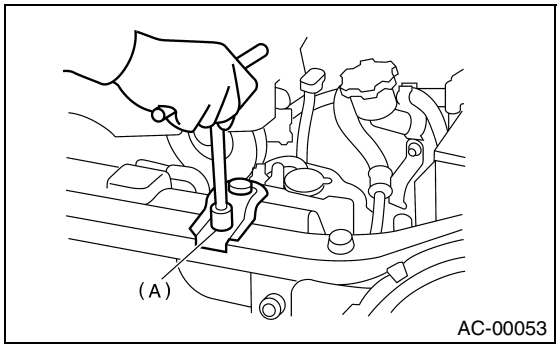
12.Condenser

A: REMOVAL

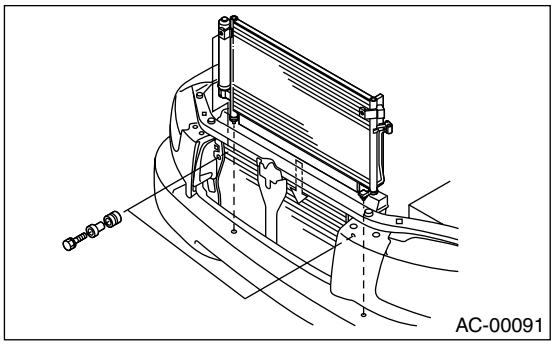
1) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-26, OPERATION, Refrigerant Recovery Procedure.>
2) Disconnect the ground cable from battery.
3) Disconnect the pressure hose and pipe from condenser.



4) Remove the radiator bracket (A).



5) Remove the two bolts. While lifting the condenser, pull it out through the space between radiator and radiator panel.

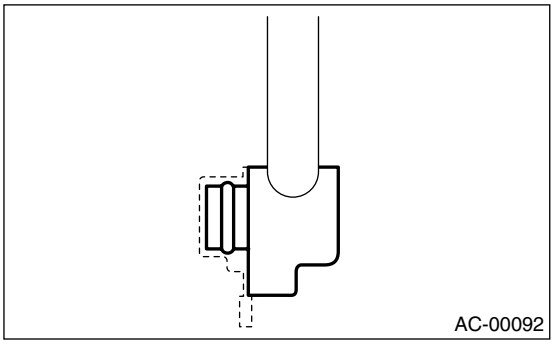


CAUTION:
Be careful not to damage the radiator fins and condensor fins. If a damaged fin is found, repair it using a thin screwdriver.
If the condenser is replaced, add appropriate amount of compressor oil to the compressor. <Ref. to AC-32, REPLACEMENT, Compressor Oil.>

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
Replace the O-rings on hoses or pipes with new ones, and then apply compressor oil. Confirm that lower guide of condenser has been fitted into holes on radiator panel.



2) Charge refrigerant. <Ref. to AC-27, OPERATION, Refrigerant Charging Procedure.>

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to AC-18, AIR CONDITIONING UNIT, COMPONENT, General Description.> and <Ref. to CO(SOHC)-5, RADIATOR AND RADIATOR FAN, COMPONENT, General Description.>

C: INSPECTION

1) Confirm that no dust or insects are found on the condenser fins. Air-blow or flush fins with water as needed.
2) Confirm that no oil leaks from condenser. If a failure is found, replace the condenser with a new one.

13.Condenser Fan (Sub Fan)

A: REMOVAL

<Ref. to CO(SOHC)-34, REMOVAL, Radiator Main Fan and Fan Motor.>

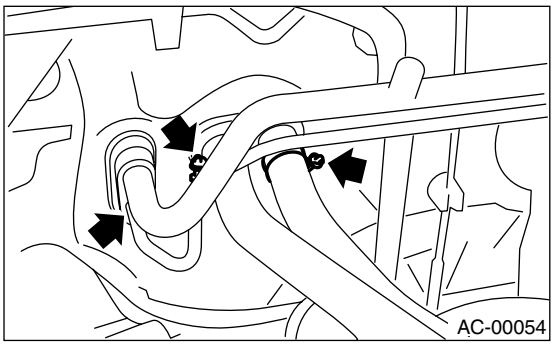
B: INSTALLATION

<Ref. to CO(SOHC)-36, INSTALLATION, Radiator Main Fan and Fan Motor.>

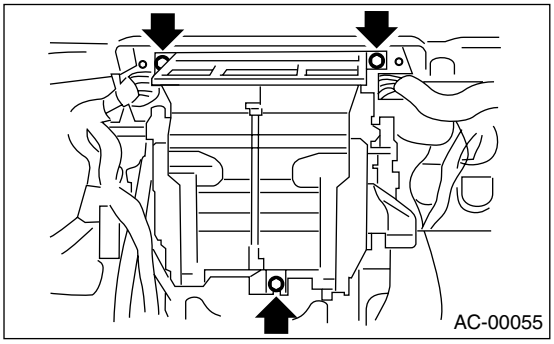
14.Heater Cooling Unit

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-26, OPERATION, Refrigerant Recovery Procedure.>
3) Drain LLC from the radiator.
4) Remove the A/C pipe of toe board. Release the heater hose clamps in engine compartment to remove the hoses.



5) Remove the instrument panel. <Ref. to EI-40, REMOVAL, Instrument Panel Assembly.>
6) Remove the support beam.
7) Remove the blower motor unit assembly. <Ref. to AC-33, REMOVAL, Blower Motor Unit Assembly.>
8) Disconnect the servo motor connectors.
9) Loosen the bolt and nuts to remove the heater and cooling unit.



B: INSTALLATION

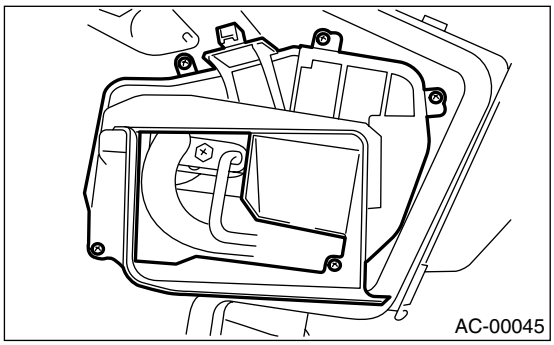
1) Install in the reverse order of removal.
2) Charge refrigerant. <Ref. to AC-27, OPERATION, Refrigerant Charging Procedure.>

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to AC-7, HEATER COOLING UNIT, COMPONENT, General Description.>

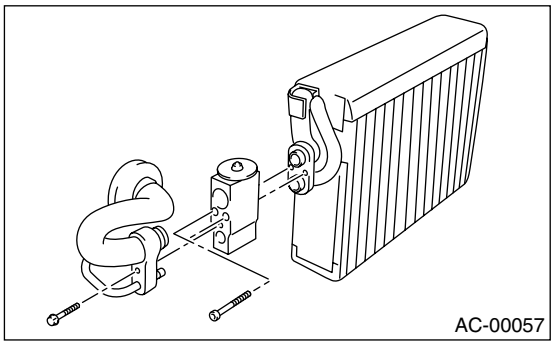
15.Evaporator

A: REMOVAL

1) Disconnect the refrigerant recovery & toe board area A/C pipe.<Ref. to AC-26, OPERATION, Refrigerant Recovery Procedure.>
2) Remove the glove box.
3) Remove lower motor unit assembly.<Ref. to AC-33, REMOVAL, Blower Motor Unit Assembly.>
4) Loosen the screws and remove evaporator cover.


AC-00045

5) Remove the A/C pipes in unit.
6) Rotate the upper evaporator core and lower evaporator core tilt toward the front vehicle and toward the interior, respectively. Then pull out the heater case to left side.
7) Loosen the two bolts to remove expansion valve.


AC-00057

CAUTION:
If the evaporator is replaced, add appropriate amount of compressor oil to evaporator. <Ref. to AC-32, REPLACEMENT, Compressor Oil.>

B: INSTALLATION

Install in the reverse order of removal.

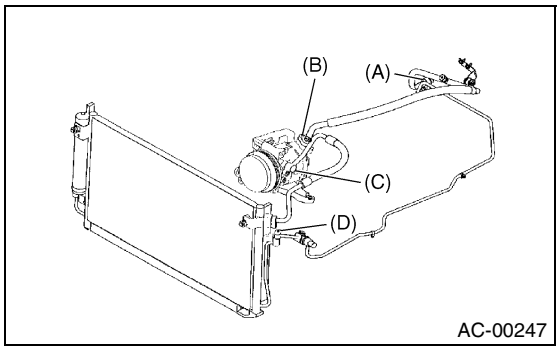
NOTE:
Replace the o-ring for refrigerant recovery & toe board area air conditioner pipe with a new one, and then apply compressor oil.

16.Hose and Tube

A: REMOVAL

CAUTION:
• When disconnecting/connecting hoses, do not apply excessive force to them. Confirm that no torsion and excessive tension exists after installing.
• Seal the disconnected hose with a plug or vinyl tape to prevent contamination from entering.

1) Disconnect the ground cable from battery.
2) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-26, OPERATION, Refrigerant Recovery Procedure.>
3) Remove the evaporator unit mounting bolt (A).
4) Remove the low-pressure hose attaching bolts (B).
5) Disconnect the low-pressure hose from evaporator unit.
6) Disconnect the low-pressure hose from compressor.
7) Remove the low-pressure hose from vehicle.
8) Remove the high-pressure hose attaching bolts (C).
9) Disconnect the high-pressure hose from compressor.
10) Disconnect the high-pressure hose from condenser.
11) Remove the high-pressure tube attaching bolt (D).
12) Remove the high-pressure tube from vehicle.



B: INSTALLATION

CAUTION:
• When disconnecting/connecting hoses, do not apply an excessive force to them. Confirm that no torsion and excessive tension exists after installing.
• Seal the disconnected hose with a plug or vinyl tape to prevent contamination from entering.
• Replace the o-rings for hoses and pipes with new ones, and then apply compressor oil.

1) Install in the reverse order of removal.
2) Charge refrigerant. <Ref. to AC-27, OPERATION, Refrigerant Charging Procedure.>

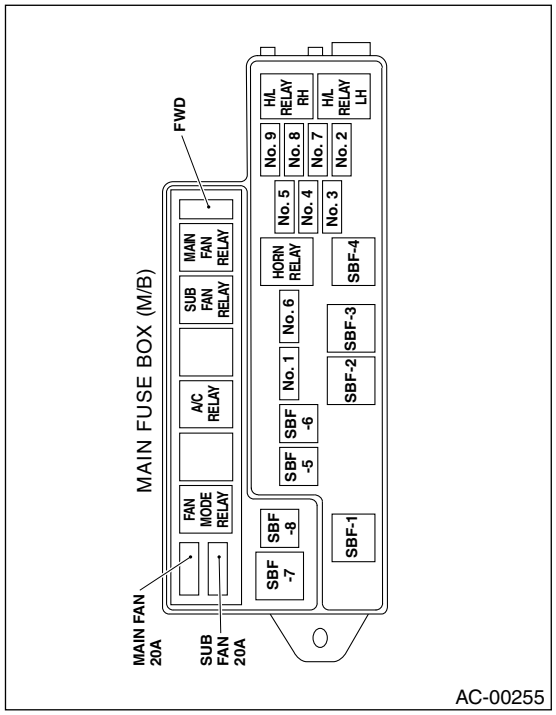
Tightening torque:
Refer to COMPONENT in General Description. <Ref. to AC-18, AIR CONDITIONING UNIT, COMPONENT, General Description.>

C: INSPECTION

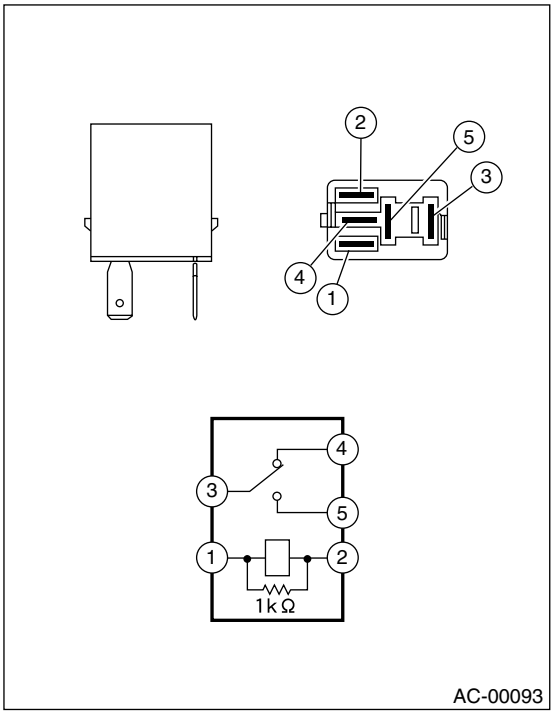
NOTE:
If cracking, damage, or swelling is found on a hose, replace it with a new one.

17.Relay and Fuse

A: LOCATION



B: INSPECTION



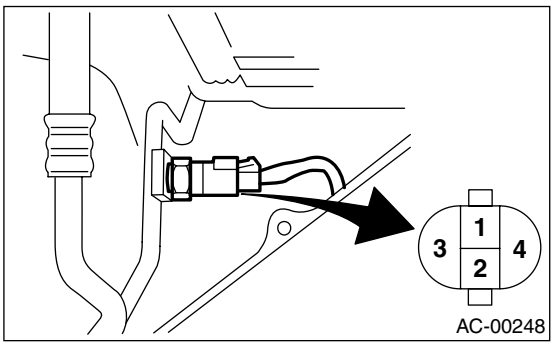
(1) — (2): Continuity exists.
(3) — (4): Continuity exists.
(3) — (5): No continuity.
While applying battery voltage to the terminal between (1) and (2), check continuity between (3) and (5).
If no continuity exists, replace the relay with a new one.

18.Pressure Switch (Triple Pressure Switch)

A: INSPECTION

1) Connect the manifold gauge to the service valve on the high-pressure side.

2) Remove the pressure switch harness connector. Using a circuit tester, inspect the ON-OFF operation of the pressure switch.

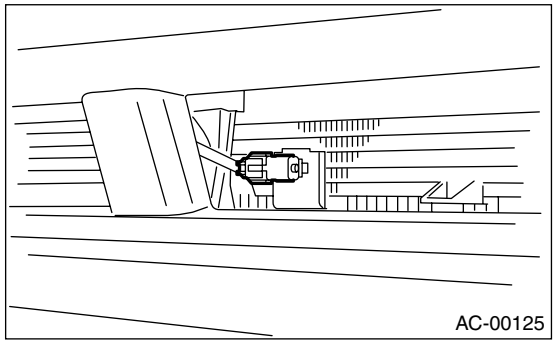


	Terminal No.	Operation	Standard kPa (kg/cm^2, psi)
High and low pressure switch	1 and 2	Turns off.	Pressure increases up to 2,940±200 (30.0±2, 427±28).
			Pressure decreases down to 177±25 (1.8±0.3, 26±4).
		Turns on.	Pressure increases up to 206±30 (2.1±0.3, 30±4).
			Pressure decreases down to 2,350±200 (24±2, 341±28).
Middle pressure switch	3 and 4	Turns off.	Pressure decreases down to 1,370±120 (14±1, 199±14).
		Turns on.	Pressure increases up to 1,770±100 (18±1, 256±14).

19.Ambient Sensor (Auto A/C Model)

A: REMOVAL

1) Open the front hood.
2) Disconnect the ground cable from battery.
3) Disconnect the ambient sensor connector.
4) Remove the ambient sensor from radiator lower panel.



B: INSTALLATION

Install in the reverse order of removal.

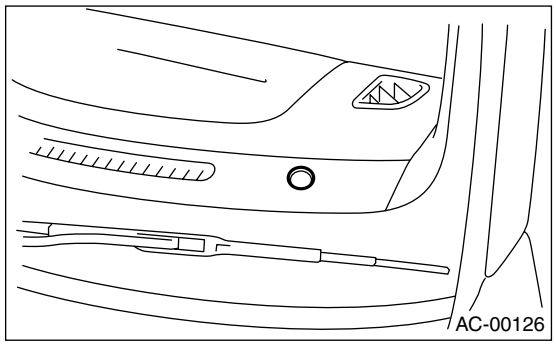
C: INSPECTION

<Ref. to AC-33, AMBIENT SENSOR, Diagnostic Procedure for Sensors.>

20.Sun-load Sensor (Auto A/C Model)

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Disconnect the sunload sensor connector (A).



CAUTION:
Be careful not to damage the sensors and interior trims when removing them.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

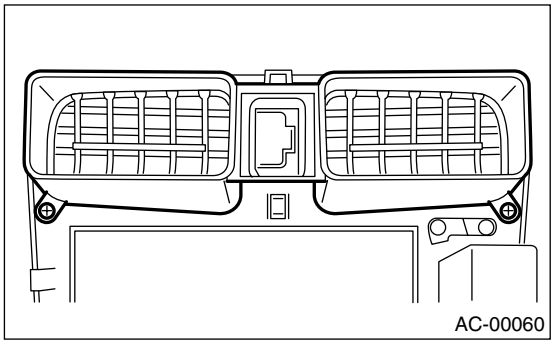
<Ref. to AC-41, SUNLOAD SENSOR, Diagnostic Procedure for Sensors.>

21.Air Vent Grille

A: REMOVAL

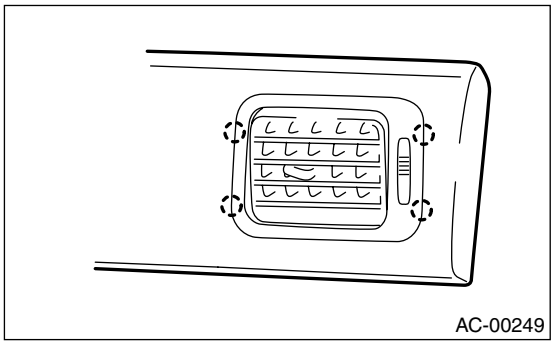
1. CENTER GRILLE

1) Disconnect the ground cable from battery.
2) Remove the center console panel. <Ref. to EI-40, REMOVAL, Instrument Panel Assembly.>
3) Loosen the two screws to remove the center air vent grille.


AC-00060

2. SIDE GRILLE

1) Remove the side vent grille by prying four points.


AC-00249

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

The direction and amount of air should be adjusted smoothly.
The adjustment should be kept in each position.

22.Heater Duct

A: REMOVAL

1) Remove the front seat. <Ref. to SE-5, REMOVAL, Front Seat.>
2) Remove the front side sill cover.
3) Pull off the floor mat, which is connected to remove the cover heater unit and heater duct, and then remove the heater duct.

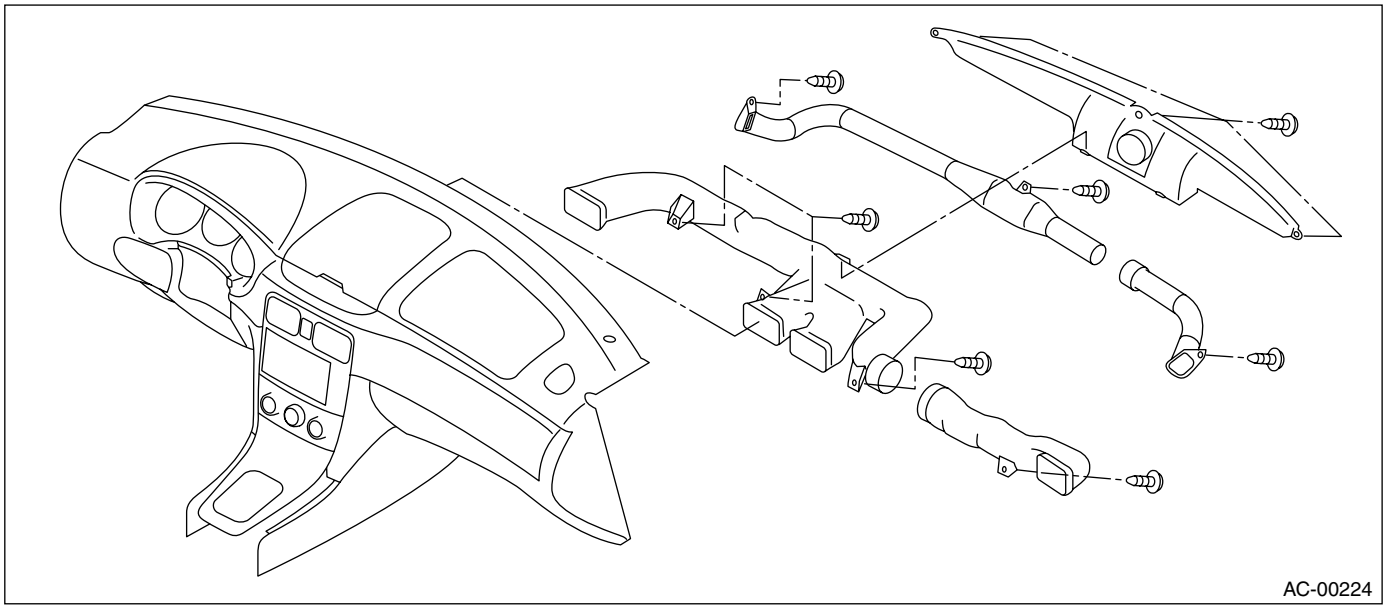
B: INSTALLATION

Install in the reverse order of removal.

23.Heater Vent Duct

A: REMOVAL

1) Remove the instrument panel. <Ref. to EI-40, REMOVAL, Instrument Panel Assembly.>
2) Remove the screws.
3) Remove the heater vent duct.



B: INSTALLATION

Install in the reverse order of removal.

24.General Diagnostics

A: INSPECTION

Symptom		Repair order
Blower motor	Does not run.	Fuse
		Blower motor relay
		Wire harness
		Blower motor
		Blower motor resistor (Manual A/C model)
		Blower switch
	Abnormal noise	Blower motor
Compressor	Does not run.	Refrigerant
		Fuse
		Air conditioning relay
		Wire harness
		Magnet clutch
		Compressor
		Pressure switch
		A/C switch
		Blower switch
	Abnormal noise	V-Belt
		Magnet clutch
		Compressor
Condensor fan	Does not run.	Fuse
		Sub fan relay
		Wire harness
	Abnormal noise	Condenser fan motor
Cold air not emitted.		Refrigerant
		V-Belt
		Magnet clutch
		Compressor
		Pressure switch
		Blower fan relay, Blower motor
		A/C switch
		Blower switch
		Wire harness
		Heater duct
		Heater vent duct
		Control unit
		Expansion valve
		Evaporator
		Air mix actuator (Auto A/C), Temerature control cable (Manual A/C)
Warm air not emitted.		Engine coolant
		Aspirator hose
		Blower switch
		Air mix actuator (Auto A/C), Temerature control cable (Manual A/C)
		Heater core
Temperature of air from vents does not change.		Wire harness
		Air mix actuator (Auto A/C), Temerature control cable (Manual A/C)
		Temperature adjustment switch

Symptom	Repair order
Unable to switch blow vents.	Wire harness
	Mode actuator (Auto A/C), Mode control cable (Manual A/C)
	Mode switch
Unable to switch suction vents.	Wire harness
	FRESH/RECIRC actuator
	Air inlet select switch

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

AC

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4.	A/C Control Module I/O Signal	8
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1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Value	Yes	No
1	**START INSPECTIONS.** 1)Perform the pre-inspection. <Ref. to AC-3, INSPECTION, General Description.> 2)Perform the self-diagnosis. <Ref. to AC-10, OPERATION, Self-diagnosis.> Does the self-diagnosis operate?	Self-diagnosis operates.	Go to step **2.**	<Ref. to AC-13, A/C AND/OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE, Diagnostics for A/C System Failure.>
2	**CONFIRM MALFUNCTION PART.** Confirm the malfunction part with self-diagnosis. Can the malfunction part be confirmed?	Malfunction part can be confirmed.	Repair the malfunction part according to each diagnostics chart.	Go to step **3.**
3	**CHECK COMPARTMENT TEMPERATURE.** 1)Turn the A/C switch ON. 2)Set the temperature at maximum cold position. 3)Check the compartment temperature changes. Is the compartment temperature changed?	Temperature changes.	Go to step **4.**	<Ref. to AC-17, COMPARTMENT TEMPERATURE IS NOT CHANGED OR A/C SYSTEM DOES NOT RESPOND QUICKLY, Diagnostics for A/C System Failure.>
4	**CHECK A/C SYSTEM RESPONSE.** Change the temperature setting, and check the response of A/C system. Does the A/C system respond quickly?	A/C syastem responds.	A/C system is OK.	<Ref. to AC-17, COMPARTMENT TEMPERATURE IS NOT CHANGED OR A/C SYSTEM DOES NOT RESPOND QUICKLY, Diagnostics for A/C System Failure.>

2. General Description

A: CAUTION

1) Never connect the battery in reverse polarity.
• The Auto A/C control module will be destroyed instantly.
2) Do not disconnect the battery cables while the engine is running.
• A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as A/C control module.
3) Before disconnecting the connectors of each sensor and the A/C control module, be sure to turn off the ignition switch.
• Otherwise, the Auto A/C control module may be damaged.
4) Every Auto A/C-related part is a precision part. Do not drop them.
5) Airbag system wiring harness is routed near the A/C control panel (A/C control module) and junction box.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the A/C control panel (A/C control module) and junction box.

B: INSPECTION

Before performing diagnosis, check the following items which might affect A/C system problems.

1. BATTERY

1) Measure the battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V

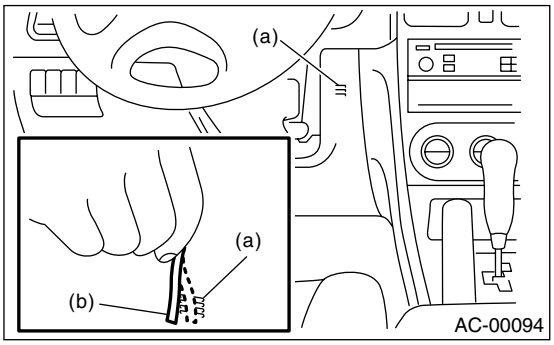
Specific gravity: Above 1.260

2) Check the condition of the fuses for A/C, heater and other fuses.
3) Check the condition of the harnesses and harness connectors connection.

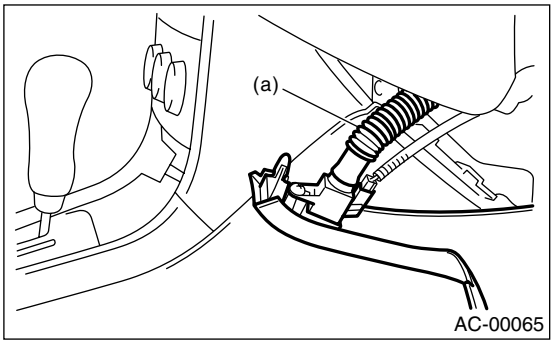
2. ASPIRATOR HOSE

1) Turn the ignition switch to ON.
2) Turn the temperature control dail to maximum hot position.
3) Turn the air flow control dial to “DEF” position.
4) Turn the fan speed control dial to 4th position.
5) Firmly hold a thin thread (b) in front of the in-vehicle sensor suction port (a) for the auto A/C control unit and check that the thread moves towards the port indicating that air is being sucked into the port.

NOTE:
Ensure the thread does not get sucked into the port.

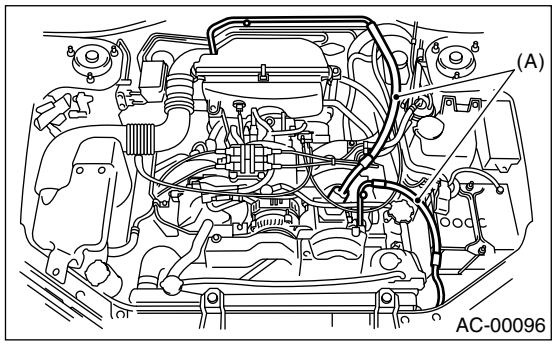


6) If the thread does not move at all, remove the lower cover <Ref. to AC-36, REMOVAL, Control Unit.> and check for improper connection of the aspirator hose (a), lower cover and heater unit and secure as necessary.



3. REFRIGERANT LINE

Check contact for refrigerant line (A) and high-pressure pipe.



4. CONTROL LINKAGE

1) Check the state of mode door linkage.
2) Check the state of air mix door linkage.
3) Check the state of intake door linkage.

5. CONTROL SWITCHES

Start and warm up the engine completely.
1) Inspection using switches.

No.	Point to check	Switch operation	Judgement standard
1	Fan speed control dial	Turn the fan speed control dial clockwise.	Fan speed changes as dial turn.
2	AUTO switch and temperature control dial	A. AUTO switch: ON B. Temperature control dial maximum cold position	• Outlet air: Cool • Fan speed: 4th • Compressor: AUTO • Outlet: VENT • Inlet: RECIRC
		C. Turn the temperature control dial from maximum cold position to maximum hot position gradually.	• Outlet air: Cool → Hot • Fan speed: AUTO • Compressor: AUTO • Outlet: AUTO • Inlet: AUTO
		D. Temperature control dial maximum hot position	• Outlet air: Hot • Fan speed: 4th • Compressor: AUTO • Outlet: HEAT • Inlet: FRESH
3	Mode control dial	Turn the mode control dial clockwise.	Air flow outlet changes from VENT → BI-LEVEL → HEAT → DEF/HEAT.
4	FRESH/RECIRC switch	Push the FRESH/RECIRC.	Air flow inlet changes from RECIRC → FRESH, or FRESH → RECIRC.
5	DEF switch	Push the DEF.	• Outlet air: AUTO • Fan speed: AUTO • Compressor: ON • Outlet: DEF • Inlet: FRE

2) Compressor operation inspection

No.	Point to check	Switch operation	Judgement standard
1	Compressor	A. A/C switch ON B. Turn the fan speed control clockwise.	Compressor: ON

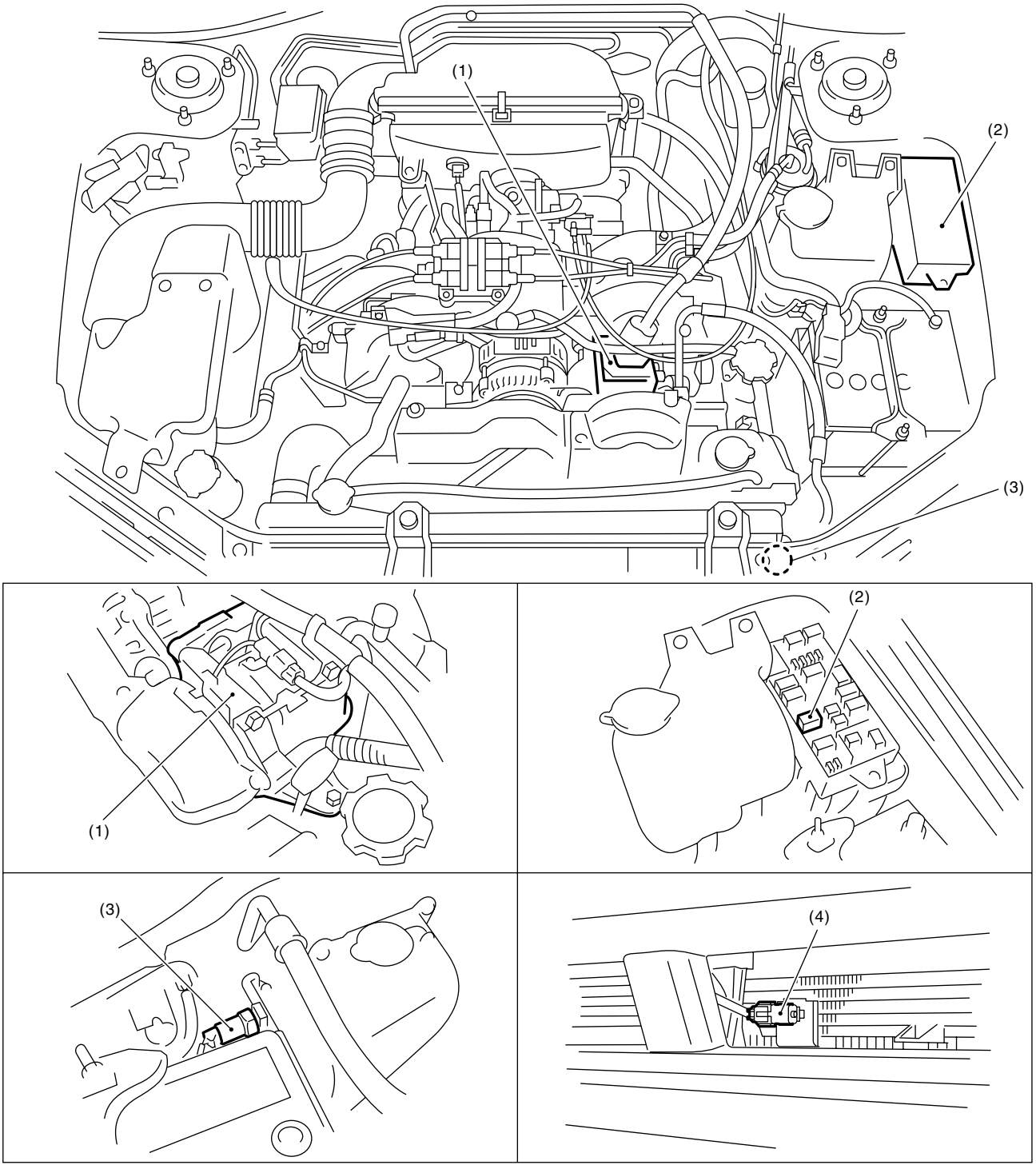
3) Illumination control inspection

No.	Point to check	Switch operation	Judgement standard
1	Illumination	A. Lighting switch ON	Illumination light illuminates.
		B. Press the OFF switch one second or more.	Illumination dimming is cancelled.

3. Electrical Components Location

A: LOCATION

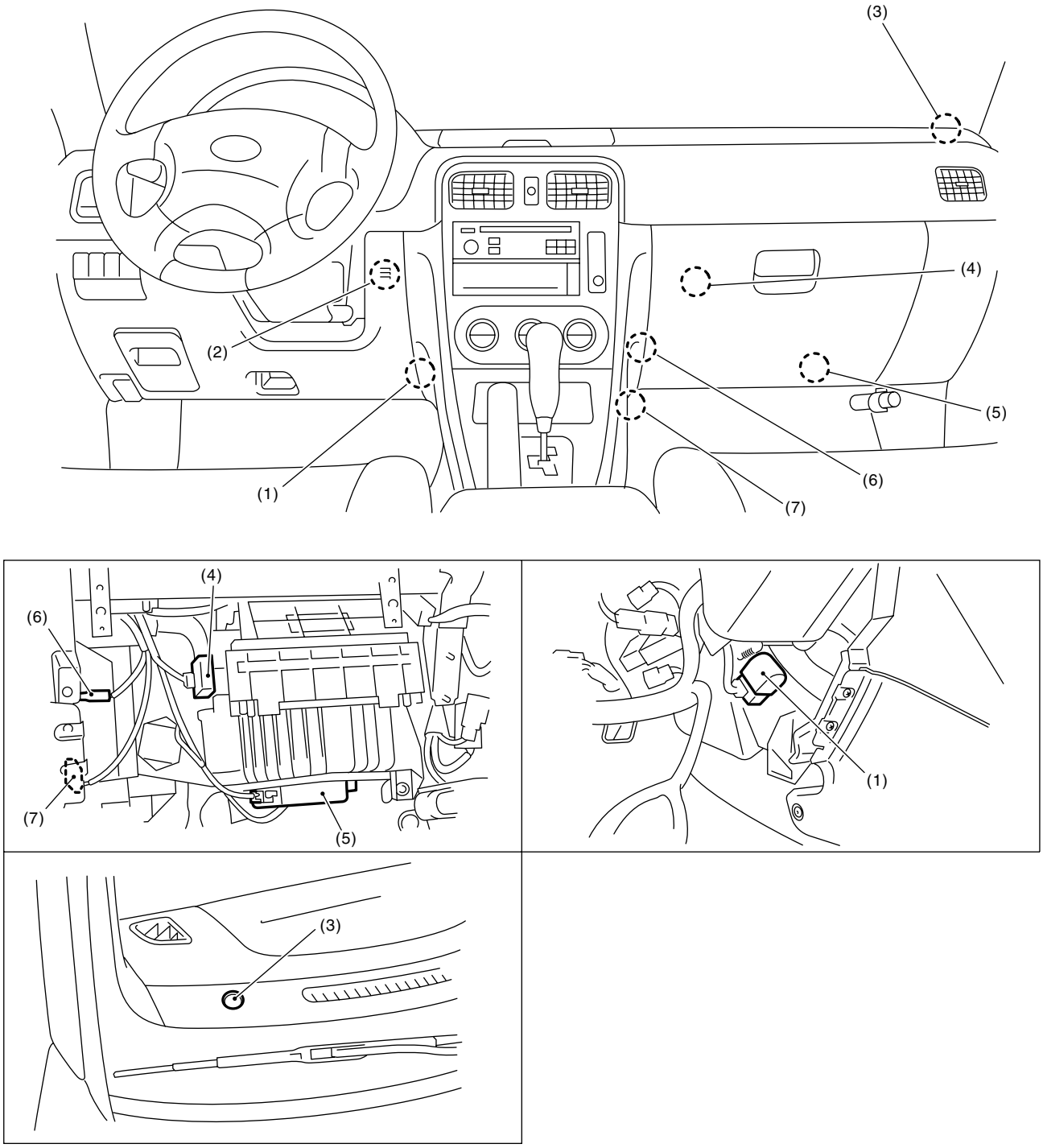
1. ENGINE COMPARTMENT



AC-00097

(1) A/C compressor
(2) A/C relay
(3) Pressure switch
(4) Ambient sensor

2. PASSENGER COMPARTMENT

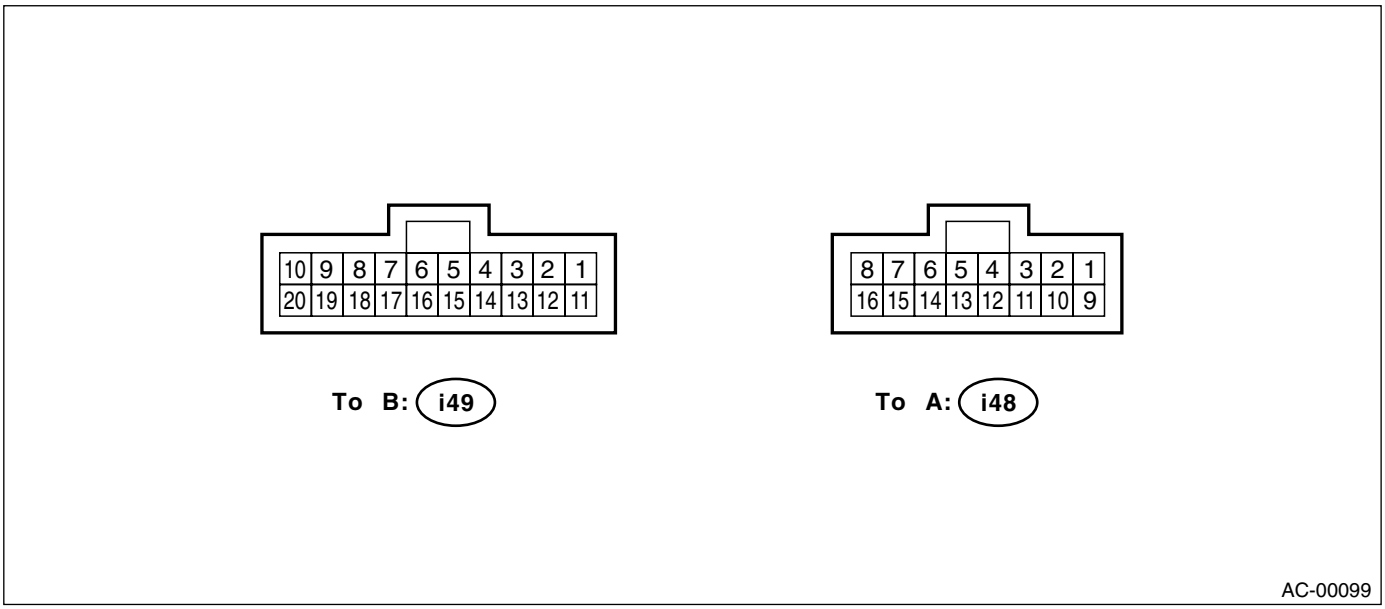


AC-00098

(1) Mode door actuator
(2) In-vehicle sensor
(3) Sunload sensor
(4) Intake door actuator
(5) Blower motor
(6) Evaporator sensor
(7) Air mix door actuator

4. A/C Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



Connector & Terminal No.	Content	Measuring condition		Specified value
B9	Mode door actuator power supply	Changes outlet from VENT to DEF.		*2
B8		Changes outlet from DEF to VENT.		
B7	Air mix door actuator power supply	Changes air mix door from COOL to HOT.		*1
B6		Changes air mix door from COOL to HOT.		
B5	IGN power supply	Ignition switch: ON		Battery voltage
B4	Battery power supply	Ignition switch: OFF, ACC, ON		Battery voltage
B3	Sunload sensor	Ignition switch: ON and under normal sunload (without sunload: 5 V)		3 V
B2	Evaporator sensor	Ignition switch: ON		5 V or less
B1	Air mix door actuator P.B.R. signal	Air mix door: COOL position		0.5 V
		Air mix door: HOT position		4.5 V
B20	Intake door actuator signal	Air inlet: FRESH (other positions: 12V)		0 V
B19		Air inlet: MIX (other positions: 12 V)		0 V
B18		Air inlet: RECIRC (other positions: 12 V)		0 V
B17	A/C ON signal	A/C: ON (A/C OFF: 0 V)		8 — 10 V
B16	Blower motor control	*3		*3
B15	Blower fan ON signal	When blower fan running (when blower fan not running: 12 V)		0 V
B13	Engine coolant temperature sensor	When the engine coolant is at 49°C (120°F)		8.9 V
B12	In-vehicle sensor	—		—
B11	Ground	When there is continuity to chassis ground		0 Ω
A7	Air mix door actuator P.B.R. reference voltage	Ignition switch: ON		5 V
A5	Mode door actuator position detection signal	Outlet	BI-LEVEL, DEF	5 V
			VENT, HEAT, DEF/HEAT	0 V
A4	Mode door actuator position detection signal	Outlet	HEAT, DEF/HEAT, DEF	5 V
			VENT, BI-LEVEL	0 V
A1	Illumination power supply	Ignition switch: ON, light switch: ON		Battery voltage
		Ignition switch: ON, light switch: OFF		0 V
A16	Sensor ground	When there is continuity to chassis ground		0 Ω

Connector & Terminal No.	Content	Measuring condition		Specified value
A14	Combination meter (ambient temperature signal)	*3		*3
A13	Mode door actuator position detection signal	Outlet	VENT, BI-LEVEL, HEAT	5 V
			DEF/HEAT, DEF	0 V
A12	Mode door actuator position detection signal	Outlet	VENT, DEF/HEAT	5 V
			BI-LEVEL, HEAT, DEF	0 V
A10	A/C cutout signal	A/C: ON		Battery voltage
		Pressure switch operated		0 V
A9	Illumination ground	When there is continuity to chassis ground		0 Ω

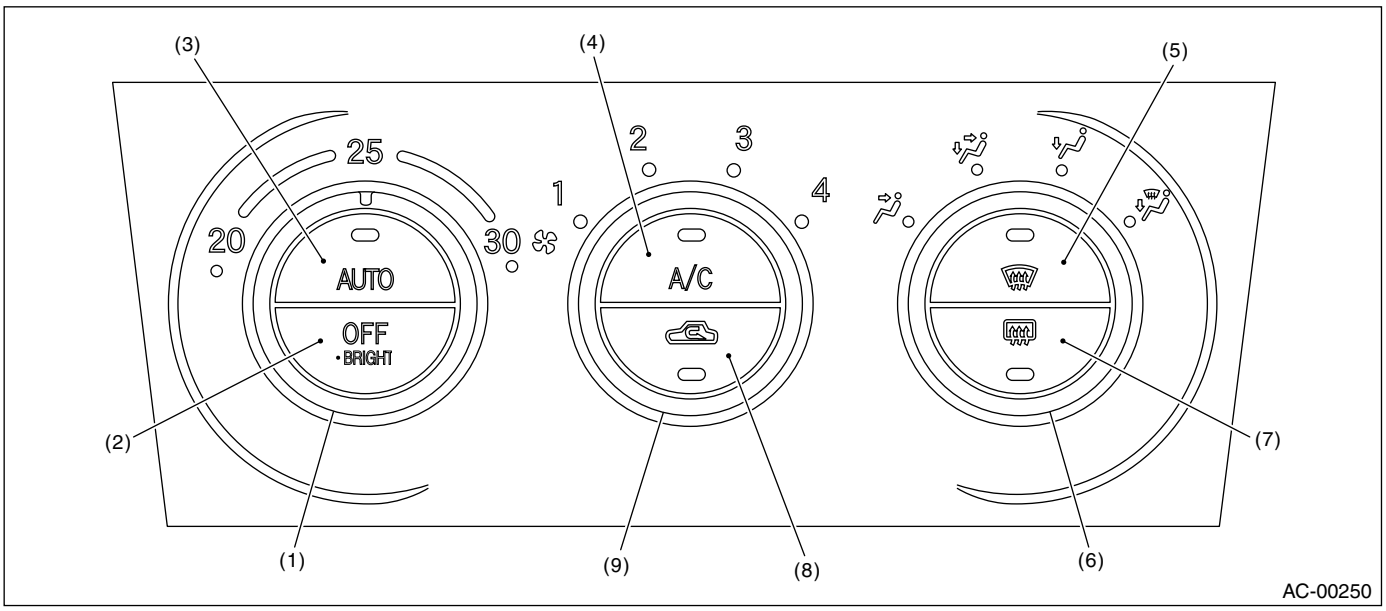
*1: Battery voltage is indicated when motor running, 0 V or battery voltage pulse signal is output when motor stops.
*2: Battery voltage is indicated when motor running, 0 V is indicated when motor stops.
*3: Voltage can not be measured because of pulse signal.

B: SCHEMATIC

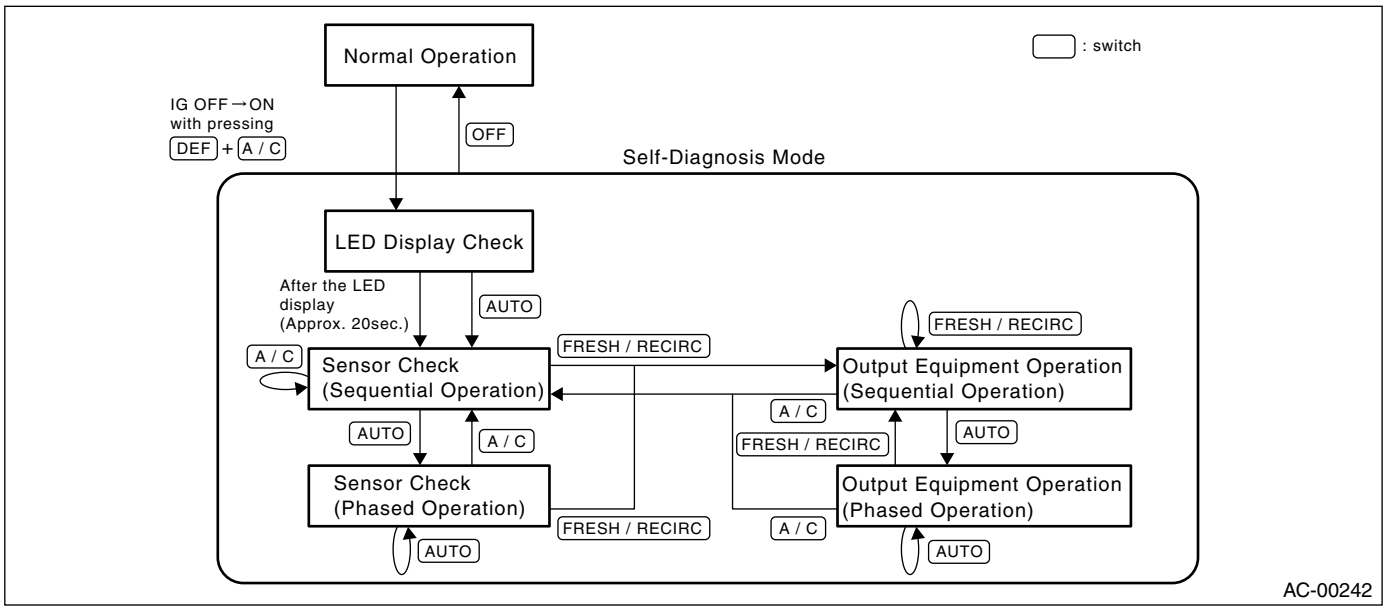
<Ref. to WI-54, SCHEMATIC, Air Conditioning System.>

5. Self-diagnosis

A: OPERATION



(1) Temperature control dial
(2) OFF/BRIGHT switch
(3) AUTO switch
(4) A/C switch
(5) DEF switch
(6) Mode control dial
(7) Rear window defogger switch
(8) FRESH/RECIRC switch
(9) Fan speed control dial



Step		Value	Yes	No
1	**SELECT CONTROL PANEL TO SELF-DIAGNOSIS MODE.** Start the engine while pressing DEF switch and A/C switch. Does the self-diagnosis mode operate?	Self-diagnosis mode operates.	Go to step **2.**	<Ref. to AC-13, A/C AND/OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE, Diagnostics for A/C System Failure.>

	Step	Value	Yes	No
2	**CHECK LED ILLUMINATION.** Make sure that three LED blink in turn on control panel (5 patterns are repeated 2 times). Do all LED blink?	LED blink.	Go to step **3.**	Go to step **5.**
3	**CHECK SENSORS MALFUNCTION.** 1)After completing the LED check or when AUTO switch is pressed, the A/C switch LED illuminates, and then the sensor check is started. 2)Check the input signal of each sensor in turn. If there are any trouble for each sensor, DEF, MODE and fan speed LEDs are blinked. Also check for each sensor is possible respectively every time AUTO switch is pressed. (At this time, the AUTO switch LED illuminates.) 3)If there is no trouble, DEF, MODE and fan speed LEDs are turned off. NOTE: Rear window defogger LED illuminates in case of stored malfunction but does not illuminate in case of present malfunction. Does each DEF, MODE and fan speed LED turn off?	LED is turned off.	Go to step **4.**	Confirm the combination of illuminating LEDs by using Sensor Check Table, and identify the malfunctioning sensor before repairing. <Ref. to AC-12, SENSOR CHECK TABLE, OPERATION, Self-diagnosis.>
4	**CHECK OPERATION OF EACH ACTUATOR, COMPRESSOR AND FAN MOTOR.** 1)Press the FRESH/RECIRC switch (FRESH/RECIRC switch LED illuminates at this time.). 2)Refer to OPERATING MODE TABLE to check the operation of each actuator, compressor and fan motor.<Ref. to AC-12, OPERATING MODE TABLE, OPERATION, Self-diagnosis.> Also check for each step is possible respectively every time AUTO switch pressed. (At this time, the AUTO switch LED illuminates.) Does each actuator, compressor and fan motor operate according to operating mode table?	Operates according to operating mode table.	Press the OFF switch or turn the ignition switch to OFF and finish the self- diagnosis mode.	Refer to each diagnostics chart for actuator, compressor and fan motor, and repair the malfunctioning part as necessary.
5	**CHECK POOR CONTACT.** Check the A/C control module connector for poor contact. Is there a poor contact in connector?	There is not poor contact.	Replace the A/C control module.	Repair the connector.

1. SENSOR CHECK TABLE

NOTE:
When the sunload sensor is checked indoors or in the shade, open circuit might be indicated. Always check the sunload sensor at a place where sun shines directly on it.

Diagnostic steps	Checked sensor	Open circuit		Short circuit		Present malfunction	Stored malfunction
		DEF LED	MODE/FAN LED	DEF LED	MODE/FAN LED	REAR WINDOW DEFOGGER LED	
1	In-vehicle sensor	Turn off	VENT LED blinks	Illuminate	VENT LED blinks	Turn off	Illuminate
2	Ambient sensor		BI-LEVEL LED blinks		BI-LEVEL LED blinks		
3	Evaporator sensor		HEAT LED blinks		HEAT LED blinks		
4	Sunload sensor*1		DEF/HEAT LED blinks		DEF/HEAT LED blinks		
5	Air mix door actuator P.B.R.		Fan speed 1st LED blinks		Fan speed 1st LED blinks		
6	Combination meter communication (Ambient sensor)		Fan speed 2nd LED blinks		Fan speed 2nd LED blinks		
	When all parts are in good condition	Turn off					

*1: Only present malfunction is indicated for open circuit of sunload sensor. (However, stored malfunction can be indicated for short circuit of sunload sensor.)

2. OPERATING MODE TABLE

Step	1	2	3	4	5	6	7	8
Illuminating LED	VENT LED	BI-LEVEL VENT	HEAT LED	DEF/HEAT LED	Fan speed 1st LED	Fan speed 2nd LED	Fan speed 3rd LED	Fan speed 4th LED
Fan speed	LO	LO	ML	ML	ML	MH	MH	HI
Mode actuator	VENT	VENT	VENT	BI-LEVEL	HEAT	HEAT	DEF/HEAT	DEF
Intake actuator	FRESH	RECIRC	RECIRC	FRESH	FRESH	FRESH	FRESH	FRESH
Air mix door actuator (%)	FULL COOL (0%)	FULL COOL (0%)	FULL COOL (0%)	MEDIUM (50%)	MEDIUM (50%)	FULL HOT (100%)	FULL HOT (100%)	FULL HOT (100%)
Compressor	OFF	ON	ON	ON	ON	ON	ON	ON

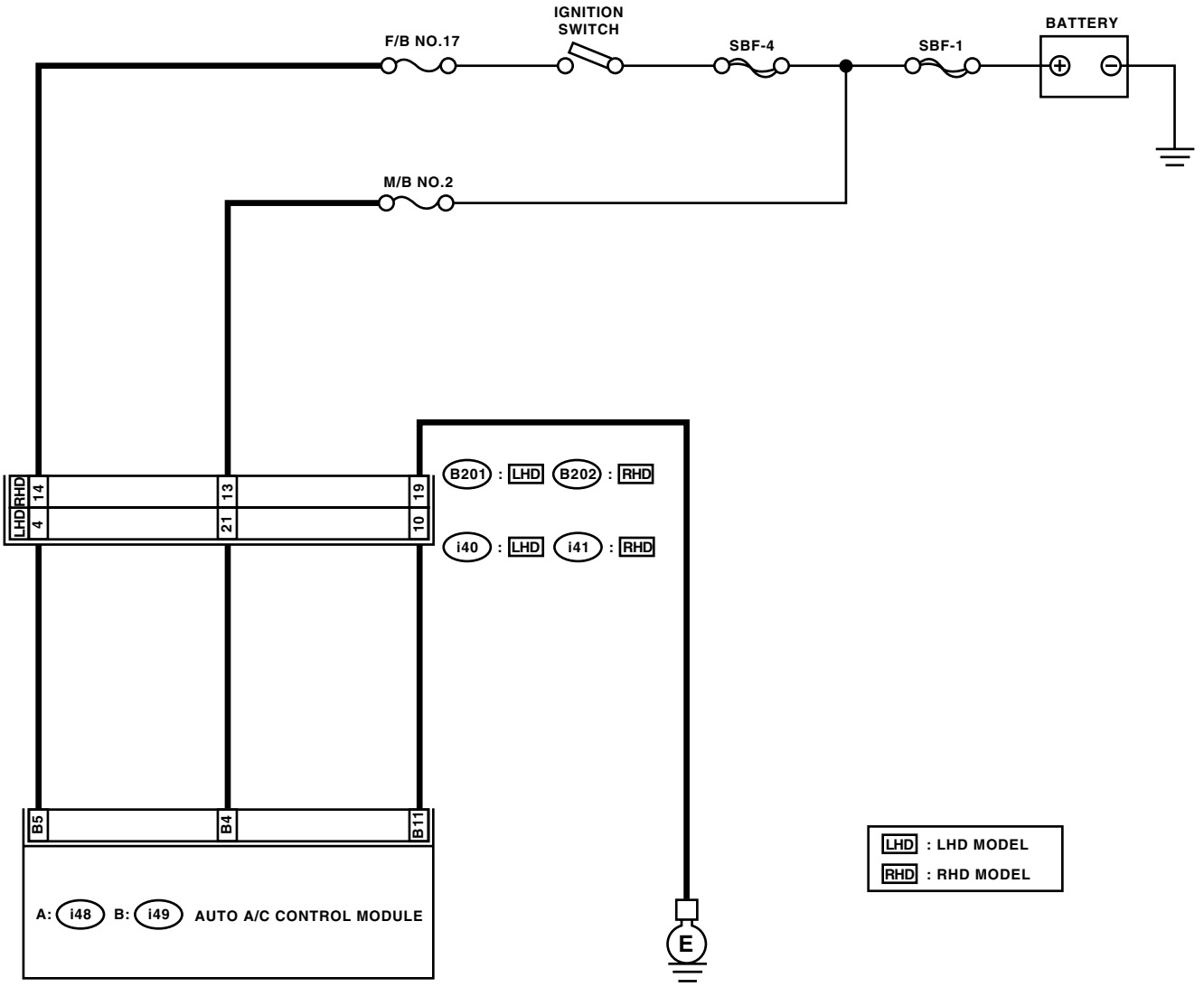
6. Diagnostics for A/C System Failure

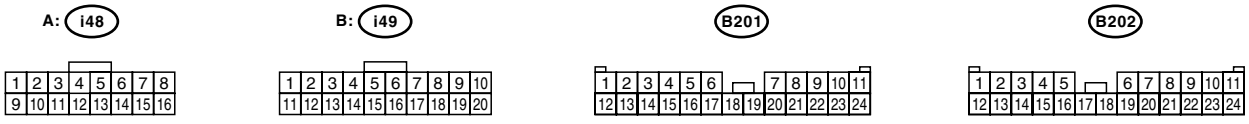
A: A/C AND/OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE

TROUBLE SYMPTOM:

- Switch LEDs are faulty and switches do not operate.
- Self-diagnosis system does not operate.

WIRING DIAGRAM:





AC-00149

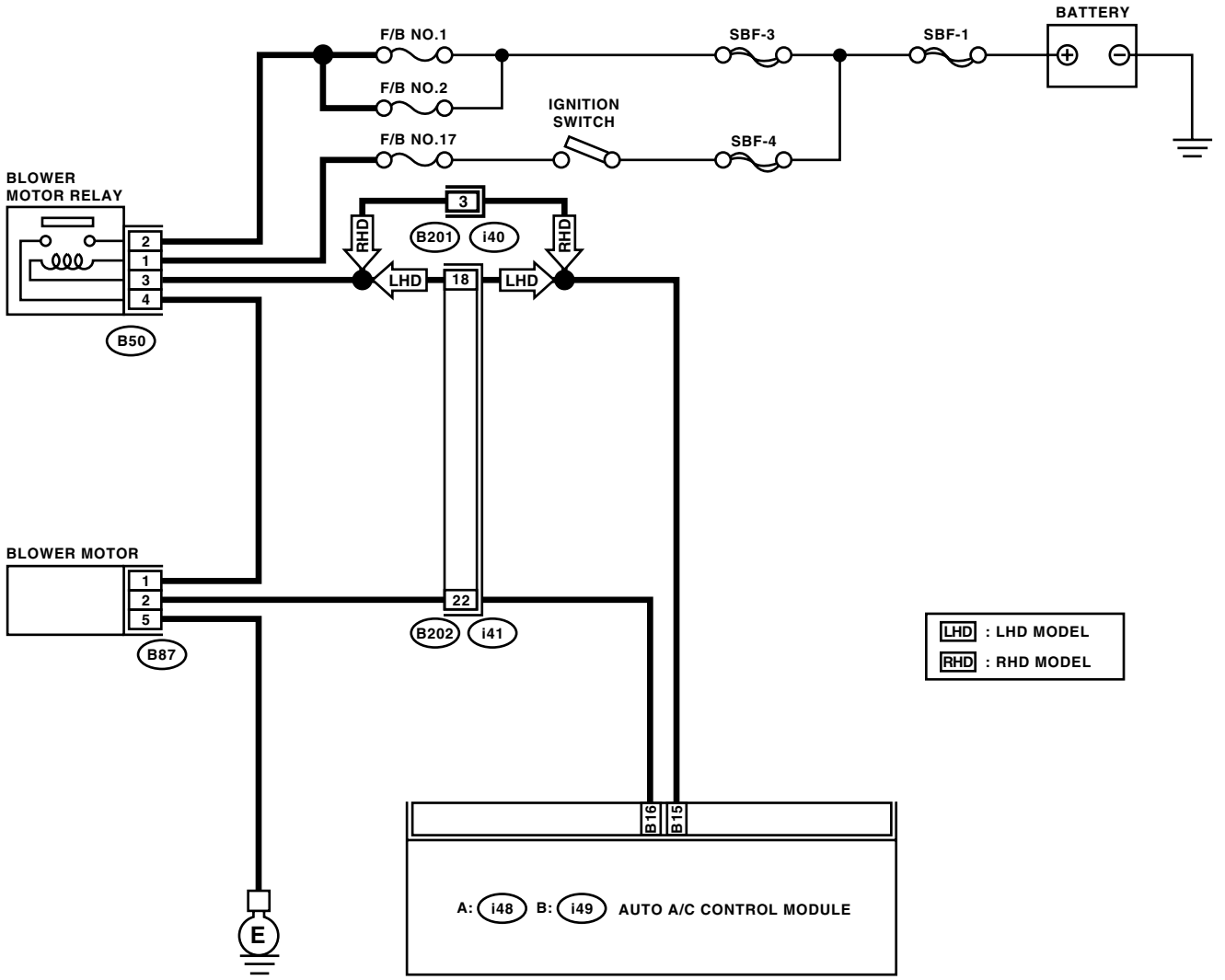
	Step	Value	Yes	No
1	**CHECK FUSE.** 1)Turn the ignition switch to OFF. 2)Remove the fuse No. 2 from main fuse box. 3)Check the condition of fuse. Is the fuse blown out?	Fuse is not blown out.	Go to step **2.**	Replace the fuse.
2	**CHECK FUSE.** 1)Turn the ignition switch to OFF. 2)Remove the fuses No. 17 from fuse & relay box. 3)Check the condition of fuse. Is the fuse blown out?	Fuse is not blown out.	Go to step **3.**	Replace the fuse.
3	**CHECK A/C CONTROL MODULE POWER CIRCUIT.** 1)Pull out the A/C control module connector. 2)Measure the voltage between A/C control module connector terminal and chassis ground when turning ignition switch to OFF. ***Connector & terminal*** ***(i49) No. 4 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **4.**	Repair the short circuit in harness for power supply line.
4	**CHECK A/C CONTROL MODULE POWER CIRCUIT.** Measure the voltage between A/C control module connector terminal and chassis ground when turning ignition switch to ON. ***Connector & terminal*** ***(i49) No. 5 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **5.**	Repair the short circuit in harness for power supply line.
5	**CHECK A/C CONTROL MODULE GROUND CIRCUIT.** Measure the resistance of harness between A/C control module and chassis ground. ***Connector & terminal*** ***(i49) No. 11 — Chassis ground:*** Is the measured value less than specified value?	1 Ω	Go to step **6.**	Repair the short circuit in harness for ground line.
6	**CHECK POOR CONTACT.** Check poor contact in A/C control module. Is there poor contact in connector?	There is no poor contact.	Repair the A/C control module.	Repair the connector.

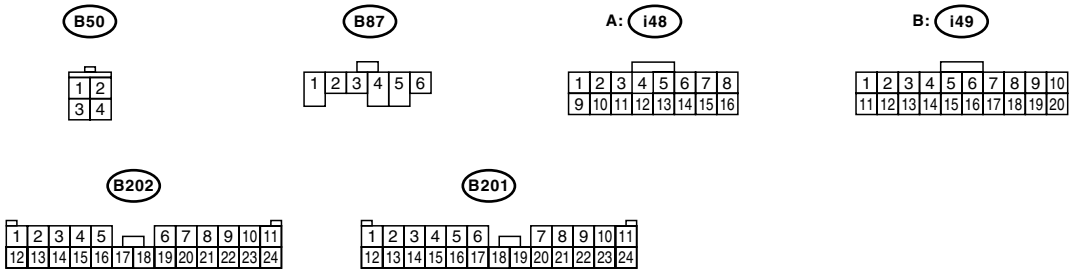
B: BLOWER MOTOR IS NOT ROTATED

TROUBLE SYMPTOM:

- Blower motor is not rotated.
- Blower motor is not shifted.

WIRING DIAGRAM:





AC-00150

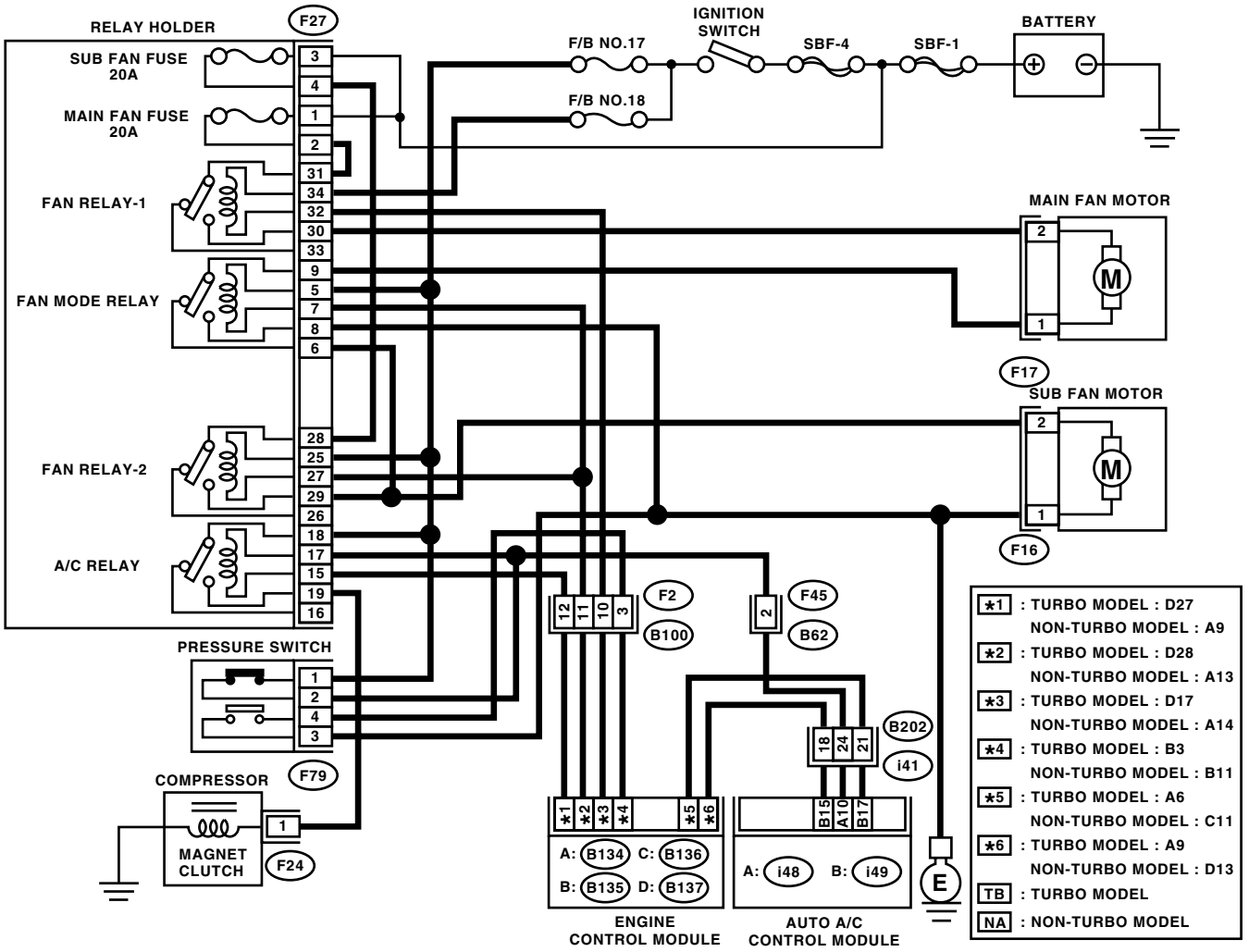
	Step	Value	Yes	No
1	**CHECK FUSE.** 1)Remove the No.1, No. 2 and No. 17 fuses in fuse & relay box. 2)Check the condition of fuses. Are any of the fuses blown out?	Fuse is not blown out.	Go to step **2.**	Replace the fuse.
2	**CHECK POWER SUPPLY TO BLOWER FAN MOTOR.** 1)Turn the ignition switch to ON. 2)Turn the fan speed control dial clockwise. 3)Measure the voltage between blower fan motor and chassis ground. ***Connector & terminal*** ***(B87) No. 1 (+) — Chassis ground (–):*** Is the measured value more than specified value?	8 V (At normal temperature)	Go to step **3.**	Repair the open circuit in harness for blower fan motor power supply line.
3	**CHECK BLOWER FAN MOTOR RELAY.** 1)Turn the ignition switch to OFF. 2)Remove the blower fan motor relay. 3)Connect the battery positive (+) terminal to terminal No. 1 and ground (–) terminal to No. 3 of blower motor connector. 4)Measure the resistance between No. 2 and No. 4 terminals. ***Terminals:*** ***No. 2 — No. 4*** Is the measured value less than specified value?	1 Ω	Go to step **4.**	Replace the blower fan motor relay.
4	**CHECK BLOWER FAN MOTOR.** 1)Disconnect the connector from blower fan motor. 2)Connect the battery positive (+) terminal to terminal No. 1 and ground (–) terminal to No. 2 and No. 5 of blower motor connector. 3)Make sure that the blower fan motor is operated. Does the blower fan motor operate?	Fan motor operates.	Go to step **5.**	Replace the blower fan motor.
5	**CHECK POOR CONTACT.** Check poor contact in A/C control module. Is there poor contact in connector?	There is no poor contact.	Repair the A/C control module.	Repair the connector.

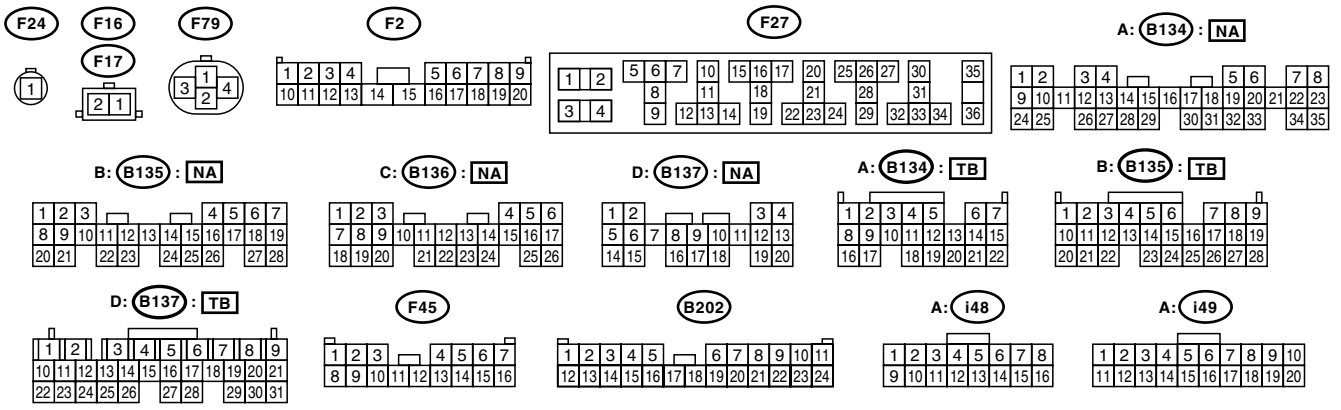
C: COMPARTMENT TEMPERATURE IS NOT CHANGED OR A/C SYSTEM DOES NOT RESPOND QUICKLY

TROUBLE SYMPTOM:

- Compartment temperature is not changed.
- A/C system does not respond quickly.

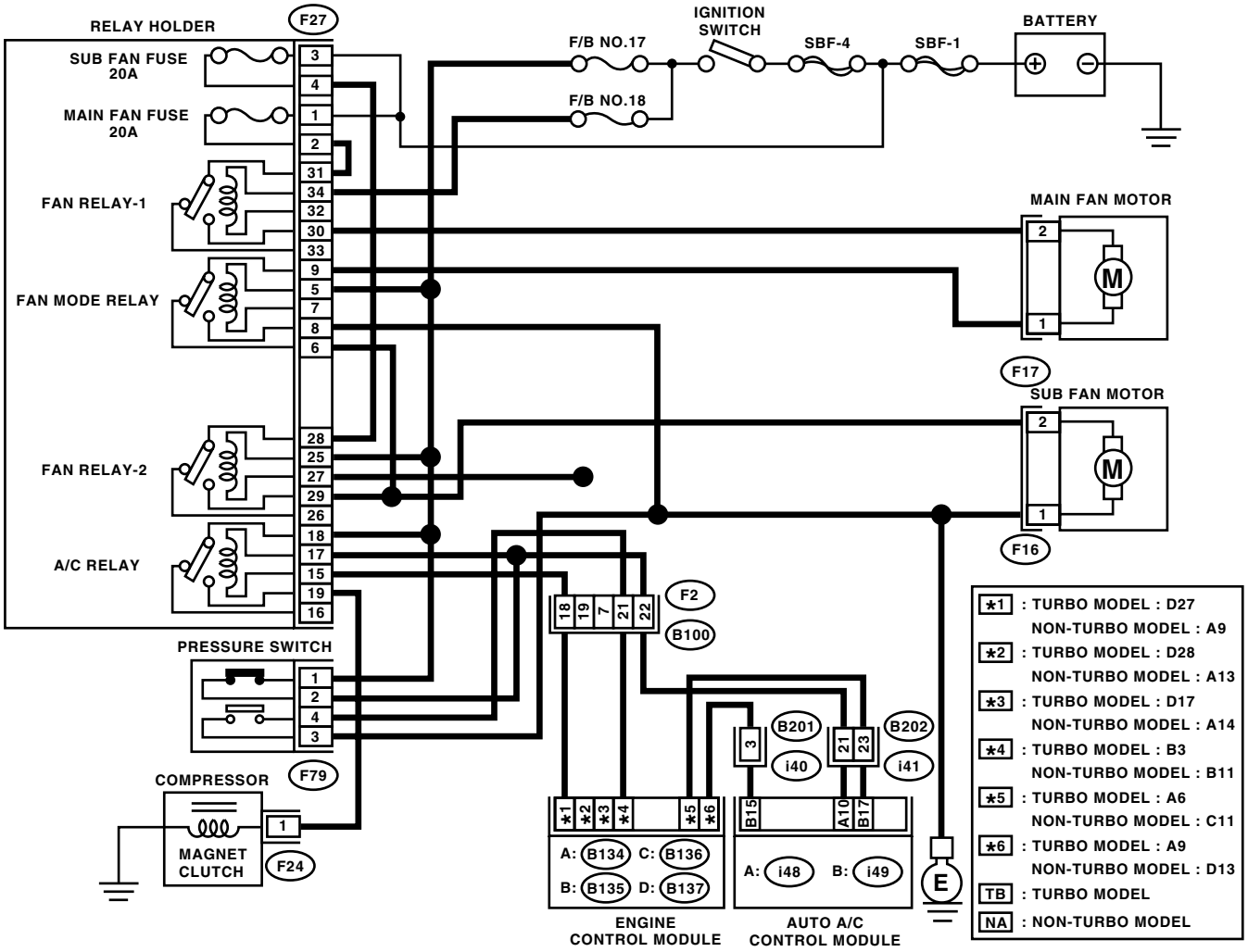
WIRING DIAGRAM FOR LHD MODEL:

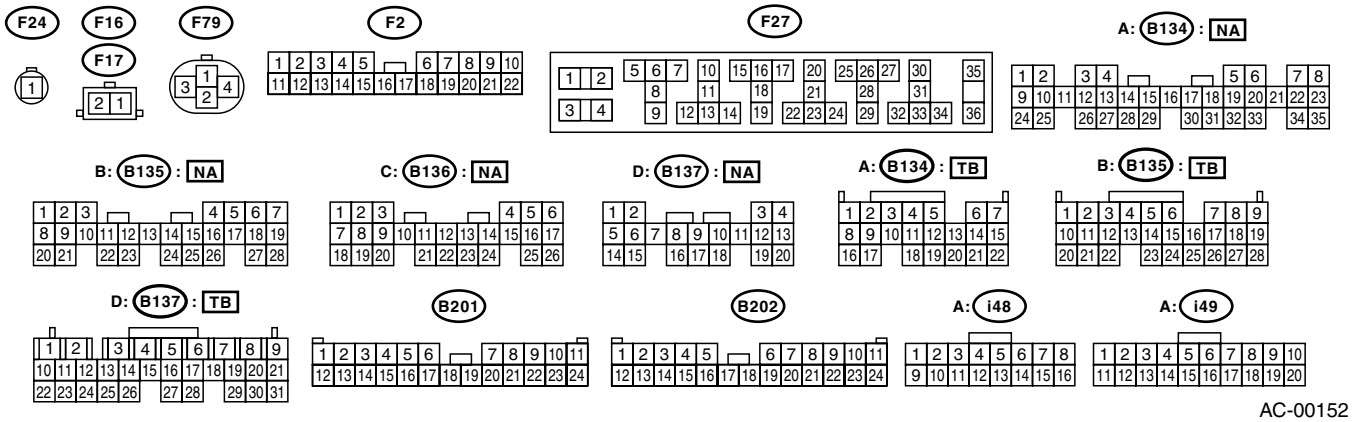




AC-00151

WIRING DIAGRAM FOR RHD MODEL:





AC-00152

	Step	Value	Yes	No
1	**CHECK FUSE.** 1)Turn the ignition switch to OFF. 2)Remove the main fan fuse and sub fan fuse in main fuse box. 3)Check the condition of fuse. Is the fuse blown out?	No fuse blown out.	Go to step **2.**	Replace the fuse.
2	**CHECK THE POWER SUPPLY TO PRESSURE SWITCH.** 1)Disconnect the connector from pressure switch. 2)Turn the ignition switch to OFF. 3)Measure the voltage between harness connector and chassis ground. ***Connector & terminal*** ***(F79) No.1 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **3.**	Repair the harness for pressure switch power supply circuit.
3	**CHECK THE HARNESS BETWEEN PRESSURE SWITCH AND A/C RELAY HARNESS.** 1)Turn the ignition switch to OFF. 2)Remove the A/C relay in the main fuse box. 3)Measure the resistance between A/C relay and pressure switch connector. ***Connector & terminal*** ***(F27) No.17 — (F79) No.2:*** Is the measured value less than specified value?	1 Ω	Go to step **4.**	Repair the harness between A/C relay and pressure switch.
4	**CHECK THE PRESSURE SWITCH.** Measure the resistance between pressure switch terminals. ***Terminals*** ***No. 1 — No.2:*** Is the measured value less than specified value?	1 Ω	Go to step **5.**	Replace the pressure switch.
5	**CHECK THE A/C CUT SIGNAL CIRCUIT.** 1)Disconnect the connector from A/C control module. 2)Measure the resistance between A/C control module and pressure switch connector. ***Connector & terminal*** ***(i48) No.10 — (F79) No.2:*** Is the measured value less than specified value?	1 Ω	Go to step **6.**	Repair the harness between A/C control module and pressure switch.
6	**CHECK THE A/C ON SIGNAL CIRCUIT.** 1)Disconnect the connector from engine control module. 2)Measure the resistance between engine control module and A/C control module connector. ***Connector & terminal*** ***Turbo model*** ***(B134) No.6 — (i49) No.17:*** ***Non-turbo model*** ***(B136) No.11 — (i49) No.17:*** Is the measured value less than specified value?	1 Ω	Go to step **7.**	Repair the harness between A/C control module and engine control module.

	Step	Value	Yes	No
7	**CHECK A/C RELAY.** 1)Remove the A/C relay in main fuse box. 2)Check the A/C relay. <Ref. to AC-44, INSPECTION, Relay and Fuse.> Is the operation of the relay OK?	Relay operates normally.	Go to step **8.**	Replace the A/C relay.
8	**CHECK POWER SUPPLY TO MAGNET CLUTCH OF A/C COMPRESSOR.** 1)Turn the ignition switch to OFF, and then connect the A/C relay connector and all removed connector. 2)Start the engine, and turn A/C switch to ON. 3)Set the temperature control dial to maximum cold position. 4)Measure the voltage between magnet clutch harness connector and chassis ground. ***Connector & terminal*** ***(F24) No. 1 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10.5 V (At normal temperature)	Go to step **9.**	Repair the harness for power supply line of A/C compressor.
9	**CHECK OPERATION OF MAIN FAN MOTOR.** 1)Start the engine and turn the A/C switch to ON. 2)Check the operation of main fan motor. Does the main fan motor operate?	Fan motor operates.	Go to step **14.**	Go to step **10.**
10	**CHECK POWER SUPPLY TO MAIN FAN MOTOR.** **CAUTION:** **Be careful not to overheat the engine during repair.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from main fan motor. 3)Start the engine, and warm it up until engine coolant temperature increases over 100°C (212°F). 4)Stop the engine and turn ignition switch to ON. 5)Measure the voltage between main fan motor harness connector and chassis ground. ***Connector & terminal*** ***Turbo engine model:*** ***(F17) No. 2 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **11.**	Repair the harness for main fan motor power supply circuit.
11	**CHECK GROUND CIRCUIT OF MAIN FAN MOTOR.** 1)Measure the resistance between main fan motor harness connector and chassis ground. ***Connector & terminal*** ***(F17) No. 1 — Chassis ground:*** Is the measured value less than specified value?	1 Ω	Go to step **12.**	Repair the harness for main fan motor ground circuit.
12	**CHECK MAIN FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 2, and ground (–) terminal to terminal No. 1 of main fan motor connector to make sure that main fan motor rotate. Does the main fan rotate?	Fan motor operates.	Go to step **13.**	Replace the main fan motor.

	Step	Value	Yes	No
13	**CHECK POOR CONTACT IN MAIN FAN MOTOR CONNECTOR.** Check poor contact in main fan motor harness connector. Is there poor contact in connector?	There is no poor contact.	Go to step **14.**	Repair the poor contact in main fan motor connector.
14	**CHECK OPERATION OF SUB FAN MOTOR.** 1)Start the engine and turn the A/C switch to ON. 2)Check the operation of sub fan motor. Does the sub fan motor operate normally?	Fan motor operates.	Go to step **19.**	Go to step **15.**
15	**CHECK POWER SUPPLY TO SUB FAN MOTOR.** **CAUTION:** **Be careful not to overheat the engine during repair.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from sub fan motor. 3)Start the engine, and warm it up until engine coolant temperature increases over 100°C (212°F). 4)Stop the engine and turn ignition switch to ON. 5)Measure the voltage between sub fan motor harness connector and chassis ground. ***Connector & terminal*** ***(F16) No. 2 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **16.**	Repair the harness for sub fan motor power supply circuit.
16	**CHECK GROUND CIRCUIT OF SUB FAN MOTOR.** Measure the resistance between sub fan motor harness connector and chassis ground. ***Connector & terminal*** ***(F16) No. 1 — Chassis ground:*** Is the measured value less than specified value?	1 Ω	Go to step **17.**	Repair the harness for sub fan motor ground circuit.
17	**CHECK SUB FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 2, and ground (–) terminal to terminal No. 1 of sub fan motor connector to make sure that sub fan motor rotate. Does the sub fan motor rotate?	Fan motor rotates.	Go to step **18.**	Replace the sub fan motor.
18	**CHECK POOR CONTACT IN SUB FAN MOTOR CONNECTOR.** Check poor contact in sub fan motor connector. Is there poor contact in connector?	There is no poor contact.	Go to step **19.**	Repair the poor contact in sub fan motor connector.
19	**CHECK POOR CONTACT IN AUTO A/C CONTROL MODULE CONNECTOR.** Check poor contact in auto A/C control module connector. Is there poor contact in connector?	There is no poor contact.	Replace the auto A/C control module.	Repair the connector.

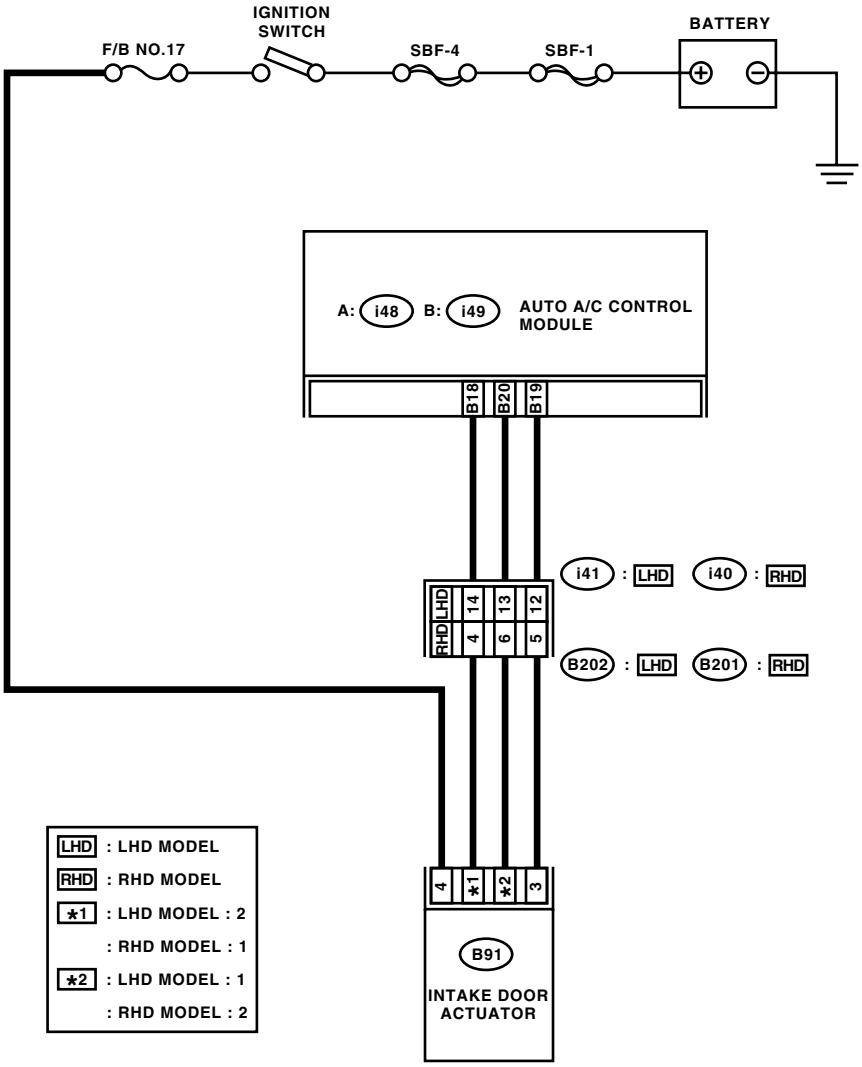
7. Diagnostic Procedure for Actuators

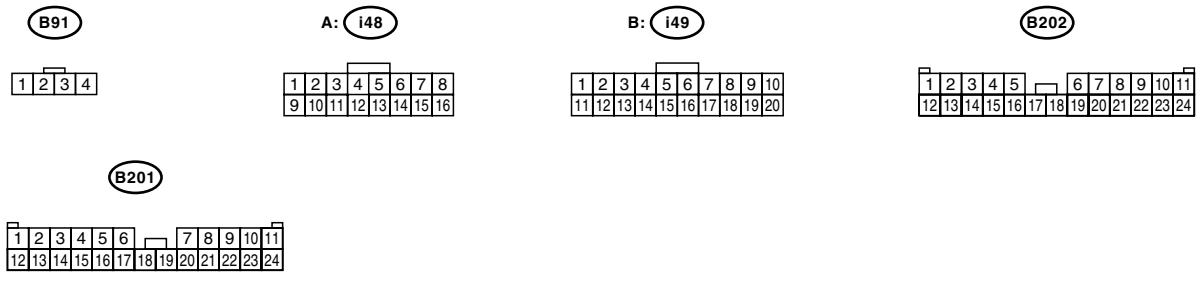
A: INTAKE DOOR ACTUATOR

TROUBLE SYMPTOM:

FRESH/RECIRC mode is not changed.

WIRING DIAGRAM:





AC-00153

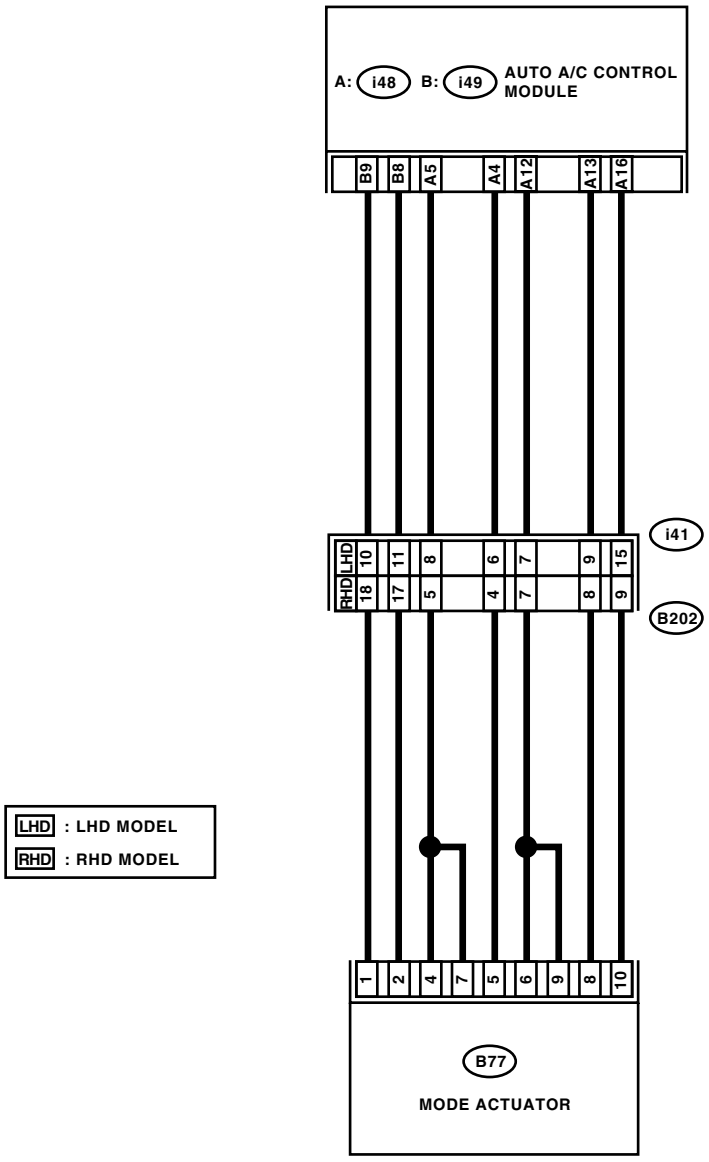
	Step	Value	Yes	No
1	**CHECK POWER SUPPLY TO INTAKE DOOR ACTUATOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the intake door actuator connector. 3)Turn the ignition switch to ON. 4)Measure the voltage between intake door actuator connector and chassis ground. ***Connector & terminal*** ***(B91) No. 4 (+) — Chassis ground (–):*** Is the measured value more than specified value?	7 V (At normal temperature)	Go to step **2.**	Check the harness for open or short between intake door actuator and fuse.
2	**CHECK HARNESS BETWEEN A/C CONTROL MODULE AND INTAKE DOOR ACTUATOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the auto A/C control module connector. 3)Measure the resistance between intake door actuator connector and auto A/C control module connector. ***Connector & terminal*** ***LHD model:*** ***(i49) No. 18 — (B91) No. 2:*** ***(i49) No. 20 — (B91) No. 1:*** ***(i49) No. 19 — (B91) No. 3:*** ***RHD model:*** ***(i49) No. 18 — (B91) No. 1:*** ***(i49) No. 20 — (B91) No. 2:*** ***(i49) No. 19 — (B91) No. 3:*** Is the measured value less than specified value?	1 Ω	Go to step **3.**	Repair the harness between auto A/C control module and intake door actuator.
3	**CHECK INTAKE DOOR ACTUATOR OPERETION.** 1)Connect the intake door actuator connector. 2)Ground the auto A/C control module connector with a suitable wire. 3)Turn the ignition switch to ON and check movement of intake door actuator. ***Connector & terminal*** ***(i49) No. 20 — Chassis ground:*** Is the intake door actuator moved to FRESH?	Door actuator moves to FRESH.	Go to step **4.**	Replace the intake door actuator.
4	**CHECK INTAKE DOOR ACTUATOR OPERATION.** 1)Turn the ignition switch to OFF. 2)Ground the auto A/C control moodule connector with a suitable wire. 3)Turn the ignition switch to ON and check movement of intake door actuator. ***Connector & terminal*** ***(i49) No. 18 — Chassis ground:*** Is the intake door actuator moved to RECIRC?	Door actuator moves to RECIRC.	Replace the auto A/C control module.	Replace the intake door actuator.

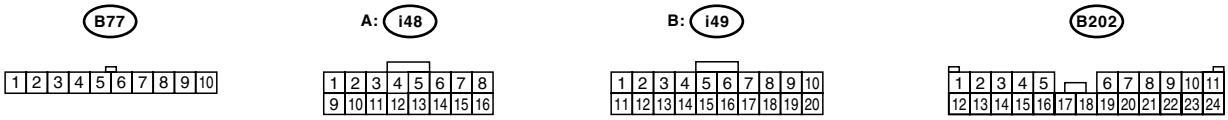
B: MODE DOOR ACTUATOR

TROUBLE SYMPTOM:

Air flow outlet is not changed.

WIRING DIAGRAM:





AC-00154

	Step	Value	Yes	No
1	**CHECK POWER SUPPLY FOR AUTO A/C CONTROL MODULE SIDE.** 1)Turn the ignition switch to ON. 2)Turn the mode control dial to VENT position. 3)Press the DEF switch and measure the voltage between auto A/C control module and chassis ground when VENT is changed to DEF position. ***Connector & terminal*** ***(i49) No. 9 (+) — Chassis ground (–):*** Is the measured value more than specified value?	12 V	Go to step **2.**	Replace the auto A/C control module.
2	**CHECK POWER SUPPLY FOR ACTUATOR SIDE.** 1)Turn the mode control dial to VENT position. 2)Press the DEF switch and measure the voltage between mode door actuator harness connector and chassis ground when VENT is changed to DEF position. ***Connector & terminal*** ***(B77) No. 1 (+) — Chassis ground (–):*** Is the measured value more than specified value?	7 V (At normal temperature)	Go to step **3.**	Repair the harness between auto A/C control module and mode door actuator.
3	**CHECK POWER SUPPLY FOR AUTO A/C CONTROL MODULE SIDE.** 1)Press the DEF switch. 2)Turn the mode control dial to VENT position and measure the voltage between auto A/C control module and chassis ground when DEF is changed to VENT position. ***Connector & terminal*** ***(i49) No. 8 (+) — Chassis ground (–):*** Is the measured value more than specified value?	12 V	Go to step **4.**	Replace the auto A/C control module.
4	**CHECK POWER SUPPLY FOR ACTUATOR SIDE.** 1)Press the DEF switch. 2)Turn the mode control dial to VENT position and measure the voltage between mode door actuator harness connector and chassis ground when DEF is changed to VENT position. ***Connector & terminal*** ***(B77) No. 2 (+) — Chassis ground (–):*** Is the measured value more than specified value?	7 V (At normal temperature)	Go to step **5.**	Repair the harness between auto A/C control module and mode door actuator.
5	**CHECK ACTUATOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from mode door actuator. 3)Connect the battery positive (+) terminal to terminal No. 1 and ground (–) terminal to terminal No. 2 of mode door actuator to make sure that actuator operates. 4)Connect the battery positive (+) terminal to terminal No. 2 and ground (–) terminal to terminal No. 1 of mode door actuator to make sure that actuator operates. Does the motor operate normally?	The motor operates normally.	Go to step **6.**	Replace the mode door actuator.

	Step	Value	Yes	No
6	**CHECK AUTO A/C CONTROL MODULE SIGNAL VOLTAGE.** 1)Turn the ignition switch to ON. 2)Turn the mode control dial and measure voltage between auto A/C control module harness connector and chassis ground for each mode. ***Connector & terminal*** ***(i48) No. 4 (+) — Chassis ground (–):*** Is the measured value within specified value?	HEAT, D/H, DEF: 5 V, VENT, BI-LEVEL: 0 V	Go to step **9.**	Go to step **7.**
7	**CHECK AUTO A/C CONTROL MODULE SIGNAL POWER SUPPLY.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from mode door actuator. 3)Turn the ignition switch to ON. 4)Measure the voltage between mode door actuator harness connector and chassis ground. ***Connector & terminal*** ***(B77) No. 5 (+) — Chassis ground (–):*** Is the measured value within specified value?	5 V	Go to step **9.**	Go to step **8.**
8	**CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND MODE DOOR ACTUATOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from auto A/C control module and mode door actuator. 3)Measure the resistance of harness between auto A/C control module and mode door actuator. ***Connector & terminal*** ***(i48) No. 4 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 Ω	Replace the auto A/C control module.	Repair the harness between auto A/C control module and mode door actuator.
9	**CHECK AUTO A/C CONTROL MODULE SIGNAL VOLTAGE.** 1)Turn ignition switch to ON. 2)Turn the mode control dial and measure voltage between auto A/C control module harness connector and chassis ground for each mode. ***Connector & terminal*** ***(i48) No. 12 (+) — Chassis ground (–):*** Is the measured value within specified value?	VENT, D/H: 5 V, BI-LEVEL, HEAT, DEF: 0 V	Go to step **12.**	Go to step **10.**
10	**CHECK AUTO A/C CONTROL MODULE SIGNAL POWER SUPPLY.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from mode door actuator. 3)Turn the ignition switch to ON. 4)Measure the voltage between mode door actuator harness connector and chassis ground. ***Connector & terminal*** ***(B77) No. 6, 9 (+) — Chassis ground (–):*** Is the measured value within specified value?	5 V	Go to step **12.**	Go to step **11.**

	Step	Value	Yes	No
11	**CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND MODE DOOR ACTUATOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from auto A/C control module and mode door actuator. 3)Measure the resistance of harness between auto A/C control module and mode door actuator. ***Connector & terminal*** ***(i48) No. 12 — (B77) No. 6, 9:*** Is the measured value less than specified value?	1 Ω	Replace the auto A/C control module.	Repair the harness between auto A/C control module and mode door actuator.
12	**CHECK AUTO A/C CONTROL MODULE SIGNAL VOLTAGE.** 1)Turn ignition switch to ON. 2)Turn the mode control dial and measure voltage between auto A/C control module harness connector and chassis ground for each mode. ***Connector & terminal*** ***(i48) No. 5 (+) — Chassis ground (–):*** Is the measured value within specified value?	BI-LEVEL, DEF: 5 V, VENT, HEAT, D/H: 0 V	Go to step **15.**	Go to step **13.**
13	**CHECK AUTO A/C CONTROL MODULE SIGNAL POWER SUPPLY.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from mode door actuator. 3)Turn the ignition switch to ON. 4)Measure the voltage between mode door actuator harness connector and chassis ground. ***Connector & terminal*** ***(B77) No. 4, 7 (+) — Chassis ground (–):*** Is the measured value within specified value?	5 V	Go to step **15.**	Go to step **14.**
14	**CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND MODE DOOR ACTUATOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from auto A/C control module and mode door actuator. 3)Measure the resistance of harness between auto A/C control module and mode door actuator. ***Connector & terminal*** ***(i48) No. 5 — (B77) No. 4, 7:*** Is the measured value less than specified value?	1 Ω	Replace the auto A/C control module.	Repair the harness between auto A/C control module and mode door actuator.
15	**CHECK AUTO A/C CONTROL MODULE SIGNAL VOLTAGE.** 1)Turn ignition switch to ON. 2)Turn the mode control dial and measure voltage between auto A/C control module harness connector and chassis ground for each mode. ***Connector & terminal*** ***(i48) No. 13 (+) — Chassis ground (–):*** Is the measured value within specified value?	VENT, BI-LEVEL, HEAT: 5V, D/H, DEF: 0 V	Go to step **19.**	Go to step **16.**

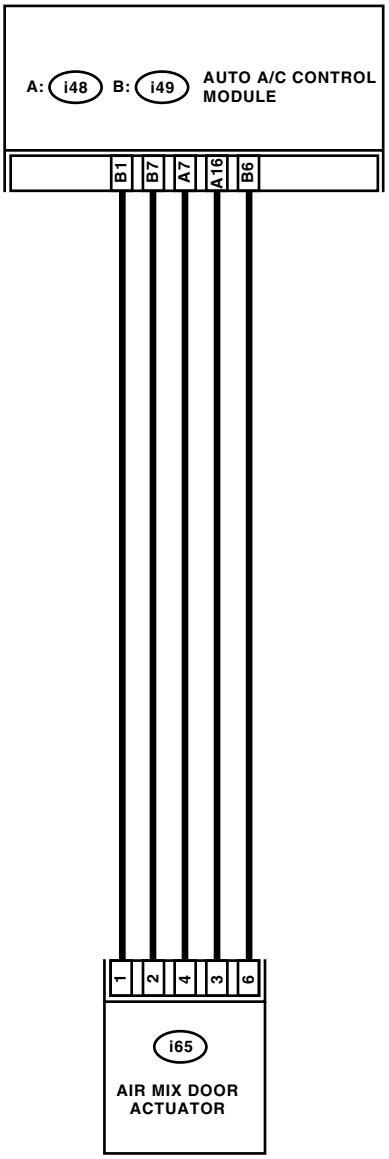
	Step	Value	Yes	No
16	**CHECK AUTO A/C CONTROL MODULE SIGNAL POWER SUPPLY.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from mode door actuator. 3)Turn the ignition switch to ON. 4)Measure the voltage between mode door actuator harness connector and chassis ground. ***Connector & terminal*** ***(B77) No. 8 (+) — Chassis ground (–):*** Is the measured value within specified value?	5 V	Go to step **18.**	Go to step **17.**
17	**CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND MODE DOOR ACTUATOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from auto A/C control module and mode door actuator. 3)Measure the resistance of harness between auto A/C control module and mode door actuator. ***Connector & terminal*** ***(i48) No. 13 — (B77) No. 8:*** Is the measured value less than specified value?	1 Ω	Replace the auto A/C control module.	Repair the harness between auto A/C control module and mode door actuator.
18	**CHECK ACTUATOR GROUND CIRCUIT.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from auto A/C control module. 3)Measure the resistance of harness between auto A/C control module and mode door actuator. ***Connector & terminal*** ***(i48) No. 16 — (B77) No. 10:*** Is the measured value less than specified value?	1 Ω	Replace the mode door actuator.	Repair the harness between auto A/C control module and mode door actuator.
19	**CHECK POOR CONTACT.** Check poor contact in auto A/C control module connector. Is there poor contact in connector?	There is no poor contact.	Repair the poor contact in auto A/C control module.	Repair the connector.

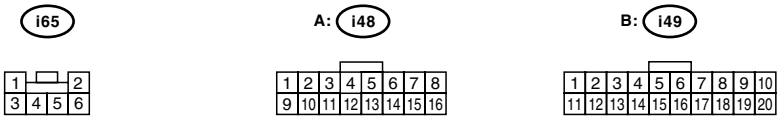
C: AIR MIX DOOR ACTUATOR

TROUBLE SYMPTOM:

Outlet air temperature is not changed.

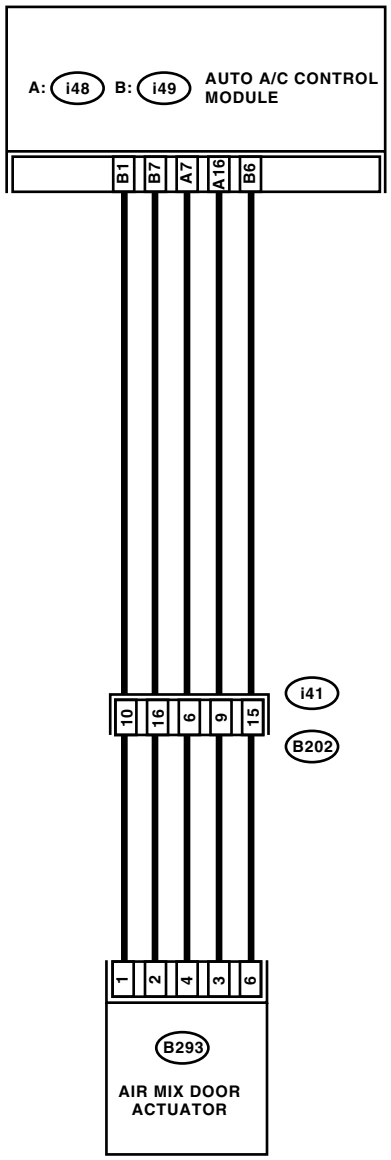
WIRING DIAGRAM FOR LHD MODEL:

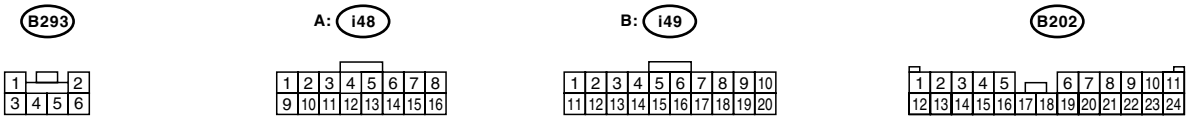




AC-00106

WIRING DIAGRAM FOR RHD MODEL:





AC-00155

	Step	Value	Yes	No
1	**CHECK POWER SUPPLY TO AIR MIX DOOR ACTUATOR PBR.** 1)Turn the ignition switch to OFF. 2)Disconnect the air mix door actuator connector. 3)Turn the ignition switch and AUTO switch to ON. 4)Measure the voltage between A/C control module connector terminals. ***Connector & terminal*** ***(i48) No. 7 (+) — (i48) No. 16 (–):*** Is the measured value within specified value?	Approx. 5 V	Go to step **2.**	Replace the auto A/C control module.
2	**CHECK POWER SUPPLY TO AIR MIX DOOR ACTUATOR.** Measure the voltage between auto A/C control module connector and chassis ground when setting temprature control dial to FULL COOL. ***Connector & terminal*** ***(i49) No. 6 (+) — Chassis ground (–):*** Is the measured value more than specified value?	7 V (At normal temperature)	Go to step **3.**	Replace the auto A/C control module.
3	**CHECK POWER SUPPLY TO AIR MIX DOOR ACTUATOR.** Measure the voltage between auto A/C control module connector and chassis ground when setting temprature control dial to FULL HOT. ***Connector & terminal*** ***(i49) No. 7 (+) — Chassis ground (–):*** Is the measured value more than specified value?	7 V (At normal temperature)	Go to step **4.**	Replace the auto A/C control module.
4	**CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND AIR MIX DOOR ACTUATOR.** 1)Turn the A/C and ignition switch to OFF. 2)Disconnect the auto A/C control module connector. 3)Measure the resistance between auto A/C control module and air mix door actuator connector. ***Connector & terminal*** ***LHD model:*** ***(i65) No. 1 — (i49) No. 1:*** ***(i65) No. 2 — (i49) No. 7:*** ***(i65) No. 3 — (i48) No. 16:*** ***(i65) No. 4 — (i48) No. 7:*** ***(i65) No. 6 — (i49) No. 6:*** ***RHD model:*** ***(B293) No. 1 — (i49) No. 1:*** ***(B293) No. 2 — (i49) No. 7:*** ***(B293) No. 3 — (i48) No. 16:*** ***(B293) No. 4 — (i48) No. 7:*** ***(B293) No. 6 — (i49) No. 6:*** Is the measured value less than specified value?	1 Ω	Go to step **5.**	Repair the open circuit in harness between auto A/C control module and air mix door actuator.

	Step	Value	Yes	No
5	**CHECK AIR MIX DOOR ACTUATOR PBR SIGNAL.** 1)Connect the auto A/C control module and air mix door actuator connector. 2)Turn the ignition switch and AUTO switch to ON. 3)Change the set temprature between FULL COOL and FULL HOT, check voltage between auto A/C control module connector terminals. ***Connector & terminal*** ***(i49) No. 1 — (i48) No. 16 (–):*** Is the measured value within specified value?	0.5 V (FULL COOL) — 4.5 V (FULL HOT)	Go to step **6.**	Replace the air mix door actuator.
6	**CHECK POOR CONTACT.** Check poor contact in the auto A/C control module connector. Is there poor contact in the connector?	There is no poor contact.	Replace the auto A/C control module.	Repair the connector.

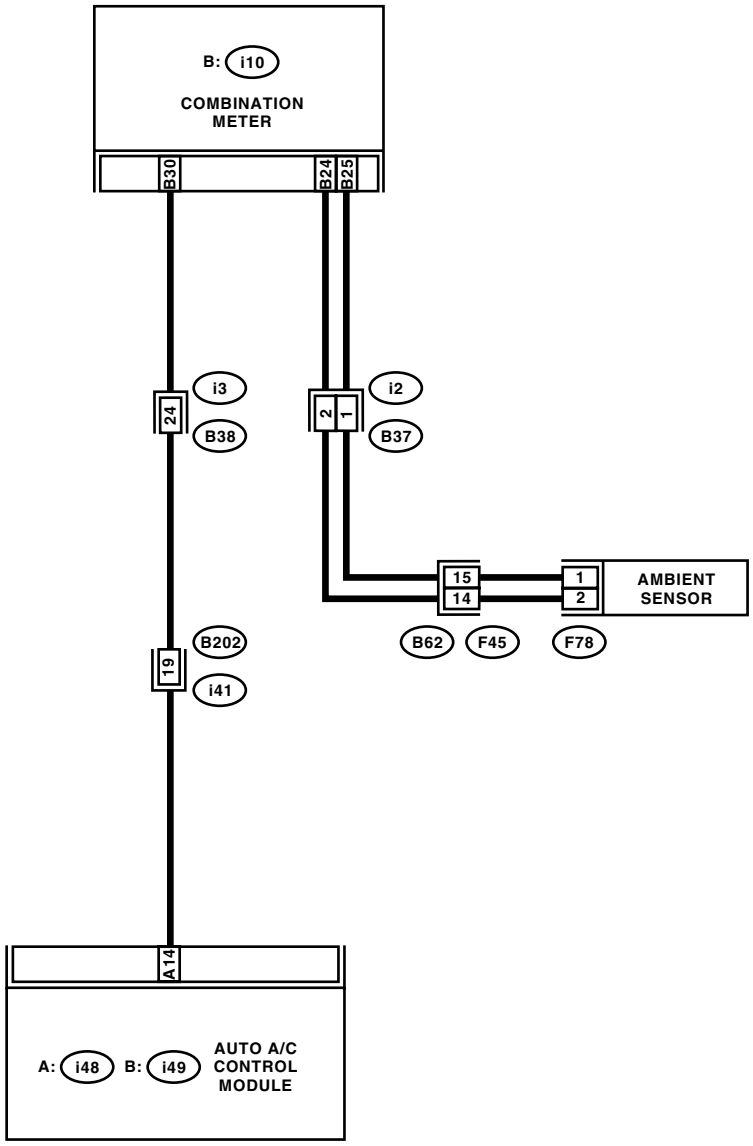
8. Diagnostic Procedure for Sensors

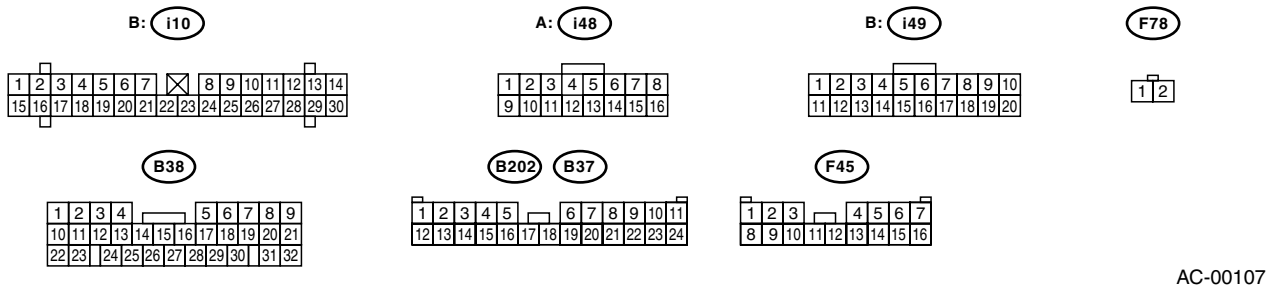
A: AMBIENT SENSOR

TROUBLE SYMPTOM:

- Fan speed is not switched when the fan speed control dial is in AUTO position.
- Malfunction related to ambient sensor is indicated in self diagnosis.

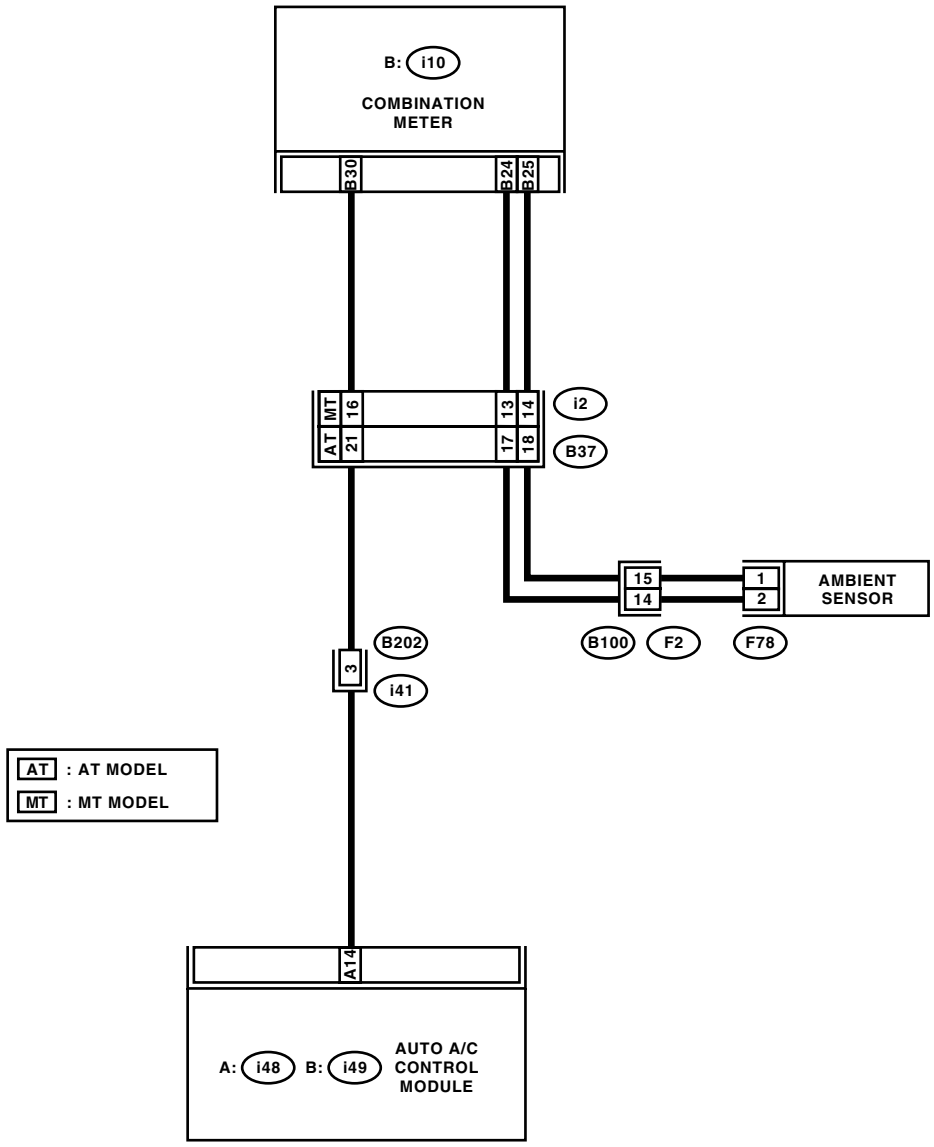
WIRING DIAGRAM FOR LHD MODEL:

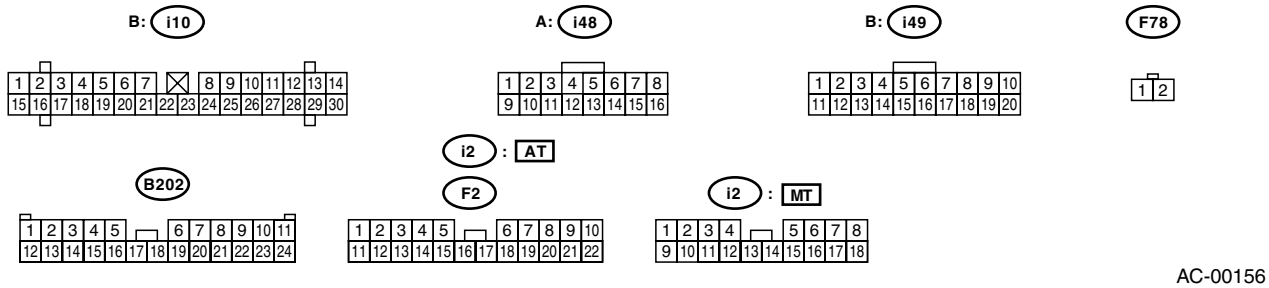




AC-00107

WIRING DIAGRAM FOR RHD MODEL:





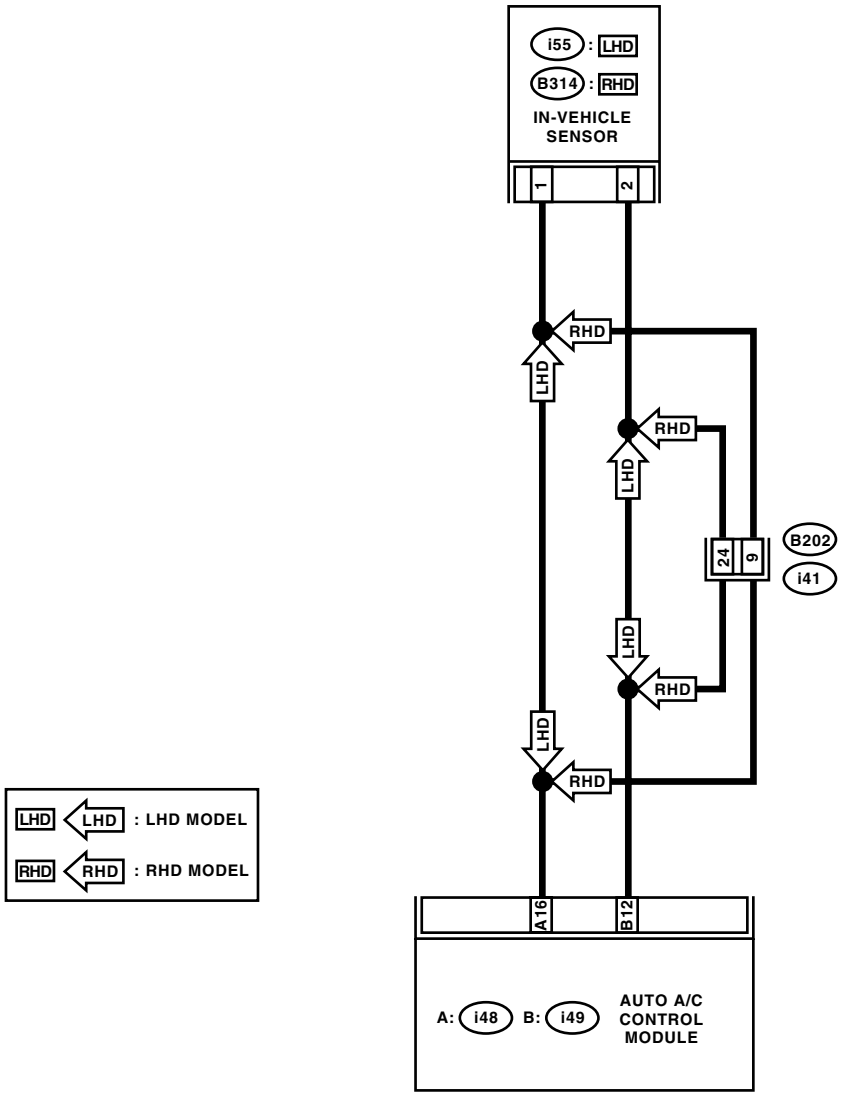
AC-00156

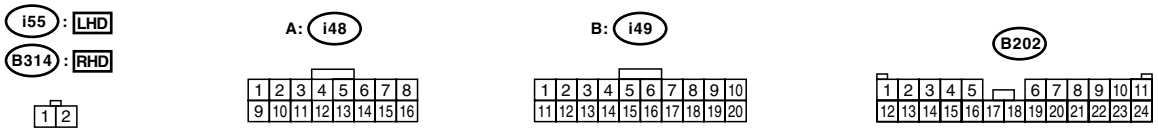
	Step	Value	Yes	No
1	**CHECK HARNESS BETWEEN A/C CONTROL MODULE AND COMBINATION METER .** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from A/C control module and combination meter. 3)Measure the resistance of harness between A/C control module and combination meter. ***Connector & terminal*** ***(i10) No. 30 — (i48) No. 14:*** Is the measured value less than specified value?	1 Ω	Go to step **2.**	Repair the harness between A/C control module and combination meter.
2	**CHECK AMBIENT SENSOR CIRCUIT.** Check the ambient sensor circuit. <Ref. to IDI-11, CHECK OUTSIDE TEMPERATURE INDICATOR, INSPECTION, Combination Meter System.> Is the ambient sensor circuit normal?	Sensor circuit is normal.	Go to step **3.**	Repair the ambient sensor circuit.
3	**CHECK POOR CONTACT.** Check poor contact in A/C control module connector. Is there poor contact in connector?	There is no poor contact.	Replace the A/C control module.	Repair the connector.

B: IN-VEHICLE SENSOR

TROUBLE SYMPTOM:

- When turning the AUTO switch to ON, blower fan speed, outlet port and inlet port is not changed.
- Malfunction related to ambient sensor is indicated in self diagnosis.





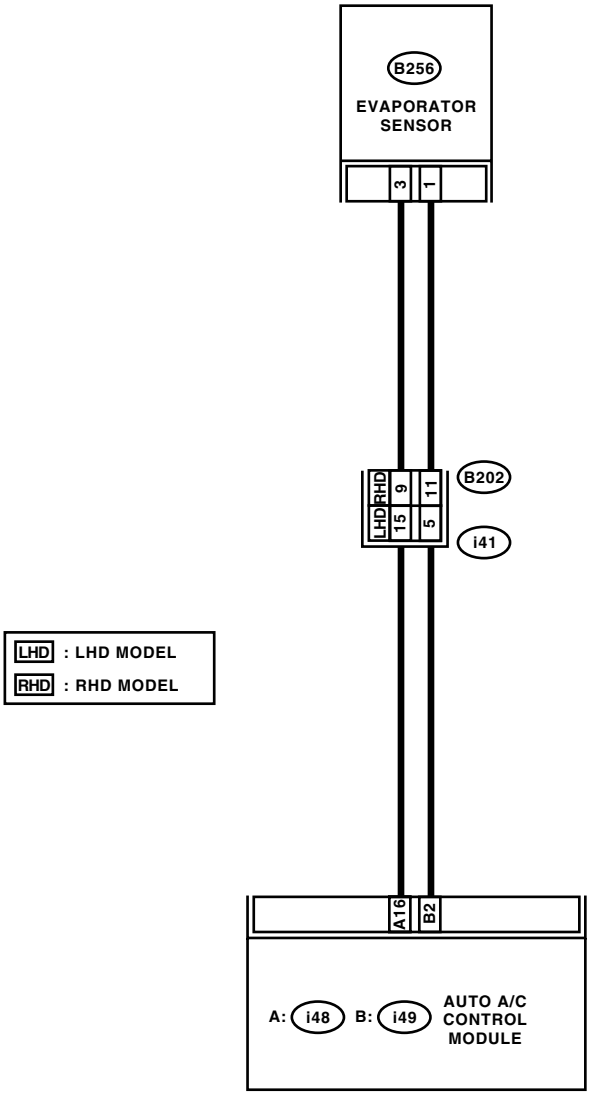
AC-00157

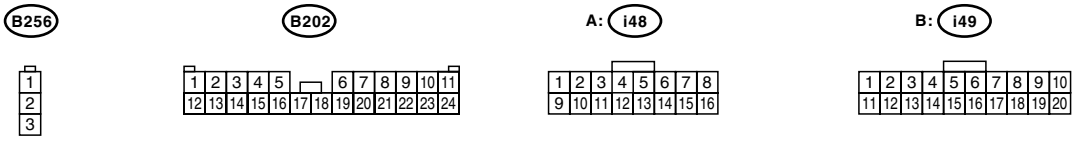
	Step	Value	Yes	No
1	**CHECK IN-VEHICLE SENSOR.** 1)Turn the ignition switch to OFF. 2)Remove the lower cover at driver side. 3)Disconnect the connector from in-vehicle sensor. 4)Measure the resistance between connector terminals of in-vehicle sensor. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within specified value?	Approx. 2.7 kΩ at 20°C (68°F)	Go to step **2.**	Replace the in-vehicle sensor.
2	**CHECK INPUT SIGNALS FOR IN-VEHICLE SENSOR.** 1)Turn the ignition to ON. 2)Measure the voltage between in-vehicle sensor harness connector terminals and chassis ground. ***Connector & terminal*** ***LHD model:*** ***(i55) No. 2 (+) — Chassis ground (–):*** ***RHD model:*** ***(B314) No. 2 (+) — Chassis ground (–):*** Is the measured value within specified value?	Approx. 5 V	Go to step **5.**	Go to step **3.**
3	**CHECK OUTPUT SIGNALS FROM A/C CONTROL MODULE.** 1)Turn the ignition switch to OFF. 2)Pull out the A/C control module. 3)Turn the ignition switch to ON. 4)Measure the voltage between A/C control module connector terminals. ***Connector & terminal*** ***(i49) No. 12 (+) — (i48) No. 16 (–):*** Is the measured value within specified value?	Approx. 5 V	Go to step **4.**	Go to step **6.**
4	**CHECK HARNESS BETWEEN A/C CONTROL MODULE AND IN-VEHICLE SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from A/C control module. 3)Measure the resistance of harness between A/C control module and in-vehicle sensor. ***Connector & terminal*** ***LHD model:*** ***(i55) No. 2 — (i49) No. 12:*** ***RHD model:*** ***(B314) No. 2 — (i49) No. 12:*** Is the measured value less than specified value?	1 Ω	Go to step **5.**	Repair the harness between A/C control module and in-vehicle sensor.
5	**CHECK HARNESS BETWEEN A/C CONTROL MODULE AND IN-VHECLE SENSOR.** Measure the resistance of harness between A/C control module and in-vehicle sensor. ***Connector & terminal*** ***LHD model:*** ***(i55) No. 1 — (i48) No. 16:*** ***RHD model:*** ***(B314) No. 1 — (i48) No. 16:*** Is the measured value less than specified value?	1 Ω	Go to step **6.**	Repair the harness between A/C control module and in-vehicle sensor.

	Step	Value	Yes	No
6	**CHECK POOR CONTACT.** Check poor contact in A/C control module connector. Is there poor contact in connector ?	There is no poor contact.	Replace the A/C control module.	Repair the connector.

C: EVAPORATOR SENSOR

WIRING DIAGRAM:





AC-00158

	Step	Value	Yes	No
1	**CHECK EVAPORATOR SENSOR.** 1)Turn the ignition switch to OFF. 2)Remove the glove box. 3)Disconnect the connector from evaporator sensor. 4)Measure the resistance between connector terminals of evaporator sensor. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within specified value?	Approx. 2.7 kΩ at 20°C (68°F)	Go to step **2.**	Replace the evaporator sensor.
2	**CHECK INPUT SIGNALS FOR EVAPORATOR SENSOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between evaporator sensor harness connector terminal and chassis ground. ***Connector & terminal*** ***(B256) No. 1 (+) — Chassis ground (–):*** Is the measured value within specified value?	Approx. 5 V	Go to step **5.**	Go to step **3.**
3	**CHECK OUTPUT SIGNALS FROM A/C CONTROL MODULE.** 1)Turn the ignition switch to OFF. 2)Pull out the A/C control module. 3)Turn the ignition switch to ON. 4)Measure the voltage between A/C control module connector terminals. ***Connector & terminal*** ***(i49) No. 2 (+) — (i48) No. 16 (–):*** Is the measured value within specified value?	Approx. 5 V	Go to step **4.**	Go to step **6.**
4	**CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND EVAPORATOR SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from A/C control module. 3)Measure the resistance of harness between A/C control module and evaporator sensor. ***Connector & terminal*** ***(B256) No. 1 — (i49) No. 2:*** Is the measured value less than specified value?	1 Ω	Go to step **5.**	Repair the harness between A/C control module and evaporator sensor.
5	**CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND EVAPORATOR SENSOR.** Measure the resistance of harness between A/C control module and evaporator sensor. ***Connector & terminal*** ***(B256) No. 3 — (i48) No. 16:*** Is the measured value less than specified value?	1 Ω	Go to step **6.**	Repair the harness between A/C control module and evaporator sensor.
6	**CHECK POOR CONTACT.** Check poor contact in A/C control module connector. Is there poor contact in connector?	There is no poor contact.	Replace the A/C control module.	Repair the connector.

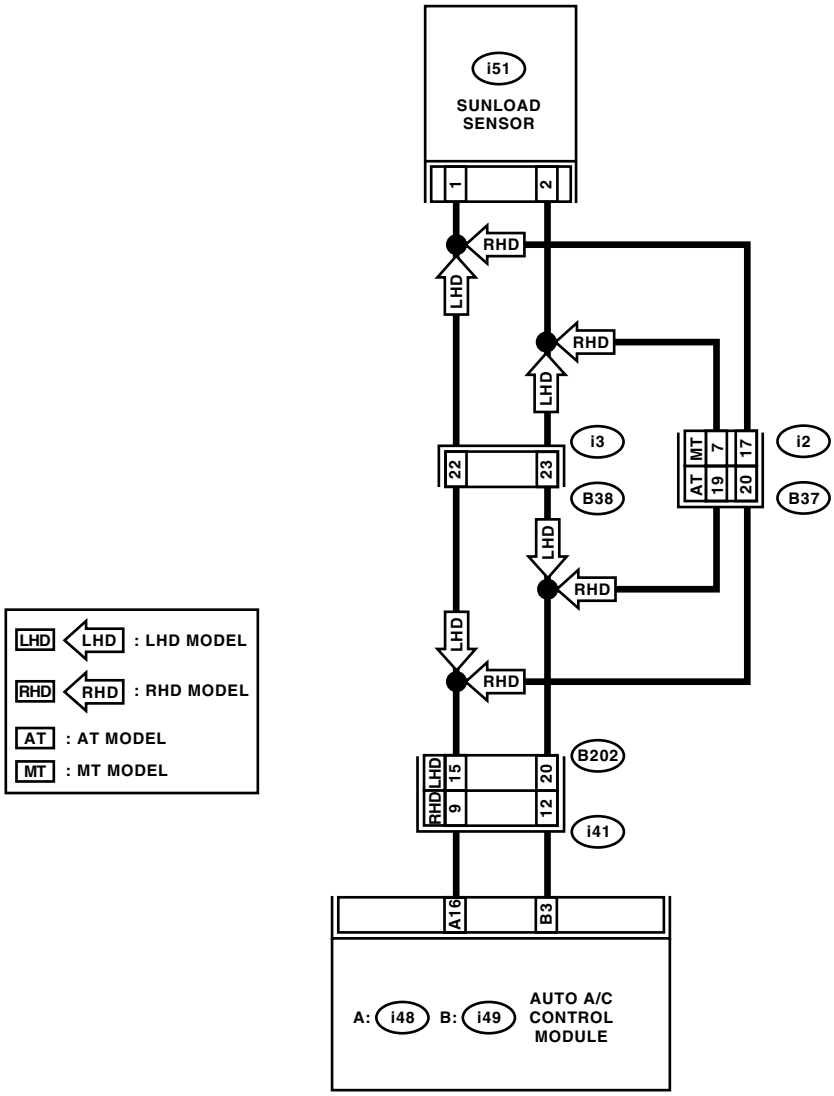
D: SUNLOAD SENSOR

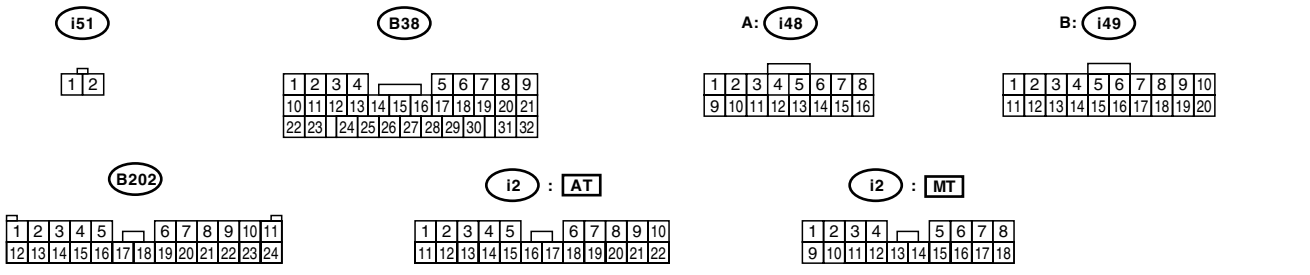
TROUBLE SYMPTOM:

- Sensor identified that sunlight is at maximum. Then, A/C system is controlled to COOL side.
- Sensor identified that sunlight is at minimum. Then, A/C system is controlled to HOT side.

NOTE:
When the sunload sensor is checked indoors or in the shade, open circuit might be indicated. Always check the sunload sensor at a place where sun shines directly on it.

WIRING DIAGRAM:





AC-00159

	Step	Value	Yes	No
1	**CHECK INPUT VOLTAGE TO SUNLOAD SENSOR.** 1)Turn the ignition switch to ON. 2)Measure the input voltage to sunload sensor. ***Connector & terminal*** ***(i51) No. 2 (+) — Chassis ground (–):*** Is the measured value within specified value?	Approx. 5 V	Go to step **3.**	Go to step **2.**
2	**CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND SUNLOAD SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from A/C control module. 3)Measure the resistance of harness between A/C control module and sunload sensor. ***Connector & terminal*** ***(i51) No. 2 — (i49) No. 3:*** Is the measured value less than specified value?	1 Ω	Go to step **3.**	Repair the harness between A/C control module and sunload sensor.
3	**CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND SUNLOAD SENSOR.** Measure the resistance of harness between A/C control module and sunload sensor. ***Connector & terminal*** ***(i51) No. 1 — (i48) No. 16:*** Is the measured value less than specified value?	1 Ω	Go to step **4.**	Repair the harness between A/C control module and sunload sensor.
4	**CHECK THE INPUT VOLTAGE TO A/C CONTROL MODULE.** 1)Connect the A/C control module connector. 2)Turn the ignition switch to ON. 3)Measure the voltage between A/C control module connector terminals. ***Connector & terminal*** ***(i49) No.3 (+) — (i48) No.16 (–):*** Is the measured value within specified value?	Approx. 2.5 V	Go to step **5.**	Replace the sunload sensor.
5	**CHECK POOR CONTACT.** Check poor contact in A/C control module connector. Is there poor contact in connector?	There is no poor contact.	Replace the A/C control module.	Repair the connector.

9. Symptom Related Diagnostic

A: GENERAL DIAGNOSTICS TABLE

Symptom / Malfunction Parts	A/C system does not operate.	Fuse is blown.	Illumination cannot be dim.	Blower fan does not operate or fan speed cannot be adjusted.	Air inlet (FRESH/RECIRC)cannot be switched.	Air outlet cannot be switched.	Compartment temperature does not increase (No hot air is discharged).	Compartment temperature does not decrease (No cool air is discharged).	Compartment temperature is higher than or lower than the set value.	Compartment temperature does not quickly respond to the set value.	Radiator fan does not rotate during A/C operation.
Fuse	○	○	○	○							
Connector (Poor contact)	○	○	○	○	○	○	○	○			
Ground	○			○							
Auto A/C control module	○		○	○	○	○	○	○	○		
Air mix door actuator							○	○	○	○	
Mode door actuator						○					
Intake door actuator					○						
Blower fan motor	○			○							
Blower fan relay	○			○							
A/C relay	○							○			
Compressor (Magnet clutch)	○							○			
Radiator fan motor								○			○
Radiator fan relay								○			○
Sensors (In-vehicle,ambient temperature, evaporator and sunload)	*1 ○						○	○	○	○	
In-vehicle sensor aspirator hose							○	○	○	○	

*1 : Evaporator sensor only

AC-00111

AIRBAG SYSTEM

AB

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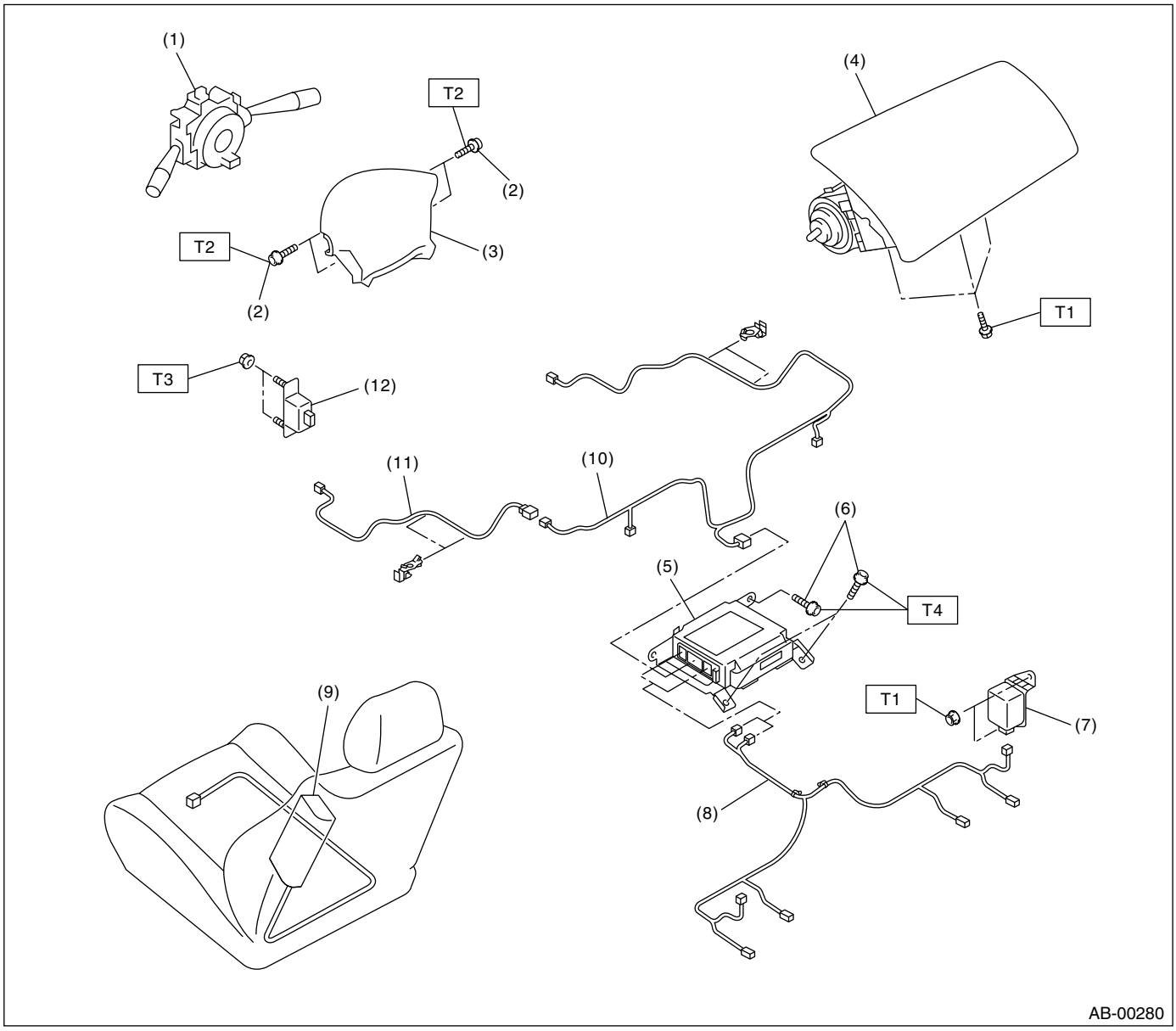
12.	Disposal of Airbag Module (Deploying After Removal from Vehicle)	26

1. General Description

A: COMPONENT

1. SRS AIRBAG

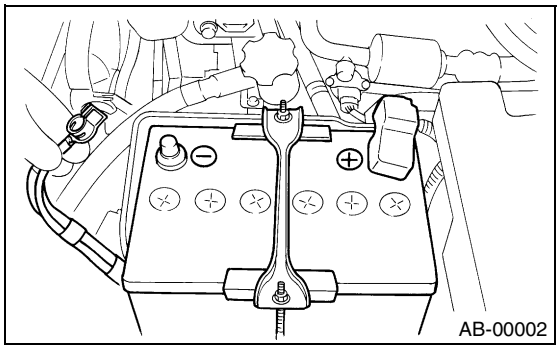


(1) Combination switch ASSY with roll connector
(2) TORX® bolt T30
(3) Airbag module ASSY (Driver's side)
(4) Airbag module ASSY (Passenger's side)
(5) Airbag control module
(6) TORX® bolt T40
(7) Side airbag sensor
(8) Side airbag harness
(9) Side airbag module
(10) Airbag main harness
(11) Front sub sensor harness
(12) Front sub sensor

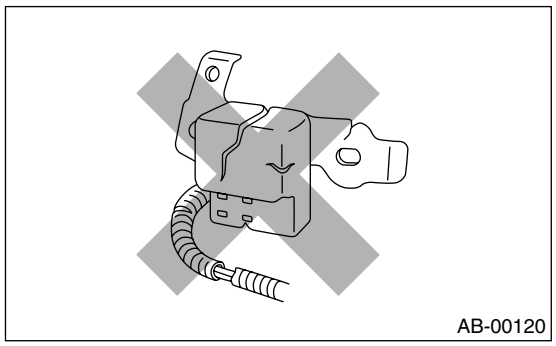
Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.4 (0.75, 5.4)
T2: 10 (1.0, 7.2)
T3: 20 (2.0, 14.5)
T4: 25 (2.5, 18.1)

B: CAUTION

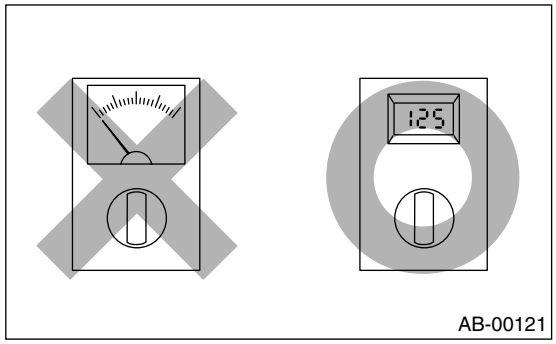
• When servicing a vehicle, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.
• The airbag system is fitted with a backup power source. If the airbag system is serviced within 20 seconds after the ground cable is disconnected, it may inflate.



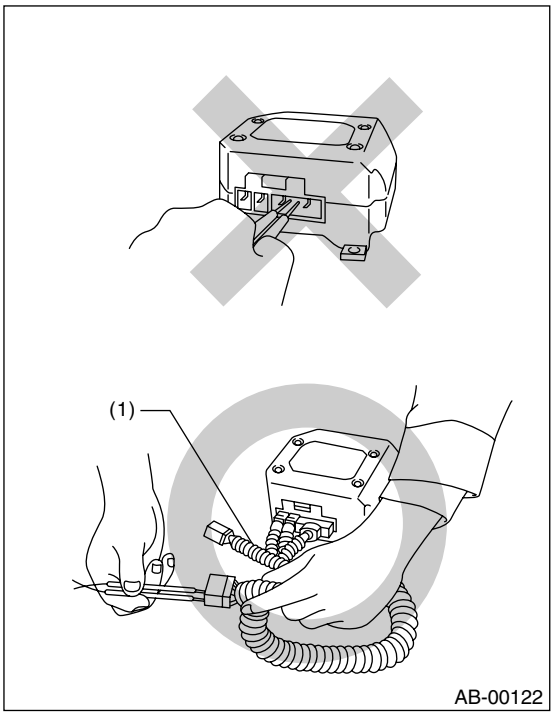
• If the airbag warning light illuminates, repair the vehicle immediately. Airbag or pretensioner may inflate incorrectly, or not inflate in collision.
• If sensors, airbag module, airbag control module, pretensioner, and harness are deformed or damaged, replace them with new genuine parts.



• When checking the system, be sure to use a digital circuit tester.
Use of an analog circuit tester may cause the airbag to activate erroneously.

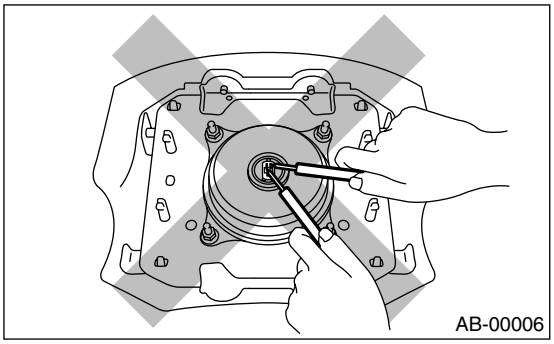


• When checking, use a test harness. Do not directly apply the tester probe to any connector terminal of the airbag.

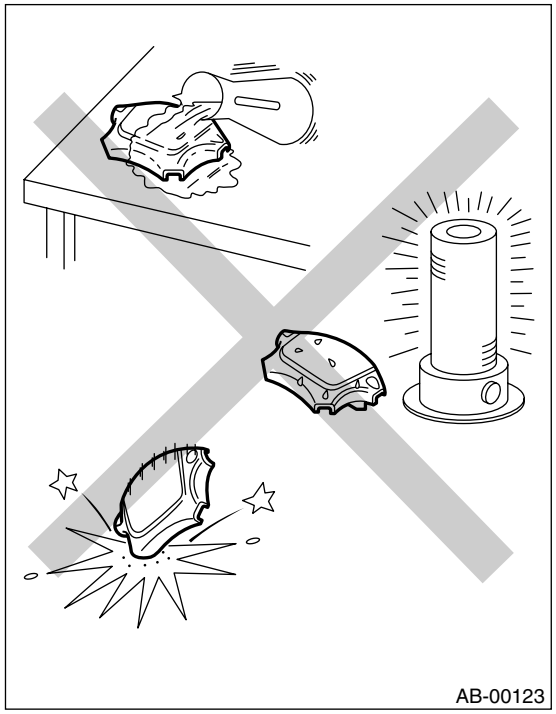


(1) Test harness

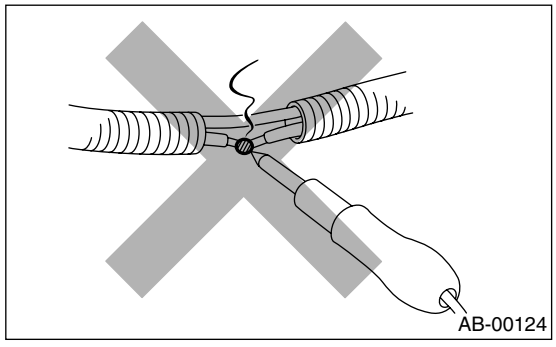
• Do not check continuity of either of the airbag modules for driver, passenger or side, or pretensioner.



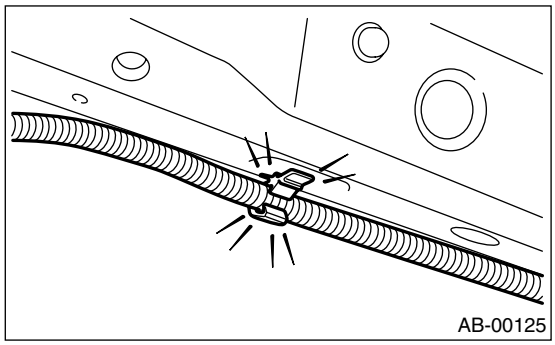
• Do not drop the airbag modulator parts, subject them to high temperature over 93°C (199°F), or let water, oil, or grease get on them; otherwise, the internal parts may be damaged and reliability greatly lowered.


AB-00123

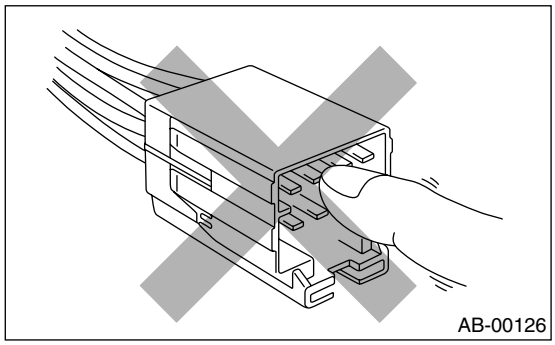
• If any damage, opening, or rust is found on the airbag system wire harness, do not attempt to repair using soldering equipment. Be sure to replace the faulty harness with a new genuine part.


AB-00124

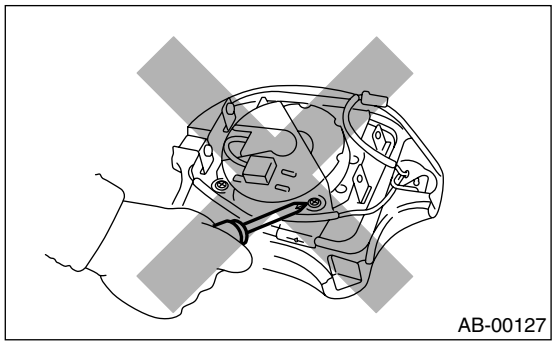
• Install the wire harness securely with the specified clips to avoid interference or tangled up with other parts.


AB-00125

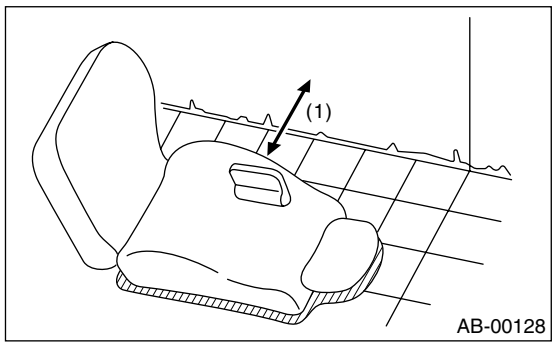
• Do not allow water or oil to come in contact with the connector terminals. Do not touch the connector terminals.


AB-00126

• Either of the airbag modules for driver, passenger or side, or pretensioner must not be disassembled.

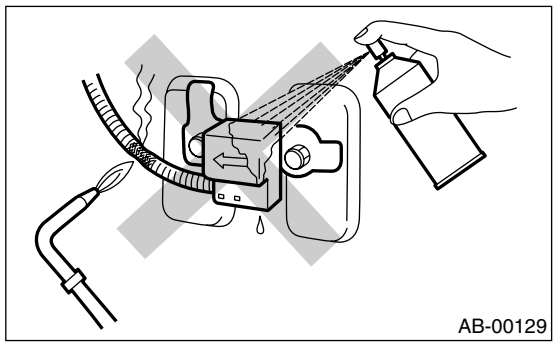

AB-00127

• The removed front seat with the airbag module must be kept at least 200 mm (8 in) away from walls and other objects.

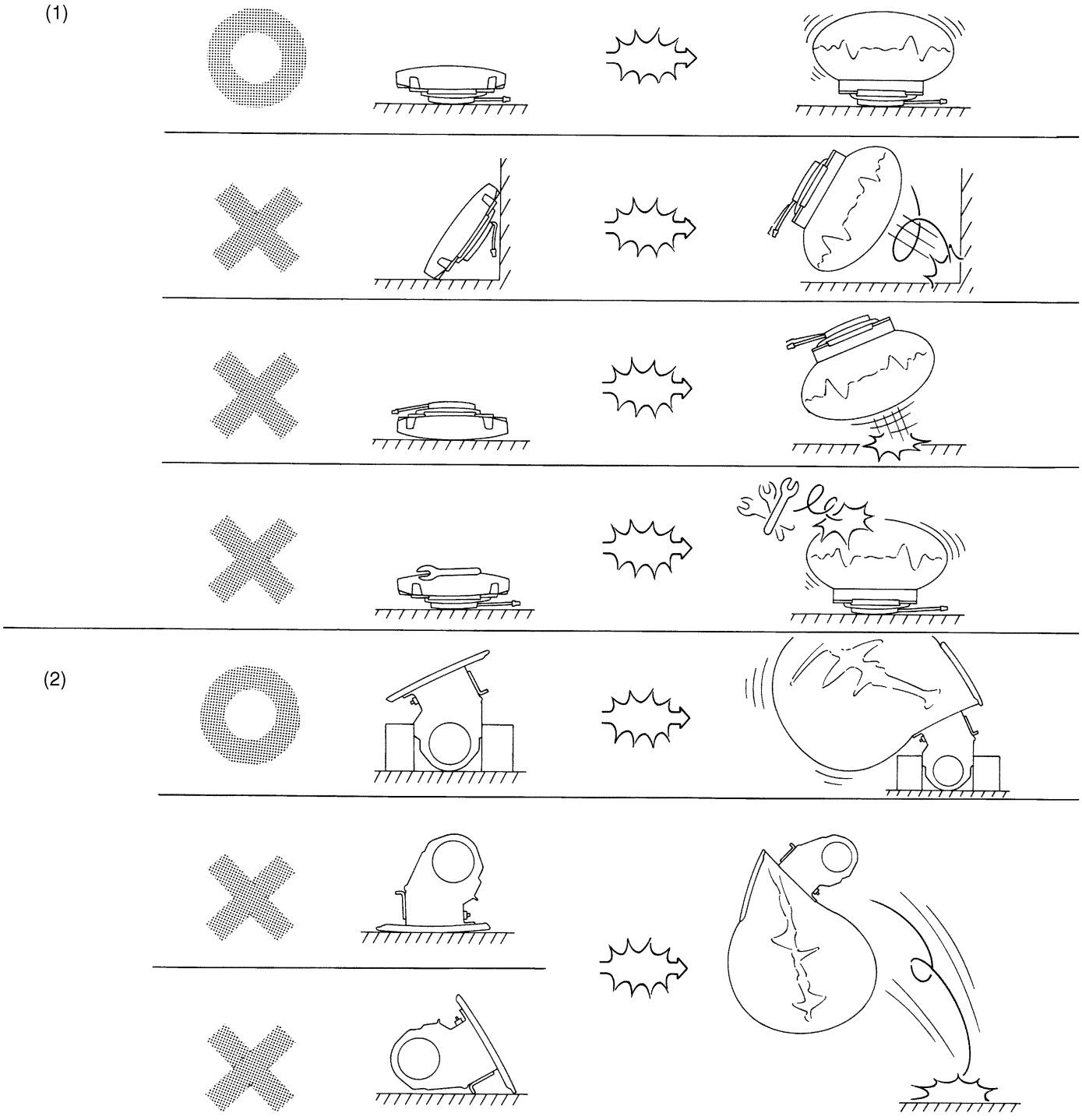


(1) More than 200 mm (8 in)

• Do not use the airbag or pretensioner parts from other vehicles. Always replace defective parts with new parts.
• Never re-use a deployed airbag or pretensioner.
• When painting or performing sheet metal work on the front part of the vehicle, including the front wheel apron, front fender, and front side frame, remove the front sub sensors and wire harness of the airbag system.
• When painting or performing sheet metal work on the side of the vehicle, including the side sill, center pillar, and front and rear doors, remove the side airbag sensors and wire harness of the airbag system.



• When storing a removed airbag module, do not place any objects on it or pile airbag modules on top of each other. If the airbag inflates for some reason when it is placed with its pad side facing downward or under any object, a serious accident may result.



C: PREPARATION TOOL

1. SPECIAL TOOLS

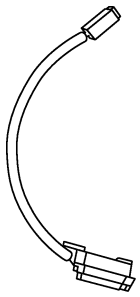
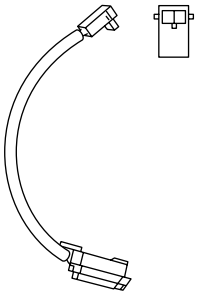
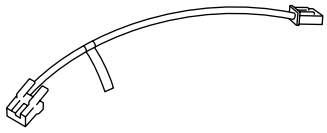
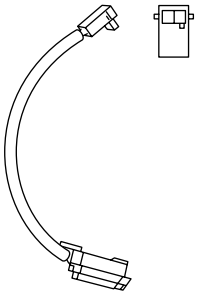
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299FC030	98299FC030	DEPLOYMENT ADAPTER A	• Used for deploying the driver's airbag module, side airbag module and seat belt pretensioner. • Used with DEPLOYMENT TOOL (98299PA030).
 ST98299SA010	98299SA010	TEST HARNESS ADAPTER D	• Used for deplaying the driver's airbag module. • Used with DEPLOYMENT TOOL (98299PA030). • Can not reuse.
 ST98299SA030	98299SA030	TEST HARNESS ADAPTER E	• Used for deploying the passenger's airbag module. • Used with DEPLOYMENT TOOL (98299PA030).
 ST98299SA050	98299SA050	TEST HARNESS ADAPTER F	• Used for deploying lap pretensioner. • Used with DEPLOYMENT TOOL (98299PA030).

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
ST98299PA030	98299PA030	DEPLOYMENT TOOL	• Used for deploying the airbag module. • Used with DEPLOYMENT ADAPTER A (98299FC030).

2. GENERAL TOOL

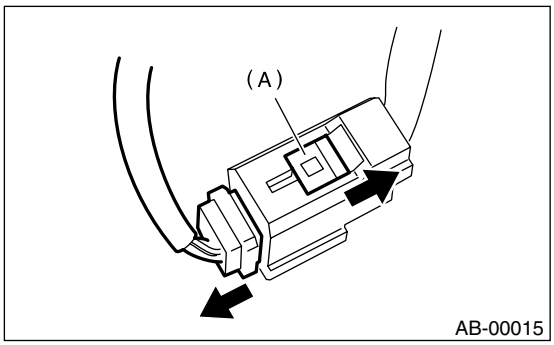
TOOL NAME	REMARKS
TORX® T30	Used for removal/installation of driver's airbag module.
TORX® T40 (Tamper resistant type)	Used for removal/installation of airbag control module.

2. Airbag Connector

A: OPERATION

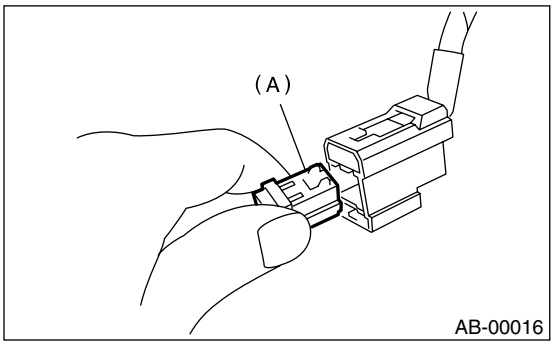
1. POWER SUPPLY

1) How to disconnect:
(1) Move the slide lock (A) in the direction of the arrow.
(2) Pull the female connector in the direction of the arrow with slide lock (A) moved.



CAUTION:
When pulling, be sure to hold onto the connector and not the wire.

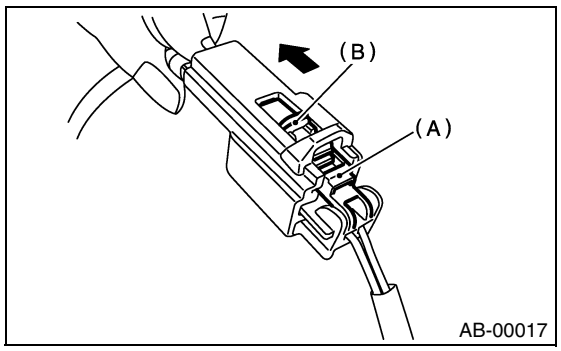
2) How to connect:
Holding the connector (A), and push it in carefully until a connecting sound is heard.



CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

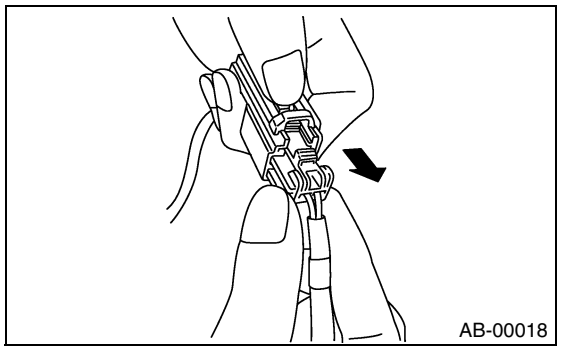
2. DRIVER'S AIRBAG (BETWEEN AIRBAG HARNESS AND ROLL CONNECTOR), SIDE AIRBAG AND PRETENSIONER

1) How to disconnect:
(1) Push the lock arm (A).
(2) With the lock arm (A) pushed in, move the slide lock (B) in the direction of the arrow.



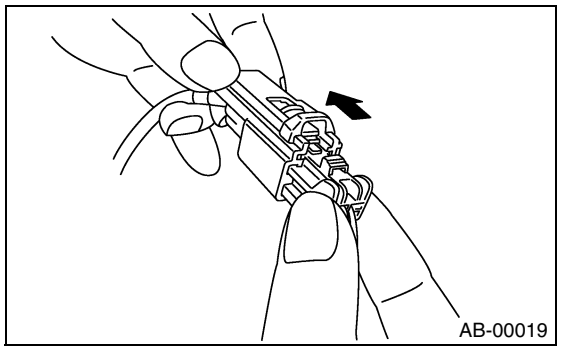
(3) With the slide lock (B) pulled, remove the lock arm (A) to its original position, and then pull in the direction of the arrow and separate the connector.

CAUTION:
When pulling, be sure to hold onto the connector and not the wire.



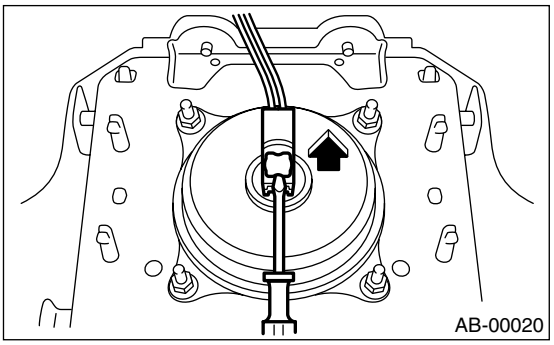
2) How to connect:
Holding the connector, and push it in carefully until a connecting sound is heard.

CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.



3. DRIVER'S AIRBAG MODULE

1) How to disconnect:
(1) Using a flat tip screwdriver, pry the push lock upward to unlock.



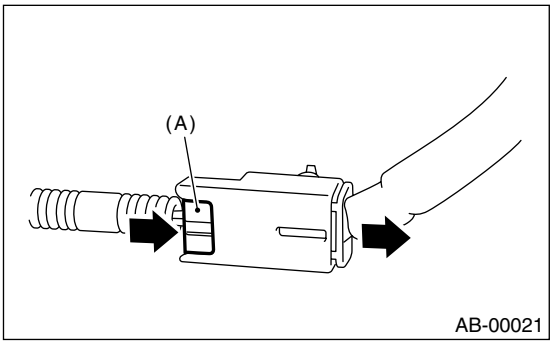
(2) Pull the connector to disconnect from driver's side airbag module assembly.

2) How to connect:
Connect the connector in reverse order of disconnecting. At this time, be sure to insert the connector in until connecting sound is heard.

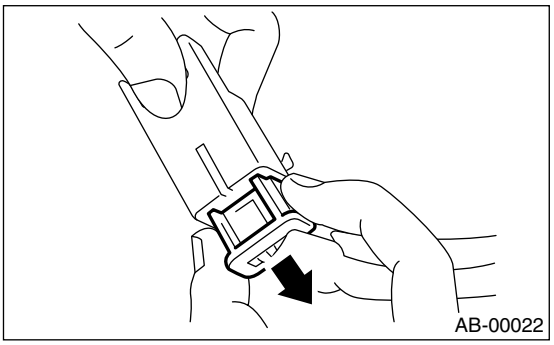
CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

4. PASSENGER'S AIRBAG

1) How to disconnect:
(1) Move the slide lock (A) in the direction of arrow.



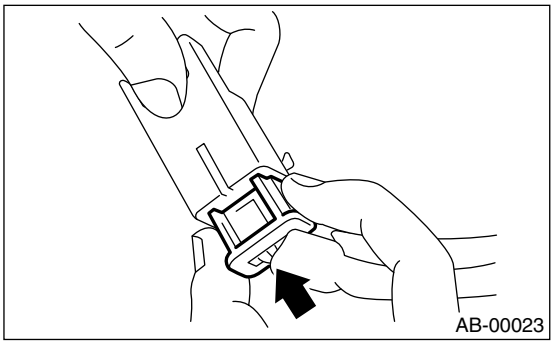
(2) With the slide lock (A) pushed, pull the connector in the direction of arrow and disconnect it.



CAUTION:
When pulling, be sure to hold onto the connector and not the wire.

2) How to connect:
Holding the connector, and push it in carefully until a connecting sound is heard.

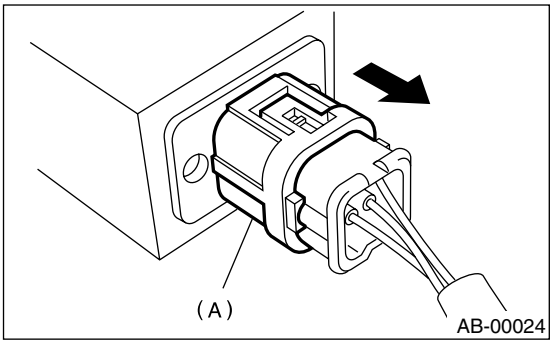
CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.



5. FRONT SUB-SENSOR AND SIDE AIRBAG SENSOR

1) How to disconnect:
Holding outer part (A), pull it in the direction of the arrow.

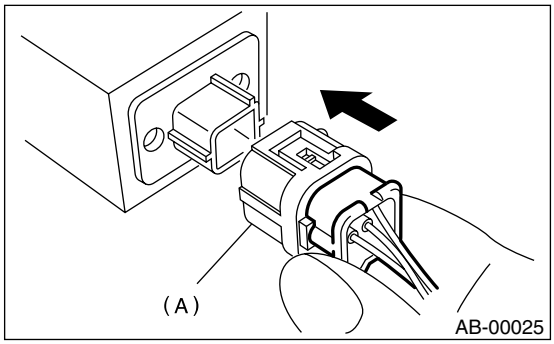
CAUTION:
When pulling, be sure to hold onto the connector and not the wire.



2) How to connect:
Holding the connector, and push it in carefully until a connecting sound is heard.

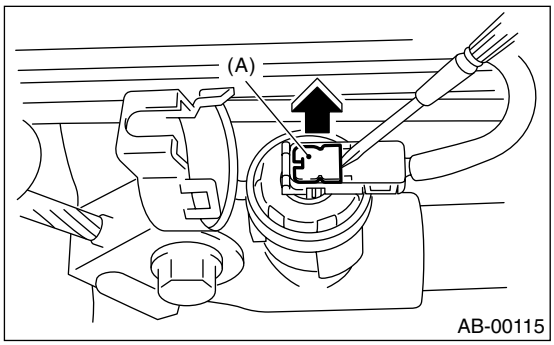
CAUTION:
• Outer (A) moves back, and so do not put your hand on the outer part.

• Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

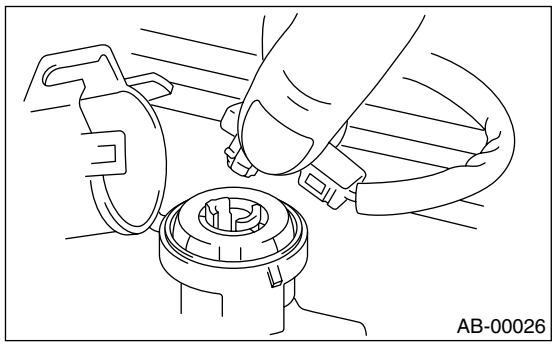


6. LAP PRETENSIONER (AUSTRALIA MODEL ONLY)

1) How to disconnect:
(1) Using a flat tip screwdriver, pry the push lock (A) upward to unlock.



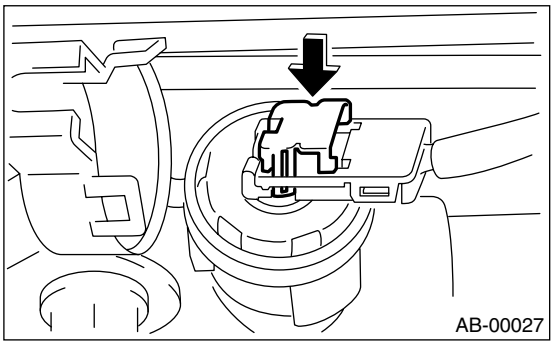
(2) Pull the the connector to disconnect from lap pretensioner.



CAUTION:
When pulling, be sure to hold onto the connector and not the wire.

2) How to connect:
Connect the connector in reverse order of disconnecting. At this time, be sure to insert the connector in until connecting sound is heard.

CAUTION:
• Be sure to insert the connector in until it locks.
Then pull on it gently to make sure that it is locked.
• Be sure to lock the push lock securely.



3. Inspection Locations After a Collision

A: REPLACEMENT

When airbag system is deployed, replace the following parts.

1. FRONT COLLISION

1) Driver's airbag module
2) Passenger's airbag module
3) Driver's seat belt (pretensioner, lap pretensioner)
4) Passenger's seat belt (pretensioner)
5) Airbag control unit
6) Front sub-sensor
7) Roll connector

2. SIDE COLLISION

1) Airbag control unit
2) Side airbag module (operating side)
3) Side airbag module (operating side)

3. INSPECTION OF OTHER PARTS

Check for the following parts, replace the damaged parts with new ones.
1) Steering wheel and steering shaft
Check the steering wheel and steering shaft for mounting condition and deflection of axial and radical, upward and downward direction. Check the steering shaft for deflection of axial and radical direction with tilt lever released. (After a collision, absorbing part of steering shaft may inflate.)
2) Check the lap pretensioner direct insert connector for damage, each harness for pinch, and connector for damage. If damage is found, replace the harness as a unit.

B: INSPECTION

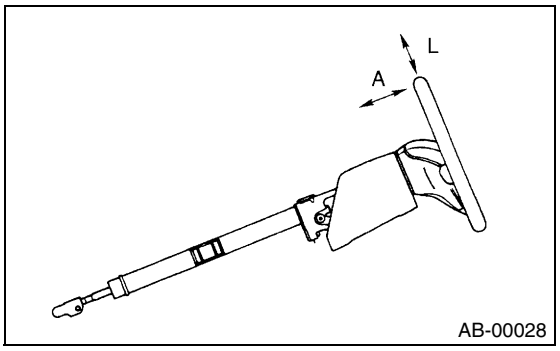
If the vehicle is involved in a collision on any side, even if it is a slight collision, be sure to check the following system parts.

1. AIRBAG MODULE (DRIVER)

1) Check for the following, and replace damaged parts with new parts.
- Airbag module is cracked or deformed.
- Harness and/or connector is cracked, deformed or open. Lead wire is exposed.
- The module surface is fouled with grease, oil, water or cleaning solvent.

2) When installing a new driver's airbag module, check the following. If necessary, install a new airbag module and steering wheel.
- The steering wheel is in the way, making it difficult to install the airbag module.
- The clearance between the driver's airbag module and steering wheel is not constant.
- The steering wheel deformation in axial and radial directions exceed limits.

Specifications:
Height deflection A
Less than 6 mm (0.24 in)
O.D. deflection L
Less than 17 mm (0.67 in)



2. AIRBAG MODULE (PASSENGER)

Check for the following, and replace damaged parts with new parts.
- Airbag module is cracked or deformed.
- Harness and/or connector is cracked, deformed or open. Lead wire is exposed.
- Mounting bracket is cracked or deformed.

3. AIRBAG MODULE (SIDE)

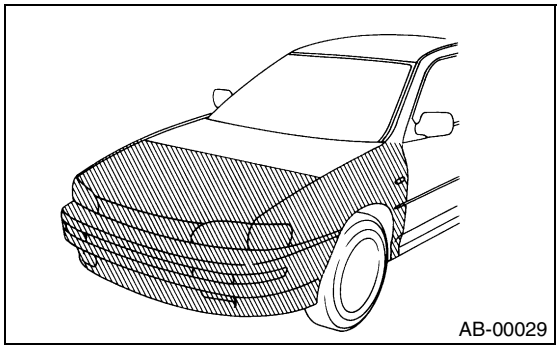
Check for the following, and replace damaged parts with new parts.
- Front seat is damaged or deformed.
- Harness and/or connector is cracked, deformed or open.
- Lead wire is exposed.

4. AIRBAG CONTROL MODULE

Check for the following, and replace damaged parts with new parts.
- Control module is cracked or deformed.
- Mounting bracket is cracked or deformed.
- Connector is scratched or deformed.
- Airbag is deployed.
- Side airbag is deployed.

5. FRONT SUB SENSOR

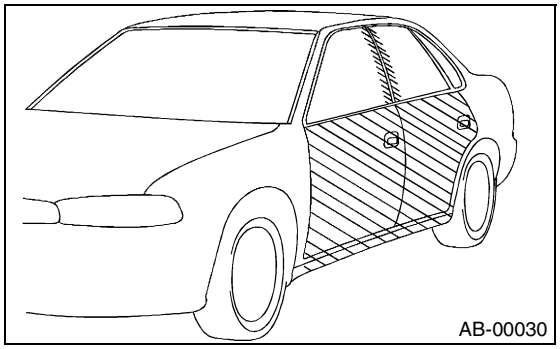
If the front section of vehicle as shown in the figure is damaged:



Check for the following, and replace damaged parts with new parts.
- Front sub sensor is cracked or deformed.
- Mounting bracket is cracked or deformed.
- Connector is scratched or cracked.
- Airbag is deployed.

6. SIDE AIRBAG SENSOR

If the side section of vehicle as shown in the figure is damaged:



Check for the following, and replace damaged parts with new parts.
- Side airbag sensor is cracked or deformed.
- Mounting bracket is cracked or deformed.
- Connector is scratched or cracked.
- Side airbag is deployed. (operating side)

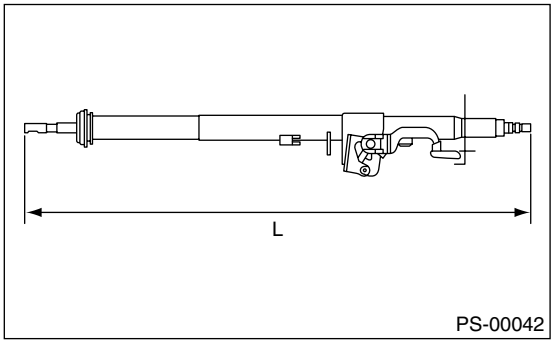
7. ROLL CONNECTOR

Check for the following, and replace damaged parts with new parts.
- Combination switch or steering roll connector is cracked or deformed.

8. STEERING SHAFT

Check for the following, and replace damaged parts with new parts.
Overall length of steering column should be within specifications.

Specifications:
Overall length L
815.6±1.5 mm (32.1±0.06 in)



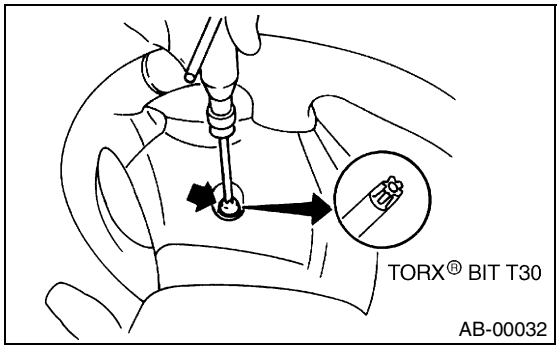
If necessary, replace it with a new part.

4. Driver's Airbag Module

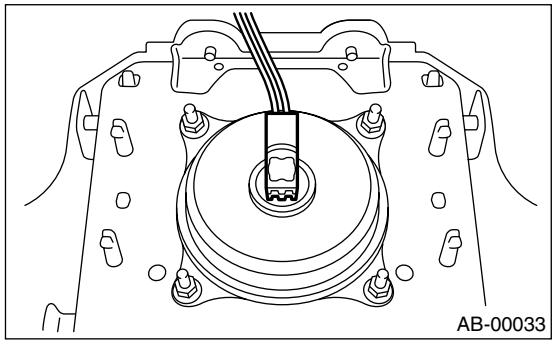
A: REMOVAL

CAUTION:
Refer to "CAUTION" in General Description before handing the airbag module. <Ref. to AB-3, CAUTION, General Description.>

1) Position the front wheels straight ahead. (After moving the vehicle more than 5 m (16 ft) with front wheels positioned straight ahead, make sure that the vehicle moves straight ahead).
2) Turn the ignition switch to OFF.
3) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
4) Using the TORX® BIT T30, remove the two TORX® bolts on side of steering wheel.



5) Disconnect the airbag connector on the back of airbag module, and then remove the airbag module.



6) Refer to "CAUTION" for handling of a removed airbag module. <Ref. to AB-3, CAUTION, General Description.>

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
Do not allow harness and connectors to interfere or get tangled up with other parts.

C: INSPECTION

CAUTION:
Refer to "CAUTION" in General Description before handing the airbag module. <Ref. to AB-3, CAUTION, General Description.>

Check for the following, and replace damaged parts with new parts.

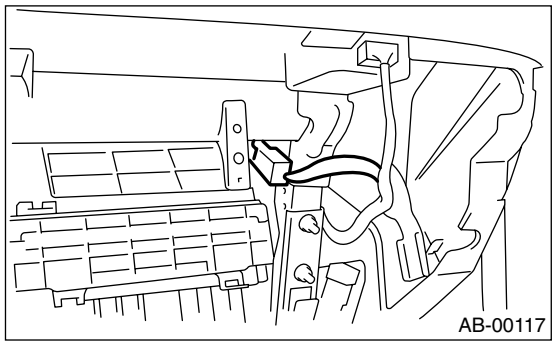
- Airbag module, harness, connector, and mounting bracket are damaged.

5. Passenger's Airbag Module

A: REMOVAL

CAUTION:
Refer to "CAUTION" in General Description before handing the airbag module. <Ref. to AB-3, CAUTION, General Description.>

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
3) Remove the glove box. <Ref. to EI-37, REMOVAL, Glove Box.>
4) Detach the airbag connector from support beam bracket, and then disconnect the airbag connector.



5) Remove the three bolts, and then carefully remove the airbag module.
6) Refer to "CAUTION" for handling of a removed airbag module. <Ref. to AB-3, CAUTION, General Description.>

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Do not allow harness and connectors to interfere or get tangled up with other parts.

C: INSPECTION

CAUTION:
Refer to "CAUTION" in General Description before handing the airbag module. <Ref. to AB-3, CAUTION, General Description.>

Check for the following, and replace damaged parts with new parts.
• Airbag module, harness, connector, and mounting bracket are damaged.

6. Side Airbag Module

A: REMOVAL

CAUTION:
• Refer to "CAUTION" in General Description before handing the airbag module. <Ref. to AB-3, CAUTION, General Description.>
• The side airbag module cannot be detached from the front seat assembly.
• When replacing the side airbag module, replace the front seat assembly.
<Ref. to SE-5, REMOVAL, Front Seat.>

B: INSTALLATION

<Ref. to SE-5, INSTALLATION, Front Seat.>

C: INSPECTION

CAUTION:
Refer to "CAUTION" in General Description before handing the airbag module. <Ref. to AB-3, CAUTION, General Description.>

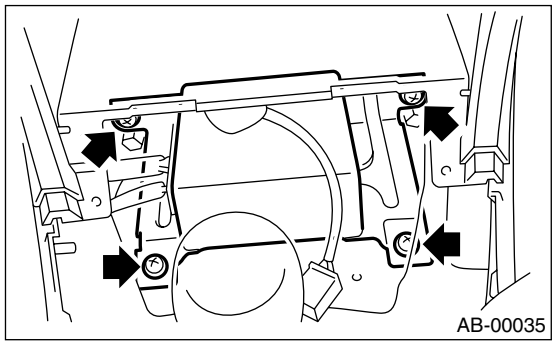
Check for the following, and replace damaged parts with new parts.
• Front seat is deformed or damaged.
• Harness and/or connector is cracked, deformed or open.
• Lead wire is exposed.

7. Airbag Control Module

A: REMOVAL

CAUTION:
• Do not disassemble the airbag control module.
• If the airbag control module is deformed or if water damage is suspected, replace the airbag control module with a new genuine part.
• Do not drop the airbag control module.
• After removal, keep the airbag control module on a dry, clean surface away from moisture, heat, and dust.

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
3) Remove the console cover. <Ref. to EI-39, REMOVAL, Console Box.>
4) Remove the center console panel. <Ref. to EI-40, REMOVAL, Instrument Panel Assembly.>
5) Disconnect the connector from airbag control module.
6) Using the T40® TORX bit (Tamper resistant type), remove the four TORX® bolts in the order shown in the figure.



B: INSTALLATION

CAUTION:
Use new TORX® bolts during re-assembly.

Install in the reverse order of removal.

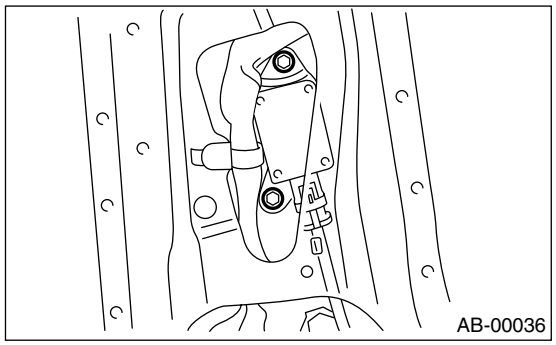
C: INSPECTION

Check for the following, and replace damaged parts with new parts.
• Control module, connector, and mounting bracket are damaged.
• Airbag is deployed.
• Side airbag is deployed.

8. Side Airbag Sensor

A: REMOVAL

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
3) Remove the outer belt (FRONT). <Ref. to SB-7, FRONT OUTER SEAT BELT WITH LAP PRETENSIONER, REMOVAL, Front Seat Belt.>
4) Detach the side airbag sensor, and then disconnect the airbag connector.



B: INSTALLATION

CAUTION:
Use new nuts when reassembling.

Install in the reverse order of removal.

C: INSPECTION

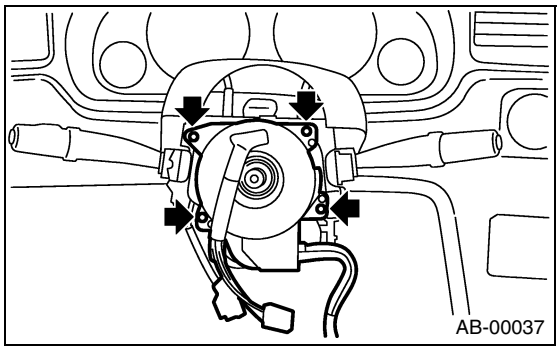
Check for the following, and replace damaged parts with new parts.

- Bracket connector for side airbag sensor is damaged.
- Side airbag is deployed.

9. Roll Connector

A: REMOVAL

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
3) Remove the driver's airbag module. <Ref. to AB-15, Driver's Airbag Module.>
4) Remove the steering wheel. <Ref. to PS-23, REMOVAL, Steering Wheel.>
5) Remove the steering column cover.
6) Remove the screws, and then remove the roll connector.



B: INSTALLATION

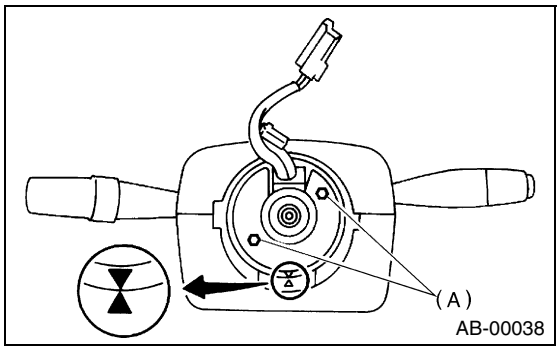
1) Install in the reverse order of removal.
2) Before installing the steering wheel, be sure the direction of roll connector is adjusted with steering. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>

C: INSPECTION

Check for the following, and replace damaged parts with new parts.
• Combination switch and roll connector is cracked or deformed.

D: ADJUSTMENT

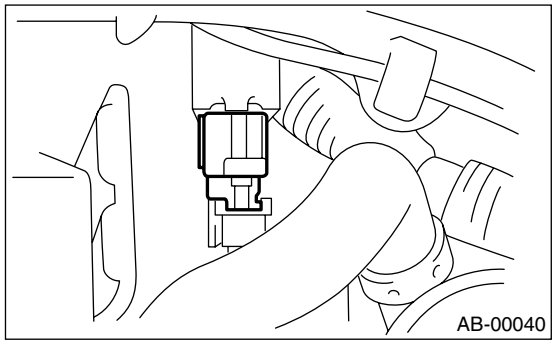
1) Check that the front wheels are positioned in straight ahead direction.
2) Turn the roll connector pin (A) clockwise until it stops.
3) Turn the roll connector pin (A) counterclockwise approx. 2.65 turns until "▲" marks are aligned.



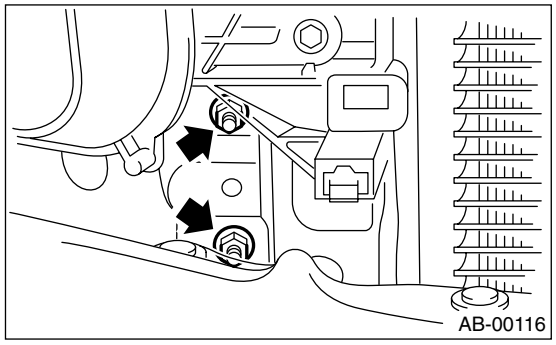
10.Front Sub Sensor

A: REMOVAL

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
3) Remove the front grille and front grille side. <Ref. to EI-18, REMOVAL, Front Grille.>
4) Disconnect the connector from front sub sensor.



5) Loosen the bolt, and then detach the front sub sensor.



B: INSTALLATION

CAUTION:
Use new nuts when reassembling.

Install in the reverse order of removal.

C: INSPECTION

Check for the following, and replace damaged parts with new parts.

- Front sub sensor, mounting bracket, and connector are damaged.
- Airbag is deployed.

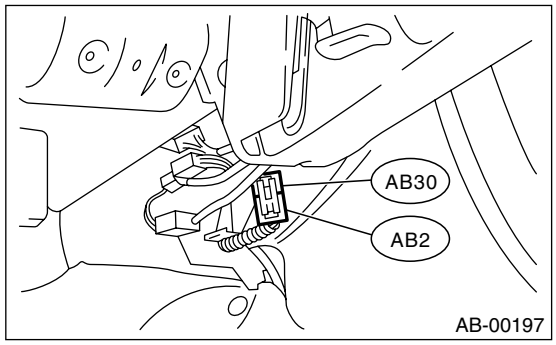
11. Disposal of Airbag Module (Deploying While Installed in Vehicle)

A: OPERATION

CAUTION:
• Do not discard an undeployed airbag module because it may cause serious personal injury when accidentally deployed.
• As a rule, the airbag module should be deployed while still installed in the vehicle. Do not remove it unless necessary.
• Deployment of the airbag module should be done on a flat place free from any possible danger. Avoid deploying outdoors during rainy or windy weather.
• Deploying the airbag module causes a high explosive noise, be sure to warn people in the area, and do not allow anyone within a 5 m (16 ft) radius of the disposal site.
• Some smoke will be emitted from deployment of the airbag module. Therefore, it must be deployed in a well-ventilated place with no fire alarms nearby.
• Wear gloves, goggles, and earplugs during this operation. Wash your hands afterwards.
• After deployment, the airbag module will be especially hot. Leave it unattended for 40 minutes, and then discard it.
• Do not let water get on the deployed airbag module.
• Wrap the deployed airbag module in an airtight vinyl bag, and discard it.
• If circumstances do not permit airbag module deployment, contact a SUBARU dealer.

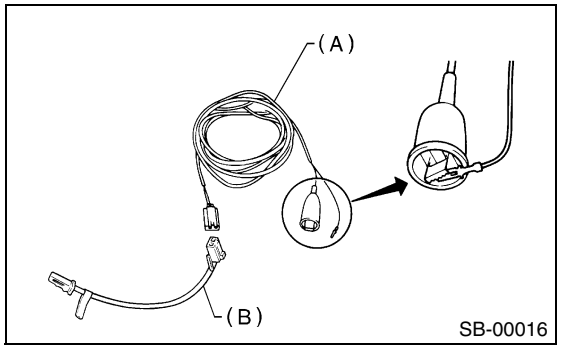
1. AIRBAG MODULE (DRIVER)

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
3) Remove the lower cover.
4) Disconnect the airbag connector (AB30) and (AB2) below steering column.



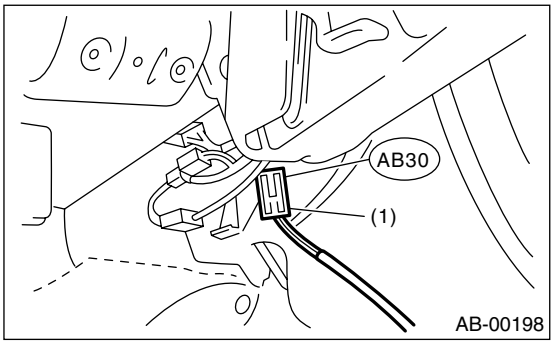
5) Short the terminal to alligator clip furnished as deployment tool (A).
6) Connect the deployment tool and adapter A (deployment) (B).

CAUTION:
The deployment tool should be kept shorted terminals until just before deployment of the airbag module.



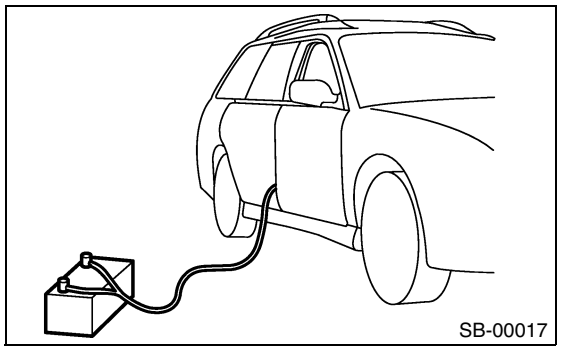
(A) Deployment tool: (Part No. 98299PA030)
(B) Adapter A: (Part No. 98299FC030)

7) Connect the adapter A (deployment) connector to airbag connector (AB30).

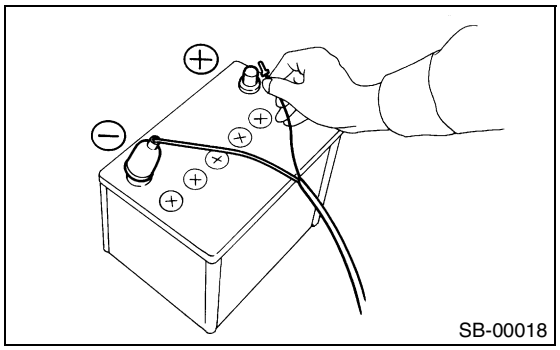


(1) Adapter A: (Part No. 98299FC030)

8) Extend the deployment tool to the limit, and make sure that the vehicle is empty. Close all windows, sunroof, and rear gate completely.

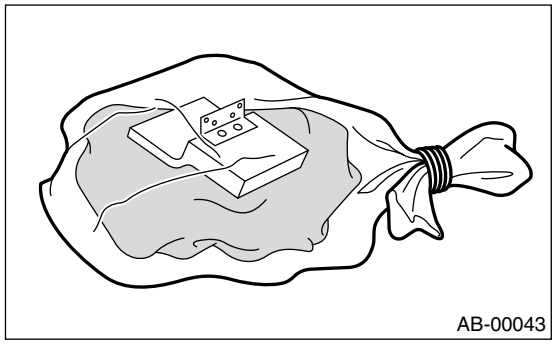


9) Move the battery at least 5 m (16 ft) from vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (–) terminal.
10) Connect the other cable of the deployment tool to the battery positive (+) terminal. Then, deploy the airbag module.


SB-00018

CAUTION:
• After deployment, the airbag module will be especially hot. Leave it unattended for 40 minutes, and then discard it.
• Do not let water get on the deployed airbag module.

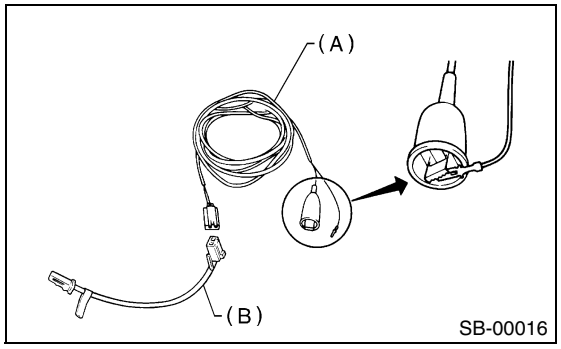
11) Remove the airbag module. <Ref. to AB-15, Driver's Airbag Module.>
12) Wrap the deployed airbag module in an airtight vinyl bag, and discard it.


AB-00043

2. AIRBAG MODULE (PASSENGER)

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
3) Remove the glove box.
4) Disconnect the airbag connectors (AB4) and (AB27).
5) Short the terminal to alligator clip furnished as deployment tool (A).
6) Connect the deployment tool and adapter E.

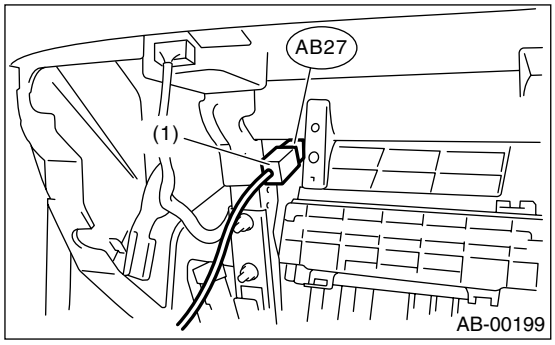
CAUTION:
The deployment tool should be kept shorted terminals until just before deployment of the airbag module.



SB-00016

(A) Deployment tool: (Part No. 98299PA030)
(B) Adapter E: (Part No. 98299SA030)

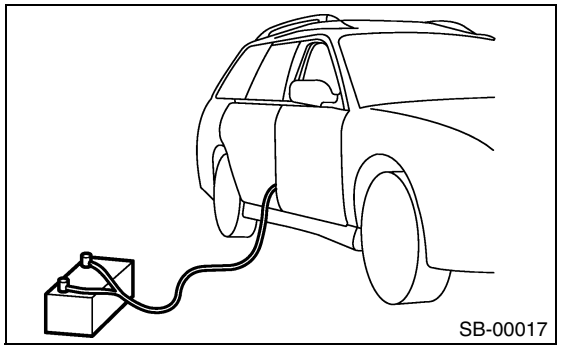
7) Connect the adapter E to airbag connector (AB27).



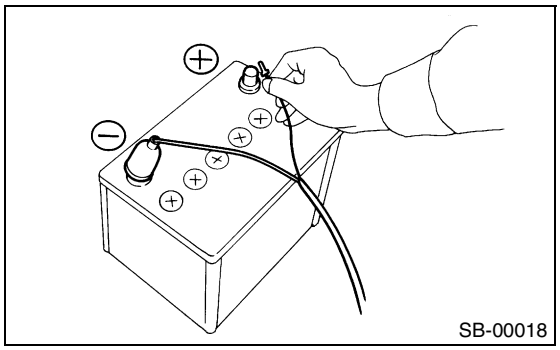
AB-00199

(1) Adapter E: (Part No. 98299SA030)

8) Extend the deployment tool to the limit, and make sure that the vehicle is empty. Close all windows, sunroof, and rear gate completely.

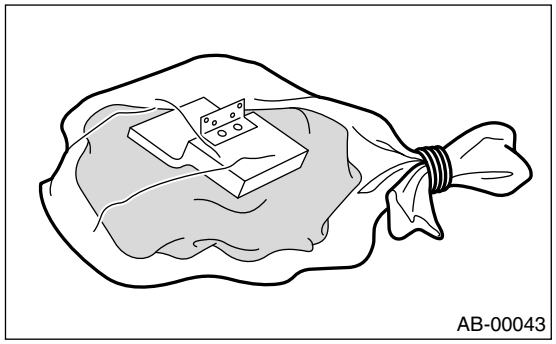

SB-00017

9) Move the battery at least 5 m (16 ft) from vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (–) terminal.
10) Connect the other cable of the deployment tool to the battery positive (+) terminal. Then, deploy the airbag module.


SB-00018

CAUTION:
• After deployment, the airbag module will be especially hot. Leave it unattended for 40 minutes, and then discard it.
• Do not let water get on the deployed airbag module.

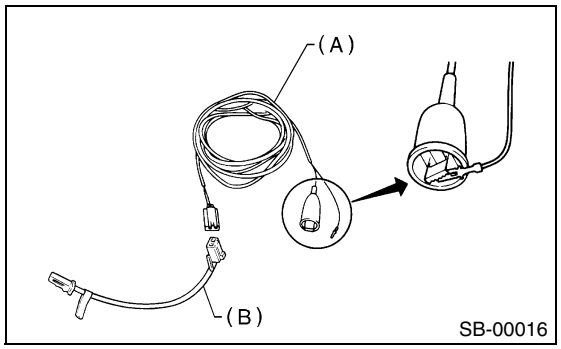
11) Remove the airbag module. <Ref. to AB-16, Passenger's Airbag Module.>
12) Wrap the deployed airbag module in an airtight vinyl bag, and discard it.


AB-00043

3. AIRBAG MODULE (SIDE)

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
3) Disconnect the side airbag module connector (yellow) under the front seat cushion.
4) Adjust both the front seat and front seat backrest to center positions.
5) Short the terminal to alligator clip furnished as deployment tool (A).
6) Connect the deployment tool and adapter A (deployment) (B).

CAUTION:
The deployment tool should be kept shorted terminals until just before deployment of the airbag module.

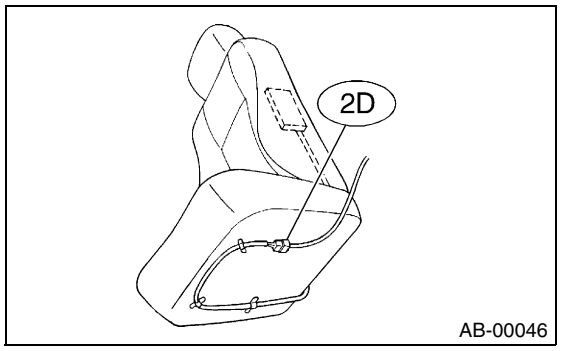


SB-00016

(A) Deployment tool: (Part No. 98299PA030)
(B) Adapter A: (Part No. 98299FC030)

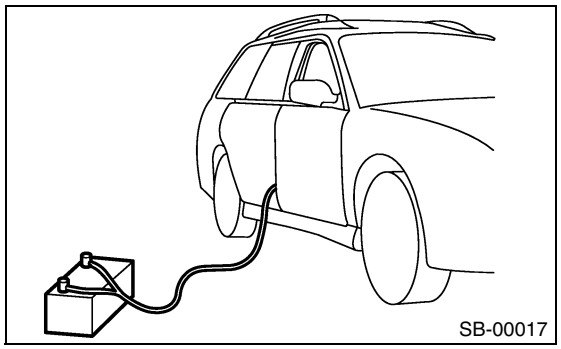
7) Connect the adapter A (deployment) connector (2D) to side airbag module connector (yellow).

CAUTION:
Do not put any objects on the front seat.

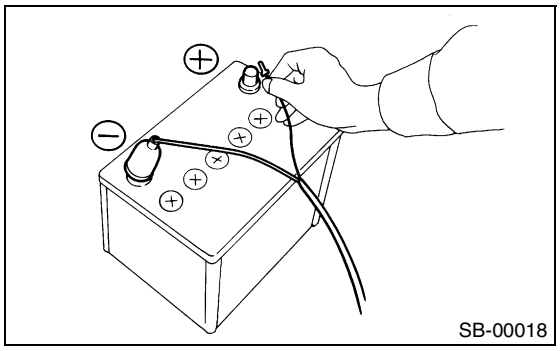


AB-00046

8) Extend the deployment tool to the limit, and make sure that the vehicle is empty. Close all windows, sunroof, and rear gate completely.

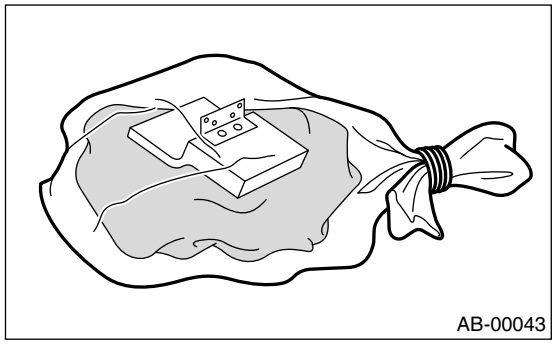

SB-00017

9) Move the battery at least 5 m (16 ft) from vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (–) terminal.
10) Connect the other cable of the deployment tool to the battery positive (+) terminal. Then, deploy the airbag module.


SB-00018

CAUTION:
• After deployment, the airbag module will be especially hot. Leave it unattended for 40 minutes, and then discard it.
• Do not let water get on the deployed airbag module.

11) Remove the side airbag module.
12) Wrap the deployed airbag module in an airtight vinyl bag, and discard it.


AB-00043

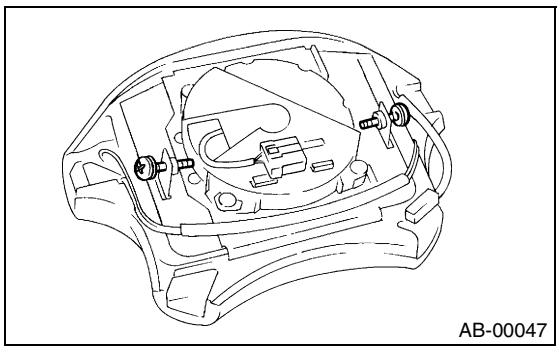
12. Disposal of Airbag Module (Deploying After Removal from Vehicle)

A: OPERATION

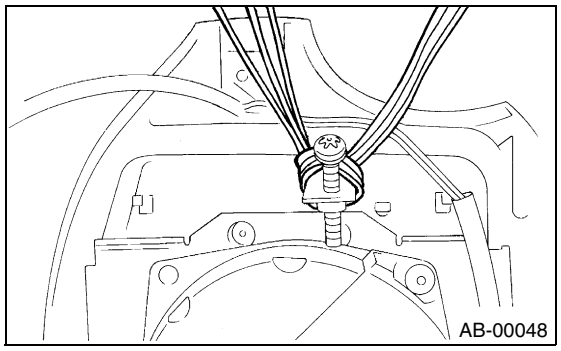
CAUTION:
• Do not discard an undeployed airbag module because it may cause serious personal injury when accidentally deployed.
• As a rule, the airbag module should be deployed while still installed in the vehicle. Do not remove it unless necessary.
• Deployment of the airbag module should be done on a flat place free from any possible danger. Avoid deploying outdoors during rainy or windy weather.
• Do not damage the airbag module or drop it.
• Deploying the airbag module causes a high explosive noise, be sure to warn people in the area, and do not allow anyone within a 5 m (16 ft) radius of the disposal site.
• Some smoke will be emitted from deployment of the airbag module. Therefore, it must be deployed in a well-ventilated place with no fire alarms nearby.
• Wear gloves, goggles, and earplugs during this operation. Wash your hands afterwards.
• After deployment, the airbag module will be especially hot. Leave it unattended for 40 minutes, and then discard it.
• Do not let water get on the deployed airbag module.
• Wrap the deployed airbag module in an airtight vinyl bag, and discard it.
• If circumstances do not permit airbag module deployment, contact a SUBARU dealer.

1. AIRBAG MODULE (DRIVER)

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
3) Remove the airbag module. <Ref. to AB-15, Driver's Airbag Module.>
4) Install the removed bolts to airbag module.

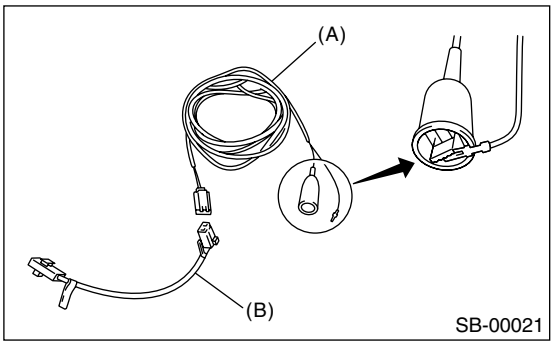

AB-00047

5) Bundle three wire automotive harnesses [each with a sectional area of 1.25 mm^2 (0.00194 sq in) or more], and bind them twofold around the airbag module stay.


AB-00048

6) Short the terminal to alligator clip furnished as deployment tool (A).
7) Connect the deployment tool and adapter D.

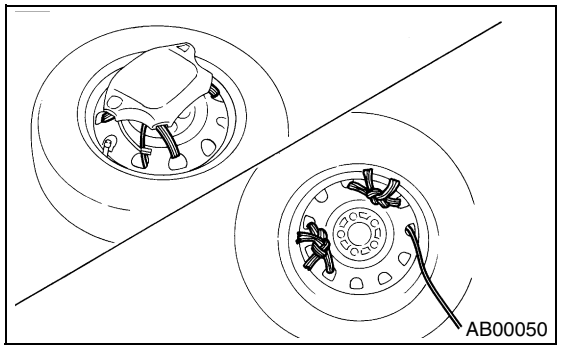
CAUTION:
The deployment tool should be kept shorted terminals until just before deployment of the airbag module.



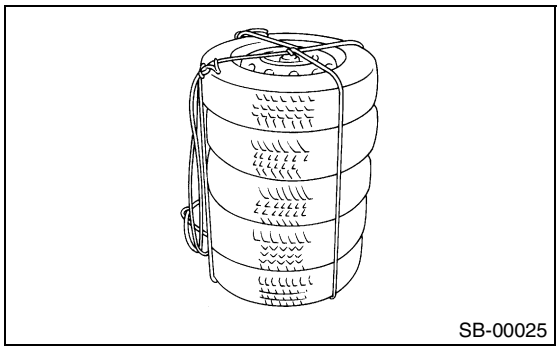
SB-00021

(A) Deployment tool: (Part No. 98299PA030)
(B) Adapter D: (Part No. 98299SA010)

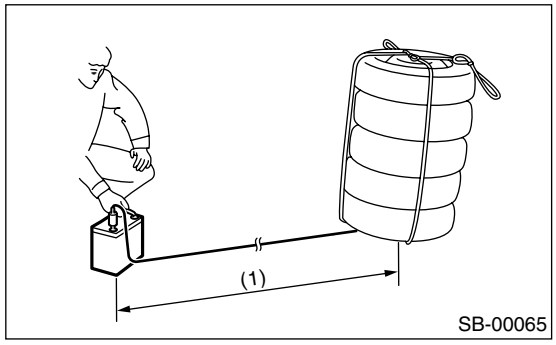
8) Connect the adapter D connector (2D) to airbag module.
9) Install the airbag module with pad side facing upward on a wheel with tire.


AB00050

10) Put three tires without a wheel on the tire installed with the airbag module. Put on an additional tire with a wheel, and then fasten them tight with a rope.


SB-00025

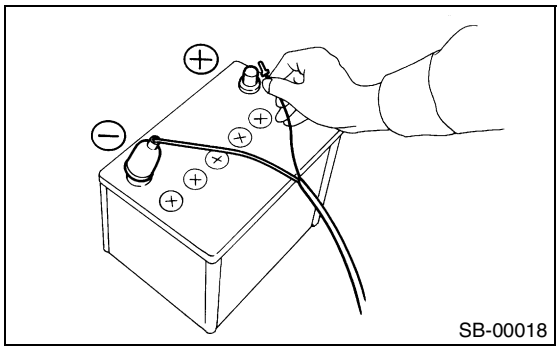
11) Move the battery at least 5 m (16 ft) from vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (–) terminal.



SB-00065

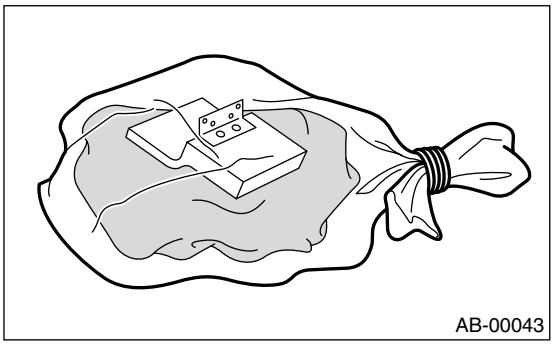
(1) More than 5 m (16 ft)

12) Connect the other cable of the deployment tool to the battery positive (+) terminal. Then, deploy the airbag module.


SB-00018

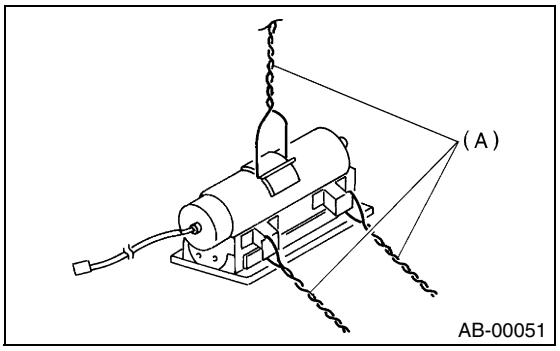
CAUTION:
• After deployment, the airbag module will be especially hot. Leave it unattended for 40 minutes, and then discard it.
• Do not let water get on the deployed airbag module.

13) Wrap the deployed airbag module in an airtight vinyl bag, and discard it.


AB-00043

2. AIRBAG MODULE (PASSENGER)

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
3) Remove the airbag module. <Ref. to AB-16, Passenger's Airbag Module.>
4) Bundle three wire automotive harnesses [each with a sectional area of 1.25 mm^2 (0.00194 sq in) or more], and route them through the airbag module bracket (A). Then, twist them for added strength.

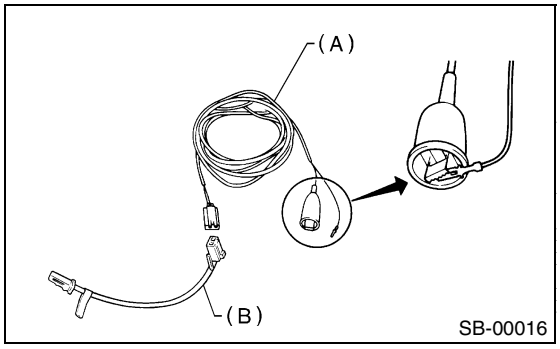


AB-00051

5) Short the terminal to alligator clip furnished as deployment tool (A).

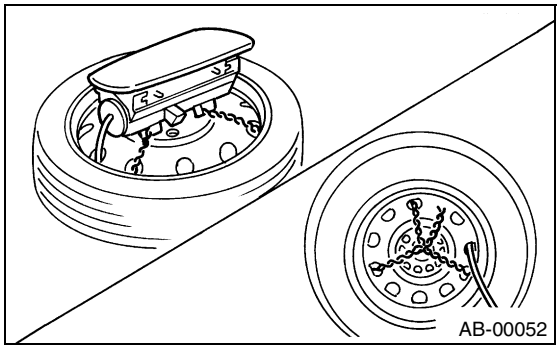
6) Connect the deployment tool and adapter E.

CAUTION:
The deployment tool should be kept shorted terminals until just before deployment of the airbag module.

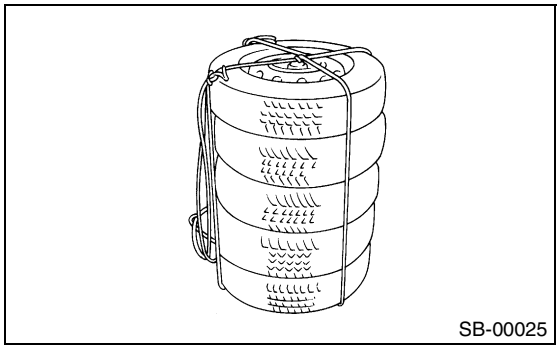


(A) Deployment tool: (Part No. 98299PA030)
(B) Adapter E: (Part No. 98299SA030)

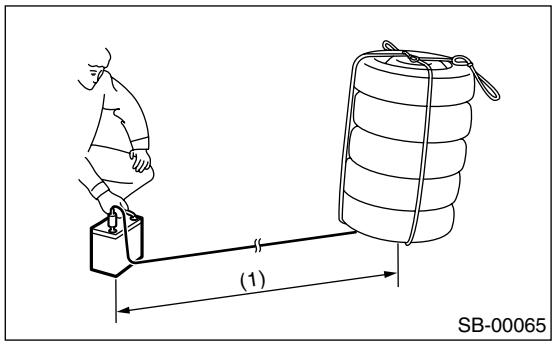
7) Connect the adapter E connector to airbag module.
8) Install the airbag module with pad side facing upward on 14 inch or greater size wheel with tire.



9) Put three tires without a wheel on the tire installed with the airbag module. Put on an additional tire with a wheel on top, and then fasten them tight with a rope.

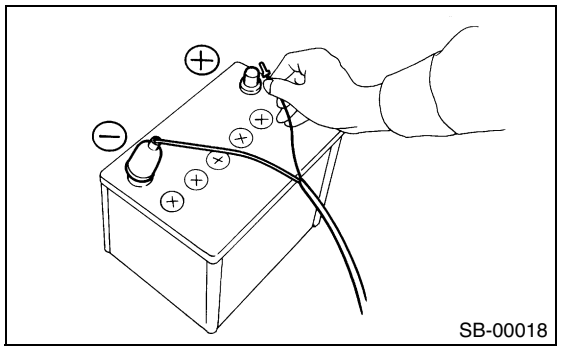


10) Move the battery at least 5 m (16 ft) from vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (–) terminal.



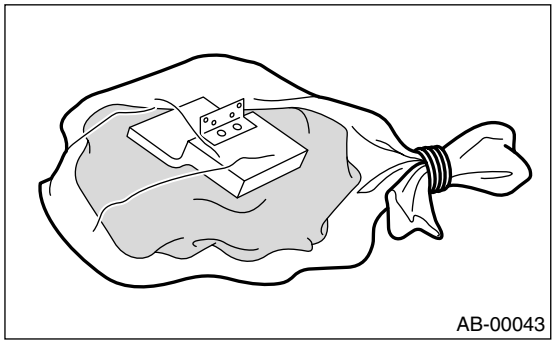
(1) More than 5 m (16 ft)

11) Connect the other cable of the deployment tool to the battery positive (+) terminal. Then, deploy the airbag module.



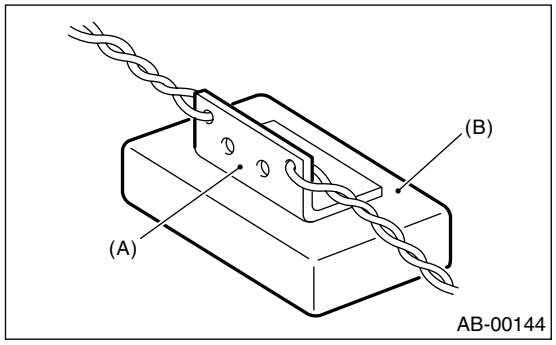
CAUTION:
• After deployment, the airbag module will be especially hot. Leave it unattended for 40 minutes, and then discard it.
• Do not let water get on the deployed airbag module.

12) Wrap the deployed airbag module in an airtight vinyl bag, and discard it.



3. AIRBAG MODULE (SIDE)

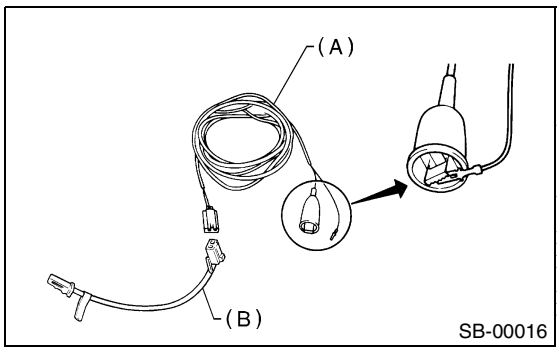
1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
3) Remove the front seat. <Ref. to SE-5, REMOVAL, Front Seat.>
4) Remove the side airbag module. <Ref. to SE-5, DISASSEMBLY, Front Seat.>
5) Bundle three wire automotive harnesses [each with a sectional area of 1.25 mm^2 (0.00194 sq in) or more], and then bind them through the holes in airbag module bracket.



(A) Airbag module bracket
(B) Side airbag module

6) Short the terminal to alligator clip furnished as deployment tool (A).
7) Connect the deployment tool and adapter A (deployment) (B).

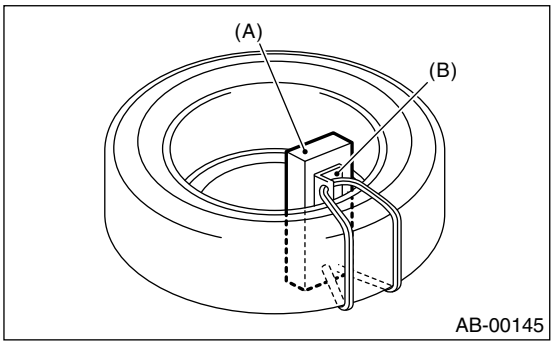
CAUTION:
The deployment tool should be kept shorted terminals until just before deployment of the airbag module.



(A) Deployment tool: (Part No. 98299PA030)
(B) Adapter A: (Part No. 98299FC030)

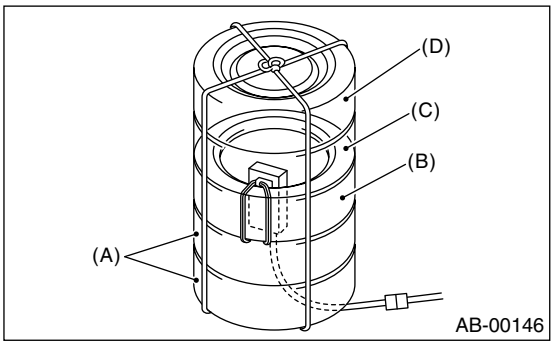
8) Connect the adapter A connector to airbag module.

9) Install the side airbag module on 14 inch or greater size tire without disk wheel.

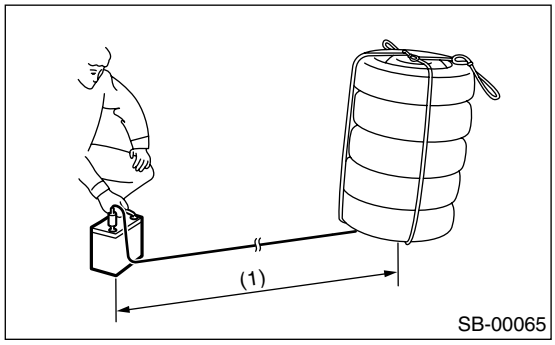


(A) Pad
(B) Airbag module bracket

10) Put two tires without a wheel (A) under the tire installed with the side airbag module (B). Put on an additional tire without disk wheel (C), and then put a tire with a wheel (D) on top. Fasten them tight with a rope.

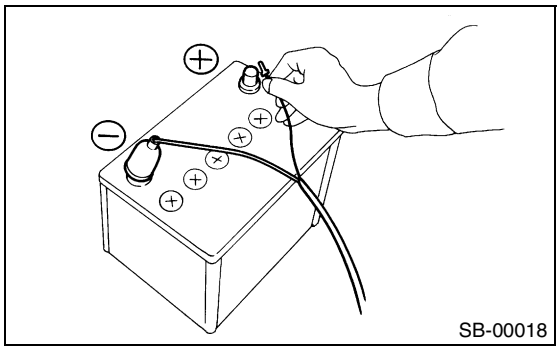


11) Move the battery at least 5 m (16 ft) from the vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (–) terminal.



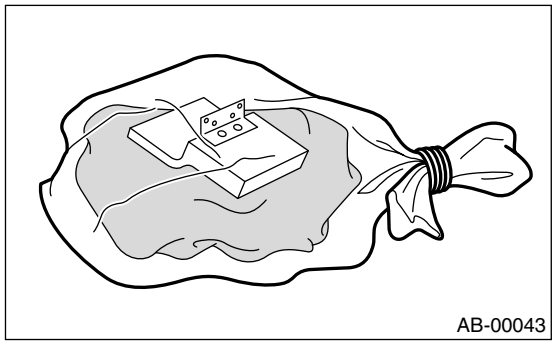
(1) More than 5 m (16 ft)

12) Connect the other cable of the deployment tool to the battery positive (+) terminal. Then, deploy the airbag module.



CAUTION:
• After deployment, the airbag module will be especially hot. Leave it unattended for 40 minutes, and then discard it.
• Do not let water get on the deployed airbag module.

13) Wrap the deployed airbag module in an airtight vinyl bag, and discard it.



AIRBAG SYSTEM (DIAGNOSTICS)

AB

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1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Value	Yes	No
1	**READ DIAGNOSTIC TROUBLE CODE (DTC).** <Ref. to AB-31, Read Diagnostic Trouble Code (DTC).> Is the normal code detected?	Normal code is detected.	Finish the diagnosis.	Go to step **2.**
2	**READ DIAGNOSTIC TROUBLE CODE (DTC).** <Ref. to AB-31, Read Diagnostic Trouble Code (DTC).> Is the DTC detected?	DTC is not detected.	Go to step **3.**	Go to “Airbag Warning Light Failure”.<Ref. to AB-34, Airbag Warning Light Failure.>
3	**PERFORM THE DIAGNOSIS.** 1)Judge the possible cause from “List of Diagnostic Trouble Code” <Ref. to AB-44, List of Diagnostic Trouble Code (DTC).> . 2)Inspect using “Diagnostic Chart with Trouble Code”. (DTC) 3)Repair the cause of the trouble. 4)Perform the clear memory mode. <Ref. to AB-33, Clear Memory Mode.> 5)Perform the inspection mode. <Ref. to AB-32, Inspection Mode.> 6)Read any DTC again. Is the DTC detected?	DTC is not detected.	Finish the diagnosis.	Perform the procedure 1) to 5) in step **3**.

2. Check List for Interview

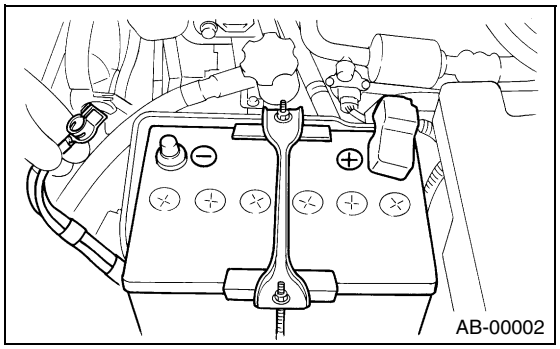
A: CHECK

Customer's Name		Inspector's Name	
Date Vehicle Brought In	/ /	Registration No.	
Odometer Reading	Km Miles	Vin No.	
Date Problem Occurred	/ /	Registration Year	/ /
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Other:		
Temperature	°C (°F)		
Road Condition	❑ Level road ❑ Uphill ❑ Downhill ❑ Rough road ❑ Others:		
Vehicle Operation	❑ Starting ❑ Idling ❑ Driving (❑ Constant Speed ❑ Acceleration ❑ Deceleration ❑ Steering wheel turn ❑ Other:)		
Details of Problem			
Check Airbag Warning Light	❑ Remains ON ❑ Remains OFF		
Check DTC	❑ Normal Code ❑ Trouble Code: (Code:)		

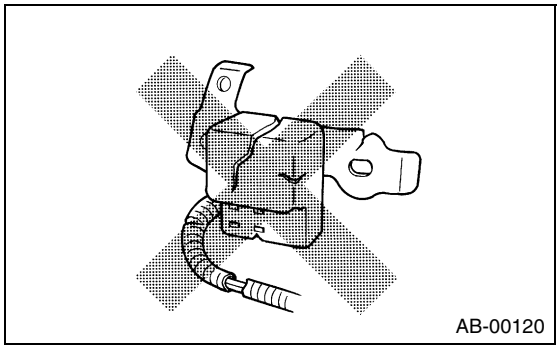
3. General Description

A: CAUTION

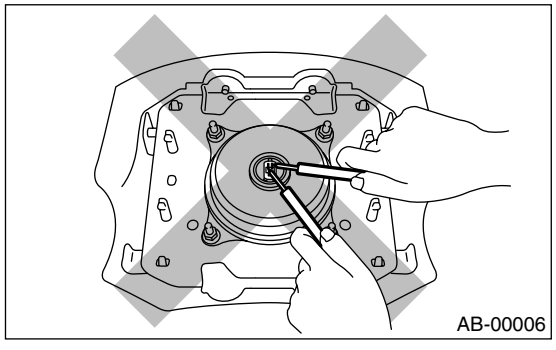
• When servicing a vehicle, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.
• The airbag system is fitted with a backup power source. If the airbag system is serviced within 20 seconds after the ground cable is disconnected, it may inflate.


AB-00002

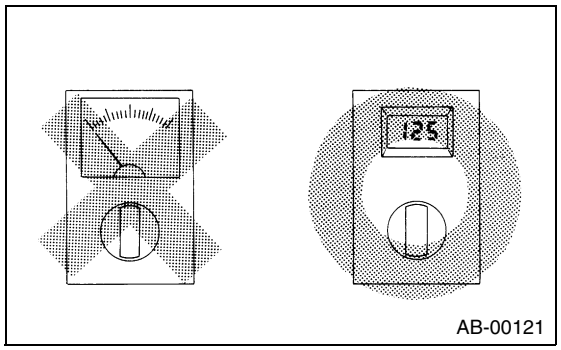
• If the airbag warning light illuminates, repair the vehicle immediately. Airbag or pretensioner may inflate incorrectly, or not inflate in collision.
• If sensors, airbag module, airbag control module, pretensioner, and harness are deformed or damaged, replace them with new genuine parts.
• Do not use the airbag system and pretensioners on other vehicles. When replacing parts, be sure to replace them with new parts.


AB-00120

• Do not check continuity of either of the airbag modules for driver, passenger or side, or pretensioner.

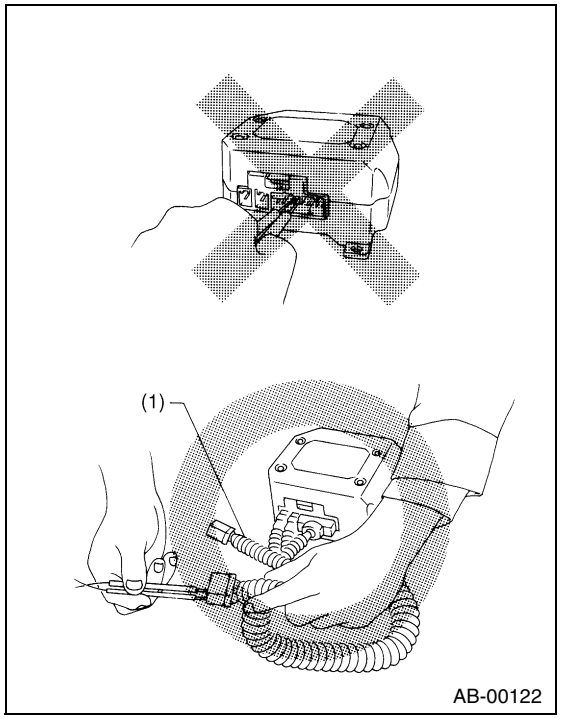

AB-00006

• When checking the system, be sure to use a digital circuit tester. Use of an analog circuit tester may cause the airbag to activate erroneously.



AB-00121

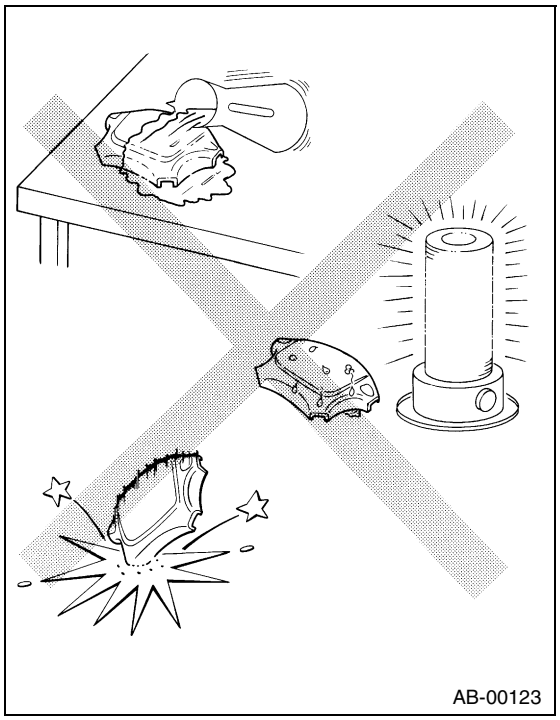
• When checking, use a test harness. Do not directly apply the tester probe to any connector terminal of the airbag.



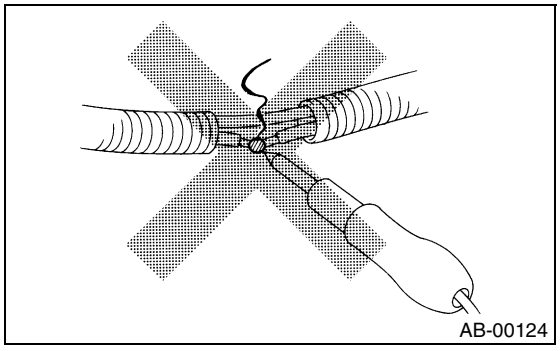
AB-00122

(1) Test harness

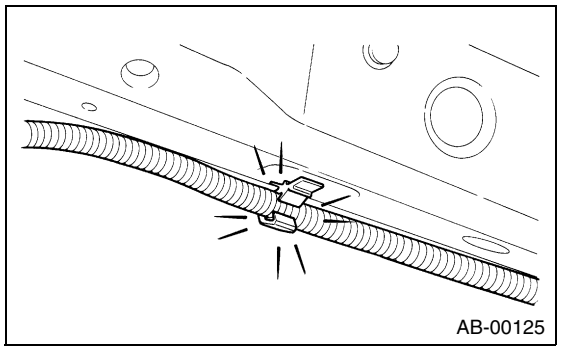
• Do not drop the airbag modulator parts, subject them to high temperature over 93°C (199°F), or let water, oil, or grase get on them; otherwise, the internal parts may be damaged and reliability greatly lowered.


AB-00123

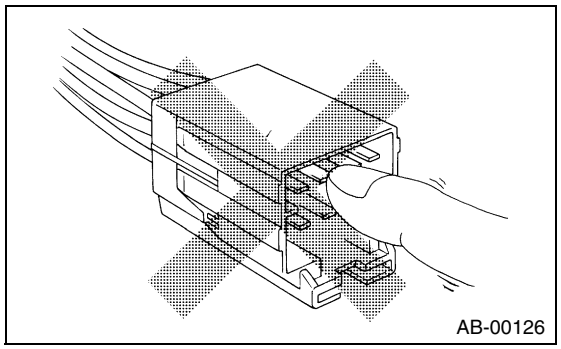
• If any damage, opening, or rust is found on the airbag system wire harness, do not attempt to repair using soldering equipment. Be sure to replace the faulty harness with a new genuine part.


AB-00124

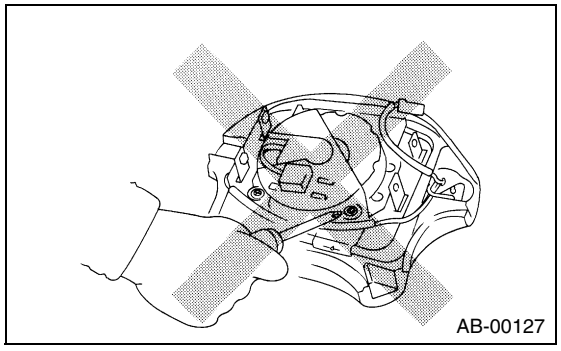
• Install the wire harness securely with the specified clips to avoid interference or tangled up with other parts.


AB-00125

• Do not allow water or oil to come in contact with the connector terminals. Do not touch the connector terminals.

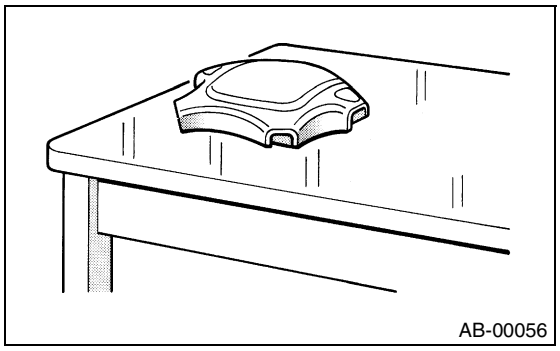

AB-00126

• Either of the airbag modules for driver, passenger or side, or pretensioner must not be disassembled.

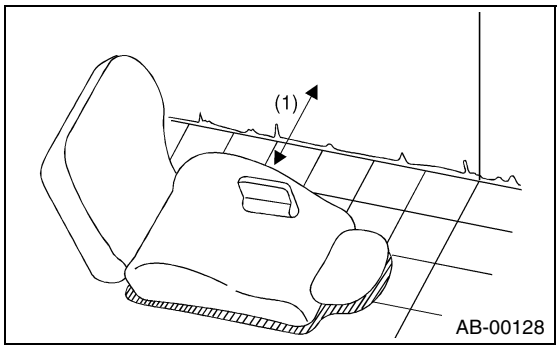

AB-00127

• The airbag module cannot be used again once inflated.

• After removal, keep the airbag module with the pad facing upward on a dry, clean, and flat surface away from heat and light sources, and moisture and dust.

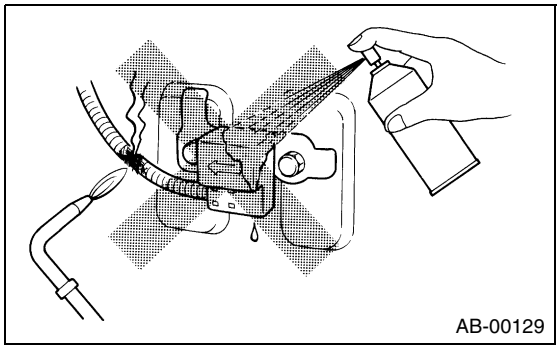


• The removed front seat with the airbag module must be kept at least 200 mm (8 in) away from walls and other objects.

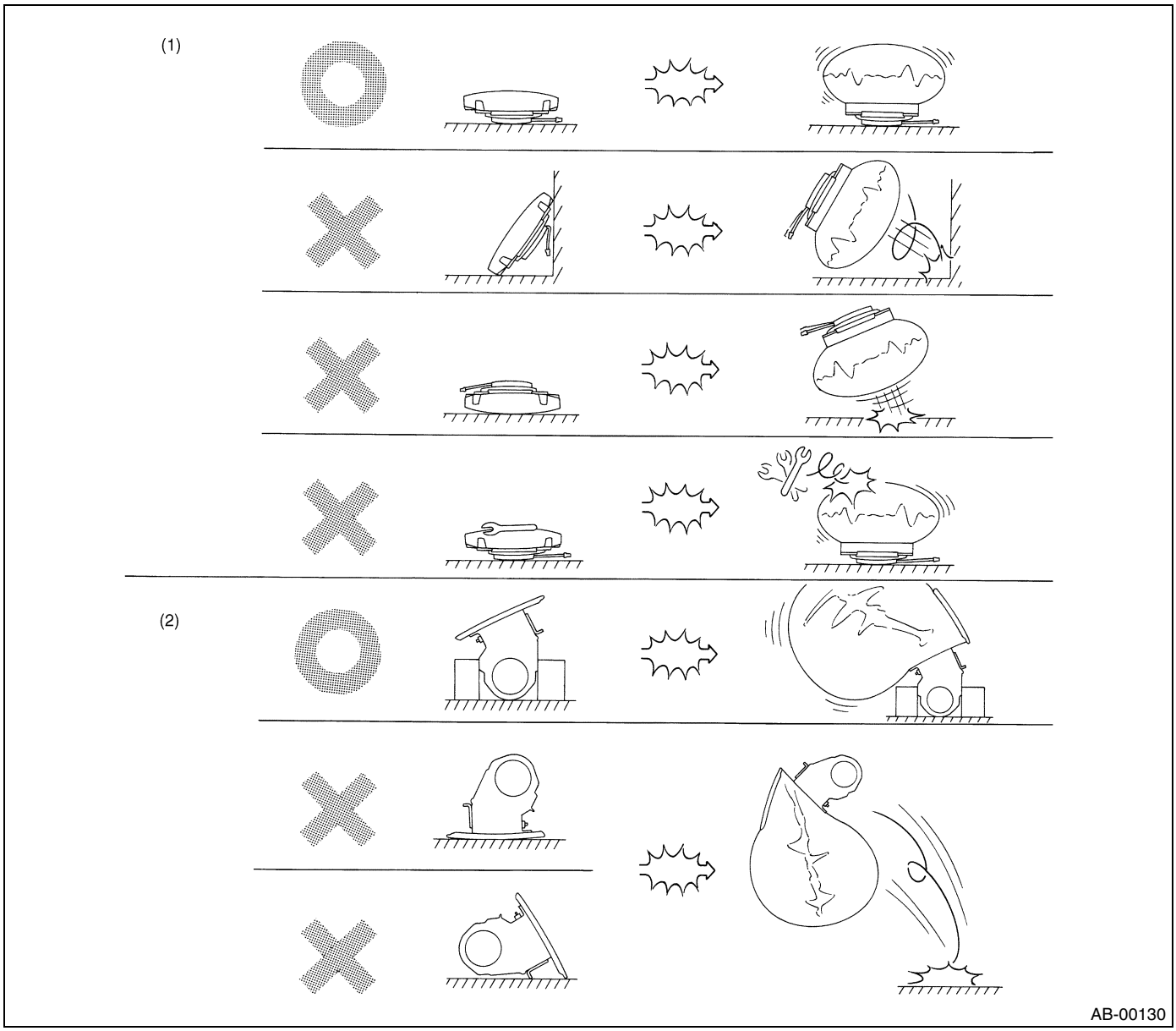


(1) More than 200 mm (8 in)

• When painting or performing sheet metal work on the front part of the vehicle, including the front wheel apron, front fender, and front side frame, remove the front sub sensors and wire harness of the airbag system.
• When painting or performing sheet metal work on the side of the vehicle, including the side sill, center pillar, and front and rear doors, remove the side airbag sensors and wire harness of the airbag system.



• When storing a removed airbag module, do not place any objects on it or pile airbag modules on top of each other. If the airbag inflates for some reason when it is placed with its pad side facing downward or under any object, a serious accident may result.



(1) Driver side (2) Passenger side

• Do not discard undeployed airbag modules. They could easily cause a serious accident if accidentally deployed.

B: INSPECTION

Before diagnosing, check the following items that might be related to the engine problem:

1. BATTERY

Measure the battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V

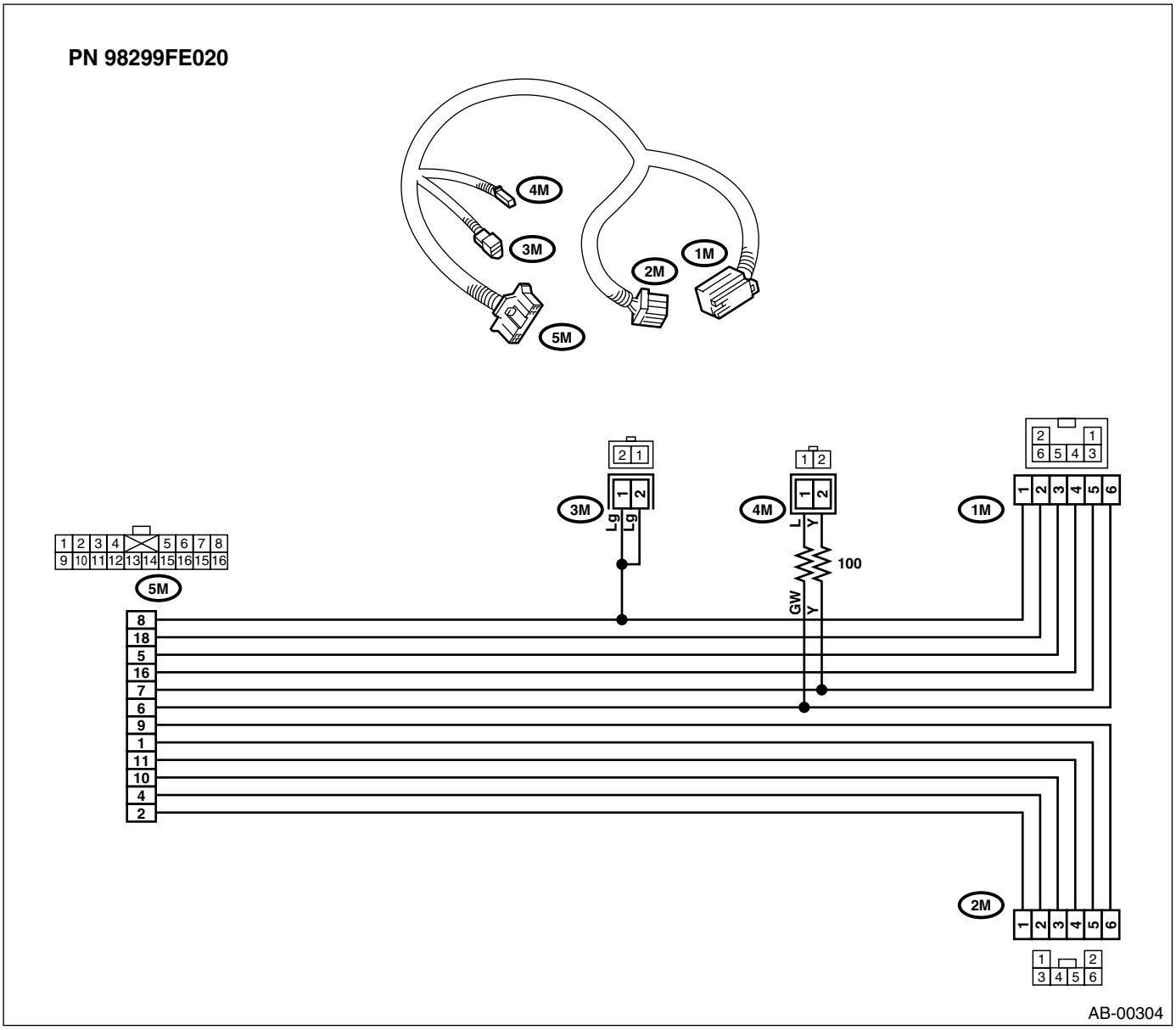
Specific gravity: Above 1.260

C: PREPARATION TOOL

CAUTION:
Be sure to use specified test harness M, F, G, H, R, L, N, P, Q, or T when measuring the voltage, resistance, etc. of AIRBAG system component parts.

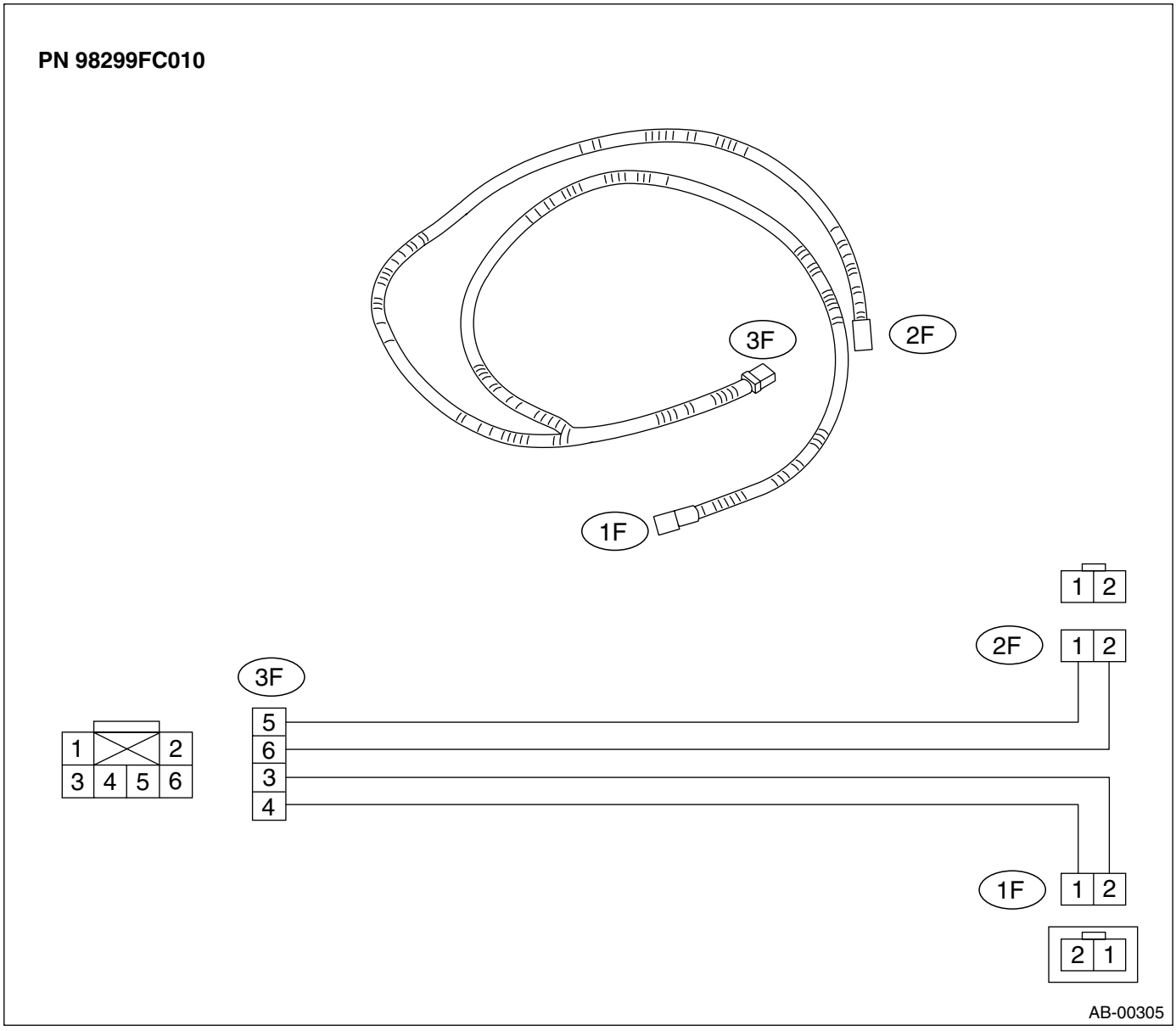
1. TEST HARNESS M

PN 98299FE020

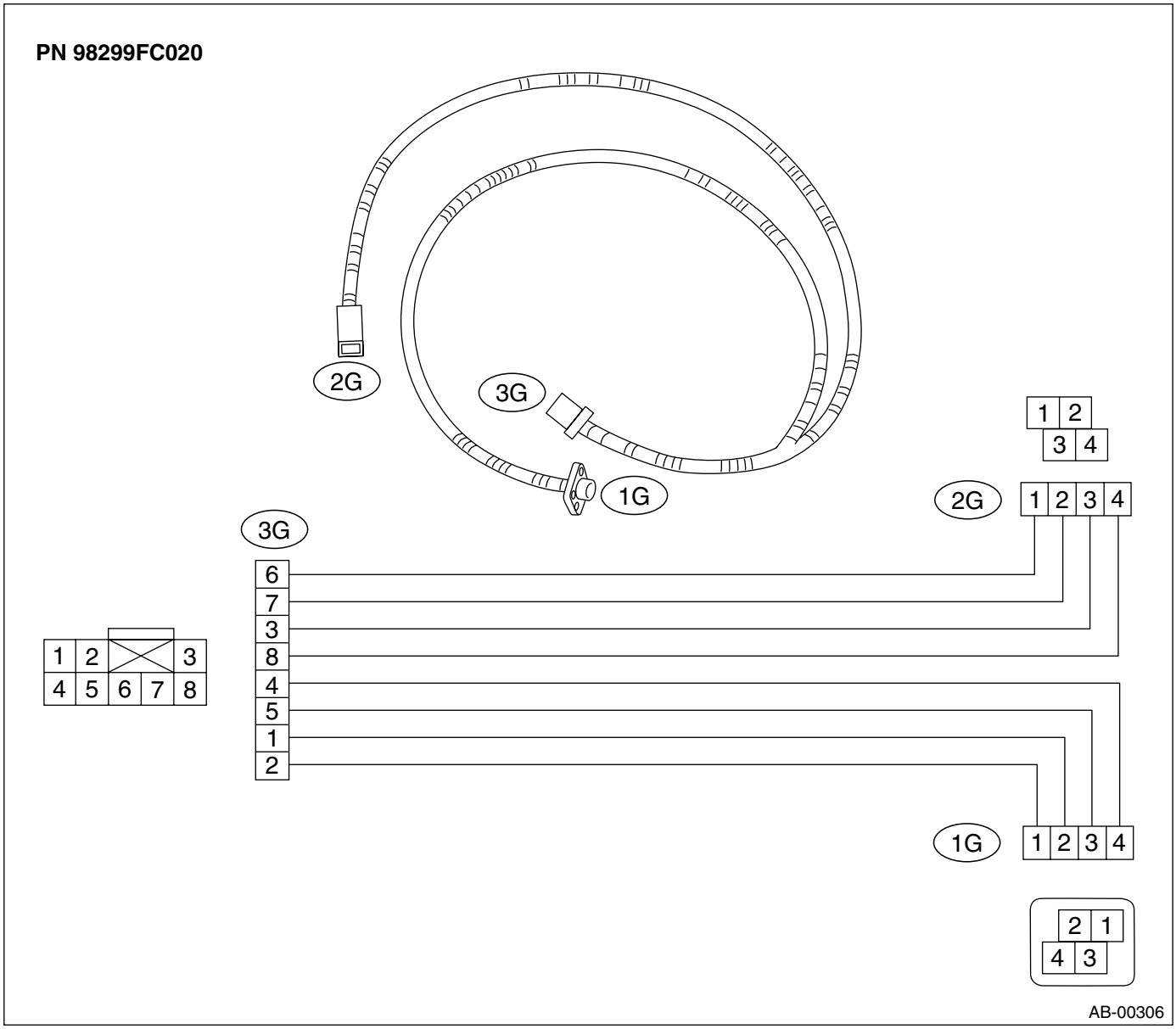


2. TEST HARNESS F

PN 98299FC010

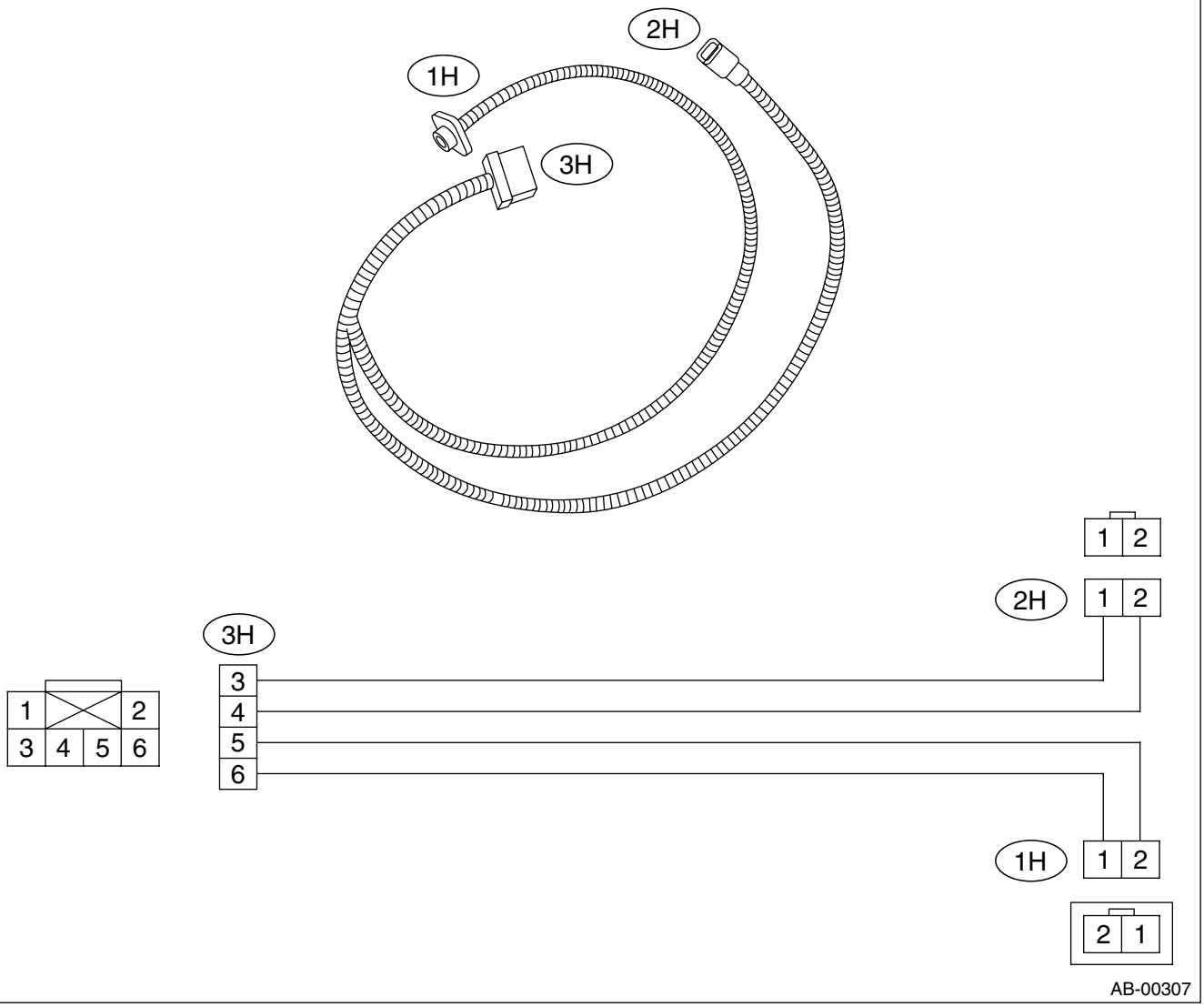


3. TEST HARNESS G



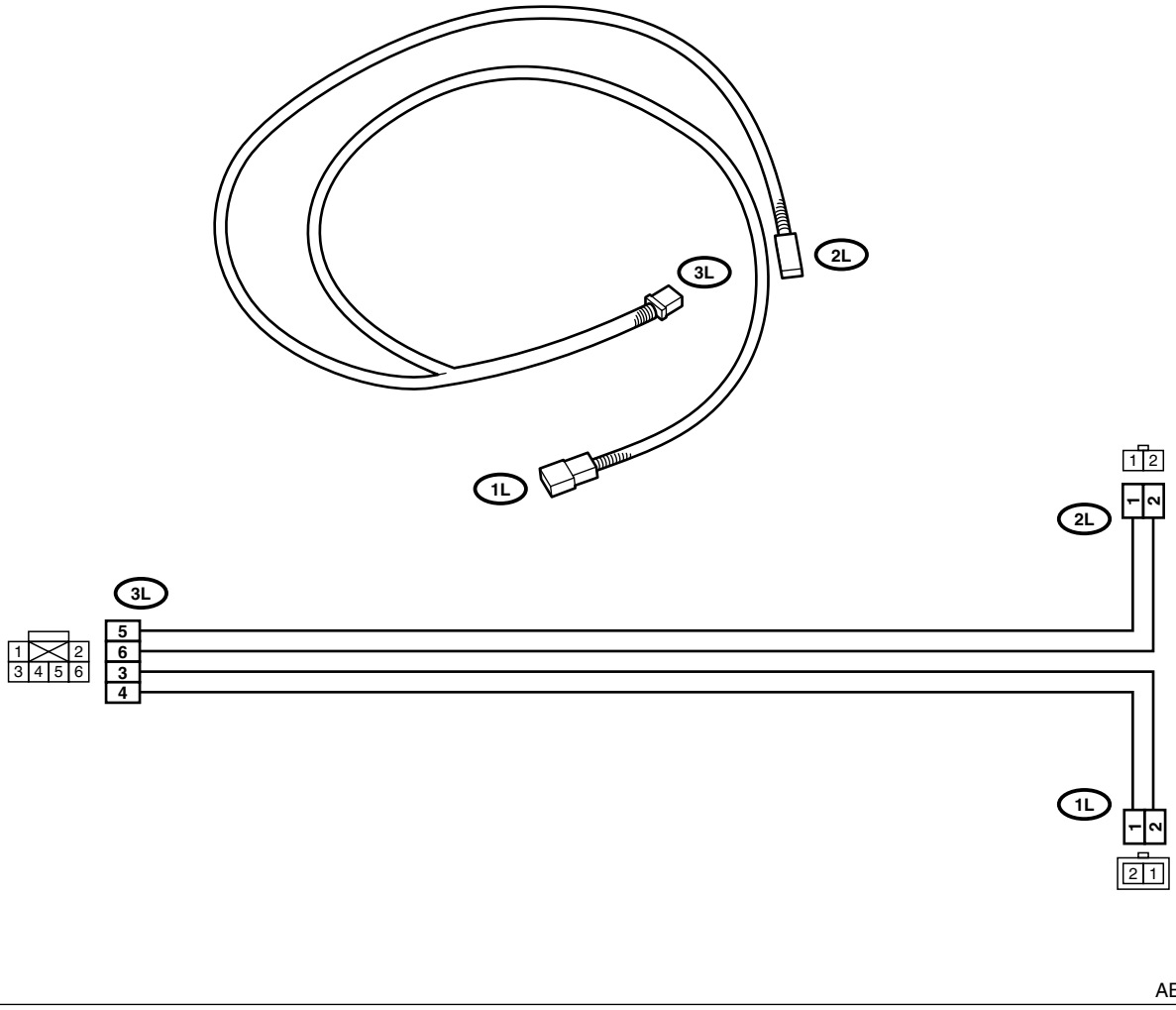
4. TEST HARNESS H

PN 98299FA030

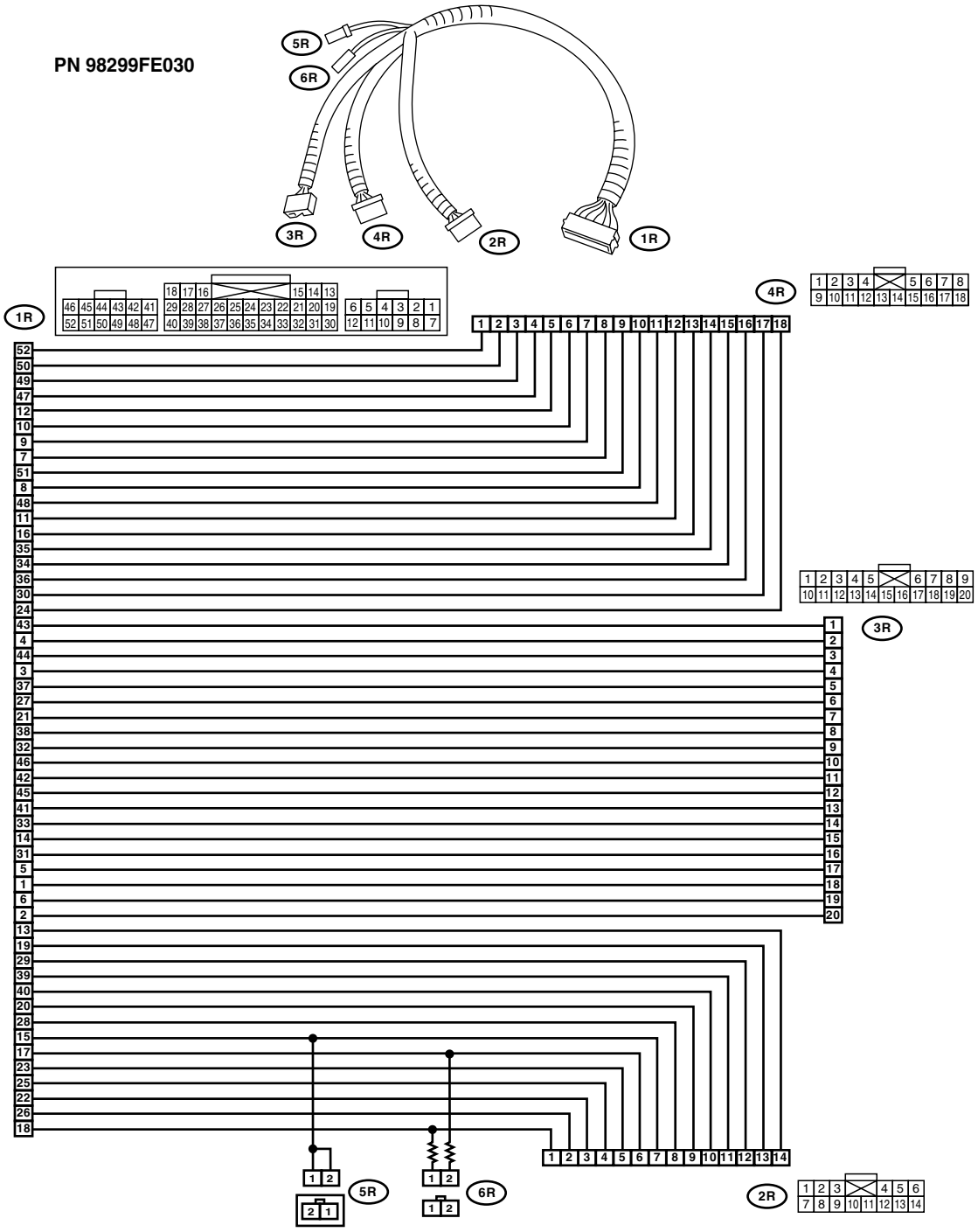


5. TEST HARNESS L

PN 98299FE000



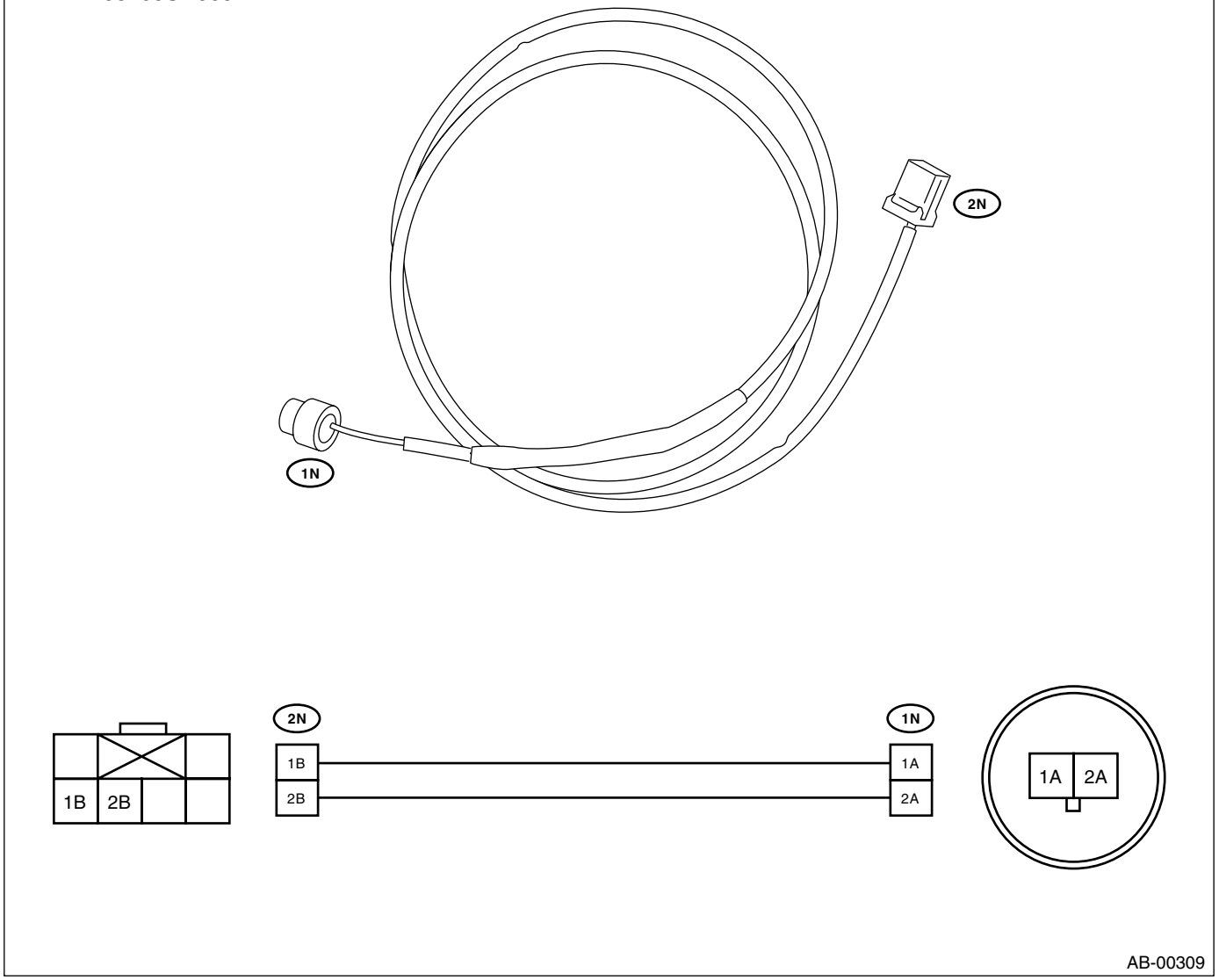
6. TEST HARNESS R



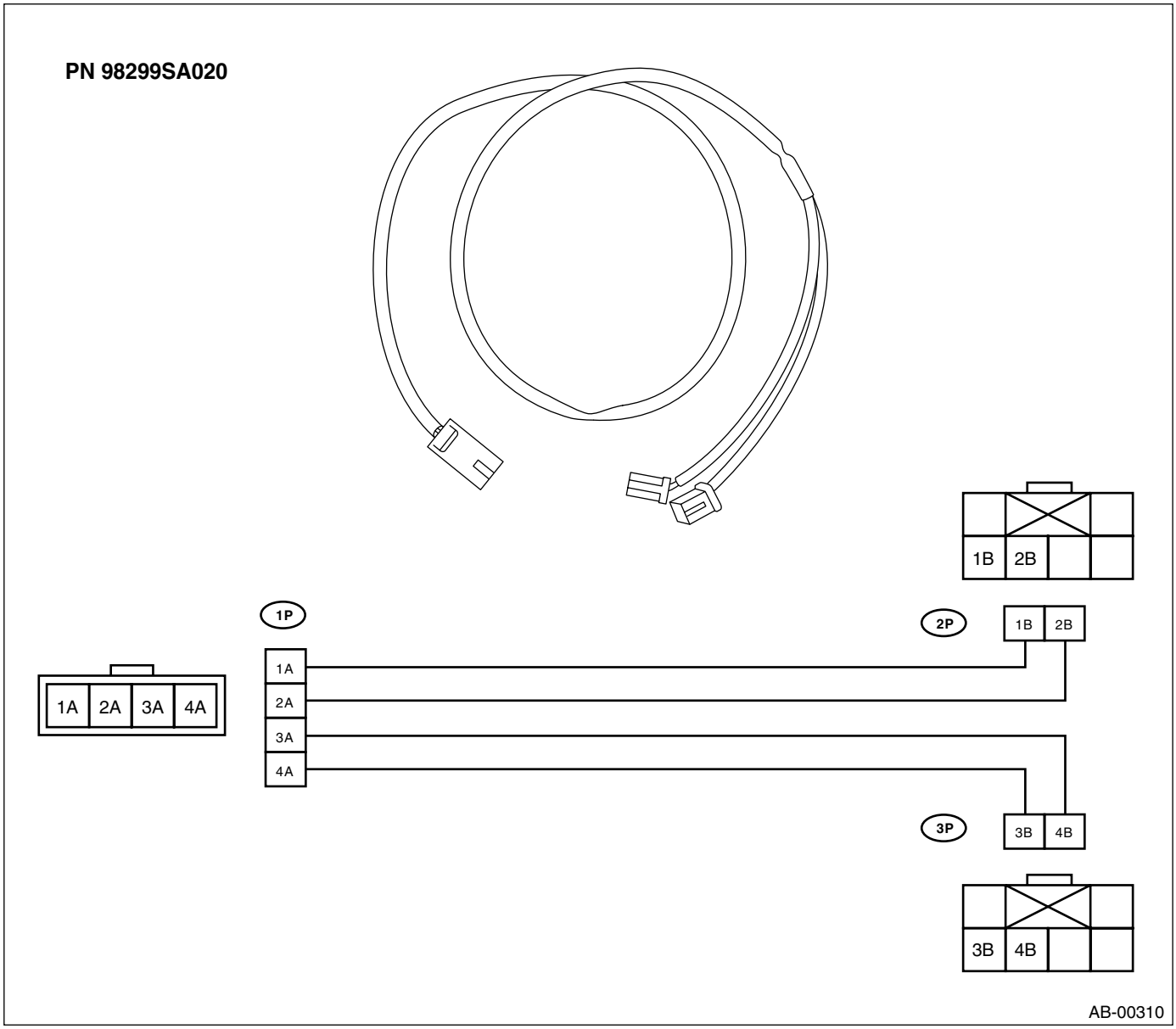
AB-00143

7. TEST HARNESS N

PN 98299SA000

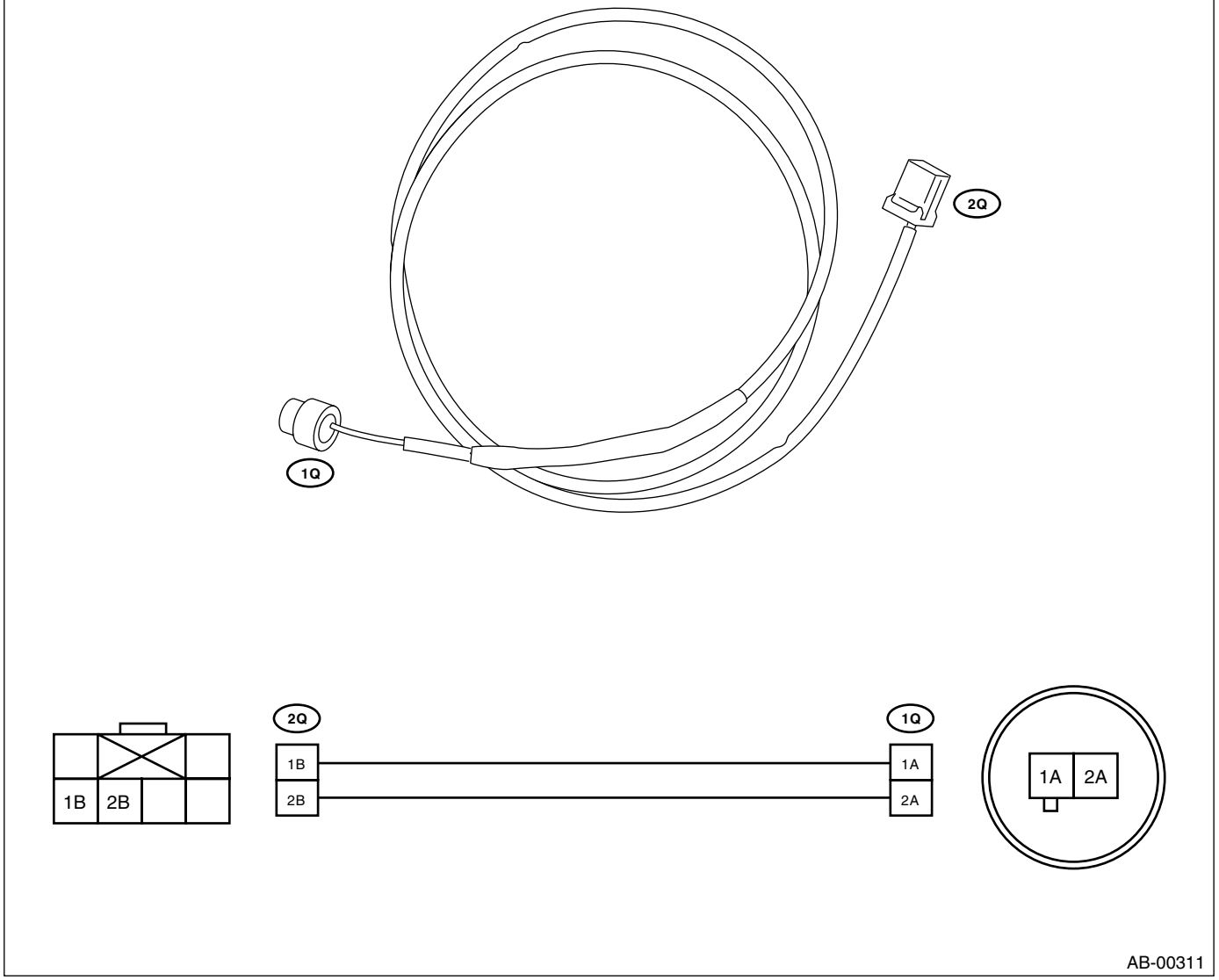


8. TEST HARNESS P



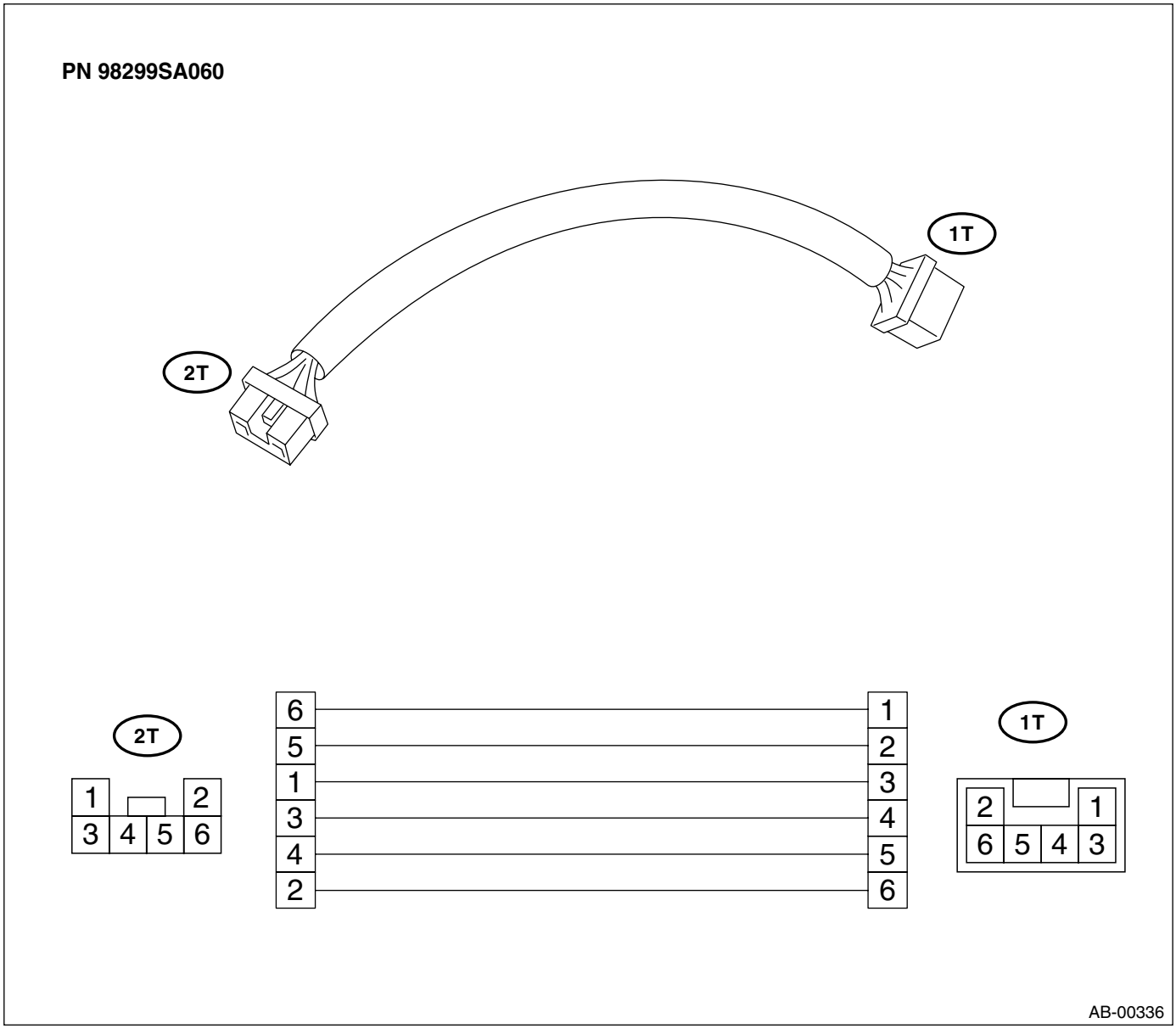
9. TEST HARNESS Q

PN 98299SA040



10.TEST HARNESS T

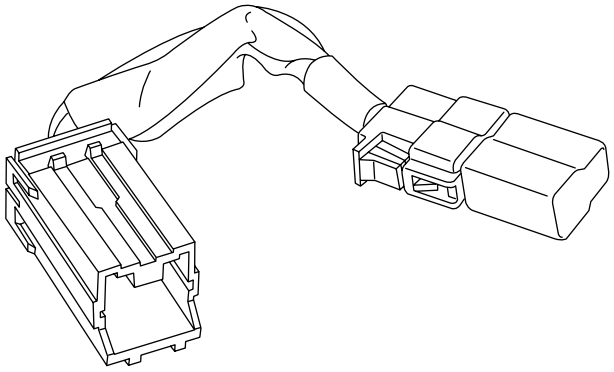
PN 98299SA060



11.AIRBAG RESISTOR

The airbag resistor is used during diagnostics. The airbag resistor has the same resistance as the airbag module and thus provides safety when used instead of the airbag module. It also makes it possible to finish, diagnostics in less time.

PN 98299PA040

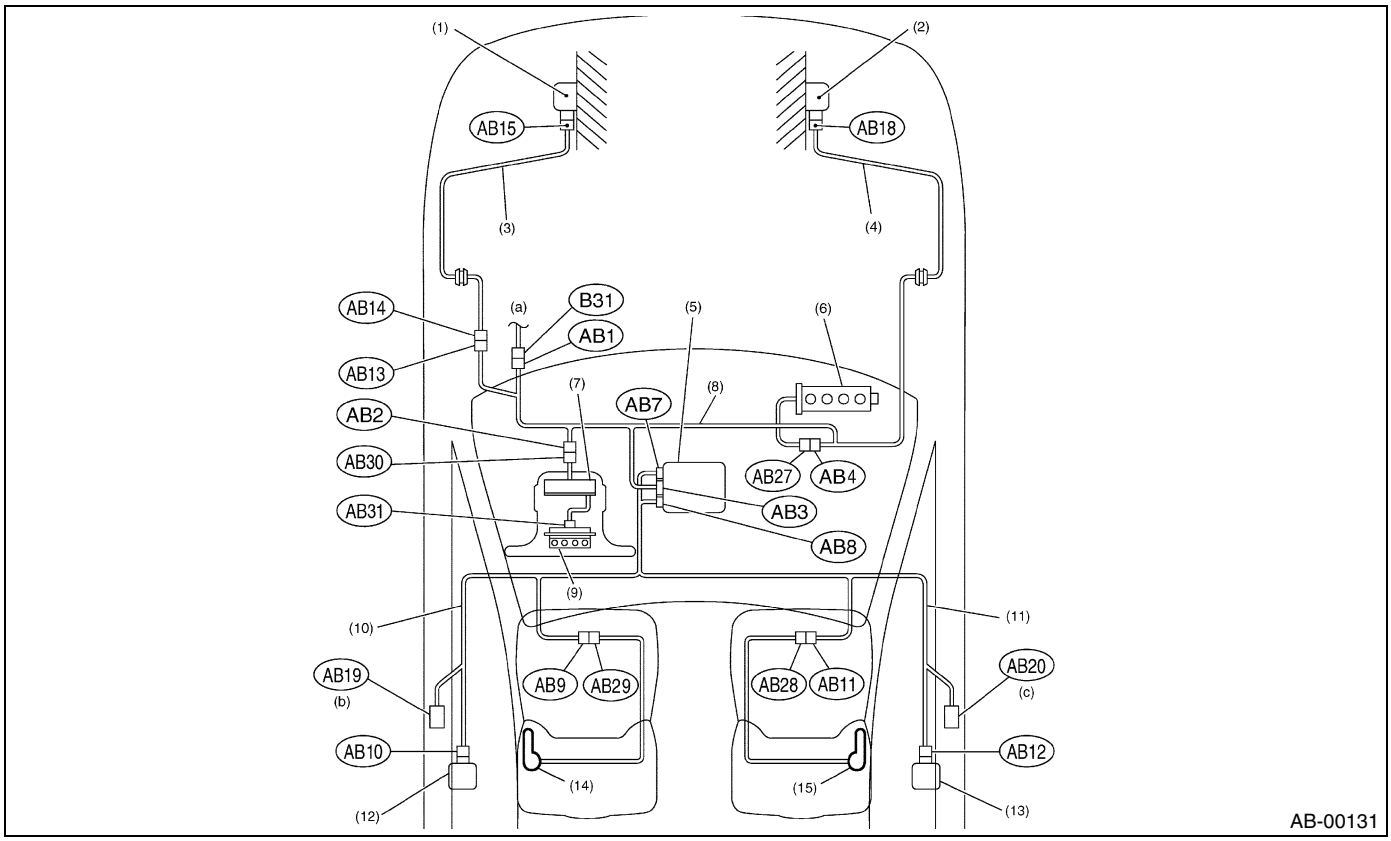


AB-00312

4. Electrical Components Location

A: LOCATION

1. LHD MODEL

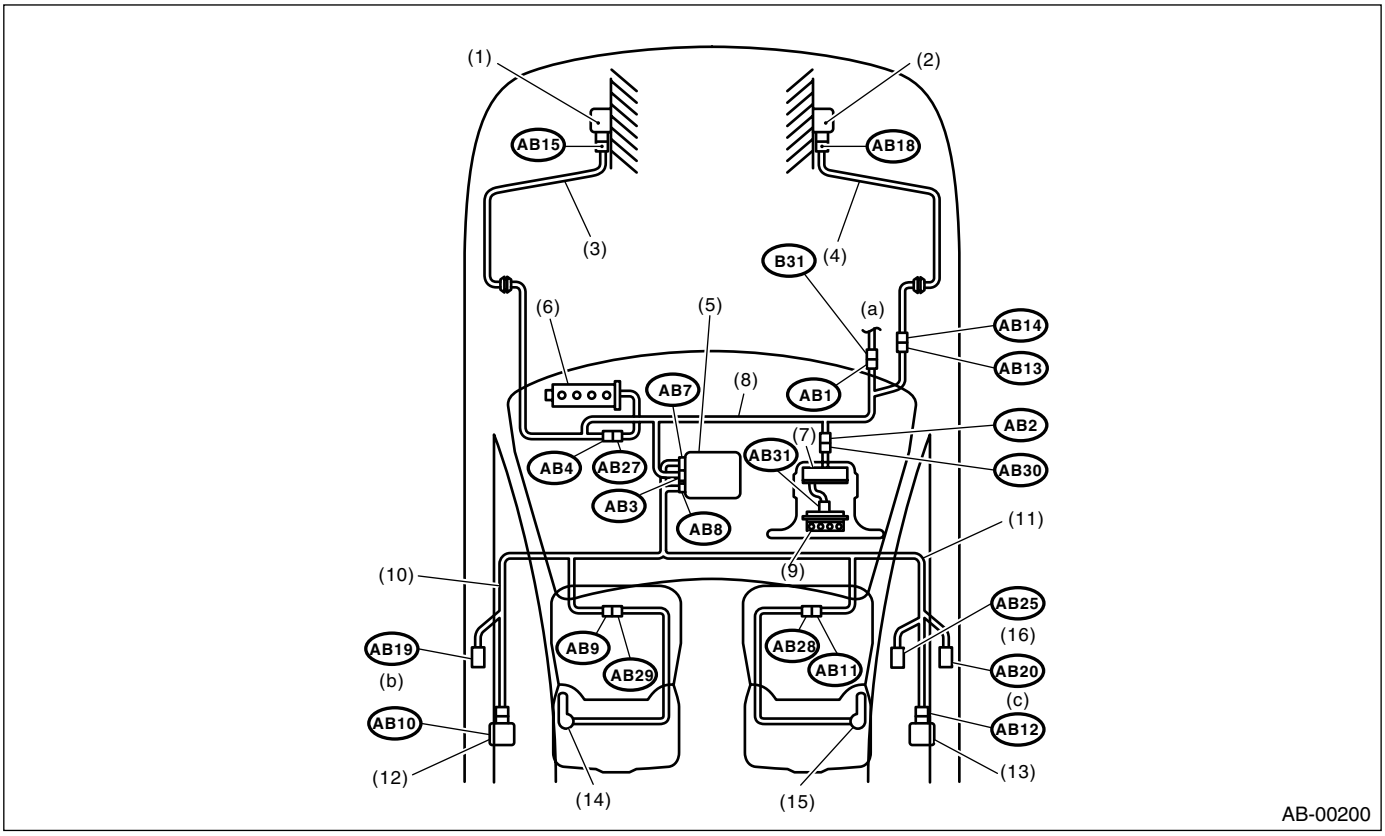


(1) Front sub sensor (LH)
(2) Front sub sensor (RH)
(3) Front sub sensor harness (LH)
(4) Front sub sensor harness (RH)
(5) Airbag control module with built-in safety and electric sensor
(6) Passenger's airbag inflator
(7) Roll connector
(8) Airbag main harness
(9) Driver's airbag inflator
(10) Side airbag harness (LH)
(11) Side airbag harness (RH)
(12) Side airbag sensor (LH)
(13) Side airbag sensor (RH)
(14) Side airbag inflator (LH)
(15) Side airbag inflator (RH)
(a) To body harness
(b) To seat belt pretensioner (LH)
(c) To seat belt pretensioner (RH)

Connector No.	(AB1)	(AB2)	(AB3)	(AB4)	(AB7)	(AB8)	(AB9)	(AB10)	(AB11)	(AB12)	(AB13)	(AB14)
Pole	6	2	28	4	12	12	2	4	2	4	2	2
Color	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Male/Female	Male	Female	Female	Female	Female	Female	Female	Female	Female	Female	Female	Male

Connector No.	(AB15)	(AB18)	(AB19)	(AB20)	(AB27)	(AB28)	(AB29)	(AB30)	(AB31)			
Pole	2	2	2	2	4	2	2	2	2			
Color	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Black			
Male/Female	Female	Female	Female	Female	Male	Male	Male	Male	Female			

2. RHD MODEL



(1) Front sub sensor (LH)
(2) Front sub sensor (RH)
(3) Front sub sensor harness (LH)
(4) Front sub sensor harness (RH)
(5) Airbag control module with built-in safety and electric sensor
(6) Passenger's airbag inflator
(7) Roll connector
(8) Airbag main harness
(9) Driver's airbag inflator
(10) Side airbag harness (LH)
(11) Side airbag harness (RH)
(12) Side airbag sensor (LH)
(13) Side airbag sensor (RH)
(14) Side airbag inflator (LH)
(15) Side airbag inflator (RH)
(16) Lap pretensioner
(a) To body harness
(b) To seat belt pretensioner (LH)
(c) To seat belt pretensioner (RH)

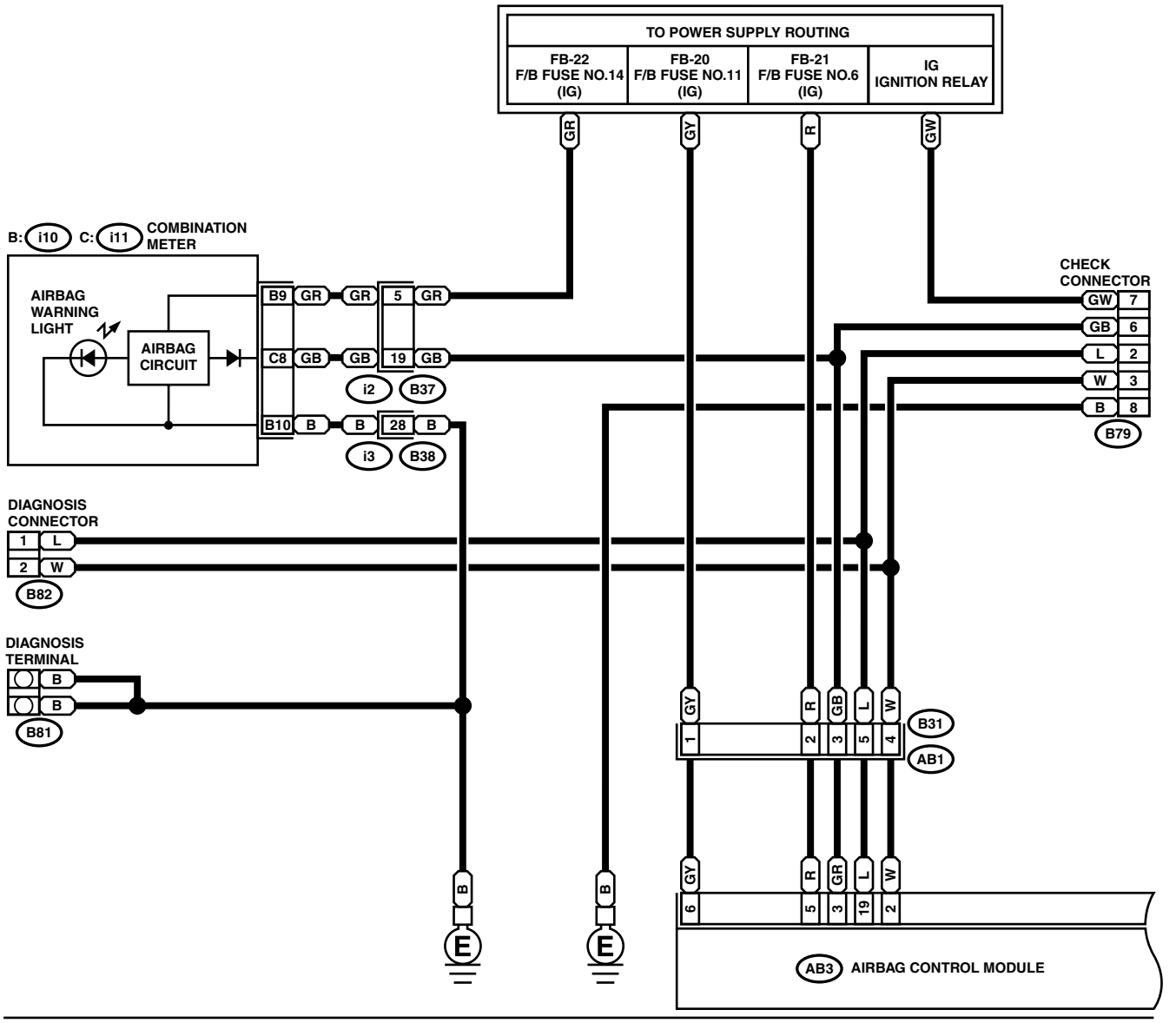
Connector No.	(AB1)	(AB2)	(AB3)	(AB4)	(AB7)	(AB8)	(AB9)	(AB10)	(AB11)	(AB12)	(AB13)	(AB14)
Pole	6	2	28	4	12	12	2	4	2	4	2	2
Color	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Male/Female	Male	Female	Female	Female	Female	Female	Female	Female	Female	Female	Female	Male

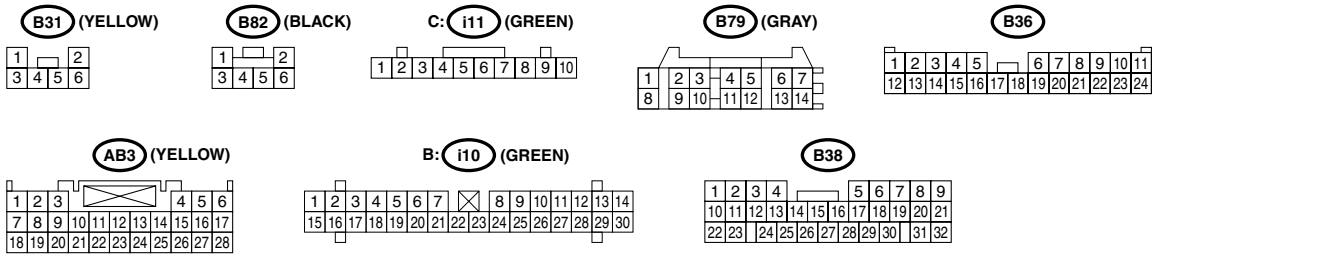
Connector No.	(AB15)	(AB18)	(AB19)	(AB20)	(AB25)	(AB27)	(AB28)	(AB29)	(AB30)	(AB31)		
Pole	2	2	2	2	2	4	2	2	2	2		
Color	Yellow	Yellow	Yellow	Yellow	Orange	Yellow	Yellow	Yellow	Yellow	Black		
Male/Female	Female	Female	Female	Female	Female	Male	Male	Male	Male	Female		

5. A/B Control Module I/O Signal

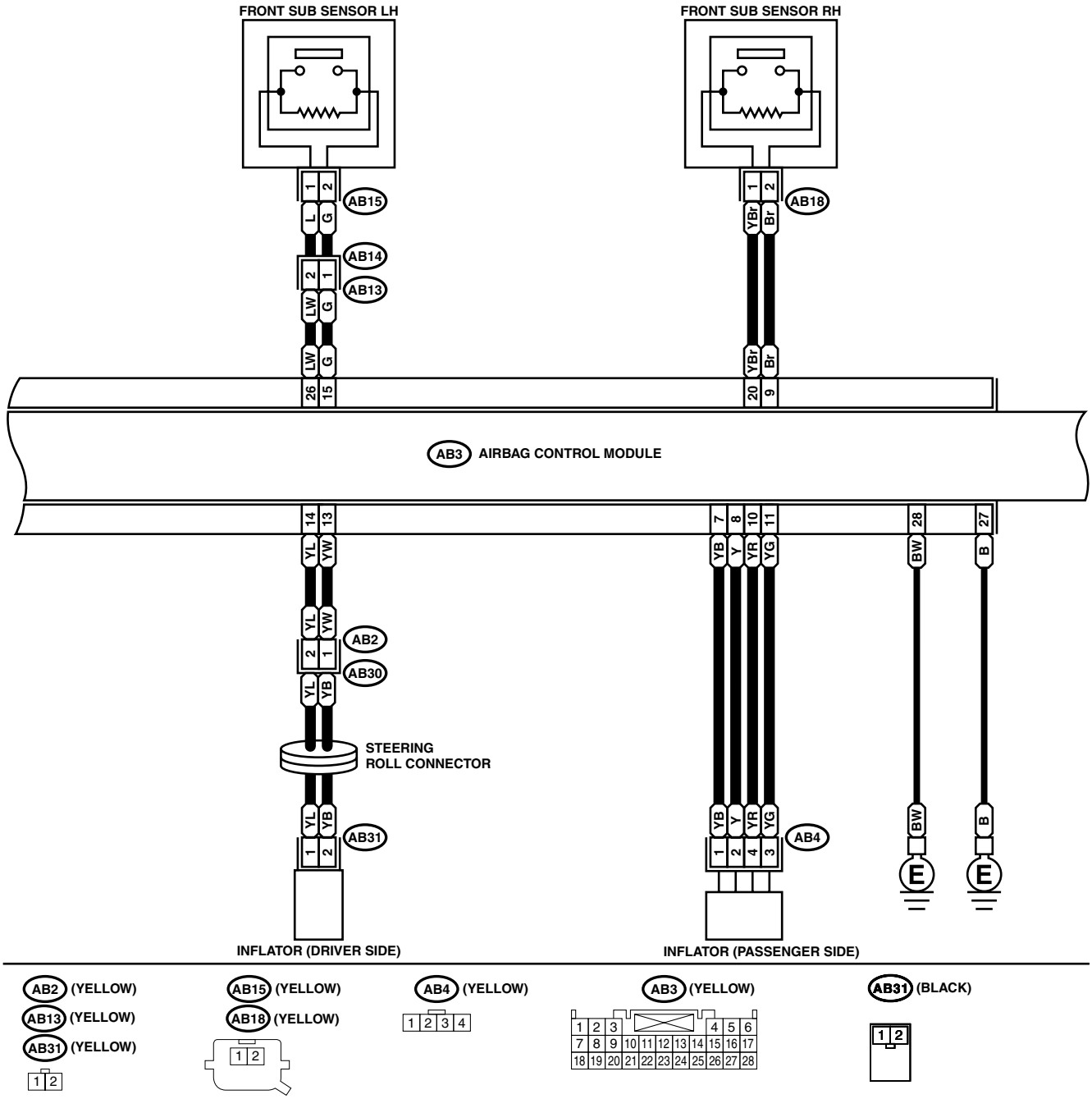
A: SCHEMATIC

1. LHD MODEL

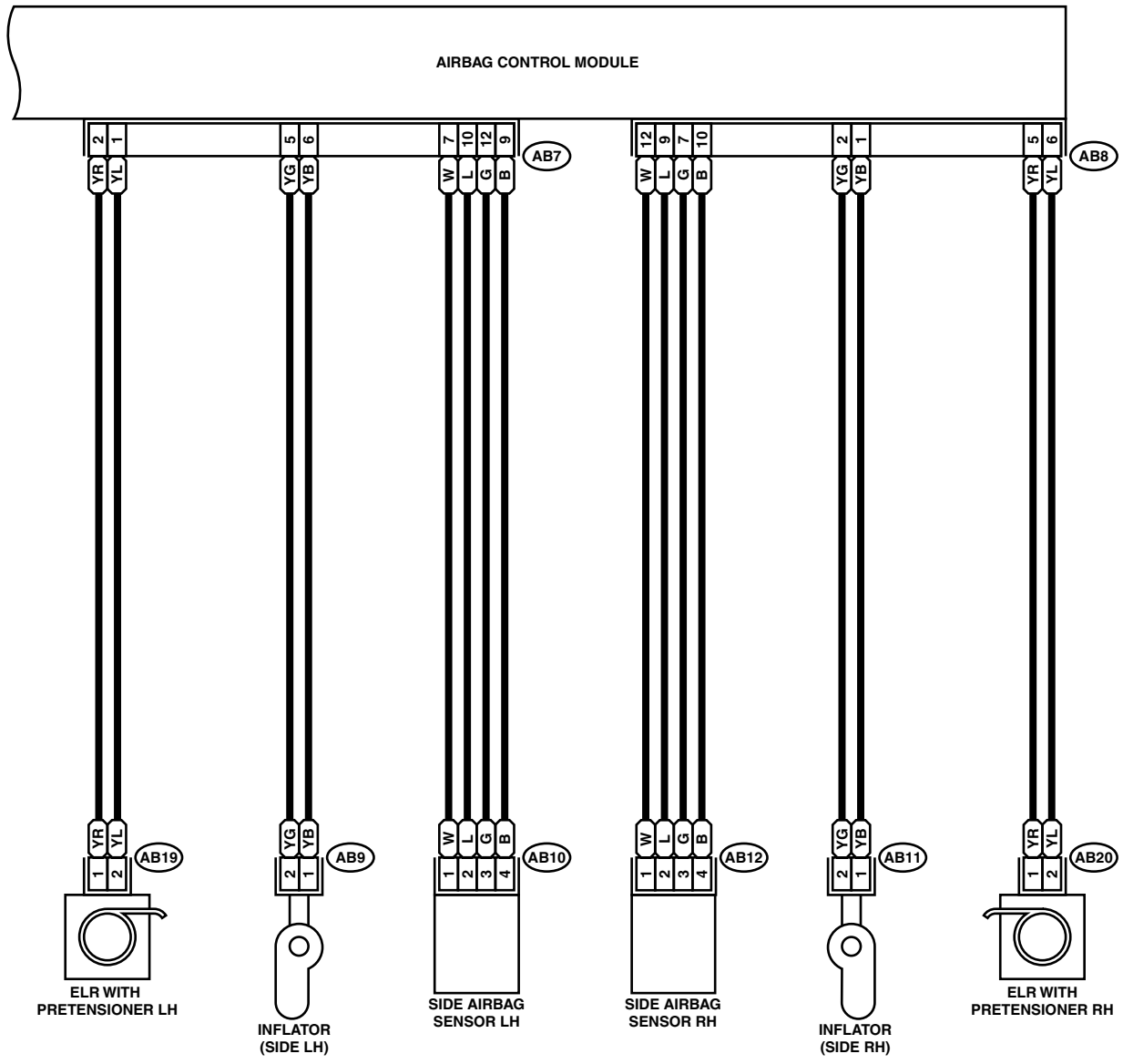




AB-00204

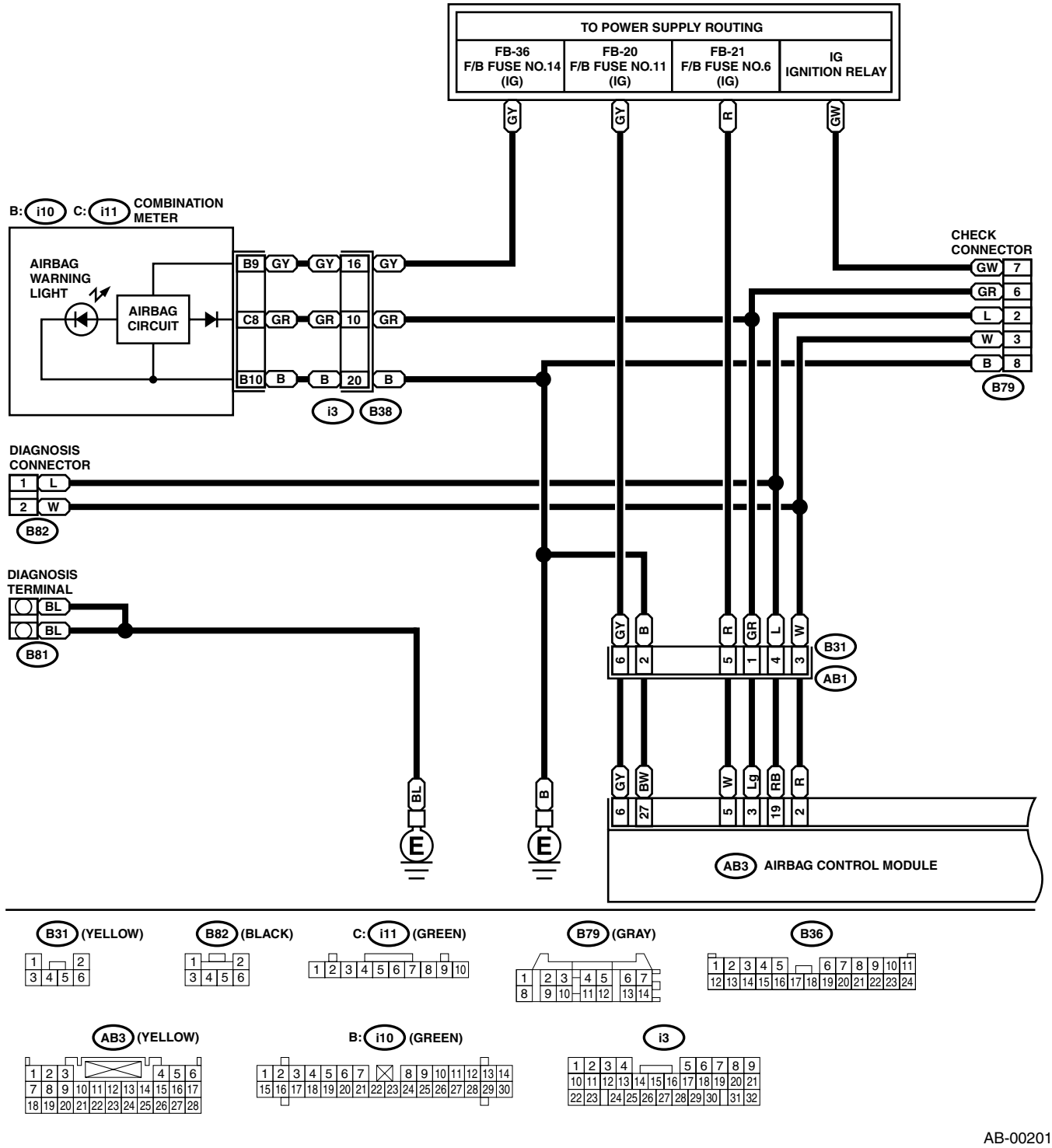

FRONT SUB SENSOR LH
FRONT SUB SENSOR RH
AB15
AB14
AB13
AB18
AB3 AIRBAG CONTROL MODULE
AB2
AB30
AB31
AB4
STEERING ROLL CONNECTOR
INFLATOR (DRIVER SIDE)
INFLATOR (PASSENGER SIDE)
AB2 (YELLOW)
AB13 (YELLOW)
AB31 (YELLOW)
AB15 (YELLOW)
AB18 (YELLOW)
AB4 (YELLOW)
AB3 (YELLOW)
AB31 (BLACK)

AB-00205

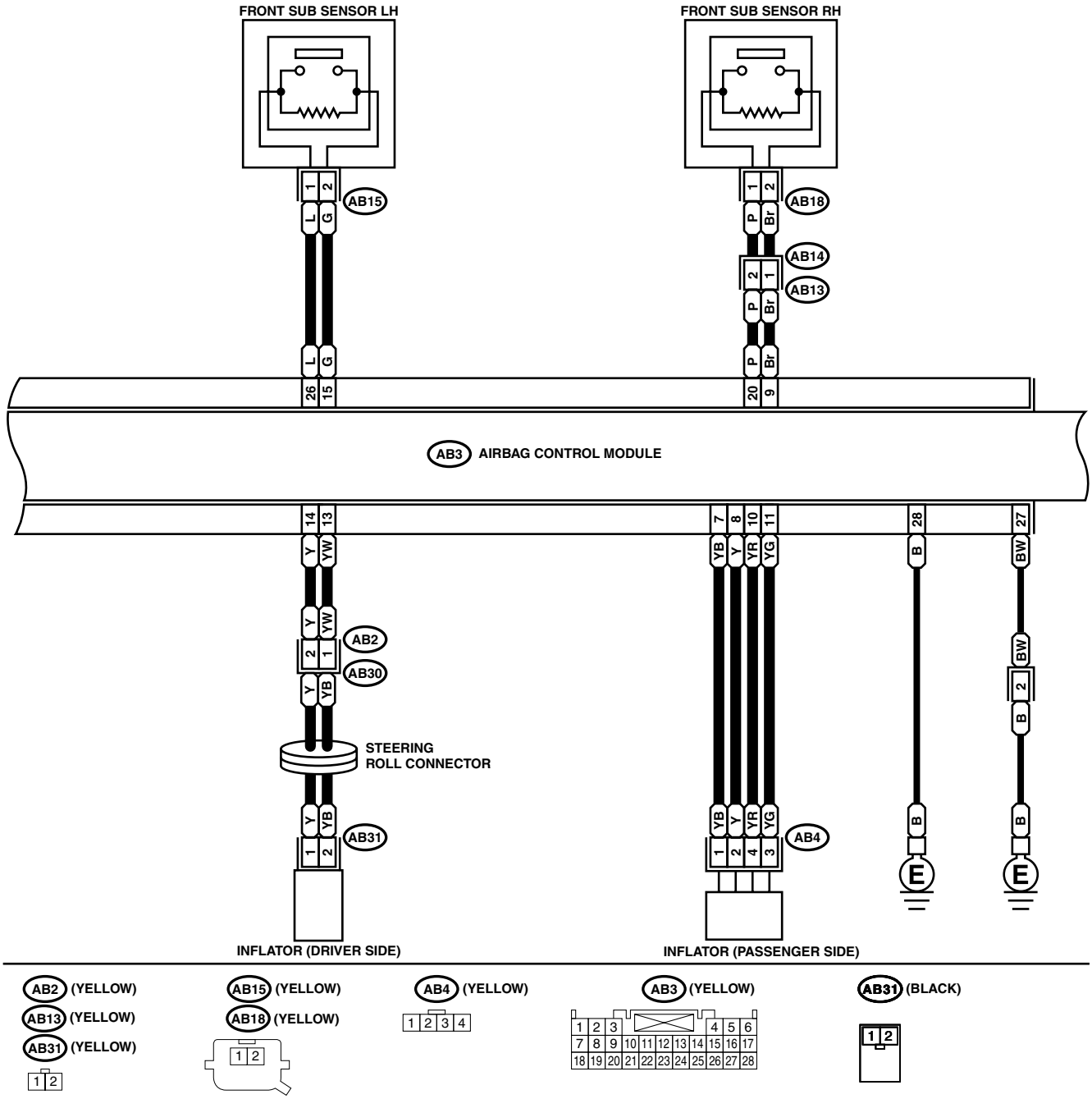

AIRBAG CONTROL MODULE
AB7
AB8
YR
YL
YG
YB
W
L
G
B
AB19
AB9
AB10
AB12
AB11
AB20
ELR WITH PRETENSIONER LH
INFLATOR (SIDE LH)
SIDE AIRBAG SENSOR LH
SIDE AIRBAG SENSOR RH
INFLATOR (SIDE RH)
ELR WITH PRETENSIONER RH
(YELLOW) AB9 AB19 (YELLOW)
(YELLOW) AB11 AB20 (YELLOW)
AB10 (YELLOW)
AB12 (YELLOW)
AB7 (YELLOW)
AB8 (YELLOW)

AB-00318

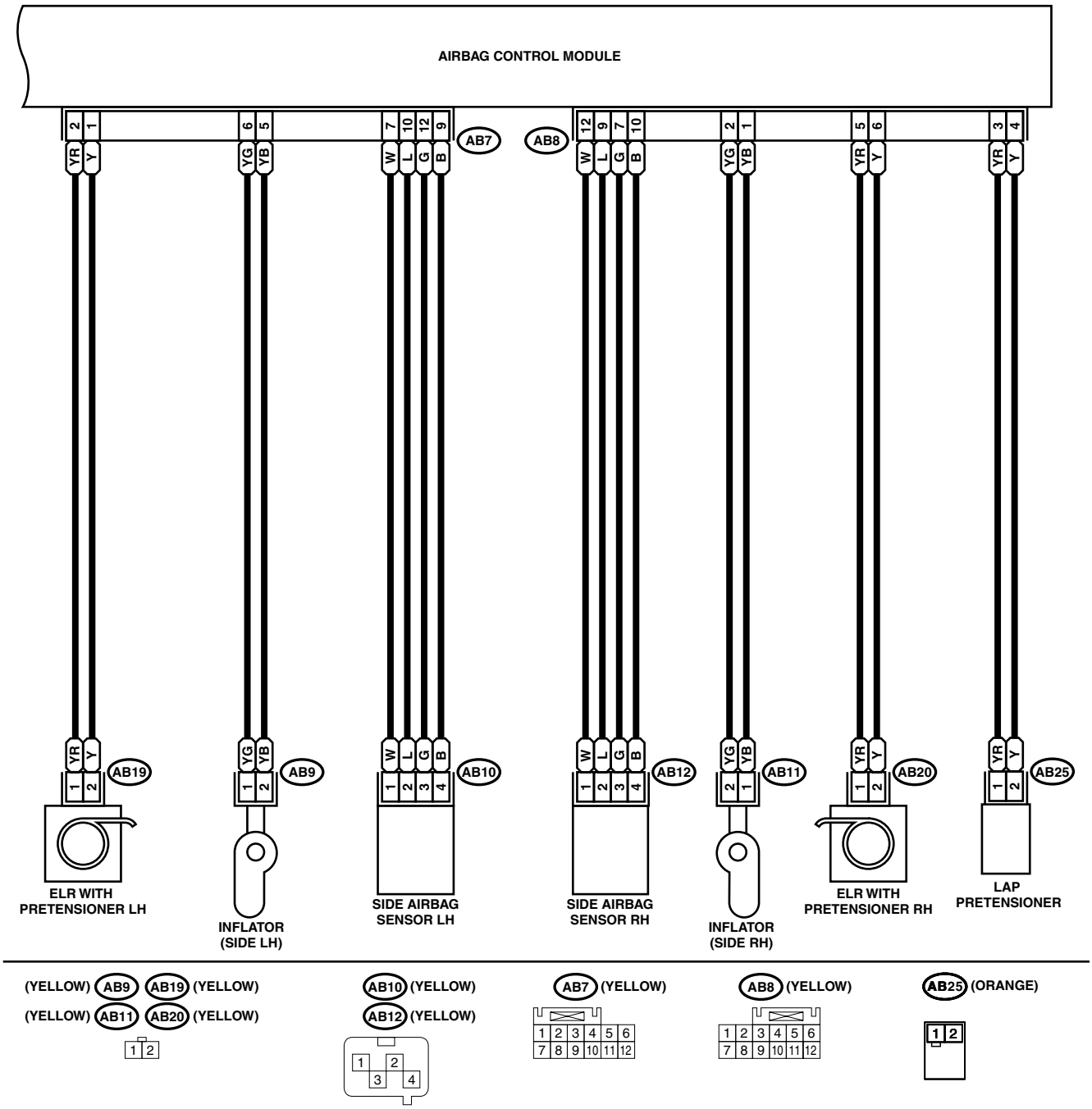
2. RHD MODEL



AB-00201


FRONT SUB SENSOR LH
FRONT SUB SENSOR RH
AB15
AB18
AB14
AB13
AB3 AIRBAG CONTROL MODULE
AB2
AB30
AB31
AB4
STEERING ROLL CONNECTOR
INFLATOR (DRIVER SIDE)
INFLATOR (PASSENGER SIDE)
AB2 (YELLOW)
AB13 (YELLOW)
AB31 (YELLOW)
AB15 (YELLOW)
AB18 (YELLOW)
AB4 (YELLOW)
AB3 (YELLOW)
AB31 (BLACK)

AB-00202


AIRBAG CONTROL MODULE
AB7
AB8
ELR WITH PRETENSIONER LH
INFLATOR (SIDE LH)
SIDE AIRBAG SENSOR LH
SIDE AIRBAG SENSOR RH
INFLATOR (SIDE RH)
ELR WITH PRETENSIONER RH
LAP PRETENSIONER
(YELLOW) AB9 AB19 (YELLOW)
(YELLOW) AB11 AB20 (YELLOW)
AB10 (YELLOW)
AB12 (YELLOW)
AB7 (YELLOW)
AB8 (YELLOW)
AB25 (ORANGE)

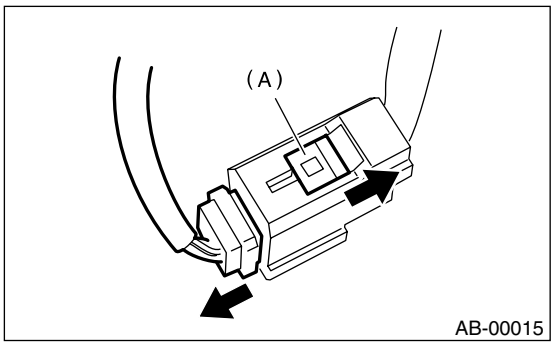
AB-00203

6. Airbag Connector

A: OPERATION

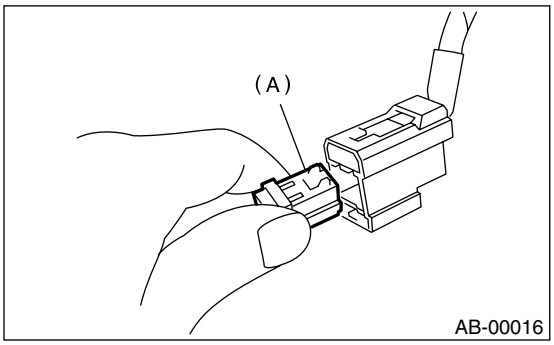
1. POWER SUPPLY

1) How to disconnect:
(1) Move the slide lock (A) in the direction of the arrow.
(2) Pull the female connector in the direction of the arrow with slide lock (A) moved.



CAUTION:
When pulling, be sure to hold onto the connector and not the wire.

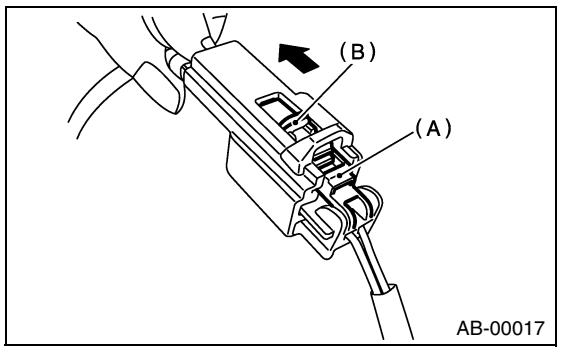
2) How to connect:
Holding the connector (A), and push it in carefully until a connecting sound is heard.



CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

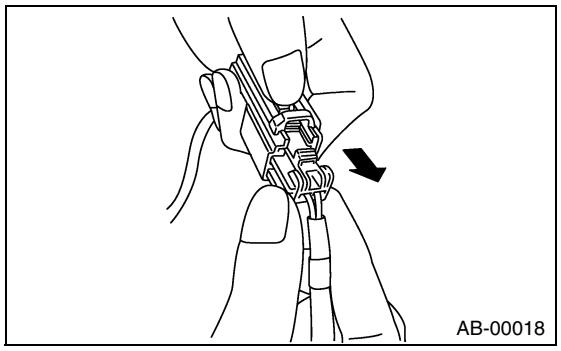
2. DRIVER'S AIRBAG (AIRBAG MAIN HARNESS AND ROLL CONNECTOR), SIDE AIRBAG AND PRETENSIONER

1) How to disconnect:
(1) Push the lock arm (A).
(2) With the lock arm (A) pushed in, move the slide lock (B) in the direction of the arrow.



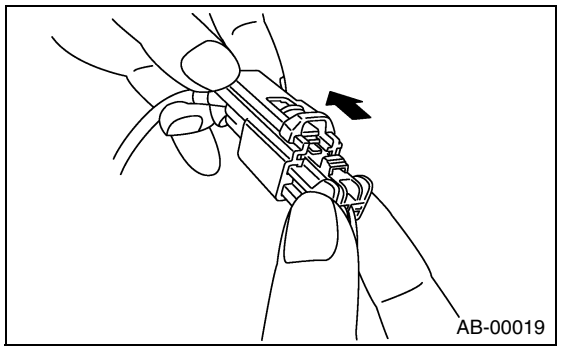
(3) With the slide lock (B) pulled, remove the lock arm (A) to its original position, and then pull in the direction of the arrow and separate the connector.

CAUTION:
When pulling, be sure to hold onto the connector and not the wire.



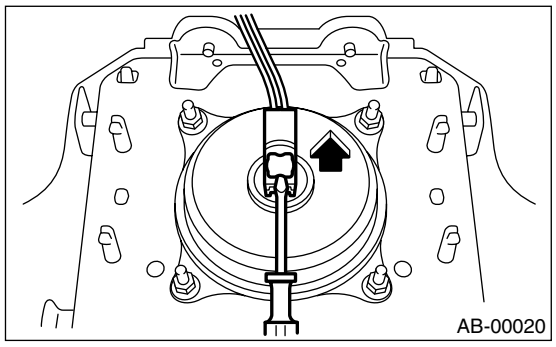
2) How to connect:
Holding the connector, and push it in carefully until a connecting sound is heard.

CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.



3. DRIVER'S AIRBAG (ROLL CONNECTOR AND AIRBAG MODULE)

1) How to disconnect:
(1) Using a flat tip screwdriver, pry the push lock upward to unlock.



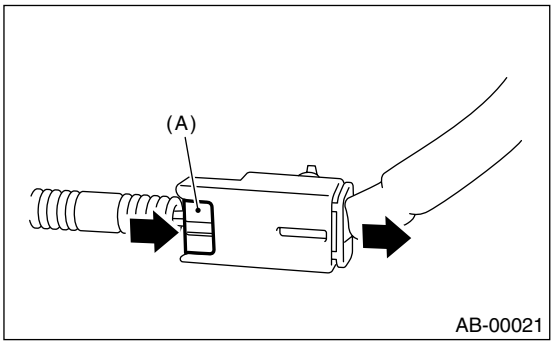
(2) Pull the connector to disconnect from driver's side airbag module assembly.

2) How to connect:
Connect the connector in reverse order of disconnecting. At this time, be sure to insert the connector in until connecting sound is heard.

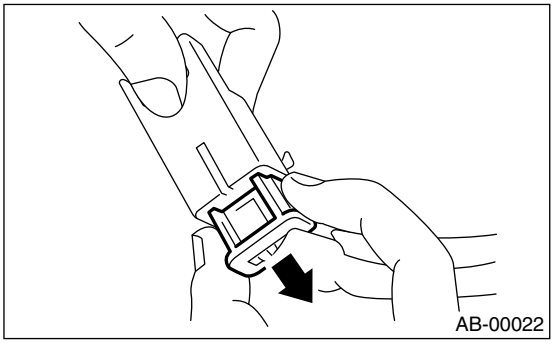
CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

4. PASSENGER'S AIRBAG

1) How to disconnect:
(1) Push the lock arm (A).
(2) With the lock arm (A) pushed in, pull the connector in direction of arrow to separate.

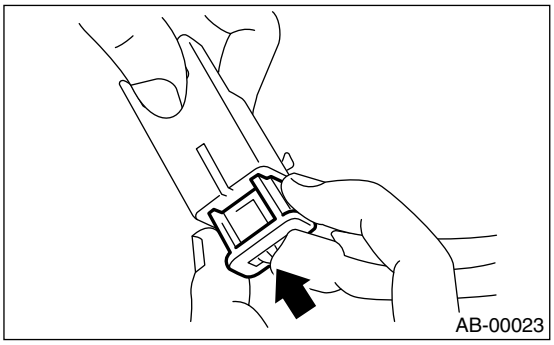


CAUTION:
When disconnecting the connector, be sure to hold onto the connector and not the wire.



2) How to connect:
Holding the connector, and push it in carefully until a connecting sound is heard.

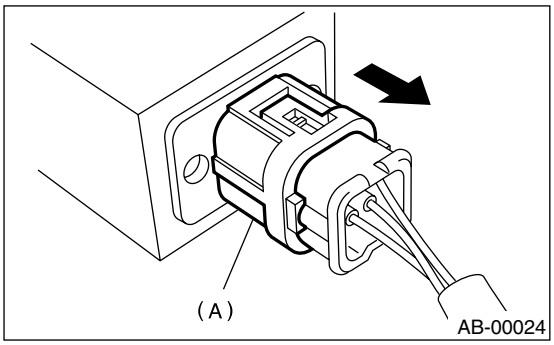
CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.



5. FRONT SUB-SENSOR AND SIDE AIR-BAG SENSOR

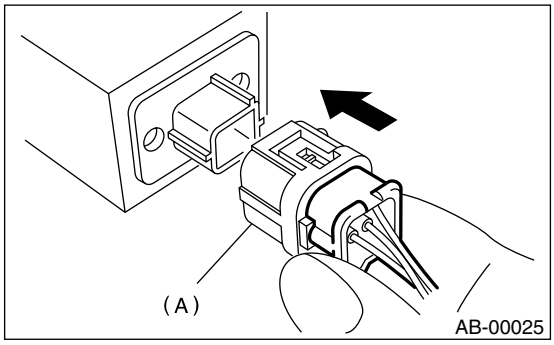
1) How to disconnect:
Holding outer part (A), pull it in the direction of the arrow.

CAUTION:
When pulling, be sure to hold onto the connector and not the wire.



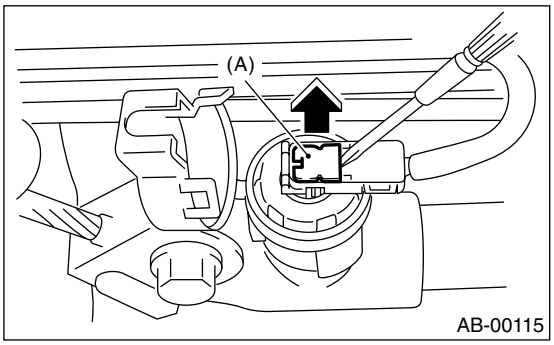
2) How to connect:
Holding the connector, and push it in carefully until a connecting sound is heard.

CAUTION:
• Outer (A) moves back, and so do not put your hand on the outer part.
• Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

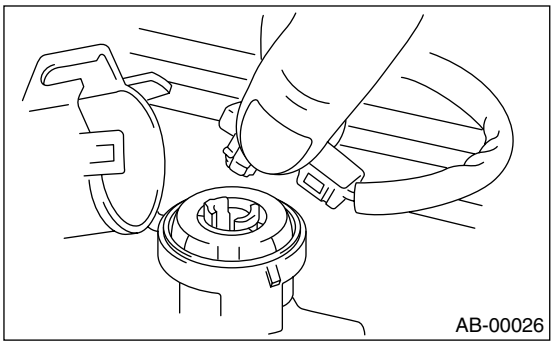


6. LAP PRETENSIONER

1) How to disconnect:
(1) Using a flat tip screwdriver, pry the push lock (A) upward to unlock.



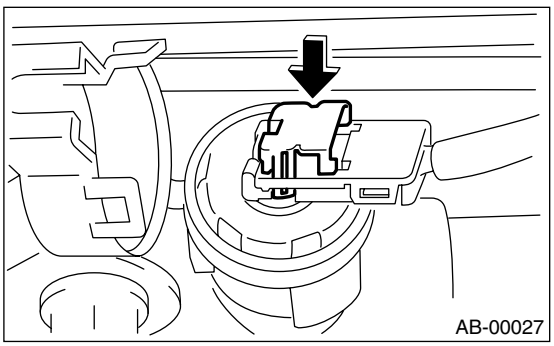
(2) Pull the the connector to disconnect from lap pretensioner.



CAUTION:
When pulling the side lock, be sure to hold onto the connector and not the wire.

2) How to connect:
Connect the connector in reverse order of disconnecting. At this time, be sure to insert the connector in until connecting sound is heard.

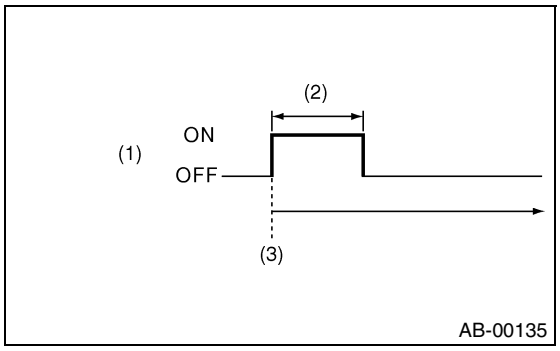
CAUTION:
• Be sure to insert the connector in until it locks.
Then pull on it gently to make sure that it is locked.
• Be sure to push the push lock in.



7. Airbag Warning Light Illumination Pattern

A: INSPECTION

Keep the ignition switch to ON, and confirm that the airbag warning light remains off approx. 6 seconds after being turned on.

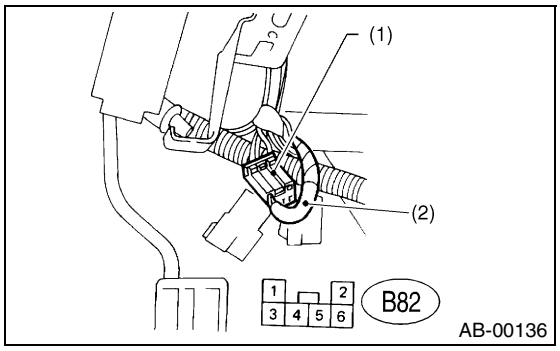


(1) Airbag warning light
(2) Approx. 6 seconds
(3) Ignition switch ON

8. Read Diagnostic Trouble Code (DTC)

A: OPERATION

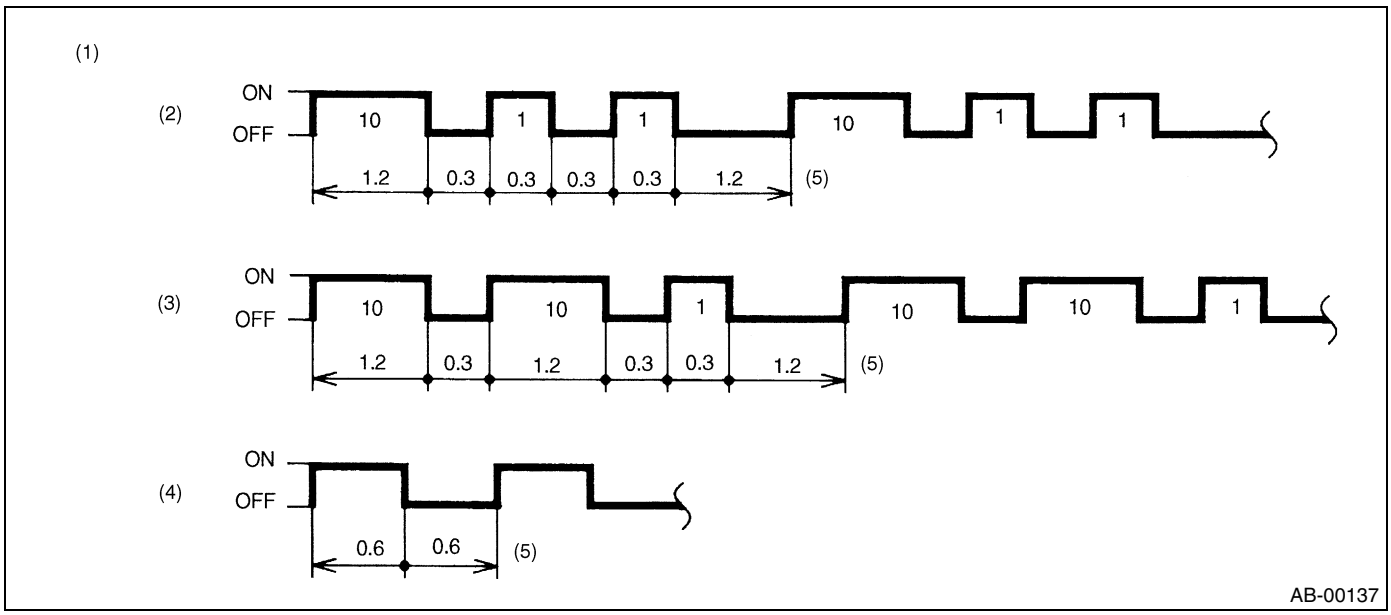
1) Turn the ignition switch to ON.
2) Connect the diagnosis terminal to diagnosis connector terminal No. 1 in the instrument panel lower cover area.



(1) Diagnosis connector
(2) DIAG terminal

3) Read the DTC by identifying the way airbag warning light flashes.
The airbag warning light flashes a code corresponding to the faulty parts.
The long segment (1.2 sec on) indicates a “ten”, and the short segment (0.3 sec on) indicates a “one”.

NOTE:
• “List of Diagnostic Trouble Code” <Ref. to AB-44, List of Diagnostic Trouble Code (DTC).>
• “Airbag Warning Light Failure” <Ref. to AB-34, Airbag Warning Light Failure.>



(1) Example
(2) Flashing code 12:
(3) Flashing code 21:
(4) Flashing normal code:
(5) Sec

4) Turn the ignition switch to OFF, and disconnect the diagnosis terminal from the diagnosis connector terminal No 1.
5) Wind tape around the diagnosis terminal and return it to its original position.

9. Inspection Mode

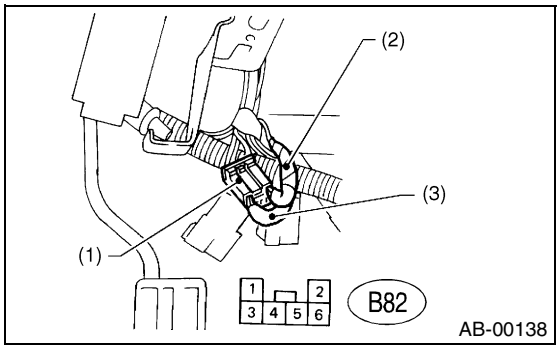
A: OPERATION

Recreate the circumstance by referring to the conditions described in the checklist.

10.Clear Memory Mode

A: OPERATION

1) Turn the ignition switch to ON.
2) Connect the diagnosis terminal (DIAG, terminal “A”) to diagnosis connector terminal No. 1 in the instrument panel lower cover area.



(1) Diagnosis connector
(2) DIAG terminal “B”
(3) DIAG terminal “A”

3) While the warning light flashes, connect another diagnosis terminal (DIAG, terminal “B”) to diagnosis connector terminal No.2.
4) Once the memory is erased, the warning light returns to the normal flash rate (0.6 sec on). The failure to recover the normal flash rate indicates that trouble parts still remain. Having repaired such parts, erase the memory again and confirm that the normal flash rate has returned.
5) When the memory has been cleared, disconnect the diagnosis terminal from the diagnosis connector.
6) Wind tape around the diagnosis terminal and return it to its original position.

11.Airbag Warning Light Failure

A: AIRBAG WARNING LIGHT REMAINS ON.

DIAGNOSIS:

- Airbag warning light unit is faulty.
- Airbag control module to airbag warning light circuit is shorted or open.
- Grounding circuit is faulty.
- Airbag control module is faulty.
- (AB1) and (B31) are not connected properly.
- (AB3) is not connected properly to the airbag control module.

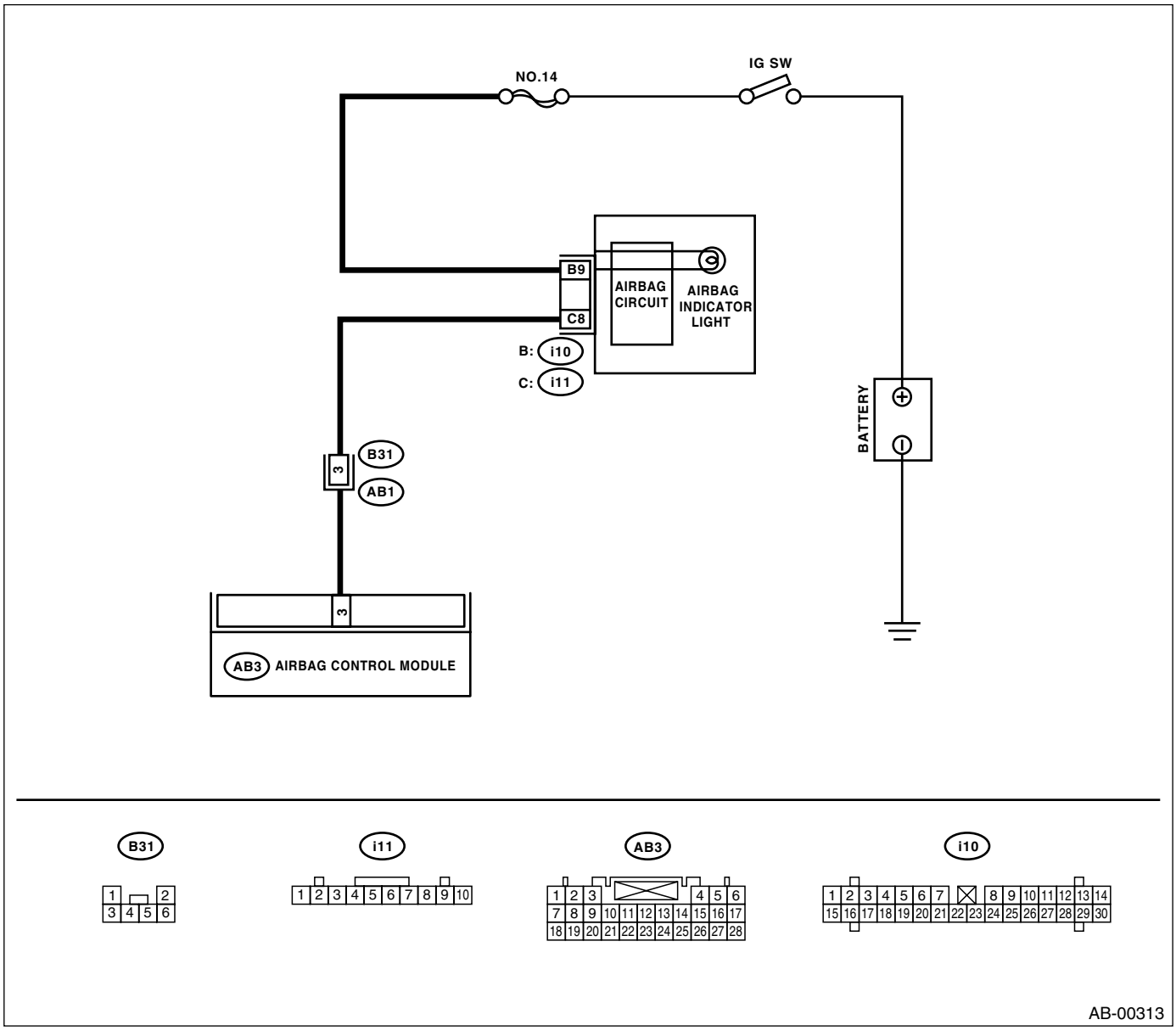
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

1. LHD MODEL

WIRING DIAGRAM:

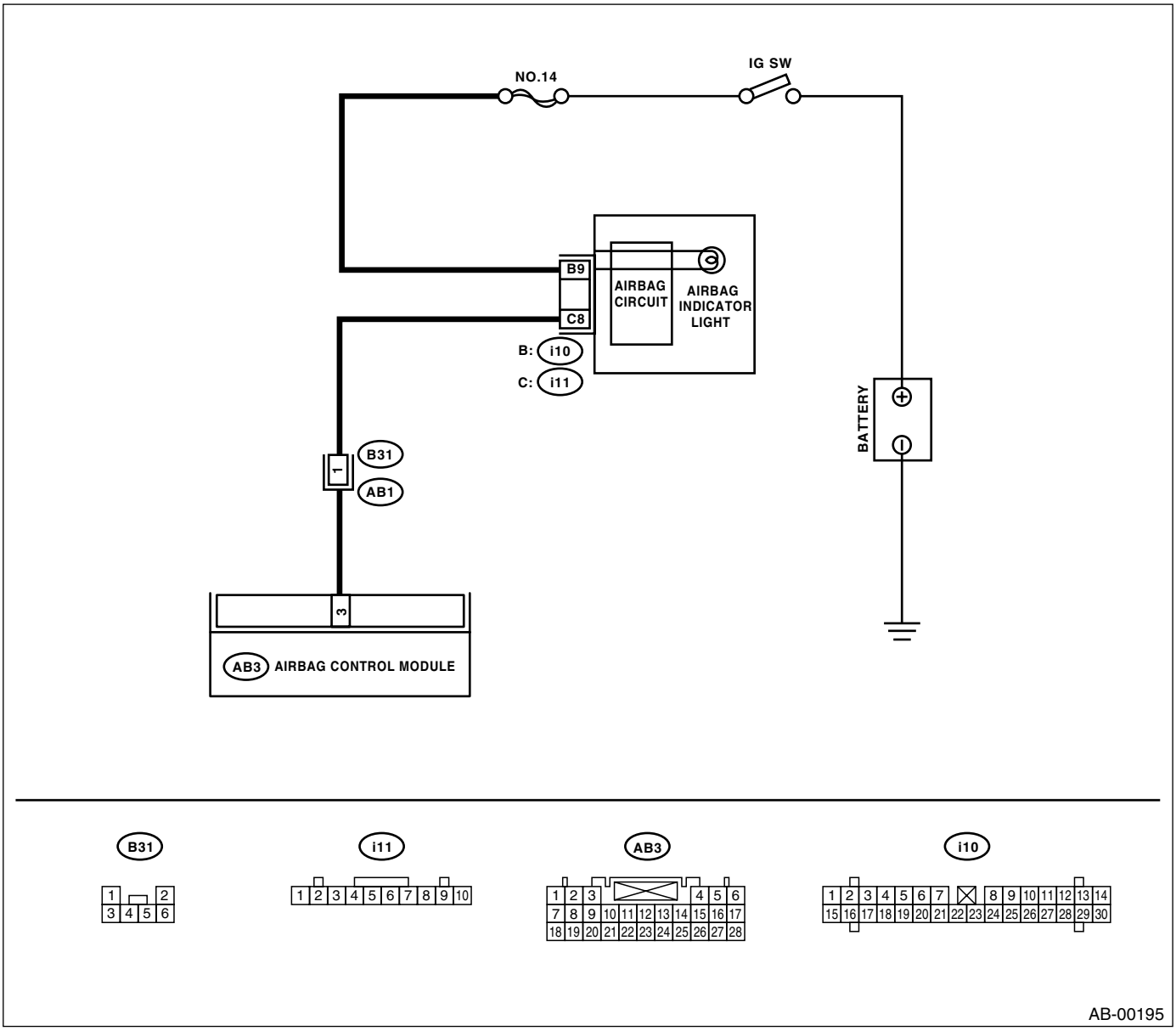


	Step	Value	Yes	No
1	**CHECK POOR CONTACT IN CONNECTORS (AB1) AND (B31).** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Remove the side sill cover. (Driver's side) 3)Confirm that firm contact is secured between connectors (AB1) and (B31). Is the poor contact in connectors (AB1) and (B31)?	There is no poor contact in connectors (AB1) and (B31).	Go to step **2.**	Repair the body harness or replace the airbag main harness with body harness.
2	**CHECK AIRBAG WARNING LIGHT.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Connect the connector (1T) in test harness T to body harness connector (B31). 3)Connect the connector (1M) in test harness M to connector (2T) in test harness T. 4)Connect the battery ground cable and turn the ignition switch to ON. 5)Connect the connectors, (3M) and (4M) in test harness M. Is the airbag warning light turned off?	Airbag warning light is turned off.	Go to step **4.**	Go to step **3.**
3	**CHECK BODY HARNESS.** Check the body harness. Is the anything unusual to body harness? NOTE: After problem has been eliminated, disconnect the connectors (3M) and (4M).	Body harness is OK.	Replace the combination meter printed circuit. <Ref. to IDI-12, Combination Meter Assembly.>	Repair the body harness.
4	**CHECK POOR CONTACT.** Confirm that firm contact is secured between the airbag control module and the connector (AB3). <Ref. to AB-18, Airbag Control Module.> Is the poor contact in connector (AB3)?	There is no poor contact in connector (AB3).	Go to step **5.**	Replace the airbag main harness with body harness or replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>
5	**CHECK AIRBAG MAIN HARNESS.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Connect the connector (AB1) to (B31). 3)Disconnect the connectors (AB2) and (AB30). 4)Remove the glove box and disconnect the connectors (AB4) and (AB27). 5)Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R. <Ref. to AB-18, Airbag Control Module.> 6)Connect the battery ground cable and turn the ignition switch to ON. 7)Connect the connectors (5R) and (6R) in test harness R. Is the airbag warning light turned off? NOTE: After problem has been eliminated, disconnect the connectors (5R) and (6R).	Airbag warning light is turned off.	Go to step **6.**	Replace the airbag main harness with body harness.

	Step	Value	Yes	No
6	**CHECK GROUNDING CIRCUIT.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB3) from the air-bag control module. 3)Connect the connector (1R) in test harness R to body harness connector (AB3). 4)Measure the resistance between connector (2R) in test harness R and the chassis ground. ***Connector & terminal*** ***(2R) No. 10 — Chassis ground:*** ***(2R) No. 11 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Repair the body-grounding circuit.

2. RHD MODEL

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK POOR CONTACT IN CONNECTORS (AB1) AND (B31).** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Remove the side sill cover. (Driver's side) 3)Confirm that firm contact is secured between connectors (AB1) and (B31). Is the poor contact in connectors (AB1) and (B31)?	There is no poor contact in connectors (AB1) and (B31).	Go to step **2.**	Repair the body harness or replace the airbag main harness with body harness.

	Step	Value	Yes	No
2	**CHECK AIRBAG WARNING LIGHT.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Connect the connector (1M) in test harness M to body harness connector (B31). 3)Connect the battery ground cable and turn the ignition switch to ON. 4)Connect the connectors, (3M) and (4M) in test harness M. Is the airbag warning light turned off?	Airbag warning light is turned off.	Go to step **4.**	Go to step **3.**
3	**CHECK BODY HARNESS.** Check the body harness. Is the anything unusual to body harness? NOTE: After problem has been eliminated, disconnect the connectors (3M) and (4M).	Body harness is OK.	Replace the combination meter printed circuit. <Ref. to IDI-12, Combination Meter Assembly.>	Repair the body harness.
4	**CHECK POOR CONTACT.** Confirm that firm contact is secured between the airbag control module and the connector (AB3). <Ref. to AB-18, Airbag Control Module.> Is the poor contact in connector (AB3)?	There is no poor contact in connector (AB3).	Go to step **5.**	Replace the airbag main harness with body harness or replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>
5	**CHECK AIRBAG MAIN HARNESS.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Connect the connector (AB1) to (B31). 3)Disconnect the connectors (AB2) and (AB30). 4)Remove the glove box and disconnect the connectors (AB4) and (AB27). 5)Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R. <Ref. to AB-18, Airbag Control Module.> 6)Connect the battery ground cable and turn the ignition switch to ON. 7)Connect the connectors (5R) and (6R) in test harness R. Is the airbag warning light turned off? NOTE: After problem has been eliminated, disconnect the connectors (5R) and (6R).	Airbag warning light is turned off.	Go to step **6.**	Replace the airbag main harness with body harness.

	Step	Value	Yes	No
6	**CHECK GROUNDING CIRCUIT.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB3) from the air-bag control module. 3)Connect the connector (1R) in test harness R to body harness connector (AB3). 4)Measure the resistance between connector (2R) in test harness R and the chassis ground. ***Connector & terminal*** ***(2R) No. 10 — Chassis ground:*** ***(2R) No. 11 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Repair the body-grounding circuit.

B: AIRBAG WARNING LIGHT REMAINS OFF.

DIAGNOSIS:

- Fuse No. 14 (in fuse box) is blown.
- Body harness circuit is open.
- Airbag warning light is faulty.
- Airbag main harness is faulty.
- Airbag control module is faulty.

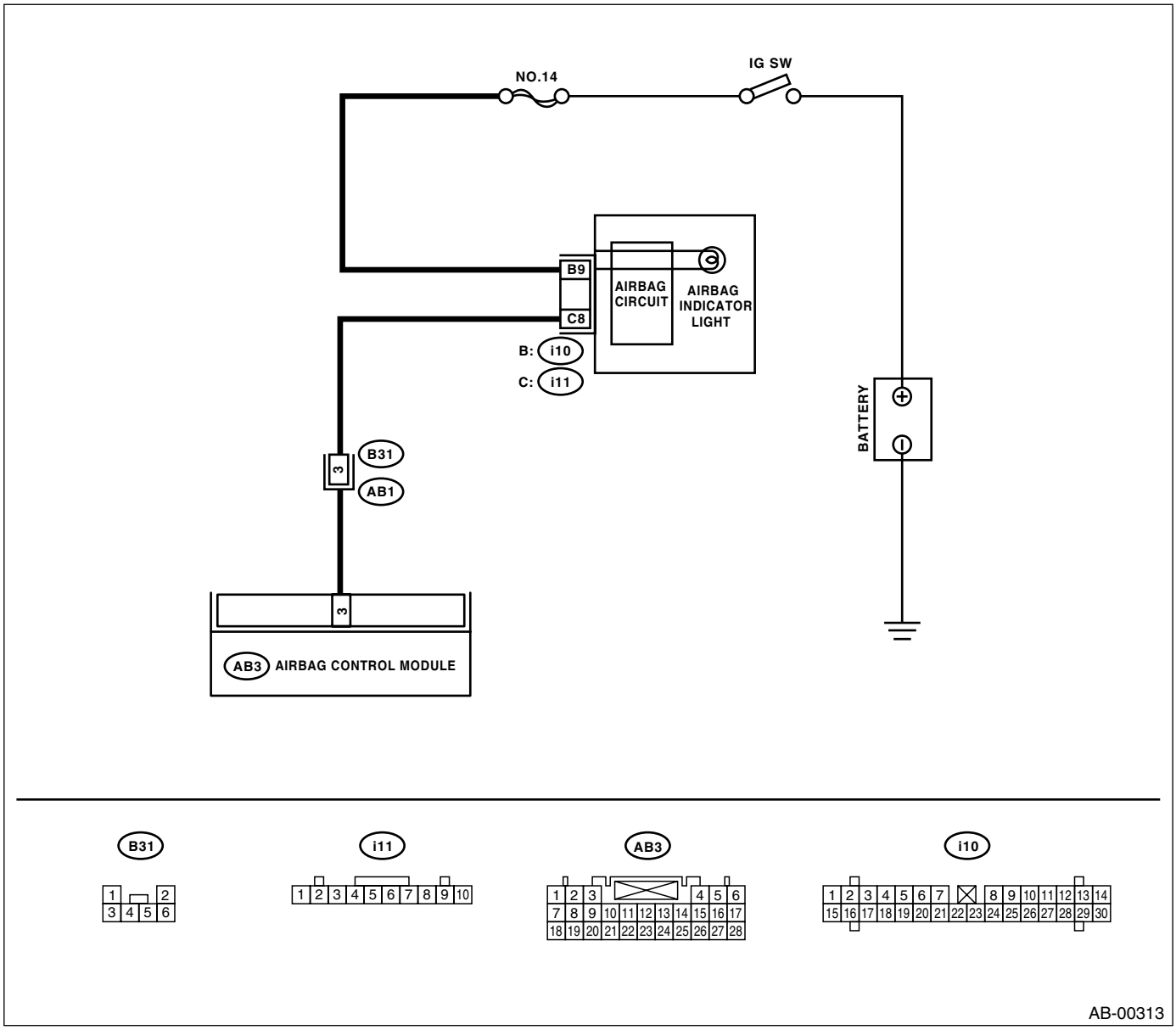
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

1. LHD MODEL

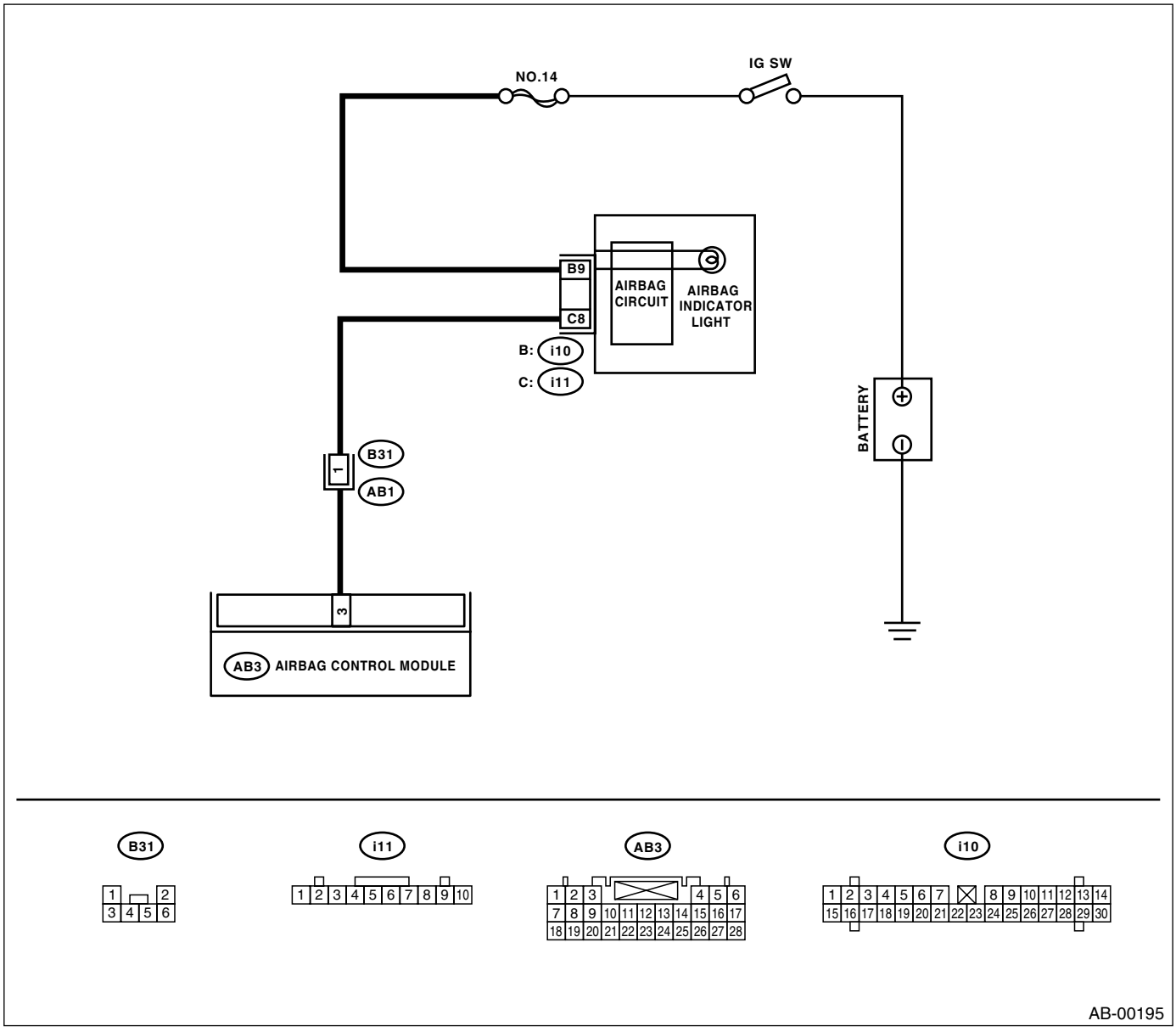
WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK COMBINATION METER.** Turn the ignition switch to ON, and confirm that warning lights equipped in the combination meter are turned on. Do the warning lights not for airbag turn on?	Warning lights not for airbag turned on.	Go to step **2.**	Repair the combination meter power supply. <Ref. to IDI-3, Combination Meter System.>
2	**CHECK FUSE NO. 14 (IN MAIN FUSE BOX).** Remove the fuse No. 14 and perform visual inspection. Is the fuse No. 14 (in main fuse box) blown out?	Fuse No. 14 is not blown out.	Go to step **3.**	Replace the fuse No. 14. If fuse No. 14 blows again, go to step **3**.
3	**CHECK AIRBAG WARNING LIGHT CIRCUIT (IN COMBINATION METER).** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB1) from (B31). 3)Connect the battery ground cable and turn the ignition switch to ON. Is the airbag warning light turned on?	Airbag warning light is turned on.	Go to step **4.**	Replace the airbag warning light bulb or combination meter printed circuit. <Ref. to IDI-12, Combination Meter Assembly.>
4	**CHECK AIRBAG MAIN HARNESS.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Connect the connector (AB1) to (B31). 3)Disconnect the connector (AB3) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 4)Connect the battery ground cable and turn the ignition switch to ON. Is the airbag warning light turned on?	Airbag warning light is turned on.	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the airbag main harness with body harness.

2. RHD MODEL

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK COMBINATION METER.** Turn the ignition switch to ON, and confirm that warning lights equipped in the combination meter are turned on. Do the warning lights not for airbag turn on?	Warning lights not for airbag turned on.	Go to step **2.**	Repair the combination meter power supply. <Ref. to IDI-3, Combination Meter System.>
2	**CHECK FUSE NO. 14 (IN MAIN FUSE BOX).** Remove the fuse No. 14 and perform visual inspection. Is the fuse No. 14 (in main fuse box) blown out?	Fuse No. 14 is not blown out.	Go to step **3.**	Replace the fuse No. 14. If fuse No. 14 blows again, go to step **3**.
3	**CHECK AIRBAG WARNING LIGHT CIRCUIT (IN COMBINATION METER).** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB1) from (B31). 3)Connect the battery ground cable and turn the ignition switch to ON. Is the airbag warning light turned on?	Airbag warning light is turned on.	Go to step **4.**	Replace the airbag warning light bulb or combination meter printed circuit. <Ref. to IDI-12, Combination Meter Assembly.>
4	**CHECK AIRBAG MAIN HARNESS.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Connect the connector (AB1) to (B31). 3)Disconnect the connector (AB3) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 4)Connect the battery ground cable and turn the ignition switch to ON. Is the airbag warning light turned on?	Airbag warning light is turned on.	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the airbag main harness with body harness.

12.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Memory function	Contents of diagnosis	Index No.
11	Provided.	• Airbag harness is open, shorted or shorted to ground. • Airbag module harness (driver) circuit is open, shorted or shorted to ground. • Roll connector circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Driver's airbag module is faulty.	<Ref. to AB-47, DTC 11, Diagnostic Chart with Trouble Code.>
12	Provided.	• Airbag harness is open, shorted or shorted to ground. • Airbag module harness (passenger) circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Passenger's airbag module is faulty.	<Ref. to AB-50, DTC 12, Diagnostic Chart with Trouble Code.>
15	Provided.	• Airbag harness (driver) is shorted to power supply. • Airbag module harness (driver) is shorted to power supply. • Roll connector is shorted to power supply. • Airbag control module is faulty. • Driver's airbag module is faulty.	<Ref. to AB-52, DTC 15, Diagnostic Chart with Trouble Code.>
16	Provided.	• Airbag harness (passenger) is shorted to power supply. • Airbag module harness (passenger) is shorted to power supply. • Airbag control module is faulty. • Passenger's airbag module is faulty.	<Ref. to AB-54, DTC 16, Diagnostic Chart with Trouble Code.>
21	Provided.	Airbag control module is faulty.	<Ref. to AB-55, DTC 21, Diagnostic Chart with Trouble Code.>
22	Provided.	Front airbag module and seat belt pretensioner (LH/RH) are inflated.	<Ref. to AB-56, DTC 22, Diagnostic Chart with Trouble Code.>
23	Not provided.	(AB3), (AB7) and (AB8) are not connected properly to airbag control module.	<Ref. to AB-58, DTC 23, Diagnostic Chart with Trouble Code.>
24	Not provided.	• Airbag control module is faulty. • Airbag harness is open. • Fuse No. 11 (in joint box) is blown. • Body harness circuit is open.	<Ref. to AB-59, DTC 24, Diagnostic Chart with Trouble Code.>
25	Provided.	• Airbag control module is faulty. • Airbag harness is open. • Fuse No. 6 (in joint box) is blown. • Body harness circuit is open.	<Ref. to AB-63, DTC 25, Diagnostic Chart with Trouble Code.>
31	Provided.	• Front sub-sensor harness (RH) circuit is shorted, opened or shorted to power supply. • Airbag harness is shorted,opened or shorted to power supply. • Front sub-sensor (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB-67, DTC 31, Diagnostic Chart with Trouble Code.>

DTC	Memory function	Contents of diagnosis	Index No.
32	Provided.	• Front sub-sensor harness (LH) circuit is shorted, opened or shorted to power supply. • Airbag harness is shorted, opened or shorted to power supply. • Front sub-sensor (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB-70, DTC 32, Diagnostic Chart with Trouble Code.>
41	Provided.	• Airbag harness is faulty. • Side airbag module (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB-73, DTC 41, Diagnostic Chart with Trouble Code.>
42	Provided.	• Airbag harness is faulty. • Side airbag module (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB-75, DTC 42, Diagnostic Chart with Trouble Code.>
45	Provided.	• Airbag harness is shorted to power supply. • Side airbag module (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB-77, DTC 45, Diagnostic Chart with Trouble Code.>
46	Provided.	• Airbag harness is shorted to power supply. • Side airbag module (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB-79, DTC 46, Diagnostic Chart with Trouble Code.>
51	Provided.	• Side airbag sensor (RH) is faulty. • Airbag harness is faulty. • Airbag control module is faulty.	<Ref. to AB-81, DTC 51, Diagnostic Chart with Trouble Code.>
52	Provided.	• Side airbag sensor (LH) is faulty. • Airbag harness is faulty. • Airbag control module is faulty.	<Ref. to AB-83, DTC 52, Diagnostic Chart with Trouble Code.>
53	Provided.	Side airbag sensor (RH) is faulty.	<Ref. to AB-85, DTC 53, Diagnostic Chart with Trouble Code.>
54	Provided.	Side airbag sensor (LH) is faulty.	<Ref. to AB-85, DTC 54, Diagnostic Chart with Trouble Code.>
55	Provided.	Side airbag module is inflated.	<Ref. to AB-85, DTC 55, Diagnostic Chart with Trouble Code.>
61	Provided.	• Seat belt pretensioner (RH) circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Pretensioner is faulty. • Airbag harness is faulty.	<Ref. to AB-86, DTC 61, Diagnostic Chart with Trouble Code.>
62	Provided.	• Seat belt pretensioner (LH) circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Pretensioner is faulty. • Airbag harness is faulty.	<Ref. to AB-88, DTC 62, Diagnostic Chart with Trouble Code.>
65	Provided.	• Seat belt pretensioner (RH) circuit is shorted to power supply. • Pretensioner is faulty. • Airbag harness is faulty. • Airbag control module is faulty.	<Ref. to AB-90, DTC 65, Diagnostic Chart with Trouble Code.>
66	Provided.	• Seat belt pretensioner (LH) circuit is shorted to power supply. • Pretensioner is faulty. • Airbag harness is faulty. • Airbag control module is faulty.	<Ref. to AB-92, DTC 66, Diagnostic Chart with Trouble Code.>

DTC	Memory function	Contents of diagnosis	Index No.
72	Provided.	• Airbag harness is open, shorted or shorted to ground. • Airbag module harness (passenger) circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Passenger's airbag module is faulty.	<Ref. to AB-94, DTC 72, Diagnostic Chart with Trouble Code.>
76	Provided.	• Airbag harness (passenger) is shorted or shorted to power supply. • Airbag module harness (passenger) is shorted to power supply. • Airbag control module is faulty. • Passenger's airbag module is faulty.	<Ref. to AB-96, DTC 76, Diagnostic Chart with Trouble Code.>
81	Provided.	• Lap seat belt pretensioner (RH) circuit is open, shorted or shorted to ground. • Lap pretensioner is faulty. • Airbag harness is faulty. • Airbag control module is faulty.	<Ref. to AB-98, DTC 81, Diagnostic Chart with Trouble Code.>
85	Provided.	• Lap seat belt pretensioner (RH) circuit is shorted to power supply. • Lap pretensioner is faulty. • Airbag harness is faulty. • Airbag control module is faulty.	<Ref. to AB-100, DTC 85, Diagnostic Chart with Trouble Code.>

13.Diagnostic Chart with Trouble Code

A: DTC 11

DIAGNOSIS:

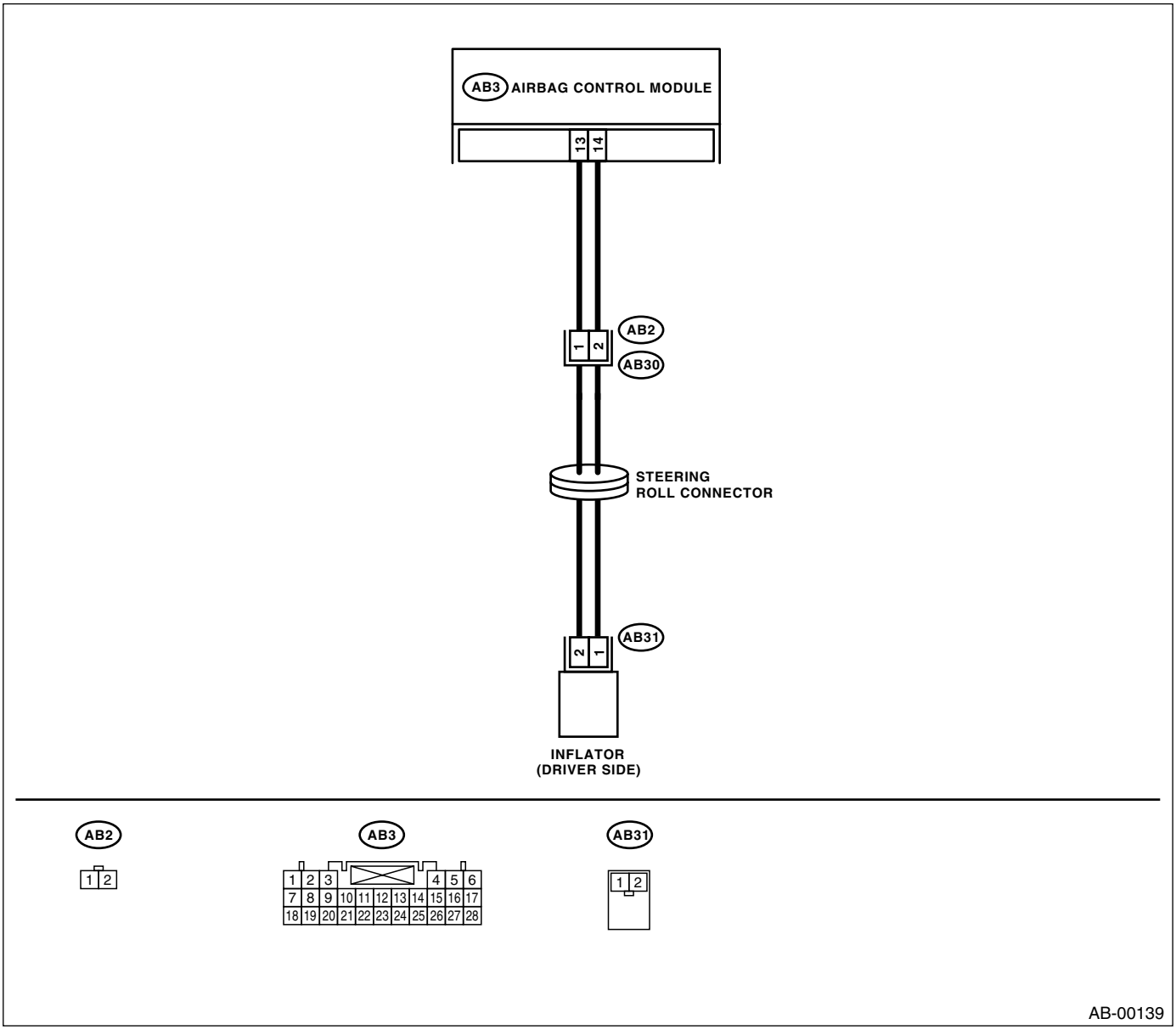
- Airbag harness is open, shorted or shorted to ground.
- Airbag module harness (Driver) circuit is open, shorted or shorted to ground.
- Roll connector circuit is open, shorted or shorted to ground.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK DRIVER'S AIRBAG MODULE.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Remove the driver's airbag module. <Ref. to AB-15, Driver's Airbag Module.> 3)Connect the connector (1N) in test harness N to connector (AB31). 4)Connect the airbag resistor to connector (2N) in test harness N. 5)Connect the battery ground cable and turn the ignition switch to ON. Is the airbag warning light turned off after it was illuminating approx. 6 seconds?	Airbag warning light is turned off after illuminating approx. 6 seconds.	Replace the driver's airbag module. <Ref. to AB-15, Driver's Airbag Module.>	Go to step **2.**
2	**CHECK ROLL CONNECTOR.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 second. 2)Disconnect the test harness N from the connector (AB31). 3)Remove the instrument panel lower cover, disconnect the connector (AB2) from (AB30) and connect the connector (1F) in test harness F to connector (AB2). 4)Connect the airbag resistor to connector (3F) in test harness F. 5)Connect the battery ground cable and turn the ignition switch to ON. Is the airbag warning light turned off after it was illuminating approx. 6 seconds?	Airbag warning light is turned off after illuminating approx. 6 seconds.	Replace the roll connector. <Ref. to AB-20, Roll Connector.>	Go to step **3.**
3	**CHECK AIRBAG MAIN HARNESS.** 1)Turn the ignition switch to OFF, disconnect the ground cable, and wait more than 20 seconds. 2)Disconnect the airbag resistor from the connector (3F) in test harness F. 3)Remove the glove box, and disconnect connectors (AB4) and passenger's airbag module (AB27).<Ref. to AB-16, Passenger's Airbag Module.> 4)Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R. <Ref. to AB-18, Airbag Control Module.> 5)Measure the resistance between connector (2R) in test harness R and the connector (3F) in test harness F. ***Connector & terminal*** ***(2R) No. 2 — (3F) No. 3:*** ***(2R) No. 4 — (3F) No. 4:*** Is the measured value less than specified value?	10 Ω	Go to step **4.**	Replace the airbag main harness with body harness.

	Step	Value	Yes	No
4	**CHECK AIRBAG MAIN HARNESS.** Measure the resistance of the connector (2R) in test harness R. ***Connector & terminal*** ***(2R) No. 2 — No. 4:*** ***(2R) No. 4 — Chassis ground:*** ***(2R) No. 2 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the airbag main harness with body harness.

B: DTC 12

DIAGNOSIS:

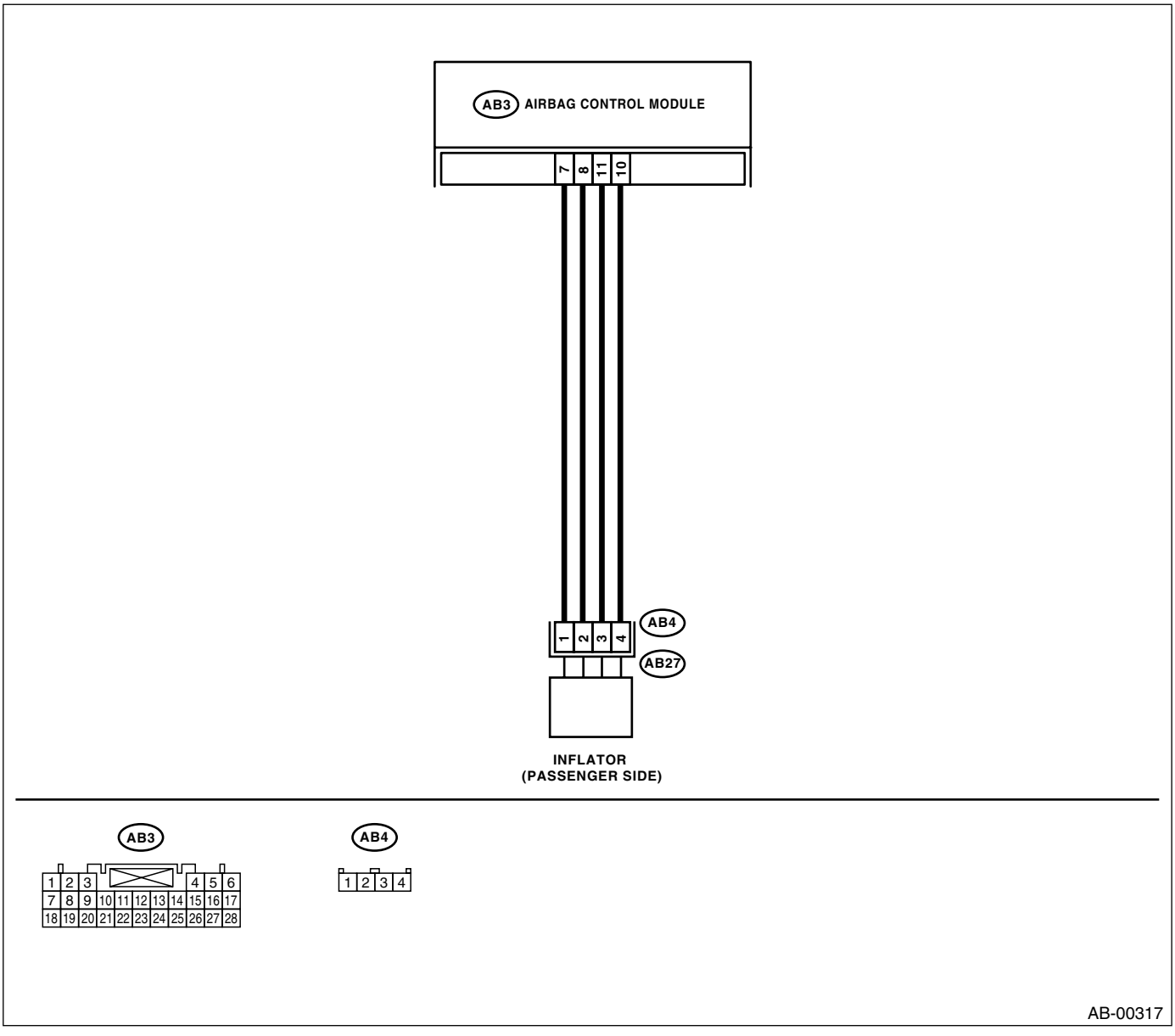
- Airbag harness is open, shorted or shorted to ground.
- Airbag module harness (Passenger) circuit is open, shorted or shorted to ground.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK PASSENGER'S AIRBAG MODULE.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Remove the glove box. 3)Disconnect the passenger's airbag connector (AB27) and (AB4). 4)Connect the connector (1P) in test harness P to connector (AB4). 5)Connect the airbag resistor to connector (2P), (3P) in test harness P. 6)Connect the battery ground cable and turn the ignition switch to ON. Is the airbag warning light turned off after it was illuminating approx. 6 seconds?	Airbag warning light is turned off after illuminating approx. 6 seconds.	Replace the passenger airbag module. <Ref. to AB-16, Passenger's Airbag Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the airbag resistor from the connector in test harness P. 3)Remove the instrument panel lower cover and disconnect the connector (AB2) from (AB30). 4)Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R. <Ref. to AB-18, Airbag Control Module.> 5)Measure the resistance between connector (2R) in test harness R and the connector (2P) in test harness P. ***Connector & terminal*** ***(2R) No. 3 — (2P) No. 3:*** ***(2R) No. 5 — (2P) No. 4:*** Is the measured value less than specified value?	10 Ω	Go to step **3.**	Replace the airbag main harness with body harness.
3	**CHECK AIRBAG MAIN HARNESS.** Measure the resistance of the connector (2R) in test harness R. ***Connector & terminal*** ***(2R) No. 3 — No. 5:*** ***(2R) No. 3 — Chassis ground:*** ***(2R) No. 5 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the airbag main harness with body harness.

C: DTC 15

DIAGNOSIS:

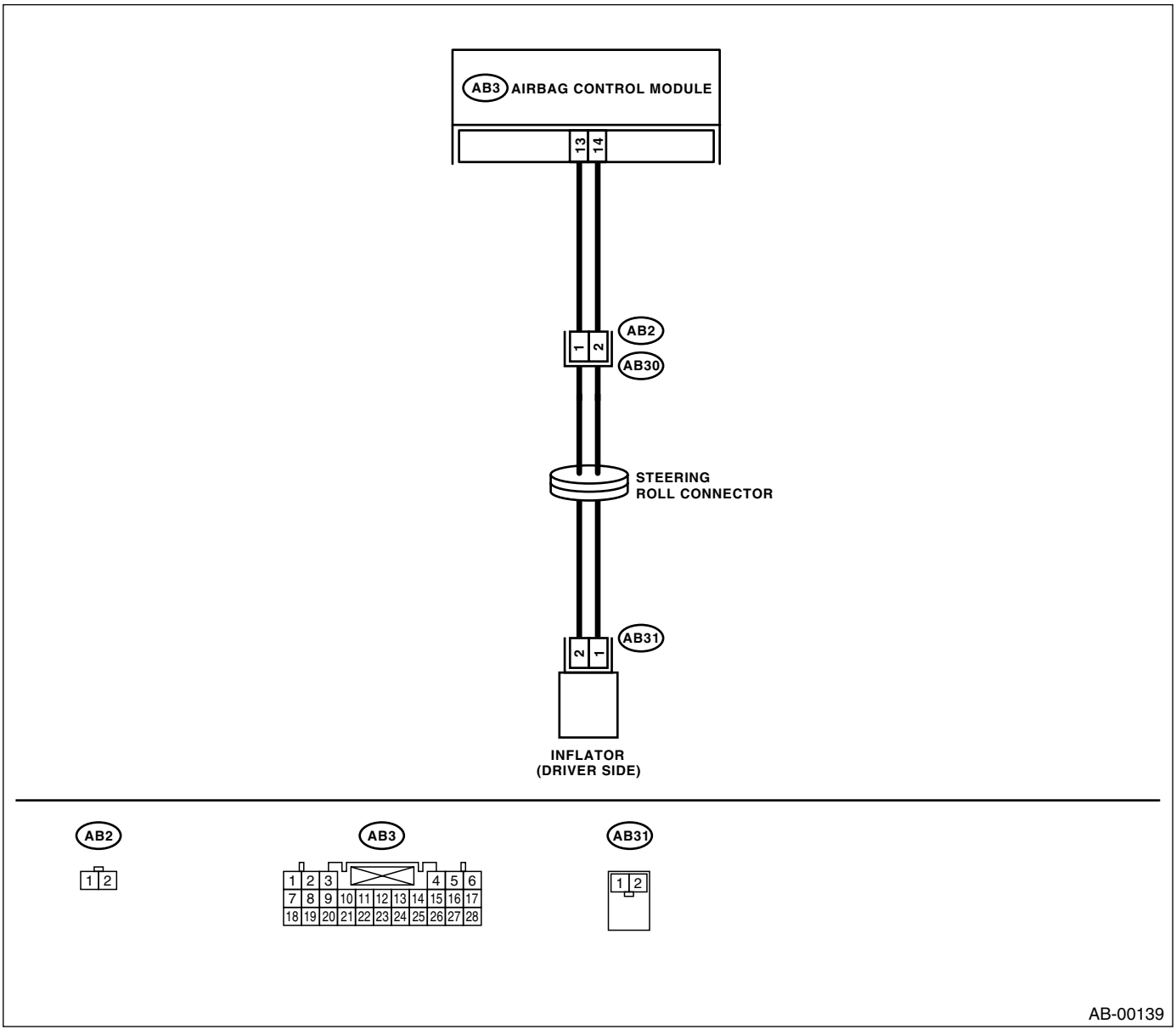
- Airbag harness (Driver) is shorted to the power supply.
- Airbag module harness (Driver) is shorted to the power supply.
- Roll connector is shorted to the power supply.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK DRIVER'S AIRBAG MODULE.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Remove the driver's airbag module. <Ref. to AB-15, Driver's Airbag Module.> 3)Connect the connector (AB31) to connector (1N) in test harness N. 4)Connect the airbag resistor to connector (2N) in test harness N. 5)Connect the battery ground cable and turn the ignition switch to ON. Is the airbag warning light turned off after it was illuminating approx. 6 seconds?	Airbag warning light is turned off after illuminating approx. 6 seconds.	Replace the driver's airbag module. <Ref. to AB-15, Driver's Airbag Module.>	Go to step **2.**
2	**CHECK ROLL CONNECTOR.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the test harness N from the connector (AB31). 3)Remove the instrument panel lower cover and disconnect the connector (AB2) from (AB30). 4)Connect the connector (1F) in test harness F to connector (AB2). 5)Connect the airbag resistor to connector (3F) in test harness F. 6)Connect the battery ground cable and turn the ignition switch to ON. Is the airbag warning light turned off after it was illuminating approx. 6 seconds?	Airbag warning light is turned off after illuminating approx. 6 seconds.	Replace the roll connector. <Ref. to AB-20, Roll Connector.>	Go to step **3.**
3	**CHECK AIRBAG MAIN HARNESS.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the airbag resistor from the connector (3F) in test harness F. 3)Remove the glove box, and disconnect the connectors (AB4) and passenger's airbag module (AB27). 4)Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R. <Ref. to AB-18, Airbag Control Module.> 5)Connect the battery ground cable and turn the ignition switch to ON. (engine OFF) 6)Measure the voltage between connector (2R) in test harness R and the chassis ground. ***Connector & terminal*** ***(2R) No. 2 (+) — Chassis ground (–):*** ***(2R) No. 4 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the airbag main harness with body harness.

D: DTC 16

DIAGNOSIS:

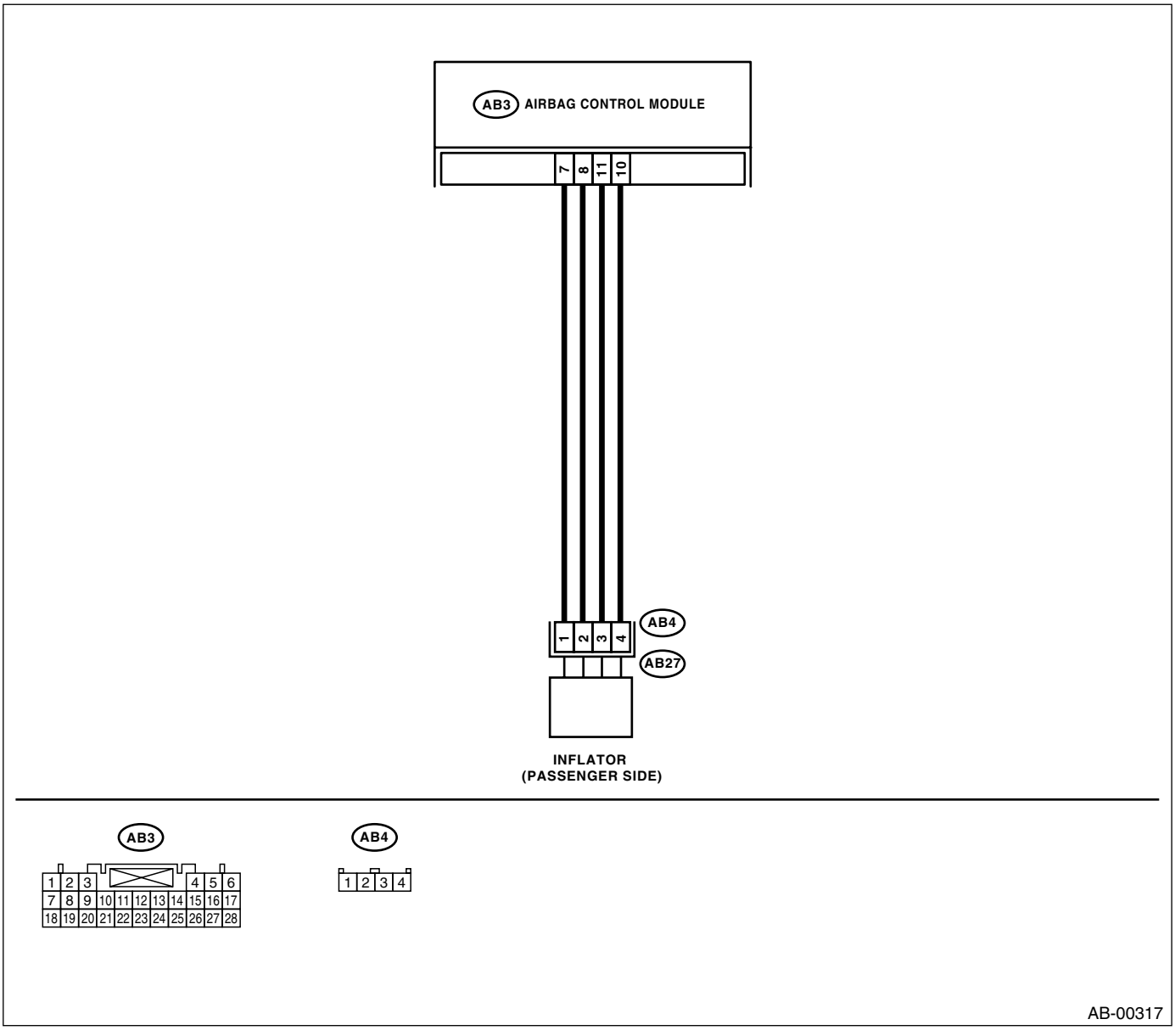
- Airbag harness (Passenger) is shorted to the power supply.
- Airbag module harness (Passenger) is shorted to the power supply.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK PASSENGER'S AIRBAG MODULE.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Remove the glove box. 3)Disconnect the passenger's airbag connector (AB27) and (AB4). 4)Connect the connector (1P) in test harness P to connector (AB4). 5)Connect the airbag resistor to connector (2P), (3P) in test harness P. 6)Connect the battery ground cable and turn the ignition switch to ON. Is the airbag warning light turned off after it was illuminating approx. 6 seconds?	Airbag warning light is turned off after illuminating approx. 6 seconds.	Replace the passenger airbag module. <Ref. to AB-16, Passenger's Airbag Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the airbag resistor from the connector in test harness P. 3)Remove the instrument panel lower cover and disconnect the connector (AB2) from (AB30). 4)Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R. <Ref. to AB-18, Airbag Control Module.> 5)Connect the battery ground cable and turn the ignition switch to ON. 6)Measure the voltage between connector (2R) in test harness R and the chassis ground. ***Connector & terminal*** ***(2R) No. 3 (+) — Chassis ground (–):*** ***(2R) No. 5 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the airbag main harness with body harness.

E: DTC 21

DIAGNOSIS:

Airbag control module is faulty.

CAUTION:

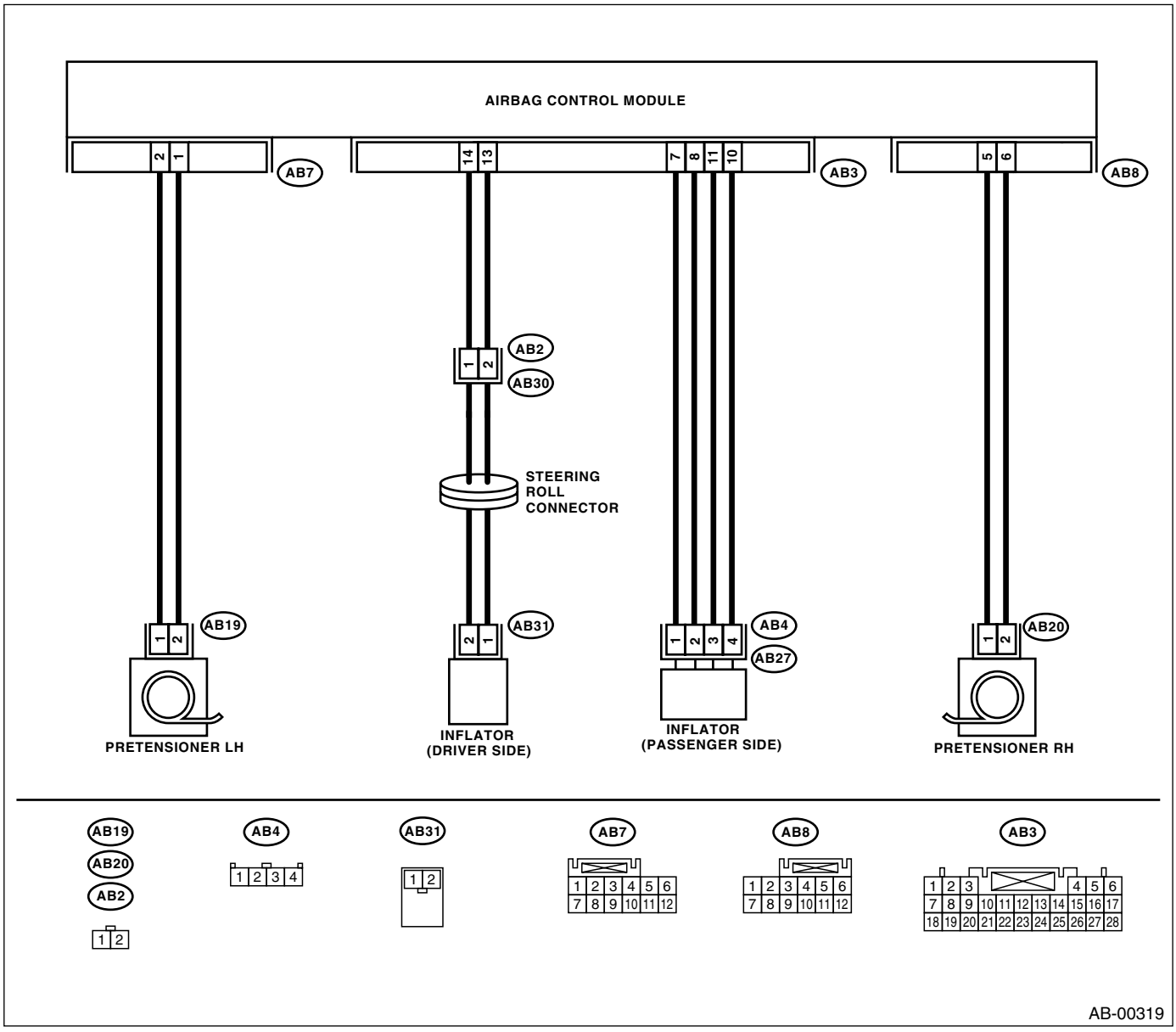
Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

	Step	Value	Yes	No
1	**CHECK IF TROUBLE CODE 21 IS INDICATED.** 1)Read the DTC. <Ref. to AB-31, Read Diagnostic Trouble Code (DTC).> 2)Perform the clear memory mode. 3)Read DTC again. Does the airbag warning light indicate DTC 21 ?	Airbag warning light does not indicate DTC 21.	Temporary poor contact.	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>

F: DTC 22

1. LHD MODEL

WIRING DIAGRAM:

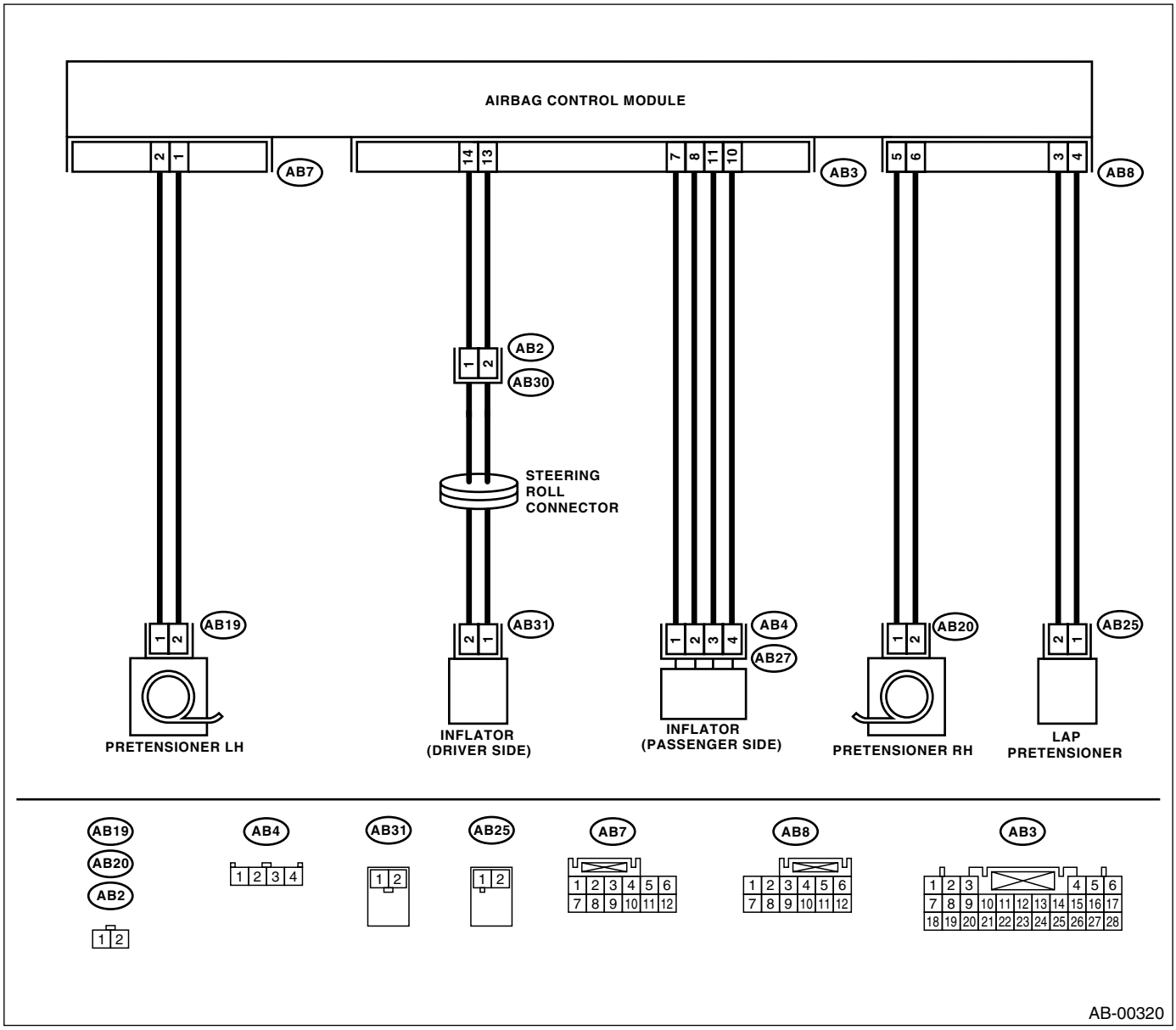


This code is indicated when the front airbag and the pretensioner are in operation.
Once this code is indicated, memory is not erasable; therefore replace the following parts.

- Airbag control module. <Ref. to AB-18, Airbag Control Module.>
- Driver's airbag module. <Ref. to AB-15, Driver's Airbag Module.>
- Passenger's airbag module. <Ref. to AB-16, Passenger's Airbag Module.>
- Front sub-sensor of both sides. <Ref. to AB-21, Front Sub Sensor.>
- Front seat belt outer with pretensioner of both sides. <Ref. to SB-7, Front Seat Belt.>

2. RHD MODEL

WIRING DIAGRAM:



This code is indicated when the front airbag, pretensioner and lap pretensioner are in operation.
Once this code is indicated, memory is not erasable; therefore replace the following parts.

- Airbag control module. <Ref. to AB-18, Airbag Control Module.>
- Driver's airbag module. <Ref. to AB-15, Driver's Airbag Module.>
- Passenger's airbag module. <Ref. to AB-16, Passenger's Airbag Module.>
- Front sub-sensor of both sides. <Ref. to AB-21, Front Sub Sensor.>
- Front seat belt outer with pretensioner of both sides. <Ref. to SB-7, Front Seat Belt.>

G: DTC 23

DIAGNOSIS:

(AB3), (AB7) and (AB8) are not connected properly to airbag control module.

CAUTION:

Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

	Step	Value	Yes	No
1	**CHECK POOR CONTACT IN CONECTORS (AB3), (AB7) and (AB8).** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connectors (AB3), (AB7) and (AB8) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> Is there any rust and damage in harness connector and control module connector?	There is no rust and damage.	Go to step **2.**	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.> Replace the airbag main harness with body harness. Replace the side airbag harness with body harness.
2	**CHECK POOR CONTACT IN CONECTORS (AB3), (AB7) and (AB8).** 1)Ensure that connectors are firmly reconnected. 2)Connect the battery ground cable and turn the ignition switch to ON. 3)Perform the clear memory mode. 4)Read DTC again. Does the airbag warning light indicate DTC 23 ?	Airbag warning light does not indicate DTC 23.	Temporary poor contact.	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>

H: DTC 24

DIAGNOSIS:

- Airbag control module is faulty.
- Airbag harness is open.
- Fuse No, 11 (in joint box) is blown.
- Body harness circuit is open.

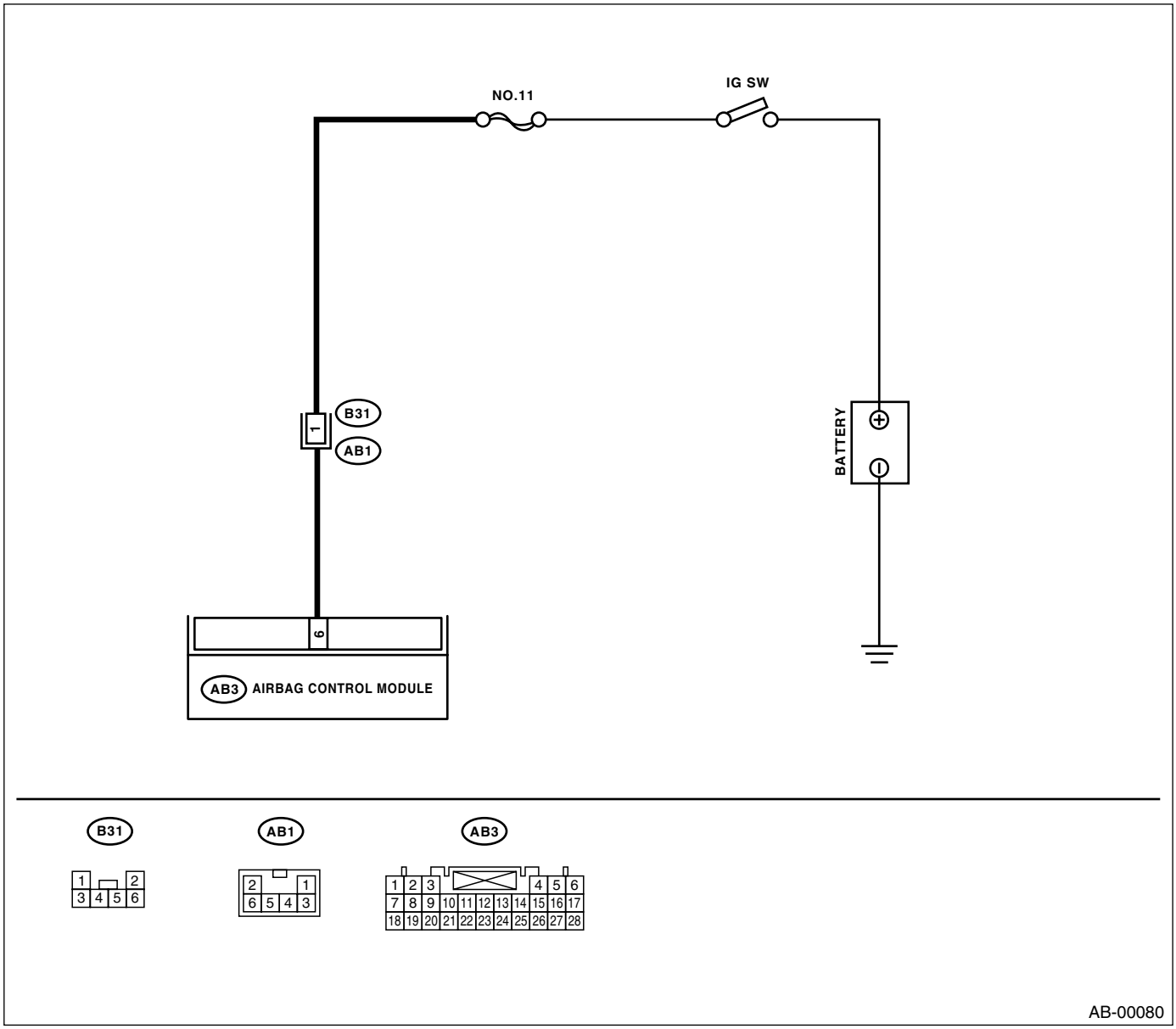
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

1. LHD MODEL

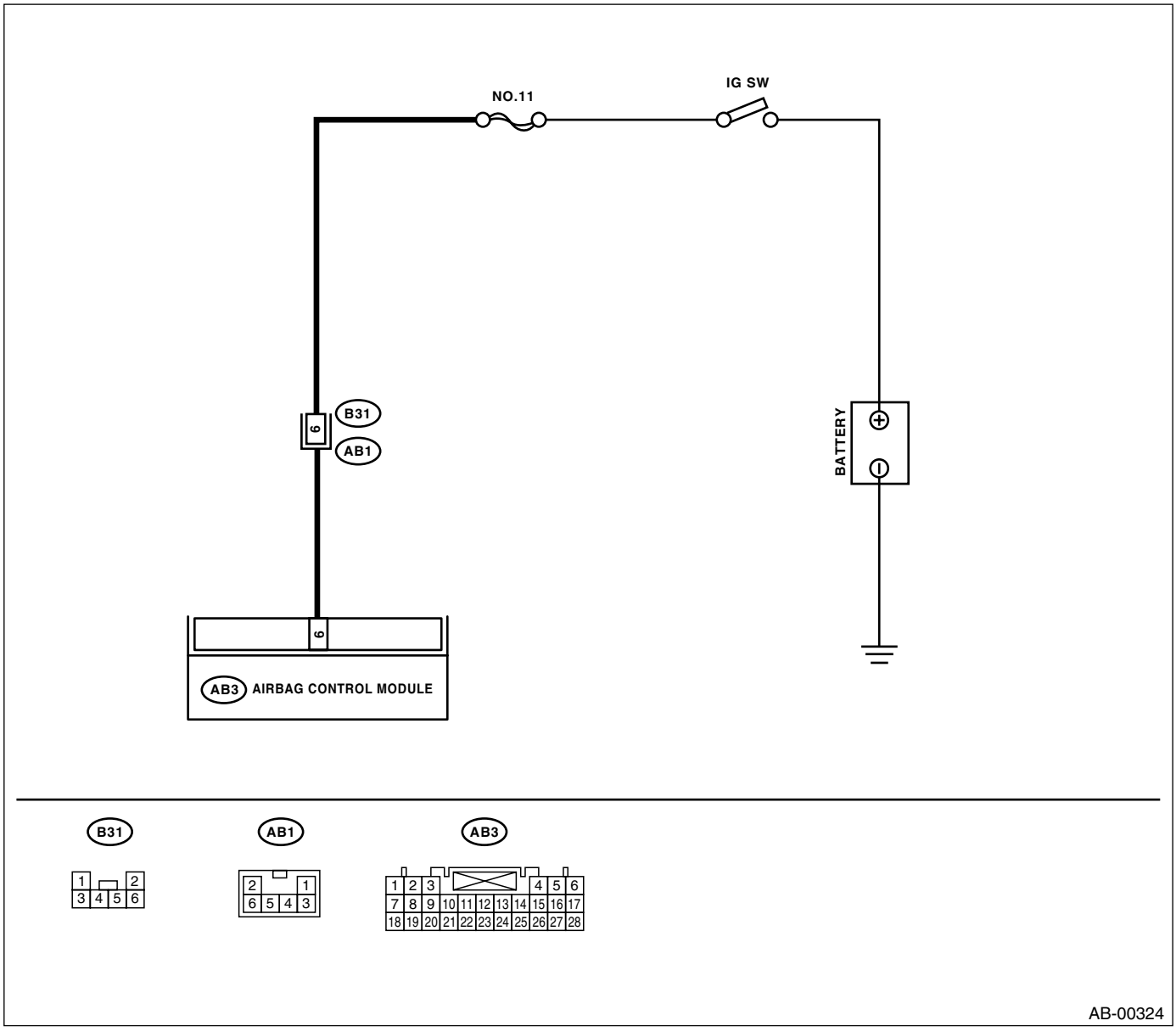
WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK AIRBAG CONTROL MODULE.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB3) from the air-bag control module. <Ref. to AB-18, Airbag Control Module.> 3)Connect the connector (1R) in test harness R to connector (AB3). 4)Connect the battery ground cable and turn the ignition switch to ON. 5)Measure the voltage between connector (2R) in test harness R and chassis ground. ***Connector & terminal*** ***(2R) No. 1 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the airbag connector (AB1) from the body harness (B31). 3)Connect the connector (2M) in test harness M to connector (AB1). 4)Measure the resistance between connector (5M) in test harness M and the connector (2R) in test harness R. ***Connector & terminal*** ***(5M) No. 2 — (2R) No. 1:*** Is the measured value less than specified value?	10 Ω	Go to step **3.**	Replace the airbag main harness with body harness.
3	**CHECK AIRBAG MAIN HARNESS.** Measure the following resistance with the above-mentioned condition maintained. ***Connector & terminal*** ***(5M) No. 2 — Chassis ground:*** ***(2R) No. 1 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **4.**	Replace the airbag main harness with body harness.
4	**CHECK FUSE No. 11 (IN JOINT BOX).** 1)Confirm that the ignition switch is turned OFF. 2)Remove the fuse No. 11 (in joint box) and perform visual inspection. Is the fuse No. 11 blown out?	Fuse No. 11 is not blown out.	Repair the body harness.	Replace the fuse No. 11. If fuse No. 11 blows again, repair the body harness.

2. RHD MODEL

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK AIRBAG CONTROL MODULE.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB3) from the air-bag control module. <Ref. to AB-18, Airbag Control Module.> 3)Connect the connector (1R) in test harness R to connector (AB3). 4)Connect the battery ground cable and turn the ignition switch to ON. 5)Measure the voltage between connector (2R) in test harness R and chassis ground. ***Connector & terminal*** ***(2R) No. 1 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the airbag connector (AB1) from the body harness (B31). 3)Connect the connector (2M) in test harness M to connector (AB1). 4)Measure the resistance between connector (5M) in test harness M and the connector (2R) in test harness R. ***Connector & terminal*** ***(5M) No. 9 — (2R) No. 1:*** Is the measured value less than specified value?	10 Ω	Go to step **3.**	Replace the airbag main harness with body harness.
3	**CHECK AIRBAG MAIN HARNESS.** Measure the following resistance with the above-mentioned condition maintained. ***Connector & terminal*** ***(5M) No. 9 — Chassis ground:*** ***(2R) No. 1 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **4.**	Replace the airbag main harness with body harness.
4	**CHECK FUSE No. 11 (IN JOINT BOX).** 1)Confirm that the ignition switch is turned OFF. 2)Remove the fuse No. 11 (in joint box) and perform visual inspection. Is the fuse No. 11 blown out?	Fuse No. 11 is not blown out.	Repair the body harness.	Replace the fuse No. 11. If fuse No. 11 blows again, repair the body harness.

I: DTC 25

DIAGNOSIS:

- Airbag control module is faulty.
- Airbag harness is open.
- Fuse No. 6 (in joint box) is blown.
- Body harness circuit is open.

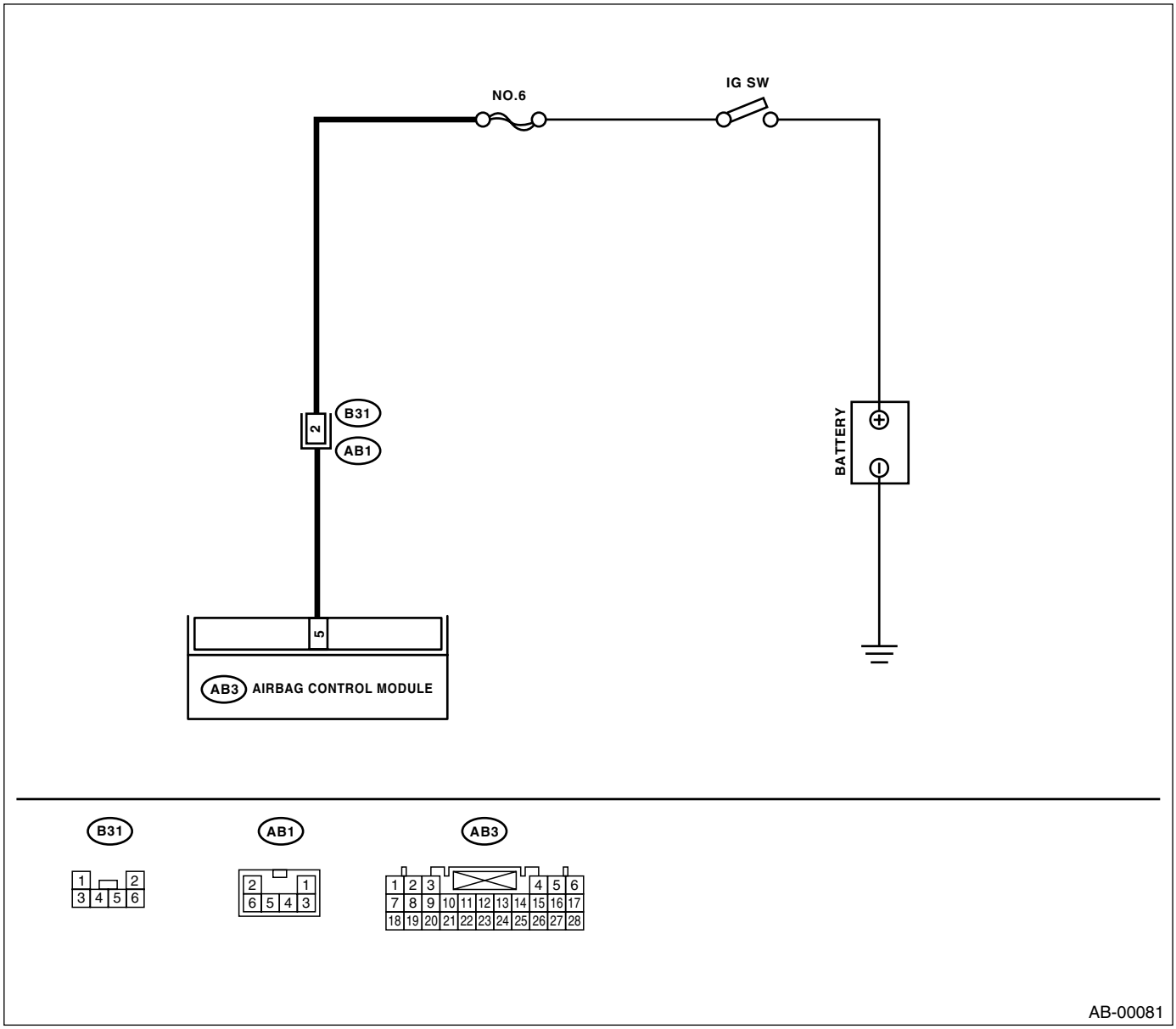
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

1. LHD MODEL

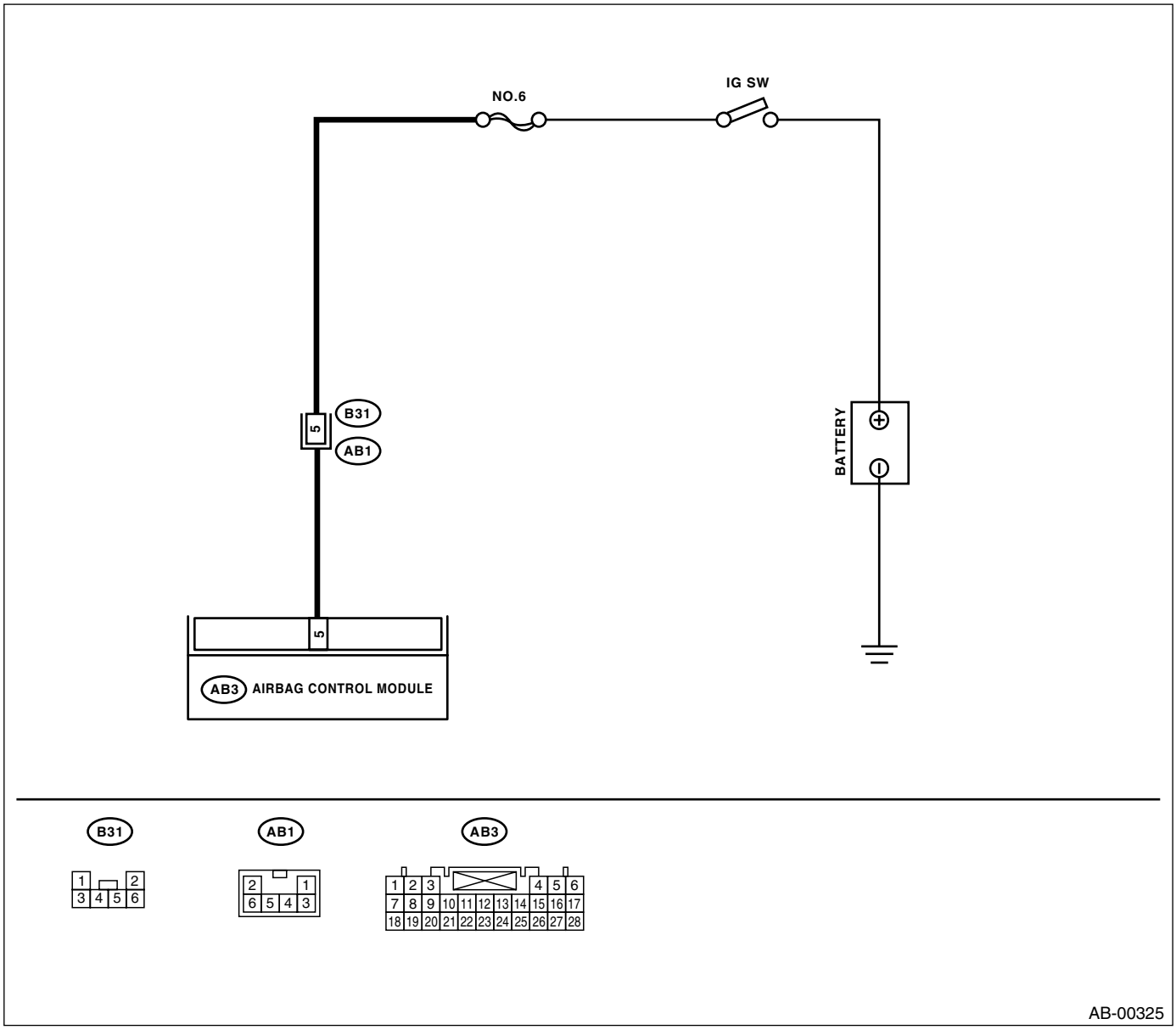
WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK AIRBAG CONTROL MODULE.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB3) from airbag control module. <Ref. to AB-18, Airbag Control Module.> 3)Connect the connector (1R) in test harness R to connector (AB3). 4)Connect the battery ground cable, and turn the ignition switch to ON. 5)Measure the voltage between the connector (2R) in test harness R and the chassis ground. ***Connector & terminal*** ***(2R) No. 6 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the airbag connector (AB1) from the body harness (B31). 3)Connect the connector (2M) in test harness M to the airbag connector (AB1). 4)Measure the resistance between the connector (5M) in test harness M and the connector (2R) in test harness R. ***Connector & terminal*** ***(5M) No. 4 — (2R) No. 6:*** Is the measured value less than specified value?	10 Ω	Go to step **3.**	Replace the airbag main harness with body harness.
3	**CHECK AIRBAG MAIN HARNESS.** Measure the following resistance with the above-metioned condition maintained. ***Connector & terminal*** ***(5M) No. 4 — Chassis ground:*** ***(2R) No. 6 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **4.**	Replace the airbag main harness with body harness.
4	**CHECK FUSE NO. 6 (IN JOINT BOX).** 1)Confirm that the ignition switch is turned OFF. 2)Remove the No. 6 fuse (in joint box) and perform visual inspection. Is the fuse No.6 blown out?	Fuse No. 6 is not blown out.	Repair the body harness.	Replace the fuse No. 6. If fuse No. 6 is blown again, repair the body harness.

2. RHD MODEL

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK AIRBAG CONTROL MODULE.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB3) from airbag control module. <Ref. to AB-18, Airbag Control Module.> 3)Connect the connector (1R) in test harness R to connector (AB3). 4)Connect the battery ground cable, and turn the ignition switch to ON. 5)Measure the voltage between the connector (2R) in test harness R and the chassis ground. ***Connector & terminal*** ***(2R) No. 6 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the airbag connector (AB1) from the body harness (B31). 3)Connect the connector (2M) in test harness M to the airbag connector (AB1). 4)Measure the resistance between the connector (5M) in test harness M and the connector (2R) in test harness R. ***Connector & terminal*** ***(5M) No. 4 — (2R) No. 6:*** Is the measured value less than specified value?	10 Ω	Go to step **3.**	Replace the airbag main harness with body harness.
3	**CHECK AIRBAG MAIN HARNESS.** Measure the following resistance with the above-metioned condition maintained. ***Connector & terminal*** ***(5M) No. 1 — Chassis ground:*** ***(2R) No. 6 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **4.**	Replace the airbag main harness with body harness.
4	**CHECK FUSE NO. 6 (IN JOINT BOX).** 1)Confirm that the ignition switch is turned OFF. 2)Remove the No. 6 fuse (in joint box) and perform visual inspection. Is the fuse No.6 blown out?	Fuse No. 6 is not blown out.	Repair the body harness.	Replace the fuse No. 6. If fuse No. 6 is blown again, repair the body harness.

J: DTC 31

DIAGNOSIS:

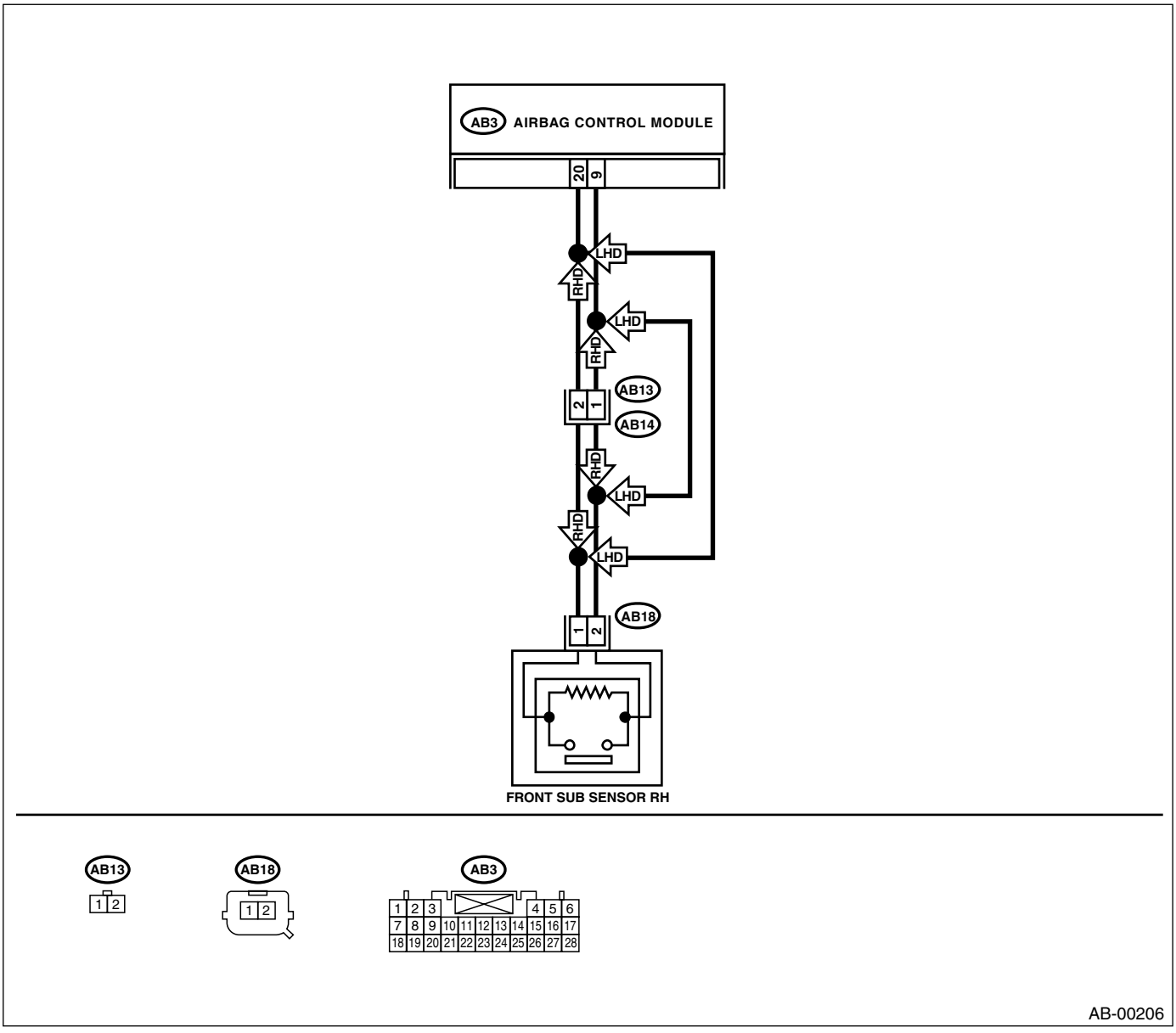
- Front sub-sensor harness (RH) circuit is shorted, open or shorted to power supply.
- Airbag harness is shorted, open or shorted to power supply.
- Front sub-sensor (RH) is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK FRONT SUB-SENSOR (RH) AND AIRBAG HARNESS.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB3) from the air-bag control module, and connect the connector (1R) in test harness R. <Ref. to AB-18, Airbag Control Module.> 3)Measure the resistance of the connector (3R) in test harness R. ***Connector & terminal*** ***(3R) No. 7 — No. 9:*** Is the measured value within specified value?	750 Ω and 1 KΩ	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (RH).** 1)Disconnect the connector (AB18) from the front sub-sensor. <Ref. to AB-21, Front Sub Sensor.> 2)Connect the connector (IH) in test harness H to connector (AB18). 3)Measure the resistance between connector (3R) in test harness R and connector (3H) in test harness H. ***Connector & terminal*** ***(3R) No. 7 — (3H) No. 5:*** ***(3R) No. 9 — (3H) No. 6:*** Is the measured value less than specified value?	10 Ω	Go to step **3.**	LHD model: Replace the airbag main harness and front sub-sensor harness with body harness. RHD model: Go to step **4.**
3	**CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (RH).** Measure the resistance between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 7 — Chassis ground:*** ***(3R) No. 9 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **8.**	LHD model: Replace the airbag main harness and front sub-sensor harness with body harness. RHD model: Go to step **4.**
4	**CHECK AIRBAG MAIN HARNESS** 1)Disconnect the connector (AB13) from (AB14), and connect the connector (1L) in test harness L to connector (AB13). 2)Measure the resistance between connector (3R) in test harness R and connector (3L) in test harness L. ***Connector & terminal*** ***(3R) No. 7 — (3L) No. 4:*** ***(3R) No. 9 — (3L) No. 3:*** Is the measured value less than specified value?	10 Ω	Go to step **5.**	Replace the airbag main harness with body harness.
5	**CHECK AIRBAG MAIN HARNESS** Measure the resistance between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 7 — Chassis ground:*** ***(3R) No. 9 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **6.**	Replace the airbag main harness with body harness.

	Step	Value	Yes	No
6	**CHECK FRONT SUB-SENSOR HARNESS (RH).** 1)Connect the connector (2L) in test harness F to the connector (AB14). 2)Measure the resistance between connector (3H) in test harness H and connector (3L) in the test harness L. ***Connector & terminal*** ***(3L) No. 5 — (3H) No. 5:*** ***(3L) No. 6 — (3H) No. 6:*** Is the measured value less than specified value?	10 Ω	Go to step **7.**	Replace the front sub-sensor harness (RH) with body harness.
7	**CHECK FRONT SUB-SENSOR HARNESS (RH).** Measure the resistance between connector (3L) in test harness L and the chassis ground. ***Connector & terminal*** ***(3L) No. 5 — Chassis ground:*** ***(3L) No. 6 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **8.**	Replace the front sub-sensor harness (RH) with body harness.
8	**CHECK FRONT SUB-SENSOR (RH).** 1)Connect the connector (2H) in test harness H to front sub-sensor (RH). 2)Measure the resistance of the connector (3H) in test harness H. ***Connector & terminal*** ***(3H) No. 3 — No. 4:*** Is the measured value within specified value?	750 Ω and 1 KΩ	Go to step **9.**	Replace the front sub-sensor (RH). <Ref. to AB-21, Front Sub Sensor.>
9	**CHECK FRONT SUB-SENSOR (RH).** Measure the resistance between connector (3H) in test harness H and the chassis ground. ***Connector & terminal*** ***(3H) No. 3 — Chassis ground:*** ***(3H) No. 4 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Finish the diagnosis.	Replace the front sub-sensor (RH). <Ref. to AB-21, Front Sub Sensor.>

K: DTC 32

DIAGNOSIS:

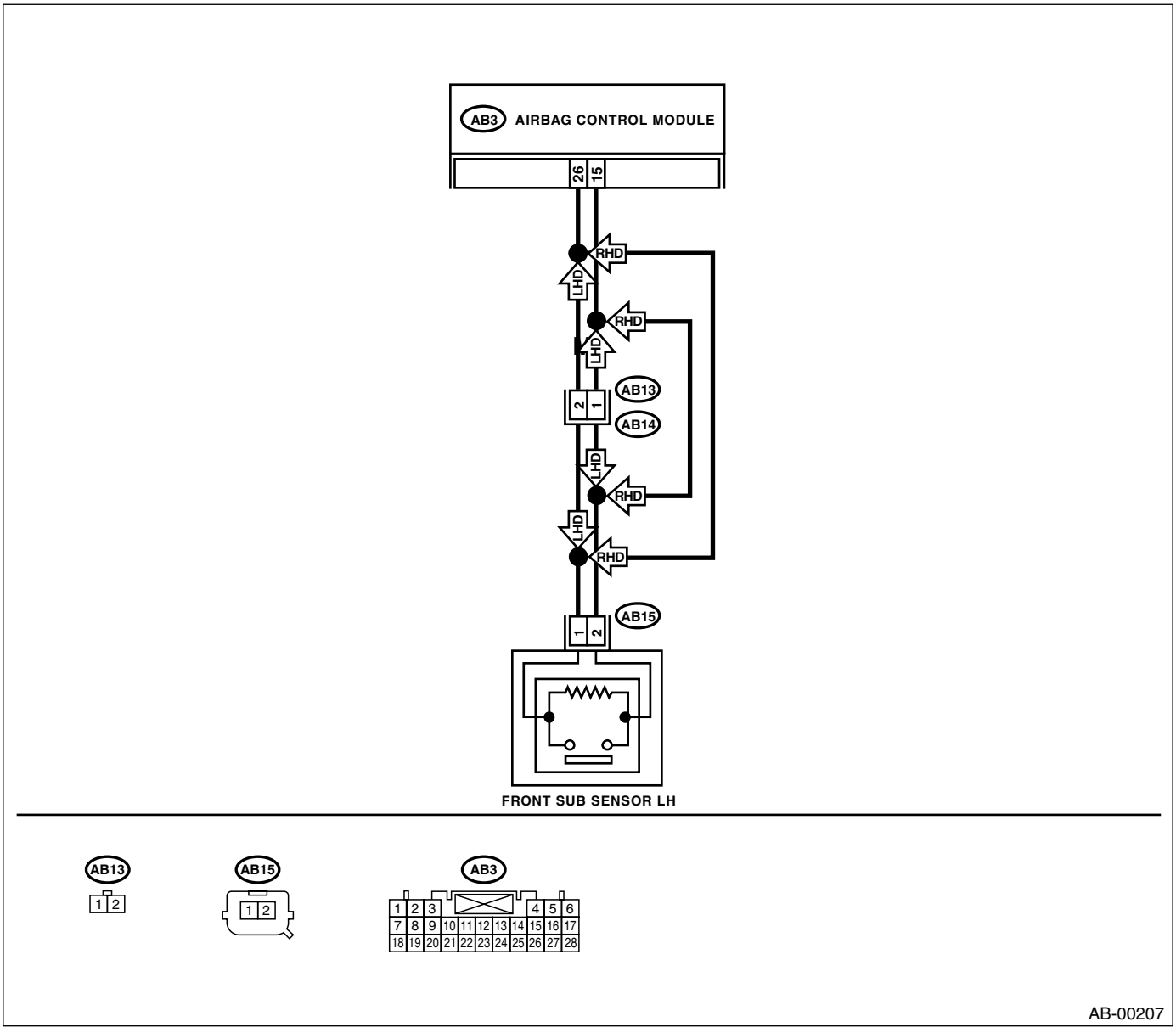
- Front sub-sensor harness (LH) circuit is shorted.is shorted, open or shorted to power supply.
- Airbag harness is shorted, open or shorted to power supply.
- Front sub-sensor (LH) is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



AB-00207

	Step	Value	Yes	No
1	**CHECK FRONT SUB-SENSOR (LH) AND AIRBAG HARNESS.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB3) from the air-bag control module, and connect connector (1R) in the test harness R to connector (AB3). <Ref. to AB-18, Airbag Control Module.> 3)Measure the resistance of the connector (3R) in the test harness R. ***Connector & terminal*** ***(3R) No. 6 — No. 8:*** Is the measured value within specified value?	750 Ω and 1 KΩ	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (LH).** 1)Disconnect the connector (AB15) from the front sub-sensor. <Ref. to AB-21, Front Sub Sensor.> 2)Connect the connector (1H) in test harness H to connector (AB15). 3)Measure the resistance between connector (3R) in test harness R and connector (3H) in test harness H. ***Connector & terminal*** ***(3R) No. 6 — (3H) No. 5:*** ***(3R) No. 8 — (3H) No. 6:*** Is the measured value less than specified value?	10 Ω	Go to step **3.**	LHD model: Go to step **4.** RHD model: Replace the airbag main harness and front sub-sensor harness with body harness.
3	**CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (LH).** Measure the resistance between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 6 — Chassis ground:*** ***(3R) No. 8 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **8.**	LHD model: Go to step **4.** RHD model: Replace the airbag main harness and front sub-sensor harness with body harness.
4	**CHECK AIRBAG MAIN HARNESS** 1)Disconnect the connector (AB13) from (AB14), and connect the connector (1L) in test harness L to connector (AB13). 2)Measure the resistance between connector (3R) in test harness R and connector (3L) in test harness L. ***Connector & terminal*** ***(3R) No. 6 — (3L) No. 4:*** ***(3R) No. 8 — (3L) No. 3:*** Is the measured value less than specified value?	10 Ω	Go to step **5.**	Replace the airbag main harness with body harness.
5	**CHECK AIRBAG MAIN HARNESS** Measure the resistance between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 6 — Chassis ground:*** ***(3R) No. 8 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **6.**	Replace the airbag main harness with body harness.

	Step	Value	Yes	No
6	**CHECK FRONT SUB-SENSOR HARNESS (LH).** 1)Connect the connector (2L) in test harness L to the connector (AB14). 2)Measure the resistance between connector (3H) in test harness H and connector (3L) in the test harness L. ***Connector & terminal*** ***(3L) No. 5 — (3H) No. 5:*** ***(3L) No. 6 — (3H) No. 6:*** Is the measured value less than specified value?	10 Ω	Go to step **7.**	Replace the front sub-sensor harness (LH) with body harness.
7	**CHECK FRONT SUB-SENSOR HARNESS (LH).** Measure the resistance between connector (3L) in test harness L and the chassis ground. ***Connector & terminal*** ***(3L) No. 5 — Chassis ground:*** ***(3L) No. 6 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Go to step **8.**	Replace the front sub-sensor harness (LH) with body harness.
8	**CHECK FRONT SUB-SENSOR (LH).** 1)Connect the connector (2H) in test harness H to front sub-sensor (LH). 2)Measure the resistance of the connector (3H) in test harness H. ***Connector & terminal*** ***(3H) No. 3 — No. 4:*** Is the measured value within specified value?	750 Ω and 1 KΩ	Go to step **9.**	Replace the front sub-sensor (LH). <Ref. to AB-21, Front Sub Sensor.>
9	**CHECK FRONT SUB-SENSOR (LH).** Measure the resistance between connector (3H) in test harness H and the chassis ground. ***Connector & terminal*** ***(3H) No. 3 — Chassis ground:*** ***(3H) No. 4 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Finish the diagnosis.	Replace the front sub-sensor (LH). <Ref. to AB-21, Front Sub Sensor.>

L: DTC 41

DIAGNOSIS:

- Side airbag harness (RH) is faulty.
- Side airbag module (RH) is faulty.
- Airbag control module is faulty.

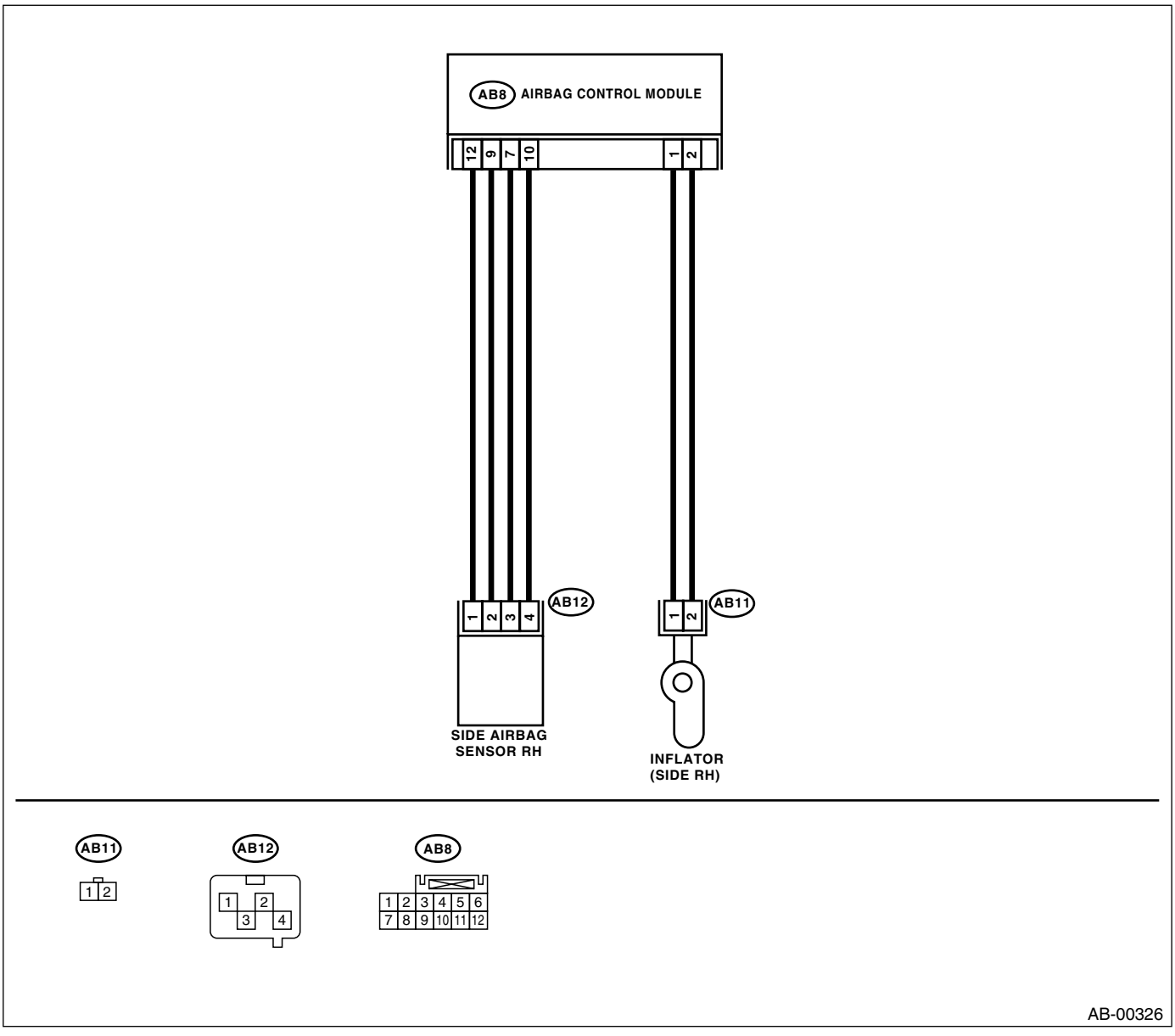
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK SIDE AIRBAG MODULE.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB11) from side airbag module (RH), and connect the connector (1F) in test harness F to (AB11). 3)Connect the airbag resistor to connector (3F) in test harness F. 4)Connect the battery ground cable, and turn the ignition switch to ON. Is the airbag warning light turned off after it was illuminating approx. 6 seconds?	Airbag warning light is turned off after illuminating approx. 6 seconds.	Replace the front seat with side airbag module (RH). <Ref. to SE-5, Front Seat.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (RH).** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB26) from the seat belt pretensioner (RH). <Ref. to SB-7, Front Seat Belt.> 3)For the vehicle with lap seat belt pretensioner, disconnect the connector (AB25) from lap pretensioner. 4)Disconnect the airbag resistor from test harness F. 5)Disconnect the connector (AB8) from air bag control module. <Ref. to AB-18, Airbag Control Module.> 6)Connect the connector (1R) in test harness R to connector (AB8). 7)Measure the resistance between connector (3R) in test harness R and connector (3F) in test harness F. ***Connector & terminal*** ***(3R) No. 18 — (3F) No. 4:*** ***(3R) No. 20 — (3F) No. 3:*** Is the measured value less than specified value?	10 Ω	Go to step **3.**	Replace the side airbag harness with body harness.
3	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance of the connector (3R) in test harness R. ***Connector & terminal*** ***(3R) No. 18 — No. 20:*** Is the measured value more than specified value?	1 MΩ	Go to step **4.**	Replace the side airbag harness with body harness.
4	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 18 — Chassis ground:*** ***(3R) No. 20 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the side airbag harness with body harness.

M: DTC 42

DIAGNOSIS:

- Side airbag harness (LH) is faulty.
- Side airbag module (LH) is faulty.
- Airbag control module is faulty.

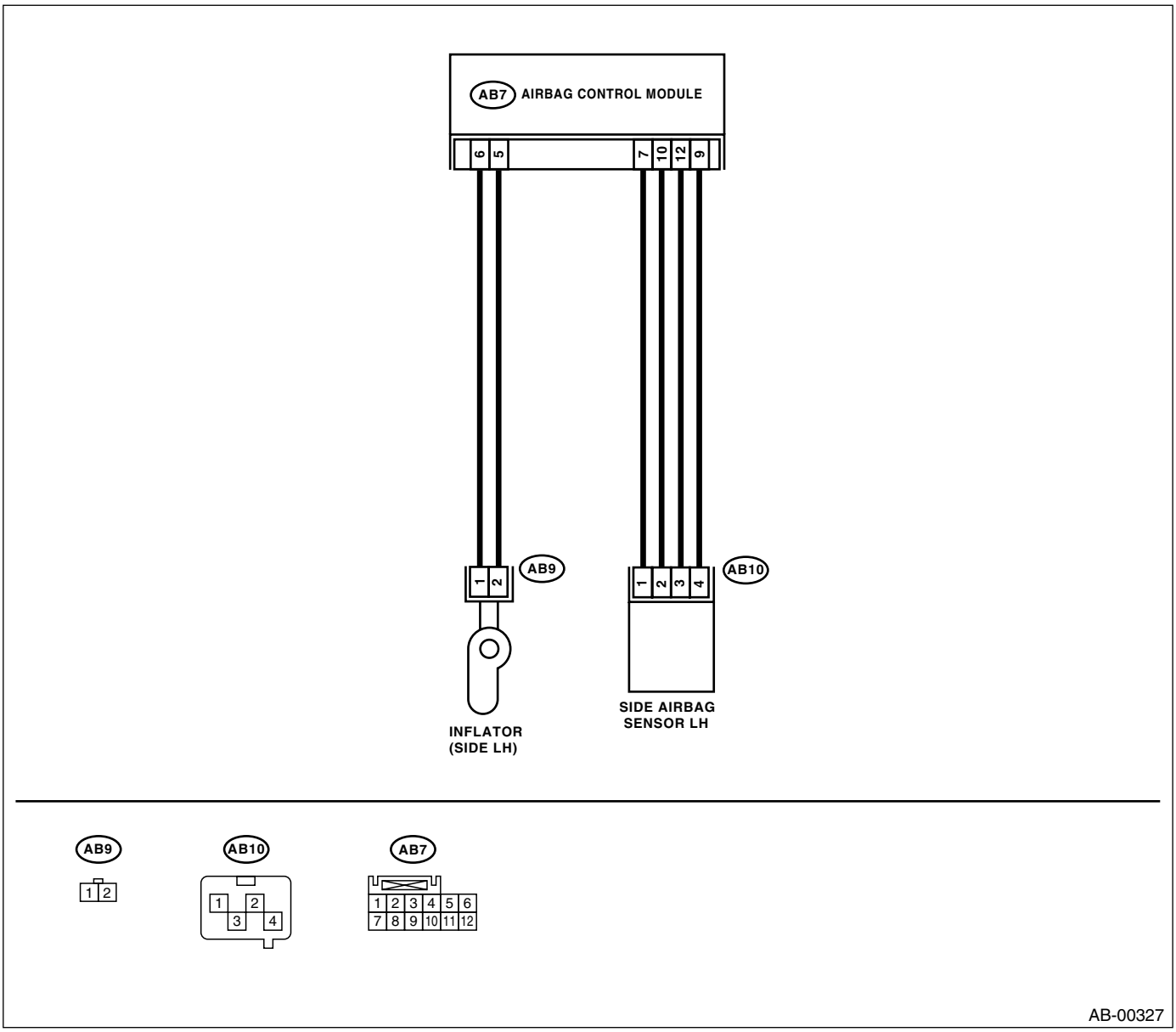
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK SIDE AIRBAG MODULE.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB9) from side airbag module (LH), and connect the connector (1F) in test harness F to (AB9). 3)Connect the airbag resistor to connector (3F) in test harness F. 4)Connect the battery ground cable, and turn the ignition switch to ON. Is the airbag warning light turned off after it was illuminating approx. 6 seconds?	Airbag warning light is turned off after illuminating approx. 6 seconds.	Replace the front seat with side airbag module (LH). <Ref. to SE-5, Front Seat.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (LH).** 1)Turn ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB19) from the seat belt pretensioner (LH). <Ref. to SB-7, Front Seat Belt.> 3)Disconnect the airbag resistor from the test harness. 4)Disconnect the connector (AB7) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 5)Connect the connector (1R) in test harness R to connector (AB7). 6)Measure the resistance between connector (3R) in test harness R and connector (3F) in test harness F. ***Connector & terminal*** ***(3R) No. 12 — (3F) No. 3:*** ***(3R) No. 10 — (3F) No. 4:*** Is the measured value less than specified value?	10 Ω	Go to step **3.**	Replace the side airbag harness with body harness.
3	**CHECK SIDE AIRBAG HARNESS (LH).** Measure the resistance of the connector (3R) in test harness R. ***Connector & terminal*** ***(3R) No. 12 — No. 10:*** Is the measured value more than specified value?	1 MΩ	Go to step **4.**	Replace the side airbag harness with body harness.
4	**CHECK SIDE AIRBAG HARNESS (LH).** Measure the resistance between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 10 — Chassis ground:*** ***(3R) No. 12 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the side airbag harness with body harness.

N: DTC 45

DIAGNOSIS:

- Side airbag harness is shorted to power supply.
- Side airbag module (RH) is faulty.
- Airbag control module is faulty.

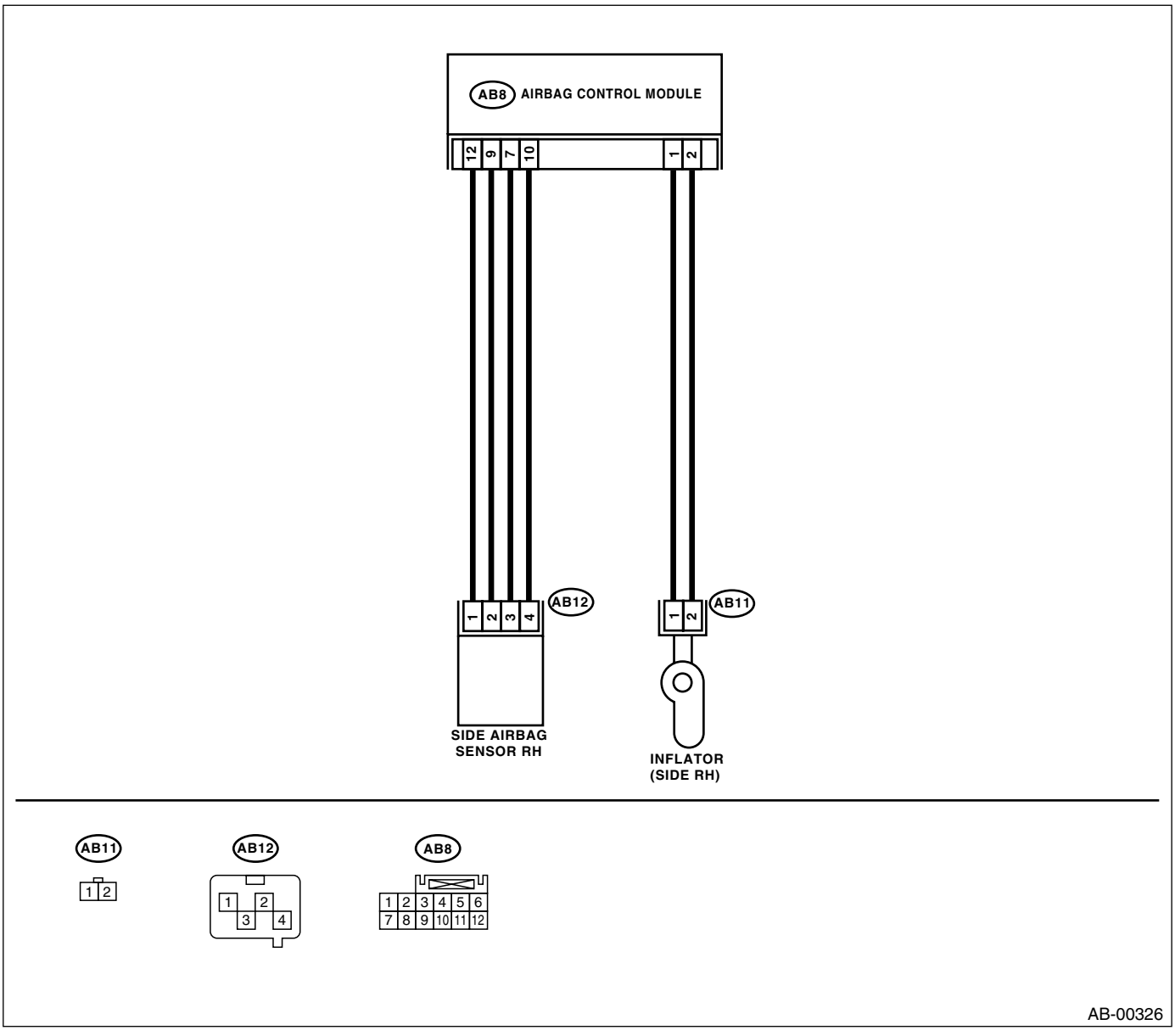
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK SIDE AIRBAG MODULE.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB11) from side airbag module (RH), and connect the connector (1F) in test harness F to (AB11). 3)Connect the airbag resistor to connector (3F) in test harness F. 4)Connect the battery ground cable, and turn the ignition switch to ON. Is the airbag warning light turned off after it was illuminating approx. 6 seconds?	Airbag warning light is turned off after illuminating approx. 6 seconds.	Replace the front seat with side airbag module (RH). <Ref. to SE-5, Front Seat.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (RH).** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB20) from the seat belt pretensioner (RH). <Ref. to SB-7, Front Seat Belt.> 3)For the vehicle with lap seat belt pretensioner, disconnect the connector (AB25) from lap pretensioner. 4)Disconnect the airbag resistor from the test harness. 5)Disconnect the connector (AB8) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 6)Connect the connector (1R) in test harness R to connector (AB8). 7)Connect the battery ground cable, and turn the ignition switch to ON. 8)Measure the voltage between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 18 (+) — Chassis ground (–):*** ***(3R) No. 20 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the side airbag harness with body harness.

O: DTC 46

DIAGNOSIS:

- Side airbag harness is shorted to power supply.
- Side airbag module (LH) is faulty.
- Airbag control module is faulty.

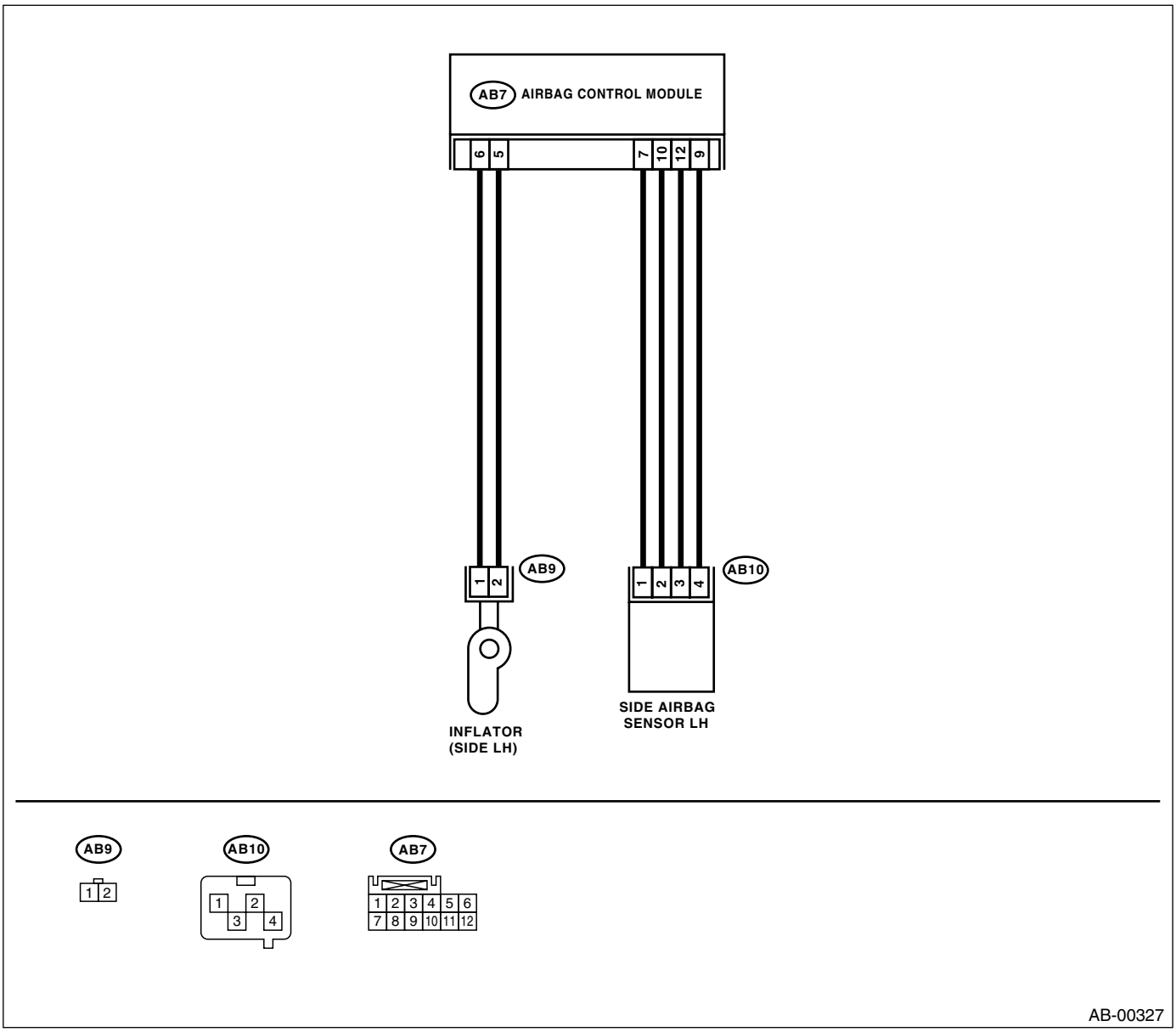
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK SIDE AIRBAG MODULE.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB9) from side airbag module (LH), and connect the connector (1F) in test harness F to (AB9). 3)Connect the airbag resistor to connector (3F) in test harness F. 4)Connect the battery ground cable and turn the ignition switch to ON. Is the airbag warning light turned off after it was illuminating approx. 6 seconds?	Airbag warning light is turned off after illuminating approx. 6 seconds.	Replace the front seat with side airbag module (LH). <Ref. to SE-5, Front Seat.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (LH).** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB19) from the seat belt pretensioner (LH). <Ref. to SB-7, Front Seat Belt.> 3)Disconnect the airbag resistor from the test harness. 4)Disconnect the connector (AB7) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 5)Connect the connector (1R) in test harness R to connector (AB7). 6)Connect the battery ground cable, and turn the ignition switch to ON. 7)Measure the voltage between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 10 (+) — Chassis ground (–):*** ***(3R) No. 12 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the side airbag harness with body harness.

P: DTC 51

DIAGNOSIS:

- Side airbag sensor (RH) is faulty.
- Side airbag harness is faulty.
- Airbag control module is faulty.

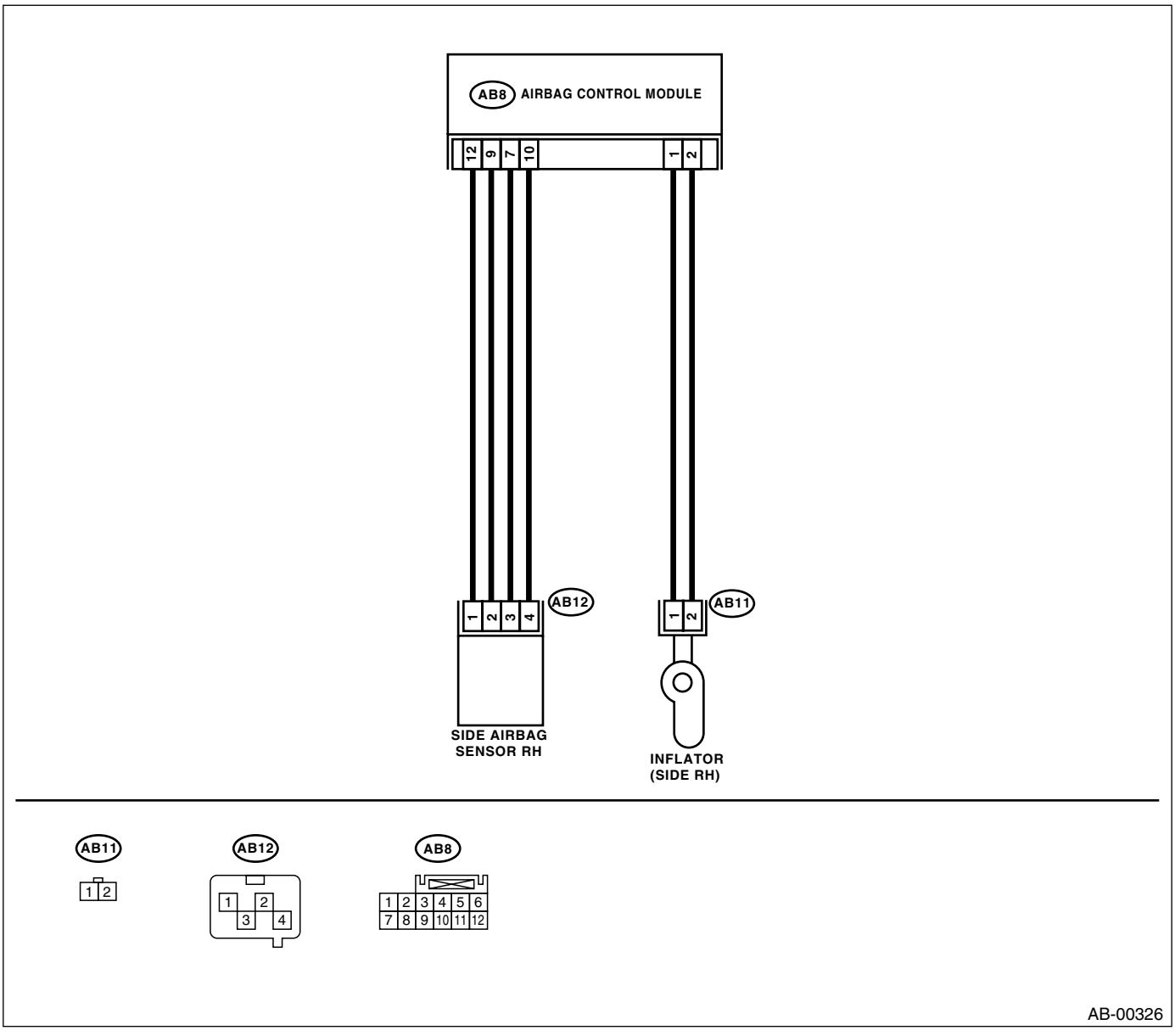
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK SIDE AIRBAG HARNESS.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB20) from the seat belt pretensioner (RH). <Ref. to SB-7, Front Seat Belt.> 3)For the vehicle with lap seat belt pretensioner, disconnect the connector (AB25) from lap pretensioner. 4)Disconnect the connector (AB11) from side airbag module (RH). 5)Disconnect the connector (AB8) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 6)Connect the connector (1R) in test harness R to the connector (AB8). 7)Disconnect the connector (AB12) from the side airbag sensor (RH), and connect the connector (1G) in test harness G to connector (AB12). 8)Measure the resistance between connector (4R) in test harness R and connector (3G) in test harness G. ***Connector & terminal*** ***(4R) No. 5 — (3G) No. 2:*** ***(4R) No. 6 — (3G) No. 4:*** ***(4R) No. 7 — (3G) No. 1:*** ***(4R) No. 8 — (3G) No. 5:*** Is the measured value less than specified value?	10 Ω	Go to step **2.**	Replace the side airbag harness with body harness.
2	**CHECK SIDE AIRBAG HARNESS.** Measure the resistance between connector (4R) in test harness R and the chassis ground. ***Connector & terminal*** ***(4R) No. 5 — Chassis ground:*** ***(4R) No. 6 — Chassis ground:*** ***(4R) No. 7 — Chassis ground:*** ***(4R) No. 8 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Replace the side airbag sensor (RH). <Ref. to AB-19, Side Airbag Sensor.> When sensor replacement is not OK, replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the side airbag harness with body harness.

Q: DTC 52

DIAGNOSIS:

- Side airbag sensor (LH) is faulty.
- Side airbag harness is faulty.
- Airbag control module is faulty.

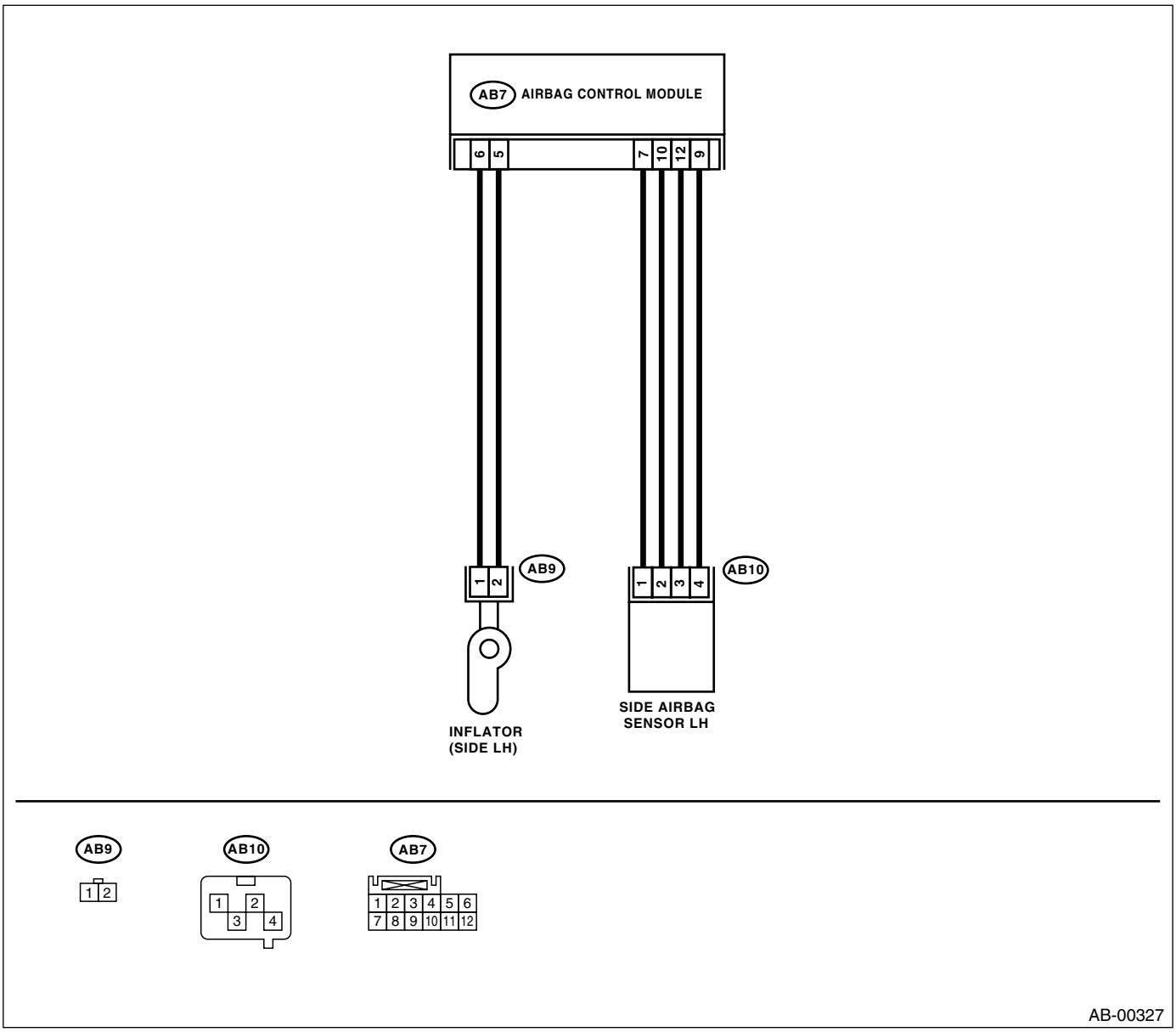
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK SIDE AIRBAG HARNESS.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB19) from the seat belt pretensioner (LH). <Ref. to SB-7, Front Seat Belt.> 3)Disconnect the connector (AB9) from side airbag module (LH). 4)Disconnect the connector (AB7) from the air-bag control module. <Ref. to AB-18, Airbag Control Module.> 5)Connect the connector (1R) in test harness R to connector (AB7). 6)Disconnect the connector (AB10) from the side airbag sensor (LH), and connect the connector (1G) in test harness G to connector (AB10). 7)Measure the resistance between connector (4R) in test harness R and connector (3G) in test harness G. ***Connector & terminal*** ***(4R) No. 4 — (3G) No. 2:*** ***(4R) No. 3 — (3G) No. 4:*** ***(4R) No. 2 — (3G) No. 1:*** ***(4R) No. 1 — (3G) No. 5:*** Is the measured value less than specified value?	10 Ω	Go to step **2.**	Replace the side airbag harness with body harness.
2	**CHECK SIDE AIRBAG HARNESS.** Measure the resistance between connector (4R) in test harness R and the chassis ground. ***Connector & terminal*** ***(4R) No. 4 — Chassis ground:*** ***(4R) No. 3 — Chassis ground:*** ***(4R) No. 2 — Chassis ground:*** ***(4R) No. 1 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Replace the side airbag sensor (LH). <Ref. to AB-19, Side Airbag Sensor.> When sensor replacement is not OK, replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the side airbag harness with body harness.

R: DTC 53

DIAGNOSIS:

- Side airbag sensor (RH) is faulty.

When Code 53 is displayed, the circuit within the side airbag sensor (RH) is faulty. Replace the side airbag sensor (RH).
<Ref. to AB-19, Side Airbag Sensor.>

S: DTC 54

DIAGNOSIS:

- Side airbag sensor (LH) is faulty.

When Code 53 is displayed, the circuit within the side airbag sensor (LH) is faulty. Replace the side airbag sensor (LH).
<Ref. to AB-19, Side Airbag Sensor.>

T: DTC 55

This code is displayed when the side airbag is deployed.
When this code is displayed, the memory cannot be erased. Replace the following parts.

- Airbag control module. <Ref. to AB-18, Airbag Control Module.>
- Front seat with side airbag module. (Operating side) <Ref. to SE-5, Front Seat.>
- Side airbag sensor. (Operating side) <Ref. to AB-19, Side Airbag Sensor.>

U: DTC 61

DIAGNOSIS:

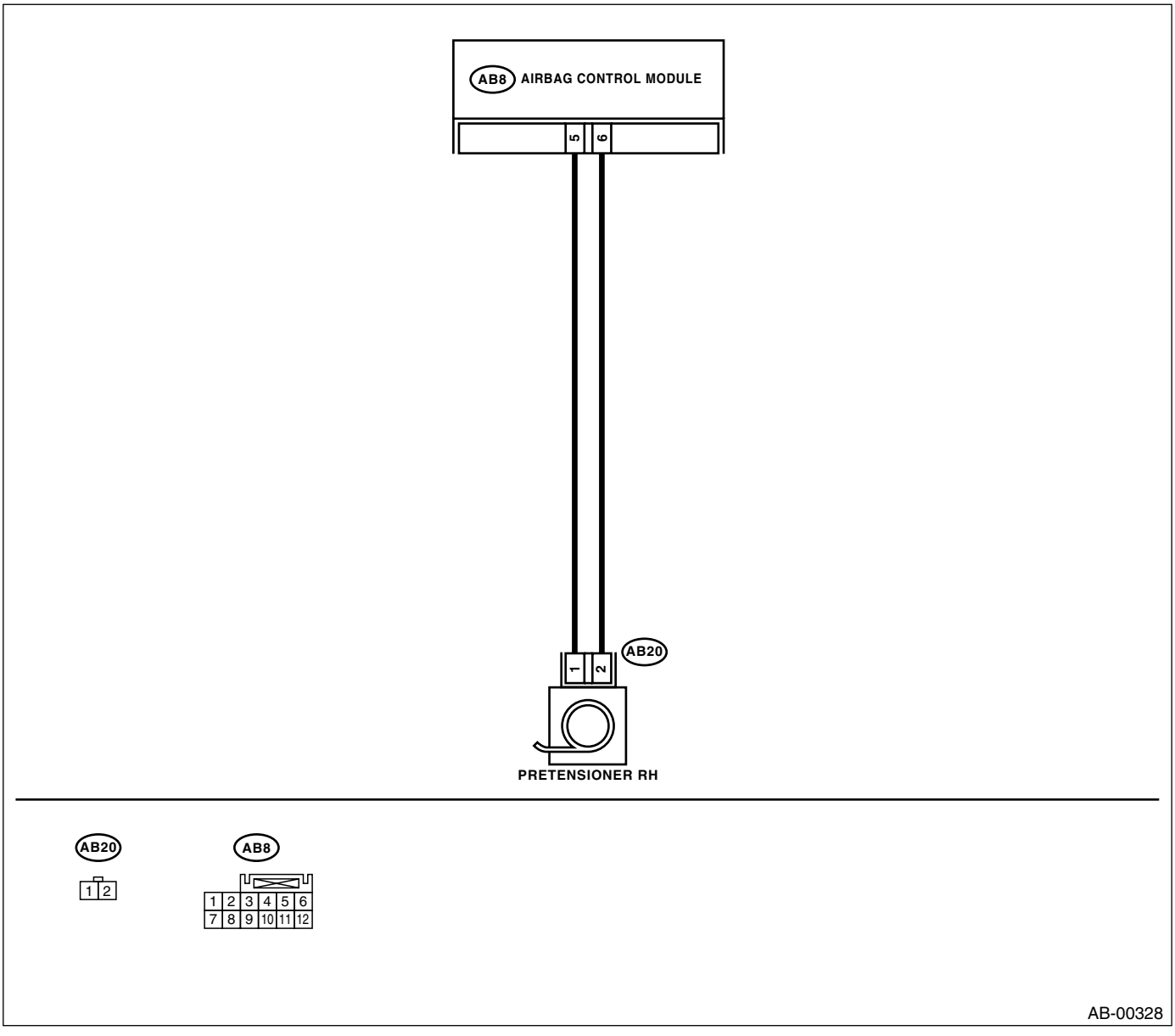
- Seat belt pretensioner (RH) circuit is open, shorted or shorted to ground.
- Airbag control module is faulty.
- Pretensioner is faulty.
- Airbag harness is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK SEAT BELT PRETENSIONER.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB20) from the seat belt pretensioner (RH). <Ref. to SB-7, Front Seat Belt.> 3)Connect the connector (1F) in test harness F to (AB20). 4)Connect the airbag resistor to connector (3F) in test harness F. 5)Connect the battery ground cable and turn the ignition switch to ON. Is the airbag warning light turned off after it was illuminating approx. 6 seconds?	Airbag warning light is turned off after illuminating approx. 6 seconds.	Replace the seat belt pretensioner (RH). <Ref. to SB-7, Front Seat Belt.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (RH).** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the airbag resistor from the test harness. 3)Disconnect the connector (AB11) from side airbag module (RH). 4)Disconnect the connectors (AB7) and (AB8) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 5)Connect the connector (1R) in test harness R to connector (AB8). 6)Measure the resistance between connector (3R) in test harness R and connector (3F) in test harness F. ***Connector & terminal*** ***(3R) No. 17 — (3F) No. 4:*** ***(3R) No. 19 — (3F) No. 3:*** Is the measured value less than specified value?	10 Ω	Go to step **3.**	Replace the side airbag harness with body harness.
3	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance of the connector (3R) in test harness R. ***Connector & terminal*** ***(3R) No. 17 — No. 19:*** Is the measured value more than specified value?	1 MΩ	Go to step **4.**	Replace the side airbag harness with body harness.
4	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 17 — Chassis ground:*** ***(3R) No. 19 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the side airbag harness with body harness.

V: DTC 62

DIAGNOSIS:

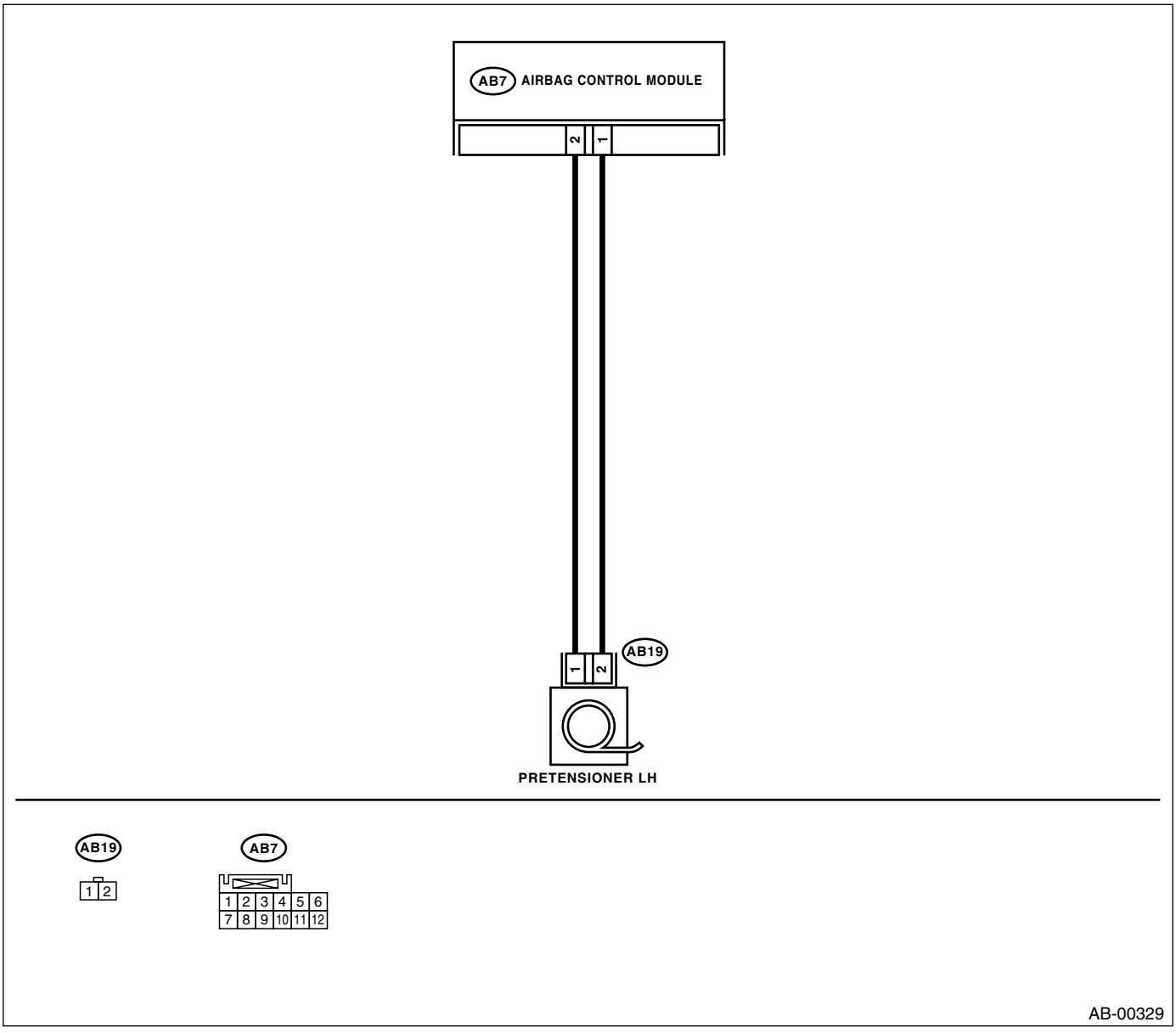
- Seat belt pretensioner (LH) circuit is open, shorted or shorted to ground.
- Airbag control module is faulty.
- Pretensioner is faulty.
- Airbag harness is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK SEAT BELT PRETENSIONER.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB19) from the seat belt pretensioner (LH). <Ref. to SB-7, Front Seat Belt.> 3)Connect the connector (1F) in test harness F to (AB19). 4)Connect the airbag resistor to the connector (3F) in test harness F. 5)Connect the battery ground cable and turn the ignition switch to ON. Is the airbag warning light turned off after it was illuminating approx. 6 seconds?	Airbag warning light is turned off after illuminating approx. 6 seconds.	Replace the seat belt pretensioner (LH). <Ref. to SB-7, Front Seat Belt.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (LH).** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the airbag resistor from the test harness. 3)Disconnect the connector (AB9) from side airbag module (LH). 4)Disconnect the connectors (AB7) and (AB8) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 5)Connect the connector (1R) in test harness R to the connector (AB7). 6)Measure the resistance between connector (3R) in test harness R and the connector (3F) in test harness F. ***Connector & terminal*** ***(3R) No. 11 — (3F) No. 4:*** ***(3R) No. 13 — (3F) No. 3:*** Is the measured value less than specified value?	10 Ω	Go to step **3.**	Replace the side airbag harness with body harness.
3	**CHECK SIDE AIRBAG HARNESS.** Measure the resistance of the connector (3R) in test harness R. ***Connector & terminal*** ***(3R) No. 11 — No. 13:*** Is the measured value more than specified value?	1 MΩ	Go to step **4.**	Replace the side airbag harness with body harness.
4	**CHECK SIDE AIRBAG HARNESS.** Measure the resistance between the connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 11 — Chassis ground:*** ***(3R) No. 13 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the side airbag harness with body harness.

W: DTC 65

DIAGNOSIS:

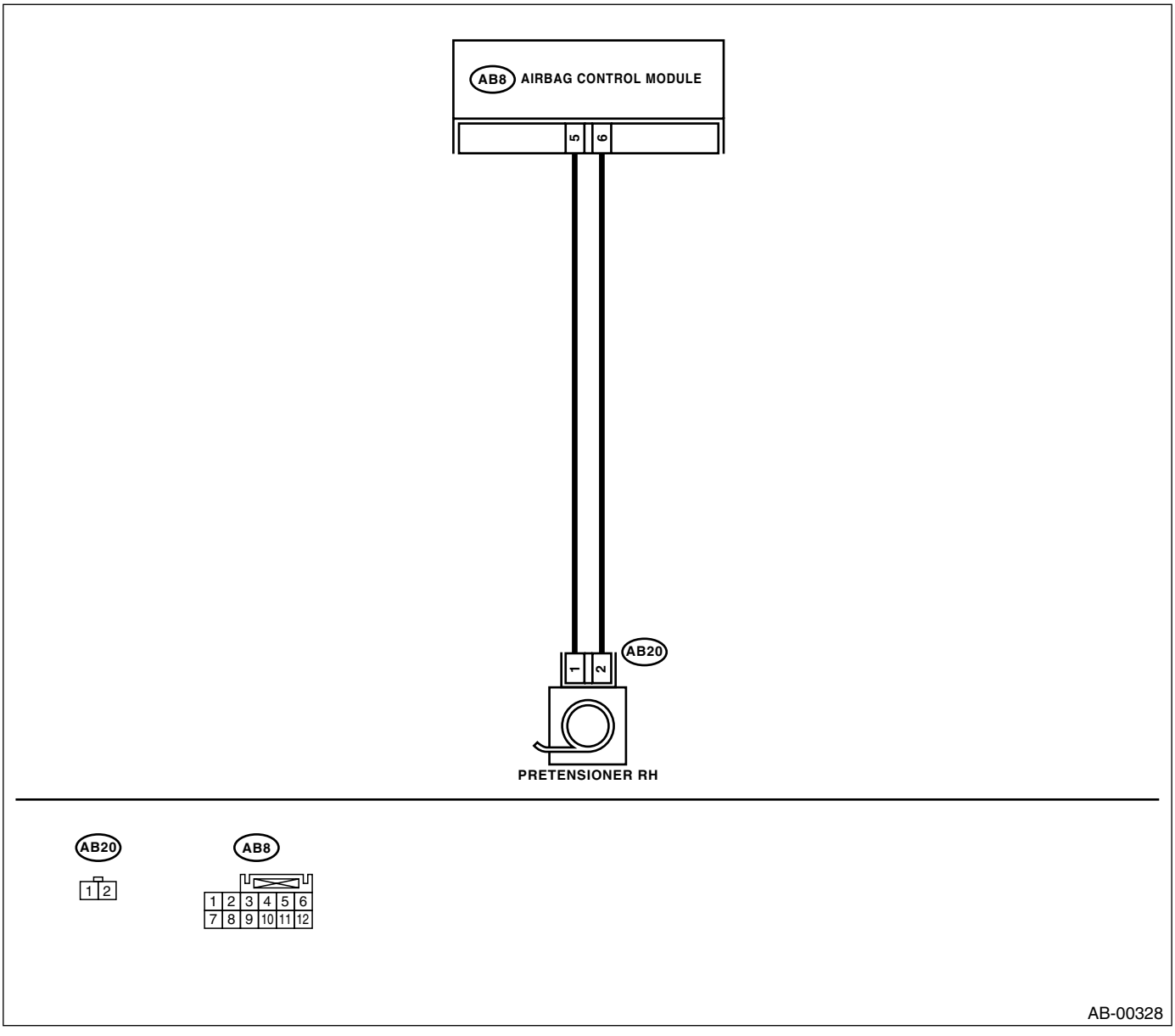
- Seat belt pretensioner (RH) circuit is shorted to the power supply.
- Pretensioner is faulty.
- Airbag harness is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK SEAT BELT PRETENSIONER.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB20) from the seat belt pretensioner (RH). <Ref. to SB-7, Front Seat Belt.> 3)Connect the connector (1F) in test harness F to (AB20). 4)Connect the airbag resistor to connector (3F) in test harness F. 5)Connect the battery ground cable, and turn the ignition switch to ON. Is the airbag warning light turned off after it was illuminating approx. 6 seconds?	Airbag warning light is turned off after illuminating approx. 6 seconds.	Replace the seat belt pretensioner (RH). <Ref. to SB-7, Front Seat Belt.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (RH).** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the airbag resistor from the test harness. 3)Disconnect the connector (AB11) from side airbag module (RH). 4)Disconnect the connectors (AB7) and (AB8) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 5)Connect the connector (1R) in test harness R to the connector (AB8). 6)Connect the battery ground cable and turn the ignition switch to ON. 7)Measure the voltage between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 17 (+) — Chassis ground (–):*** ***(3R) No. 19 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the side airbag harness with body harness.

X: DTC 66

DIAGNOSIS:

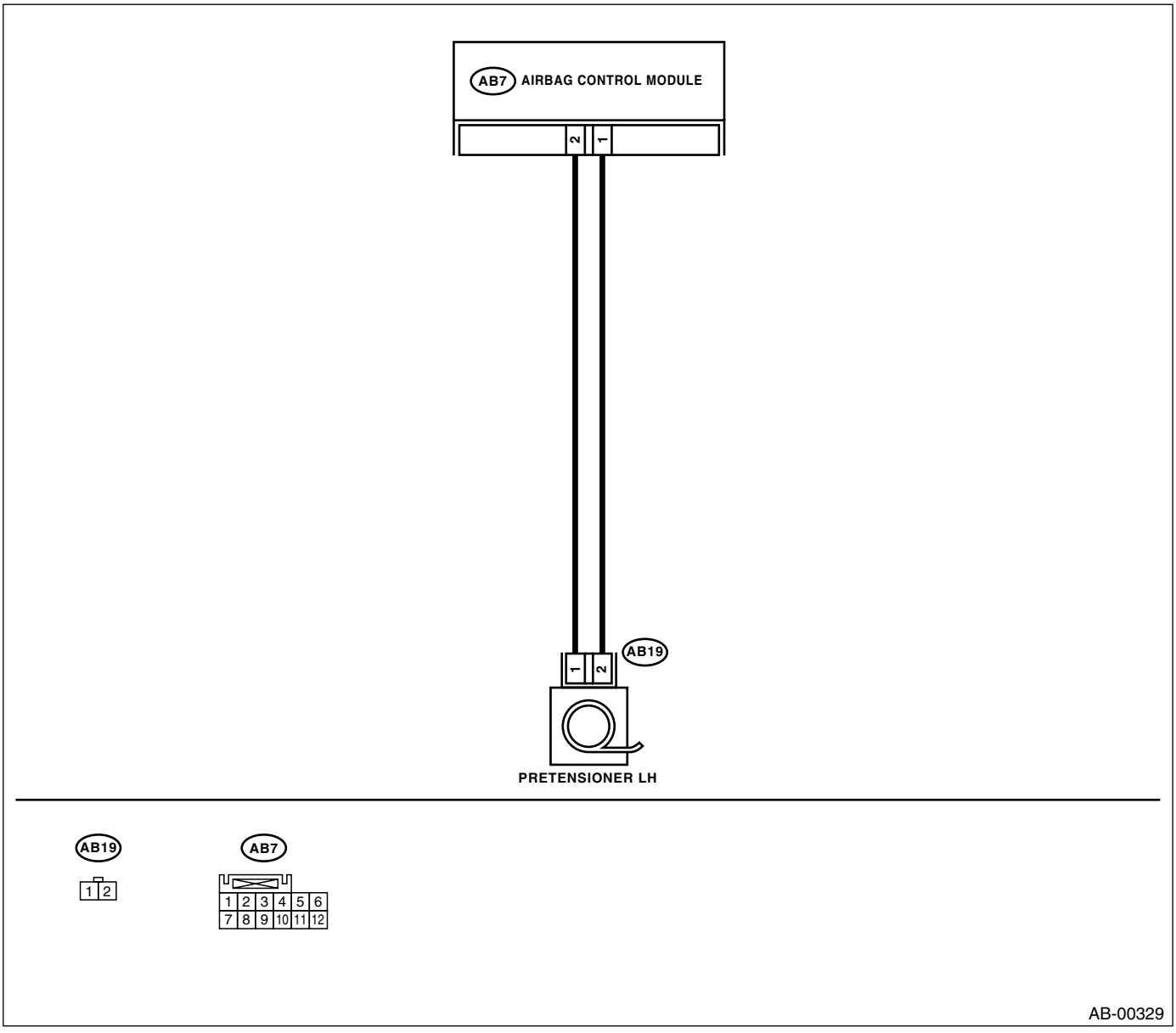
- Seat belt pretensioner (LH) circuit is shorted to the power supply.
- Pretensioner is faulty.
- Airbag harness is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK SEAT BELT PRETENSIONER.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB19) from the seat belt pretensioner (LH). <Ref. to SB-7, Front Seat Belt.> 3)Connect the connector (1F) in test harness F to (AB19). 4)Connect the airbag resistor to the connector (3F) in test harness F. 5)Connect the battery ground cable and turn the ignition switch to ON. Is the airbag warning light turned off after it was illuminating approx. 6 seconds?	Airbag warning light is turned off after illuminating approx. 6 seconds.	Replace the seat belt pretensioner (LH). <Ref. to SB-7, Front Seat Belt.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (LH).** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the airbag resistor from the test harness. 3)Disconnect the connector (AB9) from side airbag module (LH). 4)Disconnect the connectors (AB7) and (AB8) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 5)Connect the connector (1R) in test harness R to the connector (AB7). 6)Connect the battery ground cable and turn the ignition switch to ON. 7)Measure the voltage between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 11 (+) — Chassis ground (–):*** ***(3R) No. 13 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the side airbag harness with body harness.

Y: DTC 72

DIAGNOSIS:

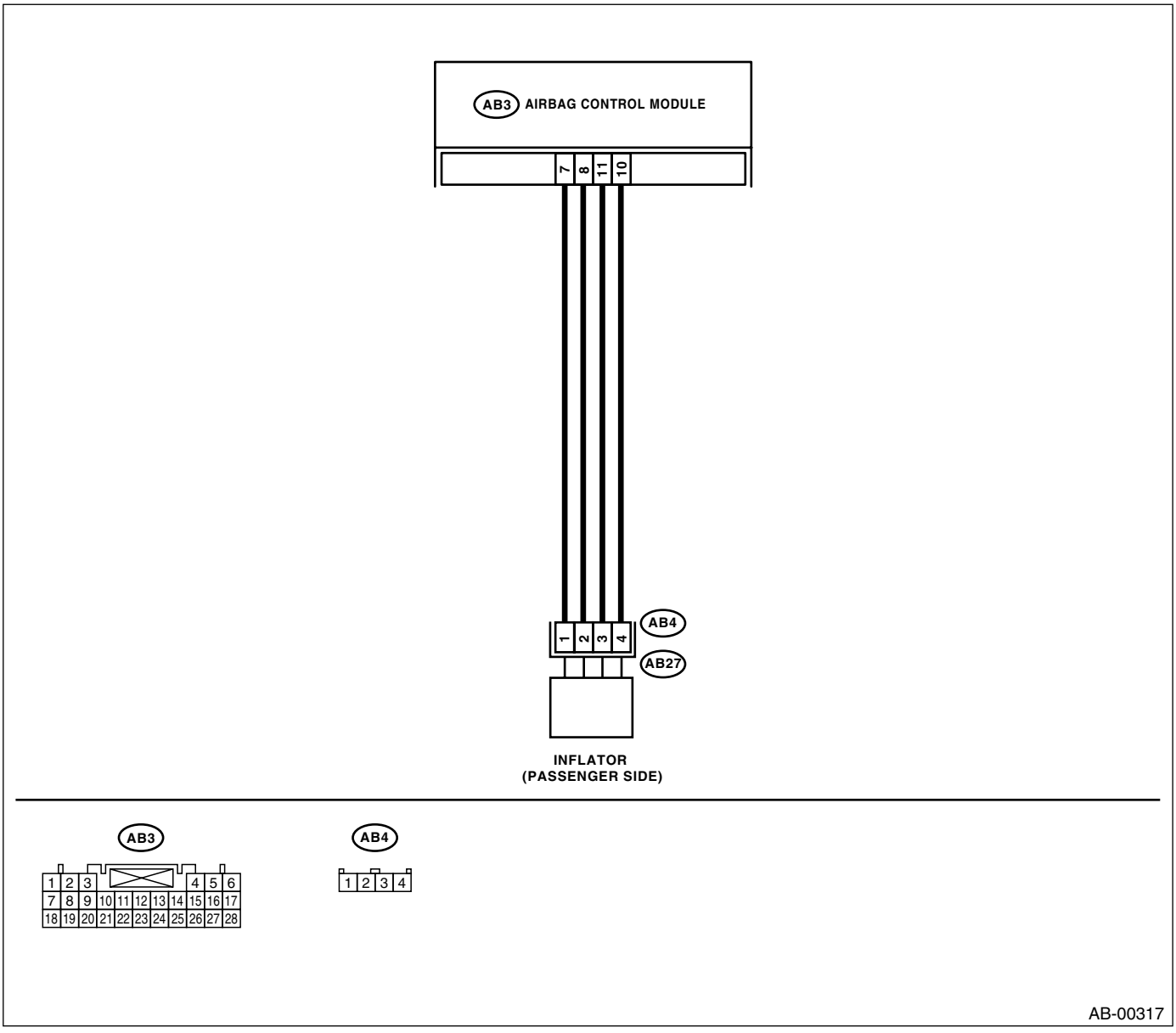
- Airbag harness is open, shorted or shorted to ground.
- Airbag module harness (Passenger) circuit is open, shorted or shorted to ground.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK PASSENGER'S AIRBAG MODULE.** 1)Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Remove the glove box. 3)Disconnect the connector passenger's airbag module from (AB4). 4)Connect the connector (1P) in test harness K to connector (AB4). 5)Connect two airbag resistors to connectors (2P) and (3P) in test harness P. 6)Connect the battery ground cable and turn the ignition switch ON. Is the airbag warning light turned off after it was illuminating approx. 6 seconds?	Airbag warning light is turned off after illuminating approx. 6 seconds.	Replace the passenger's airbag module. <Ref. to AB-16, Passenger's Airbag Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS.** 1)Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect two airbag resistors from the connectors (2P) and (3P) in test harness P. 3)Remove the lower cover and disconnect the connector (AB2) from (AB30). 4)Disconnect the connector (AB3) from the air bag control module, and connect the connector (1R) in test harness R. 5)Measure the resistance between connector (2R) in test harness R and the connector (2P) in test harness P. ***Connector & terminal*** ***(2R) No. 9 — (3P) No. 3:*** ***(2R) No. 13 — (3P) No. 4:*** Is the measured value less than specified value?	10 Ω	Go to step **3.**	Replace the airbag main harness together with body harness as a unit.
3	**CHECK AIRBAG MAIN HARNESS.** Measure the resistance of the connector (2R) in test harness R. ***Connector & terminal*** ***(2R) No. 9 — No. 13:*** ***(2R) No. 9 — Chassis ground:*** ***(2R) No. 13 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the airbag main harness together with body harness as a unit.

Z: DTC 76

DIAGNOSIS:

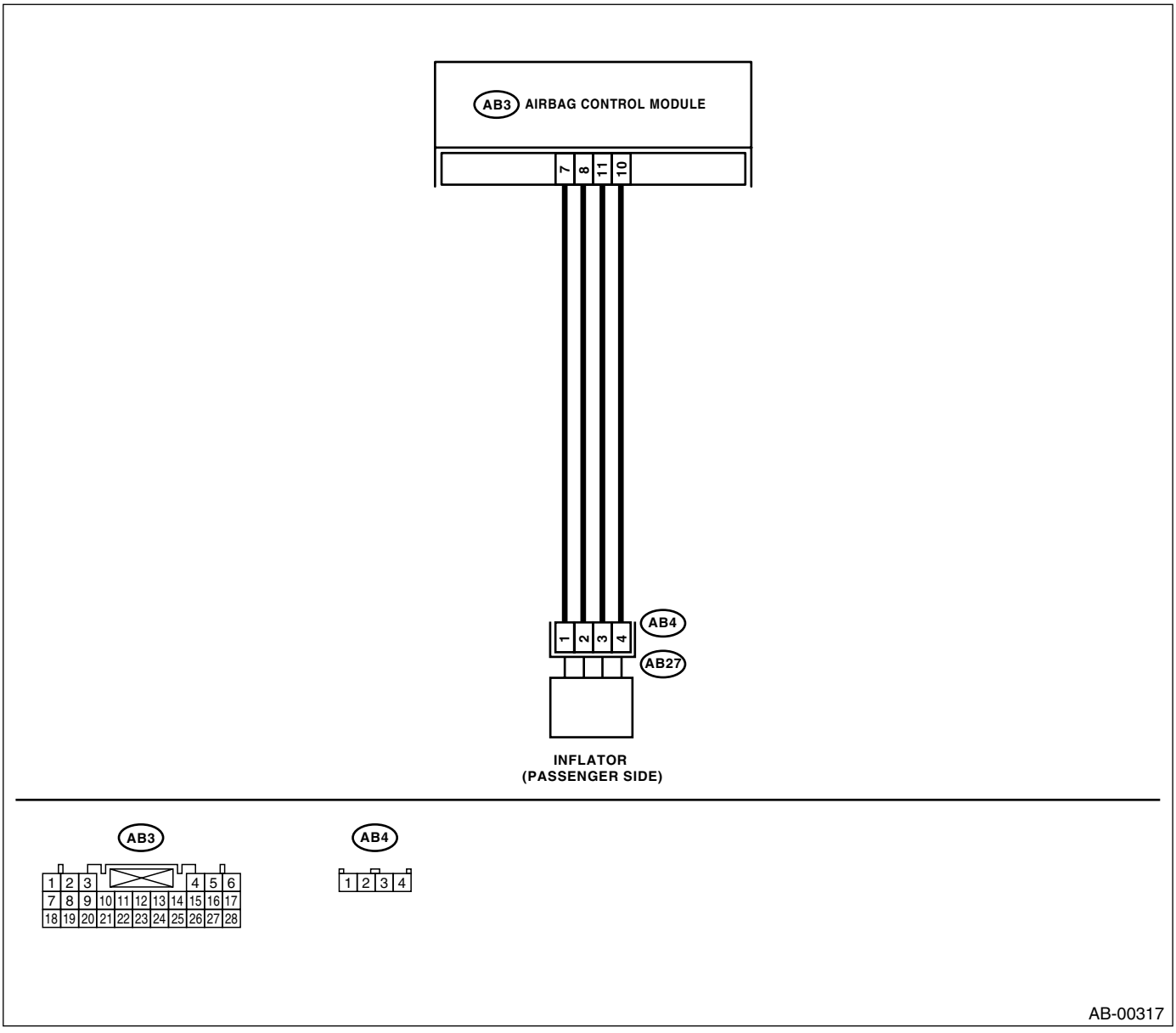
- Airbag main harness (Passenger) circuit is shorted to the power supply.
- Airbag module harness (Passenger) is shorted to the power supply.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK PASSENGER'S AIRBAG MODULE.** 1)Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Remove the glove box. 3)Disconnect the connector (AB4) from passenger's airbag module. 4)Connect the connector (1P) in test harness D to connector (AB4). 5)Connect two airbag resistors to connectors (2P) and (3P) in test harness P. 6)Connect the battery ground cable and turn the ignition switch ON. Is the airbag warning light turned off after it was illuminating approx. 6 seconds?	Airbag warning light is turned off after illuminating approx. 6 seconds.	Replace the passenger's airbag module. <Ref. to AB-16, Passenger's Airbag Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS.** 1)Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect two airbag resistors from the connectors (2P) and (3P) in test harness P. 3)Remove the lower cover and disconnect the connector (AB2) from (AB30). 4)Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R. 5)Measure the voltage between connector (2R) in test harness R and the chassis ground. ***Connector & terminal*** ***(2R) No. 9 (+) — Chassis ground (–):*** ***(2R) No. 13 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the airbag main harness together with body harness as a unit.

AA:DTC 81

DIAGNOSIS:

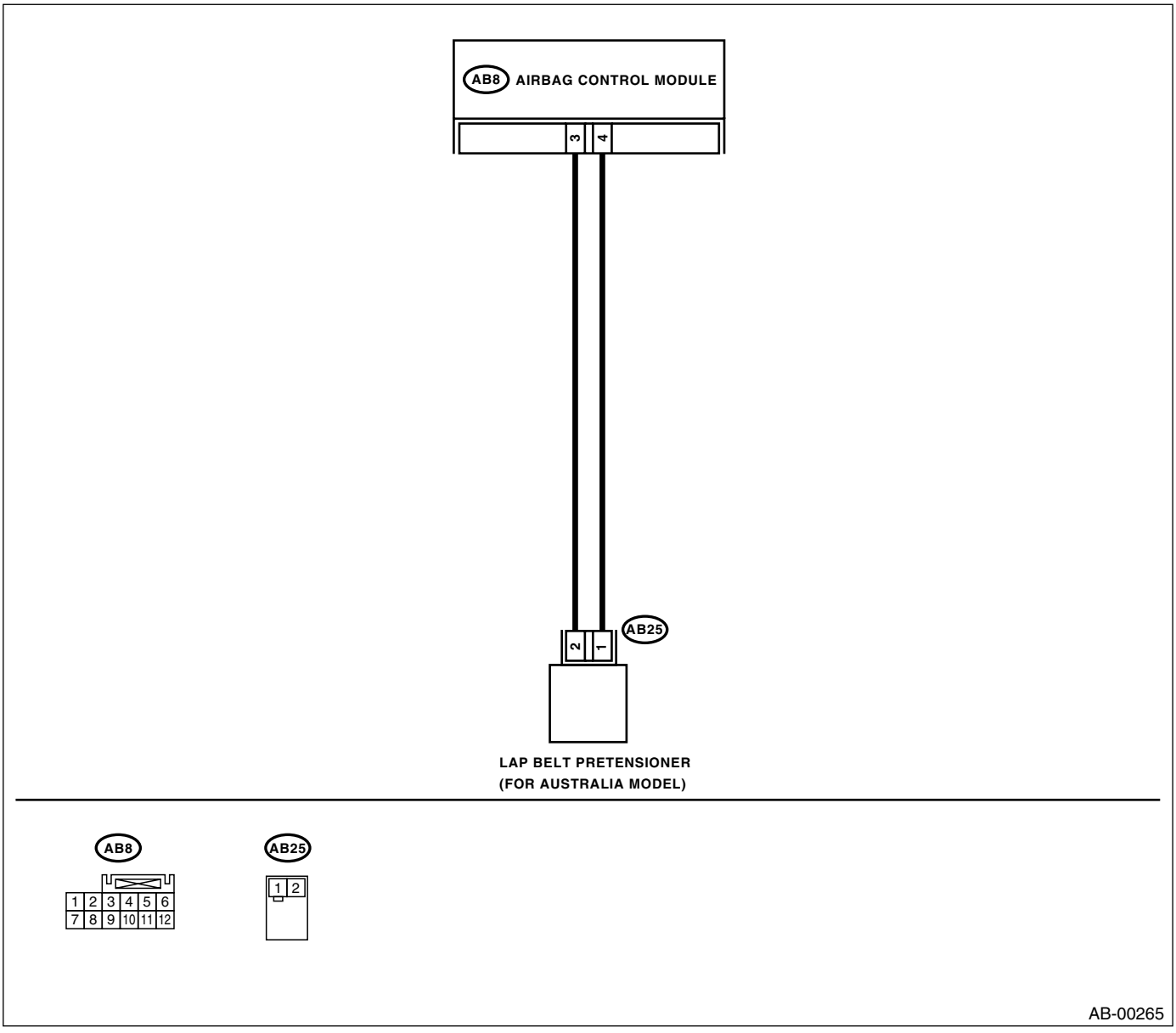
- Lap seat belt pretensioner (RH) circuit is open, shorted or shorted to ground.
- Lap pretensioner is faulty.
- Airbag harness is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK LAP SEAT BELT PRETENSIONER.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB25) from the lap seat belt pretensioner (RH). 3)Connect the connector (1Q) in test harness Q to (AB25). 4)Connect the airbag resistor to connector (2Q) in test harness Q. 5)Connect the battery ground cable, and turn the ignition switch to ON. Is the airbag warning light turned off after it was illuminating approx. 6 seconds?	Airbag warning light is turned off after illuminating approx. 6 seconds.	Replace the lap seat belt pretensioner (RH). <Ref. to SB-7, FRONT OUTER SEAT BELT WITH LAP PRETENSIONER, REMOVAL, Front Seat Belt.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (RH).** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the airbag resistor from the test harness. 3)Disconnect the connector (AB11) from side airbag module (RH). 4)Disconnect the connectors (AB20) from seat belt pretensioner. 5)Disconnect the connector (AB8) from airbag control module. 6)Connect the connector (1R) in test harness R to the connector (AB8). 7)Measure the resistance between connector (3R) in test harness R and connector (2Q) in test harness Q. ***Connector & terminal*** ***(3R) No. 2 — (2Q) No. 4:*** ***(3R) No. 4 — (2Q) No. 3:*** Is the measured value less than specified value?	10 Ω	Go to step **3.**	Replace the side airbag harness with body harness.
3	**CHECK SIDE AIRBAG HARNESS.** Measure the resistance between the connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 2 — (3R) No. 4:*** ***(3R) No. 2 — Chassis ground:*** ***(3R) No. 4 — Chassis ground:*** Is the measured value more than specified value?	1 MΩ	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the side airbag harness with body harness.

AB:DTC 85

DIAGNOSIS:

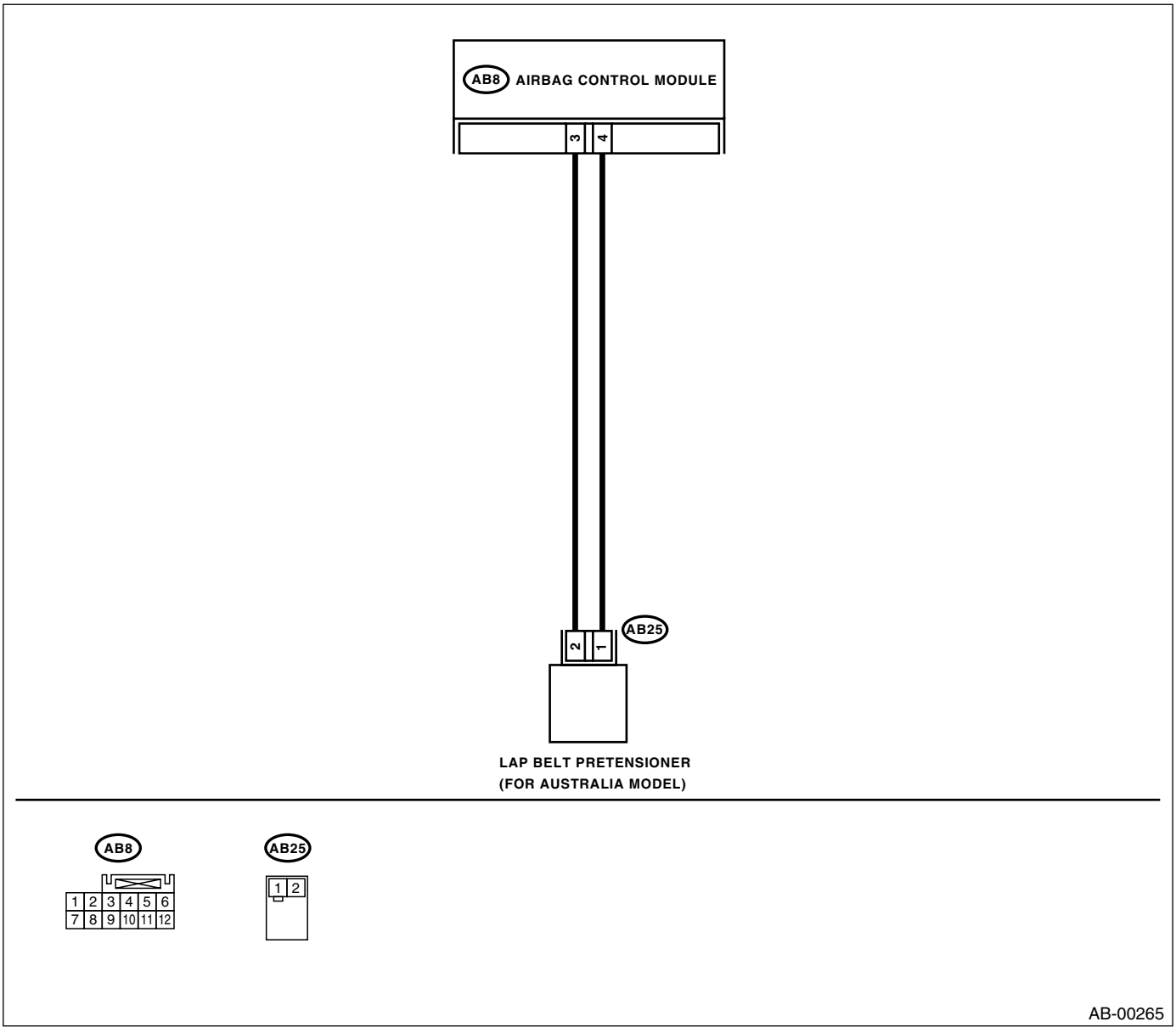
- Lap seat belt pretensioner (RH) circuit is shorted to the power supply.
- Lap retensioner is faulty.
- Pretensioner harness is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Value	Yes	No
1	**CHECK LAP SEAT BELT PRETENSIONER.** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the connector (AB25) from the lap seat belt pretensioner (RH). 3)Connect the connector (1Q) in test harness Q to (AB25). 4)Connect the airbag resistor to the connector (2Q) in test harness Q. 5)Connect the battery ground cable and turn the ignition switch to ON. Check the airbag warning light is turned off after it was illuminating approx. 6 seconds.	Airbag warning light is turned off after illuminating approx. 6 seconds.	Replace the lap seat belt pretensioner (RH). <Ref. to SB-7, FRONT OUTER SEAT BELT WITH LAP PRETENSIONER, REMOVAL, Front Seat Belt.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (RH).** 1)Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Disconnect the airbag resistor from the test harness. 3)Disconnect the connector (AB11) from side airbag module (RH). 4)Disconnect the connector (AB20) from seat belt pretensioner. 5)Disconnect the connectors (AB7) and (AB8) from the airbag control module. 6)Connect the connector (1R) in test harness R to the connector (AB7). 7)Connect the battery ground cable and turn the ignition switch to ON. 8)Measure the voltage between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 2 (+) — Chassis ground (–):*** ***(3R) No. 4 (+) — Chassis ground (–):*** Is the measured value less than specified value?	1 V	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the side airbag harness with body harness.

SEAT BELT SYSTEM

SB

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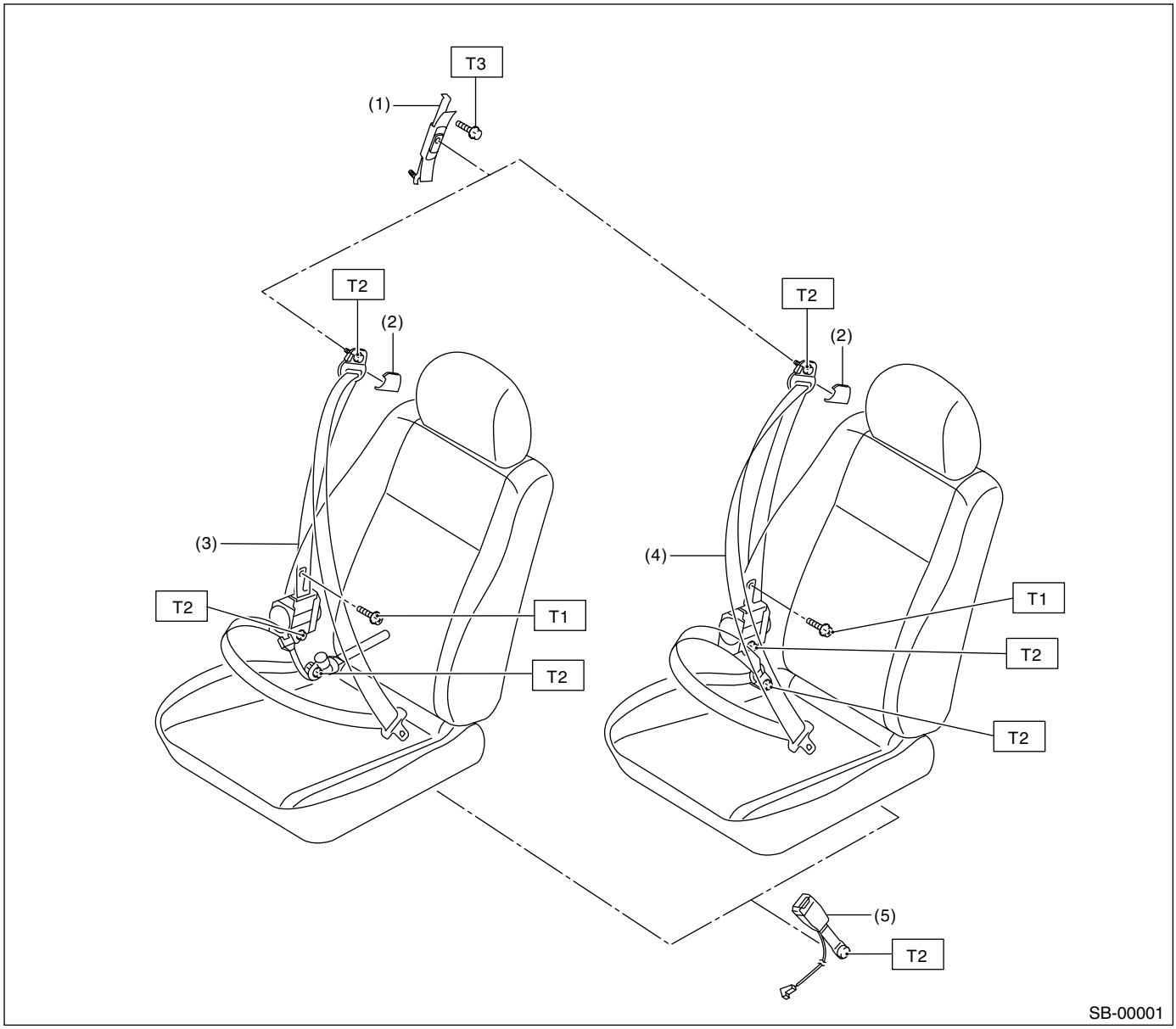
2. Inspection Locations After a Collision 6
3. Front Seat Belt 7
4. Rear Seat Belt 9
5. Disposal of Pretensioner 11

1. General Description

A: COMPONENT

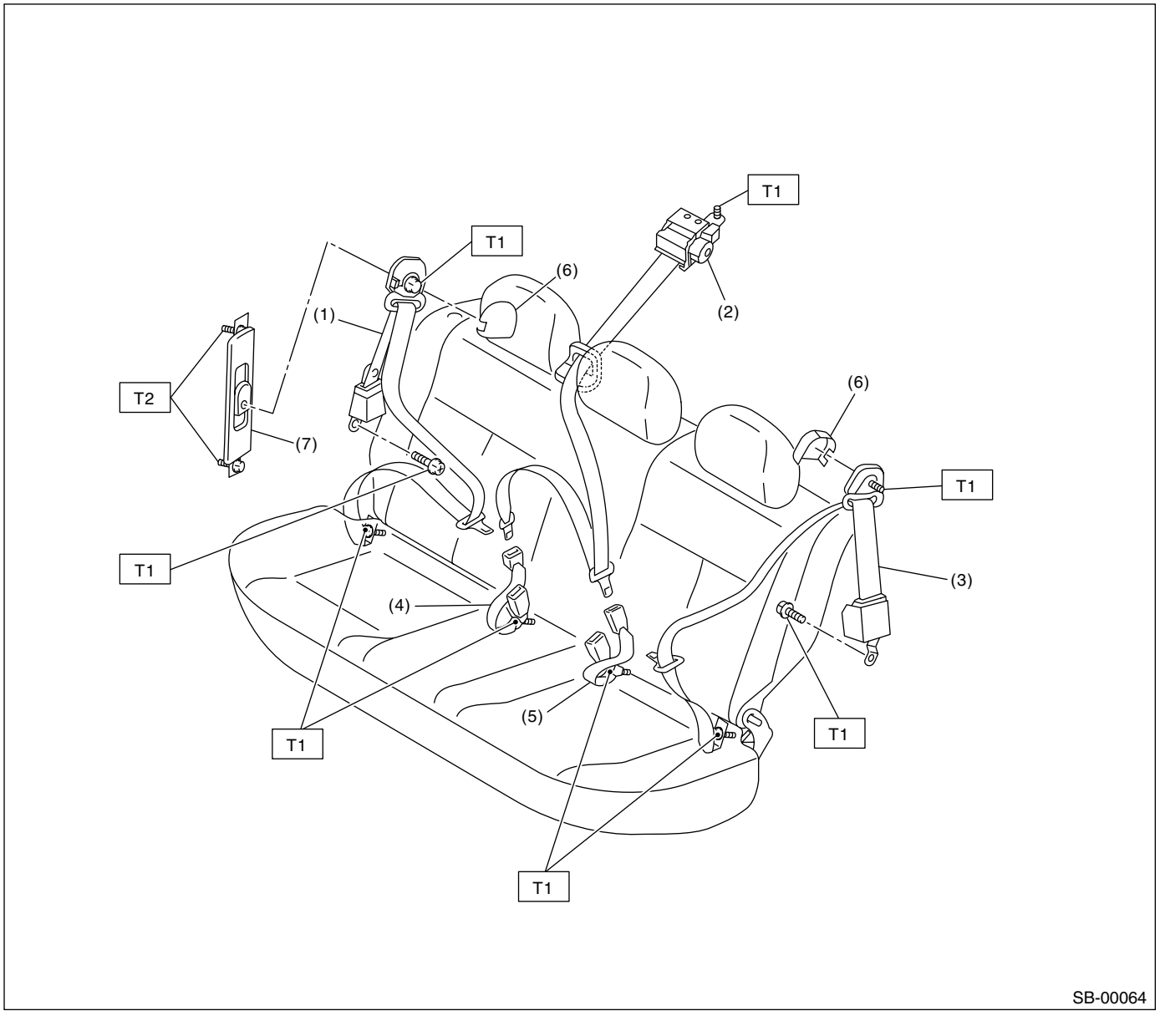
1. FRONT SEAT BELT



(1) Adjuster anchor ASSY
(2) Anchor cover
(3) Outer belt ASSY with lap pretensioner (For Australia model only)
(4) Outer belt ASSY
(5) Inner belt ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 30 (3.1, 22)
T3: 53 (5.4, 39)

2. REAR SEAT BELT



(1) Outer seat belt RH
(2) Outer seat belt CENTER
(3) Outer seat belt LH
(4) Inner seat belt RH
(5) Inner seat belt LH
(6) Anchor cover
(7) Adjuster anchor ASSY

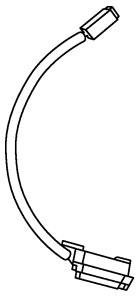
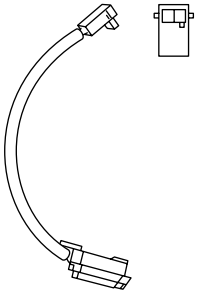
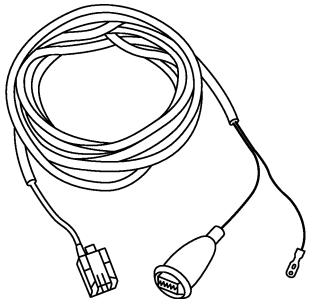
Tightening torque: N·m (kgf-m, ft-lb)
T1: 30 (3.1, 22)
T2: 53 (5.4, 39)

B: CAUTION

• Before starting, turn the ignition switch to OFF, disconnect the battery ground cable and wait for 20 seconds or more.
• The pretension system has a backup power source. The pretensioner might deploy if you do not wait for 20 seconds or more before starting work.
• Do not drop or apply any impact to the pretensioner.
• If oil, grease, or water gets on the pretensioner, wipe it off immediately with a dry cloth.
• Do not expose the pretensioner to high temperature or flame.
• Do not allow current to flow through or voltage to reach the pretensioner. Do not use a circuit tester to check resistance of the pretensioner.
• Do not disassemble or attempt to repair the pretensioner. If it is dented, cracked, or deformed, replace it with a new one.
• Do not use the airbag or pretensioner parts from other vehicles. Always replace parts with new parts.
• When handling a seat belt with a deployed pretensioner, wear gloves and goggles. Wash your hands afterwards.
• Do not re-use a seat belt with a deployed pretensioner again.
• Be sure to deploy pretensioner before disposal. <Ref. to SB-11, OPERATION, Disposal of Pretensioner.>
• If the material gets in your eyes or on your skin during deployment, wash it away with clean water, and then consult a doctor.

C: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299FC030	98299FC030	ADAPTER A (DEPLOYMENT)	• Used for deploying the pretensioner. • Used with DEPLOYMENT TOOL (98299PA030).
 ST98299SA050	98299SA050	ADAPTER F (DEPLOYMENT)	• Used for deploying the lap pretensioner. • Used with DEPLOYMENT TOOL (98299PA030).
 ST98299PA030	98299PA030	DEPLOYMENT TOOL	• Used for deploying the pretensioner. • Used with ADAPTER A or ADAPTER F (DEPLOYMENT) (98299FE010/98299SA050).

2. Inspection Locations After a Collision

A: INSPECTION

Check for the following, and then replace with new parts if necessary.

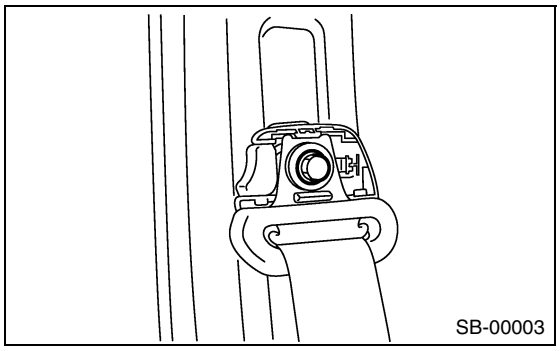
- Center pillar lower garnish is discolored or cracked.
- Wire harness and/or connector is damaged.

3. Front Seat Belt

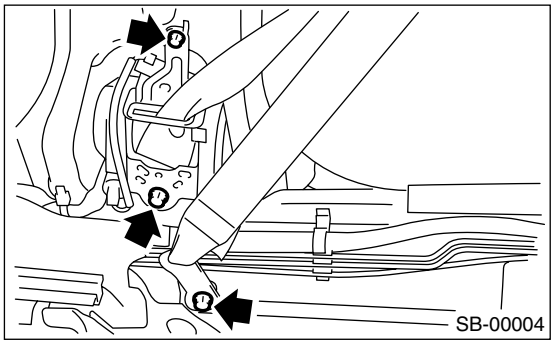
A: REMOVAL

1. FRONT OUTER BELT

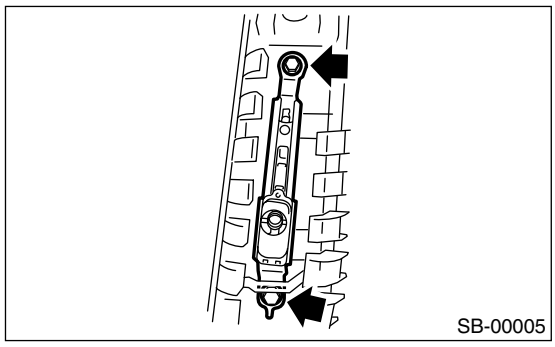
1) Fold backrest all the way forward, and then move front seat all the way forward.
2) Turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.
3) Remove the center pillar lower trim. <Ref. to EI-44, REMOVAL, Lower Inner Trim.>
4) Remove the anchor cover. Loosen the shoulder anchor bolt, and then detach the shoulder anchor from center pillar.


SB-00003

5) Turn over the floor mat to remove the bolts.


SB-00004

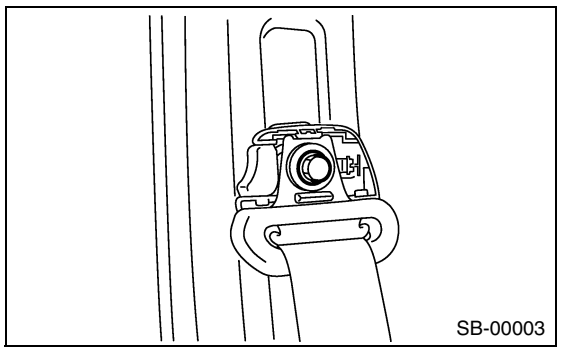
6) Disconnect the yellow connector of pretensioner harness, and remove the front outer belt.
7) Remove the center pillar upper trim. <Ref. to EI-43, REMOVAL, Upper Inner Trim.>
8) Remove the two bolts and adjustable anchor assembly.


SB-00005

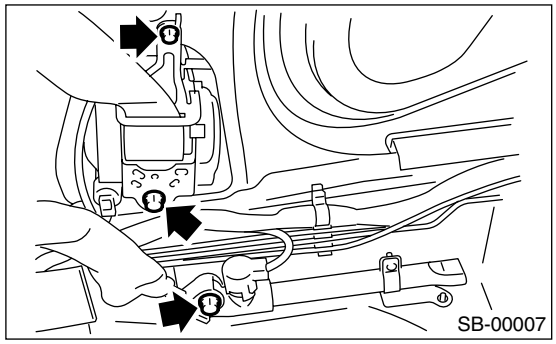
CAUTION:
• Do not drop or apply any impact to the pretensioner.
• Pretensioner and bracket should be treated as an assembly. Do not attempt to disassemble it.

2. FRONT OUTER SEAT BELT WITH LAP PRETENSIONER

1) Fold backrest forward, and then move front seat forward.
2) Turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.
3) Remove the center pillar lower trim. <Ref. to EI-44, REMOVAL, Lower Inner Trim.>
4) Remove the anchor cover. Loosen the shoulder anchor bolt, and then detach the shoulder anchor from center pillar.

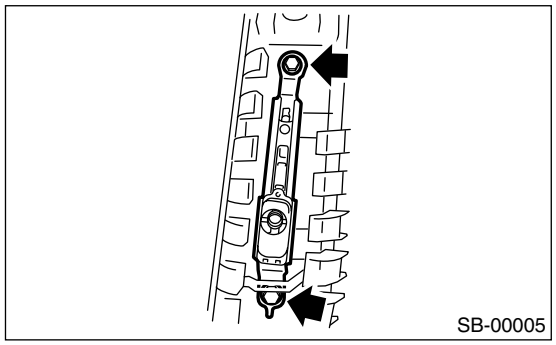

SB-00003

5) Turn over the floor mat to remove the bolts.


SB-00007

6) Disconnect the yellow connector of pretensioner harness and orange connector of lap pretensioner harness, and remove the front outer belt.
7) Remove the center pillar upper trim. <Ref. to EI-43, REMOVAL, Upper Inner Trim.>

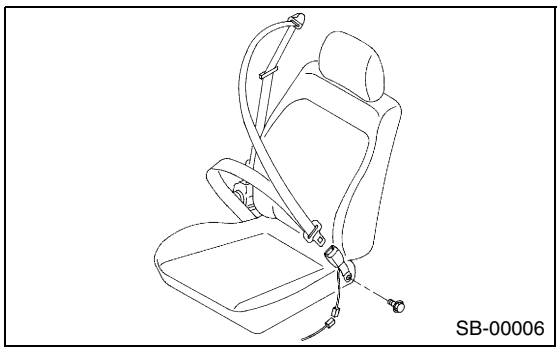
8) Remove the two bolts and adjustable anchor assembly.



CAUTION:
• Do not drop or apply any impact to the pretensioner.
• Pretensioner and bracket should be treated as an assembly. Do not attempt to disassemble it.

3. FRONT INNER BELT

1) Disconnect the connector.
2) Remove the anchor bolt, and then detach the inner belt.



B: INSTALLATION

1. FRONT OUTER BELT

Install in the reverse order of removal.

CAUTION:
• The parts on right and left are not identical. Before installation, make sure that the correct part is used.
• Be careful not to twist the belts during installation.

Tightening torque:
<Ref. to SB-2, FRONT SEAT BELT, COMPONENT, General Description.>

2. FRONT OUTER BELT WITH LAP PRETENSIONER

Install in the reverse order of removal.

CAUTION:
• The parts on right and left are not identical. Before installation, make sure that the correct part is used.
• Be careful not to twist the belts during installation.

Tightening torque:
<Ref. to SB-2, FRONT SEAT BELT, COMPONENT, General Description.>

3. FRONT INNER BELT

Install in the reverse order of removal.

Tightening torque:
<Ref. to SB-2, FRONT SEAT BELT, COMPONENT, General Description.>

C: INSPECTION

1. FRONT OUTER BELT

Check for the following, and replace with new parts if necessary.
• Pretensioner is cracked or deformed.
• Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

2. FRONT INNER BELT

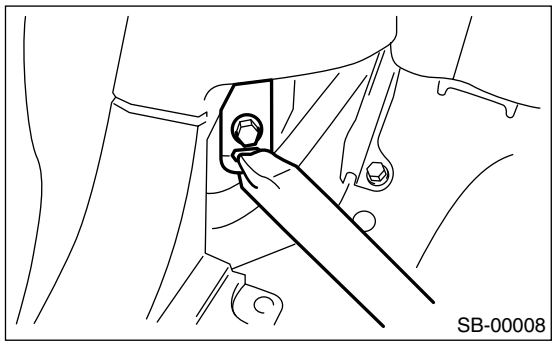
Check for the following, and replace with new parts if necessary.
• Inner belt is deformed or damaged.
• Seat belt buckle is engaged improperly.

4. Rear Seat Belt

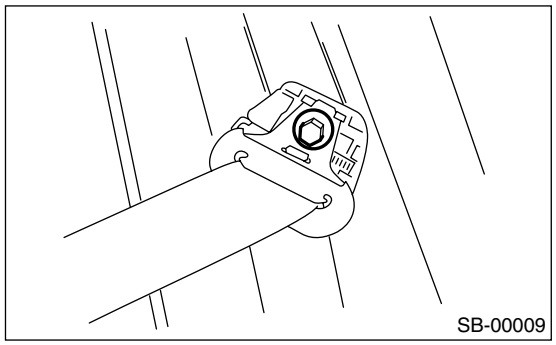
A: REMOVAL

1. OUTER BELT SIDE

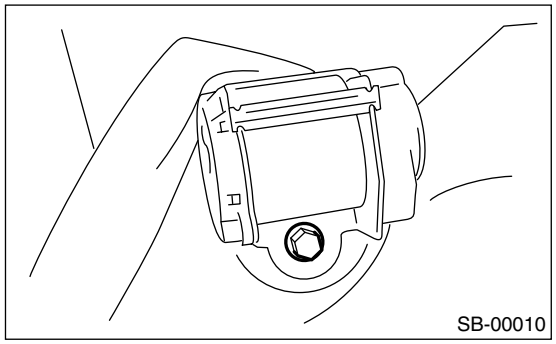
1) Remove the luggage floor mat. <Ref. to EI-50, REMOVAL, Luggage Floor Mat.>
2) Remove the rear seat. <Ref. to SE-10, REMOVAL, Rear Seat.>
3) Remove the rear quarter trim. <Ref. to EI-45, REMOVAL, Rear Quarter Trim.>
4) Remove the seat belt lower anchor bolt.


SB-00008

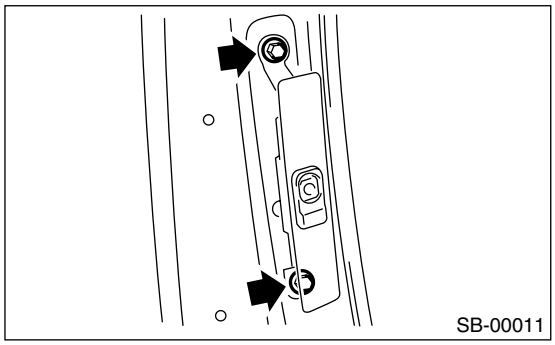
5) Remove the anchor cover. Remove the bolt and shoulder anchor from pillar.


SB-00009

6) Remove the rear quarter trim. <Ref. to EI-45, REMOVAL, Rear Quarter Trim.>
7) Remove the bolts, and then detach the outer belt side.

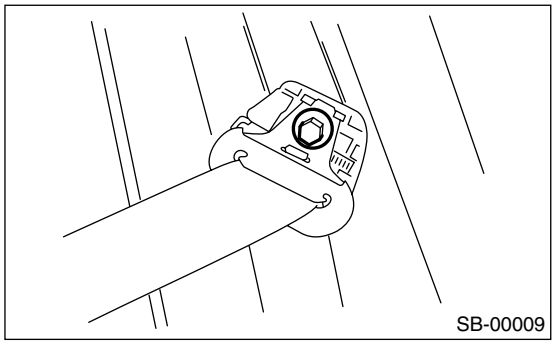

SB-00010

8) Remove the two bolts and adjustable anchor assembly.

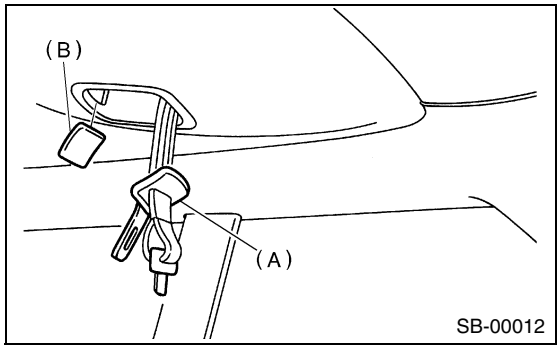

SB-00011

2. OUTER BELT CENTER

1) Remove the anchor cover. Remove the bolt and then detach the shoulder anchor from pillar.


SB-00009

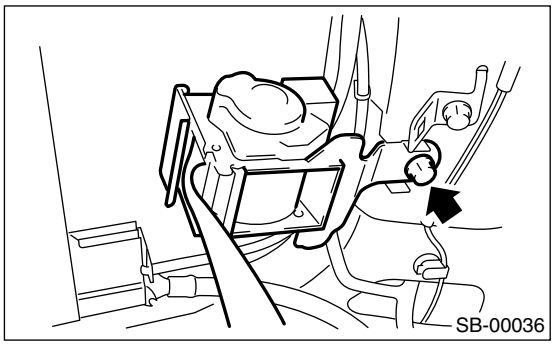
2) Remove the strut cap. <Ref. to EI-45, REMOVAL, Rear Quarter Trim.>
3) Remove the rear rail trim. <Ref. to EI-45, REMOVAL, Rear Quarter Trim.>
4) Remove the rear pillar upper trim. <Ref. to EI-45, REMOVAL, Rear Quarter Trim.>
5) Remove the rear skirt trim. <Ref. to EI-45, REMOVAL, Rear Quarter Trim.>
6) Remove the rear quarter lower trim. <Ref. to EI-45, REMOVAL, Rear Quarter Trim.>
7) Remove the cover (B) while detaching snap lock carefully. Put the outer belt center tongue (A) out to the other side of the trim through the hole.



SB-00012

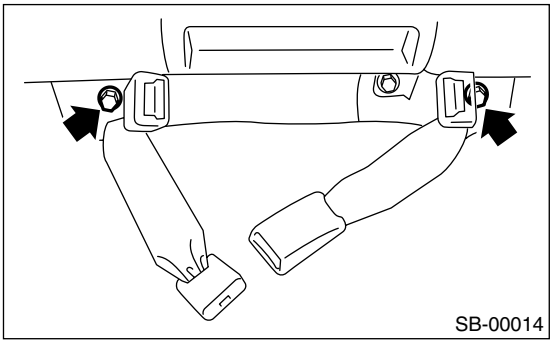
8) Remove the clips and hang down rear end of roof trim.

9) Disconnect the harness and connector, and then remove the outer belt center assembly.



3. INNER BELT

1) Remove the rear cushion.
2) Remove the bolt, and then detach the inner belt.



B: INSTALLATION

1. OUTER BELT SIDE

Install in the reverse order of removal.

CAUTION:
• During installation, make sure that the seat belts are not twisted.
• After installation, make sure that the seat belts can be smoothly extended and wound.

Tightening torque:
<Ref. to SB-3, REAR SEAT BELT, COMPONENT, General Description.>

2. OUTER BELT CENTER

Install in the reverse order of removal.

CAUTION:
• During installation, make sure that the seat belts are not twisted.
• After installation, make sure that the seat belts are smoothly extended and wound.

Tightening torque:
<Ref. to SB-3, REAR SEAT BELT, COMPONENT, General Description.>

3. INNER BELT

Install in the reverse order of removal.

CAUTION:
During installation, make sure that the seat belts are not twisted.

Tightening torque:
<Ref. to SB-3, REAR SEAT BELT, COMPONENT, General Description.>

C: INSPECTION

1. OUTER BELT SIDE

Check for the following, and replace with new parts if necessary.
• Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

2. OUTER BELT CENTER

Check for the following, and replace with new parts if necessary.
• Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

3. INNER BELT

Check for the following, and replace with new parts if necessary.
• Inner belt is deformed or damaged.
• Seat belt buckle is engaged improperly.

5. Disposal of Pretensioner

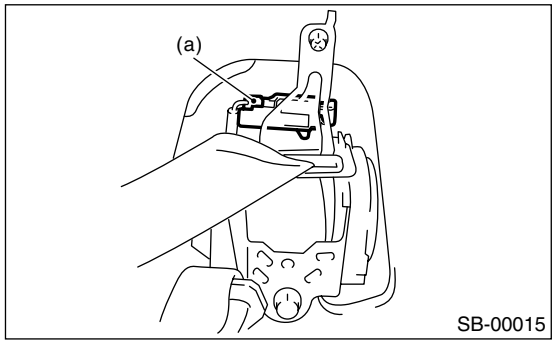
A: CAUTION

• Do not discard undeployed pretensioners, because they may cause serious personal injury when accidentally deployed.
• Deployment of the pretensioners should be done on a flat place free from any possible danger. Avoid deploying outdoors during heavy rainy or strong windy weather.
• Do not drop or damage the pretensioner.
• Because deploying the pretensioners causes a high-explosive noise, be sure to warn people in the area, and do not allow anyone within a 5 m (16 ft) radius of the disposal site.
• Some smoke will be emitted after deployment of the pretensioners. Therefore, it must be deployed in a well-ventilated area with no smoke alarms nearby.
• Wear gloves, goggles, and earplugs during this operation. Wash your hands afterwards.
• After deployment, the pretensioner is especially hot. Leave it unattended for 40 minutes or longer, and then discard it.
• Do not let water get on the deployed pretensioner.
• Wrap the deployed pretensioner in an airtight vinyl bag, and then discard it.
• If circumstances do not permit pretensioner deployment, contact a SUBARU dealer.

B: OPERATION

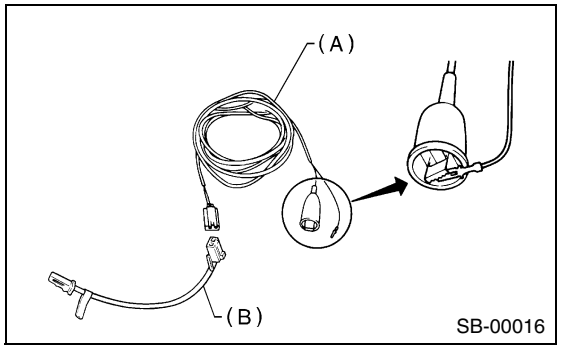
1. DEPLOYING OF PRETENSIONER WHILE INSTALLED IN VEHICLE

1) Fold backrest all the way forward, and then move front seat all the way forward.
2) Turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.
3) Remove the center pillar lower trim. <Ref. to EI-44, REMOVAL, Lower Inner Trim.>
4) Disconnect the yellow connector (a) a from pretensioner.



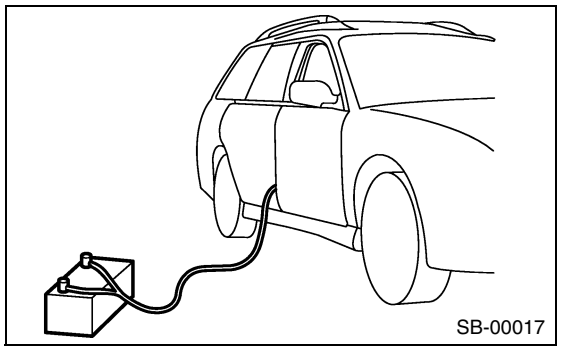
5) Short the terminal to alligator clip furnished as deployment tool (A).
6) Connect the deployment tool and adapter A (deployment) (B).

CAUTION:
The deployment tool terminals should be kept shorted until just before deployment of the pretensioner.



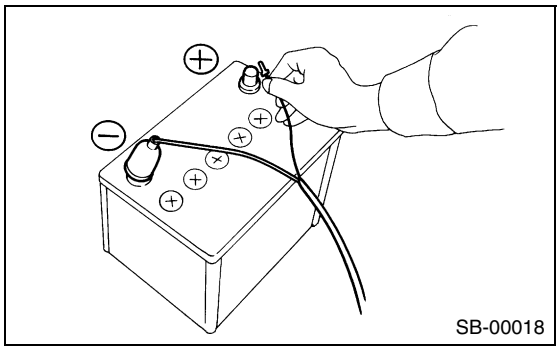
(A) Deployment tool: (Part No. 98299PA030)
(B) Adapter A (deployment): (Part No. 98299FC030)

7) Connect the adapter A (deployment) connector and pretensioner yellow connector.
8) Extend the deployment tool to the limit, and make sure that the vehicle is empty. Close all windows, sunroof, and rear gate completely.



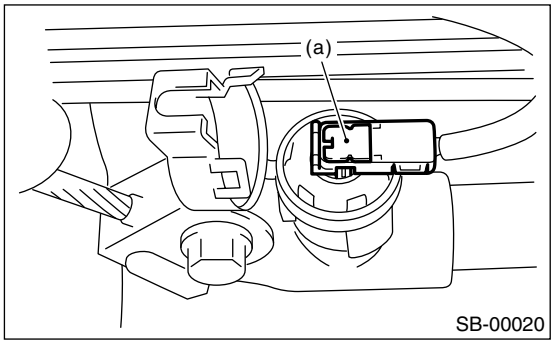
9) Move the battery at least 5 m (16 ft) from the vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (−) terminal.

10) Connect the other cable of deployment tool to the battery positive (+) terminal. Then deploy the pretensioner.



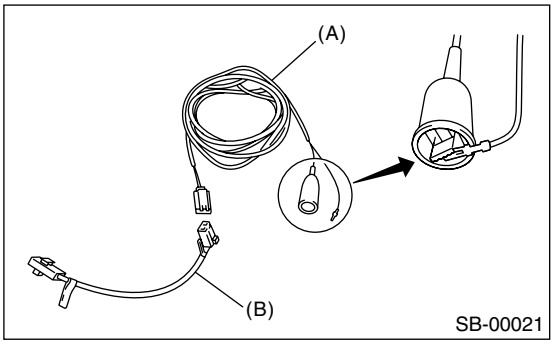
CAUTION:
• After deployment, pretensioner is especially hot. Leave it unattended for 40 minutes or longer.
• Do not let water get on the deployed pretensioner.

11) Perform the following steps 12) through 17) for the vehicle with lap pretensioner.
12) Disconnect the orange connector (a) from lap pretensioner.



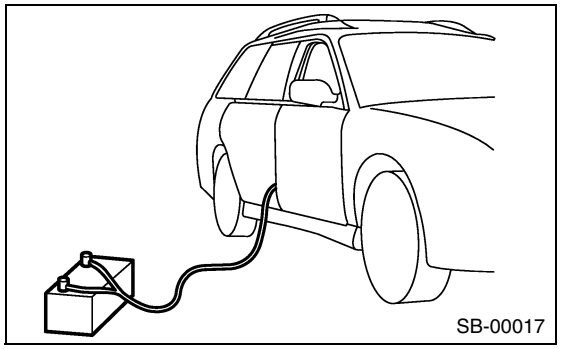
13) Connect the deployment tool (A) and adapter F (deployment) (B).

CAUTION:
The deployment tool terminals should be kept shorted until just before deployment of the pretensioner.

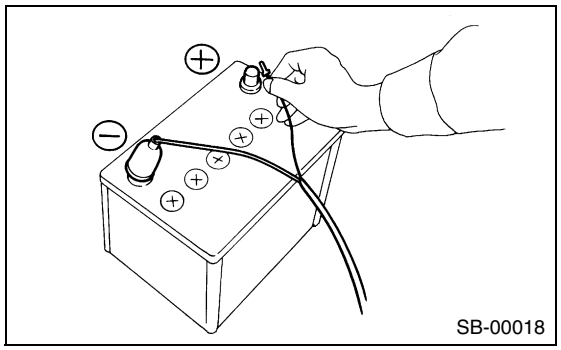


(A) Deployment tool: (Part No. 98299PA030)
(B) Adapter F (Deployment): (Part No. 98299SA050)

14) Connect the adapter F (deployment) connector and lap pretensioner orange connector.
15) Extened the deployment tool to the limit, and make sure that the vehicle is empty. Close all windows, sunroof and rear gate completely.

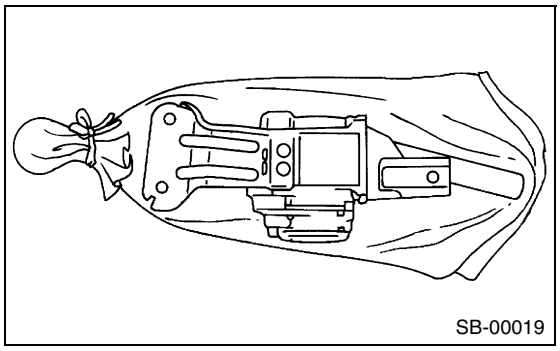


16) Move the battery at least 5 m (16 ft) from the vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (−) terminal.
17) Connect the other cable of deployment tool to the battery positive (+) terminal. Then deploy the pretensioner.



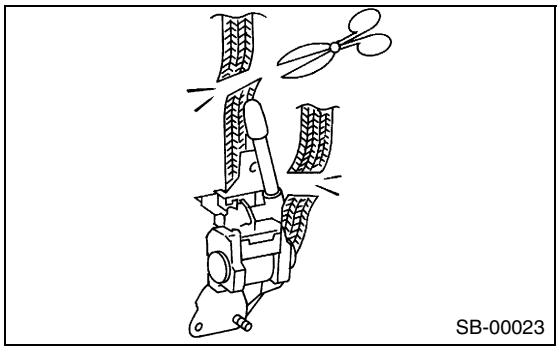
CAUTION:
• After deployment, pretensioner is especially hot. Leave it unattended for 40 minutes or longer.
• Do not let water get on the deployed pretensioner.

18) Remove the front outer belt. <Ref. to SB-7, REMOVAL, Front Seat Belt.>
19) Wrap the deployed pretensioner in an airtight vinyl bag, and discard it.


SB-00019

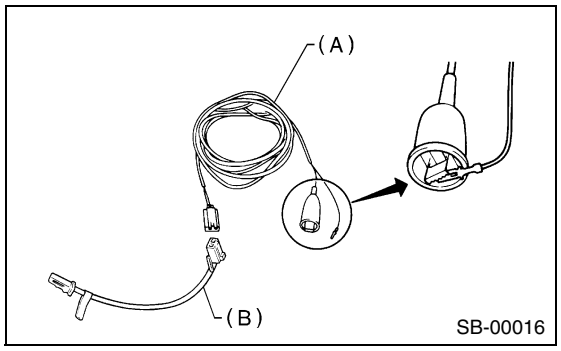
2. DEPLOYING OF RETRACTOR PRETENSIONER AFTER REMOVAL FROM VEHICLE

1) Fold backrest all the way forward, then move front seat all the way forward.
2) Turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.
3) Remove the front outer belt. <Ref. to SB-7, Removal.>
4) Cut off the seat belt as close to retractor as possible.


SB-00023

5) Short the terminal to alligator clip furnished as a deployment tool.
6) Connect the deployment tool (A) and adapter A (deployment) (B).

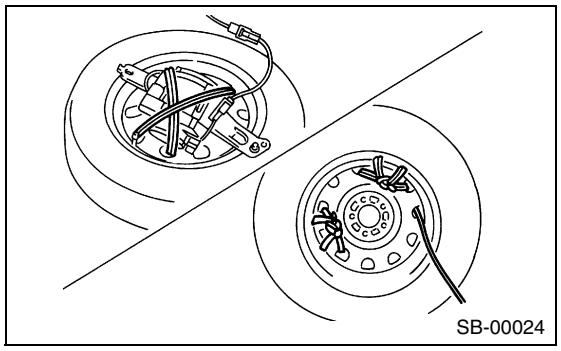
CAUTION:
The deployment tool terminals should be kept shorted until just before deployment of the pretensioner.



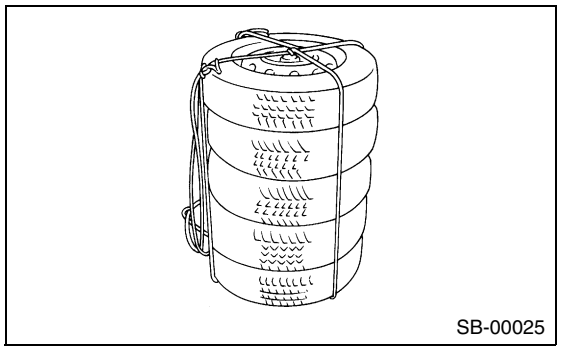
SB-00016

(A) Deployment tool: (Part No. 98299PA030)
(B) Adapter A (deployment): (Part No. 98299FC030)

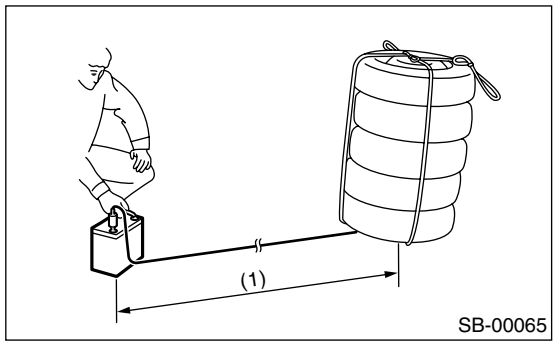
7) Connect the adapter A (deployment) connector and pretensioner yellow connector.
8) Install the pretensioner on a wheel with tire. Then, bundle three wire automotive harness [each with a sectional area of 1.25 mm^2 (0.00194 sq in) or more], and bind them twofold around the pretensioner bracket and wheel.


SB-00024

9) Put three tires without a wheel on the tire installed with pretensioner. Put on an additional tire with a wheel on top, and then fasten them tight with a rope.

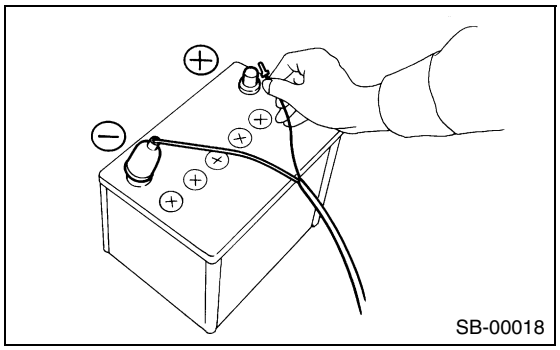

SB-00025

10) Move the battery at least 5 m (16 ft) from the vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (–) terminal.



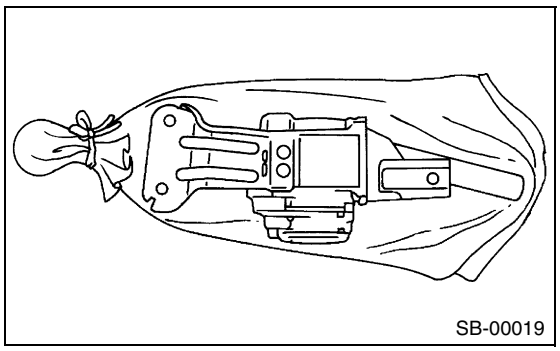
(1) 5 m (16 ft) or more

11) Connect the other cable of deployment tool to the battery positive (+) terminal. Then deploy the pretensioner.



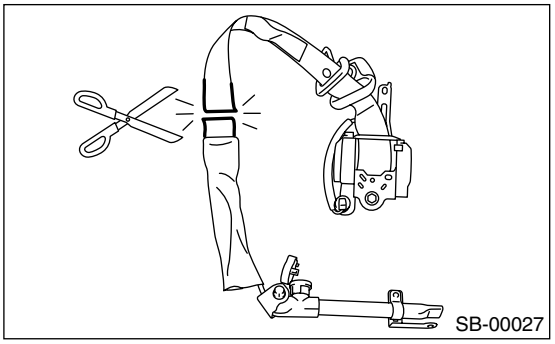
CAUTION:
• After deployment, pretensioner is especially hot. Leave it unattended for 40 minutes or longer.
• Do not let water get on the deployed pretensioner.

12) Wrap the deployed pretensioner in an airtight vinyl bag, and discard it.



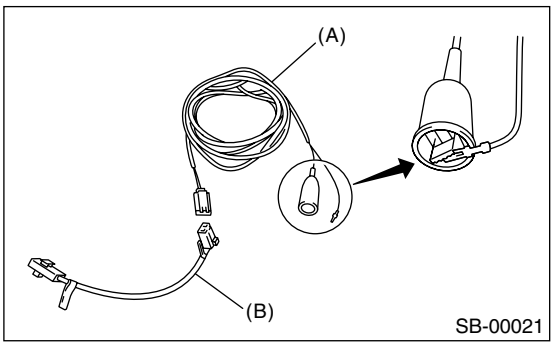
3. DEPLOYING LAP PRETENSIONER AFTER REMOVAL FROM VEHICLE

1) Fold backrest all the way forward, then move front seat all the way forward.
2) Turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.
3) Remove the fornt outer belt. <Ref. to SB-7, REMOVAL, Front Seat Belt.>
4) Cut off the seat belt as close to lap pretensioner as possible.



5) Short the terminal to alligator clip furnished as a deployment tool (A).
6) Connect the deployment tool and adapter F (deployment) (B).

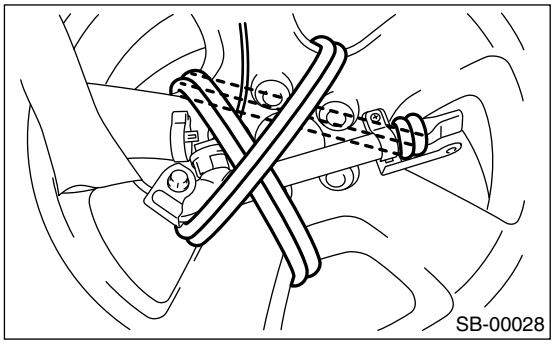
CAUTION:
The deployment tool terminals should be kept shorted until just before deployment of the pretensioner.



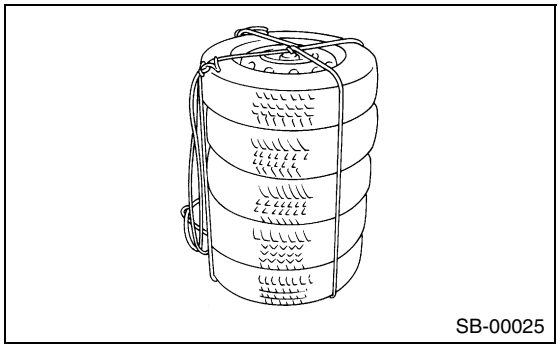
(A) Deployment tool: (Part No. 98299PA030)
(B) Adapter F (deployment): (Part No. 98299SA050)

7) Connect the adapter F (deployment) connector to pretensioner yellow connector.

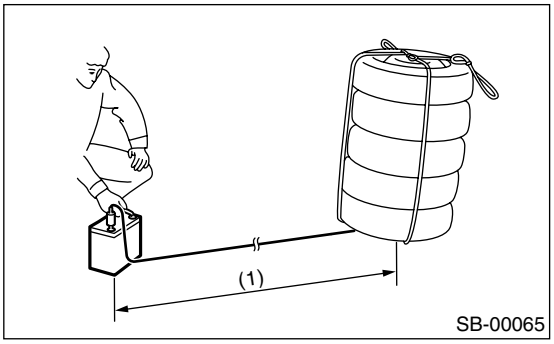
8) Install the pretensioner on a wheel with tire. Then, bundle three wire automotive harness [each with a sectional area of 1.25 mm^2 (0.00194 sq in) or more], and bind them twofold around the pretensioner bracket and wheel.



9) Put three tires without a wheel on the tire installed with pretensioner. Put on an additional tire with a wheel on top, and then fasten them tight with a rope.

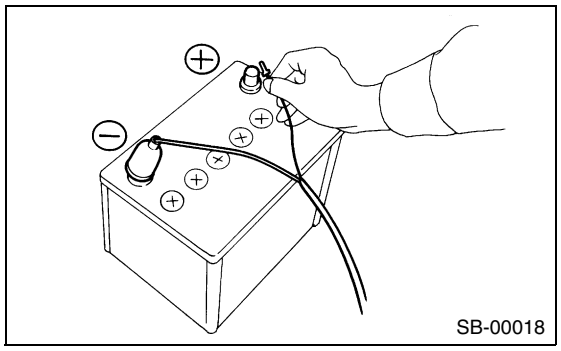


10) Move the battery at least 5 m (16 ft) from the vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (–) terminal.



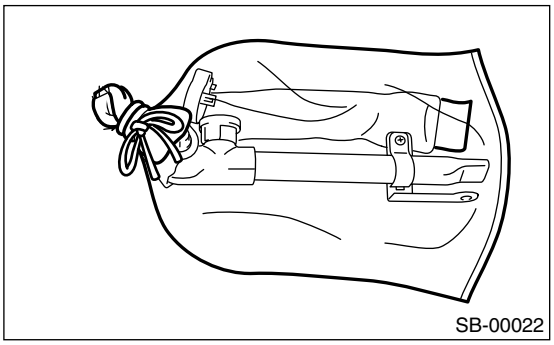
(1) 5 m (16 ft) or more

11) Connect the other cable of deployment tool to the battery positive (+) terminal. Then deploy the pretensioner.



CAUTION:
• After deployment, pretensioner is especially hot. Leave it unattended for 40 minutes or longer.
• Do not let water get on the deployed pretensioner.

12) Wrap the deployed pretensioner in an airtight vinyl bag, and discard it.



DISPOSAL OF PRETENSIONER

LIGHTING SYSTEM

LI

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24.	Side Turn Signal Light	28
25.	Spot Light	29
26.	Room Light	30
27.	Luggage Room Light	31
28.	Glove Box Light	32

1. General Description

A: SPECIFICATIONS

Headlight		12 V — 55 W/60 W
Front turn signal light		12 V — 21 W
Side turn signal light		12 V — 5 W
Parking light		12 V — 5 W
Front fog light		12 V — 55 W
Rear fog light		12 V — 21 W
Rear combination light	Tail/Stop light	12 V — 5/21 W
	Turn signal light	12 V — 21 W
	Back-up light	12 V — 16 W
License plate light		12 V — 5 W
High-mounted stop light		12 V — 10 W
Room light		12 V — 8 W
Spot light		12 V — 8 W
Luggage room light		12 V — 5 W
Glove box light		12 V — 1.4 W

B: PRECAUTIONS

- Before disassembling or reassembling parts, always disconnect the battery ground cable. When replacing radio, control module, and other parts provided with memory functions, record memory contents before disconnecting the battery ground cable. Otherwise, the memory will be erased.
- Reassemble in reverse order of disassembly, unless otherwise indicated.
- Adjust parts to the given specifications.
- Connect the connectors and hoses securely during reassembly.
- After reassembly, make sure functional parts operate smoothly.

WARNING:

- **Airbag system wiring harness is routed near electrical parts and switches. All airbag system wiring harnesses and connectors are yellow. Do not use electric test equipment on these circuits.**
- **Be careful not to damage the airbag system wiring harness when servicing electrical parts and switches.**

C: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

2. Headlight and Tail Light System

A: SCHEMATIC

1. HEADLIGHT

<Ref. to WI-216, SCHEMATIC, Security System.>

2. CLEARANCE LIGHT AND ILLUMINATION LIGHT

<Ref. to WI-99, SCHEMATIC, Clearance Light and Illumination Light System.>

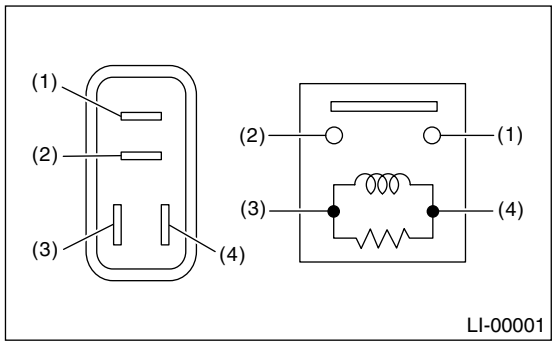
B: INSPECTION

1. HEADLIGHT SWITCH

<Ref. to LI-11, INSPECTION, Combination Switch (Light).>

2. HEADLIGHT RELAY

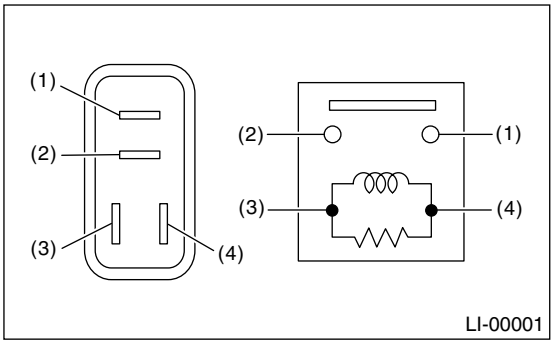
Measure the headlight relay resistance between terminals when connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground terminal.



Current	Terminal No.	Standard
Flow	1 and 2	Less than 1Ω
No flow		More than 1MΩ

3. TAIL AND ILLUMINATION RELAY

Measure the tail and illumination relay resistance between terminals when connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground terminal.



Current	Terminal No.	Standard
Flow	1 and 2	Less than 1Ω
No flow		More than 1MΩ

3. Front Fog Light System

A: SCHEMATIC

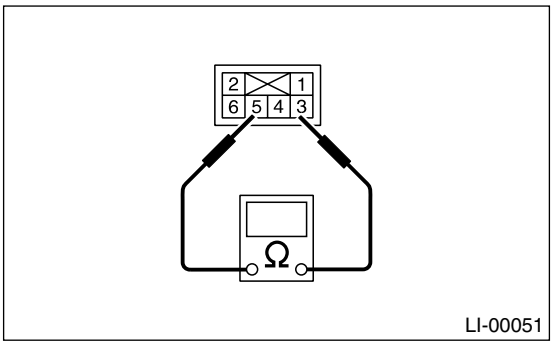
1. FRONT FOG LIGHT

<Ref. to WI-161, SCHEMATIC, Front Fog Light System.>

B: INSPECTION

1. FRONT FOG LIGHT SWITCH

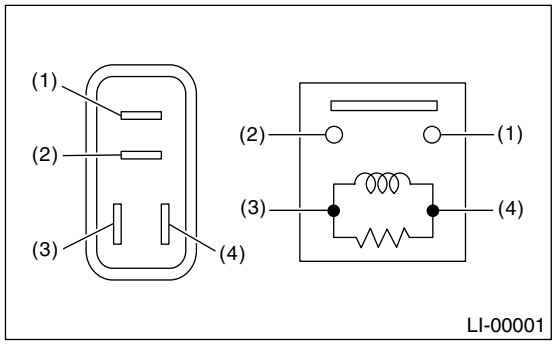
Measure the front fog light switch resistance.



Switch position	Terminal No.	Standard
OFF	3 and 5	More than 1MΩ
ON		Less than 1Ω

2. FRONT FOG LIGHT RELAY

Measure the front fog light relay resistance between terminals when connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground terminal.



Current	Terminal No.	Standard
Flow	1 and 2	Less than 1Ω
No flow		More than 1MΩ

4. Rear Fog Light System

A: SCHEMATIC

1. REAR FOG LIGHT

<Ref. to WI-206, SCHEMATIC, Rear Fog Light System.>

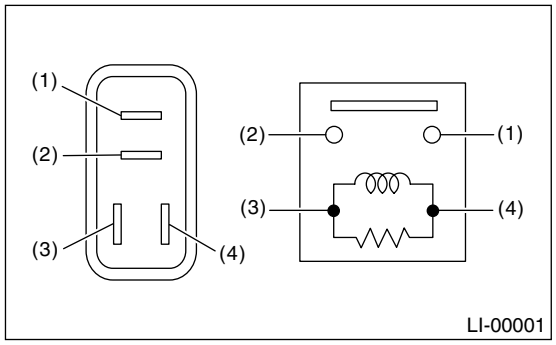
B: INSPECTION

1. REAR FOG LIGHT SWITCH

1) Turn the ignition switch to ON.
2) Turn on the headlight or front fog light.
3) Push the rear fog light switch and check if the rear fog light turns on.

2. REAR FOG LIGHT RELAY

Measure the rear fog light relay resistance between terminals when connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground terminal.



Current	Terminal No.	Standard
Flow	1 and 2	Less than 1Ω
No flow		More than 1MΩ

5. Turn Signal and Hazard Light System

A: SCHEMATIC

1. TURN SIGNAL LIGHT AND HAZARD LIGHT

<Ref. to WI-222, SCHEMATIC, Turn Signal Light and Hazard Light System.>

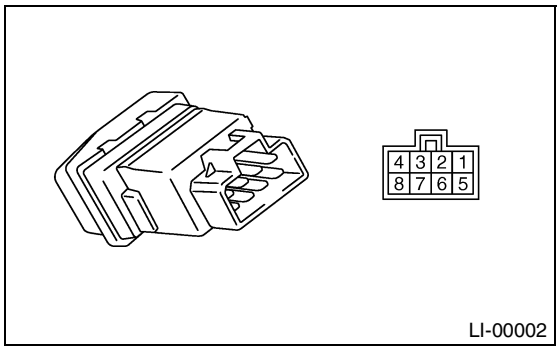
B: INSPECTION

1. TURN SIGNAL SWITCH

<Ref. to LI-11, INSPECTION, Combination Switch (Light).>

2. HAZARD SWITCH

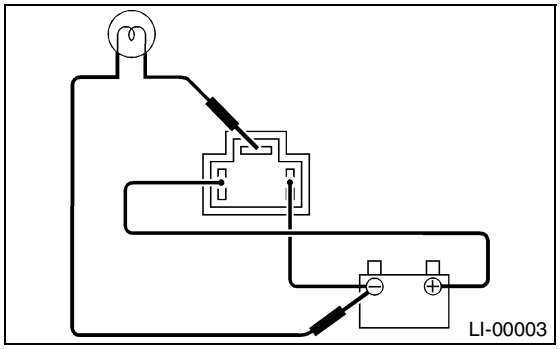
Measure the hazard switch resistance.



Switch position	Terminal No.	Standard
OFF	6 and 7	Less than 1Ω
ON	1, 3 and 4	Less than 1Ω
	7 and 8	Less than 1Ω

3. TURN SIGNAL AND HAZARD MODULE

Connect the battery and turn signal light bulb to the module, as shown in the figure. The module is properly functioning if it blinks when power is supplied to the circuit.



6. Back-up Light System

A: SCHEMATIC

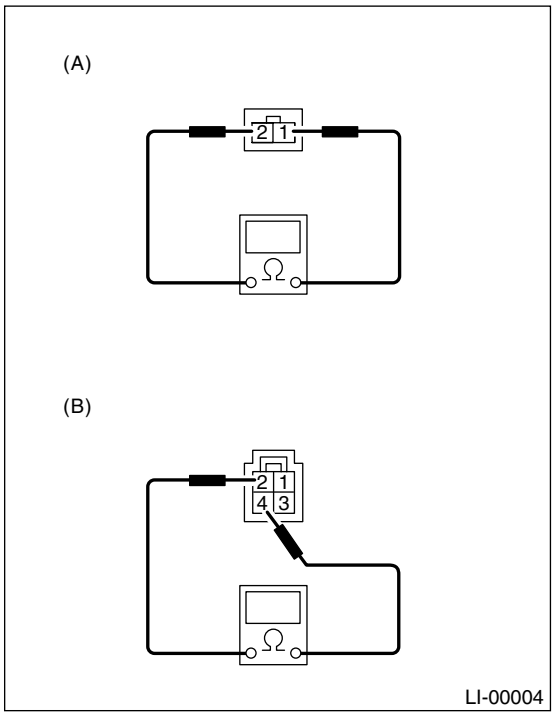
1. BACK-UP LIGHT

<Ref. to WI-97, SCHEMATIC, Back-up Light System.>

B: INSPECTION

1. BACK-UP LIGHT SWITCH (M/T)

Measure the back-up light switch resistance.

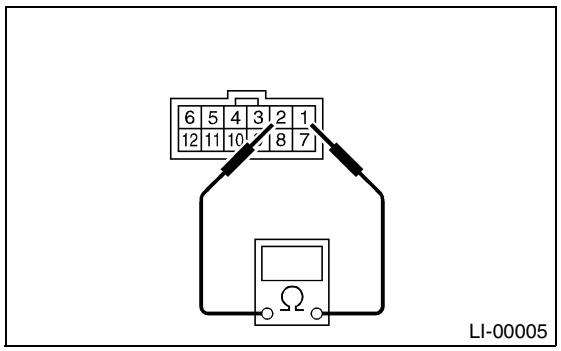


(A) Non-turbo model
(B) Turbo model

Switch position	Terminal No.	Standard
When shift lever is set in reverse position	Turbo model: 2 and 4 Non-turbo model: 1 and 2	Less than 1Ω
Other positions		More than 1MΩ

2. INHIBITOR SWITCH (A/T)

Measure the inhibitor switch resistance.



Switch position	Terminal No.	Standard
When select lever is set in “R” position	1 and 2	Less than 1Ω
Other positions		More than 1MΩ

7. Stop Light System

A: SCHEMATIC

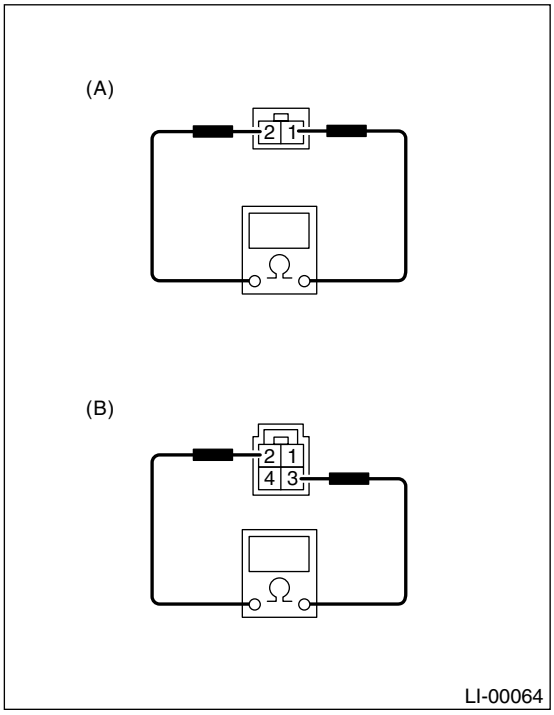
1. STOP LIGHT

<Ref. to WI-220, SCHEMATIC, Stop Light System.>

B: INSPECTION

1. STOP LIGHT SWITCH

Measure the stop light switch resistance.



(A) Without cruise control
(B) With cruise control

Switch position	Terminal No.	Standard
When brake pedal is depressed	1 and 2: Without cruise control 2 and 3: With cruise control	Less than 1Ω
When brake pedal is released		More than 1MΩ

8. Interior Light System

A: SCHEMATIC

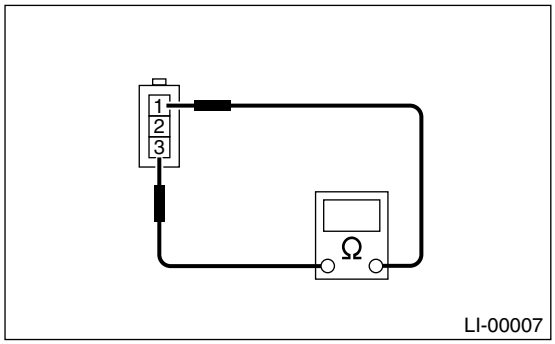
1. INTERIOR LIGHT

<Ref. to WI-176, SCHEMATIC, In Compartment Light System.>

B: INSPECTION

1. DOOR SWITCH

Measure the door switch resistance.



Switch position	Terminal No.	Standard
When door is opened	1 and 3	Less than 1Ω
When door is closed		More than 1MΩ

2. REAR GATE LATCH SWITCH

Measure the rear gate latch switch resistance.

Switch position	Terminal No.	Standard
When rear gate is opened	1 and 2	Less than 1Ω
When rear gate is closed		More than 1MΩ

9. Headlight Beam Leveler System

A: SCHEMATIC

1. HEADLIGHT BEAM LEVELER

<Ref. to WI-167, SCHEMATIC, Headlight Beam Leveler System.>

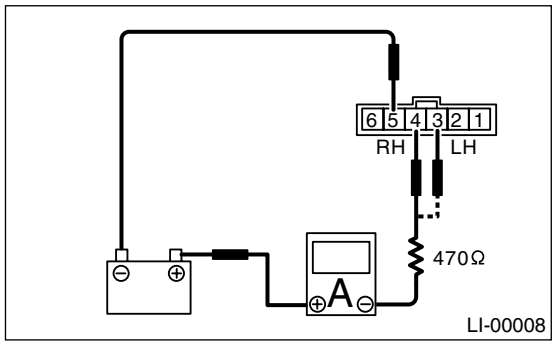
B: INSPECTION

1. HEADLIGHT BEAM LEVELER ACTUATOR

1) Turn on the headlights.
2) Confirm the headlight beam level is lowered by changing the switch position to 0 - 1 - 2 - 3 - 4 - 5.

2. HEADLIGHT BEAM LEVELER SWITCH

Connect the battery, headlight beam leveler switch connector, circuit tester and resistor (470 Ω) as shown in the figure. Measure the current at each switch position.

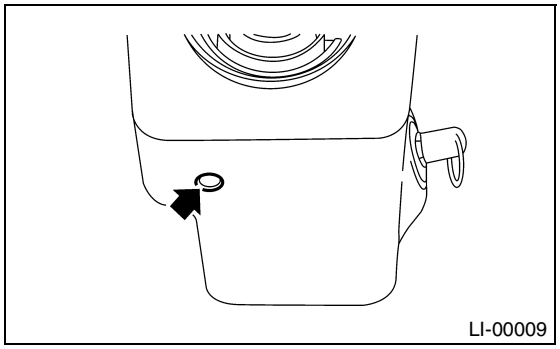


Switch position	Current (mA)
0	3.8
1	7.0
2	9.8
3	14.7
4	20.3
5	25.5

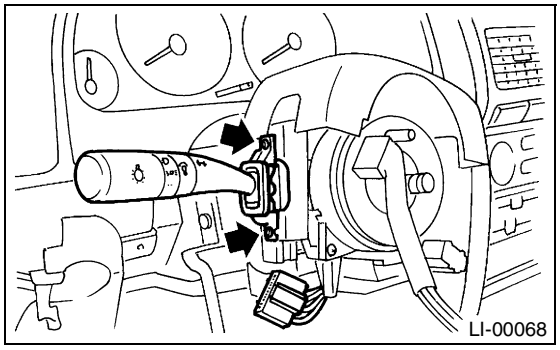
10.Combination Switch (Light)

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover. <Ref. to EI-40, REMOVAL, Instrument Panel Assembly.>
3) Remove the screws which secure upper column cover to lower column cover.



4) Disconnect the connector from combination switch.
5) Remove the screws which secure switch, and then remove the switch.

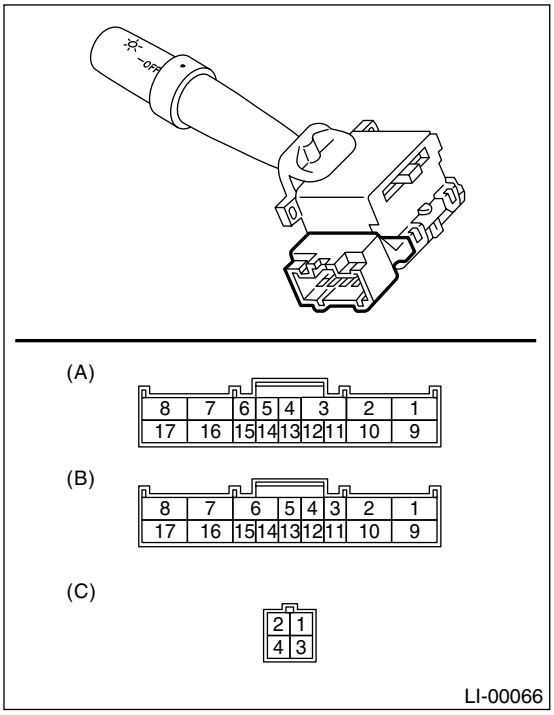


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the combination switch resistance.



(A) Lighting & turn signal switch connector LHD and RHD model with rear fog light:
(B) Lighting & turn signal switch connector RHD model without rear fog light:
(C) Parking switch connector

1. LIGHTING SWITCH

LHD and RHD model with rear fog light:

Switch position	Terminal No.	Standard
OFF	—	More than 1MΩ
Tail	14 and 16	Less than 1Ω
Head	13, 14 and 16	Less than 1Ω

RHD model without rear fog light:

Switch position	Terminal No.	Standard
OFF	—	More than 1MΩ
Tail	9 and 15	Less than 1Ω
Head	9, 14 and 15	Less than 1Ω

2. DIMMER AND PASSING SWITCH

LHD and RHD model with rear fog light:

Switch position	Terminal No.	Standard
Passing	7, 8 and 16	Less than 1Ω
Low beam	16 and 17	Less than 1Ω
High beam	7 and 16	Less than 1Ω

RHD model without rear fog light:

Switch position	Terminal No.	Standard
Passing	1, 2 and 9	Less than 1Ω
Low beam	9 and 10	Less than 1Ω
High beam	2 and 9	Less than 1Ω

3. TURN SIGNAL SWITCH

LHD and RHD with rear fog light:

Switch position	Terminal No.	Standard
Left	1 and 2	Less than 1Ω
Neutral	—	More than 1MΩ
Right	2 and 3	Less than 1Ω

RHD model without rear fog light:

Switch position	Terminal No.	Standard
Left	6 and 7	Less than 1Ω
Neutral	—	More than 1MΩ
Right	7 and 8	Less than 1Ω

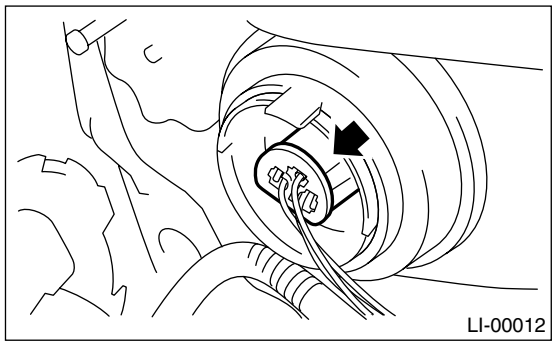
4. PARKING SWITCH

Switch position	Terminal No.	Standard
OFF	2 and 4	Less than 1Ω
ON	1 and 4	Less than 1Ω

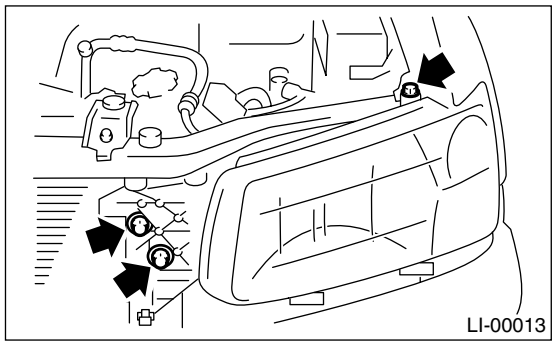
11.Headlight Assembly

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the air intake duct (when right side headlight is removed). <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
3) Remove the front grille and headlight side cover. <Ref. to EI-18, REMOVAL, Front Grille.> and <Ref. to EI-23, REMOVAL, Front Bumper.>
4) Disconnect the headlight bulb connector.


LI-00012

5) Remove the three bolts and disconnect connectors, and then detach the headlight assembly.


LI-00013

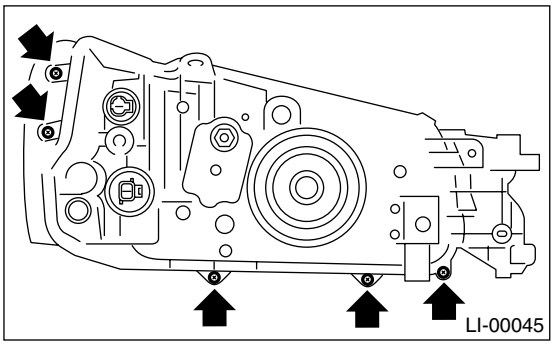
B: INSTALLATION

Install in the reverse order of removal.

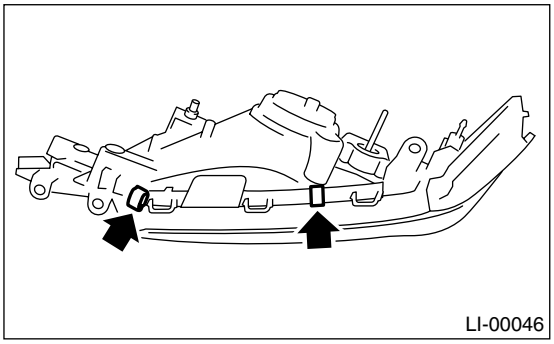
C: DISASSEMBLY

CAUTION:
- **Do not touch the bulb glass portion.**
- **Do not touch inside the lens (extension portion) or reflector portion.**
- **Replace the packing with a new one.**

1) Remove the headlight assembly. <Ref. to LI-13, REMOVAL, Headlight Assembly.>
2) Remove the five screws.

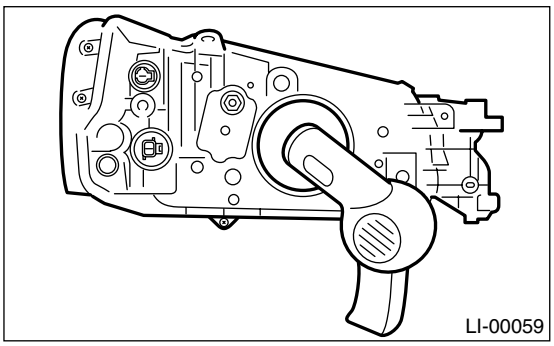

LI-00045

3) Remove the two clips.

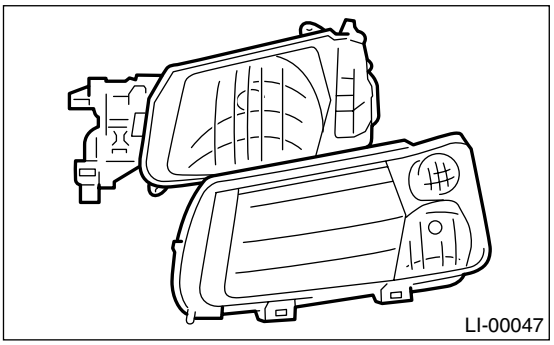

LI-00046

4) Remove the rubber cap, and then detach the bulb.
5) Heat the seal portion using a dryer through the bulb mounting hole.

CAUTION:
Avoid heating one specific point of the seal portion and heating the headlight assembly to 120°C (248°F) or more.

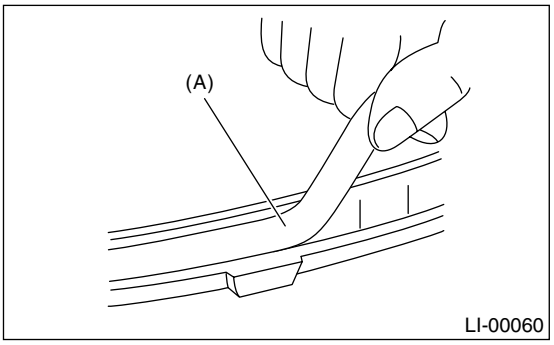

LI-00059

6) Unhook the hook, and then take the lens off the headlight assembly.



7) Remove packing (A) from the seal groove.

CAUTION:
Completely remove the packing not to leave any chips behind.

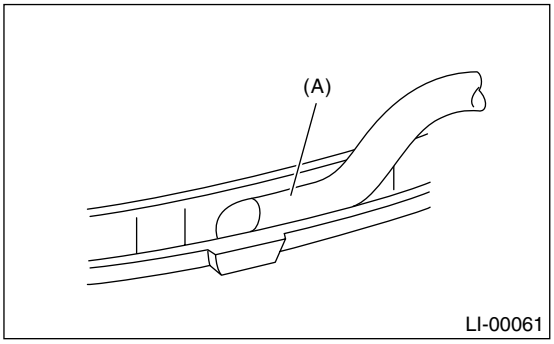


(A) Packing

D: ASSEMBLY

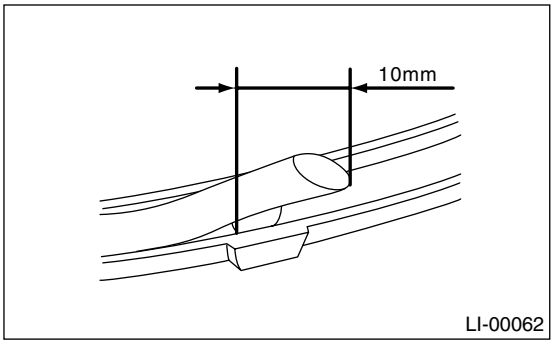
1) Cut the tip of packing (A) at an angle of 45°.
2) With the cut end facing upward, insert packing (A) into the groove around the seal.

CAUTION:
• If the packing protrudes, slowly take it off the groove.
• Do not stretch the packing. If the packing is stretched, seal fails.



(A) Packing

3) After making a round of the seal, cut its tip at an angle of 45°, with its length 10 mm (0.39 in) longer than the circumference of seal so that the tip overlaps the other. Then, press it onto the seal, using a screwdriver.



4) Match the positions of the lens and headlight assembly, and then insert the lens into the headlight assembly.
5) Secure the hook, and then install the clip and screw.
6) Put the seal portion of headlight assembly into the water and check that water does not enter inside the headlight.

CAUTION:
Be sure that water does not enter inside the headlight through the bulb socket and ventilation hole.

E: ADJUSTMENT

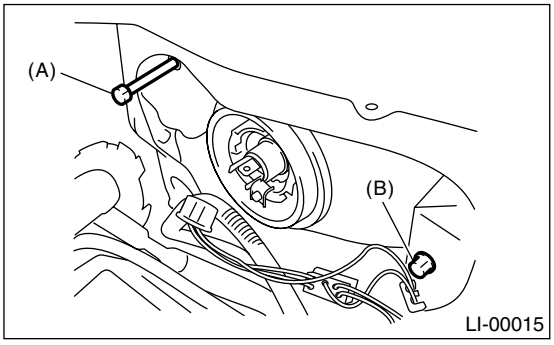
1. HEADLIGHT AIMING

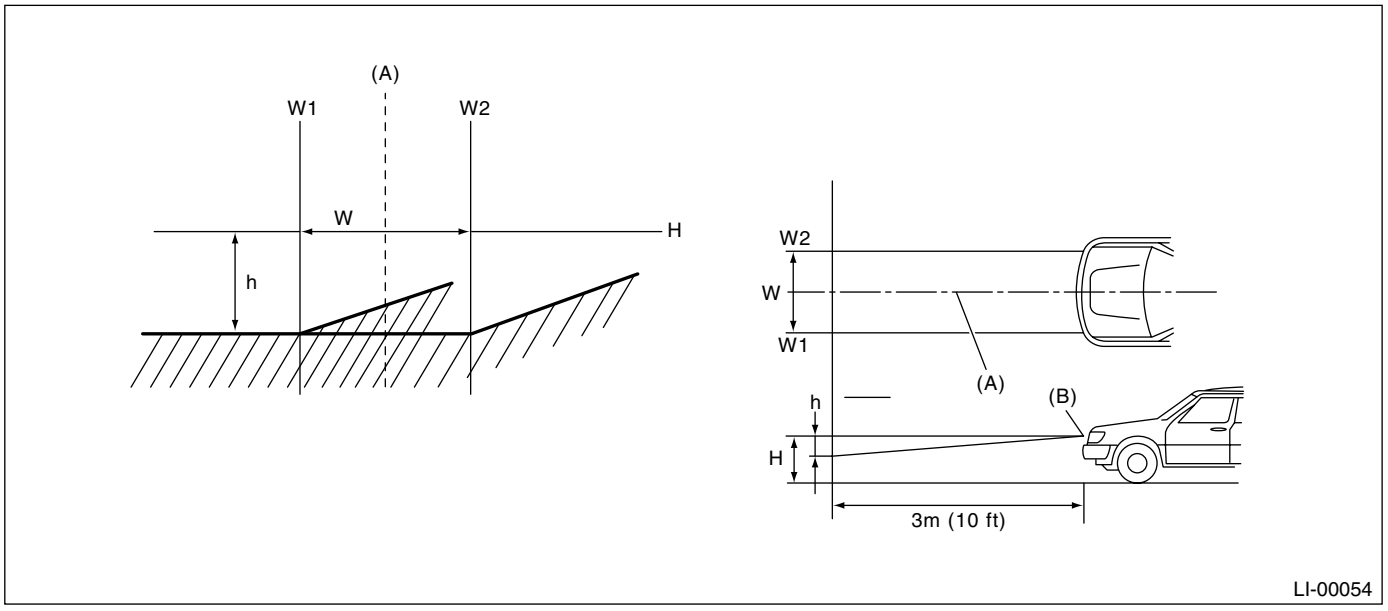
CAUTION:
Turn off the light before adjusting headlight aiming. If the light is necessary to check aiming, do not turn on for more than two minutes.

NOTE:
Before checking the headlight aiming, be sure of the following:
- The area around the headlight has not sustained any accident, damage or other type of deformation.
- Vehicle is parked on level ground.
- The inflation pressure of tires is correct.
- Vehicle's gas tank is fully charged.
- Bounce the vehicle several times to normalize the suspension.
- Make certain that someone is seated in the driver's seat.

Turn the headlights on and then adjust the low beam pattern to the following positions on the screen.

NOTE:
- Set the headlight leveler switch to "0" position.
- Adjust the vertical aim (A) first, then horizontal aim (B).





(A) Vehicle center (B) Bulb center

This illustration is for LHD model. The pattern for RHD model is symmetrically opposite.

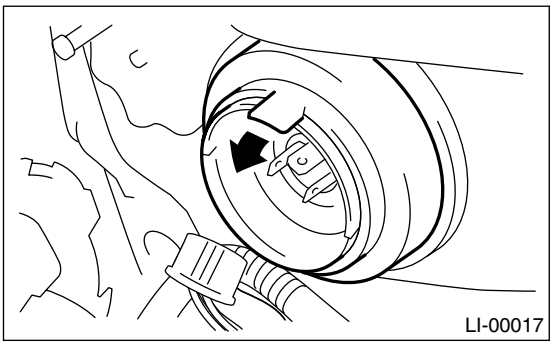
W mm (in)	H mm (in)	h mm (in) at 3 m (10 ft)
1,140 (44.88)	733 (28.9)	21 (0.83)

12.Headlight Bulb

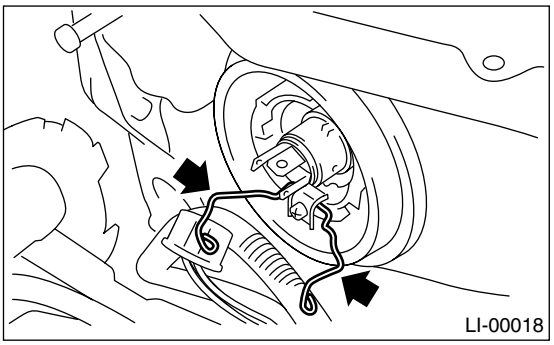
A: REMOVAL

CAUTION:
• Because the halogen bulb operates at a high temperature, dirt and oil on the bulb surface reduces the bulb's service life. Hold the flange portion when replacing the bulb. Never touch the glass portion.
• Do not leave the headlight without a bulb for a long time. Dust, moisture, etc. entering the headlight may affect its performance.

1) Disconnect the ground cable from battery.
2) Remove the air intake duct (when right side headlight is removed). <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
3) Disconnect the harness connector.
4) Remove the rubber cap.



5) Remove the light bulb retaining spring to remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
• Attach the rubber cap with letters TOP on the top so the drain hole will be on the lower side.

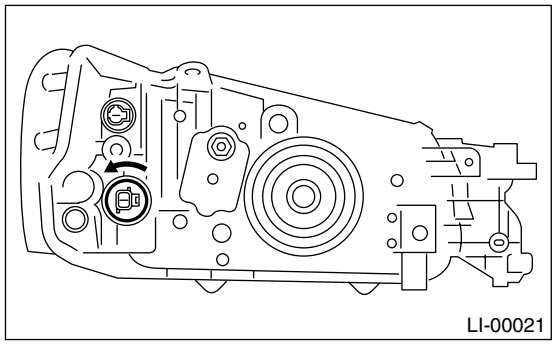
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

13.Front Turn Signal Light Bulb

A: REMOVAL

1) Remove the headlight assembly. <Ref. to LI-13, REMOVAL, Headlight Assembly.>
2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

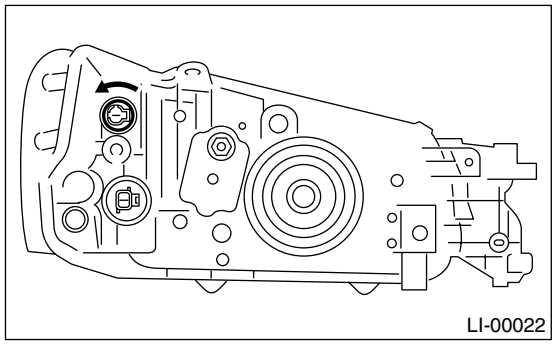
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

14.Clearance/Parking Light Bulb

A: REMOVAL

1) Remove the headlight assembly. <Ref. to LI-13, REMOVAL, Headlight Assembly.>
2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

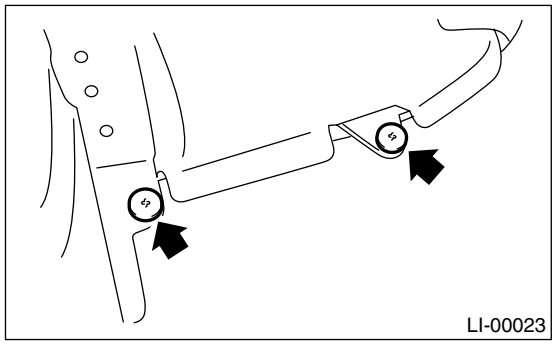
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

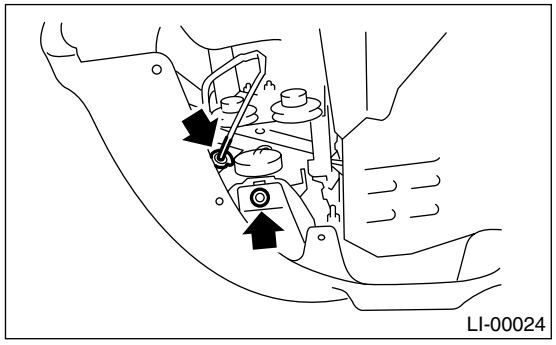
15.Front Fog Light Assembly

A: REMOVAL

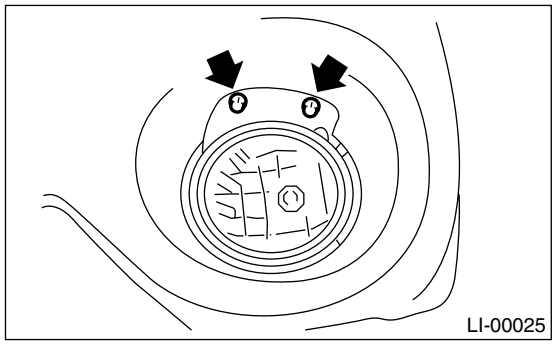
1) Disconnect the ground cable from battery.
2) Remove the two clips and lower mudguard.



3) Disconnect the harness connector.
4) Remove the lower bolts.



5) Remove the mounting bolts and clip, and then detach the fog light assembly.



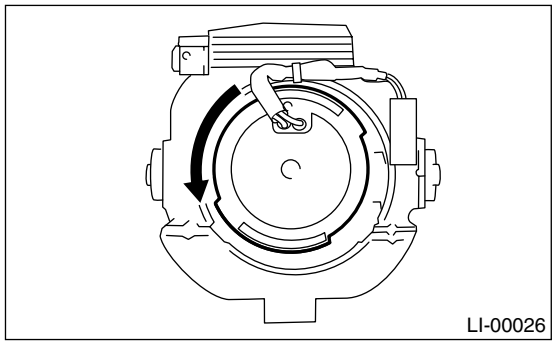
B: INSTALLATION

Install in the reverse order of removal.

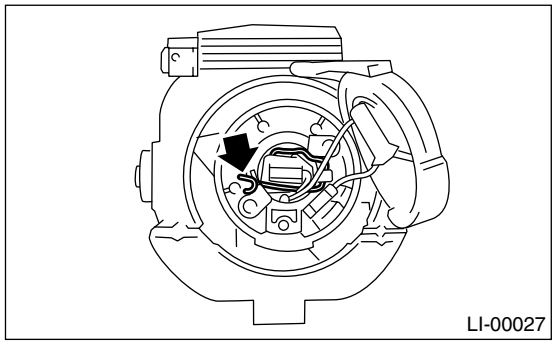
16.Front Fog Light Bulb

A: REMOVAL

1) Remove the front fog light assembly. <Ref. to LI-19, REMOVAL, Front Fog Light Assembly.>
2) Remove the back cover.



3) Remove the spring retainer, and then detach the fog light bulb.



B: INSTALLATION

Install in the reverse order of removal.

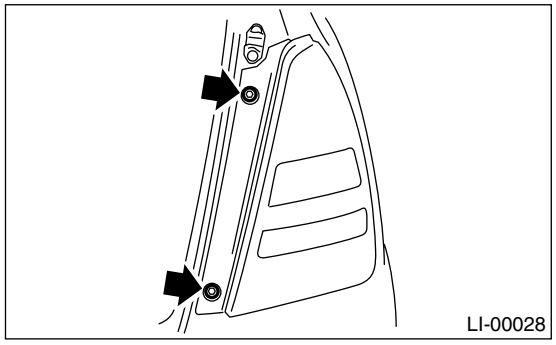
C: INSPECTION

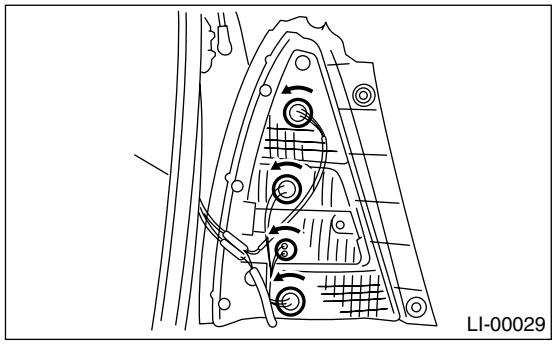
1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

17.Rear Combination Light Assembly

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the two bolts. Then turn the socket to disconnect the cord assembly, and then remove the rear combination light.





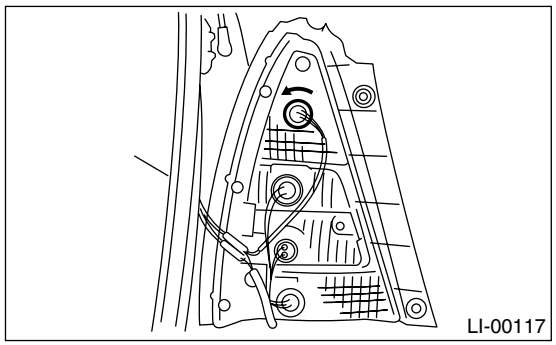
B: INSTALLATION

Install in the reverse order of removal.

18.Brake/Tail Light Bulb

A: REMOVAL

1) Remove the rear combination light assembly. <Ref. to LI-21, REMOVAL, Rear Combination Light Assembly.>
2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

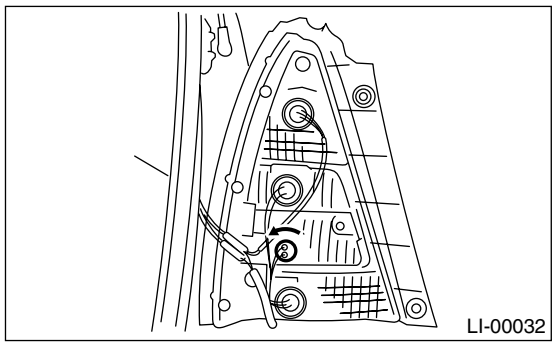
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

19.Back-up Light Bulb

A: REMOVAL

1) Remove the rear combination light assembly. <Ref. to LI-21, REMOVAL, Rear Combination Light Assembly.>
2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

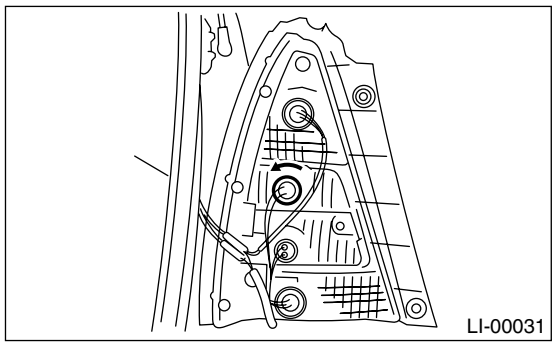
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

20.Rear Turn Signal Light Bulb

A: REMOVAL

1) Remove the rear combination light assembly. <Ref. to LI-21, REMOVAL, Rear Combination Light Assembly.>
2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

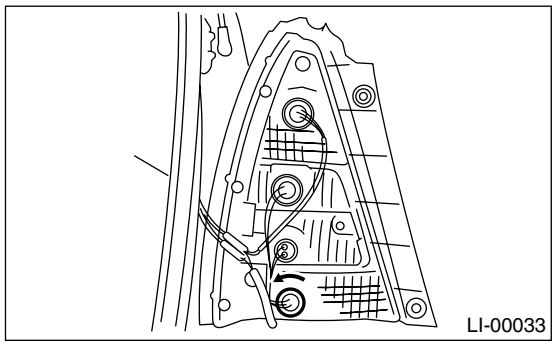
1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

21.Rear Fog Light Bulb

A: REMOVAL

NOTE:
Rear fog light bulb is attached only to driver's side combination light for both LHD and RHD models.

1) Remove the rear combination light assembly. <Ref. to LI-21, REMOVAL, Rear Combination Light Assembly.>
2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

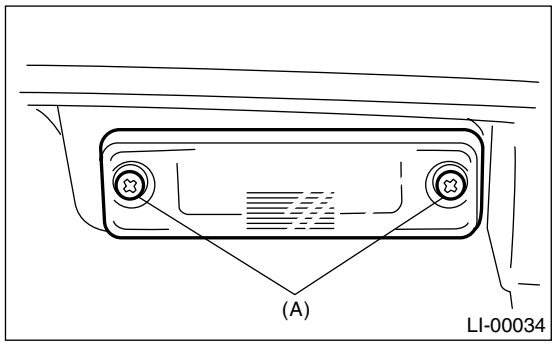
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

22.License Plate Light

A: REMOVAL

1) Remove the license plate light mounting screw (A), and then remove the lens.



2) Remove the bulb.

B: INSTALLATION

Install in the reverse order of removal.

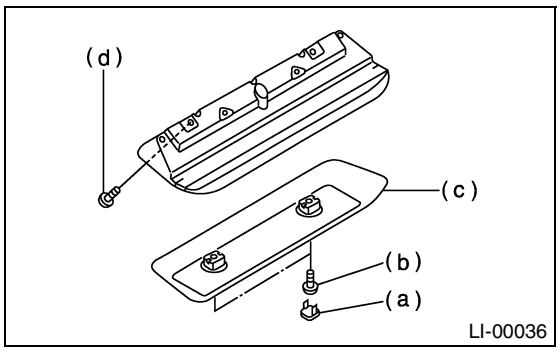
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

23.High-mounted Stop Light

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the cap (a) by prying on the edge with screwdriver.
3) Remove the screws (b), and then the detach cover (c).
4) Remove screws (d), and then detach the high-mounted stop light while disconnecting connector.



B: INSTALLATION

Install in the reverse order of removal.

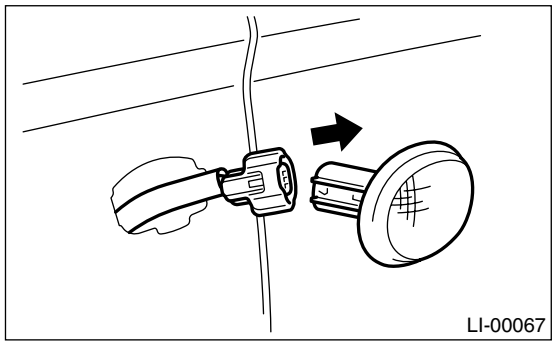
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

24.Side Turn Signal Light

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Pull out the light from body while pushing it in direction of vehicle front.
3) Disconnect the harness connector and remove the light.



B: INSTALLATION

Install in the reverse order of removal.

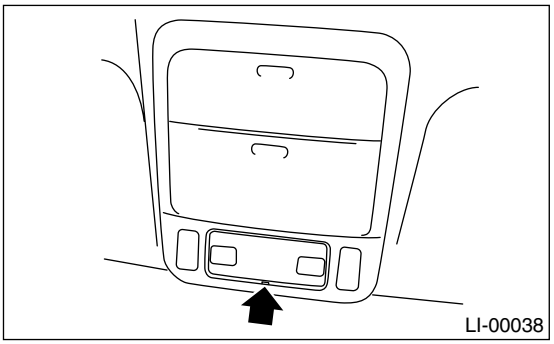
C: INSPECTION

1) Check the bulb for blow out using tester.
2) If NG, replace the side turn signal light assembly with a new one.

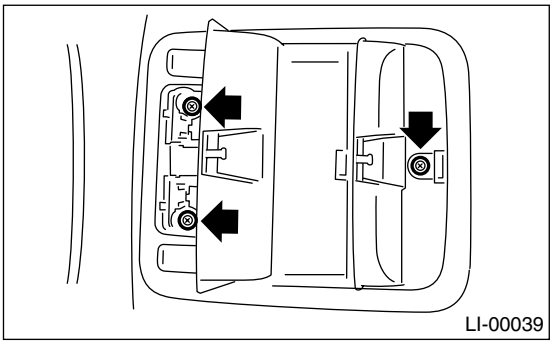
25.Spot Light

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Insert a flat tip screwdriver to slot of lens, and then pry the lens to remove.



3) Remove the spot light installation screws.



4) Disconnect the harness connectors and remove the spot light.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1. SPOT LIGHT BULB

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

2. SPOT LIGHT SWITCH

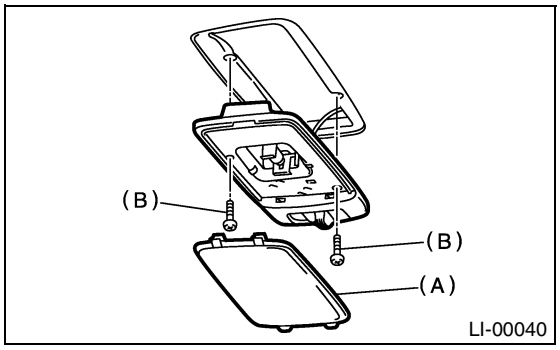
Measure the spot light switch resistance.

Switch position	Terminal No.	Standard
OFF	—	More than 1MΩ
ON	1 and 2	18 ± 5.4Ω

26.Room Light

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the lens (A) and room light mounting screws (B).



3) Disconnect the harness connectors and remove the light.

B: INSTALLATION

Install in the reverse order of removal.

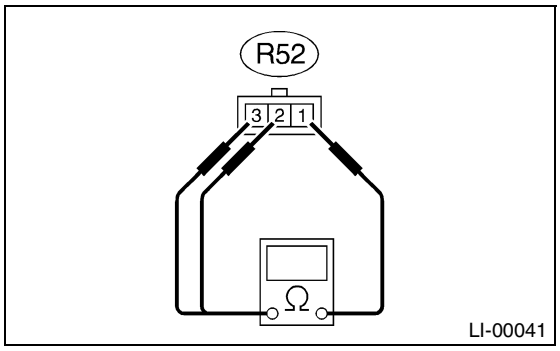
C: INSPECTION

1. ROOM LIGHT BULB

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

2. ROOM LIGHT SWITCH

Measure the room light switch resistance.

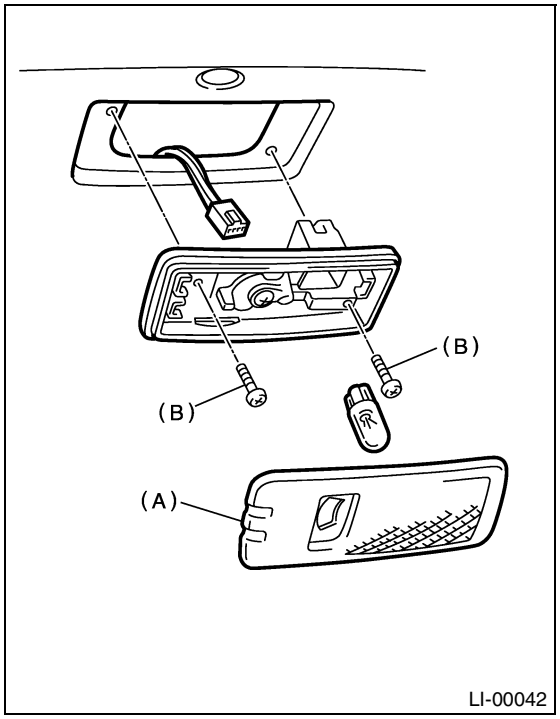


Switch position	Terminal No.	Standard
OFF	—	More than 1MΩ
ON	1 and 3	1.5 ± 0.5Ω
DOOR	1 and 2	1.5 ± 0.5Ω

27.Luggage Room Light

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the lens (A) and luggage room light mounting screws (B).



3) Disconnect the harness connectors and remove the luggage room light.

B: INSTALLATION

Install in the reverse order of removal.

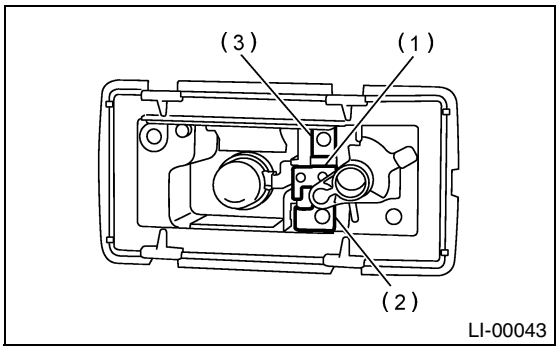
C: INSPECTION

1. LUGGAGE ROOM LIGHT BULB

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

2. LUGGAGE ROOM LIGHT SWITCH

Measure the luggage room light switch resistance.

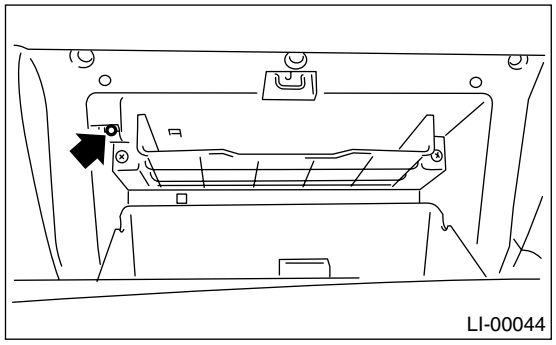


Switch position	Terminal No.	Standard
OFF	—	More than 1MΩ
ON	1 and 3	1.5 ± 0.5Ω
DOOR	1 and 2	1.5 ± 0.5Ω

28.Glove Box Light

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the glove box. <Ref. to EI-37, REMOVAL, Glove Box.>
3) Disconnect the harness connector.
4) Remove the glove box light.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

WIPER AND WASHER SYSTEMS

WW

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6.	Front Wiper Arm	12
7.	Front Wiper Motor and Link	13
8.	Front Washer Nozzle	15
9.	Rear Wiper Arm	16
10.	Rear Gate Garnish	17
11.	Rear Washer	18
12.	Wiper Control Relay	19
13.	Haedlight Washer	20

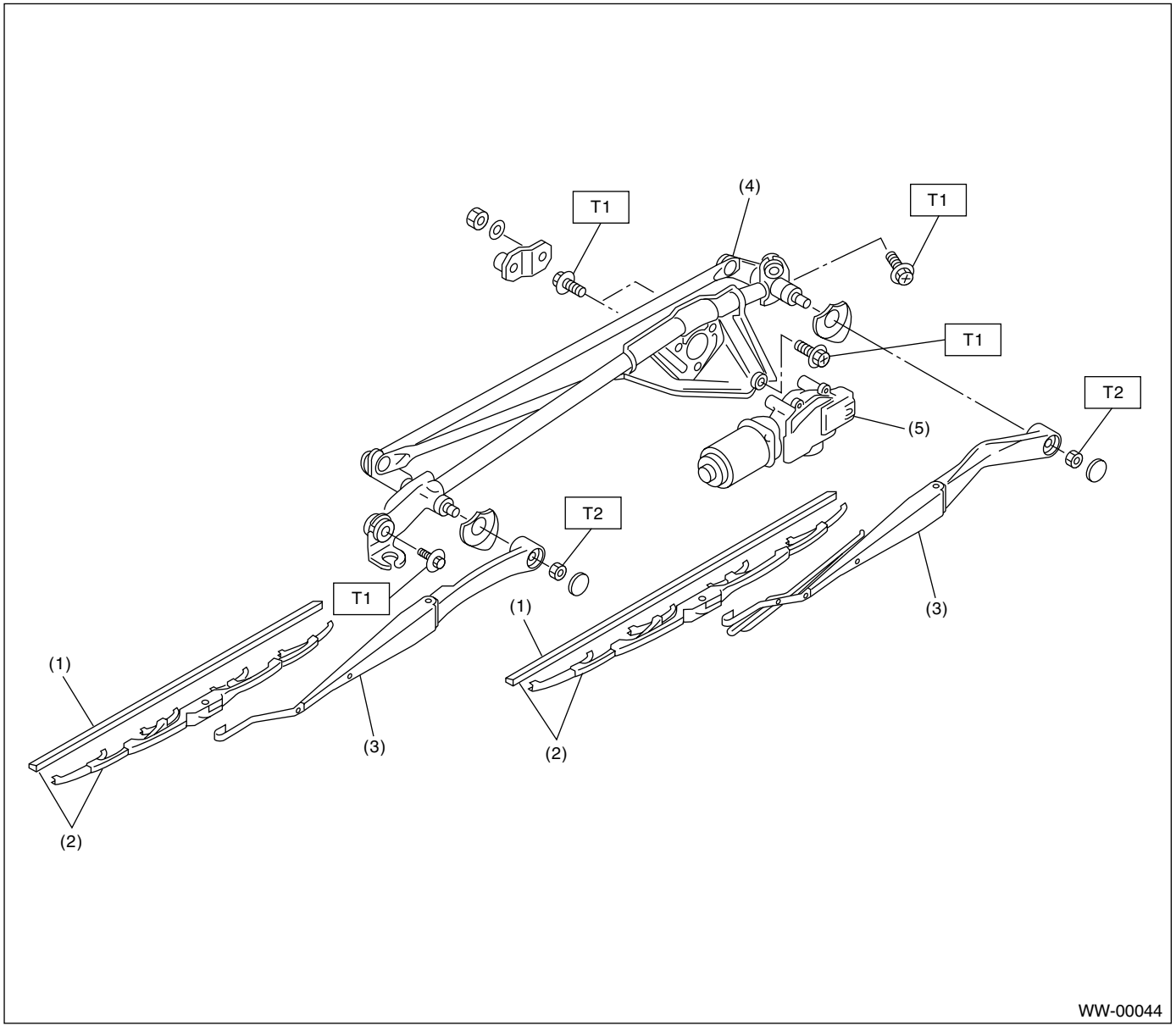
1. General Description

A: SPECIFICATIONS

Front wiper motor	Input	12 V — 72 W or less
Rear wiper motor	Input	12 V — 42 W or less
Front washer motor	Pump type	Centrifugal
	Input	12 V — 36 W or less
Rear washer motor	Pump type	Centrifugal
	Input	12 V — 36 W or less

B: COMPONENT

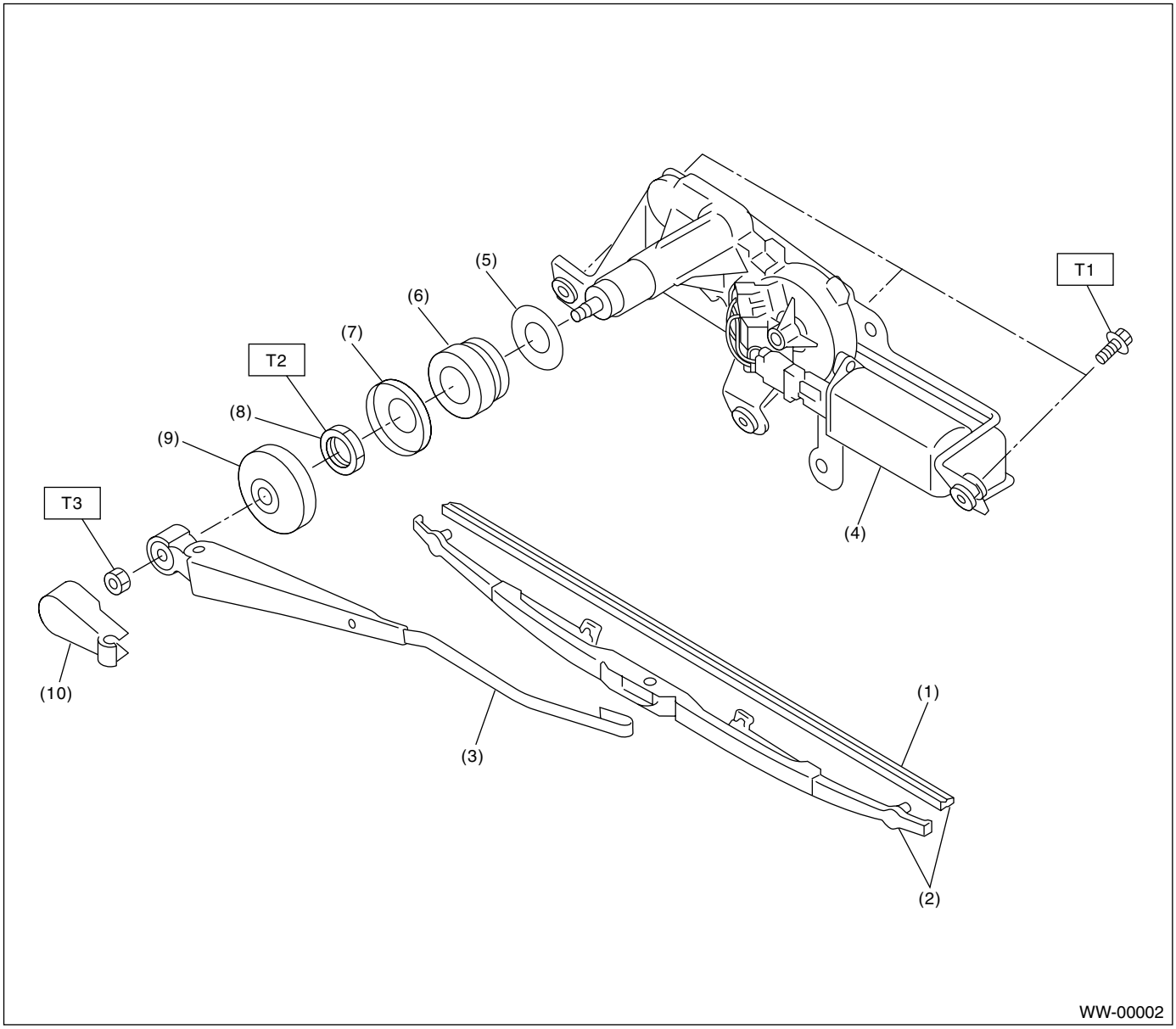
1. FRONT WIPER



(1) Wiper rubber
(2) Wiper blade ASSY
(3) Wiper arm
(4) Wiper link
(5) Wiper motor

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.0 (0.61, 4.4)
T2: 20 (2.0, 14.5)

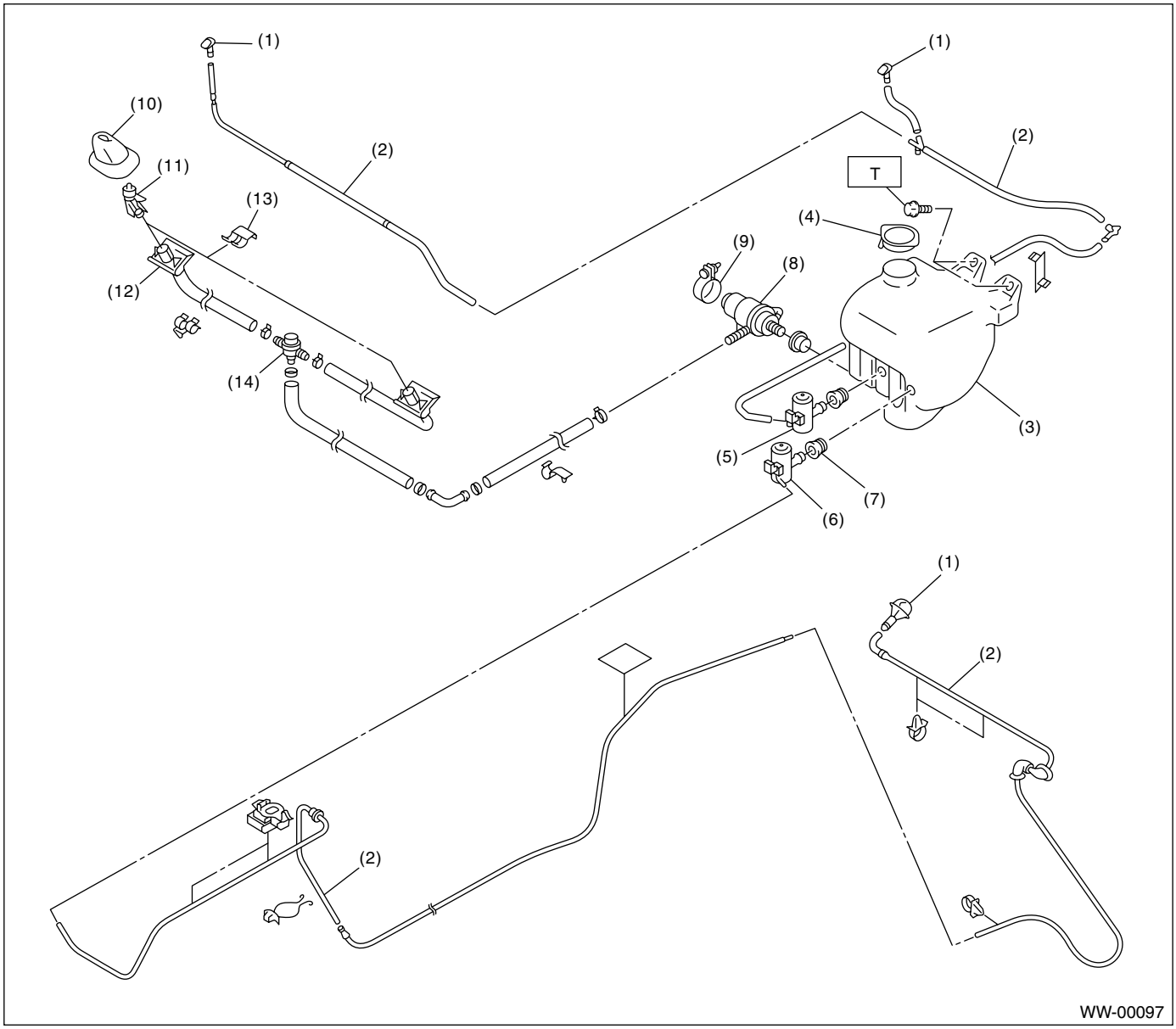
2. REAR WIPER



(1)	Wiper rubber	(6)	Cushion
(2)	Wiper blade ASSY	(7)	Spacer B
(3)	Wiper arm	(8)	Nut
(4)	Wiper motor	(9)	Cap
(5)	Spacer A	(10)	Wiper arm cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.0 (0.61, 4.4)
T2: 7.5 (0.76, 5.5)
T3: 8.0 (0.82, 5.9)

3. WASHER TANK



(1) Washer nozzle
(2) Washer hose
(3) Washer tank
(4) Washer tank cap
(5) Front washer motor
(6) Rear washer motor
(7) Grommet
(8) Headlight washer motor
(9) Motor bracket
(10) Headlight washer case
(11) Headlight washer upper nozzle
(12) Headlight washer lower nozzle

Tightening torque: N·m (kgf-m, ft-lb)
T: 6.0 (0.61, 4.4)

C: CAUTION

- Reconnect the connectors and hoses securely. After reconnecting, confirm that each function operates normally.
- Be careful that wire harnesses of airbag system pass near electrical parts and switches.
- Wire harnesses and connectors of all airbag system are yellow color. Do not use a tester on these circuits.
- Care must be taken when installing the piping hose so that no bending, jamming, etc. are caused.
- If even a little oil or grease such as silicon oil gets in the tank and washer passages, an oil film easily forms on the glass, causing the wiper to chatter and judder. Therefore, be careful not to let this happen.

2. Wiper and Washer System

A: SCHEMATIC

1. WIPER AND WASHER (FRONT)

<Ref. to WI-226, SCHEMATIC, Wiper and Washer System (Front).>

2. WIPER AND WASHER (REAR)

<Ref. to WI-227, SCHEMATIC, Wiper and Washer System (Rear).>

3. HEADLIGHT WASHER

<Ref. to WI-170, SCHEMATIC, Headlight Washer System.>

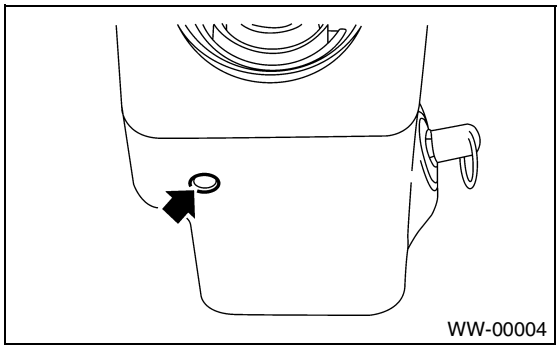
B: INSPECTION

Symptom	Repair order
Wiper and washers do not operate.	(1) Wiper fuse (F/B No. 14, 15) (2) Combination switch (3) Wiper motor (4) Wire harness
Wipers do not operate in LO or HI.	(1) Combination switch (2) Wiper motor (3) Wire harness
Wipers do not operate in INT.	(1) Combination switch (2) Wiper motor (3) Wire harness
Washer motor does not operate.	(1) Washer switch (2) Washer motor (3) Wire harness
Wipers do not operate when washer switch is ON.	(1) Washer motor (2) Wire harness
Washer fluid spray does not operate.	(1) Washer motor (2) Washer hose and nozzle

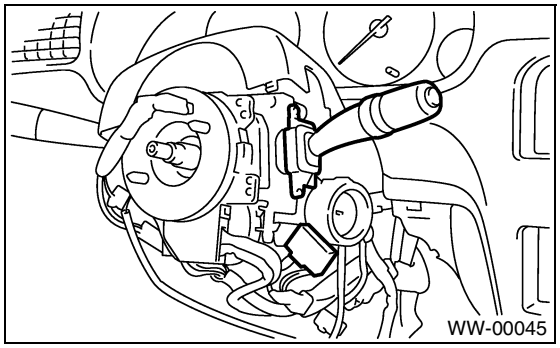
3. Combination Switch (Wiper)

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Loosen the screw to remove the steering column cover.



3) Disconnect the connectors from combination switches.
4) Loosen the screw to remove combination switch.

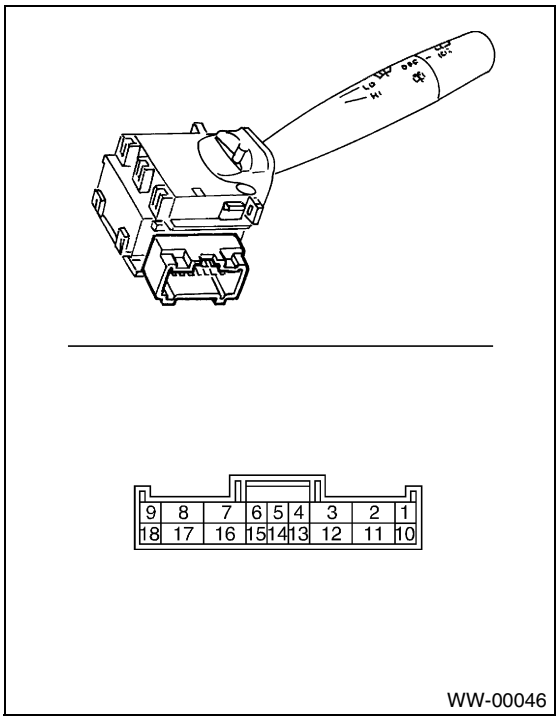


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

• Inspect the continuity between each connector terminal.



LHD model:

	Switch position	Terminal No.	Standard
FRONT	OFF	7 and 16	Less than 1Ω
	INT	7 and 16	Less than 1Ω
	LO	7 and 17	Less than 1Ω
	HI	8 and 17	Less than 1Ω
	Washer ON	2 and 11	Less than 1Ω
REAR	Washer ON	2 and 10 10 and 12 2 and 12	Less than 1Ω
	OFF	—	More than 1MΩ
	INT	2 and 13	Less than 1Ω
	ON	2 and 10	Less than 1Ω
	Washer ON	2 and 10 10 and 12 2 and 12	Less than 1Ω

If continuity is not as specified, replace the switch.

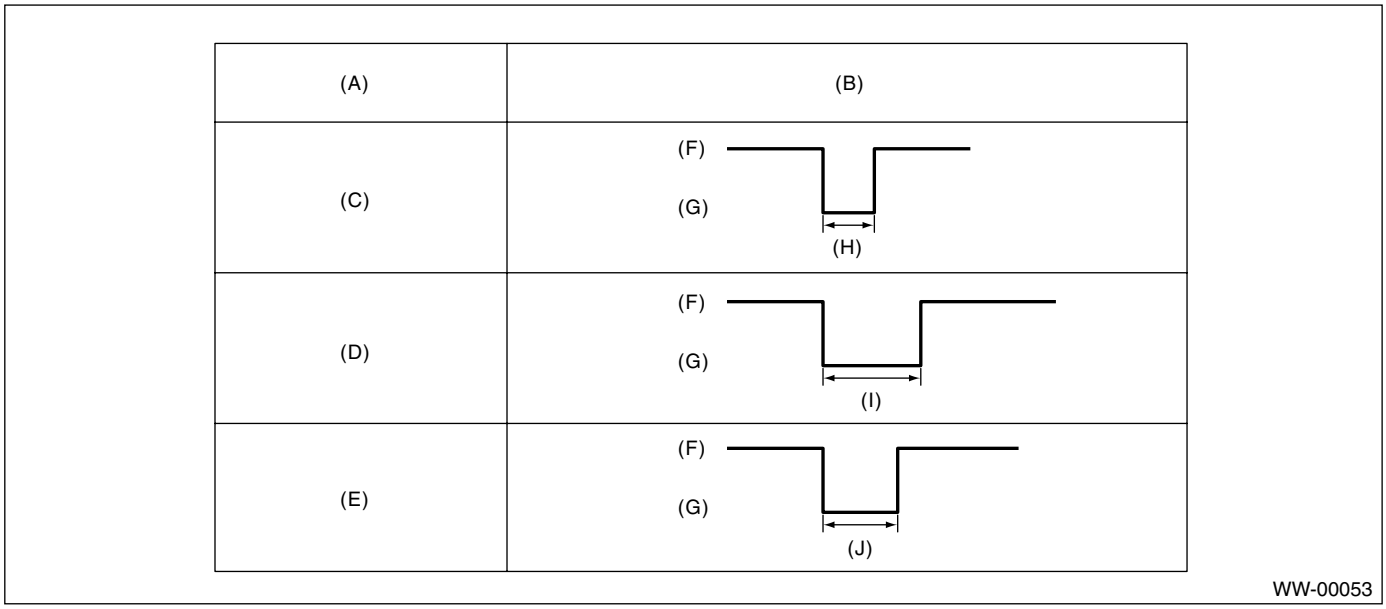
RHD model:

	Switch position	Terminal No.	Standard
FRONT	OFF	3 and 12	Less than 1Ω
	INT	3 and 12	Less than 1Ω
	LO	3 and 11	Less than 1Ω
	HI	2 and 11	Less than 1Ω
	Washer ON	8 and 17	Less than 1Ω
REAR	Washer ON	2 and 10 10 and 12 2 and 12	Less than 1Ω
	OFF	—	More than 1MΩ
	INT	2 and 13	Less than 1Ω
	ON	2 and 10	Less than 1Ω
	Washer ON	2 and 10 10 and 12 2 and 12	Less than 1Ω

If continuity is not as specified, replace the switch.

- Intermittent operation inspection

1) Turn the wiper switch to INT.
2) Adjust the intermittent control switch to MAX.
3) Apply battery voltage to switch terminals 16 and 2, and inspect the voltage of terminals 7 and 2. (Measure the voltage from after the second time the wiper stops.)



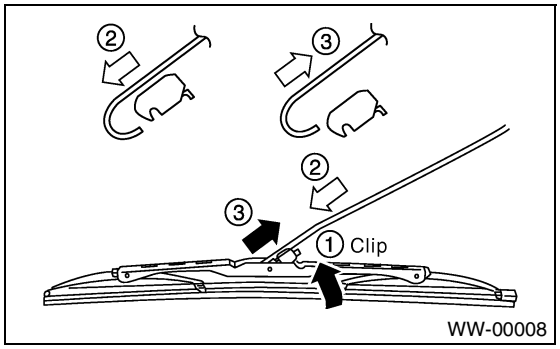
(A) Switch position
(B) Voltage
(C) MIN
(D) MAX
(E) Non variable type
(F) 12 V
(G) 0 V
(H) Approx. 2 sec.
(I) 16±6 sec.
(J) 3±1 sec.

If operation is not as specified, replace the switch.

4. Wiper Blade

A: REMOVAL

While pushing the locking clip (A) up, pull out the blade from arm to arrow direction.

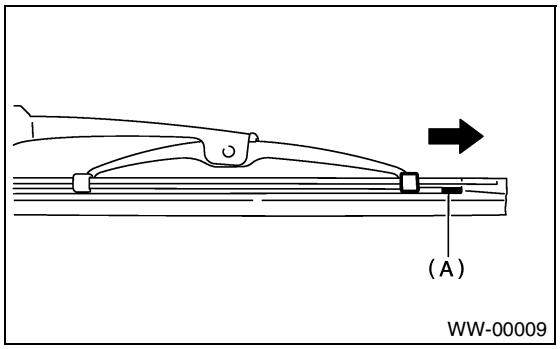


B: INSTALLATION

1) Install in the reverse order of removal.
2) Confirm that the clip is locked securely.

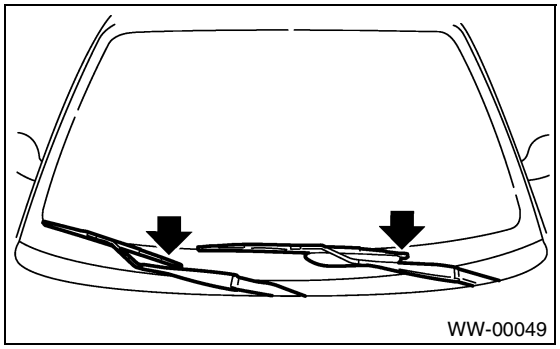
C: DISASSEMBLY

Pull on side (A) of the wiper rubber stopper and remove the rubber from the blade assembly.

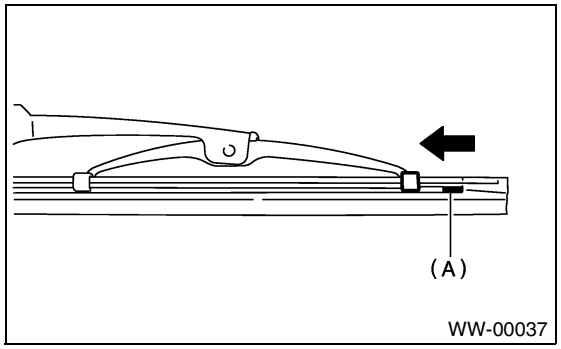


D: ASSEMBLY

1) Insert the wiper rubber onto the blade so that the stopper is in the position shown.



2) Make sure the wiper rubber is securely fastened to the pull stopper (A).



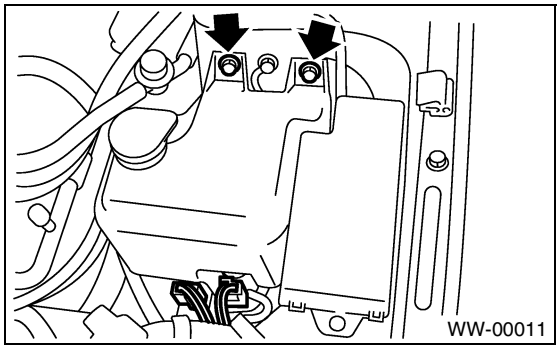
E: INSPECTION

1) When the wiper does not perform well, inspect the following:
• Make sure the movable part of the blade assembly moves smoothly.
• Make sure the wiper rubber is not deformed or damaged.
2) Replace with a new part if damage is found.

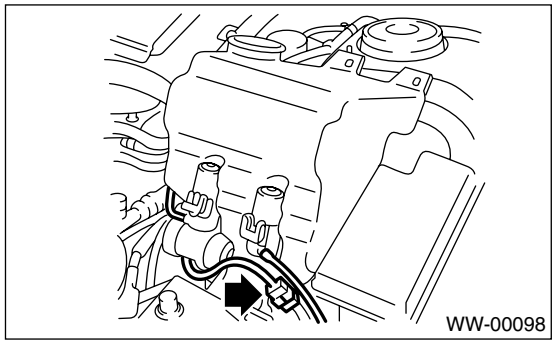
5. Washer Tank and Motor

A: REMOVAL

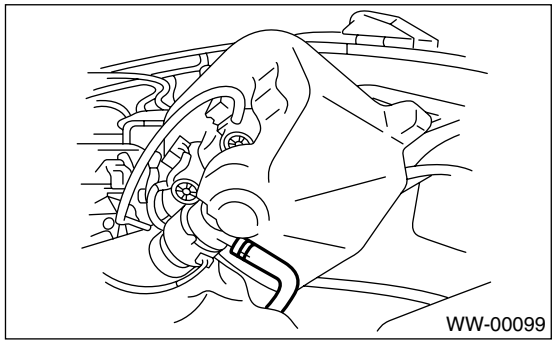
1) Open the hood.
2) Disconnect the ground cable from battery.
3) Remove the two bolts, hose and connector, and then remove the tank.



4) For the vehicle with headlight washer, proceed to step 5) and 6).
5) Lift the washer tank, and then disconnect the connector from headlight washer motor. Disconnect washer hoses.



6) Disconnect the washer hose from the motor, and then detach the washer tank.



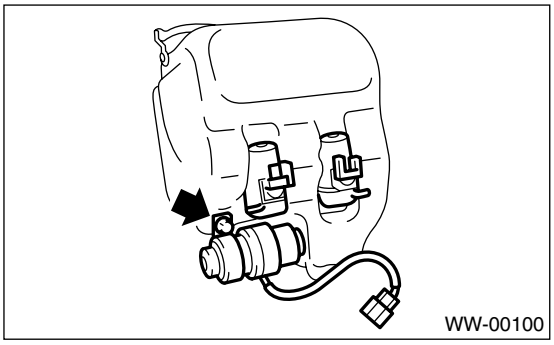
B: INSTALLATION

Install in the reverse order of removal.

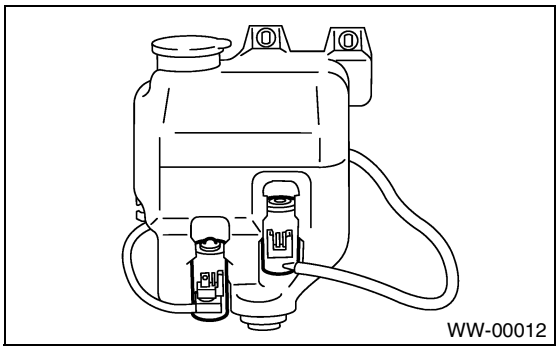
Tightening torque:
6.0 N·m (0.61 kgf-m, 4.4 ft-lb)

C: DISASSEMBLY

1) Remove bolt, and then pull out washer motor from tank. (with headlight washer)



2) Pull out the washer motor from tank.

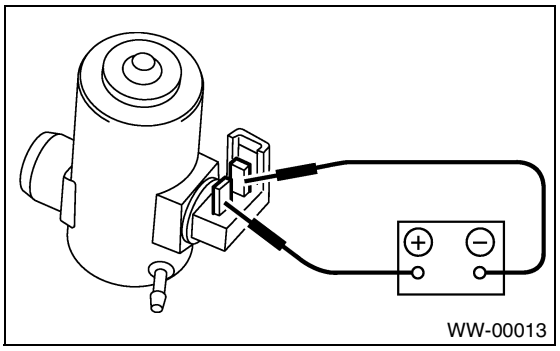


D: ASSEMBLY

1) Assemble in the reverse order of disassembly.
2) Confirm that water does not leak from installation area of motor.

E: INSPECTION

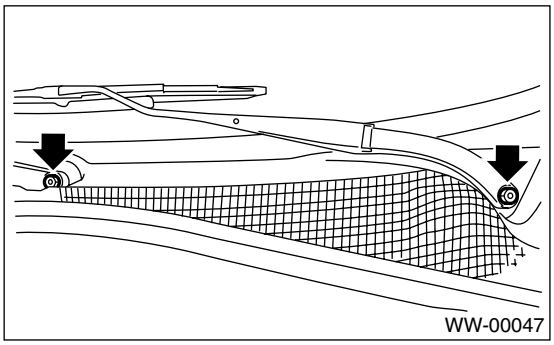
Apply battery voltage to the connector terminal of the washer motor and make sure the motor operates.



6. Front Wiper Arm

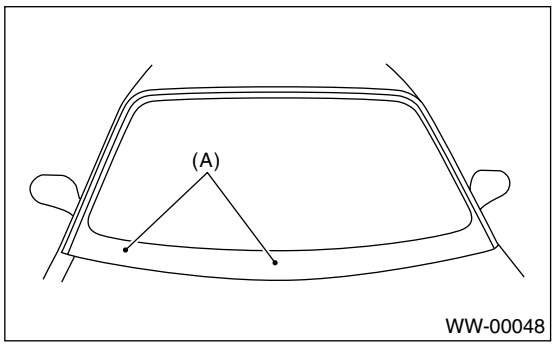
A: REMOVAL

1) Open the hood.
2) Remove the cap.
3) Loosen the nut to remove arm.



B: INSTALLATION

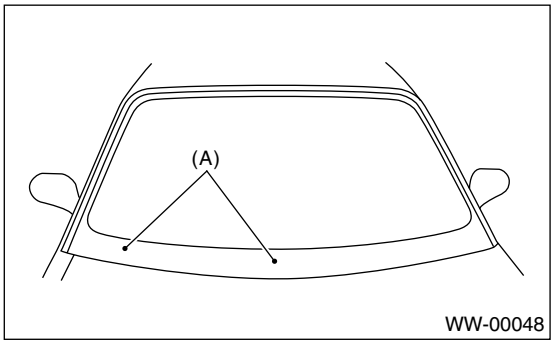
1) Install in the reverse order of removal.
2) Operate the wiper once.
3) Align the wiper blade to ceramic print point mark (A) of front window pane.



Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to WW-2, FRONT WIPER, COMPONENT, General Description.>

C: ADJUSTMENT

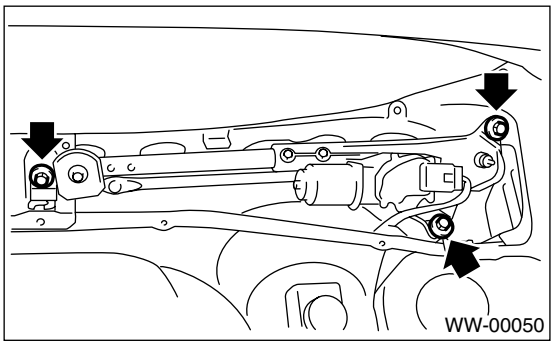
Operate the wiper once. Align the wiper blade to ceramic print point mark (A) of front window pane.



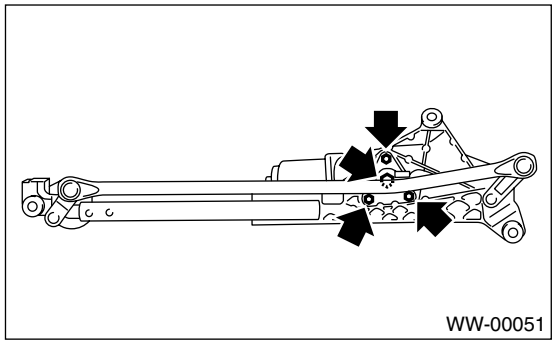
7. Front Wiper Motor and Link

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the cowl panel. <Ref. to EI-32, REMOVAL, Cowl Panel.>
3) Disconnect the connector of motor.
4) Loosen the bolts and nuts to remove wiper link.

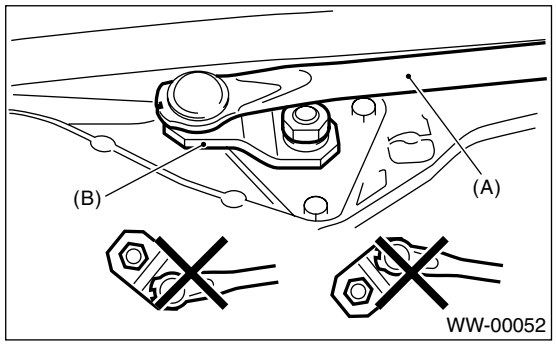


5) Loosen the bolts and nuts to remove motor.



B: INSTALLATION

1) Install the wiper link to vehicle, and then connect the motor connector.
2) Connect the battery ground cable to battery.
3) To confirm that the motor is at auto stop position, turn the wiper switch ON/OFF once.
4) Disconnect the ground cable from battery.
5) Tighten the nut where rod (A) and link plate (B) is aligned in a straight line.

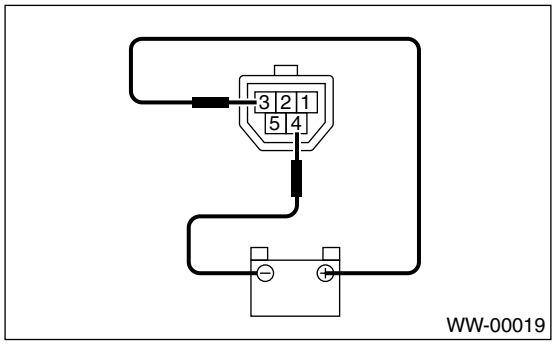


6) Install in the reverse order of removal.

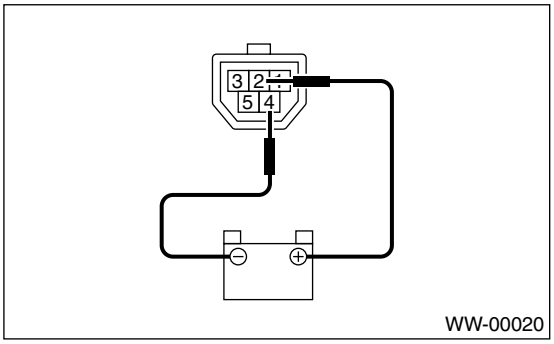
Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to WW-2, FRONT WIPER, COMPONENT, General Description.>

C: INSPECTION

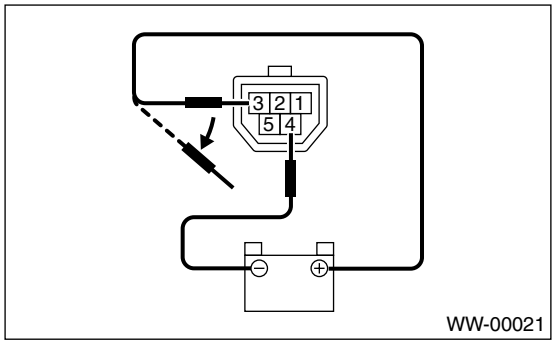
1) Connect the battery to wiper motor connectors and confirm that motor operates at low speed.



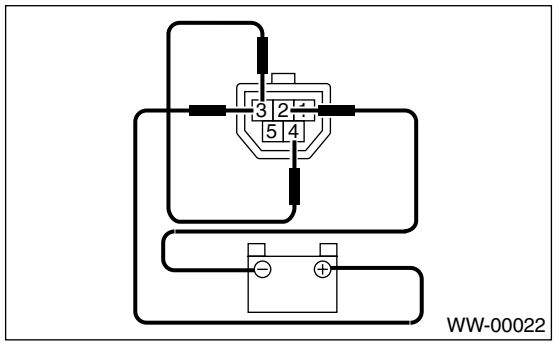
2) Connect the battery to terminal of connectors and confirm that motor operates at high speed.



3) Connect the battery to terminals of connector, and remove the terminal connection with motor rotated at low speed, and stop the wiper motor through operation.



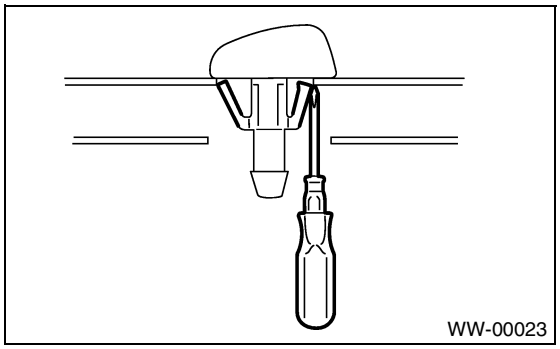
4) Connect the battery and confirm that the motor stops at automatic stop position after the motor operates at low speed again.



8. Front Washer Nozzle

A: REMOVAL

1) Remove the washer hose from the washer nozzle.
2) Open the clips on the underside of the hood with a thin screwdriver or other tool, and remove the washer nozzle.



B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust the position of the washer liquid sprayer. <Ref. to WW-15, ADJUSTMENT, Front Washer Nozzle.>

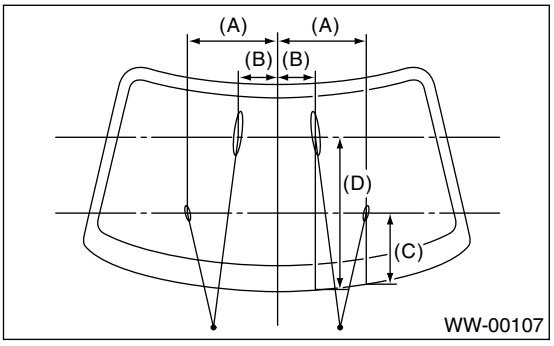
C: INSPECTION

- Make sure the nozzle and hose are not clogged.
- Make sure the hose is not bent.

D: ADJUSTMENT

1) Turn the wiper switch to OFF position.
2) When the vehicle stops, adjust the washer injection position as shown in the figure.

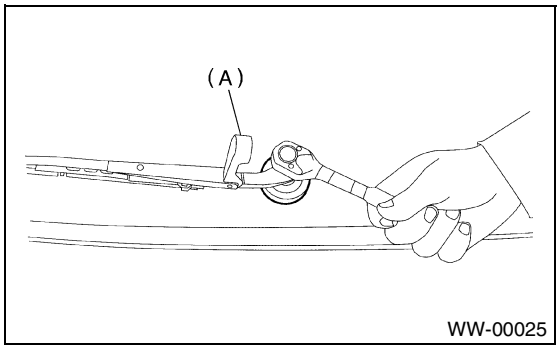
Injection position:
A: 350 mm (13.78 in)
B: 150 mm (5.91 in)
C: 275 mm (10.83 in)
D: 600 mm (23.62 in)



9. Rear Wiper Arm

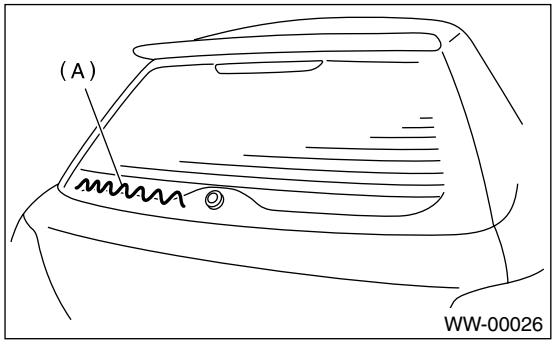
A: REMOVAL

1) Raise the wiper arm cover (A).
2) Loosen the nut to remove wiper arm.



B: INSTALLATION

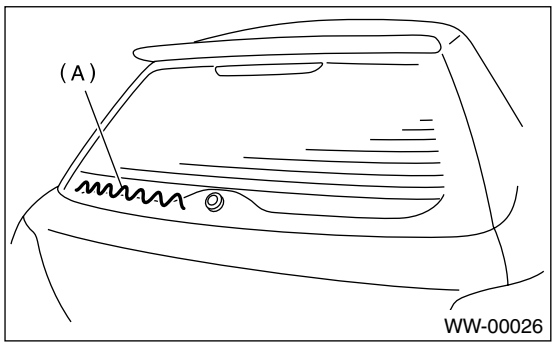
1) Install in the reverse order of removal.
2) Operate the rear wiper once.
3) Align the blade to center of rear defogger heat wire (A).



Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to WW-3, REAR WIPER, COMPONENT, General Description.>

C: ADJUSTMENT

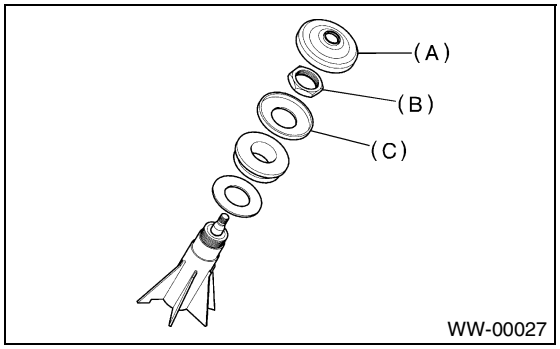
1) Operate the rear wiper once.
2) Align the blade to center of rear defogger heat wire (A).



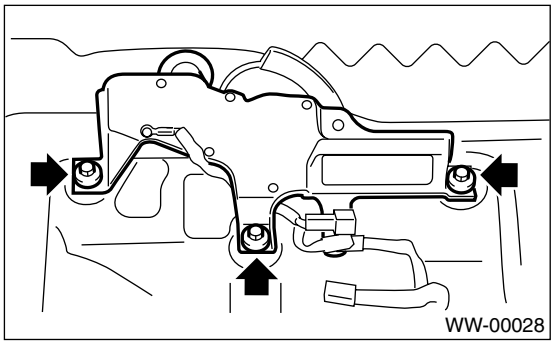
10.Rear Gate Garnish

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the rear wiper arm.
3) Remove the cap (A), nut (B), and spacer (C) from rear wiper shaft.

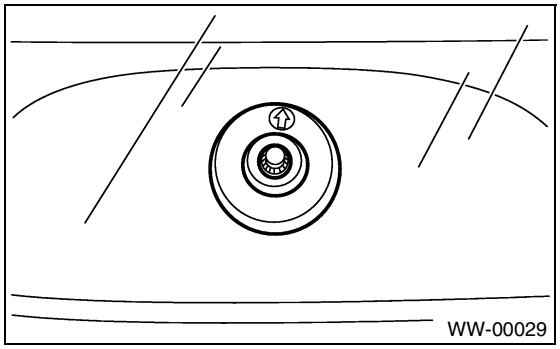


4) Remove the rear gate lower trim. <Ref. to EI-48, REMOVAL, Rear Gate Panel Trim.>
5) Unclip the clip of harness and disconnect the connector of wiper motor.
6) Loosen the bolts to remove the wiper motor assembly (A).



B: INSTALLATION

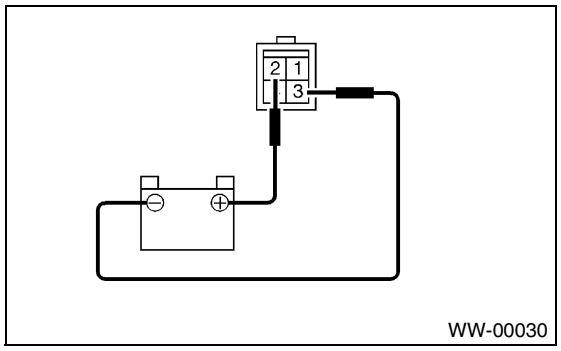
1) Install in the reverse order of removal.
2) Install the rear wiper cushion with the arrow mark facing up, as shown in the figure.



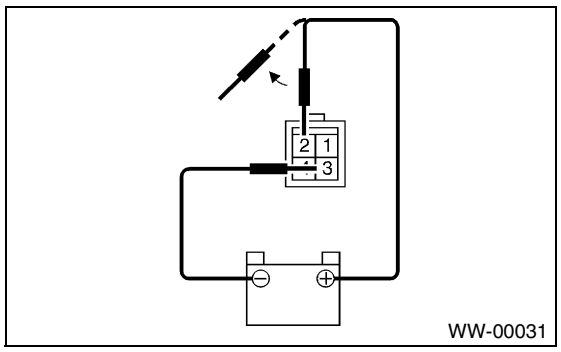
Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to WW-3, REAR WIPER, COMPONENT, General Description.>

C: INSPECTION

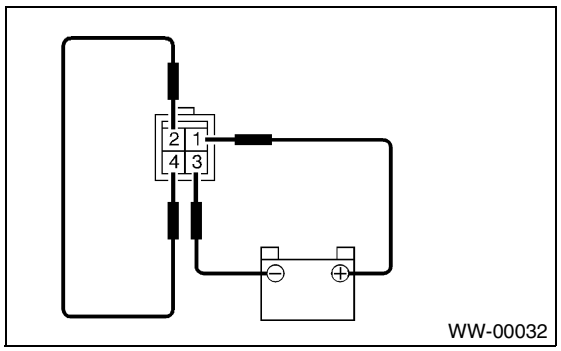
1) Connect the battery to wiper motor connector and confirm that the wiper motor operates.



2) Connect the battery to terminal of connector and remove the terminal connections with motor rotated, and stop the wiper motor through operation.



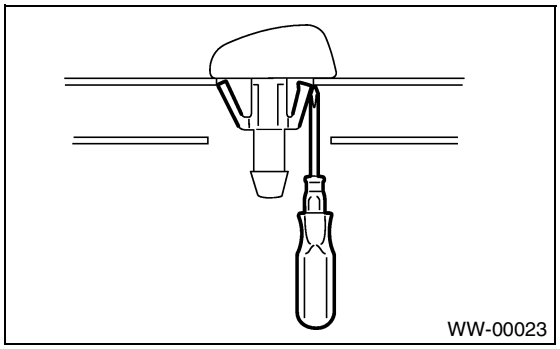
3) Connect the battery and confirm that the motor stops at automatic stop position after the motor operates at low speed again.



11.Rear Washer

A: REMOVAL

1) Remove the washer hose from the washer nozzle.
2) Open the clips on the underside of the hood with a thin screwdriver or other tool, and remove the washer nozzle.



B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust the position of the washer liquid sprayer. <Ref. to WW-18, ADJUSTMENT, Rear Washer.>

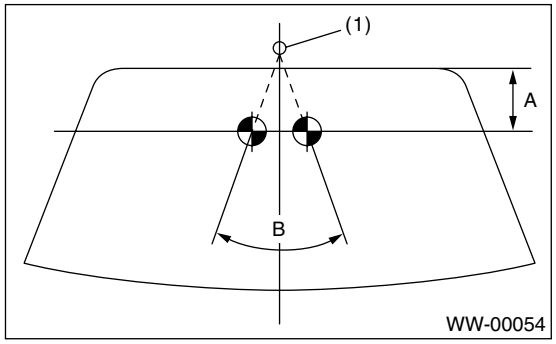
C: INSPECTION

- Make sure the nozzle and hose are not clogged.
- Make sure the hose is not bent.

D: ADJUSTMENT

1) Turn the wiper switch to OFF position.
2) When the vehicle stops, adjust the washer injection position as shown in the figure.

Injection position:
A: 36 mm (1.42 in)
B: 72°

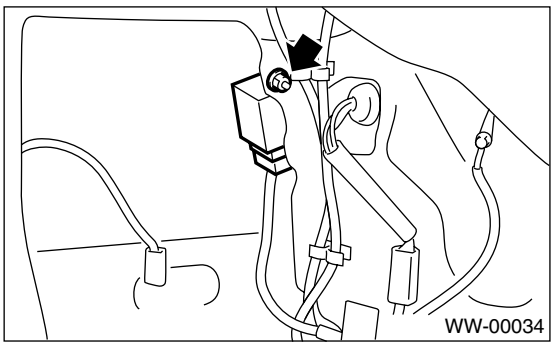


(1) Nozzle

12.Wiper Control Relay

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the right quarter lower trim. <Ref. to EI-45, REMOVAL, Rear Quarter Trim.>
3) Loosen the nut to remove control unit.

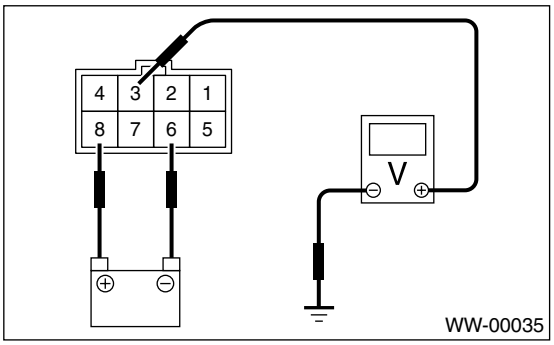


B: INSTALLATION

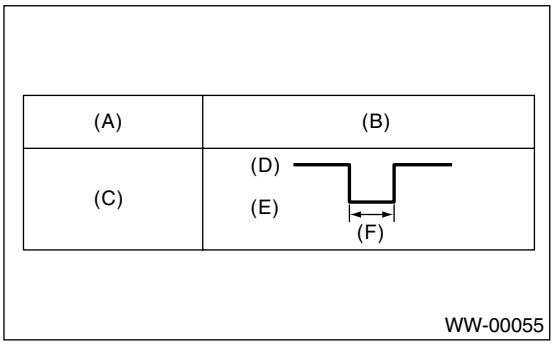
Install in the reverse order of removal.

C: INSPECTION

1) Disconnect the connector from the wiper control relay.
2) Connect the positive (+) lead from the battery to terminal 8 and the negative (–) lead to terminal 6. Connect the positive (+) lead from the voltmeter to terminal 3 and the negative (–) lead to ground.



3) Measure the voltage when the wiper relay is operated.



(A) Switch position
(B) Voltage
(C) ON
(D) 12 V
(E) 0 V
(F) 9±2 sec.

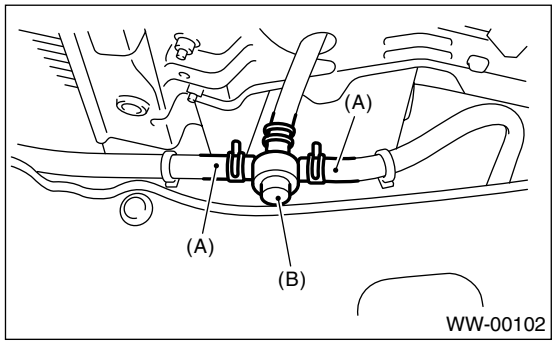
If operation is not as specified, replace the switch.

13.Haedlight Washer

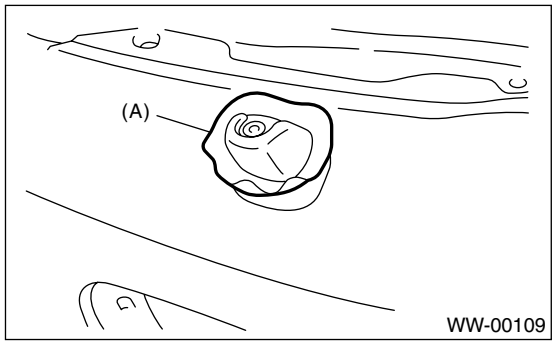
A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Remove the front grille. <Ref. to EI-18, REMOVAL, Front Grille.>
3) Remove the headlight. <Ref. to LI-13, REMOVAL, Headlight Assembly.>
4) Draw out headlight washer hose.
5) Disconnect hose (A) from valve (B).

NOTE:
Washer fluid may drain from valve. Put a pan under the valve, then disconnect valve from hose while pinching the hose edge.

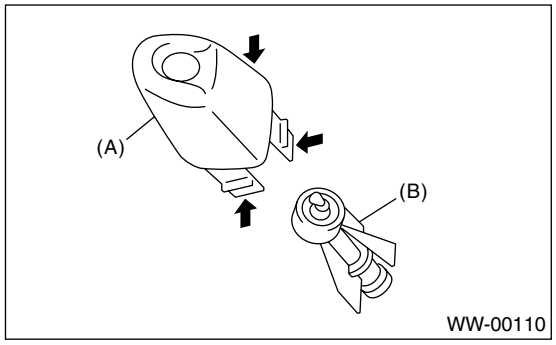


6) Remove nozzle cover (A).



7) Push the three pawls to remove outer nozzle (A). Then pull out inner nozzle (B).

NOTE:
Before pushing the outer nozzle pawls, cover the bumper to avoid scraches.



B: INSTALLATION

Install in the reverse order of removal.

ENTERTAINMENT

ET

		Page
1.	General Description	2
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3.	Cigarette Lighter System	4
4.	Radio Body	5
5.	Front Speaker	6
6.	Rear Speaker	7
7.	Antenna	8
8.	Antenna Amplifier	9
9.	Cigarette Lighter	10

1. General Description

A: CAUTION

• Before disassembling or reassembling parts, always disconnect the battery ground cable. When replacing radio, control module, and other parts provided with memory functions, record memory contents before disconnecting the battery ground cable. Otherwise, the memory will be erased.
• Reassemble in reverse order of disassembly, unless otherwise indicated.
• Adjust parts to the given specifications.
• Connect the connectors and hoses securely during reassembly.
• After reassembly, make sure functional parts operate smoothly.

B: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.
Conductive Silver Composition (DUPONT NO. 4817 or equivalent)	Used for repairing antenna wire.

2. Radio System

A: SCHEMATIC

1. RADIO

<Ref. to WI-93, SCHEMATIC, Audio System.>

B: INSPECTION

Symptom	Repair order
No power coming in. (No display and no sound from speakers.)	(1) Check the fuse and power supply for radio. (2) Check the radio ground. (3) Remove the radio for repair.
A specific speaker does not operate.	(1) Check the speaker. (2) Check the output circuit between radio and speaker.
Radio generates noise with engine running.	(1) Check the radio ground. (2) Check the generator. (3) Check the ignition coil. (4) Remove the radio for repair.
AM and FM modes are weak or noisy.	(1) Check the antenna. (2) Check the antenna amplifier. (3) Check the noise suppressor. (4) Check the radio ground. (5) Remove the radio for repair.

3. Cigarette Lighter System

A: SCHEMATIC

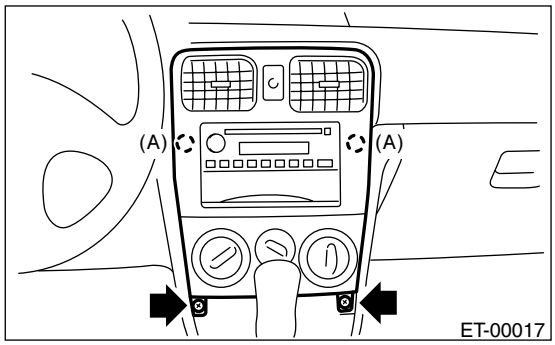
1. CIGARETTE LIGHTER

<Ref. to WI-160, SCHEMATIC, Front Accessory Power Supply System.>

4. Radio Body

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front cover. <Ref. to EI-39, REMOVAL, Console Box.>
3) Loosen the screws and clips (A), and then remove the center panel.



4) Disconnect the connector.
5) Remove the fitting screws, and slightly pull out the radio from center console.
6) Disconnect the harness connectors and antenna feeder cord.

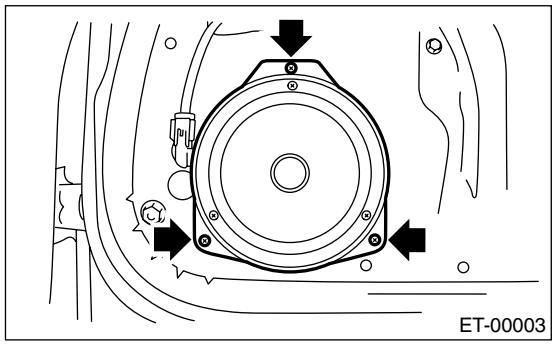
B: INSTALLATION

Install in the reverse order of removal.

5. Front Speaker

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front door trim. <Ref. to EI-35, REMOVAL, Front Door Trim.>
3) Remove the front speaker mounting screws.



4) Disconnect the harness connector and remove front speaker.

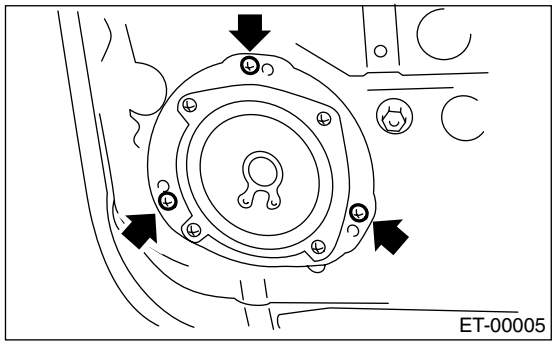
B: INSTALLATION

Install in the reverse order of removal.

6. Rear Speaker

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the rear door trim. <Ref. to EI-36, REMOVAL, Rear Door Trim.>
3) Remove the rear speaker mounting screws.



4) Disconnect the harness connector and remove rear speaker.

B: INSTALLATION

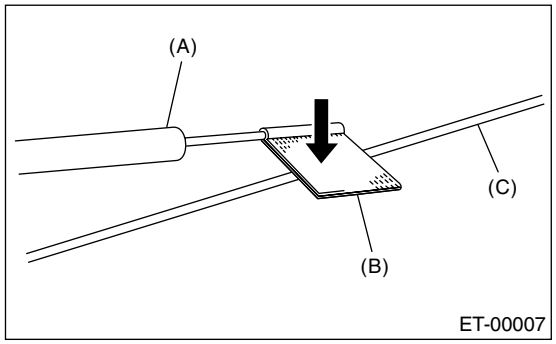
Install in the reverse order of removal.

7. Antenna

A: INSPECTION

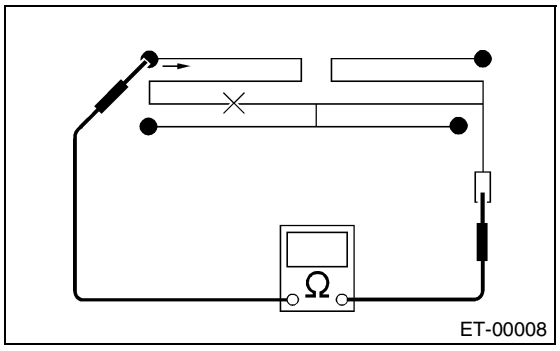
Measure the resistance between antenna terminal and each antenna wire.
If an antenna wire is OK, resistance will be less than 1 Ω. If an antenna wire is broken, the resistance will be more than 1 MΩ.

NOTE:
When checking the continuity, wind a piece of tin foil around the tip of tester probe and press foil against wire with your finger.



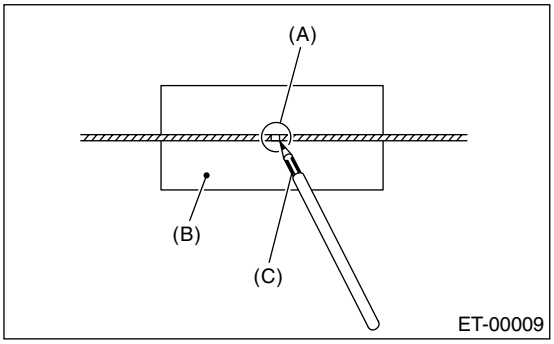
(A) Tester probe
(B) Tin foil
(C) Antenna wire

To locate the broken point, move the probe along antenna wire.



B: REPAIR

1) Clean the antenna wire and surrounding area with a cloth dampened by alcohol.
2) Paste a thin masking film on the glass along broken wire.
3) Deposit conductive silver composition (DUPONT No. 4817) on the broken portion with a drawing pen.



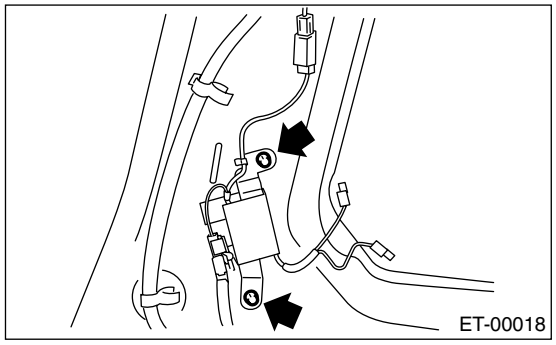
(A) Broken portion
(B) Masking thin film
(C) Conductive silver composition

4) Dry out the deposited portion.
5) After repair has been completed, measure the resistance in repaired wire.

8. Antenna Amplifier

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the rear quarter upper trim. <Ref. to EI-45, REMOVAL, Rear Quarter Trim.>
3) Disconnect the harness connector and terminal.
4) Remove the mounting screws and detach antenna amplifier.

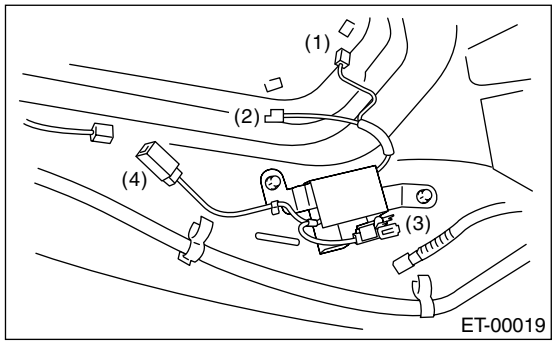


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the antenna amplifier resistance.

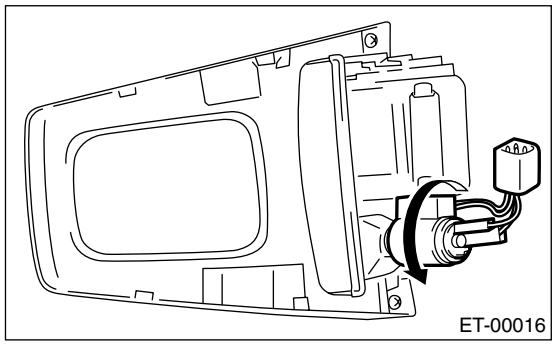


Terminal No.	Standard
1 and Amplifier body	More than 100 kΩ
2 and Amplifier body	More than 100 kΩ
3 and Amplifier body	More than 100 kΩ
4 and Amplifier body	More than 100 kΩ

9. Cigarette Lighter

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front cover. <Ref. to EI-39, REMOVAL, Console Box.>
3) Disconnect the harness connectors and remove cigarette lighter.



B: INSTALLATION

Install in the reverse order of removal.

COMMUNICATION SYSTEM

COM

Page

1. General Description 2
2. Horn System 3
3. Horn 4
4. Horn Switch 5

1. General Description

A: CAUTION

• Before disassembling or reassembling parts, always disconnect the battery ground cable. When replacing radio, control module, and other parts provided with memory functions, record memory contents before disconnecting the battery ground cable. Otherwise, the memory will be erased.
• Reassemble in reverse order of disassembly, unless otherwise indicated.
• Adjust parts to the given specifications.
• Connect the connectors and hoses securely during reassembly.
• After reassembly, make sure functional parts operate smoothly.

B: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

2. Horn System

A: SCHEMATIC

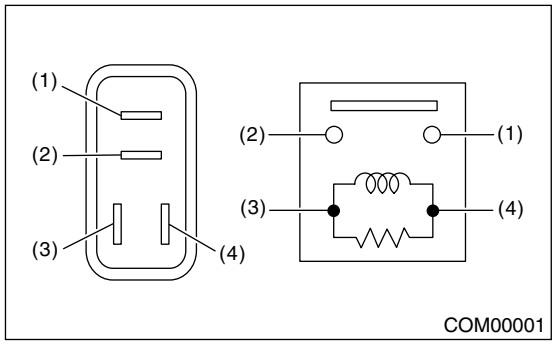
1. HORN

<Ref. to WI-171, SCHEMATIC, Horn System.>

B: INSPECTION

1. HORN RELAY

Measure the horn relay resistance between terminals (indicated in table below) when connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery negative terminal.

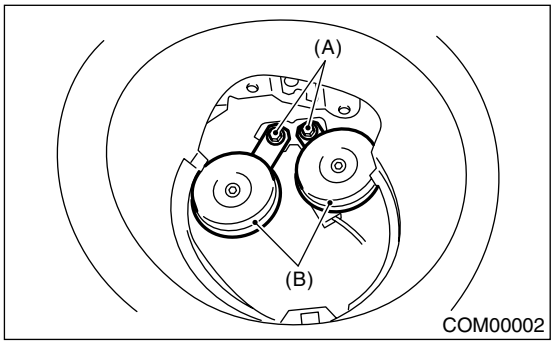


Current	Terminal No.	Standard
Flow	1 and 2	Less than 1Ω
No Flow		More than 1MΩ

3. Horn

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front fog light assembly (LH). <Ref. to LI-19, REMOVAL, Front Fog Light Assembly.>
3) Remove the horn bracket mounting bolt (A).
4) Disconnect the harness connector and remove the horn assembly (B).

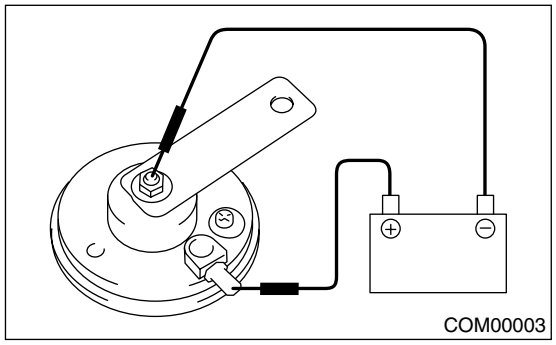


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

With 12 V direct current supplied between horn terminal and case ground, check that the horn sounds properly.

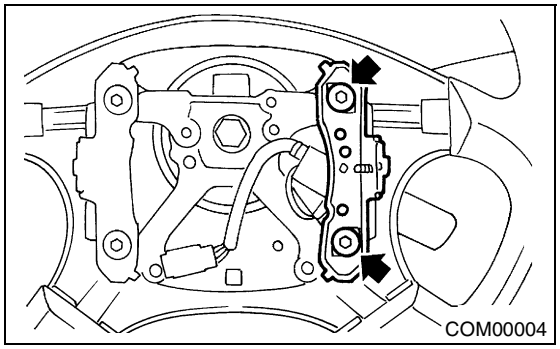


4. Horn Switch

A: REMOVAL

WARNING:
Before servicing, be sure to read the notes in the AB section for proper handling of the driver airbag module. <Ref. to AB-3, CAUTION, General Description.>

1) Disconnect the ground cable from battery.
2) Remove the driver's airbag module. <Ref. to AB-15, Driver's Airbag Module.>
3) Remove the horn switch from the steering wheel as shown in the figure.

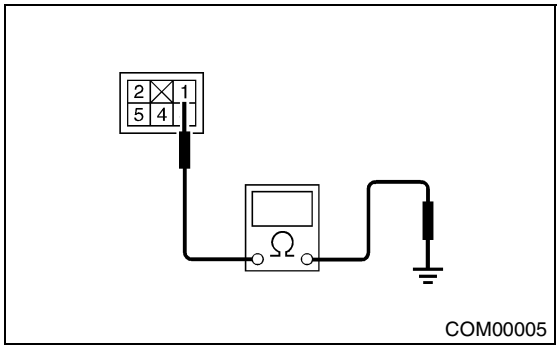


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the horn switch resistance.



Switch position	Terminal No.	Resistance
When horn switch is pushed.	1 and body ground	Less than 1Ω
When horn switch is not pushed.		More than 1MΩ

GLASS/WINDOWS/MIRRORS

GW

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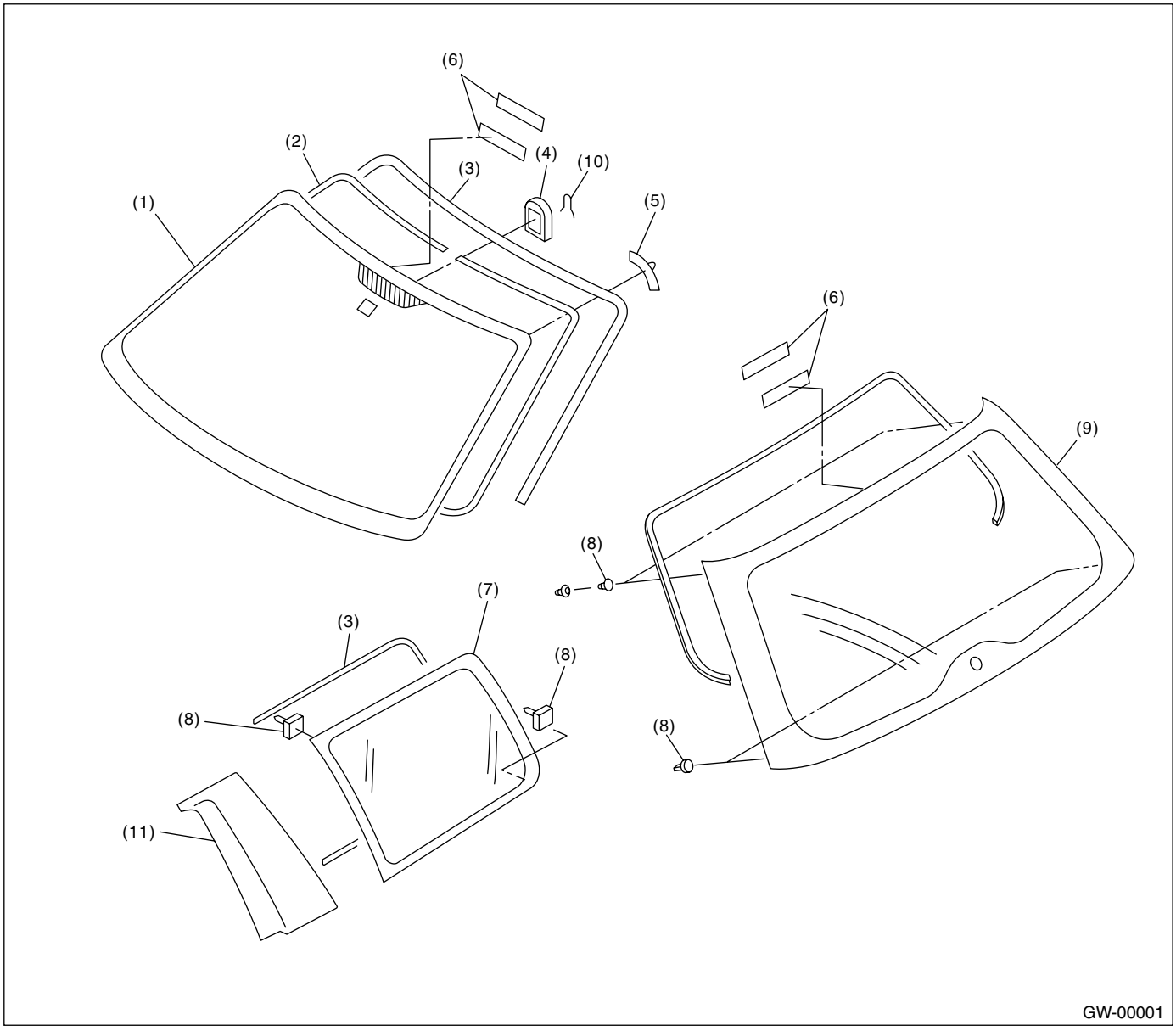
1. General Description

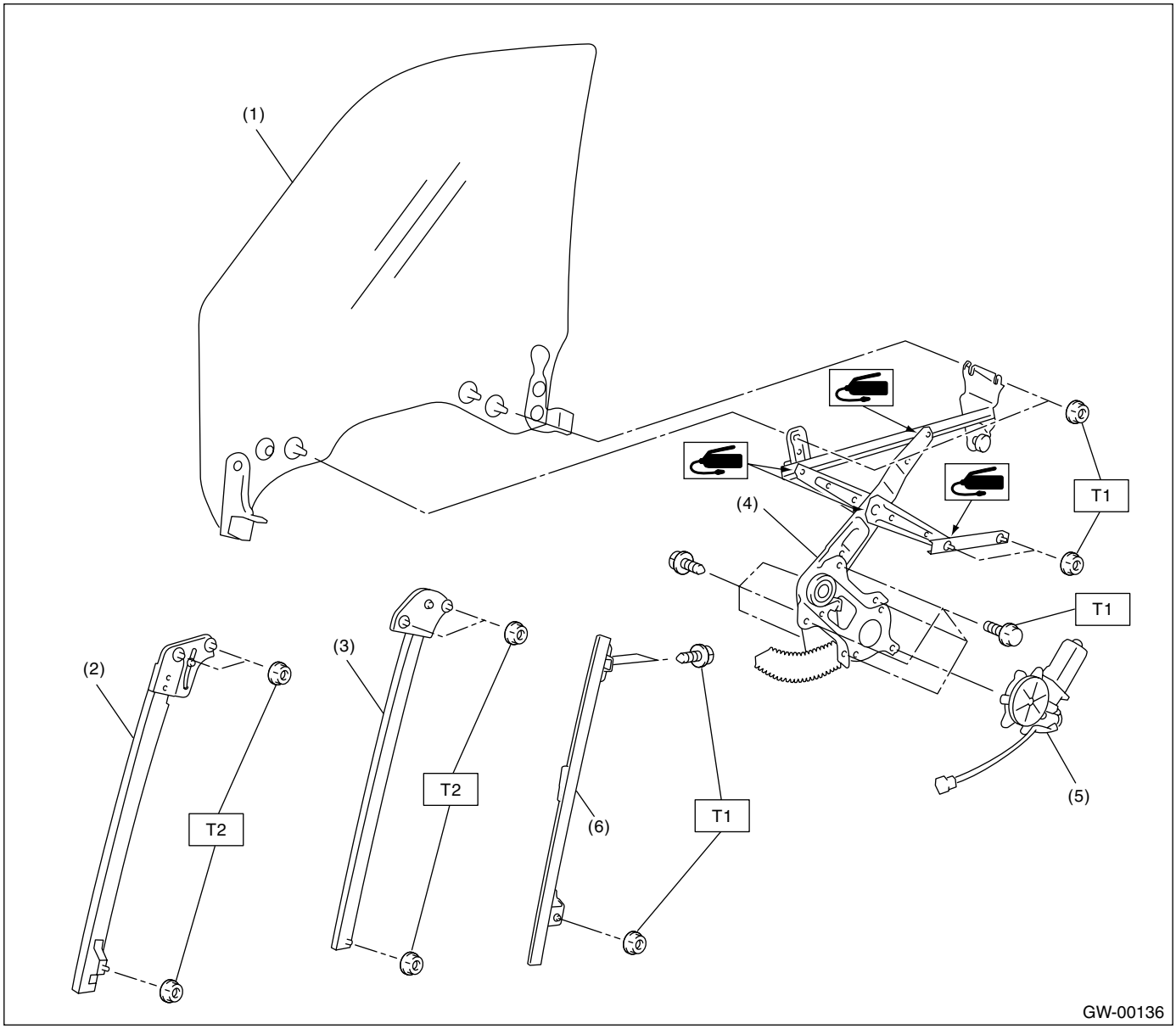
A: COMPONENT

1. FIXED GLASS



(1) Windshield glass
(2) Dam rubber
(3) Molding
(4) Rearview mirror mount
(5) Locate pin
(6) Fastener
(7) Rear quarter glass
(8) Locate pin
(9) Rear gate glass
(10) Spring
(11) Cover C pillar

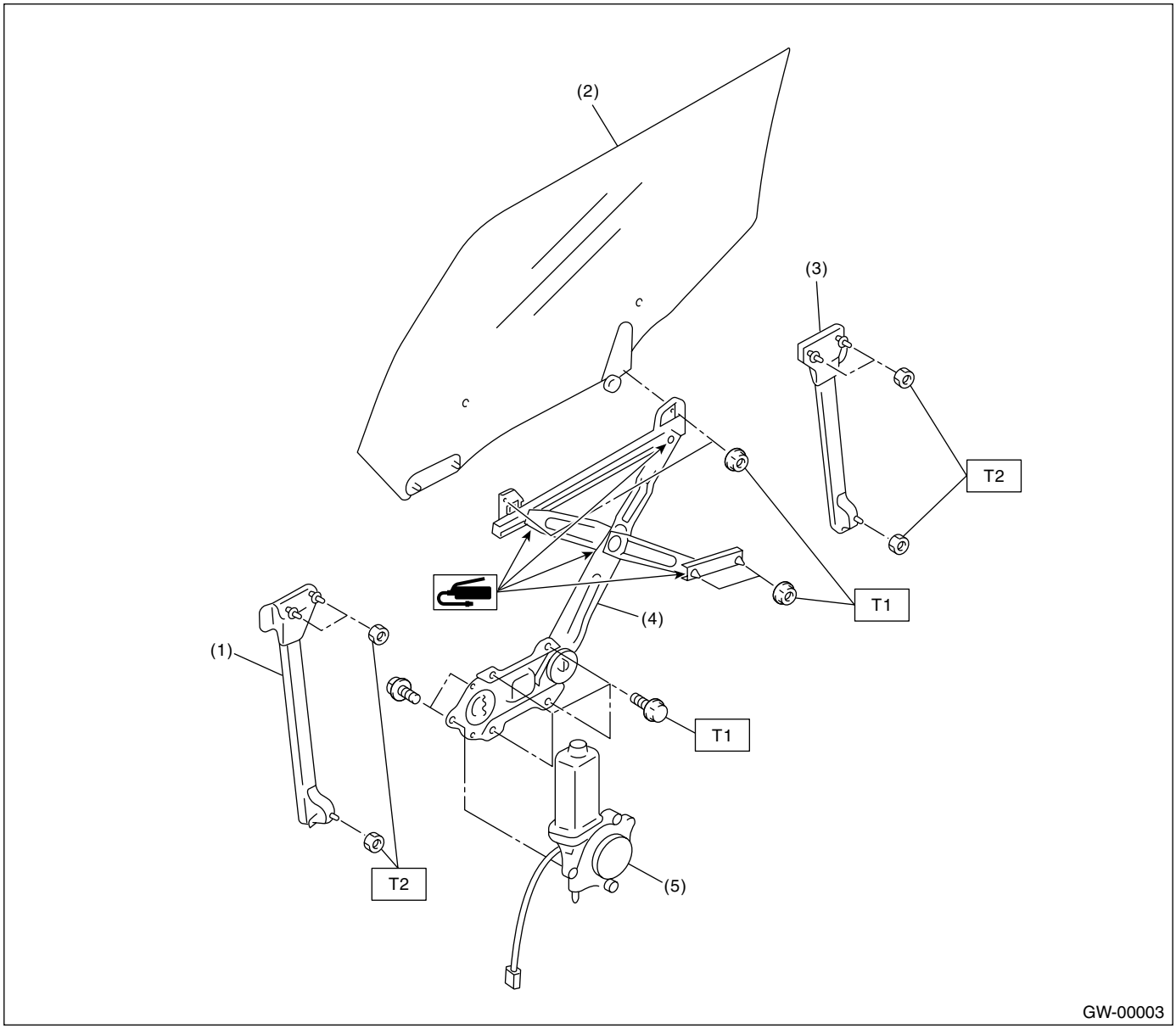
2. FRONT DOOR GLASS



(1)	Glass	(4)	Regulator ASSY
(2)	Door sash (Front)	(5)	Motor ASSY
(3)	Door sash (Rear)	(6)	Guide rail

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.4 (0.75, 5.5)
T2: 13.7 (1.4, 10.1)

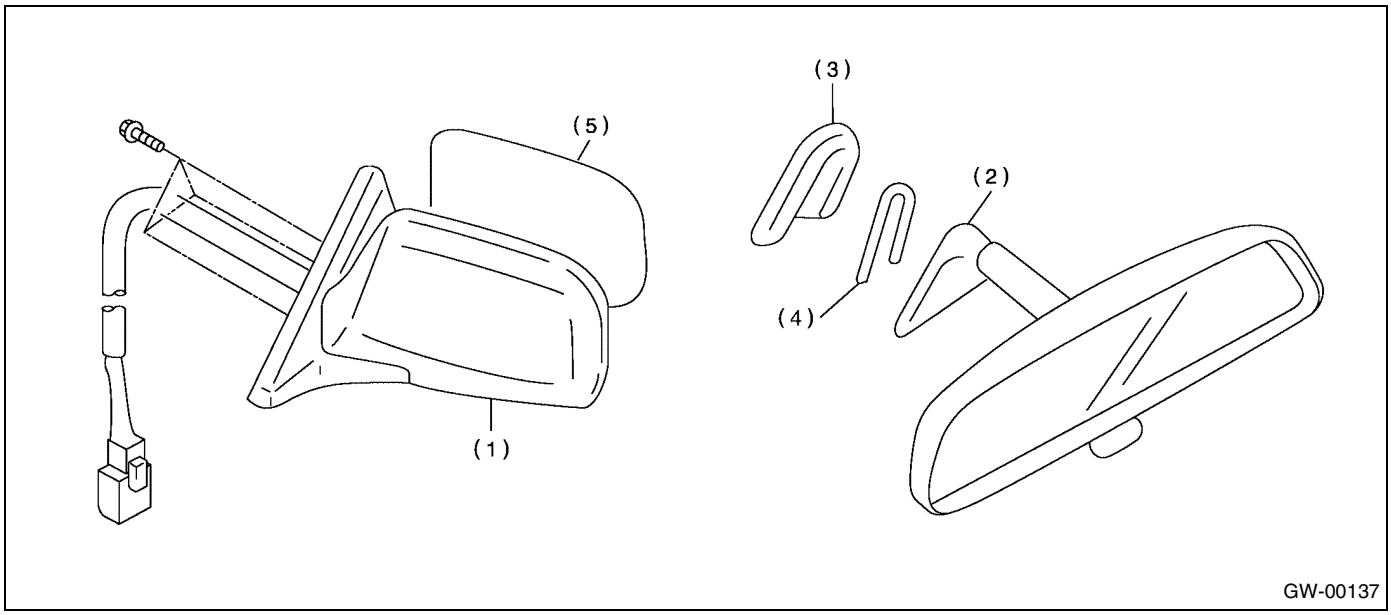
3. REAR DOOR GLASS



(1) Door sash (Front)
(2) Glass
(3) Door sash (Rear)
(4) Regulator ASSY
(5) Motor ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.4 (0.75, 5.5)
T2: 13.7 (1.4, 10.1)

4. MIRRORS



(1) Outer mirror
(2) Inner rearview mirror
(3) Mount
(4) Spring
(5) Mirror

B: PREPARATION TOOL

TOOL NAME	REMARKS
Circuit Tester	Used for checking voltage and continuity.
Piano Wire	Used for window glass removal.
Windshield Knife	Used for window glass removal.

2. Power Window System

A: SCHEMATIC

1. POWER WINDOW (LHD MODEL)

<Ref. to WI-195, LHD MODEL, SCHEMATIC, Power Window System.>

2. POWER WINDOW (RHD MODEL)

<Ref. to WI-199, RHD MODEL, SCHEMATIC, Power Window System.>

B: INSPECTION

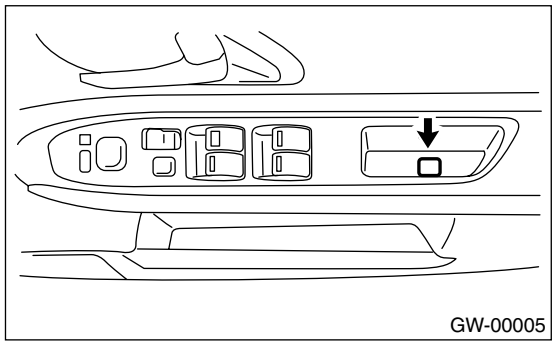
Symptom	Repair order
All power windows does not operate.	(1) Fuse (SBF-6) (2) Power window circuit breaker (3) Power window relay (4) Wire harness
One window does not operate.	(1) Power window main switch (2) Power window sub switch (3) Power window motor (4) Wire harness
“Window Lock” does not operate.	(1) Power window main switch

3. Power Window Control Switch

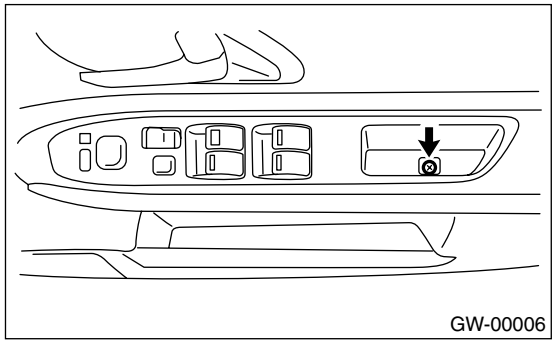
A: REMOVAL

1. MAIN SWITCH

1) Disconnect the ground cable from battery.
2) Using a flat tip screwdriver, remove the screw cover.



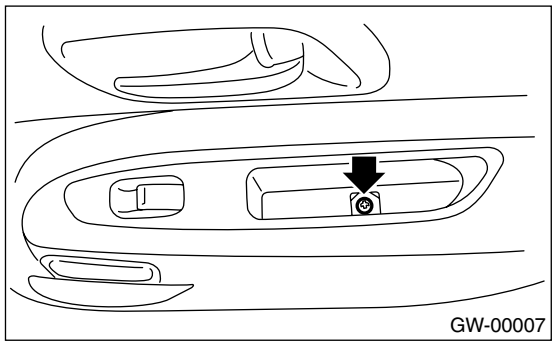
3) Loosen the screw to remove the power window main switch.



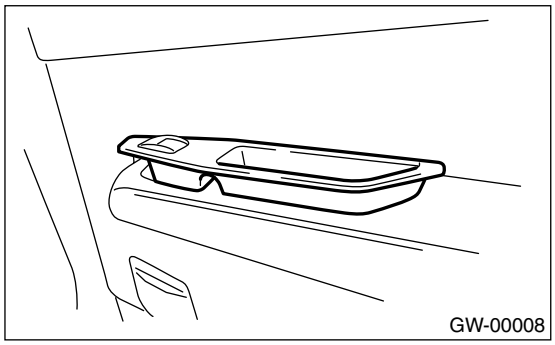
4) Disconnect the connector.

2. SUB-SWITCH

1) Disconnect the ground cable from battery.
2) Remove the screw which secures switch panel.



3) Remove the switch panel.



4) Disconnect the connector.

B: INSTALLATION

1. MAIN SWITCH

Install in the reverse order of removal.

2. SUB-SWITCH

Install in the reverse order of removal.

C: INSPECTION

1. MAIN SWITCH

Measure the switch resistance.

• LHD model

Driver's switch:

Switch position	Terminal No.	Standard
AUTO UP	13 and 1, 2 and 5	Less than 1 Ω
UP	13 and 1, 2 and 5	Less than 1 Ω
OFF	1 and 2 1 and 5 2 and 5	Less than 1 Ω
DOWN	13 and 2, 1 and 5	Less than 1 Ω
AUTO DOWN	13 and 2, 1 and 5	Less than 1 Ω

Front passenger's switch:

Switch position	Terminal No.	Standard
UP	13 and 7, 6 and 5	Less than 1 Ω
OFF	5 and 6 5 and 7 6 and 7	Less than 1 Ω
DOWN	13 and 6, 7 and 5	Less than 1 Ω

Rear left switch:

Switch position	Terminal No.	Standard
UP	13 and 11, 10 and 1	Less than 1 Ω
OFF	1 and 11 1 and 10 11 and 10	Less than 1 Ω
DOWN	13 and 11, 10 and 5	Less than 1 Ω

Rear right switch:

Switch position	Terminal No.	Standard
UP	13 and 16, 15 and 1	Less than 1 Ω
OFF	1 and 15 1 and 16 15 and 16	Less than 1 Ω
DOWN	13 and 15, 16 and 1	Less than 1 Ω

If NG, replace the main switch.

• RHD model

Driver's switch:

Switch position	Terminal No.	Standard
AUTO UP	12 and 7, 6 and 1	Less than 1 Ω
UP	12 and 7, 6 and 1	Less than 1 Ω
OFF	1 and 6 1 and 7 6 and 7	Less than 1 Ω
DOWN	12 and 6, 7 and 1	Less than 1 Ω
AUTO DOWN	12 and 6, 7 and 1	Less than 1 Ω

Front passenger's switch:

Switch position	Terminal No.	Standard
UP	12 and 2, 3 and 1	Less than 1 Ω
OFF	1 and 2 1 and 3 2 and 3	Less than 1 Ω
DOWN	12 and 3, 2 and 1	Less than 1 Ω

Rear left switch:

Switch position	Terminal No.	Standard
UP	12 and 10, 9 and 1	Less than 1 Ω
OFF	1 and 9 1 and 10 9 and 10	Less than 1 Ω
DOWN	12 and 9, 10 and 1	Less than 1 Ω

Rear right switch:

Switch position	Terminal No.	Standard
UP	12 and 14, 13 and 1	Less than 1 Ω
OFF	1 and 13 1 and 14 13 and 14	Less than 1 Ω
DOWN	12 and 13, 14 and 1	Less than 1 Ω

If NG, replace the main switch.

2. SUB-SWITCH

Measure the switch resistance.

Front passenger's door switch and rear door switch:

Switch position	Terminal No.	Standard
UP	8 and 5, 7 and 4, 1 and 8, 1 and 5	Less than 1 Ω
OFF	6 and 5, 4 and 7	Less than 1 Ω
DOWN	8 and 7, 5 and 6, 1 and 8, 1 and 7	Less than 1 Ω

If NG, replace the sub-switch.

4. Remote Control Mirror System

A: SCHEMATIC

1. REMOTE CONTROL MIRROR

<Ref. to WI-210, SCHEMATIC, Remote Controlled Rearview Mirror System.>

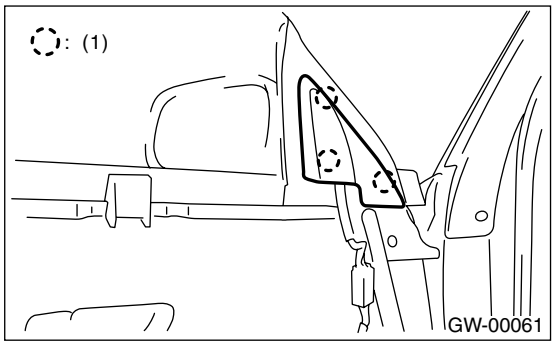
B: INSPECTION

Symptom	Repair order
All function does not operate.	(1) Fuse (F/B No. 4) (F/B No. 13) (F/B No. 17: LHD model) (F/B No. 18) (2) Mirror switch (3) Wire harness
One side of the mirror motor does not operate.	(1) Mirror switch (2) Mirror motor (3) Wire harness
Mirror heater does not operate.	(1) Mirror switch (2) Mirror heater (3) Wire harness

5. Outer Mirror Assembly

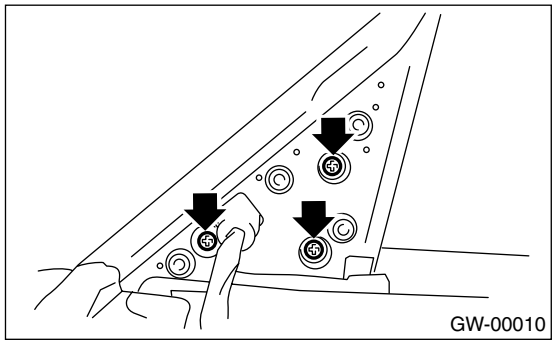
A: REMOVAL

1) Remove the door trim. <Ref. to EI-35, REMOVAL, Front Door Trim.>
2) Remove the mirror gusset cover.



(1) Hook

3) Disconnect the mirror connector.
4) Remove the grommet, and loosen the screws to remove mirror assembly.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Check to ensure that the rearview mirror moves properly when battery voltage is applied to terminals.

Mirror heater not-equipped model:

Switch position	Terminal No.
OFF	—
UP	1 (+) and 3 (–)
DOWN	3 (+) and 1 (–)
LEFT	2 (+) and 3 (–)
RIGHT	3 (+) and 2 (–)

If NG, replace the mirror.

Mirror heater equipped model:

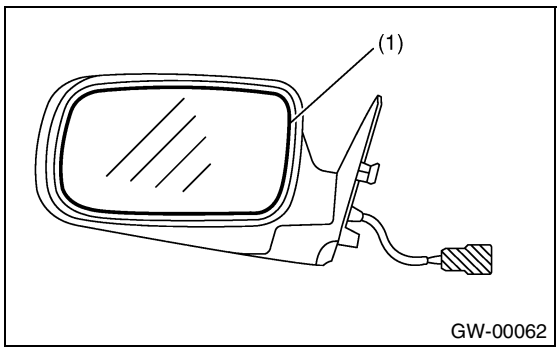
Switch position	Terminal No.
OFF	—
UP	2 (+) and 4 (–)
DOWN	4 (+) and 2 (–)
LEFT	3 (+) and 2 (–)
RIGHT	4 (+) and 3 (–)

If NG, replace the mirror.

6. Outer Mirror

A: REPLACEMENT

1) Remove the door mirror assembly. <Ref. to GW-11, REMOVAL, Outer Mirror Assembly.>
2) Warm the area around the mirror holder with a hair drier until the edges of the mirror holder become soft (about 2 or 3 minutes with a 1,000 W drier.)
3) Use a flat tip screwdriver without sharp edges to lift the mirror out of the mirror holder. (Also disconnect the mirror heater connector from the back of mirror.)



(1) Mirror holder

4) When installing the mirror, warm the area around the mirror holder with a hair drier until the edges of the mirror holder become soft again (about 2 or 3 minutes with a 1,000 W drier.)
5) Remove the backing of the new double-stick tape, and push the mirror in to install it.

NOTE:
Unless the mirror holder is warmed sufficiently, the mirror holder edges may be damaged or the mirror cracked.

7. Remote Control Mirror Switch

A: REMOVAL

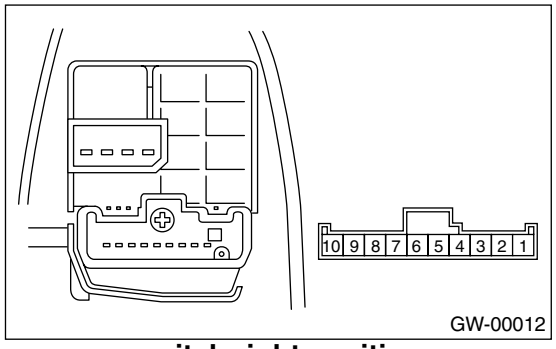
Refer to Power Window Control Switch, because the remote control mirror switch is integrated with power window control switch. <Ref. to GW-7, REMOVAL, Power Window Control Switch.>

B: INSTALLATION

Refer to Power Window Control Switch, because the remote control mirror switch is integrated with power window control switch. <Ref. to GW-7, INSTALLATION, Power Window Control Switch.>

C: INSPECTION

Move the rearview mirror switch to each position and check continuity between terminals.



Change over switch right position:

Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
UP	8 and 3, 6 and 7	Less than 1 Ω
DOWN	8 and 6, 3 and 7	Less than 1 Ω
LEFT	8 and 2, 6 and 7	Less than 1 Ω
RIGHT	8 and 6, 2 and 7	Less than 1 Ω

Change over switch left position:

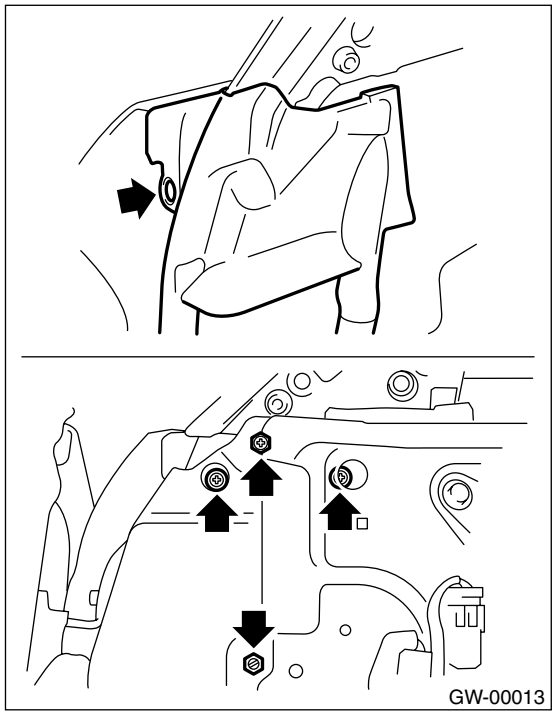
Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
UP	8 and 4, 6 and 7	Less than 1 Ω
DOWN	8 and 6, 4 and 7	Less than 1 Ω
LEFT	8 and 5, 6 and 7	Less than 1 Ω
RIGHT	8 and 6, 5 and 7	Less than 1 Ω

If NG, replace the switch.

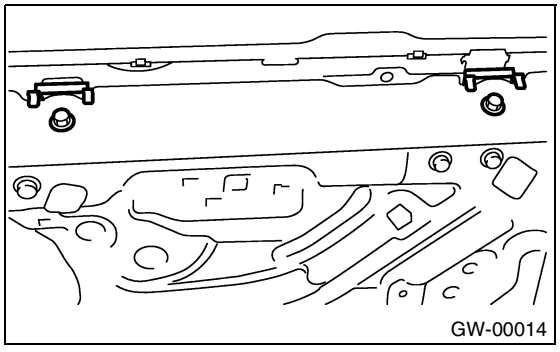
8. Front Door Glass

A: REMOVAL

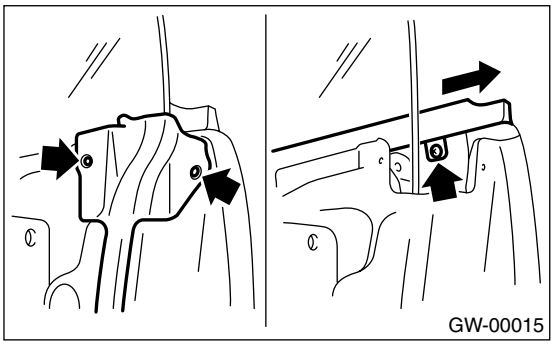
1) Remove the front door trim. <Ref. to EI-35, REMOVAL, Front Door Trim.>
2) Remove the front speaker. <Ref. to ET-6, INSTALLATION, Front Speaker.>
3) Remove the sealing cover. <Ref. to EB-13, REMOVAL, Front Sealing Cover.>
4) Remove the outer mirror assembly. <Ref. to GW-11, REMOVAL, Outer Mirror Assembly.>
5) Remove the front end of door weatherstrip and gusset.



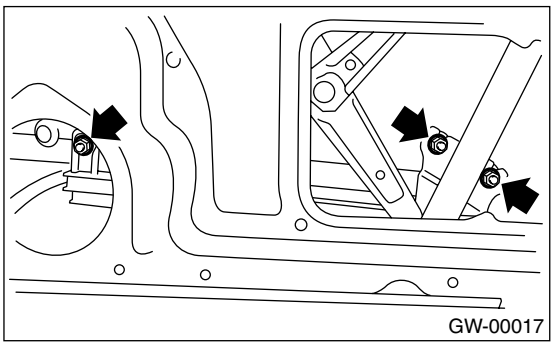
6) Remove the stabilizers.



7) Remove the rear end of door weatherstrip and weatherstrip outer.



8) Operate the power window switch to move the glass to position shown in the figure, and then remove the two nuts from service holes.



9) Take out the door glass.

NOTE:
• Do not turn the regulator in closing direction after removal of the glass. Otherwise gear may be disengaged.

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
Make sure that the glass stay is placed securely in sash.

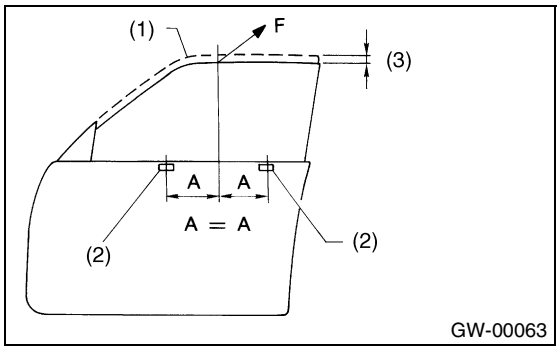
2) Adjust the front door glass. <Ref. to GW-17, ADJUSTMENT, Front Door Glass.>

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to GW-3, FRONT DOOR GLASS, COMPONENT, General Description.> and <Ref. to GW-2, FIXED GLASS, COMPONENT, General Description.>

C: ADJUSTMENT

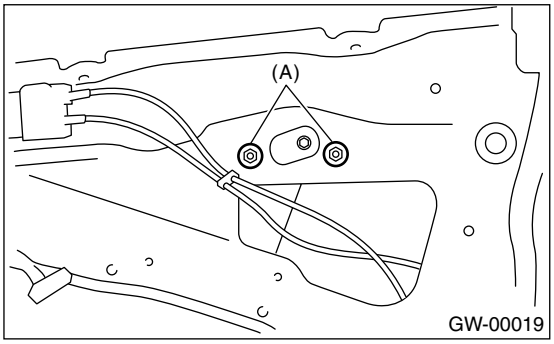
NOTE:
Before adjustment, ensure that all adjusting bolts of stabilizer, upper stopper, and sash are loose and door glass is raised so that it is in contact with weatherstrip.

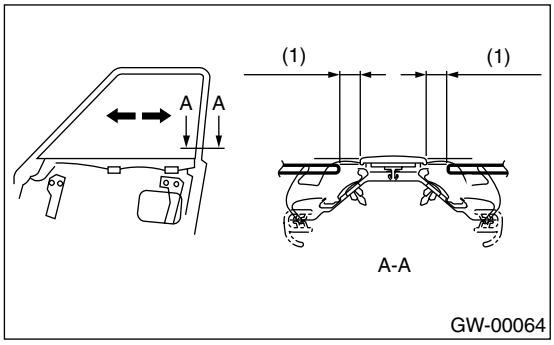
1) Temporarily tighten one adjusting bolt on one side of rear sash at the midpoint of slotted hole in the inner panel.
2) Temporarily tighten the regulator B-channel in a position at the top of slotted hole.
3) Lower the door glass 10 to 15 mm (0.39 to 0.59 in) from fully closed position. While applying outward pressure of 45.0±5 N (4.6±0.5 kg, 11.0±1.1 lb) to the point (F) of glass upper edge above midpoint of two outer stabilizers, press the inner stabilizer at pressure of 25±5 N (2.5±0.5 kg, 5.5±1.1 lb) to the glass, then secure it.



(1) Full close
(2) Stabilizer
(3) 10 — 15 mm (0.39 — 0.59 in)

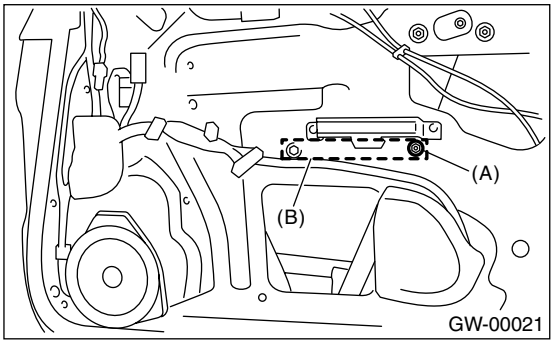
4) For adjustment of clearance between front door glass and center pillar cover, loosen the nuts (A), and move the rear sash back and forward until clearance becomes the value shown. (Difference between upper side and lower side must be within 1.5 mm (0.059 in).)



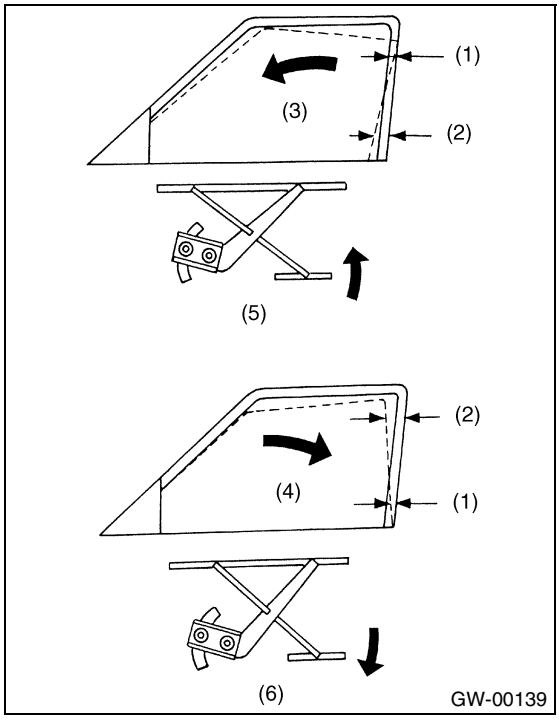


(1) 12±1 mm (0.472±0.039 in)

5) For adjustment of upper and lower ends of center pillar, loosen the adjusting nut (A) of B-channel (B).

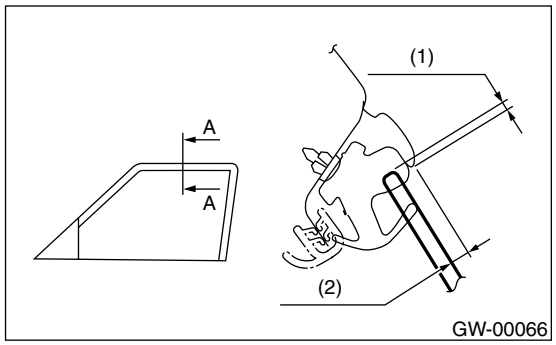


6) Adjust so that the upper and lower ends of center pillar are the same size.



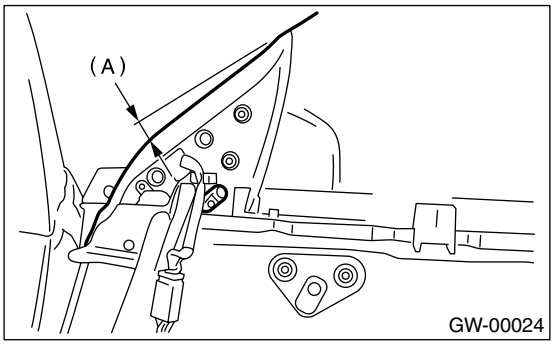
(1) Narrow
(2) Wide
(3) Glass tilts too far rearward
(4) Glass tilts too far forward
(5) Raise B channel
(6) Lower B channel

7) For glass stroke adjustment, close the door, raise glass until positional relationship between glass and weatherstrip becomes as shown. And secure the glass so that the upper stopper lightly touches the glass holder.



(1) 3.5±0.8 mm (0.137±0.031 in)
(2) 9.5±1 mm (0.374±0.039 in)

For preventing wind noise, adjust the glass at the position where tip of gusset is raised up a little.

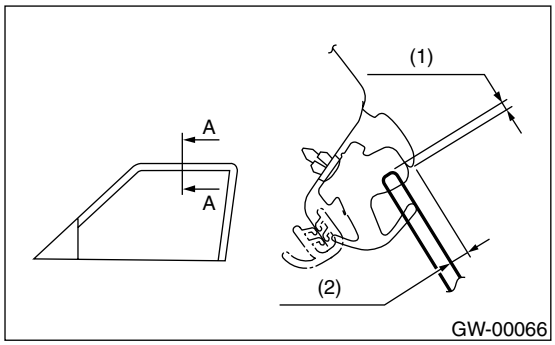


(A) 0 — 1.5 mm (0 — 0.059 in)

8) After stabilizer adjustment, carry out the glass crimp adjustment. First, visually ensure positional relationship between retainer & molding and glass of the roof side, and then begin with rear sash adjustment. Adjust two adjusting bolts alternately step by step to obtain dimensions shown below (cross-section A).

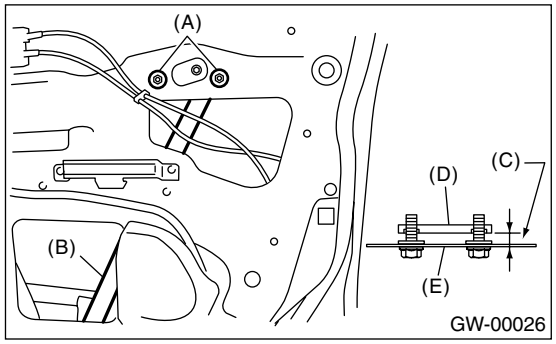
NOTE:
If two nuts are loosened at the same time, sash moves back and forth. Therefore, when one nut is adjusted, secure the other.

9) Make the same adjustment of two adjusting bolts of rear sash.



(1) 3.5±0.8 mm (0.137±0.031 in)
(2) 9.5±1 mm (0.374±0.039 in)

NOTE:
Do not tilt the sash bracket to inner panel during adjustment. Otherwise smooth regulator operation cannot be achieved.

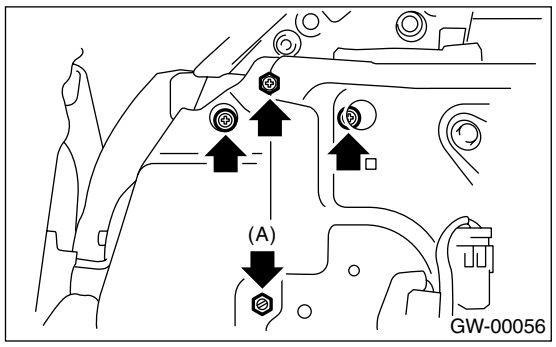


(A) Sash bracket
(B) Rear sash
(C) Adjust a line parallel
(D) Sash
(E) Innter panel

10) Make adjustment of front sash in the same manner as that of rear sash.

NOTE:
Although front and rear sashes must, as a rule, be adjusted in the same manner, in some door installation, the adjustment in a different manner may be required. However, adjustment of one sash to the maximum amount and the other to the minimum amount is not permitted. Such adjustment may result in application of excessive load to regulator.

11) After adjustments, tighten the nuts.
12) After adjustment to glass, close the door. If there is even a little gap between outer lip of gusset and glass surface, adjust the gap with adjusting nut (A) in lower fitting part of the gusset to prevent generation of wind noise.
13) During adjustments, loosen the other three clamping screws.

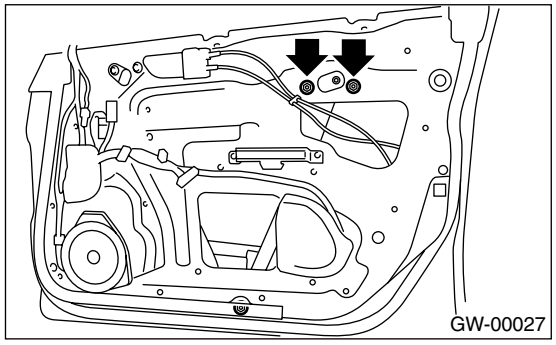


14) After adjustment, tighten the bolts and nuts.

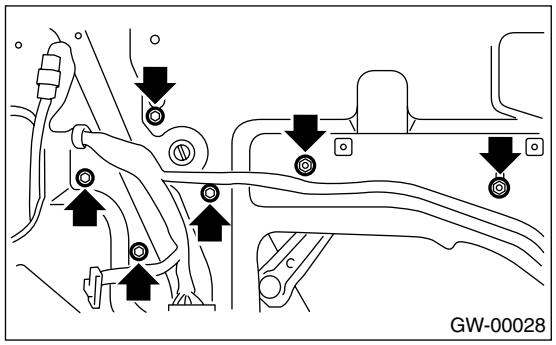
9. Front Regulator and Motor Assembly

A: REMOVAL

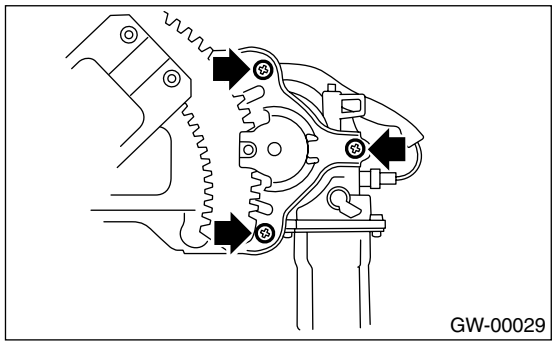
1) Remove the door glass. <Ref. to GW-16, REMOVAL, Front Door Glass.>
2) Loosen the nuts to remove rear sash.



3) Disconnect the motor connector.
4) Loosen the four bolts and two nuts to remove regulator assembly.



5) Loosen the screw to remove motor assembly.



B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust the front door glass. <Ref. to GW-17, ADJUSTMENT, Front Door Glass.>

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to GW-3, FRONT DOOR GLASS, COMPONENT, General Description.>

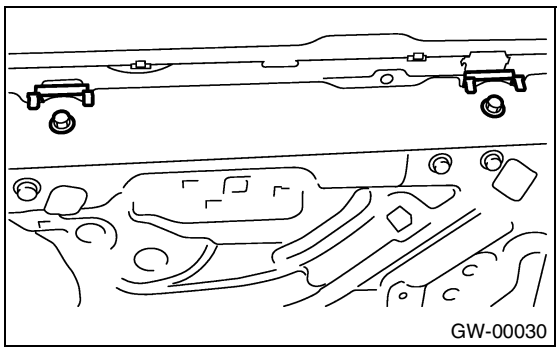
C: INSPECTION

1) Make sure that the power window motor rotates properly when battery voltage is applied to the terminals of motor connector.
2) Change polarity of battery connections to terminals to ensure that the motor rotates in reverse direction.

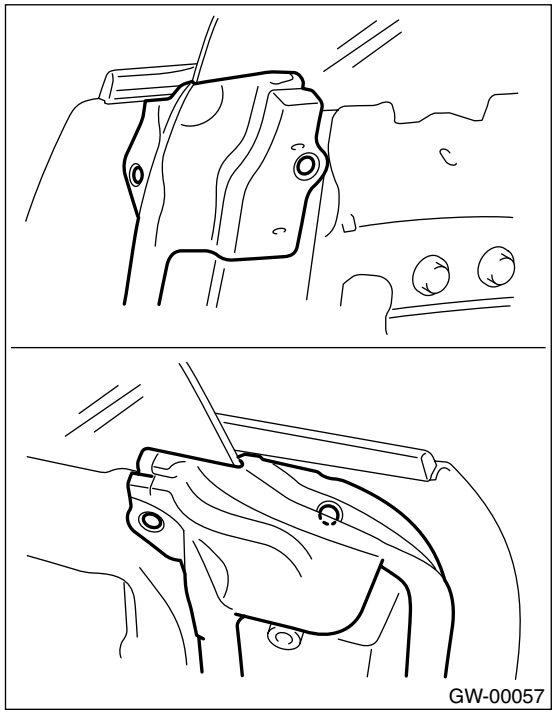
10.Rear Door Glass

A: REMOVAL

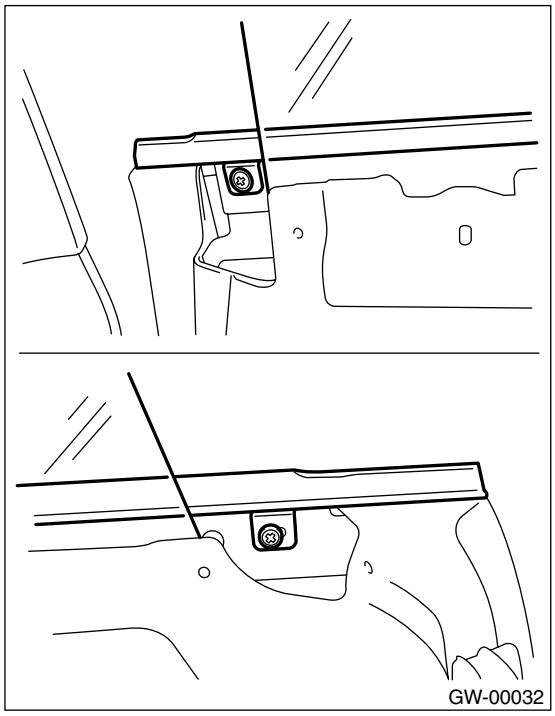
1) Remove the rear door trim. <Ref. to EI-36, REMOVAL, Rear Door Trim.>
2) Remove the front speaker. <Ref. to ET-6, REMOVAL, Front Speaker.>
3) Remove the sealing cover. <Ref. to EB-16, REMOVAL, Rear Sealing Cover.>
4) Remove the stabilizer.


GW-00030

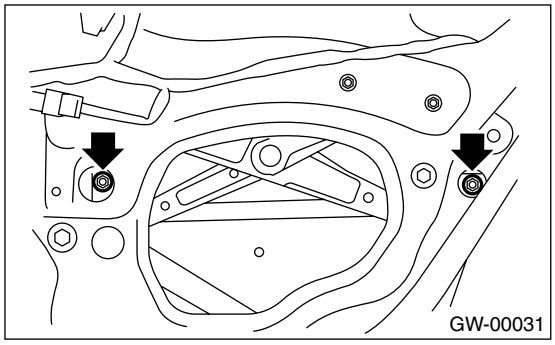
5) Remove the door weather strip.


GW-00057

6) Loosen the two screws to remove the weather strip outer.


GW-00032

7) Operate the power window switch to remove glass as shown in the figure, and then remove two nuts.


GW-00031

8) Take out the door glass.

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
Make sure that the glass stay is placed securely in sash.

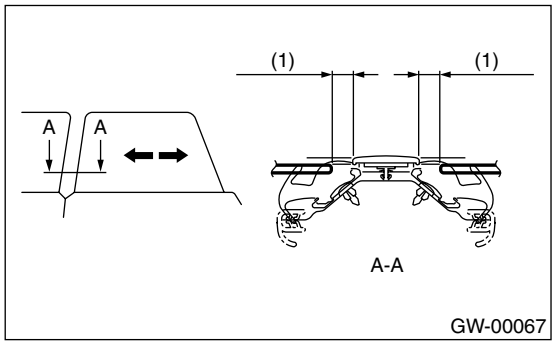
2) Adjust the rear door glass. <Ref. to GW-22, ADJUSTMENT, Rear Door Glass.>

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to GW-4, REAR DOOR GLASS, COMPONENT, General Description.> and <Ref. to GW-3, FRONT DOOR GLASS, COMPONENT, General Description.>

C: ADJUSTMENT

NOTE:
The rear door glass, as a rule, should be adjusted in the same manner as front glass, although they are different in dimension. Special notes for the rear glass are given below.

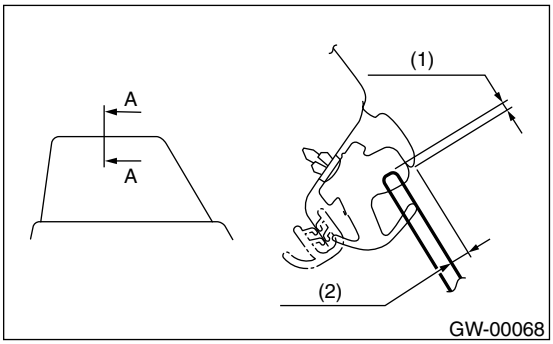
1) Adjust the glass position using the following dimensions as a guide line. (Difference between upper side and lower side must be within 1.5 mm (0.059 in).)



(1) 12±1 mm (0.472±0.039 in)

NOTE:
• If the dimensions are smaller than the given dimensions, glass may get caught in weatherstrip during lifting/lowering operation. In the worst case, it may cause the glass not to be opened fully.
• After adjustment, move the glass up and down to check whether it is caught.

2) Adjust the crimp of glass using the following dimensions as a guide line.



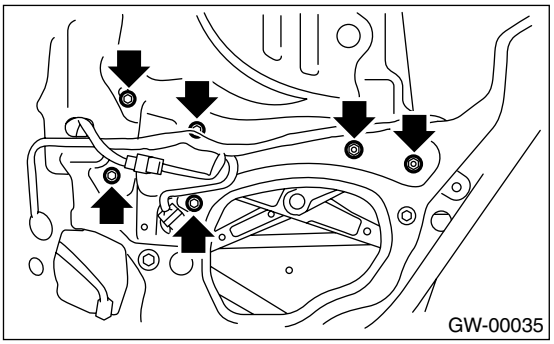
(1) 3.5±0.8 mm (0.137±0.031 in)
(2) 9.5±1 mm (0.374±0.039 in)

NOTE:
• If the crimp of rear glass is higher than necessary, glass may get caught in weatherstrip of center pillar corner, resulting in early wear of weatherstrip. Be careful when adjusting.
• After adjustment, move the glass up and down to check whether it is caught.

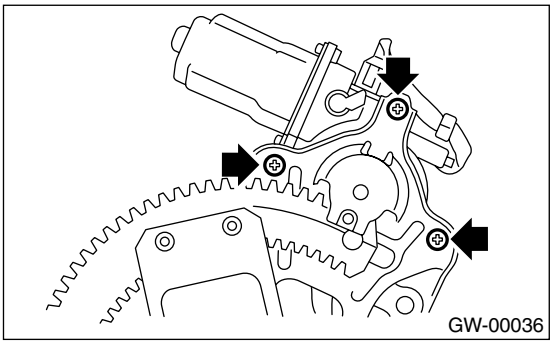
11.Rear Regulator and Motor Assembly

A: REMOVAL

1) Remove the door glass. <Ref. to GW-21, REMOVAL, Rear Door Glass.>
2) Remove the front sash.
3) Disconnect the motor connector.
4) Loosen the four bolts and two nuts to remove regulator assembly.



5) Loosen the screws to remove motor assembly.



B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust the rear door glass. <Ref. to GW-22, ADJUSTMENT, Rear Door Glass.>

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to GW-4, REAR DOOR GLASS, COMPONENT, General Description.>

C: INSPECTION

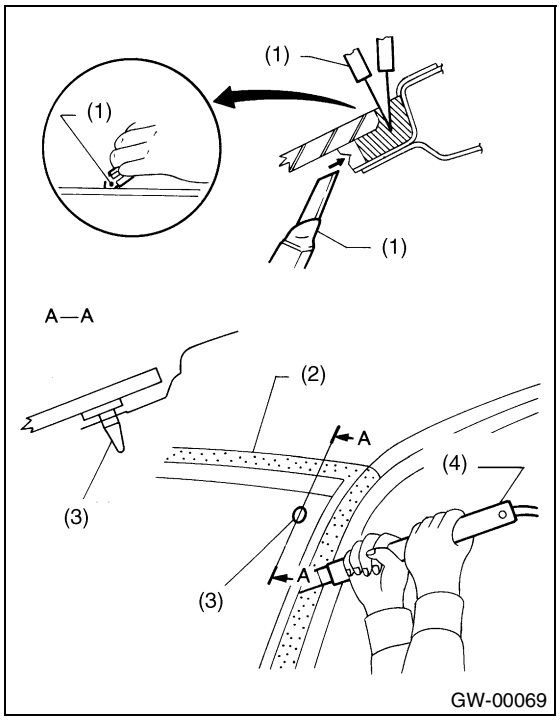
1) Make sure that the power window motor rotates properly when battery voltage is applied to the terminals of motor connector.
2) Change polarity of battery connections to the terminals to ensure that the motor rotates in reverse direction.

12.Windshield Glass

A: REMOVAL

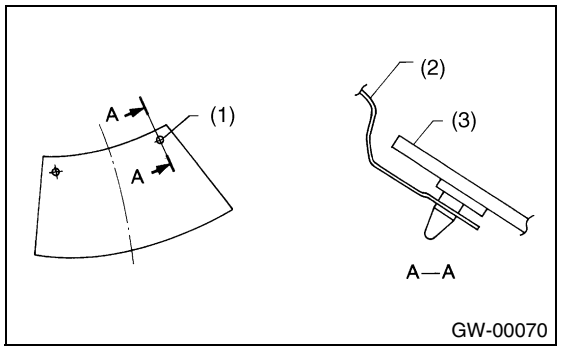
1. USING WINDSHIELD KNIFE

1) Remove the cowl panel. <Ref. to EI-32, REMOVAL, Cowl Panel.>
2) Remove the glass molding.
3) Tape the body side of the circumference of windshield glass for protection.
4) Apply sufficient amount of soapy water to the adhesive layer.
5) Insert the windshield knife into the adhesive layer.
6) While holding the knife edge and windshield glass edge at a right angle, move the windshield knife in parallel to the windshield glass edge along face and edge of windshield glass to cut the adhesive layer.



(1) Putty knife
(2) Protective tape
(3) Matching pin
(4) Windshield glass knife

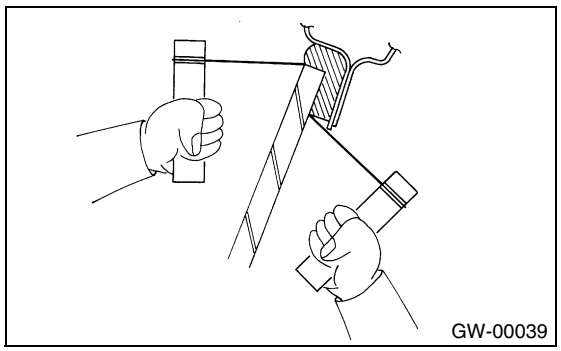
NOTE:
Because the matching pins are bonded to the corners of glass, use piano wire to cut the pin.



(1) Matching pin
(2) Body panel
(3) Glass

2. USING PIANO WIRE

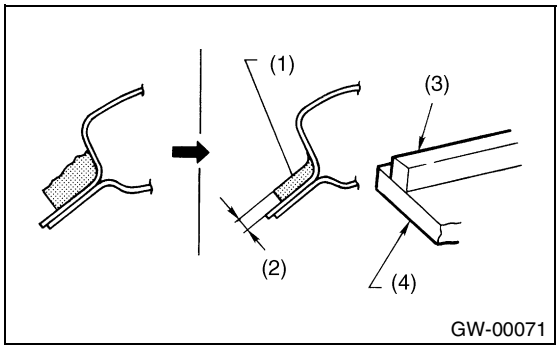
1) Remove the cowl panel. <Ref. to EI-32, REMOVAL, Cowl Panel.>
2) Remove the roof molding and upper front molding.
3) Tape the body side of the circumference of windshield glass for protection.
4) Make a hole in the adhesive layer using a drill or knife.
5) Pass the piano wire through the hole, and attach securely both the wire ends to pieces of wood.



6) Pull the wire ends alternately to cut off the adhesive layer.

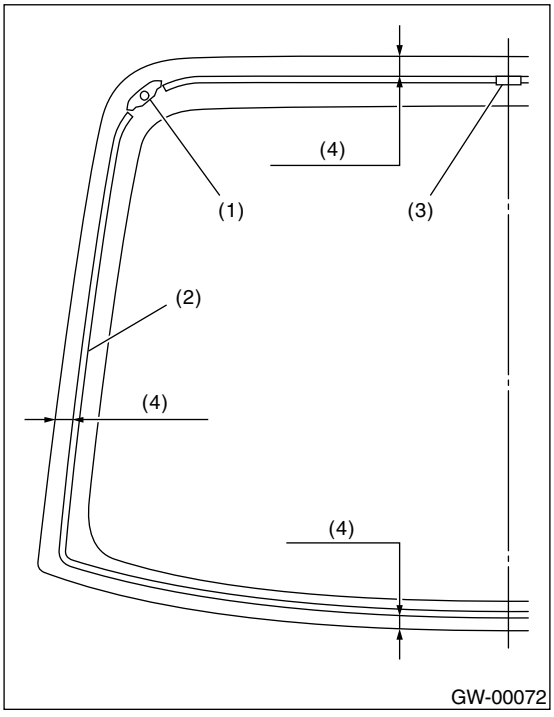
B: INSTALLATION

1) Clean the external circumference of windshield glass with alcohol or white gasoline.
2) Remove the adhesive layer on the body using cutter knife to obtain smooth face 2 mm (0.08 in) thick.



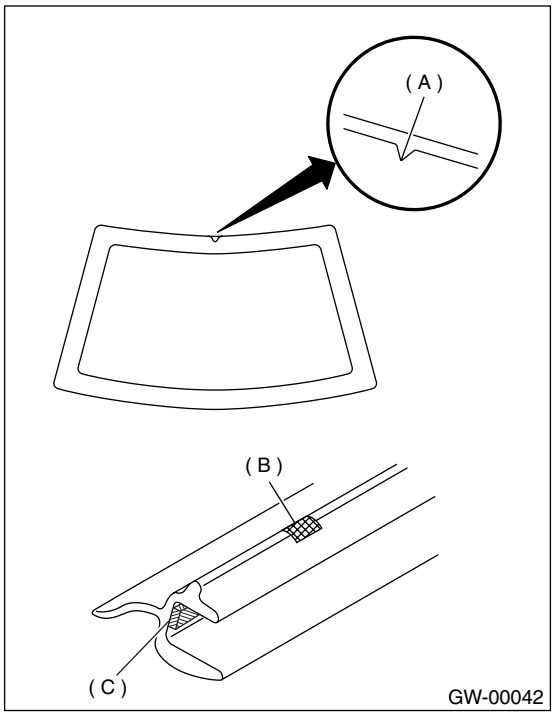
(1) Adhesive
(2) 2 mm (0.08 in)
(3) Dam rubber
(4) Glass

3) Clean the body with alcohol or white gasoline to remove thoroughly chips, dusts, and dirts from body face.
4) Apply the dam rubber to back of glass.

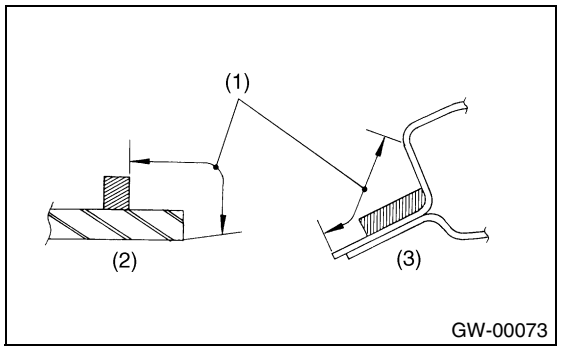


(1) Matching pin
(2) Dam rubber
(3) Fastener
(4) 13 mm (0.512 in)

5) Remove the backing of double-faced adhesive tape (C) and then align the molding mark (B) to notch (A). Attach the molding around the edge of glass, and then press it evenly to fit.

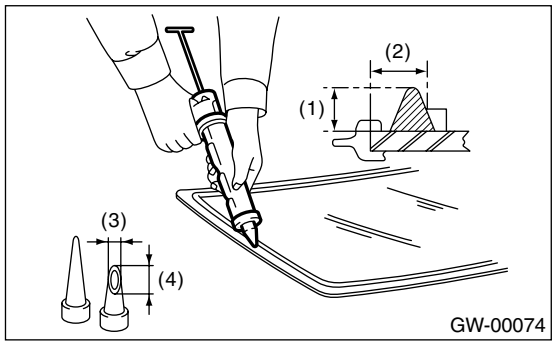


6) Apply primer to the adhesive layer of glass using sponge.
7) Apply primer to the adhesive layer of body.
Primer once attached to the painted surface of the body and internal trim is hard to wipe off. Mask the circumference of such areas.
Let the primer dry for about ten minutes before installing the glass.



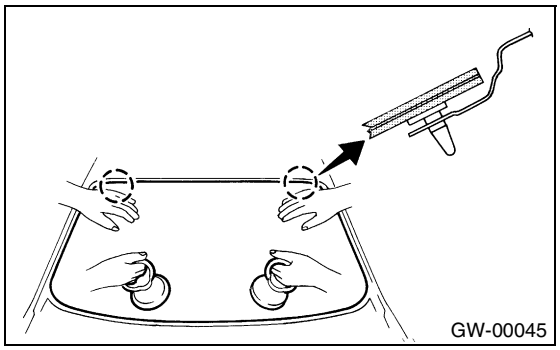
(1) Application of primer
(2) Glass side
(3) Body side

8) Cut off the cartridge nozzle tip and set it in sealant gun as shown.



(1) 10 — 13 mm (0.39 — 0.51 in)
(2) 13 mm (0.51 in)
(3) 10 mm (0.39 in)
(4) 15 mm (0.59 in)

9) Apply adhesive to the glass end surface as shown.
10) Fit the matching pins using suction rubber cup to install the windshield glass.



11) Lightly press the windshield glass for tight fit.
12) After completion of all work, allow the vehicle to stand for about 24 hours.

NOTE:
For minimum drying time and time the vehicle must be left standing before driving after bonding, follow instructions or instruction manual from the adhesive manufacturer.

13) After curing of adhesive, pour water on external surface of vehicle to check that there are no water leaks.

NOTE:
When a vehicle is returned to the user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.

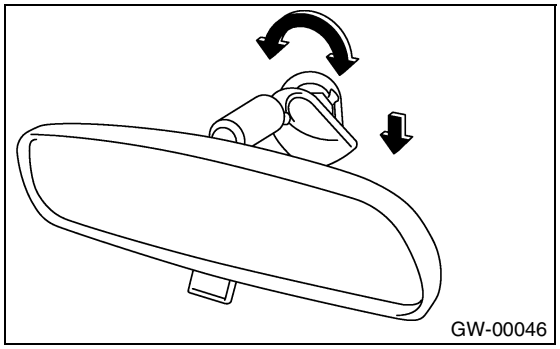
14) Install the cowl panel. <Ref. to EI-32, INSTALLATION, Cowl Panel.>

13.Inner Rearview Mirror

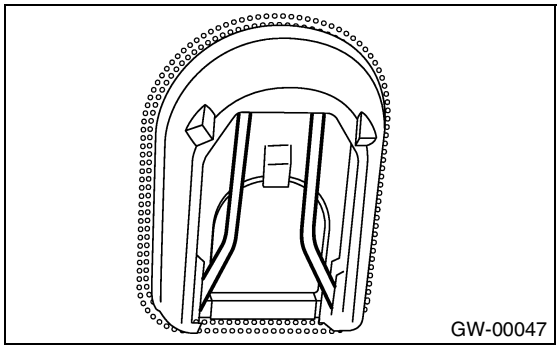
A: REMOVAL

NOTE:
The spring cannot be reused. Prepare a new spring before removal.

1) Turn the mirror base 90 degrees clockwise or counterclockwise to remove it.



2) Remove the spring from mirror base.



CAUTION:
Be careful not to damage the mirror surface.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

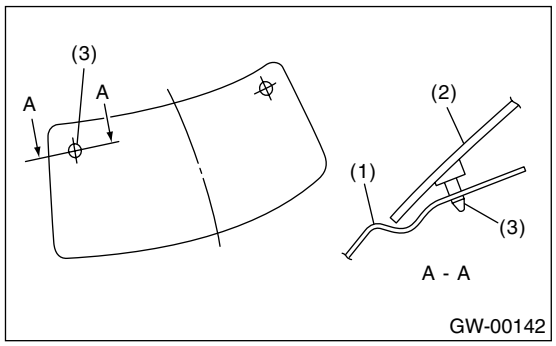
Do not let the mirror be damaged.
Do not let the spring deteriorate.

14.Rear Gate Glass

A: REMOVAL

1) Remove the rear gate garnish. <Ref. to WW-17, REMOVAL, Rear Gate Garnish.>
2) Remove the electrical connector from rear defogger terminal.
3) Remove the glass in same procedure as for windshield glass. <Ref. to GW-24, REMOVAL, Windshield Glass.>

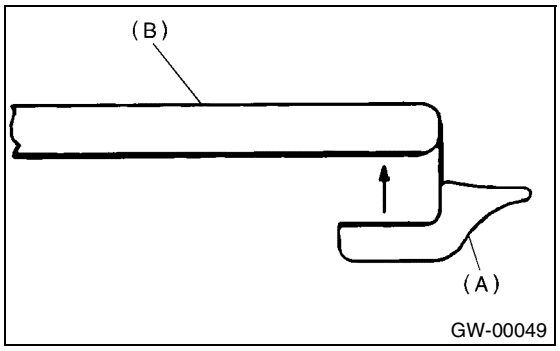
NOTE:
A matching pin is cemented to corners of the glass on the compartment side. Use a piano wire when cutting each pin.



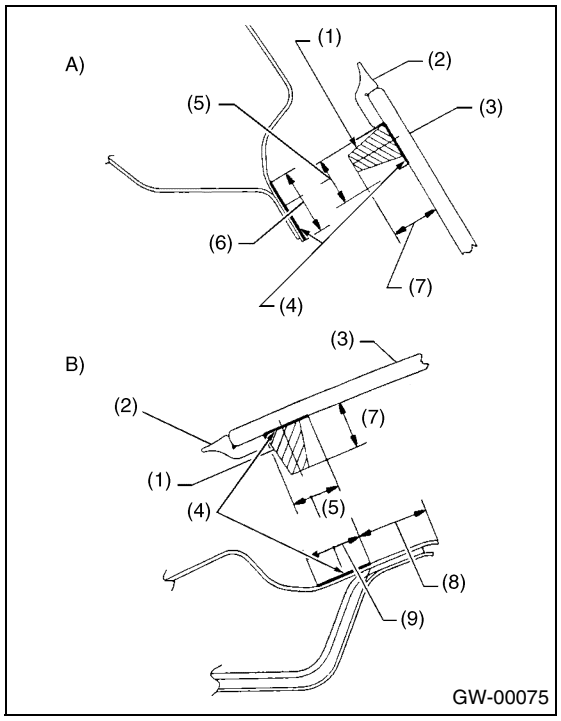
(1) Body panel
(2) Glass
(3) Matching pin

B: INSTALLATION

1) Install a new rubber strip (A) by aligning it with the end of the rear gate glass (B).



2) Install the glass in same procedure as for windshield glass. <Ref. to GW-20, INSPECTION, Front Regulator and Motor Assembly.>



A) Upper side
B) Left and right side
(1) Adhesive
(2) Strip rubber
(3) Glass
(4) Primer
(5) 12 mm (0.47 in)
(6) 14 mm (0.55 in)
(7) 10 — 13 mm (0.39 — 0.51 in)
(8) 15 mm (0.31 in)
(9) 12 mm (0.47 in)

3) About one hour after installation, conduct a leak test.
4) After completion of all work, allow the vehicle to stand for about 24 hours.

NOTE:
• For minimum drying time and time the vehicle must be left standing before driving after bonding, follow instructions or instruction manual from the adhesive manufacturer.
• When a vehicle is returned to the user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.

5) Connect the rear defogger terminals.
6) Install the rear gete garnish. <Ref. to WW-17, INSTALLATION, Rear Gate Garnish.>

15.Rear Window Defogger System

A: SCHEMATIC

1. REAR WINDOW DEFOGGER

<Ref. to WI-208, SCHEMATIC, Rear Window Defogger System.>

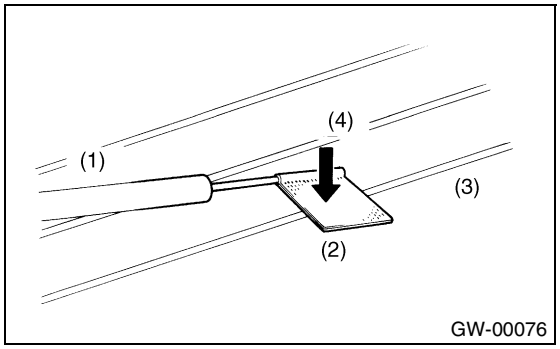
B: INSPECTION

Symptom	Repair order
Rear window defogger does not operate.	(1) Fuse (M/B No. 1) (F/B No. 17) (2) Rear defogger relay (3) Rear defogger timer (4) Defogger switch (5) Rear defogger condenser (6) Defogger wire (7) Wire harness

16.Rear Window Defogger

A: INSPECTION

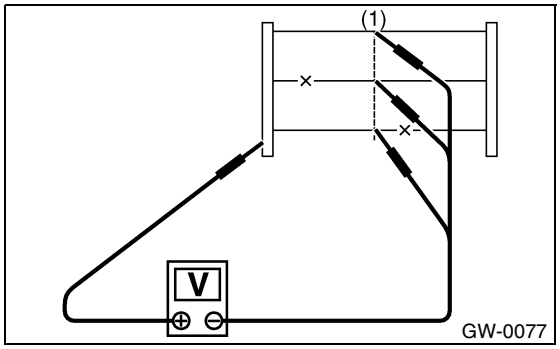
1) Turn the ignition switch to ON.
2) Turn the defogger switch to ON.
3) Wrap the tips of tester pins with aluminum foil to avoid damage to heat wire.



(1) Tester probe
(2) Tin foil
(3) Heat wire
(4) PRESS

4) Measure the voltage at wire center with DC voltmeter.

Standard voltage:
Approx. 6 V



(1) Center

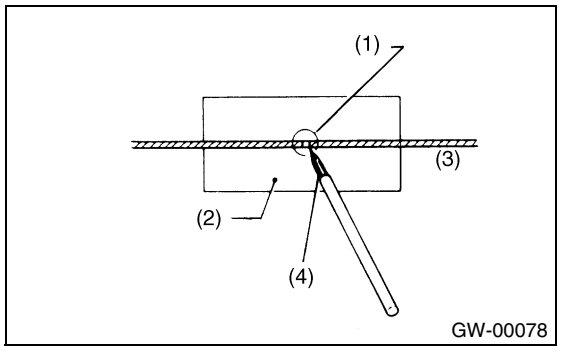
Voltage	Criteria
Approx. 6 V	OK
Approx. 12 V or 0 V	Broken

NOTE:
• If the measured value is 12 volts, heat wire is open between wire center and positive (+) end.
• If zero volt, heat wire is open between wire center and ground.

5) Apply positive lead of voltmeter to positive terminal of heat wire, and then move the negative lead along the wire up to negative terminal end. If voltage changes from zero to several volts during movement of lead, heat wire is open at the voltage change point.

B: REPAIR

1) Clean the broken portion with alcohol or white gasoline.
2) Mask both side of wire with thin film.
3) Apply conductive silver composition (DUPONT No. 4817) to broken portion.



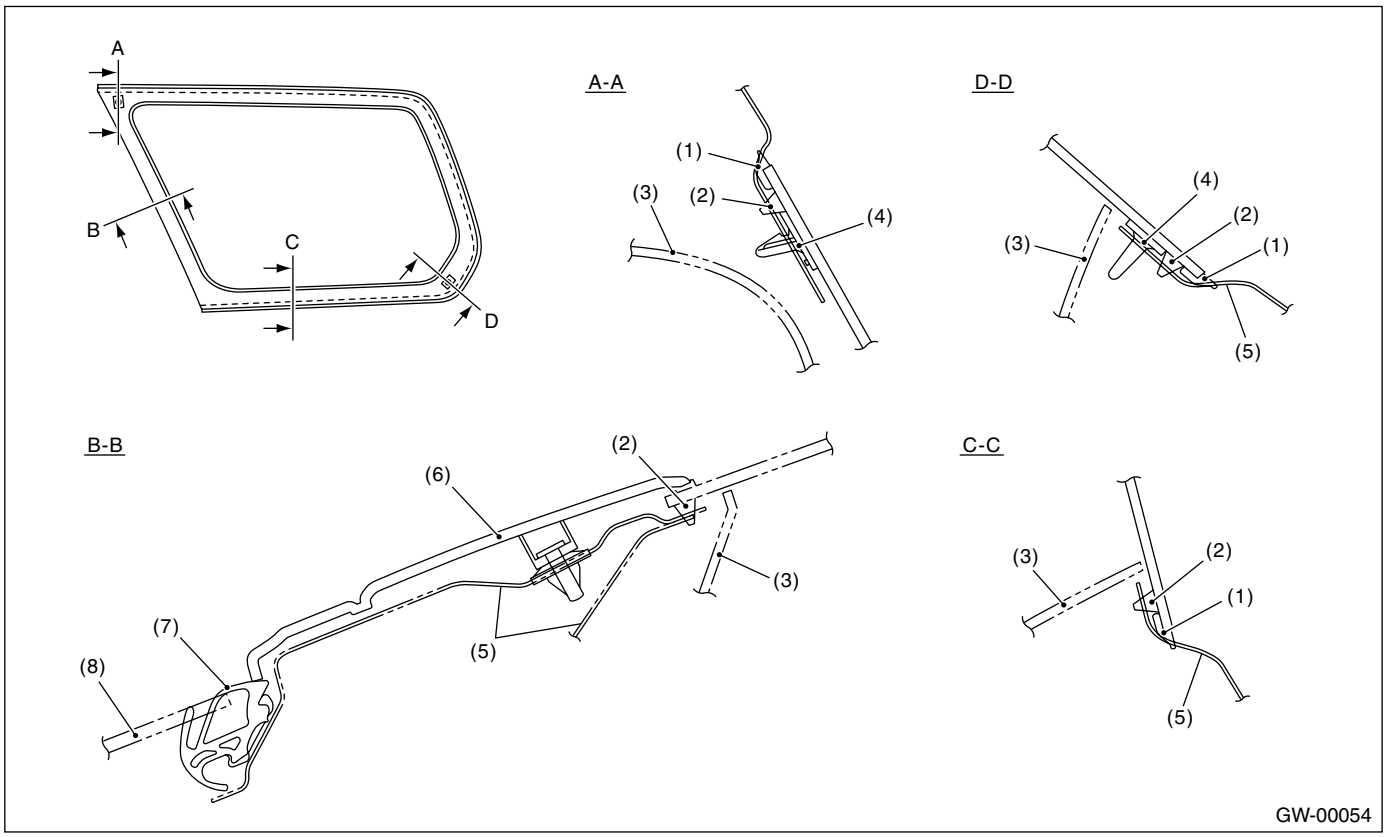
(1) Broken portion
(2) Masking thin film
(3) Broken wire
(4) Conductive silver composition

4) After repair, check the wire.

17.Rear Quarter Glass

A: REMOVAL

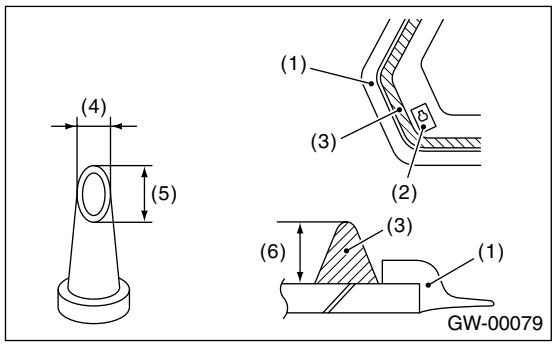
Remove the glass in the same procedure as for windshield glass. <Ref. to GW-24, REMOVAL, Windshield Glass.>



(1) Molding
(2) Adhesive
(3) Interior trim
(4) Locating pin
(5) Body
(6) Cover C pillar
(7) Weatherstrip
(8) Rear door glass

B: INSTALLATION

1) Cut off the nozzle tip as shown in the figure.



(1) Molding
(2) Matching pin
(3) Adhesive
(4) 10 mm (0.39 in)
(5) 15 mm (0.59 in)
(6) 10 — 13 mm (0.39 — 0.51 in)

2) Install the glass in the same procedure as for windshield glass. <Ref. to GW-25, INSTALLATION, Windshield Glass.>

3) After completion of all work, allow the vehicle to stand for about 24 hours.

NOTE:
For minimum drying time and time the vehicle must be left standing before driving after bonding, follow instructions or instruction manual from the adhesive manufacturer.

4) After curing of adhesive, pour water on external surface of vehicle to check that there are no water leaks.

NOTE:
When a vehicle is returned to the user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.

18.Roof Window Glass

A: REMOVAL

<Ref. to SR-5, REMOVAL, Sunroof Lid.>

B: INSTALLATION

<Ref. to SR-5, INSTALLATION, Sunroof Lid.>

C: ADJUSTMENT

<Ref. to SR-5, ADJUSTMENT, Sunroof Lid.>

BODY STRUCTURE

BS

Page

Refer to G8071GZ SUPPLEMENT for this section.

INSTRUMENTATION/DRIVER INFO

IDI

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1. General Description

A: SPECIFICATIONS

Combination meter	Speedometer	Electric pulse type
	Temperature gauge	Cross coil type
	Fuel gauge	Cross coil type
	Tachometer	Electric pulse type
	Turn signal indicator light	14 V — 2 W
	Charge indicator light	14 V — 1.4 W
	Oil pressure indicator light	LED
	ABS warning light	14 V — 1.4 W
	CHECK ENGINE warning light (Malfunction indicator light)	LED
	HI-beam indicator light	14 V — 2 W
	Door open warning light	LED
	Seat belt warning light	LED
	Brake fluid and parking brake warning light	14 V — 2 W
	FWD indicator light	LED
	AIRBAG warning light	LED
	Meter illumination light	14 V — 3.4 W, 14 V — 2 W
	AT OIL TEMP. warning light	LED
	LO indicator light	LED
	HOLD indicator light	LED
	Immobilizer indicator light	LED
	Rear differential oil temperature warning light	14 V — 2 W
	Cruise indicator light	14 V — 1.4 W
	Rear fog light indicator light	14 V — 2 W
	POWER indicator light	14 V — 1.4 W
	Low fuel warning light	LED
	AT select lever position indicator light	14 V — 100 mA
	LCD back light	14 V — 1.4 W

B: CAUTION

- Be careful not to damage meters and instrument panel.
- Be careful not to damage meter glasses.
- Make sure that electrical connector is connected securely.
- After installation, make sure that each meter operates normally.
- Use gloves to avoid damage and getting fingerprints on the glass surface and meter surfaces.
- Do not apply excessive force to the printed circuit.
- Do not drop or otherwise apply impact.

C: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

2. Combination Meter System

A: SCHEMATIC

1. COMBINATION METER

<Ref. to WI-108, SCHEMATIC, Combination Meter.>

2. OUTSIDE TEMPERATURE INDICATOR

<Ref. to WI-191, SCHEMATIC, Outside Temperature Display System.>

B: INSPECTION

CAUTION:
When measuring voltage and resistance of the ECM, TCM, or each sensor, use a tapered pin with a diameter of less than 0.64 mm (0.025 in) in order to avoid poor contact. Do not insert the pin more than 2 mm (0.08 in).

1. SYMPTOM CHART

Symptom	Repair order	Reference
Combination meter assembly does not operate.	(1) Power supply (2) Ground circuit	<Ref. to IDI-5, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Combination Meter System.>
Speedometer does not operate.	(1) (MT) Vehicle speed sensor (AT) Transmission control module (2) Harness (3) Speedometer	MT: <Ref. to IDI-6, CHECK VEHICLE SPEED SENSOR, INSPECTION, Combination Meter System.>
		AT: <Re. to IDI-<Ref. to IDI-7, CHECK TRANSMISSION CONTROL MODULE, INSPECTION, Combination Meter System.>
Tachometer does not operate.	(1) Engine control module (2) Harness (3) Tachometer	<Ref. to IDI-8, CHECK ENGINE CONTROL MODULE, INSPECTION, Combination Meter System.>
Fuel gauge does not operate.	(1) Fuel level sensor (2) Harness (3) Fuel gauge	<Ref. to IDI-9, CHECK FUEL LEVEL SENSOR, INSPECTION, Combination Meter System.>
Water temperature gauge does not operate.	(1) Engine coolant temperature sensor (2) Harness (3) Water temperature gauge	<Ref. to IDI-10, CHECK ENGINE COOLANT TEMPERATURE SENSOR, INSPECTION, Combination Meter System.>
Outside temperature indicator does not operate.	(1) Ambient sensor (2) Harness (3) Combination meter	<Ref. to IDI-11, CHECK OUTSIDE TEMPERATURE INDICATOR, INSPECTION, Combination Meter System.>

2. CHECK POWER SUPPLY AND GROUND CIRCUIT

	Step	Value	Yes	No
1	**CHECK POWER SUPPLY FOR COMBINATION METER.** 1)Remove the combination meter. <Ref. to IDI-12, REMOVAL, Combination Meter Assembly.> 2)Disconnect the combination meter harness connector. 3)Turn the ignition switch to ON. 4)Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 9 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **2.**	Check the harness for open or short between ignition switch and combination meter.
2	**CHECK POWER SUPPLY FOR COMBINATION METER.** Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 8 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **3.**	Check the harness for open or short between fuse and combination meter.
3	**CHECK GROUND CIRCUIT OF COMBINATION METER.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of harness between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 10 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	Replace the combination meter printed circuit.	Repair the wiring harness.

3. CHECK VEHICLE SPEED SENSOR

	Step	Value	Yes	No
1	**CHECK VEHICLE SPEED SENSOR.** 1)Lift-up the vehicle and support it with safety stands. 2)Remove the combination meter with harness connector. **Warning:** **Be careful not to get caught in the running wheels.** 3)Drive the vehicle at a speed greater than 20 km/h (12 MPH). 4)Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 12 (+) — Chassis ground (–):*** Is the measured value as same as specified value?	0 ←→ 5 V	Check the speedometer. <Ref. to IDI-15, REMOVAL, Speedometer.>	Go to step **2.**
2	**CHECK VEHICLE SPEED SENSOR POWER SUPPLY.** 1)Turn the ignition switch to OFF. 2)Disconnect the vehicle speed sensor harness connector. 3)Turn the ignition switch to ON. 4)Measure the voltage between vehicle speed sensor connector and engine ground. ***Connector & terminal*** ***(B17) No. 3 (+) — Engine ground (–):*** Is the measured value more than specified value?	10 V	Go to step **3.**	Check the harness for open or short between ignition switch and vehicle speed sensor.
3	**CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ENGINE GROUND.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between vehicle speed sensor connector and engine ground. ***Connector & terminal*** ***(B17) No. 2 — Engine ground:*** Is the measured value less than specified value?	10 Ω	Go to step **4.**	Repair the wiring harness.
4	**CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND COMBINATION METER.** 1)Disconnect the connector from combination meter. 2)Measure the resistance between vehicle speed sensor harness connector and combination meter harness connector. ***Connector & terminal*** ***(B17) No. 1 — (i10) No. 12:*** Is the measured value less than specified value?	10 Ω	Replace the vehicle speed sensor.	Repair the wiring harness.

4. CHECK TRANSMISSION CONTROL MODULE

	Step	Value	Yes	No
1	**CHECK TRANSMISSION CONTROL MODULE SIGNAL.** 1)Lift-up the vehicle and support it with safety stands. **Warning:** **Be careful not to get caught in the running wheels.** 2)Drive the vehicle faster than 10 km/h (6 MPH). 3)Measure the voltage between transmission control module connector and chassis ground. ***Connector & terminal*** ***(B56) No. 17 (+) — Chassis ground (–):*** Is the measured value as same as specified value?	0 ←→ 5 V	Go to step **2.**	Check the transmission control module. <Ref. to AT-2, Basic Diagnostic Procedure.>
2	**CHECK HARNESS BETWEEN TRANSMISSION CONTROL MODULE AND COMBINATION METER.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from transmission control module and combination meter. 3)Measure the resistance between transmission control module harness connector and combination meter harness connector. ***Connector & terminal*** ***(B56) No. 17 — (i10) No. 12:*** Is the measured value less than specified value?	10 Ω	Check the speedometer. <Ref. to IDI-15, REMOVAL, Speedometer.>	Repair the wiring harness.

5. CHECK ENGINE CONTROL MODULE

	Step	Value	Yes	No
1	**CHECK ENGINE CONTROL MODULE SIGNAL.** 1)Start the engine. 2)Measure the voltage between engine control module connector and engine ground. ***Connector & terminal*** ***Turbo model*** ***(B136) No. 9 (+) — Engine ground (–):*** ***Non-turbo model*** ***(B134) No. 10 (+) — Engine ground (–):*** Is the measured value as same as specified value?	0 ←→ 14 V	Go to step **2.**	Check the engine control module. <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(TURBO)-2, Basic Diagnostic Procedure.>
2	**CHECK HARNESS BETWEEN COMBINATION METER AND ENGINE CONTROL MODULE.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from engine control module and combination meter. 3)Measure the resistance between engine control module harness connector and combination meter harness connector. ***Connector & terminal*** ***Turbo model*** ***(B136) No. 9 — (i10) No. 11:*** ***Non-turbo model*** ***(B134) No. 10 — (i10) No. 11:*** Is the measured value less than specified value?	10 Ω	Check the tachometer. <Ref. to IDI-16, REMOVAL, Tachometer.>	Repair the wiring harness.

6. CHECK FUEL LEVEL SENSOR

	Step	Value	Yes	No
1	**CHECK FUEL LEVEL SENSOR.** 1)Remove the fuel level sensor. <Ref. to FU(TURBO)-61, REMOVAL, Fuel Level Sensor.> or <Ref. to FU(SOHC)-59, REMOVAL, Fuel Level Sensor.> 2)Measure the resistance between fuel level sensor terminals when setting the float to FULL and EMPTY position. ***Terminals*** ***No. 3 — No. 5:*** Is the measured value within specified value range?	FULL: 0.5 — 2.5 Ω EMPTY: 50 — 52 Ω	Go to step **2.**	Replace the fuel level sensor.
2	**CHECK FUEL SUB LEVEL SENSOR.** 1)Remove the fuel sub level sensor. <Ref. to FU(TURBO)-62, REMOVAL, Fuel Sub Level Sensor.> or <Ref. to FU(SOHC)-60, REMOVAL, Fuel Sub Level Sensor.> 2)Measure the resistance between fuel sub level sensor terminals when setting the float to FULL and EMPTY position. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within specified value range?	FULL: 0.5 — 2.5 Ω EMPTY: 42 — 44 Ω	Go to step **3.**	Replace the fuel sub level sensor.
3	**CHECK HARNESS BETWEEN FUEL SUB LEVEL SENSOR AND COMBINATION METER.** 1)Disconnect the connector from combination meter. 2)Measure the resistance between fuel sub level sensor harness connector terminal and combination meter harness connector terminal. ***Connector & terminal*** ***(R59) No. 1 — (i11) No. 1:*** Is the measured value less than specified value?	10 Ω	Go to step **4.**	Repair the wiring harness.
4	**CHECK HARNESS BETWEEN FUEL LEVEL SENSOR AND FUEL SUB LEVEL SENSOR.** Measure the resistance between fuel level sensor harness connector terminal and fuel sub level sensor harness connector terminal. ***Connector & terminal*** ***(R58) No. 3 — (R59) No.2:*** Is the measured value less than specified value?	10 Ω	Go to step **5.**	Repair the wiring harness.
5	**CHECK FUEL LEVEL SENSOR GROUND CIRCUIT.** Measure the resistance between fuel level sensor harness connector terminal and chassis ground. ***Connector & terminal*** ***(R58) No. 5 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	Check the fuel gauge. <Ref. to IDI-17, REMOVAL, Fuel Gauge.>	Repair the wiring harness.

7. CHECK ENGINE COOLANT TEMPERATURE SENSOR

	Step	Value	Yes	No
1	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** Check the engine coolant temperature sensor. <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(TURBO)-2, Basic Diagnostic Procedure.> Is the engine coolant temperature sensor OK ?	Engine coolant temperature sensor is OK.	Go to step **2.**	Replace the engine coolant temperature sensor.
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND COMBINATION METER.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from engine coolant temperature sensor and combination meter. 3)Measure the resistance between engine coolant temperature sensor harness connector and combination meter harness connector. ***Connector & terminal*** ***(E8) No. 3 — (i11) No. 10:*** Is the measured value less than specified value?	10 Ω	Go to step **3.**	Repair the wiring harness.
3	**CHECK WATER TEMPERATURE GAUGE GROUND CIRCUIT.** Measure the resistance between combination meter harness connector terminal and chassis ground. ***Connector & terminal*** ***(i11) No. 9 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	Check the water temperature gauge. <Ref. to IDI-18, REMOVAL, Water Temperature Gauge.>	Repair the wiring harness.

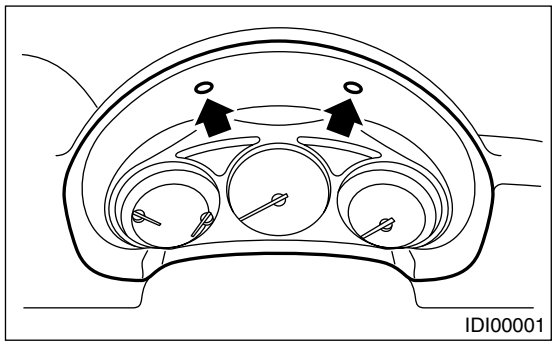
8. CHECK OUTSIDE TEMPERATURE INDICATOR

	Step	Value	Yes	No
1	**CHECK POWER SUPPLY FOR AMBIENT SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from outside temperture sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between outside temperture sensor herness connector terminal and chassis ground. ***Connector & terminal*** ***(F78) No. 2 (+) — Chassis ground (–):*** Is the measured value more than specified value?	4V	Go to step **3.**	Go to step **2.**
2	**CHECK HARNESS BETWEEN AMBIENT SENSOR AND COMBINATION METER.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from combination meter. 3)Measure the resistance between ambient sensor harness connector terminal and combination meter harness connector terminal. ***Connector & terminal*** ***(F78) No. 1 — (i10) No. 25:*** ***(F78) No. 2 — (i10) No. 24:*** Is the measured value less than specified value?	10 Ω	Replace the combination meter printed circuit.	Repair the wiring harness.
3	**CHECK AMBIENT SENSOR.** 1)Remove the ambient sensor. 2)Check the ambient sensor. <Ref. to IDI-19, INSPECTION, Ambient Sensor.> Is the ambient sensor OK?	Ambient sensor is OK.	Go to step **4.**	Replace the ambient sensor.
4	**CHECK OUTSIDE TEMPERATURE INDICATOR.** 1)Connect the combination meter harness connector. 2)Connect a resistor (3 kΩ) between terminals of ambient sensor harness connector. 3)Turn the ignition switch to ON and check the outside temperature indicator display. Does the indicator indicate specified value?	25°C (77°F)	Repair the poor contact of ambient sensor harness connector.	Replace the combination meter printed circuit.

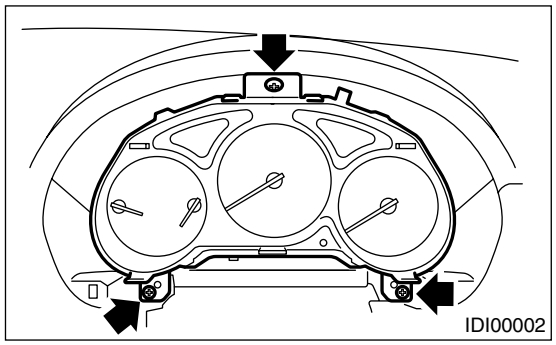
3. Combination Meter Assembly

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Set the tilt steering at lowest position.
3) Remove the screws and detach meter visor.



4) Remove the screws of combination meter and pull out the meter toward you.



5) Disconnect the connector in the upper area of combination meter to remove meter.

CAUTION:
• Be careful not to damage the meter or instrument panel.
• Pay particular attention to avoid damaging the meter glass.

B: INSTALLATION

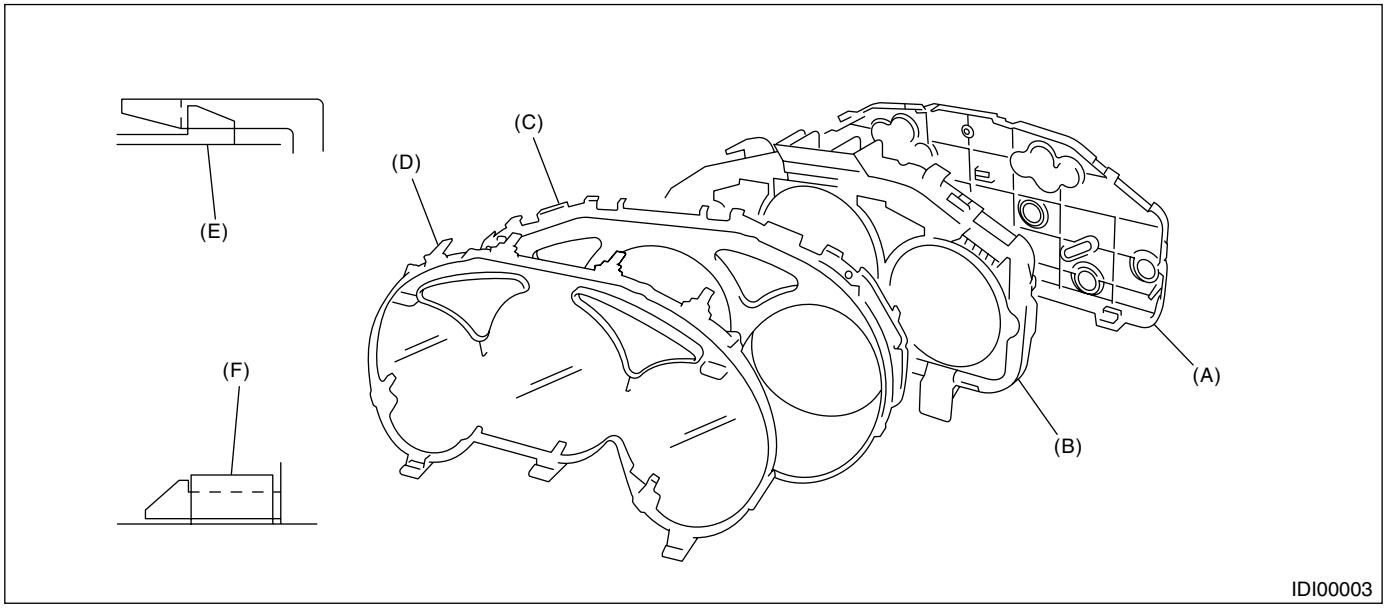
Install in the reverse order of removal.

CAUTION:
• Make sure that electrical connector is connected securely.
• Make sure that each meter operates normally.

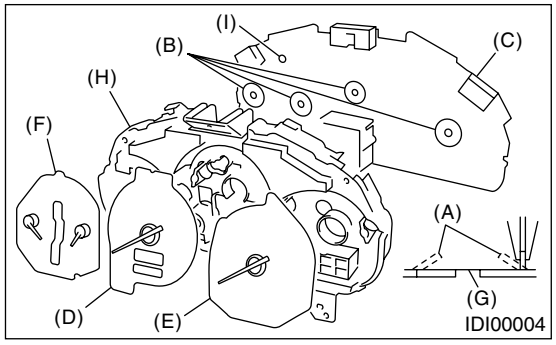
C: DISASSEMBLY

CAUTION:
Use gloves to avoid damage and getting fingerprints on the glass surface and meter surfaces.

1) Disengage the claw (E) to remove case (B) from back cover (A).
2) Disengage the claw (F) to remove meter glass (D) and reflector (C) from inner case.

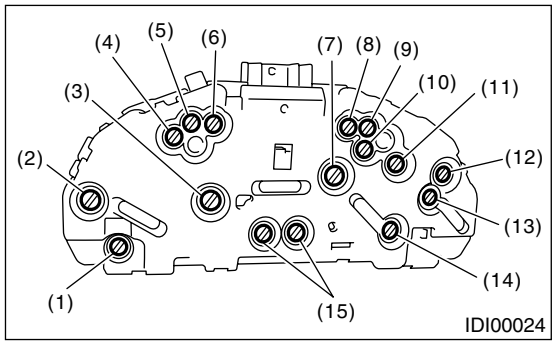


3) Pull up the claw (A) in portion (B) of combination meter printed circuit (C) with combination pliers. Push out the speedometer (D), tachometer (E) and fuel gauge and water temperature gauge assembly (F) using hole (G).
4) Pull up the claw in center of combination meter printed circuit (C), and remove the printed circuit from case (H).



5) Remove the AT select indicator light (I) from printed circuit (C).

1. BULB REPLACEMENT



(1) Charge warning
(2) Tachometer
(3) Speedometer and tachometer
(4) Rear fog light indicator light
(5) HI-beam indicator
(6) Turn signal indicator RH
(7) Speedometer
(8) Turn signal indicator LH
(9) Cruise indicator light or rear differential oil temperature warning light
(10) Brake warning
(11) ABS warning
(12) AT power mode indicator light
(13) Fuel gauge
(14) Temperature gauge
(15) LCD (Outside temperature indicator, Odometer and tripmeter)

D: ASSEMBLY

Assemble in the reverse order of disassembly.

4. Speedometer

A: REMOVAL

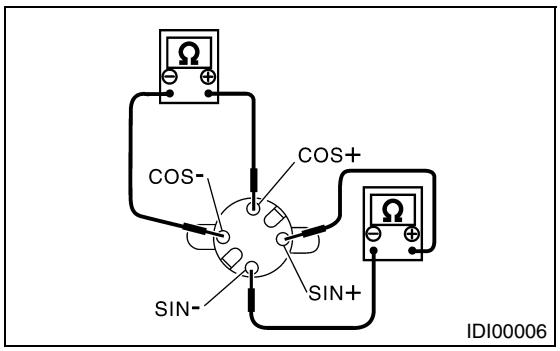
Disassemble the combination meter, and then remove the speedometer. <Ref. to IDI-13, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the speedometer resistance.



Terminal	Resistance
Terminals SIN+ and SIN–	200±8 Ω
Terminals COS+ and COS–	200±8 Ω

If NG, replace the speedometer.
If OK, replace the combination meter printed circuit.

5. Tachometer

A: REMOVAL

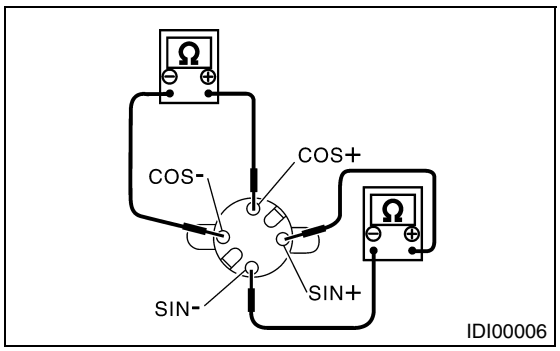
Disassemble the combination meter, and then remove the tachometer. <Ref. to IDI-13, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the tachometer resistance.



Terminal	Resistance
Terminals SIN+ and SIN–	200±8 Ω
Terminals COS+ and COS–	200±8 Ω

If NG, replace the tachometer.
If OK, replace the combination meter printed circuit.

6. Fuel Gauge

A: REMOVAL

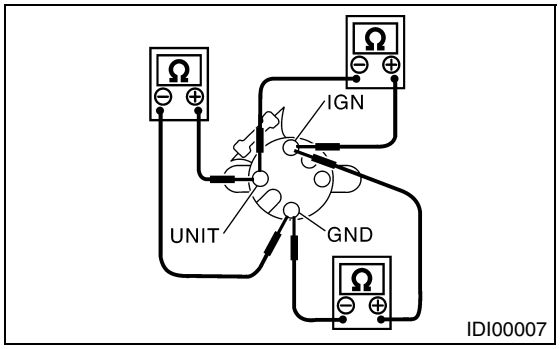
Disassemble the combination meter, and then remove the water temperature gauge and fuel gauge assembly. <Ref. to IDI-13, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the fuel gauge resistance.



Terminal	Resistance
Terminals IGN and GND	170±10 Ω
Terminals IGN and UNIT	35±10 Ω
Terminals UNIT and GND	136±10 Ω

If NG, replace the water temperature gauge and fuel gauge assembly.
If OK, replace the combination meter printed circuit.

7. Water Temperature Gauge

A: REMOVAL

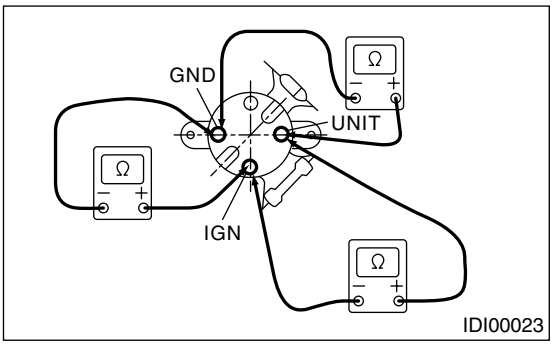
Disassemble the combination meter, and then remove the water temperature gauge and fuel gauge assembly. <Ref. to IDI-13, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the water temperature gauge resistance.



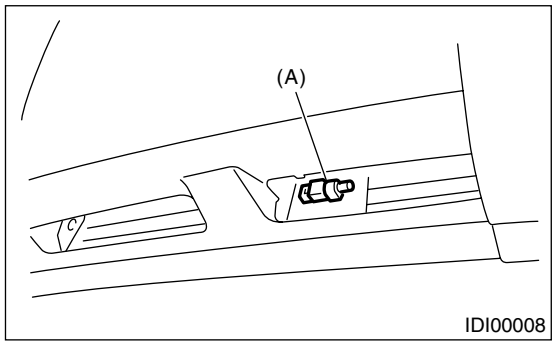
Terminal	Resistance
Terminals IGN and GND	208±10 Ω
Terminals IGN and UNIT	56±10 Ω
Terminals UNIT and GND	264±10 Ω

If NG, replace the water temperature gauge and fuel gauge assembly.
If OK, replace the combination meter printed circuit.

8. Ambient Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Disconnect the ambient sensor connector.
3) Remove the ambient sensor (A) from radiator lower panel.

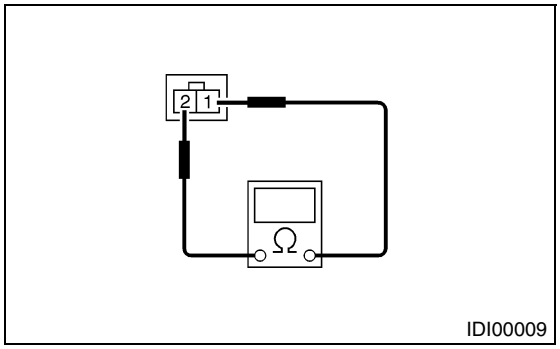


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the ambient sensor resistance.



Terminal	Resistance
1 and 2	3 kΩ/25°C (77°F)

If NG, replace the ambient sensor.

SEATS

SE

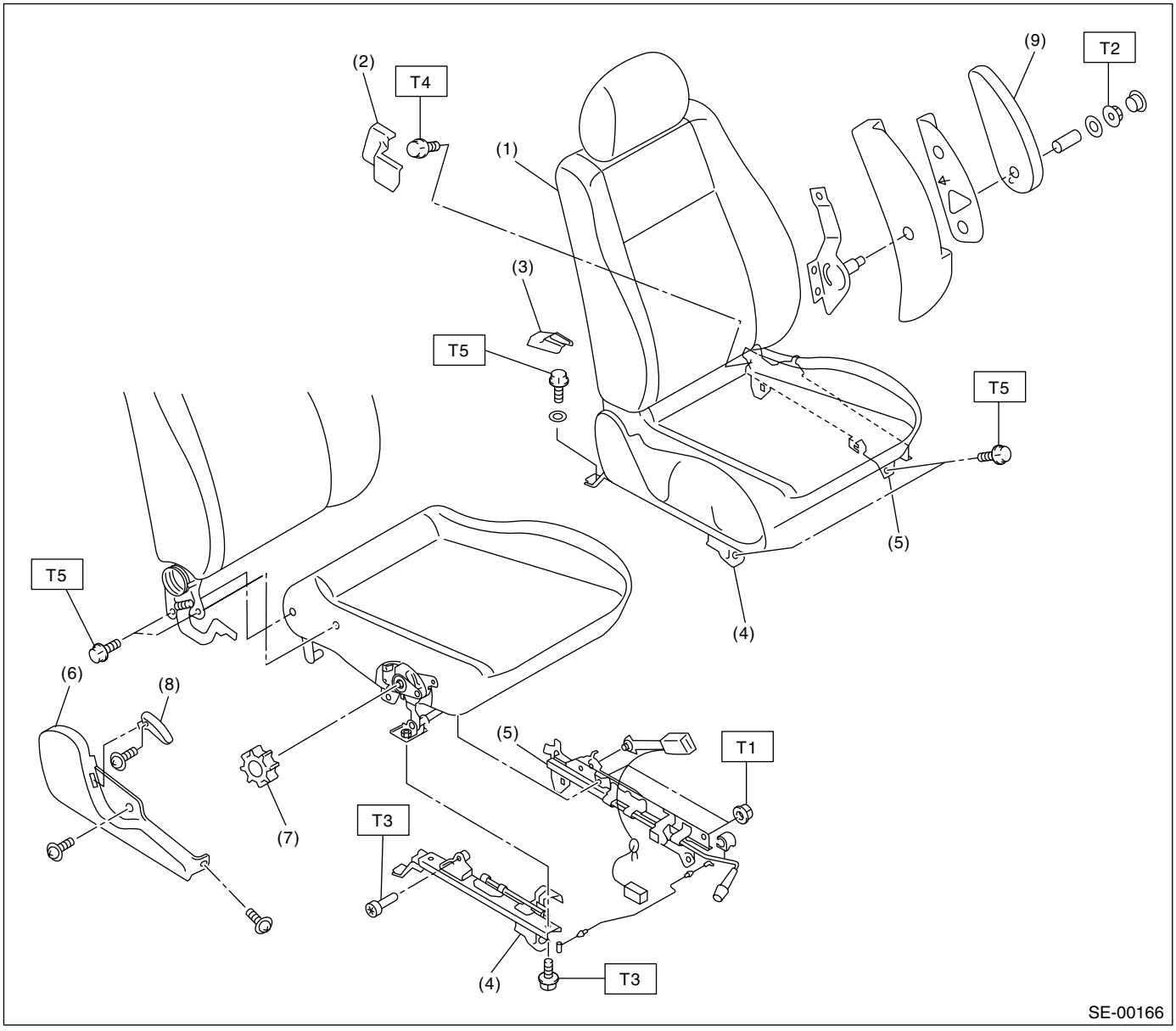
Page

1. General Description 2
2. Front Seat 5
3. Rear Seat 10

1. General Description

A: COMPONENT

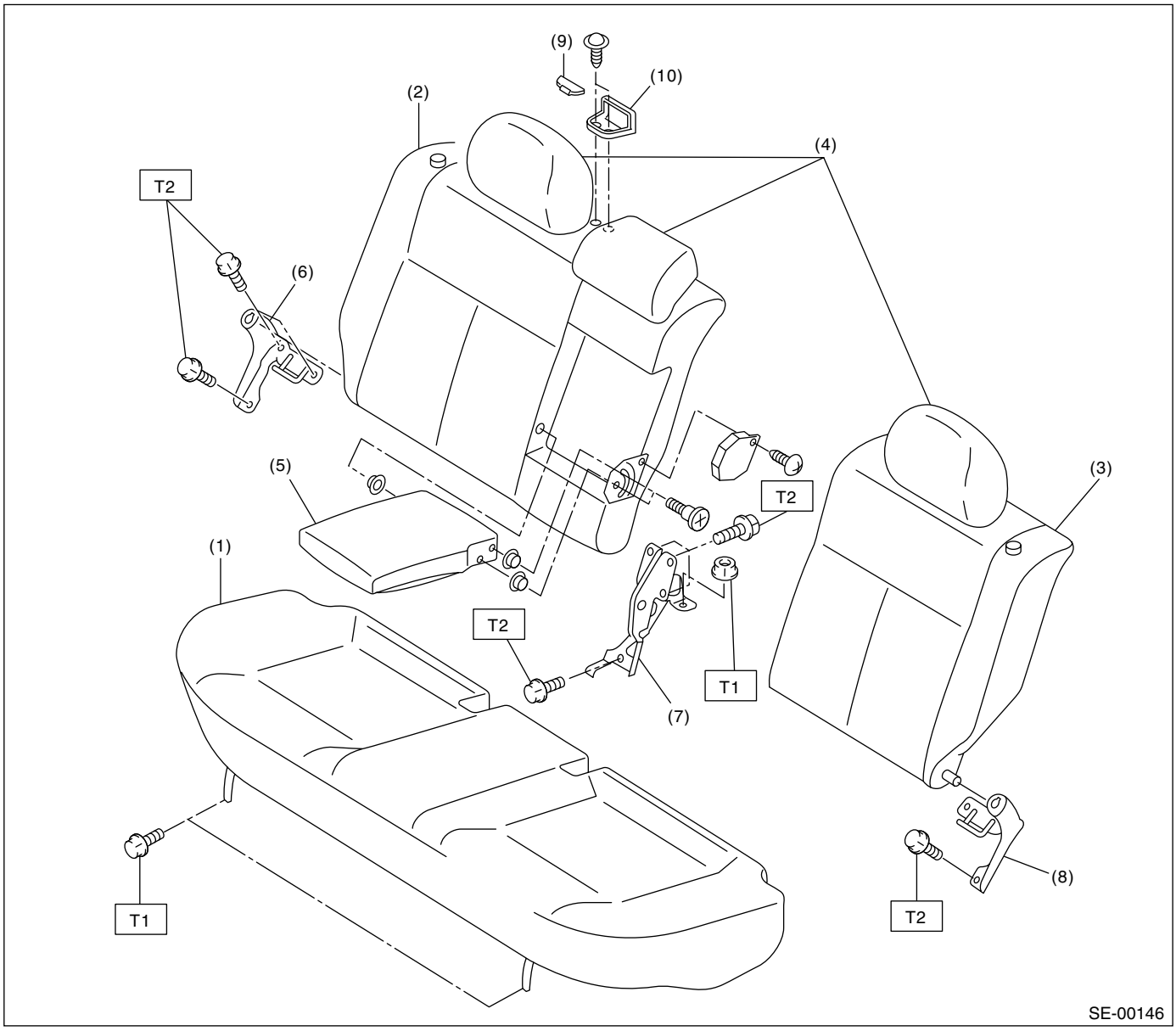
1. FRONT SEAT



(1) Front seat ASSY
(2) Rail cover IN
(3) Rail cover OUT
(4) Slide rail OUT
(5) Slide rail IN
(6) Seat hinge cover
(7) Seat lifter dial
(8) Reclining lever
(9) Arm rest

Tightening torque: N·m (kgf-m, ft-lb)
T1: 10 (1.0, 7.3)
T2: 17 (1.7, 12.5)
T3: 23 (2.3, 17)
T4: 30 (3.1, 22)
T5: 53 (5.4, 39)

2. REAR SEAT



(1)	Cushion	(6)	Hinge RH
(2)	Backrest RH	(7)	Hinge CTR
(3)	Backrest LH	(8)	Hinge LH
(4)	Head restraint	(9)	Webbing guide cap
(5)	Arm rest	(10)	Webbing guide

Tightening torque: N·m (kgf-m, ft-lb)
T1: 24.5 (2.5, 18.1)
T2: 33 (3.4, 24.6)

B: CAUTION

When removing the front seat from a side airbag loaded vehicle, follow cautions given in the airbag section.

C: PREPARATION TOOL

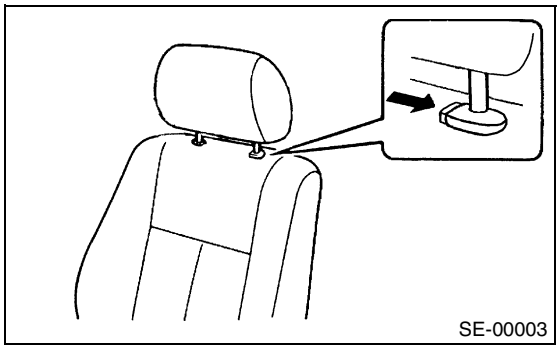
1. GENERAL TOOL

TOOL NAME	REMARKS
Long Nose Pliers	Used for removing and installing hog ring

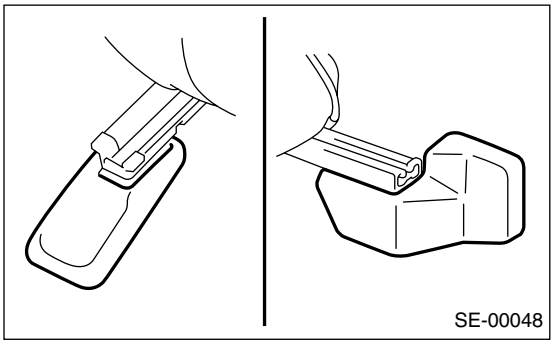
2. Front Seat

A: REMOVAL

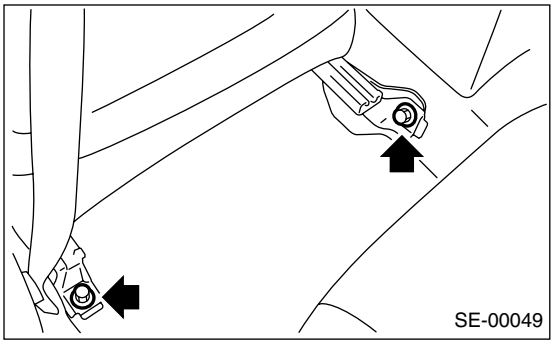
1) Disconnect the ground cable from battery.
2) While pressing the headrest lock button, remove the headrest.



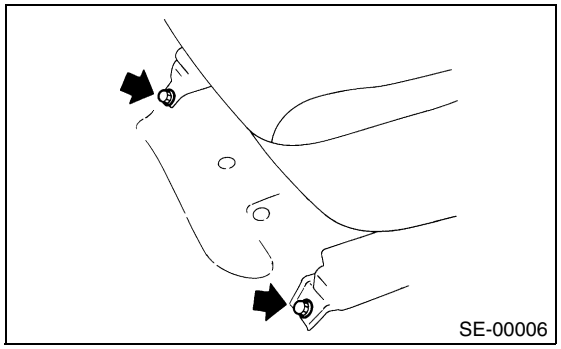
3) Tilt forward the backrest.
4) Move the seat to full front end.
5) Remove the bolt cover at rear end of slide rail.



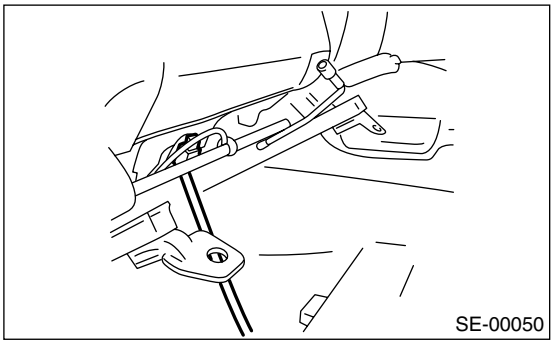
6) Remove the two bolts at rear side of seat rail.



7) Move the seat to full rear end.
8) Remove the two bolts at front side of seat rail.



9) Disconnect the side airbag connector under seat. (Side airbag equipped vehicle)
10) Disconnect the connector of seat belt warning.



11) Remove the front seat from the vehicle.

B: INSTALLATION

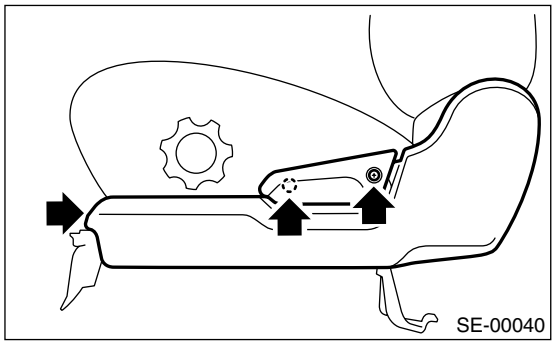
Install in the reverse order of removal.

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to SE-2, FRONT SEAT, COMPONENT, General Description.>

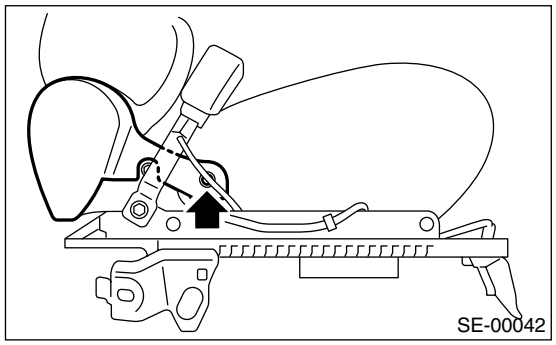
C: DISASSEMBLY

1. DRIVER'S SEAT

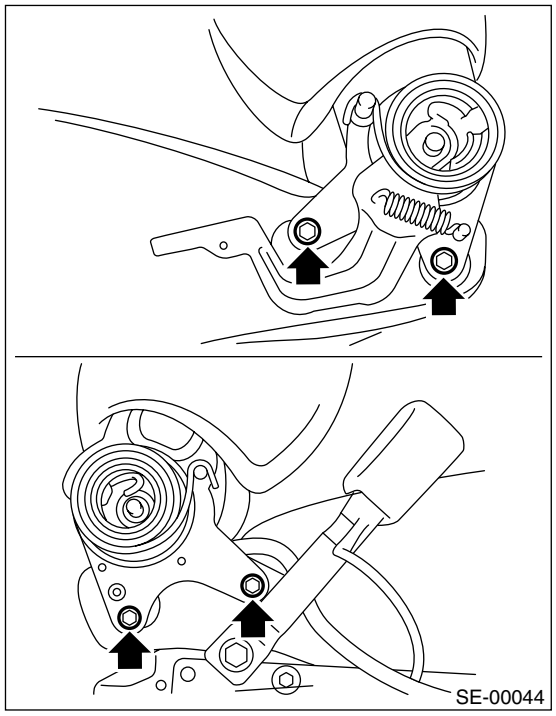
1) Remove the seat from the vehicle. <Ref. to SE-5, REMOVAL, Front Seat.>
2) Remove the reclining lever and reclining hinge cover.



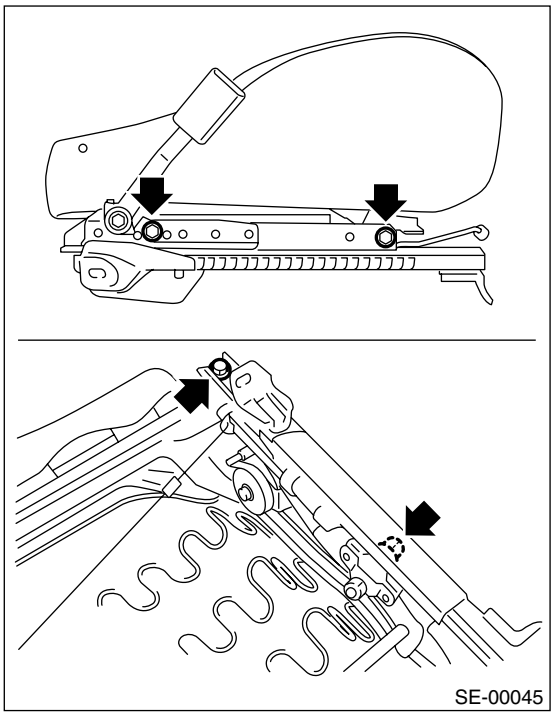
3) Loosen the screw, and then remove the hinge cover.



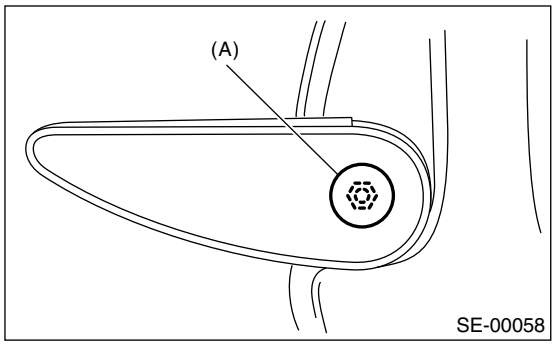
4) Remove two reclining hinge securing bolts on each side.



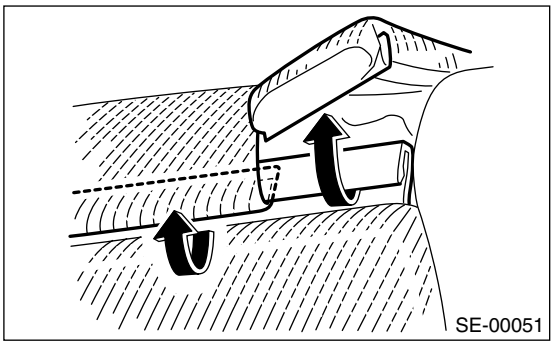
5) Loosen the bolt and nuts to remove slide rail.



6) Remove the cover (A), and then loosen the nuts to remove arm rest and arm rest guide plate.

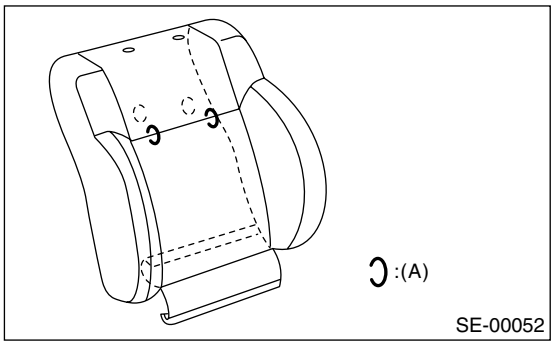


7) Remove the hook at bottom of seat backrest.



8) Remove the hog rings, and then remove the seat back rest cover.

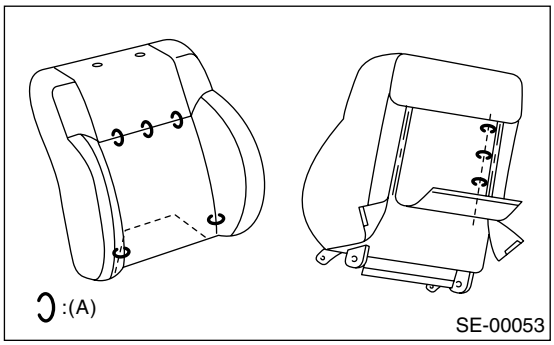
• Without SIDE AIRBAG MODEL



(A) Hog ring

• With SIDE AIRBAG MODEL

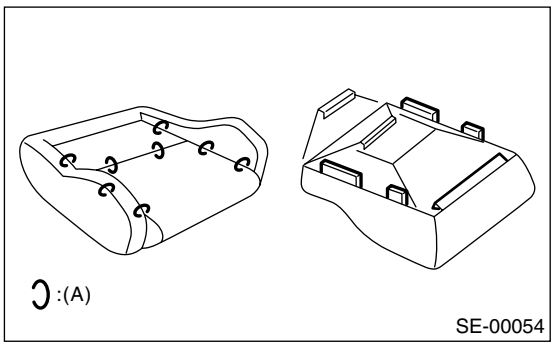
NOTE:
The back rest portion of side airbag equipped model is not allowed to be disassembled. However, in case of discarding the seat after side airbag is deployed, disassemble the back rest portion as follows.



(1) Hog ring

CAUTION:
Because it may cause the side airbag to activate incorrectly, do not assemble and reuse the seat backrest after disassembling it. Replace the seat backrest as assembly.

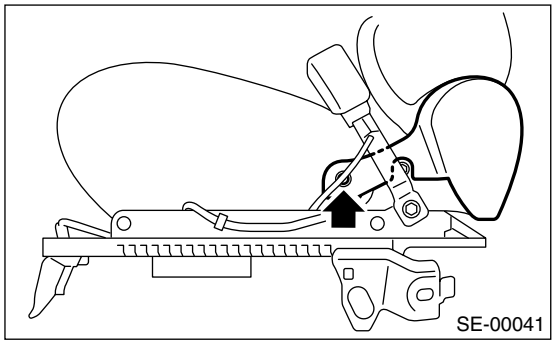
9) Remove the hog rings, and then remove the seat cushion cover.



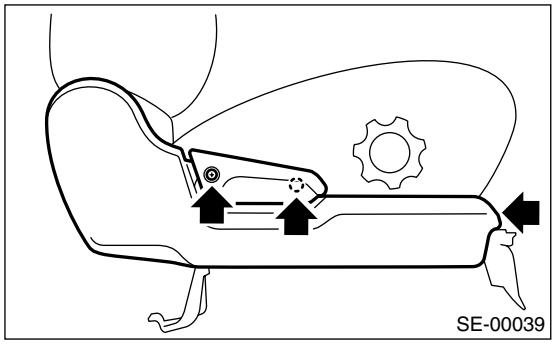
(1) Hog ring

2. PASSENGER'S SEAT

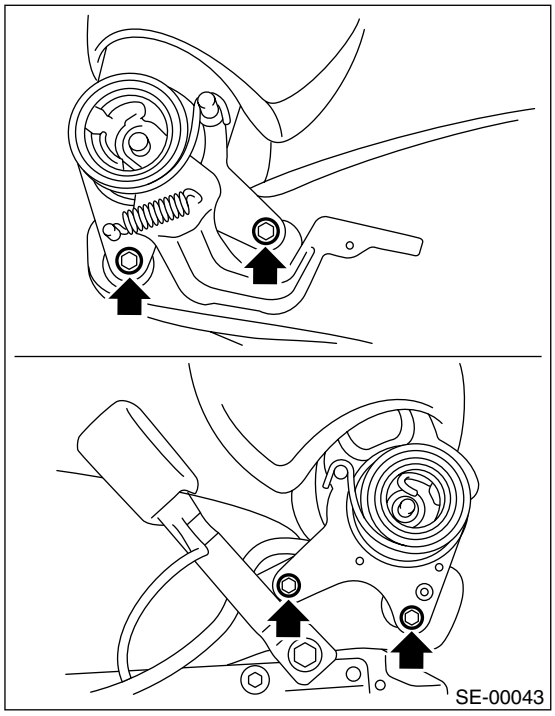
1) Remove the seat from vehicle. <Ref. to SE-5, REMOVAL, Front Seat.>
2) Loosen the screw, and then remove the hinge cover.



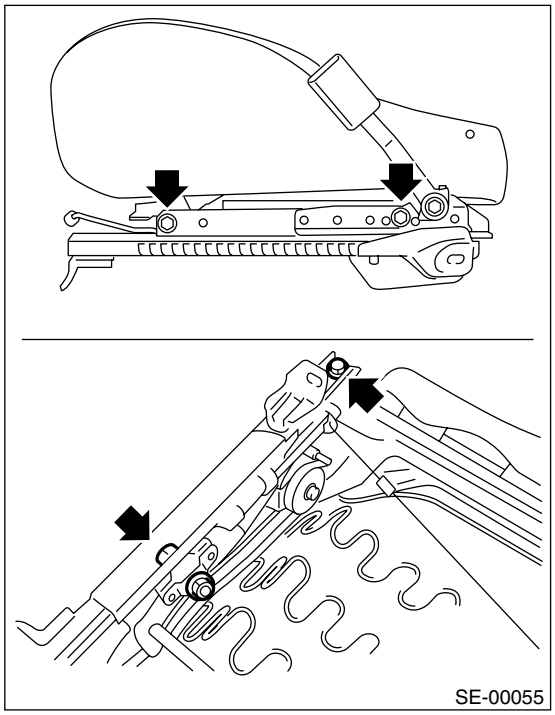
3) Remove the reclining lever cover and hinge cover.



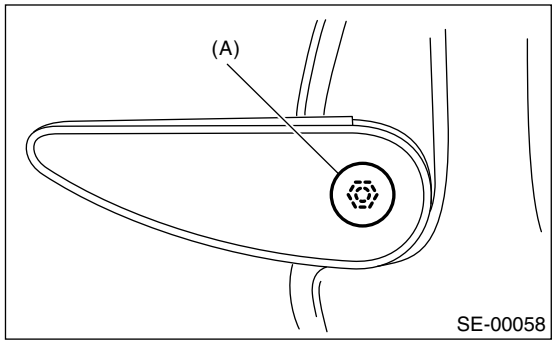
4) Remove two bolts from the reclining hinge on each side.



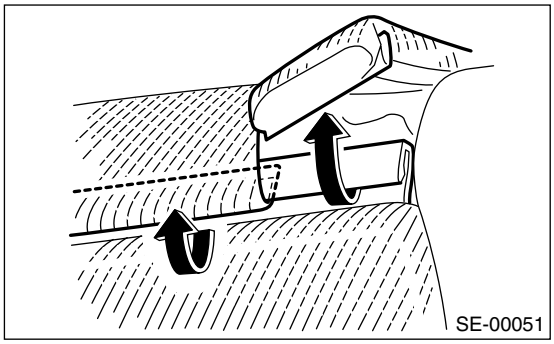
5) Loosen the four bolts to remove seat cushion.



6) Remove the cover (A), and then loosen the nuts to remove arm rest and arm rest guide plate.

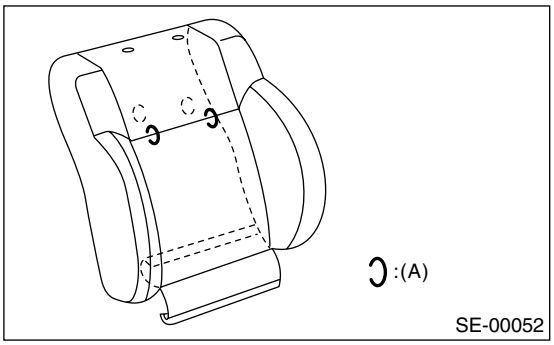


7) Remove the hook at bottom of seat back rest.



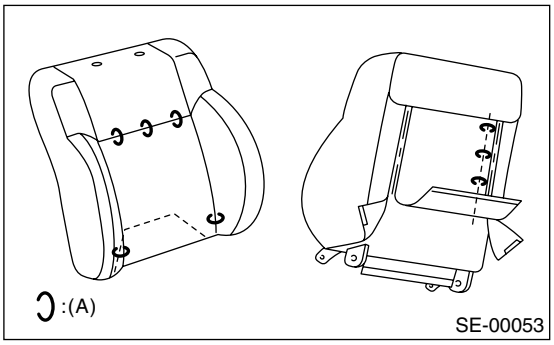
8) Remove the hog rings, and then remove the seat back rest cover.

- Without SIDE AIRBAG MODEL



(A) Hog ring

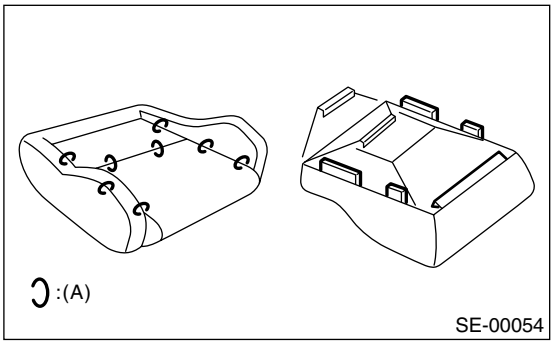
- With SIDE AIRBAG MODEL



(A) Hog ring

CAUTION:
Because it may cause the side airbag to activate incorrectly, do not assemble and reuse the seat backrest after disassembling it. Replace the seat backrest as assembly.

9) Remove the hog rings, and then remove the seat cushion cover.



(A) Hog ring

D: ASSEMBLY

1. DRIVER'S SEAT

Assemble in the reverse order of disassembly.

2. PASSENGER'S SEAT

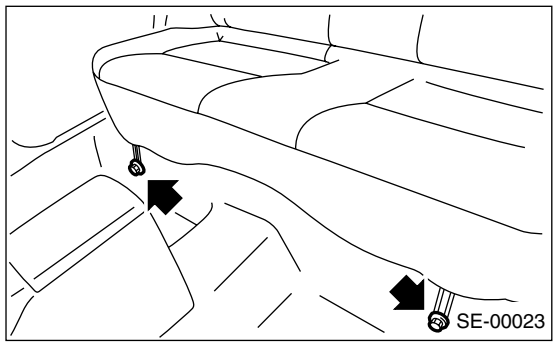
Assemble in the reverse order of disassembly.

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to SE-2, FRONT SEAT, COMPONENT, General Description.>

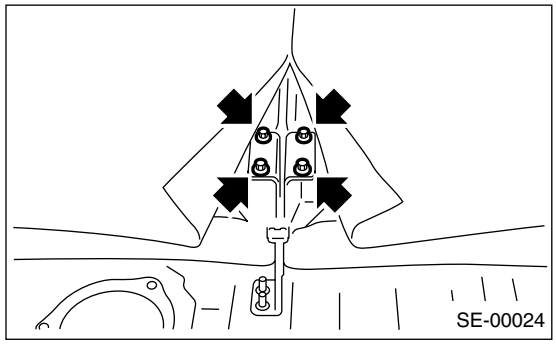
3. Rear Seat

A: REMOVAL

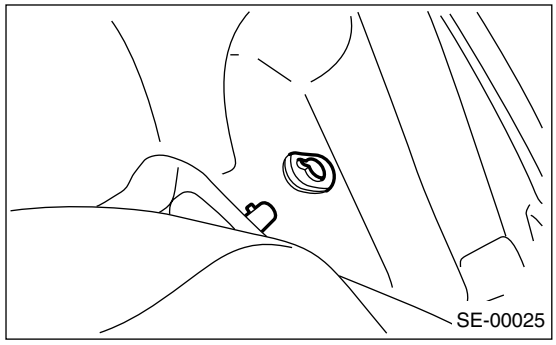
1) Remove the bolts, and then detach the rear seat cushion.



2) Remove the headrest.
3) Remove the luggage floor mat. <Ref. to EI-50, REMOVAL, Luggage Floor Mat.>
4) Fold down the rear seat backrest.
5) Turn over the mat to remove bolts.



6) Remove the rear seat backrest.



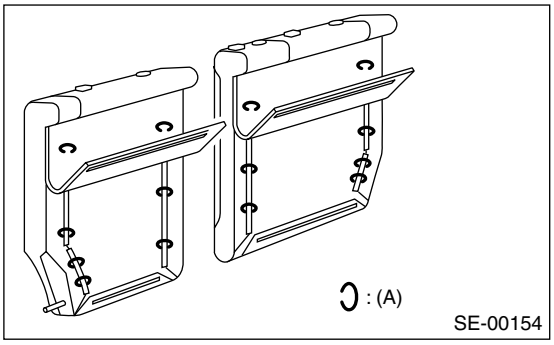
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to SE-3, REAR SEAT, COMPONENT, General Description.>

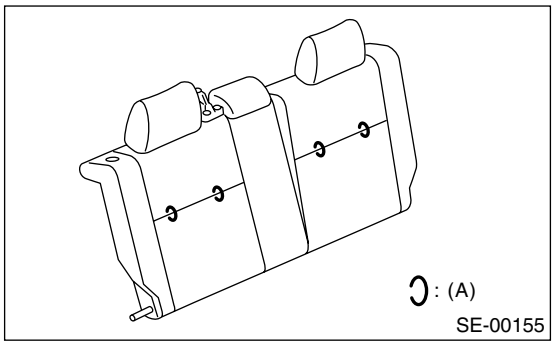
C: DISASSEMBLY

1) Remove the rear seat. <Ref. to SE-10, REMOVAL, Rear Seat.>
2) Remove the hog rings from around the seat backrest.



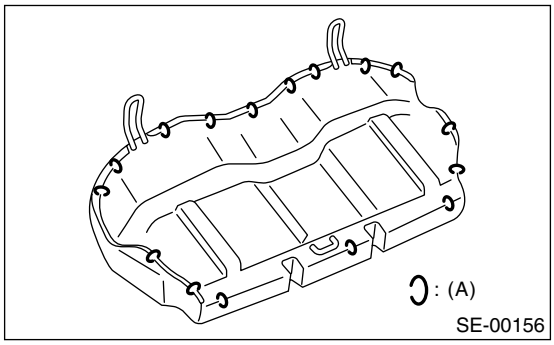
(A) Hog ring

3) Remove the hog rings on front side of cushion pad, and then remove the cover.



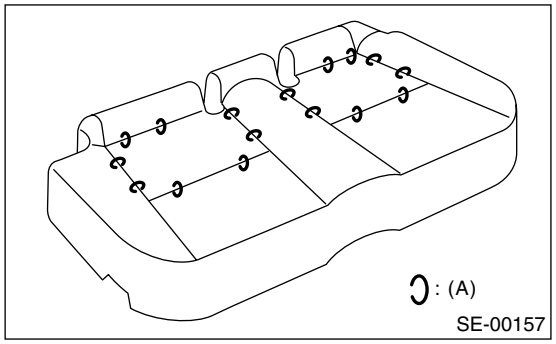
(A) Hog ring

4) Remove the hog rings from around the seat cushion.



(A) Hog ring

5) Remove the hog rings, and then remove the cover.



(A) Hog ring

D: ASSEMBLY

Assemble in the reverse order of disassembly.

SECURITY AND LOCKS

SL

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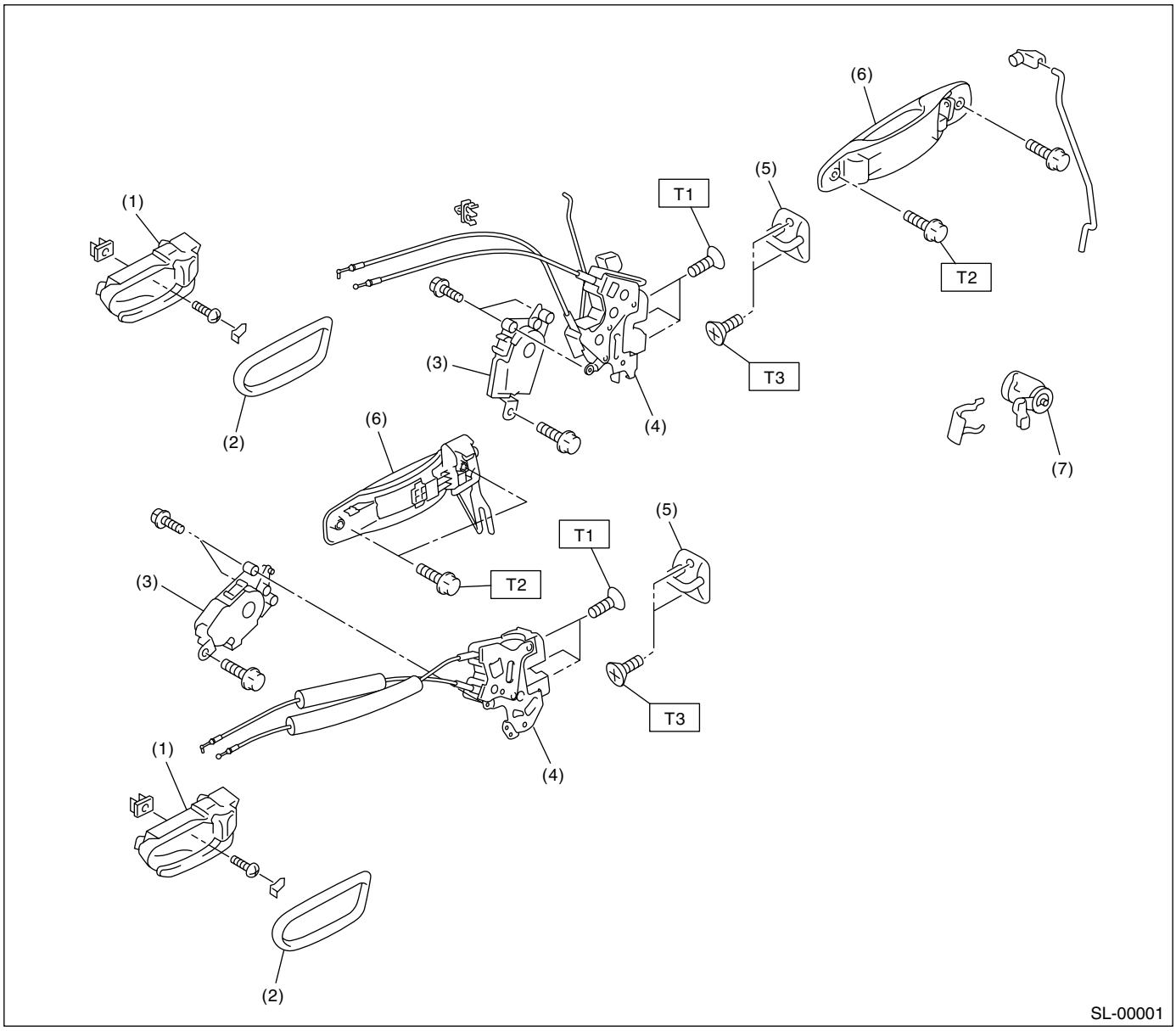
1. General Description

A: COMPONENT

1. DOOR LOCK ASSEMBLY

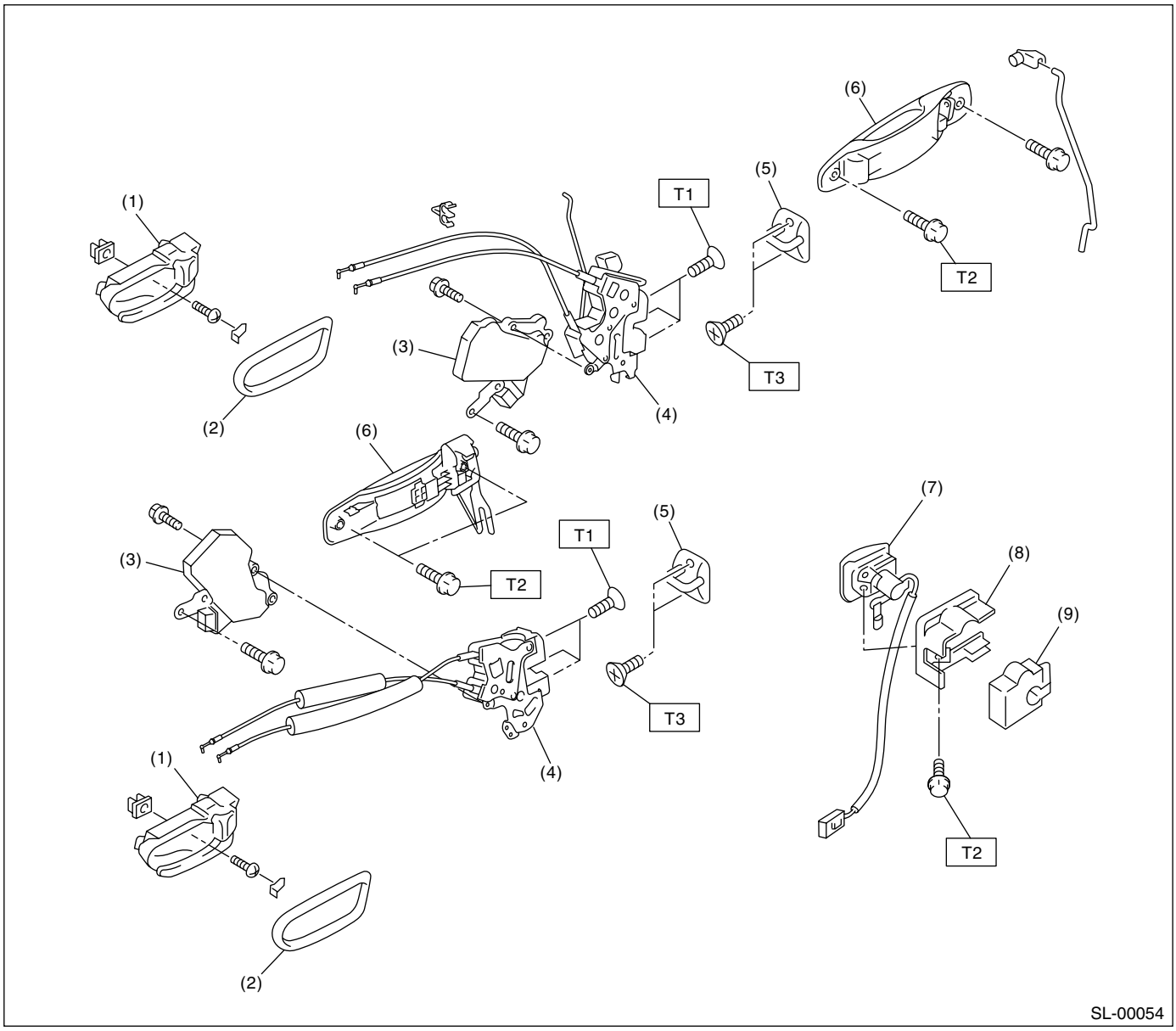
Without double lock:



(1)	Inner remote ASSY	(5)	Striker
(2)	Inner remote cover	(6)	Door outer handle
(3)	Auto-door lock actuator	(7)	Key cylinder
(4)	Door latch		

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 7.4 (0.75, 5.5)
T3: 17.6 (1.8, 13.0)

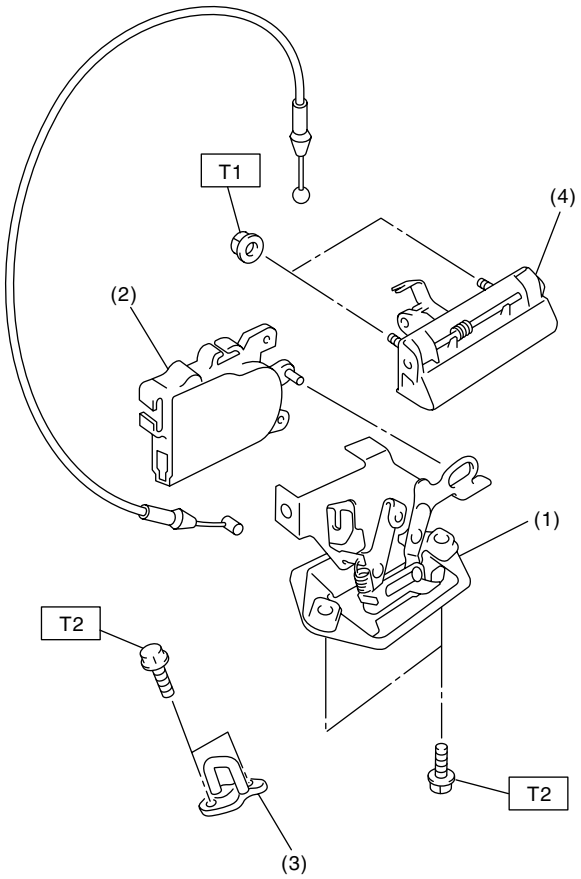
With double lock:



(1)	Inner remote ASSY	(6)	Door outer handle	
(2)	Inner remote cover	(7)	Key cylinder (switch)	
(3)	Auto-door lock actuator	(8)	Key cylinder retainer	
(4)	Door latch	(9)	Key cylinder retainer cover	
(5)	Striker			

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 7.4 (0.75, 5.5)
T3: 17.6 (1.8, 13.0)

2. REAR GATE LOCK

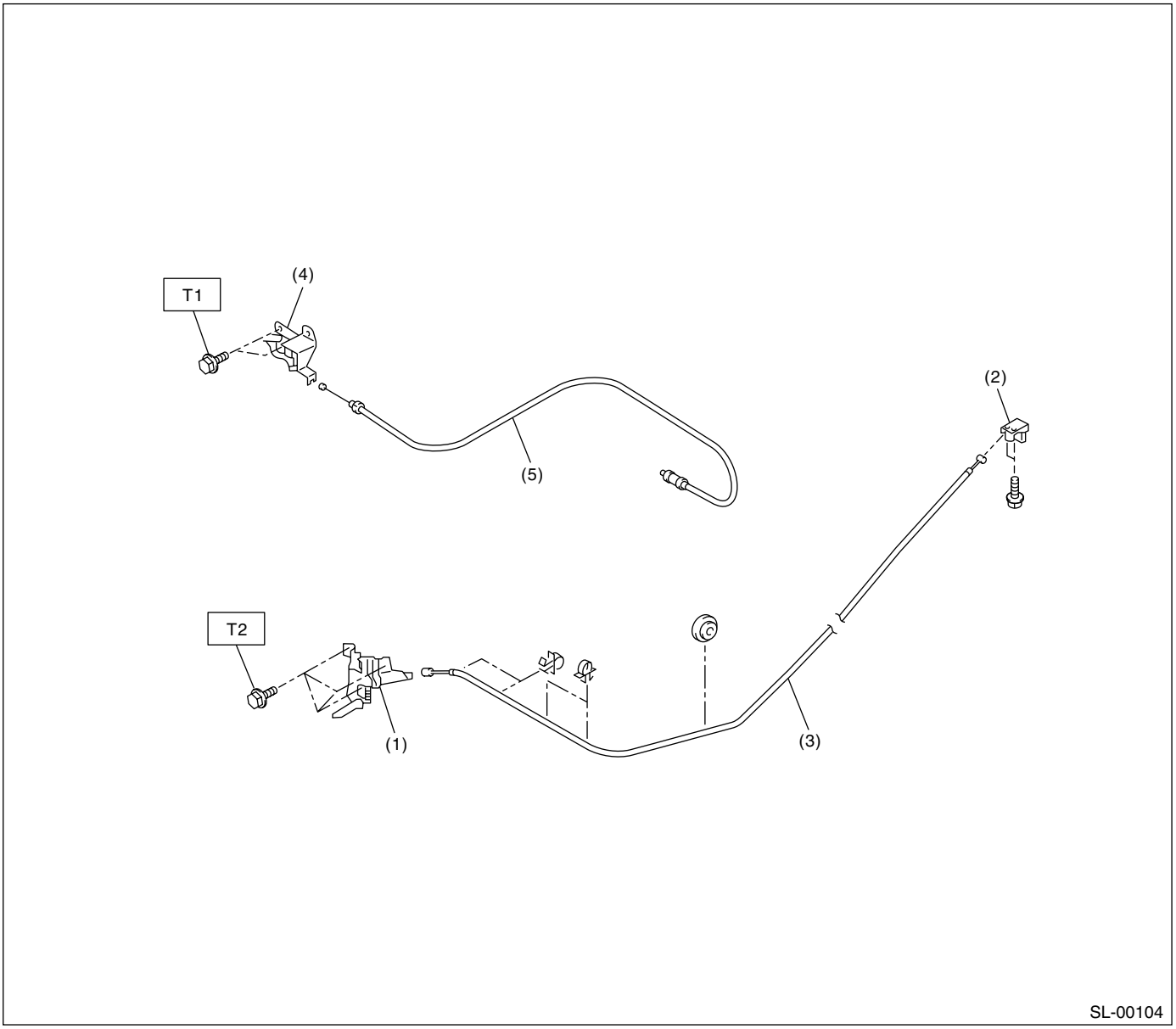


SL-00103

(1) Rear gate latch ASSY
(2) Rear gate actuator
(3) Striker
(4) Rear gate outer handle

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.75, 5.4)
T2: 25 (2.5, 18.4)

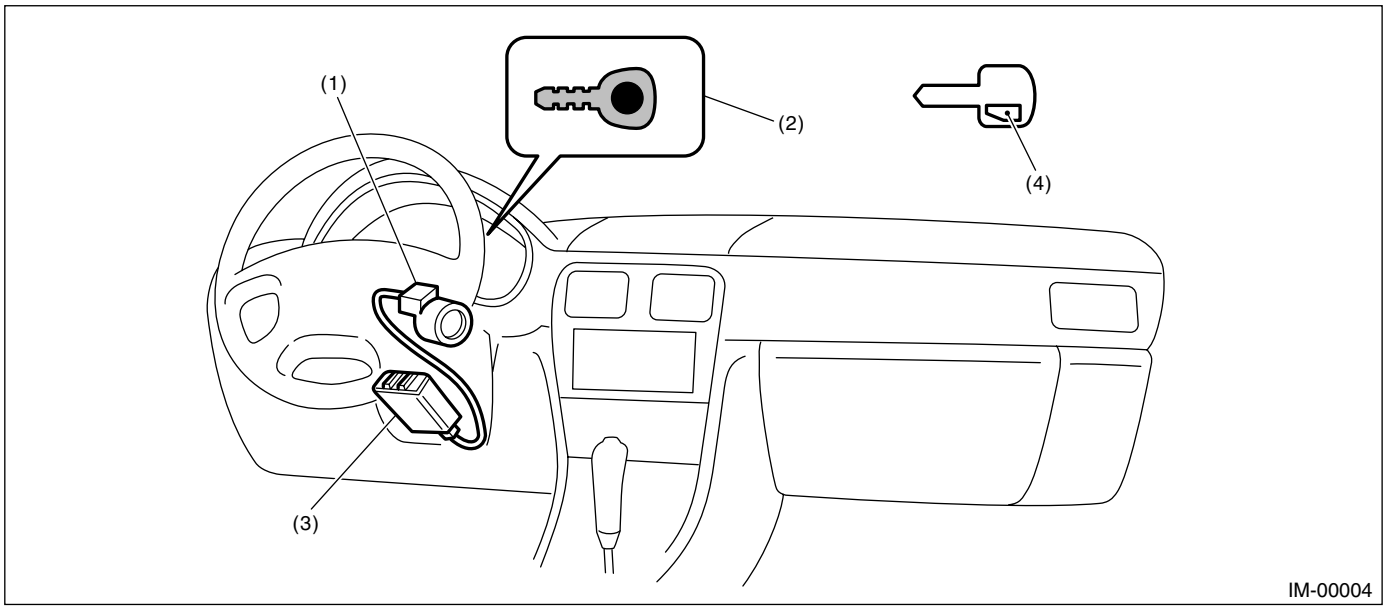
3. HOOD LOCK AND REMOTE OPENERS



(1) Hood lock ASSY
(2) Lever ASSY
(3) Hood cable ASSY
(4) Pull handle ASSY
(5) Fuel flap cable ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.4 (0.75, 5.4)
T2: 33 (3.4, 24.6)

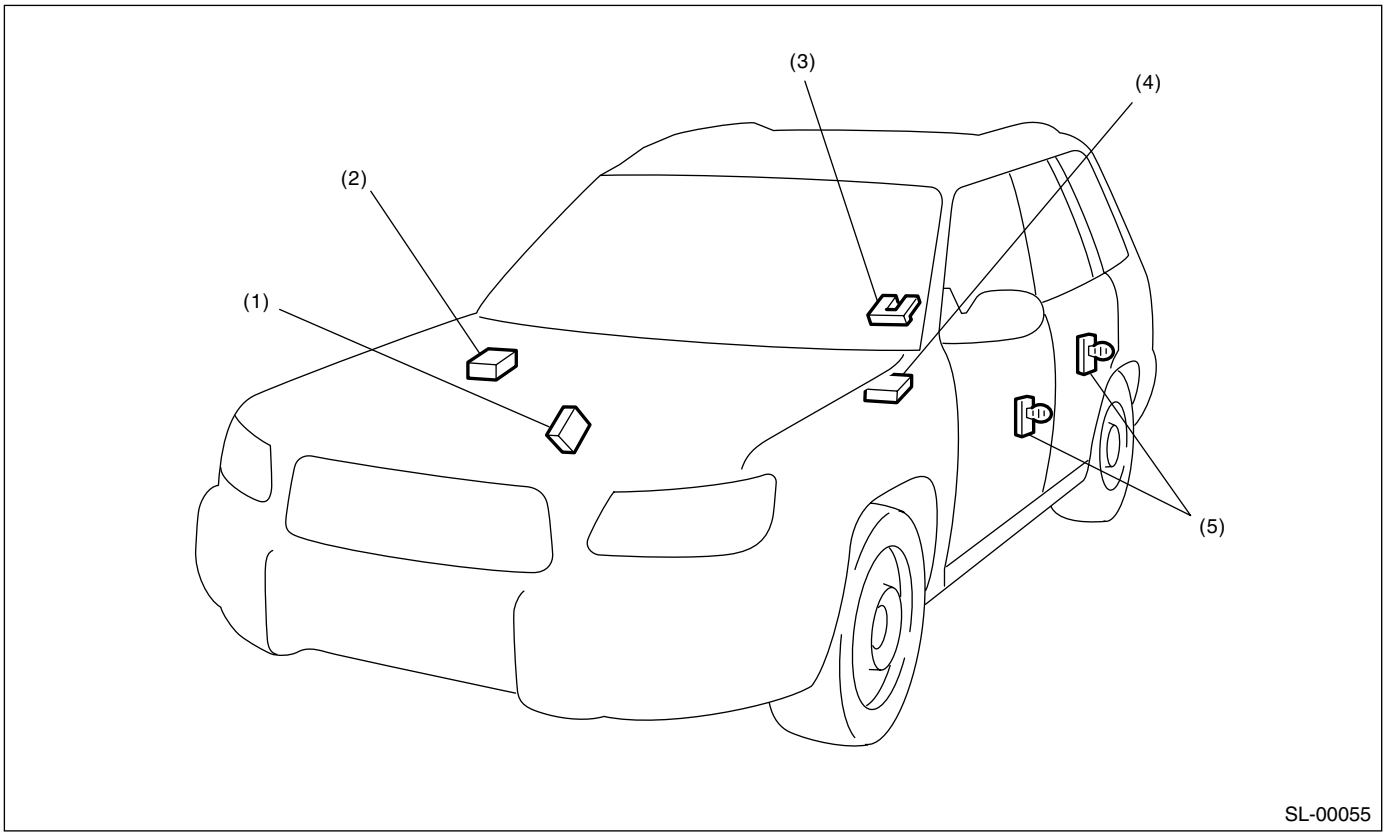
4. IMMOBILIZER SYSTEM



(1) Antenna
(2) Immobilizer indicator light (LED bulb)
(3) Immobilizer control module (IMM ECM)
(4) Transponder

NOTE:
IMM ECM location for RHD model is symmetrically opposite.

5. KEYLESS ENTRY SYSTEM



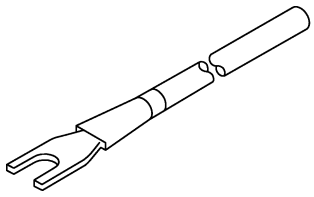
(1) Double lock module (with double lock)
(2) Keyless entry control module (LHD model)
(3) Rear gate latch switch
(4) Keyless entry control module (RHD model)
(5) Door switch

B: CAUTION

• Before disassembling or reassembling parts, always disconnect the ground cable from battery. When repairing radio, control module, etc. which are provided with memory functions, record the memory contents before disconnecting the ground cable from battery. Otherwise, these contents are cancelled upon disconnection.
• Reassemble parts in the reverse order of disassembly procedure unless otherwise indicated.
• Adjust parts to specifications contained in this manual if so designated.
• Connect the connectors and hoses securely during reassembly.
• After reassembly, ensure all functional parts operate smoothly.
• Airbag system wiring harness is routed near the electrical parts and switch.
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the ignition key cylinder.

C: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925580000	925580000	PULLER	Used for removing trim clip.

2. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.
Drill	Used for replacing ignition key lock.

2. Door Lock Control System

A: SCHEMATIC

1. DOOR LOCK CONTROL

<Ref. to WI-118, SCHEMATIC, Door Lock System.>

B: INSPECTION

1. SYMPTOM CHART

Symptom	Repair order	Reference
The door lock control system does not operate.	1. Check the fuse.	<Ref. to SL-9, CHECK FUSE, INSPECTION, Door Lock Control System.>
	2. Check the power supply and ground circuit for keyless entry control unit (without double lock) or double lock module (with double lock).	<Ref. to SL-10, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Door Lock Control System.>
	3. Check the door lock switch and the circuit.	<Ref. to SL-10, CHECK DOOR LOCK SWITCH AND CIRCUIT, INSPECTION, Door Lock Control System.>
	4. Check the door lock actuator and the circuit.	<Ref. to SL-12, CHECK DOOR LOCK ACTUATOR AND CIRCUIT, INSPECTION, Door Lock Control System.>
The door lock switch does not operate.	Check the door lock switch and the circuit.	<Ref. to SL-10, CHECK DOOR LOCK SWITCH AND CIRCUIT, INSPECTION, Door Lock Control System.>
A specific door lock actuator does not operate.	Check the door lock actuator and the circuit.	<Ref. to SL-12, CHECK DOOR LOCK ACTUATOR AND CIRCUIT, INSPECTION, Door Lock Control System.>
The key cylinder lock switch does not operate. (with double lock)	Check the key cylinder lock switch and circuit.	<Ref. to SL-12, CHECK KEY CYLINDER LOCK SWITCH AND CIRCUIT, INSPECTION, Door Lock Control System.>
The double lock does not operate. (with double lock)	Check the door lock actuator (double lock) and circuit.	<Ref. to SL-13, CHECK DOOR LOCK ACTUATOR (DOUBLE LOCK) AND CIRCUIT, INSPECTION, Door Lock Control System.>

2. CHECK FUSE

Step		Value	Yes	No
1	**CHECK FUSE.** Remove and visually check the fuse No. 2 (in the main fuse box). In the fuse blown out?	Fuse is not blown out.	Check the power supply and ground circuit. <Ref. to SL-10, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Door Lock Control System.>	Replace the fuse with a new one.

3. CHECK POWER SUPPLY AND GROUND CIRCUIT

	Step	Value	Yes	No
1	**CHECK POWER SUPPLY.** 1)Disconnect the keyless entry control module or double lock module harness connector. 2)Measure the voltage between the harness connector terminal and chassis ground. ***Connector & terminal*** ***Without double lock:*** ***(B176) No. 5, 16 (+) — Chassis ground (–):*** ***With double lock:*** ***(B324) No. 7, 8 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **2.**	Check the harness for open circuits or shorts between the keyless entry control module or double lock module and the fuse.
2	**CHECK GROUND CIRCUIT.** Measure the resistance between the harness connector terminal and chassis ground. ***Connector & terminal*** ***Without double lock:*** ***(B176) No. 6, 14 — Chassis ground:*** ***With double lock:*** ***(B324) No. 9 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	The power supply and ground circuit is OK.	Repair the harness.

4. CHECK DOOR LOCK SWITCH AND CIRCUIT

	Step	Value	Yes	No
1	**CHECK DOOR LOCK SWITCH CIRCUIT.** 1)Disconnect the keyless entry control module or double lock module harness connector. 2)Measure the resistance between the harness connector terminal and chassis ground when moving the door lock switch to LOCK. ***Connector & terminal*** ***Without double lock:*** ***(B176) No. 10 — Chassis ground:*** ***With double lock:*** ***(B325) No. 7 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	Go to step **2.**	Go to step **3.**
2	**CHECK DOOR LOCK SWITCH CIRCUIT.** Measure the resistance between the harness connector terminal and chassis ground when the door lock switch is moved to UNLOCK. ***Connector & terminal*** ***Without double lock:*** ***(B176) No. 8 — Chassis ground:*** ***With double lock:*** ***(B325) No. 4 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	The door lock switch is OK.	Go to step **3.**

	Step	Value	Yes	No
3	**CHECK DOOR LOCK SWITCH.** 1)Disconnect the door lock switch harness connector. 2)Measure the resistance between the door lock switch terminals when moving the door lock switch to LOCK. ***Connector & terminal*** ***LHD model:*** ***(D7) No. 5 — No. 9*** ***RHD model:*** ***(D7) No. 15 — Switch ground:*** Is the measured value less than specified value?	1 Ω	Go to step **4.**	Replace the door lock switch.
4	**CHECK DOOR LOCK SWITCH.** Measure the resistance between the door lock switch terminals when moving the door lock switch to UNLOCK. ***Connector & terminal*** ***LHD model:*** ***(D7) No. 5 — No. 8*** ***RHD model:*** ***(D7) No. 16 — Switch ground:*** Is the measured value less than specified value?	1 Ω	Check the harness for open circuits or shorts between the keyless entry control module or double lock module and the door lock switch.	Replace the door lock switch.

5. CHECK DOOR LOCK ACTUATOR AND CIRCUIT

	Step	Value	Yes	No
1	**CHECK OUTPUT SIGNAL.** Measure the voltage between the harness connector terminal of keyless entry control module or double lock module and chassis ground when moving the door lock switch to LOCK. ***Connector & terminal*** ***Without double lock:*** ***(B176) No. 18 (+) — Chassis ground (–):*** ***With double lock:*** ***(B324) No. 3 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **2.**	Replace the keyless entry control module or double lock module.
2	**CHECK OUTPUT SIGNAL.** Measure the voltage between the harness connector terminal of keyless entry control module or double lock module and chassis ground when moving the door lock switch to UNLOCK. ***Connector & terminal*** ***Without double lock:*** ***(B176) No. 17 (+) — Chassis ground (–):*** ***With double lock:*** ***(B324) No. 5 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **3.**	Replace the keyless entry control module or double lock module.
3	**CHECK DOOR LOCK ACTUATOR.** Check the door lock actuator. Front door lock actuator: <Ref. to SL-25, Front Door Lock Actuator.> Rear door lock actuator: <Ref. to SL-29, Rear Door Lock Actuator.> Rear gate latch lock actuator: <Ref. to SL-32, Rear Gate Latch Lock Actuator.> Is the door lock actuator OK?	Door lock actuator is OK.	Check the harness for open circuits or shorts between the keyless entry control module or double lock module and the door lock actuator.	Replace the door lock actuator.

6. CHECK KEY CYLINDER LOCK SWITCH AND CIRCUIT

	Step	Value	Yes	No
1	**CHECK KEY CYLINDER LOCK SWITCH CIRCUIT.** 1)Disconnect the double lock module harness connector. 2)Measure the resistance between harness connector terminal and chassis ground when turning the key cylinder lock switch to lock position. ***Connector & terminal*** ***(B325) No. 2 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	Go to step **2.**	Go to step **3.**

	Step	Value	Yes	No
2	**CHECK KEY CYLINDER LOCK SWITCH CIRCUIT.** Measure the resistance between harness connector terminal and chassis ground when turning the key cylinder lock switch to unlock position. ***Connector & terminal*** ***(B325) No. 3 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	Key cylinder lock switch is normal.	Go to step **3.**
3	**CHECK KEY CYLINDER LOCK SWITCH.** 1)Disconnect the key cylinder lock switch connector. 2)Measure the resistance between key cylinder lock switch terminals when turning the key cylinder lock switch to lock position. ***Terminals*** ***No. 1 — No. 2*** Is the measured value less than specified value?	1 Ω	Go to step **4.**	Replace the key cylinder lock switch.
4	**CHECK KEY CYLINDER LOCK SWITCH.** Measure the resistance between key cylinder lock switch terminals when turning the key cylinder lock switch to unlock position. ***Terminals*** ***No. 2 — No. 3*** Is the measured value less than specified value?	1 Ω	Check the harness for open or short circuits between double lock module and key cylinder lock switch.	Replace the key cylinder lock switch.

7. CHECK DOOR LOCK ACTUATOR (DOUBLE LOCK) AND CIRCUIT

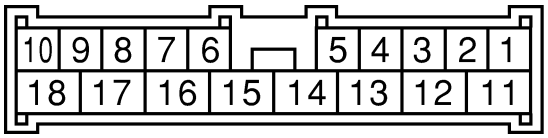
	Step	Value	Yes	No
1	**CHECK OUTPUT SIGNAL.** Measure the resistance between double lock module harness connector terminal and chassis ground when turning the key cylinder lock switch to lock position. ***Connector & terminal*** ***(B324) No. 6 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **2.**	Replace the double lock module.
2	**CHECK OUTPUT SIGNAL.** Measure the resistance between double lock module harness connector terminal and chassis ground when turning the key cylinder lock switch to unlock position. ***Connector & terminal*** ***(B324) No. 6 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **3.**	Replace the double lock module.
3	**CHECK DOOR LOCK ACTUATOR.** Check door lock actuator. Front door lock actuator: <Ref. to SL-25, Front Door Lock Actuator.> Rear door lock actuator: <Ref. to SL-29, Rear Door Lock Actuator.> Is the door lock actuator normal?	Door lock actuator is normal.	Check the harness for open or short circuits between double lock module and door lock actuator.	Replace the door lock actuator.

3. Keyless Entry System

A: SCHEMATIC

<Ref. to WI-180, SCHEMATIC, Keyless Entry System.>

B: ELECTRICAL SPECIFICATION



SL-00036

Content	Terminal No.	Measuring condition
Key warning switch	1 (INPUT)	Battery voltage is present when inserting the key into ignition switch.
Registration connector	2 (INPUT)	0 V is present when connecting the registration connector.
Door switch	3 (INPUT)	0 V is present when any door is open.
Power supply	5	Battery voltage is constantly present.
Empty	6	—
Empty	7	—
Door lock switch (Unlock)	8 (INPUT)	0 V is present when the door lock switch is turned to unlock position.
Empty	9	—
Door lock switch (Lock)	10 (INPUT)	0 V is present when the door lock switch is turned to lock position.
Room light/Ignition switch illumination	11 (OUTPUT)	• 0 V is present when pressing the transmitter OPEN button. • 0 V is present when any door is open.
Turn signal light (Left)	12 (OUTPUT)	Battery voltage is present when pressing the transmitter OPEN or LOCK button.
Turn signal light (Right)	13 (OUTPUT)	Battery voltage is present when pressing the transmitter OPEN or LOCK button.
Ground	14	0 V is constantly present.
Power supply (Hazard light)	15	Battery voltage is constantly present.
Power supply	16	Battery voltage is constantly present.
Door, rear gate lock actuator (without double lock) or double lock module (with double lock)	17 (OUTPUT)	Battery voltage is present when pressing the transmitter OPEN button.
Door, rear gate lock actuator (without double lock) or double lock module (with double lock)	18 (OUTPUT)	Battery voltage is present when pressing the transmitter LOCK button.

C: INSPECTION

1. SYMPTOM CHART

Symptom	Repair order	Reference
None of the functions of keyless entry system operate.	1. Check the transmitter battery.	<Ref. to SL-16, CHECK TRANSMITTER BATTERY, INSPECTION, Keyless Entry System.>
	2. Check the fuse.	<Ref. to SL-16, CHECK FUSE, INSPECTION, Keyless Entry System.>
	3. Check the keyless entry control module power supply and ground circuit.	<Ref. to SL-16, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Keyless Entry System.>
	4. Replace the keyless entry control module.	<Ref. to SL-39, Keyless Entry Control Module.>
The transmitter cannot be registered.	1. Check the transmitter battery.	<Ref. to SL-16, CHECK TRANSMITTER BATTERY, INSPECTION, Keyless Entry System.>
	2. Check the registration connector circuit.	<Ref. to SL-17, CHECK REGISTRATION CONNECTOR CIRCUIT, INSPECTION, Keyless Entry System.>
	3. Replace the keyless entry control module.	<Ref. to SL-39, Keyless Entry Control Module.>
The door lock or unlock does not operate. NOTE: If the door lock control system does not operate when using the door lock switch, check the door lock control system. <Ref. to SL-9, INSPECTION, INSPECTION, Door Lock Control System.>	1. Check the transmitter battery.	<Ref. to SL-16, CHECK TRANSMITTER BATTERY, INSPECTION, Keyless Entry System.>
	2. Check the key warning switch.	<Ref. to SL-19, CHECK KEY WARNING SWITCH, INSPECTION, Keyless Entry System.>
	3. Check the door switch.	<Ref. to SL-18, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	4. Check output signal to double lock module. (with double lock)	<Ref. to SL-21, CHECK OUTPUT SIGNAL TO DOUBLE LOCK MODULE, INSPECTION, Keyless Entry System.>
	5. Replace the keyless entry control module.	<Ref. to SL-39, Keyless Entry Control Module.>
The hazard light does not operate.	1. Check the hazard light operation.	<Ref. to SL-20, CHECK HAZARD LIGHT OPERATION, INSPECTION, Keyless Entry System.>
	2. Replace the keyless entry control module.	<Ref. to SL-39, Keyless Entry Control Module.>
The room light and ignition switch illumination operation does not activate.	1. Check the room light operation.	<Ref. to SL-20, CHECK ROOM LIGHT OPERATION, INSPECTION, Keyless Entry System.>
	2. Check the ignition switch illumination circuit.	<Ref. to SL-21, CHECK IGNITION SWITCH ILLUMINATION CIRCUIT, INSPECTION, Keyless Entry System.>
	3. Replace the keyless entry control module. (without double lock)	<Ref. to SL-39, Keyless Entry Control Module.>
	4. Replace the double lock module. (witht double lock)	<Ref. to SL-40, Double Lock Module.>

2. CHECK TRANSMITTER BATTERY

	Step	Value	Yes	No
1	**CHECK TRANSMITTER BATTERY.** 1)Remove the battery from transmitter. <Ref. to SL-41, REMOVAL, Keyless Transmitter.> 2)Check the battery voltage. <Ref. to SL-41, INSPECTION, Keyless Transmitter.> Is the measured value more than specified value?	2 V	Further inspection is necessary, refer to "SYMPTOM CHART". <Ref. to SL-15, SYMPTOM CHART, INSPECTION, Keyless Entry System.>	Replace the transmitter battery.

3. CHECK FUSE

	Step	Value	Yes	No
1	**CHECK FUSE.** Remove and visually check the fuse No. 2 (in the main fuse box), No. 3 (in the fuse and relay box) and SBF-6 (in the main fuse box) Is the fuse blown out?	Fuse is not blown out.	Check the power supply and ground circuit. <Ref. to SL-16, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Keyless Entry System.>	Replace the fuse with a new one.

4. CHECK POWER SUPPLY AND GROUND CIRCUIT

	Step	Value	Yes	No
1	**CHECK POWER SUPPLY.** 1)Disconnect the keyless entry control module harness connector. 2)Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal (B176) No. 5, No. 16 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **2.**	Check the harness for open circuits or shorts between keyless entry control module and fuse.
2	**CHECK GROUND CIRCUIT.** Measure the resistance between harness connector terminal and chassis ground. ***Connector & terminal (B176) No. 6, No. 14 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	The power supply and ground circuit are OK.	Repair the harness.

5. CHECK REGISTRATION CONNECTOR CIRCUIT

	Step	Value	Yes	No
1	**REGISTRATION CONNECTOR INPUT VOLTAGE INSPECTION** 1)Disconnect the registration connector. 2)Measure the voltage between keyless entry control module harness connector and chassis ground. ***Connector & terminal*** ***(B176) No. 2 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **2.**	Repair the harness, and (or) connector.
2	**REGISTRATION CONNECTOR INPUT VOLTAGE INSPECTION** 1)Connect the registration connector. 2)Measure the voltage between keyless entry control module harness connector and chassis ground. ***Connector & terminal*** ***(B176) No. 2 (+) — Chassis ground (–):*** Is the measured value less than specified value?	0 V	Registration connector circuit is OK.	Repair the harness, and (or) connector.

6. CHECK DOOR SWITCH

	Step	Value	Yes	No
1	**CHECK DOOR SWITCH CIRCUIT.** Measure the voltage between keyless entry control module harness connector terminal and chassis ground. ***Connector & terminal*** ***(B176) No. 3 (+) — Chassis ground (–):*** Is the measured value less than specified value when any one of the doors or rear gate is opened?	0 V	Go to step **2.**	Go to step **3.**
2	**CHECK DOOR SWITCH CIRCUIT.** Measure the voltage between keyless entry control module harness connector terminal and chassis ground. ***Connector & terminal*** ***(B176) No. 3 (+) — Chassis ground (–):*** Is the measured value more than specified value when all doors and rear gate are closed?	10 V	The door switch is OK.	Go to step **3.**
3	**CHECK DOOR SWITCH.** 1)Disconnect the door switch harness connector. 2)Measure the resistance between door switch terminals. ***Terminal*** ***Door switch No. 1 — No. 3:*** ***Rear gate latch switch No. 1 — No. 2:*** Is the measured value more than specified value when the door switch is pressed?	1 MΩ	Go to step **4.**	Replace the door switch.
4	**CHECK DOOR SWITCH.** Measure the resistance between door switch terminals. ***Terminal*** ***Door switch No. 1 — No. 3:*** ***Rear gate latch switch No. 1 — No. 2:*** Is the measured value less than specified value when the door switch is released?	1 Ω	Check the harness for open circuits or shorts between keyless entry control module and door switch.	Replace the door switch.

7. CHECK KEY WARNING SWITCH

	Step	Value	Yes	No
1	**CHECK FUSE.** Remove and visually check the fuse No. 6 (in the main fuse box). Is the fuse blown out?	Fuse is not blown out.	Go to step **2.**	Replace the fuse with a new one.
2	**CHECK KEY WARNING SWITCH CIRCUIT.** 1)Disconnect the keyless entry control module harness connector. 2)Insert the key into ignition switch. (LOCK position) 3)Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B176) No. 1 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **3.**	Go to step **4.**
3	**CHECK KEY WARNING SWITCH CIRCUIT.** 1)Remove the key from ignition switch. 2)Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B176) No. 1 (+) — Chassis ground (–):*** Is the measured value less than specified value?	0 V	The key warning switch is OK.	Go to step **4.**
4	**CHECK KEY WARNING SWITCH.** 1)Disconnect the key warning switch harness connector. 2)Insert the key into ignition switch. (LOCK position) 3)Measure the resistance between key warning switch terminals. ***Terminal*** ***No. 1 — No. 2:*** Is the measured value less than specified value?	1 Ω	Go to step **5.**	Replace the key warning switch.
5	**CHECK KEY WARNING SWITCH.** 1)Remove the key from ignition switch. 2)Measure the resistance between key warning switch terminals. ***Terminal*** ***No. 1 — No. 2:*** Is the measured value more than specified value?	1 MΩ	Check the following: • Harness for open circuits or shorts between the key warning switch and fuse • Harness for open circuits and shorts between the keyless entry control module and key warning switch	Replace the key warning switch.

8. CHECK HAZARD LIGHT OPERATION

	Step	Value	Yes	No
1	**CHECK HAZARD LIGHT OPERATION.** Make sure the hazard light blinks when hazard switch is turned ON. Does the hazard light blink?	Hazard light blinks.	Go to step **2.**	Check the hazard light circuit.
2	**CHECK OUTPUT SIGNAL.** 1)Remove the key from ignition switch. 2)Close all doors and rear gate. 3)Measure the voltage between keyless entry control module harness connector terminal and chassis ground when LOCK or OPEN button of transmitter is pressed. ***Connector & terminal*** ***(B176) No. 12, No. 13 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Check the harness for open or short between keyless entry control module and turn signal lights.	Replace the keyless entry control module.

9. CHECK ROOM LIGHT OPERATION

	Step	Value	Yes	No
1	**CHECK ROOM LIGHT OPERATION.** Make sure the room light illuminates when the room light switch is turned ON. Does the room light illuminate?	Room light illuminates.	Go to step **2.**	Check the room light circuit.
2	**CHECK HARNESS BETWEEN ROOM LIGHT AND KEYLESS ENTRY CONTROL MODULE (WITHOUT DOUBLE LOCK) OR DOUBLE LOCK MODULE (WITH DOUBLE LOCK).** 1)Disconnect the keyless entry control module or double lock module harness connector and room light harness connector. 2)Measure the resistance between keyless entry control module or double lock module harness connector terminal and room light harness connector terminal. ***Connector & terminal*** ***Without double lock:*** ***(B176) No. 11 — (R52) No. 2:*** ***With double lock:*** ***(B325) No. 1 — (R52) No. 2:*** Is the measured value less than specified value?	10 Ω	The room light operation circuit is OK.	Check the harness for open circuits or shorts between keyless entry control module (without double lock) or double lock module (with double lock) and room light.

10.CHECK IGNITION SWITCH ILLUMINATION CIRCUIT

	Step	Value	Yes	No
1	**CHECK IGNITION SWITCH ILLUMINATION POWER SUPPLY.** 1)Disconnect the ignition switch illumination harness connector. 2)Measure the voltage between ignition switch illumination harness connector terminal and chassis ground. ***Connector & terminal*** ***(B224) No. 1 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **2.**	Check the harness for open circuit or shorts between ignition switch illumination and fuse.
2	**CHECK HARNESS BETWEEN IGNITION SWITCH ILLUMINATION AND KEYLESS ENTRY CONTROL MODULE (WITHOUT DOUBLE LOCK) OR DOUBLE LOCK MODULE (WITH DOUBLE LOCK).** 1)Disconnect the keyless entry control module or double lock module harness connector. 2)Measure the resistance between keyless entry or double lock module harness connector terminal and ignition switch illumination harness connector. ***Connector & terminal*** ***Without double lock:*** ***(B176) No. 11 — (R224) No. 2:*** ***With double lock:*** ***(B325) No. 1 — (R224) No. 2:*** Is the measured value less than specified value?	10 Ω	Check the ignition switch illumination. If NG, replace the ignition switch illumination.	Repair the harness.

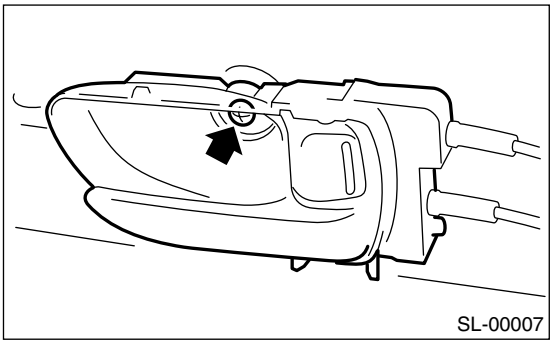
11.CHECK OUTPUT SIGNAL TO DOUBLE LOCK MODULE

	Step	Value	Yes	No
1	**CHECK OUTPUT SIGNAL.** Measure the voltage between the keyless entry control module harness connector terminal and chassis ground when OPEN button of transmitter is pressed. ***Connector & terminal*** ***(B176) No. 17 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **2.**	Replace the keyless entry control module.
2	**CHECK OUTPUT SIGNAL.** Measure the voltage between the keyless entry control module harness connector terminal and chassis ground when LOCK button of transmitter is pressed. ***Connector & terminal*** ***(B176) No. 18 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Replace the double lock module.	Check the harness for open circuit or shorts between the keyless entry control module and double lock module.

4. Front Inner Remote

A: REMOVAL

1) Remove the door trim. <Ref. to EI-35, REMOVAL, Front Door Trim.>
2) Remove the sealing cover. <Ref. to EB-13, REMOVAL, Front Sealing Cover.>
3) Remove a screw and two cables.
4) Remove the front inner remote.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the inner remote works properly after installation.

C: INSPECTION

1) Make sure the cable is not deformed.
2) Make sure the lever and cable work smoothly.

NOTE:
If the remote handle is metalclad type, make sure that grease is sufficiently applied to the cable connection portion. If the grease is insufficient, apply additional grease to the cable connection portion before connecting the cable.

5. Front Outer Handle

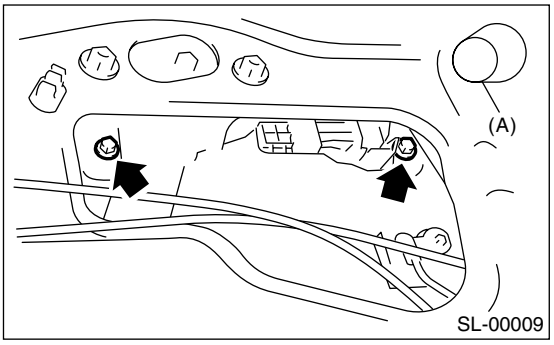
A: REMOVAL

1) Remove the door trim. <Ref. to EI-35, REMOVAL, Front Door Trim.>

CAUTION:
Do not use excessive force to remove the door panel. This will deform it.

2) Remove the sealing cover. <Ref. to EB-13, REMOVAL, Front Sealing Cover.>
3) Remove the front inner remote. <Ref. to SL-22, REMOVAL, Front Inner Remote.>
4) Remove the cable from cable holder to make cable move freely.
5) Remove two bolts and rod clamp, and then remove the front outer handle.

NOTE:
The rear bolt can be removed from service hole (A) of inner panel by adjusting the glass position.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the outer handle works properly after installation.

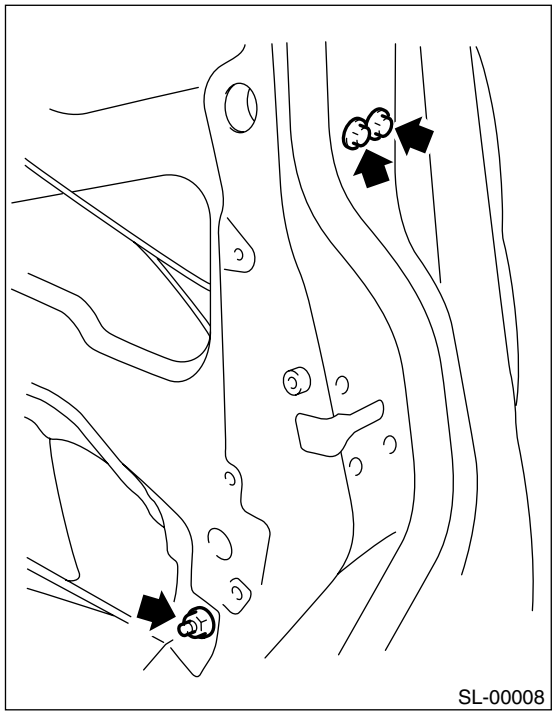
C: INSPECTION

1) Make sure the cable is not deformed.
2) Make sure the lever and rod work smoothly.

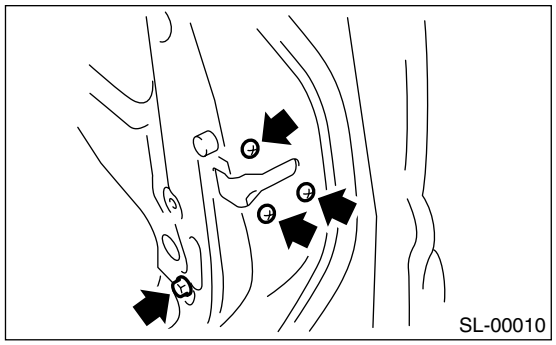
6. Front Door Latch Assembly

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front door trim. <Ref. to EI-35, REMOVAL, Front Door Trim.>
3) Remove the sealing cover. <Ref. to EB-13, REMOVAL, Front Sealing Cover.>
4) Remove the front inner remote. <Ref. to SL-22, REMOVAL, Front Inner Remote.>
5) Remove two bolts and nut, and then remove the guide rail.



6) Remove the three screws and bolt.



7) Remove the front door latch assembly, and then disconnect the connector.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the lock works properly after installation.

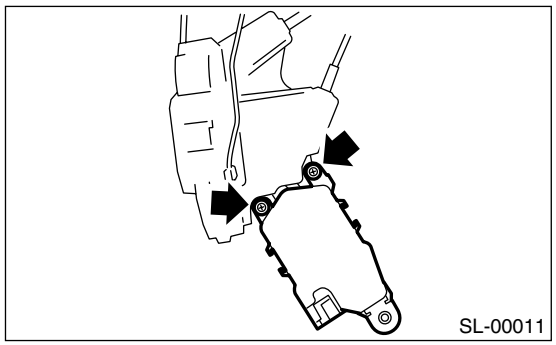
C: INSPECTION

1) Make sure the cable is not deformed.
2) Make sure the lever, rod and cable work smoothly.

7. Front Door Lock Actuator

A: REMOVAL

1) Remove the front door latch assembly. <Ref. to SL-24, REMOVAL, Front Door Latch Assembly.>
2) Loosen the two screws to remove front door lock actuator.



B: INSTALLATION

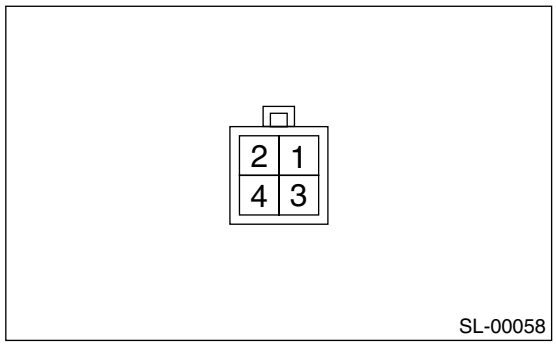
Install in the reverse order of removal.

NOTE:
Make sure the lock works properly after installation.

C: INSPECTION

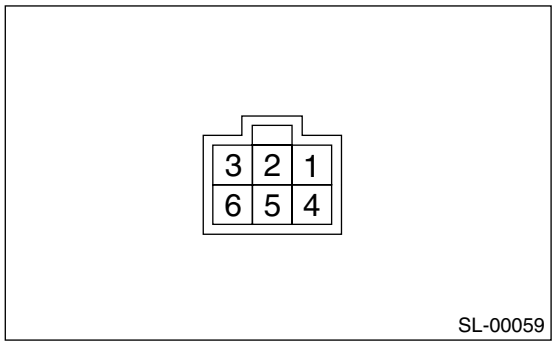
1) Disconnect the door lock actuator harness connector.
2) Connect the battery to door lock actuator terminals.
If NG, replace the door lock actuator.

1. Without double lock:



Terminal No.	Actuator operation
No. 2 (+) and No. 4 (–)	Unlocked → Locked
No. 4 (+) and No. 2 (–)	Locked → Unlocked

2. With double lock:



DOOR ACTUATOR RH:

Terminal No.	Actuator operation
No. 1 (+) and No. 4 (–)	Unlocked → Locked
No. 4 (+) and No. 1 (–)	Locked → Unlocked
No. 6 (+) and No. 3 (–)	Double lock released → Double lock set
No. 3 (+) and No. 6 (–)	Double lock set → Double lock released

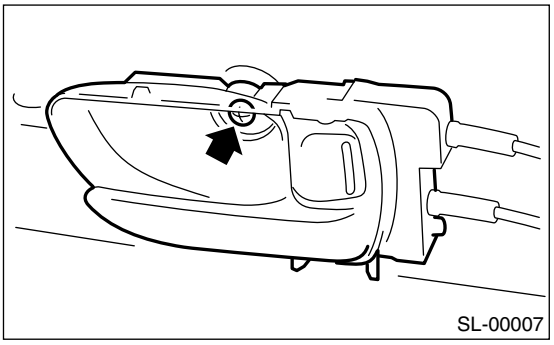
DOOR ACTUATOR LH:

Terminal No.	Actuator operation
No. 6 (+) and No. 3 (–)	Unlocked → Locked
No. 3 (+) and No. 6 (–)	Locked → Unlocked
No. 1 (+) and No. 4 (–)	Double lock released → Double lock set
No. 4 (+) and No. 1 (–)	Double lock set → Double lock released

8. Rear Inner Remote

A: REMOVAL

1) Remove the rear door trim. <Ref. to EI-36, REMOVAL, Rear Door Trim.>
2) Remove the sealing cover. <Ref. to EB-16, REMOVAL, Rear Sealing Cover.>
3) Remove a screw and two cables.
4) Remove the inner remote.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the inner remote works properly after installation.

C: INSPECTION

1) Make sure the cable is not deformed.
2) Make sure the lever and cable work smoothly.
3) Make sure the child safety lock on rear doors work properly, when applicable.

NOTE:
If the remote handle is metalclad type, make sure that grease is sufficiently applied to the cable connection portion. If the grease is insufficient, apply additional grease to the cable connection portion before connecting the cable.

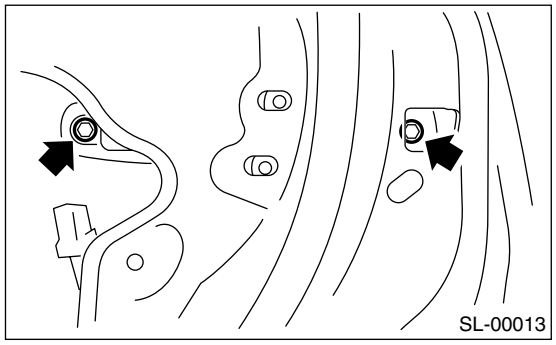
9. Rear Outer Handle

A: REMOVAL

1) Remove the rear door trim. <Ref. to EI-36, REMOVAL, Rear Door Trim.>

CAUTION:
Do not use excessive force to remove the door panel. This will deform it.

2) Remove the sealing cover. <Ref. to EB-16, REMOVAL, Rear Sealing Cover.>
3) Remove the rear inner remote. <Ref. to SL-26, REMOVAL, Rear Inner Remote.>
4) Remove the rear door latch assembly. <Ref. to SL-28, REMOVAL, Rear Door Latch Assembly.>
5) Remove two bolts, and then remove the rear outer handle.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the outer handle works properly after installation.

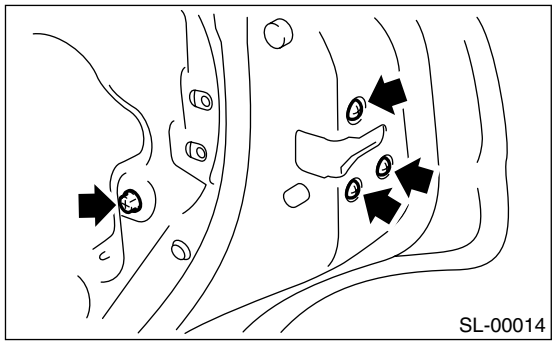
C: INSPECTION

1) Make sure the resinous lever is not deformed, damaged or cracked.
2) Make sure the resinous lever operate smoothly.

10.Rear Door Latch Assembly

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the rear door trim. <Ref. to EI-36, REMOVAL, Rear Door Trim.>
3) Remove the sealing cover. <Ref. to EB-16, REMOVAL, Rear Sealing Cover.>
4) Remove the rear inner remote. <Ref. to SL-26, REMOVAL, Rear Inner Remote.>
5) Remove the three screws and bolt.



6) Remove the rear door latch assembly, and then disconnect the connector.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the lock works properly after installation.

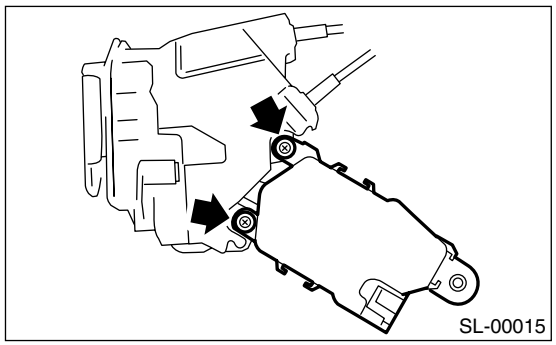
C: INSPECTION

1) Make sure the cable is not deformed.
2) Make sure the lever and cable work smoothly.

11.Rear Door Lock Actuator

A: REMOVAL

1) Remove the rear door latch assembly. <Ref. to SL-28, REMOVAL, Rear Door Latch Assembly.>
2) Loosen the two screws to remove rear door lock actuator.



B: INSTALLATION

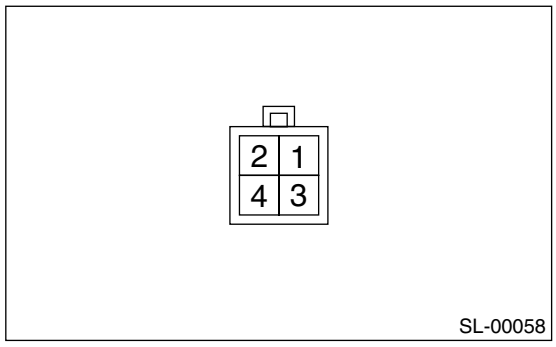
Install in the reverse order of removal.

NOTE:
Make sure the lock works properly after installation.

C: INSPECTION

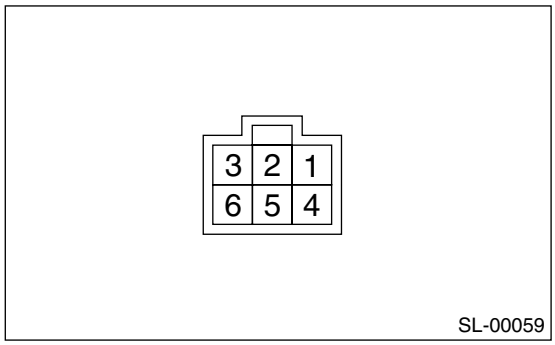
1) Disconnect the door lock actuator harness connector.
2) Connect the battery to door lock actuator terminals.
If NG, replace the door lock actuator.

1. Without double lock



Terminal No.	Actuator operation
No. 2 (+) and No. 4 (–)	Unlocked → Locked
No. 4 (+) and No. 2 (–)	Locked → Unlocked

2. With double lock



DOOR ACTUATOR RH:

Terminal No.	Actuator operation
No. 1 (+) and No. 4 (–)	Unlocked → Locked
No. 4 (+) and No. 1 (–)	Locked → Unlocked
No. 6 (+) and No. 3 (–)	Double lock released → Double lock set
No. 3 (+) and No. 6 (–)	Double lock set → Double lock released

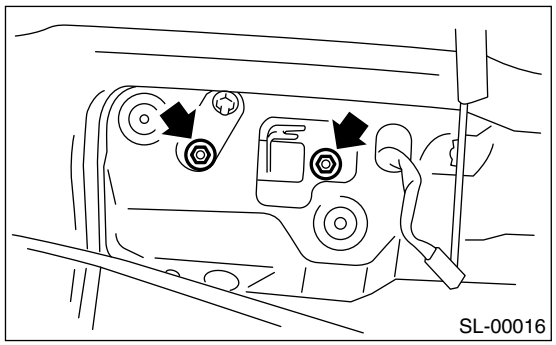
DOOR ACTUATOR LH:

Terminal No.	Actuator operation
No. 6 (+) and No. 3 (–)	Unlocked → Locked
No. 3 (+) and No. 6 (–)	Locked → Unlocked
No. 1 (+) and No. 4 (–)	Double lock released → Double lock set
No. 4 (+) and No. 1 (–)	Double lock set → Double lock released

12.Rear Gate Outer Handle

A: REMOVAL

1) Remove the rear gate trim. <Ref. to EI-48, REMOVAL, Rear Gate Panel Trim.>
2) Remove the rear wiper motor assembly.
<Ref. to WW-17, REMOVAL, Rear Gate Garnish.>
3) Remove the rear finisher.
4) Remove the cable, and then remove two nuts.



5) Remove the rear gate outer handle.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the outer handle works properly after installation.

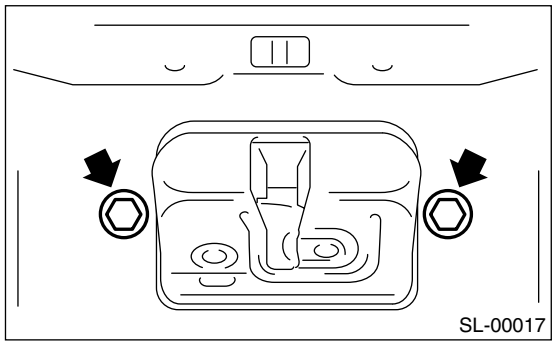
C: INSPECTION

1) Inspect the cable for deformation.
2) Make sure the lever and cable move smoothly.

13.Rear Gate Latch Assembly

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the rear gate trim. <Ref. to EI-48, REMOVAL, Rear Gate Panel Trim.>
3) Remove two bolts.



4) Remove the rear gate latch assembly, and then disconnect the connector.
5) Remove the rear gate outer handle cable, and then remove the rear gate latch assembly.
6) Disconnect the connectors, and then remove the rear gate latch assembly.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the lock works properly after installation.

C: INSPECTION

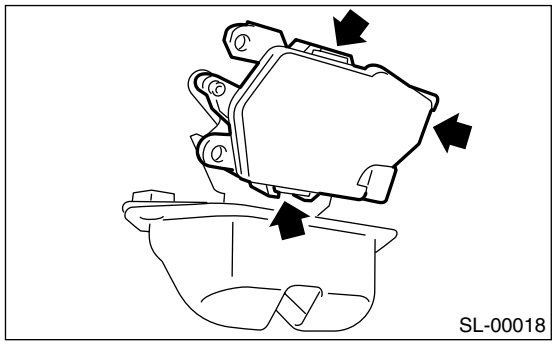
1) Make sure the cable is not deformed.
2) Make sure the lever, cable, rear gate latch switch and door lock operate smoothly.

14.Rear Gate Latch Lock Actuator

A: REMOVAL

1) Remove the rear gate latch assembly. <Ref. to SL-31, REMOVAL, Rear Gate Latch Assembly.>
2) Remove three pawls, and then remove the rear gate latch lock actuator from rear gate latch assembly.

CAUTION:
Do not use excessive force to remove the rear gate latch lock actuator. The pawl surroundings of rear gate latch assembly will be deformed.



B: INSTALLATION

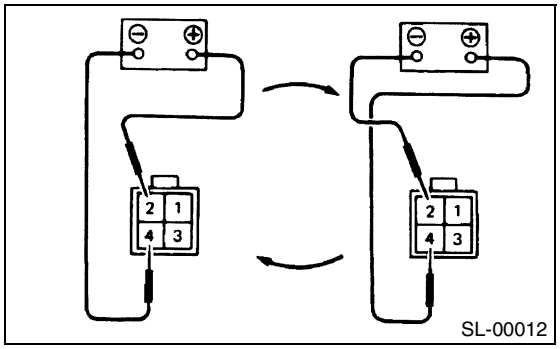
Install in the reverse order of removal.

CAUTION:
Be sure to align the lever groove of rear gate latch assembly and actuator lever.

NOTE:
Make sure the lock works properly after installation.

C: INSPECTION

1) Disconnect the door lock actuator harness connector.
2) Connect the battery to door lock actuator terminals.



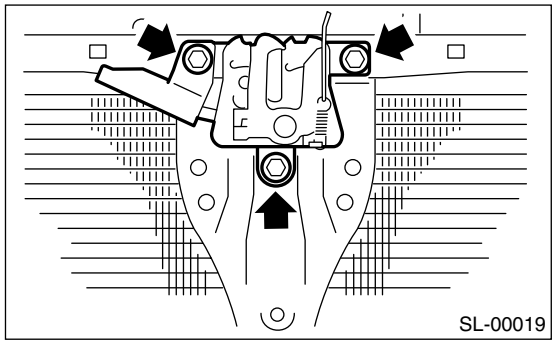
Terminal No.	Actuator operation
No. 4 (+) and No. 2 (–)	Unlocked → Locked
No. 2 (+) and No. 4 (–)	Locked → Unlocked

If NG, replace the rear gate latch lock actuator.

15.Front Hood Lock Assembly

A: REMOVAL

1) Open the hood.
2) Remove the front grille.
3) Remove the bolt. Remove the hood lock assembly.
4) Remove the release cable from lock assembly.



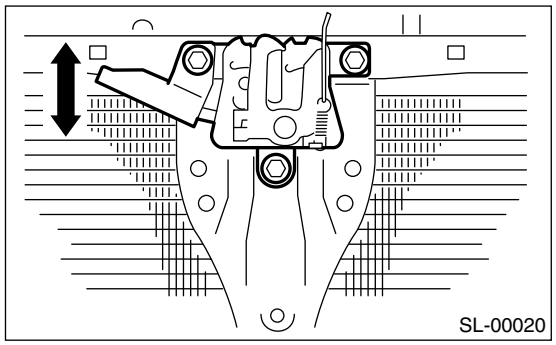
B: INSTALLATION

Install in the reverse order of removal.

NOTE:
- Apply grease to parts that rub.
- Make sure the release cable works properly after installation.

C: ADJUSTMENT

Loosen the bolt. Adjust the lock assembly while moving it up and down.



D: INSPECTION

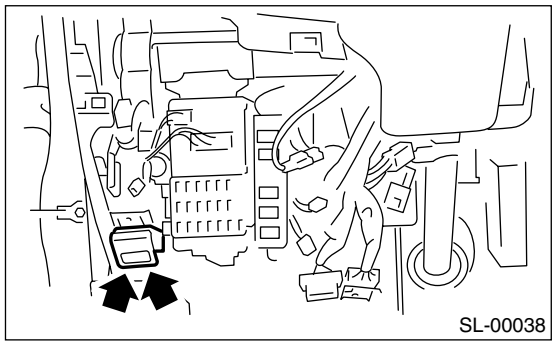
1) Check the striker for bending or abnormal wear.
2) Check the safety lever for improper movement.
3) Check other levers and the spring for rust formation and unsmooth movement.

16.Remote Openers

A: REMOVAL

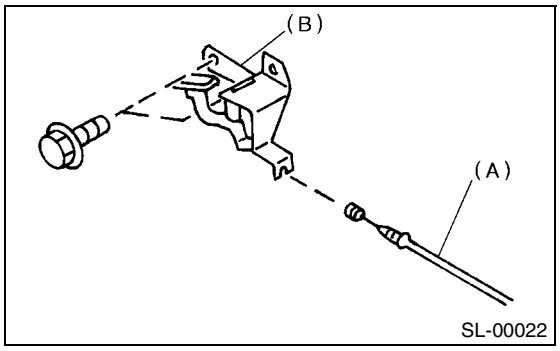
1. HOOD OPENER

1) Remove the front hood lock assembly. <Ref. to SL-33, REMOVAL, Front Hood Lock Assembly.>
2) Remove the release cable from hood lock.
3) Remove the bolt. Remove the opener lever.

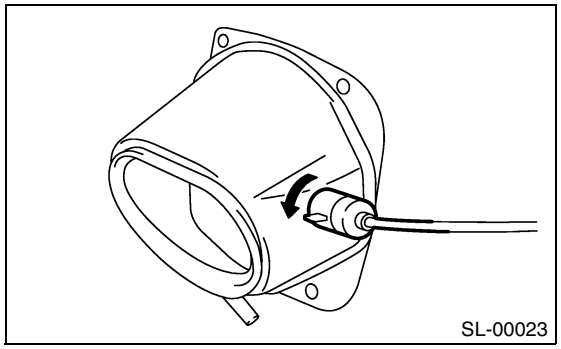


2. FUEL FLAP OPENER

1) Remove the rear seat. <Ref. to SE-10, REMOVAL, Rear Seat.>
2) Remove the center pillar lower trim and side sill cover. Remove the rear pillar lower trim. Pull back the floor mat.
3) Remove the right rear quarter trim. <Ref. to EI-45, REMOVAL, Rear Quarter Trim.>
Remove the clip holding the cable.
4) Remove the bolt. Remove the opener pull handle.
5) Remove the cable (A) from opener pull handle (B).



6) Rotate the fuel lock inside the quarter panel to left and remove.



B: INSTALLATION

1. HOOD OPENER

Install in the reverse order of removal.

2. FUEL FLAP OPENER

Install in the reverse order of removal.

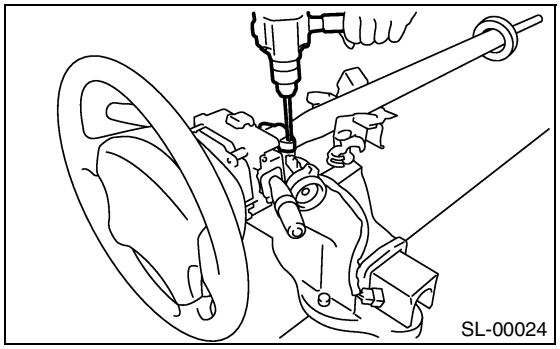
C: INSPECTION

Make sure the fuel flap opens and closes smoothly.

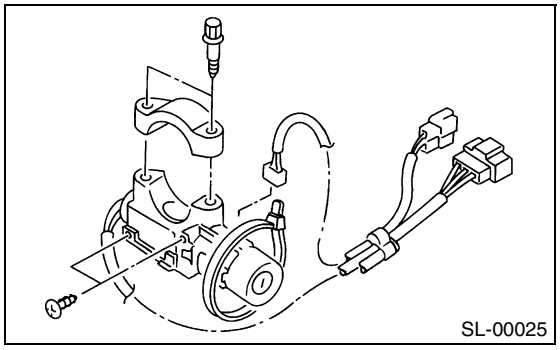
17.Ignition Key Lock

A: REPLACEMENT

1) Remove the ground cable from battery.
2) Remove the steering column. <Ref. to PS-26, REMOVAL, Tilt Steering Column.>
3) Secure the steering column in a vise. Remove the bolt with a drill.



4) Remove the ignition key lock.
5) Use a new torn bolt. Tighten the torn bolt to end of thread.



B: INSPECTION

1) Remove the instrument panel lower cover.
2) Remove the lower column cover.
3) Unfasten the holddown clip which secures harness and disconnect the connector of ignition switch from body harness.
4) Turn the ignition key plate to each position and check the continuity between terminals of ignition connector.

Switch position	Terminal No.	Standard
LOCK	—	—
ACC	No. 1 and No. 2	Less than 1 Ω
ON	No. 1 and No. 2 No. 1 and No. 4 No. 2 and No. 4	Less than 1 Ω
ST	No. 1 and No. 3 No. 1 and No. 4 No. 3 and No. 4	Less than 1 Ω

If NG, replace the ignition switch.

18.Key Lock Cylinder

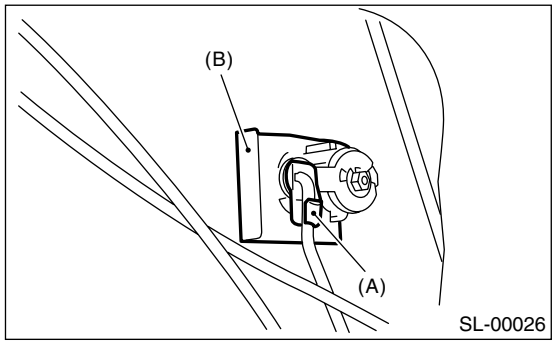
A: REPLACEMENT

1. FRONT DOOR

• Without double lock:

1) Remove the door trim. <Ref. to EI-35, REMOVAL, Front Door Trim.>
2) Pull back the sealing cover. <Ref. to EB-13, REMOVAL, Front Sealing Cover.>
3) Close the front door glass completely.
4) Remove the rod clamp (A). Remove the lock plate (B). Replace the key cylinder.

CAUTION:
Be sure to replace the lock plate (B) with a new one.

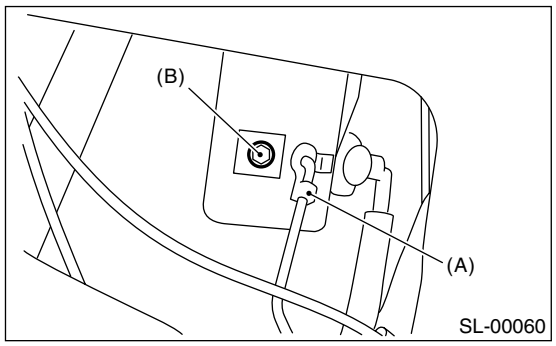


• With double lock:

1) Remove the door trim. <Ref. to EI-35, REMOVAL, Front Door Trim.>
2) Remove the sealing cover. <Ref. to EB-13, REMOVAL, Front Sealing Cover.>
3) Close the front door glass completely.
4) Remove the key cylinder retainer cover, and then remove the rod clamp (A).

CAUTION:
Be sure to replace the key cylinder retainer cover with a new one when removing.

5) Remove the bolt (B) and key cylinder retainer to replace the key cylinder.

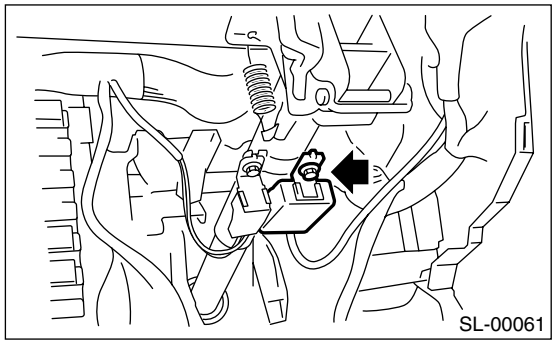


19.Immobilizer Control Module

A: REMOVAL

NOTE:
The following positions for removal and installation are for LHD models. The positions for RHD models are symmetrically opposite.

1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover. <Ref. to EI-40, REMOVAL, Instrument Panel Assembly.>
3) Disconnect the connector from immobilizer control module.
4) Remove the immobilizer control module.



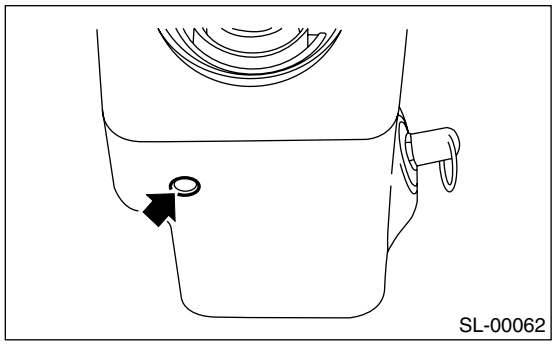
B: INSTALLATION

Install in the reverse order of removal.

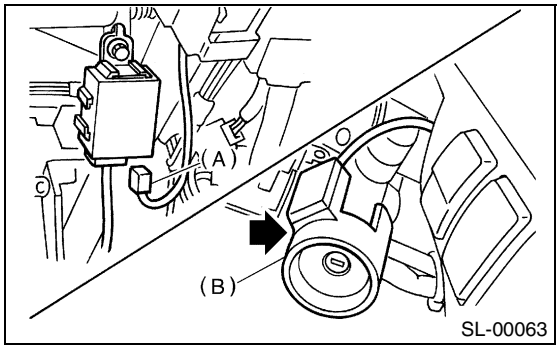
20.Immobilizer Antenna

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover. <Ref. to EI-40, REMOVAL, Instrument Panel Assembly.>
3) Remove the screws, separate upper column cover and lower column cover.



4) Disconnect the immobilizer antenna connector (A) from immobilizer control module.
5) Remove the screw, and detach the immobilizer antenna (B).



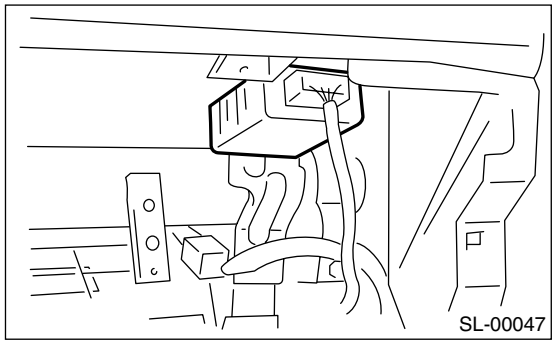
B: INSTALLATION

Install in the reverse order of removal.

21.Keyless Entry Control Module

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the glove box. <Ref. to EI-37, REMOVAL, Glove Box.>
3) Remove the nut, and then remove the keyless entry control module while disconnecting connector.



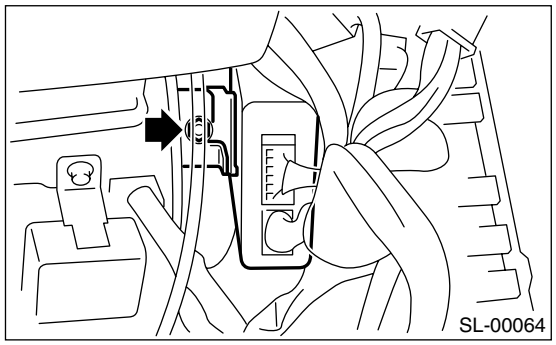
B: INSTALLATION

Install in the reverse order of removal.

22.Double Lock Module

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover. <Ref. to EI-40, REMOVAL, Instrument Panel Assembly.>
3) Remove the nut, then remove the double lock module while disconnecting the connector.



B: INSTALLATION

Install in the reverse order of removal.

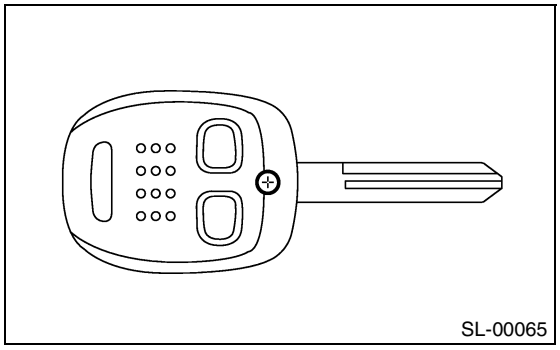
23.Keyless Transmitter

A: REMOVAL

1. TRANSMITTER BATTERY

Remove the battery from transmitter.

NOTE:
To prevent static electricity damage to transmitter printed circuit board, touch the steel area of building with hand to discharge the static electricity carried on body or clothes before disassembling transmitter.



B: INSTALLATION

1. TRANSMITTER BATTERY

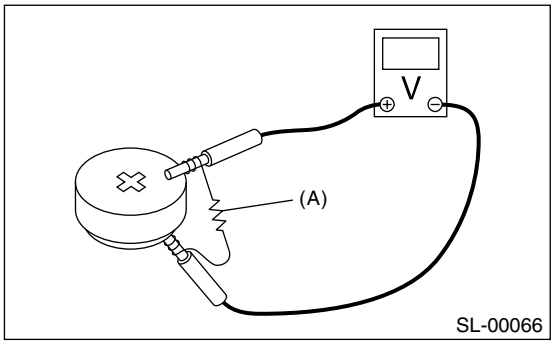
Install in the reverse order of removal.

C: INSPECTION

1. TRANSMITTER BATTERY

Measure the voltage between battery (+) terminal and (–) terminal.

NOTE:
• Battery discharge occurs during measurement. Complete the measurement within 5 seconds.
• During battery voltage measurement, voltage falls more than 1.8 volts in 3 seconds period.



(A) Resistance 300 Ω

Tester connection		Standard
(+)	(–)	
Battery (+) terminal	Battery (–) terminal	2.5 — 3.0 V

If NG, replace the battery. (Use CR1620 or equivalent.)

D: REPLACEMENT

1. TRANSMITTER REGISTRATION

NOTE:
• A maximum of three transmitters can be registered for each individual vehicle.
• When replacing the transmitter (key), registration to immobilizer system is also necessary.

1) Remove the side sill cover at driver's side, then connect the registration connectors at front pillar lower section.
2) Unlock the door lock.
3) Press any button of the transmitter twice while pressing driver's door lock switch to unlock side to be registered.
4) The door lock will automatically lock and unlock in sequence. This indicates the completion of transmitter registration for first transmitter.
5) If the registration of second and third transmitter is now to be carried out, repeat the procedure 3) and 4).
6) Disconnect the registration connectors after the completion of all registration operations. After confirming the operation of door lock using newly registered transmitter(s), reinstall the side sill cover at driver's side.

IMMOBILIZER (DIAGNOSTICS)

IM

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1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	**CHECK ILLUMINATION OF IMMOBILIZER INDICATOR LIGHT.** 1)Turn the ignition switch to OFF or ACC position. 2)Wait at least 60 seconds. Does the immobilizer indicator light blink?	Indicator light blinks.	Go to step **2.**	Check the immobilizer indicator light circuit.<Ref. to IM-10, CHECK IMMOBILIZER INDICATOR CIRCUIT, Diagnostics Chart for Immobilizer Indicator Light.>
2	**CHECK ILLUMINATION OF IMMOBILIZER INDICATOR LIGHT.** Remove the key from ignition switch. Does the immobilizer indicator light begin to blink within 1 second after the key is removed?	Indicator light starts blinking.	Go to step **3.**	Check the key switch circuit. <Ref. to IM-12, CHECK KEY SWITCH CIRCUIT, Diagnostics Chart for Immobilizer Indicator Light.>
3	**CHECK ENGINE START.** Turn the ignition switch to START position. Does the engine start?	Engine starts.	Go to step **4.**	Go to step **5.**
4	**CHECK ILLUMINATION OF IMMOBILIZER INDICATOR LIGHT.** Turn the ignition switch to ON. Does the immobilizer indicator light illuminate?	Indicator light illuminates.	Check the immobilizer indicator light circuit.<Ref. to IM-10, CHECK IMMOBILIZER INDICATOR CIRCUIT, Diagnostics Chart for Immobilizer Indicator Light.>	Immobilizer system is normal.
5	**CHECK INDICATION OF DTC ON DISPLAY.** 1)Turn the ignition switch to OFF. 2)Connect the Subaru Select Monitor to data link connector. <Ref. to IM-7, Subaru Select Monitor.> 3)Turn the ignition switch and Subaru Select Monitor switch to ON. 4)Read any DTC on the display. Are DTCs indicated on display?	DTCs are indicated on display.	Go to step **6.**	Repair the related parts.
6	**PERFORM THE DIAGNOSIS.** 1)Inspect using “Diagnostics Chart with Trouble Code”.<Ref. to IM-15, Diagnostics Chart with Diagnostic Trouble Code (DTC).> 2)Repair the trouble cause. 3)Perform the clear memory mode. 4)Read any DTC again. Are DTCs indicated on display?	DTCs are indicated on display.	Inspect using “Diagnostic Chart with Trouble Code”. <Ref. to IM-15, Diagnostics Chart with Diagnostic Trouble Code (DTC).>	Finish the diagnostics.

2. General Description

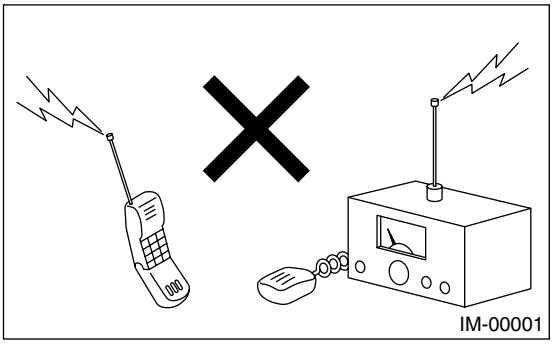
A: CAUTION

CAUTION:

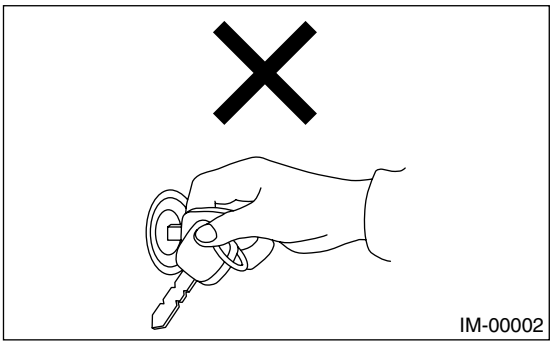
• The airbag system wiring harness is routed near the immobilizer control module. All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.

• Be careful not to damage the airbag system wiring harness when servicing the immobilizer control module.

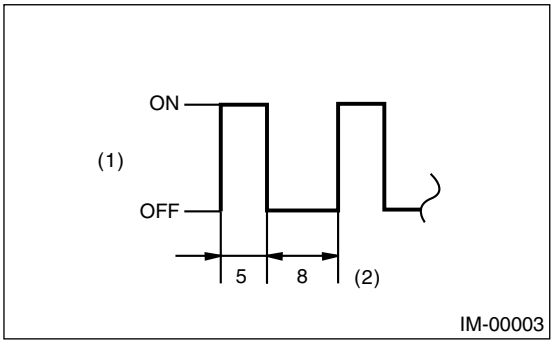
• While diagnostic items are being checked, do not operate radios, portable telephones, etc. which emit electromagnetic waves near or inside the vehicle.



• When the ignition switch is being turned ON or OFF while diagnostic items are being checked, do not allow keys with different ID codes close to the ignition switch. If the ignition key is in a key holder, remove it from the holder before carrying out diagnoses.



• When repeatedly turning the ignition ON or OFF while diagnostic items are being checked, it should be switched in cycles of "ON" for at least 5 seconds → "OFF" for at least 8 seconds.



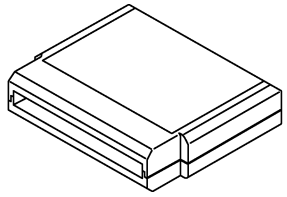
(1) Ignition switch position
(2) Sec.

• If the engine fails to start with a registered ignition key, detach the ignition key from ignition switch and wait for approx. 1 second until immobilizer indicator light begins to flash. Start the engine again.

• Before checking the diagnostic items, obtain all keys for the vehicle to be checked possessed by owner.

B: PREPARATION TOOL

1. SPECIAL TOOLS

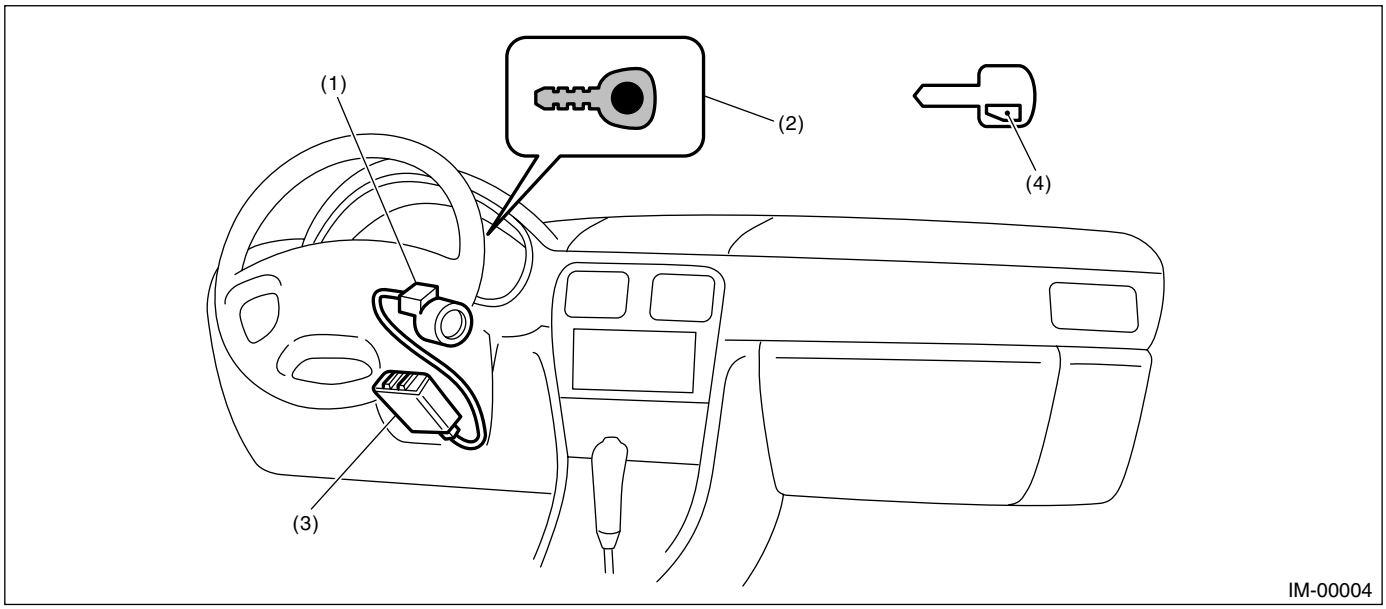
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA210	24082AA210 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.

3. Electrical Components Location

A: LOCATION



(1) Antenna
(2) Immobilizer indicator light (LED bulb)
(3) Immobilizer control module (IMM ECM)
(4) Transponder

NOTE:
IMM ECM location for RHD model is symmetrically opposite.

4. Immobilizer Control Module I/O Signal

A: SCHEMATIC

1. IMMOBILIZER

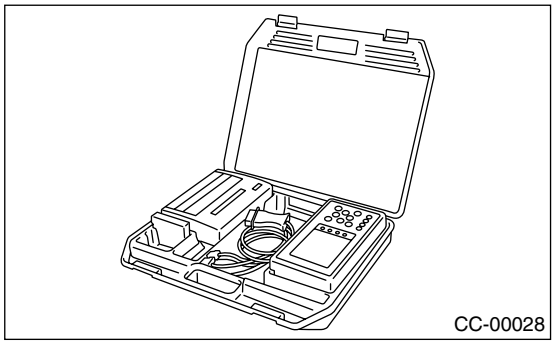
<Ref. to WI-172, SCHEMATIC, Immobilizer System.>

5. Subaru Select Monitor

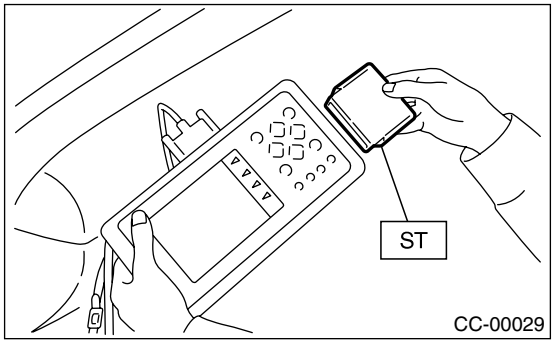
A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit.

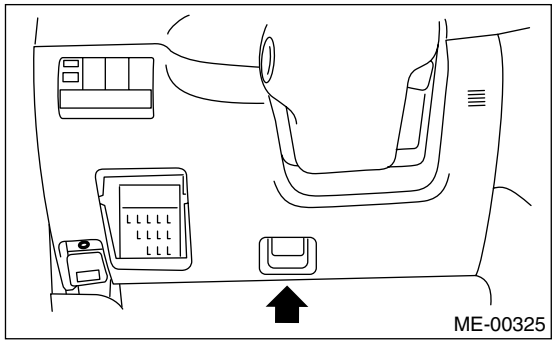


2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor.



4) Connect the Subaru Select Monitor to data link connector.

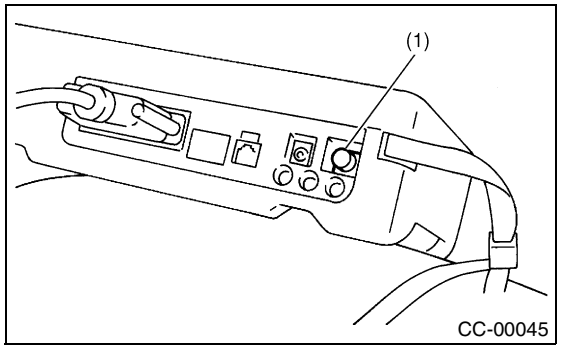
(1) Data link connector is located in the lower portion of the instrument panel (on driver's side).



(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor.

5) Turn the ignition switch to ON (engine OFF), and then Subaru Select Monitor switch to ON.



(1) Power switch

6) Using the Subaru Select Monitor, call up any DTCs and various data, and then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE.

Refer to Read Diagnostic Trouble Code for information about how to indicate DTC. <Ref. to IM-8, Read Diagnostic Trouble Code (DTC).>

3. INTERFACE CHECK

NOTE:
The communication line between ECM and IMM ECM can be checked in «System Operation Check Mode». This is referred to as "interface check".

1) Connect the Subaru Select Monitor.
2) Set the «System Operation Check Mode» menu display screen, and then select «Immobilizer System».
3) Start the interface check.
4) Does "Communication Line not Shorted" appear on screen?
If "YES". Go to step 5).
If "NO". Go to step 6).
5) After diagnostic results, it is determined that the short circuit is not a diagnostic item. This completes interface check.
6) If a problem is detected, repair. <Ref. to IM-16, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostics Chart with Diagnostic Trouble Code (DTC).>

6. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1) On the «Main Menu» display screen, select the {Each System Check}, and then press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System}, and then press the [YES] key.
3) Press the [YES] key after displayed information of engine type.
4) On the «Engine Diagnosis» display screen, select the {Diagnostic Code(s) Display}, and then press the [YES] key.
5) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)}, and then press the [YES] key.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to IM-14, LIST, List of Diagnostic Trouble Code (DTC).>

7. Clear Memory Mode

A: OPERATION

1) On the «Main Menu» display screen, select the {2. Each System Check}, and then press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System}, and then press the [YES] key.
3) Press the [YES] key after displayed information of engine type.
4) On the «Engine Diagnosis» display screen, select the {Clear Memory}, and then press the [YES] key.
5) When the `Done' and `Turn Ignition Switch OFF' are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

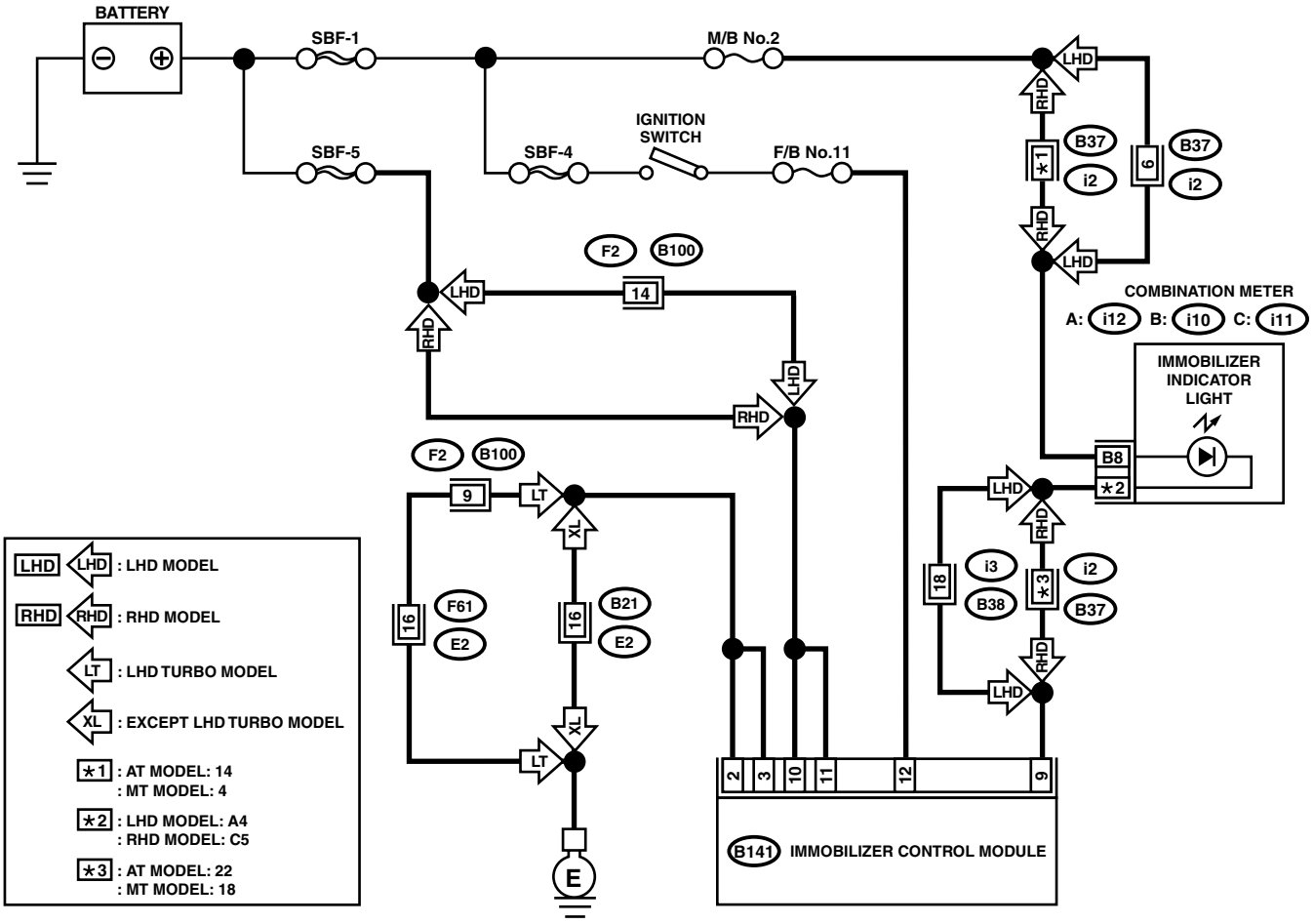
NOTE:
• After the memory has been cleared, the ISC must be initialized. To do this, turn the ignition switch to ON position. Wait 3 seconds before starting the engine.
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

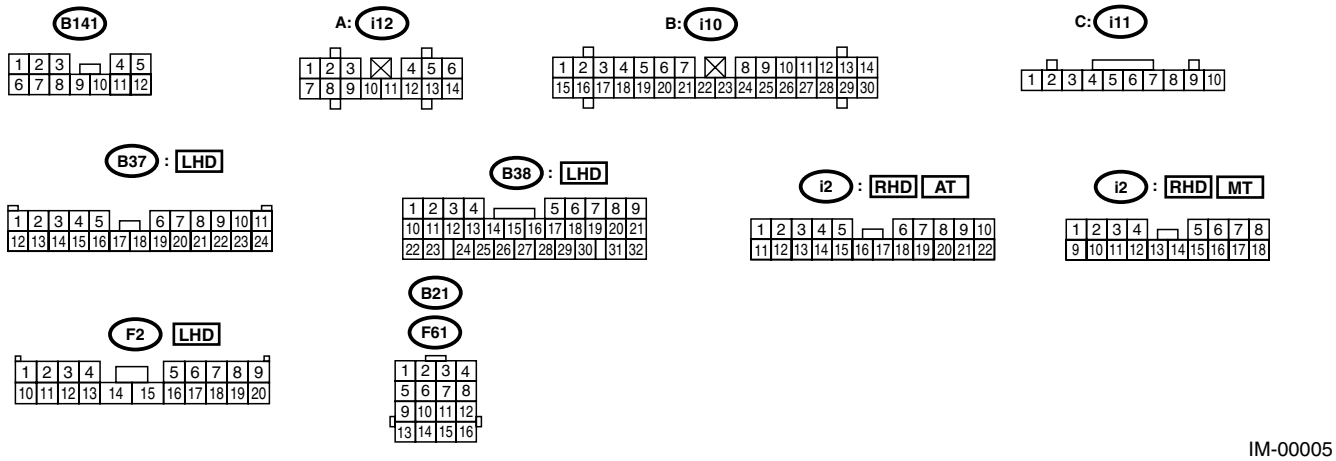
8. Diagnostics Chart for Immobilizer Indicator Light

A: INSPECTION

1. CHECK IMMOBILIZER INDICATOR CIRCUIT

WIRING DIAGRAM:





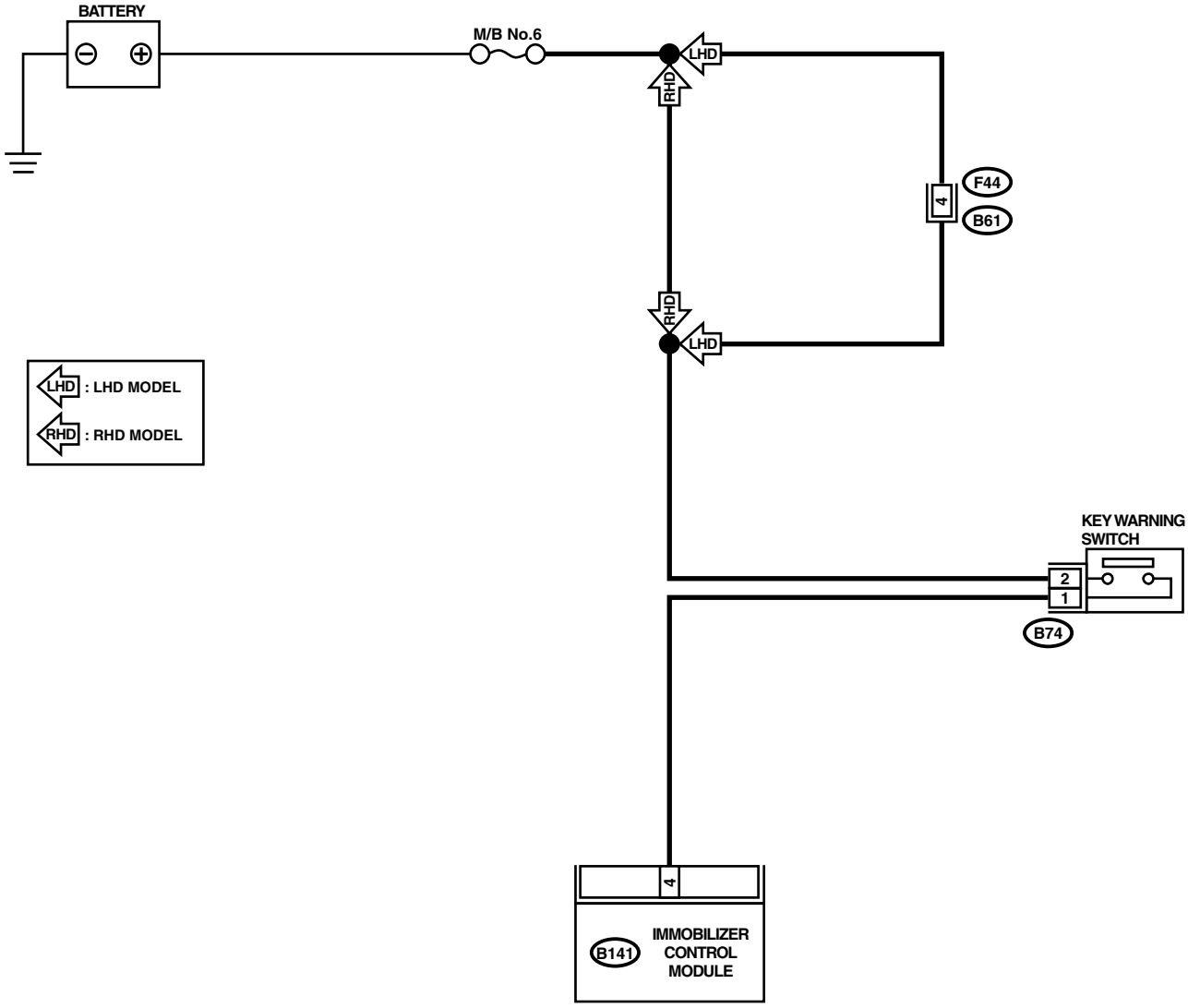
IM-00005

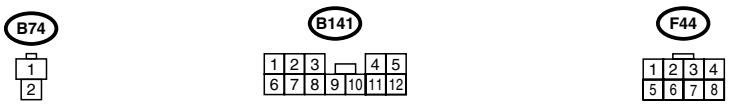
DIAGNOSTICS CHART FOR IMMOBILIZER INDICATOR LIGHT

	Step	Check	Yes	No
1	**CHECK IMMOBILIZER INDICATOR LIGHT.** 1)Turn the ignition switch to OFF. 2)Disconnect the harness connector from IMM ECM. 3)Connect a resistor (750 Ω) between IMM ECM harness connector terminal No. 9 and chassis ground. Does the indicator light come on?	Indicator light illuminates.	Go to step **2.**	Go to step **5.**
2	**CHECK IMM ECM GROUND CIRCUIT.** Measure the resistance between IMM ECM harness connector terminal and chassis ground. ***Connector & terminal*** ***(B141) No. 2, No. 3 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	Go to step **3.**	Repair the open circuit of IMM ECM ground circuit.
3	**CHECK IMM ECM IGNITION CIRCUIT.** 1)Turn the ignition switch to ON. (engine OFF.) 2)Measure the voltage between IMM ECM harness connector terminal and chassis ground. ***Connector & terminal*** ***(B141) No. 12 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **4.**	Check the harness for open or short between IMM ECM and ignition switch.
4	**CHECK IMM ECM POWER SUPPLY CIRCUIT.** 1)Turn the ignition switch to OFF. 2)Measure the voltage between IMM ECM harness connector terminal and chassis ground. ***Connector & terminal*** ***(B141) No. 10, No. 11 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Replace the IMM ECM <Ref. to SL-37, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).	Check the harness for open or short between IMM ECM and fuse.
5	**CHECK COMBINATION METER CIRCUIT.** 1)Remove the combination meter. <Ref. to IDI-12, Combination Meter Assembly.> 2)Measure the voltage between combination meter harness connector terminal and chassis ground. ***Connector & terminal*** ***(i10) No. 8 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **6.**	Check the harness for open or short between combination meter and fuse.
6	**CHECK COMBINATION METER CIRCUIT.** Measure the resistance between IMM ECM harness connector terminal and combination meter harness connector terminal. ***Connector & terminal*** ***LHD model*** ***(B141) No. 9 — (i12) No. 4:*** ***RHD model*** ***(B141) No. 9 — (i11) No. 5:*** Is the measured value less than specified value?	10 Ω	Faulty LED bulb. Replace the combination meter printed circuit. <Ref. to IDI-13, DISASSEMBLY, Combination Meter Assembly.>	Repair the harness or connector.

2. CHECK KEY SWITCH CIRCUIT

WIRING DIAGRAM:





IM-00006

DIAGNOSTICS CHART FOR IMMOBILIZER INDICATOR LIGHT

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY CIRCUIT.** 1)Disconnect the harness connector from key warning switch. 2)Measure the voltage between key warning switch harness connector terminal and chassis ground. ***Connector & terminal*** ***(B74) No. 2 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **2.**	Check the harness for open or short between key warning switch and fuse.
2	**CHECK KEY SWITCH.** 1)Insert the ignition key to the ignition switch. (OFF or ACC position) 2)Measure the resistance between key warning switch connector terminals. ***Terminal*** ***No. 1 — No. 2:*** Is the measured value less than specified value?	1 Ω	Go to step **3.**	Replace the key warning switch.
3	**CHECK KEY SWITCH.** 1)Remove the ignition key from the ignition switch. 2)Measure the resistance between key warning switch connector terminals. ***Terminal*** ***No. 1 — No. 2:*** Is the measured value more than specified value?	1 MΩ	Go to step **4.**	Replace the key warning switch.
4	**CHECK HARNESS BETWEEN KEY SWITCH AND IMM ECM.** 1)Disconnect the harness connector from key warning switch. 2)Disconnect the harness connector from IMM ECM. 3)Measure the resistance between key warning switch harness connector terminal and IMM ECM harness connector terminal. ***Connector & terminal*** ***(B74) No. 1 — (B141) No. 4:*** Is the measured value less than specified value?	10 Ω	Replace the IMM ECM <Ref. to SL-37, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).	Repair the harness between key warning switch and IMM ECM.

9. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Contents of diagnosis	Index No.
P1571	Reference Code Incompatibility	Reference code incompatibility between IMM ECM and ECM	<Ref. to IM-15, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1572	IMM Circuit Failure (Except Antenna Circuit)	Communication failure between IMM ECM and ECM	<Ref. to IM-16, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1574	Key Communication Failure	Failure of IMM ECM to verify key (transponder) ID code	<Ref. to IM-19, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P0153	Use of Unregistered Key	Incorrect immobilizer key (Use of unregistered key in IMM ECM)	<Ref. to IM-20, DTC P0153 INCORRECT IMMOBILIZER KEY (USE OF UNREGISTERED KEY), Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1576	EGI Control Module EEPROM	ECM malfunctioning	<Ref. to IM-20, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1577	IMM Control Module EEPROM	IMM ECM malfunctioning	<Ref. to IM-20, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1570	ANTENNA	Faulty antenna	<Ref. to IM-21, DTC P1570 ANTENNA, Diagnostics Chart with Diagnostic Trouble Code (DTC).>

NOTE:
• If any DTC except for the above immobilizer trouble code has been output, carry out diagnosis for the engine trouble code. <Ref. to EN(SOHC)-75, List of Diagnostic Trouble Code (DTC).> or <Ref. to EN(TURBO)-77, List of Diagnostic Trouble Code (DTC).>

10.Diagnostics Chart with Diagnostic Trouble Code (DTC)

A: DTC P1571 REFERENCE CODE INCOMPATIBILITY

DIAGNOSIS:

- Reference code incompatibility between IMM ECM and ECM

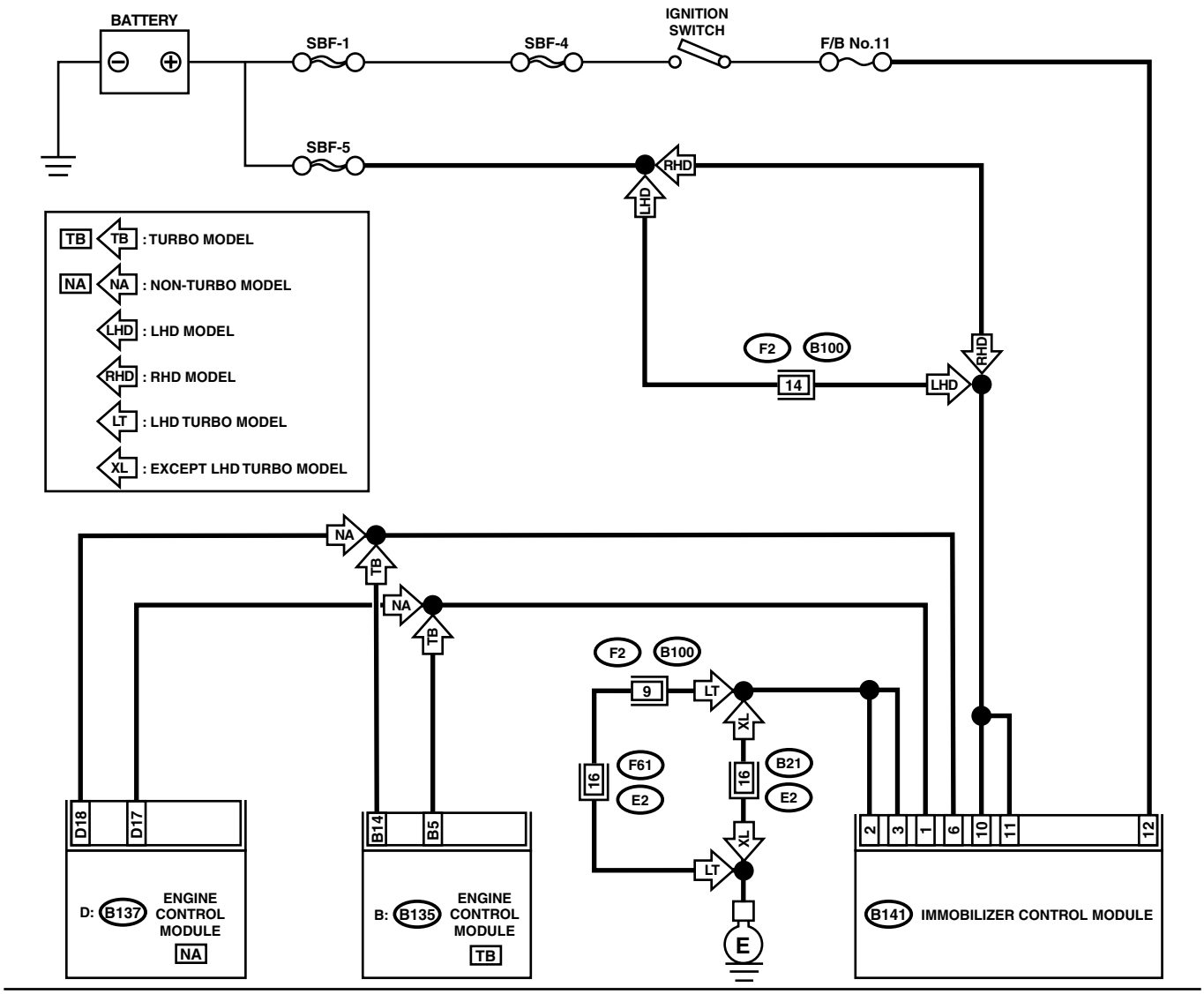
	Step	Check	Yes	No
1	**PERFORM TEACHING OPERATION ON IGNITION KEY.** Perform teaching operation on all keys of the vehicle. Refer to the teaching operation manual. Is teaching operation for all keys completed?	Teaching operation is completed.	END	Replace the ECM <Ref. to FU(SOHC)-46, Engine Control Module.>, or <Ref. to FU(TURBO)-48, Engine Control Module.>, IMM ECM <Ref. to SL-37, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).

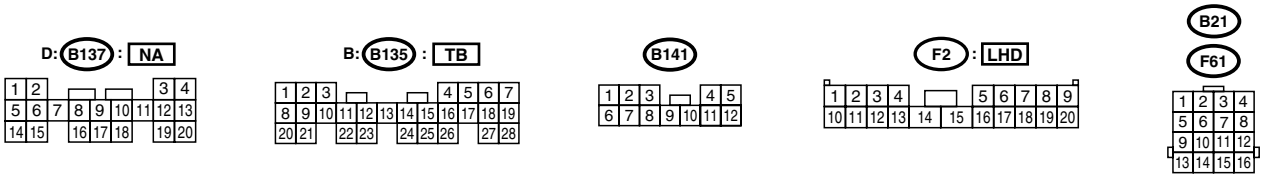
B: DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)

DIAGNOSIS:

- Communication failure between IMM ECM and ECM

WIRING DIAGRAM:





IM-00007

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY CIRCUIT OF IMM ECM.** 1)Turn the ignition switch to OFF. 2)Disconnect the harness connector from IMM ECM. 3)Measure the voltage between IMM ECM harness connector terminal and chassis ground. ***Connector & terminal*** ***(B141) No. 10, No.11 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **2.**	Check the harness for open or short between IMM ECM and fuse.
2	**CHECK IGNITION SWITCH CIRCUIT.** 1)Turn the ignition switch to ON. (engine OFF.) 2)Measure the voltage between IMM ECM harness connector terminal and chassis ground. ***Connector & terminal*** ***(B141) No. 12 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **3.**	Check the harness for open or short between IMM ECM and ignition switch.
3	**CHECK GROUND CIRCUIT OF IMM ECM.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between IMM ECM harness connector terminal and chassis ground. ***Connector & terminal*** ***(B141) No. 2, No.3 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	Go to step **4.**	Repair the open circuit of IMM ECM ground circuit.
4	**CHECK HARNESS BETWEEN IMM ECM AND ECM.** 1)Disconnect the harness connector from ECM and IMM ECM. 2)Measure the resistance between IMM ECM harness connector terminal and ECM harness connector terminal. ***Connector & terminal*** ***Non-turbo model*** ***(B141) No. 1 — (B137) No. 17:*** ***Turbo model*** ***(B141) No. 1 — (B135) No. 14:*** Is the measured value less than specified value?	10 Ω	Go to step **5.**	Repair the open circuit of harness between IMM ECM and ECM.
5	**CHECK HARNESS BETWEEN IMM ECM AND ECM.** Measure the resistance between IMM ECM harness connector terminal and ECM harness connector terminal. ***Connector & terminal*** ***Non-turbo model*** ***(B141) No. 6 — (B137) No. 18:*** ***Turbo model*** ***(B141) No. 6 — (B135) No. 5:*** Is the measured value less than specified value?	10 Ω	Go to step **6.**	Repair the open circuit of harness between IMM ECM and ECM.

	Step	Check	Yes	No
6	**CHECK HARNESS OF COMMUNICATION LINE.** 1)Turn the ignition switch to ON. (engine OFF.) 2)Measure the voltage between IMM ECM harness connector terminal and chassis ground. ***Connector & terminal*** ***(B141) No. 1, No.6 (+) — Chassis ground (–):*** Is the measured value as specified?	0 V	Go to step **7.**	Repair the harness between IMM ECM and ECM, because there is short circuit with battery voltage line or ignition switch "ON" line.
7	**CHECK HARNESS OF COMMUNICATION LINE.** Measure the voltage between ECM harness connector terminal and engine ground. ***Connector & terminal*** ***Non-turbo model*** ***(B137) No. 17, No.18 (+) — Engine ground (–):*** ***Turbo model*** ***(B135) No. 5, No.14 (+) — Engine ground (–):*** Is the measured value as specified?	0 V	Go to step **8.**	Repair the harness between IMM ECM and ECM, because there is short circuit with battery voltage line or ignition switch "ON" line.
8	**CHECK ECM BY INTERFACE CHECK.** 1)Connect the harness connector to ECM. 2)Disconnect the harness connector from IMM ECM. 3)Perform interface check. <Ref. to IM-7, INTERFACE CHECK, Subaru Select Monitor.> Does "Commun. Line Shorted to Ground" appear on the screen?	"Commun. Line Shorted to Ground" appear on the screen.	Replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>, or <Ref. to FU(TURBO)-48, Engine Control Module.> Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).	Go to step **9.**
9	**CHECK ECM BY INTERFACE CHECK.** Perform interface check. Does "Commun. Line Shorted to Battery" appear on the screen?	"Commun. Line Shorted to Battery" appear on the screen.	Replace the ECM. <Ref. to FU(SOHC)-46, Engine Control Module.>, or <Ref. to FU(TURBO)-48, Engine Control Module.> Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).	Go to step **10.**

	Step	Check	Yes	No
10	**CHECK ECM BY INTERFACE CHECK.** Perform interface check. Does “Communication Line not Shorted” appear on the screen?	“Communication Line not Shorted” appear on the screen.	Replace the IMM ECM <Ref. to SL-37, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).	When “**Check (Time Out)**” appears on the screen, perform interface check again.

C: DTC P1574 KEY COMMUNICATION FAILURE

DIAGNOSIS:

- Failure of IMM ECM to verify key (transponder) ID code

	Step	Check	Yes	No
1	**CHECK IMM ECM FUNCTION.** Insert the key to ignition switch (LOCK position), measure changes in voltage between Antenna connector. ***Connector & terminal*** ***(B142) No. 1 (+) — No. 2: (–)*** Is the measured value as specified?	–30 to 30 V: Approx. 0.1 second after inserting the key 0 V: Approx. 1 second after inserting the key	Go to step **2.**	Replace the IMM ECM <Ref. to SL-37, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).
2	**CHECK IGNITION KEY (TRANSPONDER).** 1)Remove the key from ignition switch. 2)Start the engine using other keys that have undergone the teaching operation, furnished with vehicle. Does the engine start?	Engine starts.	Replace the ignition key (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).	Replace the IMM ECM <<Ref. to SL-37, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).

D: DTC P0153 INCORRECT IMMOBILIZER KEY (USE OF UNREGISTERED KEY)

DIAGNOSIS:

- Use of unregistered key in IMM ECM

	Step	Check	Yes	No
1	**PERFORM TEACHING OPERATION ON IGNITION KEY.** Perform teaching operation on all keys of the vehicle. Refer to the teaching operation manual (Pub. No. S0820GZ). Is teaching operation for all keys completed?	Teaching operation is completed.	END	Replace all ignition keys (including the transponder). Go to step **2.**
2	**PERFORM TEACHING OPERATION ON IGNITION KEY.** Perform teaching operation on all keys with vehicle. Refer to the teaching operation manual (Pub. No. S0820GZ). Is teaching operation for all keys completed?	Teaching operation is completed.	END	Replace the IMM ECM <Ref. to SL-37, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).

E: DTC P1576 EGI CONTROL MODULE EEPROM

DIAGNOSIS:

- ECM malfunctioning

1. REPLACE ECM.

Replace the ECM.
<Ref. to FU(SOHC)-46, Engine Control Module.>, or <Ref. to FU(TURBO)-48, Engine Control Module.>
Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).

F: DTC P1577 IMM CONTROL MODULE EEPROM

DIAGNOSIS:

- IMM ECM malfunctioning

1. REPLACE IMM ECM.

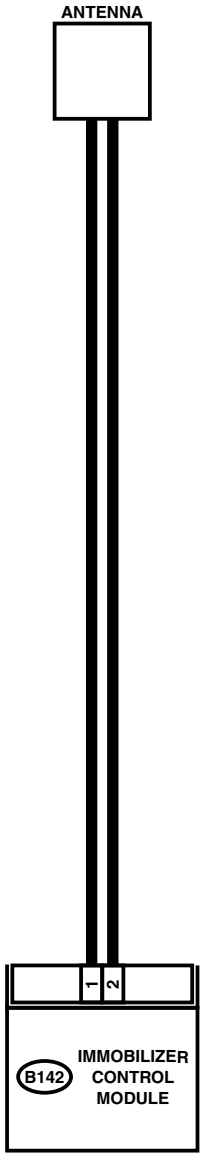
Replace the IMM ECM <Ref. to SL-37, Immobilizer Control Module.>, and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).

G: DTC P1570 ANTENNA

DIAGNOSIS:

- Faulty antenna

WIRING DIAGRAM:



B142

1 2

IM-00008

	Step	Check	Yes	No
1	**CHECK ANTENNA CIRCUIT.** 1)Turn the ignition switch to OFF. 2)Disconnect the harness antenna connector from IMM ECM. <Ref. to SL-38, Immobilizer Antenna.> 3)Measure the resistance of antenna circuit. ***Connector & terminal*** ***(B142) No. 1 — No. 2:*** Is the measured value less than specified value?	10 Ω	Go to step **2.**	Replace the antenna. <Ref. to SL-38, Immobilizer Antenna.>
2	**CHECK ANTENNA CIRCUIT.** Measure the resistance between antenna harness connector and chassis ground. ***Connector & terminal*** ***(B142) No. 1 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	Replace the antenna. <Ref. to SL-38, Immobilizer Antenna.>	Go to step **3.**
3	**CHECK ANTENNA CIRCUIT.** Measure the resistance between antenna harness connector and chassis ground. ***Connector & terminal*** ***(B142) No. 2 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	Replace the antenna. <Ref. to SL-38, Immobilizer Antenna.>	Go to step **4.**
4	**CHECK ANTENNA CIRCUIT.** 1)Turn the ignition switch to ON. (engine OFF.) 2)Measure the voltage between antenna harness connector and chassis ground. ***Connector & terminal*** ***(B142) No. 1 (+) — Chassis ground (–):*** Is the measured value as specified?	0 V	Go to step **5.**	Replace the antenna. <Ref. to SL-38, Immobilizer Antenna.>
5	**CHECK ANTENNA CIRCUIT.** Measure the voltage between antenna harness connector and chassis ground. ***Connector & terminal*** ***(B142) No. 2 (+) — Chassis ground (–):*** Is the measured value as specified?	0 V	Go to step **6.**	Replace the antenna. <Ref. to SL-38, Immobilizer Antenna.>
6	**CHECK IMM ECM FUNCTION.** 1)Turn the ignition switch to OFF. 2)Connect the antenna harness connector to IMM ECM. 3)Insert the key to ignition switch, measure changes in voltage between antenna harness connector. ***Connector & terminal*** ***(B142) No. 1 (+) — No. 2 (–):*** Is the measured value as specified?	–30 to 30 V: Approx. 0.1 second after inserting the key 0 V: Approx. 1 second after inserting the key	Go to step **7.**	Replace the IMM ECM <Ref. to SL-37, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).

	Step	Check	Yes	No
7	**CHECK IGNITION KEY (TRANSPONDER).** 1)Remove the key from ignition switch. 2)Start the engine using other keys that have undergone the teaching operation, furnished with vehicle. Does the engine start?	Engine starts.	Replace the ignition key (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).	Replace the IMM ECM <Ref. to SL-37, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

SR

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3. Sunroof Lid 5
4. Sunroof Assembly 6
5. Sunroof Motor 8
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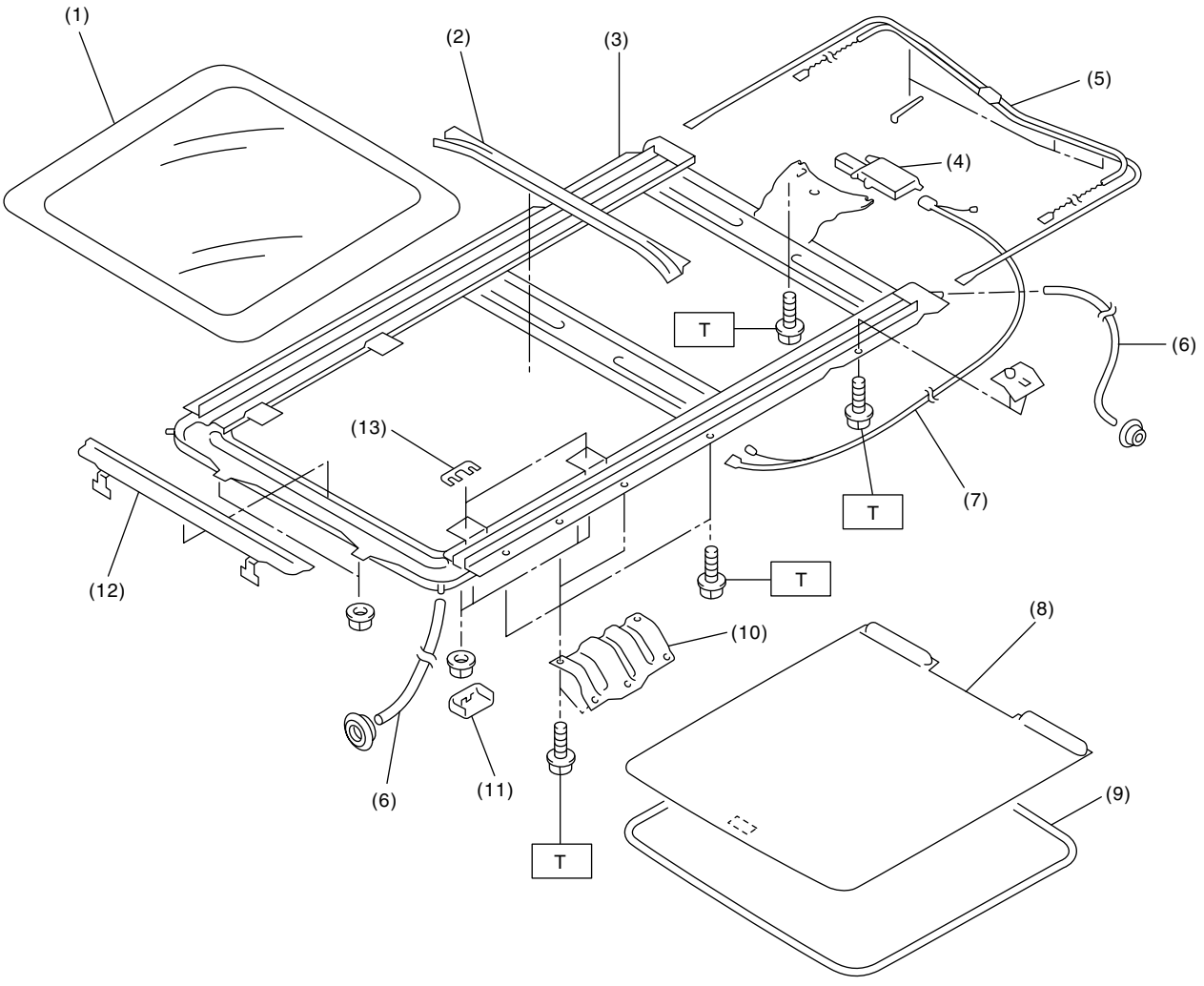
1. General Description

A: COMPONENT



(1) Glass lid
(2) Rear drain ASSY
(3) Frame ASSY
(4) Motor ASSY
(5) Drive unit
(6) Drain tube
(7) Harness
(8) Sunshade
(9) Garnish
(10) Frame bracket
(11) Cover
(12) Deflector
(13) Shim

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.4 (0.75, 5.4)

B: CAUTION

• Before disassembling or reassembling parts, always disconnect battery ground cable. When replacing radio, control module, and other parts provided with memory functions, record memory contents before disconnecting the battery ground cable. Otherwise, the memory will be erased.
• Reassemble in reverse order of disassembly, unless otherwise indicated.
• Adjust parts to the given specifications.
• Connect connectors and hoses securely during reassembly.
• After reassembly, make sure functional parts operate smoothly.

C: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

2. Sunroof Control System

A: SCHEMATIC

1. SUNROOF

<Ref. to WI-221, SCHEMATIC, Sunroof System.>

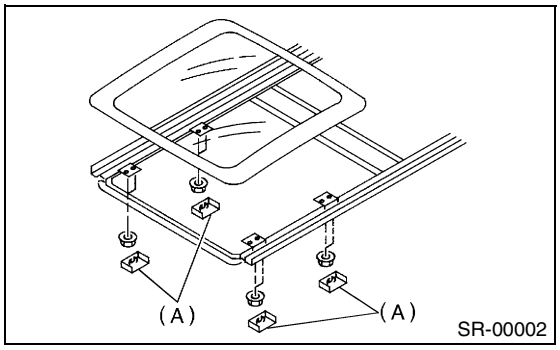
B: INSPECTION

Symptom	Checking order
Water leaks.	(1) Check roof panel and sunroof lid for improper or poor sealing. (2) Check drain tube for clogging. (3) Check sunroof frame seal and body for improper fit.
Booming noise	(1) Check sunroof lid and roof panel for improper clearance. (2) Check sunshade and roof trim for improper clearance.
Abnormal motor noise	(1) Check motor for looseness. (2) Check gears and bearings for wear. (3) Check cables for wear. (4) Check cable pipe for deformities.
Failure of sunroof (Motor operates properly.)	(1) Check guide rail for foreign particles. (2) Check guide rail for improper installation. (3) Check parts for mutual interference. (4) Check cable slider for improper clinching. (5) Check cable for improper installation.
Motor does not rotate or rotates improperly.	(1) Check fuse for blow-out. (2) Check switch for improper function. (3) Check motor for incorrect terminal voltage. (4) Check relay for improper operation. (5) Check poor grounding system. (6) Check harness for open or short and terminals for poor connections.

3. Sunroof Lid

A: REMOVAL

1) Completely close glass lid and open sunshade.
2) Detach the four covers (A) and then remove eight nuts.



3) Carefully remove glass lid.

B: INSTALLATION

Install in the reverse order of removal.

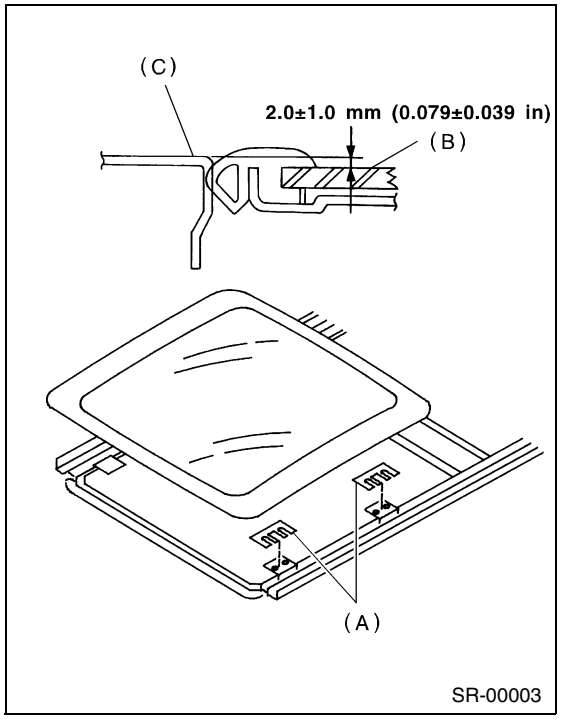
C: ADJUSTMENT

1. ALIGNMENT OF HEIGHT BETWEEN SUNROOF LID AND ROOF PANEL

Loosen sunroof lid nuts and then adjust height by adding (max: four pieces) or extracting (min: zero piece) shims (standard: two pieces) between sunroof lid and roof panel.

Difference in height between sunroof lid and roof panel

2.0±1.0 mm (0.079±0.039 in)

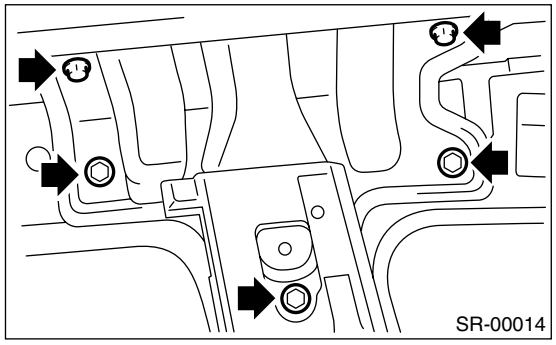


(A) Shim
(B) Sunroof lid
(C) Roof panel

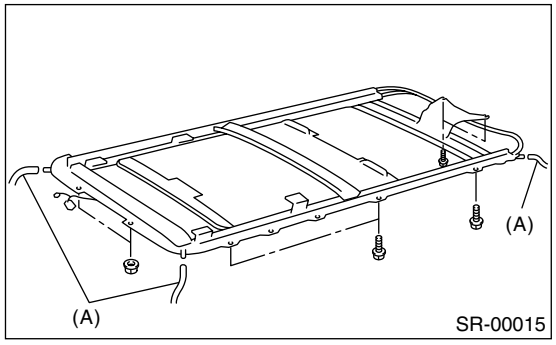
4. Sunroof Assembly

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove roof trim. <Ref. to EI-47, REMOVAL, Roof Trim.>
3) Remove sunroof lid. <Ref. to SR-5, REMOVAL, Sunroof Lid.>
4) Disconnect the four drain tubes (A) from sunroof frame.
5) Disconnect sunroof harness connector.
6) Remove the bolts, and then remove the frame bracket.


SR-00014

7) Remove bolts and nuts and then detach sunroof frame.



SR-00015

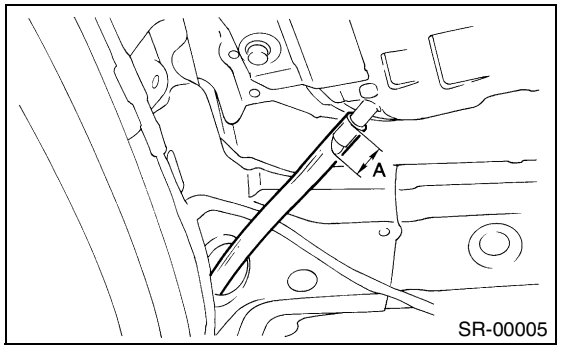
B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Be careful not to snag harness.

NOTE:
- Make sure to connect harness connector.
- When installing drain tube, insert it securely into drain pipe.

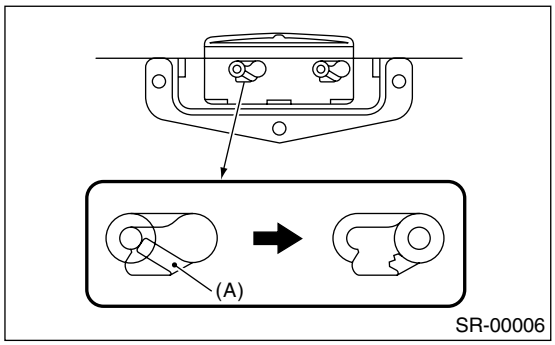
Length A:
15 mm (0.59 in) or more



SR-00005

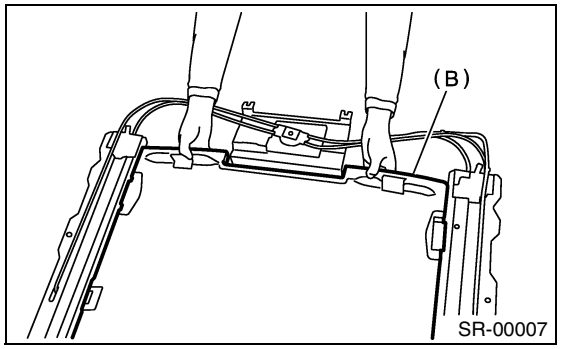
C: DISASSEMBLY

1) Remove sunroof frame.
2) Cut the pawl (A) of front sunshade RH.
3) Remove the front slider RH.



SR-00006

4) Pull out the sunshade (B) from sunroof frame.



SR-00007

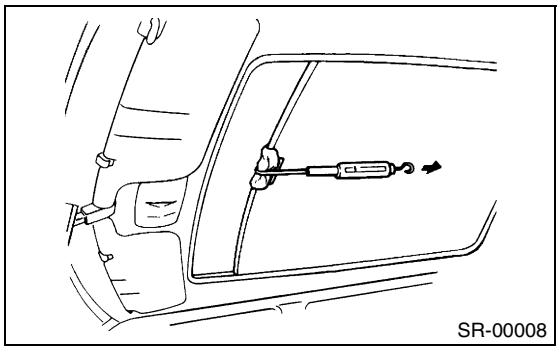
D: ASSEMBLY

Assemble in the reverse order of disassembly.

E: INSPECTION

1. CHECK FOR MOVEMENT OF SUNSHADE

1) Place a cloth on sunshade, and attach a spring scale to sunshade edge using a cloth.



2) Pull the spring scale to measure force required to move the sunshade.

Force required to move sunshade:
25 N (2.5 kgf, 5.5 lb) or less

NOTE:
Considerable effort is required to start sunshade moving, so take a scale reading while sunroof panel is moving smoothly.

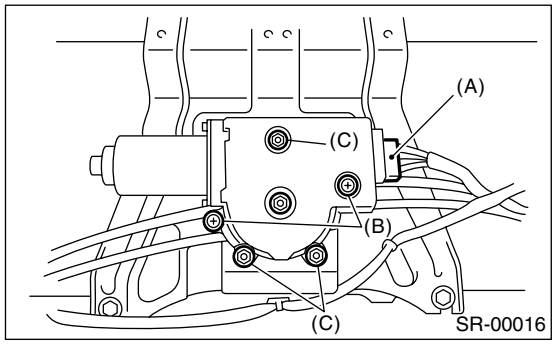
3) If force required exceeds specifications, check the sunroof glass lid, sunshade and deflector, and guide rail assembly for improper installation

5. Sunroof Motor

A: REMOVAL

CAUTION:
• Fully close sunroof when removing sunroof motor.
• When removing clip, use great care to not damage the roof trim.

1) Completely close the sunroof.
2) Disconnect the ground cable from battery.
3) Remove roof trim. <Ref. to EI-47, REMOVAL, Roof Trim.>
4) Disconnect harness connector (A) and remove sunroof motor mounting screw (B) and nut (C).



B: INSTALLATION

CAUTION:
Be careful not to move the sunroof cable when installing sunroof motor.

1) Install sunroof motor.
2) Connect sunroof motor harness connector and then connect battery ground cable.
3) Reset the sunroof motor. <Ref. to SR-8, ADJUSTMENT, Sunroof Motor.>
4) Check sunroof operation with the following procedure.

Checking order	Switch position
(1) Completely close sunroof.	Closed
(2) Open sunroof 500 mm (19.69 in) away from completely closed position.	Open
(3) Completely open sunroof.	Open
(4) Close sunroof 200 mm (7.87 in) from completely closed position.	Closed
(5) Completely close sunroof.	Closed

5) Install the roof trim. <Ref. to EI-47, INSTALLATION, Roof Trim.>

C: ADJUSTMENT

1) Reset the sunroof motor.
(1) Close the sunroof lid completely, and then push the switch to close for more than 1 second. (At this time, the sunroof operates 50 mm each intermittently. And also the switch is needed to push for several times.)
(2) Open the sunroof lid approx. 400 mm (15.75 in).
(3) Close the sunroof lid completely, and then push the switch to close for more than 1 second. (Sunroof operates automatically by performing this operation.)

D: INSPECTION

1. AUTO REVERSE FUNCTION

1) Open the sunroof lid.
2) While the sunroof lid closing automatically, press the switch to open and check if auto reverse function operates properly.
3) Check that the sunroof opens 150 mm (5.91 in) by auto reverse function operated.

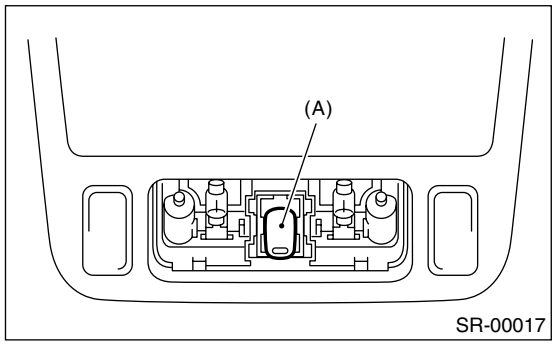
CAUTION:
Do not check the auto reverse operation with pinching any object.

NOTE:
• Auto function is canceled if auto reverse function operates more than five times.
• Reset if auto function is canceled. <Ref. to SR-8, ADJUSTMENT, Sunroof Motor.>

6. Sunroof Switch

A: REMOVAL

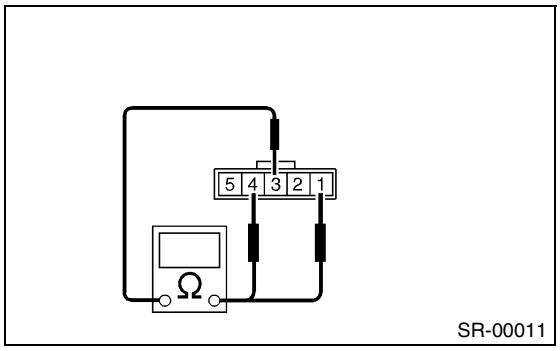
1) Disconnect ground cable from battery.
2) Remove the map light.<Ref. to LI-29, REMOVAL, Spot Light.>
3) Disconnect harness connectors and remove sunroof switch (A).



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION



Check continuity between terminals when operating the switch.

Switch	Terminal No.	Standard value
Open	1 — 3	Less than 1 Ω
Close	3 — 4	More than 1 MΩ

EXTERIOR/INTERIOR TRIM

EI

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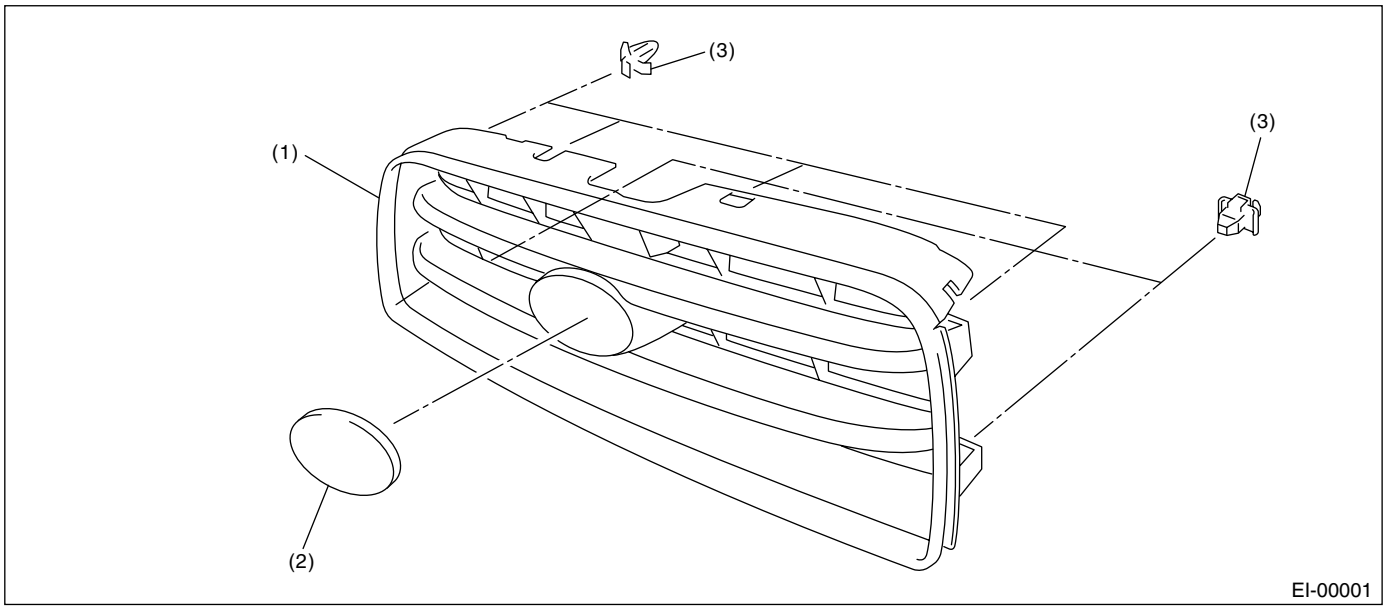
1. General Description

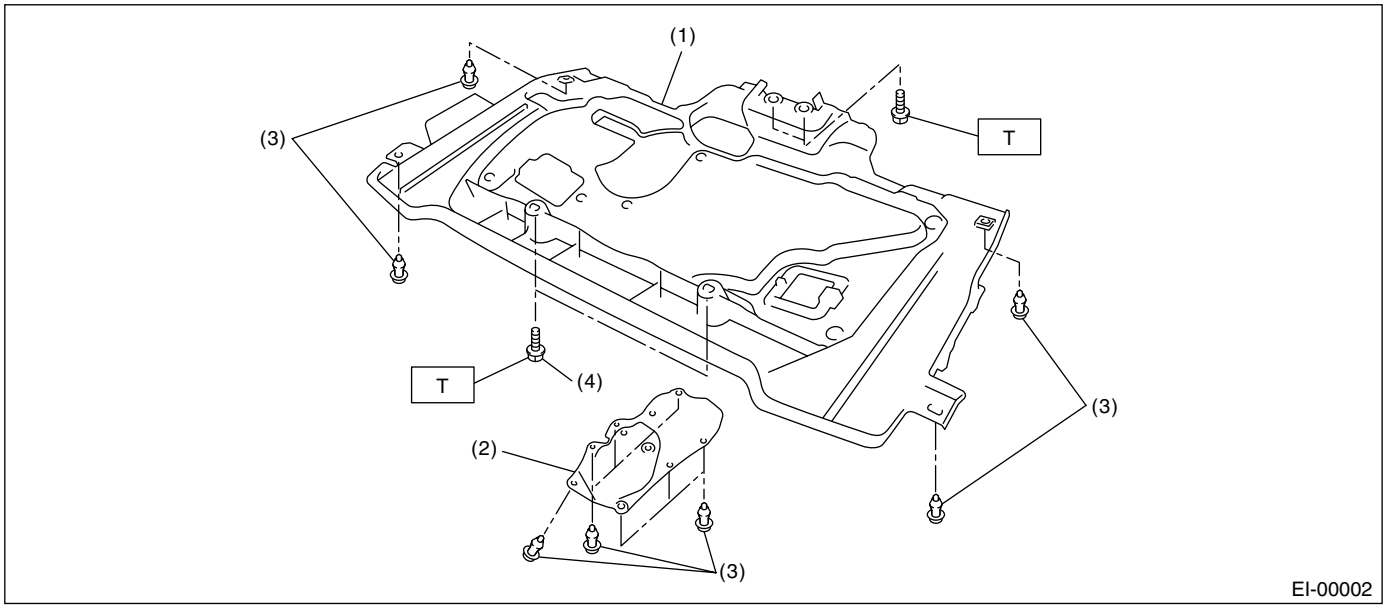
A: COMPONENT

1. FRONT GRILLE



(1) Front grille
(2) Front ornament ASSY
(3) Clip

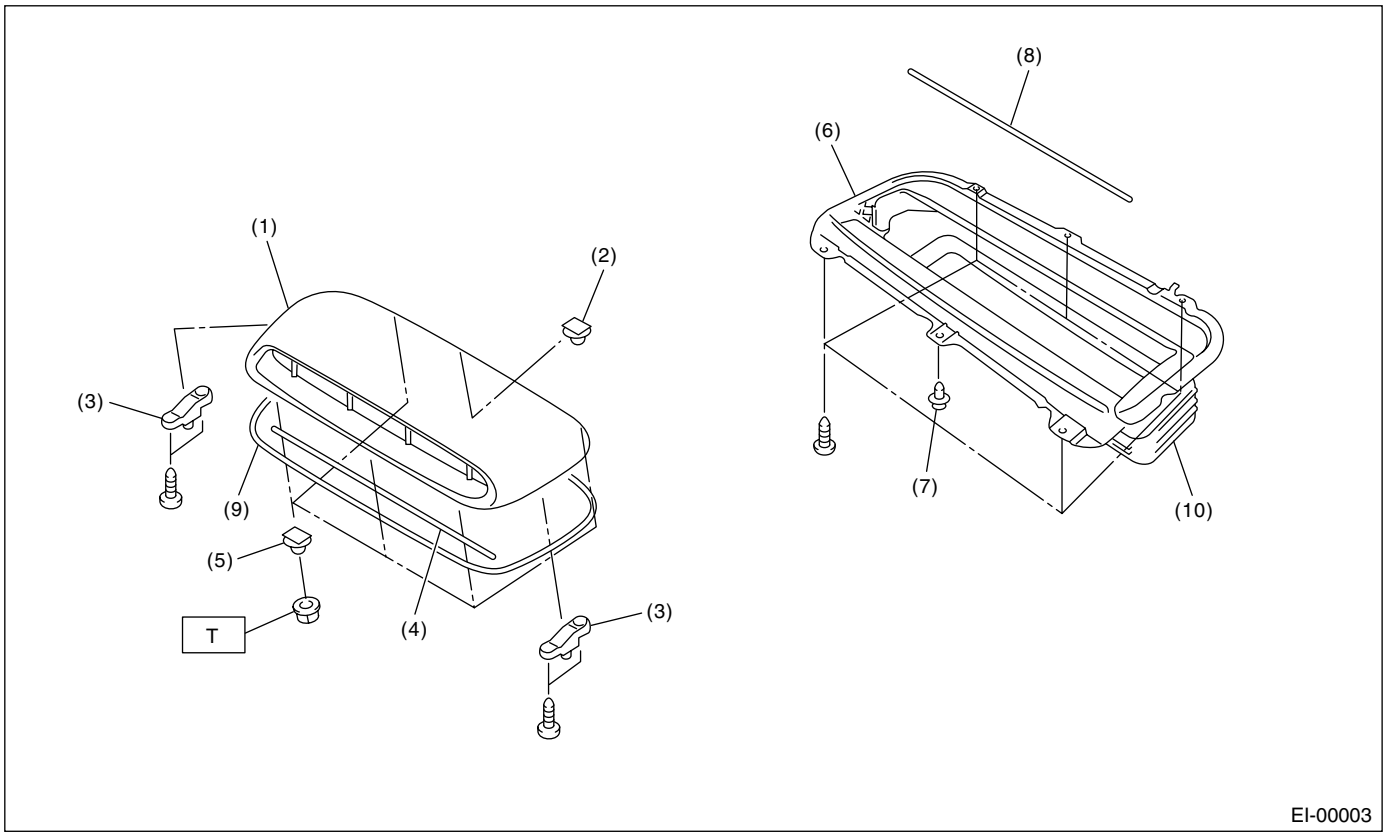
2. UNDER COVER



(1) Under cover
(2) Service hole cover
(3) Clip
(4) Bolt

Tightening torque: N·m (kgf-m, ft-lb)
T: 18 (1.84, 13.3)

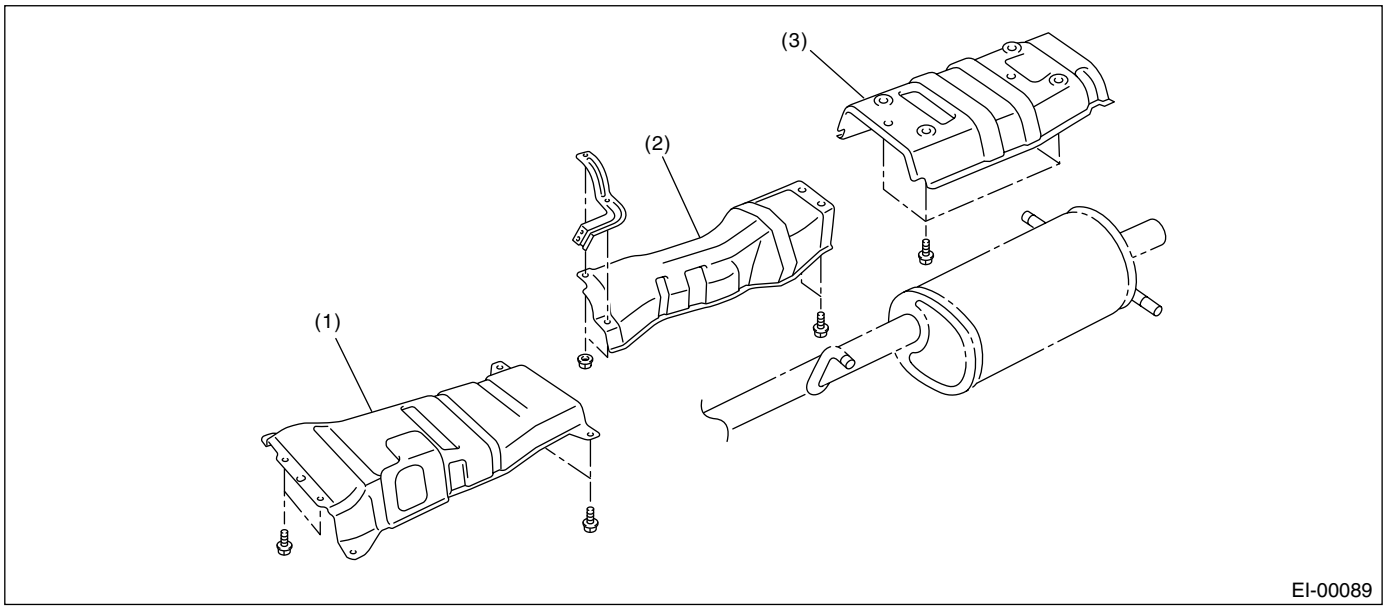
3. HOOD GRILLE



(1) Hood grille
(2) White clip
(3) Black clip
(4) Packing B
(5) Bolt
(6) Grille duct
(7) Clip
(8) Packing C
(9) Packing A
(10) Duct bellows

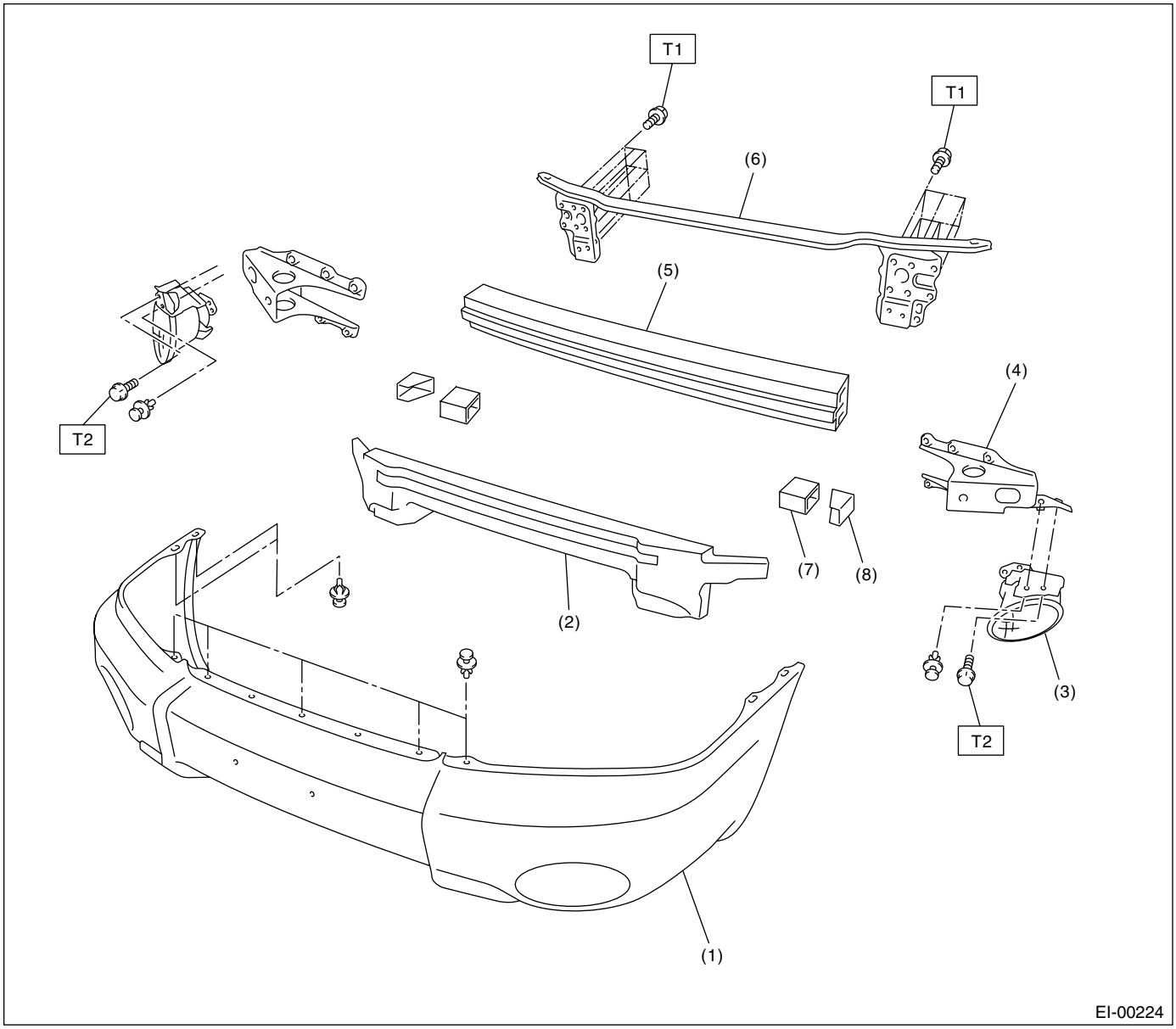
Tightening torque: N·m (kgf-m, ft-lb)
T: 4.4 (0.45, 3.25)

4. HEAT SHIELD COVER



(1) Front heat shield cover
(2) Center heat shield cover
(3) Rear heat shield cover

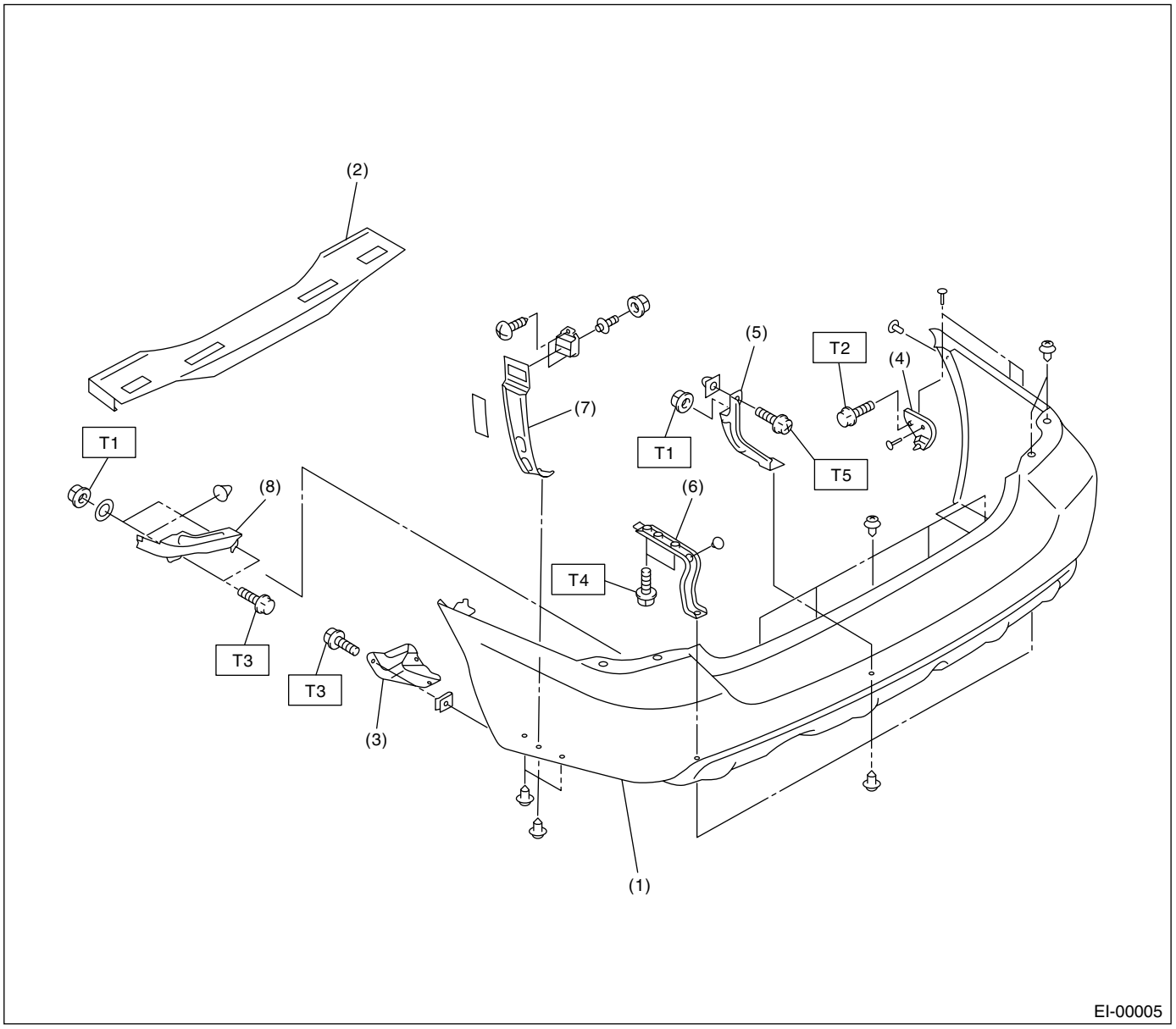
5. FRONT BUMPER



(1) Bumper face
(2) E/A form
(3) Fog light
(4) Side bracket
(5) Main beam
(6) Upper beam
(7) Outer pushing part
(8) Inner pushing part

Tightening torque: N·m (kgf-m, ft-lb)
T1: 70 (7.1, 51)
T2: 32 (3.3, 24)

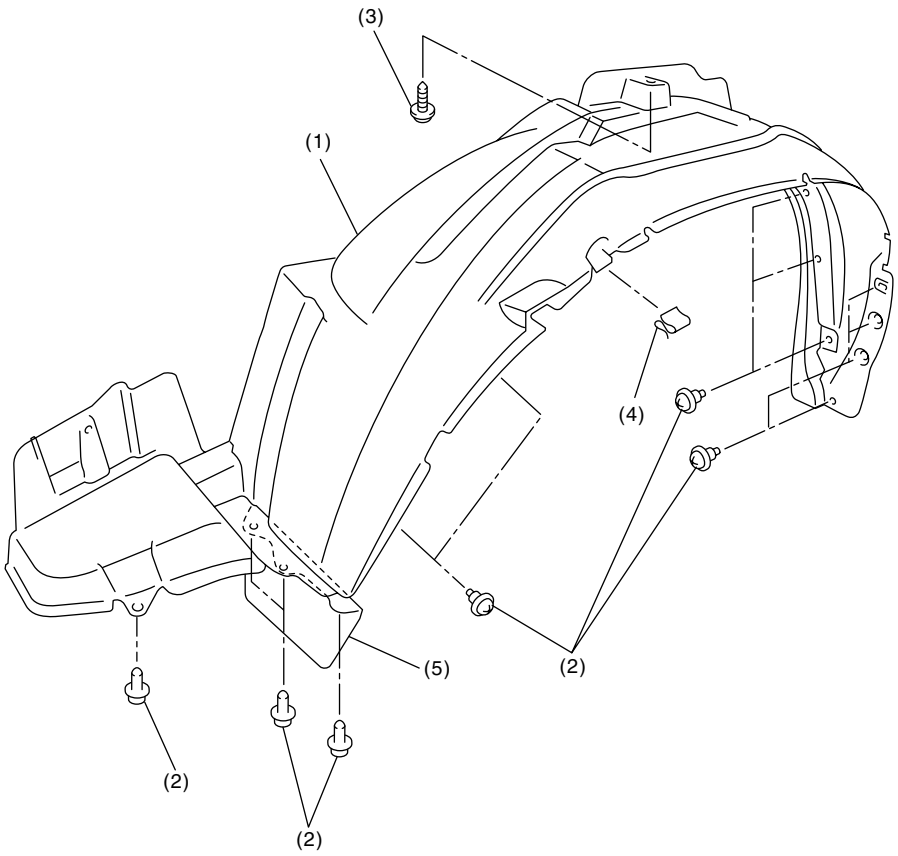
6. REAR BUMPER



(1)	Bumper face	(5)	Center bracket
(2)	Rear bumper upper beam	(6)	Stay COMPL
(3)	Rear arch cover	(7)	Rear bumper side bracket ASSY
(4)	Rear bumper front side bracket	(8)	Rear bumper upper beam side

Tightening torque: N·m (kgf-m, ft-lb)
T1: 32 (3.3, 24)
T2: 7.4 (0.75, 5.46)
T3: 4.4 (0.45, 3.26)
T4: 93 (9.5, 68.7)
T5: 1.8 (0.18, 1.3)

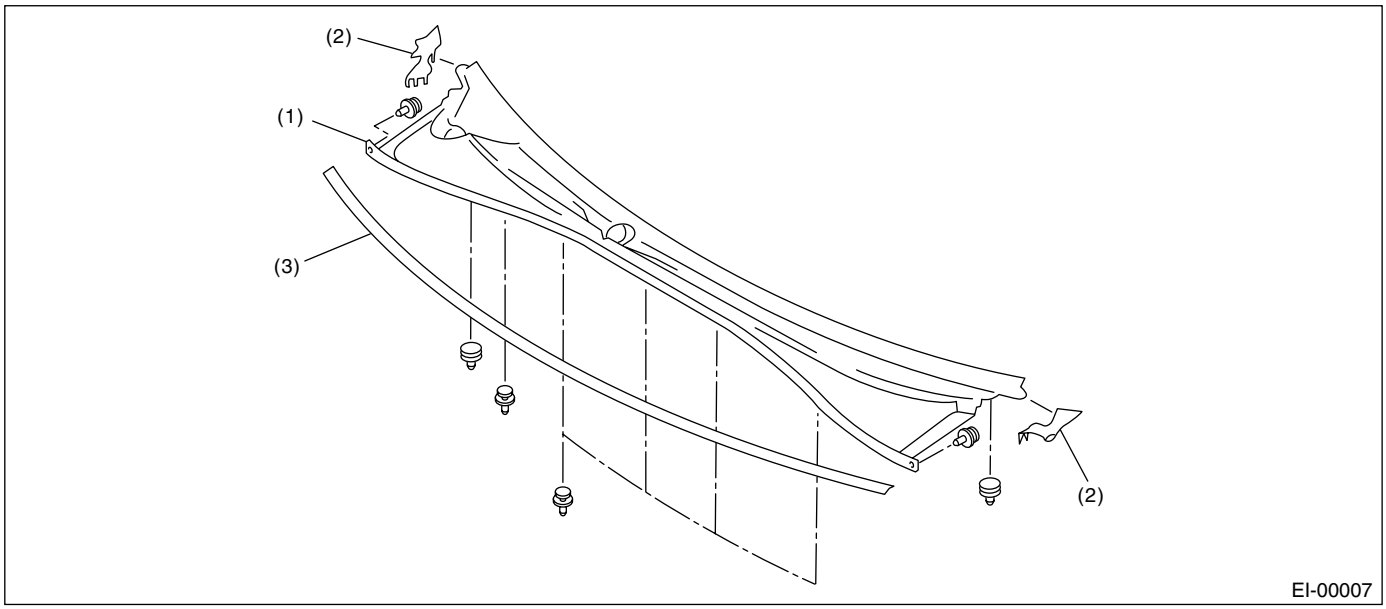
7. MUD GUARD



EI-00238

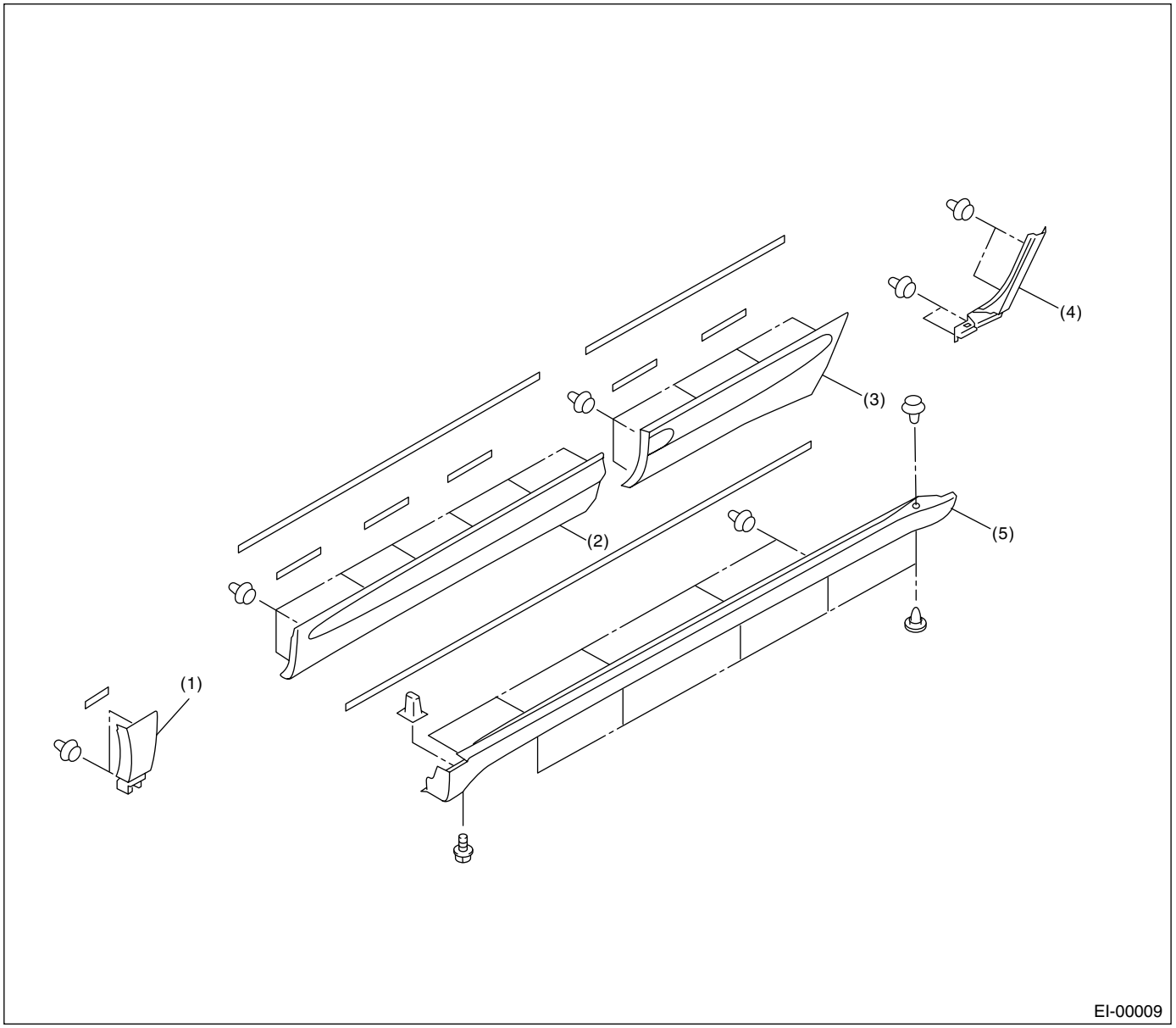
(1) Mud guard
(2) Clip
(3) Screw
(4) Clip (S-shape)
(5) Air flap

8. COWL PANEL



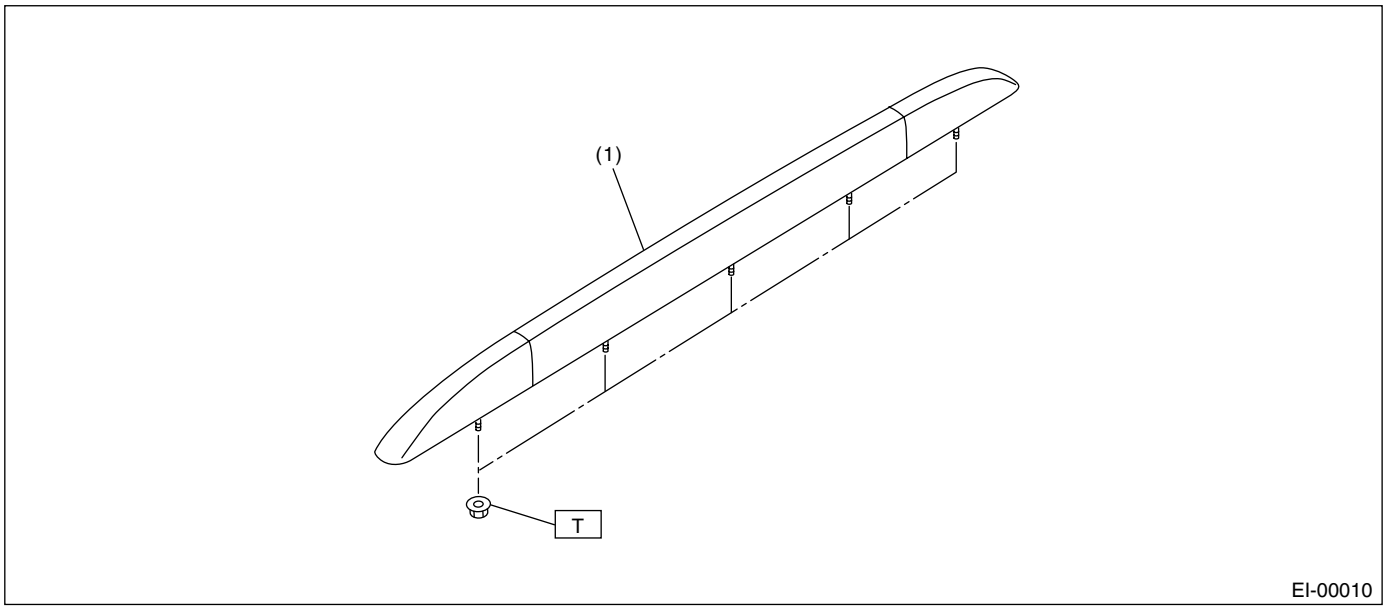
(1) Cowl panel (2) Cowl side panel (3) Seal

9. SIDE SILL SPOILER



(1) Side protector (Front fender)
(2) Side protector (Front door)
(3) Side protector (Rear door)
(4) Side protector (Rear fender)
(5) Side sill spoiler

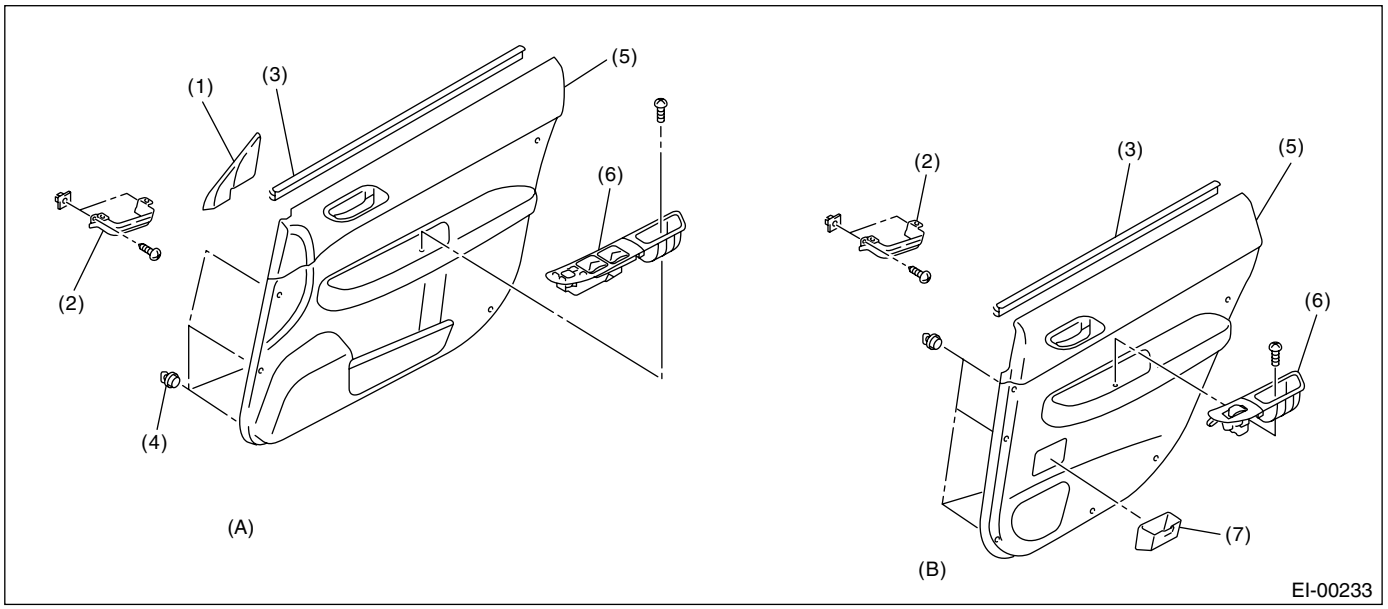
10.ROOF RAIL



(1) Roof rail

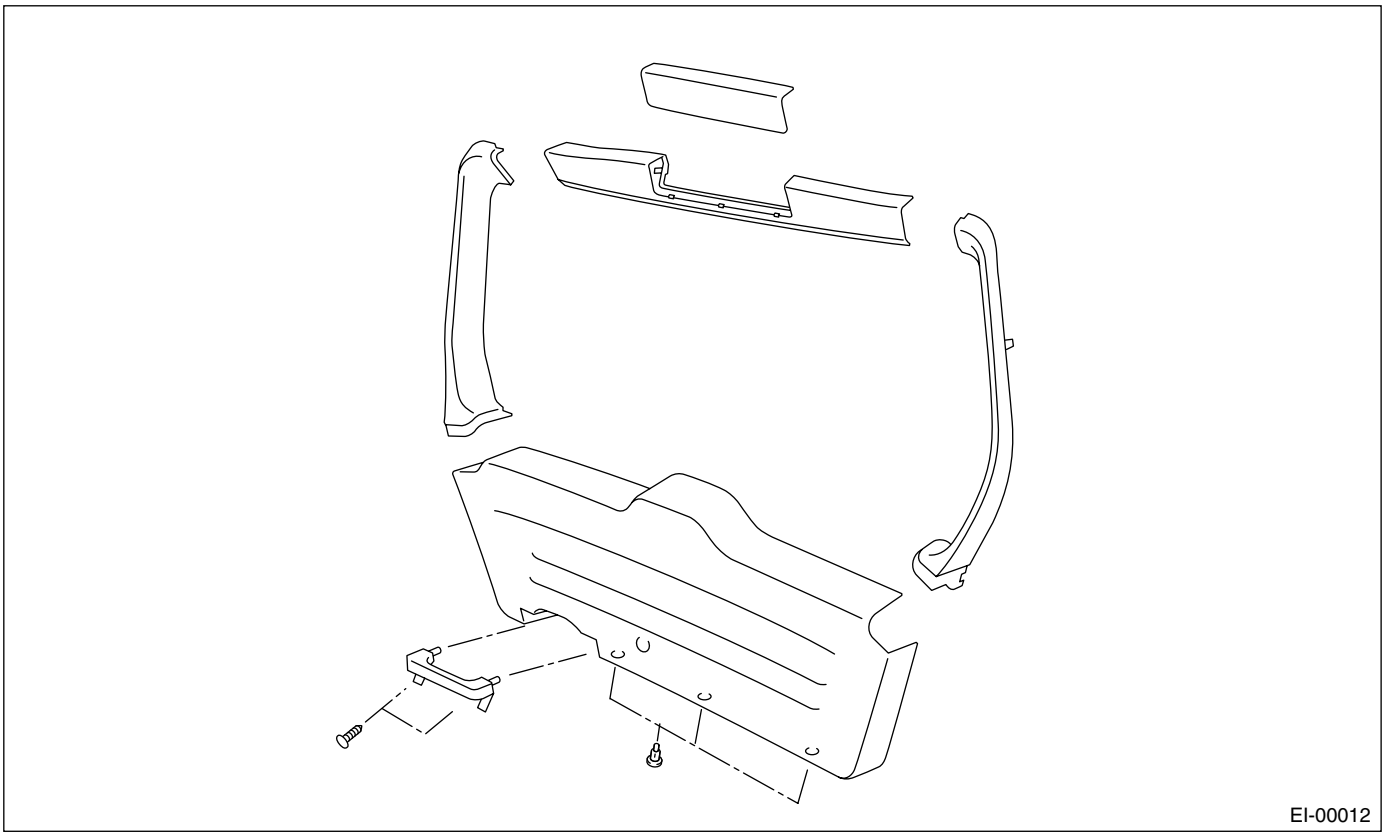
Tightening torque: N·m (kgf-m, ft-lb)
T: 7.4 (0.75, 5.46)

11.DOOR TRIM

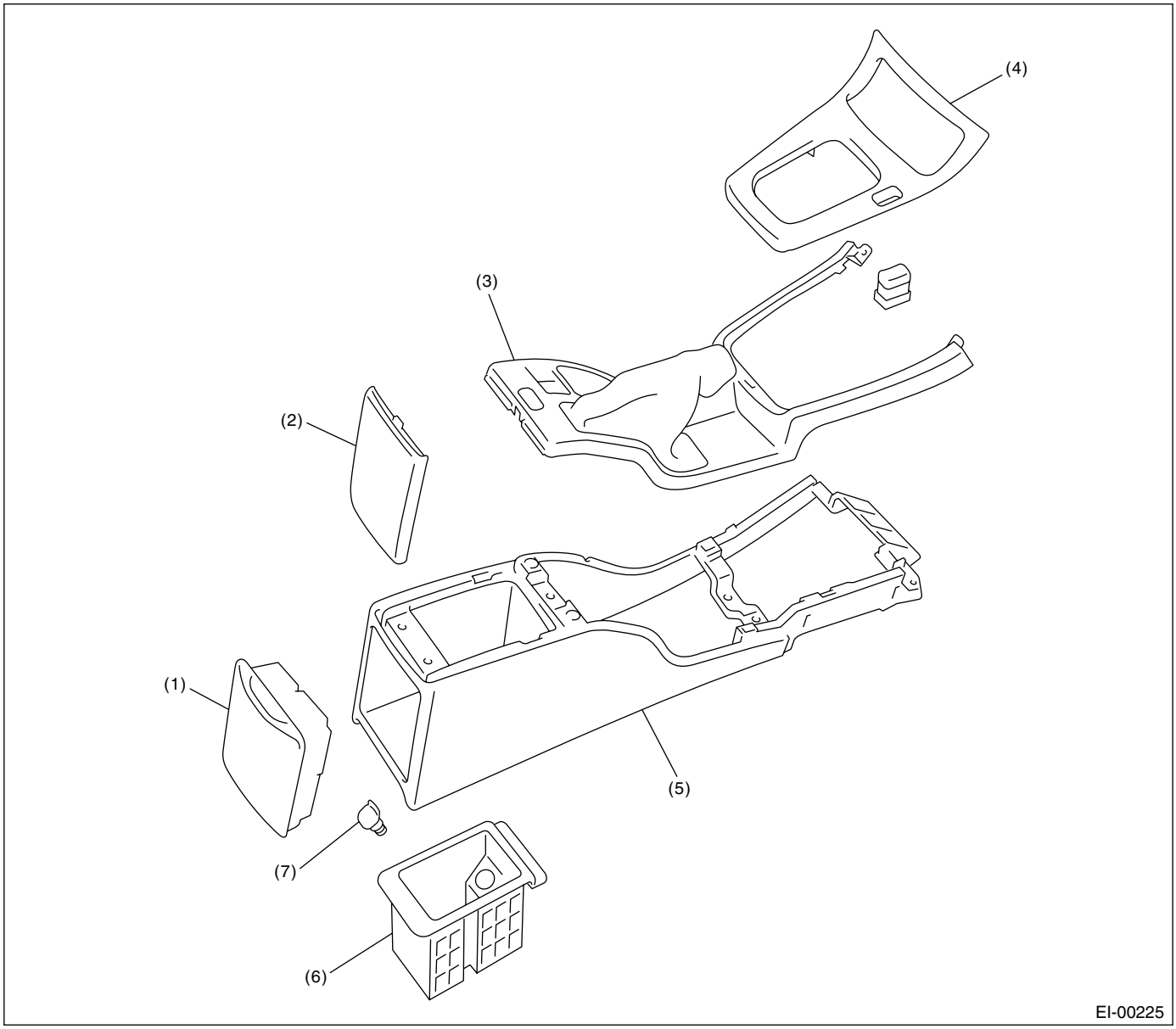


(1) Gusset cover
(2) Bracket
(3) Weatherstrip upper
(4) Clip
(5) Trim panel
(6) Power window switch cover
(7) Ash tray
(A) Front
(B) Rear

12.REAR GATE TRIM

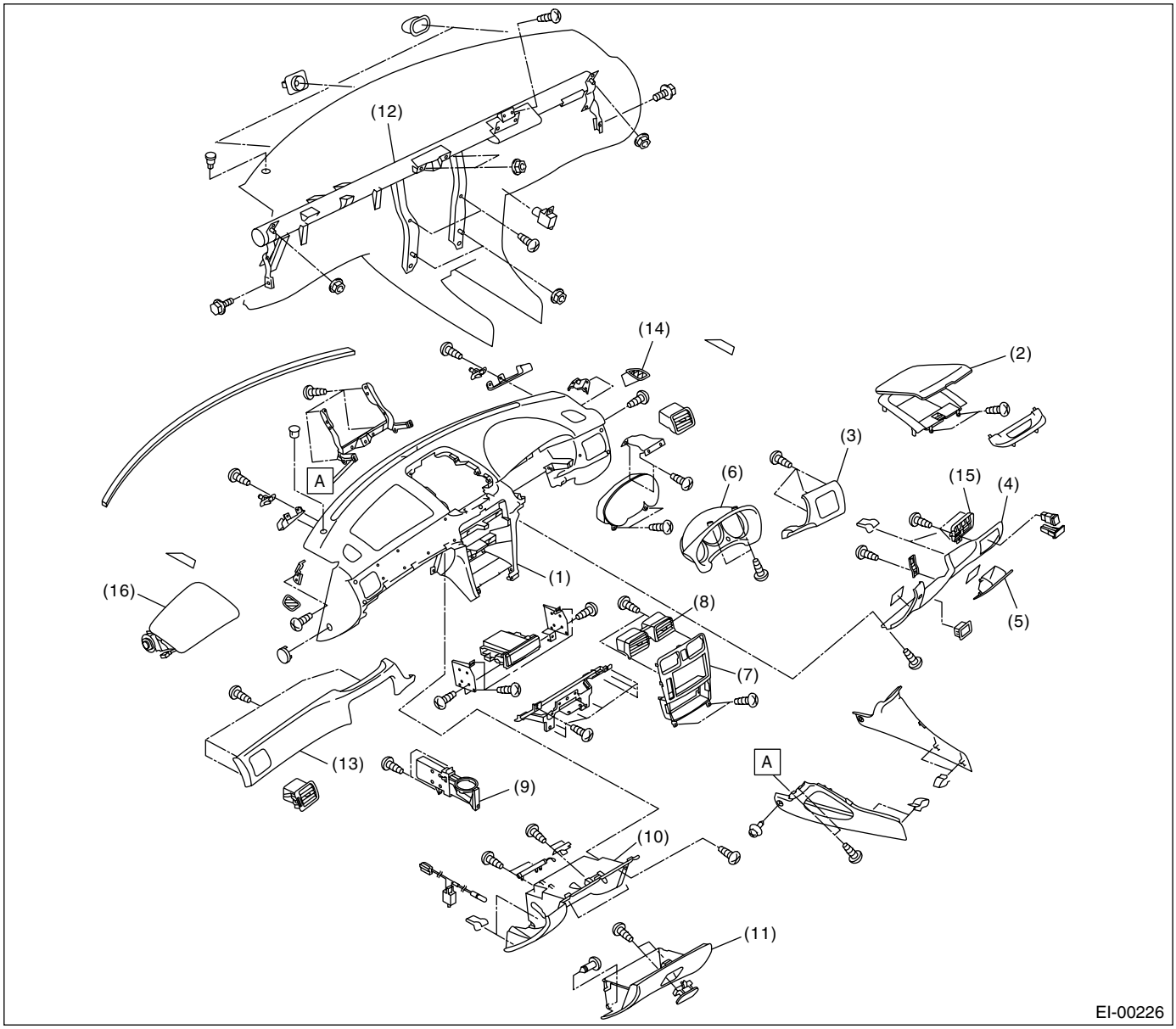


13.CONSOLE BOX



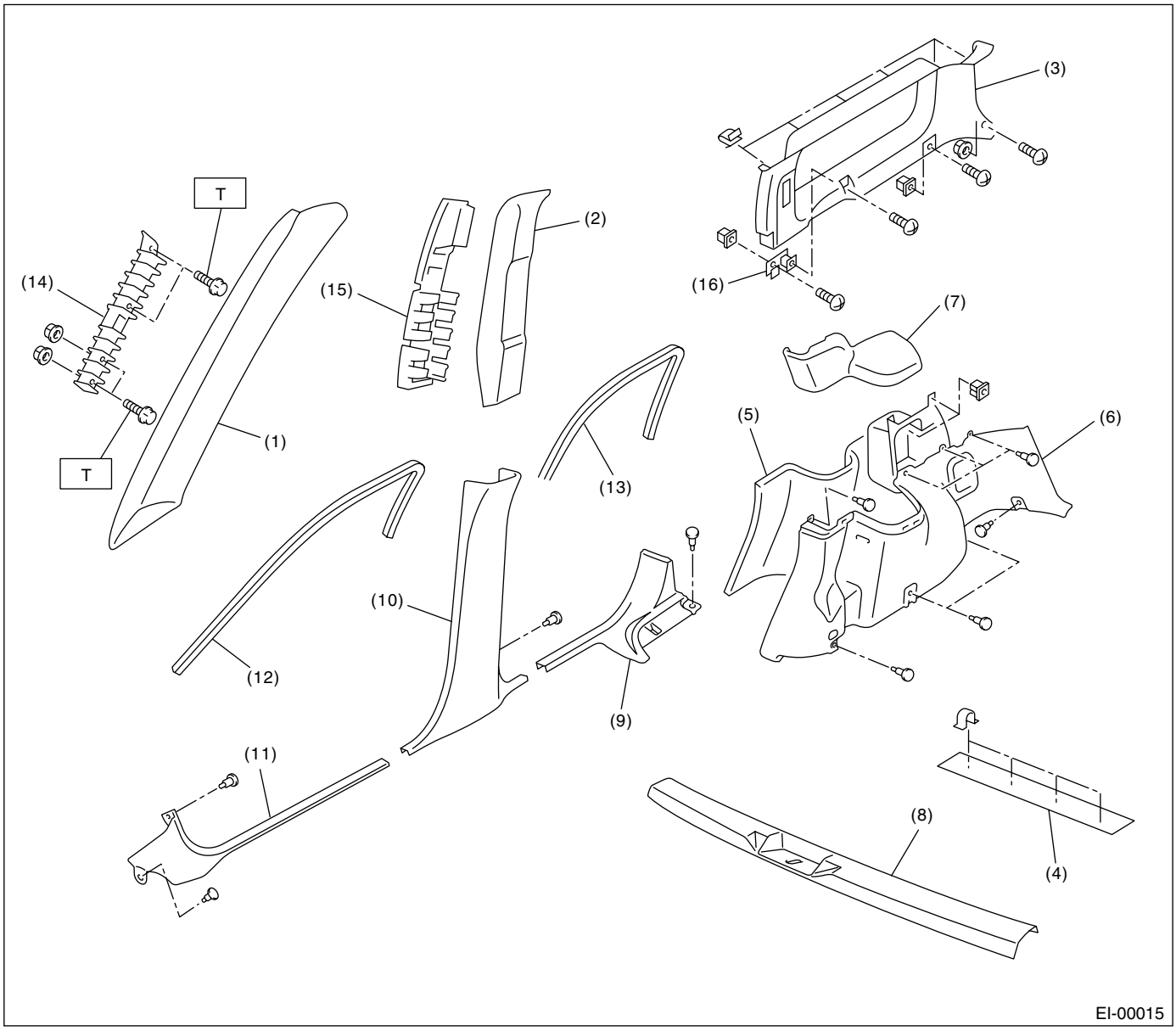
(1) Cup holder
(2) Console lid
(3) Console cover
(4) Front cover
(5) Console box
(6) Console pocket
(7) Accessory socket

14.INSTRUMENT PANEL



(1) Pad & frame
(2) Center compartment
(3) Grille cover
(4) Lower cover
(5) Coin box
(6) Meter cover
(7) Center panel
(8) Air vent grille
(9) Cup holder
(10) Glove box panel
(11) Glove box lid
(12) Steering beam
(13) Grille cover
(14) Air vent grille (Defroster)
(15) Switch panel
(16) Passenger's airbag module

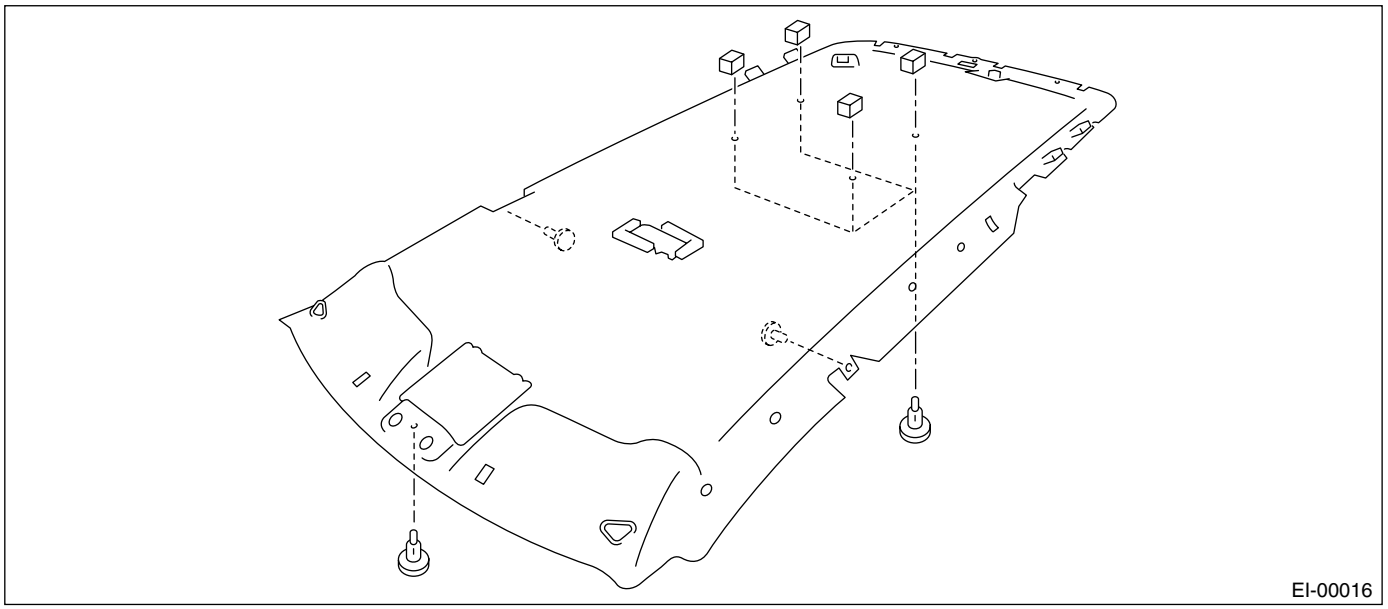
15.INNER TRIM



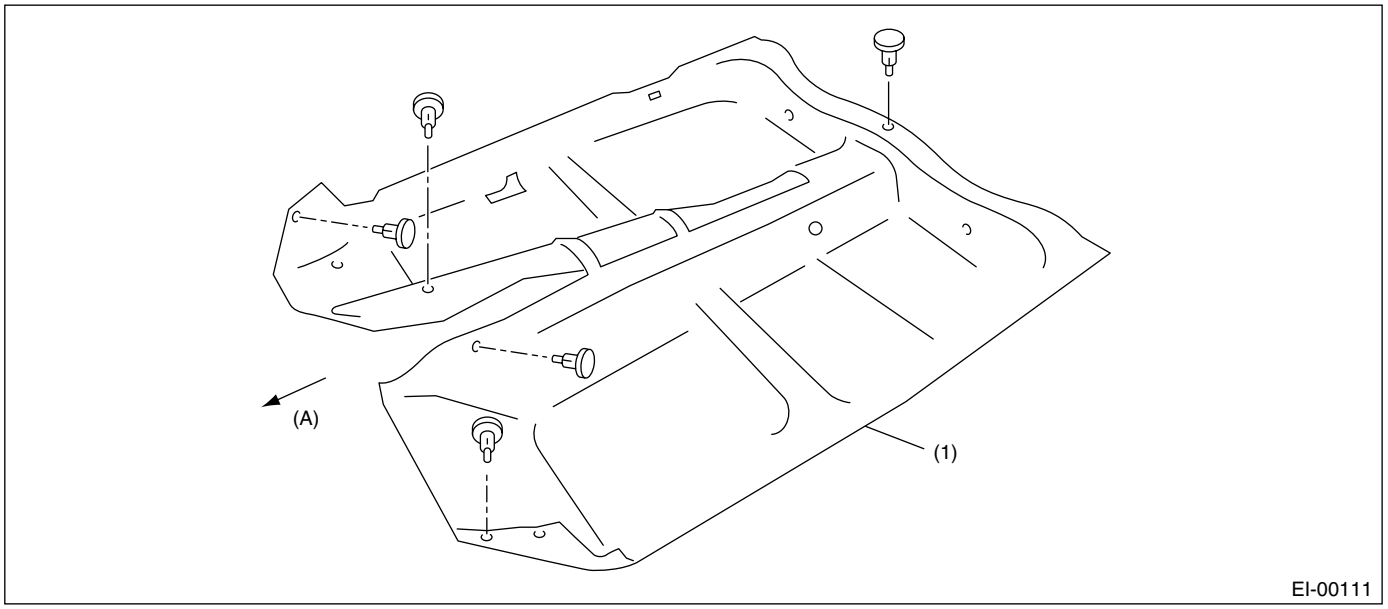
(1) Front pillar upper trim
(2) Center pillar upper trim
(3) Rear pillar upper trim
(4) Rear rail trim
(5) Insulator
(6) Rear quarter lower trim
(7) Strut cap
(8) Rear skirt trim
(9) Side sill rear cover
(10) Center pillar lower trim
(11) Side sill front cover
(12) Front garnish
(13) Rear garnish
(14) Front pillar inner rib
(15) Center pillar inner rib
(16) Bracket

Tightening torque: N·m (kgf-m, ft-lb)
T: 2 (0.2, 1.4)

16.ROOF TRIM



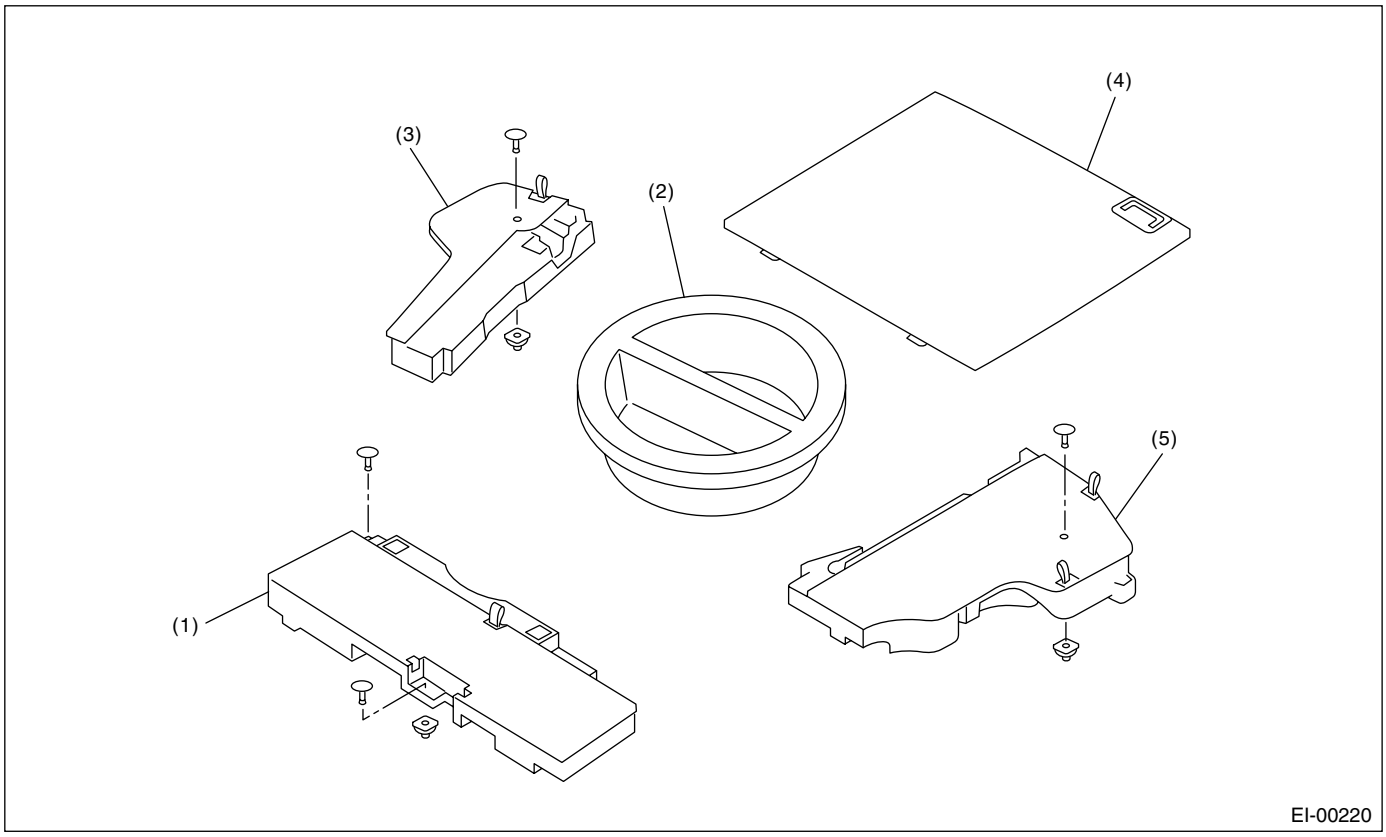
17.FLOOR MAT



(A) Front

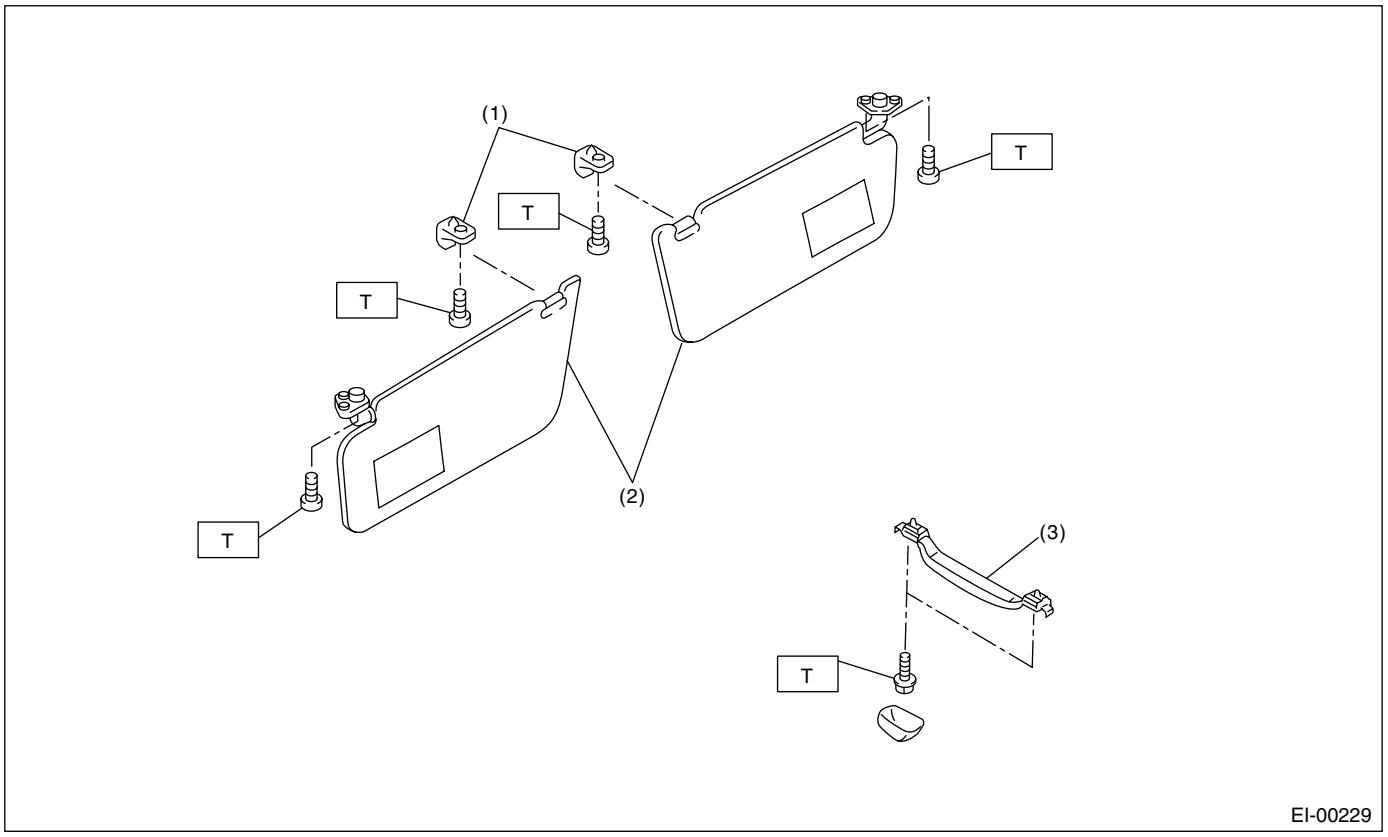
(1) Floor mat

18.LUGGAGE FLOOR MAT



(1) Front floor mat
(2) Floor box
(3) Side floor mat RH
(4) Center floor mat
(5) Side floor mat LH

19.INNER ACCESSORIES



(1) Hook
(2) Sun visor
(3) Assist grip (Retractable)

Tightening torque: N·m (kgf-m, ft-lb)
T: 2 (0.2, 1.4)

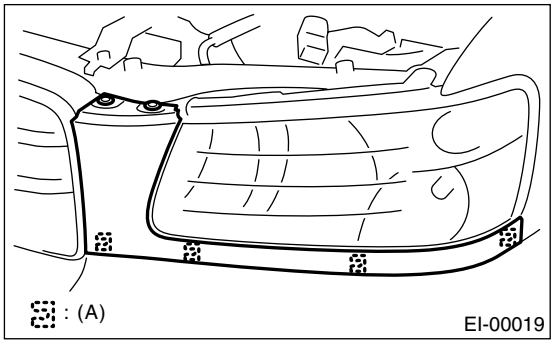
B: PREPARATION TOOL

TOOL NAME	REMARKS
Clip remover	Used for removal of trim.

2. Front Grille

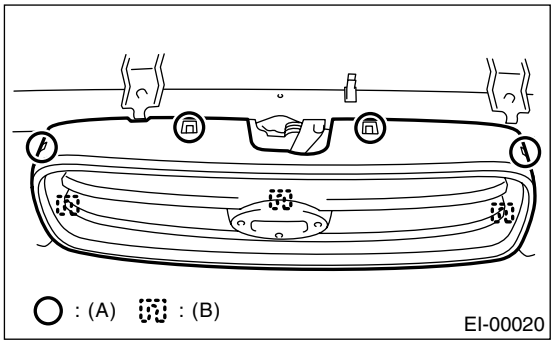
A: REMOVAL

1) Open the hood.
2) Remove the two upper clips of front grille side. Slide the front grille side to vehicle outside, then remove the four lower hooks to remove front grille side.



(A) Hook

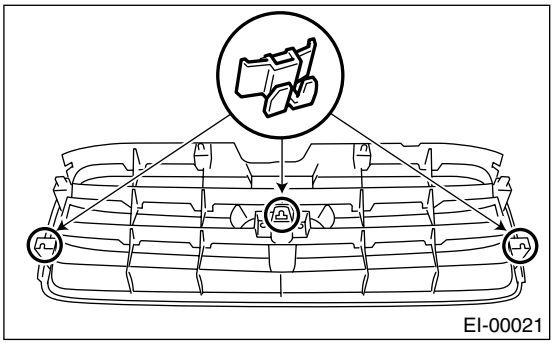
3) Remove the four upper clips of front grille, then pull the front grille up and remove the three hooks to remove front grille.



(A) Clip
(B) Hook

B: INSTALLATION

1) Remove the three hooks remained on body during removal, then install them to front grille.



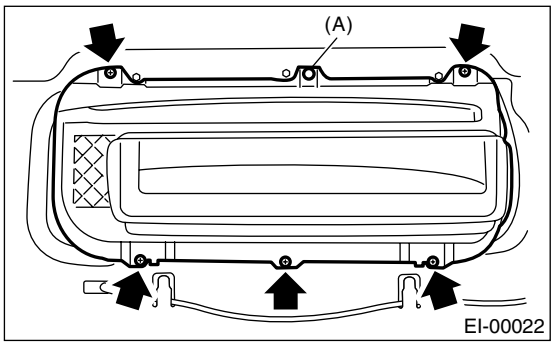
NOTE:
Make sure that the clip direction is correct.

2) Install the front grille to body.
3) Install the front grille side.

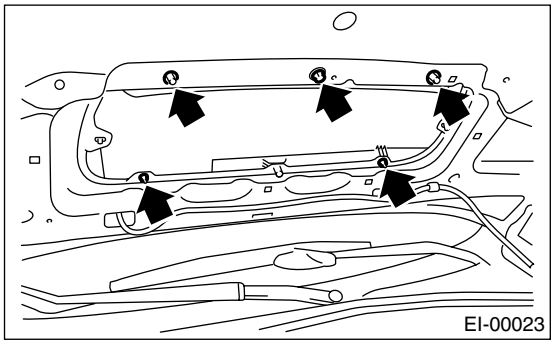
3. Hood Grille

A: REMOVAL

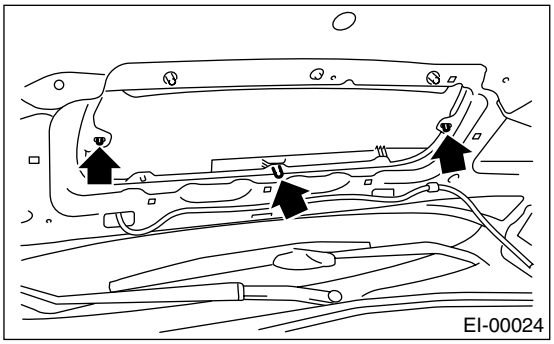
1) Remove the five screws and clip (A) to remove hood duct.



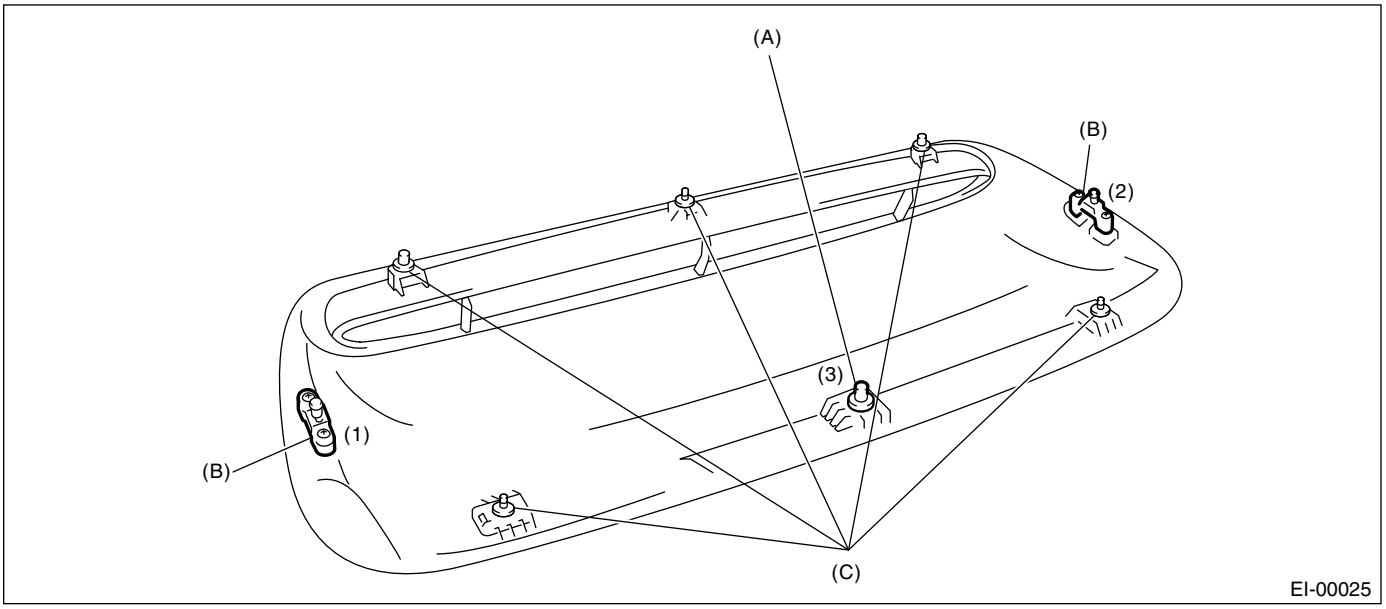
2) Remove the five nuts.



3) Remove the white clip and two black clips to remove hood grille.

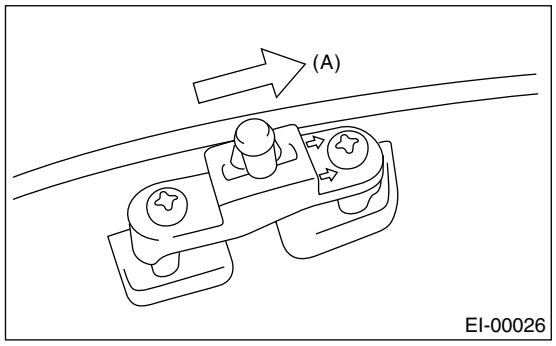


B: INSTALLATION



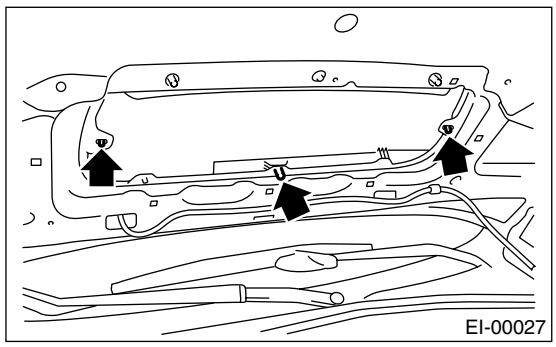
(A) White clip (B) Black clip (C) Bolt

1) Replace the black clip (1), (2) with a new one. Install the clip with arrow mark facing the front side of grille (A).



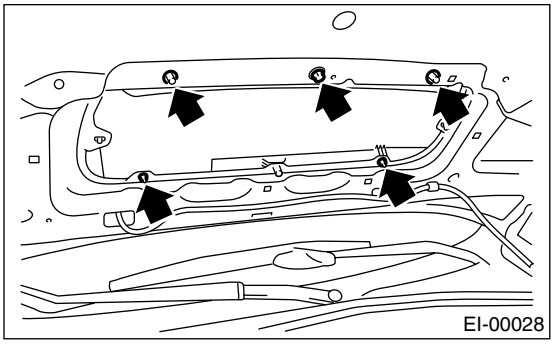
2) Replace the white clip (3) with a new one.
3) Insert the hood grille clip and engage the three clips.

NOTE:
Make sure that the anchor portion of each clip is firmly engaged.

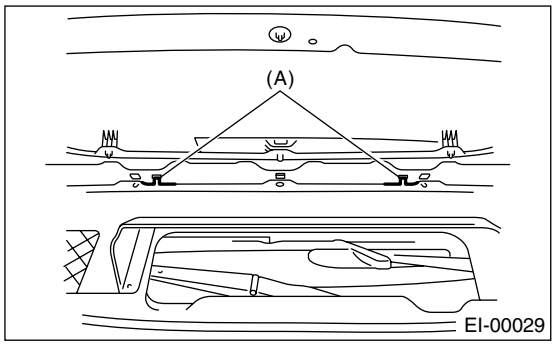


4) Install the five nuts.

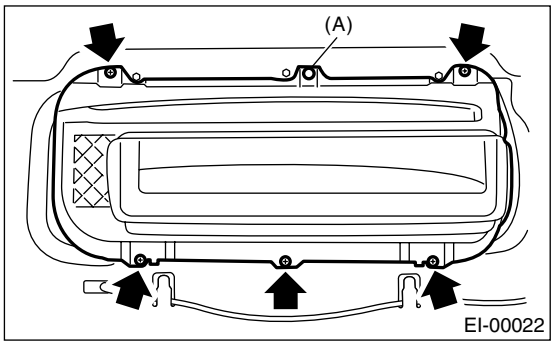
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.25 ft-lb)



5) Catch the two hooks (A) of hood duct to the hood holes.



6) Install the hood duct with clip (A) and five screws.



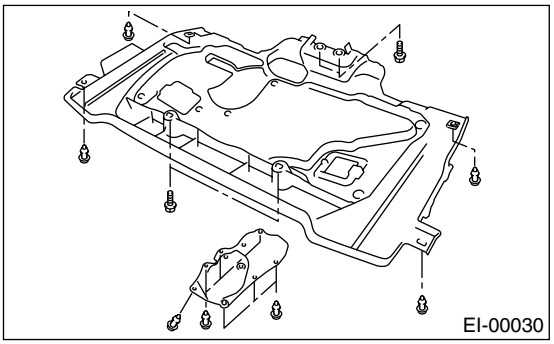
C: INSPECTION

Make sure that the clip is firmly engaged.
Make sure that there is no abnormal gap at whole periphery of hood grille.
Make sure that there is no damage on hood grille.

4. Front Under Cover

A: REMOVAL

1) Lift-up the vehicle.
2) Loosen the bolts, and then remove the clips to remove under cover.



B: INSTALLATION

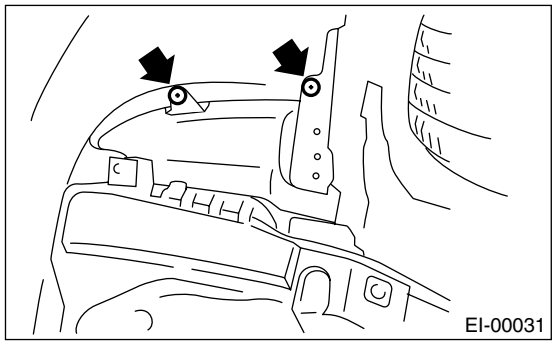
Install in the reverse order of removal.

Tightening torque:
18 N·m (1.84 kgf-m, 13.3 ft-lb)

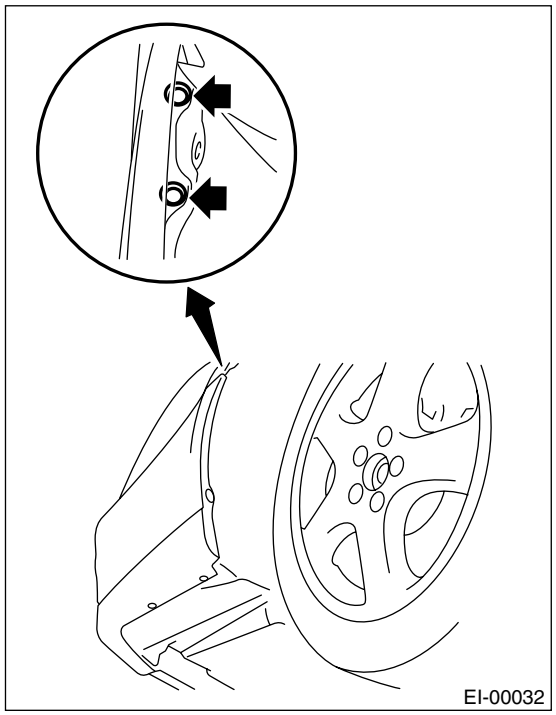
5. Front Bumper

A: REMOVAL

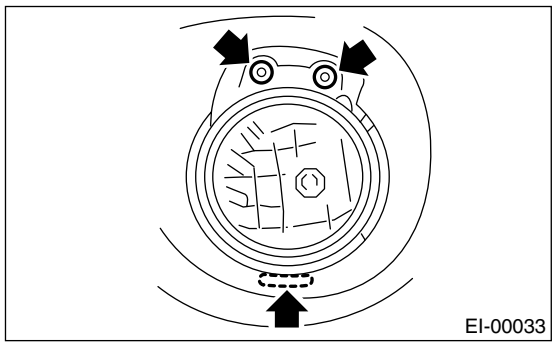
1) Disconnect the ground cable from battery.
2) Disengage the two clips to remove the mud guard and front under cover.



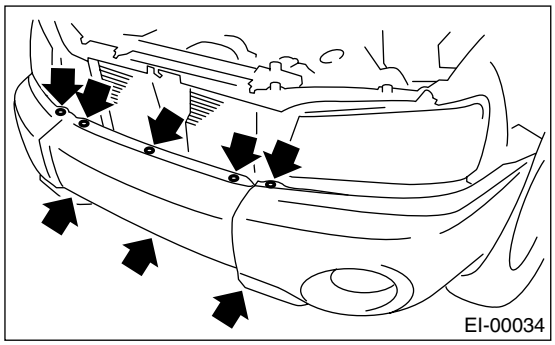
3) Turn over the mud guard, and remove two inside clips which securing front bumper to fender.



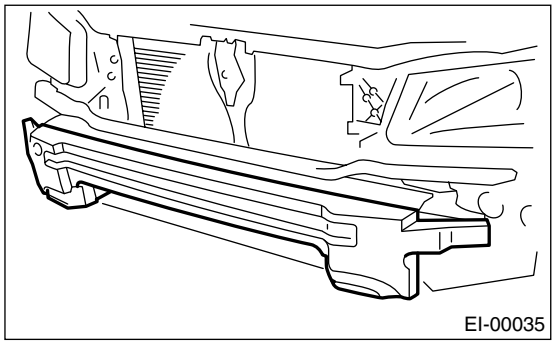
4) Turn over the mud guard, and disconnect the fog light connector before removing a bolt and clip which installed to under side of fog light hole.



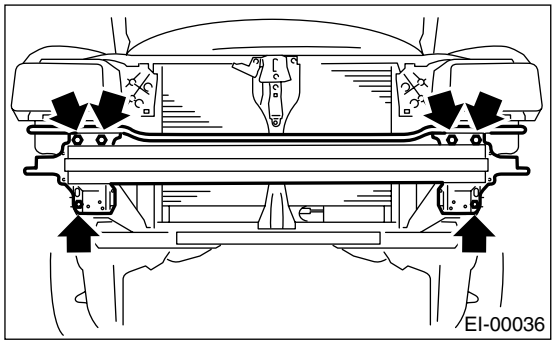
5) Remove the front grille and front grille side. <Ref. to EI-18, REMOVAL, Front Grille.>
6) Remove the eight clips, and pull out the bumper slightly.



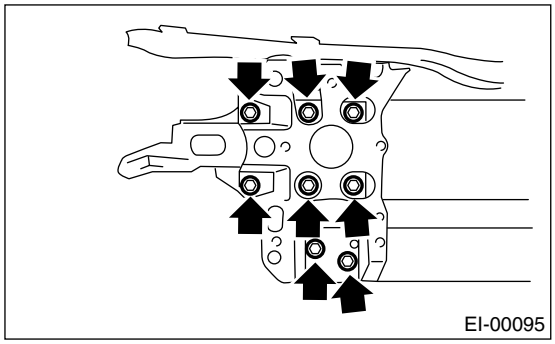
7) Remove the E/A FORM from bumper beam.
E/A FORM may easily break. Do not apply excessive force to it during removal.



8) Remove the bumper beam.



9) Remove the eight boits to disassemble front bumper beam.



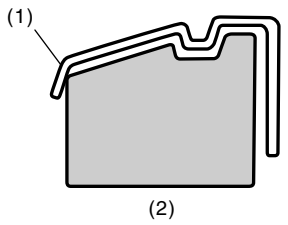
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to EI-5, FRONT BUMPER, COMPONENT, General Description.>

C: REPAIR

1. COATING METHOD FOR PP BUMPER

Process No.	Process name	Job contents	
1	Bumper mounting	Set the bumper on paint worktable if required. Use paint worktable conforming to inner shape of bumper when possible.	 EI-00234 (1) Bumper (2) Set bumper section
2	Masking	Mask specified part (black base) with masking tape. Use masking tape for PP (example, Nichiban No. 533, etc.).	
3	Degreasing, cleaning	Clean all parts to be painted with white gasoline, normal alcohol, etc. to remove dirt, oil, fat, etc.	
4	Primer paint	Apply primer one to all parts to be painted, using air gun. Use primer (clear).	
5	Drying	Dry at normal temperature [10 to 15 min. at 20°C (68°F)]. In half-dried condition, PP primer paint is dissolved by solvent, e.g. thinner, etc. Therefore, if dust or dirt must be removed, use ordinary alcohol, etc.	
6	Top coat paint (I)	Solid color	Metallic color
		Use section (block) paint for top coat. • Paint in use (for each color): Solid paint Hardener PB Thinner T-301 • Mixing ratio: Main agent vs. hardener = 4:1 • Viscosity: 10 — 13 sec/20°C (68°F) • Film thickness: 35 — 45μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)	Use section (block) paint for top coat. • Paint in use (for each color): Metallic paint Hardener PB Thinner T-306 • Mixing ratio: Main agent vs. hardener = 10:1 • Viscosity: 10 — 13 sec/20°C (68°F) • Film thickness: 15 — 20μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)
7	Drying	Not required.	Dry at normal temperature [10 min. or more at 20°C (68°F)]. In half-dried condition, avoid dust, dirt.
8	Top coat paint (II)	Not required.	Apply a clear coat to parts with top coat paint (I), three times, at 5 — 7 minutes intervals. • Paint in use: Metallic paint Hardener PB Thinner T-301 • Mixing ratio: Clear vs. hardener = 6:1 • Viscosity: 14 — 16 sec/20°C (68°F) • Film thickness: 25 — 30μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)
9	Drying	60°C (140°F), 60 min. or 80°C (176°F), 30 min. If higher than 80°C (176°F), PP may be deformed. Keep maximum temperature of 80°C (176°F).	
10	Inspection	Paint check.	
11	Masking removal	Remove the masking in process No. 2.	

2. REPAIR INSTRUCTIONS FOR COLORED PP BUMPER

NOTE:
All PP bumpers are provided with a grained surface, and if the surface is damaged, it cannot normally be restored to its former condition. Damage limited to shallow scratches that cause only a change in the lustre of the base material or coating, can be almost fully restored. Before repairing a damaged area, explain this point to the customer and get an understanding about the matter. Repair methods are outlined below, based on a classification of the extent of damage.

• Minor damage causing only a change in the lustre of the bumper due to a light touch

Almost restorable.

<table>
<tr><th>Process No.</th><th>Process name</th><th colspan="2">Job contents</th></tr>
<tr><td>1</td><td>Cleaning</td><td colspan="2">Clean the area to be repaired using water.</td></tr>
<tr><td>2</td><td>Sanding</td><td colspan="2">Grind the repairing area with #500 sand paper in a “feathering” motion.</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Finish</td><td>Resin section</td><td>Coated section</td></tr>
<tr><td>Repeatedly apply wax to the affected area using a soft cloth (such as flannel). Recommended wax: NITTO KASEI Soft 99 TIRE WAX BLACK, or equivalent.</td><td rowspan="2">Perform either the same operation as for the resin section or process No. 18 and subsequent operations in the “(3)” section, depending on the degree and nature of damage.</td></tr>
<tr><td>Polish the waxed area with a clean cloth after 5 to 10 minutes.</td></tr>
</table>

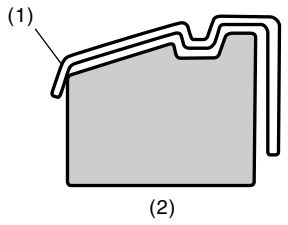
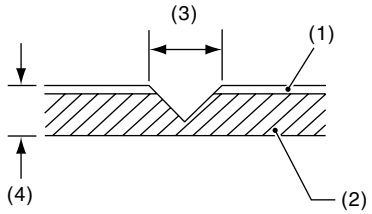
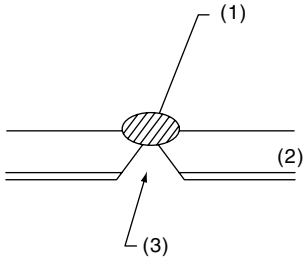
• Deep damage caused by scratching fences, etc.

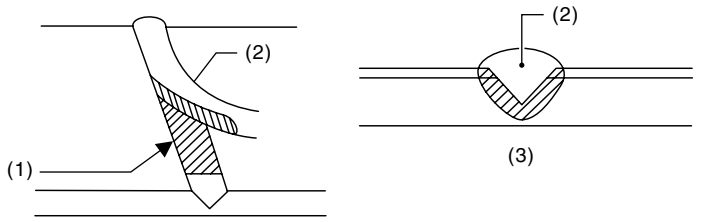
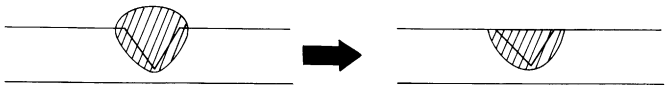
A dent cannot be repaired but a whitened or swelled part can be removed.

<table>
<tr><th>Process No.</th><th>Process name</th><th colspan="2">Job contents</th></tr>
<tr><td>1</td><td>Cleaning</td><td colspan="2">Clean the damaged area with water.</td></tr>
<tr><td>2</td><td>Removal of damaged area</td><td colspan="2">Cut off protruding area, if any, due to collision, using a putty knife.</td></tr>
<tr><td>3</td><td>Sanding</td><td colspan="2">Grind the affected area with #100 to #500 sand paper.</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Finish</td><td>Resin section</td><td>Coated section</td></tr>
<tr><td>Same as Process No. 3 in the “(1)” section.</td><td>Perform Process No. 12 and subsequent operations in the “(3)” section.</td></tr>
</table>

• Deep damage such as a break or hole that requires filling

Much of the peripheral grained surface must be sacrificed for repair, and the degree of restoration is not really worth the expense. (The surface, however, will become almost flush with adjacent areas.)
Recommended repair kit: PP Part Repair Kit (NRM)

Process No.	Process name	Job contents	
1	Bumper removal	Remove the bumper as required.	
2	Part removal	Remove the parts built into bumper as required.	
3	Bumper placement	Place the bumper on a paint worktable as required. It is recommended that contour of worktable accommodate internal shape of bumper.	 EI-00234 (1) Bumper (2) Set bumper section
4	Surface preparation	Remove dust, oil, etc. from areas to be repaired and surrounding areas, using a suitable solvent (NRM No. 900 Precleno, white gasoline, or alcohol).	
5	Cutting	If nature of damage are cracks or holes, cut a guide slit of 20 to 30 mm (0.79 to 1.18 in) in length along the crack or hole up to the bumper's base surface. Then, bevel or “vee-out” the affected area using a knife or grinder.	 EI-00235 (1) Paint surface (2) PP base surface (3) 20—30 mm (0.79—1.18 in) (4) 3 mm (0.12 in)
6	Sanding (I)	Grind beveled surface with sand paper (#40 to #60) to smooth finish.	
7	Cleaning	Clean the sanded surface with the same solvent as used in Process No. 4.	
8	Temporary welding	Grind the side just opposite the beveled area with sand paper (#40 to #60) and clean using a solvent. Temporarily spot-weld the side, using a PP welding rod and heater gun.	 EI-00236 (1) Welded spot (Use heater gun and PP welding rod) (2) PP base surface (3) Beveled section NOTE: • Do not melt the welding rod until it flows out. This results in reduced strength. • Leave the welded spot unattended until it cools completely.

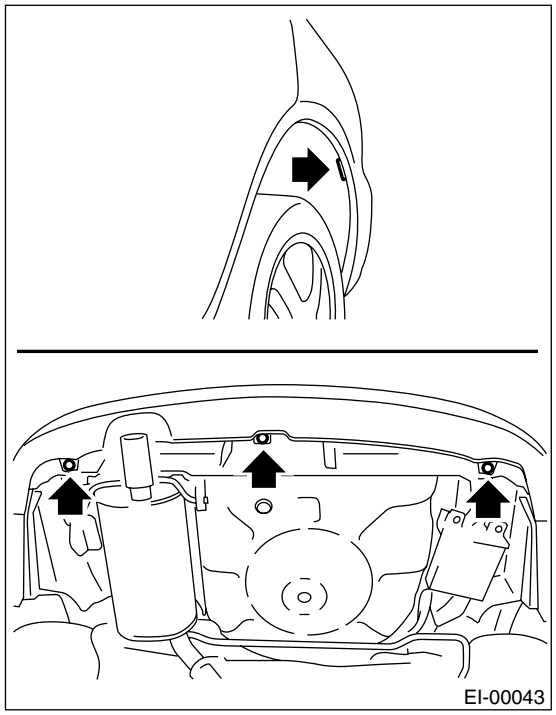
Process No.	Process name	Job contents
9	Welding	Using a heater gun and PP welding rod, weld the beveled spot while melting the rod and damaged area.  EI-00237 (1) Melt hatched area (2) Welding rod (3) Section NOTE: • Melt the sections indicated by hatched area. • Do not melt the welding rod until it flows out, in order to provide strength. • Always keep the heater gun 1 to 2 cm (0.4 to 0.8 in) away from the welding spot. • Leave the welded spot unattended until it cools completely.
10	Sanding (II)	Remove excess part of weld with a putty knife. If a drill or disc wheel is used instead of the knife, operate it at a rate lower than 1,500 rpm and grind the excess part little by little. A higher rpm will cause the PP substrate to melt from the heat.  EI-00042 Sand the welded spot smooth with #240 sand paper.
11	Masking	Mask the black substrate section using masking tape. Recommended masking tape: Nichiban No. 533 or equivalent
12	Cleaning/ degreasing	Completely clean the entire coated area, using solvent similar to that used in Process No. 4.
13	Primer coating	Apply a coat of primer to the repaired surface and its surrounding areas. Mask these areas, if necessary. Recommended primer: Mp/ 364 PP Primer NOTE: Be sure to apply one coat of primer at a spraying pressure of 245 to 343 kPa (2.5 to 3.5 kg/cm^2, 36 to 50 psi) with a spray gun.
14	Leave unattended.	Leave the repaired area unattended at 20°C (68°F) for 10 to 15 minutes until primer is half-dry. NOTE: If dirt or dust comes in contact with the coated area, wipe it off with a cloth dampended with alcohol. (Do not use thinner since the coated area tends to melt.)
15	Primer surfacer coating	Apply a coat of primer surfacer to the repaired area two or three times at an interval of 3 to 5 minutes. Recommended surfacer: • UPS 300 Flex Primer • No. 303 UPS 300 Exclusive hardener • NPS 725 Exclusive Reducer (thinner) • Mixing ratio: 2 : 1 (UPS 300: No. 303) • Viscosity: 12 — 14 sec/20°C (68°F) • Coated film thickness: 40 — 50μ
16	Drying	Allow the coated surface to dry for 60 minutes at 20°C (68°F) [or 30 minutes at 60°C (140°F)].
17	Sanding (III)	Sand the coated surface and its surrounding areas using #400 sand paper and water.
18	Cleaning/ degreasing	Same as Process No. 12.

Process No.	Process name	Job contents	
		Solid color	Metallic color
19	Top coat (I)	Use a “block” coating method. • Recommended paint: Suncryl (SC) No. 307 Flex Hardener SC Reducer (thinner) • Mixing ratio: 3 : 1 Suncryl (SC) vs. No. 307 Flex Hardener • Viscosity: 11 — 13 sec/20°C (68°F) • Coated film thickness: 40 — 50μ • Spraying thickness: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)	Use a “block” coating method. • Recommended paint: Suncryl (SC) No. 307 Flex Hardener SC Reducer (thinner) • Mixing ratio: 3 : 1 Suncryl (SC) vs. No. 307 Flex Hardener • Viscosity: 11 — 13 sec/20°C (68°F) • Coated film thickness: 20 — 30μ • Spraying thickness: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)
20	Leave unattended.	Not required.	Leave unattended at 20°C (68°F) for at least 10 minutes until the topcoated area is half-dry. NOTE: Be careful to keep dust or dirt from coming in contact with the affected area.
21	Top coat (II)	Not required.	Apply a clear coat three times at an interval of 3 to 5 minutes. • Recommended paint: SC710 Overlay Clear No. 307 Flex Hardener SC Reducer (thinner) • Mixing ratio: 3 : 1 Suncryl (SC) vs. No. 307 Flex Hardener • Viscosity: 10 — 13 sec/20°C (68°F) • Coated film thickness: 20 — 30μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)
22	Drying	Allow the coated surface to dry at 20°C (68°F) for two hours or 60°C (140°F) for 30 minutes. NOTE: Do not allow the temperature to exceed 80°C (176°F) since this will deform the PP substrate.	
23	Inspection	Carefully check the condition of the repaired area.	
24	Masking removal	Remove the masking tape applied in Process No. 11 and 13.	
25	Parts installation	Install the parts on bumper in reverse order of removal.	
26	Bumper installation	Install the bumper.	

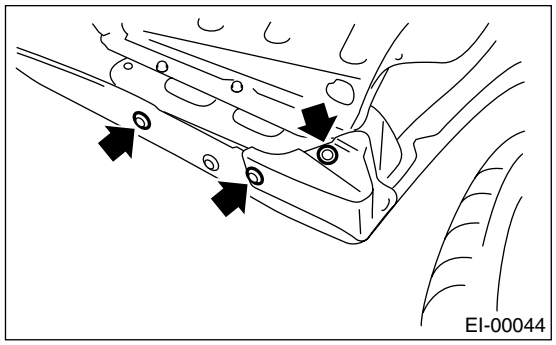
6. Rear Bumper

A: REMOVAL

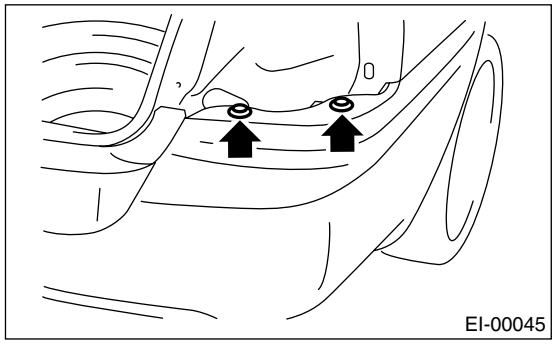
1) Disconnect the ground cable from battery.
2) Remove the bolts and clips.


EI-00043

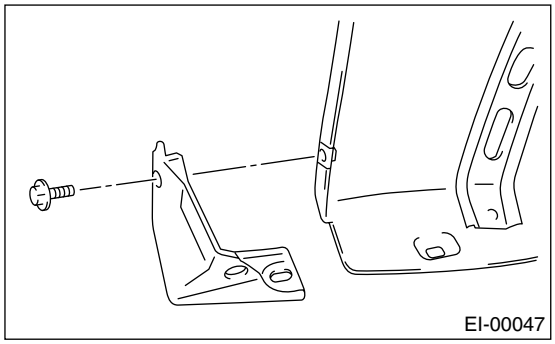
3) Remove the clips from bumper and bracket.


EI-00044

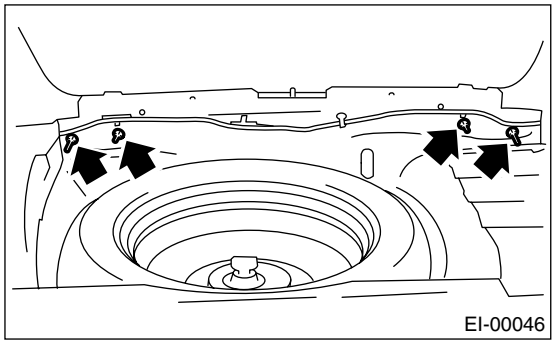
4) Remove the rear combination light assembly. <Ref. to LI-21, REMOVAL, Rear Combination Light Assembly.>
5) Remove the two clips from each side.


EI-00045

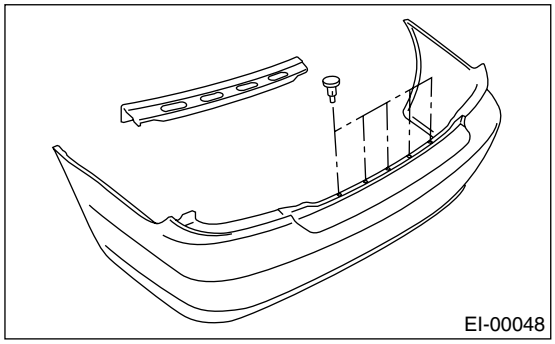
6) Remove the floor box.
7) Remove the rear skirt trim.
8) Remove the bolt to remove rear arch cover from bumper.


EI-00047

9) Loosen four nuts to remove the rear bumper.


EI-00046

10) Loosen the clips to remove bumper upper beam.


EI-00048

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to EI-6, REAR BUMPER, COMPONENT, General Description.>

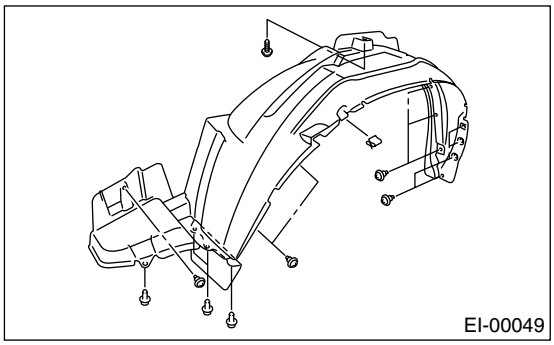
C: REPAIR

Refer to front bumper repair. <Ref. to EI-23, REMOVAL, Front Bumper.>

7. Mud Guard

A: REMOVAL

1) Jack-up the vehicle.
2) Remove the clips to remove air flap.
3) Remove the screws and clips to remove mud guard.



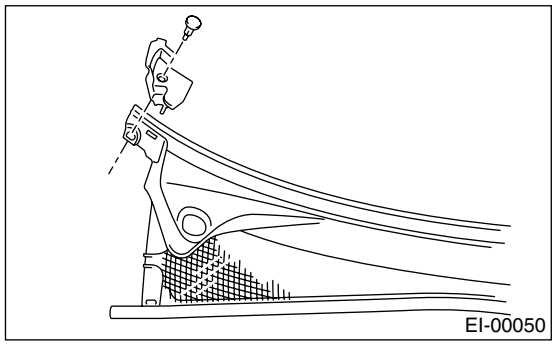
B: INSTALLATION

Install in the reverse order of removal.

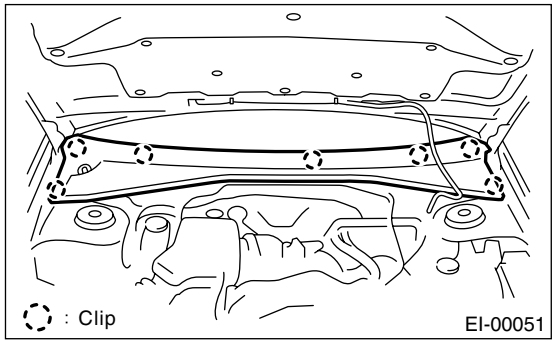
8. Cowl Panel

A: REMOVAL

1) Open the hood.
2) Remove the wiper arm. <Ref. to WW-12, REMOVAL, Front Wiper Arm.>
3) Remove the clips to remove cowl side panel.



4) Disengage the clips to remove cowl panel.



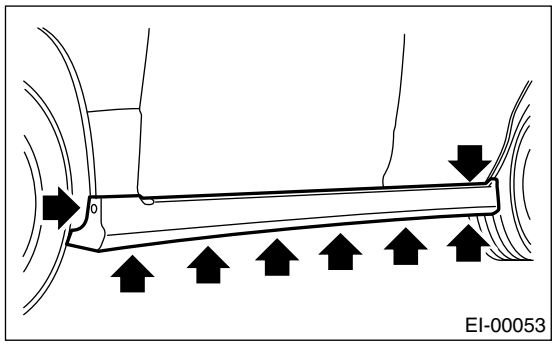
B: INSTALLATION

Install in the reverse order of removal.

9. Side Sill Spoiler

A: REMOVAL

Remove the clips (one on front fender arch, six on bottom of side sill spoiler, one on top of side sill spoiler), then remove the side sill spoiler.



B: INSTALLATION

Install in the reverse order of removal.

10.Side Protector

A: REMOVAL

1) Incise the edge of protector using cutter, and then remove the protector with pulling towards you by hands.

NOTE:
Remove the protector carefully. Forced removal of protector may damage protector and clips.

2) Adhere the masking tape around area where the double-sided tape of side protector was adhere.
3) Apply the solvent (SUMITOMO 3M 4000 or equivalent) to the area where double-sided tape was adhered.

NOTE:
• Wipe off immediately when the solvent is touched on the protector surface.
• Do not use the solvent to the body which repaired with laquer paint.

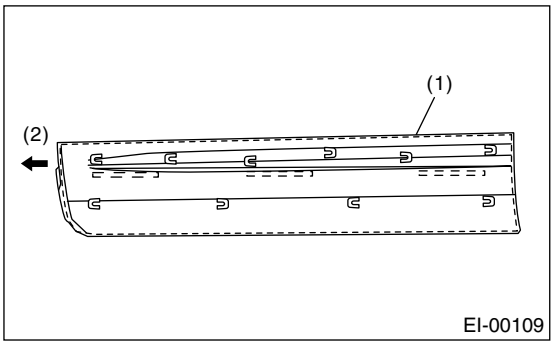
4) Cover the area where the solvent applied using plastic wrap, and then heat the double-sided tape was adhered for 5 to 15 minutes in 40 to 60°C (104 to 140°F) using heat lamp.
5) Remove the double-sided tape of side protector side tape by following above step 3) and 4).

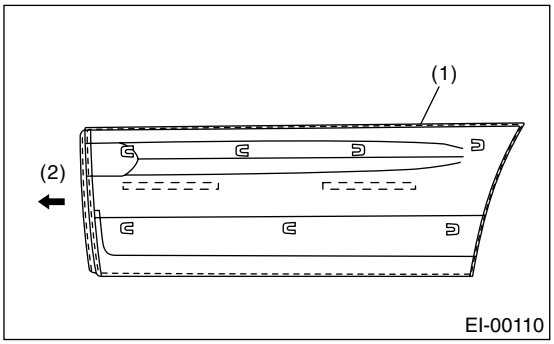
NOTE:
When the double-sided tape is not removed completely using above steps, use the scraper.

B: INSTALLATION

1) Apply the PRIMER (SUMITOMO 3M K-5000 or equivalent) widely to the slightly larger area where double-sided tape was adhered, and then adhere the double-sided tape (SUMITOMO 3M 5305 or equivalent).

NOTE:
Use 5 mm width and 1 mm thickness double-sided tape.





(1) Double-sided tape
(2) Front side

2) Heat the body to 40 to 60°C (104 to 140°F) and protector to 20 to 30°C (68 to 86°F) using heat lamp.
3) Remove the double-sided tape backing sheet, and then align the clips to body holes. Press and install the side protector applying 69-98 N (7-10 kgf, 15-22 lbf) by the hands, using care to avoid air entering.

NOTE:
• To keep the adhesion, do not wash the vehicle within 24 hours.
• After the adhesion, use care not to move the side protector up and down.

C: INSPECTION

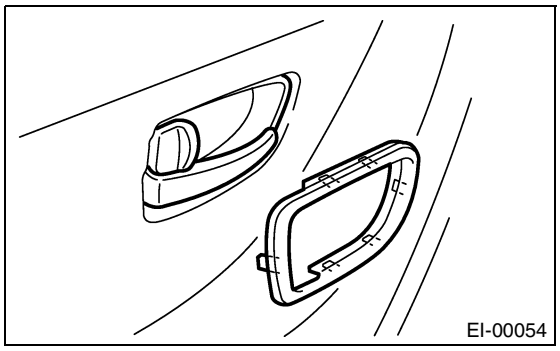
• Check the side protector is not damaged or cracked.
• Check the clips are not broken.

11.Front Door Trim

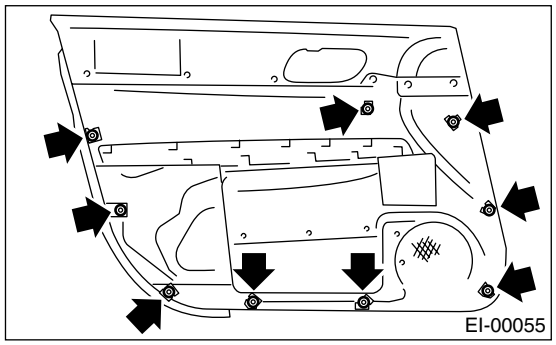
A: REMOVAL

CAUTION:
Do not apply excessive force to the clip. Otherwise the clip may be broken.

1) Disconnect the ground cable from battery.
2) Pull the gusset cover toward you to remove.
3) Pull up the inner remote cover toward you to remove upper hook. Pull down it to remove the lower hook. Remove the inner remote cover.



4) Remove the power window control switch. <Ref. to GW-7, REMOVAL, Power Window Control Switch.>
5) Remove the clips of trim panel using clip remover to remove trim panel.



B: INSTALLATION

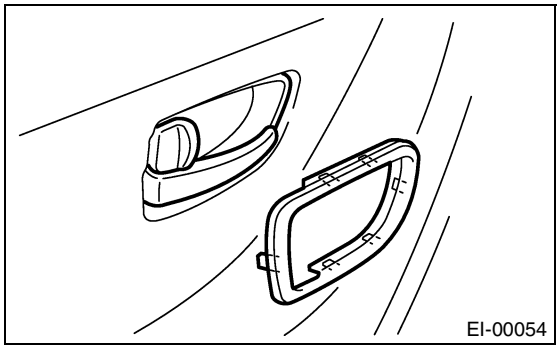
Install in the reverse order of removal.

12.Rear Door Trim

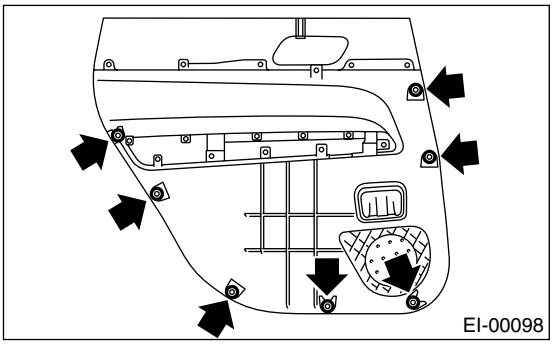
A: REMOVAL

CAUTION:
Do not apply excessive force to the clip. Otherwise the clip may be broken.

1) Disconnect the ground cable from battery.
2) Pull up the inner remote cover toward you to remove upper hook. Pull down it to remove the lower hook. Remove the inner remote cover.



3) Remove the power window control switch. <Ref. to GW-7, REMOVAL, Power Window Control Switch.>
4) Remove the clips of trim panel using clip remover to remove trim panel.



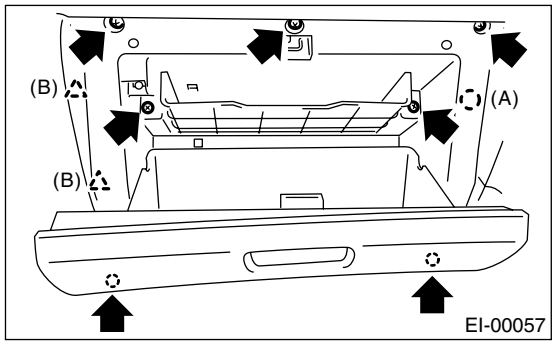
B: INSTALLATION

Install in the reverse order of removal.

13.Glove Box

A: REMOVAL

1) Open the glove box.
2) Loosen the screws to remove glove box.



(A) Hook
(B) Clip

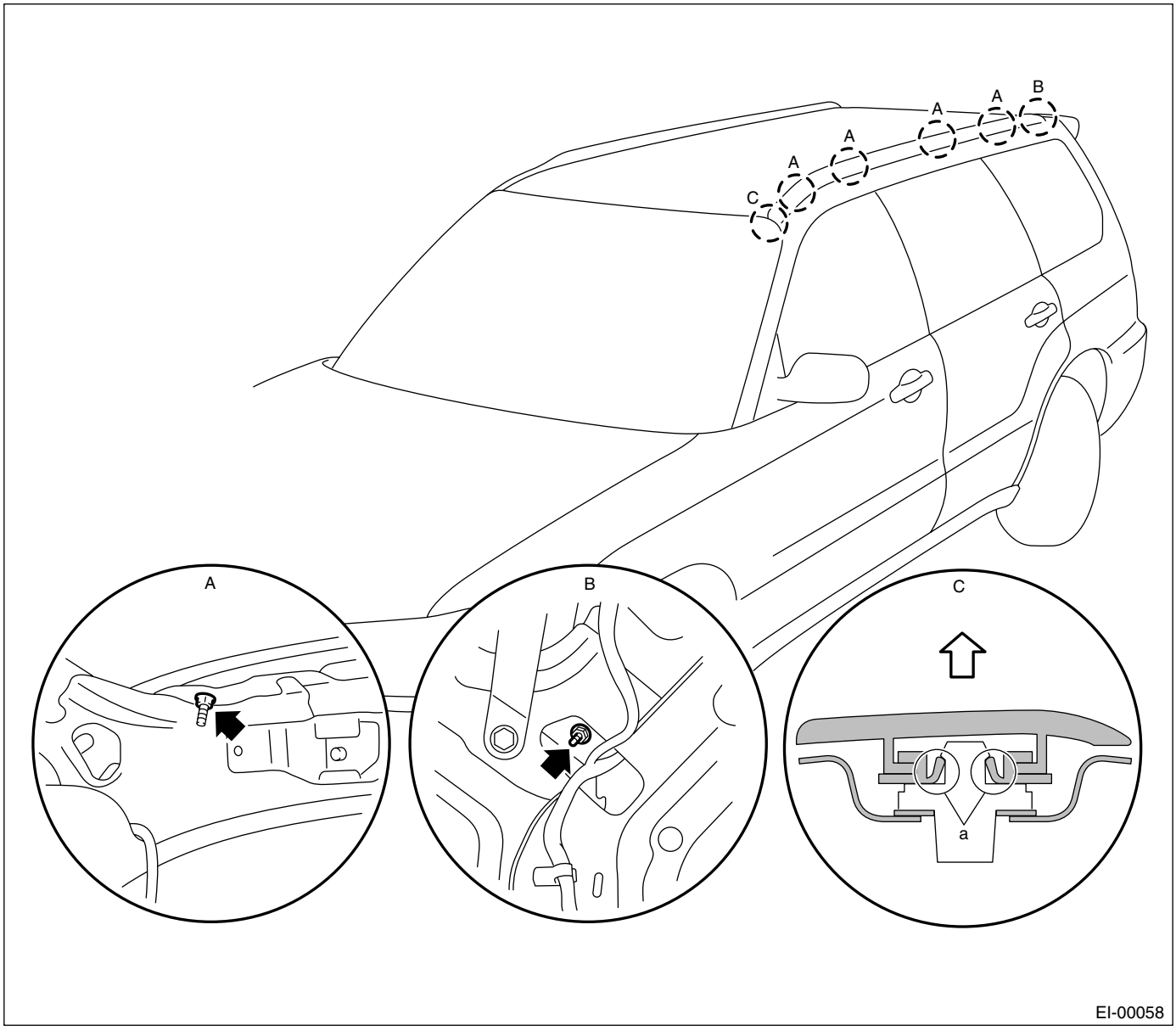
B: INSTALLATION

Install in the reverse order of removal.

14.Roof Rail

A: REMOVAL

1) Remove the roof trim. <Ref. to EI-47, REMOVAL, Roof Trim.>
2) Remove the five mounting nuts (A and B) and then detach the clip at front edge sideways carefully to remove the roof rail upwards.



NOTE:
Remove the clip at “C” area upwards while applying sideway force to deflect hook at “a” area.

B: INSTALLATION

Install in the reverse order of removal.

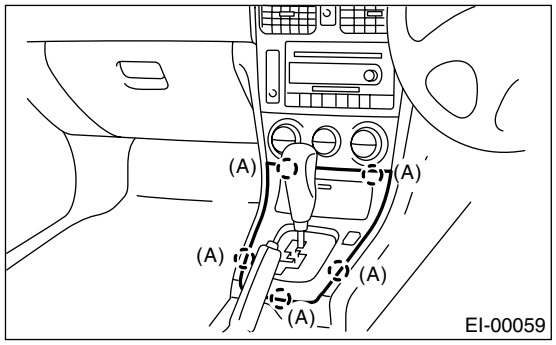
Tightening torque:
7.4 N·m (0.75 kgf-m, 5.46 ft-lb)

CAUTION:
Be careful not to scratch the body panels with roof rail stud bolts when removing and installing them.

15.Console Box

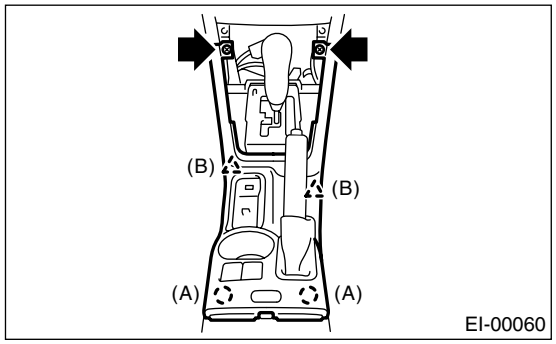
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front cover by lowering it.



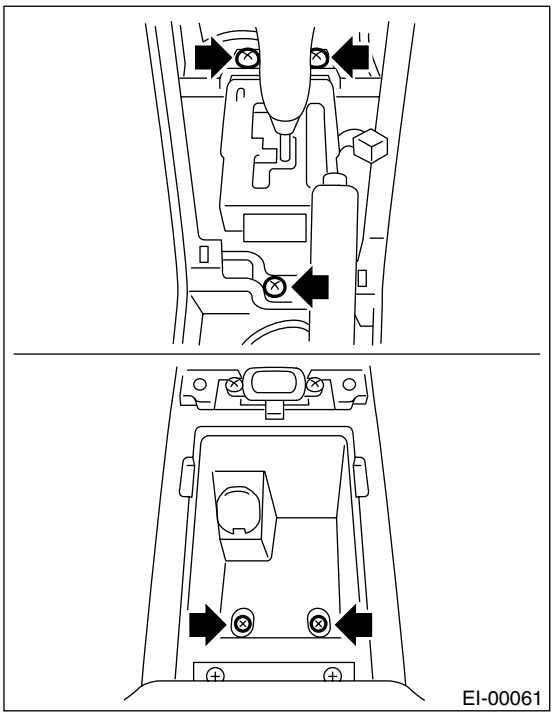
(A) Hook pawl

3) Remove the shift knob (MT vehicles).
4) Loosen the screws to remove console cover.

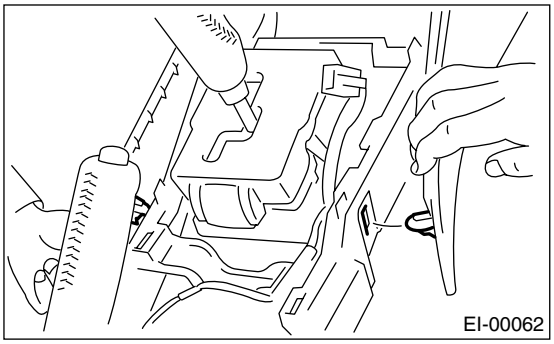


(A) Hook pawl
(B) Clip

5) Loosen the screws.



6) Remove the hook pawl of console side panel to remove console box.



B: INSTALLATION

Install in the reverse order of removal.

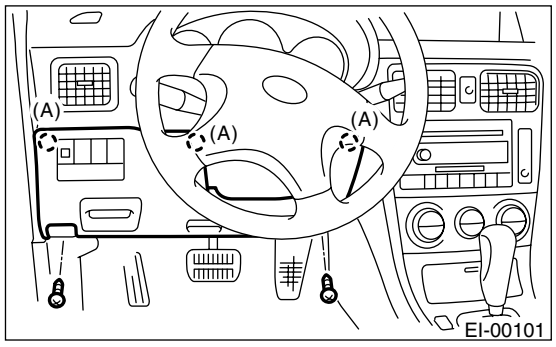
16.Instrument Panel Assembly

A: REMOVAL

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage the airbag system harness when servicing the instrument panel.

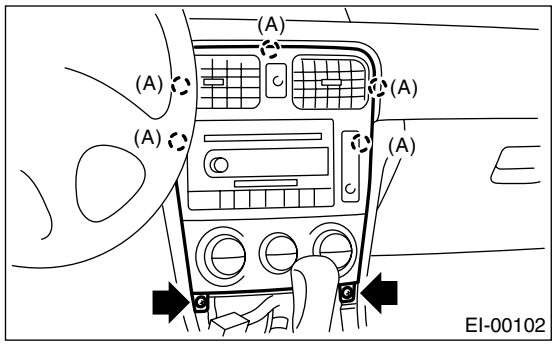
1. REMOVAL OF INSTRUMENT PANEL ONLY

1) Disconnect the ground cable from battery.
2) Loosen the screws and clips, and then remove the lower cover.



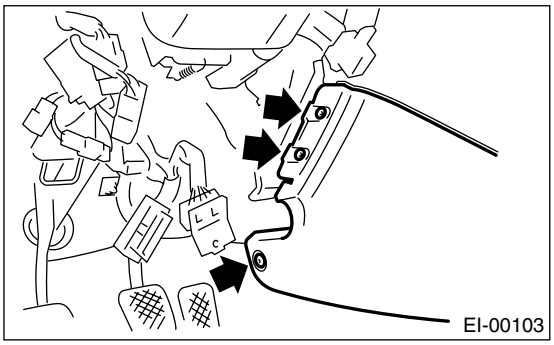
(A) Clip

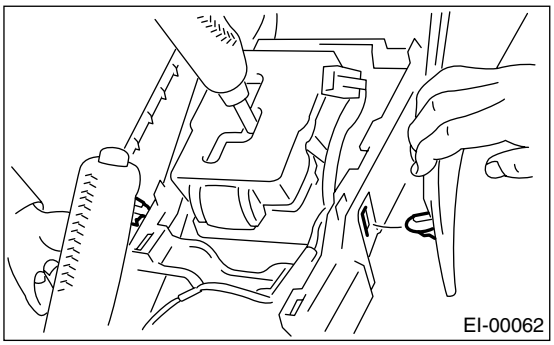
3) Disconnect the in-vehicle sensor hose and connector.
4) Remove the front cover and console cover. <Ref. to EI-39, REMOVAL, Console Box.>
5) Loosen the screws and clips, and then remove the center console panel.



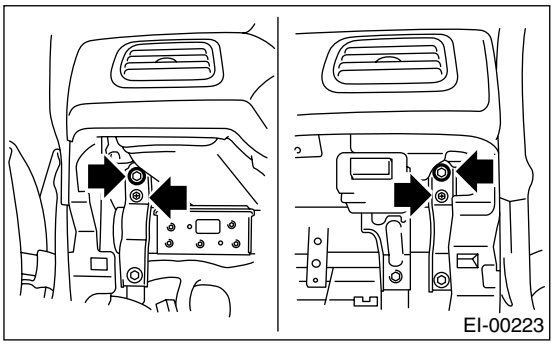
(A) Clip

6) Disconnect the connector of A/C control panel and hazard switch.
7) Loosen the screws and clips, and then remove the side console panel.





8) Remove the passenger's airbag module. <Ref. to AB-16, REMOVAL, Passenger's Airbag Module.>
9) Remove the two bolts which securing steering column.<Ref. to PS-26, REMOVAL, Tilt Steering Column.>
10) Loosen the four instrument panel installation bolts.



11) Remove the combination meter assembly. <Ref. to IDI-12, REMOVAL, Combination Meter Assembly.>
12) Loosen the instrument panel installation screws.
13) Remove the instrument panel center compartment. <Ref. to EI-51, REMOVAL, Instrument Panel Center Compartment.>
14) Remove the radio. <Ref. to ET-5, REMOVAL, Radio Body.>
15) Remove the side cover of instrument panel assembly (both side), and then loosen two bolts.

16) Remove the instrument panel assembly.

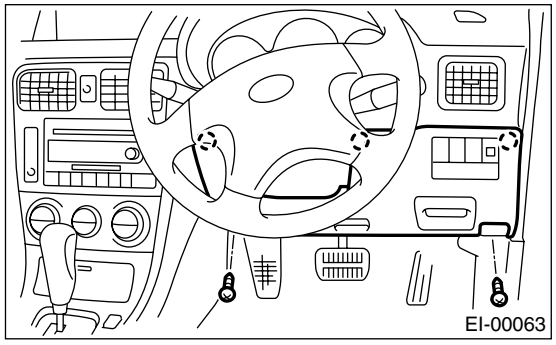
NOTE:
Remove the front pillar upper trim as necessary. <Ref. to EI-43, REMOVAL, Upper Inner Trim.>

17) Disconnect the harness connector of combination meter.

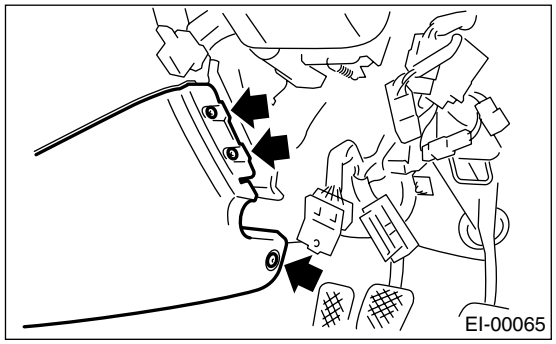
CAUTION:
Do not disconnect the connector by pulling harness.

2. REMOVAL OF INSTRUMENT PANEL WITH STEERING BEAM

1) Disconnect the ground cable from battery.
2) Loosen the screws and clips, and then remove the lower cover.

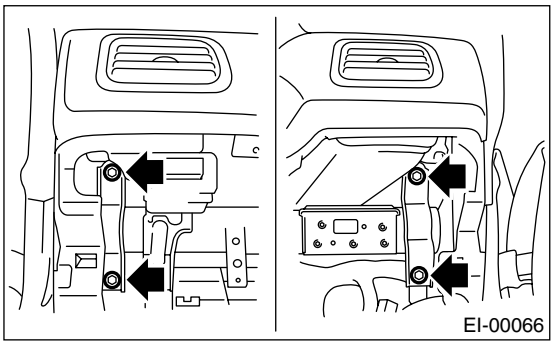

EI-00063

3) Remove the front cover. <Ref. to EI-39, REMOVAL, Console Box.>
4) Remove the console cover. <Ref. to EI-39, REMOVAL, Console Box.>
5) Loosen the screws and clips, and then remove the side console panel.


EI-00065

6) Remove the steering column.

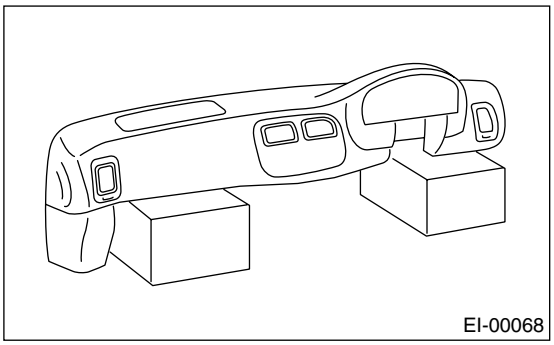
7) Loosen the four instrument panel installation bolts.


EI-00066

8) Remove the driver's and passenger's airbag module. <Ref. to AB-15, REMOVAL, Driver's Airbag Module.> and <Ref. to AB-16, REMOVAL, Passenger's Airbag Module.>
9) Loosen the steering beam installation bolts.
10) Loosen the brake pedal installation bolts. <Ref. to BR-50, REMOVAL, Brake Pedal.>
11) Loosen the bracket beside airbag module and steering beam installation bolts.
12) Remove two clips from the edge of instrument panel assembly.
13) Remove the instrument panel assembly.

CAUTION:
Do not disconnect the connector by pulling harness.

NOTE:
• If necessary, make matching marks for easy reassembly.
• When storing the removed instrument panel, place it standing up on the floor.

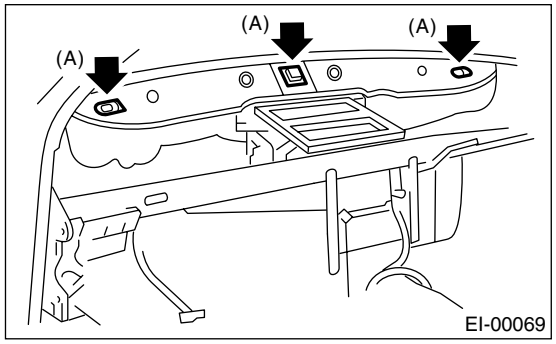

EI-00068

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
- **Be careful not to snag the harness.**
- **Make sure to connect the harness connector.**

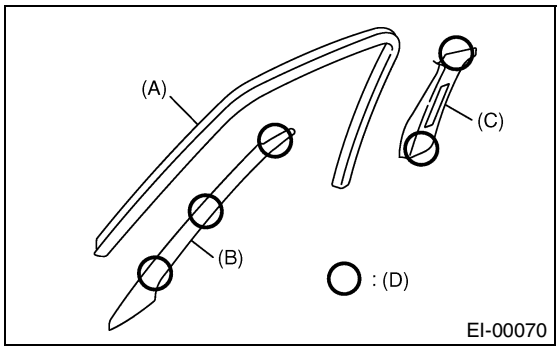
NOTE:
When setting the instrument panel into position, push the hook into grommet (A) on the body panel.



17.Upper Inner Trim

A: REMOVAL

1) Remove the lower inner trim. <Ref. to EI-44, REMOVAL, Lower Inner Trim.>
2) Remove the front mole (A).
3) Remove the front pillar upper trim (B).
4) Detach the front seat belt shoulder anchor, then remove the center pillar upper trim (C).



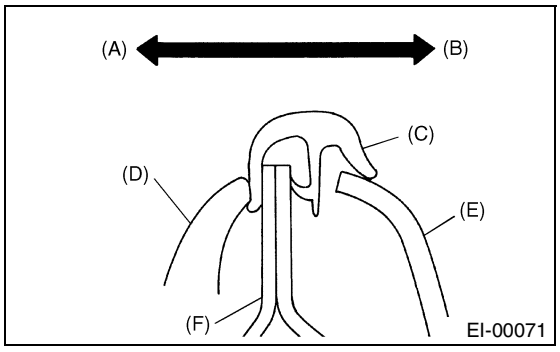
(D) Clip

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Be sure to securely hook pawls of inner trim panel to body flange.

NOTE:
When installing the center pillar upper trim and front pillar upper trim, be sure to set the front mole as shown in the figure.

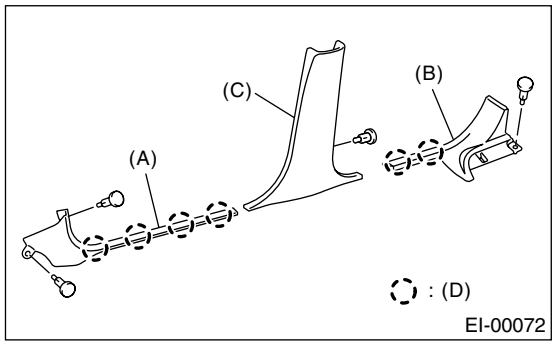


(A) Outside
(B) Inside
(C) Mole
(D) Weatherstrip
(E) Trim
(F) Body

18.Lower Inner Trim

A: REMOVAL

1) Remove the side sill front cover (A).
2) Remove the rear seat cushion <Ref. to SE-10, REMOVAL, Rear Seat.>, then remove side sill rear cover (B).
3) Remove the center pillar lower trim (C).



(D) Clip

B: INSTALLATION

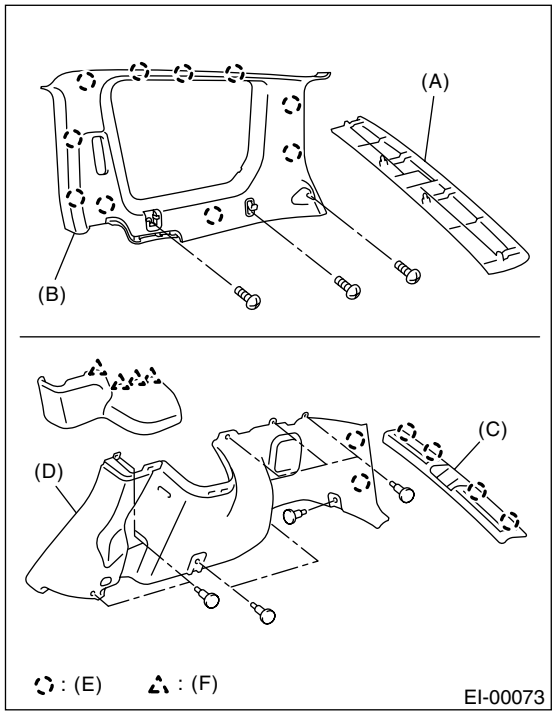
Install in the reverse order of removal.

CAUTION:
Be sure to securely hook pawls of inner trim panel to body flange.

19.Rear Quarter Trim

A: REMOVAL

1) Remove the rear seat. <Ref. to SE-10, REMOVAL, Rear Seat.>
2) Remove the side sill rear cover.
3) Remove the rear rail trim (A).
4) Remove the strut cap.
5) Remove the rear seat belt shoulder anchor.
6) Loosen the screws and clips to remove rear quarter upper trim (B).
7) Remove the rear skirt trim (C).
8) Loosen the screws and clips to remove rear quarter lower trim (D).



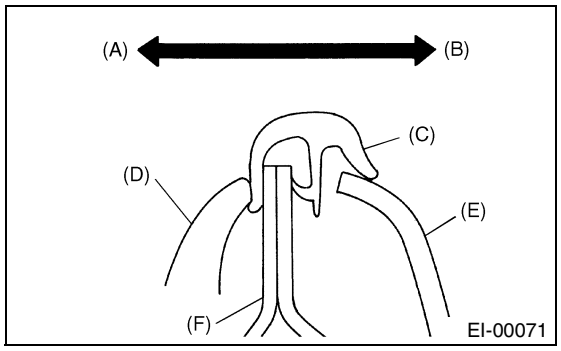
(E) Clip
(F) Hook

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Be sure to securely hook pawls of inner trim panel to body flange.

NOTE:
When installing the rear quarter upper trim, be sure to set the rear mole as shown in the figure.

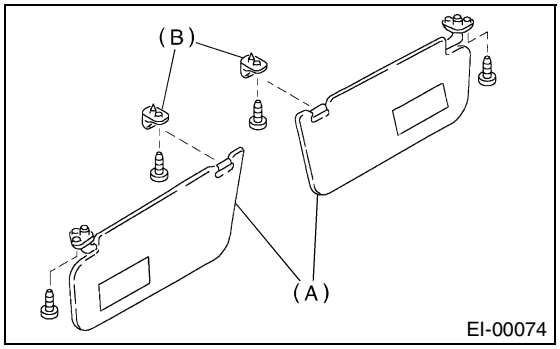


(A) Outside
(B) Inside
(C) Mole
(D) Weatherstrip
(E) Trim
(F) Body

20.Sun Visor

A: REMOVAL

Remove the mounting screws then detach sun visor (A) and hook (B).



B: INSTALLATION

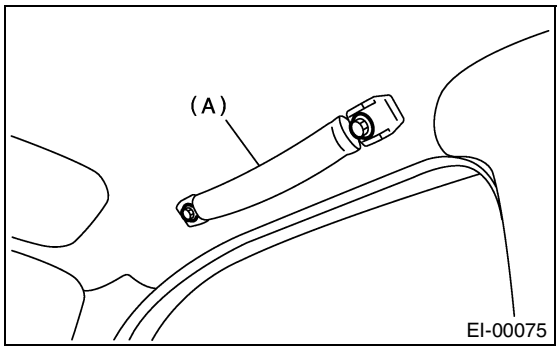
Install in the reverse order of removal.

21.Roof Trim

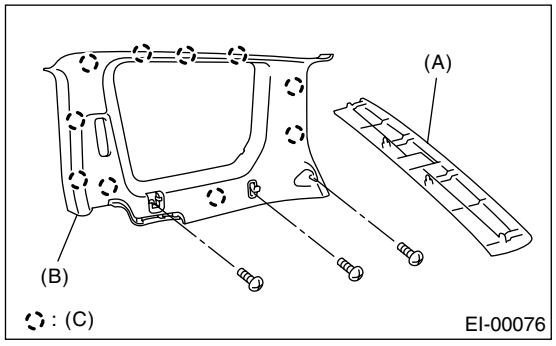
A: REMOVAL

CAUTION:
When removing the clip, use great care not to damage the roof trim.

1) Disconnect the ground cable from battery.
2) Remove the overhead console. (Sunroof equipped model) <Ref. to SR-9, REMOVAL, Sunroof Switch.>
3) Remove the room light. <Ref. to LI-30, REMOVAL, Room Light.>
4) Remove the sun visor and hook or both sides. <Ref. to EI-46, REMOVAL, Sun Visor.>
5) Remove the assist-grip cap, and then remove the assist-grip (A).

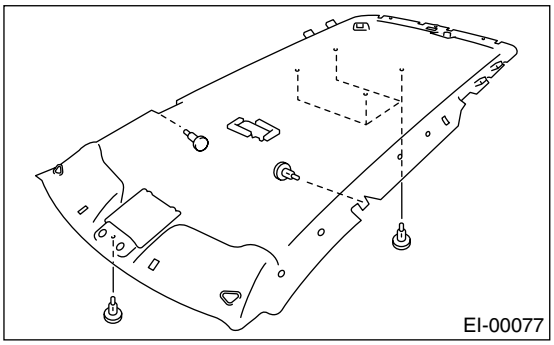


6) Remove the upper inner trim. <Ref. to EI-43, REMOVAL, Upper Inner Trim.>
7) Remove the rear quarter upper trim shown in the figure.
   (1) Remove the rear rail trim (A).
   (2) Remove the rear quarter upper trim (B) of both sides.



(C) Clip

8) Remove the clips, and then remove the roof trim.



B: INSTALLATION

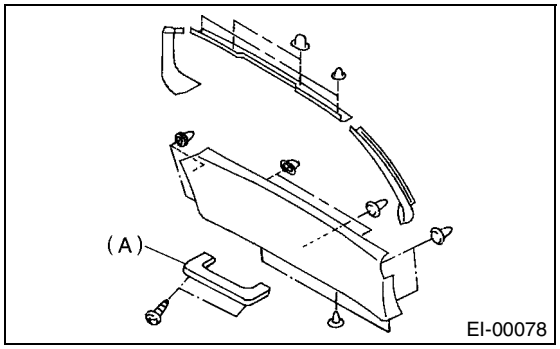
Install in the reverse order of removal.

22.Rear Gate Panel Trim

A: REMOVAL

CAUTION:
Be careful not to damage the clips or their holes.

Remove the rear gate inner handle (A) from rear gate and then detach trim panel.



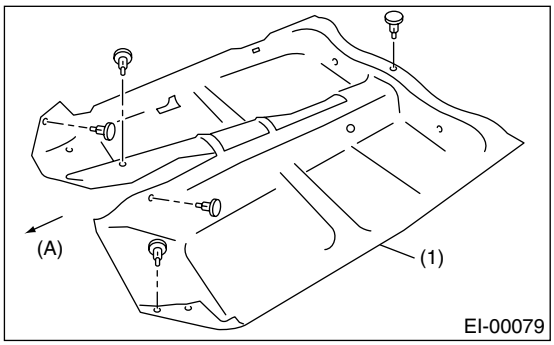
B: INSTALLATION

Install in the reverse order of removal.

23.Floor Mat

A: REMOVAL

1) Remove the front seats. <Ref. to SE-5, REMOVAL, Front Seat.>
2) Remove the rear seat cushion. <Ref. to SE-10, REMOVAL, Rear Seat.>
3) Remove the console box. <Ref. to EI-39, Console Box.>
4) Remove the side sill front cover, side sill rear cover and center pillar lower trim. <Ref. to EI-44, REMOVAL, Lower Inner Trim.>
5) Remove the foot rest.
6) Remove the clips from floor mat.
7) Remove the mat hook.
8) Remove the mat from toe board area.
9) Remove the mat from rear heater duct.
10) Roll the mat, and then take it out of opened rear door.



(A) Front
(1) Floor mat

B: INSTALLATION

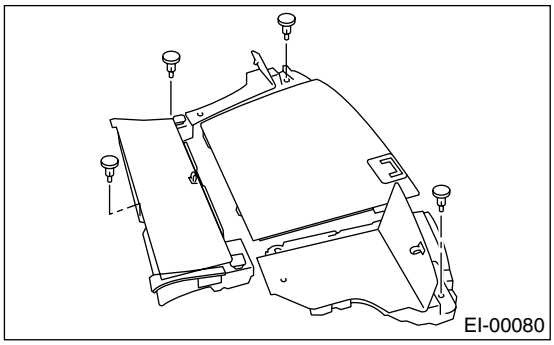
Install in the reverse order of removal.

NOTE:
- Secure the mat firmly with hook and Velcro tape.
- Insert the mat edge firmly into the groove of side sill cover.

24.Luggage Floor Mat

A: REMOVAL

1) Remove the back mat of rear seat backrest.
2) Remove the clips, and then remove the rear floor mat and box.



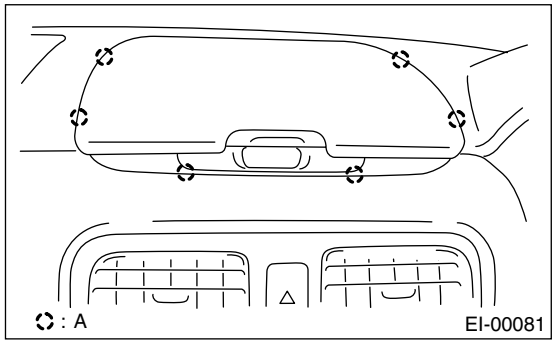
B: INSTALLATION

Install in the reverse order of removal.

25.Instrument Panel Center Compartment

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Insert a flat tip screwdriver, and then pry up to remove the clips.



(A) Clip

3) Remove the instrument panel center compartment from instrument panel.
4) Disconnect the connector from clock.

B: INSTALLATION

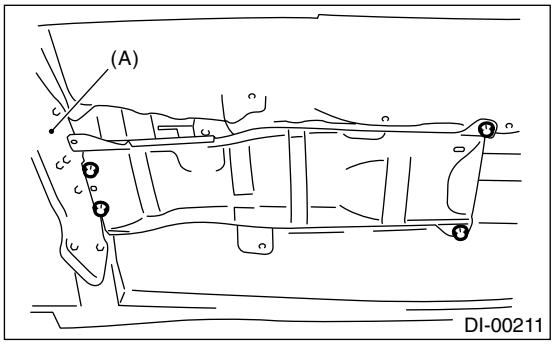
Install in the reverse order of removal.

26.Heat Shield Cover

A: REMOVAL

1. FRONT HEAT SHIELD COVER

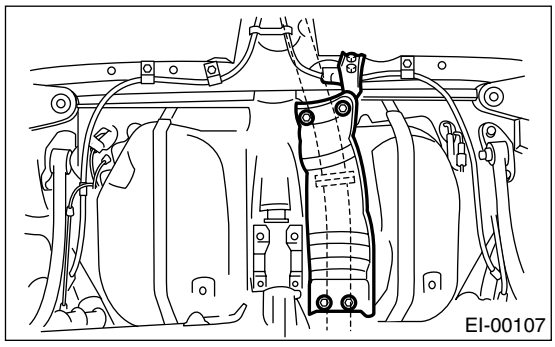
1) Loosen the four bolts to remove front heat shield cover.



(A) Transmission mount

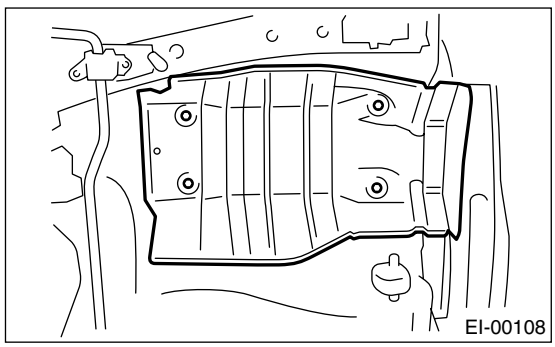
2. CENTER HEAT SHIELD COVER

1) Loosen the four bolts to remove center heat shield cover.



3. REAR HEAT SHIELD COVER

1) Remove the muffler. <Ref. to EX(SOHC)-13, REMOVAL, Muffler.>
2) Loosen the four bolts to remove rear heat shield cover.



B: INSTALLATION

Install in the reverse order of removal.

EXTERIOR BODY PANELS

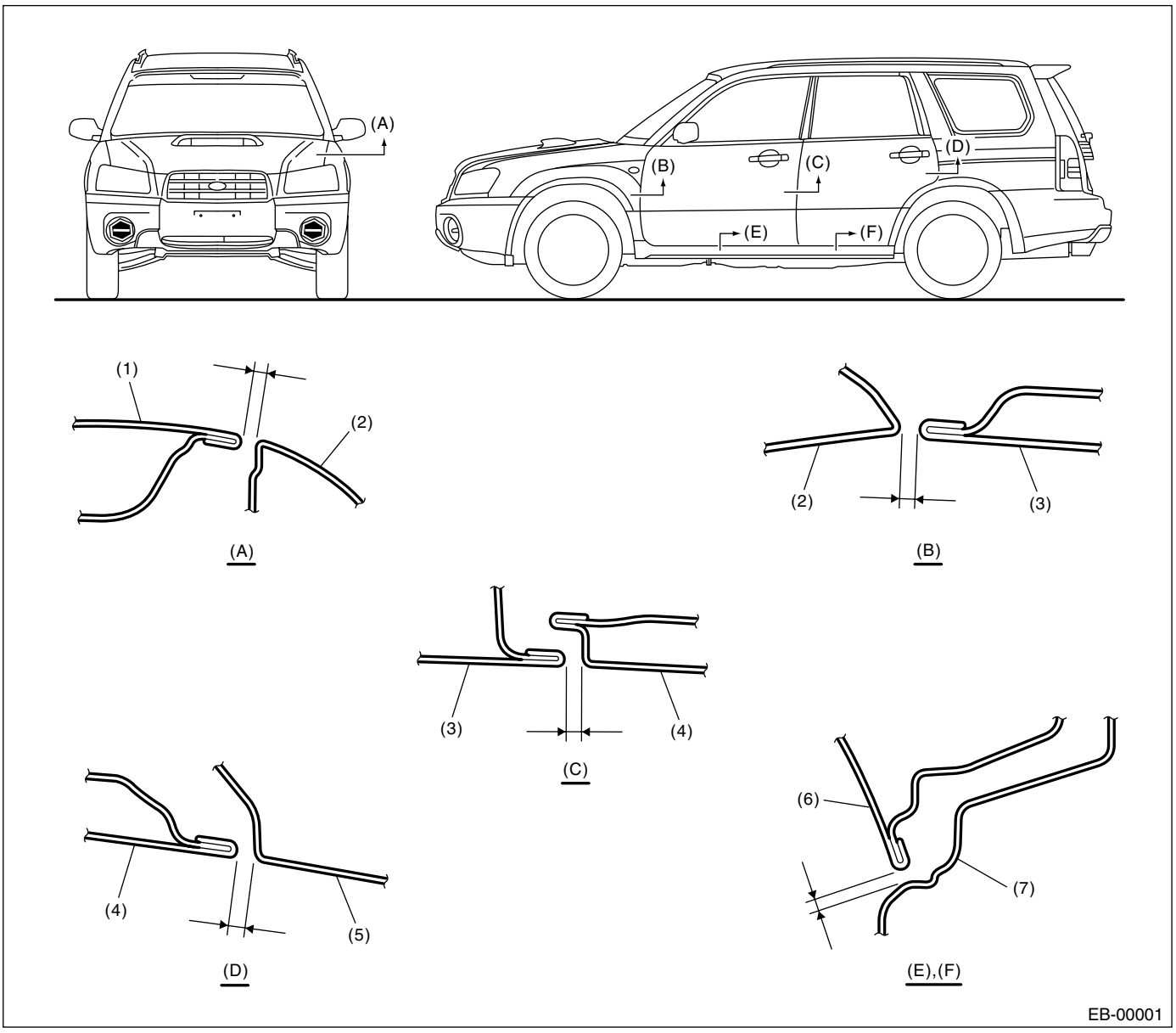
EB

Page

1. General Description 2
2. Front Hood 9
3. Fender Panel....10
4. Front Door Panel....11
5. Front Sealing Cover 13
6. Rear Door Panel 14
7. Rear Sealing Cover....16
8. Rear Gate Panel 17
9. Rear Gate Garnish Assembly 20

1. General Description

A: SPECIFICATIONS

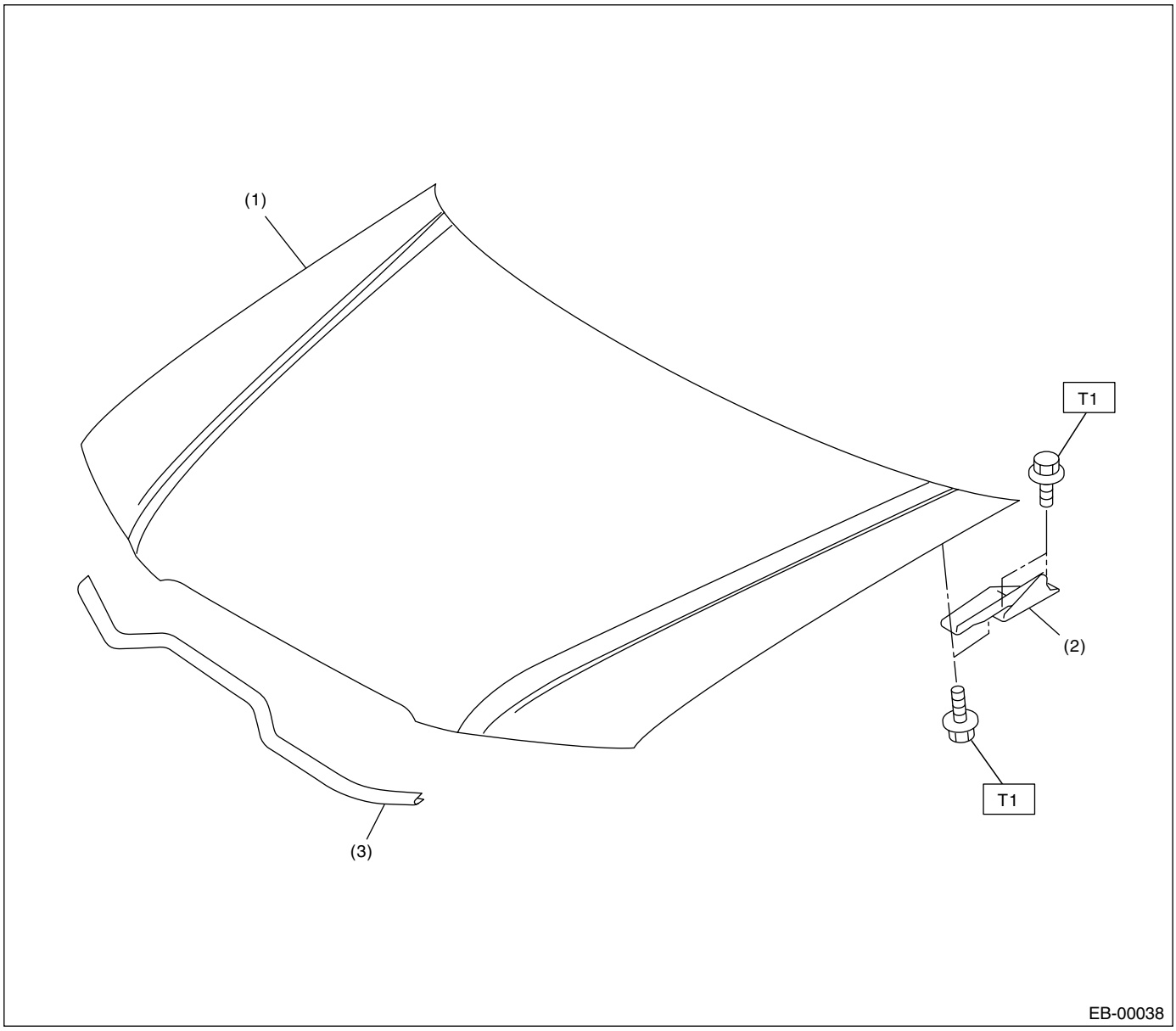


(1) Front hood
(2) Front fender
(3) Front door
(4) Rear door
(5) Rear quarter
(6) Door panel
(7) Side sill

Section	Part	Specification
(A)	Front hood to Front fender	3.5±1.0 (0.14±0.04 in)
(B)	Front fender to Front door	4.7±1.0 (0.19±0.04 in)
(C)	Front door to Rear door	5.0 (0.20 in)
(D)	Rear door to Rear quarter	4.6 (0.18 in)
(E), (F)	Door panel to Side sill	7.0 (0.28 in)

B: COMPONENT

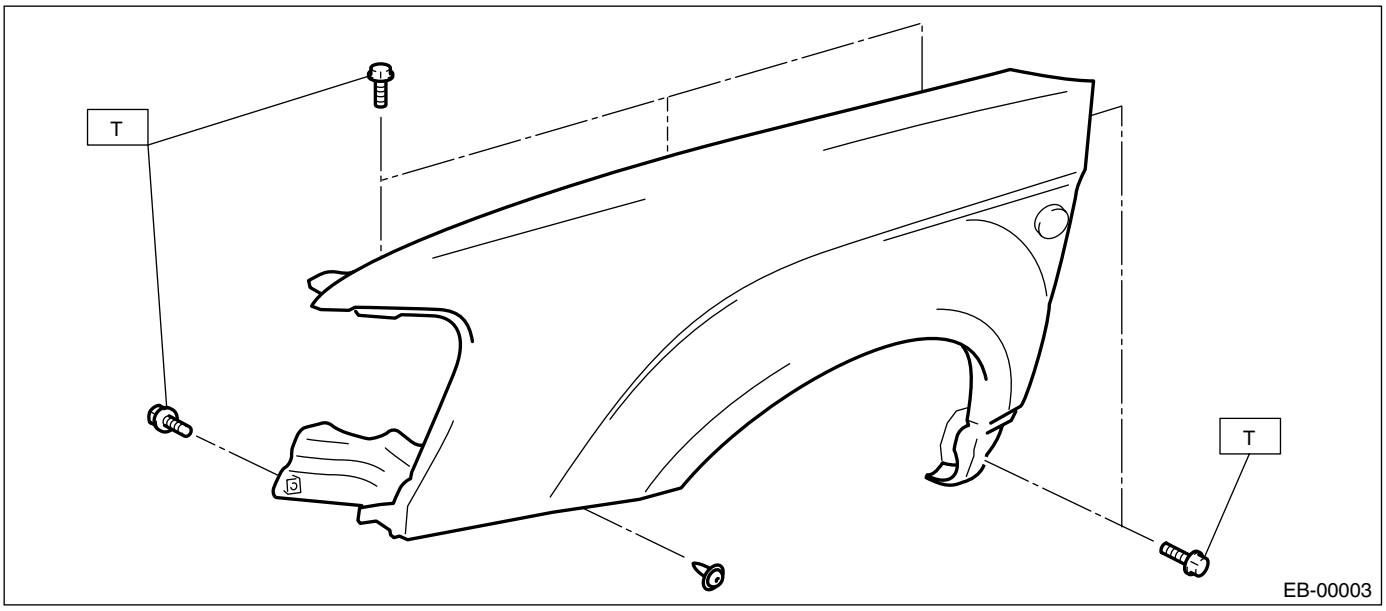
1. FRONT HOOD



(1) Front hood
(2) Hinge
(3) Seal

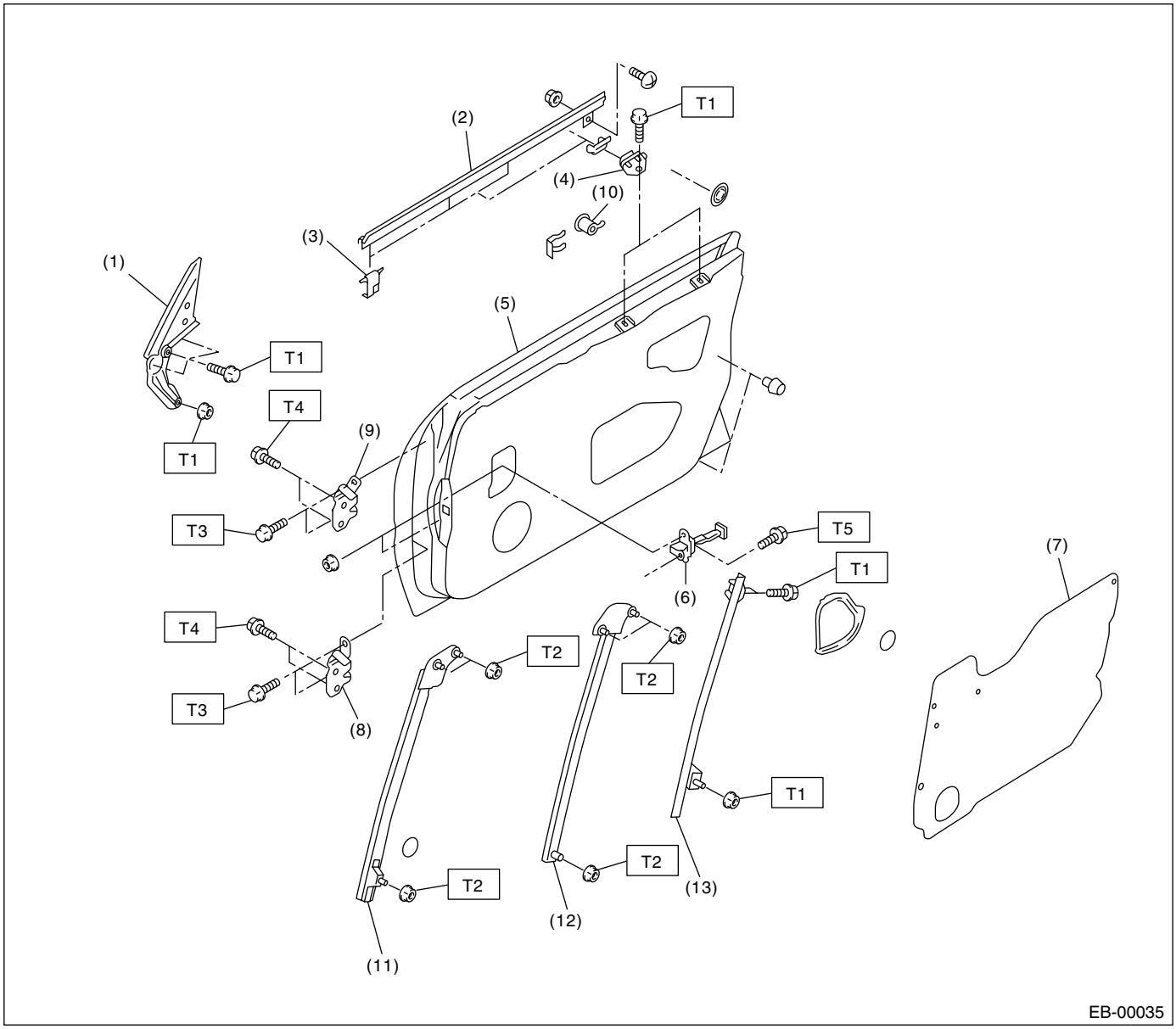
Tightening torque: N·m (kgf-m, ft-lb)
T1: 24.5 (2.5, 18.1)

2. FRONT FENDER PANEL



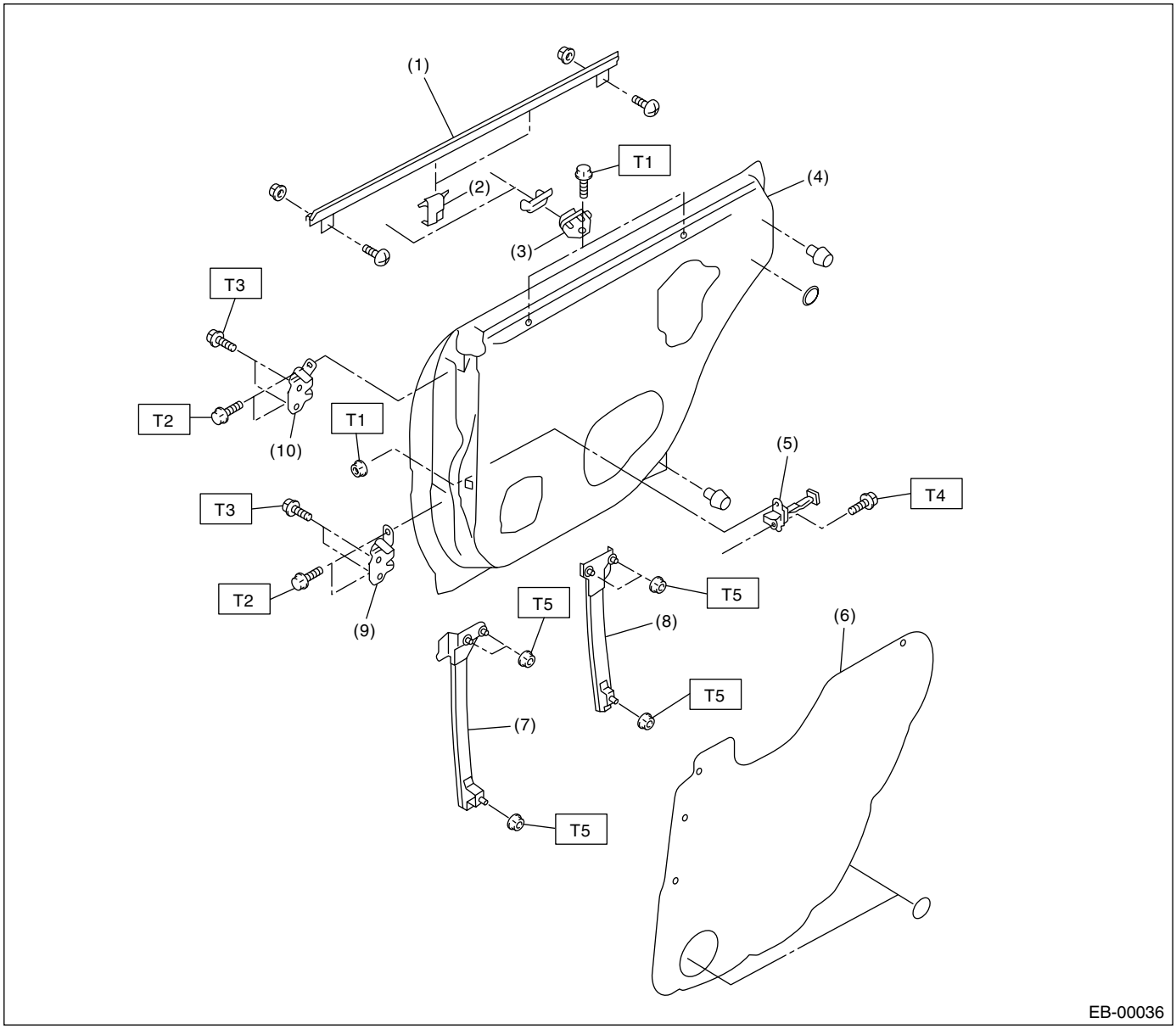
Tightening torque: N·m (kgf-m, ft-lb)
T: 7.4 (0.75, 5.5)

3. FRONT DOOR PANEL



(1)	Gusset	(8)	Lower hinge	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	Weatherstrip	(9)	Upper hinge	***T1: 7.35 (0.75, 5.4)***
(3)	Stabilizer (Outer)	(10)	Key cylinder (Driver's side only)	***T2: 14 (1.4, 10.3)***
(4)	Stabilizer (Inner)	(11)	Front sash	***T3: 25 (2.5, 18)***
(5)	Door panel	(12)	Rear sash	***T4: 30 (3.1, 22)***
(6)	Checker	(13)	Guide rail	***T5: 32 (3.3, 24)***
(7)	Sealing cover			

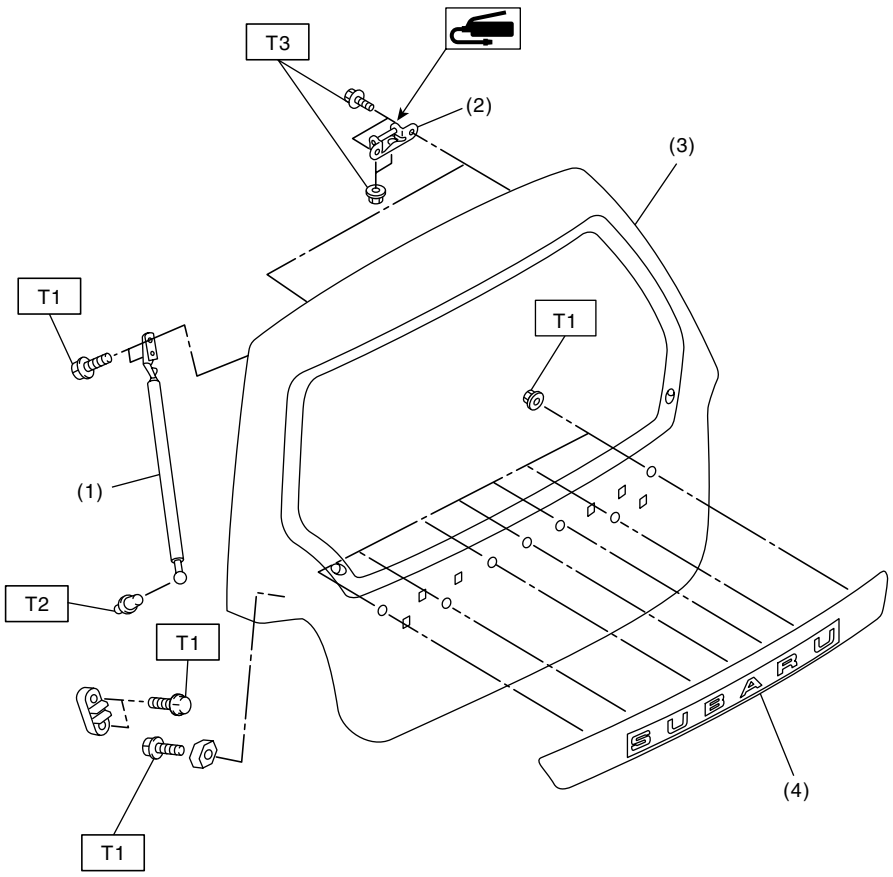
4. REAR DOOR PANEL



(1) Weatherstrip
(2) Stabilizer (Outer)
(3) Stabilizer (Inner)
(4) Door panel
(5) Checker
(6) Sealing cover
(7) Front sash
(8) Rear sash
(9) Lower hinge
(10) Upper hinge

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.35 (0.75, 5.4)
T2: 25 (2.5, 18)
T3: 30 (3.1, 18)
T4: 32 (3.3, 24)
T5: 14 (1.4, 10.3)

5. REAR GATE PANEL



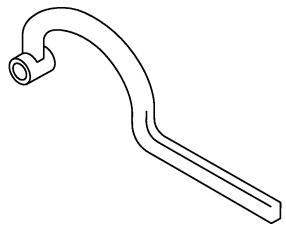
EB-00037

(1) Gas stay
(2) Hinge
(3) Rear gate
(4) Rear gate garnish

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 14 (1.4, 10.1)
T3: 25 (2.5, 18.1)

C: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925610000	925610000	WRENCH	Used for removing and installing door hinge.

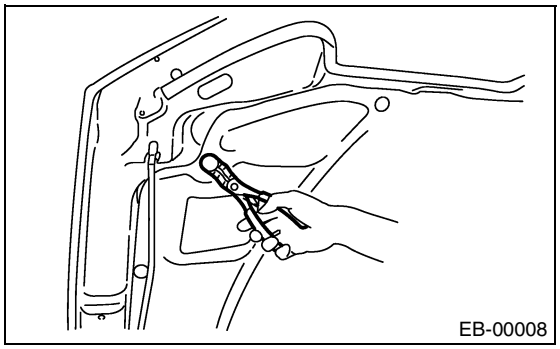
2. GENERAL TOOL

TOOL NAME	REMARKS
Support Jack	Used for supporting door panel.

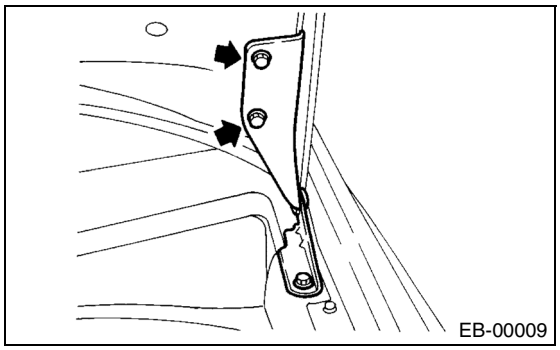
2. Front Hood

A: REMOVAL

1) Open the front hood to remove washer nozzles.
2) Release the clips to remove hood insulator.



3) Remove the bolts to remove front hood from hinges.



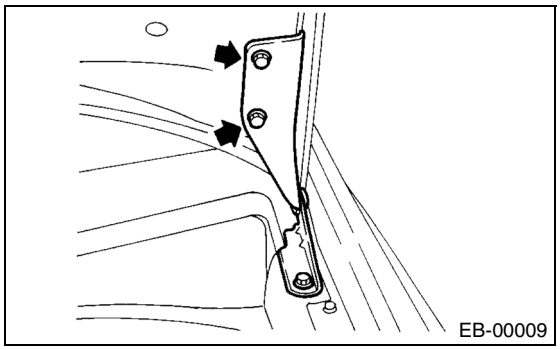
B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust the clearance between hood and fender. Clearance must be equal at both sides.

Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)

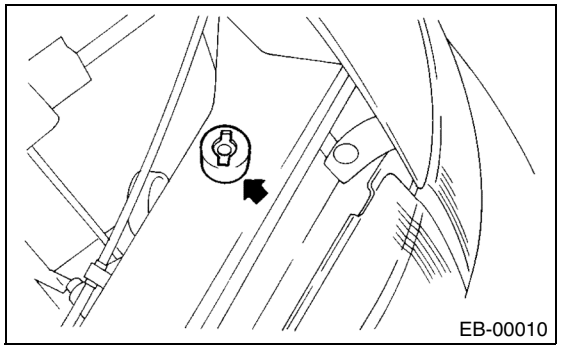
C: ADJUSTMENT

1) Use the hinge mounting holes to align the front hood longitudinally and laterally.



2) Adjust the height at front end of hood. <Ref. to SL-33, ADJUSTMENT, Front Hood Lock Assembly.>

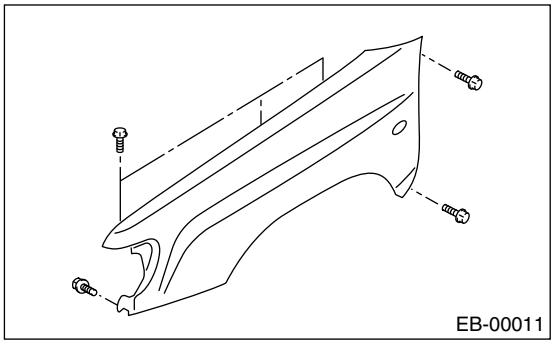
3) Rotate the hood buffer to adjust lateral height.



3. Fender Panel

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front bumper face. <Ref. to EI-23, REMOVAL, Front Bumper.>
3) Remove the mud guard. <Ref. to EI-31, REMOVAL, Mud Guard.>
4) Remove the side sill spoiler. <Ref. to EI-33, REMOVAL, Side Sill Spoiler.>
5) Remove the side protector. <Ref. to EI-34, REMOVAL, Side Protector.>
6) Loosen the bolts and clip to remove front fender.



B: INSTALLATION

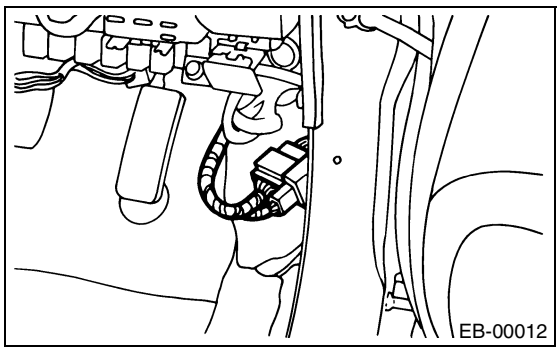
1) Install in the reverse order of removal.
2) When the fender panel is installed, clearance between fender panel and hood or front fender must be equal.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.5 ft-lb)

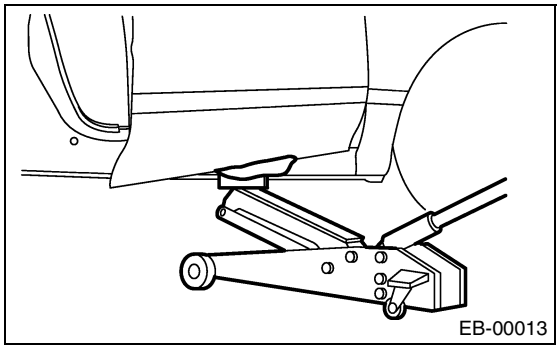
4. Front Door Panel

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front door trim. <Ref. to EI-35, REMOVAL, Front Door Trim.>
3) Remove the outer mirror assembly. <Ref. to GW-11, REMOVAL, Outer Mirror Assembly.>
4) Remove the front sealing cover. <Ref. to EB-13, REMOVAL, Front Sealing Cover.>
5) Remove the front door glass. <Ref. to GW-16, REMOVAL, Front Door Glass.>
6) Remove the front door regulator and motor. <Ref. to GW-20, REMOVAL, Front Regulator and Motor Assembly.>
7) Remove the front door latch assembly. <Ref. to SL-23, REMOVAL, Front Outer Handle.>
8) Remove the front outer handle. <Ref. to SL-23, REMOVAL, Front Outer Handle.>
9) Remove the front pillar lower trim to disconnect the connector from body harness.

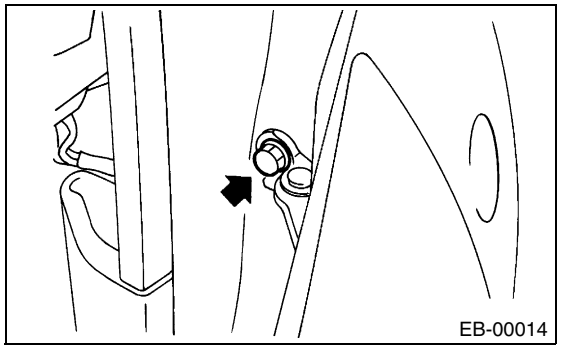

EB-00012

10) Put a wooden block on jack and place jack under door. Support the door with a jack to protect it from damage.

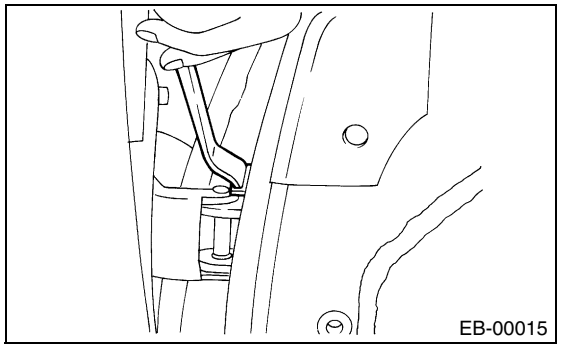

EB-00013

NOTE:
When supporting the door with a jack, be careful not to deform the door hinges while working.

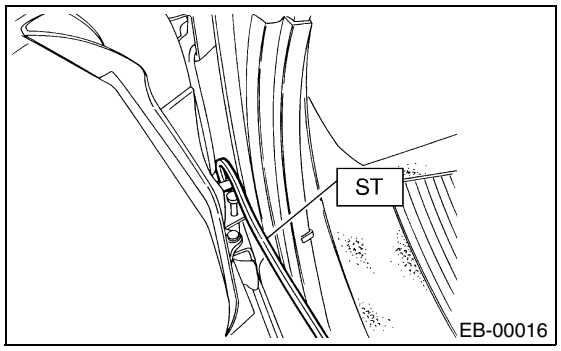
11) Remove the checker bolts.


EB-00014

12) Remove the door-side bolts for upper and lower hinges to remove the door.


EB-00015

13) Using the ST, remove the body-side bolts for upper and lower hinges, and remove door hinges.
ST 925610000 DOOR HINGE WRENCH



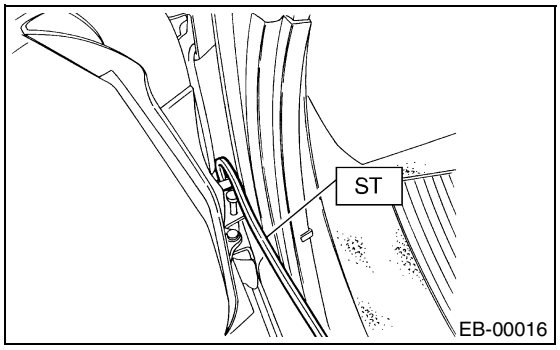
EB-00016

B: INSTALLATION

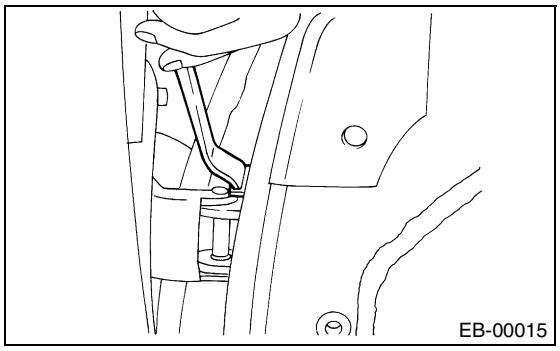
1) Install in the reverse order of removal.
2) Apply grease to the sliding area of door hinges.

C: ADJUSTMENT

1) Using the ST, loosen the body-side bolts of upper and lower hinges to align the position of front door panel longitudinally and vertically.
ST 925610000 DOOR HINGE WRENCH

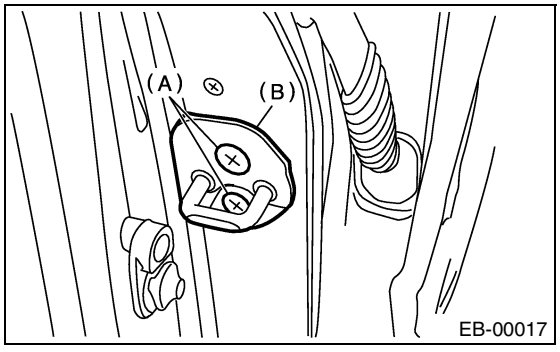


2) Loosen the door-side bolts of upper and lower hinges to align the position of front door panel vertically and laterally at the front end.



3) Loosen the screw (A) and lightly tap striker (B) using a plastic hammer to adjust striker to align the position of front door panel vertically and laterally at the rear end.

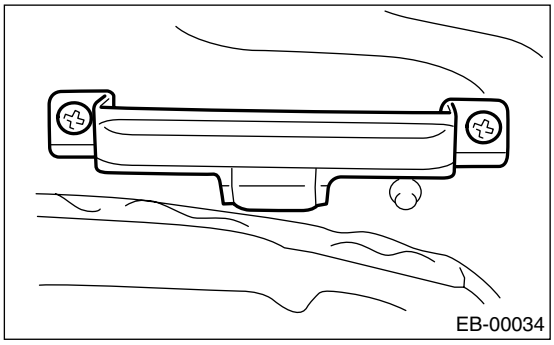
CAUTION:
Do not use an impact wrench. Welding area on the striker nut plate is easily broken.



5. Front Sealing Cover

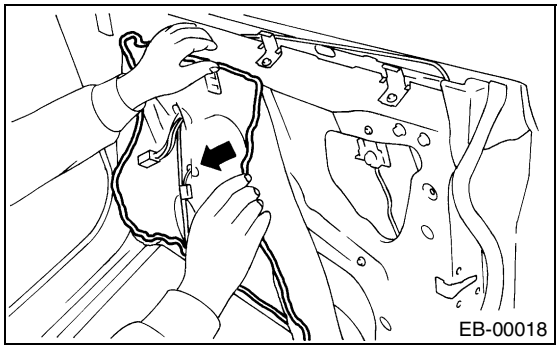
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front door trim. <Ref. to EI-35, REMOVAL, Front Door Trim.>
3) Remove the front speaker. <Ref. to ET-6, REMOVAL, Front Speaker.>
4) Remove the door trim bracket.



5) Remove the sealing cover.

NOTE:
• Carefully remove the butyl tape. Excessive force will easily break the cover.
• If the cover gets broken, replace it with a new one.



B: INSTALLATION

1) Install in the reverse order of removal.
2) When replacing the sealing cover, use butyl tape sealer.
3) Press the sealer-applied area firmly to prevent any floating on surface.

Butyl tape:
3M8626 or equivalent

NOTE:
• Apply a uniform bead of butyl tape.
• Attach the sealing cover, keeping it from becoming wrinkled.
• Breaks in the bead will allow water leakage and contamination.

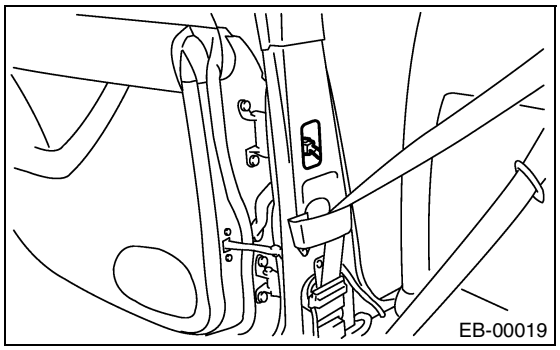
C: INSPECTION

If the sealing cover is damaged, replace it with a new one.

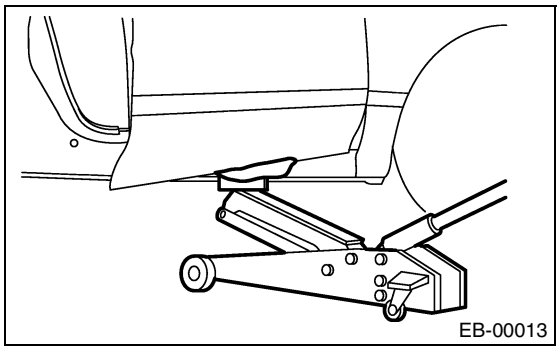
6. Rear Door Panel

A: REMOVAL

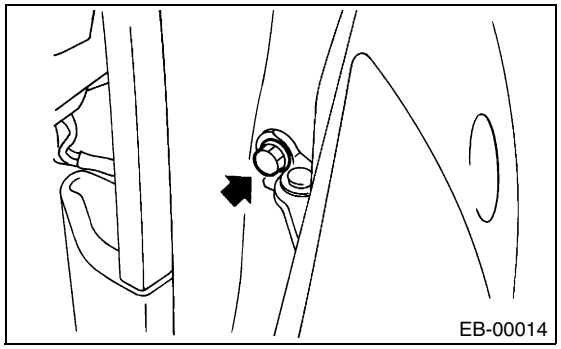
1) Disconnect the ground cable from battery.
2) Remove the rear door trim. <Ref. to EI-36, REMOVAL, Rear Door Trim.>
3) Remove the rear sealing cover. <Ref. to EB-16, REMOVAL, Rear Sealing Cover.>
4) Remove the rear door glass. <Ref. to GW-21, REMOVAL, Rear Door Glass.>
5) Remove the rear door regulator and motor assembly. <Ref. to GW-23, REMOVAL, Rear Regulator and Motor Assembly.>
6) Remove the rear door latch assembly. <Ref. to SL-28, REMOVAL, Rear Door Latch Assembly.>
7) Remove the rear outer handle. <Ref. to SL-27, REMOVAL, Rear Outer Handle.>
8) Remove the center pillar lower trim. <Ref. to EI-44, REMOVAL, Lower Inner Trim.>
9) Remove the seatbelt bracket and blind plug.
Disconnect the connector of door harness and remove the door hinge nut.


EB-00019

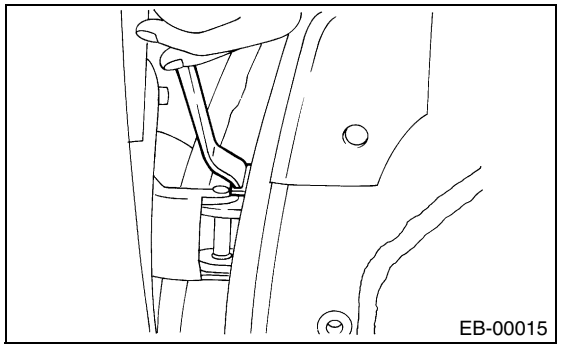
10) Put a wooden block on the jack and place the jack under the door. Support the door with the jack to protect it.


EB-00013

11) Remove the checker bolts.


EB-00014

12) Remove the door-side bolts for upper and lower hinges to remove the door.


EB-00015

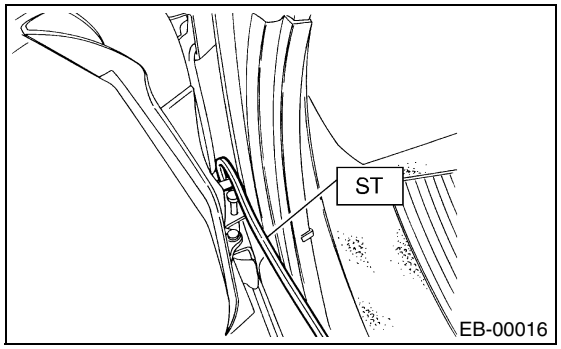
13) Using the ST, remove the body-side bolts for upper and lower hinges, and remove door hinges.

B: INSTALLATION

1) Install in the reverse order of removal.
2) Apply grease to the sliding area of door hinges.

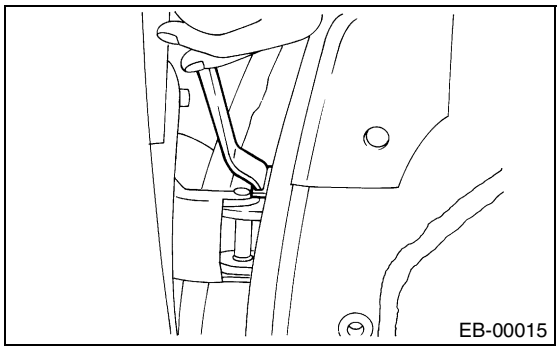
C: ADJUSTMENT

1) Using the ST, loosen the body-side bolts of upper and lower hinges to align the position of rear door panel longitudinally and vertically.
ST 925610000 DOOR HINGE WRENCH



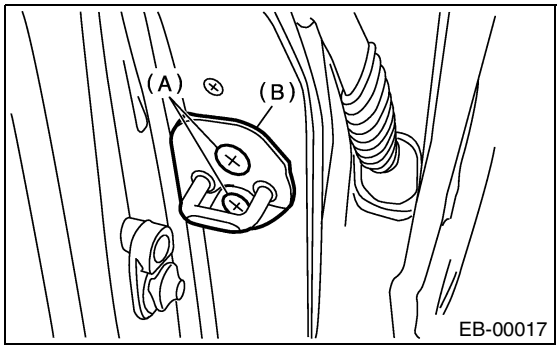
EB-00016

2) Loosen the door-side bolts of upper and lower hinges to align the position of rear door panel vertically and laterally at front-end.



3) Loosen the screw (A) and lightly tap striker (B) using plastic hammer to adjust striker to align the position of front door panel vertically and laterally at the rear end.

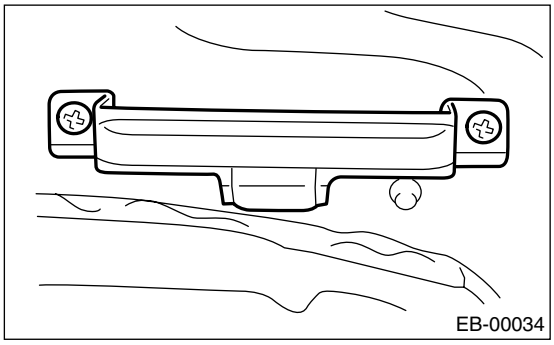
CAUTION:
Do not use an impact wrench. The welding area on the striker nut plate is easily broken.



7. Rear Sealing Cover

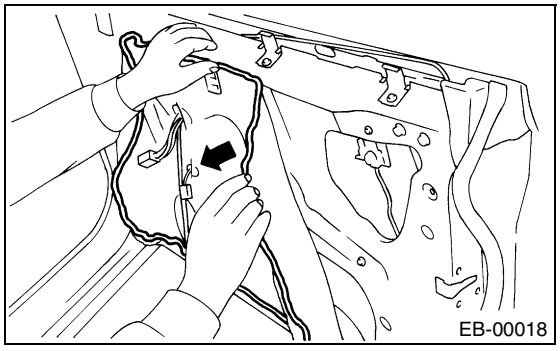
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the rear door trim. <Ref. to EI-36, REMOVAL, Rear Door Trim.>
3) Remove the rear speaker. <Ref. to ET-7, REMOVAL, Rear Speaker.>
4) Remove the door trim bracket.



5) Remove the sealing cover.

NOTE:
• Carefully remove the butyl tape. Excessive force will easily break the cover.
• If the cover gets broken, replace it with a new one.



B: INSTALLATION

1) Install in the reverse order of removal.
2) When replacing the sealing cover, use butyl tape.
3) Press the sealer-applied area firmly to prevent any floating on surface.

Butyl tape:
3M8626 or equivalent

NOTE:
• Apply an uniform bead of butyl tape.
• Attach the sealing cover, keeping it from becoming wrinkled.
• Breaks in the bead will allow water leakage and contamination.

C: INSPECTION

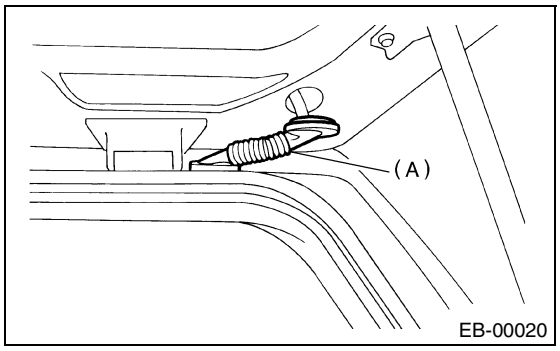
If the sealing cover is damaged, replace it with a new one.

8. Rear Gate Panel

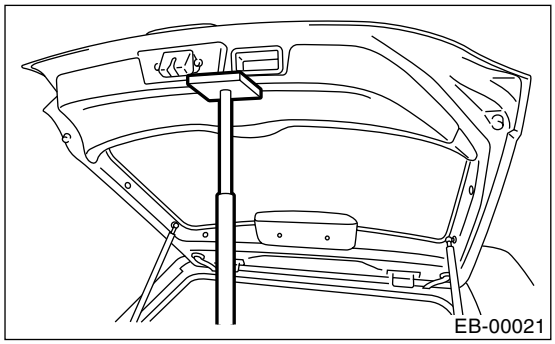
A: REMOVAL

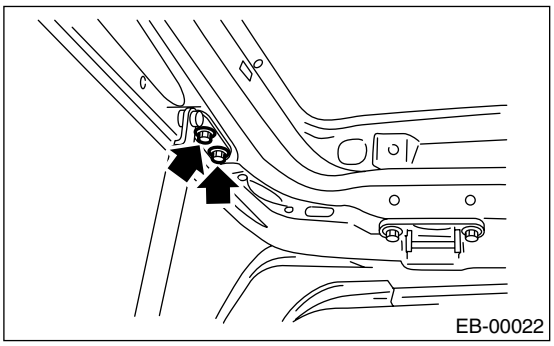
1. REAR GATE PANEL

1) Disconnect the ground cable from battery.
2) Open the rear gate.
3) Remove the rear gate trim. <Ref. to EI-48, REMOVAL, Rear Gate Panel Trim.>
4) Remove the rear wiper motor. <Ref. to WW-17, REMOVAL, Rear Gate Garnish.>
5) Remove the rear gate outer handle. <Ref. to SL-30, REMOVAL, Rear Gate Outer Handle.>
6) Remove the rear gate garnish assembly. <Ref. to EB-20, REMOVAL, Rear Gate Garnish Assembly.>
7) Remove the rear gate latch assembly. <Ref. to SL-31, REMOVAL, Rear Gate Latch Assembly.>
8) Disconnect the connectors of rear wiper, rear defogger, and other lighting devices.
9) Disconnect the washer hose.
10) Remove the rubber duct (A) connection, and pull out the harness and washer hose from rear gate.



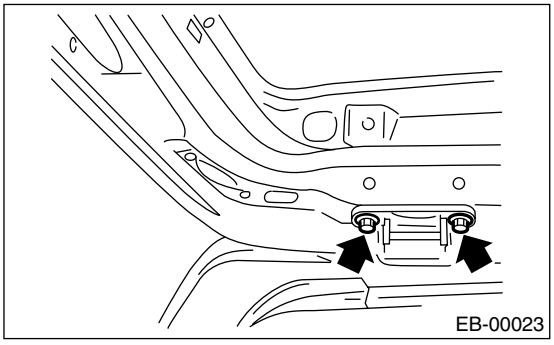
11) Using a support, support the rear gate while removing gas stay mounting bolts.





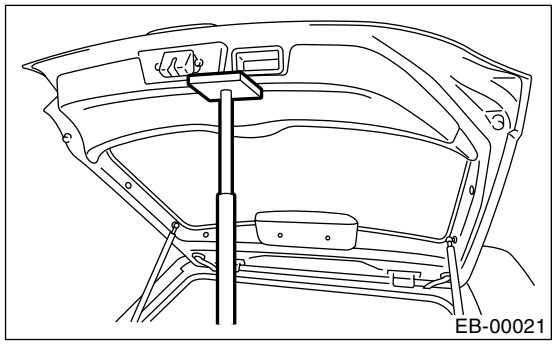
NOTE:
When the rear gate is released, it may hit and damage the body. To prevent this, place a shop cloth between the body and gate.

12) Loosen the rear gate bolts to remove rear gate.



2. GAS STAY

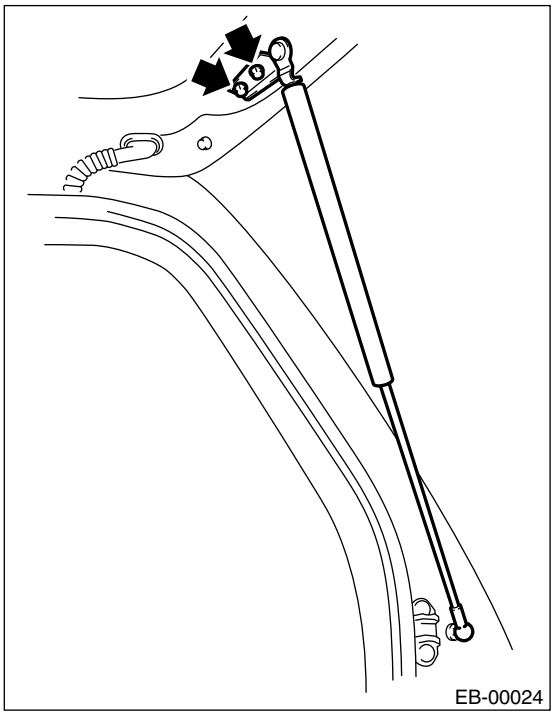
1) Open the rear gate. Use a support jack to support the rear gate.



NOTE:
After the gas stay is removed, the rear gate cannot stay open. Supporting the rear gate with a jack, remove the bolts.

CAUTION:
• Do not damage the piston rods and oil seals.
• Never disassemble the cylinders: They contain gas.

2) Loosen the bolts to remove the gas stay from rear gate.



B: INSTALLATION

1. REAR GATE PANEL

1) Install in the reverse order of removal.

2) Install the rear gate panel with uniform clearance to the body.
Refer to COMPONENT of General Description for tightening torque. <Ref. to EB-7, REAR GATE PANEL, General Description.>

NOTE:
After supporting the rear gate with a jack, start working.

2. GAS STAY

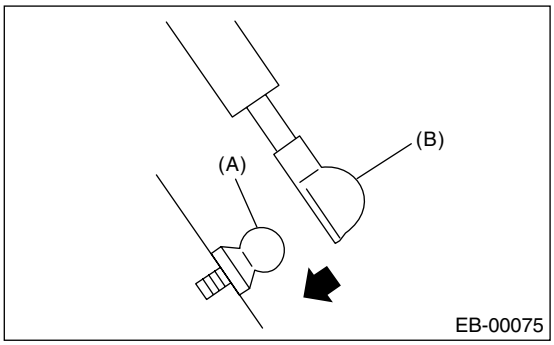
1) Install the mounting bolt (A) to the body.

Tightening torque:
14 N·m (1.43 kgf-m, 10.3 ft-lb)

2) Tighten the bolts at upper side of gas stay.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

3) Firmly install the gas stay (B) to mounting bolt (A).

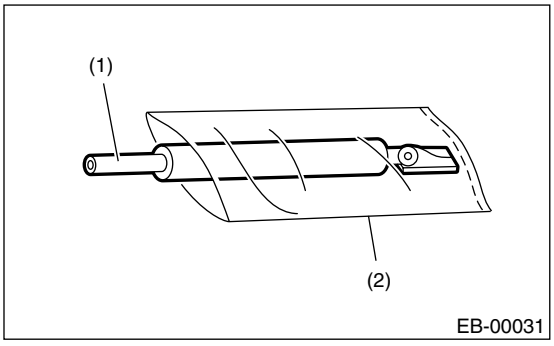


C: DISPOSAL

1. GAS STAY

CAUTION:
Gas is colorless, odorless, and harmless. However, gas pressure may spray cutting powder or oil. Be sure to wear dust-resistant goggles.

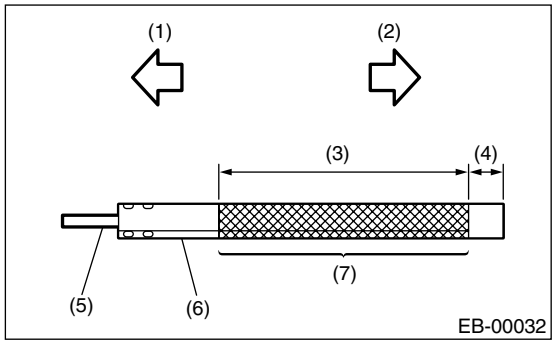
1) Cover with a vinyl case as shown in the figure.



(1) Gas stay
(2) Vinyl sack

NOTE:
Prevent the vinyl case from being caught by drill cutting edge

2) Lift the body side slightly with piston rods fully extended, and secure the body side on vise stand. Drill a hole in 2 to 3 mm (0.08 to 0.12 in) diameter at a point 10 to 200 mm (0.39 to 7.87 in) from the door side, and bleed the gas stay completely.



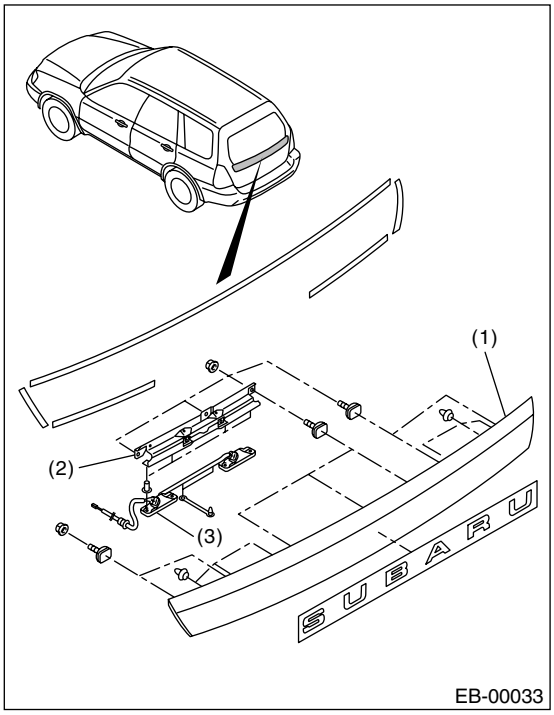
(1) Body side
(2) Door side
(3) 190 mm (7.48 in)
(4) 10 mm (0.39 in)
(5) Piston rod
(6) Cylinder
(7) Portion to be drilled

9. Rear Gate Garnish Assembly

A: REMOVAL

1) Remove the rear gate panel trim. <Ref. to EI-48, REMOVAL, Rear Gate Panel Trim.>
2) Remove the rear wiper motor. <Ref. to WW-17, REMOVAL, Rear Gate Garnish.>
3) Remove the seven frange nuts from inside of rear gate panel.
4) Remove the lisence plate light assembly.
5) Close the gate, and then remove the rear gate garnish assembly, pulling it forward by hand.

NOTE:
Be careful not to pulling it forword by hand the rear gate garnish assembly strongly to avoid damage to clips.



(1) Rear gate garnish ASSY
(2) Licence plate light bracket
(3) Licence plate light

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Check for serious scratches or cracks in rear gate garnish assembly.

CRUISE CONTROL SYSTEM

CC

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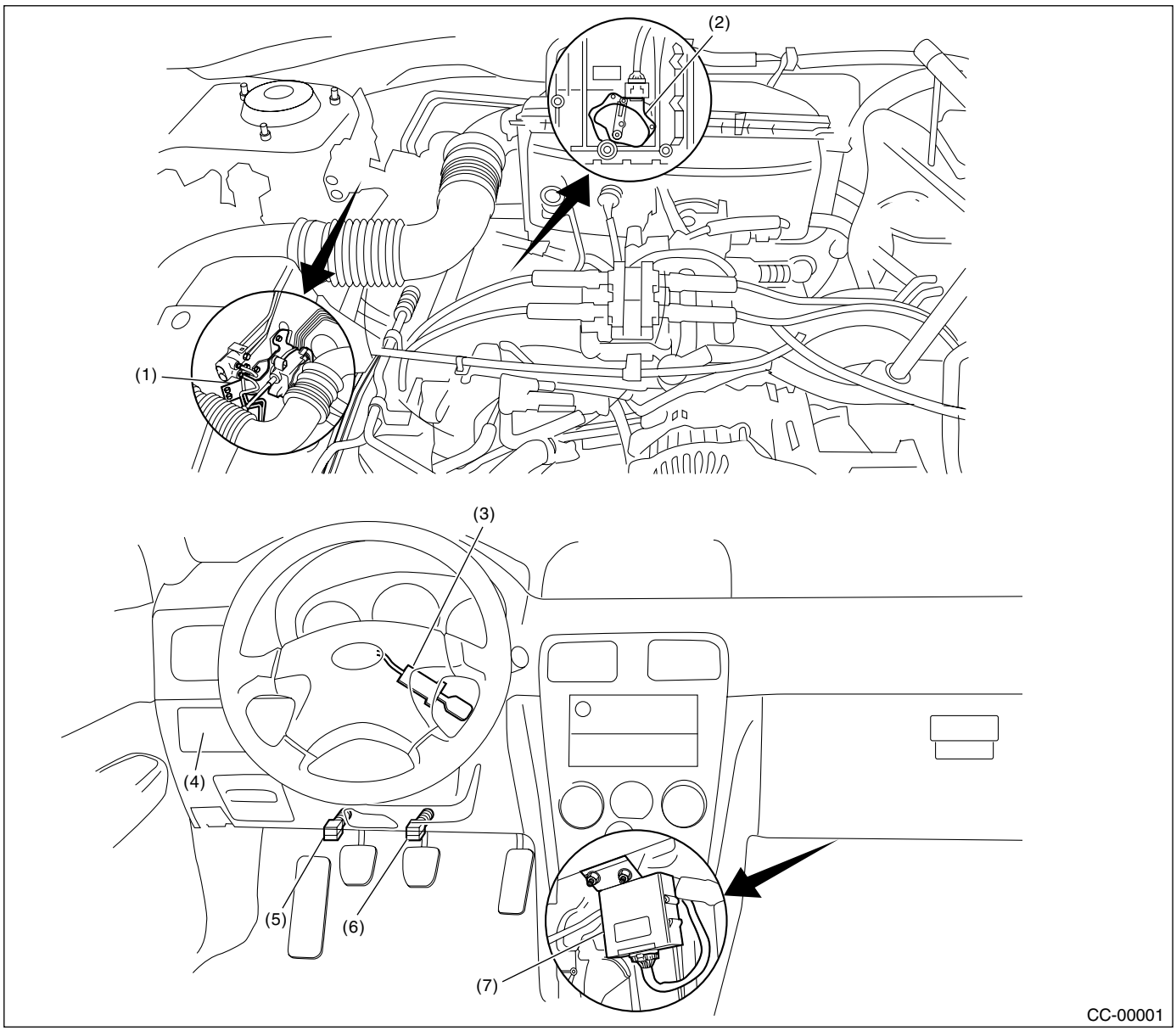
1. General Description 2
2. Actuator 4
3. Cruise Control Module 6
4. Cruise Control Main Switch 7
5. Cruise Control Command Switch 8
6. Stop and Brake Switch 9
7. Clutch Switch 10
8. Inhibitor Switch 11

1. General Description

A: COMPONENT



(1) Actuator
(2) Inhibitor switch (AT vehicles only)
(3) Cruise control command switch
(4) Cruise control main switch
(5) Clutch switch (MT vehicles only)
(6) Stop and brake switch
(7) Cruise control module

NOTE:
Electrical component location are for LHD vehicles. Cruise control autuator and cruise control module location for RHD vehicles are symmetrically opposite.

B: CAUTION

• Before disassembling or reassembling parts, always disconnect the battery ground cable. When repairing the radio, control module and other parts with memory functions, make note of the memory before disconnecting the battery ground cable. All memory will be erased.
• Reassemble parts in the reverse order of disassembly unless otherwise indicated.
• Adjust parts to specifications specified in this manual.
• Connect the connectors and hoses securely during reassembly.
• After reassembly, ensure functional parts operate properly.

C: PREPARATION TOOL

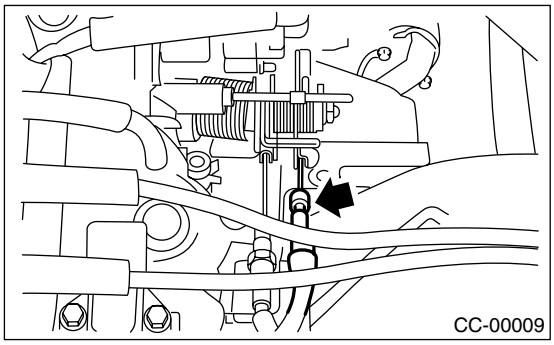
TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

2. Actuator

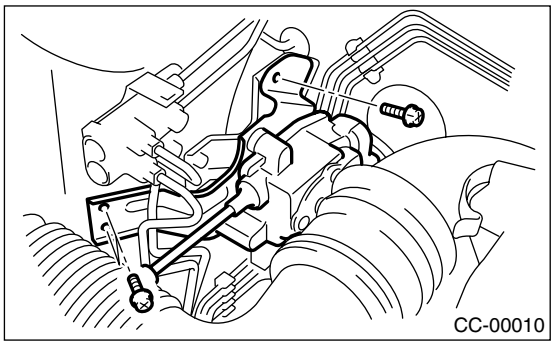
A: REMOVAL

CAUTION:
• Be careful not to apply excessive load to the wire cable when adjusting and/or installing; otherwise, the actuator may be deformed or damaged.
• Do not bend the cable sharply with a radius less than 100 mm (3.94 in); otherwise, cable may bend permanently, resulting in poor performance.
• When installing the cable, be careful not to sharply bend or pinch the inner cable; otherwise, the cable may break.

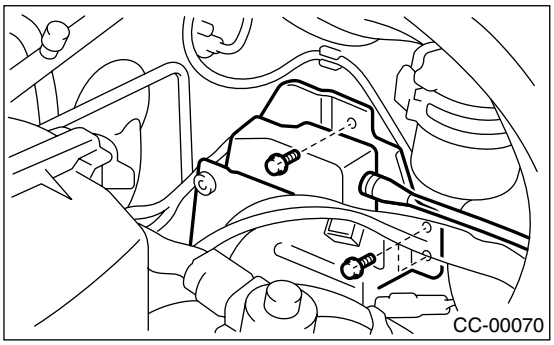
1) Disconnect the ground cable from battery.
2) Remove the clip bands from cruise control cable.
3) Loosen the nut which secures cruise control cable end to throttle cam, and then remove the cable from throttle cam.


CC-00009

4) Remove the four actuator attaching bolts.
5) Remove the actuator while disconnecting the connector.
• LHD MODEL


CC-00010

• RHD MODEL

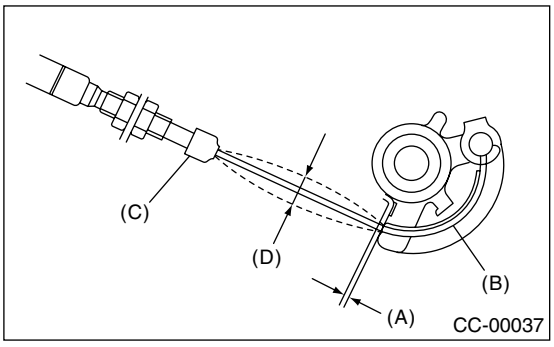

CC-00070

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Actuator:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)
Cable end nut:
12 N·m (1.2 kgf-m, 8.7 ft-lb)

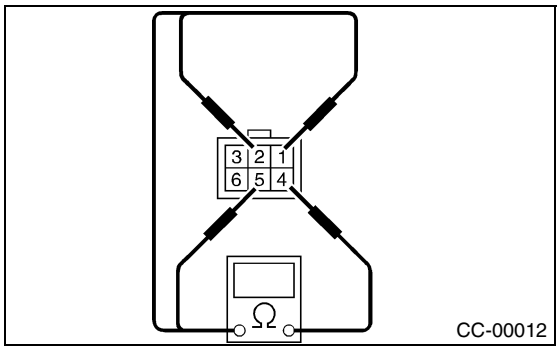
NOTE:
(A): Must be adjusted when the cable end outer is fixed in place, so that gap between throttle cam and lever is 0 — 1 mm (0 — 0.04 in), otherwise, inner cable detlection (D) is 1 — 8 mm (0.039 — 0.315 in) when the throttle cable is installed.
(Must be attached while the throttle cam is being pulled by wire cable.)
(B): Must be coated evenly on the cam end inner connection.
(C): Cover must be inserted securely, until tip of cable touches cover stopper.



CC-00037

C: INSPECTION

Measure the cruise control actuator resistance.



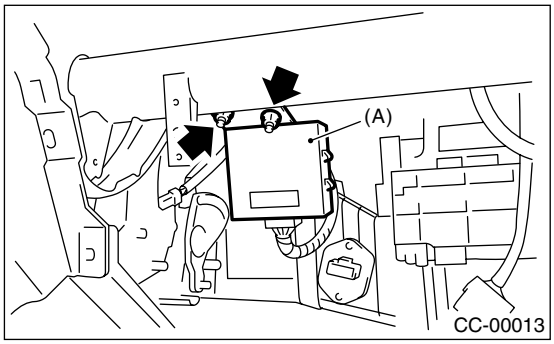
Terminal No.	Standard
4 and 1	Approx. 5 Ω
4 and 2	Approx. 5 Ω
4 and 5	Approx. 5 Ω
3 and 6	Approx. 39 Ω

If NG, replace the cruise control actuator.

3. Cruise Control Module

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the glove box. <Ref. to EI-37, REMOVAL, Glove Box.>
3) Disconnect the connector from cruise control module.
4) Remove the bolt, then detach the cruise control module (A).



B: INSTALLATION

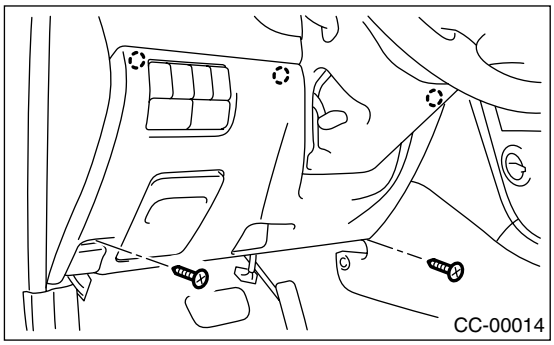
Install in the reverse order of removal.

NOTE:
Attach the part number label, facing the rear side of the vehicle.

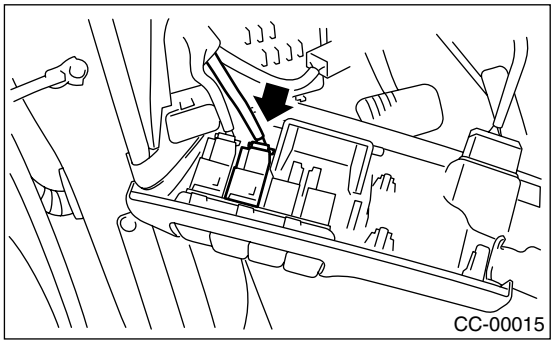
4. Cruise Control Main Switch

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the screws and clip from instrument panel lower cover.
3) Remove the instrument panel lower cover.

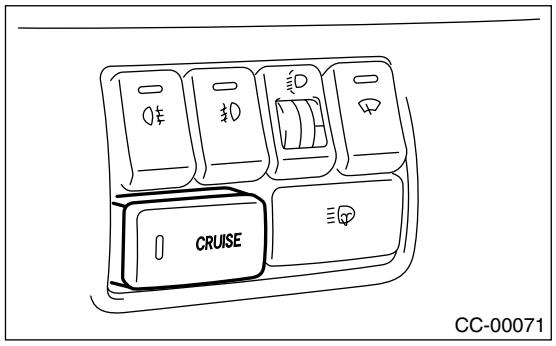


4) Disconnect the connector from cruise control main switch.

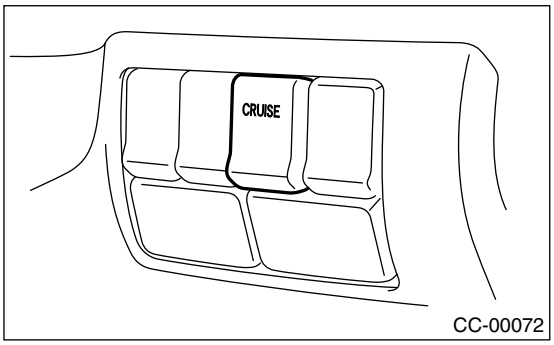


5) Remove the main switch by pushing it outward.

- FOR EUROPE MODEL



- FOR AUSTRALIA MODEL

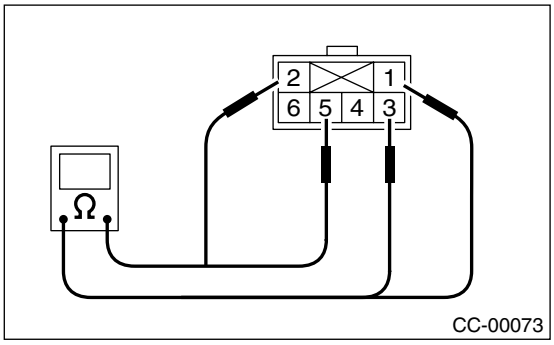


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the cruise control main switch resistance.



Switch position	Terminal No.	Standard
OFF (released)	LHD model: 1 and 2	More than 1 MΩ
ON (depressed)	RHD model: 3 and 5	Less than 1 Ω

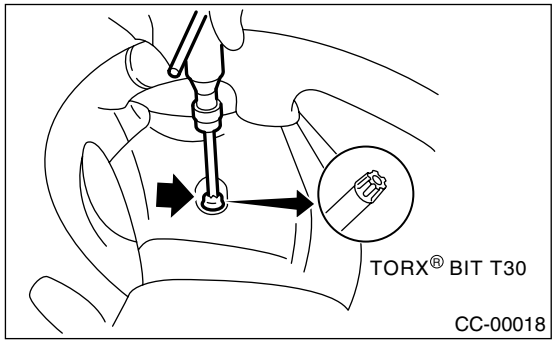
If NG, replace the cruise control main switch.

5. Cruise Control Command Switch

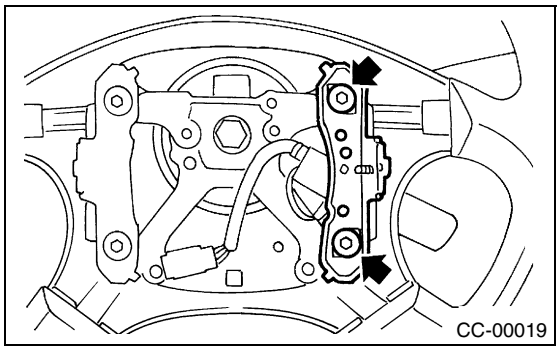
A: REMOVAL

WARNING:
Before servicing, be sure to read the notes in the AB section for proper handling of the driver's airbag module. <Ref. to AB-3, CAUTION, General Description.>

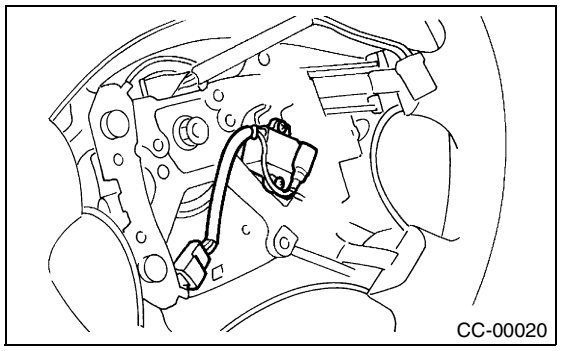
1) Set the front wheels in straight ahead position.
2) Turn the ignition switch to OFF.
3) Disconnect the ground cable from battery and wait for at least 20 seconds before starting work.
4) Using the TORX® BIT T30 (Tamper resistant type), loosen the two TORX® bolts which secure driver's airbag module.



5) Disconnect the airbag module connector on back of airbag module.
6) Remove the horn switch from steering wheel as shown.



7) Disconnect the horn and cruise control command switch connector, then remove the cruise control command switch.

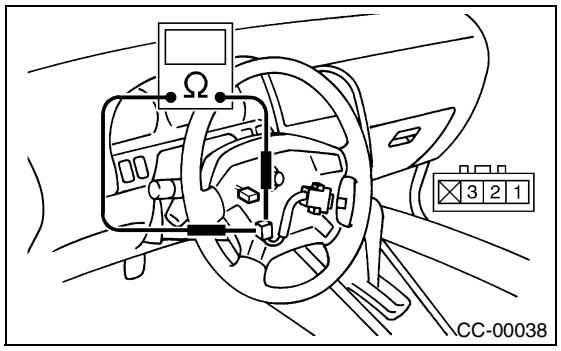


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the cruise control command switch resistance.



Switch	Position	Terminal No.	Standard
CANCEL	ON	1 (+) and 2 (–)	Less than 1 Ω
	ON	1 (+) and 3 (–)	Less than 1 Ω
SET/COAST	OFF	1 and 2	More than 1 MΩ
	ON	1 and 2	Less than 1 Ω
RESUME/ ACCEL	OFF	1 and 3	More than 1 MΩ
	ON	1 and 3	Less than 1 Ω

If NG, replace the cruise control command switch.

6. Stop and Brake Switch

A: REMOVAL

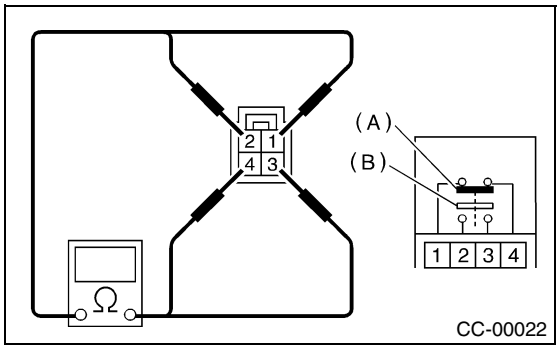
1) Disconnect the ground cable from battery.
2) Disconnect the connector from stop and brake switch, and then remove the switch. <Ref. to BR-54, REMOVAL, Stop Light Switch.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the brake switch (A) and stop light switch (B) resistance.



Switch	Pedal	Terminal No.	Standard
Brake	Released	1 and 4	Less than 1 Ω
	Depressed	1 and 4	More than 1 MΩ
Stop light	Released	2 and 3	More than 1 MΩ
	Depressed	2 and 3	Less than 1 Ω

If NG, replace the stop and brake switch.

7. Clutch Switch

A: REMOVAL

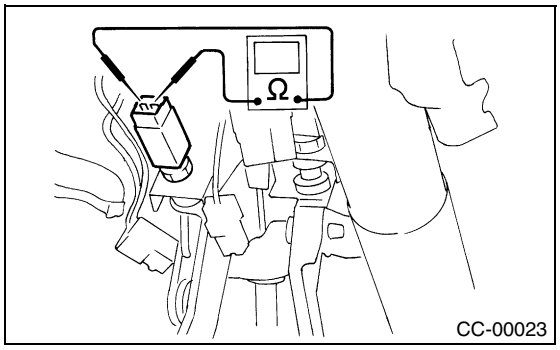
1) Disconnect the ground cable from battery.
2) Disconnect the connector from clutch switch, and then remove the switch. <Ref. to CL-37, REMOVAL, Clutch Pedal.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the clutch switch resistance.



Switch	Pedal	Terminal No.	Standard
Clutch	Released	1 and 2	Less than 1 Ω
	Depressed	1 and 2	More than 1 MΩ

If NG, replace the clutch switch.

8. Inhibitor Switch

A: REMOVAL

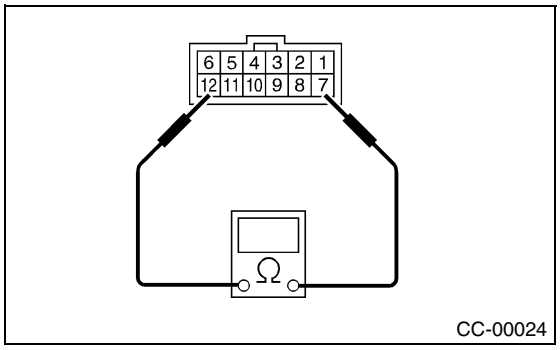
1) Disconnect the ground cable from battery.
2) Disconnect the connector from inhibitor switch, and then remove the switch. <Ref. to AT-49, REMOVAL, Inhibitor Switch.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the inhibitor switch resistance.



Selector lever position	Terminal No.	Standard
P	7 and 12	Less than 1 Ω
N		Less than 1 Ω
Except P and N		More than 1 MΩ

If NG, replace the inhibitor switch.

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

CC

Page

1. Basic Diagnostic Procedure 2
2. General Description 4
3. Electrical Components Location....6
4. Cruise Control Module I/O Signal....7
5. Subaru Select Monitor....9
6. Diagnostics Chart with Symptom 11
7. List of Diagnostic Trouble Code (DTC) 26
8. Diagnostics Chart with Trouble Code....27

1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Value	Yes	No
1	**START DIAGNOSIS.** 1)Perform the pre-inspection. <Ref. to CC-5, INSPECTION, General Description.> 2)Check the cruise control main switch operation. Is the cruise control main switch turned ON?	Cruise control main switch is turned to ON.	Go to step **2.**	Go to symptom 1. <Ref. to CC-11, SYMPTOM CHART, Diagnostics Chart with Symptom.>
2	**PREPARE SUBARU SELECT MONITOR.** Is the select monitor available?	Subaru Select Monitor is available.	Go to step **3.**	Go to step **4.**
3	**PERFORM CRUISE CANCEL CONDITIONS DIAGNOSIS.** Perform the cruise cancel conditions diagnosis. <Ref. to CC-9, Subaru Select Monitor.> Are any trouble codes indicated?	DTC is not indicated.	Go to step **4.**	Go to "List of Diagnostic Trouble Code (DTC)". <Ref. to CC-26, List of Diagnostic Trouble Code (DTC).>
4	**CHECK CRUISE CONTROL SET OPERATION.** Check the cruise control set operation. Can the cruise control be set while driving at 40 km/h (25 MPH)?	Cruise control can be set.	Go to step **5.**	Go to symptom 2. <Ref. to CC-11, SYMPTOM CHART, Diagnostics Chart with Symptom.>
5	**CHECK VEHICLE SPEED IS HELD WITHIN SET SPEED.** Make sure the vehicle speed is held within set speed. Is the vehicle speed held within set speed ±3 km/h (±2 MPH) ?	Vehicle speed is held.	Go to step **6.**	Go to symptom 3. <Ref. to CC-11, SYMPTOM CHART, Diagnostics Chart with Symptom.>
6	**CHECK RESUME/ACCEL OPERATION.** Check the RESUME/ACCEL operation. Does the vehicle speed increase or return to set speed after RESUME/ACCEL switch has been pressed?	Vehicle speed increases or returns to set speed.	Go to step **7.**	Go to symptom 4. <Ref. to CC-11, SYMPTOM CHART, Diagnostics Chart with Symptom.>
7	**CHECK SET/COAST OPERATION.** Check the SET/COAST operation. Does the vehicle speed decrease after SET/COAST switch has been pressed?	Vehicle speed decreases.	Go to step **8.**	Go to symptom 5. <Ref. to CC-11, SYMPTOM CHART, Diagnostics Chart with Symptom.>
8	**CHECK CANCEL OPERATION.** Check the CANCEL operation. Is the cruise control released after CANCEL switch has been pressed	Cruise control is released.	Go to step **9.**	Go to symptom 6. <Ref. to CC-11, SYMPTOM CHART, Diagnostics Chart with Symptom.>
9	**CHECK CRUISE CONTROL RELEASE OPERATION.** Check the cruise control release operation. Is the cruise control released after brake pedal has been depressed?	Cruise control is released.	Go to step **10.**	Go to symptom 7. <Ref. to CC-11, SYMPTOM CHART, Diagnostics Chart with Symptom.>

	Step	Value	Yes	No
10	**CHECK CRUISE CONTROL RELEASE OPERATION.** Check the cruise control release operation. Is the cruise control released after clutch pedal has been depressed? (MT vehicle)	Cruise control is released.	Finish the diagnostics.	Go to symptom 8. <Ref. to CC-11, SYMPTOM CHART, Diagnostics Chart with Symptom.>

2. General Description

A: CAUTION

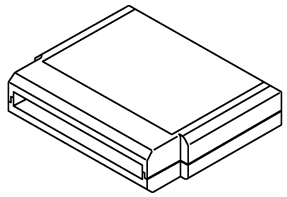
1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the cruise control module and cruise control command switch.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the cruise control module and cruise control command switch.

B: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA210	24082AA210 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.

C: INSPECTION

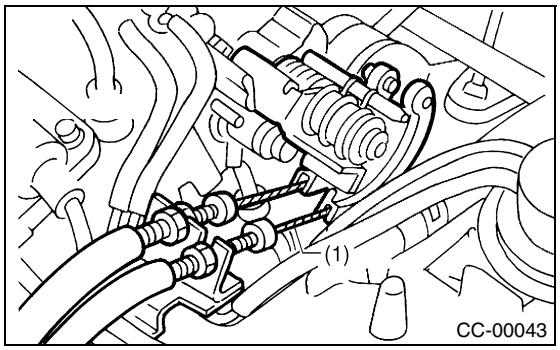
1. BATTERY

Measure the battery voltage and specific gravity of electrolyte.

Standard voltage:
12 V, or more

Specific gravity:
Above 1.260

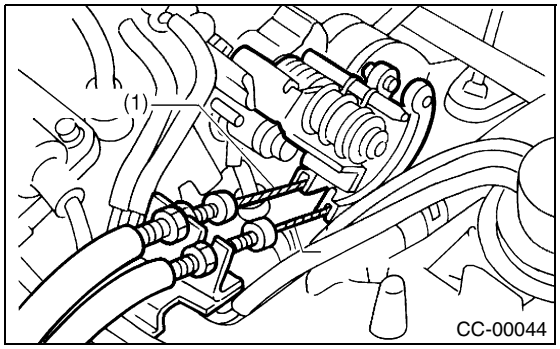
2. CRUISE CONTROL CABLE



(1) Cruise control cable

Check the cruise control cable installation.
If NG, install the cable securely.

3. ACCELERATOR CABLE



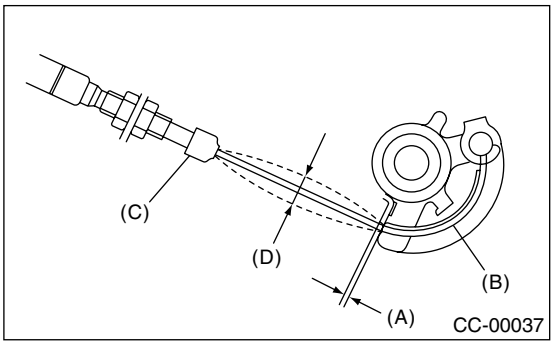
(1) Accelerator cable

Check the movement of accelerator cable when the cruise control throttle is moved by hand.
If NG, check the throttle cam.

4. THROTTLE CAM

Check that the throttle cam moves smoothly.
If NG, repair the throttle cam.

5. CABLE FREE PLAY



Check that the throttle cam-to-lever clearance (A) or cable (B) deflection amount (D) is within specifications.

Throttle cam-to-lever clearance:
0 — 1 mm (0 — 0.04 in)

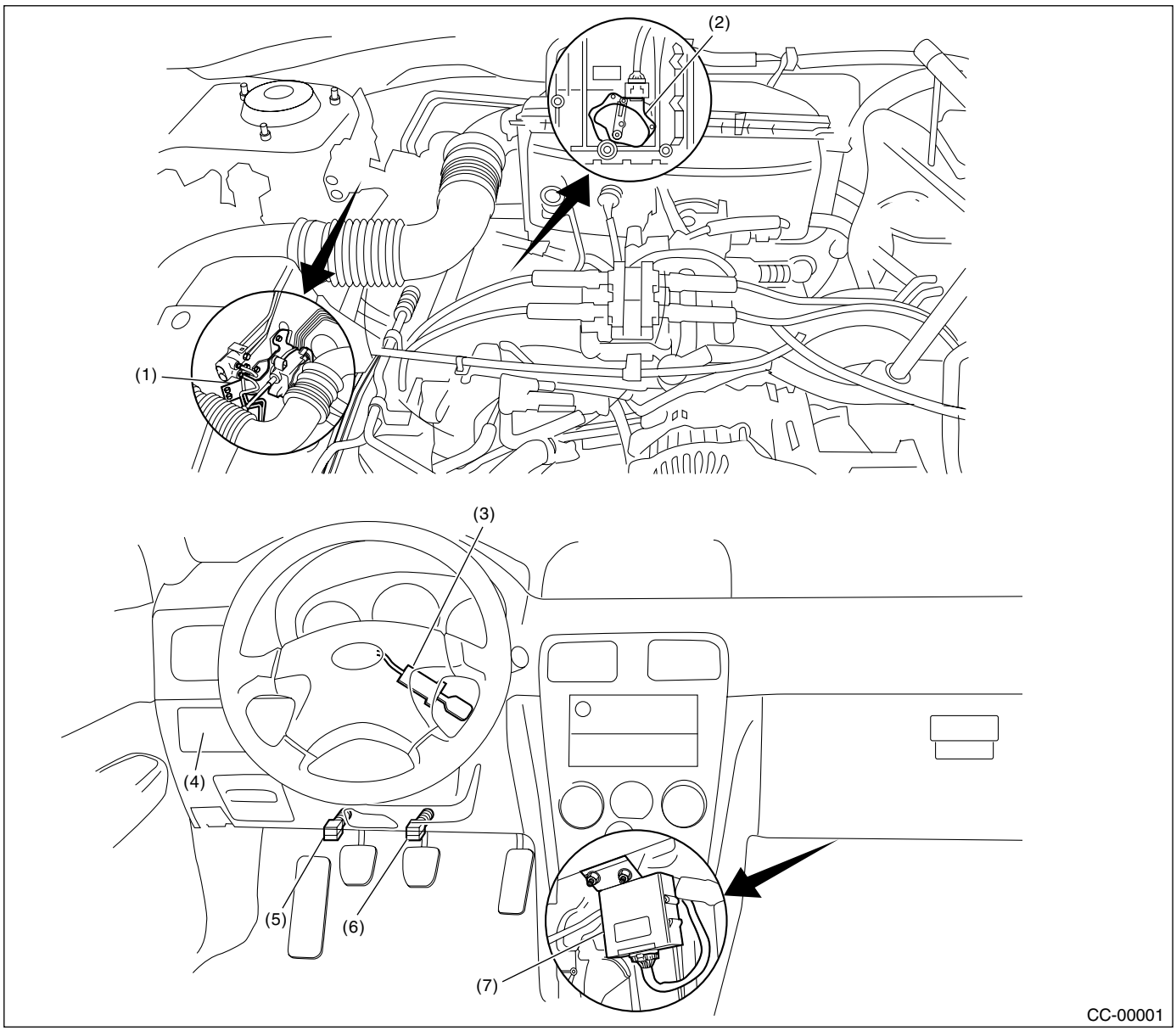
Inner cable deflection:
1 — 8 mm (0.04 — 0.31 in)

If NG, adjust the clearance with the adjust nut.

NOTE:
Check that the cap (C) is positioned in the groove.

3. Electrical Components Location

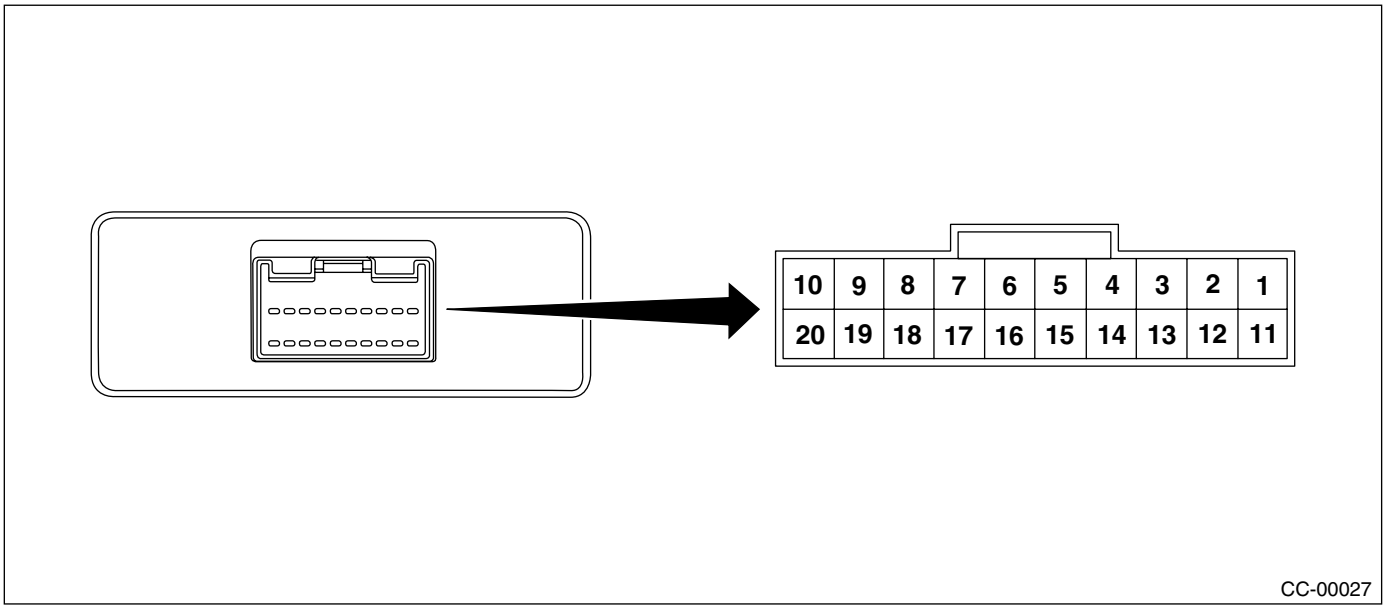
A: LOCATION



(1) Actuator
(2) Inhibitor switch (AT vehicles only)
(3) Cruise control command switch
(4) Cruise control main switch
(5) Clutch switch (MT vehicles only)
(6) Stop and brake switch
(7) Cruise control module

4. Cruise Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



Content	Terminal No.	Measuring conditions and I/O signals (ignition switch ON and engine idling)
Cruise indicator light	1	• Battery voltage is present when main switch is turned ON. • "0" volt is present when main switch is turned OFF.
Inhibitor switch (AT vehicles)	4	• Battery voltage is present when selector lever is other than "P" or "N" position. • "0" volt is present when selector lever is set to "P" or "N" position.
Motor B	5	• ON-and-OFF ("0"-and-battery voltage) operation is alternately repeated while cruise control is operating. • "0" volt is present when main switch is turned OFF.
Ground	6	—
Motor A	7	• ON-and-OFF ("0"-and-battery voltage) operation is alternately repeated while cruise control is operating. • "0" volt is present when main switch is turned OFF.
RESUME/ACCEL switch	9	• Battery voltage is present when command switch is turned to RESUME/ACCEL position. • "0" volt is present when command switch is released.
SET/COAST switch	10	• Battery voltage is present when command switch is turned to SET/COAST position. • "0" volt is present when command switch is released.
Main power supply	11	• Battery voltage is present when main power is turned ON. • "0" volt is present when main power is turned OFF.
Ignition switch	12	• Battery voltage is present when ignition switch is turned ON. • "0" volt is present when ignition switch is turned OFF.
Motor C	13	• ON-and-OFF ("0"-and-battery voltage) operation is alternately repeated while cruise control is operating. • "0" volt is present when main switch is turned OFF.
Motor clutch	14	• ON-and-OFF ("0"-and-battery voltage) operation is alternately repeated while cruise control is operating. • "0" volt is present when vehicle is stopped.
Cruise control main switch	15	• Battery voltage is present while pressing the main switch. • "0" volt is present when main switch is released.

Content	Terminal No.	Measuring conditions and I/O signals (ignition switch ON and engine idling)
Brake switch/Clutch switch (MT vehicles)	16	Leave clutch pedal released (MT vehicles), while cruise control main switch is turned ON. Then check that; • Battery voltage is present when brake pedal is released. • “0” volt is present when brake pedal is depressed. Additionally only in MT vehicle, keep the cruise control main switch to ON and leave brake pedal released. Then check that; • Battery voltage is present when clutch pedal is released. • “0” volt is present when clutch pedal is depressed.
Data link connector	17	—
Data link connector	18	—
Vehicle speed sensor (MT vehicles) TCM (AT vehicles)	19	Lift-up the vehicle until all four wheels are raised off ground, and then rotate any wheel manually. Approx. “5” and “0” volt pulse signals are alternately input to cruise control module.
Stop light switch	20	Turn ignition switch to OFF. Then check that; • Battery voltage is present when brake pedal is depressed. • “0” volt is present when brake pedal is released.
NOTE: Voltage at terminals 5, 7, 13 and 14 cannot be checked unless vehicle is driving by cruise control operation.		

B: SCHEMATIC

<Ref. to WI-112, SCHEMATIC, Cruise Control System.>

5. Subaru Select Monitor

A: OPERATION

1. GENERAL

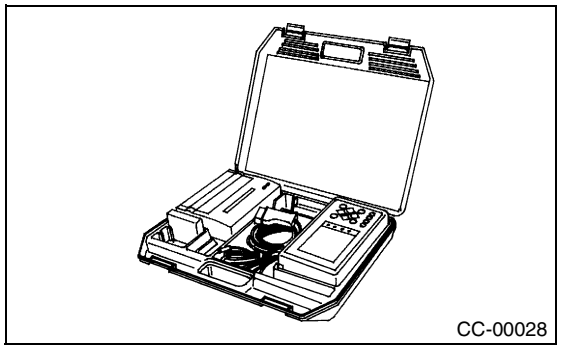
The on-board diagnosis function of the cruise control system uses an external Subaru Select Monitor.
The on-board diagnosis function operates in two categories, which are used depending on the type of problems;
1) Cruise cancel conditions diagnosis:
(1) This category of diagnosis requires actual vehicle driving in order to determine the cause, (as when cruise speed is cancelled during driving although cruise cancel condition is not entered).
(2) Cruise control module memory stores the cancel condition (Code No.) which occurred during driving. When there are plural cancel conditions (Code No.), they are shown on the Subaru Select Monitor.

CAUTION:
• The cruise control memory stores not only the cruise "cancel" which occurred (although "cancel" operation is not entered by the driver), but also the "cancel" condition input by the driver.
• The content of memory is cleared when ignition switch or cruise main switch is turned OFF.

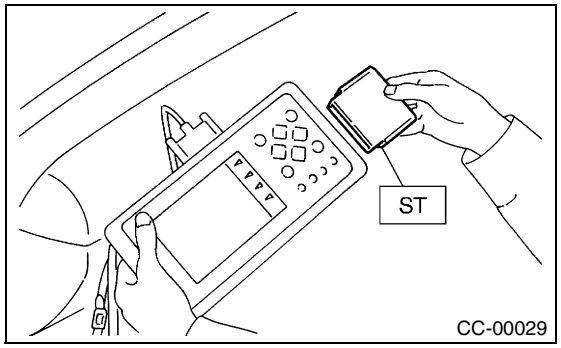
2) Real-time diagnosis:
The real-time diagnosis function is used to determine whether or not the input signal system is in good order, according to signal emitted from switches, sensors, etc.
(1) Vehicle cannot be driven at cruise speed because problem occurs in the cruise control system or its associated circuits.
(2) Monitor the signal conditions from switches and sensors.

2. CRUISE CANCEL CONDITIONS DIAGNOSIS

1) Prepare the Subaru Select Monitor kit.

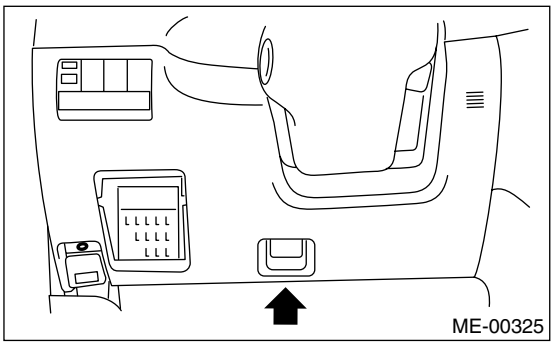

CC-00028

2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to CC-4, SPECIAL TOOLS, PREPARATION TOOL, General Description.>



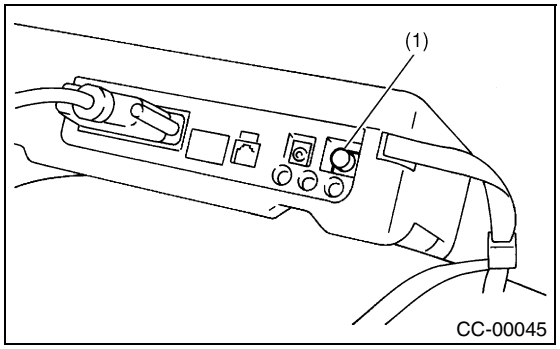
CC-00029

4) Connect the Subaru Select Monitor to data link connector.
(1) Data link connector is located in the lower portion of the instrument panel (on the driver's side).


ME-00325

(2) Connect the diagnosis cable to data link connector.
5) Start the engine and turn the cruise control main switch to ON.

6) Turn the Subaru Select Monitor switch to ON.



(1) Power switch

7) On the Main Menu display screen, select the {All System Diagnosis} and press [YES] key.

NOTE:
The diagnostic trouble code (DTC) is also shown in the {Each System Check} mode. This mode is called up on the Cruise Control Diagnosis screen by selecting the item {Cancel Code(s) Display}.

8) Drive the vehicle at least 30 km/h (19 MPH) with cruise speed set.
9) If the cruise speed is canceled itself (without doing any cancel operations), a diagnostic trouble code (DTC) will appear on select monitor display.

CAUTION:
• A diagnostic trouble code (DTC) will also appear when cruise cancel is effected by driver. Do not confuse.
• Have a co-worker ride in the vehicle to assist in diagnosis during driving.

NOTE:
Diagnostic trouble code (DTC) will be cleared by turning the ignition switch or cruise control main switch to OFF.

3. REAL-TIME DIAGNOSIS

1) Connect the select monitor.
2) Turn the ignition switch and cruise control main switch to ON.
3) Turn the Subaru Select Monitor switch to ON.
4) On the Main Menu display screen, select the {Each System Check} and press [YES] key.
5) On the System Selection Menu display screen, select the {Cruise Control} and press [YES] key.
6) Press the [YES] key after displayed the information of engine type.
7) On the Cruise Control Diagnosis display screen, select the {Current Data Display & Save} and press [YES] key.
8) Make sure that normal indication is displayed when controls are operated as indicated below:
• Depress/release the brake pedal. (Stop light switch and brake switch turn ON or OFF.)
• Turn ON or OFF the “SET/COAST” switch.
• Turn ON or OFF the “RESUME/ACCEL” switch.
• Depress/release the clutch pedal. (MT)
• Set the selector lever to P or N. (AT)

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning diagnostic trouble codes (DTCs), refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to CC-26, List of Diagnostic Trouble Code (DTC).>

6. Diagnostics Chart with Symptom

A: SYMPTOM CHART

Symptom		Repair area	Reference
1	Cruise control main switch is not turned ON.	(1) Check the power supply.	<Ref. to CC-13, CHECK POWER SUPPLY, Diagnostics Chart with Symptom.>
		(2) Check the cruise control main switch.	<Ref. to CC-15, CHECK CRUISE CONTROL MAIN SWITCH, Diagnostics Chart with Symptom.>
2	Cruise control cannot be set.	(1) Check the SET/COAST switch.	<Ref. to CC-17, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostics Chart with Symptom.>
		(2) Check the stop light switch and brake switch.	<Ref. to CC-20, CHECK STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostics Chart with Symptom.>
		(3) Check the clutch switch (MT).	<Ref. to CC-22, CHECK CLUTCH SWITCH (MT VEHICLES), Diagnostics Chart with Symptom.>
		(4) Check the inhibitor switch (AT).	<Ref. to CC-24, CHECK INHIBITOR SWITCH (AT VEHICLES), Diagnostics Chart with Symptom.>
		(5) Check the vehicle speed sensor.	<Ref. to CC-28, DTC 22 VEHICLE SPEED SENSOR, Diagnostics Chart with Trouble Code.>
		(6) Check the motor drive system.	<Ref. to CC-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(7) Check the motor clutch drive system.	<Ref. to CC-34, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>
3	Vehicle speed is not held within set speed ±3 km/h (±2 MPH).	(1) Check the vehicle speed sensor.	<Ref. to CC-28, DTC 22 VEHICLE SPEED SENSOR, Diagnostics Chart with Trouble Code.>
		(2) Check the motor drive system.	<Ref. to CC-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(3) Check the motor clutch drive system.	<Ref. to CC-34, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>
4	Vehicle speed does not increase or does not return to set speed after RESUME/ ACCEL switch has been pressed.	(1) Check the RESUME/ ACCEL switch.	<Ref. to CC-17, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostics Chart with Symptom.>
		(2) Check the motor drive system.	<Ref. to CC-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(3) Check the motor clutch drive system.	<Ref. to CC-34, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>
5	Vehicle speed does not decrease after SET/COAST switch has been pressed.	(1) Check the SET/COAST switch.	<Ref. to CC-17, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostics Chart with Symptom.>
		(2) Check the motor drive system.	<Ref. to CC-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(3) Check the motor clutch drive system.	<Ref. to CC-34, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>
6	Cruise control is not released after CANCEL switch has been pressed.	(1) Check the CANCEL switch.	<Ref. to CC-17, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostics Chart with Symptom.>
		(2) Check the motor drive system.	<Ref. to CC-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(3) Check the motor clutch drive system.	<Ref. to CC-34, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>
7	Cruise control is not released after brake pedal has been depressed.	(1) Check the stop light switch and brake switch.	<Ref. to CC-20, CHECK STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostics Chart with Symptom.>
		(2) Check the motor drive system.	<Ref. to CC-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(3) Check the motor clutch drive system.	<Ref. to CC-34, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>

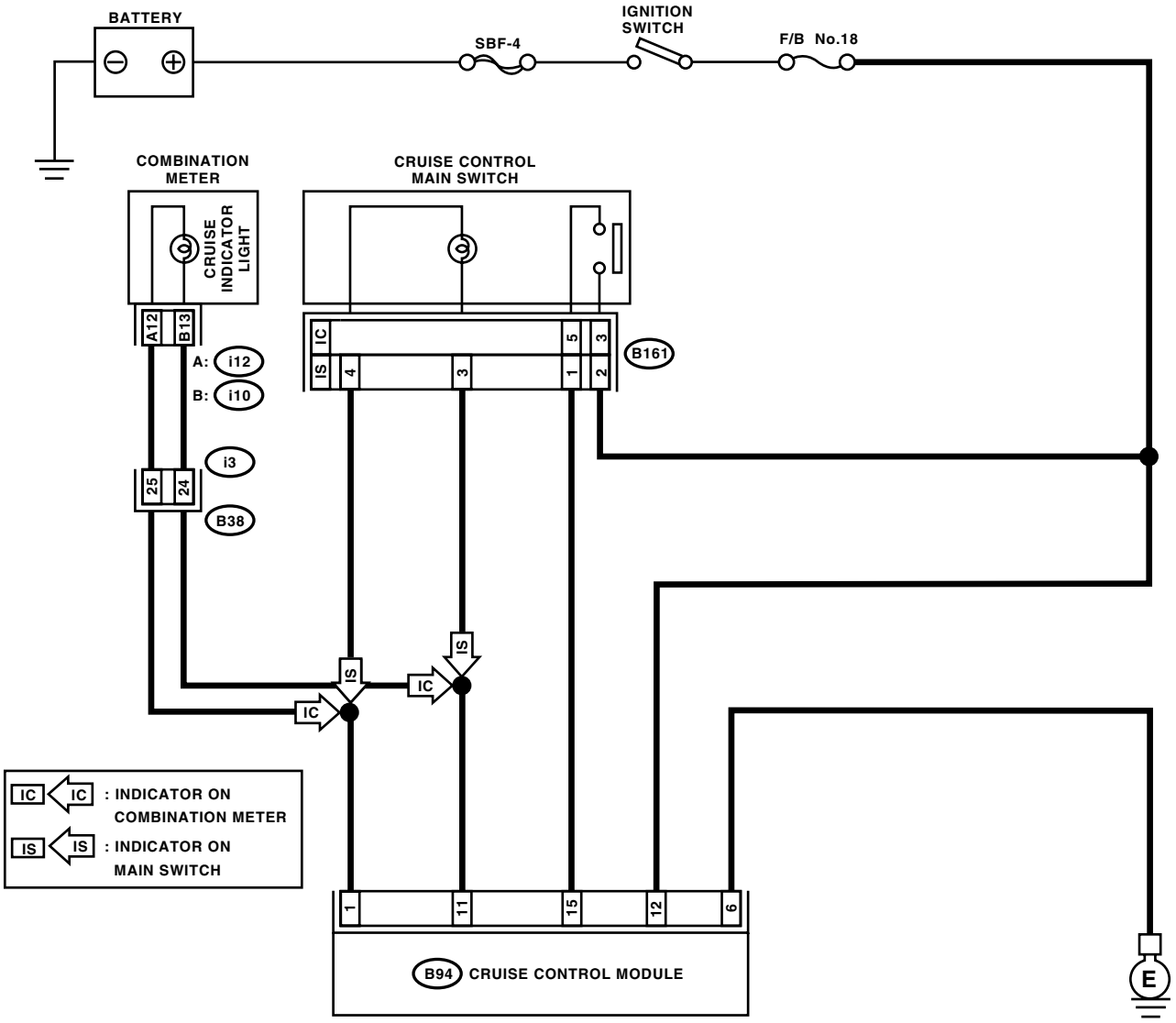
Symptom		Repair area	Reference
8	Cruise control is not released after clutch pedal has been depressed (MT).	(1) Check the clutch switch.	<Ref. to CC-22, CHECK CLUTCH SWITCH (MT VEHICLES), Diagnostics Chart with Symptom.>
		(2) Check the motor drive system.	<Ref. to CC-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(3) Check the motor clutch drive system.	<Ref. to CC-34, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>

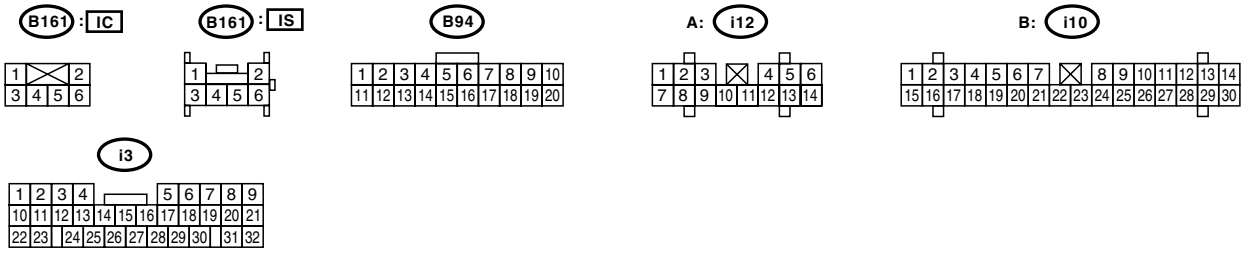
B: CHECK POWER SUPPLY

TROUBLE SYMPTOM:

Cruise control can be set normally, but indicator does not come on. (When main switch is pressed.)

WIRING DIAGRAM:





CC-00039

	Step	Value	Yes	No
1	**CHECK POWER SUPPLY.** 1)Turn the ignition switch to OFF. 2)Disconnect the cruise control module harness connector. 3)Turn the ignition switch to ON. 4)Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B94) No. 12 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **2.**	• Check the fuse No. 18 (in fuse & relay box). • Check the harness for open or short between cruise control module and fuse & relay box.
2	**CHECK GROUND CIRCUIT.** 1)Turn the ignition switch OFF. 2)Measure the resistance between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B94) No. 6 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	Power supply and ground circuit are OK.	Repair the harness.

C: CHECK CRUISE CONTROL MAIN SWITCH

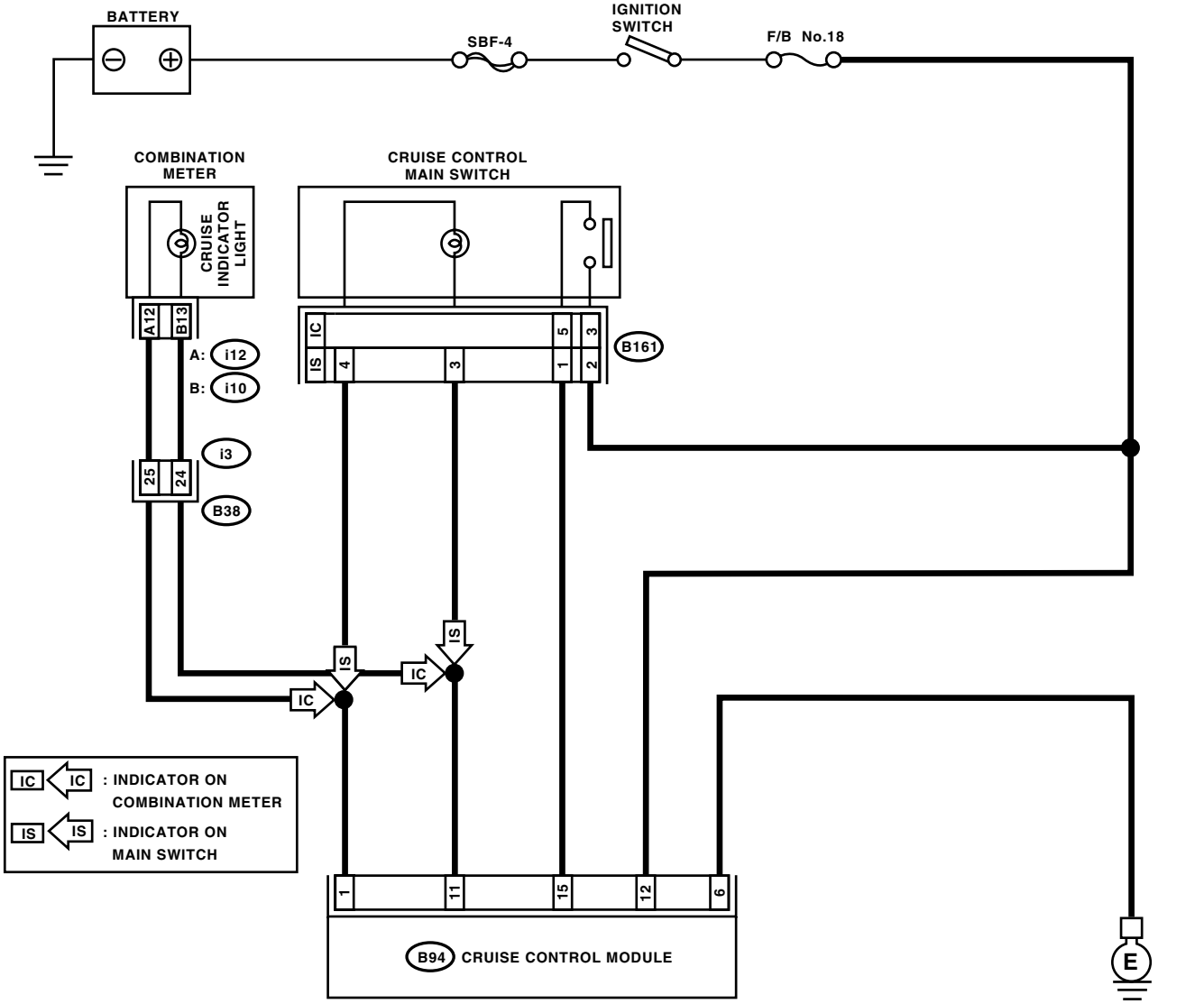
TROUBLE SYMPTOM:

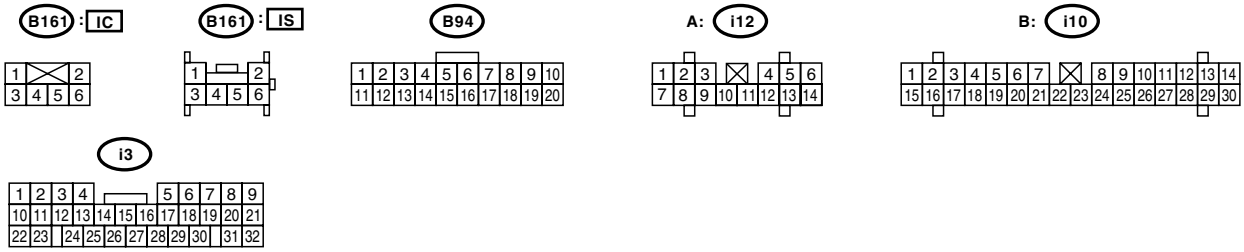
Cruise control main switch is not turned ON and cruise control cannot be set.

NOTE:

When the main relay (built-in cruise control module) operates, the main switch circuit is in normal condition.
The main relay operation can be checked by hearing the operation sound.
This operation sound will be heard when the ignition switch and cruise control main switch is turned to ON.

WIRING DIAGRAM:





CC-00039

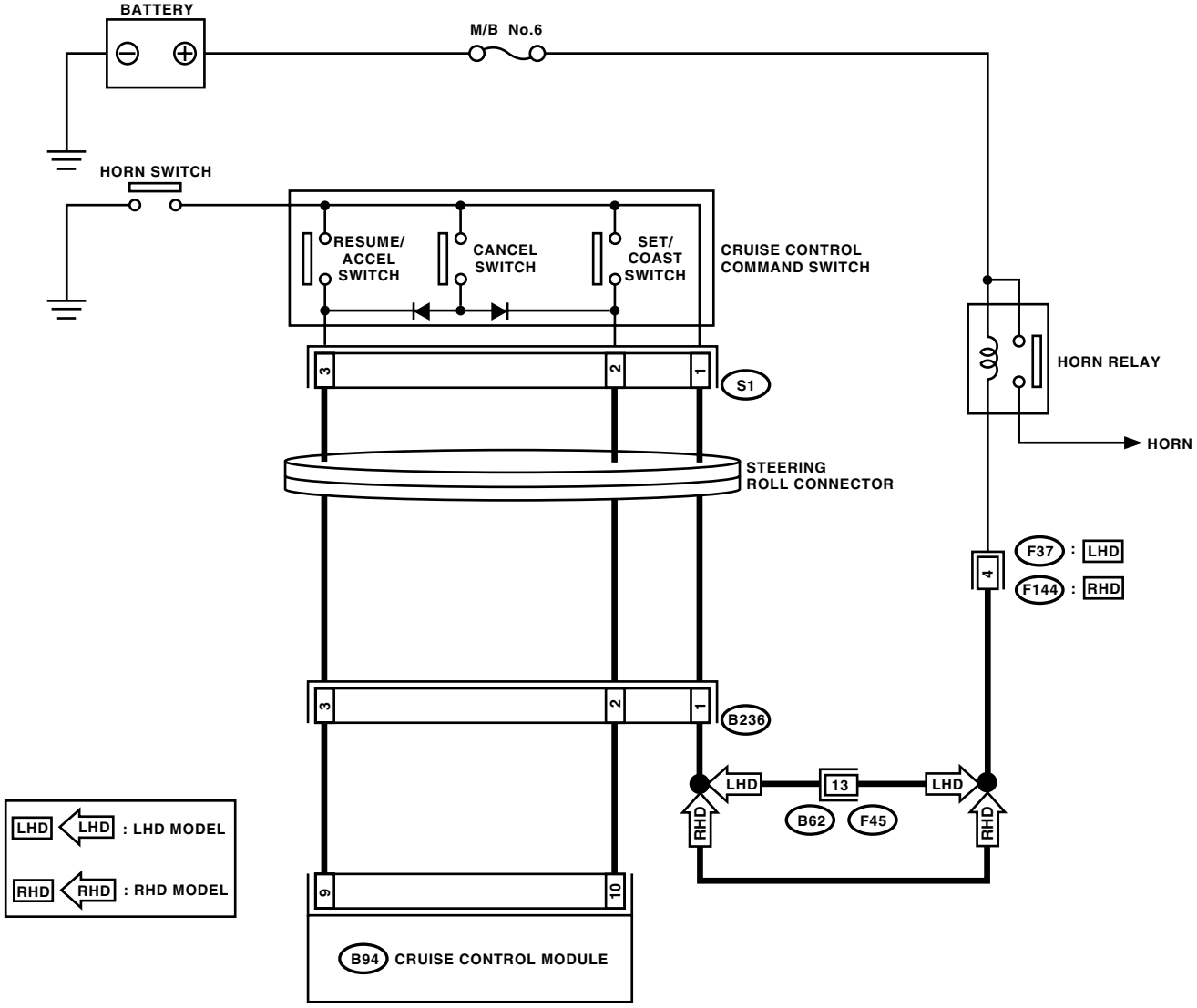
	Step	Value	Yes	No
1	**CHECK CRUISE CONTROL MAIN SWITCH CIRCUIT.** 1)Turn the ignition switch to OFF. 2)Disconnect the cruise control main switch harness connector. 3)Turn the ignition switch to ON. 4)Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***With indicator built in combination meter:*** ***(B161) No. 3 (+) — Chassis ground (–):*** ***With indicator built in main switch:*** ***(B161) No. 2 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **2.**	• Check the fuse No. 18 (in fuse & relay box). • Check the harness for open or short between cruise control main switch and fuse & relay box.
2	**CHECK CRUISE CONTROL MAIN SWITCH CIRCUIT.** 1)Turn the ignition switch OFF. 2)Disconnect the cruise control module harness connector. 3)Measure the resistance between cruise control module harness connector terminal and cruise control main switch harness connector terminal. ***Connector & terminal*** ***With indicator built in combination meter:*** ***(B94) No. 15 — (B161) No. 5:*** ***With indicator built in main switch:*** ***(B94) No. 15 — (B161) No. 1:*** Is the measured value less than specified value?	10 Ω	Go to step **3.**	Repair the harness.
3	**CHECK CRUISE CONTROL MAIN SWITCH.** Remove and check the cruise control main switch. <Ref. to CC-7, Cruise Control Main Switch.> Is the cruise control main switch OK?	Cruise control main switch is OK.	Replace the cruise control module.	Replace the cruise control main switch.

D: CHECK CRUISE CONTROL COMMAND SWITCH

TROUBLE SYMPTOM:

Cruise control cannot be set. (Cancelled immediately.)

WIRING DIAGRAM:



CC-00040

	Step	Value	Yes	No
1	**CHECK SET/COAST SWITCH CIRCUIT.** 1)Turn the ignition switch to OFF. 2)Disconnect the cruise control module harness connector. 3)Measure the voltage between harness connector terminal and chassis ground when SET/COAST switch is pressed and not pressed. ***Connector & terminal*** ***(B94) No. 10 (+) — Chassis ground (–):*** Is the measured value less than specified value when SET/COAST switch is not pressed? Is the measured value more than specified value when SET/COAST switch is pressed?	When the SET/COAST switch is not pressed: 0 V When the SET/COAST switch is pressed: 10 V	Go to step **2.**	Go to step **4.**
2	**CHECK RESUME/ACCEL SWITCH CIRCUIT.** Measure the voltage between harness connector terminal and chassis ground when RESUME/ACCEL switch is pressed and not pressed. ***Connector & terminal*** ***(B94) No. 9 (+) — Chassis ground (–):*** Is the measured value less than specified value when RESUME/ACCEL switch is not pressed? Is the measured value more than specified value when RESUME/ACCEL switch is pressed?	When the RESUME/ACCEL switch is not pressed: 0 V When the RESUME/ACCEL switch is pressed: 10 V	Go to step **3.**	Go to step **4.**
3	**CHECK CANCEL SWITCH CIRCUIT.** Measure the voltage between harness connector terminal and chassis ground when CANCEL switch is pressed and not pressed. ***Connector & terminal*** ***(B94) No. 9 (+) — Chassis ground (–):*** ***(B94) No. 10 (+) — Chassis ground (–):*** Is the measured value less than specified value when CANCEL switch is not pressed? Is the measured value more than specified value when CANCEL switch is pressed?	When the CANCEL switch is not pressed: 0 V When the CANCEL switch is pressed: 10 V	Cruise control command switch circuit is OK.	Go to step **4.**
4	**CHECK POWER SUPPLY FOR COMMAND SWITCH.** Check the horn operation. Does the horn sound?	Horn sounds.	Go to step **5.**	• Check the fuse No. 6 (in main fuse box). • Check the horn relay. <Ref. to COM-3, HORN RELAY, INSPECTION, Horn System.> • Check the harness for open or short between cruise control command switch and fuse & relay box.

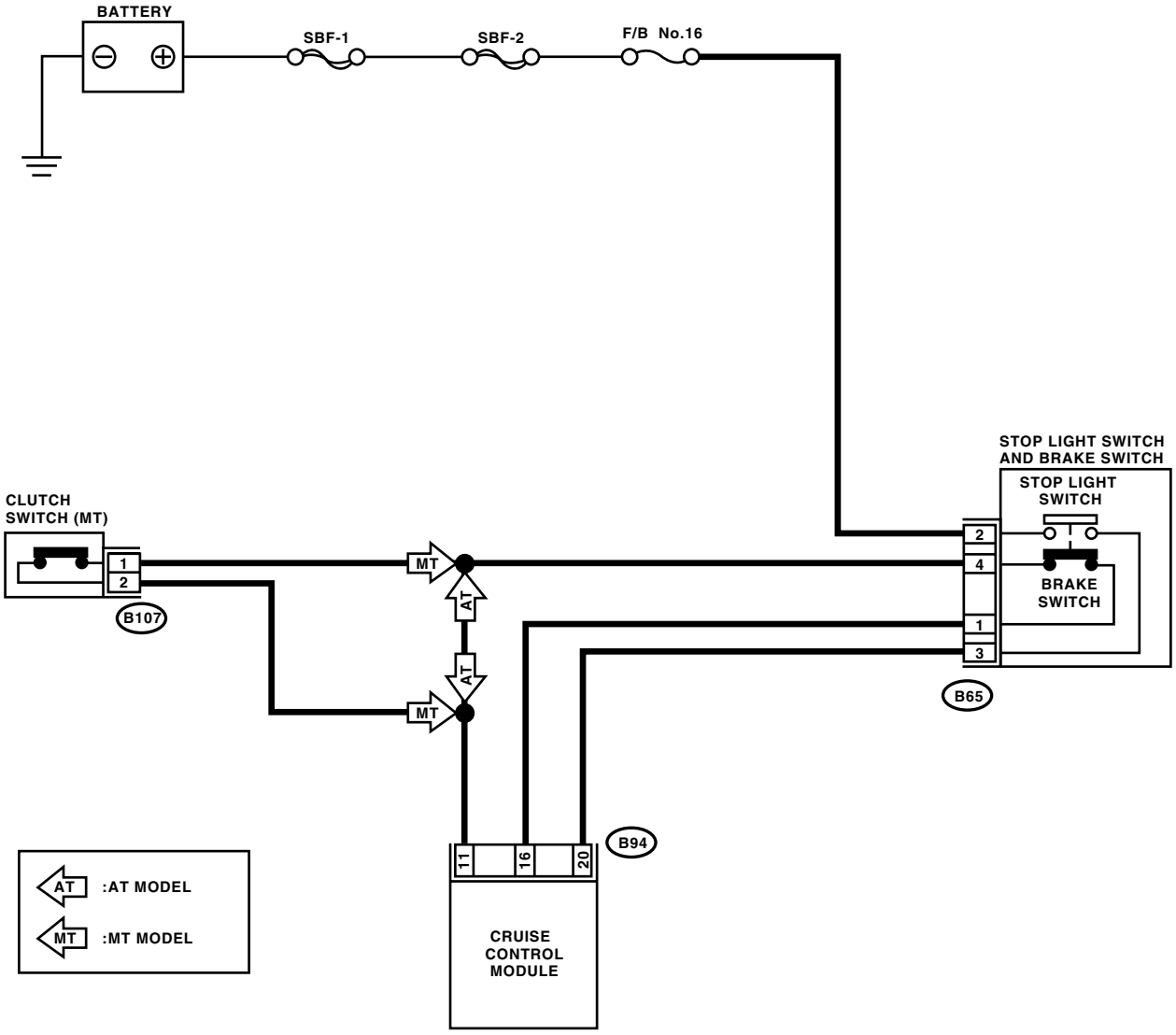
	Step	Value	Yes	No
5	**CHECK CRUISE CONTROL COMMAND SWITCH.** Remove and check the cruise control command switch. <Ref. to CC-8, Cruise Control Command Switch.> Is the cruise control command switch OK?	Cruise control command switch OK.	Check the harness between cruise control command switch and cruise control module.	Replace the cruise control command switch.

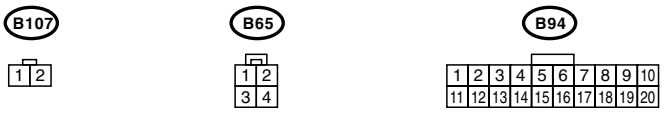
E: CHECK STOP LIGHT SWITCH AND BRAKE SWITCH

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:





CC-00033

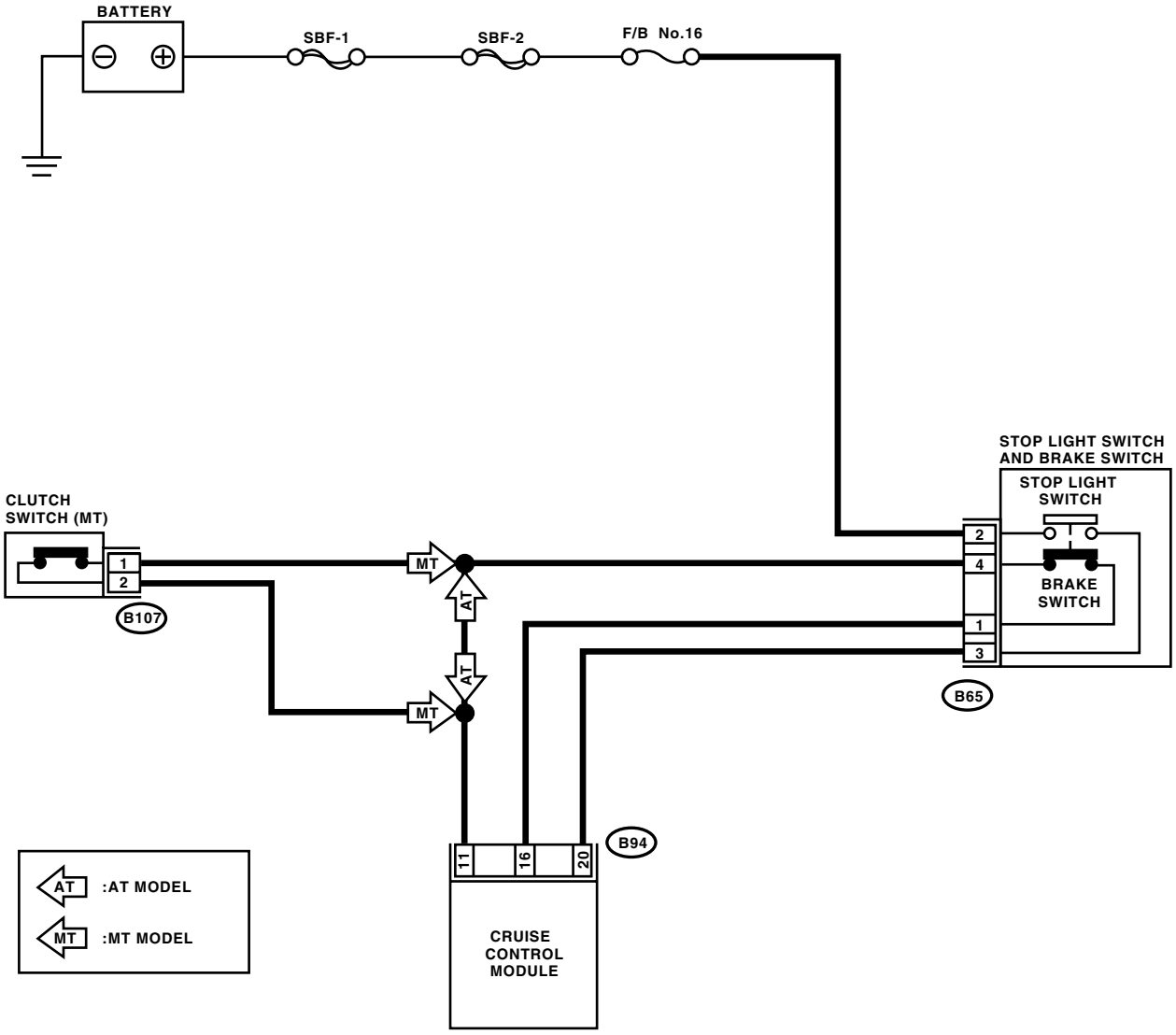
	Step	Value	Yes	No
1	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT.** 1)Turn the ignition switch to OFF. 2)Disconnect the stop light switch and brake switch harness connector. 3)Turn the ignition switch to ON. 4)Turn the cruise control main switch to ON. 5)Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B65) No. 2 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **2.**	• Check the fuse No. 16 (in fuse & relay box). • Check the harness for open or short between stop light/brake switch and fuse & relay box.
2	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT.** Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B65) No. 4 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **3.**	• Check the harness for open or short between stop light/brake switch and cruise control module (AT). • Check the clutch switch and circuit (MT).
3	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT.** 1)Turn the cruise control main switch and ignition switch to OFF. 2)Disconnect the cruise control module harness connector. 3)Measure the resistance between cruise control module harness connector terminal and stop light switch and brake switch harness connector terminal. ***Connector & terminal*** ***(B94) No. 20 — (B65) No. 3:*** ***(B94) No. 16 — (B65) No. 1:*** Is the measured value less than specified value?	10 Ω	Go to step **4.**	Repair the harness.
4	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH.** Remove and check the stop light switch and brake switch. <Ref. to CC-9, Stop and Brake Switch.> Are the stop light switch and brake switch OK?	Stop light switch and brake switch are OK.	Stop light switch and brake switch circuit are OK.	Replace the stop light switch and brake switch.

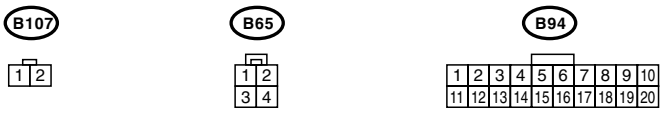
F: CHECK CLUTCH SWITCH (MT VEHICLES)

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:





CC-00033

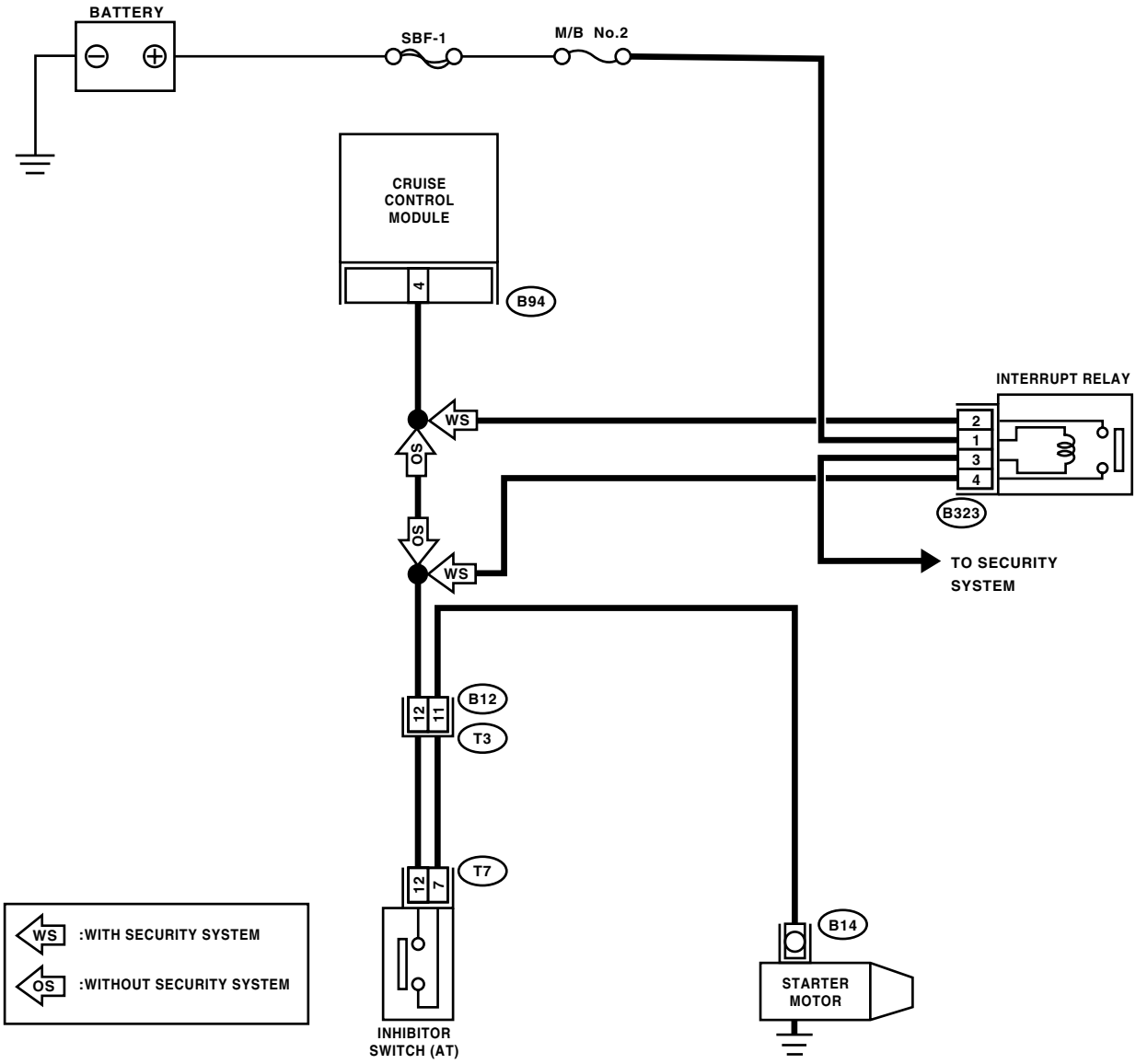
	Step	Value	Yes	No
1	**CHECK CLUTCH SWITCH CIRCUIT.** 1)Turn the ignition switch to OFF. 2)Disconnect the clutch switch harness connector. 3)Turn the ignition switch to ON. 4)Turn the cruise control main switch to ON. 5)Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B107) No. 2 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **2.**	Check the harness for open or short between clutch switch and cruise control module.
2	**CHECK CLUTCH SWITCH CIRCUIT.** 1)Turn the cruise control main switch and ignition switch OFF. 2)Disconnect the stop light switch and brake switch harness connector. 3)Measure the resistance between clutch switch harness connector terminal and stop light switch and brake switch harness connector terminal. ***Connector & terminal*** ***(B107) No. 1 — (B65) No. 4:*** Is the measured value less than specified value?	10 Ω	Go to step **3.**	Repair the harness.
3	**CHECK CLUTCH SWITCH.** Remove and check the clutch switch. <Ref. to CC-10, Clutch Switch.> Is the clutch switch OK?	Clutch switch is OK.	Clutch switch circuit is OK.	Replace the clutch switch.

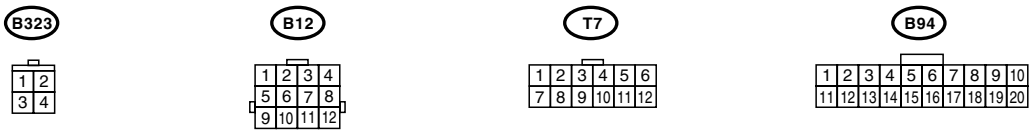
G: CHECK INHIBITOR SWITCH (AT VEHICLES)

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:





CC-00041

	Step	Value	Yes	No
1	**CHECK INHIBITOR SWITCH CIRCUIT.** 1)Turn the ignition switch to OFF. 2)Disconnect the inhibitor switch harness connector. 3)Turn the ignition switch to ON. 4)Turn the cruise control main switch to ON. 5)Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(T7) No. 12 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **2.**	Check the harness for open or short between inhibitor switch and cruise control module.
2	**CHECK INHIBITOR SWITCH CIRCUIT.** 1)Turn the cruise control main switch and ignition switch to OFF. 2)Disconnect the starter motor harness connector. 3)Measure the resistance between inhibitor switch harness connector terminal and starter motor harness connector terminal. ***Connector & terminal*** ***(T7) No. 7 — (B14) No. 1:*** Is the measured value less than specified value?	10 Ω	Go to step **3.**	Repair the harness.
3	**CHECK INHIBITOR SWITCH.** Remove and check the inhibitor switch. <Ref. to CC-11, Inhibitor Switch.> Is the inhibitor switch OK?	Inhibitor switch is OK.	Inhibitor switch circuit is OK.	Replace the inhibitor switch.

7. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Contents of diagnosis	Reference
21	Inner relay is seized.	Cruise control module inner relay is seized when main switch is OFF.	<Ref. to CC-27, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostics Chart with Trouble Code.>
22	Vehicle speed sensor	Vehicle speed signal changes more than 10 km/h (6 MPH) within 350 ms.	<Ref. to CC-28, DTC 22 VEHICLE SPEED SENSOR, Diagnostics Chart with Trouble Code.>
24	Cruise control module is abnormal.	Two vehicle speed values stored in cruise control module memory are not the same.	<Ref. to CC-27, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostics Chart with Trouble Code.>
25	Cruise control module is abnormal.	Two output values stored in cruise control module memory are not the same.	<Ref. to CC-27, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostics Chart with Trouble Code.>
28	Wiring harness opened.	Open wiring harness circuit is detected via control module relay when main switch is ON.	<Ref. to CC-31, DTC 28 WIRING HARNESS OPENED., Diagnostics Chart with Trouble Code.>
35	Motor drive system is abnormal.	• Motor output circuit is open or shorted. • Motor drive circuit is open or shorted.	<Ref. to CC-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
36	Trouble of motor turning speed	Motor turning speed is low.	<Ref. to CC-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
37	Motor clutch drive system is abnormal.	• Motor clutch output circuit is open or shorted. • Motor clutch drive circuit is open or shorted.	<Ref. to CC-34, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>
38	Motor drive shaft does not engage properly.	Motor drive gear engagement is not properly adjusted.	<Ref. to CC-36, DTC 38 MOTOR DRIVE SHAFT DOES NOT ENGAGE PROPERLY., Diagnostics Chart with Trouble Code.>
39	Motor is overloaded.	Current flows through motor more frequently than under normal conditions.	<Ref. to CC-36, DTC 39 MOTOR IS OVERLOADED., Diagnostics Chart with Trouble Code.>
2A	Cruise control module is abnormal.	Cruise control module self-diagnosis function senses abnormality.	<Ref. to CC-27, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostics Chart with Trouble Code.>

8. Diagnostics Chart with Trouble Code

A: DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM

DIAGNOSIS:

• Poor welding of built-in relay of cruise control module.

• Failure of built-in CPU RAM of cruise control module.

TROUBLE SYMPTOM:

• Cruise control is canceled and memorized cruise speed is also canceled.

• Once cruise control is canceled, cruise control cannot be set until the ignition switch and cruise control main switch turns OFF, and then turns ON again.

NOTE:

Check input/output signal and vehicle speed signal with select monitor. When signals are in good condition, failure is in cruise control module. (Check the power supply and ground conditions of cruise control module.)

B: DTC 22 VEHICLE SPEED SENSOR

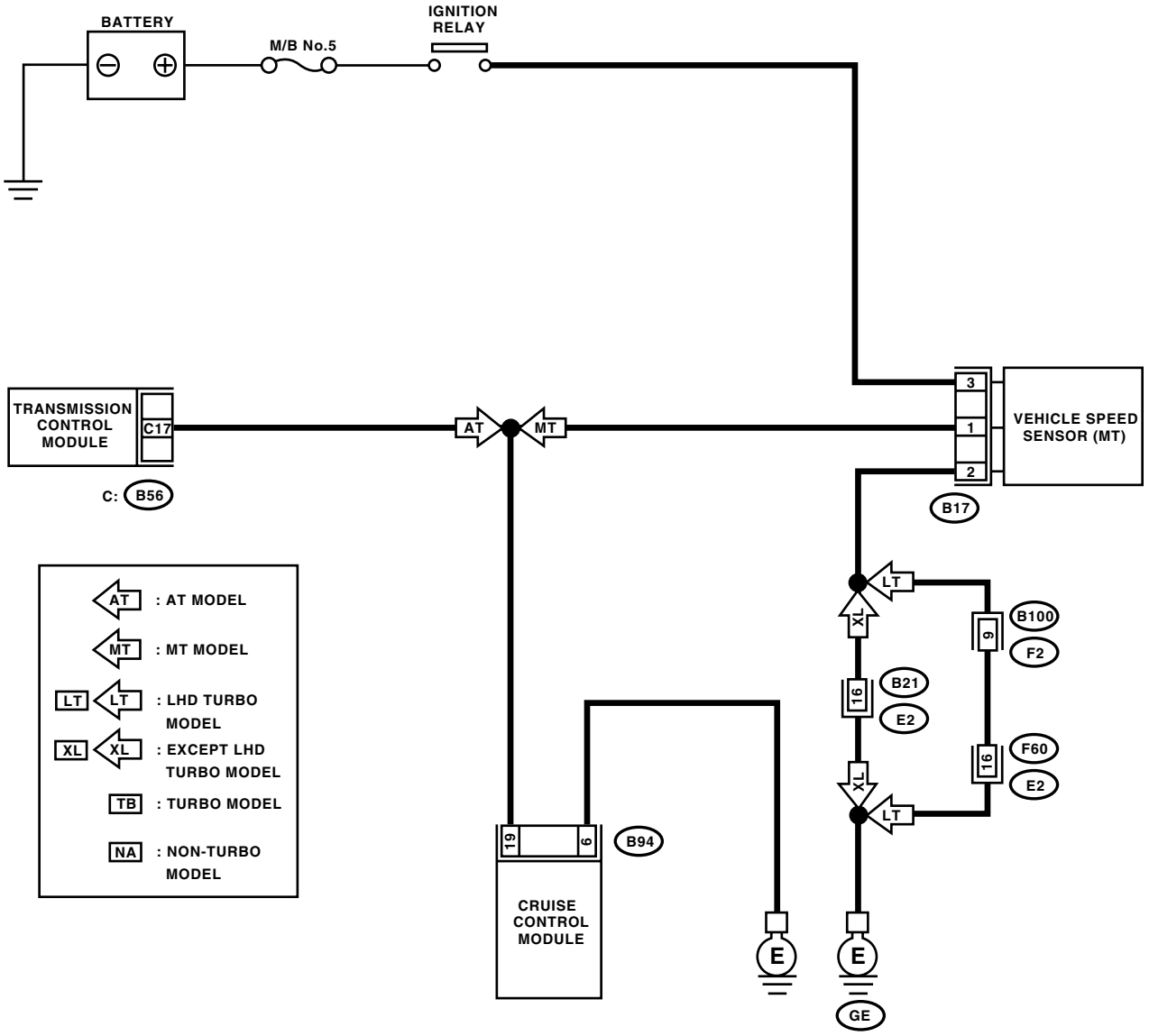
DIAGNOSIS:

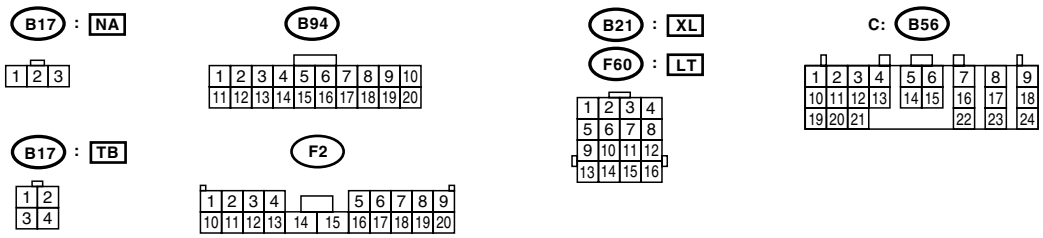
Disconnection or short circuit of vehicle speed sensor system.

TROUBLE SYMPTOM:

Cruise control cannot be set. (Cancelled immediately.)

WIRING DIAGRAM:





CC-00042

	Step	Value	Yes	No
1	**CHECK TRANSMISSION TYPE.** Is the target MT vehicle?	Target is MT vehicle.	Go to step **2.**	Go to step **6.**
2	**CHECK HARNESS BETWEEN BATTERY AND VEHICLE SPEED SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the harness connector from vehicle speed sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between vehicle speed sensor harness connector terminal and chassis ground. ***Connector & terminal*** ***(B17) No. 3 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **3.**	Check the harness for open or short between ignition relay and vehicle speed sensor.
3	**CHECK HARNESS BETWEEN CRUISE CONTROL MODULE AND VEHICLE SPEED SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the harness connector from cruise control module. 3)Measure the resistance between vehicle speed sensor harness connector terminal and cruise control module harness connector terminal. ***Connector & terminal*** ***(B17) No. 1 — (B94) No. 19:*** Is the measured value less than specified value?	10 Ω	Go to step **4.**	Repair the harness.
4	**CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ENGINE GROUND.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between vehicle speed sensor harness connector terminal and engine ground. ***Connector & terminal*** ***(B17) No. 2 — Engine ground:*** Is the measured value less than specified value?	10 Ω	Go to step **5.**	Repair the harness.
5	**CHECK VEHICLE SPEED SENSOR.** 1)Connect the harness connector to vehicle speed sensor. 2)Lift-up the vehicle and support with safety stands. 3)Drive the vehicle at speed greater than 20 km/h (12 MPH). **Warning:** **Be careful not to be caught up by the running wheels.** 4)Measure the voltage between cruise control module harness connector terminal and chassis ground. ***Connector & terminal*** ***(B94) No. 19 (+) — Chassis ground (–):*** Is the measured value as same as specified value?	0 ←→ 5 V	Replace the cruise control module. <Ref. to CC-6, Cruise Control Module.>	Replace the vehicle speed sensor.

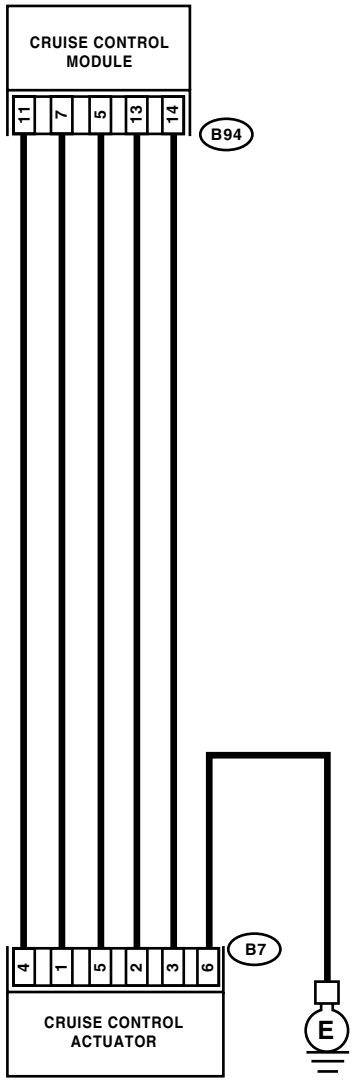
	Step	Value	Yes	No
6	**CHECK HARNESS BETWEEN CRUISE CONTROL MODULE AND TRANSMISSION CONTROL MODULE.** 1)Turn the ignition switch to OFF. 2)Disconnect the harness connector from transmission control module and cruise control module. 3)Measure the resistance between cruise control module harness connector terminal and transmission control module harness connector terminal. ***Connector & terminal (B94) No. 19 — (B56) No. 17:*** Is the measured value less than specified value?	10 Ω	Go to step **7.**	Repair the harness.
7	**CHECK TRANSMISSION CONTROL MODULE.** 1)Connect the harness connector to transmission control module. 2)Lift-up the vehicle and support with safety stands. 3)Drive the vehicle faster than 10 km/h (6 MPH). **Warning:** **Be careful not to be caught by the running wheels.** 4)Measure the voltage between transmission control module harness connector terminal and chassis ground. ***Connector & terminal (B56) No. 17 (+) — Chassis ground (–):*** Is the measured value as same as specified value?	0 ←→ 5 V	Replace the cruise control module. <Ref. to CC-6, Cruise Control Module.>	Replace the transmission control module. <Ref. to AT-70, Transmission Control Module (TCM).>

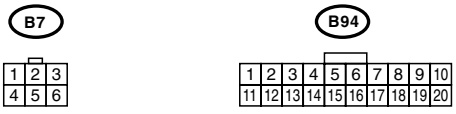
C: DTC 28 WIRING HARNESS OPENED.

	Step	Value	Yes	No
1	**CHECK BATTERY.** Measure the battery specific gravity of electrolyte. Is the measured value more than specified value?	1.250	Go to step **2.**	Charge or replace the battery. Go to step **2.**
2	**CHECK FUSES, CONNECTORS AND HARNESSES.** Check the condition of fuses, and harnesses and connectors. Also check for proper grounding. Is there anything unusual about the appearance of fuse, harness, connector and grounding?	Fuse, harness, connector and grounding are OK.	End of inspection.	Repair or replace the faulty parts.

D: DTC 35 AND 36 ACTUATOR MOTOR

DIAGNOSIS:
Open or poor contact of cruise control actuator motor.
TROUBLE SYMPTOM:
Cruise control cannot be set. (Cancelled immediately.)
WIRING DIAGRAM:



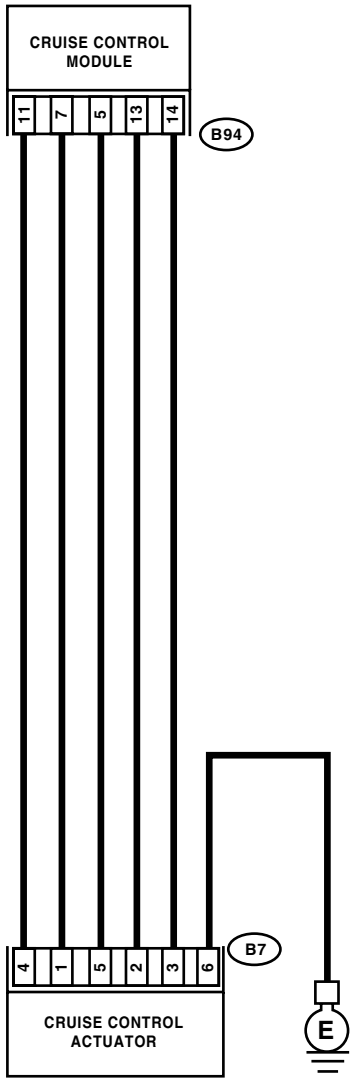


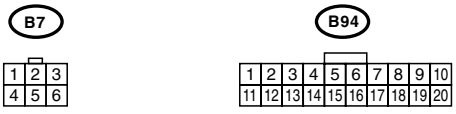
CC-00036

	Step	Value	Yes	No
1	**CHECK POWER SUPPLY.** 1)Turn the ignition switch to OFF. 2)Disconnect the harness connector from cruise control actuator. 3)Turn the ignition switch to ON. 4)Turn the cruise control main switch to ON. 5)Measure the voltage between cruise control actuator harness connector terminal and chassis ground. ***Terminals*** ***(B7) No. 4 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **2.**	Check the harness for open or short between cruise control module and cruise control actuator.
2	**CHECK GROUND CIRCUIT OF ACTUATOR.** 1)Turn the ignition switch and cruise control main switch to OFF. 2)Measure the resistance between cruise control actuator harness connector terminal and chassis ground. ***Terminals*** ***(B7) No. 6 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	Go to step **3.**	Repair the harness.
3	**MEASURE RESISTANCE OF ACTUATOR.** Measure the resistance of cruise control actuator motor. ***Terminals*** ***No. 4 — No. 1:*** ***No. 4 — No. 2:*** ***No. 4 — No. 5:*** Is the measured value as same as specified value?	Approx. 5 Ω	Go to step **4.**	Replace the cruise control actuator. <Ref. to CC-4, Actuator.>
4	**CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE.** 1)Disconnect the harness connector from cruise control module. 2)Measure the resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal. ***Connector & terminal*** ***(B7) No. 1 — (B94) No. 7:*** Is the measured value less than specified value?	10 Ω	Go to step **5.**	Repair the harness.
5	**CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE.** Measure the resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal . ***Connector & terminal*** ***(B7) No. 5 — (B94) No. 5:*** Is the measured value less than specified value?	10 Ω	Replace the cruise control module. <Ref. to CC-6, Cruise Control Module.>	Repair the harness.

E: DTC 37 ACTUATOR MOTOR CLUTCH

DIAGNOSIS:
Open or poor contact of cruise control actuator motor clutch.
TROUBLE SYMPTOM:
Cruise control cannot be set. (Cancelled immediately.)
WIRING DIAGRAM:





CC-00036

	Step	Value	Yes	No
1	**CHECK POWER SUPPLY.** 1)Turn the ignition switch to OFF. 2)Disconnect the harness connector from cruise control actuator. 3)Turn the ignition switch to ON. 4)Turn the cruise control main switch to ON. 5)Measure the voltage between cruise control actuator harness connector terminal and chassis ground. ***Terminals*** ***(B7) No. 4 (+) — Chassis ground (–):*** Is the measured value more than specified value?	10 V	Go to step **2.**	Check the harness for open or short between cruise control module and cruise control actuator.
2	**CHECK GROUND CIRCUIT OF ACTUATOR.** 1)Turn the ignition switch and cruise control main switch to OFF. 2)Measure the resistance between cruise control actuator harness connector terminal and chassis ground. ***Terminals*** ***(B7) No. 6 — Chassis ground:*** Is the measured value less than specified value?	10 Ω	Go to step **3.**	Repair the harness.
3	**MEASURE RESISTANCE OF ACTUATOR CLUTCH.** Measure the resistance of cruise control actuator clutch. ***Terminals*** ***No. 3 — No. 6:*** Is the measured value as same as specified value?	Approx. 39 Ω	Go to step **4.**	Replace the cruise control actuator. <Ref. to CC-4, Actuator.>
4	**CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE.** 1)Disconnect the harness connector from cruise control module. 2)Measure the resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal. ***Connector & terminal*** ***(B7) No. 2 — (B94) No. 13:*** Is the measured value less than specified value?	10 Ω	Go to step **5.**	Repair the harness.
5	**CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE.** Measure the resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal. ***Connector & terminal*** ***(B7) No. 3 — (B94) No. 14:*** Is the measured value less than specified value?	10 Ω	Replace the cruise control module. <Ref. to CC-6, Cruise Control Module.>	Repair the harness.

F: DTC 38 MOTOR DRIVE SHAFT DOES NOT ENGAGE PROPERLY.

	Step	Value	Yes	No
1	**CHECK ACTUATOR MOTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the harness connector from cruise control actuator. 3)Remove the cruise control actuator from mounting bracket. 4)Pull the cable by hand to check for looseness or status of inner gear engagement. Are foreign particles caught in the inner gear or does inner gear engage and disengage improperly?	Cable and inner gear are OK.	Replace the cruise control actuator. <Ref. to CC-4, Actuator.>	Check the cruise control cable adjustment.<Ref. to CC-5, CABLE FREE PLAY, General Description.>

G: DTC 39 MOTOR IS OVERLOADED.

	Step	Value	Yes	No
1	**CHECK THE OPERATING CURRENT TO ACTUATOR MOTOR.** 1)Connect the Subaru Select Monitor to data link connector. 2)Try to drive the vehicle while operating the cruise control system. 3)Measure the operation current to the cruise control actuator motor. ***Connector & terminal*** ***(B7) No. 4 — Chassis ground:*** Is the measured value more than specified value?	10 A	Replace the cruise control module. <Ref. to CC-6, Cruise Control Module.>	Check the power supply circuit. <Ref. to CC-13, CHECK POWER SUPPLY, Diagnostics Chart with Symptom.>

WIRING SYSTEM SECTION

WIRING SYSTEM WI

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FUJI HEAVY INDUSTRIES LTD. G8070GE7

WIRING SYSTEM

WI

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1. Basic Diagnostics Procedure

A: BASIC PROCEDURES

1. GENERAL

The most important purpose of diagnostics is to determine which part is malfunctioning quickly, to save time and labor.

2. IDENTIFICATION OF TROUBLE SYMPTOM

Determine what the problem is based on the symptom.

3. PROBABLE CAUSE OF TROUBLE

Look at the wiring diagram and check the system's circuit. Then check the switch, relay, fuse, ground, etc.

4. LOCATION AND REPAIR OF TROUBLE

1) Using the diagnostics narrow down the causes.
2) If necessary, use a voltmeter, ohmmeter, etc.
3) Before replacing certain component parts (switch, relay, etc.), check the power supply, ground, for open wiring harness, poor connectors, etc. If no problems are encountered, check the component parts.

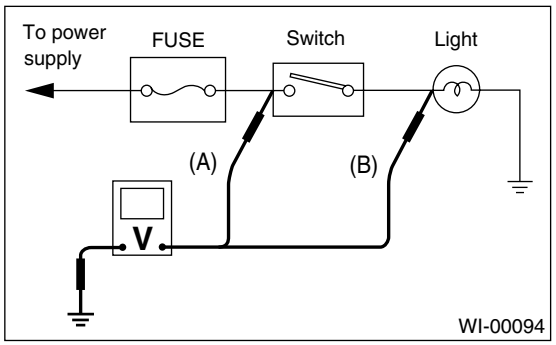
5. CONFIRMATION OF SYSTEM OPERATION

After repairing, ensure that the system operates properly.

B: BASIC INSPECTION

1. VOLTAGE MEASUREMENT

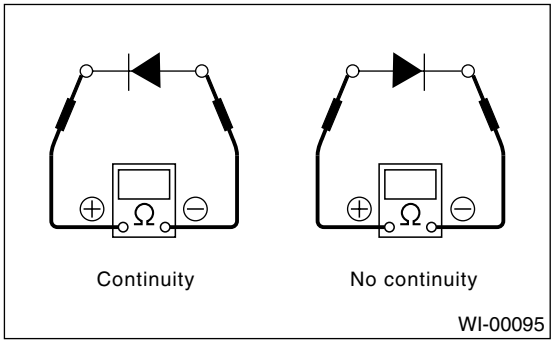
1) Using a voltmeter, connect the negative lead to a good ground point or negative battery terminal and the positive lead to the connector or component terminal.
2) Contact the positive probe of the voltmeter on connector (A).
The voltmeter will indicate a voltage.
3) Shift the positive probe to connector (B). The voltmeter will indicate no voltage.



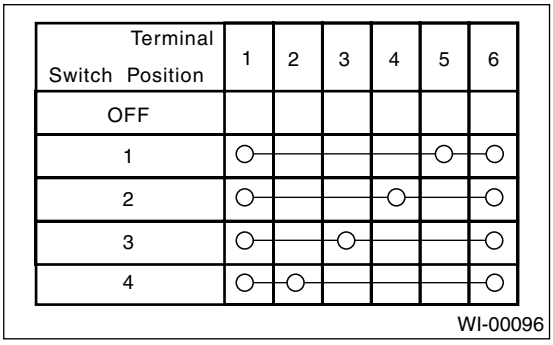
4) With test set-up held as it is, turn switch ON. The voltmeter will indicate a voltage and, at the same time, the light will come on.
5) The circuit is in good order. If a problem such as a lamp failing to light occurs, use the procedures outlined above to track down the malfunction.

2. CIRCUIT CONTINUITY CHECKS

1) Disconnect the battery terminal or connector so there is no voltage between the check points.
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.
2) Use an ohmmeter to check for diode continuity.
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.



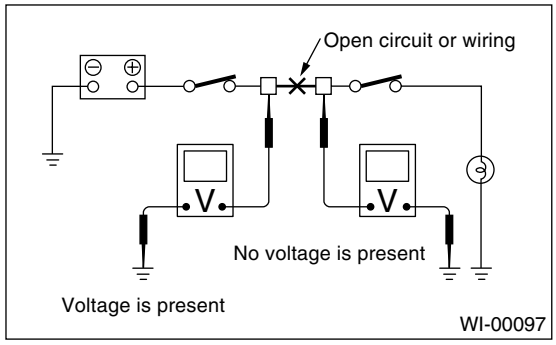
3) Symbol "❍—❍" indicates that continuity exists between two points or terminals. For example, when a switch position is "3", continuity exists among terminals 1, 3 and 6, as shown in table below.



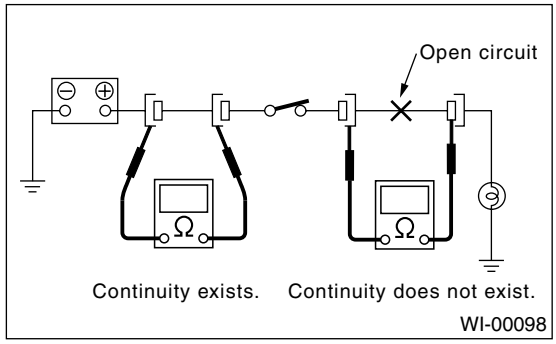
Terminal / Switch Position	1	2	3	4	5	6
OFF						
1	○				○	○
2	○			○		○
3	○		○			○
4	○	○				○

3. HOW TO DETERMINE AN OPEN CIRCUIT

1) Voltmeter Method:
An open circuit is determined by measuring the voltage between respective connectors and ground using a voltmeter, starting with the connector closest to the power supply. The power supply must be turned ON so that current flows in the circuit. If voltage is not present between a particular connector and ground, the circuit between that connector and the previous connector is open.

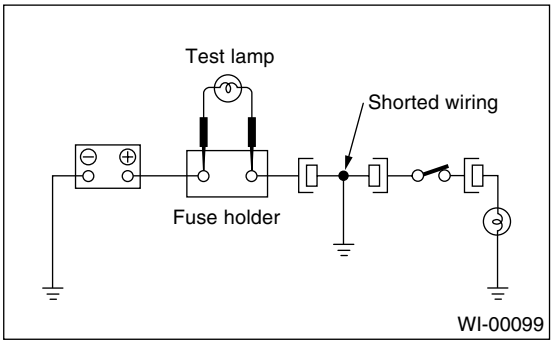


2) Ohmmeter method:
Disconnect all connectors affected, and check continuity in the wiring between adjacent connectors. When the ohmmeter indicates “infinite”, the wiring is open.

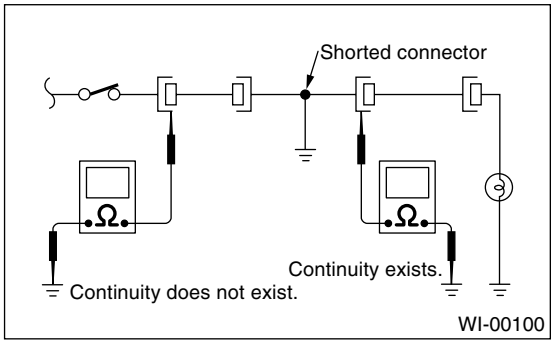


4. HOW TO DETERMINE A SHORT CIRCUIT

1) Test lamp method:
Connect a test lamp (rated at approximately 3 watts) in place of the blown fuse and allow current to flow through the circuit. Disconnect one connector at a time from the circuit, starting with the one located farthest from the power supply. If the test lamp goes out when a connector is disconnected, the wiring between that connection and the next connector (farther from the power supply) is shorted.



2) Ohmmeter method:
Disconnect all affected connectors, and check continuity between each connector and ground. When ohmmeter indicates continuity between a particular connector and ground, that connector is shorted.

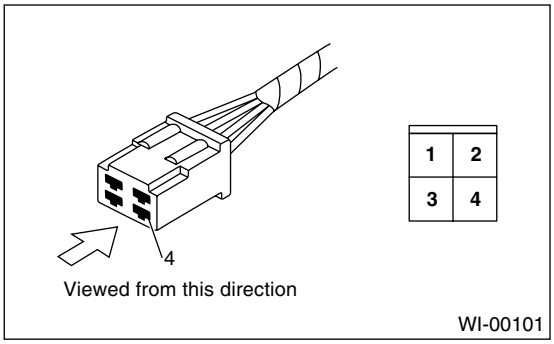


C: HOW TO READ WIRING DIAGRAMS

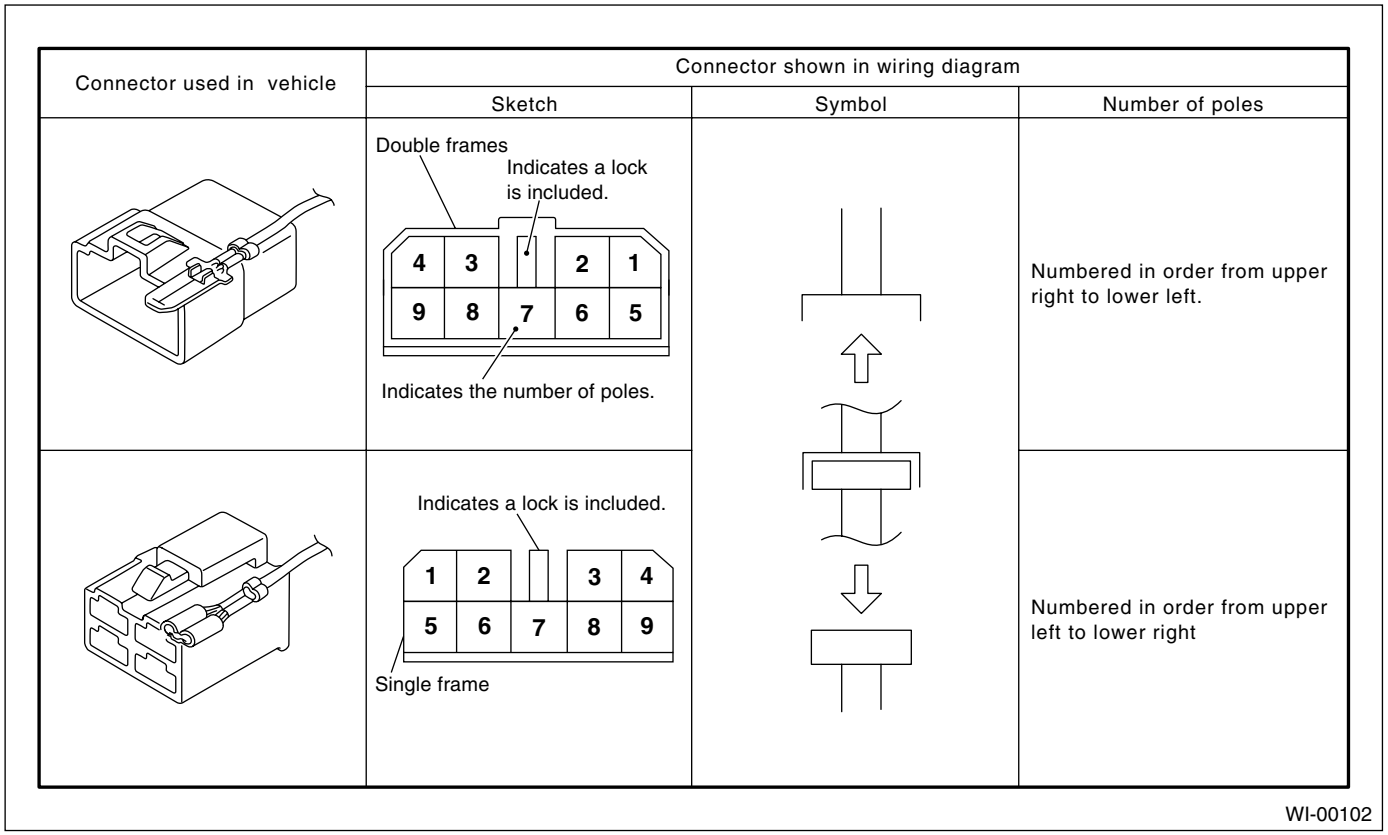
1. WIRING DIAGRAM

The wiring diagram of each system is illustrated so that you can understand the path through which the electric current flows from the battery.
Sketches and codes are used in the diagrams. They should read as follows:

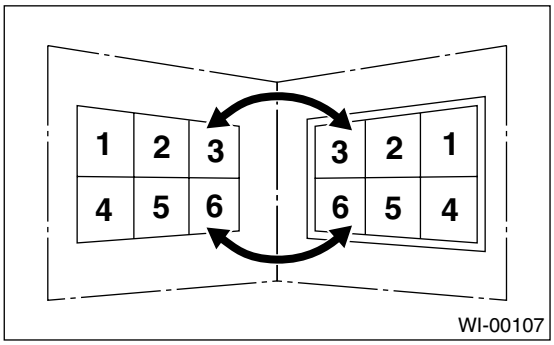
- Each connector and its terminal position are indicated by a sketch of the connector in a disconnected state which is viewed from the front.



- The number of poles or pins, presence of a lock, and pin number of each terminal are indicated in the sketch of each connector. In the sketch, the highest pole number refers to the number of poles which the connector has. For example, the sketch of the connector shown in figure indicates the connector has 9 poles.

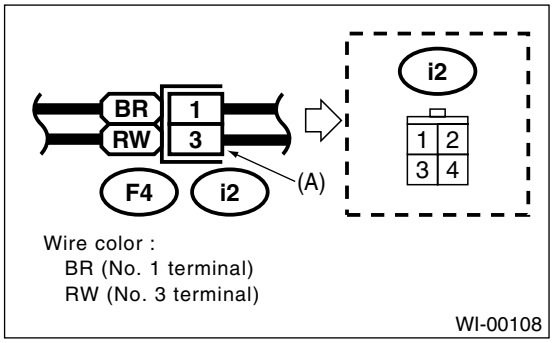


• When one set of connectors is viewed from the front side, the pole numbers of one connector are symmetrical to those of the other. When these two connectors are connected as a unit, the poles which have the same number are joined.

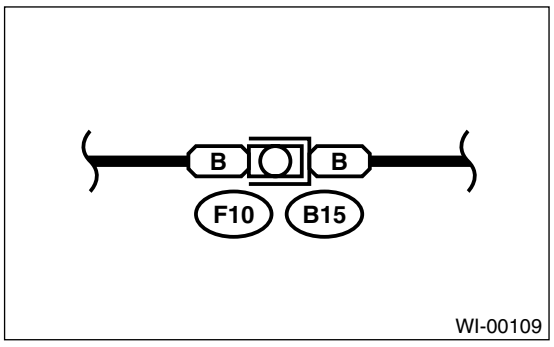


• Electrical wiring harness:
The connectors are numbered along with the number of poles, external colors, and mating connections in the accompanying list.
• The sketch of each connector in the wiring diagram usually shows the (A) side of the connector. The relationship between the wire color, terminal number and connector is described in figure.

NOTE:
A wire which runs in one direction from a connector terminal sometimes may have a different color from that which runs in the other direction from that terminal.

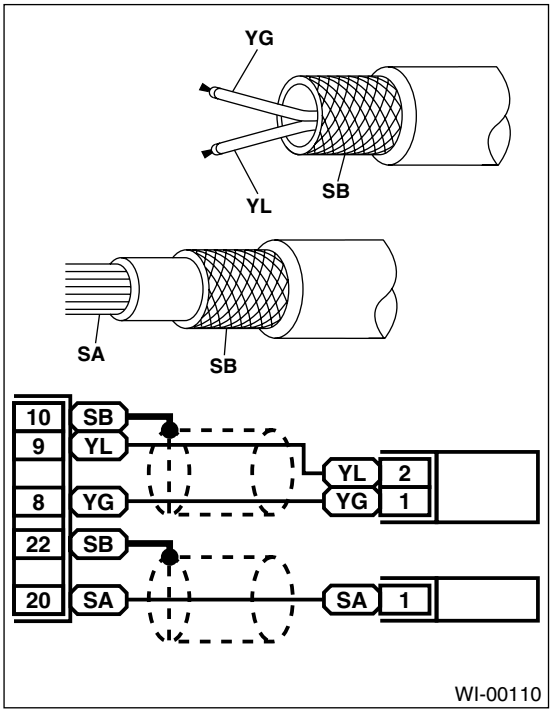


• In wiring diagram, connectors which have no terminal number refer to one-pole types. Sketches of these connectors are omitted intentionally.

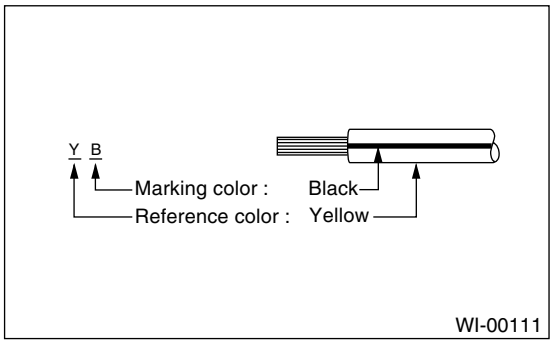


• The following color codes are used to indicate the colors of the wires used.

Color code	Color
L	Blue
B	Black
Y	Yellow
G	Green
R	Red
W	White
Br	Brown
Lg	Light green
Gr	Gray
P	Pink
Or	Orange
Lb	Light Blue
V	Violet
SA	Sealed (Inner)
SB	Sealed (Outer)



• The wire color code, which consists of two letters (or three letters including Br or Lg), indicates the standard color (base color of the wire covering) by its first letter and the stripe marking by its second letter.



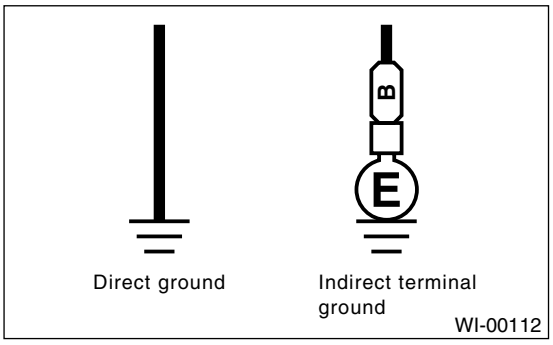
• The table lists the nominal sectional areas and allowable currents of the wires.

CAUTION:
When replacing or repairing a wire, be sure to use the same size and type of the wire which was originally used.

NOTE:
• The allowable current in the table indicates the tolerable amperage of each wire at an ambient temperature of 40°C (104°F).
• The allowable current changes with ambient temperature. Also, it changes if a bundle of more than two wires is used.

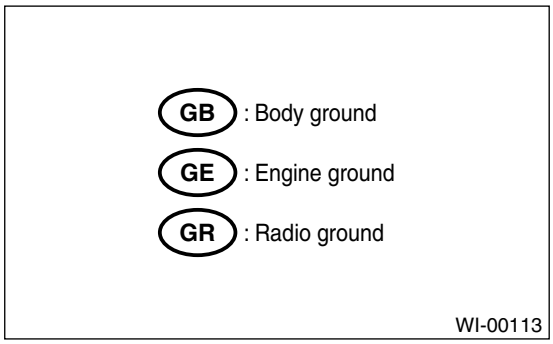
Nominal sectional area mm^2	No. of strands/ strand diameter	Outside diameter of finished wiring mm	Allowable current Amps/ 40°C (104°F)
0.3	7/0.26	1.8	7
0.5	7/0.32	2.2 (or 2.0)	12
0.75	30/0.18	2.6 (or 2.4)	16
0.85	11/0.32	2.4 (or 2.2)	16
1.25	16/0.32	2.7 (or 2.5)	21
2	26/0.32	3.1 (or 2.9)	28
3	41/0.32	3.8 (or 3.6)	38
5	65/0.32	4.6 (or 4.4)	51
8	50/0.45	5.5	67

• Each unit is directly grounded to the body or indirectly grounds through a harness ground terminal. Different symbols are used in the wiring diagram to identify the two grounding systems.

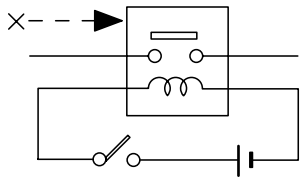
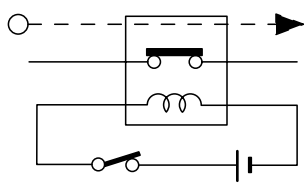
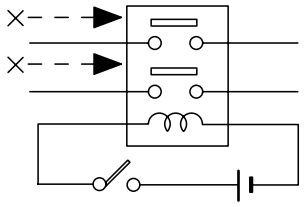
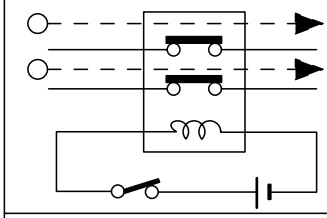
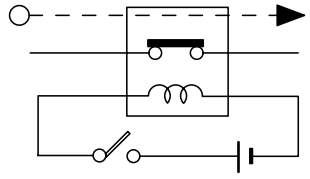
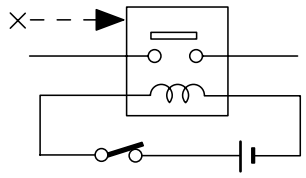
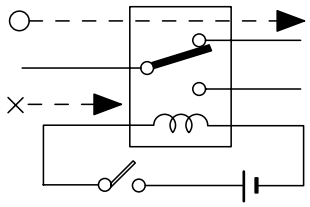
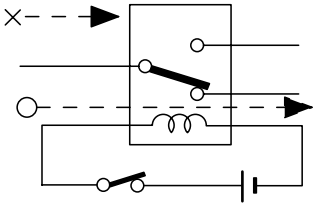


• The ground points shown in the wiring diagram refer to the following:

NOTE:
All wiring harnesses are provided with a ground point which should be securely connected.



• Relays are classified as normally-open or normally-closed. The normally-closed relay has one or more contacts.
The wiring diagram shows the relay mode when the energizing circuit is OFF.

Relay type		Energizing circuit OFF	Energizing circuit ON
Normally-open type	4-pole		
	6-pole		
Normally-closed type	4-pole		
Mixed type	6-pole		

Key to symbols:

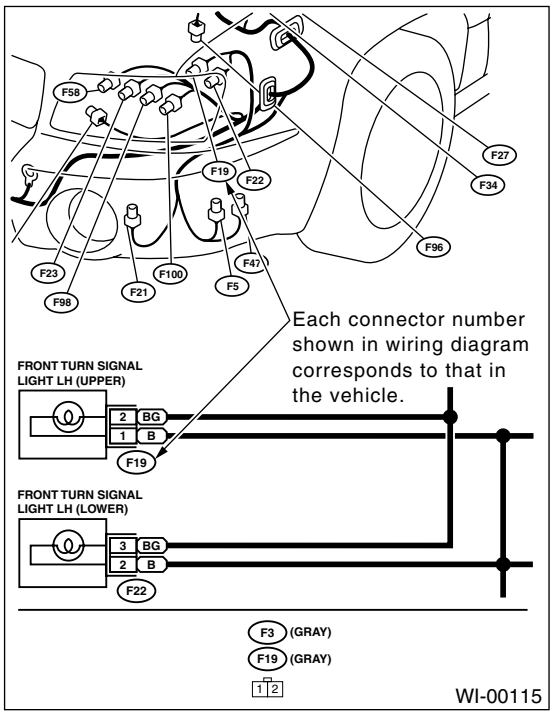
○ ⟶ : Current flows.

× ⟶ : Current does not flow.

WI-00114

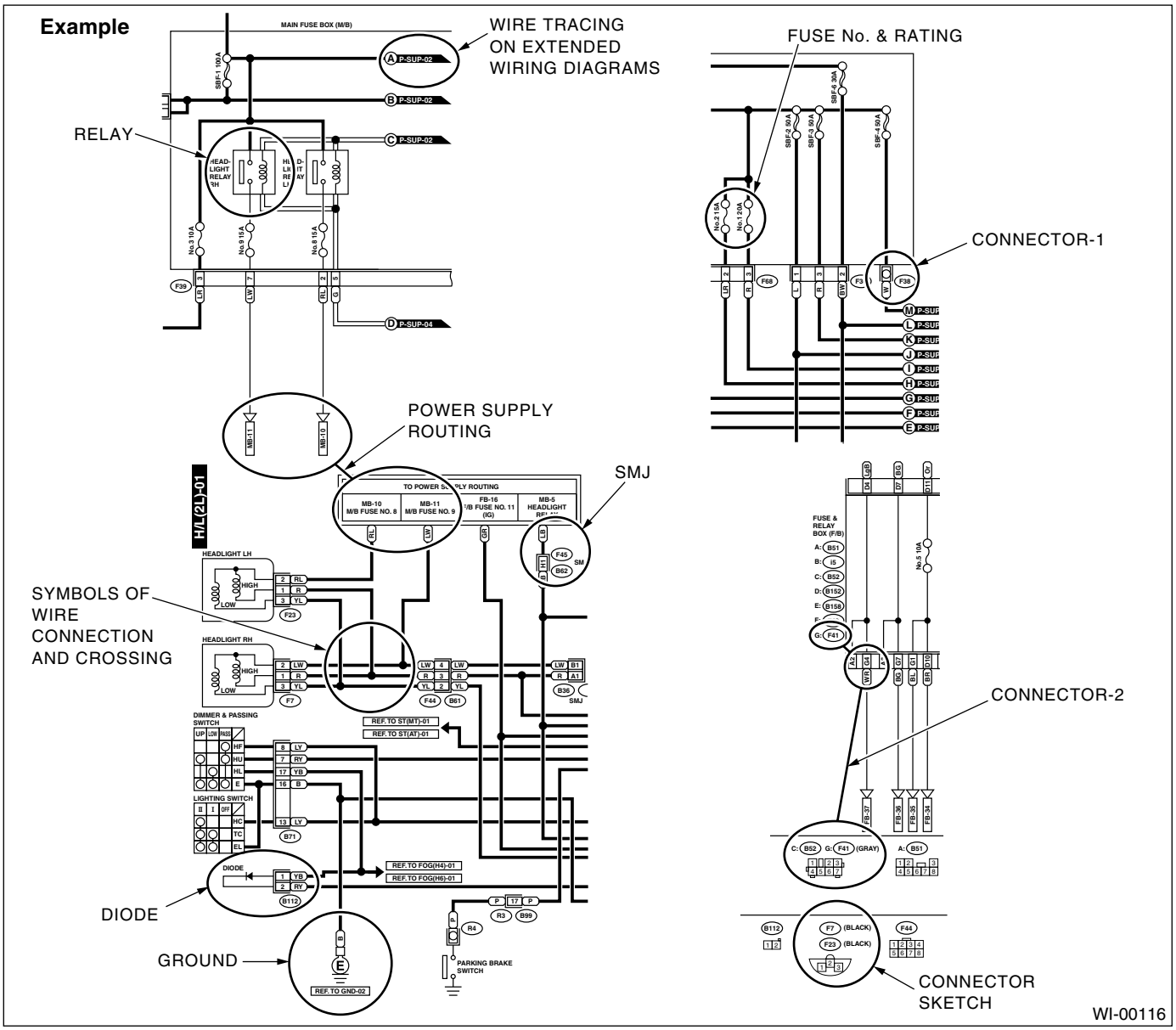
• Each connector number shown in the wiring diagram corresponds to that in the wiring harness. The location of each connector in the actual vehicle is determined by reading the first character of the connector (for example, a “F” for F8, “i” for i16, etc.) and the type of wiring harness.
The first character of each connector number refers to the area or system of the vehicle.

Symbol	Wiring harness and cord
F	Front wiring harness
B	Bulkhead wiring harness
E	Engine wiring harness
T	Transmission cord
D	Door cord LH & RH, Rear door cord LH & RH
i	Instrument panel wiring harness
R	Rear wiring harness, Fuel tank cord, Roof cord, Rear gate cord



D: SYMBOLS IN WIRING DIAGRAMS

A number of symbols are used in each wiring diagram to easily identify parts or circuits.



1. RELAY

A symbol used to indicate a relay.

2. CONNECTOR-1

The sketch of the connector indicates the one-pole types.

3. WIRING CONNECTION

Some wiring diagrams are indicated in foldouts for convenience. Wiring destinations are indicated where necessary by corresponding symbols (as when two pages are needed for clear indication).

4. FUSE NO. & RATING

The “FUSE No. & RATING” corresponds with that used in the fuse box (main fuse box, fuse and joint box).

5. CONNECTOR-2

- Each connector is indicated by a symbol.
- Each terminal number is indicated in the corresponding wiring diagram in an abbreviated form.
- For example, terminal number “C2” refers to No. 2 terminal of connector (C: F41) shown in the connector sketch.

6. CONNECTOR SKETCH

• Each connector sketch clearly identifies the shape and color of a connector as well as terminal locations. Non-colored connectors are indicated in natural color.
• When more than two types of connector number are indicated in a connector sketch, it means that the same type connectors are used.

7. GROUND

Each grounding point can be located easily by referring to the corresponding wiring harness.

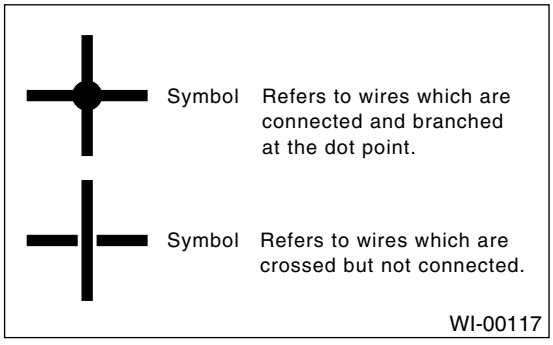
8. DIODE

A symbol is used to indicate a diode.

9. WIRE TRACING ON EXTENDED WIRING DIAGRAMS

For a wiring diagram extending over at least two pages, a symbol (consisting of the same characters with arrows), facilitates wire tracing from one page to the next.
A ←→ A, B ←→ B

10.SYMBOLS OF WIRE CONNECTION AND CROSSING



11.POWER SUPPLY ROUTING

A symbol is used to indicate the power supply in each wiring diagram.
“MB-5”, “MB-6”, etc., which are used as power-supply symbols throughout the text, correspond with those shown in the POWER SUPPLY ROUTING in the wiring diagram.
Accordingly, using the POWER SUPPLY ROUTING and wiring diagrams permits service personnel to understand the entire electrical arrangement of a system.

12.CLASSIFICATION BY SPECIFICATION

When the wiring diagrams differ according to vehicle specifications, the specification difference is described by using abbreviations.
Destination difference is described by using option codes. (EK, KA, etc.)

Option code is described on model number plate attached in engine compartment of the vehicle. <Ref. to ID-5, MODEL NUMBER PLATE, IDENTIFICATION, Identification.>

E: ABBREVIATION IN WIRING DIAGRAMS

Abbr.	Full name
ABS	Antilock Brake System
ACC	Accessory
A/C	Air Conditioning
AD	Auto Down
AT	Automatic Transmission
AU	Auto Up
A/B	Air Bag
A/F	Air Fuel
ATF	Automatic Transmission Fluid
AWD	All Wheel Drive
B	Battery
D	Drive Range
DN	Down
E	Ground
EBD	Electronic Brake Distribution
ELR	Emergency Locking Retractor
F/B	Fuse & Joint Box
FL1.5	Fusible Link 1.5 mm^2
H/L	Headlight
I/F	Interface
IG	Ignition
Illumi.	Illumination
INT	Intermittent
L/C	Low Clutch
LCD	Liquid Crystal Display
LH	Left Hand
Lo	Low
M	Motor
M/B	Main Fuse Box
MG	Magnet
Mi	Middle
MT	Manual Transmission
N	Neutral Range
OP	Optional Parts
P	Parking Range
PASS	Passing
R	Reverse Range
RH	Right Hand
SBF	Slow Blow Fuse
ST	Starter
SW	Switch
TGV	Tumble Generation Valve
UP	Up
WASH	Washer

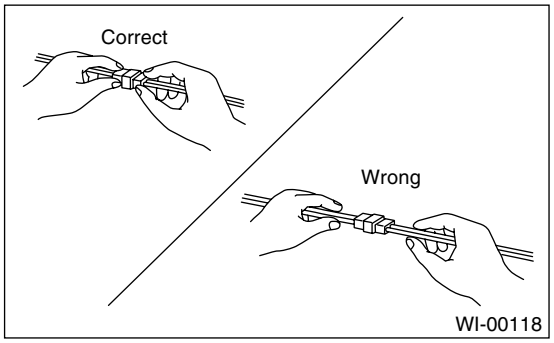
2. Working Precautions

A: PRECAUTIONS WHEN WORKING WITH THE PARTS MOUNTED ON THE VEHICLE

1) When working under a vehicle which is jacked-up, always be sure to use safety stands.
2) The parking brake must always be applied during working. Also, in automatic transmission vehicles, keep the select lever set to the P (Parking) range.
3) Be sure the workshop is properly ventilated when running the engine. Further, be careful not to touch the belt or fan while the engine is operating.
4) Be careful not to touch hot metal parts, especially the radiator and exhaust system immediately after the engine has been shut off.

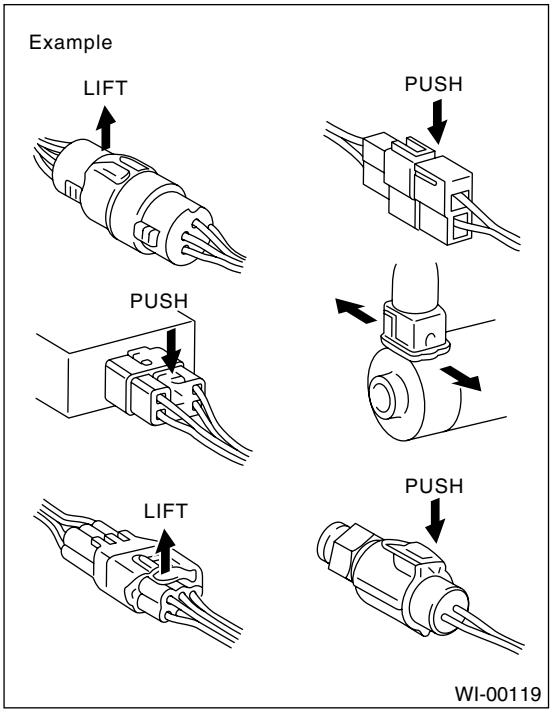
B: PRECAUTIONS IN TROUBLE DIAGNOSIS AND REPAIR OF ELECTRIC PARTS

1) The battery cable must be disconnected from the battery's (–) terminal, and the ignition switch must be set to the OFF position, unless otherwise required by the diagnostics.
2) Securely fasten the wiring harness with clamps and slips so that the harness does not interfere with the body end parts or edges and bolts or screws.
3) When installing parts, be careful not to catch them on the wiring harness.
4) When disconnecting a connector, do not pull the wires, but pull while holding the connector body.

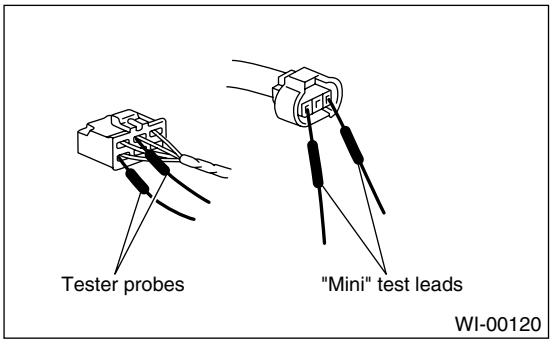


5) Some connectors are provided with a lock. One type of such a connector is disconnected by pushing the lock, and the other, by moving the lock up. In either type the lock shape must be identified before attempting to disconnect the connector.

To connect, insert the connector until it snaps and confirm that it is tightly connected.



6) When checking continuity between connector terminals, or measuring voltage across the terminal and ground, always contact tester probe(s) on terminals from the wiring connection side. If the probe is too thick to gain access to the terminal, use “mini” test leads.
To check waterproof connectors (which are not accessible from the wiring side), contact test probes on the terminal side being careful not to bend or damage the terminals.



7) Sensors, relays, electrical unit, etc., are sensitive to strong impacts.
Handle them with care so that they are not dropped or mishandled.

3. Power Supply Routing

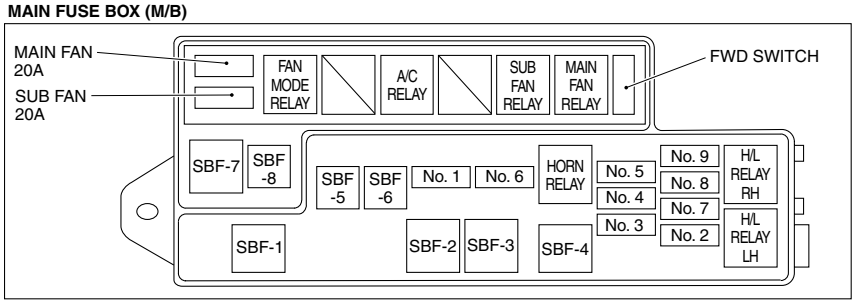
A: SCHEMATIC

1. LHD MODEL

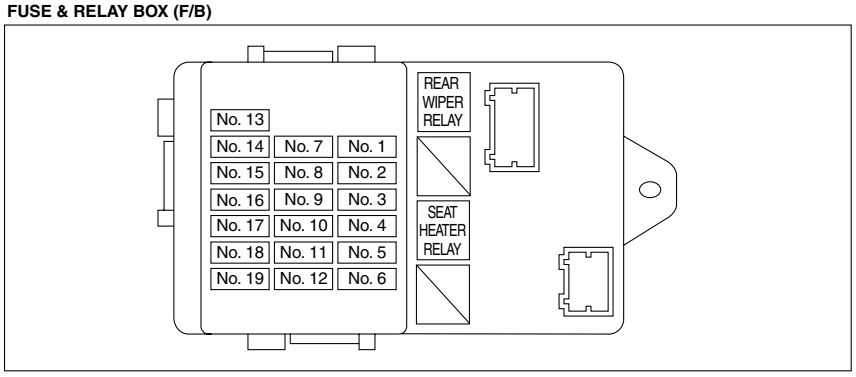
P-SUP(L)-01

P-SUP(L)-01

MAIN FUSE BOX (M/B)

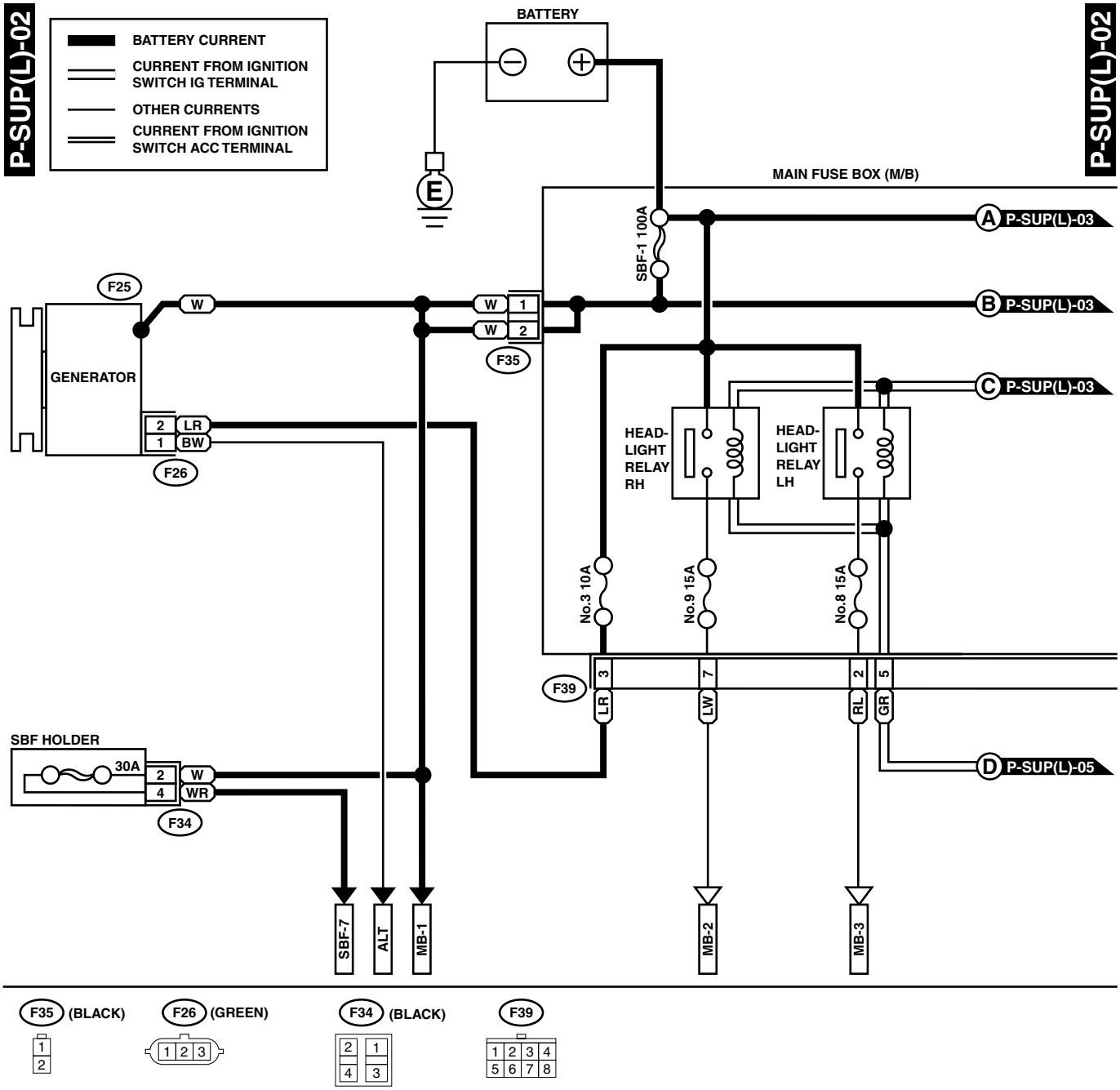


FUSE & RELAY BOX (F/B)

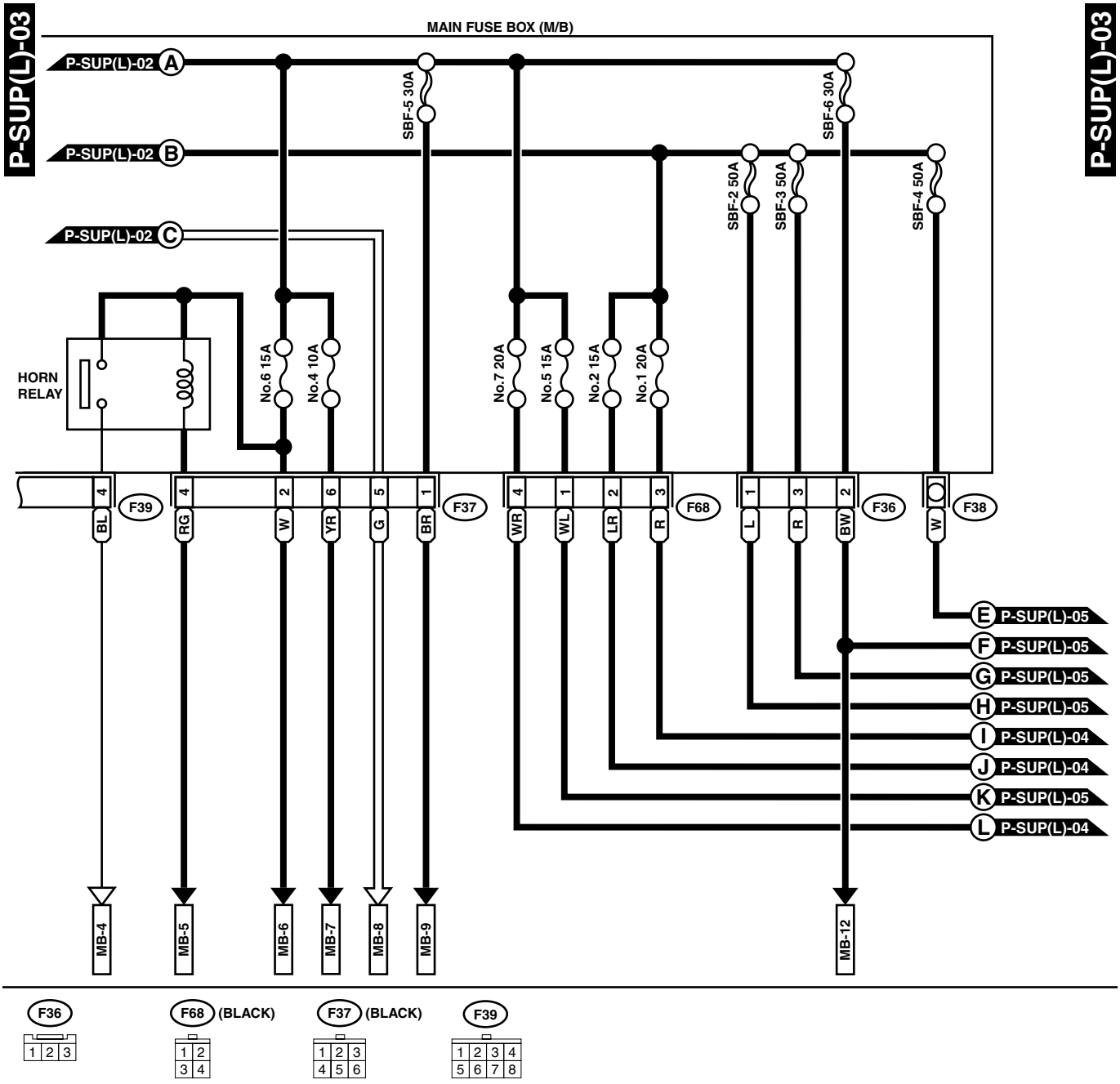


WI-00224

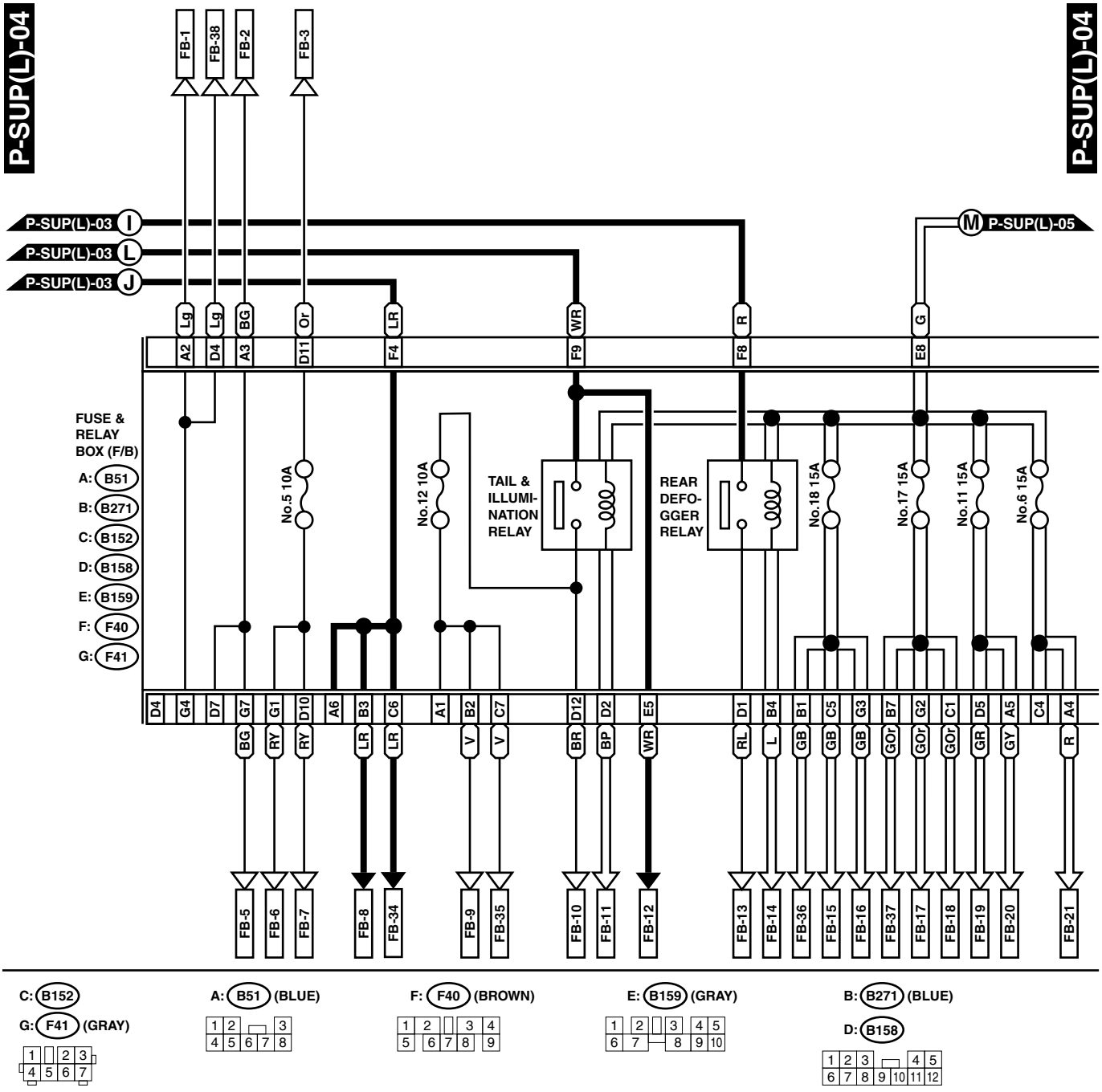
POWER SUPPLY ROUTING



WI-00225


P-SUP(L)-03
P-SUP(L)-03
MAIN FUSE BOX (M/B)
P-SUP(L)-02 A
P-SUP(L)-02 B
P-SUP(L)-02 C
SBF-5 30A
SBF-6 30A
SBF-2 50A
SBF-3 50A
SBF-4 50A
HORN RELAY
No.6 15A
No.4 10A
No.7 20A
No.5 15A
No.2 15A
No.1 20A
F39
F37
F68
F36
F38
BL
RG
W
YR
G
BR
WR
WL
LR
R
L
R
BW
W
E P-SUP(L)-05
F P-SUP(L)-05
G P-SUP(L)-05
H P-SUP(L)-05
I P-SUP(L)-04
J P-SUP(L)-04
K P-SUP(L)-05
L P-SUP(L)-04
MB-4
MB-5
MB-6
MB-7
MB-8
MB-9
MB-12
F36
F68 (BLACK)
F37 (BLACK)
F39

WI-00226



C: B152
G: F41 (GRAY)

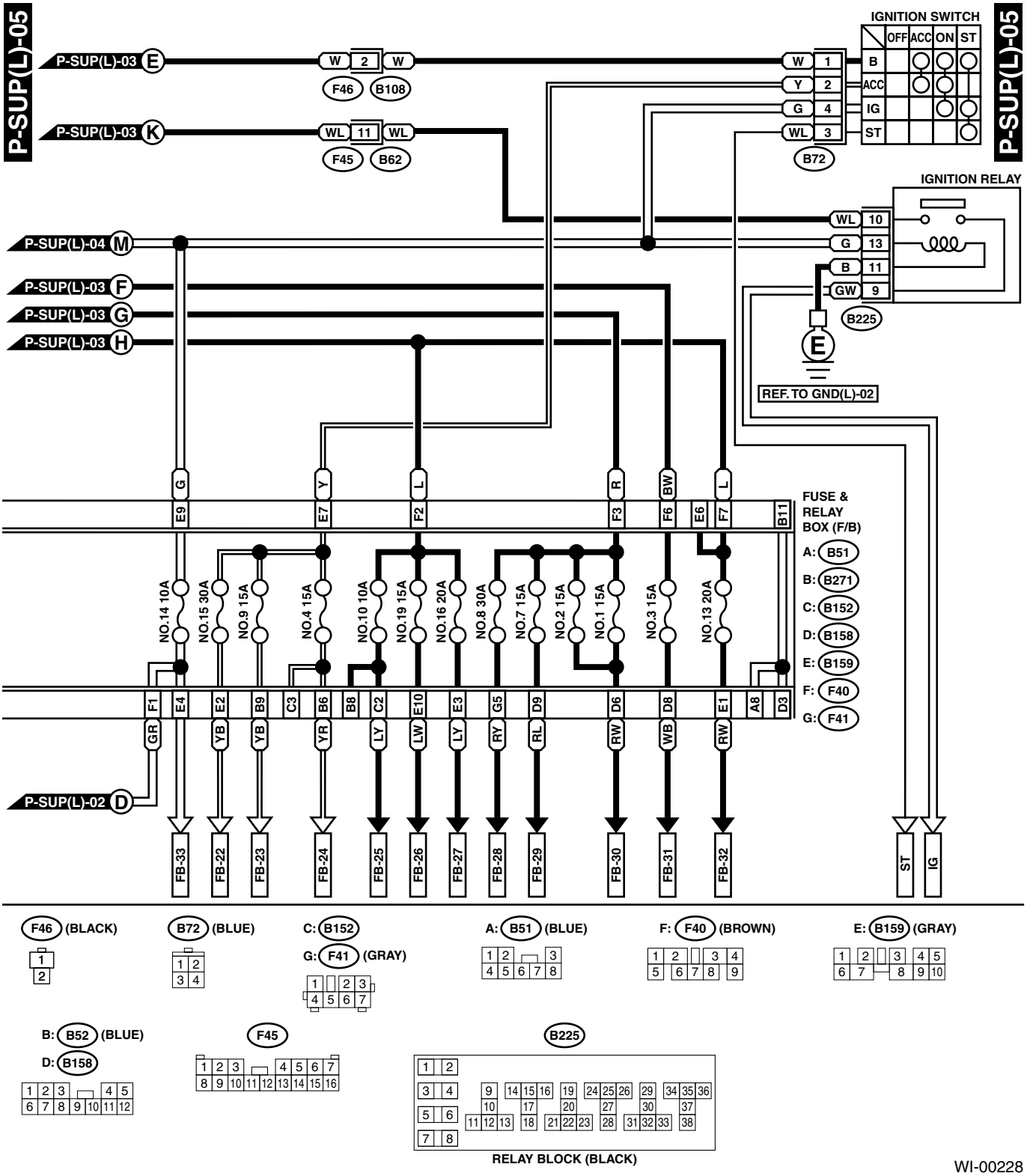
A: B51 (BLUE)

F: F40 (BROWN)

E: B159 (GRAY)

B: B271 (BLUE)
D: B158

WI-00227


P-SUP(L)-05
P-SUP(L)-03 E
P-SUP(L)-03 K
P-SUP(L)-04 M
P-SUP(L)-03 F
P-SUP(L)-03 G
P-SUP(L)-03 H
P-SUP(L)-02 D
F46
B108
F45
B62
B72
IGNITION SWITCH
OFF ACC ON ST
B
ACC
IG
ST
IGNITION RELAY
B225
REF. TO GND(L)-02
FUSE & RELAY BOX (F/B)
A: B51
B: B271
C: B152
D: B158
E: B159
F: F40
G: F41
NO.14 10A
NO.15 30A
NO.9 15A
NO.4 15A
NO.10 10A
NO.19 15A
NO.16 20A
NO.8 30A
NO.7 15A
NO.2 15A
NO.1 15A
NO.3 15A
NO.13 20A
FB-33
FB-22
FB-23
FB-24
FB-25
FB-26
FB-27
FB-28
FB-29
FB-30
FB-31
FB-32
ST
IG

F46 (BLACK)
B72 (BLUE)
C: B152
G: F41 (GRAY)
A: B51 (BLUE)
F: F40 (BROWN)
E: B159 (GRAY)
B: B52 (BLUE)
D: B158
F45
B225
RELAY BLOCK (BLACK)

WI-00228

No.	Load
MB-1	A/C relay holder
MB-2	Headlight RH
	Combination meter
MB-3	Headlight LH
MB-4	Horn
MB-5	Horn switch
MB-6	Hazard switch
	Keyless entry control module
	Key warning switch
MB-7	Transmission control module (AT)
MB-8	Diode (With passing)
	Lighting switch
MB-9	Data link connector
	Engine control module
	Fuel pump relay
	Ignition relay
	Immobilizer control module
MB-12	Headlight washer module
	Power window circuit breaker
SBF-7	ABS control module
ALT-1	Combination meter
IG	Check connector
	Hazard switch
	Headlight washer switch
	Ignition relay-2
	OP connector
	Power window relay
	Vehicle speed sensor (MT)
ST	Cruise control module
	Engine control module
	Key switch
	Inhibitor switch (AT)
	Starter motor (AT)
FB-1	ABS condenser
	Break fluid level warning switch
	Combination meter
	OP connector
	Parking switch
FB-2	Combination meter
	Keyless entry control module
	Hazard switch
	Rear combination light LH
	Turn signal switch
	Trailer connector
FB-3	Parking switch
FB-5	Side turn signal light LH
	Front turn signal light LH
FB-6	Front clearance light LH
	Front clearance light RH
	Headlight leveler LH
	Headlight leveler RH

No.	Load
FB-7	License plate light
	Trailer connector
FB-8	A-A/C control module
	Audio
	Clock
	Combination meter
	Luggage room light
	Room light
	Spot light
	Trailer connector
FB-9	Audio
	CD illumination light
	Combination meter
	Glove box illumination light (Turbo model)
FB-10	Parking switch
FB-11	Engine control module
	Lighting switch
FB-12	Parking switch
FB-13	A-A/C control module
	A/C switch
	Rear defogger
FB-14	Rear defogger timer
FB-15	Back-up light switch (NA/MT model)
	Belt & key warning module (NA model)
	Cruise control module
	Cruise control switch
	Inhibitor switch (AT)
FB-16	Main fan relay-1
	Air conditioner relay
FB-17	Main fan relay-2
	Sub fan relay
	A/C pressure switch
FB-18	F/C actuator
	Rear defogger timer
	Wiper deicer relay
FB-19	Fuel pump relay
	Engine control module
	Ignition coil & ignitor
	Transmission control module (AT)
	Immobilizer control module
FB-20	Airbag control module
FB-21	Airbag control module
FB-22	Front washer motor
	Front wiper motor
	Wiper & washer switch
FB-23	Audio
	Clock

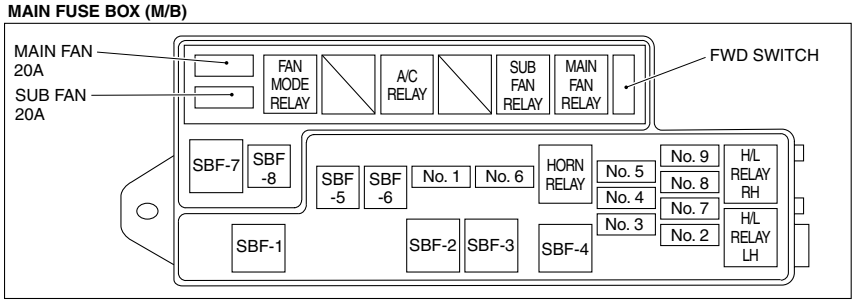
No.	Load
FB-24	Seat heater relay
	Rear accessory power supply socket relay
	Front accessory power supply socket
	OP connector
	Remote control rearview mirror switch
FB-25	Rear fog light relay
FB-26	Rear accessory power supply socket relay
FB-27	Stop light switch
FB-28	ABS control module
FB-29	Front fog light relay
FB-30	Blower motor relay
FB-31	Keyless entry control module
	OP connector
FB-32	Wiper deicer & mirror heater relay
FB-33	Combination meter
FB-34	Keyless entry control module
	Key illumination light
FB-35	AT power & hold mode switch
	AT select lever illumination light
	Cruise control switch
	Front accessory power supply socket
	Front fog light relay
	Front fog light switch
	Headlight leveler switch
	Headlight washer switch
	Lighting switch
	OP connector
	Rear fog light relay
	Rear fog light switch
	Wiper deicer switch
FB-36	ABS control module
	Wiper deicer & mirror heater relay
FB-37	A/C switch
	Blower motor relay
	A-A/C control module
FB-38	ABS control module

2. RHD MODEL

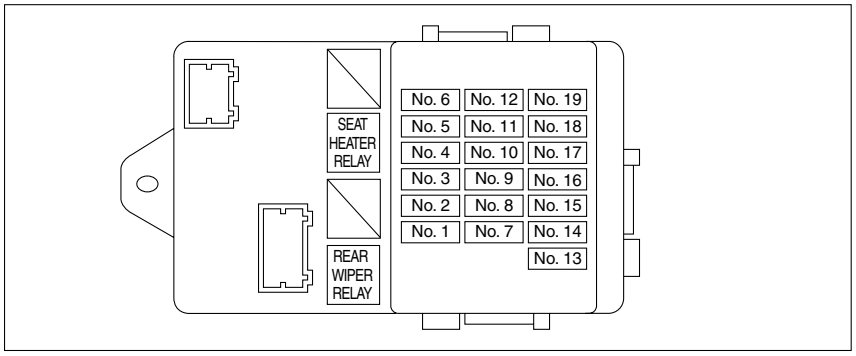
P-SUP(R)-01

P-SUP(R)-01

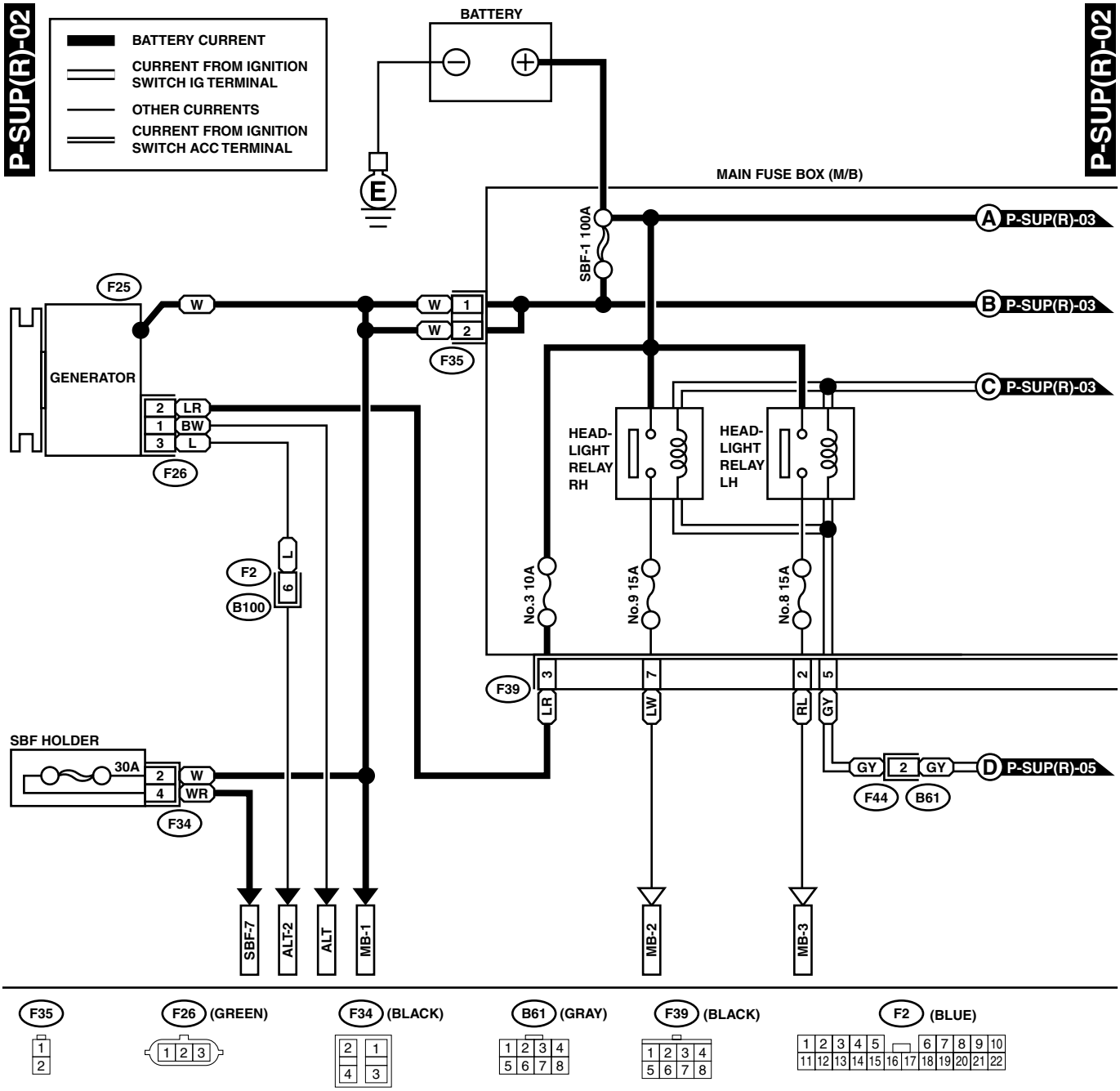
MAIN FUSE BOX (M/B)



FUSE & RELAY BOX (F/B)

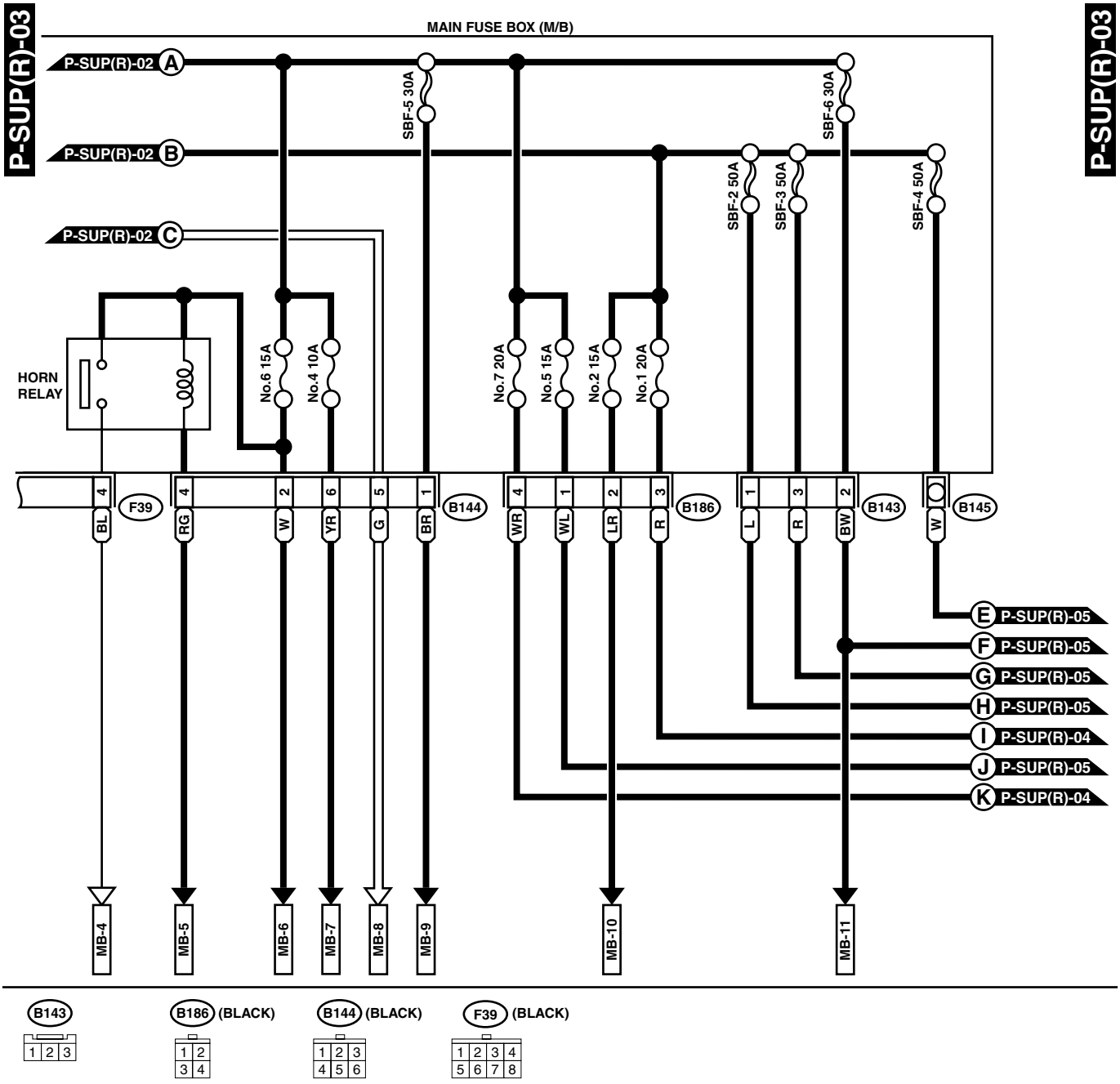


WI-00229

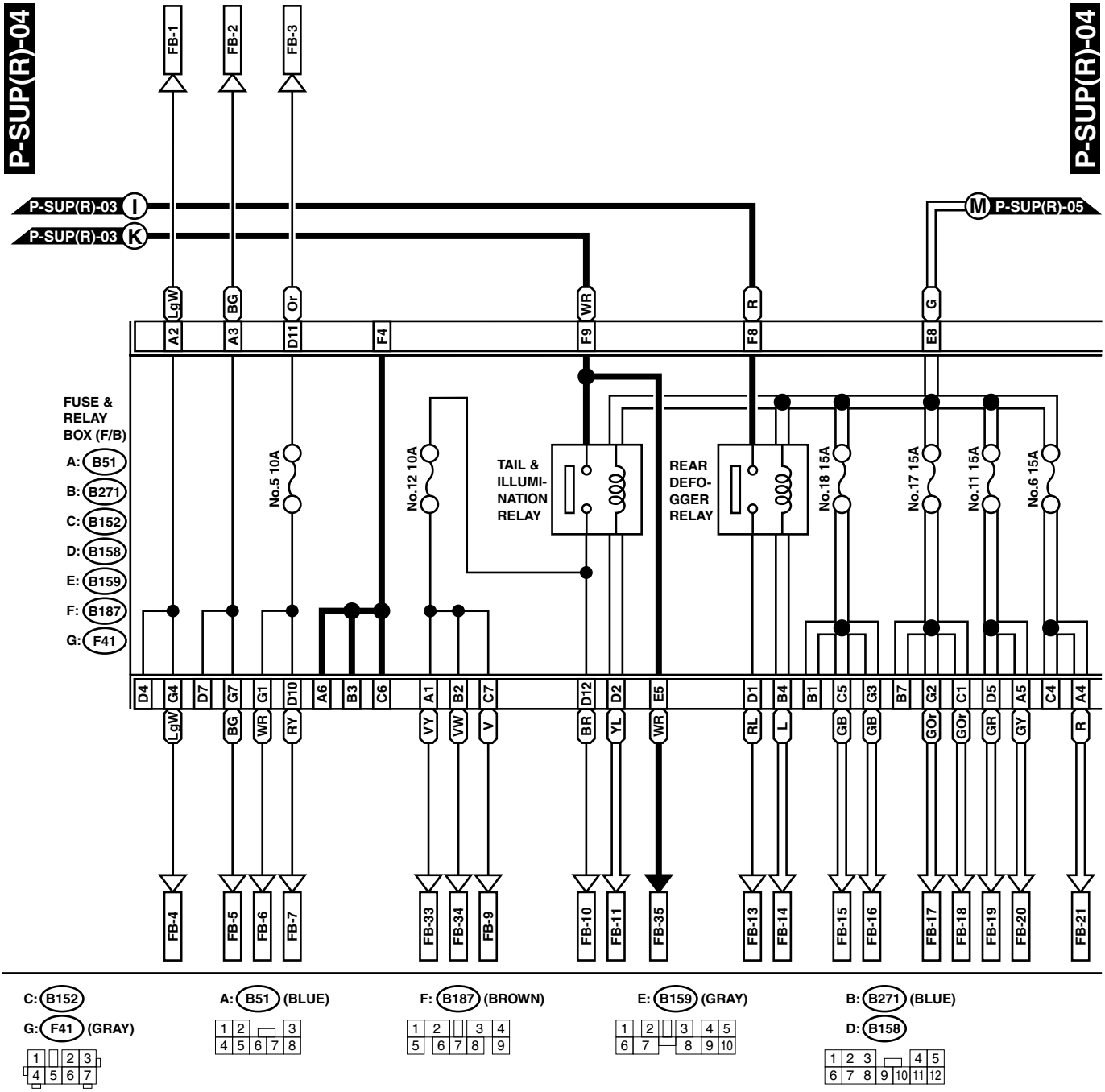

P-SUP(R)-02
BATTERY CURRENT
CURRENT FROM IGNITION SWITCH IG TERMINAL
OTHER CURRENTS
CURRENT FROM IGNITION SWITCH ACC TERMINAL
BATTERY
E
MAIN FUSE BOX (M/B)
SBF-1 100A
A P-SUP(R)-03
B P-SUP(R)-03
C P-SUP(R)-03
F25
W
W 1
W 2
F35
GENERATOR
2 LR
1 BW
3 L
F26
HEAD-LIGHT RELAY RH
HEAD-LIGHT RELAY LH
F2
L
6
B100
No.3 10A
No.9 15A
No.8 15A
F39
3
7
2
5
LR
LW
RL
GY
SBF HOLDER
30A
2 W
4 WR
F34
GY 2 GY
D P-SUP(R)-05
F44
B61
SBF-7
ALT-2
ALT
MB-1
MB-2
MB-3
F35
F26 (GREEN)
F34 (BLACK)
B61 (GRAY)
F39 (BLACK)
F2 (BLUE)

WI-00230

POWER SUPPLY ROUTING



WI-00231



C: B152
G: F41 (GRAY)

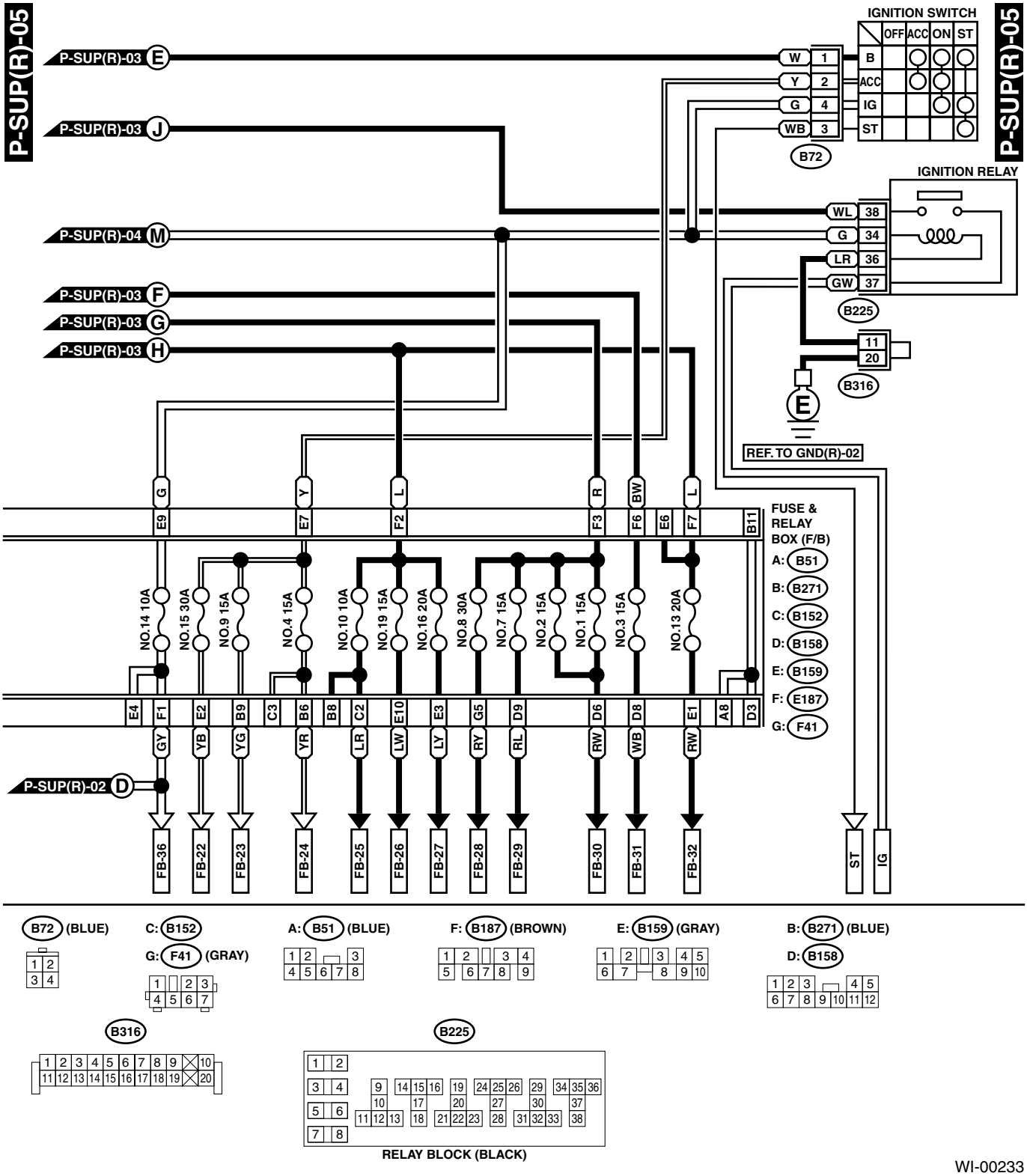
A: B51 (BLUE)

F: B187 (BROWN)

E: B159 (GRAY)

B: B271 (BLUE)
D: B158

WI-00232


P-SUP(R)-05
P-SUP(R)-05
P-SUP(R)-03 E
P-SUP(R)-03 J
P-SUP(R)-04 M
P-SUP(R)-03 F
P-SUP(R)-03 G
P-SUP(R)-03 H
P-SUP(R)-02 D
IGNITION SWITCH
OFF ACC ON ST
B ACC IG ST
W 1
Y 2
G 4
WB 3
B72
IGNITION RELAY
WL 38
G 34
LR 36
GW 37
B225
11
20
B316
E
REF. TO GND(R)-02
G Y L R BW L
E9 E7 F2 F3 F6 E6 F7 B11
FUSE & RELAY BOX (F/B)
A: B51
B: B271
C: B152
D: B158
E: B159
F: E187
G: F41
NO.14 10A
NO.15 30A
NO.9 15A
NO.4 15A
NO.10 10A
NO.19 15A
NO.16 20A
NO.8 30A
NO.7 15A
NO.2 15A
NO.1 15A
NO.3 15A
NO.13 20A
E4 F1 E2 B9 C3 B6 B8 C2 E10 E3 G5 D9 D6 D8 E1 A8 D3
GY YB YG YR LR LW LY RY RL RW WB RW
FB-36 FB-22 FB-23 FB-24 FB-25 FB-26 FB-27 FB-28 FB-29 FB-30 FB-31 FB-32 ST IG
B72 (BLUE)
C: B152
G: F41 (GRAY)
A: B51 (BLUE)
F: B187 (BROWN)
E: B159 (GRAY)
B: B271 (BLUE)
D: B158
B316
B225
RELAY BLOCK (BLACK)

WI-00233

No.	Load
MB-1	A/C relay holder
MB-2	Combination meter
	Headlight RH
MB-3	Headlight LH
MB-4	Horn
MB-5	Horn switch
MB-6	Hazard switch
	Keyless entry control module
	Key warning switch
MB-7	Transmission control module (AT)
MB-8	Diode (With rear fog light)
	Lighting switch
MB-9	Data link connector
	Engine control module
	Fuel pump relay
	Immobilizer control module
	Ignition relay
MB-10	Audio
	Clock
	Combination meter
	Key illumination light
	Keyless entry control module
	Luggage room light
	Double lock control module
	Room light
	Security relay
	Spot light
	Trailer connector
MB-11	Headlight washer module
	Power window circuit breaker
SBF-7	ABS control module
ALT-1	Combination meter
ALT-2	Engine control module
IG	Check connector
	Headlight washer switch
	Hazard switch
	Ignition relay-2
	Option connector
	Power window relay
	Vehicle speed sensor (MT)
ST	Cruise control module
	Engine control module
	Inhibitor switch (AT)
	Key switch
	Security relay
	Starter motor (AT)

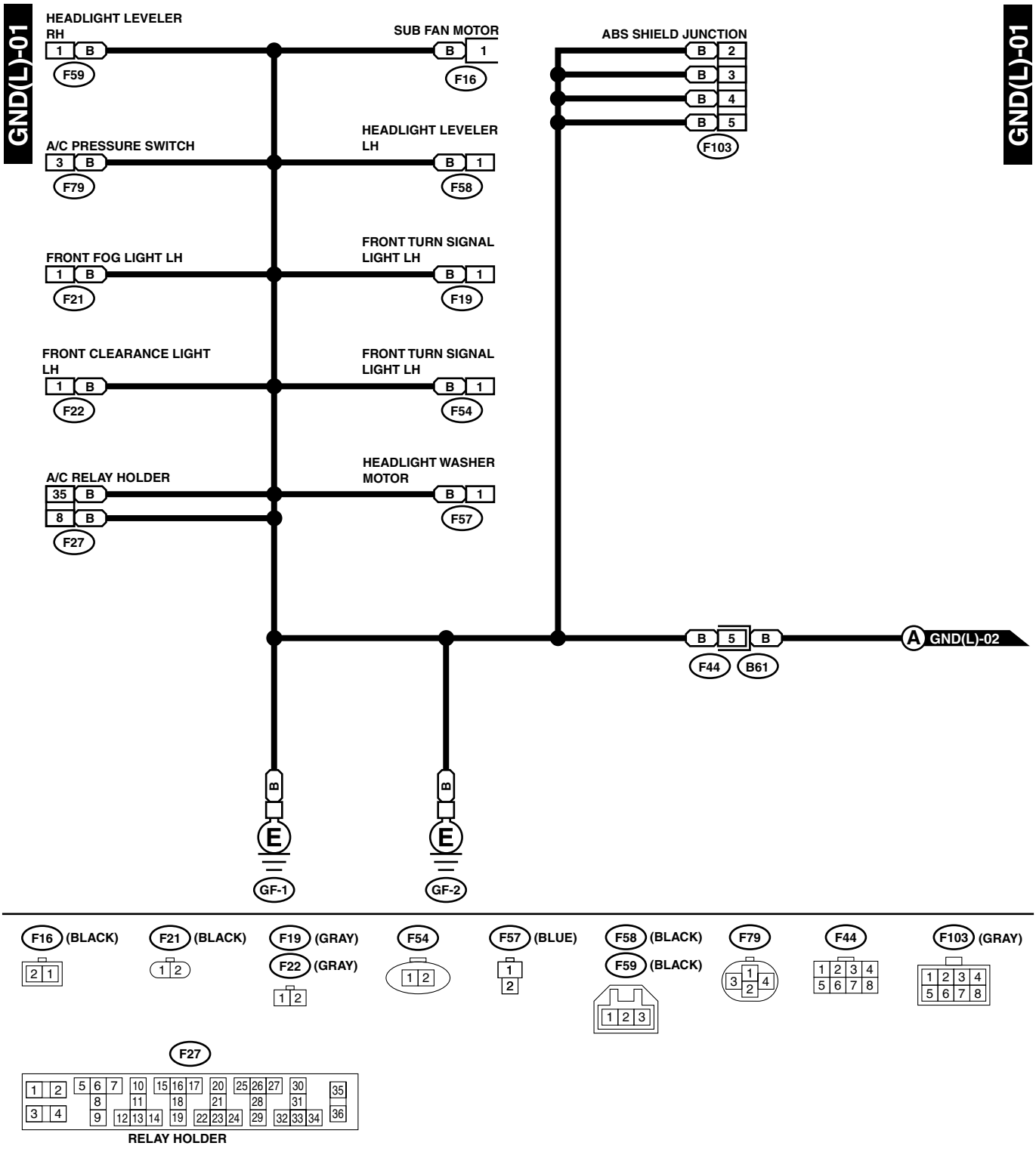
No.	Load
FB-1	Combination meter
	Hazard switch
	Keyless entry control module
	Lighting switch
	Rear combination light LH
	Trailer connector
	Turn signal switch
FB-2	Combination meter
	Front turn signal light LH
	Hazard switch
	Keyless entry control module
	Lighting switch
	Rear combination light LH
	Rear combination light RH
	Side turn signal light LH
	Trailer connector
	Turn signal switch
FB-3	Parking switch
FB-4	Side turn signal light RH
	Front turn signal light RH
FB-5	Front turn signal light LH
FB-6	Front clearance light LH
	Front clearance light RH
	Headlight leveler LH
	Headlight leveler RH
FB-7	License plate light
	Trailer connector
	Rear combination light LH
	Rear combination light RH
FB-9	Audio
	Combination meter
	Front accessory power supply socket
	Front fog light switch
	Hazard switch
	Option connector
	Wiper deicer switch
FB-10	Parking switch
FB-11	Lighting switch
FB-13	Rear defogger
FB-14	Rear defogger timer
	Double lock control module
FB-15	Cruise control module
	Cruise control switch
	Inhibitor switch (AT)
	Wiper deicer relay
	Wiper deicer switch
FB-16	ABS control module
	A/C relay holder
FB-17	A/C pressure switch
	A/C relay holder
	Air conditioner relay

No.	Load
FB-18	A-A/C control module
	A/C & Rear defogger switch
	Blower motor relay
	Double lock control module (Turbo model)
	F/C actuator
	Rear defogger timer
FB-19	A/T control module
	Fuel pump relay
	Engine control module
	Immobilizer module
	Security control module
FB-20	Airbag control module
FB-21	Airbag control module
FB-22	Front washer motor
	Front wiper motor
	Wiper switch
FB-23	Audio
	Clock
FB-24	Front accessory power supply socket
	OP connector
	Rear accessory power supply relay
	Remote control rearview mirror switch
	Seat heater relay
FB-25	Rear fog light relay
FB-26	Rear accessory power supply relay
FB-27	Stop light switch
FB-28	ABS control module
FB-29	Front fog light relay
FB-30	Blower motor relay
FB-31	Double lock control module
	Keyless entry control module
FB-32	Wiper deicer relay
FB-33	Cruise control main switch
	Front fog light switch
	Front fog light relay
	Glove box illumination light
	Headlight washer switch
	Headlight leveler switch
	Illumination control module
	Lighting switch
	Rear fog light relay
FB-34	AT power & hold mode switch
	AT select lever illumination light
FB-35	Parking switch
FB-36	Combination meter

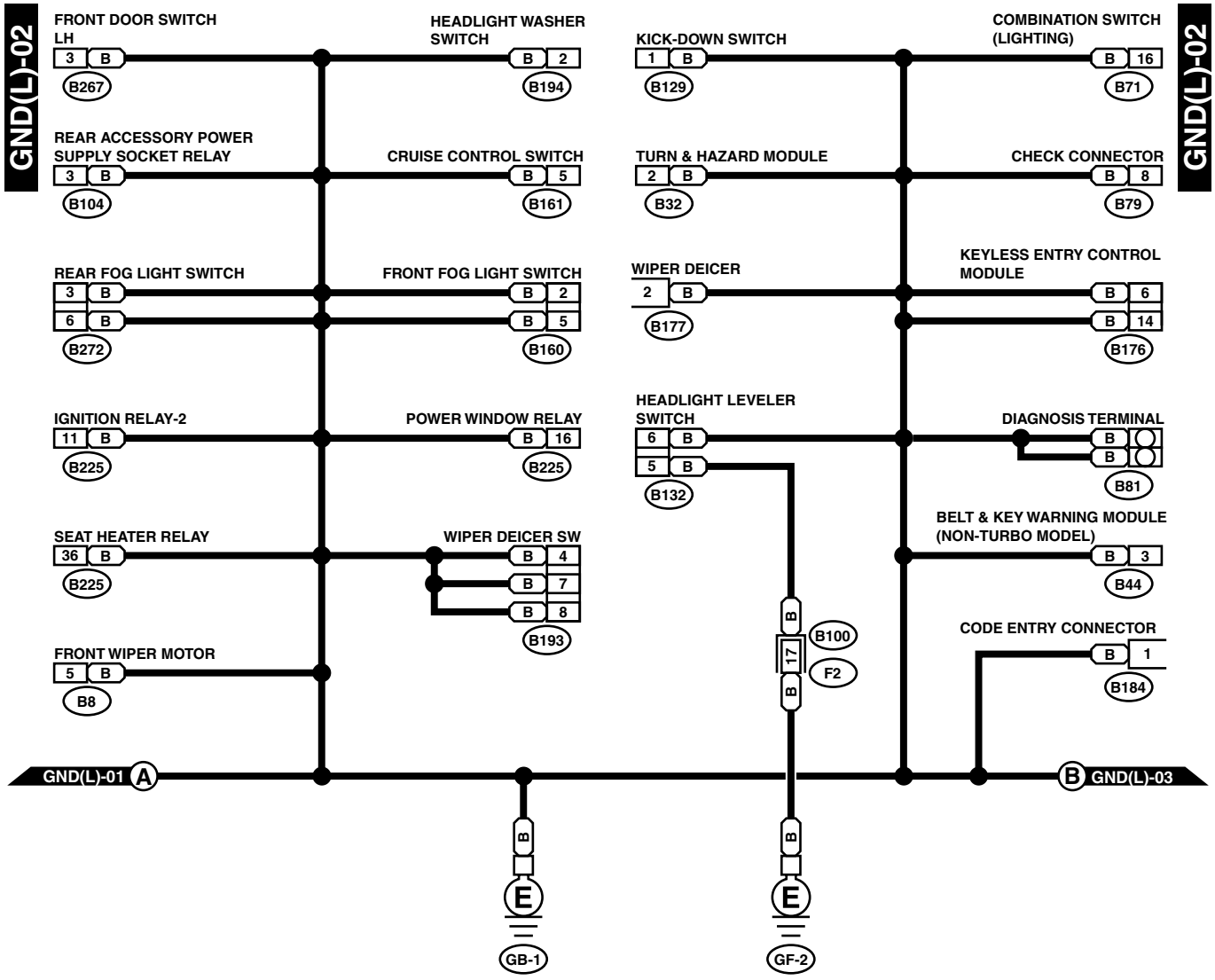
4. Ground Distribution

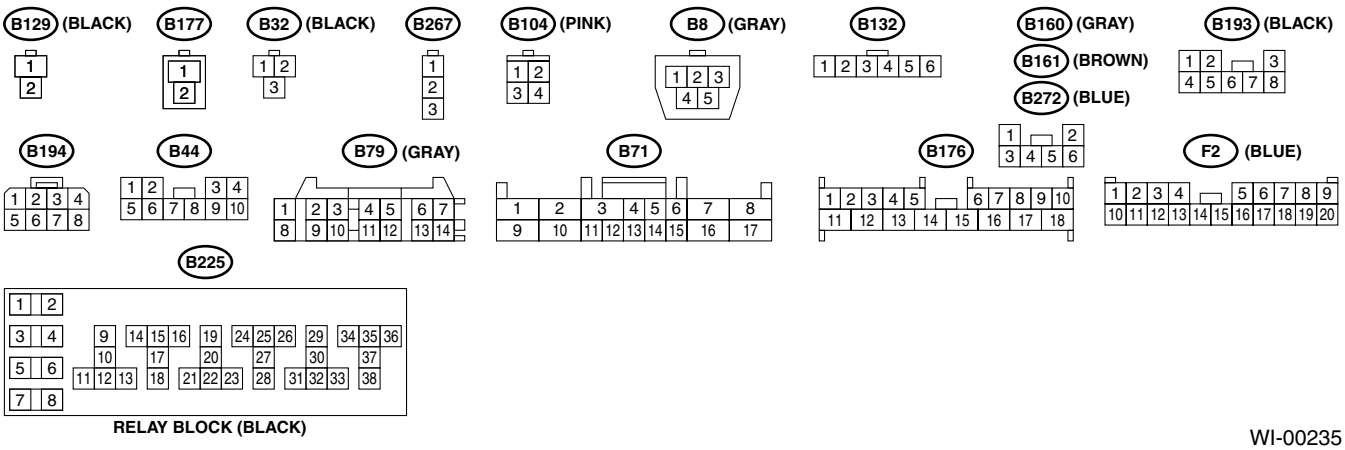
A: SCHEMATIC

1. LHD MODEL

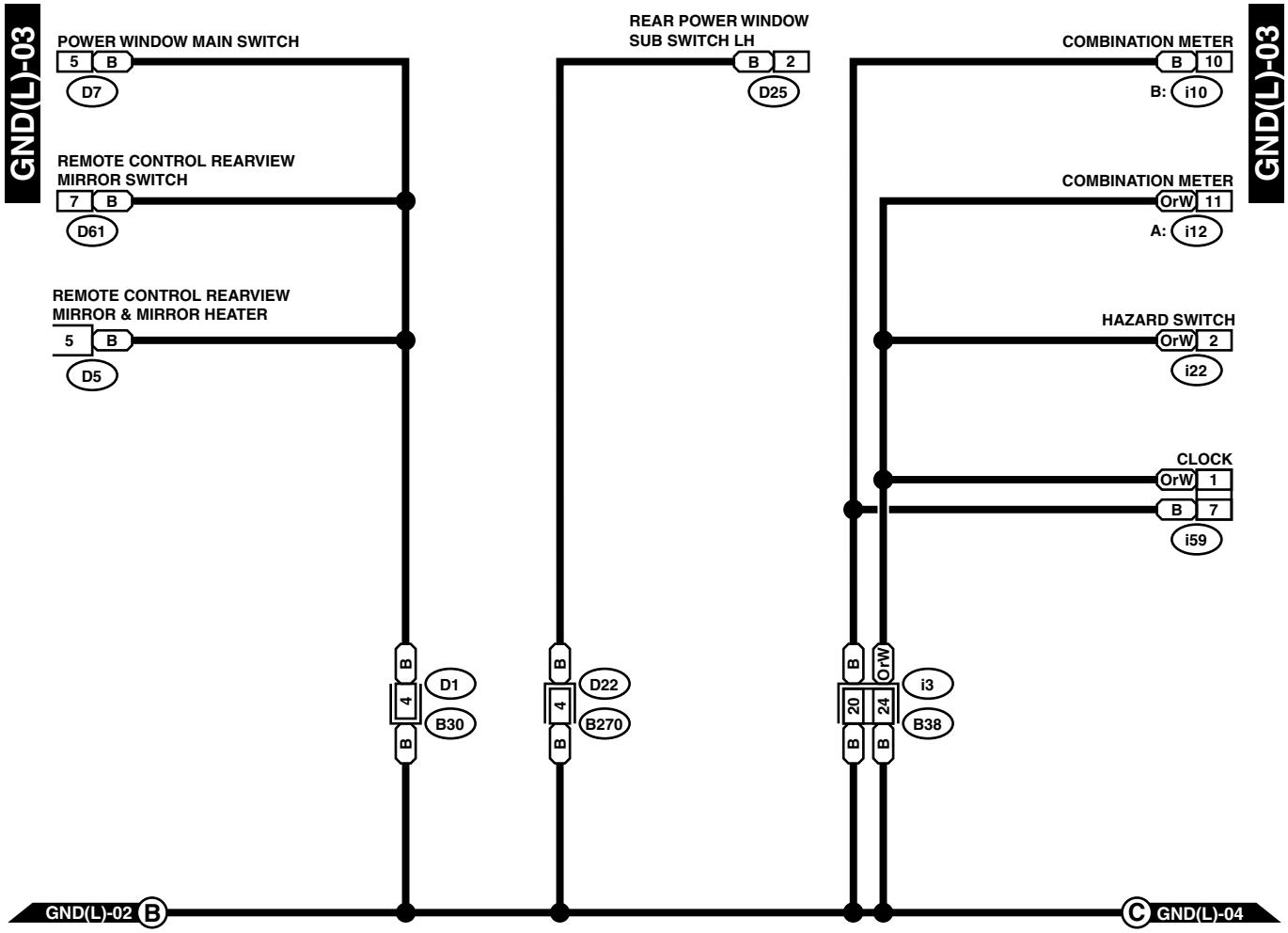


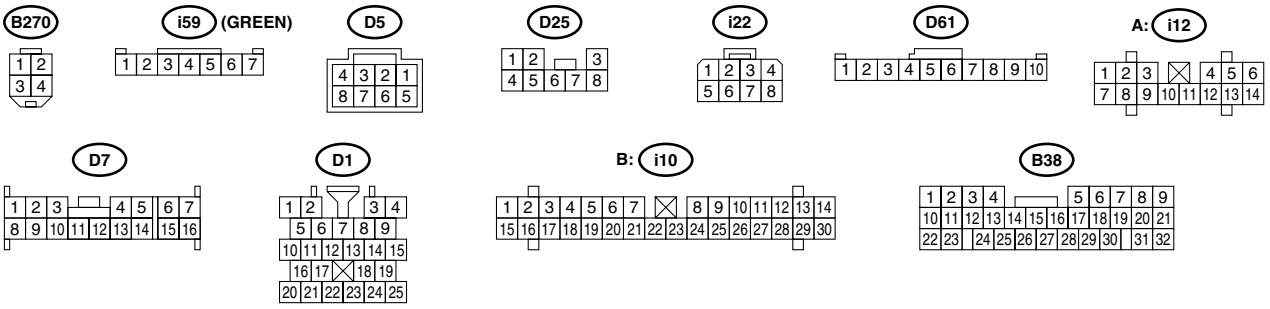
WI-00234


GND(L)-02
FRONT DOOR SWITCH LH
3 B
B267
HEADLIGHT WASHER SWITCH
B 2
B194
KICK-DOWN SWITCH
1 B
B129
COMBINATION SWITCH (LIGHTING)
B 16
B71
GND(L)-02
REAR ACCESSORY POWER SUPPLY SOCKET RELAY
3 B
B104
CRUISE CONTROL SWITCH
B 5
B161
TURN & HAZARD MODULE
2 B
B32
CHECK CONNECTOR
B 8
B79
REAR FOG LIGHT SWITCH
3 B
6 B
B272
FRONT FOG LIGHT SWITCH
B 2
B 5
B160
WIPER DEICER
2 B
B177
KEYLESS ENTRY CONTROL MODULE
B 6
B 14
B176
IGNITION RELAY-2
11 B
B225
POWER WINDOW RELAY
B 16
B225
HEADLIGHT LEVELER SWITCH
6 B
5 B
B132
DIAGNOSIS TERMINAL
B
B
B81
SEAT HEATER RELAY
36 B
B225
WIPER DEICER SW
B 4
B 7
B 8
B193
BELT & KEY WARNING MODULE (NON-TURBO MODEL)
B 3
B44
B 17 B
B100
F2
CODE ENTRY CONNECTOR
B 1
B184
FRONT WIPER MOTOR
5 B
B8
GND(L)-01 A
B GND(L)-03
B
E
GB-1
B
E
GF-2


B129 (BLACK)
B177
B32 (BLACK)
B267
B104 (PINK)
B8 (GRAY)
B132
B160 (GRAY)
B161 (BROWN)
B272 (BLUE)
B193 (BLACK)
B194
B44
B79 (GRAY)
B71
B176
F2 (BLUE)
B225
RELAY BLOCK (BLACK)

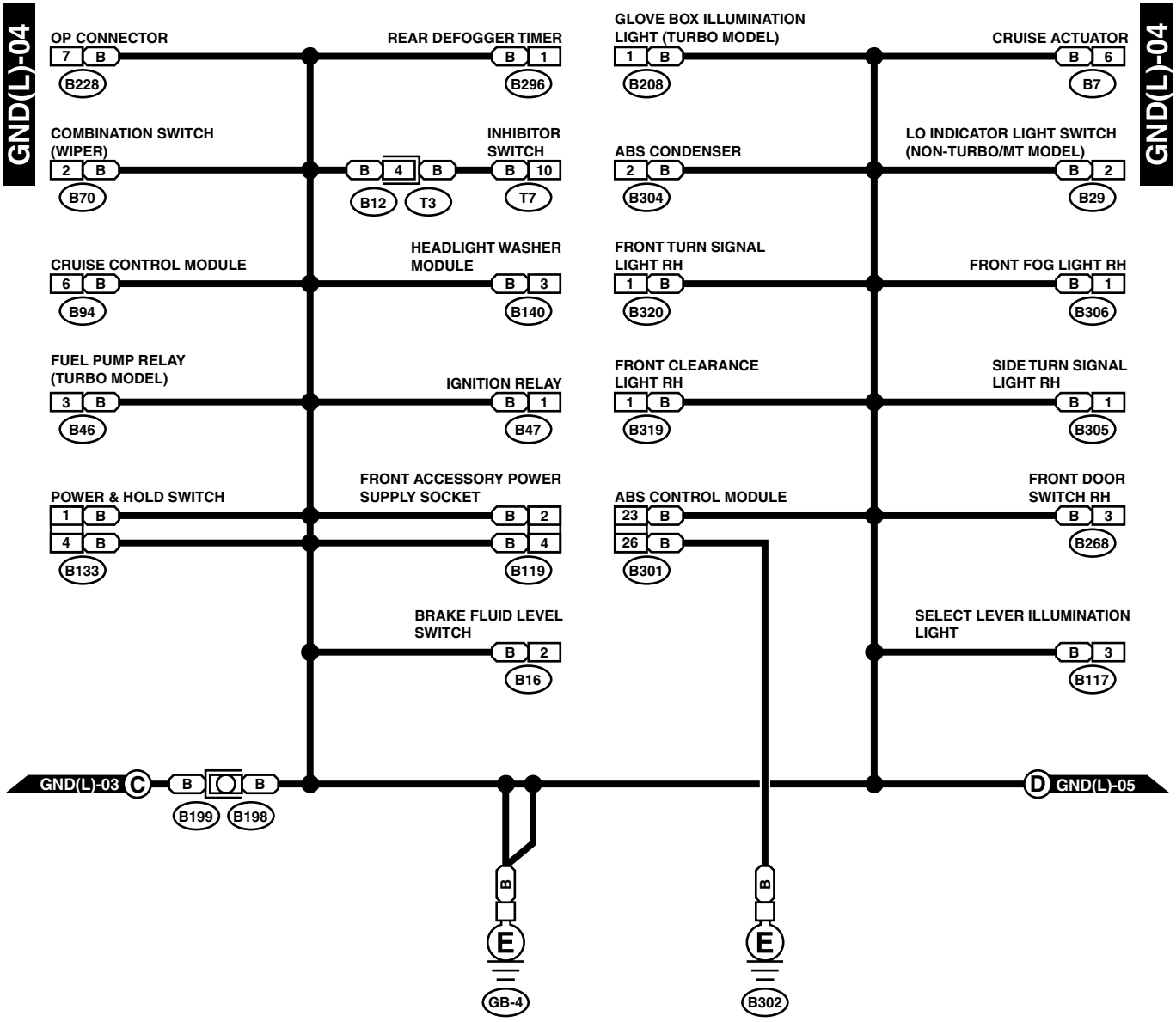
WI-00235

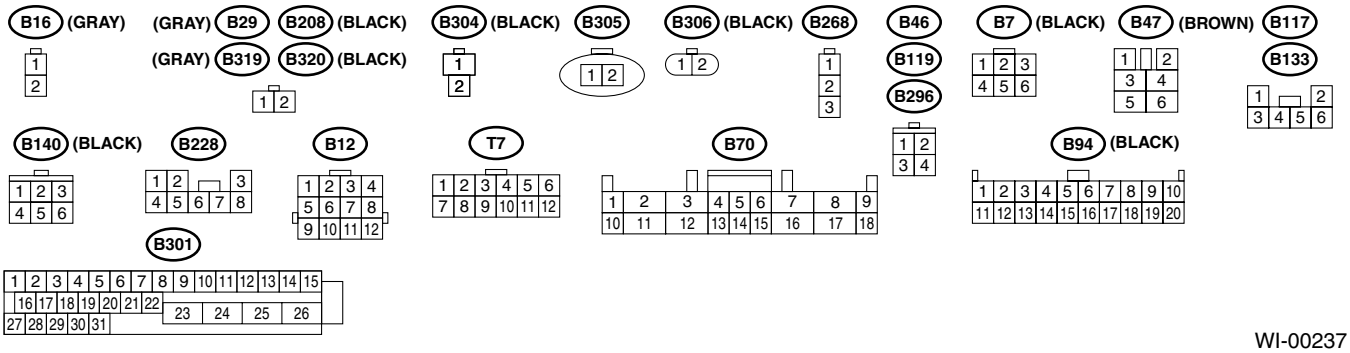

GND(L)-03
POWER WINDOW MAIN SWITCH
5 B
D7
REMOTE CONTROL REARVIEW MIRROR SWITCH
7 B
D61
REMOTE CONTROL REARVIEW MIRROR & MIRROR HEATER
5 B
D5
REAR POWER WINDOW SUB SWITCH LH
B 2
D25
COMBINATION METER
B 10
B: i10
COMBINATION METER
OrW 11
A: i12
HAZARD SWITCH
OrW 2
i22
CLOCK
OrW 1
B 7
i59
GND(L)-03
B 4 B
D1
B30
B 4 B
D22
B270
B 20 OrW 24 B
i3
B38
GND(L)-02 B
C GND(L)-04


B270
i59 (GREEN)
D5
D25
i22
D61
A: i12
D7
D1
B: i10
B38

WI-00236

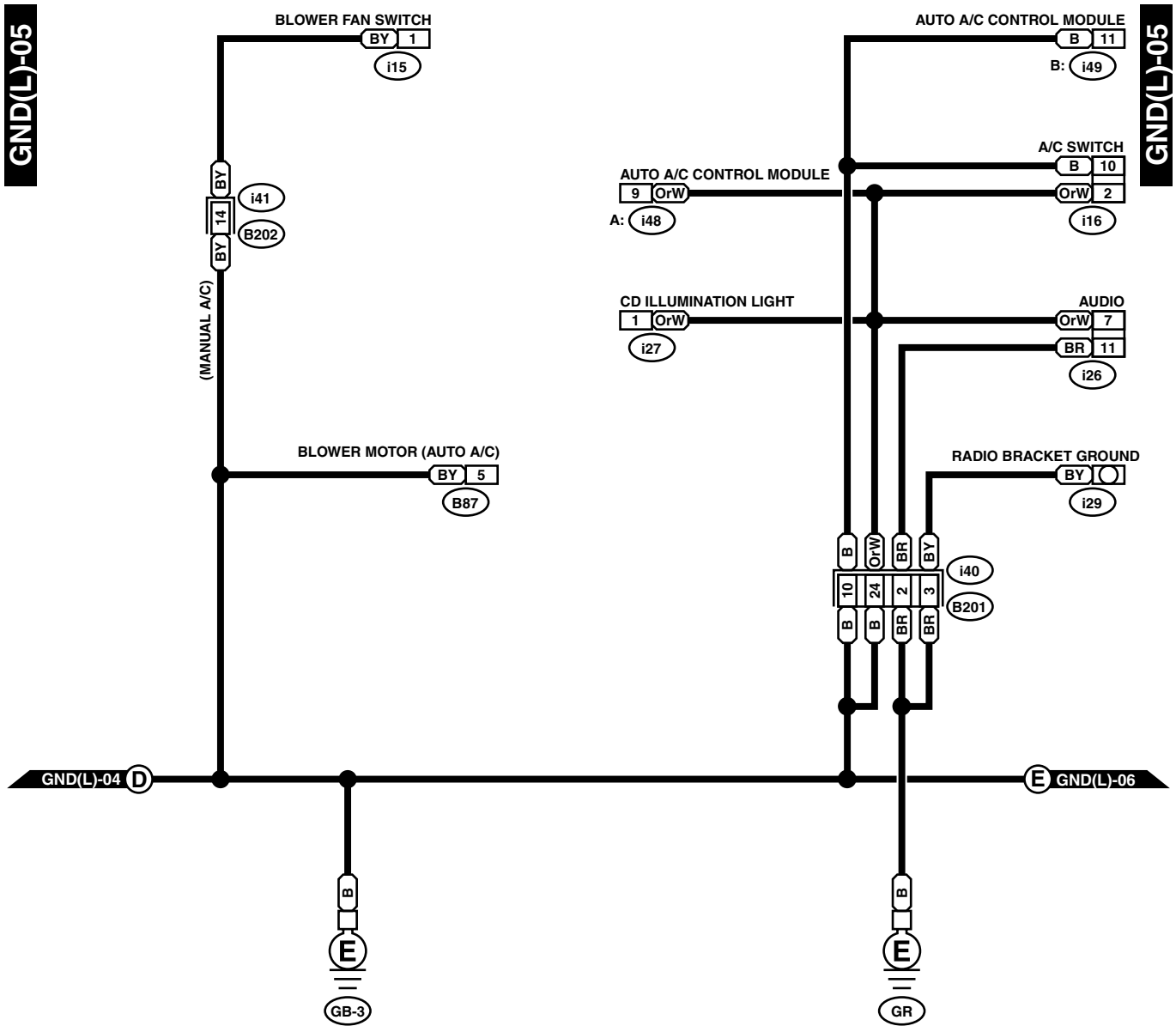
GROUND DISTRIBUTION

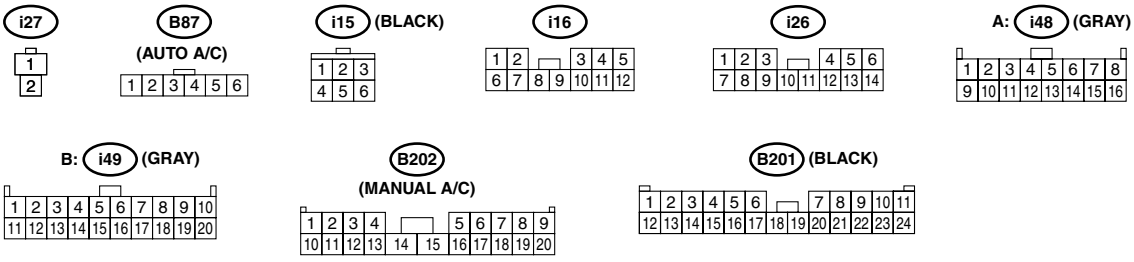




WI-00237

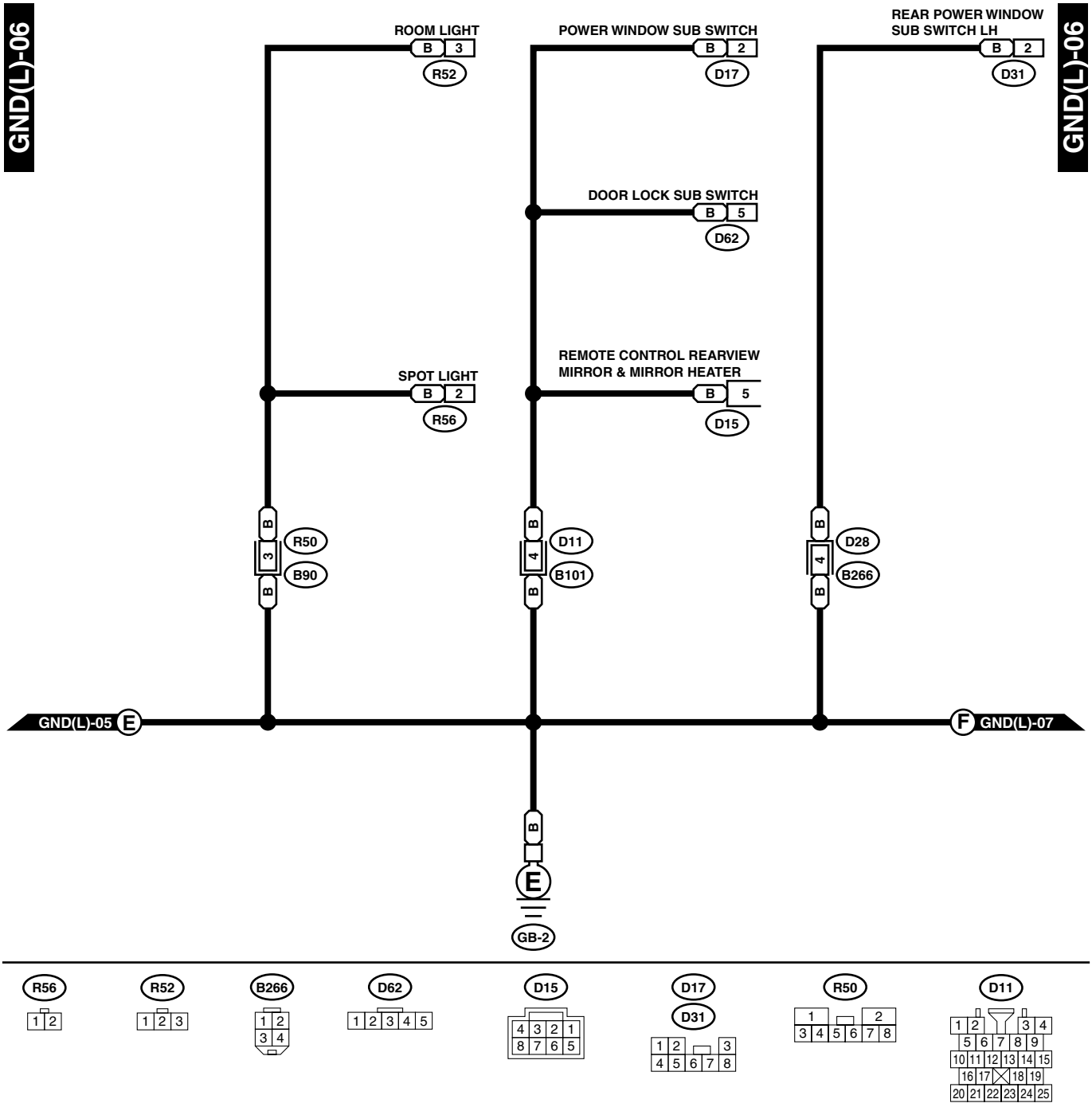
GROUND DISTRIBUTION



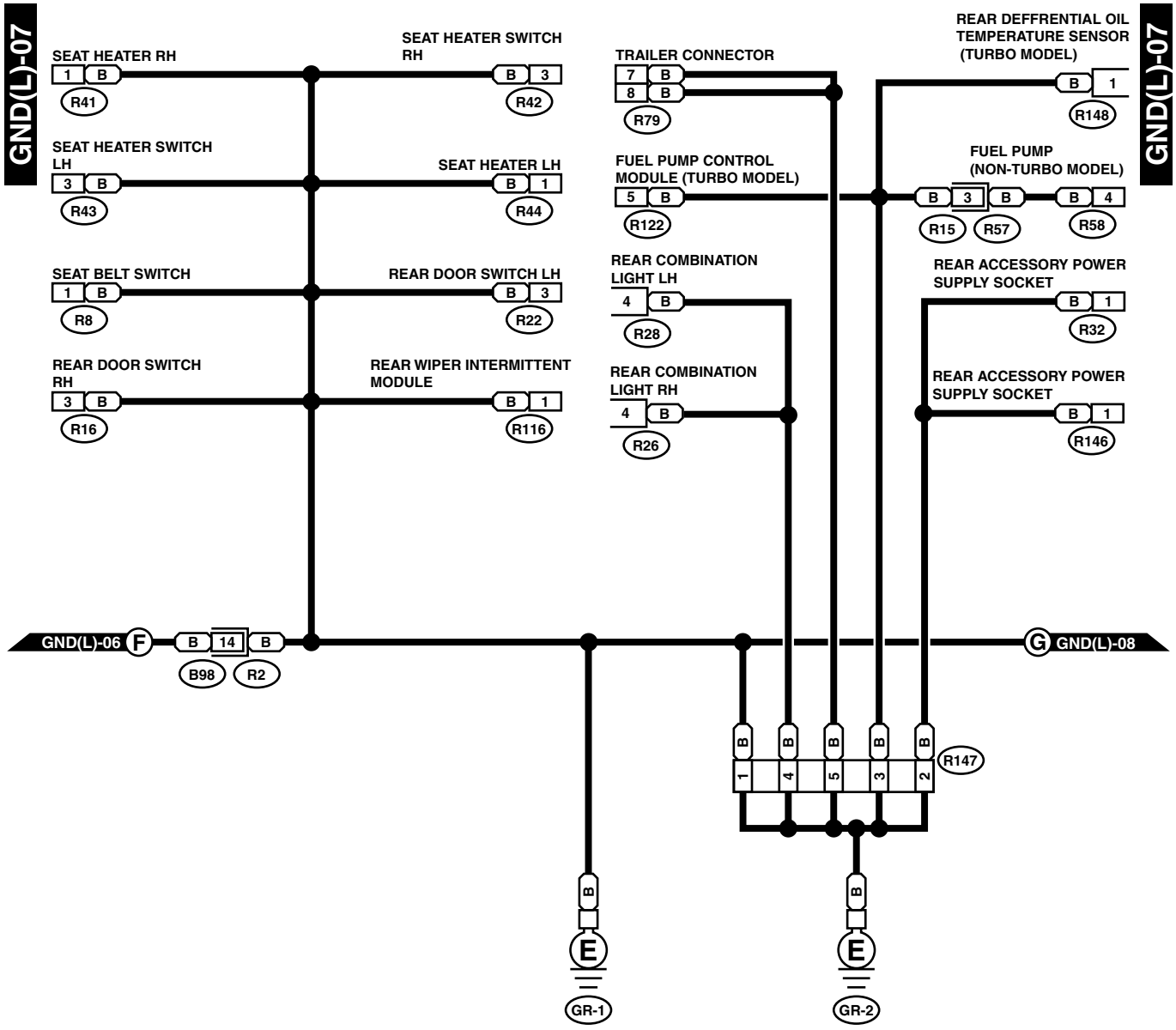


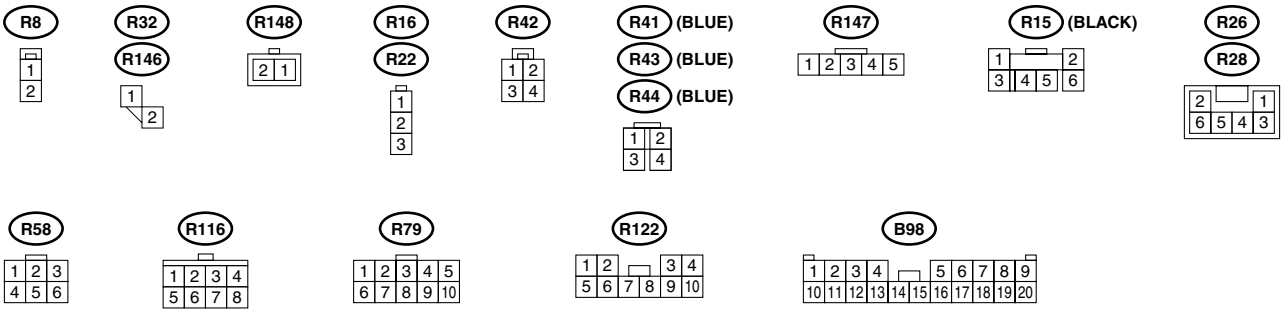
WI-00238

GROUND DISTRIBUTION



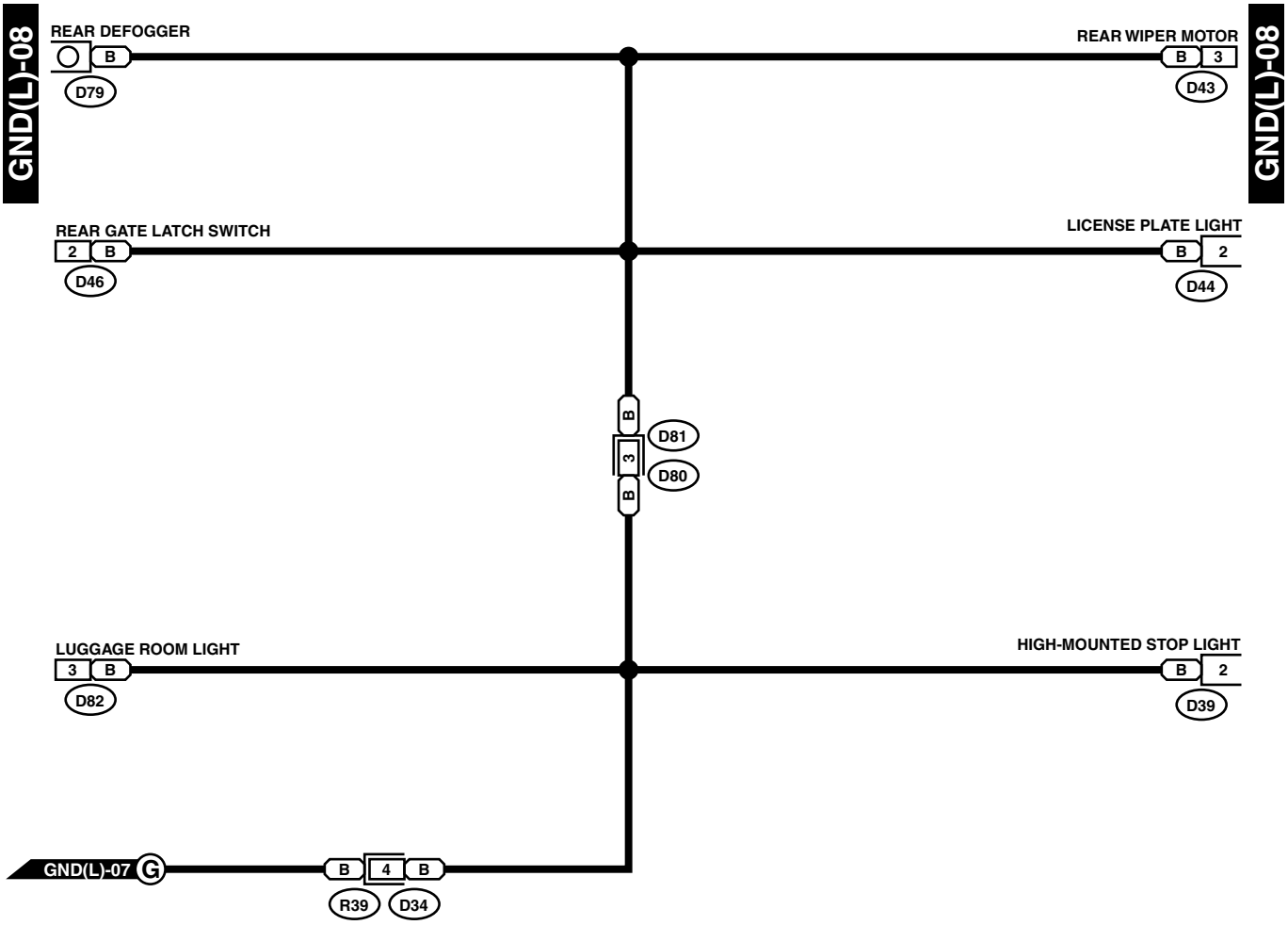
WI-00239

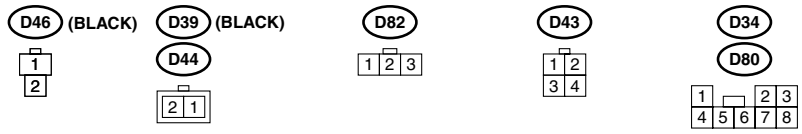

GND(L)-07
SEAT HEATER RH
1 B
R41
SEAT HEATER SWITCH RH
B 3
R42
SEAT HEATER SWITCH LH
3 B
R43
SEAT HEATER LH
B 1
R44
SEAT BELT SWITCH
1 B
R8
REAR DOOR SWITCH LH
B 3
R22
REAR DOOR SWITCH RH
3 B
R16
REAR WIPER INTERMITTENT MODULE
B 1
R116
TRAILER CONNECTOR
7 B
8 B
R79
FUEL PUMP CONTROL MODULE (TURBO MODEL)
5 B
R122
REAR COMBINATION LIGHT LH
4 B
R28
REAR COMBINATION LIGHT RH
4 B
R26
REAR DEFFRENTIAL OIL TEMPERATURE SENSOR (TURBO MODEL)
B 1
R148
FUEL PUMP (NON-TURBO MODEL)
B 3 B B 4
R15 R57 R58
REAR ACCESSORY POWER SUPPLY SOCKET
B 1
R32
REAR ACCESSORY POWER SUPPLY SOCKET
B 1
R146
GND(L)-06 F
B 14 B
B98 R2
G GND(L)-08
B 1 4 5 3 2
R147
E
GR-1
E
GR-2
GND(L)-07


R8
R32
R146
R148
R16
R22
R42
R41 (BLUE)
R43 (BLUE)
R44 (BLUE)
R147
R15 (BLACK)
R26
R28
R58
R116
R79
R122
B98

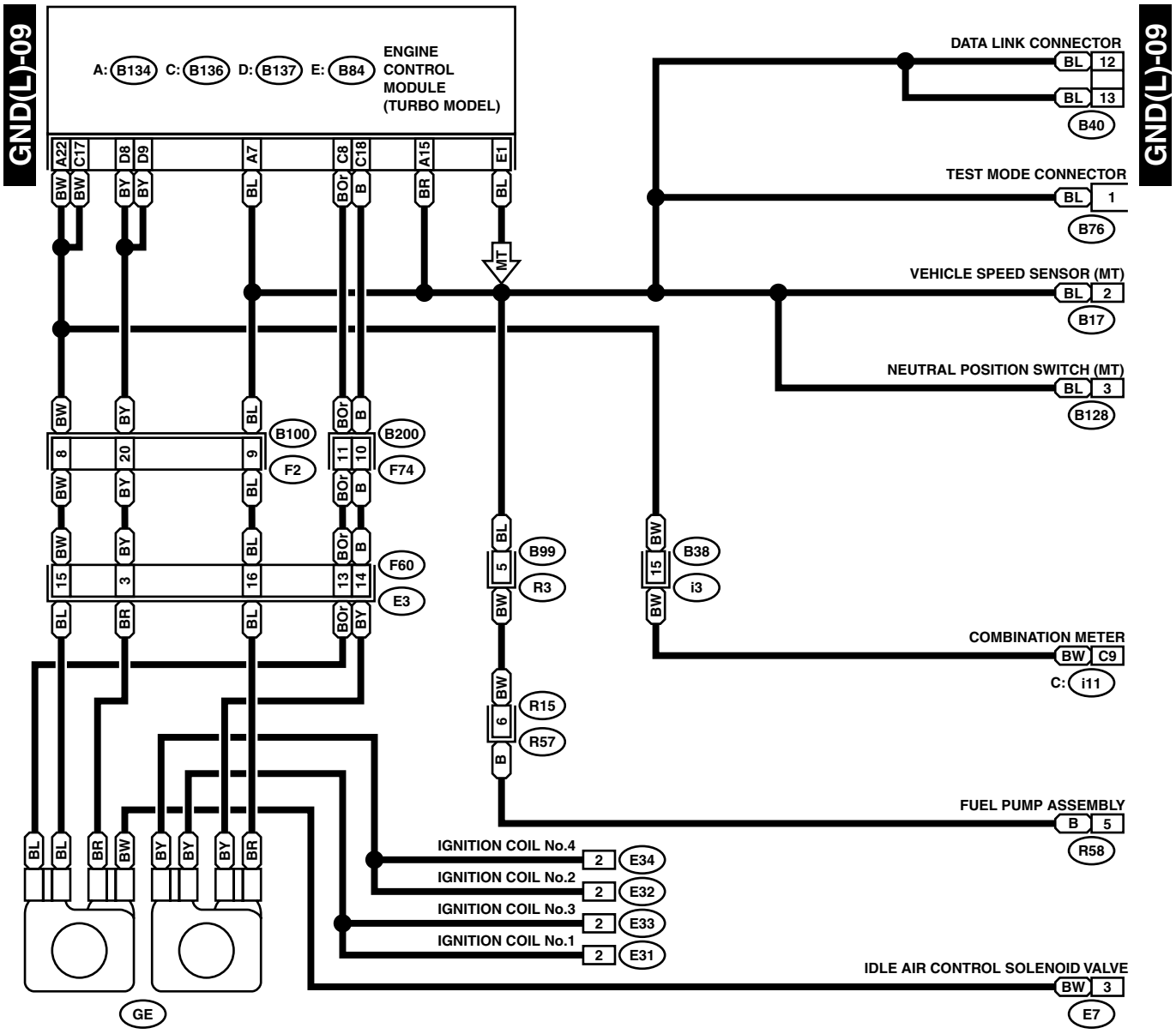
WI-00240

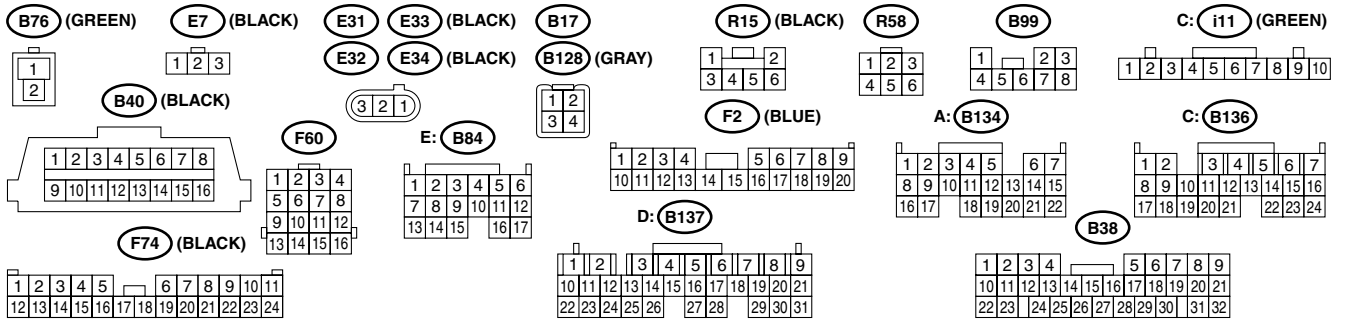
GROUND DISTRIBUTION



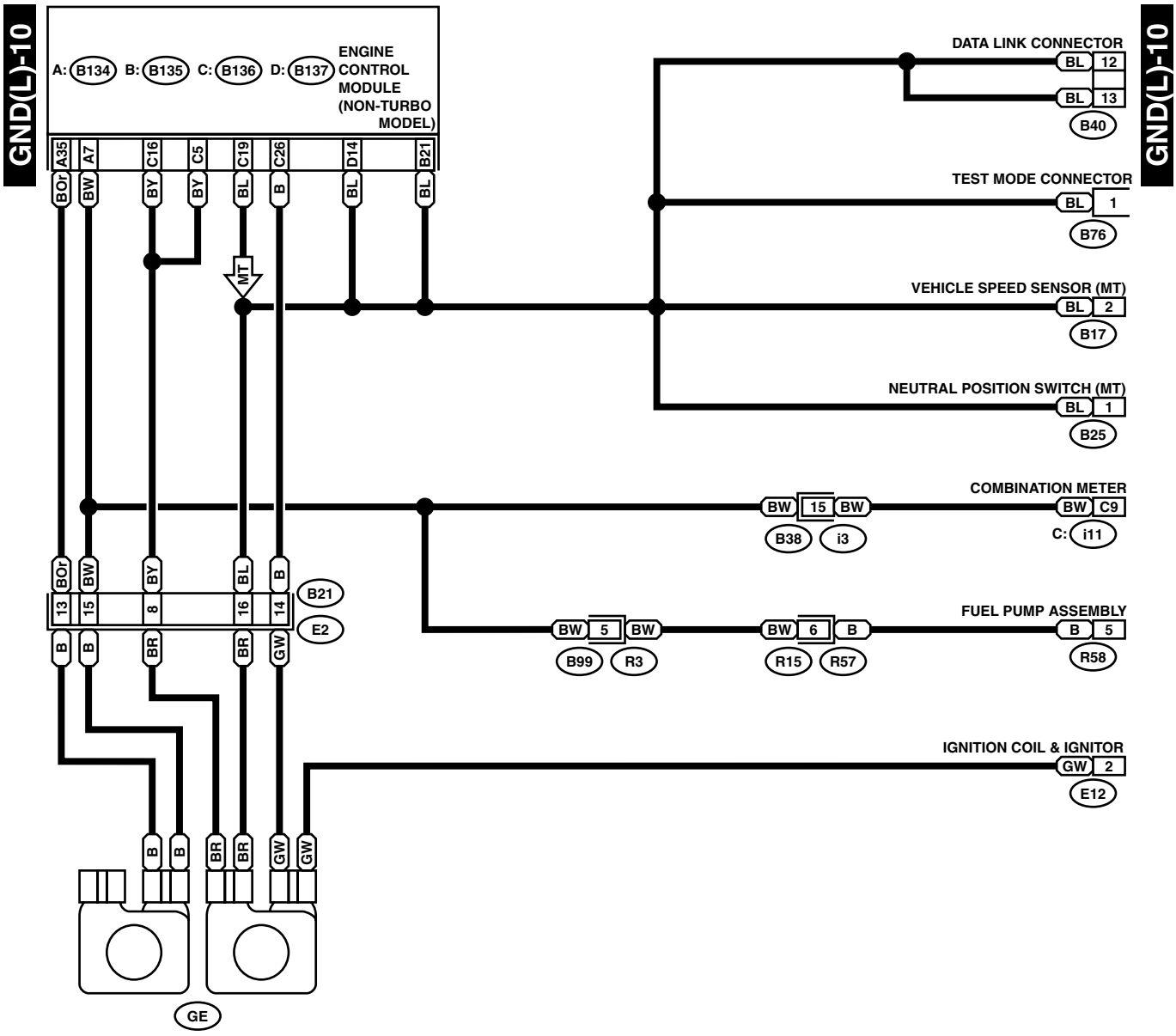


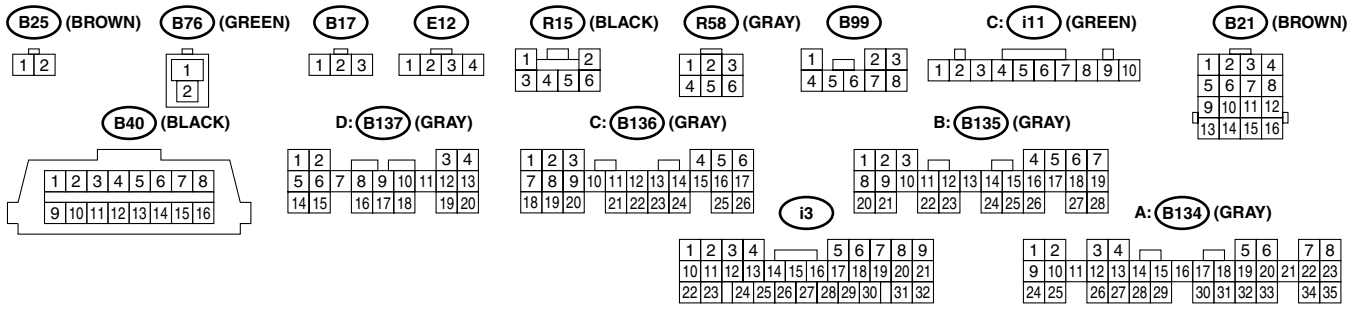
WI-00241


GND(L)-09
GND(L)-09
A: B134 C: B136 D: B137 E: B84
ENGINE CONTROL MODULE (TURBO MODEL)
A22 C17 D8 D9 A7 C8 C18 A15 E1
BW BW BY BY BL BOr B BR BL
MT
DATA LINK CONNECTOR
BL 12
BL 13
B40
TEST MODE CONNECTOR
BL 1
B76
VEHICLE SPEED SENSOR (MT)
BL 2
B17
NEUTRAL POSITION SWITCH (MT)
BL 3
B128
B100 B200
F2 F74
F60 E3
B99 R3
B38 i3
COMBINATION METER
BW C9
C: i11
R15 R57
FUEL PUMP ASSEMBLY
B 5
R58
IGNITION COIL No.4 2 E34
IGNITION COIL No.2 2 E32
IGNITION COIL No.3 2 E33
IGNITION COIL No.1 2 E31
IDLE AIR CONTROL SOLENOID VALVE
BW 3
E7
GE

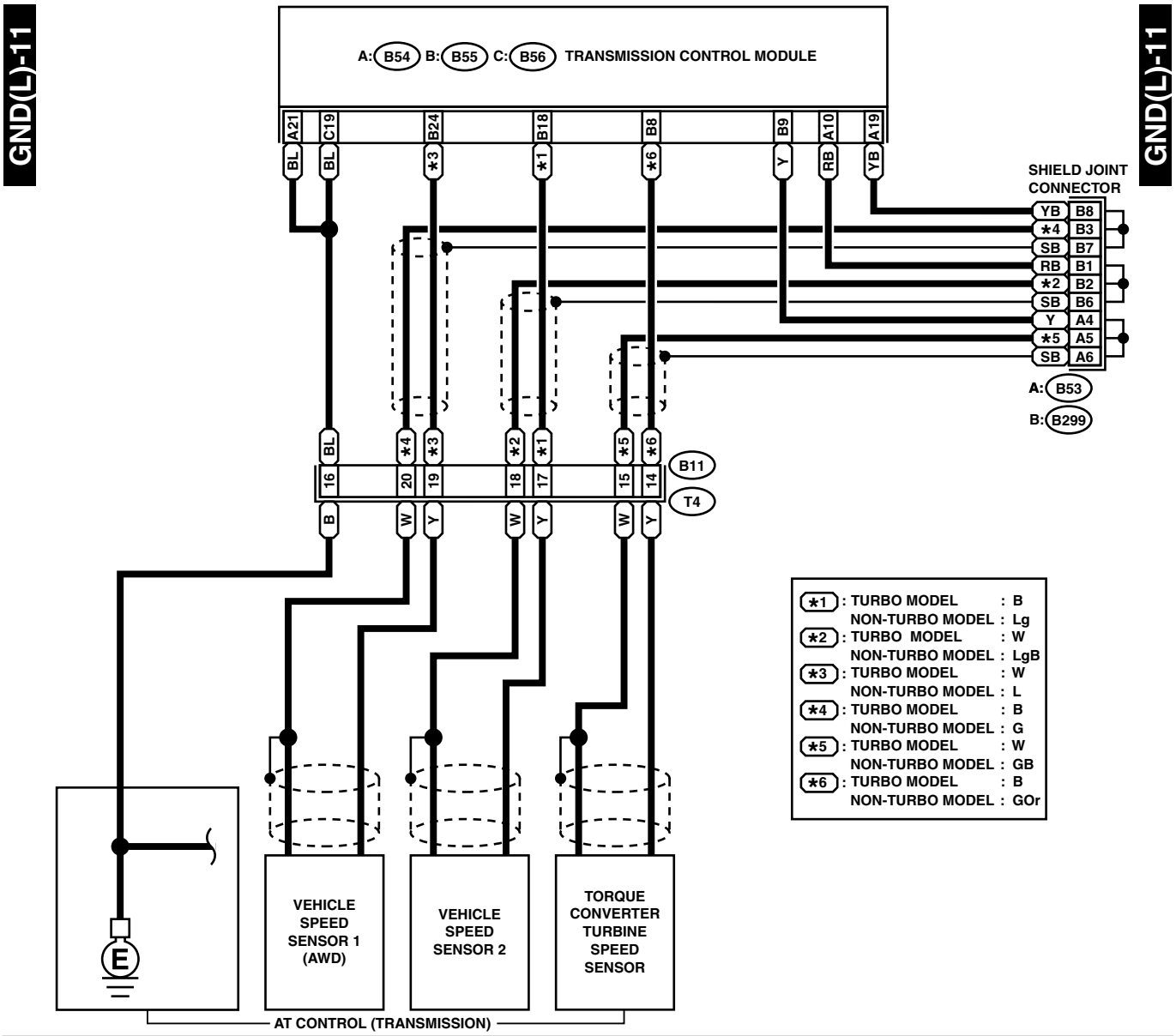

B76 (GREEN)
E7 (BLACK)
E31 E33 (BLACK)
E32 E34 (BLACK)
B17
B128 (GRAY)
R15 (BLACK)
R58
B99
C: i11 (GREEN)
B40 (BLACK)
F2 (BLUE)
A: B134
C: B136
F60
E: B84
D: B137
B38
F74 (BLACK)

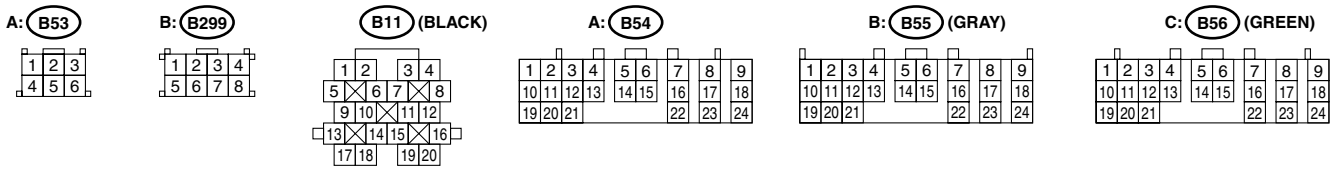
WI-00242


GND(L)-10
A: B134 B: B135 C: B136 D: B137
ENGINE CONTROL MODULE (NON-TURBO MODEL)
A35 A7 C16 C5 C19 C26 D14 B21
BOr BW BY BY BL B BL BL
MT
DATA LINK CONNECTOR
BL 12
BL 13
B40
TEST MODE CONNECTOR
BL 1
B76
VEHICLE SPEED SENSOR (MT)
BL 2
B17
NEUTRAL POSITION SWITCH (MT)
BL 1
B25
COMBINATION METER
BW 15 BW
B38 i3
BW C9
C: i11
13 15 8 16 14
B21
E2
FUEL PUMP ASSEMBLY
BW 5 BW
B99 R3
BW 6 B
R15 R57
B 5
R58
B B BR BR GW
IGNITION COIL & IGNITOR
GW 2
E12
B B BR BR GW GW
GE


B25 (BROWN)
B76 (GREEN)
B17
E12
R15 (BLACK)
R58 (GRAY)
B99
C: i11 (GREEN)
B21 (BROWN)
B40 (BLACK)
D: B137 (GRAY)
C: B136 (GRAY)
B: B135 (GRAY)
i3
A: B134 (GRAY)

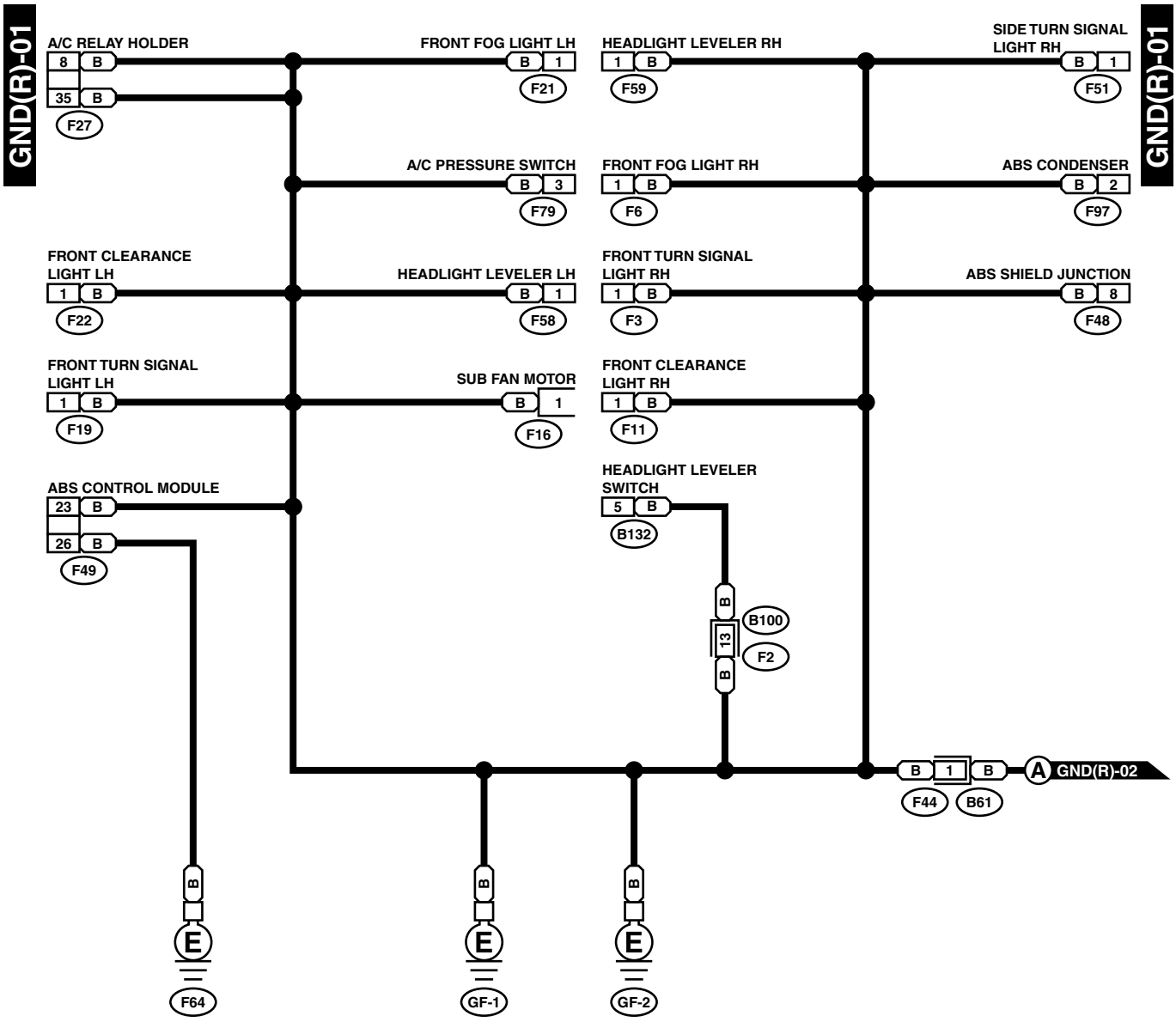
WI-00244

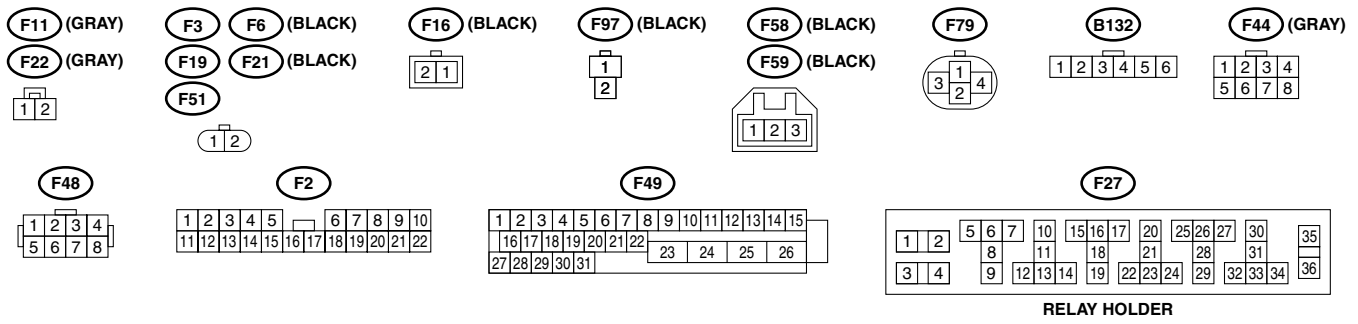

GND(L)-11
GND(L)-11
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE
A21
C19
B24
B18
B8
B9
A10
A19
BL
BL
*3
*1
*6
Y
RB
YB
SHIELD JOINT CONNECTOR
YB B8
*4 B3
SB B7
RB B1
*2 B2
SB B6
Y A4
*5 A5
SB A6
A: B53
B: B299
BL
*4
*3
*2
*1
*5
*6
16
20
19
18
17
15
14
B11
T4
B
W
Y
W
Y
W
Y
*1 : TURBO MODEL : B
NON-TURBO MODEL : Lg
*2 : TURBO MODEL : W
NON-TURBO MODEL : LgB
*3 : TURBO MODEL : W
NON-TURBO MODEL : L
*4 : TURBO MODEL : B
NON-TURBO MODEL : G
*5 : TURBO MODEL : W
NON-TURBO MODEL : GB
*6 : TURBO MODEL : B
NON-TURBO MODEL : GOr
E
VEHICLE SPEED SENSOR 1 (AWD)
VEHICLE SPEED SENSOR 2
TORQUE CONVERTER TURBINE SPEED SENSOR
AT CONTROL (TRANSMISSION)


A: B53
B: B299
B11 (BLACK)
A: B54
B: B55 (GRAY)
C: B56 (GREEN)

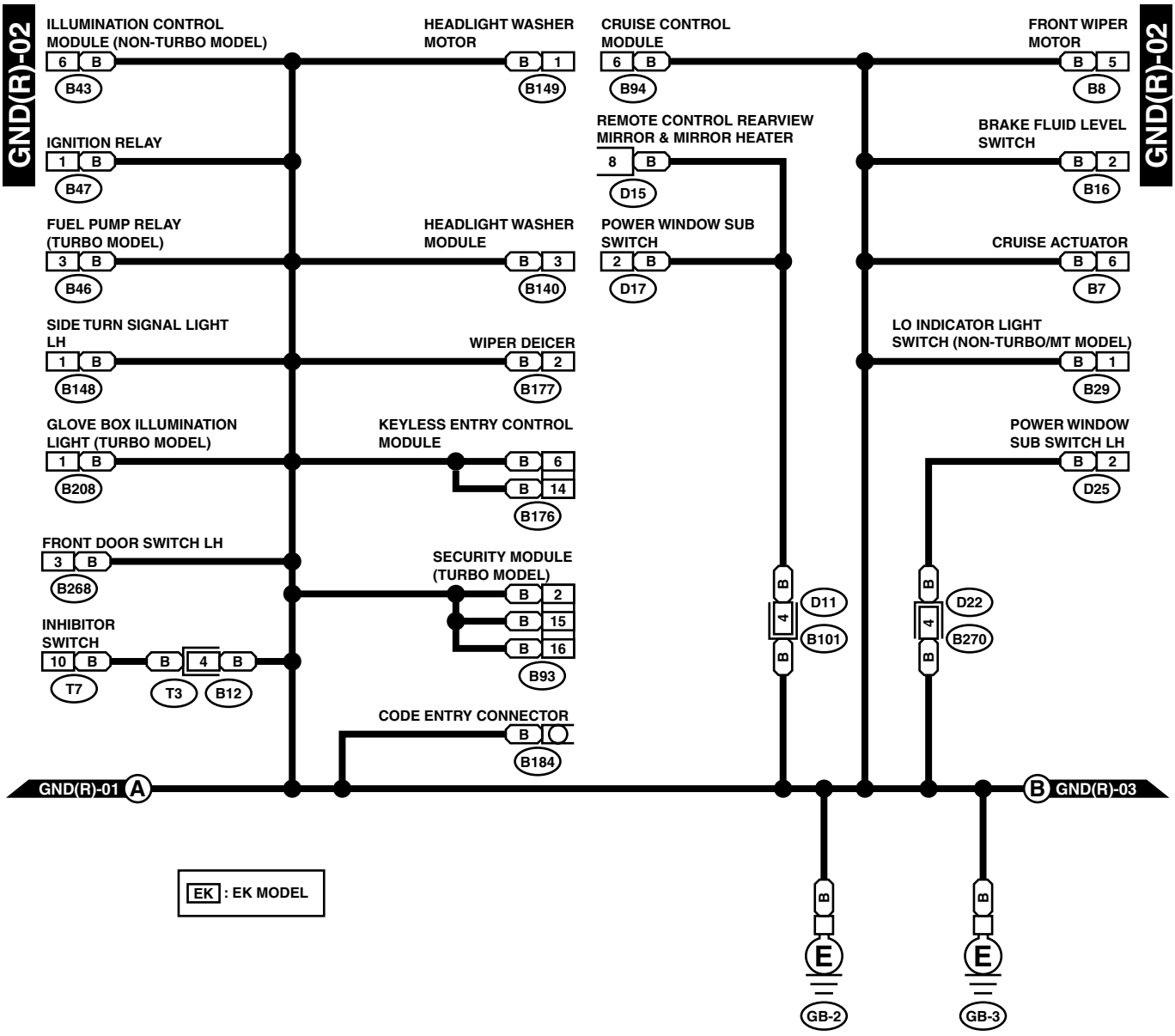
WI-00245

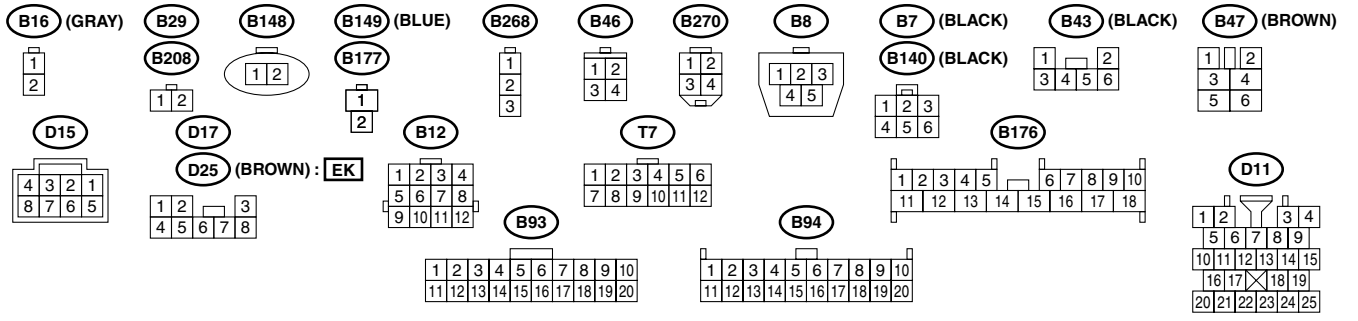
2. RHD MODEL



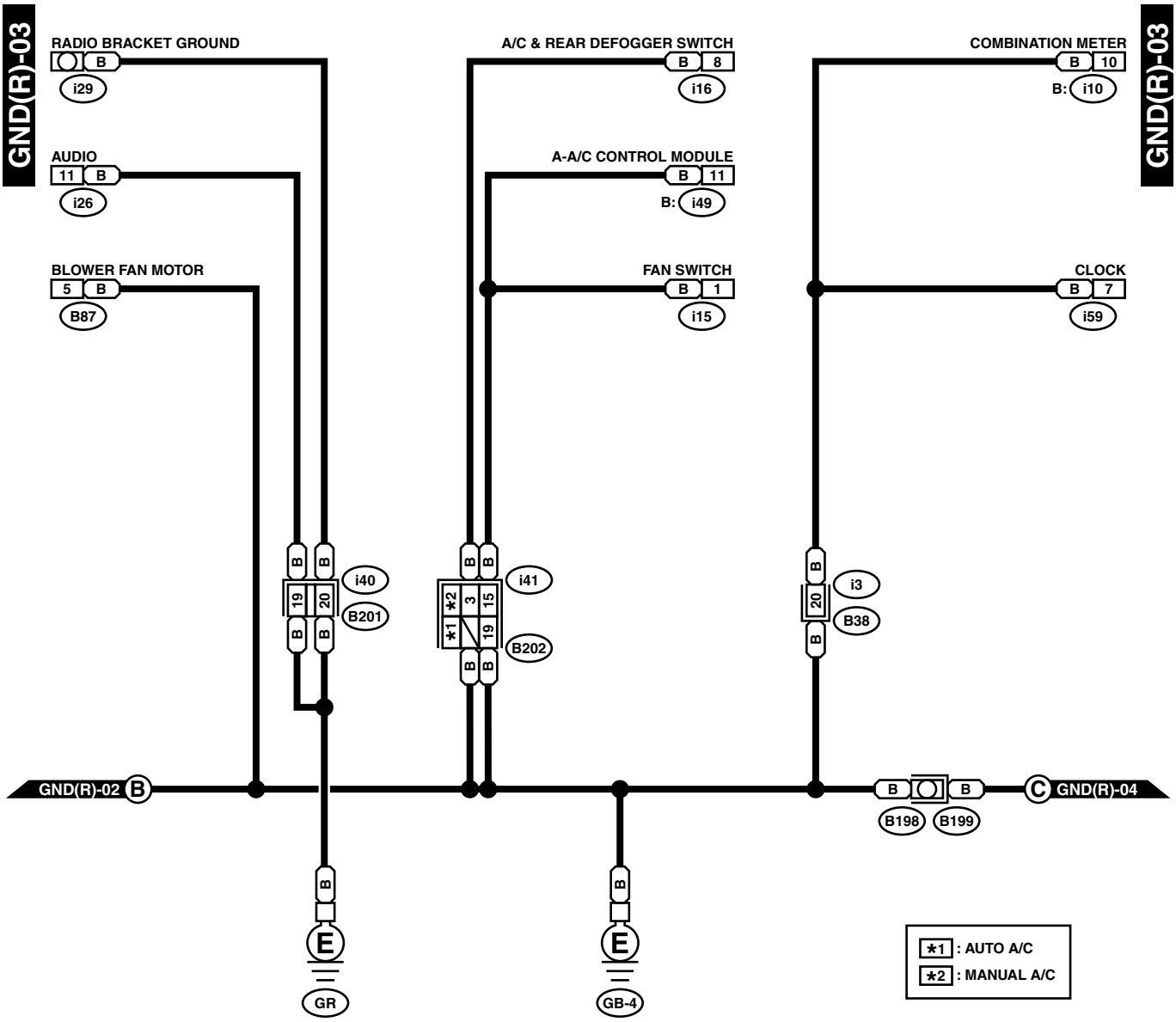


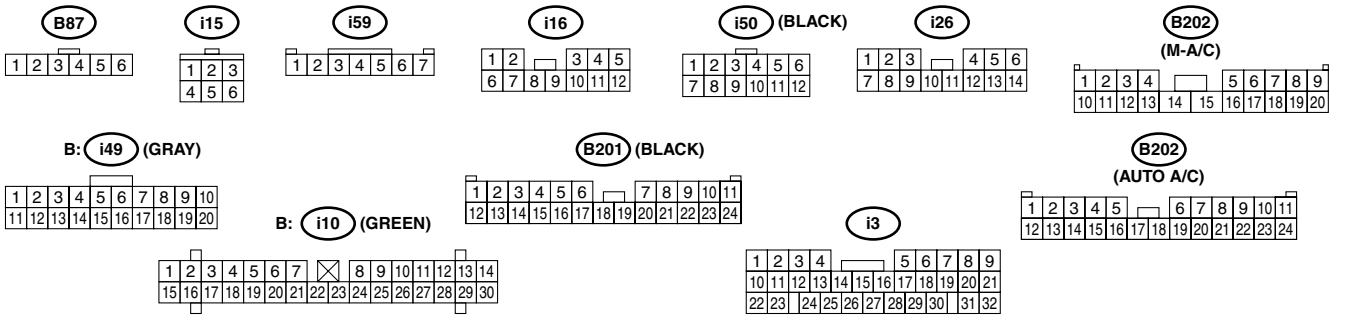
WI-00246


GND(R)-02
ILLUMINATION CONTROL MODULE (NON-TURBO MODEL)
6 B
B43
HEADLIGHT WASHER MOTOR
B 1
B149
CRUISE CONTROL MODULE
6 B
B94
FRONT WIPER MOTOR
B 5
B8
GND(R)-02
IGNITION RELAY
1 B
B47
REMOTE CONTROL REARVIEW MIRROR & MIRROR HEATER
8 B
D15
BRAKE FLUID LEVEL SWITCH
B 2
B16
FUEL PUMP RELAY (TURBO MODEL)
3 B
B46
HEADLIGHT WASHER MODULE
B 3
B140
POWER WINDOW SUB SWITCH
2 B
D17
CRUISE ACTUATOR
B 6
B7
SIDE TURN SIGNAL LIGHT LH
1 B
B148
WIPER DEICER
B 2
B177
LO INDICATOR LIGHT SWITCH (NON-TURBO/MT MODEL)
B 1
B29
GLOVE BOX ILLUMINATION LIGHT (TURBO MODEL)
1 B
B208
KEYLESS ENTRY CONTROL MODULE
B 6
B 14
B176
POWER WINDOW SUB SWITCH LH
B 2
D25
FRONT DOOR SWITCH LH
3 B
B268
SECURITY MODULE (TURBO MODEL)
B 2
B 15
B 16
B93
INHIBITOR SWITCH
10 B
T7
B 4 B
T3
B12
B D11 B
4
B101
B D22 B
4
B270
CODE ENTRY CONNECTOR
B
B184
GND(R)-01 A
B GND(R)-03
EK : EK MODEL
B
E
GB-2
B
E
GB-3


B16 (GRAY)
B29
B208
B148
B149 (BLUE)
B177
B268
B46
B270
B8
B7 (BLACK)
B140 (BLACK)
B43 (BLACK)
B47 (BROWN)
D15
D17
D25 (BROWN) : EK
B12
T7
B93
B94
B176
D11

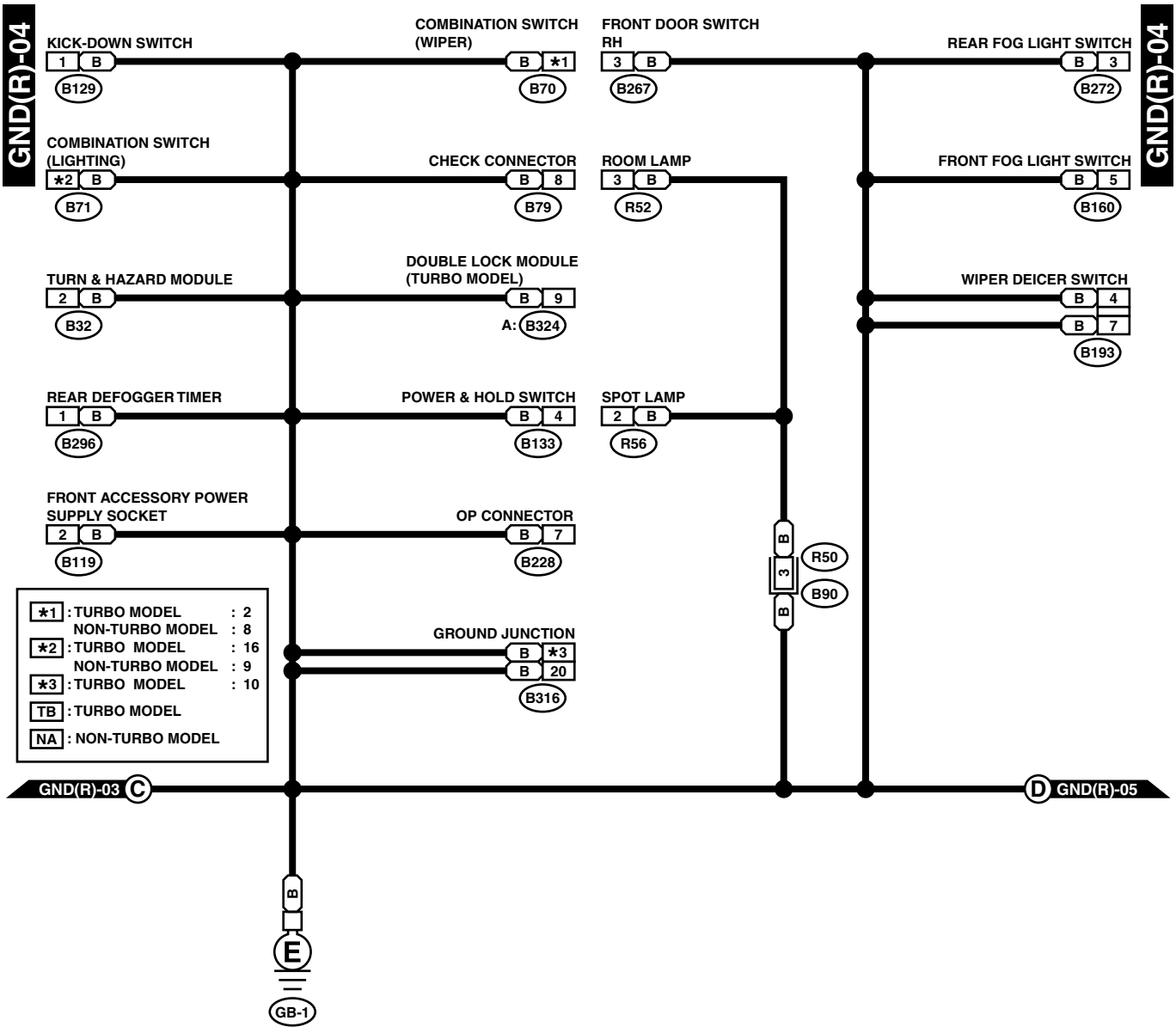
WI-00247

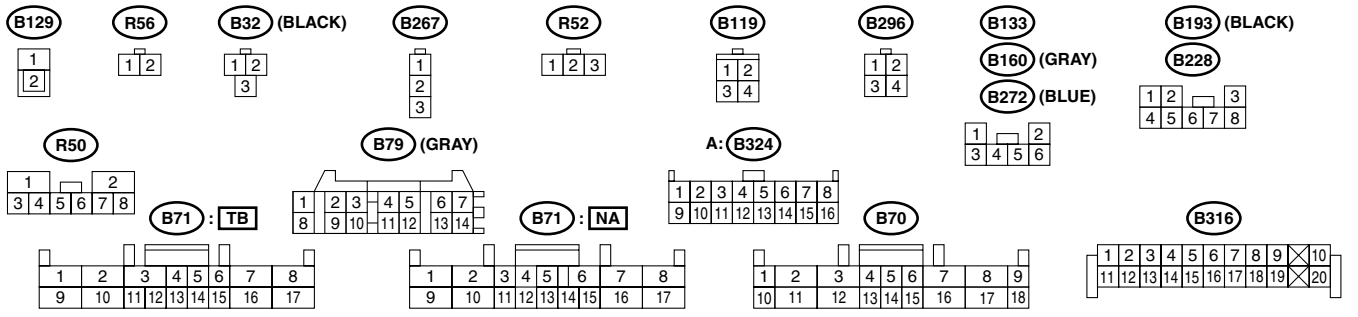

GND(R)-03
RADIO BRACKET GROUND
B
i29
AUDIO
11
B
i26
BLOWER FAN MOTOR
5
B
B87
A/C & REAR DEFOGGER SWITCH
B
8
i16
A-A/C CONTROL MODULE
B
11
B: i49
FAN SWITCH
B
1
i15
COMBINATION METER
B
10
B: i10
CLOCK
B
7
i59
GND(R)-03
i40
B201
i41
B202
i3
B38
GND(R)-02
B
GND(R)-04
C
B198
B199
E
GR
GB-4
*1 : AUTO A/C
*2 : MANUAL A/C


B87
i15
i59
i16
i50 (BLACK)
i26
B202
(M-A/C)
B: i49 (GRAY)
B: i10 (GREEN)
B201 (BLACK)
i3
B202
(AUTO A/C)

WI-00248

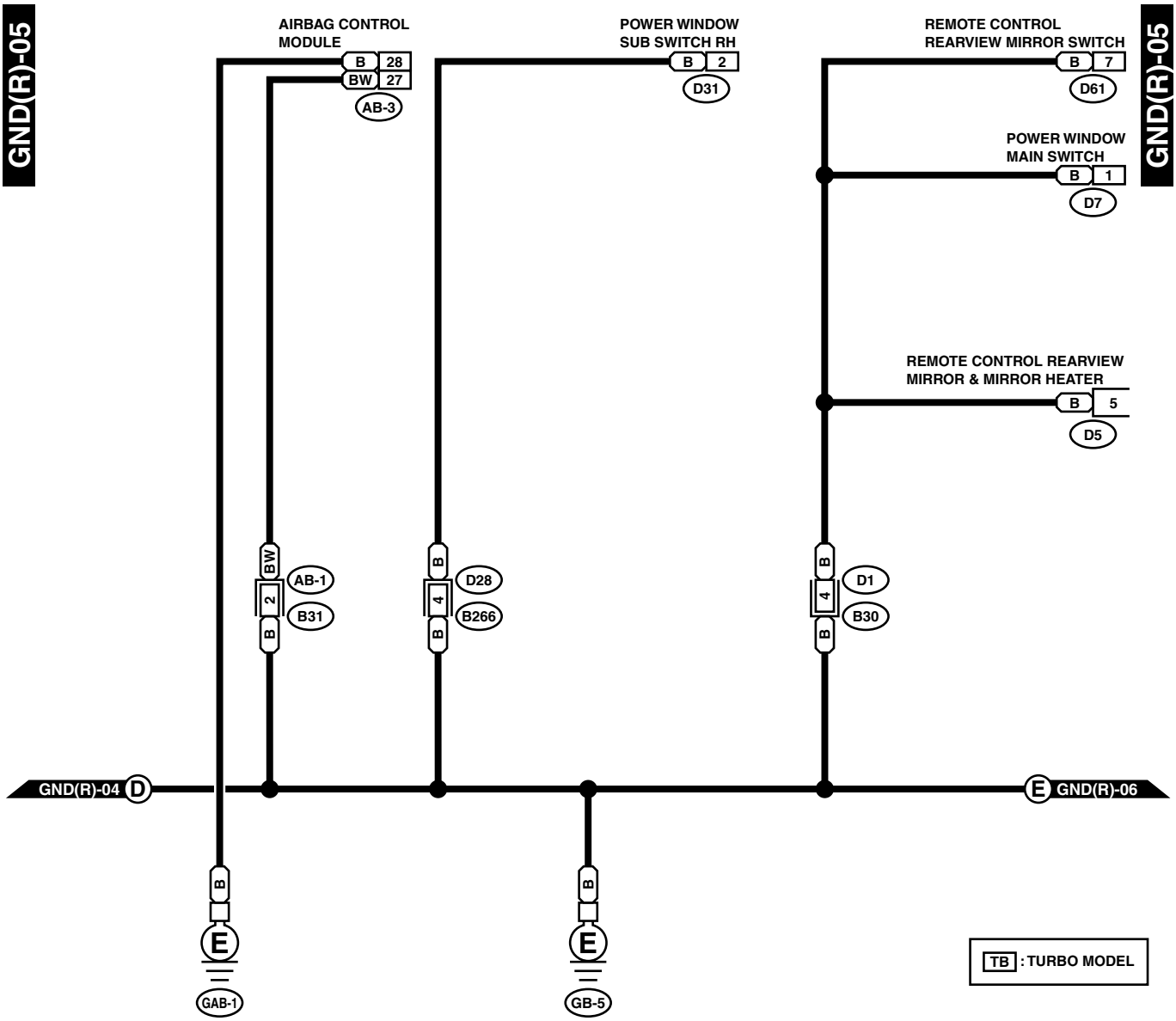
GROUND DISTRIBUTION

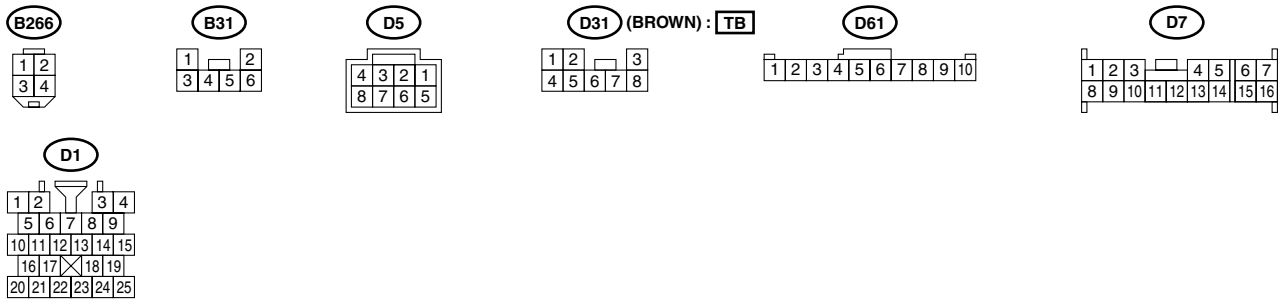




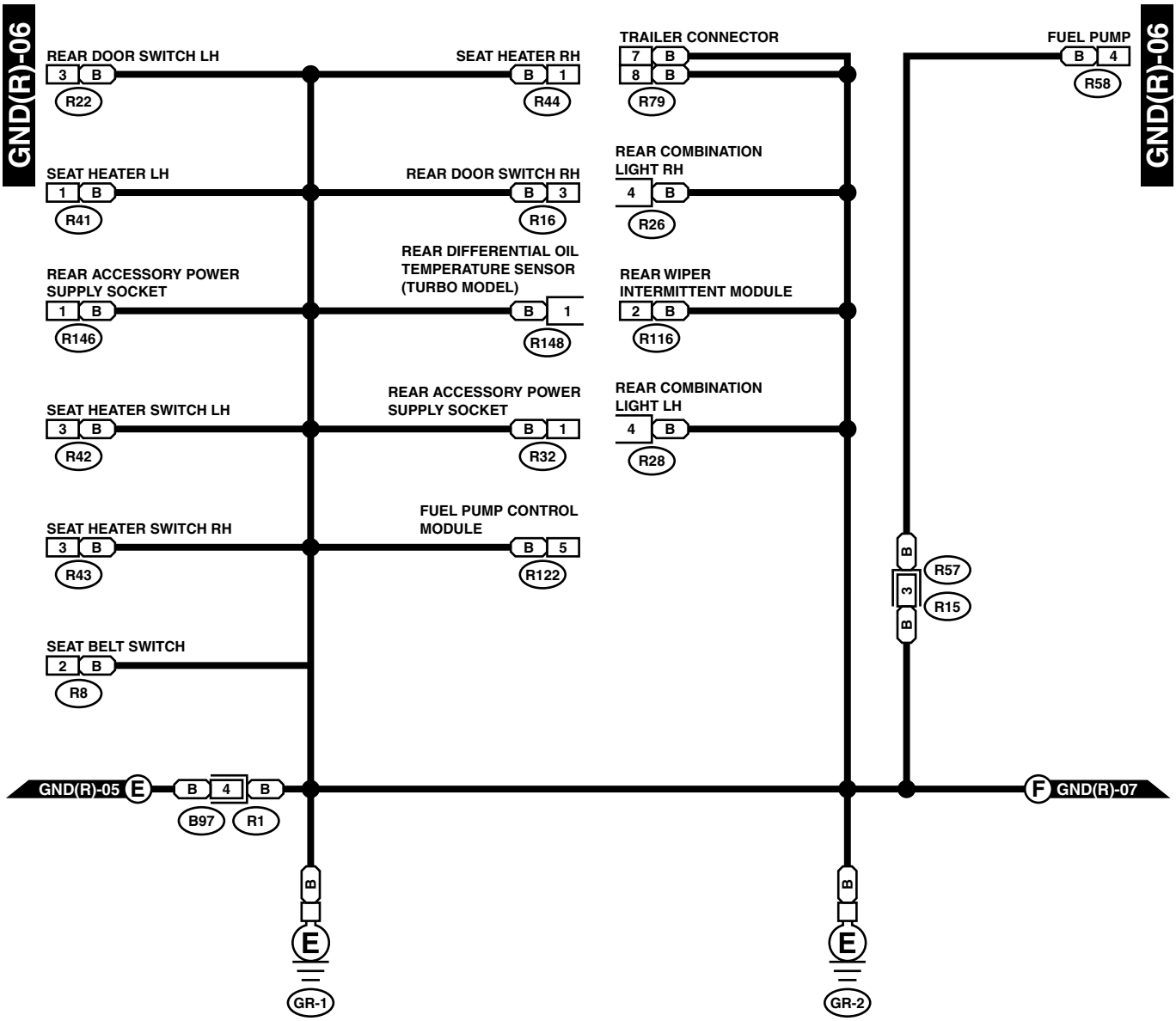
WI-00249

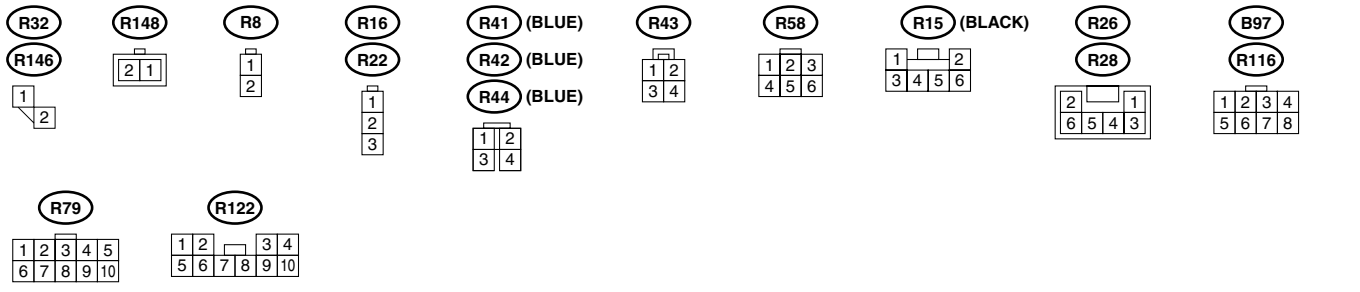
GROUND DISTRIBUTION





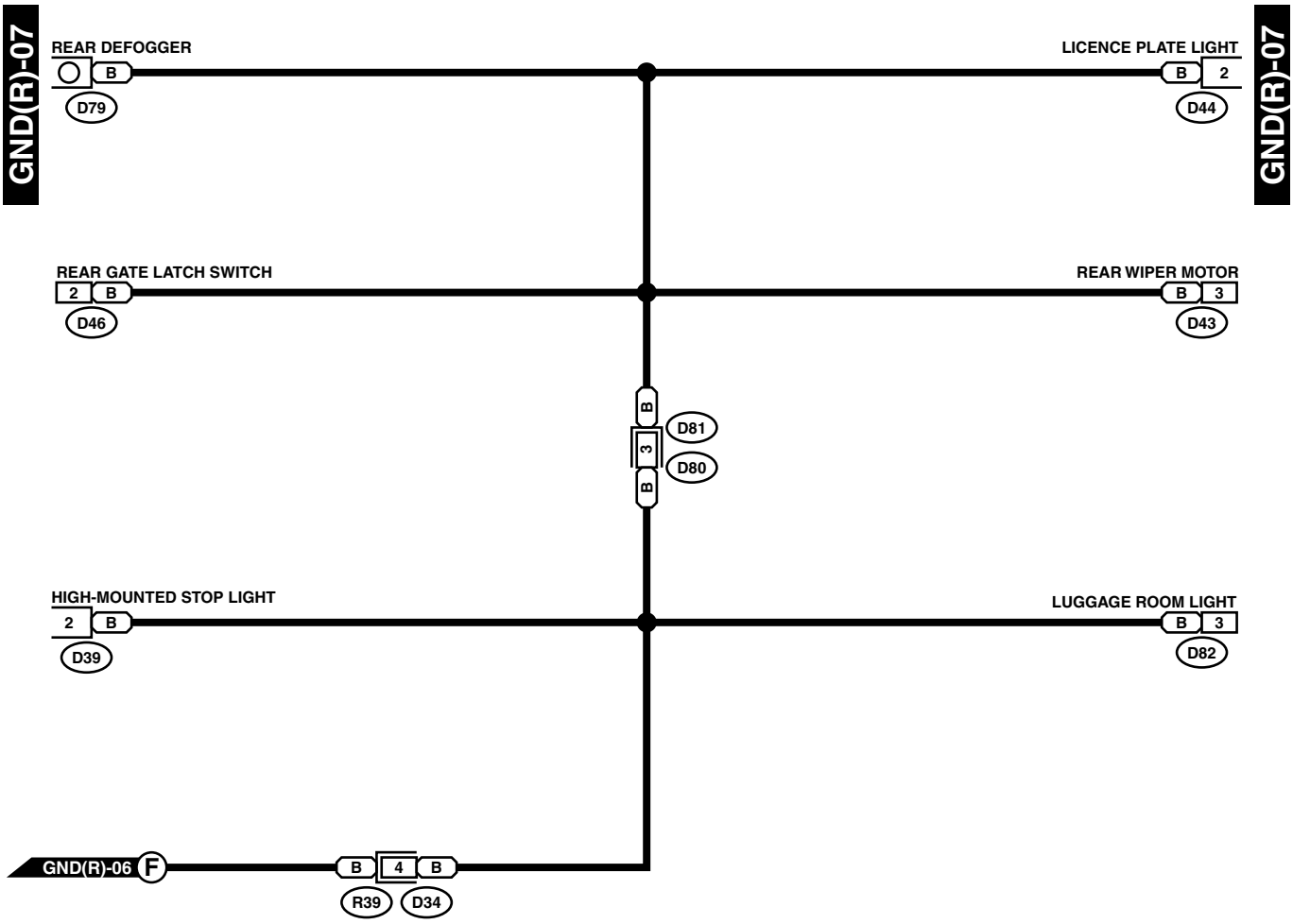
WI-00250

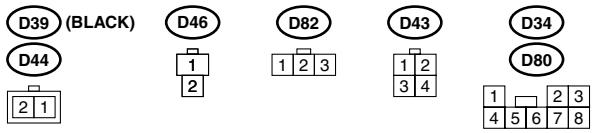

GND(R)-06
REAR DOOR SWITCH LH
3 B
R22
SEAT HEATER LH
1 B
R41
REAR ACCESSORY POWER SUPPLY SOCKET
1 B
R146
SEAT HEATER SWITCH LH
3 B
R42
SEAT HEATER SWITCH RH
3 B
R43
SEAT BELT SWITCH
2 B
R8
SEAT HEATER RH
B 1
R44
REAR DOOR SWITCH RH
B 3
R16
REAR DIFFERENTIAL OIL TEMPERATURE SENSOR (TURBO MODEL)
B 1
R148
REAR ACCESSORY POWER SUPPLY SOCKET
B 1
R32
FUEL PUMP CONTROL MODULE
B 5
R122
TRAILER CONNECTOR
7 B
8 B
R79
REAR COMBINATION LIGHT RH
4 B
R26
REAR WIPER INTERMITTENT MODULE
2 B
R116
REAR COMBINATION LIGHT LH
4 B
R28
FUEL PUMP
B 4
R58
GND(R)-06
B
3
B
R57
R15
GND(R)-05 E
B 4 B
B97
R1
F GND(R)-07
B
E
GR-1
B
E
GR-2


R32
R146
R148
R8
R16
R22
R41 (BLUE)
R42 (BLUE)
R44 (BLUE)
R43
R58
R15 (BLACK)
R26
R28
B97
R116
R79
R122

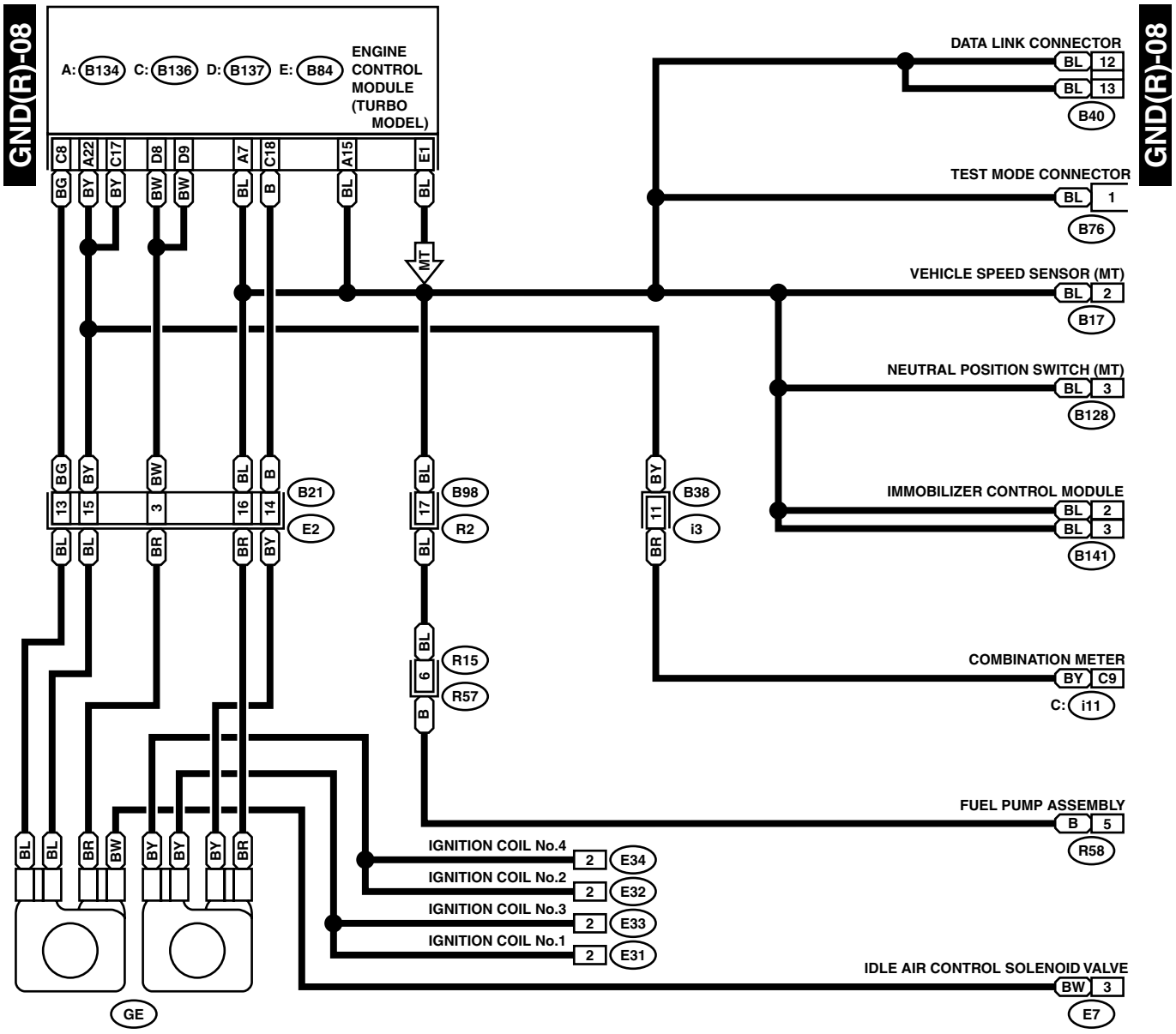
WI-00251

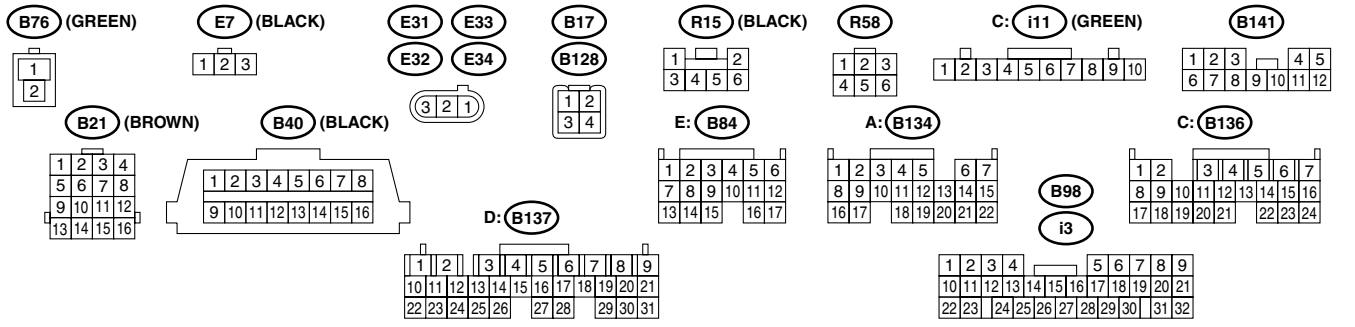
GROUND DISTRIBUTION



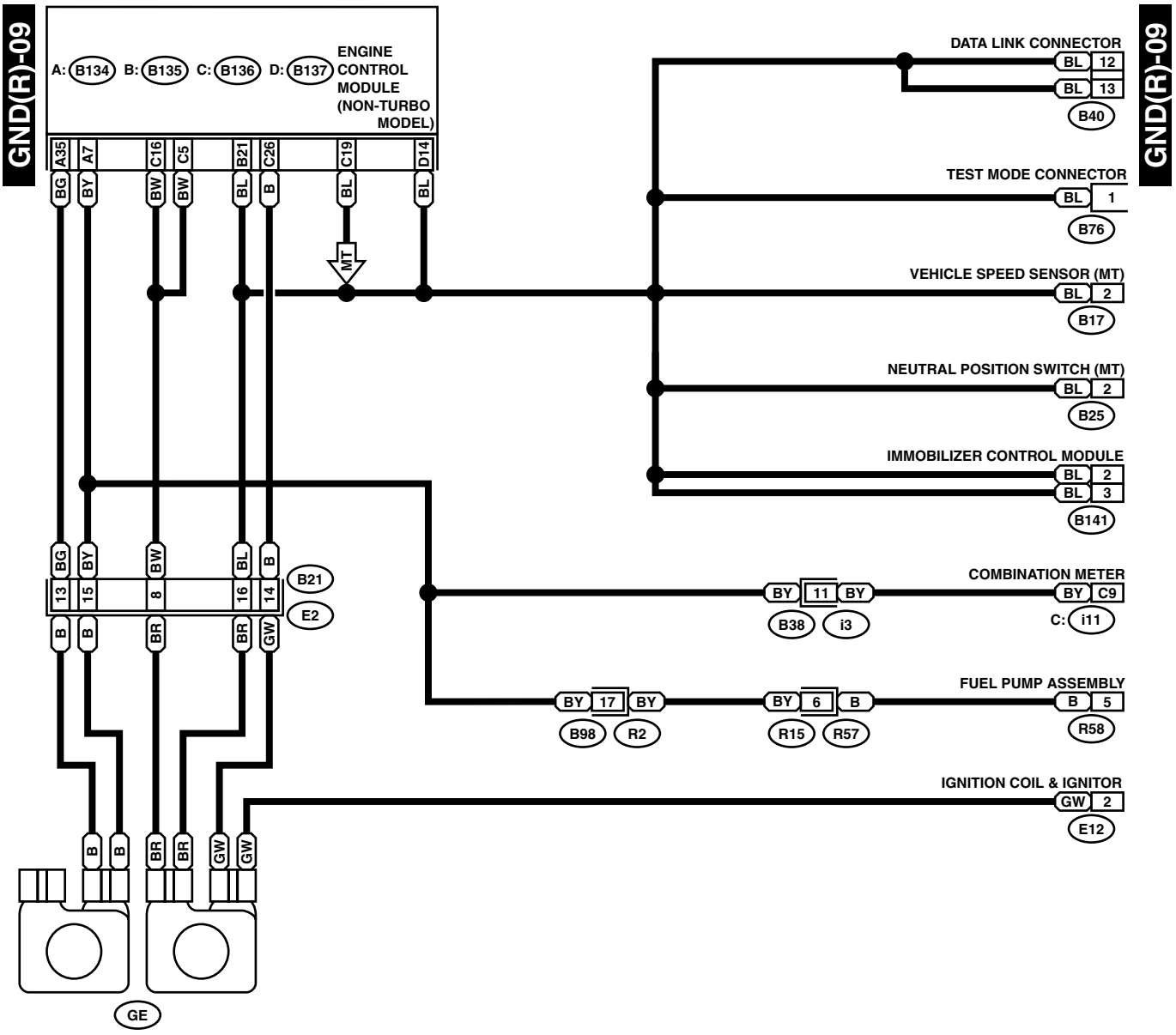


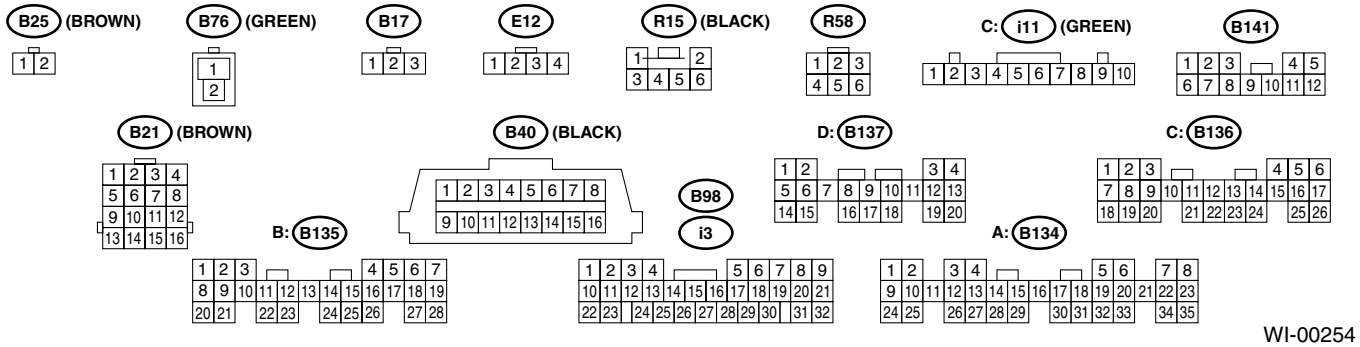
WI-00252


GND(R)-08
A: B134 C: B136 D: B137 E: B84
ENGINE CONTROL MODULE (TURBO MODEL)
C8 A22 C17 D8 D9 A7 C18 A15 E1
BG BY BY BW BW BL B BL BL
MT
DATA LINK CONNECTOR
BL 12
BL 13
B40
TEST MODE CONNECTOR
BL 1
B76
VEHICLE SPEED SENSOR (MT)
BL 2
B17
NEUTRAL POSITION SWITCH (MT)
BL 3
B128
IMMOBILIZER CONTROL MODULE
BL 2
BL 3
B141
B21
13 15 3 16 14
E2
B98
17
R2
B38
11
i3
R15
6
R57
COMBINATION METER
BY C9
C: i11
FUEL PUMP ASSEMBLY
B 5
R58
IGNITION COIL No.4 2 E34
IGNITION COIL No.2 2 E32
IGNITION COIL No.3 2 E33
IGNITION COIL No.1 2 E31
IDLE AIR CONTROL SOLENOID VALVE
BW 3
E7
GE

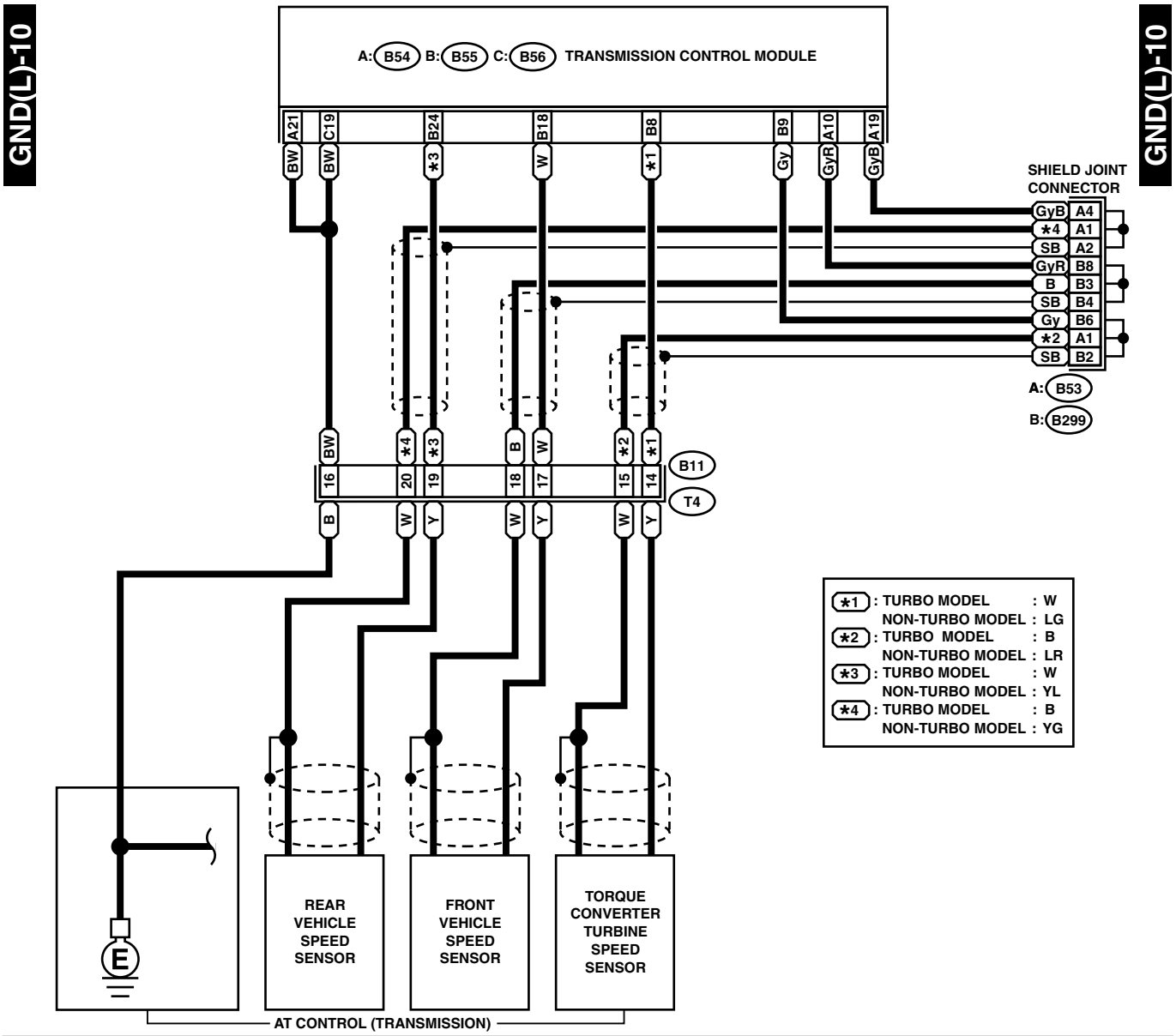

B76 (GREEN)
E7 (BLACK)
E31 E33 E32 E34
B17 B128
R15 (BLACK)
R58
C: i11 (GREEN)
B141
B21 (BROWN)
B40 (BLACK)
E: B84
A: B134
C: B136
D: B137
B98 i3

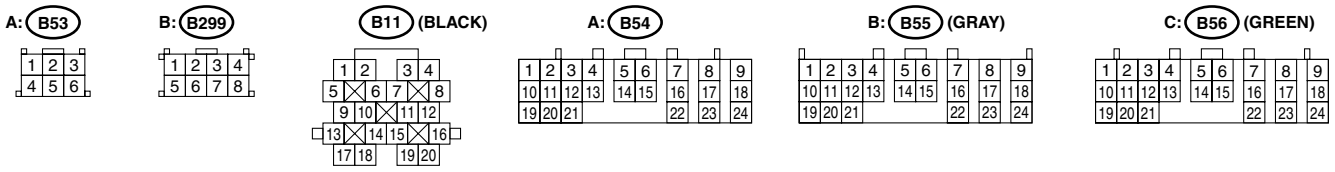
WI-00253


GND(R)-09
GND(R)-09
A: B134 B: B135 C: B136 D: B137
ENGINE CONTROL MODULE (NON-TURBO MODEL)
A35 A7 C16 C5 B21 C26 C19 D14
BG BY BW BW BL B BL BL
MT
DATA LINK CONNECTOR
BL 12
BL 13
B40
TEST MODE CONNECTOR
BL 1
B76
VEHICLE SPEED SENSOR (MT)
BL 2
B17
NEUTRAL POSITION SWITCH (MT)
BL 2
B25
IMMOBILIZER CONTROL MODULE
BL 2
BL 3
B141
BG BY BW BL B
13 15 8 16 14
B21
E2
B B BR BR GW
COMBINATION METER
BY 11 BY
BY C9
B38 i3
C: i11
FUEL PUMP ASSEMBLY
BY 17 BY
BY 6 B
B 5
B98 R2
R15 R57
R58
IGNITION COIL & IGNITOR
GW 2
E12
B B BR BR GW GW
GE


B25 (BROWN)
B76 (GREEN)
B17
E12
R15 (BLACK)
R58
C: i11 (GREEN)
B141
B21 (BROWN)
B40 (BLACK)
D: B137
C: B136
B: B135
B98
i3
A: B134

WI-00254


GND(L)-10
GND(L)-10
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE
A21 C19 B24 B18 B8 B9 A10 A19
BW BW ✱3 W ✱1 Gy GyR GyB
SHIELD JOINT CONNECTOR
GyB A4
✱4 A1
SB A2
GyR B8
B B3
SB B4
Gy B6
✱2 A1
SB B2
A: B53
B: B299
BW ✱4 ✱3 B W ✱2 ✱1
16 20 19 18 17 15 14
B11
T4
B W Y W Y W Y
✱1 : TURBO MODEL : W
NON-TURBO MODEL : LG
✱2 : TURBO MODEL : B
NON-TURBO MODEL : LR
✱3 : TURBO MODEL : W
NON-TURBO MODEL : YL
✱4 : TURBO MODEL : B
NON-TURBO MODEL : YG
E
REAR VEHICLE SPEED SENSOR
FRONT VEHICLE SPEED SENSOR
TORQUE CONVERTER TURBINE SPEED SENSOR
AT CONTROL (TRANSMISSION)

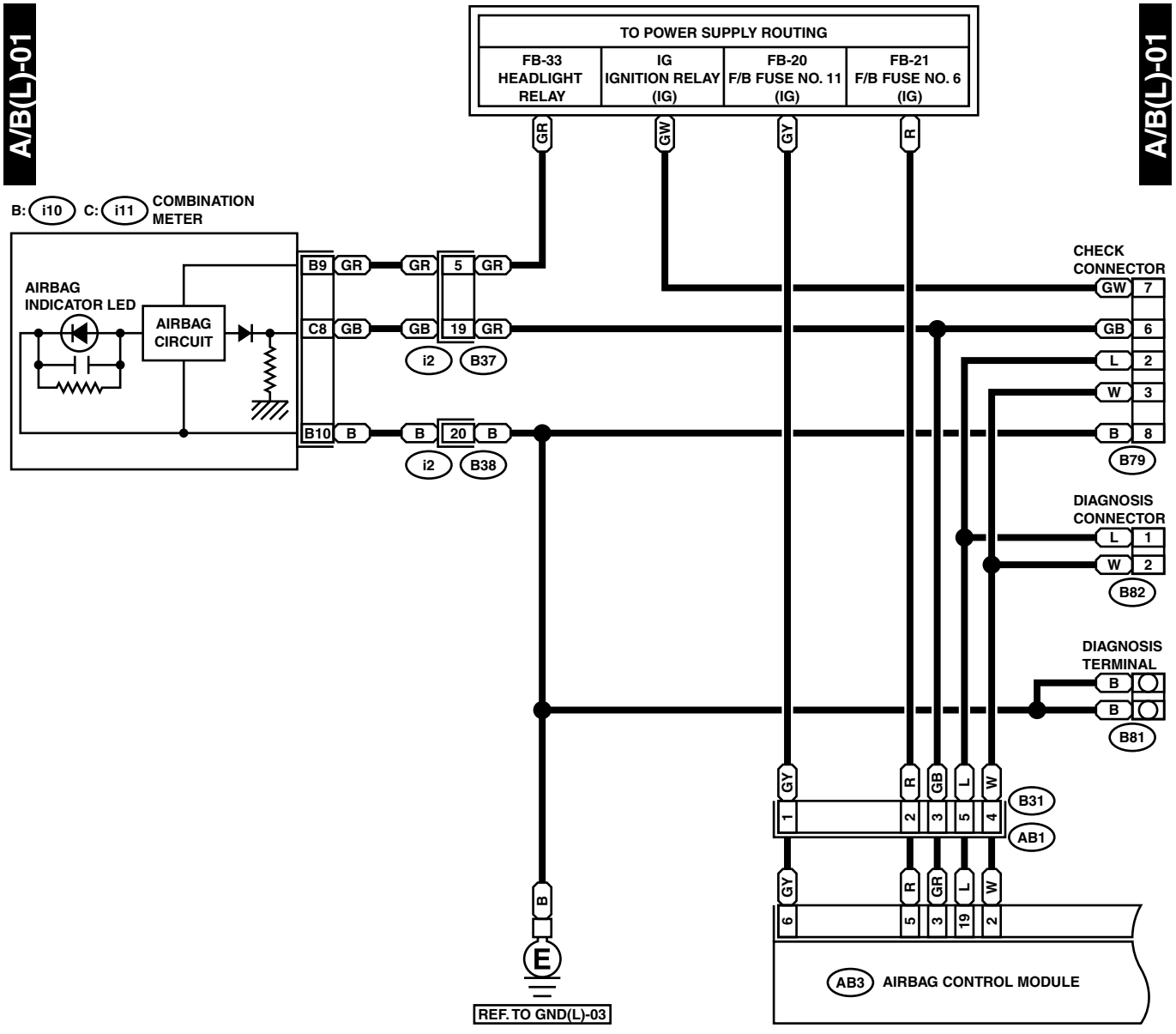

A: B53
B: B299
B11 (BLACK)
A: B54
B: B55 (GRAY)
C: B56 (GREEN)

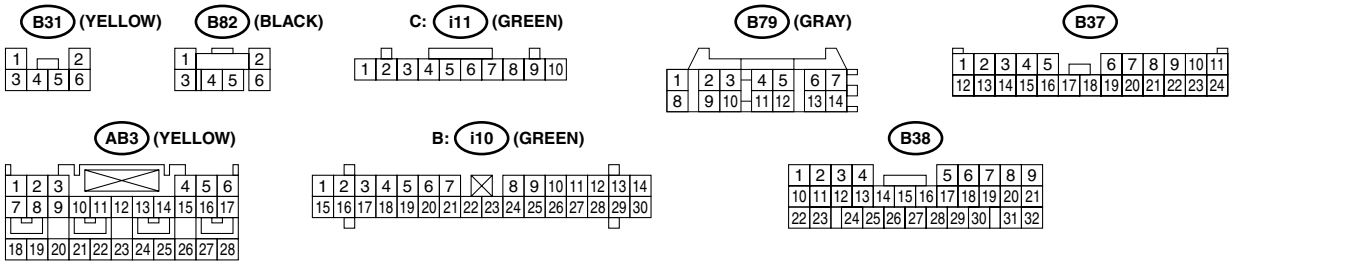
WI-00255

5. Airbag System

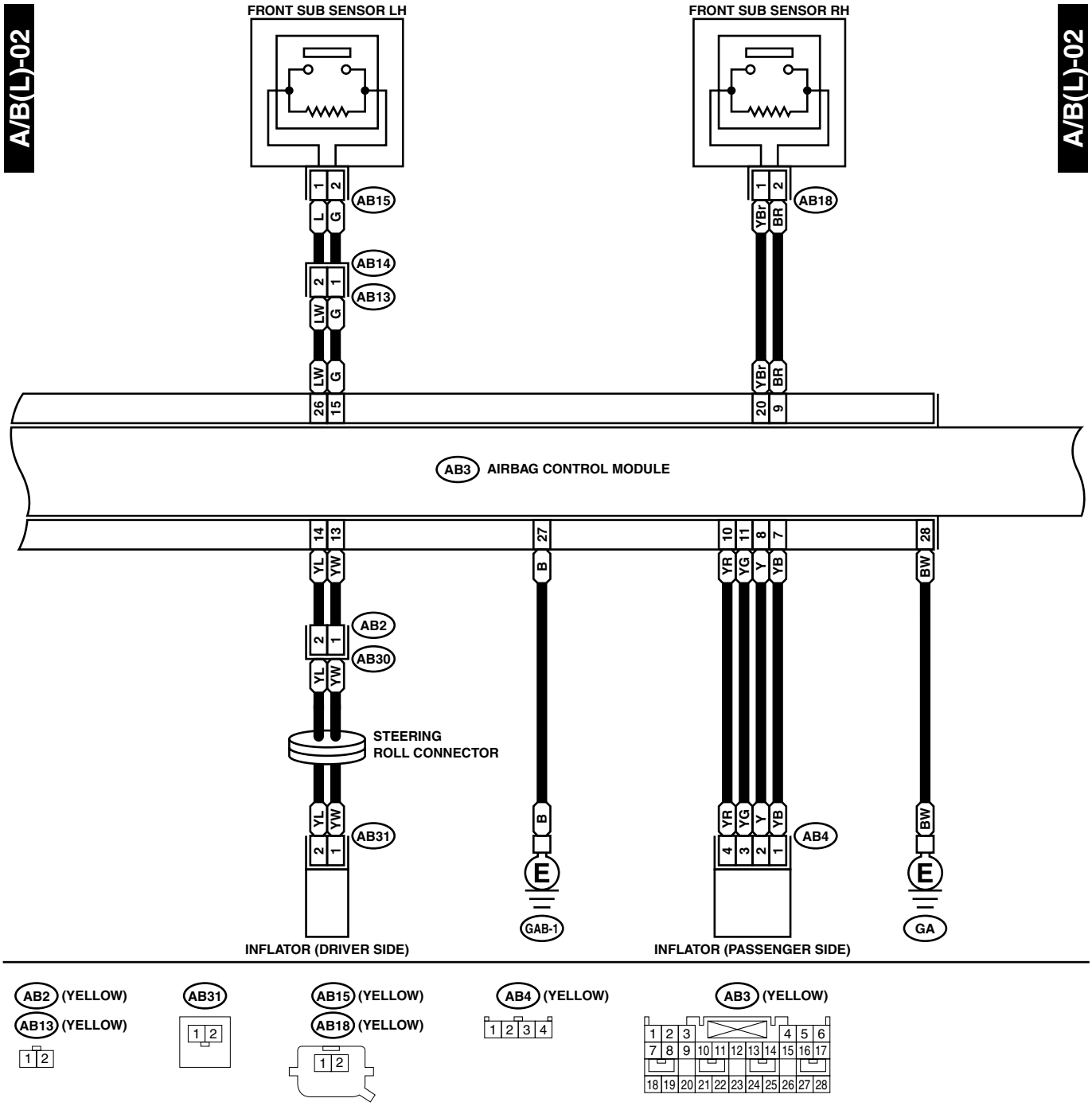
A: SCHEMATIC

1. LHD MODEL

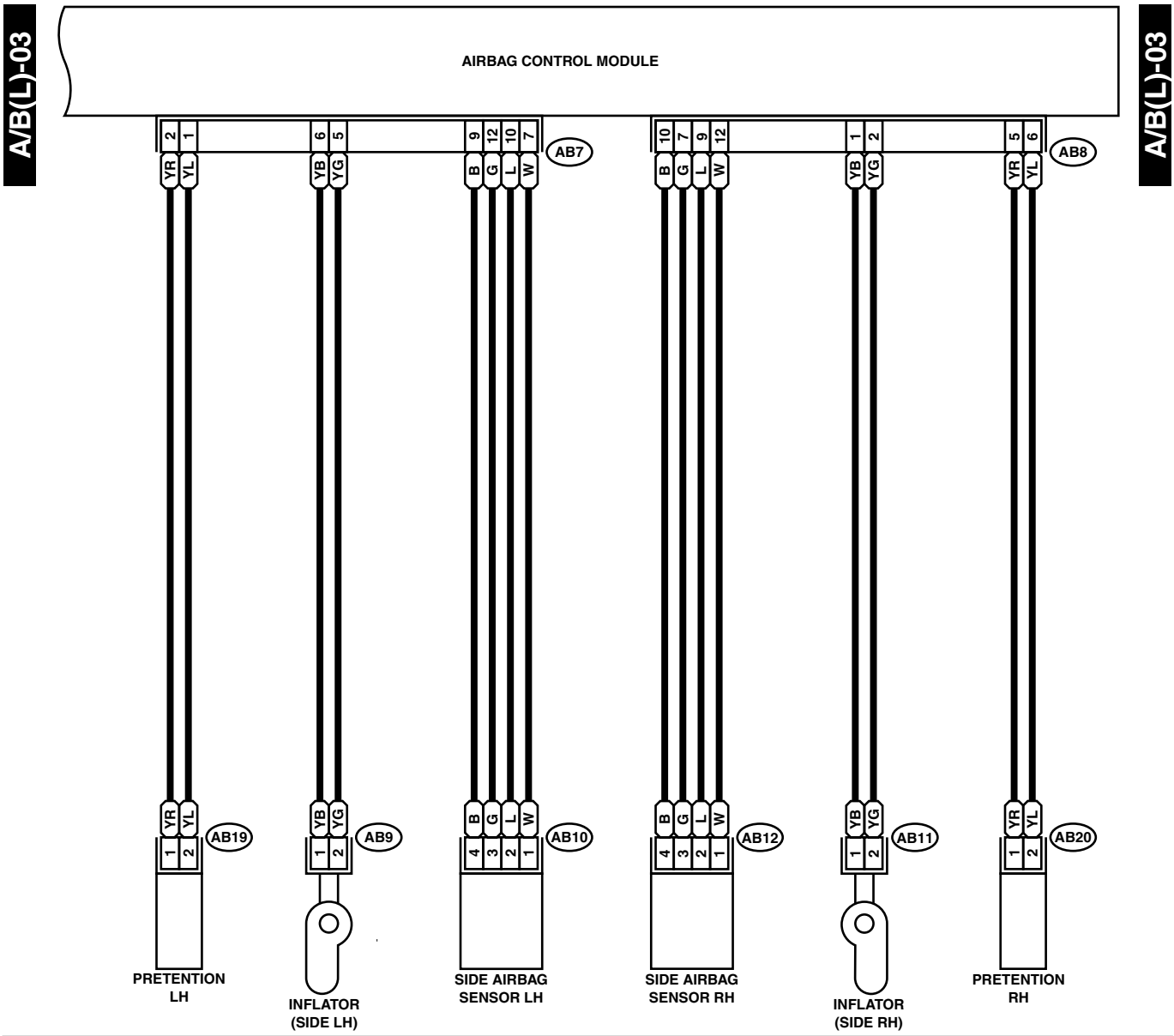




WI-00256

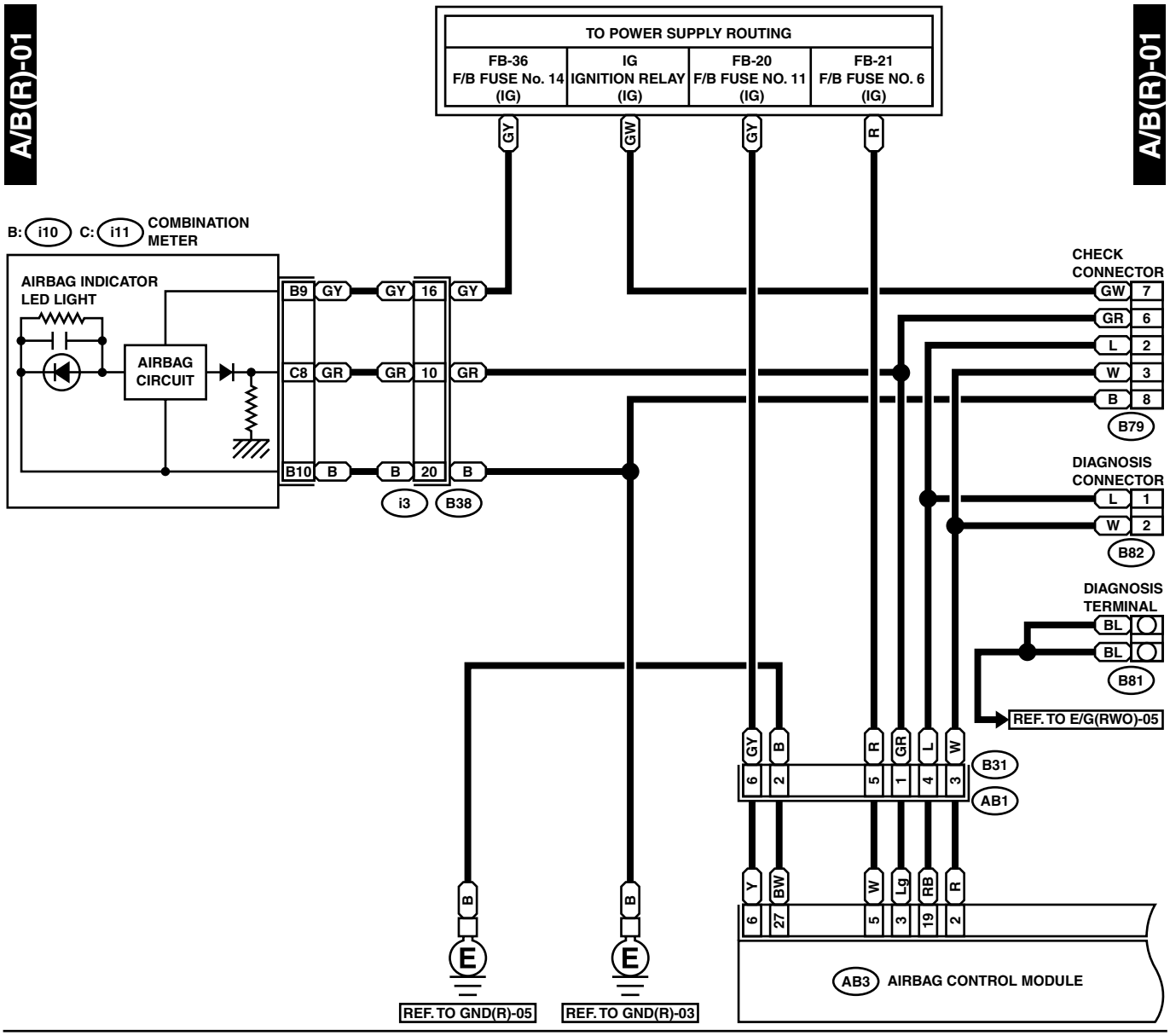

A/B(L)-02
A/B(L)-02
FRONT SUB SENSOR LH
FRONT SUB SENSOR RH
AB15
AB18
AB14
AB13
AB3 AIRBAG CONTROL MODULE
AB2
AB30
AB31
AB4
STEERING
ROLL CONNECTOR
GAB-1
GA
INFLATOR (DRIVER SIDE)
INFLATOR (PASSENGER SIDE)
AB2 (YELLOW)
AB13 (YELLOW)
AB31
AB15 (YELLOW)
AB18 (YELLOW)
AB4 (YELLOW)
AB3 (YELLOW)

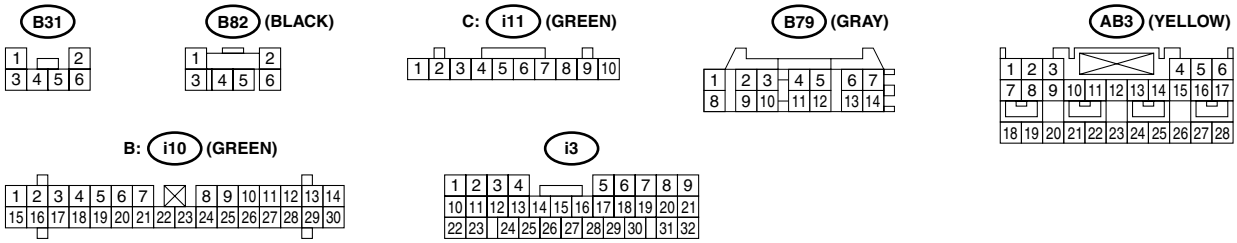
WI-00257


A/B(L)-03
A/B(L)-03
AIRBAG CONTROL MODULE
AB7
AB8
AB19
AB9
AB10
AB12
AB11
AB20
PRETENTION LH
INFLATOR (SIDE LH)
SIDE AIRBAG SENSOR LH
SIDE AIRBAG SENSOR RH
INFLATOR (SIDE RH)
PRETENTION RH
(YELLOW) AB9 AB11 (YELLOW)
(YELLOW) AB19 AB20 (YELLOW)
AB10 (YELLOW)
AB12 (YELLOW)
AB7 (YELLOW)
AB8 (YELLOW)

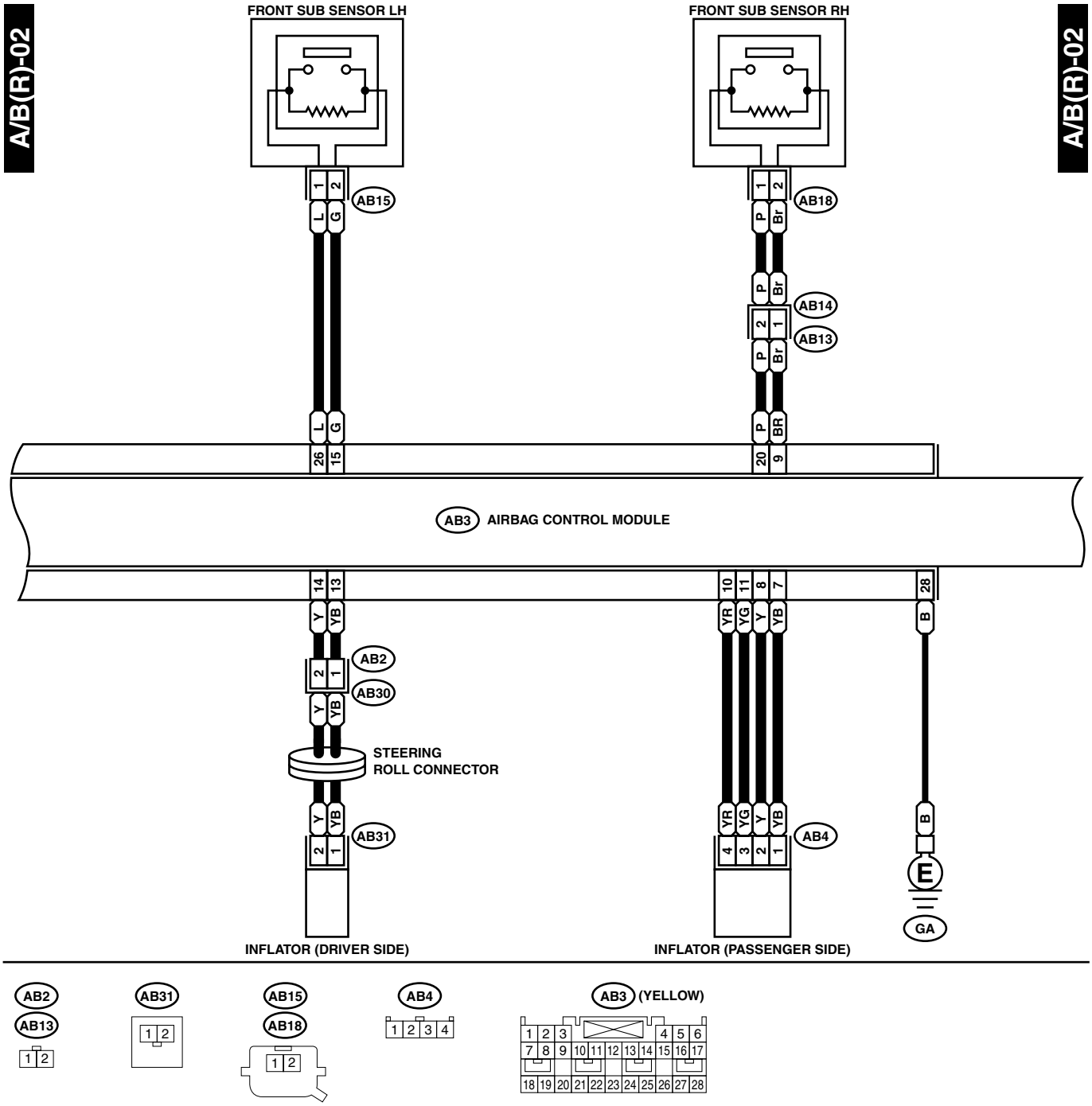
WI-00258

2. RHD MODEL

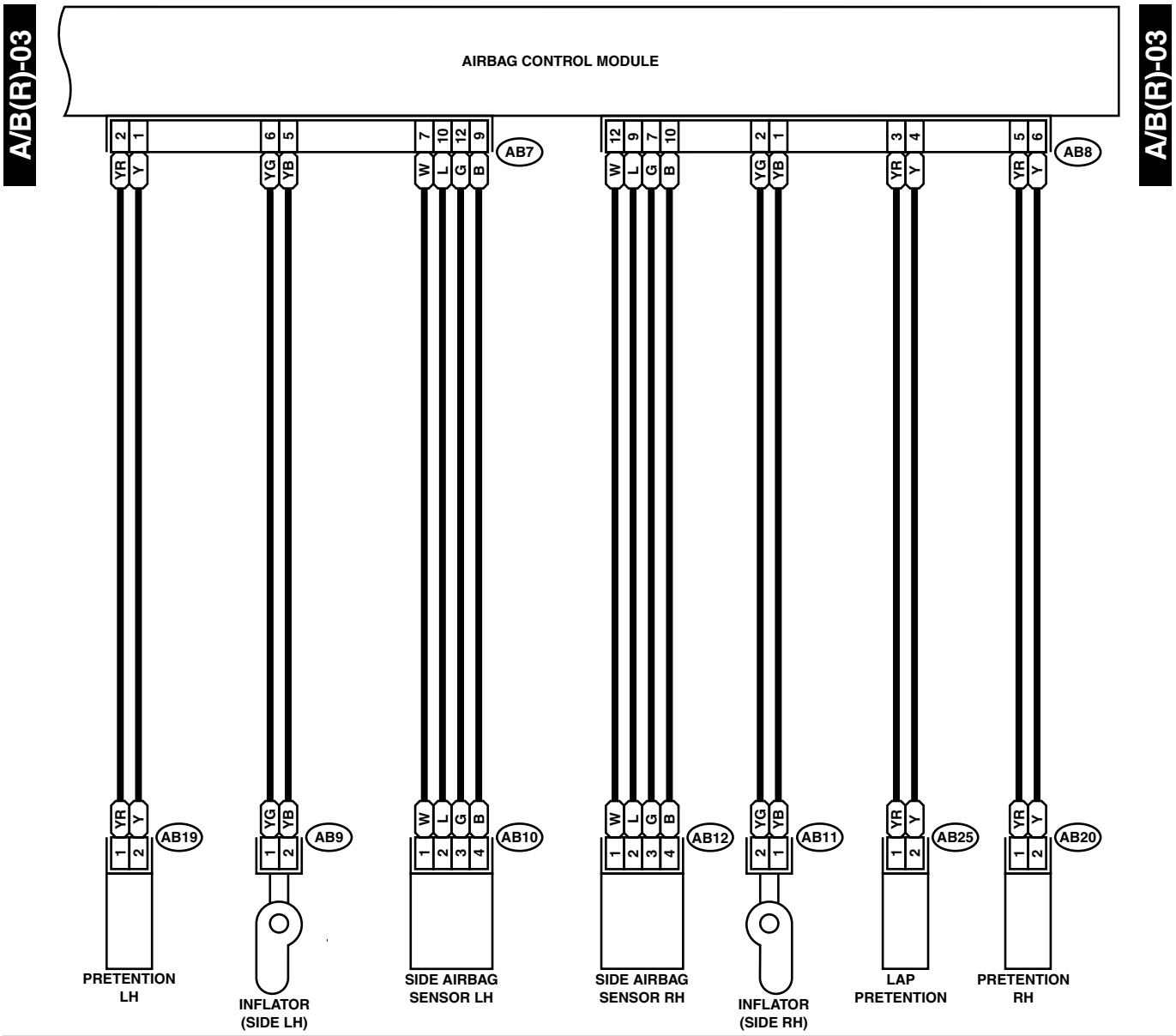


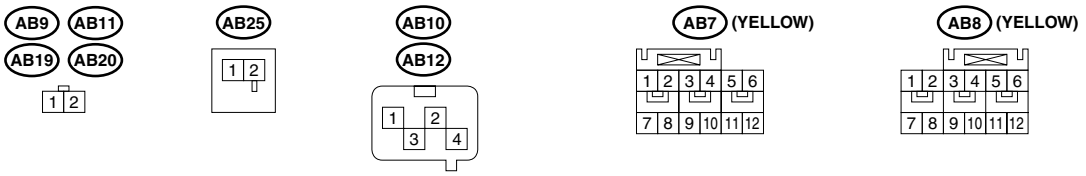


WI-00259


A/B(R)-02
A/B(R)-02
FRONT SUB SENSOR LH
FRONT SUB SENSOR RH
AB15
AB18
AB14
AB13
AB3 AIRBAG CONTROL MODULE
AB2
AB30
STEERING
ROLL CONNECTOR
AB31
AB4
GA
INFLATOR (DRIVER SIDE)
INFLATOR (PASSENGER SIDE)
AB2
AB13
AB31
AB15
AB18
AB4
AB3 (YELLOW)

WI-00260


A/B(R)-03
A/B(R)-03
AIRBAG CONTROL MODULE
AB7
AB8
PRETENTION LH
INFLATOR (SIDE LH)
SIDE AIRBAG SENSOR LH
SIDE AIRBAG SENSOR RH
INFLATOR (SIDE RH)
LAP PRETENTION
PRETENTION RH
AB19
AB9
AB10
AB12
AB11
AB25
AB20

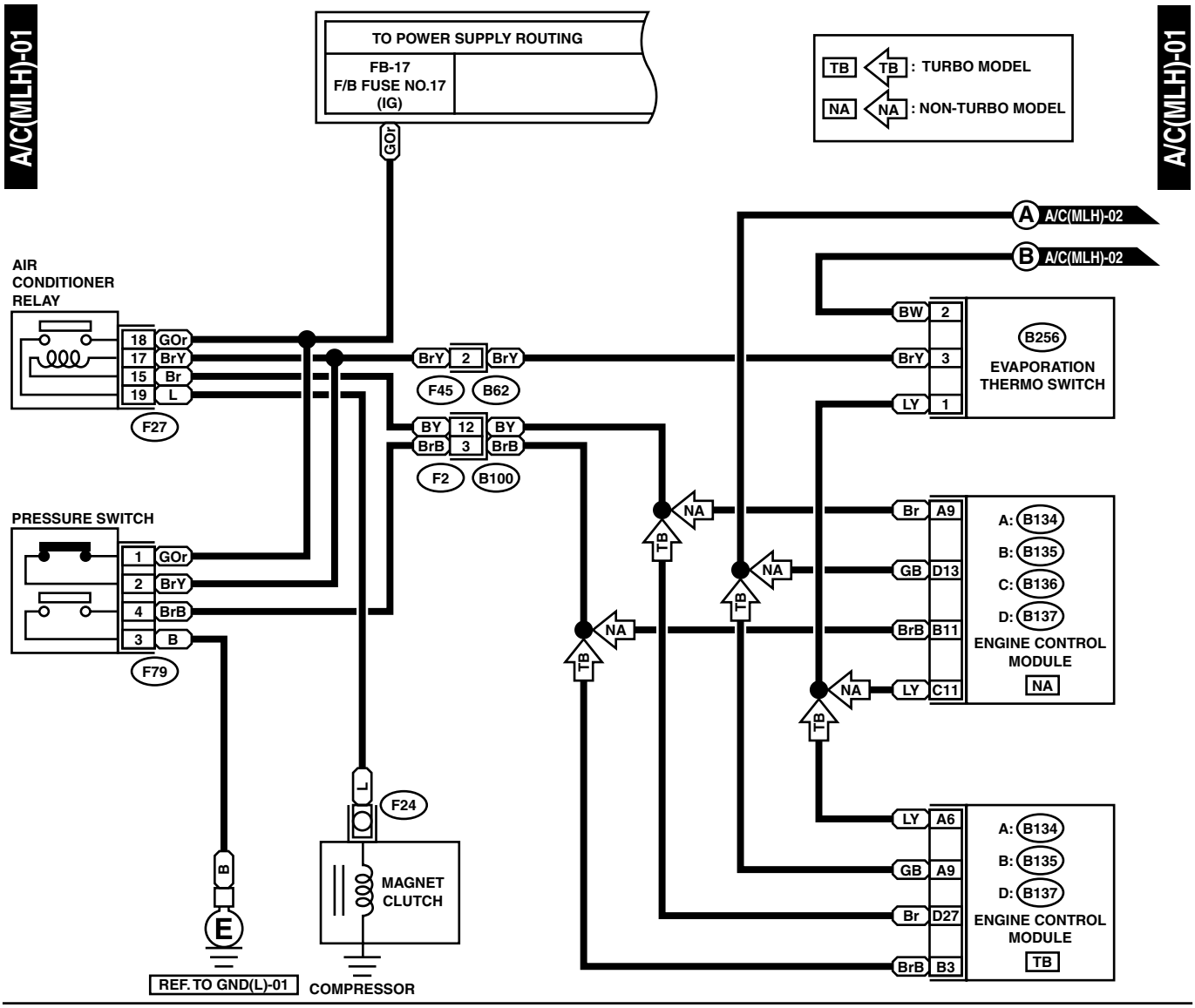

AB9
AB11
AB19
AB20
AB25
AB10
AB12
AB7 (YELLOW)
AB8 (YELLOW)

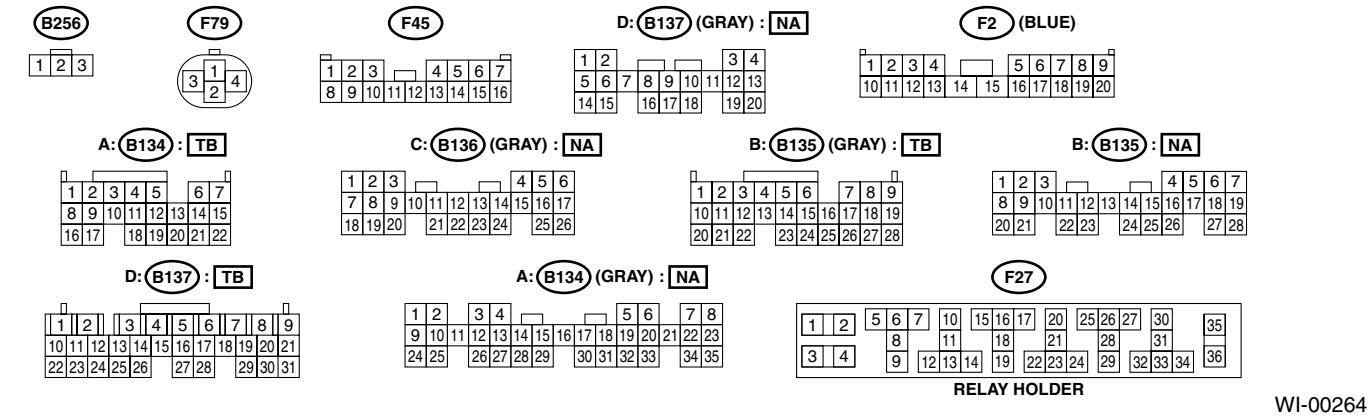
WI-00261

6. Air Conditioning System

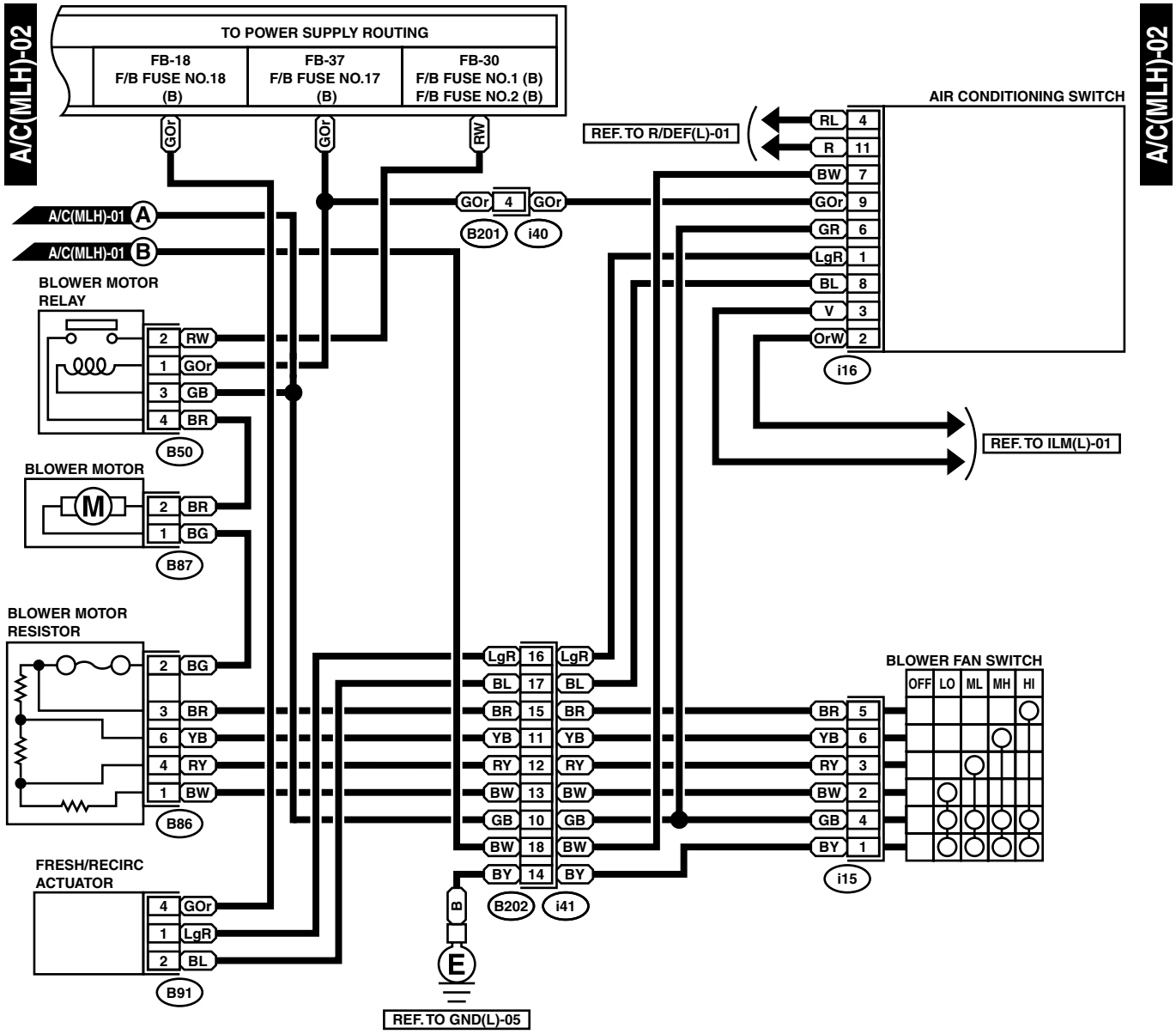
A: SCHEMATIC

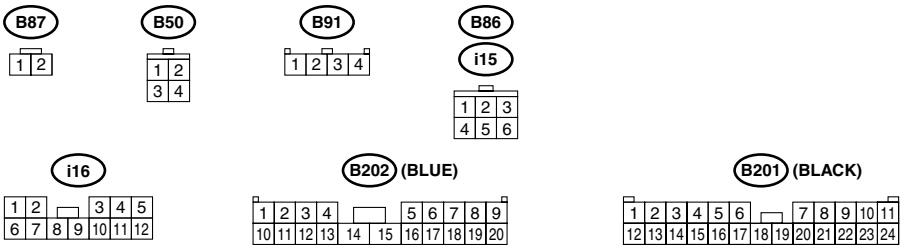
1. MANUAL A/C LHD MODEL





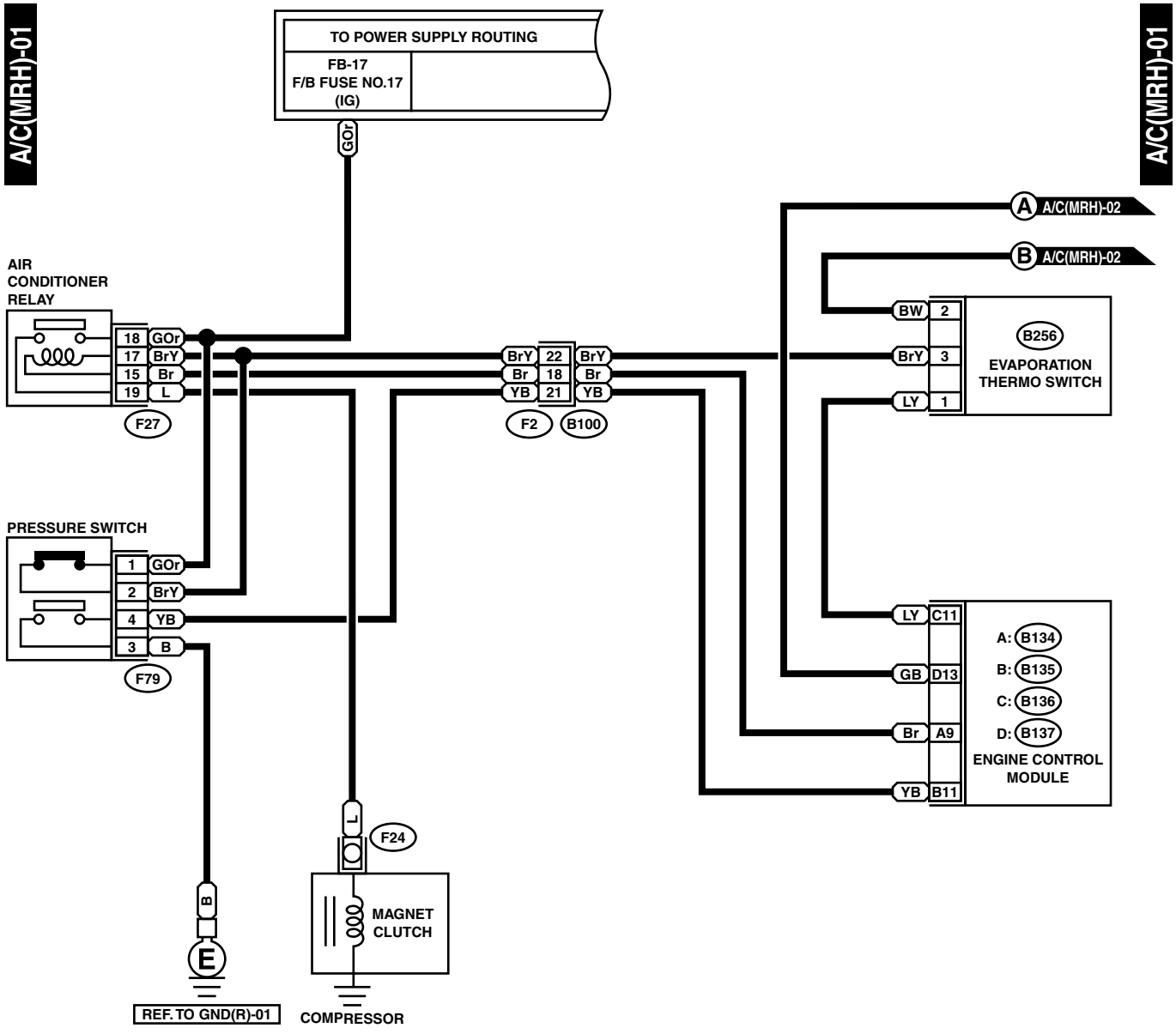
WI-00264

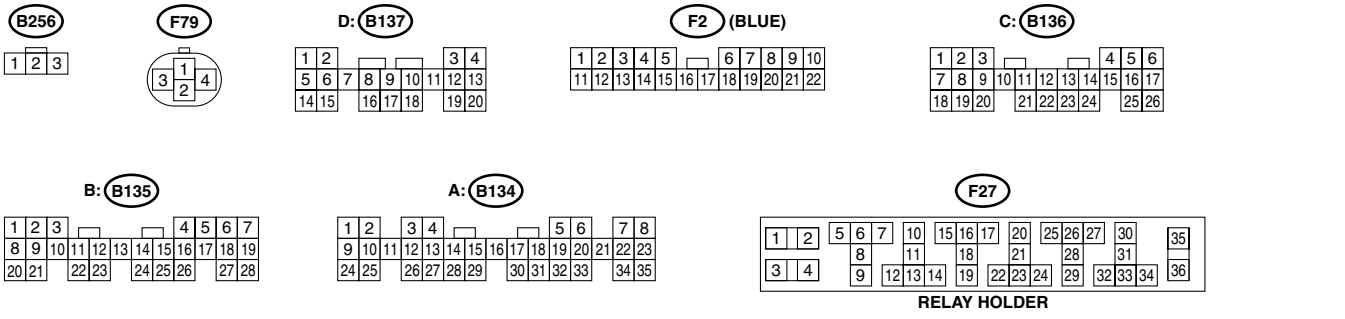

A/C(MLH)-02
TO POWER SUPPLY ROUTING
FB-18
F/B FUSE NO.18
(B)
FB-37
F/B FUSE NO.17
(B)
FB-30
F/B FUSE NO.1 (B)
F/B FUSE NO.2 (B)
A/C(MLH)-02
AIR CONDITIONING SWITCH
REF. TO R/DEF(L)-01
RL 4
R 11
BW 7
GOr 9
GR 6
LgR 1
BL 8
V 3
OrW 2
i16
REF. TO ILM(L)-01
A/C(MLH)-01 A
A/C(MLH)-01 B
GOr 4 GOr
B201
i40
BLOWER MOTOR RELAY
2 RW
1 GOr
3 GB
4 BR
B50
BLOWER MOTOR
M
2 BR
1 BG
B87
BLOWER MOTOR RESISTOR
2 BG
3 BR
6 YB
4 RY
1 BW
B86
FRESH/RECIRC ACTUATOR
4 GOr
1 LgR
2 BL
B91
LgR 16 LgR
BL 17 BL
BR 15 BR
YB 11 YB
RY 12 RY
BW 13 BW
GB 10 GB
BW 18 BW
BY 14 BY
B202
i41
BLOWER FAN SWITCH
OFF LO ML MH HI
BR 5
YB 6
RY 3
BW 2
GB 4
BY 1
i15
B
E
REF. TO GND(L)-05


B87
1 2
B50
1 2
3 4
B91
1 2 3 4
B86
i15
1 2 3
4 5 6
i16
1 2 3 4 5
6 7 8 9 10 11 12
B202 (BLUE)
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19 20
B201 (BLACK)
1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22 23 24

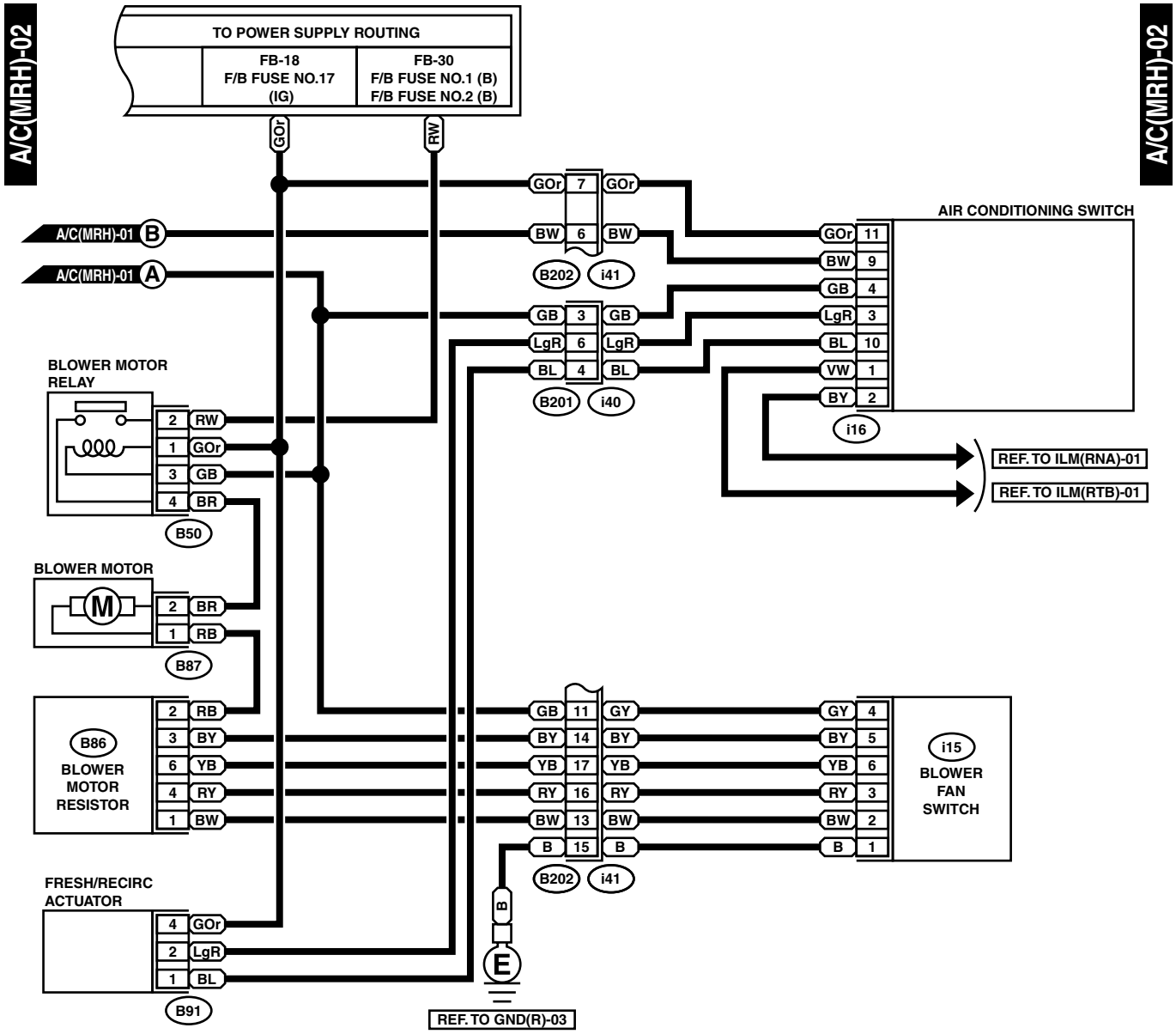
WI-00265

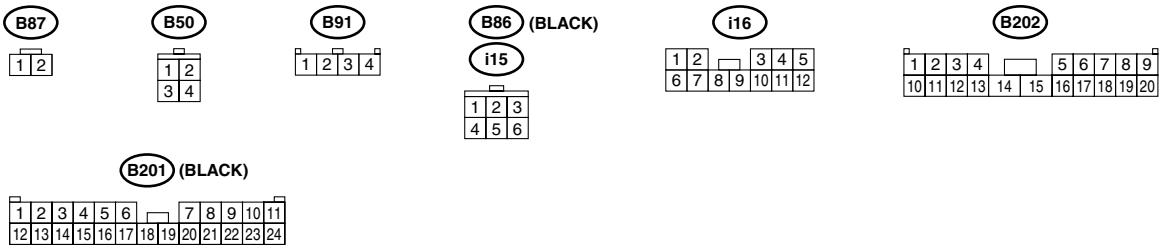
2. MANUAL A/C RHD MODEL





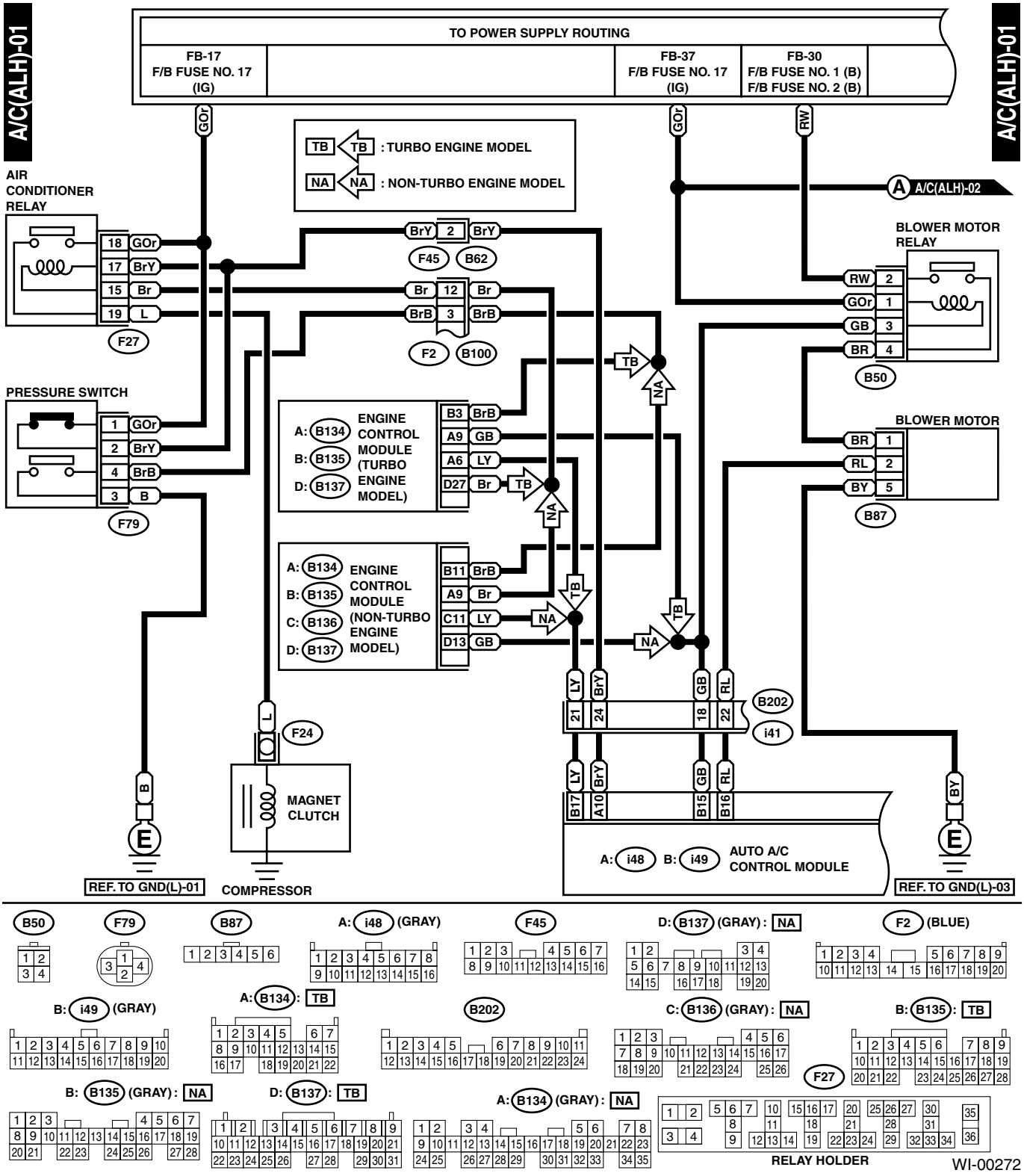
WI-00266

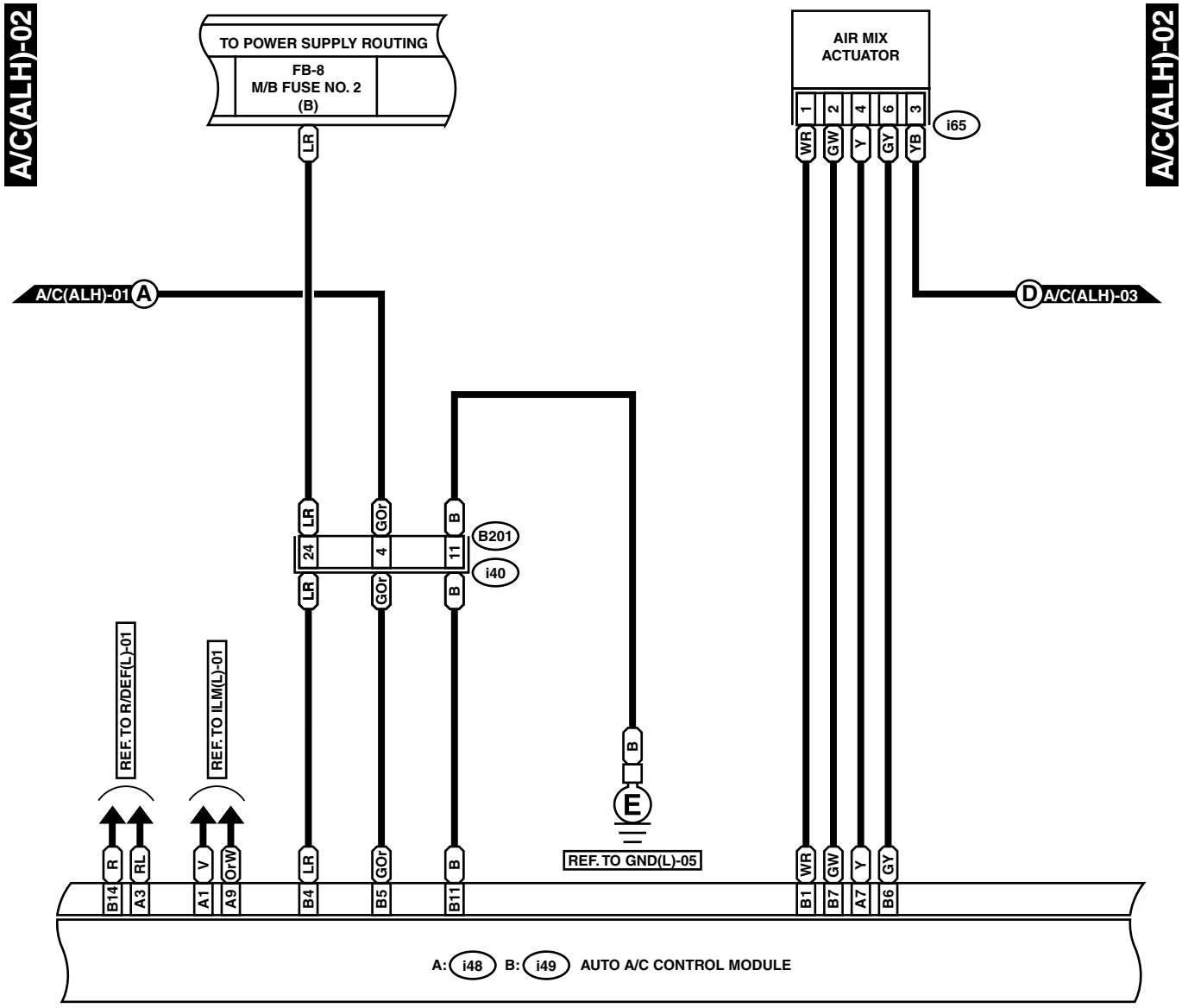

A/C(MRH)-02
A/C(MRH)-02
TO POWER SUPPLY ROUTING
FB-18
F/B FUSE NO.17
(IG)
FB-30
F/B FUSE NO.1 (B)
F/B FUSE NO.2 (B)
GOr
RW
A/C(MRH)-01 B
A/C(MRH)-01 A
AIR CONDITIONING SWITCH
BLOWER MOTOR RELAY
BLOWER MOTOR
B86
BLOWER MOTOR RESISTOR
FRESH/RECIRC ACTUATOR
B87
B50
B91
B202
i41
i40
i16
i15
BLOWER FAN SWITCH
B201
REF. TO ILM(RNA)-01
REF. TO ILM(RTB)-01
REF. TO GND(R)-03

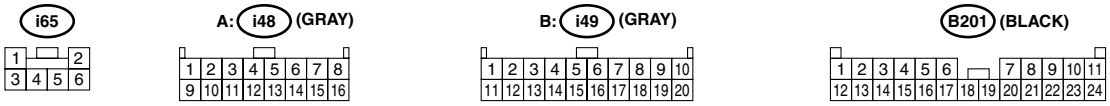

B87
B50
B91
B86 (BLACK)
i15
i16
B202
B201 (BLACK)

WI-00267

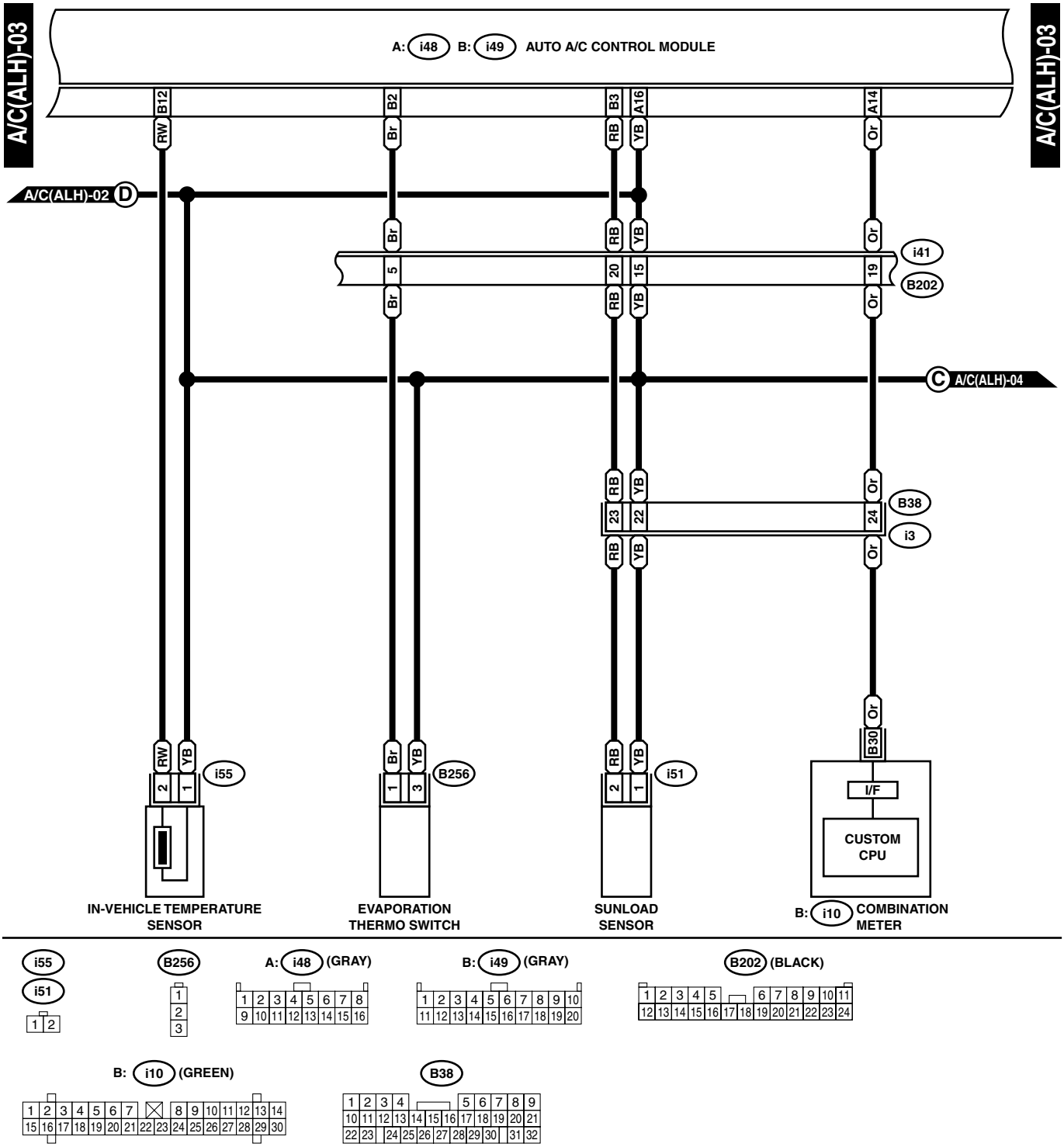
3. AUTO A/C LHD MODEL



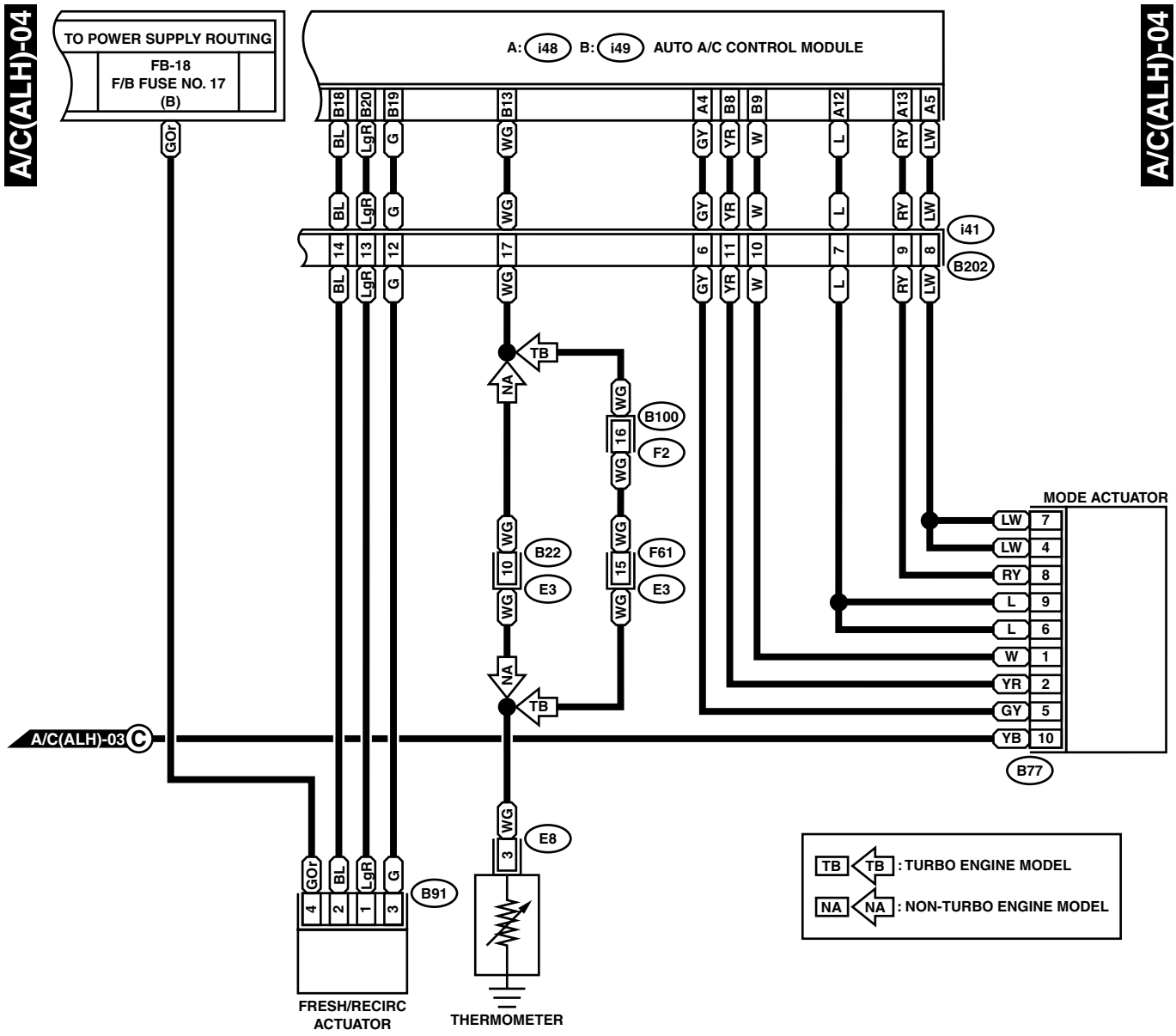

A/C(ALH)-02
TO POWER SUPPLY ROUTING
FB-8
M/B FUSE NO. 2
(B)
AIR MIX
ACTUATOR
i65
A/C(ALH)-01 A
D A/C(ALH)-03
B201
i40
REF. TO R/DEF(L)-01
REF. TO ILM(L)-01
REF. TO GND(L)-05
A: i48 B: i49 AUTO A/C CONTROL MODULE

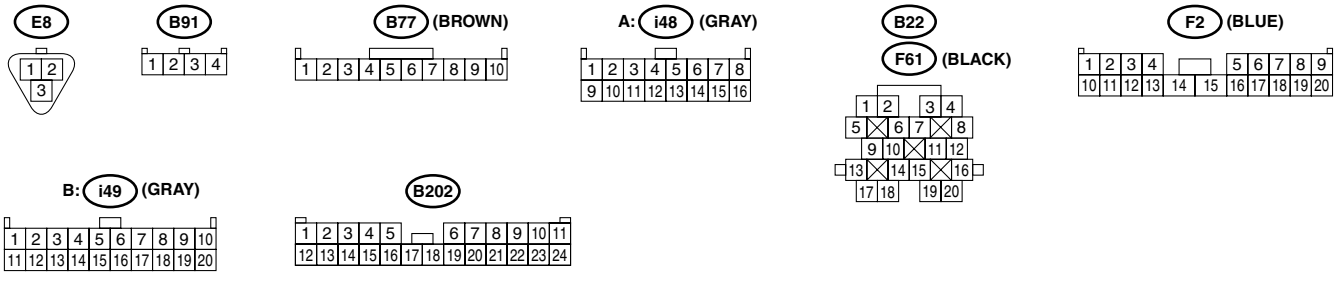

i65
A: i48 (GRAY)
B: i49 (GRAY)
B201 (BLACK)

WI-00273


A/C(ALH)-03
A/C(ALH)-03
A: i48 B: i49 AUTO A/C CONTROL MODULE
B12
B2
B3
A16
A14
RW
Br
RB
YB
Or
A/C(ALH)-02 D
i41
B202
5
20
15
19
C A/C(ALH)-04
23
22
24
B38
i3
2
1
3
i55
i51
B256
B30
I/F
CUSTOM CPU
IN-VEHICLE TEMPERATURE SENSOR
EVAPORATION THERMO SWITCH
SUNLOAD SENSOR
B: i10 COMBINATION METER
A: i48 (GRAY)
B: i49 (GRAY)
B202 (BLACK)
B: i10 (GREEN)
B38

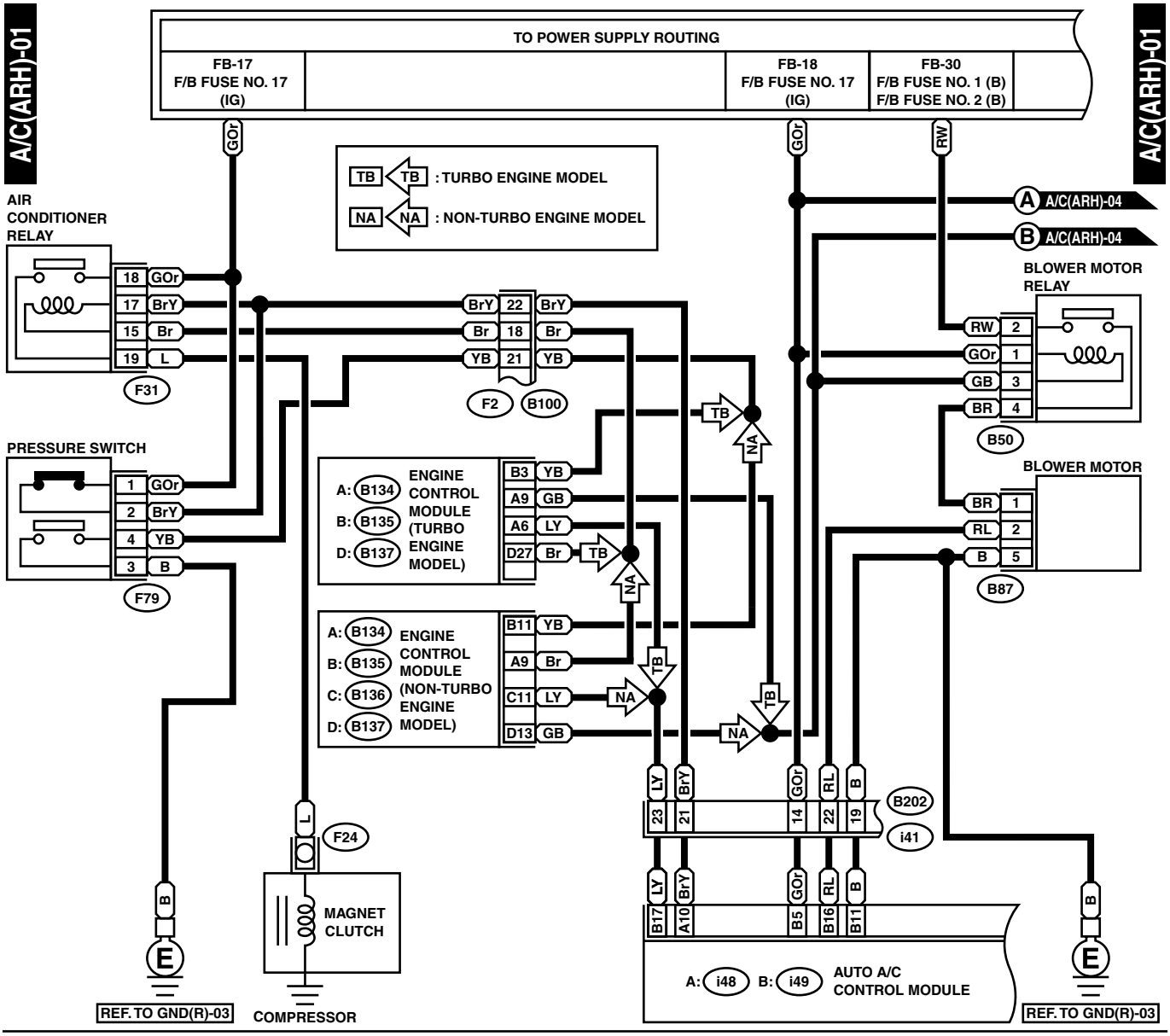
WI-00274

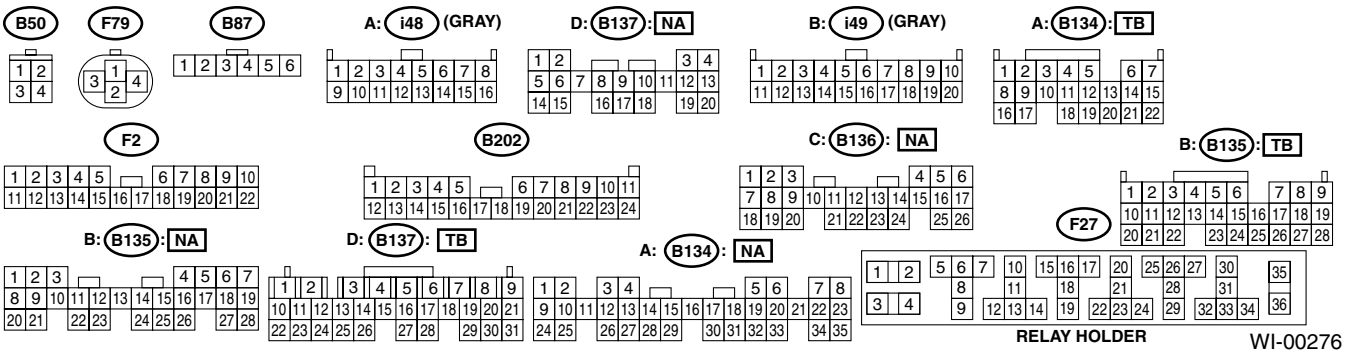

A/C(ALH)-04
A/C(ALH)-04
TO POWER SUPPLY ROUTING
FB-18
F/B FUSE NO. 17
(B)
A: i48 B: i49 AUTO A/C CONTROL MODULE
i41
B202
MODE ACTUATOR
B100
F2
B22
E3
F61
E3
A/C(ALH)-03 C
B77
E8
B91
FRESH/RECIRC ACTUATOR
THERMOMETER
TB : TURBO ENGINE MODEL
NA : NON-TURBO ENGINE MODEL


E8
B91
B77 (BROWN)
A: i48 (GRAY)
B22
F61 (BLACK)
F2 (BLUE)
B: i49 (GRAY)
B202

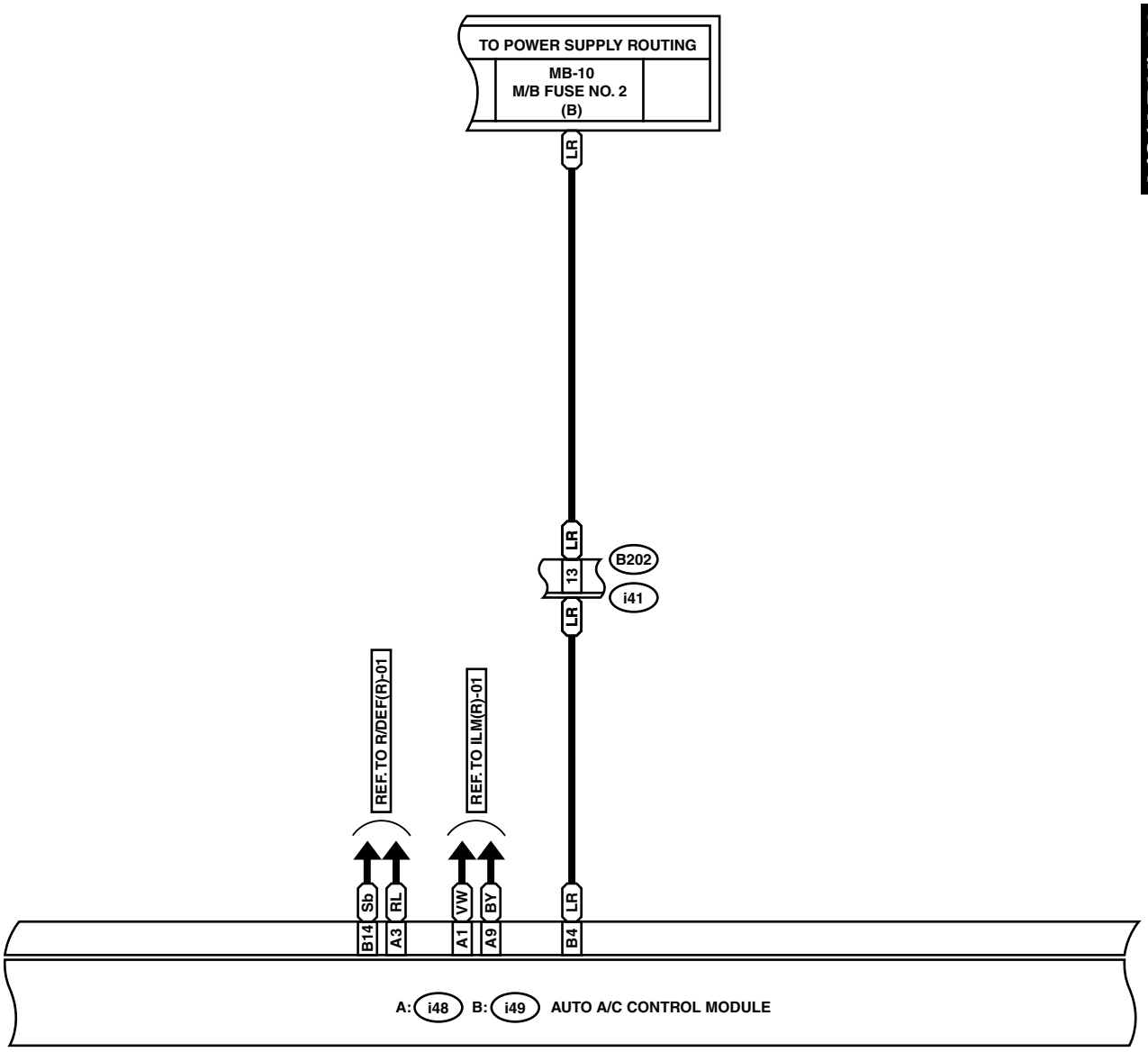
WI-00275

4. AUTO A/C RHD MODEL





A/C(ARH)-02



A/C(ARH)-02

A: i48 (GRAY)

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16

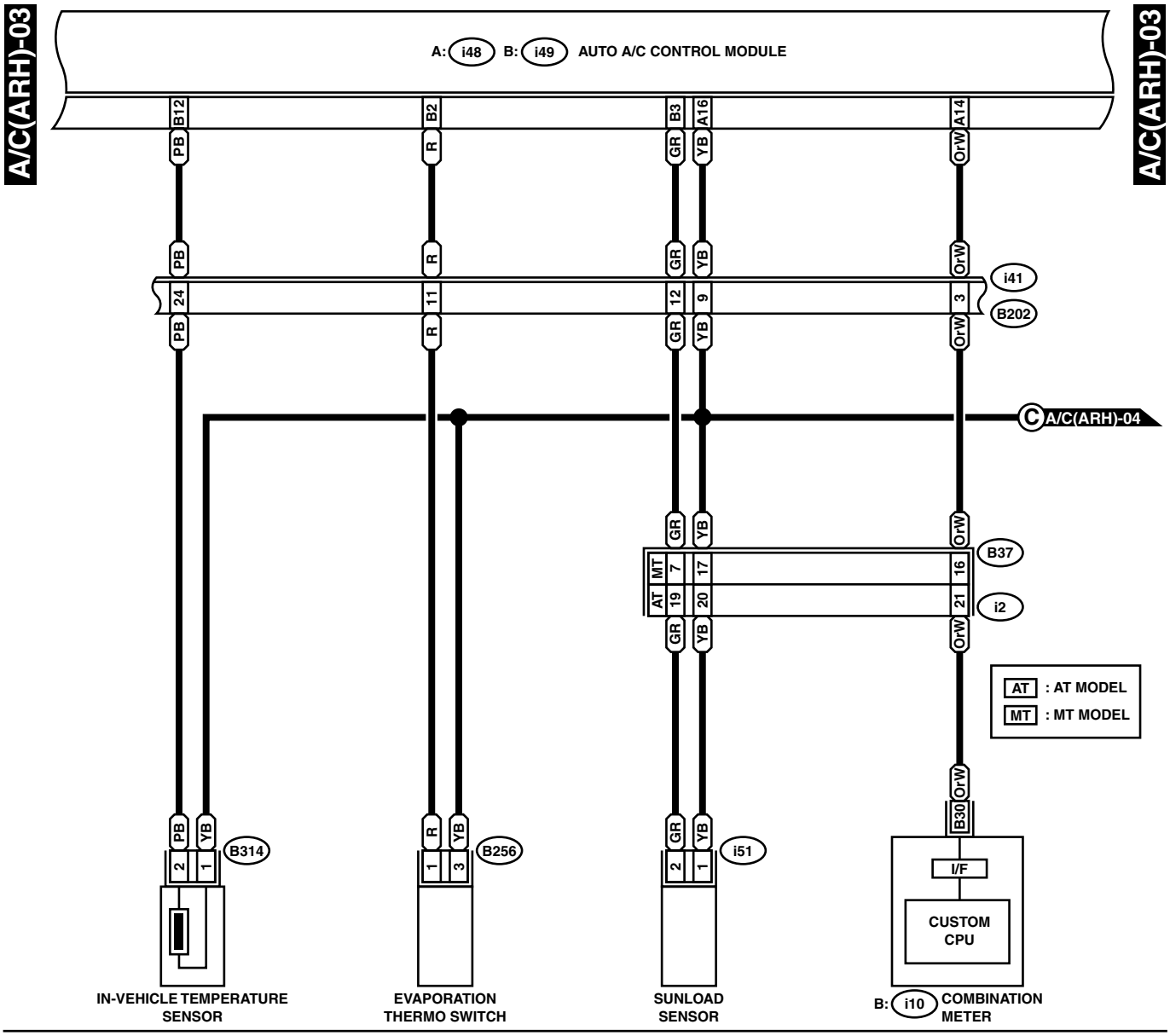
B: i49 (GRAY)

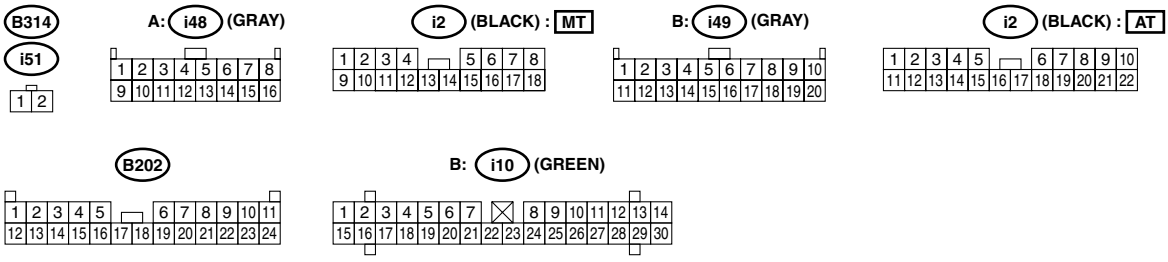
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

B202

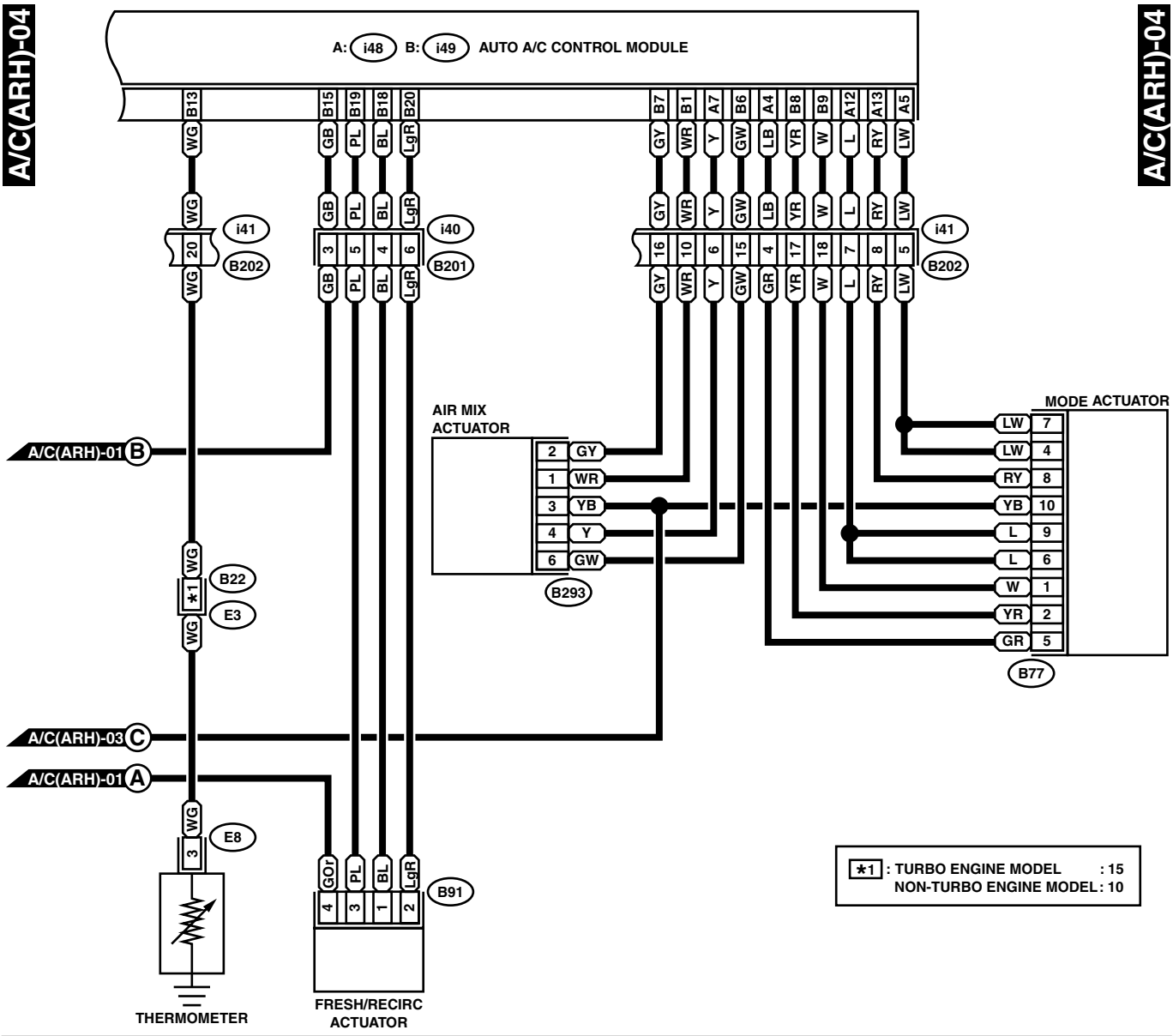
1	2	3	4	5		6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22	23	24

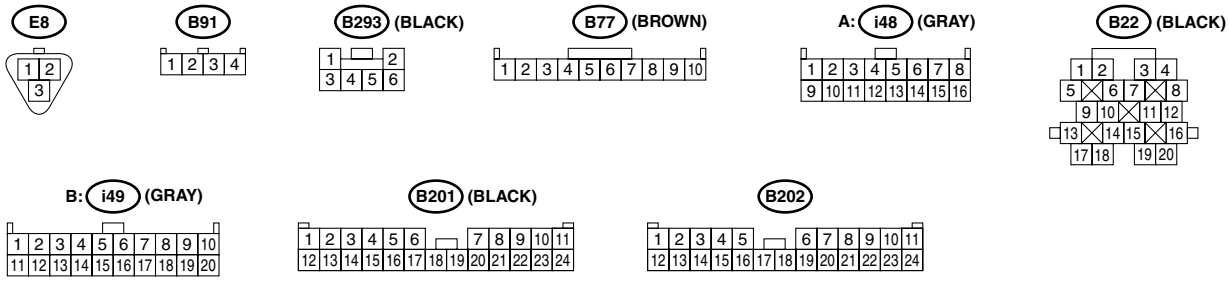
WI-00277


A/C(ARH)-03
A/C(ARH)-03
A: i48 B: i49 AUTO A/C CONTROL MODULE
B12
B2
B3
A16
A14
PB
R
GR
YB
OrW
24
11
12
9
3
i41
B202
C A/C(ARH)-04
MT
AT
7
17
16
19
20
21
B37
i2
AT : AT MODEL
MT : MT MODEL
B30
I/F
CUSTOM CPU
B314
i51
B256
2
1
3
IN-VEHICLE TEMPERATURE SENSOR
EVAPORATION THERMO SWITCH
SUNLOAD SENSOR
B: i10 COMBINATION METER


B314
i51
A: i48 (GRAY)
i2 (BLACK) : MT
B: i49 (GRAY)
i2 (BLACK) : AT
B202
B: i10 (GREEN)

WI-00278


A/C(ARH)-04
A/C(ARH)-04
A: i48 B: i49 AUTO A/C CONTROL MODULE
B13 B15 B19 B18 B20 B7 B1 A7 B6 A4 B8 B9 A12 A13 A5
WG GB PL BL LgR GY WR Y GW LB YR W L RY LW
i41 20 B202
i40 3 5 4 6 B201
i41 16 10 6 15 4 17 18 7 8 5 B202
AIR MIX ACTUATOR
2 GY
1 WR
3 YB
4 Y
6 GW
B293
MODE ACTUATOR
LW 7
LW 4
RY 8
YB 10
L 9
L 6
W 1
YR 2
GR 5
B77
A/C(ARH)-01 B
A/C(ARH)-03 C
A/C(ARH)-01 A
B22
*1
E3
E8
3
THERMOMETER
GOr PL BL LgR
4 3 1 2
B91
FRESH/RECIRC ACTUATOR
*1 : TURBO ENGINE MODEL : 15
NON-TURBO ENGINE MODEL : 10

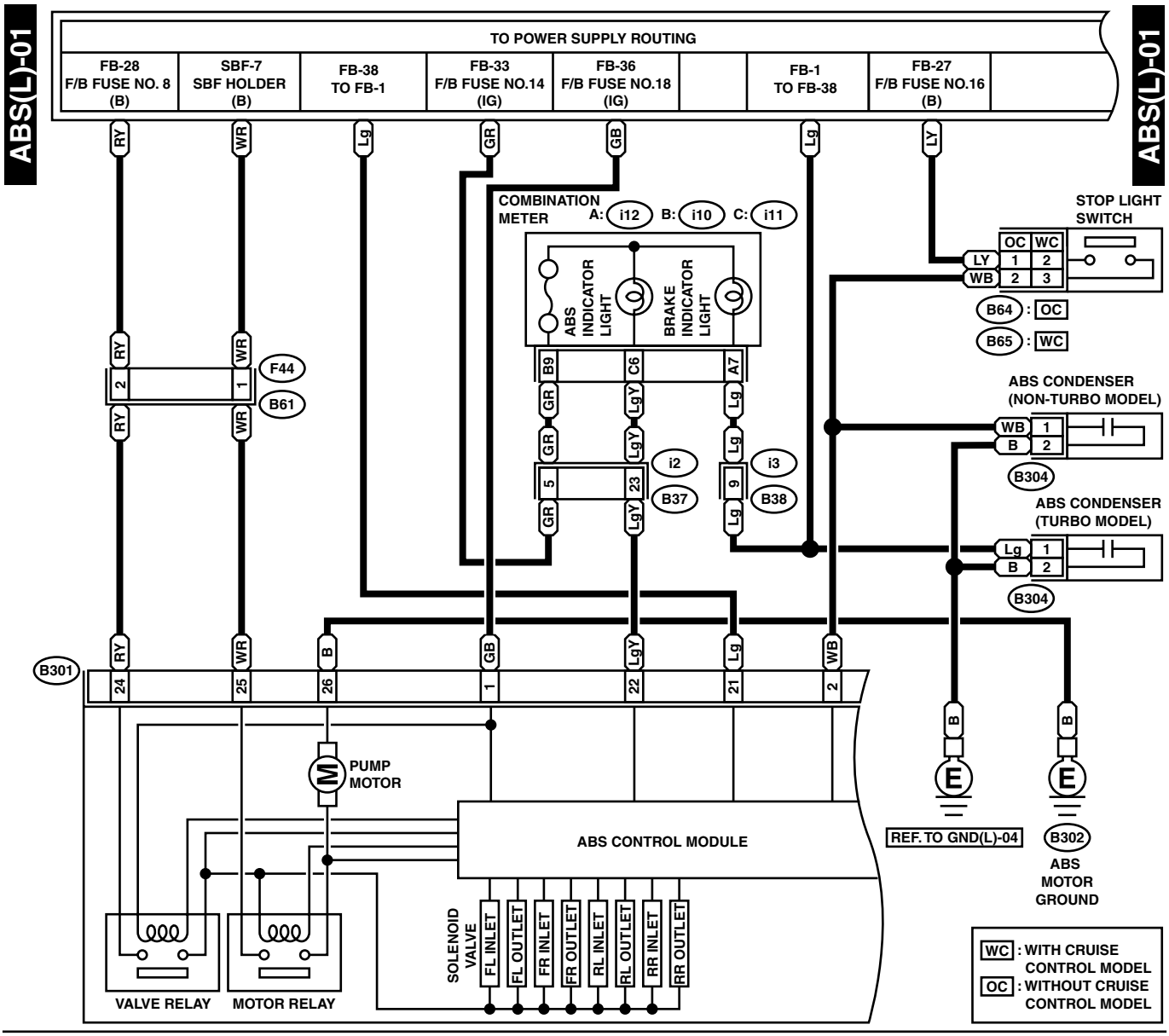

E8
B91
B293 (BLACK)
B77 (BROWN)
A: i48 (GRAY)
B22 (BLACK)
B: i49 (GRAY)
B201 (BLACK)
B202

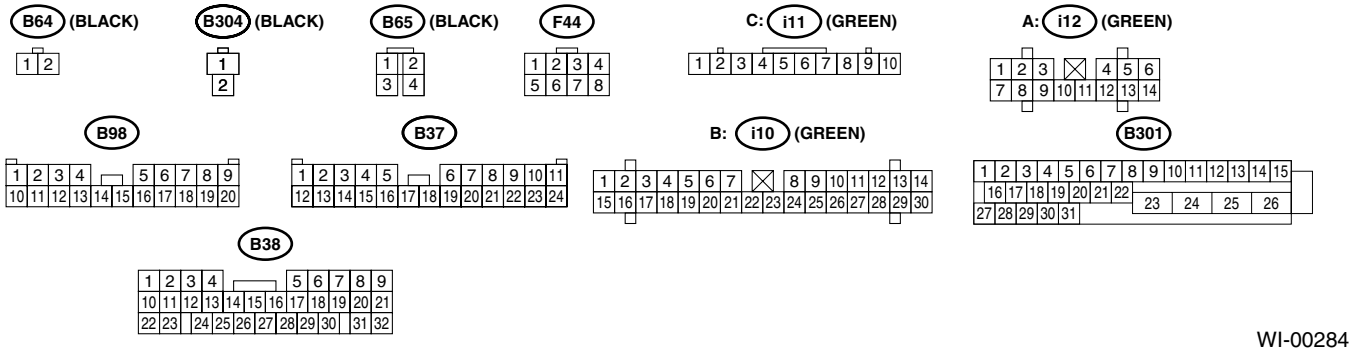
WI-00279

7. Anti-lock Brake System

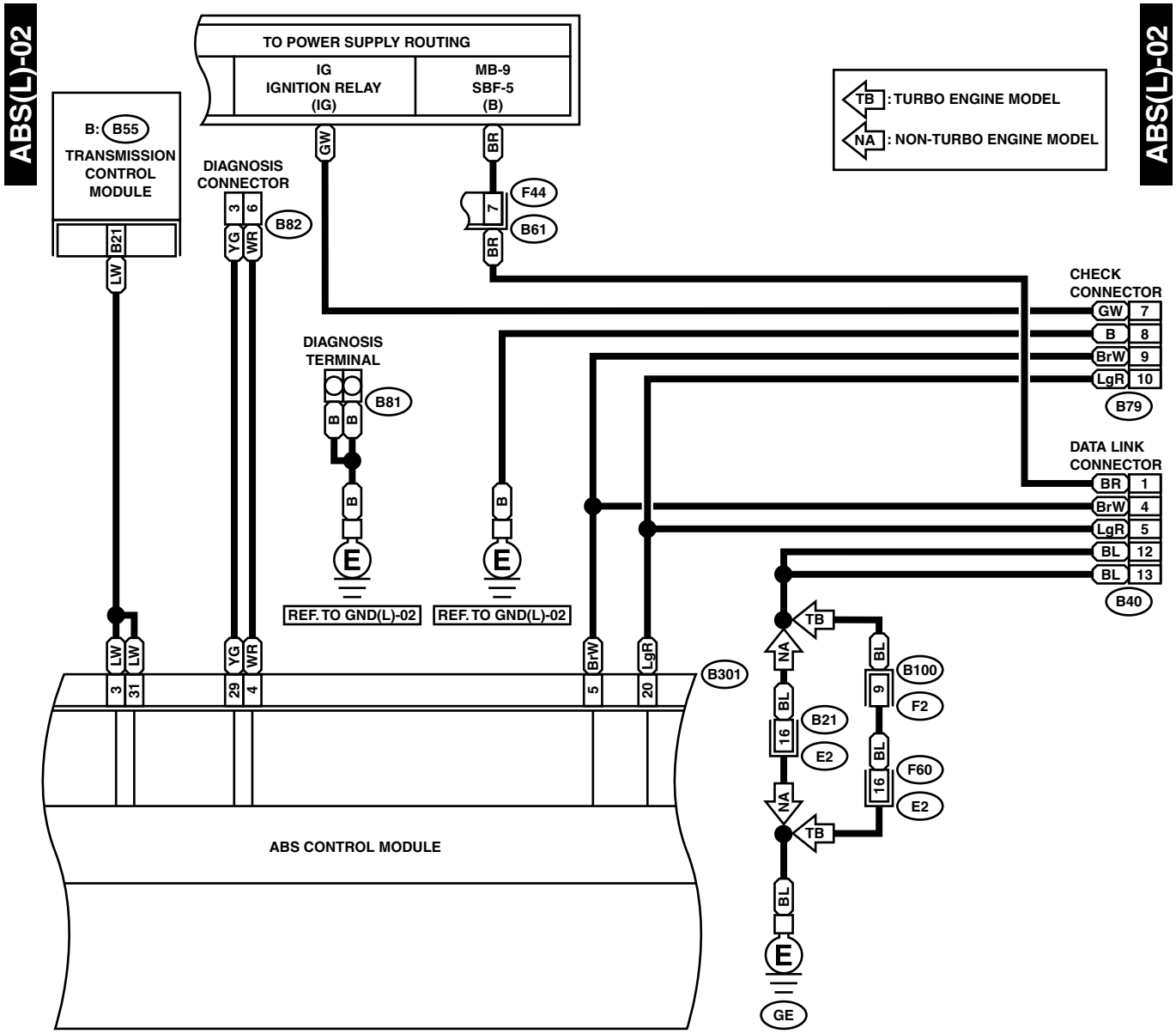
A: SCHEMATIC

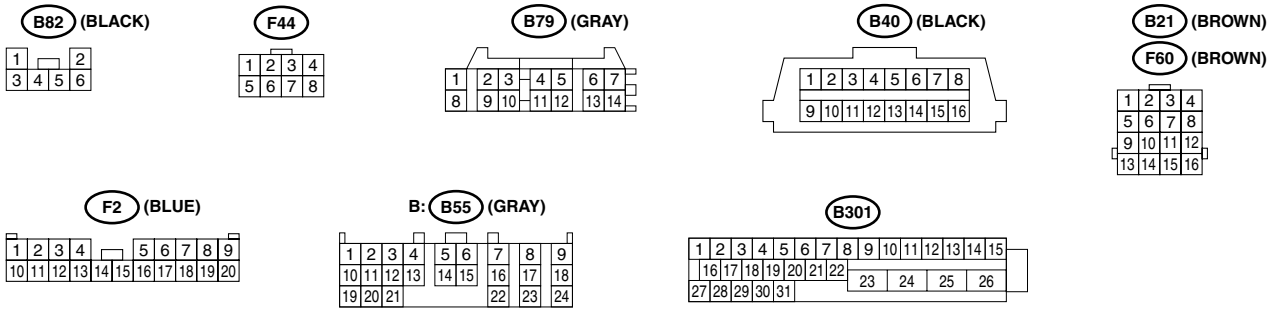
1. LHD MODEL



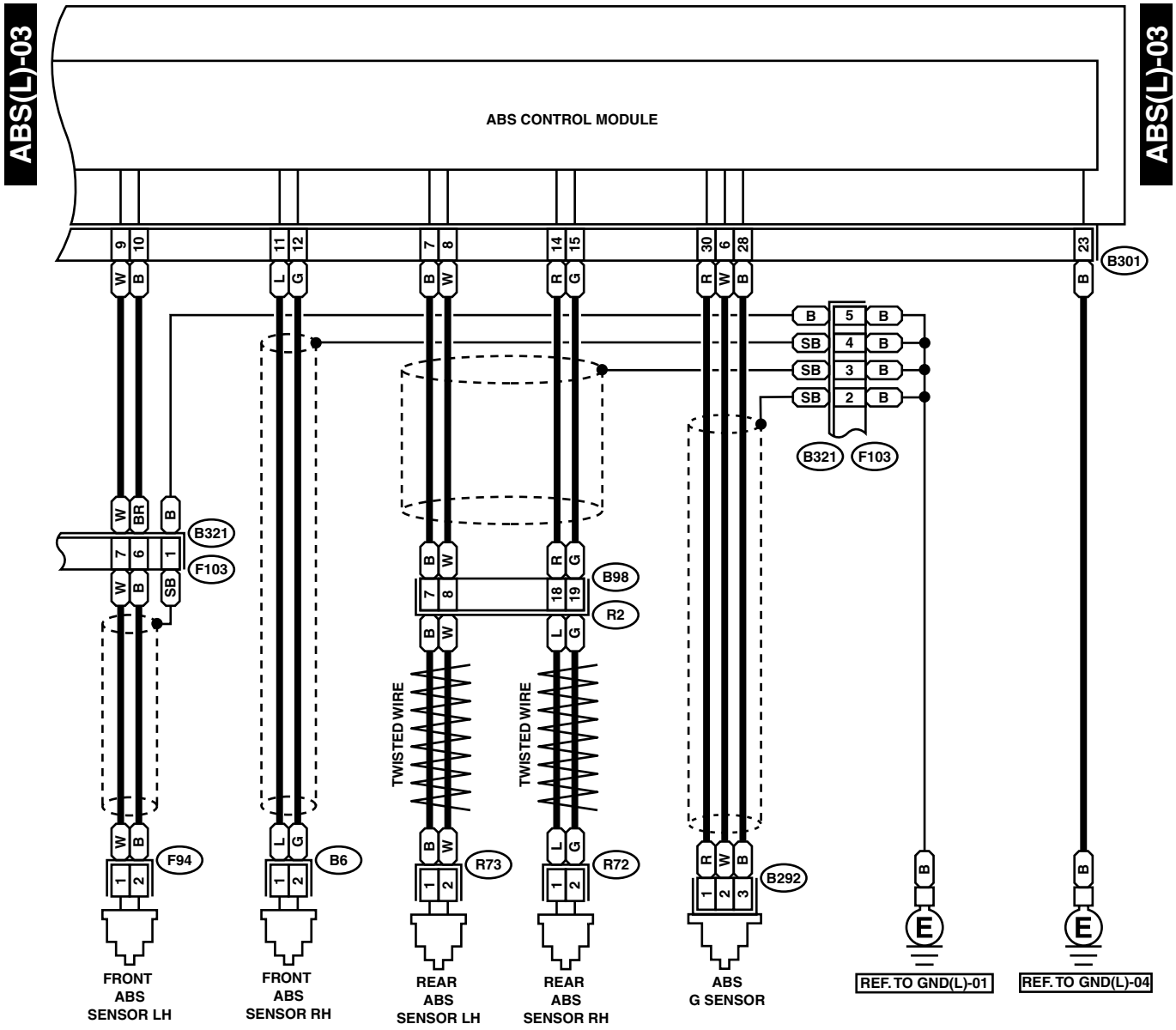


WI-00284


ABS(L)-02
ABS(L)-02
TO POWER SUPPLY ROUTING
IG
IGNITION RELAY
(IG)
MB-9
SBF-5
(B)
TB: TURBO ENGINE MODEL
NA: NON-TURBO ENGINE MODEL
B: B55
TRANSMISSION CONTROL MODULE
B21
LW
DIAGNOSIS CONNECTOR
3
6
YG
WR
B82
GW
BR
F44
7
B61
BR
CHECK CONNECTOR
GW 7
B 8
BrW 9
LgR 10
B79
DIAGNOSIS TERMINAL
B81
B
B
B
B
E
E
REF. TO GND(L)-02
REF. TO GND(L)-02
DATA LINK CONNECTOR
BR 1
BrW 4
LgR 5
BL 12
BL 13
B40
LW
LW
3
31
YG
WR
29
4
BrW
5
LgR
20
B301
TB
NA
BL
B100
9
F2
BL
B21
16
E2
BL
F60
16
E2
NA
TB
ABS CONTROL MODULE
BL
E
GE


B82 (BLACK)
F44
B79 (GRAY)
B40 (BLACK)
B21 (BROWN)
F60 (BROWN)
F2 (BLUE)
B: B55 (GRAY)
B301

WI-00285

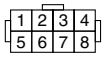


B6 (BROWN)
F94 (BROWN)

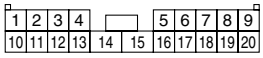
R72
R73

B292

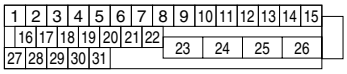
F103 (GRAY)



B98

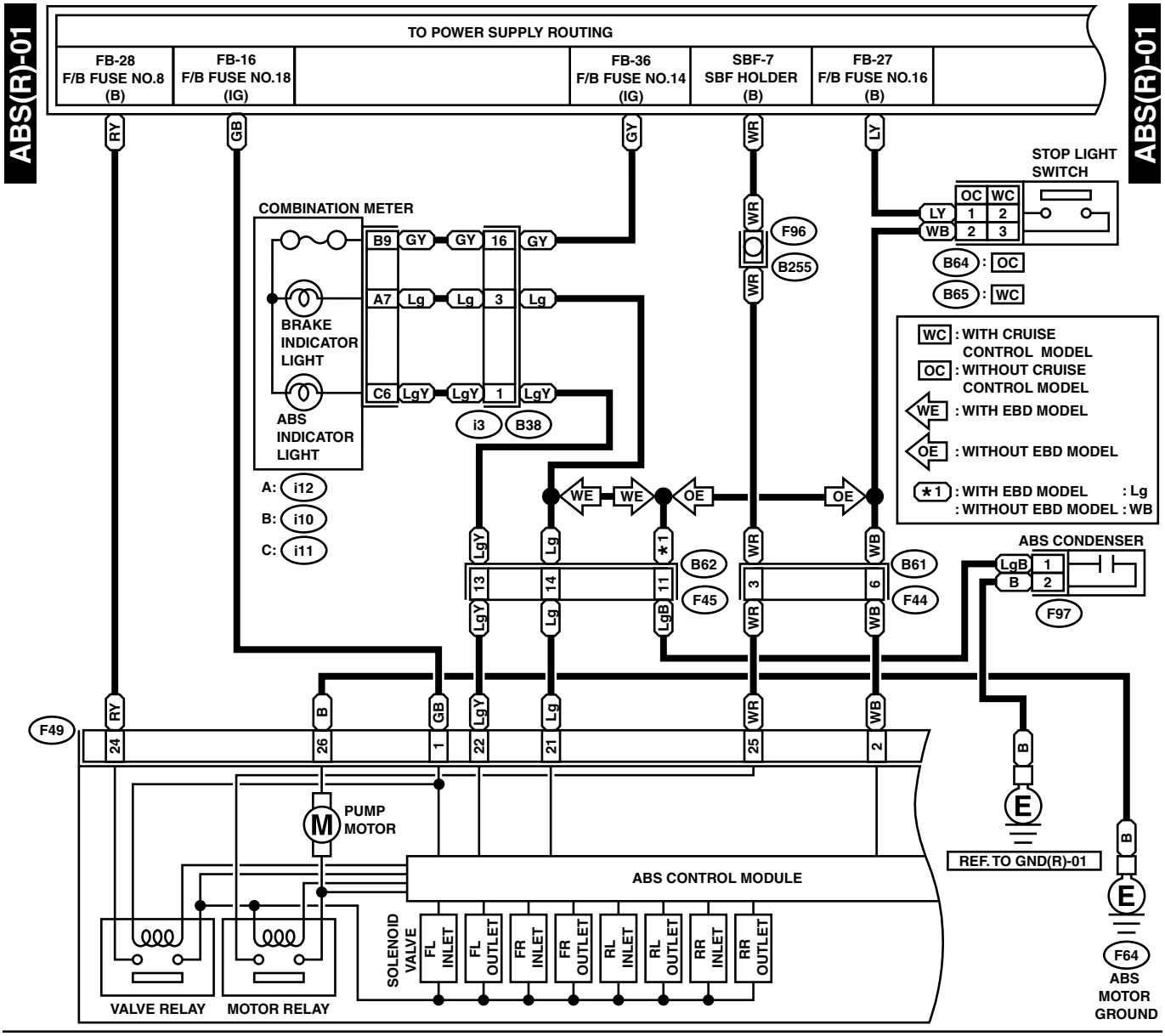


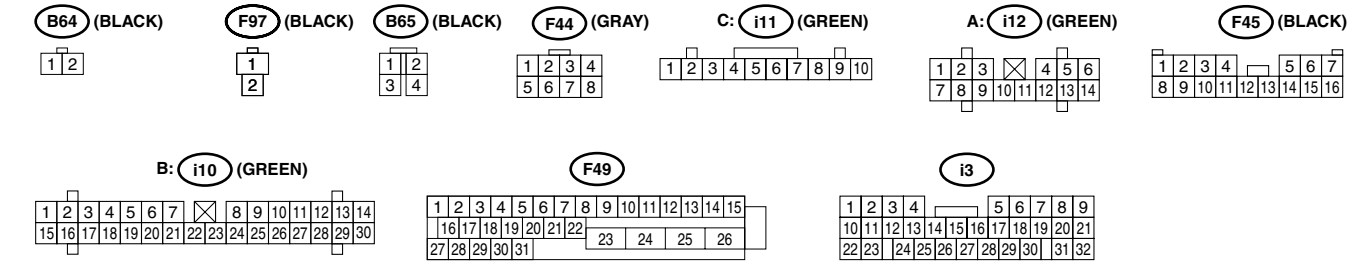
B301



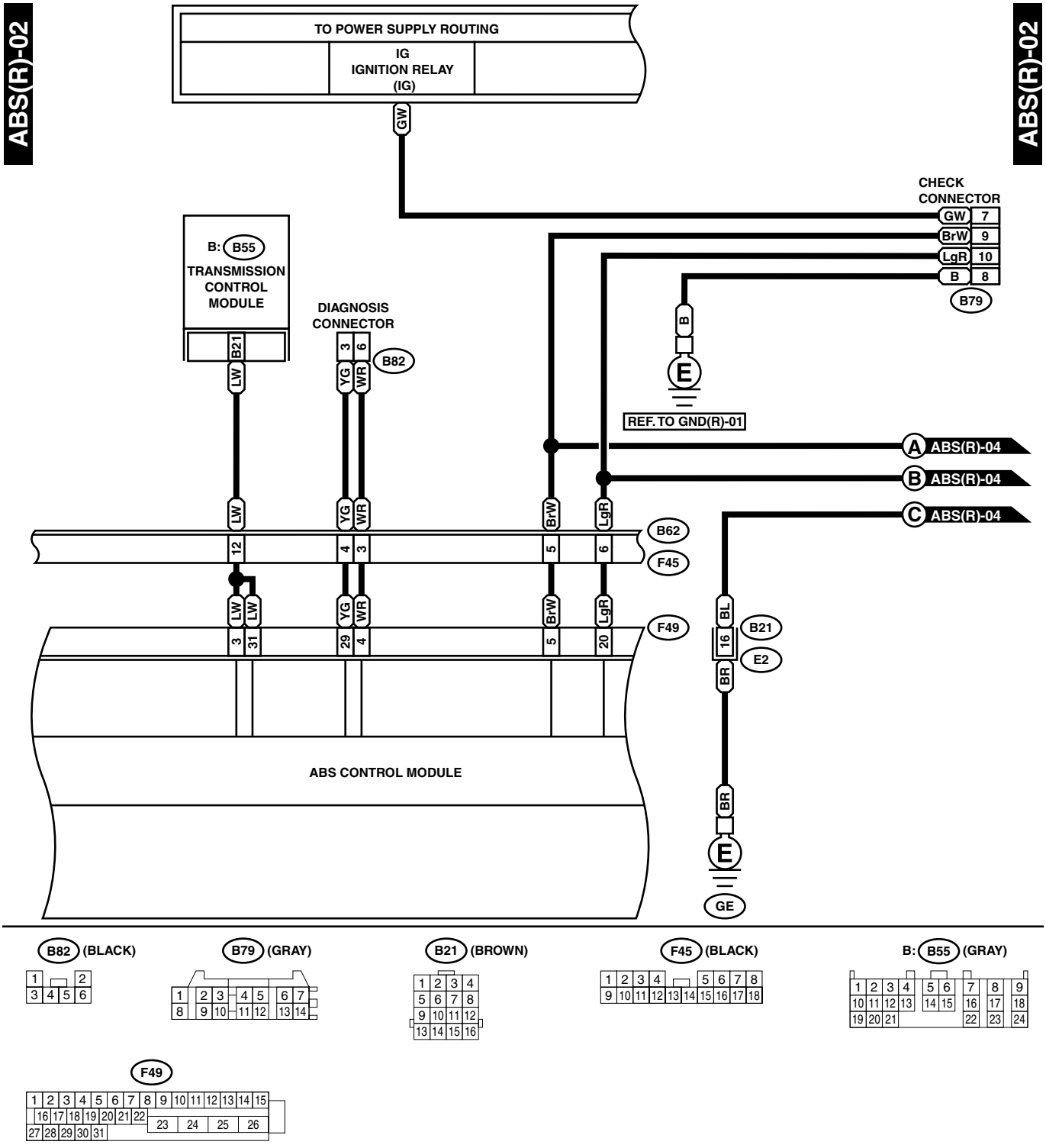
WI-00286

2. RHD MODEL



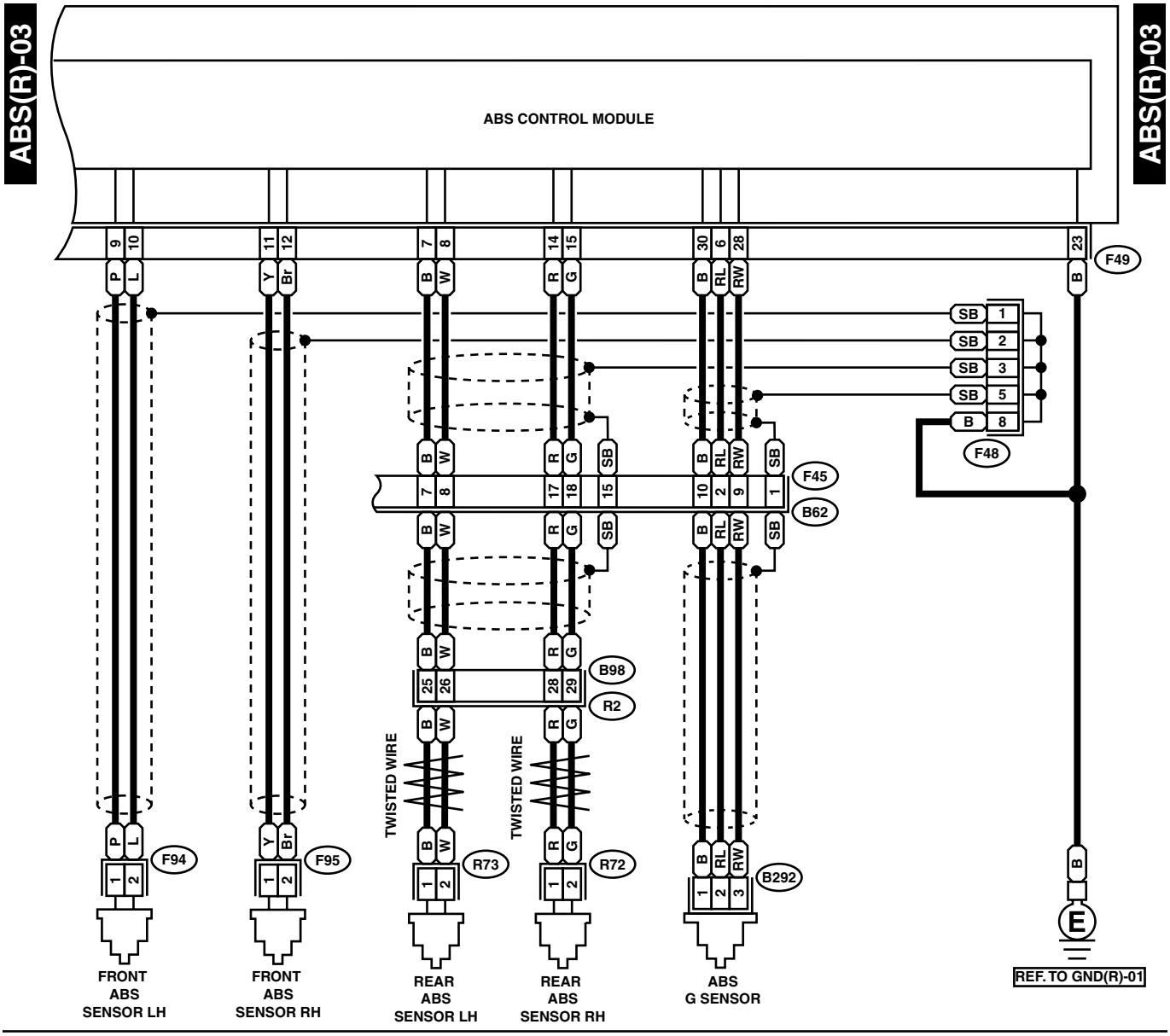


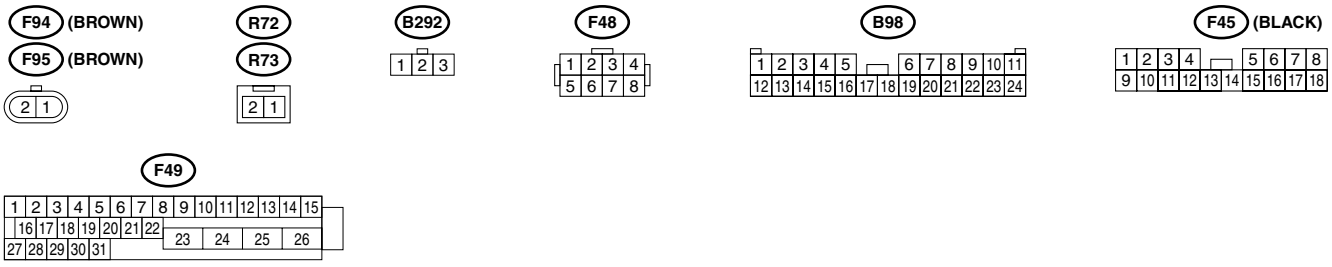
WI-00288


ABS(R)-02
ABS(R)-02
TO POWER SUPPLY ROUTING
IG
IGNITION RELAY
(IG)
GW
CHECK
CONNECTOR
GW 7
BrW 9
LgR 10
B 8
B79
B: B55
TRANSMISSION
CONTROL
MODULE
B21
LW
DIAGNOSIS
CONNECTOR
3
6
B82
YG
WR
B
E
REF. TO GND(R)-01
A ABS(R)-04
B ABS(R)-04
C ABS(R)-04
LW
YG
WR
BrW
LgR
B62
12
4
3
5
6
F45
LW
LW
YG
WR
BrW
LgR
F49
3
31
29
4
5
20
BL
16
B21
E2
BR
ABS CONTROL MODULE
BR
E
GE

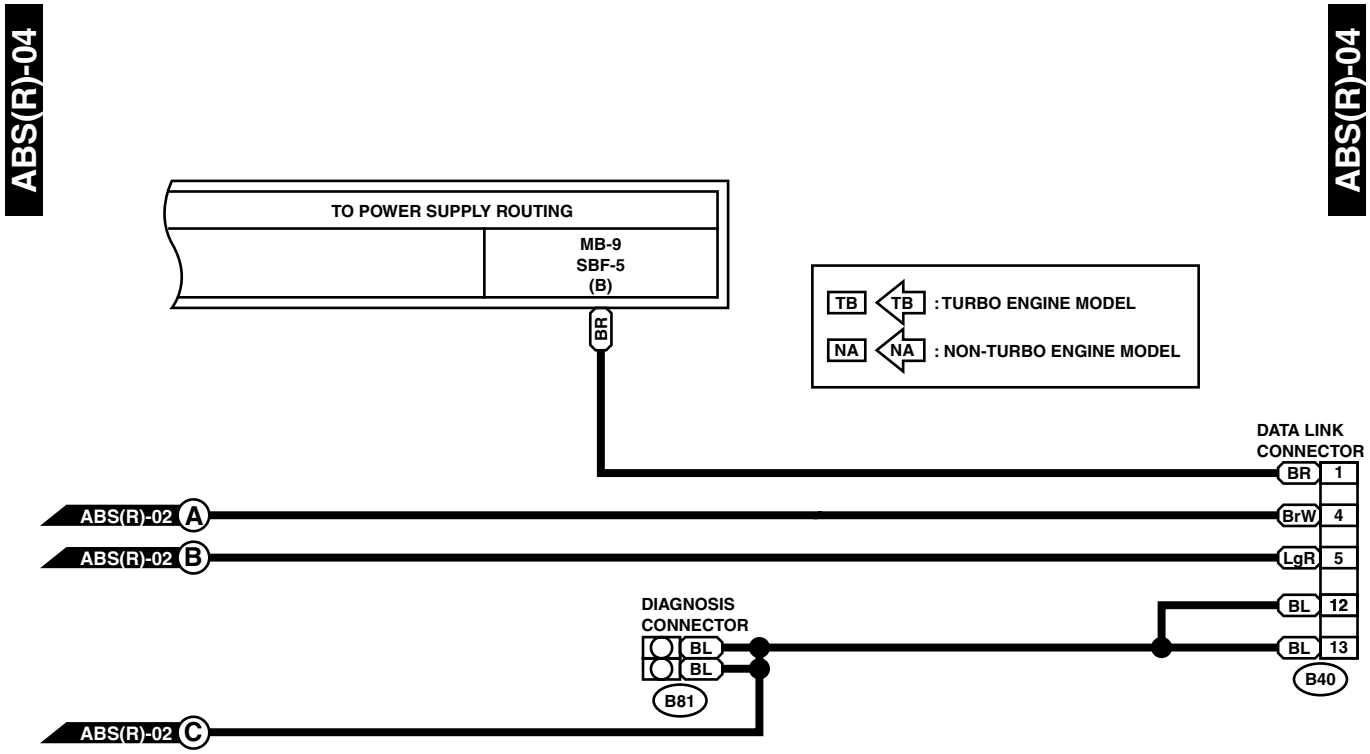
B82 (BLACK)
B79 (GRAY)
B21 (BROWN)
F45 (BLACK)
B: B55 (GRAY)
F49

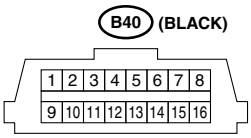
WI-00289


ABS(R)-03
ABS(R)-03
ABS CONTROL MODULE
9 10 11 12 7 8 14 15 30 6 28 23
P L Y Br B W R G B RL RW B
F49
SB 1
SB 2
SB 3
SB 5
B 8
F48
F45
B62
B98
R2
TWISTED WIRE
TWISTED WIRE
F94
F95
R73
R72
B292
FRONT ABS SENSOR LH
FRONT ABS SENSOR RH
REAR ABS SENSOR LH
REAR ABS SENSOR RH
ABS G SENSOR
REF. TO GND(R)-01


F94 (BROWN)
F95 (BROWN)
R72
R73
B292
F48
B98
F45 (BLACK)
F49

WI-00290


ABS(R)-04
ABS(R)-04
TO POWER SUPPLY ROUTING
MB-9
SBF-5
(B)
BR
TB TB : TURBO ENGINE MODEL
NA NA : NON-TURBO ENGINE MODEL
DATA LINK
CONNECTOR
BR 1
BrW 4
LgR 5
BL 12
BL 13
B40
ABS(R)-02 A
ABS(R)-02 B
ABS(R)-02 C
DIAGNOSIS
CONNECTOR
BL
BL
B81

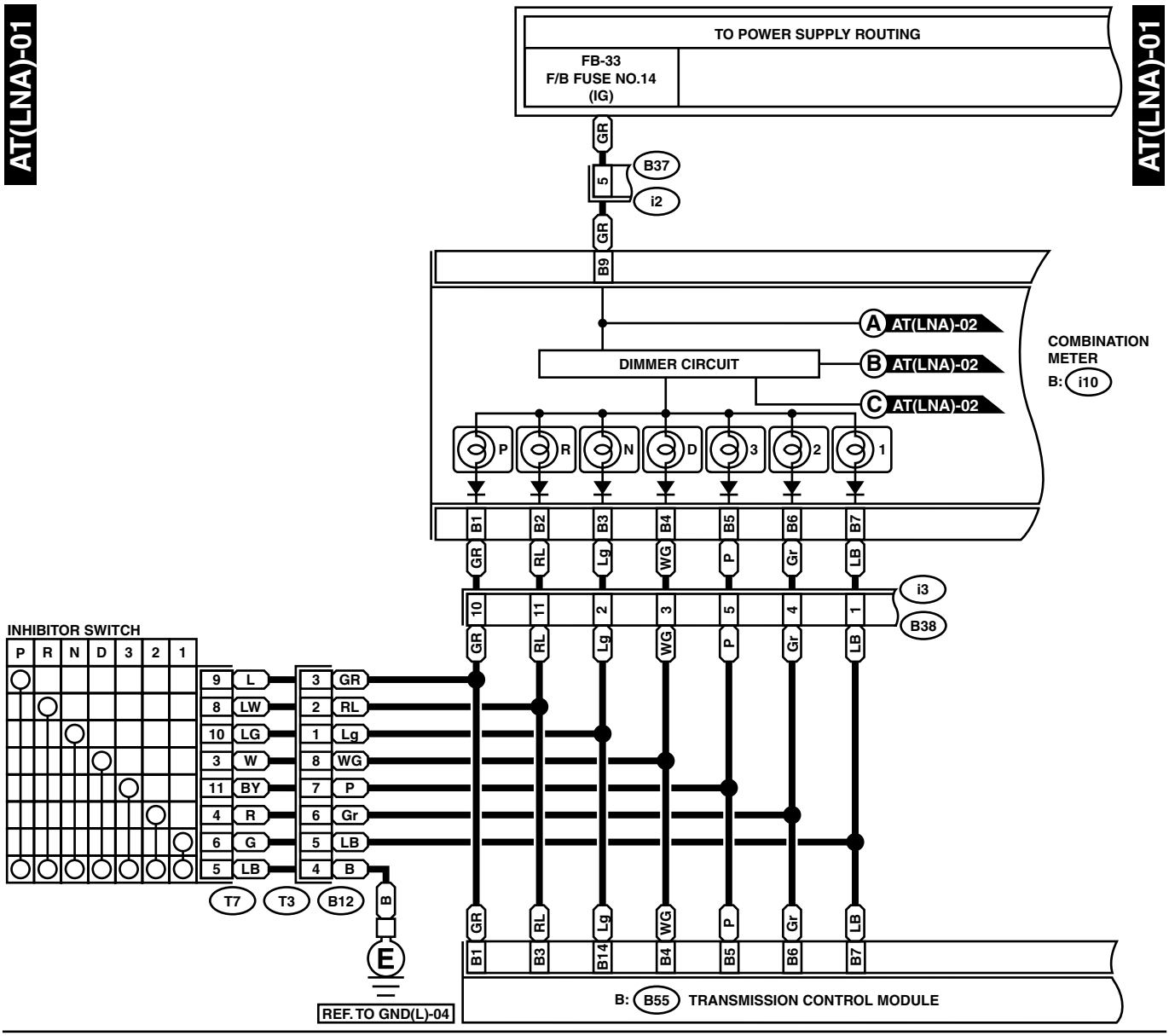

B40 (BLACK)
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16

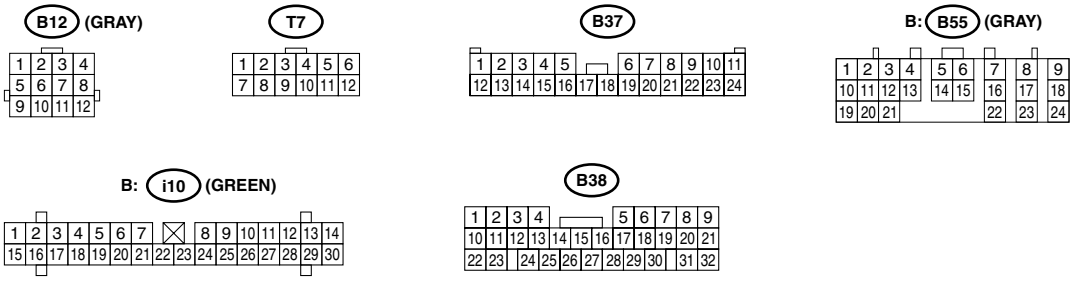
WI-00291

8. A/T Control System

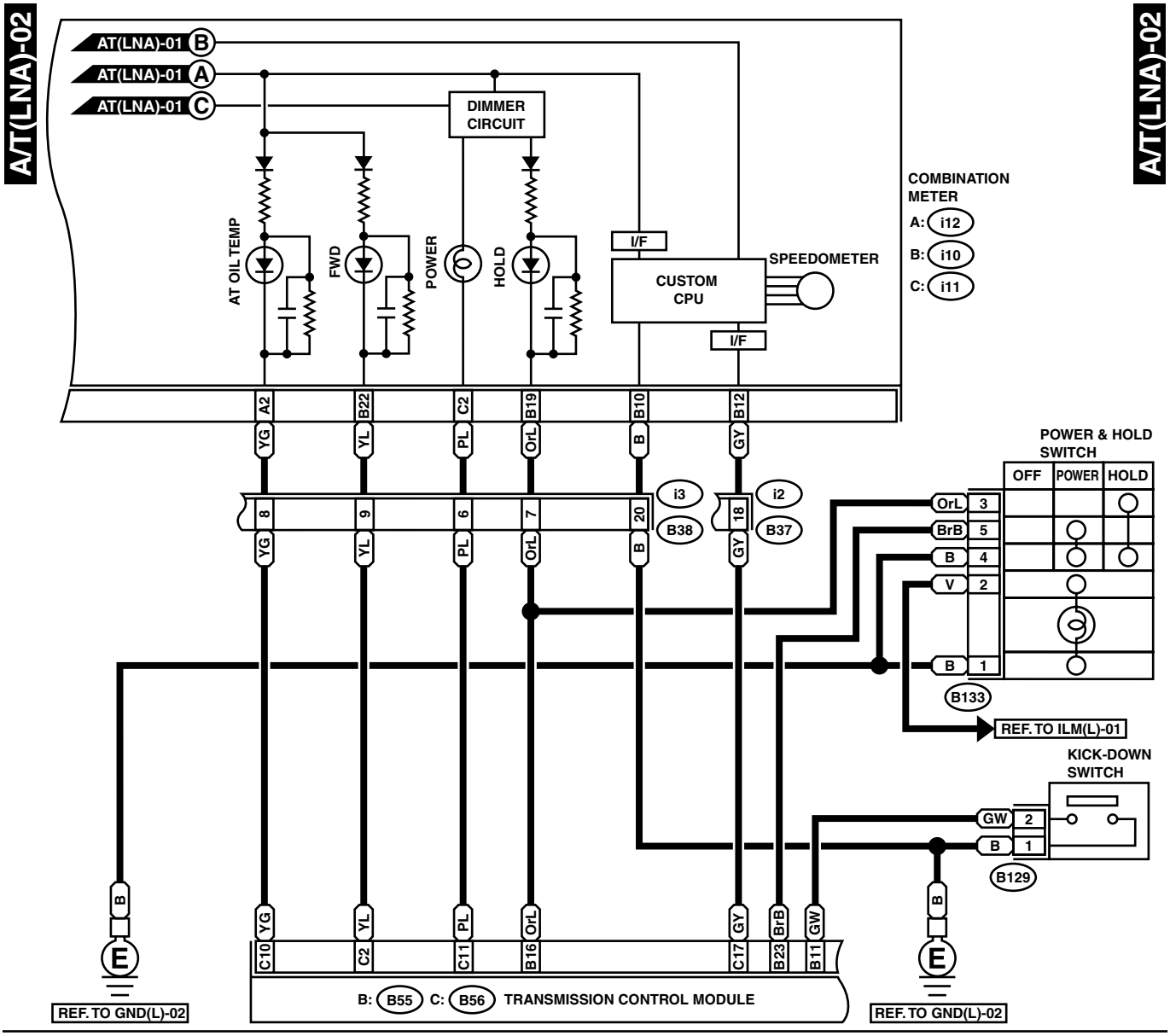
A: SCHEMATIC

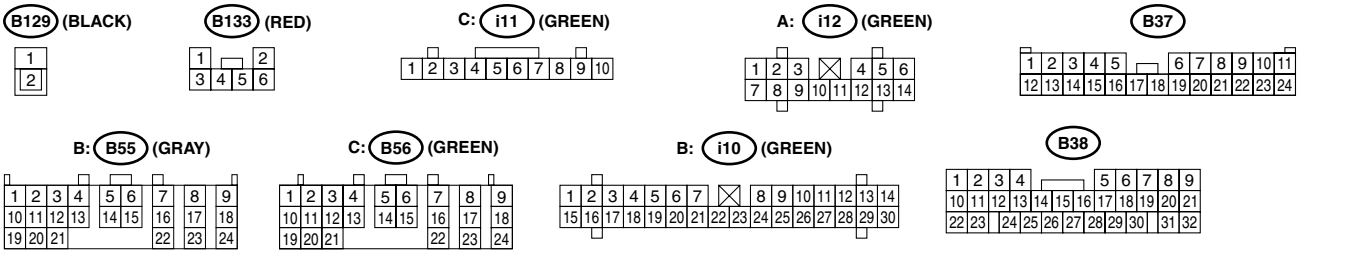
1. LHD NON-TURBO MODEL



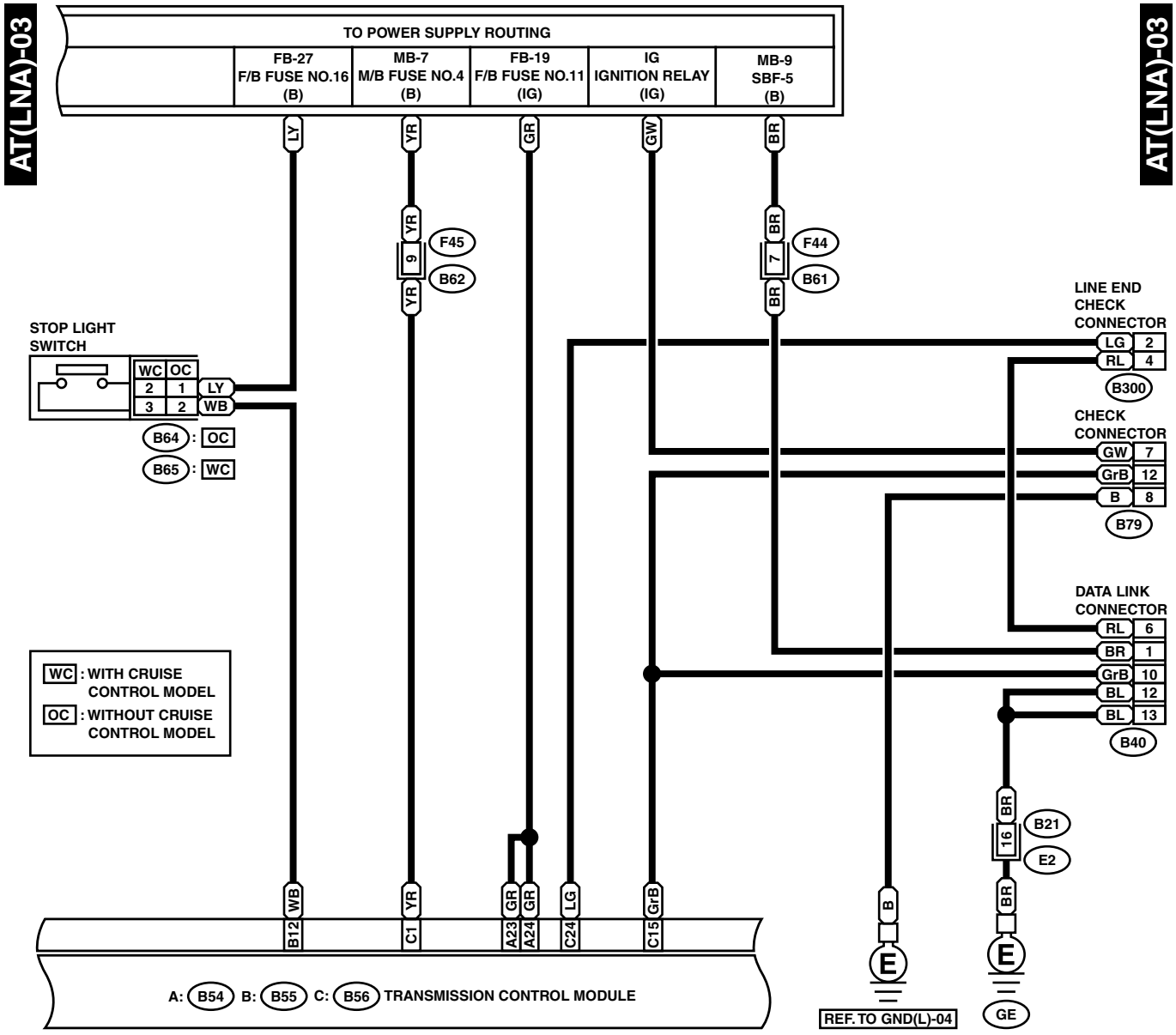


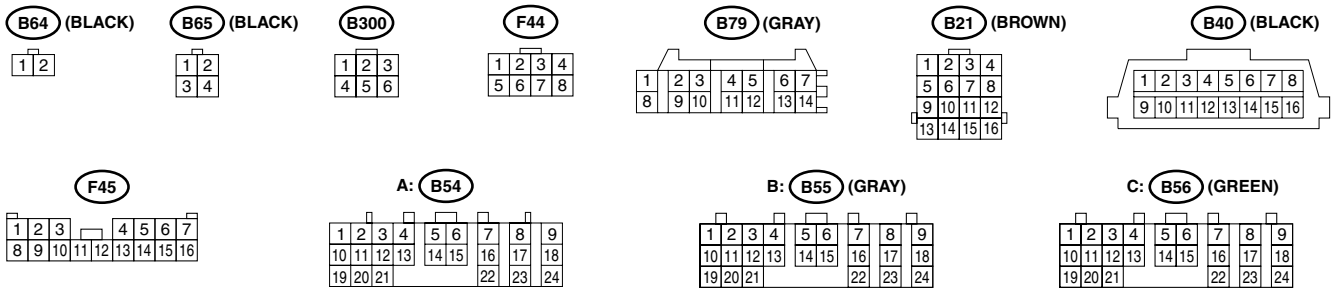
WI-00713


A/T(LNA)-02
AT(LNA)-01 B
AT(LNA)-01 A
AT(LNA)-01 C
DIMMER CIRCUIT
AT OIL TEMP
FWD
POWER
HOLD
I/F
CUSTOM CPU
SPEEDOMETER
I/F
COMBINATION METER
A: i12
B: i10
C: i11
A2
B22
C2
B19
B10
B12
YG
YL
PL
OrL
B
GY
i3
i2
B38
B37
POWER & HOLD SWITCH
OFF
POWER
HOLD
OrL 3
BrB 5
B 4
V 2
B 1
B133
REF. TO ILM(L)-01
KICK-DOWN SWITCH
GW 2
B 1
B129
BrB
GW
C10
C2
C11
B16
C17
B23
B11
B: B55 C: B56 TRANSMISSION CONTROL MODULE
REF. TO GND(L)-02
REF. TO GND(L)-02

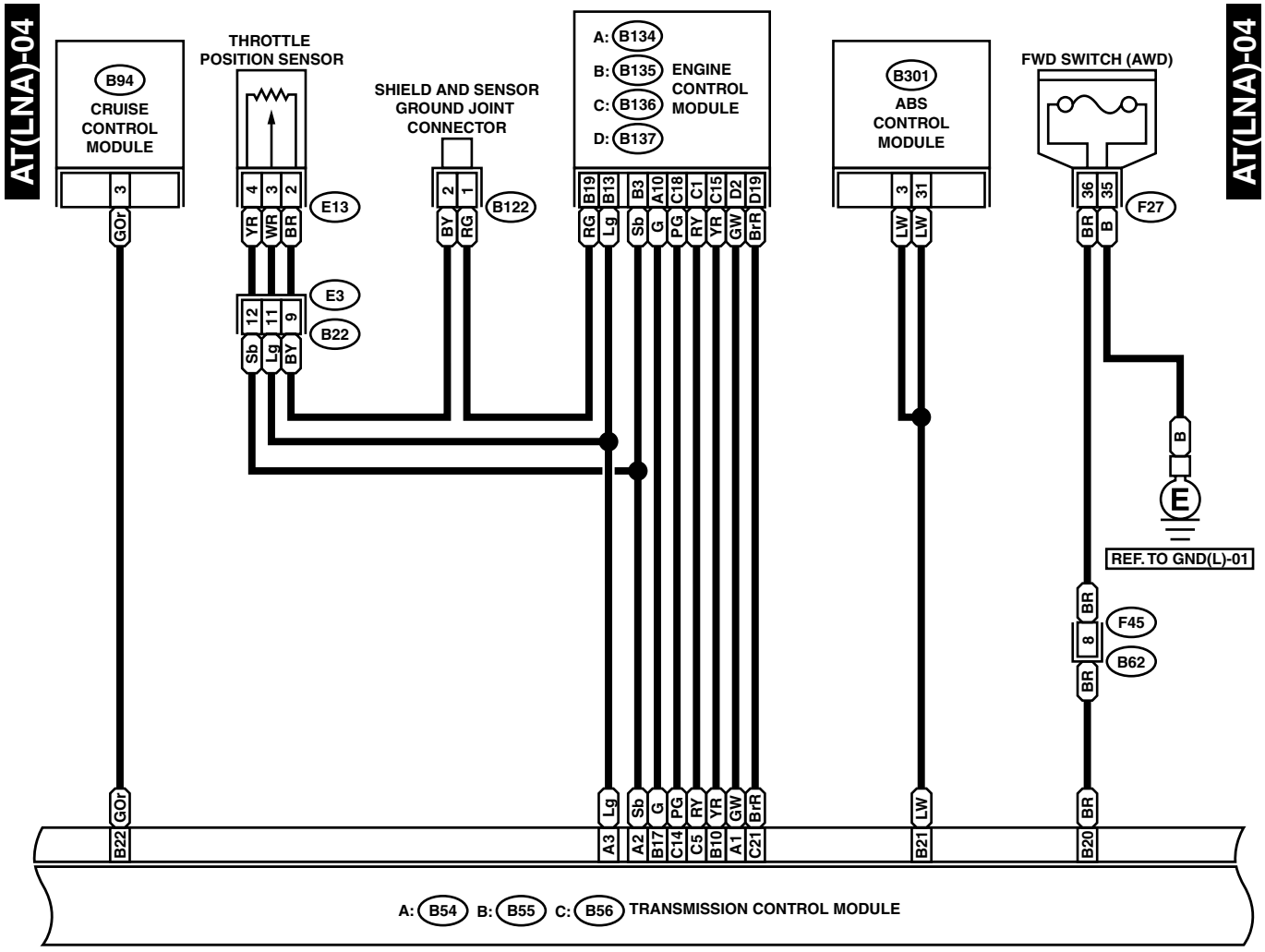

B129 (BLACK)
B133 (RED)
C: i11 (GREEN)
A: i12 (GREEN)
B37
B: B55 (GRAY)
C: B56 (GREEN)
B: i10 (GREEN)
B38

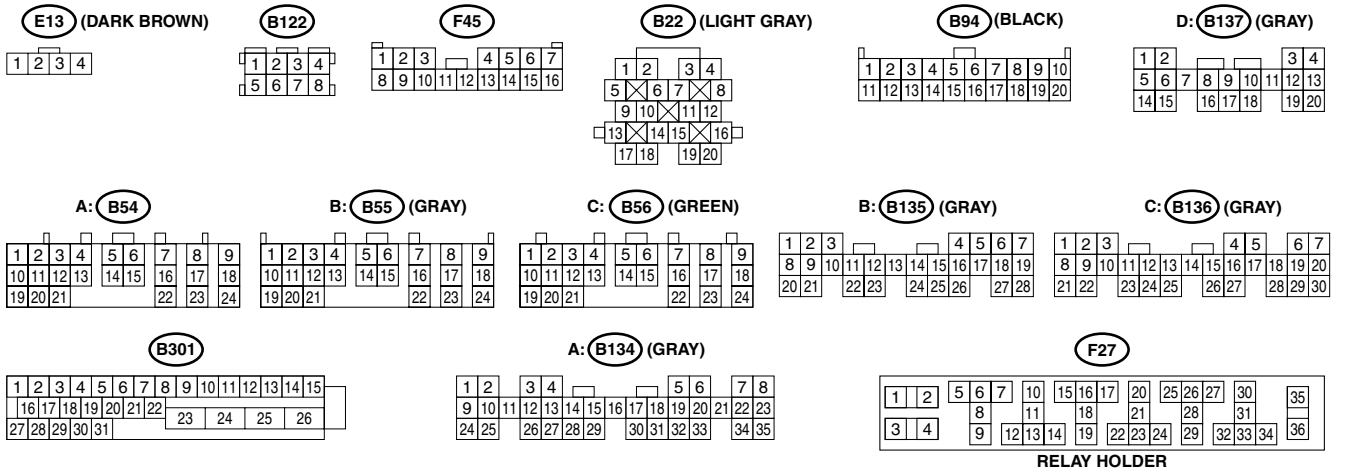
WI-00296


AT(LNA)-03
AT(LNA)-03
TO POWER SUPPLY ROUTING
FB-27
F/B FUSE NO.16
(B)
MB-7
M/B FUSE NO.4
(B)
FB-19
F/B FUSE NO.11
(IG)
IG
IGNITION RELAY
(IG)
MB-9
SBF-5
(B)
LY
YR
GR
GW
BR
F45
B62
F44
B61
STOP LIGHT
SWITCH
WC
OC
LY
WB
B64 : OC
B65 : WC
LINE END
CHECK
CONNECTOR
LG
RL
B300
CHECK
CONNECTOR
GW
GrB
B
B79
DATA LINK
CONNECTOR
RL
BR
GrB
BL
BL
B40
B21
E2
WC : WITH CRUISE
CONTROL MODEL
OC : WITHOUT CRUISE
CONTROL MODEL
B12
C1
A23
A24
C24
C15
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE
REF. TO GND(L)-04
GE

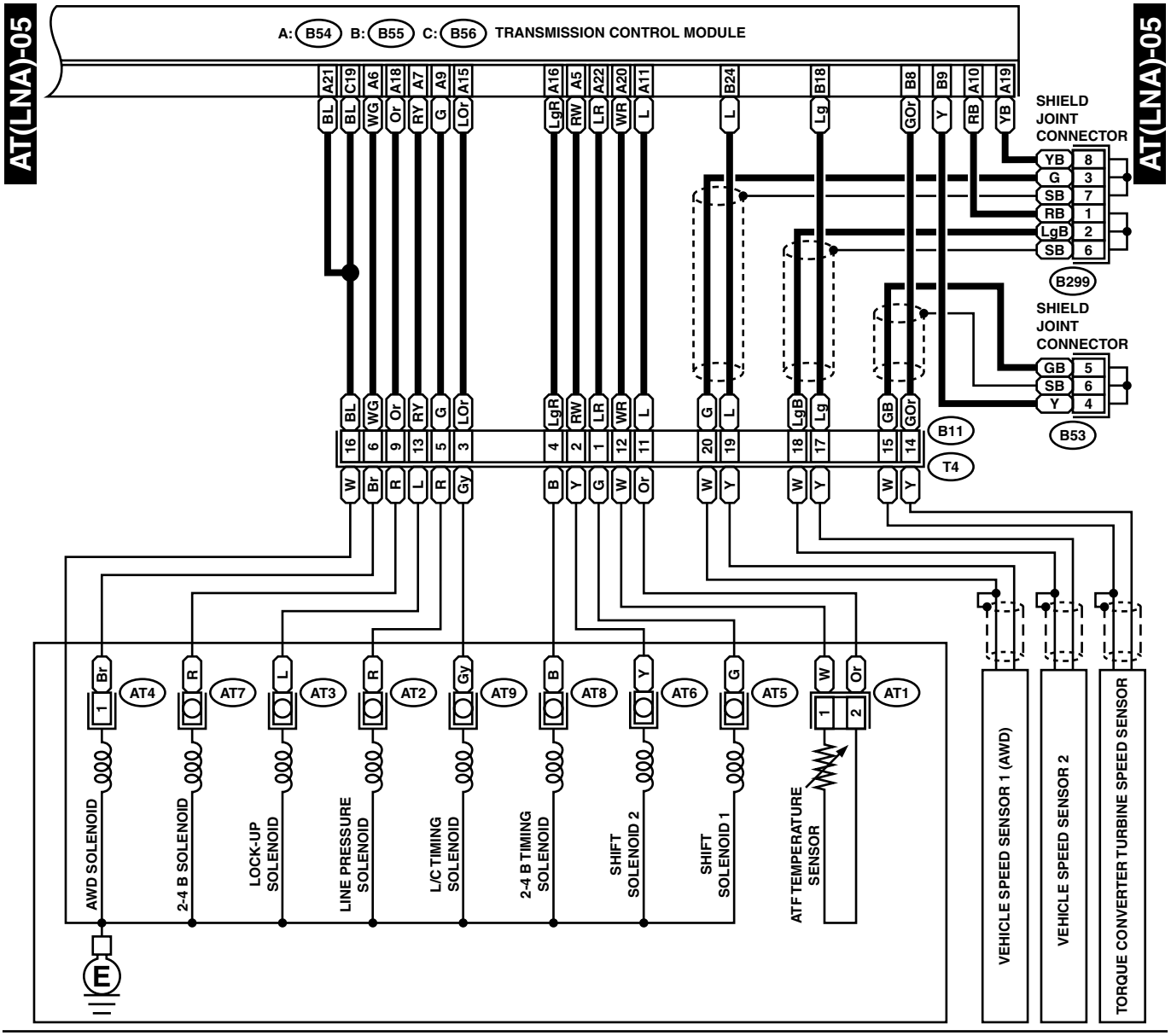

B64 (BLACK)
B65 (BLACK)
B300
F44
B79 (GRAY)
B21 (BROWN)
B40 (BLACK)
F45
A: B54
B: B55 (GRAY)
C: B56 (GREEN)

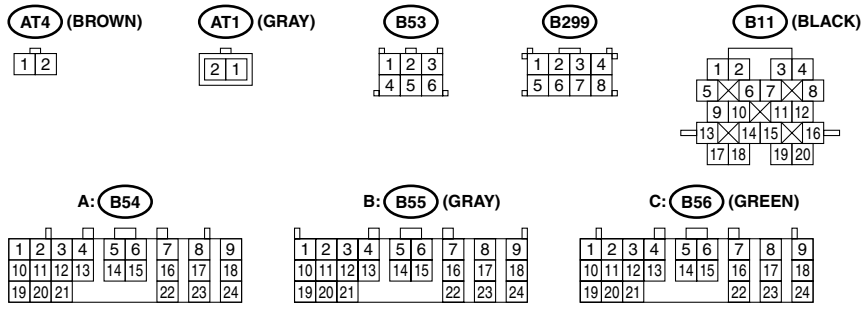
WI-00297


AT(LNA)-04
B94
CRUISE CONTROL MODULE
THROTTLE POSITION SENSOR
SHIELD AND SENSOR GROUND JOINT CONNECTOR
A: B134
B: B135
C: B136
D: B137
ENGINE CONTROL MODULE
B301
ABS CONTROL MODULE
FWD SWITCH (AWD)
AT(LNA)-04
E13
B122
E3
B22
F27
REF. TO GND(L)-01
F45
B62
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE


E13 (DARK BROWN)
B122
F45
B22 (LIGHT GRAY)
B94 (BLACK)
D: B137 (GRAY)
A: B54
B: B55 (GRAY)
C: B56 (GREEN)
B: B135 (GRAY)
C: B136 (GRAY)
B301
A: B134 (GRAY)
F27
RELAY HOLDER

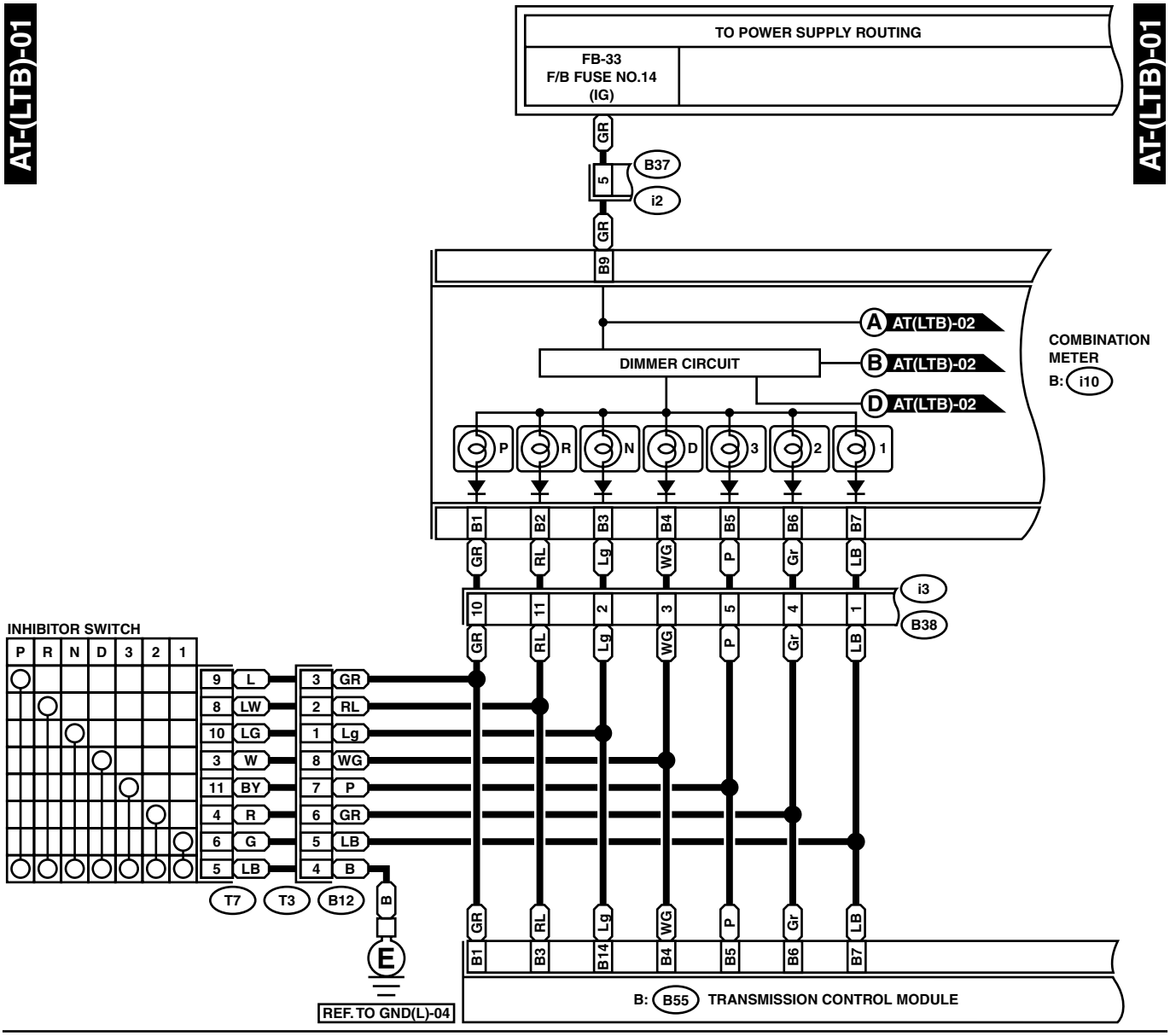
WI-00298

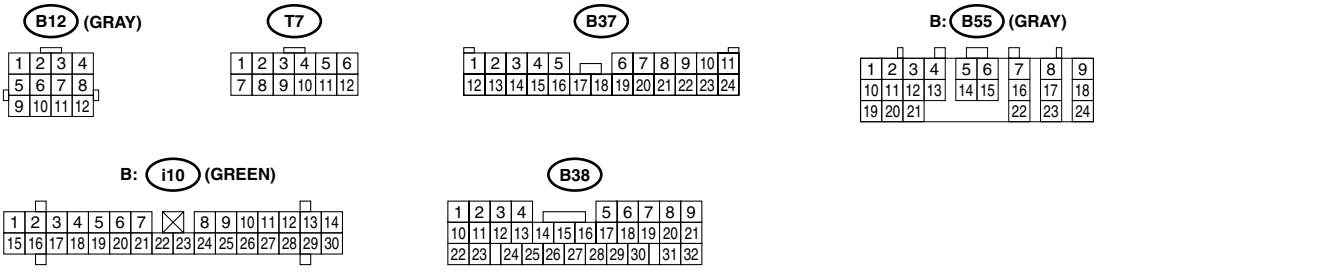

AT(LNA)-05
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE
SHIELD JOINT CONNECTOR
B299
B53
B11
T4
AWD SOLENOID
2-4 B SOLENOID
LOCK-UP SOLENOID
LINE PRESSURE SOLENOID
L/C TIMING SOLENOID
2-4 B TIMING SOLENOID
SHIFT SOLENOID 2
SHIFT SOLENOID 1
ATF TEMPERATURE SENSOR
VEHICLE SPEED SENSOR 1 (AWD)
VEHICLE SPEED SENSOR 2
TORQUE CONVERTER TURBINE SPEED SENSOR


AT4 (BROWN)
AT1 (GRAY)
B53
B299
B11 (BLACK)
A: B54
B: B55 (GRAY)
C: B56 (GREEN)

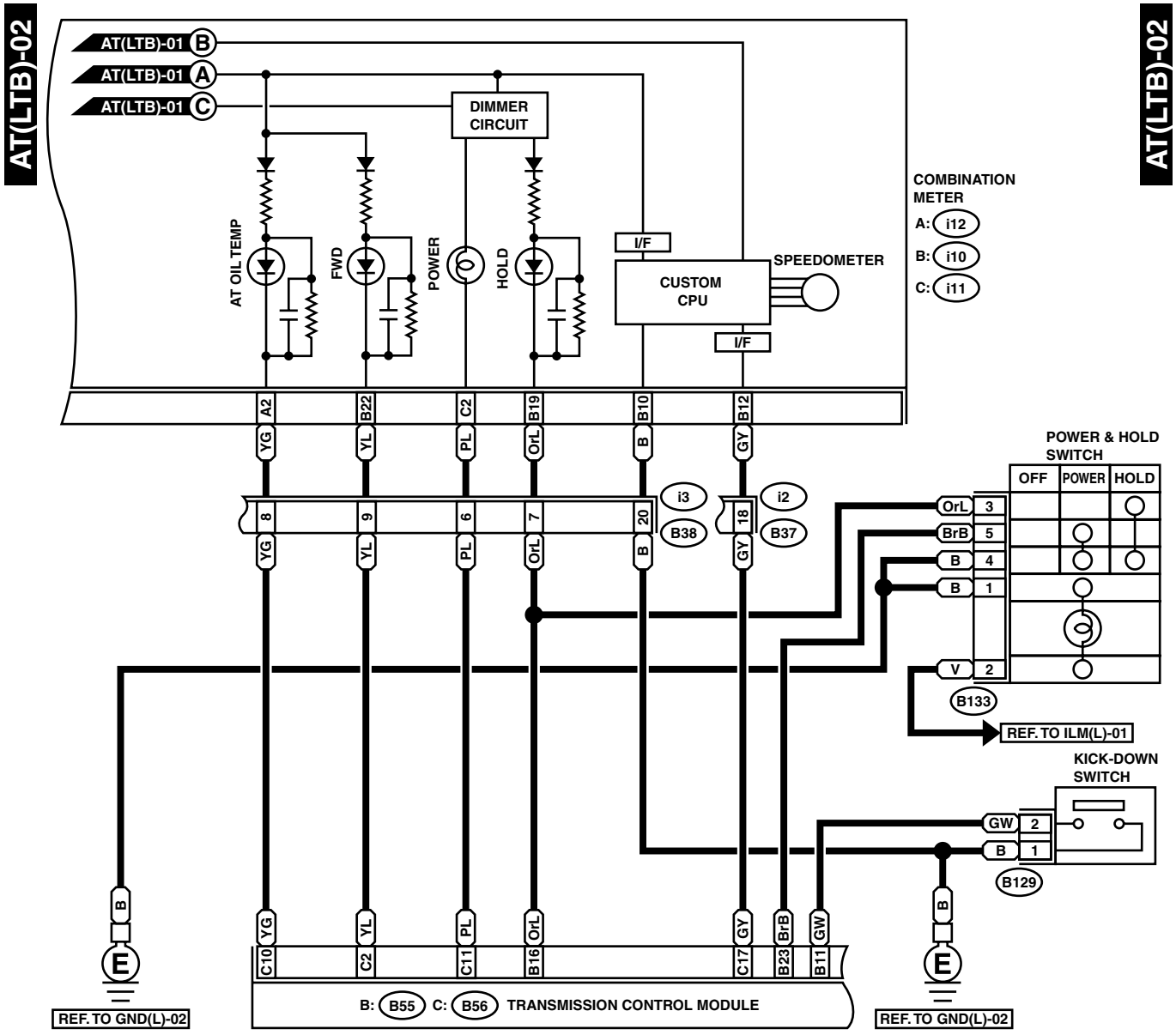
WI-00299

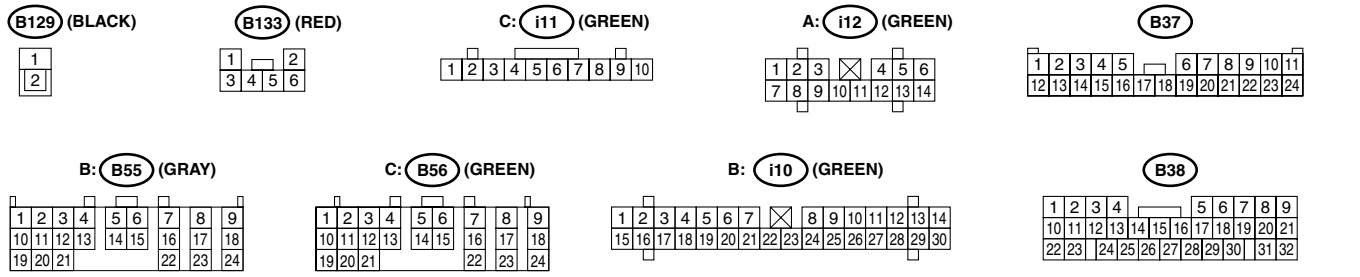
2. LHD TURBO MODEL



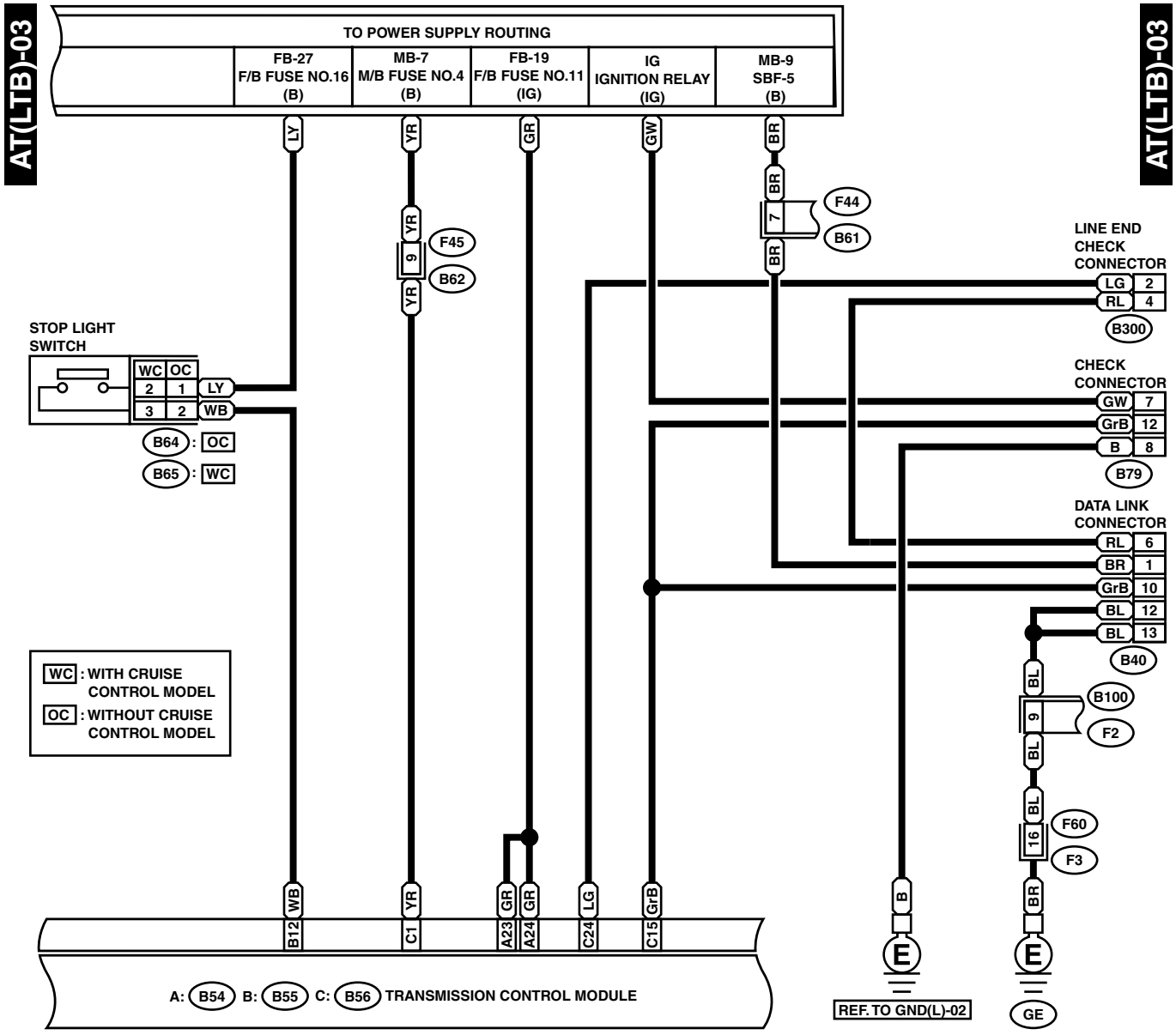


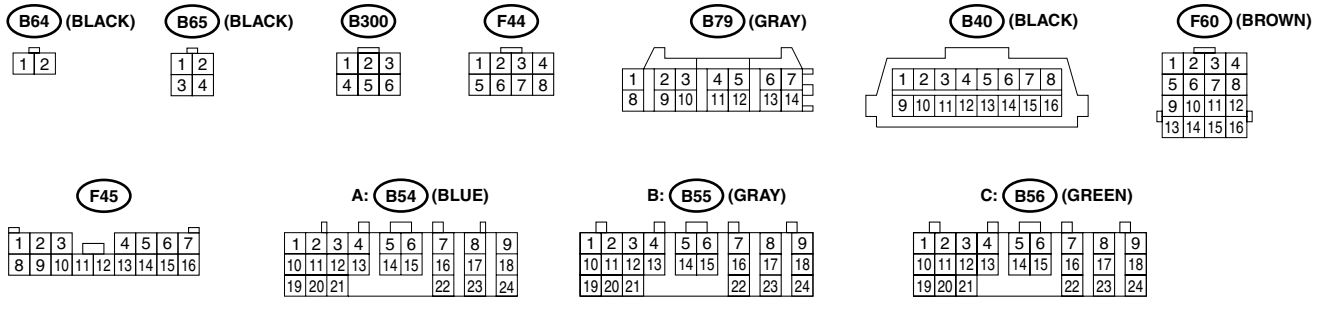
WI-00714


AT(LTB)-02
AT(LTB)-01 B
AT(LTB)-01 A
AT(LTB)-01 C
DIMMER CIRCUIT
AT OIL TEMP
FWD
POWER
HOLD
I/F
CUSTOM CPU
SPEEDOMETER
I/F
COMBINATION METER
A: i12
B: i10
C: i11
A2
B22
C2
B19
B10
B12
YG
YL
PL
OrL
B
GY
i3
i2
B38
B37
POWER & HOLD SWITCH
OFF
POWER
HOLD
OrL 3
BrB 5
B 4
B 1
V 2
B133
REF. TO ILM(L)-01
KICK-DOWN SWITCH
GW 2
B 1
B129
BrB
GW
C10
C17
B23
B11
B16
B: B55 C: B56 TRANSMISSION CONTROL MODULE
REF. TO GND(L)-02
REF. TO GND(L)-02

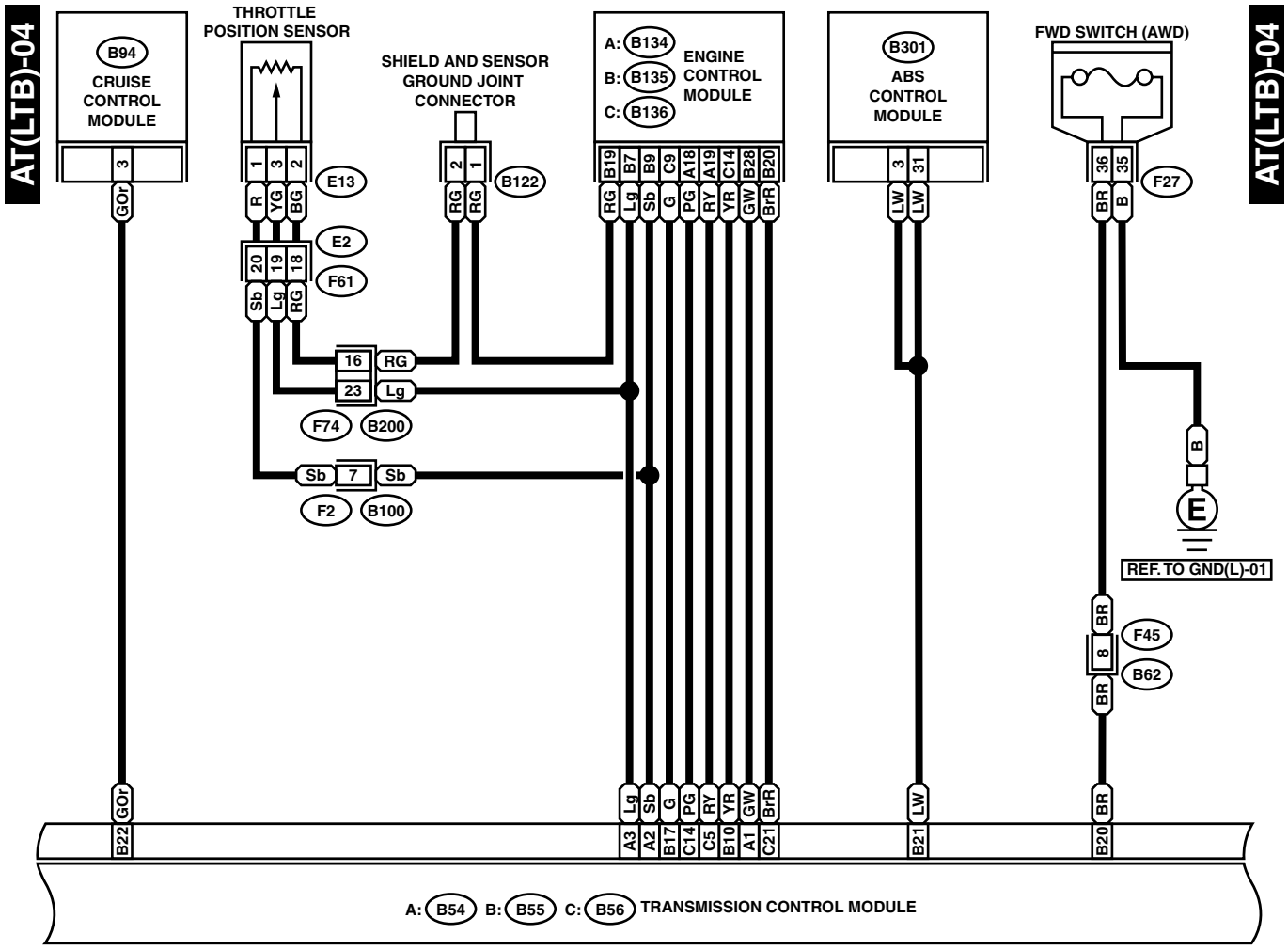

B129 (BLACK)
B133 (RED)
C: i11 (GREEN)
A: i12 (GREEN)
B37
B: B55 (GRAY)
C: B56 (GREEN)
B: i10 (GREEN)
B38

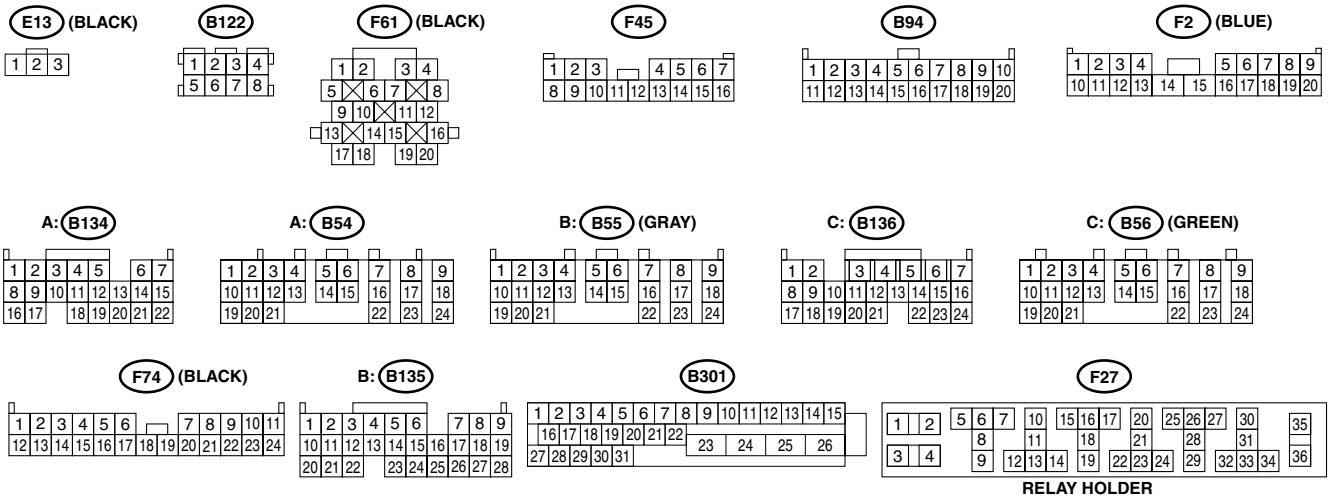
WI-00300


AT(LTB)-03
TO POWER SUPPLY ROUTING
FB-27 F/B FUSE NO.16 (B)
MB-7 M/B FUSE NO.4 (B)
FB-19 F/B FUSE NO.11 (IG)
IG IGNITION RELAY (IG)
MB-9 SBF-5 (B)
LY
YR
GR
GW
BR
F44
B61
F45
B62
LINE END CHECK CONNECTOR
LG 2
RL 4
B300
STOP LIGHT SWITCH
WC OC
2 1 LY
3 2 WB
B64 : OC
B65 : WC
CHECK CONNECTOR
GW 7
GrB 12
B 8
B79
DATA LINK CONNECTOR
RL 6
BR 1
GrB 10
BL 12
BL 13
B40
B100
F2
F60
F3
WC : WITH CRUISE CONTROL MODEL
OC : WITHOUT CRUISE CONTROL MODEL
B12 WB
C1 YR
A23 GR
A24 GR
C24 LG
C15 GrB
B
BR
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE
REF. TO GND(L)-02
GE

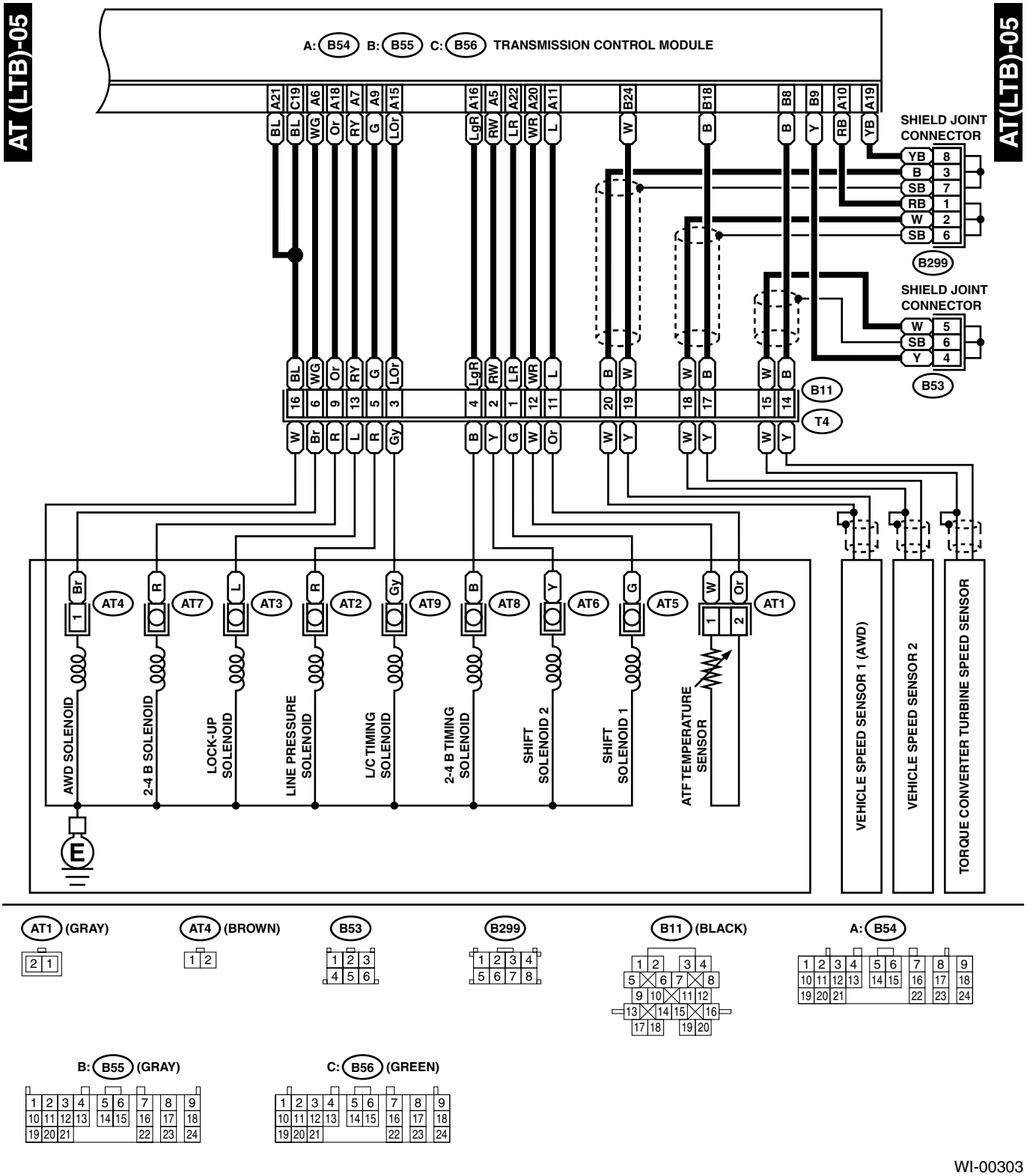

B64 (BLACK)
B65 (BLACK)
B300
F44
B79 (GRAY)
B40 (BLACK)
F60 (BROWN)
F45
A: B54 (BLUE)
B: B55 (GRAY)
C: B56 (GREEN)

WI-00301


AT(LTB)-04
B94
CRUISE CONTROL MODULE
THROTTLE POSITION SENSOR
SHIELD AND SENSOR GROUND JOINT CONNECTOR
A: B134
B: B135
C: B136
ENGINE CONTROL MODULE
B301
ABS CONTROL MODULE
FWD SWITCH (AWD)
E13
B122
E2
F61
F74
B200
F2
B100
F27
REF. TO GND(L)-01
F45
B62
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE

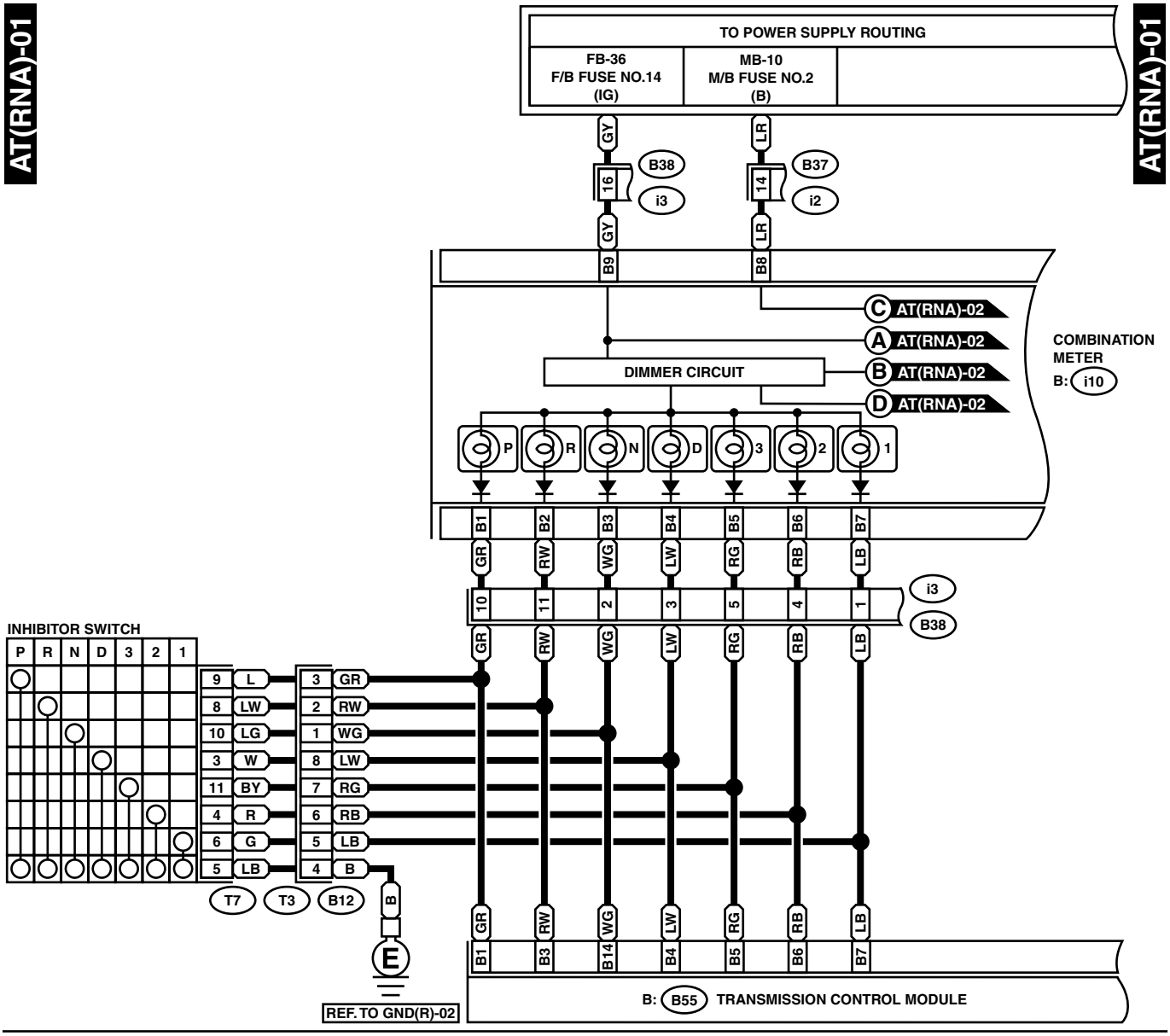

E13 (BLACK)
B122
F61 (BLACK)
F45
B94
F2 (BLUE)
A: B134
A: B54
B: B55 (GRAY)
C: B136
C: B56 (GREEN)
F74 (BLACK)
B: B135
B301
F27
RELAY HOLDER

WI-00302

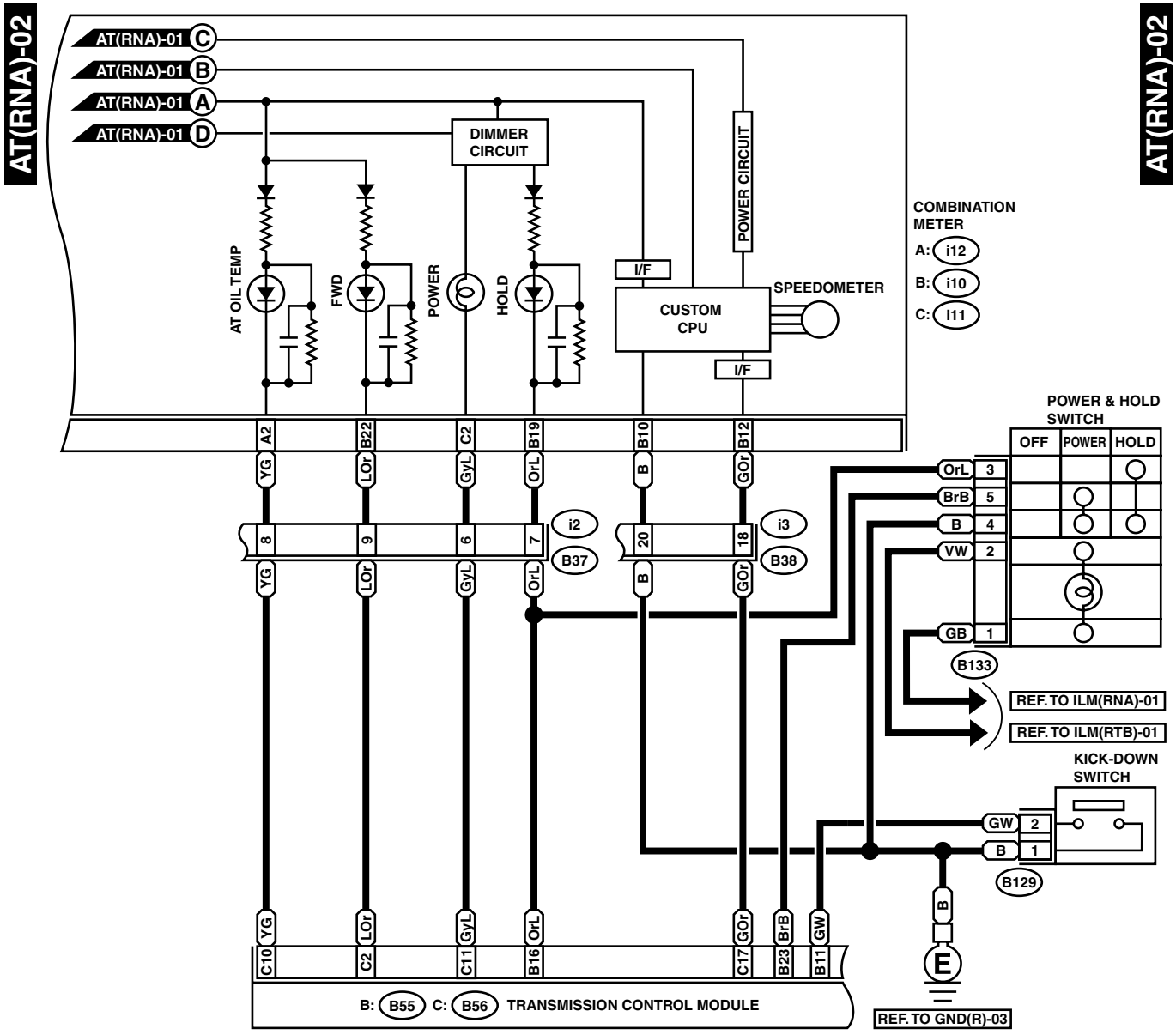

AT (LTB)-05
AT(LTB)-05
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE
A21 C19 A6 A18 A7 A9 A15 A16 A5 A22 A20 A11 B24 B18 B8 B9 A10 A19
BL BL WG Or RY G LOr LgR RW LR WR L W B B Y RB YB
SHIELD JOINT CONNECTOR
YB 8
B 3
SB 7
RB 1
W 2
SB 6
B299
SHIELD JOINT CONNECTOR
W 5
SB 6
Y 4
B53
B11
T4
16 6 9 13 5 3 4 2 1 12 11 20 19 18 17 15 14
W Br R L R Gy B Y G W Or W Y W Y W Y
AT4 AT7 AT3 AT2 AT9 AT8 AT6 AT5 AT1
AWD SOLENOID
2-4 B SOLENOID
LOCK-UP SOLENOID
LINE PRESSURE SOLENOID
L/C TIMING SOLENOID
2-4 B TIMING SOLENOID
SHIFT SOLENOID 2
SHIFT SOLENOID 1
ATF TEMPERATURE SENSOR
VEHICLE SPEED SENSOR 1 (AWD)
VEHICLE SPEED SENSOR 2
TORQUE CONVERTER TURBINE SPEED SENSOR
E
AT1 (GRAY)
AT4 (BROWN)
B53
B299
B11 (BLACK)
A: B54
B: B55 (GRAY)
C: B56 (GREEN)

WI-00303

3. RHD NON-TURBO MODEL



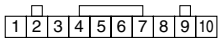
WI-00715



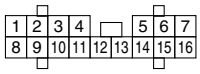
B129 (BLACK)

B133 (RED)

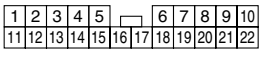
C: i11 (GREEN)



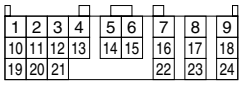
A: i12 (GREEN)



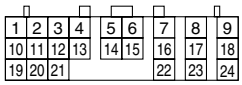
i2 (BLACK)



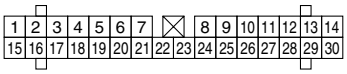
B: B55 (GRAY)



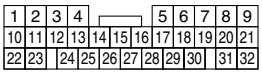
C: B56 (GREEN)



B: i10 (GREEN)

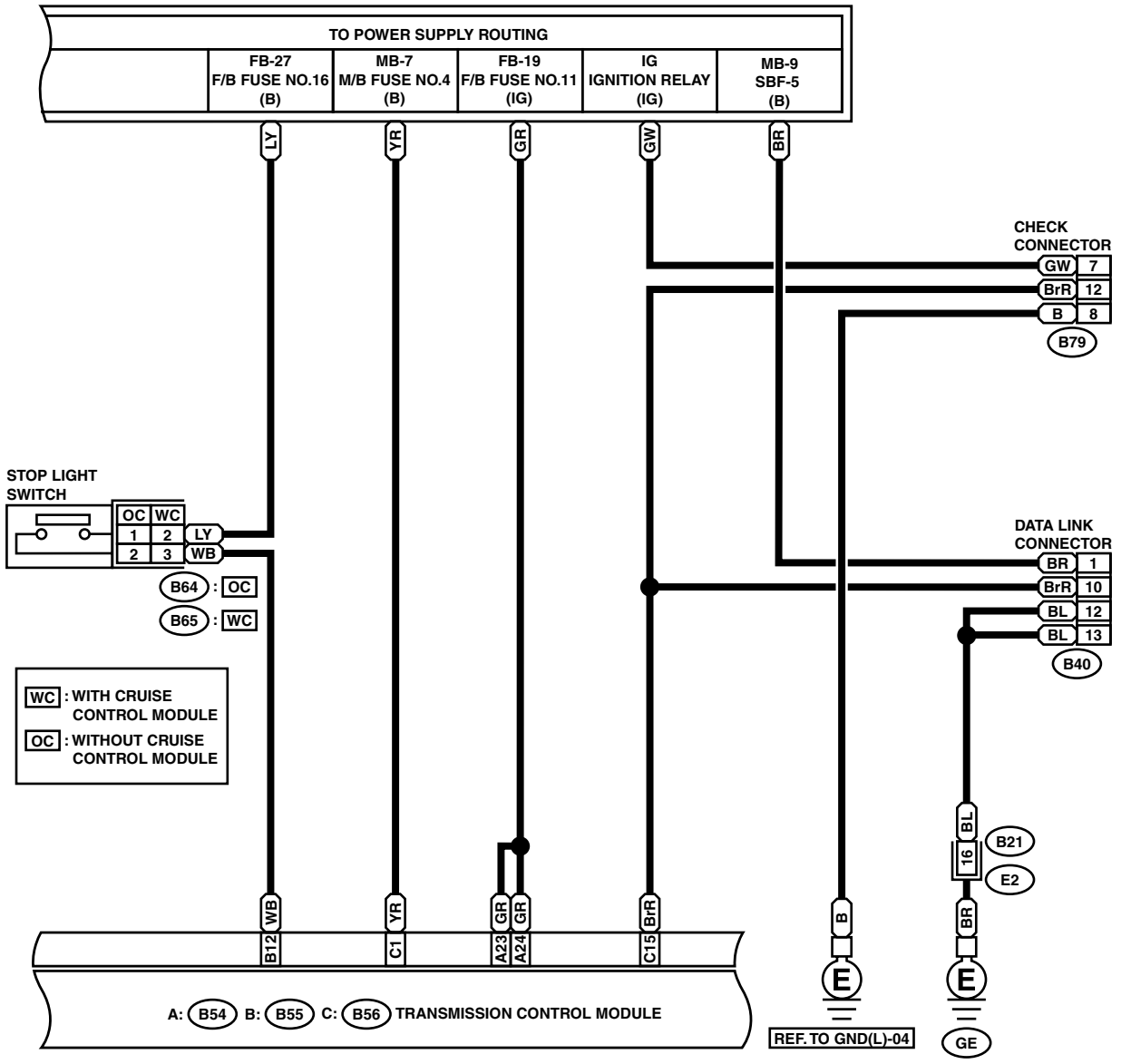


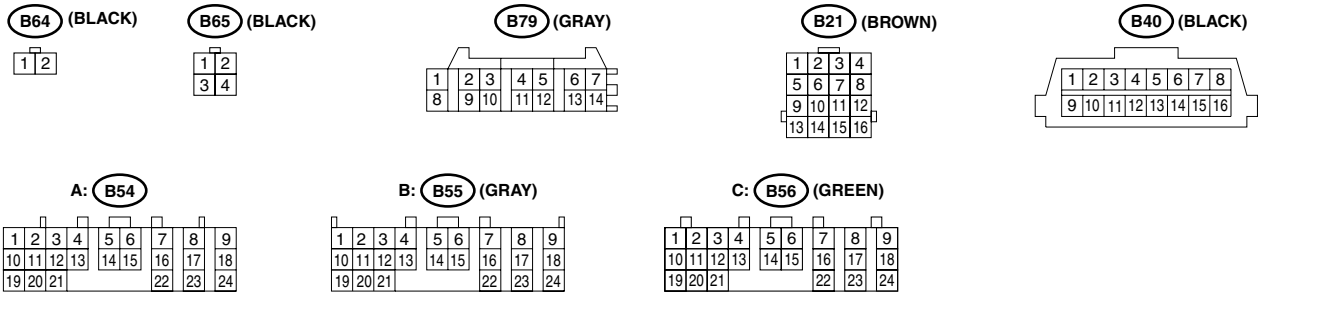
i3



WI-00304

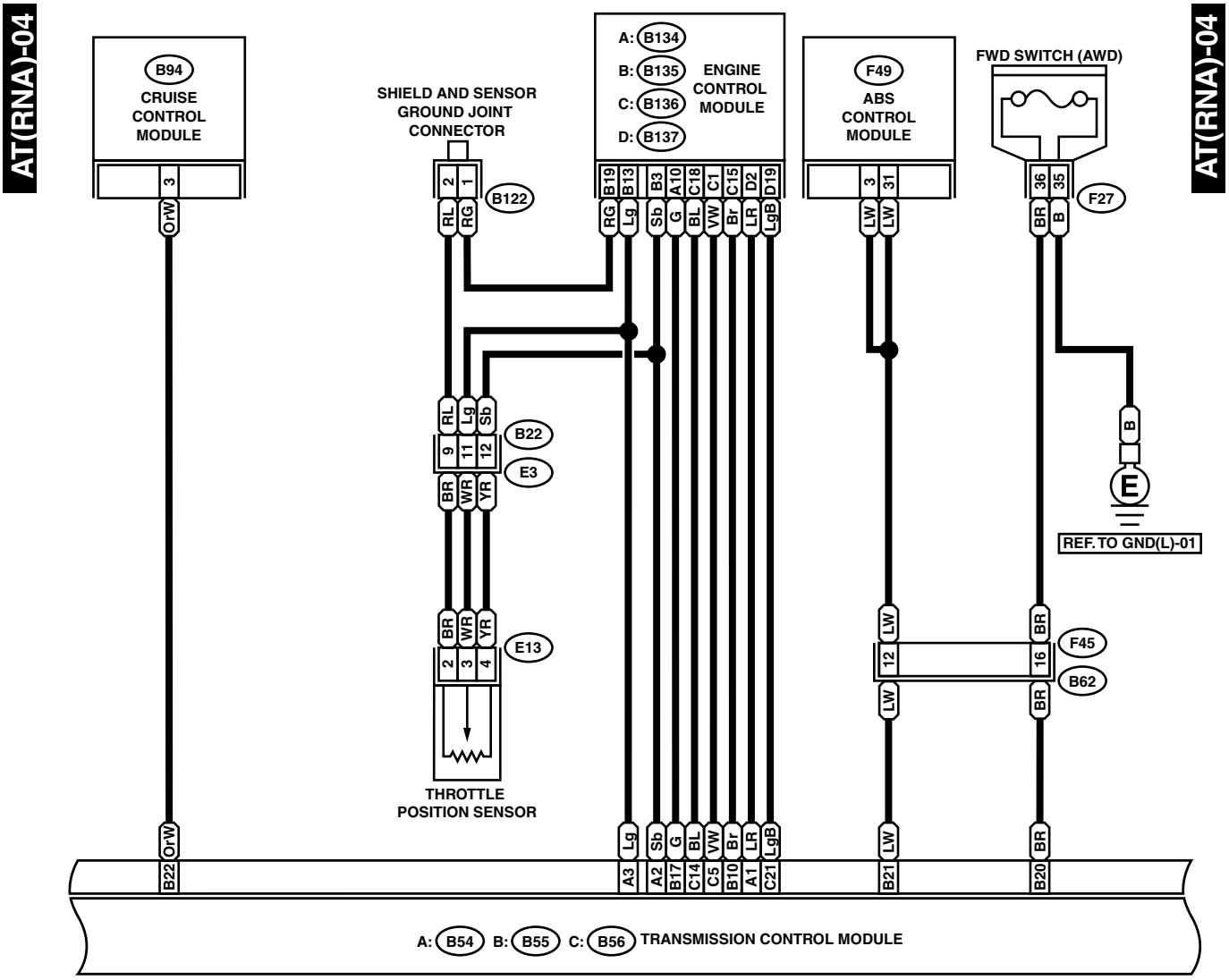
AT(RNA)-03

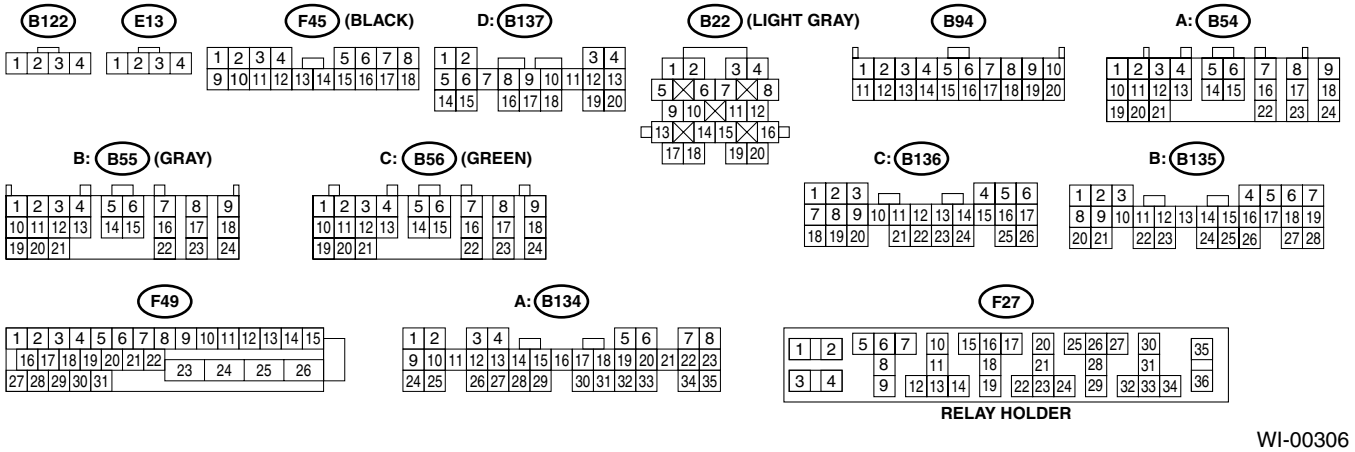




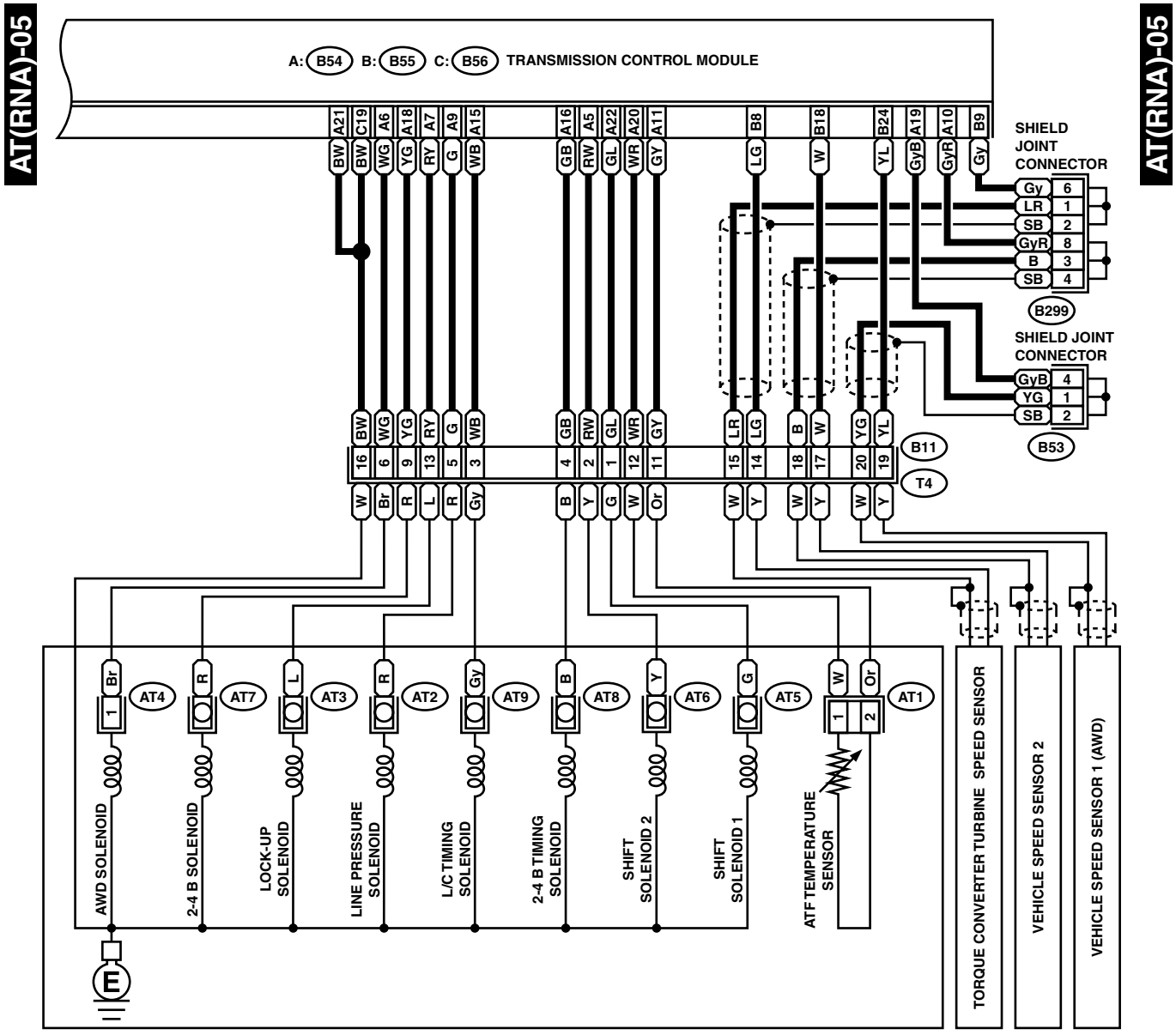
WI-00305

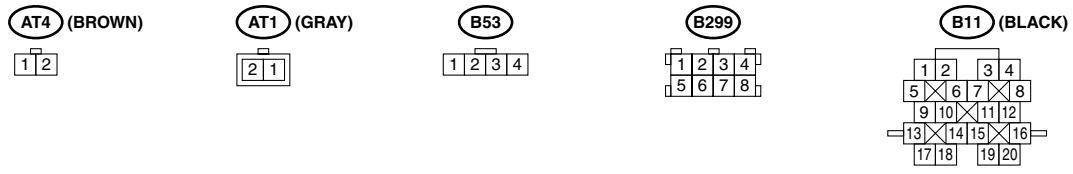
AT(RNA)-03

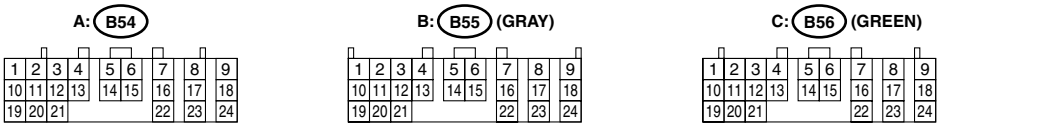

AT(RNA)-04
AT(RNA)-04
B94
CRUISE CONTROL MODULE
3
OrW
SHIELD AND SENSOR GROUND JOINT CONNECTOR
2
1
B122
RL
RG
A: B134
B: B135
C: B136
D: B137
ENGINE CONTROL MODULE
B19
B13
B3
A10
C18
C1
C15
D2
D19
RG
Lg
Sb
G
BL
VW
Br
LR
LgB
F49
ABS CONTROL MODULE
3
31
LW
LW
FWD SWITCH (AWD)
36
35
F27
BR
B
B
REF. TO GND(L)-01
RL
Lg
Sb
9
11
12
B22
E3
BR
WR
YR
BR
WR
YR
2
3
4
E13
THROTTLE POSITION SENSOR
LW
12
BR
16
F45
B62
LW
BR
OrW
B22
Lg
Sb
G
BL
VW
Br
LR
LgB
A3
A2
B17
C14
C5
B10
A1
C21
LW
B21
BR
B20
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE


B122
E13
F45 (BLACK)
D: B137
B22 (LIGHT GRAY)
B94
A: B54
B: B55 (GRAY)
C: B56 (GREEN)
C: B136
B: B135
F49
A: B134
F27
RELAY HOLDER

WI-00306

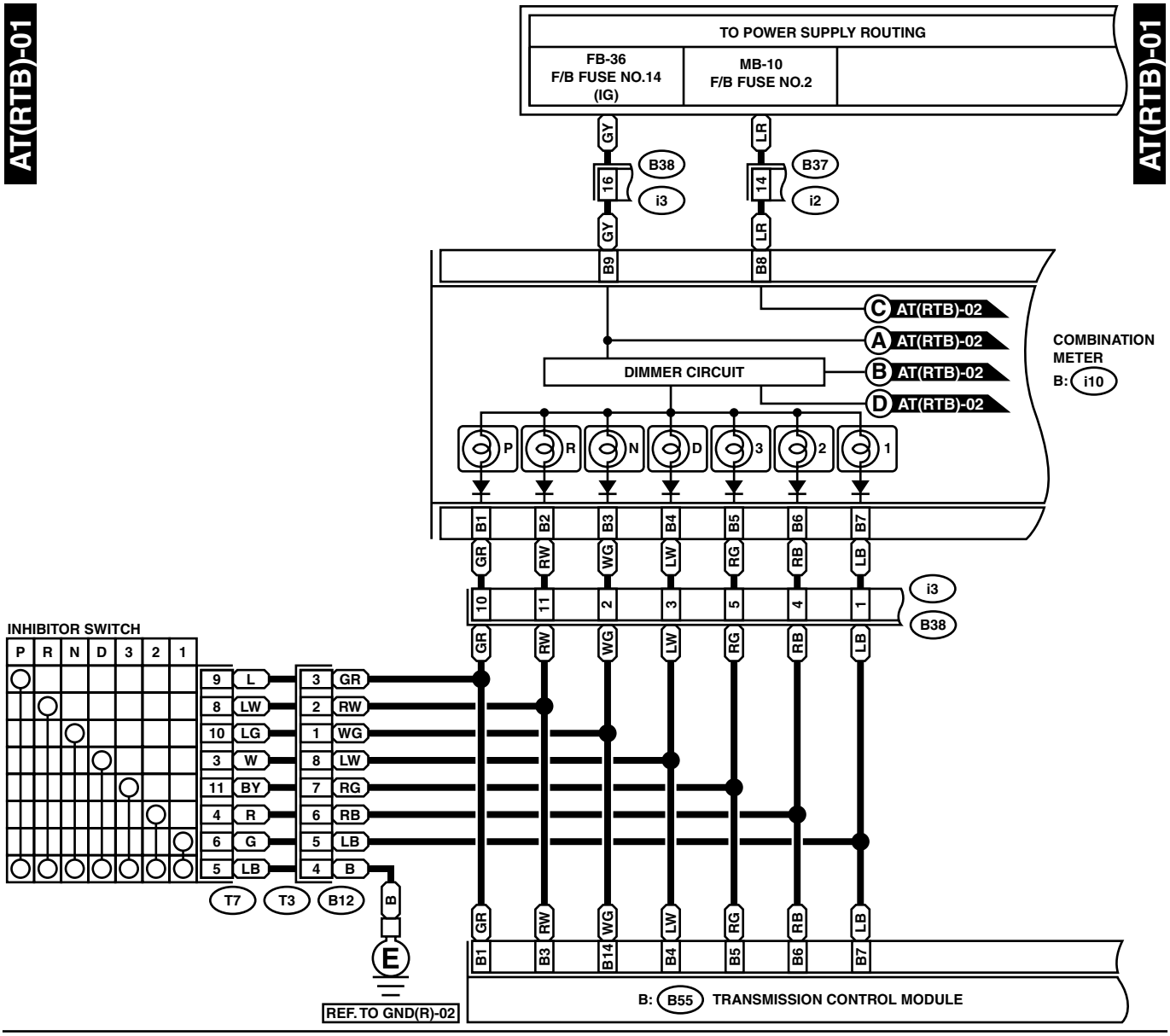

AT(RNA)-05
AT(RNA)-05
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE
SHIELD JOINT CONNECTOR
B299
SHIELD JOINT CONNECTOR
B53
B11
T4
AWD SOLENOID
2-4 B SOLENOID
LOCK-UP SOLENOID
LINE PRESSURE SOLENOID
L/C TIMING SOLENOID
2-4 B TIMING SOLENOID
SHIFT SOLENOID 2
SHIFT SOLENOID 1
ATF TEMPERATURE SENSOR
TORQUE CONVERTER TURBINE SPEED SENSOR
VEHICLE SPEED SENSOR 2
VEHICLE SPEED SENSOR 1 (AWD)

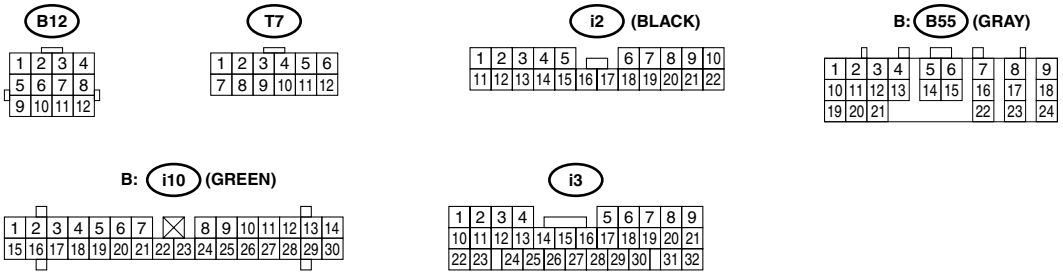

AT4 (BROWN)
AT1 (GRAY)
B53
B299
B11 (BLACK)


A: B54
B: B55 (GRAY)
C: B56 (GREEN)

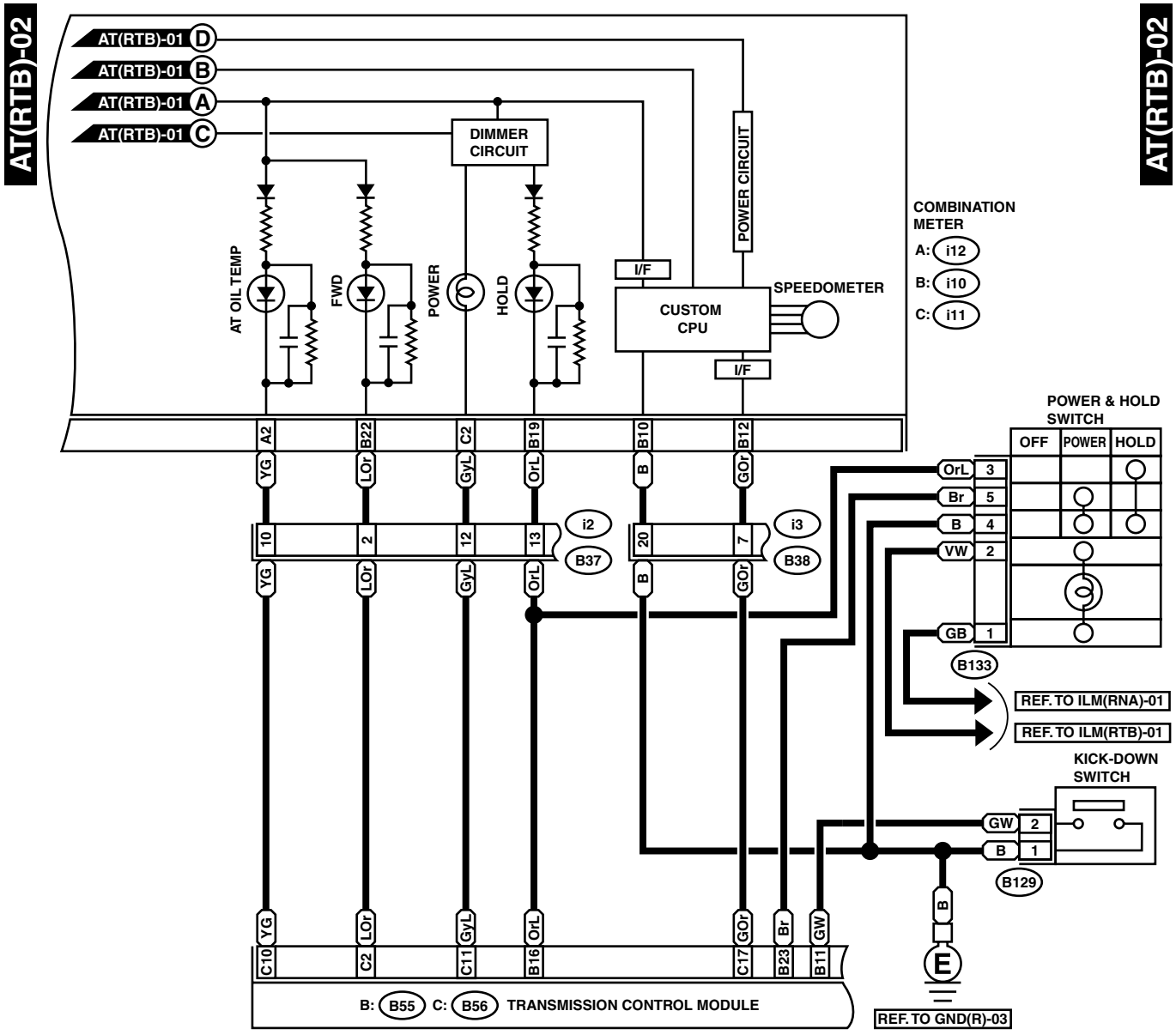
WI-00307

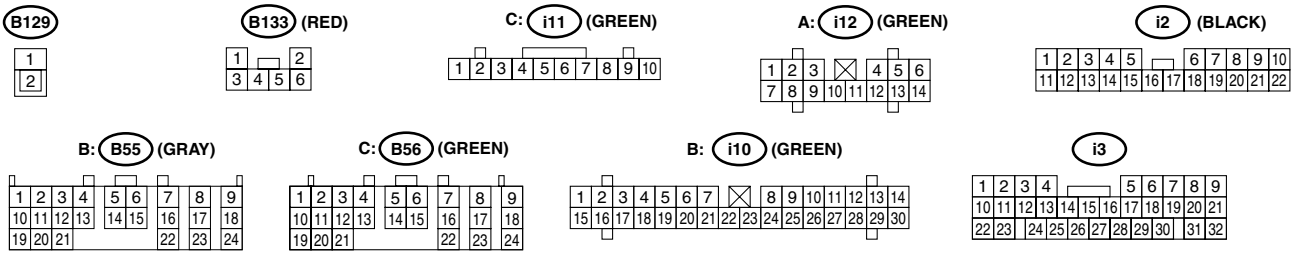
4. RHD TURBO MODEL



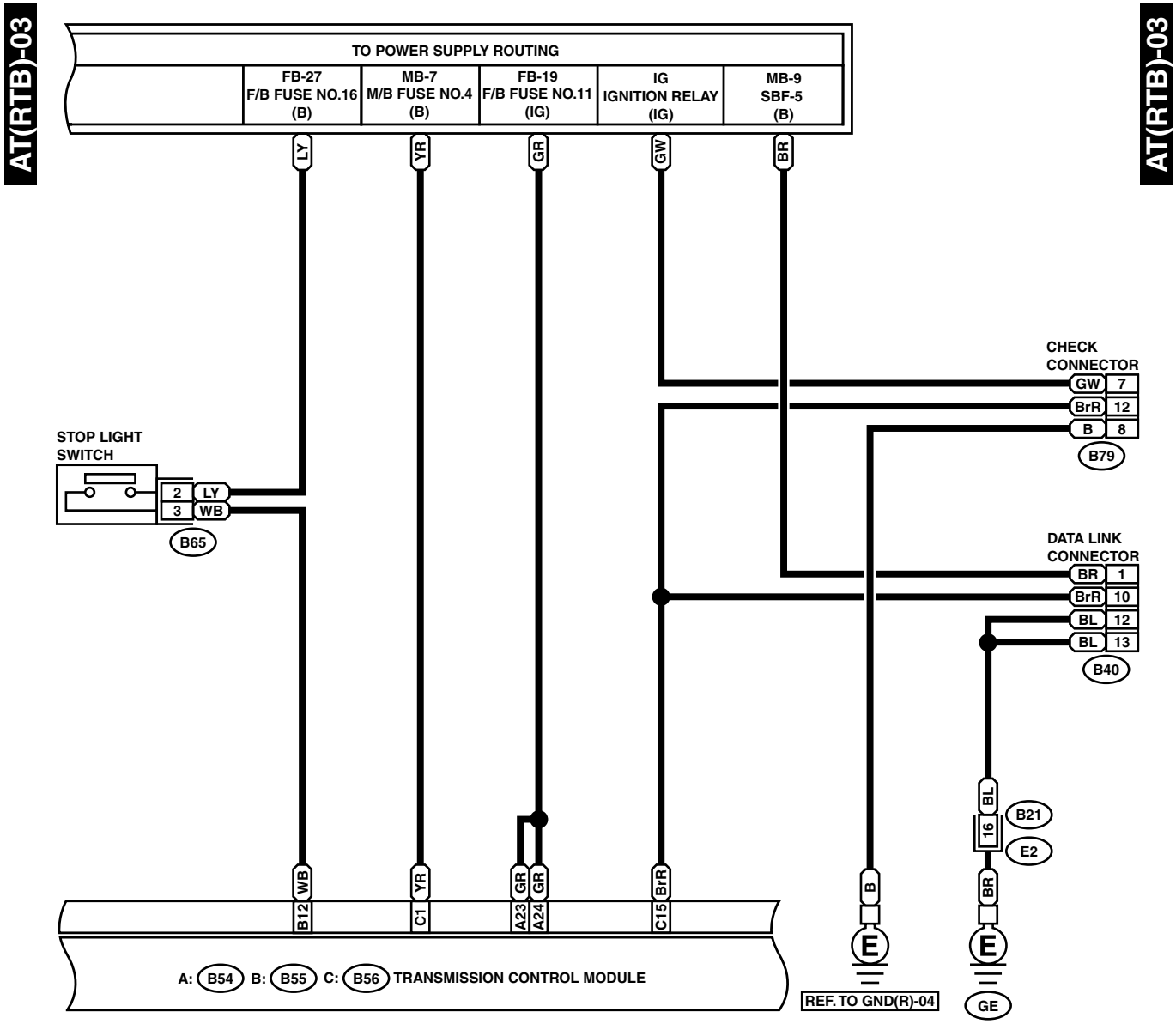


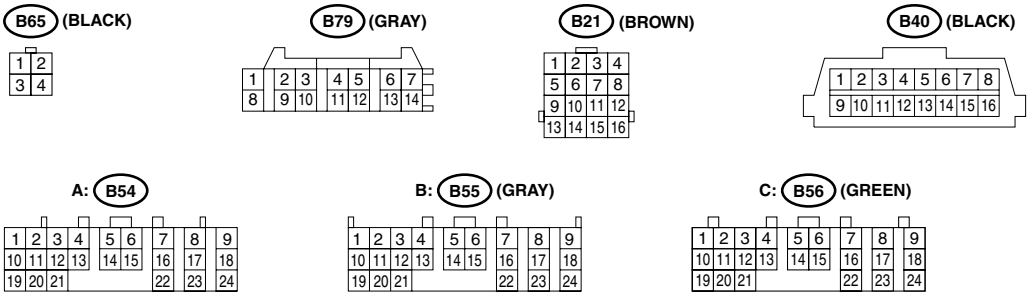
WI-00716


AT(RTB)-02
AT(RTB)-01 D
AT(RTB)-01 B
AT(RTB)-01 A
AT(RTB)-01 C
DIMMER CIRCUIT
POWER CIRCUIT
AT OIL TEMP
FWD
POWER
HOLD
I/F
CUSTOM CPU
SPEEDOMETER
I/F
COMBINATION METER
A: i12
B: i10
C: i11
POWER & HOLD SWITCH
OFF POWER HOLD
OrL 3
Br 5
B 4
VW 2
GB 1
B133
REF. TO ILM(RNA)-01
REF. TO ILM(RTB)-01
KICK-DOWN SWITCH
GW 2
B 1
B129
A2 B22 C2 B19 B10 B12
YG LOr GyL OrL B GOr
10 2 12 13 20 7
i2 B37 i3 B38
C10 C2 C11 B16 C17 B23 B11
YG LOr GyL OrL GOr Br GW
B
E
B: B55 C: B56 TRANSMISSION CONTROL MODULE
REF. TO GND(R)-03

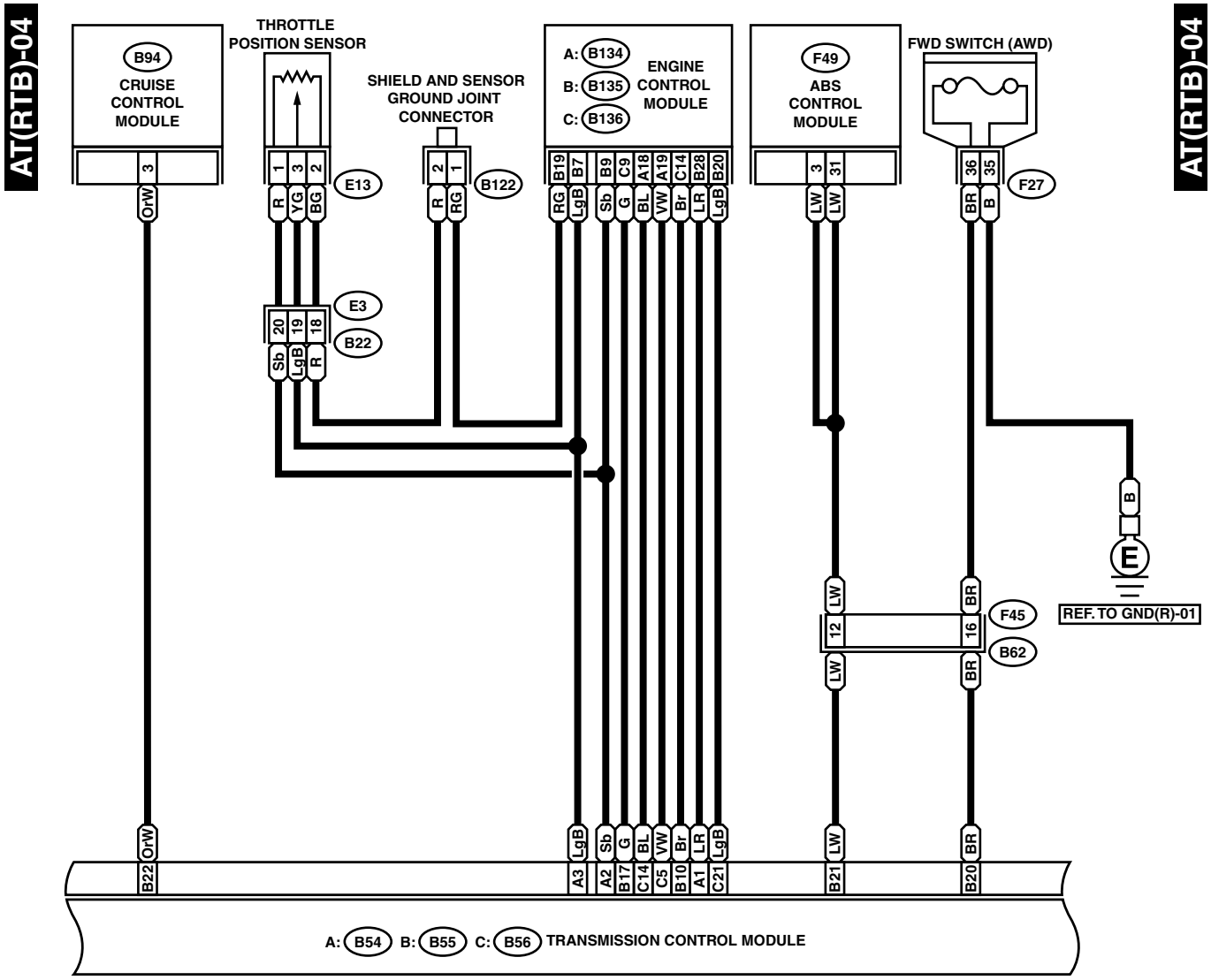

B129
B133 (RED)
C: i11 (GREEN)
A: i12 (GREEN)
i2 (BLACK)
B: B55 (GRAY)
C: B56 (GREEN)
B: i10 (GREEN)
i3

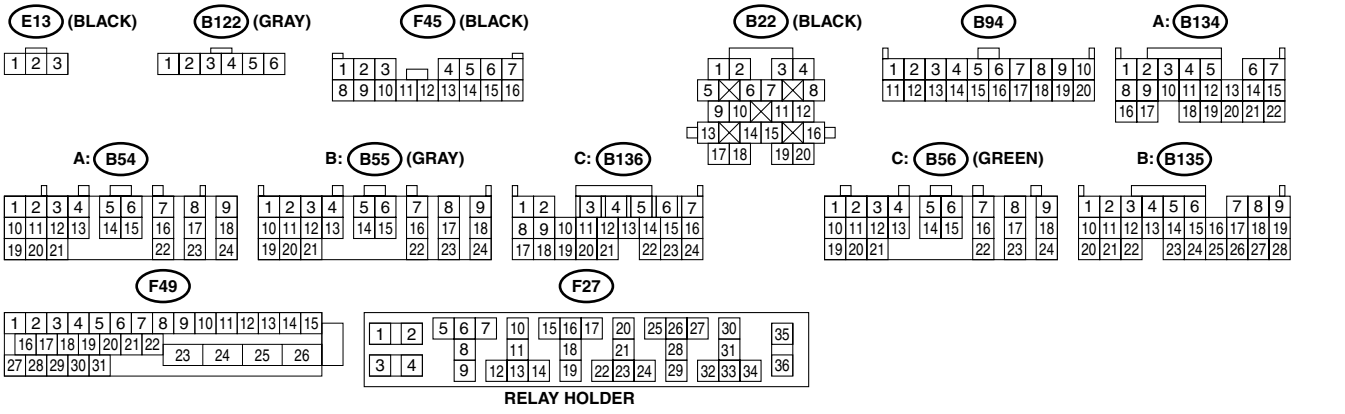
WI-00308


AT(RTB)-03
AT(RTB)-03
TO POWER SUPPLY ROUTING
FB-27
F/B FUSE NO.16
(B)
MB-7
M/B FUSE NO.4
(B)
FB-19
F/B FUSE NO.11
(IG)
IG
IGNITION RELAY
(IG)
MB-9
SBF-5
(B)
LY
YR
GR
GW
BR
CHECK
CONNECTOR
GW 7
BrR 12
B 8
B79
STOP LIGHT
SWITCH
2 LY
3 WB
B65
DATA LINK
CONNECTOR
BR 1
BrR 10
BL 12
BL 13
B40
BL
16
B21
E2
WB
YR
GR
GR
BrR
B12
C1
A23
A24
C15
B
BR
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE
REF. TO GND(R)-04
GE

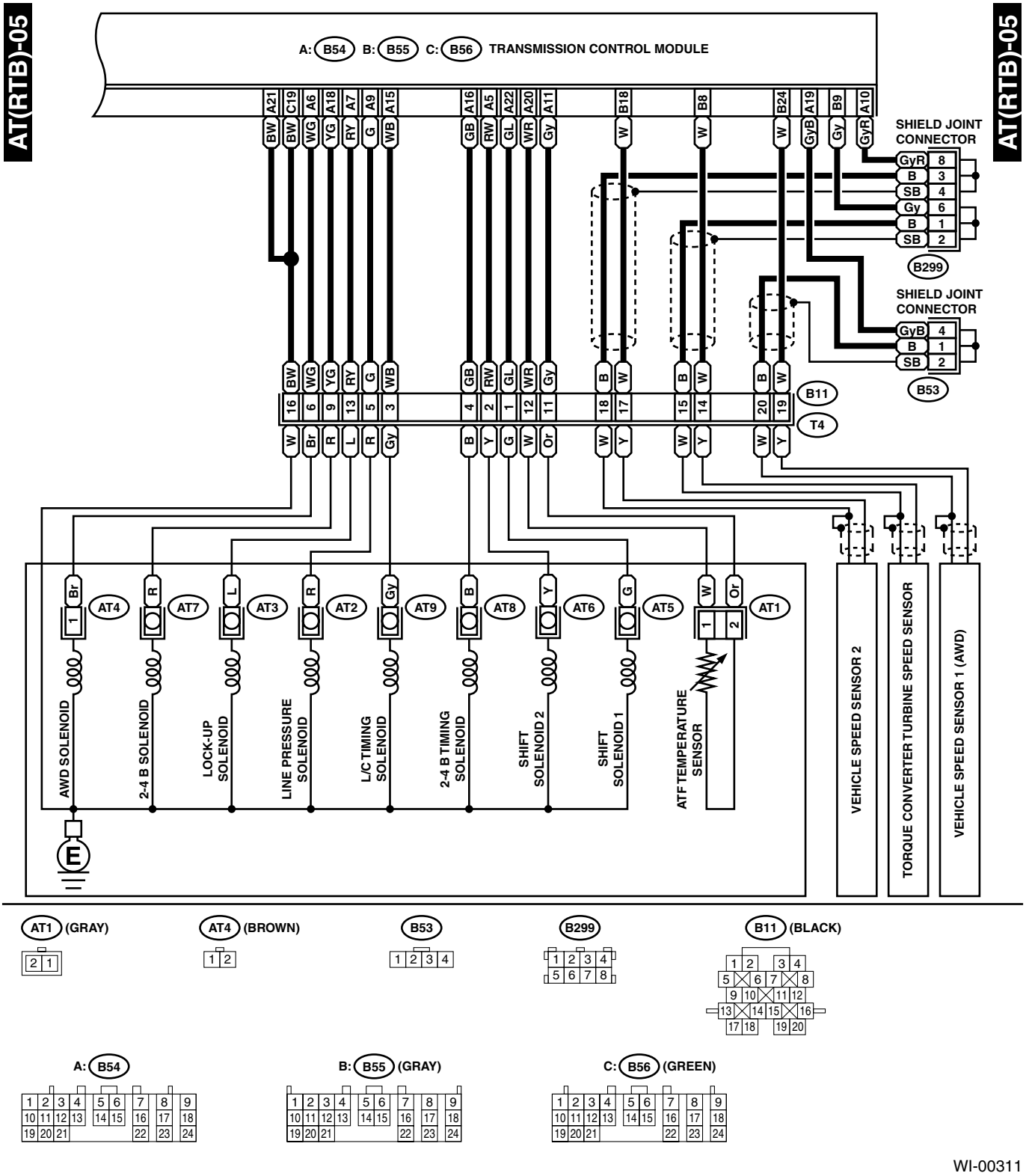

B65 (BLACK)
B79 (GRAY)
B21 (BROWN)
B40 (BLACK)
A: B54
B: B55 (GRAY)
C: B56 (GREEN)

WI-00309


AT(RTB)-04
AT(RTB)-04
B94
CRUISE CONTROL MODULE
THROTTLE POSITION SENSOR
SHIELD AND SENSOR GROUND JOINT CONNECTOR
A: B134
B: B135
C: B136
ENGINE CONTROL MODULE
F49
ABS CONTROL MODULE
FWD SWITCH (AWD)
E13
B122
E3
B22
F27
F45
B62
REF. TO GND(R)-01
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE


E13 (BLACK)
B122 (GRAY)
F45 (BLACK)
B22 (BLACK)
B94
A: B134
A: B54
B: B55 (GRAY)
C: B136
C: B56 (GREEN)
B: B135
F49
F27
RELAY HOLDER

WI-00310

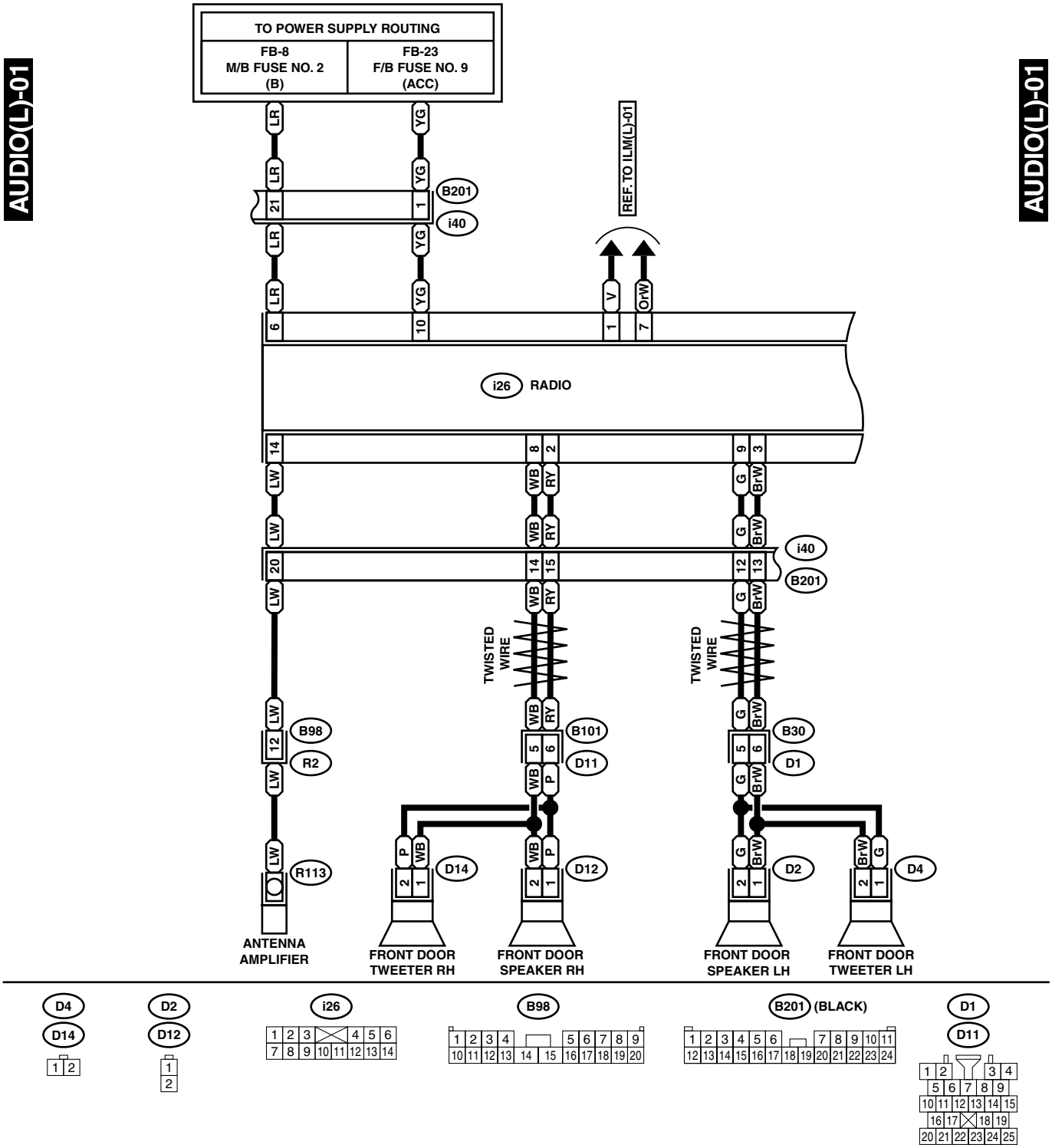

AT(RTB)-05
AT(RTB)-05
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE
SHIELD JOINT CONNECTOR
B299
SHIELD JOINT CONNECTOR
B53
B11
T4
AWD SOLENOID
2-4 B SOLENOID
LOCK-UP SOLENOID
LINE PRESSURE SOLENOID
L/C TIMING SOLENOID
2-4 B TIMING SOLENOID
SHIFT SOLENOID 2
SHIFT SOLENOID 1
ATF TEMPERATURE SENSOR
VEHICLE SPEED SENSOR 2
TORQUE CONVERTER TURBINE SPEED SENSOR
VEHICLE SPEED SENSOR 1 (AWD)
AT1 (GRAY)
AT4 (BROWN)
B53
B299
B11 (BLACK)
A: B54
B: B55 (GRAY)
C: B56 (GREEN)

WI-00311

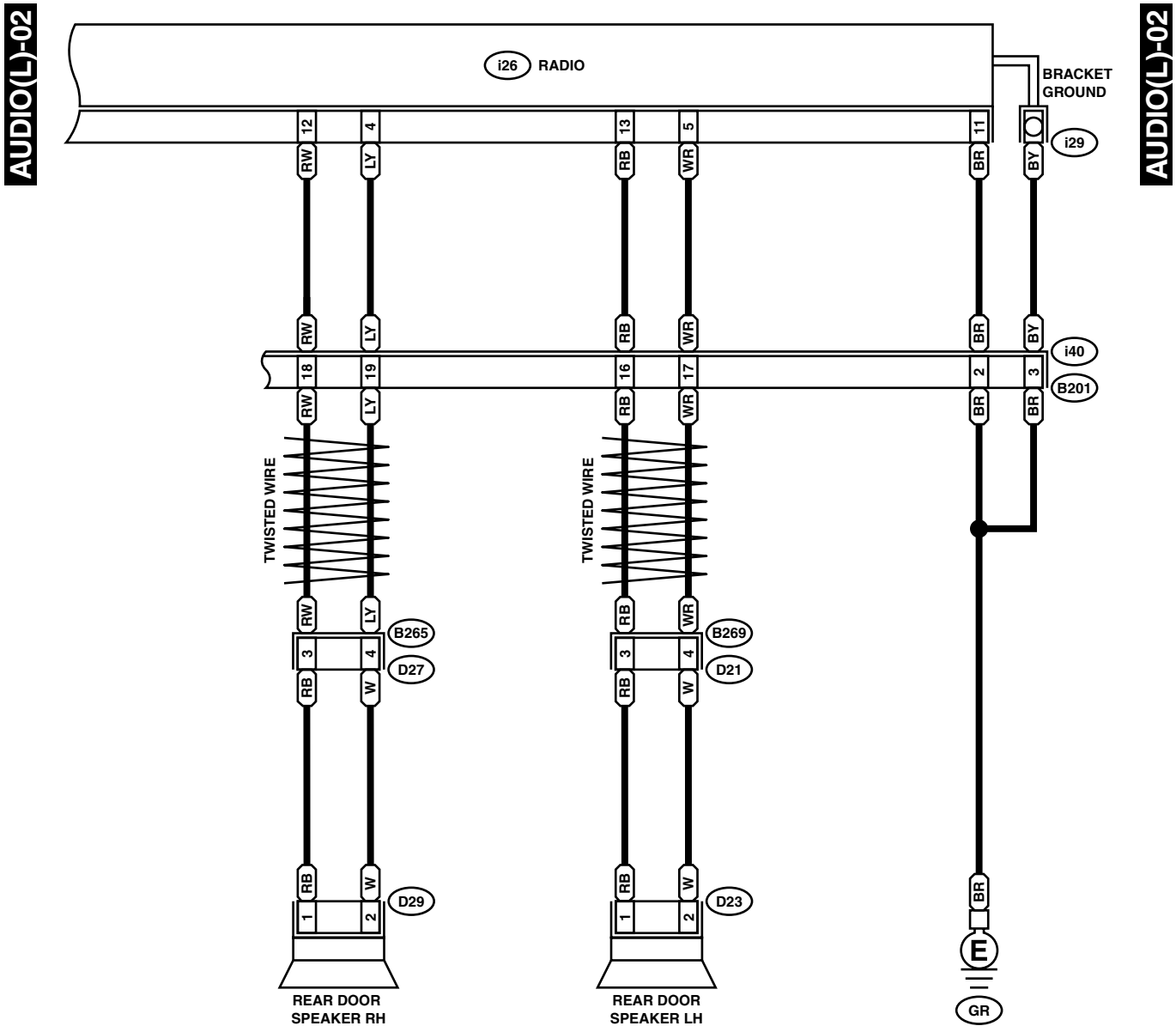
9. Audio System

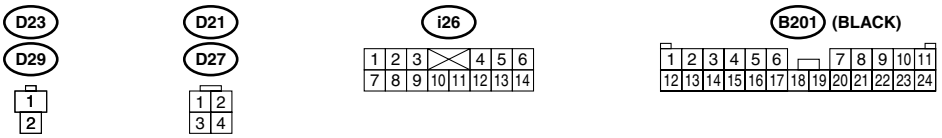
A: SCHEMATIC

1. LHD MODEL



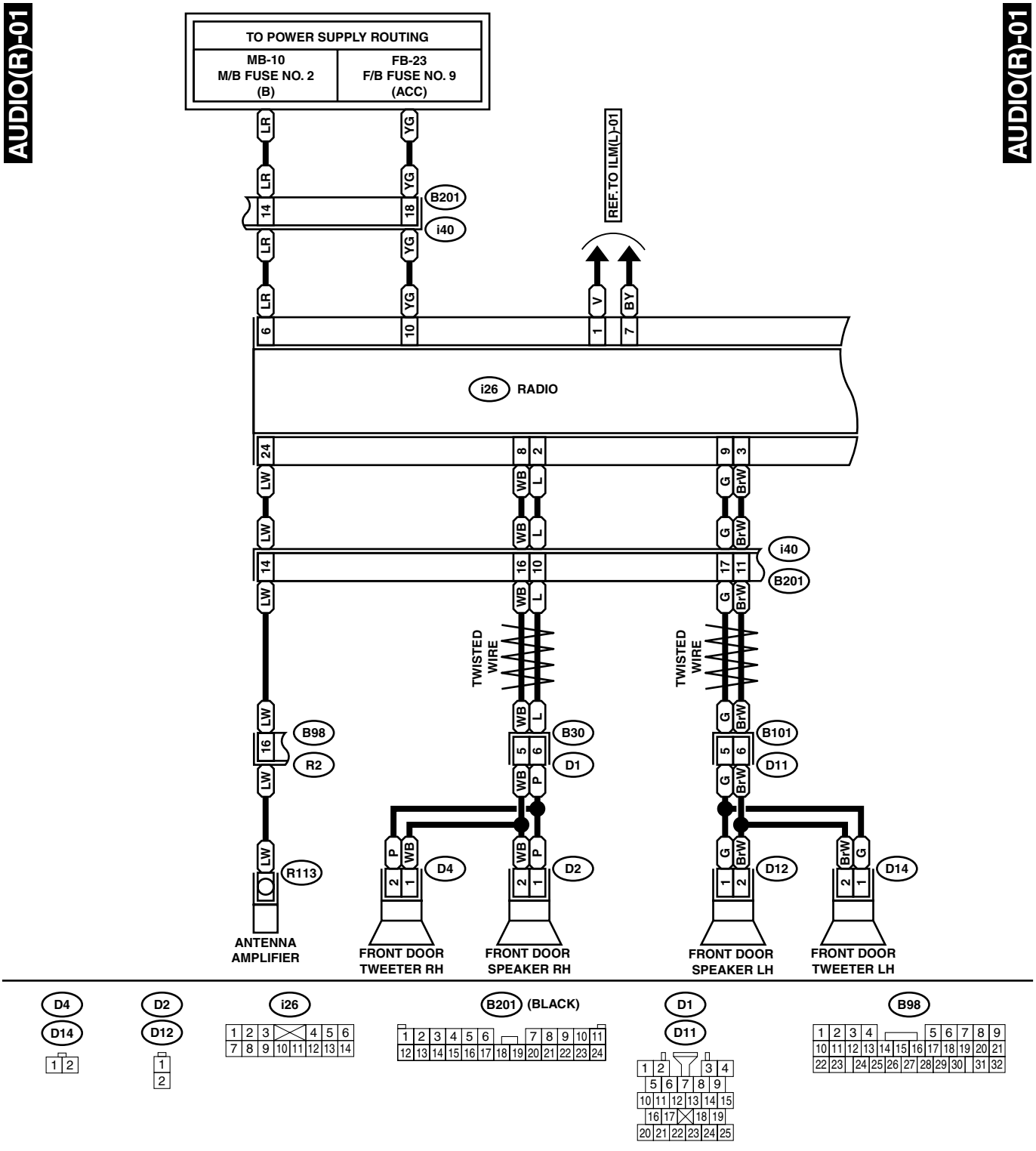
WI-00312


AUDIO(L)-02
AUDIO(L)-02
i26 RADIO
BRACKET GROUND
i29
i40
B201
TWISTED WIRE
TWISTED WIRE
B265
D27
B269
D21
D29
D23
REAR DOOR SPEAKER RH
REAR DOOR SPEAKER LH
E
GR

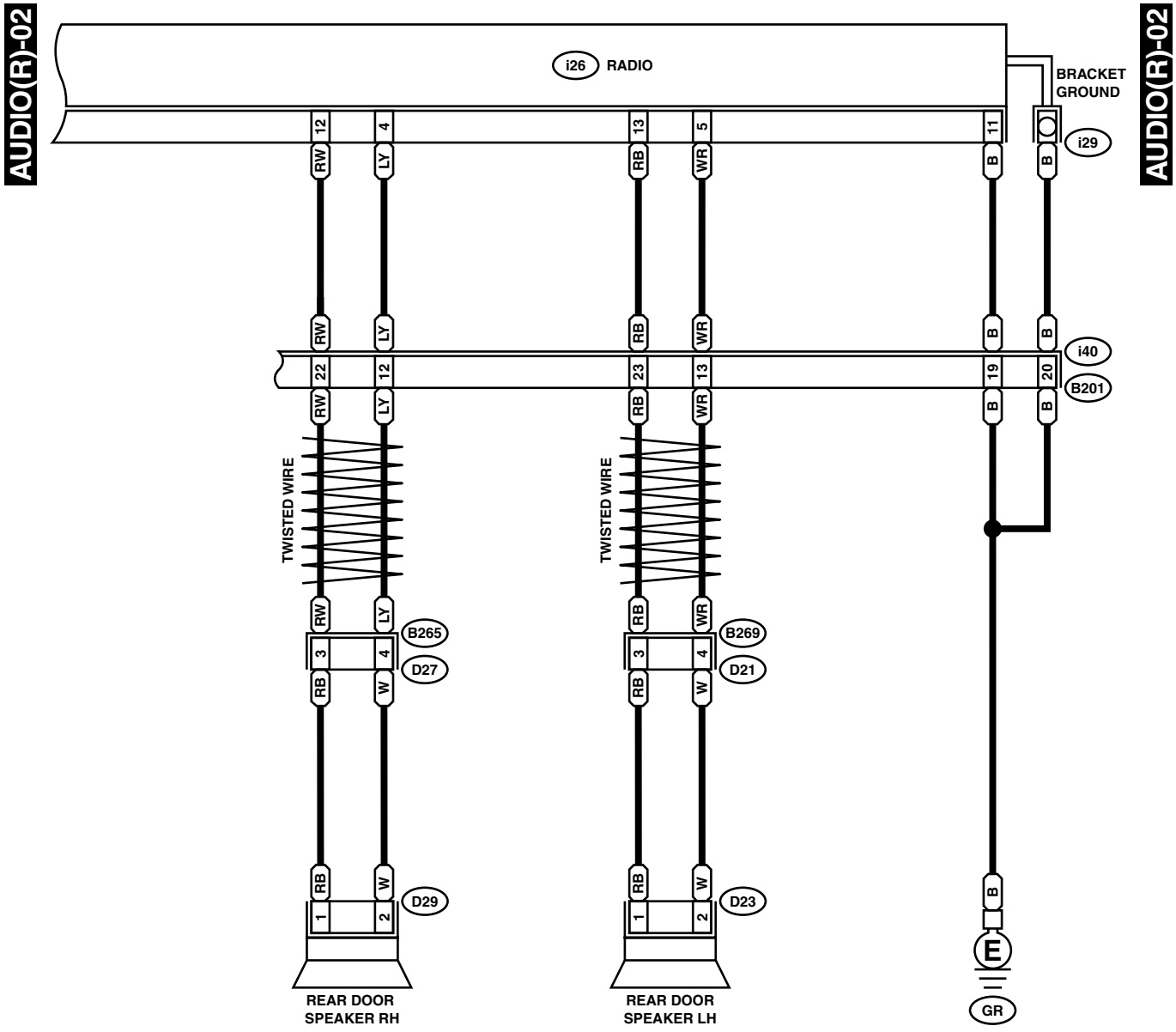

D23
D29
D21
D27
i26
B201 (BLACK)

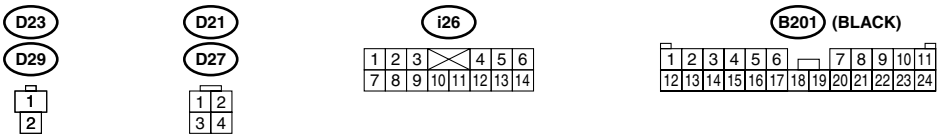
WI-00313

2. RHD MODEL



WI-00314

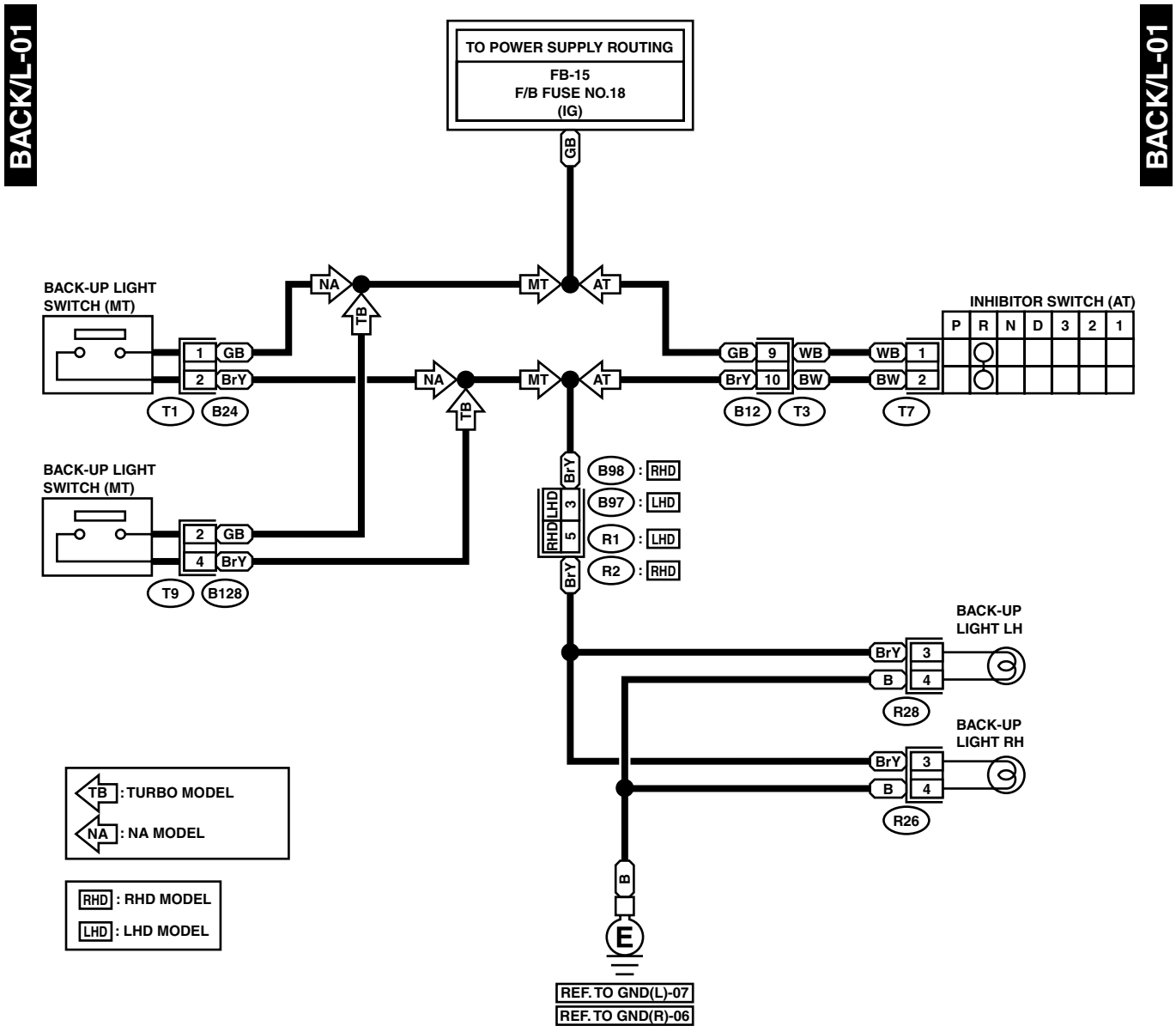

AUDIO(R)-02
AUDIO(R)-02
i26 RADIO
BRACKET GROUND
i29
i40
B201
TWISTED WIRE
TWISTED WIRE
B265
D27
B269
D21
D29
D23
REAR DOOR SPEAKER RH
REAR DOOR SPEAKER LH
E
GR

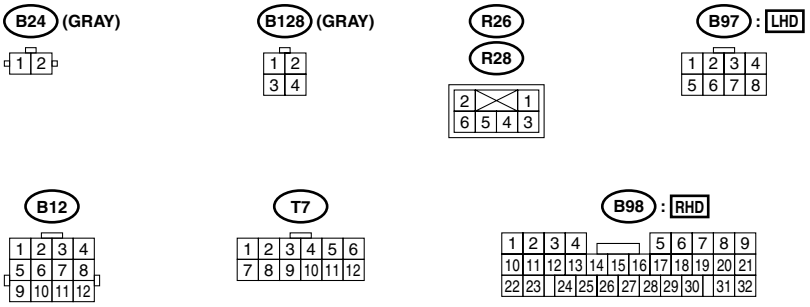

D23
D29
D21
D27
i26
B201 (BLACK)

WI-00315

10.Back-up Light System

A: SCHEMATIC



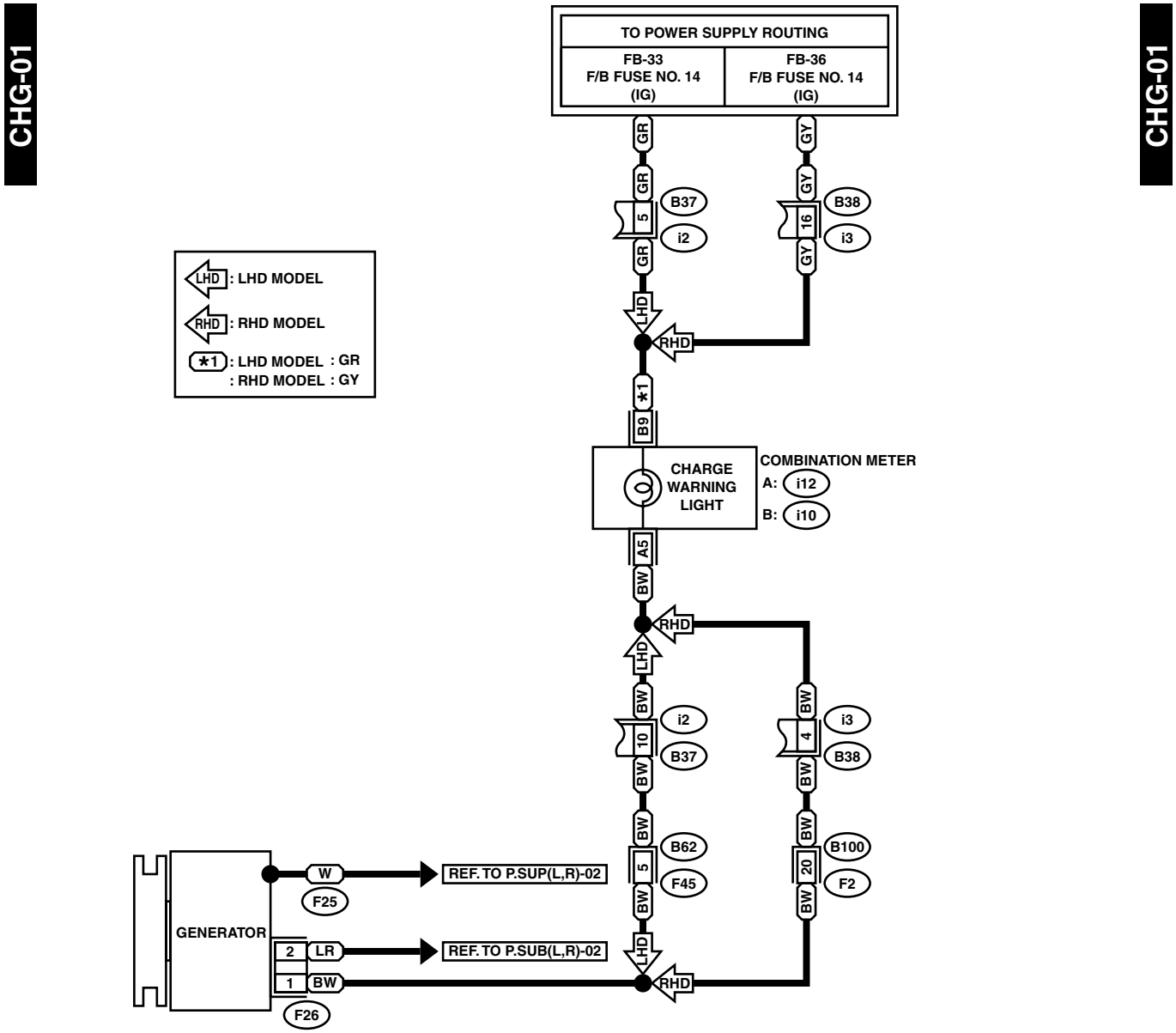


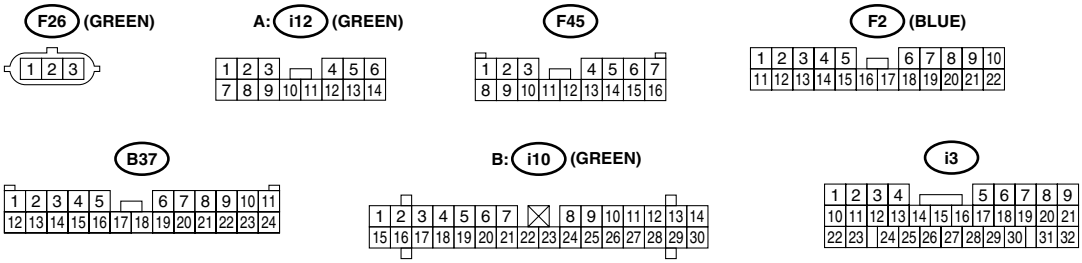
WI-00317

11.Charging System

A: SCHEMATIC

CHG-01



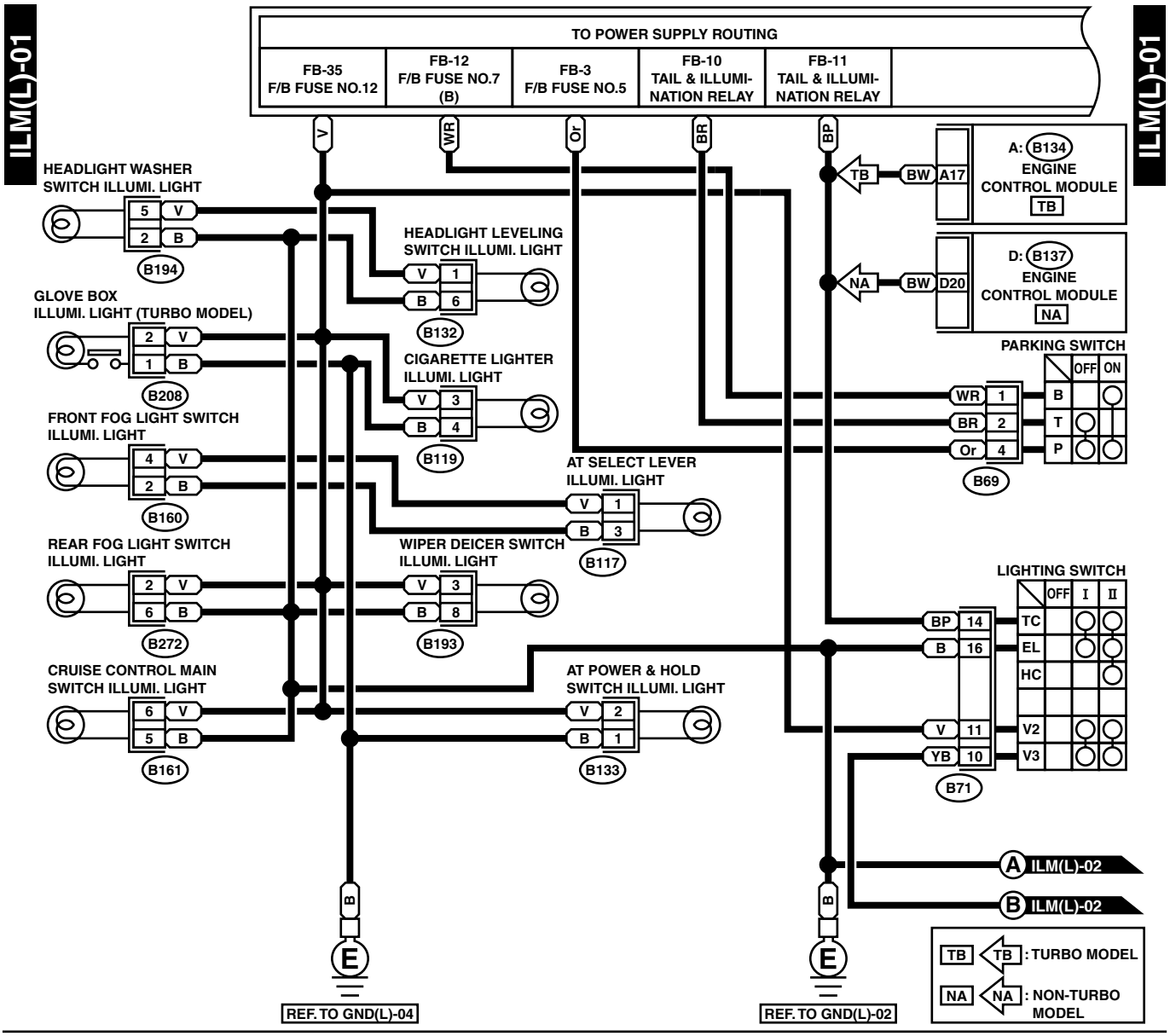


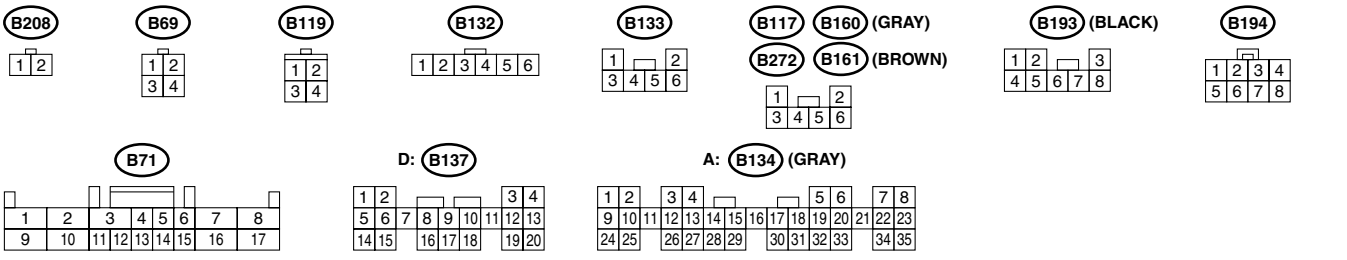
WI-00319

12.Clearance Light and Illumination Light System

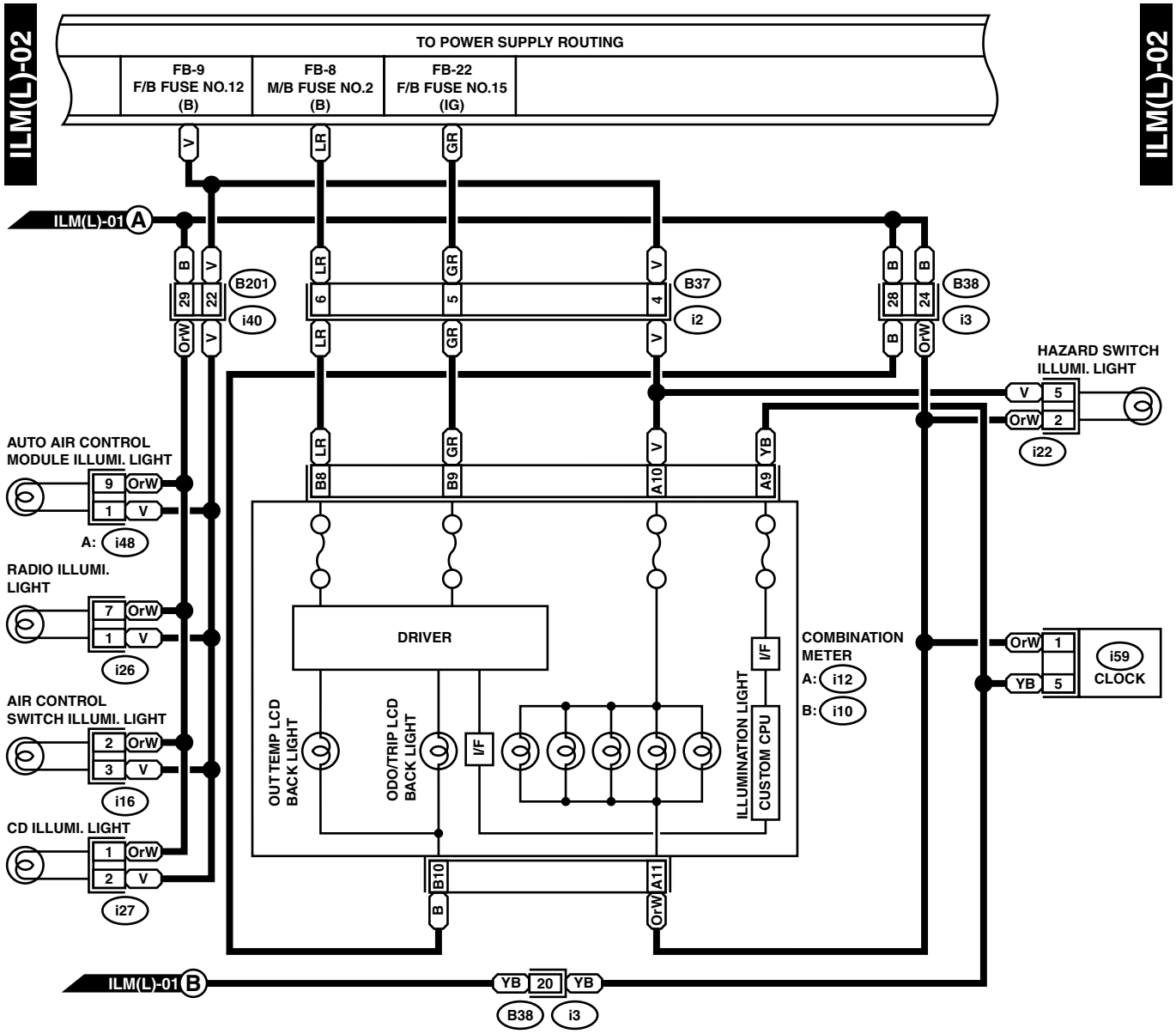
A: SCHEMATIC

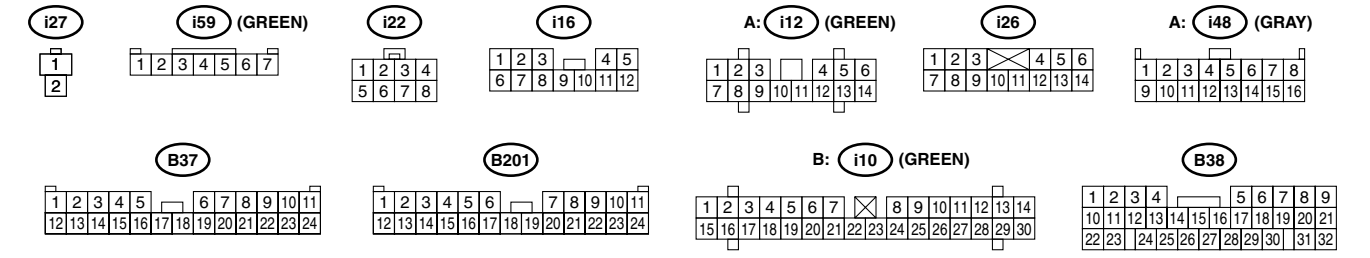
1. LHD MODEL



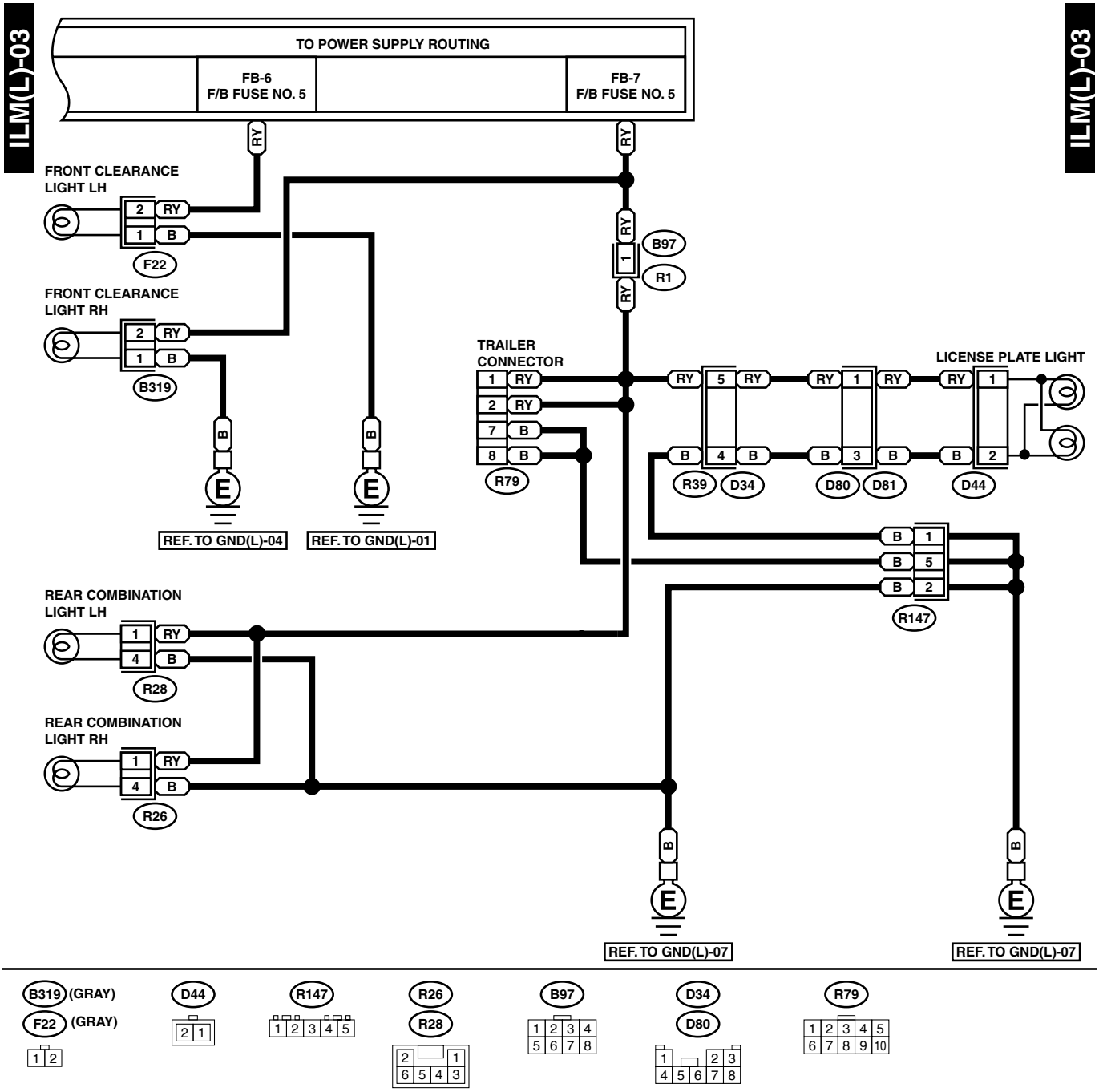


WI-00323


ILM(L)-02
TO POWER SUPPLY ROUTING
FB-9
F/B FUSE NO.12
(B)
FB-8
M/B FUSE NO.2
(B)
FB-22
F/B FUSE NO.15
(IG)
ILM(L)-01 A
ILM(L)-01 B
B201
i40
B37
i2
B38
i3
HAZARD SWITCH
ILLUMI. LIGHT
i22
AUTO AIR CONTROL
MODULE ILLUMI. LIGHT
A: i48
RADIO ILLUMI.
LIGHT
i26
AIR CONTROL
SWITCH ILLUMI. LIGHT
i16
CD ILLUMI. LIGHT
i27
DRIVER
OUT TEMP LCD
BACK LIGHT
ODO/TRIP LCD
BACK LIGHT
I/F
ILLUMINATION LIGHT
CUSTOM CPU
COMBINATION
METER
A: i12
B: i10
i59
CLOCK


i27
i59 (GREEN)
i22
i16
A: i12 (GREEN)
i26
A: i48 (GRAY)
B37
B201
B: i10 (GREEN)
B38

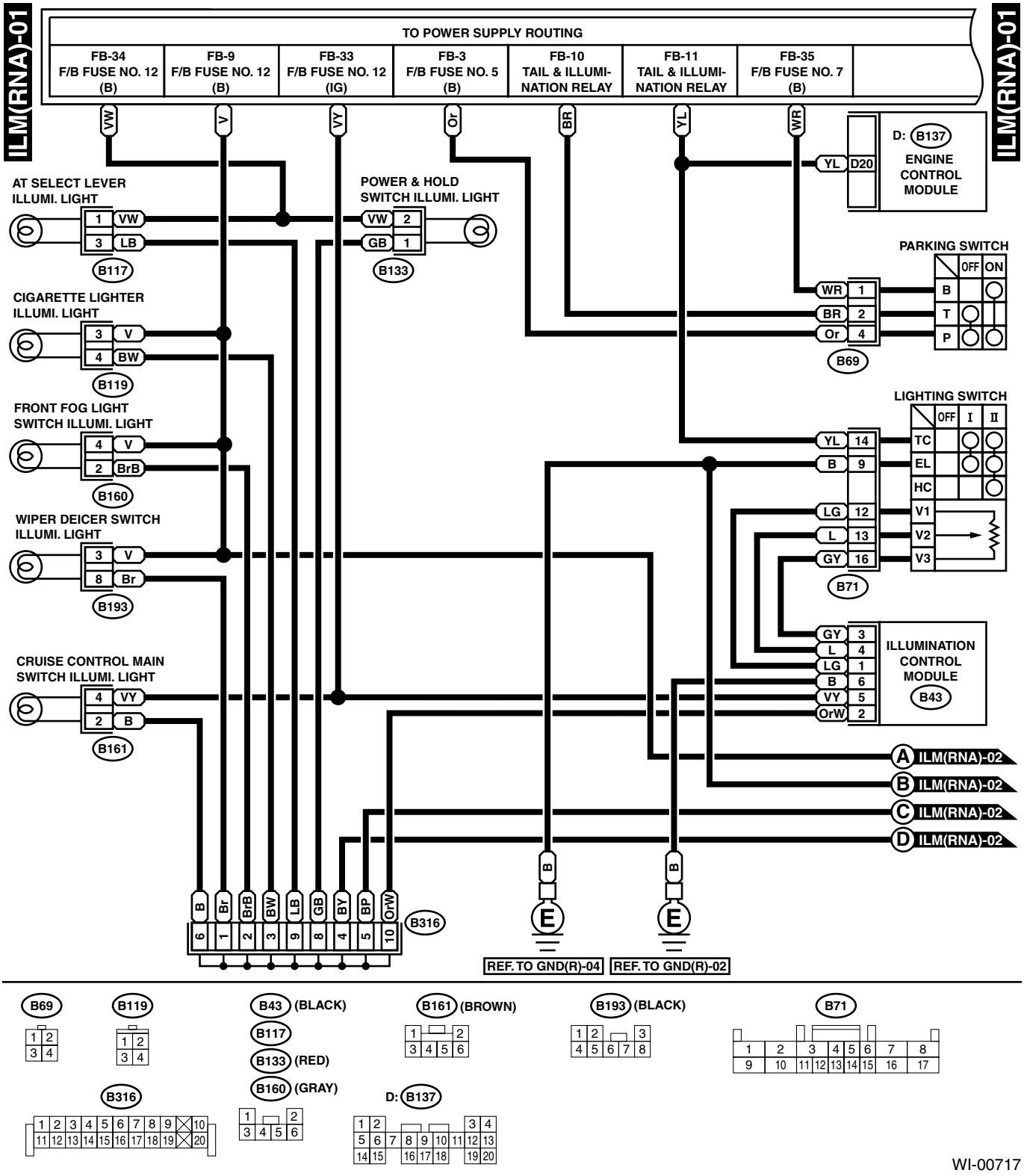
WI-00324


ILM(L)-03
ILM(L)-03
TO POWER SUPPLY ROUTING
FB-6
F/B FUSE NO. 5
FB-7
F/B FUSE NO. 5
RY
FRONT CLEARANCE
LIGHT LH
2
1
RY
B
F22
FRONT CLEARANCE
LIGHT RH
B319
B97
R1
TRAILER
CONNECTOR
7
8
R79
LICENSE PLATE LIGHT
5
4
3
2
R39
D34
D80
D81
D44
B
E
REF. TO GND(L)-04
REF. TO GND(L)-01
R147
REAR COMBINATION
LIGHT LH
R28
REAR COMBINATION
LIGHT RH
R26
REF. TO GND(L)-07
REF. TO GND(L)-07

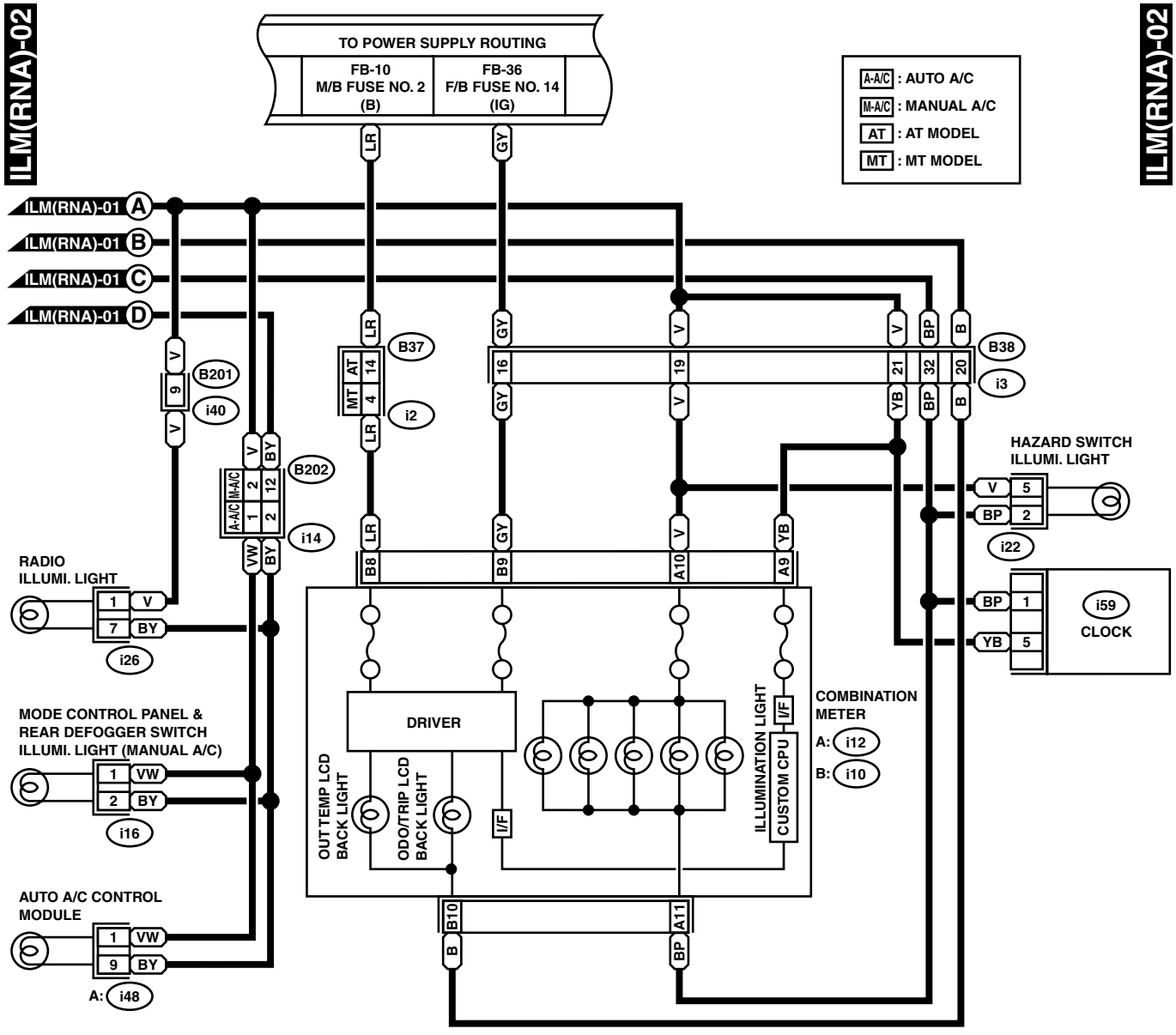
B319 (GRAY)
F22 (GRAY)
D44
R147
R26
R28
B97
D34
D80
R79

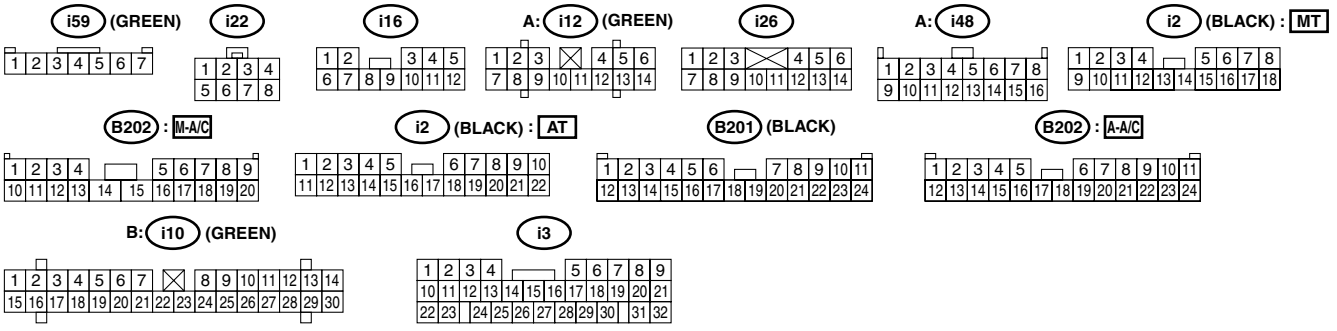
WI-00325

2. RHD NON-TURBO MODEL

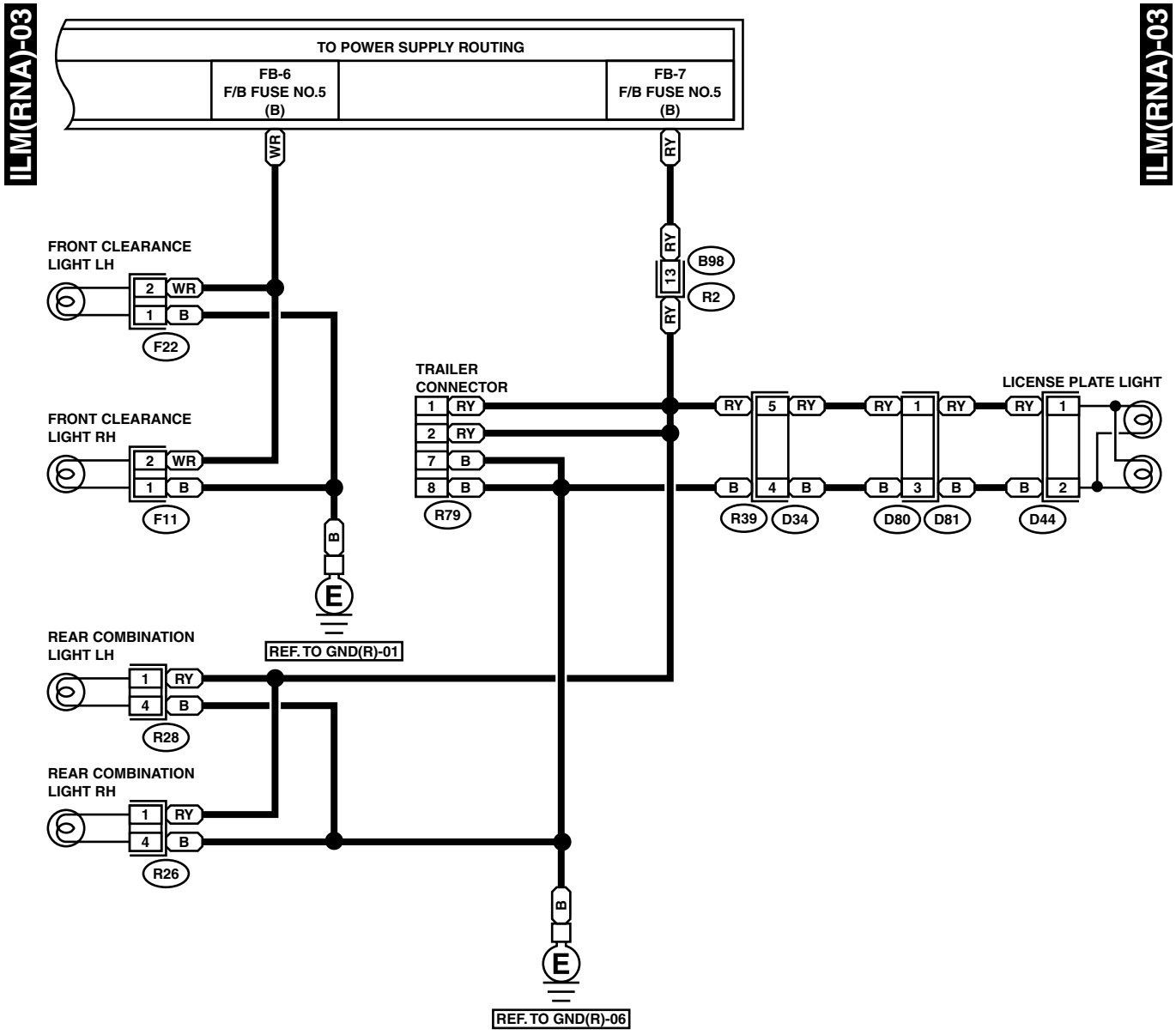


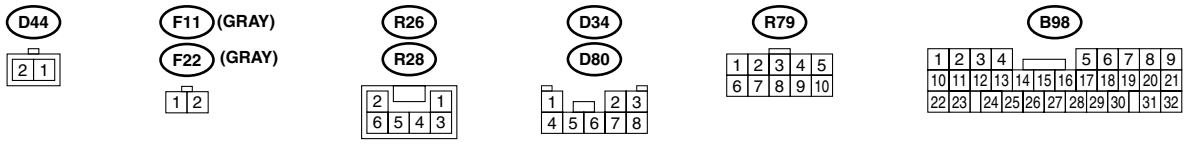
WI-00717


ILM(RNA)-02
TO POWER SUPPLY ROUTING
FB-10
M/B FUSE NO. 2
(B)
FB-36
F/B FUSE NO. 14
(IG)
A-A/C : AUTO A/C
M-A/C : MANUAL A/C
AT : AT MODEL
MT : MT MODEL
ILM(RNA)-01 A
ILM(RNA)-01 B
ILM(RNA)-01 C
ILM(RNA)-01 D
B201
i40
B37
i2
B38
i3
B202
i14
HAZARD SWITCH
ILLUMI. LIGHT
i22
RADIO
ILLUMI. LIGHT
i26
i59
CLOCK
MODE CONTROL PANEL &
REAR DEFOGGER SWITCH
ILLUMI. LIGHT (MANUAL A/C)
i16
DRIVER
OUT TEMP LCD
BACK LIGHT
ODO/TRIP LCD
BACK LIGHT
I/F
ILLUMINATION LIGHT
CUSTOM CPU
COMBINATION
METER
A: i12
B: i10
AUTO A/C CONTROL
MODULE
A: i48
B10
A11


i59 (GREEN)
i22
i16
A: i12 (GREEN)
i26
A: i48
i2 (BLACK) : MT
B202 : M-A/C
i2 (BLACK) : AT
B201 (BLACK)
B202 : A-A/C
B: i10 (GREEN)
i3

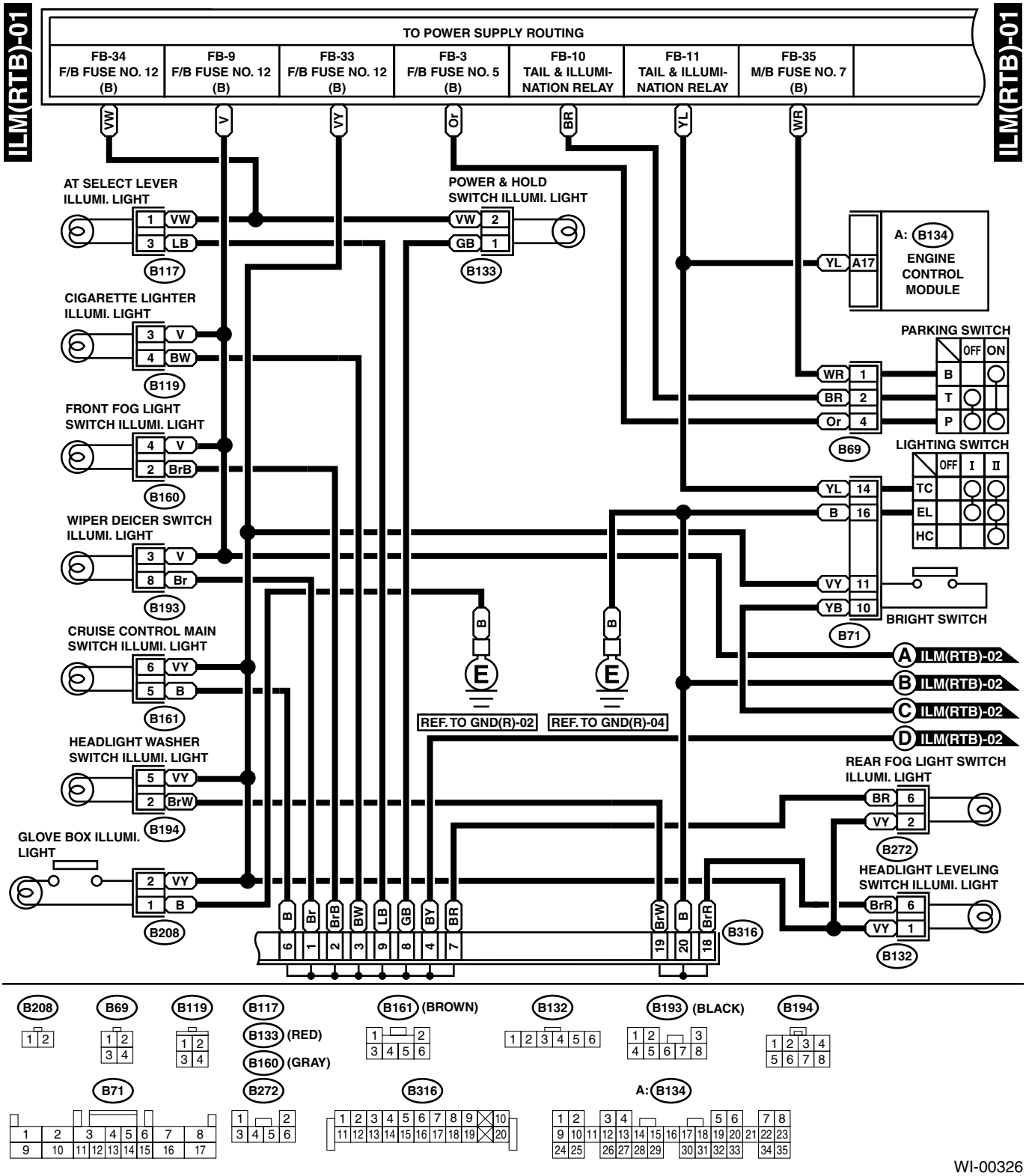
WI-00718


ILM(RNA)-03
ILM(RNA)-03
TO POWER SUPPLY ROUTING
FB-6
F/B FUSE NO.5
(B)
FB-7
F/B FUSE NO.5
(B)
WR
RY
FRONT CLEARANCE
LIGHT LH
2 WR
1 B
F22
FRONT CLEARANCE
LIGHT RH
2 WR
1 B
F11
RY
13
RY
B98
R2
TRAILER
CONNECTOR
1 RY
2 RY
7 B
8 B
R79
LICENSE PLATE LIGHT
RY 5 RY
B 4 B
R39 D34
RY 1 RY
B 3 B
D80 D81
RY 1
B 2
D44
B
E
REF. TO GND(R)-01
REAR COMBINATION
LIGHT LH
1 RY
4 B
R28
REAR COMBINATION
LIGHT RH
1 RY
4 B
R26
B
E
REF. TO GND(R)-06

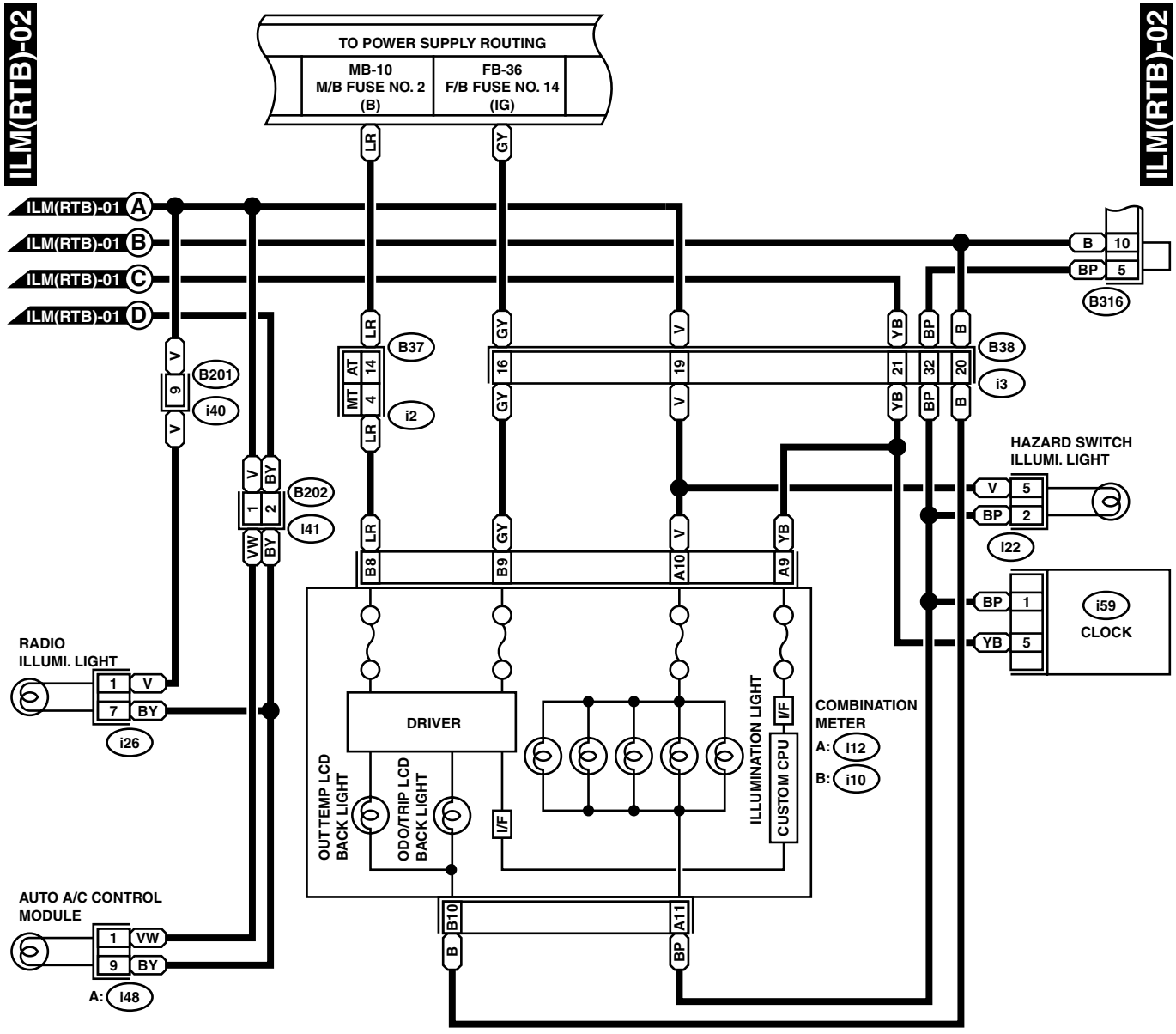

D44
F11 (GRAY)
F22 (GRAY)
R26
R28
D34
D80
R79
B98

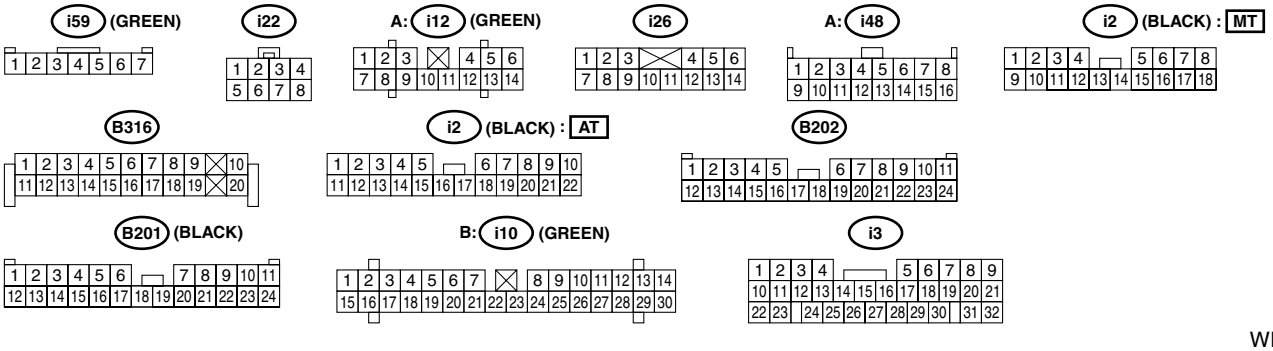
WI-00719

3. RHD TURBO MODEL

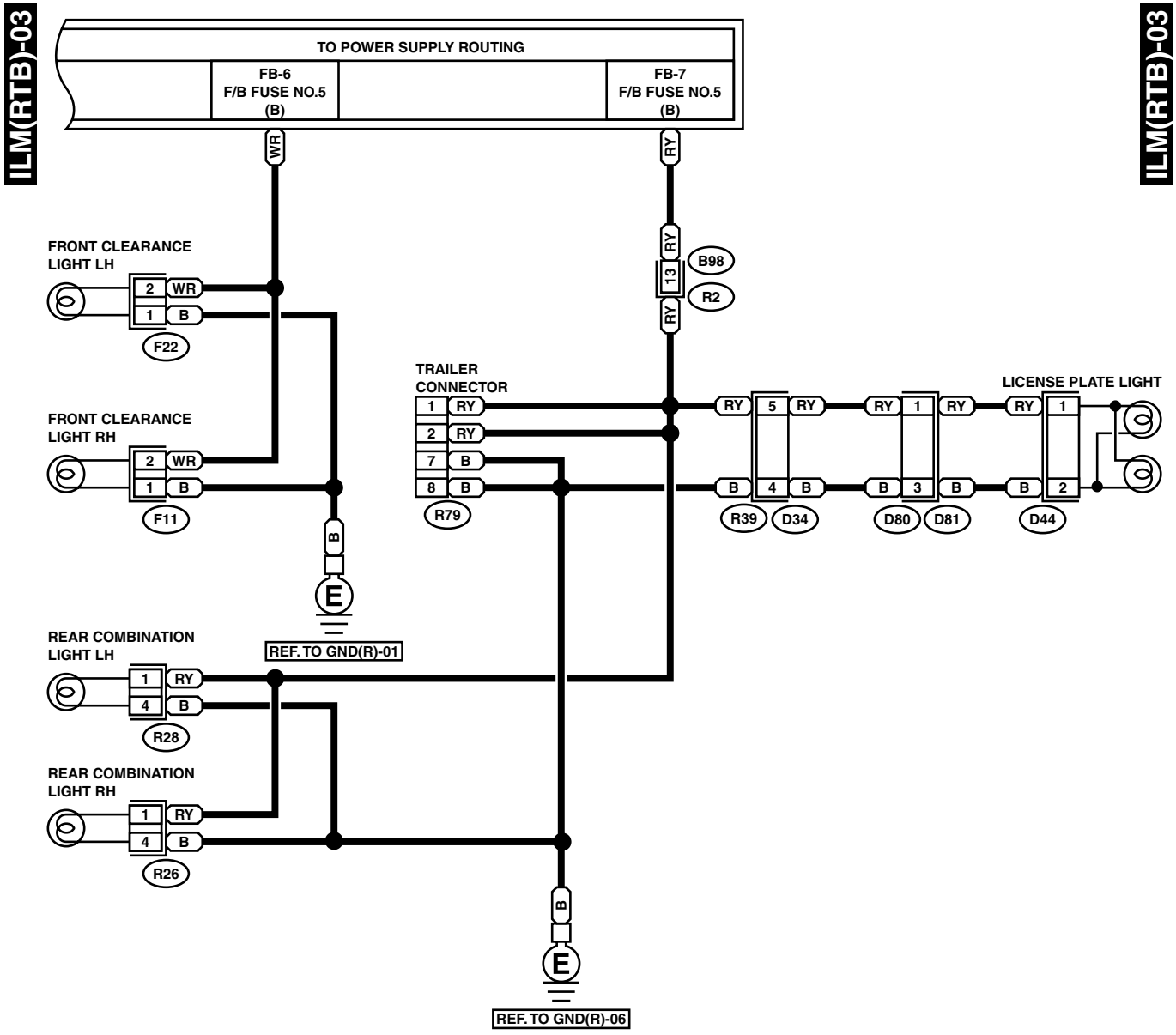


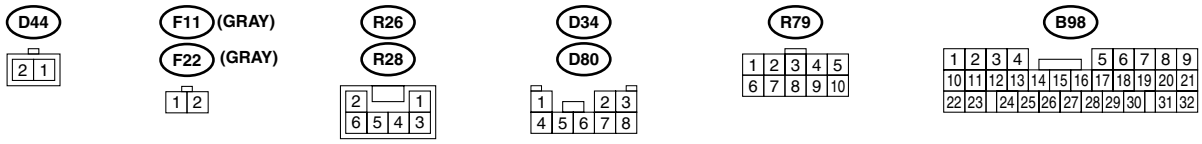
WI-00326


ILM(RTB)-02
ILM(RTB)-02
TO POWER SUPPLY ROUTING
MB-10
M/B FUSE NO. 2
(B)
FB-36
F/B FUSE NO. 14
(IG)
ILM(RTB)-01 A
ILM(RTB)-01 B
ILM(RTB)-01 C
ILM(RTB)-01 D
B316
B201
i40
B37
i2
B38
i3
B202
i41
HAZARD SWITCH
ILLUMI. LIGHT
i22
i59
CLOCK
RADIO
ILLUMI. LIGHT
i26
DRIVER
OUT TEMP LCD
BACK LIGHT
ODO/TRIP LCD
BACK LIGHT
I/F
ILLUMINATION LIGHT
CUSTOM CPU
COMBINATION
METER
A: i12
B: i10
AUTO A/C CONTROL
MODULE
A: i48


i59 (GREEN)
i22
A: i12 (GREEN)
i26
A: i48
i2 (BLACK) : MT
B316
i2 (BLACK) : AT
B202
B201 (BLACK)
B: i10 (GREEN)
i3

WI-00327


ILM(RTB)-03
ILM(RTB)-03
TO POWER SUPPLY ROUTING
FB-6
F/B FUSE NO.5
(B)
FB-7
F/B FUSE NO.5
(B)
WR
RY
FRONT CLEARANCE
LIGHT LH
2 WR
1 B
F22
FRONT CLEARANCE
LIGHT RH
2 WR
1 B
F11
RY
13
B98
R2
TRAILER
CONNECTOR
1 RY
2 RY
7 B
8 B
R79
LICENSE PLATE LIGHT
RY 5 RY
B 4 B
R39 D34
RY 1 RY
B 3 B
D80 D81
RY 1
B 2
D44
B
E
REF. TO GND(R)-01
REAR COMBINATION
LIGHT LH
1 RY
4 B
R28
REAR COMBINATION
LIGHT RH
1 RY
4 B
R26
B
E
REF. TO GND(R)-06


D44
F11 (GRAY)
F22 (GRAY)
R26
R28
D34
D80
R79
B98

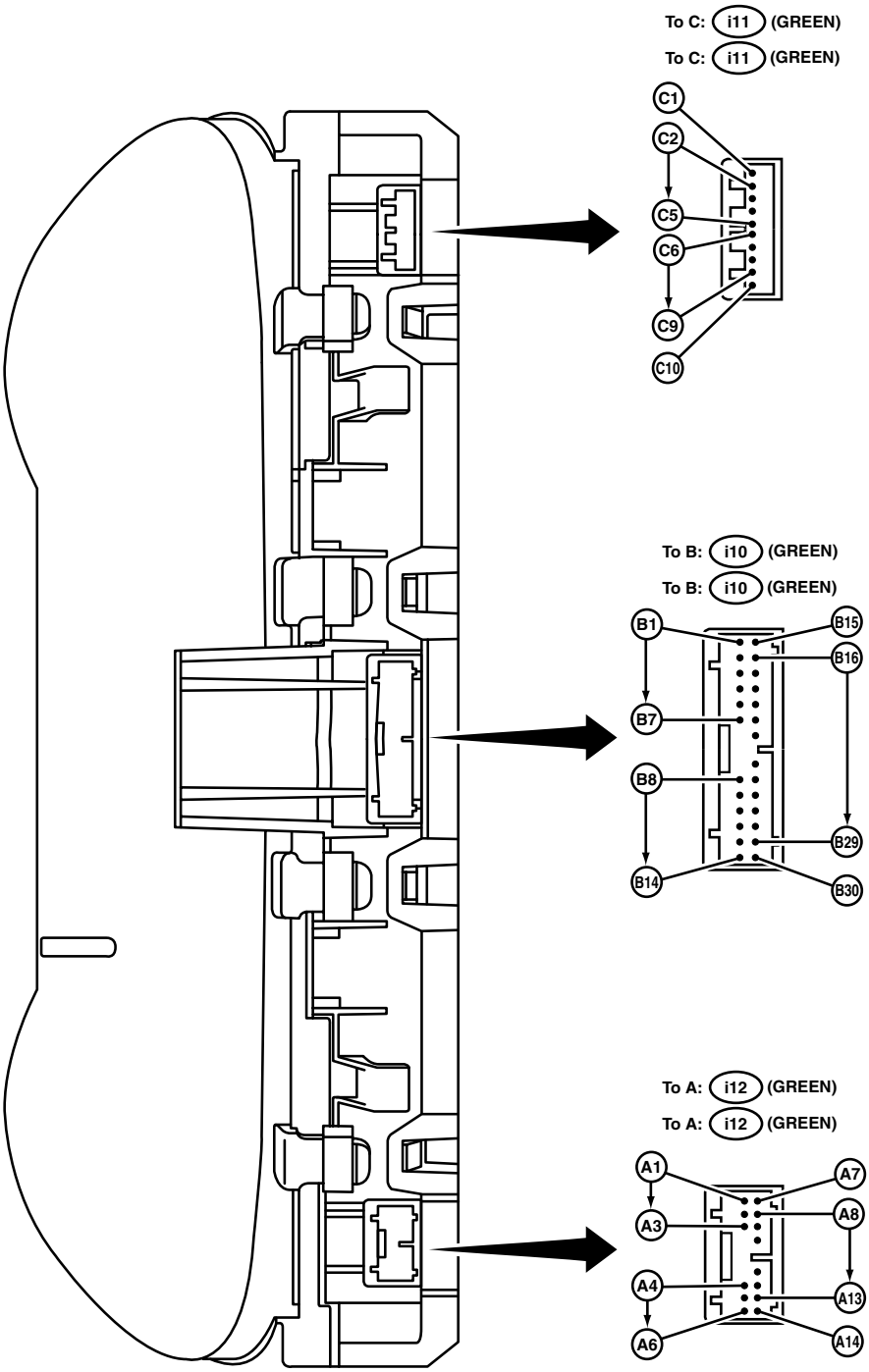
WI-00328

13.Combination Meter

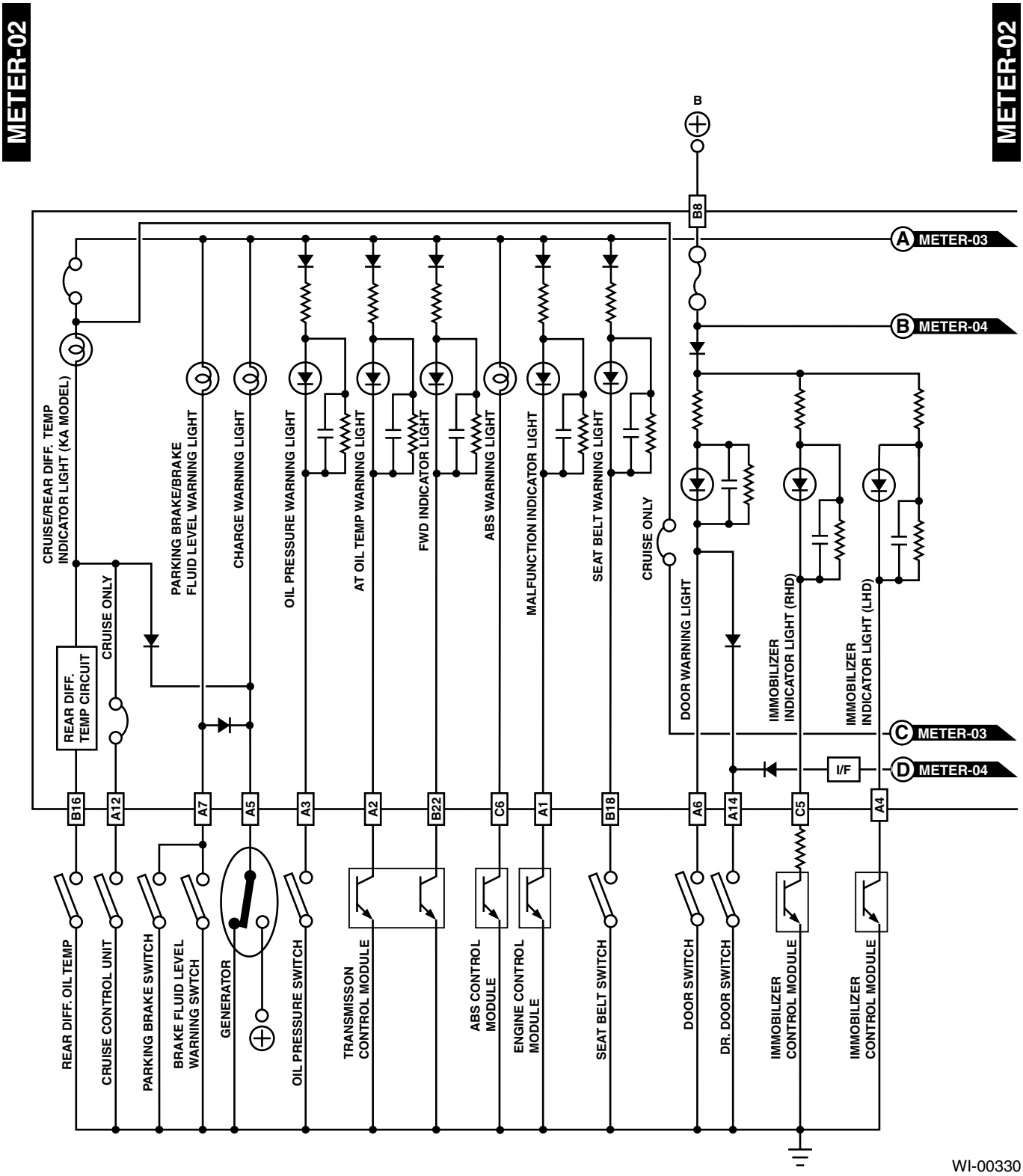
A: SCHEMATIC

METER-01

METER-01

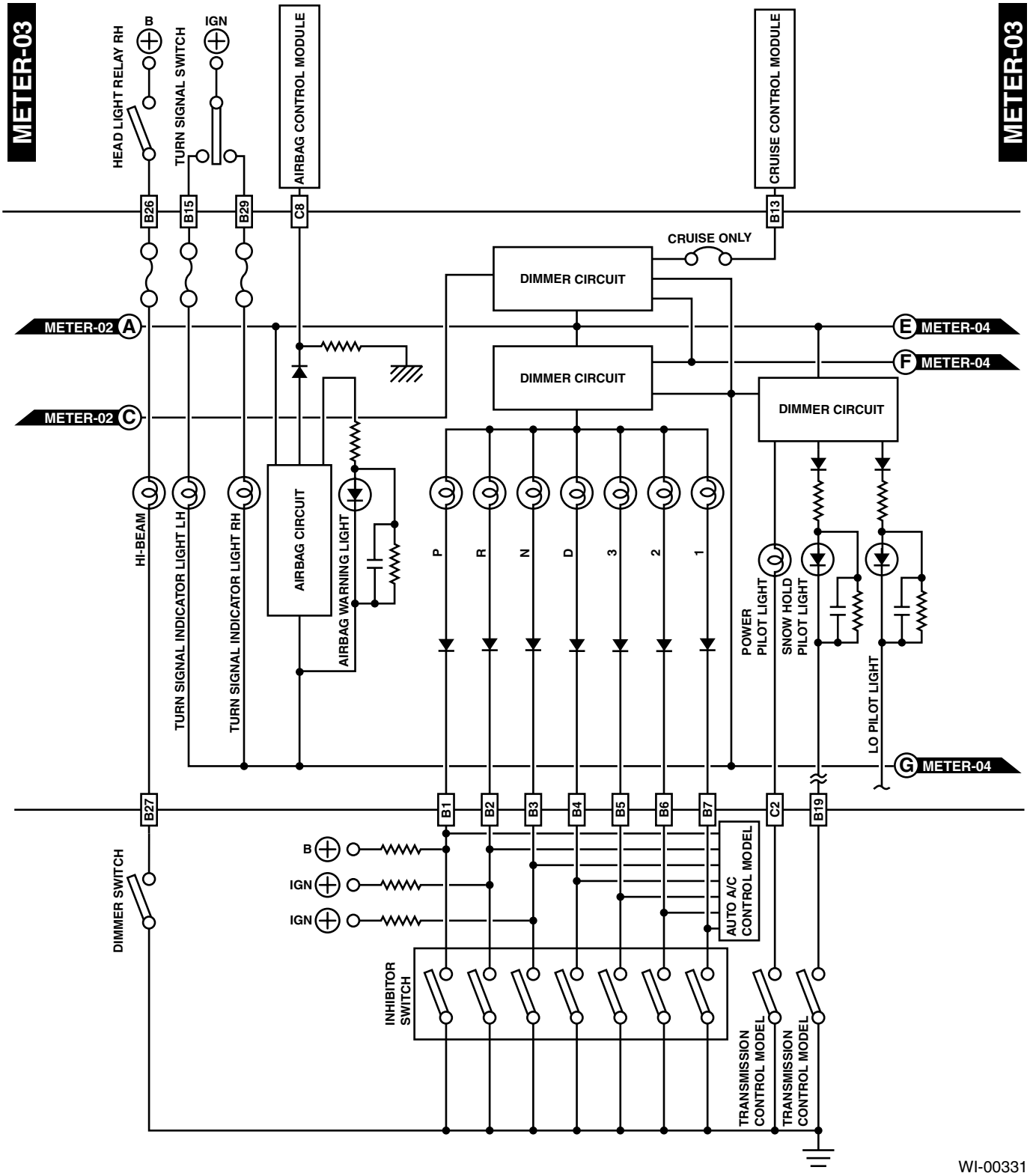


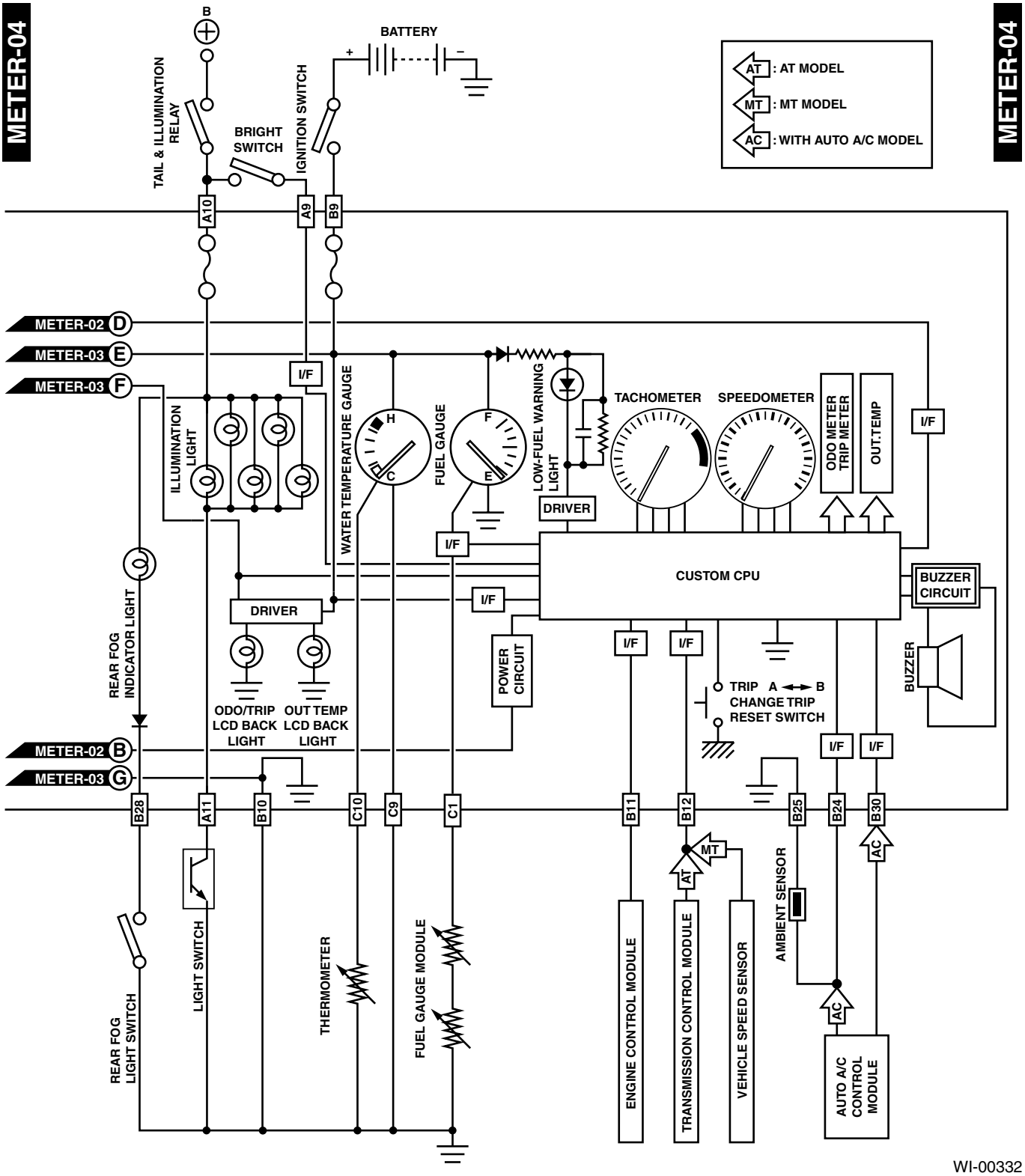
WI-00329


METER-02
METER-02
B
B8
A METER-03
B METER-04
C METER-03
D METER-04
I/F
CRUISE/REAR DIFF. TEMP INDICATOR LIGHT (KA MODEL)
REAR DIFF. TEMP CIRCUIT
CRUISE ONLY
PARKING BRAKE/BRAKE FLUID LEVEL WARNING LIGHT
CHARGE WARNING LIGHT
OIL PRESSURE WARNING LIGHT
AT OIL TEMP WARNING LIGHT
FWD INDICATOR LIGHT
ABS WARNING LIGHT
MALFUNCTION INDICATOR LIGHT
SEAT BELT WARNING LIGHT
CRUISE ONLY
DOOR WARNING LIGHT
IMMOBILIZER INDICATOR LIGHT (RHD)
IMMOBILIZER INDICATOR LIGHT (LHD)
B16
A12
A7
A5
A3
A2
B22
C6
A1
B18
A6
A14
C5
A4
REAR DIFF. OIL TEMP
CRUISE CONTROL UNIT
PARKING BRAKE SWITCH
BRAKE FLUID LEVEL WARNING SWTCH
GENERATOR
OIL PRESSURE SWITCH
TRANSMISSON CONTROL MODULE
ABS CONTROL MODULE
ENGINE CONTROL MODULE
SEAT BELT SWITCH
DOOR SWITCH
DR. DOOR SWITCH
IMMOBILIZER CONTROL MODULE
IMMOBILIZER CONTROL MODULE

WI-00330

COMBINATION METER



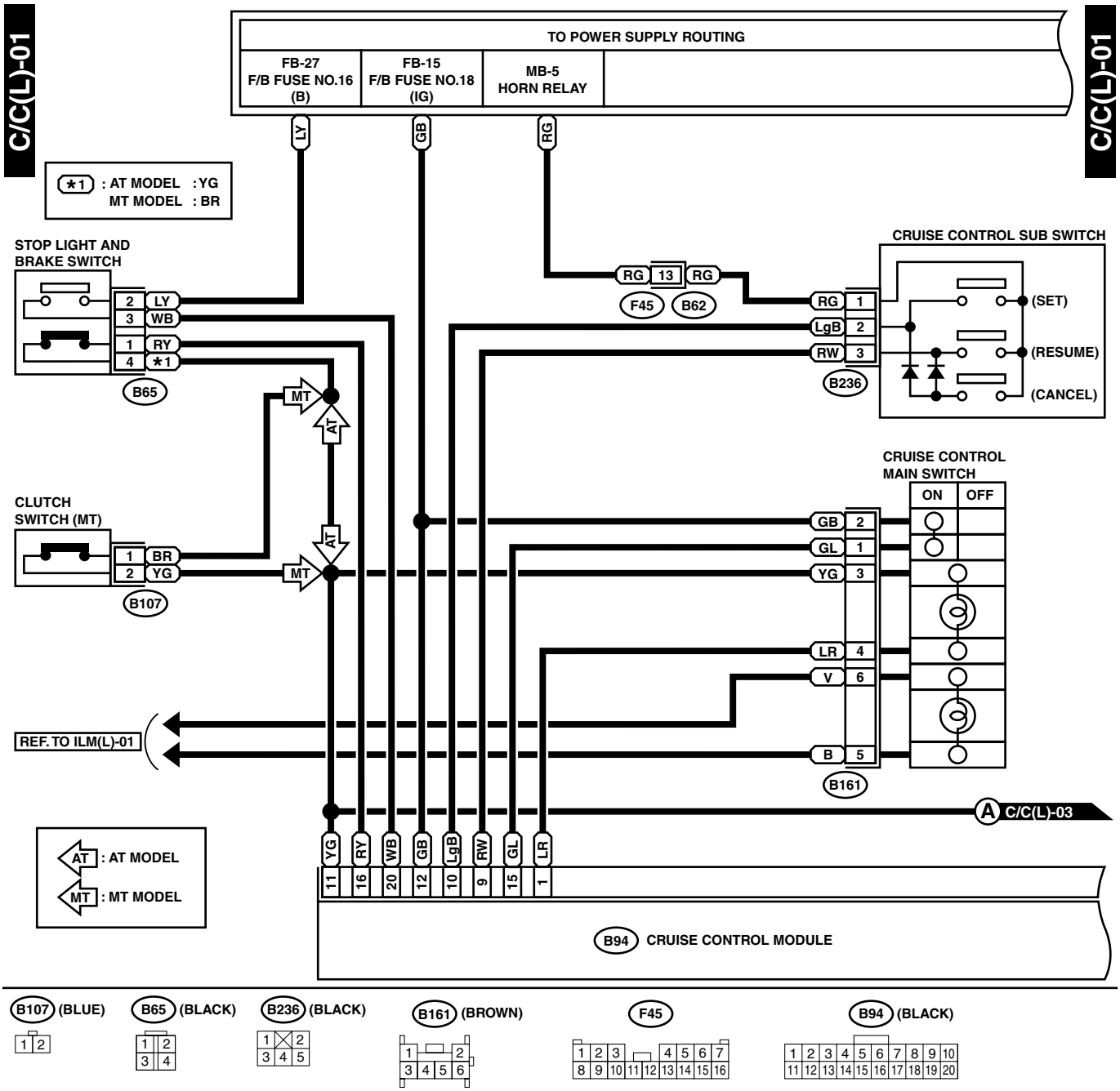

METER-04
METER-04
B
BATTERY
TAIL & ILLUMINATION RELAY
BRIGHT SWITCH
IGNITION SWITCH
AT : AT MODEL
MT : MT MODEL
AC : WITH AUTO A/C MODEL
A10
A9
B9
METER-02 D
METER-03 E
METER-03 F
I/F
ILLUMINATION LIGHT
WATER TEMPERATURE GAUGE
FUEL GAUGE
LOW-FUEL WARNING LIGHT
TACHOMETER
SPEEDOMETER
ODO METER TRIP METER
OUT.TEMP
DRIVER
CUSTOM CPU
BUZZER CIRCUIT
BUZZER
REAR FOG INDICATOR LIGHT
POWER CIRCUIT
TRIP A ↔ B CHANGE TRIP RESET SWITCH
ODO/TRIP LCD BACK LIGHT
OUT TEMP LCD BACK LIGHT
METER-02 B
METER-03 G
B28
A11
B10
C10
C9
C1
B11
B12
B25
B24
B30
MT
AT
AC
AMBIENT SENSOR
REAR FOG LIGHT SWITCH
LIGHT SWITCH
THERMOMETER
FUEL GAUGE MODULE
ENGINE CONTROL MODULE
TRANSMISSION CONTROL MODULE
VEHICLE SPEED SENSOR
AUTO A/C CONTROL MODULE

WI-00332

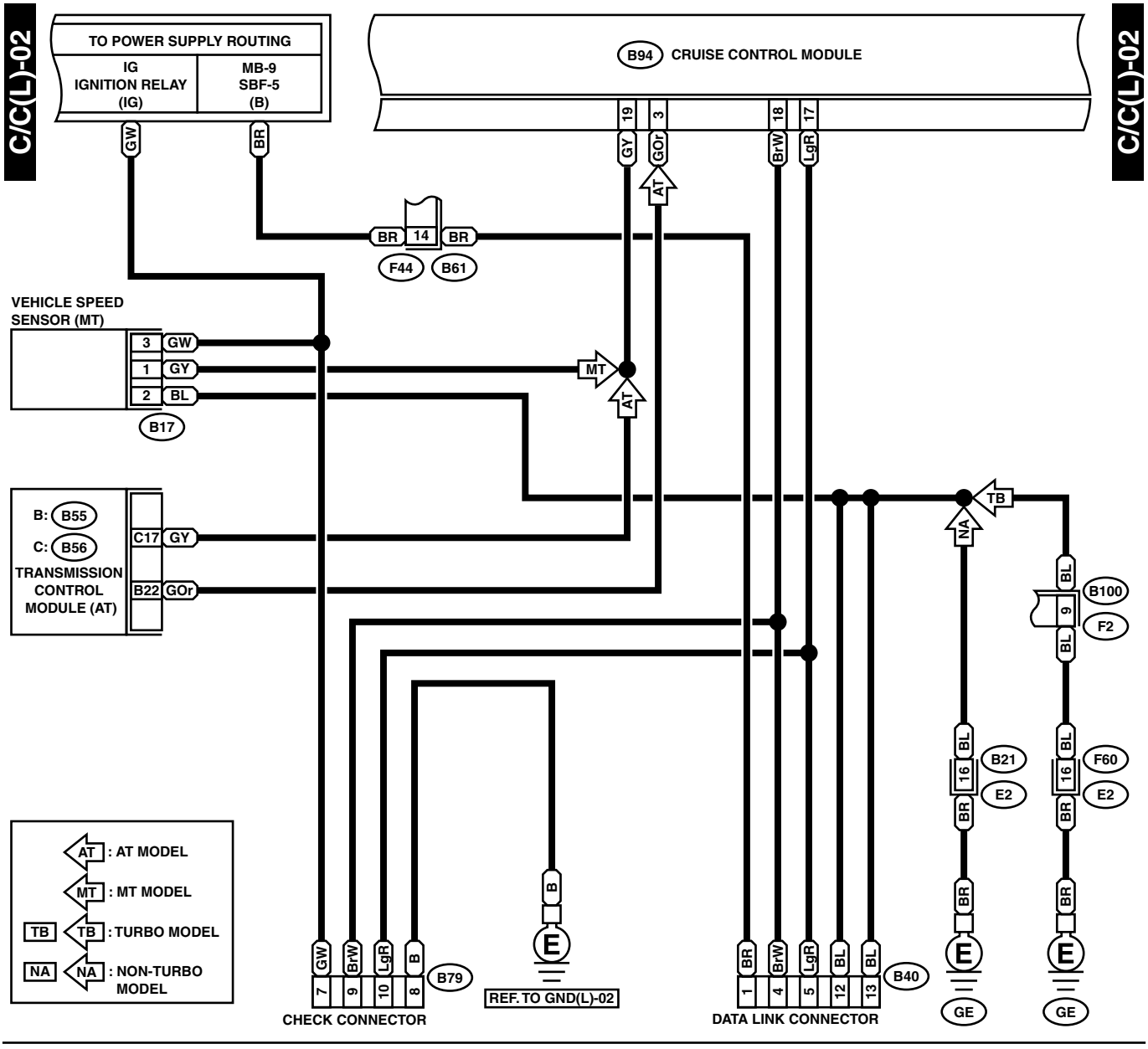
14.Cruise Control System

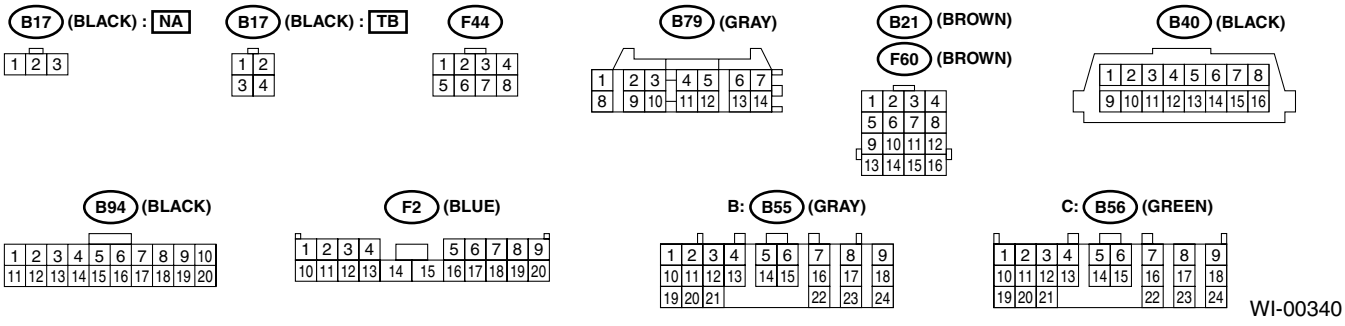
A: SCHEMATIC

1. LHD MODEL

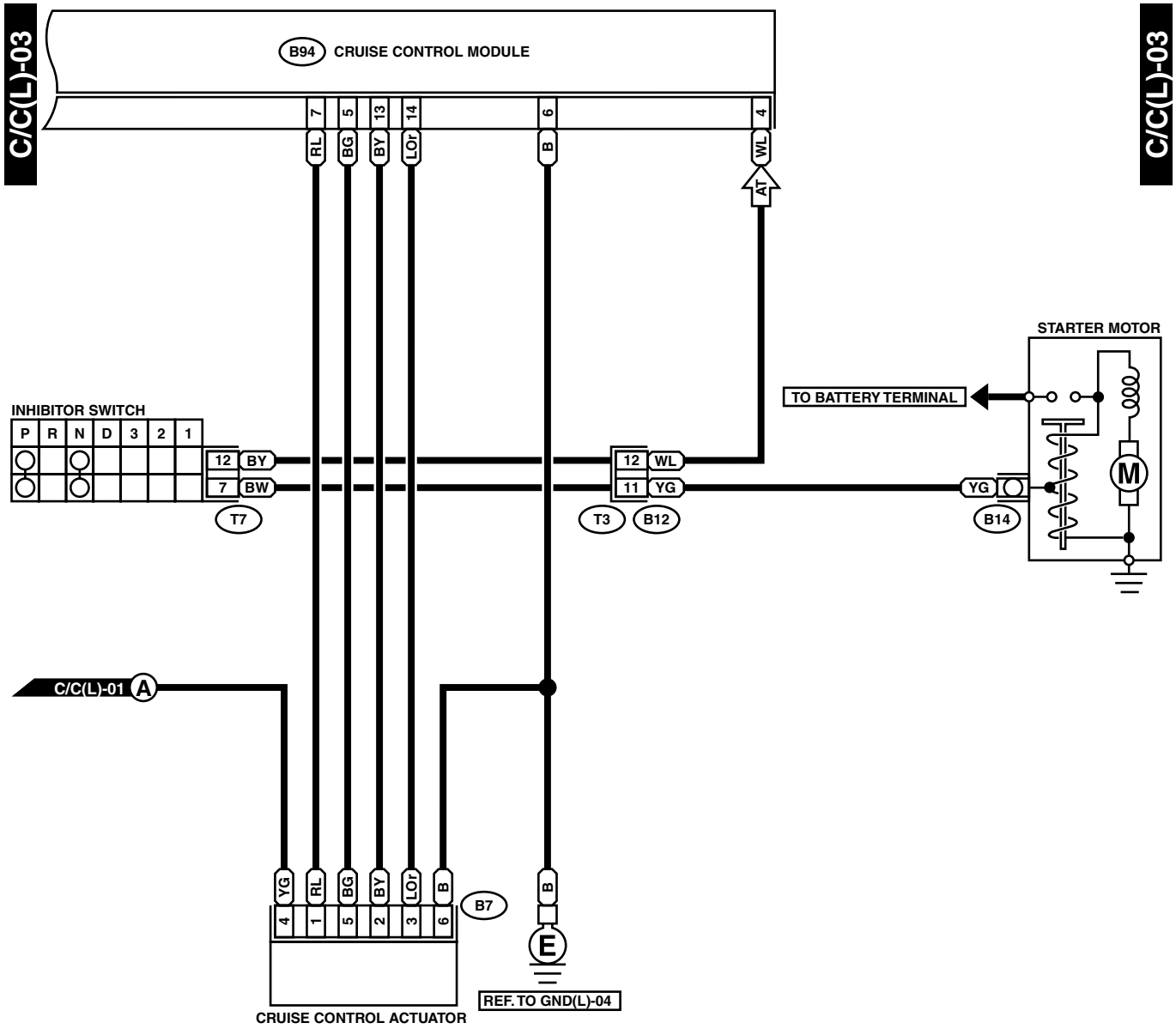


WI-00339


C/C(L)-02
TO POWER SUPPLY ROUTING
IG
IGNITION RELAY
(IG)
MB-9
SBF-5
(B)
B94 CRUISE CONTROL MODULE
C/C(L)-02
GW
BR
19
3
18
17
GY
GOr
BrW
LgR
AT
BR 14 BR
F44
B61
VEHICLE SPEED
SENSOR (MT)
3 GW
1 GY
2 BL
B17
MT
AT
B: B55
C: B56
TRANSMISSION
CONTROL
MODULE (AT)
C17 GY
B22 GOr
TB
NA
BL
B100
9
F2
BL
BL
16
B21
E2
BR
BL
16
F60
E2
BR
BR
BR
E
E
GE
GE
AT : AT MODEL
MT : MT MODEL
TB : TURBO MODEL
NA : NON-TURBO
MODEL
GW
BrW
LgR
B
B79
7
9
10
8
B
E
REF. TO GND(L)-02
CHECK CONNECTOR
BR
BrW
LgR
BL
BL
B40
1
4
5
12
13
DATA LINK CONNECTOR


B17 (BLACK) : NA
B17 (BLACK) : TB
F44
B79 (GRAY)
B21 (BROWN)
F60 (BROWN)
B40 (BLACK)
B94 (BLACK)
F2 (BLUE)
B: B55 (GRAY)
C: B56 (GREEN)

WI-00340



B7 (BLACK)

1	2	3
4	5	6

B12

1	2	3	4
5	6	7	8
9	10	11	12

T7

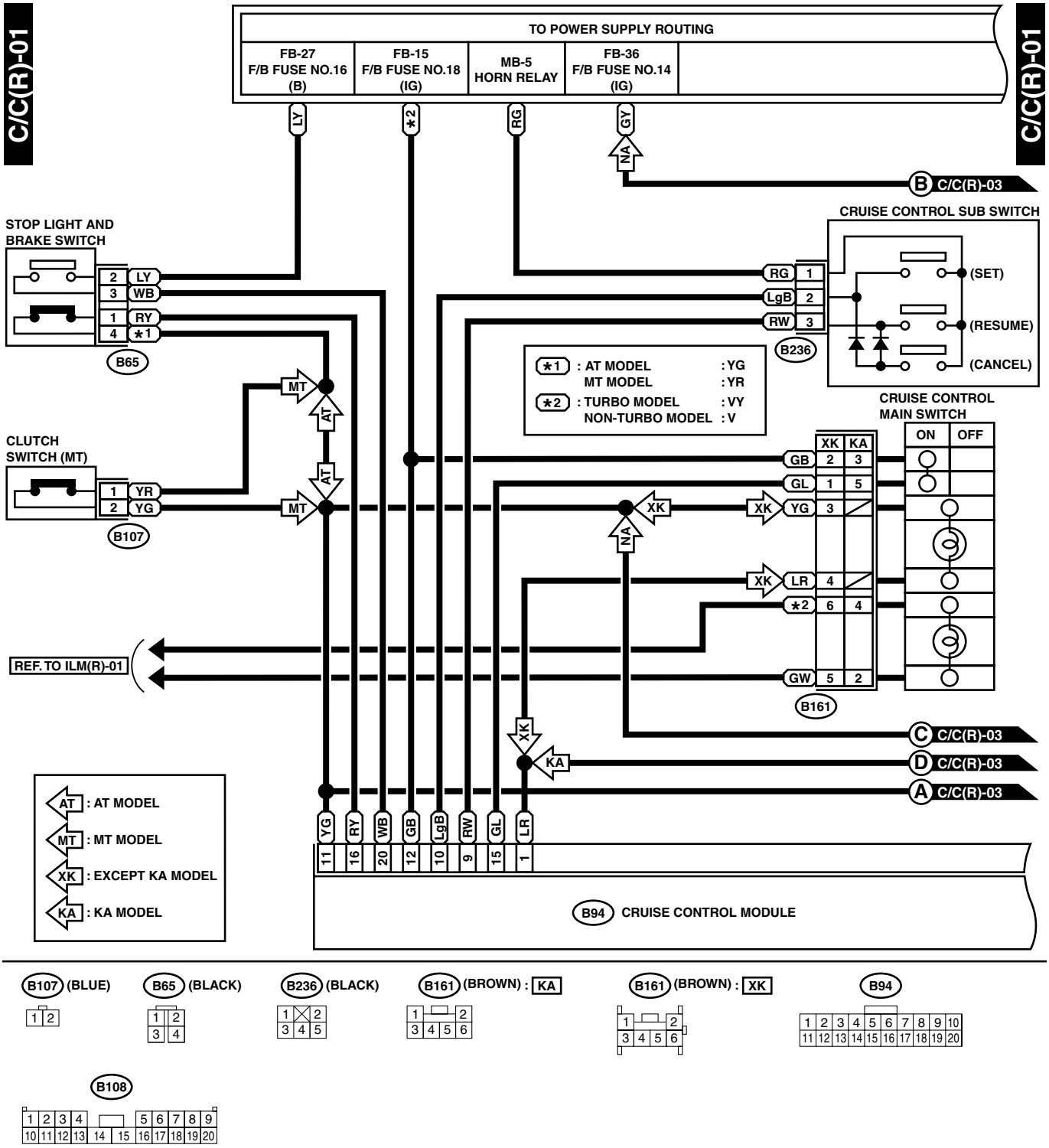
1	2	3	4	5	6	
7	8	9	10	11	12	

B94 (BLACK)

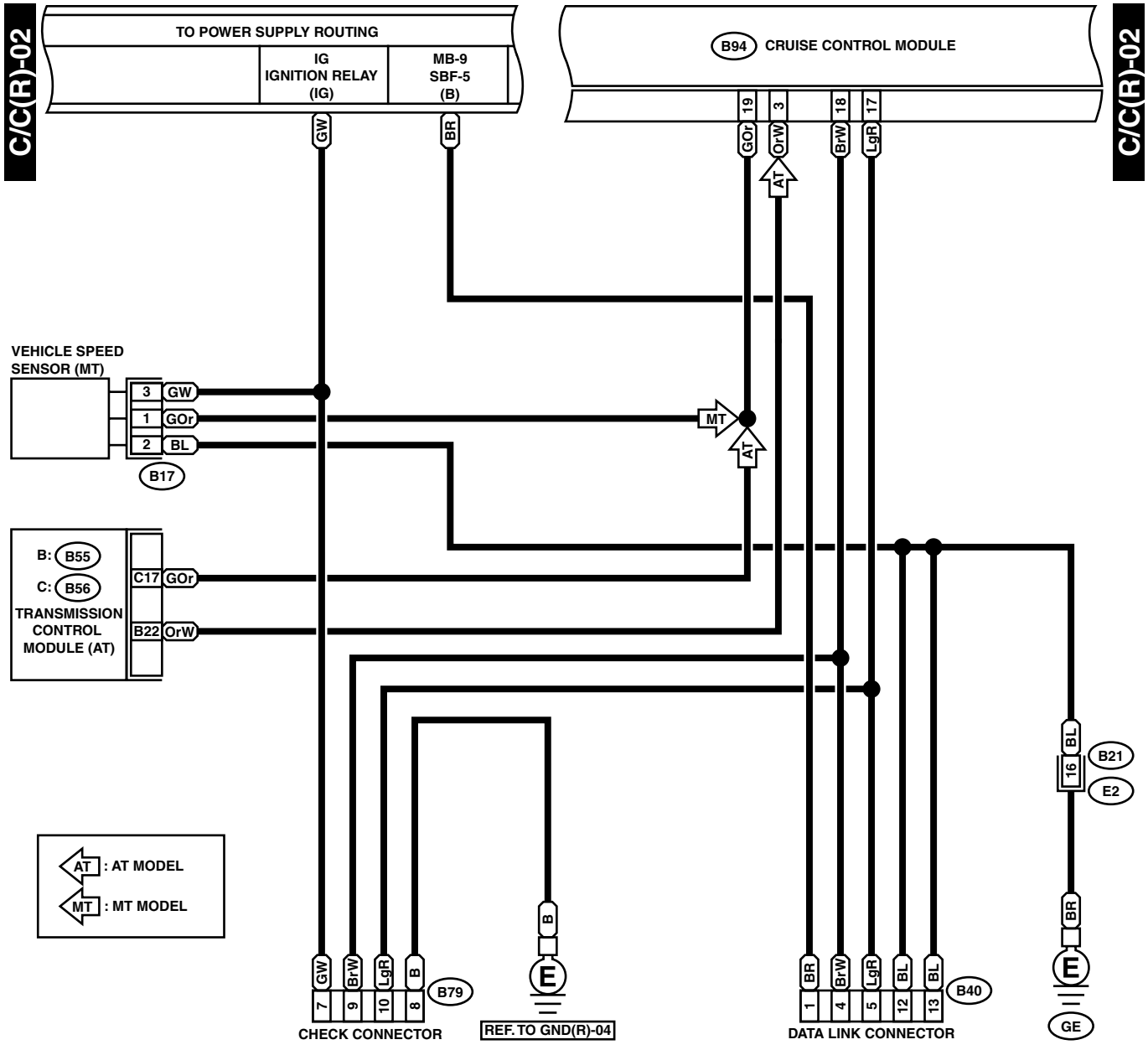
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

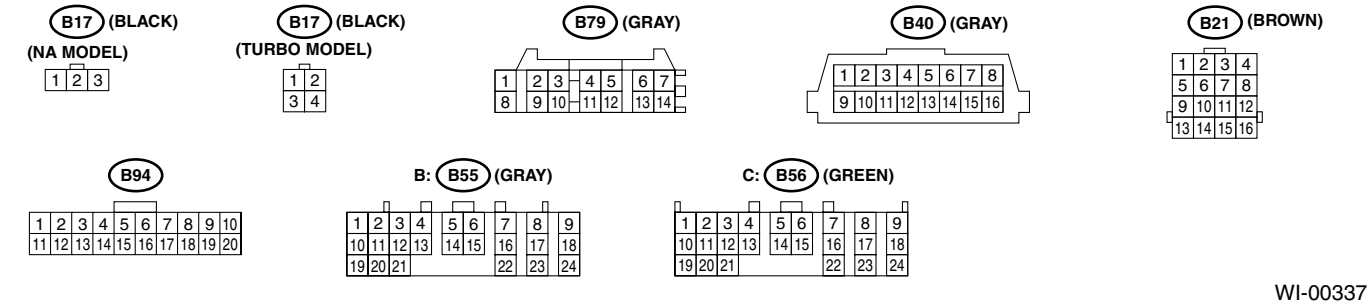
WI-00341

2. RHD MODEL

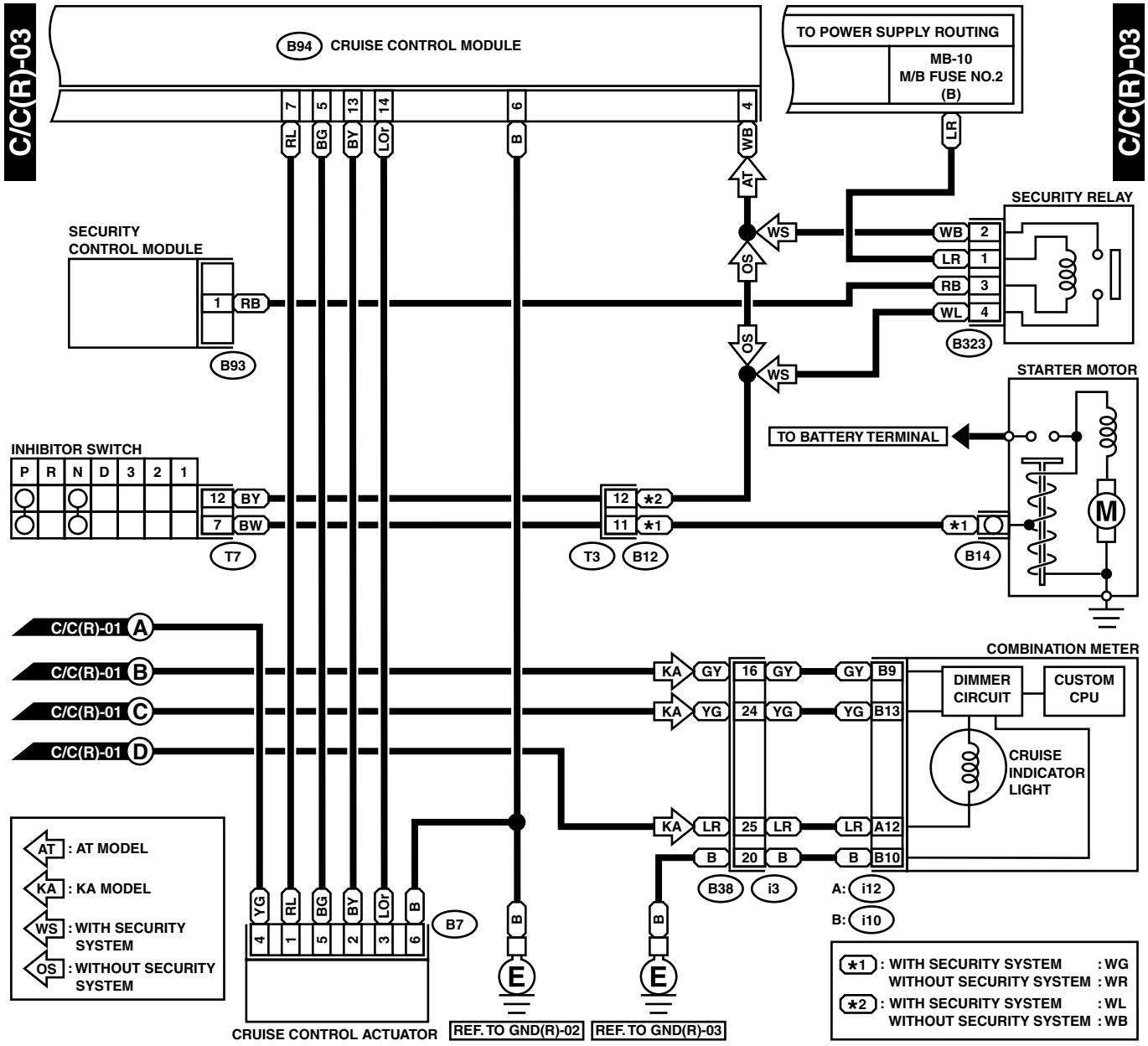


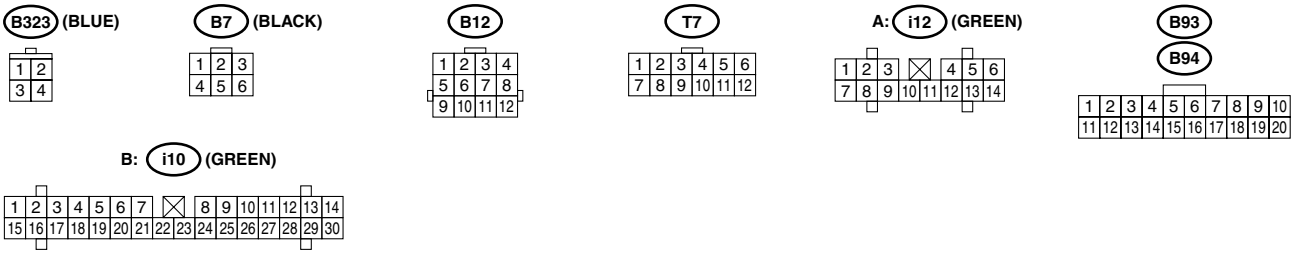
WI-00336


C/C(R)-02
TO POWER SUPPLY ROUTING
IG
IGNITION RELAY
(IG)
MB-9
SBF-5
(B)
B94 CRUISE CONTROL MODULE
C/C(R)-02
19
3
18
17
GW
BR
GOr
OrW
BrW
LgR
AT
VEHICLE SPEED
SENSOR (MT)
3 GW
1 GOr
2 BL
B17
MT
AT
B: B55
C: B56
TRANSMISSION
CONTROL
MODULE (AT)
C17 GOr
B22 OrW
16 BL
B21
E2
AT : AT MODEL
MT : MT MODEL
GW
BrW
LgR
B
7
9
10
8
B79
E
REF. TO GND(R)-04
CHECK CONNECTOR
BR
BrW
LgR
BL
BL
1
4
5
12
13
B40
DATA LINK CONNECTOR
BR
E
GE


B17 (BLACK)
(NA MODEL)
1 2 3
B17 (BLACK)
(TURBO MODEL)
1 2
3 4
B79 (GRAY)
1 2 3 4 5 6 7
8 9 10 11 12 13 14
B40 (GRAY)
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
B21 (BROWN)
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
B94
1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20
B: B55 (GRAY)
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18
19 20 21 22 23 24
C: B56 (GREEN)
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18
19 20 21 22 23 24

WI-00337


C/C(R)-03
B94 CRUISE CONTROL MODULE
TO POWER SUPPLY ROUTING
MB-10
M/B FUSE NO.2
(B)
C/C(R)-03
SECURITY RELAY
SECURITY
CONTROL MODULE
B93
B323
STARTER MOTOR
TO BATTERY TERMINAL
INHIBITOR SWITCH
P R N D 3 2 1
T7
T3
B12
B14
C/C(R)-01 A
C/C(R)-01 B
C/C(R)-01 C
C/C(R)-01 D
COMBINATION METER
DIMMER
CIRCUIT
CUSTOM
CPU
CRUISE
INDICATOR
LIGHT
B38
i3
A: i12
B: i10
B7
CRUISE CONTROL ACTUATOR
REF. TO GND(R)-02
REF. TO GND(R)-03
AT : AT MODEL
KA : KA MODEL
WS : WITH SECURITY SYSTEM
OS : WITHOUT SECURITY SYSTEM
*1 : WITH SECURITY SYSTEM : WG
WITHOUT SECURITY SYSTEM : WR
*2 : WITH SECURITY SYSTEM : WL
WITHOUT SECURITY SYSTEM : WB

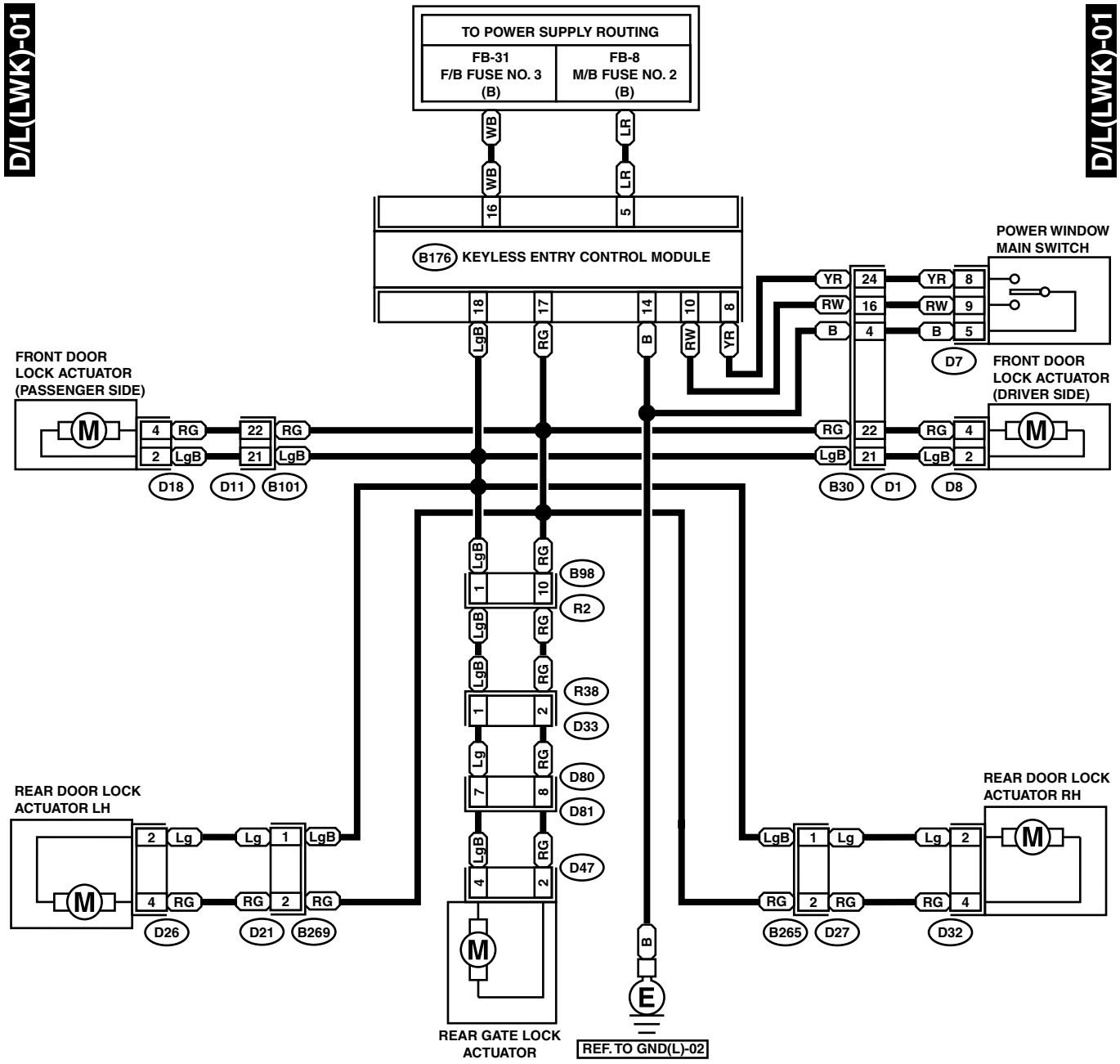

B323 (BLUE)
B7 (BLACK)
B12
T7
A: i12 (GREEN)
B93
B94
B: i10 (GREEN)

WI-00338

15.Door Lock System

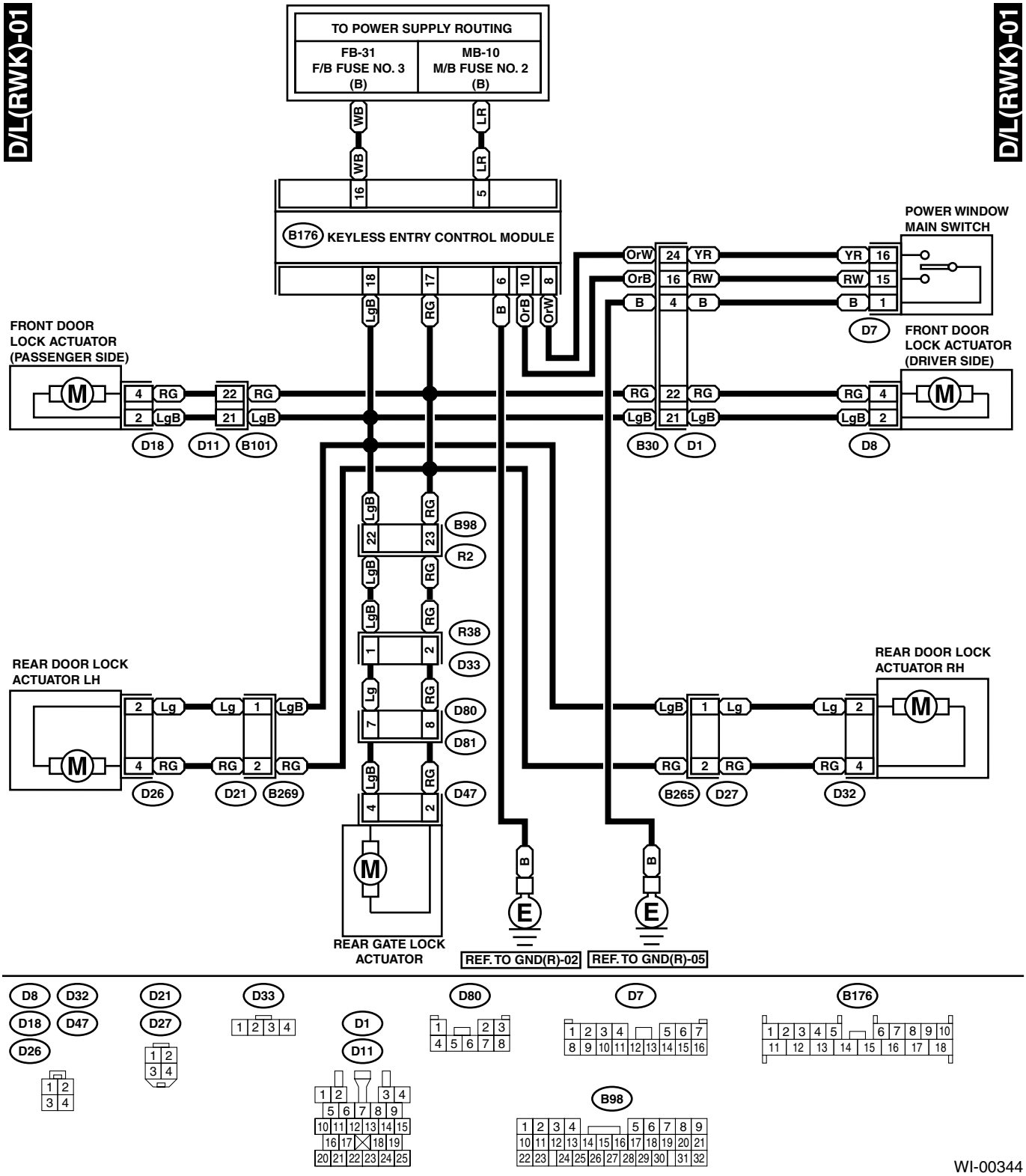
A: SCHEMATIC

1. LHD MODEL



WI-00343

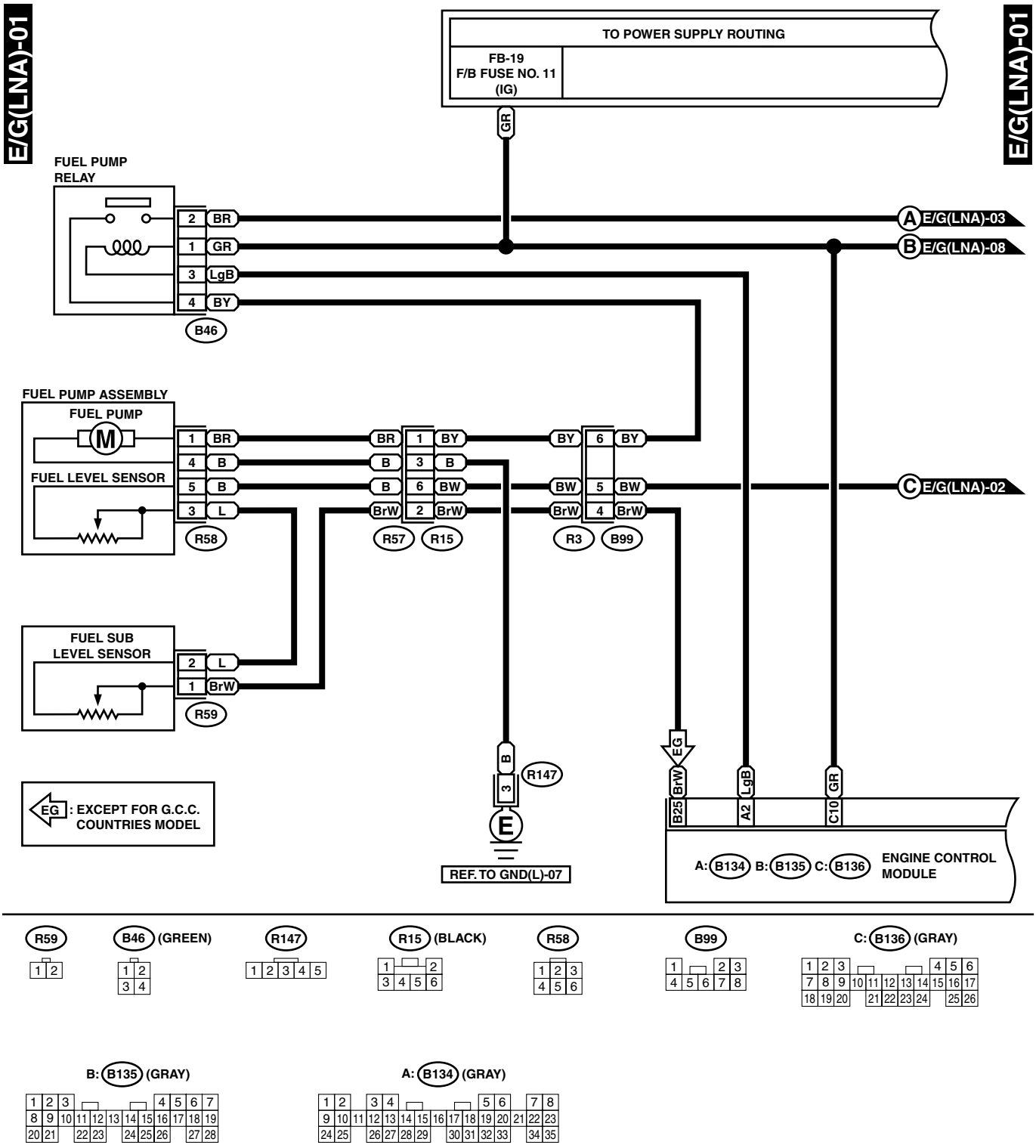
2. RHD MODEL


D/L(RWK)-01
D/L(RWK)-01
TO POWER SUPPLY ROUTING
FB-31
F/B FUSE NO. 3
(B)
MB-10
M/B FUSE NO. 2
(B)
B176 KEYLESS ENTRY CONTROL MODULE
POWER WINDOW
MAIN SWITCH
D7
FRONT DOOR
LOCK ACTUATOR
(PASSENGER SIDE)
D18
D11
B101
FRONT DOOR
LOCK ACTUATOR
(DRIVER SIDE)
B30
D1
D8
B98
R2
R38
D33
D80
D81
D47
REAR DOOR LOCK
ACTUATOR LH
D26
D21
B269
REAR DOOR LOCK
ACTUATOR RH
B265
D27
D32
REAR GATE LOCK
ACTUATOR
REF. TO GND(R)-02
REF. TO GND(R)-05
D8
D32
D18
D47
D26
D21
D27
D33
D1
D11
D80
D7
B176
B98
WI-00344

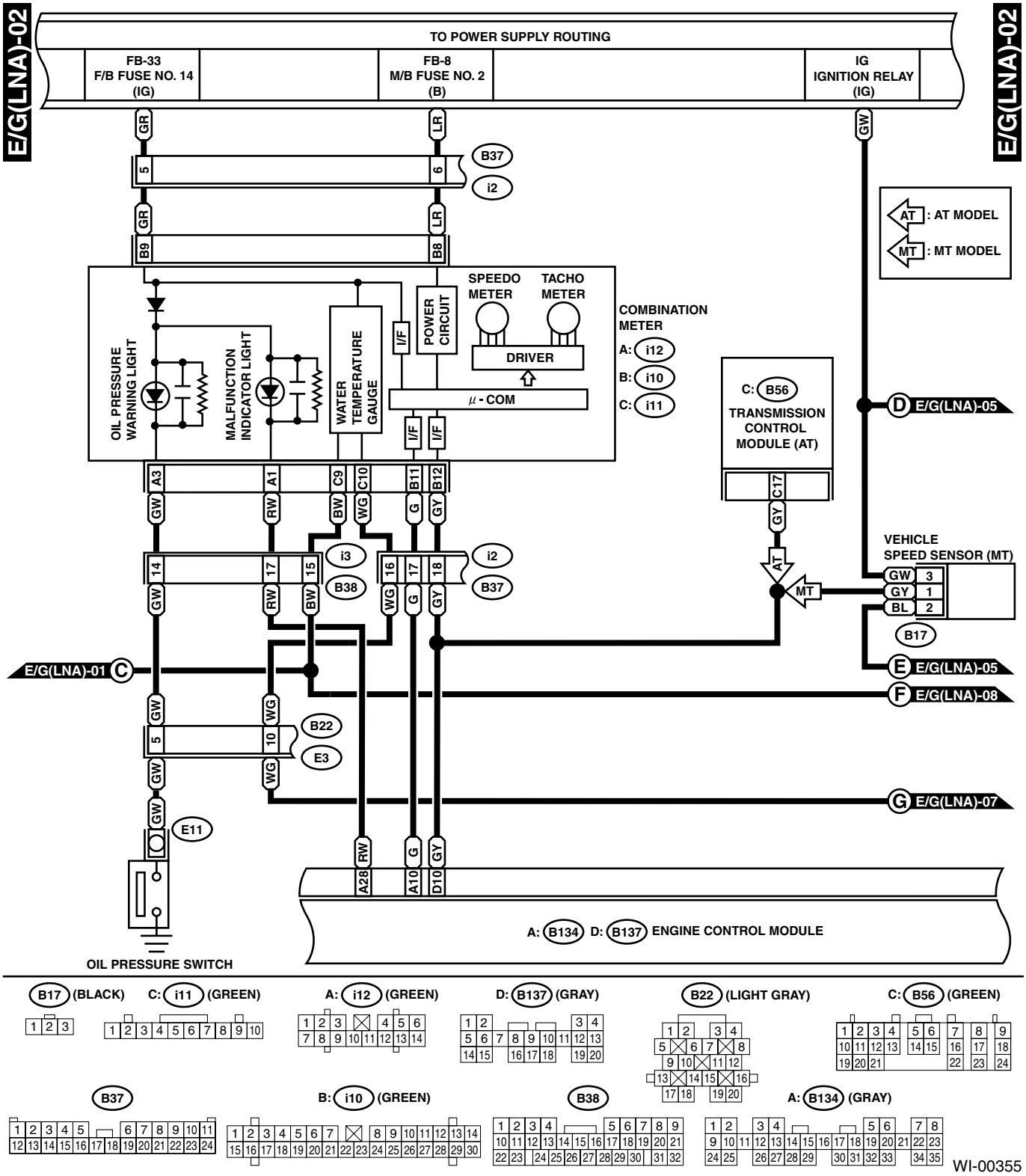
16.Engine Electrical System

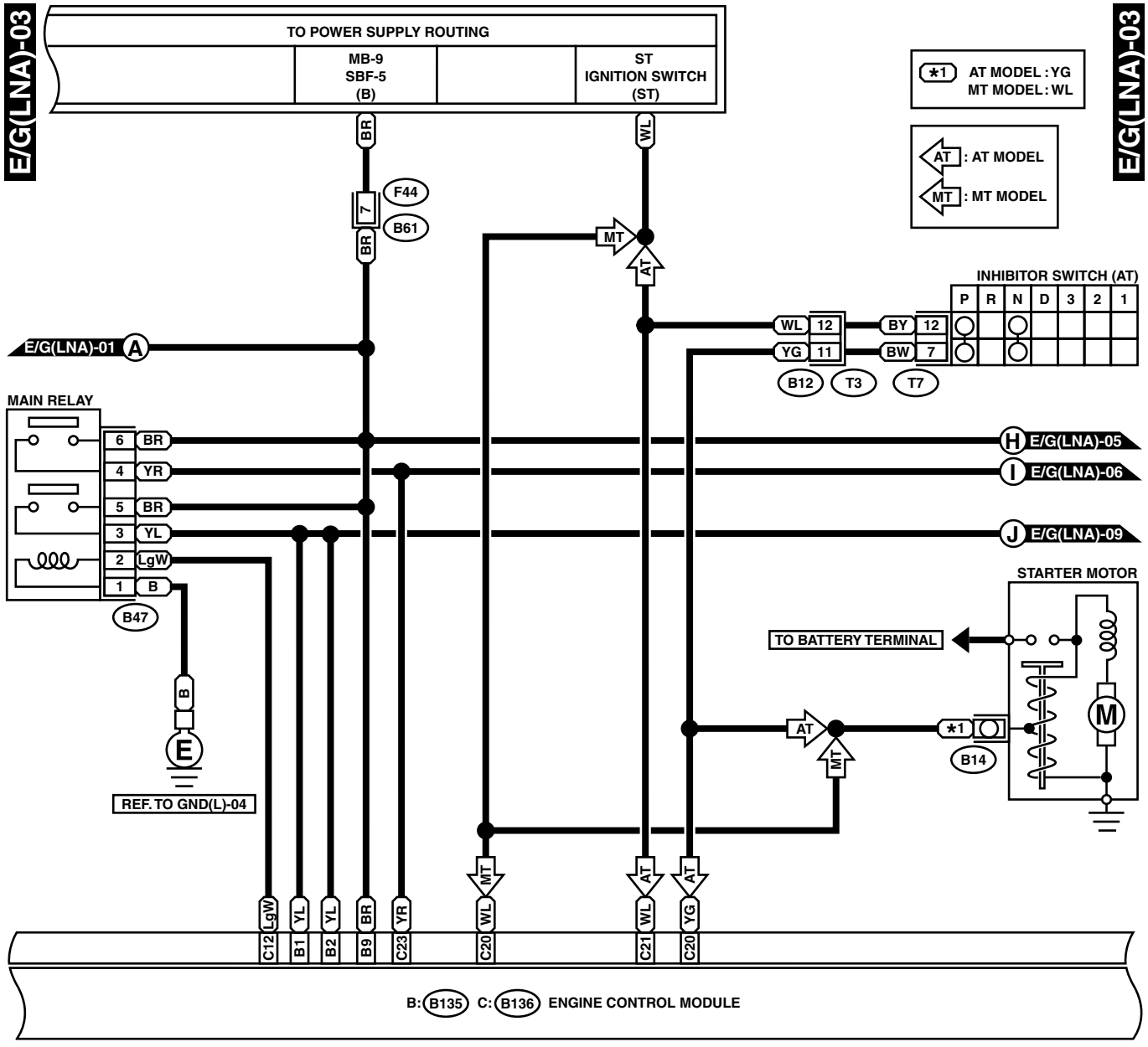
A: SCHEMATIC

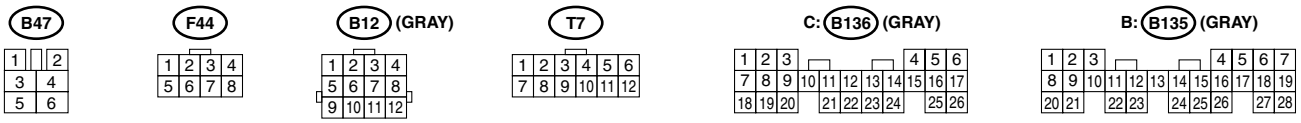
1. LHD NON-TURBO MODEL



WI-00354


E/G(LNA)-02
TO POWER SUPPLY ROUTING
FB-33
F/B FUSE NO. 14
(IG)
FB-8
M/B FUSE NO. 2
(B)
IG
IGNITION RELAY
(IG)
B37
i2
B9
B8
AT : AT MODEL
MT : MT MODEL
SPEEDO METER
TACHO METER
COMBINATION METER
A: i12
B: i10
C: i11
DRIVER
μ - COM
POWER CIRCUIT
I/F
OIL PRESSURE WARNING LIGHT
MALFUNCTION INDICATOR LIGHT
WATER TEMPERATURE GAUGE
C: B56
TRANSMISSION CONTROL MODULE (AT)
D E/G(LNA)-05
VEHICLE SPEED SENSOR (MT)
B17
E E/G(LNA)-05
F E/G(LNA)-08
E/G(LNA)-01 C
B22
E3
G E/G(LNA)-07
E11
OIL PRESSURE SWITCH
A: B134 D: B137 ENGINE CONTROL MODULE
B17 (BLACK)
C: i11 (GREEN)
A: i12 (GREEN)
D: B137 (GRAY)
B22 (LIGHT GRAY)
C: B56 (GREEN)
B37
B: i10 (GREEN)
B38
A: B134 (GRAY)
WI-00355

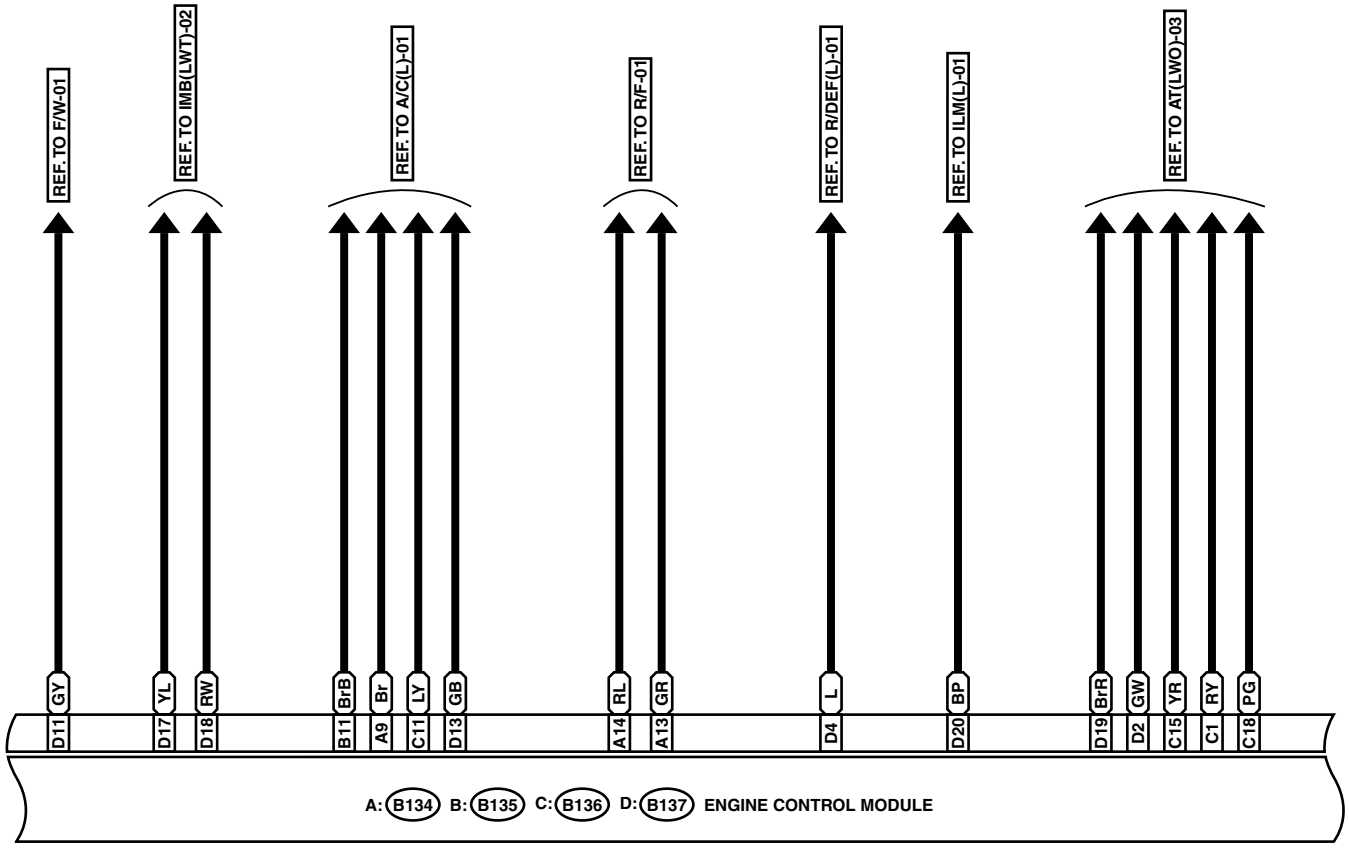

E/G(LNA)-03
TO POWER SUPPLY ROUTING
MB-9
SBF-5
(B)
ST
IGNITION SWITCH
(ST)
*1 AT MODEL : YG
MT MODEL : WL
AT : AT MODEL
MT : MT MODEL
BR
WL
F44
7
B61
MT
AT
INHIBITOR SWITCH (AT)
P R N D 3 2 1
E/G(LNA)-01 A
WL 12
YG 11
BY 12
BW 7
B12 T3 T7
MAIN RELAY
6 BR
4 YR
5 BR
3 YL
2 LgW
1 B
B47
H E/G(LNA)-05
I E/G(LNA)-06
J E/G(LNA)-09
STARTER MOTOR
TO BATTERY TERMINAL
M
*1
B14
E
REF. TO GND(L)-04
C12 LgW
B1 YL
B2 YL
B9 BR
C23 YR
C20 WL
C21 WL
C20 YG
B: B135 C: B136 ENGINE CONTROL MODULE

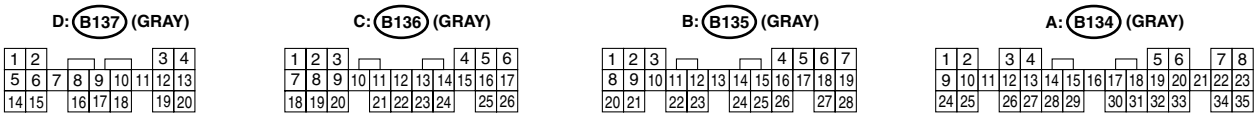

B47
F44
B12 (GRAY)
T7
C: B136 (GRAY)
B: B135 (GRAY)

WI-00356

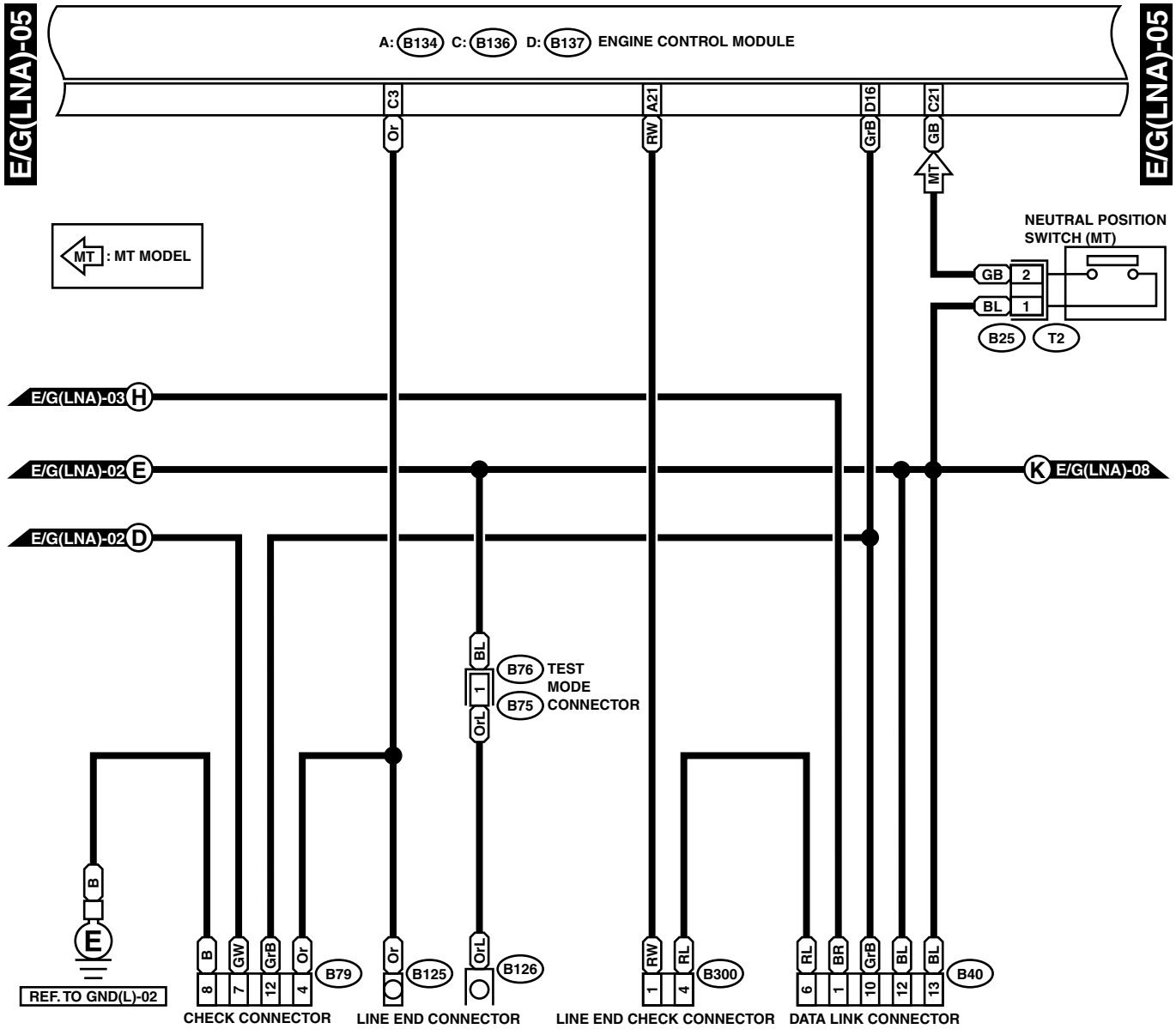
E/G(LNA)-04

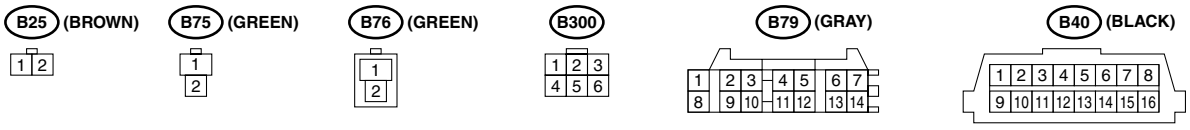
E/G(LNA)-04

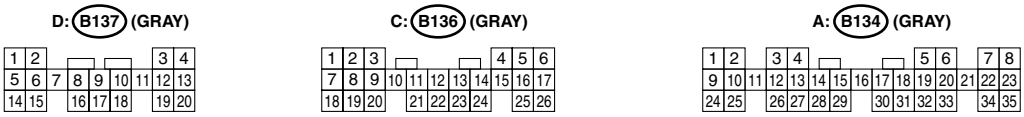




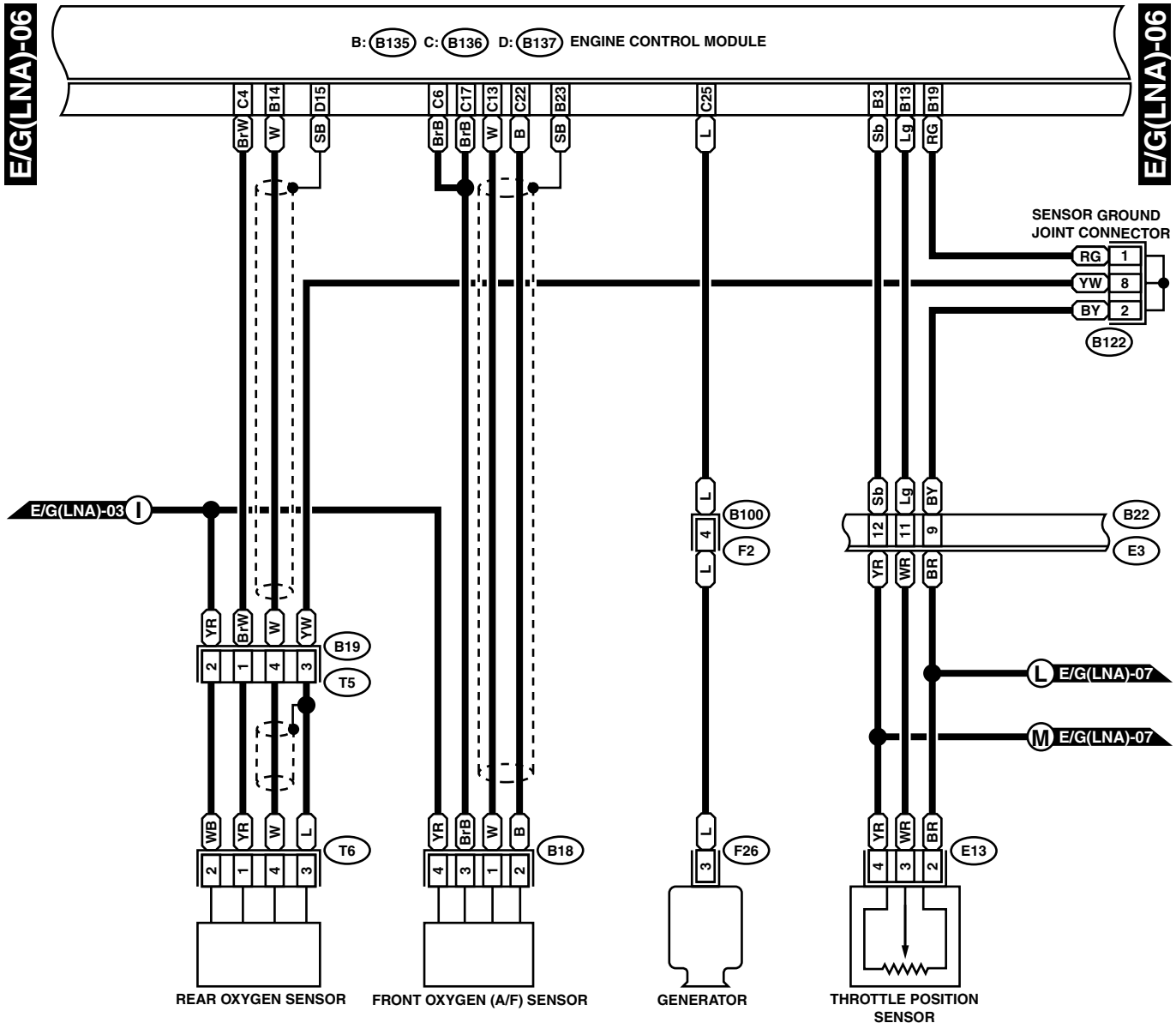
WI-00357

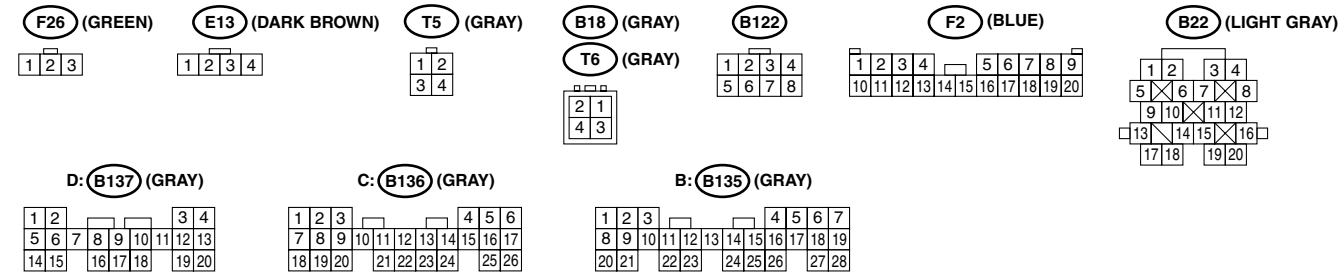

E/G(LNA)-05
A: B134 C: B136 D: B137 ENGINE CONTROL MODULE
E/G(LNA)-05
C3
A21
D16
C21
Or
RW
GrB
GB
MT
MT : MT MODEL
NEUTRAL POSITION SWITCH (MT)
GB 2
BL 1
B25
T2
E/G(LNA)-03 H
E/G(LNA)-02 E
K E/G(LNA)-08
E/G(LNA)-02 D
BL
B76 TEST MODE
B75 CONNECTOR
OrL
B
E
REF. TO GND(L)-02
B GW GrB Or
8 7 12 4
B79
Or
B125
OrL
B126
RW RL
1 4
B300
RL BR GrB BL BL
6 1 10 12 13
B40
CHECK CONNECTOR
LINE END CONNECTOR
LINE END CHECK CONNECTOR
DATA LINK CONNECTOR


B25 (BROWN)
B75 (GREEN)
B76 (GREEN)
B300
B79 (GRAY)
B40 (BLACK)

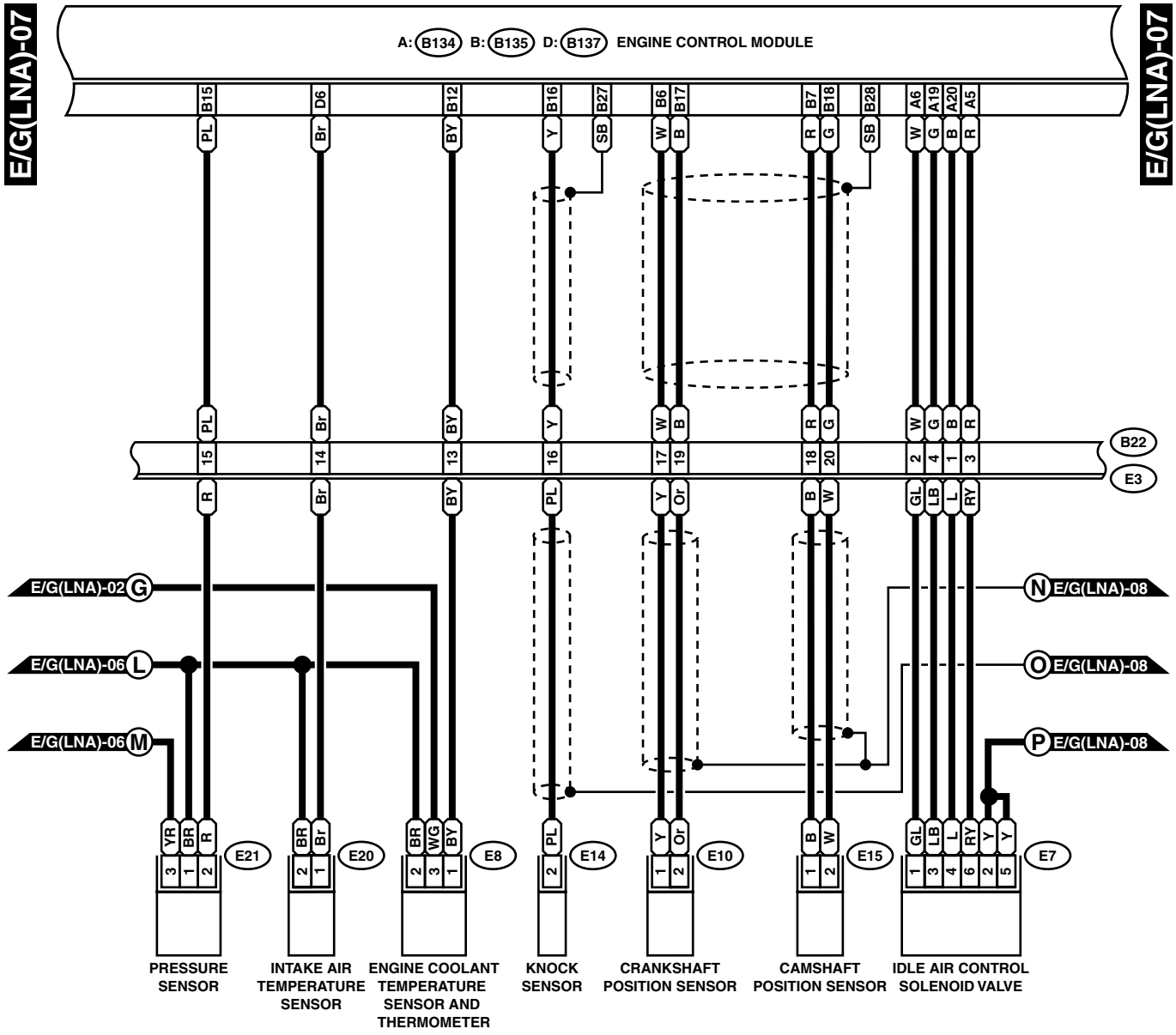

D: B137 (GRAY)
C: B136 (GRAY)
A: B134 (GRAY)

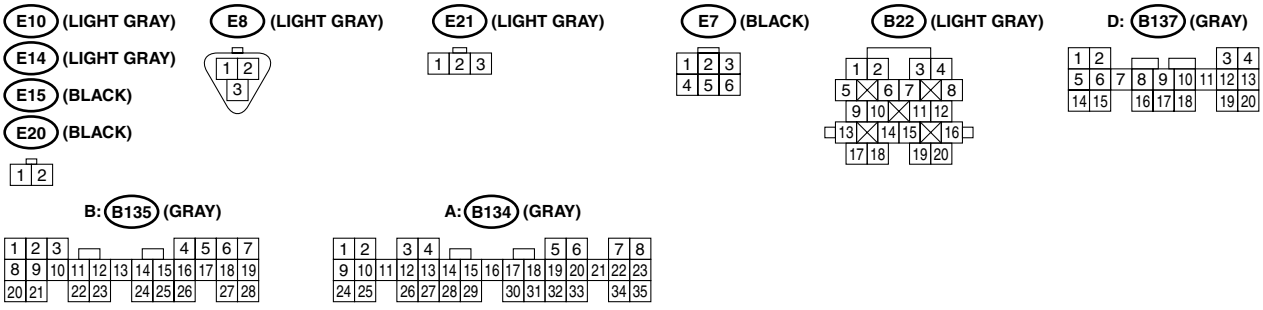
WI-00358


E/G(LNA)-06
B: B135 C: B136 D: B137 ENGINE CONTROL MODULE
E/G(LNA)-06
SENSOR GROUND JOINT CONNECTOR
RG 1
YW 8
BY 2
B122
E/G(LNA)-03 I
B100
F2
B22
E3
L E/G(LNA)-07
M E/G(LNA)-07
B19
T5
T6
B18
F26
E13
REAR OXYGEN SENSOR
FRONT OXYGEN (A/F) SENSOR
GENERATOR
THROTTLE POSITION SENSOR

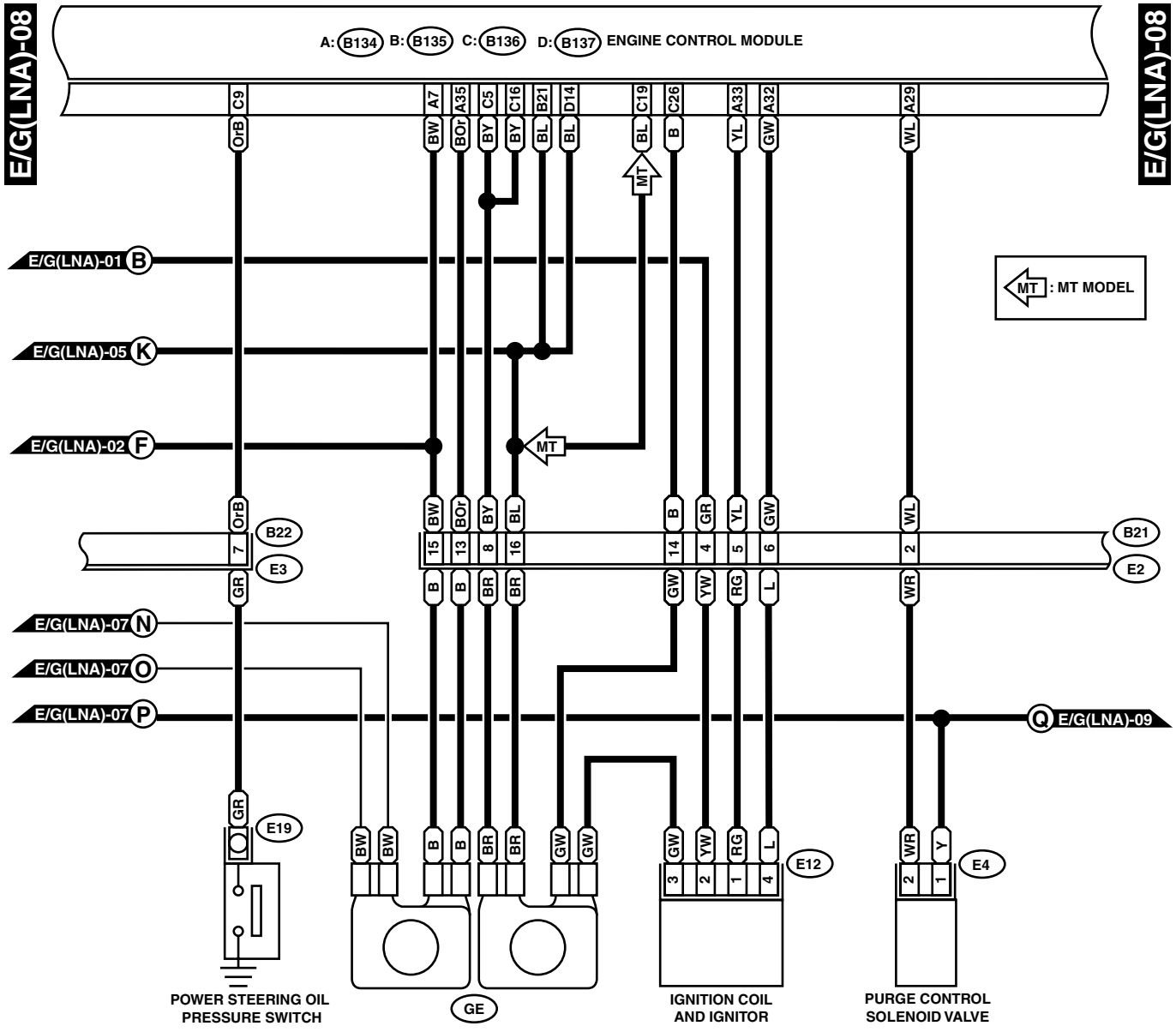

F26 (GREEN)
E13 (DARK BROWN)
T5 (GRAY)
B18 (GRAY)
T6 (GRAY)
B122
F2 (BLUE)
B22 (LIGHT GRAY)
D: B137 (GRAY)
C: B136 (GRAY)
B: B135 (GRAY)

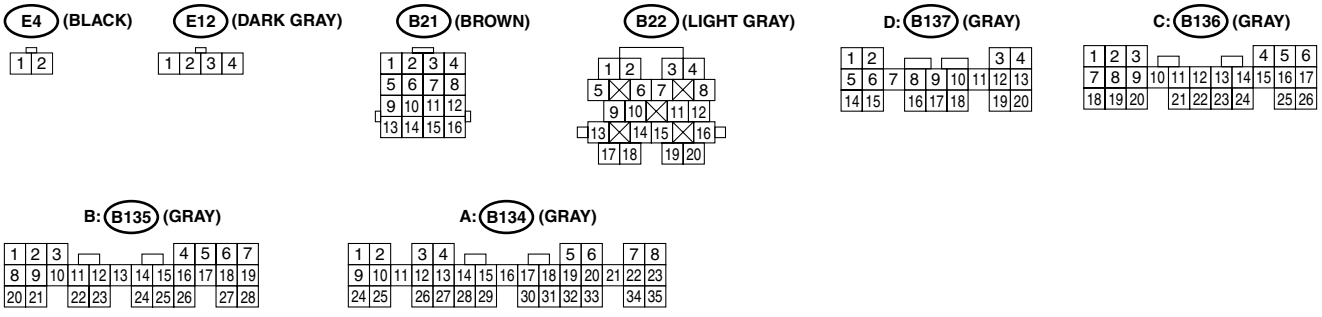
WI-00359


E/G(LNA)-07
A: B134 B: B135 D: B137 ENGINE CONTROL MODULE
E/G(LNA)-07
B22
E3
E/G(LNA)-02 G
E/G(LNA)-06 L
E/G(LNA)-06 M
N E/G(LNA)-08
O E/G(LNA)-08
P E/G(LNA)-08
E21
E20
E8
E14
E10
E15
E7
PRESSURE SENSOR
INTAKE AIR TEMPERATURE SENSOR
ENGINE COOLANT TEMPERATURE SENSOR AND THERMOMETER
KNOCK SENSOR
CRANKSHAFT POSITION SENSOR
CAMSHAFT POSITION SENSOR
IDLE AIR CONTROL SOLENOID VALVE

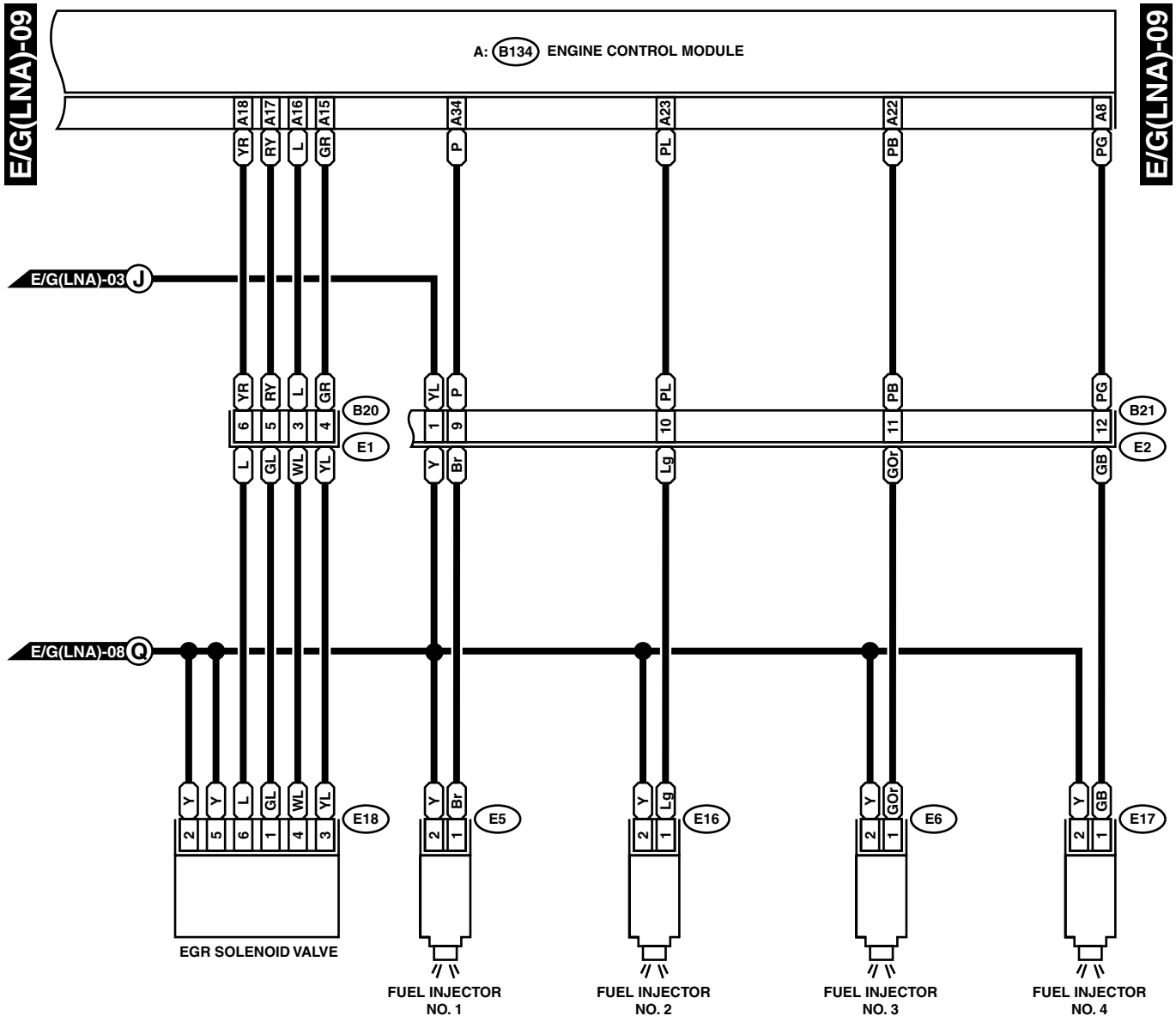

E10 (LIGHT GRAY)
E14 (LIGHT GRAY)
E15 (BLACK)
E20 (BLACK)
E8 (LIGHT GRAY)
E21 (LIGHT GRAY)
E7 (BLACK)
B22 (LIGHT GRAY)
D: B137 (GRAY)
B: B135 (GRAY)
A: B134 (GRAY)

WI-00360


E/G(LNA)-08
A: B134 B: B135 C: B136 D: B137 ENGINE CONTROL MODULE
E/G(LNA)-08
C9 A7 A35 C5 C16 B21 D14 C19 C26 A33 A32 A29
OrB BW BOr BY BY BL BL BL B YL GW WL
MT
E/G(LNA)-01 B
E/G(LNA)-05 K
E/G(LNA)-02 F
MT : MT MODEL
B22
E3
B21
E2
E/G(LNA)-07 N
E/G(LNA)-07 O
E/G(LNA)-07 P
Q E/G(LNA)-09
E19
E12
E4
POWER STEERING OIL PRESSURE SWITCH
GE
IGNITION COIL AND IGNITOR
PURGE CONTROL SOLENOID VALVE


E4 (BLACK)
E12 (DARK GRAY)
B21 (BROWN)
B22 (LIGHT GRAY)
D: B137 (GRAY)
C: B136 (GRAY)
B: B135 (GRAY)
A: B134 (GRAY)

WI-00361



E5 (LIGHT GRAY)
E6 (LIGHT GRAY)
E16 (LIGHT GRAY)
E17 (LIGHT GRAY)

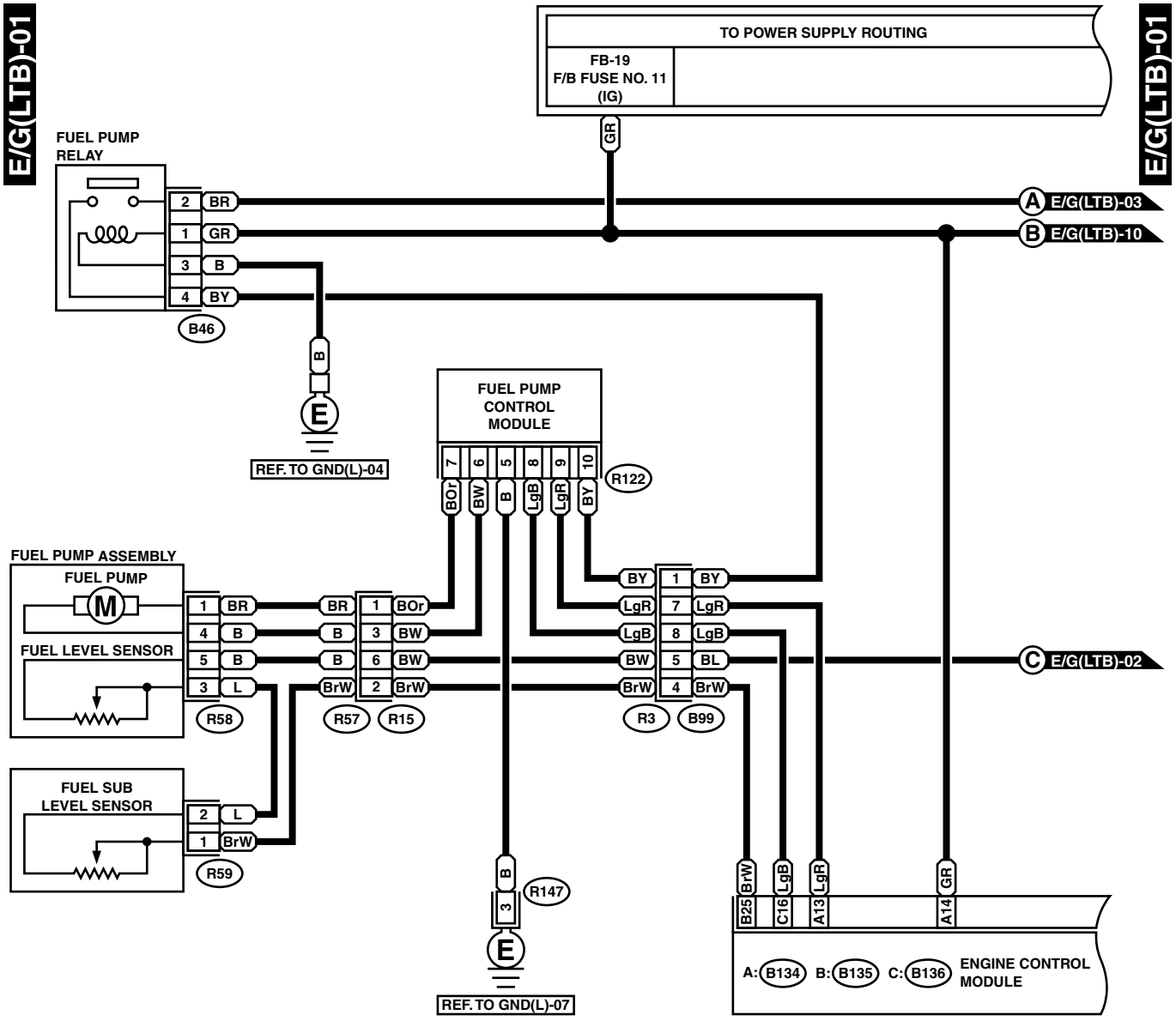
B20 (BLACK)
E18 (LIGHT GRAY)

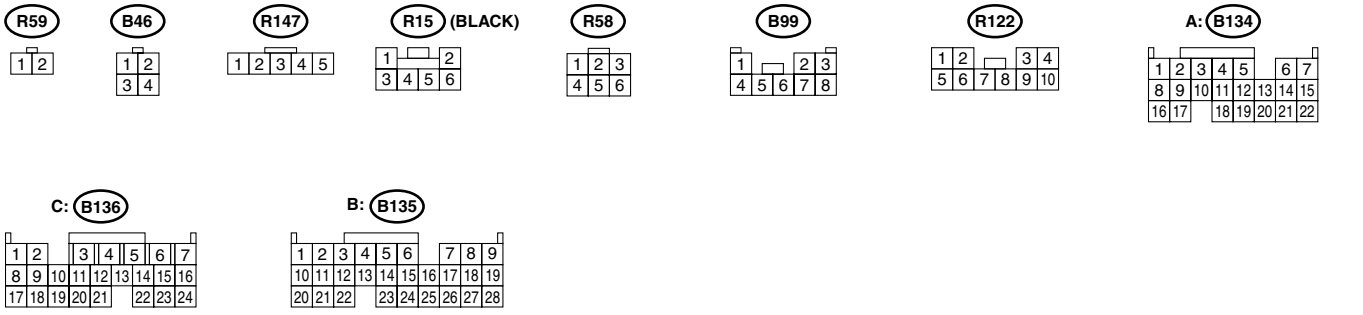
B21 (BROWN)

A: B134 (GRAY)

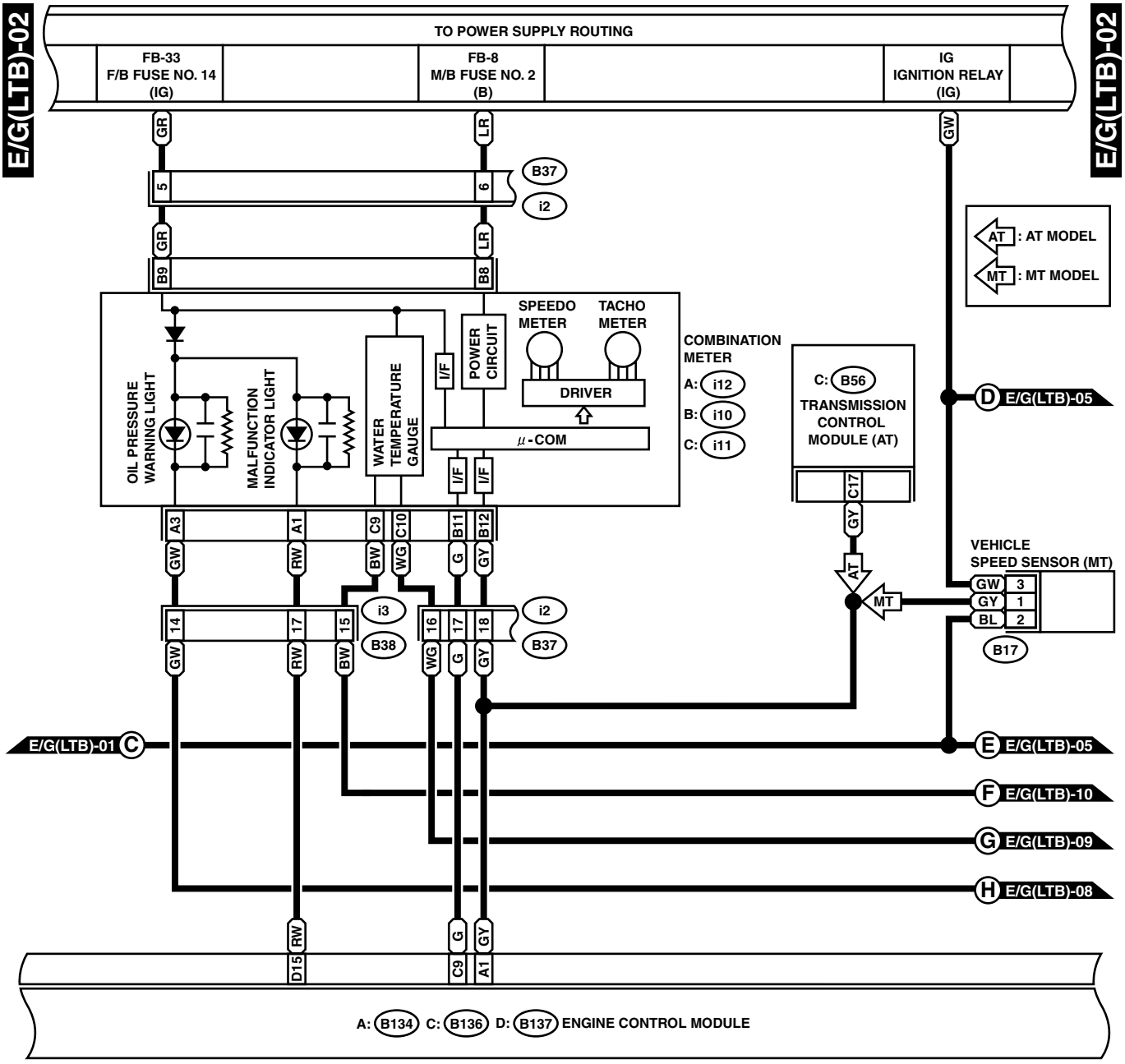
WI-00362

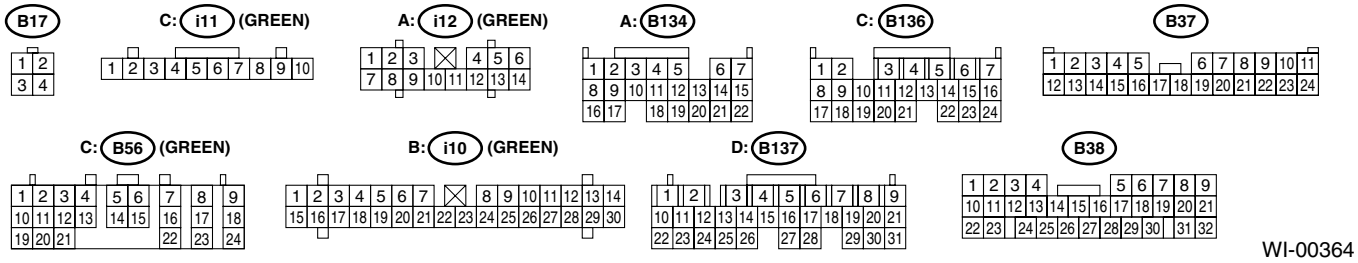
2. LHD TURBO MODEL



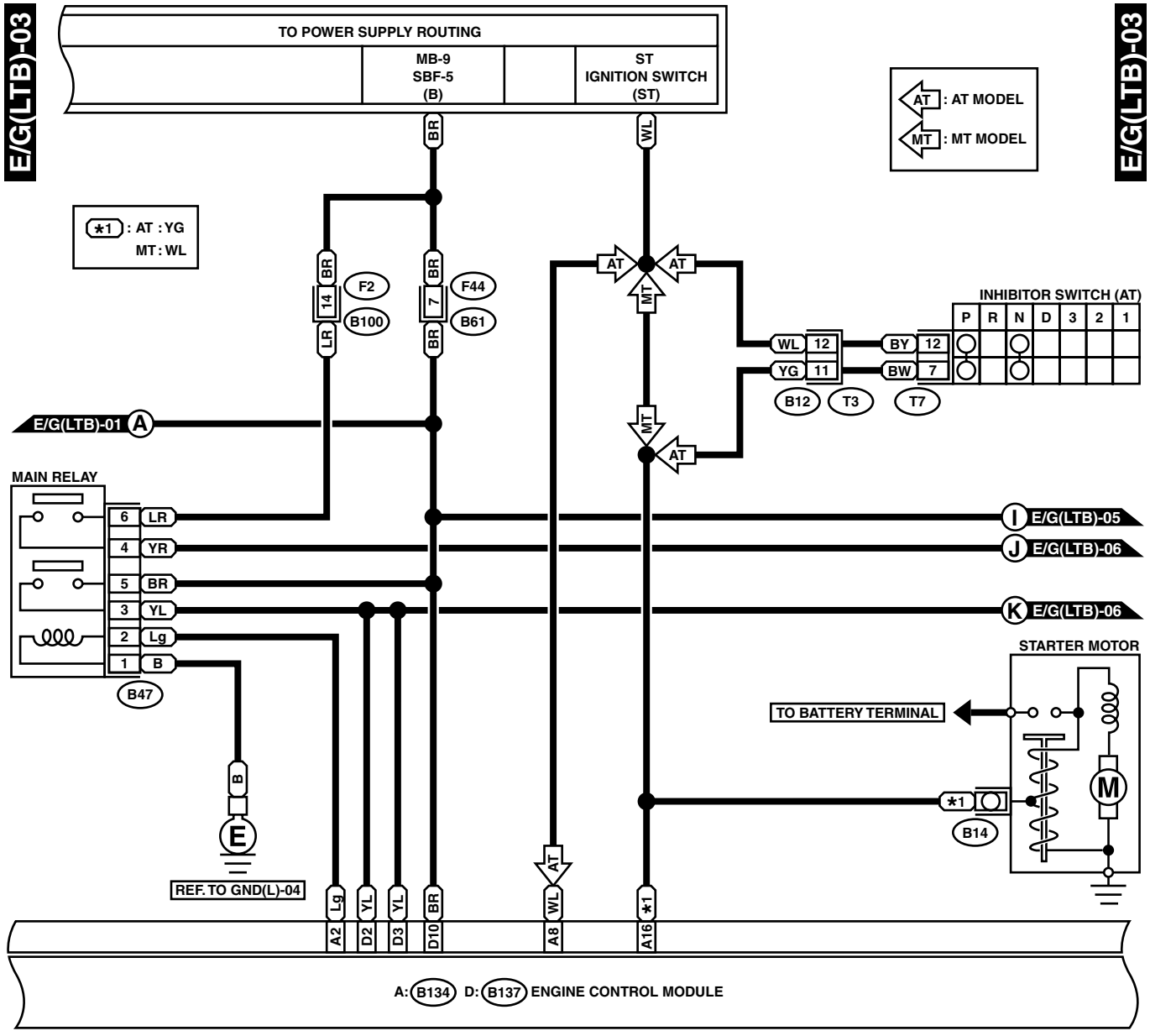


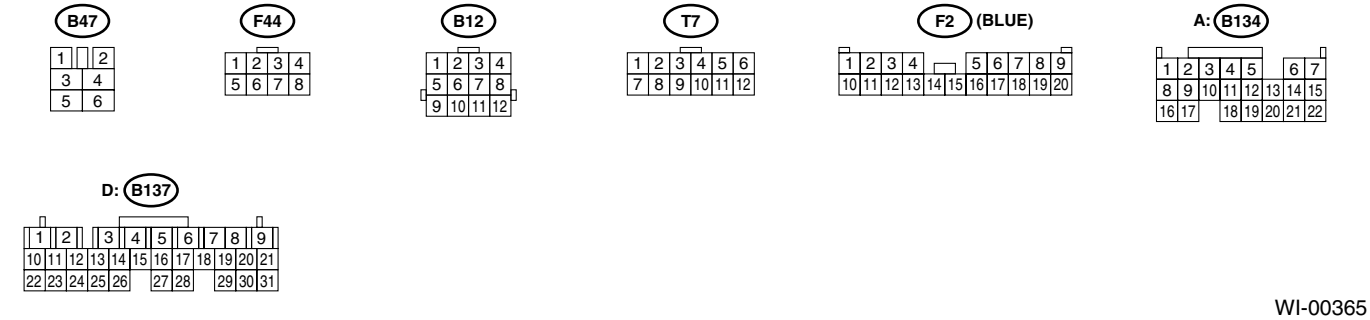
WI-00363


E/G(LTB)-02
TO POWER SUPPLY ROUTING
FB-33
F/B FUSE NO. 14
(IG)
FB-8
M/B FUSE NO. 2
(B)
IG
IGNITION RELAY
(IG)
E/G(LTB)-02
GR
LR
GW
B37
i2
AT : AT MODEL
MT : MT MODEL
B9
B8
SPEEDO METER
TACHO METER
COMBINATION METER
A: i12
B: i10
C: i11
OIL PRESSURE WARNING LIGHT
MALFUNCTION INDICATOR LIGHT
WATER TEMPERATURE GAUGE
I/F
POWER CIRCUIT
DRIVER
μ-COM
C: B56
TRANSMISSION CONTROL MODULE (AT)
D E/G(LTB)-05
C17
GY
AT
MT
VEHICLE SPEED SENSOR (MT)
GW 3
GY 1
BL 2
B17
A3
A1
C9
C10
B11
B12
RW
BW
WG
G
i3
B38
E/G(LTB)-01 C
E E/G(LTB)-05
F E/G(LTB)-10
G E/G(LTB)-09
H E/G(LTB)-08
D15
A: B134 C: B136 D: B137 ENGINE CONTROL MODULE


B17
C: i11 (GREEN)
A: i12 (GREEN)
A: B134
C: B136
B37
C: B56 (GREEN)
B: i10 (GREEN)
D: B137
B38

WI-00364

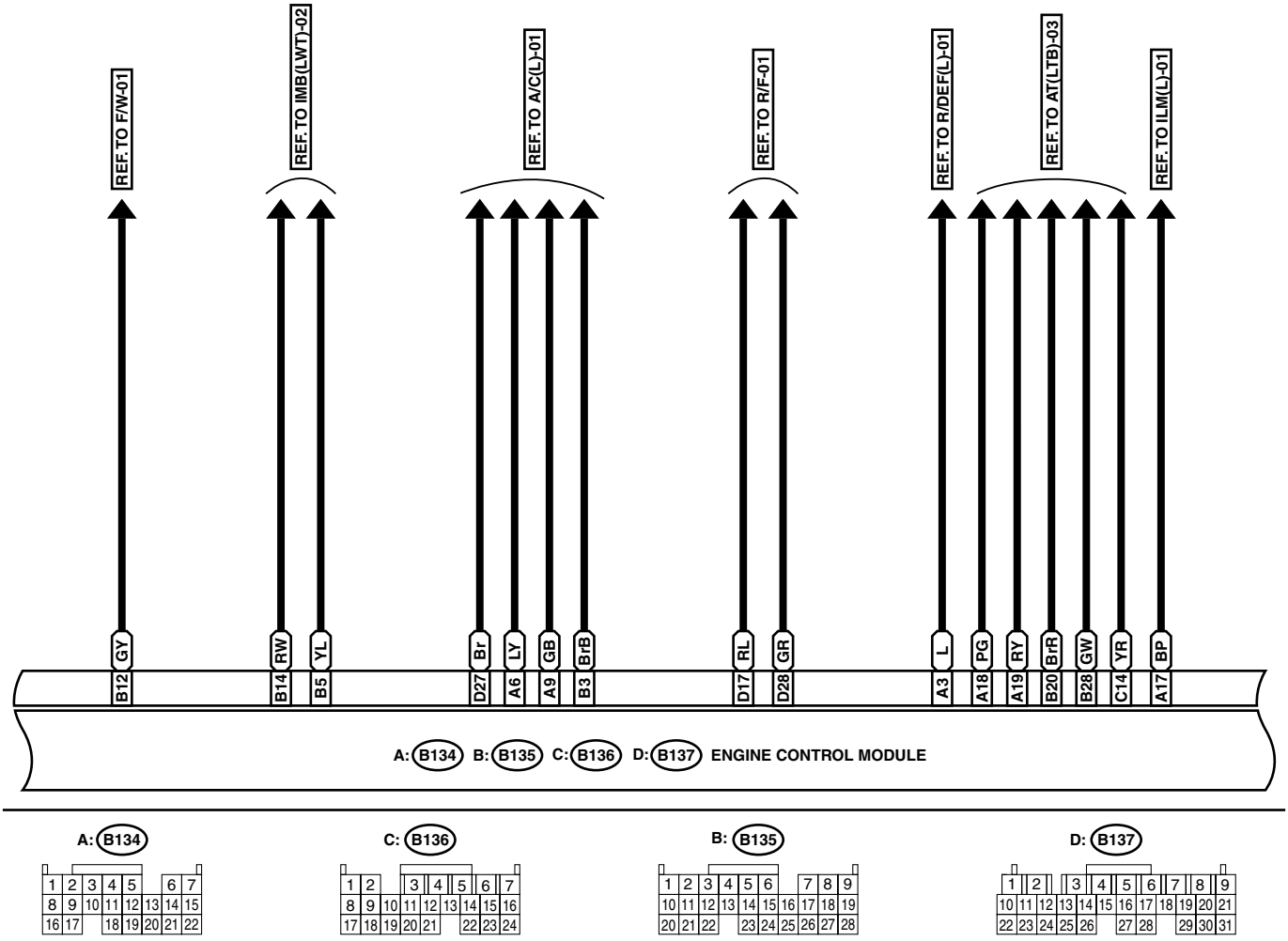

E/G(LTB)-03
TO POWER SUPPLY ROUTING
MB-9
SBF-5
(B)
ST
IGNITION SWITCH
(ST)
AT : AT MODEL
MT : MT MODEL
*1 : AT : YG
MT : WL
INHIBITOR SWITCH (AT)
P R N D 3 2 1
E/G(LTB)-01 A
MAIN RELAY
E/G(LTB)-05 I
E/G(LTB)-06 J
E/G(LTB)-06 K
STARTER MOTOR
TO BATTERY TERMINAL
B47
B14
REF. TO GND(L)-04
A: B134 D: B137 ENGINE CONTROL MODULE


B47
F44
B12
T7
F2 (BLUE)
A: B134
D: B137

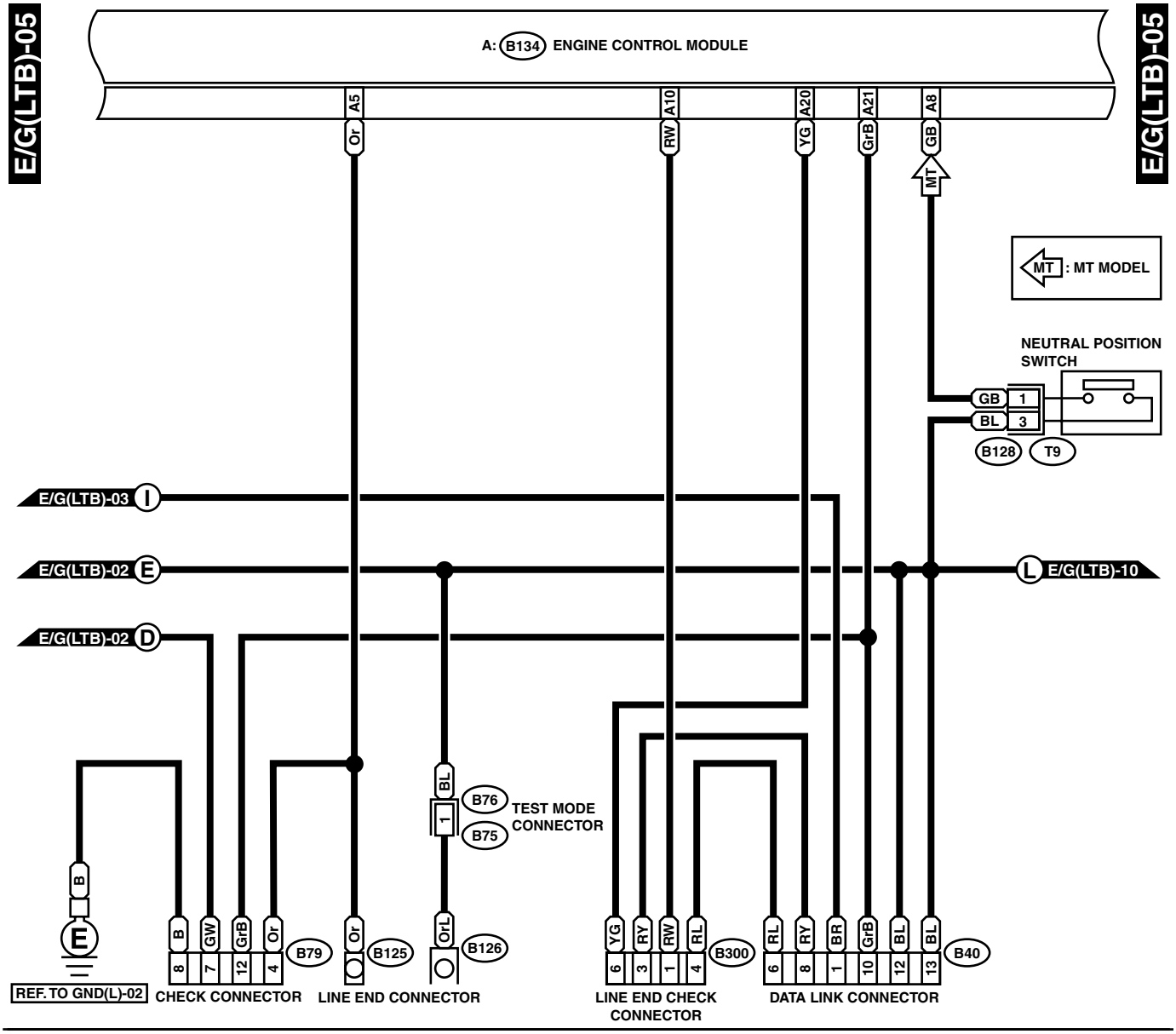
WI-00365

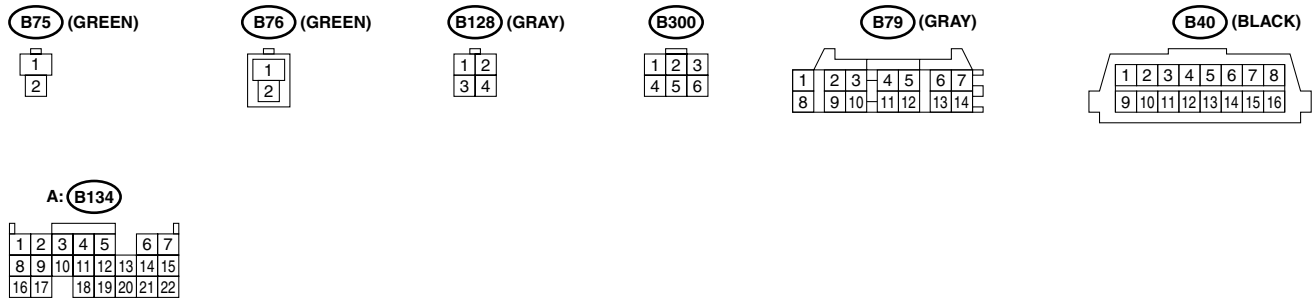
E/G(LTB)-04

E/G(LTB)-04



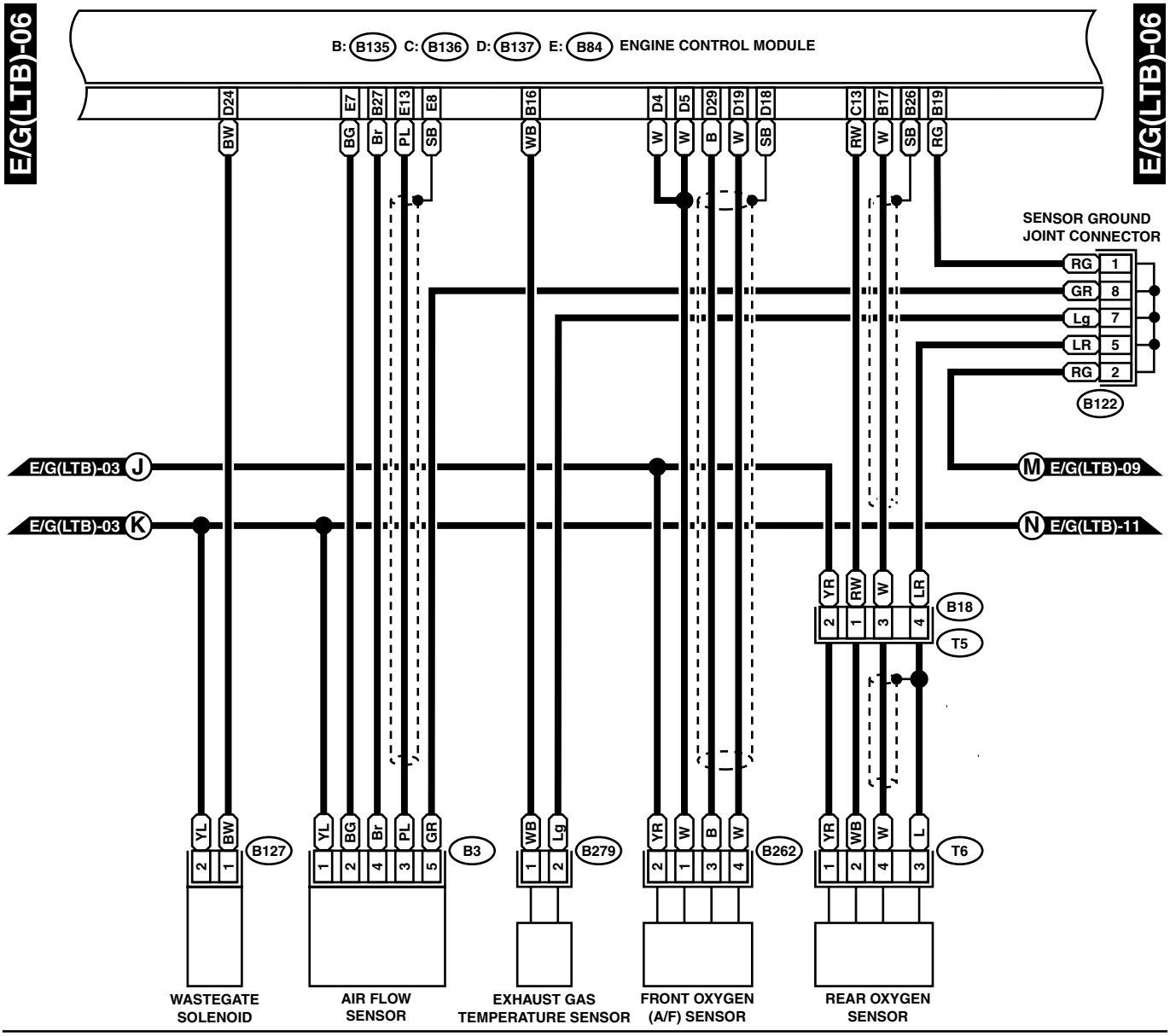
WI-00366

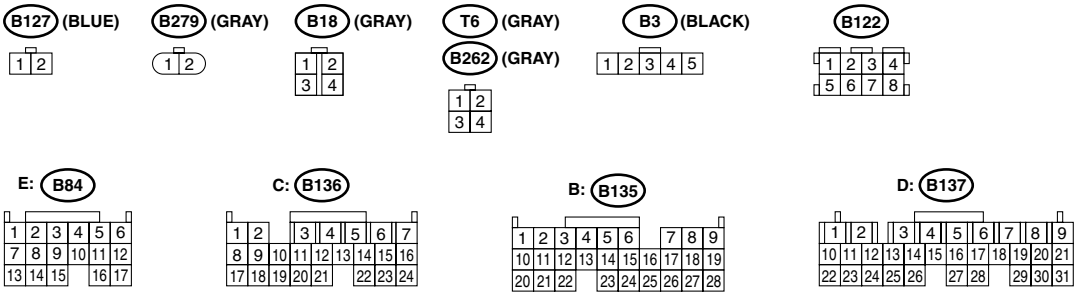

E/G(LTB)-05
E/G(LTB)-05
A: B134 ENGINE CONTROL MODULE
A5
A10
A20
A21
A8
Or
RW
YG
GrB
GB
MT
MT : MT MODEL
NEUTRAL POSITION SWITCH
GB
BL
1
3
B128
T9
E/G(LTB)-03 I
E/G(LTB)-02 E
E/G(LTB)-02 D
L E/G(LTB)-10
BL
B76
1
B75
TEST MODE CONNECTOR
B
E
REF. TO GND(L)-02
B
GW
GrB
Or
B79
CHECK CONNECTOR
Or
B125
LINE END CONNECTOR
OrL
B126
YG
RY
RW
RL
B300
LINE END CHECK CONNECTOR
RL
RY
BR
GrB
BL
BL
B40
DATA LINK CONNECTOR


B75 (GREEN)
B76 (GREEN)
B128 (GRAY)
B300
B79 (GRAY)
B40 (BLACK)

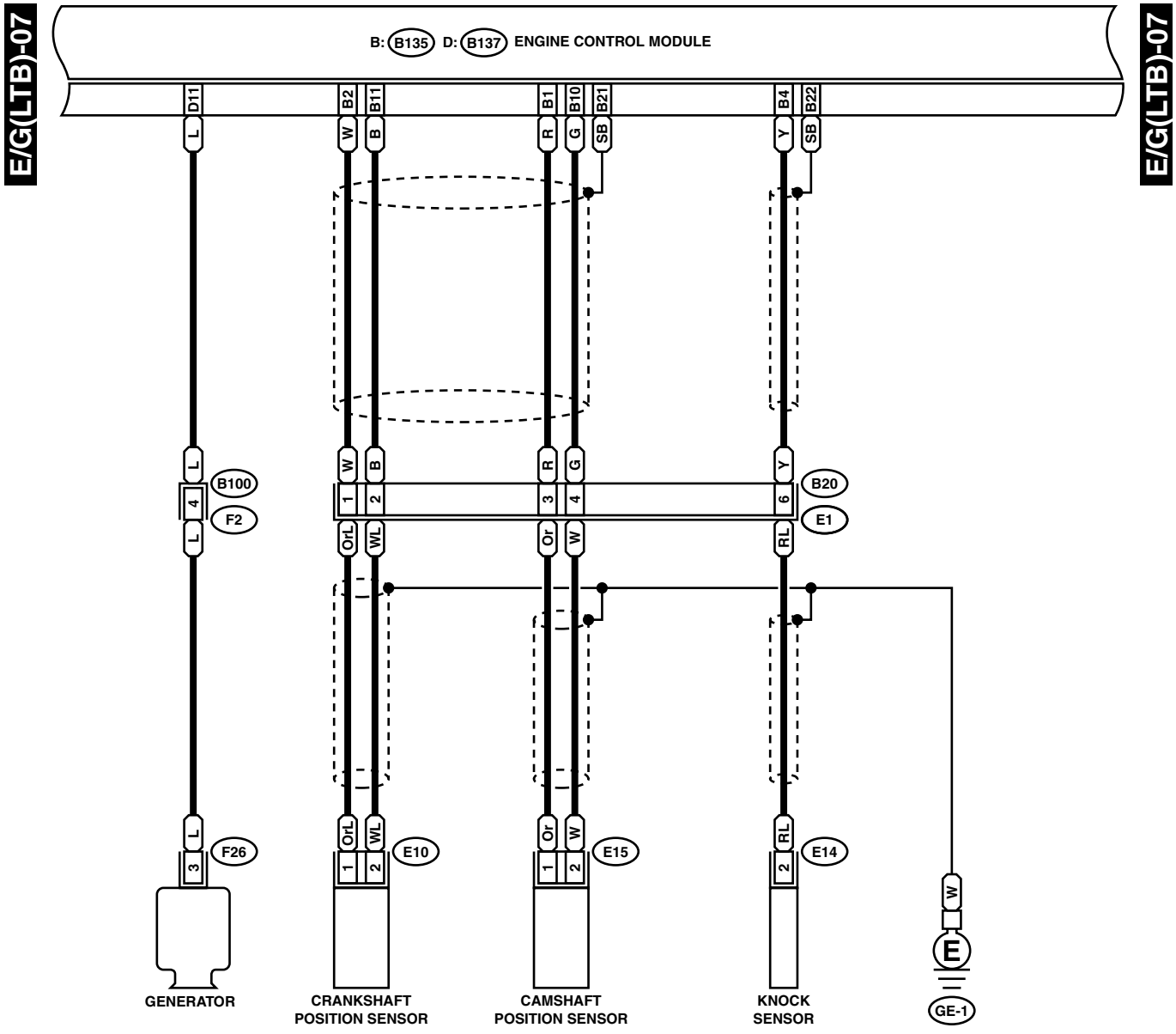
A: B134

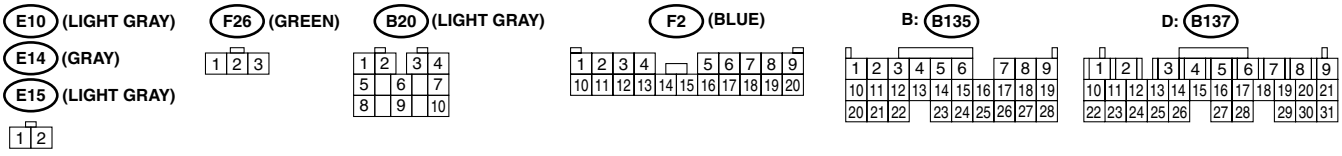
WI-00367


E/G(LTB)-06
E/G(LTB)-06
B: B135 C: B136 D: B137 E: B84 ENGINE CONTROL MODULE
D24 E7 B27 E13 E8 B16 D4 D5 D29 D19 D18 C13 B17 B26 B19
BW BG Br PL SB WB W W B W SB RW W SB RG
SENSOR GROUND JOINT CONNECTOR
RG 1
GR 8
Lg 7
LR 5
RG 2
B122
E/G(LTB)-03 J
E/G(LTB)-03 K
M E/G(LTB)-09
N E/G(LTB)-11
YR RW W LR
2 1 3 4
B18
T5
YL BW
2 1
B127
YL BG Br PL GR
1 2 4 3 5
B3
WB Lg
1 2
B279
YR W B W
2 1 3 4
B262
YR WB W L
1 2 4 3
T6
WASTEGATE SOLENOID
AIR FLOW SENSOR
EXHAUST GAS TEMPERATURE SENSOR
FRONT OXYGEN (A/F) SENSOR
REAR OXYGEN SENSOR

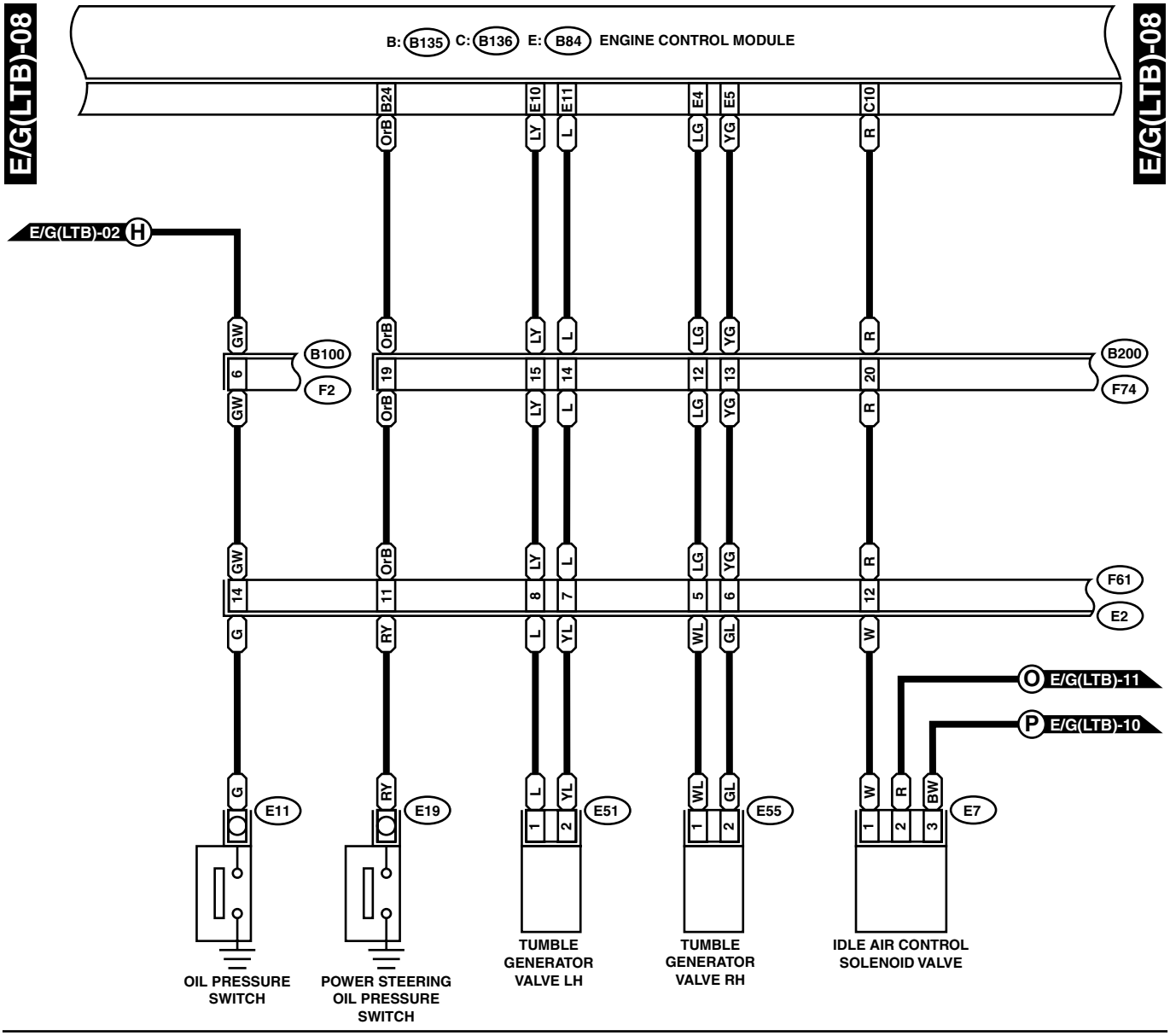

B127 (BLUE)
B279 (GRAY)
B18 (GRAY)
T6 (GRAY)
B262 (GRAY)
B3 (BLACK)
B122
E: B84
C: B136
B: B135
D: B137

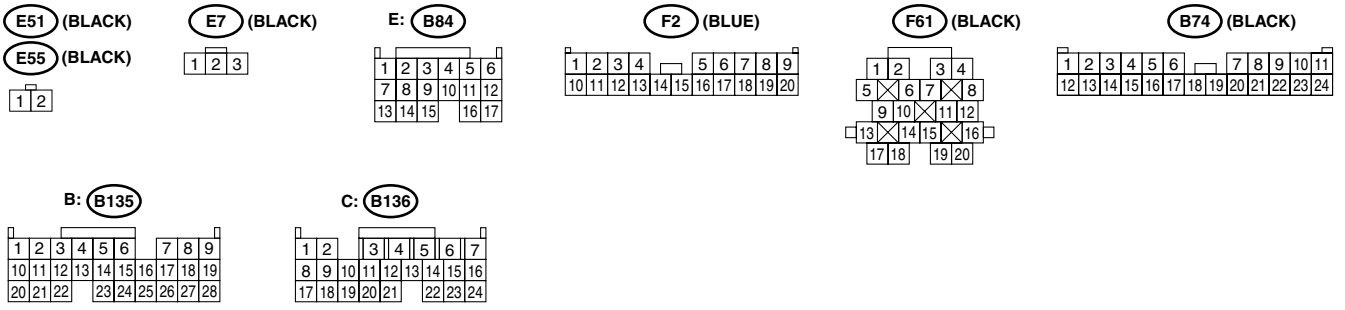
WI-00368


E/G(LTB)-07
E/G(LTB)-07
B: B135 D: B137 ENGINE CONTROL MODULE
D11
B2
B11
B1
B10
B21
B4
B22
L
W
B
R
G
SB
Y
SB
B100
F2
B20
E1
OrL
WL
Or
W
RL
F26
E10
E15
E14
GENERATOR
CRANKSHAFT POSITION SENSOR
CAMSHAFT POSITION SENSOR
KNOCK SENSOR
GE-1

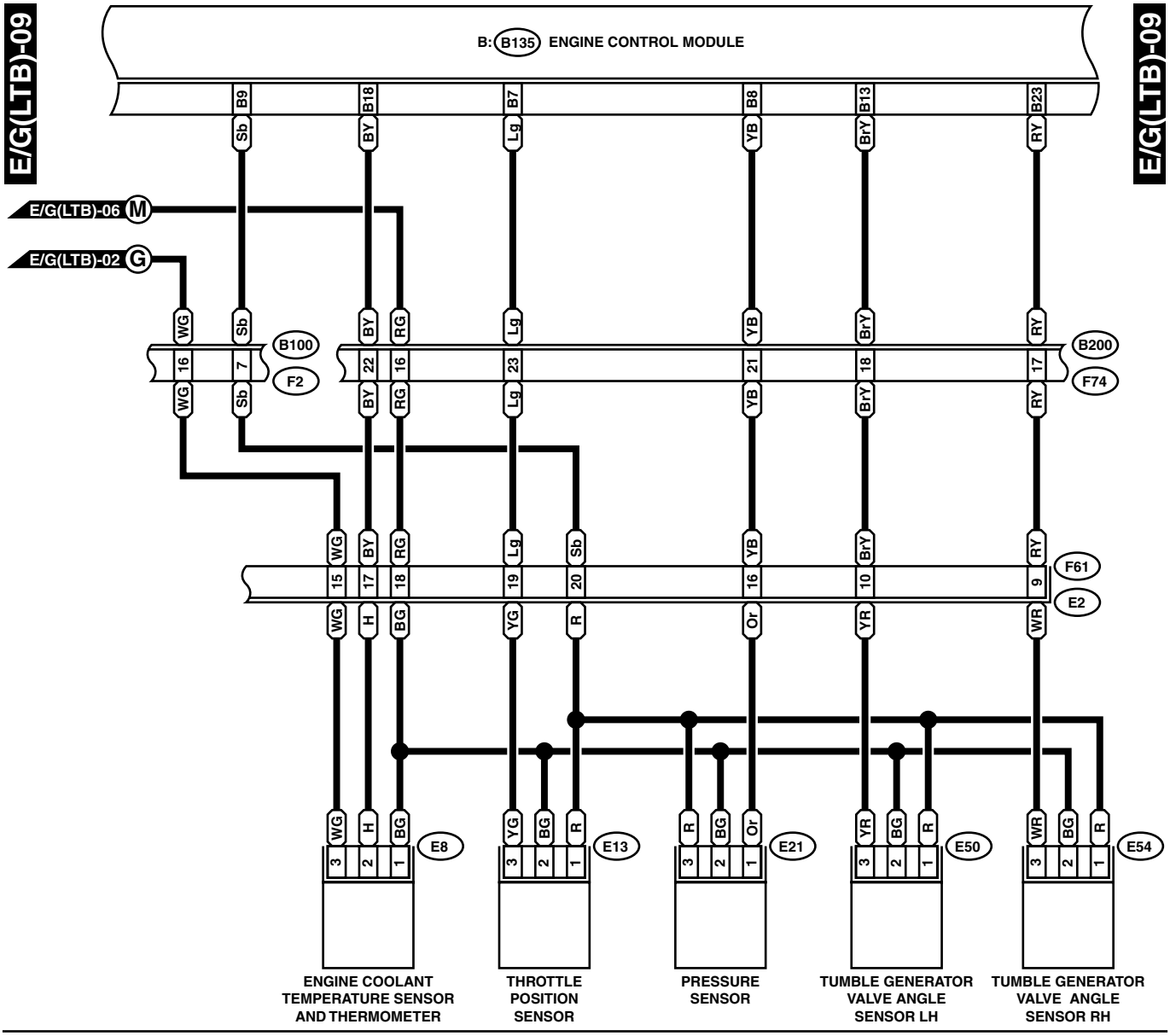

E10 (LIGHT GRAY)
E14 (GRAY)
E15 (LIGHT GRAY)
F26 (GREEN)
B20 (LIGHT GRAY)
F2 (BLUE)
B: B135
D: B137

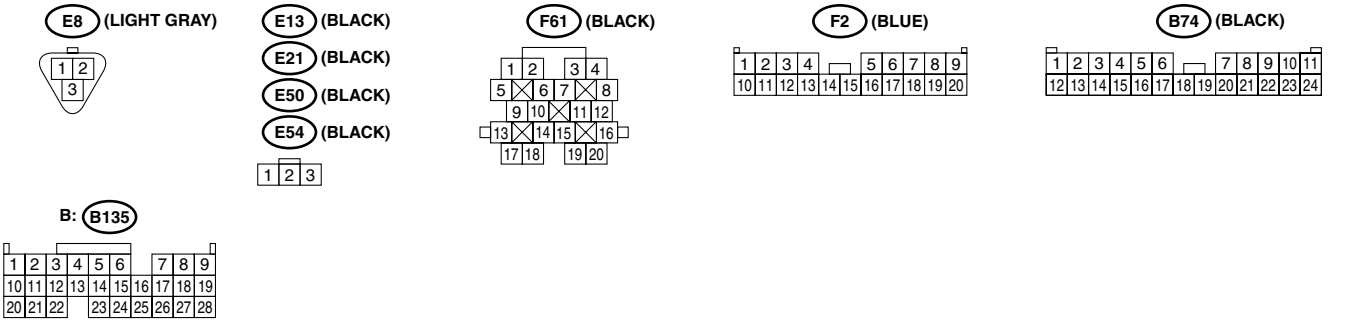
WI-00369


E/G(LTB)-08
B: B135 C: B136 E: B84 ENGINE CONTROL MODULE
E/G(LTB)-08
E/G(LTB)-02 H
B100
F2
B200
F74
F61
E2
O E/G(LTB)-11
P E/G(LTB)-10
E11
E19
E51
E55
E7
OIL PRESSURE SWITCH
POWER STEERING OIL PRESSURE SWITCH
TUMBLE GENERATOR VALVE LH
TUMBLE GENERATOR VALVE RH
IDLE AIR CONTROL SOLENOID VALVE

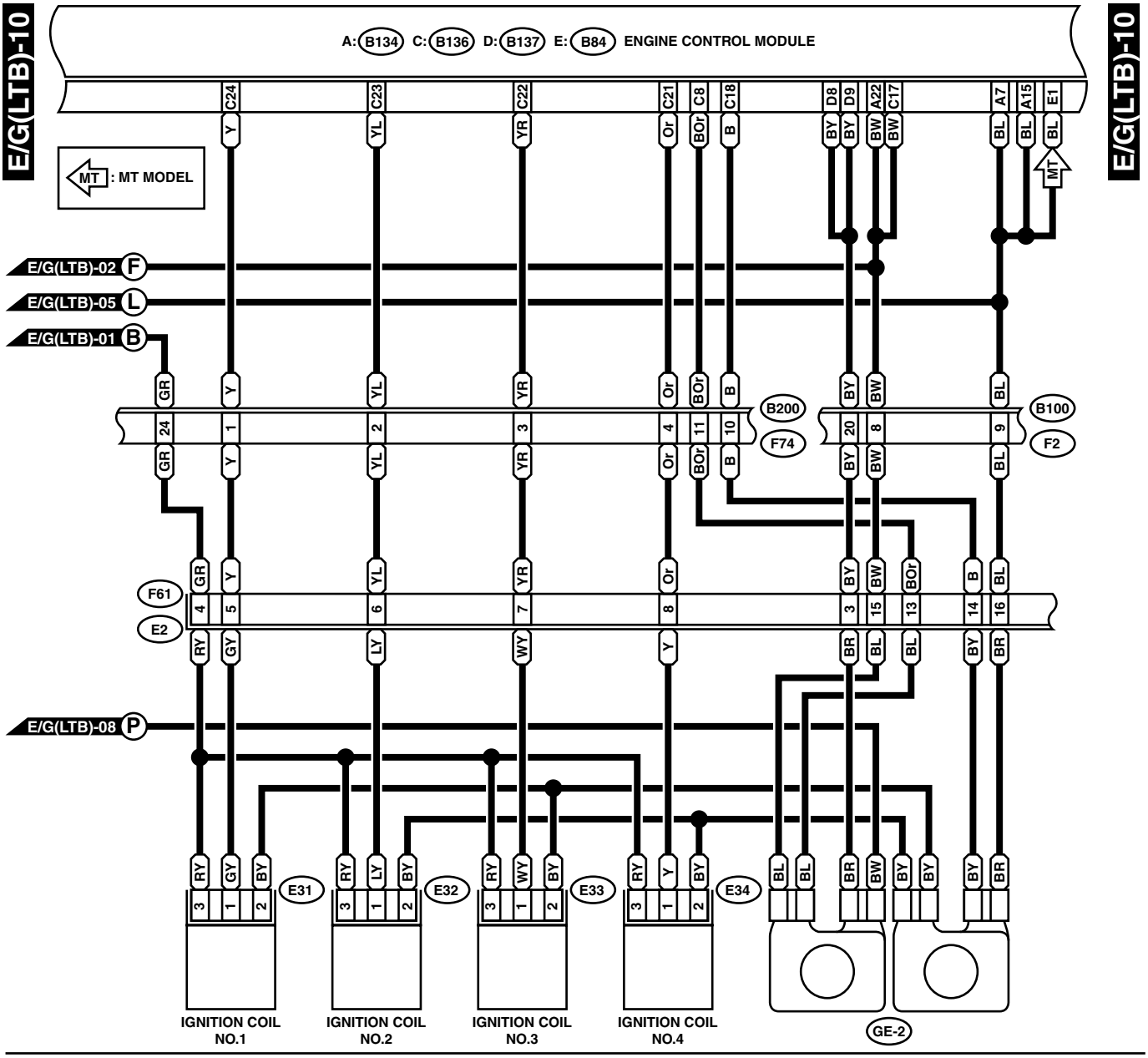

E51 (BLACK)
E55 (BLACK)
E7 (BLACK)
E: B84
F2 (BLUE)
F61 (BLACK)
B74 (BLACK)
B: B135
C: B136

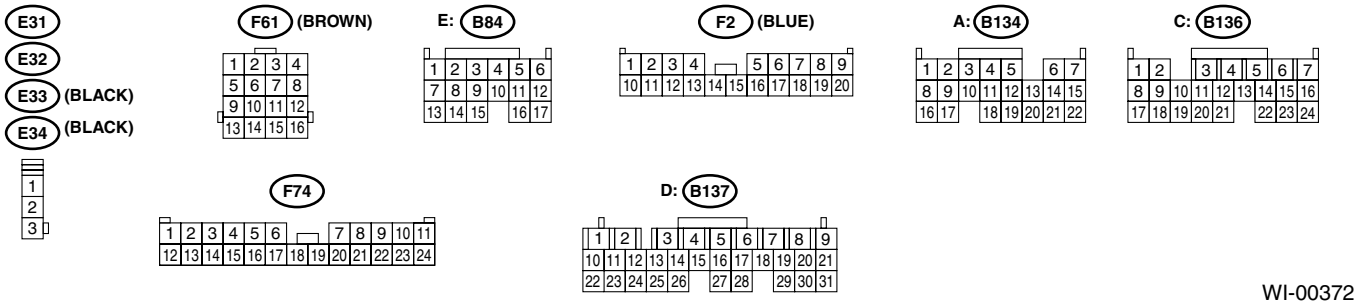
WI-00370


E/G(LTB)-09
E/G(LTB)-09
B: B135 ENGINE CONTROL MODULE
B9 Sb
B18 BY
B7 Lg
B8 YB
B13 BrY
B23 RY
E/G(LTB)-06 M
E/G(LTB)-02 G
WG Sb BY RG Lg YB BrY RY
B100
F2
16 7 22 16 23 21 18 17
B200
F74
WG Sb BY RG Lg YB BrY RY
WG BY RG Lg Sb YB BrY RY
F61
E2
15 17 18 19 20 16 10 9
WG H BG YG R Or YR WR
E8
E13
E21
E50
E54
3 2 1
ENGINE COOLANT TEMPERATURE SENSOR AND THERMOMETER
THROTTLE POSITION SENSOR
PRESSURE SENSOR
TUMBLE GENERATOR VALVE ANGLE SENSOR LH
TUMBLE GENERATOR VALVE ANGLE SENSOR RH

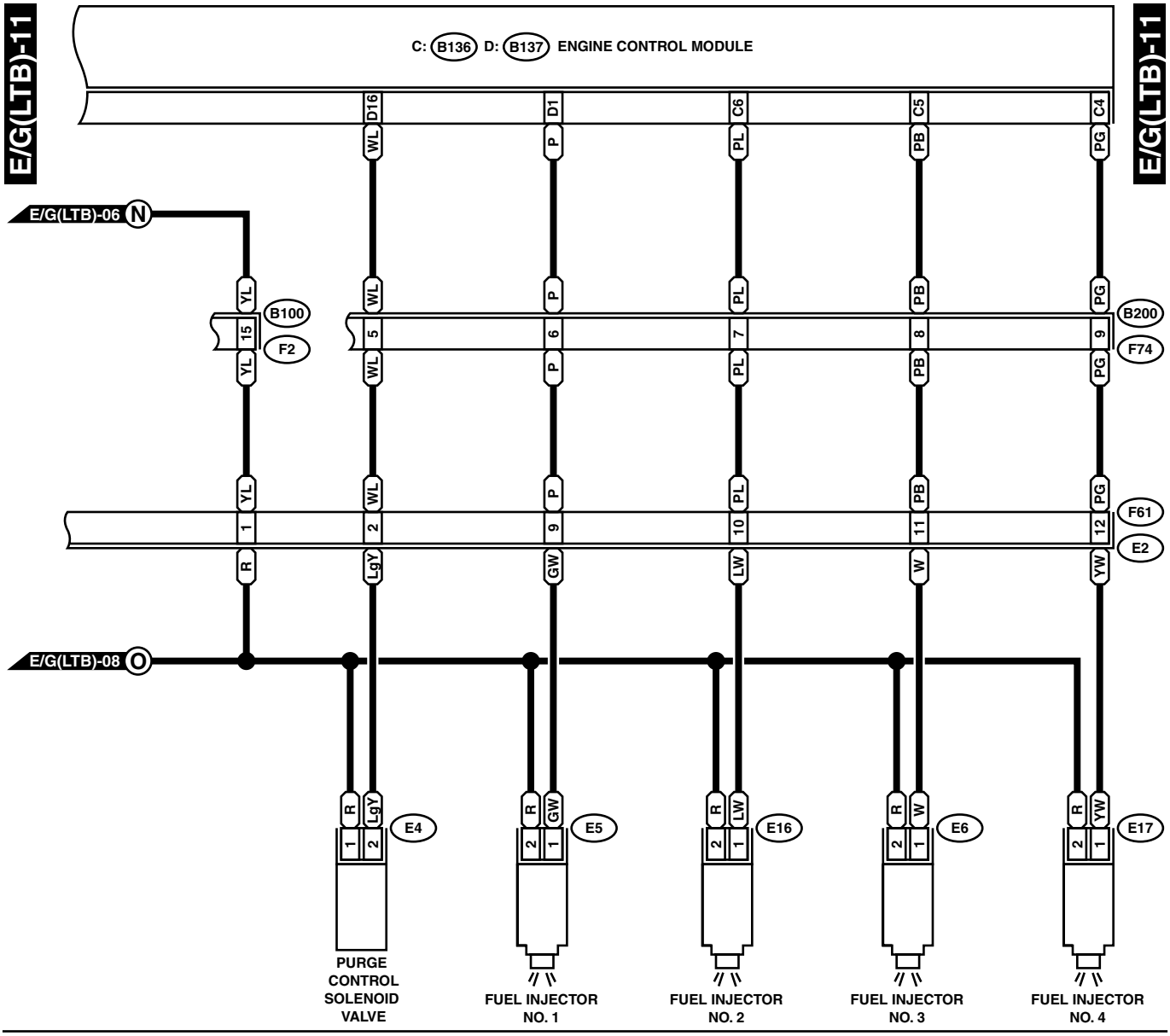

E8 (LIGHT GRAY)
E13 (BLACK)
E21 (BLACK)
E50 (BLACK)
E54 (BLACK)
F61 (BLACK)
F2 (BLUE)
B74 (BLACK)
B: B135

WI-00371


E/G(LTB)-10
A: B134 C: B136 D: B137 E: B84 ENGINE CONTROL MODULE
C24 C23 C22 C21 C8 C18 D8 D9 A22 C17 A7 A15 E1
MT : MT MODEL
E/G(LTB)-02 F
E/G(LTB)-05 L
E/G(LTB)-01 B
B200
F74
B100
F2
F61
E2
E/G(LTB)-08 P
E31
E32
E33
E34
IGNITION COIL NO.1
IGNITION COIL NO.2
IGNITION COIL NO.3
IGNITION COIL NO.4
GE-2


E31
E32
E33 (BLACK)
E34 (BLACK)
F61 (BROWN)
E: B84
F2 (BLUE)
A: B134
C: B136
F74
D: B137

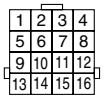
WI-00372



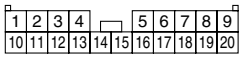
E5 (DARK GRAY)
E6 (DARK GRAY)
E16 (DARK GRAY)
E17 (DARK GRAY)

E4 (BLACK)

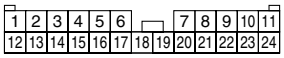
F61 (BROWN)



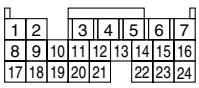
F2 (BLUE)



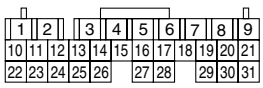
F74



C: B136

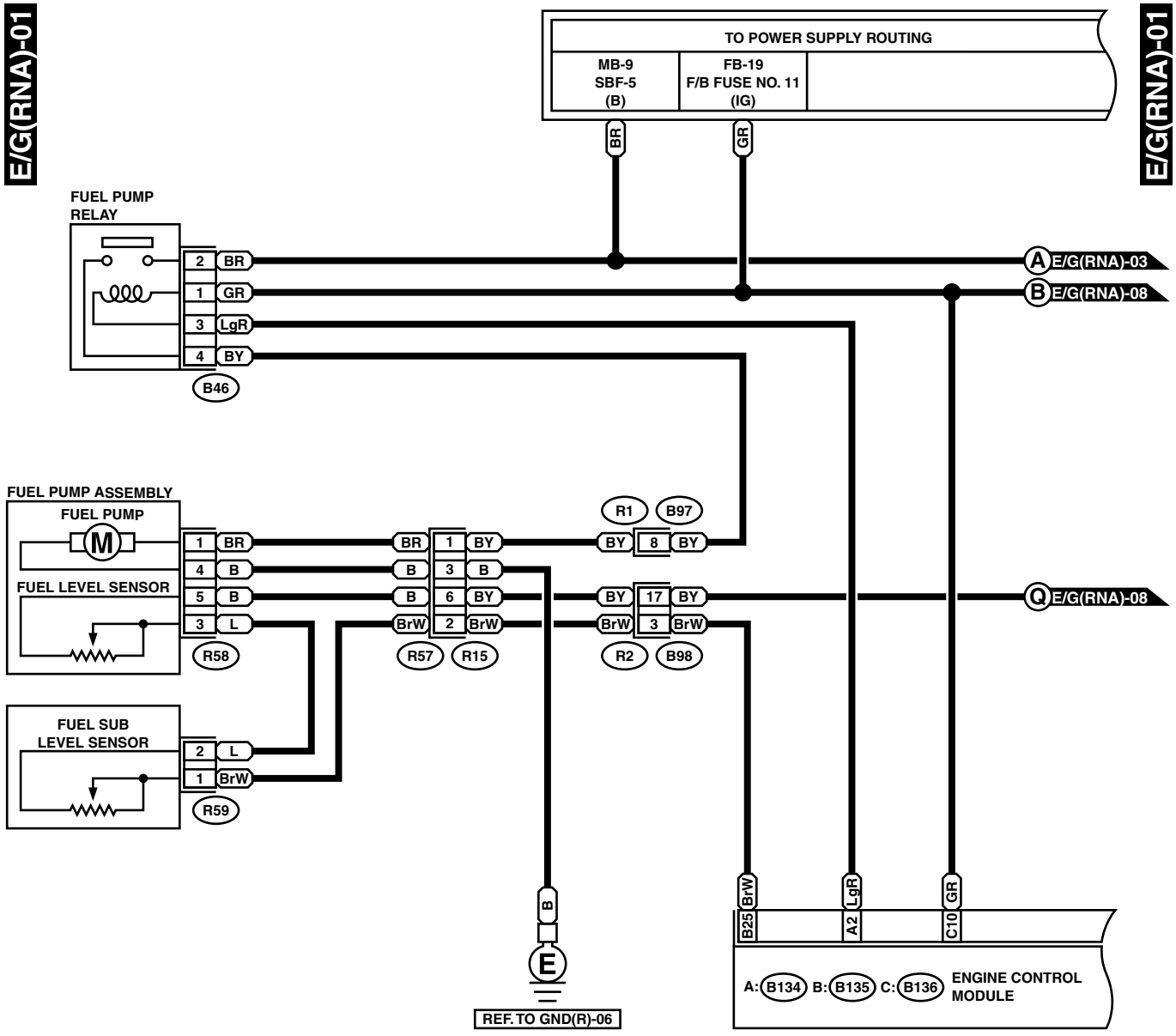


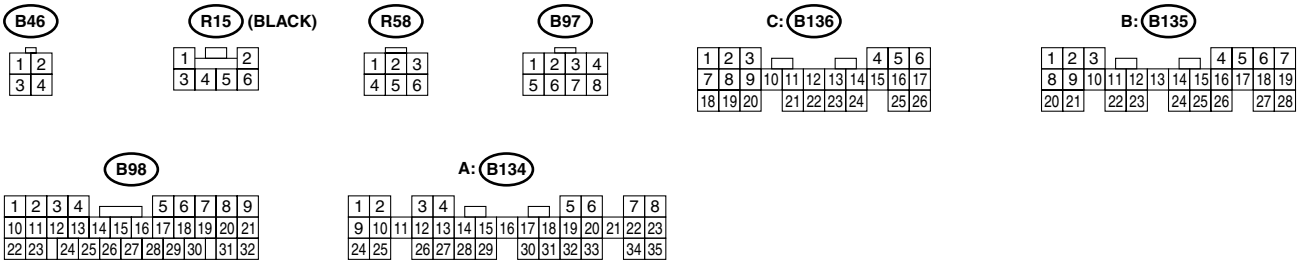
D: B137



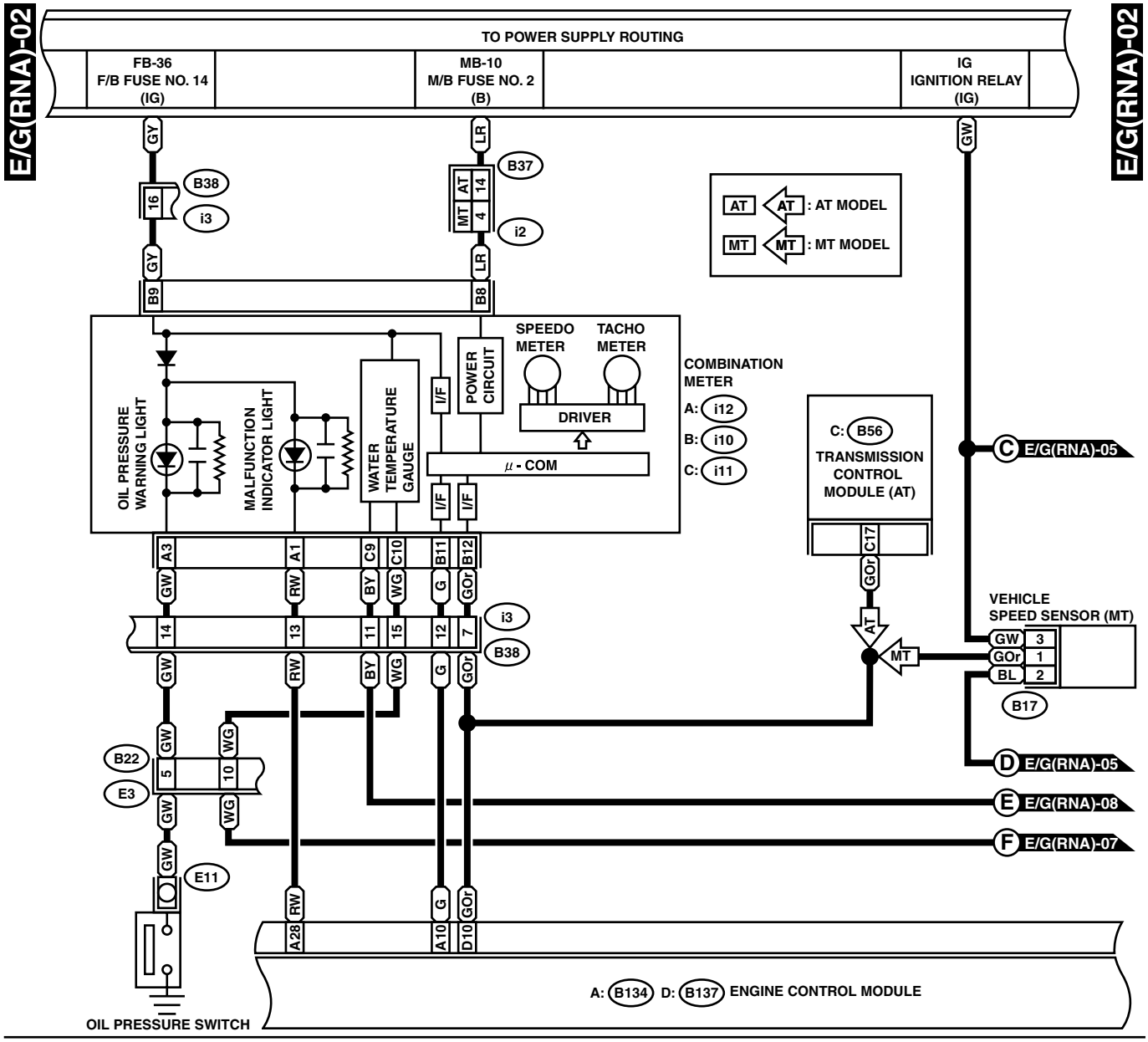
WI-00373

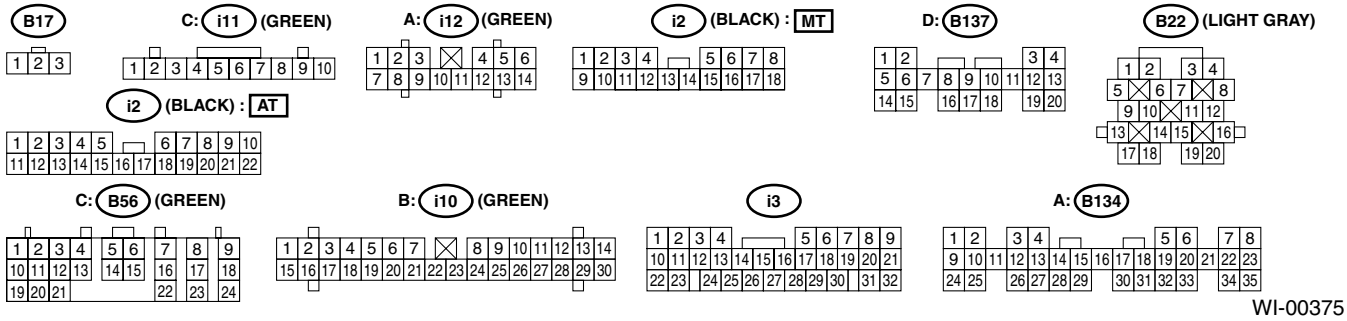
3. RHD NON-TURBO MODEL



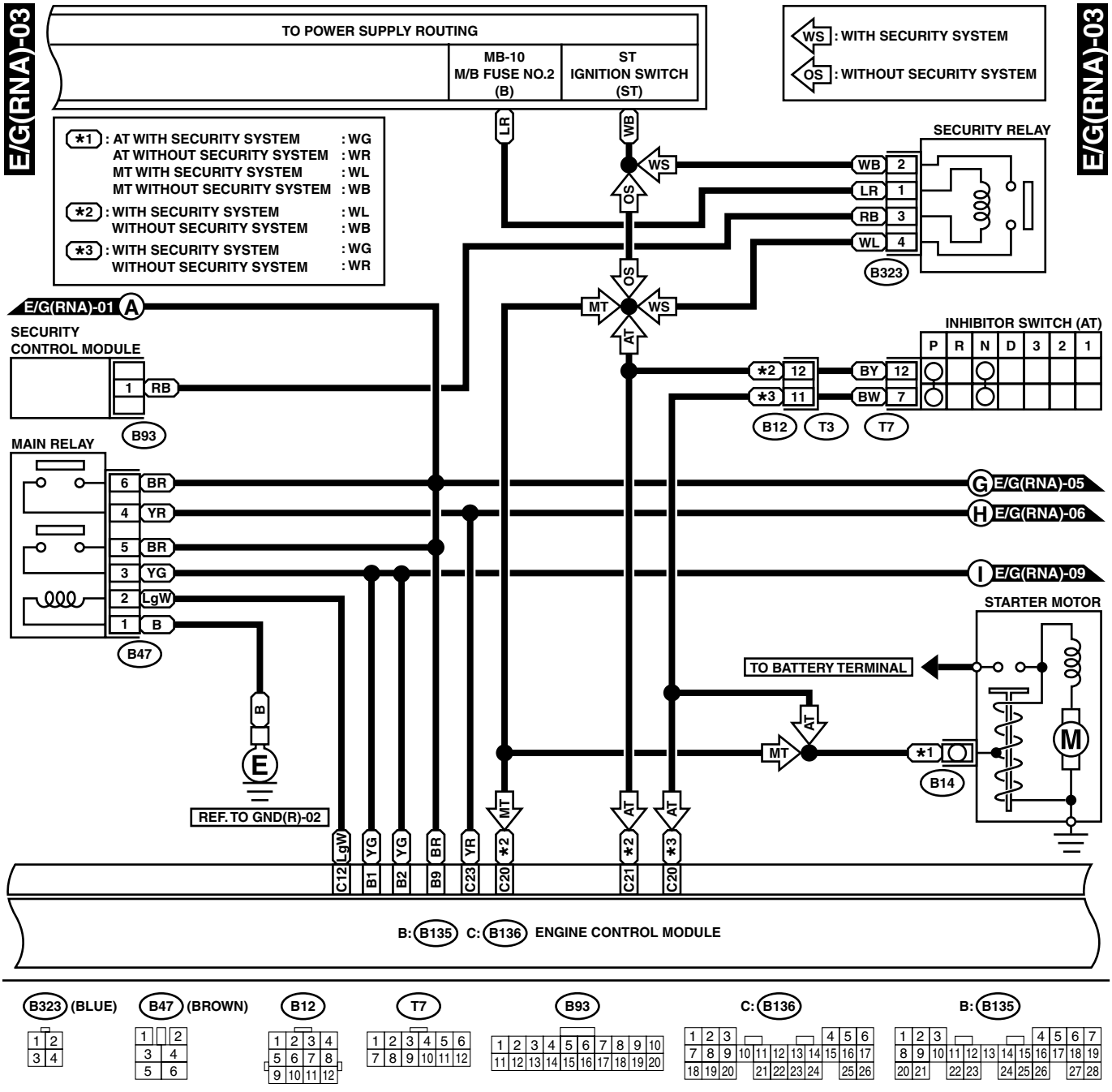


WI-00374


E/G(RNA)-02
E/G(RNA)-02
TO POWER SUPPLY ROUTING
FB-36
F/B FUSE NO. 14
(IG)
MB-10
M/B FUSE NO. 2
(B)
IG
IGNITION RELAY
(IG)
AT : AT MODEL
MT : MT MODEL
B37
B38
i3
i2
B9
B8
SPEEDO METER
TACHO METER
COMBINATION METER
A: i12
B: i10
C: i11
DRIVER
POWER CIRCUIT
OIL PRESSURE WARNING LIGHT
MALFUNCTION INDICATOR LIGHT
WATER TEMPERATURE GAUGE
I/F
μ - COM
C: B56
TRANSMISSION CONTROL MODULE (AT)
C17
C E/G(RNA)-05
VEHICLE SPEED SENSOR (MT)
GW 3
GOr 1
BL 2
B17
D E/G(RNA)-05
E E/G(RNA)-08
F E/G(RNA)-07
B22
E3
E11
OIL PRESSURE SWITCH
A: B134 D: B137 ENGINE CONTROL MODULE


B17
C: i11 (GREEN)
A: i12 (GREEN)
i2 (BLACK) : MT
D: B137
B22 (LIGHT GRAY)
i2 (BLACK) : AT
C: B56 (GREEN)
B: i10 (GREEN)
i3
A: B134

WI-00375

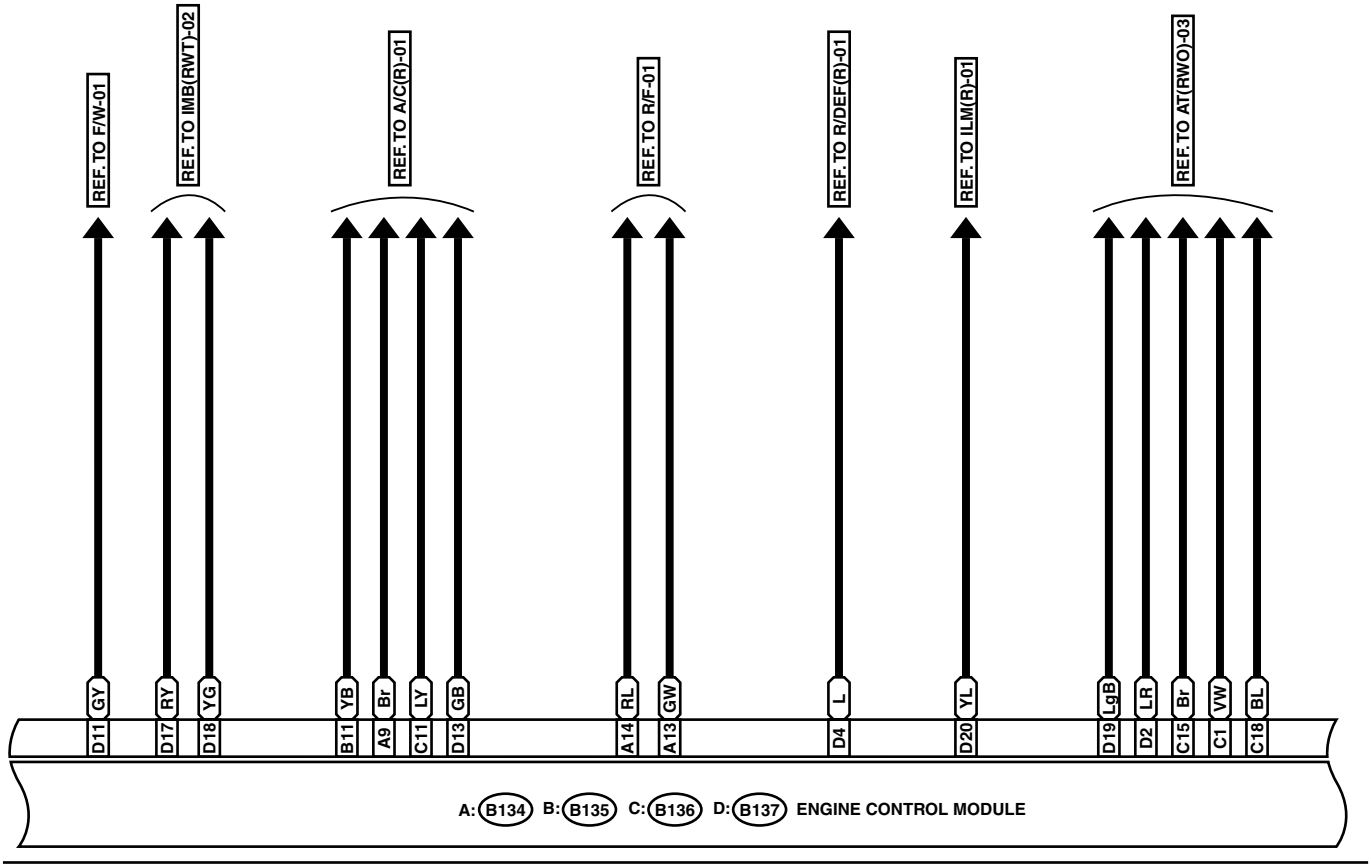


B323 (BLUE) B47 (BROWN) B12 T7 B93 C: B136 B: B135

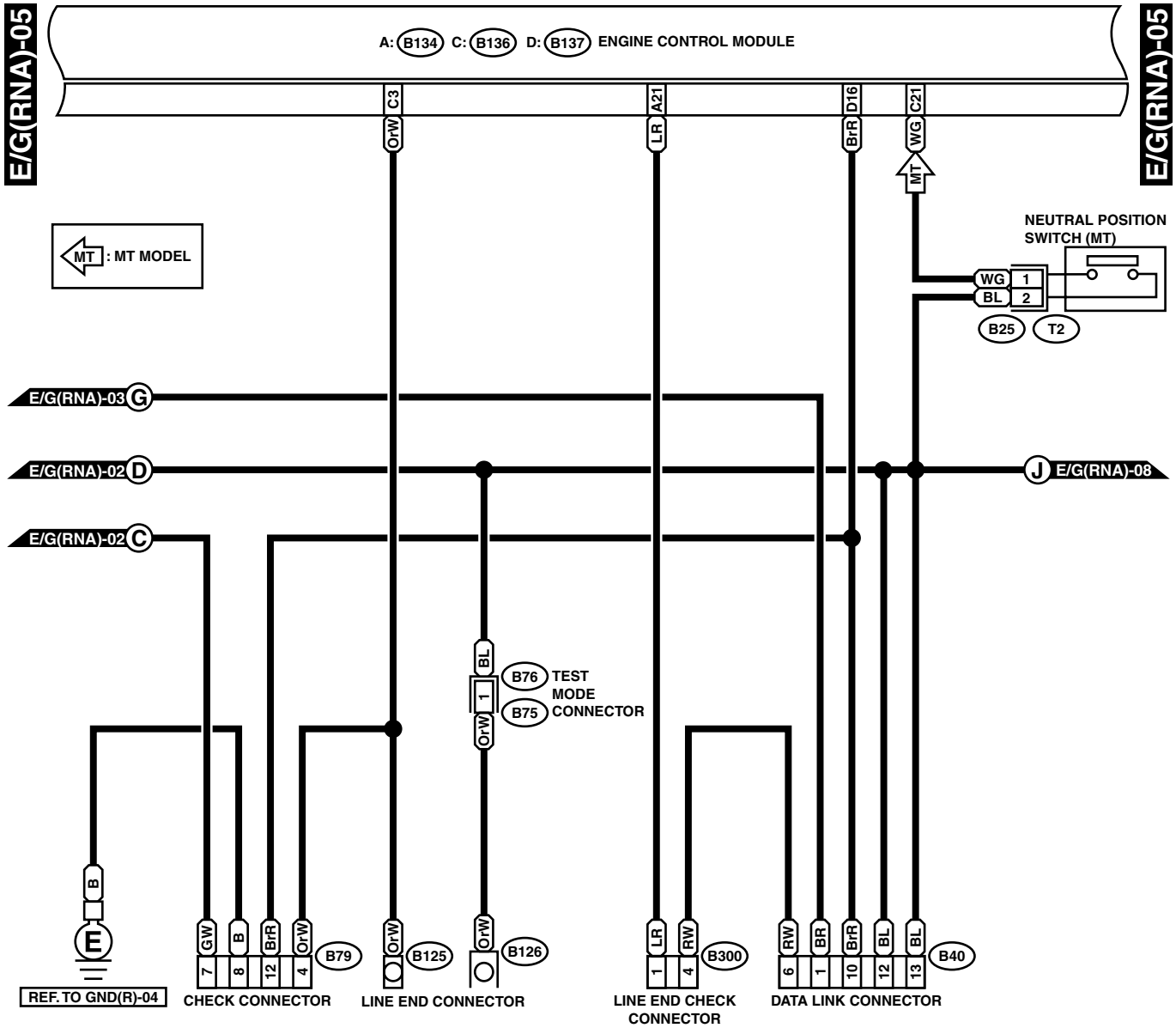
WI-00376

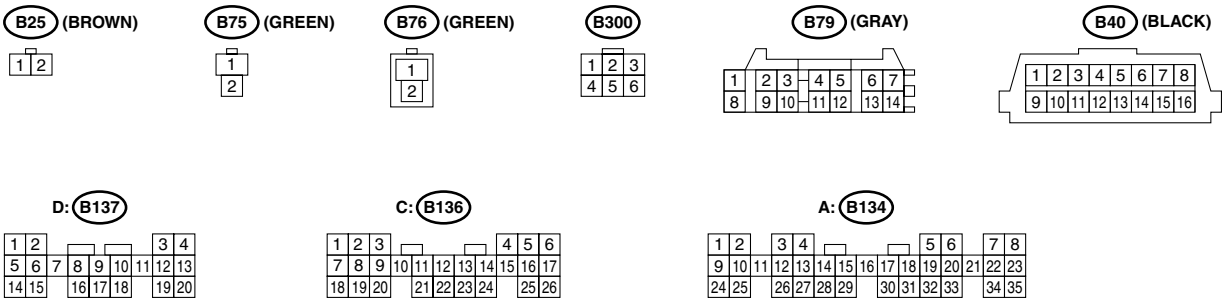
E/G(RNA)-04

E/G(RNA)-04



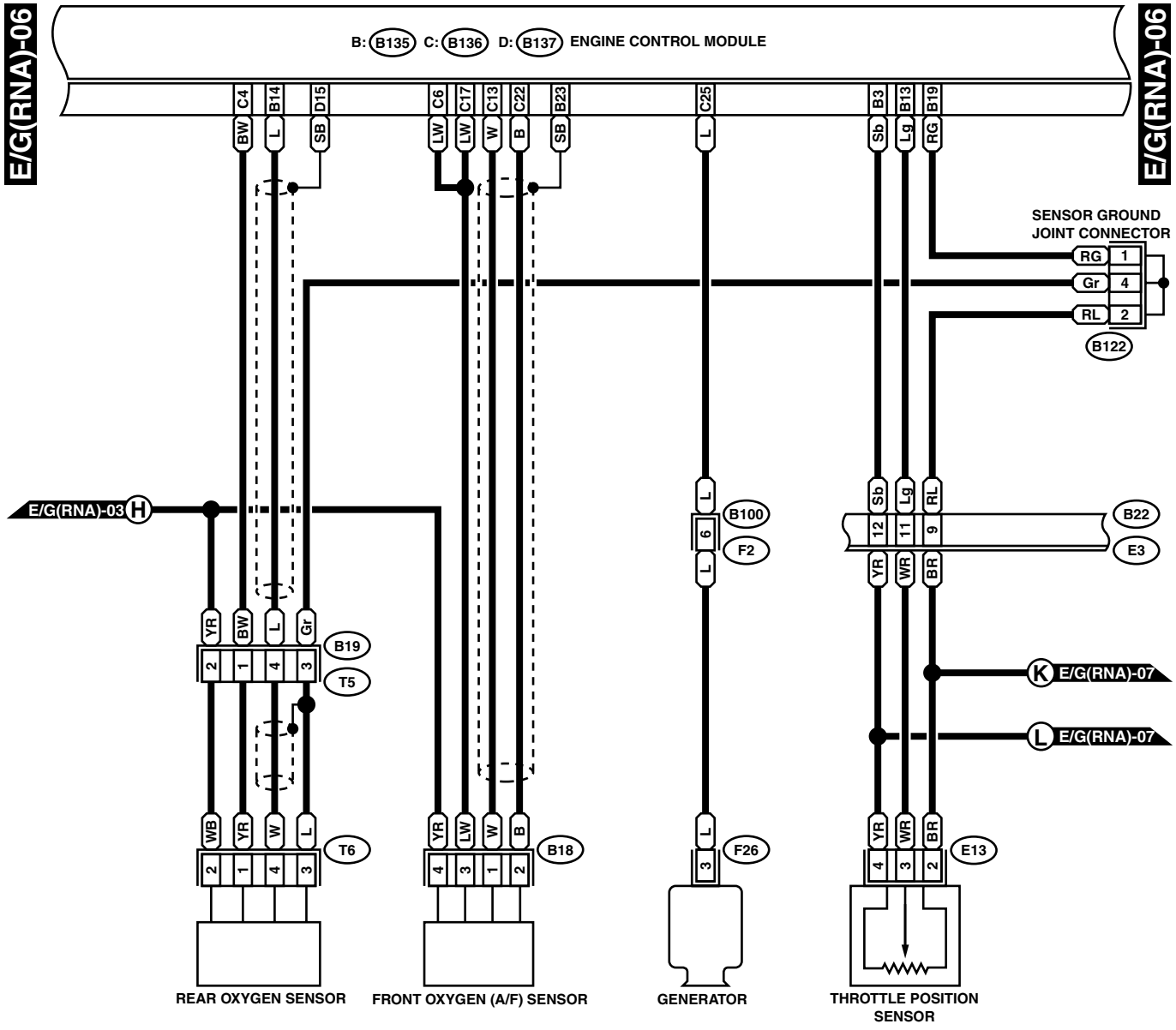
WI-00377


E/G(RNA)-05
A: B134 C: B136 D: B137 ENGINE CONTROL MODULE
E/G(RNA)-05
C3
A21
D16
C21
OrW
LR
BrR
WG
MT
MT : MT MODEL
NEUTRAL POSITION SWITCH (MT)
WG 1
BL 2
B25
T2
E/G(RNA)-03 G
E/G(RNA)-02 D
J E/G(RNA)-08
E/G(RNA)-02 C
BL
B76 TEST MODE CONNECTOR
B75
1
OrW
B
E
REF. TO GND(R)-04
GW
B
BrR
OrW
7
8
12
4
B79
CHECK CONNECTOR
OrW
B125
OrW
B126
LINE END CONNECTOR
LR
RW
1
4
B300
LINE END CHECK CONNECTOR
RW
BR
BrR
BL
BL
6
1
10
12
13
B40
DATA LINK CONNECTOR


B25 (BROWN)
1 2
B75 (GREEN)
1
2
B76 (GREEN)
1
2
B300
1 2 3
4 5 6
B79 (GRAY)
1 2 3 4 5 6 7
8 9 10 11 12 13 14
B40 (BLACK)
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16

D: B137
1 2 3 4
5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20
C: B136
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25 26
A: B134
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
24 25 26 27 28 29 30 31 32 33 34 35

WI-00378



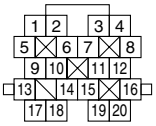
F26 (GREEN)

B122
E13 (DARK BROWN)

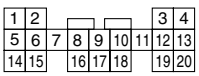
T5 (GRAY)

B18 (GRAY)
T6 (GRAY)

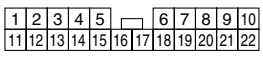
B22 (LIGHT GRAY)



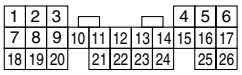
D: B137



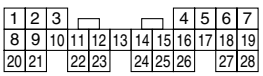
F2 (BLUE)



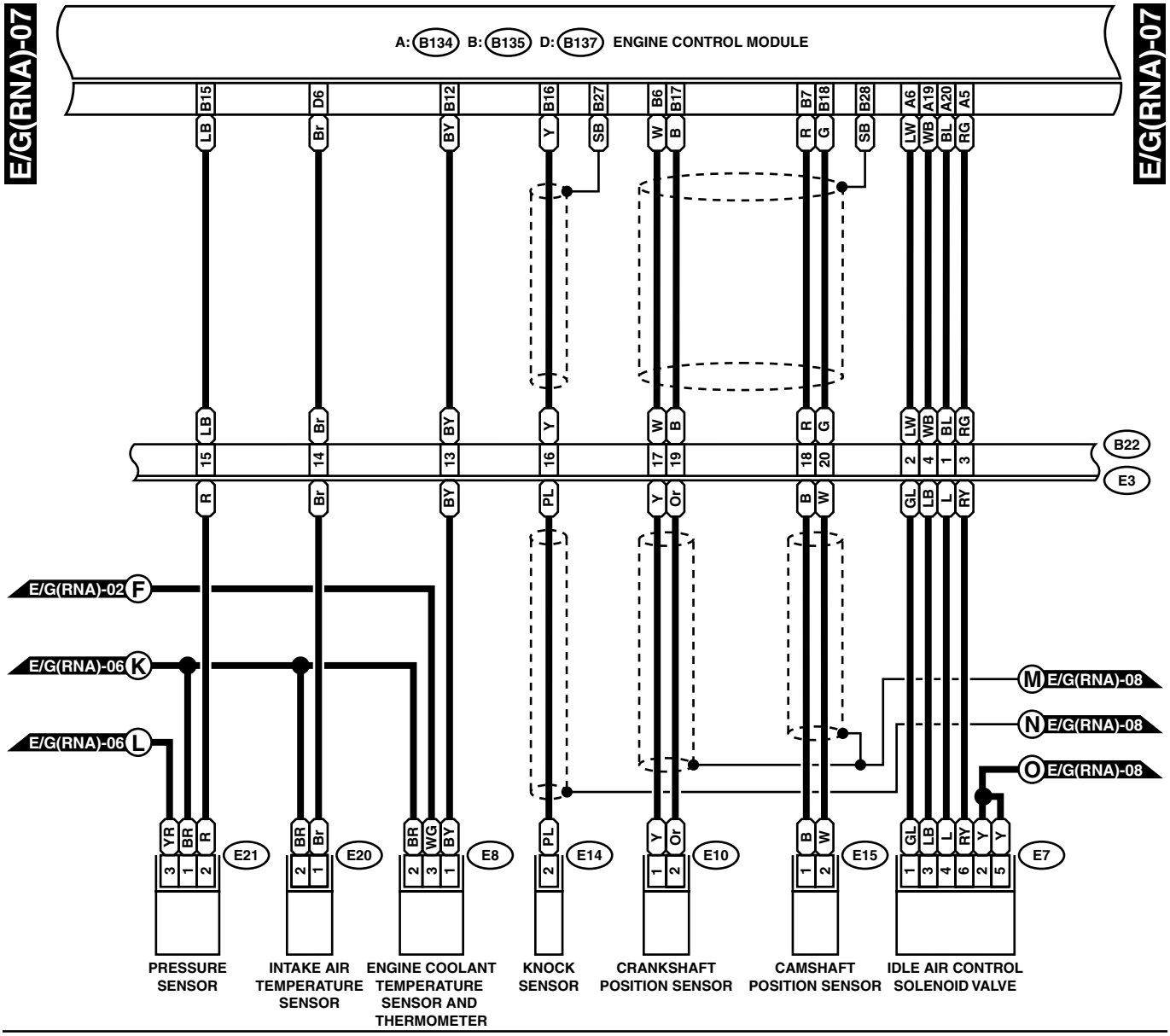
C: B136

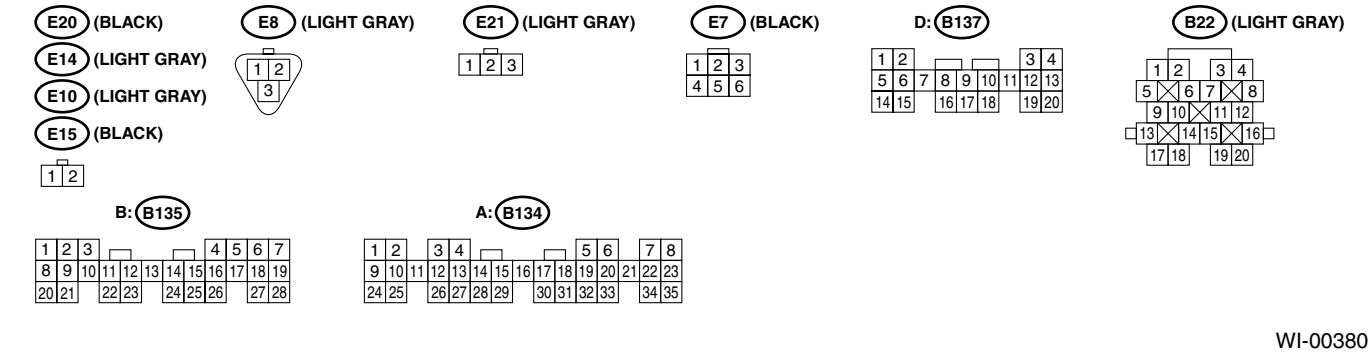


B: B135

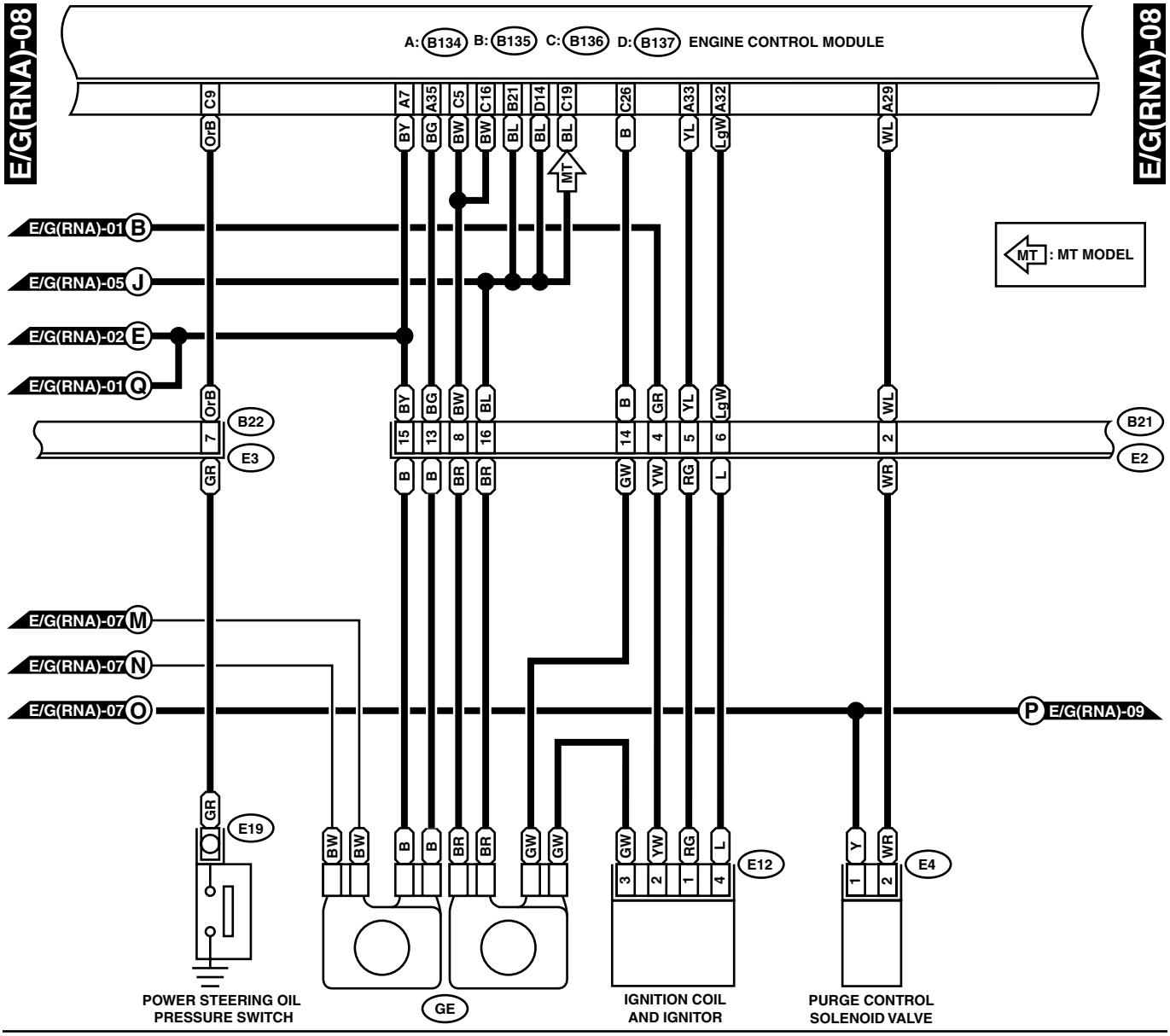


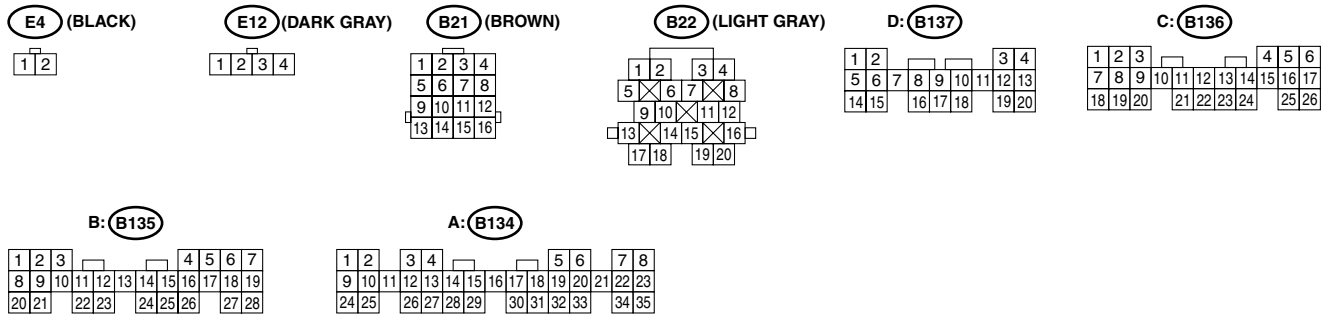
WI-00379


E/G(RNA)-07
A: B134 B: B135 D: B137 ENGINE CONTROL MODULE
E/G(RNA)-07
B22
E3
E/G(RNA)-02 F
E/G(RNA)-06 K
E/G(RNA)-06 L
M E/G(RNA)-08
N E/G(RNA)-08
O E/G(RNA)-08
E21
E20
E8
E14
E10
E15
E7
PRESSURE SENSOR
INTAKE AIR TEMPERATURE SENSOR
ENGINE COOLANT TEMPERATURE SENSOR AND THERMOMETER
KNOCK SENSOR
CRANKSHAFT POSITION SENSOR
CAMSHAFT POSITION SENSOR
IDLE AIR CONTROL SOLENOID VALVE

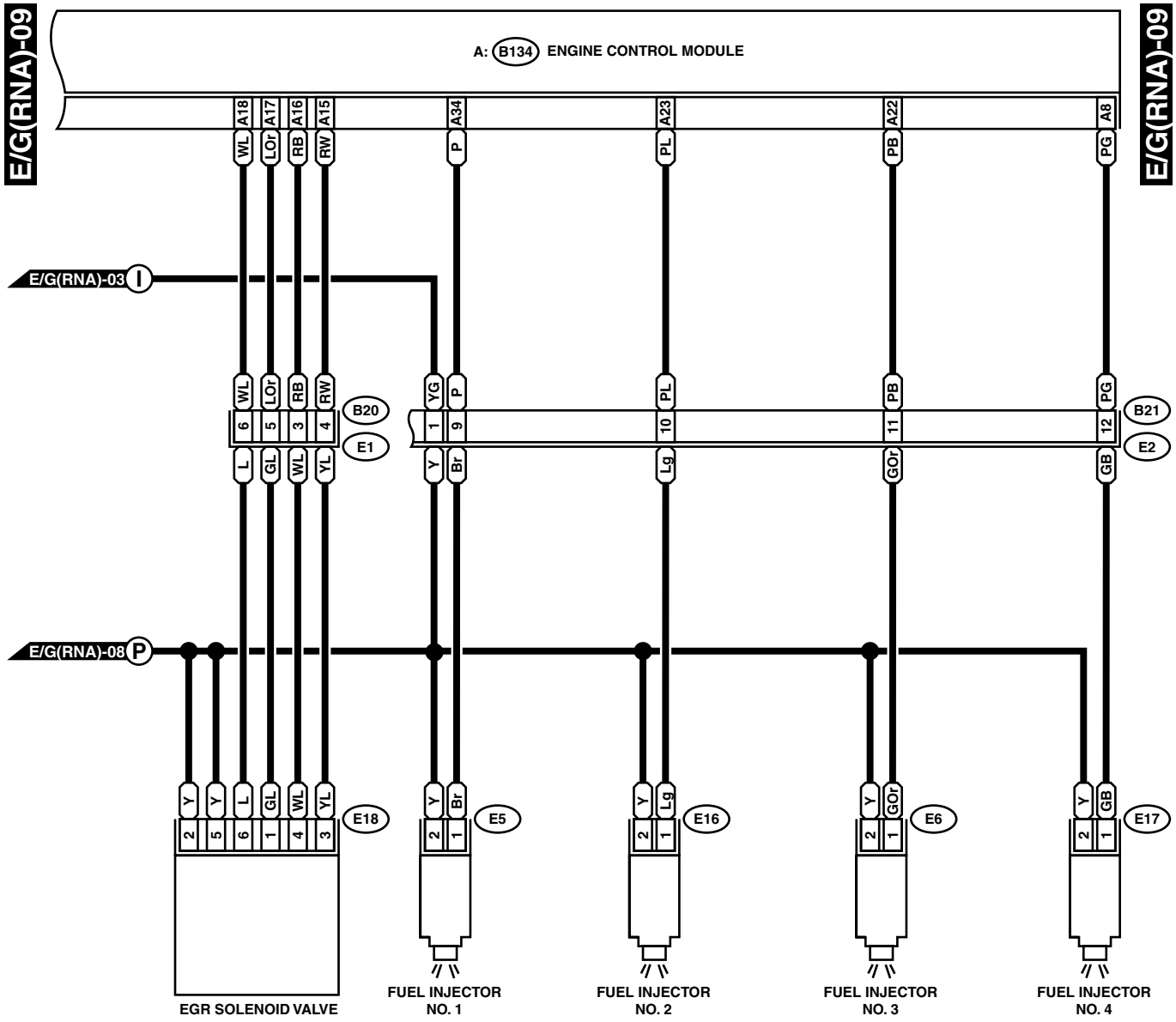

E20 (BLACK)
E14 (LIGHT GRAY)
E10 (LIGHT GRAY)
E15 (BLACK)
E8 (LIGHT GRAY)
E21 (LIGHT GRAY)
E7 (BLACK)
D: B137
B22 (LIGHT GRAY)
B: B135
A: B134

WI-00380


E/G(RNA)-08
A: B134 B: B135 C: B136 D: B137 ENGINE CONTROL MODULE
C9 A7 A35 C5 C16 B21 D14 C19 C26 A33 A32 A29
OrB BY BG BW BW BL BL BL B YL LgW WL
MT
E/G(RNA)-01 B
E/G(RNA)-05 J
E/G(RNA)-02 E
E/G(RNA)-01 Q
MT : MT MODEL
B22
E3
B21
E2
E/G(RNA)-07 M
E/G(RNA)-07 N
E/G(RNA)-07 O
P E/G(RNA)-09
E19
E12
E4
POWER STEERING OIL PRESSURE SWITCH
GE
IGNITION COIL AND IGNITOR
PURGE CONTROL SOLENOID VALVE


E4 (BLACK)
E12 (DARK GRAY)
B21 (BROWN)
B22 (LIGHT GRAY)
D: B137
C: B136
B: B135
A: B134

WI-00381



E5 (LIGHT GRAY)
E6 (LIGHT GRAY)
E16 (LIGHT GRAY)
E17 (LIGHT GRAY)

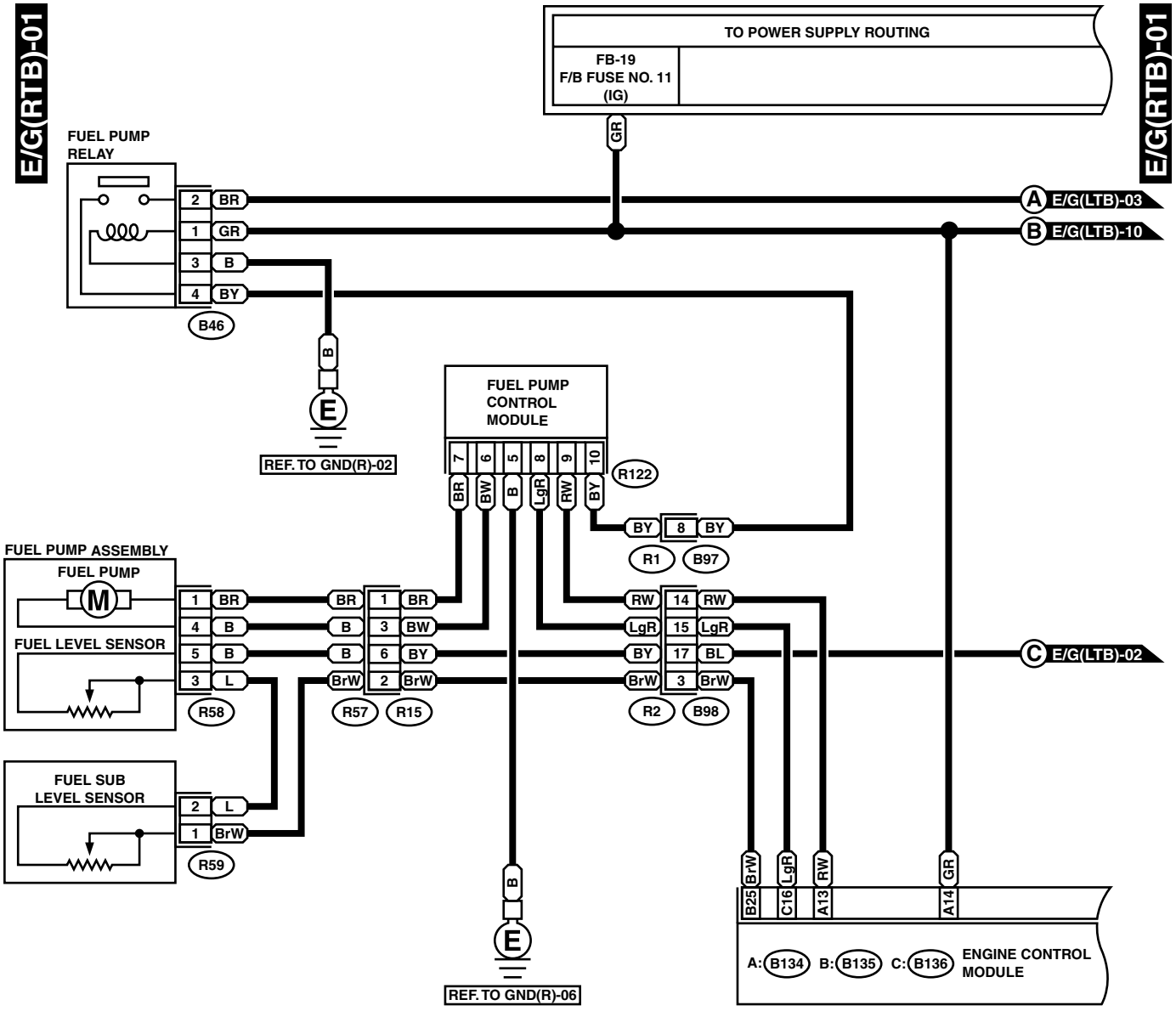
B20 (GRAY)
E18 (DARK GRAY)

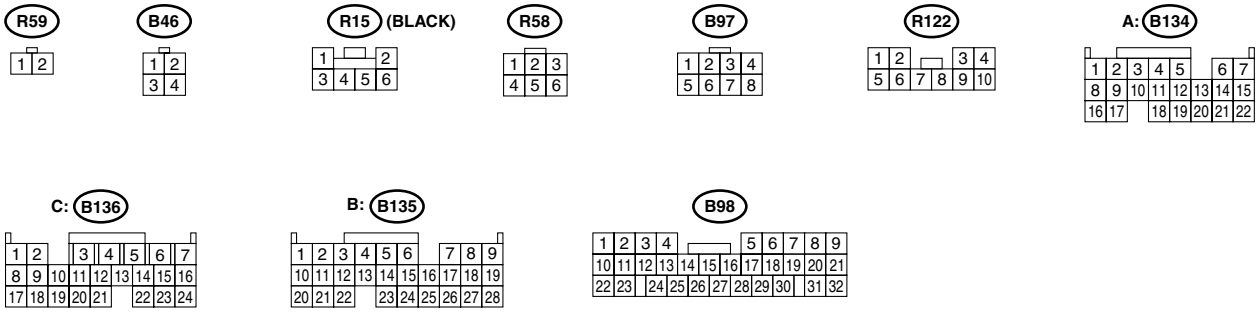
B21 (BROWN)

A: B134

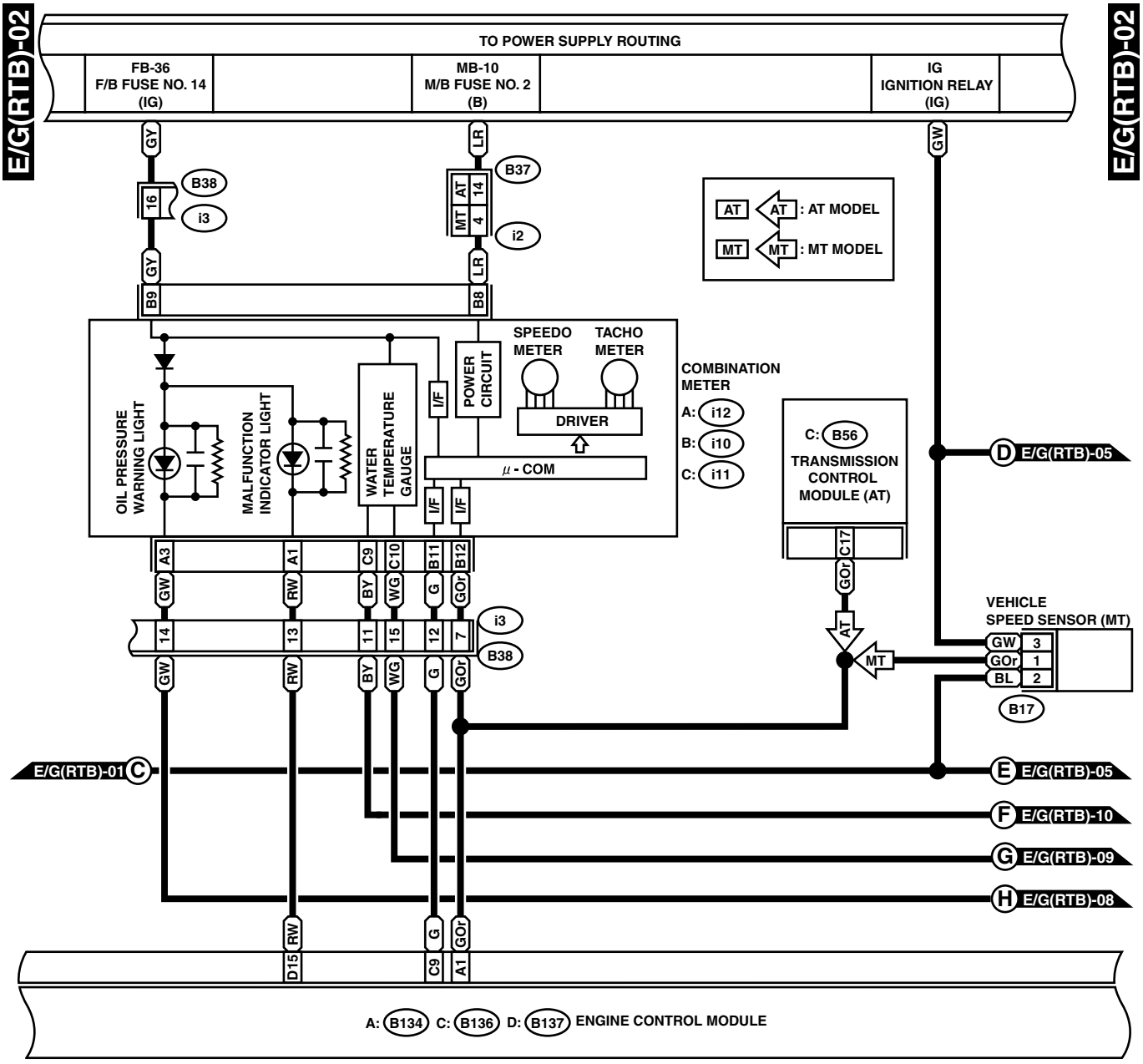
WI-00382

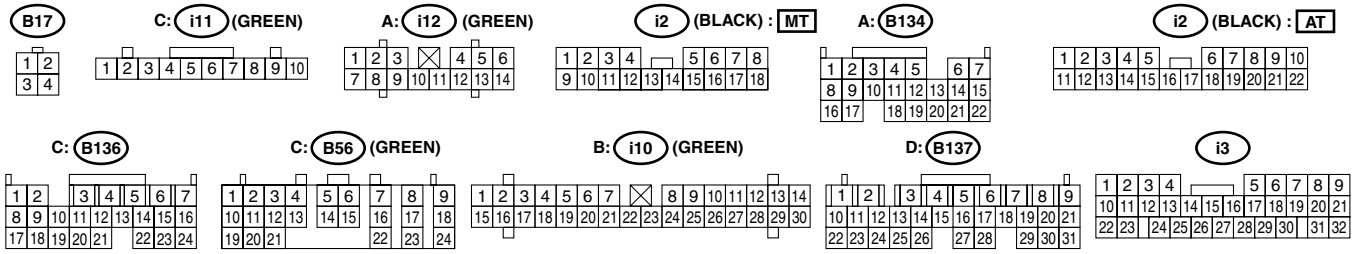
4. RHD TURBO MODEL



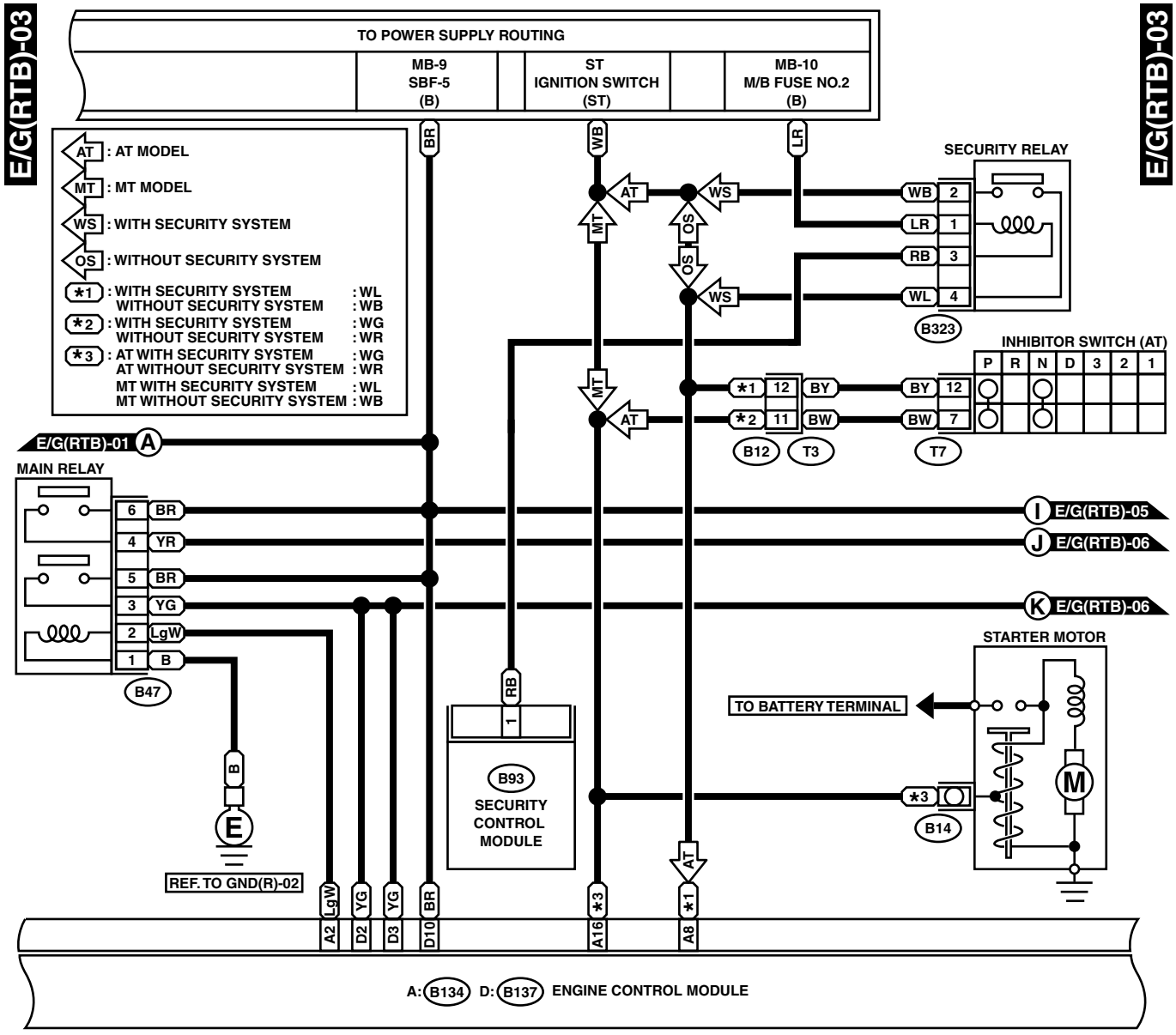


WI-00383


E/G(RTB)-02
TO POWER SUPPLY ROUTING
FB-36
F/B FUSE NO. 14
(IG)
MB-10
M/B FUSE NO. 2
(B)
IG
IGNITION RELAY
(IG)
E/G(RTB)-02
GY
LR
GW
B38
16
i3
B37
AT
14
MT
4
i2
AT : AT MODEL
MT : MT MODEL
B9
B8
SPEEDO METER
TACHO METER
COMBINATION METER
A: i12
B: i10
C: i11
POWER CIRCUIT
DRIVER
OIL PRESSURE WARNING LIGHT
MALFUNCTION INDICATOR LIGHT
WATER TEMPERATURE GAUGE
I/F
μ - COM
C: B56
TRANSMISSION CONTROL MODULE (AT)
D E/G(RTB)-05
C17
GOr
VEHICLE SPEED SENSOR (MT)
GW 3
GOr 1
BL 2
B17
A3
A1
C9
C10
B11
B12
RW
BY
WG
G
14
13
11
15
12
7
E/G(RTB)-01 C
E/G(RTB)-05 E
E/G(RTB)-10 F
E/G(RTB)-09 G
E/G(RTB)-08 H
D15
C9
A1
A: B134 C: B136 D: B137 ENGINE CONTROL MODULE


B17
C: i11 (GREEN)
A: i12 (GREEN)
i2 (BLACK) : MT
A: B134
i2 (BLACK) : AT
C: B136
C: B56 (GREEN)
B: i10 (GREEN)
D: B137
i3

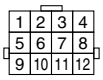
WI-00384



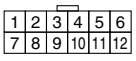
B323 (BLUE)

B47 (BROWN)

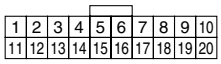
B12



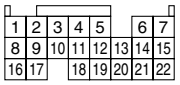
T7



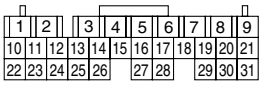
B93



A: B134



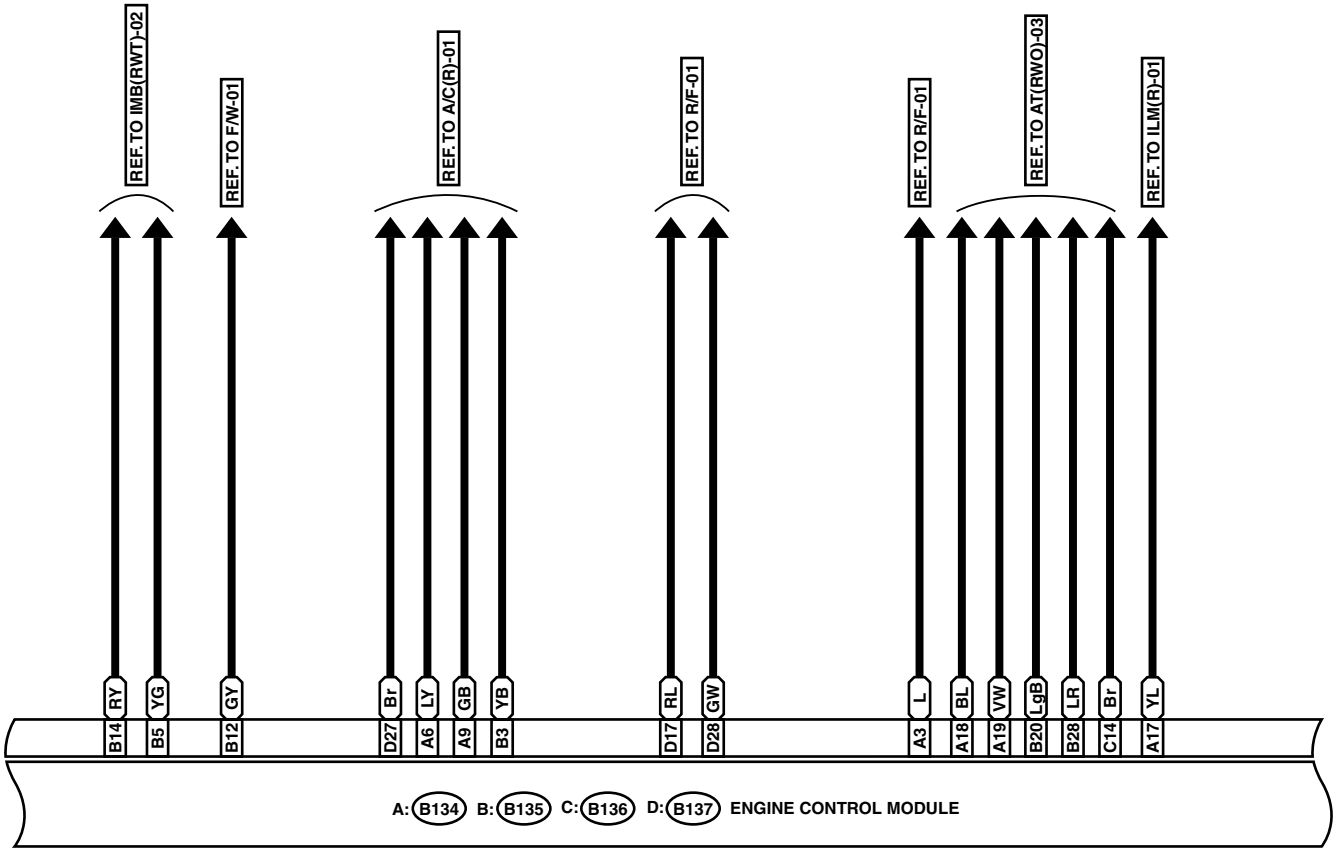
D: B137

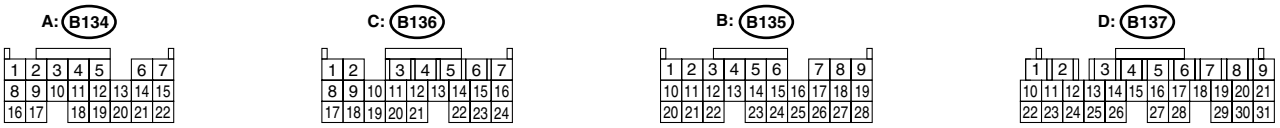


WI-00385

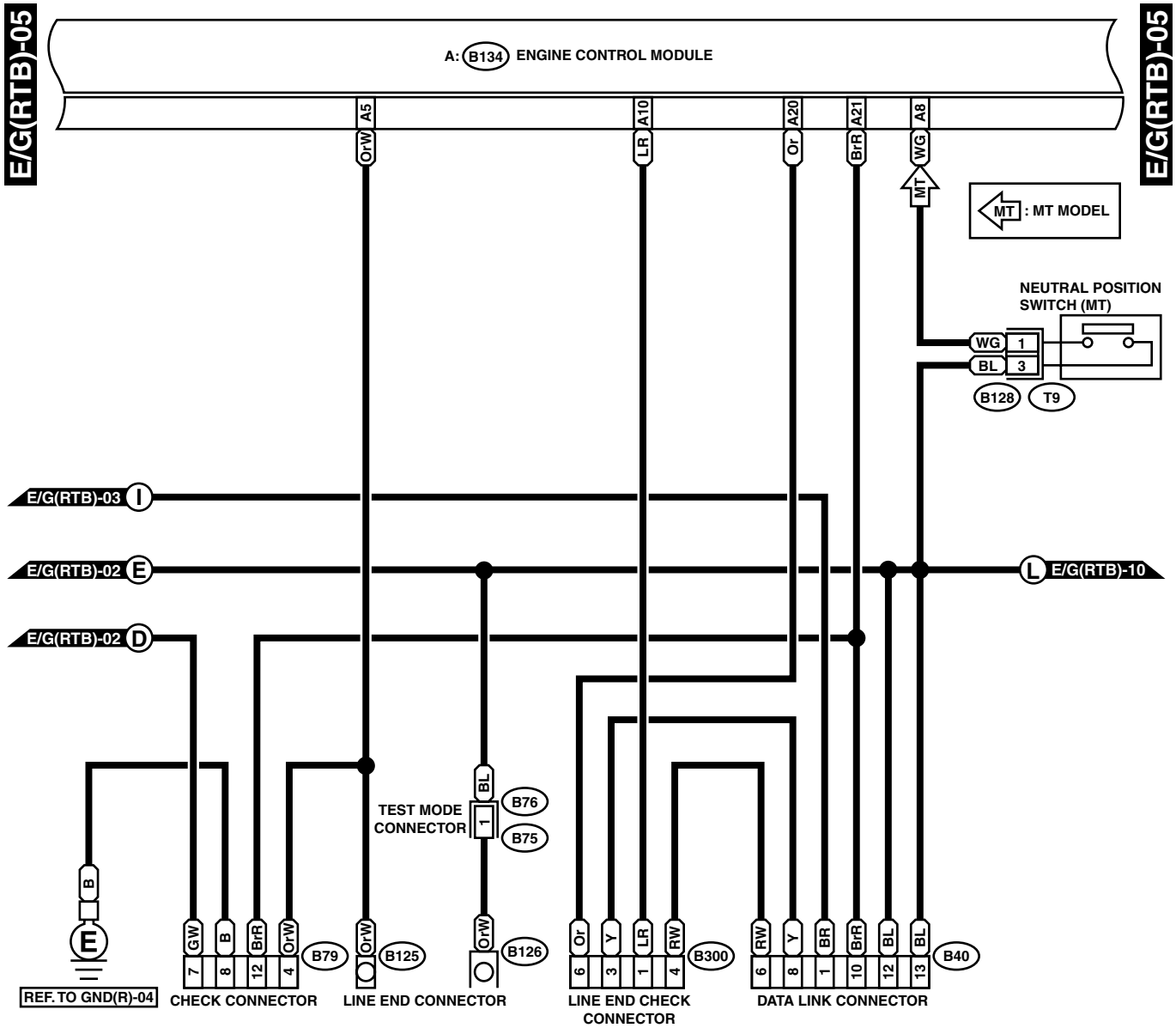
E/G(RTB)-04

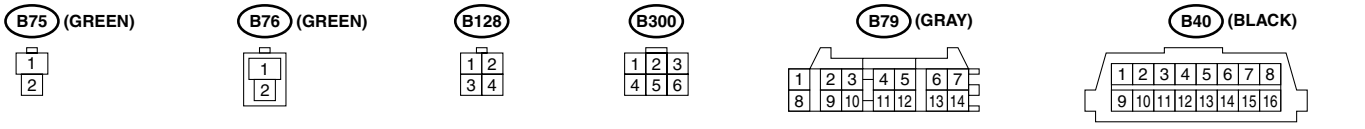
E/G(RTB)-04

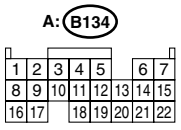




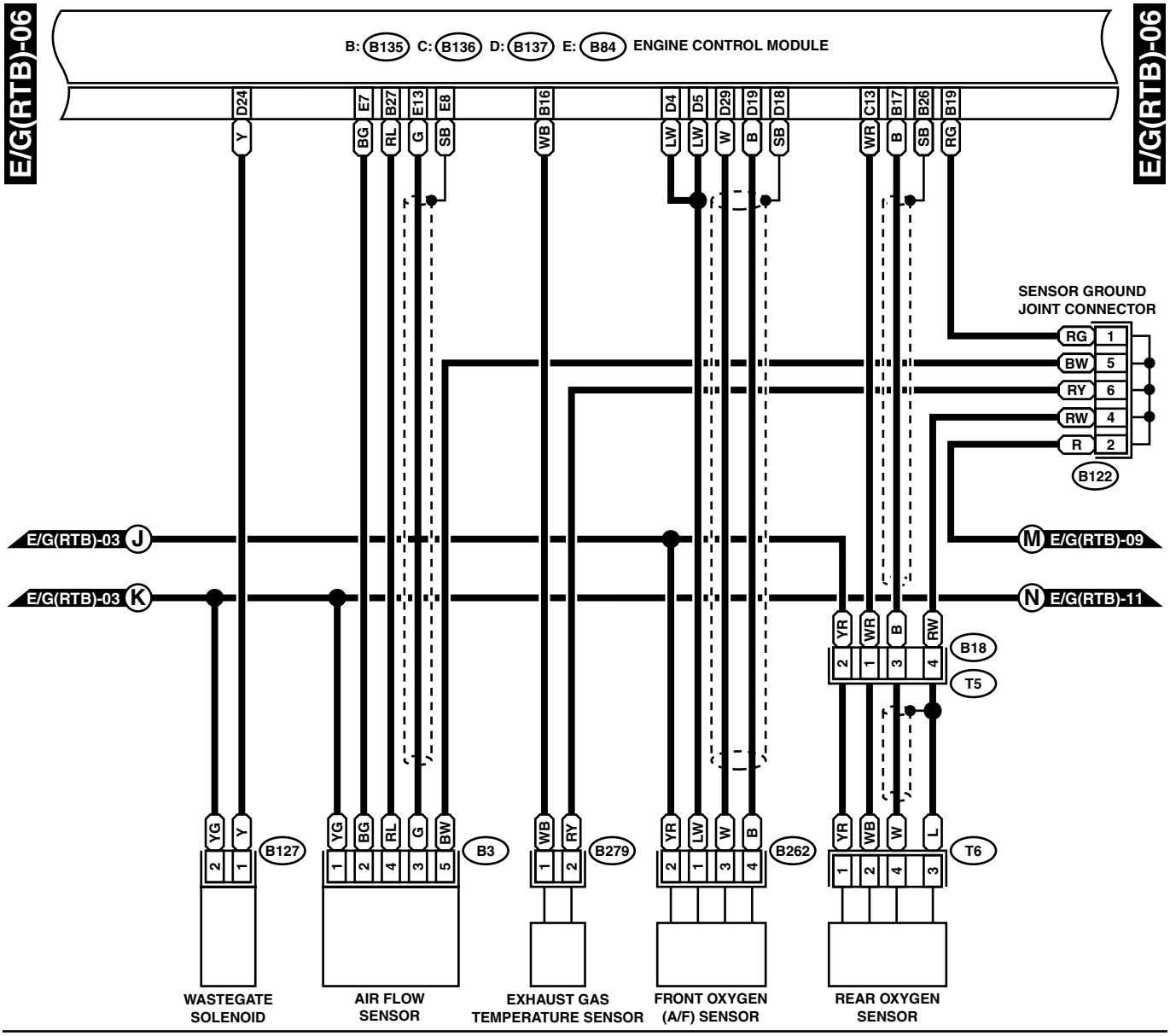
WI-00386

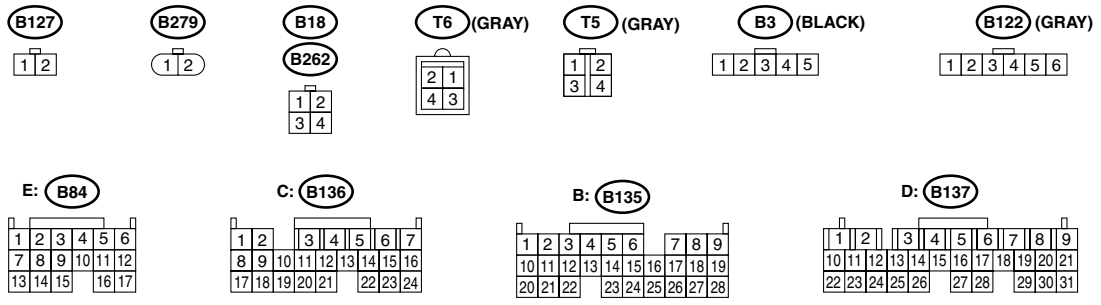

E/G(RTB)-05
E/G(RTB)-05
A: B134 ENGINE CONTROL MODULE
A5
A10
A20
A21
A8
OrW
LR
Or
BrR
WG
MT
MT : MT MODEL
NEUTRAL POSITION SWITCH (MT)
WG 1
BL 3
B128
T9
E/G(RTB)-03 I
E/G(RTB)-02 E
E/G(RTB)-02 D
L E/G(RTB)-10
B
E
REF. TO GND(R)-04
GW
B
BrR
OrW
B79
7
8
12
4
CHECK CONNECTOR
OrW
B125
LINE END CONNECTOR
TEST MODE CONNECTOR
BL
1
B76
B75
OrW
B126
Or
Y
LR
RW
B300
6
3
1
4
LINE END CHECK CONNECTOR
RW
Y
BR
BrR
BL
BL
B40
6
8
1
10
12
13
DATA LINK CONNECTOR


B75 (GREEN)
B76 (GREEN)
B128
B300
B79 (GRAY)
B40 (BLACK)

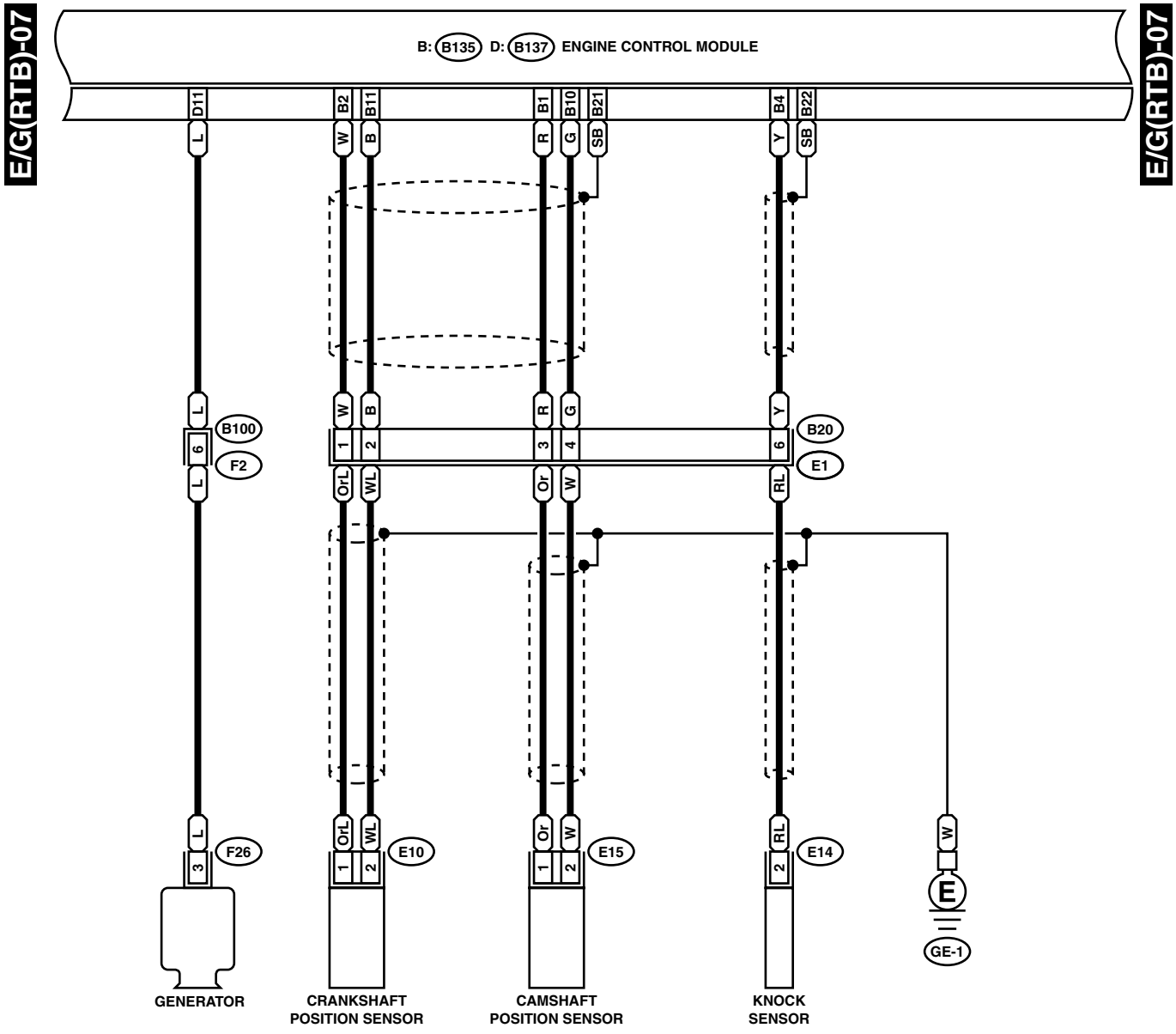

A: B134

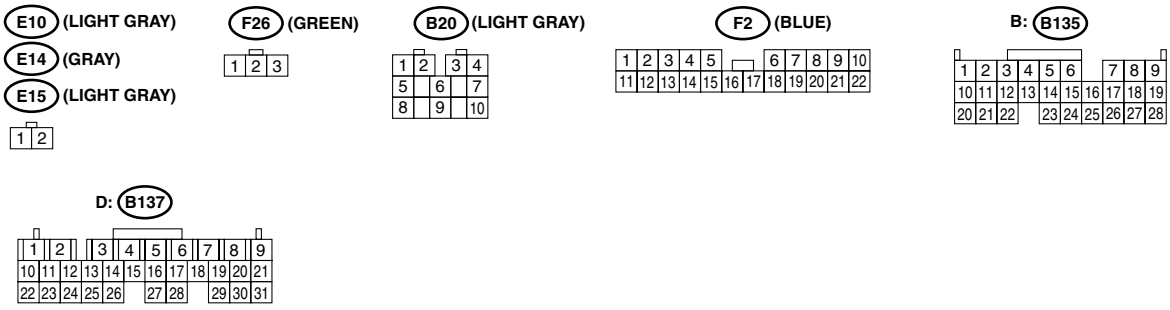
WI-00387


E/G(RTB)-06
B: B135 C: B136 D: B137 E: B84 ENGINE CONTROL MODULE
E/G(RTB)-06
SENSOR GROUND JOINT CONNECTOR
RG 1
BW 5
RY 6
RW 4
R 2
B122
E/G(RTB)-03 J
E/G(RTB)-03 K
M E/G(RTB)-09
N E/G(RTB)-11
B18
T5
B127
B3
B279
B262
T6
WASTEGATE SOLENOID
AIR FLOW SENSOR
EXHAUST GAS TEMPERATURE SENSOR
FRONT OXYGEN (A/F) SENSOR
REAR OXYGEN SENSOR

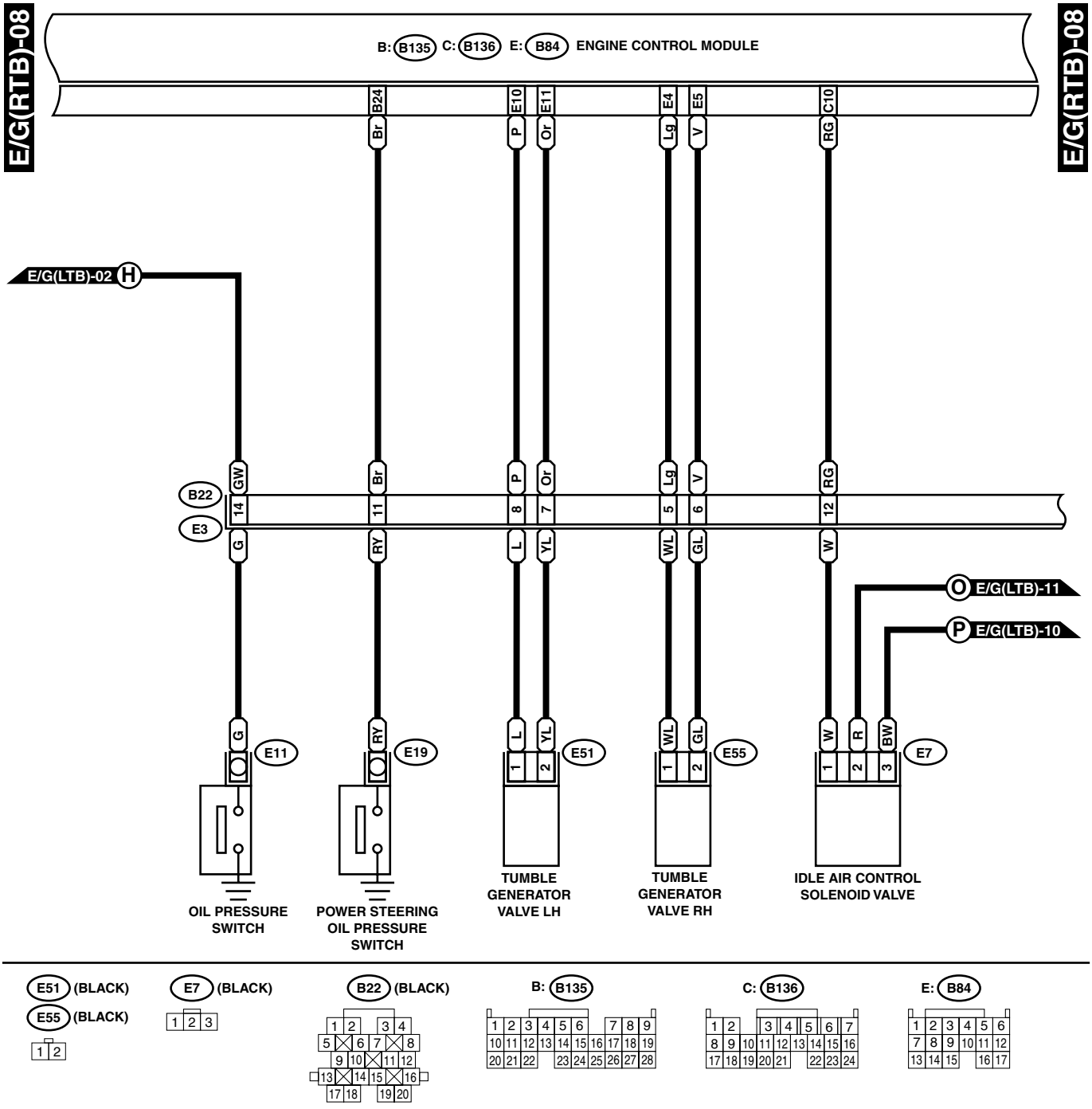

B127
B279
B18
B262
T6 (GRAY)
T5 (GRAY)
B3 (BLACK)
B122 (GRAY)
E: B84
C: B136
B: B135
D: B137

WI-00388

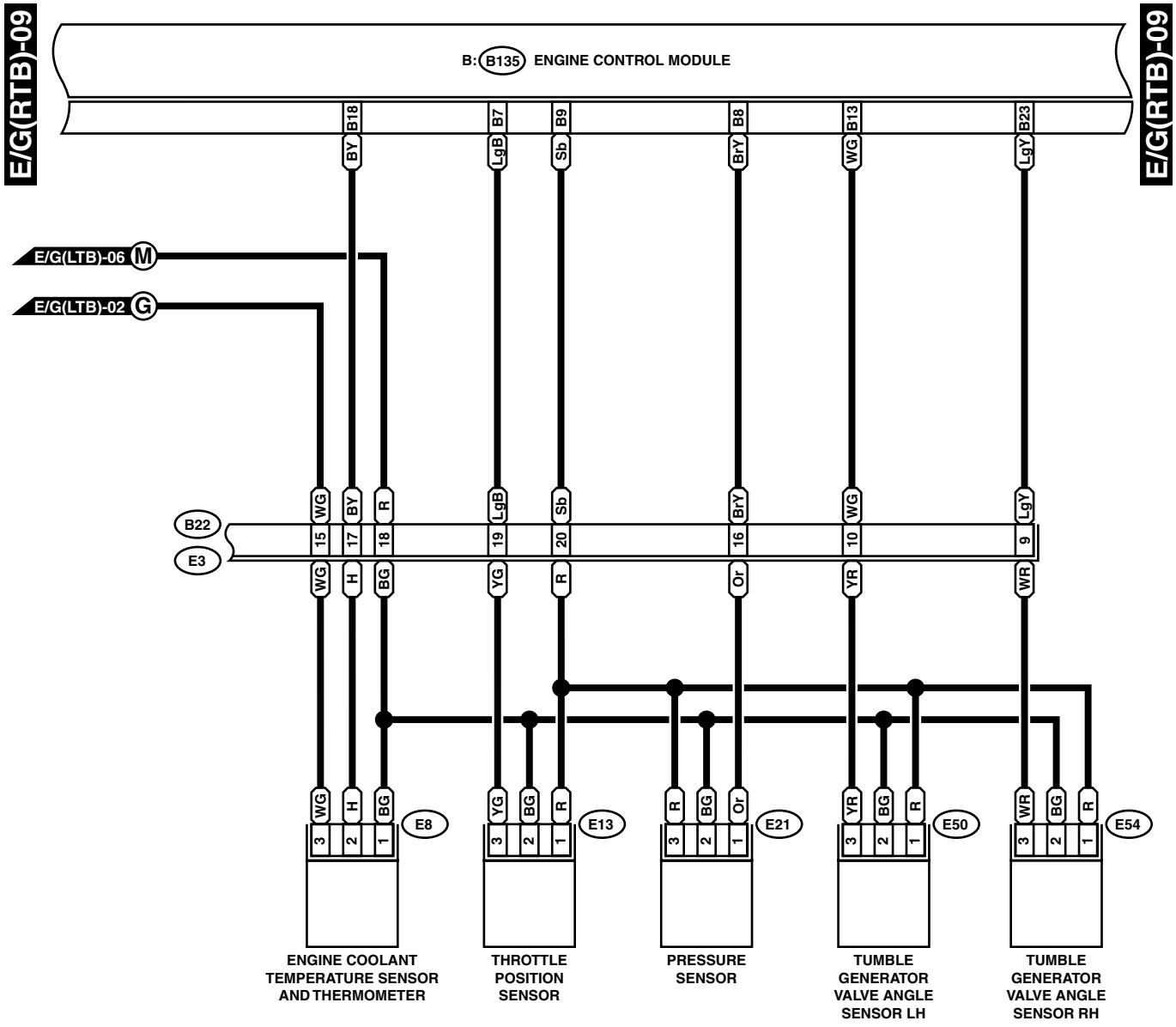

E/G(RTB)-07
E/G(RTB)-07
B: B135 D: B137 ENGINE CONTROL MODULE
D11
B2
B11
B1
B10
B21
B4
B22
L
W
B
R
G
SB
Y
SB
B100
F2
B20
E1
F26
E10
E15
E14
GENERATOR
CRANKSHAFT POSITION SENSOR
CAMSHAFT POSITION SENSOR
KNOCK SENSOR
GE-1


E10 (LIGHT GRAY)
E14 (GRAY)
E15 (LIGHT GRAY)
F26 (GREEN)
B20 (LIGHT GRAY)
F2 (BLUE)
B: B135
D: B137

WI-00389


E/G(RTB)-08
E/G(RTB)-08
B: B135 C: B136 E: B84 ENGINE CONTROL MODULE
B24 Br
E10 P
E11 Or
E4 Lg
E5 V
C10 RG
E/G(LTB)-02 H
B22
E3
GW 14 G
Br 11 RY
P 8 L
Or 7 YL
Lg 5 WL
V 6 GL
RG 12 W
O E/G(LTB)-11
P E/G(LTB)-10
G E11
RY E19
L YL 1 2 E51
WL GL 1 2 E55
W R BW 1 2 3 E7
OIL PRESSURE SWITCH
POWER STEERING OIL PRESSURE SWITCH
TUMBLE GENERATOR VALVE LH
TUMBLE GENERATOR VALVE RH
IDLE AIR CONTROL SOLENOID VALVE
E51 (BLACK)
E55 (BLACK)
E7 (BLACK)
B22 (BLACK)
B: B135
C: B136
E: B84

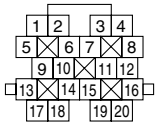
WI-00390



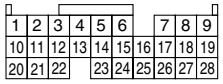
E8 (LIGHT GRAY)

E13 (BLACK)
E21 (BLACK)
E50 (BLACK)
E54 (BLACK)

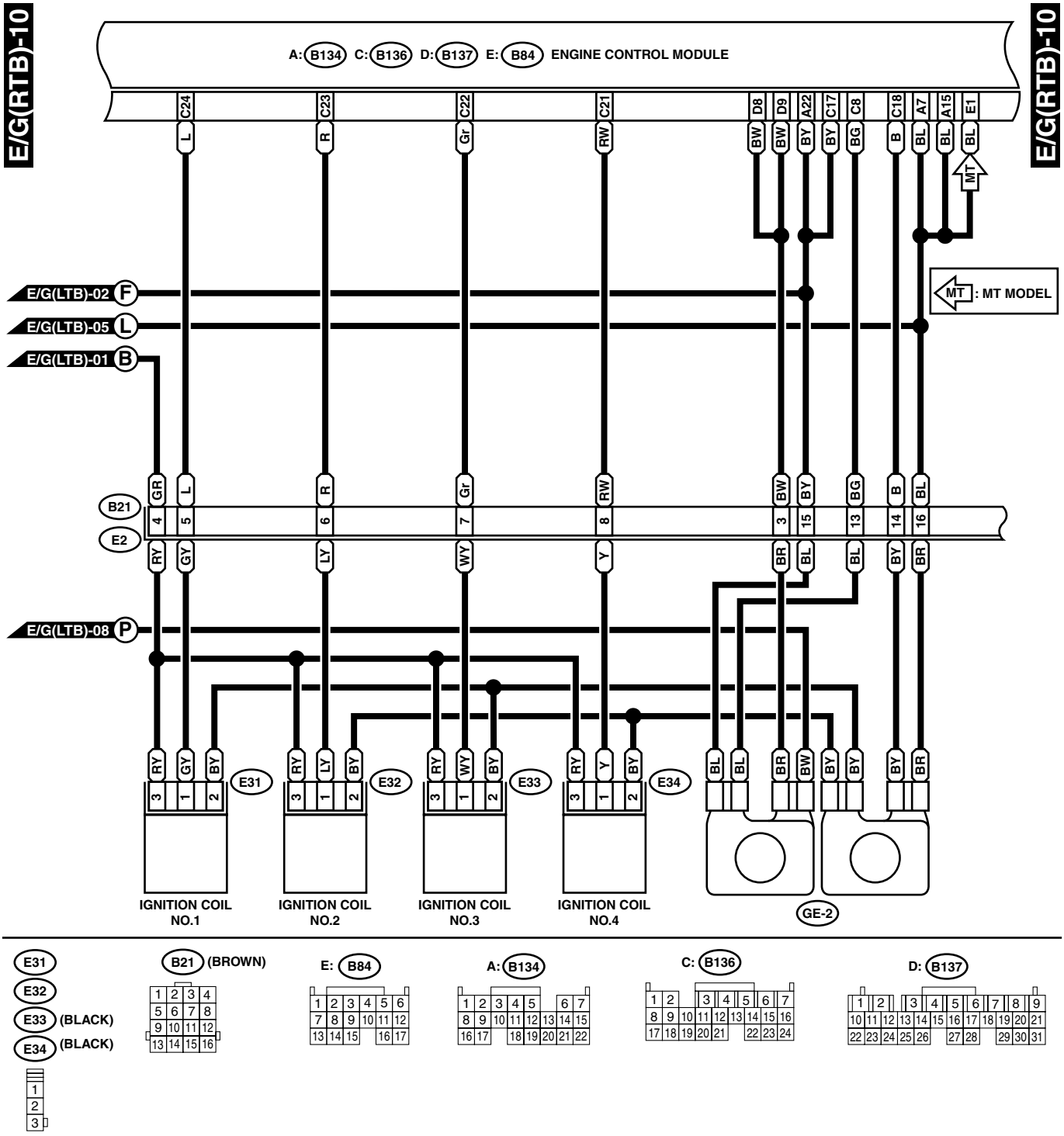
B22 (BLACK)



B: B135

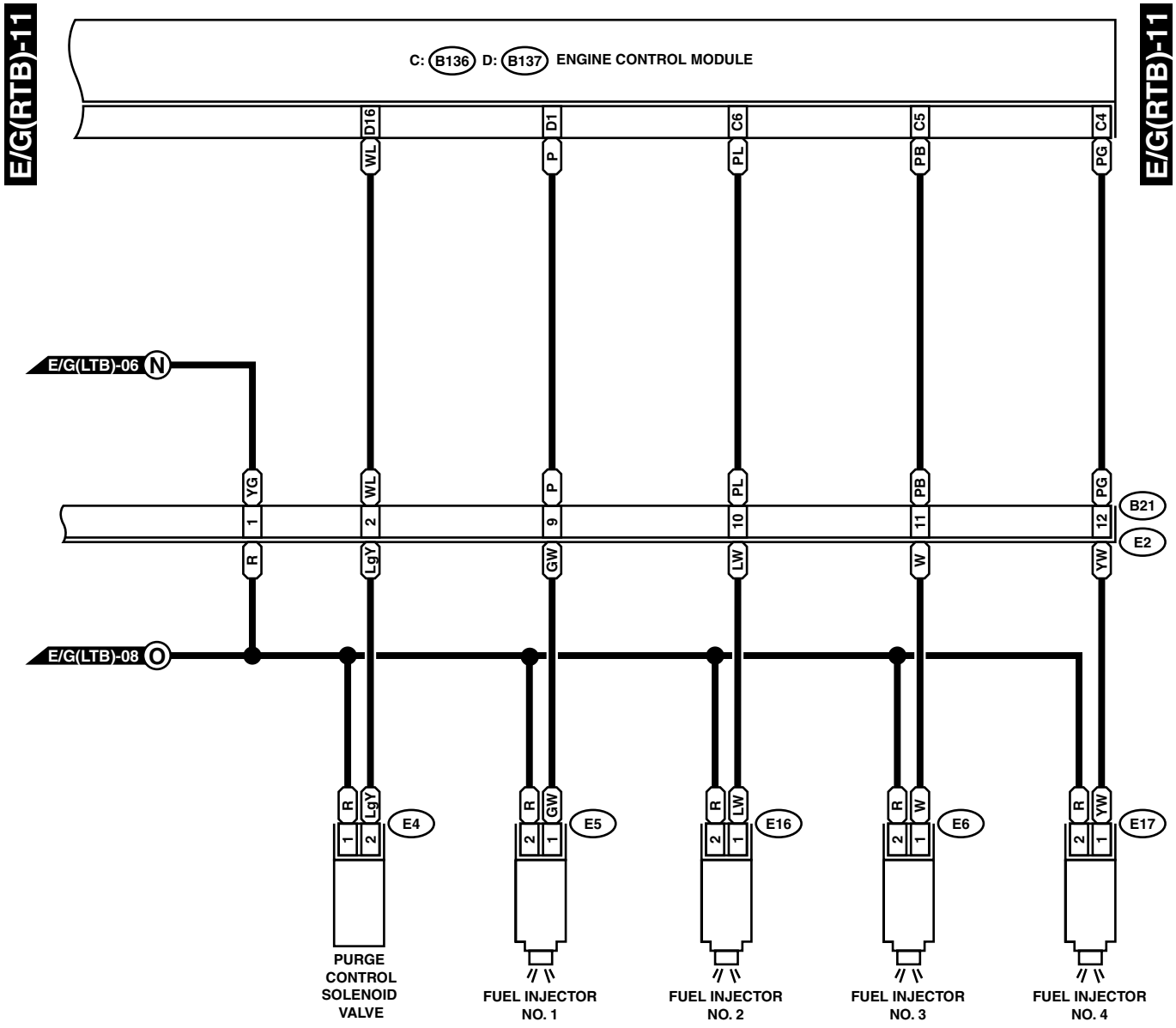


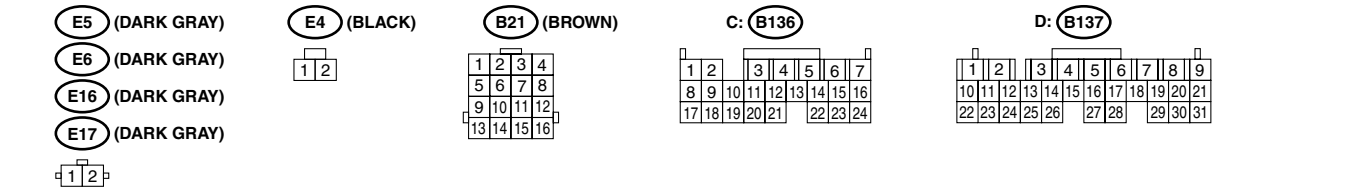
WI-00391


E/G(RTB)-10
A: B134 C: B136 D: B137 E: B84 ENGINE CONTROL MODULE
E/G(RTB)-10
C24 C23 C22 C21 D8 D9 A22 C17 C8 C18 A7 A15 E1
L R Gr RW BW BW BY BY BG B BL BL BL
MT
MT : MT MODEL
E/G(LTB)-02 F
E/G(LTB)-05 L
E/G(LTB)-01 B
B21
E2
GR L R Gr RW BW BY BG B BL
4 5 6 7 8 3 15 13 14 16
RY GY LY WY Y BR BL BL BY BR
E/G(LTB)-08 P
RY GY BY E31
RY LY BY E32
RY WY BY E33
RY Y BY E34
BL BL BR BW BY BY BY BR
3 1 2
IGNITION COIL NO.1
IGNITION COIL NO.2
IGNITION COIL NO.3
IGNITION COIL NO.4
GE-2

E31
E32
E33 (BLACK)
E34 (BLACK)
B21 (BROWN)
E: B84
A: B134
C: B136
D: B137

WI-00392


E/G(RTB)-11
E/G(RTB)-11
C: B136 D: B137 ENGINE CONTROL MODULE
D16
D1
C6
C5
C4
WL
P
PL
PB
PG
E/G(LTB)-06 N
E/G(LTB)-08 O
YG
WL
P
PL
PB
PG
1
2
9
10
11
12
B21
E2
R
LgY
GW
LW
W
YW
E4
E5
E16
E6
E17
PURGE CONTROL SOLENOID VALVE
FUEL INJECTOR NO. 1
FUEL INJECTOR NO. 2
FUEL INJECTOR NO. 3
FUEL INJECTOR NO. 4

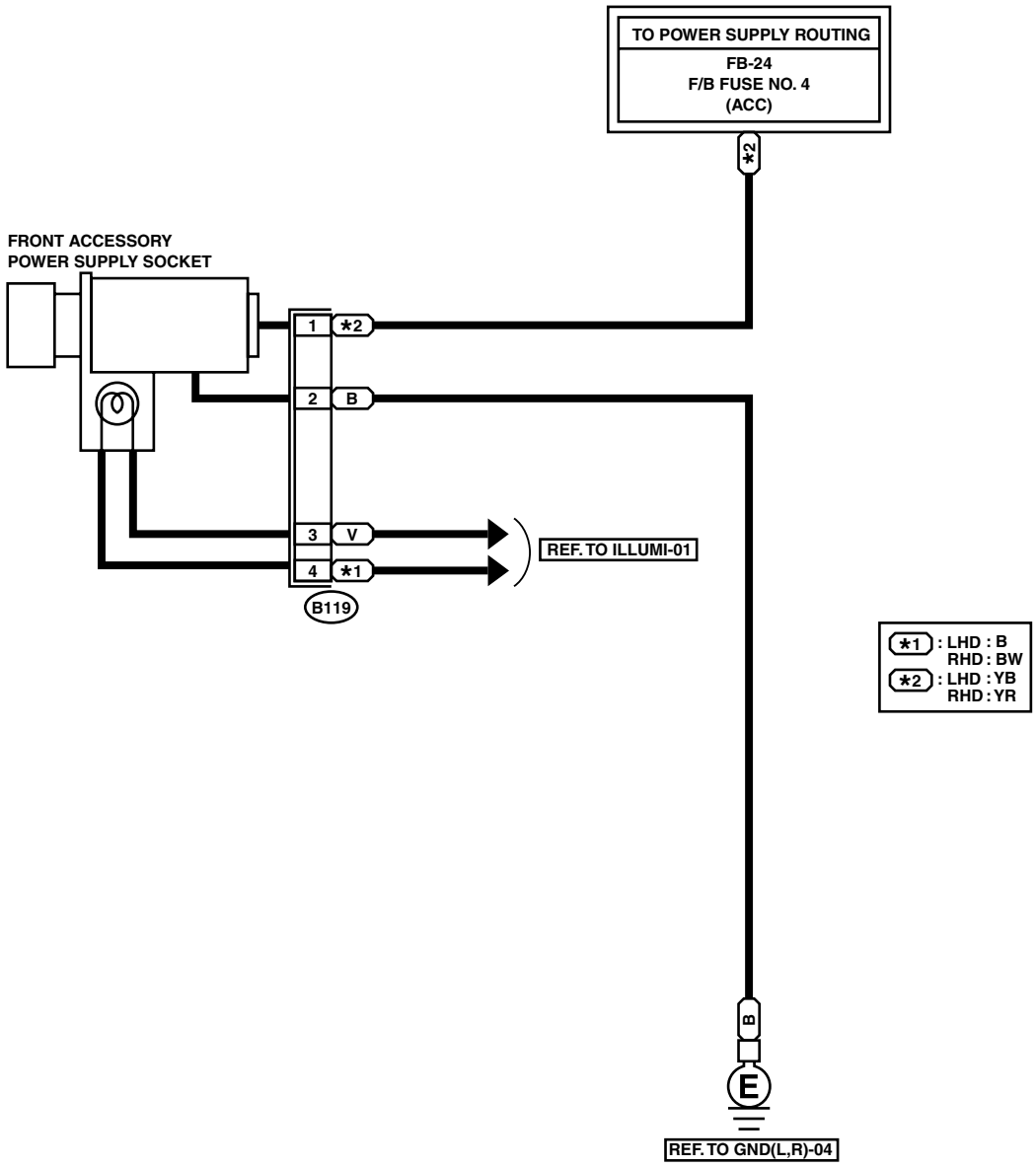

E5 (DARK GRAY)
E6 (DARK GRAY)
E16 (DARK GRAY)
E17 (DARK GRAY)
E4 (BLACK)
B21 (BROWN)
C: B136
D: B137

WI-00393

17.Front Accessory Power Supply System

A: SCHEMATIC

FAPS-01



FAPS-01

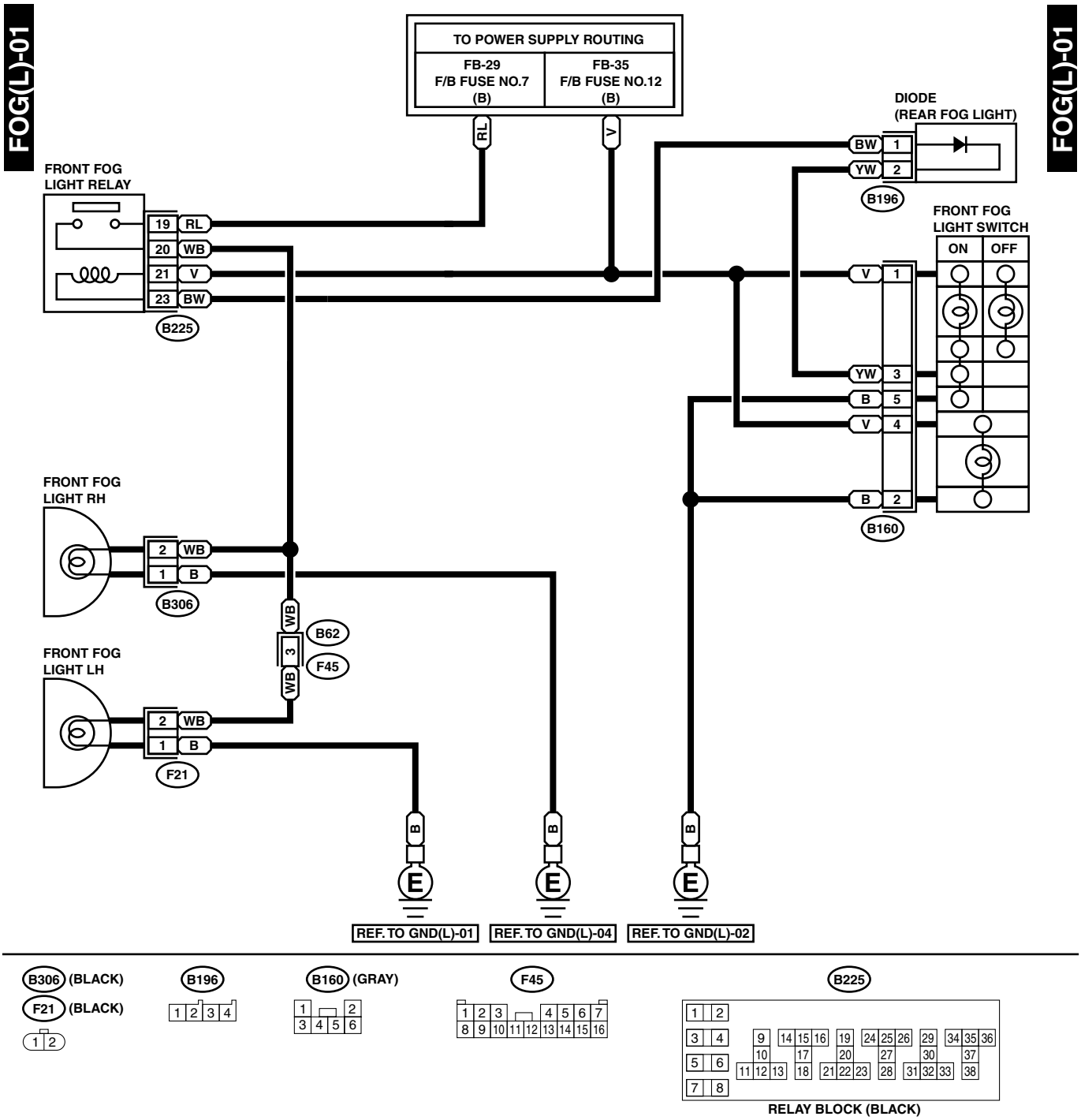
B119

WI-00395

18.Front Fog Light System

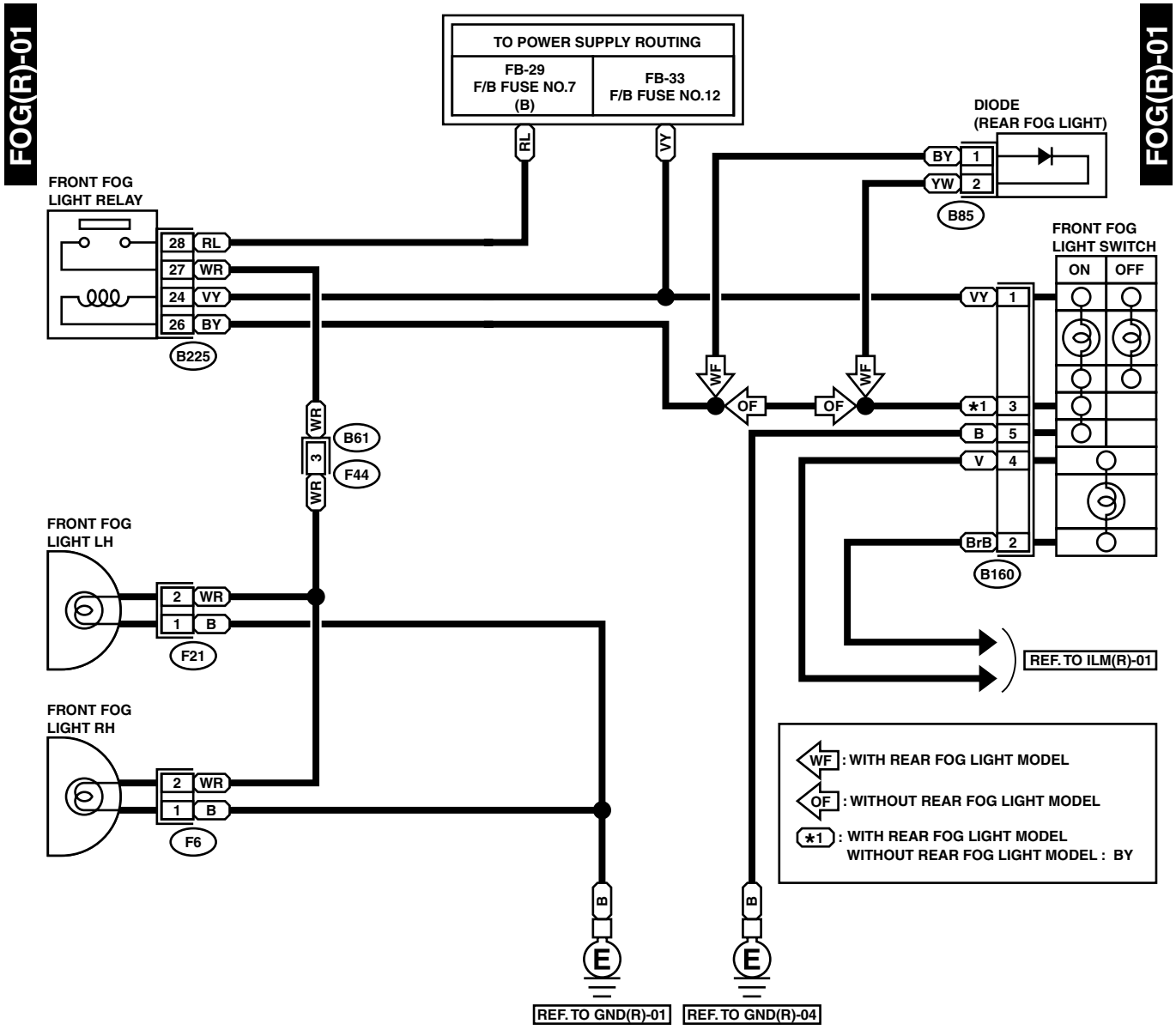
A: SCHEMATIC

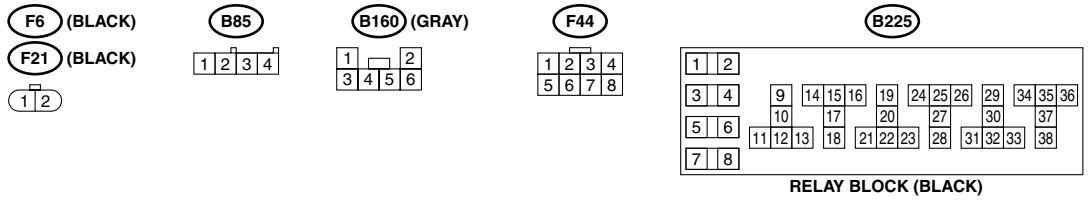
1. LHD MODEL



WI-00396

2. RHD MODEL



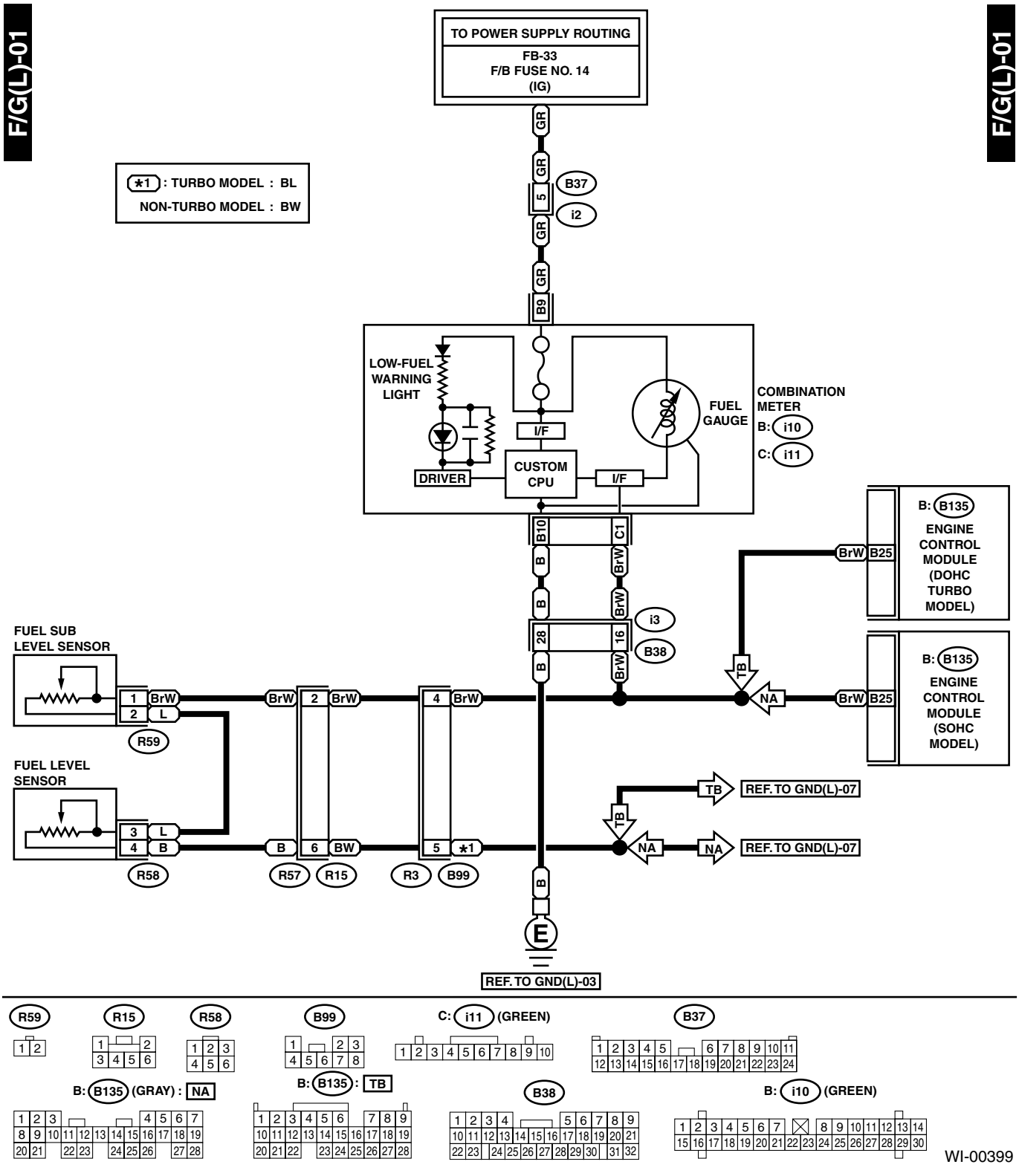


WI-00397

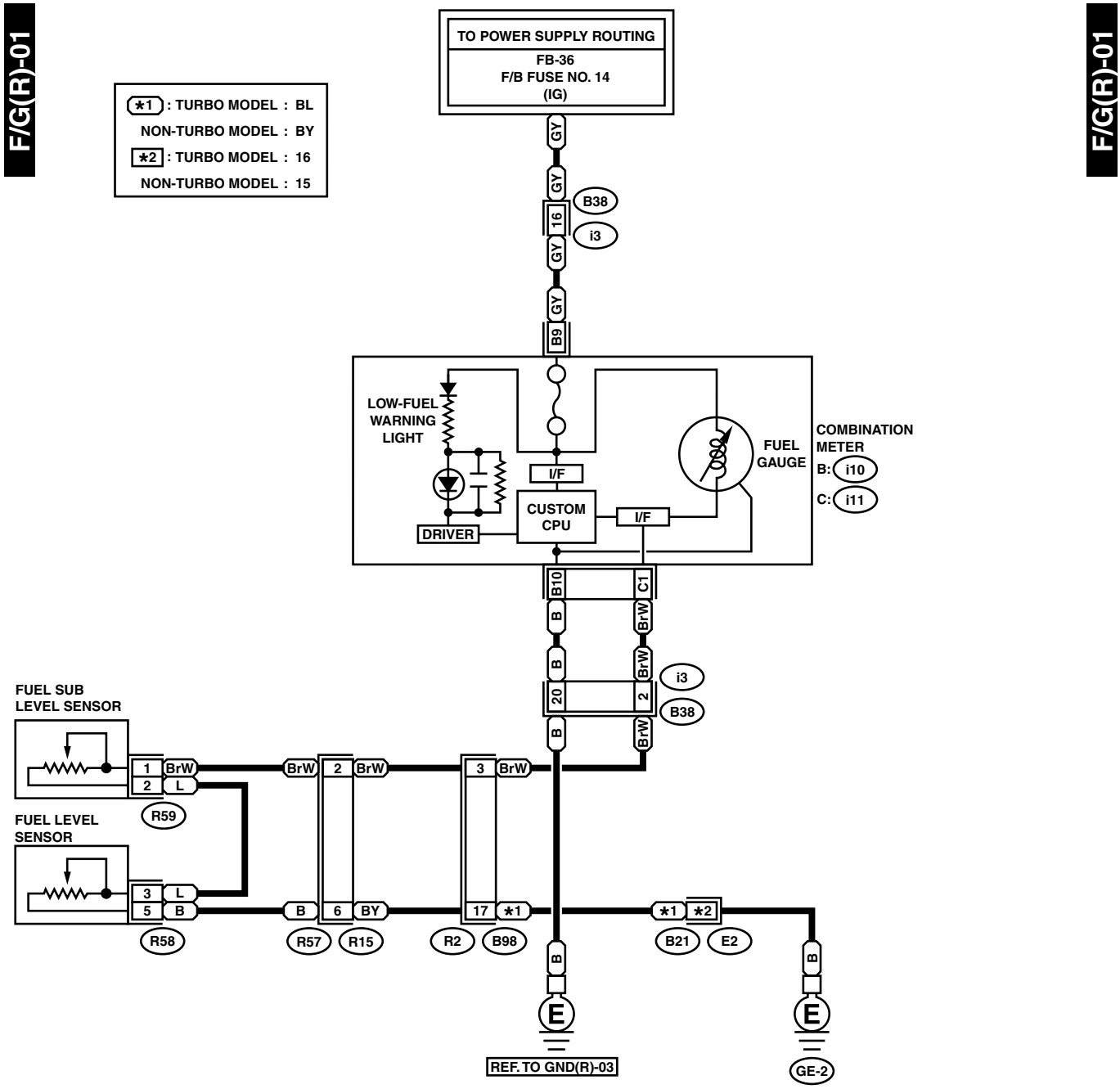
19.Fuel Gauge System

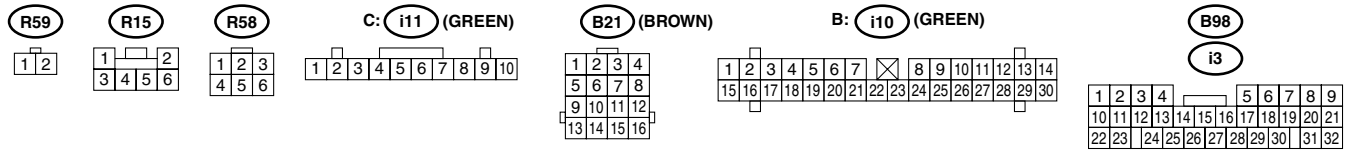
A: SCHEMATIC

1. LHD MODEL



2. RHD MODEL





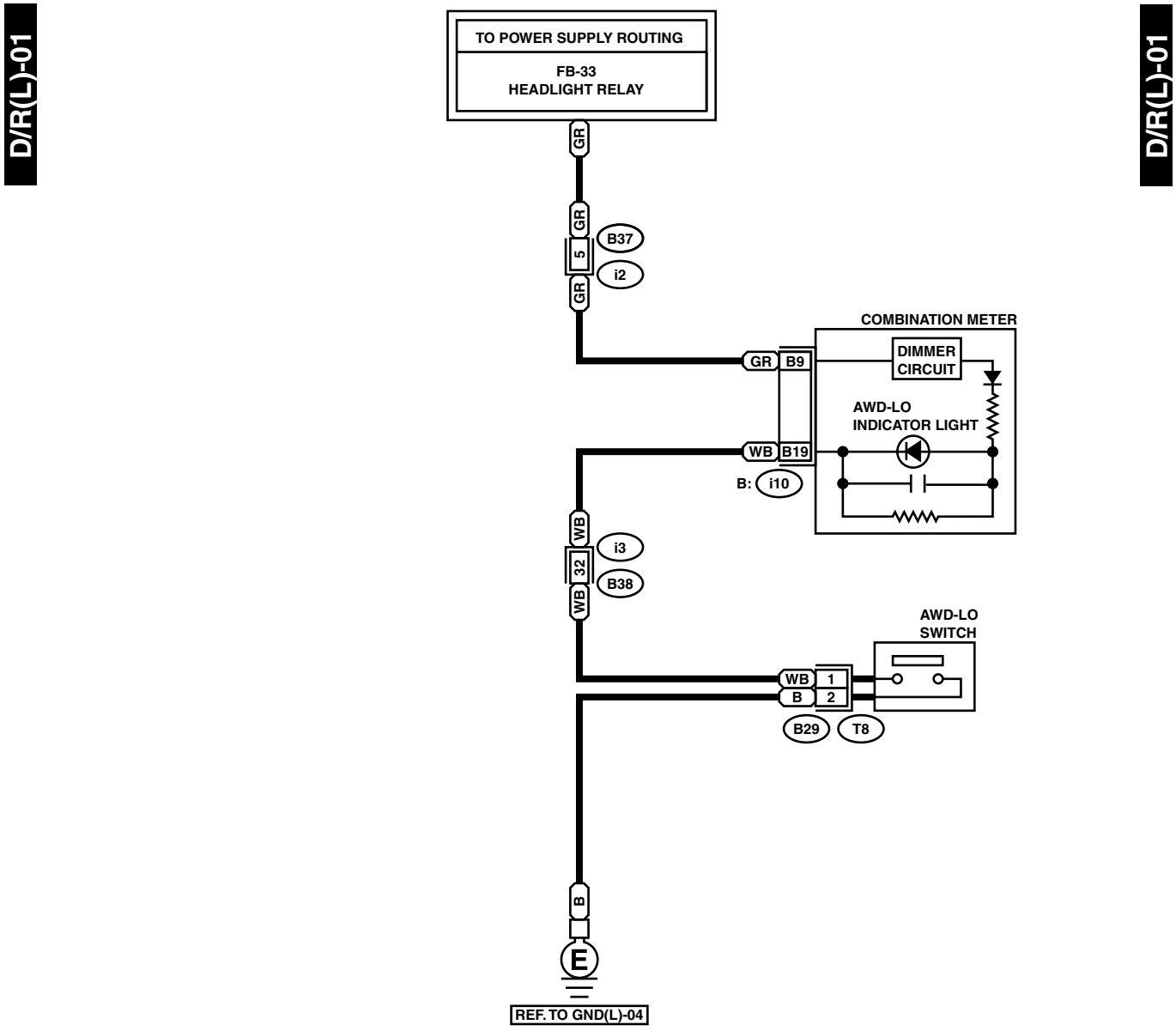
WI-00400

20.Full-Time Dual-Range System

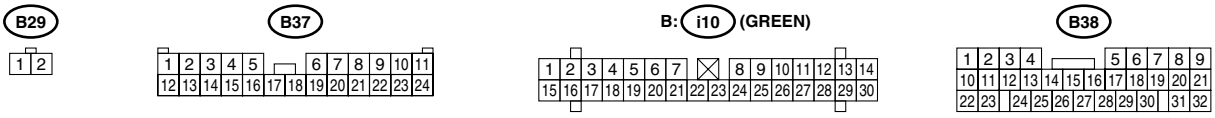
A: SCHEMATIC

1. LHD MODEL

D/R(L)-01

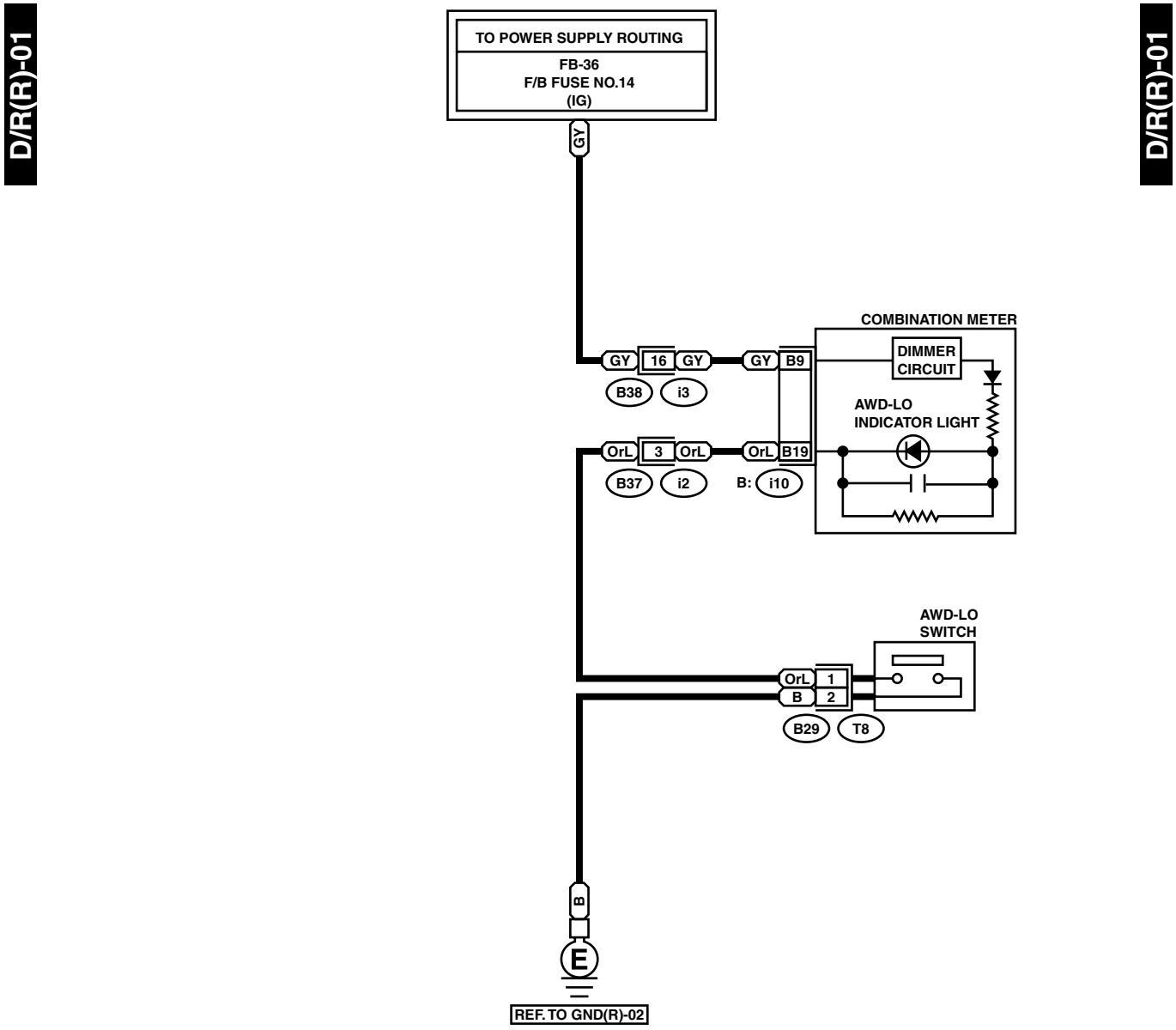


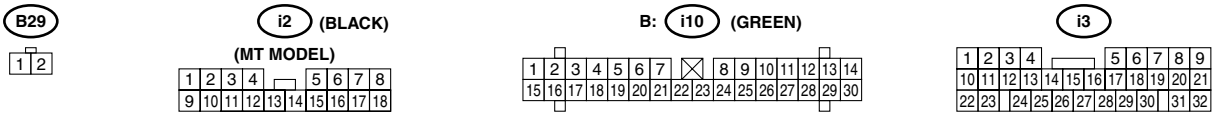
D/R(L)-01



WI-00401

2. RHD MODEL

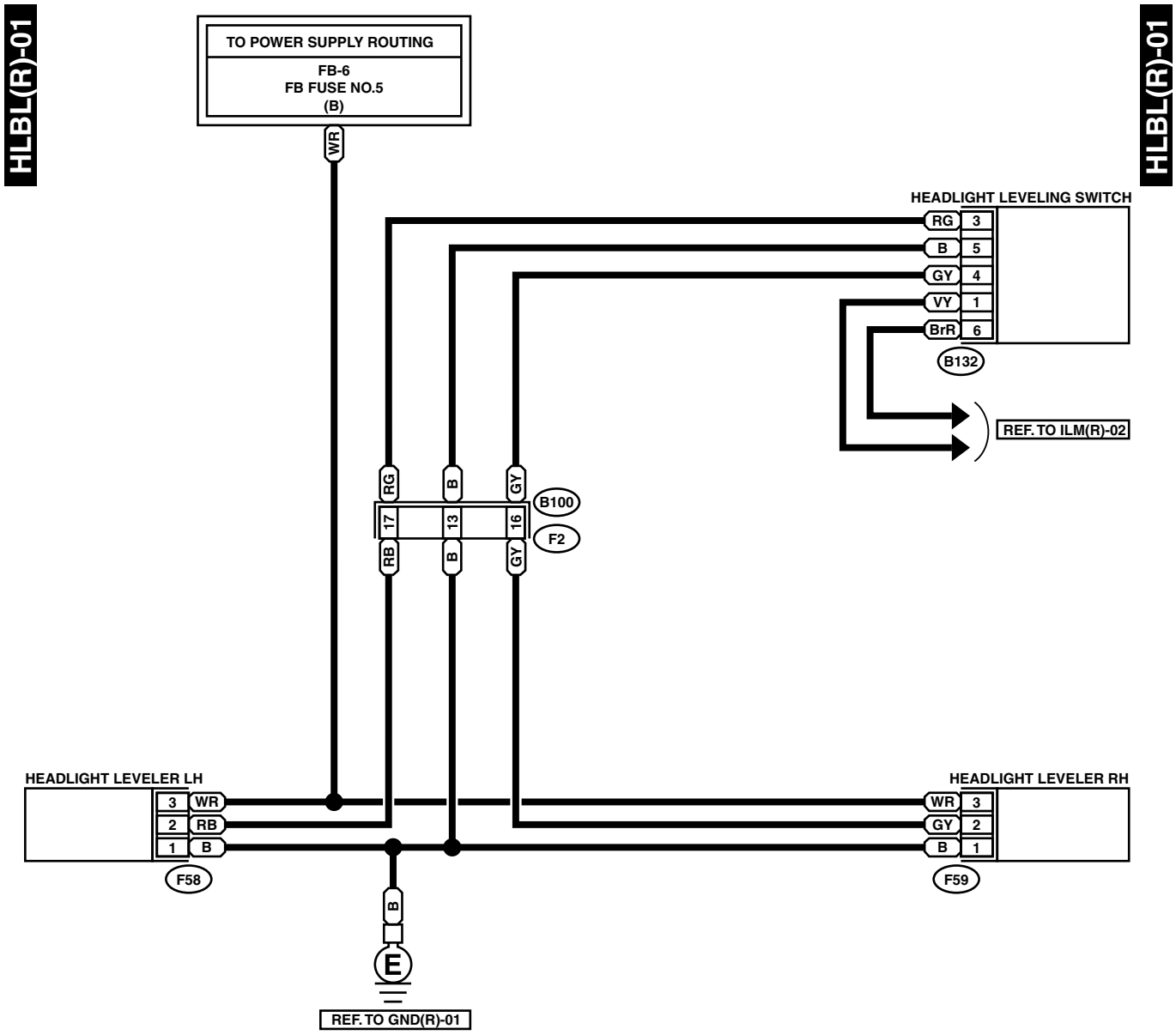


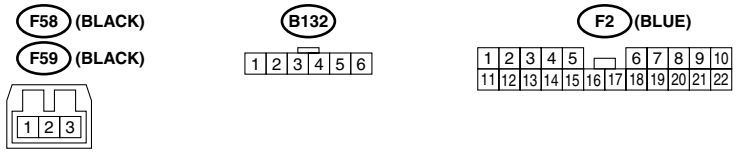


WI-00402

21.Headlight Beam Leveler System

A: SCHEMATIC



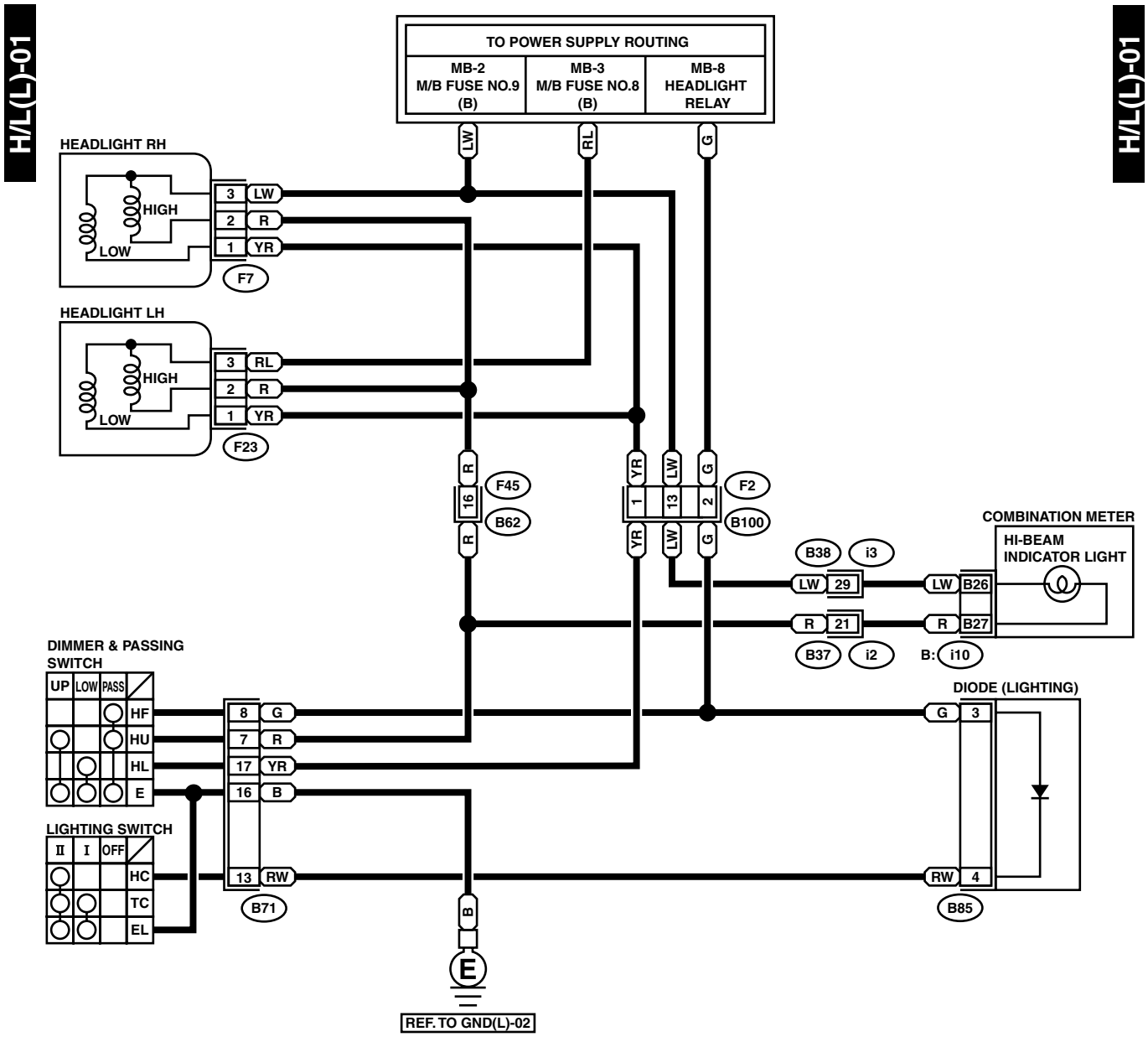


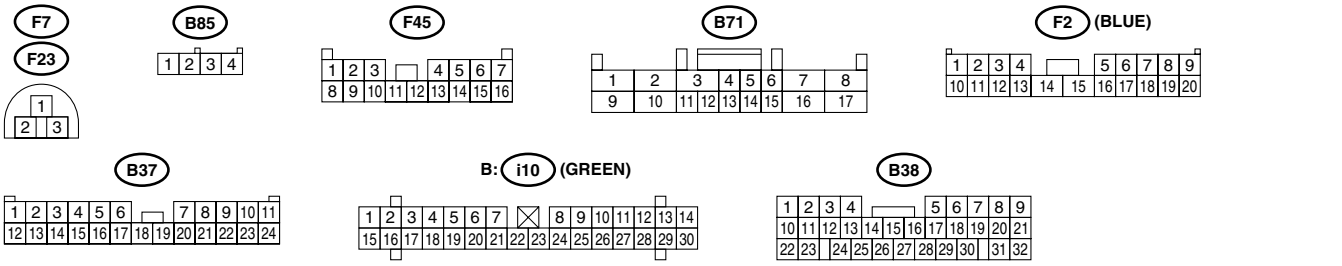
WI-00404

22.Headlight System

A: SCHEMATIC

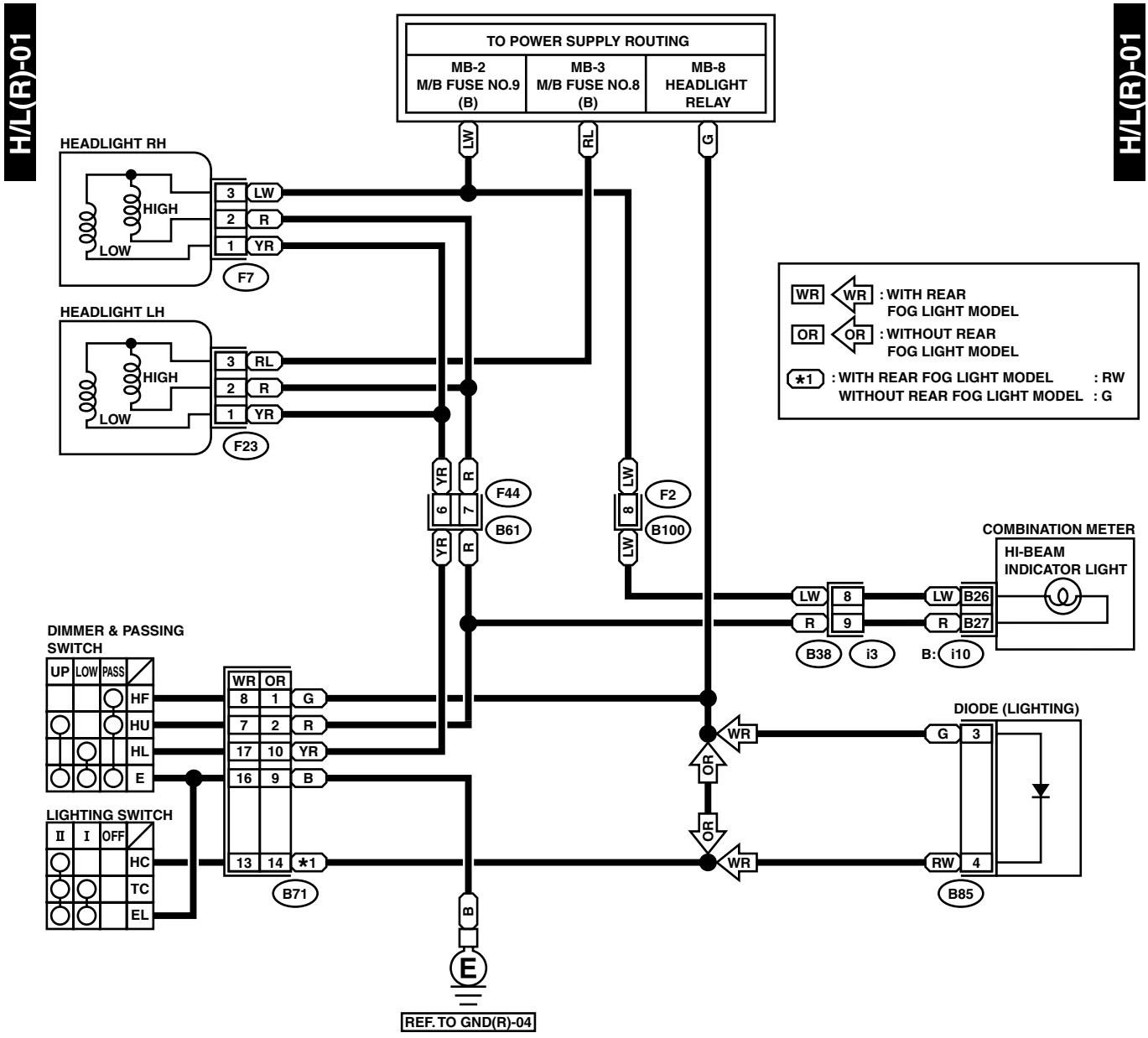
1. LHD MODEL





WI-00406

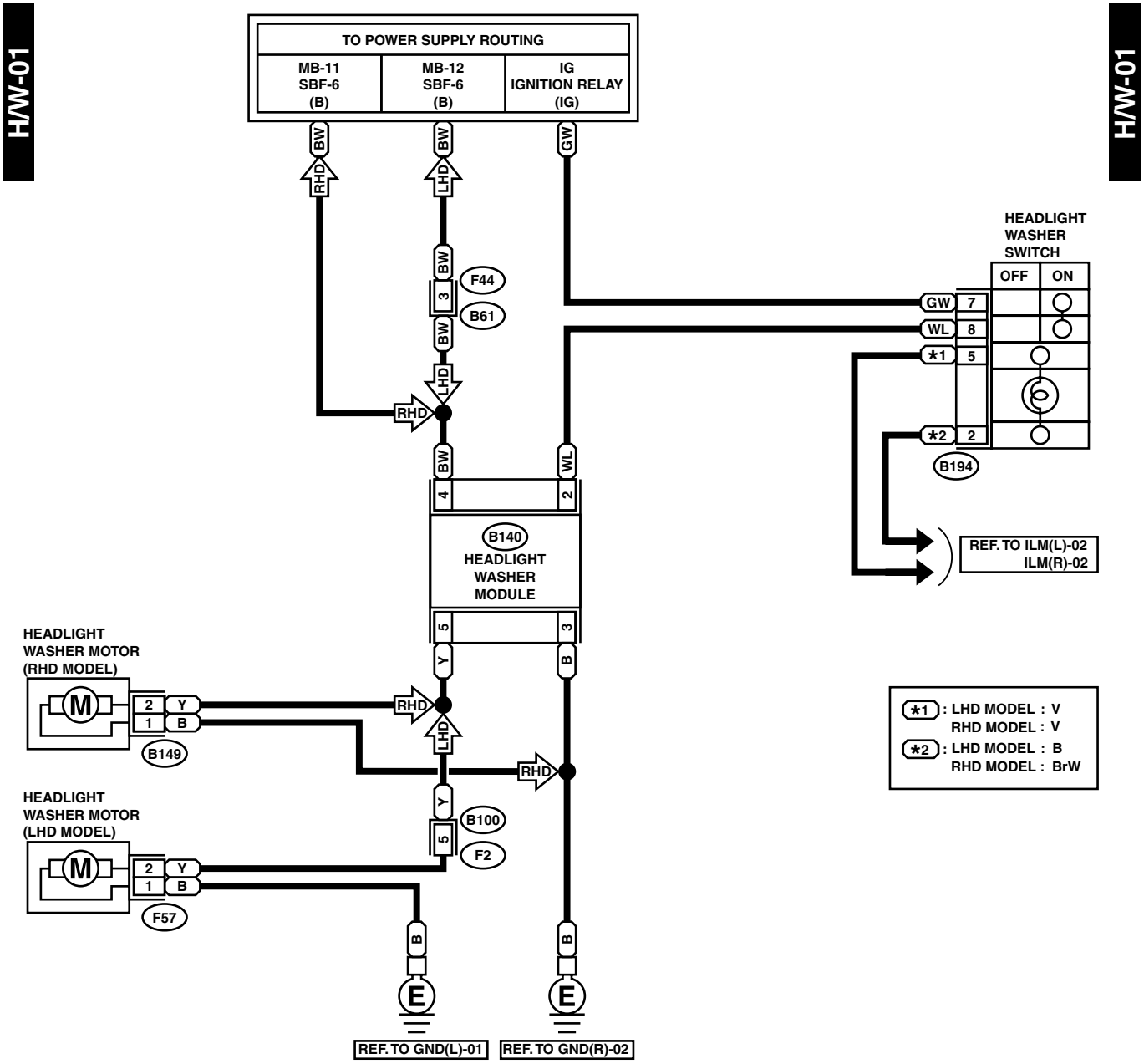
2. RHD MODEL



WI-00407

23.Headlight Washer System

A: SCHEMATIC

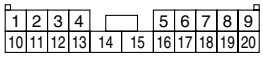


F57 (BLUE)
B149 (BLUE)

B140 (BLACK)

F44
B194

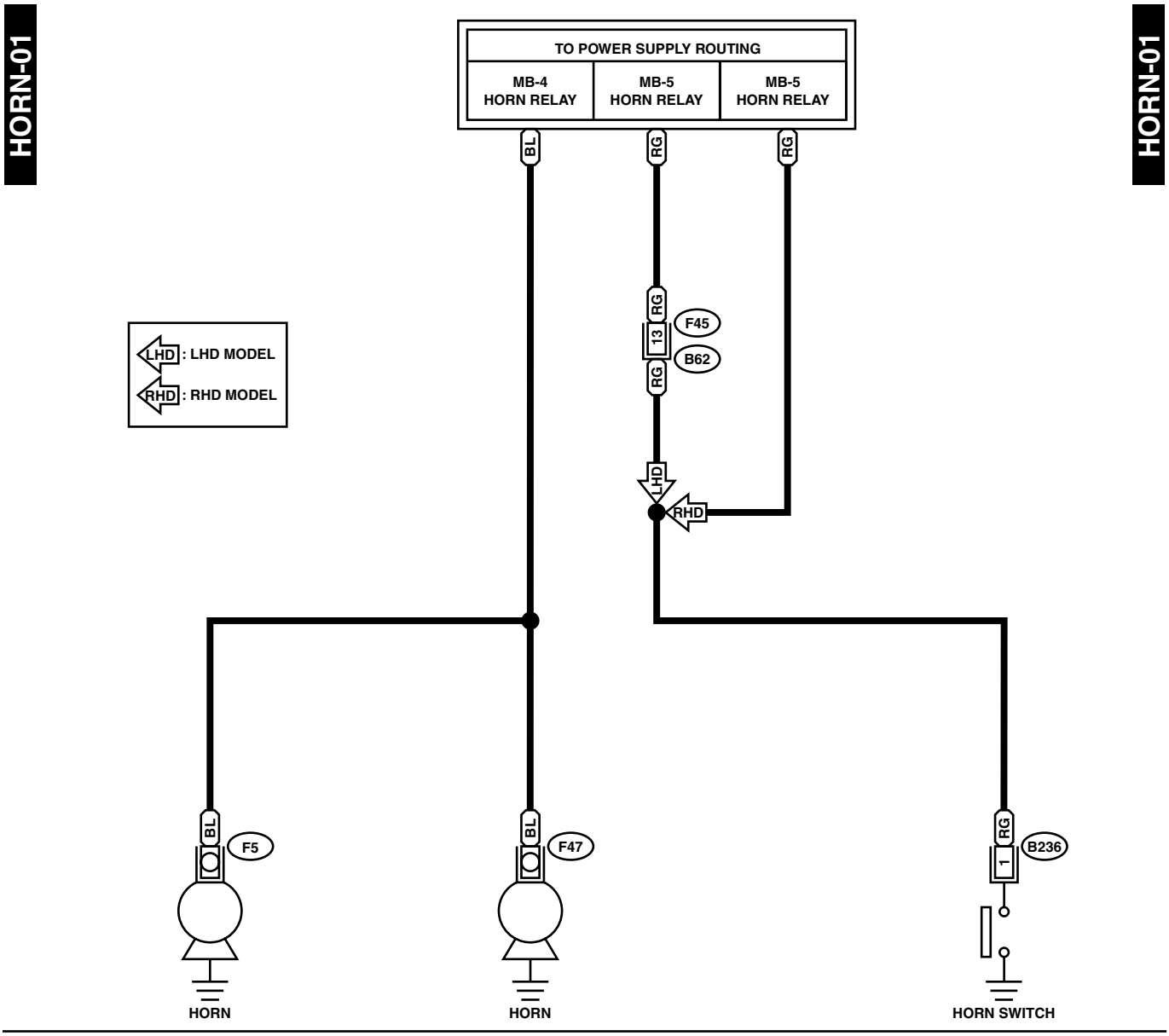
F2 (BLUE)



WI-00408

24.Horn System

A: SCHEMATIC

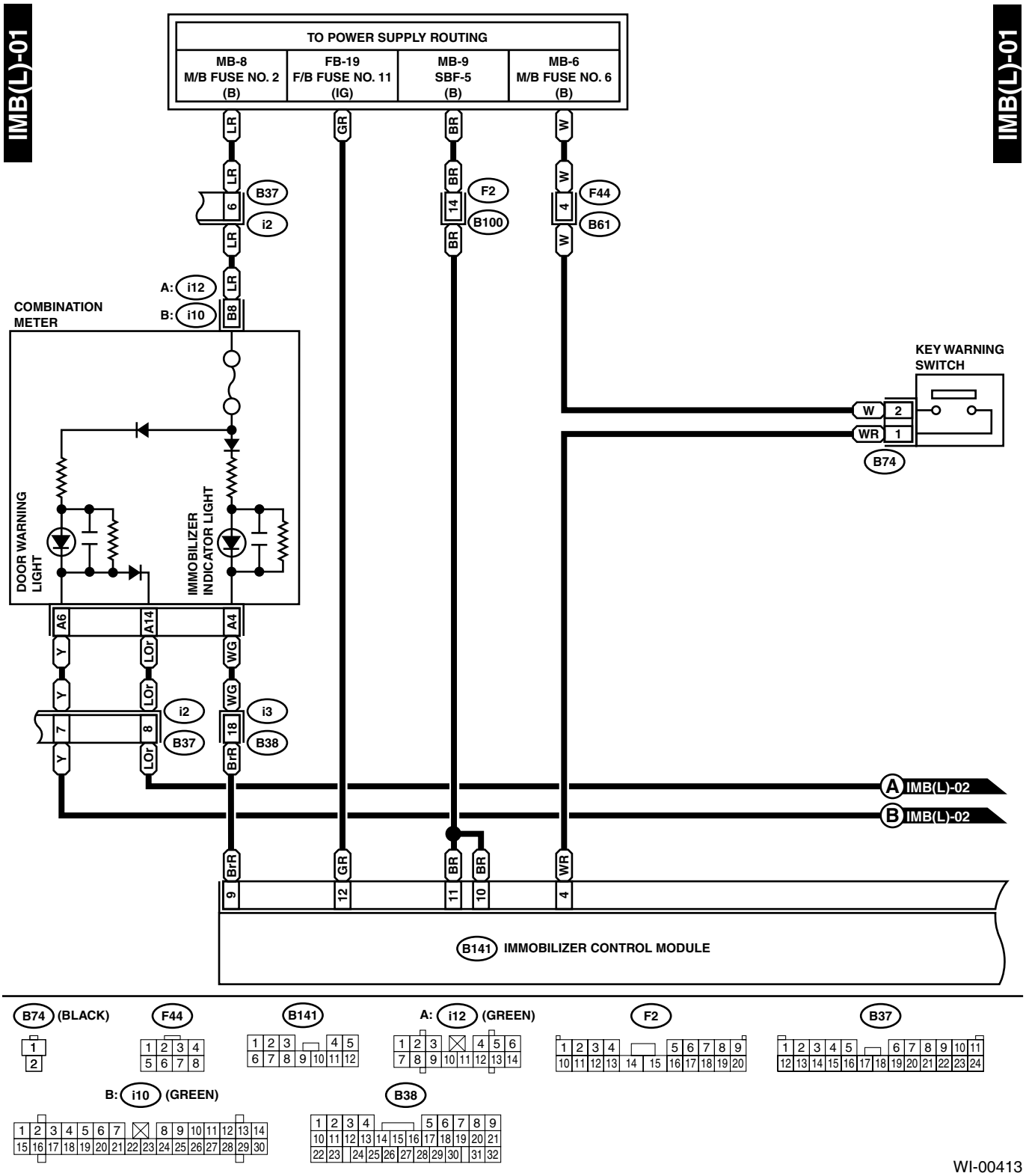


WI-00410

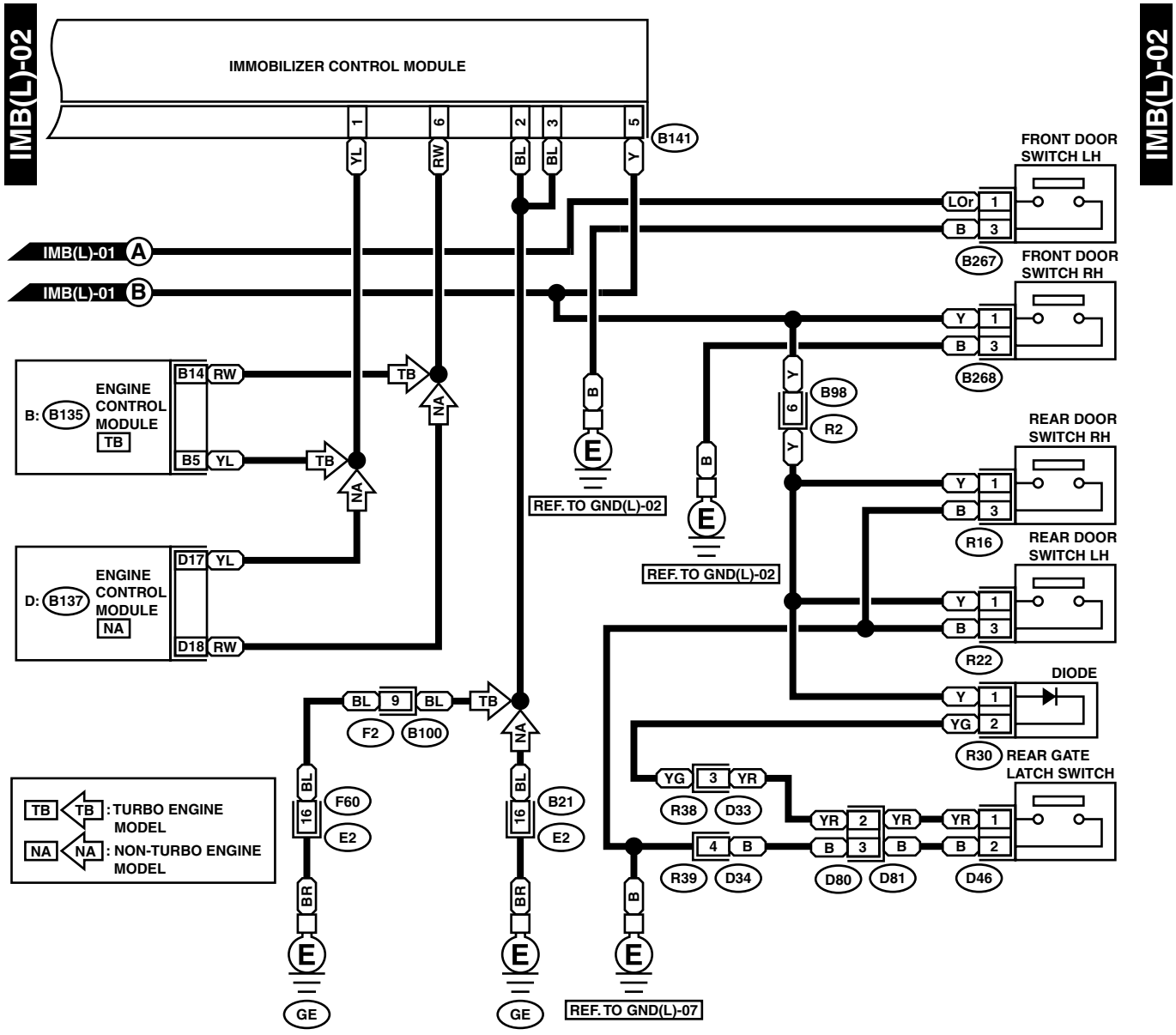
25.Immobilizer System

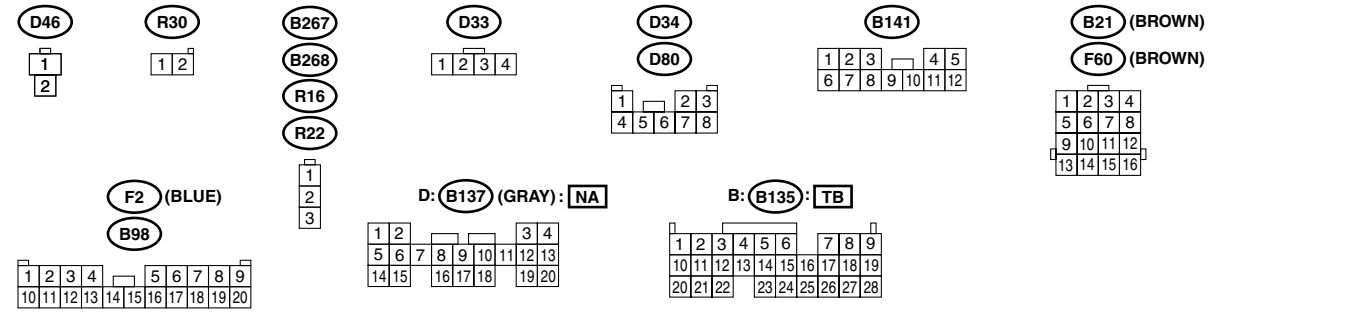
A: SCHEMATIC

1. LHD MODEL



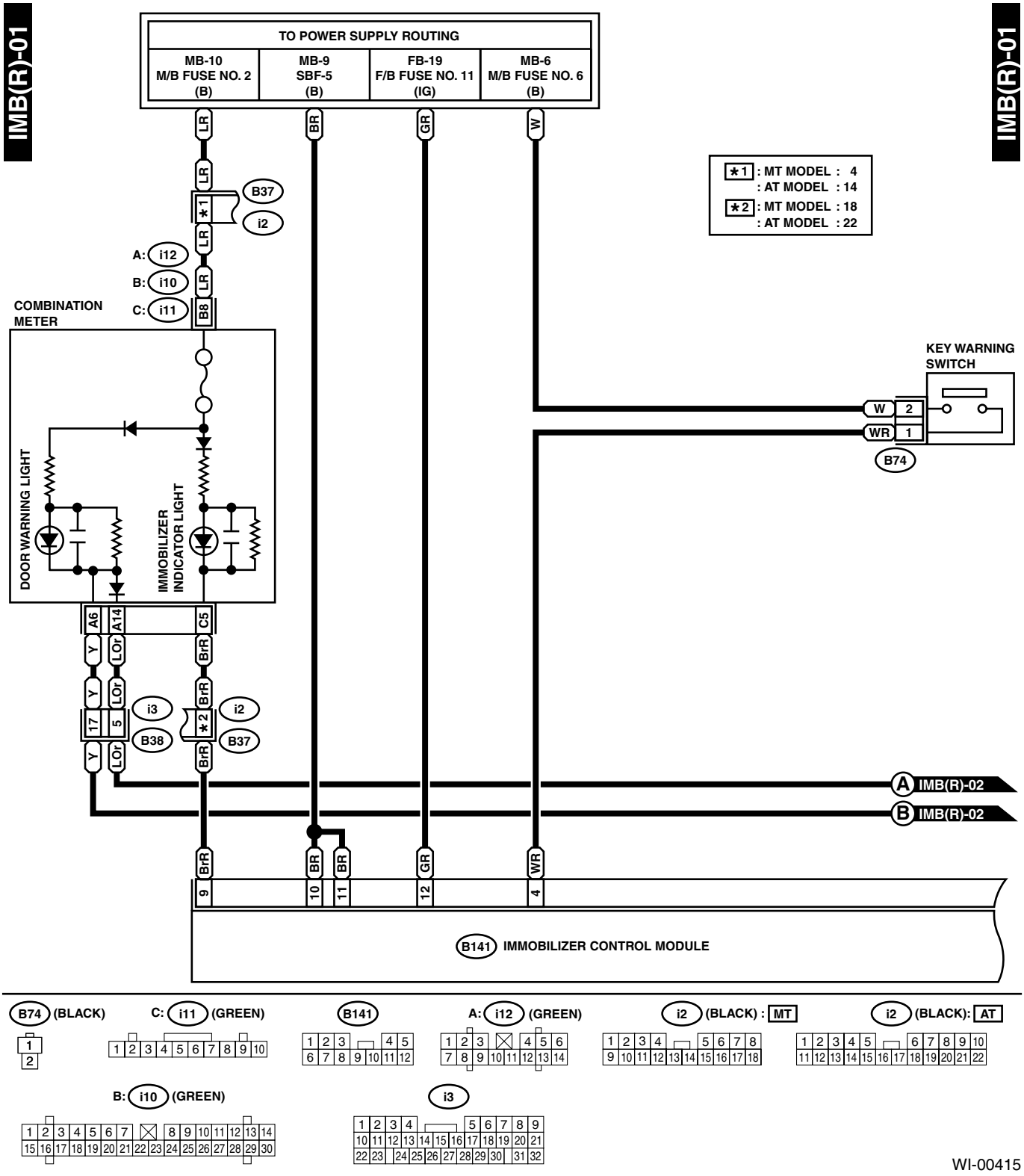
WI-00413


IMB(L)-02
IMMOBILIZER CONTROL MODULE
1
6
2
3
5
B141
YL
RW
BL
BL
Y
IMB(L)-01 A
IMB(L)-01 B
FRONT DOOR SWITCH LH
LOr 1
B 3
B267
FRONT DOOR SWITCH RH
Y 1
B 3
B268
REAR DOOR SWITCH RH
Y 1
B 3
R16
REAR DOOR SWITCH LH
Y 1
B 3
R22
DIODE
Y 1
YG 2
R30
REAR GATE LATCH SWITCH
B: B135 ENGINE CONTROL MODULE
TB
B14 RW
B5 YL
TB
NA
D: B137 ENGINE CONTROL MODULE
NA
D17 YL
D18 RW
B
E
REF. TO GND(L)-02
B98
R2
Y
6
REF. TO GND(L)-02
BL 9 BL
F2
B100
TB
NA
YG 3 YR
R38
D33
YR 2 YR YR 1
4 B
B 3 B B 2
R39
D34
D80
D81
D46
BL
16
F60
E2
B21
E2
BR
GE
GE
REF. TO GND(L)-07
TB TB : TURBO ENGINE MODEL
NA NA : NON-TURBO ENGINE MODEL

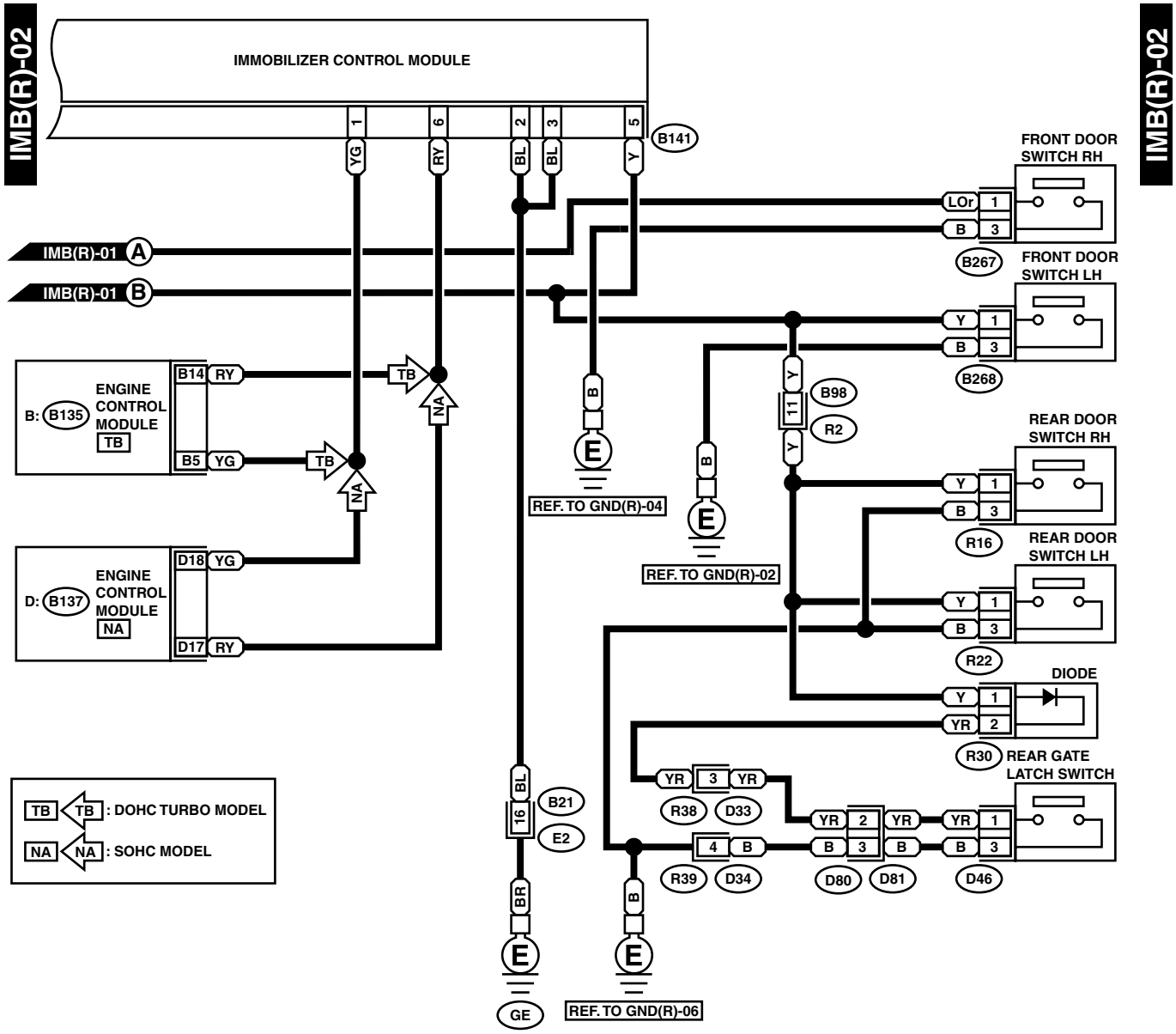

D46
R30
B267
B268
R16
R22
D33
D34
D80
B141
B21 (BROWN)
F60 (BROWN)
F2 (BLUE)
B98
D: B137 (GRAY) : NA
B: B135 : TB

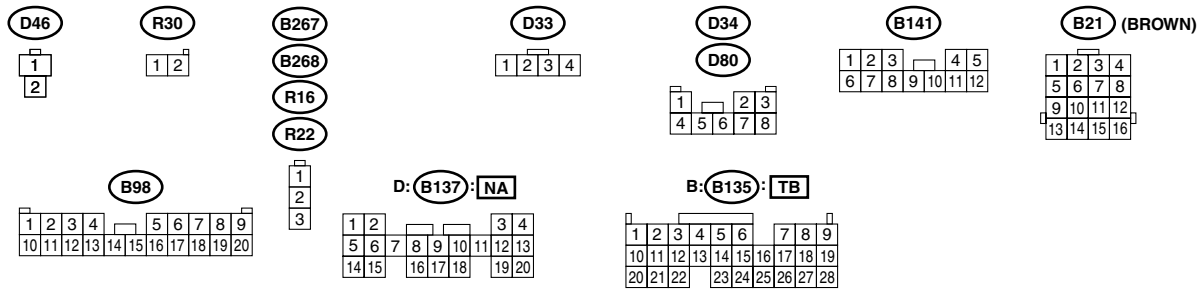
WI-00414

2. RHD MODEL



WI-00415


IMB(R)-02
IMMOBILIZER CONTROL MODULE
1
6
2
3
5
B141
YG
RY
BL
BL
Y
FRONT DOOR SWITCH RH
LOr 1
B 3
B267
FRONT DOOR SWITCH LH
Y 1
B 3
B268
IMB(R)-01 A
IMB(R)-01 B
B: B135
ENGINE CONTROL MODULE
TB
B14 RY
B5 YG
TB
NA
D: B137
ENGINE CONTROL MODULE
NA
D18 YG
D17 RY
B
E
REF. TO GND(R)-04
Y
11
B98
R2
REAR DOOR SWITCH RH
Y 1
B 3
R16
REAR DOOR SWITCH LH
Y 1
B 3
R22
REF. TO GND(R)-02
DIODE
Y 1
YR 2
R30
REAR GATE LATCH SWITCH
YR 3 YR
R38 D33
4 B
R39 D34
YR 2 YR
B 3 B
D80 D81
YR 1
B 3
D46
BL
16
B21
E2
BR
GE
REF. TO GND(R)-06
TB TB : DOHC TURBO MODEL
NA NA : SOHC MODEL

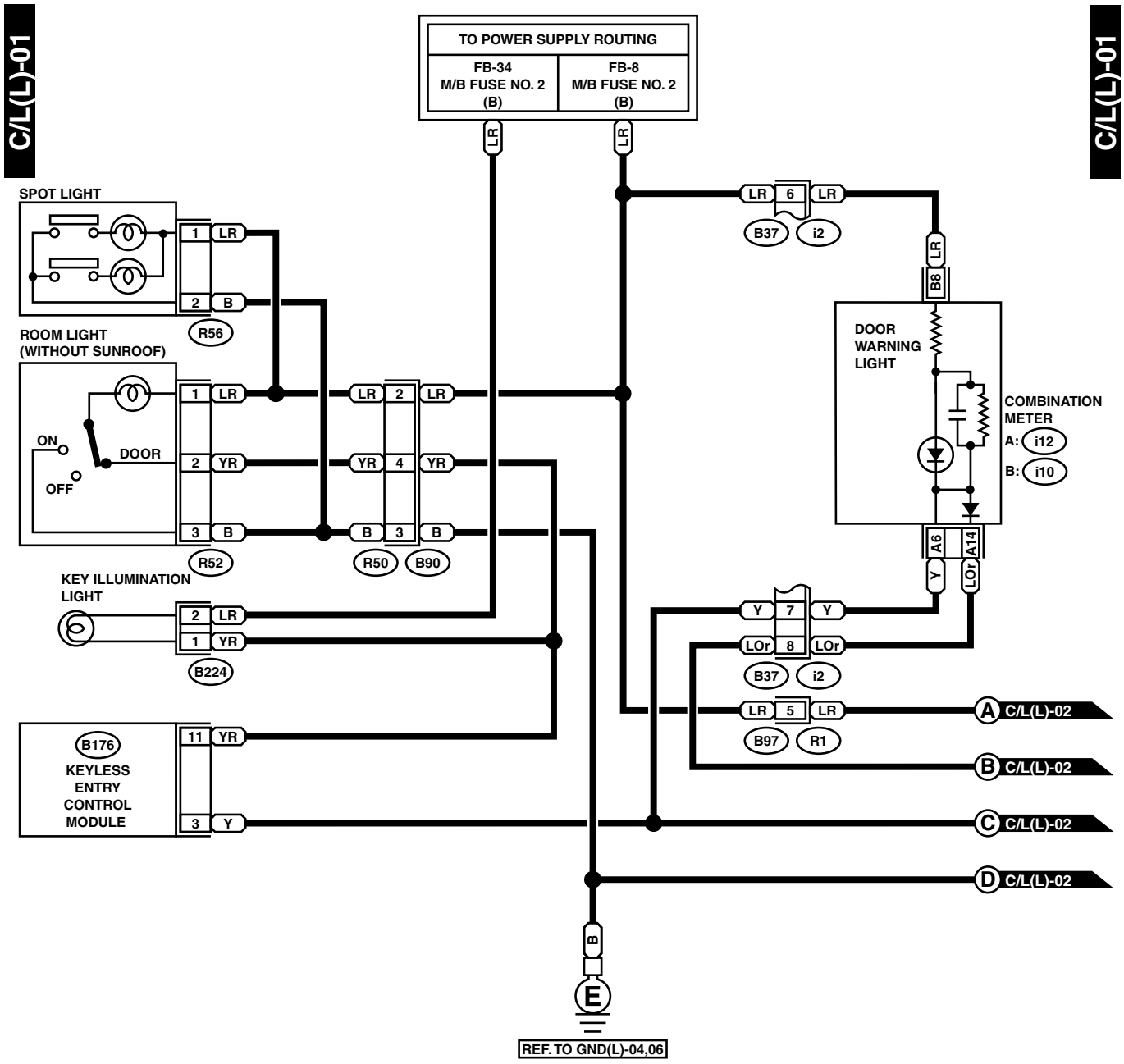

D46
R30
B267
B268
R16
R22
D33
D34
D80
B141
B21 (BROWN)
B98
D: B137 : NA
B: B135 : TB

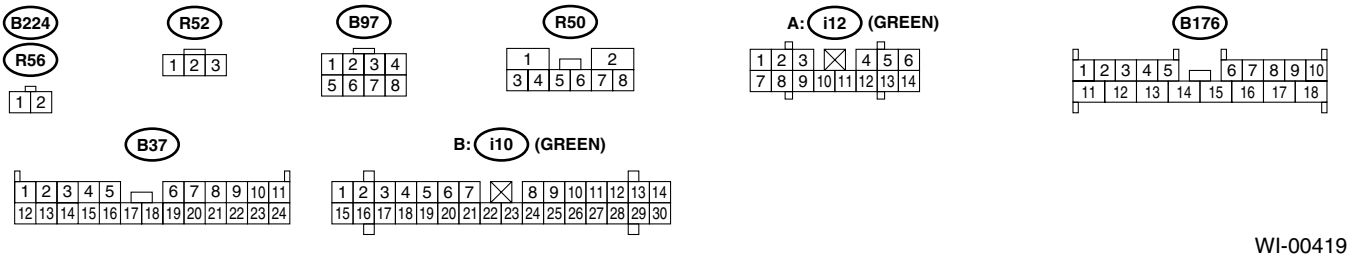
WI-00416

26.In Compartment Light System

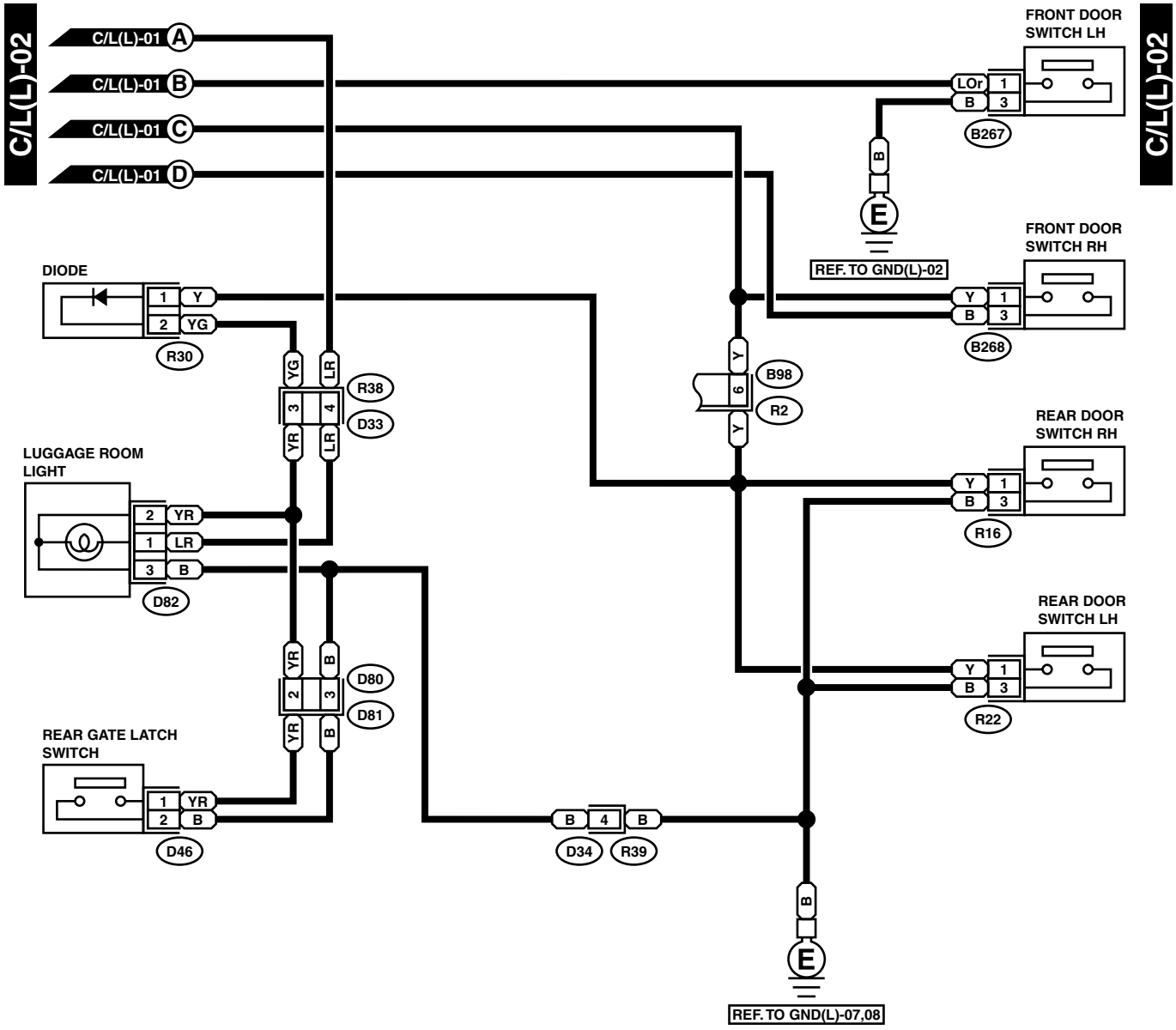
A: SCHEMATIC

1. LHD MODEL



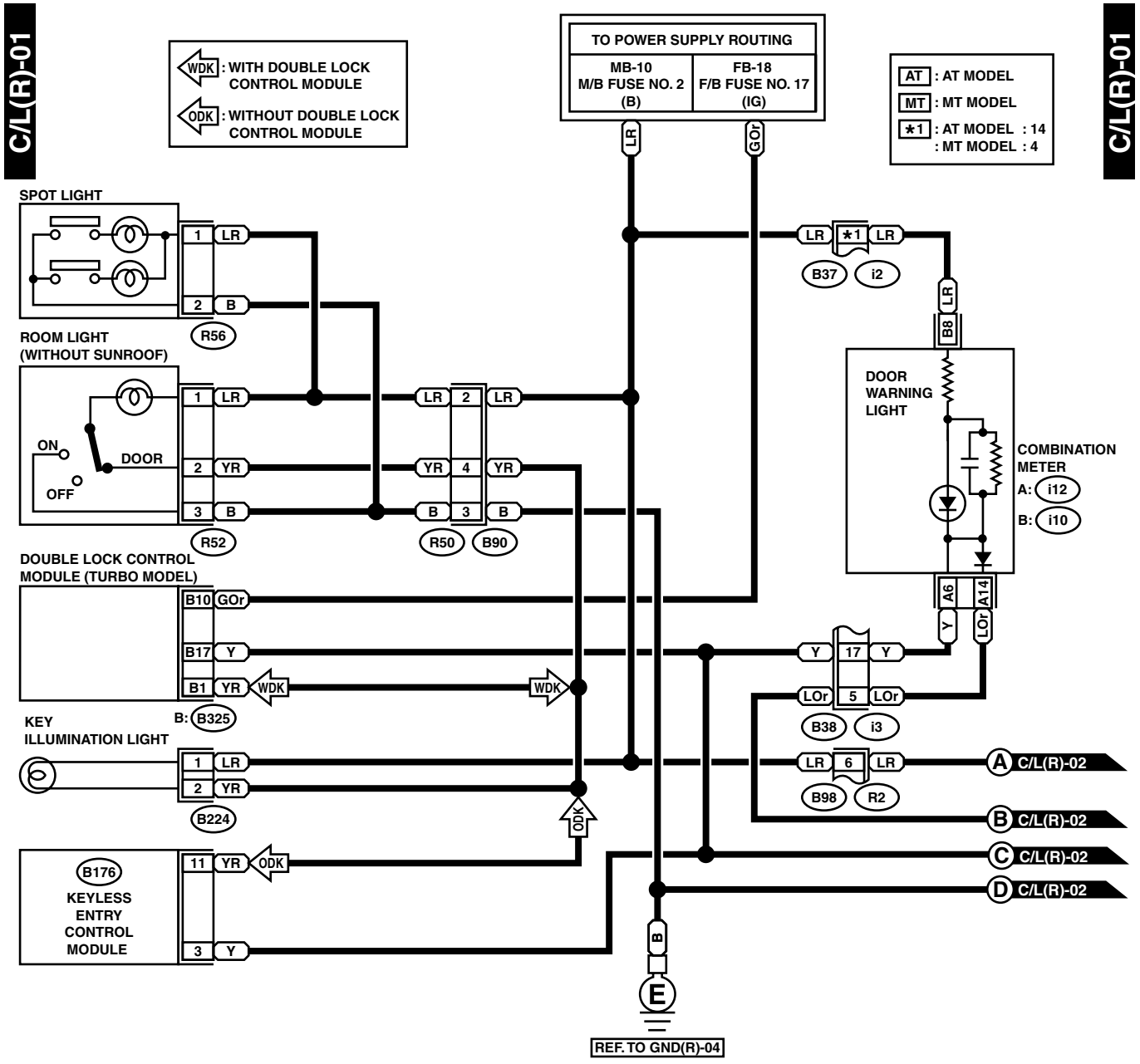


WI-00419

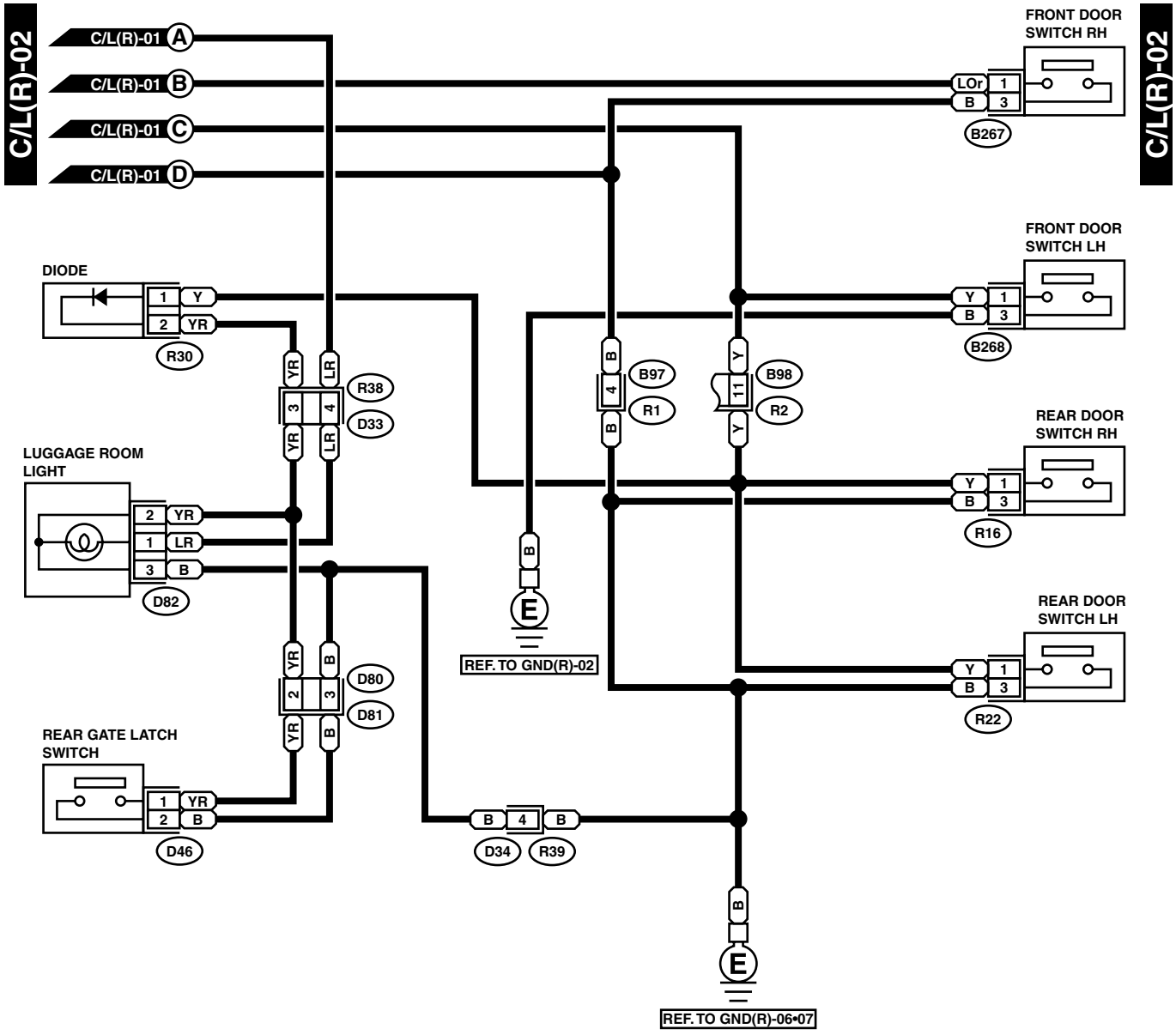

C/L(L)-02
C/L(L)-01 A
C/L(L)-01 B
C/L(L)-01 C
C/L(L)-01 D
C/L(L)-02
FRONT DOOR SWITCH LH
LOr 1
B 3
B267
B
E
REF. TO GND(L)-02
FRONT DOOR SWITCH RH
Y 1
B 3
B268
DIODE
1 Y
2 YG
R30
YG LR
R38
3 4
D33
YR LR
Y
B98
6
R2
Y
REAR DOOR SWITCH RH
Y 1
B 3
R16
LUGGAGE ROOM LIGHT
2 YR
1 LR
3 B
D82
REAR DOOR SWITCH LH
Y 1
B 3
R22
YR B
D80
2 3
D81
YR B
REAR GATE LATCH SWITCH
1 YR
2 B
D46
B 4 B
D34 R39
B
E
REF. TO GND(L)-07,08
D46
1
2
R30
1 2
R16
R22
B267
B268
1
2
3
D82
1 2 3
D33
1 2 3 4
D34
D80
1
2 3
4 5 6 7 8
B98
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19 20

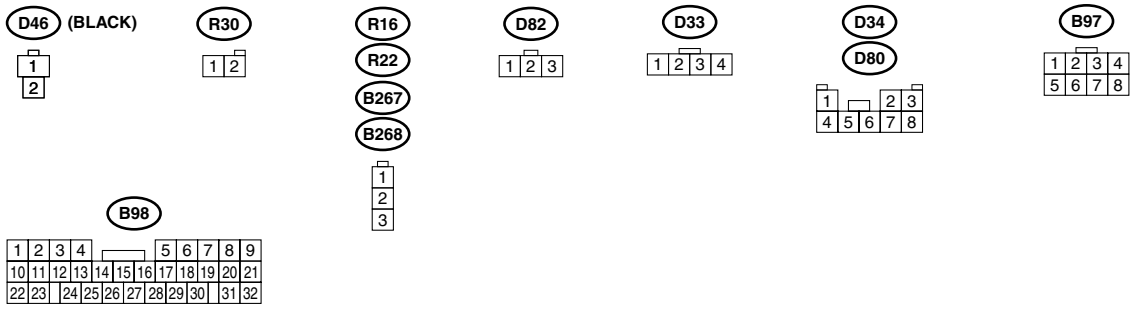
WI-00420

2. RHD MODEL



WI-00423


C/L(R)-02
C/L(R)-01 A
C/L(R)-01 B
C/L(R)-01 C
C/L(R)-01 D
C/L(R)-02
FRONT DOOR SWITCH RH
LOr
B
1
3
B267
FRONT DOOR SWITCH LH
Y
B
1
3
B268
DIODE
1 Y
2 YR
R30
YR
LR
R38
D33
3
4
B97
R1
B98
R2
11
4
B
Y
LUGGAGE ROOM LIGHT
2 YR
1 LR
3 B
D82
REAR DOOR SWITCH RH
R16
REAR DOOR SWITCH LH
R22
E
REF. TO GND(R)-02
D80
D81
REAR GATE LATCH SWITCH
1 YR
2 B
D46
B 4 B
D34
R39
E
REF. TO GND(R)-06•07

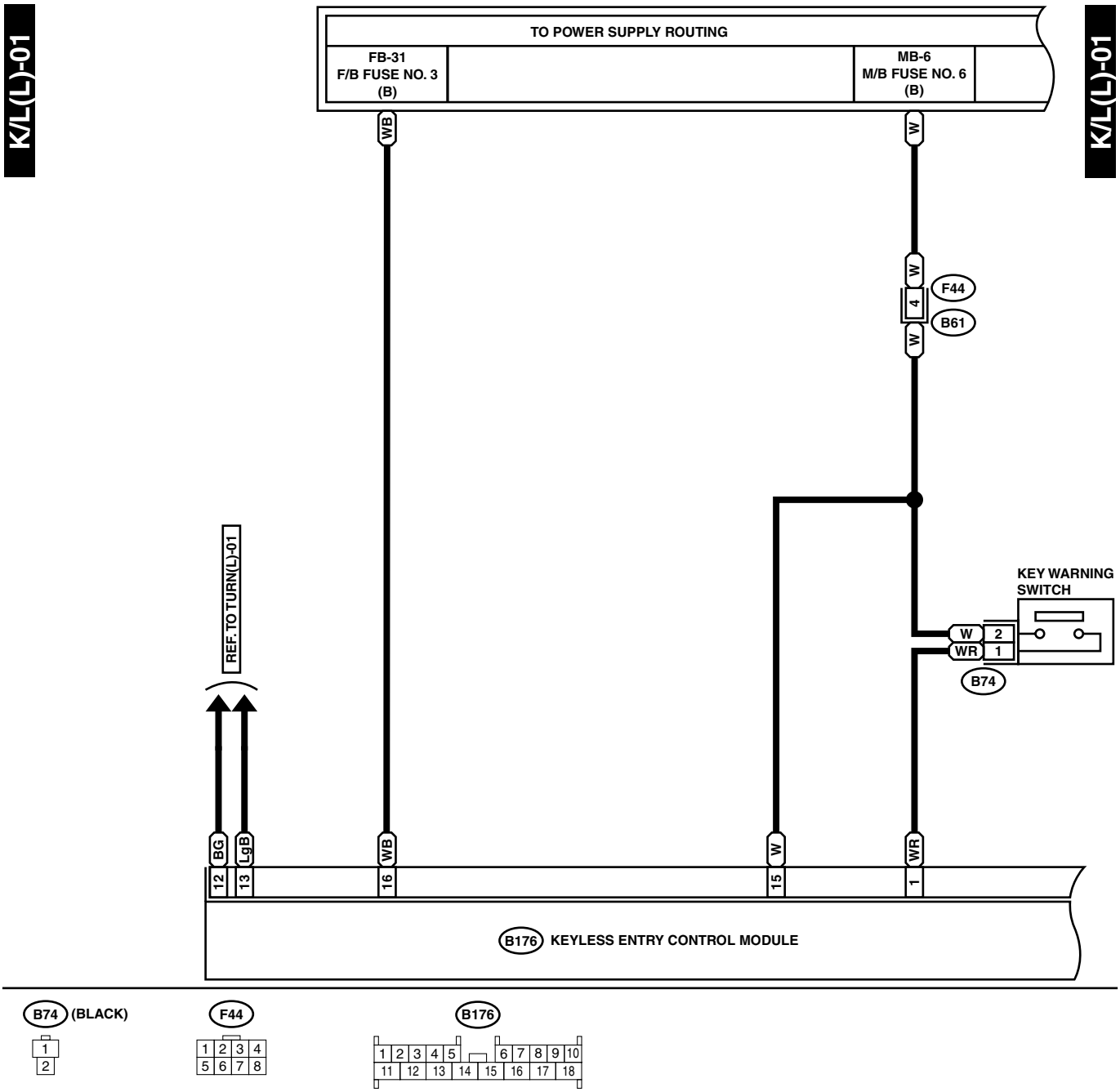

D46 (BLACK)
R30
R16
R22
B267
B268
D82
D33
D34
D80
B97
B98

WI-00424

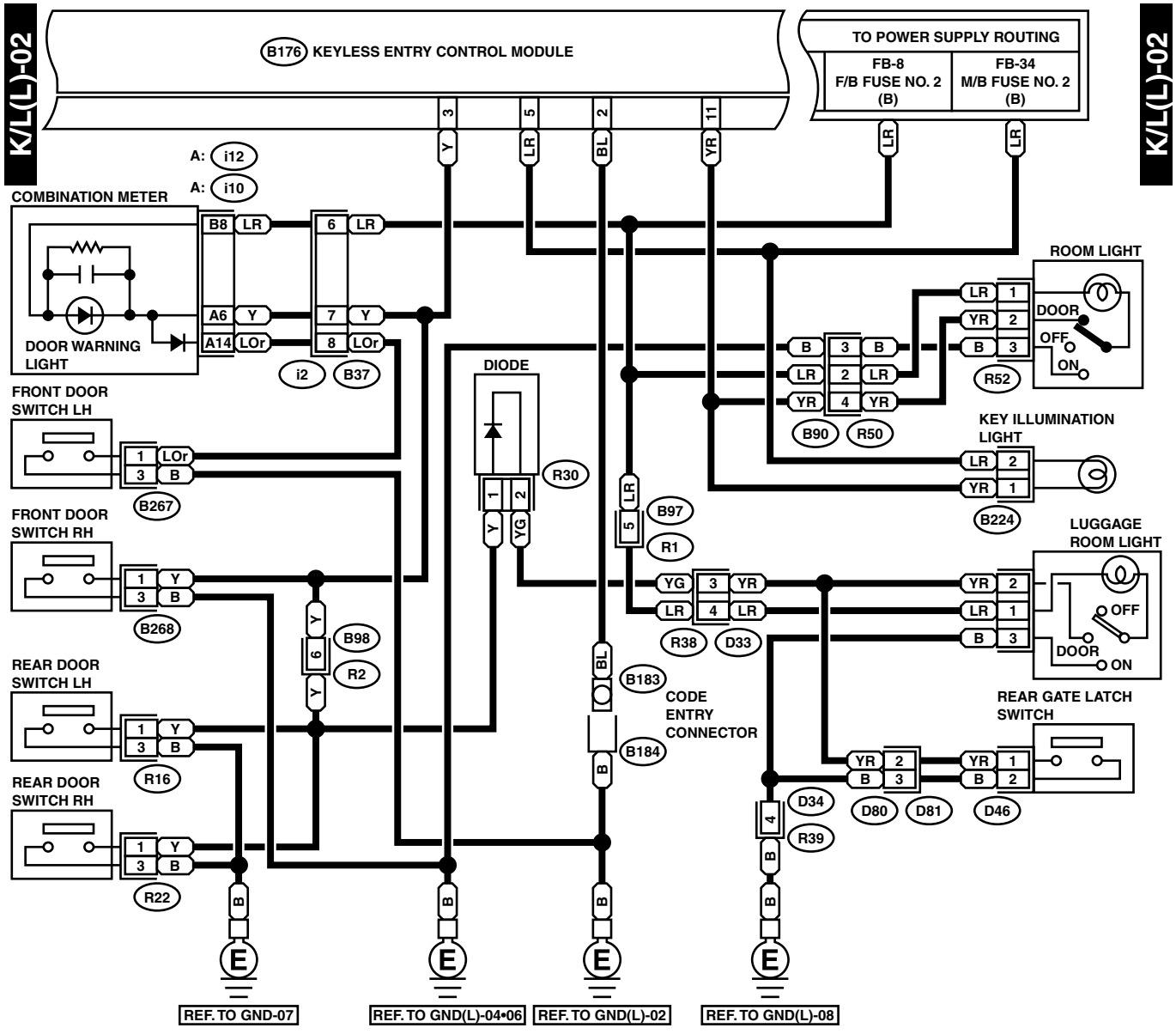
27.Keyless Entry System

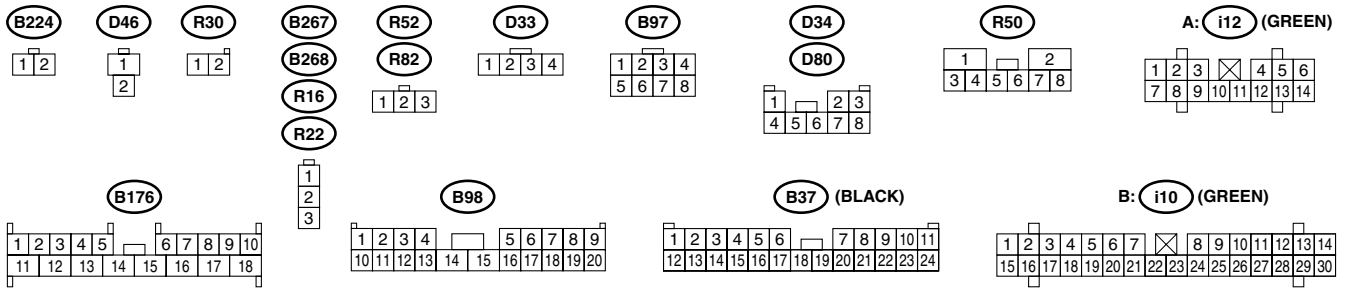
A: SCHEMATIC

1. LHD MODEL

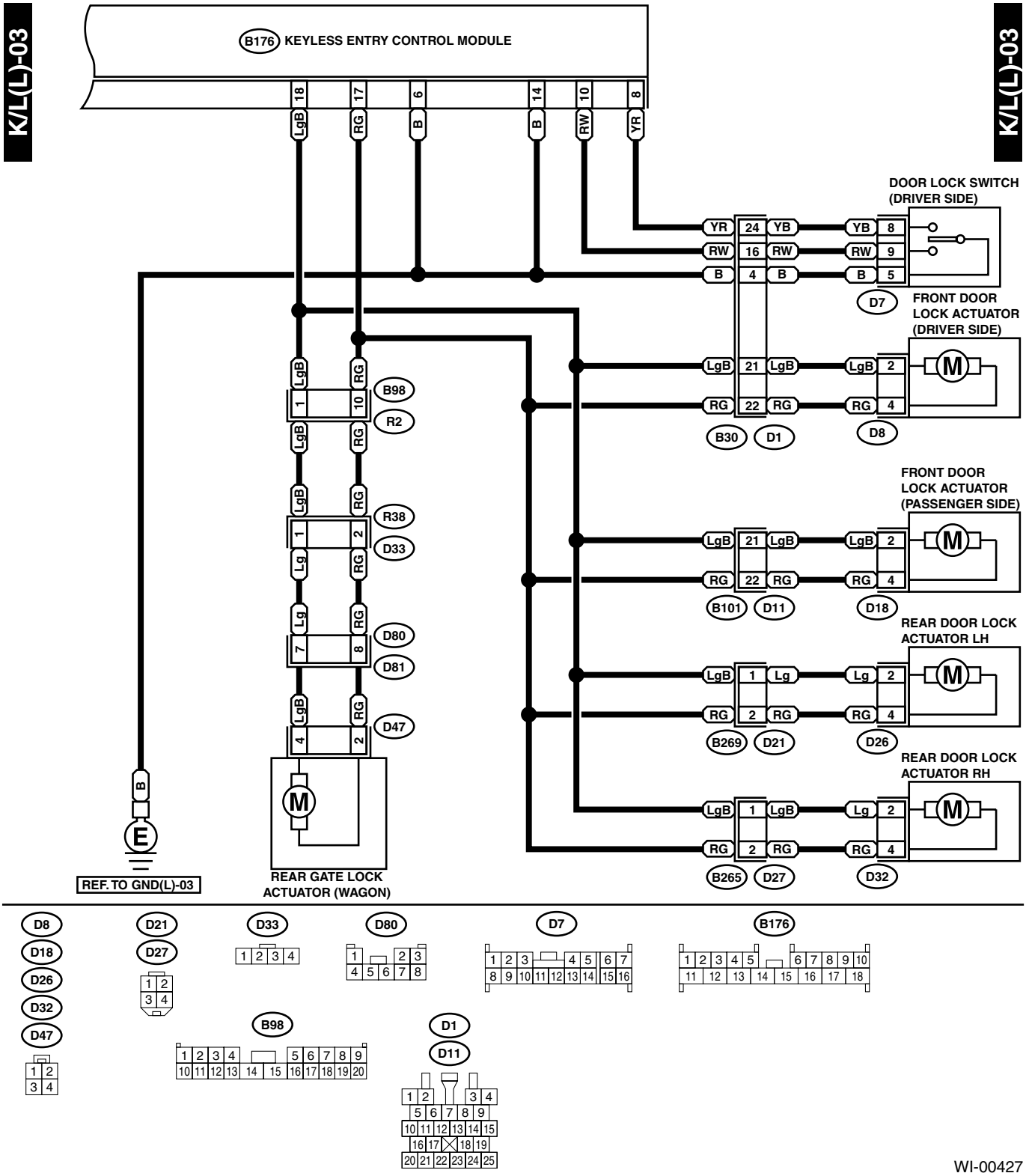


WI-00425

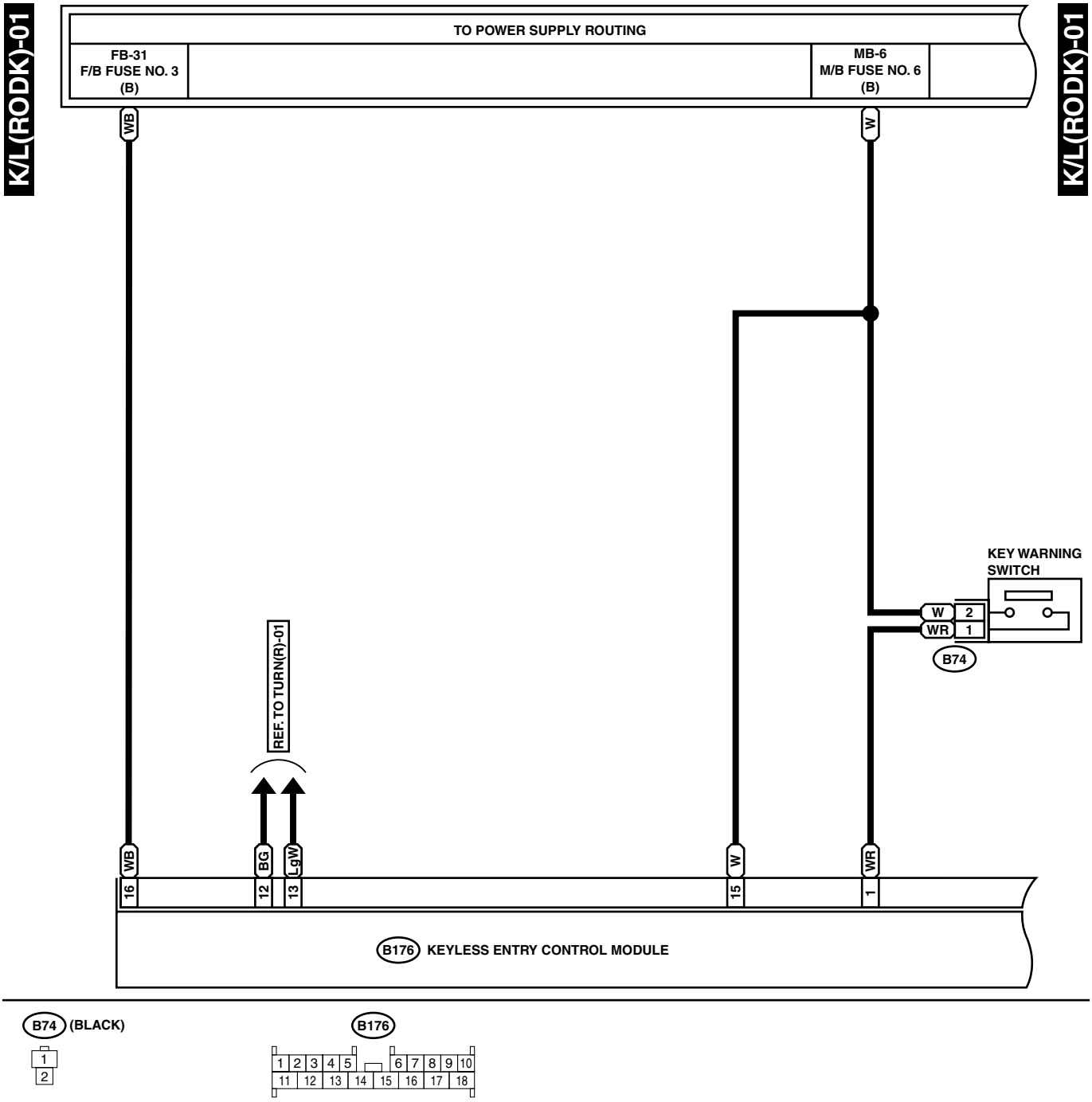

K/L(L)-02
K/L(L)-02
B176 KEYLESS ENTRY CONTROL MODULE
TO POWER SUPPLY ROUTING
FB-8 F/B FUSE NO. 2 (B)
FB-34 M/B FUSE NO. 2 (B)
A: i12
A: i10
COMBINATION METER
DOOR WARNING LIGHT
i2
B37
DIODE
R30
ROOM LIGHT
DOOR
OFF
ON
R52
B90
R50
KEY ILLUMINATION LIGHT
B224
LUGGAGE ROOM LIGHT
FRONT DOOR SWITCH LH
B267
FRONT DOOR SWITCH RH
B268
REAR DOOR SWITCH LH
R16
REAR DOOR SWITCH RH
R22
B97
R1
B98
R2
B183
CODE ENTRY CONNECTOR
B184
R38
D33
D34
R39
D80
D81
D46
REAR GATE LATCH SWITCH
REF. TO GND-07
REF. TO GND(L)-04•06
REF. TO GND(L)-02
REF. TO GND(L)-08


B224
D46
R30
B267
B268
R16
R22
R52
R82
D33
B97
D34
D80
R50
A: i12 (GREEN)
B176
B98
B37 (BLACK)
B: i10 (GREEN)

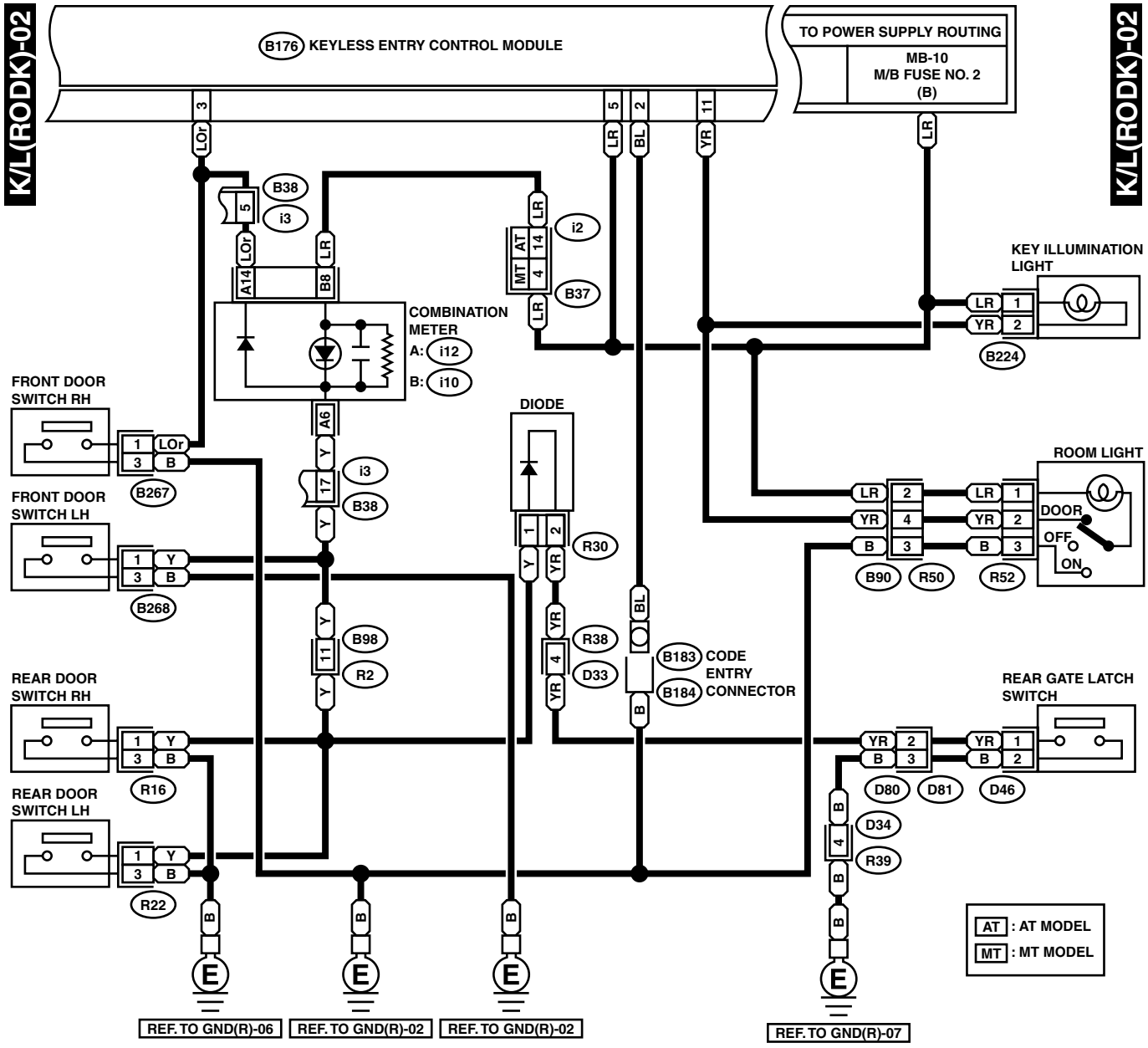
WI-00426

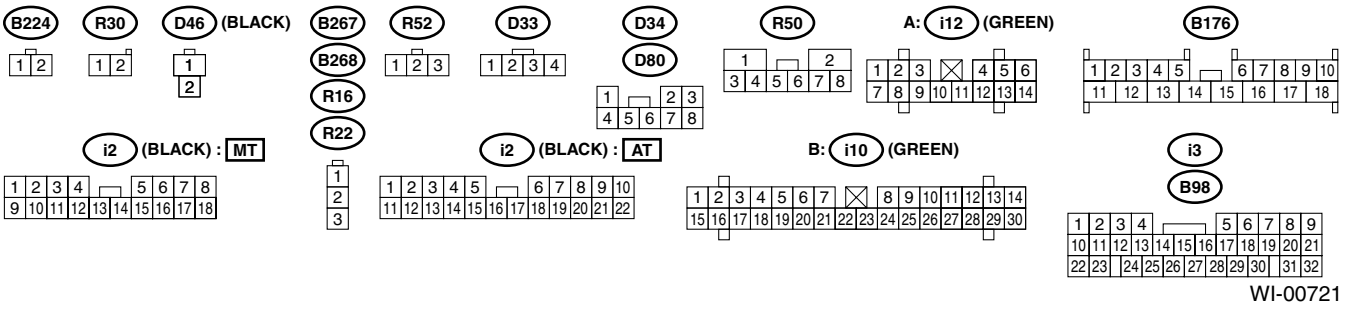

K/L(L)-03
K/L(L)-03
B176 KEYLESS ENTRY CONTROL MODULE
18 17 6 14 10 8
LgB RG B B RW YR
DOOR LOCK SWITCH (DRIVER SIDE)
D7
FRONT DOOR LOCK ACTUATOR (DRIVER SIDE)
D8
B30 D1
FRONT DOOR LOCK ACTUATOR (PASSENGER SIDE)
D18
B101 D11
REAR DOOR LOCK ACTUATOR LH
D26
B269 D21
REAR DOOR LOCK ACTUATOR RH
D32
B265 D27
B98
R2
R38
D33
D80
D81
D47
REAR GATE LOCK ACTUATOR (WAGON)
REF. TO GND(L)-03
D8
D18
D26
D32
D47
D21
D27
D33
D80
D7
B176
B98
D1
D11
WI-00427

2. RHD WITHOUT DOUBLE LOCK MODEL

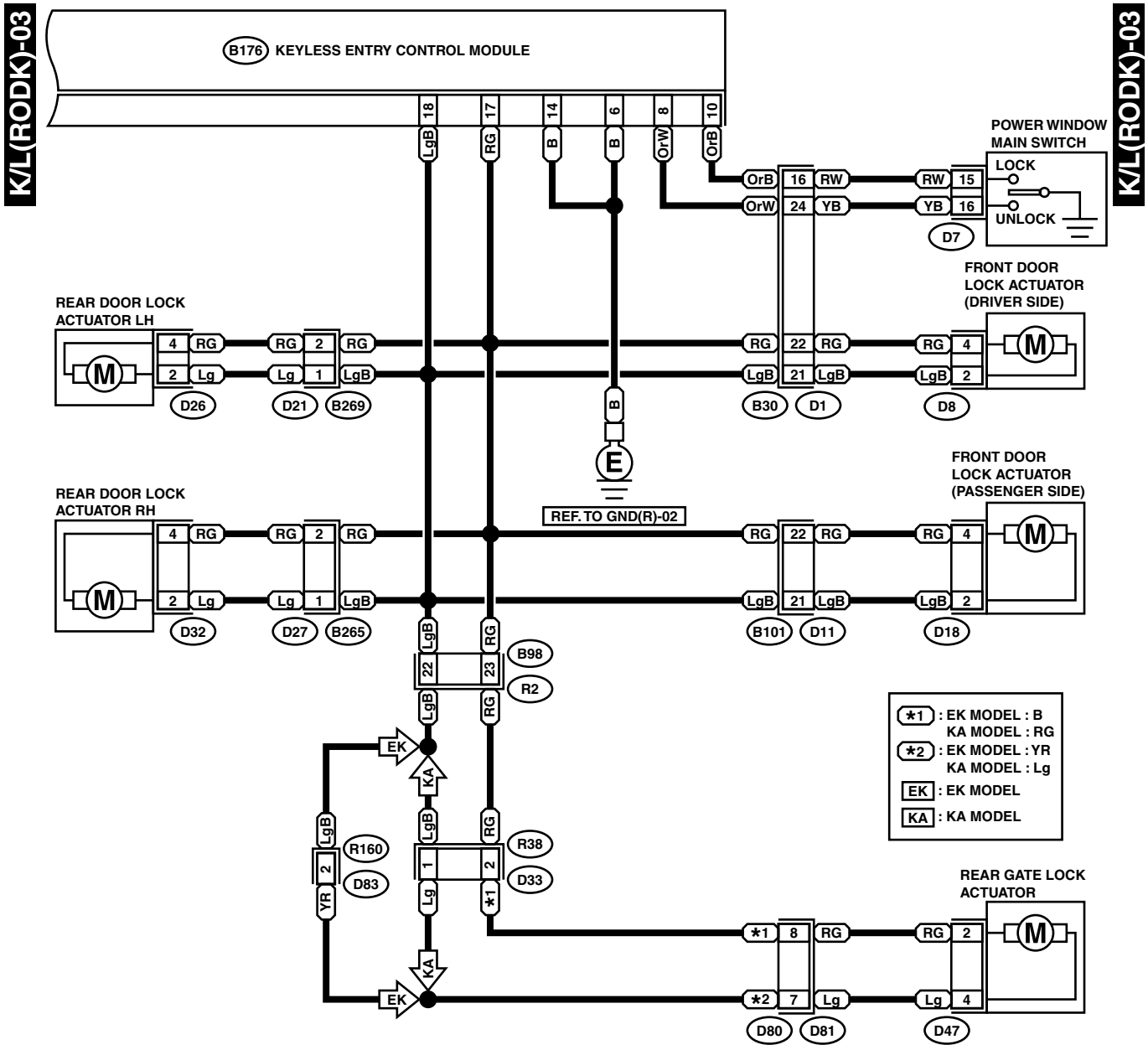


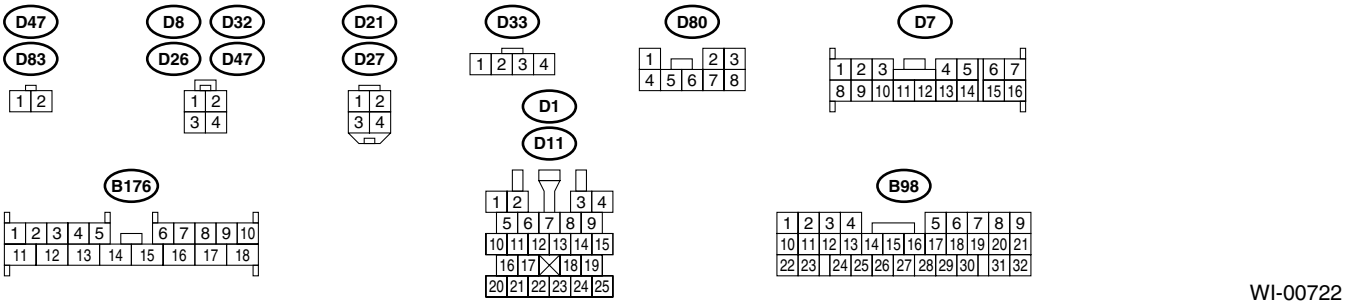
WI-00720


K/L(RODK)-02
B176 KEYLESS ENTRY CONTROL MODULE
TO POWER SUPPLY ROUTING
MB-10
M/B FUSE NO. 2
(B)
K/L(RODK)-02
B38
i3
i2
B37
COMBINATION METER
A: i12
B: i10
KEY ILLUMINATION LIGHT
B224
FRONT DOOR SWITCH RH
B267
FRONT DOOR SWITCH LH
B268
DIODE
R30
ROOM LIGHT
DOOR
OFF
ON
B90
R50
R52
B98
R2
R38
D33
B183 CODE ENTRY
B184 CONNECTOR
REAR DOOR SWITCH RH
R16
REAR DOOR SWITCH LH
R22
REAR GATE LATCH SWITCH
D80
D81
D46
D34
R39
AT : AT MODEL
MT : MT MODEL
REF. TO GND(R)-06
REF. TO GND(R)-02
REF. TO GND(R)-02
REF. TO GND(R)-07


B224
R30
D46 (BLACK)
B267
B268
R16
R22
R52
D33
D34
D80
R50
A: i12 (GREEN)
B176
i2 (BLACK) : MT
i2 (BLACK) : AT
B: i10 (GREEN)
i3
B98

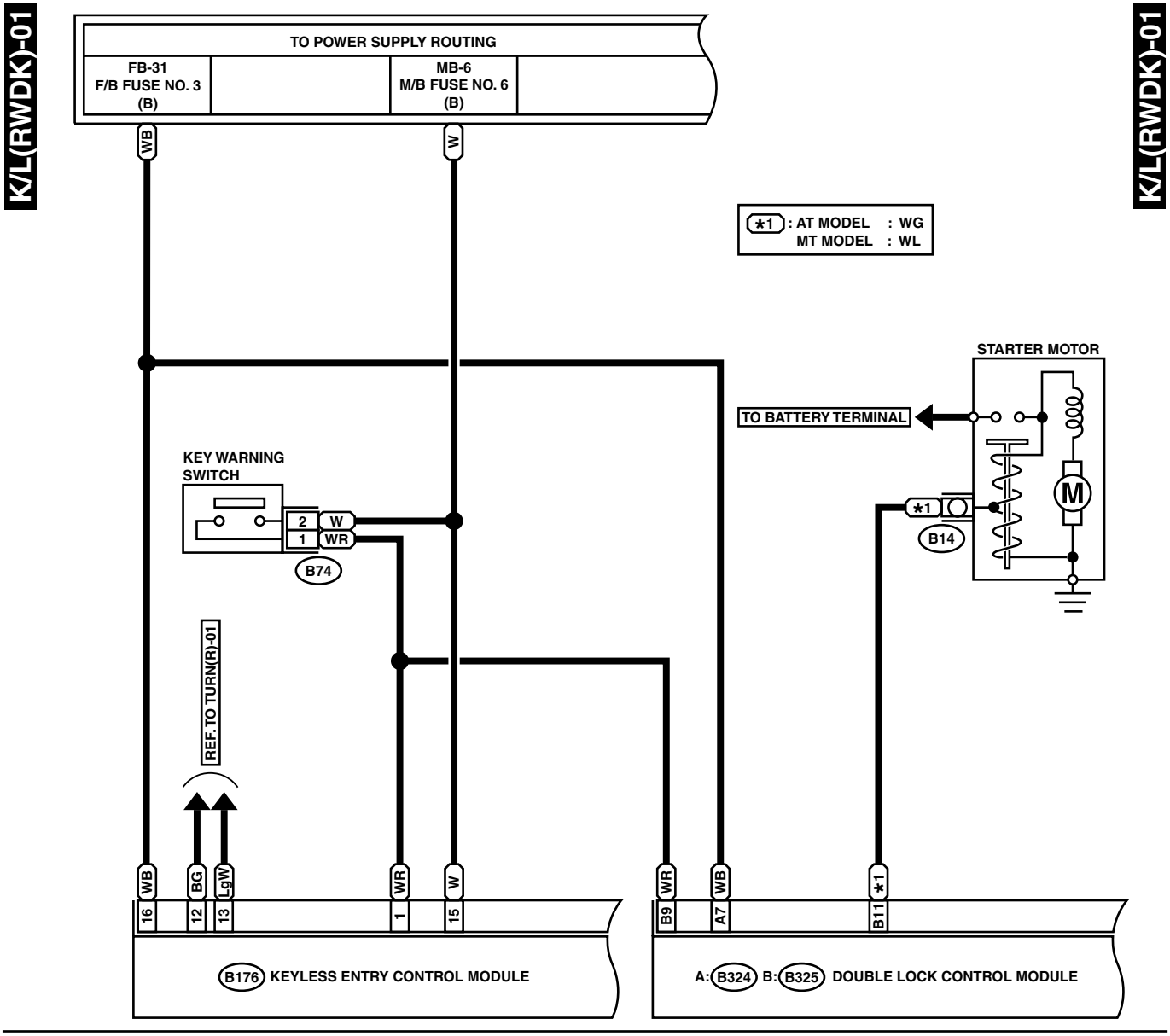
WI-00721


K/L(RODK)-03
K/L(RODK)-03
B176 KEYLESS ENTRY CONTROL MODULE
18 LgB
17 RG
14 B
6 B
8 OrW
10 OrB
POWER WINDOW MAIN SWITCH
LOCK
UNLOCK
OrB 16 RW
OrW 24 YB
RW 15
YB 16
D7
FRONT DOOR LOCK ACTUATOR (DRIVER SIDE)
REAR DOOR LOCK ACTUATOR LH
4 RG
2 Lg
RG 2 RG
Lg 1 LgB
RG 22 RG
LgB 21 LgB
RG 4
LgB 2
D26
D21
B269
B30
D1
D8
B
E
REF. TO GND(R)-02
FRONT DOOR LOCK ACTUATOR (PASSENGER SIDE)
REAR DOOR LOCK ACTUATOR RH
D32
D27
B265
B101
D11
D18
LgB 22
RG 23
B98
R2
EK
KA
LgB 2
R160
D83
RG 1
R38
D33
YR
Lg
*1
REAR GATE LOCK ACTUATOR
*1 8 RG
*2 7 Lg
RG 2
Lg 4
D80
D81
D47
*1 : EK MODEL : B
KA MODEL : RG
*2 : EK MODEL : YR
KA MODEL : Lg
EK : EK MODEL
KA : KA MODEL

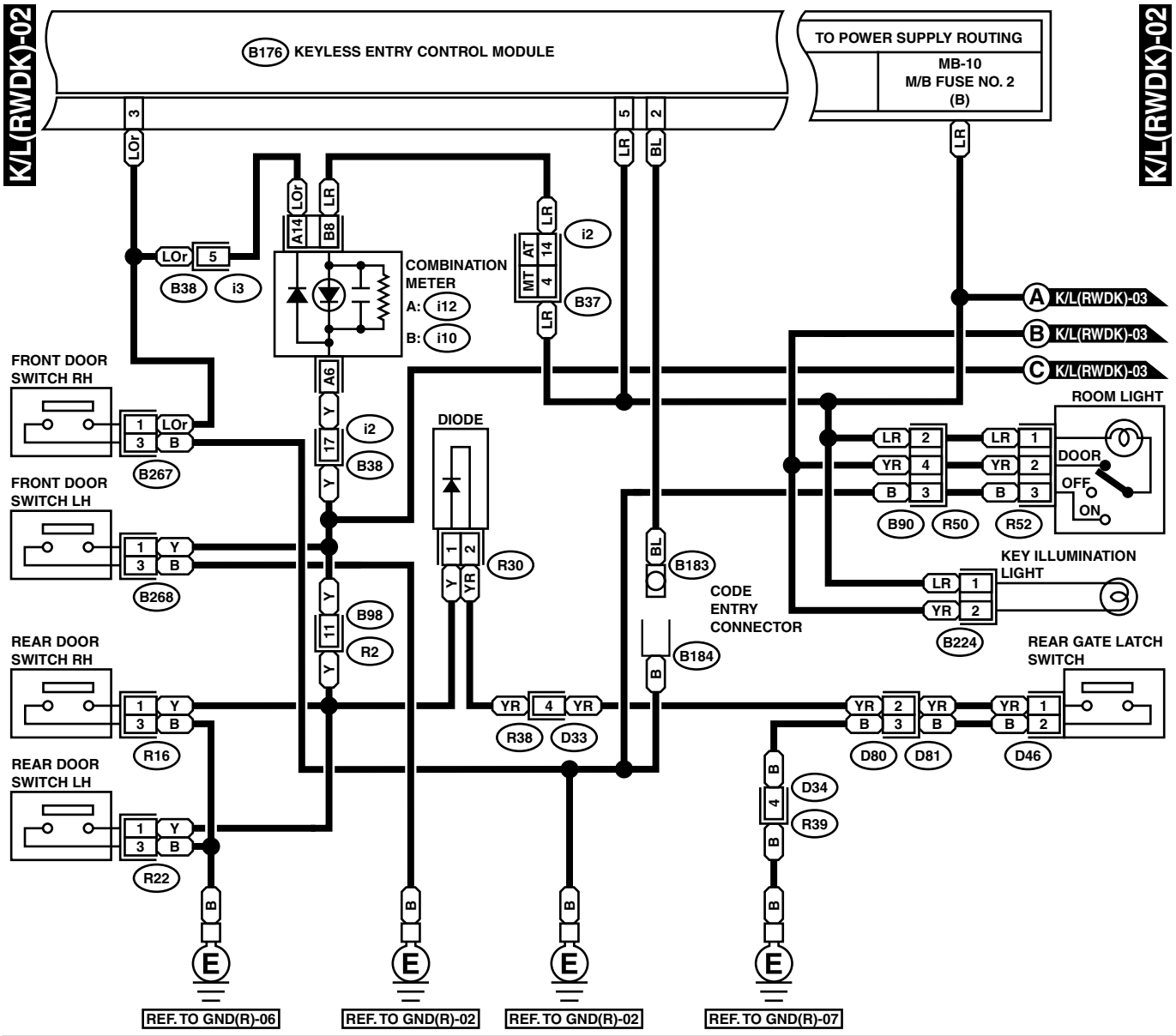

D47
D83
D8
D32
D26
D47
D21
D27
D33
D1
D11
D80
D7
B176
B98

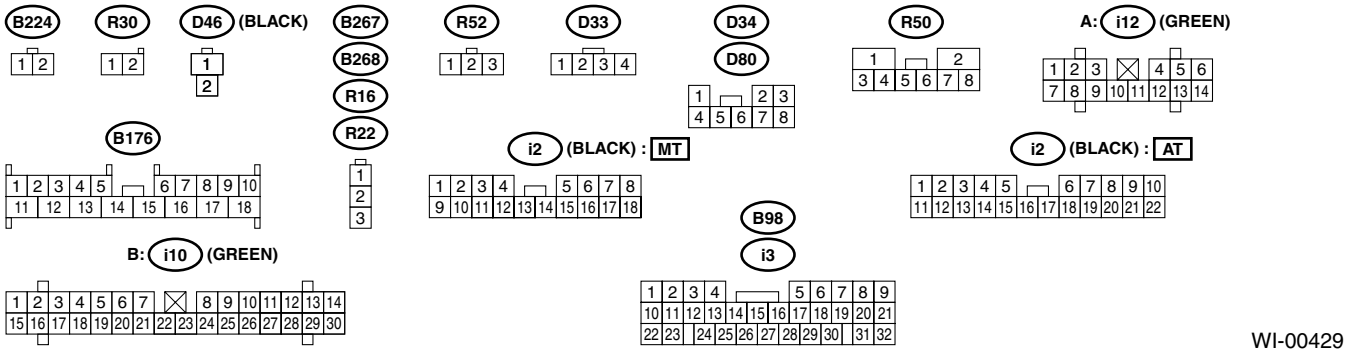
WI-00722

3. RHD WITH DOUBLE LOCK MODEL

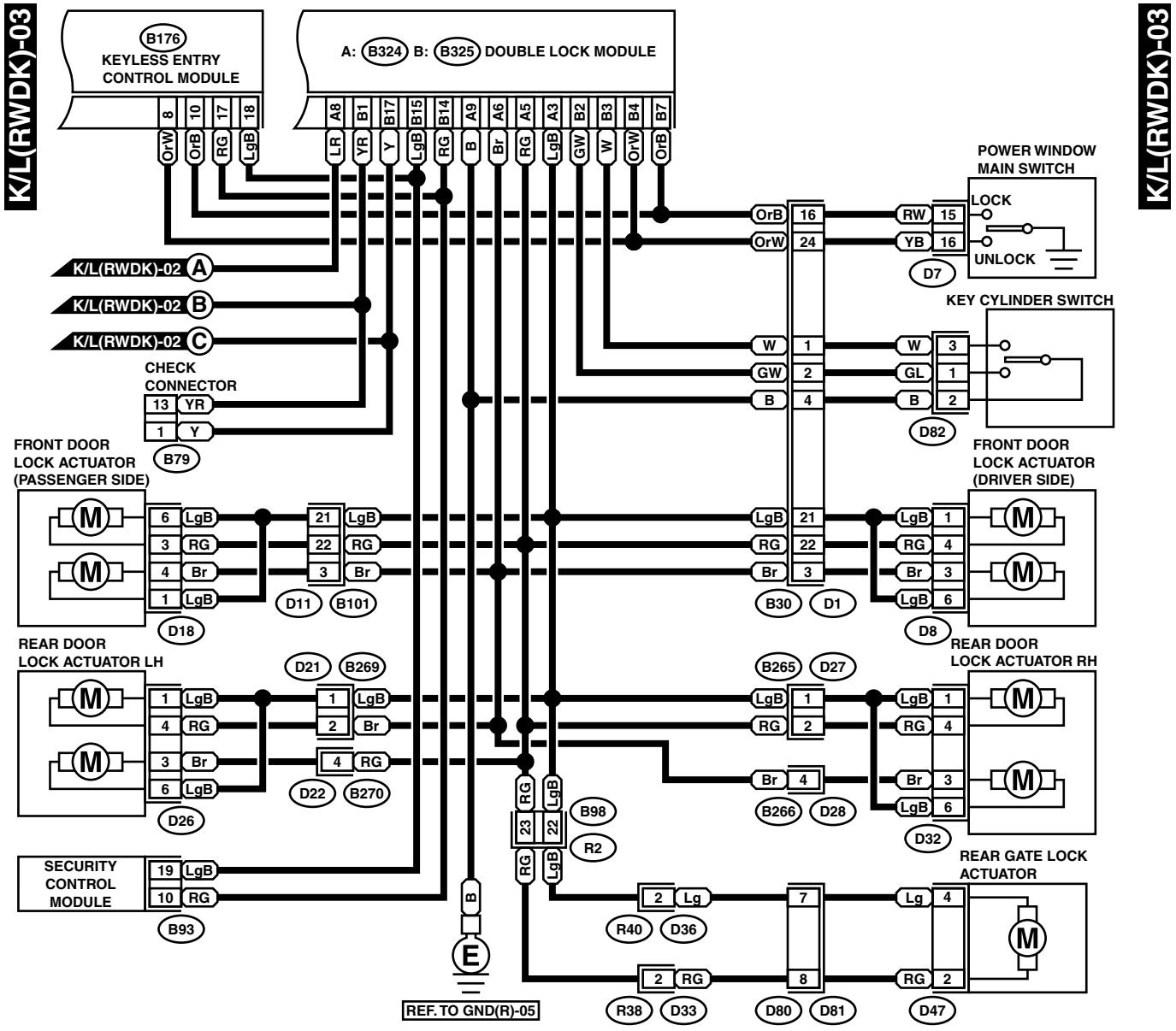


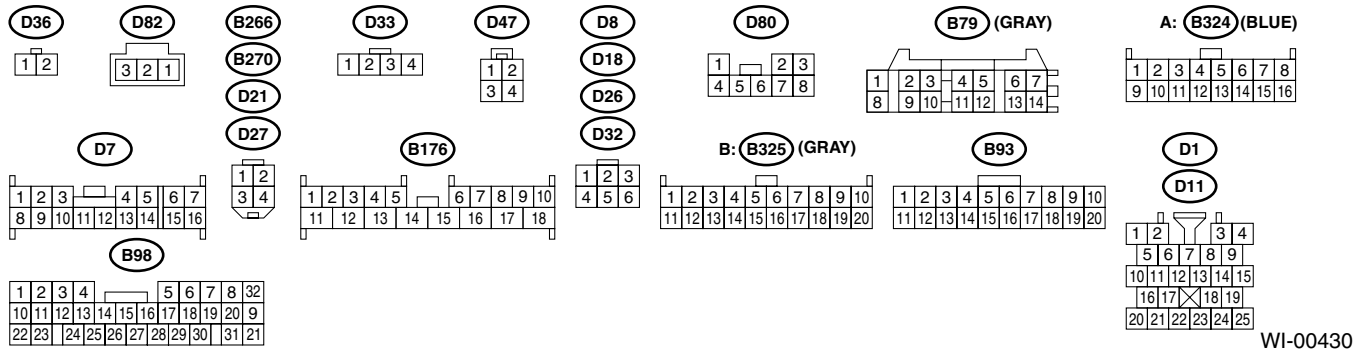
WI-00428


K/L(RWDK)-02
K/L(RWDK)-02
B176 KEYLESS ENTRY CONTROL MODULE
TO POWER SUPPLY ROUTING
MB-10
M/B FUSE NO. 2
(B)
COMBINATION METER
A: i12
B: i10
B38
i3
B37
i2
A K/L(RWDK)-03
B K/L(RWDK)-03
C K/L(RWDK)-03
ROOM LIGHT
DOOR
OFF
ON
B90
R50
R52
FRONT DOOR SWITCH RH
B267
FRONT DOOR SWITCH LH
B268
DIODE
R30
B38
B98
R2
B183
CODE ENTRY CONNECTOR
B184
KEY ILLUMINATION LIGHT
B224
REAR GATE LATCH SWITCH
D80
D81
D46
REAR DOOR SWITCH RH
R16
REAR DOOR SWITCH LH
R22
R38
D33
D34
R39
REF. TO GND(R)-06
REF. TO GND(R)-02
REF. TO GND(R)-02
REF. TO GND(R)-07


B224
R30
D46 (BLACK)
B267
B268
R16
R22
R52
D33
D34
D80
R50
A: i12 (GREEN)
B176
i2 (BLACK) : MT
i2 (BLACK) : AT
B: i10 (GREEN)
B98
i3

WI-00429


K/L(RWDK)-03
K/L(RWDK)-03
B176
KEYLESS ENTRY CONTROL MODULE
A: B324 B: B325 DOUBLE LOCK MODULE
POWER WINDOW MAIN SWITCH
LOCK
UNLOCK
D7
KEY CYLINDER SWITCH
D82
K/L(RWDK)-02 A
K/L(RWDK)-02 B
K/L(RWDK)-02 C
CHECK CONNECTOR
B79
FRONT DOOR LOCK ACTUATOR (PASSENGER SIDE)
FRONT DOOR LOCK ACTUATOR (DRIVER SIDE)
D11
B101
D18
B30
D1
D8
REAR DOOR LOCK ACTUATOR LH
REAR DOOR LOCK ACTUATOR RH
D21
B269
B265
D27
D22
B270
D26
B266
D28
D32
B98
R2
SECURITY CONTROL MODULE
B93
REAR GATE LOCK ACTUATOR
R40
D36
D80
D81
D47
R38
D33
REF. TO GND(R)-05

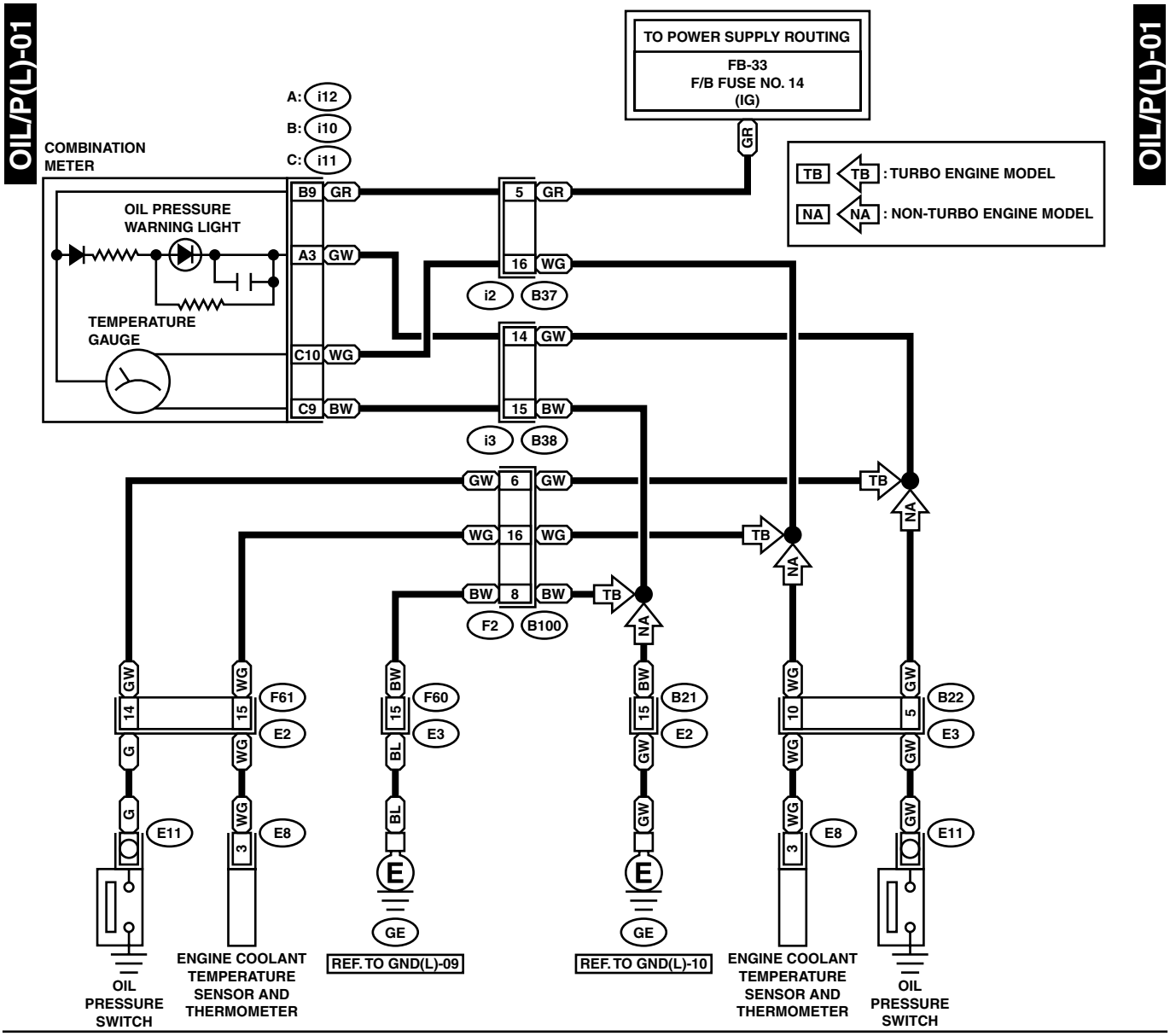

D36
D82
B266
B270
D21
D27
D33
D47
D8
D18
D26
D32
D80
B79 (GRAY)
A: B324 (BLUE)
D7
B176
B: B325 (GRAY)
B93
D1
D11
B98

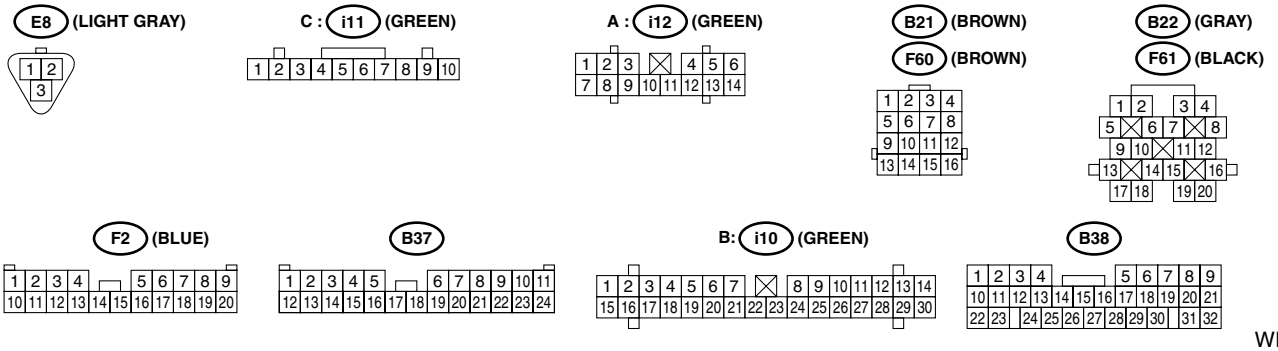
WI-00430

28.Oil Pressure and Temperature Gauge System

A: SCHEMATIC

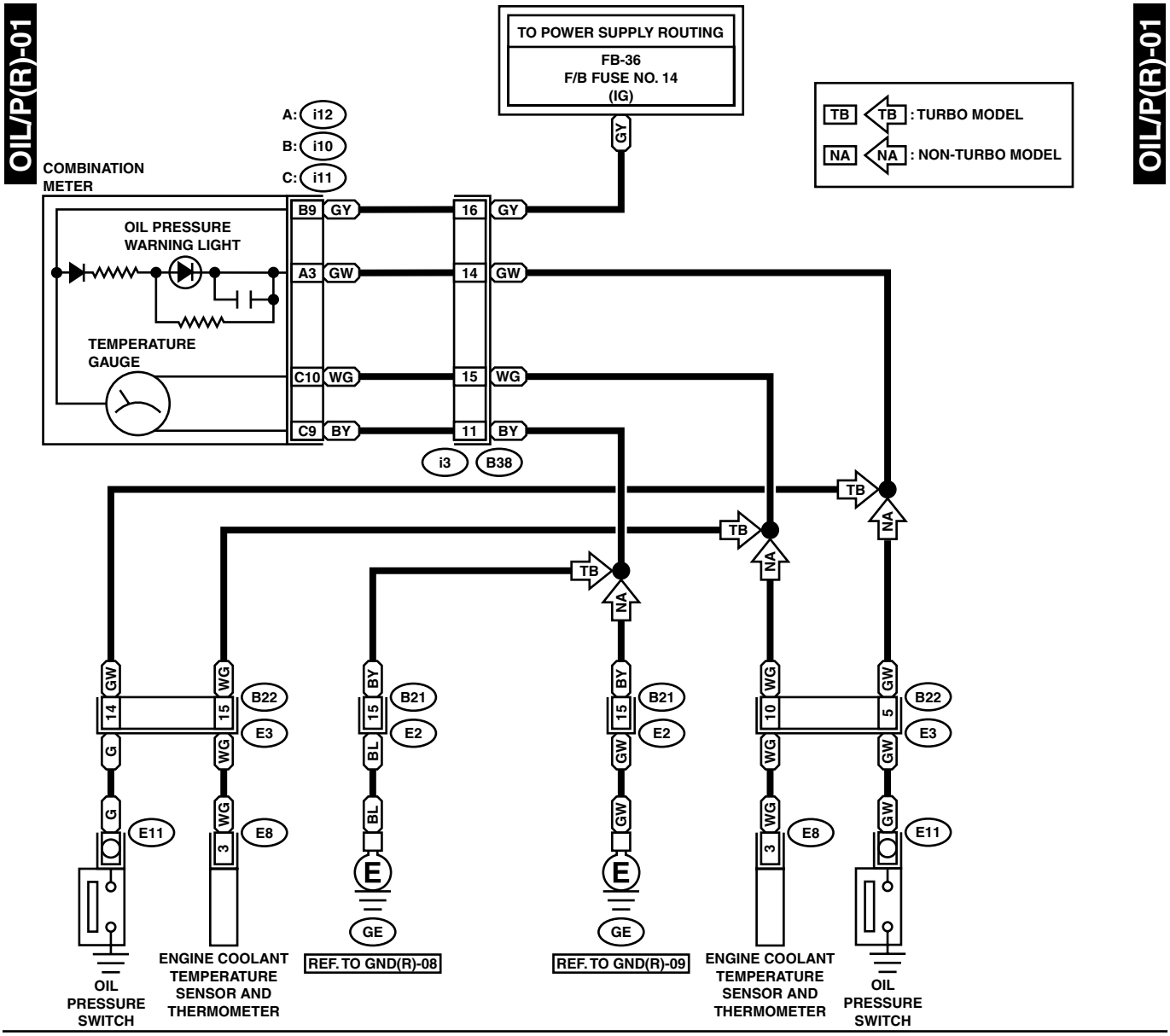
1. LHD MODEL

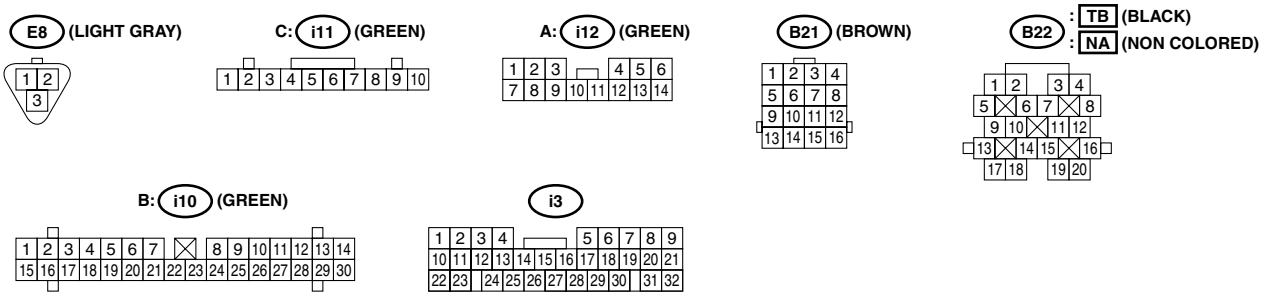




WI-00432

2. RHD MODEL



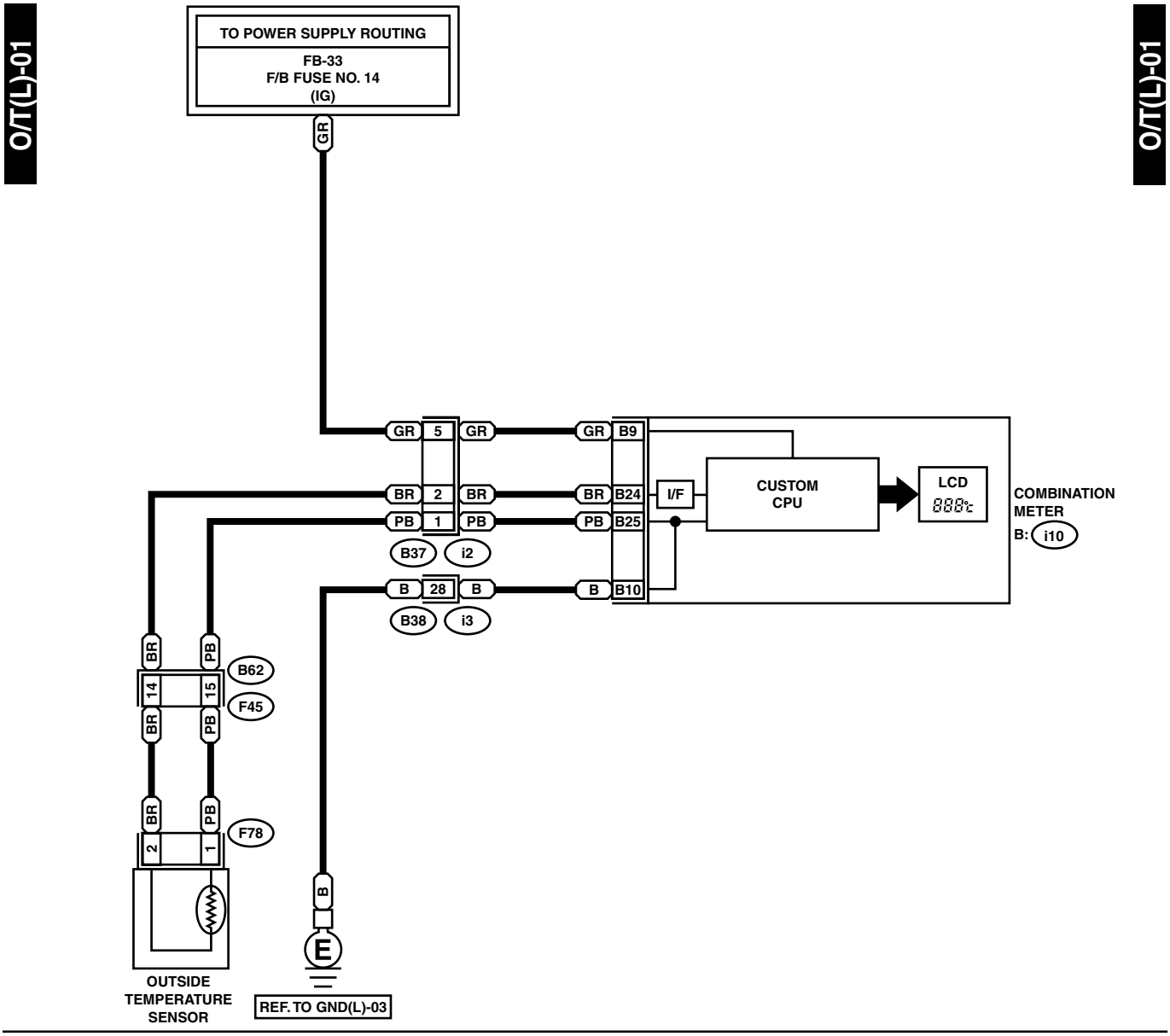


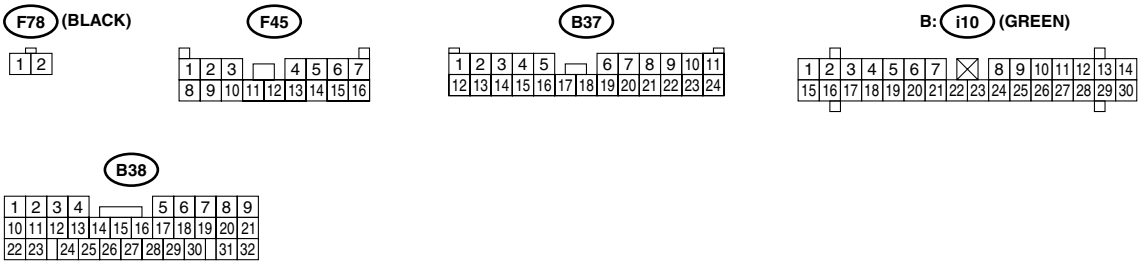
WI-00433

29.Outside Temperature Display System

A: SCHEMATIC

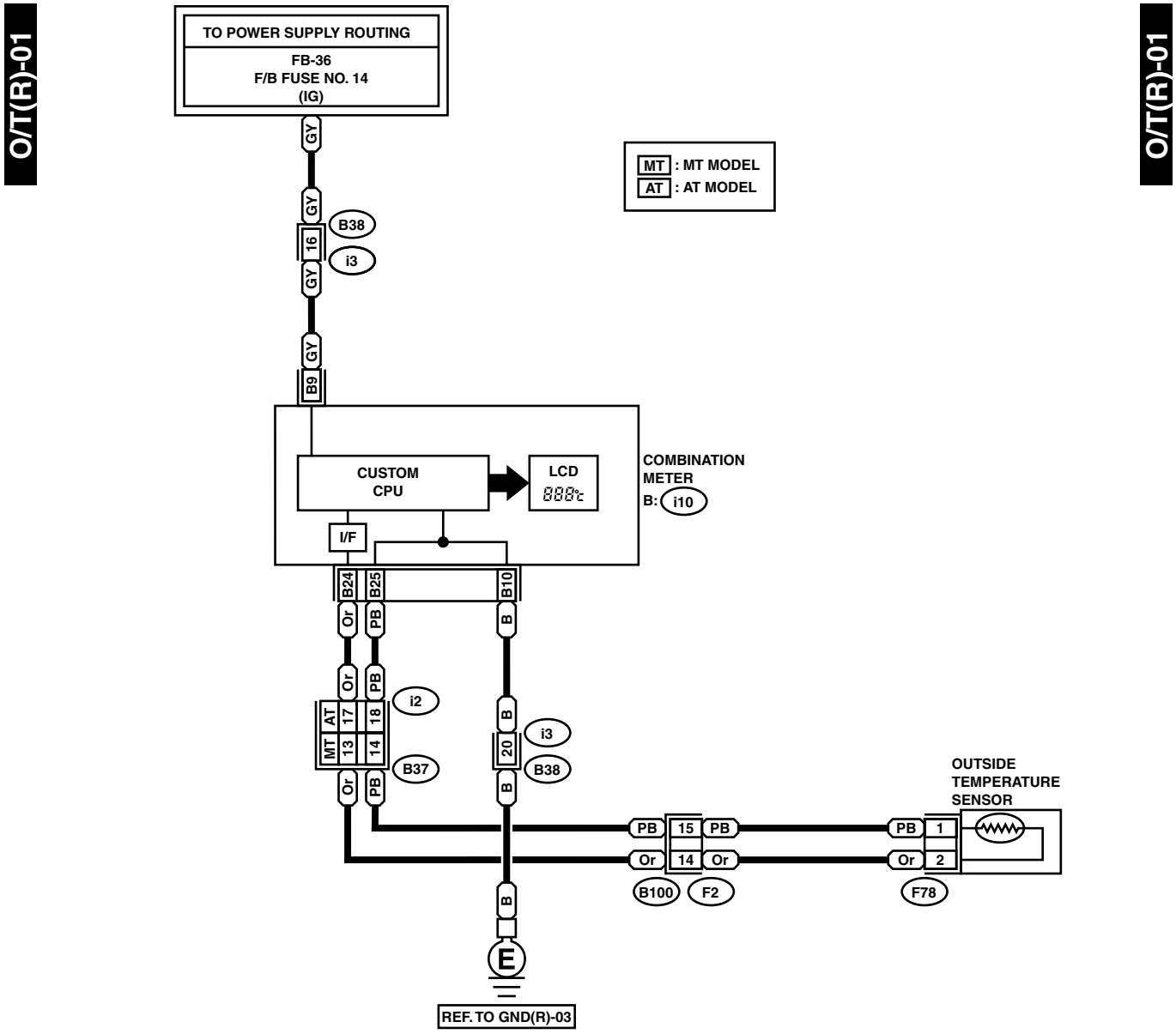
1. LHD MODEL

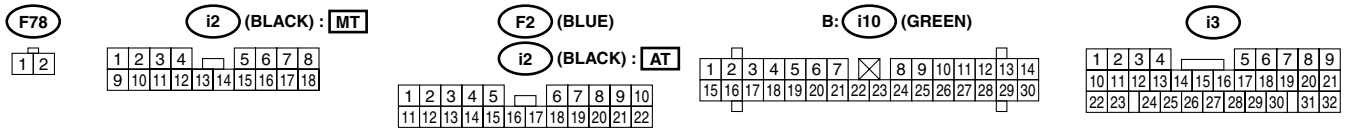




WI-00435

2. RHD MODEL



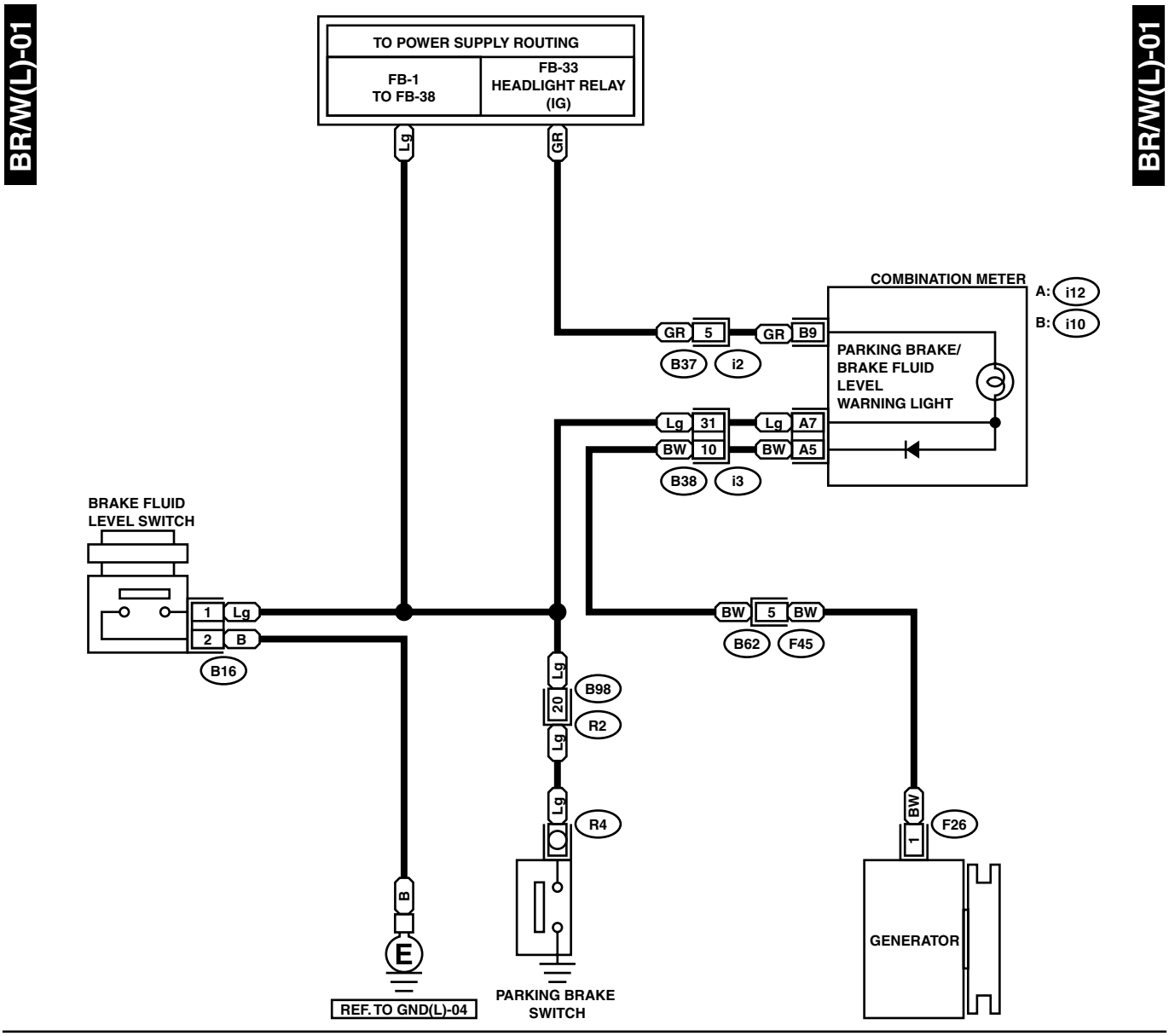


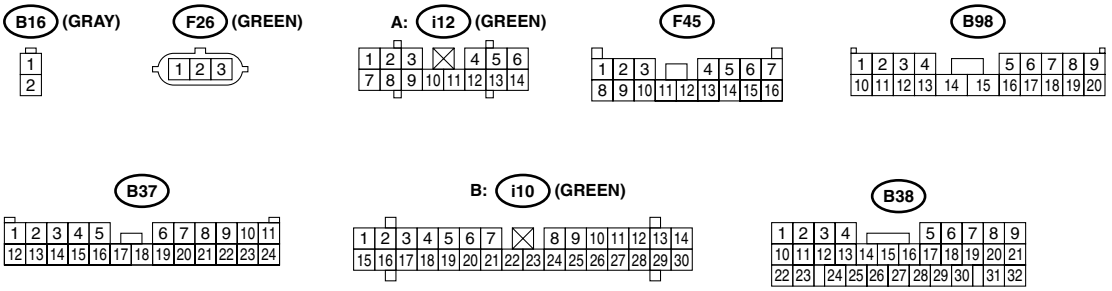
WI-00436

30.Parking Brake and Brake Fluid Level Warning System

A: SCHEMATIC

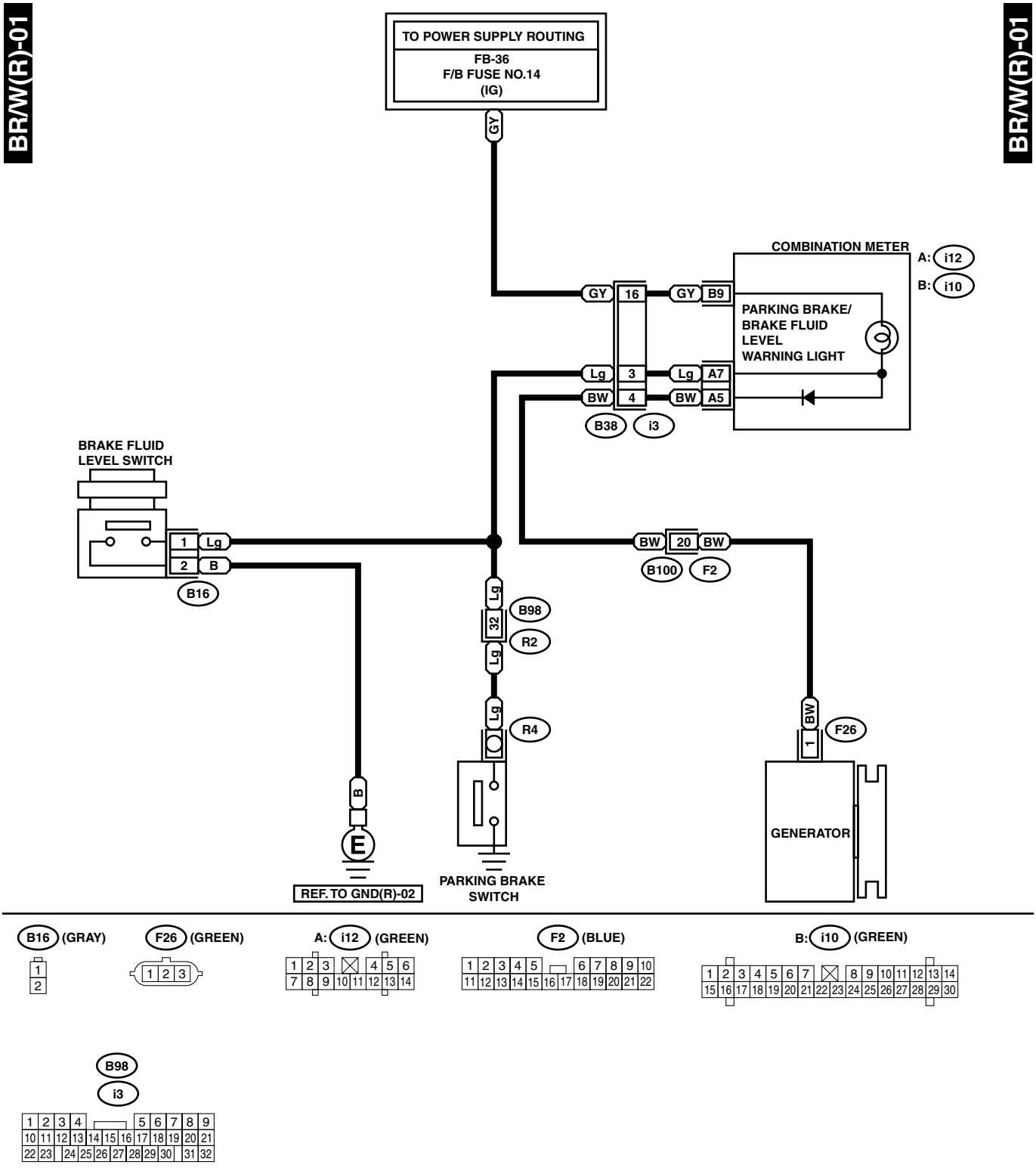
1. LHD MODEL





WI-00438

2. RHD MODEL

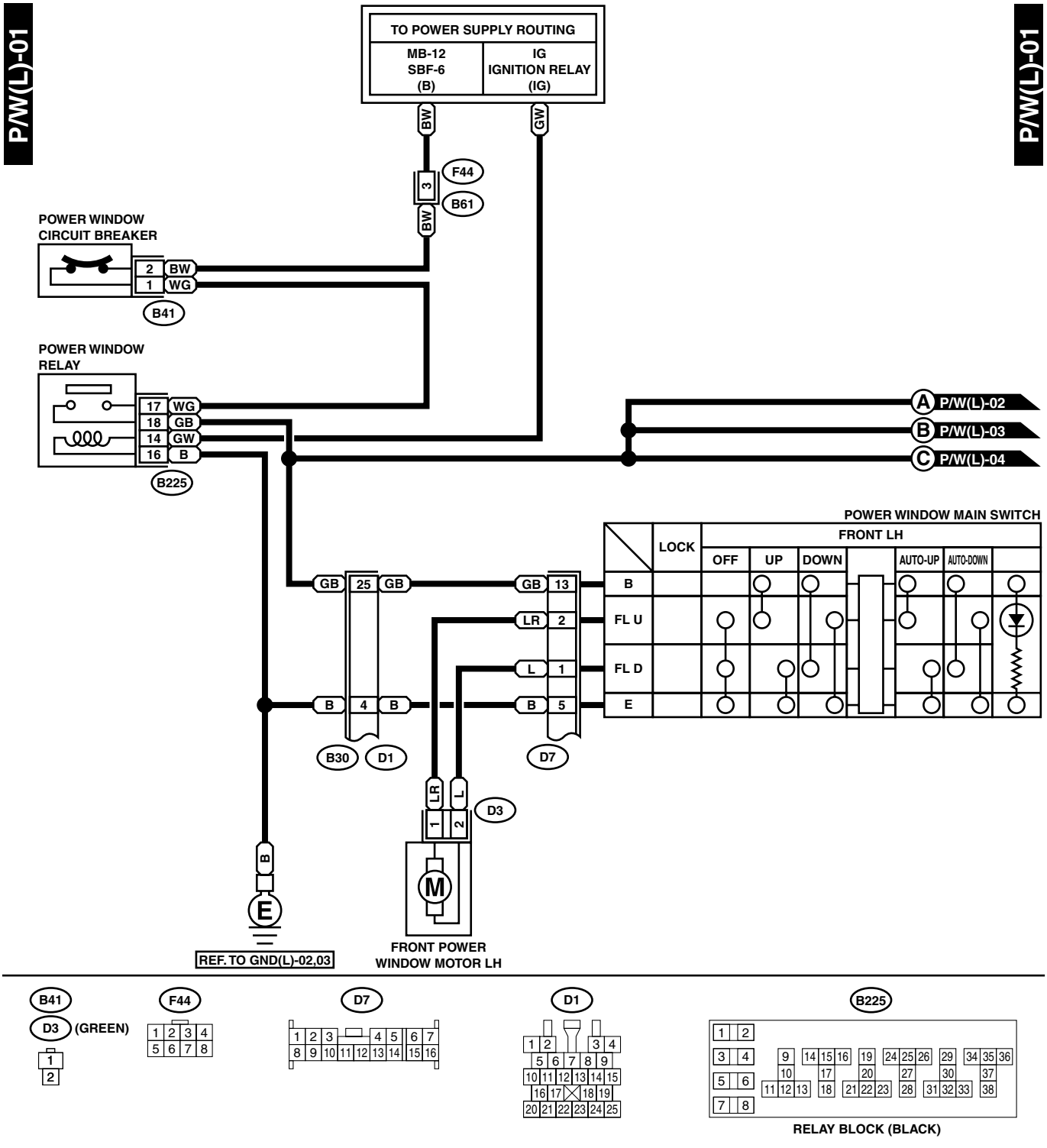


WI-00439

31.Power Window System

A: SCHEMATIC

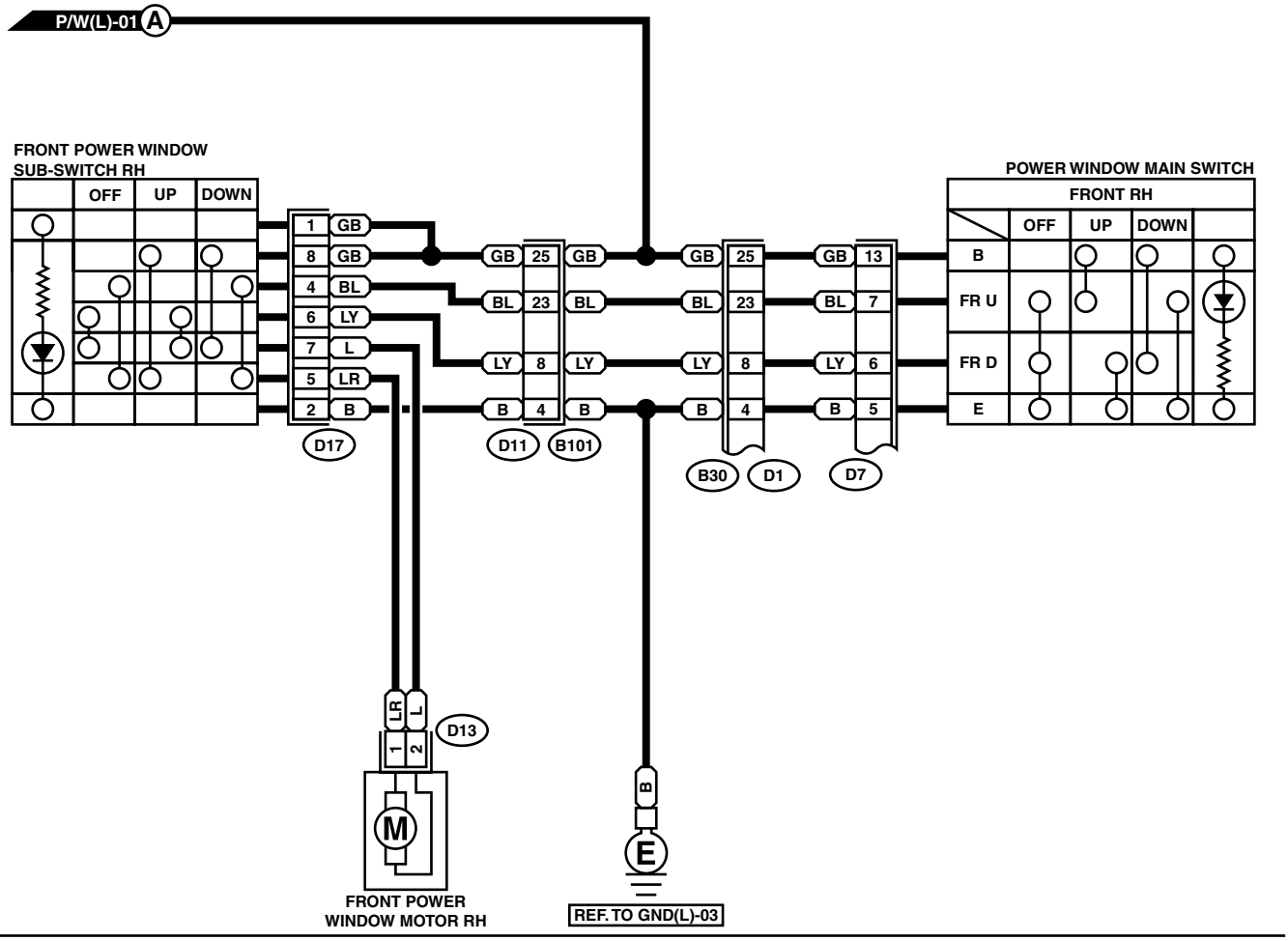
1. LHD MODEL

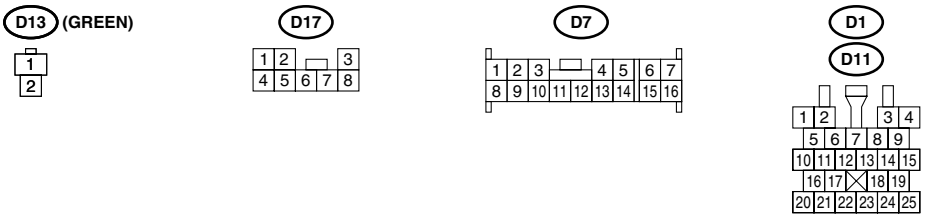


WI-00444

P/W(L)-02

P/W(L)-02

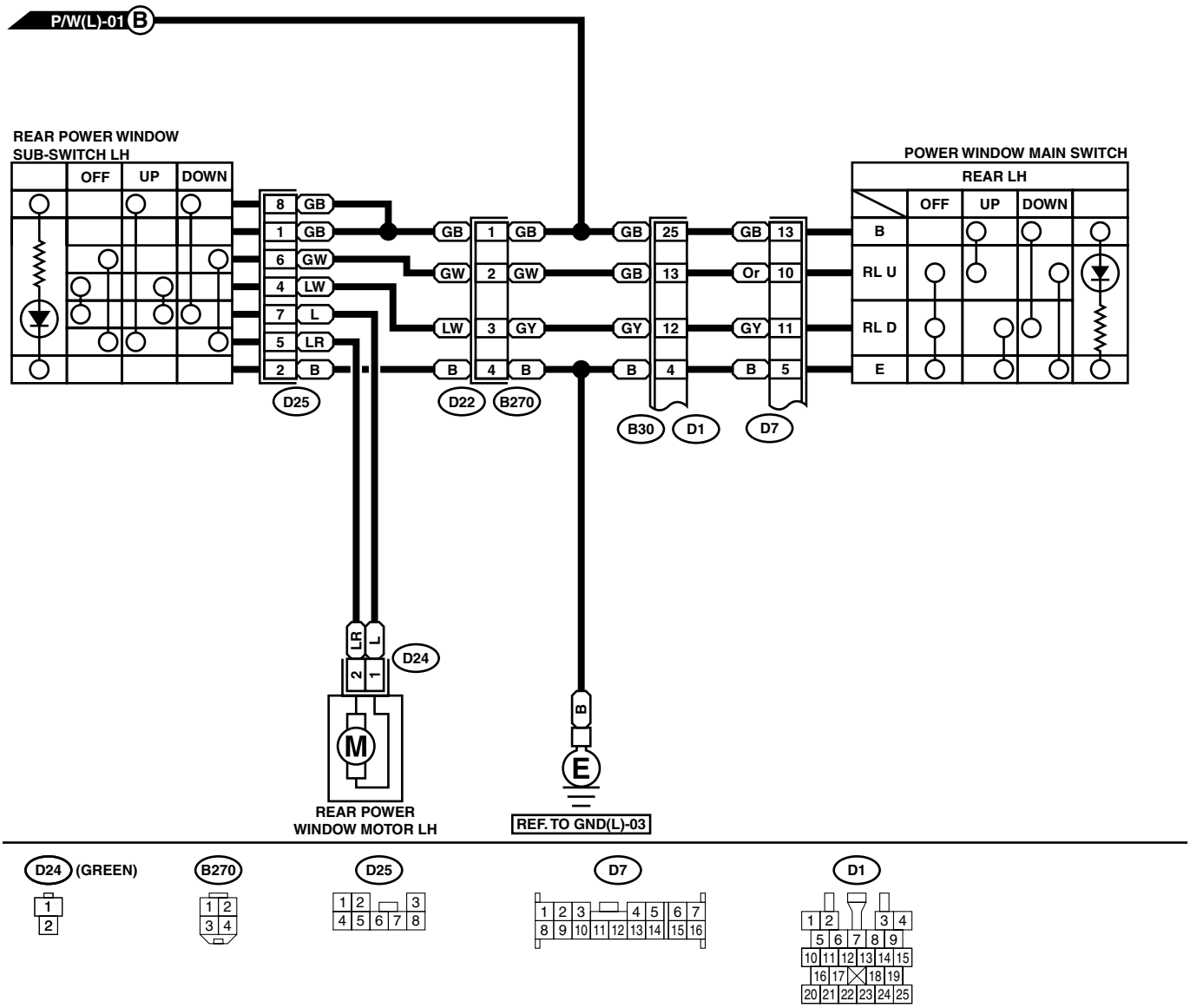




WI-00445

P/W(L)-03

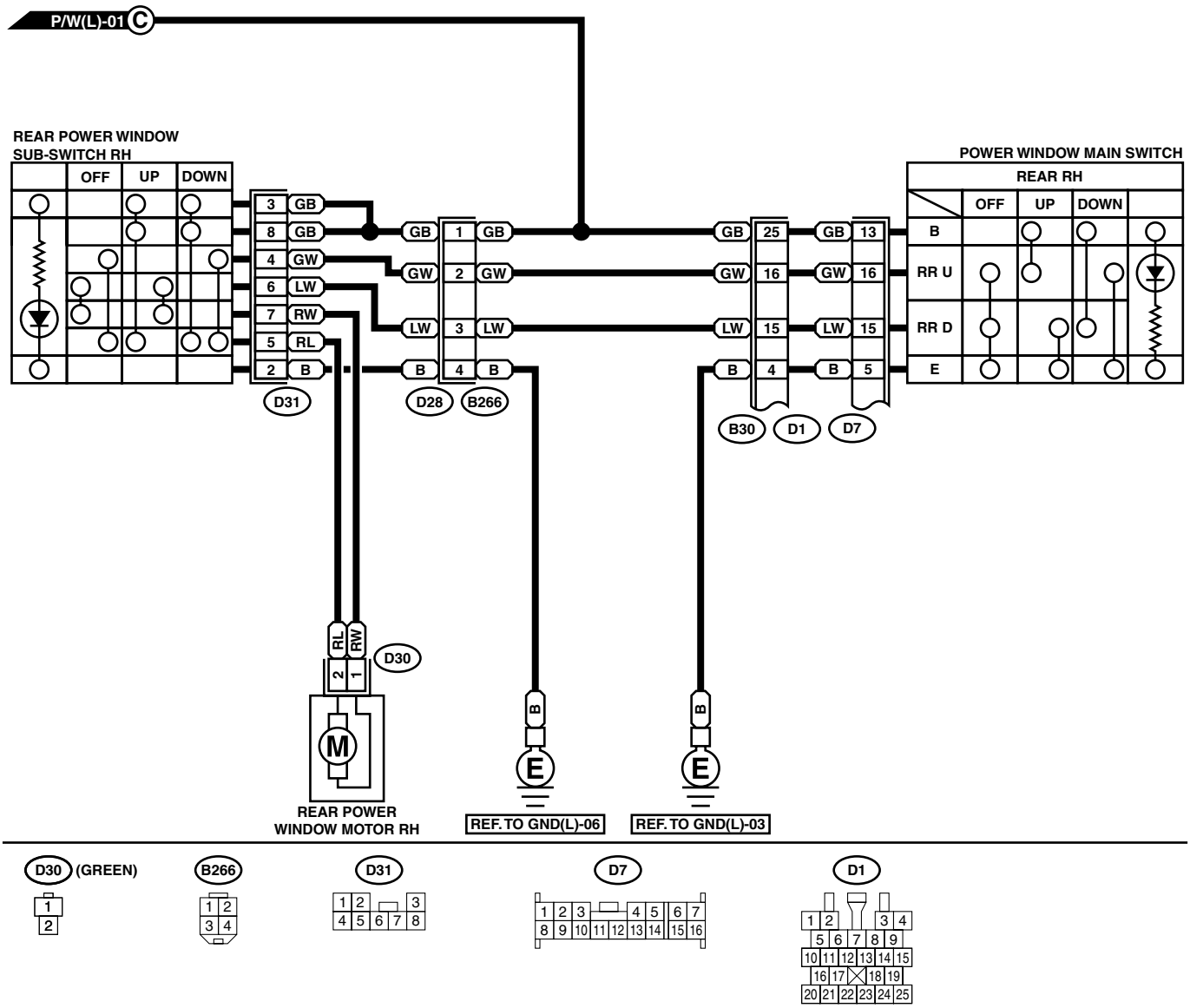
P/W(L)-03



WI-00446

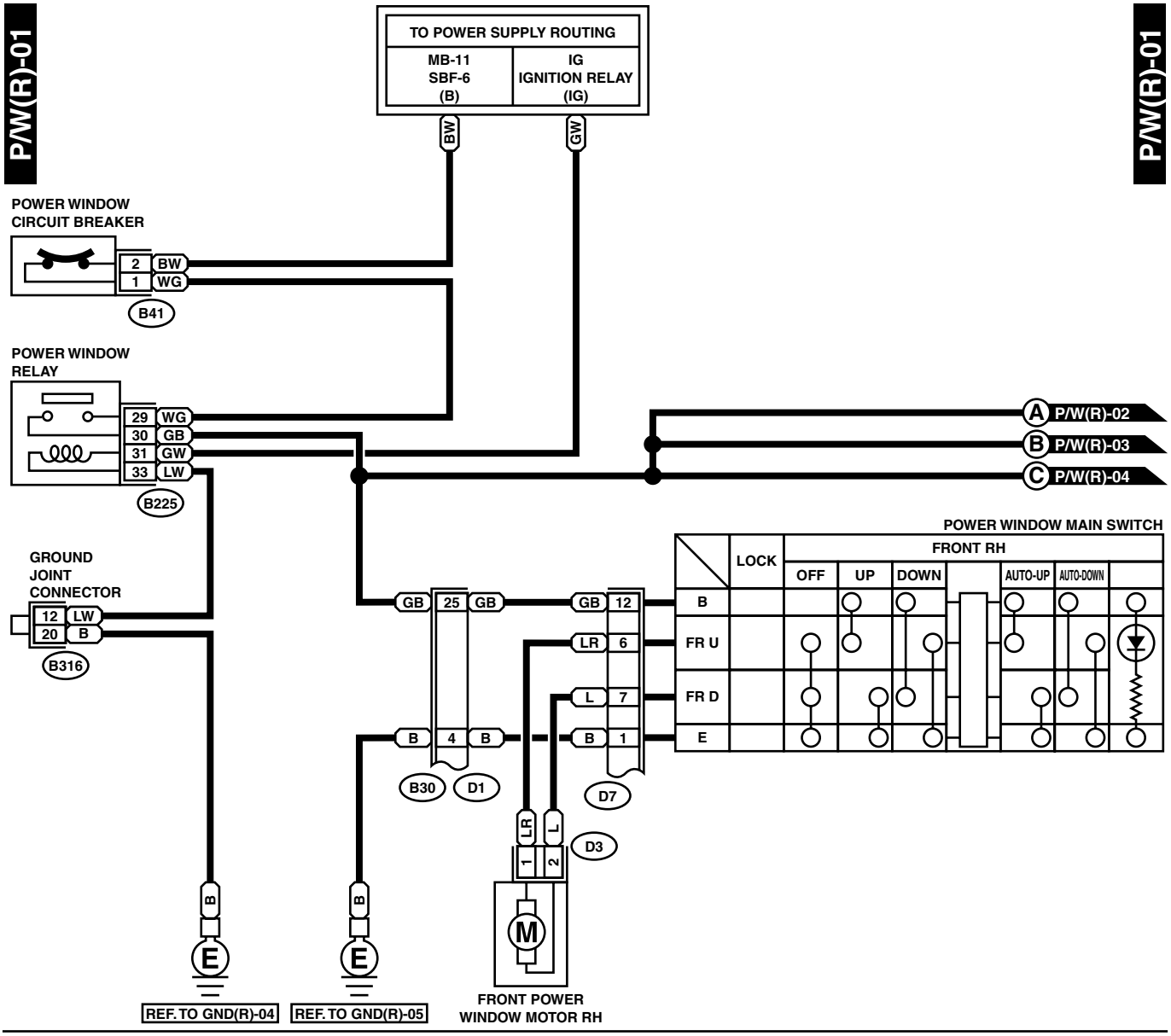
P/W(L)-04

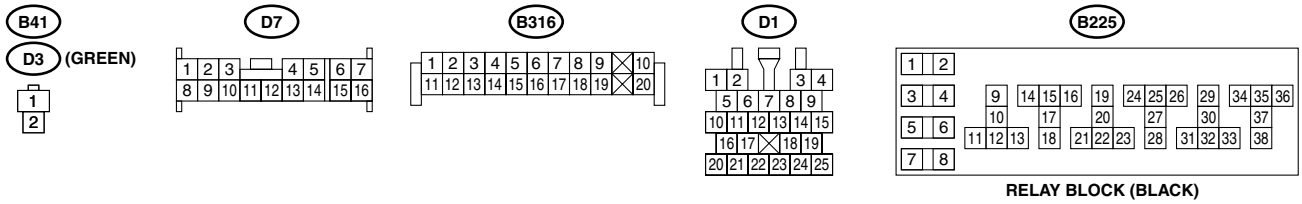
P/W(L)-04



WI-00447

2. RHD MODEL

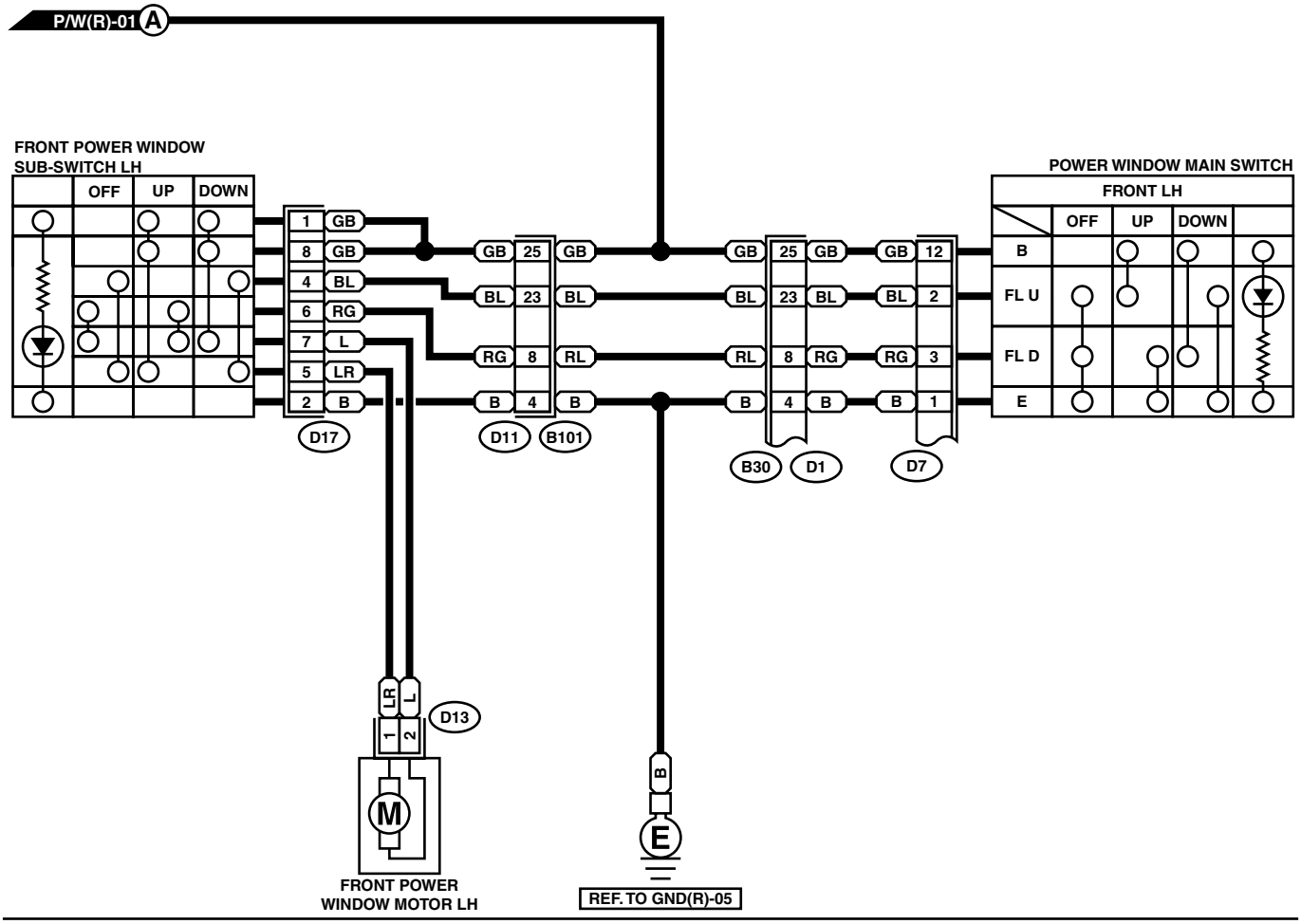


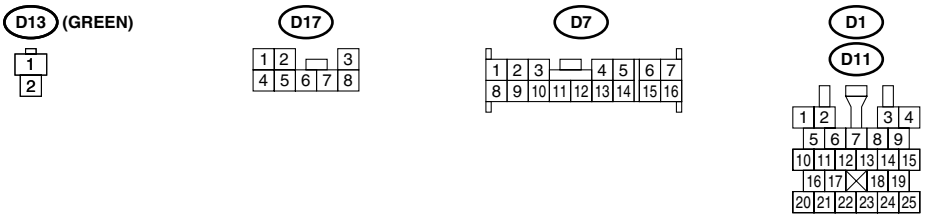


WI-00448

P/W(R)-02

P/W(R)-02

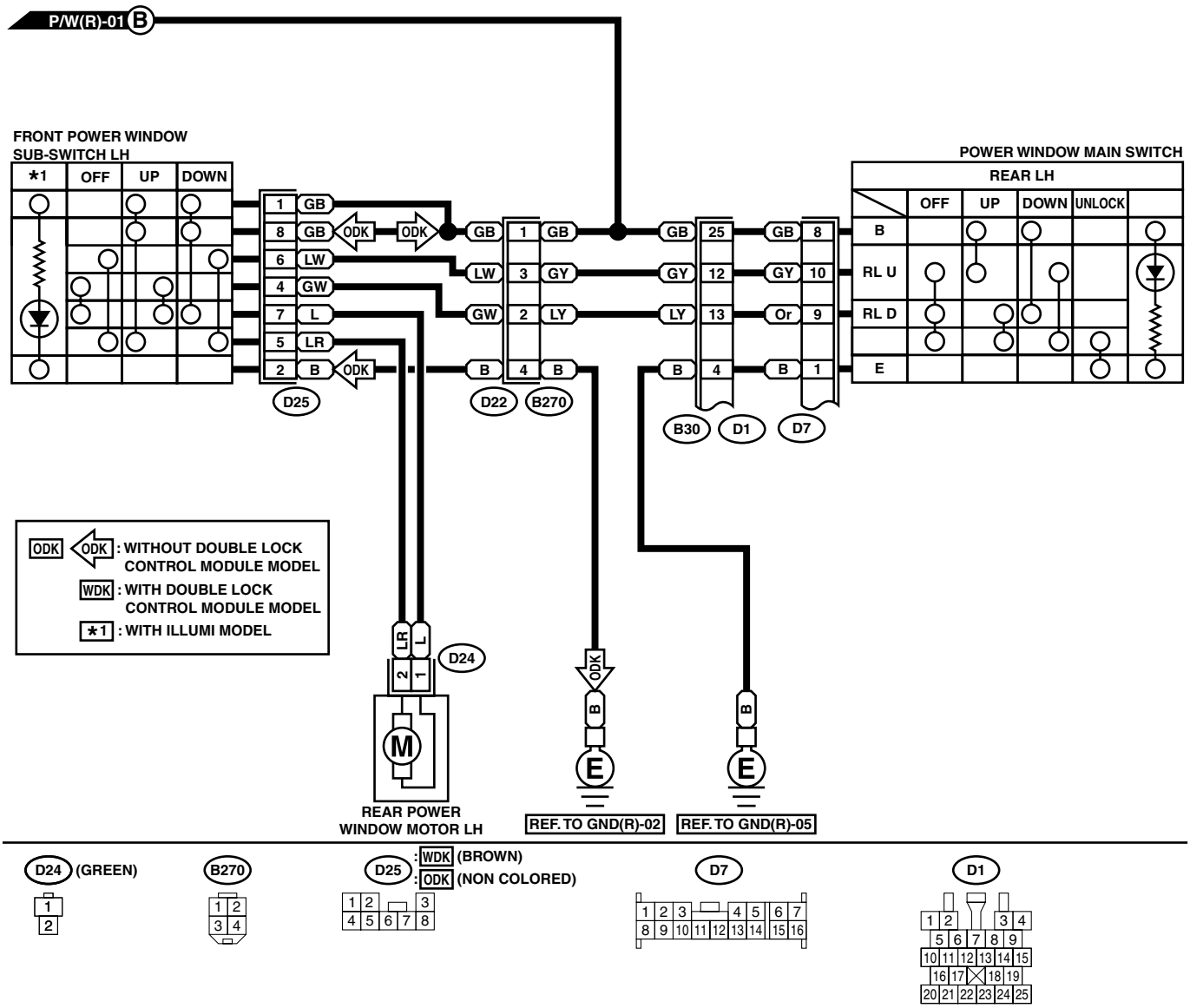




WI-00449

P/W(R)-03

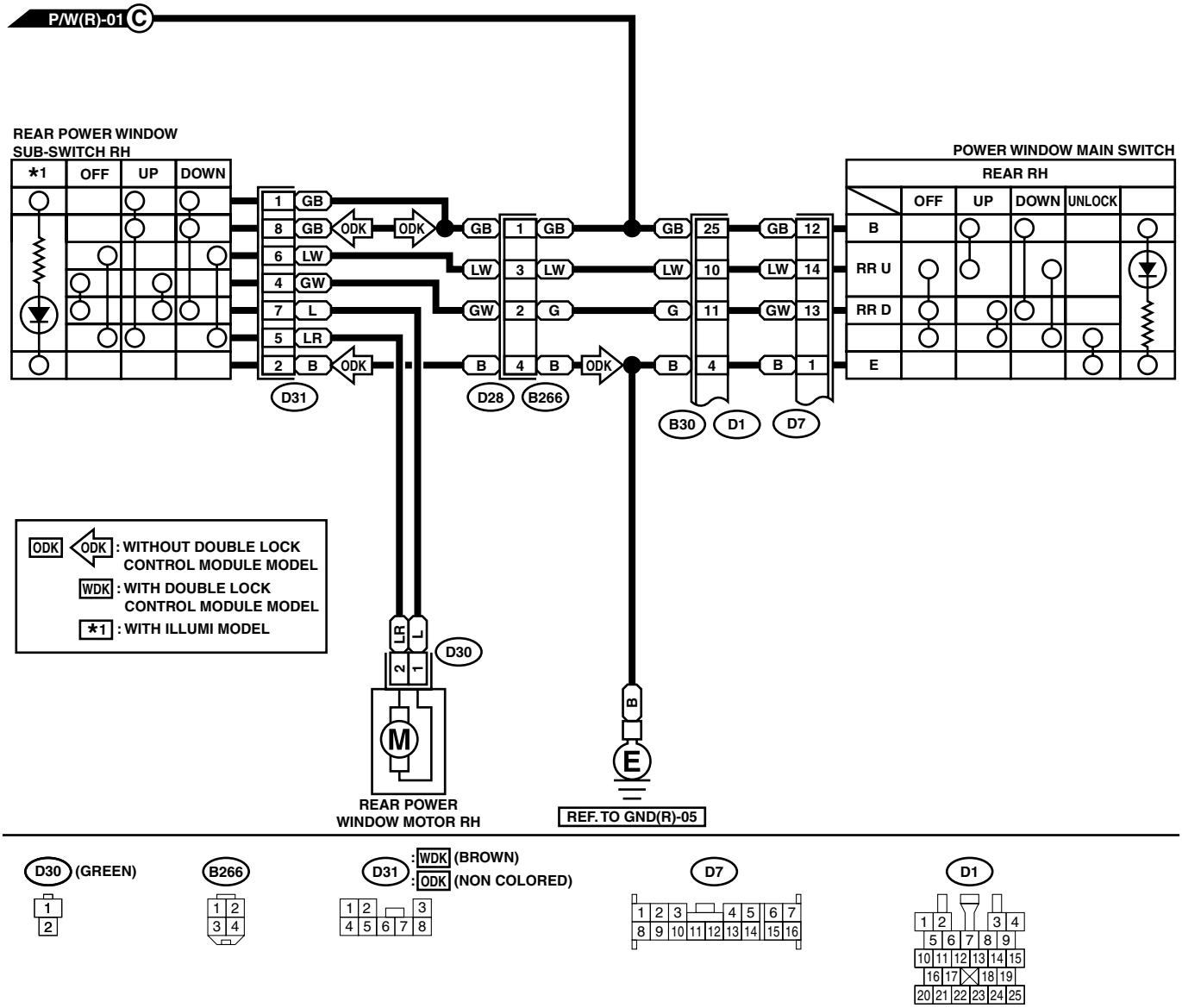
P/W(R)-03



WI-00450

P/W(R)-04

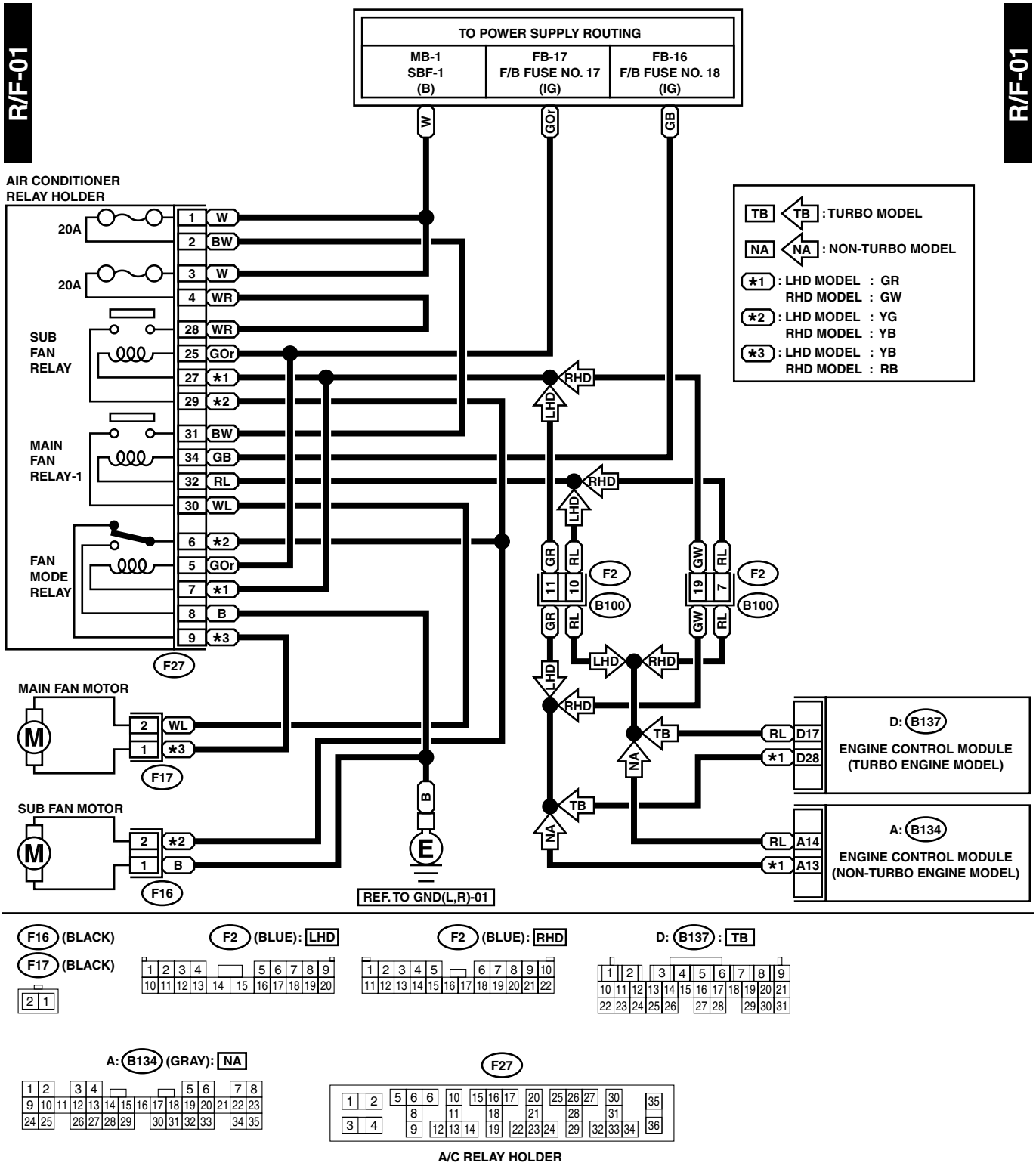
P/W(R)-04



WI-00451

32.Radiator Fan System

A: SCHEMATIC

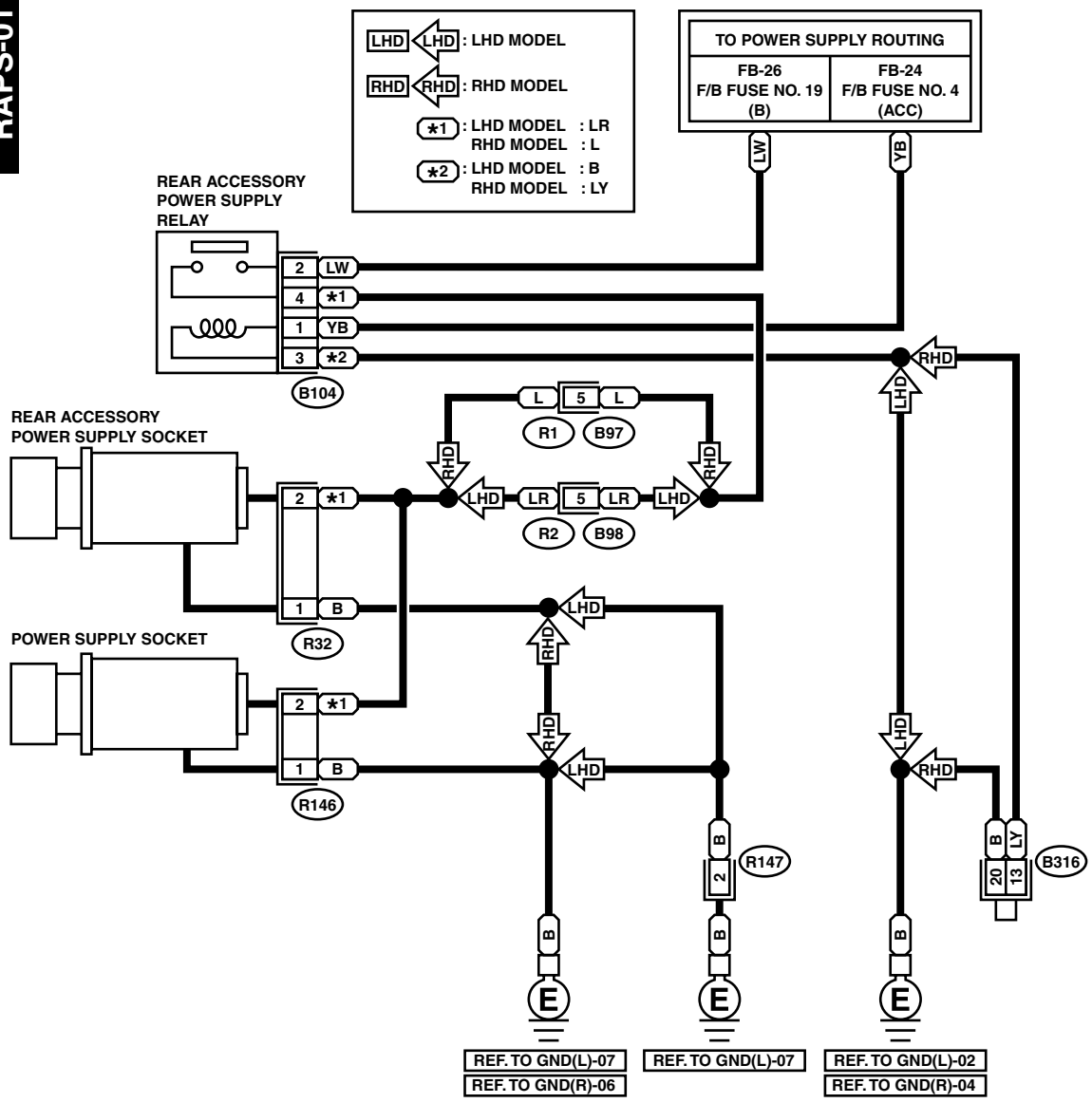


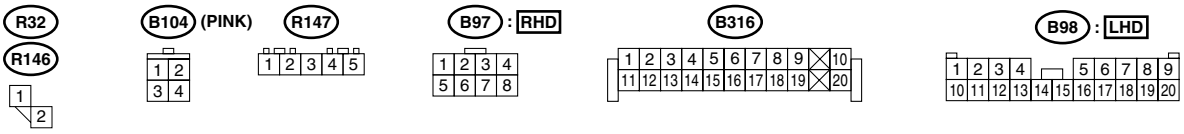
WI-00453

33.Rear Accessory Power Supply System

A: SCHEMATIC

RAPS-01

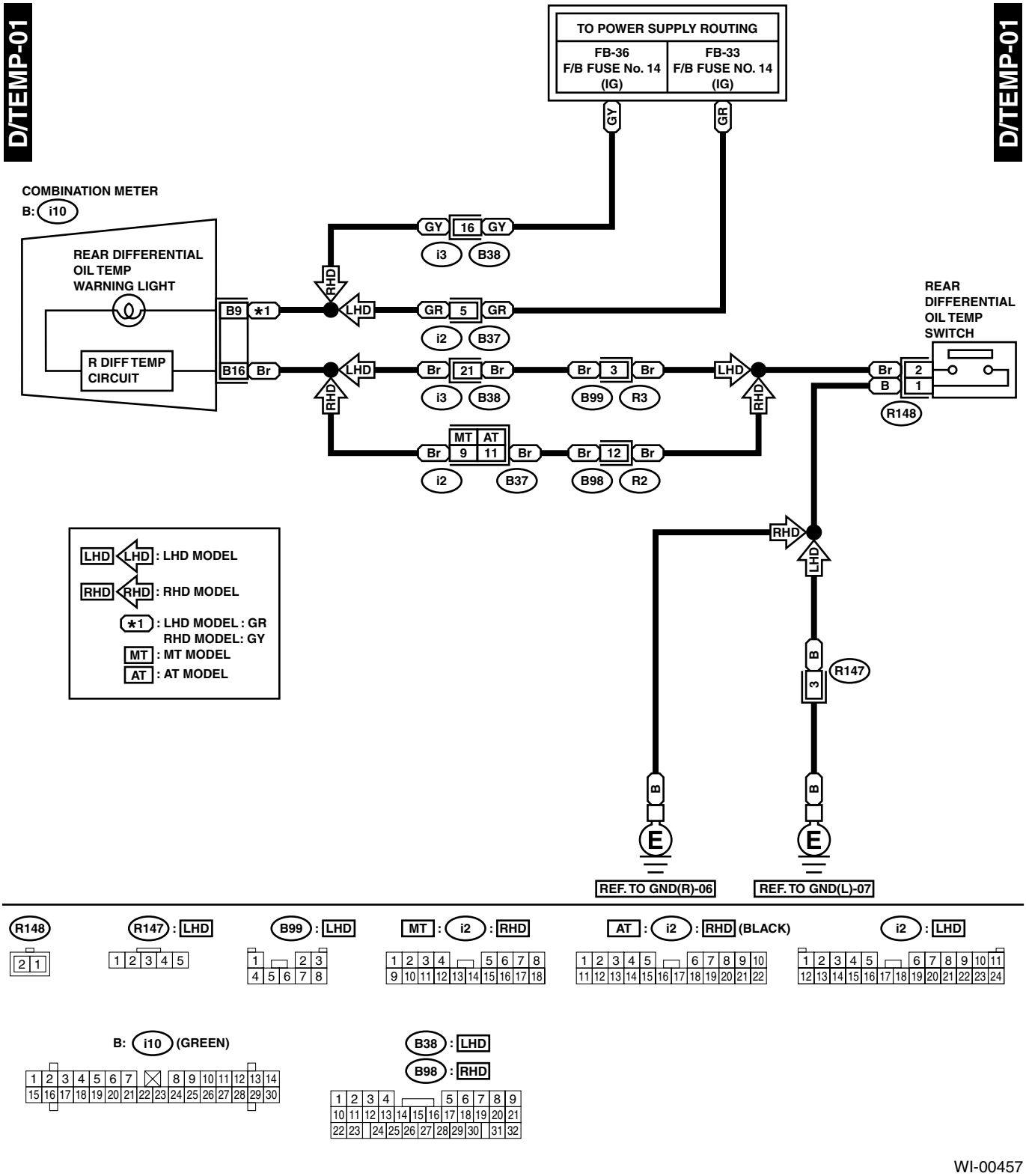




WI-00455

34.Rear Differential Oil Temperature Warning System

A: SCHEMATIC

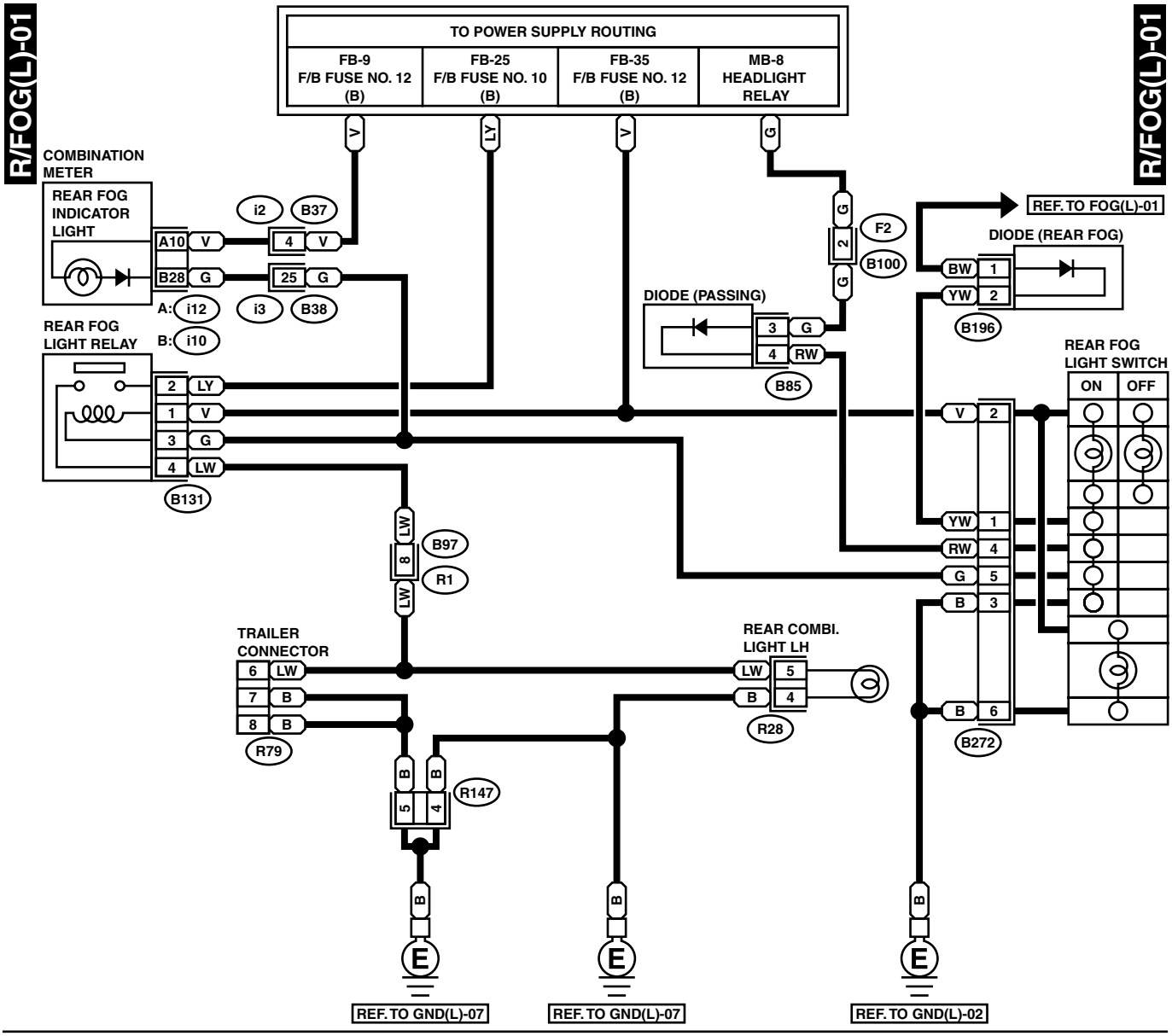


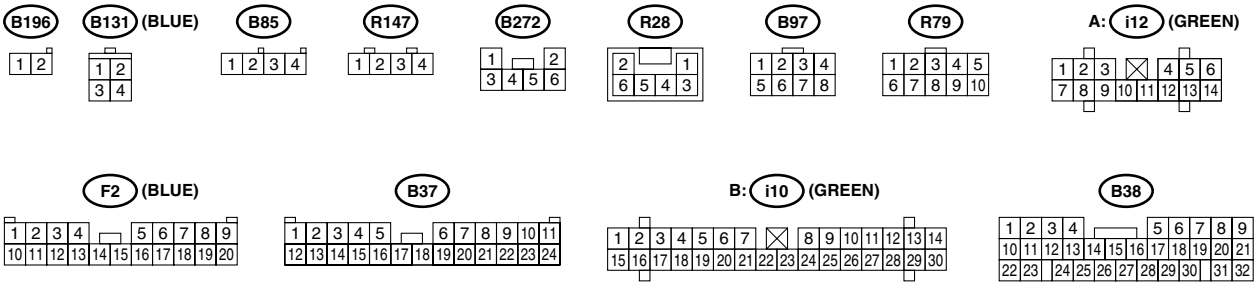
WI-00457

35.Rear Fog Light System

A: SCHEMATIC

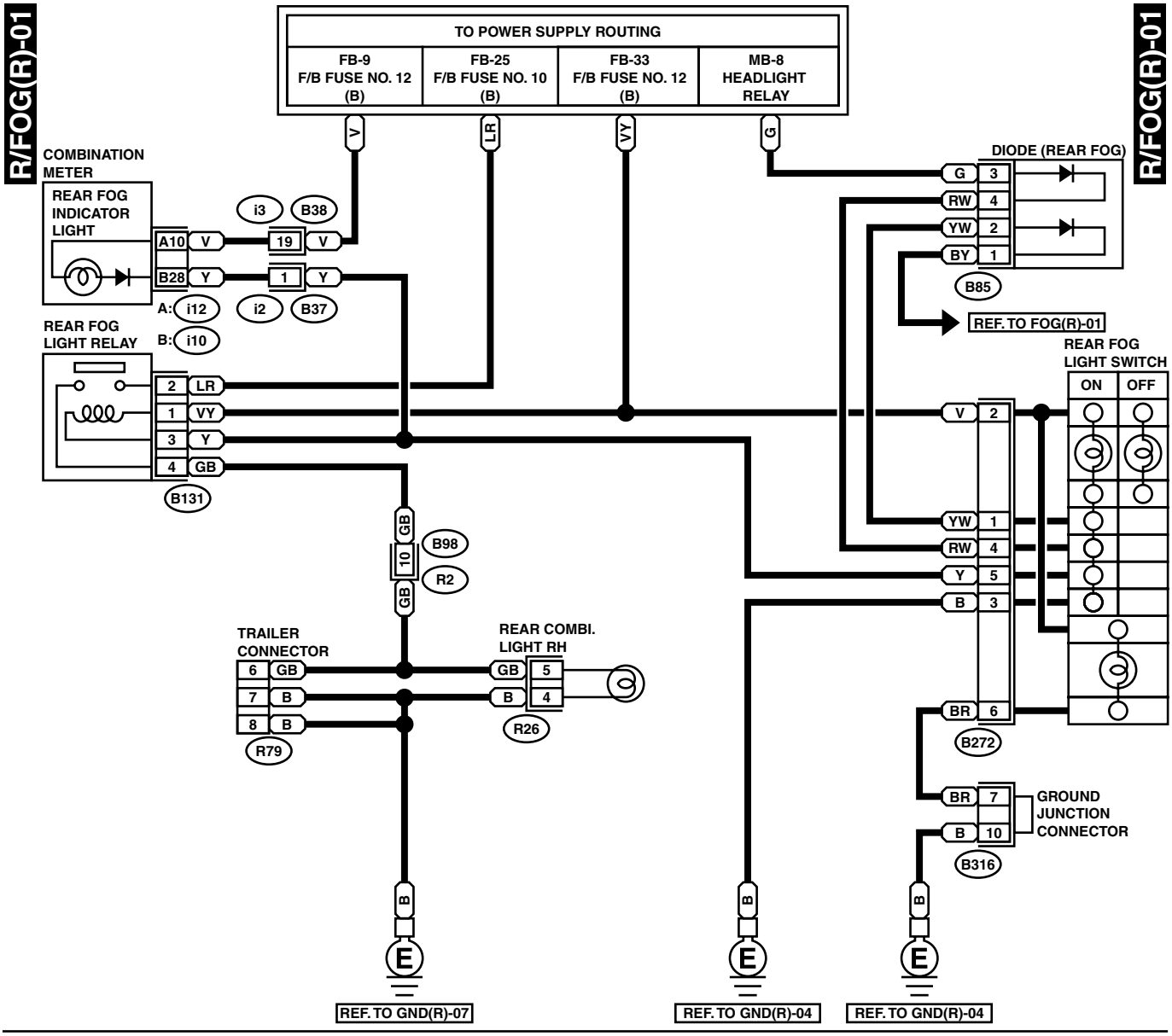
1. LHD MODEL

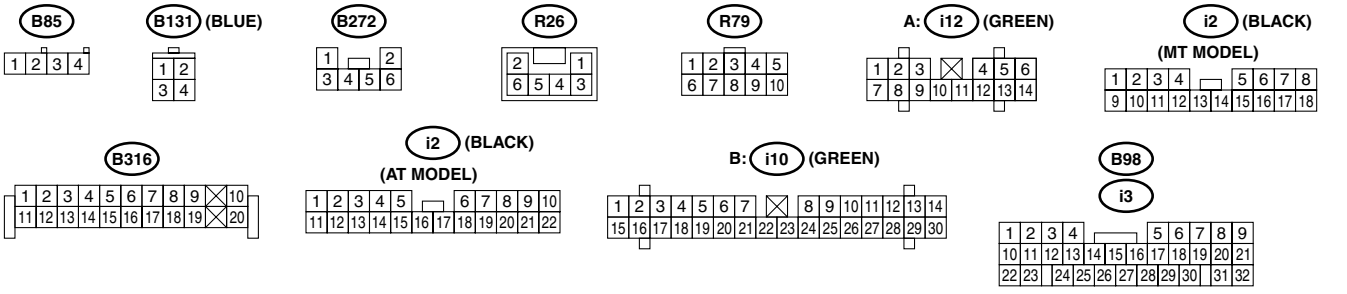




WI-00459

2. RHD MODEL



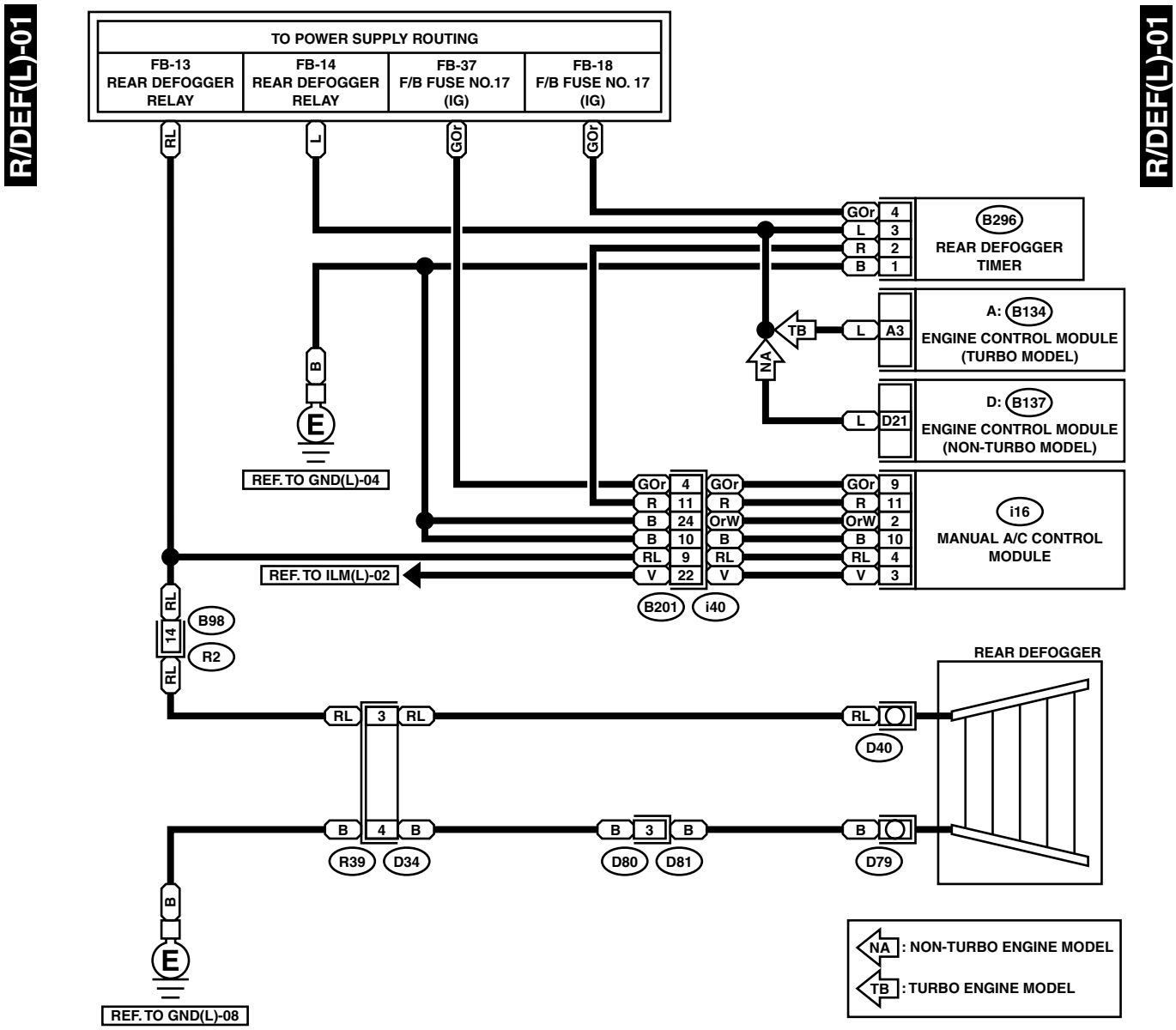


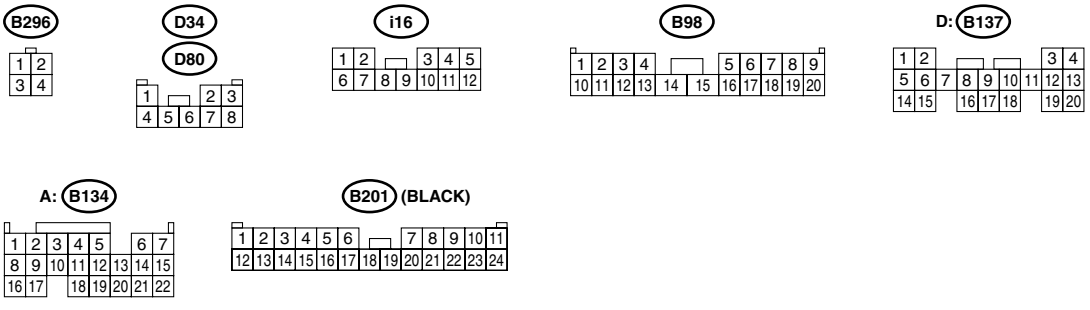
WI-00460

36.Rear Window Defogger System

A: SCHEMATIC

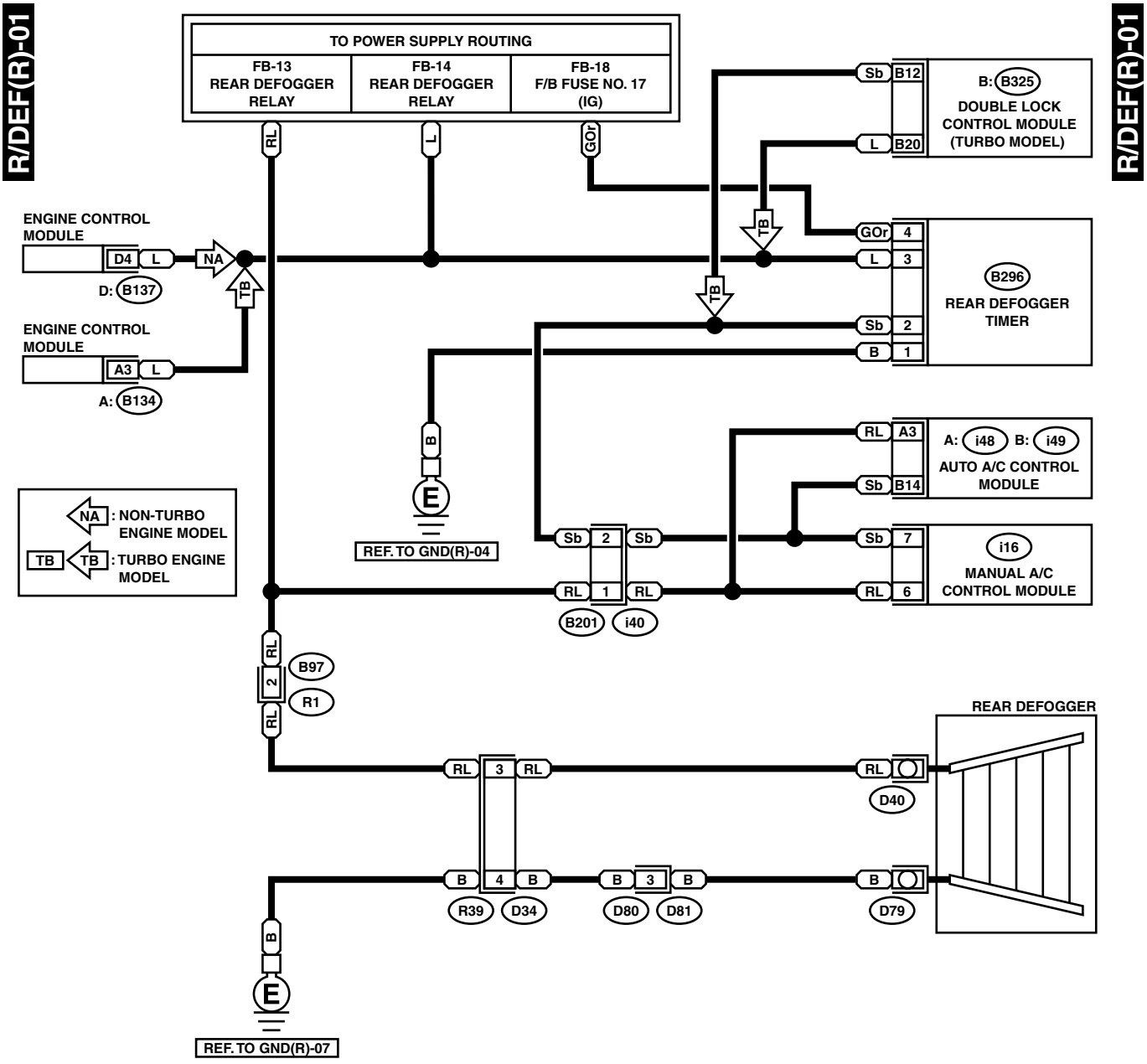
1. LHD MODEL

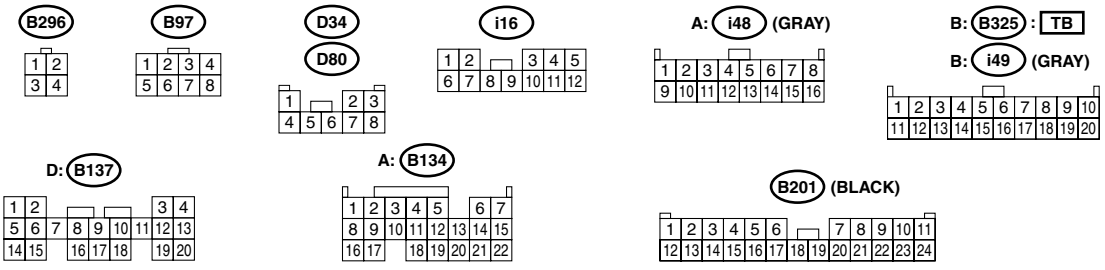




WI-00461

2. RHD MODEL



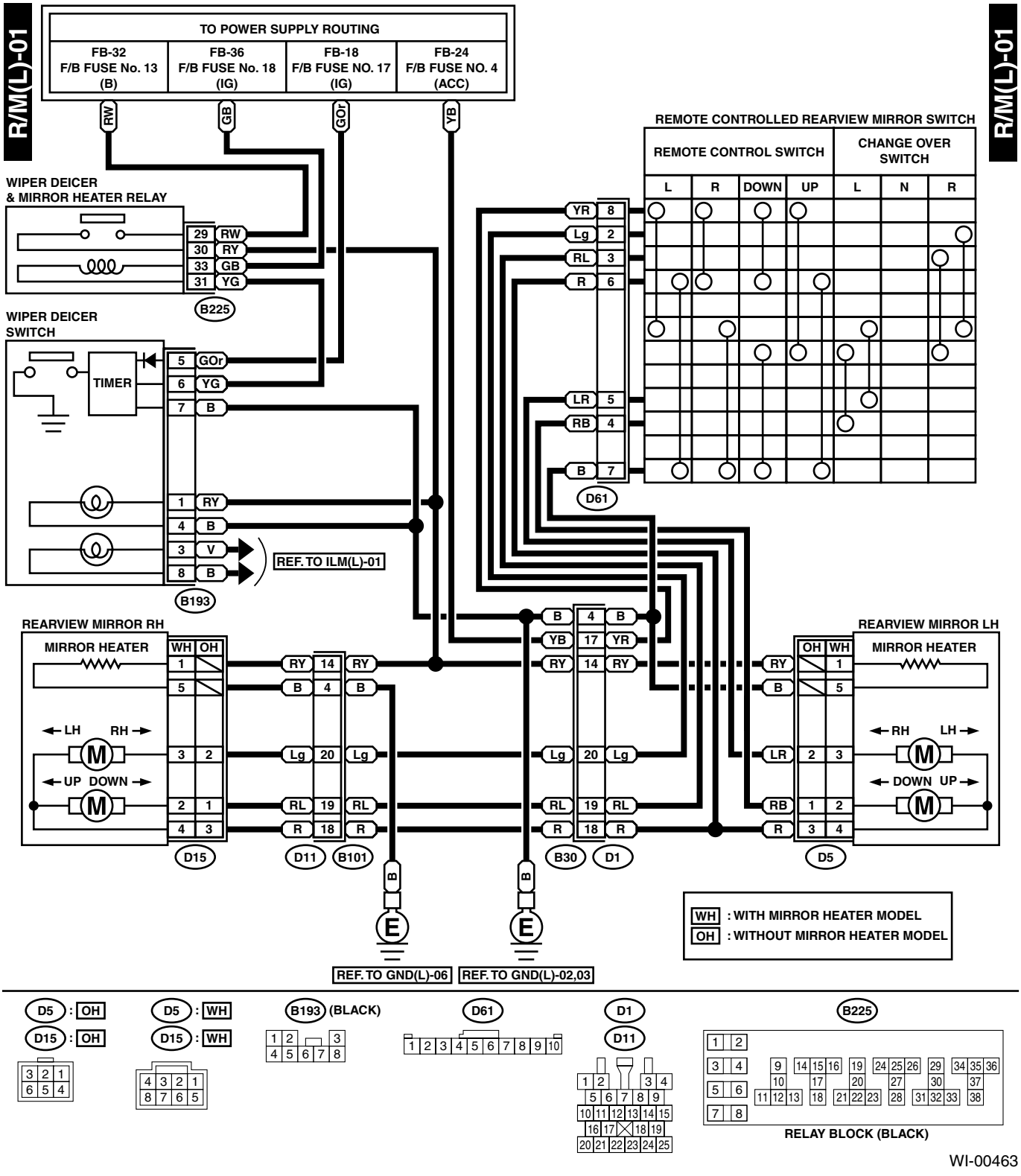


WI-00462

37.Remote Controlled Rearview Mirror System

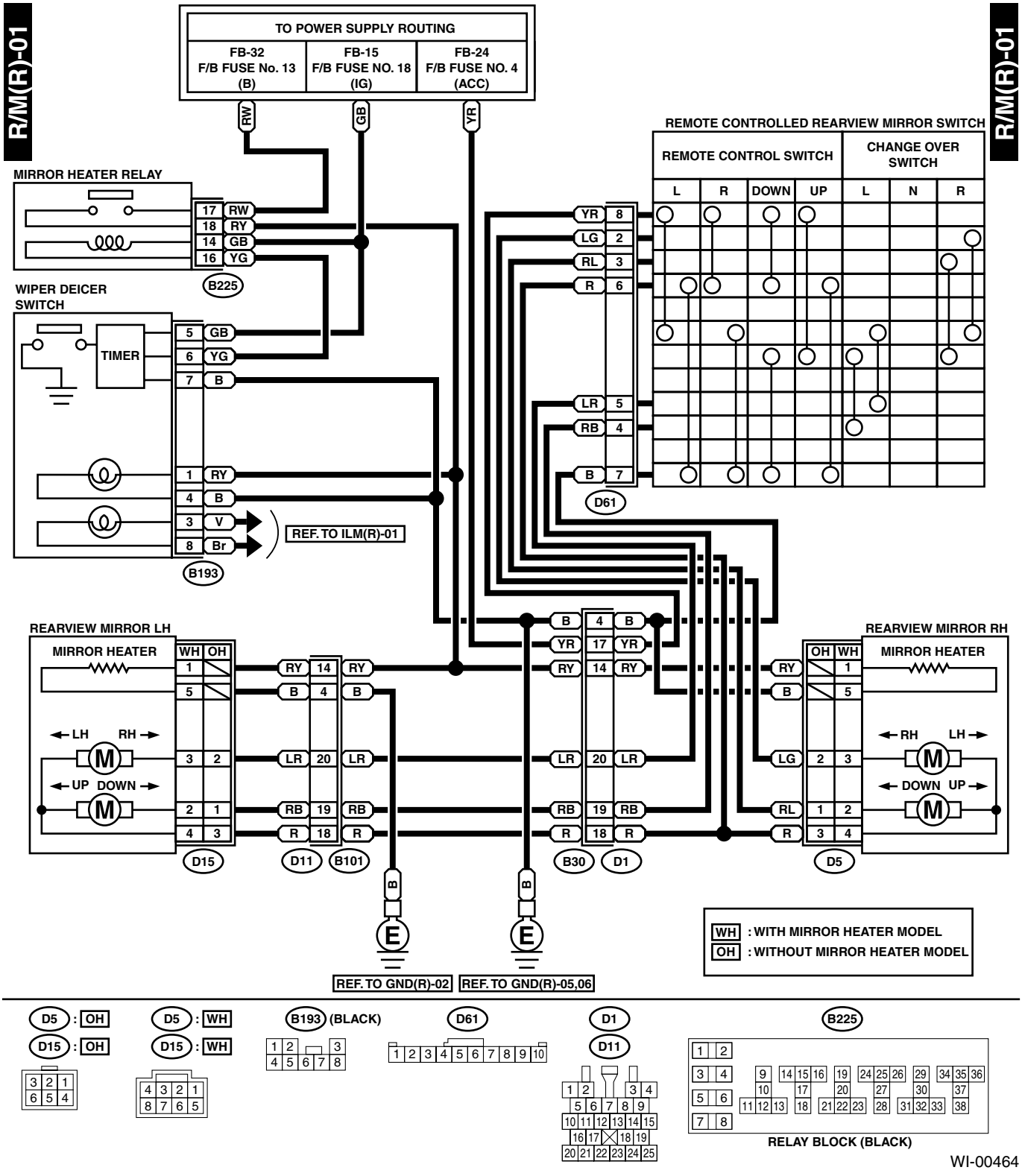
A: SCHEMATIC

1. LHD MODEL



WI-00463

2. RHD MODEL

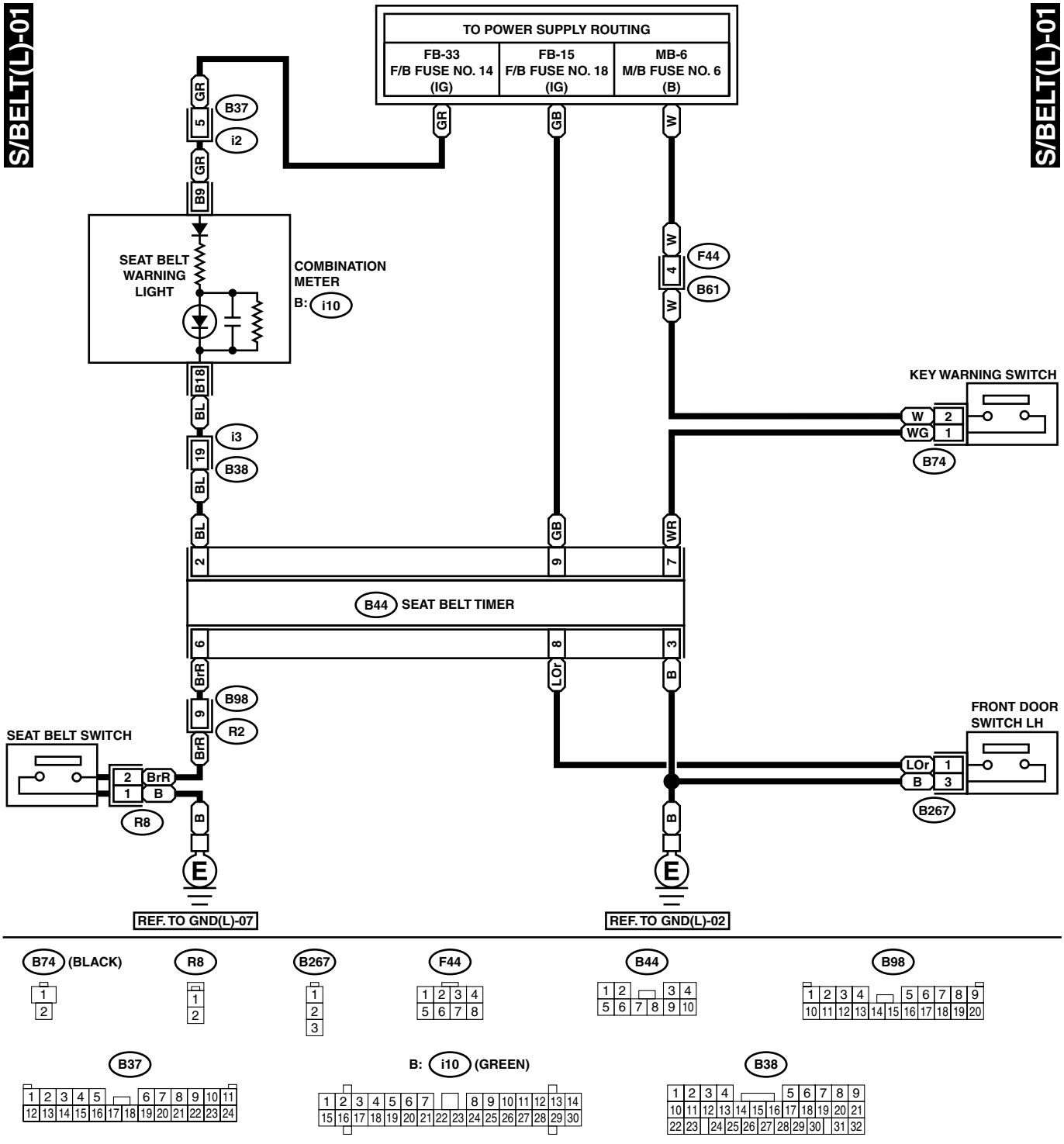


WI-00464

38.Seat Belt Warning System

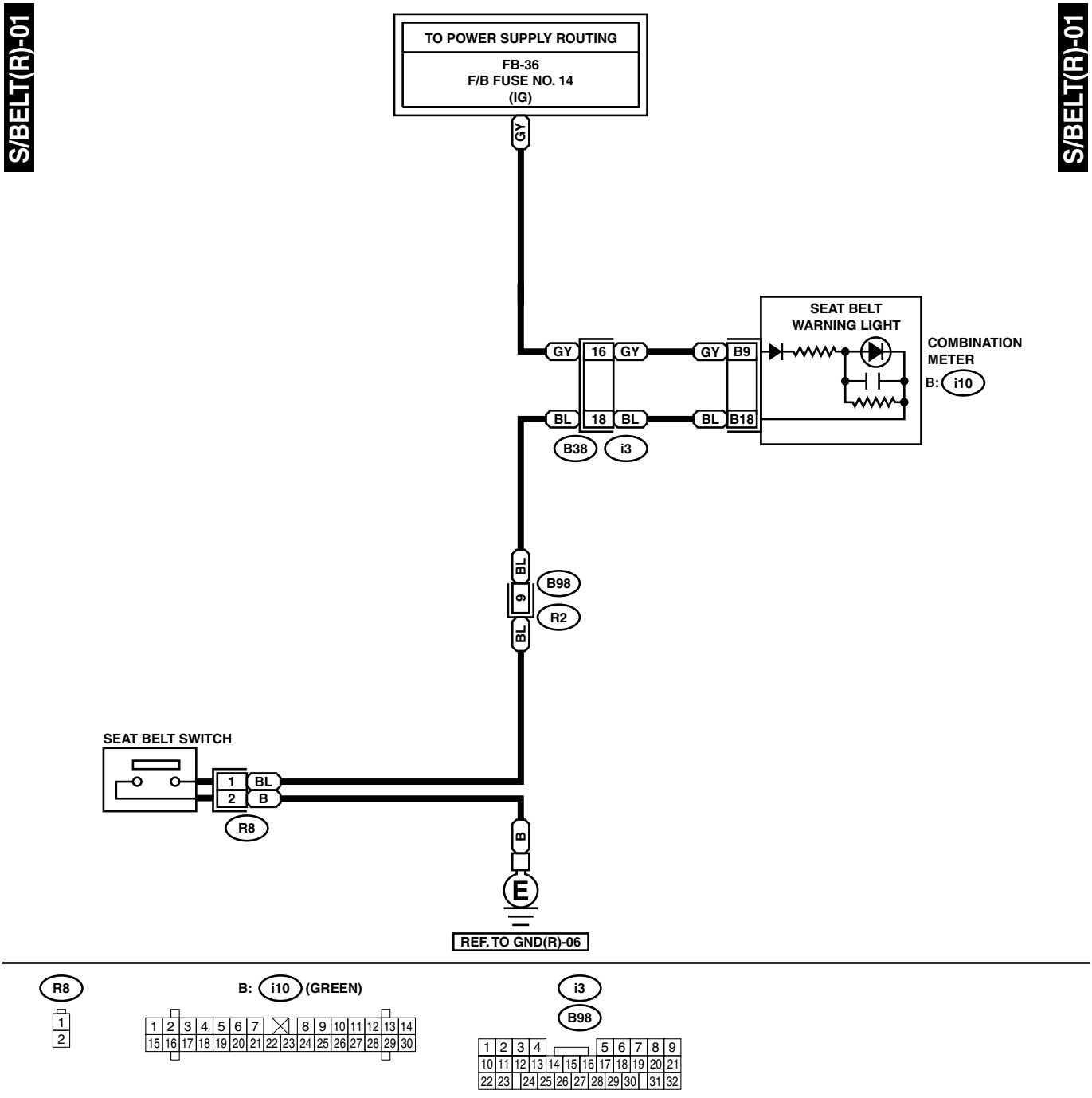
A: SCHEMATIC

1. LHD MODEL



WI-00466

2. RHD MODEL

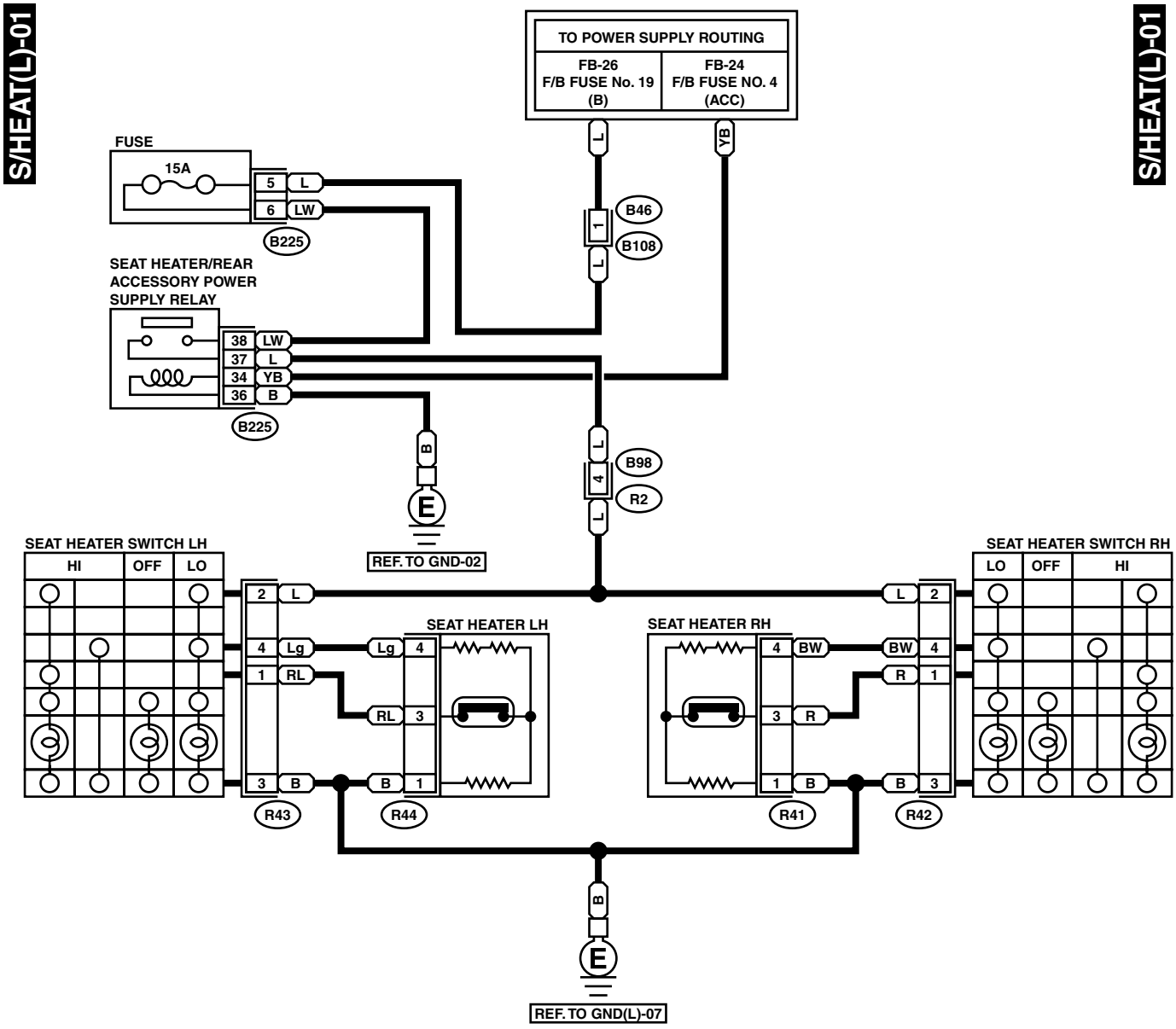


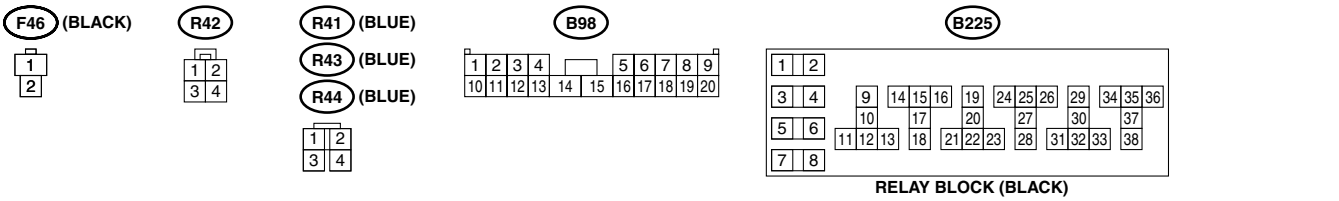
WI-00467

39.Seat Heater System

A: SCHEMATIC

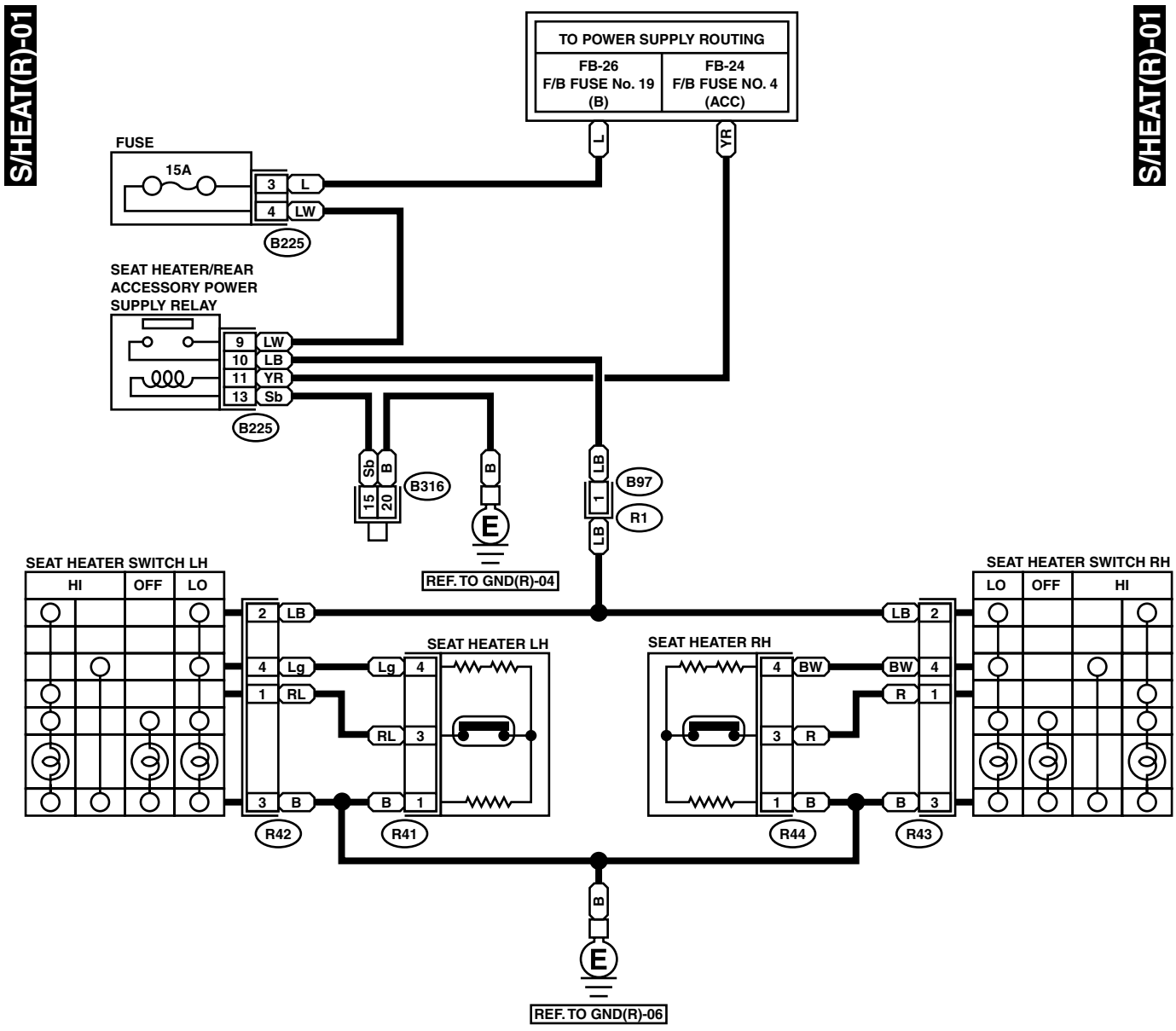
1. LHD MODEL

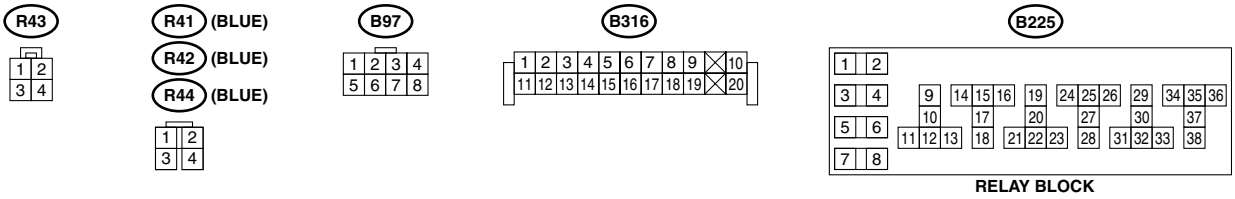




WI-00468

2. RHD MODEL

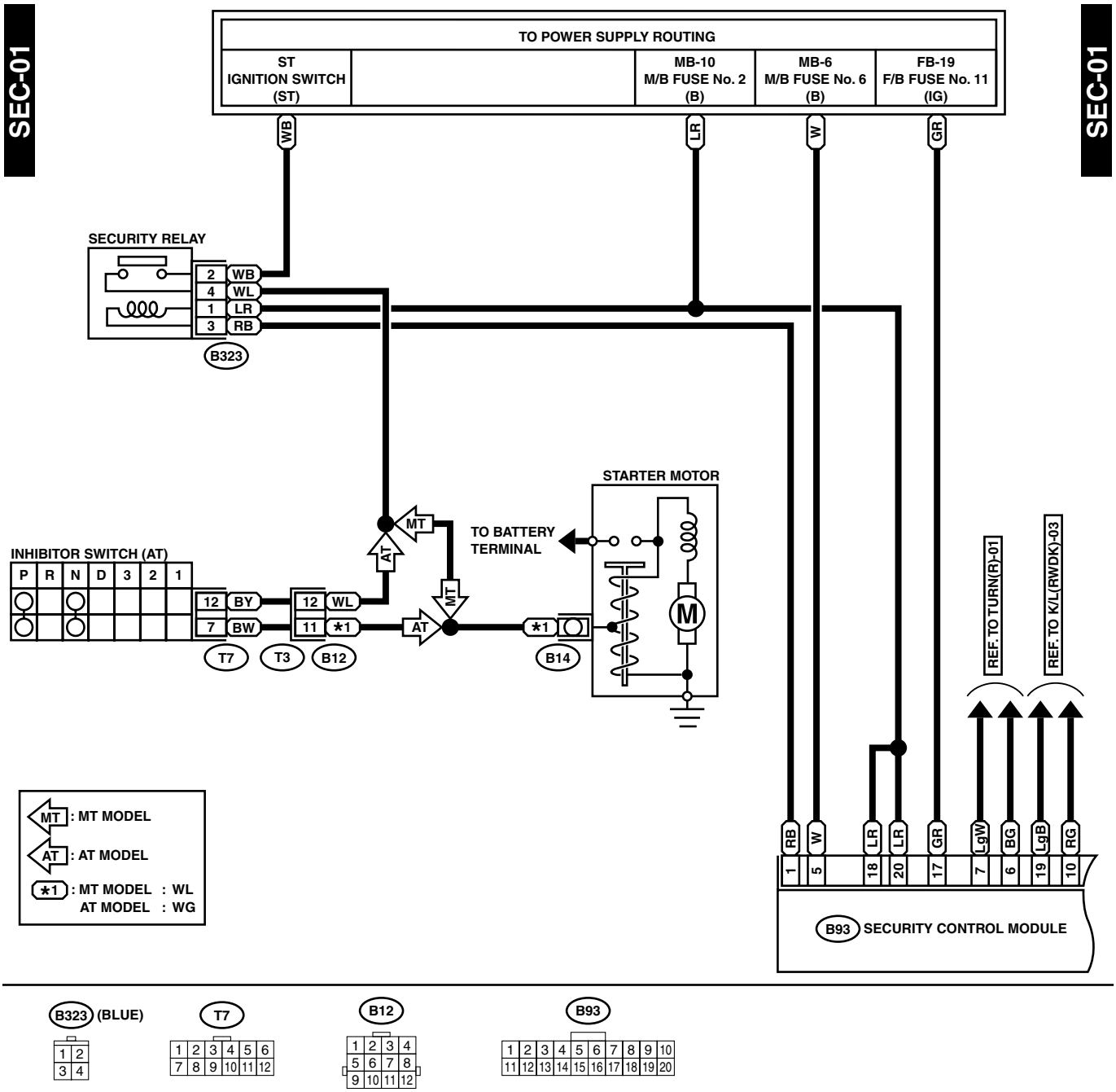




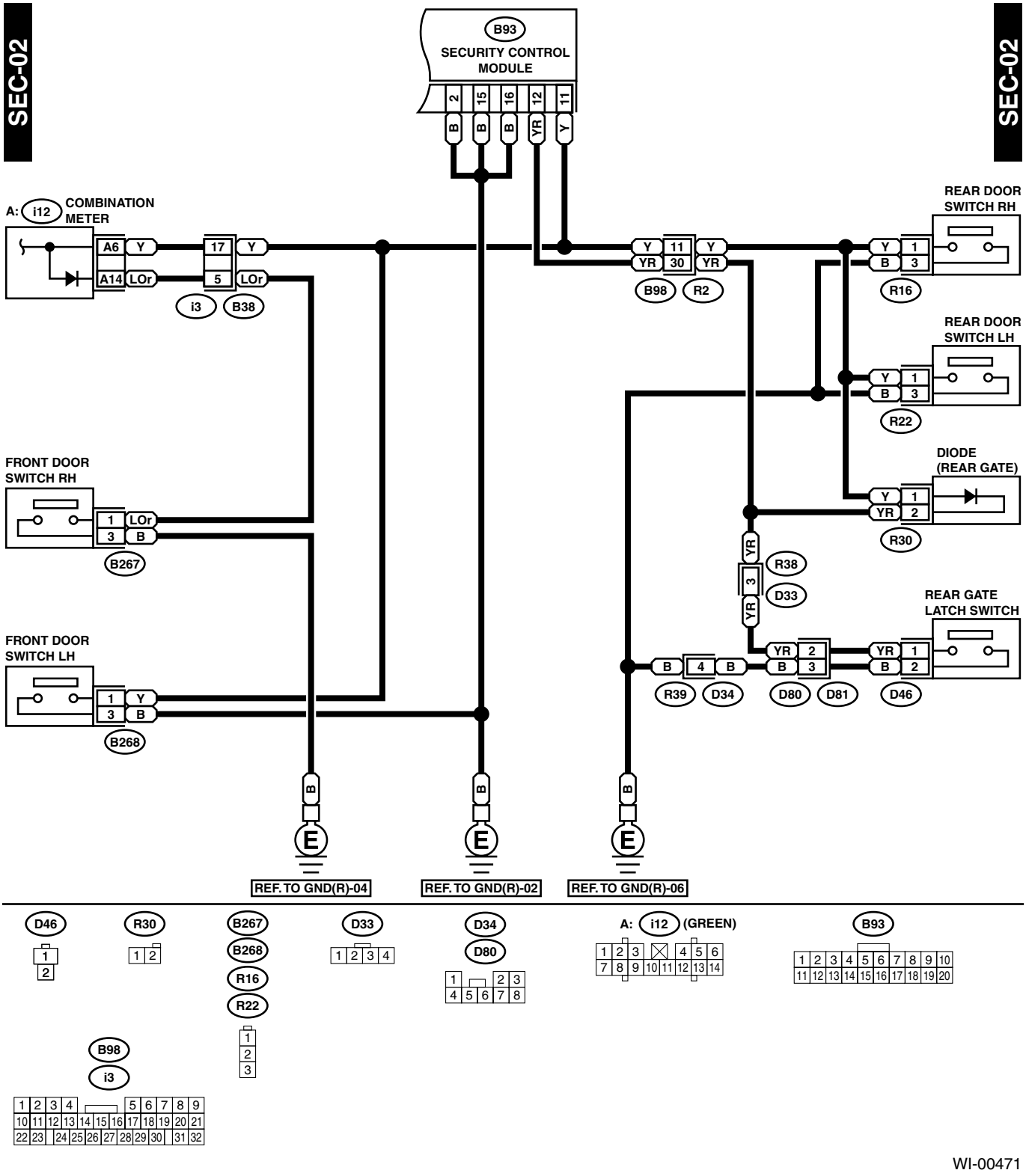
WI-00469

40.Security System

A: SCHEMATIC



WI-00470

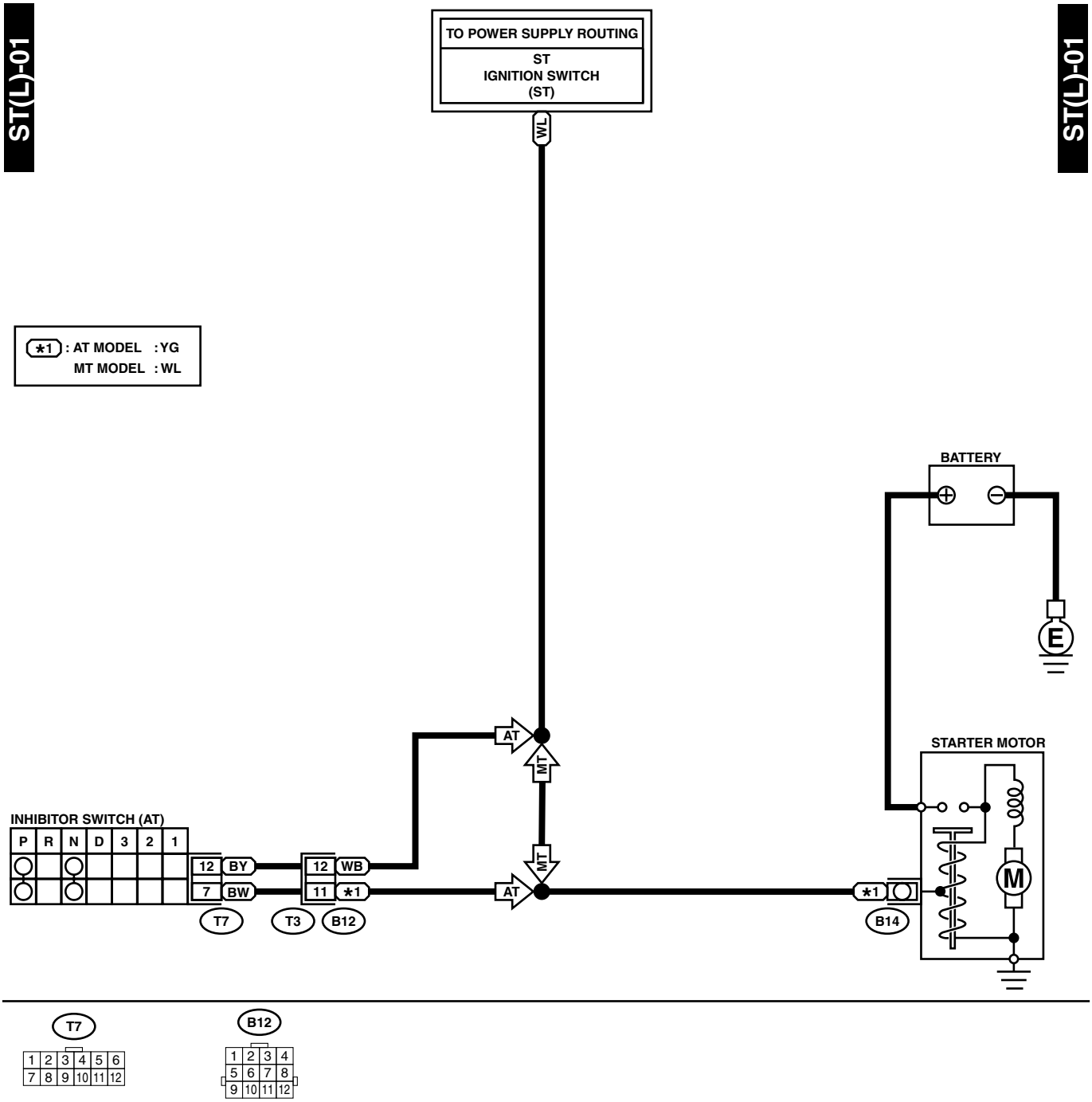

SEC-02
SEC-02
B93
SECURITY CONTROL MODULE
2 15 16 12 11
B B B YR Y
A: i12 COMBINATION METER
A6 Y
A14 LOr
17 Y
5 LOr
i3 B38
Y 11 Y
YR 30 YR
B98 R2
REAR DOOR SWITCH RH
Y 1
B 3
R16
REAR DOOR SWITCH LH
Y 1
B 3
R22
DIODE (REAR GATE)
Y 1
YR 2
R30
FRONT DOOR SWITCH RH
1 LOr
3 B
B267
FRONT DOOR SWITCH LH
1 Y
3 B
B268
YR
R38
3
D33
YR
REAR GATE LATCH SWITCH
YR 2
B 3
R39 D34 D80 D81
YR 1
B 2
D46
B B B
REF. TO GND(R)-04
REF. TO GND(R)-02
REF. TO GND(R)-06
D46
1
2
R30
1 2
B267
B268
R16
R22
1
2
3
D33
1 2 3 4
D34
D80
1 2 3
4 5 6 7 8
A: i12 (GREEN)
1 2 3 4 5 6
7 8 9 10 11 12 13 14
B93
1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20
B98
i3
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19 20 21
22 23 24 25 26 27 28 29 30 31 32

WI-00471

41.Starter System

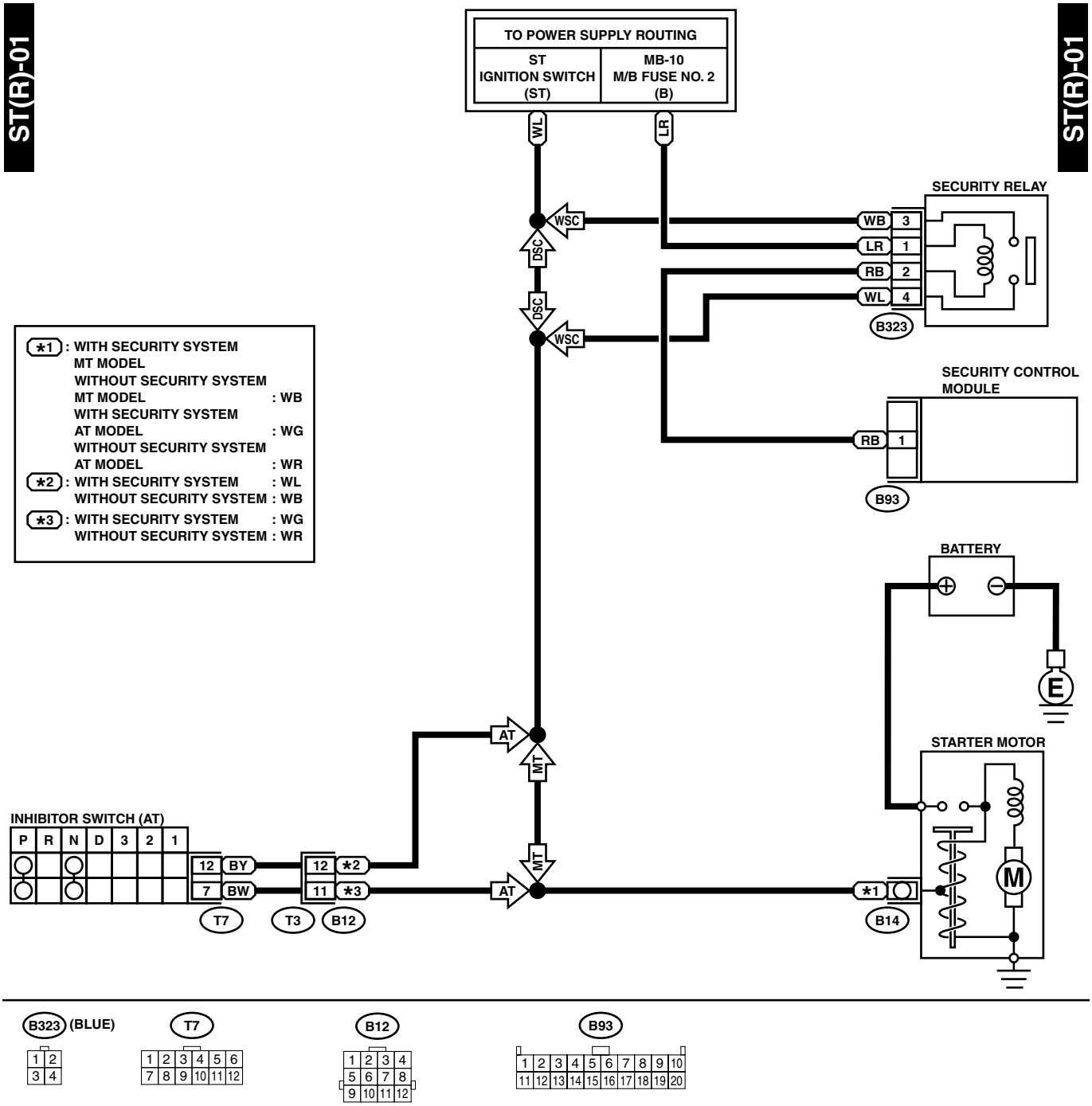
A: SCHEMATIC

1. LHD MODEL



WI-00473

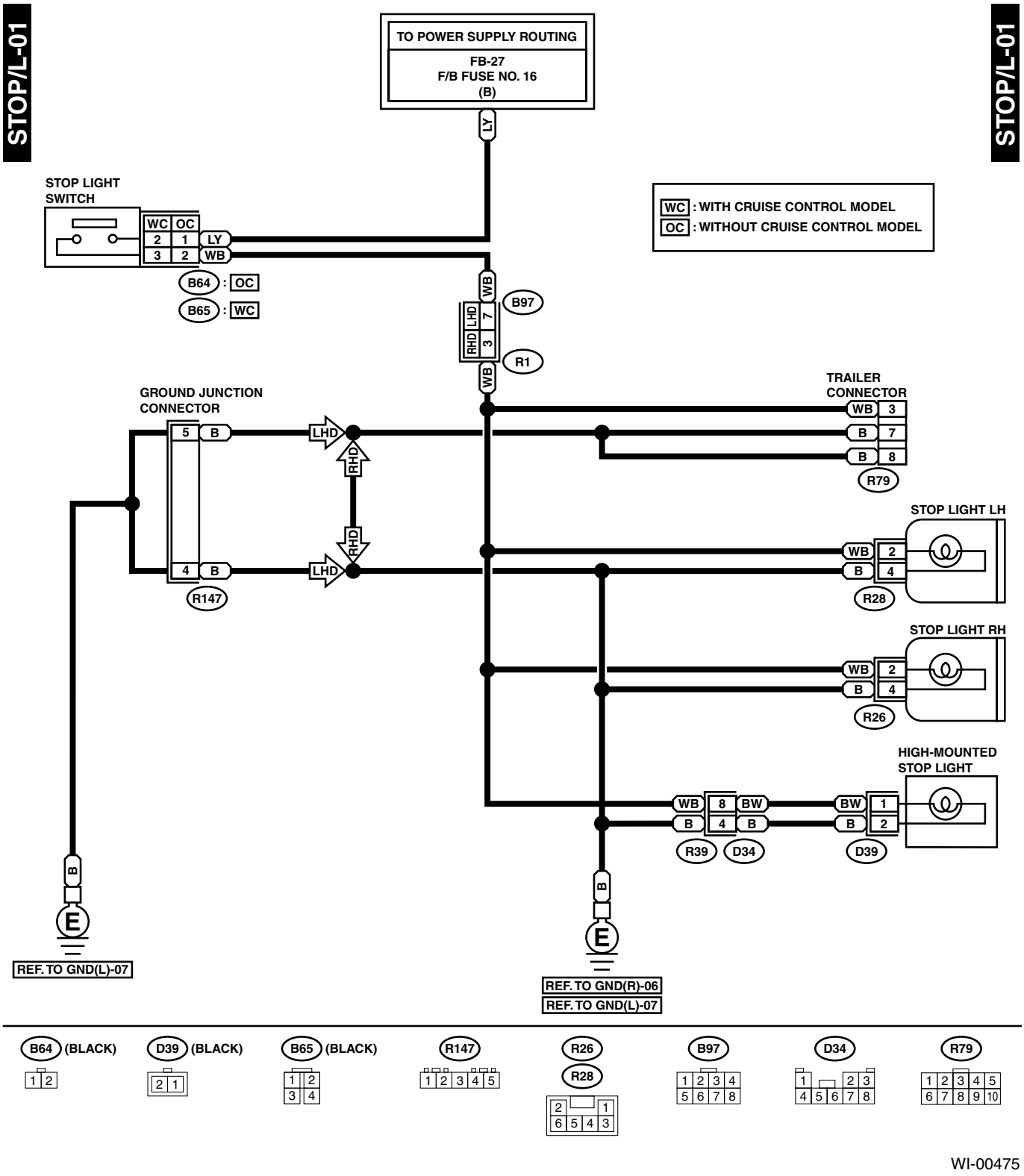
2. RHD MODEL



WI-00333

42.Stop Light System

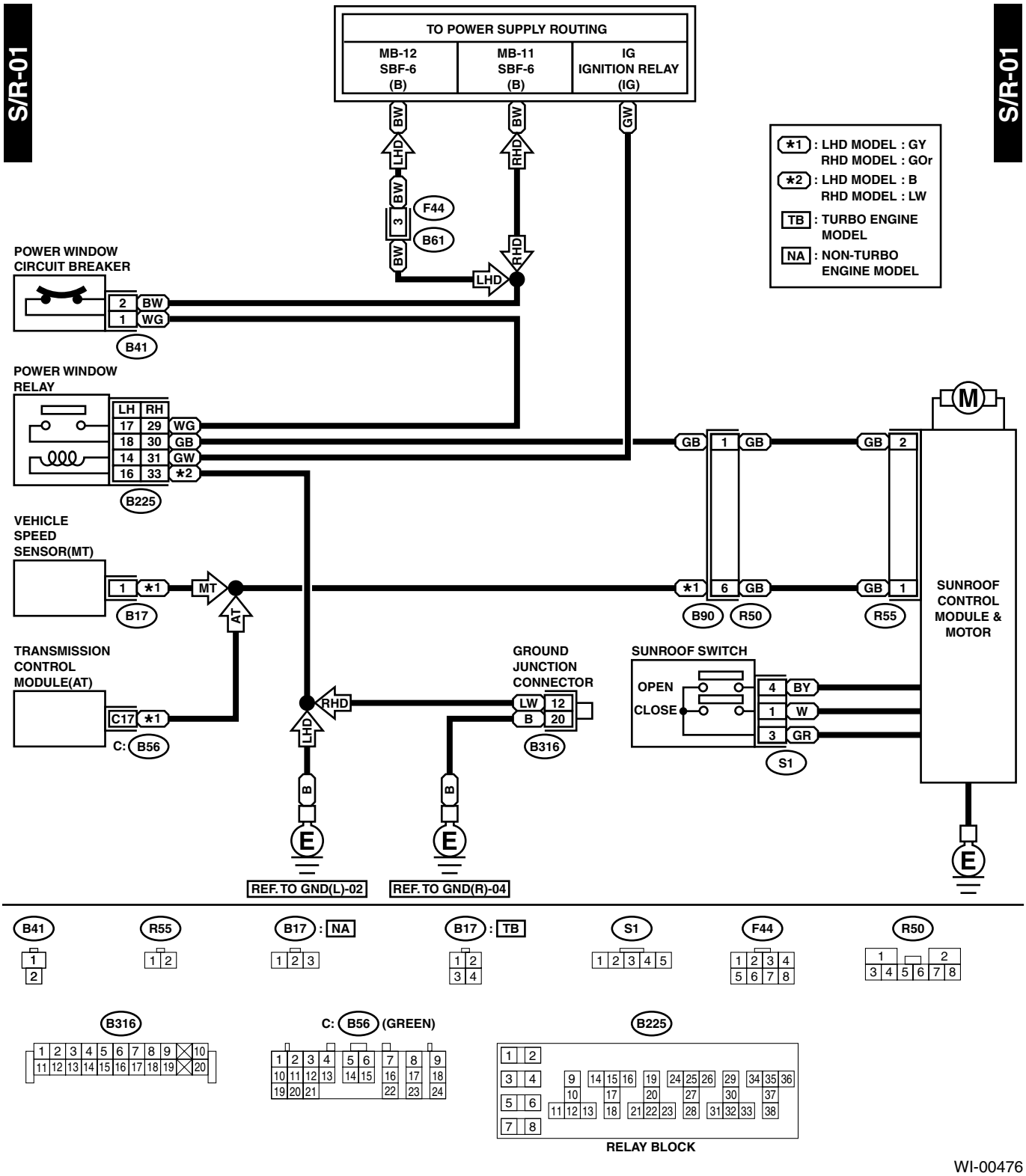
A: SCHEMATIC



WI-00475

43.Sunroof System

A: SCHEMATIC

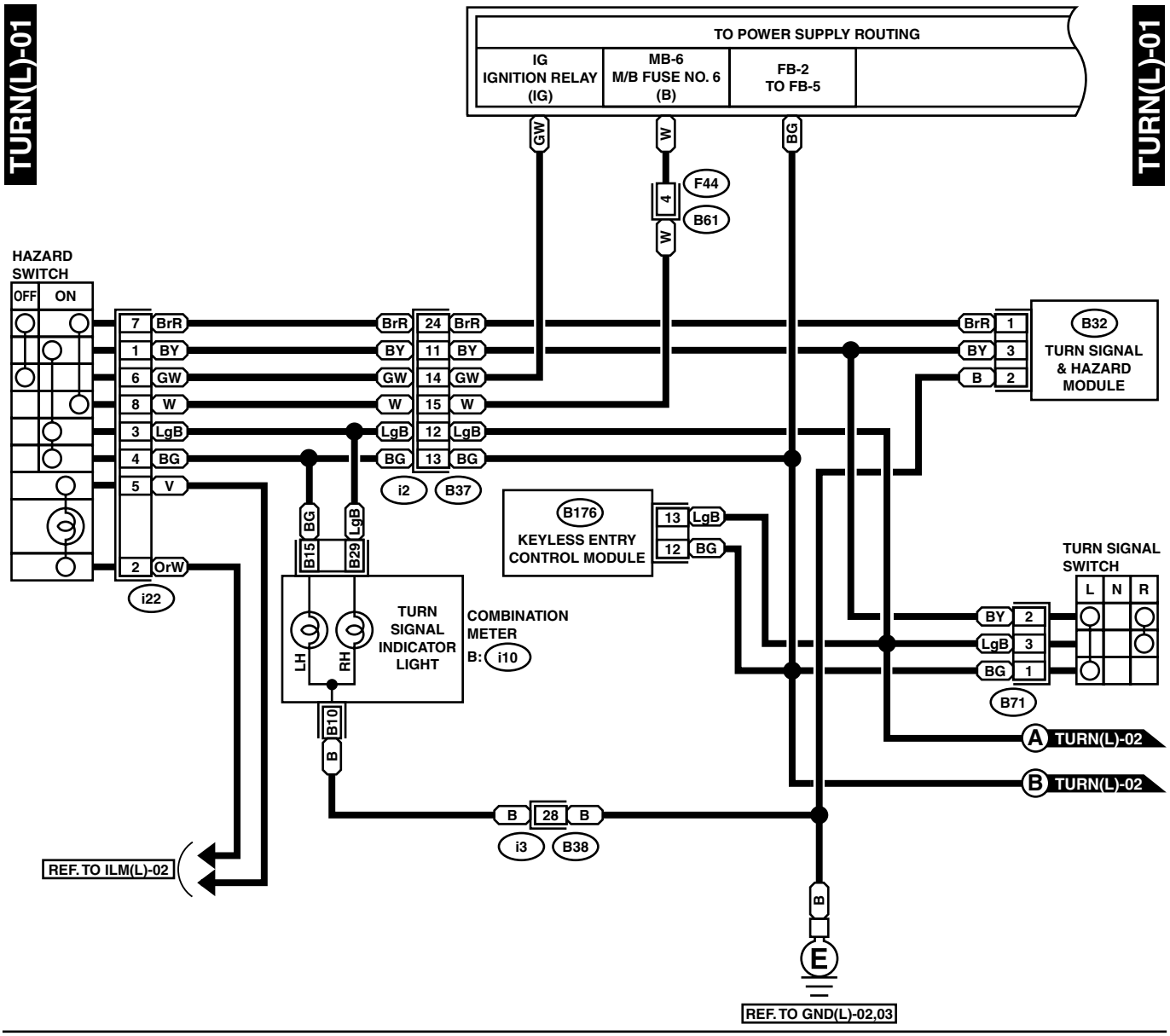


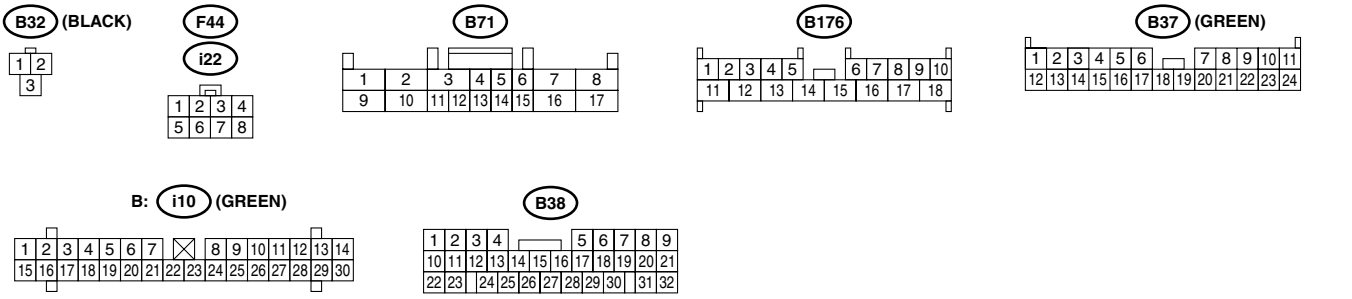
WI-00476

44.Turn Signal Light and Hazard Light System

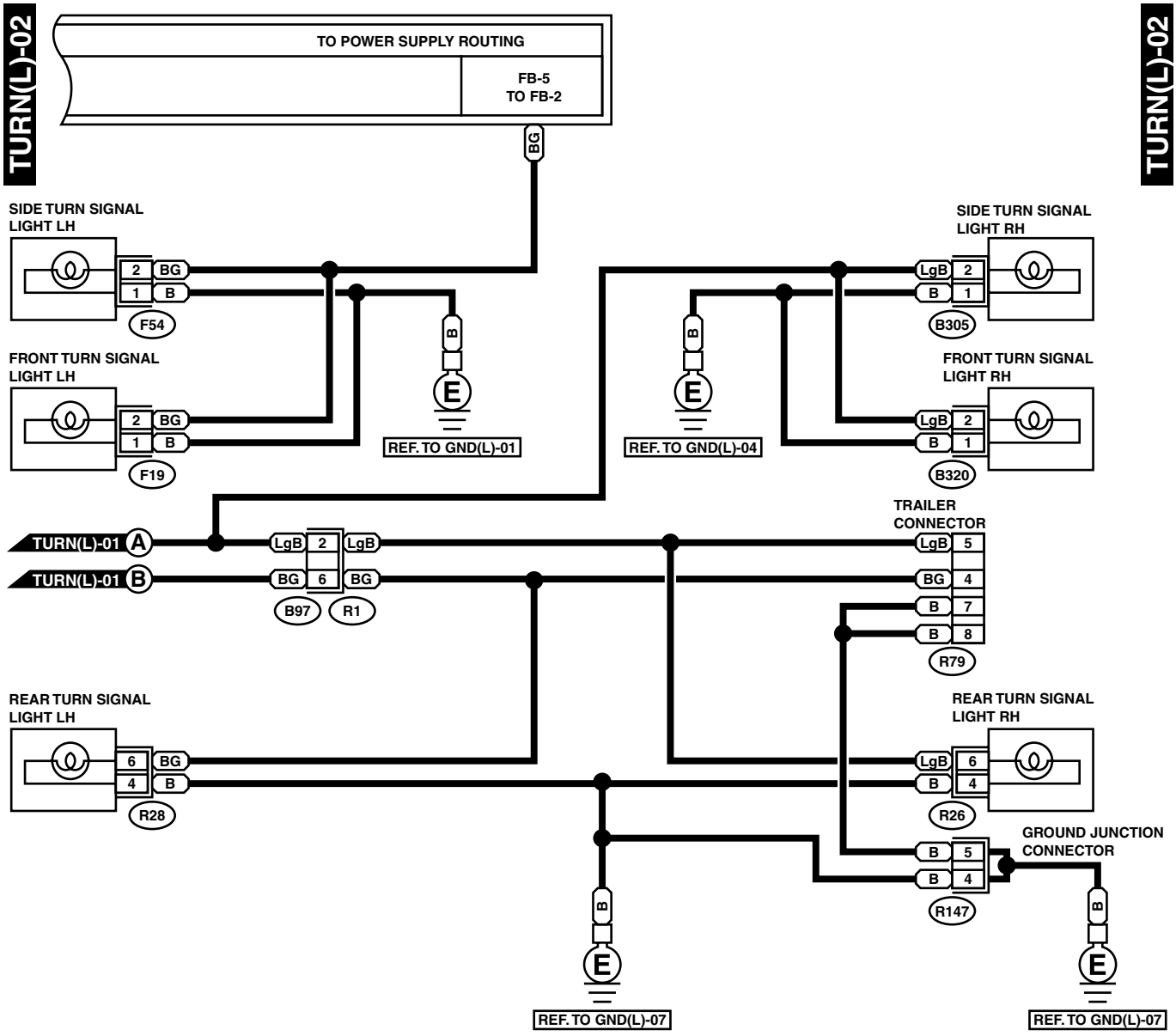
A: SCHEMATIC

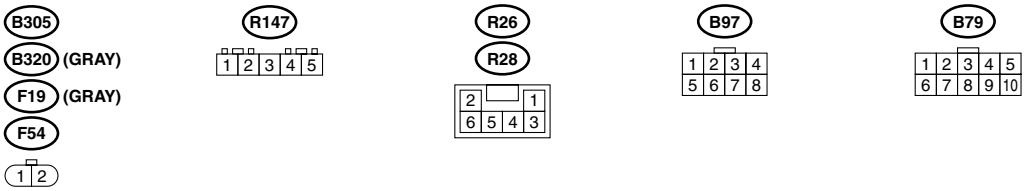
1. LHD MODEL





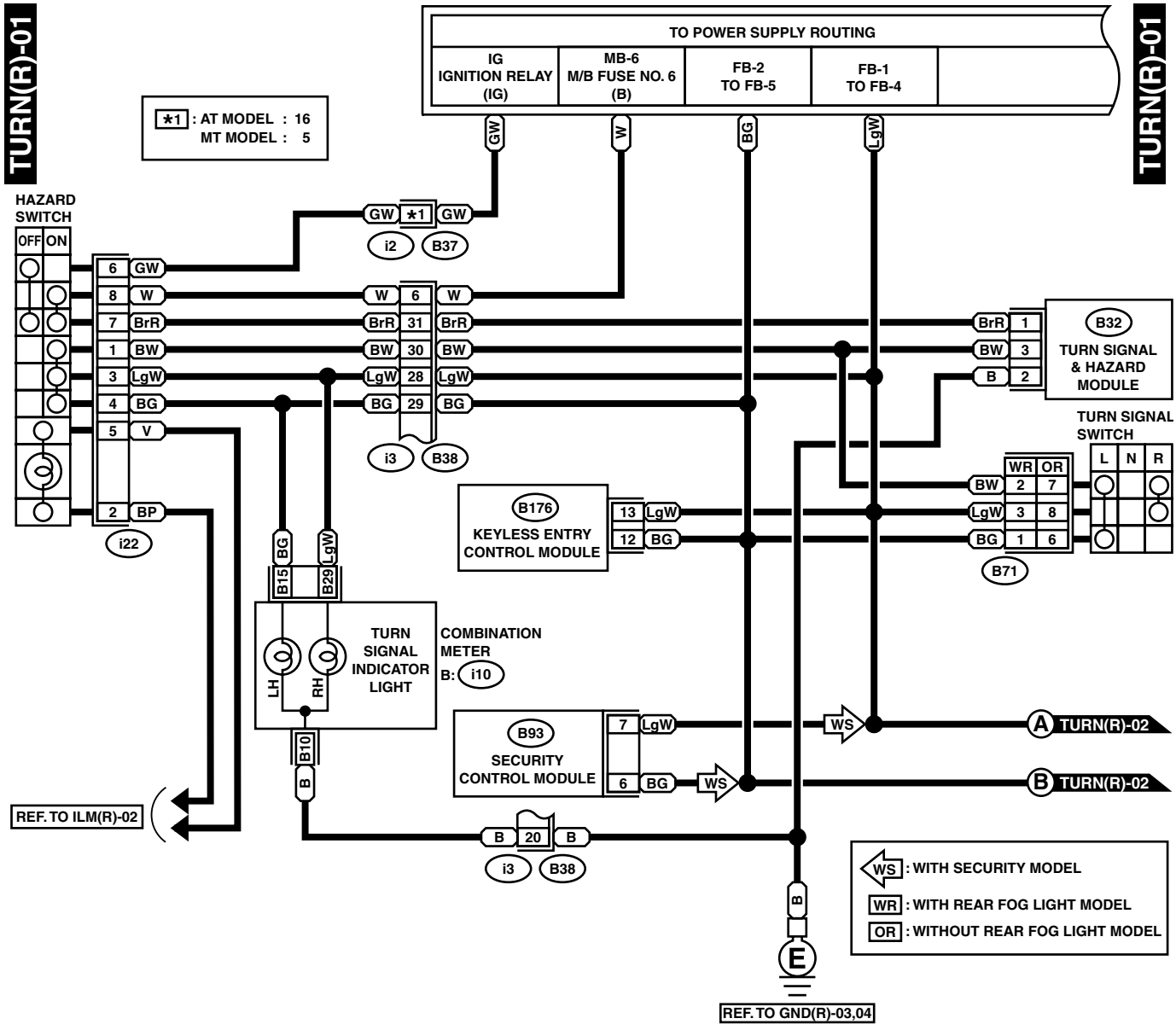
WI-00421

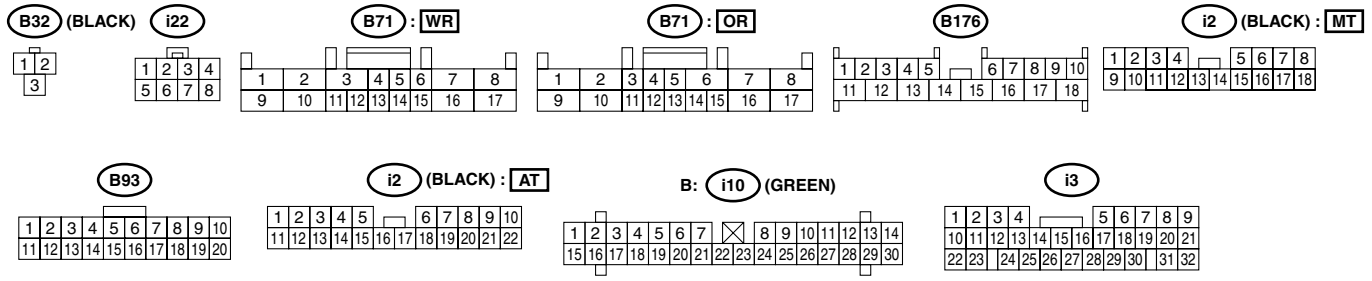

TURN(L)-02
TO POWER SUPPLY ROUTING
FB-5
TO FB-2
BG
SIDE TURN SIGNAL LIGHT LH
2 BG
1 B
F54
SIDE TURN SIGNAL LIGHT RH
LgB 2
B 1
B305
FRONT TURN SIGNAL LIGHT LH
2 BG
1 B
F19
FRONT TURN SIGNAL LIGHT RH
LgB 2
B 1
B320
B
E
REF. TO GND(L)-01
REF. TO GND(L)-04
TRAILER CONNECTOR
TURN(L)-01 A
TURN(L)-01 B
LgB 2 LgB
BG 6 BG
B97
R1
LgB 5
BG 4
B 7
B 8
R79
REAR TURN SIGNAL LIGHT LH
6 BG
4 B
R28
REAR TURN SIGNAL LIGHT RH
LgB 6
B 4
R26
GROUND JUNCTION CONNECTOR
B 5
B 4
R147
REF. TO GND(L)-07
REF. TO GND(L)-07


B305
B320 (GRAY)
F19 (GRAY)
F54
1 2
R147
1 2 3 4 5
R26
R28
2 1
6 5 4 3
B97
1 2 3 4
5 6 7 8
B79
1 2 3 4 5
6 7 8 9 10

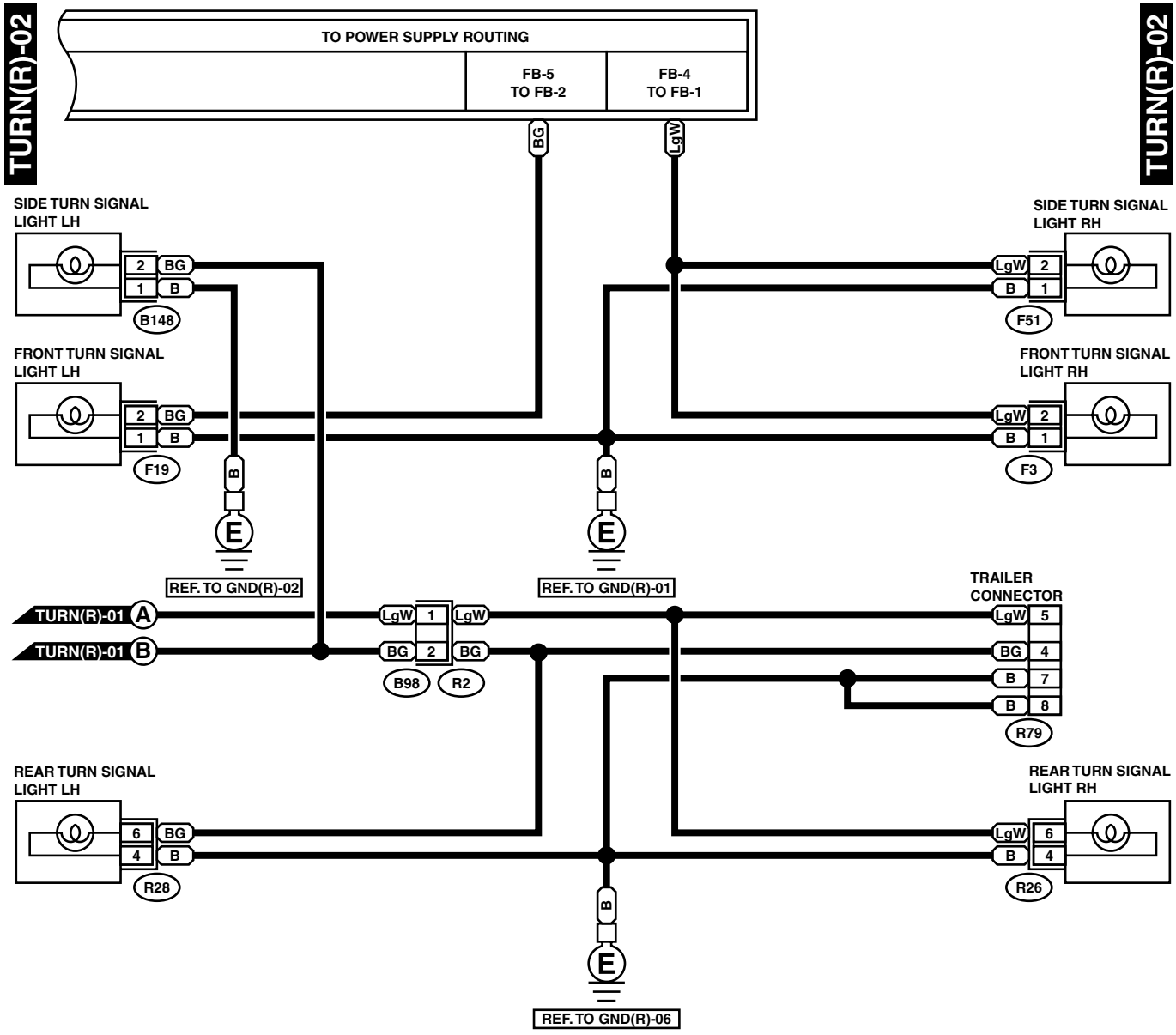
WI-00422

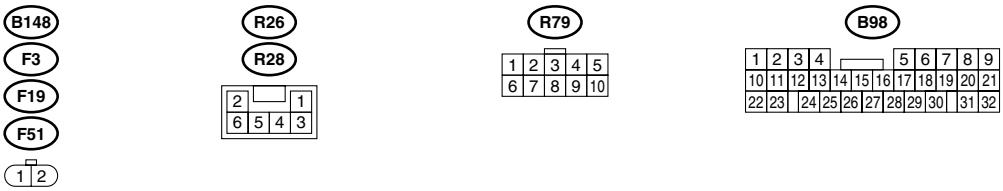
2. RHD MODEL





WI-00479

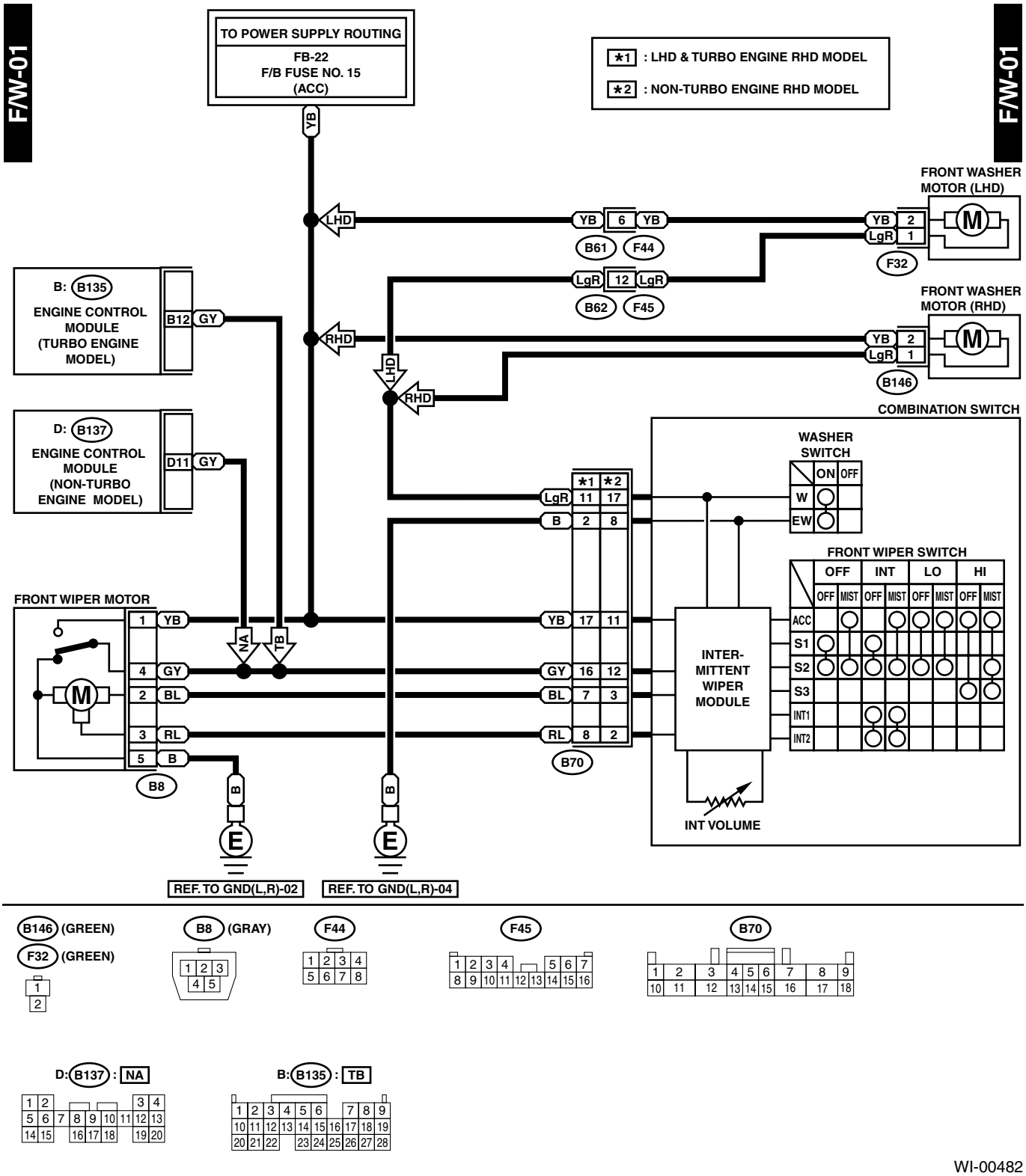

TURN(R)-02
TO POWER SUPPLY ROUTING
FB-5
TO FB-2
FB-4
TO FB-1
BG
LgW
TURN(R)-02
SIDE TURN SIGNAL
LIGHT LH
SIDE TURN SIGNAL
LIGHT RH
2 BG
1 B
B148
LgW 2
B 1
F51
FRONT TURN SIGNAL
LIGHT LH
FRONT TURN SIGNAL
LIGHT RH
F19
F3
B
E
REF. TO GND(R)-02
REF. TO GND(R)-01
TRAILER
CONNECTOR
TURN(R)-01 A
TURN(R)-01 B
LgW 1 LgW
BG 2 BG
B98
R2
LgW 5
BG 4
B 7
B 8
R79
REAR TURN SIGNAL
LIGHT LH
REAR TURN SIGNAL
LIGHT RH
6 BG
4 B
R28
LgW 6
B 4
R26
REF. TO GND(R)-06


B148
F3
F19
F51
1 2
R26
R28
2 1
6 5 4 3
R79
1 2 3 4 5
6 7 8 9 10
B98
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19 20 21
22 23 24 25 26 27 28 29 30 31 32

WI-00480

45.Wiper and Washer System (Front)

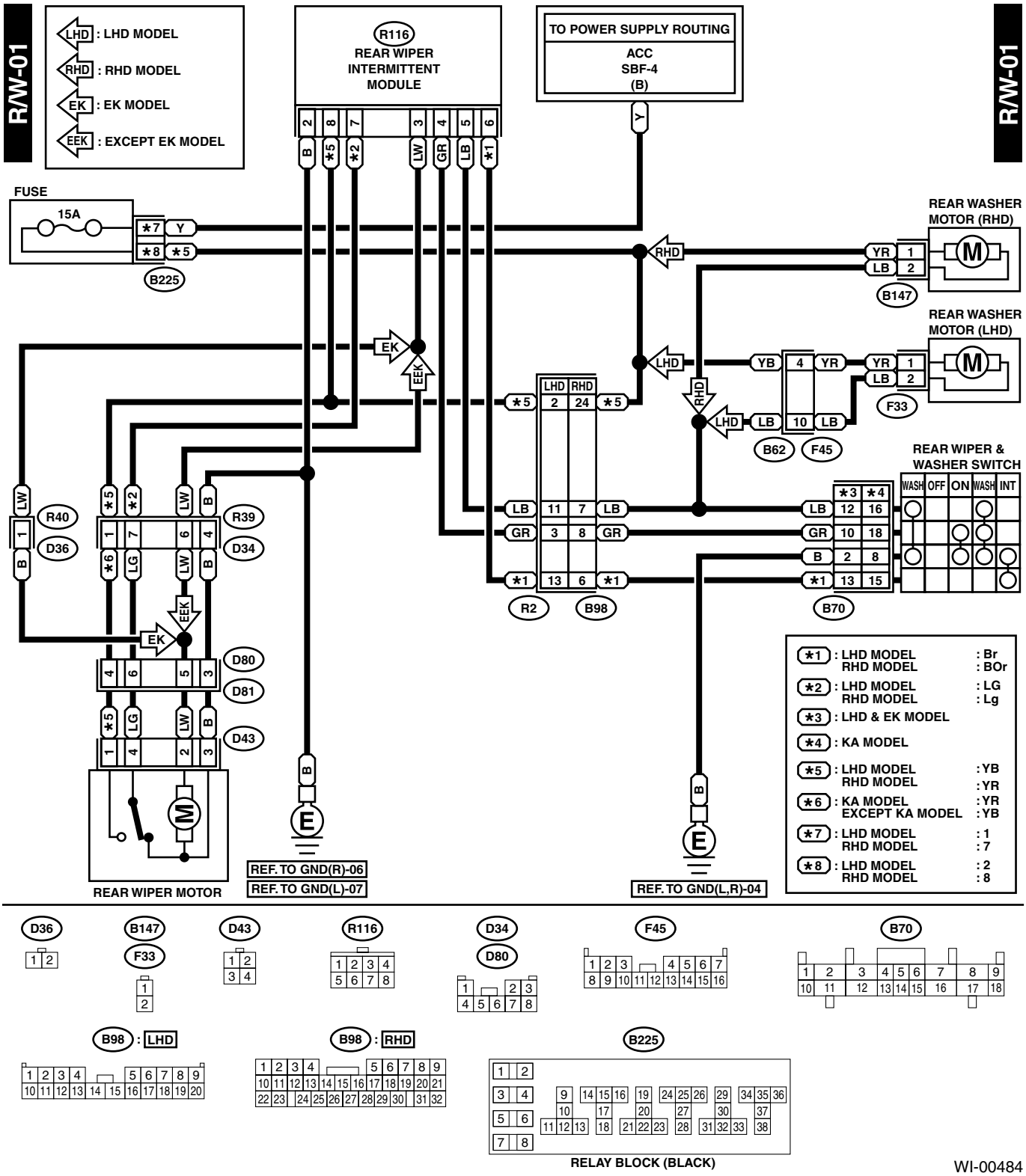
A: SCHEMATIC



WI-00482

46.Wiper and Washer System (Rear)

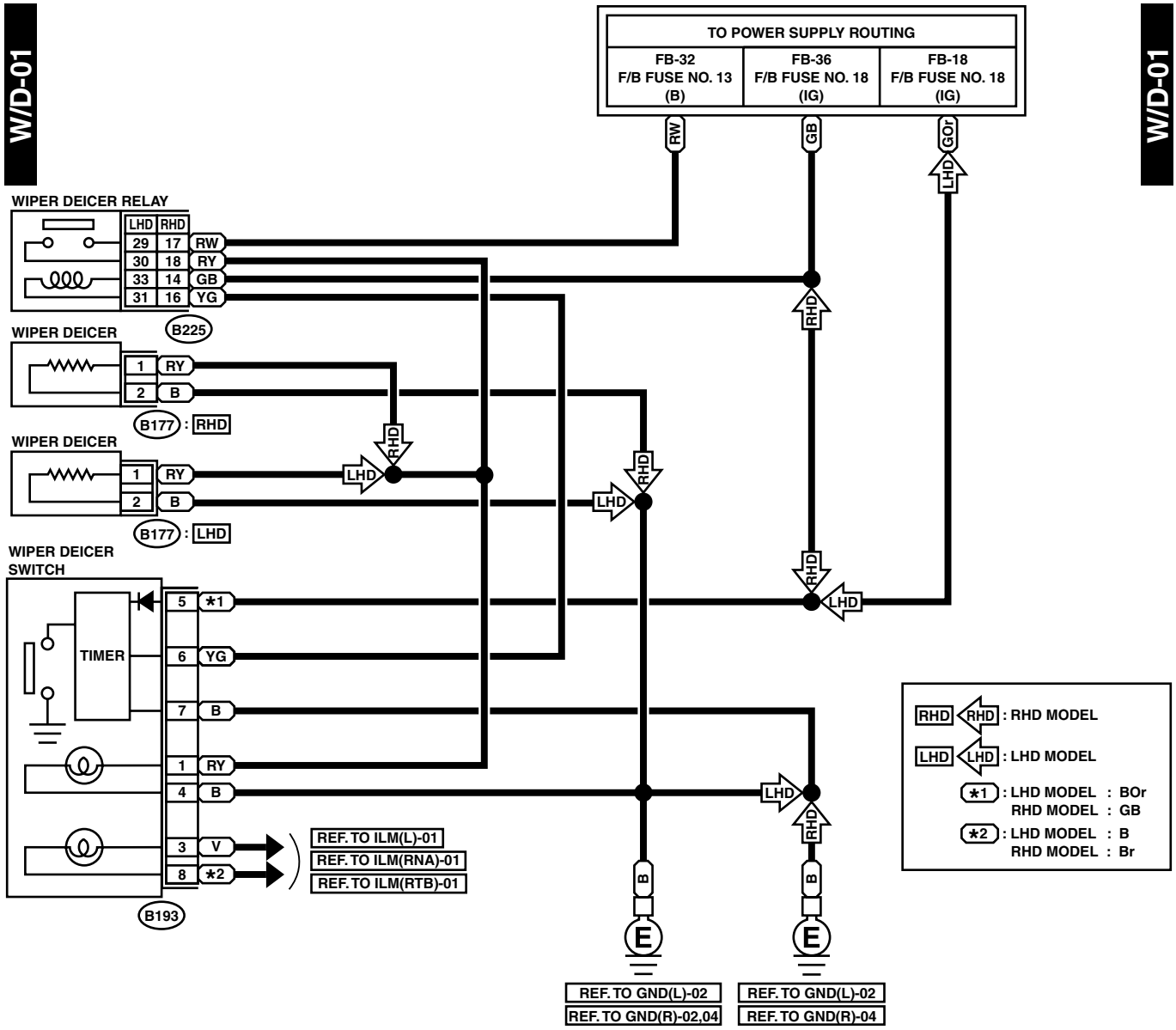
A: SCHEMATIC

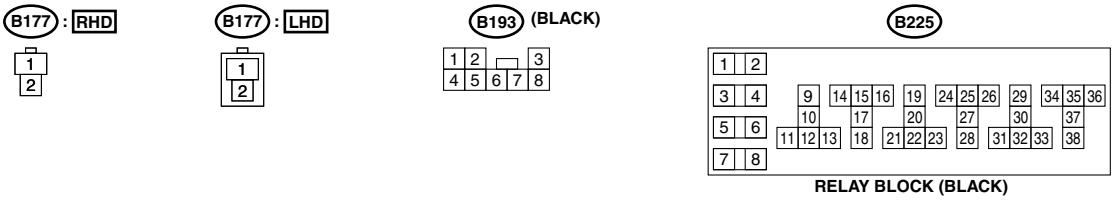


WI-00484

47.Wiper Deicer System

A: SCHEMATIC



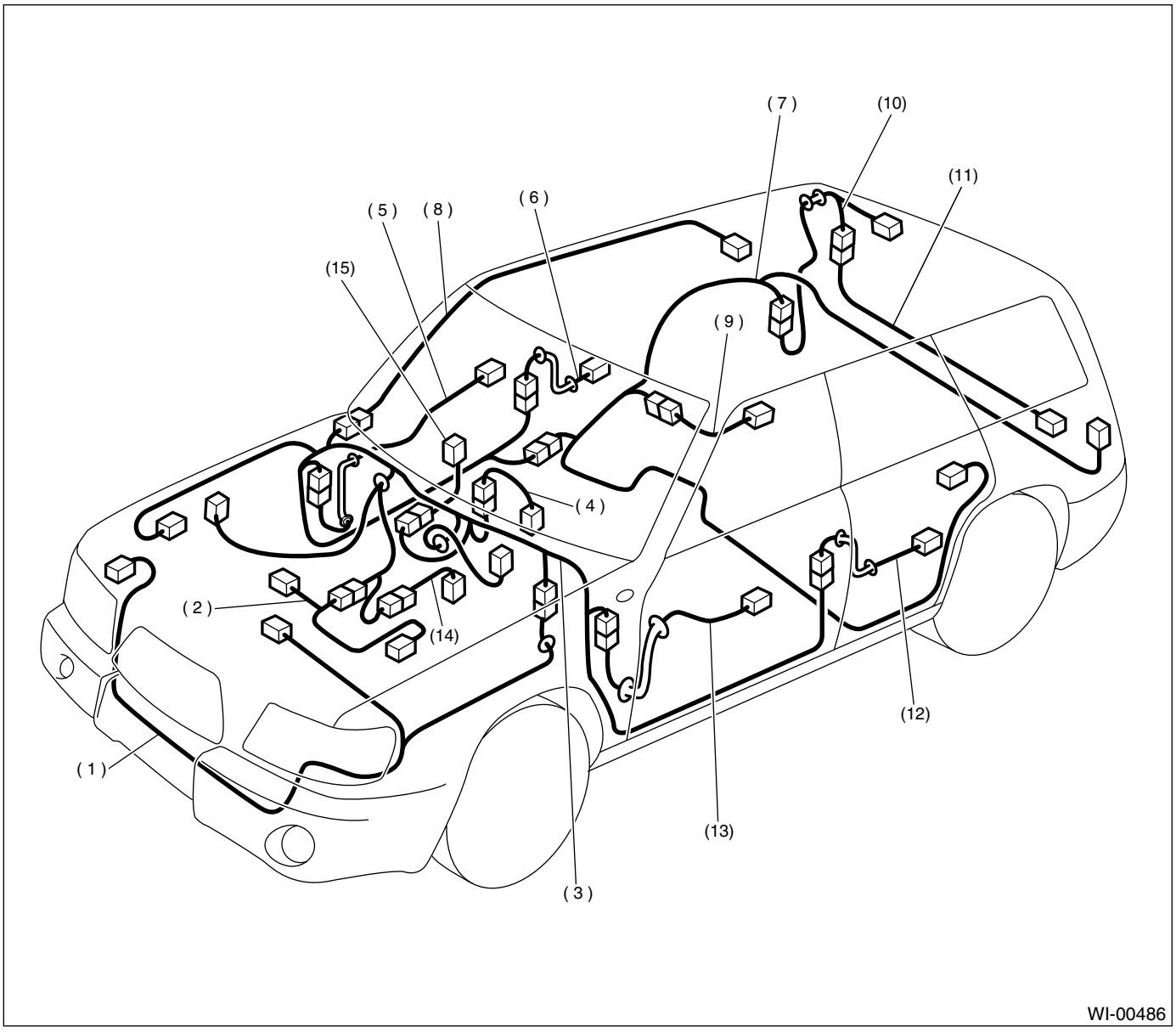


WI-00485

48.Harness Components Location

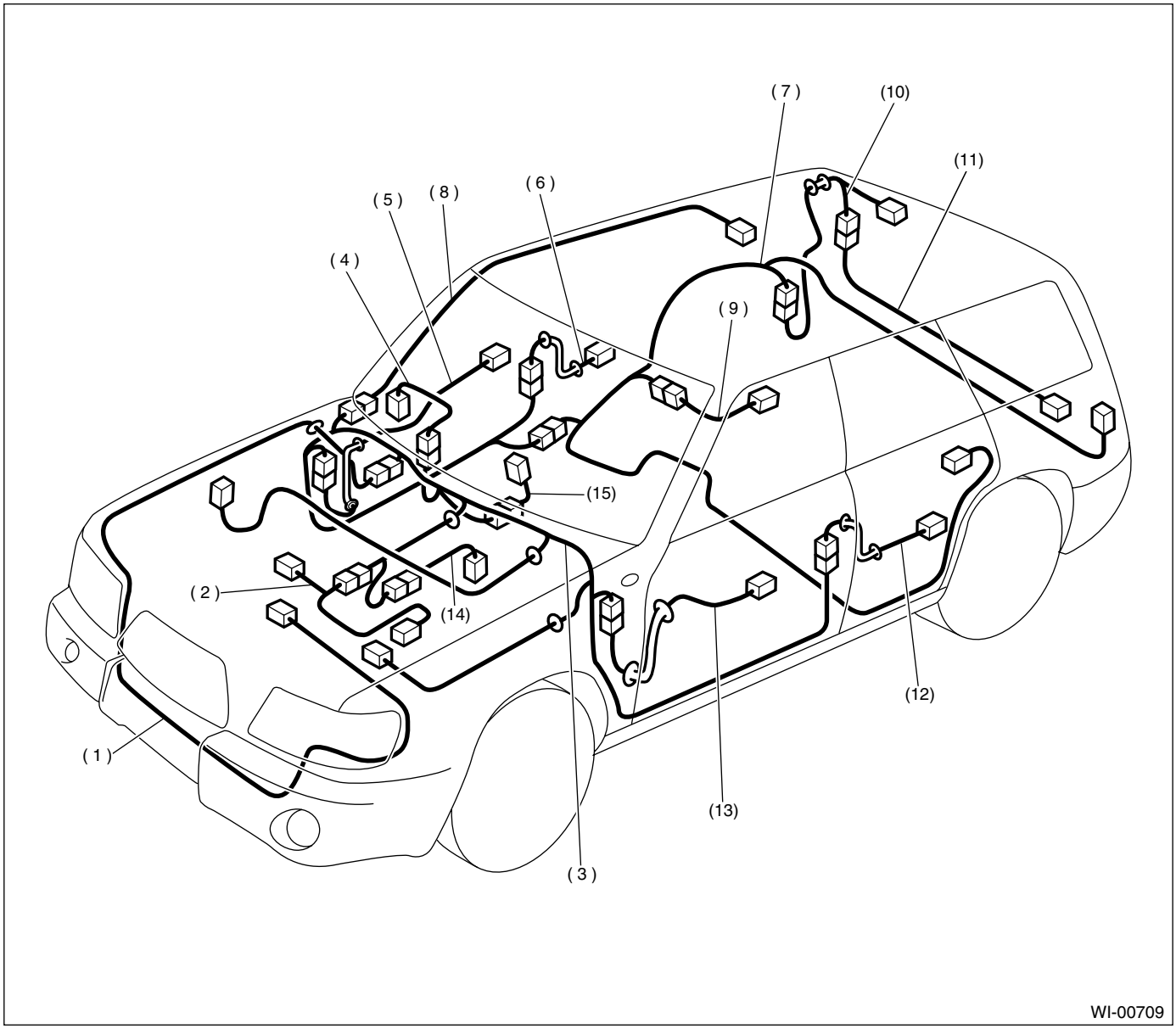
A: LOCATION

1. LHD MODEL



(1) Front wiring harness
(2) Engine wiring harness
(3) Bulkhead wiring harness
(4) Instrument panel wiring harness
(5) Front door cord RH
(6) Rear door cord RH
(7) Rear wiring harness
(8) Roof cord
(9) Fuel tank cord
(10) Rear gate cord 1
(11) Rear gate cord 2
(12) Rear door cord LH
(13) Front door cord LH
(14) Transmission cord
(15) Panel-center harness

2. RHD MODEL



(1)	Front wiring harness	(6)	Rear door cord RH	(11)	Rear gate cord 2
(2)	Engine wiring harness	(7)	Rear wiring harness	(12)	Rear door cord LH
(3)	Bulkhead wiring harness	(8)	Roof cord	(13)	Front door cord LH
(4)	Instrument panel wiring harness	(9)	Fuel tank cord	(14)	Transmission cord
(5)	Front door cord RH	(10)	Rear gate cord 1	(15)	Panel-center harness

49.Front Wiring Harness

A: LOCATION

1. LHD MODEL

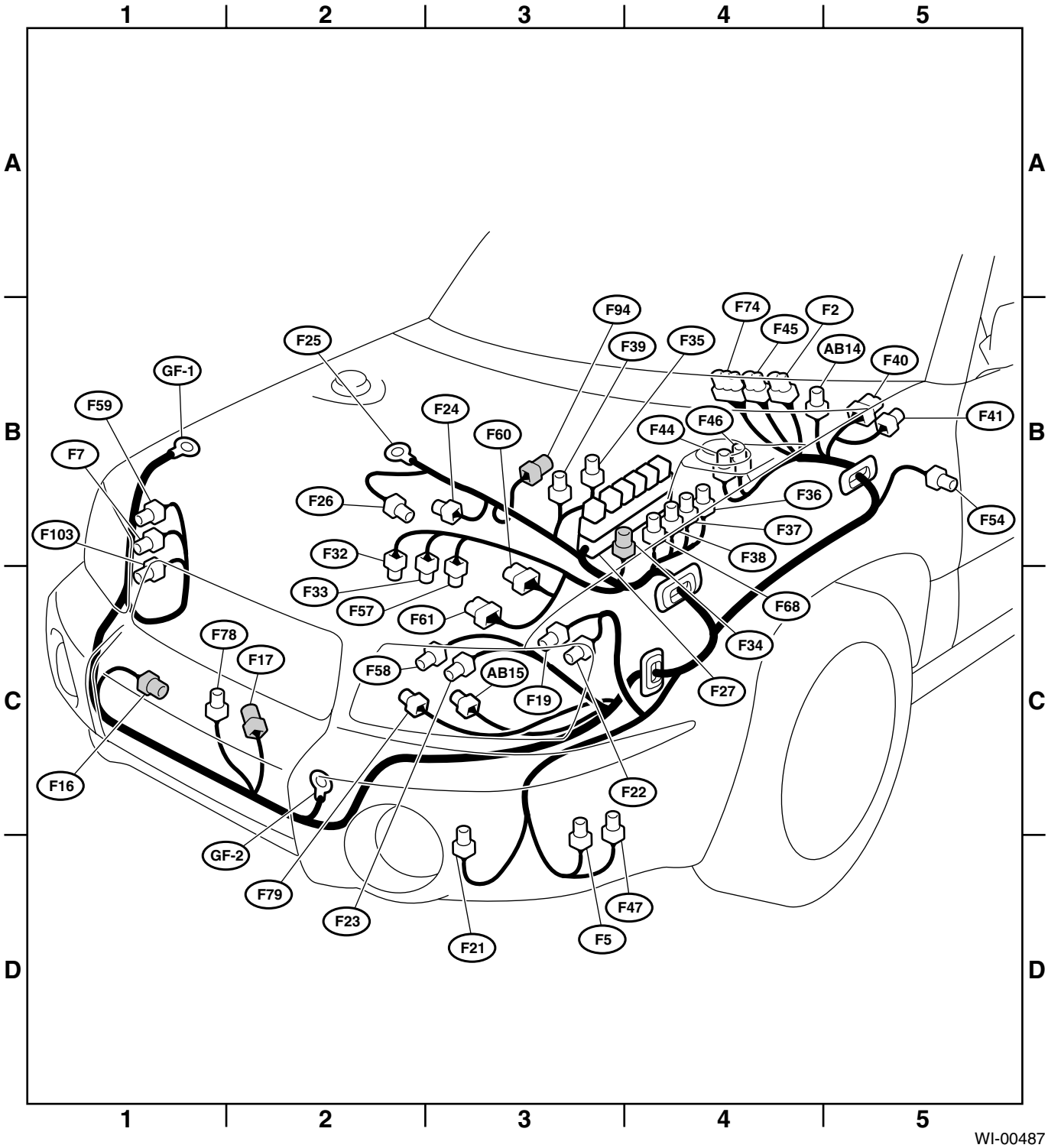
FRONT WIRING HARNESS

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
F2	20	Blue	B-4	B100	Bulkhead wiring harness
F5	1	★	D-3		Horn
F7	3	★	B-1		Headlight RH
F16	2	Black	C-1		Sub fan motor
F17	2	Black	C-2		Radiator main fan motor
F19	2	★	C-3		Front turn signal light LH
F21	2	Black	D-3		Front fog light LH
F22	2	Gray	C-3		Front clearance light LH
F23	3	★	C-3		Headlight LH
F24	1	Black	B-3		A/C compressor
F25	1	★	B-2		Generator
F26	3	★	B-2		
F27	36	★	C-3		A/C relay holder
F32	2	Green	B-4		Front washer motor
F33	2	★	B-3		Rear washer motor
F34	4	★	B-4		SBF holder
F35	2	★	B-3		Main fuse box (M/B)
F36	3	★	B-4		
F37	6	★	B-4		
F38	1	★	B-4		
F39	8	★	B-3		
F40	9	Brown	B-5		Fuse and relay box (J/B)
F41	7	Gray	B-5		
F44	8	★	B-4	B61	Bulkhead wiring harness
F45	16	★	B-4	B62	
F46	2	Black	B-4	B108	
F47	1	★	C-3		Horn
F54	2	★	B-5		Side turn signal light LH
F57	2	Blue	C-3		Headlight washer motor
F58	3	Black	C-3		Headlight leveler LH
F59	3	Black	B-1		Headlight leveler RH
F60	16	★	C-3	E2	Engine wiring harness
F61	20	Black	C-3	E3	
F68	4	★	B-4		Main fuse box (M/B)
F74	24	Black	B-4	B200	Bulkhead wiring harness
F78	2	Black	C-1		Outside temperature sensor
F79	4	★	C-2		A/C pressure switch
F94	2	★	D-3		ABS front sensor
F103	8	★	C-1	B321	ABS shield connector
★: Non-colored					

FRONT SUB SENSOR HARNESS LH

AB14	2	Yellow	B-4	AB13	Airbag Harness
AB15	2	Yellow	C-3		Front Sub Sensor LH

FRONT WIRING HARNESS



2. RHD MODEL

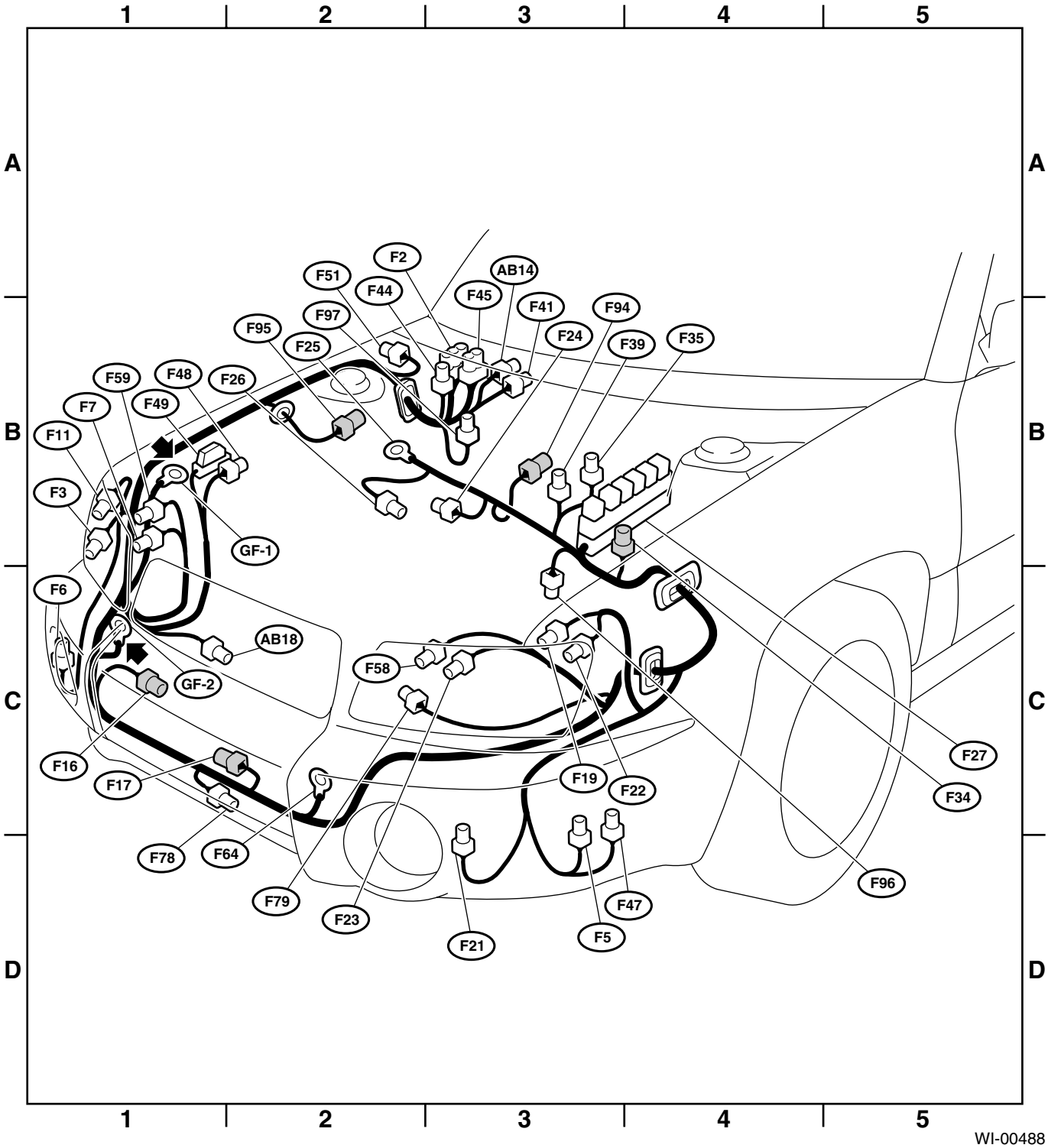
FRONT WIRING HARNESS

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
F2	22	Blue	B-3	B100	Bulkhead wiring harness (ABS)
F3	2	★	B-1		Front turn signal light RH
F5	1	★	C-3		Horn
F6	2	Black	B-1		Front fog light RH
F7	3	★	B-2		Headlight RH
F11	2	Gray	B-1		Front clearance light RH
F16	2	Black	C-1		Sub fan motor
F17	2	Black	C-2		Radiator main fan motor
F19	2	★	C-3		Front turn signal light LH
F21	2	Black	D-3		Front fog light LH
F22	2	Gray	C-3		Front clearance light LH
F23	3	★	C-3		Headlight LH
F24	1	★	B-2		A/C compressor
F25	1	★	B-2		Generator
F26	3	Green	B-2		
F27	36	★	B-4		A/C relay holder
F34	4	★	B-4		SBF holder (ABS)
F35	2	★	B-3		M/B
F39	8	Black	B-3		
F41	7	Gray	B-3		F/B
F44	8	Gray	B-3	B61	Bulkhead wiring harness
F45	18	Black	B-3	B62	
F47	1	★	C-3		Horn
F48	8	★	B-2		Shield junction (ABS)
F49	31	★	B-1		ABS control module
F51	2	★	B-2		Side turn signal light RH
F58	3	Black	C-3		Headlight leveler LH
F59	3	Black	B-1		Headlight leveler RH
F64	1	★	B-2		ABS motor ground
F78	2	★	C-1		Ambient sensor
F79	4	★	C-2		A/C pressure switch
F94	2	Brown	B-3		ABS front sensor LH
F95	2	Brown	B-2		ABS front sensor RH
F96	1	★	C-3	B255	Bulkhead wiring harness (ABS)
F97	2	Black	B-3		ABS condenser
★: Non-colored					

FRONT SUB SENSOR HARNESS RH

AB14	2	Yellow	B-3	AB13	Airbag Harness
AB18	2	Yellow	C-1		Front Sub Sensor RH

FRONT WIRING HARNESS



50.Bulkhead Wiring Harness (In Engine Room)

A: LOCATION

1. LHD NON-TURBO MODEL

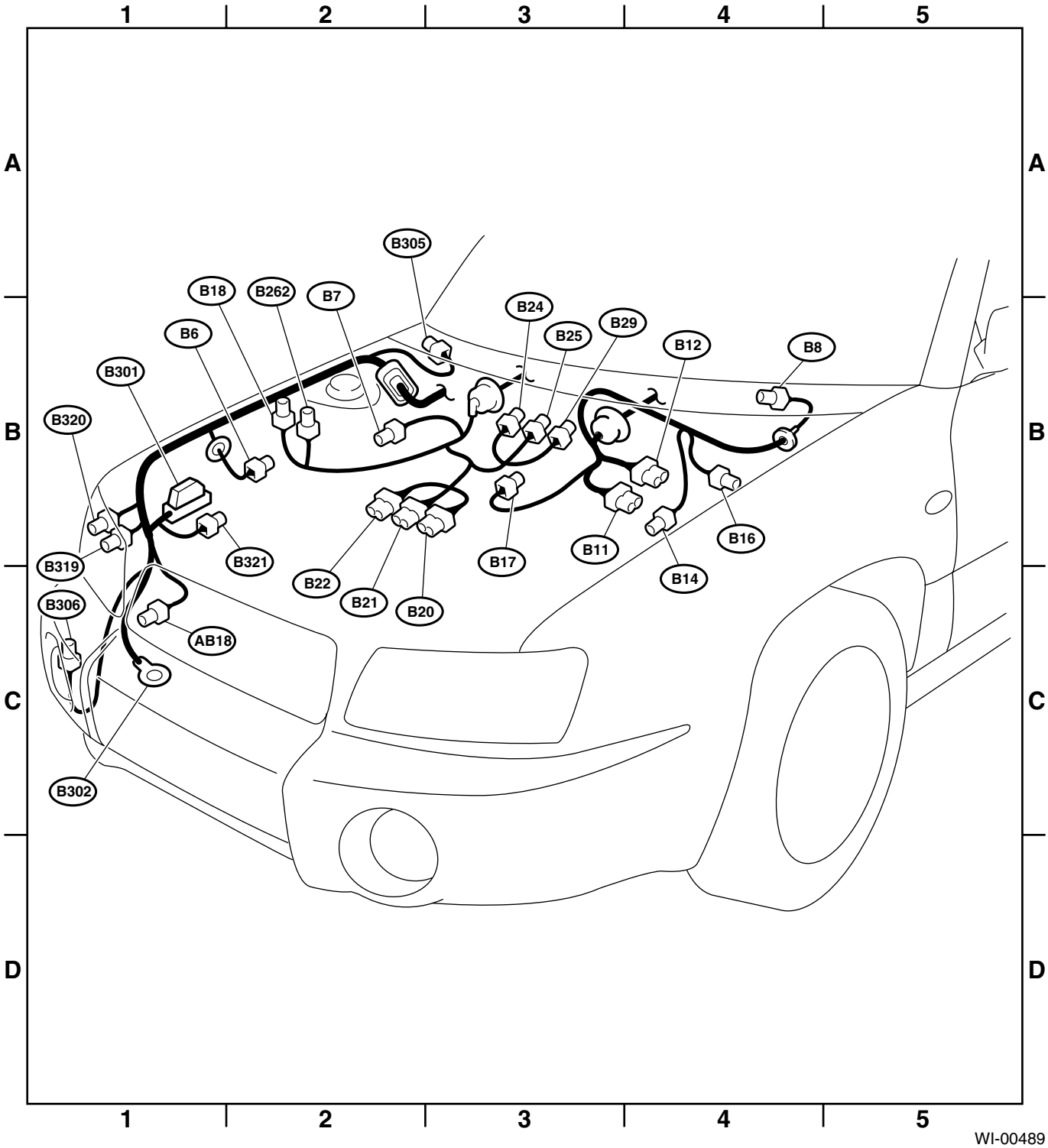
BULKHEAD WIRING HARNESS

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B6	2	Brown	B-2		ABS front sensor RH
B7	6	★	B-2		Cruise control actuator
B8	5	★	B-4		Front wiper motor
B11	20	Black	B-3	T4	Transmission (AT)
B12	12	★	B-4	T3	
B14	1	★	B-4		Starter (Magnet)
B16	2	Gray	B-4		Brake fluid level switch
B17	3	Black	B-3		Vehicle speed sensor (MT)
B18	4	★	B-2		Rear oxygen sensor
B20	6	★	B-3	E1	Engine wiring harness
B21	16	★	B-2	E2	Engine wiring harness
B22	20	★	B-2	E3	
B24	2	Gray	B-3	T1	Back-up light switch (MT)
B25	2	Brown	B-3	T2	Neutral position switch (MT)
B29	2	★	B-3	T8	Lo (AWD) indicator light switch (MT)
B262	4	★	B-2		Front oxygen (A/F) sensor
B301	31	★	B-1		ABS control module
B302	1	★	C-1		ABS motor ground
B305	2	★	B-3		Side turn signal light RH
B306	2	Black	C-1		Front fog light RH
B319	2	Gray	B-1		Front clearance light RH
B320	2	★	B-1		Front turn signal light RH
B321	8	★	B-1		ABS shield connector
★: Non-colored					

FRONT SUB SENSOR HARNESS RH

AB18	2	Yellow	C-1		Front Sub Sensor RH

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)



2. LHD TURBO MODEL

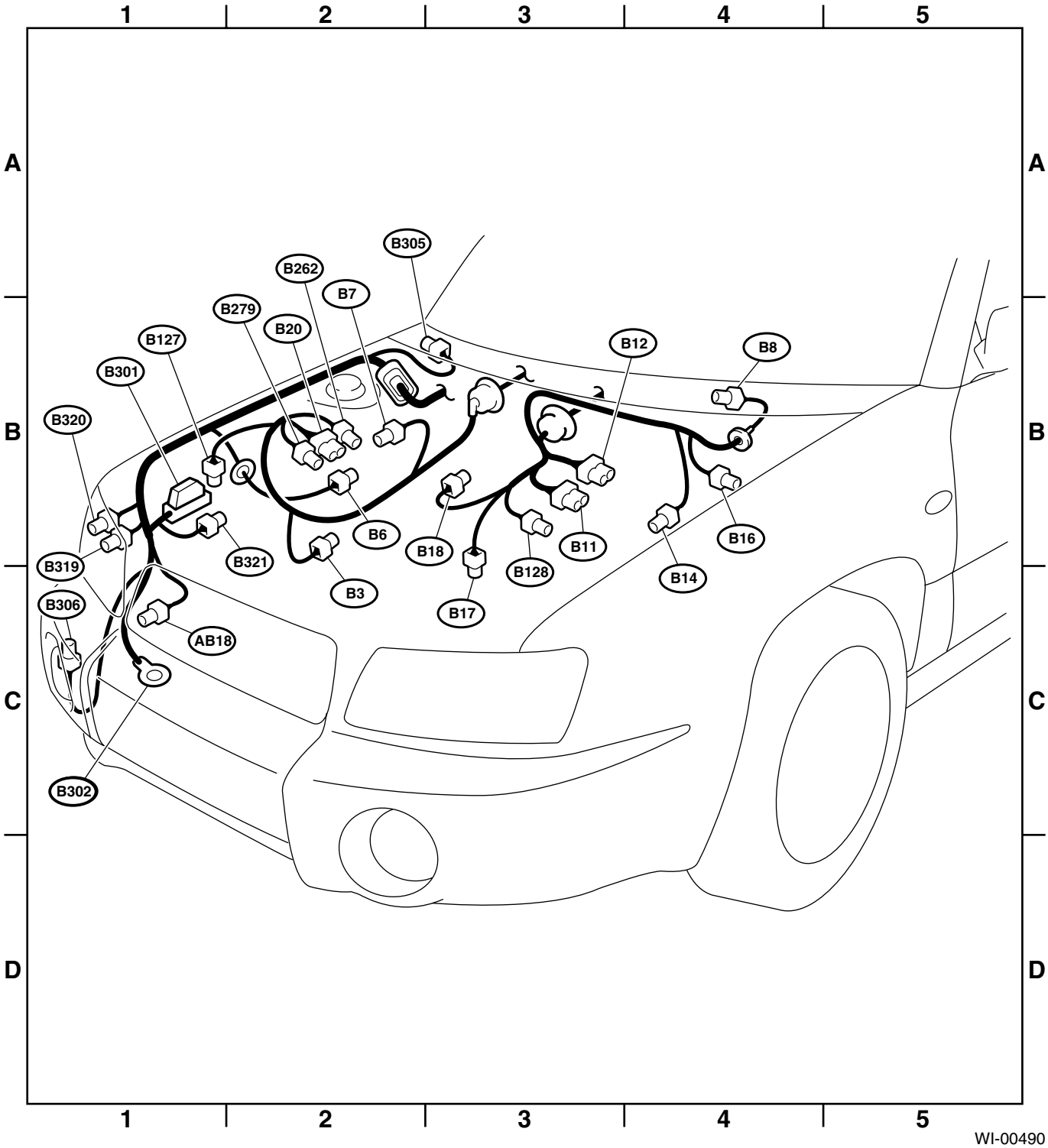
BULKHEAD WIRING HARNESS

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B3	5	Black	B-2		Mass air flow sensor
B6	2	Brown	B-2		ABS front sensor RH
B7	6	Black	B-2		Cruise control actuator
B8	5	★	B-4		Front wiper motor
B11	20	Black	B-3	T4	Transmission (AT)
B12	12	★	B-3	T3	
B14	1	★	B-4		Starter (Magnet)
B16	2	Gray	B-4		Brake fluid level switch
B17	4	★	B-3		Vehicle speed sensor (MT)
B18	4	★	B-3	T5	Rear oxygen sensor
B20	10	★	B-2	E1	Engine wiring harness
B127	2	★	B-1		Wastgate control solenoid valve
B128	4	Gray	B-3	T9	Transmission (MT)
B262	4	Gray	B-3		Front oxygen (A/F) sensor
B279	2	★	B-2		Exhaust temperature sensor
B301	31	★	B-1		ABS control module
B302	1	★	C-1		ABS motor ground
B305	2	★	B-3		Side turn signal light RH
B306	2	Black	C-1		Front fog light RH
B319	2	Gray	B-1		Front clearance light RH
B320	2	★	B-1		Side turn signal light RH
B321	8	★	B-1		ABS shield connector
★: Non-colored					

FRONT SUB SENSOR HARNESS RH

AB18	2	Yellow	C-1		Front Sub Sensor RH

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)



3. RHD NON-TURBO MODEL

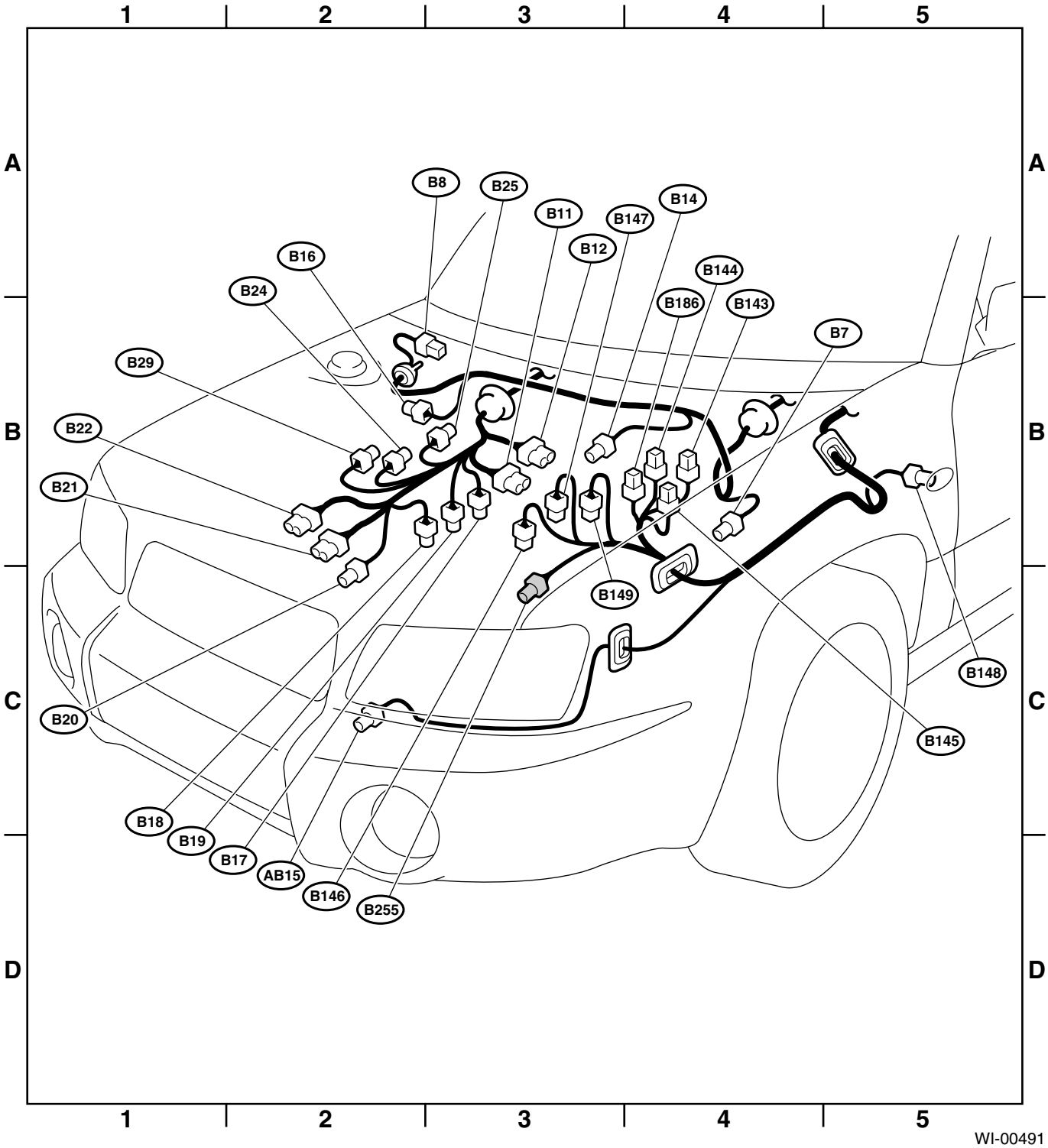
BULKHEAD WIRING HARNESS

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B7	6	Black	B-4		Cruise control actuator
B8	5	★	B-3		Front wiper motor
B11	20	Black	B-3	T4	Transmission (AT)
B12	12	★	B-3	T3	
B14	1	Black	B-3		Starter (Magnet)
B16	2	Gray	B-2		Brake fluid level switch
B17	3	★	B-3		Vehicle speed sensor (MT)
B18	4	★	B-3		Front oxygen (A/F) sensor
B19	4	★	B-3		Rear oxygen sensor
B20	6	★	C-3	E1	Engine wiring harness
B21	16	Brown	B-2	E2	Engine wiring harness
B22	20	★	B-2	E3	
B24	2	Gray	B-2	T1	Back-up light switch (MT)
B25	2	Brown	B-3	T2	Neutral position switch (MT)
B29	2	★	B-2	T8	Lo (AWD) indicator light switch (MT)
B143	3	★	B-4		M/B
B144	6	Black	B-4		
B145	1	★	B-4		
B146	2	Green	B-3		Front washer motor
B147	2	★	B-3		Rear washer motor
B148	2	★	B-5		Side turn signal light LH
B149	2	Blue	B-3		Headlight washer motor
B186	4	Black	B-4		M/B
B255	1	★	C-3	F96	Front wiring harness (ABS)
★: Non-colored					

FRONT SUB SENSOR HARNESS LH

AB15	2	Yellow	C-2		Front Sub Sensor LH

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)



4. RHD TURBO MODEL

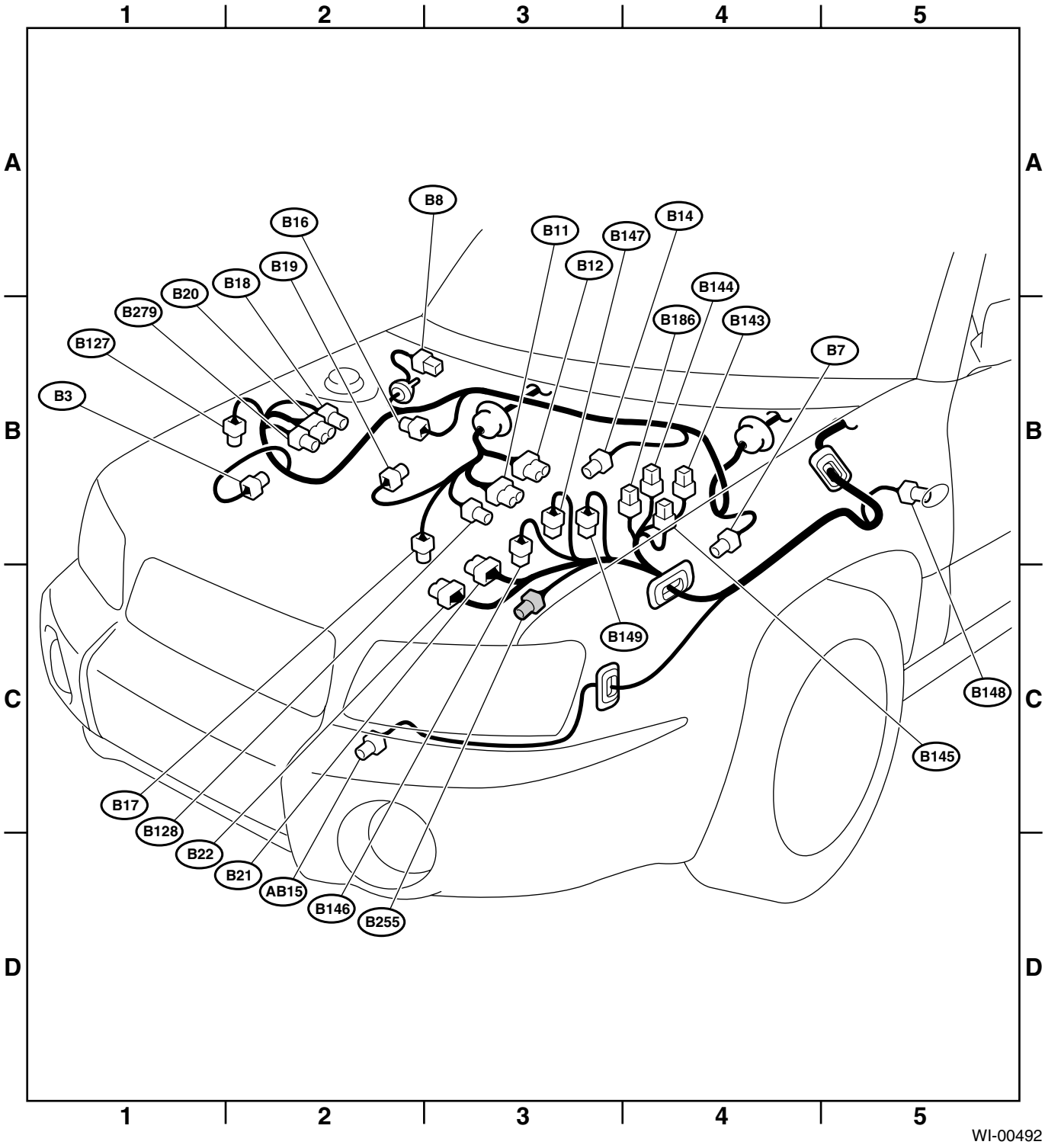
BULKHEAD WIRING HARNESS

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B3	5	★	B-2		Mass air flow sensor
B7	6	Gray	B-4		Cruise control actuator
B8	5	★	B-3		Front wiper motor
B11	20	Black	B-3	T4	Transmission (AT)
B12	12	★	B-3	T3	
B14	1	★	B-3		Starter (Magnet)
B16	2	Gray	B-2		Brake fluid level switch
B17	4	Black	B-2		Vehicle speed sensor (MT)
B18	4	★	B-2		Front oxygen (A/F) sensor
B19	4	★	B-2	T5	Rear oxygen sensor cord
B20	10	★	B-2	E1	Engine wiring harness
B21	16	Brown	C-3	E2	Engine wiring harness
B22	20	Black	C-3	E3	Engine wiring harness
B127	2	★	B-2		Wastegate control solenoid valve
B128	4	★	B-3	T9	Transmission (MT)
B143	3	★	B-4		M/B
B144	6	Black	B-4		
B145	1	★	B-4		
B146	2	Green	B-3		Front washer motor
B147	2	★	B-3		Rear washer motor
B148	2	★	B-5		Side turn signal light LH
B149	2	Blue	B-3		Headlight washer motor
B186	4	Black	B-4		M/B
B255	1	★	C-3	F96	Front harness (ABS)
B279	2	Gray	B-2		Exhaust temperature sensor
★: Non-colored					

FRONT SUB SENSOR HARNESS LH

AB15	2	Yellow	C-2		Front Sub Sensor LH

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)



51.Bulkhead Wiring Harness (In Compartment)

A: LOCATION

1. LHD MODEL

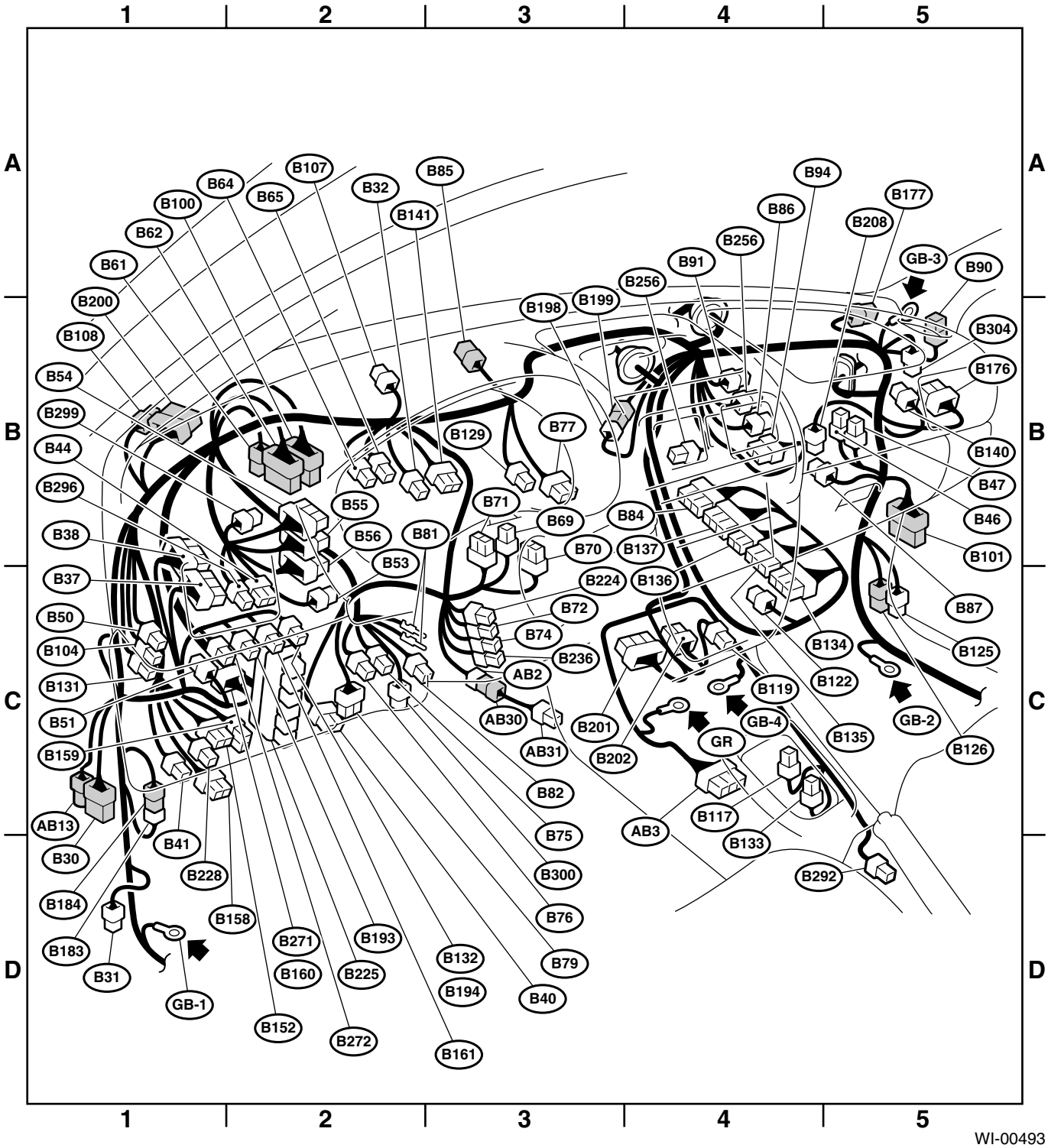
BULKHEAD WIRING HARNESS

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B30	25	★	C-1	D1	Front door cord LH
B31	6	Yellow	D-1	AB1	SRS (Airbag) harness
B32	3	Black	B-2		Turn & hazard module
B37	24	★	C-1	i2	Instrument panel wiring harness
B38	32	★	C-1	i3	
B40	16	Black	C-2		Data link connector
B41	2	★	C-1		Power window circuit breaker
B44	10	★	C-2		Belt warning module
B46	4	★	B-5		Fuel pump relay
B47	6	Brown	B-5		Main relay
B50	4	★	C-1		Blower fan relay
B51	8	Blue	C-1		J/B
B53	6	★	C-2		Shield joint connector (AT)
B54	24	★	B-2		Transmission control module (AT)
B55	24	Gray	B-2		
B56	24	Green	B-2		
B61	8	★	B-2	F44	Front wiring harness
B62	16	★	B-2	F45	
B64	2	Black	B-2		Stop & brake switch
B65	4	Black	B-2		Stop & brake switch (With cruise control)
B69	4	★	B-3		Combination switch
B70	18	★	B-3		
B71	17	★	B-3		
B72	4	Blue	C-3		Ignition switch
B74	2	Black	C-3		Key warning switch
B75	1	Green	C-2	B76	Test mode connector
B76	1	Green	C-2	B75	
B77	10	Brown	B-3		Mode actuator (A-A/C)
B79	14	Gray	C-2		Check connector
B81	1 × 2	★	C-2		Diagnosis terminal (Ground)
B82	6	Black	C-2		Diagnosis connector
B84	17	★	B-4		Engine control module (Turbo engine model)
B85	4	★	B-3		Passing diode
B86	6	Black	B-4		Blower fan motor resistor

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B87	2	★	B-4		Blower fan motor (M-A/C)
	6	★	B-4		Blower fan motor (A-A/C)
B90	8	★	B-5		Roof cord
B91	4	★	B-4		Fresh/recirc actuator
B94	20	Black	B-4		Cruise control module
B100	20	Blue	B-2	F2	Front wiring harness
B101	25	★	B-5	D30	Front door cord RH
B104	4	Red	C-1		Rear accessory power supply socket relay
B107	2	Blue	B-2		Cruise switch (MT-cruise control)
B108	2	Black	B-1	F46	Front wiring harness
B117	6	★	C-4		Select lever illumination light (AT)
B119	4	★	C-4		Front accessory power supply socket
B122	8	★	C-4		Sensor ground joint connector (EG)
B125	1	Green	C-5	B126	Test mode connector
B126	1	Green	C-5	B125	
B129	2	Black	B-3		Kick-down switch (AT)
B131	4	Blue	C-1		Rear fog light relay
B132	6	★	C-2		Headlight leveler switch
B133	6	Red	C-4		AT power mode & hold mode switch
B134	35	Gray	C-4		Engine control module (Non-turbo engine model)
	22	★	C-4		Engine control module (Turbo engine model)
B135	26	Gray	B-4		Engine control module (Non-turbo engine model)
	28	★	B-4		Engine control module (Turbo engine model)
B136	20	Gray	B-4		Engine control module (Non-turbo engine model)
	24	★	B-4		Engine control module (Turbo engine model)

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B137	28	Gray	B-4		Engine control module (Non-turbo engine model)
	31	★	B-4		Engine control module (Turbo engine model)
B140	6	Black	B-5		Headlight washer module
B141	12	★	B-3		Immobilizer control module
B152	7	★	C-1		F/B
B158	12	★	C-1		
B159	10	Gray	C-2		
B160	6	Gray	C-2		Front fog light switch
B161	6	Brown	C-2		Cruise control switch
B176	18	★	B-5		Keyless entry control module
B177	2	★	B-5		Wiper deicer
B183	1	★	D-1	B184	Joint connector (Keyless entry)
B184	1	★	C-1	B183	
B193	8	Black	C-2		Wiper deicer switch
B194	8	★	C-2		Headlight washer switch
B198	1	★	B-3	B199	Ground short connector
B199	1	★	B-3	B198	
B200	24	Black	B-1	F74	Front wiring harness
B201	24	Black	C-4	i40	Instrument panel wiring harness
B202	20	★	C-4	i41	Instrument panel wiring harness
	24	★	C-4	i41	
B208	2	Black	B-4		Glove box light
B224	2	★	C-3		Key switch illumination light
B225	38	★	C-2		Relay block
B228	8	★	C-1		OP connector
B236	5	Black	C-3		Cruise control sub switch
B256	3	★	B-4		Evaporator sensor
B271	12	Blue	C-2		F/B
B272	6	★	C-1		Rear fog light switch
B292	3	★	D-5		ABS G sensor
B296	4	★	C-2		Rear defogger timer
B299	8	★	B-2		Shield joint connector (AT)
B300	6	★	C-2		Line end check connector (Reprogram connector)
B304	2	Black	B-5		ABS condenser
★: Non-colored					

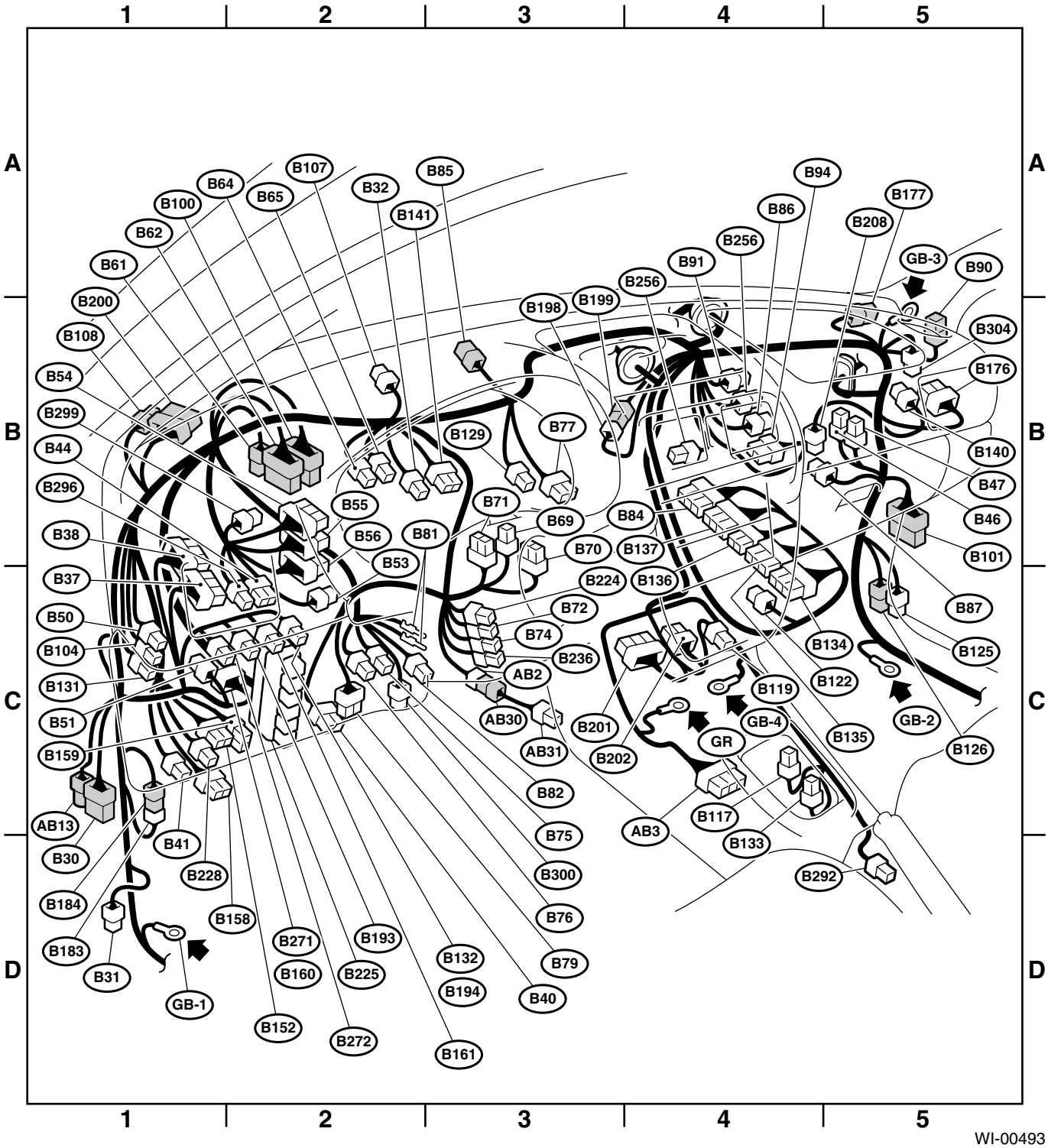
BULKHEAD WIRING HARNESS (IN COMPARTMENT)



AIRBAG WIRING HARNESS

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
AB2	2	Yellow	C-2	AB30	Steering roll connector
AB3	28	Yellow	C-4		Airbag control module
AB13	2	Yellow	C-1	AB14	Front sub sensor harness LH
AB31	2	Yellow	C-3		Inflator (Driver side)

BULKHEAD WIRING HARNESS (IN COMPARTMENT)



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2. RHD MODEL

BULKHEAD WIRING HARNESS

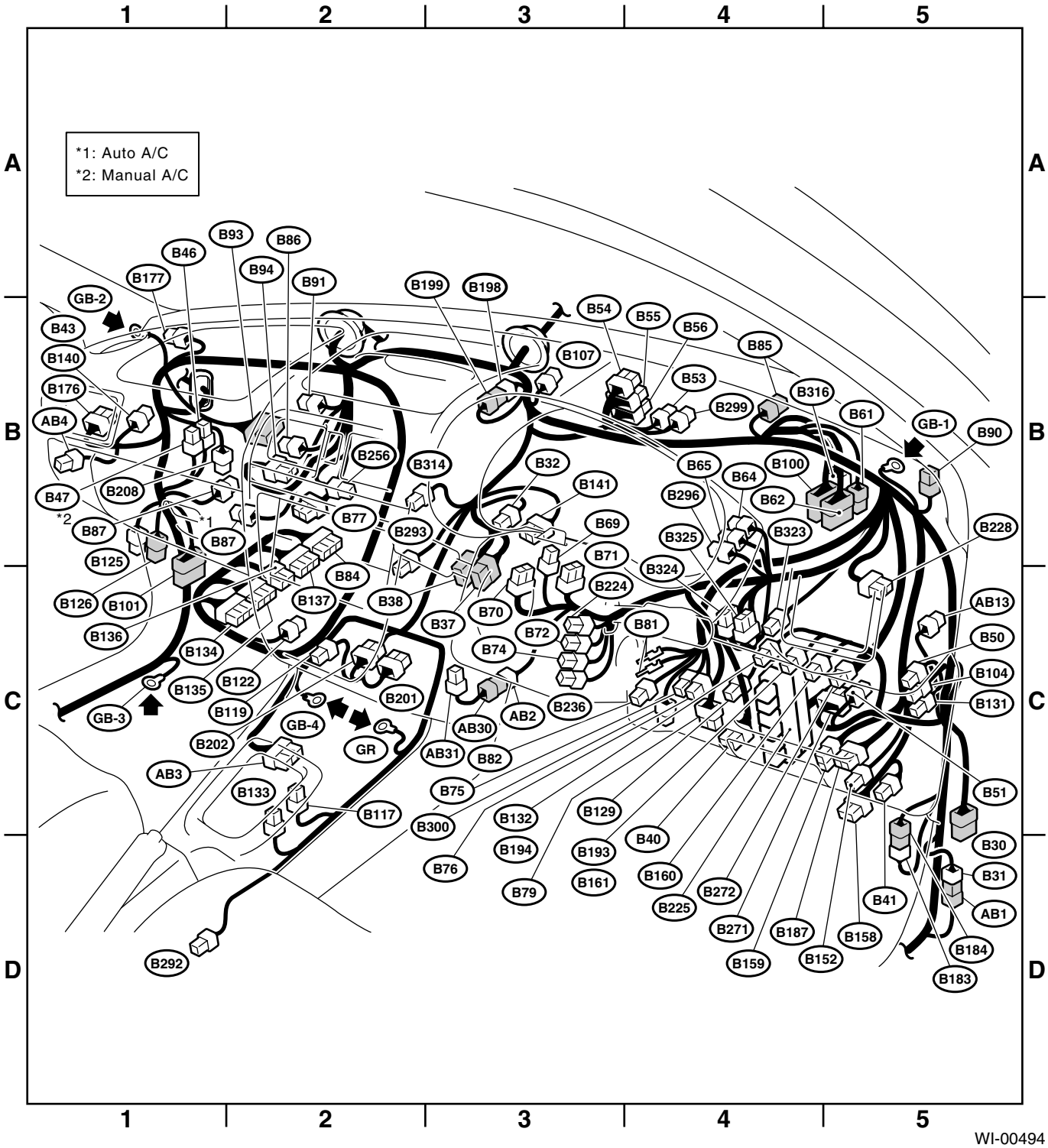
Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B30	25	★	C-5	D1	Front door cord RH
B31	6	Yel-low	D-5	AB1	SRS (Airbag) har-ness
B32	3	Black	B-3		Turn & hazard mod-ule
B37	18	Black	C-3	i2	Instrument panel wir-ing harness
	22	Black	C-3		
B38	32	★	C-3	i3	Instrument panel wir-ing harness
B40	16	★	C-4		Data link connector
B41	2	★	C-5		Power window cir-cuit breaker
B43	6	Black	B-1		Illumination control module
B46	4	★	B-1		Fuel pump relay
B47	6	Brown	B-1		Main relay
B50	4	★	C-5		Blower fan relay
B51	8	Blue	C-5		F/B
B53	4	★	B-4		Shield joint connector
B54	24	★	B-4		Transmission control module (AT)
B55	24	Gray	B-4		
B56	24	Green	B-4		
B61	8	Gray	B-5	F44	Front wiring harness
B62	18	Black	B-5	F45	Front wiring harness
B64	2	Black	B-4		Stop light switch (Without cruise con-trol)
B65	4	Black	B-4		Stop & brake switch (With cruise control)
B69	4	★	B-3		Combination switch
B70	18	★	C-3		
B71	17	★	C-3		
B72	4	Blue	C-3		Ignition switch
B74	2	Black	C-3		Key warning switch
B75	2	Green	C-4	B76	Test mode connector
B76	2	Green	C-4	B75	
B77	10	Brown	B-2		Mode actuator (A-A/C)
B79	14	Gray	C-4		Check connector
B81	1 × 2	★	C-4		Diagnosis terminal (Ground)
B82	6	Black	C-4		Diagnosis connector
B84	17	★	B-2		Engine control mod-ule (Turbo engine model)
B85	4	★	C-5		Rear fog light diode
B86	6	Black	B-2		Blower fan motor resistor (M-A/C)

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B87	2	★	B-1		Blower fan motor resistor (M-A/C) *2
	6	★	B-2		Blower fan motor resistor (A-A/C) *1
B90	8	★	B-5	R50	Roof cord
B91	4	★	B-2		Fresh/recirc actuator
B93	20	★	B-2		Security control mod-ule
B94	20	★	B-2		Cruise control mod-ule
B100	22	Blue	B-5	F2	Front wiring harness
B101	25	★	C-1	D11	Front door cord LH
B104	4	Pink	C-5		Rear accessory power supply socket
B107	2	Blue	B-3		Cruise switch (MT-cruise control)
B117	6	★	C-2		Select lever illumina-tion light (AT)
B119	4	★	C-2		Front accessory power supply socket
B122	4	★	C-2		Sensor ground joint connector (Non-turbo engine model)
	6	Gray	C-2		Sensor ground joint connector (Turbo engine model)
B125	1	Green	B-1	B126	Test mode connector
B126	1	Green	B-1	B125	
B129	2	★	C-4		Kick-down switch (AT)
B131	4	Blue	C-5		Rear fog light relay
B132	6	★	C-4		Headlight leveler switch
B133	6	★	C-2		AT power mode & hold mode switch
B134	35	Gray	C-2		Engine control mod-ule (Non-turbo engine model)
	22	★	C-2		Engine control mod-ule (Turbo engine model)
B135	28	Gray	C-2		Engine control mod-ule (Non-turbo engine model)
	28	★	C-2		Engine control mod-ule (Turbo engine model)

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B136	26	Gray	C-2		Engine control module (Non-turbo engine model)
	24	★	C-2		Engine control module (Turbo engine model)
B137	20	Gray	B-2		Engine control module (Non-turbo engine model)
	31	★	B-2		Engine control module (Turbo engine model)
B140	6	Black	B-1		Headlight washer module
B141	12	★	B-3		Immobilizer control module
B152	7	★	C-5		F/B
B158	12	★	C-5		
B159	10	Gray	C-5		
B160	6	Gray	C-4		Front fog light switch
B161	6	Brown	C-4		Cruise control switch
B176	18	★	B-1		Keyless entry control module
B177	2	★	B-1		Wiper deicer
B183	1	★	D-5	B184	Joint connector (Keyless entry)
B184	1	★	C-5	B183	
B187	9	Brown	D-5		F/B
B193	8	Black	C-4		Wiper deicer switch
B194	8	★	C-4		Headlight washer switch
B198	1	★	B-3	B199	Ground short connector
B199	1	★	B-3	B198	
B201	24	Black	C-2	i40	Instrument panel wiring harness
B202	20	★	C-2	i41	Instrument panel wiring harness
	24	★	C-2	i41	
B208	2	★	B-1		Glove box light
B224	2	★	C-3		Key switch illumination light
B225	38	★	C-4		Relay block
B228	8	★	C-5		OP connector
B236	5	Black	C-3		Cruise control sub switch
B256	3	★	B-2		Evaporator sensor
B271	12	Blue	C-5		F/B
B272	6	★	C-5		Rear fog light switch
B292	3	★	D-1		ABS G sensor
B293	6	Black	B-2		Air mix actuator
B296	4	★	B-4		Rear defogger timer
B299	8	★	B-4		Shield joint connector
B300	6	★	C-4		Line end check connector

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B314	2	★	B-2		In-vehicle temperature sensor (A-A/C)
B316	20	★	B-5		Ground joint connector
B323	4	Blue	C-4		Security relay
B324	16	Blue	C-4		Double lock module
B325	20	Gray	C-4		
★: Non-colored					

BULKHEAD WIRING HARNESS (IN COMPARTMENT)



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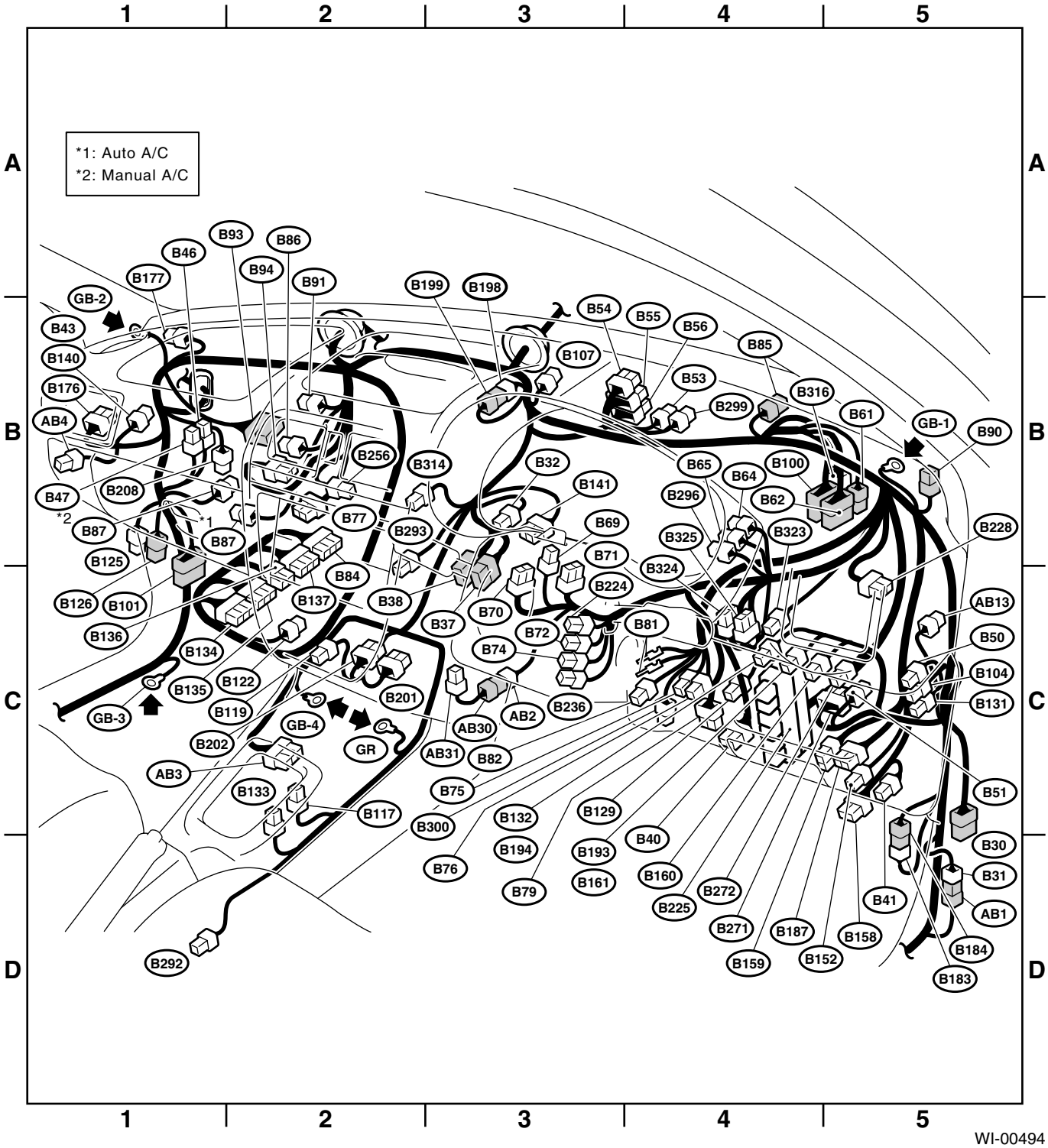
AIRBAG WIRING HARNESS

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
AB1	6	Yellow	D-5	B31	Bulkhead wiring harness
AB2	2	Yellow	C-3	AB30	Steering roll connector
AB3	28	Yellow	C-2		Airbag control module
AB4	4	Yellow	B-1		Inflator (Passenger side)
AB13	2	Yellow	C-5	AB14	Front sub sensor cord RH

BULKHEAD WIRING HARNESS (IN COMPARTMENT)

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
AB31	2	Yellow	C-3		Inflator (Driver side)



WI-00494

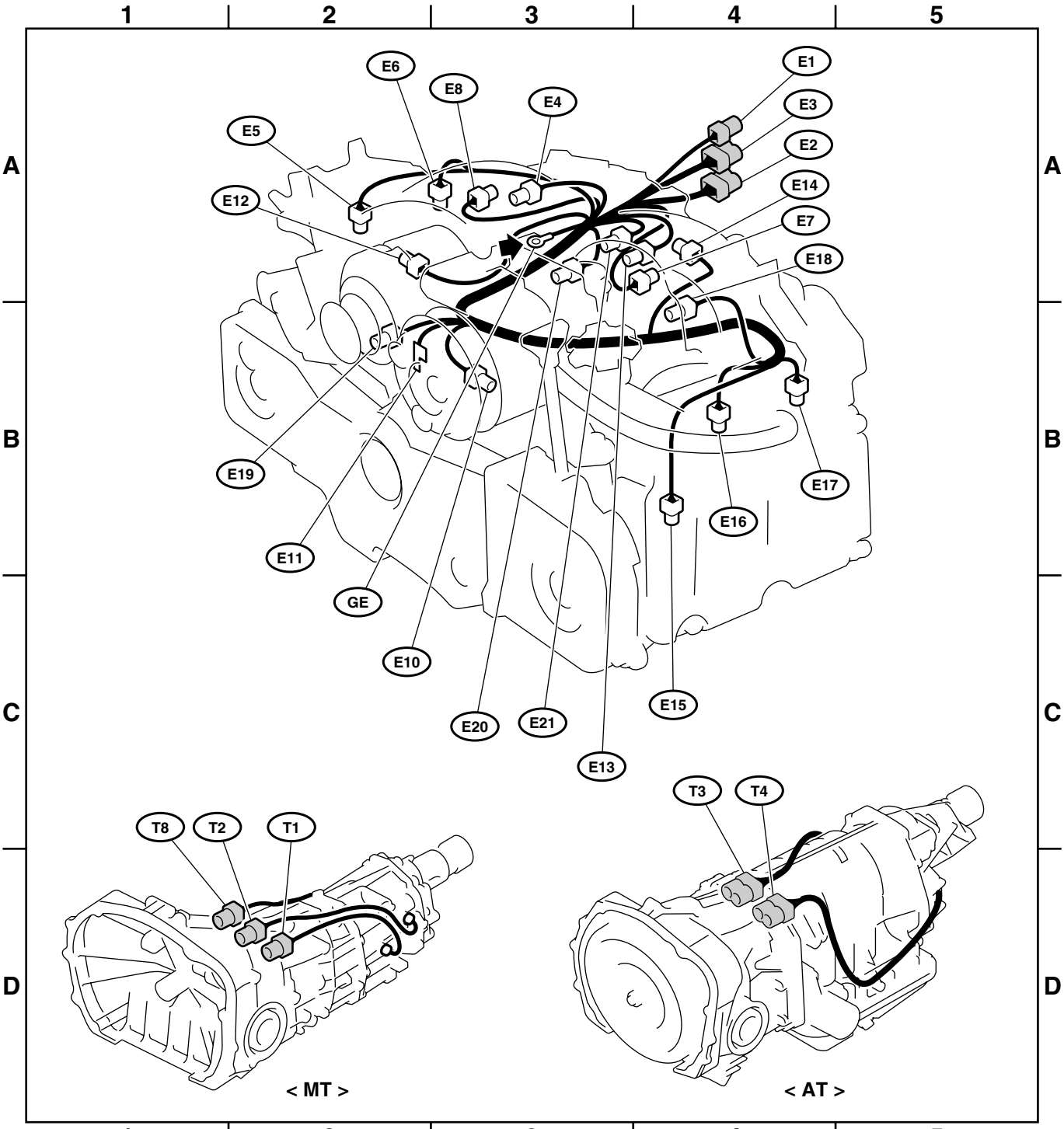
52.Engine Wiring Harness and Transmission Cord

A: LOCATION

1. NON-TURBO MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
E1	6	Black	A-4	B20	Bulkhead wiring harness
E2	16	Brown	A-4	B21	Bulkhead wiring harness
E3	20	Light gray	A-4	B22	Bulkhead wiring harness
E4	2	Black	A-3		Purge control solenoid valve
E5	2	Light gray	A-2		Injector #1
E6	2	Light gray	A-3		Injector #3
E7	6	Black	A-4		Idle air control solenoid valve
E8	3	Light gray	B-3		Engine coolant temperature sensor and thermometer
E10	2	Light gray	B-3		Crankshaft position sensor
E11	1	★	B-2		Oil pressure switch
E12	4	Dark gray	A-2		Ignition coil and igniter
E13	4	Dark gray	A-4		Throttle position sensor
E14	2	★	A-4		Knock sensor
E15	2	Black	B-4		Camshaft position sensor
E16	2	Light gray	B-4		Injector #2
E17	2	Light gray	B-4		Injector #4
E18	6	Dark gray	B-4		EGR solenoid valve
E19	1	★	B-2		Power steering oil pressure switch
E20	4	Black	A-3		Pressure sensor and intake air temperature sensor
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
T1	2	Gray	D-2	B24	Bulkhead wiring harness (MT)
T2	2	Brown	D-2	B25	
T3	12	Black	D-4	B12	Bulkhead wiring harness (AT)
T4	20	Black	D-4	B11	
T8	2	Gray	D-1	B29	Bulkhead wiring harness (MT)
★: Non-colored					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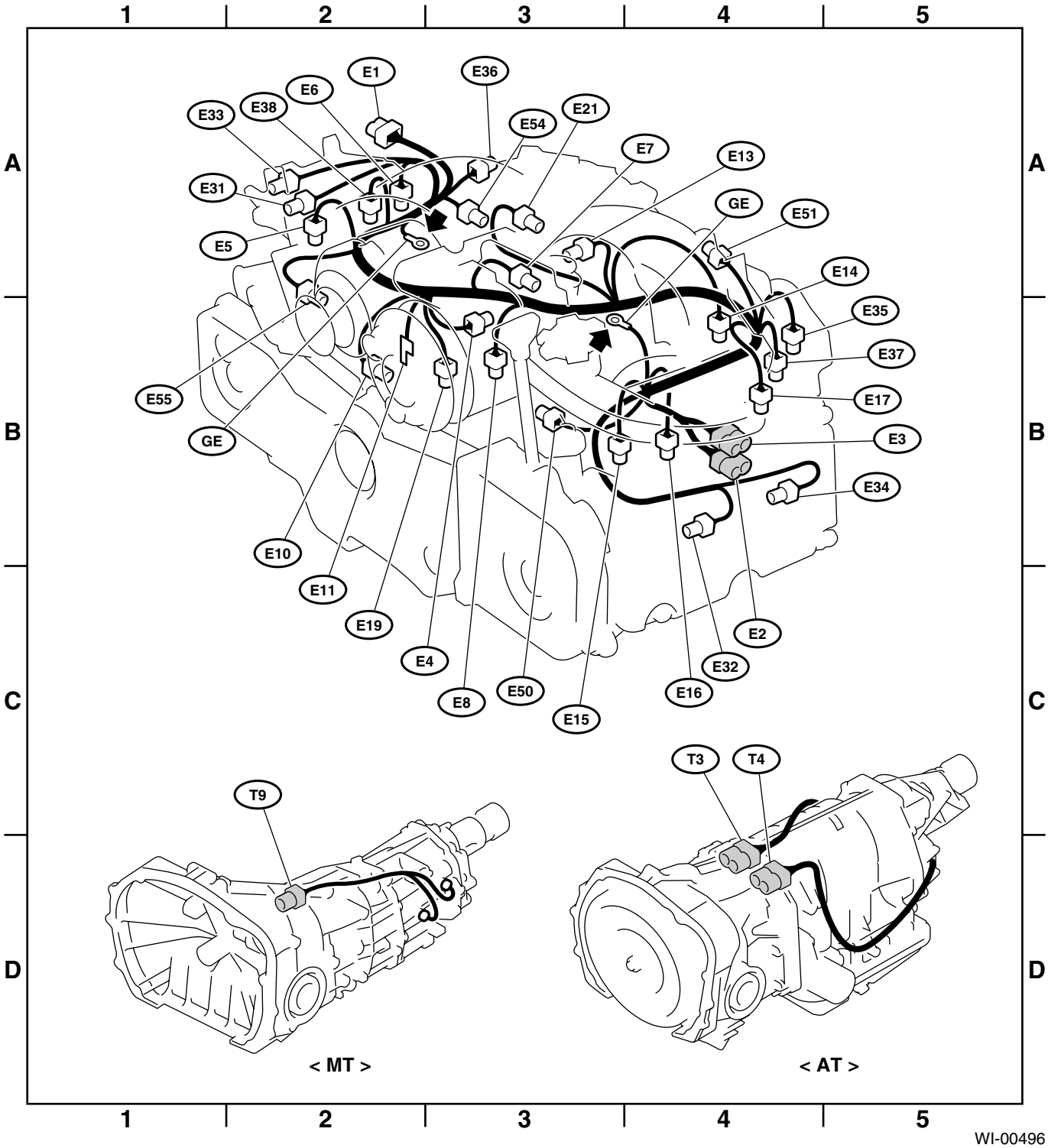
2. TURBO MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
E1	10	Light gray	A-2	B20	Bulkhead wiring harness
E2	16	Brown	B-4	F61	Front wiring harness (LHD model)
				B21	Bulkhead wiring harness (RHD model)
E3	20	Black	B-4	F60	Front wiring harness (LHD model)
				B22	Bulkhead wiring harness (RHD model)
E4	2	Black	B-3		Purge control solenoid valve
E5	2	Dark gray	A-2		Injector #1
E6	2	Dark gray	A-2		Injector #3
E7	3	Black	A-3		Idle air control solenoid valve
E8	3	Light gray	B-3		Engine coolant temperature sensor & thermometer
E10	2	Light gray	B-2		Crankshaft position sensor
E11	1	★	B-2		Oil pressure switch
E13	3	Black	A-3		Throttle position sensor
E14	2	Gray	B-4		Knock sensor
E15	2	Light gray	B-3		Camshaft position sensor
E16	2	Dark gray	B-4		Injector #2
E17	2	Dark gray	B-4		Injector #4
E19	2	★	B-3		Power steering oil pressure switch
E21	3	Black	A-3		Pressure sensor
E31	3	★	A-2		Ignition coil No. 1
E32	3	★	B-4		Ignition coil No. 2
E33	3	Black	A-2		Ignition coil No. 3
E34	3	Black	B-4		Ignition coil No. 4
E50	3	Black	B-3		TGV angle sensor LH
E51	2	Black	A-4		TGV LH
E54	3	Black	A-3		TGV angle sensor RH
E55	2	Black	A-2		TGV RH
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
T3	12	★	D-4	B12	Bulkhead wiring harness (AT)
T4	20	Black	D-4	B11	
T9	4	★	D-2	B128	Bulkhead wiring harness (MT)
★: Non-colored					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T4
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WI-00496

53.Instrument Panel Wiring Harness

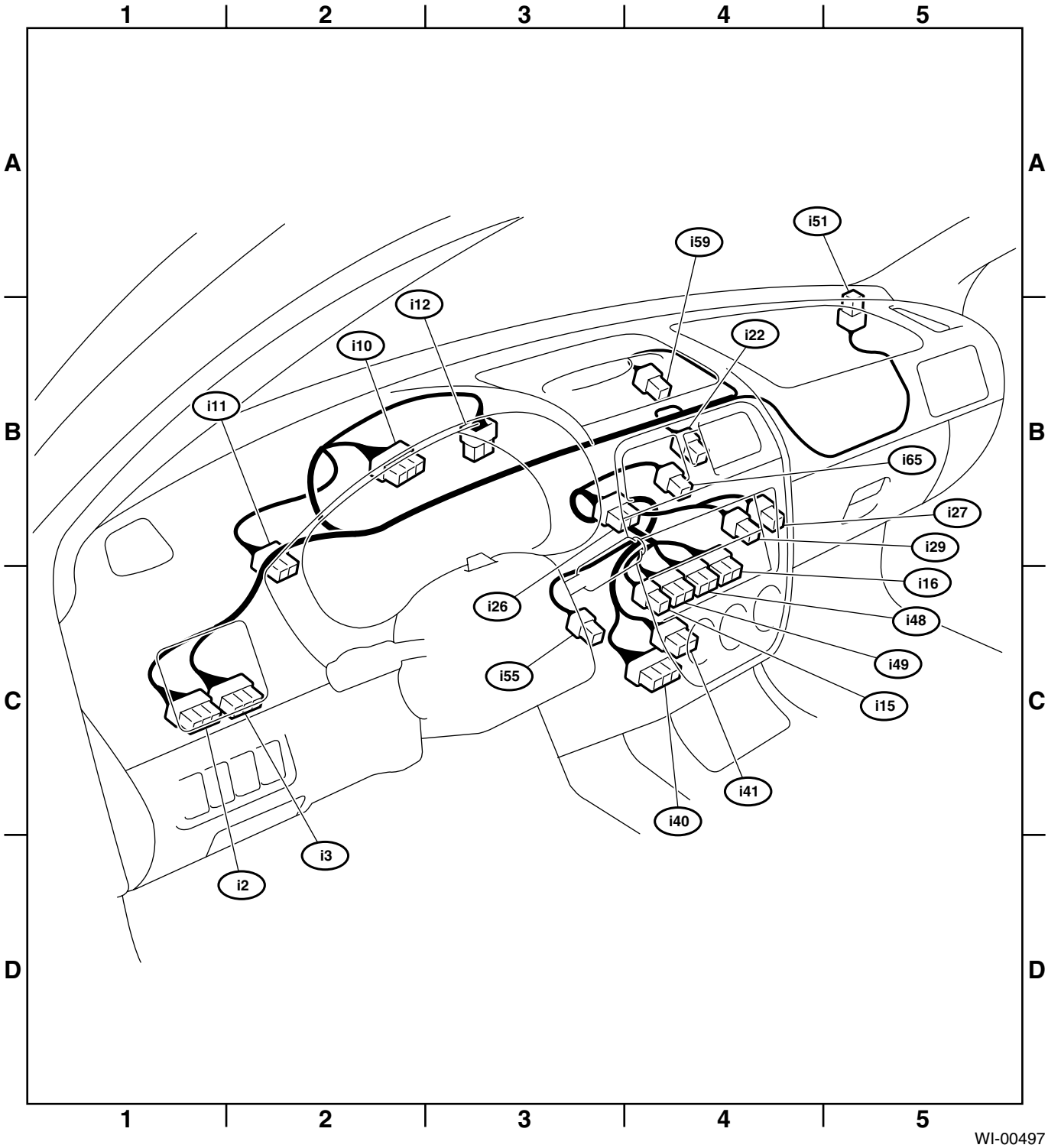
A: LOCATION

1. LHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
i2	24	★	C-1	B37	Bulkhead wiring harness
i3	32	★	C-2	B38	
i10	30	Green	B-2		Combination meter
i11	10	Green	B-2		
i12	14	Green	B-3		
i15	6	Black	C-4		Blower fan switch
i16	12	★	B-4		Air conditioning switch
i22	8	★	B-4		Hazard switch
i26	14	★	B-3		Radio
i27	2	★	B-4		CD player illumination light
i29	1	Black	B-4		Body ground (Radio)
i40	24	Black	C-4	B201	Bulkhead wiring harness
i41	20	★	C-4	B202	
	24	★	C-4		
i48	16	Gray	C-4		Auto A/C control module
i49	20	Gray	C-4		
i51	2	★	A-5		Sun load sensor
i55	2	★	C-3		In-vehicle temperature sensor
i59	7	Green	B-4		Clock
i65	6	Black	B-4		Air mix actuator

★: Non-colored

INSTRUMENT PANEL WIRING HARNESS



2. RHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
i2	22	Black	C-3	B37	Bulkhead wiring harness (AT)
	18	Black	C-3		Bulkhead wiring harness (MT)
i3	32	★	C-3	B38	Bulkhead wiring harness
i10	30	Green	B-4		Combination meter
i11	10	Green	B-4		
i12	14	Green	B-3		
i15	6	★	C-2		Mode control panel (Manual A/C)
i16	12	★	B-2		
i22	8	★	B-2		Hazard switch
i26	14	★	B-3		Radio
i29	1	★	B-2		Body ground (Radio)
i40	24	Black	C-2	B201	Bulkhead wiring harness
i41	20	★	C-2	B202	Bulkhead wiring harness (M-A/C)
	24	★	C-2		Bulkhead wiring harness (A-A/C)
i48	16	★	C-2		Auto A/C control module
i49	20	★	C-2		
i51	2	★	A-1		Sun load sensor
i59	7	Green	B-2		Clock
★: Non-colored					

INSTRUMENT PANEL WIRING HARNESS

54.Rear Wiring Harness, Bulkhead Wiring Harness, Roof Cord and Fuel Tank Cord

A: LOCATION

1. LHD MODEL

REAR WIRING HARNESS

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R1	8	★	B-2	B97	Bulkhead wiring harness
R2	20	★	B-2	B98	
R3	8	★	B-2	B99	
R4	1	Black	B-3		Parking brake switch
R8	2	★	C-3		Seat belt switch
R15	6	Black	B-3	R57	Fuel cord
R22	3	★	B-4		Rear door switch LH
R41	4	Blue	B-2		Seat heater RH
R42	4	★	B-2		Seat heater switch RH
R43	4	Blue	B-3		Seat heater switch LH
R44	4	Blue	C-3		Seat heater LH
R72	2	★	B-3		ABS rear sensor RH
R73	2	★	C-4		ABS rear sensor LH
R146	2	★	B-3		Rear 12 V accessory power supply socket
★: Non-colored					

BULKHEAD WIRING HARNESS

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R97	8	★	B-2	R1	Rear wiring harness
R98	20	★	B-2	R2	
R99	8	★	B-2	R3	
R265	4	★	B-2	D27	Rear door cord RH
R266	4	★	B-2	D28	
R267	3	★	C-3		Front door switch LH
R268	3	★	B-2		Front door switch RH
R269	4	★	C-4	D21	Rear door cord LH
R270	4	★	C-4	D22	
★: Non-colored					

ROOF CORD

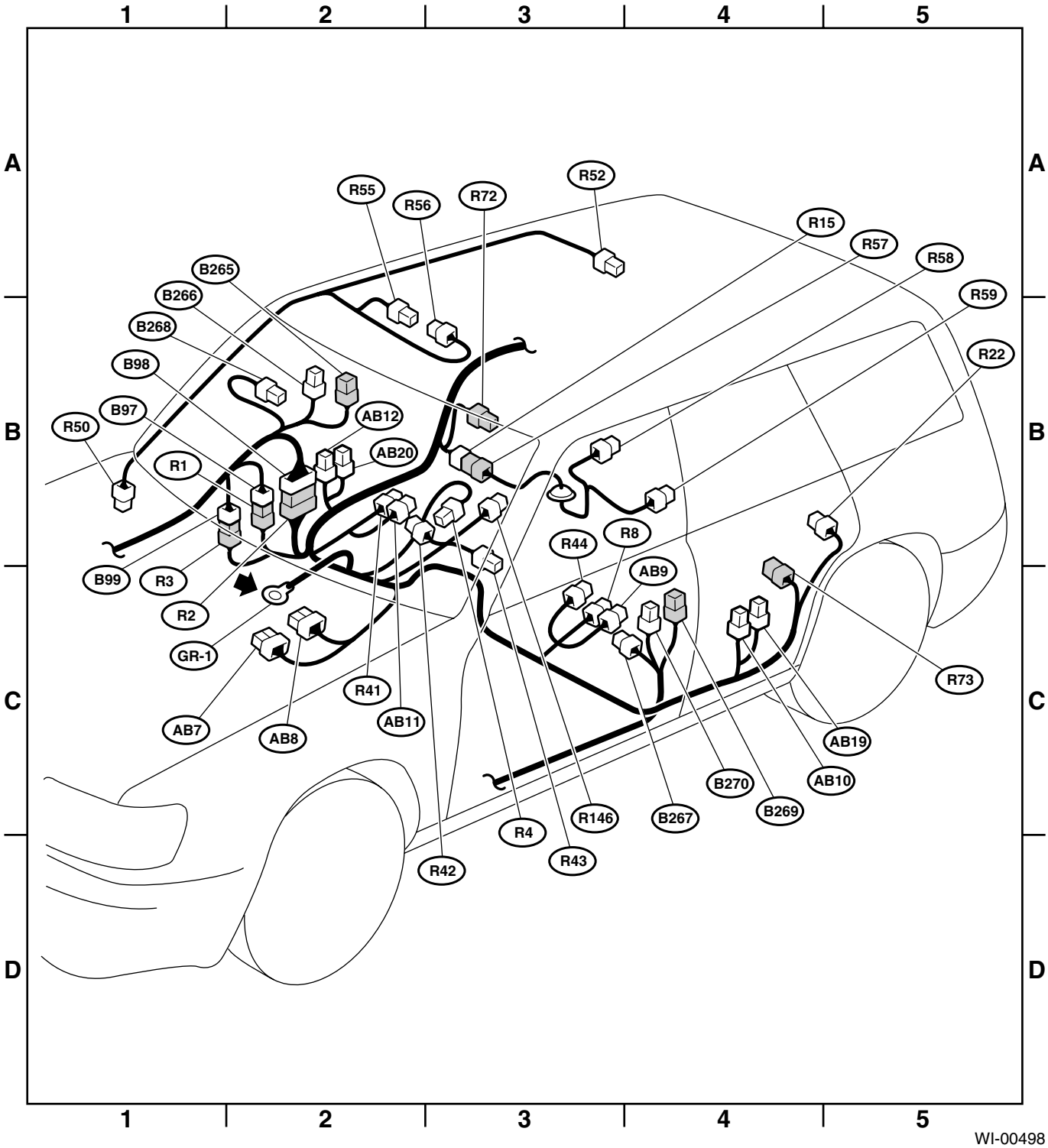
Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R50	8	★	B-1	B90	Bulkhead wiring harness
R52	3	★	A-3		Room light
R55	2	★	B-2		Sunroof motor
R56	2	★	B-3		Spot light
★: Non-colored					

FUEL TANK CORD

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R57	6	Black	B-3	R15	Rear wiring harness
R58	6	★	B-3		Fuel gauge module & fuel pump assembly
R59	2	★	B-4		Fuel gauge sub module
★: Non-colored					

AIRBAG WIRING HARNESS

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
AB7	12	Yellow	C-2		Airbag control module
AB8	12	Yellow	C-2		
AB9	2	Yellow	C-4		Inflator (Side LH)
AB10	4	Yellow	C-4		Side airbag sensor LH
AB11	2	Yellow	B-2		Inflator (Side RH)
AB12	4	Yellow	B-2		Side airbag sensor RH
AB19	2	Yellow	C-4		Pretensioner LH
AB20	2	Yellow	B-2		Pretensioner RH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AB7
AB8
R41
AB11
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R44
R8
AB9
R146
B267
B270
B269
AB10
AB19
R73
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2. RHD MODEL

REAR WIRING HARNESS

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R1	8	★	B-2	B97	Bulkhead wiring harness
R2	32	★	B-2	B98	
R4	1	★	B-3		Parking brake switch
R8	2	★	C-3		Seat belt switch
R15	6	Black	B-3	R57	Fuel tank cord
R22	3	★	B-4		Rear door switch LH
R41	4	Blue	B-2		Seat heater LH
R42	4	Blue	B-2		Seat heater switch LH
R43	4	★	B-3		Seat heater switch RH
R44	4	Blue	C-3		Seat heater RH
R72	2	★	B-3		Rear ABS sensor RH
R73	2	★	C-4		Rear ABS sensor LH
R146	2	★	B-3		Rear accessory power supply socket
★: Non-colored					

BULKHEAD WIRING HARNESS

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R97	8	★	B-2	R1	Rear wiring harness
R98	32	★	B-2	R2	
R265	4	★	B-2	D27	Rear door cord RH
R266	4	★	B-2	D28	
R267	3	★	C-3		Front door switch RH
R268	3	★	B-2		Front door switch LH
R269	4	★	C-4	D21	Rear door cord LH
R270	4	★	C-4	D22	
★: Non-colored					

ROOF CORD

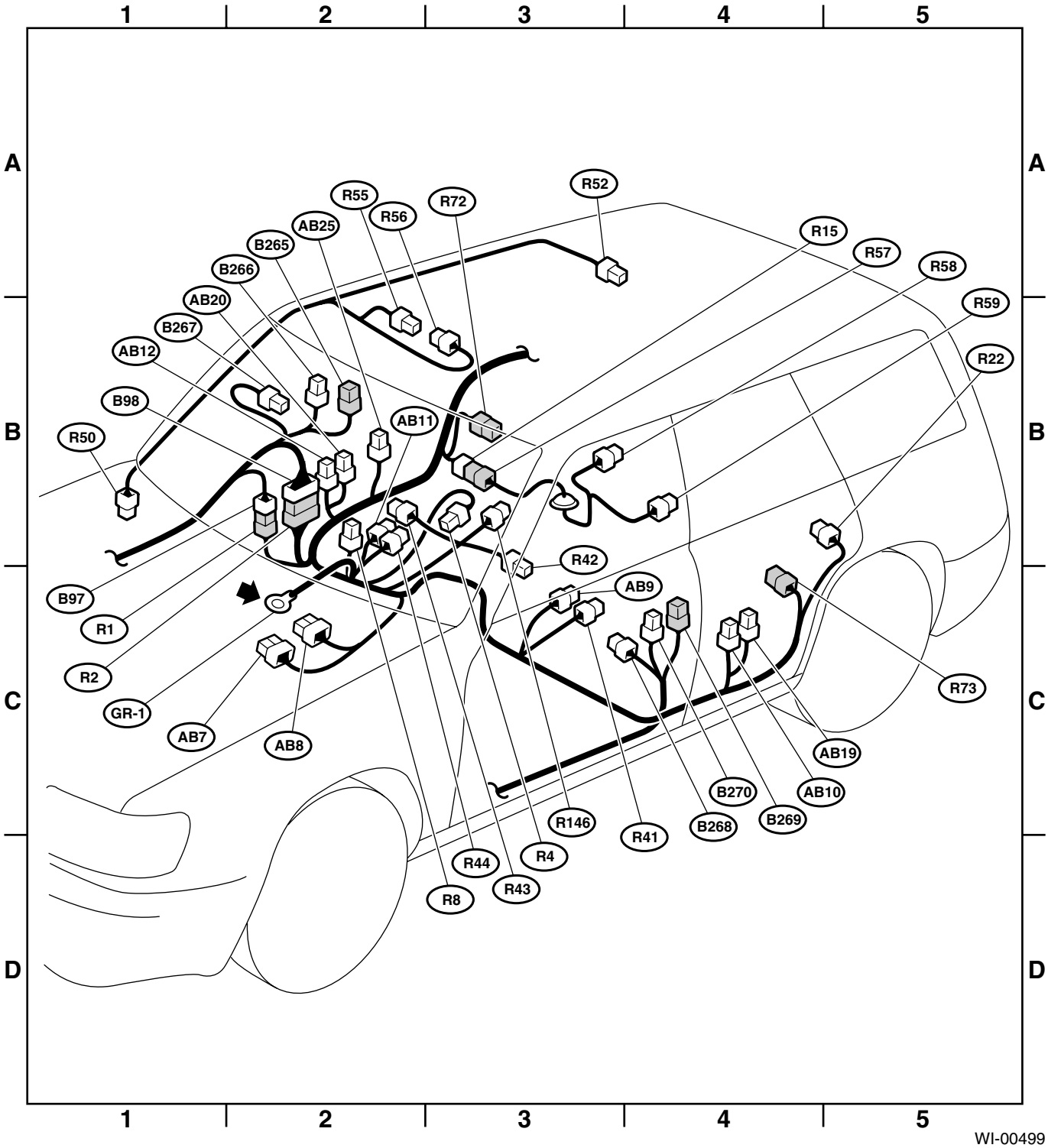
Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R50	8	★	B-1	B90	Bulkhead wiring harness
R52	3	★	A-3		Room light
R55	2	★	B-2		Sunroof motor
R56	2	★	B-3		Spot light
★: Non-colored					

FUEL TANK CORD

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R57	6	Black	B-3	R15	Rear wiring harness
R58	6	★	B-3		Fuel gauge module & fuel pump assembly
R59	2	★	B-4		Fuel gauge sub module
★: Non-colored					

AIRBAG WIRING HARNESS

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
AB7	12	Yellow	C-2		Airbag control module
AB8	12	Yellow	C-2		
AB9	2	Yellow	C-3		Inflator (Side LH)
AB10	4	Yellow	C-4		Side airbag sensor LH
AB11	2	Yellow	B-2		Inflator (Side RH)
AB12	4	Yellow	B-2		Side airbag sensor RH
AB19	2	Yellow	C-4		Pretensioner LH
AB20	2	Yellow	B-2		Pretensioner RH
AB25	2	Orange	B-2		Lap pretensioner RH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R22
R73
R42
AB9
B97
R1
R2
GR-1
AB7
AB8
AB19
B270
AB10
B269
B268
R146
R41
R44
R4
R43
R8
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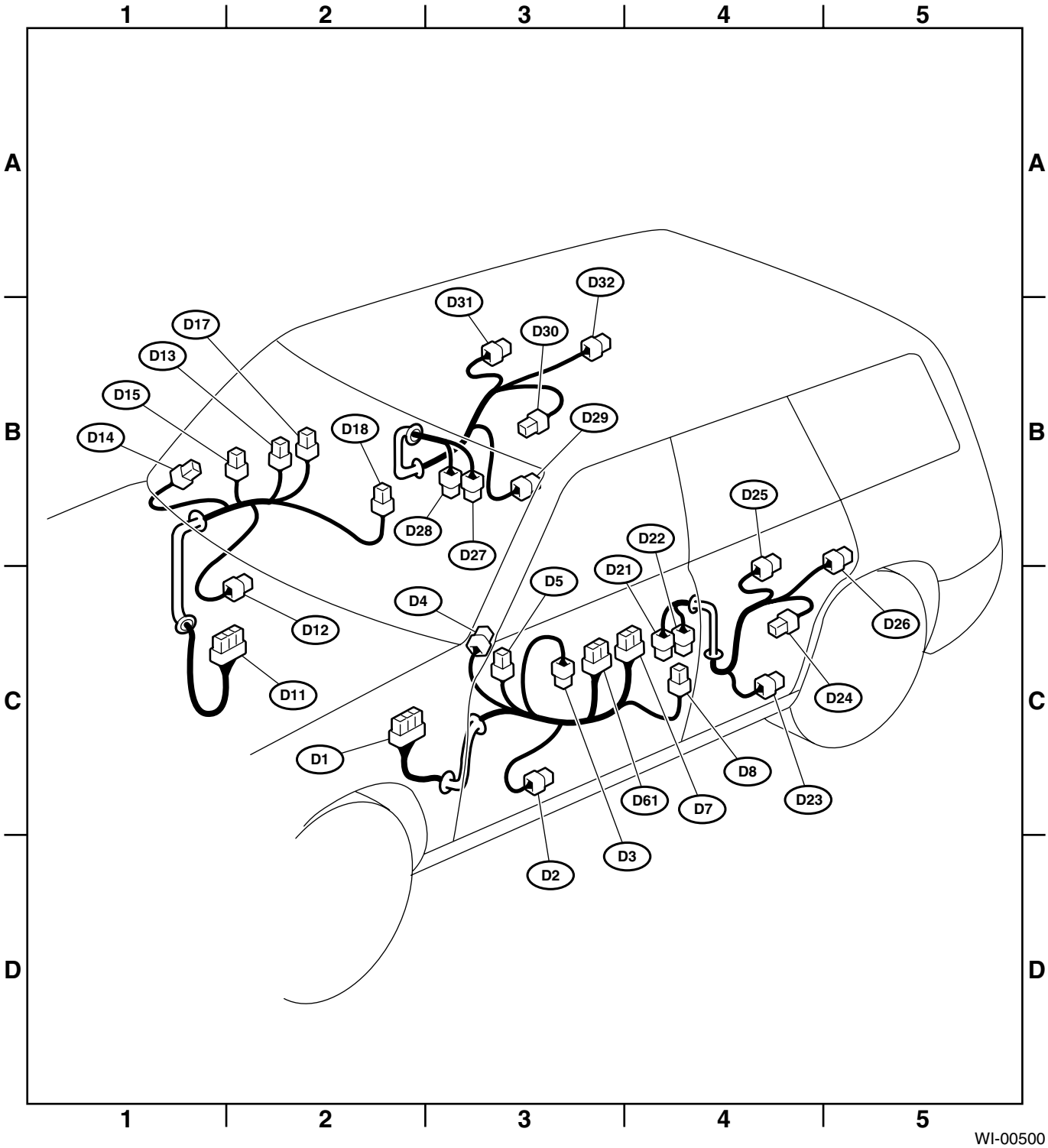
55.Door Cord

A: LOCATION

1. LHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
D1	25	★	C-2	B30	Bulkhead wiring harness
D2	2	★	C-3		Front door speaker (Driver side)
D3	2	Green	C-3		Front power window motor (Driver side)
D4	2	Black	C-3		Front door tweeter (Driver side)
D5	6	★	C-3		Remote control rearview mirror (Driver side)
	8	★	C-3		
D7	16	★	C-4		Power window main switch
D8	4	Gray	C-4		Front door lock actuator LH
D11	25	★	C-1	B101	Bulkhead wiring harness
D12	2	★	C-2		Front door speaker RH
D13	2	Green	B-2		Front power window motor RH
D14	2	Black	B-1		Front door tweeter RH
D15	6	★	B-2		Remote control rearview mirror RH (Without mirror heater)
	8	★	B-2		Remote control rearview mirror RH (With mirror heater)
D17	8	★	B-2		Front power window sub switch RH
D18	4	★	B-2		Front door lock actuator RH
D21	4	★	C-4	B269	Bulkhead wiring harness
D22	4	★	C-4	B270	
D23	2	★	C-4		Rear door speaker LH
D24	2	Green	C-4		Rear power window motor LH
D25	8	★	C-4		Rear power window sub switch LH
D26	4	★	B-5		Rear door lock actuator LH
D27	4	★	B-3	B265	Bulkhead wiring harness
D28	4	★	B-3	B266	
D29	2	★	B-3		Rear door speaker RH
D30	2	Green	B-3		Rear power window motor RH
D31	8	★	B-3		Rear power window sub switch RH
D32	4	★	B-3		Rear door lock actuator RH
D61	10	★	C-3		Remote control rearview mirror switch
★: Non-colored					

DOOR CORD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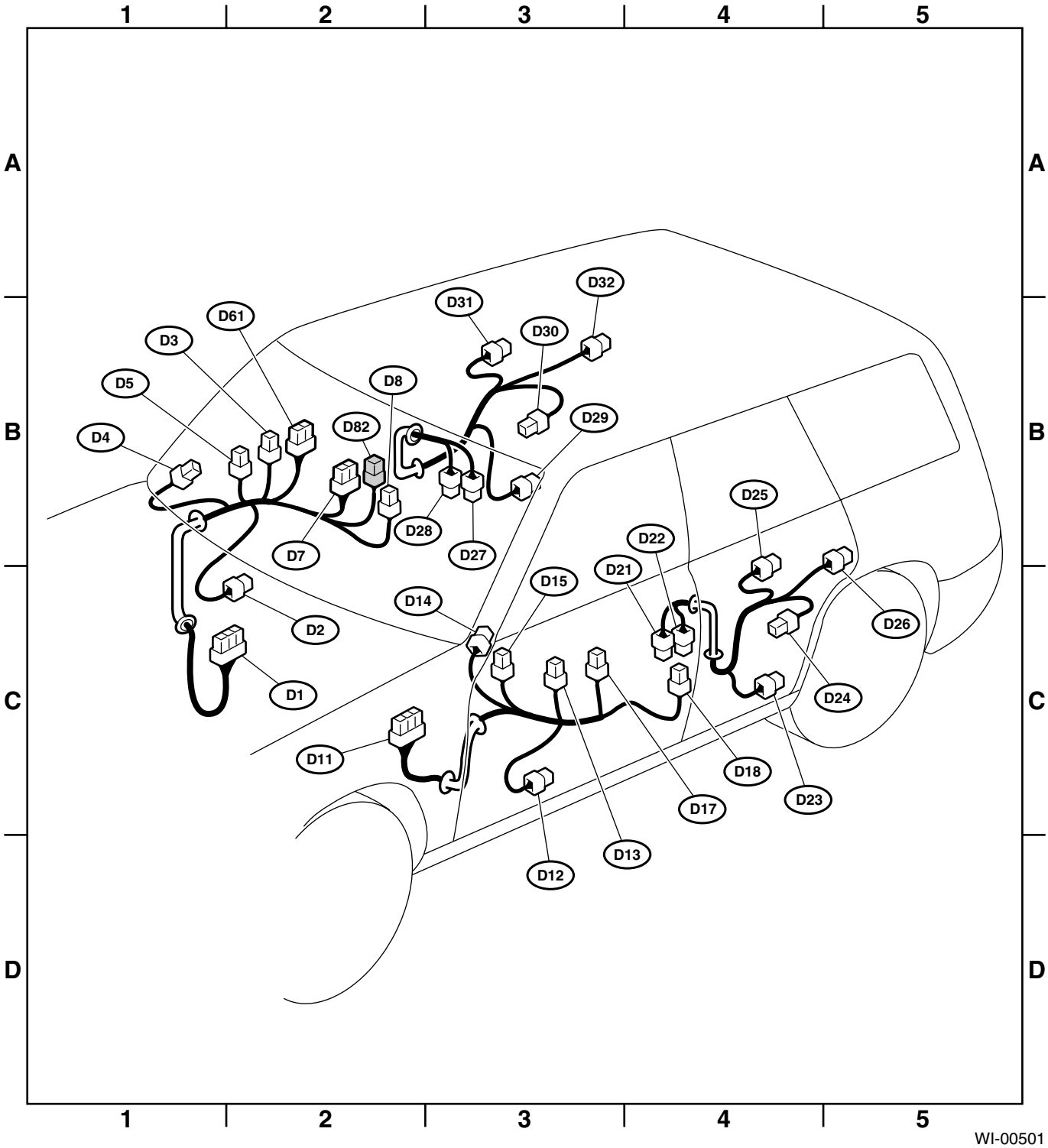
WI-00500

2. RHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
D1	25	★	C-2	B30	Bulkhead wiring harness
D2	2	★	C-2		Front door speaker (Driver side)
D3	2	Green	B-2		Front power window motor (Driver side)
D4	2	Black	B-1		Front door tweeter (Driver side)
D5	6	★	B-2		Remote control rearview mirror (Driver side)
	8	★	B-2		
D7	16	★	B-2		Power window main switch
D8	4	★	B-2		Front door lock actuator RH (Without double lock model)
	6	Black	B-2		Front door lock actuator RH (With double lock model)
D11	25	★	C-2	B101	Bulkhead wiring harness
D12	2	★	C-3		Front door speaker LH
D13	2	Green	C-3		Front power window motor LH
D14	2	Black	C-3		Front door tweeter LH
D15	6	★	C-3		Remote control rearview mirror LH (Without mirror heater)
	8	★	C-3		Remote control rearview mirror LH (With mirror heater)
D17	8	★	C-3		Front power window sub switch LH
D18	4	★	C-4		Front door lock actuator LH (Without double lock model)
	6	Black	C-4		Front door lock actuator LH (With double lock model)
D21	4	★	C-4	B269	Bulkhead wiring harness
D22	4	★	C-4	B270	
D23	2	Green	C-4		Rear door speaker LH
D24	2	★	C-4		Rear power window motor LH
D25	8	★	B-4		Rear power window sub switch LH
D26	4	★	B-5		Rear door lock actuator LH (Without double lock model)
	6	Black	B-5		Rear door lock actuator LH (With double lock model)
D27	4	★	B-3	B265	Bulkhead wiring harness
D28	4	★	B-3	B266	
D29	2	★	B-3		Rear door speaker RH
D30	2	Green	B-3		Rear power window motor RH
D31	8	★	B-3		Rear power window sub switch RH
D32	4	★	B-3		Rear door lock actuator RH (Without double lock model)
	6	Black	B-3		Rear door lock actuator RH (With double lock model)
D61	10	★	B-2		Remote control rearview mirror switch
D82	3	Brown	B-2	R81	Key cylinder switch
★: Non-colored					

DOOR CORD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56.Rear Wiring Harness and Rear Gate Cord

A: LOCATION

REAR WIRING HARNESS

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R16	3	★	C-5		Rear door switch RH
R26	6	★	C-4		Rear combination light RH
R28	6	★	C-1		Rear combination light LH
R30	2	★	C-4		Luggage room light diode
R32	2	★	C-4		Rear accessory power supply socket
R38	4	★	C-4	D33	Rear gate cord
R39	8	★	C-4	D34	
R40	2	★	C-4	D36	Rear gate cord (RHD MODEL)
R79	10	★	C-4		Trailer connector
R113	1	★	B-2		Antenna amp
R116	8	★	C-4		Rear wiper intermittent module
R122	10	★	C-4		Fuel pump control module
R147	5	Blue	B-4		Ground joint connector LHD MODEL
R148	2	★	C-4		Rear deferential oil temperature sensor
★: Non-colored					

REAR GATE CORD

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
D33	4	★	C-4	R38	Rear wiring harness
D34	8	★	C-4	R39	
D36	2	★	C-4	R40	Rear wiring harness (RHD MODEL)
D39	2	Black	B-3		High-mount stop light
D40	1	Black	A-3		Rear defogger
D43	4	★	B-2		Rear wiper motor
D44	2	★	A-2		License plate light
D46	2	★	A-2		Rear gate latch switch
D47	4	★	A-1		Rear gate lock actuator
D79	1	Black	B-2		Rear defogger
D80	8	★	A-3	D81	Rear gate cord
D81	8	★	A-3	D80	
D82	3	★	B-3		Luggage room light
★: Non-colored					

REAR WIRING HARNESS AND REAR GATE CORD