GENERAL INFOMATION 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.

G1830BE1

FOREWORD

FW

Page

1. Foreword 2

1. Foreword

A: FOREWORD

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

Applied model: GG***** and GD***** from 2001MY.

The additional manuals below are also available:
AUTOMATIC TRANSMISSION SERVICE MANUAL (Pub. No. G0853ZE)

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

HOW TO USE THIS MANUALS

HU

Page

1. How to Use This Manuals 2

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 the diagnosis information has also been added where necessary.

2. INDEX

The first page has an index with tabs. And at the end of each section is an alphabetical index.

3. COMPONENTS

For each component, a composition drawing is included.

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 are provided for each component. When multiple components comprise one process, refer to the instructions for that process for each component.

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.

SPECIFICATIONS

SPC

Page

1. Impreza 2

1. Impreza

A: DIMENSIONS

Model			Sedan	Wagon	OUTBACK
Overall length		mm (in)	4,405 (173.4)		
Overall width		mm (in)	1,730 (68.1)	1,695 (66.7)	1,710 (67.3)
Overall height (at CW)		mm (in)	1,440 (56.7)	1,465 (57.7), 1,485 (58.5)★2	1,475 (58.1), 1,495 (58.9)★2
Compartment	Length	mm (in)	1,890 (74.4)	1,845 (72.6)	
	Width	mm (in)	1,380 (54.3)		
	Height	mm (in)	1,180 (46.5)	1,200 (47.2), 1,150 (45.3)★3	1,200 (47.2), 1,150 (45.3)★3
Wheelbase		mm (in)	2,525 (99.4)		
Tread	Front	mm (in)	1,485 (58.5)	1,465 (57.7)	1,460 (57.5)
	Rear	mm (in)	1,475 (58.1), 1,480 (58.3)★1	1,455 (57.3)	1,455 (57.3)
Minimum road clearance		mm (in)	150 (5.9), 155 (6.1)★1	150 (5.9), 155 (6.1)★1	160 (6.3)

★1: WRX
★2: With roof rail
★3: With sun roof

B: ENGINE

Model		Turbo 2.0 L	2.5 L
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 × 79.0 (3.917 × 3.110)
Displacement	cm^3 (cu in)	1,994 (121.67)	2,457 (149.9)
Compression ratio		8.0	10.0
Firing order		1 — 3 — 2 — 4	
Idle speed at Park/Neutral position (A/C OFF)	rpm	750	650 (MT) 700 (AT)
Maximum output	kW (HP)/rpm	169 (227)/6,000	123 (165)/5,600
Maximum torque	N·m (kgf-m, ft-lb)/rpm	294 (30.0, 217)/4,000	226 (23.0, 166)/4,000

C: ELECTRICAL

Model			Turbo 2.0 L	2.5 L
Ignition timing at idling speed		BTDC/rpm	12°±10°/750	MT: 10°±10°/650 AT: 10°±10°/700
Spark plug			NGK: PFR6G	CHAMPION: RC10YC4(Standard) NGK: BKR5E-11 NGK: BKR6E-11
Generator			12V — 75A	12V — 90A
Battery	Type		MT: 12V — 48AH (55D23L) AT: 12V — 52AH (65D23L)	MT: 12V — 48AH (55D23L) AT: 12V — 52AH (75D23L)
	Reserve capacity	min	MT: 99 AT: 111	MT: 99 AT: 118
	Cold cranking amperes	amp	MT: 356 AT: 420	MT: 356 AT: 520

D: TRANSMISSION

Model			Turbo 2.0 L	
Transmission type			5MT★1	4AT★2
Clutch type			DSPD	TCC
Gear ratio		1st	3.454	2.785
		2nd	1.947	1.545
		3rd	1.366	1.000
		4th	0.972	0.694
		5th	0.738	—
		Reverse	3.333	2.272
Reduction gear (Front drive)	1st reduction	Type of gear	—	Helical
		Gear ratio	—	1.000
	Final reduction	Type of gear	Hypoid	Hypoid
		Gear ratio	3.900	4.111
Reduction gear (Rear drive)	Transfer reduction	Type of gear	Helical	—
		Gear ratio	1.100	—
	Final reduction	Type of gear	Hypoid	Hypoid
		Gear ratio	3.545	4.111

5MT★1: 5 forward speeds with synchromesh and 1-reverse
4AT★2: Electronically controlled fully-automatic, 4-forward speeds and 1-reverse
DSPD: Dry Single Plate Diaphragm
TCC: Torque Converter Clutch

Model			2.5 L			
			RS		Others	
Transmission type			5MT★1	4AT★2	5MT★1	4AT★2
Clutch type			DSPD	TCC	DSPD	TCC
Gear ratio		1st	3.454	3.027	3.454	2.785
		2nd	2.062	1.619	2.062	1.545
		3rd	1.448	1.000	1.448	1.000
		4th	1.088	0.694	1.088	1.694
		5th	0.780	—	0.780	—
		Reverse	3.333	2.272	3.333	2.272
		Dual range	—	—	—	—
Reduction gear (Front drive)	1st reduction	Type of gear	—	Helical	—	Helical
		Gear ratio	—	1.000	—	1.000
	Final reduction	Type of gear	Hypoid	Hypoid	Hypoid	Hypoid
		Gear ratio	4.111	4.444	3.900	4.111
Reduction gear (Rear drive)	Transfer reduction	Type of gear	Helical	—	Helical	—
		Gear ratio	1.000	—	1.000	—
	Final reduction	Type of gear	Hypoid	Hypoid	Hypoid	Hypoid
		Gear ratio	4.111	4.444	3.900	4.111

5MT★1: 5 forward speeds with synchromesh and 1-reverse
4AT★2: Electronically controlled fully-automatic, 4-forward speeds and 1-reverse
DSPD: Dry Single Plate Diaphragm
TCC: Torque Converter Clutch

E: STEERING

Model		TS	OTHERS
Type		Rack and Pinion	
Turns, lock to lock		3.2	3
Minimum turning circle m (ft)	Curb to curb	10.2 (33.5)	10.8 (35.4)
	Wall to wall	11.1 (36.3)	11.7 (38.3)

F: SUSPENSION

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

G: BRAKE

Model	SEDAN	WAGON
Service brake system	Dual circuit hydraulic with vacuum suspended power unit	
Front	Ventilated disc brake	
Rear	Disc brake	Drum brake, Disc brake★1
Parking brake	Mechanical on rear brakes	

★1: WRX

H: TIRE

Model	TS	OTHERS
Rim size	15 × 6JJ	16 × $6^{1}/_{2}$JJ
Tire size	P195/60R15 87H	P205/55R16 89V
Type	Steel belted radial, Tubeless	

I: CAPACITY

Model			Turbo 2.0 L		2.5 L	
			5MT	4AT	5MT	4AT
Fuel tank		ℓ (US gal, Imp gal)	60 (15.9, 13.2)		60 (15.9, 13.2)	
Engine oil	Upper level	ℓ (US qt, Imp qt)	4.5 (4.8, 4.0)		4.0 (4.2, 3.5)	
	Lower level	ℓ (US qt, Imp qt)	3.5 (3.7, 3.1)		3.0 (3.2, 2.6)	
Transmission gear oil		ℓ (US qt, Imp qt)	3.5 (3.7, 3.1)	—	3.5 (3.7, 3.1)	—
Automatic transmission fluid		ℓ (US qt, Imp qt)	—	9.3 (9.8, 8.2)	—	9.5 (10.0, 8.4)
AT differential gear oil		ℓ (US qt, Imp qt)	—	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)	7.7 (8.1, 6.8)	7.6 (8.0, 6.7)	7.0 (7.4, 6.2)	6.9 (7.3, 6.1)

J: WEIGHT

1. U.S. SPEC. VEHICLE

Sedan

Model			AWD			
			Turbo 2.0 L		2.5 L	
			WRX		RS	
			5MT★1	4AT★1	5MT	4AT
Curb weight (C.W.)	Front	kg (lb)	826 (1,820)	851 (1,875)	778 (1,715)	803 (1,770)
	Rear	kg (lb)	569 (1,255)	569 (1,255)	567 (1,250)	567 (1,250)
	Total	kg (lb)	1,395 (3,075)	1,420 (3,130)	1,345 (2,965)	1,370 (3,020)
Gross vehicle weight (G.V.W.)	Front	kg (lb)	998 (2,200)	998 (2,200)	939 (2,070)	939 (2,070)
	Rear	kg (lb)	857 (1,890)	857 (1,890)	857 (1,890)	857 (1,890)
	Total	kg (lb)	1,837 (4,050)	1,795 (4,050)	1,778 (3,920)	1,837 (4,050)

★1: Excludes weight of side air bag.

Wagon

Model			AWD	
			Turbo 2.0 L	
			WRX	
			5MT★2	4AT★2
Curb weight (C.W.)	Front	kg (lb)	825 (1,820)	851 (1,875)
	Rear	kg (lb)	606 (1,335)	605 (1,335)
	Total	kg (lb)	1,431 (3,155)	1,458 (3,210)
Gross vehicle weight (G.V.W.)	Front	kg (lb)	998 (2,200)	998 (2,200)
	Rear	kg (lb)	925 (2,040)	925 (2,040)
	Total	kg (lb)	1,901 (4,190)	1,901 (4,190)

Model			AWD			
			2.5 L			
			TS		OUTBACK	
			5MT★1	4AT★1	5MT	4AT
Curb weight (C.W.)	Front	kg (lb)	773 (1,705)	796 (1,755)	783 (1,725)	805 (1,775)
	Rear	kg (lb)	603 (1,330)	606 (1,335)	601 (1,325)	603 (1,330)
	Total	kg (lb)	1,376 (3,035)	1,402 (3,090)	1,384 (3,050)	1,408 (3,105)
Gross vehicle weight (G.V.W.)	Front	kg (lb)	939 (2,070)	939 (2,070)	939 (2,070)	939 (2,070)
	Rear	kg (lb)	925 (2,040)	925 (2,040)	925 (2,040)	925 (2,040)
	Total	kg (lb)	1,833 (4,040)	1,833 (4,040)	1,833 (4,040)	1,833 (4,040)

★1: Excludes weight of ABS, cruise control.
★2: Excludes weight of side air bag.

2. CANADA SPEC. VEHICLE

Sedan

Model			AWD			
			Turbo 2.0 L		2.5 L	
			WRX		RS	
			5MT	4AT	5MT	4AT
Curb weight (C.W.)	Front	kg (lb)	826 (1,820)	851 (1,875)	778 (1,715)	803 (1,770)
	Rear	kg (lb)	573 (1,265)	573 (1,265)	567 (1,250)	567 (1,250)
	Total	kg (lb)	1,399 (3,085)	1,424 (3,140)	1,345 (2,965)	1,370 (3,020)
Gross vehicle weight (G.V.W.)	Front	kg (lb)	998 (2,200)	998 (2,200)	939 (2,070)	939 (2,070)
	Rear	kg (lb)	857 (1,890)	857 (1,890)	857 (1,890)	857 (1,890)
	Total	kg (lb)	1,837 (4,050)	1,837 (4,050)	1,778 (3,920)	1,778 (3,920)

Wagon

Model			AWD					
			Turbo 2.0 L		2.5 L			
			WRX		TS		OUTBACK	
			5MT★1	4AT	5MT★1	4AT★1	5MT	4AT
Curb weight (C.W.)	Front	kg (lb)	826 (1,820)	851 (1,875)	758 (1,670)	780 (1,720)	783 (1,725)	805 (1,775)
	Rear	kg (lb)	610 (1,345)	610 (1,345)	594 (1,310)	597 (1,315)	601 (1,325)	603 (1,330)
	Total	kg (lb)	1,436 (3,165)	1,461 (3,220)	1,352 (2,980)	1,377 (3,035)	1,384 (3,050)	1,408 (3,105)
Gross vehicle weight (G.V.W.)	Front	kg (lb)	998 (2,200)	998 (2,200)	939 (2,070)	939 (2,070)	939 (2,070)	939 (2,070)
	Rear	kg (lb)	925 (2,040)	925 (2,040)	925 (2,040)	925 (2,040)	925 (2,040)	925 (2,040)
	Total	kg (lb)	1,901 (4,190)	1,901 (4,190)	1,833 (4,040)	1,833 (4,040)	1,833 (4,040)	1,833 (4,040)

★1: Excludes weight of air conditioner

PRECAUTION

PC

Page

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 the airbag components or nearby, and the 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: Remove the negative battery terminal.

6. AIRBAG DISPOSAL

To prevent bodily injury from unexpected airbag deployment, do not dispose the airbag modules in the same way as other refuse. Follow instructions of SOA (distributor) service for disposal of airbag module. Follow all government regulations concerning the 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 the 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

Page

1. Note 2

1. Note

A: NOTE

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

1. FASTENER NOTICE

Fasteners are used to prevent the 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.

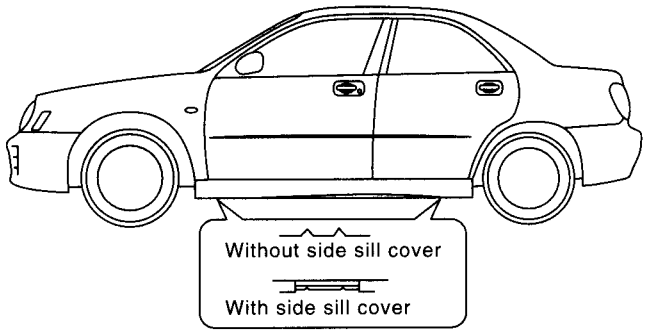
4. SERVICE PARTS

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.

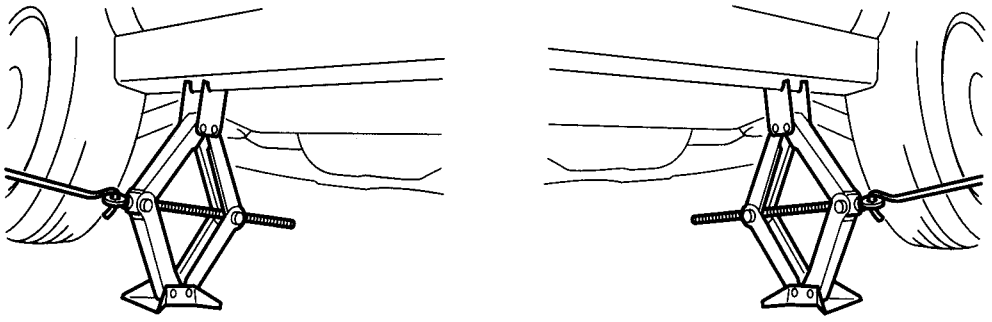
5. LIFTS AND JACKS

When using a lift or jack-ridged rack to raise a vehicle, always follow the 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.

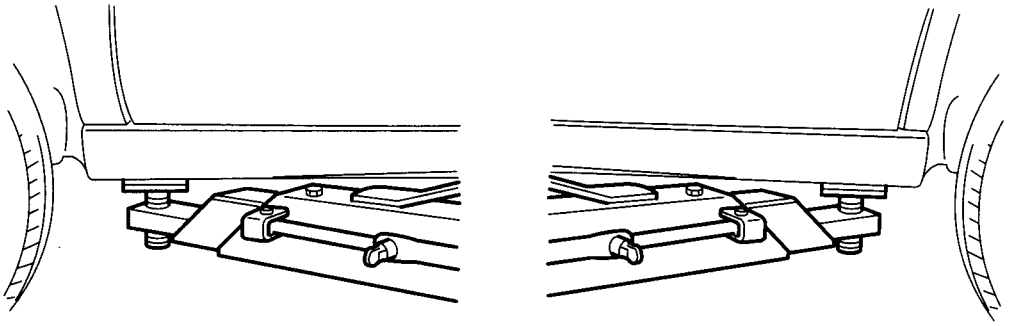
Support locations



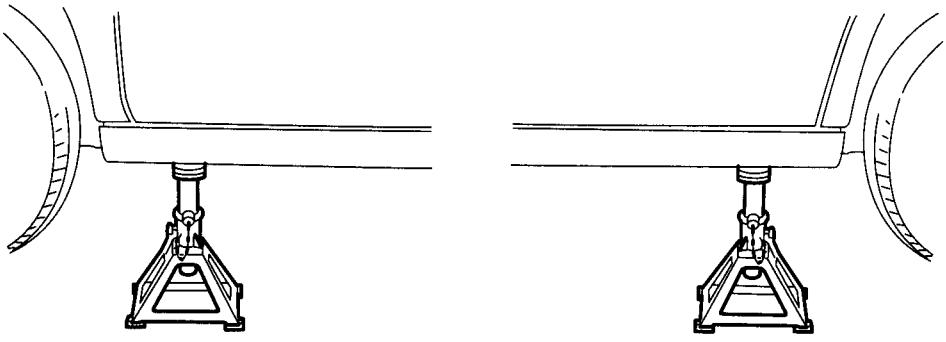
Pantograph jack



Lift



Safety stand



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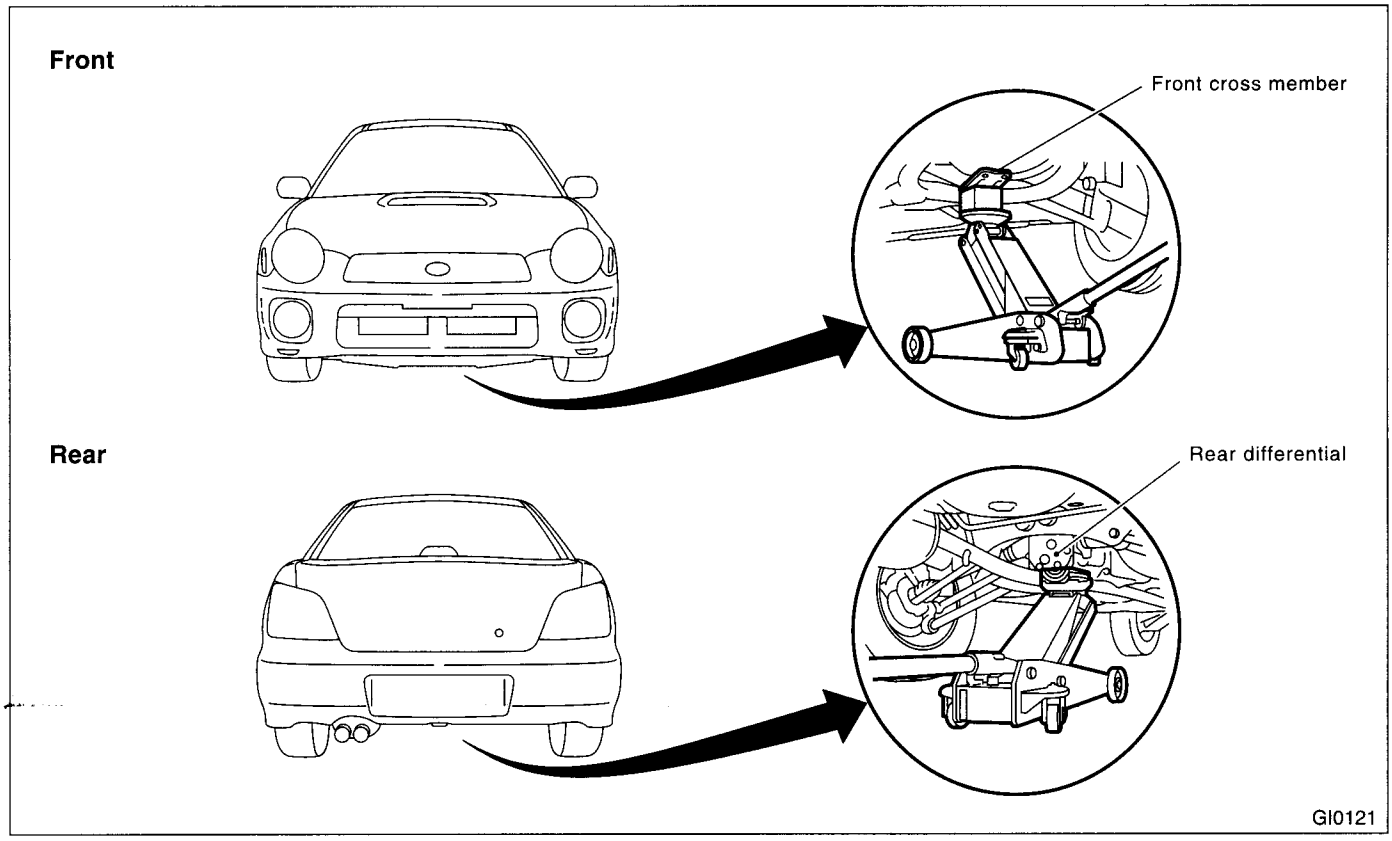
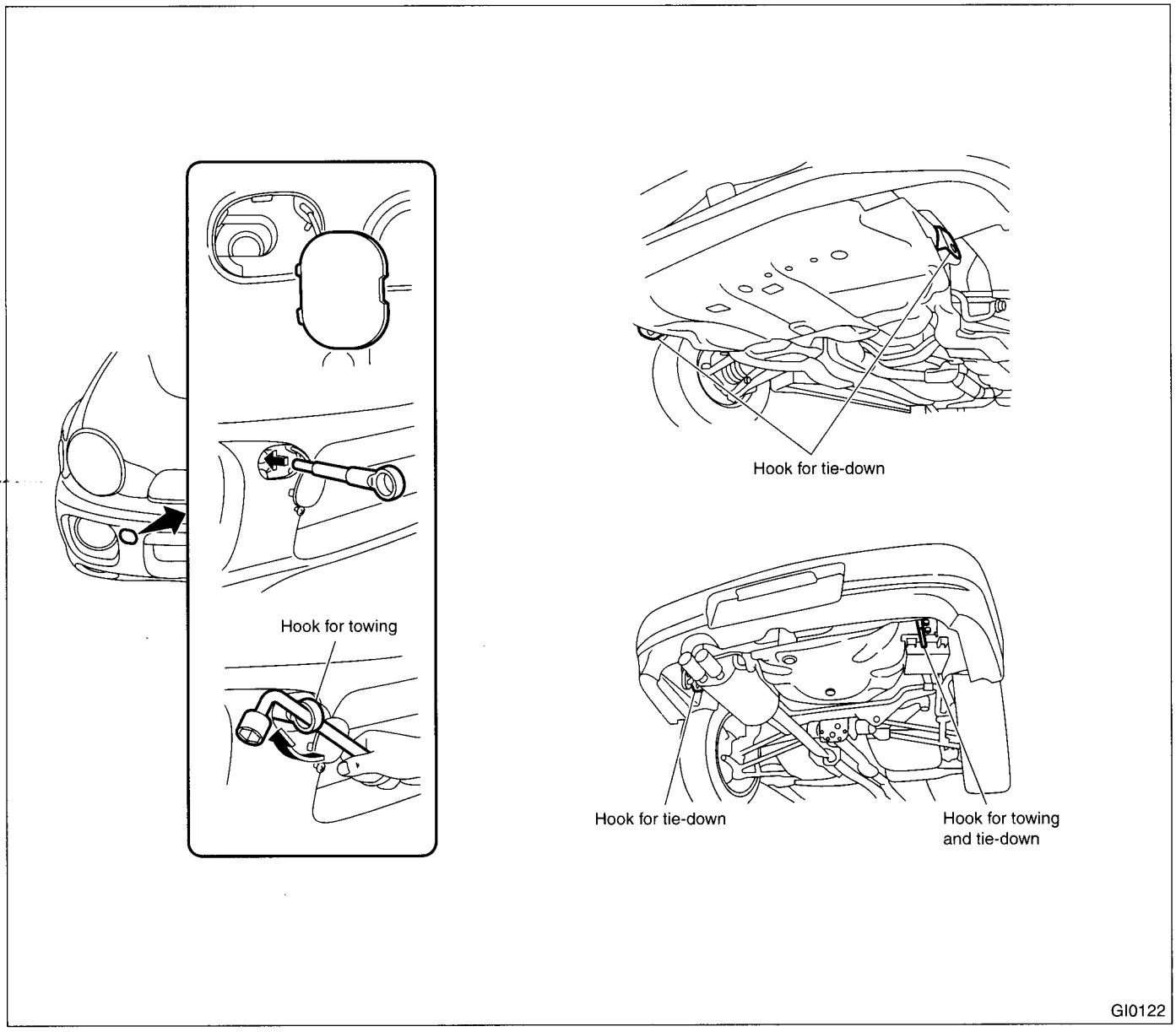
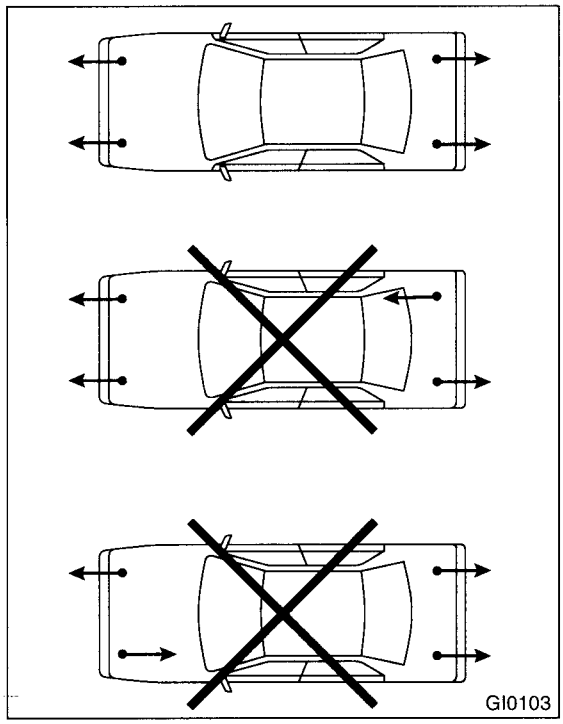
NOTE

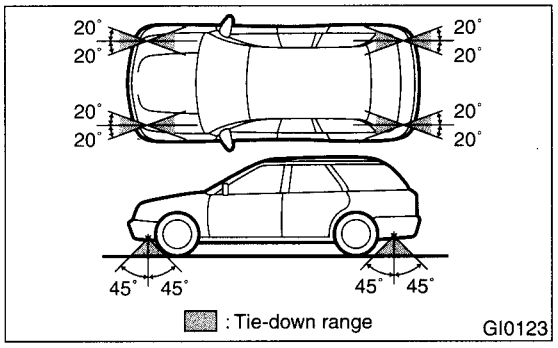


6. TIE DOWNS

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







7. TOWING

Avoid towing vehicles except when the vehicle cannot be driven. For vehicles with AWD, AT or VTD, 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 than the vehicle being towed.

8. TRAINING

For an information about training, contact a dealer or agent.

9. GENERAL SCAN TOOL

Using general scan tools will greatly improve the 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

Page

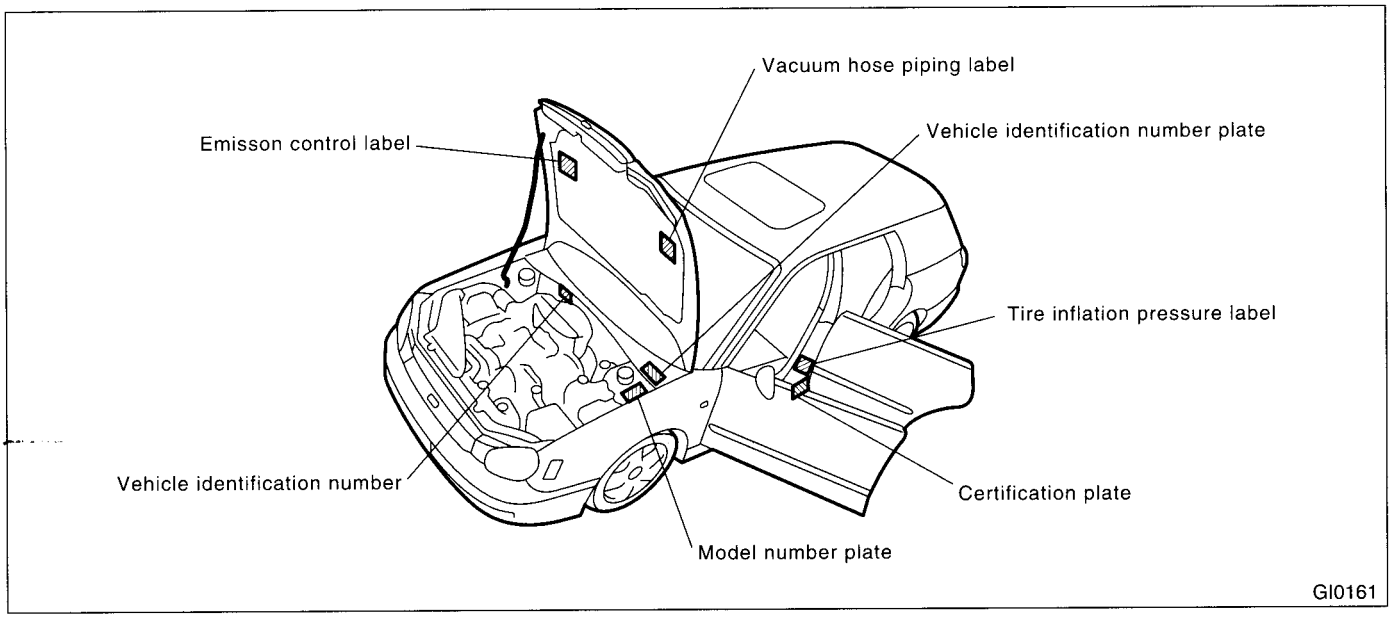
1. Identification 2

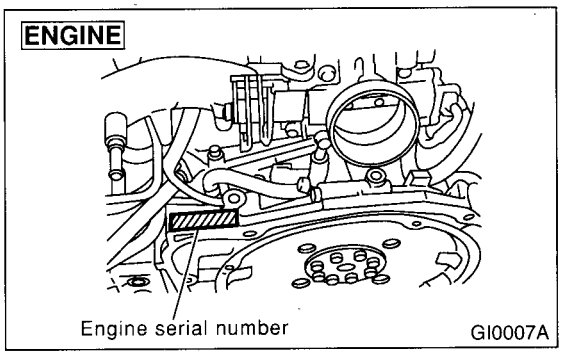
1. Identification

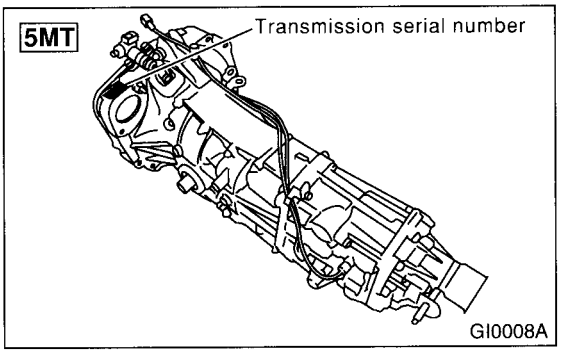
A: IDENTIFICATION

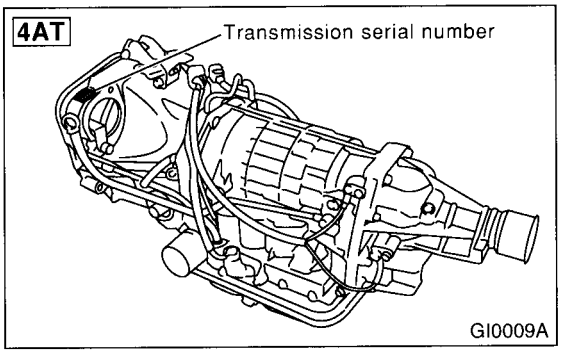
1. IDENTIFICATION NUMBER AND LABEL LOCATIONS

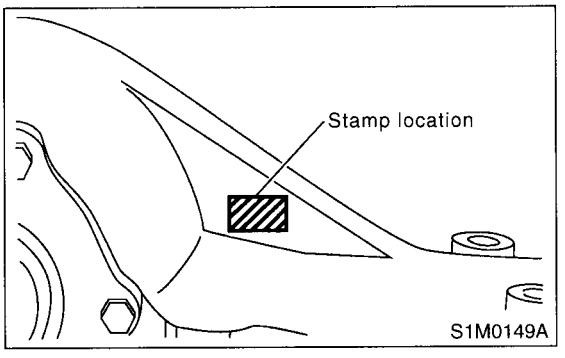
The VIN (Vehicle Identification Numbers) is used to classify the vehicle.
Positioning of the plate label for identification



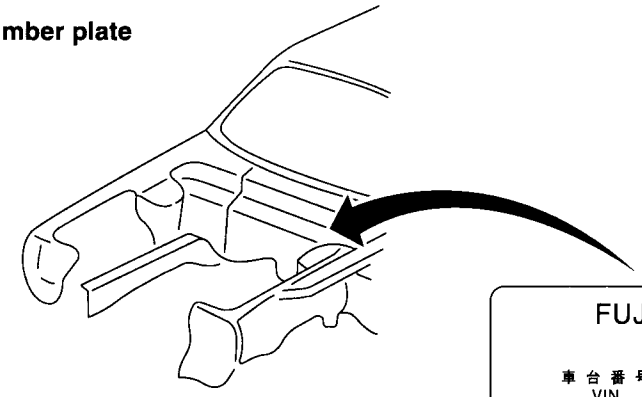








Model number plate



FUJI HEAVY INDUSTRIES LTD.

型　式

車台番号 VIN: JF1BD4LG9RG002001

アプライトモデル applied model: BD4AL3G　オプションコード option code: E0

トリムコード trim code: 410　エンジン型式 engine type: EJ20ENMABA

外装飾コード Color code: 230　ミッション型式 transmission type: TM752RGAAA

富士重工業株式会社

GI0011A

2. MEANING OF V.I.N.

The meaning of the VIN is as follows:

- **North America**

]JF1GD255X2G500001[

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	G	Car line	G: IMPREZA
5	D	Body type	D: 4 Door Sedan G: Wagon
6	2	Displacement	2: 2.0 L AWD Turbo 6: 2.5 L AWD
7	5	Grade	5: TS 7: RS 8: OUTBACK 9: WRX
8	5	Restraint	5: Manual belts, dual airbag. 6: Manual belts, dual airbag, side airbag.
9	X	Check digit	0-9 & X
10	2	Model year	2: 2002MY 3: 2003MY
11	G	Transmission type	G: Full-time AWD 5-speed MT H: Full-time AWD 4-speed AT
12 to 17	500001	Manufacture number	From 500001: 4 Door Sedan From 800001: Wagon

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.

GDEAY4R

Digits	Code	Meaning	Details
1	G	Series	G: IMPREZA
2	D	Body style	D: 4 Door Sedan G: Wagon
3	E	Engine displacement Drive system Suspension system	A: 2.0 L AWD Turbo E: 2.5 L AWD
4	A	Minor change	A: Initial
5	Y	Destination	Y: Left-hand drive for United States and Canada
6	4	Grade	4: TS 6: RS 7: OUTBACK 8: WRX
7	R	Transmission, fuel feed system	R: SOHC MPI 4-speed AT P: DOHC B MPI 4-speed AT J: SOHC MPI 5-speed MT AWD D: DOHC B MPI 5-speed MT AWD

The engine and transmission type are as follows:

- **Engine**

EJ251AW3AB

Digits	Code	Meaning	Details
1 and 2	EJ	Engine type	EJ: 4 cylinders
3 and 4	25	Displacement	20: 2.0 L 25: 2.5 L
5	1	Fuel feed system	1: D-MPI SOHC-A 5: MPI Turbo
6	A	Exhaust regulations	US Federal & California
7	W	Transmission	W: MT X: AT
8	3	Minor change	3: 3 is applied for this vehicle.
9 to 10	AB	Detailed specifications	Used when ordering parts. See the parts catalog for details.

• Transmission

TV1A4Z1AA

Digits	Code	Meaning	Details	
1	T	Transmission	T: Transmission	
2	V	Transmission type	Y: Full-time AWD MT center differential V: Full-time AWD AT center differential Z: Full-time AWD AT MPT	
3 and 4	1A	Classification	75: MT 1A: AT	
5	4	Series	MT	4: 5 MT
			AT	4: New AT
6	Z	Transmission specifications	V: Full-time AWD 5-speed MT with viscous coupling center differential single range Z: Full-time AWD 4-speed AT with MPT Y: Full-time AWD 4-speed AT with VTD	
7	1	Minor change	1: Initial	
8 to 10	AA	Detailed specifications	Used when ordering parts. See the parts catalog for details.	

• Rear differential

EH

Code	Reduction gear ratio	LSD
EG	3.900	No
EH	4.111	No
EL	4.444	No
EJ	4.111	Viscous
EF	3.545	Viscous

RECOMMENDED MATERIALS

RM

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1. Recommended Materials 2

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

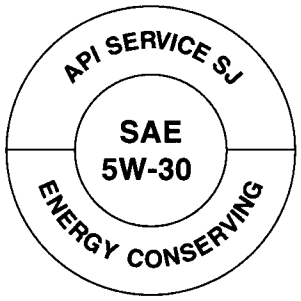
Always use a gasoline of the same or higher octane value than specified in the owner's manual. Ignoring the specifications below will result in damage or poor operation of the engine and fuel injection system. Use the specified gasoline to correct performance.

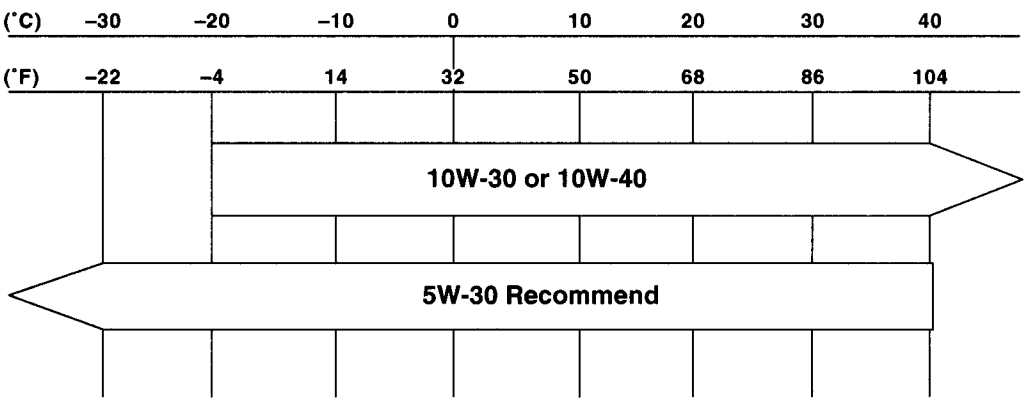
- **Unleaded gasoline**

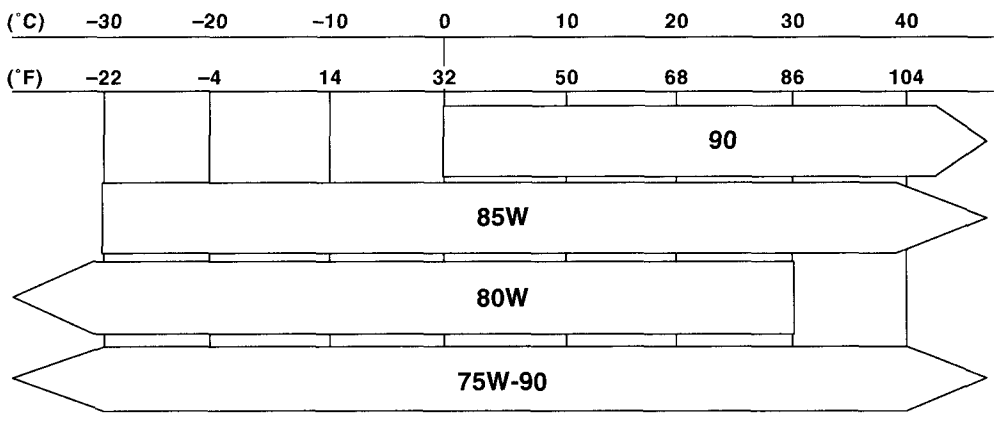
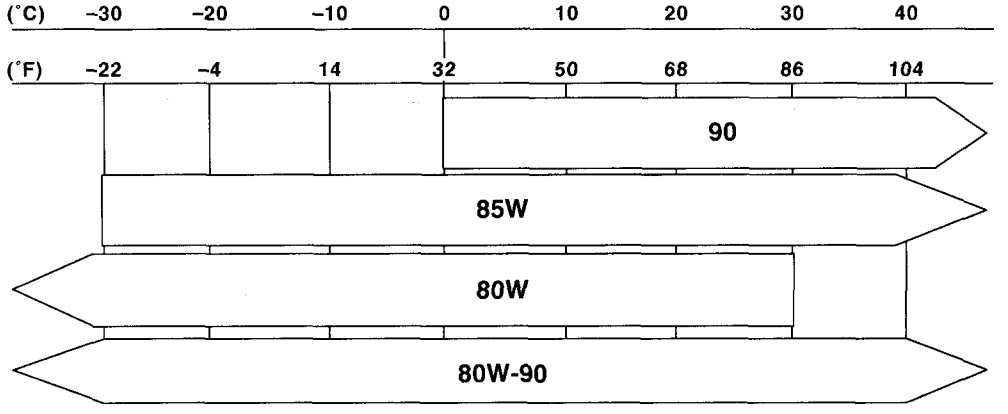
Use unleaded gasoline and not leaded gasoline on vehicles with a catalytic converter installed to reduce air pollution. Using leaded gasoline will damage the catalytic converter.

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.	ACEA Spec.	
Engine oil	SJ Grade "Energy conserving"  GI0001 GI0002	A1, A2 or A3	API: SH or SG
Manual transmission oil	GL-5	—	—
Front differential	GL-5	—	—
Rear differential	GL-5	—	—

SAE viscosity	SAE viscosity No. and applicable temperature SAE J300
Engine oil	 GI0003A

SAE viscosity	SAE viscosity No. and applicable temperature SAE J300
Manual transmission oil Rear differential	 GI0004A
Front differential	 GI0005A

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 the genuine coolant to protect the engine. The table below shows the ratio of coolant to distilled water.

Coolant	Recommended	Item number	Alternative
Coolant	SUBARU coolant	000016218	None
Water for dilution	Distilled water	—	Tap 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 DH-PR.

Air conditioner	Recommended	Item number	Alternative
Refrigerant	HFC134a	—	None
Compressor oil	DH-PR	—	None

7. GREASE

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

Grease	Application point	Recommended	Item number	Alternative
Supplementary lubricants	• O2 sensor • Bolts, etc.	SUBARU CRC	004301003	—
Grease	MT main shaft	FX clutch grease	000040901	—
	Clutch master cylinder push rod	Slicolube G-40M	004404003	—
	• Steering shaft bush (Toe board) • Gear shift bush	SUNLIGHT2	003602010	—
	Steering gear box	Valiant grease M-2	003608001	—
	Disc brake	Niglube RX-2	003606000 or 725191040	—
	Drum brake	Molykote No. 7439	72519460	—
	• Brake pad • Brake shoe	Molykote AS-880N	26298AC000	—
	Front axle SFJ	SSG-6003	28093TA000	—
	Front axle EBJ	NTG 2218	28093AA000	—
	Rear axle EBJ (Turbo model)	NTG 2218	28093AA000	—
	Rear axle BJ (Non-turbo model)	Molylex No. 2	723223010	—
	Rear axle DOJ	VU-3A702	23223GA050	—
	• Control cable • Throttle linkage • 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 the seal material shown in the table below, or equivalent.

Seal material	Application point	Recommended	Item number	Alternative
	Engine case	Three Bond 1215	004403007	Dow Corning's No. 7038
	Transmission oil pan	Three Bond 1217B	K0877YA020	—
	Torque converter clutch case	Three Bond 1215B	004403007	Dow Corning's No. 7038
	Rear differential	Three Bond 1324	004403042	—
	Rear differential	Three Bond 1105	004403010	—
	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. Check the doors for lock/unlock and open/close operations.	(7) Using the key, check if the door can be locked and unlocked normally. (8) Open and close all doors to see that there are no abnormal conditions. (9) Operate the power door locking switch to check that all doors is locked and unlocked normally.
5. Power window operation check	(10) Check the power window for correct operations.
6. Check the trunk lid open/close operations.	(11) Operate the trunk lock release lever to check that the trunk opens normally. (12) Using the key, check if the trunk lid can be unlocked normally. (13) Open and close the trunk lid to see that there are no abnormal conditions.
7. Check the rear gate for lock/unlock and open/close operations.	(14) Using the key, check if the rear gate can be lock and unlocked normally. (15) Open and close the rear gate to see that there are no abnormal conditions. (16) Operate the power door locking switch to check that the rear gate is locked and unlocked normally.
8. Operation check of trunk lid release handle	(17) Operate the trunk lid release lever to check the trunk is unlocked normally.
9. Operation check of fuel lid opener lock release lever	(18) Operate the fuel lid opener to check that the fuel lid is unlocked normally.
10. Accessory check	Check 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	(1) Operate the hood lock release lever to check that the hood opens normally.
12. Connection of air conditioner harness	(2) If the vehicle is about to be delivered to the customer, connect the air conditioner harness.
13. Battery	(3) Check the battery for any abnormal conditions such as rust and trace of battery fluid leaks.
14. Brake fluid	(4) Check the fluid amount.
15. Engine oil	(5) Check the oil amount.
16. Transmission fluid	(6) Check the fluid amount. (7) For AT, check the front differential oil.
17. AT front differential oil	(8) Check the AT front differential oil amount.
18. Coolant	(9) Check the coolant amount.
19. Clutch fluid	(10) Check the clutch fluid amount.
20. Window washer fluid	(11) Check the window washer fluid amount.
21. Hood latch check	(12) Check that the hood is closed and latched securely.

Step	Check point
22. Keyless entry system	(13) Check that the keyless entry system operates normally.
23. Security system	(14) Check that the security system operates normally.
24. Seat	(15) Check the seat surfaces for smears or dirt. (16) Check the seat installation conditions and functionality.
25. Seat belt	(17) Check the seat belt installation conditions and functionality.
26. Wheel alignment	(18) Check that the wheel alignments are properly adjusted.

Checks with the Engine Running

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

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 that 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. Cruise control	(6) Check that the cruise control system 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 (if any). (6) Check the body paints for damage and smears. (7) Check the plated parts for damage and rust.

1. APPEARANCE CHECK

- If the vehicle is covered with protective coating, visually check the vehicle body for damage and dents.
- If there is no protective coating, check the body paints for small areas of damage or stains and repair as necessary.
- Check the window glass, door glass, and lights for any cracks or damage and repair or replace the parts as necessary.
- 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.

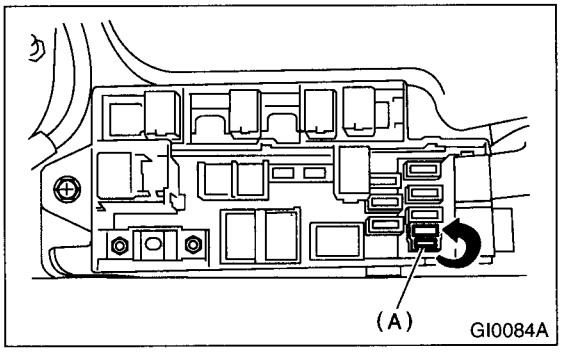
2. TIRE CHECK

- 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
P195/60R1587H	220 (2.2, 32)	200 (2.0, 25)
P205/55R1689V	220 (2.2, 32)	200 (2.0, 25)

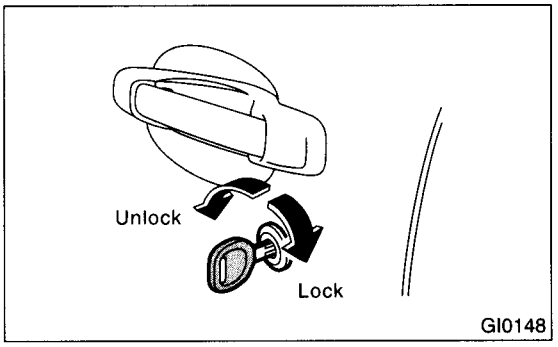
3. FUSE INSTALLATION

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

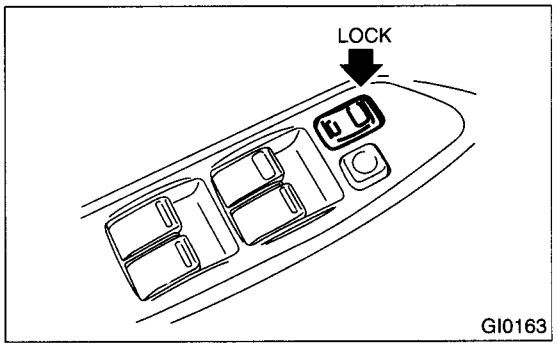


4. CHECK THE DOOR OPERATIONS, LOCK/UNLOCK AND OPEN/CLOSE, AS FOLLOWS.

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.



Operate the power door locking switch on the front door arm rest, and check that all doors lock and unlock normally.

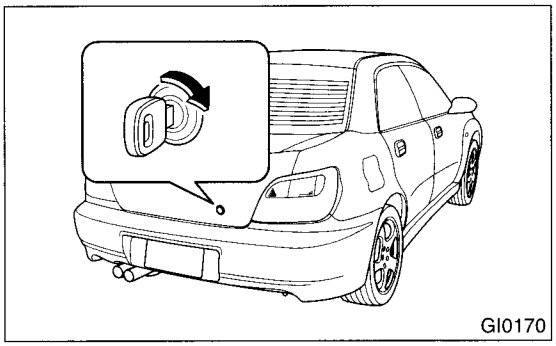


5. POWER WINDOW OPERATION CHECK

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

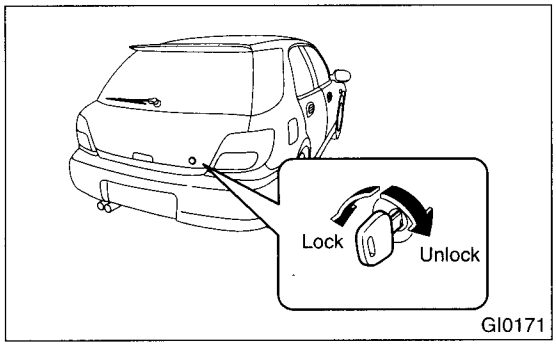
6. CHECK THE TRUNK LID OPERATIONS, OPEN/CLOSE, AS FOLLOWS.

- Operate the trunk lock release lever and verify that the trunk lid opens.
- Using the key, open the trunk lid several times to check for normal operation.
- Open and close the trunk lid several times for smooth movement.



7. CHECK THE REAR GATE OPERATIONS, LOCK/UNLOCK AND OPEN/CLOSE, AS FOLLOWS.

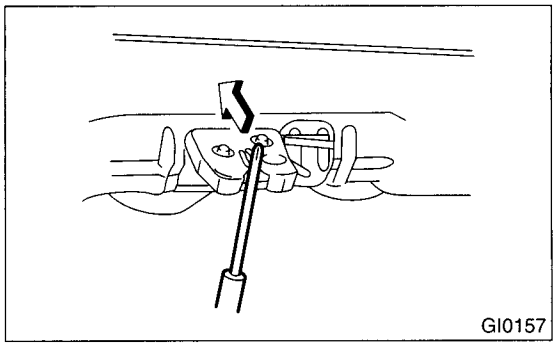
- Using the key, lock and unlock the rear gate several times to check for normal opeartion.
- Open and close the rear gate several times for smooth movement.

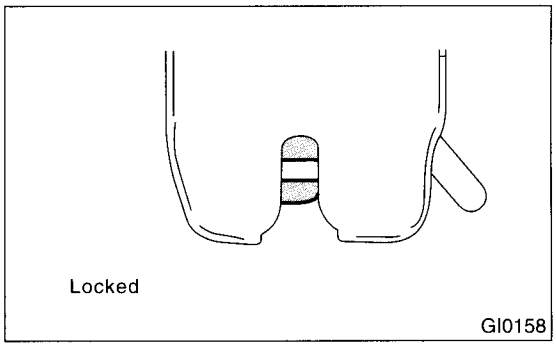


- Operate the power door locking switch to check that the rear gate is locked and unlocked normally.

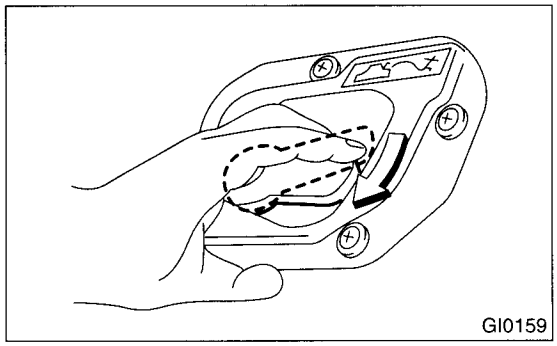
8. OPERATION CHECK OF TRUNK LID RELEASE HANDLE

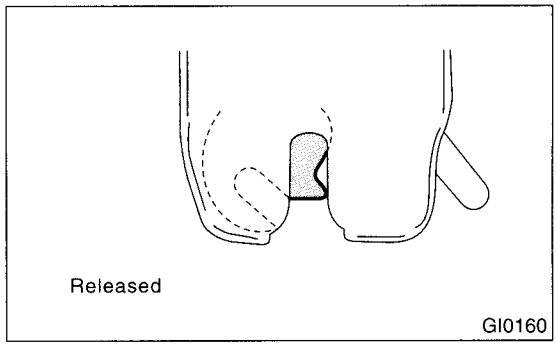
1) Use a screwdriver with a thin blade. Slide the screwdriver blade from the slit aperture of the lock assembly fully to the end until you hear a click. This places the latch in the locked position.





2) Move the release handle from outside the vehicle, in the direction of the arrow to check if the latch is released.





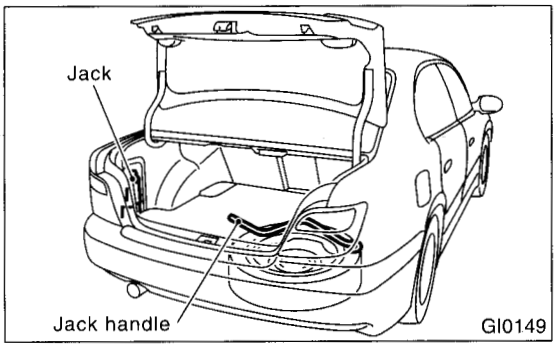
9. OPERATION CHECK OF FUEL LID OPENER LOCK RELEASE LEVER

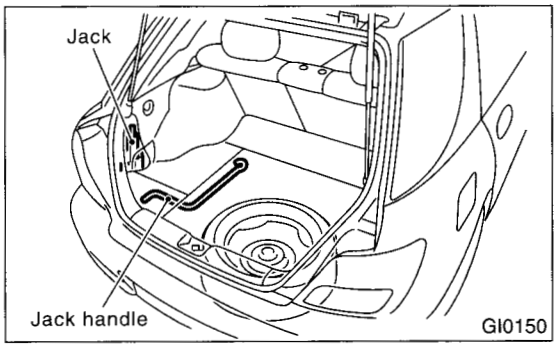
Operate the fuel lid opener and verify that the fuel lid opens normally. Check that the filler cap is securely closed.

10.ACCESSORY CHECK

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

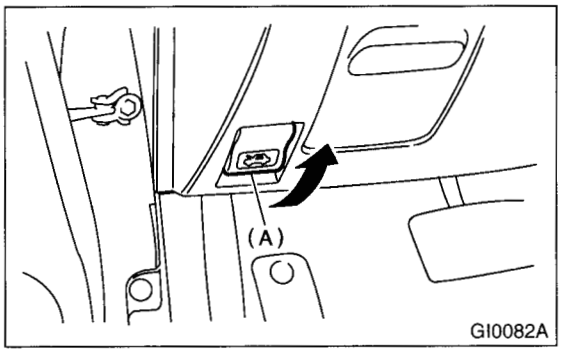
- Owner's manual
- Warranty booklet
- Service booklet
- Spare key
- Jack
- Tool set
- Spare tire

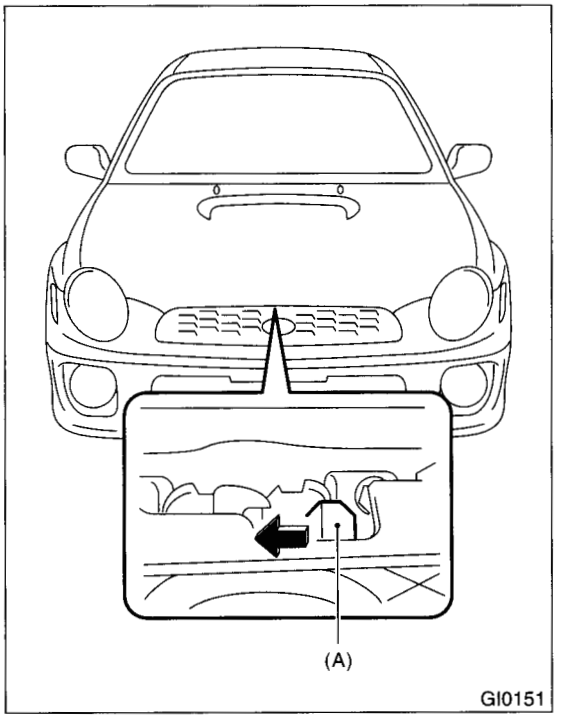




11.OPERATION CHECK OF HOOD LOCK RELEASE SYSTEM

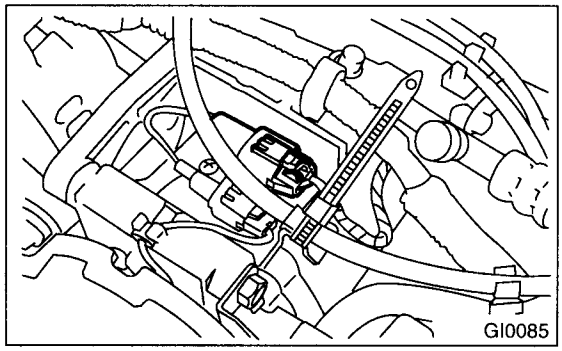
Unlatch and open the hood while checking that no abnormal conditions are found. Then, support the hood with the hood stay.





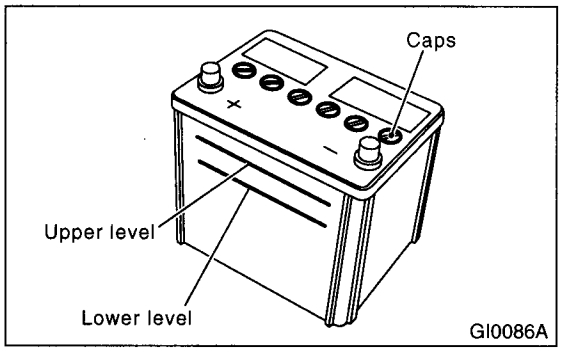
12.CONNECTION OF AIR CONDITIONER HARNESS

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



13.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.

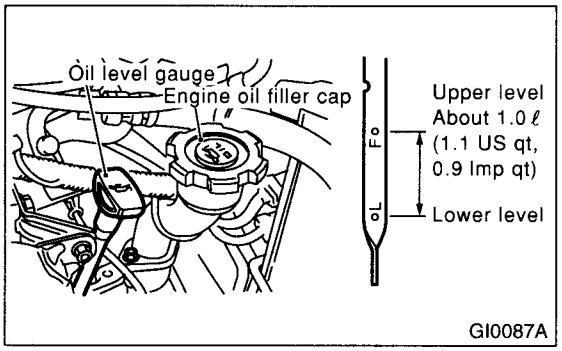


14.BRAKE FLUID

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.

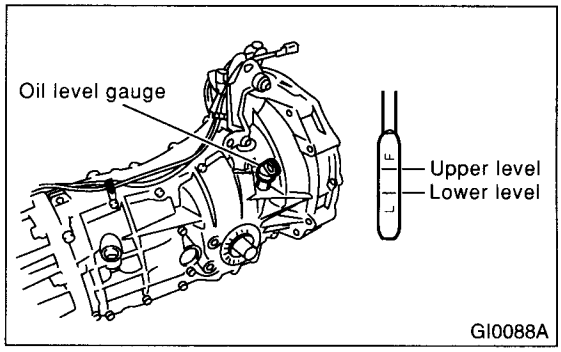
15.ENGINE OIL

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.



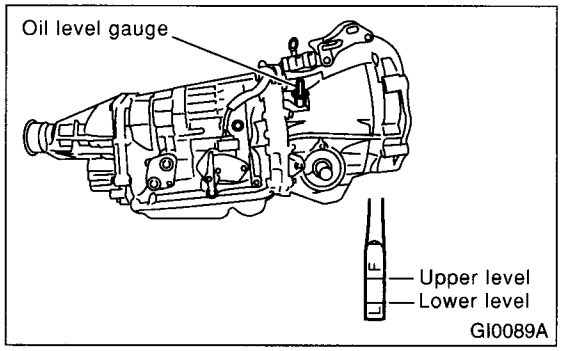
16.TRANSMISSION FLUID

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.



17.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.

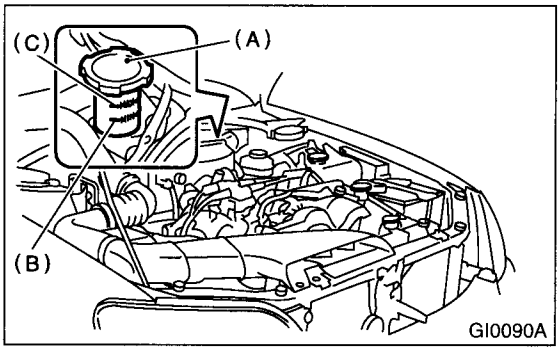


18.COOLANT

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.

19.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.



20.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.

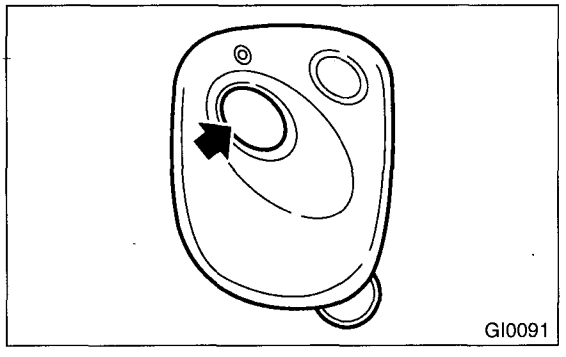
21.HOOD LATCH CHECK

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

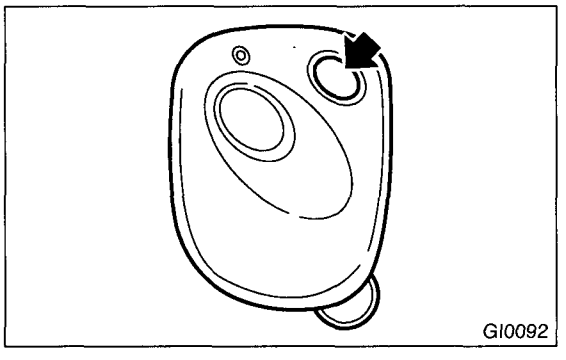
22.KEYLESS ENTRY SYSTEM

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 (wagon).
- Press the "LOCK/ARM" button on the transmitter momentarily once and check if all the doors are locked and the horn chirps once.


GI0091

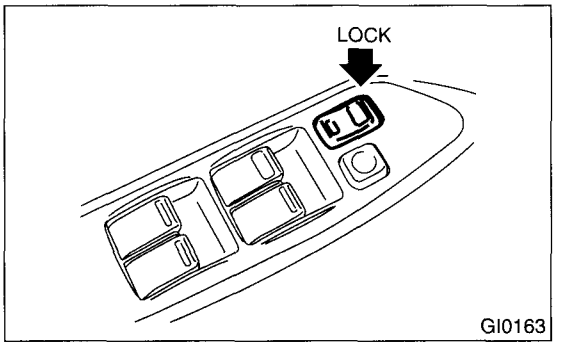
- Press the "UNLOCK/DISARM" button on the transmitter momentarily once and check if the driver's door is unlocked, the horn chirps twice and the dome light illuminates.


GI0092

- Press the "UNLOCK/DISARM" button on the transmitter momentarily once again within five seconds and check if all the doors including the rear gate on wagon are unlocked.
- Press the "LOCK/ARM" button on the transmitter a little bit of time (approx. 1.5 sec.) and check if a panicking condition occurs; the horn sounds continuously. Also, check if that condition lasts for 30 seconds or until any button of the transmitter is pressed.
- Press the "LOCK/ARM" button on the transmitter momentarily once with one of the doors including the rear gate (wagon) open and check if the horn chirps three times to warn of a door ajar.

Then, bring all the doors including the rear gate (wagon) in closed condition and check if all the doors are locked and the horn chirps once.

- Press the "LOCK" side of the power door locking switch with any one of the doors including the rear gate (wagon) open. Then, bring all the doors including the rear gate (wagon) in the closed condition and check if all the doors are locked and the horn chirps once.



GI0163

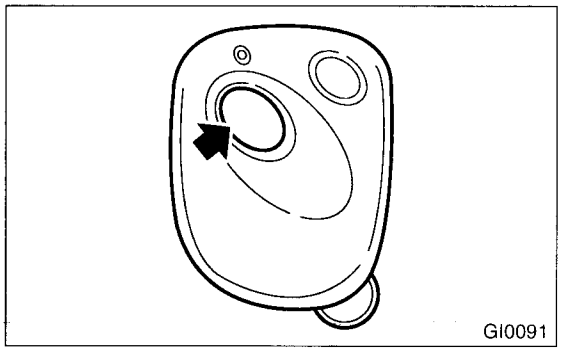
Check selecting audible signal operation.

- Using the horn, the system will give you an audible signal when the doors lock and unlock.

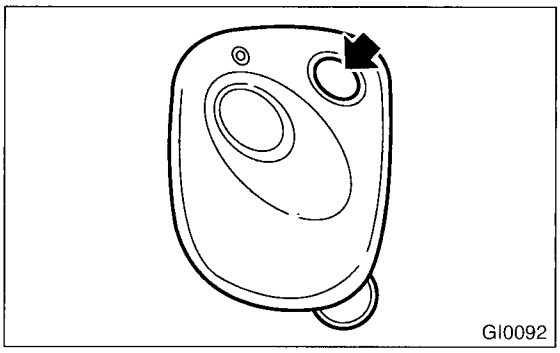
If desired, you may turn the audible signal off.
To turn the audible signal off, carry out the unlocking procedure of keyless entry system, then simultaneously depress LOCK/ARM and UNLOCK/DISARM buttons for more than two seconds.
The horn will sound two times to inform you that the audible signal has been turned off.
To turn the audible signal on, carry out the unlocking procedure of keyless entry system, then simultaneously depress LOCK/ARM and UNLOCK/DISARM buttons for more than two seconds.
The forn will sound one time to inform you that the audible signal has been turned on.

23.SECURITY SYSTEM

Check the security 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 (wagon).
- Press the "LOCK/ARM" button on the transmitter momentarily once and check if all the doors are locked, the horn chirps once, the parking lights flash once and the security indicator light flashes slowly to ensure that the security system has been brought into the arming state.

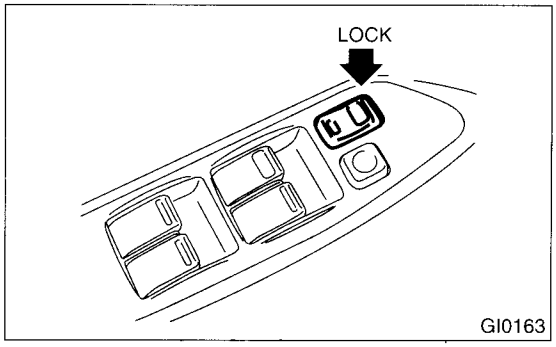

GI0091

- Press the "UNLOCK/DISARM" button on the transmitter momentarily once and check if the driver's door is unlocked, the horn chirps twice, the parking light flash twice, the dome light illuminates and the security indicator light goes off to ensure that the system has been brougt into the disarming state.


GI0092

- Press the "UNLOCK/DISARM" button on the transmitter momentarily once again within five seconds and check if all the doors including the rear gate on wagon are unlocked.
- Press the "LOCK/ARM" button on the transmitter a little bit of time (approx. 1.5 sec.) and check if a panicking condition occurs; the horn sounds continuously, the parking lights flash and the security indicator light flashes rapidly. Also, check if that condition lasts for 30 seconds or until any button of the transmitter is pressed.
- Press the "LOCK/ARM" button on the transmitter momentarily once with one of the doors including the rear gate (wagon) open and check if the horn chirps three times to warn of a door ajar.

Then, bring all the doors including the rear gate (wagon) in closed condition and check if the arming condition is brought about; all the doors are locked, the horn chirps once and the parking lights flash once.
- Press the "LOCK" side of the power door locking switch with any one of the doors including the rear gate (wagon) open. Then, bring all the doors including the rear gate (wagon) in the closed condition and check if all the doors are locked, the horn chirps once and the parking lights flash once to ensure that the security system has been brought into the arming state.



GI0163

- Unlock a door using the inner lock knob or the key and open the door while the security system is in the arming state. Check to ensure that the alarming condition occurs, i.e. the horn sounds continuously, the parking lights flash and security indicator light flashes rapidly, and that it lasts for 30 seconds or until the "UNLOCK/DISARM" button on the transmitter is pressed. Also, check to ensure that turning the ignition key to the "START" position in the arming state does not cause the starter motor to turn, thus the engine being prevented from starting.
- Apply a shock to the vehicle body with the security system in arming state, and check to ensure that the alarming condition occurs.
- Troubleshoot the security system if any one of the above-mentioned checks does not meet the requirements.

24.SEAT

Check that each seat provides full functionality in sliding and reclining. Check all available functions of the rear seat such as a trunk-through center arm rest.

25.SEAT BELT

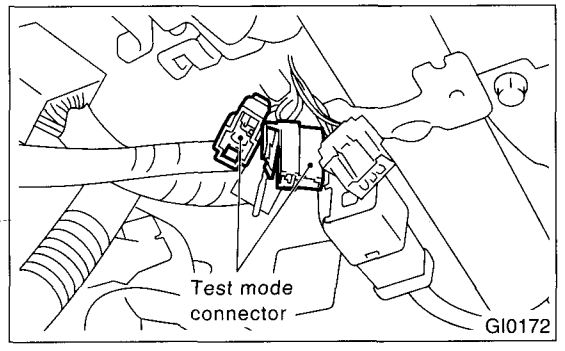
- Pull out the seat belt and then release it. Check that the belt webbing retracts smoothly.
- Check the seatbelt warning light and chime operations.

26.WHEEL ALIGNMENT

Check the wheel alignments. <Ref. to FS-8, Wheel Alignment.> and <Ref. to RS-9, Wheel Alignment, .>

27.READ MEMORY AND 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.



28.KEY WARNING SYSTEM

Check that the chime sounds when the driver's door opens and the key is in the "LOCK" or "ACC" position.

29.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.

30.EXHAUST SYSTEM

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

31.INDICATOR LIGHT

Check that all the indicator lights are off.

32.CLOCK

Check the clock for normal operations and enough accuracy.

33.RADIO

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

34.CIGARETTE LIGHTER

Check the cigarette lighter operations.

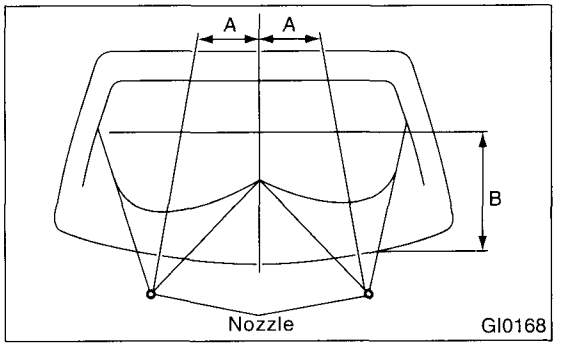
35.LIGHTING SYSTEM

- Check the headlight operations.
- Check the brake light operations.
- Check the other lights for normal operations.
- Check the daytime running light system operations.
- Check the illumination brightness control system operations.

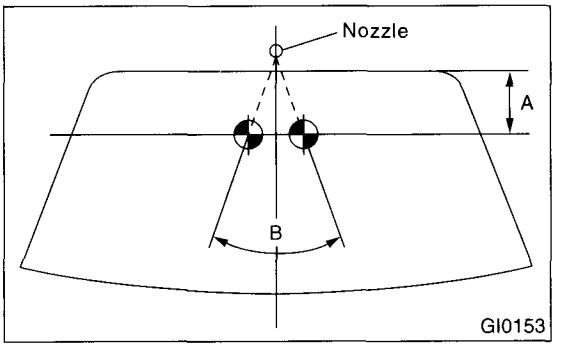
36.WINDOW WASHER

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

Front Injection position:
A: 257mm (10.12 in)
B: 512mm (20.16 in)



Rear Injection position:
A: 39 mm (2.36 in)
B: 72°



37.WIPER

Check the front and rear wipers for normal operations.

38.BRAKE TEST

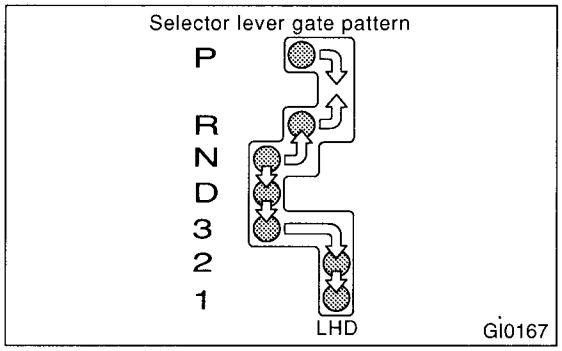
Check the foot brake for normal operations.

39.PARKING BRAKE

Check the parking brake for normal operations.

40.AT SHIFT CONTROL

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



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

- Check the shift lock system operations.
- Check the key interlock system operations.

41.HEATER & VENTILATION

Operate the heater and ventilation system to check for normal airflow and heating capacity.

42.AIR CONDITIONER

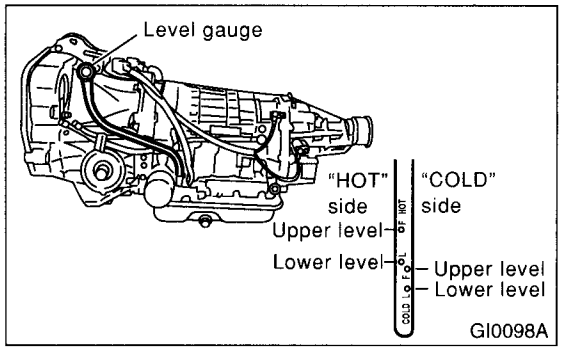
Operate the air conditioner. Check that the A/C compressor operates normally and enough cooling is provided.

43.CRUISE CONTROL

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

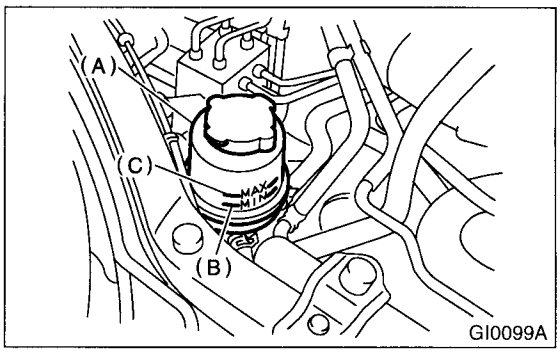
44.ATF LEVEL

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



45.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.



46.FLUID LEAK CHECK

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

47.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 of the windows completely, and then close all of the doors tightly. Close the hood and trunk lid 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 to 25 liters (5.3 to 6.6 US gal, 4.4 to 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 compartments is discovered after the water has been applied, carefully check all areas that may have possibly contributed to the leak.

48.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

		MAINTENANCE INTERVAL [Number of months or km (miles), whichever occurs first]																	
	Months	3	7.5	15	22.5	**30**	37.5	45	52.5	**60**	67.5	75	82.5	**90**	97.5	105	112.5	**120**	Remarks
	× 1,000 km	4.8	12	24	36	**48**	60	72	81.4	**96**	108	120	132	**144**	156	168	180	**192**	
	× 1,000 miles	3	7.5	15	22.5	**30**	37.5	45	52.5	**60**	67.5	75	82.5	**90**	97.5	105	112.5	**120**	
1	Engine oil	R	R	R	R	**R**	R	R	R	**R**	R	R	R	**R**	R	R	R	**R**	
2	Engine oil filter	R	R	R	R	**R**	R	R	R	**R**	R	R	R	**R**	R	R	R	**R**	
3	Spark plugs					**R**				**R**				**R**				**R**	For 2.5 L
										R								**R**	For Turbo
4	Drive belt(s)					**I**				**I**				**I**		R			
5	Camshaft Drive belt					**I**				**I**				**I**		R			
6	Fuel line					**(I)**				**(I)**				**(I)**				**I**	Note (1)
7	Fuel filter					**(R)**				**(R)**				**(R)**				**R**	Note (1)
8	Air cleaner element					**R**				**R**				**R**				**R**	Note (2)
9	Cooling system					**I**				**I**				**I**				**I**	
10	Coolant					**R**				**R**				**R**				**R**	
11	Clutch system			I		**I**		I		**I**		I		**I**		I		**I**	
12	Transmission oil					**I**				**I**				**I**				**I**	
13	ATF					**I**				**I**				**I**				**I**	Note (3)
14	Front & rear differential oil					**I**				**I**				**I**				**I**	
15	Brake line			I		**I**		I		**I**		I		**I**		I		**I**	
16	Brake fluid					**R**				**R**				**R**				**R**	
17	Disc brake pads & discs					**I**				**I**				**I**				**I**	
18	Brake linings and drums					**I**				**I**				**I**				**I**	
19	Parking brake			I		**I**		I		**I**		I		**I**		I		**I**	
20	Suspension			I		**I**		I		**I**		I		**I**		I		**I**	
21	Wheel bearing					**I**				**I**								**(I)**	
22	Axle boots & joints			I		**I**		I		**I**		I		**I**		I		**I**	
23	Tire rotation		I	I	I	**I**	I	I	I	**I**	I	I	I	**I**	I	I	I	**I**	Note (4)
24	Steering system (Power steering)			I		**I**		I		**I**		I		**I**		I		**I**	
25	Supplement restraint system	Inspect every 10 years																	

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

NOTE:
(1) This inspection is not required to maintain emission warranty eligibility and it dose not affect the manufacturer's obligations under EPA's in-use compliance program.
(2) When the vehicle is used in extremely dusty conditions, the air cleaner element should be replaced more often.
(3) ATF filter is maintenance free part. ATF filter needs replacement, when it has physically damaged or ATF leaked.
(4) A tire should be replaced when the tread wear indicator appears as a solid band across the tread. The indicators appear when the remaining tread has been worn to 1.6 mm (0.063 in) or less.

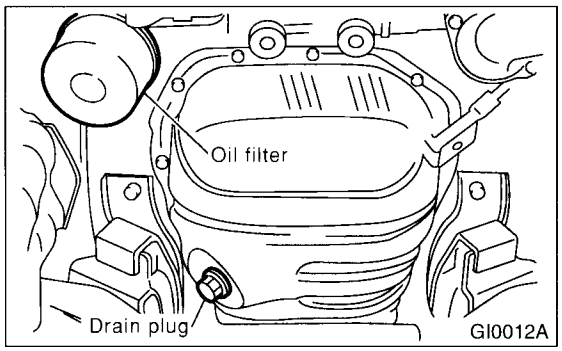
B: MAINTENANCE SCHEDULE 2

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	3.75 months	R		R			R
	6,000 km						
	3,750 miles						
Engine oil filter	3.75 months	R		R			R
	6,000 km						
	3,750 miles						
Fuel filter	15 months				I		
	24,000 km						
	15,000 miles						
Fuel line	15 months				I		
	24,000 km						
	15,000 miles						
Transmission oil	15 months						R
	24,000 km						
	15,000 miles						
ATF	15 months						R
	24,000 km						
	15,000 miles						
Front & rear differential oil	15 months						R
	24,000 km						
	15,000 miles						
Brake line	15 months	I	I		I		I
	24,000 km						
	15,000 miles						
Brake fluid	15 months					R	
	24,000 km						
	15,000 miles						
Disc brake pads & discs	15 months	I	I		I		I
	24,000 km						
	15,000 miles						
Brake linings and drums	15 months	I	I		I		I
	24,000 km						
	15,000 miles						
Parking brake	15 months	I	I		I		I
	24,000 km						
	15,000 miles						
Suspension	7.5 months		I	I	I		I
	12,000 km						
	7,500 miles						
Axle boots & joints	7.5 months	I	I	I	I		I
	12,000 km						
	7,500 miles						
Steering system (Power steering)	7.5 months	I	I	I	I		I
	12,000 km						
	7,500 miles						

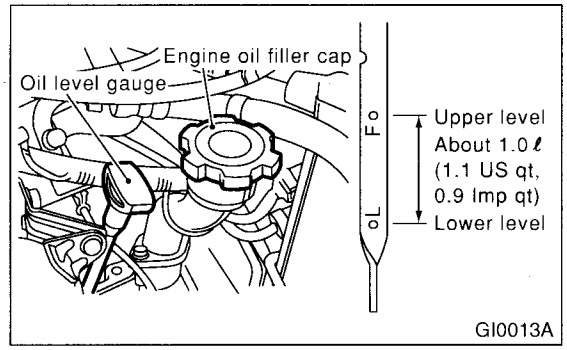
3. Engine Oil

A: REPLACEMENT

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

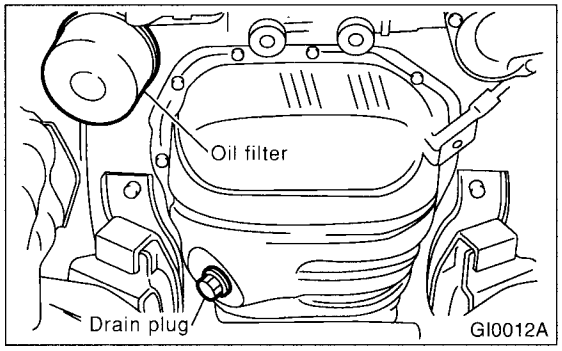


2) Open the engine oil filler cap for quick draining of the engine oil.



3) Replace the drain plug gasket.
4) Tighten the engine oil drain plug after draining engine oil.

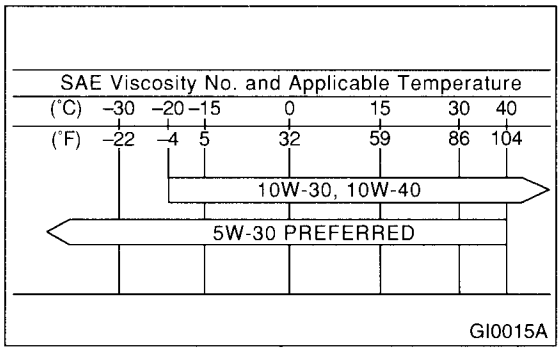
Tightening torque:
44 N·m (4.5 kgf-m, 33 ft-lb)



5) Fill the engine oil through filler pipe up to the upper point on level gauge. 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.

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)

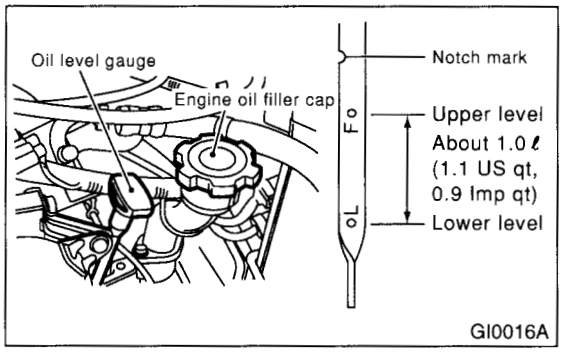


The proper viscosity helps vehicle get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

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: SJ or SH
SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50

6) Close the engine oil filler cap.
7) Start the engine and warm it up for a time.

8) After the engine stops, recheck the oil level. If necessary, add the engine oil up to the upper level on level gauge.



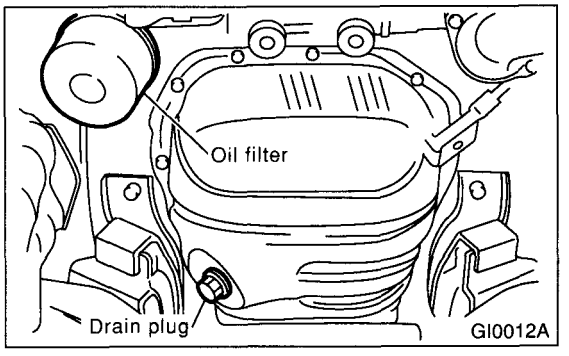
B: INSPECTION

1) Park 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.
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, the 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 the oil above the "F" line when the engine is cold.

4. Engine Oil Filter

A: REPLACEMENT

1) Remove the oil filter with ST.
ST 498547000 OIL FILTER WRENCH



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

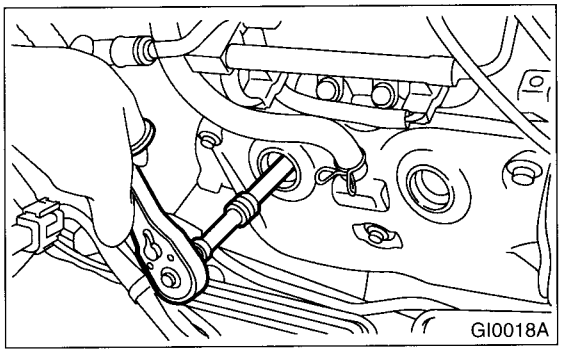
NOTE:
The filter element and filter case are permanently joined; therefore, interior cleaning is not necessary.

6) 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 :
Non-Turbo model
CHAMPION RC10YC4 (Standard)
NGK BKR5E-11
NGK BKR6E-11
Spark plug gap
1.0 — 1.1 mm (0.039 — 0.043 in)
Turbo model
NGK PFR6G
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)

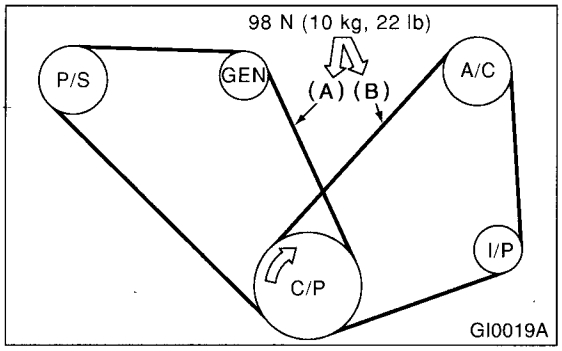
NOTE:
• Be sure to place the gasket between the cylinder head and spark plug.
• If the torque wrench is not available, tighten spark plug until gasket contacts cylinder head; then tighten further 1/4 to 1/2 turns.

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 generator installing position and/or idler pulley installing position.

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)
*: There is no belt (B) on models without an air conditioner.

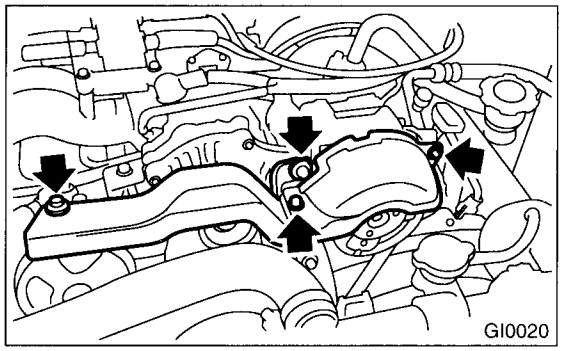


C/P	Crankshaft pulley
GEN	Generator
P/S	Power steering oil pump pulley
A/C	Air conditioning compressor pulley
I/P	Idler pulley

B: REPLACEMENT

1. V-BELT COVER

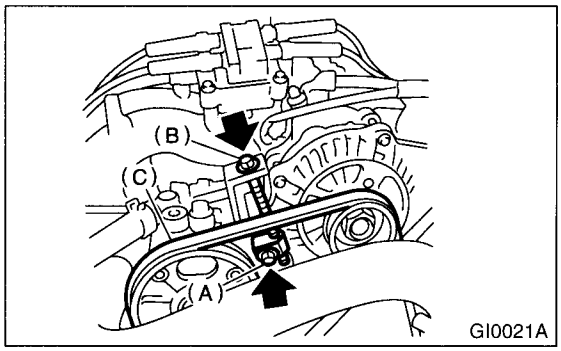
1) Remove the V-belt cover.



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 slider bolt (B).
6) Tighten the lock bolt (A).

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

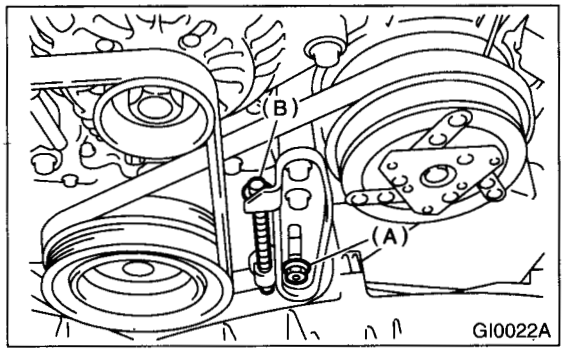


3. REAR SIDE BELT (DRIVING AIR CONDITIONER)

NOTE:
- Wipe off any oil or water on the belt and pulley.
- Before removing the rear side belt, remove the front side belt.

1) Loosen the lock nut (A).
2) Loosen the slider bolt (B).
3) Remove the rear side belt.
4) Install a new belt, and tighten the slider bolt so as to obtain the specified belt tension.
5) Tighten the slider bolt (B).
6) Tighten the lock nut (A).

Tightening torque:
22.6 N·m (2.3 kgf-m, 16.6 ft-lb)

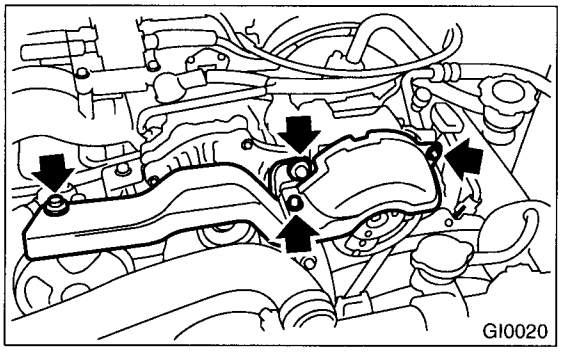


7. Camshaft Drive Belt

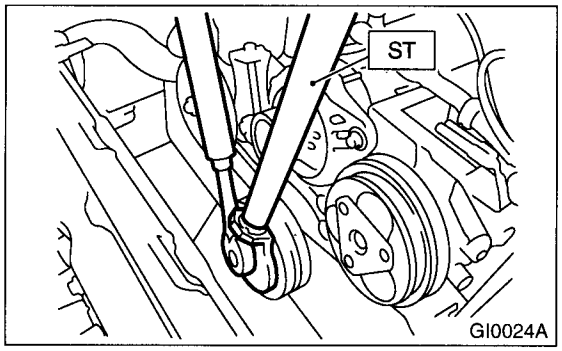
A: REPLACEMENT

1. SOHC MODEL

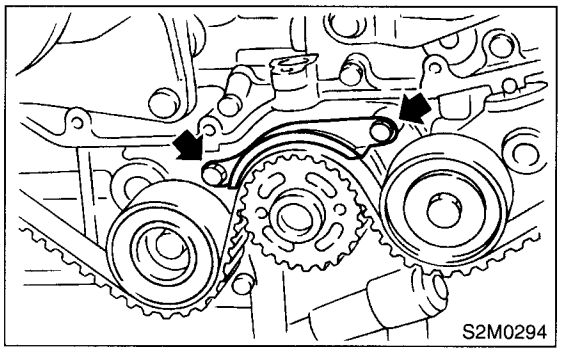
1) Remove the radiator fan <Ref. to CO-9, Radiator Main Fan System.> and air conditioner fan. <Ref. to CO-17, Radiator Sub Fan System.>
2) Remove the V-belt cover.



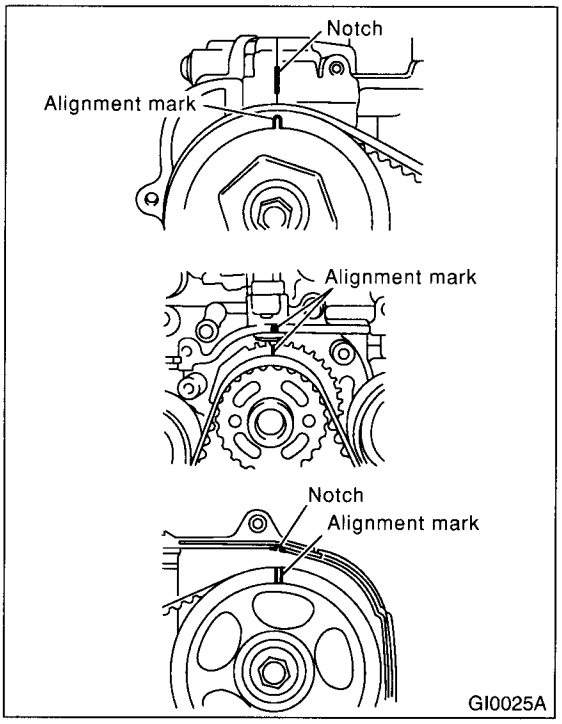
3) Remove the V-belts. <Ref. to ME(SOHC)-43, V-belt.>
4) Remove the air conditioning compressor drive belt tensioner.
5) Remove the pulley bolt. To lock crankshaft use ST.
ST 499977100 CRANKSHAFT PULLEY WRENCH



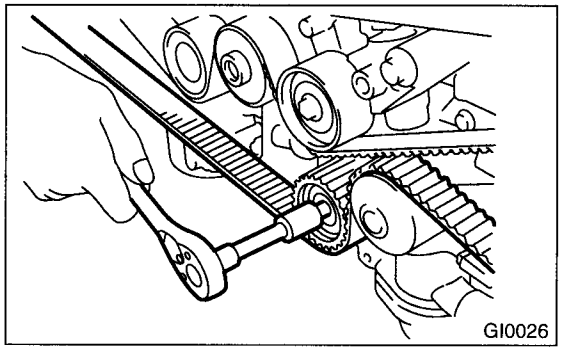
6) Remove the crankshaft pulley.
7) Remove the left side belt cover.
8) Remove the front belt cover.
9) Remove the timing belt guide. (MT vehicle only)



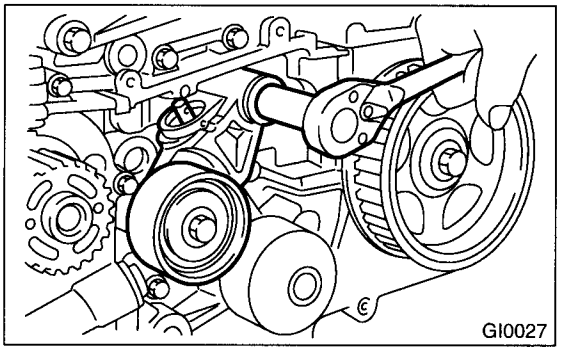
10) Turn the crankshaft and align alignment marks on crankshaft, and left and right camshaft sprockets with notches of belt cover and cylinder block:
ST 499987500 CRANKSHAFT SOCKET



11) Remove the belt idler.
12) Remove the belt idler (No. 2).

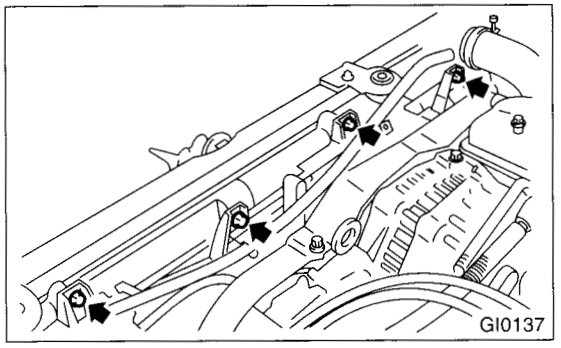


13) Remove the timing belt.
14) Remove the automatic belt tension adjuster assembly.



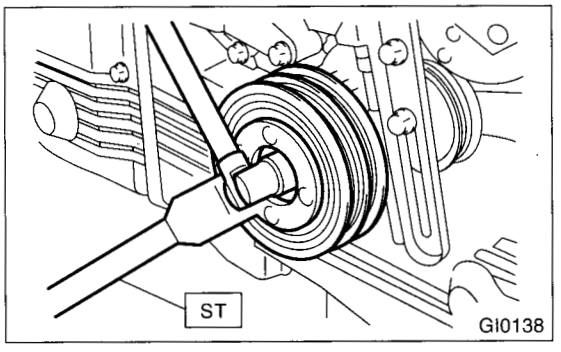
2. DOHC MODEL

1) Remove the radiator fan and air conditioner fan.



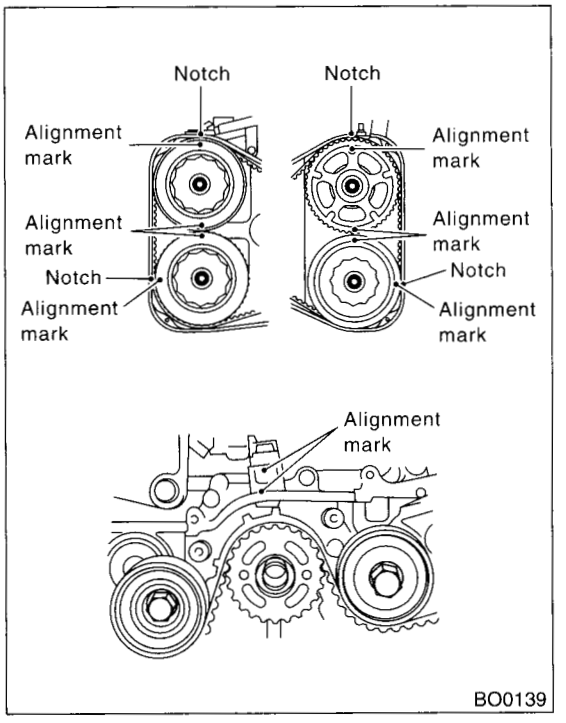
2) Remove the V-belts. <Ref. to ME(DOHC TURBO)-44, V-belt.>
3) Remove the air conditioning compressor drive belt tensioner.
4) Remove the pulley bolt. To lock crankshaft use ST.

ST 499977300 CRANKSHAFT PULLEY WRENCH

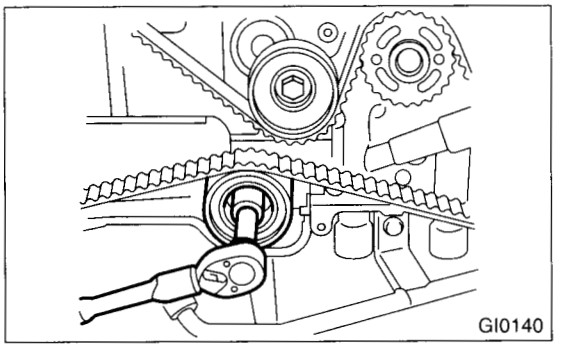


5) Remove the crankshaft pulley.
6) Remove the air conditioning compressor drive belt tensioner.
7) Remove the left side belt cover.
8) Remove the right side belt cover.
9) Remove the front belt cover.
10) Turn the crankshaft and align alignment marks on crankshaft, and left and right camshaft sprockets with notches of belt cover and cylinder block. To turn crankshaft, use ST:

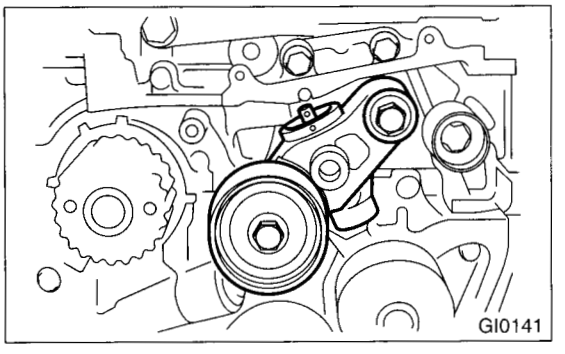
ST 499987500CRANKSHAFT SOCKET



11) Remove the belt idler.



12) Remove the timing belt.
13) Remove the automatic belt tension adjuster assembly.



B: INSTALLATION

1. SOHC MODEL

To install, reverse order of removal procedures. <Ref. to ME(SOHC)-47, Timing Belt Assembly.>

2. DOHC MODEL

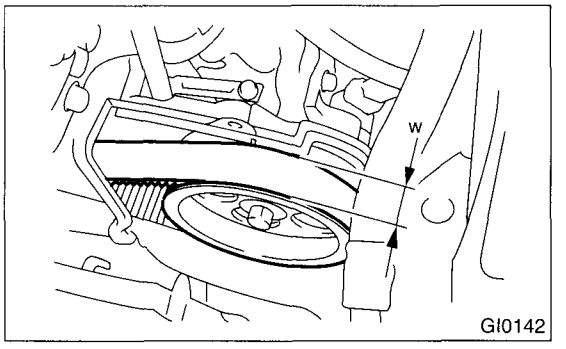
To install, reverse order of removal procedures. <Ref. to ME(DOHC TURBO)-48, Timing Belt Assembly.>

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.

C: INSPECTION

1. SOHC MODEL

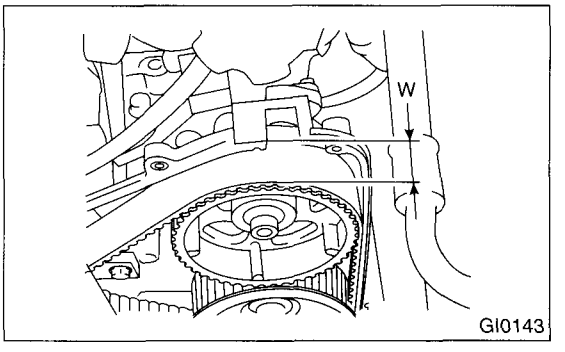
1) Remove the left and right timing belt covers.
2) While cranking engine at least four rotations, check the timing belt back surface for cracks or damage. Replace the faulty timing belt as needed.
3) Measure the timing belt width W. If it is less than 27 mm (1.06 in), check the idlers, tensioner, water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



4) Install the left and right timing belt covers.

2. DOHC MODEL

1) Remove the left and right timing belt covers.
2) While cranking 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 the idlers, tensioner, water pump pulley and cam sprocket to determine idler alignment (squareness). Replace the worn timing belt.
4) Install the left and right timing belt covers.



8. Fuel Line

A: INSPECTION

The fuel line is located mostly internally, so check the pipes, areas near pipes, and engine compartment piping for rust, hose damage, loose bands, etc. If the faulty parts are found, repair or replace them. <Ref. to FU(SOHC)-68, Fuel Delivery, Return and Evaporation Lines.> or <Ref. to FU(DOHC TURBO)-68, Fuel Delivery, Return and Evaporation Lines.>

9. Fuel Filter

A: REPLACEMENT

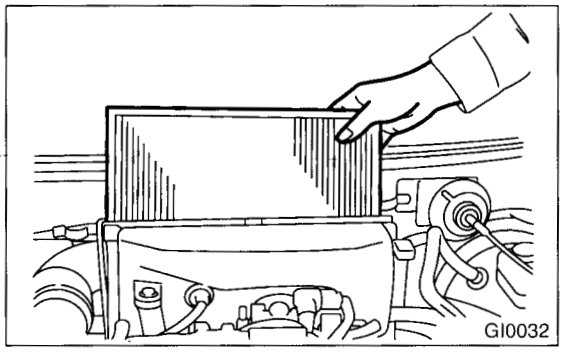
For fuel filter replacement procedures, refer to "FU" section.
<Ref. to FU(SOHC)-65, Fuel Filter.> or <Ref. to FU(DOHC TURBO)-65, Fuel Filter.>

10. Air Cleaner Element

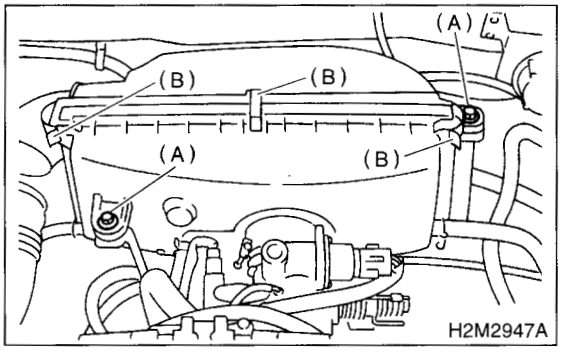
A: REPLACEMENT

NOTE:
Do not attempt to clean the air cleaner element. The filter paper of the element is wetted with a special non-inflammable slow-evaporating viscous liquid. It is resistant to cold weather and has a long service life. Dirt adhering to this filter paper forms porous laminations with the viscous liquid, which function as a filtration layer to reduce dust penetration into the filter paper. If this filter paper is cleaned, the filtration layer thus formed will be lost along with the viscous liquid.

1. NON-TURBO MODEL



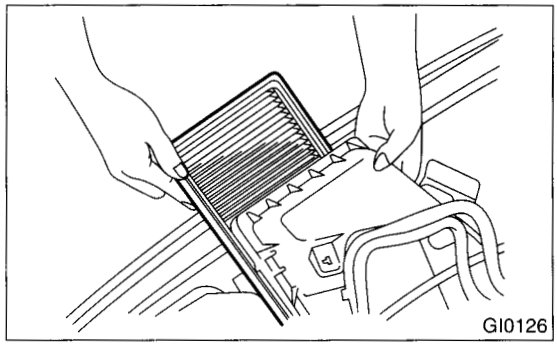
1) Remove the bolt (A) which install air cleaner case to stays.
2) Remove the clip (B) above the air cleaner case.



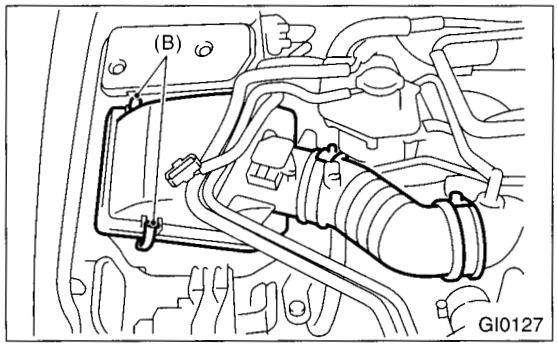
3) Remove the air cleaner.
4) Install in the reverse order of removal.

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

2. TURBO MODEL

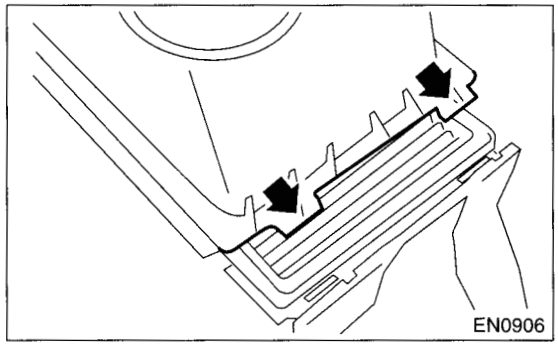


1) Remove the clip (B) above the air cleaner case.



2) Remove the air cleaner.
3) Install in the reverse order of removal.

CAUTION:
Before installing air cleaner upper cover, align holes with protruding portion of air cleaner lower case, then secure upper cover to lower case.



11.Cooling System

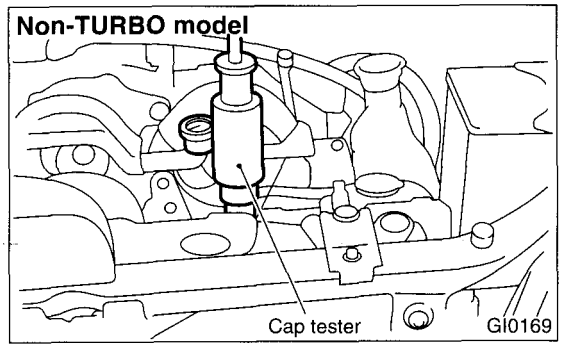
A: INSPECTION

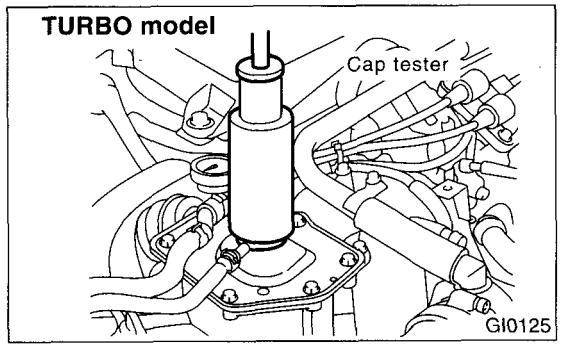
1) Check the radiator for leakage, filling it with coolant and attach radiator cap tester to the filler neck. Then apply a pressure of 157 kPa (1.6 kg/cm^2 , 23 psi) and check the following points:

- 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.





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

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

NOTE:

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

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

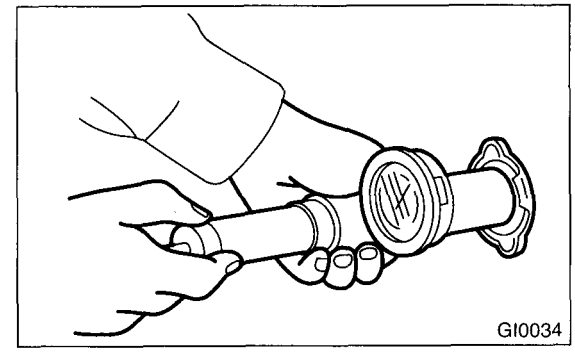
Radiator cap valve open pressure

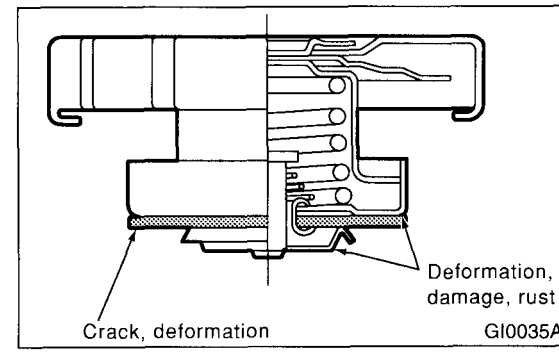
Standard value:

93 — 123 kPa (0.95 — 1.25 kg/cm^2, 14 — 18 psi)

Service limit:

83 kPa (0.85 kg/cm^2 , 12 psi)





3) If the coolant temperature exceeds 76.0 to 80.0°C (169 to 176°F) while radiator is not so hot, check thermostat. If thermostat does not open at 76.0 to 80.0°C (169 to 176°F), replace it with a new one.

4) If electric fan does not operate when coolant temperature exceeds 90 to 94°C (194 to 201°F), check thermoswitch or fan motor.

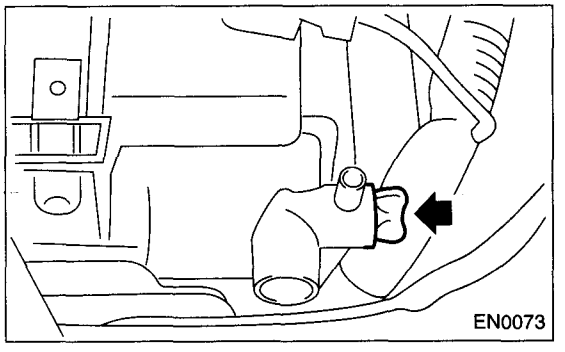
12.Coolant

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 plug to drain engine coolant into the container.



5) For quick draining, open the radiator cap.

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

6) Drain the coolant from reservoir tank.
7) Tighten the radiator drain screw securely after draining coolant.
8) Slowly pour the prepared coolant from radiator filler port to neck of filler, then pour into the reservoir tank up to "FULL" level.

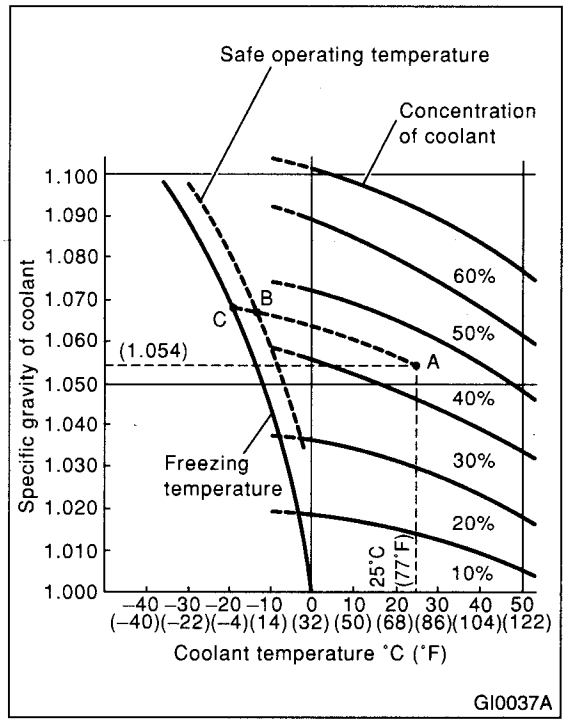
Coolant capacity (fill up to "FULL" level)
Non-turbo AT model:
Approx. 6.9 ℓ (7.3 US qt, 6.1 Imp qt)
Non-turbo MT model:
Approx. 7.0 ℓ (7.4 US qt, 6.2 Imp qt)
Turbo AT model:
Approx. 7.6 ℓ (8.0 US qt, 6.7 Imp qt)
Turbo MT model:
Approx. 7.7 ℓ (8.1 US qt, 6.8 Imp qt)

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.

9) Securely install the radiator cap.
10) Run engine for more than five minutes at 2,000 to 3,000 rpm. (Run engine until radiator becomes hot in order to purge air trapped in cooling system.)
11) 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.
12) After adding coolant, securely the install radiator and reservoir tank caps.

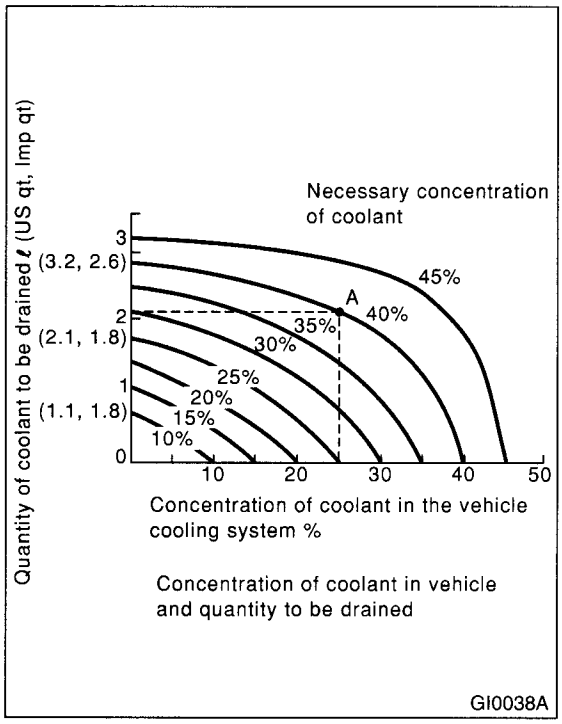
2. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

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).



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 liters (2.2 US qt, 1.8 Imp qt). Drain 2.1 liters (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 liters (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.



13.Idle Mixture

A: INSPECTION AND ADJUSTMENT

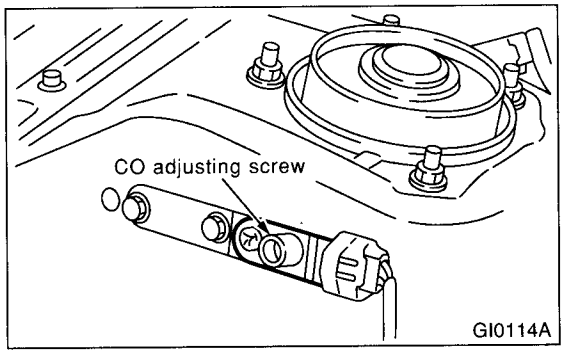
1. IDLE MIXTURE

Before measuring the idle mixture, make sure that the ignition timing and the engine idle speed are within specifications.
1) Set the gear position at "Neutral" for MT, or "N" or "P" for AT.
2) Warm up the engine sufficiently until cooling fan starts to operate.
3) Measure the idle mixture with the CO meter.

Engine idle speed	CO
700±100 rpm	1.0±0.5%

4) If out of specification, adjust the idle mixture using CO adjusting screw of mass air flow sensor.
5) After adjusting the CO value, check and adjust the increment coefficient of CO resistor by using Select Monitor.
   (1) Select the "Current data display & Save" on the select monitor.
   (2) If out of specified data, adjust the increment coefficient of CO resistor while rotating CO adjusting screw.

Specified data:
0.28 — 4.22 V

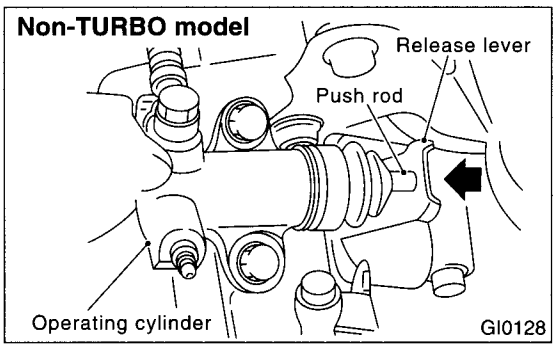


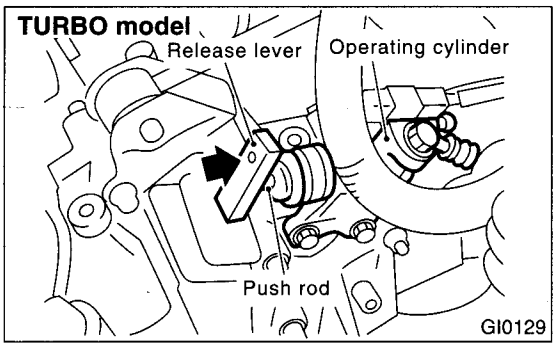
NOTE:
If driving the vehicle on out of specified data, the "trouble code 49" is indicated in many case.

14.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.

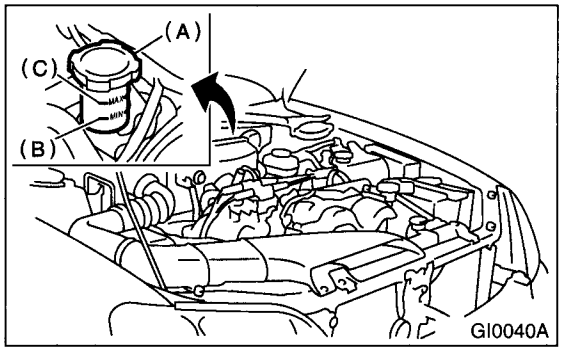




2) If the fluid level rises, pedal free play is correct.
3) If the fluid level does not rise, or the push rod cannot be retracted, adjust the clutch pedal. <Ref. to CL-26, Clutch Pedal.>
4) Inspect the underside of master cylinder, clutch damper and operating cylinder for clutch system, hoses, piping and their couplings for fluid leaks.
If the fluid leaks are found, correct them by retightening their fitting bolt and/or replacing their parts.
5) Check the fluid level using the scale on the outside of the clutch master cylinder tank (A). If the level is below "MIN" (B), add clutch fluid to bring it up to "MAX" (C).

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

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.



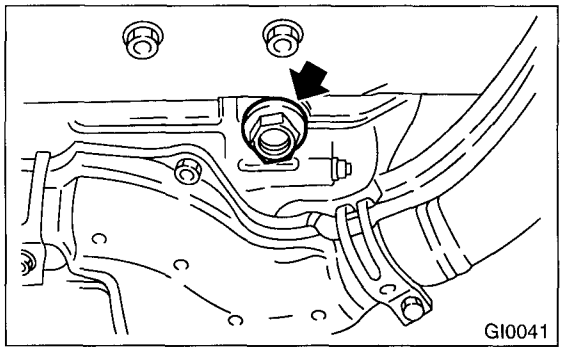
15.Transmission Oil

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.



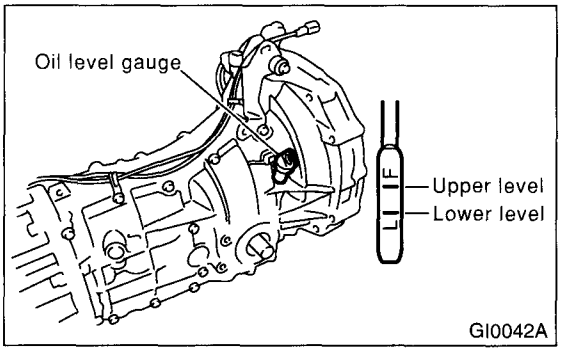
2) Reinstall the drain plug after draining gear oil and tighten it to the specified torque.

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

NOTE:
- Be sure to place a gasket between the transmission case and drain plug.
- Replace the gasket with a new one.
- Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.

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

Gear oil capacity:
3.5 ℓ (3.7 US qt, 3.1 Imp qt)



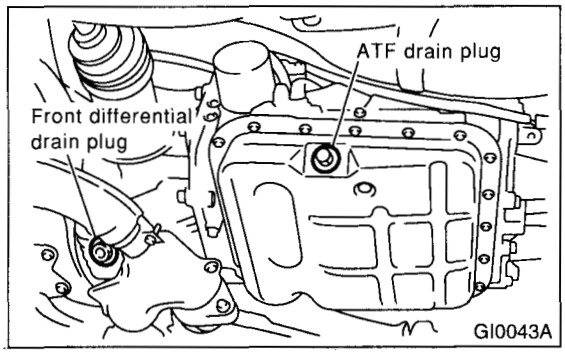
16.ATF

A: REPLACEMENT

1. AUTOMATIC TRANSMISSION FLUID

1) Drain 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.



2) Reinstall the drain plug after draining ATF, and tighten it to the specified torque.

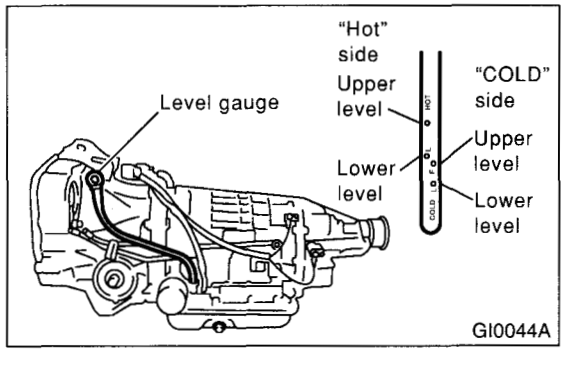
Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)

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) Run the vehicle until the ATF temperature rises to 60 to 80°C (140 to 176°F) and check the ATF level.



2. ATF FILTER

NOTE:
ATF filter is 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-44, ATF Filter.>

17.Front & Rear Differential Oil

A: REPLACEMENT

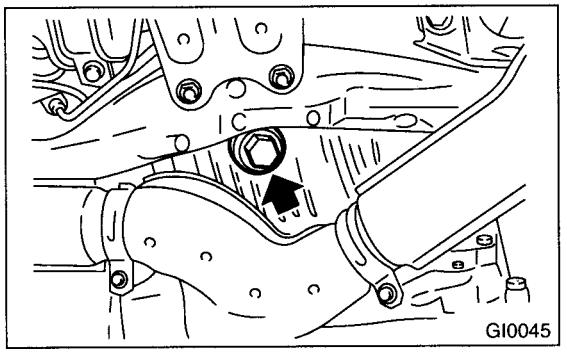
1. FRONT DIFFERENTIAL (MANUAL TRANSMISSION)

For M/T 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.



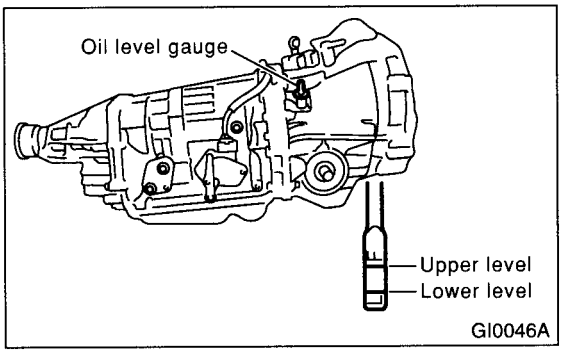
2) Reinstall drain plug after draining differential gear oil and tighten it to the specified torque.

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

NOTE:
- Be sure to place a gasket between the transmission case and drain plug.
- Replace the gasket with a new one.
- Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.

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

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



3. REAR DIFFERENTIAL

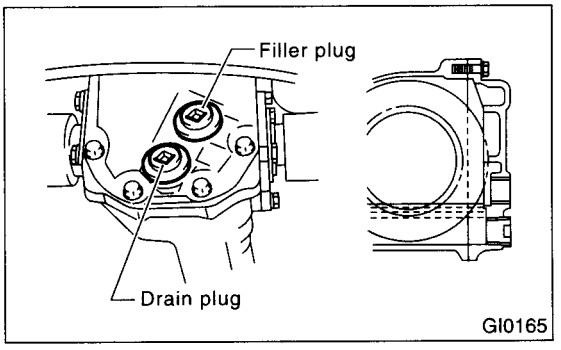
1) Drain the oil by removing drain plug.
2) Remove the filler plug for quick draining oil.
3) Reinstall the drain plug after draining oil.

NOTE:
- Apply the fluid packing to drain plug threads before installation in Except Non-TURBO AT model.

Fluid packing:
Three Bond 1105

Tightening torque:
49.0 N·m (5.0 kgf-m, 36.2 ft-lb)

4) After installing drain plug onto rear differential gear case firmly, fill oil up fully to the mouth of filler 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 the fluid packing to filler plug before installation.

Fluid packing:
Three Bond 1105

Tightening torque:
49.0 N·m (5.0 kgf-m, 36.2 ft-lb)

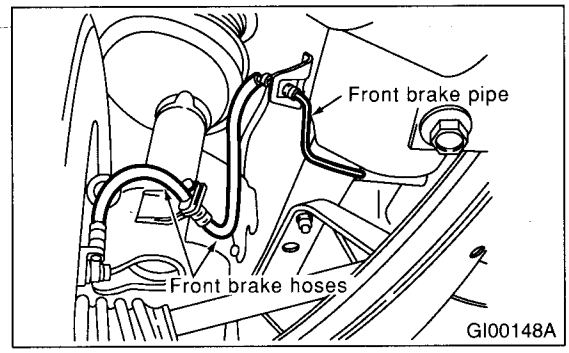
18.Brake Line

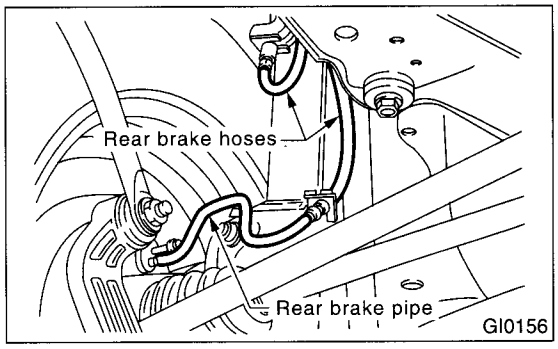
A: INSPECTION

1. BRAKE LINE

1) Check the scratches, swelling, corrosion and/or traces of fluid leakage on 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 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 brake hose (using a mirror where it is difficult to see) for any damage.



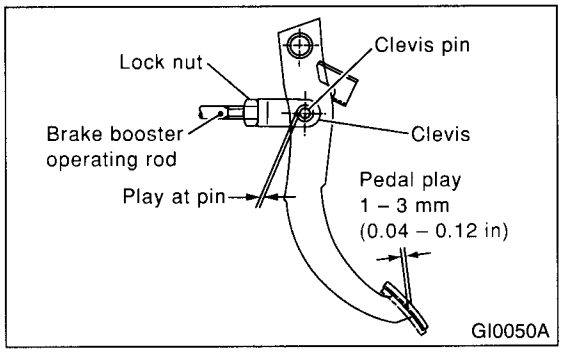


B: CHECKING

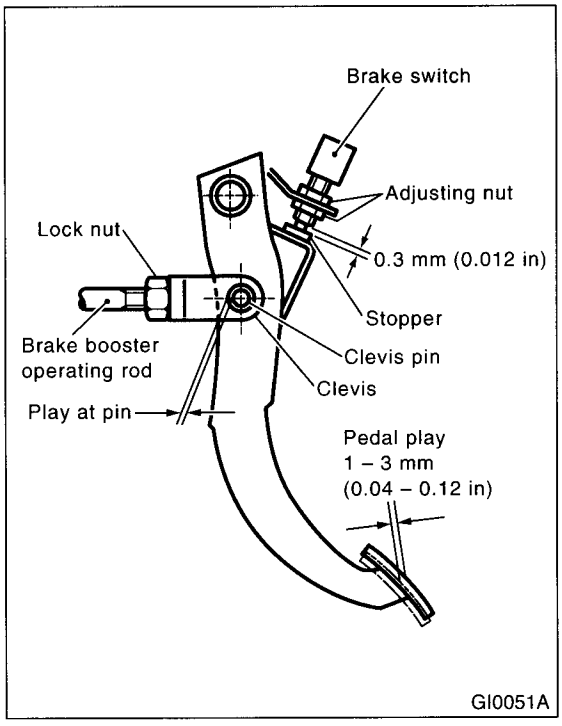
1. SERVICE BRAKE

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

Brake pedal free play:
1 — 3 mm (0.04 — 0.12 in)

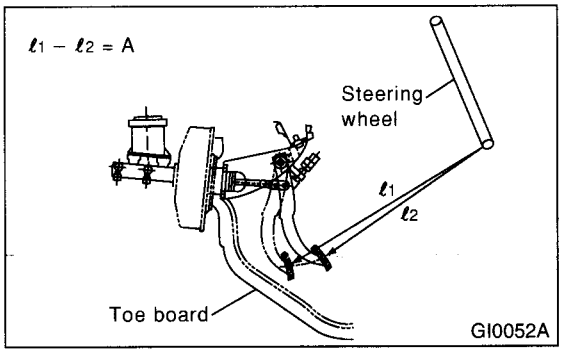


2) If the free play is out of specifications above, adjust the brake pedal as follows:
(1) Be sure the engine is off. (No vacuum is applied to brake booster.)
(2) There should be play between brake booster clevis and pin at brake pedal installing portion.
[Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lb) to a stroke of 1 to 3 mm (0.04 to 0.12 in).]
(3) Depress the surface of brake pad by hand.
(4) If there is no free play between clevis pin and clevis, turn brake switch adjusting nut until the clearance between stopper and screw of brake switch becomes 0.3 mm (0.012 in).



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 the brake pedal and steering wheel. With the brake pedal released, measure the distance between the pedal and steering wheel again. The difference between the two measurements must be less than 95 mm (3.74 in). If the distance is more than specified, there is a possibility air is in the inside of the hydraulic unit.

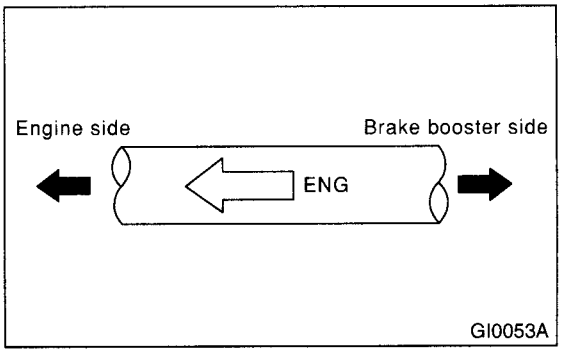
Brake pedal reserve distance: A
more than 95 mm (3.74 in)/ 490 N (50 kgf, 110 lb)



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 the valve is built into vacuum hose. Disconnect the vacuum hose to inspect function of check valve.
Blow air into vacuum hose from its brake booster side end: Air must flow out of engine side end of hose. Next blow air into hose from engine side: Air should not flow out of hose.
Replace the both check valve and vacuum hose if the check valve is faulty. Engine side of vacuum hose is indicated by marking "ENGINE" as shown.



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 the vacuum hose to make sure it is tight and secure.

19.Brake Fluid

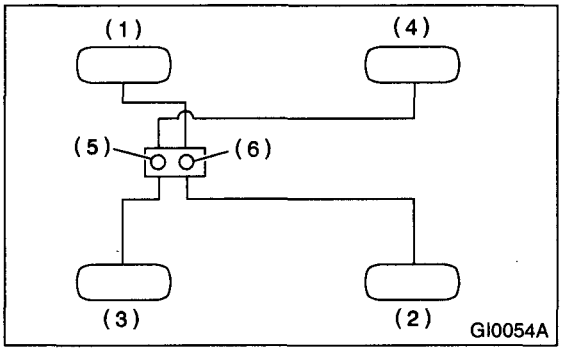
A: REPLACEMENT

1) Either jack up the vehicle and place a safety stand under it, or lift up the vehicle.
2) Remove the 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

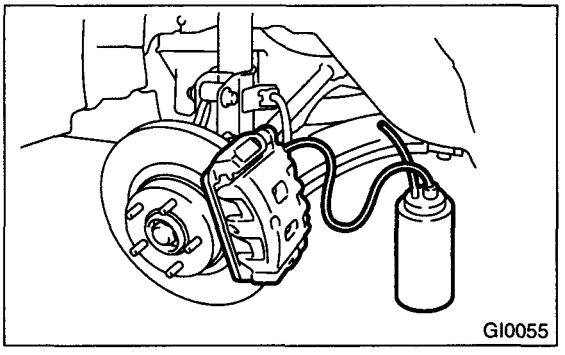
NOTE:
• Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.

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 bleeding operation, keep the brake reserve tank filled with brake fluid to eliminate entry of air.
• Brake pedal operation must be very slow.
• For convenience and safety, it is advisable to have two men working.
• The amount of brake fluid required is approximately 500 m ℓ (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 approximately 1/4 turn until a small amount of brake fluid drains into container, and then quickly tighten screw.
8) Repeat steps 6) and 7) above until there are no air bubbles in drained brake fluid and new fluid flows through vinyl tube.

NOTE:
Add the 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 the bleeder cap.

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

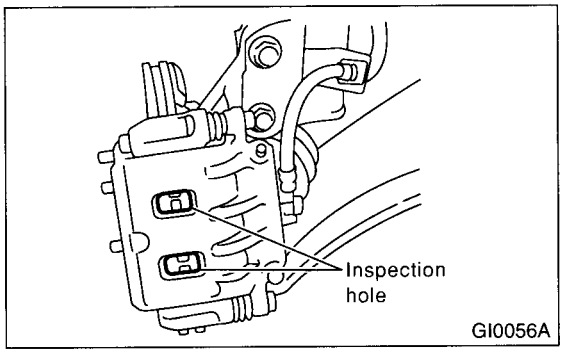
10) Bleed the air from each wheel cylinder by following the previous 5 steps.
11) Depress the brake pedal with a force of approximately 294 N (30 kgf, 66 lb) and hold it there for approximately 20 seconds. At this time check pedal to see if it makes any unusual movement. Visually inspect bleeder screws 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

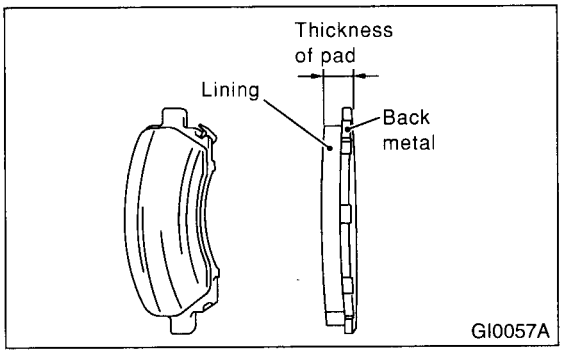
A: INSPECTION

1. DISC BRAKE PAD AND DISC

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



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)



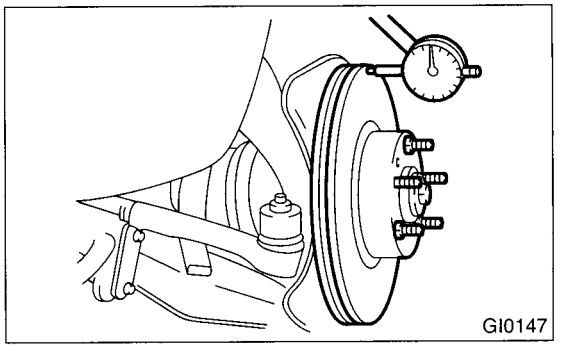
3) Check the disc rotor, and correct or replace if it is damaged or worn.

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

4) Measure the disc rotor runout at a point less than 5 mm (0.20 in) from the outer periphery of the rotor.

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

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



21.Brake Linings and Drums

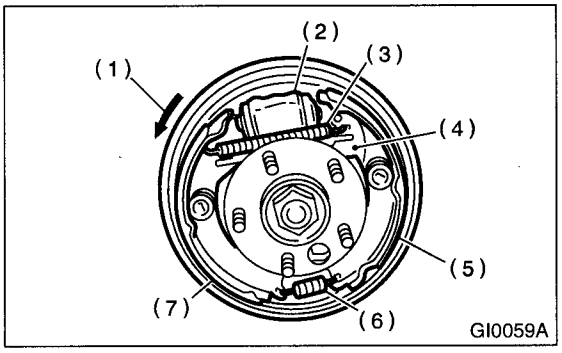
A: INSPECTION

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, replace it.
2) Inspect the brake shoes for damage or deformities and check the brake linings for wear.

NOTE:
• Always replace both leading and trailing brake shoes for the left and right wheels at the same time.
• When either the left or the right brake assembly is replaced, always replace the leading shoe and trailing shoe of the other.
• The cotter pin, once removed, cannot be reused.

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



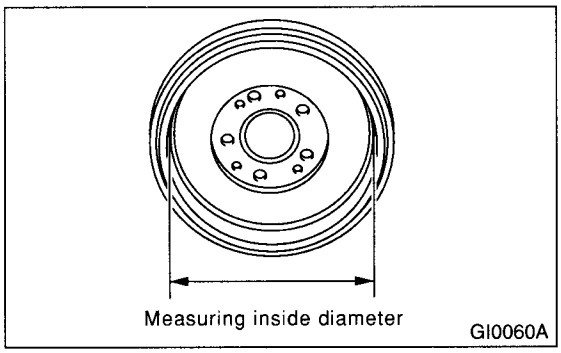
(1) Rotational direction of drum (Forward)
(2) Wheel cylinder
(3) Upper shoe return spring
(4) Adjusting lever
(5) Trailing shoe
(6) Lower shoe return spring
(7) Leading shoe

To replace the trailing shoe, remove the cotter pin. Clevis pin should also be replaced if worn.

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.

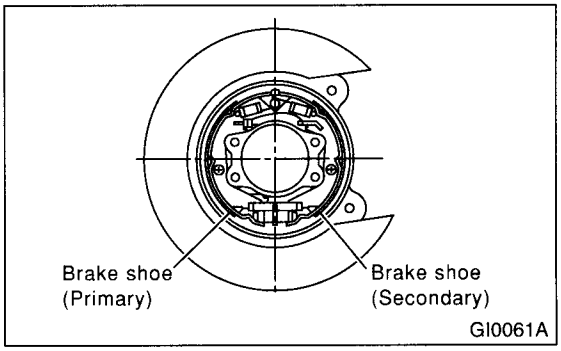


2. PARKING BRAKE (REAR DISC BRAKE)

Inspect 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 the brake linings for wear.

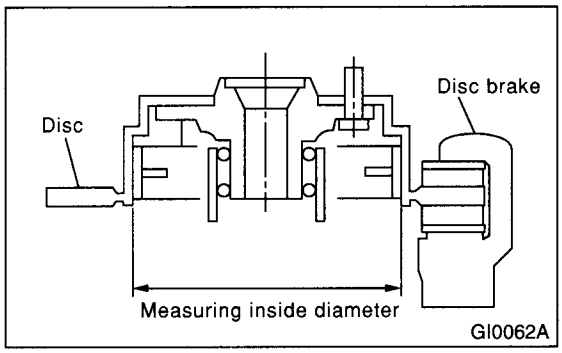
NOTE:
Always replace both primary and secondary brake shoes for the left and right wheels at the same time.

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



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



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, taking care to identify upper and lower springs.

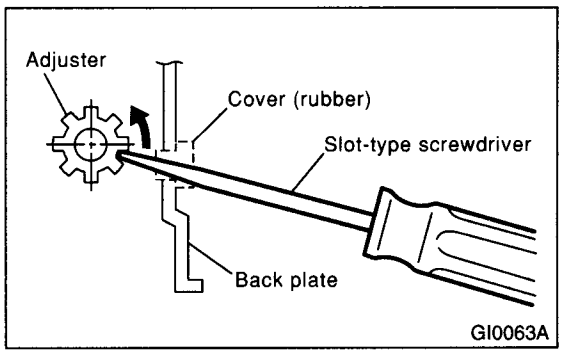
B: ADJUSTMENT

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



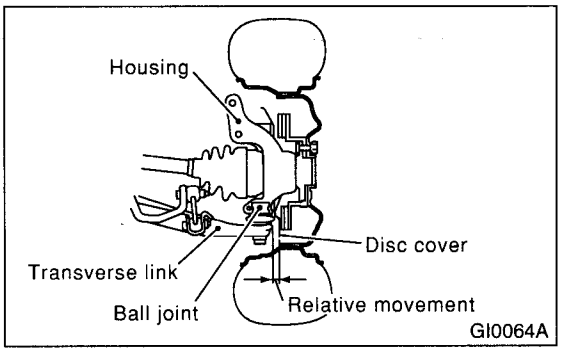
3) Turn back (downward) the adjuster 3 to 4 notches.
4) Install the cover (rubber) at original position correctly.

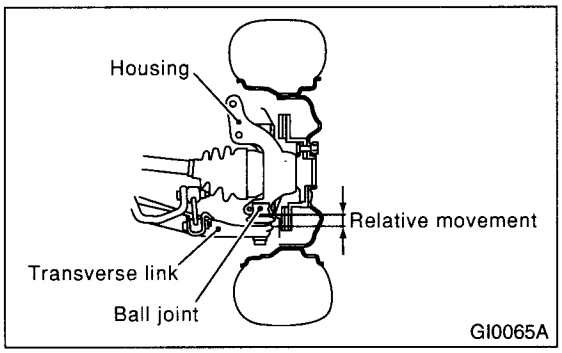
22.Suspension

A: INSPECTION

1. SUSPENSION BALL JOINT

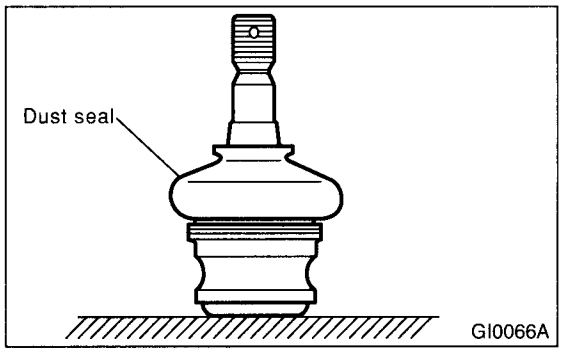
1) Jack up the vehicle until front wheels are off ground.
2) Next, grasp the bottom of tire and move it in and out. If relative movement is observed between brake disc cover and end of transverse link, ball joint may be excessively worn.
3) Next, grasp the end of transverse link and move it up and down. Relative movement between housing and transverse link boss indicates ball joint may be excessively worn.
4) If the relative movement is observed in the immediately preceding two steps, remove and inspect the ball joint. If the free play exceeds standard, replace the ball joint. <Ref. to FS-19, Front Ball Joint.>





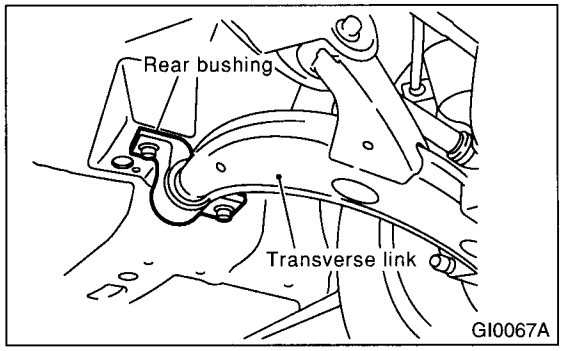
5) Damage of dust seal
Visually inspect ball joint dust seal. If it is damaged, remove the transverse link. <Ref. to FS-17, Front Transverse Link.> And measure free play of ball joint. <Ref. to FS-19, Front Ball Joint.>
(1) When looseness exceeds standard value, replace ball joint.
(2) If the dust seal is damaged, replace with the new ball joint.

NOTE:
When transverse link ball joint has been removed or replaced, check toe-in of front wheel. If front wheel toe-in is not at specified value, adjust toe-in. <Ref. to FS-8, Wheel Alignment.>



2. TRANSVERSE LINK'S REAR BUSHING

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



3. WHEEL ARCH HEIGHT

1) Unload the 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.
3) When the wheel arch height is out of standard, visually inspect following components and replace deformed parts.
- Suspension components [Front strut assembly and rear strut assembly]
- Body parts to which suspensions are installed.

4) When no components are deformed, adjust wheel arch height by replacing coil spring in the suspension whose wheel arch height is out of standard. <Ref. to FS-8, 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-8, Wheel Alignment.>
2) When the caster angle does not conform to standard value, visually inspect 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 standard value, visually inspect parts listed below. If the deformation is observed, replace damaged parts.
- Suspension components [Strut assembly, crossmember, trailing link, lateral links, 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 AND SHOCK ABSORBER

Visually inspect 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 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 damaged parts with new ones. If minor rust formation, pitting, etc. are noted, remove 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

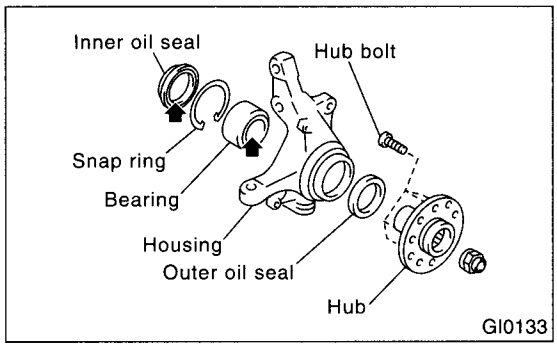
1. FRONT WHEEL BEARING

NOTE:
Inspect the condition of front wheel bearing grease.

1) Jack up the front of vehicle.
2) While holding front wheel by hand, swing it in and out to check bearing free play.
3) Loosen the wheel nuts and remove the front wheel.
4) If the bearing free play exists in step 2) above, attach a dial gauge to 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 the front crossmember.
6) While lightly hammering spring pin which secures S.F.J. to transmission spindle, remove it.
7) Extract S.F.J. from the transmission spindle. <Ref. to DS-17, Front Axle.>
8) While supporting 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.

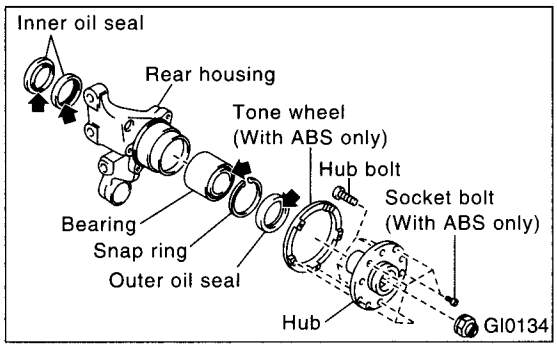


2. REAR WHEEL BEARING

1) Jack up the rear of vehicle.
2) While holding rear wheel by hand, swing it in and out to check bearing free play.
3) Loosen the wheel nuts and remove the rear wheel.
4) If the bearing free play exists in step 2) above, attach a dial gauge to 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-39, Rear Drive Shaft.>
6) While supporting 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.

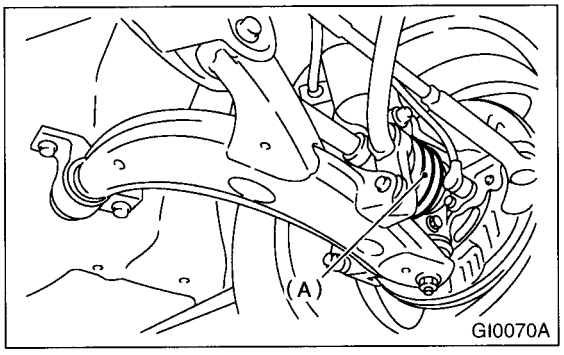


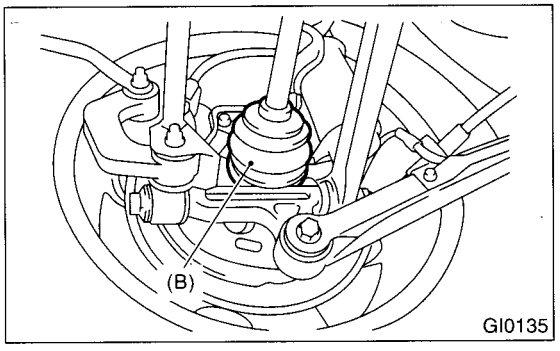
24.Axle Boots & Joints

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-32, Front Drive Shaft.> <Ref. to DS-39, Rear Drive Shaft.>





2. PROPELLER SHAFT

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

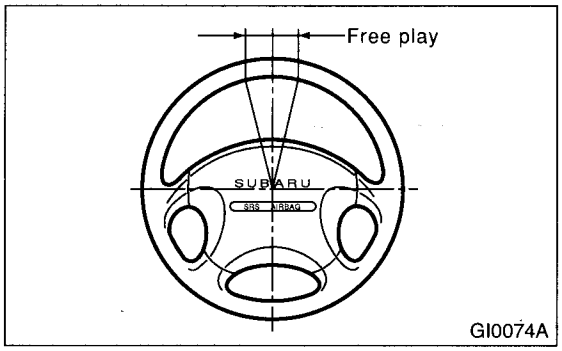
25.Steering System (Power Steering)

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 left and right 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)



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)

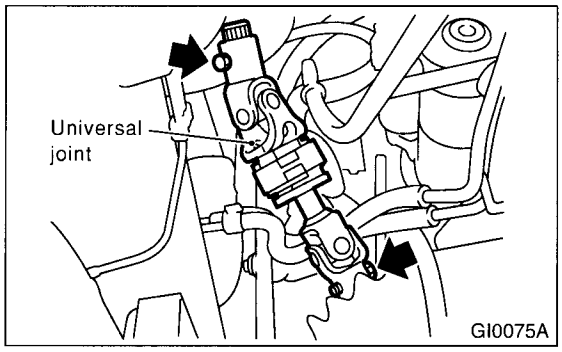
3) Drive the vehicle and check the following items during operation.
(1) Steering force:
The effort required for steering should be smooth and even at all points, and should not vary.
(2) Pull to one side:
Steering wheel should not be pulled to either side while driving on a level surface.
(3) Wheel 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.

Maximum permissible play:
0.5 mm (0.020 in)

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.

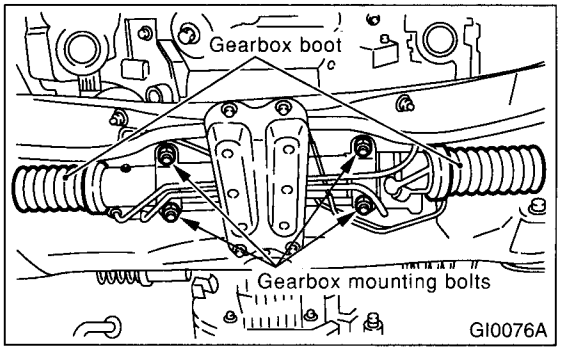
Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)



3. GEARBOX

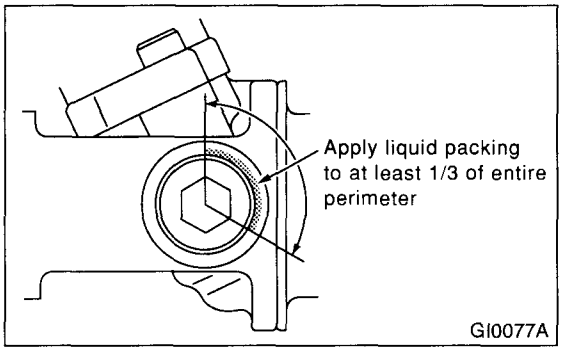
1) With wheels placed on a level surface, turn the steering wheel 90° in both the left and right directions.
While the wheel is being rotated, reach under vehicle and check for looseness in gearbox.

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



2) Check the boot for damage, cracks or deterioration.
3) With vehicle on a level surface, quickly turn steering wheel to the left and right.
While 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 adjusting screw to 7.4 N·m (0.75 kgf-m, 5.4 ft-lb) and then loosen. Repeat this operation twice.
(2) Retighten adjusting screw to 7.4 N·m (0.75 kgf-m, 5.4 ft-lb) and back off 25°.

(3) Apply the liquid packing to at least 1/3 of entire perimeter of adjusting screw thread.



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

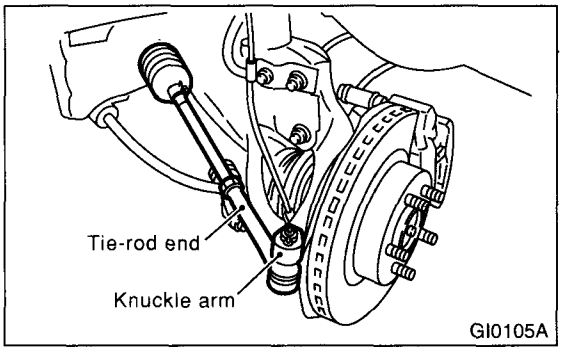
ST 926230000 SPANNER

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.



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

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

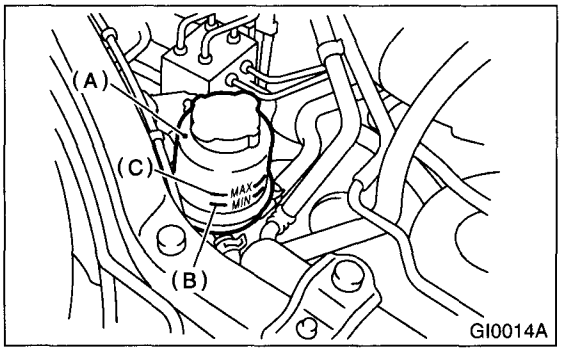
3) Check the lock nut on the tie-rod end for tightness. If it is loose, retighten it to the specified torque.

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

5. POWER STEERING FLUID LEVEL

NOTE:
The fluid level must be checked when the temperature of the reservoir tank surface is approximately 20°C (68°F).

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



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

Recommended fluid:
Dexron IIE or III

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

6. POWER STEERING FLUID FOR LEAKS

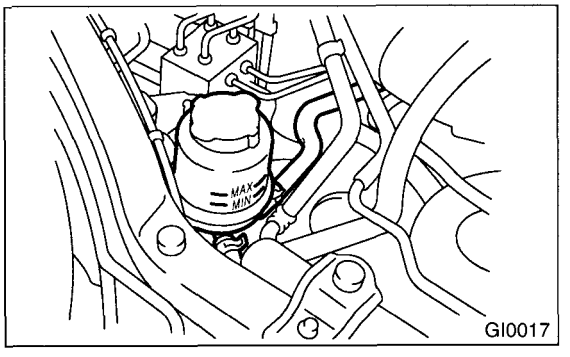
Inspect the underside of oil pump and gearbox for power steering system, hoses, piping and their couplings for fluid leaks.
If the fluid leaks are found, correct them by retightening their fitting bolts (or nuts) and/or replacing their parts.

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 new one if necessary.

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



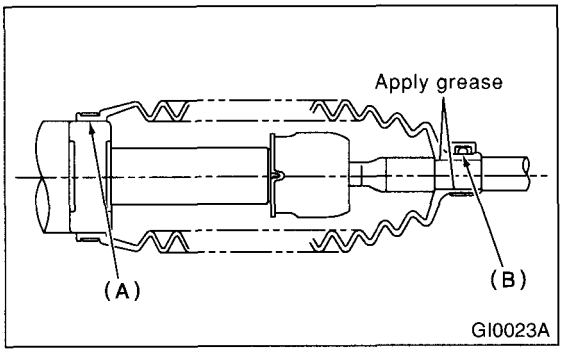
8. POWER STEERING PIPES FOR DAMAGE

Check the power steering pipes for corrosion and damage.
Replace the pipes with 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.
2) Clips are fitted outside of (A) and (B) positions of boot.
3) Boot does not have crack and hole.

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



10.FITTING BOLTS AND NUTS

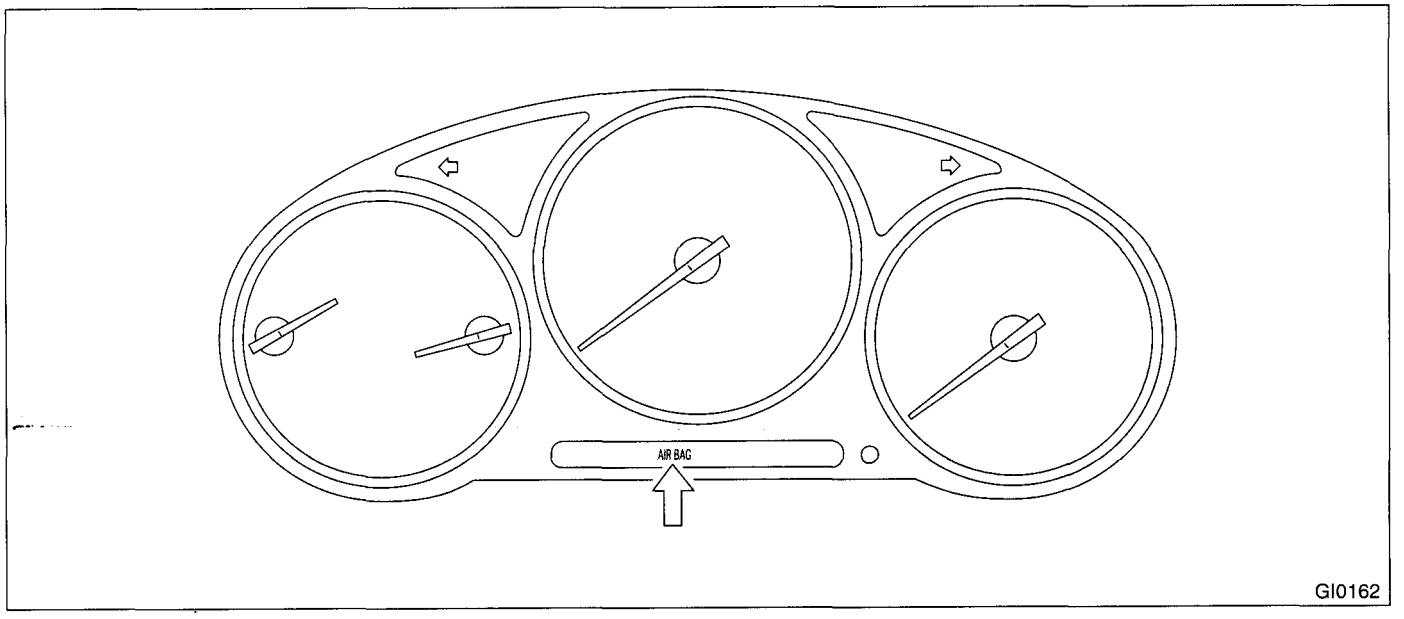
Inspect the fitting bolts and nuts of oil pump and bracket for looseness, and retighten them if necessary.
Inspect and/or retighten them when engine is cold.

26.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.



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

QUICK REFERENCE INDEX

NEW CAR INFORMATION SECTION

FOREWORD

This manual has been prepared to provide information for the construction, operation and other technical details of SUBARU vehicles.
Read this manual thoroughly and make the most of it to give better service to your customers and improve your knowledge of vehicle maintenance.

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.

Specifications	SPC
Fuel Injection (Fuel System)	FU (SOHC)
Fuel Injection (Fuel System)	FU (DOHC TURBO)
Emission Control (Aux. Emission Control Devices)	EC (SOHC)
Emission Control (Aux. Emission Control Devices)	EC (DOHC TURBO)
Intake (Induction)	IN (SOHC)
Intake (Induction)	IN (DOHC TURBO)
Mechanical	ME (SOHC)
Mechanical	ME (DOHC TURBO)
Exhaust	EX (SOHC)
Exhaust	EX (DOHC TURBO)
Cooling	CO
Lubrication	LU
Speed Control System	SP
Ignition	IG (SOHC)
Ignition	IG (DOHC TURBO)
Starting/Charging	SC
Control System	CS

W1830BE

QUICK REFERENCE INDEX

Automatic Transmission	AT
Manual Transmission and Differential	MT
Clutch	CL
Front Suspension	FS
Rear Suspension	RS
Differentials	DI
Drive Shaft System	DS
ABS	ABS
Brakes	BR
Parking Brake	PB
Power Assisted System (Power Steering)	PS
HVAC System (Heater, Ventilator and A/C)	AC
Airbag System	AB
Seat Belt System	SB
Wiper and Washer Systems	WW
Glass/Windows/Mirrors	GW
Body Structure	BS
Instrumentation/Driver Info	IDI

QUICK REFERENCE INDEX

Seats SE

Security and Locks SL

Exterior/Interior Trim EI

Exterior Body Panels EB

Cruise Control System CC

FOREWORD

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SPECIFICATIONS SPC

Page

1. Impreza 2

1. Impreza

A: DIMENSIONS

Model			Sedan	Wagon	OUTBACK
Overall length		mm (in)	4,405 (173.4)		
Overall width		mm (in)	1,730 (68.1)	1,695 (66.7)	1,710 (67.3)
Overall height (at CW)		mm (in)	1,440 (56.7)	1,465 (57.7), 1,485 (58.5)★2	1,475 (58.1), 1,495 (58.9)★2
Compartment	Length	mm (in)	1,890 (74.4)	1,845 (72.6)	
	Width	mm (in)	1,380 (54.3)		
	Height	mm (in)	1,180 (46.5)	1,200 (47.2), 1,150 (45.3)★3	1,200 (47.2), 1,150 (45.3)★3
Wheelbase		mm (in)	2,525 (99.4)		
Tread	Front	mm (in)	1,485 (58.5)	1,465 (57.7)	1,460 (57.5)
	Rear	mm (in)	1,475 (58.1), 1,480 (58.3)★1	1,455 (57.3)	1,455 (57.3)
Minimum road clearance		mm (in)	150 (5.9), 155 (6.1)★1	150 (5.9), 155 (6.1)★1	160 (6.3)

★1:WRX
★2:With roof rail
★3:With sun roof

B: ENGINE

Model		Turbo 2.0 L	2.5 L
Engine type		Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine	
Valve arrangement		Overhead camshaft type	
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 (149.9)
Compression ratio		8.0	10.0
Firing order		1 — 3 — 2 — 4	
Idle speed at Park/Neutral position (A/C OFF)	rpm	750	650 (MT) 700 (AT)
Maximum output	kW (HP)/rpm	160 (215)/6,000	123 (165)/5,600
Maximum torque	N.m (kgf-m, ft-lb)/rpm	294 (30.0, 217)/4,000	226 (23.0, 166)/4,000

C: ELECTRICAL

Model			Turbo 2.0 L	2.5 L
Ignition timing at idling speed		BTDC/rpm	12° ± 10°/750	MT: 10° ± 10°/650 AT: 10° ± 10°/700
Spark plug			NGK: PFR6G	CHAMPION: RC10YC4 (standard) NGK: BKR5E-11 NGK: BKR6E-11
Generator			12V — 75A	12V — 90A
Battery	Type		MT: 12V — 48AH (55D23L) AT: 12V — 52AH (65D23L)	MT: 12V — 48AH (55D23L) AT: 12V — 52AH (75D23L)
	Reserve capacity	min	MT: 99 AT: 111	MT: 99 AT: 118
	Cold cranking amperes	amp	MT: 356 AT: 420	MT: 356 AT: 520

D: TRANSMISSION

Model			Turbo 2.0 L	
Transmission type			5MT★1	4AT★2
Clutch type			DSPD	TCC
Gear ratio		1st	3.454	2.785
		2nd	1.947	1.545
		3rd	1.366	1.000
		4th	0.972	0.694
		5th	0.738	—
		Reverse	3.333	2.272
Reduction gear (Front drive)	1st reduction	Type of gear	—	Helical
		Gear ratio	—	1.000
	Final reduction	Type of gear	Hypoid	Hypoid
		Gear ratio	3.900	4.111
Reduction gear (Rear drive)	Transfer reduction	Type of gear	Helical	—
		Gear ratio	1.100	—
	Final reduction	Type of gear	Hypoid	Hypoid
		Gear ratio	3.545	4.111

5MT★1:5 forward speeds with synchromesh and 1-reverse
4AT★2:Electronically controlled fully-automatic, 4-forward speeds and 1-reverse
DSPD:Dry Single Plate Diaphragm
TCC:Torque Converter Clutch

Model			2.5 L			
			RS		OTHERS	
Transmission type			5MT★1	4AT★2	5MT★1	4AT★2
Clutch type			DSPD	TCC	DSPD	TCC
Gear ratio		1st	3.454	3.027	3.454	2.785
		2nd	2.062	1.619	2.062	1.545
		3rd	1.448	1.000	1.448	1.000
		4th	1.088	0.694	1.088	1.694
		5th	0.780	—	0.780	—
		Reverse	3.333	2.272	3.333	2.272
		Dual range	—	—	—	—
Reduction gear (Front drive)	1st reduction	Type of gear	—	Helical	—	Helical
		Gear ratio	—	1.000	—	1.000
	Final reduction	Type of gear	Hypoid	Hypoid	Hypoid	Hypoid
		Gear ratio	4.111	4.444	3.900	4.111
Reduction gear (Rear drive)	Transfer reduction	Type of gear	Helical	—	Helical	—
		Gear ratio	1.000	—	1.000	—
	Final reduction	Type of gear	Hypoid	Hypoid	Hypoid	Hypoid
		Gear ratio	4.111	4.444	3.900	4.111

E: STEERING

Model			TS	OTHERS
Type			Rack and Pinion	
Turns, lock to lock			3.2	3
Minimum turning circle	m (ft)	Curb to curb	10.2 (33.5)	10.8 (35.4)
		Wall to wall	11.1 (36.3)	11.7(38.3)

F: SUSPENSION

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

G: BRAKE

Model	SEDAN	WAGON
Service brake system	Dual circuit hydraulic with vacuum suspended power unit	
Front	Ventilated disc brake	
Rear	Disc brake	Drum brake, Disc brake★1
Parking brake	Mechanical on rear brakes	

★1:WRX

H: TIRE

Model	TS	OTHERS
Rim size	15 x 6JJ	16 x 6 $^{1}/_{2}$ JJ
Tire size	P195/60R15 87H	P205/55R16 89V
Type	Steel belted radial, Tubeless	

I: CAPACITY

Model			Turbo 2.0 L		2.5 L	
			5MT	4AT	5MT	4AT
Fuel tank		ℓ (US gal, Imp gal)	60 (15.9, 13.2)		60 (15.9, 13.2)	
Engine oil	Upper level	ℓ (US qt, Imp qt)	4.5 (4.8, 4.0)		4.0 (4.2, 3.5)	
	Lower level	ℓ (US qt, Imp qt)	3.5 (3.7, 3.1)		3.0 (3.2, 2.6)	
Transmission gear oil		ℓ (US qt, Imp qt)	3.5 (3.7, 3.1)	—	3.5 (3.7, 3.1)	—
Automatic transmission fluid		ℓ (US qt, Imp qt)	—	9.3 (9.8, 8.2)	—	9.5 (10.0, 8.4)
AT differential gear oil		ℓ (US qt, Imp qt)	—	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)	7.7 (8.1, 6.8)	7.6 (8.0, 6.7)	7.0 (7.4, 6.2)	6.9 (7.3, 6.1)

J: WEIGHT

1. U.S. SPEC. VEHICLE

Sedan

Model			AWD			
			Turbo 2.0 L		2.5 L	
			WRX		RS	
			5MT★1	4AT★1	5MT	4AT
Curb weight (C.W.)	Front	kgf (lb)	826 (1,820)	851 (1,875)	778 (1,715)	803 (1,770)
	Rear	kgf (lb)	569 (1,255)	569 (1,255)	567 (1,250)	567 (1,250)
	Total	kgf (lb)	1,395 (3,075)	1,420 (3,130)	1,345 (2,965)	1,370 (3,020)
Gross vehicle weight (G.V.W.)	Front	kgf (lb)	998 (2,200)	998 (2,200)	939 (2,070)	939 (2,070)
	Rear	kgf (lb)	857 (1,890)	857 (1,890)	857 (1,890)	857 (1,890)
	Total	kgf (lb)	1,837 (4,050)	1,837 (4,050)	1,778 (3,920)	1,778 (3,920)

★1:Excludes weight of side air bag.

Wagon

Model			AWD					
			Turbo 2.0 L		2.5 L			
			WRX		TS		OUTBACK	
			5MT★1	4AT★1	5MT★2	4AT★2	5MT	4AT
Curb weight (C.W.)	Front	kgf (lb)	825 (1,820)	851 (1,875)	773 (1,705)	796 (1,755)	783 (1,725)	805 (1,775)
	Rear	kgf (lb)	606 (1,335)	605 (1,335)	603 (1,330)	606 (1,335)	601 (1,325)	603 (1,330)
	Total	kgf (lb)	1,431 (3,155)	1,458 (3,210)	1,376 (3,035)	1,402 (3,090)	1,384 (3,050)	1,408 (3,105)
Gross vehicle weight (G.V.W.)	Front	kgf (lb)	998 (2,200)	998 (2,200)	939 (2,070)	939 (2,070)	939 (2,070)	939 (2,070)
	Rear	kgf (lb)	925 (2,040)	925 (2,040)	925 (2,040)	925 (2,040)	925 (2,040)	925 (2,040)
	Total	kgf (lb)	1,901 (4,190)	1,901 (4,109)	1,833 (4,040)	1,833 (4,040)	1,833 (4,040)	1,833 (4,040)

★1:Excludes weight of side air bag.
★2:Excludes weight of ABS, cruise control.

2. CANADA SPEC. VEHICLE

Sedan

Model			AWD			
			Turbo 2.0 L		2.5 L	
			WRX		RS	
			5MT	4AT	5MT	4AT
Curb weight (C.W.)	Front	kgf (lb)	826 (1,820)	851 (1,875)	778 (1,715)	803 (1,770)
	Rear	kgf (lb)	573 (1,265)	573 (1,265)	567 (1,250)	567 (1,250)
	Total	kgf (lb)	1,399 (3,085)	1,424 (3,140)	1,345 (2,965)	1,370 (3,020)
Gross vehicle weight (G.V.W.)	Front	kgf (lb)	998 (2,200)	998 (2,200)	939 (2,070)	939 (2,070)
	Rear	kgf (lb)	857 (1,890)	857 (1,890)	857 (1,890)	857 (1,890)
	Total	kgf (lb)	1,837 (4,050)	1,837 (4,050)	1,778 (3,920)	1,778 (3,920)

Wagon

Model			AWD					
			Turbo 2.0 L		2.5 L			
			WRX		TS		OUTBACK	
			5MT★1	4AT	5MT★1	4AT★1	5MT	4AT
Curb weight (C.W.)	Front	kgf (lb)	826 (1,820)	851 (1,875)	758 (1,670)	780 (1,720)	783 (1,725)	805 (1,775)
	Rear	kgf (lb)	610 (1,345)	610 (1,345)	594 (1,310)	597 (1,315)	601 (1,325)	603 (1,330)
	Total	kgf (lb)	1,436 (3,165)	1,461 (3,220)	1,352 (2,980)	1,377 (3,035)	1,384 (3,050)	1,408 (3,105)
Gross vehicle weight (G.V.W.)	Front	kgf (lb)	998 (2,200)	998 (2,200)	939 (2,070)	939 (2,070)	939 (2,070)	939 (2,040)
	Rear	kgf (lb)	925 (2,040)	925 (2,040)	925 (2,040)	925 (2,040)	925 (2,040)	925 (2,040)
	Total	kgf (lb)	1,901 (4,190)	1,901 (4,190)	1,833 (4,040)	1,833 (4,040)	1,833 (4,040)	1,833 (4,040)

★1:Excludes weight of air conditioner.

MEMO

FUEL INJECTION (FUEL SYSTEM) FU (SOHC)

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1.	General	2
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4.	Sensors and Switches	16
5.	Control System	26
6.	On-board Diagnosis System	34

1. General

• The Multipoint Fuel Injection (MFI) system supplies optimum air-fuel mixture under every engine operating condition through the use of the latest electronic control technology.

This system pressurizes the fuel to a constant pressure and injects it into each intake air port in the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where an electro-magnetic injection valve or injector opens for a short period that is precisely controlled depending on the quantity of air appropriate for each condition of operation. In actual control, an optimum fuel injection quantity is achieved by varying the duration of an electric pulse applied to the injector. This way of control enables simple, yet highly precise metering of the fuel.

• The engine control module (ECM) that controls the fuel injection system corrects the fuel injection amount depending on the vehicle speed, throttle opening, coolant temperature and other vehicle-operation-related information. The ECM receives the information in the form of electric signals from the corresponding sensors and switches.

The MFI system also has the following features:

• Reduced exhaust emissions

• Reduced fuel consumption

• Increased engine output

• Quick response to accelerator and brake pedal operation

• Superior startability and warm-up performance in cold weather due to corrective controls made according to coolant and intake air temperatures

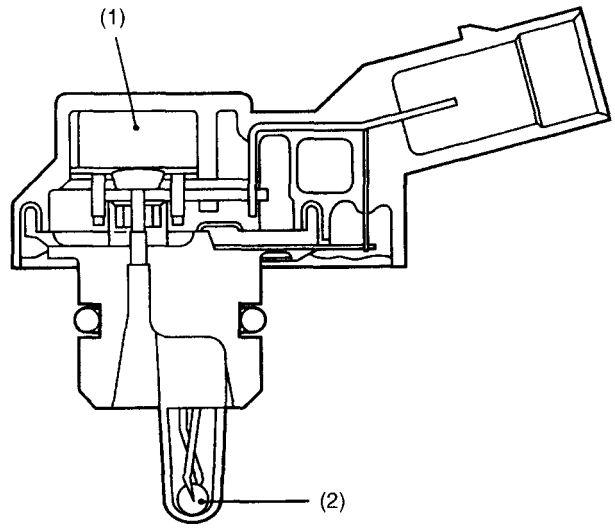
2. Air Line

A: GENERAL

The air filtered by the air cleaner enters the throttle body where it is regulated in the volume by the throttle valve and then enters the intake manifold. It is then distributed to each cylinder where the air is mixed with fuel injected by the injector. During idling operation, air flows into the cylinder through the idle air control solenoid valve, bypassing the throttle valve. This enables controlling the engine idling speed properly.

B: INTAKE MANIFOLD PRESSURE AND AIR TEMPERATURE SENSORS

The intake manifold pressure sensor and the intake air temperature sensor are integrated into a single unit. The unit is mounted on the intake manifold and measures the absolute air pressure in the intake manifold as well as the temperature of the intake air.
The measured pressure and temperature are converted into electrical signals and sent to the ECM. The ECM uses these signals to control injection and ignition timing as well as the fuel injection amount.

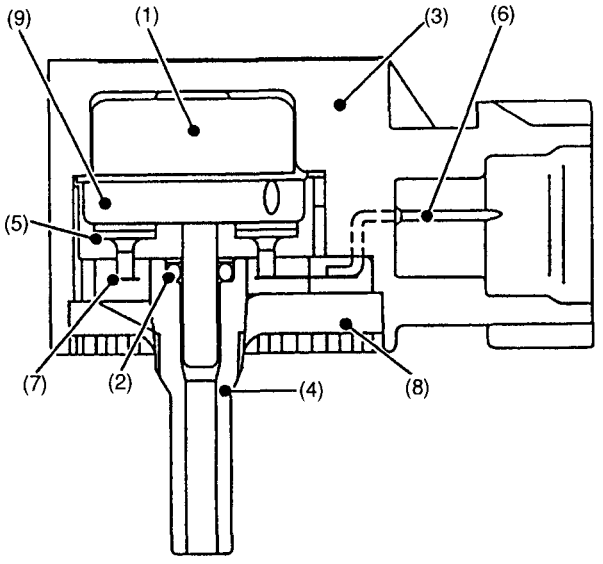


H2H2825B

(1) Pressure sensor
(2) Intake air temperature sensor

C: ATMOSPHERIC PRESSURE SENSOR

The atmospheric pressure sensor converts pressure values into electric signals, and sends the signals to the ECM.



NF0007

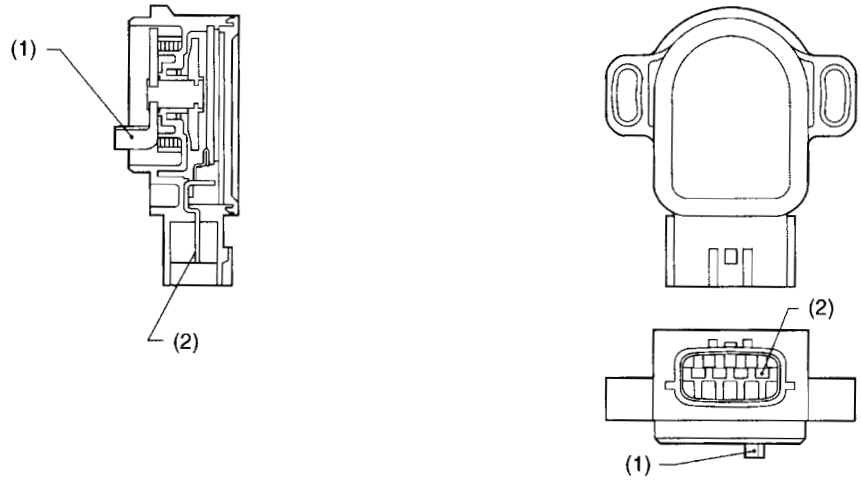
(1) Sensor unit
(2) O-ring
(3) Case
(4) Pipe
(5) Through capacity
(6) Terminal
(7) Inner lead
(8) Resin
(9) Metal lid

D: THROTTLE BODY

- In response to operation of the accelerator pedal, the throttle valve in the throttle body opens/closes to regulate the volume of the air drawn into the combustion chamber.
- During idling, the throttle valve is almost fully closed and the volume of air passing through the throttle body is less than that passing through the idle air control solenoid valve.
- More than half of the air necessary for idling is supplied to the intake manifold via the idle air control solenoid valve which controls properly the engine idling speed, so the idling speed needs not be adjusted.

E: THROTTLE POSITION SENSOR

- The throttle position sensor is mounted in the throttle body and linked to the throttle valve.
- The throttle position sensor sends the ECM voltage signal corresponding to the opening of the throttle valve. When the sensor's output voltage exceeds a predetermined level, the ECM interprets it as complete closure of the throttle valve. When the output voltage is at another predetermined level, the ECM recognizes that the throttle valve is at a wide open position. Since the output characteristics of the sensor change over years, the ECM is provided with a learning function to be able to interpret signals into throttle valve angles always correctly.

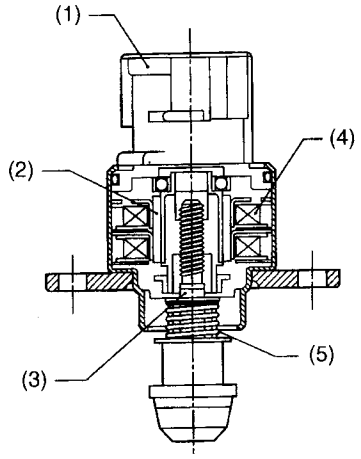


B2H2004B

(1) Lever
(2) Terminal

F: IDLE AIR CONTROL SOLENOID VALVE

- The idle air control solenoid valve is located in the throttle body and regulates the amount of intake air that flows bypassing the throttle valve into the intake manifold during engine idling. It is activated by a signal from the ECM in order to maintain the engine idling speed at a target speed.
- The idle air control solenoid valve is a stepping motor type solenoid-actuated valve which consists of coils, a shaft, a permanent magnet, a spring and a housing. The housing is an integral part of the throttle body.
- The stepping motor consists of two paired coils, the coils of each pair being arranged face to face with a shaft in between.
- The shaft has a screw at the end around which the permanent magnets are arranged.
- As current flows in the form of pulses through the paired coils sequentially while alternating the polarity, the N and S poles of the permanent magnets around the shaft are repelled by the same poles of the magnetism generated by the coils. This causes a nut externally fixed to the magnets and internally engaging with the screw of the shaft to turn.
The shaft then goes upward or downward.
- This upward and downward motions of the shaft open or close the valve port, adjusting the amount of bypass air.

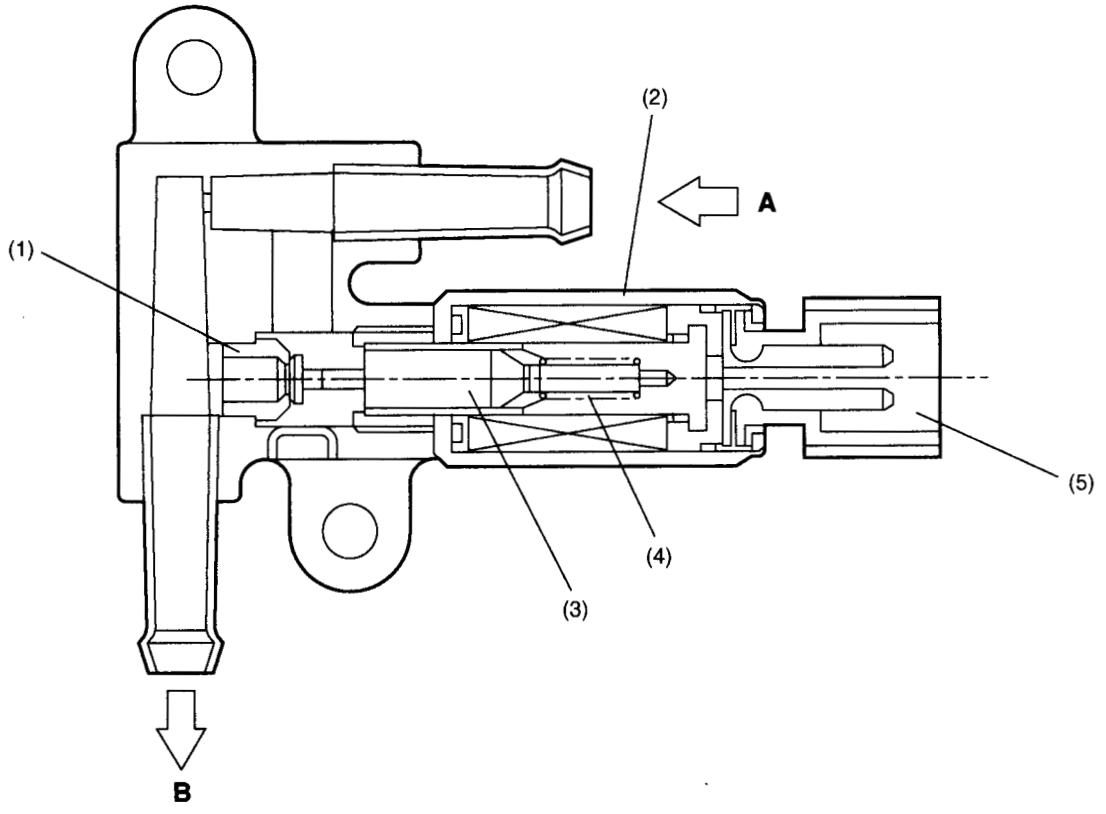


B2H2005B

(1) Connector
(2) Permanent magnet
(3) Shaft
(4) Coil
(5) Spring

G: AIR ASSIST INJECTOR SOLENOID VALVE

The air assist injector solenoid valve is located in the piping between the throttle body and the injector and secured to the intake manifold.
This solenoid valve is opened or closed by the signals from the ECM, adjusting the flow rate of air supplied to the injector.



B2H3447B

(1) Valve sheet
(2) Solenoid
(3) Plunger and valve
(4) Spring
(5) Connector

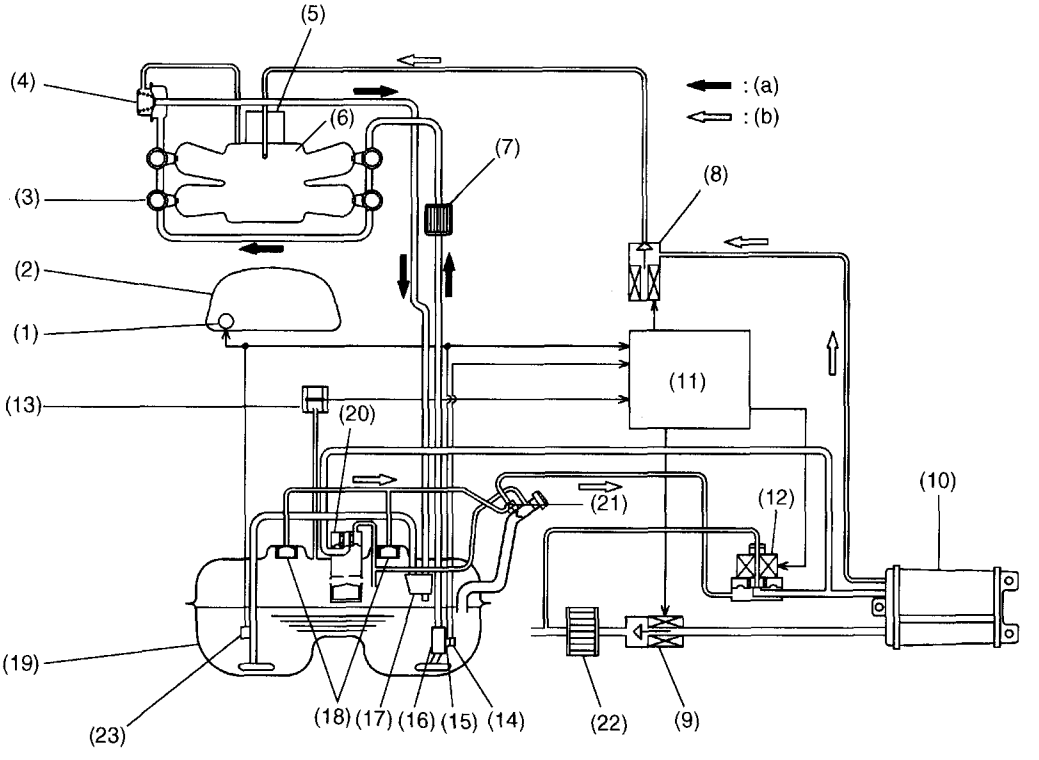
A: From idle air control solenoid valve
B: To injector

3. Fuel Line

A: GENERAL

- The fuel pressurized by the fuel tank inside pump is delivered to each fuel injector by way of the fuel pipe and fuel filter. Fuel injection pressure is regulated to an optimum level by the pressure regulator.
- Each injector injects fuel into the intake port of the corresponding cylinder where the fuel is mixed with air. The mixture then enters the cylinder.

Fuel injection amount and timing are regulated by the ECM.

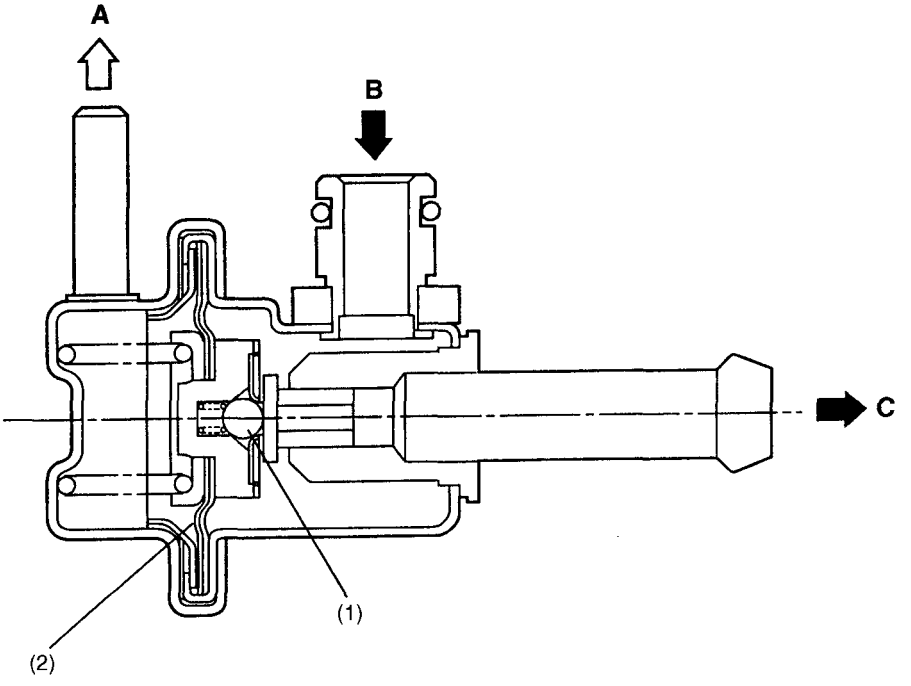


NF0477

(1)	Fuel gauge	(10)	Canister	(19)	Fuel tank
(2)	Combination meter	(11)	ECM	(20)	Vent valve
(3)	Fuel injector	(12)	Pressure control solenoid valve	(21)	Shut-off valve
(4)	Pressure regulator	(13)	Fuel tank pressure sensor	(22)	Drain filter
(5)	Throttle body	(14)	Fuel temperature sensor	(23)	Fuel sub level sensor
(6)	Intake manifold	(15)	Fuel level sensor		
(7)	Fuel filter	(16)	Fuel pump		
(8)	Purge control solenoid valve	(17)	Jet pump	(a)	Fuel line
(9)	Drain valve	(18)	Fuel cut valve	(b)	Evaporation line

B: PRESSURE REGULATOR

The pressure regulator is installed at the injector end of the fuel supply line. It has a fuel chamber and spring chamber separated by a diaphragm. Fuel chamber is connected to the fuel supply line and the spring chamber is connected to the intake manifold. Fuel chamber also has a relief valve connected to the fuel return line through which fuel returns to the fuel tank. When the intake manifold vacuum increases, the diaphragm is pulled and the relief valve opens to decrease the fuel supply line pressure (or fuel injection pressure). When the intake manifold vacuum decreases, the diaphragm is pushed by the spring to increase the fuel supply line pressure. Thus, the difference between the fuel injection pressure and the intake manifold vacuum is kept at a constant level of 299.1 kPa (3.05 kgf/cm^2, 43.4 psi) to precisely control the amount of injected fuel.



S2H0623C

(1) Relief valve
(2) Diaphragm

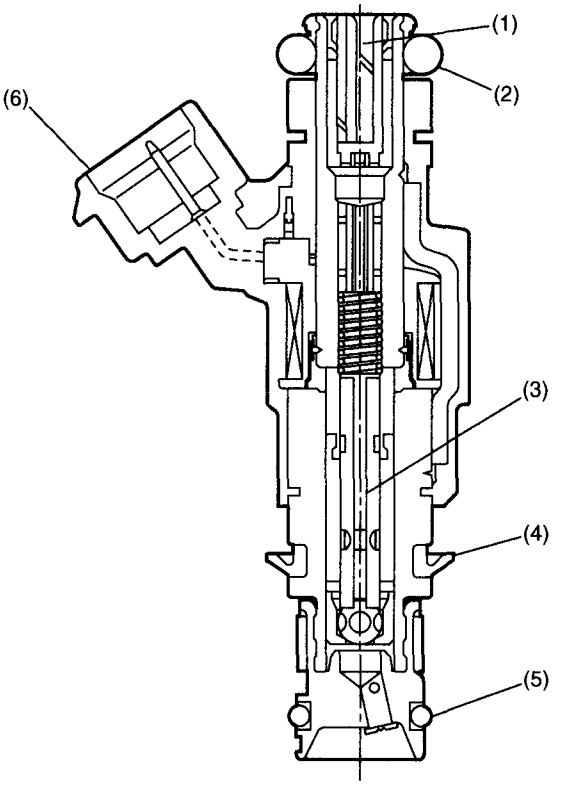
A: To intake manifold
B: Fuel IN
C: Fuel OUT

C: FUEL INJECTORS

- The MFI system employs top feed type fuel injectors with an air assist feature.
- Each injector is installed in the fuel pipe in such a way that the injector is cooled by fuel.
- The features of this type of fuel injector are as follows:

1) High heat resistance
2) Low driving noise
3) Easy to service
4) Small size

- The injector injects fuel according to the valve open signal from the ECM. The needle valve is lifted by the solenoid which is energized on arrival of the valve open signal.
- Since the injector's nozzle hole area, the lift of valve and the fuel pressure are kept constant, the amount of fuel injected is controlled only by varying the duration of the valve open signal from the ECM.
- Fuel atomization is enhanced using assist air supplied from the idle air control solenoid valve passing through the passage formed in the intake manifold at the area in which each injector is installed. This contributes not only to higher combustion efficiency and higher output but also to cleaner exhaust emissions.



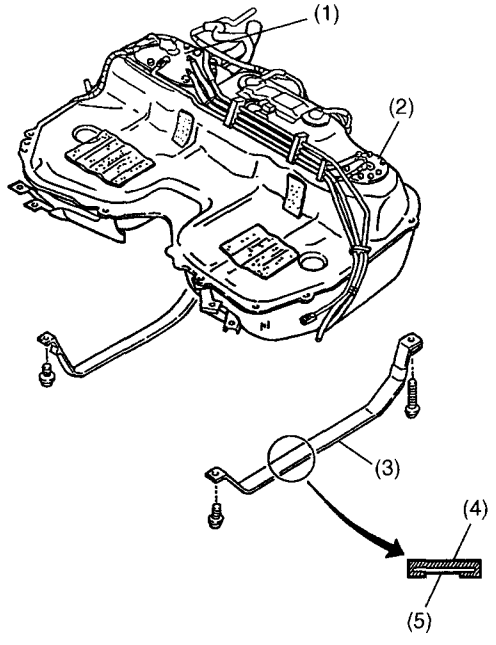
S2H1943A

(1) Filter
(2) O-ring
(3) Plunger
(4) Seal
(5) O-ring
(6) Connector

D: FUEL TANK

The fuel tank utilizes a two-compartment design to ensure sufficient capacity without interfering with the rear differential. It is provided with a suction jet pump (included in the fuel pump and fuel level sensor assembly) which transfers fuel from one compartment to the other. Each compartment has an individual fuel level sensor.

The fuel tank is located under the rear seat and secured with hold-down bands.



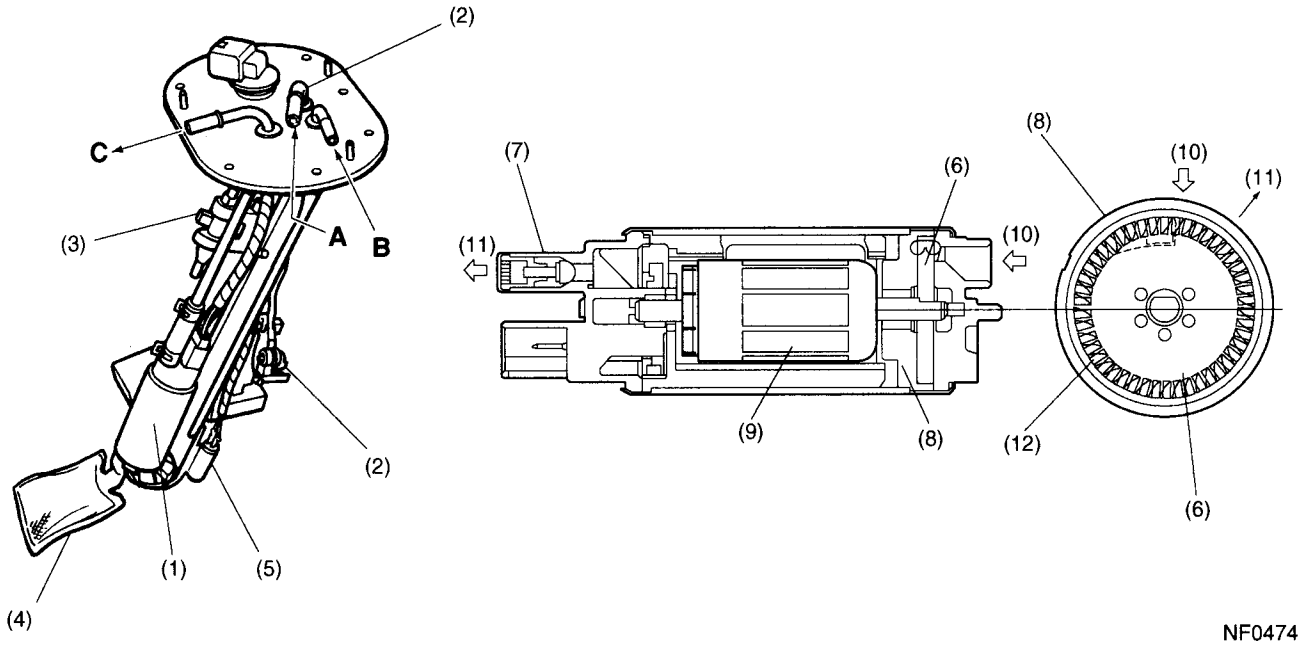
NF0473

(1) Fuel pump and fuel level sensor assembly
(2) Fuel sub level sensor
(3) Band
(4) Cushion
(5) Steel

E: FUEL PUMP AND FUEL LEVEL SENSOR ASSEMBLY

1. FUEL PUMP

The fuel pump consists of a motor, impeller, pump casing, pump cover, check valve and filter. It is located in the fuel tank and combined with the fuel level sensor into a single unit. The operation of this impeller type pump is very quiet.



NF0474

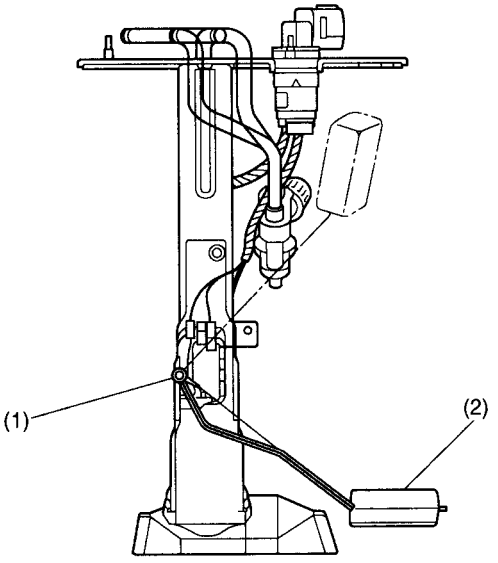
(1) Fuel pump
(2) Fuel level sensor
(3) Jet pump
(4) Mesh filter
(5) Fuel temperature sensor
(6) Impeller
(7) Check valve
(8) Pump casing
(9) Motor armature
(10) Suction
(11) Discharge
(12) Vane groove

A: From engine (return line)
B: From sub tank
C: To engine (delivery line)

- When the ignition switch is turned ON, fuel pump relay is activated. Then the motor operates to rotate the impeller.
- As the impeller rotates, fuel in a vane groove of the impeller flows along the fuel passage into the next vane groove by centrifugal force. When fuel flows from one groove to the next, a pressure difference occurs due to friction. This creates a pumping effect.
- The fuel pushed up by rotation of the impeller then passes through the clearance between the armature and the magnet of the motor and is discharged through the check valve.
- When the fuel discharge pressure reaches the specified level, the relief valve opens and excess fuel is released into the fuel tank. In this manner, the relief valve prevents an abnormal increase in fuel pressure.
- When the engine and the fuel pump stop, spring force acts on the check valve to close the discharge port, so that the fuel pressure in the fuel delivery line is retained.

2. FUEL LEVEL SENSOR

The fuel level sensor forms part of the fuel pump and located in the fuel tank. The sensor outputs an electric resistance signal that varies with movement of its float to indicate the level of the fuel remaining in the tank.

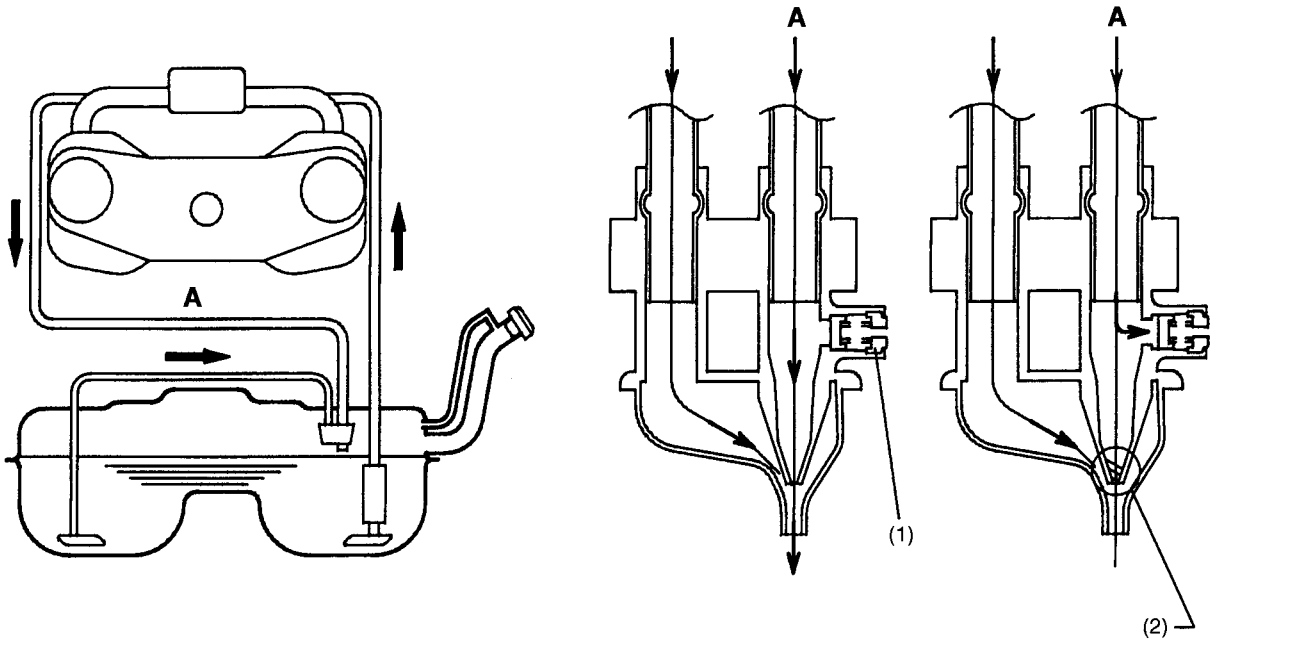


NF0327

(1) Fuel level sensor
(2) Float

3. JET PUMP

- The jet pump utilizes the velocity of fuel returning from the engine to produce negative pressure in it.
- Using the pumping effect produced by the negative pressure, the jet pump transfers fuel from the sub-compartment to the main compartment of the fuel tank.
- When the return line nozzle is clogged, the fuel sent back through the return line flows back into the fuel tank via the relief valve.



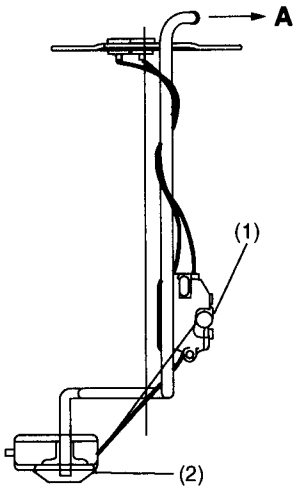
NF0328

(1) Relief valve
(2) Nozzle

A: Return line

F: SUB-COMPARTMENT FUEL LEVEL SENSOR

This sensor detects the level of the fuel in the sub-compartment (the compartment in which the fuel pump is not located) and acts as part of the fuel transfer line when the jet pump is in operation to maintain the fuel in both compartments at the same level.



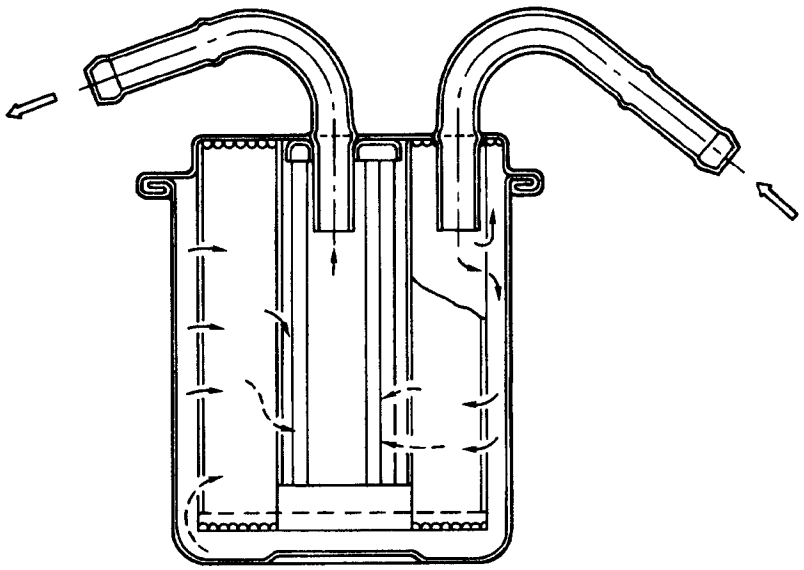
NF0396

(1) Fuel level sensor
(2) Float

A: To jet pump

G: FUEL FILTER

The fuel filter located in the engine compartment is a pressure-withstanding, cartridge type. It has a filter element in a metal case. The fuel entering the filter flows from the perimeter of the element to the center of the filter and goes out from there.

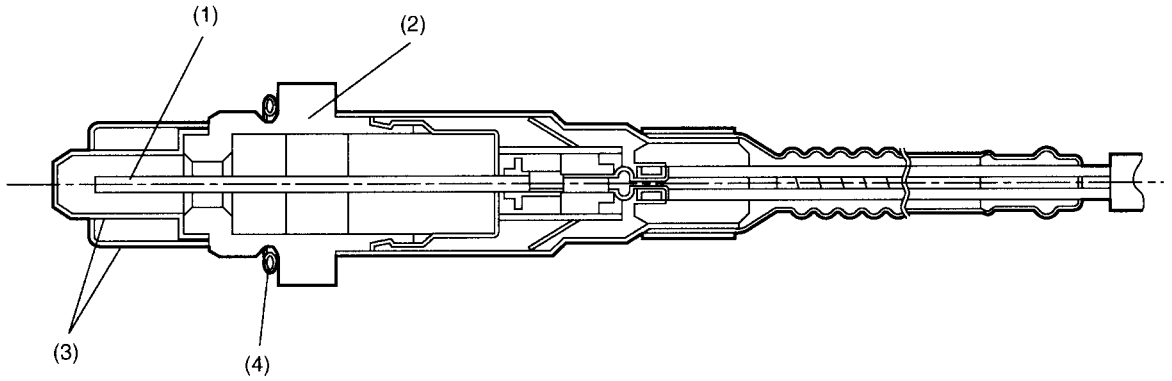


NF0018

4. Sensors and Switches

A: FRONT OXYGEN (A/F) SENSOR

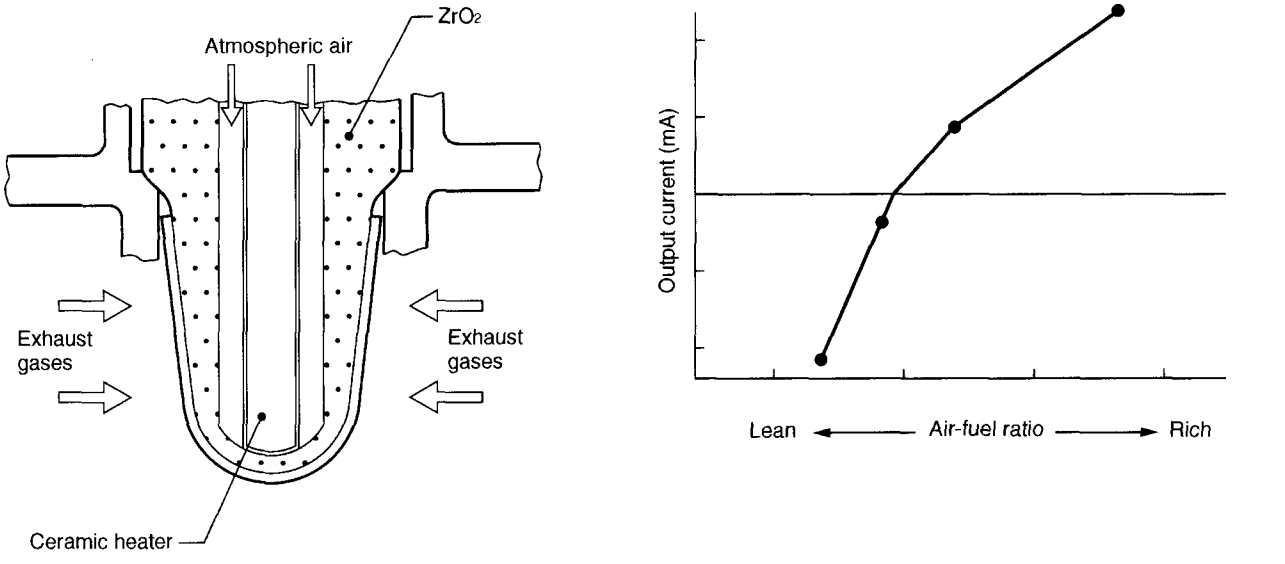
- The front oxygen sensor uses zirconium oxide (ZrO_2) which is a solid electrolyte, at portions exposed to exhaust gas.
- The zirconium oxide has the property of generating electromotive force when its both sides are exposed to oxygen ions of different concentration and the magnitude of this electromotive force depends on how much the difference is.
- The front oxygen sensor detects the amount of oxygen in exhaust gases by making use of this property of the zirconium oxide material.
- The zirconium oxide material is formed into a closed end tube and its external surface is exposed to exhaust gases with smaller oxygen ion concentration, whereas its internal surface is exposed to atmospheric air. The external surface has a porous platinum coating. The sensor housing is grounded to the exhaust pipe and the inside is connected to the ECM through the harness to be able to use the current output from the sensor.
- The sensor incorporates a ceramic heater to improve its performance at low temperatures.



S2H1791B

(1) Sensor element
(2) Sensor housing
(3) Protection tube
(4) Gasket

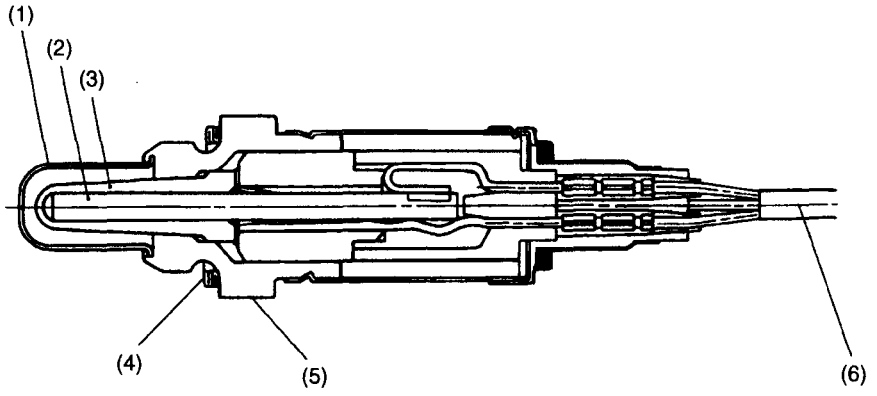
- When rich air-fuel mixture is burnt in the cylinder, the oxygen in the exhaust gases is almost completely used in the catalytic reaction by the platinum coating on the external surface of the zirconia tube. This results in a very large difference in the oxygen ion concentration between the inside and outside of the tube, and the electromotive force generated is large.
- When a lean air-fuel mixture is burnt in the cylinder, relatively large amount of oxygen remains in the exhaust gases even after the catalytic action, and this results in a small difference in the oxygen ion concentration between the tube's internal and external surfaces. The electromotive force in this case is very small.
- The difference in oxygen concentration changes drastically in the vicinity of the stoichiometric air-fuel ratio, and hence the change in the electromotive force is also large. By using this information, the ECM can determine the air-fuel ratio of the supplied mixture easily. The front oxygen sensor does not generate much electromotive force when the temperature is low. The output characteristics of the sensor stabilize at a temperature of approximately 700°C (1,292°F).



NF0331

B: REAR OXYGEN SENSOR

- The rear oxygen sensor is used to sense oxygen concentration in the exhaust gas. If the air-fuel ratio is leaner than the stoichiometric ratio in the mixture (i.e., excessive amount of air), the exhaust gas contains more oxygen. To the contrary, if the fuel ratio is richer than the stoichiometric ratio, the exhaust gas contains almost no oxygen.
- Detecting the oxygen concentration in exhaust gas using the oxygen sensor makes it possible to determine whether the air-fuel ratio is leaner or richer than the stoichiometry.
- The rear oxygen sensor has a zirconia tube (ceramic) which generates voltage if there is a difference in oxygen ion concentration between the inside and outside of the tube. Platinum is coated on the inside and outside of the zirconia tube as a catalysis and electrode material. The sensor housing is grounded to the exhaust pipe and the inside is connected to the ECM through the harness.
- A ceramic heater is employed to improve performance at low temperatures.



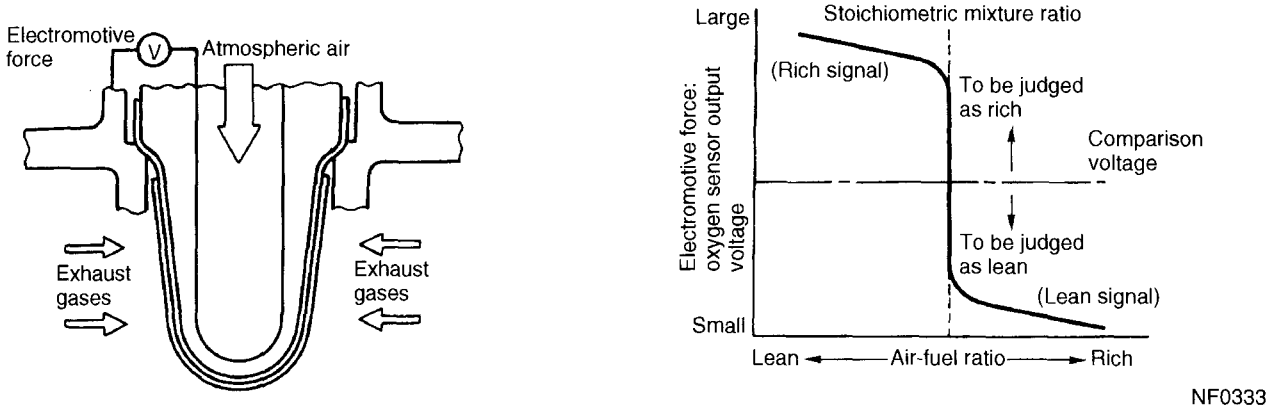
B2H3810C

(1) Protection tube
(2) Ceramic heater
(3) Zirconia tube
(4) Gasket
(5) Sensor housing
(6) Harness

• When rich air-fuel mixture is burnt in the cylinder, the oxygen in the exhaust gases is almost completely used in the catalytic reaction by the platinum coating on the external surface of the zirconia tube. This results in a very large difference in the oxygen ion concentration between the inside and outside of the tube, and the electromotive force generated is large.

• When a lean air-fuel mixture is burnt in the cylinder, relatively large amount of oxygen remains in the exhaust gases even after the catalytic action, and this results in a small difference in the oxygen ion concentration between the tube's internal and external surfaces. The electromotive force in this case is very small.

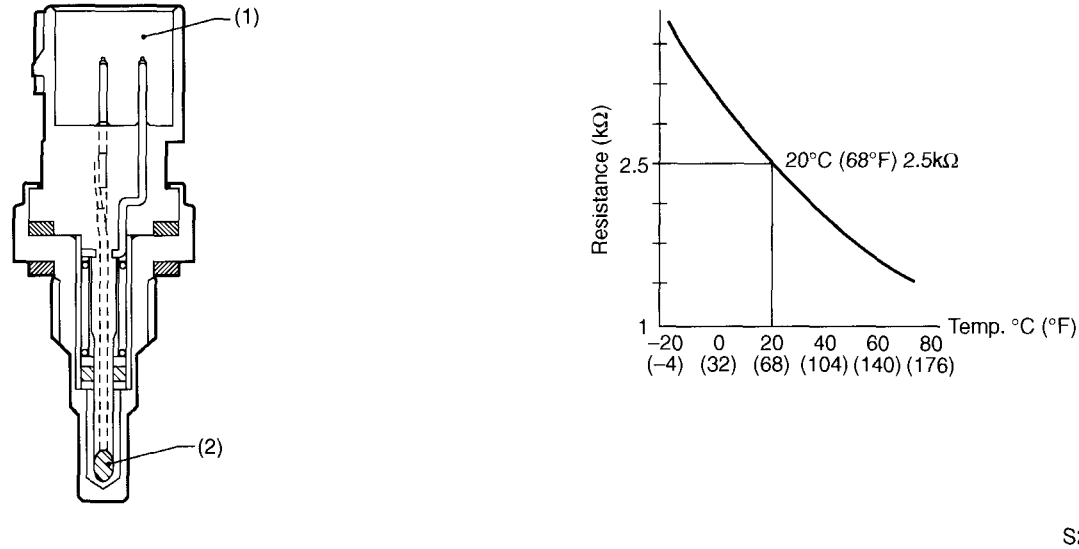
• The difference in oxygen concentration changes drastically in the vicinity of the stoichiometric air-fuel ratio, and hence the change in the electromotive force is also large. By using this information, the ECM can determine the air-fuel ratio of the supplied mixture easily. The rear oxygen sensor does not generate much electromotive force when the temperature is low. The output characteristics of the sensor stabilize at a temperature of approximately 300 to 400°C (572 to 752°F).



NF0333

C: ENGINE COOLANT TEMPERATURE SENSOR

The engine coolant temperature sensor is located on the engine coolant pipe. The sensor uses a thermistor whose resistance changes inversely with temperature. Resistance signals as engine coolant temperature information are transmitted to the ECM to make fuel injection, ignition timing, purge control solenoid valve and other controls.



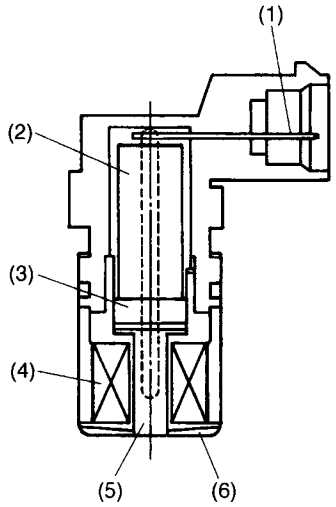
S2H1113B

(1) Connector

(2) Thermistor element

D: CRANKSHAFT POSITION SENSOR

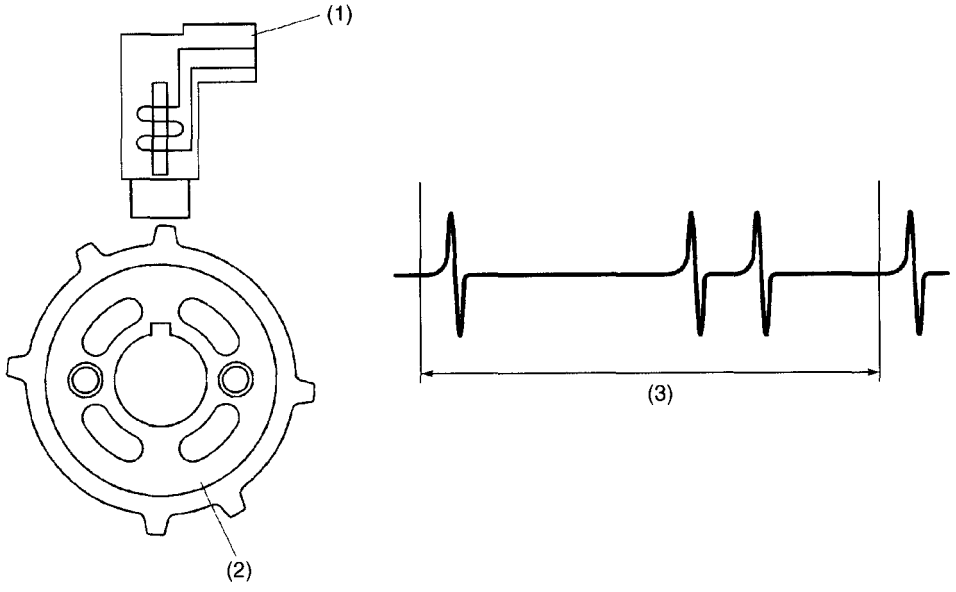
- The crankshaft position sensor is installed on the oil pump which is located in the front center portion of the cylinder block. The sensor generates a pulse when one of the teeth on the perimeter of the crankshaft sprocket (rotating together with the crankshaft) passes in front of it. The ECM determines the crankshaft angular position by counting the number of pulses.
- The crankshaft position sensor is a molded type which consists of a magnet, core, coil, terminals and other components as illustrated below.



NF0024

(1) Terminal
(2) Yoke core
(3) Magnet
(4) Coil
(5) Core
(6) Cover

• As the crankshaft rotates, each tooth aligns with the crankshaft position sensor. At that time, the magnetic flux in the sensor's coil changes since the air gap between the sensor pickup and the sprocket changes. This change in magnetic flux induces a voltage pulse in the sensor and the pulse is transmitted to the ECM.



NF0398

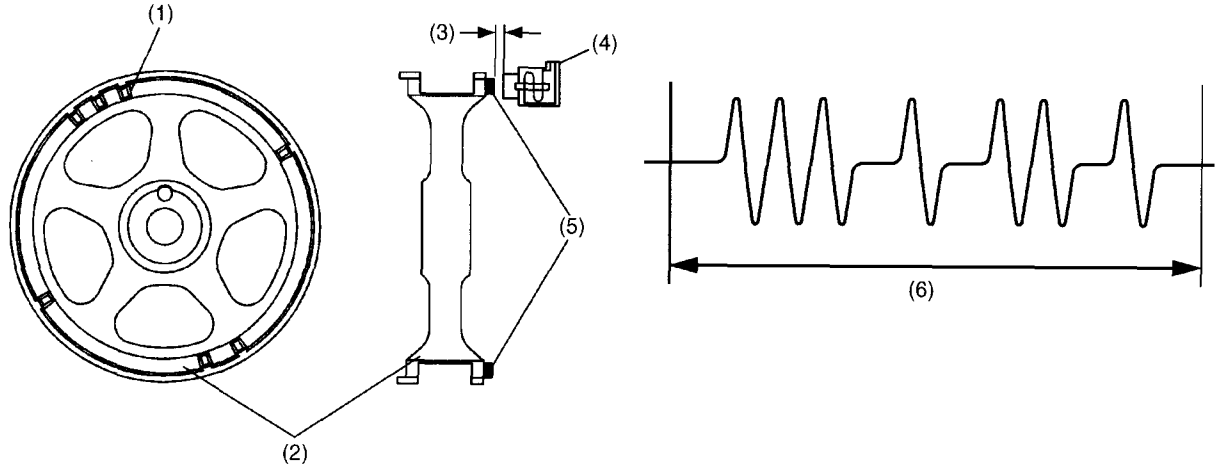
(1) Crankshaft position sensor
(2) Crankshaft sprocket
(3) Crankshaft half rotation

E: CAMSHAFT POSITION SENSOR

- The camshaft position sensor is located on the left-hand camshaft support. It detects the combustion cylinder at any given moment.

- The sensor generates a pulse when one of the bosses on the back of the left-hand camshaft drive sprocket passes in front of the sensor. The ECM determines the camshaft angular position by counting the number of pulses.

Internal construction and the basic operating principle of the camshaft position sensor are similar to those of the crankshaft position sensor. A total of seven bosses are arranged at equally spaced four locations (one each at two locations, two at one location, and three at one location) of the sprocket as shown below.

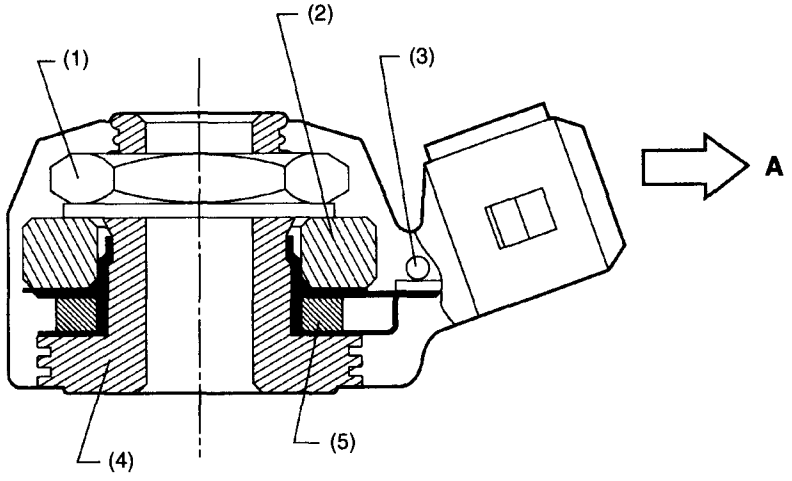


S2H1813A

(1) Boss
(2) Camshaft sprocket
(3) Air gap
(4) Camshaft position sensor
(5) Boss
(6) Camshaft one rotation (Crankshaft two rotations)

F: KNOCK SENSOR

- The knock sensor is installed on the cylinder block, and senses knocking that occurs in the engine.
- The sensor is a piezo-electric type which converts vibration resulting from knocking into electric signals.
- In addition to a piezo-electric element, the sensor has a weight and case as its components. If knocking occurs in the engine, the weight in the case moves causing the piezo-electric element to generate a voltage.
- The knock sensor harness is connected to the bulkhead harness.



B2H1998B

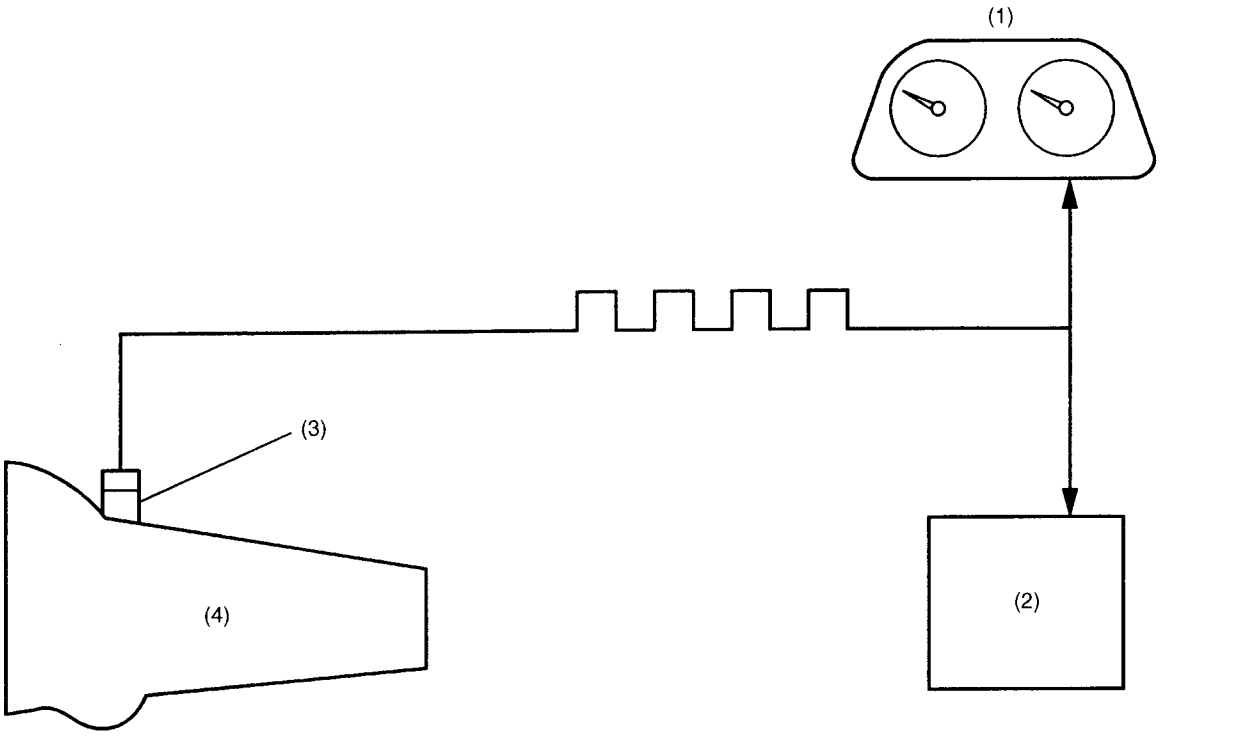
(1) Nut
(2) Weight
(3) Resistor
(4) Housing
(5) Piezo-electric element

A: To knock sensor harness

G: VEHICLE SPEED SENSOR

1. MT VEHICLES

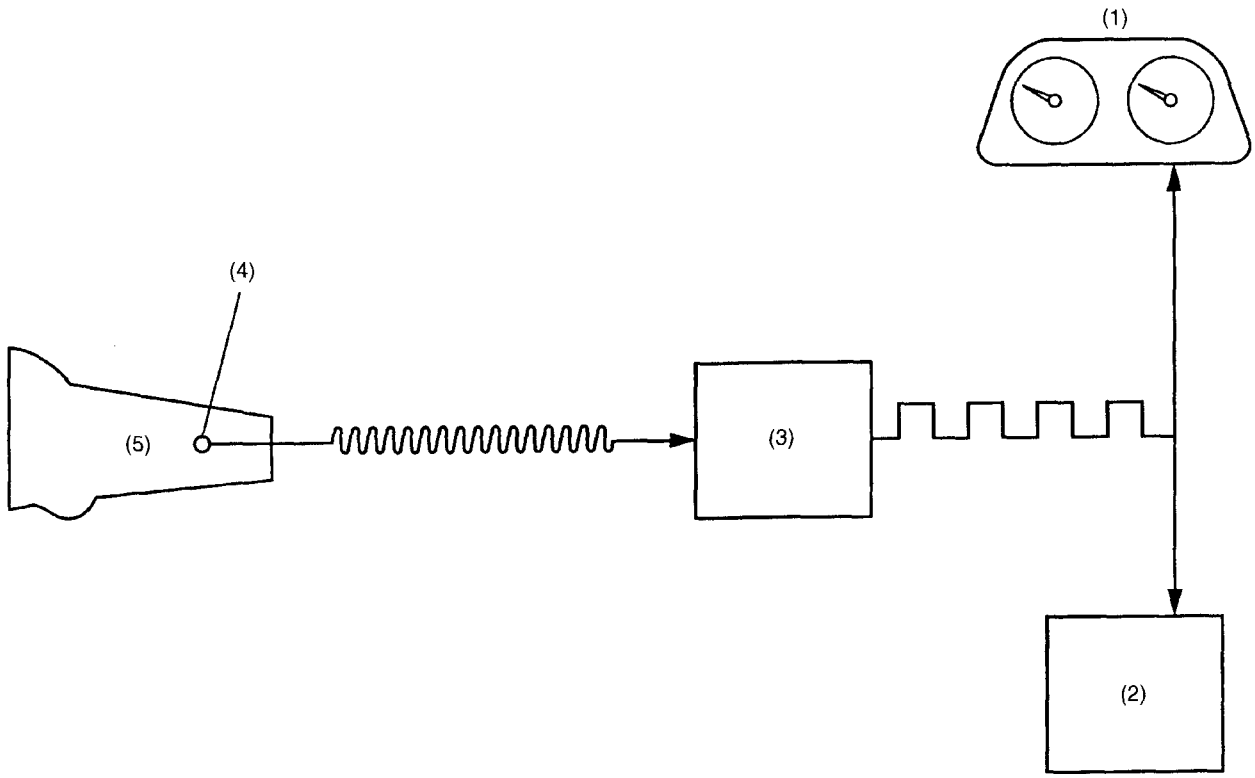
- The vehicle speed sensor is mounted on the transmission.
- The vehicle speed sensor generates a 4-pulse signal for every rotation of the front differential and send it to the ECM and the combination meter.



(1) Combination meter
(2) ECM
(3) Vehicle speed sensor
(4) Transmission

2. AT VEHICLES

- The vehicle speed sensor is mounted on the transmission.
- The vehicle speed sensor generates a 16-pulse signal for every rotation of the front differential and send it to the transmission control module (TCM). The signal sent to the TCM is converted there into a 4-pulse signal, and then sent to the ECM and the combination meter.



B2H2459B

(1) Combination meter
(2) ECM
(3) TCM
(4) Vehicle speed sensor
(5) Transmission

5. Control System

A: GENERAL

The ECM receives signals from various sensors, switches, and other control modules. Using these signals, it determines the engine operating conditions and if necessary, emits signals to one or more systems to control them for optimum operation.

Major control items of the ECM are as follow:

- Fuel injection control
- Ignition system control
- Idle air control
- Fuel pump control
- Canister purge control*1
- Radiator fan control*2
- On-board diagnosis function

*1: Canister purge control is described under "EC (SOHC) – Emission Control (Aux. Emission Control Devices) Evaporative Emission Control System".

*2: Radiator fan control is described under "CO – Cooling".

B: INPUT AND OUTPUT SIGNALS

Signal	Unit	Function
Input signals	Intake air temperature and pressure sensor	Detects the temperature of intake and amount of intake air (Measures the absolute pressure).
	Atmospheric pressure sensor	Detects the amount of intake air (Measure the atmospheric pressure).
	Throttle position sensor	Detects the throttle valve position.
	Front oxygen (A/F) sensor	Detects the density of oxygen in exhaust gases at the upstream of the front catalytic converter.
	Rear oxygen sensor	Detects the density of oxygen in exhaust gases at the downstream of the front catalytic converter.
	Crankshaft position sensor	Detects the crankshaft angular position.
	Camshaft position sensor	Detects the combustion cylinder.
	Engine coolant temperature sensor	Detects the engine coolant temperature.
	Knock sensor	Detects engine knocking.
	Vehicle speed sensor	Detects the vehicle speed.
	Ignition switch	Detects operation of the ignition switch.
	Starter switch	Detects the condition of engine cranking.
	Neutral position switch (MT)	Detects that the gear is in neutral.
	Park/Neutral position switch (AT)	Detects shift positions.
	Torque control signal (AT)	Controls engine torque.
	Heater circuit of front and rear oxygen sensor	Detects abnormality in the heater circuit of the front and rear oxygen sensors.
	Diagnostics of TCM (AT)	Detects the self-diagnostics of the TCM.
	A/C switch	Detects ON-OFF operation of the A/C switch.
	Fuel temperature sensor	Detects the temperature of the fuel in the fuel tank.
	Fuel level sensor	Detects the level of the fuel in the fuel tank.
	Fuel tank pressure sensor	Detects the evaporation gas pressure in the fuel tank.
	Small light switch	Detects ON-OFF operation of the small light switch.
	Blower fan switch	Detects ON-OFF operation of the blower fan switch.
	Rear defogger switch	Detects ON-OFF operation of the rear defogger switch.
Output signals	Fuel Injector	Activates an injector.
	Ignition signal	Turns the primary ignition current ON or OFF.
	Fuel pump relay	Turns the fuel pump relay ON or OFF.
	A/C control relay	Turns the A/C control relay ON or OFF.
	Radiator fan control relay	Turns the radiator fan control relay ON or OFF.
	Idle air control solenoid valve	Adjusts the amount of air flowing through the bypass line in the throttle body.
	Malfunction indicator lamp	Indicates existence of abnormality.
	Purge control solenoid valve	Controls purge of evaporative gas absorbed by the canister.
	Power supply	Control ON/OFF of the main power supply relay.
	Pressure control solenoid valve	Controls evaporation gas pressure in the fuel tank.
	Drain valve	Closes the evaporation line between the fuel tank and canister to detect leakage of evaporation gases.

C: FUEL INJECTION CONTROL

• The ECM receives signals from various sensors and based on them, it determines the amount of fuel injected and the fuel injection timing. It performs the sequential fuel injection control over the entire engine operating range except during start-up of the engine.

• The amount of fuel injected depends upon the length of time the injector stays open. The fuel injection duration is determined according to varying operating condition of the engine. For the purpose of achieving highly responsive and accurate fuel injection duration control, the ECM performs a new feedback control that incorporates a learning feature as detailed later.

• The sequential fuel injection control is performed such that fuel is injected accurately at the time when the maximum air intake efficiency can be achieved for each cylinder (i.e., fuel injection is completed just before the intake valve begins to open).

1. FUEL INJECTION DURATION

Fuel injection duration is basically determined as indicated below:

• During engine start-up:
The duration defined below is used.
  • Duration of fuel injection during engine start-up ..... Determined according to the engine coolant temperature detected by the engine coolant temperature sensor.

• During normal operation:
The duration is determined as follows:

  Basic duration of fuel injection x Correction factors + Voltage correction time

  • Basic duration of fuel injection ..... The basic length of time fuel is injected. This is determined by two factors – the amount of intake air detected by the manifold pressure sensor and the engine speed monitored by the crankshaft position sensor.
  • Correction factors ..... See the next section.
  • Voltage correction time ..... This is added to compensate for the time lag before operation of injector that results from variation in the battery voltage.

2. CORRECTION FACTORS

The following factors are used to correct the basic duration of fuel injection in order to make the air-fuel ratio meet the requirements of varying engine operating conditions:

- Air-fuel ratio feedback factor:

This factor is used to correct the basic duration of fuel injection in relation to the actual engine speed. (See the next section for more detail.)

- Start increment factor:

This factor is used to increase the fuel injection duration only while the engine is being cranked to improve its startability.

- Coolant-temperature-dependent increment factor:

This factor is used to increase the fuel injection duration depending on engine coolant temperature signals to facilitate cold starting. The lower the coolant temperature, the greater the increment.

- After-start increment factor:
  - This factor is used to increase the fuel injection duration for a certain period immediately after start of the engine to stabilize engine operation.
  - The increment depends on the coolant temperature at the start of the engine.

- Wide-open-throttle increment factor:

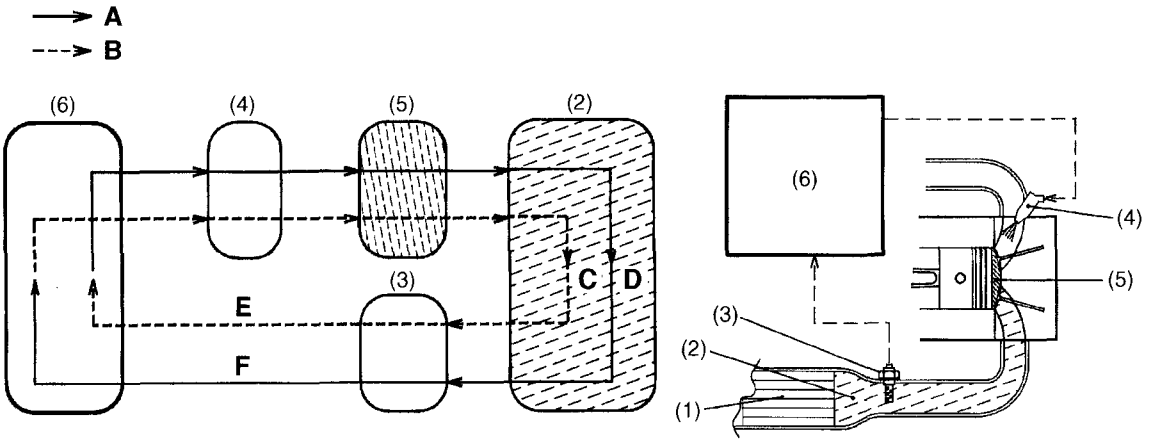
This factor is used to increase the fuel injection duration depending on the relationship between the throttle position sensor signal and manifold pressure sensor signal.

- Acceleration increment factor:

This factor is used to increase the fuel injection duration to compensate for a time lag between air flow measurement and fuel injection control for better engine response to driver's pedal operation during acceleration.

3. AIR-FUEL RATIO FEEDBACK FACTOR

The ECM creates this factor utilizing the front oxygen sensor signal. When the signal voltage is low, the air-fuel ratio is richer than the stoichiometric ratio. The ECM then makes the fuel injection duration shorter by modifying the factor. When the voltage is high showing that the mixture is lean, the ECM modifies the factor to make the injection duration longer. In this way, the air-fuel ratio is maintained at a level close to the stoichiometric ratio at which the three-way catalyst acts most effectively.



B2H0989B

(1) Front catalyst
(2) Exhaust gas
(3) Front oxygen (A/F) sensor
(4) Fuel injector
(5) Combustion chamber
(6) ECM

A: Injection duration increment signal
B: Injection duration decrement signal
C: High oxygen density
D: Low oxygen density
E: Lean signal
F: Rich signal

4. LEARNING FEATURE

The air-fuel ratio feedback control includes a learning feature which contributes to more accurate and responsive control.

- In the air-fuel ratio feedback control, the ECM calculates the necessary amount of correction based on data from the oxygen sensor and adds the result to the basic duration (which is stored in the ECM's memory for each condition defined by the engine speed and various loads.)

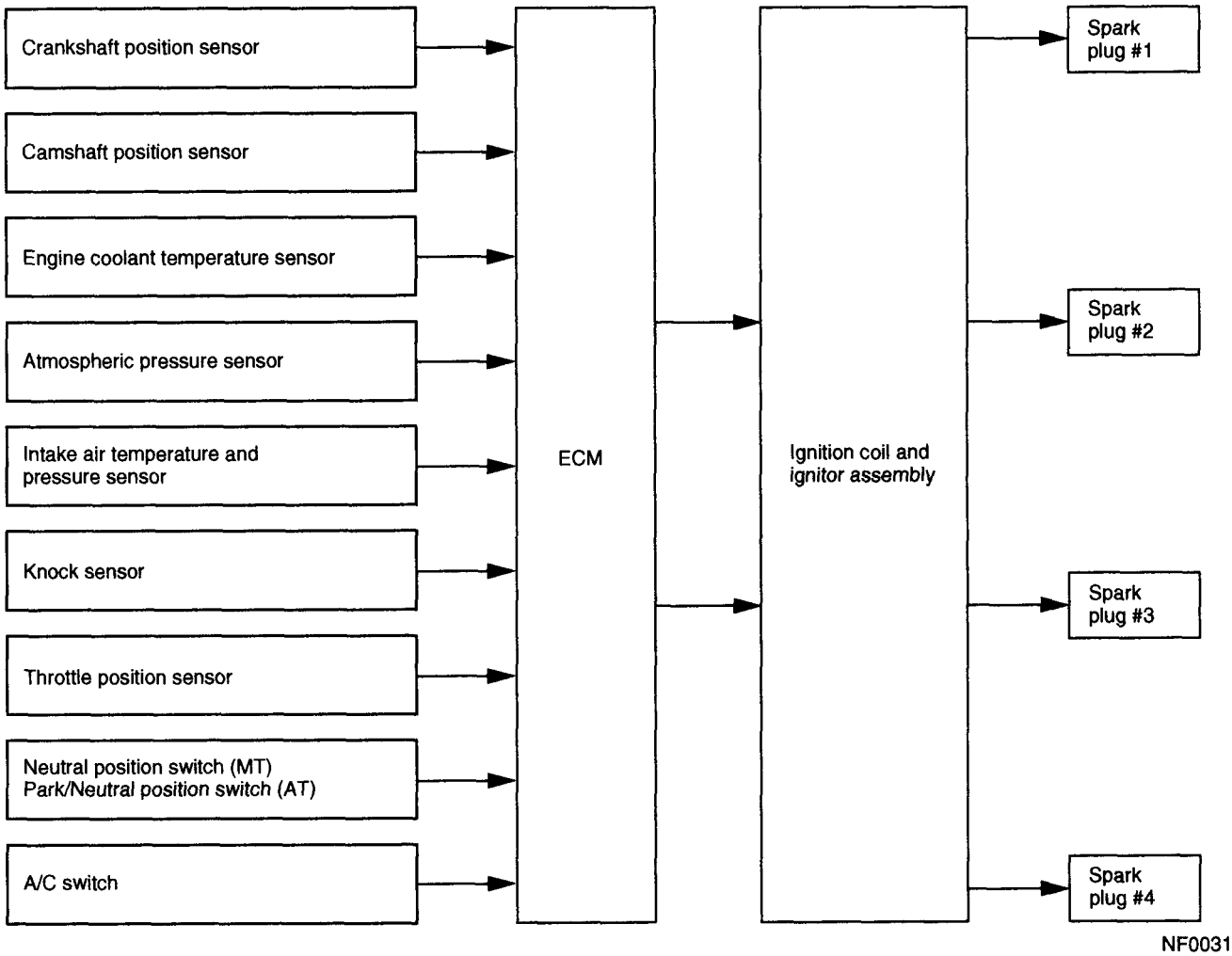
- Without a learning feature, the ECM carries out the above-mentioned process every time. This means that if the amount of necessary correction is large, the air-fuel ratio feedback control becomes less responsive and less accurate.

- The learning feature enables the ECM to store the amount of correction into memory and add it to the basic fuel injection duration to create a new reference fuel injection duration. Using the reference duration as the basic duration for the injection a few times later, the ECM can reduce the amount of correction and thus make its feedback control more accurate and responsive to changes in the air-fuel ratio due to difference in driving condition and sensor/actuator characteristics that may result from unit-to-unit variation or aging over time.

D: IGNITION SYSTEM CONTROL

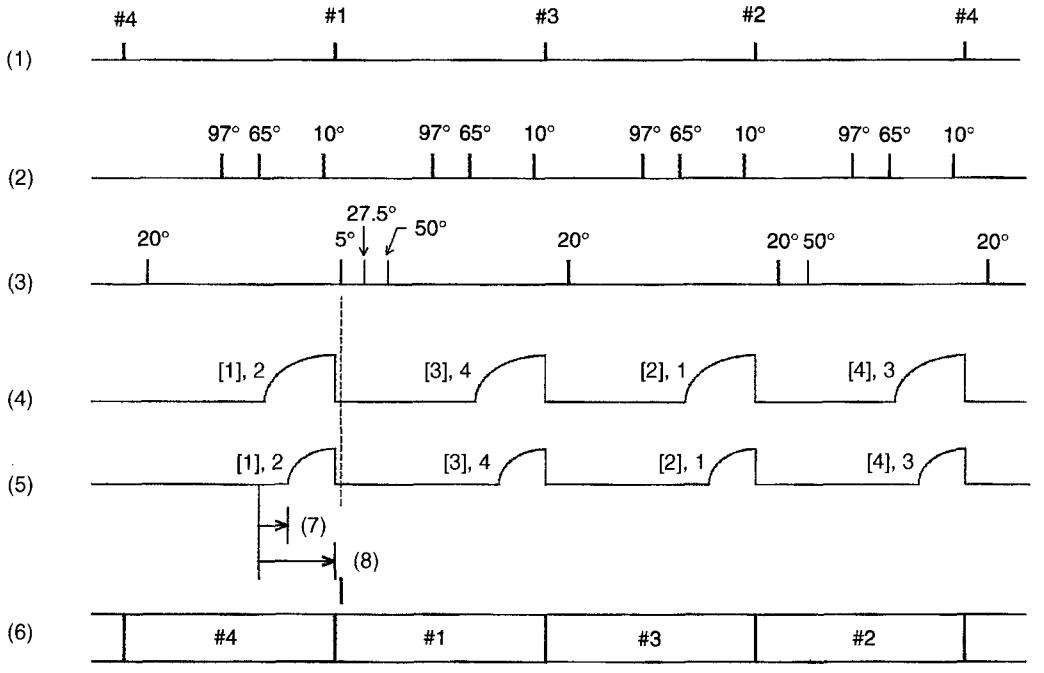
- The ECM determines operating condition of the engine based on signals from the pressure sensor, engine coolant temperature sensor, intake air temperature sensor, crankshaft position sensor and other sources. It then selects the ignition timing most appropriate for the condition thus determined from those stored in its memory and outputs at that timing a primary current OFF signal to the ignitor to initiate ignition.
- This control uses a quick-to-response learning feature by which the data stored in the ECM memory is processed in comparison with information from various sensors and switches.
- Thus, the ECM can always perform optimum ignition timing taking into account the output, fuel consumption, exhaust gas, and other factors for every engine operating condition.
- Ignition control during start-up

Engine speed fluctuates during start of the engine, so the ECM cannot control the ignition timing. During that period, the ignition timing is fixed at 10° BTDC by using the 10° signal from the crankshaft position sensor.



- Ignition control after start of engine

Between the 97° and 65° crank angle signal, the ECM measures the engine speed, and by using this data it decides the dwell set timing and ignition timing according to the engine condition.

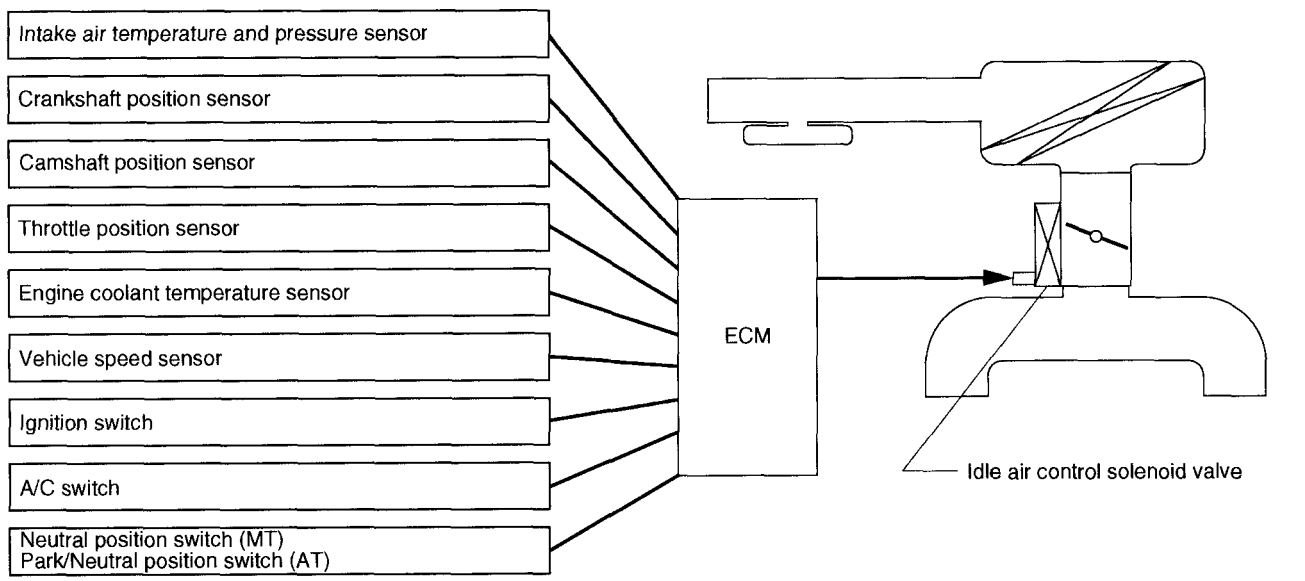


B2H0410D

(1) Cylinder number
(2) Crank angle pulse (BTDC)
(3) Cam angle pulse (ATDC)
(4) Ignition timing at starting
(5) Ignition timing at normal condition
(6) Burning cylinder
(7) Dwell set
(8) Ignite

E: IDLE AIR CONTROL

- The ECM activates the idle air control solenoid valve to control the bypass air flowing through the bypass passage in the throttle body depending on signals from the crankshaft position sensor, engine coolant temperature sensor, pressure sensor and A/C switch so that the proper idle speed for each engine load is achieved.
- The idle air control solenoid valve uses a duty-ratio-controlled solenoid which can continuously vary the opening area of the rotary valve. As the ECM increases the duty ratio, opening of the rotary valve increases so that the bypass air flow increases, and the engine idling speed becomes higher as a result.
- The bypass air control is necessary for:
  - Increasing idling speed when the air conditioning system and/or electrical loads are turned on.
  - Increasing idling speed during early stage of warm up period.
  - Obtaining dashpot function when the throttle valve is quickly closed.
  - Prevention of engine speed variation during idling.



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F: FUEL PUMP CONTROL

Using the signal from the crankshaft position sensor, the ECM controls operation of the fuel pump by turning its relay ON or OFF. To improve safety, the fuel pump is stopped if the engine stalls with the ignition switch ON.

Ignition switch ON	Fuel pump relay	Fuel pump
A certain period of time after ignition switch is turned ON	ON	Operates
While cranking the engine	ON	Operates
While engine is operating	ON	Operates
When engine stops	OFF	Does not operate

6. On-board Diagnosis System

A: GENERAL

- The on-board diagnosis system detects and indicates a fault by generating a code corresponding to each fault location. The malfunction indicator lamp (CHECK ENGINE light) on the combination meter indicates occurrence of a fault or abnormality.
- When the malfunction indicator lamp comes on as a result of detection of a fault by the ECM, the corresponding diagnostic trouble code (DTC) and freeze frame engine condition are stored in the ECM.
- On the OBD-II conformable car, it is necessary to connect the Subaru Select Monitor (SSM) or General Scan Tool (GST) to the data link connector in order to check the DTC.
- The SSM and GST can read and erase DTCs. They can also read freeze frame data in addition to other pieces of engine data.
- If there is a failure involving sensors which may affect drive control of the vehicle, the fail-safe function ensures minimum level of driveability.

B: FAIL-SAFE FUNCTION

For a sensor or switch which has been judged faulty in the on-board diagnosis, the ECM, if appropriate, generates an associated pseudo signal to keep the vehicle operational. (The control becomes degraded.)

FUEL INJECTION (FUEL SYSTEM) FU (DOHC TURBO)

		Page
1.	General	2
2.	Air Line	3
3.	Fuel Line	8
4.	Sensors and Switches	16
5.	Control System	27
6.	On-board Diagnosis System	36

1. General

• The Multipoint Fuel Injection (MFI) system supplies optimum air-fuel mixture under every engine operating condition through the use of the latest electronic control technology.

This system pressurizes the fuel to a constant pressure and injects it into each intake air port in the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where an electro-magnetic injection valve or injector opens for a short period that is precisely controlled depending on the quantity of air appropriate for each condition of operation. In actual control, an optimum fuel injection quantity is achieved by varying the duration of an electric pulse applied to the injector. This way of control enables simple, yet highly precise metering of the fuel.

• The engine control module (ECM) that controls the fuel injection system corrects the fuel injection amount depending on the vehicle speed, throttle opening, coolant temperature and other vehicle-operation-related information. The ECM receives the information in the form of electric signals from the corresponding sensors and switches.

The MFI system also has the following features:

- Reduced exhaust emissions
- Reduced fuel consumption
- Increased engine output
- Quick response to accelerator and brake pedal operation
- Superior startability and warm-up performance in cold weather due to corrective controls made according to coolant and intake air temperatures

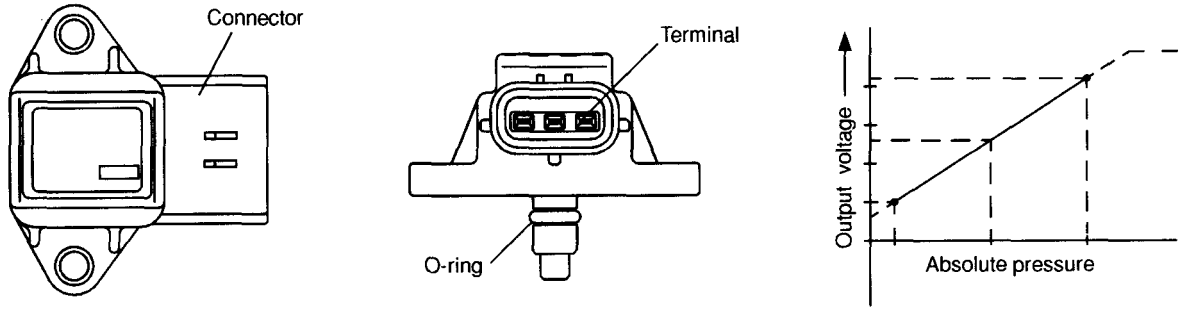
2. Air Line

A: GENERAL

The air filtered by the air cleaner enters the throttle body where it is regulated in the volume by the throttle valve and then enters the intake manifold. It is then distributed to each cylinder where the air is mixed with fuel injected by the injector. During idling operation, air flows into the cylinder through the idle air control solenoid valve, bypassing the throttle valve. This enables controlling the engine idling speed properly.

B: PRESSURE SENSOR

The pressure sensor is attached to the top of the throttle body, and continuously sends to the engine control module (ECM) voltage signals that are proportional to intake manifold absolute pressures. The ECM controls the fuel injection and ignition timing based on the intake manifold absolute pressure signals in addition to other signals from many sensors and other control modules.



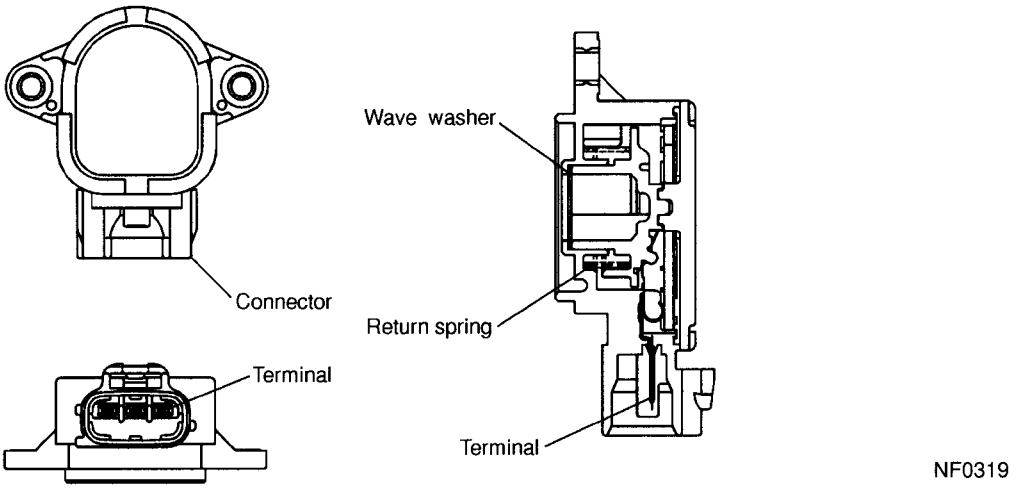
NF0318

C: THROTTLE BODY

- In response to operation of the accelerator pedal, the throttle valve in the throttle body opens/closes to regulate the volume of the air drawn into the combustion chamber.
- During idling, the throttle valve is almost fully closed and the volume of air passing through the throttle body is less than that passing through the idle air control solenoid valve.
- More than half of the air necessary for idling is supplied to the intake manifold via the idle air control solenoid valve which controls properly the engine idling speed, so the idling speed needs not be adjusted.

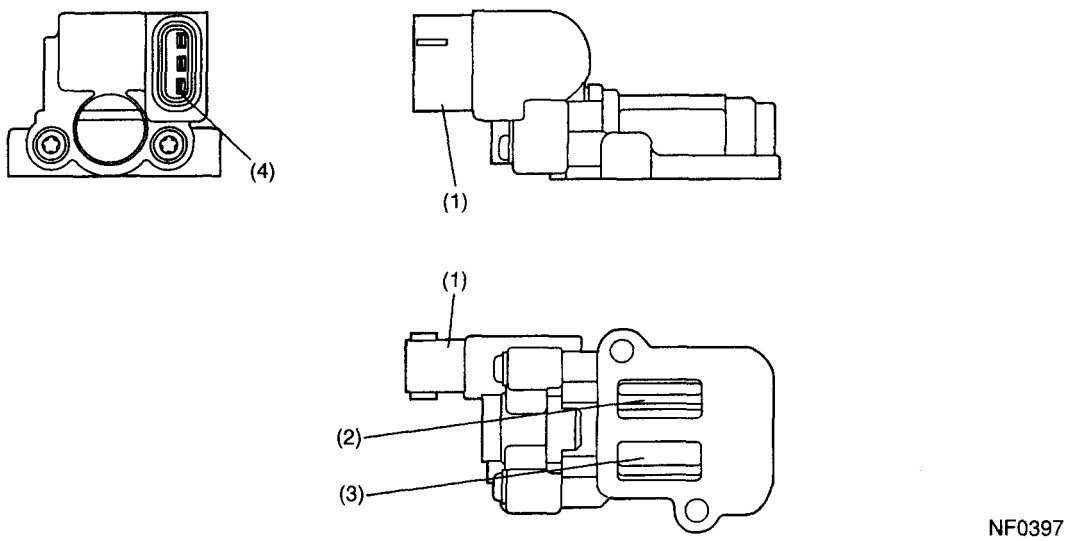
D: THROTTLE POSITION SENSOR

- The throttle position sensor is mounted in the throttle body and linked to the throttle valve.
- The throttle position sensor sends the ECM voltage signal corresponding to the opening of the throttle valve. When the sensor's output voltage exceeds a predetermined level, the ECM interprets it as complete closure of the throttle valve. When the output voltage is at another predetermined level, the ECM recognizes that the throttle valve is at a wide open position. Since the output characteristics of the sensor change over years, the ECM is provided with a learning function to be able to interpret signals into throttle valve angles always correctly.



E: IDLE AIR CONTROL SOLENOID VALVE

- The idle air control solenoid valve is located in the throttle body and regulates the amount of intake air that flows bypassing the throttle valve into the intake manifold during engine idling. It is activated by a signal from the ECM in order to maintain the engine idling speed at a target speed.
- The idle air control solenoid valve is a solenoid-actuated rotary valve consisting of a coil, rotary valve, spring and housing. The housing is an integral part of the throttle body and provided with a bypass air port whose opening area is changed by the rotary valve.

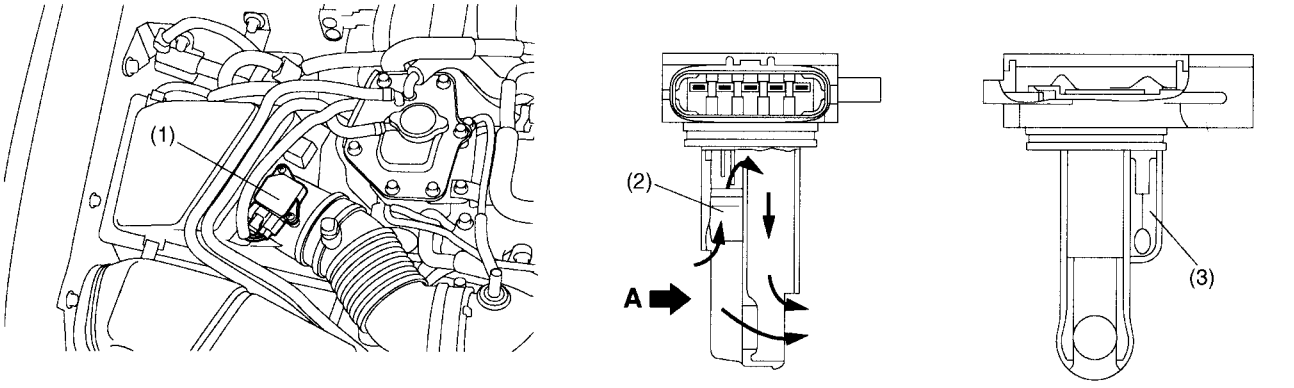


NF0397

(1) Connector
(2) Air outlet port
(3) Air inlet port
(4) Terminal

F: MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR

The mass air flow and the intake air temperature sensors are integrated into a single unit. The unit is mounted on the air cleaner case and measures the amount as well as the temperature of the intake air.
The measured amount and temperature are converted into electrical signals and sent to the ECM. The ECM uses these signals to control injection and ignition timing as well as the fuel injection amount.



NF0321

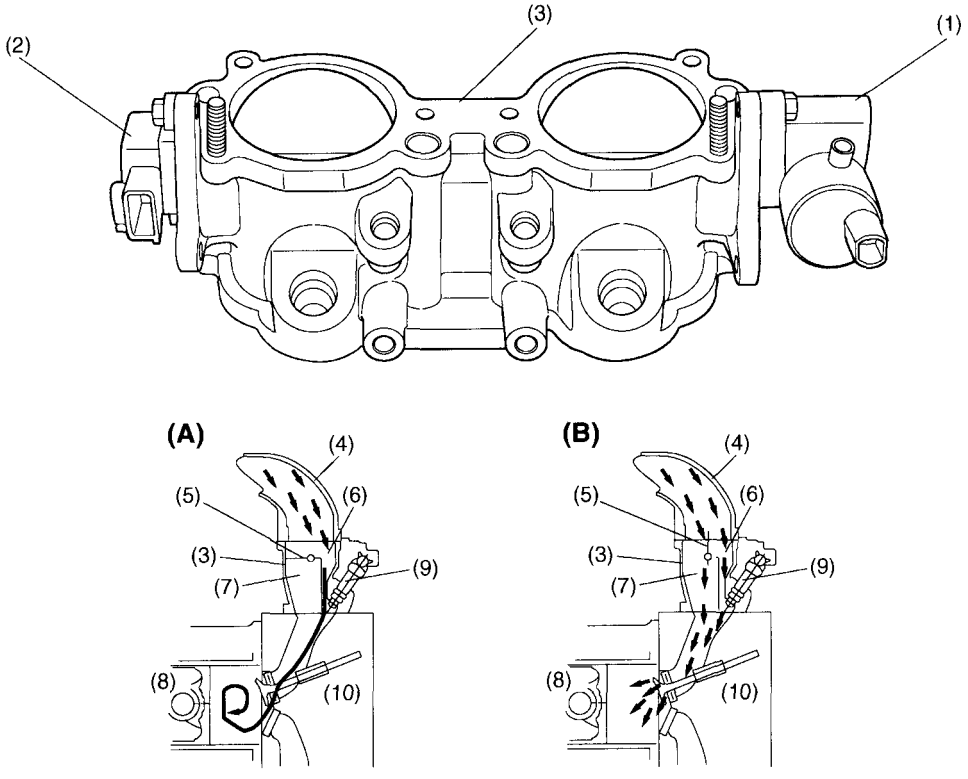
(1) Mass air flow and the intake air temperature sensor unit
(2) Mass air flow sensor
(3) Intake air temperature sensor

A: Air

G: TUMBLE GENERATOR VALVES

• A tumble generator valve is provided on each engine bank, between the intake manifold and intake air ports. The right bank tumble generator valve has butterfly valves for the #1 and #3 cylinders and the left bank tumble generator valve has those for the #2 and #4 cylinders. The two butterfly valves in each tumble generator valve are fitted on a single shaft that is driven by an actuator.

• The tumble generator valves are controlled by the ECM according to the coolant temperature and the time elapsed after start of the engine. When the engine is started, the butterfly valves are moved to the closing ends. In this state, the intake air flows at very high speeds passing through narrowed passages in the directions determined by the individual intake air ports in the cylinder head. This creates tumbling air motions in the cylinders, which enables lean mixtures to be ignited and thus harmful exhaust emissions to be reduced during engine start. The tumble generator valves are fully open when the engine is operating at an ordinary driving speed, allowing intake air to flow without being changed in direction and velocity.



NF0322

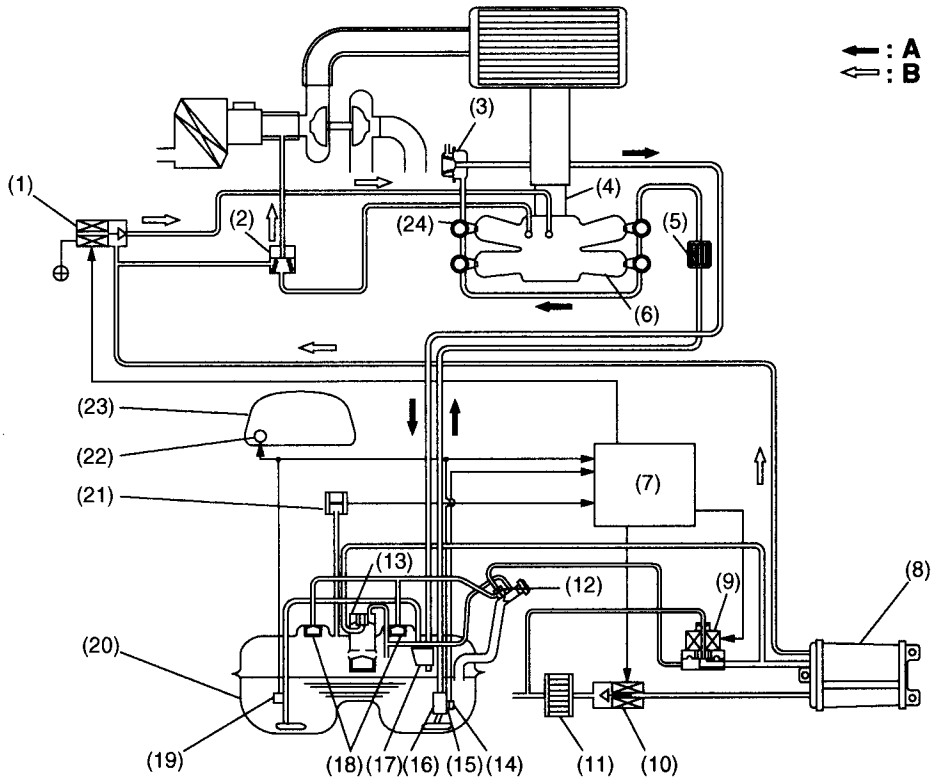
(A) Activated
(B) Not activated
(1) Actuator
(2) Tumble generator valve position sensor
(3) Tumble generator housing
(4) Intake manifold
(5) Tumble generator valve
(6) Tumble generating air passage
(7) Intake main air passage
(8) Piston
(9) Injector
(10) Cylinder head

3. Fuel Line

A: GENERAL

- The fuel pressurized by the fuel tank inside pump is delivered to each fuel injector by way of the fuel pipe and fuel filter. Fuel injection pressure is regulated to an optimum level by the pressure regulator.
- Each injector injects fuel into the intake port of the corresponding cylinder where the fuel is mixed with air. The mixture then enters the cylinder.

Fuel injection amount and timing are regulated by the ECM.

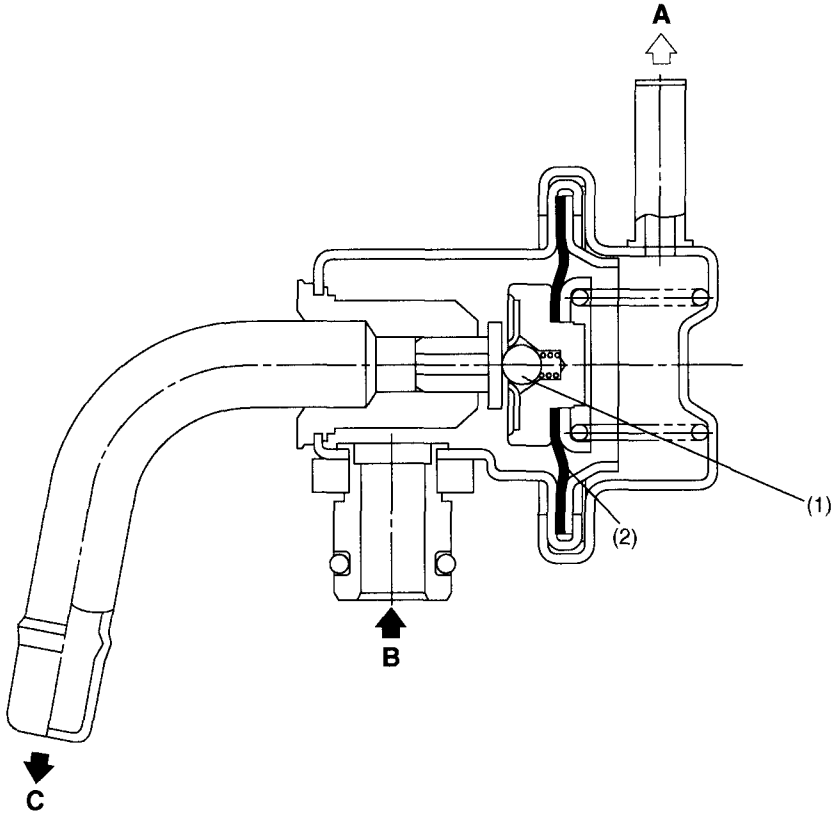


(1) Purge control solenoid valve
(2) Purge valve
(3) Pressure regulator
(4) Throttle body
(5) Fuel filter
(6) Intake manifold
(7) ECM
(8) Canister
(9) Pressure control solenoid valve
(10) Drain valve
(11) Drain filter
(12) Shut-off valve
(13) Vent valve
(14) Fuel temperature sensor
(15) Fuel level sensor
(16) Fuel pump
(17) Jet pump
(18) Fuel cut valve
(19) Fuel sub level sensor
(20) Fuel tank
(21) Fuel tank pressure sensor
(22) Fuel gauge
(23) Combination meter
(24) Fuel injector

A: Fuel line
B: Evaporation line

B: PRESSURE REGULATOR

The pressure regulator is installed at the injector end of the fuel supply line. It has a fuel chamber and spring chamber separated by a diaphragm. Fuel chamber is connected to the fuel supply line and the spring chamber is connected to the intake manifold. Fuel chamber also has a relief valve connected to the fuel return line through which fuel returns to the fuel tank. When the intake manifold vacuum increases, the diaphragm is pulled and the relief valve opens to decrease the fuel supply line pressure (or fuel injection pressure). When the intake manifold vacuum decreases, the diaphragm is pushed by the spring to increase the fuel supply line pressure. Thus, the difference between the fuel injection pressure and the intake manifold vacuum is kept at a constant level of 294 kPa (3.00 kgf/cm^2, 43.0 psi) to precisely control the amount of injected fuel.



NF0387

A: To intake manifold
B: Fuel IN
C: Fuel OUT

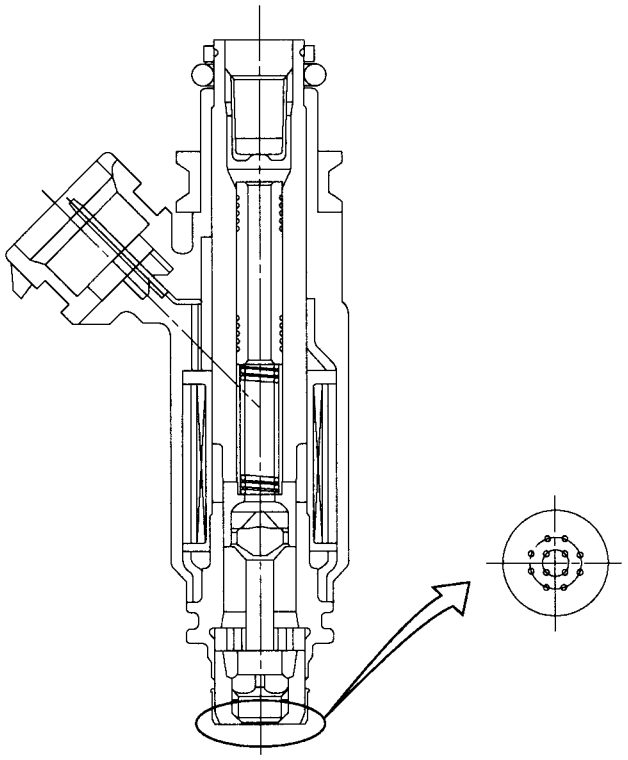
(1) Relief valve
(2) Diaphragm

C: FUEL INJECTORS

- The MFI system employs top feed type fuel injectors.
- Each injector is installed in the fuel pipe in such a way that the injector is cooled by fuel.
- The features of this type of fuel injector are as follows:

1) High heat resistance
2) Low driving noise
3) Easy to service
4) Small size

- The injector injects fuel according to the valve open signal from the ECM. The needle valve is lifted by the solenoid which is energized on arrival of the valve open signal.
- Since the injector's nozzle hole area, the lift of valve and the fuel pressure are kept constant, the amount of fuel injected is controlled only by varying the duration of the valve open signal from the ECM.
- The multi-hole nozzle makes it possible for the injector to produce fire fuel particles, which enhances the combustion efficiency and output performance of the engine.

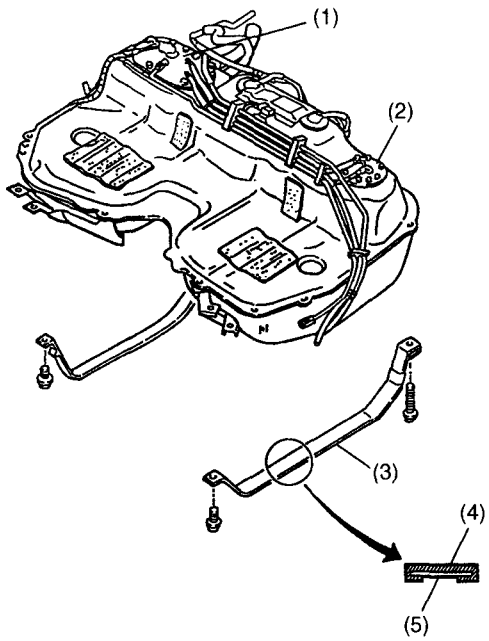


NF0388

D: FUEL TANK

The fuel tank utilizes a two-compartment design to ensure sufficient capacity without interfering with the rear differential. It is provided with a suction jet pump (included in the fuel pump and fuel level sensor assembly) which transfers fuel from one compartment to the other. Each compartment has an individual fuel level sensor.

The fuel tank is located under the rear seat and secured with hold-down bands.



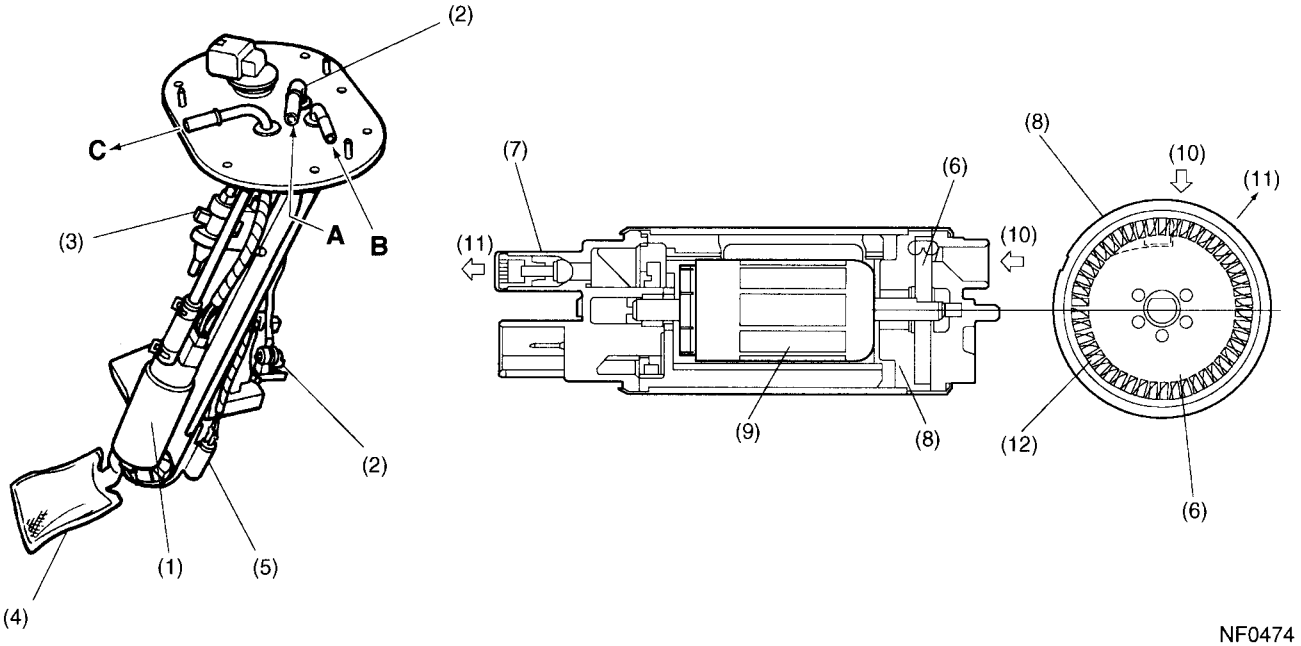
NF0473

(1) Fuel pump and fuel level sensor assembly
(2) Fuel sub level sensor
(3) Band
(4) Cushion
(5) Steel

E: FUEL PUMP AND FUEL LEVEL SENSOR ASSEMBLY

1. FUEL PUMP

The fuel pump consists of a motor, impeller, pump casing, pump cover, check valve and filter. It is located in the fuel tank and combined with the fuel level sensor into a single unit. The operation of this impeller type pump is very quiet.



NF0474

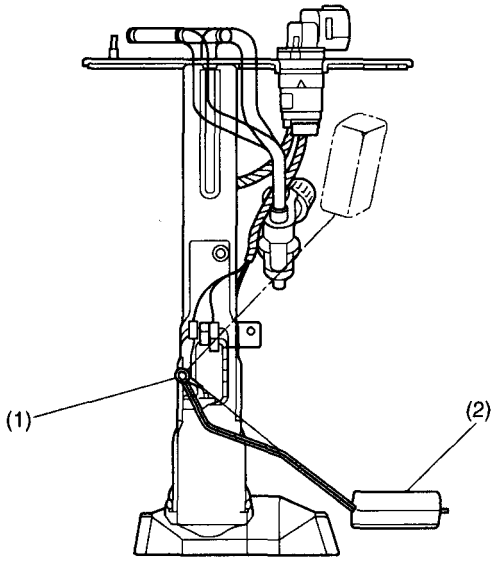
(1) Fuel pump
(2) Fuel level sensor
(3) Jet pump
(4) Mesh filter
(5) Fuel temperature sensor
(6) Impeller
(7) Check valve
(8) Pump casing
(9) Motor armature
(10) Suction
(11) Discharge
(12) Vane groove

A: From engine (return line)
B: From sub tank
C: To engine (delivery line)

- When the ignition switch is turned ON, fuel pump relay is activated. Then the motor operates to rotate the impeller.
- As the impeller rotates, fuel in a vane groove of the impeller flows along the fuel passage into the next vane groove by centrifugal force. When fuel flows from one groove to the next, a pressure difference occurs due to friction. This creates a pumping effect.
- The fuel pushed up by rotation of the impeller then passes through the clearance between the armature and the magnet of the motor and is discharged through the check valve.
- When the fuel discharge pressure reaches the specified level, the relief valve opens and excess fuel is released into the fuel tank. In this manner, the relief valve prevents an abnormal increase in fuel pressure.
- When the engine and the fuel pump stop, spring force acts on the check valve to close the discharge port, so that the fuel pressure in the fuel delivery line is retained.

2. FUEL LEVEL SENSOR

The fuel level sensor forms part of the fuel pump and located in the fuel tank. The sensor outputs an electric resistance signal that varies with movement of its float to indicate the level of the fuel remaining in the tank.

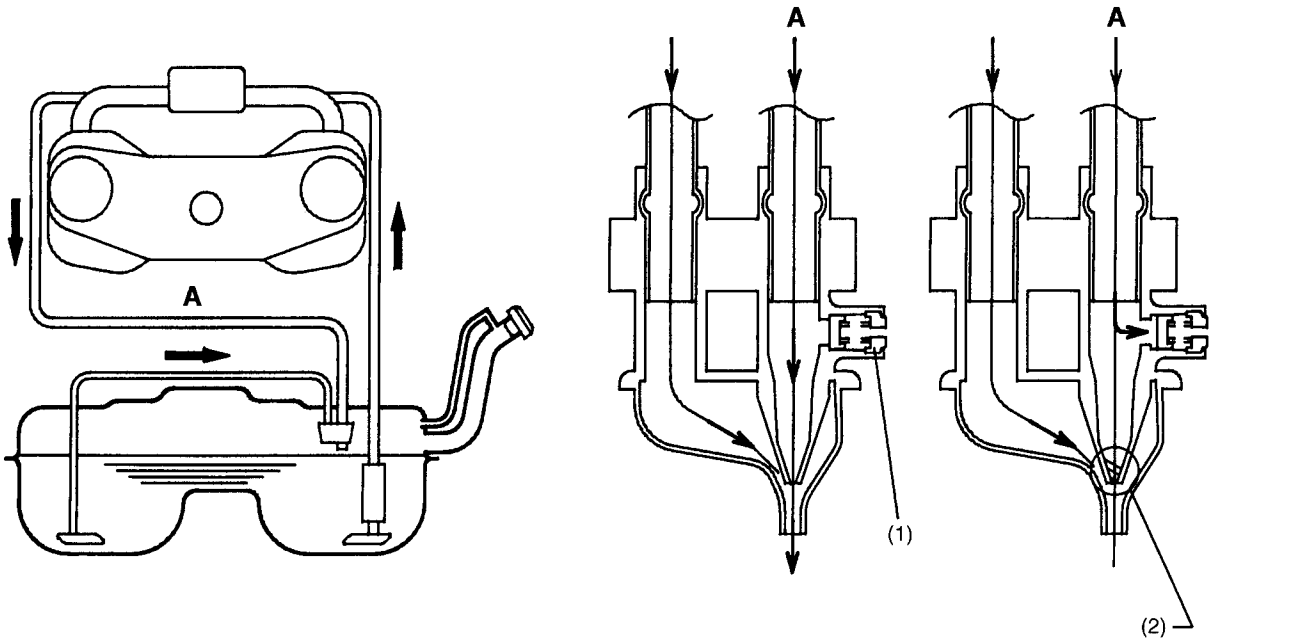


NF0327

(1) Fuel level sensor
(2) Float

3. JET PUMP

- The jet pump utilizes the velocity of fuel returning from the engine to produce negative pressure in it.
- Using the pumping effect produced by the negative pressure, the jet pump transfers fuel from the sub-compartment to the main compartment of the fuel tank.
- When the return line nozzle is clogged, the fuel sent back through the return line flows back into the fuel tank via the relief valve.



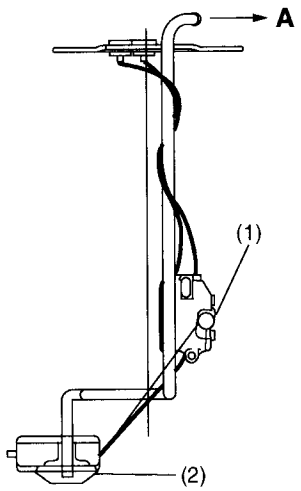
NF0328

(1) Relief valve
(2) Nozzle

A: Return line

F: SUB-COMPARTMENT FUEL LEVEL SENSOR

This sensor detects the level of the fuel in the sub-compartment (the compartment in which the fuel pump is not located) and acts as part of the fuel transfer line when the jet pump is in operation to maintain the fuel in both compartments at the same level.



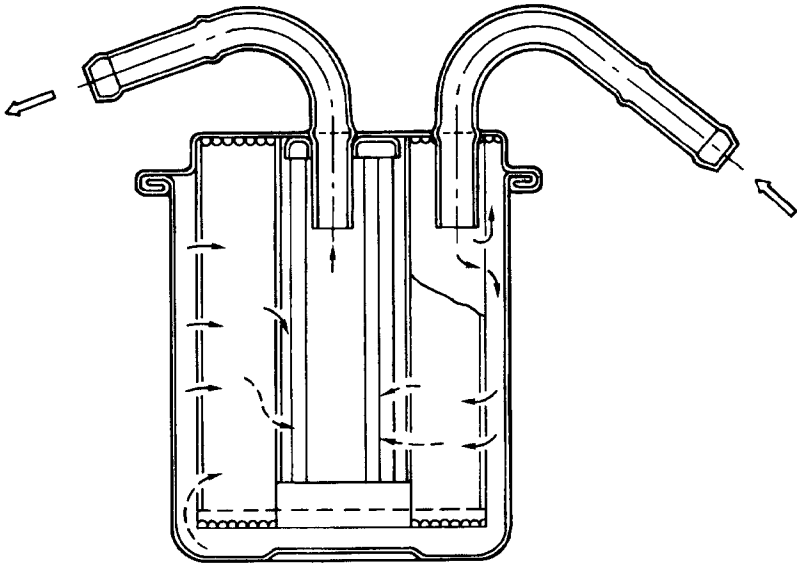
NF0396

(1) Fuel level sensor
(2) Float

A: To jet pump

G: FUEL FILTER

The fuel filter located in the engine compartment is a pressure-withstanding, cartridge type. It has a filter element in a metal case. The fuel entering the filter flows from the perimeter of the element to the center of the filter and goes out from there.

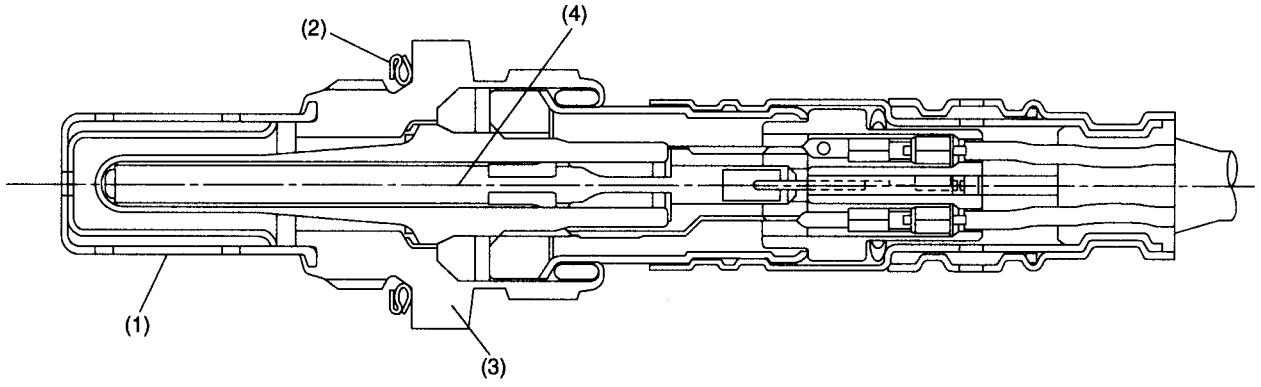


NF0018

4. Sensors and Switches

A: FRONT OXYGEN (A/F) SENSOR

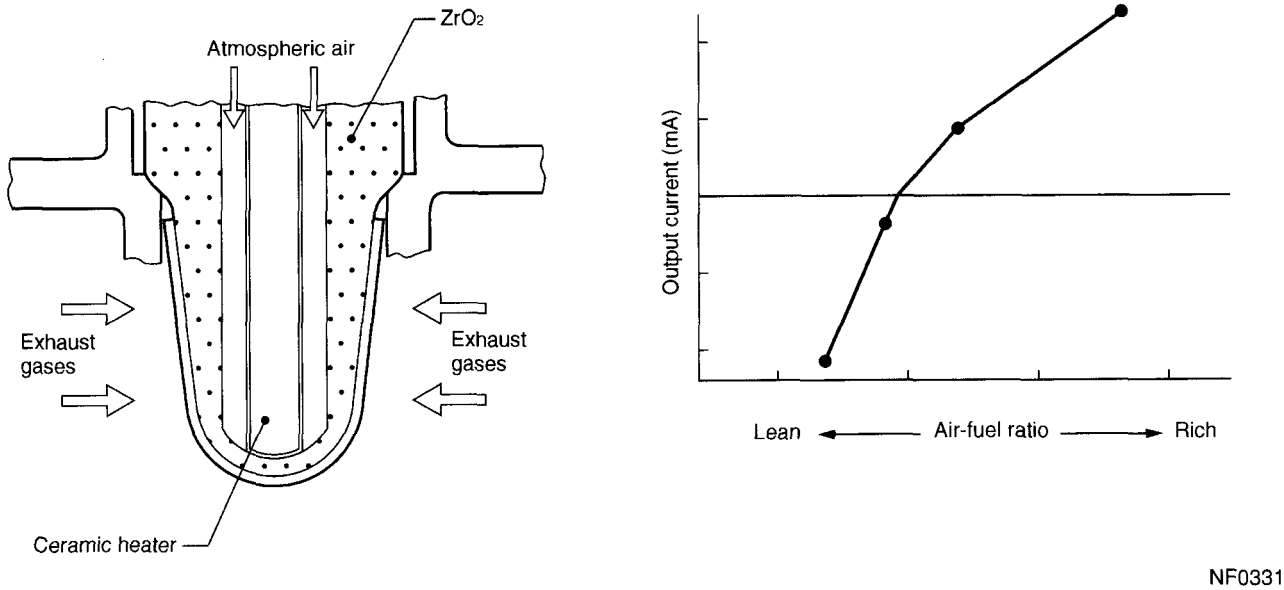
- The front oxygen sensor uses zirconium oxide (ZrO_2) which is a solid electrolyte, at portions exposed to exhaust gas.
- The zirconium oxide has the property of generating electromotive force when its both sides are exposed to oxygen ions of different concentration and the magnitude of this electromotive force depends on how much the difference is.
- The front oxygen sensor detects the amount of oxygen in exhaust gases by making use of this property of the zirconium oxide material.
- The zirconium oxide material is formed into a closed end tube and its external surface is exposed to exhaust gases with smaller oxygen ion concentration, whereas its internal surface is exposed to atmospheric air. The external surface has a porous platinum coating. The sensor housing is grounded to the exhaust pipe and the inside is connected to the ECM through the harness to be able to use the current output from the sensor.
- The sensor incorporates a ceramic heater to improve its performance at low temperatures.



NF0389

(1) Protection tube
(2) Gasket
(3) Sensor housing
(4) Ceramic heater

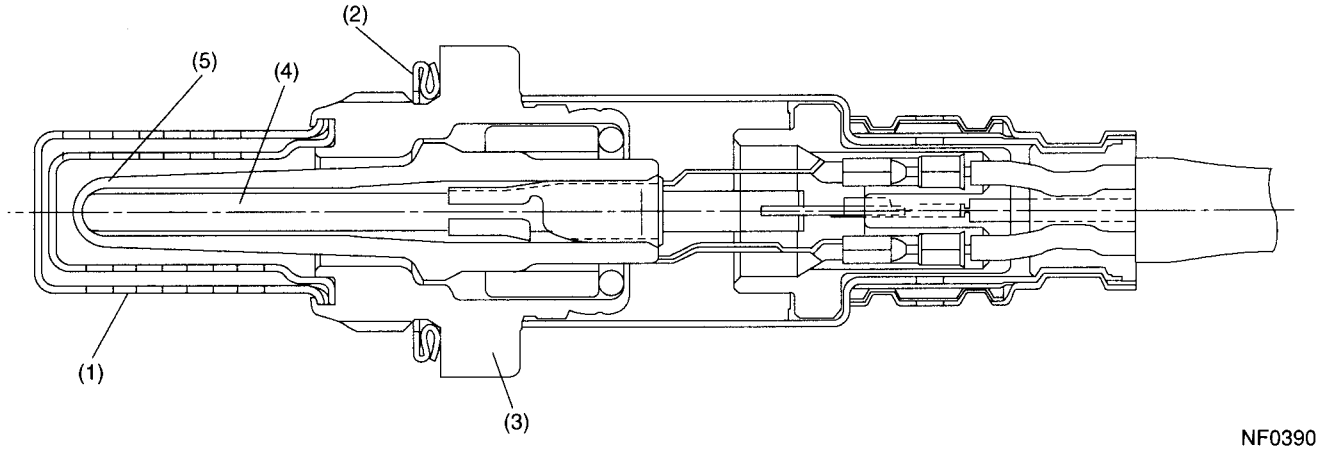
- When rich air-fuel mixture is burnt in the cylinder, the oxygen in the exhaust gases is almost completely used in the catalytic reaction by the platinum coating on the external surface of the zirconia tube. This results in a very large difference in the oxygen ion concentration between the inside and outside of the tube, and the electromotive force generated is large.
- When a lean air-fuel mixture is burnt in the cylinder, relatively large amount of oxygen remains in the exhaust gases even after the catalytic action, and this results in a small difference in the oxygen ion concentration between the tube's internal and external surfaces. The electromotive force in this case is very small.
- The difference in oxygen concentration changes drastically in the vicinity of the stoichiometric air-fuel ratio, and hence the change in the electromotive force is also large. By using this information, the ECM can determine the air-fuel ratio of the supplied mixture easily. The front oxygen sensor does not generate much electromotive force when the temperature is low. The output characteristics of the sensor stabilize at a temperature of approximately 700°C (1,292°F).



NF0331

B: REAR OXYGEN SENSOR

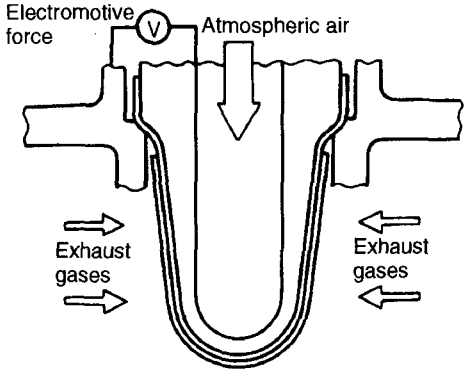
- The rear oxygen sensor is used to sense oxygen concentration in the exhaust gas. If the air-fuel ratio is leaner than the stoichiometric ratio in the mixture (i.e., excessive amount of air), the exhaust gas contains more oxygen. To the contrary, if the fuel ratio is richer than the stoichiometric ratio, the exhaust gas contains almost no oxygen.
- Detecting the oxygen concentration in exhaust gas using the oxygen sensor makes it possible to determine whether the air-fuel ratio is leaner or richer than the stoichiometry.
- The rear oxygen sensor has a zirconia tube (ceramic) which generates voltage if there is a difference in oxygen ion concentration between the inside and outside of the tube. Platinum is coated on the inside and outside of the zirconia tube as a catalysis and electrode material. The sensor housing is grounded to the exhaust pipe and the inside is connected to the ECM through the harness.
- A ceramic heater is employed to improve performance at low temperatures.

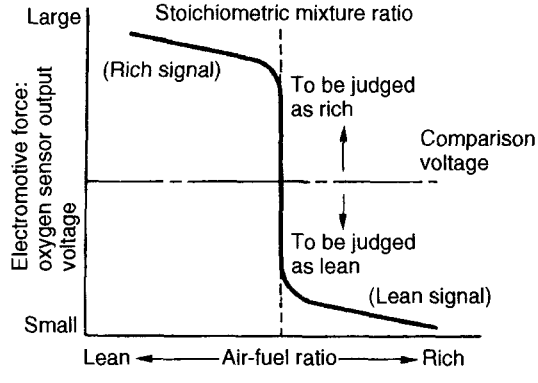


NF0390

(1) Protection tube
(2) Gasket
(3) Sensor housing
(4) Ceramic heater
(5) Zirconia tube

- When rich air-fuel mixture is burnt in the cylinder, the oxygen in the exhaust gases is almost completely used in the catalytic reaction by the platinum coating on the external surface of the zirconia tube. This results in a very large difference in the oxygen ion concentration between the inside and outside of the tube, and the electromotive force generated is large.
- When a lean air-fuel mixture is burnt in the cylinder, relatively large amount of oxygen remains in the exhaust gases even after the catalytic action, and this results in a small difference in the oxygen ion concentration between the tube's internal and external surfaces. The electromotive force in this case is very small.
- The difference in oxygen concentration changes drastically in the vicinity of the stoichiometric air-fuel ratio, and hence the change in the electromotive force is also large. By using this information, the ECM can determine the air-fuel ratio of the supplied mixture easily. The rear oxygen sensor does not generate much electromotive force when the temperature is low. The output characteristics of the sensor stabilize at a temperature of approximately 300 to 400°C (572 to 752°F).

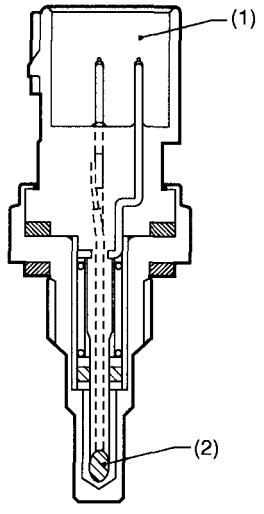


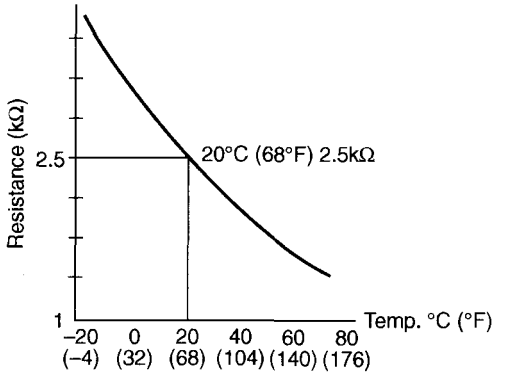


NF0333

C: ENGINE COOLANT TEMPERATURE SENSOR

The engine coolant temperature sensor is located on the engine coolant pipe. The sensor uses a thermistor whose resistance changes inversely with temperature. Resistance signals as engine coolant temperature information are transmitted to the ECM to make fuel injection, ignition timing, purge control solenoid valve and other controls.





S2H1113B

(1) Connector

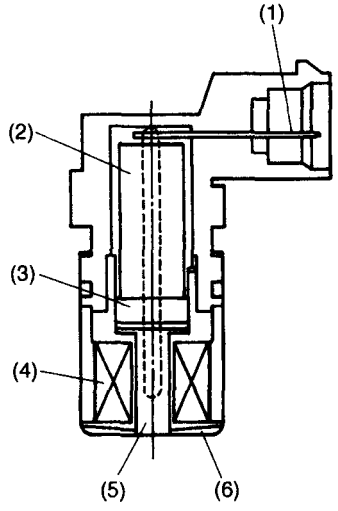
(2) Thermistor element

D: EXHAUST GAS TEMPERATURE SENSOR

The exhaust gas temperature sensor is located on the joint pipe and used to monitor the condition of the precatalytic converter.

E: CRANKSHAFT POSITION SENSOR

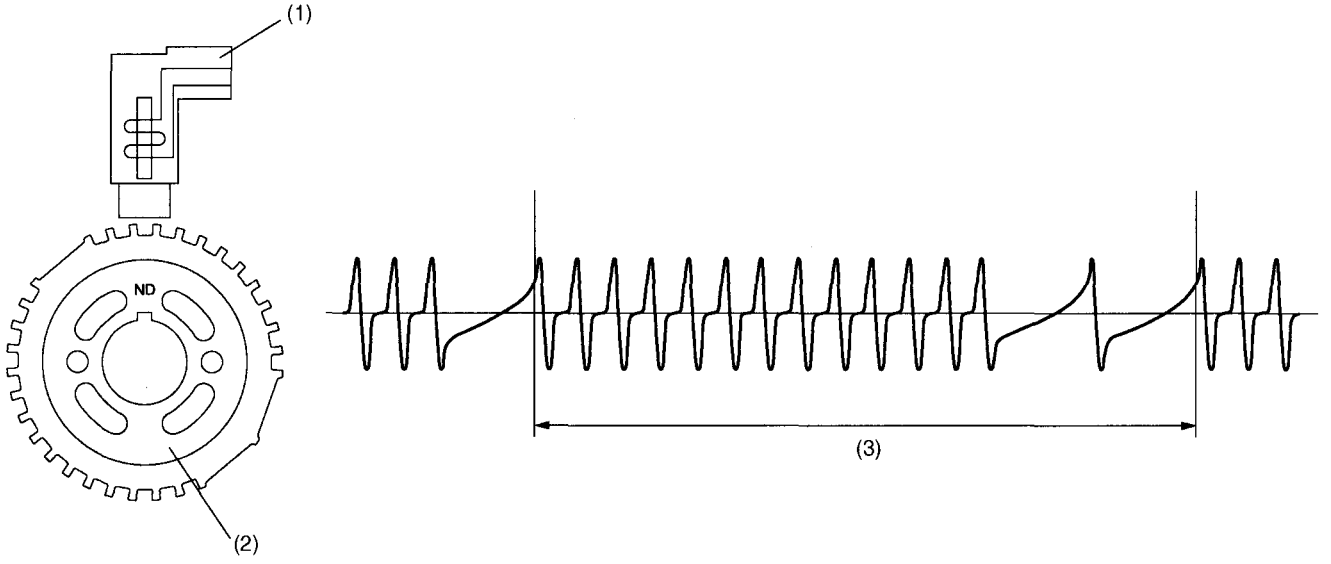
- The crankshaft position sensor is installed on the oil pump which is located in the front center portion of the cylinder block. The sensor generates a pulse when one of the teeth on the perimeter of the crankshaft sprocket (rotating together with the crankshaft) passes in front of it. The ECM determines the crankshaft angular position by counting the number of pulses.
- The crankshaft position sensor is a molded type which consists of a magnet, core, coil, terminals and other components as illustrated below.



NF0024

(1) Terminal
(2) Yoke core
(3) Magnet
(4) Coil
(5) Core
(6) Cover

• As the crankshaft rotates, each tooth aligns with the crankshaft position sensor. At that time, the magnetic flux in the sensor's coil changes since the air gap between the sensor pickup and the sprocket changes. This change in magnetic flux induces a voltage pulse in the sensor and the pulse is transmitted to the ECM.



NF0429

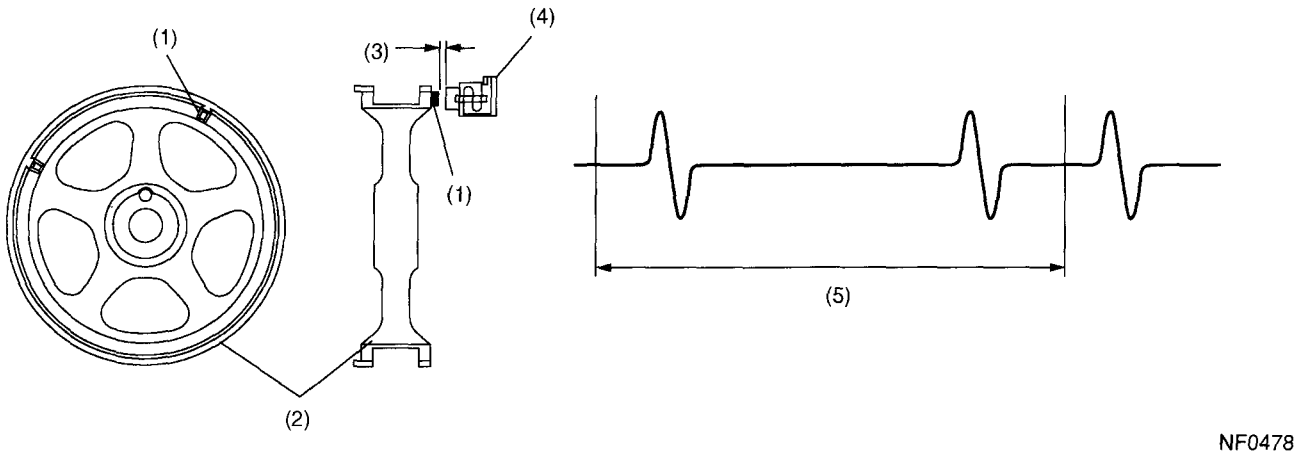
(1) Crankshaft position sensor
(2) Crankshaft sprocket
(3) Crankshaft half rotation

F: CAMSHAFT POSITION SENSOR

- The camshaft position sensor is located on the left-hand camshaft support. It detects the combustion cylinder at any given moment.

- The sensor generates a pulse when one of the bosses on the back of the left-hand camshaft drive sprocket passes in front of the sensor. The ECM determines the camshaft angular position by counting the number of pulses.

Internal construction and the basic operating principle of the camshaft position sensor are similar to those of the crankshaft position sensor. Two bosses are provided on the sprocket as shown below.

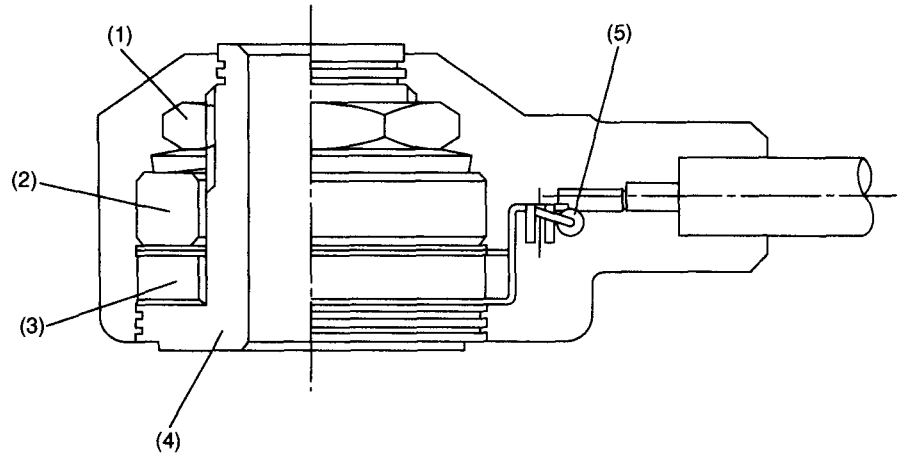


NF0478

(1) Boss
(2) Camshaft sprocket
(3) Air gap
(4) Camshaft position sensor
(5) Camshaft one rotation (Crankshaft two rotations)

G: KNOCK SENSOR

- The knock sensor is installed on the cylinder block, and senses knocking that occurs in the engine.
- The sensor is a piezo-electric type which converts vibration resulting from knocking into electric signals.
- In addition to a piezo-electric element, the sensor has a weight and case as its components. If knocking occurs in the engine, the weight in the case moves causing the piezo-electric element to generate a voltage.
- The knock sensor harness is connected to the bulkhead harness.



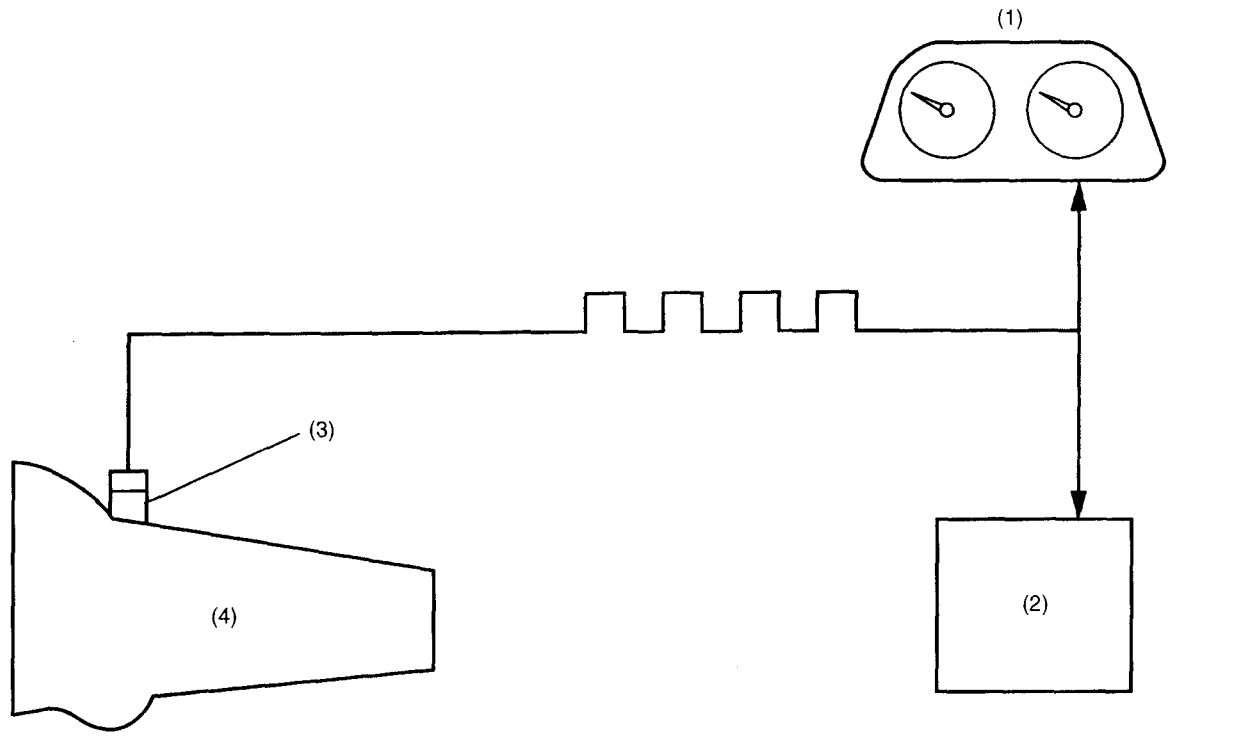
NF0391

(1) Nut
(2) Weight
(3) Piezo-electric element
(4) Housing
(5) Resistor

H: VEHICLE SPEED SENSOR

1. MT VEHICLES

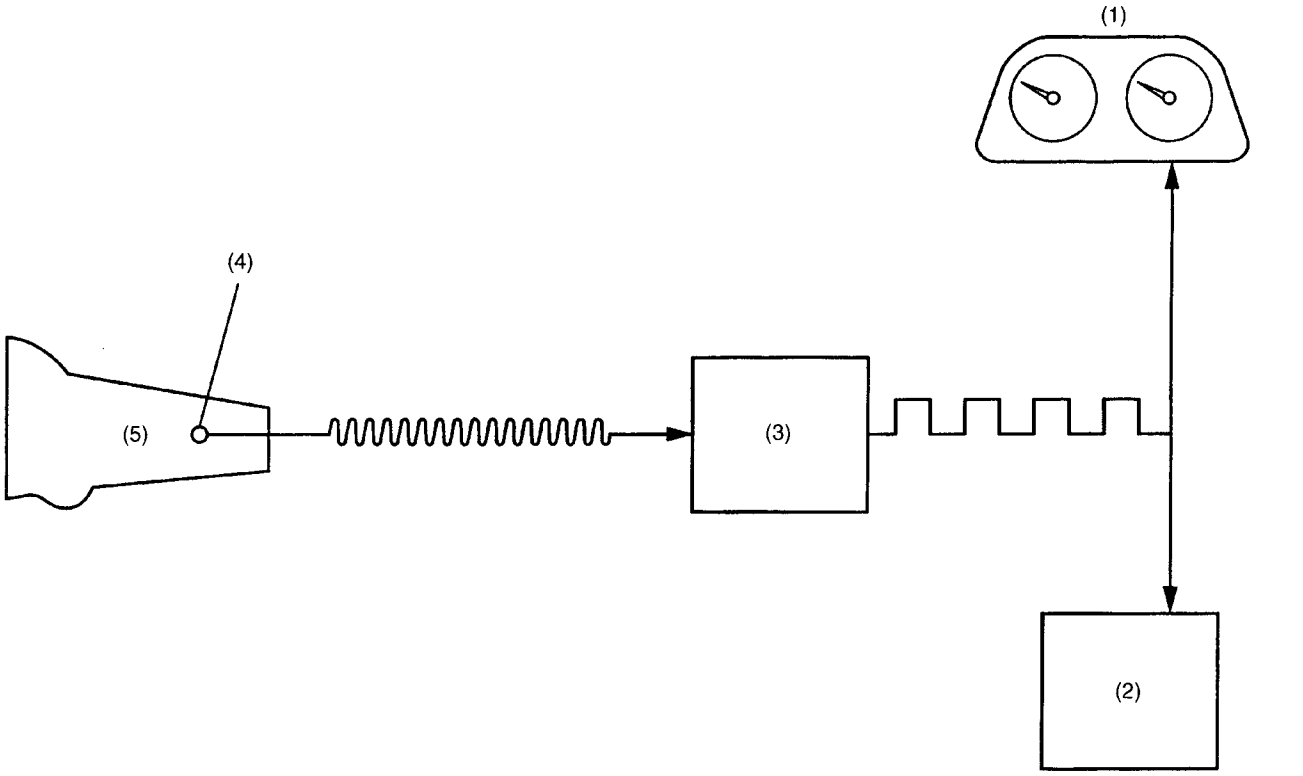
- The vehicle speed sensor is mounted on the transmission.
- The vehicle speed sensor generates a 4-pulse signal for every rotation of the front differential and send it to the ECM and the combination meter.



(1) Combination meter
(2) ECM
(3) Vehicle speed sensor
(4) Transmission

2. AT VEHICLES

- The vehicle speed sensor is mounted on the transmission.
- The vehicle speed sensor generates a 16-pulse signal for every rotation of the front differential and send it to the transmission control module (TCM). The signal sent to the TCM is converted there into a 4-pulse signal, and then sent to the ECM and the combination meter.



B2H2459B

(1) Combination meter
(2) ECM
(3) TCM
(4) Vehicle speed sensor
(5) Transmission

5. Control System

A: GENERAL

The ECM receives signals from various sensors, switches, and other control modules. Using these signals, it determines the engine operating conditions and if necessary, emits signals to one or more systems to control them for optimum operation.

Major control items of the ECM are as follow:

- Fuel injection control
- Ignition system control
- Idle air control
- Fuel pump control
- Canister purge control*1
- Radiator fan control*2
- On-board diagnosis function

*1: Canister purge control is described under "EC (DOHC TURBO) – Emission Control (Aux. Emission Control Devices) Evaporative Emission Control System".

*2: Radiator fan control is described under "CO – Cooling".

B: INPUT AND OUTPUT SIGNALS

Signal	Unit	Function
Input signals	Pressure sensor	Detects the amount of intake air (Measures the absolute pressure).
	Mass air flow and intake air temperature sensor	Detects the temperature and amount of intake air.
	Throttle position sensor	Detects the throttle valve position.
	Front oxygen (A/F) sensor	Detects the density of oxygen in exhaust gases at the upstream of the front catalytic converter.
	Rear oxygen sensor	Detects the density of oxygen in exhaust gases at the downstream of the rear catalytic converter.
	Exhaust gas temperature sensor	Detects the exhaust gas temperature.
	Tumble generator valve position sensor	Detects the tumble generator valve position.
	Crankshaft position sensor	Detects the crankshaft angular position.
	Camshaft position sensor	Detects the combustion cylinder.
	Engine coolant temperature sensor	Detects the engine coolant temperature.
	Knock sensor	Detects engine knocking.
	Vehicle speed sensor	Detects the vehicle speed.
	Ignition switch	Detects operation of the ignition switch.
	Starter switch	Detects the condition of engine cranking.
	Neutral position switch (MT)	Detects that the gear is in neutral.
	Park/Neutral position sensor (AT)	Detects shift positions.
	Heater circuit of front and rear oxygen sensor	Detects the abnormality in heater circuit of front and rear oxygen sensor.
	Diagnostics of TCM (AT)	Detects the self-diagnostics of the TCM.
	Torque control signal (AT)	Controls engine torque.
	A/C switch	Detects ON-OFF operation of the A/C switch.
	Fuel level sensor	Detects the level of the fuel in the fuel tank.
	Fuel temperature sensor	Detects the temperature of the fuel in the fuel tank.
	Fuel tank pressure sensor	Detects the evaporation gas pressure in the fuel tank.
	Small light switch	Detects ON-OFF operation of the small light switch.
	Blower fan switch	Detects ON-OFF operation of the blower fan switch.
	Rear defogger switch	Detects ON-OFF operation of the rear defogger switch.

Signal	Unit	Function
Output signals	Fuel Injector	Activates an injector.
	Ignition signal	Turns the primary ignition current ON or OFF.
	Fuel pump controller	Controls the fuel pump.
	A/C control relay	Turns the A/C control relay ON or OFF.
	Radiator fan control relay	Turns the radiator fan control relay ON or OFF.
	Idle air control solenoid valve	Adjusts the amount of air flowing through the bypass line in the throttle body.
	Tumble generator valve actuator	Operates the tumble generator valve.
	Wastegate control solenoid valve	Controls supercharging pressure.
	Malfunction indicator lamp	Indicates existence of abnormality.
	Purge control solenoid valve	Controls purge of evaporative gas absorbed by the canister.
	Pressure control solenoid valve	Controls evaporation gas pressure in the fuel tank.
	Drain valve	Close the evaporation line between the fuel tank and canister to detect leakage of evaporation gases.
	Power supply	Controls ON/OFF of the main power supply relay.

C: FUEL INJECTION CONTROL

• The ECM receives signals from various sensors and based on them, it determines the amount of fuel injected and the fuel injection timing. It performs the sequential fuel injection control over the entire engine operating range except during start-up of the engine.

• The amount of fuel injected depends upon the length of time the injector stays open. The fuel injection duration is determined according to varying operating condition of the engine. For the purpose of achieving highly responsive and accurate fuel injection duration control, the ECM performs a new feedback control that incorporates a learning feature as detailed later.

• The sequential fuel injection control is performed such that fuel is injected accurately at the time when the maximum air intake efficiency can be achieved for each cylinder (i.e., fuel injection is completed just before the intake valve begins to open).

1. FUEL INJECTION DURATION

Fuel injection duration is basically determined as indicated below:

• During engine start-up:
The duration defined below is used.
  • Duration of fuel injection during engine start-up ..... Determined according to the engine coolant temperature detected by the engine coolant temperature sensor.

• During normal operation:
The duration is determined as follows:

  Basic duration of fuel injection x Correction factors + Voltage correction time

  • Basic duration of fuel injection ..... The basic length of time fuel is injected. This is determined by two factors – the amount of intake air detected by the manifold pressure sensor and the engine speed monitored by the crankshaft position sensor.
  • Correction factors ..... See the next section.
  • Voltage correction time ..... This is added to compensate for the time lag before operation of injector that results from variation in the battery voltage.

2. CORRECTION FACTORS

The following factors are used to correct the basic duration of fuel injection in order to make the air-fuel ratio meet the requirements of varying engine operating conditions:

- Air-fuel ratio feedback factor:

This factor is used to correct the basic duration of fuel injection in relation to the actual engine speed. (See the next section for more detail.)

- Start increment factor:

This factor is used to increase the fuel injection duration only while the engine is being cranked to improve its startability.

- Coolant-temperature-dependent increment factor:

This factor is used to increase the fuel injection duration depending on engine coolant temperature signals to facilitate cold starting. The lower the coolant temperature, the greater the increment.

- After-start increment factor:
  - This factor is used to increase the fuel injection duration for a certain period immediately after start of the engine to stabilize engine operation.
  - The increment depends on the coolant temperature at the start of the engine.

- Wide-open-throttle increment factor:

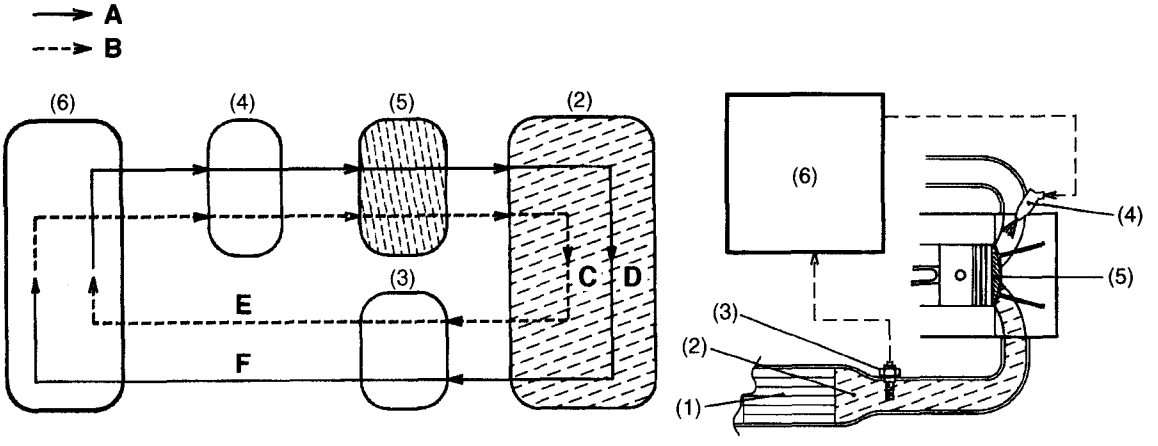
This factor is used to increase the fuel injection duration depending on the relationship between the throttle position sensor signal and manifold pressure sensor signal.

- Acceleration increment factor:

This factor is used to increase the fuel injection duration to compensate for a time lag between air flow measurement and fuel injection control for better engine response to driver's pedal operation during acceleration.

3. AIR-FUEL RATIO FEEDBACK FACTOR

The ECM creates this factor utilizing the front oxygen sensor signal. When the signal voltage is low, the air-fuel ratio is richer than the stoichiometric ratio. The ECM then makes the fuel injection duration shorter by modifying the factor. When the voltage is high showing that the mixture is lean, the ECM modifies the factor to make the injection duration longer. In this way, the air-fuel ratio is maintained at a level close to the stoichiometric ratio at which the three-way catalyst acts most effectively.



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(1) Front catalyst
(2) Exhaust gas
(3) Front oxygen (A/F) sensor
(4) Fuel injector
(5) Combustion chamber
(6) ECM

A: Injection duration increment signal
B: Injection duration decrement signal
C: High oxygen density
D: Low oxygen density
E: Lean signal
F: Rich signal

4. LEARNING FEATURE

The air-fuel ratio feedback control includes a learning feature which contributes to more accurate and responsive control.

- In the air-fuel ratio feedback control, the ECM calculates the necessary amount of correction based on data from the oxygen sensor and adds the result to the basic duration (which is stored in the ECM's memory for each condition defined by the engine speed and various loads.)

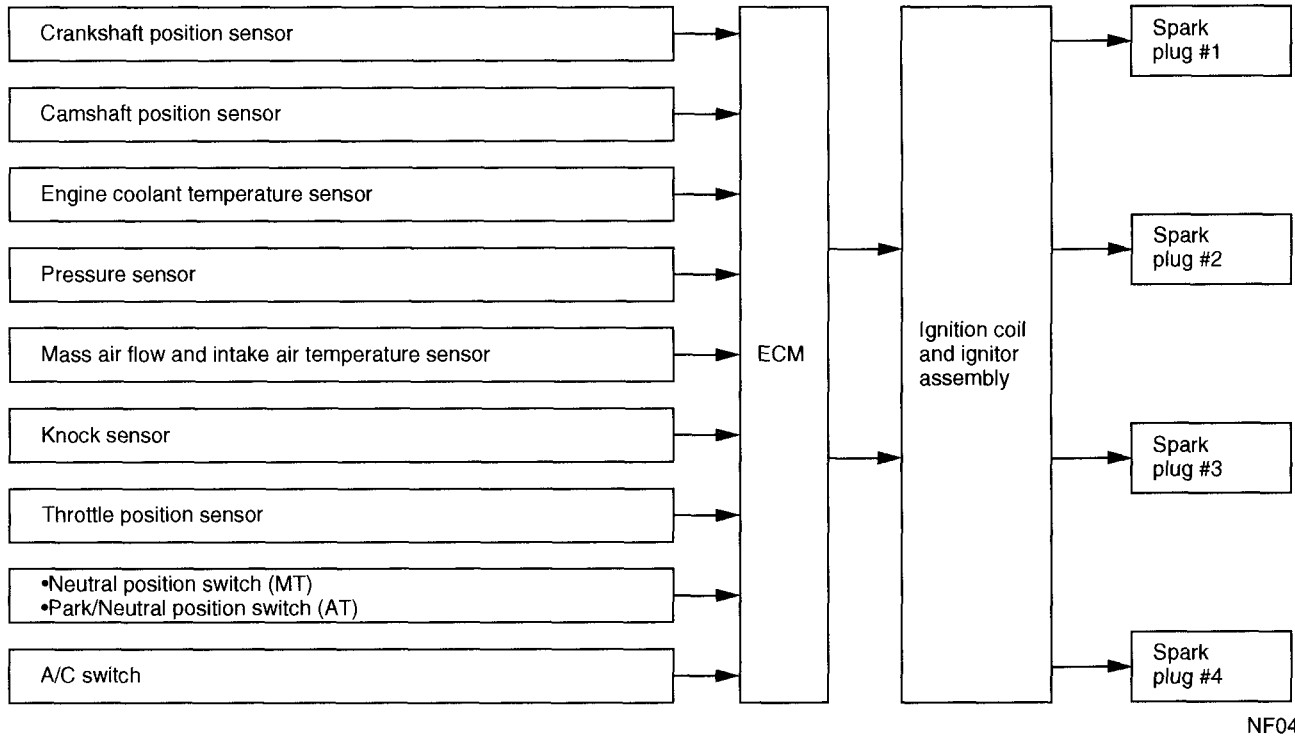
- Without a learning feature, the ECM carries out the above-mentioned process every time. This means that if the amount of necessary correction is large, the air-fuel ratio feedback control becomes less responsive and less accurate.

- The learning feature enables the ECM to store the amount of correction into memory and add it to the basic fuel injection duration to create a new reference fuel injection duration. Using the reference duration as the basic duration for the injection a few times later, the ECM can reduce the amount of correction and thus make its feedback control more accurate and responsive to changes in the air-fuel ratio due to difference in driving condition and sensor/actuator characteristics that may result from unit-to-unit variation or aging over time.

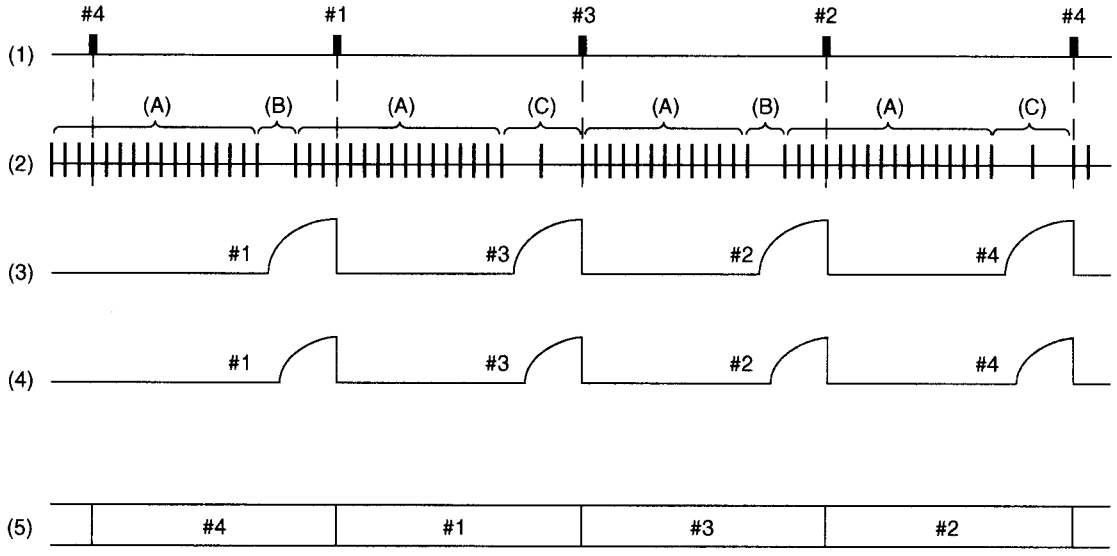
D: IGNITION SYSTEM CONTROL

- The ECM determines operating condition of the engine based on signals from the pressure sensor, engine coolant temperature sensor, intake air temperature sensor, crankshaft position sensor and other sources. It then selects the ignition timing most appropriate for the condition thus determined from those stored in its memory and outputs at that timing a primary current OFF signal to the ignitor to initiate ignition.
- This control uses a quick-to-response learning feature by which the data stored in the ECM memory is processed in comparison with information from various sensors and switches.
- Thus, the ECM can always perform optimum ignition timing taking into account the output, fuel consumption, exhaust gas, and other factors for every engine operating condition.
- Ignition control during start-up

Engine speed fluctuates during start of the engine, so the ECM cannot control the ignition timing. During that period, the ignition timing is fixed at 10° BTDC by using the 10° signal from the crankshaft position sensor.



- The ECM identifies cylinders at TDC and determines ignition timing as follows:
  - Within the range (A), the crank angle signal is input every 10° rotation of the crankshaft.
  - The ECM discriminates a TDC cylinder group from the other by detecting the ranges (B) and (C) where no signals are input.
  - The ECM judges that the No. 1 and No. 2 cylinders are at TDC when it detects the range (B), and that the No. 3 and No. 4 cylinders are at TDC when it detects the range (C).

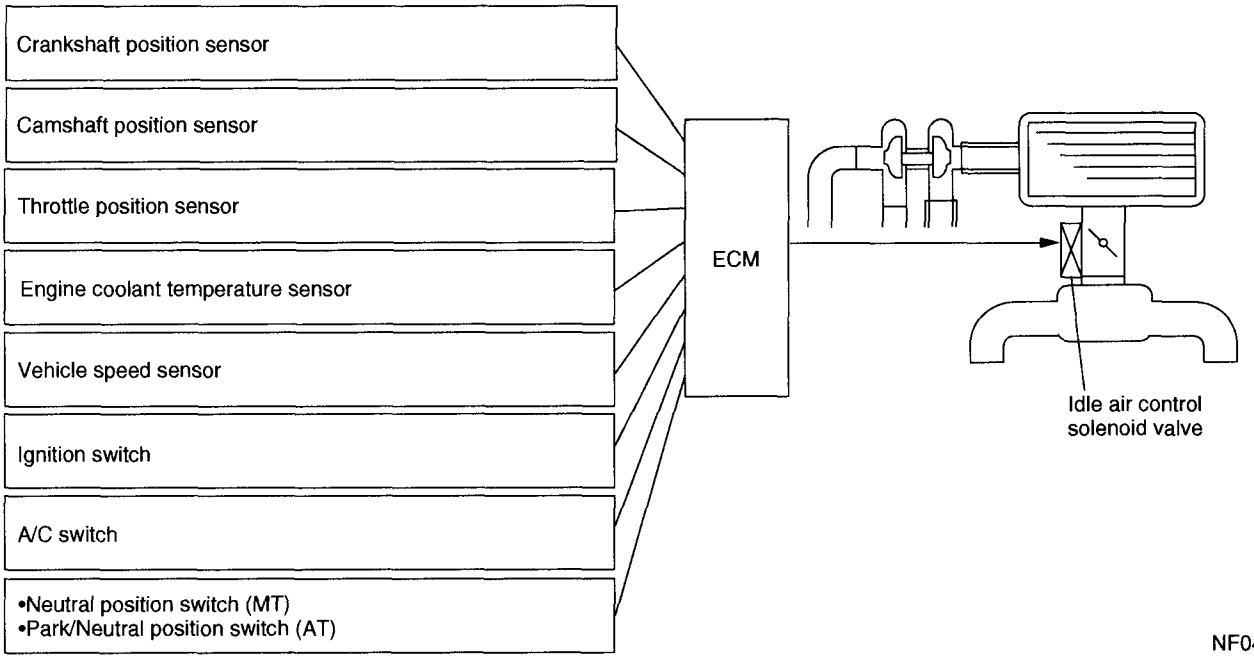


NF0430

(1) Cylinder number (TDC)
(2) Crank angle pulse
(3) Ignition timing at starting
(4) Ignition timing at normal condition
(5) Burning cylinder

E: IDLE AIR CONTROL

- The ECM activates the idle air control solenoid valve to control the bypass air flowing through the bypass passage in the throttle body depending on signals from the crankshaft position sensor, engine coolant temperature sensor, pressure sensor and A/C switch so that the proper idle speed for each engine load is achieved.
- The idle air control solenoid valve uses a duty-ratio-controlled solenoid which can continuously vary the opening area of the rotary valve. As the ECM increases the duty ratio, opening of the rotary valve increases so that the bypass air flow increases, and the engine idling speed becomes higher as a result.
- The bypass air control is necessary for:
  - Increasing idling speed when the air conditioning system and/or electrical loads are turned on.
  - Increasing idling speed during early stage of warm up period.
  - Obtaining dashpot function when the throttle valve is quickly closed.
  - Prevention of engine speed variation during idling.



F: FUEL PUMP CONTROL

Using the signal from the crankshaft position sensor, the ECM controls operation of the fuel pump by turning its relay ON or OFF. To improve safety, the fuel pump is stopped if the engine stalls with the ignition switch ON.

Ignition switch ON	Fuel pump relay	Fuel pump
A certain period of time after ignition switch is turned ON	ON	Operates
While cranking the engine	ON	Operates
While engine is operating	ON	Operates
When engine stops	OFF	Does not operate

6. On-board Diagnosis System

A: GENERAL

- The on-board diagnosis system detects and indicates a fault by generating a code corresponding to each fault location. The malfunction indicator lamp (CHECK ENGINE light) on the combination meter indicates occurrence of a fault or abnormality.
- When the malfunction indicator lamp comes on as a result of detection of a fault by the ECM, the corresponding diagnostic trouble code (DTC) and freeze frame engine condition are stored in the ECM.
- On the OBD-II conformable car, it is necessary to connect the Subaru Select Monitor (SSM) or General Scan Tool (GST) to the data link connector in order to check the DTC.
- The SSM and GST can read and erase DTCs. They can also read freeze frame data in addition to other pieces of engine data.
- If there is a failure involving sensors which may affect drive control of the vehicle, the fail-safe function ensures minimum level of driveability.

B: FAIL-SAFE FUNCTION

For a sensor or switch which has been judged faulty in the on-board diagnosis, the ECM, if appropriate, generates an associated pseudo signal to keep the vehicle operational. (The control becomes degraded.)

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

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1. System Overview

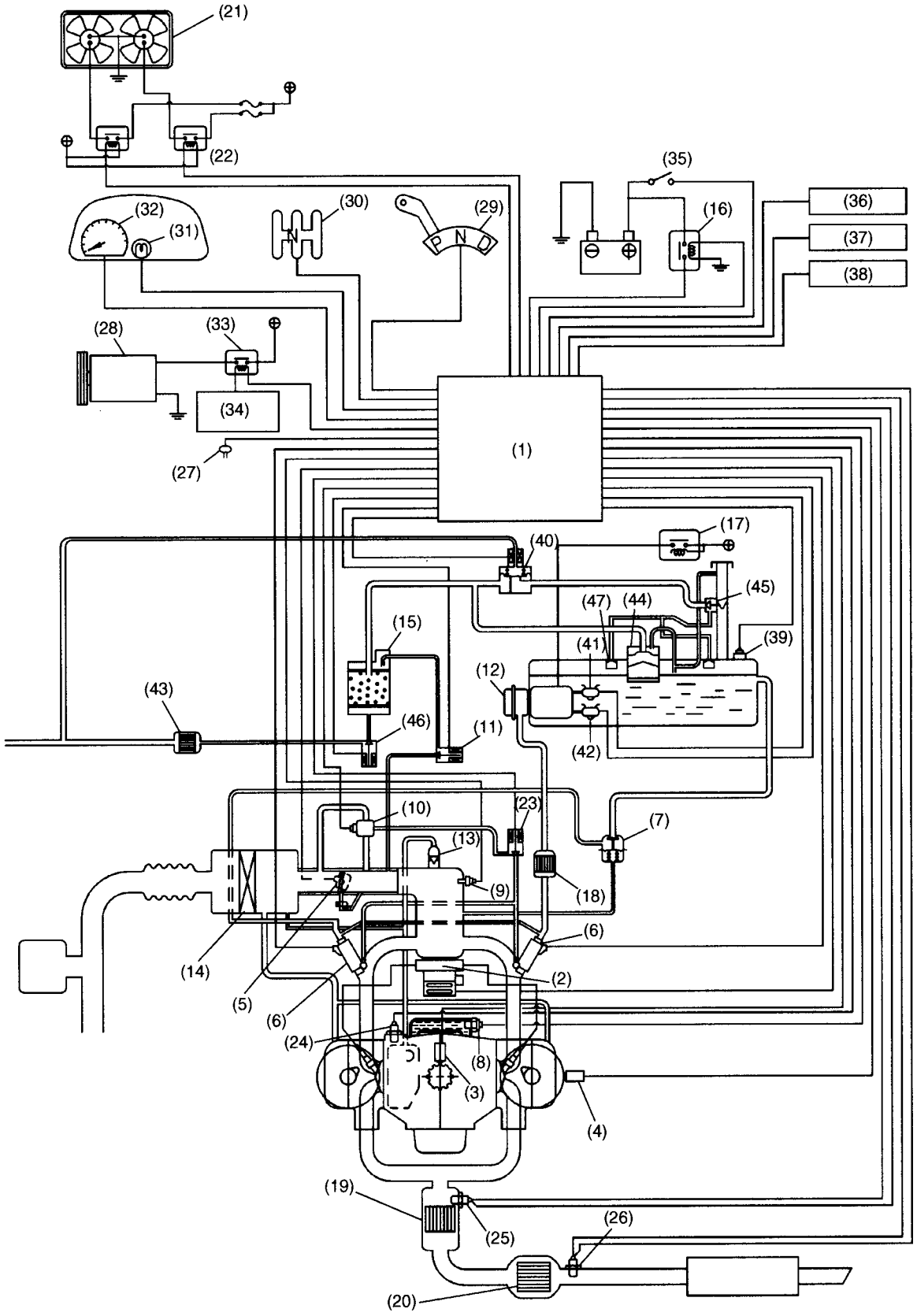
There are three emission control systems which are as follows:

- Crankcase emission control system
- Exhaust emission control system
  - Three-way catalyst system
  - Air/fuel (A/F) control system
  - Ignition control system
- Evaporative emission control system
  - On-board refueling vapor recovery (ORVR) system

Item			Main components	Function
Crankcase emission control system			Positive crankcase ventilation (PCV) valve	Draws blow-by gas into intake manifold from crankcase and burns it together with air-fuel mixture. Amount of blow-by gas to be drawn in is controlled by intake manifold pressure.
Exhaust emission control system	Catalyst system	Front	Three-way catalyst	Oxidizes HC and CO contained in exhaust gases as well as reducing NOx.
		Rear		
	A/F control system		Engine control module (ECM)	Receives input signals from various sensors, compares signals with stored data, and emits a signal for optimal control of air-fuel mixture ratio.
			Front oxygen (A/F) sensor	Detects quantity of oxygen contained exhaust gases.
			Rear oxygen sensor	Detects density of oxygen contained exhaust gases.
			Throttle position sensor	Detects throttle position.
			Intake air temperature and pressure sensor	Detects absolute pressure of intake manifold.
				Detects intake air temperature of intake manifold.
	Ignition control system		ECM	Receives various signals, compares signals with basic data stored in memory, and emits a signal for optimal control of ignition timing.
			Crankshaft position sensor	Detects engine speed (Revolution).
			Camshaft position sensor	Detects reference signal for combustion cylinder discrimination.
			Engine coolant temperature sensor	Detects coolant temperature.
			Knock sensor	Detects engine knocking.
Evaporative emission control system			Canister	Absorbs evaporative gas which occurs in fuel tank when engine stops, and releases it to combustion chambers for a complete burn when engine is started. This prevents HC from being discharged into atmosphere.
			Purge control solenoid valve	Receives a signal from ECM and controls purge of evaporative gas absorbed by canister.
			Pressure control solenoid valve	Receives a signal from ECM and controls evaporative gas pressure in fuel tank.
ORVR system			Vent valve	Controls evaporation pressure in fuel tank.
			Drain valve	Closes the evaporation line by receiving a signal from ECM to check the evaporation gas leak.

MEMO

2. Schematic Diagrams



NF0475

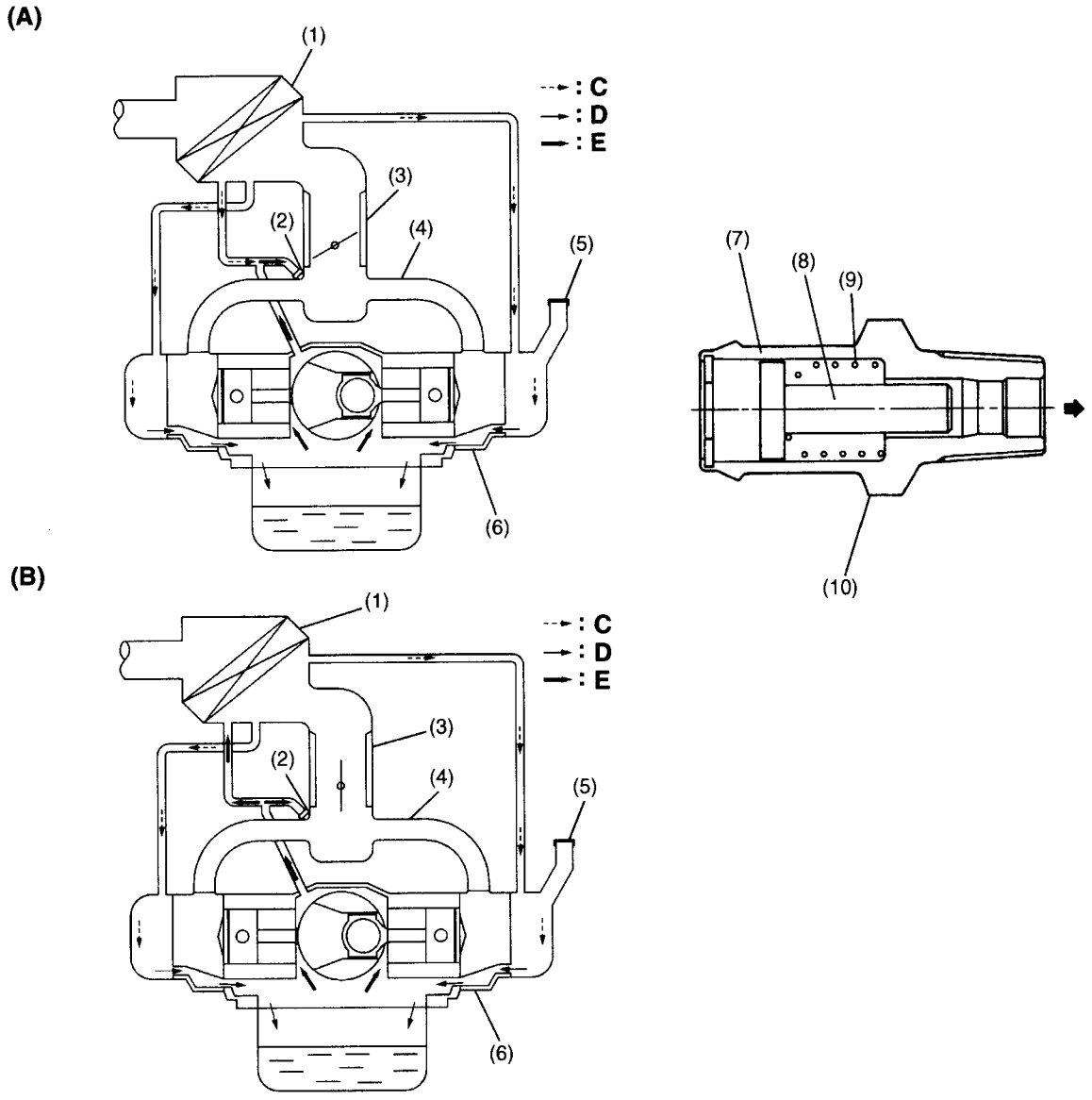
(1) Engine control module (ECM)
(2) Ignition coil and ignitor assembly
(3) Crankshaft position sensor
(4) Camshaft position sensor
(5) Throttle position sensor
(6) Fuel injectors
(7) Pressure regulator
(8) Engine coolant temperature sensor
(9) Intake air temperature and pressure sensor
(10) Idle air control solenoid valve
(11) Purge control solenoid valve
(12) Fuel pump
(13) PCV valve
(14) Air cleaner element
(15) Canister
(16) Main relay
(17) Fuel pump relay
(18) Fuel filter
(19) Front catalytic converter
(20) Rear catalytic converter
(21) Radiator fan
(22) Radiator fan relay
(23) Air assist injector solenoid valve
(24) Knock sensor
(25) Front oxygen (A/F) sensor
(26) Rear oxygen sensor
(27) Atmospheric pressure sensor
(28) A/C compressor
(29) Inhibitor switch (AT vehicles only)
(30) Neutral switch (MT vehicles only)
(31) CHECK ENGINE malfunction indicator lamp (MIL)
(32) Tachometer
(33) A/C relay
(34) A/C control module
(35) Ignition switch
(36) Transmission control module (TCM) (AT vehicles only)
(37) Vehicle speed sensor
(38) Data link connector
(39) Fuel tank pressure sensor
(40) Pressure control solenoid valve
(41) Fuel temperature sensor
(42) Fuel level sensor
(43) Drain filter
(44) Vent valve
(45) Shut-off valve
(46) Drain valve
(47) Fuel cut valve

3. Crankcase Emission Control System

• The positive crankcase ventilation (PCV) system prevents air pollution which will be caused by blow-by gas being emitted from the crankcase.
The system consists of a sealed oil filler cap, rocker covers with fresh air inlet, connecting hoses, a PCV valve and an air intake duct.

• In a part-throttle condition, the blow-by gas in the crankcase flows into the intake manifold through the connecting hose of crankcase and PCV valve by the strong vacuum created in the intake manifold. Under this condition, fresh air is introduced into the crankcase through the connecting hose of the rocker cover.

• In a wide-open-throttle condition, a part of blow-by gas flows into the air intake duct through the connecting hose and is drawn into the throttle chamber, because under this is condition, the intake manifold vacuum is not strong enough to introduce through the PCV valve all blow-by gases that increase in the amount with engine speed.



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(1) Air cleaner case
(2) PCV valve
(3) Throttle body
(4) Intake manifold
(5) Oil filler cap
(6) Crankcase
(7) Case
(8) Valve
(9) Spring
(10) PCV valve

(A) Part-throttle condition
(B) Wide-open-throttle condition
C: Fresh air
D: Mixture of air and blow-by gas
E: Blow-by gas

4. Three-way Catalyst

- The basic material of three-way catalyst is platinum (Pt), rhodium (Rh) and palladium (Pd), and a thin coat of their mixture is applied onto honeycomb or porous ceramics of an oval shape (carrier). To avoid damaging the catalyst, only unleaded gasoline should be used.
- The catalyst reduces HC, CO and NOx in exhaust gases through chemical reactions (oxidation and reduction). These harmful components are reduced most efficiently when their concentrations are in a certain balance. These concentrations vary with the air-fuel ratio. The ideal air-fuel ratio for reduction of these components is the stoichiometric ratio.
- Therefore, the air-fuel ratio needs to be controlled to around the stoichiometric ratio to purify the exhaust gases most efficiently.

5. A/F Control System

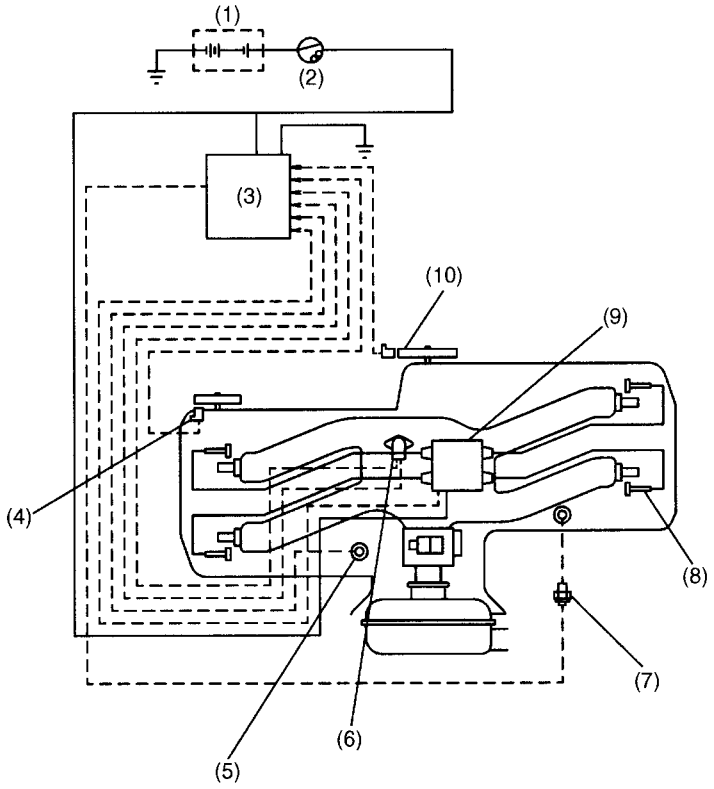
- The air/fuel (A/F) control system makes a correction to the basic fuel injection duration in accordance with the signal from the front oxygen sensor so that the stoichiometric ratio is maintained, thus ensuring most effective exhaust gas purification by the three-way catalyst. Different basic fuel injection durations are preset for various engine speeds and loads, as well as the amount of intake air.

- This system also has a "learning" control function which stores the corrected data in relation to the basic fuel injection in the memory map. This allows an appropriate air-fuel ratio correction to be added automatically in quick response to any situation that requires such an effect. Thus, the air-fuel ratio is optimally maintained under various conditions while purifying exhaust gases most effectively, improving driving performance and compensating for changes in sensors' performance over time.

6. Ignition Control System

• The ignition system is controlled by the ECM.
The ECM monitors the operating condition of the engine using the signals from the sensors and switches shown below and determines the ignition timing most appropriate for each engine operating condition. Then it sends a signal to the ignitor, commanding generation of a spark at that timing.

• The ECM uses a preprogrammed map for a "closed-loop" control which provides its ignition timing control with excellent transient characteristics, i.e., highly responsive ignition timing control.



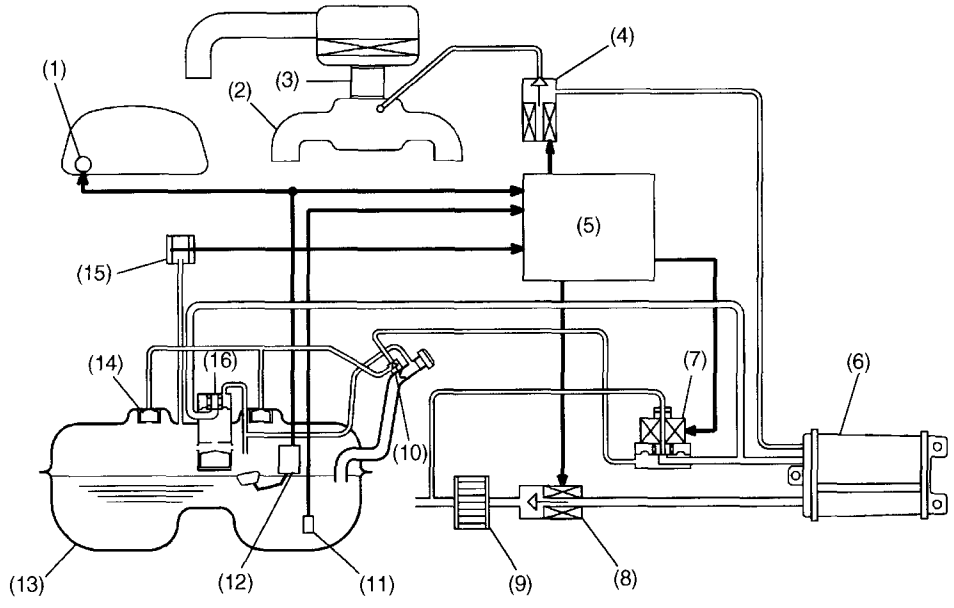
B2H3536D

(1) Battery
(2) Ignition switch
(3) ECM
(4) Camshaft position sensor
(5) Knock sensor
(6) Intake air temperature and pressure sensor
(7) Engine coolant temperature sensor
(8) Spark plug
(9) Ignition coil and ignitor assembly
(10) Crankshaft position sensor

7. Evaporative Emission Control System

A: GENERAL

- The evaporative emission control system prevents fuel vapors from escaping into atmosphere. This system includes a canister, purge control solenoid valve, fuel cut valve, and the lines connecting them.
- Fuel vapors in the fuel tank is introduced into the canister through the evaporation line, and are absorbed by activated carbon in it. The fuel cut valve is also incorporated in the fuel tank line.
- The purge control solenoid valve is controlled optimally by the ECM according to the engine condition.
- The pressure control solenoid valve incorporated in the fuel tank evaporation line regulates the pressure/vacuum in the fuel tank under the control of the ECM which uses the signal from the fuel tank pressure sensor.

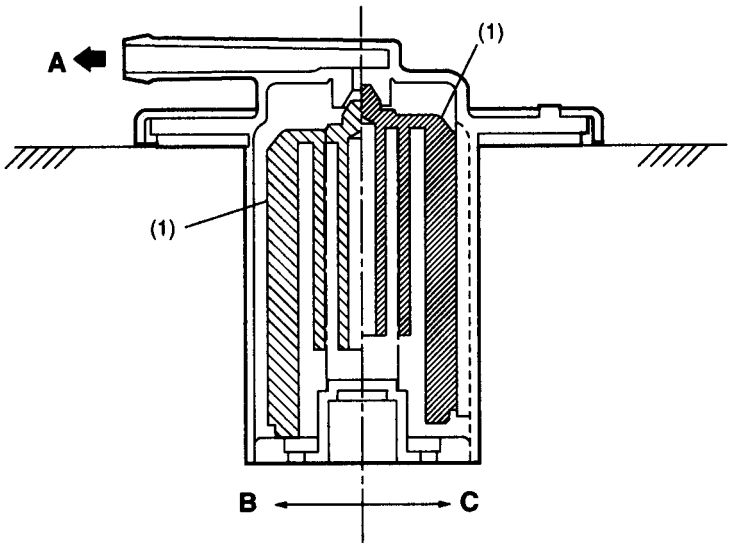


NF0476

(1) Fuel gauge
(2) Intake manifold
(3) Throttle body
(4) Purge control solenoid valve
(5) Engine control module (ECM)
(6) Canister
(7) Pressure control solenoid valve
(8) Drain valve
(9) Drain filter
(10) Shut-off valve
(11) Fuel temperature sensor
(12) Fuel level sensor
(13) Fuel tank
(14) Fuel cut valve
(15) Fuel tank pressure sensor
(16) Vent valve

B: FUEL CUT VALVE

The fuel cut valve is built onto the evaporation pipe of the fuel tank cap. The rising level of the fuel in the fuel tank causes the float to move up and close the cap hole so that no fuel can enter the evaporation line.



NF0469

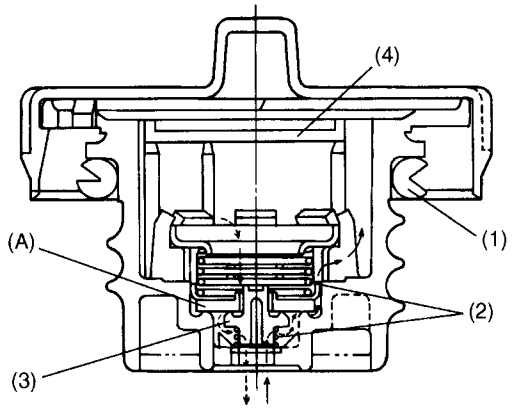
(1) Float

A: To canister
B: Valve open
C: Valve closed

C: FUEL TANK CAP

The fuel tank cap has a relief valve which prevents development of vacuum in the fuel tank in the event of a problem with the fuel vapor line.

When there is no problem with the fuel vapor line, the filler pipe is sealed at the portion (A) and by the seal pressed against the filler pipe end. If vacuum develops in the fuel tank, the atmospheric pressure forces the spring down to open the valve; consequently outside air flows into the fuel tank, thus controlling the inside pressure.

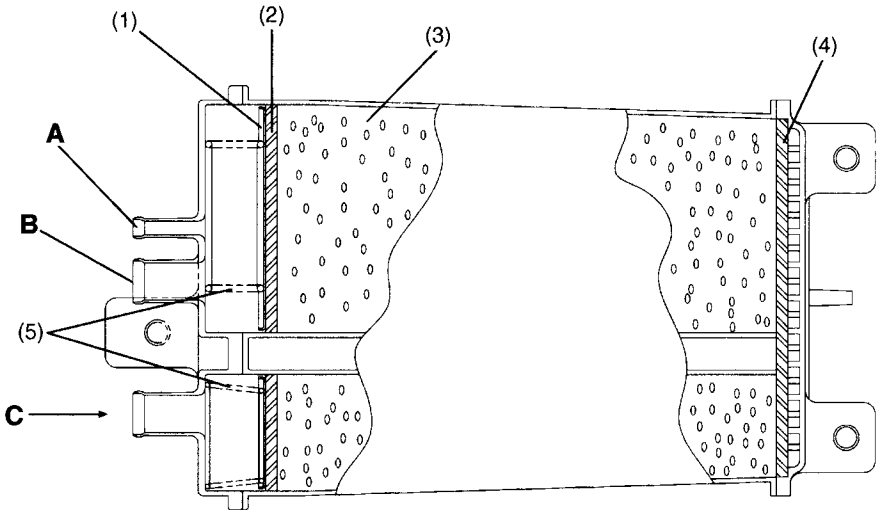


NF0470

(1) Seal
(2) Spring
(3) Valve
(4) Filter

D: CANISTER

The charcoal filled in the canister temporarily stores fuel vapors. When the purge control solenoid valve is opened by a signal from the ECM, the external fresh air entering the canister carries the fuel vapors into the collector chamber.



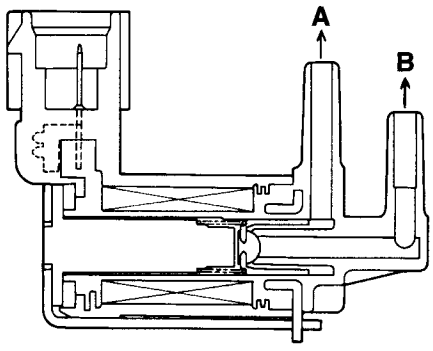
H2H3223B

(1) Grid
(2) Filter
(3) Charcoal
(4) Filter
(5) Spring

A: To purge control solenoid valve
B: From fuel tank
C: Air

E: PURGE CONTROL SOLENOID VALVE

The purge control solenoid valve is on the evaporation line between the canister and intake manifold. It is installed at the underside of intake manifold.



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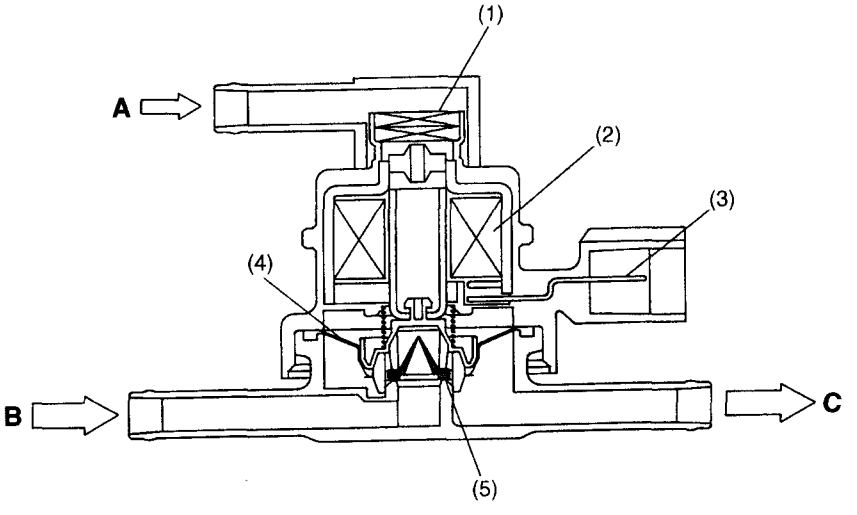
A: To canister
B: To intake manifold

F: PRESSURE CONTROL SOLENOID VALVE

The fuel tank pressure control solenoid valve is located in the evaporation line between the shut-off valve on fuel filler pipe and the fuel tank. It adjusts the fuel tank inside pressure under the control of the ECM.
When the tank inside pressure becomes higher than the atmospheric pressure, the valve is opened allowing fuel vapors to be introduced into the canister.
On the other hand, when the tank inside pressure becomes lower than the atmospheric pressure, external air is taken from the drain valve into the canister.
The pressure control solenoid valve can also be electrically closed for the system diagnosis purposes.



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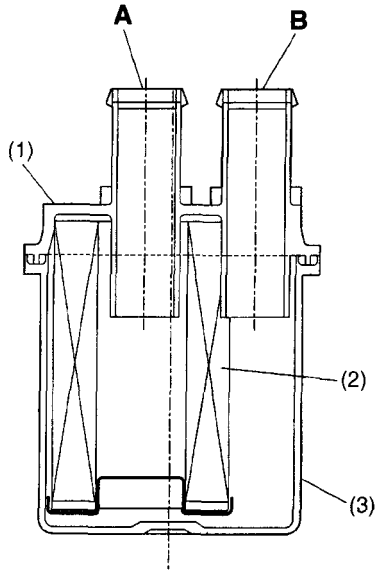
(1) Filter
(2) Coil
(3) Connector terminal
(4) Diaphragm
(5) Valve

A: Atmospheric pressure
B: From shut-off valve
C: To fuel tank

G: DRAIN FILTER

The drain filter is installed at the air inlet port of the vent control solenoid valve. It cleans the air taken in the canister through the vent control solenoid valve.



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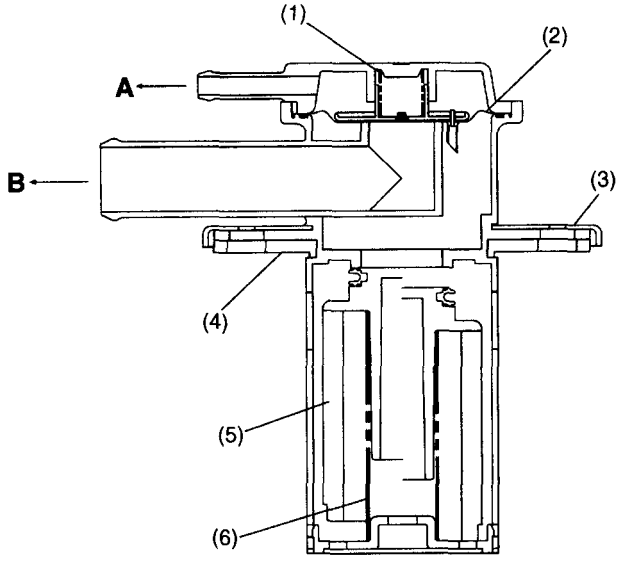
(1) Cap
(2) Element
(3) Case

A: To drain valve
B: To atmosphere

H: VENT VALVE

The vent valve is located on the fuel tank. During filling the fuel tank, fuel vapors are introduced into the canister through the vent valve.
When the fuel vapor pressure becomes higher than the atmospheric pressure and overcomes the spring force which is applied to the back side of the diaphragm, the port toward the canister is opened. The vent valve also has a float which blocks the fuel vapor passage when the tank is filled up. Increasing fuel level raises the float to close the port toward the canister.



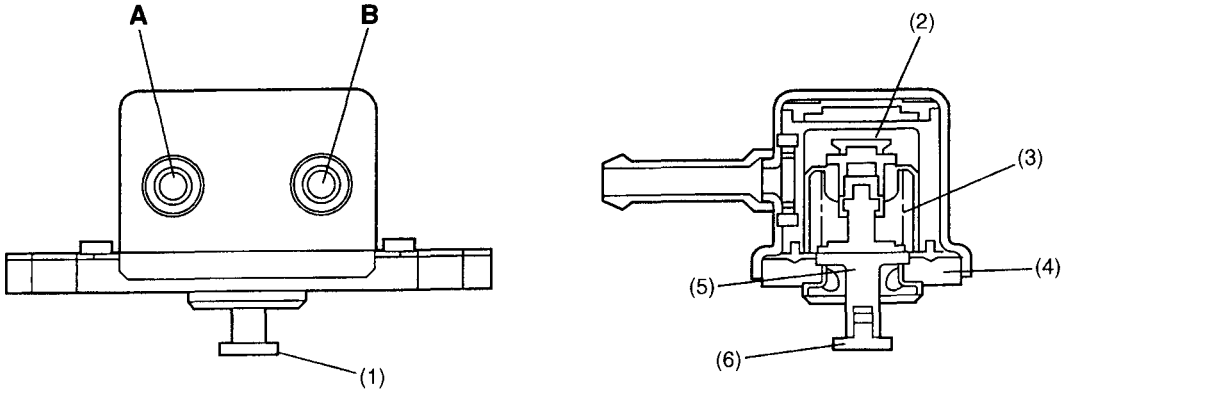
H2H3224B

(1) Spring
(2) Diaphragm
(3) Plate cover
(4) Packing
(5) Float
(6) Float spring

A: To filler pipe
B: To canister

I: SHUT-OFF VALVE

The shut-off valve is located at the top of the fuel filler pipe. When a filler gun is inserted into the filler pipe, the shut-off valve closes the evaporation line.



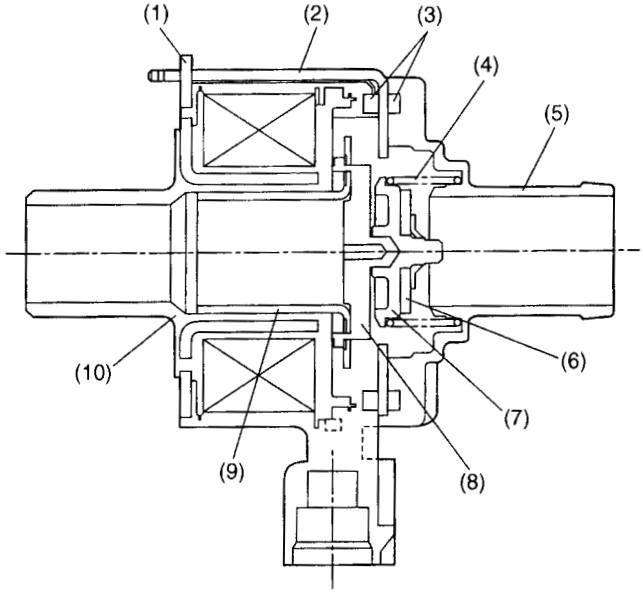
B2H1769B

(1) Pin
(2) Valve
(3) Spring
(4) Plate
(5) Shaft
(6) Pin

A: To canister
B: To fuel tank

J: DRAIN VALVE

The drain valve is located on the line connecting the drain filter and canister, just below the drain filter. The drain valve is forcibly closed by a signal from the ECM while the evaporation system diagnosis is being conducted.



B2H1770A

(1) Magnetic plate
(2) Yoke
(3) Packing
(4) Spring
(5) Valve seat
(6) Valve
(7) Plate
(8) Retainer
(9) Moving core
(10) Bobin

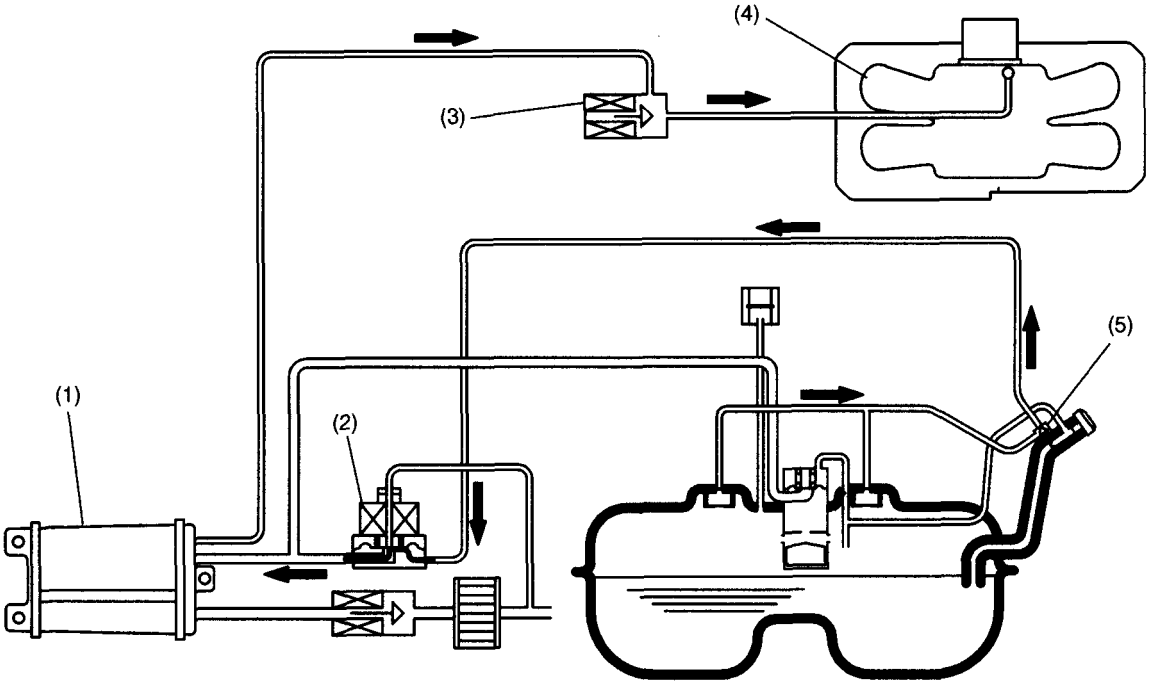
8. On-board Refueling Vapor Recovery (ORVR) System

A: GENERAL

The on-board refueling vapor recovery system allows the fuel vapors in the fuel tank to be introduced directly into the canister through the vent valve when the fuel tank inside pressure increases as a result of refueling.
The diagnosis of the system is performed by monitoring the fuel tank inside pressure data from the fuel tank pressure sensor while forcibly closing the drain valve.

B: OPERATION

• While driving
Since the back side of the diaphragm in the pressure control solenoid valve is open to the atmosphere, the diaphragm is held pressed by the atmospheric pressure in the position where only the external air is introduced into the canister. When the fuel vapor pressure acting on the other side of the diaphragm increases and overcomes the atmospheric pressure, it pushes the diaphragm and opens the port through which the fuel vapors make their way to the canister.

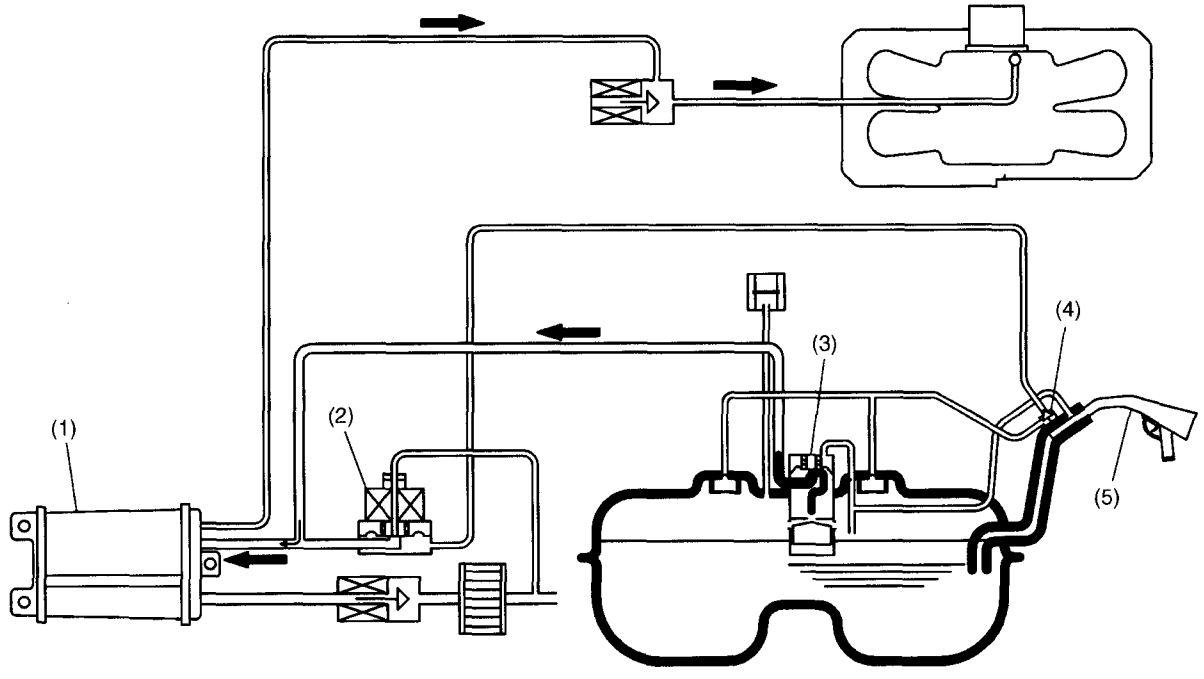


NF0471

(1) Canister
(2) Pressure control solenoid valve
(3) Purge control solenoid valve
(4) Intake manifold
(5) Shut-off valve: opened

- While refueling

As the fuel enters the fuel tank, the tank inside pressure increases. When the inside pressure becomes higher than the atmospheric pressure, the port of the vent valve opens, allowing the fuel vapors to be introduced into the canister through the vent line. The fuel vapors are absorbed by charcoal in the canister, so the air discharged from the drain valve contains no fuel. When a filler gun is inserted, the shut-off valve closes the evaporation line.

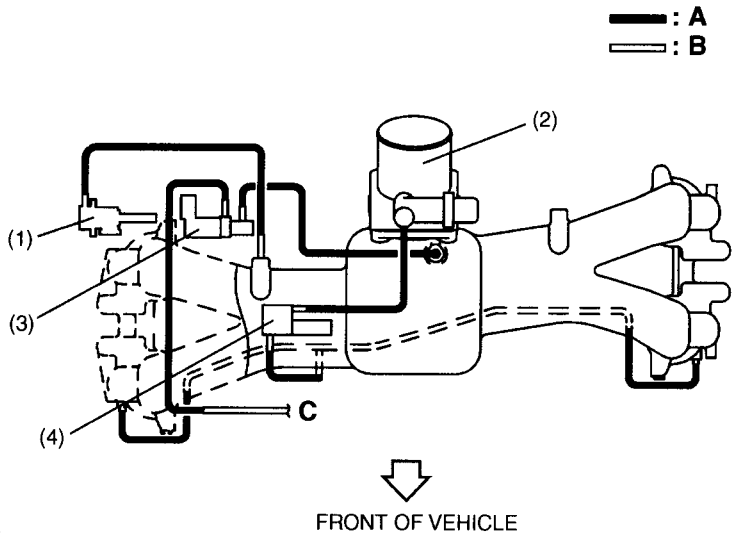


NF0472

(1) Canister
(2) Pressure control solenoid valve
(3) Vent valve
(4) Shut-off valve: closed
(5) Filler gun

9. Vacuum Connections

The hose and pipe connections of the intake manifold, throttle body and other related parts are as shown in the illustration.



B2H3540B

(1) Pressure regulator
(2) Throttle body
(3) Purge control solenoid valve
(4) Air assist injector solenoid valve

A: HOSE
B: PIPE
C: To canister

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES) EC (DOHC TURBO)

		Page
1.	System Overview	2
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1. System Overview

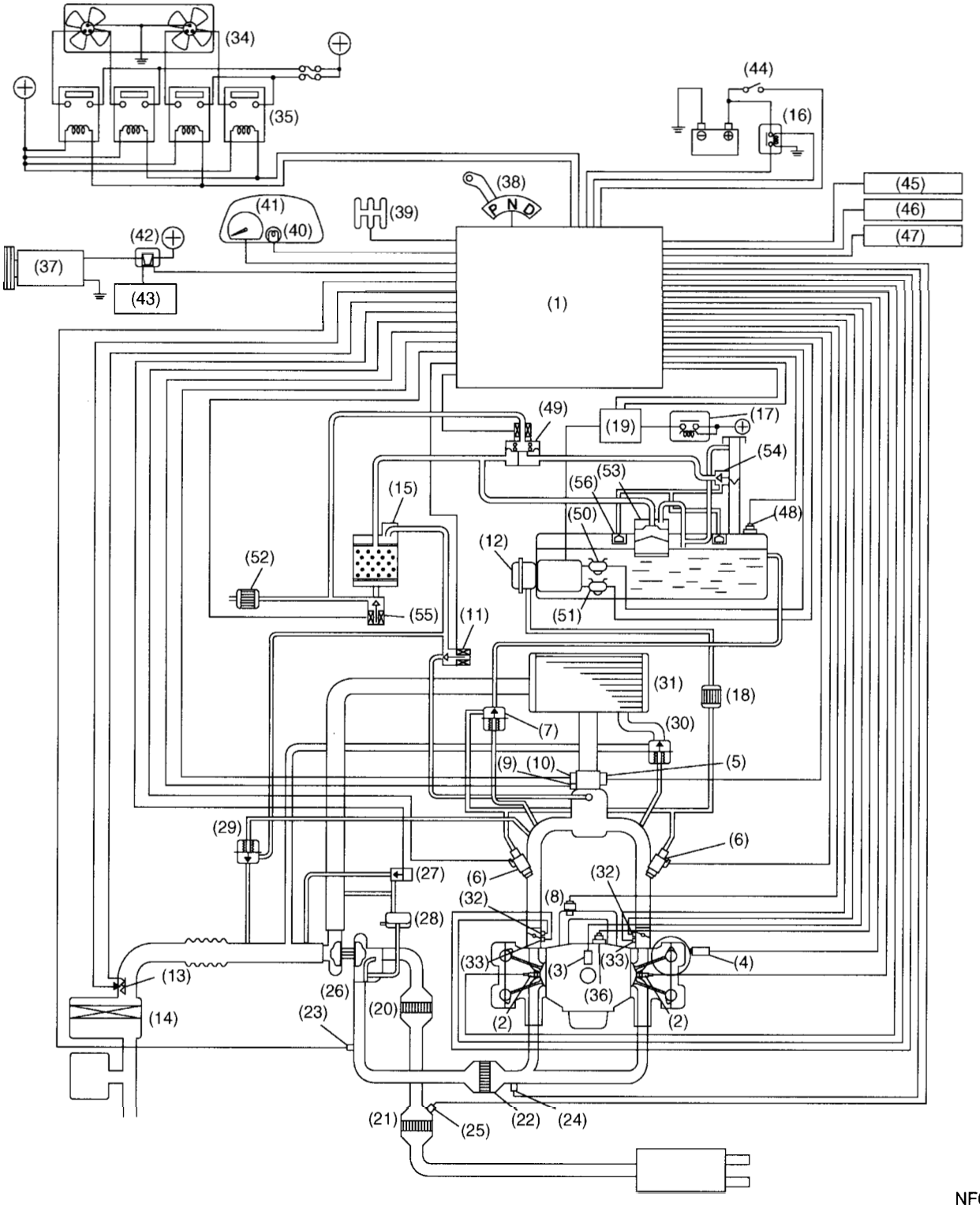
There are three emission control systems which are as follows:

- Crankcase emission control system
- Exhaust emission control system
  - Three-way catalyst system
  - Air/fuel (A/F) control system
  - Ignition control system
- Evaporative emission control system
  - On-board refueling vapor recovery (ORVR) system

Item			Main components	Function
Crankcase emission control system			Positive crankcase ventilation (PCV) valve	Draws blow-by gas into intake manifold from crankcase and burns it together with air-fuel mixture. Amount of blow-by gas to be drawn in is controlled by intake manifold pressure.
Exhaust emission control system	Catalyst system	Pre	Three-way catalyst	Oxidizes HC and CO contained in exhaust gases as well as reducing NOx.
		Front		
		Rear		
	A/F control system		Engine control module (ECM)	Receives input signals from various sensors, compares signals with stored data, and emits a signal for optimal control of air-fuel mixture ratio.
			Front oxygen (A/F) sensor	Detects quantity of oxygen contained exhaust gases.
			Rear oxygen sensor	Detects density of oxygen contained exhaust gases.
			Throttle position sensor	Detects throttle position.
			Mass air flow sensor and intake air temperature sensor	Detects amount of intake air.
				Detects intake air temperature of air cleaner case.
	Ignition control system		ECM	Receives various signals, compares signals with basic data stored in memory, and emits a signal for optimal control of ignition timing.
			Crankshaft position sensor	Detects engine speed (Revolution).
			Camshaft position sensor	Detects reference signal for combustion cylinder discrimination.
			Engine coolant temperature sensor	Detects coolant temperature.
			Knock sensor	Detects engine knocking.
Evaporative emission control system			Canister	Absorbs evaporative gas which occurs in fuel tank when engine stops, and releases it to combustion chambers for a complete burn when engine is started. This prevents HC from being discharged into atmosphere.
			Purge control solenoid valve	Receives a signal from ECM and controls purge of evaporative gas absorbed by canister.
ORVR system			Vent valve	Controls evaporation pressure in fuel tank.
			Drain valve	Closes the evaporation line by receiving a signal from ECM to check the evaporation gas leak.

MEMO

2. Schematic Diagrams



NF0435

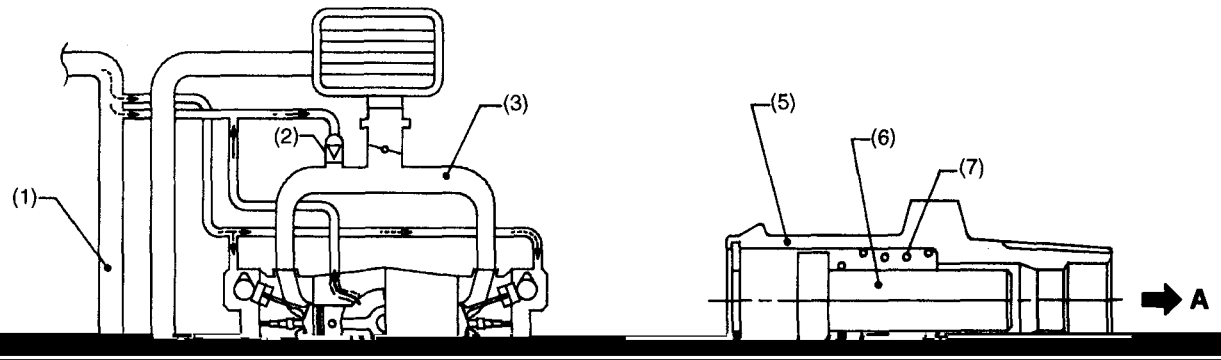
(1) Engine control module (ECM)
(2) Ignition coil and ignitor assembly
(3) Crankshaft position sensor
(4) Camshaft position sensor
(5) Throttle position sensor
(6) Fuel injectors
(7) Pressure regulator
(8) Engine coolant temperature sensor
(9) Pressure sensor
(10) Idle air control solenoid valve
(11) Purge control solenoid valve
(12) Fuel pump
(13) Mass air flow and intake air temperature sensor
(14) Air cleaner element
(15) Canister
(16) Main relay
(17) Fuel pump relay
(18) Fuel filter
(19) Fuel pump controller
(20) Front catalytic converter
(21) Rear catalytic converter
(22) Precatalytic converter
(23) Exhaust temperature sensor
(24) Front oxygen (A/F) sensor
(25) Rear oxygen sensor
(26) Turbocharger
(27) Wastegate control solenoid valve
(28) Wastegate controller
(29) Purge valve
(30) Air bypass valve
(31) Intercooler
(32) Tumble generator valve position sensor
(33) Tumble generator valve actuator
(34) Radiator fan
(35) Radiator fan relay
(36) Knock sensor
(37) A/C compressor
(38) Inhibitor switch (AT vehicles only)
(39) Neutral switch (MT vehicles only)
(40) CHECK ENGINE malfunction indicator lamp (MIL)
(41) Tachometer
(42) A/C relay
(43) A/C control module
(44) Ignition switch
(45) Transmission control module (TCM) (AT vehicles only)
(46) Vehicle speed sensor
(47) Data link connector
(48) Fuel tank pressure sensor
(49) Pressure control solenoid valve
(50) Fuel temperature sensor
(51) Fuel level sensor
(52) Drain filter
(53) Vent valve
(54) Shut-off valve
(55) Drain valve
(56) Fuel cut valve

3. Crankcase Emission Control System

• The positive crankcase ventilation (PCV) system prevents air pollution which will be caused by blow-by gas being emitted from the crankcase.
The system consists of a sealed oil filler cap, rocker covers with fresh air inlet, connecting hoses, a PCV valve and an air intake duct.

• In a part-throttle condition, the blow-by gas in the crankcase flows into the intake manifold through the connecting hose of crankcase and PCV valve by the strong vacuum created in the intake manifold. Under this condition, fresh air is introduced into the crankcase through the connecting hose of the rocker cover.

• In a wide-open-throttle condition, a part of blow-by gas flows into the air intake duct through the connecting hose and is drawn into the throttle chamber, because under this is condition, the intake manifold vacuum is not strong enough to introduce through the PCV valve all blow-by gases that increase in the amount with engine speed.



4. Three-way Catalyst

- The basic material of three-way catalyst is platinum (Pt), rhodium (Rh) and palladium (Pd), and a thin coat of their mixture is applied onto honeycomb or porous ceramics of an oval shape (carrier). To avoid damaging the catalyst, only unleaded gasoline should be used.
- The catalyst reduces HC, CO and NOx in exhaust gases through chemical reactions (oxidation and reduction). These harmful components are reduced most efficiently when their concentrations are in a certain balance. These concentrations vary with the air-fuel ratio. The ideal air-fuel ratio for reduction of these components is the stoichiometric ratio.
- Therefore, the air-fuel ratio needs to be controlled to around the stoichiometric ratio to purify the exhaust gases most efficiently.

5. A/F Control System

- The air/fuel (A/F) control system makes a correction to the basic fuel injection duration in accordance with the signal from the front oxygen sensor so that the stoichiometric ratio is maintained, thus ensuring most effective exhaust gas purification by the three-way catalyst. Different basic fuel injection durations are preset for various engine speeds and loads, as well as the amount of intake air.

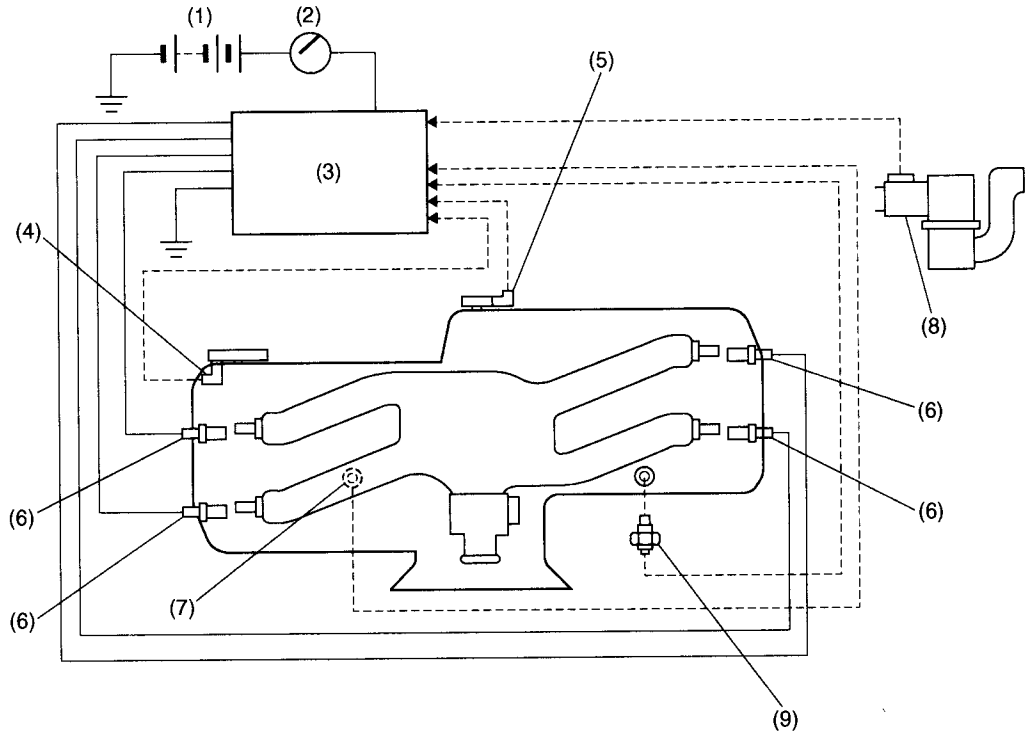
- This system also has a "learning" control function which stores the corrected data in relation to the basic fuel injection in the memory map. This allows an appropriate air-fuel ratio correction to be added automatically in quick response to any situation that requires such an effect. Thus, the air-fuel ratio is optimally maintained under various conditions while purifying exhaust gases most effectively, improving driving performance and compensating for changes in sensors' performance over time.

6. Ignition Control System

- The ignition system is controlled by the ECM.

The ECM monitors the operating condition of the engine using the signals from the sensors and switches shown below and determines the ignition timing most appropriate for each engine operating condition. Then it sends a signal to the ignitor, commanding generation of a spark at that timing.

- The ECM uses a preprogrammed map for a "closed-loop" control which provides its ignition timing control with excellent transient characteristics, i.e., highly responsive ignition timing control.



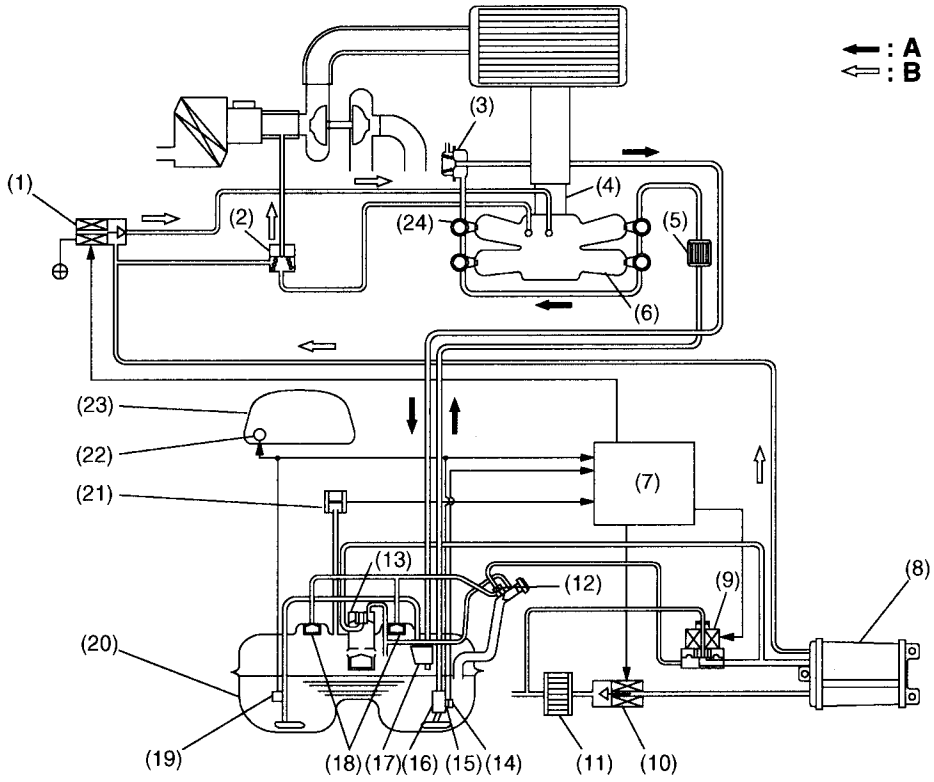
NF0308

(1) Battery
(2) Ignition switch
(3) ECM
(4) Camshaft position sensor
(5) Crankshaft position sensor
(6) Ignition coil and ignitor assembly
(7) Knock sensor
(8) Mass air flow and intake air temperature sensor
(9) Engine coolant temperature sensor

7. Evaporative Emission Control System

A: GENERAL

- The evaporative emission control system prevents fuel vapors from escaping into atmosphere. This system includes a canister, purge control solenoid valve, fuel cut valve, and the lines connecting them.
- Fuel vapors in the fuel tank is introduced into the canister through the evaporation line, and are absorbed by activated carbon in it. The fuel cut valve is also incorporated in the fuel tank line.
- The purge control solenoid valve is controlled optimally by the ECM according to the engine condition.
- The pressure control solenoid valve incorporated in the fuel tank evaporation line regulates the pressure/vacuum in the fuel tank under the control of the ECM which uses the signal from the fuel tank pressure sensor.

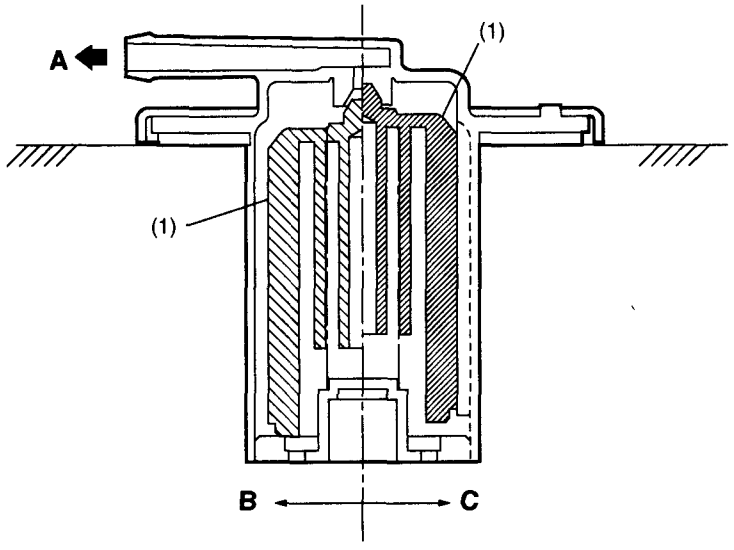


(1) Purge control solenoid valve
(2) Purge valve
(3) Pressure regulator
(4) Throttle body
(5) Fuel filter
(6) Intake manifold
(7) ECM
(8) Canister
(9) Pressure control solenoid valve
(10) Drain valve
(11) Drain filter
(12) Shut-off valve
(13) Vent valve
(14) Fuel temperature sensor
(15) Fuel level sensor
(16) Fuel pump
(17) Jet pump
(18) Fuel cut valve
(19) Fuel sub level sensor
(20) Fuel tank
(21) Fuel tank pressure sensor
(22) Fuel gauge
(23) Combination meter
(24) Fuel injector

A: Fuel line
B: Evaporation line

B: FUEL CUT VALVE

The fuel cut valve is built onto the evaporation pipe of the fuel tank cap. The rising level of the fuel in the fuel tank causes the float to move up and close the cap hole so that no fuel can enter the evaporation line.



NF0469

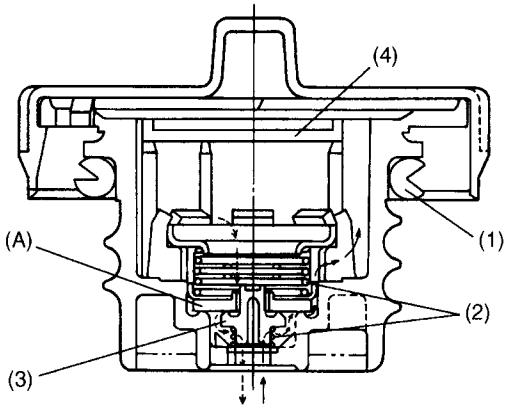
(1) Float

A: To canister
B: Valve open
C: Valve closed

C: FUEL TANK CAP

The fuel tank cap has a relief valve which prevents development of vacuum in the fuel tank in the event of a problem with the fuel vapor line.

When there is no problem with the fuel vapor line, the filler pipe is sealed at the portion (A) and by the seal pressed against the filler pipe end. If vacuum develops in the fuel tank, the atmospheric pressure forces the spring down to open the valve; consequently outside air flows into the fuel tank, thus controlling the inside pressure.

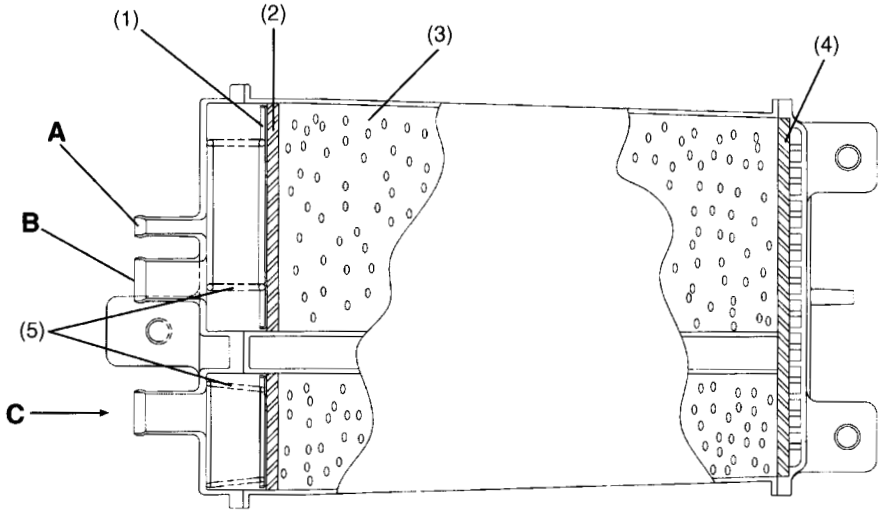


NF0470

(1) Seal
(2) Spring
(3) Valve
(4) Filter

D: CANISTER

The charcoal filled in the canister temporarily stores fuel vapors. When the purge control solenoid valve is opened by a signal from the ECM, the external fresh air entering the canister carries the fuel vapors into the collector chamber.



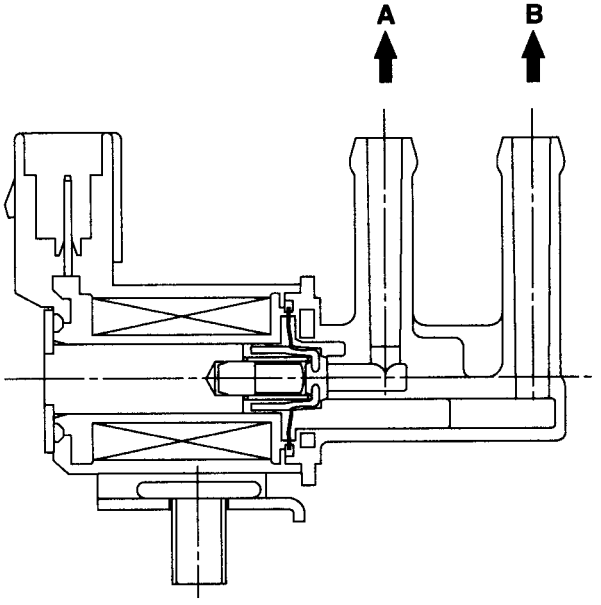
H2H3223B

(1) Grid
(2) Filter
(3) Charcoal
(4) Filter
(5) Spring

A: To purge control solenoid valve
B: From fuel tank
C: Air

E: PURGE CONTROL SOLENOID VALVE

The purge control solenoid valve is on the evaporation line between the canister and intake manifold. It is installed at the underside of intake manifold.



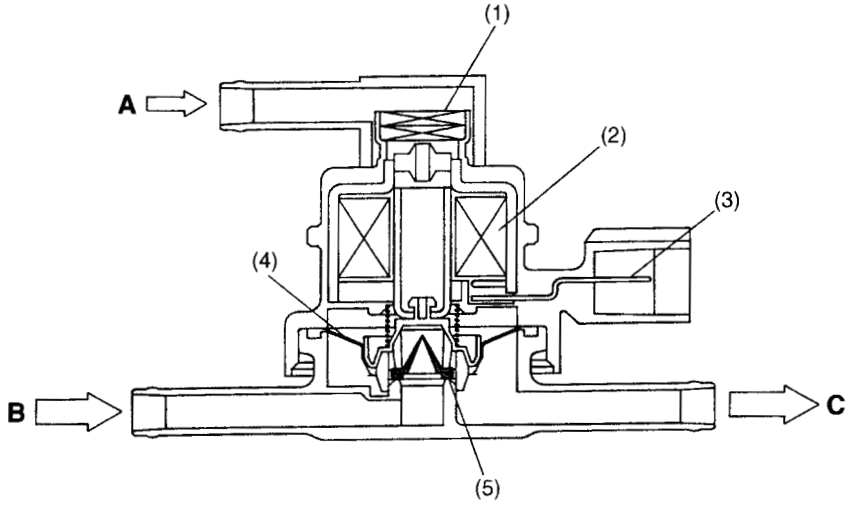
NF0386

A: To canister

B: To intake manifold

F: PRESSURE CONTROL SOLENOID VALVE

The fuel tank pressure control solenoid valve is located in the evaporation line between the shut-off valve on fuel filler pipe and the fuel tank. It adjusts the fuel tank inside pressure under the control of the ECM.
When the tank inside pressure becomes higher than the atmospheric pressure, the valve is opened allowing fuel vapors to be introduced into the canister.
On the other hand, when the tank inside pressure becomes lower than the atmospheric pressure, external air is taken from the drain valve into the canister.
The pressure control solenoid valve can also be electrically closed for the system diagnosis purposes.



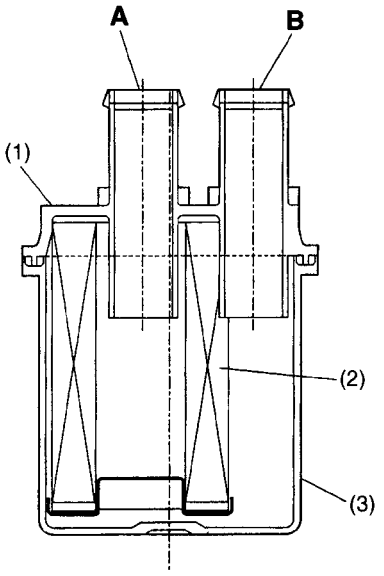
B2H1719C

(1) Filter
(2) Coil
(3) Connector terminal
(4) Diaphragm
(5) Valve

A: Atmospheric pressure
B: From shut-off valve
C: To fuel tank

G: DRAIN FILTER

The drain filter is installed at the air inlet port of the vent control solenoid valve. It cleans the air taken in the canister through the vent control solenoid valve.



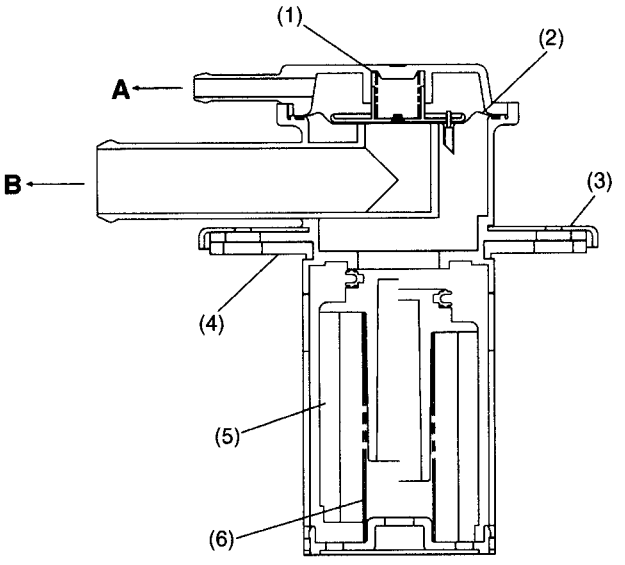
S2H0874B

(1) Cap
(2) Element
(3) Case

A: To drain valve
B: To atmosphere

H: VENT VALVE

The vent valve is located on the fuel tank. During filling the fuel tank, fuel vapors are introduced into the canister through the vent valve.
When the fuel vapor pressure becomes higher than the atmospheric pressure and overcomes the spring force which is applied to the back side of the diaphragm, the port toward the canister is opened. The vent valve also has a float which blocks the fuel vapor passage when the tank is filled up. Increasing fuel level raises the float to close the port toward the canister.



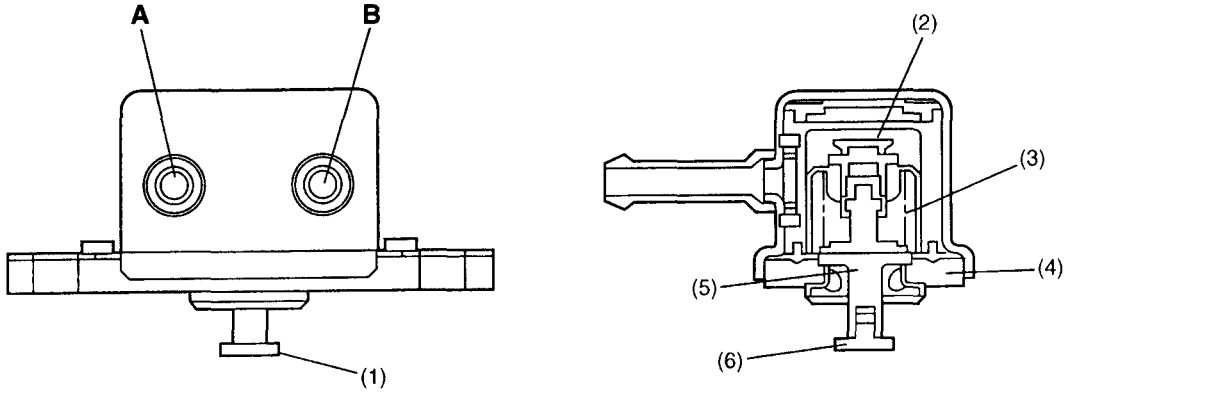
H2H3224B

(1) Spring
(2) Diaphragm
(3) Plate cover
(4) Packing
(5) Float
(6) Float spring

A: To filler pipe
B: To canister

I: SHUT-OFF VALVE

The shut-off valve is located at the top of the fuel filler pipe. When a filler gun is inserted into the filler pipe, the shut-off valve closes the evaporation line.



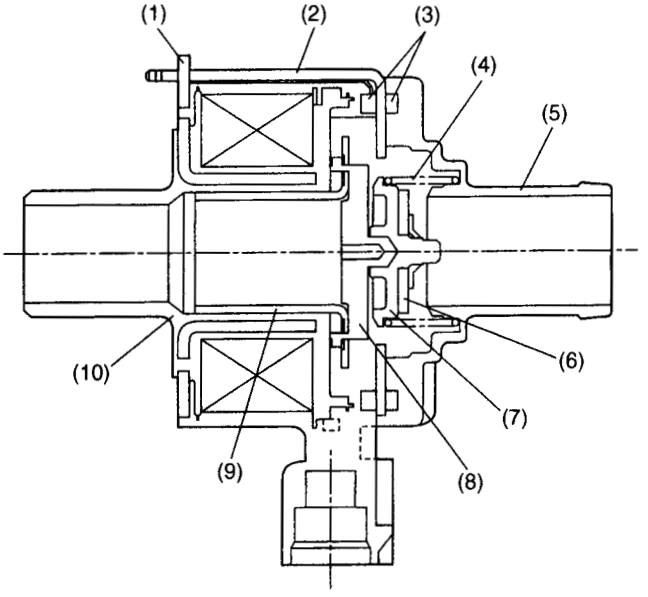
B2H1769B

(1) Pin
(2) Valve
(3) Spring
(4) Plate
(5) Shaft
(6) Pin

A: To canister
B: To fuel tank

J: DRAIN VALVE

The drain valve is located on the line connecting the drain filter and canister, just below the drain filter. The drain valve is forcibly closed by a signal from the ECM while the evaporation system diagnosis is being conducted.



B2H1770A

(1) Magnetic plate
(2) Yoke
(3) Packing
(4) Spring
(5) Valve seat
(6) Valve
(7) Plate
(8) Retainer
(9) Moving core
(10) Bobin

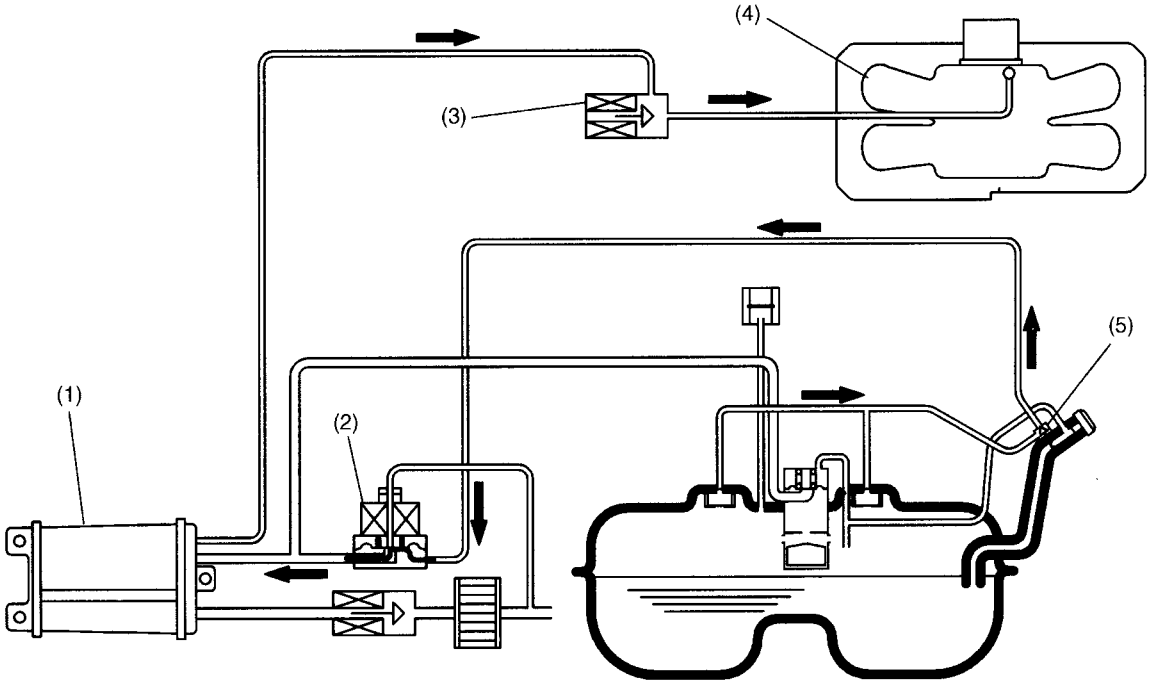
8. On-board Refueling Vapor Recovery (ORVR) System

A: GENERAL

The on-board refueling vapor recovery system allows the fuel vapors in the fuel tank to be introduced directly into the canister through the vent valve when the fuel tank inside pressure increases as a result of refueling.
The diagnosis of the system is performed by monitoring the fuel tank inside pressure data from the fuel tank pressure sensor while forcibly closing the drain valve.

B: OPERATION

• While driving
Since the back side of the diaphragm in the pressure control solenoid valve is open to the atmosphere, the diaphragm is held pressed by the atmospheric pressure in the position where only the external air is introduced into the canister. When the fuel vapor pressure acting on the other side of the diaphragm increases and overcomes the atmospheric pressure, it pushes the diaphragm and opens the port through which the fuel vapors make their way to the canister.

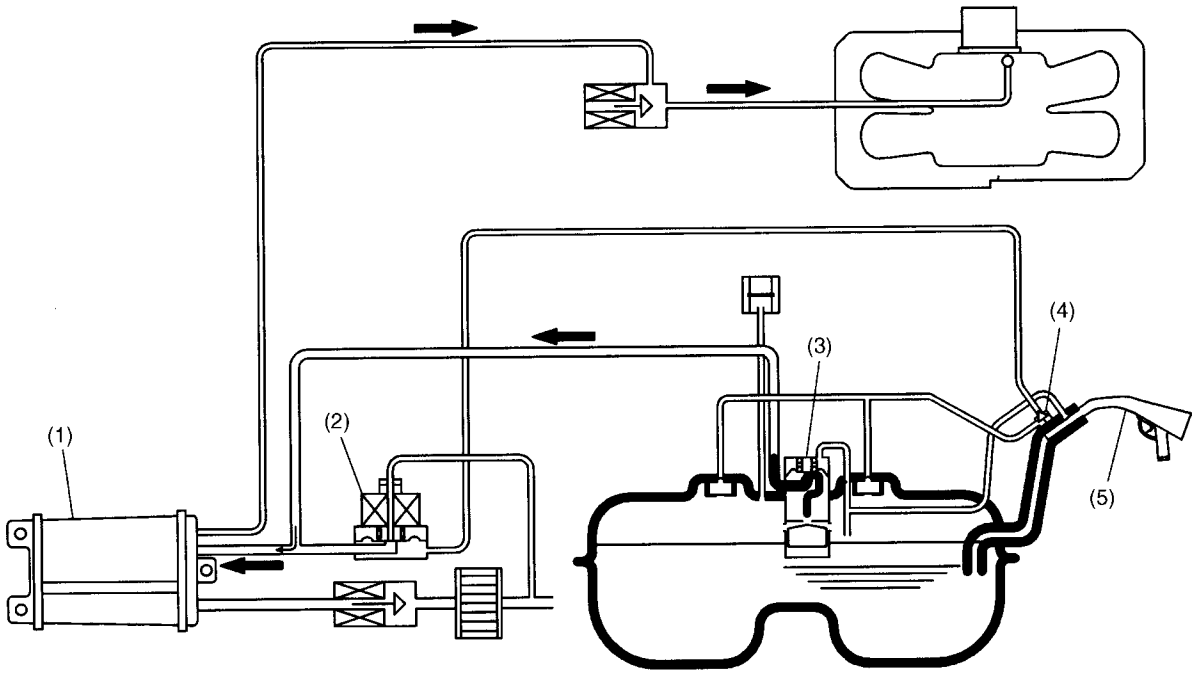


NF0471

(1) Canister
(2) Pressure control solenoid valve
(3) Purge control solenoid valve
(4) Intake manifold
(5) Shut-off valve: opened

• While refueling

As the fuel enters the fuel tank, the tank inside pressure increases. When the inside pressure becomes higher than the atmospheric pressure, the port of the vent valve opens, allowing the fuel vapors to be introduced into the canister through the vent line. The fuel vapors are absorbed by charcoal in the canister, so the air discharged from the drain valve contains no fuel. When a filler gun is inserted, the shut-off valve closes the evaporation line.

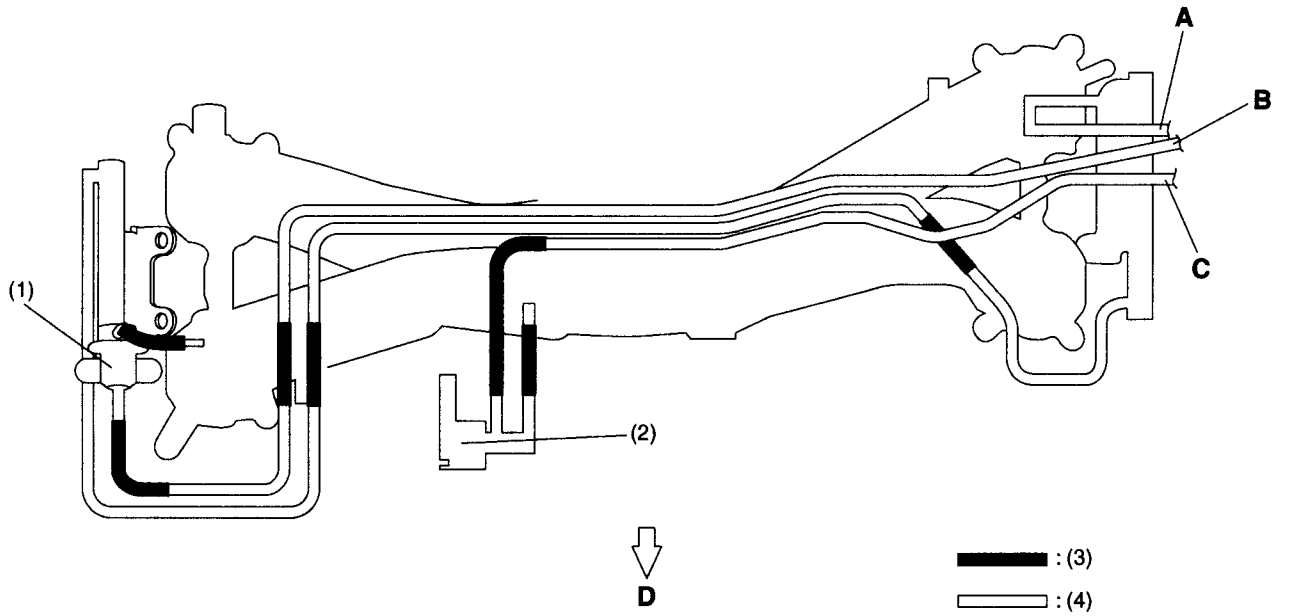


NF0472

(1) Canister
(2) Pressure control solenoid valve
(3) Vent valve
(4) Shut-off valve: closed
(5) Filler gun

9. Vacuum Connections

The hose and pipe connections of the intake manifold, throttle body and other related parts are as shown in the illustration.



NF0315

(1) Pressure regulator
(2) Purge control solenoid valve
(3) Hose
(4) Pipe

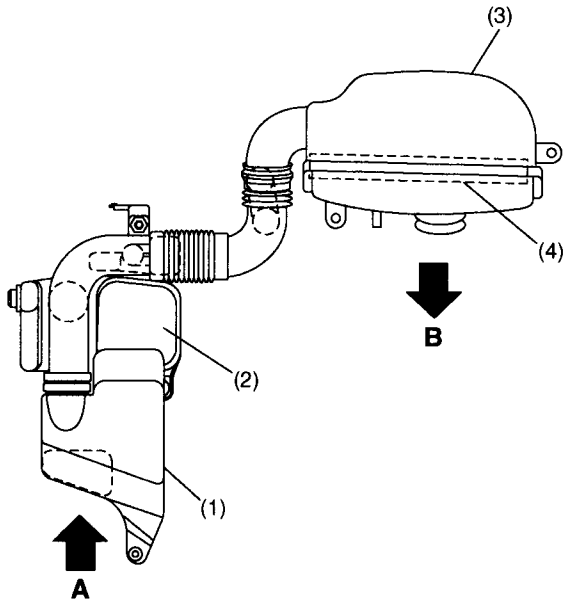
A: IN
B: OUT
C: To canister
D: Front of vehicle

INTAKE (INDUCTION) IN (SOHC)

Page
1. General 2

1. General

The intake system consists of an air intake duct, a resonator chamber, and an air cleaner element housed in its case. The resonator, located upstream of the air cleaner case, effectively reduces the intake noise level.



NF0450

(1) Air intake duct
(2) Resonator chamber
(3) Air cleaner case
(4) Air cleaner element

A: Fresh air
B: To throttle body

INTAKE (INDUCTION) IN (DOHC TURBO)

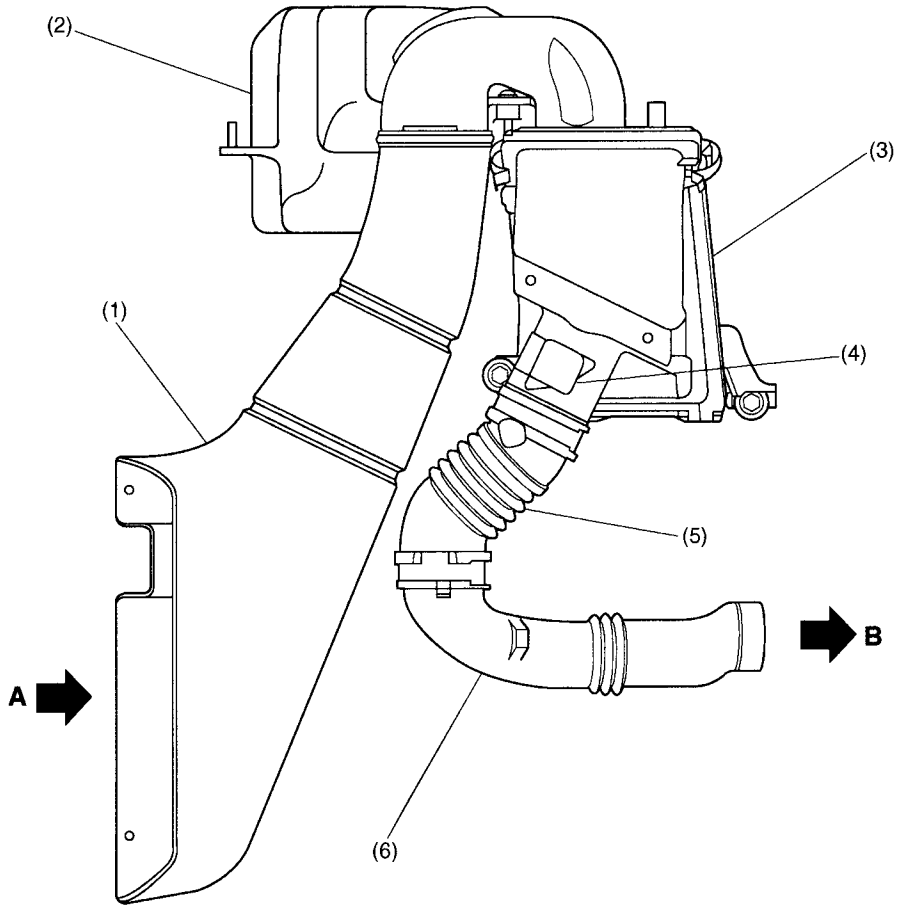
Page

1. Intake System 2
2. Turbocharger System 3

1. Intake System

A: GENERAL

The intake system consists of an air intake duct, a resonator chamber, and an air cleaner element housed in its case. The resonator, located upstream of the air cleaner case, effectively reduces the intake noise level.



NF0342

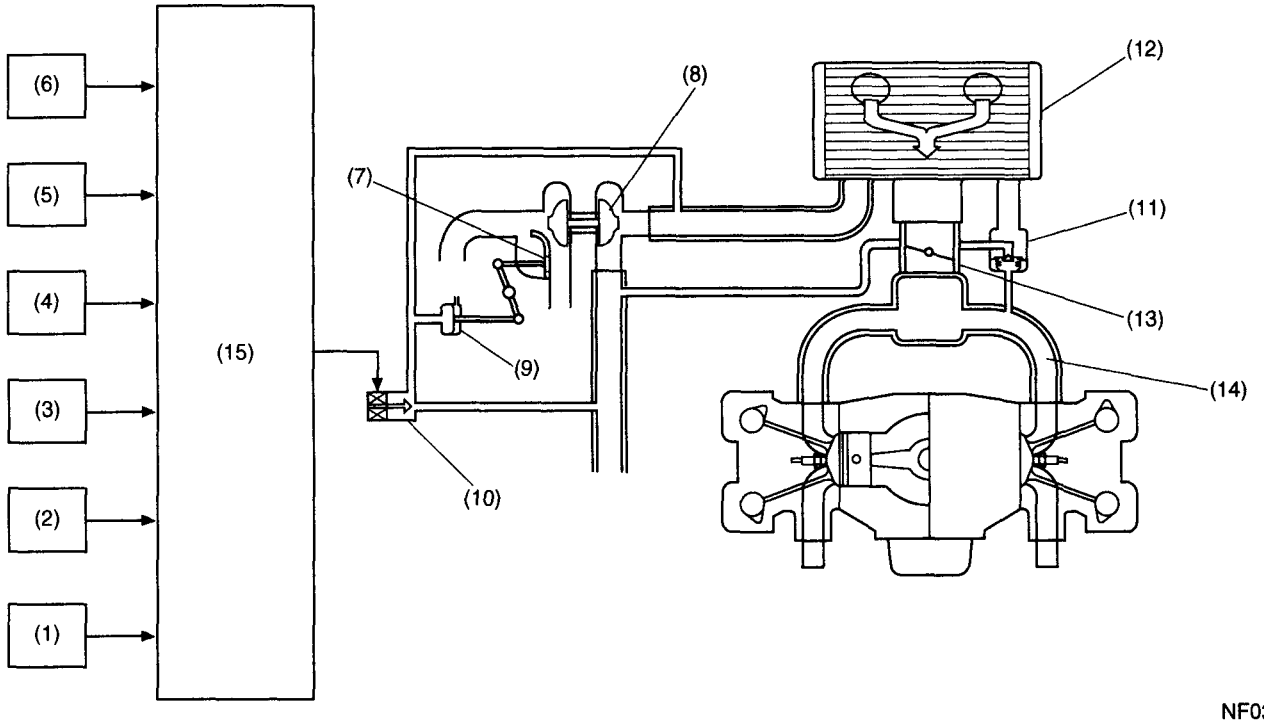
(1) Air intake duct
(2) Resonator chamber
(3) Air cleaner case
(4) Mass air flow and intake air temperature sensor
(5) Intake boot
(6) Intake duct

A: Fresh air
B: To turbocharger

2. Turbocharger System

A: GENERAL

- The turbocharger system consists of a water-cooled turbocharger, air-cooled intercooler, wastegate control solenoid valve, etc.
- The outlet side turbine, rotated by exhaust gas pressure, rotates the inlet side turbine. As a result, the inlet side turbine compresses the intake air before it is delivered to the intake manifold.
- The intake air is heated when it passes through the turbocharger unit. The air is cooled as it passes through the intercooler.
- This turbocharger system controls the supercharging pressure according to changes in the atmospheric pressure. Even at a high altitude, therefore, the system offers stable performance without being affected by variations in atmospheric pressure.

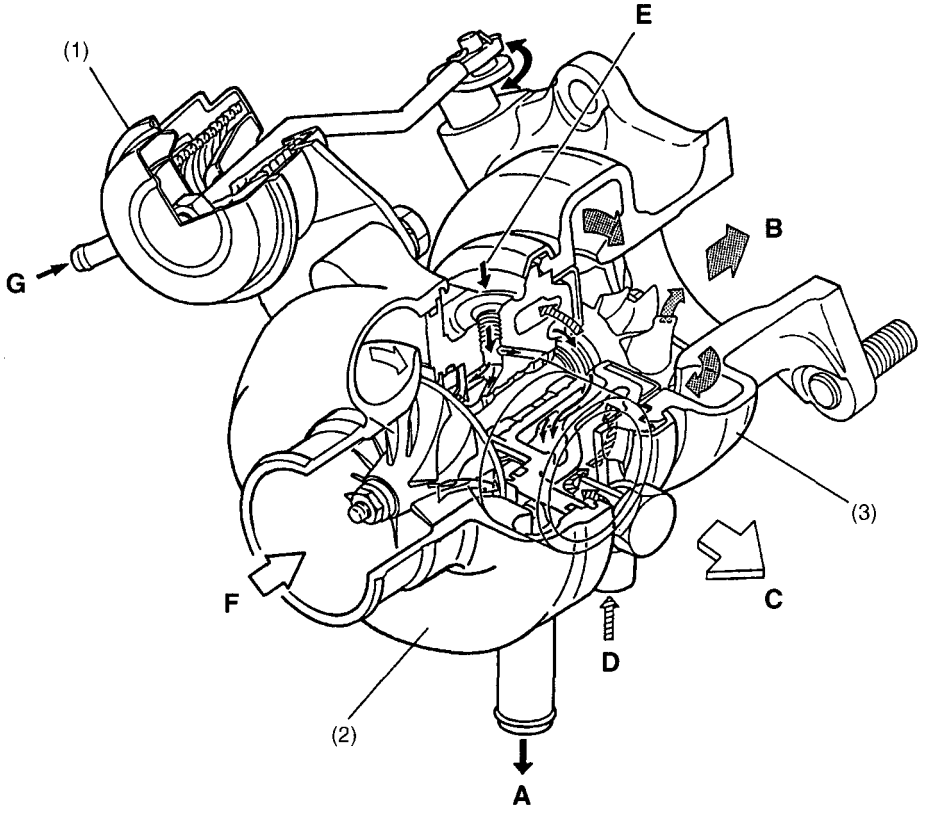


NF0343

(1) Pressure sensor
(2) Crankshaft position sensor
(3) Camshaft position sensor
(4) Throttle position sensor
(5) Engine coolant temperature sensor
(6) Mass air flow and intake air temperature sensor
(7) Wastegate valve
(8) Turbocharger unit
(9) Wastegate controller
(10) Wastegate control solenoid valve
(11) Air bypass valve
(12) Intercooler
(13) Throttle body
(14) Intake manifold
(15) ECM

B: TURBOCHARGER UNIT

The turbocharger is water-cooled. It utilizes a wastegate valve to adjust its supercharging pressure to an optimum level. The turbine is housed in a lightweight, thin-wall, heat-resistant casting. The compressor housing is made of thin-wall, aluminum alloy casting. The shaft for turbine and compressor is supported by a full-floating metal bearing system.



NF0344

(1) Wastegate controller
(2) Compressor housing
(3) Turbine housing

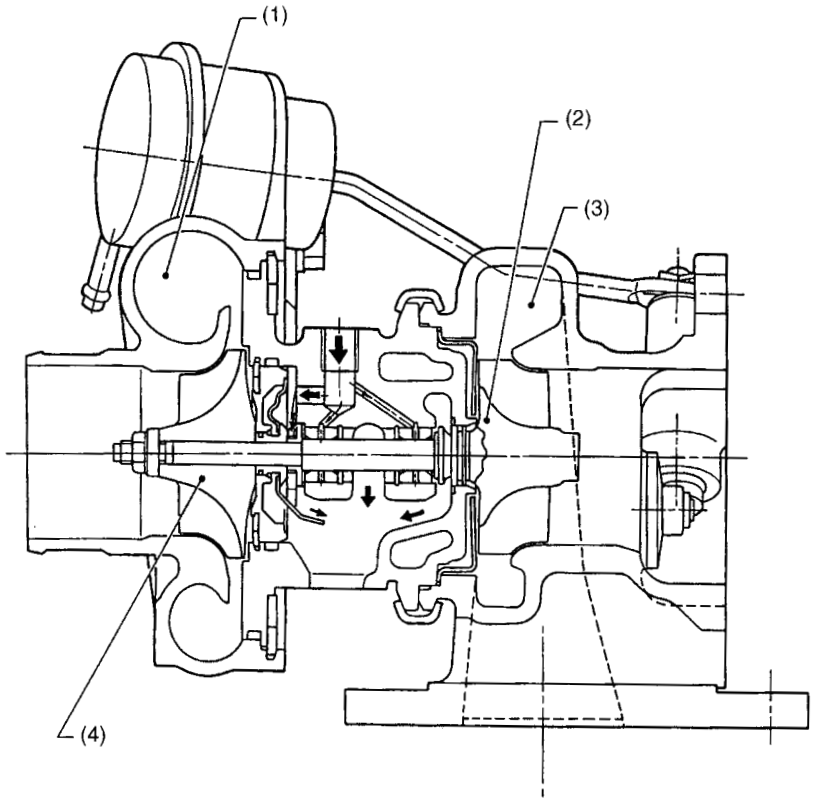
A: Lubricating oil outlet
B: Exhaust gas outlet
C: Air outlet
D: Engine coolant inlet

E: Lubricating oil inlet
F: Air inlet
G: Wastegate valve operating pressure

C: LUBRICATION OF TURBOCHARGER

The turbocharger is lubricated by engine oil branched out from the oil pump. To cope with very high speed of the turbocharger turbine and the compressor shaft which may reach a maximum of several hundred thousands of rpm, full-floating type bearings are used which can form adequate oil films on their inside and outside during running.

Further the oil supplied to the turbocharger also plays a role of cooling the turbine so that heat from exhaust gas does not transmitted to the bearings.



NF0345

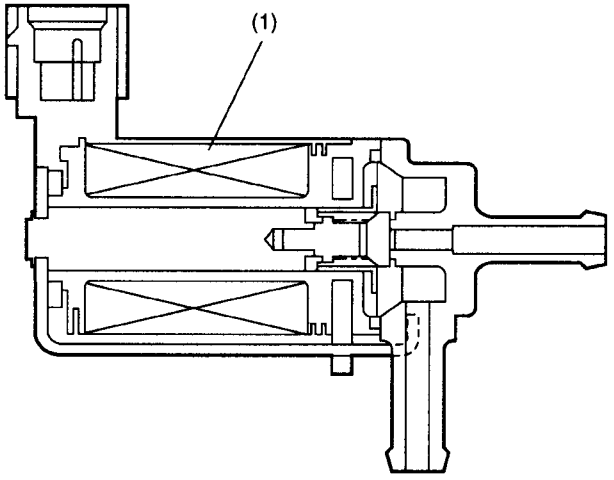
(1) Compressor housing
(2) Turbine wheel
(3) Turbine housing
(4) Compressor impeller

D: COOLING OF TURBOCHARGER

The turbocharger unit is cooled by engine coolant, which enhances the reliability and durability of the unit. The engine coolant from the coolant drain hose located under the cylinder head is led by a pipe to the coolant passage provided in the turbocharger bearing housing. After cooling the bearing housing, the engine coolant is led into the coolant filler tank through a pipe.

E: WASTEGATE CONTROL SOLENOID VALVE

The wastegate control solenoid valve switches the intake air pressure passages to the wastegate controller in response to signals from the ECM. When the solenoid valve is closed, the intake air pressure upstream of the turbocharger unit is applied to the wastegate controller. When the solenoid valve is opened, the intake air pressure downstream of the turbocharger unit (supercharged air pressure) is applied to the wastegate controller.



NF0346

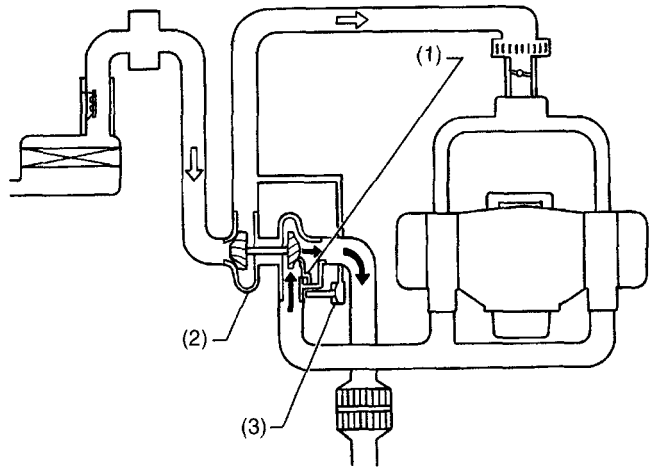
(1) Coil

F: REGULATION OF SUPERCHARGING PRESSURE

1. BASIC FUNCTION OF THE WASTEGATE VALVE

When the engine speed increases as the throttle valve opens, the amount of exhaust gas increases. This increases the speed of the turbine (approx. 20,000 to 150,000 rpm), the supercharging pressure and the engine output.

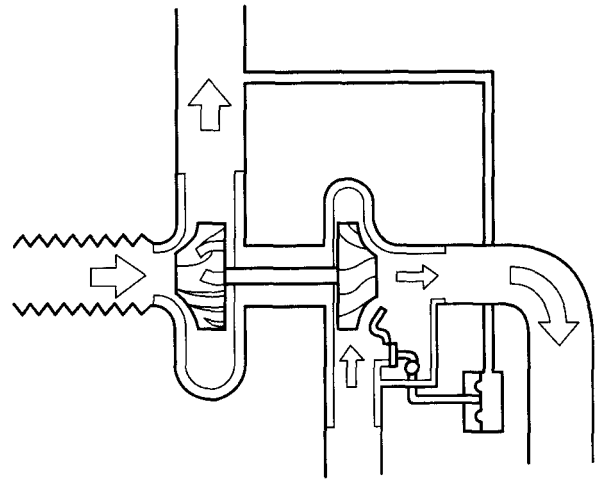
If the resultant supercharging pressure is extremely high, however, it may cause knocking and an excessively high thermal load on such engine components as pistons. In the worst case, the engine may be damaged or broken. To prevent this, the wastegate valve and its controller are provided. By sensing the supercharging pressure, the wastegate valve controller controls the operation of the wastegate valve to maintain the supercharging pressure below a predetermined level.



NF0347

(1) Wastegate valve
(2) Turbocharger
(3) Wastegate valve controller

While the supercharging pressure is lower than the predetermined level, the wastegate valve is closed so that entire exhaust gas is directed to the turbine.



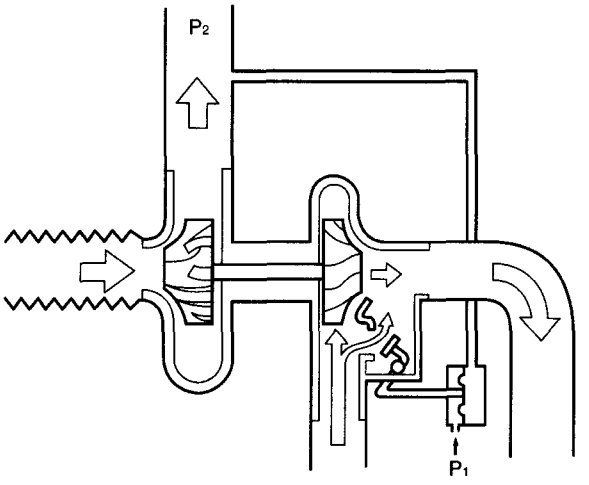
NF0348

When the supercharging pressure reaches the predetermined level, the wastegate controller lets the supercharging pressure press the diaphragm. This causes the wastegate valve to open through a linkage. With the wastegate valve open, part of the exhaust gas is allowed to flow into the exhaust gas pipe that bypasses the passage to the turbine.

This decreases the exhaust gas pressure that rotates the turbine and keeps the supercharging pressure constant.

- It means $P_2 - P_1$ = constant.

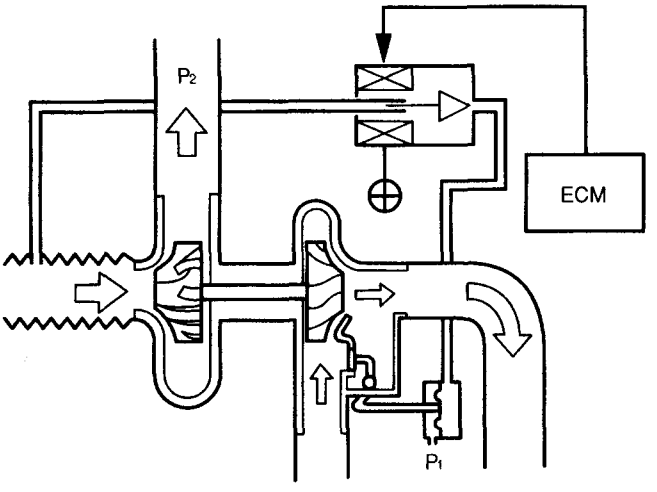
P_1: Atmospheric pressure
P_2: Supercharging pressure



NF0349

2. CONCEPT OF THE WASTEGATE VALVE CONTROL

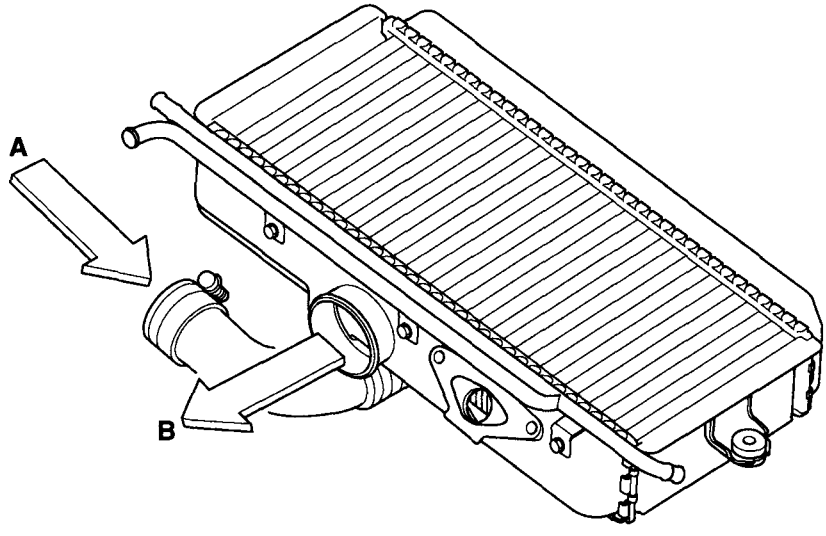
At high altitudes, the atmospheric pressure (P_1) is low, so that the supercharging pressure (P_2) is also low in a conventional system. The wastegate solenoid valve operates in such a way that a constant supercharging pressure (P_2) is maintained by acting in response to change in the atmospheric pressure.



NF0350

G: INTERCOOLER

- Since the intake air having passed through the turbocharger unit is heated to a very high temperature, the air itself is expanded, resulting in a lower supercharging charging efficiency. The intercooler is provided just before the throttle body to cool down the intake air and improve the supercharging efficiency.
- The intercooler is an air cooled type. The air delivered from the air duct provided at the engine hood flows through the core and cools the intake air passing through the intercooler.

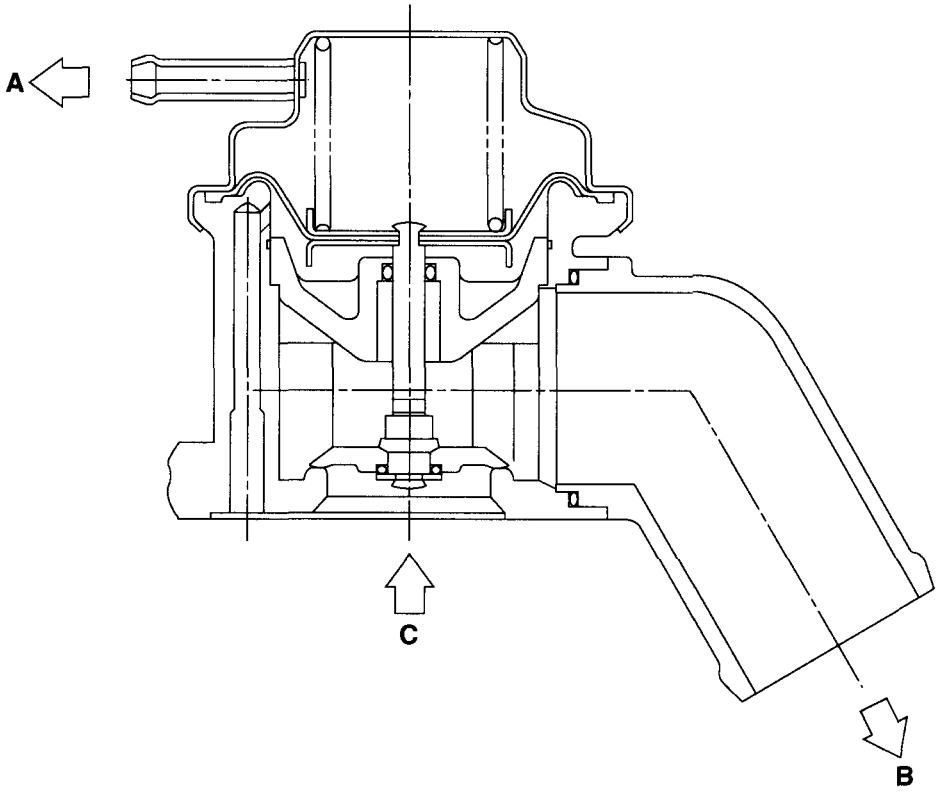


NF0351

A: From turbocharger
B: To throttle body

H: AIR BYPASS VALVE

When a throttle valve is suddenly closed, low air suction noise may occur due to a sudden rise of the air pressure in the passage between the turbocharger and throttle body. To prevent this, an air bypass valve and air passage are provided. The air bypass valve, actuated by the vacuum created by a sudden closure of the throttle valve, allows the suction air to bypass the turbocharger and flow directly upstream, thus lowering the pressure in the air passage.



NF0393

A: To intake manifold
B: To turbocharger inlet duct
C: From intercooler

MECHANICAL ME (SOHC)

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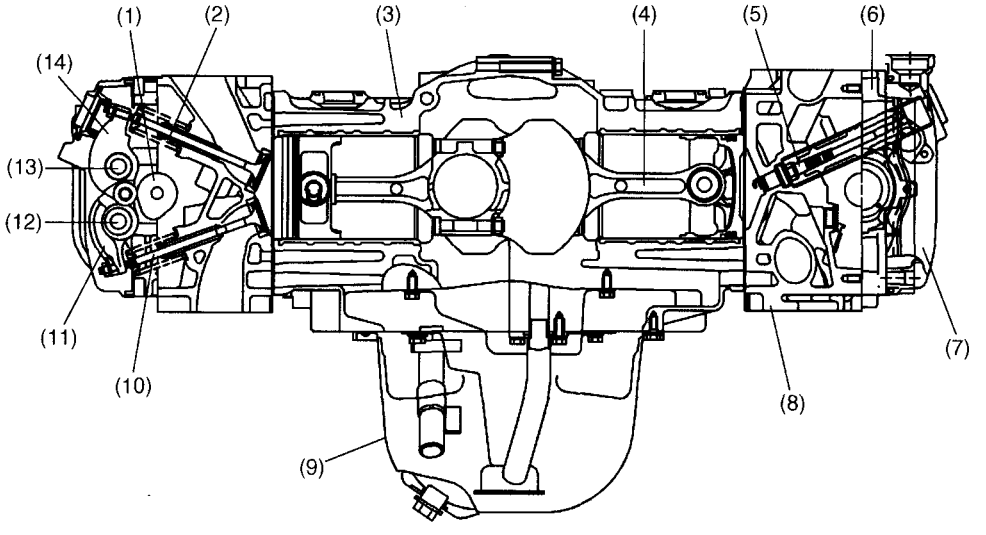
1. General

The engine used in this vehicle is of a horizontally opposed, four-cylinder design. This four-stroke-cycle, water-cooled, SOHC engine uses a total of 16 valves and its main components are made of aluminum alloy. It is fueled by a multiple fuel injection system.

The engine's major structural and functional features are as follows:

- The cylinder head forms pentroof combustion chambers, each having a spark plug located at its center and two each of intake and exhaust valves (four valves per cylinder). The intake and exhaust ports are located in a cross-flow arrangement.
- There are a screw and nut at the valve end of each rocker arm. They are used for adjusting the valve clearance.
- A single timing belt drives two camshafts on the left and right banks and the engine coolant pump on the left bank. Belt tension is automatically adjusted by a belt tension adjuster, eliminating need for a manual adjustment.
- The crankshaft is supported by five bearings with high rigidity and strength.
- The cylinder block is an aluminum die casting fitted with iron die-cast cylinder liners.

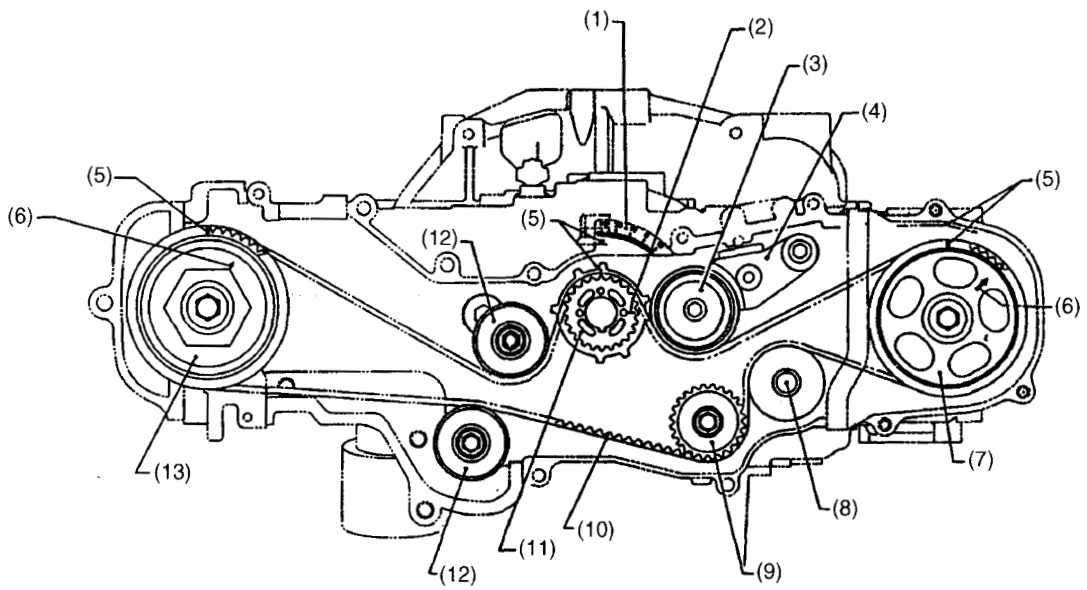


NF0039

(1) Camshaft
(2) Intake valve
(3) Cylinder block
(4) Connecting rod
(5) Spark plug
(6) Camshaft cap
(7) Valve rocker cover
(8) Cylinder head
(9) Oil pan
(10) Exhaust valve
(11) Exhaust rocker arm
(12) Exhaust rocker shaft
(13) Intake rocker shaft
(14) Intake rocker arm

2. Timing Belt

- A single timing belt drives two camshafts (one in the left bank and one in the right bank). The belt also drives the water pump by its non-toothed side.
- The timing belt teeth have a specially designed round profile which contributes to quiet operation. The timing belt is made of strong and inflexible core cords, wear-resistant canvas and heat-resistant rubber material.
- A hydraulic automatic belt tension adjuster always keeps the belt taut to the specified tension. Any manual belt tension adjustment is unnecessary.



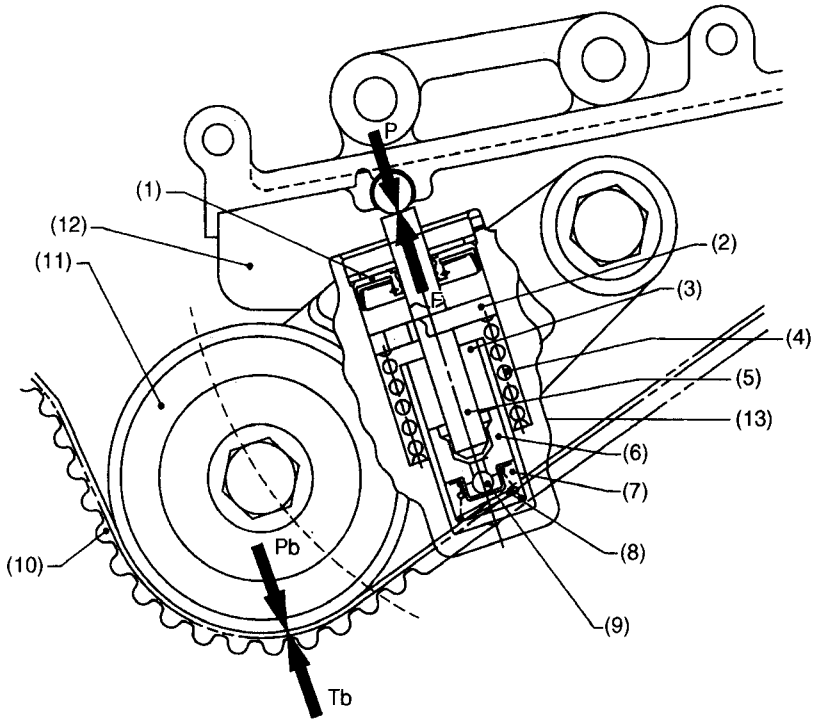
NF0040

(1) Timing indicator (For timing mark of crankshaft pulley)
(2) *Piston position mark
(3) Belt tension pulley
(4) Automatic belt tension adjuster
(5) Alignment mark
(6) **Piston position mark
(7) Camshaft sprocket LH
(8) Water pump pulley
(9) Idler No. 2
(10) Timing belt
(11) Crankshaft sprocket
(12) Idler
(13) Camshaft sprocket RH

NOTE:
*: The #1 piston is at TDC when the piston position mark on the crankshaft sprocket is aligned with the timing mark on the cylinder block.
**: The #1 piston is at TDC on the compression stroke when the piston position mark on the camshaft sprocket is aligned with the timing mark on the belt cover.

3. Automatic Belt Tension Adjuster

The automatic belt tension adjuster consists of a tensioner unit and a bracket. It maintains the timing belt tension automatically at a specified level to enable the belt to transmit power correctly, reduce operating noise and increase the life of the belt.
The cylinder of the tensioner unit incorporates an adjuster rod, wear ring, plunger spring, return spring, check ball and silicone oil.
The automatic belt tension adjuster gives tension to the belt by a levering action which is produced by the push force of the tensioner unit's adjuster rod. It operates in the process detailed below.



NF0368

(1) Oil seal
(2) Wear ring
(3) Oil reservoir chamber
(4) Return spring
(5) Adjuster rod
(6) Plunger
(7) Oil pressure chamber
(8) Plunger spring
(9) Check ball
(10) Timing belt
(11) Belt tension pulley
(12) Tensioner bracket
(13) Cylinder

- Timing belt tensioning action

When the belt becomes slack, the adjuster rod is pushed upward by the return spring. The oil in the reservoir chamber, which is pressurized by the plunger spring to a certain level, pushes open the check ball and flows into the oil pressure chamber to keep the pressure constant.
The thrust force F resulting from extension of the adjuster rod applies a counterclockwise torque to the tensioner bracket, which causes the belt tension pulley at its end to turn in the same direction. This applies tensioning pressure Pb to the timing belt.

- Timing belt tension balancing action

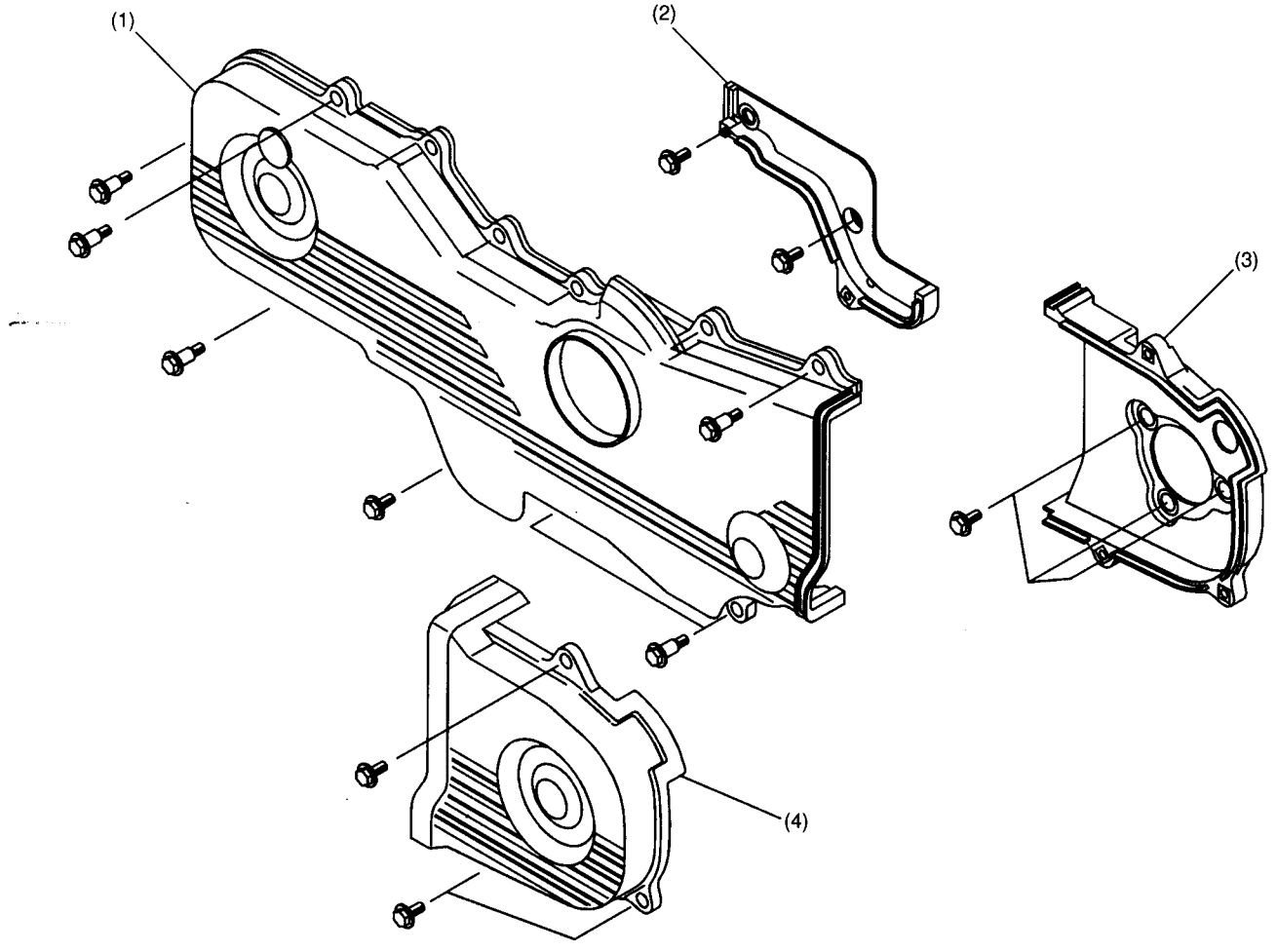
When the belt tension pulley is pushed against the timing belt with pressure Pb, reaction force Tb of the timing belt generates the reaction force P at the point on which the adjustor rod force is acting.
This force P pushes the adjuster rod until it balances with the sum of the thrust force F and the pressure of the oil in the oil pressure chamber. Therefore, the timing belt tension is kept constant.

- Overtension correction action

If the tension of the timing belt increases excessively, the force P becomes larger than the thrust force F and silicone oil is returned from the oil pressure chamber to the reservoir chamber little by little until the force P balances again with the thrust force F. Thus the timing belt tension is maintained at the specified level at all times.

4. Belt Cover

- The belt cover is made of lightweight, heat resistant synthetic resin molding. It constitutes a totally enclosed housing with its cylinder block mating edges sealed with rubber gaskets. This effectively protects the inside components from dust and liquid.
- Rubber seals used between the cylinder block and the belt cover effectively reduces transmission of noise and vibration.
- The front belt cover has a line mark for ignition-timing checking.

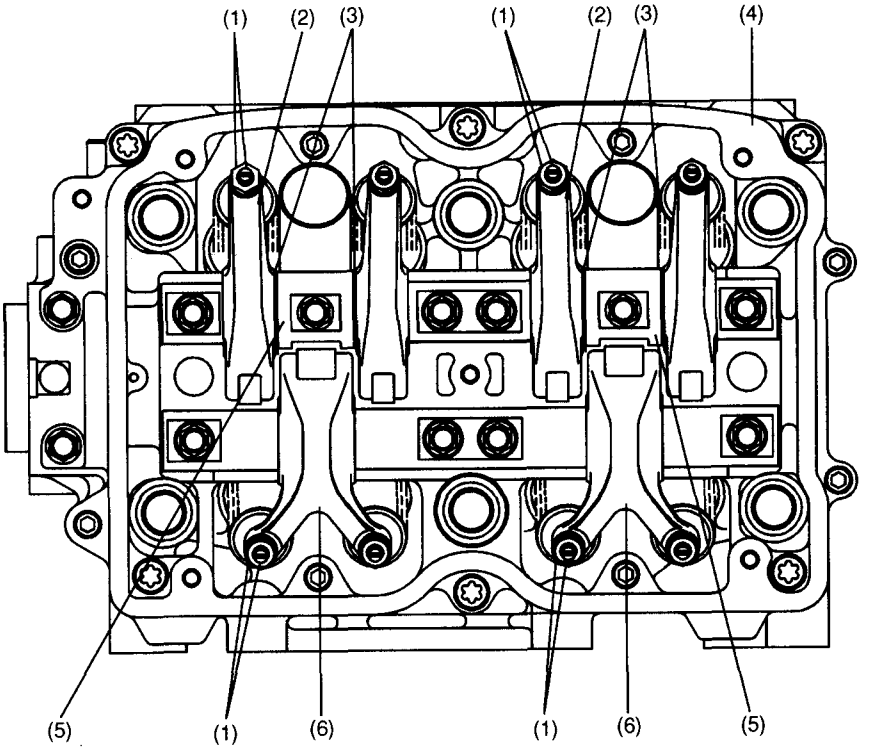


NF0042

(1) Front belt cover
(2) Belt cover No. 2 (RH)
(3) Belt cover No. 2 (LH)
(4) Belt cover (LH)

5. Valve Rocker Assembly

- The intake valve rocker arms and the exhaust valve rocker arms are installed on their own rocker shafts both of which are retained by the camshaft caps.
- The valve end of each rocker arm is provided with valve rocker adjusting screw and nut. Turning of this screw adjusts the valve clearance.
- The exhaust valve rocker arms are Y-shaped, and each arm operates two exhaust valves simultaneously.
- Each rocker shaft has an oil passage in it.



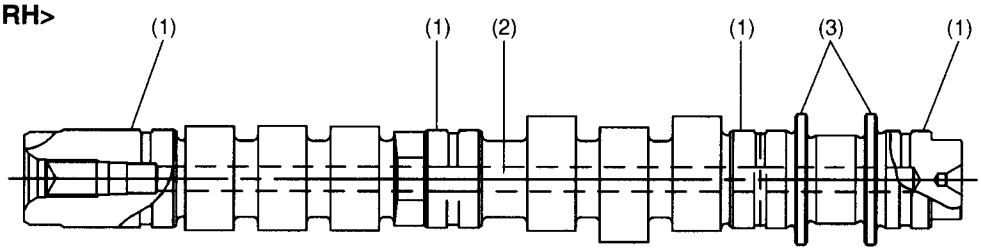
NF0043

(1) Valve rocker adjusting screw and nut
(2) Intake valve rocker arm
(3) Wave washer
(4) Camshaft cap
(5) Supporter
(6) Exhaust valve rocker arm

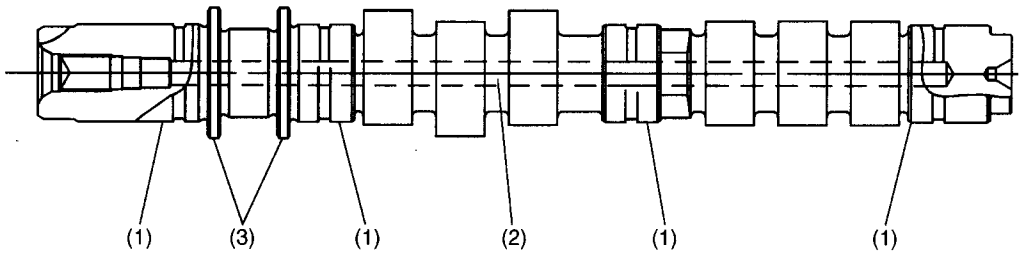
6. Camshaft

- The camshaft is supported inside the cylinder head at four journals.
- The two flanges on each camshaft supports thrust forces to limit the end play of the camshaft within the tolerance.
- Each camshaft has an oil passage in it.

<RH>



<LH>

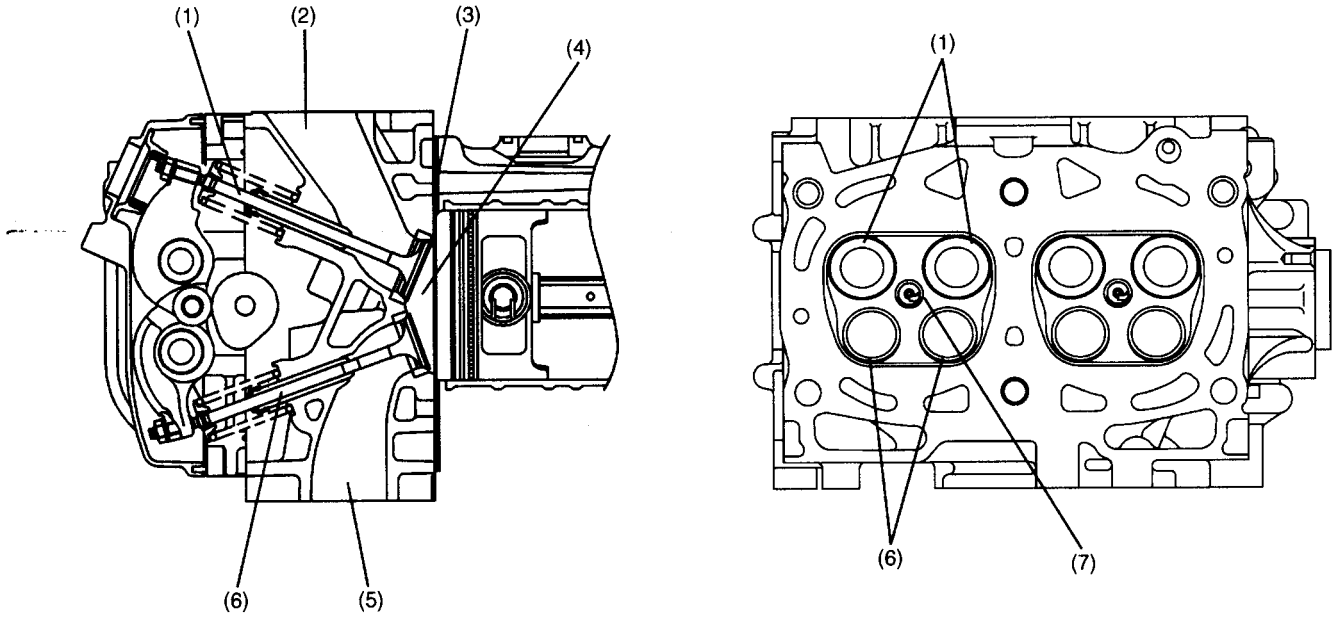


B2H1987B

(1) Journal
(2) Oil passage
(3) Shaft flange

7. Cylinder Head

- The cylinder head is made of aluminium die casting.
- Each combustion chamber in the cylinder head is a compact, pentroof design. The spark plug is located at the center of the combustion chamber, which contributes to creation of a wide "squish area" for increased combustion efficiency.
- The two intake and two exhaust valves are arranged on opposite sides for a cross-flow feature.
- The cylinder head gasket is a metallic gasket consisting of three layers of the stainless steel sheets. It is highly resistant to heat and maintains high level of sealing performance for a long period.



NF0045

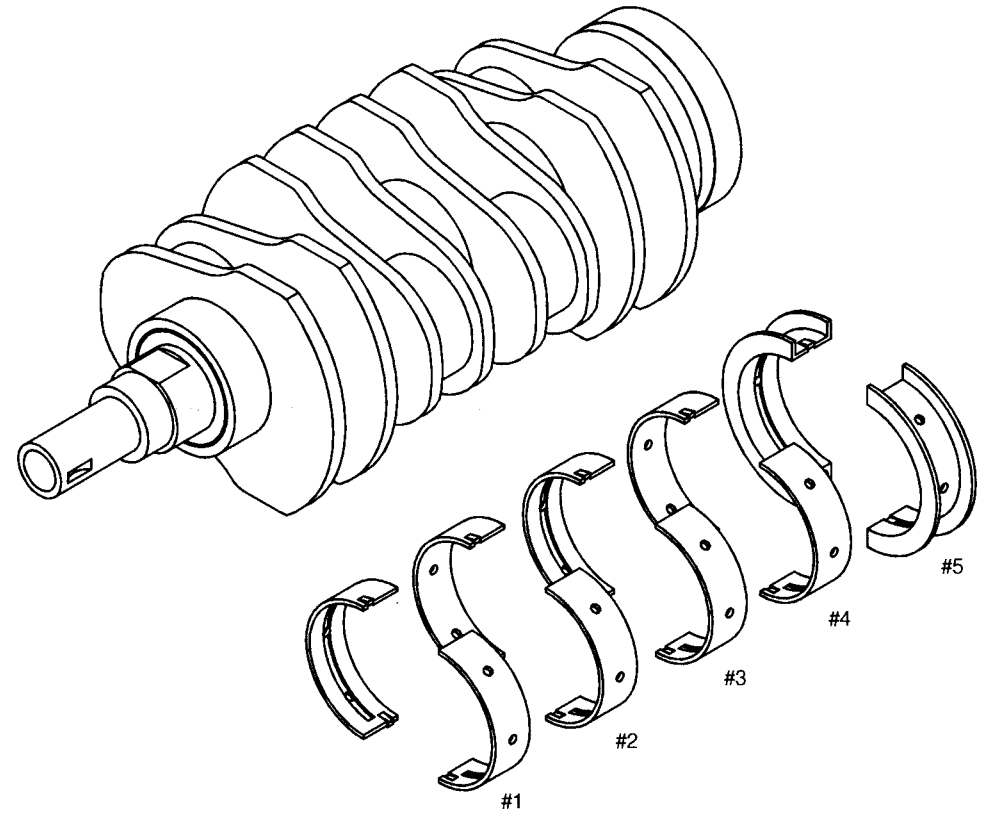
(1) Intake valve
(2) Intake port
(3) Squish area
(4) Combustion chamber
(5) Exhaust port
(6) Exhaust valve
(7) Spark plug

8. Cylinder Block

- The cylinder block is made of aluminum die casting. Its open-deck design provides it with such advantageous features as relatively small weight, high rigidity and excellent cooling efficiency.
- The cylinder liners are made of cast iron. They are dry type which means their outer surfaces are entirely in contact with the cylinder block.
- The cylinder block supports the crankshaft at its five journals. The journal supporting portions are designed such that sufficient stiffness and quiet operation are ensured.
- The oil pump is located in the front center of the cylinder block and the engine coolant pump is located at the front of the left-cylinder bank. At the rear of the right-cylinder bank is an oil separator which removes oil mist contained in blow-by gas.

9. Crankshaft

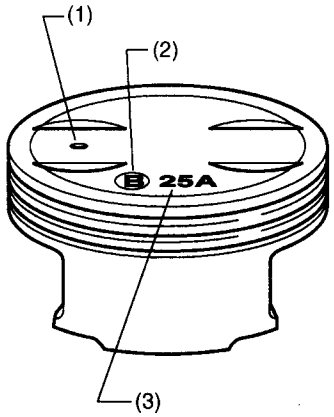
The crankshaft is supported in the cylinder block by five bearings. Each corner formed by a journal or pin and a web is finished by fillet-rolling method which increases strength of that area. The five crankshaft bearings are made of aluminum alloy and the No. 5 bearing is provided with a flanged metal to support thrust forces.

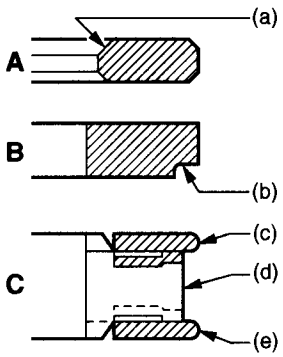


NF0372

10. Piston

- The pistons are of a slipper skirt design for reduced weight and friction. The oil control ring groove utilizes a thermal design.
- The piston pin is offset either downward (Nos. 1 and 3 pistons) or upward (Nos. 2 and 4 pistons).
- The piston head has recesses to prevent interference with the intake and exhaust valves. It also has engraved marks to identify the piston size and the direction of installation. All the pistons are common in their design.
- Three piston rings are used for each piston – two compression rings and one oil control ring. The top piston ring has inner bevels and the second piston ring has an interrupt (cut) on the bottom outside to reduce oil consumption.





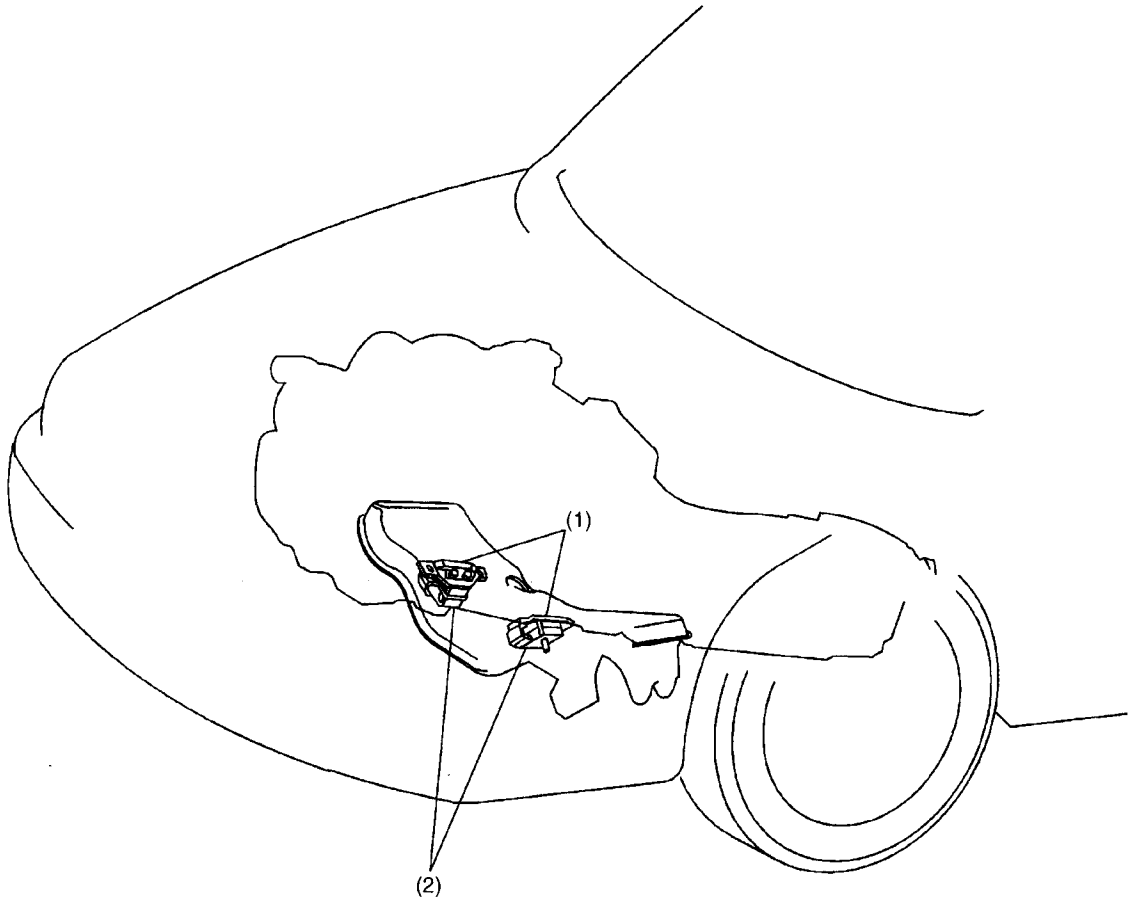
NF0449

(1) Location mark (Engine front side)
(2) Identification mark (Piston size)
(3) Engine capacity (2500 cc)

A: Top ring
B: Second ring
C: Oil ring

(a) Inner-bevel
(b) Interrupt (cut)
(c) Upper rail
(d) Spacer
(e) Lower rail

11. Engine Mounting



NF0374

(1) Bracket
(2) Cushion rubber

MEMO

MECHANICAL ME (DOHC TURBO)

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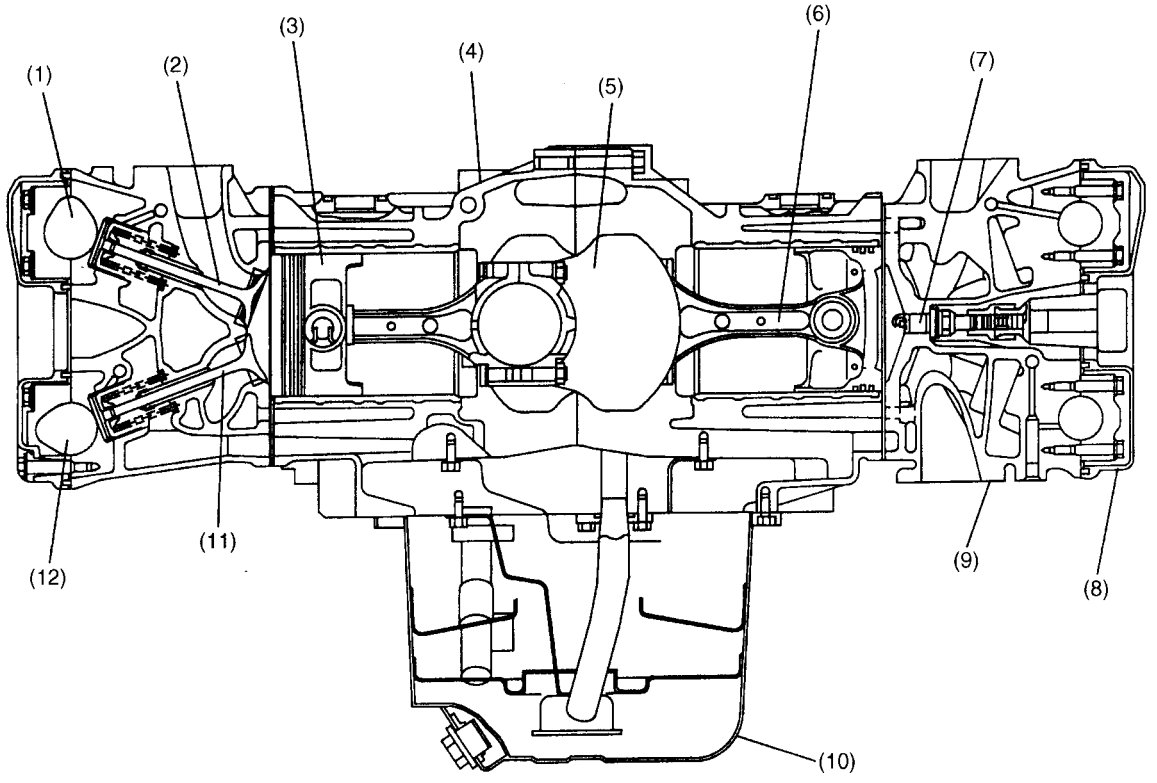
7.	Cylinder Block	9
8.	Crankshaft	10
9.	Piston	11
10.	Engine Mounting	12

1. General

The engine used in this vehicle is of a horizontally opposed, four-cylinder design. This four-stroke-cycle, water-cooled, DOHC turbocharged engine uses a total of 16 valves and its main components are made of aluminum alloy. It is fueled by a multiple fuel injection system.

The engine's major structural and functional features are as follows:

- The cylinder head forms pentroof combustion chambers, each having a spark plug located at its center and two each of intake and exhaust valves (four valves per cylinder). The intake and exhaust ports are located in a cross-flow arrangement.
- A single timing belt drives four camshafts on the left and right banks and the engine coolant pump on the left bank. Belt tension is automatically adjusted by a belt tension adjuster, eliminating need for a manual adjustment.
- The crankshaft is supported by five bearings with high rigidity and strength.
- The cylinder block is an aluminum die casting fitted with iron die-cast cylinder liners.

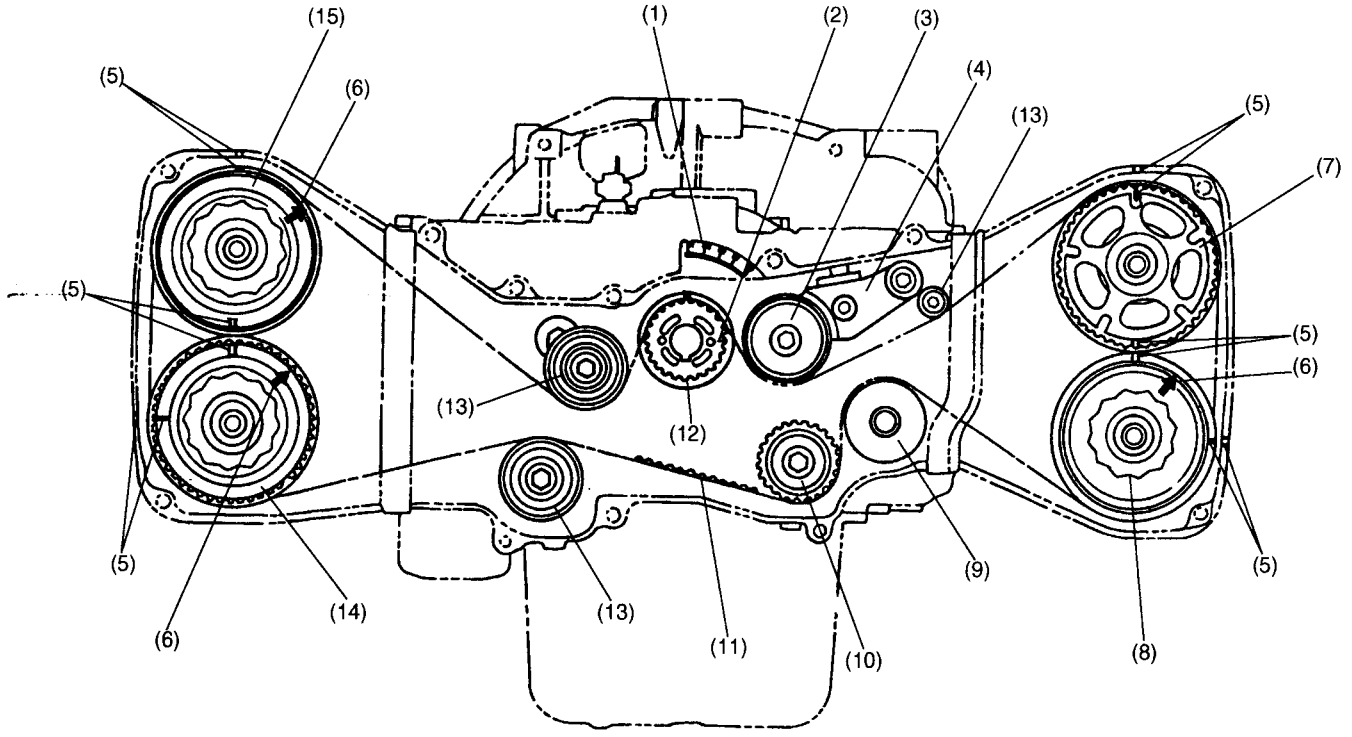


NF0366

(1) Intake camshaft
(2) Intake valve
(3) Piston
(4) Cylinder block
(5) Crankshaft
(6) Connecting rod
(7) Spark plug
(8) Valve rocker cover
(9) Cylinder head
(10) Oil pan
(11) Exhaust valve
(12) Exhaust camshaft

2. Timing Belt

- A single timing belt drives four camshafts (intake and exhaust camshafts on each bank). The belt also drives the water pump by its non-toothed side.
- The timing belt teeth have a specially designed round profile which contributes to quiet operation. The timing belt is made of strong and inflexible core cords, wear-resistant canvas and heat-resistant rubber material.
- A hydraulic automatic belt tension adjuster always keeps the belt taut to the specified tension. Any manual belt tension adjustment is unnecessary.



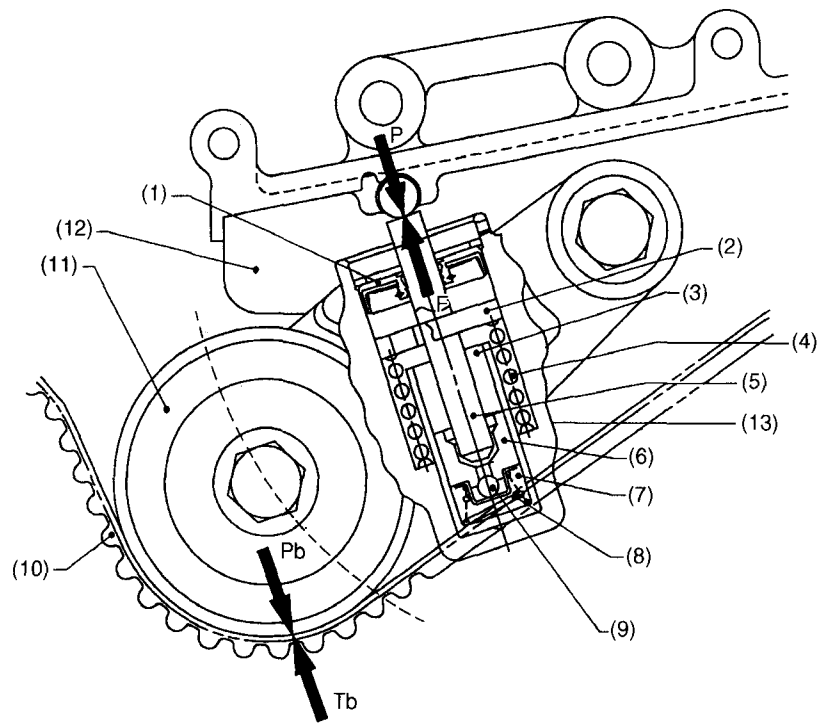
NF0367

(1) Timing indicator (For timing mark of crankshaft pulley)
(2) *Piston position mark
(3) Belt tension pulley
(4) Automatic belt tension adjuster assembly
(5) Alignment mark
(6) **Piston position mark
(7) Intake camshaft sprocket LH
(8) Exhaust camshaft sprocket LH
(9) Water pump pulley
(10) Idler No. 2
(11) Timing belt
(12) Crankshaft sprocket
(13) Idler
(14) Exhaust camshaft sprocket RH
(15) Intake camshaft sprocket RH

NOTE:
*: The #1 piston is set at the top dead center (TDC) when the piston-position mark on the crankshaft sprocket is aligned with the mark on cylinder block.
**: The #1 piston is set at TDC on the compression stroke when the piston-position mark on the camshaft sprocket is facing directly upward.

3. Automatic Belt Tension Adjuster

The automatic belt tension adjuster consists of a tensioner unit and a bracket. It maintains the timing belt tension automatically at a specified level to enable the belt to transmit power correctly, reduce operating noise and increase the life of the belt.
The cylinder of the tensioner unit incorporates an adjuster rod, wear ring, plunger spring, return spring, check ball and silicone oil.
The automatic belt tension adjuster gives tension to the belt by a levering action which is produced by the push force of the tensioner unit's adjuster rod. It operates in the process detailed below.



NF0368

(1) Oil seal
(2) Wear ring
(3) Oil reservoir chamber
(4) Return spring
(5) Adjuster rod
(6) Plunger
(7) Oil pressure chamber
(8) Plunger spring
(9) Check ball
(10) Timing belt
(11) Belt tension pulley
(12) Tensioner bracket
(13) Cylinder

- Timing belt tensioning action

When the belt becomes slack, the adjuster rod is pushed upward by the return spring. The oil in the reservoir chamber, which is pressurized by the plunger spring to a certain level, pushes open the check ball and flows into the oil pressure chamber to keep the pressure constant.
The thrust force F resulting from extension of the adjuster rod applies a counterclockwise torque to the tensioner bracket, which causes the belt tension pulley at its end to turn in the same direction. This applies tensioning pressure Pb to the timing belt.

- Timing belt tension balancing action

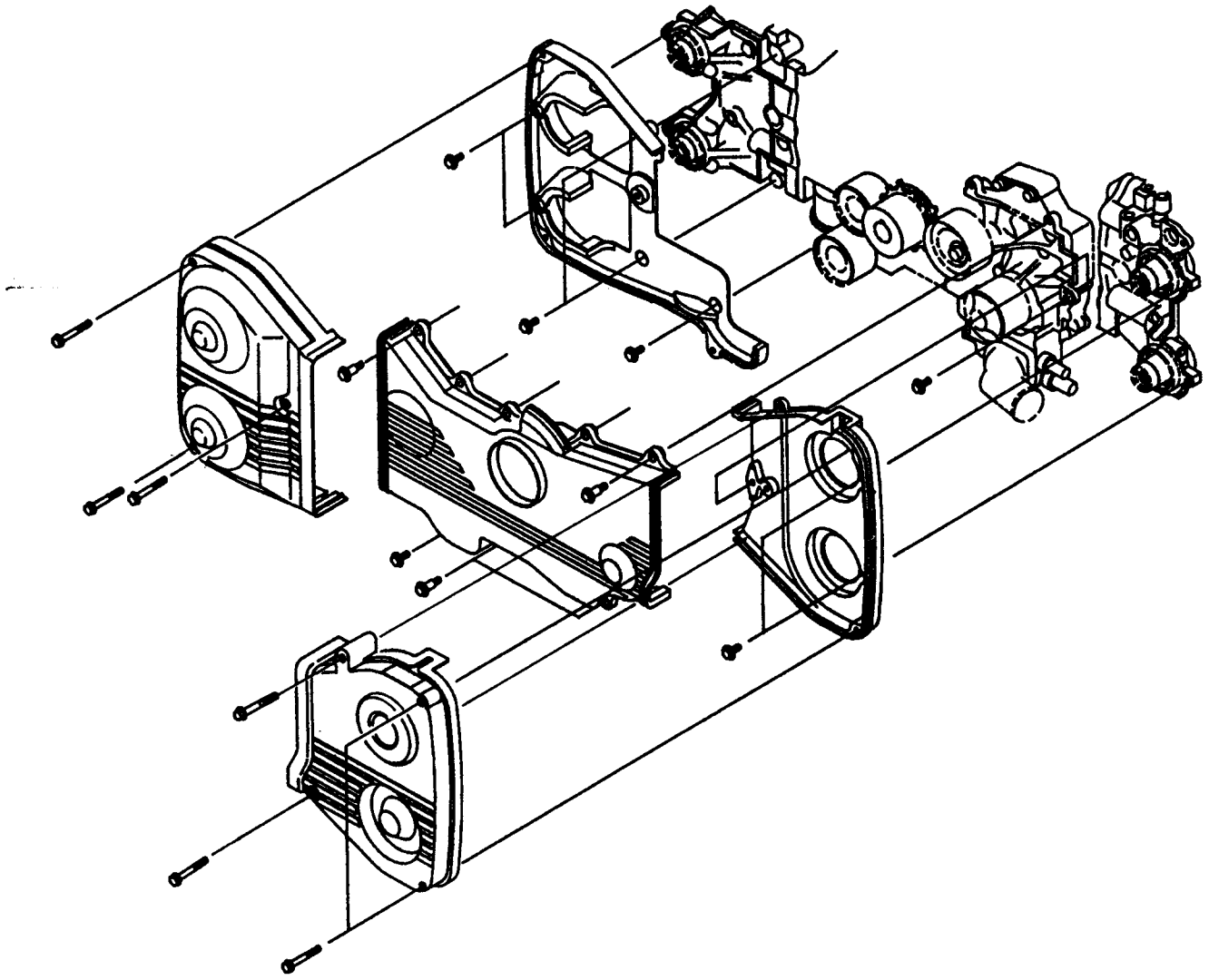
When the belt tension pulley is pushed against the timing belt with pressure Pb, reaction force Tb of the timing belt generates the reaction force P at the point on which the adjustor rod force is acting.
This force P pushes the adjuster rod until it balances with the sum of the thrust force F and the pressure of the oil in the oil pressure chamber. Therefore, the timing belt tension is kept constant.

- Overtension correction action

If the tension of the timing belt increases excessively, the force P becomes larger than the thrust force F and silicone oil is returned from the oil pressure chamber to the reservoir chamber little by little until the force P balances again with the thrust force F. Thus the timing belt tension is maintained at the specified level at all times.

4. Belt Cover

- The belt cover is made of lightweight, heat resistant synthetic resin molding. It constitutes a totally enclosed housing with its cylinder block mating edges sealed with rubber gaskets. This effectively protects the inside components from dust and liquid.
- Rubber seals used between the cylinder block and the belt cover effectively reduces transmission of noise and vibration.
- The front belt cover has a line mark for ignition-timing checking.



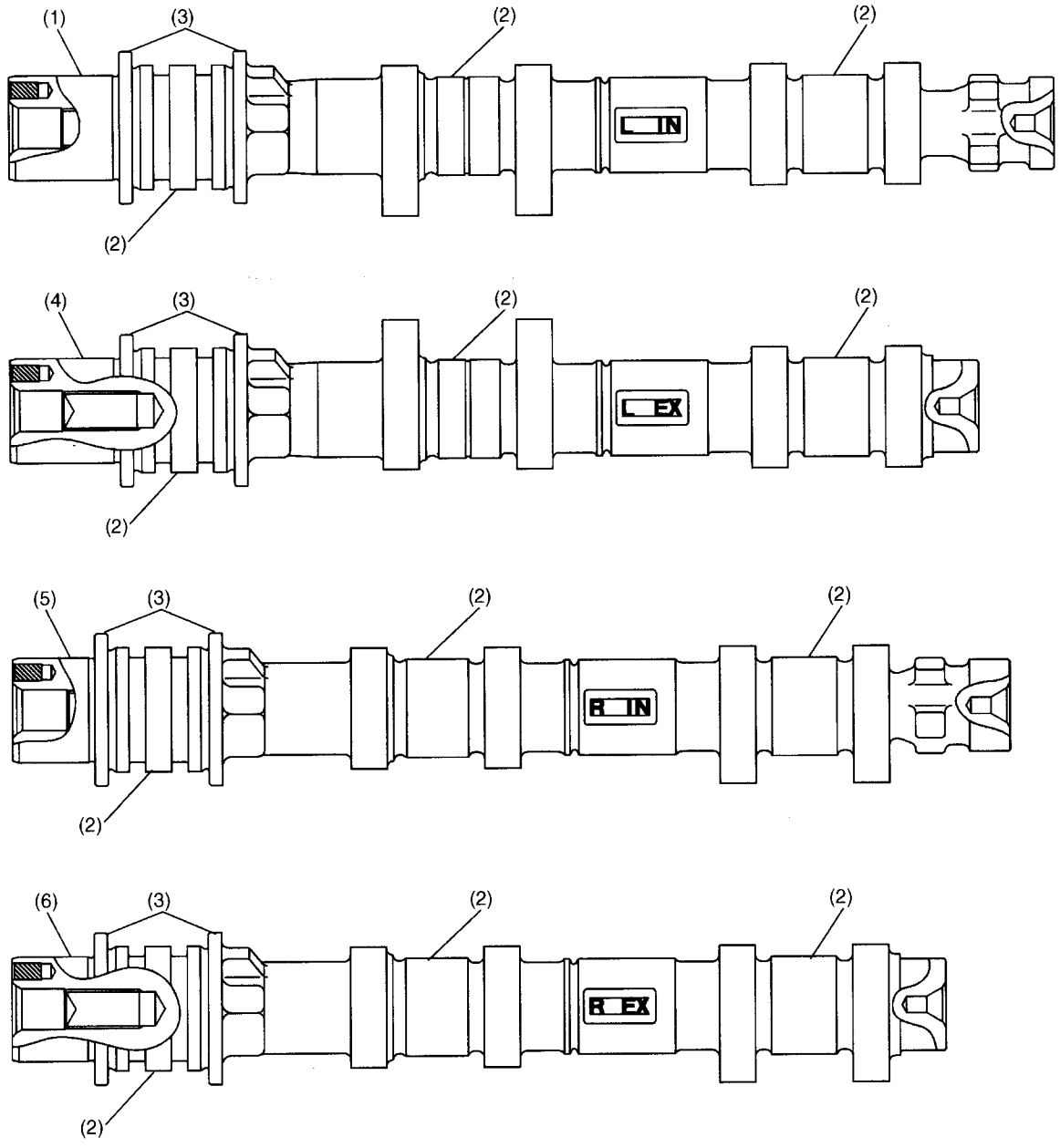
NF0369

5. Camshaft

The DOHC engine uses four camshafts in all; intake and exhaust camshafts on each of the right and left banks.

The cam lobe noses are finished by "chill" treatment to increase wear resistance and anti-scuffing properties.

Each camshaft is supported at its three journals and held in position by three camshaft caps. Each camshaft has a flange which fits in the corresponding groove in the cylinder head to receive thrust forces generated in the camshaft.

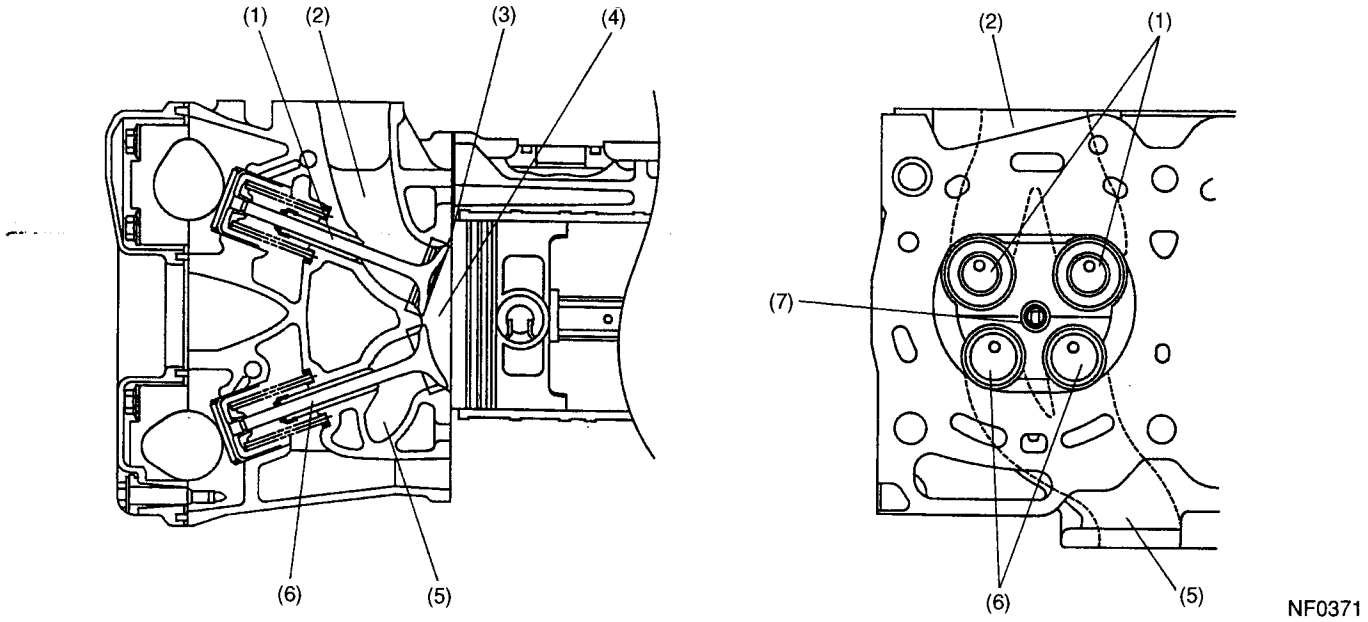


NF0370

(1) Left intake camshaft
(2) Journal
(3) Flange
(4) Left exhaust camshaft
(5) Right intake camshaft
(6) Right exhaust camshaft

6. Cylinder Head

- The cylinder head is made of aluminium die casting.
- Each combustion chamber in the cylinder head is a compact, pentroof design. The spark plug is located at the center of the combustion chamber, which contributes to creation of a wide "squish area" for increased combustion efficiency.
- The two intake and two exhaust valves are arranged on opposite sides for a cross-flow feature.
- The cylinder head gasket is a metallic gasket consisting of three layers of the stainless steel sheets. It is highly resistant to heat and maintains high level of sealing performance for a long period.



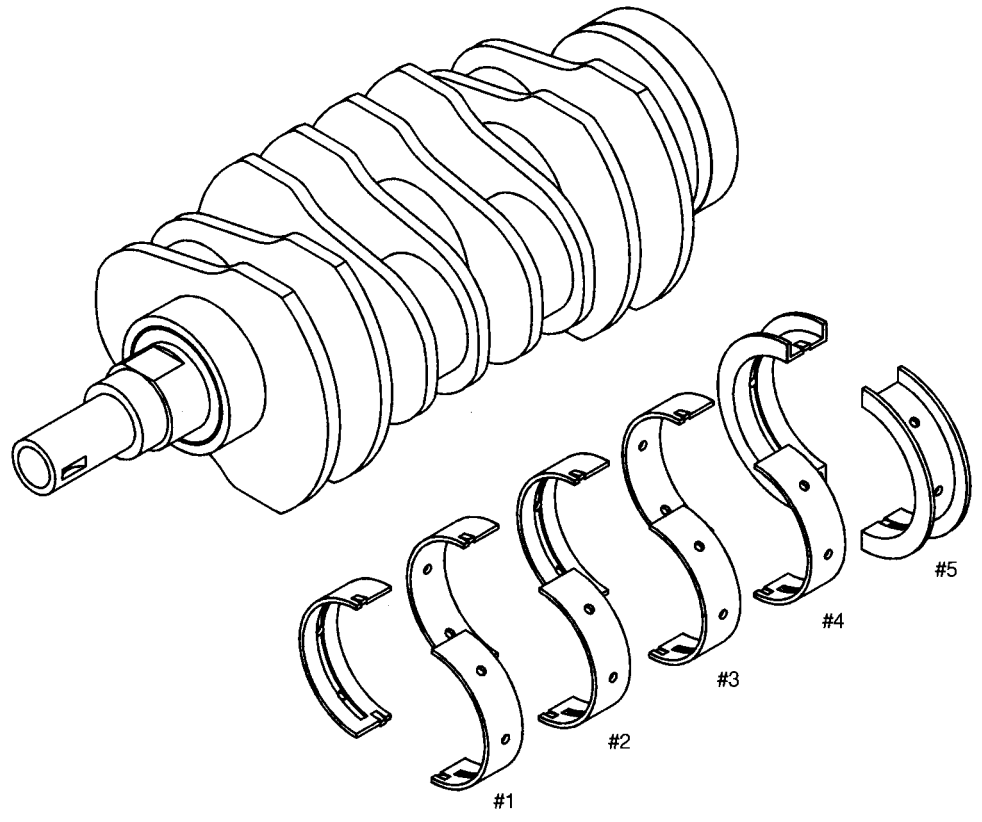
(1) Intake valve
(2) Intake port
(3) Squish area
(4) Combustion chamber
(5) Exhaust port
(6) Exhaust valve
(7) Spark plug

7. Cylinder Block

- The cylinder block is made of aluminum die casting. Its open-deck design provides it with such advantageous features as relatively small weight, high rigidity and excellent cooling efficiency.
- The cylinder liners are made of cast iron. They are dry type which means their outer surfaces are entirely in contact with the cylinder block.
- The cylinder block supports the crankshaft at its five journals. The journal supporting portions are designed such that sufficient stiffness and quiet operation are ensured.
- The oil pump is located in the front center of the cylinder block and the engine coolant pump is located at the front of the left-cylinder bank. At the rear of the right-cylinder bank is an oil separator which removes oil mist contained in blow-by gas.

8. Crankshaft

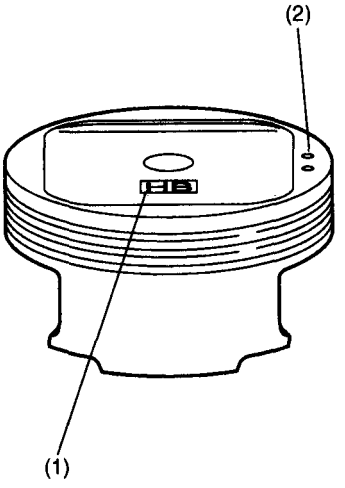
The crankshaft is supported in the cylinder block by five bearings. Each corner formed by a journal or pin and a web is finished by fillet-rolling method which increases strength of that area. The five crankshaft bearings are made of aluminum alloy and the No. 5 bearing is provided with a flanged metal to support thrust forces.

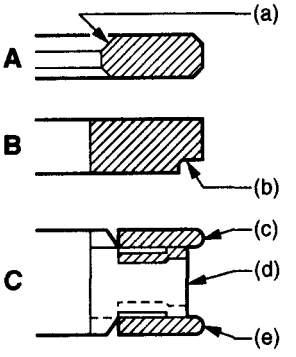


NF0372

9. Piston

- The pistons are of a slipper skirt design for reduced weight and friction. The oil control ring groove utilizes a thermal design.
- The piston pin is offset either downward (Nos. 1 and 3 pistons) or upward (Nos. 2 and 4 pistons).
- The piston head has recesses to prevent interference with the intake and exhaust valves. It also has engraved marks to identify the piston size and the direction of installation. All the pistons are common in their design.
- Three piston rings are used for each piston – two compression rings and one oil control ring. The top piston ring has inner bevels and the second piston ring has a cut on the bottom outside to reduce oil consumption.





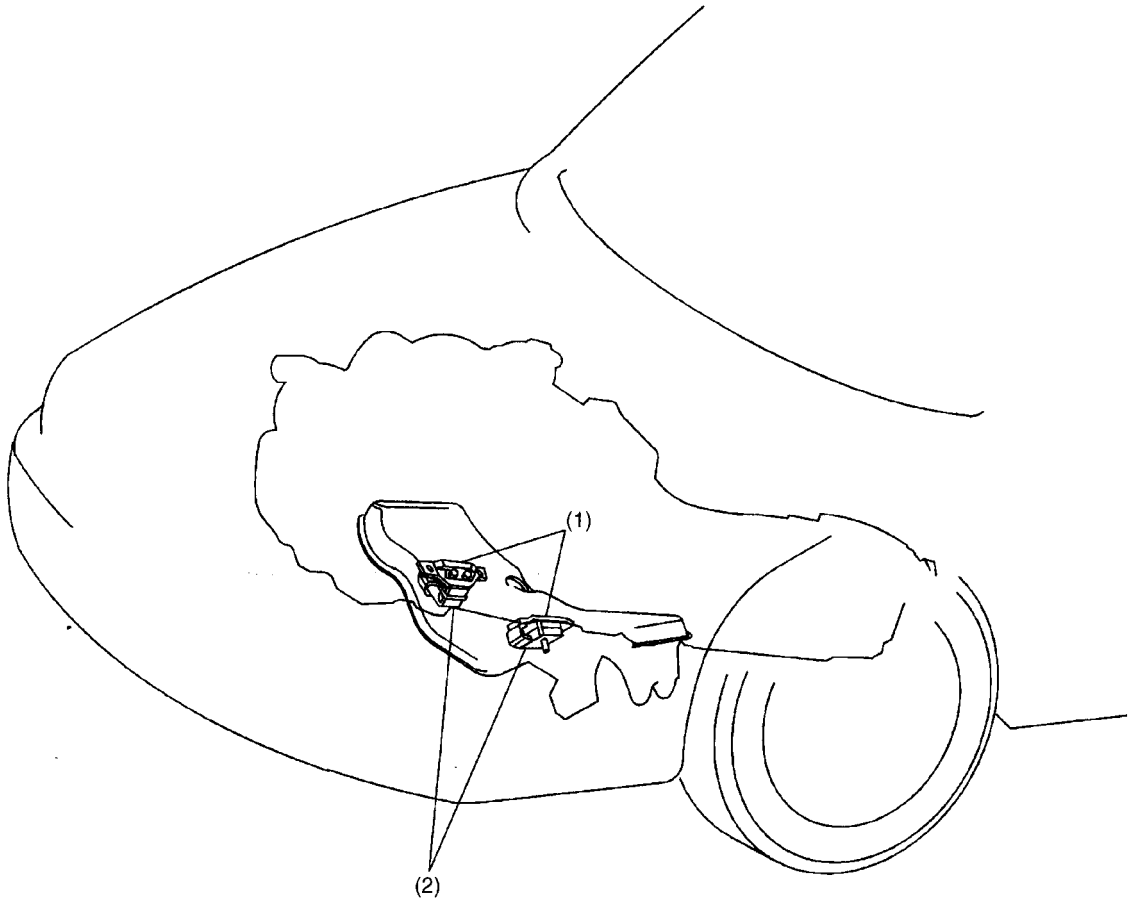
NF0373

(1) Identification mark
(2) Location mark (Engine front side)

A: Top ring
B: Second ring
C: Oil ring

(a) Inner-bevel
(b) Cut
(c) Upper rail
(d) Spacer
(e) Lower rail

10. Engine Mounting



NF0374

(1) Bracket
(2) Cushion rubber

EXHAUST EX (SOHC)

Page

1. General 2
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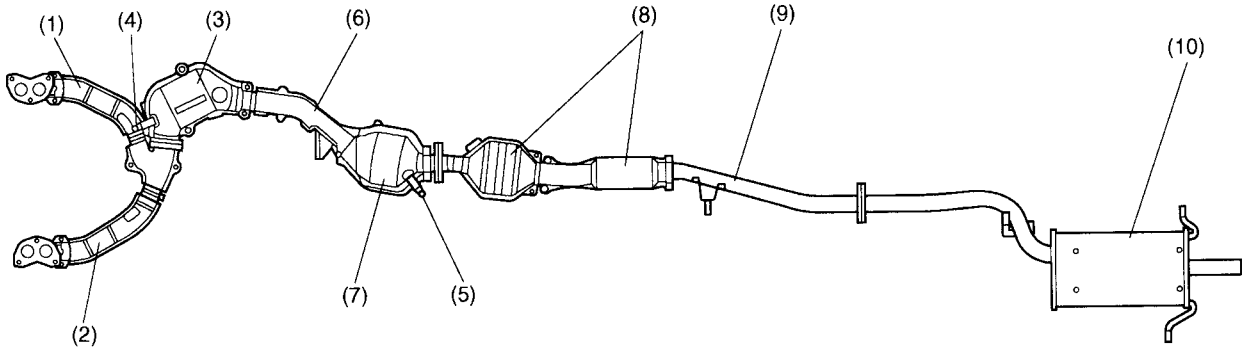
1. General

- The exhaust system consists of front exhaust pipes, catalytic converters, a center exhaust pipe, a rear exhaust pipe and a muffler. The front catalytic converter is located immediately behind the front exhaust pipe, and the rear catalytic converter is incorporated in the center exhaust pipe.
- The exhaust system features an improved sound suppression design; the two branches of the front exhaust pipe join at a point almost equal in distance from the engine's exhaust ports and the rear exhaust pipe has resonance chambers in addition to a large capacity muffler.

2. Composition



NF0441

(1) Right front exhaust pipe
(2) Left front exhaust pipe
(3) Front catalytic converter
(4) Front oxygen (A/F) sensor
(5) Rear oxygen sensor
(6) Center exhaust pipe
(7) Rear catalytic converter
(8) Resonance chamber
(9) Rear exhaust pipe
(10) Muffler

MEMO

EXHAUST EX (DOHC TURBO)

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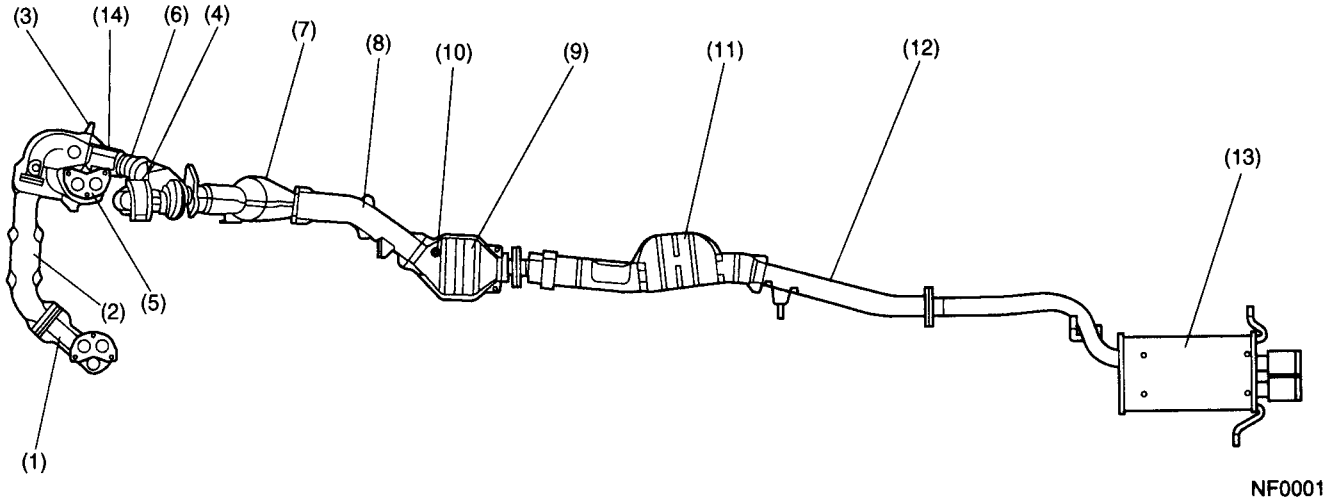
1. General 2
2. Construction 3

1. General

- The exhaust system consists of left and right exhaust manifolds, a front joint pipe, a turbocharger joint pipe, a center exhaust pipe, a rear exhaust pipe and a muffler. The turbocharger joint pipe incorporates the precatalytic converter, the center exhaust pipe incorporates the front catalytic converter, and the rear exhaust pipe incorporates the rear catalytic converter.
- The exhaust system features an improved sound suppression design; the rear exhaust pipe has a resonance chamber in addition to a large capacity muffler.

2. Construction



NF0001

(1) Left exhaust manifold
(2) Front joint pipe
(3) Front oxygen (A/F) sensor
(4) Exhaust temperature sensor
(5) Right exhaust manifold
(6) Precatalytic converter
(7) Front catalytic converter
(8) Center exhaust pipe
(9) Rear catalytic converter
(10) Rear oxygen sensor
(11) Chamber
(12) Rear exhaust pipe
(13) Muffler
(14) Turbocharger joint pipe

MEMO

COOLING CO

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2.	Cooling Circuits	3
3.	Water Pump	5
4.	Mechanical Seal	7
5.	Thermostat	8
6.	Radiator Fan	9

1. General

- The engine cooling system consists of a down-flow radiator which features high heat-dissipation performance, an electric-motor-driven fan, a water pump, a thermostat, and an engine coolant temperature sensor.
- The engine coolant reservoir tank is designed to minimize the need for replenishing coolant.
- The ECM controls the operation of the radiator main fan and sub fan depending on the signals from the engine coolant temperature sensor, vehicle speed sensor and A/C switch.

2. Cooling Circuits

A: NON-TURBO MODEL

The cooling system operates in three different phases depending on the temperature of the engine coolant.

- 1st phase (thermostat closed)

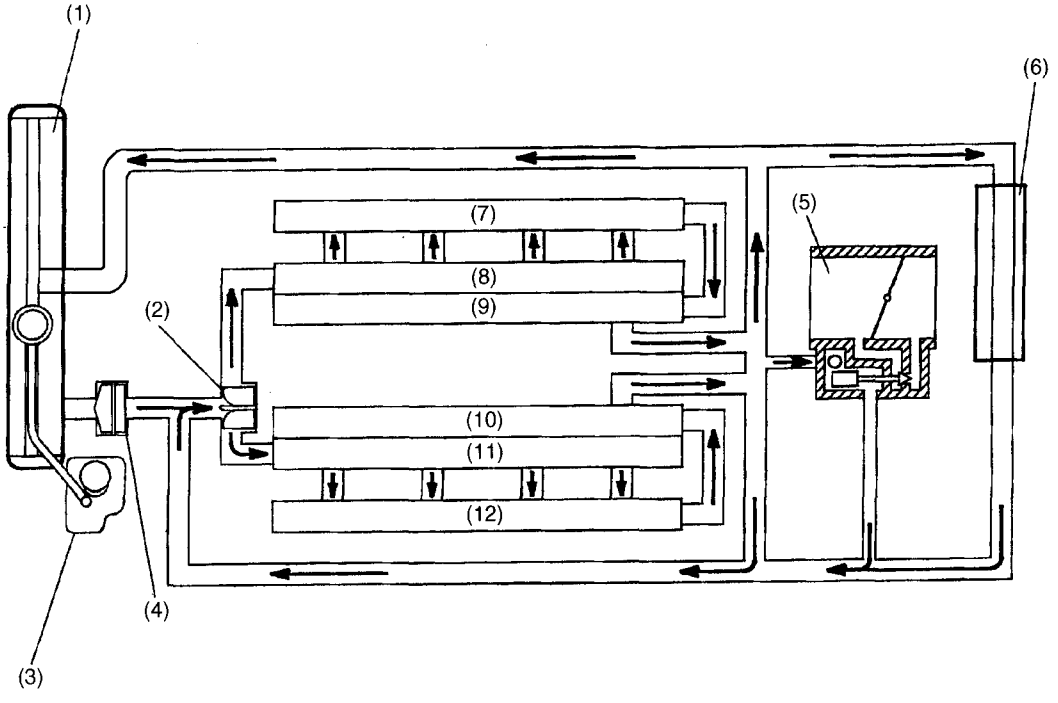
When the engine coolant temperature is below 76°C (169°F), the thermostat remains closed. The coolant flows through the bypass and heater circuits.
This permits the engine to warm up quickly.

- 2nd phase (thermostat open)

When the engine coolant temperature is above 76 – 80°C (169 – 176°F), the thermostat opens. The coolant flows through the radiator where it is cooled.

- 3rd phase (thermostat open and radiator fan operating)

When the engine coolant temperature sensor sends a signal indicating a temperature above 95°C (203°F) to the ECM, it causes the radiator fan (or fans) to operate.



B2H2915C

(1) Radiator
(2) Water pump
(3) Engine coolant reservoir tank
(4) Thermostat
(5) Throttle body
(6) Heater core
(7) Cylinder head RH
(8) Cylinder jacket RH
(9) Cylinder block RH
(10) Cylinder block LH
(11) Cylinder jacket LH
(12) Cylinder head LH

B: TURBO MODEL

The cooling system operates in three different phases depending on the temperature of the engine coolant.

- 1st phase (thermostat closed)

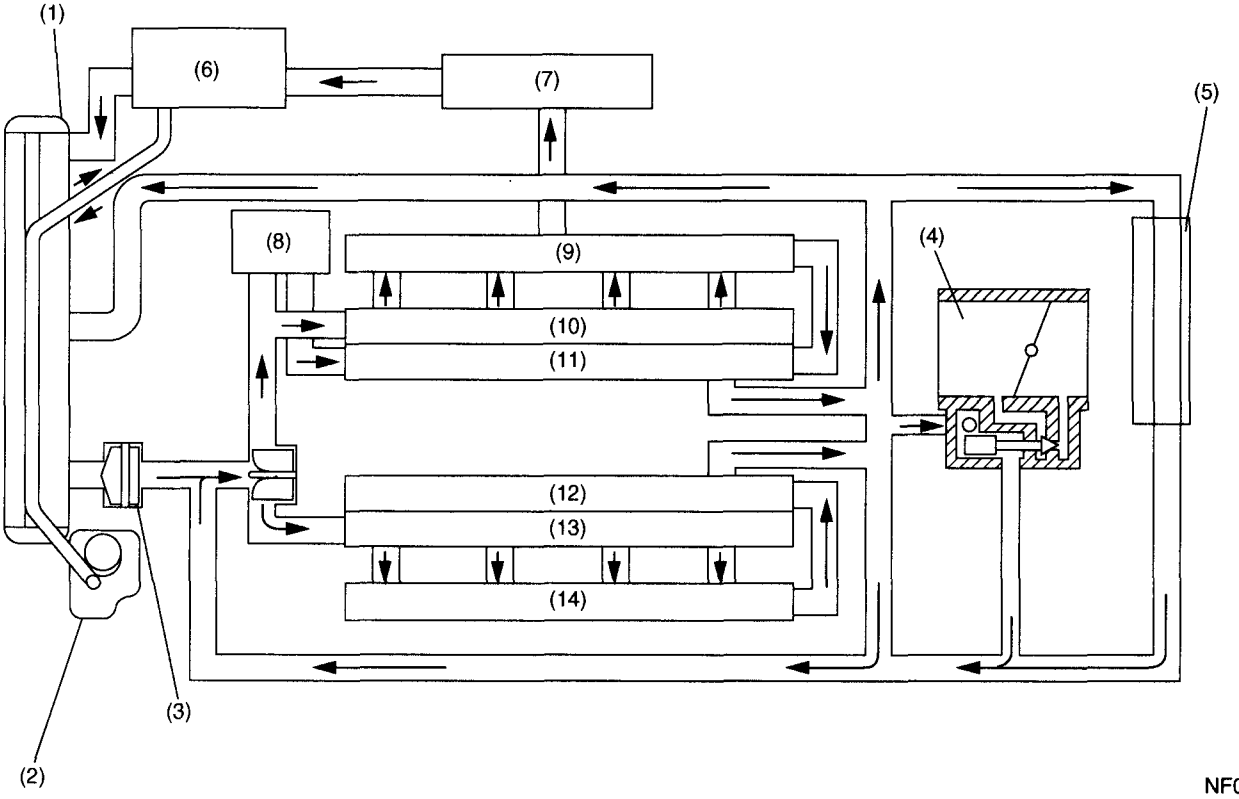
When the engine coolant temperature is below 76°C (169°F), the thermostat remains closed. The coolant flows through the bypass and heater circuits.
This permits the engine to warm up quickly.

- 2nd phase (thermostat open)

When the engine coolant temperature is above 76 – 80°C (169 – 176°F), the thermostat opens. The coolant flows through the radiator where it is cooled.

- 3rd phase (thermostat open and radiator fan operating)

When the engine coolant temperature sensor sends a signal indicating a temperature above 95°C (203°F) to the ECM, it causes the radiator fan (or fans) to operate.
When the engine is stopped after high-speed operation, vapor produced in the turbocharger cooling section flows from the coolant filler tank to the reservoir tank where it condenses back into water.
Water is then absorbed by the coolant filler tank as the engine cools down.



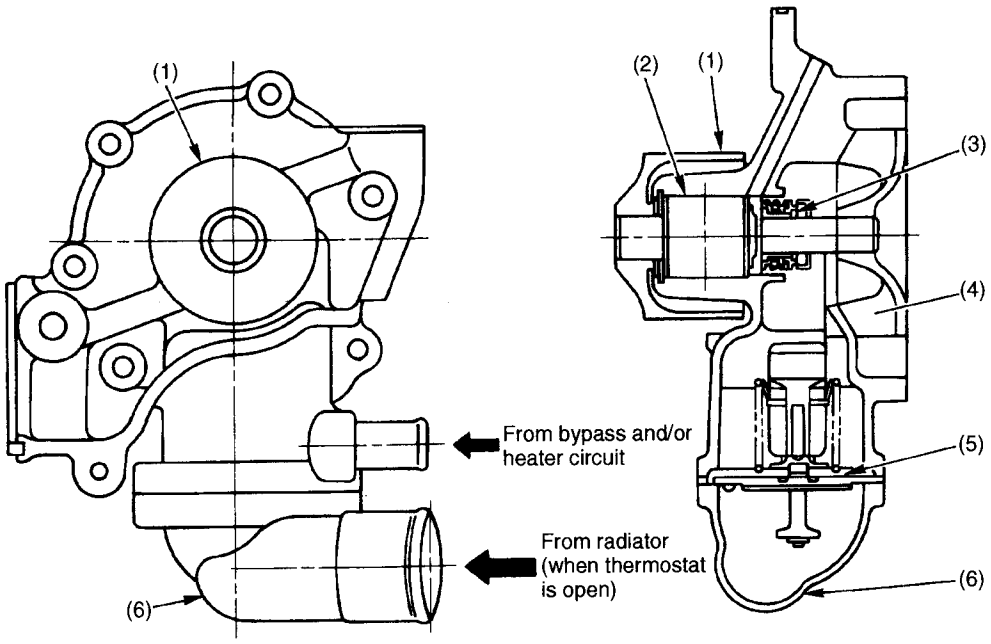
NF0483

(1) Radiator
(2) Engine coolant reservoir tank
(3) Thermostat
(4) Throttle body
(5) Heater core
(6) Coolant filler tank
(7) Turbocharger
(8) Oil cooler
(9) Cylinder head RH
(10) Cylinder jacket RH
(11) Cylinder block RH
(12) Cylinder block LH
(13) Cylinder jacket LH
(14) Cylinder head LH

3. Water Pump

The water pump is located in the front portion of the left bank cylinder block and is driven by the engine through the timing belt. The thermostat is fitted into the coolant inlet at the bottom of the water pump. When the pump's impeller rotates, the coolant is drawn into the pump from the lower pipe (which is connected to the radiator hose) via the thermostat. It then flows along the perimeter of the impeller and then is discharged for circulation through a circuit depending on the coolant temperature.

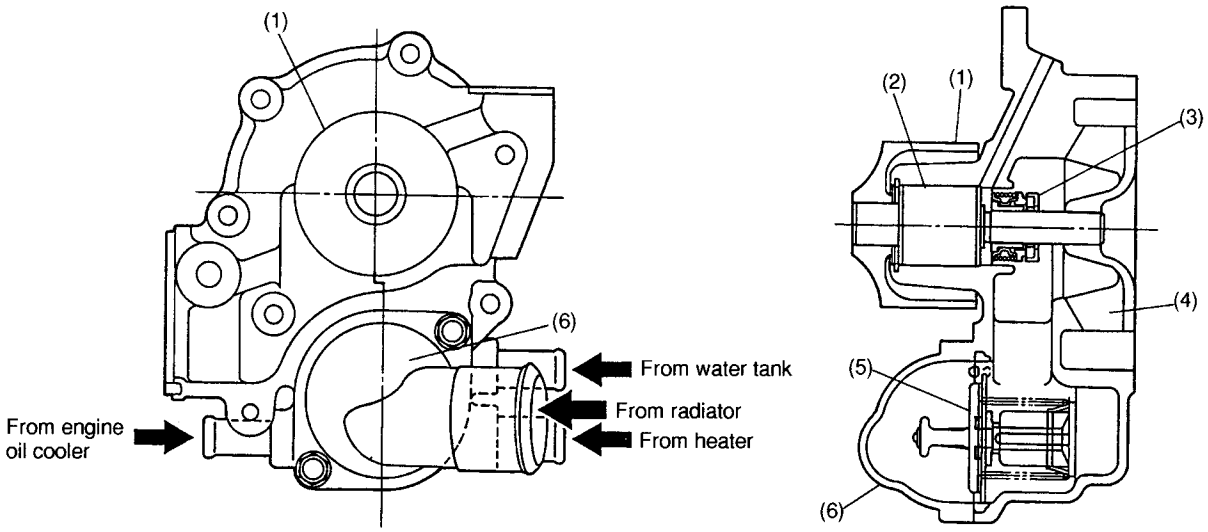
A: NON-TURBO MODEL



NF0050

(1) Pulley
(2) Ball bearing
(3) Mechanical seal
(4) Impeller
(5) Thermostat
(6) Thermostat case

B: TURBO MODEL

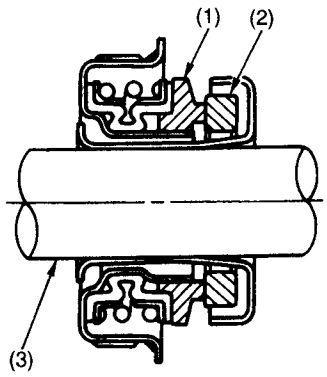


NF0051

(1) Pulley
(2) Ball bearing
(3) Mechanical seal
(4) Impeller
(5) Thermostat
(6) Thermostat case

4. Mechanical Seal

The mechanical seal has its seat tightly fitted on the water pump shaft. Since it is a hermetic seal forming an integral part of the water pump, the water pump cannot be disassembled.

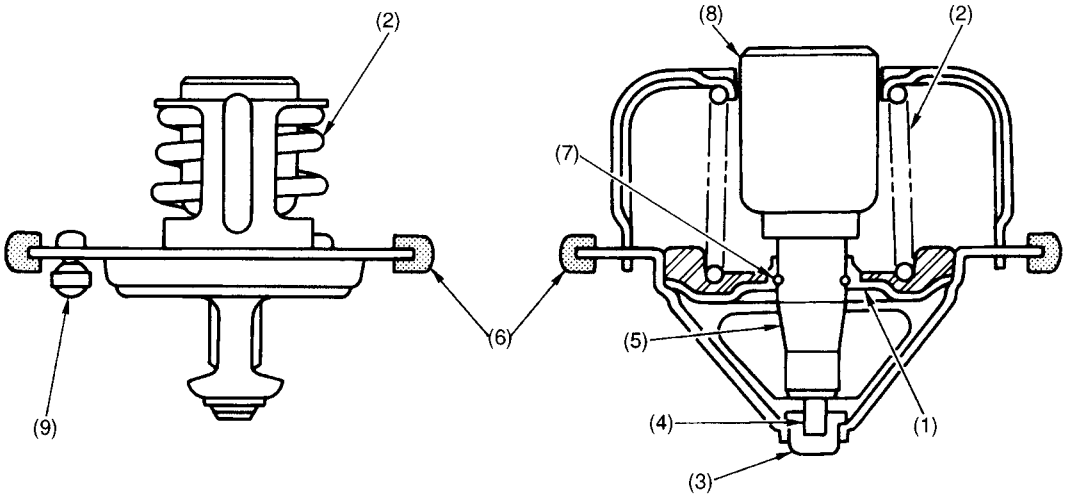


NF0052

(1) Carbon seal
(2) Ceramics seat
(3) Water pump shaft

5. Thermostat

The thermostat has a totally-enclosed wax pellet which expands as the coolant temperature increases. It opens and closes accurately at the preset temperatures and features high durability.



NF0053

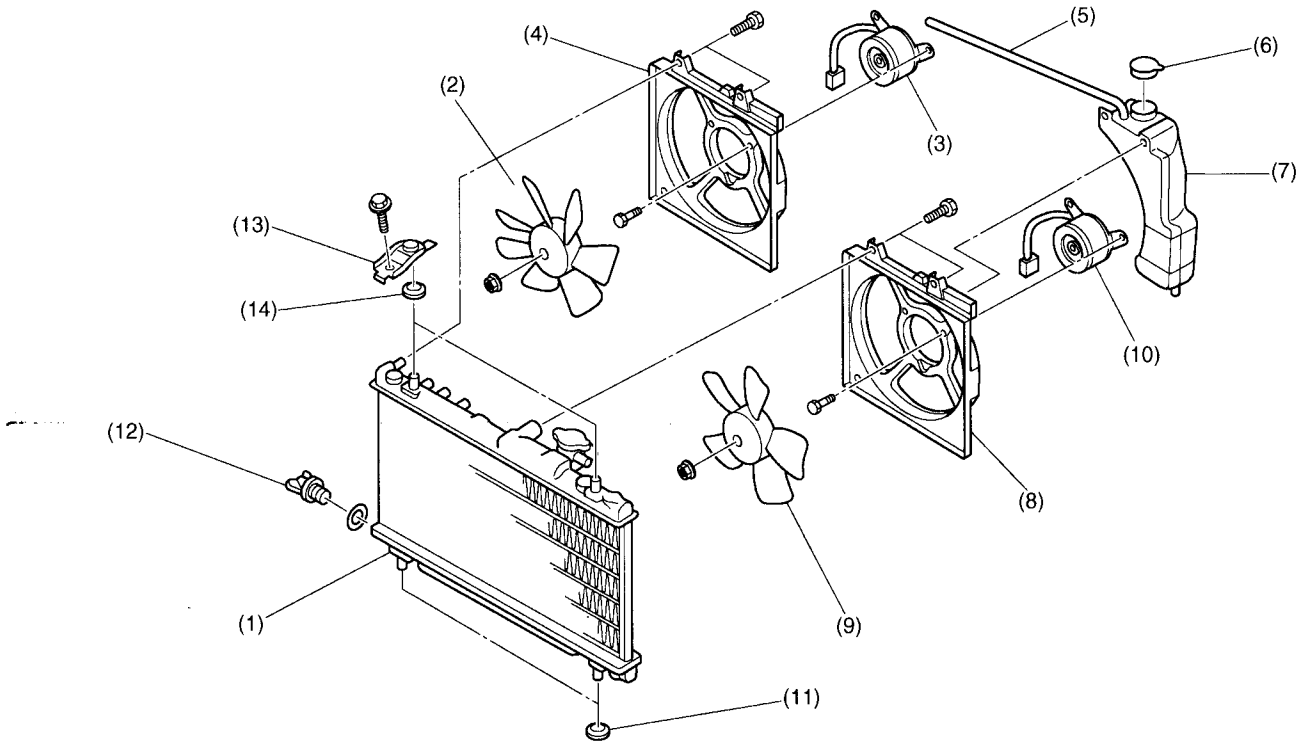
(1) Valve
(2) Spring
(3) Stopper
(4) Piston
(5) Guide
(6) Rubber packing
(7) Stop ring
(8) Wax element
(9) Jiggle valve

6. Radiator Fan

A: DESCRIPTION

Each radiator fan is made of plastic. It is driven by an electric motor which is retained on a shroud.

1. NON-TURBO MODEL

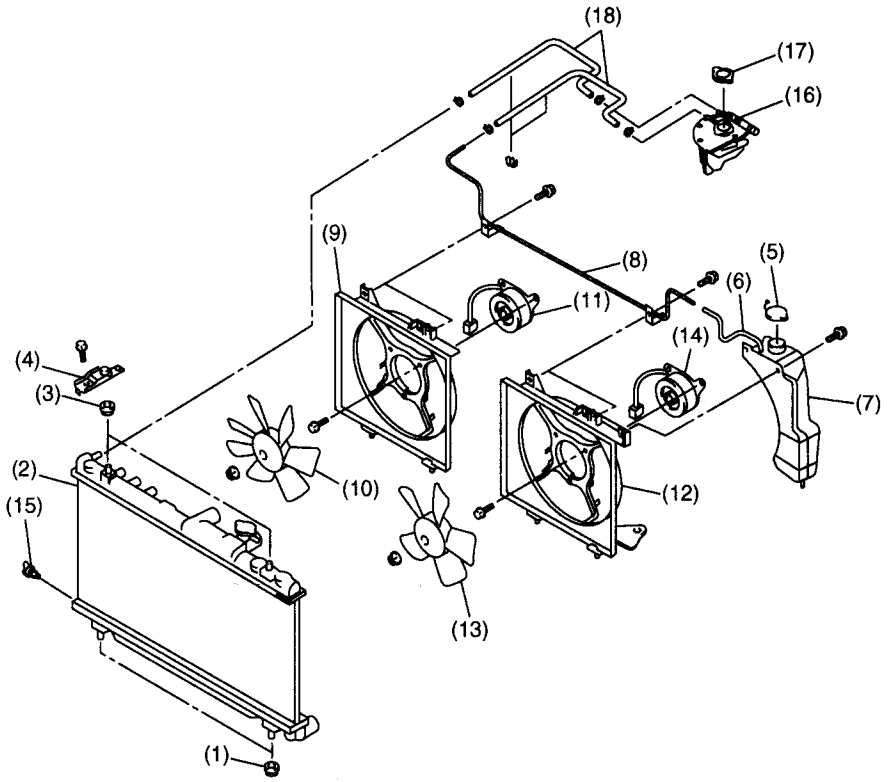


NF0054

(1) Radiator
(2) Radiator sub fan (model with A/C)
(3) Radiator sub fan motor (model with A/C)
(4) Radiator sub fan shroud (model with A/C)
(5) Overflow hose
(6) Engine coolant reservoir tank cap
(7) Engine coolant reservoir tank
(8) Radiator main fan shroud
(9) Radiator main fan
(10) Radiator main fan motor
(11) Lower cushion
(12) Radiator drain plug
(13) Upper bracket
(14) Upper cushion

A/C : Air conditioning system

2. TURBO MODEL



NF0437

(1) Radiator lower cushion
(2) Radiator
(3) Radiator upper cushion
(4) Radiator upper bracket
(5) Engine coolant reservoir tank cap
(6) Overflow hose
(7) Engine coolant reservoir tank
(8) Overflow pipe
(9) Sub fan shroud
(10) Radiator sub fan
(11) Radiator sub fan motor
(12) Main fan shroud
(13) Radiator main fan
(14) Radiator main fan motor
(15) Radiator drain plug
(16) Engine coolant filler tank
(17) Engine coolant filler tank cap
(18) Engine coolant hose

B: FUNCTION

1. MODELS WITHOUT A/C

The ON-OFF control of the radiator fan is performed by the ECM which receives signals from the engine coolant temperature and vehicle speed sensors.

Vehicle speed	Engine coolant temperature		
	Lower than 95°C (203°F)	Between 95 and 99°C (203 and 210°F)	Higher than 100°C (212°F)
	Operation of radiator fan	Operation of radiator fan	Operation of radiator fan
Lower than 19 km/h (12 MPH)	OFF	ON	ON
Between 20 and 69 km/h (12 and 43 MPH)	OFF	ON	ON
Between 70 and 89 km/h (43 and 55 MPH)	OFF	OFF	ON
Higher than 90 km/h (56 MPH)	OFF	OFF	ON

2. MODELS WITH A/C

On models equipped with an air conditioning system, the ECM receives signals from the engine coolant temperature sensor, vehicle speed sensor and A/C switch. According to these signals, the ECM turns ON or OFF the radiator main fan and sub fan simultaneously (and also selects the Hi or Low fan speed in turbo model).

• Non-turbo model

Vehicle speed	A/C compressor	Engine coolant temperature					
		Lower than 95°C (203°F)		Between 95 and 99°C (203 and 210°F)		Higher than 100°C (212°F)	
		Operation of radiator fans		Operation of radiator fans		Operation of radiator fans	
		Main fan	sub fan	Main fan	sub fan	Main fan	sub fan
Lower than 19 km/h (12 MPH)	OFF	OFF	OFF	ON	OFF	ON	ON
	ON	ON	ON	ON	ON	ON	ON
Between 20 and 69 km/h (12 and 43 MPH)	OFF	OFF	OFF	ON	OFF	ON	ON
	ON	ON	ON	ON	ON	ON	ON
Between 70 and 89 km/h (43 and 55 MPH)	OFF	OFF	OFF	OFF	OFF	ON	ON
	ON	ON	OFF	ON	ON	ON	ON
Higher than 90 km/h (56 MPH)	OFF	OFF	OFF	OFF	OFF	ON	ON
	ON	OFF	OFF	ON	OFF	ON	ON

• Turbo model

Vehicle speed	A/C compressor	Engine coolant temperature					
		Lower than 90°C (194°F)		Between 90 and 95°C (194 and 203°F)		Higher than 96°C (205°F)	
		Operation of radiator fans		Operation of radiator fans		Operation of radiator fans	
		Main fan	sub fan	Main fan	sub fan	Main fan	sub fan
Lower than 19 km/h (12 MPH)	OFF	OFF	OFF	OFF	OFF	Low-speed	Low-speed
	ON	Low-speed*1	Low-speed*1	Hi-speed	Hi-speed	Hi-speed	Hi-speed
		High-speed*2	High-speed*2				
Between 20 and 69 km/h (12 and 43 MPH)	OFF	OFF	OFF	OFF	OFF	Hi-speed	Hi-speed
	ON	Hi-speed	Hi-speed	Hi-speed	Hi-speed	Hi-speed	Hi-speed
Between 70 and 105 km/h (43 and 65 MPH)	OFF	OFF	OFF	OFF	OFF	Hi-speed	Hi-speed
	ON	Low-speed	Low-speed	Low-speed	Low-speed	Hi-speed	Hi-speed
Higher than 106 km/h (66 MPH)	OFF	OFF	OFF	OFF	OFF	Hi-speed	Hi-speed
	ON	OFF	OFF	Low-speed	OFF	Hi-speed	Hi-speed

*1: When the intake air temperature is 76°C (169°F).
*2: When the intake air temperature is 78°C (172°F) or higher, the radiator fans perform "Hi-speed" operation for 10 minutes.

LUBRICATION LU

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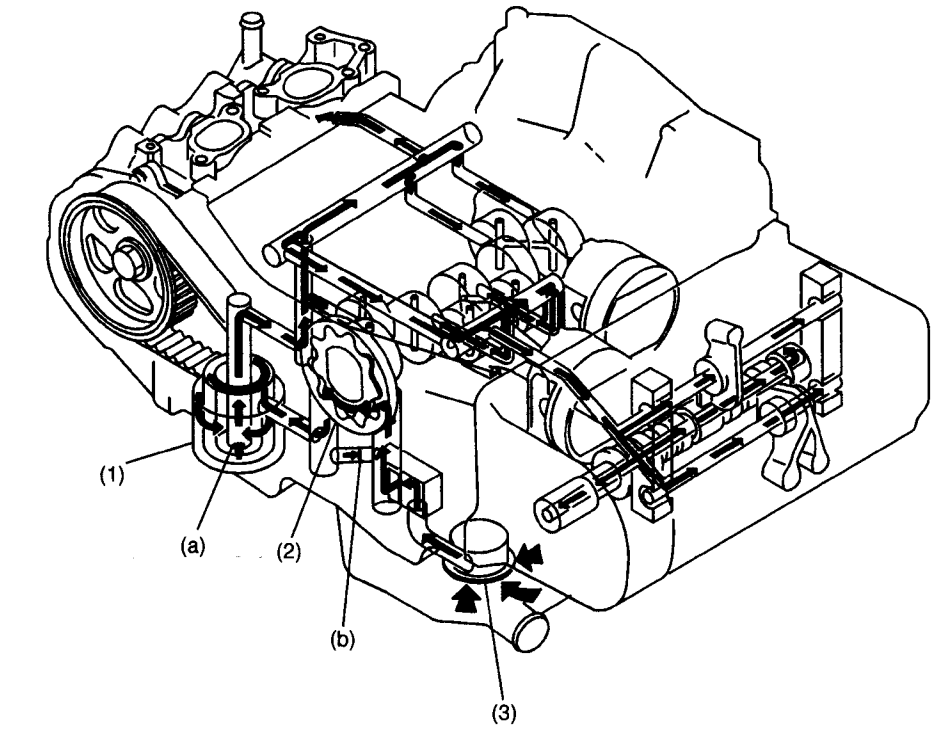
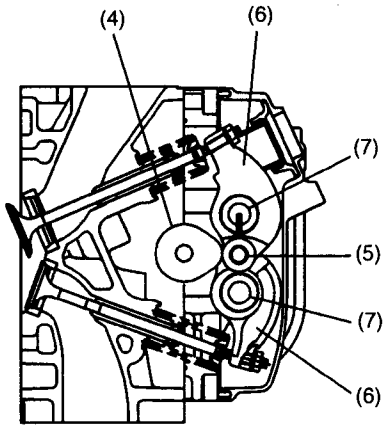
4.	Oil Filter	8
5.	Oil Pan and Oil Strainer	9
6.	Oil Pressure Switch	11
7.	Oil Cooler (Turbo Model Only)	12

1. General

- The lubrication system force-circulates engine oil throughout the engine using an oil pump. The oil pressure is regulated by the relief valve built into the oil pump.
- The oil pump is a thin, large-diameter trochoid rotor type which can accommodate the engine's high output. The pump is directly driven by the crankshaft.
- The engine oil is cleaned by a full-flow, paper element type oil filter. The filter has a bypass valve which allows the engine oil to flow bypassing the filter if it is clogged.
- The inside of the oil pan is fitted with a baffle plate which reduces changes in the oil level due to movement of the vehicle, thus ensuring uninterrupted suction of oil.
- The engine oil discharged from the oil pump is delivered to the journal bearings, connecting rod bearings, and other parts requiring lubrication and cooling via the vertical passage in the right bank of the cylinder block, the oil filter, and the oil galleries in the right and left banks of the cylinder block.
- The engine oil is also distributed to each cylinder head valve mechanism at a proper flow rate achieved by metering by the orifice provided in each oil gallery.
- A water-cooled oil cooler is located between the oil filter and cylinder block to keep the engine oil in an optimum temperature range and prevent degradation of lubrication performance (Turbo model).

A: NON-TURBO MODEL



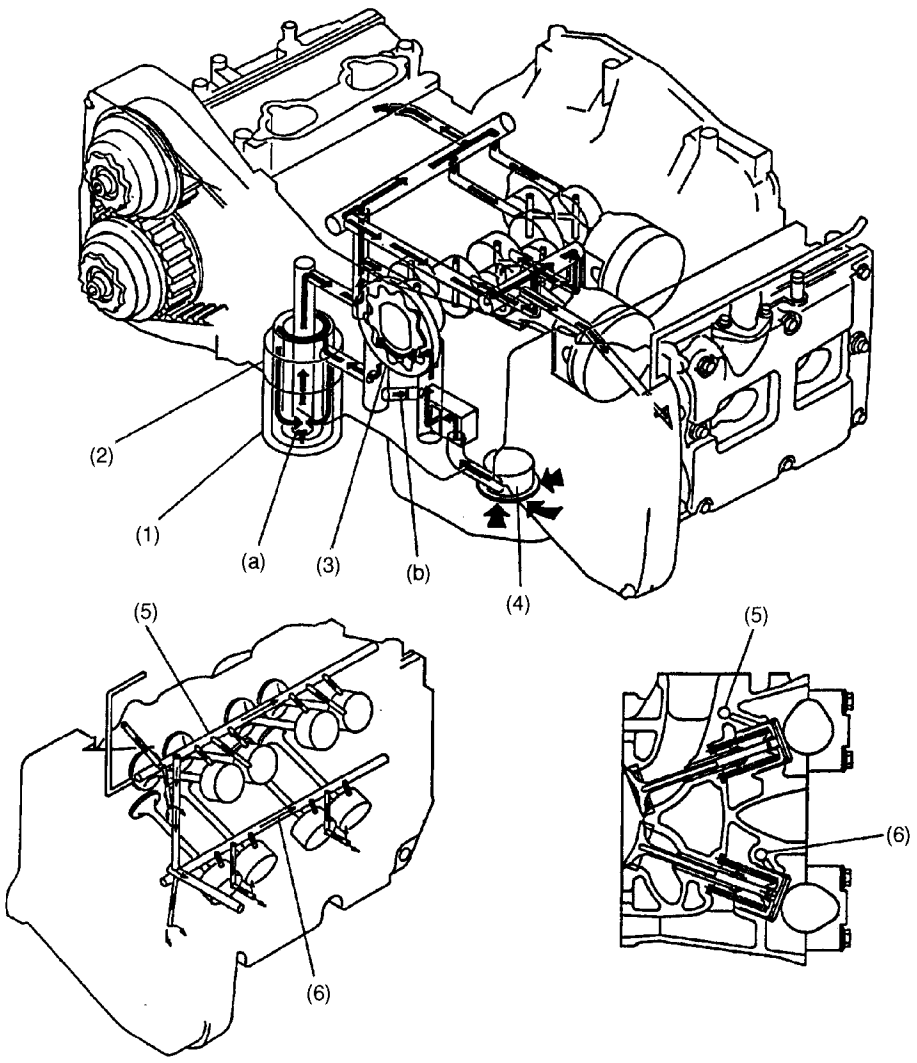


NF0057

(1) Oil filter
(2) Oil pump
(3) Oil strainer
(4) Camshaft
(5) Roller
(6) Rocker arm
(7) Rocker shaft

(a) Bypass valve opening pressure: 157 kPa (1.6 kgf/cm^2, 23 psi)
(b) Relief valve opening pressure: 490 kPa (5.0 kgf/cm^2, 71 psi)

B: TURBO MODEL

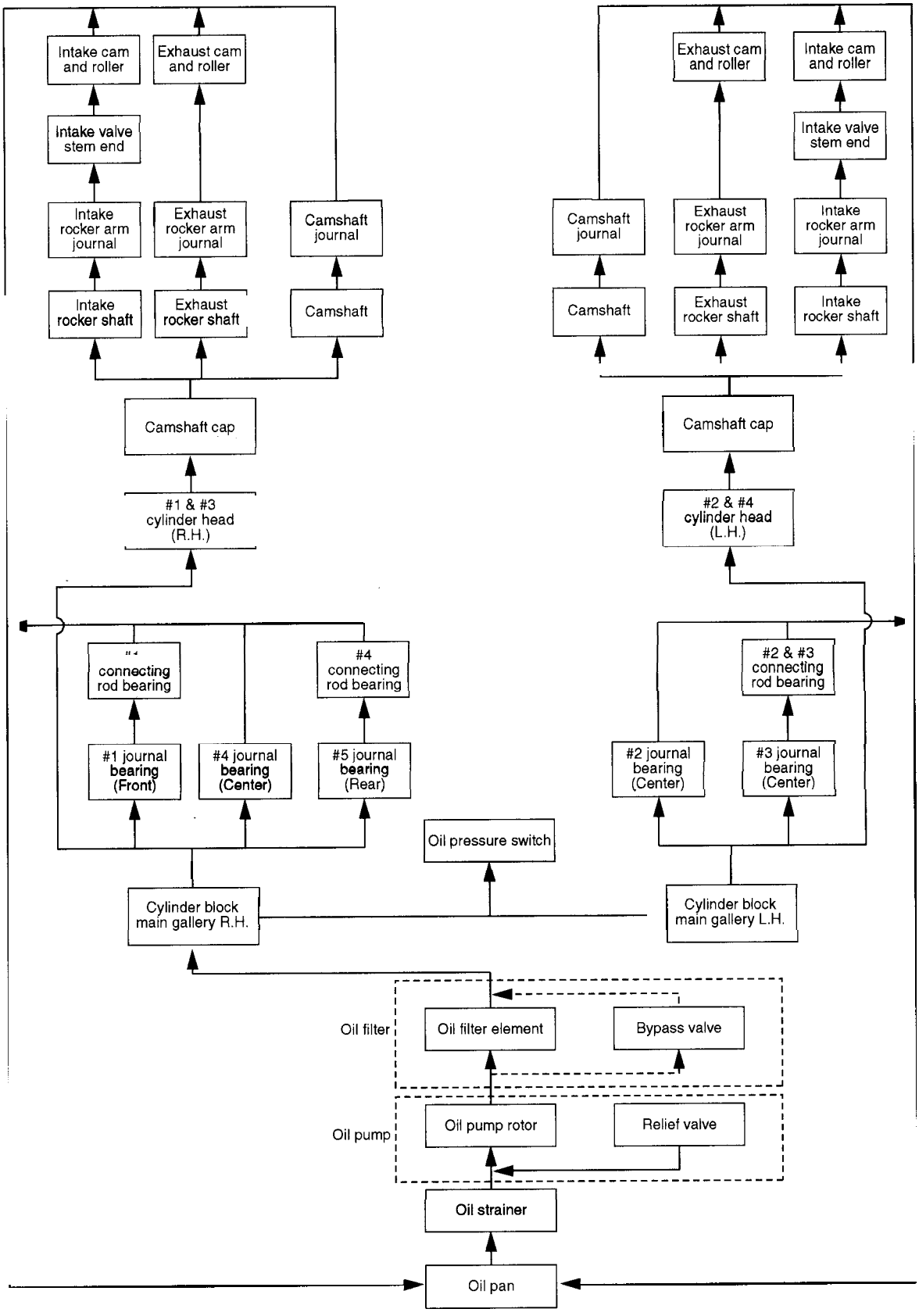


NF0058

(1) Oil filter
(2) Oil cooler
(3) Oil pump
(4) Oil strainer
(5) Intake gallery
(6) Exhaust gallery
(a) Bypass valve opening pressure: 157 kPa (1.6 kgf/cm^2, 23 psi)
(b) Relief valve opening pressure: 588 kPa (6.0 kgf/cm^2, 85 psi)

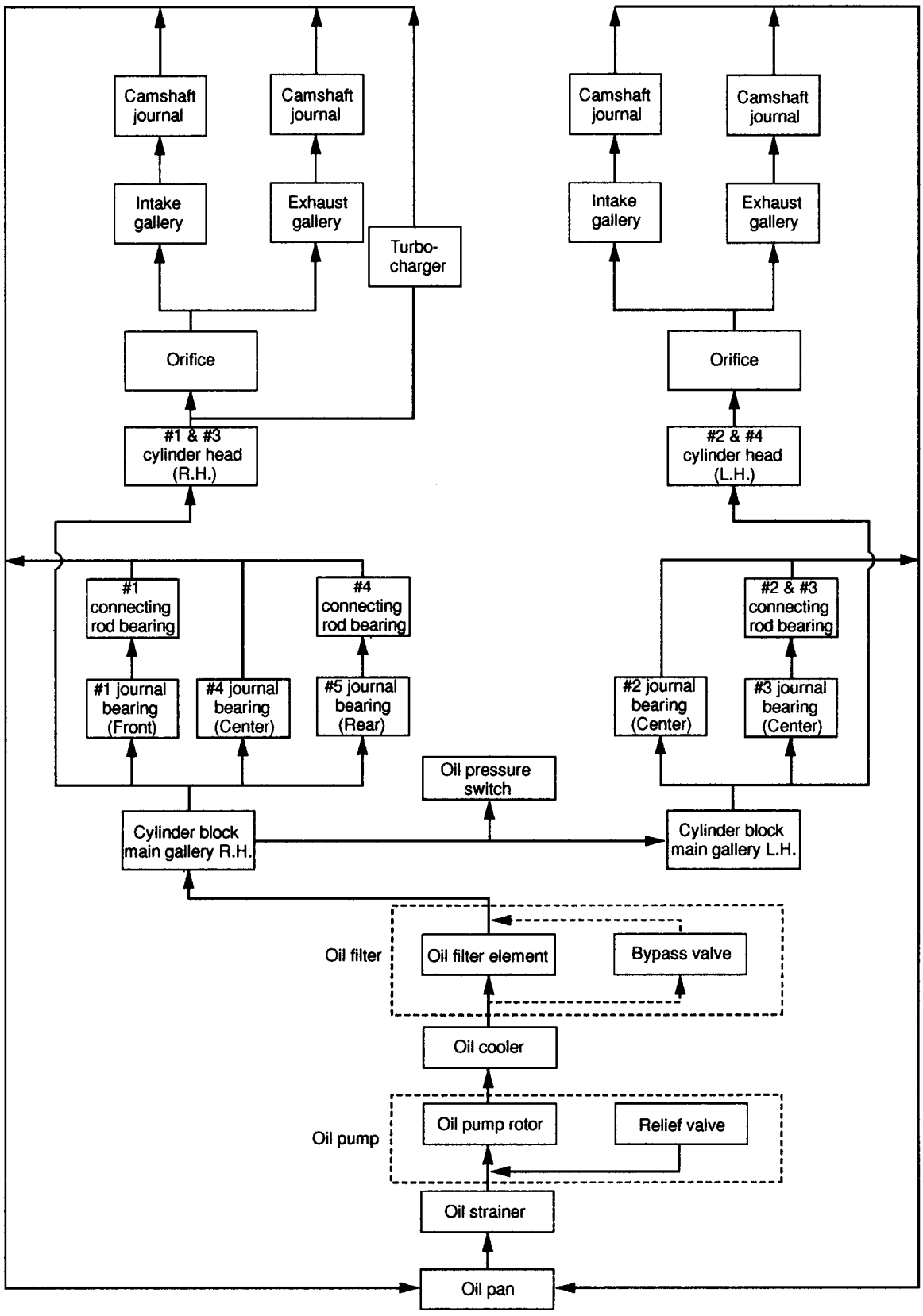
2. Engine Oil Flow

A: NON-TURBO MODEL



NF0059

B: TURBO MODEL

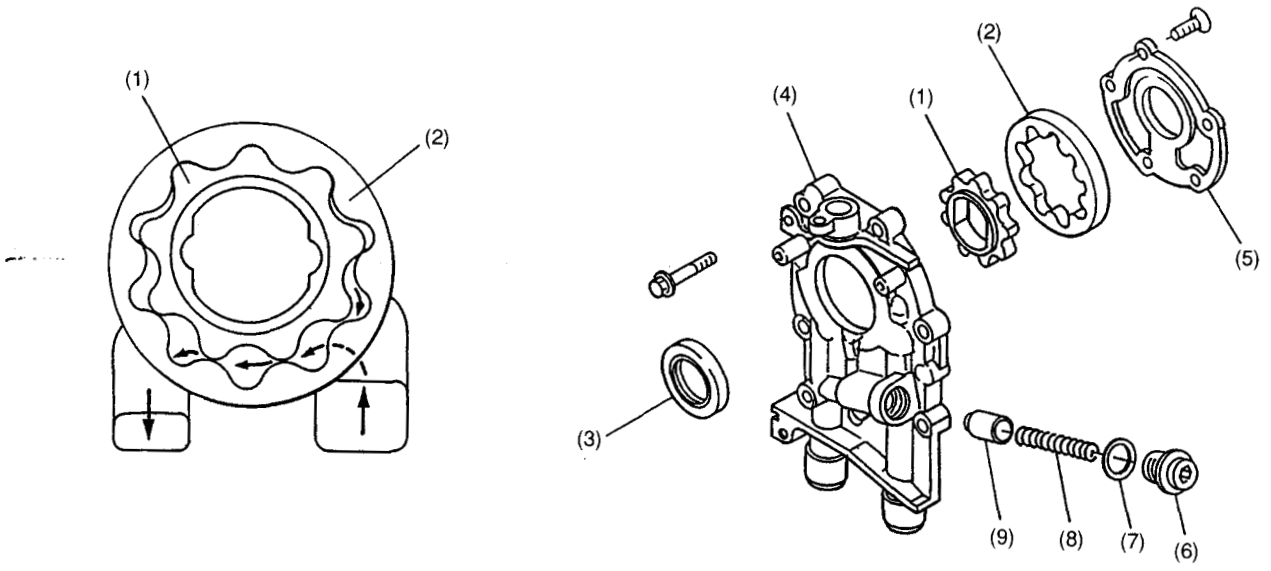


NF0060

3. Oil Pump

• The oil pump is a trochoid rotor type consisting of an inner rotor and outer rotor assembled with each other in a pump body. When the inner rotor is driven by the crankshaft, the outer rotor is rotated, changing the space between it and the inner rotor. The change in the space occurs because of the difference in the number of teeth between the rotors.

• Engine oil is drawn into the large space created near the inlet of the pump. It is then carried to the discharge port. As the pump rotates, the space carrying the oil becomes smaller, thus the oil is pressurized and discharged from the outlet port. Oil pressure is regulated by the relief valve built into the pump. Excess oil is directly returned to the inlet port.

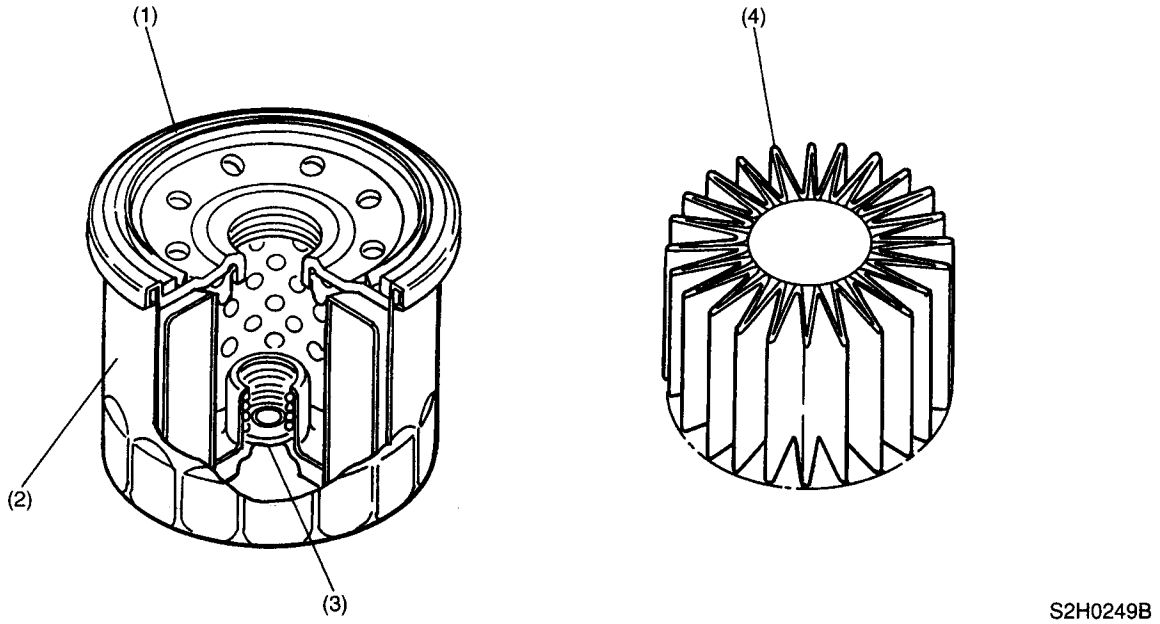


NF0061

(1) Inner rotor
(2) Outer rotor
(3) Oil seal
(4) Oil pump case
(5) Oil pump cover
(6) Plug
(7) Gasket
(8) Relief valve spring
(9) Relief valve

4. Oil Filter

The oil filter is a full-flow filtering, cartridge type that utilizes a paper element. It also has a built-in bypass valve. The filter element has a special pleat design to increase the effective filtering area.



S2H0249B

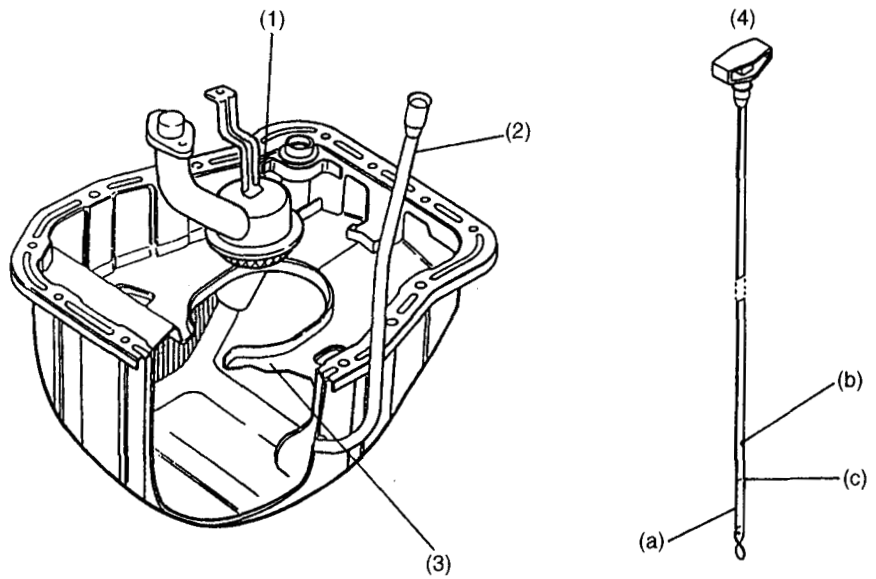
(1) Oil seal
(2) Filter body
(3) Bypass valve
(4) Pleated element

5. Oil Pan and Oil Strainer

• The oil pan is attached to the cylinder block using liquid gasket for sealing. The oil strainer is a metal net type and removes large foreign particles from the engine oil. It is located in the middle of the oil pan. The pipe from the strainer is connected to the suction port of the oil pump in the left bank of the cylinder block.

• There is a baffle plate in the oil pan, near the bottom of the cylinder block. It stabilizes the oil level and reinforces the oil pan.

A: NON-TURBO MODEL

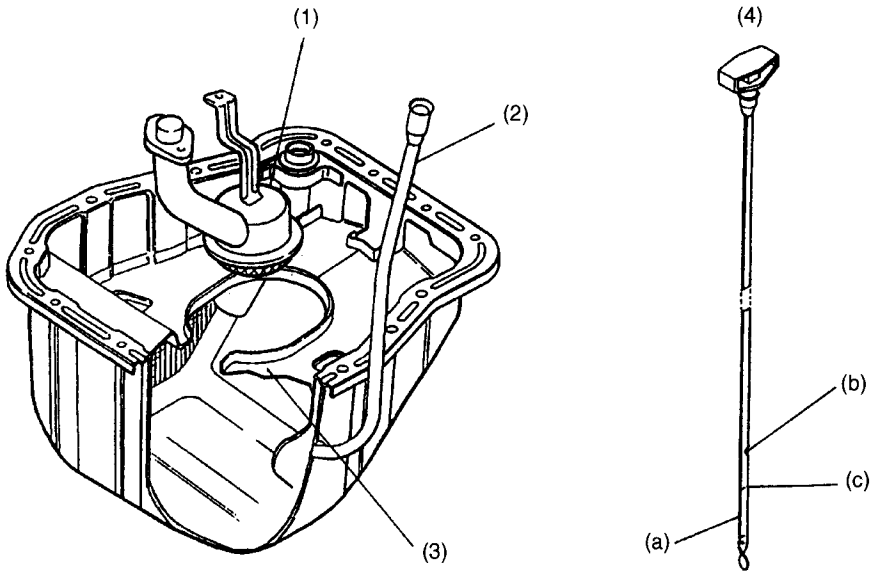


S2H0852B

(1) Oil strainer
(2) Level gauge guide
(3) Baffle plate
(4) Oil level gauge

(a) LOW level
(b) FULL level (Engine HOT condition)
(c) FULL level (Engine COLD condition)

B: TURBO MODEL



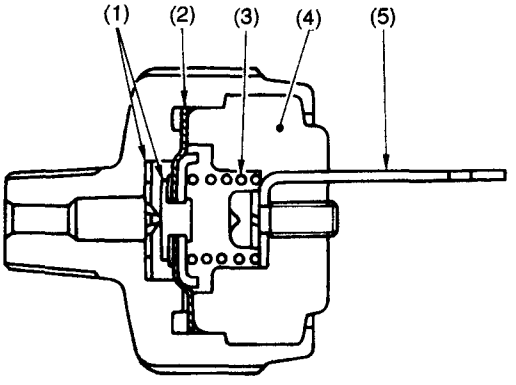
NF0468

(1) Oil strainer
(2) Level gauge guide
(3) Baffle plate
(4) Oil level gauge

(a) LOW level
(b) FULL level (Engine HOT condition)
(c) FULL level (Engine COLD condition)

6. Oil Pressure Switch

The oil pressure switch is located in the front upper portion of the right cylinder block bank. The purpose of this switch is to monitor the operation of the oil pump as well as the lubricating oil pressure when the engine is running.



NF0065

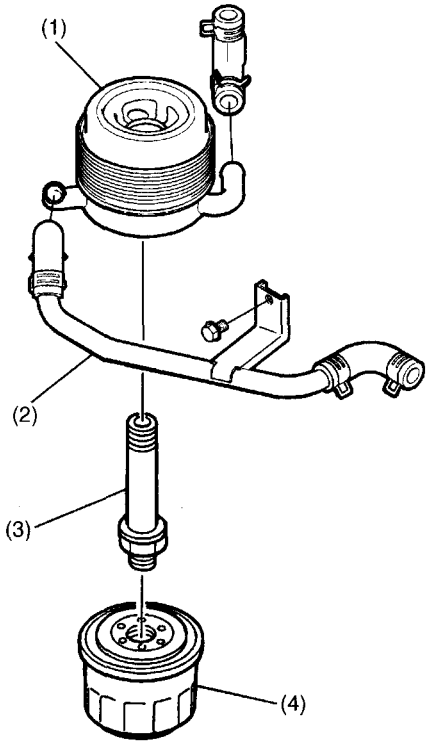
(1) Contact point
(2) Diaphragm
(3) Spring
(4) Molded portion
(5) Terminal

1) When oil pressure does not build up (immediately after ignition switch is turned ON):
The diaphragm is pushed toward the cylinder block by the spring force (a force equivalent to the specified oil pressure). This closes the contact points, causing the oil pressure warning light in the combination meter to illuminate.

2) When oil pressure reaches the specified value (after engine starts):
After reaching the specified value of 14.7 kPa (0.15 kgf/cm^2, 2.1 psi), the oil pressure pushes the diaphragm overcoming the spring force. This opens the contact points and the oil pressure warning light goes out.

7. Oil Cooler (Turbo Model Only)

The oil cooler used in models is of a water cooled type. It serves to maintain engine oil in proper temperature range and so prevent degradation of lubricating oil performance.



NF0360

(1) Oil cooler
(2) Water pipe
(3) Connector
(4) Oil filter

SPEED CONTROL SYSTEM SP

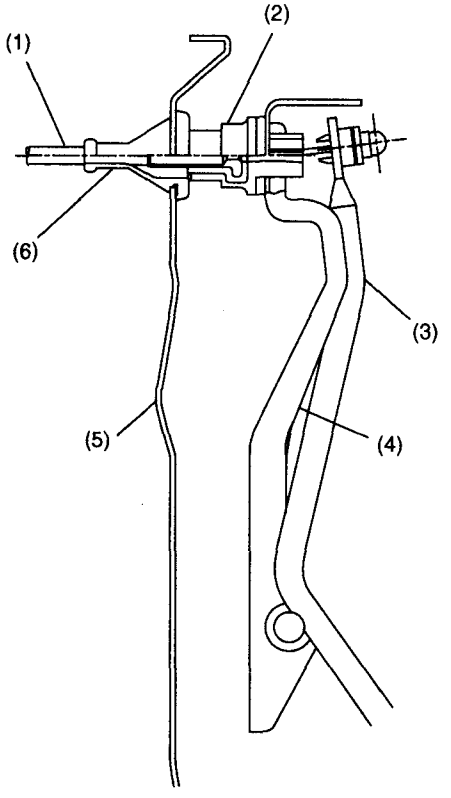
Page

1. General 2

1. General

The accelerator outer cable is secured to the accelerator pedal bracket rather than to the toeboard. Securing the outer cable in this way has a merit of making the ratio of throttle valve movement to cable stroke less variable. This arrangement is also effective to prevent unsmooth cable return movement that may result from deformation of the toeboard or improper installation of the accelerator pedal and, therefore, to improve safety.

In addition, the floating type casing cap through which the cable is attached to the bracket reduces vibration of the pedal, thus improving quietness.



NF0438

(1) Accelerator cable
(2) Casing cap (floating type)
(3) Accelerator pedal
(4) Bracket
(5) Toeboard
(6) Grommet

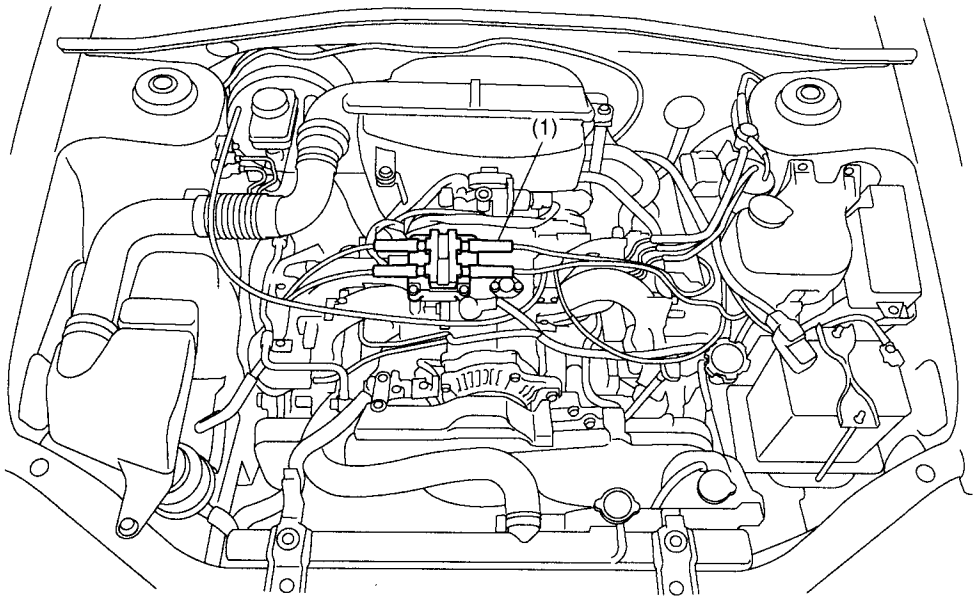
IGNITION IG (SOHC)

		Page
1.	Ignition Coil	2
2.	Spark Plug	4

1. Ignition Coil

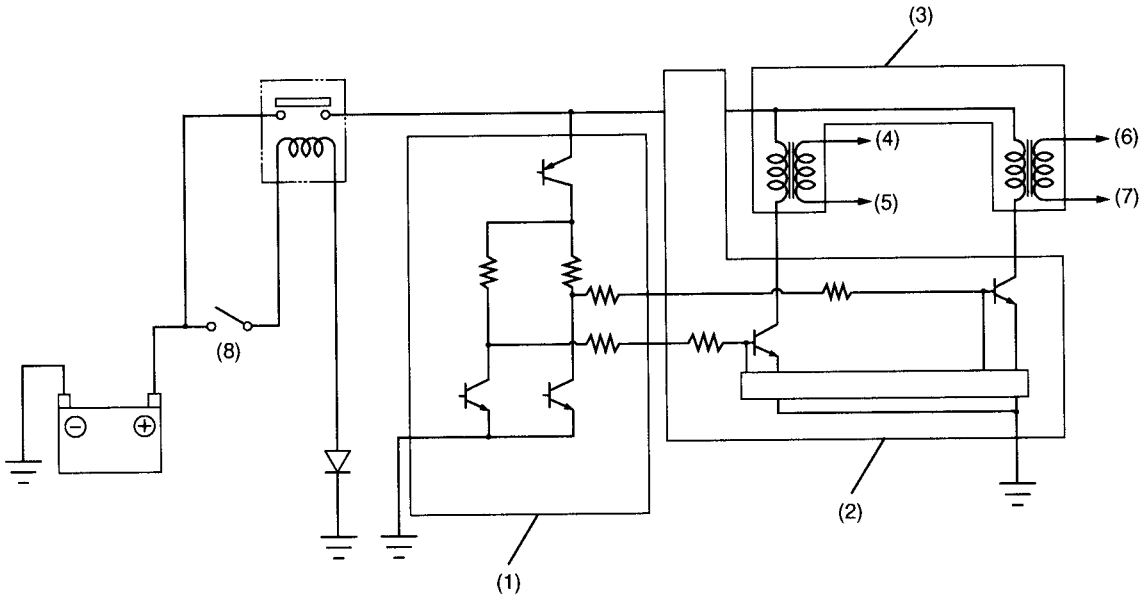
Ignition coils are made integral with an ignitor.

The ignition system is of a dual-ignition-coil design, each coil causing two plugs to generate sparks simultaneously. In response to the signal from the ECM, the ignitor supplies current to an ignition coil and the ignition coil supplies high-voltage current to a pair of spark plugs (#1 and #2 or #3 and #4) simultaneously.



NF0034

(1) Ignition coil and ignitor assembly

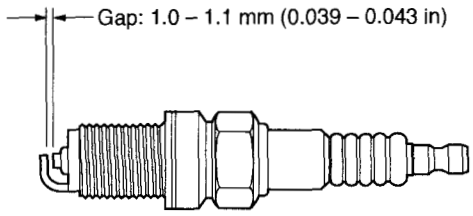


NF0035

(1) ECM
(2) Ignitor
(3) Ignition coil
(4) Spark plug #1
(5) Spark plug #2
(6) Spark plug #3
(7) Spark plug #4
(8) Ignition switch

2. Spark Plug

The spark plug's thread diameter is 14 mm (0.551 in) and the gap is controlled to a value between 1.0 and 1.1 mm (0.039 and 0.043 in).



NF0036

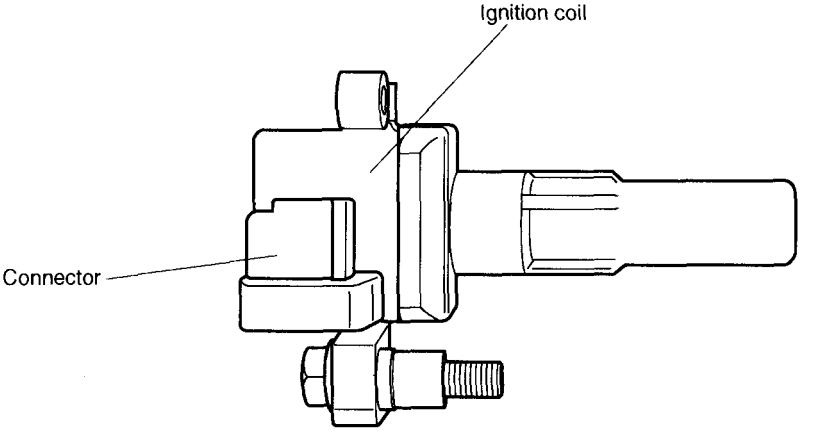
IGNITION IG (DOHC TURBO)

Page

1. Ignition Coil 2
2. Spark Plug 3

1. Ignition Coil

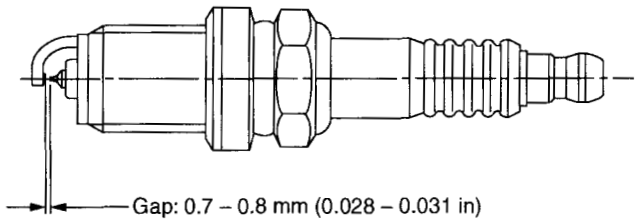
The engine uses a direct ignition system with one ignition coil mounted for each cylinder (or spark plug).
The secondary terminal of the ignition coil is in contact with the spark plug terminal nut.
Since no spark plug cable is used, secondary voltage drop, leaks, or other problems that are inherent in a system using spark plug cables do not occur. The result is high performance and high reliability.



NF0316

2. Spark Plug

The spark plug has a platinum tipped electrode. The thread diameter is 14 mm (0.551 in) and the gap is controlled to a value between 0.7 and 0.8 mm (0.028 and 0.031 in).



NF0317

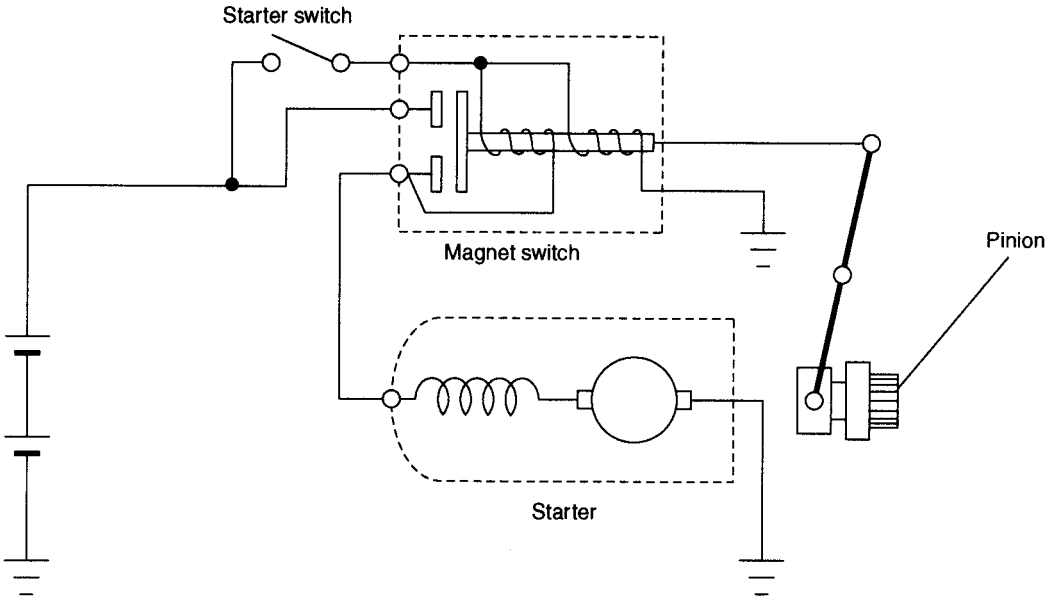
MEMO

STARTING/CHARGING SC

		Page
1.	Starter	2
2.	Generator	3
3.	Battery	4

1. Starter

The starter is of a reduction type. Its output is 1.0 kW on the MT model and 1.4 kW on the AT model.



NF0364

2. Generator

The generator has a built-in regulator which provides diagnostic functions in addition to a voltage regulating function as follows:

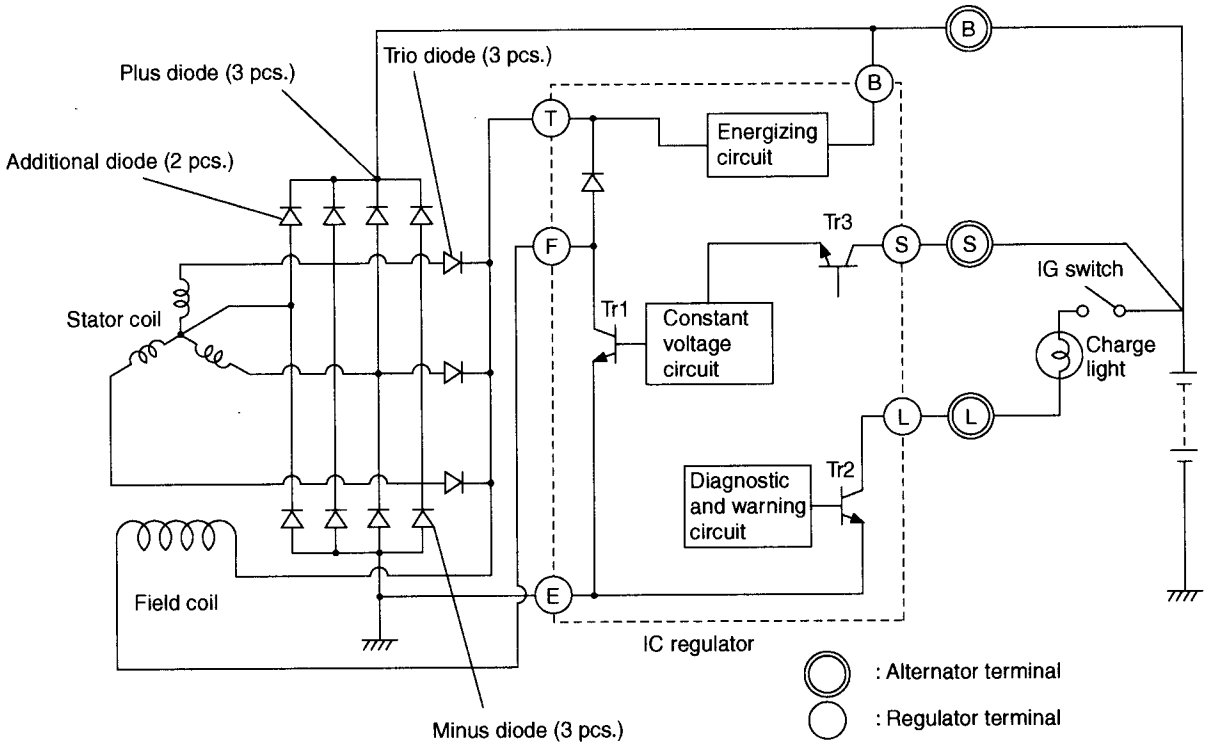
1) Voltage regulation

The on-off operation of transistor Tr_1 connects and disconnects the field current circuit, providing a constant level of output voltage.

2) Diagnosis warning

When any of the following problems occur, the charge lamp illuminates.

a. No voltage generation
   Brush wear exceeds specified wear limits, field coil circuit is broken, etc.
b. Excessive output
   Output voltage is greater than 16 volts (approx).
c. Terminal B disconnection
   Harness is disconnected from alternator terminal B.
d. Terminal S disconnection
   Harness is disconnected from alternator terminal S. In this case, voltage is slightly greater than specified regulated voltage; however, voltage regulation is still controlled and the battery is prevented from becoming overcharged.



NF0365

3. Battery

The battery is located in the left front part of the engine compartment. It is held on a tray by the battery holder.

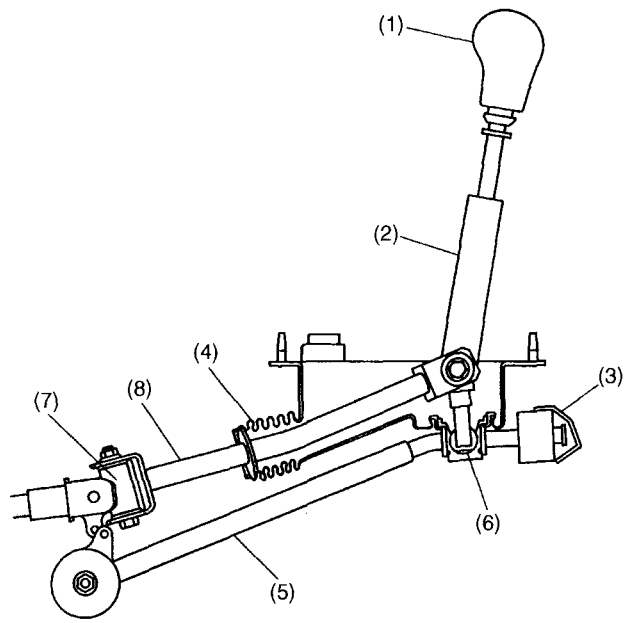
CONTROL SYSTEM CS

Page

1. Gear Shift Lever 2
2. Select Lever 3
3. Sift Lock System 4

1. Gear Shift Lever

The manual transmission's gear shift lever system is a parallel link type whose stay is mounted through a cushion rubber.

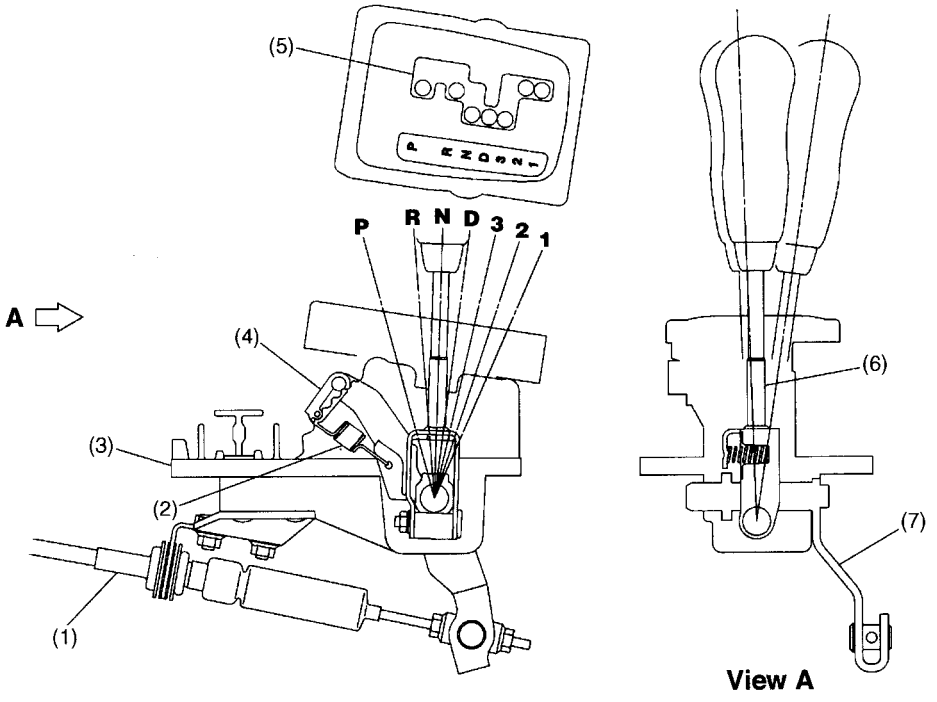


NF0103

(1) Knob
(2) Gear shift lever
(3) Cushion rubber
(4) Boot
(5) Stay
(6) Bush
(7) Joint
(8) Rod

2. Select Lever

- The automatic transmission's select lever moves through seven positions.
- The select lever makes shift direction (longitudinal) movements as well as select direction (lateral) movements. The select lever is guided by a gate to make these movements.
- To transmit movements of the select lever to the transmission, a push-pull cable is used.
- The detent arm is a new addition to the select lever mechanism. It ensures more precise positioning of the select lever.
- A plastic select lever base plate is used.



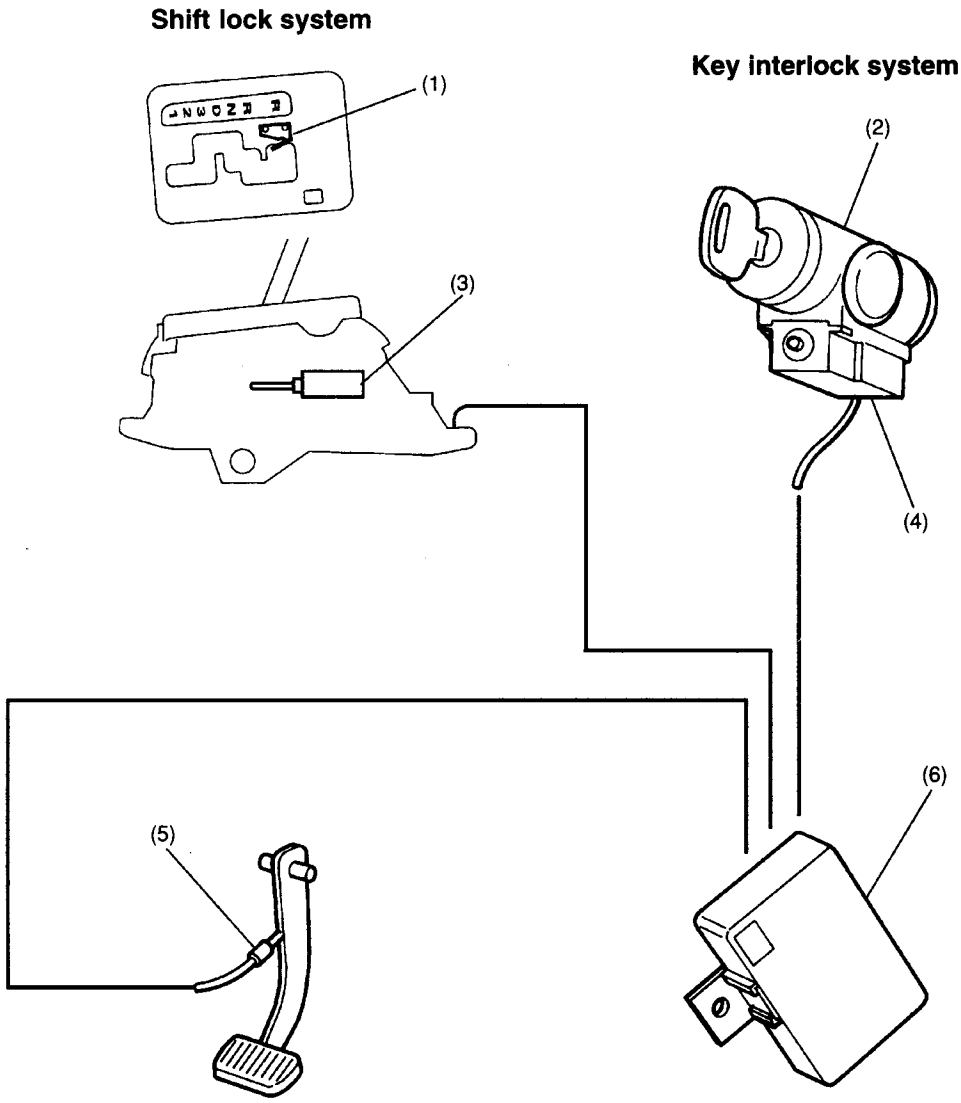
NF0104

(1) Push-pull cable
(2) Detent spring
(3) Base plate
(4) Detent arm
(5) Gate
(6) Select lever
(7) Arm

3. Shift Lock System

A: GENERAL

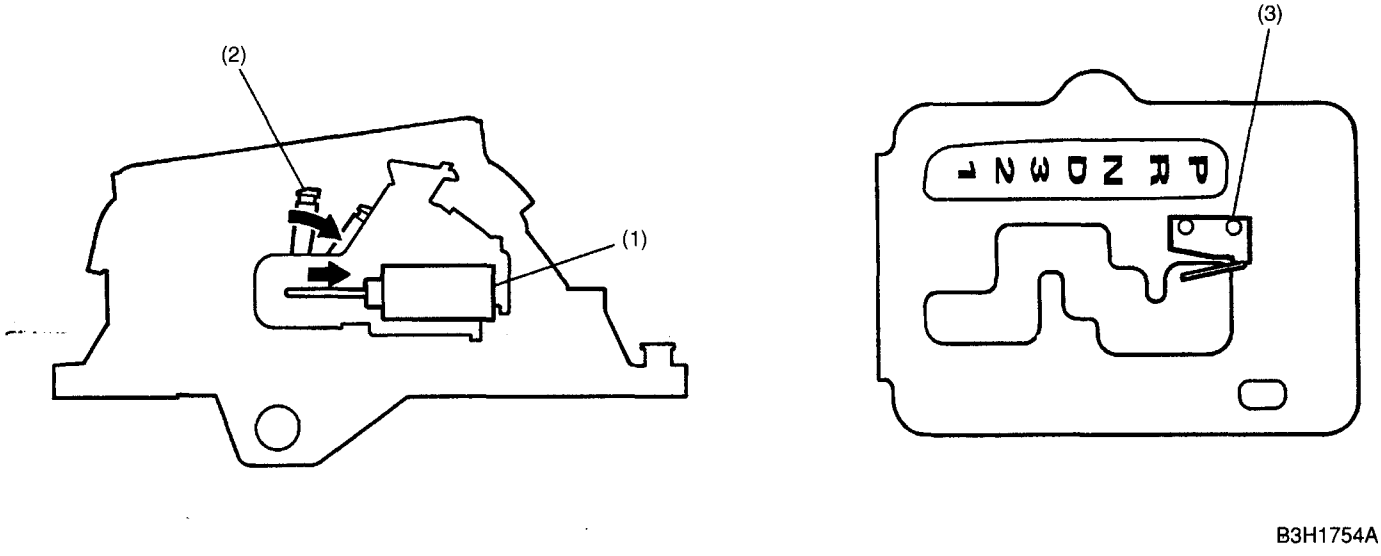
To increase safety during standing start, the shift lock system prevents movement of the select lever from the "P" position to any other position unless the brake pedal is depressed. This system is also provided with a key interlock function which prevents removal of the ignition key from the key cylinder unless the selector lever is placed in the "P" position.



(1) "P" position switch
(2) Key cylinder
(3) Shift lock solenoid
(4) Key lock solenoid
(5) Brake pedal switch
(6) Integrated module

B: SHIFT LOCK SYSTEM OPERATION

The shift lock system has a solenoid-operated plunger (1). With the select lever in the "P" position, the plunger remains extended, holding the lock arm (2) in its raised (locking) position. When the brake pedal is depressed with the ignition switch in either the ON or START position, the solenoid is energized and the plunger is retracted. This causes the lock arm to tilt forward to the select lever release position. The select lever now can be moved to any other position.
The "P" position of the select lever is detected by the "P" position switch (3).

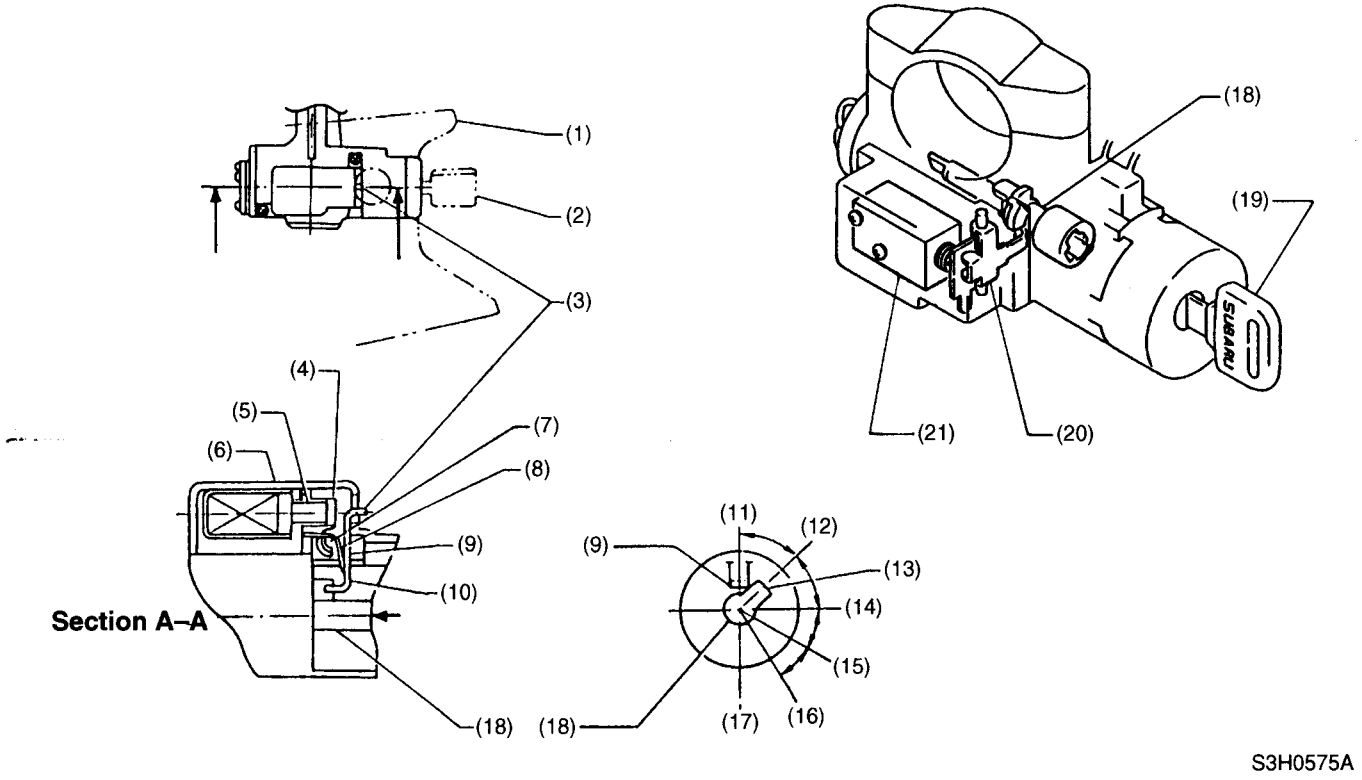


B3H1754A

(1) Solenoid
(2) Lock arm
(3) "P" position switch

C: KEY INTERLOCK FUNCTION

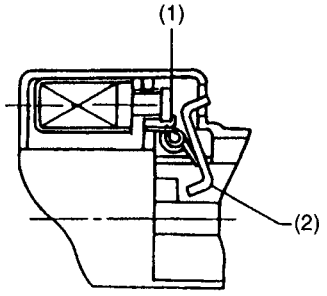
• When the select lever is at any position other than "P", the solenoid is energized and its pin is held extended. Being caused to stay in its upright position by extension of the pin, the interlock lever interferes with the stopper portion of the rotator which turns together with the ignition key. Thus, the ignition key cannot be rotated to the "LOCK" position.



S3H0575A

(1) Column cover
(2) Key
(3) Push button
(4) Extended
(5) Solenoid pin
(6) Solenoid unit
(7) Lever fulcrum
(8) Lever spring
(9) Interlock lever
(10) Interlock activated
(11) LOCK
(12) Interlock position
(13) Stopper
(14) ACC
(15) ON
(16) START
(17) View B
(18) Rotator
(19) Key
(20) Interlock lever
(21) Solenoid

• When the select lever is moved to "P", the "P" position switch in the select lever assembly operates, deenergizing the solenoid. As the push force of the solenoid pin is removed, the lever spring causes the interlock lever to tilt and become clear of the rotator's stopper. Then the key can be rotated to the "LOCK" position and removed from the ignition switch.



S3H0576A

(1) Retracted
(2) Interlock deactivated

MEMO

AUTOMATIC TRANSMISSION AT

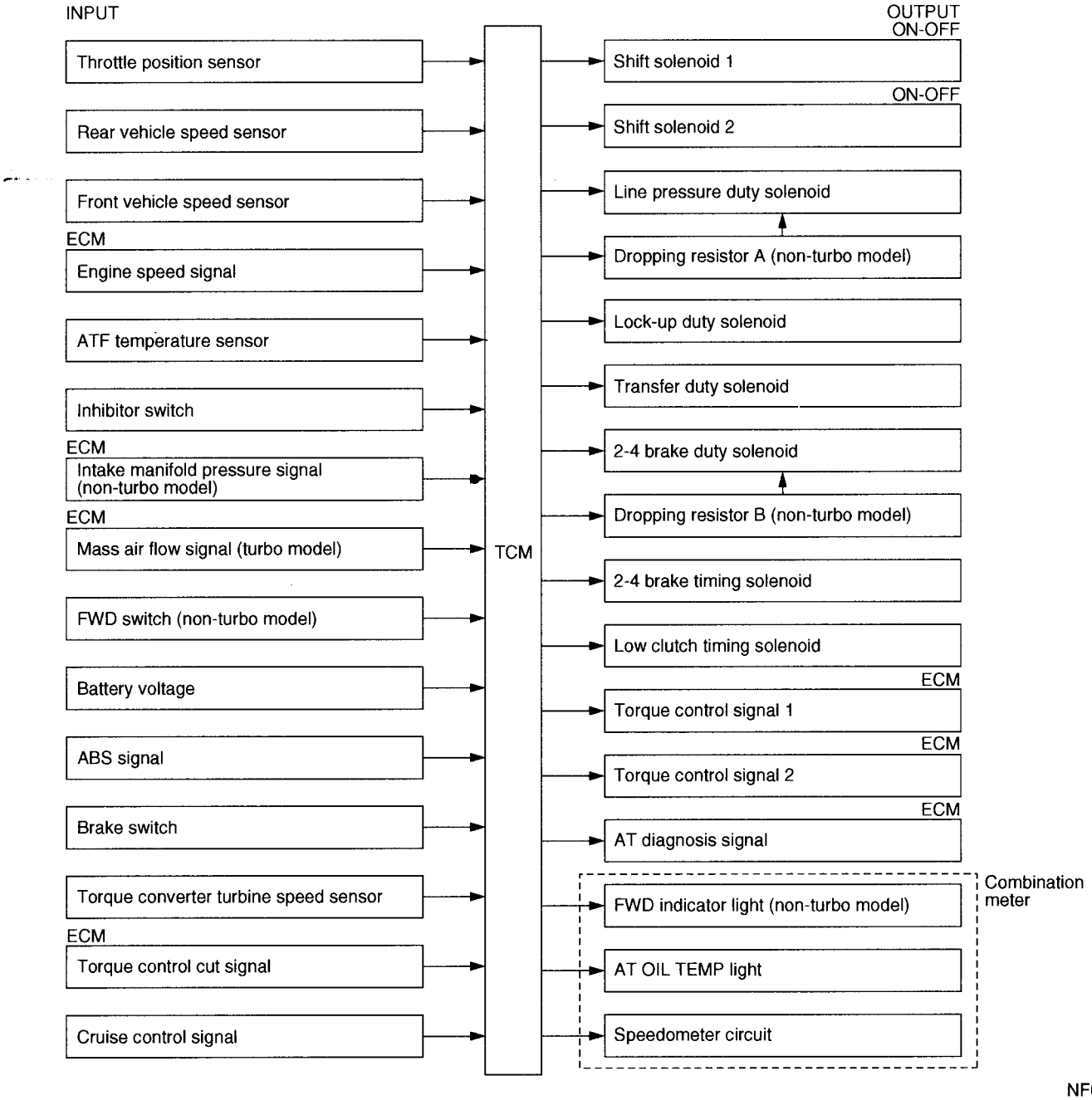
Page

1. Electrohydraulic Control System 2
2. Transmission Control Module (TCM) 14
3. On-board Diagnostics System 34
4. Fail-safe Function 36
5. Transmission Mounting 38

1. Electrohydraulic Control System

A: GENERAL

The electrohydraulic control system for the transmission and transfer consists of various sensors and switches, a transmission control module (TCM) and the hydraulic controlling units including solenoid valves. The system controls the automatic transmission operation, including gear shifting, lock-up clutch operation, line pressure, automatic control pattern selection ("Base" and "Power"), and gear-shift timing. It also controls the operation of the transfer clutch. The TCM determines vehicle operating conditions from various input signals and controls a total of eight solenoids (shift solenoids 1 and 2, low clutch timing solenoid, 2-4 brake timing solenoid, line pressure duty solenoid, lock-up duty solenoid, transfer duty solenoid, and 2-4 brake duty solenoid) by sending appropriate signals to them.



NF0464

B: INPUT SIGNALS

Signal name	Major function
Throttle position sensor	Indicates the throttle valve position. This signal is used to determine shift point, line pressure, and lock-up engaging vehicle speed, which vary with engine load.
Front vehicle speed sensor (located on transmission case)	Indicates the vehicle speed. This signal is used for control of gear shifting, lock-up engaging, line pressure, and transfer clutch operation.
Rear vehicle speed sensor (located on extension case)	Used to control transfer clutch, and also as backup signal in case of failure of front vehicle speed sensor.
Engine speed signal	Indicates the engine speed. This signal is used for control of lock-up clutch to ensure smooth engagement.
Inhibitor switch	Used to determine gears and line pressures in each of ranges "P", "R", "N", "D", "3", "2" and "1".
ATF temperature sensor	Indicates the ATF temperature. This signal is used for inhibition of lock-up, release of OD and determination of ATF temperature.
FWD switch (non-turbo model)	Used to change the mode from AWD to FWD. Also used to adapt the vehicle to FWD tester roller. Changeover from AWD to FWD can be made by inserting a fuse into the fuse holder.
ABS signal	Used when ABS is operating to optimize ABS control. In this control, transfer clutch torque load capacity is adjusted to eliminate the influence of engine braking and reduce the degree of coupling between front and rear wheels.
Cruise control signal	Indicates operation of cruise control system. It is used to expand "4th" operating range.
Torque converter turbine speed sensor	Tells the rotation speed of the input shaft. The proportion of this speed to the vehicle speed determines whether shifting should be made or not.
Torque control cut signal	Sent from engine control module (ECM) to TCM to inhibit the torque control.
Intake manifold pressure signal (non-turbo model)	Used to determine line pressure of gear shifting.
Mass air flow signal (turbo model)	Used to determine line pressure of gear shifting.
Brake switch	If this signal is issued during downhill driving, TCM makes shift down control, causing the vehicle speed to be reduced.

C: OUTPUT SIGNALS

Signal name	Function
Shift solenoid 1, 2	Each of these signals controls shift step by turning the corresponding solenoid ON/OFF. Activating timing is controlled for each solenoid to reduce shift shock.
Line pressure duty solenoid	Regulates the line pressure according to driving conditions.
Lock-up duty solenoid	Regulates the hydraulic pressure of the lock-up clutch to operate it in three modes (open, smooth and lock-up).
Transfer duty solenoid	Regulates the hydraulic pressure of the transfer clutch to control the driving force to the rear drive shaft.
AT OIL TEMP light	Causes the light to illuminate when ATF becomes excessively hot (exceeds a set temperature level). This light is also used for on-board diagnostics.
2-4 brake duty solenoid	Regulates 2-4 brake operating pressure to reduce shifting shocks.
2-4 brake timing solenoid	Switches on or off the pressure acting on 2-4 brake timing valve B to control the release timing of the 2-4 brake.
Low clutch timing solenoid	Switches on or off the pressure acting on the low clutch timing valve B to control the release timing of the low clutch. Also switches on or off the pressure acting on the reverse inhibit valve to control the reverse inhibit function.
Torque control signal 1	Reduces engine torque during range selection and gear change.
Torque control signal 2	Reduces engine torque during range selection and gear change.

D: CONTROL ITEMS

Control item			Description of control
Transmission control	Gear shift control	Base shift control • Base pattern • Power pattern	Upshifting and downshifting are set for each range, gear and pattern according to throttle position and vehicle speed.
		ABS-in-operation control	Gear is locked in 3rd when ABS signal enters.
		ATF-low-temperature control	Shifting into 4th gear is prevented when ATF temperature is below the preset value.
	Automatic pattern select control	Power pattern control	Power pattern is selected when throttle opening is changed at a speed exceeding the preset value.
		Base pattern control	When throttle opening is changed at a speed less than the preset value, Base pattern is resumed.
	Lock-up control	Base lock-up control	Lock-up ON is set for D-range 4th gear; ON/OFF is set for all gears (except D-range 4th) and patterns. Lock-up control is performed according to throttle position and vehicle speed. (Basically lock-up is OFF during gear shifting.)
		Smooth control	Smooth lock-up is performed when lock-up is switched on.
	Line pressure control	Ordinary control	Line pressure is regulated according to throttle position, vehicle speed and range signals.
		Shifting control	Line pressure is regulated when shifting to lessen shifting shock.
		Starting control	Line pressure is lowered to a minimum so as to reduce engine cranking load.
	Shift timing control	Shift step control	ON/OFF timing for shift solenoid is controlled.
		Lock-up control	When shifting, the lock-up clutch is temporarily released.
		Line pressure control	When shifting, line pressure is controlled to the optimum level so as to reduce shifting shock.
AWD transfer clutch control (non-turbo model)	Ordinary transfer control		Transfer clutch pressure is regulated according to the throttle valve angle and vehicle speed.
	1 range control		Transfer clutch pressure is increased.
	Slip control		Immediately after detecting a slip, transfer clutch pressure is controlled to the same pressure as 1 range. (This control is canceled if V ≧ 60 km/h (37 MPH), or when throttle valve is closed fully.)
	Control in turns		Transfer clutch pressure is reduced after detecting a turn.
	ABS-in-operation control		Transfer clutch pressure is adjusted to a set level immediately after reception of ABS signal.
AWD multi-plate clutch control (LSD) (turbo model)	Ordinary transfer control		Multi-plate clutch (LSD) pressure is regulated according to the torque input to the transfer and the driving condition.
	Start control		When starting, the LSD pressure is adjusted proportionately to the throttle value angle.
	Control in turns		When the front and rear wheel speed ratio is less than the set value for a vehicle speed, the LSD pressure is decreased.
	Slip control		When a front or rear wheel starts slipping, the LSD pressure is decreased.
	ABS-in-operation control		The LSD pressure is adjusted to the set level immediately after reception of ABS signal.
	Base brake control		When the brake switch is ON and throttle valve is fully closed, the LSD pressure is lowered.
	1 range control		The LSD pressure is increased to improve driveability.

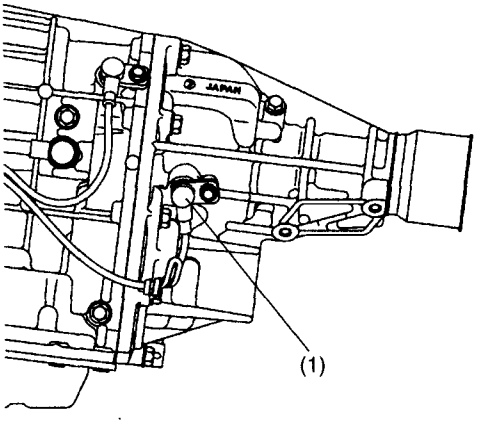
E: THROTTLE POSITION SENSOR

The throttle position sensor provides electrical signals corresponding to throttle valve positions. The throttle valve angular position and accelerator depressing speed are detected by this throttle position sensor.

F: REAR VEHICLE SPEED SENSOR

1. NON-TURBO MODEL

This vehicle speed sensor (output shaft speed sensor) is externally mounted on the extension case. It detects the rear wheel speed in terms of the peripheral speed of the transfer clutch drum and sends sine wave signals (30 pulses per rotation) to the TCM.

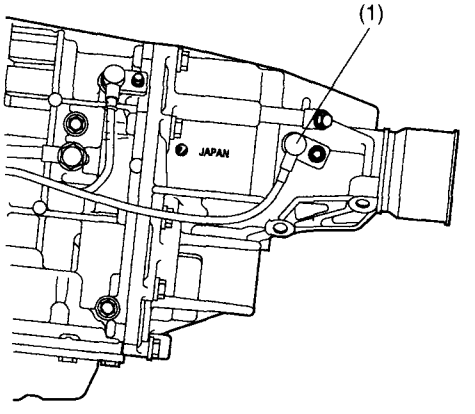


NF0068

(1) Rear vehicle speed sensor

2. TURBO MODEL

This vehicle speed sensor (output shaft speed sensor) is externally mounted on the extension case. It detects the rear wheel speed in terms of the peripheral speed of the rear drive shaft and sends sine wave signals (22 pulses per rotation) to the TCM.



H3H1818C

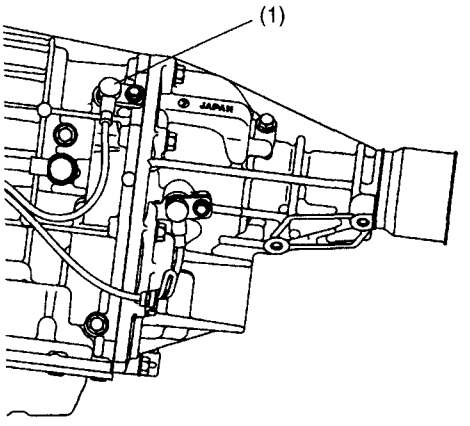
(1) Rear vehicle speed sensor

G: FRONT VEHICLE SPEED SENSOR

This vehicle speed sensor (output shaft speed sensor) is externally mounted on the transmission case. It detects the front wheel speed and sends sine wave signals (16 pulses per rotation) to the TCM.

The TCM converts the signals into pulse signals and outputs them to both the engine control module (ECM) and the combination meter.

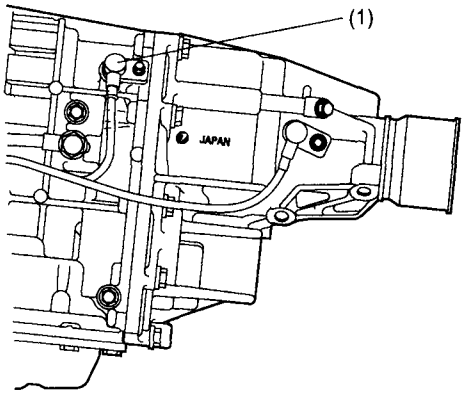
1. NON-TURBO MODEL



NF0069

(1) Front vehicle speed sensor

2. TURBO MODEL

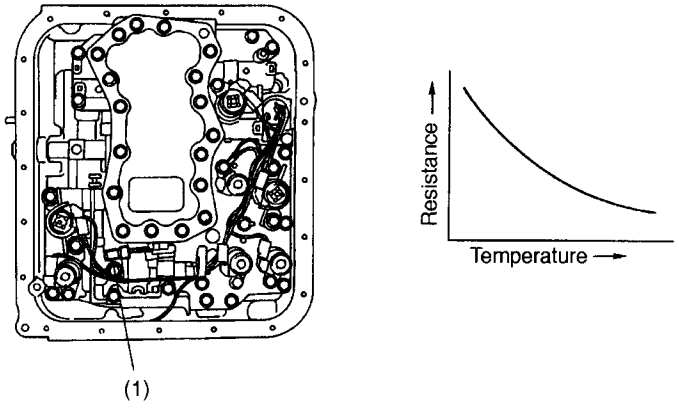


H3H1818D

(1) Front vehicle speed sensor

H: ATF TEMPERATURE SENSOR

This sensor is located in the hydraulic control valve of the transmission. It detects the temperature of ATF and outputs it as an electrical resistance signal. The output characteristics of the sensor are shown below.

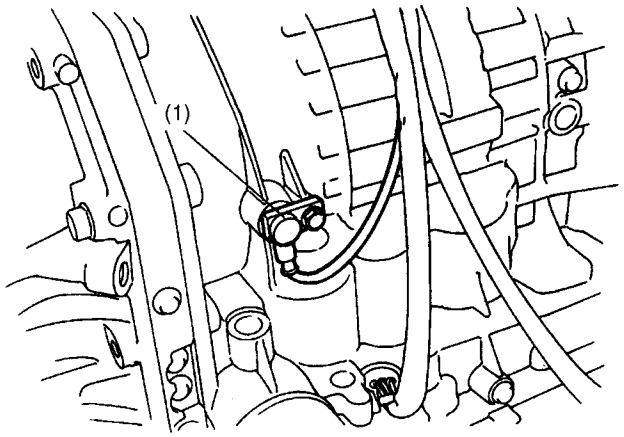


NF0071

(1) ATF temperature sensor

I: TORQUE CONVERTER TURBINE SPEED SENSOR

The torque converter turbine speed sensor (output shaft speed sensor) is externally mounted on the transmission case.
The sensor detects the torque converter turbine speed in terms of the rotation speed of the periphery of the high clutch drum coupled to the input shaft, and sends sine wave signals (32 pulses per rotation) to the TCM. The TCM calculates the proportion of the input shaft speed to the vehicle speed and determines whether the shifting is to be made or not.



NF0072

(1) Torque converter turbine speed sensor

J: INHIBITOR SWITCH

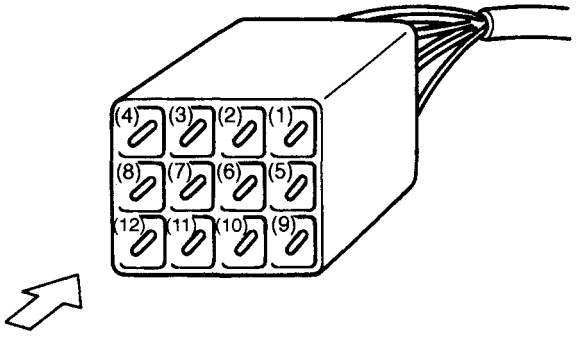
The inhibitor switch assures safety when starting the engine. This switch is mounted on the right side of the transmission case, and is operated by the selector lever.

When the selector lever is set to P or N, the electrical circuit in the inhibitor switch is closed and the starter circuit is completed for cranking the engine.

When the selector lever is in the R, D, 3, 2 or 1 range, the electrical circuit in the inhibitor switch is open. Hence engine cranking is disabled. In the R range, the backup light circuit is completed in the switch, and the backup lights come on.

In addition to the above function, the inhibitor switch incorporates a circuit for detecting the selected range position and sending the range signal to the TCM.

Inhibitor switch side connector

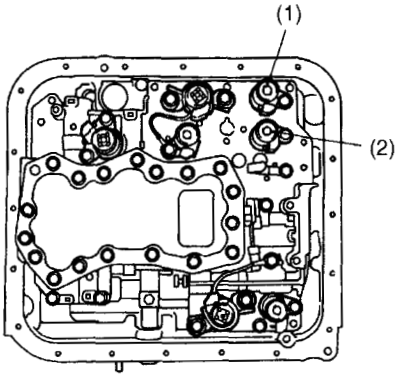


NF0073

Range position	Pin No.
P	(4) – (3) (12) – (11)
R	(4) – (2) (10) – (9)
N	(4) – (1) (12) – (11)
D	(4) – (8)
3	(4) – (7)
2	(4) – (6)
1	(4) – (5)

K: SHIFT SOLENOIDS 1 AND 2

These solenoids are located in the transmission hydraulic control valve. They are turned ON or OFF according to signals from the TCM. The gear positions are changed according to the ON and OFF condition of these solenoids.

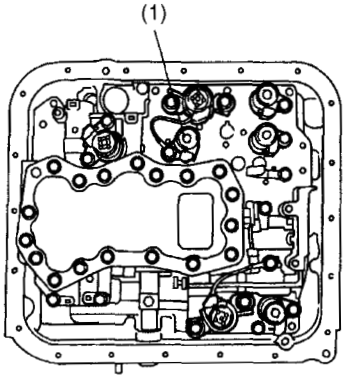


NF0074

(1) Shift solenoid 2
(2) Shift solenoid 1

L: LOW CLUTCH TIMING SOLENOID

This solenoid is located in the transmission hydraulic control valve. It is turned ON or OFF according to signals from the TCM. It then controls the low clutch timing valve B and reverse inhibitor valve.

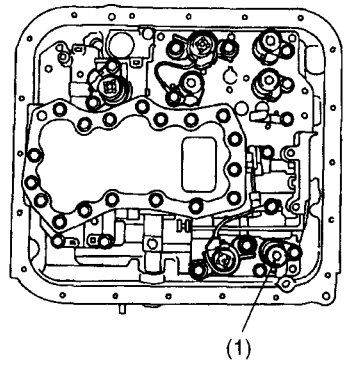


NF0075

(1) Low clutch timing solenoid

M: 2-4 BRAKE TIMING SOLENOID

This solenoid is located in the transmission hydraulic control valve. It is turned ON or OFF according to signals from the TCM. It then controls the 2-4 brake timing valve B to decrease the change gear shock.

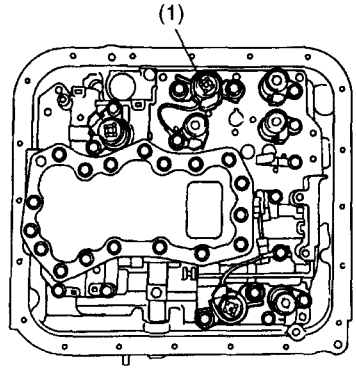


NF0076

(1) 2-4 brake timing solenoid

N: LINE PRESSURE DUTY SOLENOID

This solenoid is located in the transmission hydraulic control valve. Its duty ratio is controlled by signals from the TCM. This solenoid then controls the pressure modifier valve and accumulator control valve A to adjust the line pressure to an optimum pressure level suitable for operating conditions.

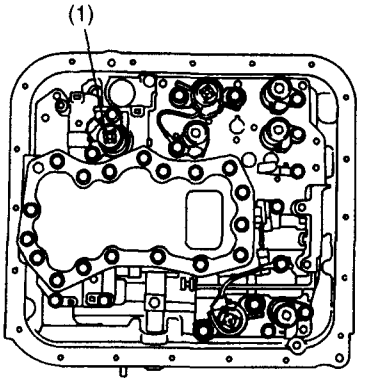


NF0077

(1) Line pressure duty solenoid

O: LOCK-UP DUTY SOLENOID

This solenoid is located in the transmission hydraulic control valve. Its duty ratio is controlled by signals from the TCM. It then controls the lock-up control valve to provide smooth engagement and disengagement of the lock-up clutch.

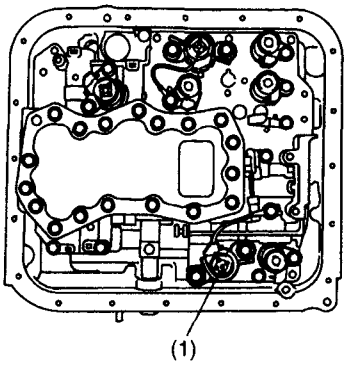


NF0078

(1) Lock-up duty solenoid

P: 2-4 BRAKE DUTY SOLENOID

This solenoid is located in the transmission hydraulic control valve. Its duty ratio is controlled by signals from the TCM. It modulates the 2-4 brake pressure when the 2-4 brake is operated, reducing shifting shocks.



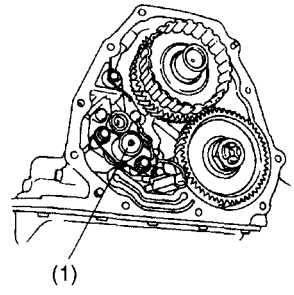
NF0079

(1) 2-4 brake duty solenoid

Q: TRANSFER DUTY SOLENOID

This solenoid is located in the transfer hydraulic pressure control unit on the rear end of transmission case. Its duty ratio is controlled by signals from the TCM. It then controls the transfer clutch/control valve to control the pressure applied to the transfer clutch.

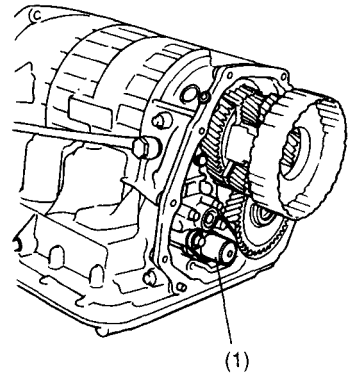
1. NON-TURBO MODEL



NF0080

(1) Transfer duty solenoid

2. TURBO MODEL



H3H1929C

(1) Transfer duty solenoid

2. Transmission Control Module (TCM)

The TCM receives various sensor signals and determines the running conditions of the vehicle. It then sends control signals to each solenoid according to the preset gearshift characteristic data, lock-up operation data, and transfer clutch torque data (duty ratios).

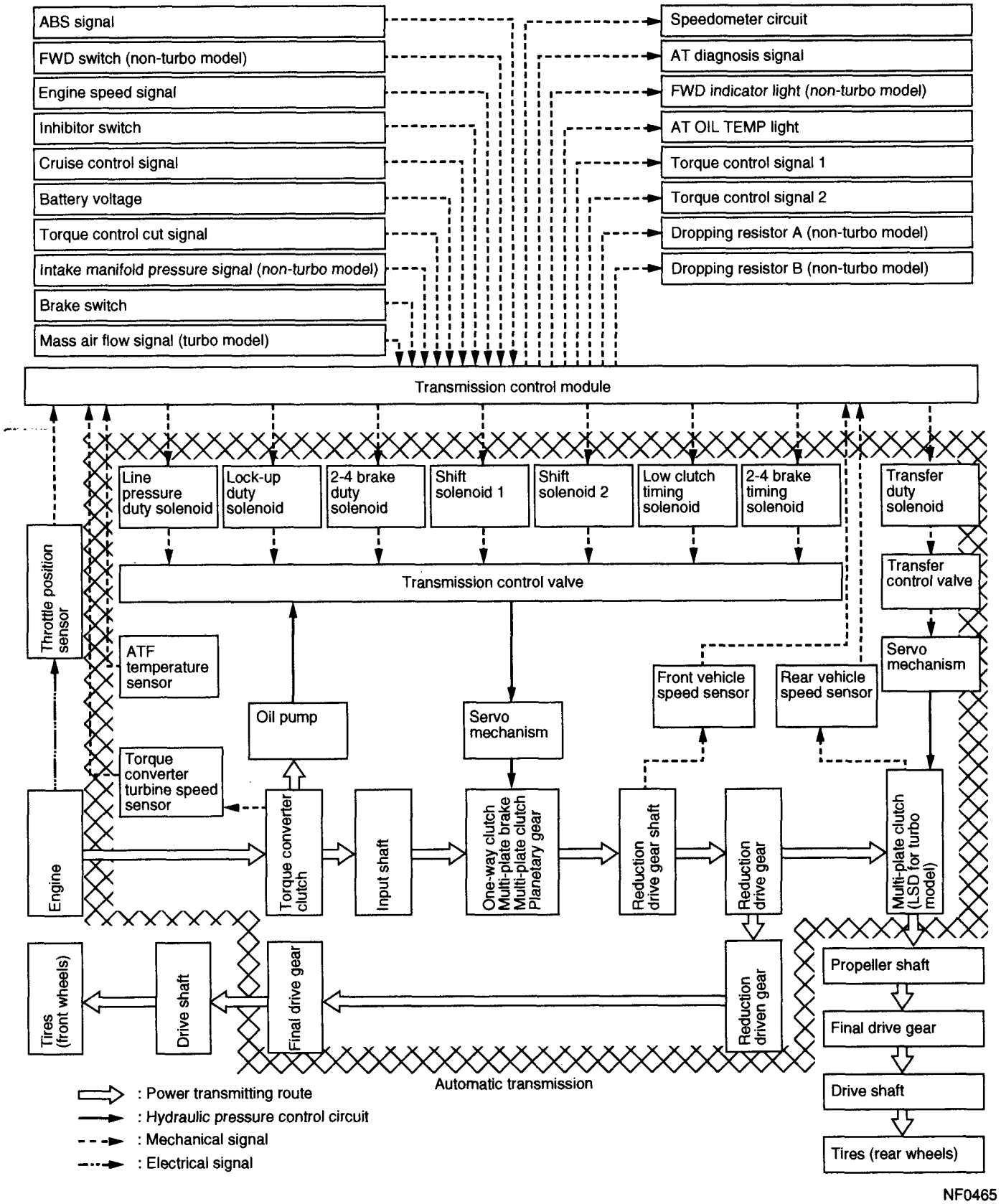
A: CONTROL SYSTEM

Control item		Input signal
Shift control	Ordinary shift control	Throttle position sensor Rear vehicle speed sensor Front vehicle speed sensor Engine speed Inhibitor switch
	ABS-in-operation control	ABS signal Throttle position sensor Rear vehicle speed sensor Front vehicle speed sensor Brake switch
	Hydraulic oil temperature control	ATF temperature sensor
	Reverse inhibiting control	Throttle position sensor Rear vehicle speed sensor Front vehicle speed sensor Inhibitor switch
	Shift pattern (Base/Power) select control	Throttle position sensor Rear vehicle speed sensor Front vehicle speed sensor Inhibitor switch
	Grade control	Throttle position sensor Rear vehicle speed sensor Front vehicle speed sensor Brake switch Inhibitor switch Engine speed Intake manifold pressure
Lock-up control	Ordinary lock-up control	Throttle position sensor Rear vehicle speed sensor Front vehicle speed sensor Engine speed Inhibitor switch
	Smooth control	Throttle position sensor
	Hydraulic oil temperature control	ATF temperature sensor

Control item		Input signal
Oil pressure control	Ordinary pressure control	Throttle position sensor Rear vehicle speed sensor Front vehicle speed sensor Engine speed Inhibitor switch ATF temperature sensor
	Shifting control	Throttle position sensor Rear vehicle speed sensor Front vehicle speed sensor Engine speed Torque converter turbine speed sensor Inhibitor switch ATF temperature sensor
	Starting control	Engine speed ATF temperature sensor Inhibitor switch
	Learning control	Shift solenoid A Shift solenoid B Rear vehicle speed sensor Front vehicle speed sensor Throttle position sensor Torque converter turbine speed sensor ATF temperature sensor
AWD transfer clutch control (non-turbo model)	Ordinary transfer control	Throttle position sensor Rear vehicle speed sensor Front vehicle speed sensor Inhibitor switch ATF temperature sensor FWD switch
	1 range control	Throttle position sensor Rear vehicle speed sensor Front vehicle speed sensor Inhibitor switch
	Slip detection control	Throttle position sensor Rear vehicle speed sensor Front vehicle speed sensor
	Steering control	Throttle position sensor Rear vehicle speed sensor Front vehicle speed sensor
	ABS-in-operation control	ABS signal Throttle position sensor Rear vehicle speed sensor Front vehicle speed sensor Brake switch

Control item		Input signal
AWD multi-plate clutch (LSD) control (turbo model)	Ordinary transfer control	Throttle position sensor Rear vehicle speed sensor Front vehicle speed sensor Inhibitor switch ATF temperature sensor
	1 range control	Throttle position sensor Rear vehicle speed sensor Front vehicle speed sensor Inhibitor switch
	Slip detection control	Throttle position sensor Rear vehicle speed sensor Front vehicle speed sensor
	Steering control	Throttle position sensor Rear vehicle speed sensor Front vehicle speed sensor
	ABS-in-operation control	ABS signal Throttle position sensor Rear vehicle speed sensor Front vehicle speed sensor Brake switch
	Base brake operating control	Throttle position sensor Front vehicle speed sensor Brake switch

B: SYSTEM DIAGRAM

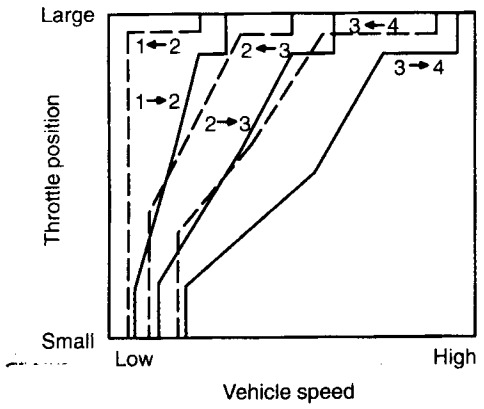


NF0465

C: SHIFT CONTROL

The TCM performs gear shifting control according to driving conditions by using the shift point characteristic data stored in its memory. Appropriate solenoids are operated at the proper timing corresponding to the shift pattern, throttle position, and vehicle speed for smooth shifting.

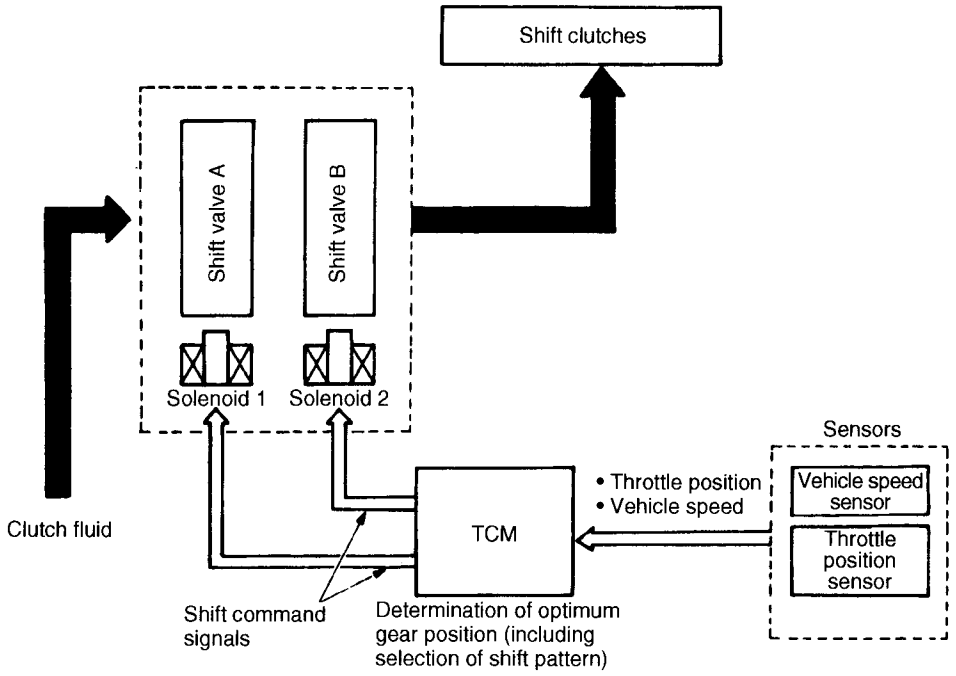
NOTE:
When the ATF temperature is below approximately 10°C (50°F), the gear cannot be shifted to the 4th speed.



	Solenoid 1	Solenoid 2
1st	ON	ON
2nd	OFF	ON
3rd	OFF	OFF
4th	ON	OFF

NF0082

- The TCM activates both solenoids 1 and 2 in response to throttle and vehicle speed signals.
- Shift valves move in response to operation of the solenoids, supplying or interrupting the line pressure to each clutch.
- A shift to each gear takes place according to ON-OFF operation of both the solenoids as indicated in the table above.



NF0083

D: LOCK-UP CONTROL

• The TCM has pre-programmed lock-up clutch engagement and disengagement conditions for each gear and shift pattern. In addition, it specifies engagement of the clutch whenever the 4th gear is selected in the D range. The engagement and disengagement conditions are defined in terms of the throttle valve position and vehicle speed.

• The TCM controls the operation of the lock-up clutch by means of the duty solenoid which in turn controls the lock-up control valve as described below:

1. NON-LOCK-UP OPERATION

The duty solenoid allows the pilot pressure (supplied from the pilot valve) to be applied to the "disengaging" end of the lock-up control valve spool. The lock-up control valve then opens the clutch disengaging circuit port to allow the lock-up operating pressure (torque converter clutch regular pressure) to build up in the circuit. On the other hand, the valve opens the clutch engaging circuit's port and allows the fluid in the circuit to flow to the ATF cooler, thus lowering the pressure in the circuit. As a result, the lock-up clutch is disengaged due to difference in pressure between both circuits.

This operation is performed for all the speed gears except the 4th gear of the D range.

2. LOCK-UP OPERATION

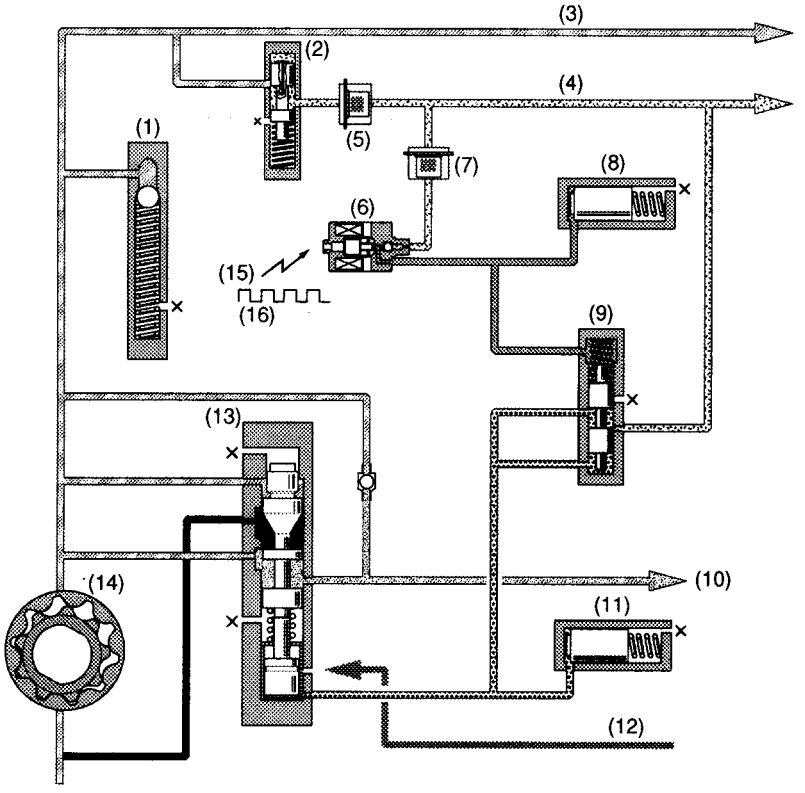
The duty solenoid allows the pilot pressure to be applied to the "engaging" end of the lock-up control valve spool. The lock-up control valve then opens the clutch engaging circuit's port that communicates to the torque converter's impeller chamber, allowing high pressure fluid to flow to the lock-up clutch. The clutch then engages.

• The TCM controls the current to the duty solenoid by gradually changing the duty ratio. As a result, the lock-up control valve also moves gradually, so the clutch engagement pressure increases smoothly. This causes the lock-up clutch to become initially in a half-engaged state and then in a fully engaged state, thus preventing shock during engagement.

This operation is performed for all the speed gears and always when the 4th gear is selected in the D range.

E: LINE-PRESSURE CONTROL

- The oil pump delivery pressure (line pressure) is regulated to a constant pressure by the pilot valve. This pressure is used as the pilot pressure for controlling spool valves.
- The pilot pressure applied to the pressure modifier valve is modulated by the line pressure duty solenoid into the pressure modifier pressure.
- The pressure modifier valve is an auxiliary valve for the pressure regulator valve, and it creates a signal pressure (pressure modifier pressure). The pressure modifier pressure is used to regulate the line pressure to a level optimum for a particular driving condition.
- This pressure modifier pressure is applied to the pressure regulator valve which controls the oil pump delivery pressure.
- The pressure modifier pressure from the pressure modifier valve is cushioned by the pressure modifier accumulator to remove pulsation of the pressure.



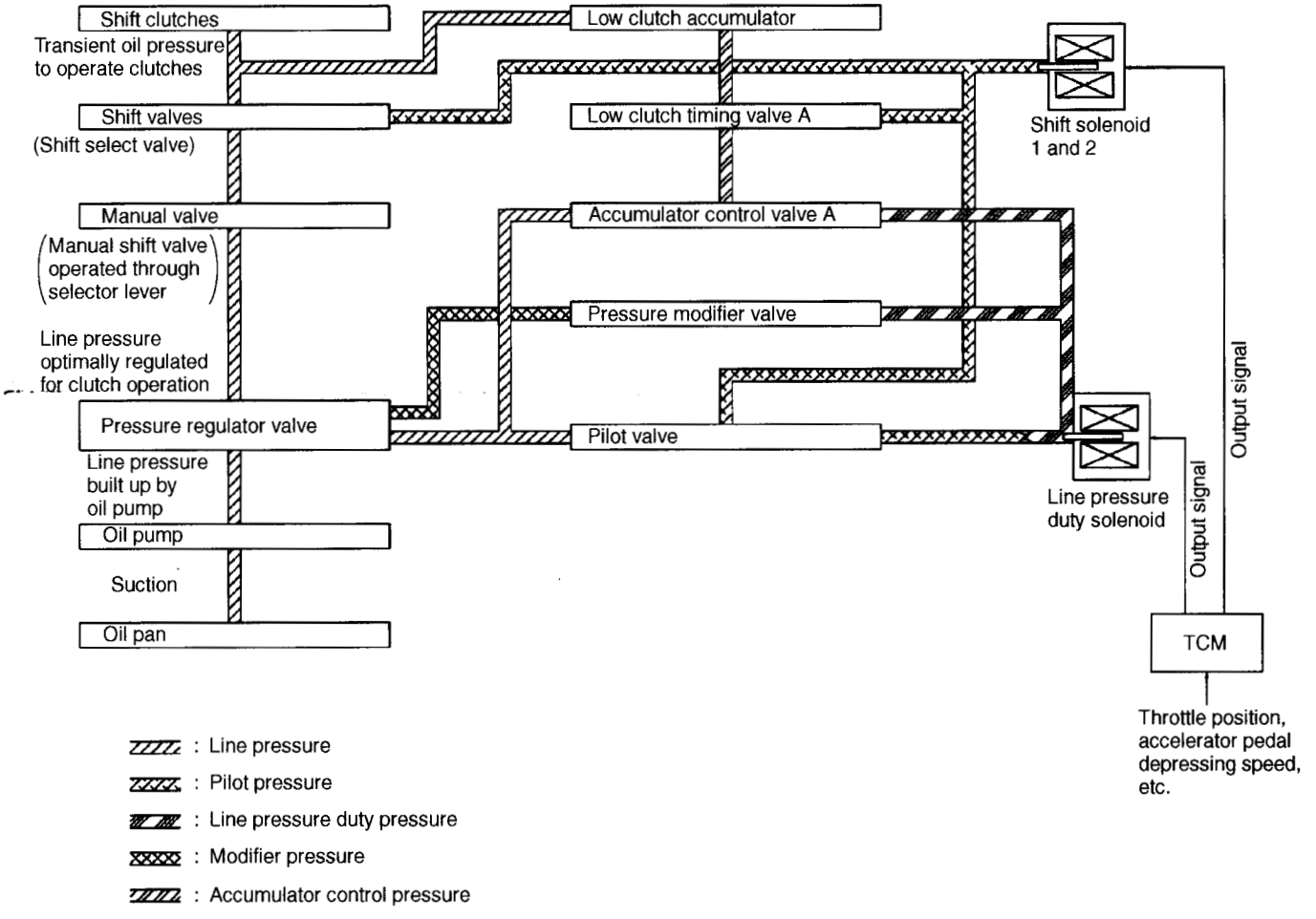
NF0084

(1) Relief valve
(2) Pilot valve
(3) Line pressure
(4) Pilot pressure
(5) Filter
(6) Line pressure duty solenoid
(7) Filter
(8) Accumulator
(9) Pressure modifier valve
(10) To ATF cooler circuit
(11) Accumulator
(12) From R range pressure circuit
(13) Pressure regulator valve
(14) Oil pump
(15) ON
(16) OFF

F: LINE-PRESSURE CONTROL DURING SHIFTING

The line pressure which engages shift clutches to create 1st to 4th speeds is controlled by the TCM to meet varying operating conditions.

During gear shifting, the TCM decreases the line pressure to a level that matches the selected gear in order to minimize shifting shock loads.



NF0085

During gear shifting, the TCM controls the line pressure as follows:

- The TCM receives signals such as throttle position signal and accelerator pedal speed signal. Based on these input signals, it issues a control signal to the line pressure duty solenoid.
- The pressure from the line pressure duty solenoid (line pressure duty pressure) is converted by the pressure modifier valve into a modifier pressure, and the modifier pressure is applied to the pressure regulator valve.
- The pressure regulator valve adjusts the oil-pump-generated line pressure according to the modifier pressure to make the line pressure matched to the driving condition.

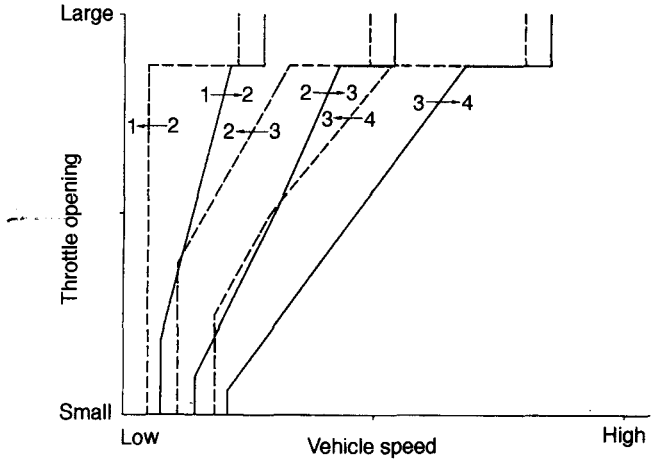
G: SHIFT PATTERN SELECTION CONTROL

The TCM changes its gear shift control pattern automatically between the Base pattern suitable for ordinary economy driving and the Power pattern suitable for climbing uphill or rapid acceleration.

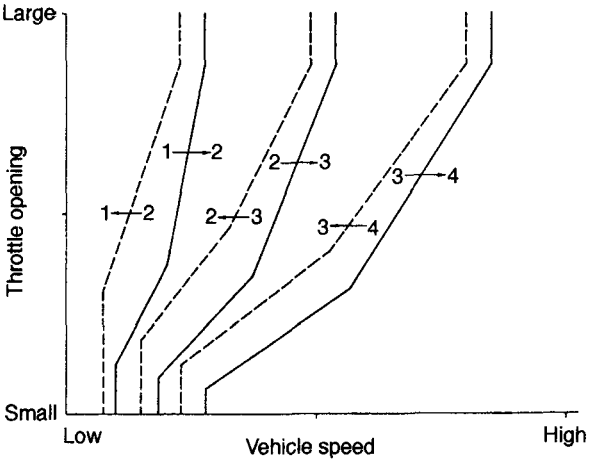
In the Power pattern, the downshift point and upshift point are set higher than those of the Base pattern.

Selector lever position	Changeover from Base to Power pattern
D and 3 ranges	Performed automatically according to accelerator pedal depression speed.

"D" range (Base pattern)



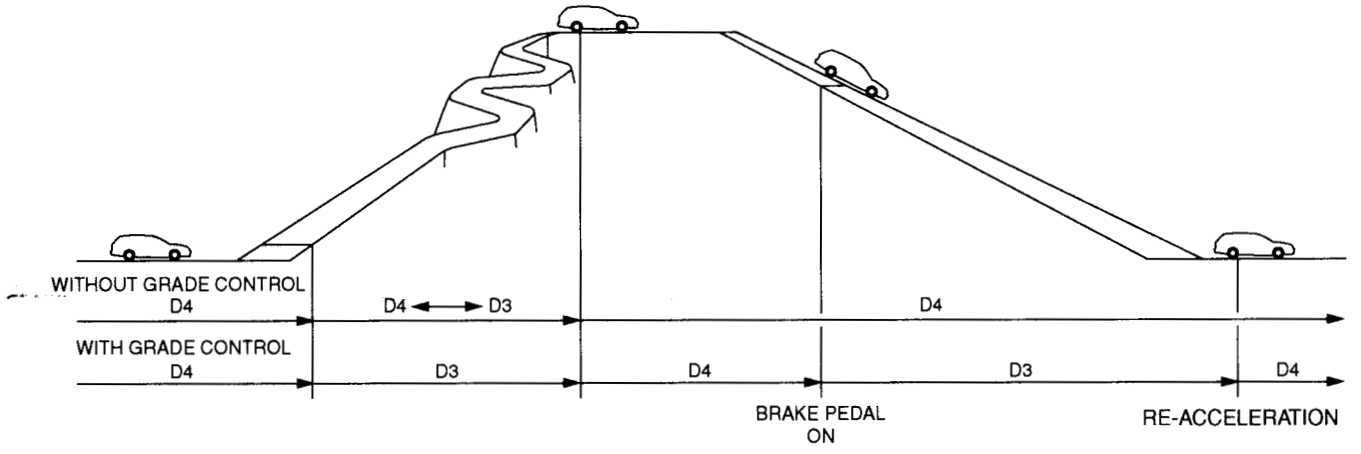
"D" range (Power pattern)



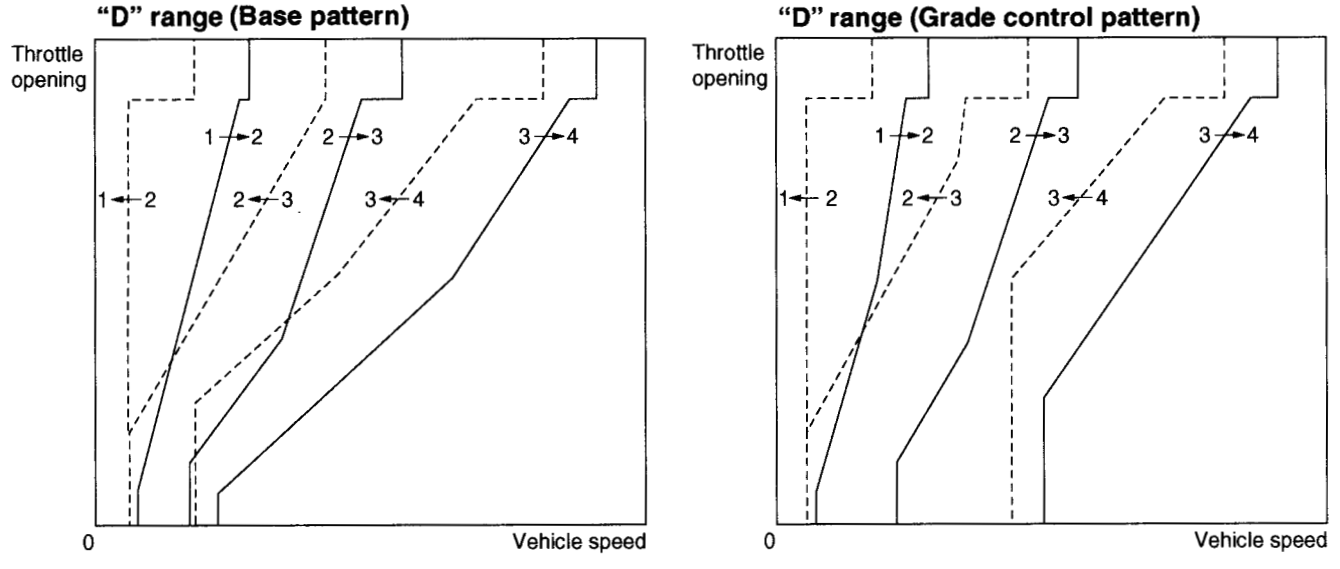
H3H1231A

H: GRADE CONTROL

While the vehicle is driving up a hill, the gear is fixed to the 3rd to avoid repeated gear shift between the 3rd and 4th gears.
When the vehicle is descending a steep slope at a speed of approximately 80 km/hour (50 miles/hour), a 4th to 3rd downshift occurs automatically when the brake pedal is depressed.
This gearshift control is cancelled when the accelerator pedal is depressed.
The TCM performs these controls based mainly on the throttle opening, engine speed and vehicle speed.



NF0087



NF0088

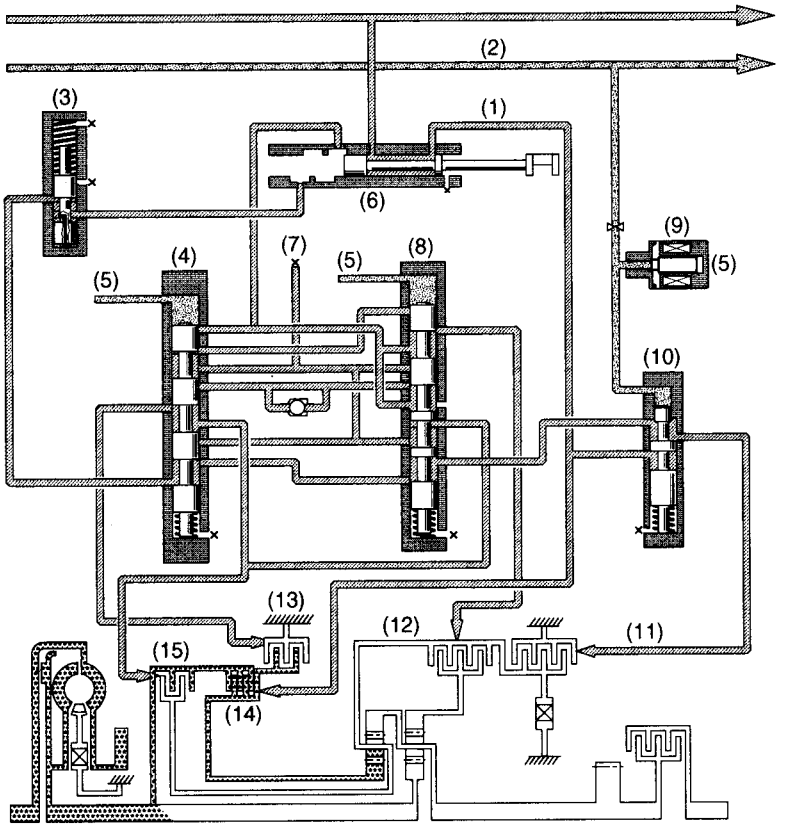
I: LEARNING CONTROL

The TCM has a learning control function with which it can adapt gear shift timing optimally to the current vehicle conditions by updating correction factors in the memory.
For this reason, gear shift shock may become larger after the power supply is interrupted (disconnection of battery, flat battery, etc.) or immediately after the ATF is replaced.
Larger gear shift shock after power supply interruption occurs because the correction data is reset to those for the new vehicle condition.
The TCM starts learning function again as soon as the power supply is restored. After driving for a while, therefore, the transmission will become able to make gear shifts at the optimum timing.
Larger shift shock immediately after ATF change is caused by change in friction characteristics of the transmission internal parts. Also in this case, the transmission recovers shockless gear shifting after driving for a while.

J: REVERSE INHIBITION CONTROL

This control prevents the transmission from shifting into the reverse gear when the select lever is accidentally placed in the R position, thus protecting the components such as reverse clutch from being damaged.

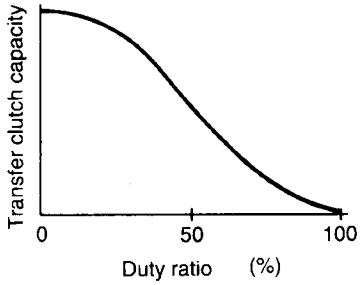
If the selector lever is moved to the R position during driving at a speed faster than the predetermined speed, the low clutch timing solenoid is energized. Then, the pilot pressure is supplied to the reverse inhibitor valve. This causes the reverse inhibitor valve to move downward, closing the low & reverse brake port.
In this condition, the low & reverse brake does not engage since the ATF flowing from the manual valve is blocked by the reverse inhibitor valve.
As a result, the transmission is put into the neutral state, and the shifting into the reverse gear is inhibited.

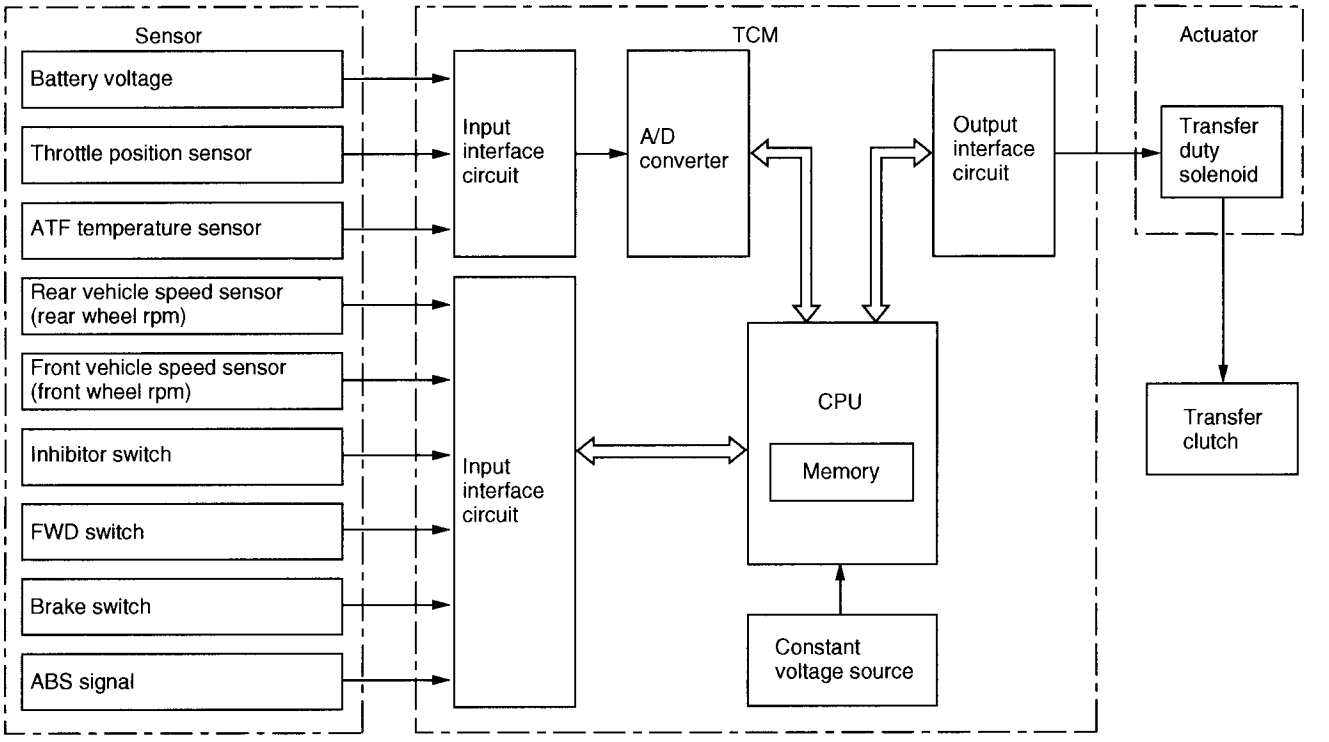


NF0089

(1) Line pressure
(2) Pilot pressure
(3) 1st reducing valve
(4) Shift valve A
(5) ON
(6) Manual valve (P range)
(7) Drain
(8) Shift valve B
(9) Low clutch timing solenoid
(10) Reverse inhibitor valve
(11) Low & reverse brake (Release)
(12) Low clutch
(13) 2-4 brake
(14) Reverse clutch
(15) High clutch

K: AWD TRANSFER CLUTCH CONTROL (NON-TURBO MODEL)

Control item		Type of control	Gear position	Remarks
1	Basic control	Regulates transfer clutch pressure in response to throttle position and vehicle speed.	1st thru 4th and reverse	Normal control  NF0361
2	1 range control	Increases transfer clutch pressure above basic control pressure.	1st	–
3	Slip control	Increases transfer clutch pressure to the same level as in the 1 range immediately after a slip is detected.	1st thru 4th and reverse	Release: When running faster than the set vehicle speed with fully closed throttle
4	Turning control	Decreases transfer clutch pressure upon detection of a turn.	1st thru 4th and reverse	–
5	ABS control	Regulates to the specified transfer clutch pressure quickly when the ABS signal is input.	1st thru 4th and reverse	–
6	P and N range control	Regulates to the specified transfer clutch pressure quickly when shifted to the P or N range.	P and N	–



NF0466

L: AWD CENTER DIFFERENTIAL CONTROL (TURBO MODEL)

1. CONTROL DESCRIPTION

The TCM controls the engagement of the center differential's multi-plate clutch (LSD) using maps that are pre-programmed based on the throttle opening and engine speed. It selects a map according to driving conditions and use it as the control basis.

2. ORDINARY CONTROL

A specific map is given to each of the 1st to 4th gears and the reverse gear for use by the TCM to control the torque distribution appropriately during ordinary driving conditions.

The maps are programmed in such a way that the differential action limiting torque decreases as the throttle valve opening decreases and as the vehicle speed increases. This way of control is employed in order to reduce internal circulation of torque and also to improve steering performance and stability of the vehicle's behavior when the accelerator pedal is released or when a downshift is performed, thus upgrading the stability achieved by the AWD system.

3. START CONTROL

When the vehicle speed is 0 km/h (0 MPH), the TCM makes control to generate differential action limiting torque that is proportional to the throttle angle.

This enables the vehicle to start smoothly without swerving even on a slippery road.

4. TURNING CONTROL

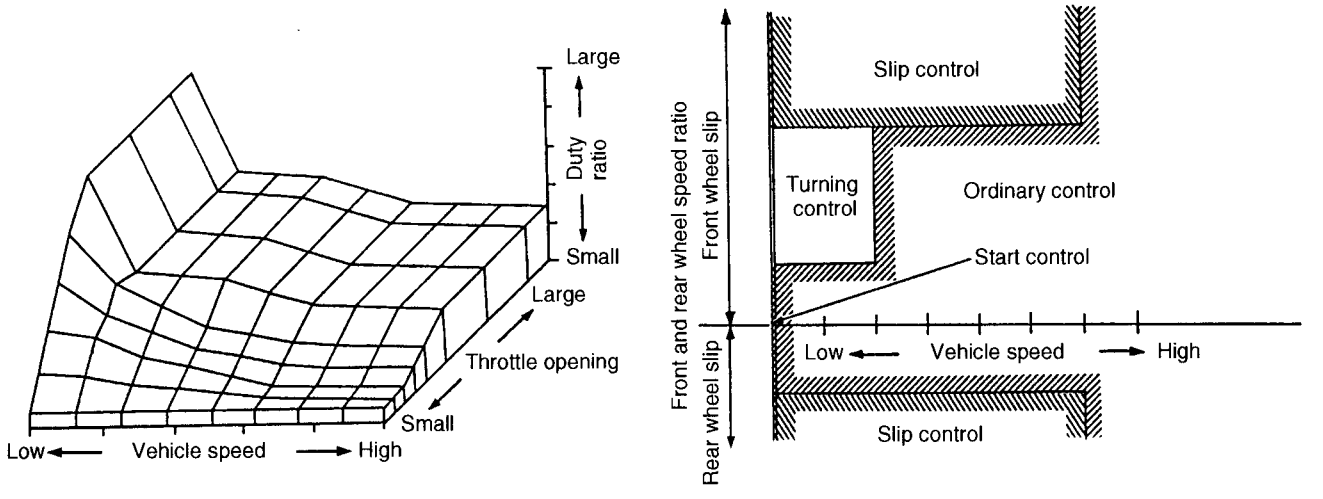
The TCM makes a correction such that the input torque to the multi-plate clutch is reduced as the steering angle increases.

This function is performed to improves turning performance at certain vehicle speed range.

5. SLIP CONTROL

When front or rear wheels start slipping with the vehicle running slower than the predetermined speed, the TCM makes control to increase the differential action limiting torque.

This function maintains traction and improves driving stability.



NF0489

6. ABS CONTROL

When the TCM receives an ABS operation signal from the ABS unit, it adjusts the differential action limiting torque to the predetermined level and selects the 3rd gear in which the one-way clutch is freewheeling.

This function improves ABS control.

7. BASE BRAKE CONTROL

When the brake switch is ON and the throttle valve is fully closed, the TCM makes control to decrease the differential action limiting torque. The ABS control has priority over this control.

This function improves stability during braking.

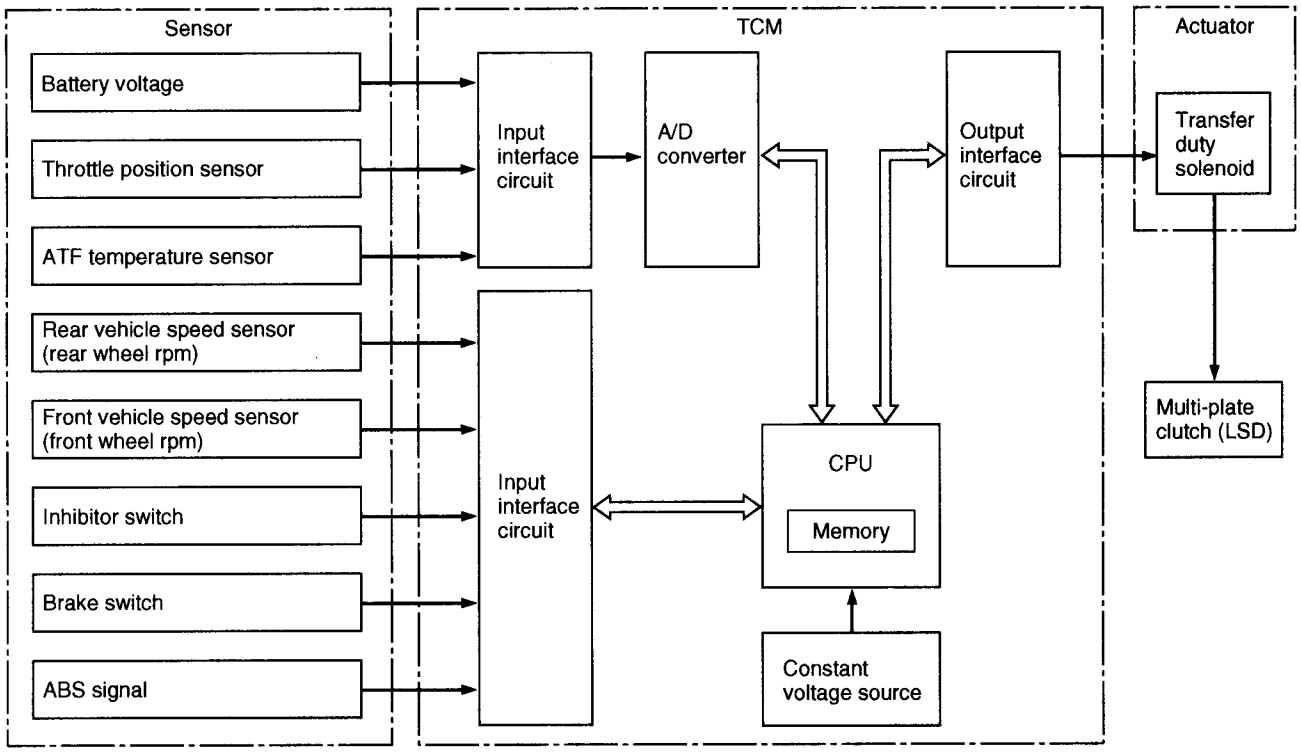
8. 1 RANGE CONTROL

When the 1 range is selected, the TCM makes control to increase the differential action limiting torque.

This function improves driving performance and traction.

9. CONTROL SYSTEM

The TCM is constantly monitoring the driving conditions of the vehicle using the eleven input signals. Based on the conditions it has determined, the TCM adjusts the duty ratio of current to the transfer duty solenoid thus changing the engagement of the multi-plate clutch. The input signals are used also for automatic transmission control.



NF0493

MEMO

M: TRANSFER CONTROL

1. NON-TURBO MODEL

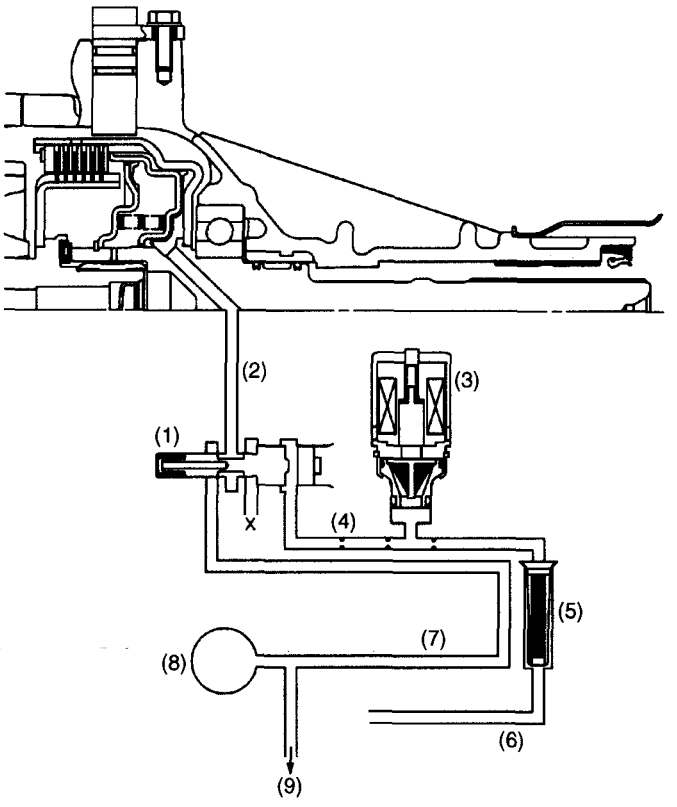
The transfer hydraulic pressure control unit includes a valve body attached to the side of the extension case through a gasket and separator plate.

The pressurized fluids for the transfer hydraulic pressure control (line pressure and pilot pressure) are supplied from the oil pump by way of the passages formed in the transmission case and then the passages in the extension case that lead to the hydraulic circuit in the transfer valve body.

The line pressure is regulated by the transfer control valve whose opening is controlled by the transfer pressure created by the transfer duty solenoid.

- The transfer duty solenoid is controlled by the TCM. The TCM changes the solenoid controlling duty ratio according to the driving conditions.
- The transfer duty solenoid creates the transfer pressure from the pilot pressure. The transfer pressure is applied to the transfer control valve and adjusts the valve's opening.
- The line pressure directly led to the transfer control valve, on the other hand, is regulated by the transfer control valve and becomes the transfer clutch pressure.
- The transfer clutch pressure is applied to the transfer clutch and engages the clutch to a controlled degree.

In this way, the degree of transfer clutch engagement is varied so that optimum torque is distributed to the rear wheels according to vehicle driving conditions.



NF0091

(1) Transfer control valve
(2) Transfer clutch pressure
(3) Transfer duty solenoid
(4) Transfer pressure
(5) Filter
(6) Pilot pressure
(7) Line pressure
(8) Oil pump
(9) Control valve

2. TURBO MODEL

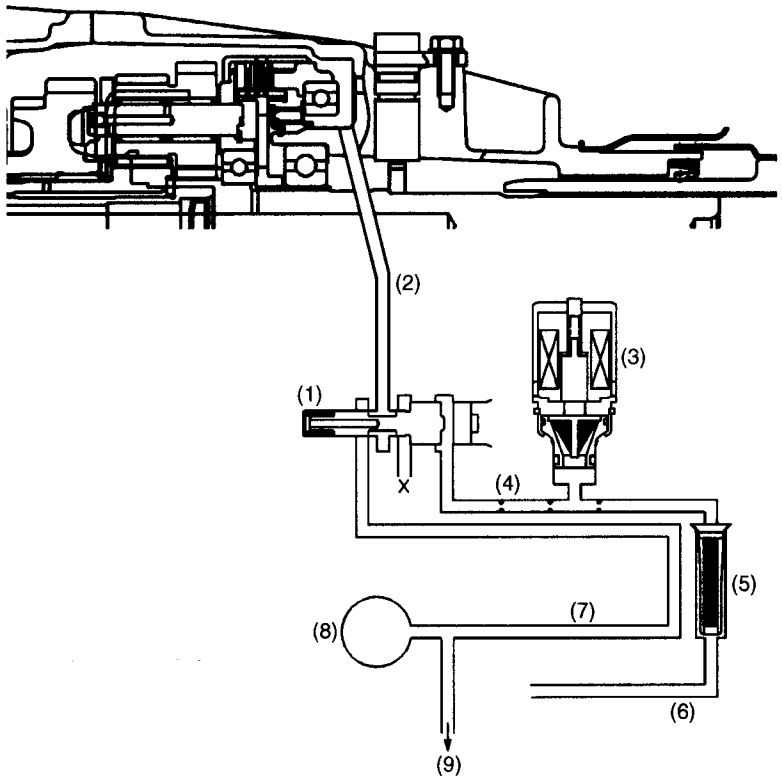
The drive power distribution system includes a valve body attached to the side of the extension case through a gasket and separator plate.

The pressurized fluids for the drive power distribution system (line pressure and pilot pressure) are supplied from the oil pump by way of the passages formed in the transmission case and then the passages in the extension case that lead to the hydraulic circuit in the transfer valve body.

The line pressure is regulated by the transfer control valve whose opening is controlled by the transfer pressure created by the transfer duty solenoid.

- The pilot pressure created by passing through the pilot valve in the transmission's hydraulic control assembly is further regulated into the transfer pressure by the transfer duty solenoid.
- The transfer duty solenoid is controlled by the TCM. The TCM changes the solenoid controlling duty ratio according to driving conditions.
- The transfer pressure thus created is applied to the transfer control valve and adjusts the valve's opening.
- The line pressure directly led to the transfer control valve, on the other hand, is regulated by the transfer control valve and becomes the transfer clutch pressure.
- The transfer clutch pressure is applied to the multi-plate clutch (LSD) and engages the clutch to a controlled degree.

In this way, the degree of multi-plate clutch engagement is varied so that optimum torque is distributed to the rear wheels.



H3H0759A

(1) Transfer control valve
(2) Transfer clutch pressure
(3) Transfer duty solenoid
(4) Transfer pressure
(5) Filter
(6) Pilot pressure
(7) Line pressure
(8) Oil pump
(9) Control valve

3. On-board Diagnostics System

A: FUNCTION

The on-board diagnostics system detects and stores in the form of a code a fault that has occurred in any of the following input and output signal systems.

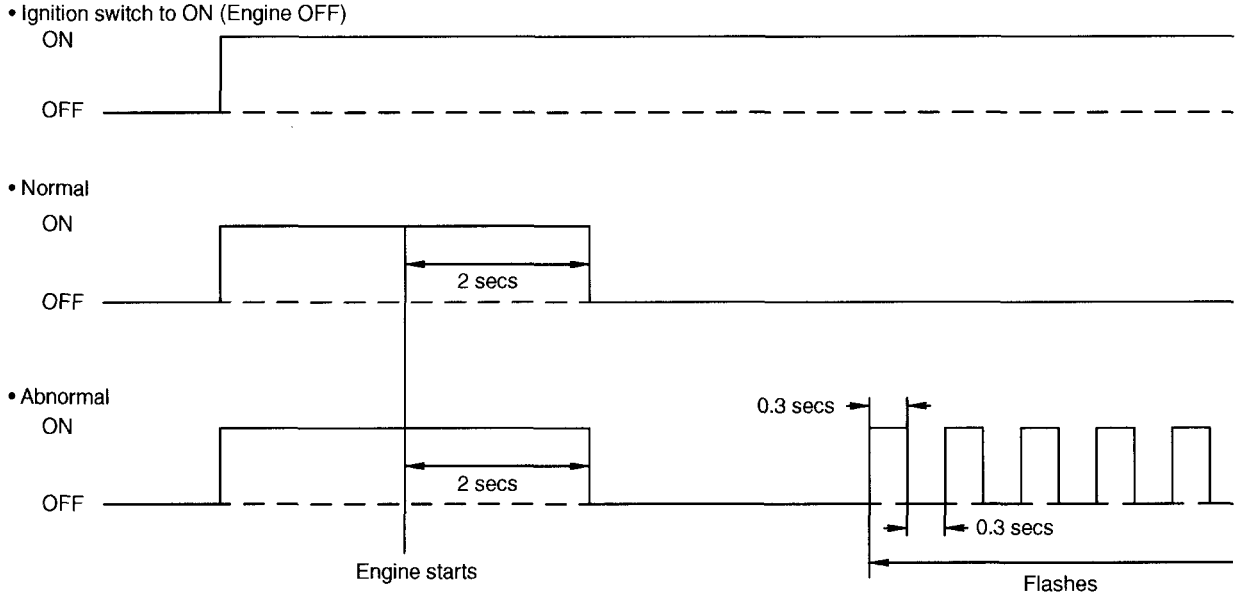
Rear vehicle speed sensor	Transfer duty solenoid	Low clutch timing solenoid
Front vehicle speed sensor	ATF temperature sensor	Torque converter turbine speed sensor
Throttle position sensor	Engine speed signal circuit	–
Shift solenoid 1	Line pressure duty solenoid	–
Shift solenoid 2	AT load signal circuit	–
2-4 brake timing solenoid	Torque control signal circuit	–
Lock-up duty solenoid	2-4 brake duty solenoid	–

If a fault has been detected, the system tells the fault by causing the AT OIL TEMP warning light to operate as follows:

- Repeated flashing at 4 Hz frequency ...Errors such as battery trouble
- Repeated flashing at 2 Hz frequency ...No faults in the system
- Flashing at different intervals and frequencies ...Diagnostic trouble codes of corresponding faults
- Continued illumination of light ...Fault in inhibitor switch, idle switch, or wiring

B: OPERATION OF AT OIL TEMP WARNING LIGHT

On starting the engine, the AT OIL TEMP warning light illuminates and then goes out as shown in the "Normal" diagram below.
If any problem exists, the light continues flashing as shown in the "Abnormal" diagram below.



S3H0227B

C: DIAGNOSTIC TROUBLE CODE (DTC)

DTC	Faulty component
11	Engine speed signal circuit
23	Mass air flow signal circuit
27	ATF temperature sensor
31	Throttle position sensor
33	Front vehicle speed sensor
36	Torque converter turbine speed sensor
38	Torque control signal circuit
45	Intake manifold pressure signal circuit
71	Shift solenoid 1
72	Shift solenoid 2
73	Low clutch timing solenoid
74	2-4 brake timing solenoid
75	Line pressure duty solenoid
76	2-4 brake duty solenoid
77	Lock-up duty solenoid
79	Transfer duty solenoid
93	Rear vehicle speed sensor

D: SELECT MONITOR

Various sensor and switch data as well as diagnostic trouble codes for faults that are currently present and occurred in the past can be monitored by connecting the select monitor to the select monitor terminal located under the instrument panel.

4. Fail-safe Function

The fail-safe control function ensures minimum level of driveability even if a fault should occur in the vehicle speed sensors, throttle position sensor, inhibitor switch, or any of the solenoids.

- FRONT AND REAR VEHICLE SPEED SENSORS

A dual speed-sensing system is used. The speed signal is taken from the transmission (by the output shaft speed sensor). Even if one sensor system fails, the vehicle can be controlled normally with the other normally operating sensor system.

If both the front and rear vehicle speed sensors become faulty, the vehicle is made to operate only in the 1st and 3rd speeds.

- THROTTLE POSITION SENSOR

If the throttle position sensor becomes faulty, the throttle opening is fixed at the predetermined angle.

- INHIBITOR SWITCH

If the TCM receives different signals simultaneously from a faulty inhibitor switch, it selects a range in the following priority:

D > N (P) > R > 3 > 2 > 1 >

- SHIFT SOLENOID 1 AND 2

If a fault occurs in either of solenoids 1 and 2, both the solenoids are de-energized, and the gear is held in the 3rd.

If both the solenoids should fail, the TCM invariably selects and keeps the 3rd gear.

- LINE PRESSURE DUTY SOLENOID

If the line pressure duty solenoid fails, the solenoid is de-energized and the line pressure is raised to the maximum to enable the vehicle to operate.

In this condition, the usable gears are limited to the 1st and 3rd.

- LOCK-UP DUTY SOLENOID

If the lock-up duty solenoid fails, the solenoid is de-energized and the lock-up clutch is disengaged.

- TRANSFER DUTY SOLENOID

When the transfer duty solenoid becomes faulty, it is de-energized. This causes maximum oil pressure to be applied to the transfer clutch so that the power is always transmitted to the rear axle (direct-coupled AWD condition).

- 2-4 BRAKE DUTY SOLENOID

If a fault occurs in the 2-4 brake duty solenoid, the solenoid is de-energized and the usable gears are limited to the 1st and 3rd.

- LOW-CLUTCH TIMING SOLENOID

If a fault occurs in the low clutch timing solenoid, the solenoid is de-energized and the usable gears are limited to the 1st and 3rd.

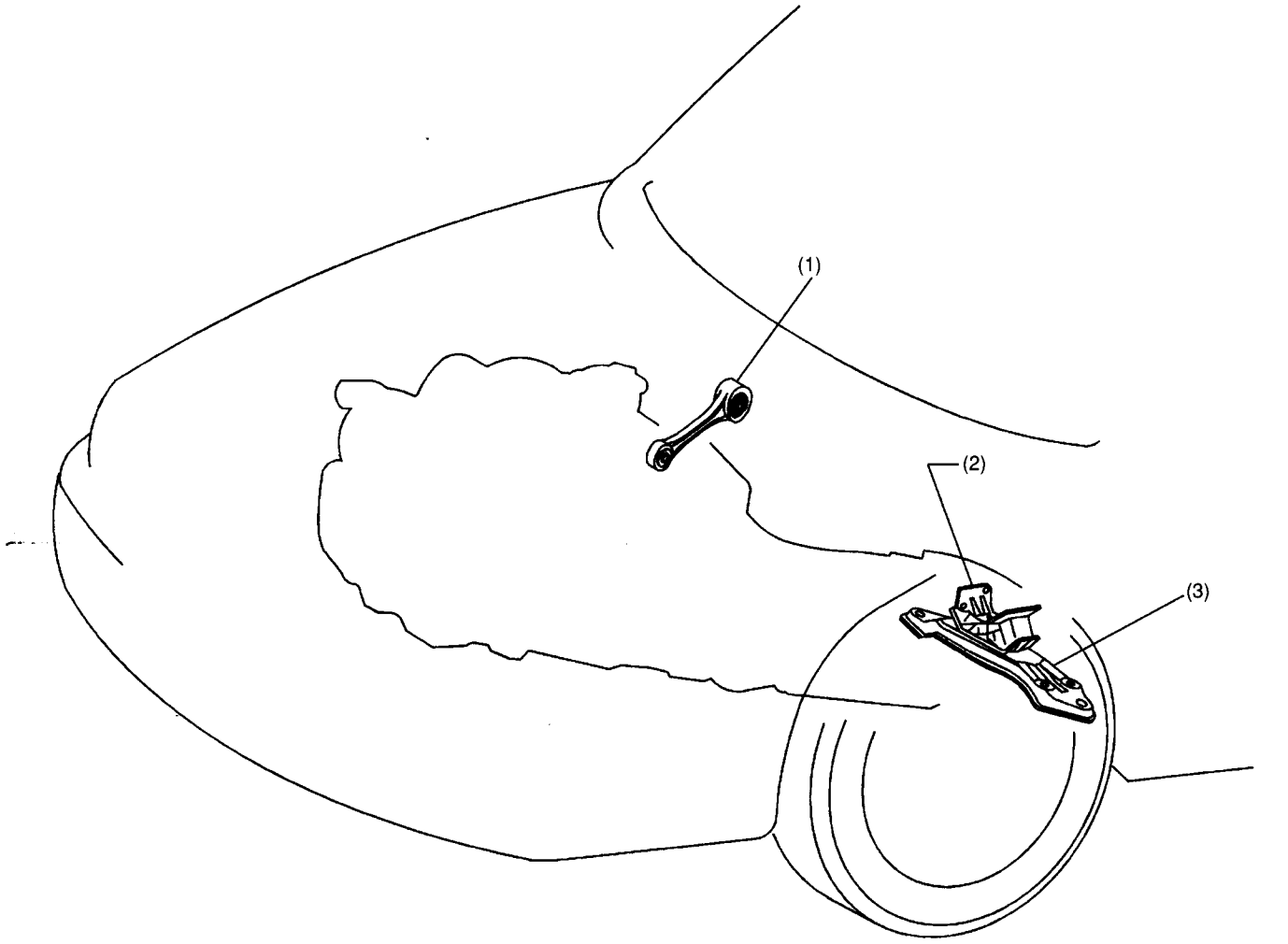
- 2-4 BRAKE TIMING SOLENOID

If a fault occurs in the 2-4 brake timing solenoid, the solenoid is de-energized and the usable gears are limited to the 1st and 3rd.

- TORQUE CONVERTOR TURBINE SPEED SENSOR

If a fault occurs in the torque converter turbine speed sensor, the usable gears are limited to the 1st and 3rd.

5. Transmission Mounting



B2H3145B

(1) Pitching stopper
(2) Cushion rubber
(3) Cross member

MANUAL TRANSMISSION AND DIFFERENTIAL MT

Page

1. General 2
2. Reverse Check Mechanism 4
3. Center Differential 10
4. Transmission Mounting 15

1. General

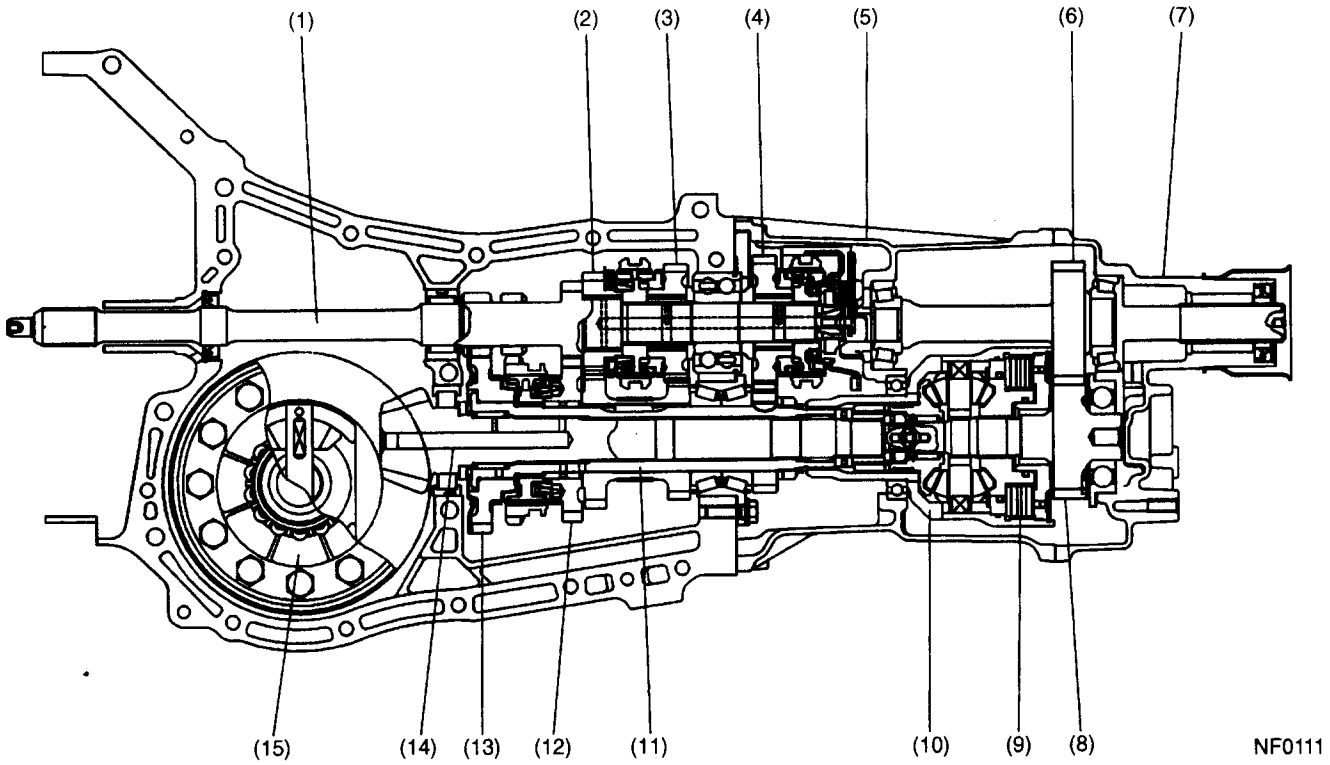
The Impreza's single-range manual transmission is of a full-time all-wheel-drive design integrating a transmission assembly, front differential, and transfer gear assembly with center differential into a single unit. The transmission creates five forward speeds and one reverse using the corresponding gears all provided with inertia lock-key type synchronizers.

The transmission and front differential are housed in an aluminum case which is split into right and left halves and constitutes also a clutch housing. Located at the rear and joined each other are the transfer case and extension case which house the transfer gears and center differential as well as part of the transmission assembly.

The major features of the transmission are as follows:

- The forward speed gears are helical gears featuring high tooth face strength, large tooth contact areas, and quiet operation.
- Reversing rotation is achieved by making a slidable reverse idler gear engage with both the reverse drive gear on the mainshaft and the reverse driven gear integral with the 1st-2nd synchronizer hub on the drive pinion shaft.

The center differential compensates for the difference in front and rear axle speeds. It consists of a bevel gear set and a viscous coupling located at its rear end which are housed in a single case. The center differential, together with a pair of transfer gears, transmits the power from the transmission to the drive pinion shaft (front wheel drive shaft) and the rear drive shaft. The viscous coupling functions as a differential-action-control element.



(1) Mainshaft
(2) 3rd drive gear
(3) 4th drive gear
(4) 5th drive gear
(5) Transfer case
(6) Transfer driven gear
(7) Extension case
(8) Transfer drive gear
(9) Viscous coupling
(10) Center differential assembly
(11) Driven shaft (countershaft)
(12) 2nd driven gear
(13) 1st driven gear
(14) Drive pinion shaft
(15) Front differential assembly

2. Reverse Check Mechanism

Located in the transfer case, the reverse check mechanism prevents a direct 5th-to-reverse shift by using a selector arm and cam combination which allows the gear to be shifted into the reverse only after it has been returned once into the neutral.

A: CONSTRUCTION

The construction of the reverse check mechanism is as shown in the drawing on the opposing page.

The reverse check sleeve is bolted to the transfer case and houses the mechanism's main components.

The reverse accent shaft is slidable inside the reverse check sleeve and its smaller-diameter end is fitted with the reverse check cam. The cam is rotatable and axially movable on the shaft but its leftward movement is restricted by a step formed on the sleeve's inner wall.

The reverse accent shaft has hollows in both ends. In the left end hollow are the 1st return spring and its cap and in the right end hollow is the reverse return spring which pushes the shaft leftward.

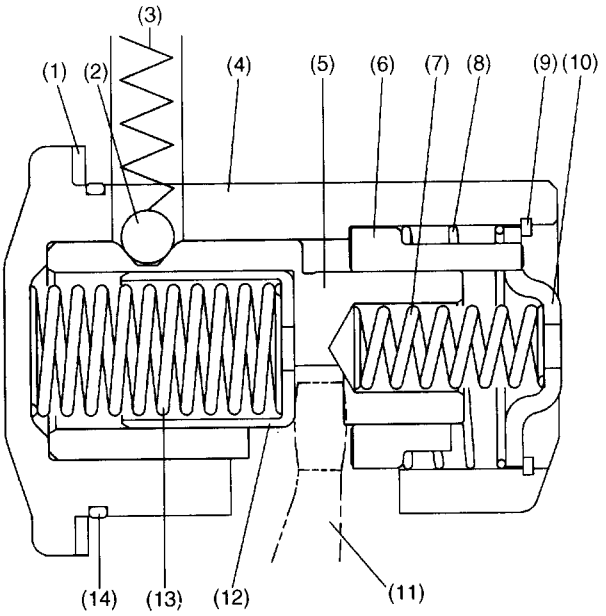
Around the check cam is the reverse check spring whose left end applies simultaneous leftward and rotational forces to the cam.

Both the reverse check spring and reverse return spring are retained at their right ends by the reverse check plate which is held in place by the snap ring.

The reverse accent shaft has a V-groove in which the detent ball is pressed by the reverse accent spring fitted through the hole in the reverse check sleeve.

The reverse check sleeve and reverse accent shaft have a slot and a notch at their bottoms, respectively, and the selector arm is inserted in the notch through the slot.

REVERSE CHECK MECHANISM



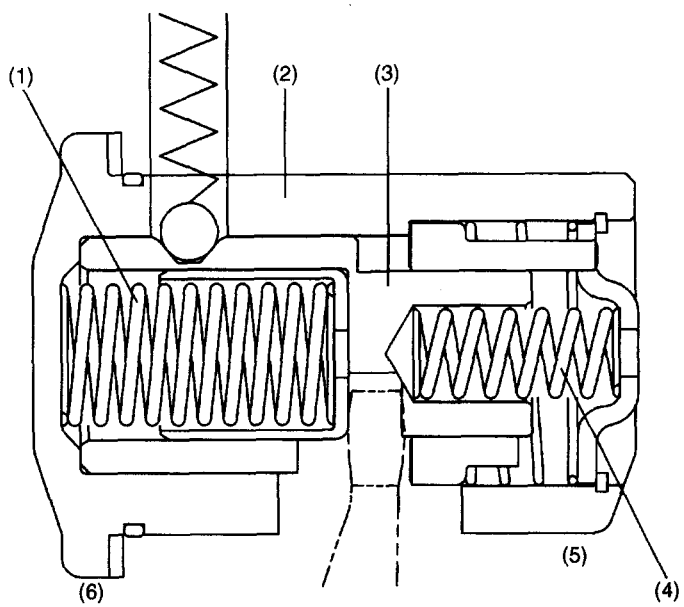
NF0114

(1) Select adjust shim
(2) Detent ball
(3) Reverse accent spring
(4) Reverse check sleeve
(5) Reverse accent shaft
(6) Reverse check cam
(7) Reverse return spring
(8) Reverse check spring
(9) Snap ring
(10) Reverse check plate
(11) Selector arm
(12) Spring cap
(13) 1st return spring
(14) O-ring

B: OPERATION

The drawing below shows the state of the reverse check mechanism when the selector arm is in the neutral position. The 1st and 2nd gears will be selected if the selector arm is moved leftward from this point to a stop and then turned in either way. A rightward movement of the arm to a stop will enable selection of the 5th and reverse gears. In the neutral position, the selector arm receives a rightward force (force toward the 5th and reverse gear side) from the 1st return spring and a leftward force (force toward the 1st and 2nd gear side) from the reverse return spring to stay in that position.

The following explanation describes how the selector arm and reverse check mechanism operate when the driver selects the 5th gear and then selects the reverse gear.

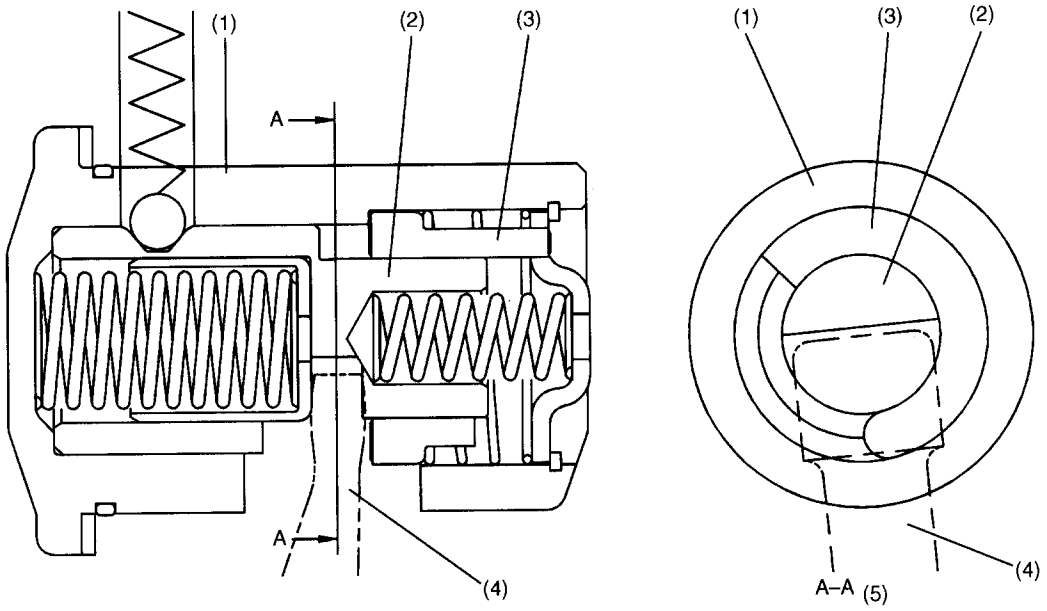


NF0115

(1) 1st return spring
(2) Reverse check sleeve
(3) Reverse accent shaft
(4) Reverse return spring
(5) 5th and reverse gear side
(6) 1st and 2nd gear side

1. WHEN SELECTOR ARM IS MOVED TOWARD 5TH AND REVERSE GEAR SIDE

The selector arm moves rightward while pushing both the reverse accent shaft and reverse check cam simultaneously.

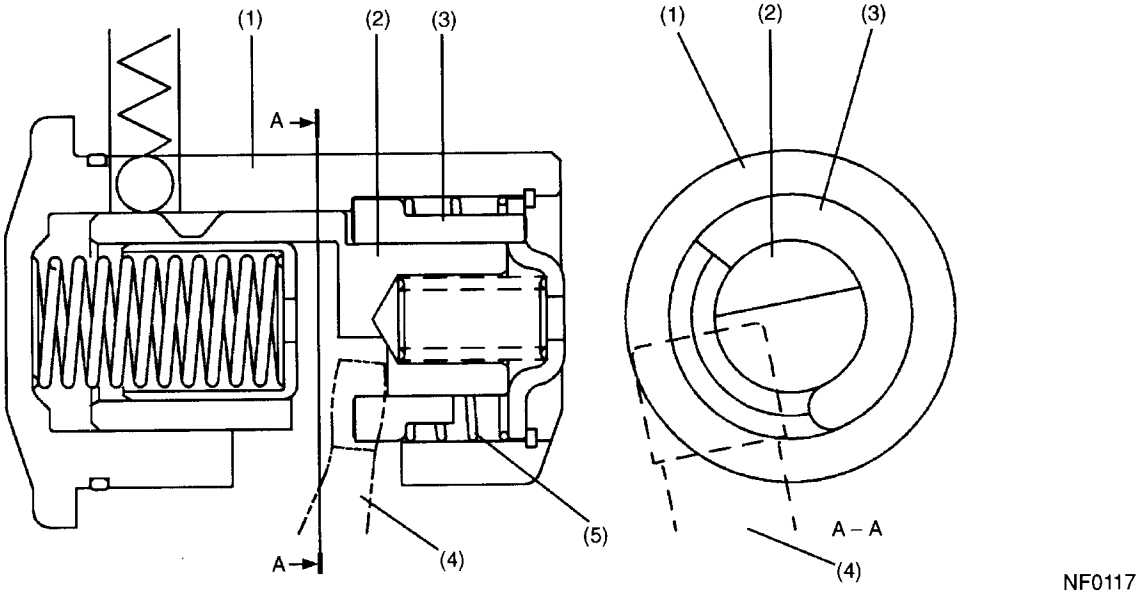


NF0116

(1) Reverse check sleeve
(2) Reverse accent shaft
(3) Reverse check cam
(4) Selector arm
(5) Neutral position

2. WHEN SHIFT IS MADE TO 5TH GEAR

The selector arm is turned toward the 5th gear selection direction. When the arm clears the edge of the reverse check cam as it turns, the cam becomes free of the selector arm's pressure and returns to its original position by the force of the reverse check spring.



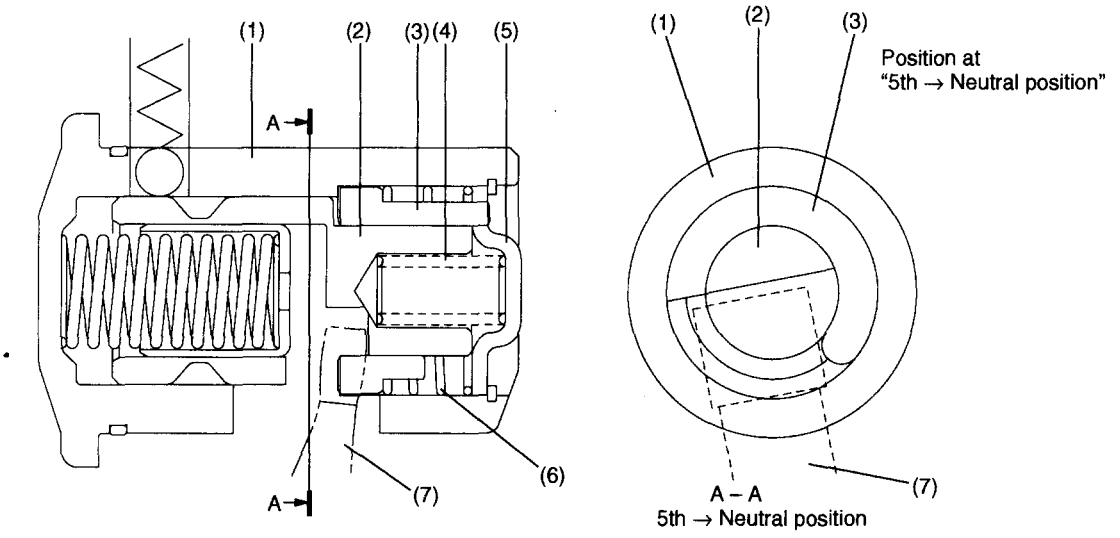
NF0117

(1) Reverse check sleeve
(2) Reverse accent shaft
(3) Reverse check cam
(4) Selector arm
(5) Reverse check spring

3. WHEN A SHIFT FROM 5TH TO REVERSE IS ATTEMPTED

The selector arm turns toward the reverse gear while pushing the reverse accent shaft rightward and the reverse check cam counterclockwise (as viewed in the direction of arrows A).

The reverse check cam, however, stops to rotate at a point where its stopper hits against the reverse check plate (this point corresponds to the neutral position in terms of the angle) and prevents the selector arm from moving toward the reverse gear selection direction. The selector arm is then axially pushed to the neutral position by the reverse accent shaft which is given a leftward force by the reverse return spring.

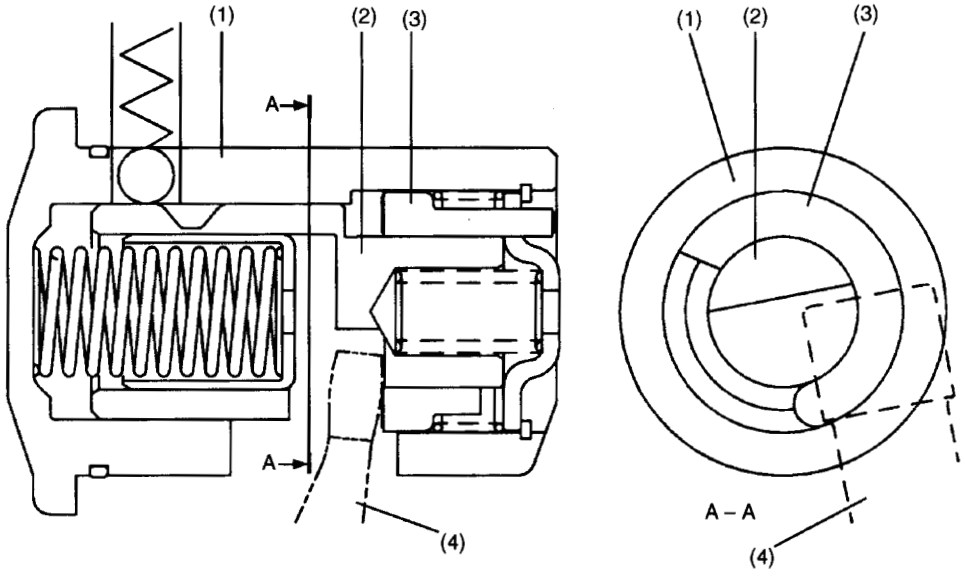


NF0118

(1) Reverse check sleeve
(2) Reverse accent shaft
(3) Reverse check cam
(4) Reverse return spring
(5) Reverse check plate
(6) Snap ring
(7) Selector arm

4. WHEN A SHIFT TO REVERSE IS MADE AFTER RETURN OF SELECTOR ARM TO NEUTRAL

As the ends of the reverse accent shaft and the reverse check cam are on the same plane, the selector arm now can turn toward the reverse gear selection direction after pushing leftward both the shaft and cam simultaneously.



NF0119

(1) Reverse check sleeve
(2) Reverse accent shaft
(3) Reverse check cam
(4) Selector arm

3. Center Differential

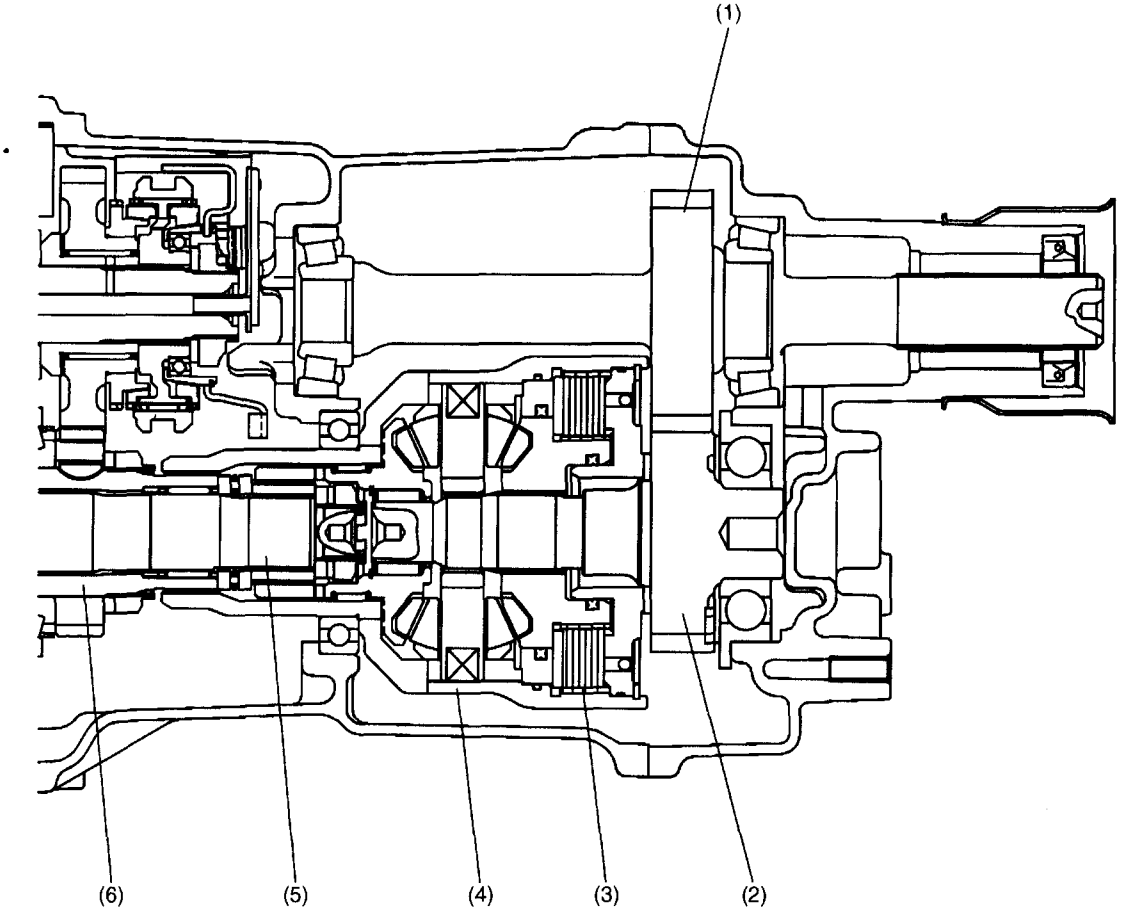
A: CONSTRUCTION

The center differential consists of a set of bevel gears and a viscous coupling.

The center differential has the following two functions: distributing the engine torque to the front and rear wheel drive shafts and absorbing the difference in rotating speed between the front and rear wheels.

The engine torque enters the center differential case from the transmission's driven shaft. The torque is then distributed through the bevel gear set directly to the drive pinion shaft and via the transfer drive and driven gears to the rear drive shaft.

The viscous coupling limits the bevel gear set's differential action when either front or rear wheels spin so that adequate torques are transmitted to the front and rear wheels and proper traction is obtained.

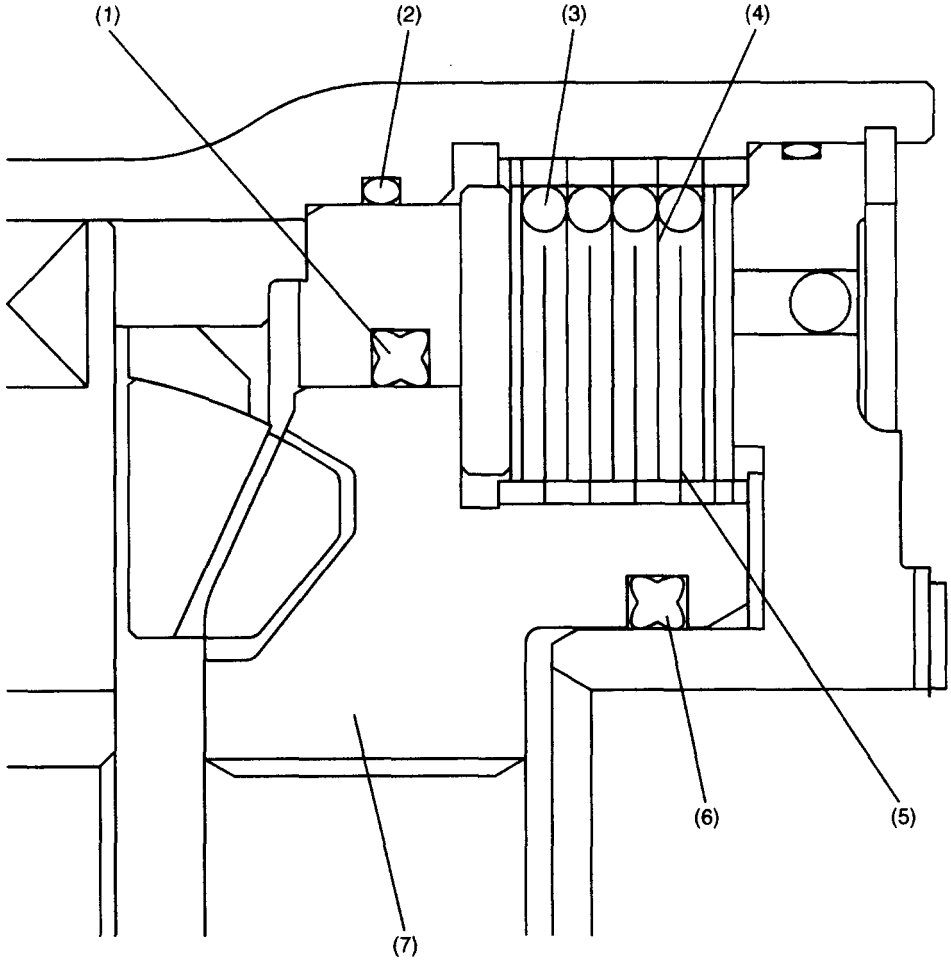


NF0120

(1) Transfer driven gear
(2) Transfer drive gear
(3) Viscous coupling
(4) Center differential assembly (with viscous coupling)
(5) Drive pinion shaft
(6) Driven shaft

B: MECHANISM OF VISCOUS COUPLING

The viscous coupling consists of a number of alternately arranged inner and outer plates and air-and-silicone oil mixture filled into a sealed space that is formed by the center differential case and the rear side gear of the differential gear set. The inner plates have their inner perimeters splined to the side gear and the outer plates have their outer perimeters splined to the center differential case. The outer plates are held apart by spacer rings. There are no spacer rings between the inner rings, so the inner rings are movable slightly in axial directions. X-section rings are used to prevent leakage of silicone oil which would otherwise occur if the oil is pressurized due to large difference in front and rear axle speeds.



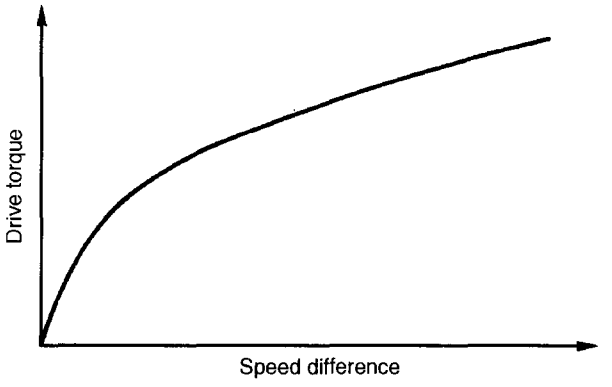
NF0121

(1) X-section ring
(2) O-ring
(3) Spacer ring
(4) Outer plate
(5) Inner plate
(6) X-section ring
(7) Side gear (rear)

1. TORQUE CHARACTERISTICS

When a speed difference occurs between the center differential case and the rear side gear, a shear force is generated in the silicone oil placed between the outer and inner plates. The torque is then transmitted by the silicone oil between the center differential case and the rear side gear.

The greater the speed difference, the greater the shear force generated in the silicone oil. The relationship between the torque transmission and the speed difference is shown in the figure below. As can be seen from the figure, the smaller the speed difference, the smaller the torque transmission and the differential action.



NF0122

2. HUMP PHENOMENON

Silicone oil is heated and expanded as differential action continues. This causes the pressure of air inside the viscous coupling to increase and the pressure of oil between plates to decrease. As a result, the inner and outer plates are pushed together. This direct plate-to-plate contact causes a non-viscous operation to occur, and this phenomenon is called "hump".

The hump eliminates the rotating speed difference between the center differential case and the rear side gear (or locks the differential), so soon after it has occurred, the internal pressure and temperature drop. The viscous coupling then returns to the normal shear torque transmitting operation. (The hump phenomenon does not occur under normal operating conditions.)

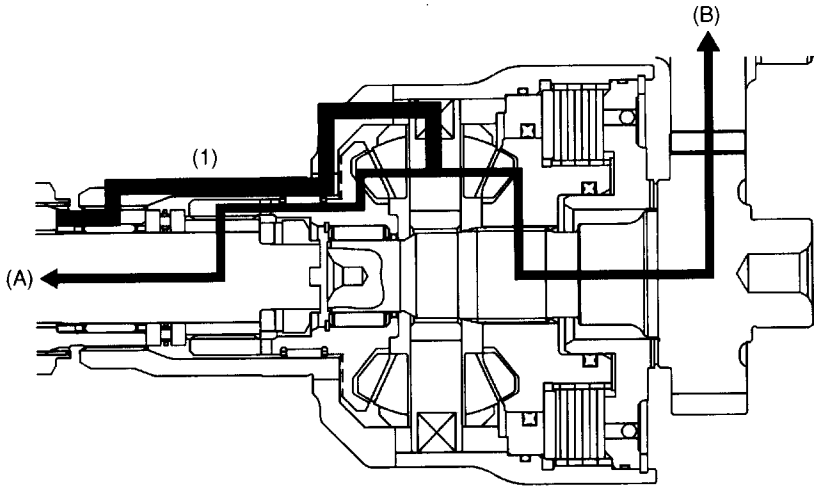
C: FUNCTION

When there is no speed difference between the front and rear wheels, the center differential delivers the engine torque to the front and rear wheels at a ratio of 50:50.

When a rotating speed difference occurs between the front and rear wheels, the center differential operates to absorb it in a controlled way by the function of the viscous coupling.

1. DURING NORMAL DRIVING

During straight-line driving on a flat road at a constant speed, all the four wheels rotate at the same speed. The center differential delivers engine torque evenly to the front and rear drive axles. The viscous coupling does not generate shear torque because there is no relative movements between the inner and outer plates.



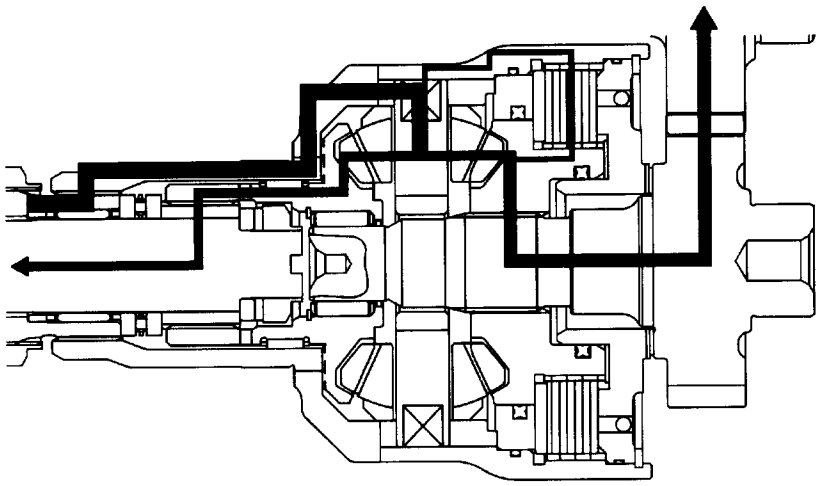
NF0123

(1) Engine torque (A) To front differential (B) To rear differential

2. DURING TURNS AT LOW SPEEDS

During turns at low speeds, rotating speed difference occurs between the front and rear wheels, as well as between the left and right wheels. More particularly, the front wheels rotate faster than the rear wheels. The center differential then acts to absorb the speed difference to enable smooth driving.

Although the speed difference is small under this condition, operation of the viscous coupling causes more torque to be transmitted to the rear than to the front.

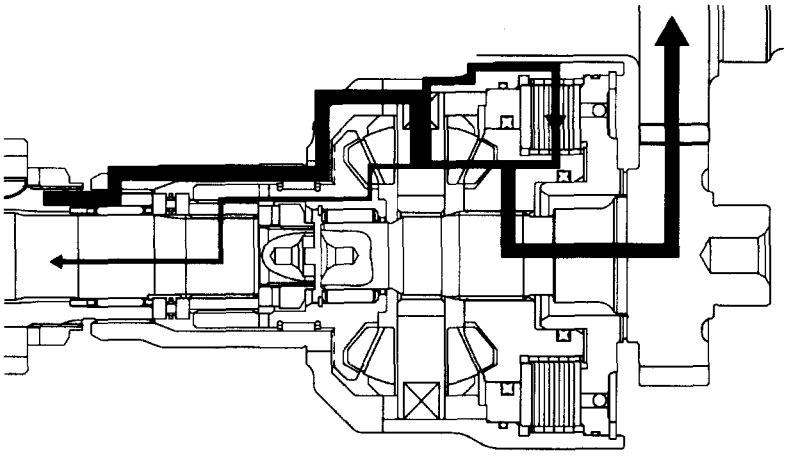


NF0124

3. DRIVING ON ROUGH OR SLIPPERY ROADS

• When front wheels are on a slippery surface

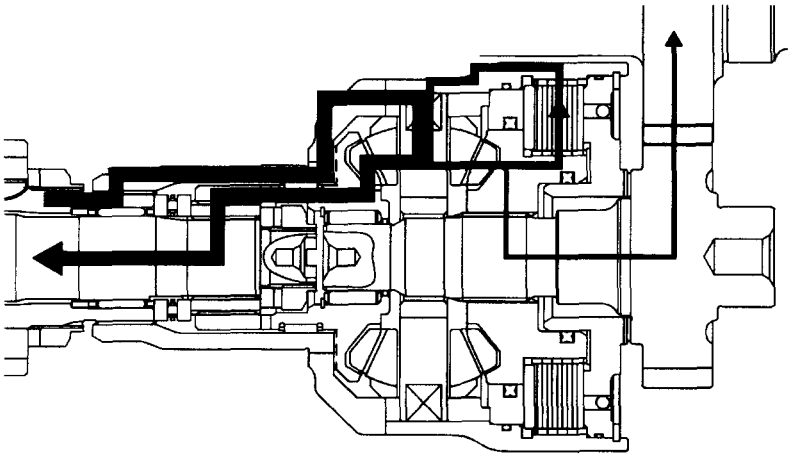
When the front wheels begin to spin, the resulting speed difference between the front and rear drive shafts causes the viscous coupling to generate significant amount of shear torque. As a result, the torque distributed to the rear wheels becomes much larger than that distributed to the spinning front wheels. The traction and driving stability are thus ensured on a rough or slippery road.



NF0125

• When rear wheels are on a slippery surface

When the vehicle is accelerated quickly from a standing start with the rear wheels on a slippery surface, the distribution of the vehicle weight on the front and rear wheels changes and the rear wheels start spinning. Due to the resulting speed difference between the front and rear drive shafts, the viscous coupling generates a significant amount of shear torque, now in the direction opposite to that generated when the front wheels are on a slippery surface. As a result, the torque distributed to the front wheels becomes much larger than that distributed to the rear wheels.

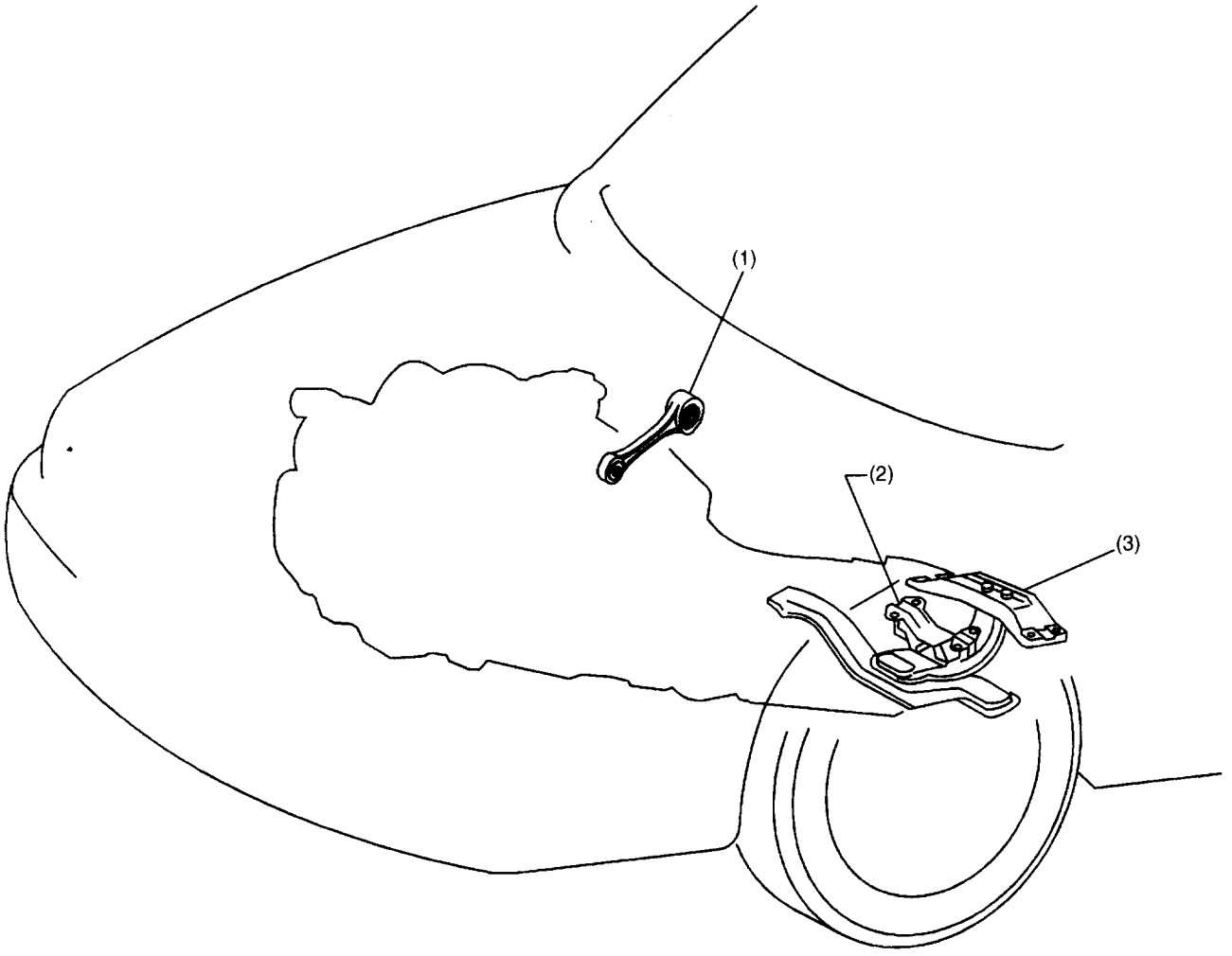


NF0126

4. Transmission Mounting

A: GENERAL

The pitching stopper is made of resin. It is a non-adjusting type and has a slot on the transmission end as a bolt hole.



NF0128

(1) Pitching stopper
(2) Cushion rubber
(3) Cross member

MEMO

CLUTCH CL

Page

1. Outline 2
2. Operation 3
3. Cross Sectional View 4
4. Flywheel 6
5. Hydraulic Clutch Pedal System 7

1. Outline

A: NON-TURBO MODEL

• The clutch control operates the release fork using the hydraulic pressure generated in the master cylinder when the pedal is depressed. This ensures smooth and reliable clutch control with minimum frictional resistance.

• The clutch itself is a push type clutch. When the clutch pedal is depressed, the self-aligning release bearing is caused to slide on a guide pressing the center of the diaphragm spring. The warped diaphragm spring disengages the pressure plate from the clutch disc.
The clutch using a diaphragm spring has the advantage of little variation in push load even when the clutch disc facing is worn.
The diaphragm spring is located inside the clutch cover.

• The clutch has a clutch disc between the flywheel and the pressure plate.

• Inside the clutch cover, there is a diaphragm spring and a pressure plate combined with each other by means of strap plates, which also serve to prevent the pressure plate from turning.

B: TURBO MODEL

• The turbo model adopts a hydraulic control which is appropriate for increased clutch load.

• The clutch control system operates the release fork using the hydraulic pressure that is generated in the master cylinder when the clutch pedal is depressed.

• The clutch itself is a pull type clutch. When the clutch pedal is depressed, the self-aligning release bearing is caused to slide on a guide pulling the center of the diaphragm spring. The warped diaphragm spring disengages the pressure plate from the clutch disc.
The clutch using a diaphragm spring has the advantage of little variation in push load even when the clutch disc facing is worn.
The diaphragm spring is located inside the clutch cover.

• The clutch has a clutch disc between the flywheel and the pressure plate.

• Inside the clutch cover, there is a diaphragm spring and a pressure plate combined with each other by means of strap plates, which also serve to prevent the pressure plate from turning with respect to the clutch cover.

2. Operation

A: NON-TURBO MODEL

Applying foot pressure to the clutch pedal moves the release lever. This causes the release bearing to slide on the guide, pressing the center of the diaphragm spring. The spring is warped and the force having pressed the pressure plate is lost. As a result, the flywheel, clutch disc and pressure plate are disengaged, disconnecting the driving power.

The push type clutch has the point of action at the tips of the diaphragm spring fingers, through which the pressure plate is pressed to the clutch disc. When the power transmission is to be interrupted, the diaphragm spring is forced to warp using the pivots established on the inward side of the spring finger tips (on the principle of the lever and fulcrum) to disengage the pressure plate from the clutch disc.

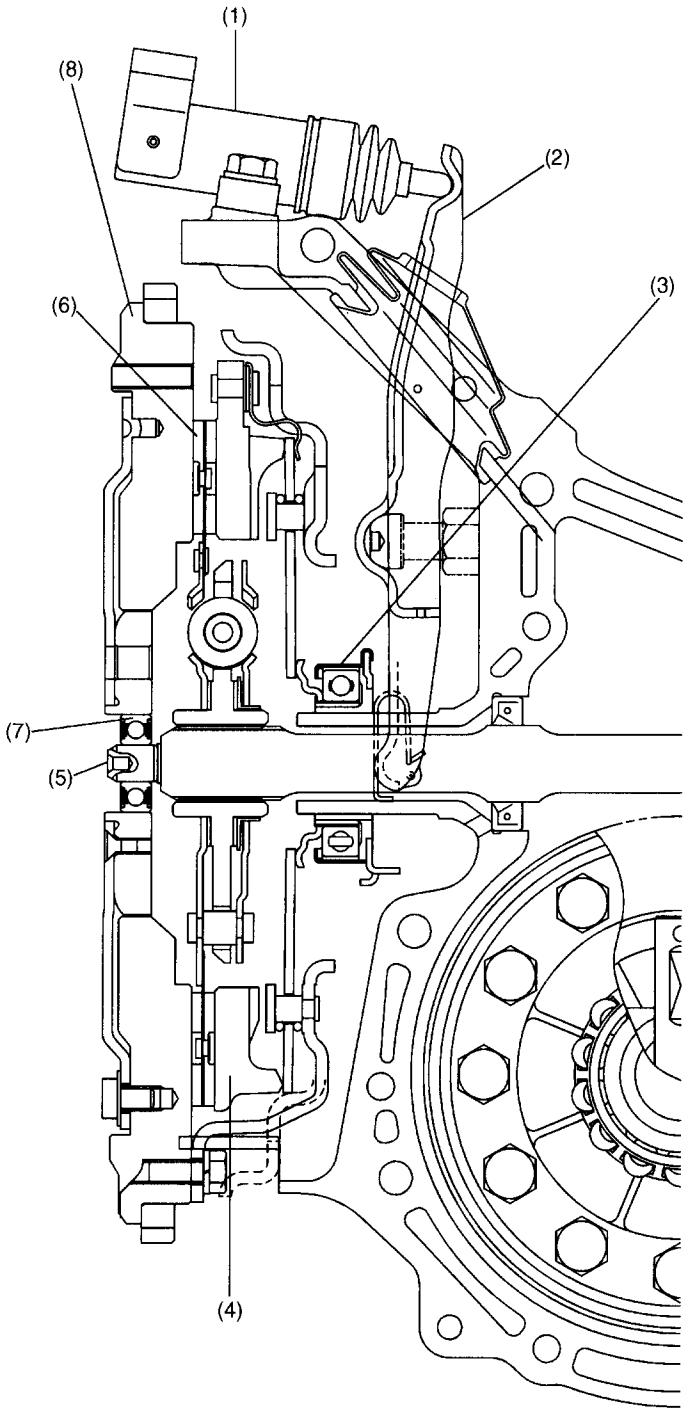
B: TURBO MODEL

Applying foot pressure to the clutch pedal moves the release lever. This causes the release bearing to slide on the guide, pulling the center of the diaphragm spring. The spring is warped and the force having pressed the pressure plate is lost. As a result, the flywheel, clutch disc and pressure plate are disengaged, disconnecting the driving power.

In the pull type clutch, the diaphragm spring has the point of action located inward from the tip, through which the pressure plate is pressed against the clutch disc. When the power transmission is to be interrupted, the diaphragm spring is forced to pivot on the tip and warp away from the pressure plate (on the principle of lever and fulcrum).

3. Cross Sectional View

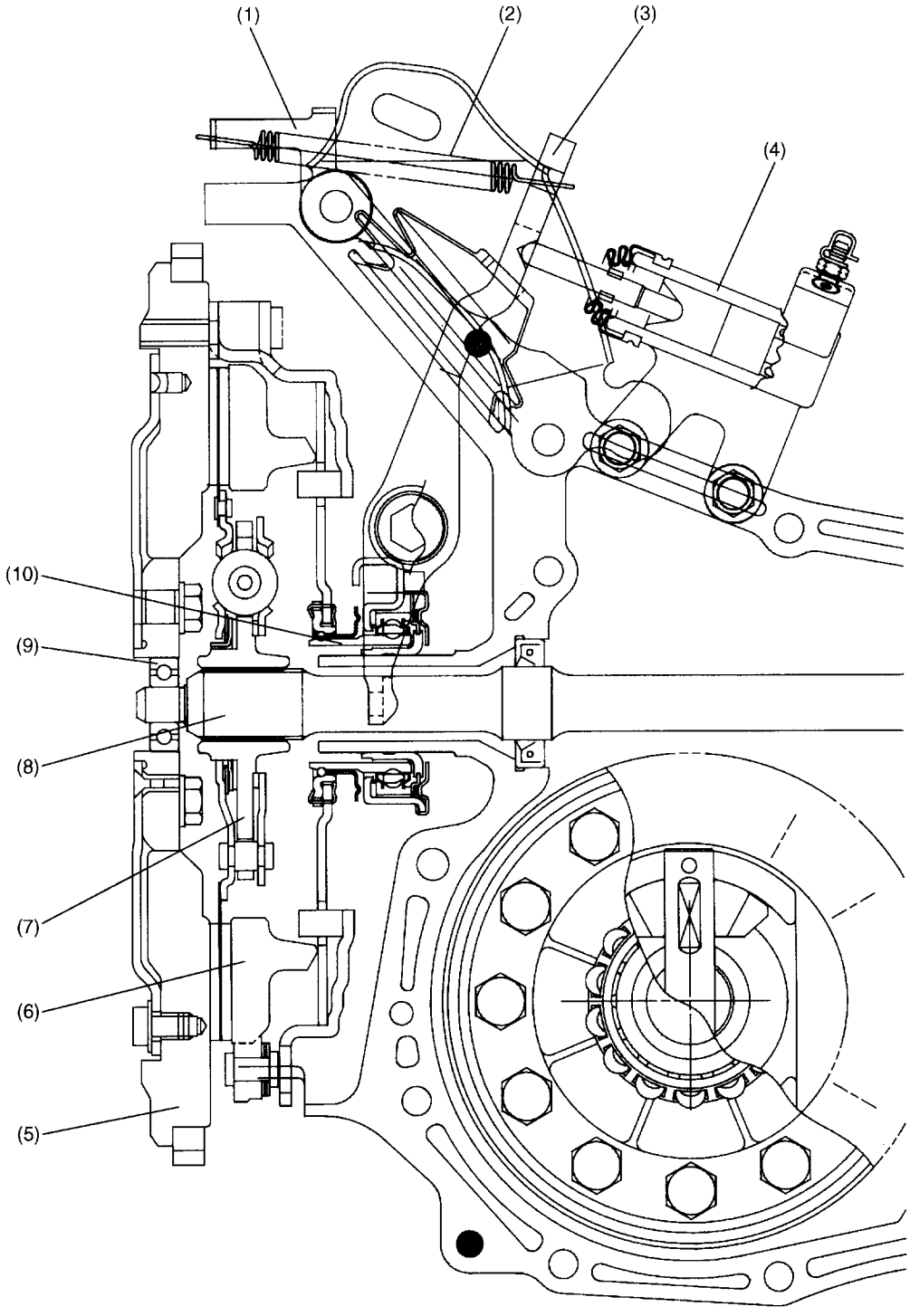
A: NON-TURBO MODEL



NF0451

(1) Operating cylinder
(2) Release lever
(3) Release bearing
(4) Clutch cover
(5) Transmission main shaft
(6) Clutch disc
(7) Ball bearing
(8) Flywheel

B: TURBO MODEL



NF0211

(1) Spring bracket
(2) Spring
(3) Release lever
(4) Operating cylinder
(5) Flywheel
(6) Clutch cover
(7) Clutch disc
(8) Transmission main shaft
(9) Ball bearing
(10) Release bearing

4. Flywheel

A: OUTLINE

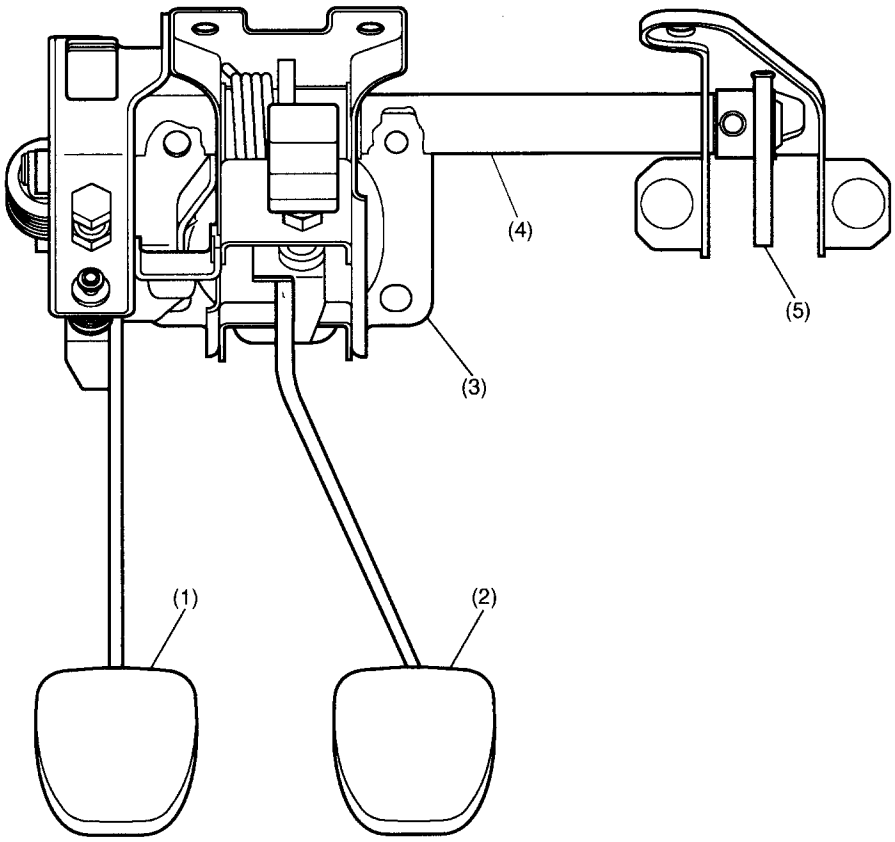
The flywheel is of a flexible type, consisting of a drive plate, reinforcement and mass flywheel.

This type of flywheel is characterized by less vibration and less noise, since it transmits the engine power from the crankshaft to the clutch disc through the drive plate and mass flywheel.

5. Hydraulic Clutch Pedal System

A: CONSTRUCTION

- The hydraulic clutch pedal is connected to the master cylinder via a rod.
- The clutch pedal and brake pedal are mounted on the same bracket.
- The clutch pedal has a mechanism that reduces the initial force required to depress the clutch pedal.



NF0213

(1) Clutch pedal
(2) Brake pedal
(3) Brake and clutch pedal bracket
(4) Rod
(5) Lever

B: OPERATION

The clutch pedal used with the hydraulic clutch control system is similar to that for a mechanical clutch control system except that it has a spring that returns it to the original position.

MEMO

FRONT SUSPENSION FS

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1. Front Suspension 2

1. Front Suspension

A: OUTLINE

The front suspension is a strut-type independent suspension, with cylindrical double-acting, low-pressure-gas-filled dampers and coil springs. The top of each strut assembly is attached to the body through a rubber cushion. Used in combination with other rubber cushions, this rubber cushion effectively insulate vibration and shock and thus improves ride comfort. This type also maintains a wide distance between the upper and lower supporting points and makes adjustment of the caster unnecessary.

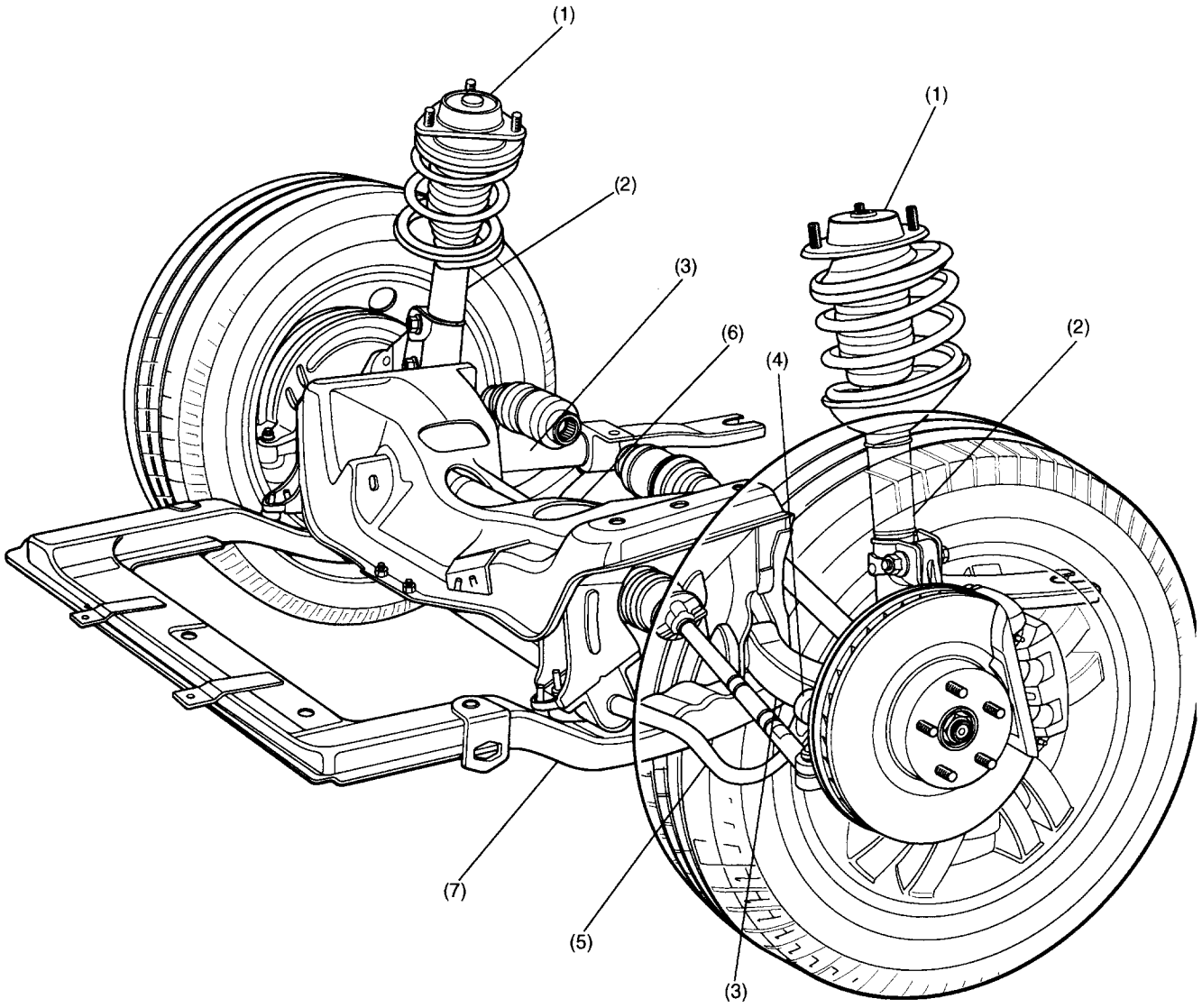
The transverse link is an "L" shaped arm design to increase steering stability and reduce road noise. The transverse link has a maintenance-free ball joint fitted by a castle nut at its outer end. The front of the link's inner end is fitted to the front crossmember through a rubber cushion and the rear of the inner end is bolted to the vehicle body through a fluid-filled bushing.

The front crossmember is bolted to the vehicle body.

The stabilizer is attached to the front crossmember through rubber cushions and its right and left ends are connected to the stabilizer links through rubber bushings.

The lower end of the stabilizer link is connected to the transverse link through rubber bushings.

A camber angle adjustment mechanism, which uses eccentric bolts, is provided at the joint of the damper strut and axle housing.



NF0129

(1) Strut mount
(2) Strut
(3) Transverse link
(4) Stabilizer link
(5) Stabilizer
(6) Front crossmember
(7) Sub frame

B: CONSTRUCTION

1. TRANSVERSE LINK

All the Sedans have larger tread than the previous model for enhanced handling stability.

2. STRUTS

- All models use struts with low-pressure-gas-filled dampers that feature stable shock attenuating performance. They improve ride quality and reduce vibration and noise.
- The coil spring of each strut is arranged in an "S" form so that friction generated in the strut is minimized and riding comfort is improved.

REAR SUSPENSION RS

Page

1. Rear Suspension 2

1. Rear Suspension

A: OUTLINE

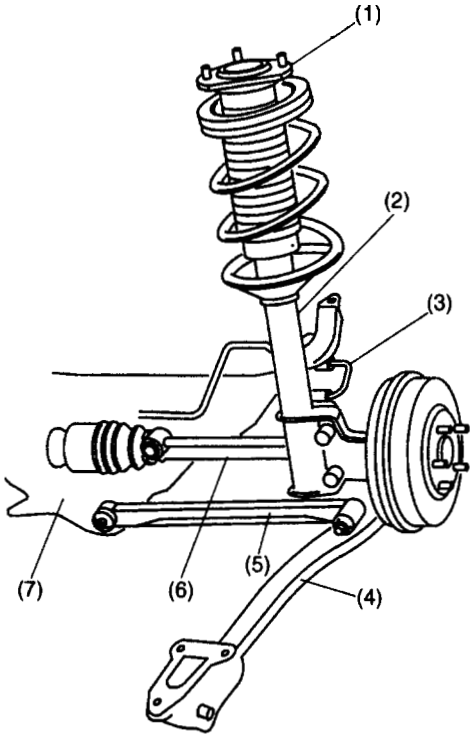
The rear suspension is an independent, dual link strut type. The suspension on each side consists of two parallelly arranged lateral links, a trailing link, and a strut assembly. The strut assembly consists of a cylindrical double-acting low pressure gas- and oil-filled damper and coil spring.

The respective component parts of this suspension are optimally designed to act in response to vertical, lateral and longitudinal loads transmitted from the tires. Thus, riding comfort and steering stability are substantially enhanced.

- Longitudinal loads act on each trailing link.
- Vertical loads act on each coil spring, strut and rubber mount (which is located on the top of each strut).
- Lateral loads act on the two lateral links on each side.

The crossmember is installed on the body frame via bushings. (AWD model)

The stabilizer that extends to the rear of the crossmember, is installed on the body frame via a bracket and to the wheel side end of each rear lateral link via a stabilizer link.



NF0094

(1) Strut mount
(2) Strut
(3) Stabilizer
(4) Trailing link
(5) Front lateral link
(6) Rear lateral link
(7) Rear crossmember

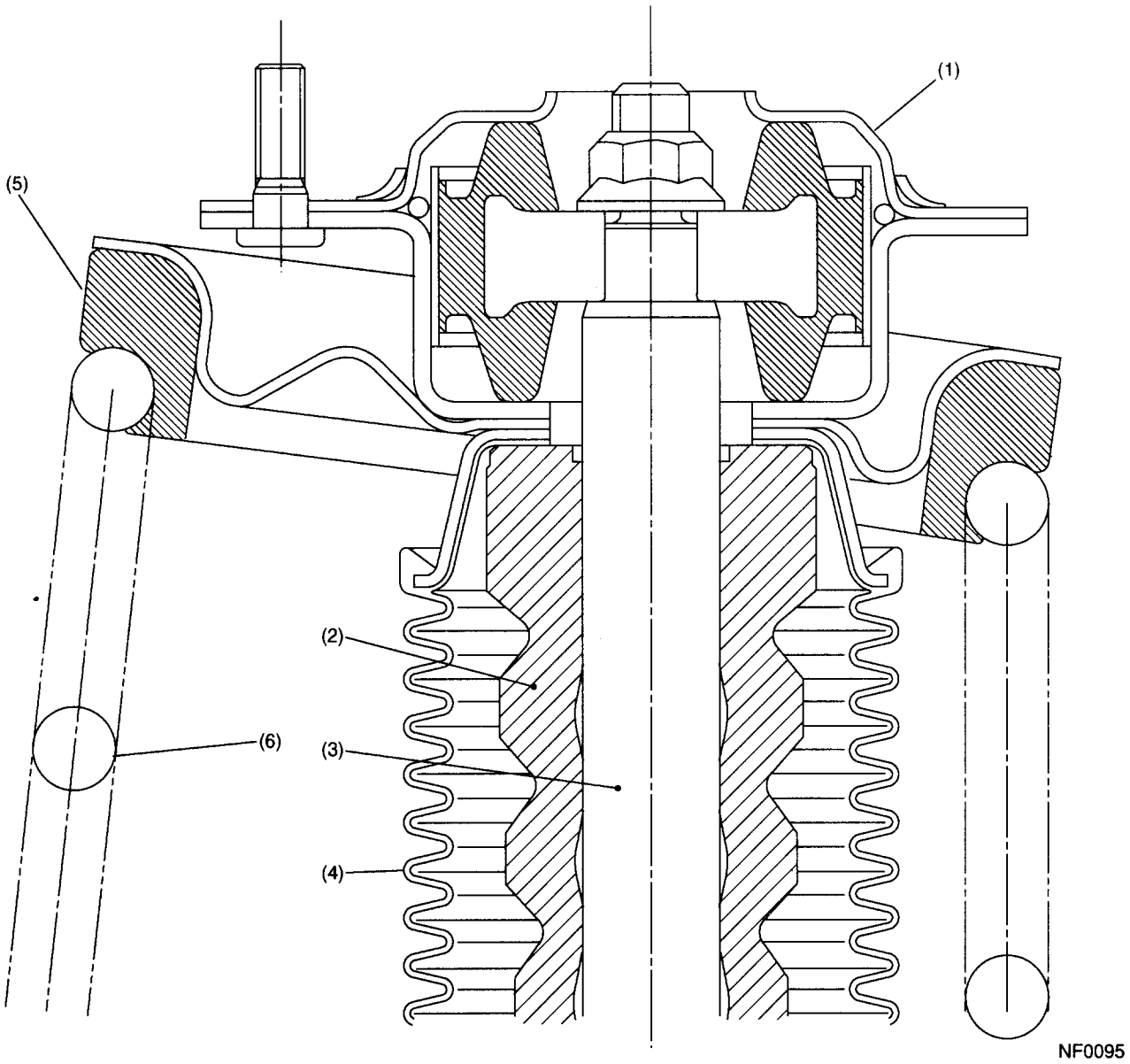
B: CONSTRUCTION

1. LATERAL LINKS

- All the Sedans have larger tread than the previous model for enhanced handling stability.
- Unsprung weight of the Impreza has been made smaller than the previous model by using a pair of steel-pipe lateral links on each side. This enhances both handling stability and riding comfort.

2. STRUTS

- The camber angle of the Impreza has been made more negative than in the earlier model to improve cornering performance.
- The dampers used in the struts are of a gas-filled type that features stable shock attenuating performance. They improve ride quality and reduce vibration and noise.
- Each strut has at its top a new type strut mount. The strut mounts effectively disperse input forces from coil springs and struts so that vibration and noise are reduced and riding comfort is improved. The body attaching flange of each strut mount is adequately rigid, which helps improve handling stability.
- The helper made of highly durable urethane enhances handling stability when the vehicle is loaded. It also satisfies riding comfort and anti-roll rigidity requirements simultaneously.



(1) Strut mount
(2) Helper
(3) Damper strut
(4) Dust cover
(5) Rubber seat
(6) Coil spring

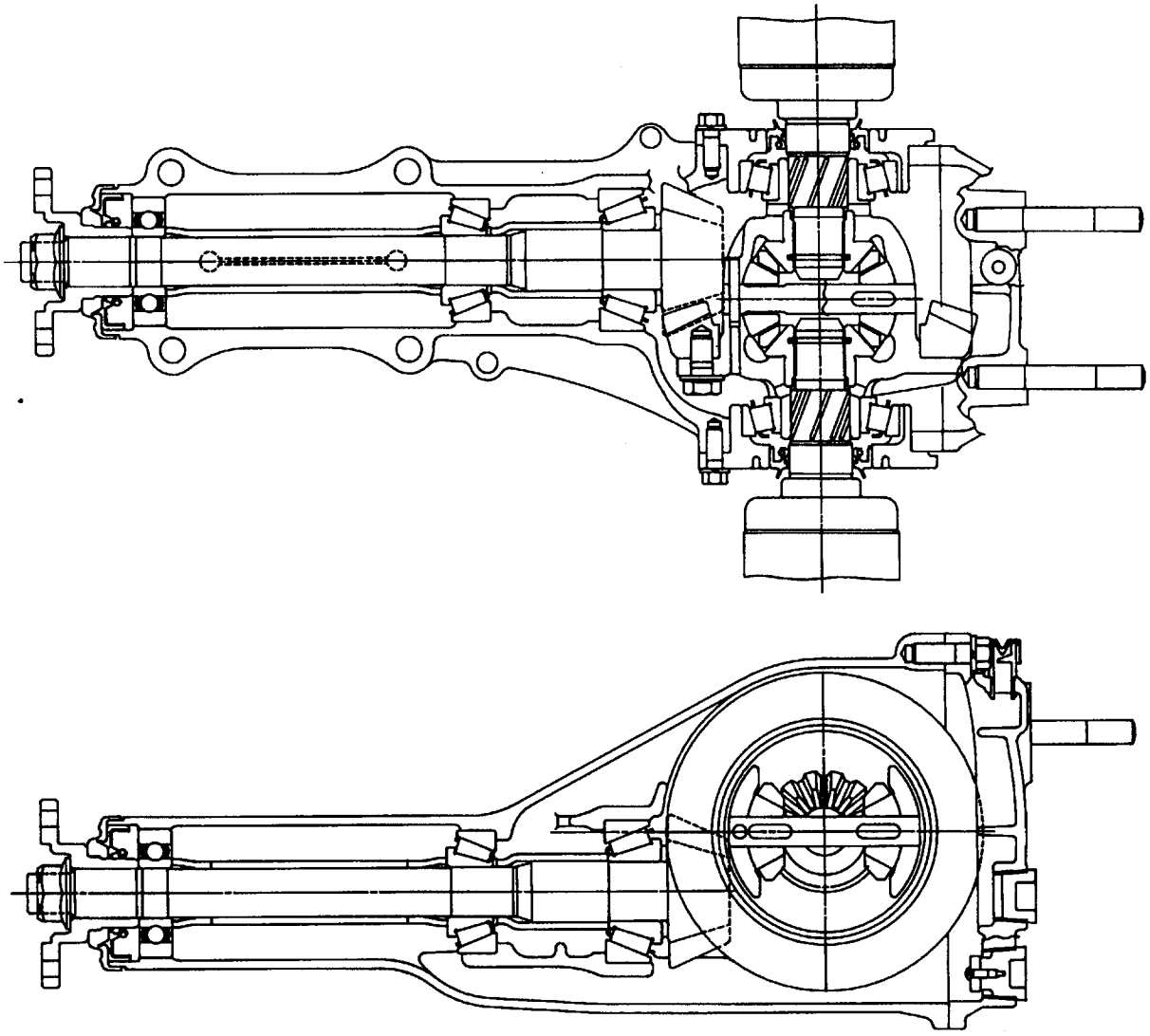
DIFFERENTIALS DI

Page

1. Rear Differential 2
2. Limited Slip Differential (LSD) 3

1. Rear Differential

The drive gear is a hypoid gear with a nominal diameter of 160 mm (6.30 in). The drive pinion shaft is supported by three bearings. The bearing preload is adjusted by selecting a spacer and washer combination of a proper thickness. The drive pinion height is adjusted by properly selecting the thickness of the washers located at the drive pinion neck using Dummy Shaft and Gauge.



NF0097

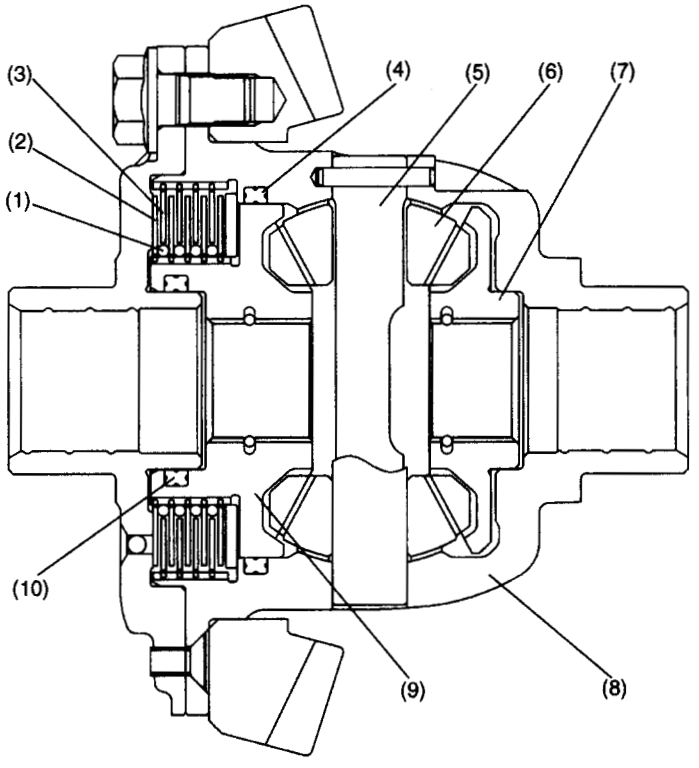
2. Limited Slip Differential (LSD)

A: OUTLINE

The limited slip differential is of a viscous coupling (V/C) type which automatically limits the differential action and distributes torque to the left and right wheels adequately to enhance driving stability when the left and right wheels are rotating at speeds different from each other during driving on a slippery road (muddy, snow-covered or slushy road) or cornering.

B: STRUCTURE

The V/C type LSD has outer plates and inner plates arranged alternately. Each outer plate is splined to the inside of the differential case at its outer periphery and each inner plate is splined to the outer circumference of the left side gear at its inner periphery.
The inner plates are held in position by spacer rings while the outer rings can slide in the axial direction along the spline teeth.
The space between the differential case and the left side gear is filled with a mixture of high viscosity silicone oil and air and hermetically sealed with X-rings.



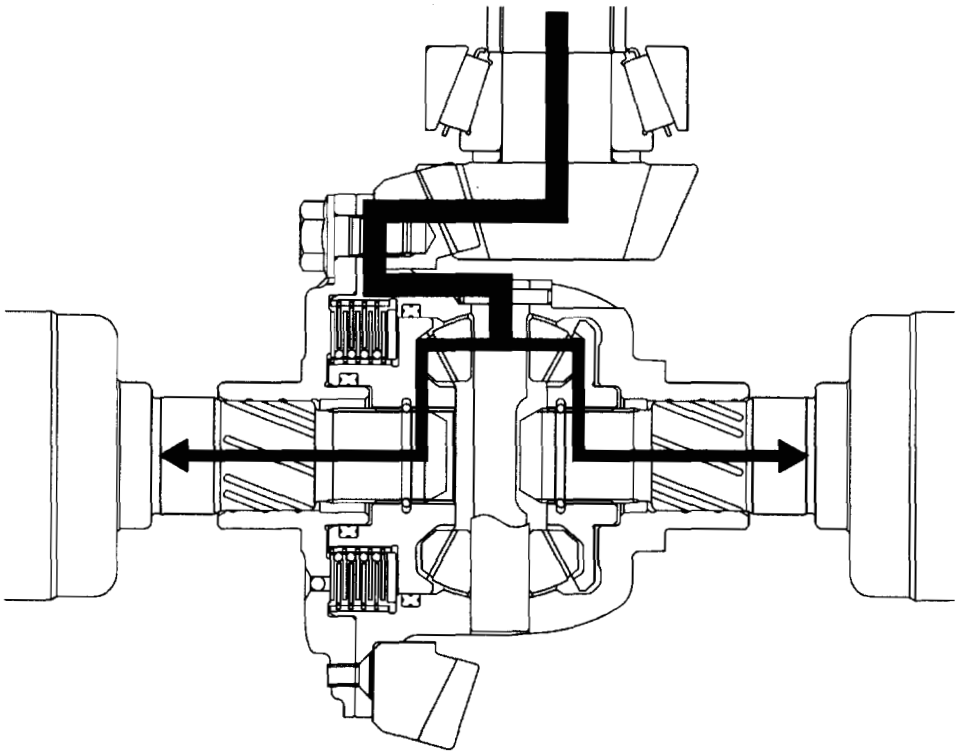
NF0098

(1) Spacer ring
(2) Inner plate
(3) Outer plate
(4) X-ring
(5) Pinion shaft
(6) Pinion gear
(7) Side gear (right)
(8) Differential case
(9) Side gear (left)
(10) X-ring

C: OPERATION

1. WHEN RIGHT AND LEFT WHEELS ROTATE AT THE SAME SPEED

During normal straight-ahead driving where the right and left wheels rotate at the same speed, the differential case and side gears rotate together, just as in conventional differentials. As a result, driving torque is distributed equally to the right and left side gears.

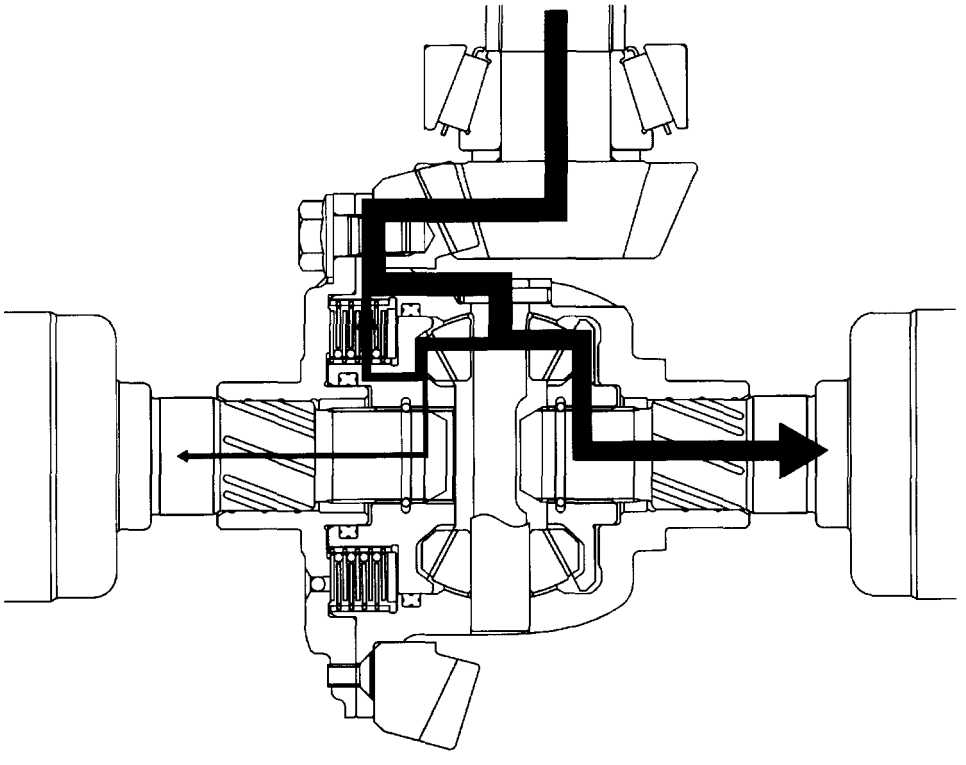


NF0099

2. WHEN RIGHT AND LEFT WHEELS ROTATE AT DIFFERENT SPEEDS

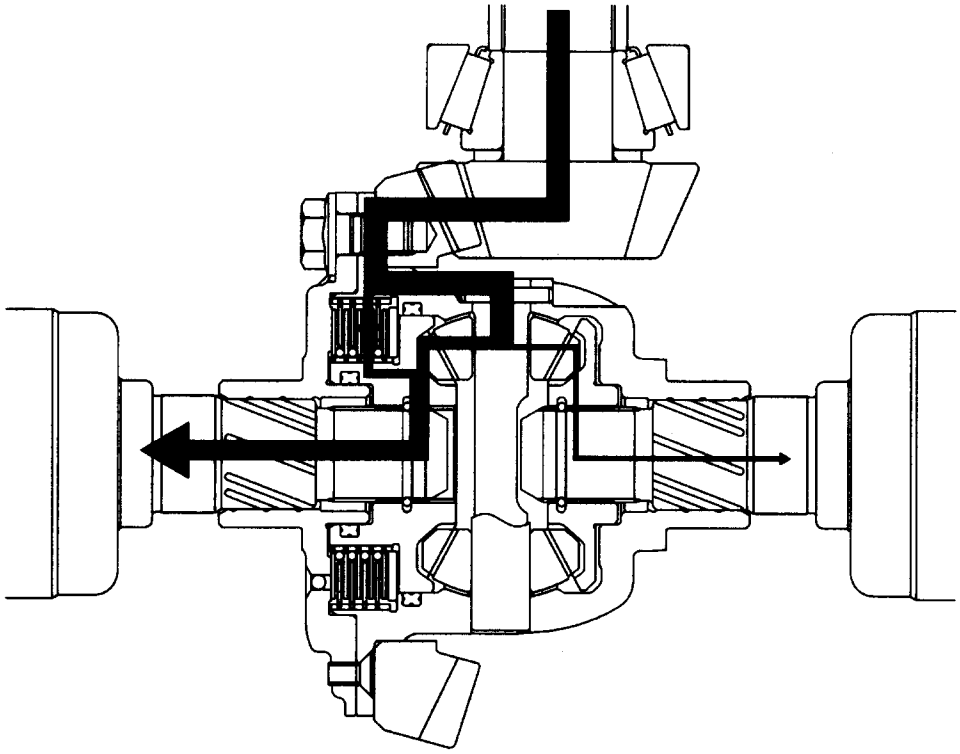
When a speed difference occurs between the right and left wheels, the differential case and the left side gear do not rotate at the same speed any more. The speed difference between them corresponds to that between both the wheels. Because of the shear force caused in the silicone oil, a differential torque is then generated, which limits differential action.
For example, if the left wheel spins due to small road resistance, a speed difference occurs between the right and left wheels. Since there is the V/C between the differential case and left side gear, a differential torque corresponding to the speed difference is generated in the V/C. This differential torque is transferred from the left wheel to the right wheel. As a result, a greater driving torque is distributed to the right wheel which is rotating at a lower speed.
When the right wheel spins, the differential torque is transferred from the right wheel to the left wheel. Also in this case, a torque greater by the differential torque than the torque to the spinning wheel is transmitted to the wheel rotating at the lower speed.

When left wheel spins



NF0100

When right wheel spins



NF0101

D: SERVICE PROCEDURES FOR LSD

It is not recommended to disassemble the LSD assembly as component parts of LSD assembly are not available individually.

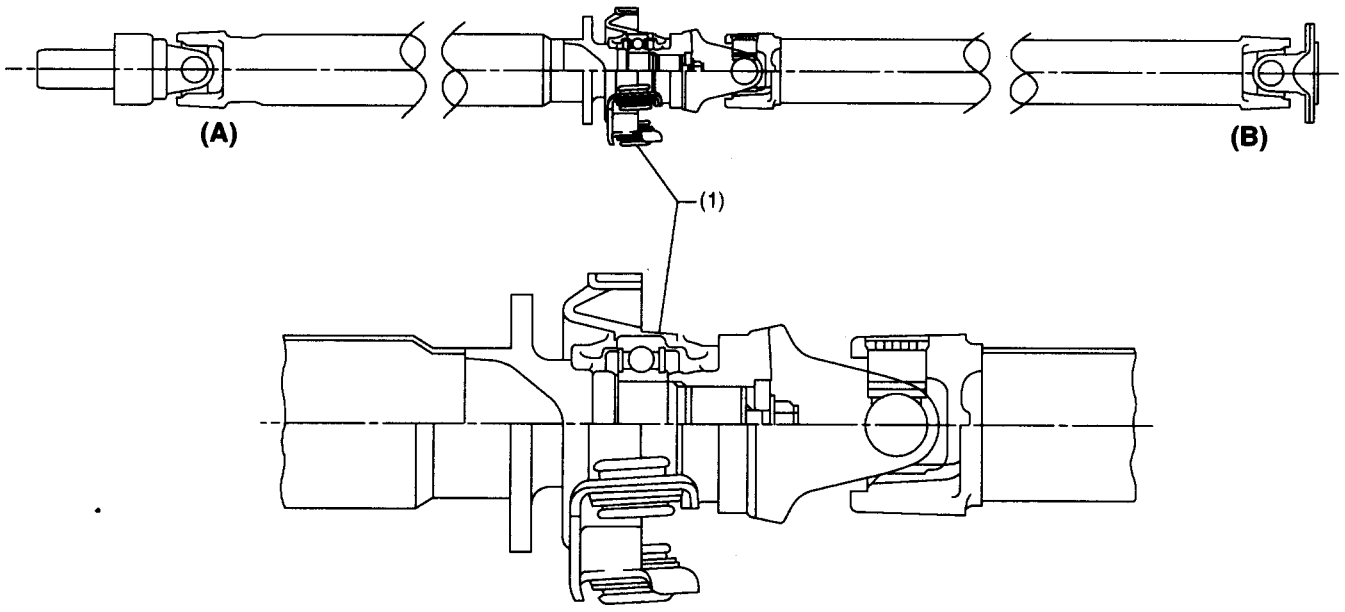
DRIVE SHAFT SYSTEM DS

		Page
1.	Propeller Shaft	2
2.	Front Axle	4
3.	Rear Axle	6

1. Propeller Shaft

A: NON-TURBO MODELS

The propeller shaft is of a two-piece design that uses three joints.



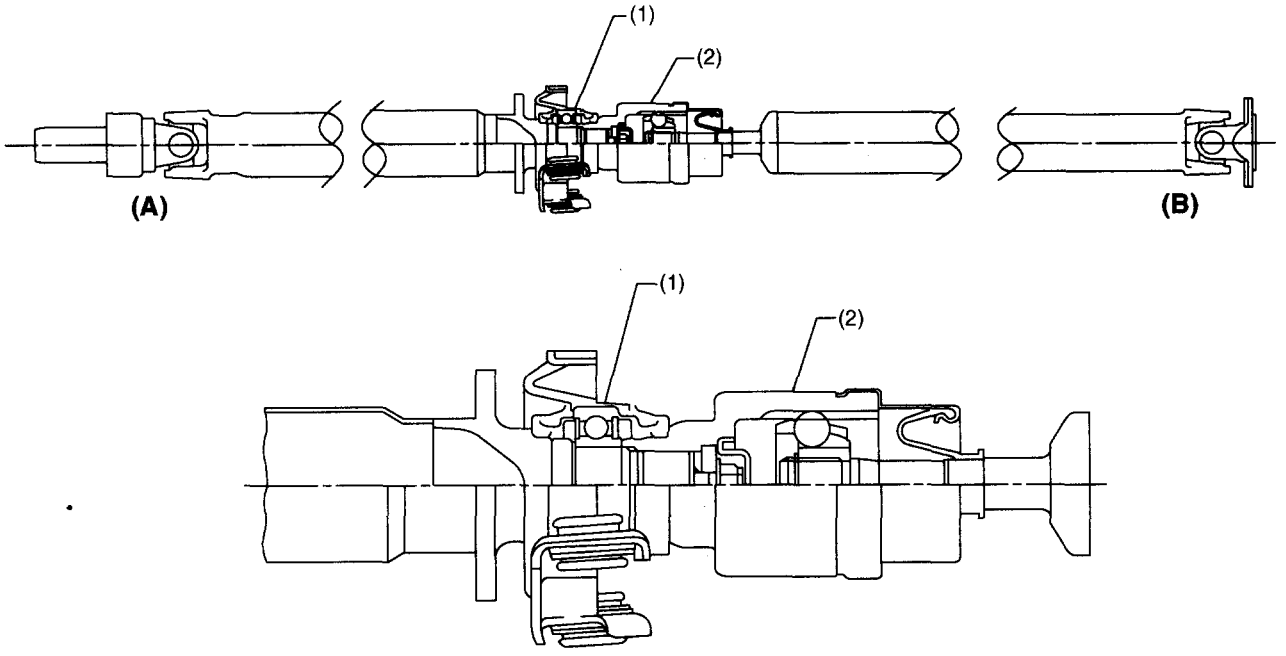
NF0150

(1) Center bearing

(A) Transmission side
(B) Rear differential side

B: TURBO MODELS

The propeller shaft uses constant velocity joints for quiet operation of the driveline components. The center joint is a double offset joint (DOJ) type which can extend and retract in the axial directions.



NF0149

(1) Center bearing
(2) DOJ

(A) Transmission side
(B) Rear differential side

2. Front Axle

A: GENERAL

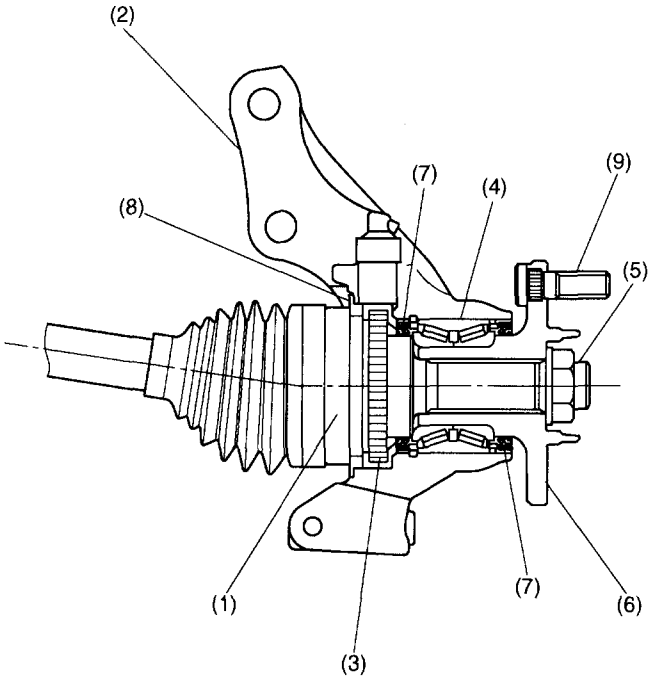
- The inboard end of the axle shaft is connected to the transmission via a constant velocity joint (shudder-less freering tripod joint: SFJ) which is flexible in the axial directions, while the outboard end is connected via a high efficiency compact ball fixed joint (EBJ) to the wheel hub which is supported by a taper roller bearing located inside the axle housing. The EBJ features a large operating angle.

Both the constant velocity joints (SFJ and EBJ) ensure smooth, regular rotation of the drive wheels with minimum vibration.

- The bearing is a preloaded, non-adjustable tapered roller unit bearing.

Each hub is fitted in the axle housing via the tapered roller bearing.

- The EBJ's spindle is splined to the hub and is secured with an axle nut clinched to it.
- The disc rotor is an external mounting type. It is secured to the disc wheel using hub bolts to facilitate maintenance of the disc rotor.

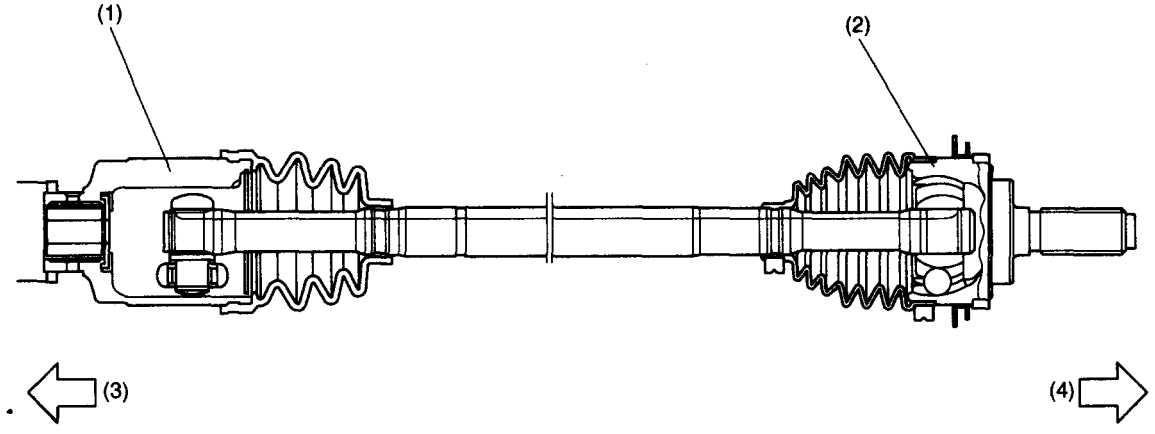


NF0151

(1) EBJ
(2) Axle housing
(3) Tone wheel
(4) Bearing
(5) Axle nut
(6) Hub
(7) Oil seal
(8) Baffle plate
(9) Hub bolt

B: FRONT DRIVE SHAFT

- A shudder-less freering tripod joint (SFJ) is used on the differential side of each front drive shaft. The SFJ can be disassembled for maintenance. It provides a maximum operating angle of 25° and can be moved in the axial directions.
- A high efficiency compact ball fixed joint (EBJ) is used on the wheel side of each front drive shaft. The EBJ's maximum operating angle is 46.5°.



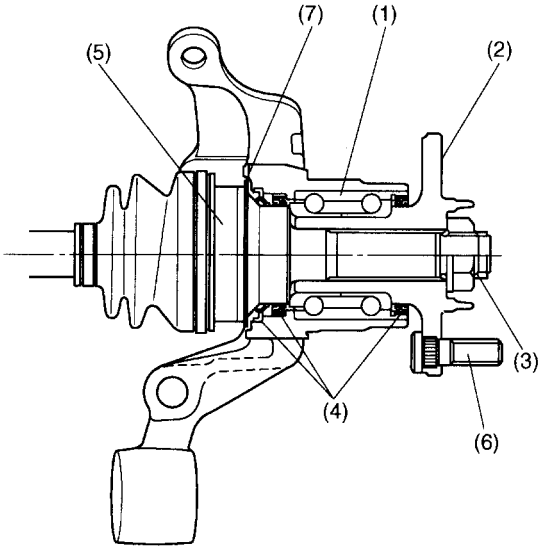
NF0153

(1) SFJ
(2) EBJ
(3) Transmission side
(4) Wheel side

3. Rear Axle

A: NON-TURBO MODELS

- The inboard end of each axle shaft is connected to the transmission via a double offset joint: DOJ which can extend and retract in the axial directions.
- The outboard end is supported by angular contact ball bearings located inside the axle housing via a bell joint (BJ) which features a large operating angle. Both the constant velocity joints (DOJ and BJ) ensure smooth, regular rotation of the drive wheels with minimum vibration.
- The bearing is a preloaded, non-adjustable angular contact ball unit type.
Each hub is fitted in the axle housing via the angular contact ball bearing.
- The BJ's spindle is splined to the hub and secured with an axle nut clinched to it.
- The disc rotor or brake drum is held in position by the hub bolts and wheel nuts together with the wheel. This facilitates removal and installation of the disc rotor or brake drum and thus improves serviceability.

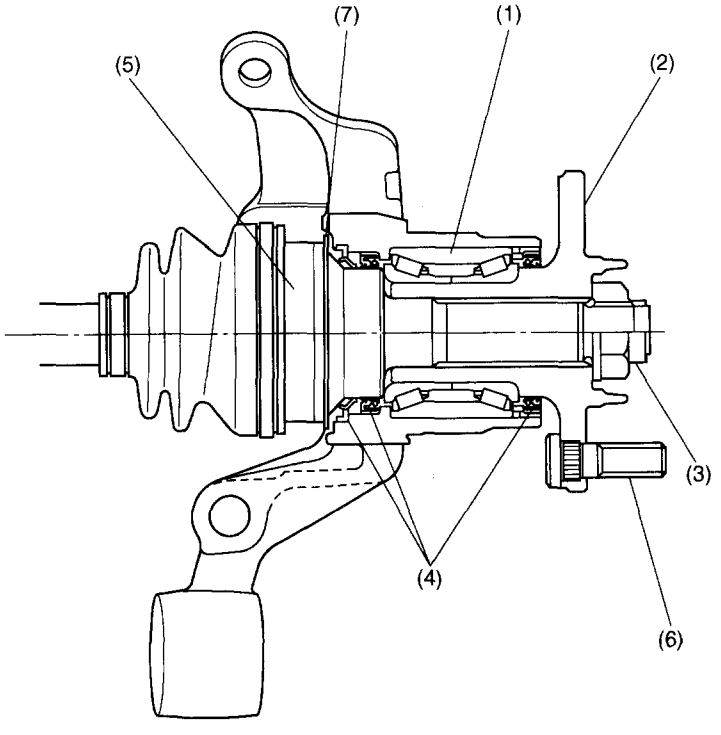


S3H0644A

(1) Bearing
(2) Hub
(3) Axle nut
(4) Oil seal
(5) BJ
(6) Hub bolt
(7) Baffle plate

B: TURBO MODELS

- The inboard end of each axle shaft is connected to the transmission via a double offset joint (DOJ) which can extend and retract in the axial directions.
- The outboard end is supported by taper roller bearings located inside the axle housing via a high efficiency compact ball fixes joint (EBJ) which features a large operating angle. Both the constant velocity joint (DOJ and EBJ) ensure smooth, regular rotation of the drive wheels with minimum vibration.
- The bearing is a preloaded, non-adjustable taper roller unit type.
Each hub is fitted in the axle housing via the taper roller bearing.
- The EBJ's spindle is splined to the hub and secured with an axle nut clinched to it.
- The disc rotor is held in position by the hub bolts and wheel nuts together with the wheel. This facilitates removal and installation of the disc rotor and thus improves serviceability.



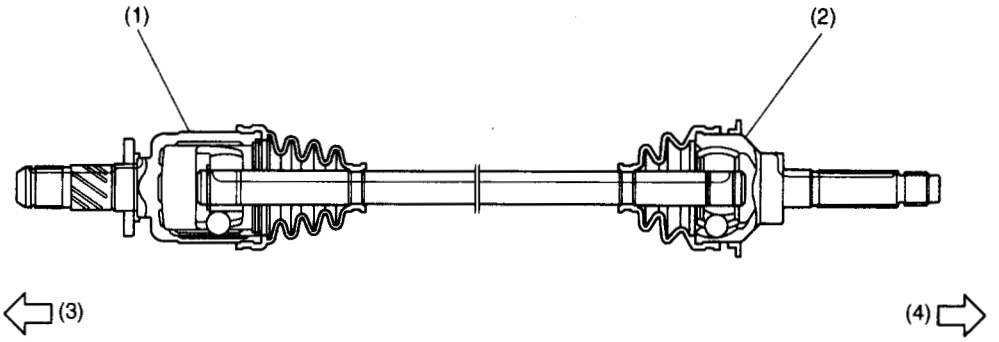
S3H0645A

(1) Tapered roller bearing
(2) Hub
(3) Axle nut
(4) Oil seal
(5) EBJ
(6) Hub bolt
(7) Baffle plate

C: REAR DRIVE SHAFT

1. NON-TURBO MODELS

- A double offset joint (DOJ) is used on the differential side of each rear drive shaft. The DOJ can be disassembled for maintenance. It provides a maximum operating angle of 23° and can be moved in the axial directions.
- A bell joint (BJ) is used on the wheel side of each rear drive shaft. Its maximum operating angle is 42°.

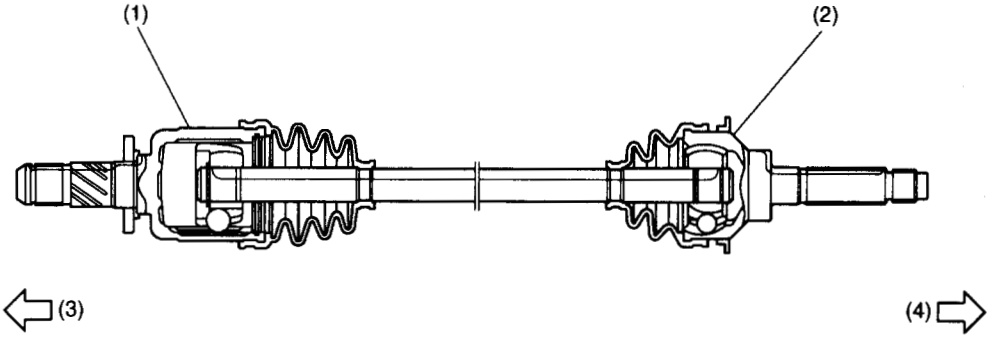


NF0156

(1) DOJ
(2) BJ
(3) Differential side
(4) Wheel side

2. TURBO MODELS

- A double offset joint (DOJ) is used on the differential side of each rear drive shaft. The DOJ can be disassembled for maintenance. It provides a maximum operating angle of 23° and can be moved in the axial directions.
- A high efficiency compact ball fixed joint (EBJ) is used on the wheel side of each rear drive shaft. Its maximum operating angle is 42°.



NF0157

(1) DOJ
(2) EBJ
(3) Differential side
(4) Wheel side

ABS ABS

Page

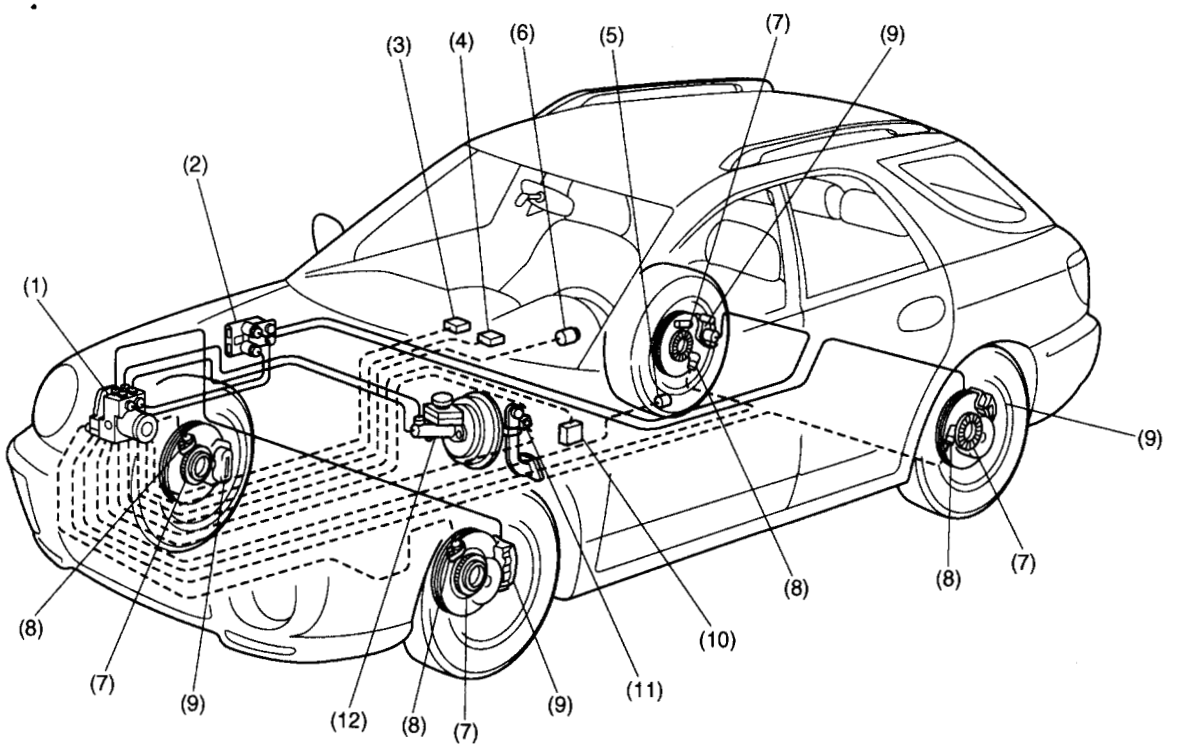
1. Anti-lock Brake System (ABS) 2

1. Anti-lock Brake System (ABS)

A: FEATURE

- The 5.3i type ABS used in the Impreza has a hydraulic control unit, an ABS control module, a valve relay and a motor relay integrated into a single unit (called "ABSCM & H/U") for circuit simplicity and reduced weight.
- The ABS electrically controls the brake fluid pressure to each wheel to prevent the wheel from locking during braking on slippery road surfaces, thereby enabling the driver to maintain the directional control.
- If the ABS becomes inoperative, a fail-safe system is activated to ensure same level of braking performance as with a conventional brake system. In that case, the warning light comes on to indicate that the ABS is malfunctioning.
- The ABS is a 4-sensor, 4-channel system; the front wheel system is an independent control design*1, while the rear wheel system is a select-low control design*2.

*1: A system which controls the front wheel brakes individually.
*2: A system which applies the same fluid pressure to both the rear wheels if either wheel starts to lock. The pressure is determined based on the lower of the frictional coefficients of both wheels.

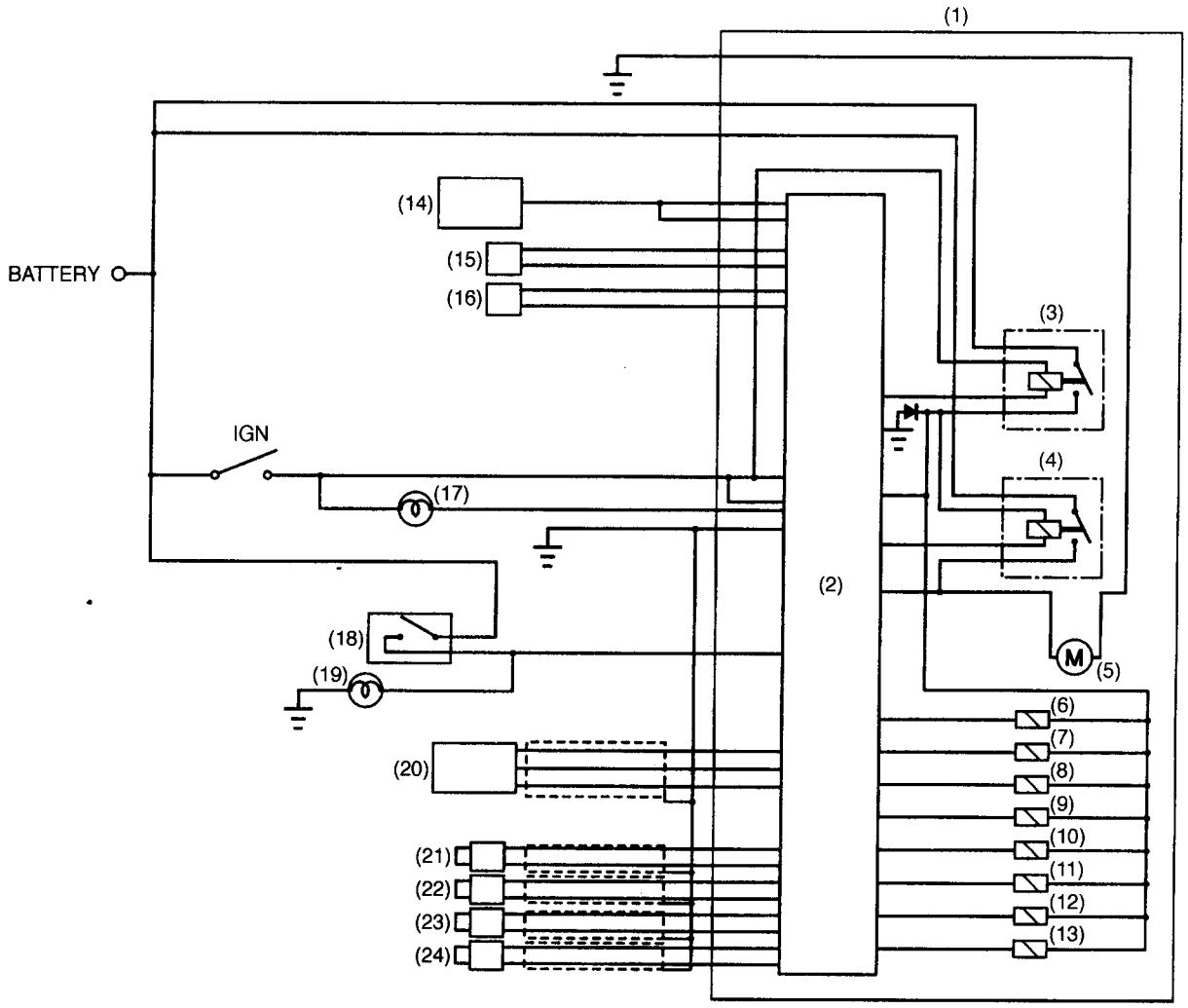


NF0197

(1) ABS control module and hydraulic control unit (ABSCM & H/U)
(2) Proportioning valve
(3) Diagnosis connector
(4) Data link connector (for SUBARU select monitor)
(5) G sensor
(6) ABS warning light
(7) Tone wheel
(8) ABS sensor
(9) Wheel cylinder
(10) Automatic transmission control module
(11) Brake switch
(12) Master cylinder

B: FUNCTIONS OF SENSORS AND ACTUATORS

Name		Function
ABS control module and hydraulic control unit (ABSCM & H/U)	ABSCM section	• It determines the conditions of the wheels and the vehicle body from the wheel speed data and controls the hydraulic unit depending on the result. • When the ABS is active, the ABSCM provides the automatic transmission control module with control signals which are used by the module for cooperative control of the vehicle with the ABSCM. • Whenever the ignition switch is placed at ON, the module performs a self diagnosis sequence. If anything wrong is detected, the module cuts off the system. • It communicates with the SUBARU select monitor.
	H/U section	• When the ABS is active, the H/U changes fluid passages to the wheel cylinders in response to commands from the ABSCM. • It constitutes the brake fluid passage from the master cylinder to the wheel cylinders together with the piping.
	Valve relay section	It serves as a power switch for the solenoid valves and motor relay coil. It operates in response to a command from the ABSCM.
	Motor relay section	It serves as a power switch for the pump motor. It operates in response to a command from the ABSCM.
ABS sensors (wheel speed sensors)		They detect the wheel speed in terms of a change in the density of the magnetic flux passing through them and convert it into an electrical signal. The electrical signal is sent to the ABSCM.
Tone wheels		They give a change in the magnetic flux density by the teeth around themselves to let the ABS sensors generate electrical signals.
G sensor		It detects a change in acceleration in the longitudinal direction of the vehicle and outputs it to the ABSCM as a voltage signal.
Stop light switch		It provides information on whether the brake pedal is depressed or not to the ABSCM. The ABSCM uses it to determine ABS operation.
ABS warning light		It alerts the driver to an ABS fault. When the diagnosis connector and diagnosis terminal are connected, the light flashes to indicate a trouble code stored in the ABSCM.
Automatic transmission control module		It provides gear controls (fixing the speed at 3rd or changing power transmission to front and rear wheels) in response to control signals from the ABSCM.



NF0198

(1) ABS control module and hydraulic control unit
(2) ABS control module section
(3) Valve relay
(4) Motor relay
(5) Motor
(6) Front left inlet solenoid valve
(7) Front left outlet solenoid valve
(8) Front right inlet solenoid valve
(9) Front right outlet solenoid valve
(10) Rear left inlet solenoid valve
(11) Rear left outlet solenoid valve
(12) Rear right inlet solenoid valve
(13) Rear right outlet solenoid valve
(14) Automatic transmission control module
(15) Diagnosis connector
(16) Data link connector
(17) ABS warning light
(18) Stop light switch
(19) Stop light
(20) G sensor
(21) Front left ABS sensor
(22) Front right ABS sensor
(23) Rear left ABS sensor
(24) Rear right ABS sensor

C: PRINCIPLE OF ABS CONTROL

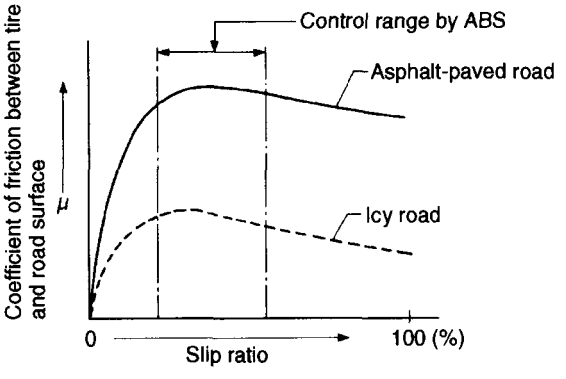
When the brake pedal is depressed during driving, the wheel speed decreases and the vehicle speed does as well. The decrease in the vehicle speed, however, is not always proportional to the decrease in the wheel speed. The non-correspondence between the wheel speed and vehicle speed is called "slip" and the magnitude of the slip is expressed by the "slip ratio" which is defined as follows:

Slip ratio = Vehicle speed – Wheel speed/Vehicle speed x 100%

When the slip ratio is 0%, the vehicle speed corresponds exactly to the wheel speed; when it is 100%, the wheels are completely locking (rotating at a zero speed) while the vehicle is moving.

The braking effectiveness is represented by the "coefficient of friction" between the tire and road surface. The larger the coefficient, the higher the braking effectiveness. The diagram below shows the relationship between the coefficient of friction and the slip ratio for two different road surface conditions (asphalt-paved road and icy road), assuming that the same tires are used for both the conditions and the vehicles are moving forward. Although the braking effectiveness (coefficient of friction) depends on the road surface condition as shown and also on the type of the tire, its peak range generally corresponds to the 8 – 30% range of the slip ratio.

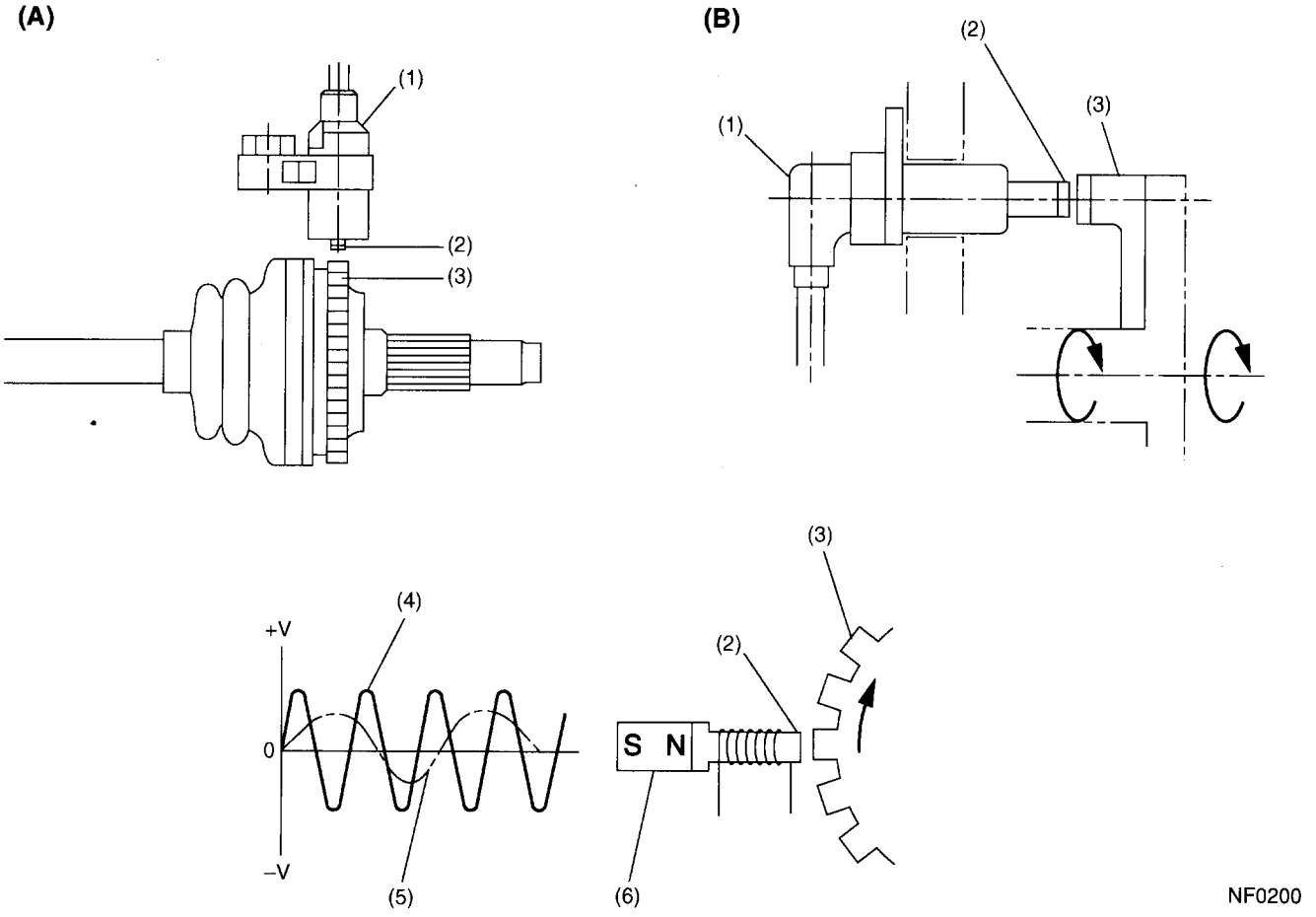
The ABS controls the fluid pressure to each wheel so that a coefficient of friction corresponding to this slip ratio range is maintained.



NF0199

D: ABS SENSORS

Each of the ABS sensors detects the speed of the corresponding wheel. The sensor consists of a permanent magnet, coil and tone wheel. The magnetic flux produced by the permanent magnet changes as each tooth of the tone wheel (which rotates together with the wheel) passes in front of the magnet's pole piece. The changing magnetic flux induces voltages at a frequency corresponding to the wheel speed.



(A) Front
(B) Rear

(1) Sensor body
(2) Pole piece
(3) Tone wheel

(4) Full speed
(5) Low speed
(6) Permanent magnet

E: ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM & H/U)

• ABS CONTROL MODULE SECTION (ABSCM)

The ABSCM contains two microcontrol modules (MCMs): master and slave. Both the MCMs process the same program and each MCM monitors the other's outputs. If a mismatch occurs between their outputs, the ABSCM cuts off the system and activate the fail-safe function.

The ABSCM can store a maximum of 3 trouble codes in an EEP ROM. If more than 3 faults have occurred, only the 3 most recent failures are stored and others are erased. Trouble codes remain stored until they are internally or externally erased.
The ABSCM has a test routine (sequence control pattern) which facilitates checking of the hydraulic control unit.

• ABS control
Using primarily the wheel speed data from each ABS sensor and secondarily the vehicle deceleration rate data from the G sensor as parameters, the ABSCM generates a simulated vehicle speed when there is a risk of wheel lock-up. Using the simulated vehicle speed (called "dummy" vehicle speed) as a reference, the ABSCM determines the state of the wheel in terms of the tendency toward lock-up. If the result shows that the wheels are about to lock, the ABSCM issues commands to energize or de-energize the solenoid valves and activate the motor pump of the H/U to modulate the brake fluid pressures that act on the wheel cylinders, thereby preventing the wheels from locking.
The ABSCM controls the right and left front wheel fluid pressures independently and the rear wheel fluid pressures based on the wheel which is the most likely to lock (select-low control).

• Functions available using SUBARU select monitor
When the SUBARU select monitor is connected, the ABSCM allows it
- To read out analog data
- To read out ON/OFF data
- To read out or erase trouble code
- To read out data showing conditions under which a trouble code has been stored (Freeze frame data)
- To initiate ABS sequence control pattern

• Indication functions
Under the control of the ABSCM, the ABS warning light provides the following three indication function:
- ABS fault alerting
- Trouble code indication (by flashing in the diagnosis mode)
- Valve ON/OFF indication (when sequence control pattern is initiated)

• HYDRAULIC CONTROL UNIT SECTION (H/U)

The H/U is a fluid pressure controller consisting of, among others, a motor, solenoid valves, a housing and relays. It also constitutes passage of the two diagonally split brake circuits.

• The pump motor drives an eccentric cam which in turn moves the plunger pump to generate hydraulic pressure.

• The housing accommodates the pump motor, solenoid valve and reservoir. It also constitutes a brake fluid passage.

• The plunger pump, when operated, draws the brake fluid from the reservoir, lets the fluid in a wheel cylinder drain into the reservoir, and/or forces the fluid into the master cylinder.

• The outlet solenoid valve is a 2-position type. It opens or closes the brake fluid passage between a wheel cylinder and the reservoir according to commands from the ABSCM.

• The inlet solenoid valve is duty-controlled to reduce brake fluid pulsation for minimum ABS operation noise.

• The reservoir temporarily stores the brake fluid drained from a wheel cylinder when pressure "decrease" control is performed.

• The damper chamber suppresses brake fluid pulsation which would occur during pressure "decrease" control in the fluid discharged from the plunger pump to minimize kickbacks of the brake pedal.

• The valve relay controls power supply to the solenoid valves and motor relay in response to a command from the ABSCM. In normal (IG ON) condition, the relay is closed to supply power to the solenoid valves and motor relay. When an error occurs in the system, the valve relay is turned OFF to keep the fluid pressure circuit in the normal mode (non-ABS mode).

• The motor relay closes and supplies power to the pump motor in response to a command from the ABSCM during the ABS drive mode operations.

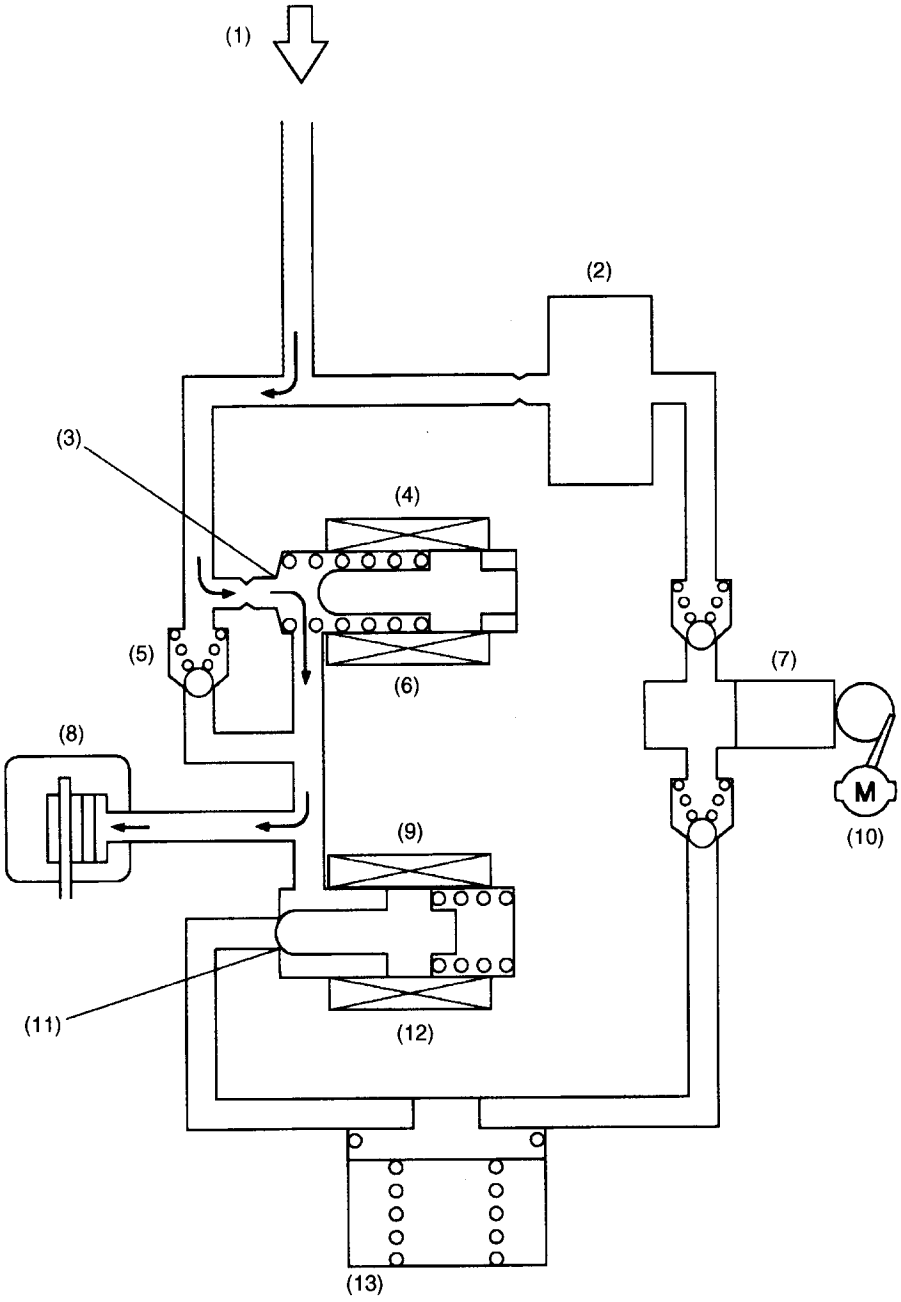
The H/U has four operating modes; normal mode (non-ABS mode), and three ABS active modes, i.e., "increase", "hold" and "decrease" modes.

MEMO

1. DURING NORMAL BRAKING (ABS NOT ACTIVE)

Both the inlet and outlet solenoid valves are not energized.
This means that the inlet port of the inlet solenoid valve is open, whereas the outlet port of the outlet solenoid valve is closed. So the fluid pressure generated in the master cylinder is transmitted to the wheel cylinder, producing a brake force.

NOTE:
For simplicity of explanation, operation of the hydraulic control unit is represented by operation of a single wheel circuit.



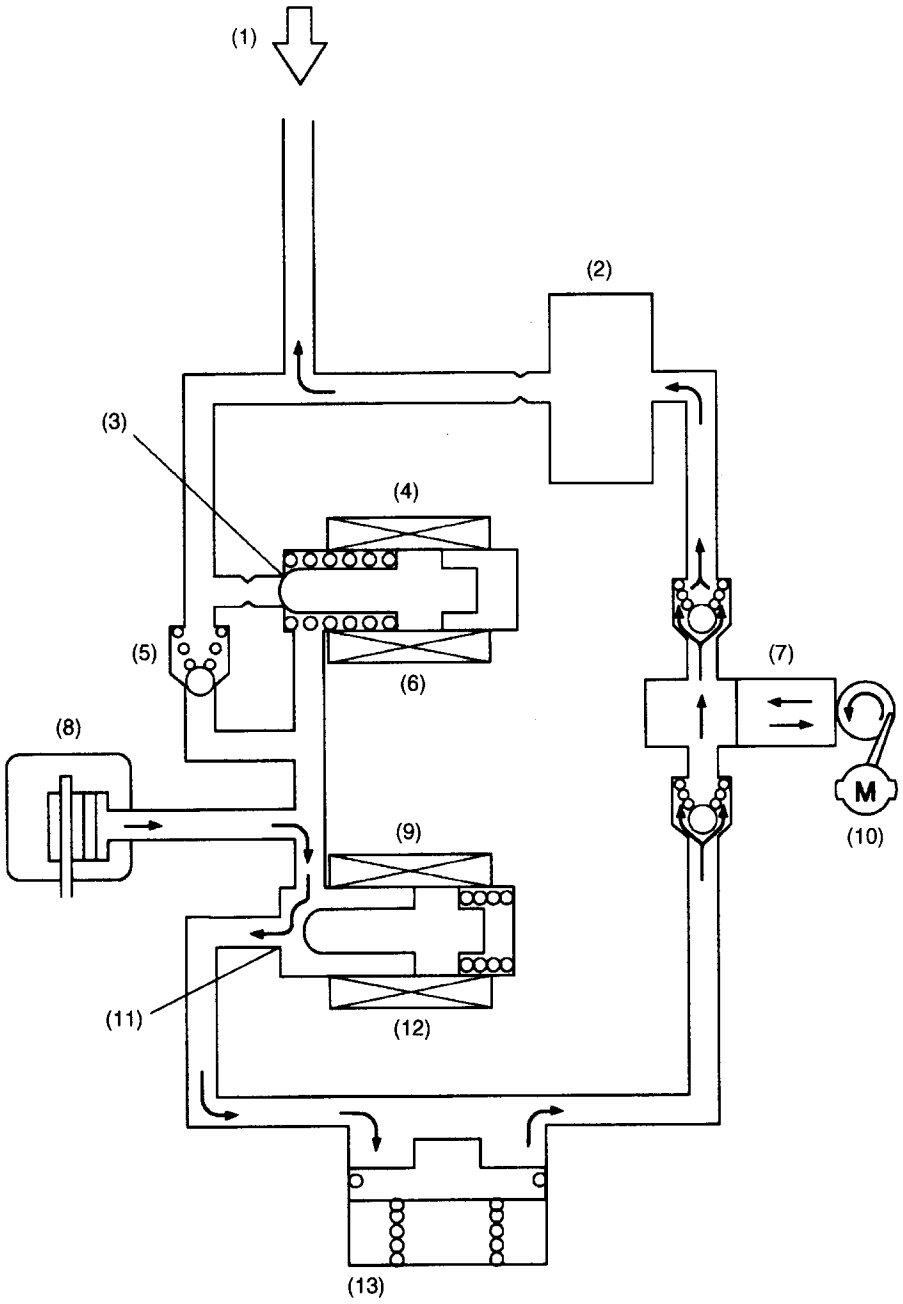
NF0201

(1) From master cylinder
(2) Damper chamber
(3) Inlet port open
(4) Inlet solenoid valve
(5) Check valve
(6) De-energized
(7) Pump
(8) Wheel cylinder
(9) Outlet solenoid valve
(10) Motor
(11) Outlet port closed
(12) De-energized
(13) Reservoir

2. PRESSURE "DECREASE" CONTROL (ABS ACTIVE)

Both the inlet and outlet solenoid valves are energized, which means that the inlet port is closed and the outlet port is open.
In this state, the wheel cylinder is isolated from the master cylinder but open to the reservoir, so the brake fluid in it can be drained into the reservoir, decreasing its pressure and reducing the braking force of the wheel.
The brake fluid collected in the reservoir is forced into the master cylinder by the pump.
During this phase of ABS operation, the pump motor continues operating.

NOTE:
For simplicity of explanation, operation of the hydraulic control unit is represented by operation of a single wheel circuit.



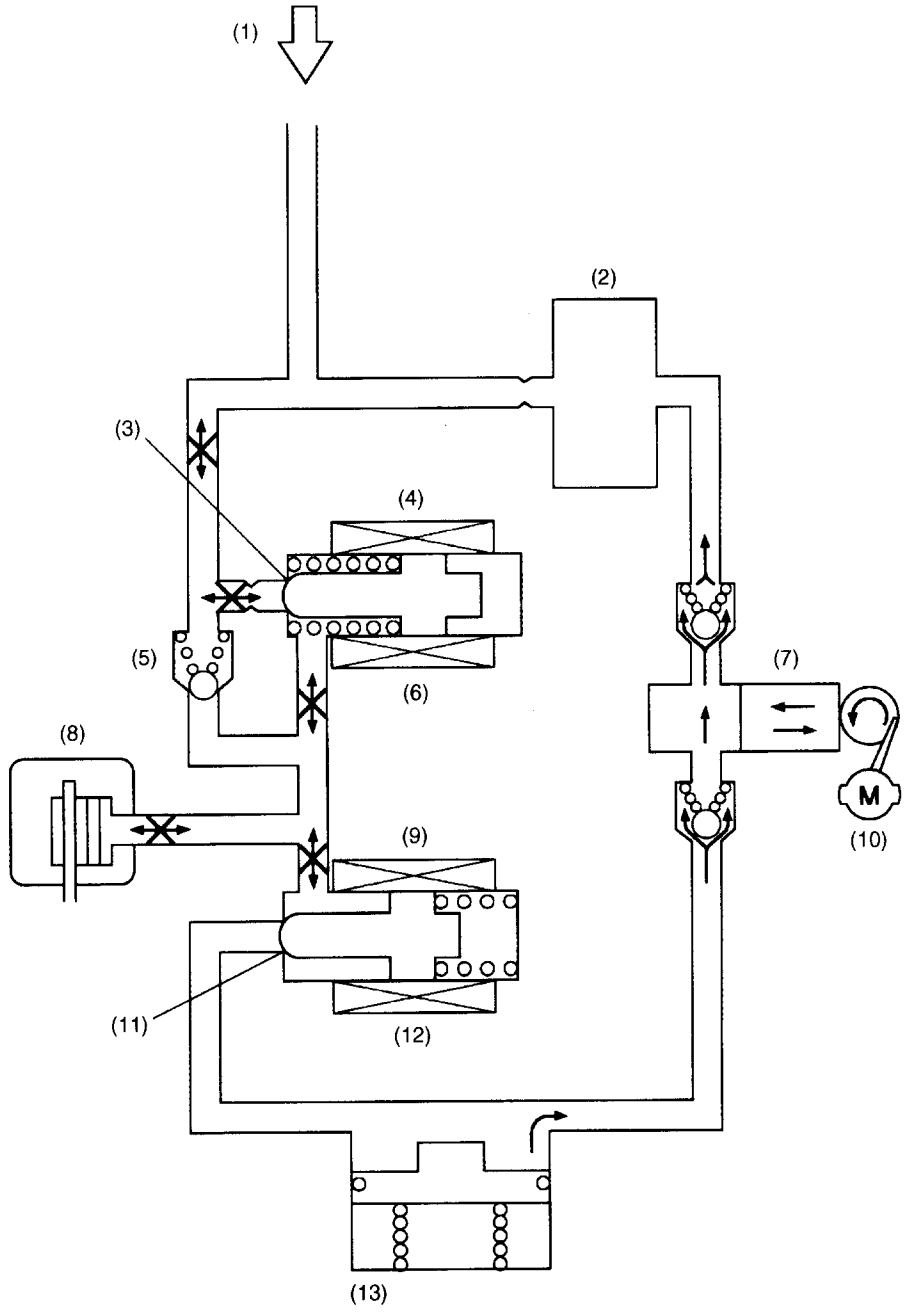
NF0202

(1) From master cylinder
(2) Damper chamber
(3) Inlet port closed
(4) Inlet solenoid valve
(5) Check valve
(6) Energized
(7) Pump
(8) Wheel cylinder
(9) Outlet solenoid valve
(10) Motor
(11) Outlet port open
(12) Energized
(13) Reservoir

3. PRESSURE "HOLD" CONTROL (ABS ACTIVE)

The inlet solenoid valve is energized, so the inlet port is closed.
On the other hand, the outlet solenoid valve is de-energized, so the output port is also closed. In this state, all the passages connecting the wheel cylinder, master cylinder and reservoir are blocked. As a result, the fluid pressure in the wheel cylinder is held unchanged.
During this phase of ABS operation, the pump motor continues operating.

NOTE:
For simplicity of explanation, operation of the hydraulic control unit is represented by operation of a single wheel circuit.



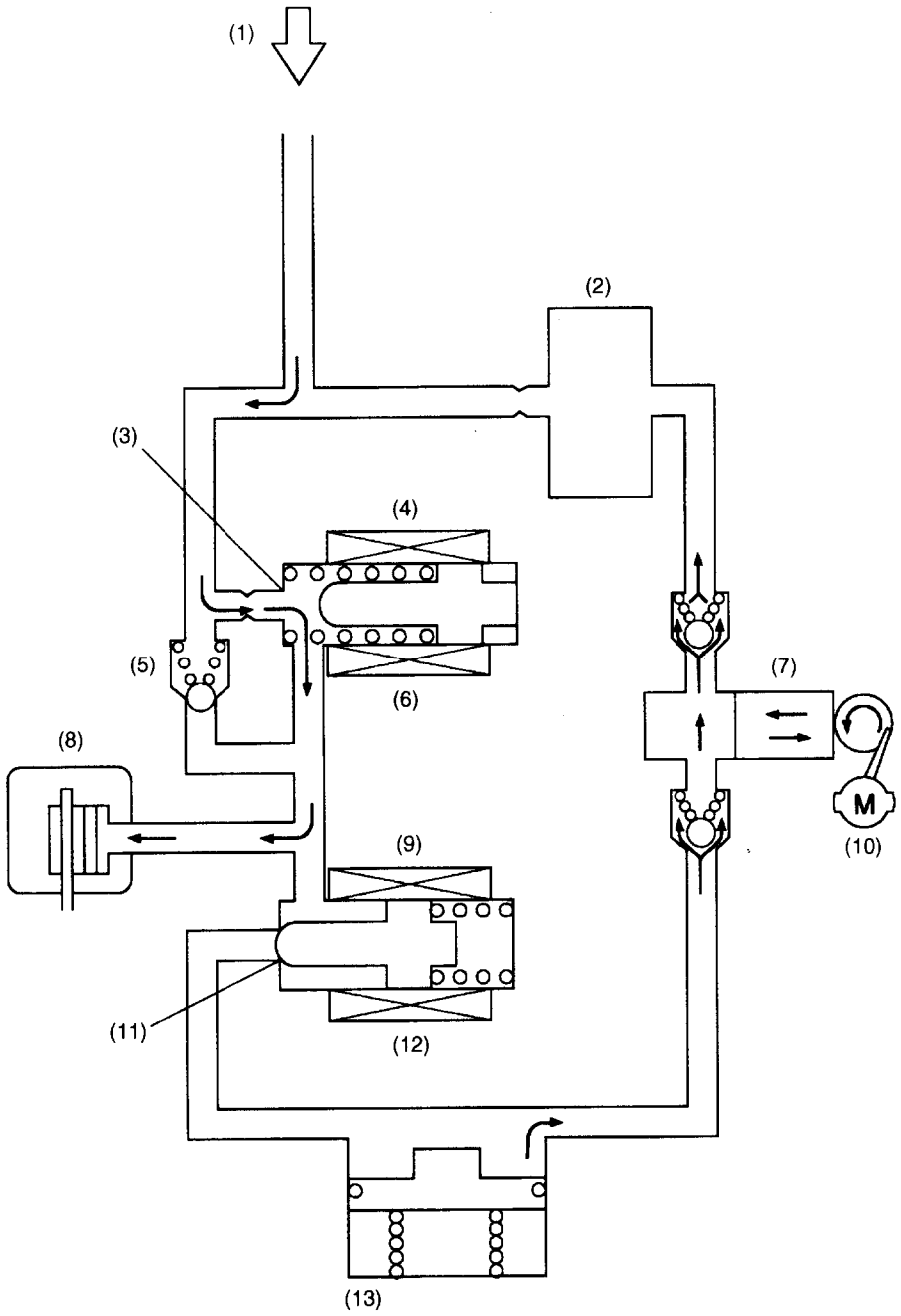
NF0203

(1) From master cylinder
(2) Damper chamber
(3) Inlet port closed
(4) Inlet solenoid valve
(5) Check valve
(6) Energized
(7) Pump
(8) Wheel cylinder
(9) Outlet solenoid valve
(10) Motor
(11) Outlet port closed
(12) De-energized
(13) Reservoir

4. PRESSURE "INCREASE" CONTROL (ABS ACTIVE)

Both the inlet and outlet solenoid valves are de-energized, which means that the inlet port of the inlet solenoid valve is open, whereas the outlet port of the outlet solenoid valve is closed. So the fluid pressure generated in the master cylinder is transmitted to the wheel cylinder and increased fluid pressure in the wheel cylinder applies the brake with a larger force.
During this phase of ABS operation, the pump motor continues operating.

NOTE:
For simplicity of explanation, operation of the hydraulic control unit is represented by operation of a single wheel circuit.



NF0204

(1) From master cylinder
(2) Damper chamber
(3) Inlet port open
(4) Inlet solenoid valve
(5) Check valve
(6) De-energized
(7) Pump
(8) Wheel cylinder
(9) Outlet solenoid valve
(10) Motor
(11) Outlet port closed
(12) De-energized
(13) Reservoir

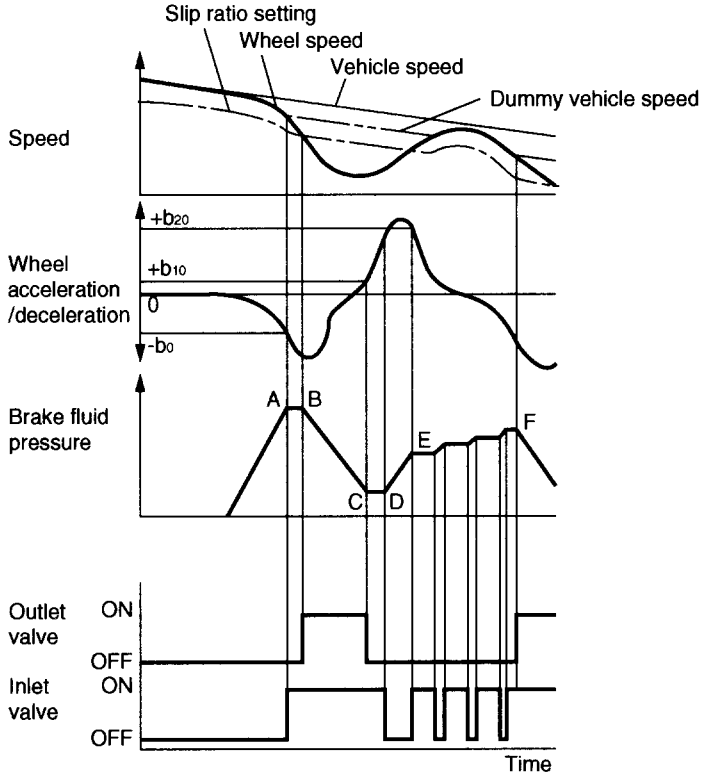
F: ABS CONTROL CYCLE CURVES

Depressing the brake pedal increases the brake fluid pressure in each wheel cylinder, which in turn decreases the wheel speed (or increases the wheel deceleration rate). When the brake fluid pressure is increased to a level of point "A" of the brake fluid pressure curve in the diagram below (at which the wheel deceleration rate exceeds threshold "$-b_0$"), the ABSCM makes a pressure "hold" control. At the same time, the ABSCM calculates a "dummy" vehicle speed which is a reference speed it uses in the next stage of control.

When the wheel speed then drops below the slip ratio setting, i.e., a speed lower than the "dummy" vehicle speed by the predetermined value (at point "B" of the pressure curve), the ABSCM makes a control to prevent the wheel from locking, or a pressure "decrease" control.

As the wheel cylinder pressure decreases, the wheel speed starts increasing (or the wheel acceleration rate starts rising). When the wheel acceleration rate exceeds threshold "$+b_{10}$" (at point "C" of the pressure curve), the ABSCM makes a pressure "hold" control. When the wheel acceleration rate exceeds threshold "$+b_{20}$" (at point "D" of the pressure curve), the ABSCM recognizes that wheel lock-up will not occur and then makes a pressure "increase" control.

When the wheel acceleration rate drops below threshold "$+b_{20}$", (at point "E" of the pressure curve), the ABSCM starts pressure "hold" and "increase" control cycles at a given interval. When the wheel deceleration rate then exceeds threshold "$-b_0$" (at point "F" of the pressure curve), the ABSCM immediately makes a pressure "decrease" control.



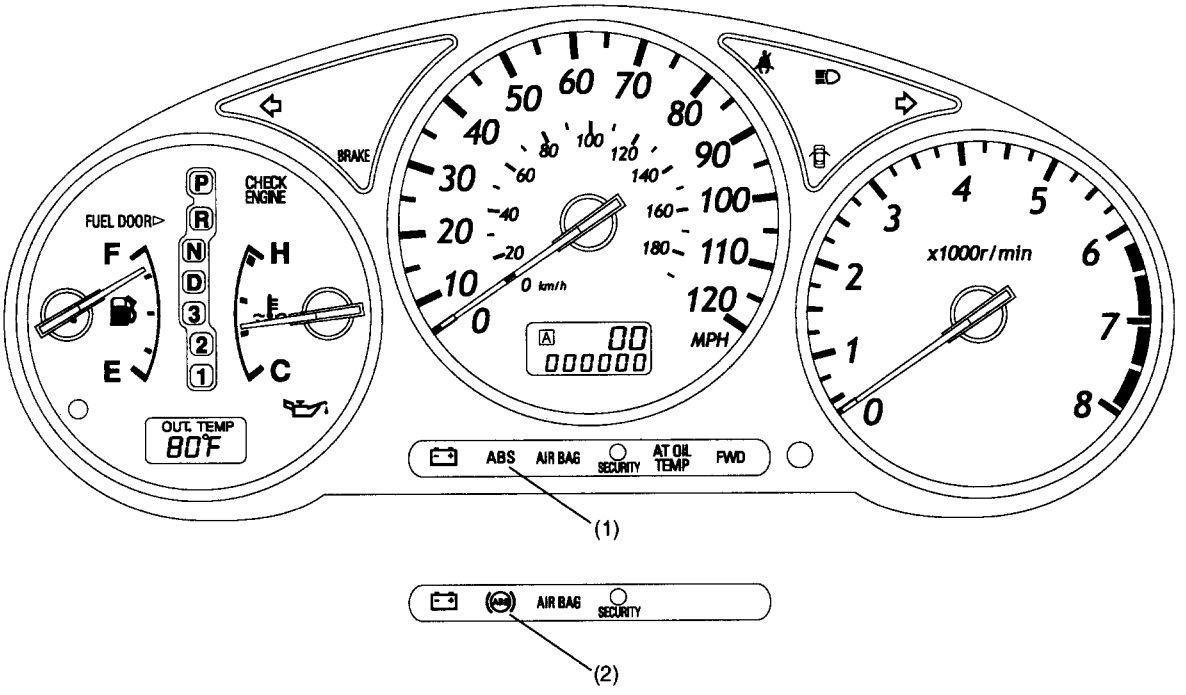
NF0205

Brake fluid Pressure	Inlet valve	Outlet valve
Increase	OFF	OFF
Hold	ON	OFF
Decrease	ON	ON

G: ABS WARNING LIGHT

When a fault occurs in the signal transmission system or the ABSCM, the ABS warning light in the combination meter comes on. At the same time, the current to the hydraulic control unit is interrupted. The brake system then functions in the same manner as a system without ABS. The warning light utilizes a dual circuit design.

If the warning light comes on, one or more trouble codes should be stored in the control module. They must be identified using the warning light's code indicating function.



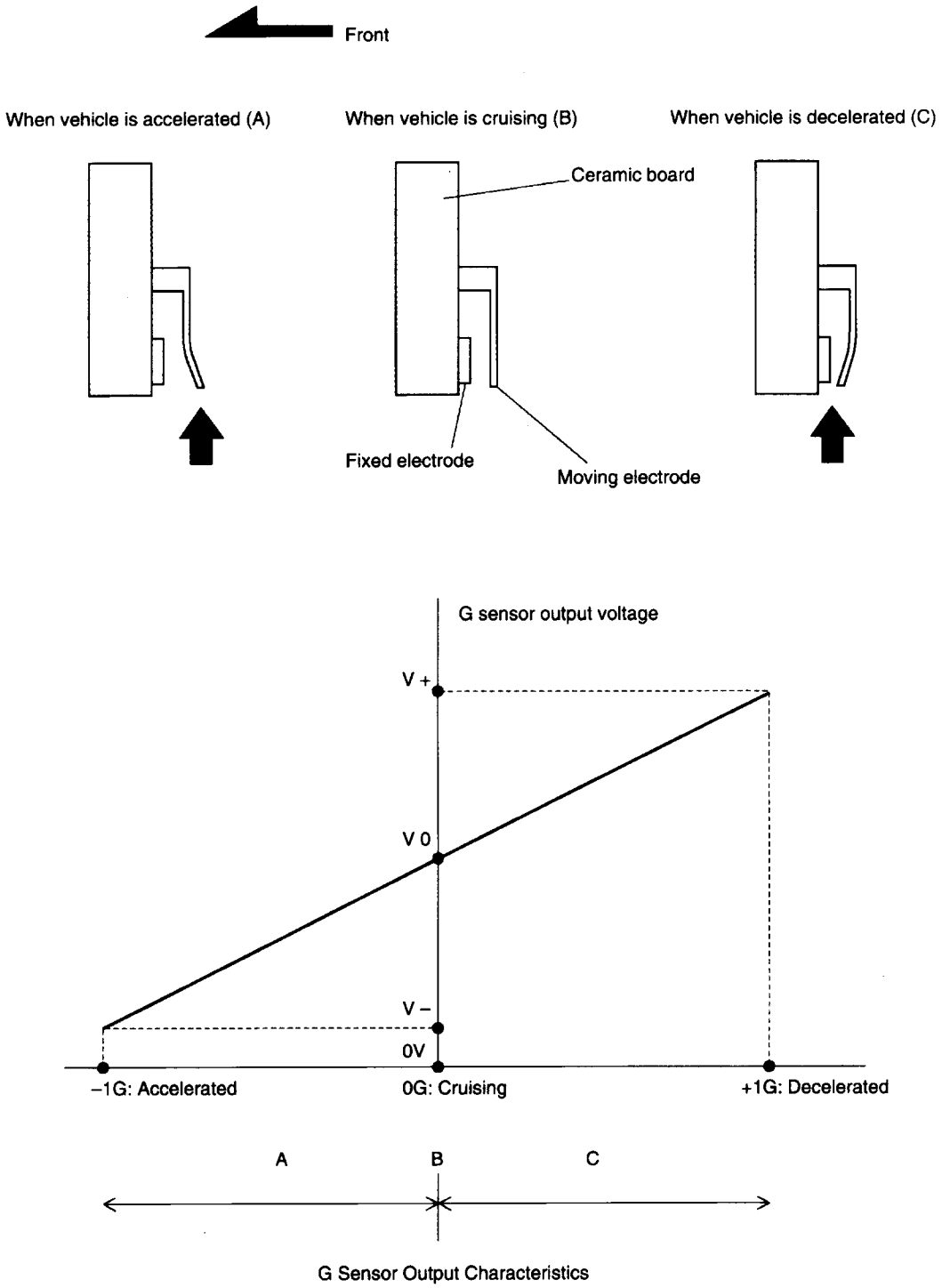
NF0467

(1) ABS warning light (U.S. spec. vehicles)

(2) ABS warning light (Canada spec. vehicles)

H: G SENSOR

The G sensor detects changes in the vehicle's acceleration/deceleration rate in the longitudinal direction.
The moving electrode of a capacitor in the sensor moves away from or close to the fixed electrode as the vehicle accelerates or decelerates and the resulting change in the capacitance of the capacitor is outputs to the ABSCM as a change in the voltage.



G Sensor Output Characteristics

NF0207

BRAKES BR

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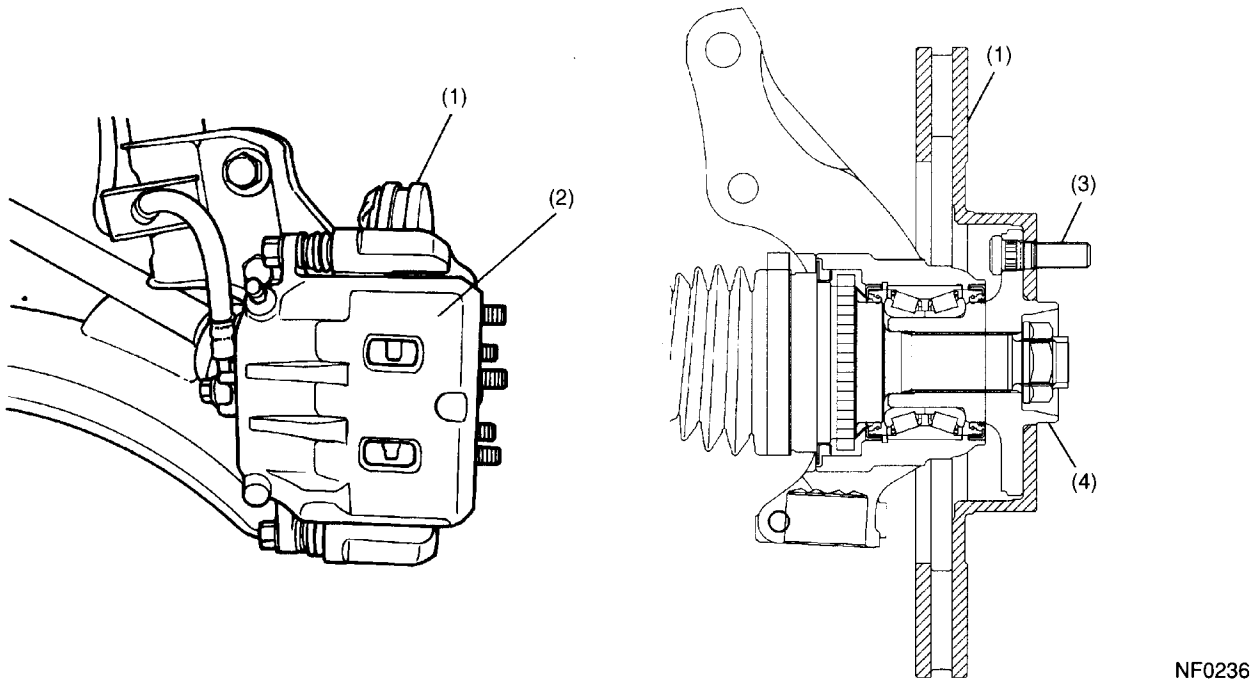
1.	Front and Rear Disc Brakes	2
2.	Rear Drum Brakes	4
3.	Master Cylinder	6
4.	Brake Booster	9
5.	Proportioning Valve	10

1. Front and Rear Disc Brakes

- The disc brakes are of a ventilated disc type which features high heat dissipation and superb braking stability. In addition, the front brakes quickly restores their original braking performance even when they get wet.
- Ventilated discs are used only on the front wheels.
- Each disc rotor, which is fitted on the outside of the hub, is secured together with the wheel using the hub bolts. This facilitates its removal and installation.
- The inner brake pad is provided with a wear indicator.

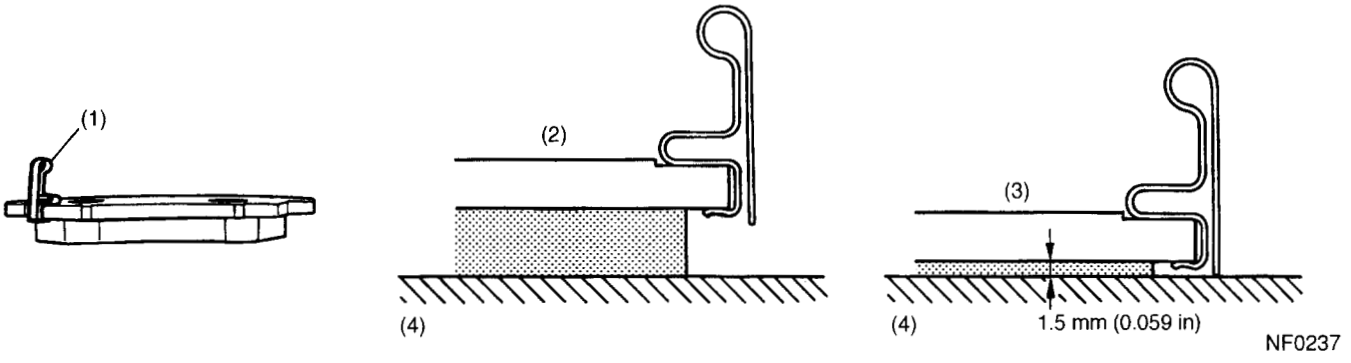


NF0236

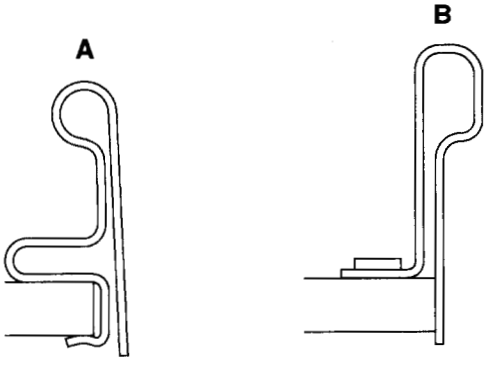
(1) Disc rotor
(2) Caliper body
(3) Hub bolt
(4) Hub

A: PAD WEAR INDICATOR

A wear indicator is provided on the inner disc brake pads. When the pad wears down to 1.5 mm (0.059 in) the tip of the wear indicator comes into contact with the disc rotor, and makes a squeaking sound as the wheel rotates. This alerts the driver to the situation.



(1) Wear indicator
(2) New pad
(3) Worn pad
(4) Disc rotor



A: TURBO MODEL
B: NON-TURBO MODEL

B: FRICTIONAL MATERIAL OF BRAKE PADS

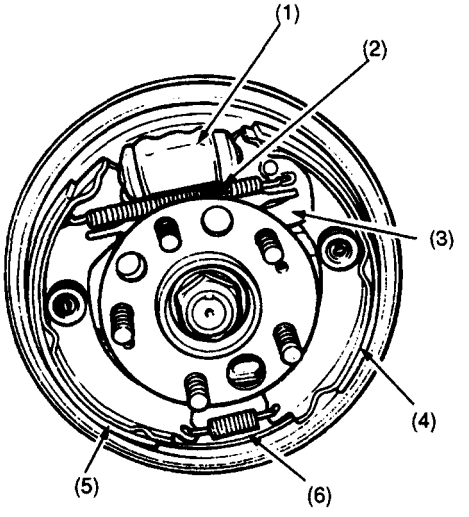
The brake pads materials do not contain any asbestos which is harmful to human body.

2. Rear Drum Brakes

• The rear drum brakes are of a leading-trailing shoe type. When fluid pressure is applied to each wheel cylinder, the piston expands the leading and trailing shoes. During expansion of the shoes, the lower shoe return spring joint acts as a pivot. The shoes come in contact with the inner surface of the drum, producing braking action.

• When brakes are applied during the forward movement, the tip of the brake leading shoe lining is pressed against the inner surface of the drum so as to oppose the drum's rotating force. This increases the braking force. The trailing shoe, however, undergoes a force that pushes it back so that braking force applied to the trailing shoe decreases.
The above shoe actions are reverse while the vehicle is moving backward; the braking force exerted on the trailing shoe is greater than that on the leading shoe. This means that there is no difference in braking force between when the vehicle is moving forward and when it is reversing.

• An inspection hole is provided in the backing plate for easier inspection of the linings for wear. The hole is closed with a rubber cap.

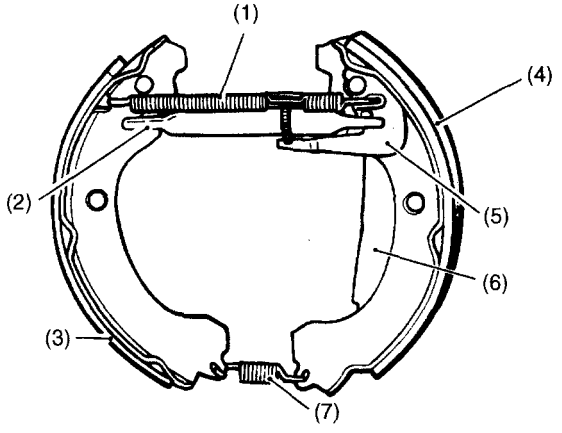


NF0238

(1) Wheel cylinder
(2) Upper shoe return spring
(3) Adjuster lever
(4) Trailing shoe
(5) Leading shoe
(6) Lower shoe return spring

A: AUTOMATIC ADJUSTER

The brake lining-to-drum clearance is automatically adjusted by the automatic adjuster. When the brake shoe is contracting after expansion, the adjuster lever rotates the adjuster assembly's screw to lengthen the adjuster assembly so that the clearance is maintained at the specified value.



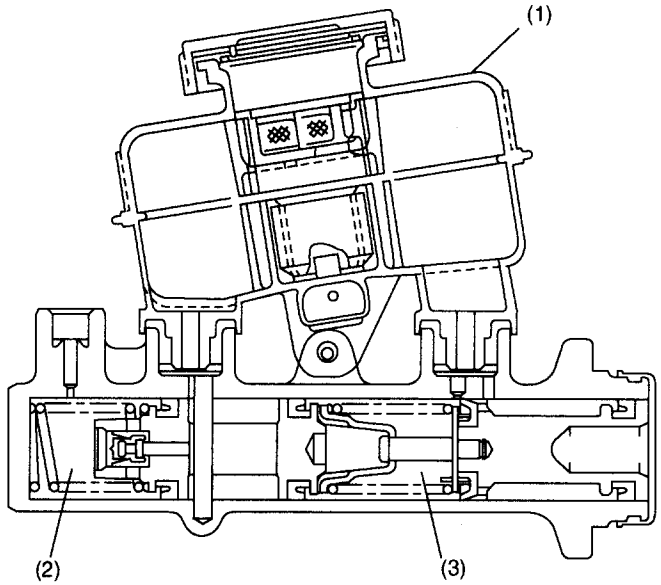
NF0239

(1) Upper shoe return spring
(2) Adjuster assembly
(3) Leading shoe
(4) Trailing shoe
(5) Adjuster lever
(6) Parking lever
(7) Lower shoe return spring

3. Master Cylinder

• There is a brake fluid reservoir tank on the master cylinder. The reservoir is completely sealed for extended service life of the brake fluid.

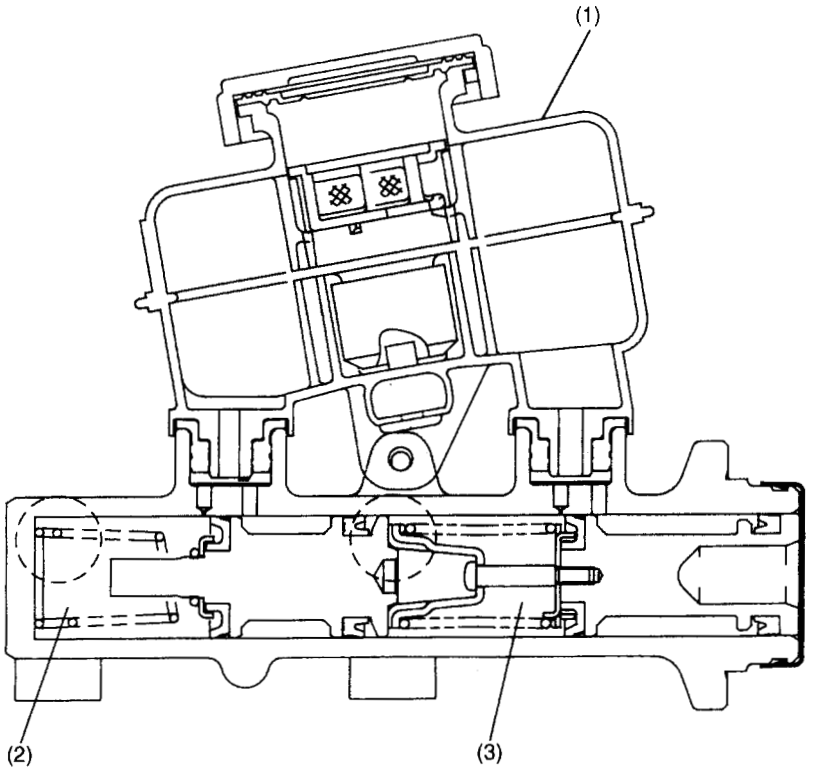
With ABS model



NF0461

(1) Reservoir tank
(2) Secondary hydraulic chamber (chamber S)
(3) Primary hydraulic chamber (chamber P)

Without ABS model



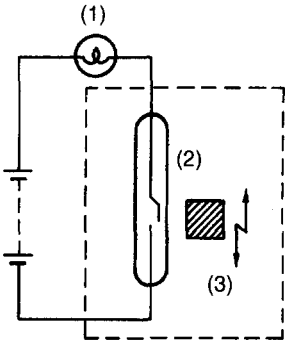
NF0241

(1) Reservoir tank
(2) Secondary hydraulic chamber (chamber S)
(3) Primary hydraulic chamber (chamber P)

A: BRAKE FLUID LEVEL SWITCH

The brake fluid level switch is located inside the brake fluid reservoir tank and causes the brake system warning light on the combination meter to come on when the fluid level has dropped below the predetermined level.

The switch assembly consists of a reed switch (normally open) and a permanent magnet that is incorporated in a float.
When the brake fluid level is normal, the float is far above the reed switch, so the force of the magnet is unable to act on the reed switch. The warning light circuit, therefore, remains open.
When the brake fluid level drops to a level approximately 30 mm (1.18 in) below the maximum level and the float lowers accordingly, the magnet aligns with the reed switch, activating the reed switch contact. The warning light then comes on to warn the driver of the situation.
The warning light may, although momentarily, illuminate even when the brake fluid level is normal if the vehicle tilts or swing largely.

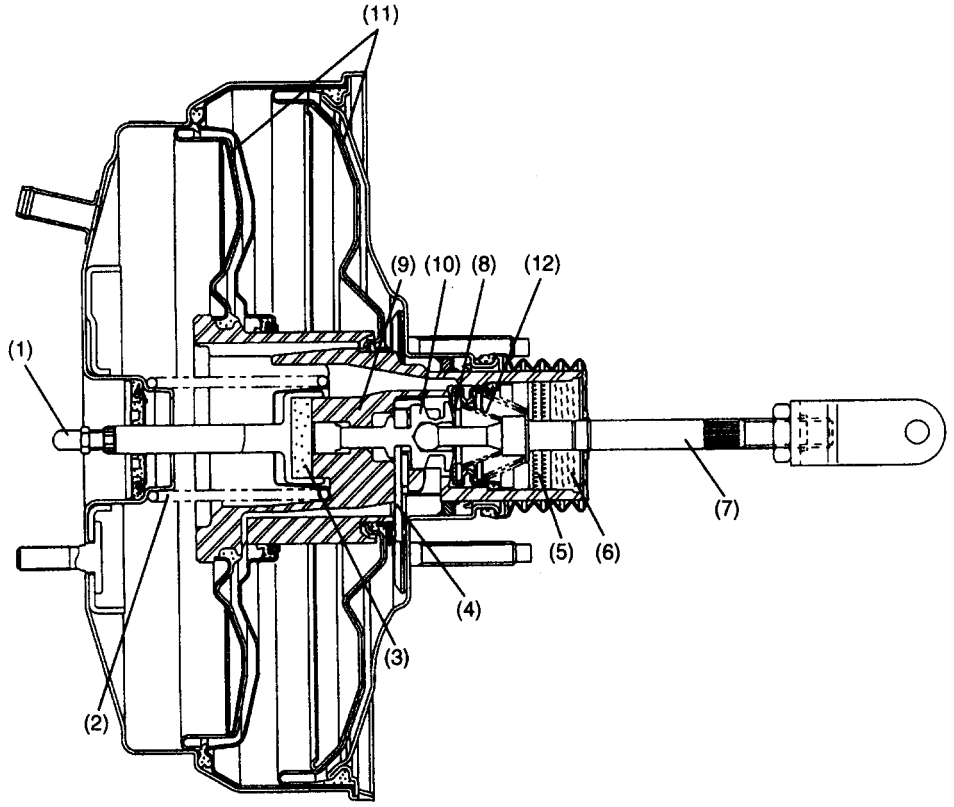


NF0242

(1) Warning light
(2) Reed switch
(3) Permanent magnet

4. Brake Booster

The brake booster is a tandem type that uses two diaphragms. This design provides high brake boosting effects in spite of a reduced diameter.

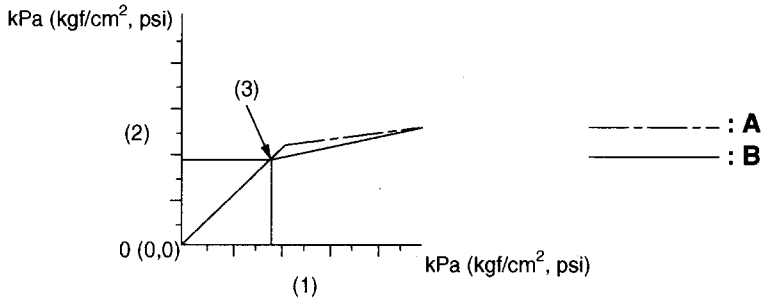


NF0243

(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

5. Proportioning Valve

The proportioning valve prevents the rear wheels from locking and resultant skidding that would occur during hard braking due to transfer of vehicle weight toward the front wheels. The valve distributes a reduced pressure to the rear wheel brakes as compared with the pressure to the front wheel brakes when a specified master cylinder fluid pressure (called "split point") is exceeded as shown in the diagrams below.



NF0248

(1) Master cylinder fluid pressure
(2) Rear wheel cylinder fluid pressure
(3) Split point

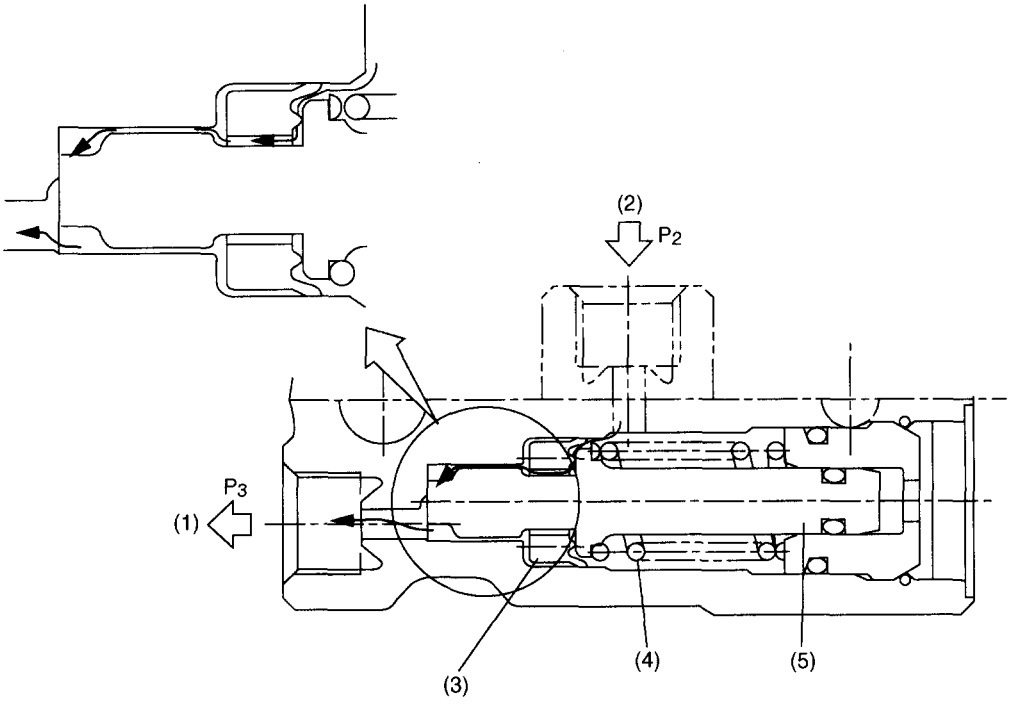
A: Brakes released
B: Brakes kept applied

A: OPERATION

1) Operation before the split point

The piston is held pressed toward the left by the spring so that the piston is kept away from its lip seal.

Under this condition, fluid pressure "P_3" to the rear wheel cylinders is equal to fluid pressure "P_2" from the master cylinder.

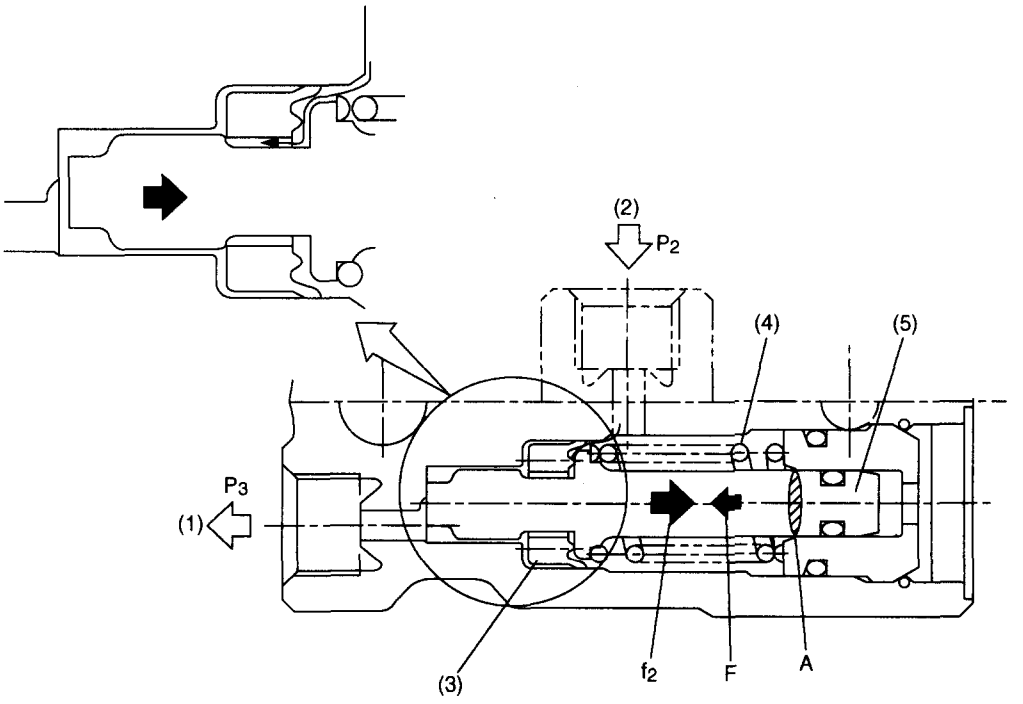


NF0250

(1) To rear wheel cylinder
(2) From master cylinder
(3) Lip seal
(4) Spring
(5) Piston

2) Operation at the split point pressure

When pressure "P_2" increases to the split point pressure, force "f_2" is generated. (Piston's cross sectional area "A" has been selected so that the force is generated starting with the split point pressure.) The pressure pushes the piston rightward, overcoming spring force "F". As a result, the piston moves rightward and comes in contact with the lip seal, blocking the passage toward the rear wheel cylinders.



NF0251

(1) To rear wheel cylinder
(2) From master cylinder
(3) Lip seal
(4) Spring
(5) Piston

3) Operation after reaching the split point pressure

Immediately before the fluid passage toward the rear wheel cylinders is closed, pressure "P_2" is slightly higher than pressure "P_3". So the piston can move in the spring force acting direction and the fluid can flow to the wheel cylinders. However, as soon as pressure "P_2" becomes equal to "P_3", the passage closes.

This cycle is repeated as long as the pedal is depressed further, but pressure increasing rate of the rear wheel cylinders is smaller than that of the front wheel cylinders.

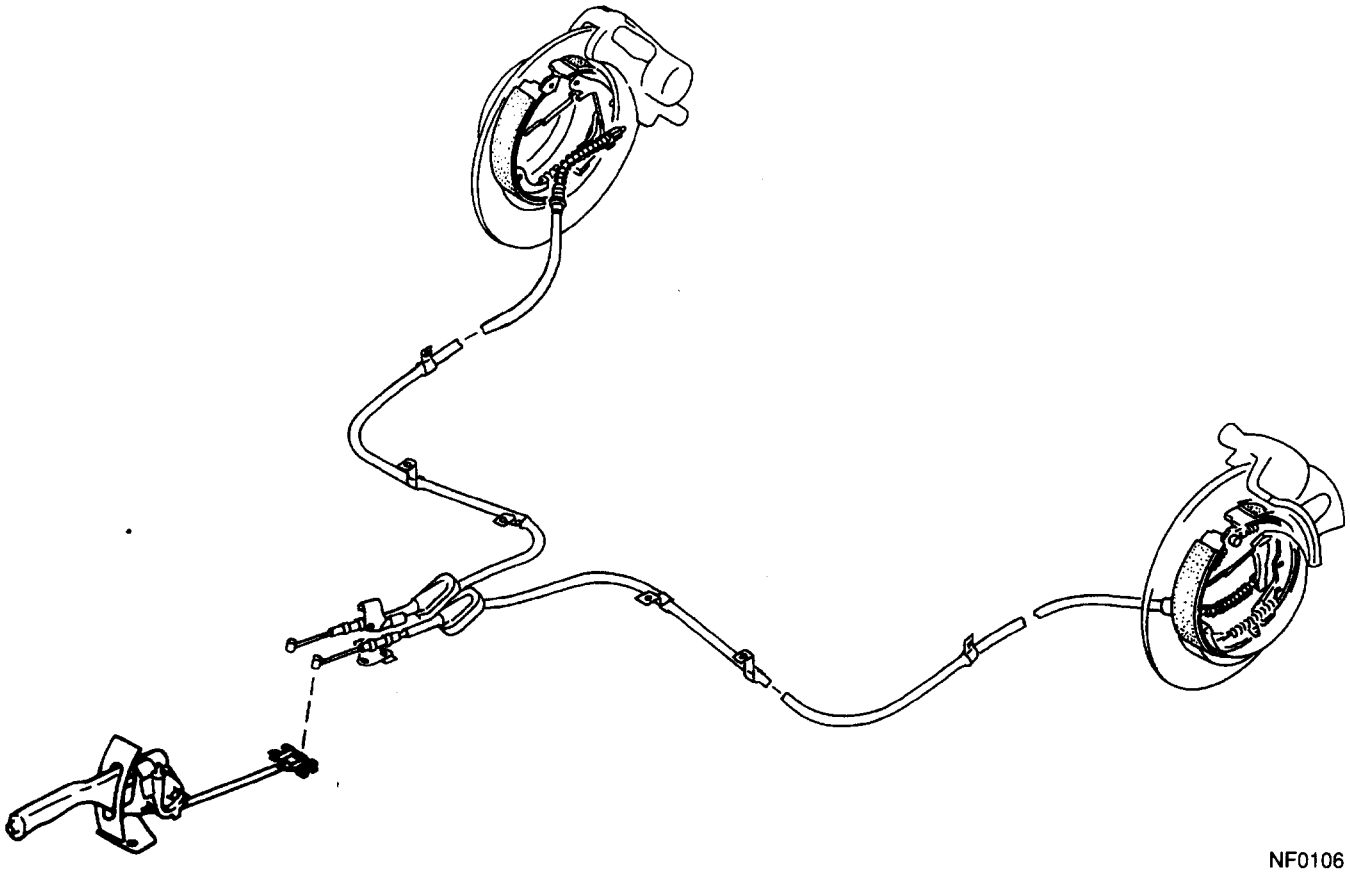
PARKING BRAKE PB

Page

1. Parking Brake (Rear Disc Brakes) 2
2. Parking Brake (Rear Drum Brakes) 5

1. Parking Brake (Rear Disc Brakes)

The parking brake uses a drum housed in the disc rotor of each rear disc brake. The shoes are mechanically controlled through linkage and cables.



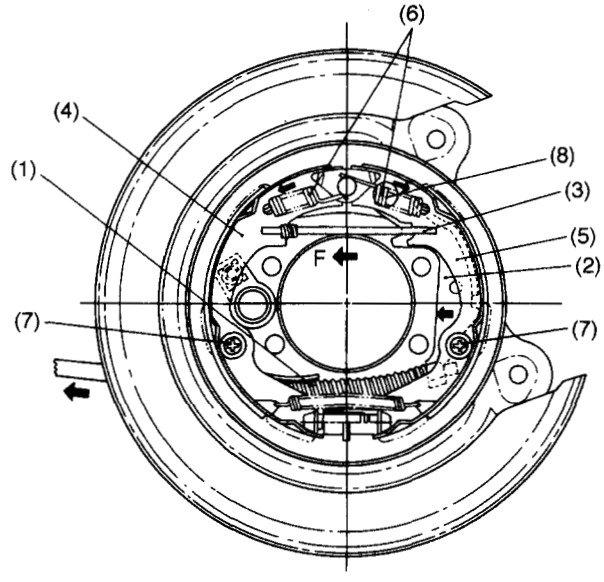
NF0106

A: OPERATION

1. SETTING

When the parking brake lever is pulled, the shoe actuating lever to which the end of the parking brake cable is connected turns the strut in direction "F" around point "P".

The strut then presses the brake shoes A and B against the drum. These brake shoes utilize a floating design and are movably supported by hold-down pins. The force applied to brake shoe A and the reaction force "F" applied to the brake shoe B via point "P" press them against the brake drum.

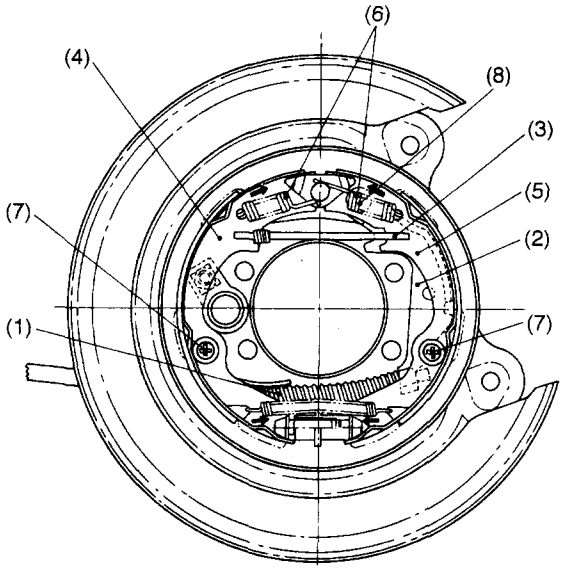


NF0107

(1) Parking brake cable
(2) Lever
(3) Strut
(4) Brake shoe A
(5) Brake shoe B
(6) Shoe return spring
(7) Shoe hold down pin
(8) Point "P"

2. RELEASING

When the parking brake lever is returned to the release position and the parking brake cables are slackened, the brake shoes A and B are moved back to their original positions by the tension of return springs, so that the parking brake is released.

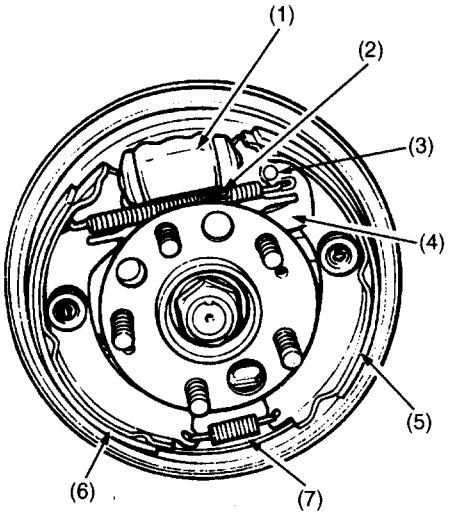


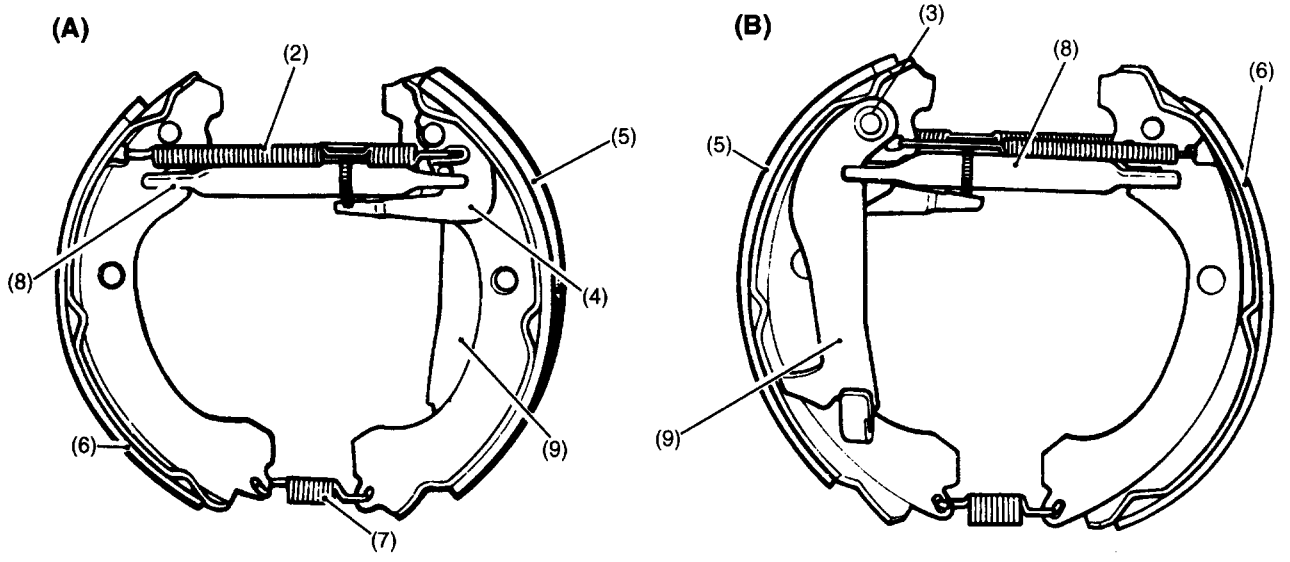
NF0108

(1) Parking brake cable
(2) Lever
(3) Strut
(4) Brake shoe A
(5) Brake shoe B
(6) Shoe return spring
(7) Shoe hold down pin
(8) Point "P"

2. Parking Brake (Rear Drum Brakes)

When the parking brake lever is moved up, the parking lever in each rear drum brake moves around point "A" so that the trailing shoe expands. The leading shoe also expands by way of the adjuster assembly. The shoes are thus pressed against the drum to generate a wheel locking force.





NF0109

(1) Wheel cylinder
(2) Upper shoe return spring
(3) Point "A"
(4) Adjuster lever
(5) Trailing shoe
(6) Leading shoe
(7) Lower shoe return spring
(8) Adjuster assembly
(9) Parking lever

(A) Automatic brake lining clearance adjustment mechanism
(B) Parking brake mechanism

MEMO

POWER ASSISTED SYSTEM (POWER STEERING) PS

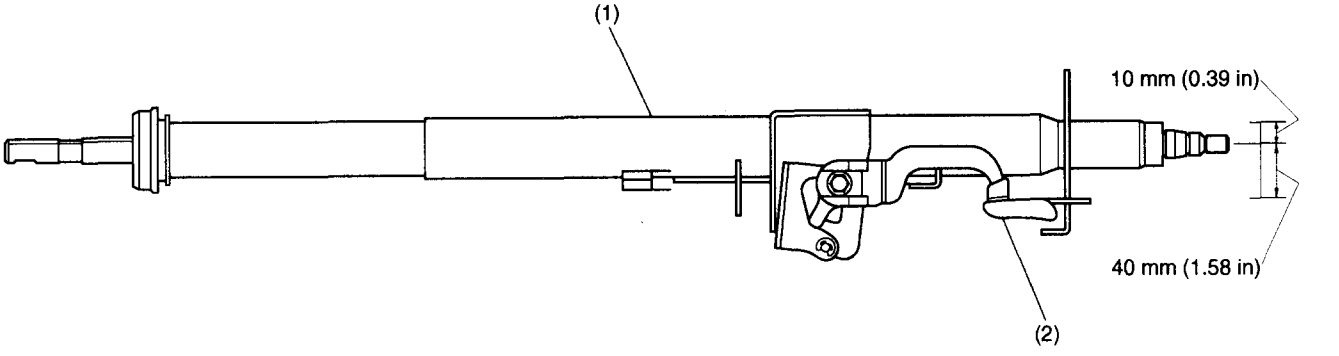
Page

1. Tilt Steering Column 2
2. Power Steering System 5

1. Tilt Steering Column

A: TILT MECHANISM

• The steering wheel vertical position can be adjusted within a 50 mm (1.97 in) range by using the tilt lever to unlock the steering column and lock it again at the desired position.

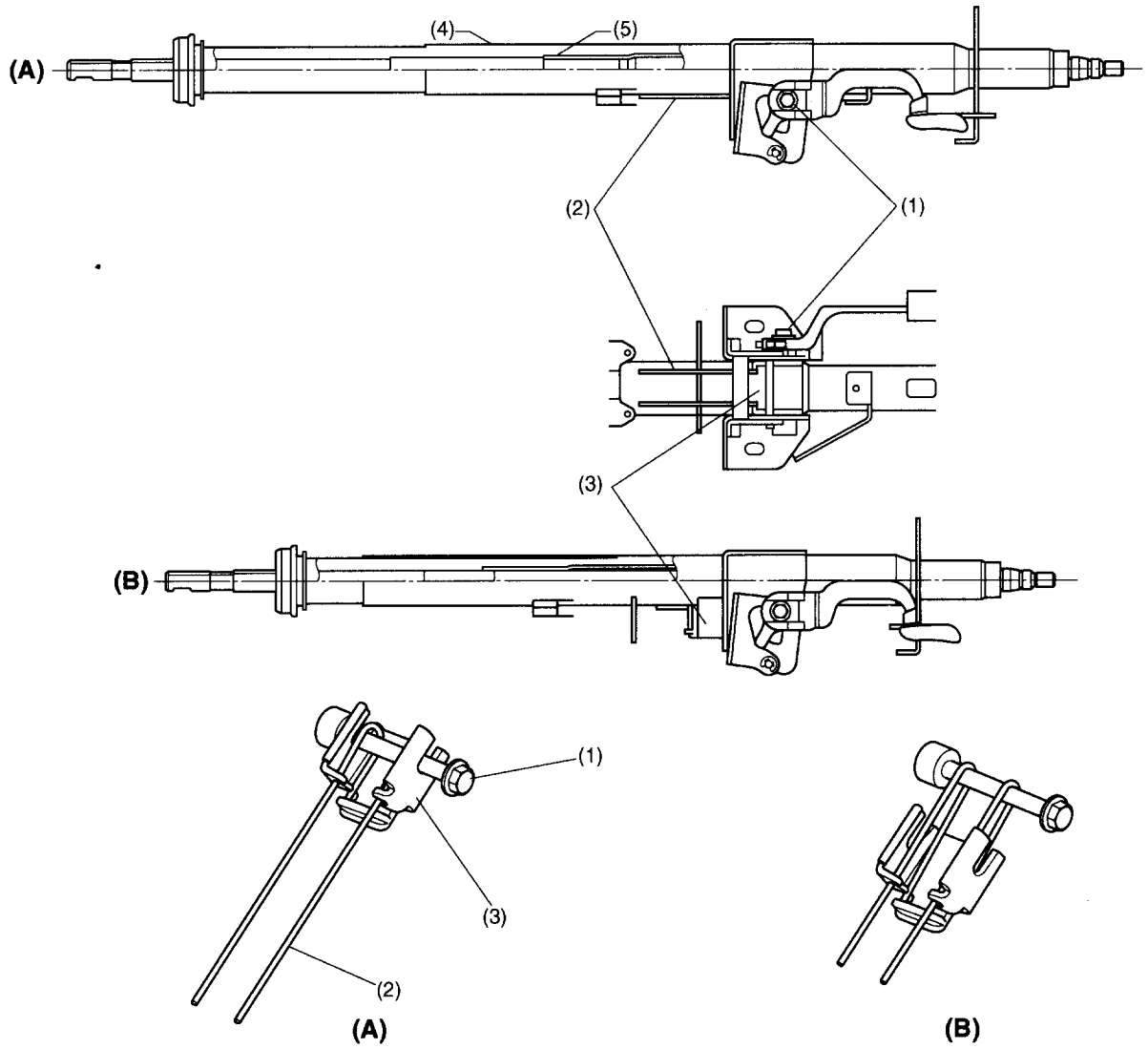


NF0279

(1) Tilt steering column
(2) Tilt lever

B: ENERGY-ABSORBING MECHANISM

- To absorb the backward movement energy generated in the engine in the event of a frontal collision, a cylindrical fitting type steering column pipe has been adopted. When an impact load exceeding a certain level is applied to the steering column, the shaft moves in the jacket. Since the shaft is press-fitted in the jacket, friction generated between them during the above-mentioned movement absorbs impact. The column bending load is supported by the fittings.
- Another measure to alleviate impact on the driver in the event of a collision is the wire which is located between the tilt pin and the distance plate attached to the steering support beam. When a large impact load is applied to the steering column, the wire is deformed progressively. The impact energy is absorbed during this process.



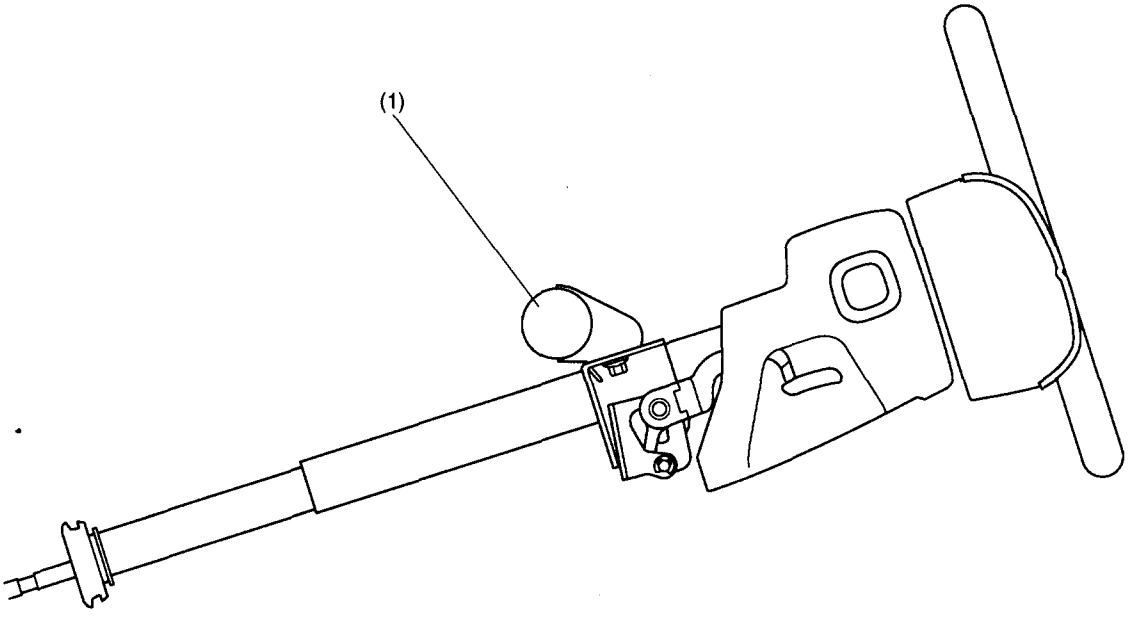
NF0447

(A) Before absorption of impact energy
(B) After absorption of impact energy

(1) Tilt pin
(2) Wire
(3) Distance plate
(4) Jacket
(5) Shaft

C: STEERING SUPPORT BEAM

The steering column is held in position by a support beam which is installed crosswise in the vehicle body at a level close to the steering wheel to reduce the overhang distance of the steering wheel from the supporting point of the column. The steering shaft upper bearing is also located close to the steering wheel to increase supporting efficiency as well as to minimize vibration of the steering wheel.



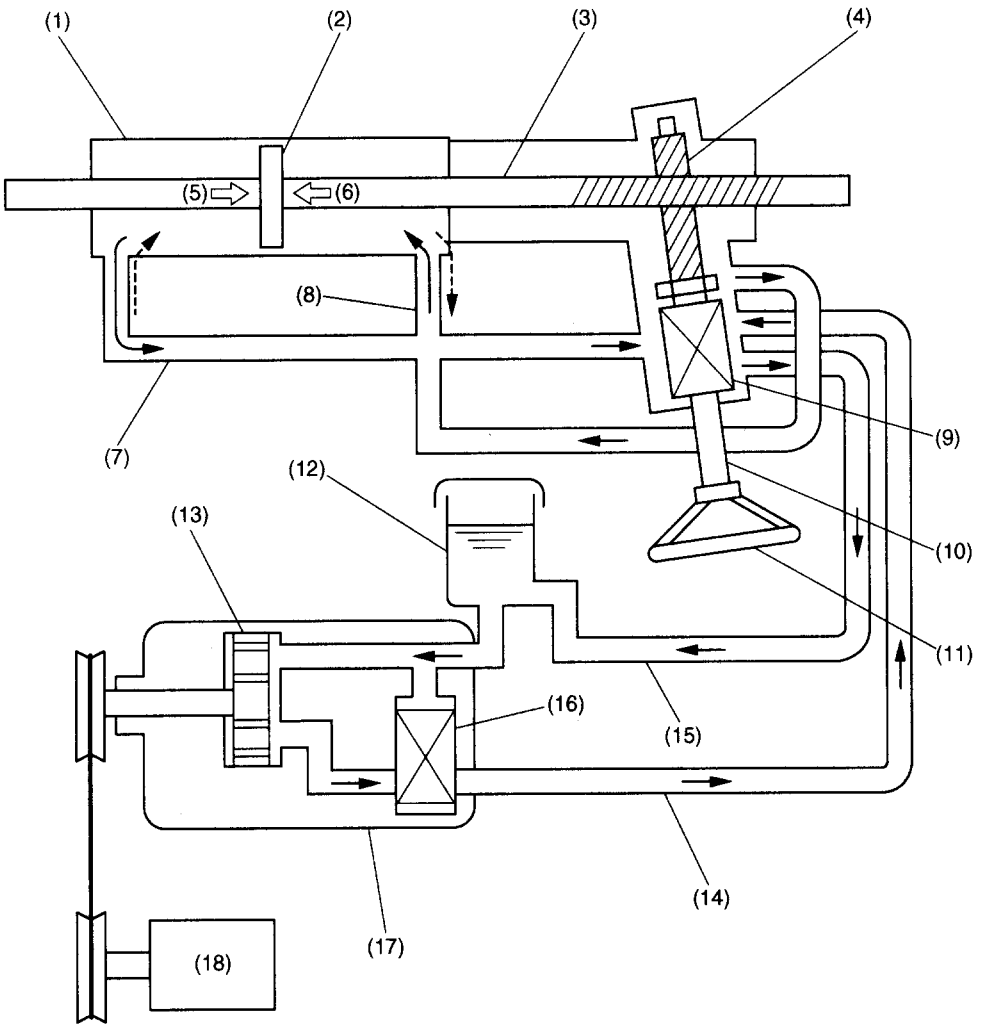
NF0281

(1) Steering support beam

2. Power Steering System

A: HYDRAULIC SYSTEM

- The fluid pump is directly driven by the engine through a belt.
- When the steering wheel is not being turned, the pressure-sensitive valve in the pump opens to drain the fluid into the fluid reservoir tank (Turbo model).
- The fluid pressure is maintained almost constant regardless of change in the engine speed by the function of the flow control valve. The pressure-regulated fluid is delivered to the control valve via hose A.
- When the steering wheel is turned, the rotary control valve connected to the pinion shaft opens the hydraulic circuit corresponding to the direction in which the steering wheel is turned. The fluid then flows into chamber A or B via pipe A or B.
- The fluid pressure in chamber A or B acts on the rack piston in the same direction as that in which the rack shaft is moved by rotation of the steering wheel. This helps reduce the effort required of the driver to operate the steering wheel.
- Movement of the rack piston causes the fluid in the other chamber to return to the reservoir tank via pipe A or B, control valve, and hose B.
- As the steering shaft is connected to the pinion shaft mechanically via the rotary control valve, the steering system can operate as a manual system even if the hydraulic system becomes inoperative.
- To control the maximum fluid pressure, a relief valve is built into the fluid pump to prevent build-up of an excessive fluid pressure.



NF0283

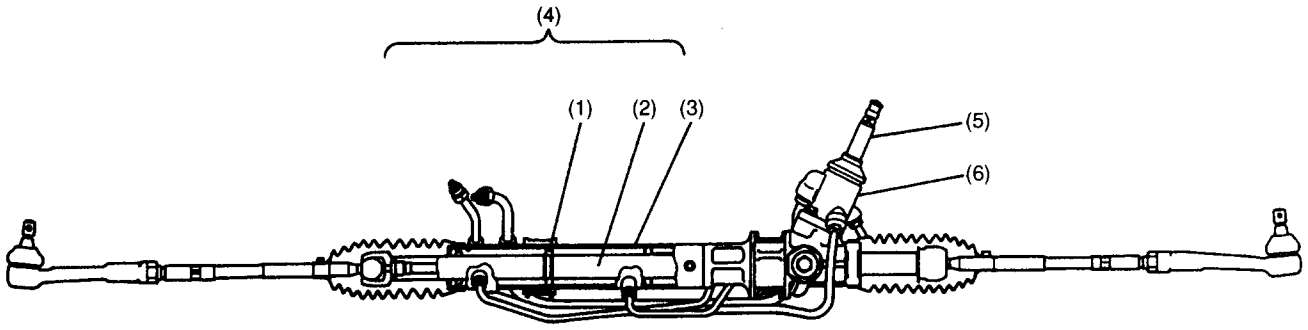
(1) Power cylinder
(2) Rack piston
(3) Rack shaft
(4) Pinion shaft
(5) Chamber A
(6) Chamber B
(7) Pipe A
(8) Pipe B
(9) Control valve
(10) Steering shaft
(11) Steering wheel
(12) Tank
(13) Vane pump
(14) Hose A
(15) Hose B
(16) Turbo model: flow control, energy-saving and pressure sensitive valve assembly
Non-turbo model: flow control and relief valve assembly
(17) Fluid pump
(18) Engine

B: GEARBOX ASSEMBLY

1. POWER CYLINDER

The gearbox integrates the control valve and power cylinder into a single unit. The rack shaft serves as a power cylinder piston. The rotary control valve is located around the pinion shaft.

The rotary control valve and power cylinder are connected to each other by two pipes through which hydraulic fluid flows.



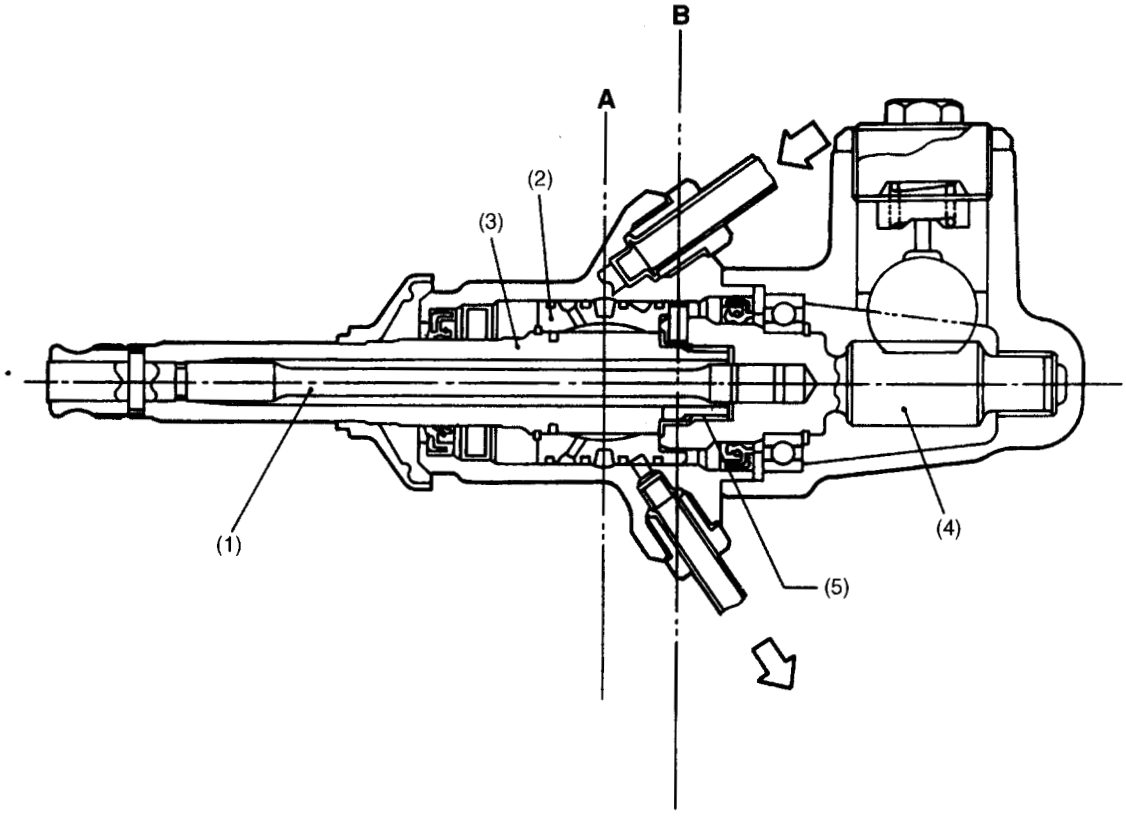
NF0284

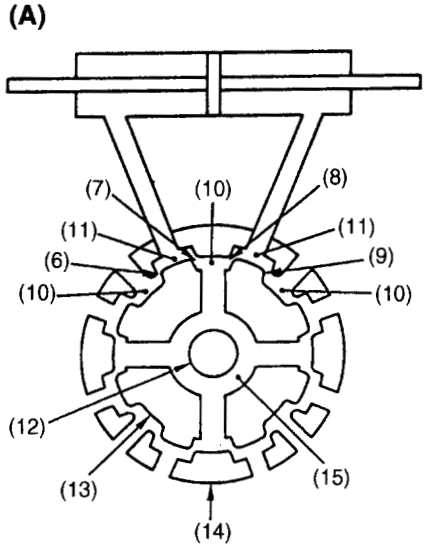
(1) Piston
(2) Rack shaft
(3) Cylinder
(4) Power cylinder
(5) Pinion shaft
(6) Control valve

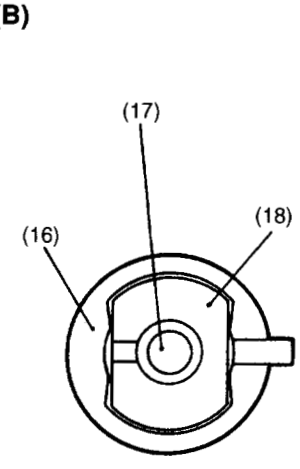
2. ROTARY CONTROL VALVE

The rotary control valve consists of a rotor (which rotates together with the steering shaft), a pinion (which is connected to the rotor and torsion bar), and a sleeve (which rotates together with the pinion). The rotor and sleeve have grooves C and D, respectively, which form fluid passages V_1 through V_4.

The pinion is in mesh with the rotor with adequate clearance, which enable the rack to be moved manually by rotating the steering shaft (fail-safe feature).







NF0286

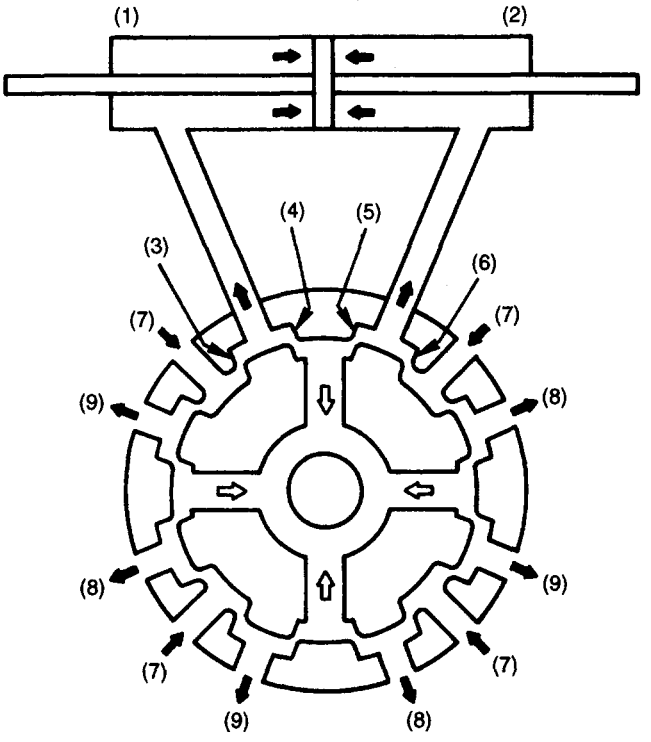
(1) Torsion bar
(2) Sleeve
(3) Rotor
(4) Pinion
(5) Pinion-to-rotor engagement (fail-safe feature)
(6) Fluid passage V_1
(7) Fluid passage V_2
(8) Fluid passage V_3
(9) Fluid passage V_4
(10) Groove C
(11) Groove D
(12) Torsion bar
(13) Rotor
(14) Sleeve
(15) Fluid return line (to reservoir tank)
(16) Pinion
(17) Torsion bar
(18) Rotor

(A) Cross-sectional view A (fluid passage switching circuit)
(B) Cross-sectional view B (pinion-to-rotor engagement)

- Principle of operation

When the torsion bar is twisted by a rotational force applied to the steering wheel, the relative position between the rotor and sleeve changes. This changes the cross-sectional area of fluid passages V_1, V_2, V_3 and V_4. The fluid passages are thus switched and the fluid pressure is controlled in accordance with the operation of the steering wheel.

- When no steering force is applied:
The rotor and sleeve are held at the neutral position. Fluid passages V_1, V_2, V_3 and V_4, which are formed by grooves C and D are open equally. Under this condition, the fluid from the pump returns to the reservoir tank so that neither fluid pressure builds up nor the rack piston moves in the power cylinder.

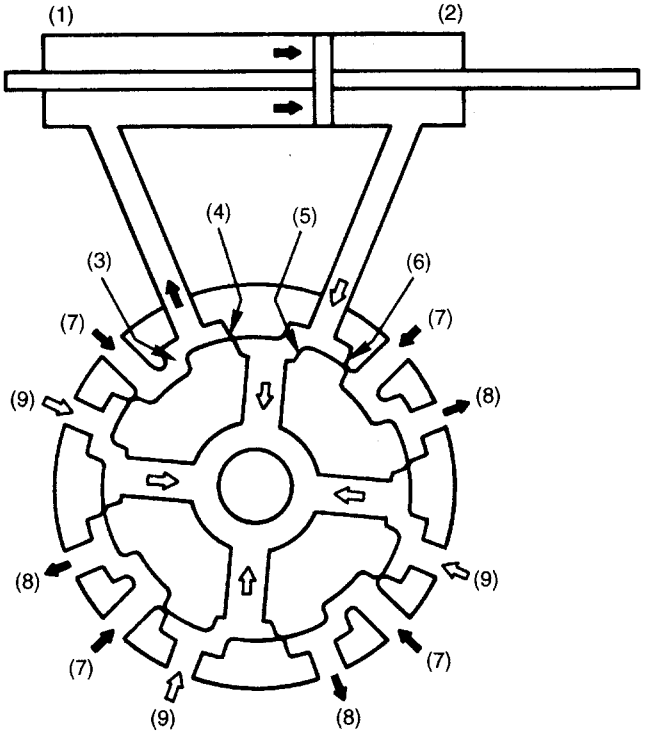


NF0288

(1) Chamber A
(2) Chamber B
(3) V_1
(4) V_2
(5) V_3
(6) V_4
(7) From fluid pump
(8) To A
(9) To B

- When steering force is applied:

When the steering wheel is turned to the right, for example, fluid passages V_1 and V_3 are opened while fluid passages V_2 and V_4 are nearly closed.
At this point, the fluid pressure in chamber A of the power cylinder increases depending on the degree of closure of fluid passages V_2 and V_4 so that the rack piston moves to the right. The fluid in chamber B, on the other hand, is drained through fluid passage V_3 into the reservoir tank.



NF0290

(1) Chamber A
(2) Chamber B
(3) V_1
(4) V_2
(5) V_3
(6) V_4
(7) From fluid pump
(8) To A
(9) From B

- Fail-safe feature

If fluid pressure fails to build up due to, for example, a broken fluid pump drive belt, the steering wheel rotating torque is transmitted from the valve rotor to the pinion through mechanical engagement between them.

C: FLUID PUMP AND RESERVOIR TANK

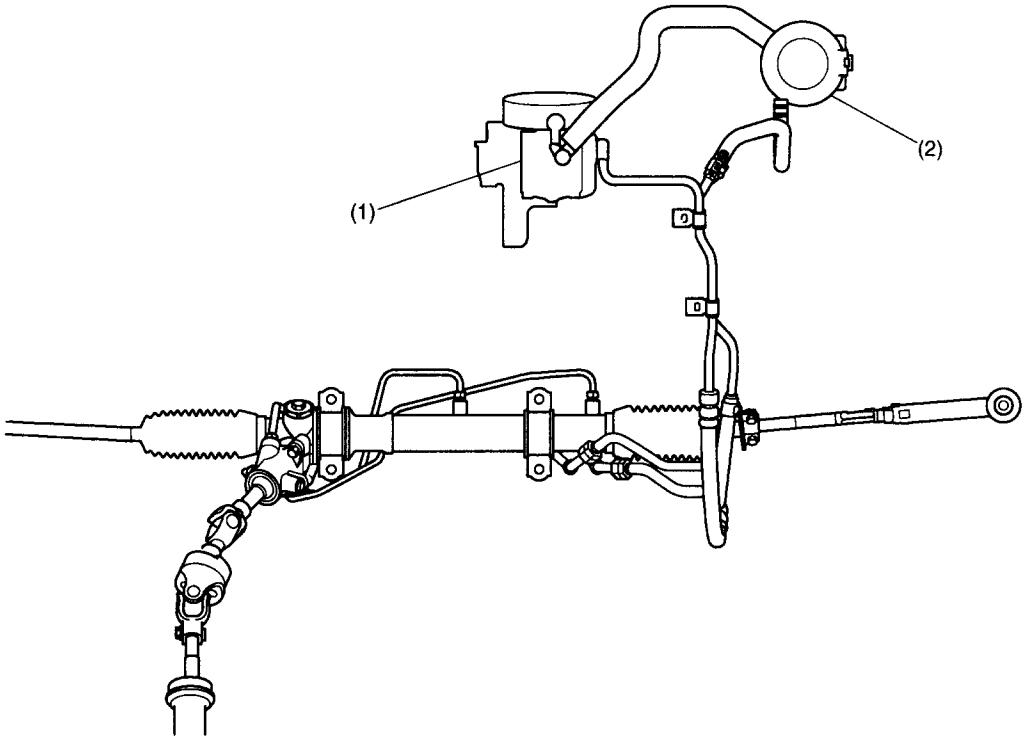
1. NON-TURBO MODEL

The fluid pump is a vane type driven by the engine via belt.

The reservoir tank is mounted on the vehicle body.

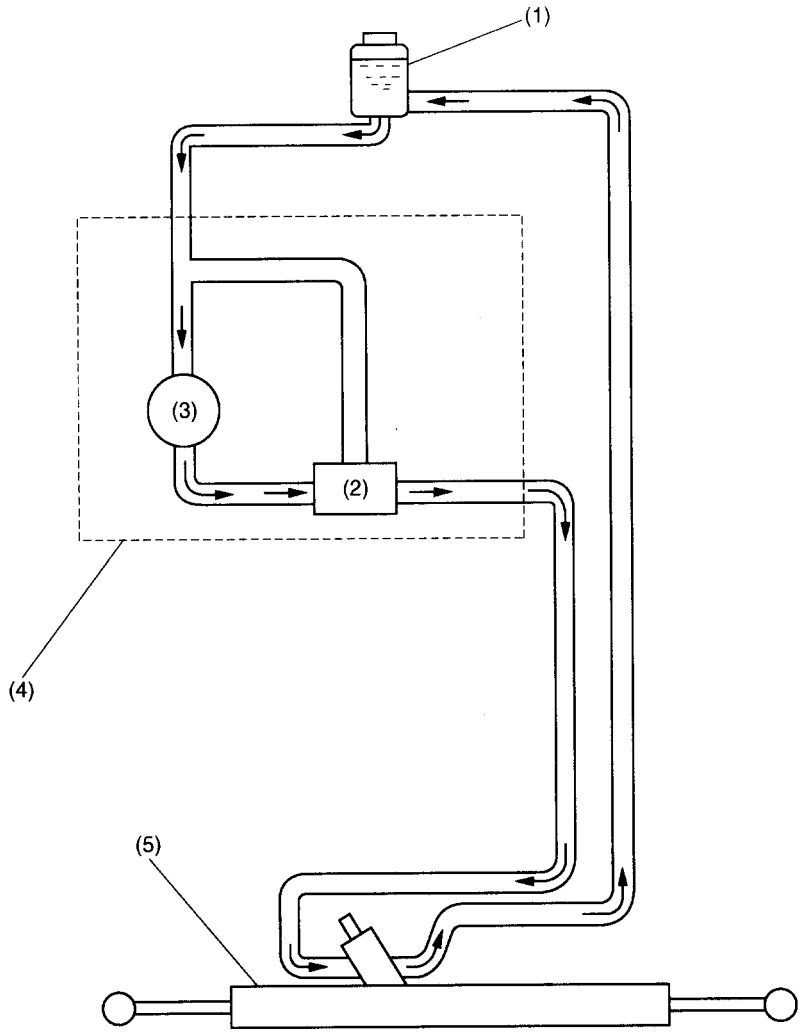
The fluid pump incorporates the flow control valve and relief valve, each performing the following functions:

- The flow control valve regulates the flow rate of discharged fluid to a constant level irrespective of the engine speed.
- The relief valve protects the system from an excessively high pressure which may occur, for example, when the steering wheel is turned all the way.



NF0292

(1) Fluid pump
(2) Reservoir tank



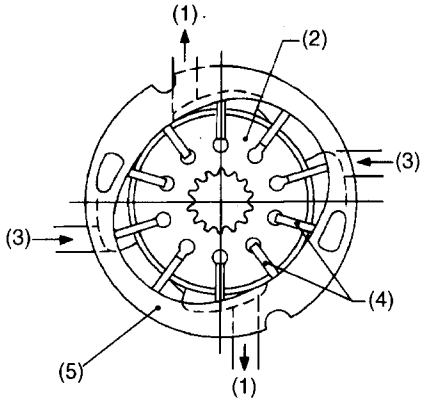
NF0299

(1) Reservoir tank
(2) Flow control and relief valve assembly
(3) Vane pump
(4) Fluid pump assembly
(5) Steering gearbox

• VANE PUMP

The vane pump consists of a rotor, a cam ring, and ten vanes.

When the rotor rotates, the vane movably fitted in each slot of the rotor is radially moved out by centrifugal force and pressed against the inside wall of the cam ring. Since the inside of the cam ring is oval-shaped, the fluid from the suction port is confined and pressurized in the chamber formed between two adjacent vanes as the rotor rotates and is delivered through the discharge port. The pressurized fluid circulates through the hydraulic circuit.

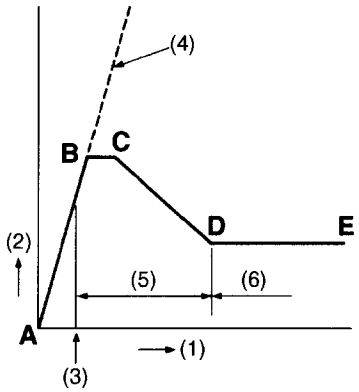


NF0381

(1) Discharge
(2) Rotor
(3) Suction
(4) Vane
(5) Cam ring

• FLOW CONTROL VALVE

The flow control valve regulates flow rate of fluid which otherwise would increase as pump speed increases and deliver dangerously high pressure to the gearbox. It consists of orifices 1 and 2, valve spool, return port and flow control spring. When a pressure difference occurs between the front and rear of orifice 2 as a result of an increase in discharge rate, the valve spool moves against the tension of the flow control spring in such a way that the oil flow rate is controlled by opening and closing of the return port and orifice 2.

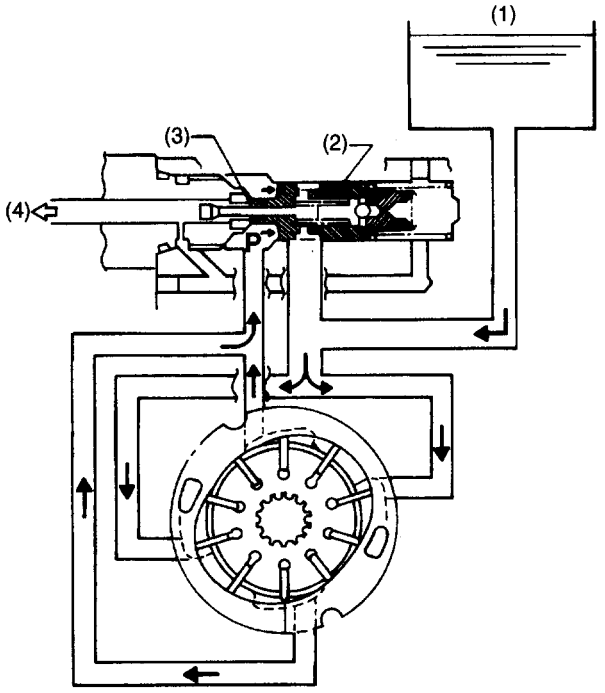


NF0382

(1) Pump speed
(2) Oil flow
(3) Idling
(4) When oil flow is not controlled
(5) Low and mid-range speeds
(6) High speeds

• When the pump begins to rotate, pressure P increases, causing the valve spool to move to the right. If the pump is operating in the A-to-B speed range, the fluid delivered by the pump is sent to the gear box in its whole amount through orifice 1.

Pump speed range: A to B

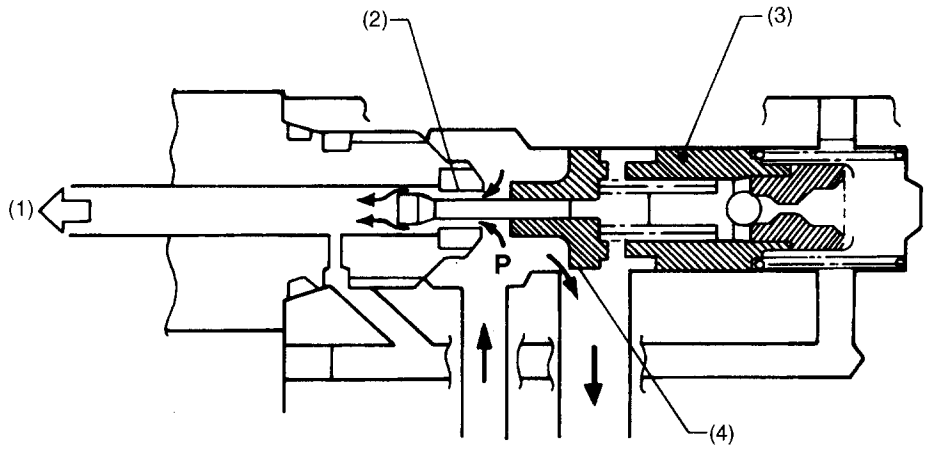


NF0448

(1) Oil reservoir tank
(2) Valve spool
(3) Orifice 1
(4) To gear box

- As the pump speed increases, pressure P increases further, pushing the valve spool further to the right. As a result, orifice 2 opens allowing part of fluid to return to the pump circuit. Accordingly, a constant flow of oil is maintained.

Pump speed range: B to D

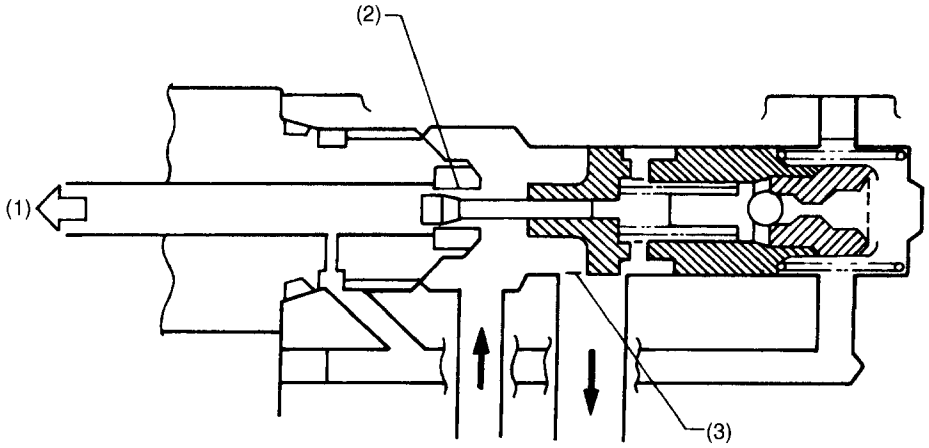


NF0384

(1) To gear box
(2) Orifice 1
(3) Valve spool
(4) Orifice 2

- When the pump speed further increases, the valve spool is pushed fully to the right. Now, orifice 1 is restricted while orifice 2 opens wide. Oil flow to the gear box is thus maintained at a low rate.

Pump speed range: D to E

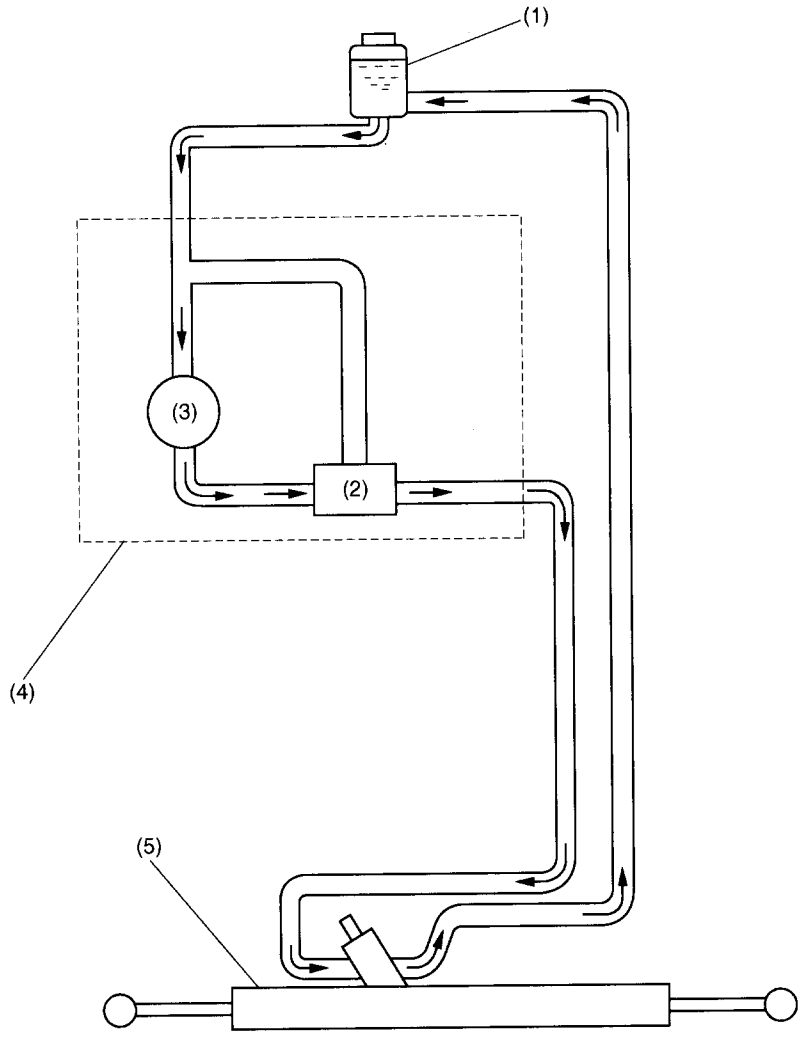


NF0385

(1) To gear box
(2) Orifice 1
(3) Orifice 2

2. TURBO MODEL

- The reservoir tank is mounted on the vehicle body.
- The fluid pump is belt-driven by the engine. The fluid pump for the turbo models is different from that for the non-turbo models in that it has additionally an energy-saving valve mechanism. This valve mechanism reduces the rate of fluid recirculation during straight-ahead driving, which helps reduce engine load.



NF0299

(1) Reservoir tank
(2) Flow control, energy-serving and pressure sensitive valve assembly
(3) Vane pump
(4) Fluid pump assembly
(5) Steering gearbox

• VANE PUMP

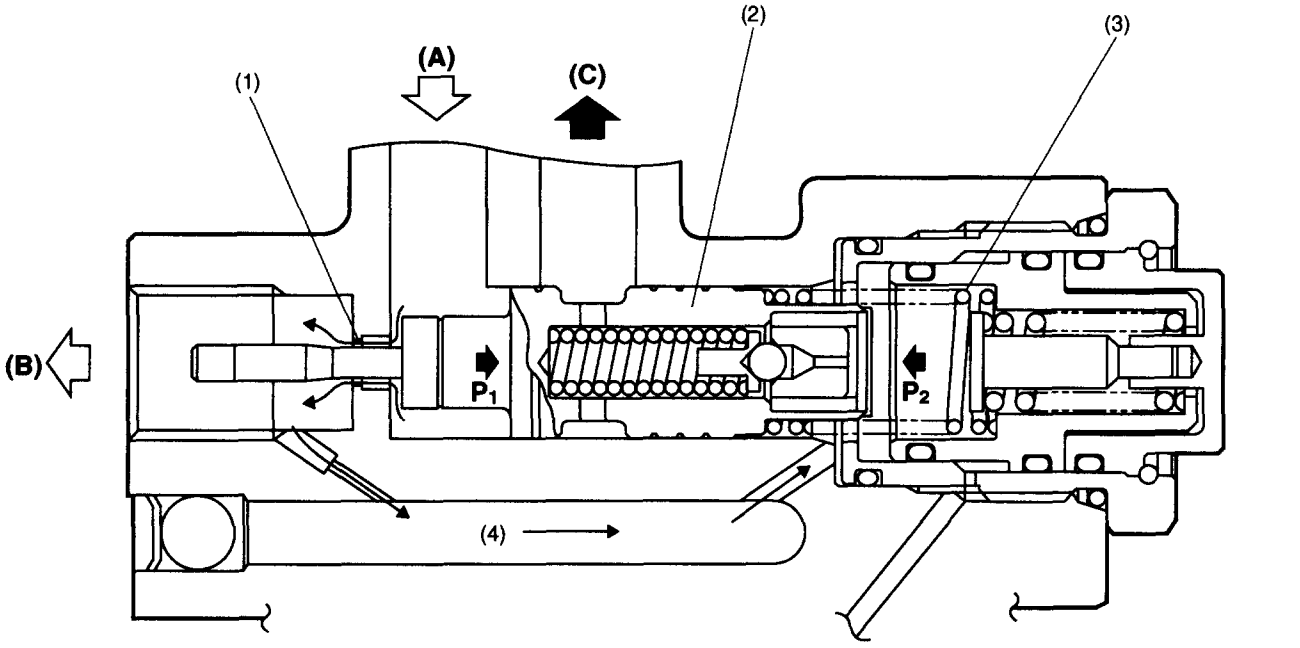
The vane pump consists of a rotor, a cam ring, and ten vanes.

When the rotor rotates, the vane movably fitted in each slot of the rotor is radially moved out by centrifugal force and pressed against the inside wall of the cam ring. Since the inside of the cam ring is oval-shaped, the fluid from the suction port is confined and pressurized in the chamber formed between two adjacent vanes as the rotor rotates and is delivered through the discharge port. The pressurized fluid circulates through the hydraulic circuit.

• FLOW CONTROL AND ENERGY-SAVING VALVE ASSEMBLY

- During engine idling

When the engine is idling, the fluid pump speed is low. As the delivery rate of the pump is small, the metering orifice allows whole fluid to flow passing through it. So, there is no difference in the fluid pressure between the right and left of the metering orifice. This means that pressure P_1 acting on the left end of the flow control valve is equal to pressure P_2 (pressure of the fluid flowing through the pressure sensing holes in the valve body) acting on the right end of the valve. As a result, the flow control valve is held pressed leftward by the force of the control valve spring. With the flow control valve in this position, the passage to the fluid pump suction port is closed, so that the whole fluid delivered from the pump flows toward the power steering gear box.



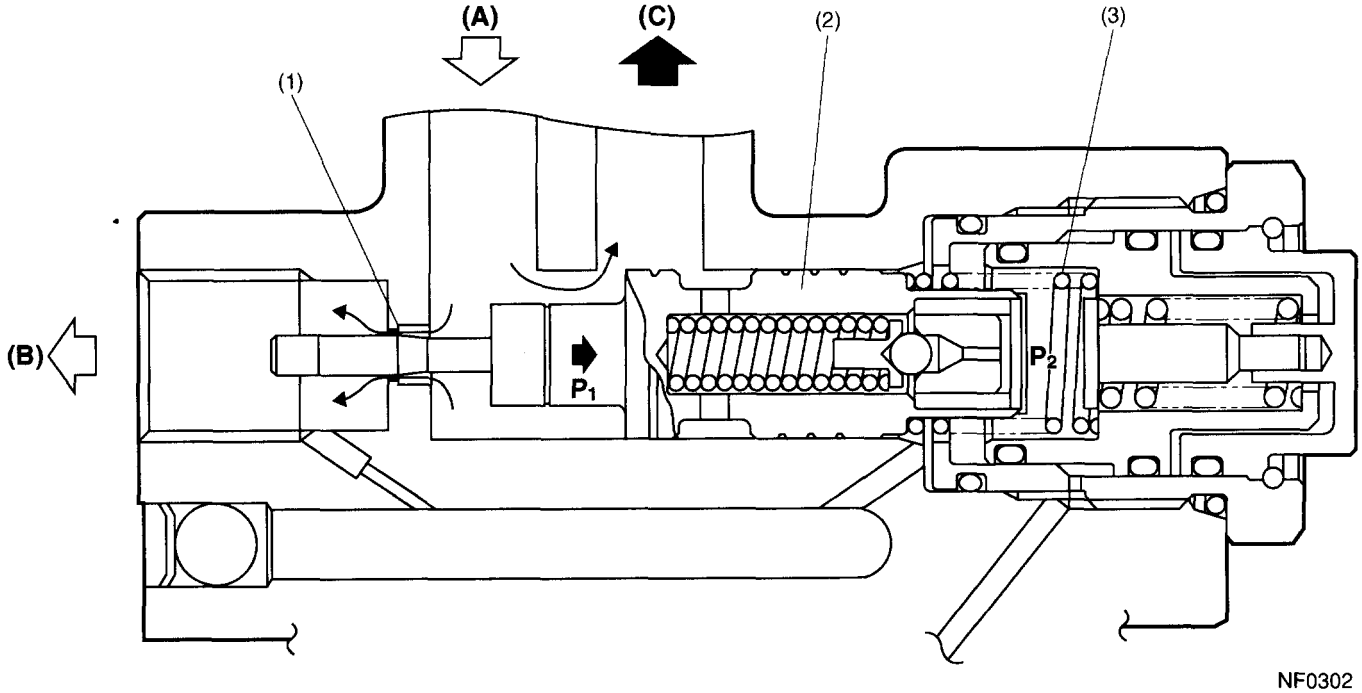
NF0301

(A) From fluid pump delivery port
(B) To steering gear box
(C) To fluid pump suction port

(1) Metering orifice
(2) Flow control valve
(3) Flow control valve spring
(4) Pressure sensing hole in valve body

- During straight-ahead driving

The speed of the fluid pump increases and the fluid pressure becomes high. The metering orifice does not allow whole fluid to pass through it any longer.
Since the amount of the fluid flowing toward the left end of the flow control valve is larger than the amount of the fluid flowing toward the right end of the valve passing through the pressure sensing holes, pressure P_1 becomes larger than pressure P_2.
As a result, pressure P_1 overcomes the force of the flow control valve spring and pushes the valve rightward. This keeps the passage to the fluid pump suction port open, allowing part of the fluid to return to the pump suction port and thus reducing flow of fluid to the steering gear box.
The energy-saving valve mechanism reduces the fluid pump delivery pressure in this way when steering power assistance is unnecessary, thus reducing load on the engine.

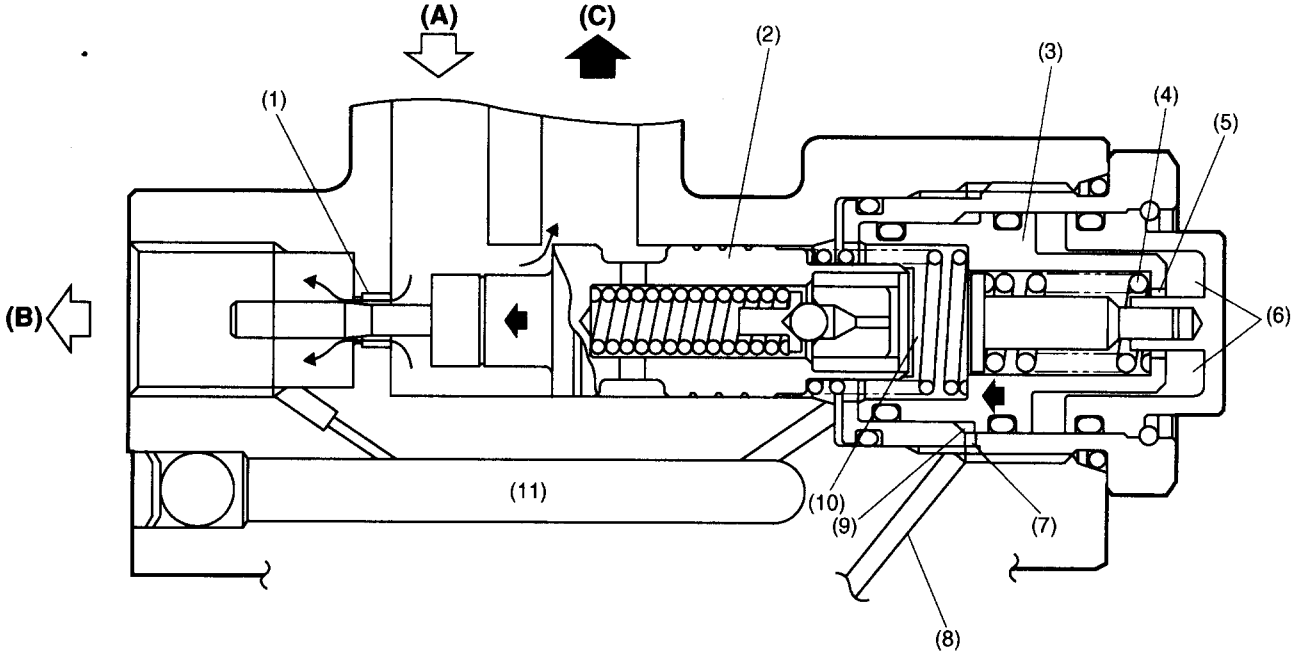


NF0302

(A) From fluid pump delivery port
(B) To steering gear box
(C) To fluid pump suction port
(1) Metering orifice
(2) Flow control valve
(3) Flow control valve spring

- During a turn

When the steering wheel is turned, the power steering system starts the steering assist function and the fluid pressure increases.
Although the pressure of the fluid entering chamber B through the pressure sensing holes in the valve body increases, the pump delivery pressure is still higher than the chamber B pressure. So, the flow control valve cannot move leftward.
The fluid in chamber B then enters chamber A at the right end of energy-saving valve piston and increase the pressure of chamber A.
Since the pressure in chambers A and B is higher than the pressure (ambient pressure) in chamber C at the left end of the energy-saving valve piston, the energy-saving valve piston moves leftward, overcoming the force of the energy-saving valve spring.
Leftward movement of the energy-saving valve piston compresses the flow control valve spring. The combination of the tension of the spring and the pressure in chamber B now causes the flow control valve to move leftward, overcoming the fluid pump delivery pressure. As a result, the flow control valve closes the passage to the fluid pump suction port and the passage in the metering orifice opens wider. This enables the fluid delivered by the pump to be supplied to the steering gear box at the same rate as in the system without an energy-saving valve mechanism.



NF0303

(A) From fluid pump delivery port
(B) To steering gear box
(C) To fluid pump suction port

(1) Metering orifice
(2) Flow control valve
(3) Energy-saving valve piston
(4) Energy-saving valve spring
(5) Pressure sensing hole in piston
(6) Chamber A
(7) Low-pressure hole in energy-saving valve
(8) Low-pressure hole in valve body
(9) Chamber C
(10) Chamber B
(11) Pressure sensing holes in the valve body

HVAC SYSTEM (HEATER, VENTILATOR AND A/C) AC

Page

1. Heater System 2
2. Air Conditioner 10

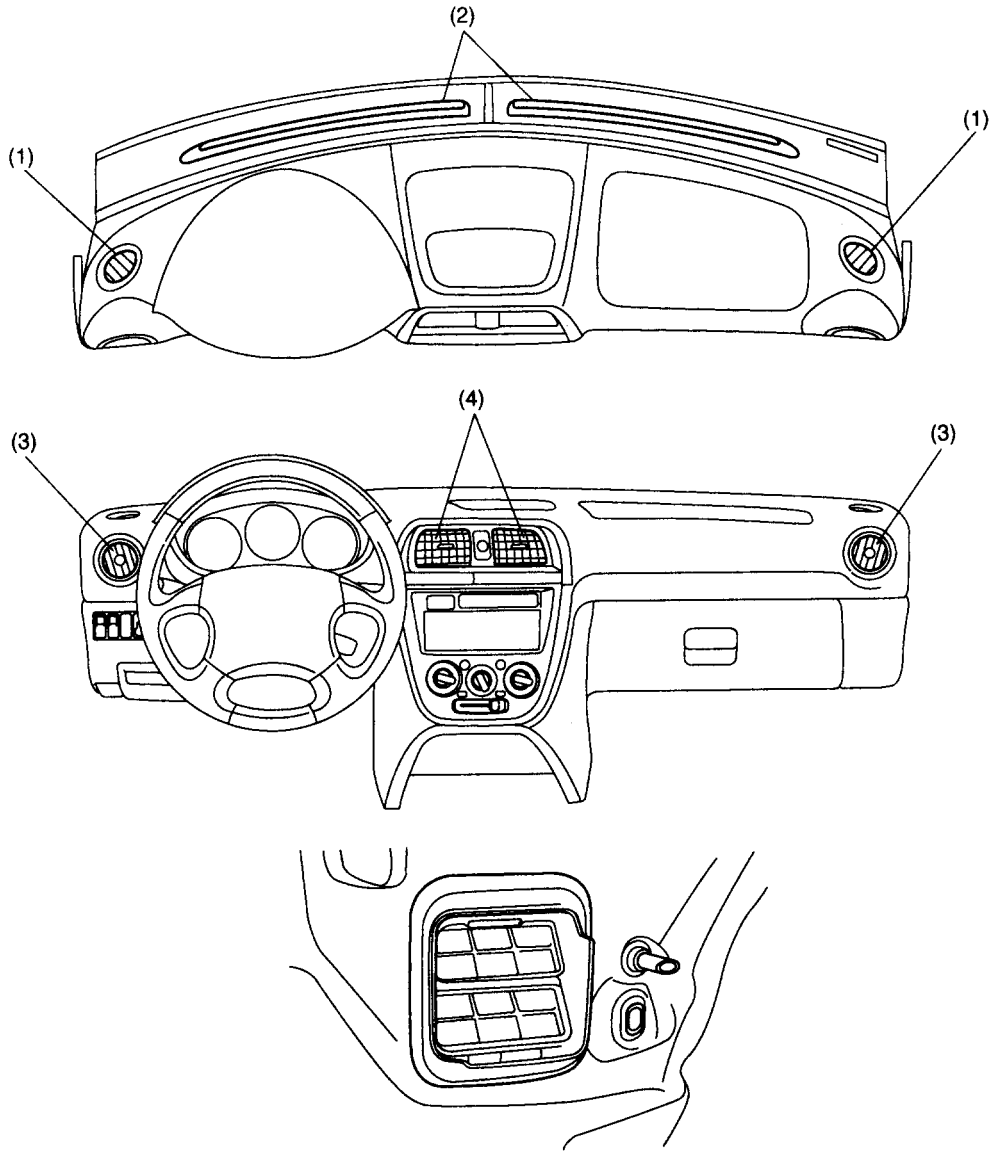
1. Heater System

A: GENERAL

• The Impreza's HVAC system uses an integral air conditioning unit with thin-wall, high-performance heater core at the front and evaporator core at the rear. Being compact in size, this unit enables providing sufficient front passenger's legroom while ensuring a high air-distribution efficiency by minimizing air flow resistance in all air passages. Overall, the system can create comfortable interior air conditions quietly and in all seasons by its excellent heating, cooling, ventilating, and defrosting performances.

• There are three ventilation grilles in the dashboard; a trapezoidal grille at the center and round grilles at both sides. The side grilles are rotatable for air flow direction adjustments.

• To ensure adequate ventilation, large-size air outlets are provided behind the side portions of the rear bumper where high-level vacuums are generated during driving.



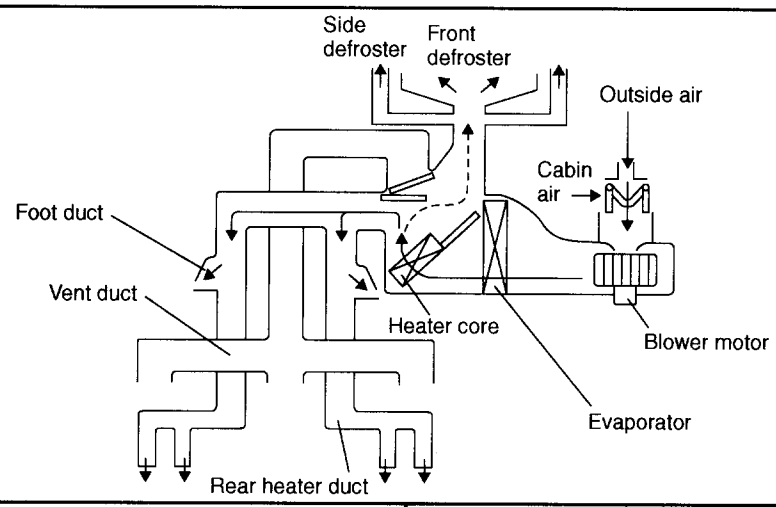
NF0158

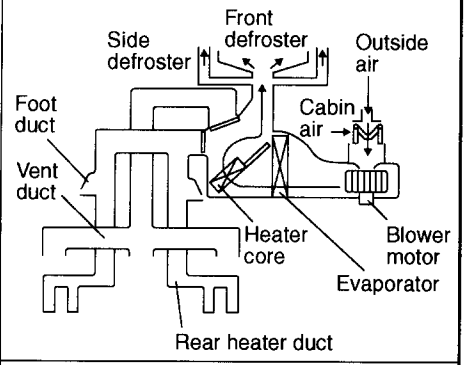
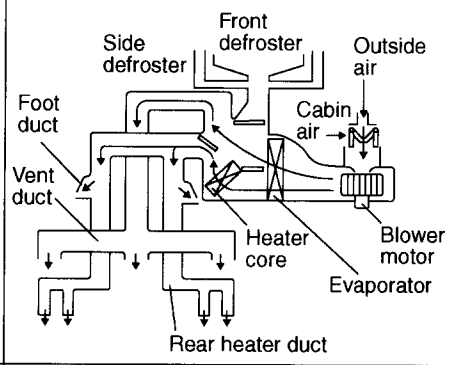
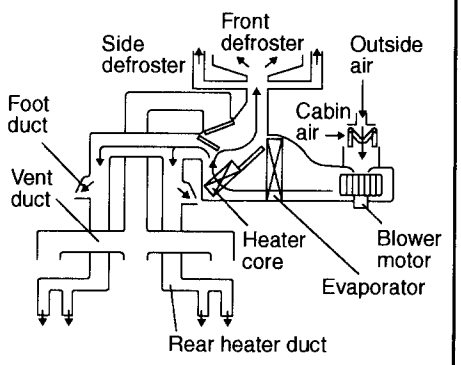
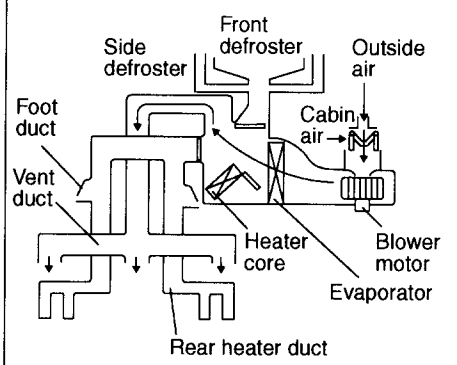
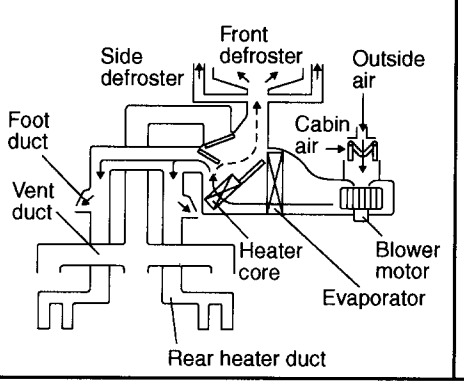
(1) Side defroster
(2) Front defroster
(3) Side ventilation grille
(4) Center ventilation grille

1. SPECIFICATIONS

Heating type	Heating performance (W)	Blower power consumption (W)	Maximum blower capacity (m^3/h)		
			VENT	HEAT	DEF
Coolant-heated air / outside air mixing type ("full-air-mix" type)	5000	200	450	280	300

B: AIR FLOW MODES



Position	Heater unit door positions	Position	Heater unit door positions
Air flow control dial — DEF		Air flow control dial — BILEVEL	
Air flow control dial — DEF/HEAT		Air flow control dial — VENT	
Air flow control dial — HEAT		FRESH/RECIRC lever	This lever allows selecting either cabin-air-recirculation or outside-air-introduction. Cabin air recirculation or outside air introduction is selected when the lever switch is moved to the corresponding position.

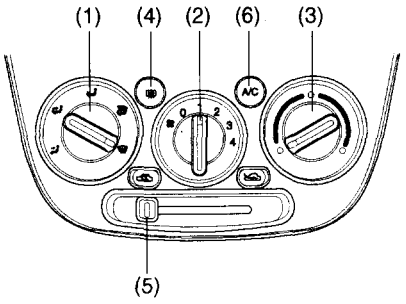
NF0452

C: CONTROL PANEL

- The HVAC control panel is incorporated into the center panel.
- A rear window defogger switch is located in the control panel.

1. MODELS WITH AIR CONDITIONER

- The control panel uses three large-diameter, dial type switches for easy operation and good visual recognition.



NF0453

(1) Air flow control dial:
This switch allows selecting any of the five air flow modes.

NF0376

(2) Fan speed control dial:
This switch allows turning on/off the blower and selecting any of the four blower speeds.

0 1 2 3 4

NF0377

(3) Temperature control dial:
This switch allows adjusting the temperature of air delivered through ventilators steplessly.

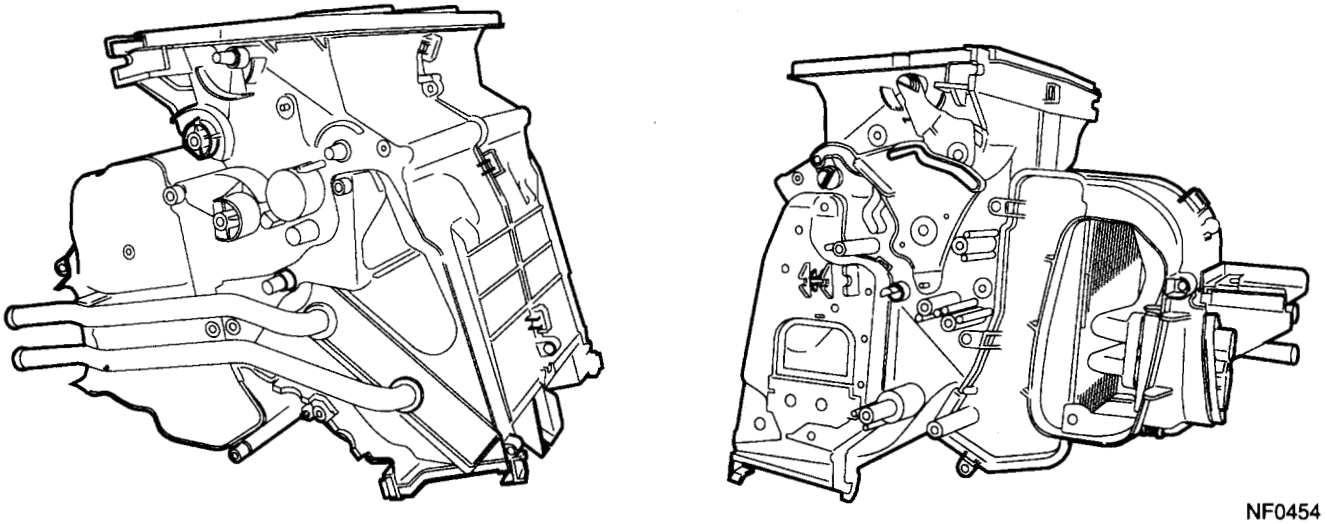
(4) Rear window defogger switch:
This switch activates the rear defogger. When the switch is left on, a timer keeps the defogger activated for 15 minutes and then turns it off automatically.

(5) FRESH/RECIRC lever:
This lever allows selecting either cabin-air-recirculation or outside-air-introduction.

(6) Air conditioner switch:
This switch turns on or off the air conditioner compressor.

D: HEATER AND COOLING UNIT

- Having an evaporator core at the front and a heater core at the rear, this single unit combines both heating and cooling functions.
- The heater and cooling unit incorporates doors for creating different air flow modes and a door for mixing heated air and outside air.
- The air flow mode switching doors and air mixing door are moved by cables through corresponding linkages.



NF0454

1. SPECIFICATIONS

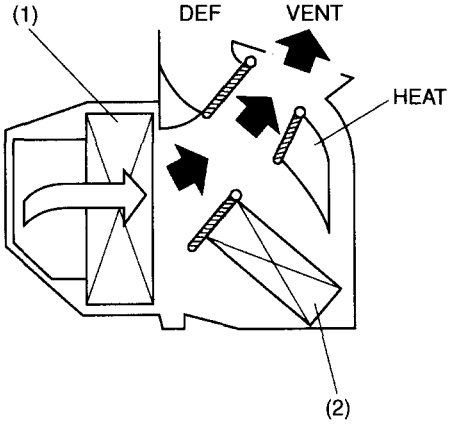
Heater core size	Heat output
163.9 x 200 x 25	5000W

2. DESIGN FEATURES FOR EACH AIR FLOW MODE

1) Ventilation (VENT) mode

• The passage leading air from the evaporator to the ventilation outlet (VENT) is made straight to reduce air flow resistance.

• When the air temperature is necessary to be adjusted, heated air is blown at right angles against the flow of cool air from the evaporator. This allows the airs to mix thoroughly.

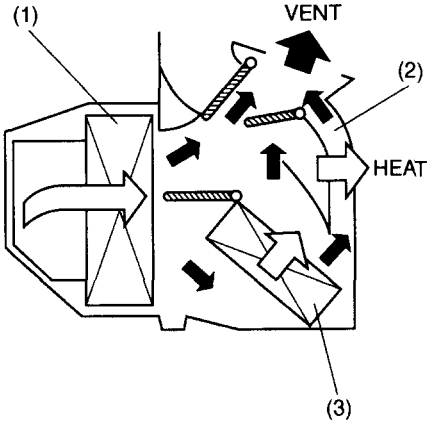


NF0163

(1) Evaporator
(2) Heater core

2) Foot/face (BILEVEL) mode

• Warm and cool air flows are created by structural means, namely, by forming sealing surface for air toward leg area on the heated air passage side and that for air toward the ventilation outlet (VENT) on the cooled air passage side.
To prevent an excessive difference in the temperature between the two air flows, a bypass passage is provided to allow part of heated air to flow toward the ventilation (VENT) outlet.



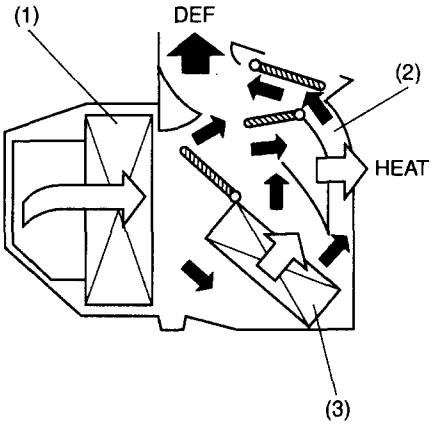
NF0164

(1) Evaporator
(2) Bypass passage
(3) Heater core

3) Heating (HEAT) mode

• Warm and cool air flows are created by structural means, namely, by forming sealing surface for air toward leg area on the heated air passage side and that for air toward the defroster (DEF) outlet on the cooled air passage side.
To prevent an excessive difference in the temperature between the two air flows, a bypass passage is provided to allow part of heated air to flow toward the ventilation (VENT) outlet.

• To maintain the passage toward the defroster (DEF) outlet even during the heating mode operation, the door of the passage toward leg area is fully opened to the make the passage also serve as a passage toward the defroster (DEF) outlet.



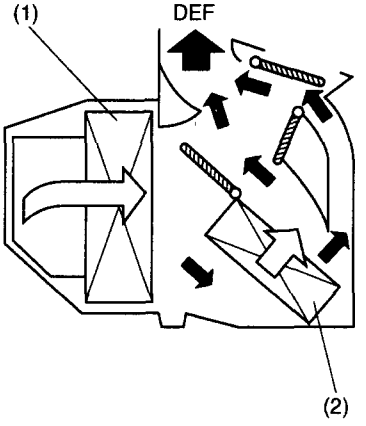
NF0165

(1) Evaporator
(2) Bypass passage
(3) Heater core

4) Defroster (DEF) mode

• Air passages are designed in such a way that air flow resistance is minimized and defrosting performance is maximized.

• The air passages toward the defroster (DEF) outlet is long enough to ensure a same airflow rate at all defroster outlets.

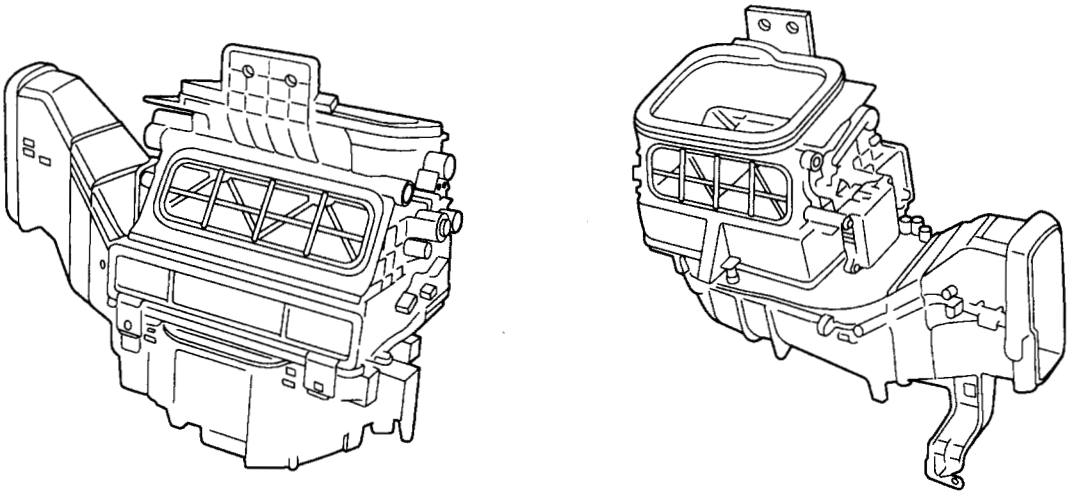


NF0166

(1) Evaporator
(2) Heater core

E: BLOWER UNIT

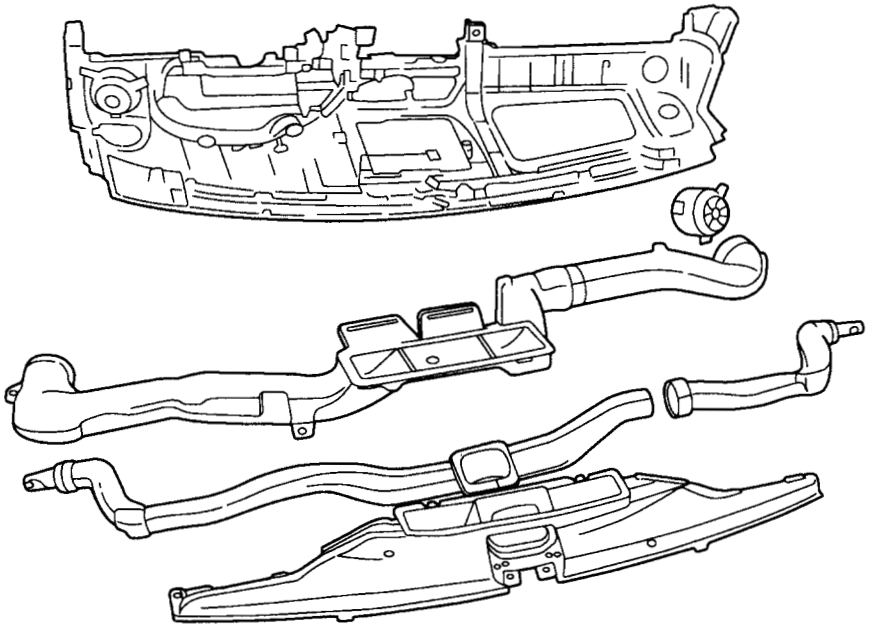
- The blower unit uses a low-noise-type motor.



NF0455

F: DUCTS

- The ventilation duct and defroster duct are located behind the instrument panel. Both the ducts have been modified in the shape to reduce air flow resistance.
- Defrosting air flow is divided at the center, so that air can flow out evenly through a wide center defroster as well as right and left side defrosters.



NF0457

2. Air Conditioner

A: GENERAL

The air conditioner has a newly-developed subcool condenser for improved heat-exchange efficiency.

As with the previous model's air conditioner, the refrigerant employed is the chlorine-free HFC-134a (R134a), which does not contribute to ozone-layer damage.

A simple system structure is realized by incorporation of the receiver dryer into the condenser.

1. SPECIFICATIONS

Item	Specification		Remarks
Air conditioner	"Full-air-mix" type		
Cooling performance	Cooling capacity (W)	5100	
	Air flow rate (m^3/h)	450	
Refrigerant quantity	HFC-134a (g)	500 ± 50	
Compressor	Type	Rotary type with vanes	Calsonic CR14
	Capacity (g/revolution)	144	
	Maximum permissible speed (rpm)	7000	
	Lubricant (amount contained in compressor in g)	DH-PR	
Magnetic clutch	Type	Dry, single disc	
	Power consumption (W)	47	
	Pulley ratio	1:1.064 (crankshaft pulley diameter: 133 mm; compressor pulley diameter: 125 mm)	
	Belt	Polyurethane V-belt with four ribs	
Condenser	Type	Multi-flow type (with built-in liquid tank capatible with sub-cooling)	
	Fan Type	Electric-motor-driven axial flow fan	
	Fan diameter	320 mm (7+5 blades)	
	Power consumption (W)	120 x 2 (turbo model), 70 x 2 (non-turbo model)	
Evaporator	Type	Laminated	
	Expansion valve	External pressure equalizing type	
	Temperature control sensor	Thermistor	
Other controls	Fast idle control	Performed by engine control module (ECM)	
	High and low pressure limit control	Low-pressure switch: turns off compressor at a pressure lower than 0.278 MPa High-pressure switch: turns off compressor at a pressure lower than 2.8 MPa	
	High-speed limit control	Performed by ECM	
	Radiator and condenser fan control	Performed by ECM	

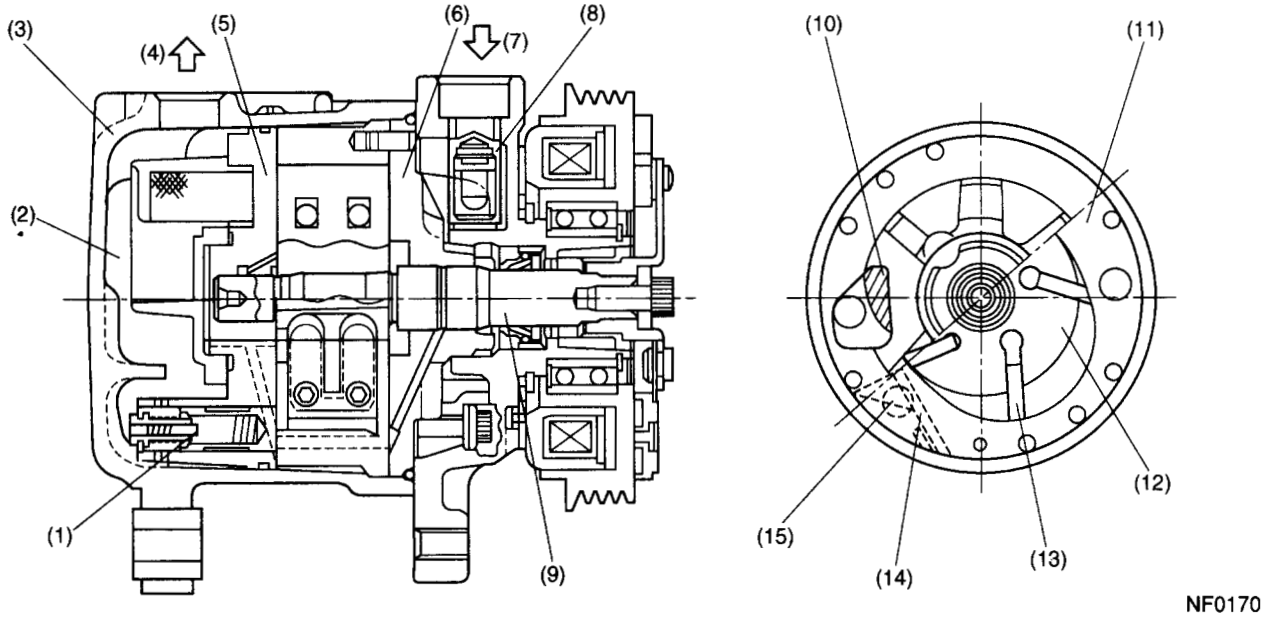
B: COMPRESSOR

The rotary type compressor consists of an integrally formed rotor and shaft, five vanes, and a cylinder.

As the rotor turns, the vanes that are movally fitted in the rotor slide over the wall of the oval-shaped cylinder while drawing, compressing, and discharging refrigerant gas.

The compressor shell has at its rear end an oil separator. High-pressure refrigerant gas having entered this chamber is separated from the oil it contains before flowing out through the compressor's delivery port.

There is a check valve in the front housing to avoid reverse rotation of the compressor which would otherwise occur when the compressor is stopped.



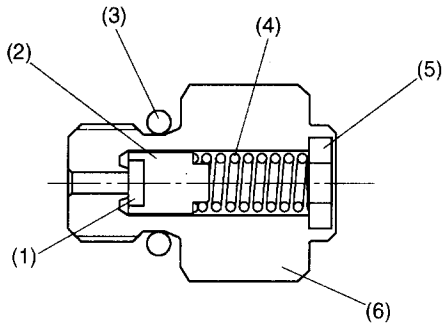
NF0170

(1) Oil cut-off valve
(2) Oil separator chamber
(3) Shell
(4) Discharge
(5) Rear side plate
(6) Front side plate
(7) Suction
(8) Check valve
(9) Shaft
(10) Suction port
(11) Cylinder
(12) Rotor
(13) Vane
(14) Discharge valve
(15) Discharge port

1. PRESSURE RELIEF VALVE

This valve opens if the pressure of the high-pressure refrigerant gas rises to a dangerously high level to release part of refrigerant into the atmosphere, thus protecting the compressor. The valve is designed to limit the amount of released gas to the necessary minimum.

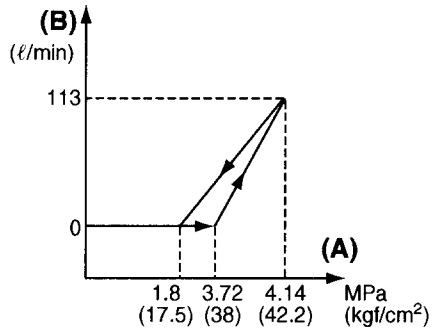
Valve opening pressure: 3.72 MPa (38 kgf/cm^2)
Valve closing pressure: 1.8 MPa (17.5 kgf/cm^2)



NF0380

(1) Seat rubber
(2) Seat cover
(3) O-ring
(4) Spring
(5) Cap
(6) Body

Operating characteristic



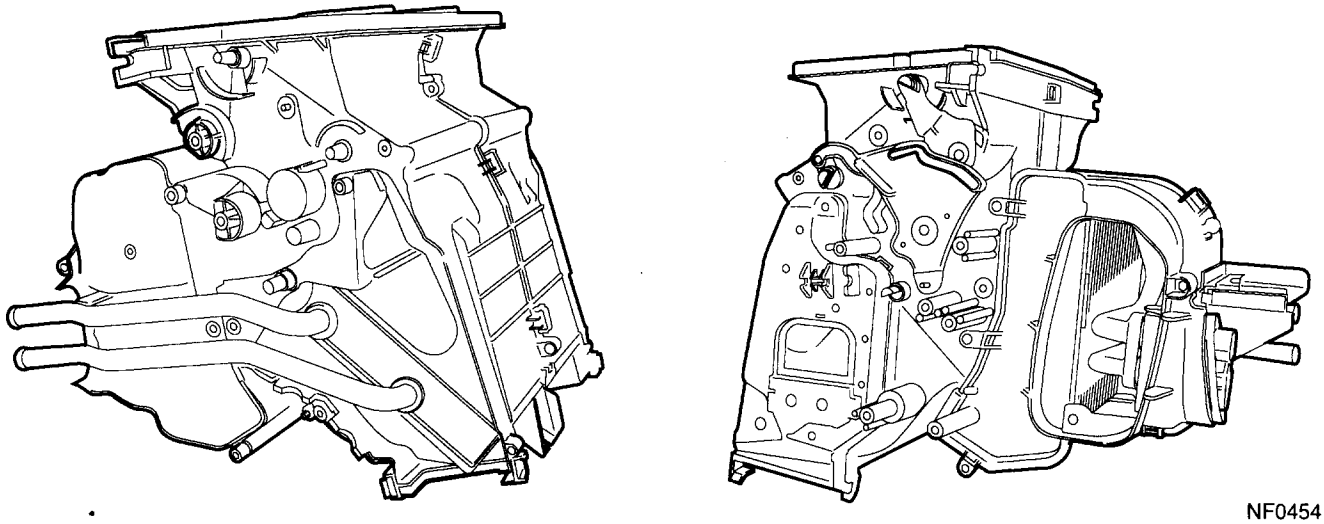
NF0172

(A) Pressure
(B) Leakage

C: COOLING UNIT

The heater unit and cooling unit are integrated into a single "heater and cooling unit".

The cooling section components of this unit include an evaporator, expansion valve, and case.



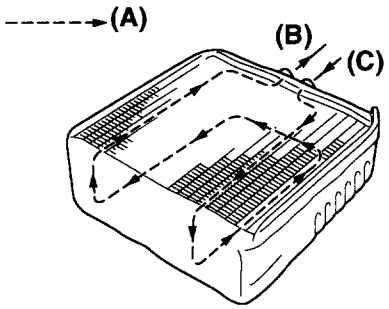
NF0454

1. EVAPORATOR

The evaporator is a laminated type.

When a low-pressure, low-temperature refrigerant is sprayed by the expansion valve into the evaporator, it evaporates and cools the evaporator surfaces.

The cabin air is drawn by the blower and cooled down as it flows over the evaporator. The cooled air then flows passing through the heater unit and delivered into the cabin through versions outlets.



NF0174

(A) Flow of refrigerant

(B) Outlet

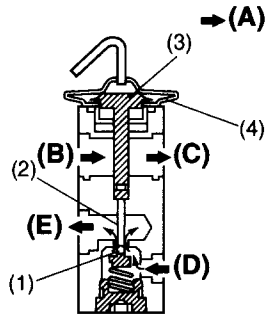
(C) Inlet

2. EXPANSION VALVE

The expansion valve regulates the flow of refrigerant such that heat exchange takes place optimally.

The expansion valve performs two functions; it sprays the high-pressure refrigerant from the condenser using a throttle valve, and it regulates the amount of the spray by changing opening of the throttle valve.

The expansion valve consists of such main components as a heat sensing cylinder, diaphragm, ball valve, spring, and adjusting screw.



NF0175

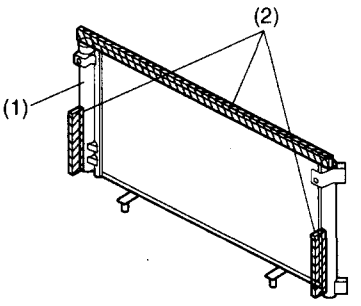
(1) Ball valve
(2) Shaft
(3) Heat sensing part
(4) Diaphragm

(A) Flow of refrigerant
(B) From evaporator (low-pressure side)
(C) To compressor
(D) From condenser
(E) To evaporator (high-pressure side)

The heat (temperature) sensing cylinder is held in contact with the evaporator outlet pipe so that a pressure corresponding to the sensed temperature may be applied to the chamber above the diaphragm. There is a pressure equalizing hole which communicates with the chamber below the diaphragm to transmit changes in the refrigerant pressure to the chamber. The ball valve is linked with the diaphragm and moves according to changes in the balance between the force applied to the diaphragm and the tension of the spring.

D: CONDENSER

The condenser used in the Impreza's air conditioning system is the newly developed "subcooling condenser" that integrates a multi-flow type condenser and a modulator (gas-liquid separator) into a single unit. The condenser has a high heat-exchange efficiency.

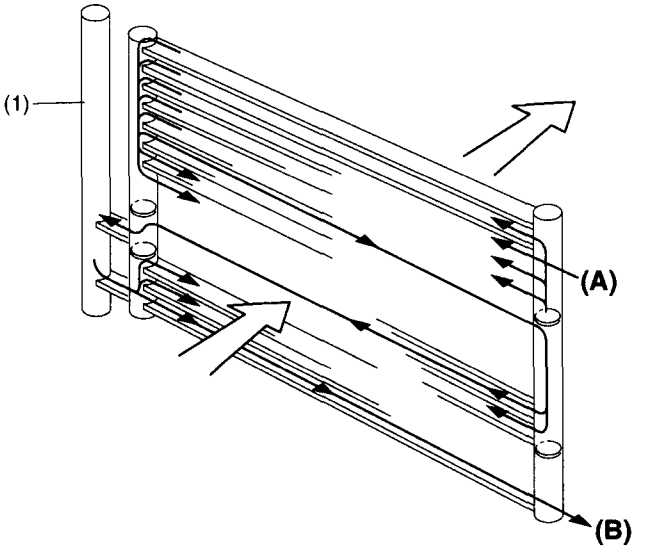


NF0177

(1) Liquid tank
(2) Gasket

1. SUBCOOLING CONDENSER

The new subcooling condenser has a subcooling section where part of the refrigerant that remains in gas form is cooled and reduced into liquid form. This enables almost 100% of the refrigerant to be requefied.



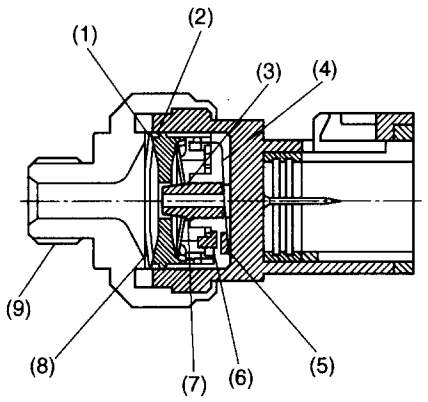
NF0488

(1) Liquid tank
(A) Inlet
(B) Outlet

E: PRESSURE SWITCH

The pressure switch is a high-pressure side component of the refrigeration cycle (cooling cycle). It consists of a diaphragm that receives refrigerant gas pressure, a snap plate, a rod, and contacts that open both when the gas pressure is too low and when it is too high.

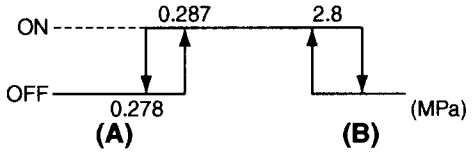
The pressure switch plays the following roles:
- Preventing "no-gas" operation due to leakage (when gas pressure is too low)
- Protecting the cooling system against abnormally high refrigerant pressure (when gas pressure is too high)



NF0378

(1) Snap plate (high pressure)
(2) Disc
(3) Rod
(4) Leaf spring
(5) Contact
(6) Contact
(7) Snap plate (low pressure)
(8) Diaphragm
(9) Housing

ON-OFF pressures



NF0179

(A) Low pressures
(B) High pressures

1. SPECIFICATIONS

Low limit pressure	OFF	0.278 MPa (2.8 kgf/cm^2) or lower
Normal pressure	ON	0.287 – 2.8 MPa (2.8 – 28 kgf/cm^2)
High limit pressure	OFF	2.8 MPa (28 kgf/cm^2) or higher

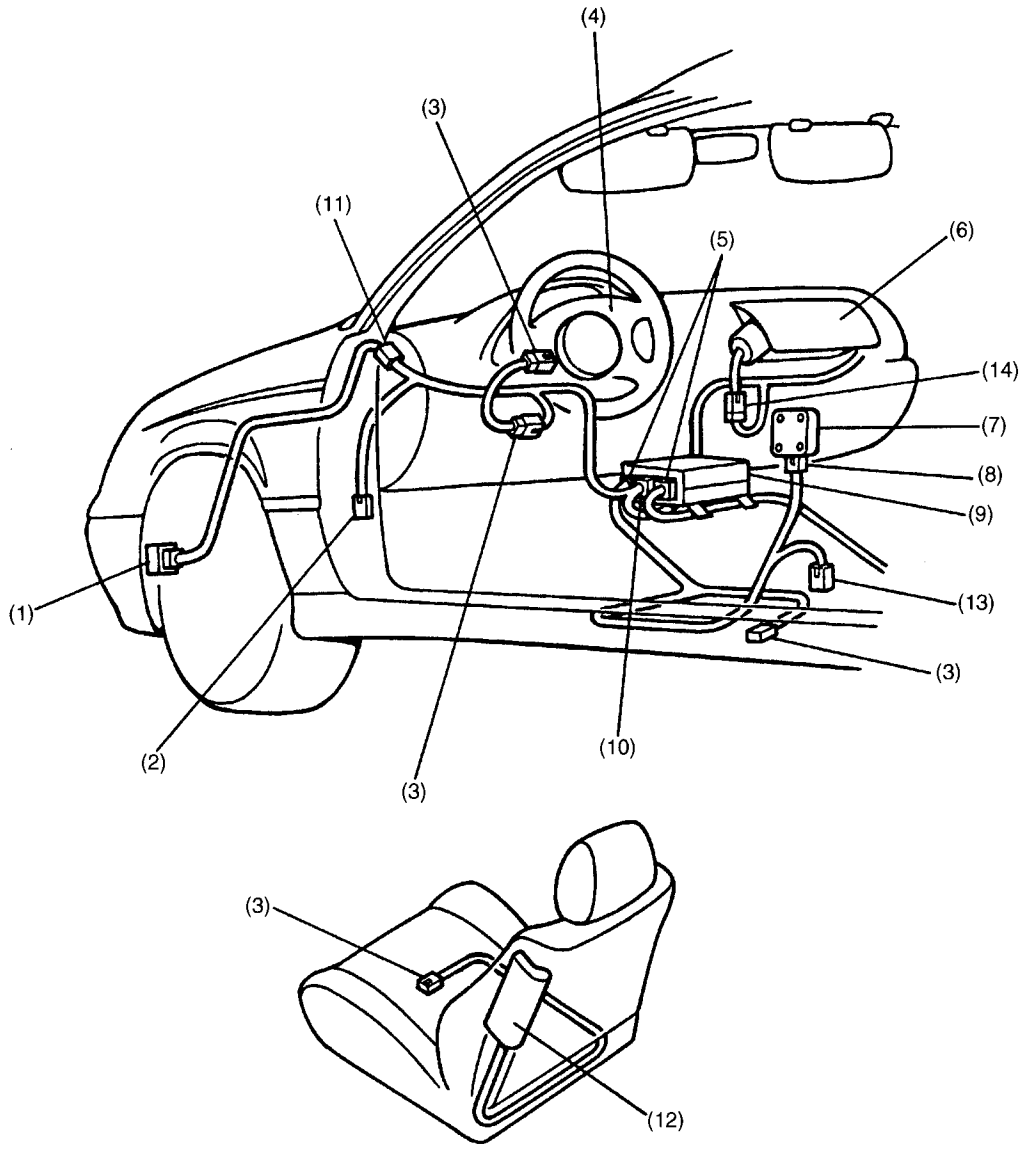
AIRBAG SYSTEM AB

Page

1. Airbag System 2
2. Construction 5

1. Airbag System

A: INSTALLATION



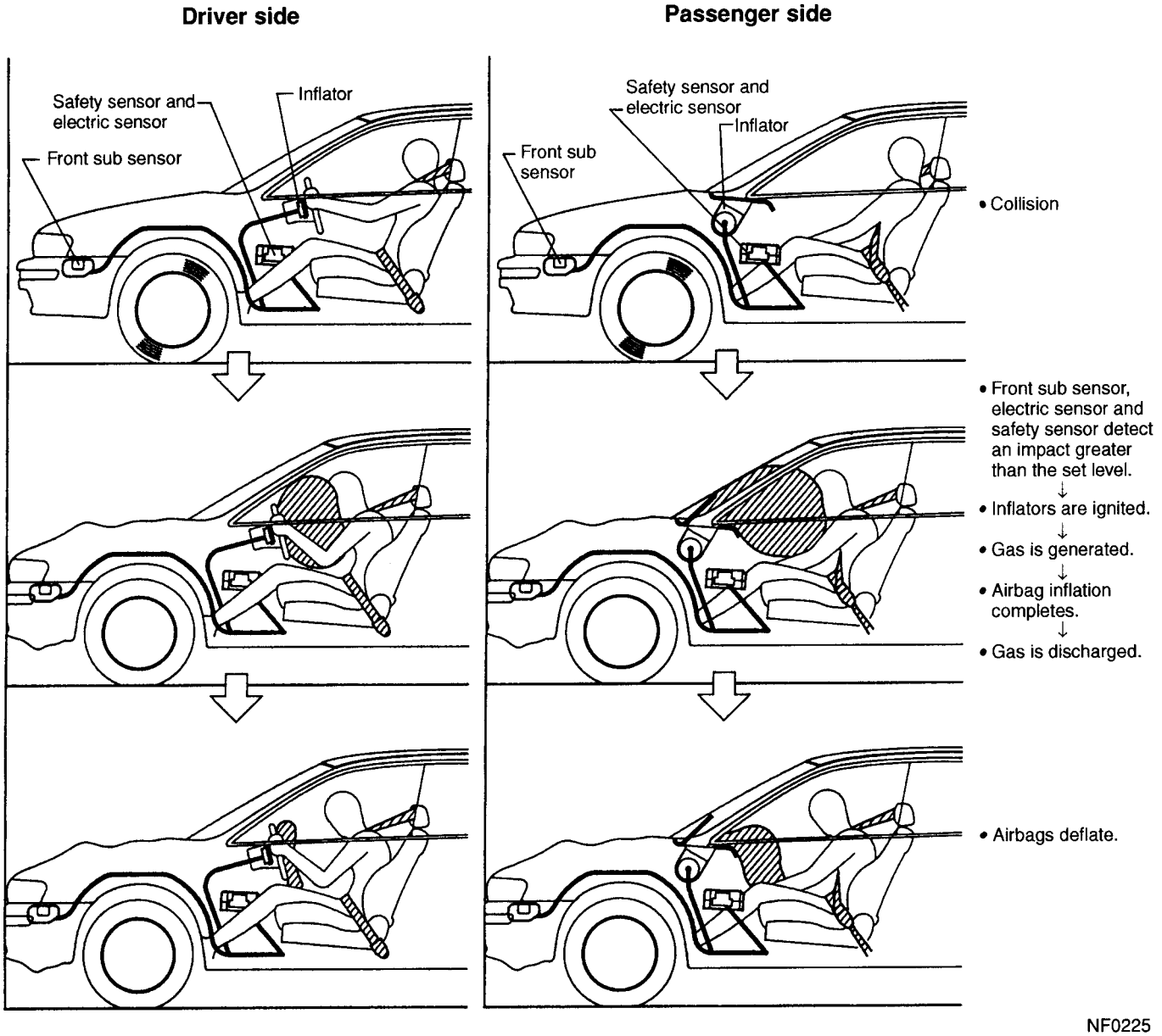
NF0224

(1) Front sub sensor
(2) 7-pin connector (Yellow)
(3) 2-pin connector (Yellow)
(4) Airbag module (Driver)
(5) 12-pin connector (Yellow)
(6) Airbag module (Passenger)
(7) Side airbag sensor
(8) 4-pin connector (Yellow)
(9) Airbag control module
(10) 28-pin connector (Yellow)
(11) 2-pin connector (Blue)
(12) Airbag module (Side)
(13) 2-pin connector (Yellow) (To seat belt pretensioner)
(14) 2-pin connector (Yellow)

B: FUNCTION

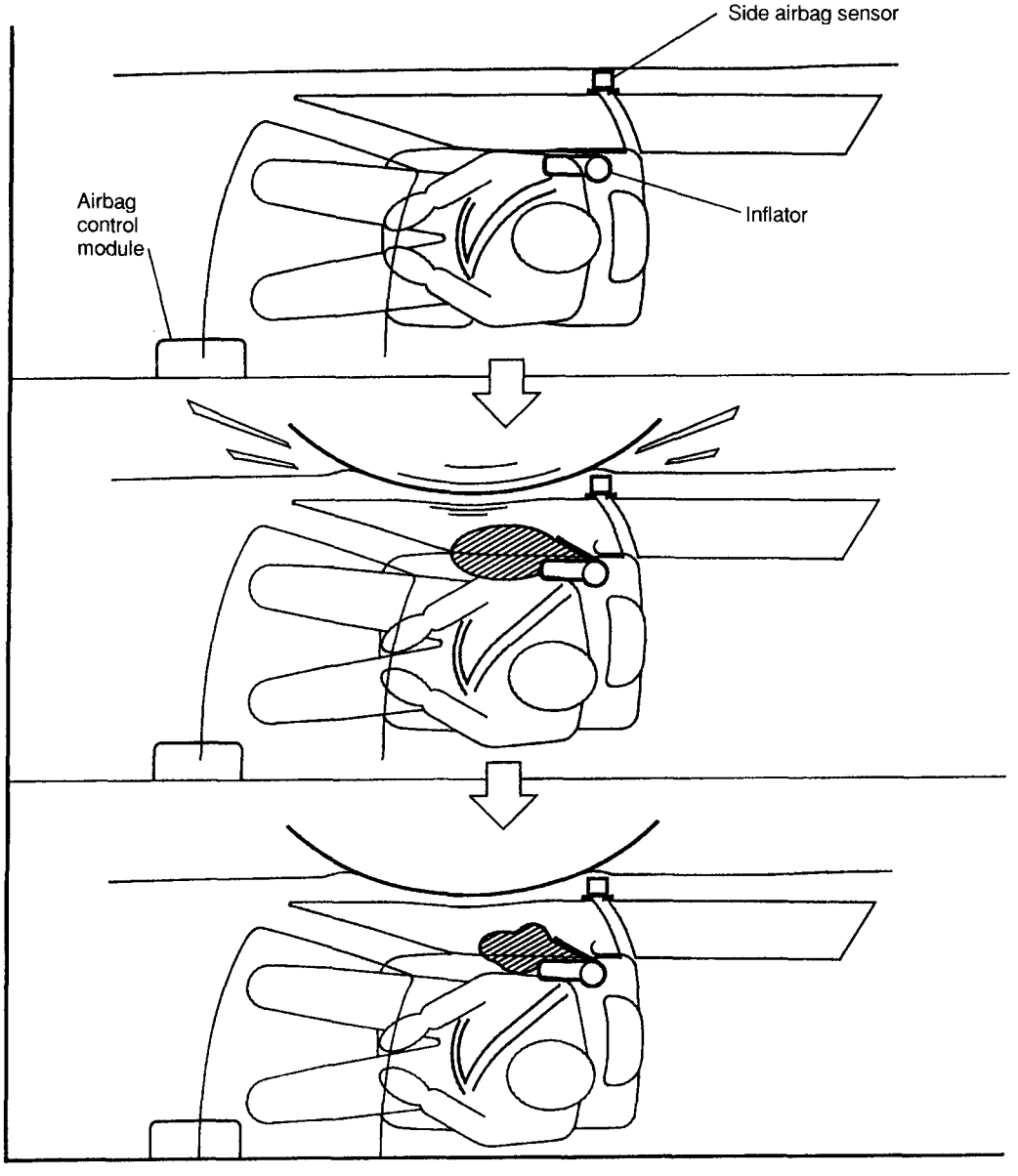
1. FRONT AIRBAGS

The airbag system is provided as a driver and front passenger restraint system supplementary to the seat belts. When an impact greater than a set level is applied to the front of the vehicle, the sensors generate an electrical pulse to inflate the airbags in the airbag modules, thus preventing the driver's and passenger's upper bodies from directly hitting against the steering wheel, instrument panel and/or windshield.



2. SIDE AIRBAGS

The side airbags provide the driver and front passenger with a restraint supplementary to that by the seat belts in the event of a side-on collision. When an impact greater than the set level is applied to either side of the vehicle, the relevant side airbag sensor sends an ignition signal to the corresponding airbag control module. The side airbag module operates to inflate the airbag, thus reducing the shock inflicted in the outside upper body (chest) of the driver or front passenger.



NF0226

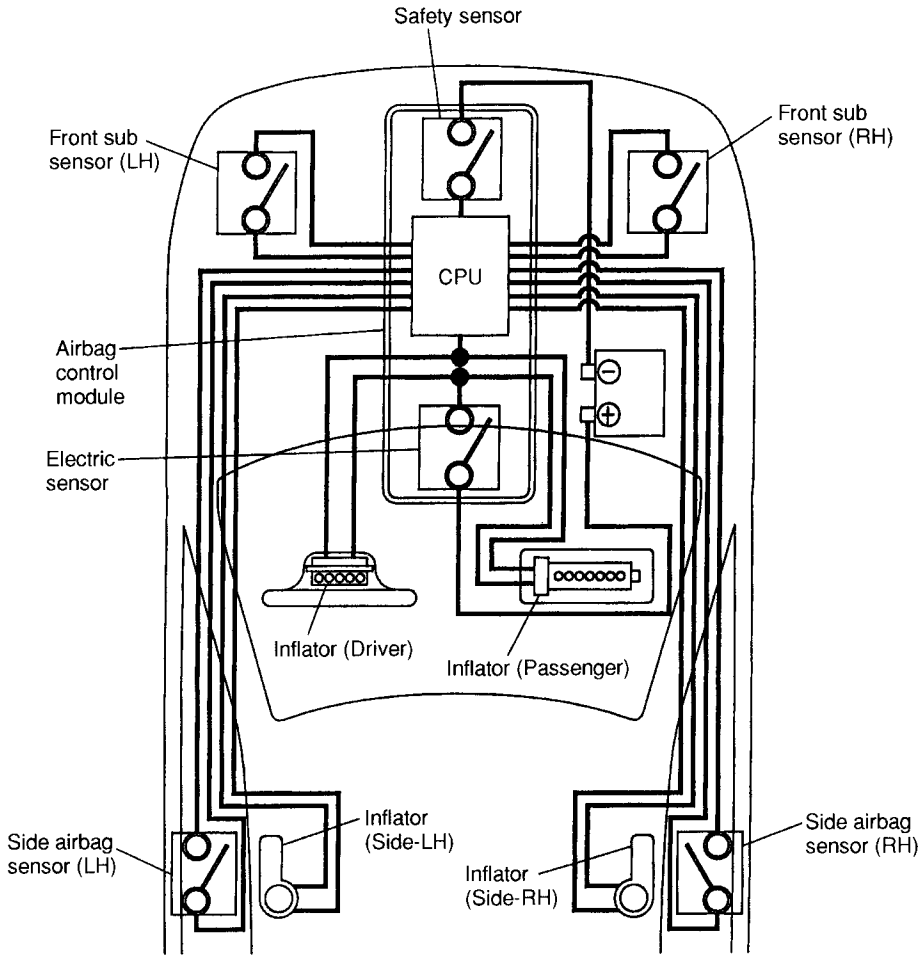
2. Construction

A: GENERAL

• The airbag system consists of an airbag control module, left and right front sub sensors, an electric sensor and safety sensor built into the control module, driver's and passenger's airbag modules each containing an inflator and airbag, and side airbag sensors and modules each containing an inflator and airbag (Side airbag equipped model).

• FRONT AIRBAG SYSTEM:
A frontal impact exceeding the set level causes the safety sensor, electric sensor and one or both front sub sensors to input impact signals to the CPU. The CPU determines whether the airbags should be inflated or not based on these signals.

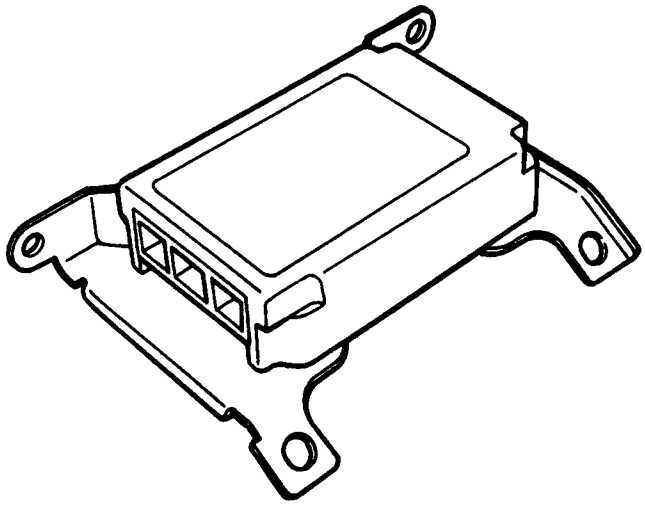
• SIDE AIRBAG SYSTEM:
Input of a side impact signal showing shock energy greater than the set level causes the airbag on the corresponding side to inflate.



NF0227

B: AIRBAG CONTROL MODULE

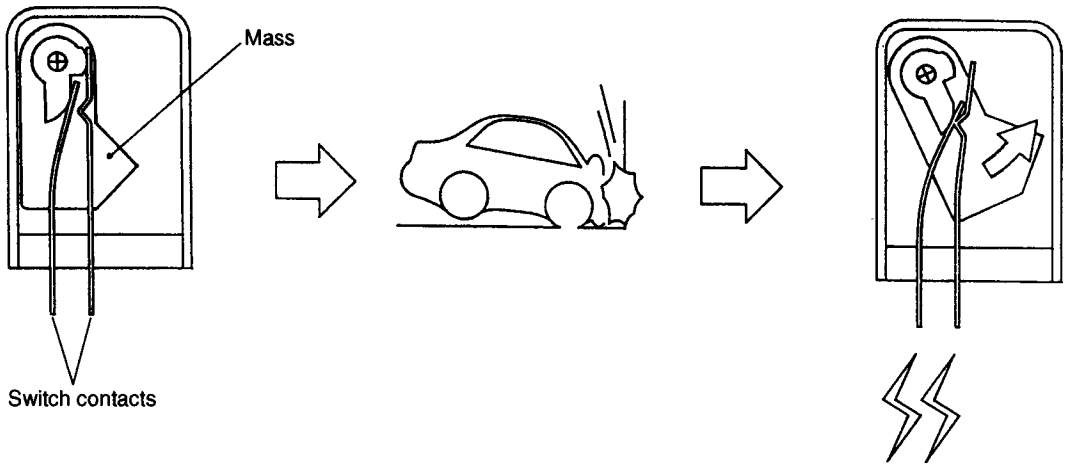
The airbag control module is installed in front of the front floor tunnel. It detects the vehicle's deceleration by receiving electrical signals from its inside safety and electric sensors as well as the front sub sensors and judges whether to inflate the airbags. This control module has a built-in self-diagnosis function. If a fault occurs inside the system, it lights up the airbag warning light in the combination meter. The fault data is stored in the module. A back-up power supply is provided for possible damage to the battery during an accident, and a boosting circuit is built into the module in case of a battery voltage drop.



NF0228

C: FRONT SUB SENSOR

One front sub sensor is installed on each side, in front of the front wheel apron wall. The front sub sensor is a pendulum type sensor. If the sensor receives a frontal impact exceeding a certain limit, the mass in the sensor rotates forward to turn the switch ON.



NF0229

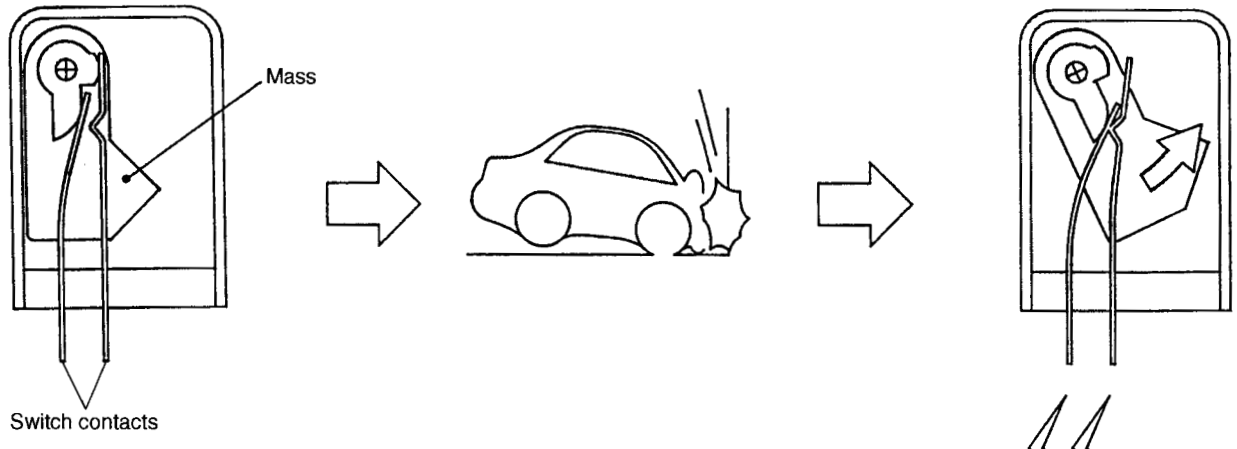
D: AIRBAG SENSOR

The safety sensor and electric sensor are incorporated into the airbag control module and the side airbag sensors.

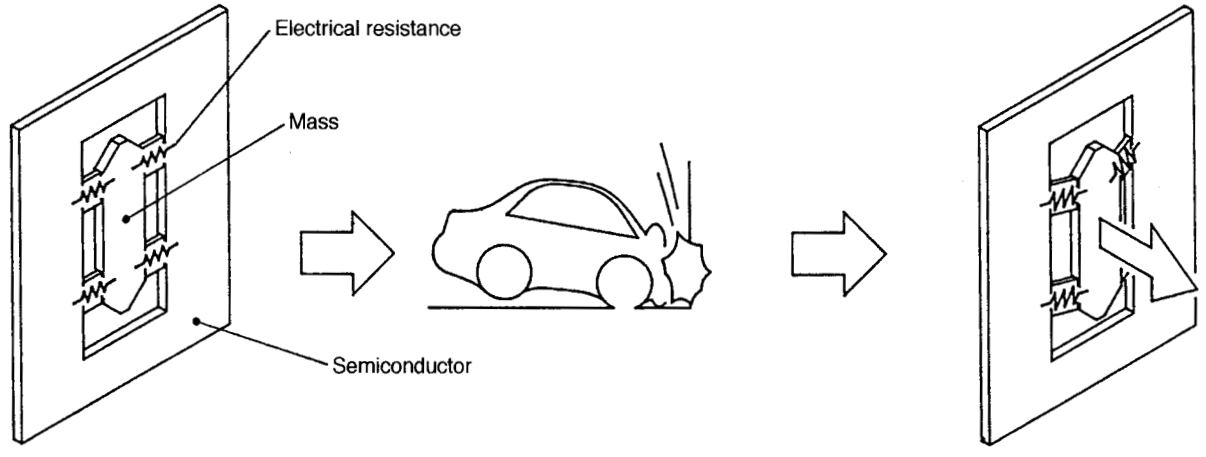
The safety sensor is also a pendulum type sensor. If the sensor receives a frontal or side impact exceeding a certain limit, the mass in the sensor moves in the direction opposite to the impact direction to turn the switch ON.

The electric sensor consists of a semiconductor type sensor which senses the deceleration caused by collision in terms of change in the electrical resistance of the impact sensing circuit.

SAFETY SENSOR



ELECTRIC SENSOR



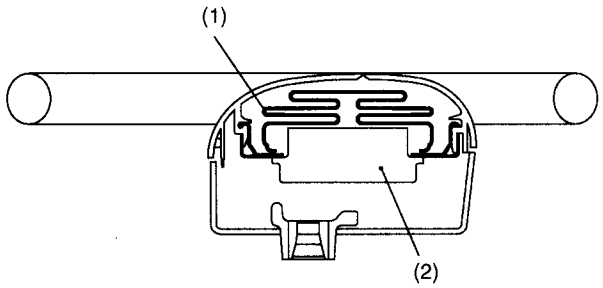
NF0230

E: AIRBAG MODULE

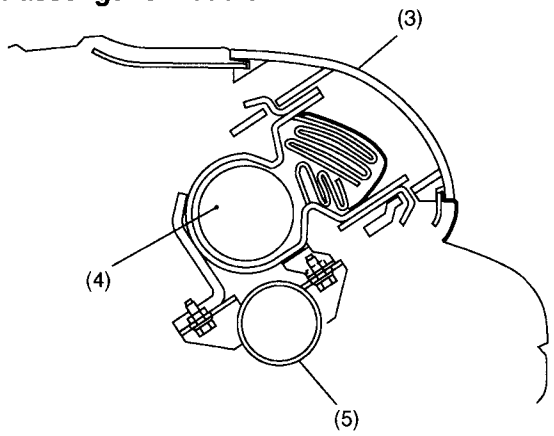
1. FRONT AIRBAG

The driver's airbag module is located at the center of the steering wheel and the passenger's airbag module is located at upper portion of instrument panel. Each module contains an airbag and an inflator. If a collision occurs, the inflator produces a large volume of gas to inflate the airbag in a very short time.

Driver's module



Passenger's module

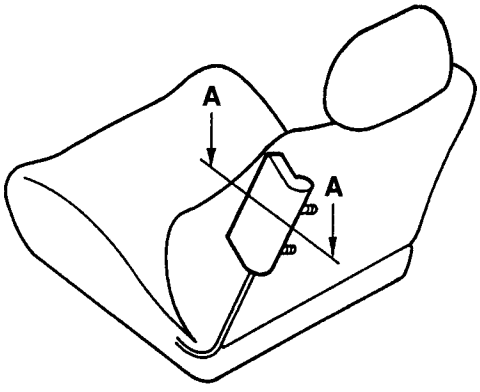


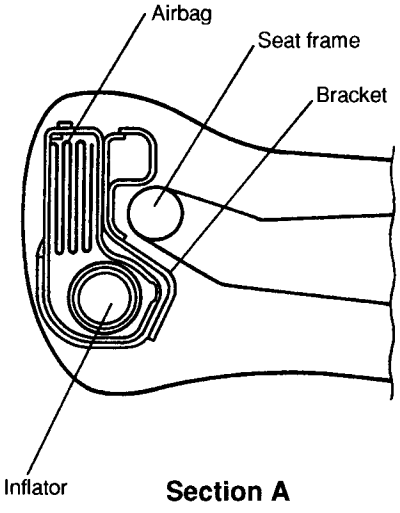
NF0231

(1) Airbag
(2) Inflator (Driver)
(3) Airbag module lid
(4) Inflator (Passenger)
(5) Steering support beam

2. SIDE AIRBAG

A side airbag module is located at the outer side of each front seat backrest, and it contains an airbag and an inflator.
If a side-on collision occurs, the inflator produces a large volume of gas to inflate the airbag in a very short time.





Section A

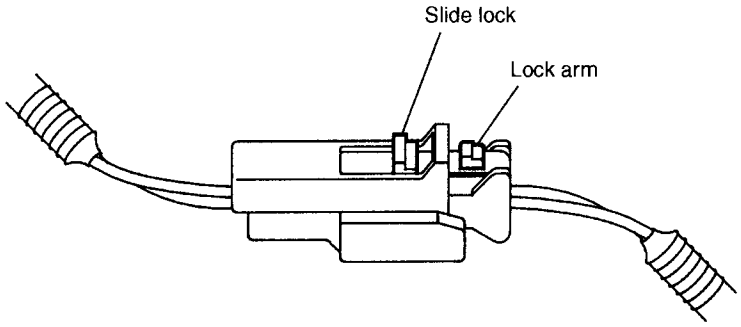
NF0232

F: AIRBAG CONNECTORS

1. DESCRIPTION

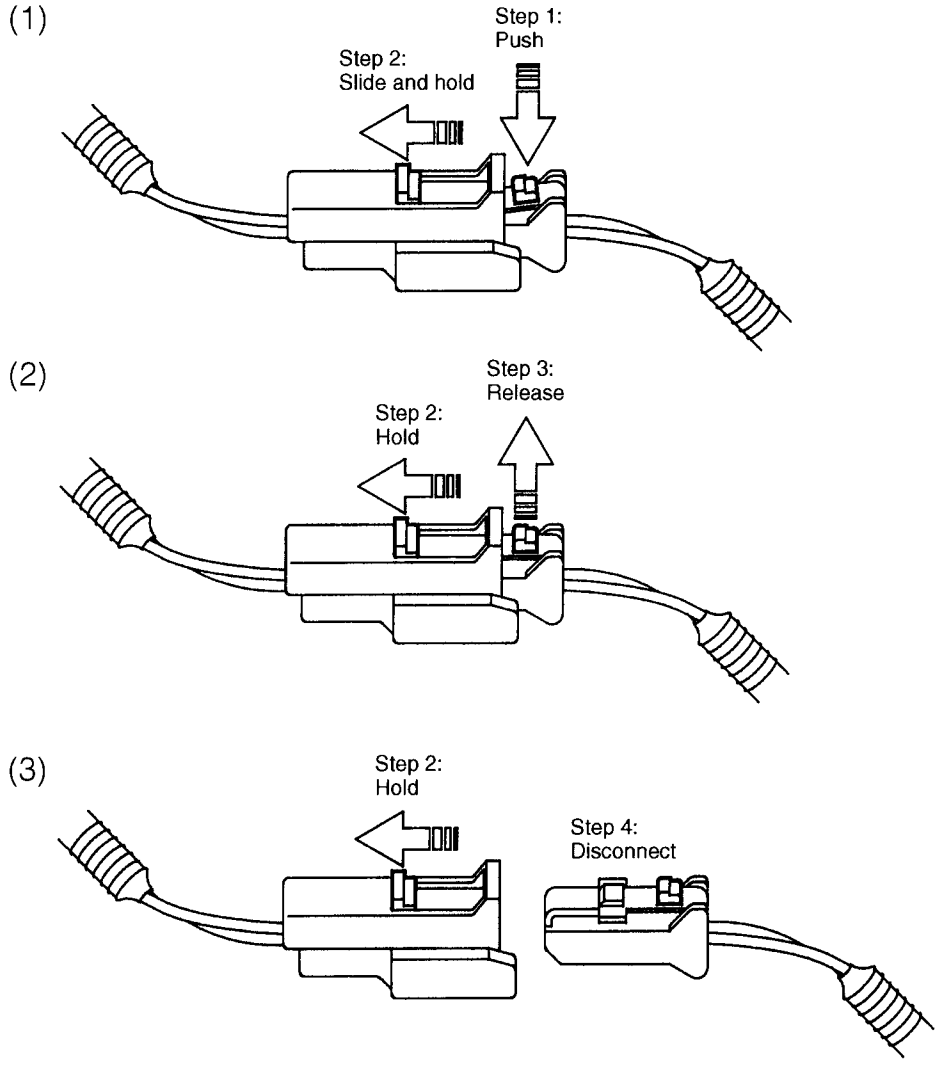
The airbag system uses connectors with a double lock mechanism and an incomplete coupling detection mechanism for enhanced reliability. If coupling is incomplete, the airbag warning light comes on in the combination meter.

2. AIRBAG HARNESS-TO-AIRBAG HARNESS CONNECTOR



NF0304

Disconnection:

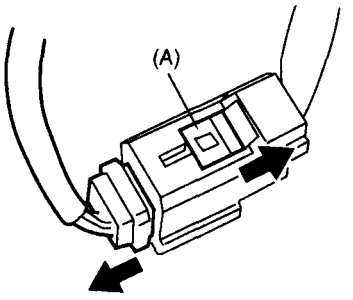


NF0305

Connection:
Insert the male side connector half into the other until a "click" is heard.

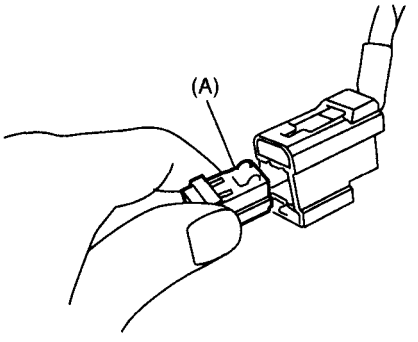
3. AIRBAG HARNESS-TO-BODY HARNESS CONNECTOR

Disconnection:
Hold the slide lock (A) moved in the direction of the arrow, then pull the female connector in the direction of the arrow.



NF0130

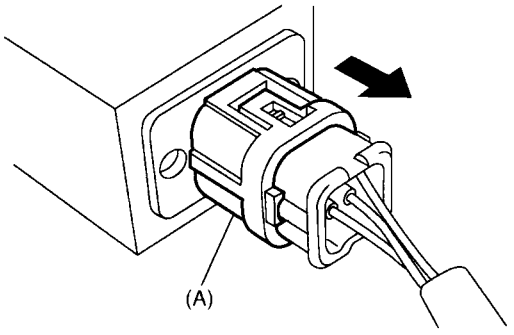
Connection:
Push the connector (A) into the male connector carefully until a click is heard.



NF0131

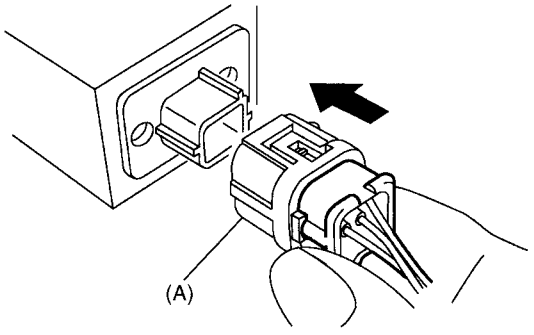
4. FRONT SUB SENSOR AND SIDE AIRBAG SENSOR CONNECTORS

Disconnection:
Holding the outer part (A), pull the connector in the direction of the arrow.



NF0132

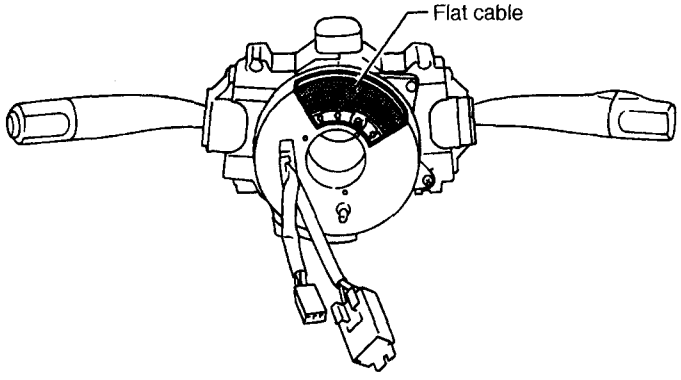
Connection:
Holding the inner part, push the connector into the socket carefully until a click is heard.
Do not hold the outer part (A) as it moves back during connection of the connector.



NF0133

G: STEERING ROLL CONNECTOR

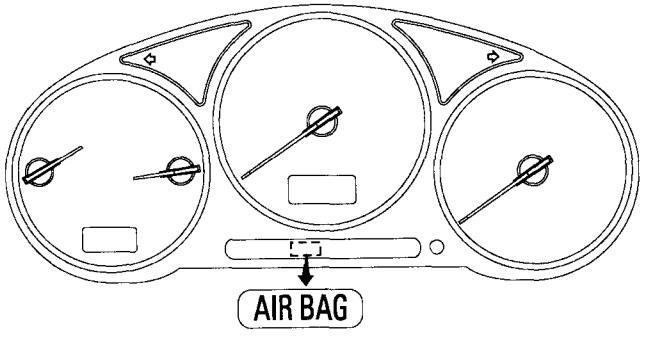
The steering roll connector is located between the steering column and steering wheel. The connector contains a spirally wound flat cable. The cable can follow rotational movements of the steering wheel and ensures connection between the airbag module in the steering wheel and the airbag harness through which electrical signals are transmitted from the airbag control module.



NF0234

H: AIRBAG WARNING LIGHT

The airbag warning light is located inside the combination meter. It illuminates if a poor connection in the airbag circuit occurs, or if the airbag control module detects an abnormal condition. When the airbag system is normal, this light comes on when the ignition switch is turned ON and then goes out about 7 seconds later.



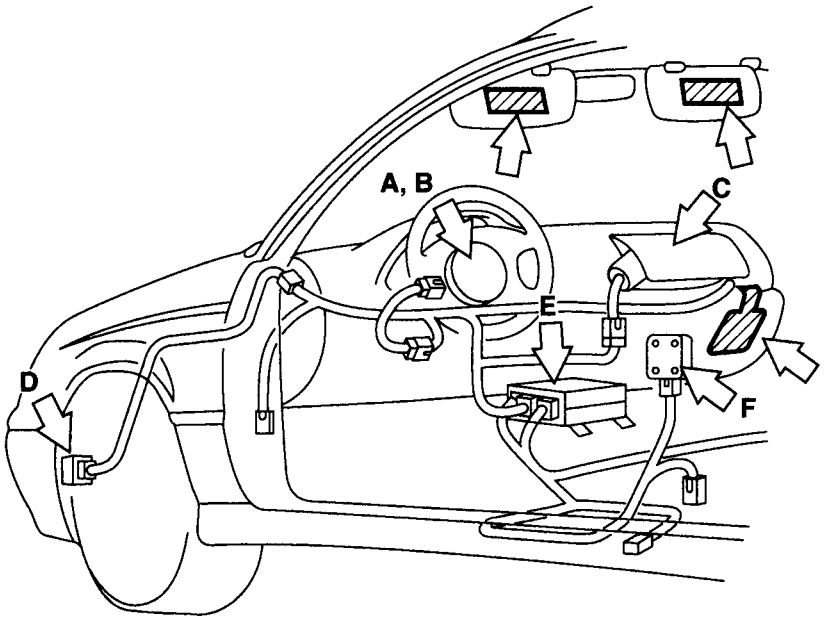
NF0134

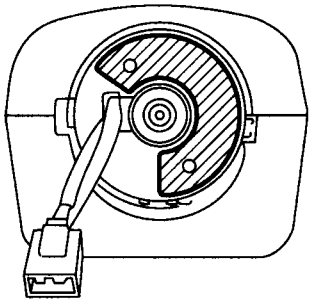
I: WIRE HARNESS

The airbag harnesses are integrated into the body harness as follows:

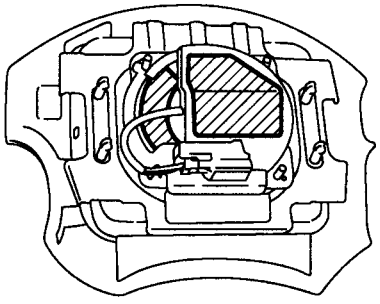
- Front sub sensor harness: Integrated into the front harness.
- Airbag main harness: Integrated into the bulkhead harness.
- Pretensioner and side airbag harnesses: Integrated into the rear harness.

J: LOCATIONS OF WARNING AND CAUTION LABELS

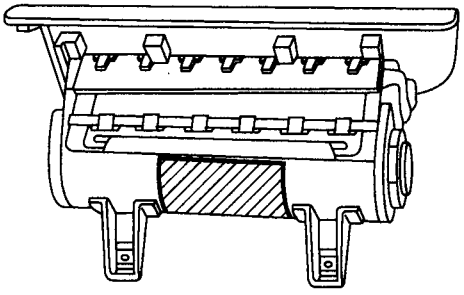




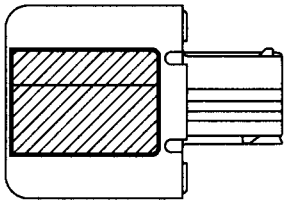
View A



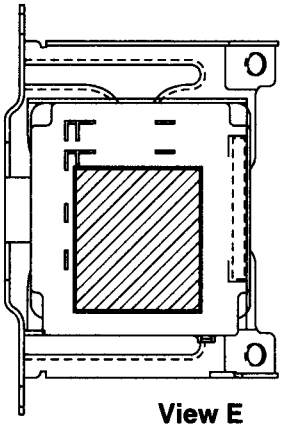
View B



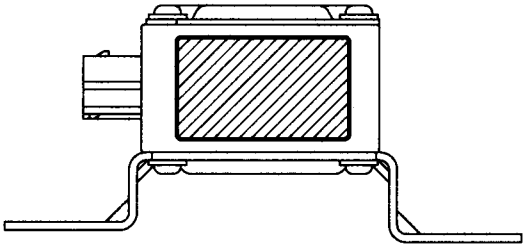
View C



View D



View E



View F

NF0490

SEAT BELT SYSTEM SB

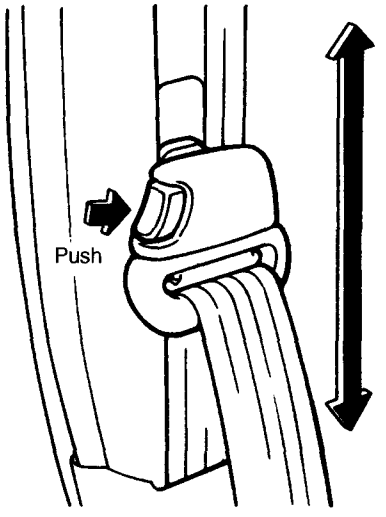
Page
1. Seat Belt 2

1. Seat Belt

A: ADJUSTABLE SHOULDER BELT ANCHOR

1. FRONT

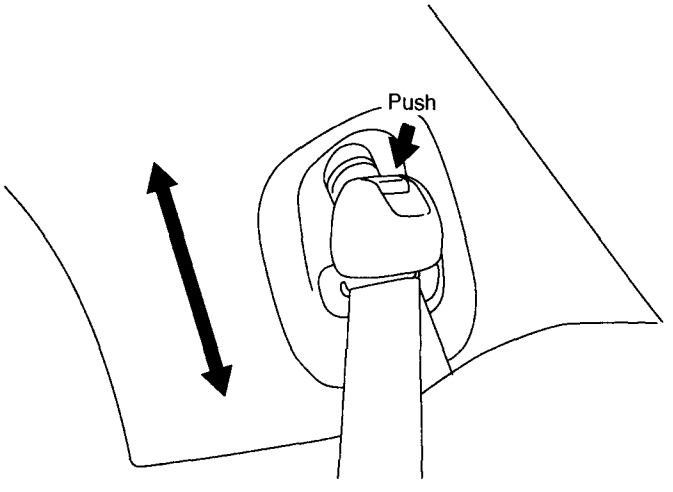
Each front seat belt system has an adjustable shoulder belt anchor which allows the occupant to select the most appropriate anchor height from among the five positions in a 100 mm (3.94 in) range.



NF0217

2. REAR

The side rear seat belt system has an adjustable shoulder belt anchor which allows the occupant to select the most appropriate anchor height from among the three positions in a 36 mm (1.4 in) range.

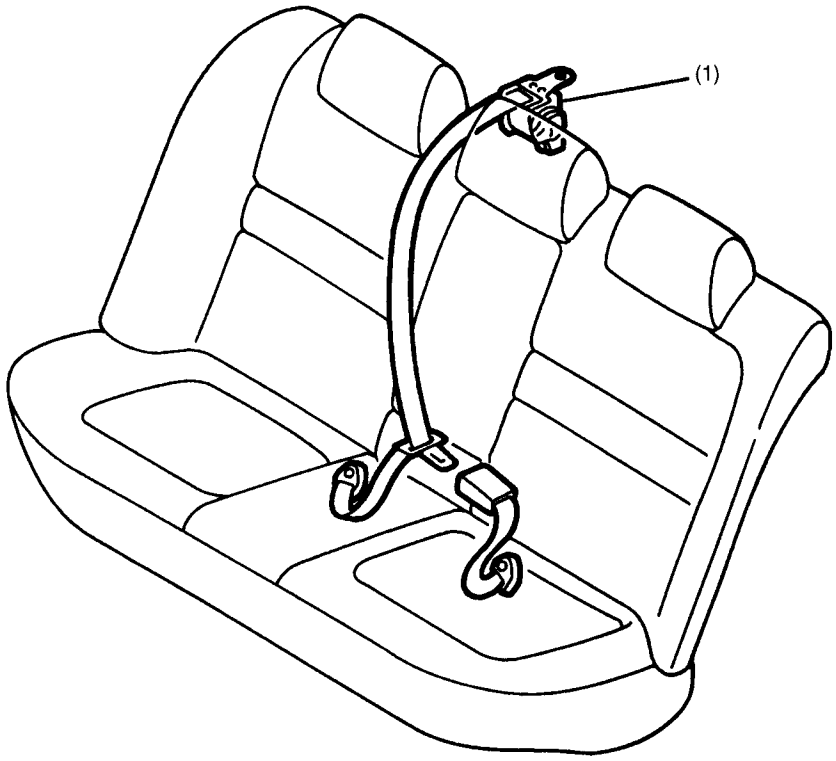


NF0459

B: REAR CENTER THREE-POINT TYPE SEAT BELT

1. SEDAN

A three-point type seat belt is available for the center seating position of the rear seat.
The retractor for the seat belt is installed on the luggage shelf behind the seating position.

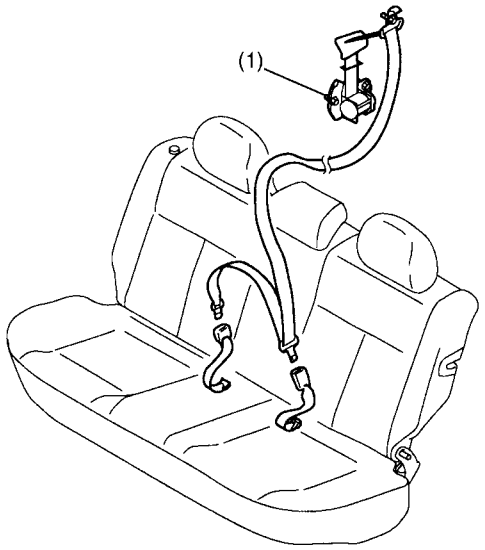


NF0218

(1) Retractor

2. WAGON

A three-point type seat belt is available for the center seating position of the rear seat. The retractor is installed inside the right rear quarter panel.

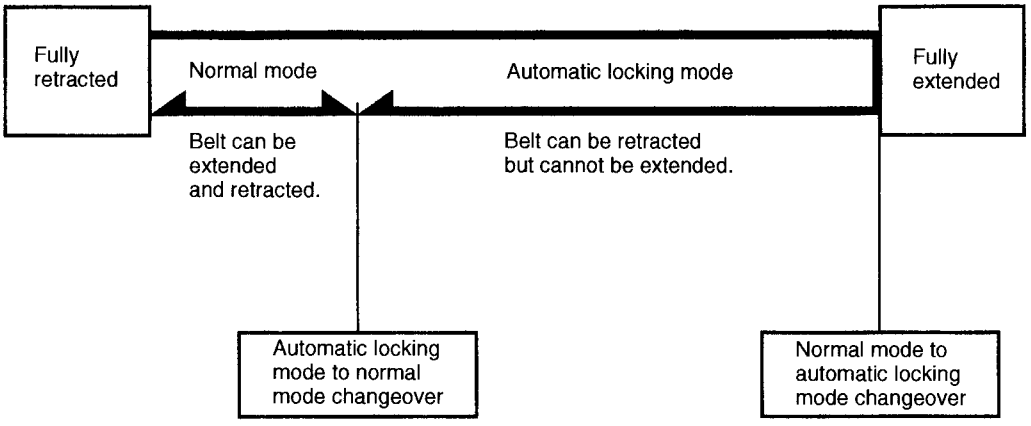


NF0142

(1) Retractor

C: AUTOMATIC RETRACTOR

When the front passenger's seat belt and all the rear seat belts are drawn out completely, their retractors are placed in the automatic locking mode which is used when installing a child restraint system. In this mode, the belt can be retracted but cannot be extended. When the belt is retracted to a certain length, this mode is cancelled and normal operation is restored.



NF0219

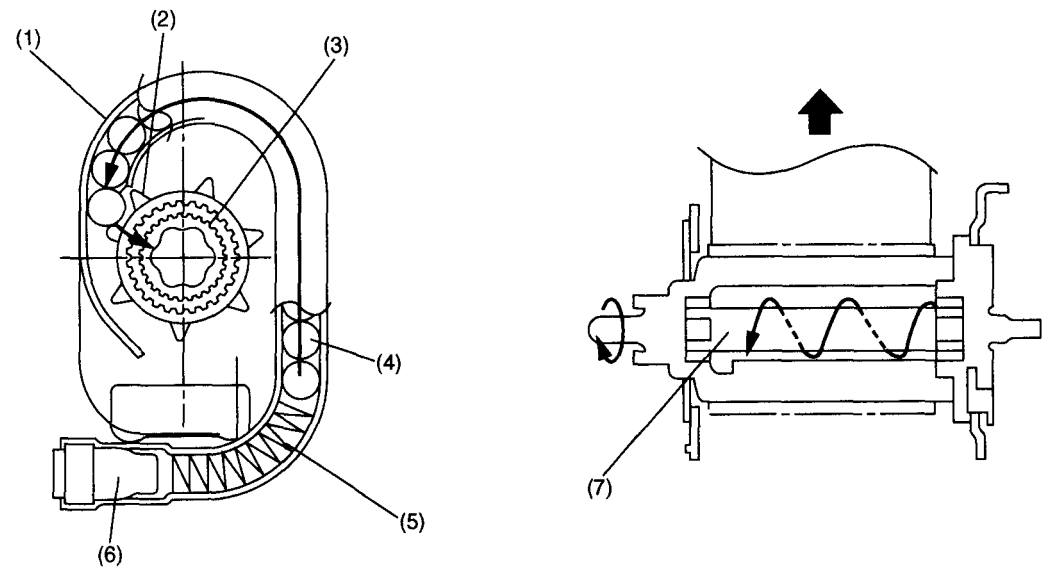
D: PRETENSIONER

1. CONSTRUCTION

The driver's and front passenger's seat belts are equipped with seat belt pretensioners.
The pretensioners use the front sub sensors and the airbag control module inside sensors to control their operation. If the sensors detect an impact exceeding the predetermined level during a frontal or front-angled collision, the front seat belts are quickly rewound by the retractors to take up slacks for maximum restraining of the seat occupants. If the load placed on a seat belt exceeds the predetermined level, the torsion bar twists to allow the belt to be payed out, thus lessening the load imposed on the belt wearer's chest. Once the seat belt pretensioner has been activated, the seat belt retractor remains locked.

- **Driver's pretensioner**

The gas generator is activated.
The generated gas pushes the steel balls.
Moving steel balls cause the ring gear to rotate.

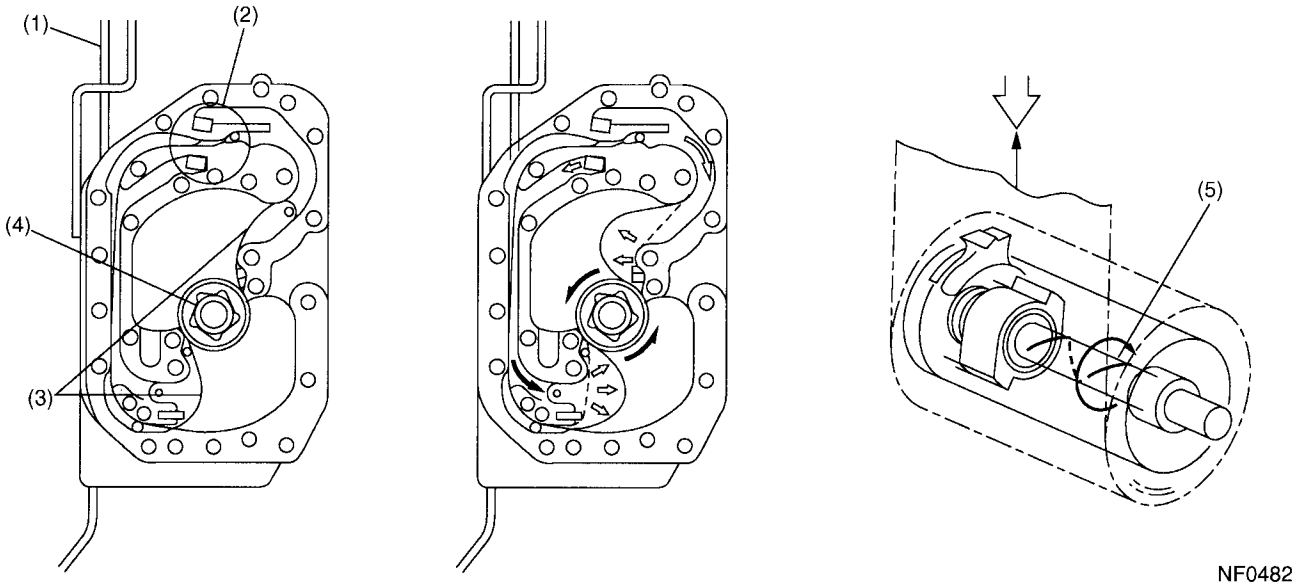


NF0481

(1) Tube
(2) Ring gear
(3) Pinion
(4) Steel ball
(5) Spring
(6) Gas generator
(7) Torsion bar

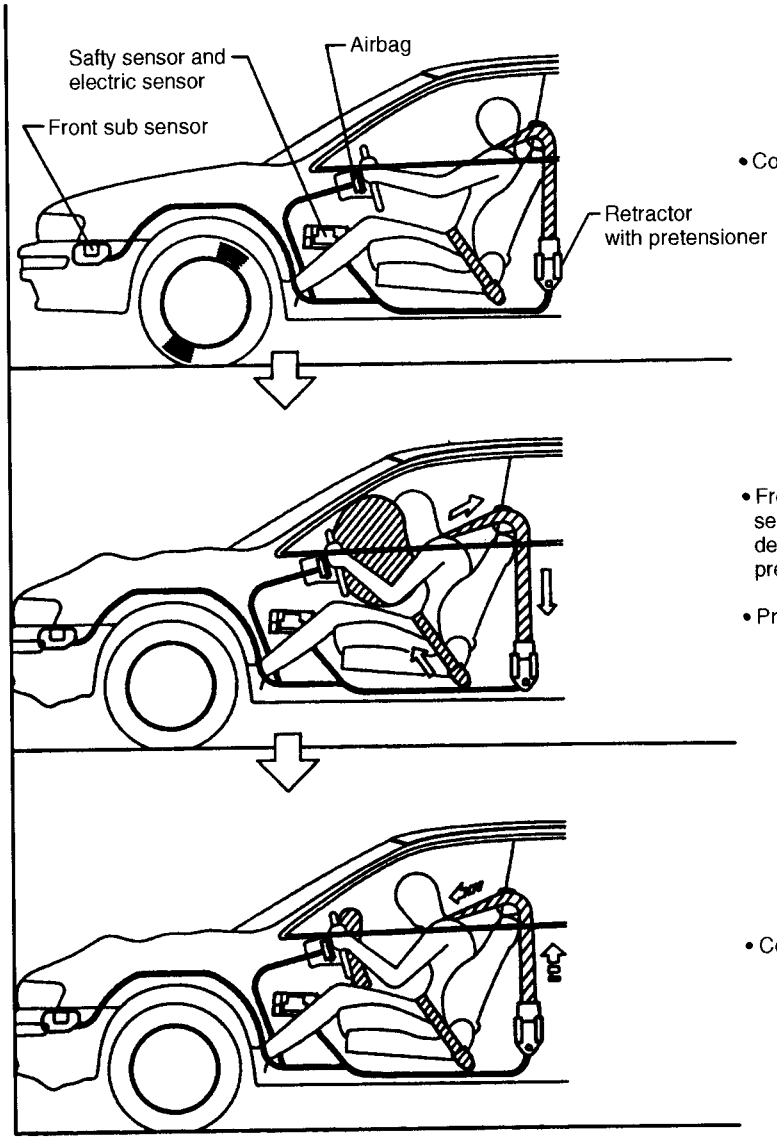
- **Front passenger's pretensioner**

The strip is wrapped onto the clutch shaft.
The gas generator is activated.
The generated gas pushes the strip.
A pull given at the strip rotates the clutch shaft.



(1) Webbing
(2) Gas generator
(3) Strip
(4) Clutch
(5) Torsion bar

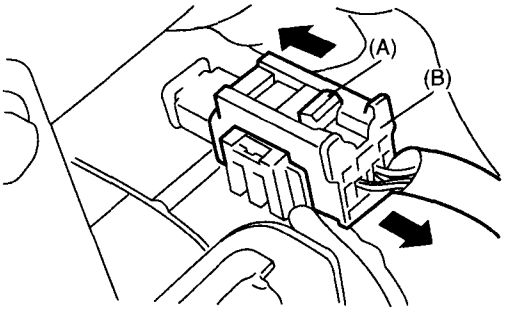
2. FUNCTION



NF0221

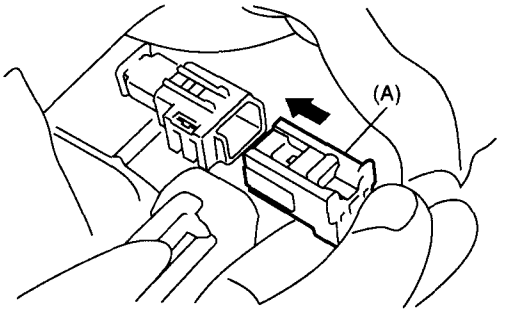
3. PRETENSIONER CONNECTOR

Disconnection:
Hold slide lock (A) moved in the direction of the arrow, then pull the connector (B) in the direction of the arrow.



NF0135

Connection:
Push the connector (A) into the male connector carefully until a click is heard.



NF0136

WIPER AND WASHER SYSTEMS

WW

Page

1. Front Wiper and Washer 2
2. Rear Wiper and Washer 4

1. Front Wiper and Washer

A: DESCRIPTION

1. FRONT WIPER

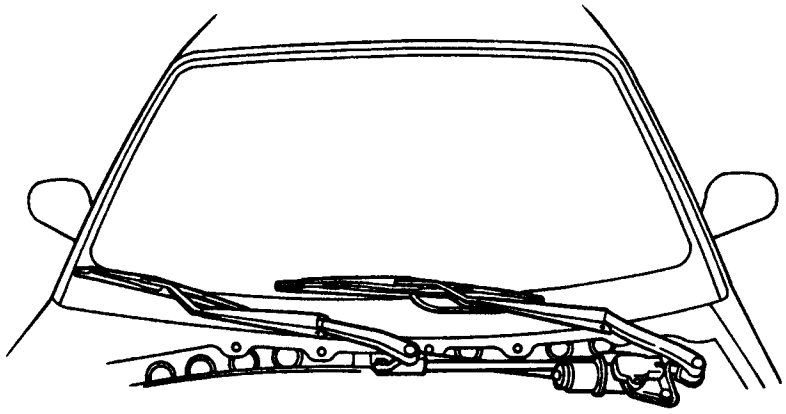
1) The front wiper is of a tandem type featuring wide wiping area. The blade is installed to the arm by means of U-hook joint to improve serviceability.

2) The front wiper operates in the HI and LOW speed modes and the INTERMITTENT mode.

The operation modes can be selected by turning the wiper switch incorporated in the combination switch.

3) In the INTERMITTENT mode, the intermittent unit installed behind the combination switch controls the front wiper operation interval.

4) The front wiper system uses a modular construction in which the wiper motor forms an integral part of the linkage. The motor is installed on the body through rubber mounting.



NF0223

2. FRONT WASHER SYSTEM

1) The washer system consists of a washer tank, a motor and pump unit and a pair of nozzles.

2) The washer tank is installed at the front of the strut mount on the left side of the engine compartment.

3) The washer motor and pump unit is installed at the bottom of the washer tank.

4) The washer nozzles are installed on the hood. Each nozzle has a diffusion jet hole.

5) Each washer nozzle is provided with a check valve which is located just below it.

3. SPECIFICATIONS

Washer Tank	Capacity			4.0 liters (4.2 US qt, 3.5 Imp qt)
Wiper Motor	Rated voltage			12 V
	No-load current			4 A or less
	Speed [at 2.0 N·m (20 kg-cm, 17 in-lb)]		HIGH	66 ± 6 rpm
			LOW	43 ± 5 rpm
	Locked rotor characteristics	HIGH	Torque	29.4 N·m (300 kg-cm, 2.2 ft-lb) or more
			Current	36.0 A or less
		LOW	Torque	34.3 N·m (350 kg-cm, 2.5 ft-lb)
			Current	31.5 A or less
Wiper Blade	Length	Driver side		550 mm (21.65 in)
		Passenger side		425 mm (19.69 in)

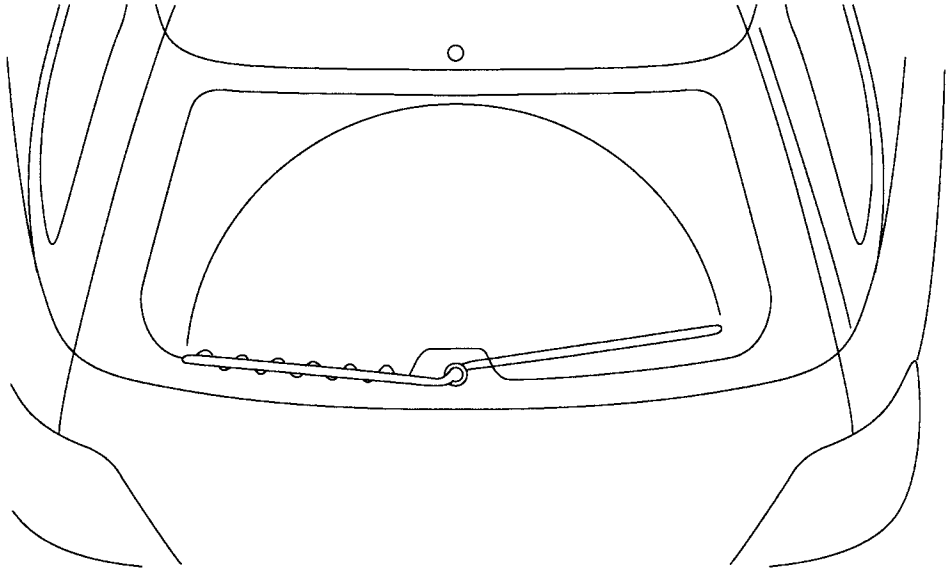
2. Rear Wiper and Washer

A: DESCRIPTION

1. REAR WIPER

1) The rear wiper operates intermittently at a 10-second interval.

2) The rear wiper operates over a 168-degree angle.



NF0141

3) The wiper blade is attached to the arm by means of a U-hook joint in the same way as with the front wipers.

2. REAR WASHER SYSTEM

1) The same washer tank is shared by the front and rear washer systems.

2) The washer motor and pump unit is installed at the bottom of the washer tank, adjacent to the front washer's unit.

3) The washer nozzle is installed on the upper portion of rear gate panel. The nozzle has two spray holes.

4) The washer nozzle is provided with a check valve which is located just below it.

3. SPECIFICATIONS

Wiper Motor	Rated voltage	12 V
	No-load current	2 A or less
	Speed [at 0.5 N·m (5 kg-cm, 4.3 in-lb)]	25 rpm or more
	Locked rotor current	13 A or less
Wiper Blade	Length	375 mm (14.76 in)

GLASS/WINDOWS/MIRRORS GW

Page

1. Power Window 2

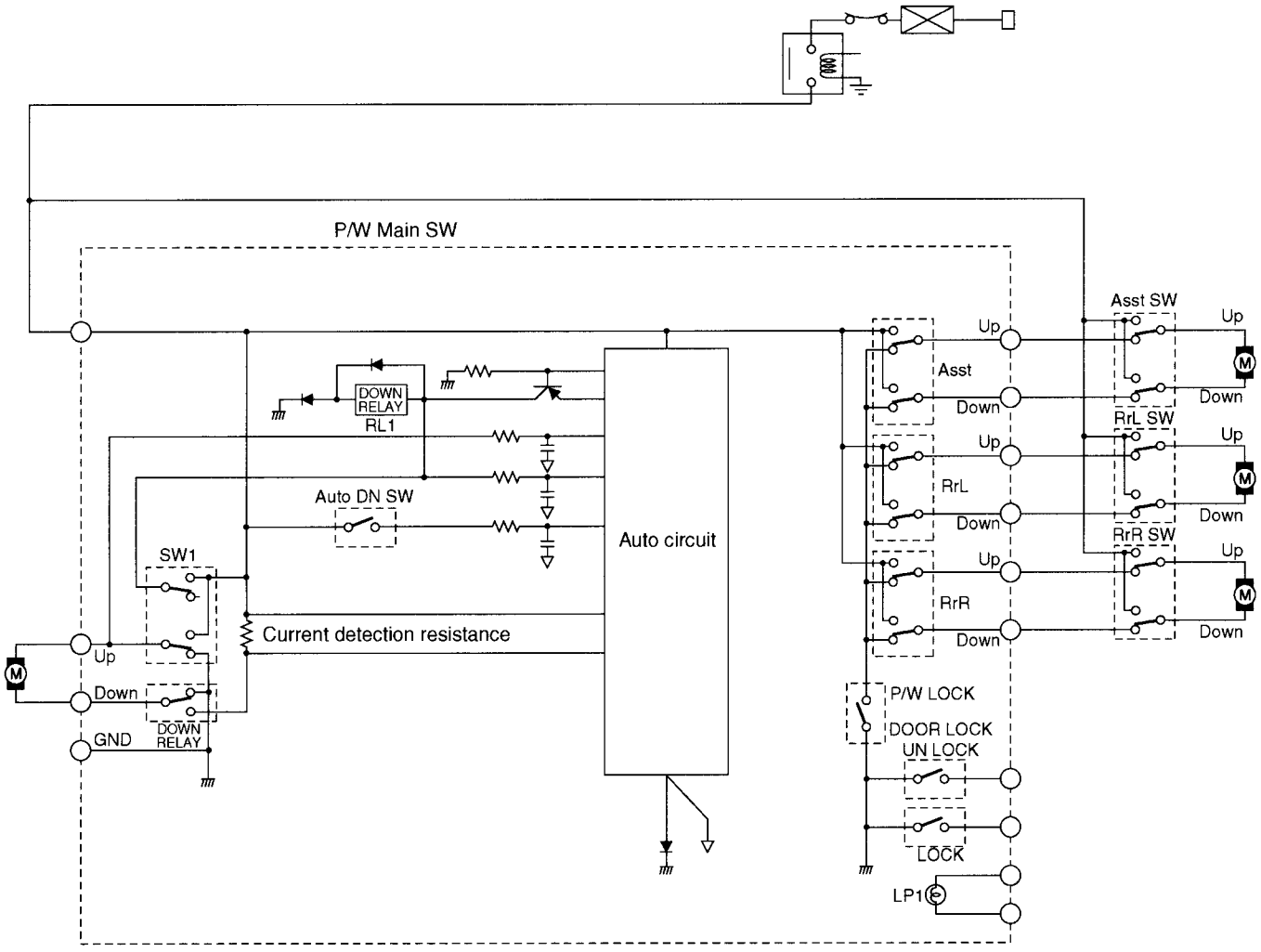
1. Power Window

A: CONSTRUCTION

- The power window system consists of regulator motors and switches for individual doors, relays and a circuit breaker unit.
- Each door window opens/closes by pushing down/pulling up the switch.
- Only the driver's door window switch has a 2-stage mechanism:
  - When the switch is pushed lightly and held in the pushed position, the window continues to lower until the switch is released.
  - When the switch is pushed down fully, the window lowers to the end position automatically.

NOTE:
For the sake of safety, the power window system is designed to operate only when the ignition switch is in the ON position.

B: CIRCUIT DIAGRAM



NF0222

BODY STRUCTURE BS

Page

Refer to G1831BE SUPPLEMENT for this section.

BODY STRUCTURE BS

		Page
1.	Steering Support Beam	2
2.	Quietness	3
3.	Body Sealing	5
4.	Painting	6
5.	Anti Chipping Coat (ACC) Application	7
6.	Stone Guard Coat (SGC) Application	8
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8.	Anti-rust Wax (Bitumen Wax) Application	16
9.	Polyvinyl Chloride (PVC) Application	19
10.	Hot Wax Application	20
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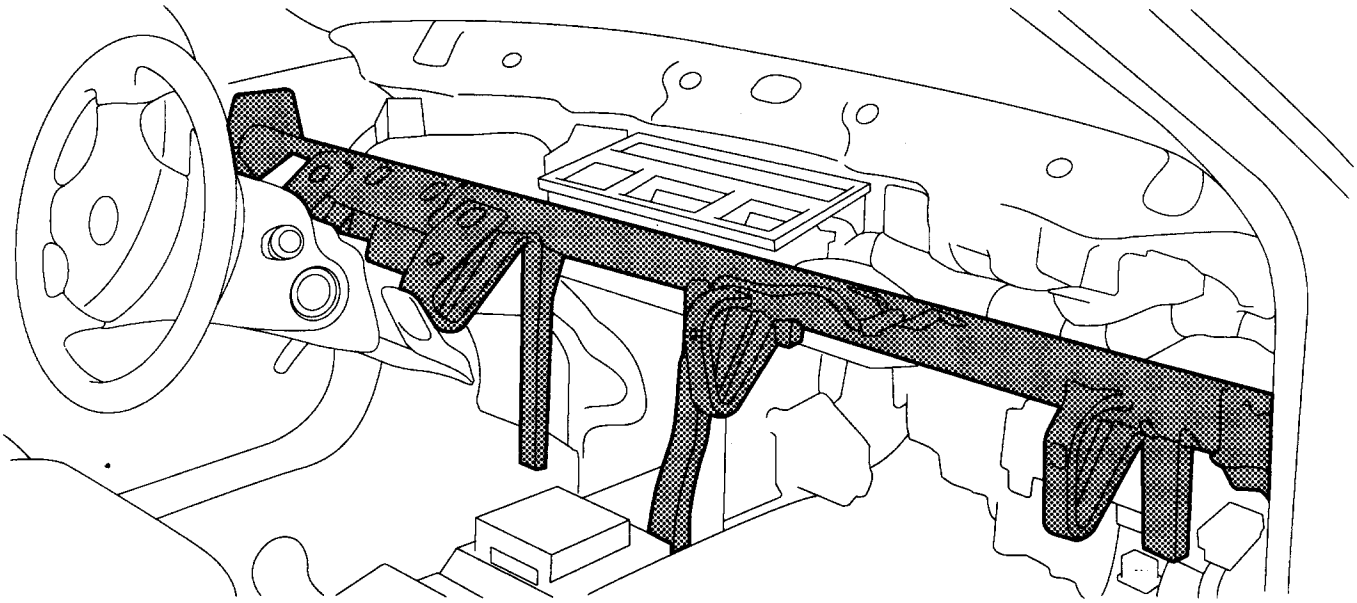
1. Steering Support Beam

A steering support beam is provided between the left and right front pillars for reinforced support of the steering column. It also minimizes vibration of the steering column and limits its extension to a minimum in the event of a collision.



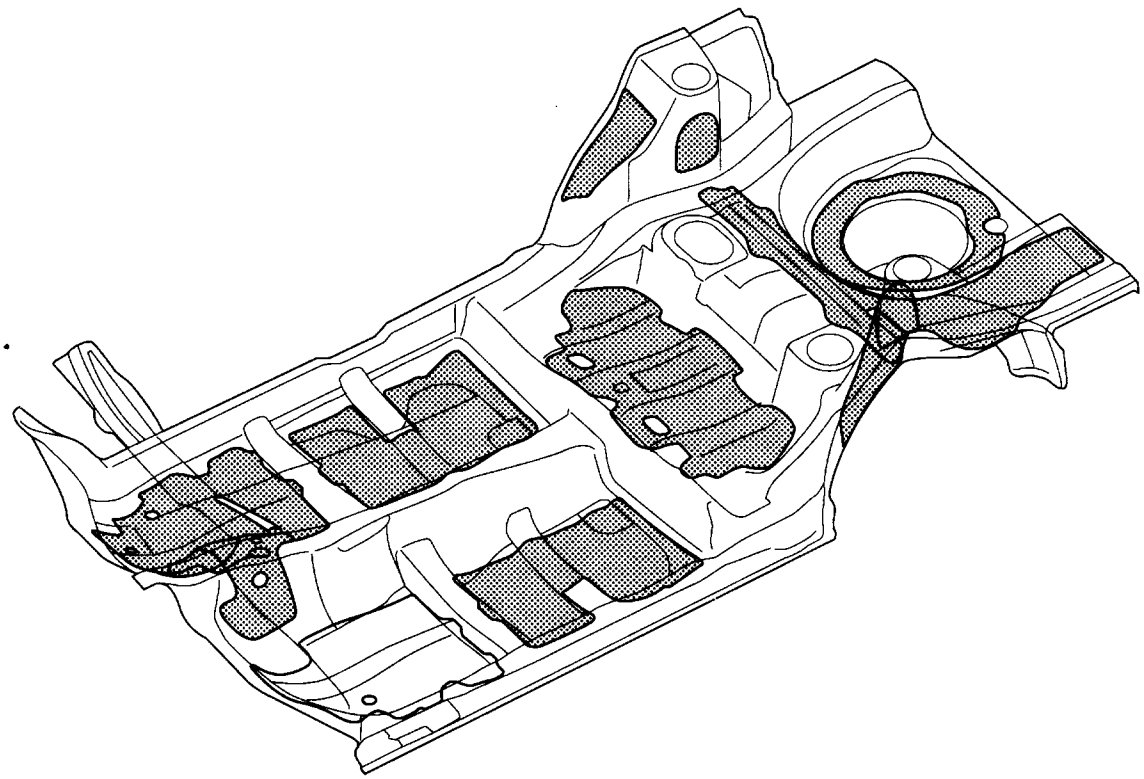
NF0498

2. Quietness

Silencers, dual-wall panels, sound-absorbing materials, etc. are utilized in conjunction with a high-rigidity and vibration/noise-proof body structure in order to ensure quietness of the passenger compartment.

A: SILENCERS

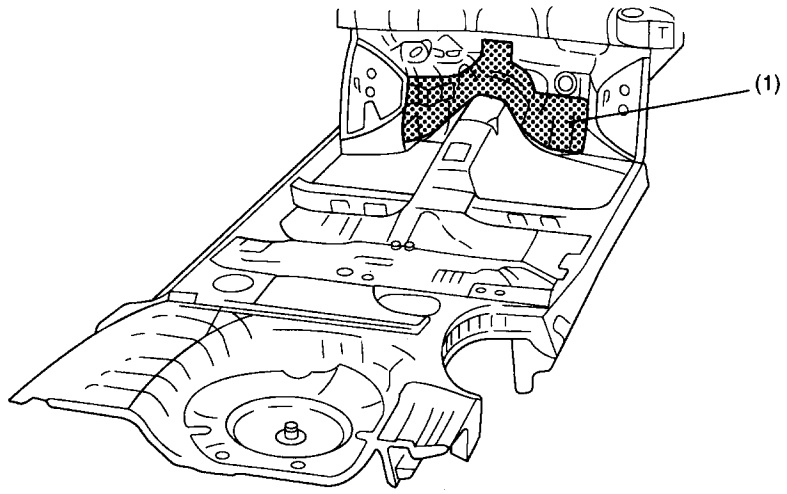
Silencers (= asphalt sheets) minimize transmission of noise/vibration into the passenger compartment.



NF0527

B: DUAL-WALL TOEBOARD

The toeboard is a dual-wall design consisting of an asphalt sheet placed between two steel panels to reduce the transmission of noise and vibration from the engine compartment to the passenger compartment.



NF0499

(1) Dual-wall toeboard

3. Body Sealing

A: SEALED PARTS

All gauge holes and other holes used during the body manufacturing process are plugged to prevent entry of water and dust.

Any time the vehicle body has been repaired, the affected holes should be properly plugged with the use of the specified plugs.

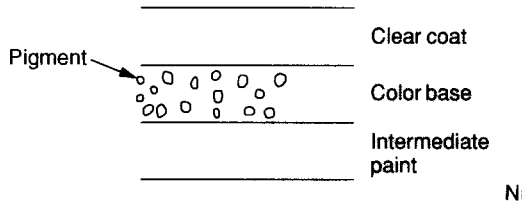
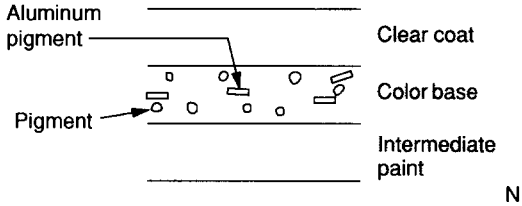
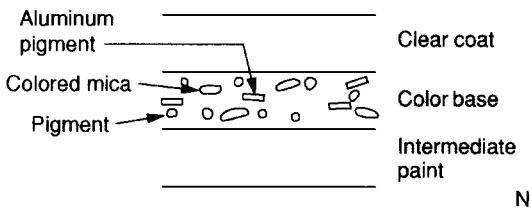
4. Painting

A: SPECIFICATION

Color name	Color code
PURE WHITE	51E
PREMIUM SILVER (M)	01G
GREEN (M)	07V
RED MICA (M)	94H
DEEP BLUE MICA	95H
BLUE BLACK MICA	08V
WR BLUE MICA	02C
SPORTS YELLOW	797
PURE WHITE / GRAY (M)	0G5 (51E / 09V)
RED MICA (M) / GRAY (M)	0L1 (94H / 09V)
PREMIUM SILVER (M) / GRAY (M)	0T9 (01G / 09V)
GREEN (M) / GRAY (M)	0A6 (07V / 09V)
BLUE BLACK MICA / GRAY (M)	0A9 (08V / 09V)

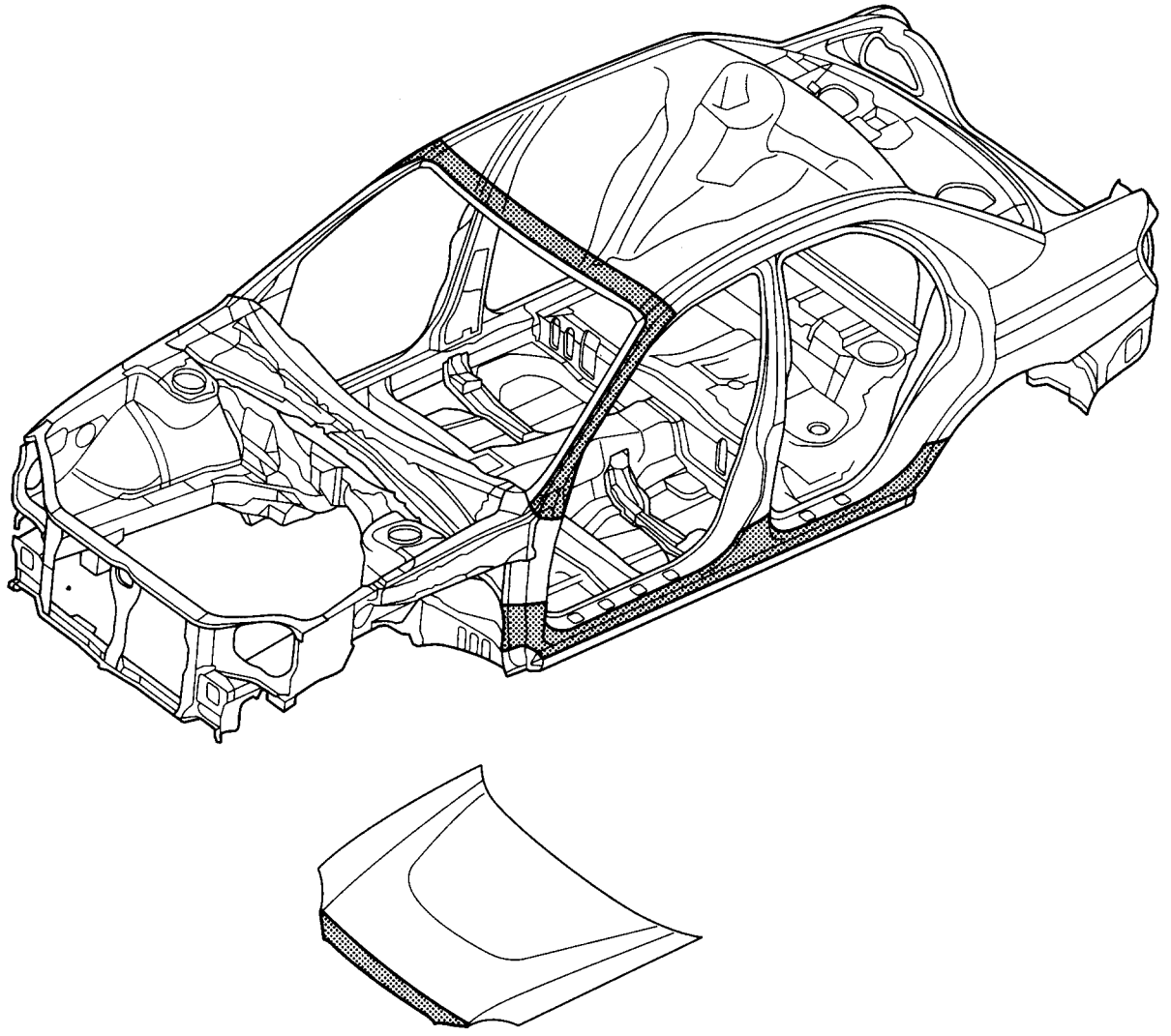
(M): Metallic

B: PAINT FILM STRUCTURE

Color name	Paint film structure
• PURE WHITE • SPORTS YELLOW	
• PREMIUM SILVER (M) • GREEN (M) • GRAY (M)	
• RED MICA (M) • DEEP BLUE MICA • BLUE BLACK MICA • WR BLUE MICA	

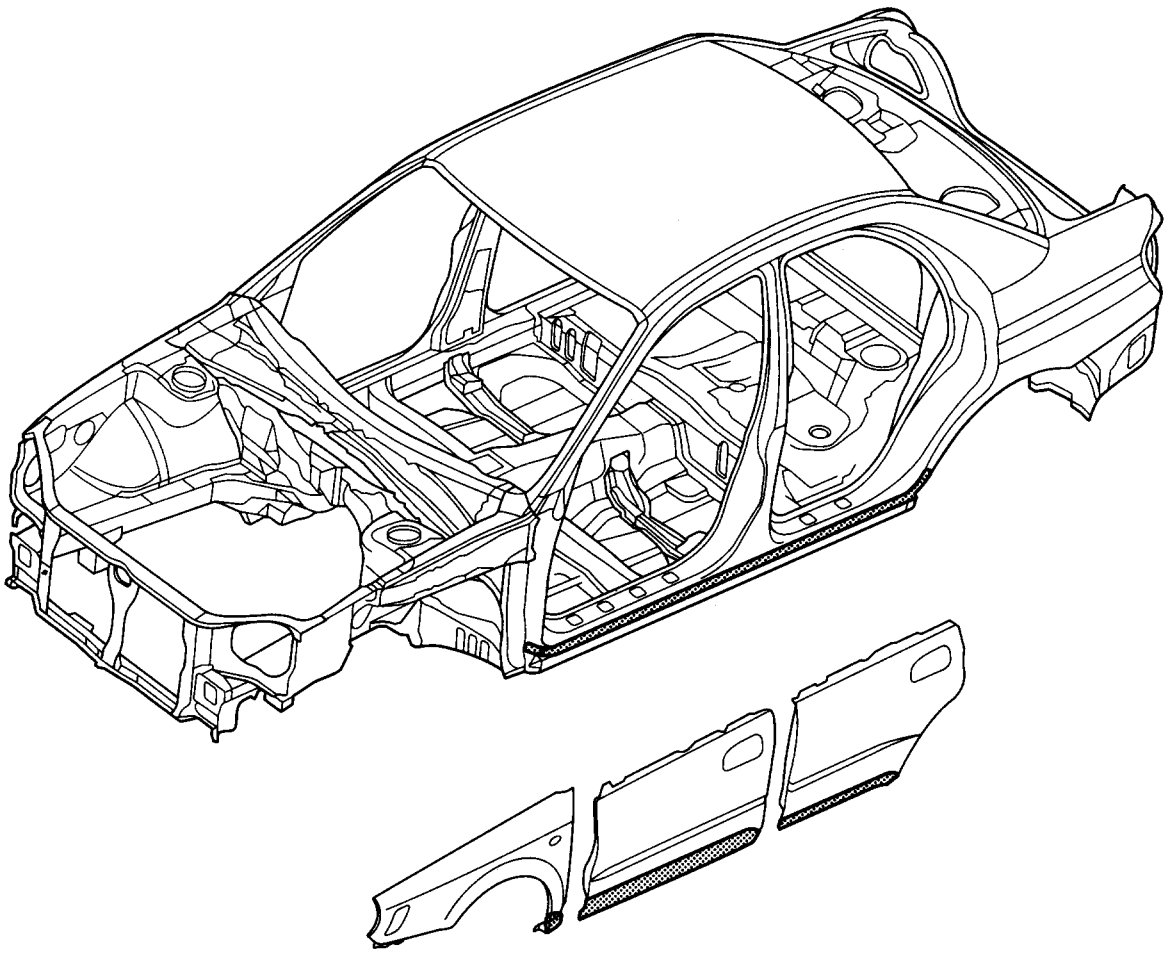
(M): Metallic

5. Anti Chipping Coat (ACC) Application



NF0500

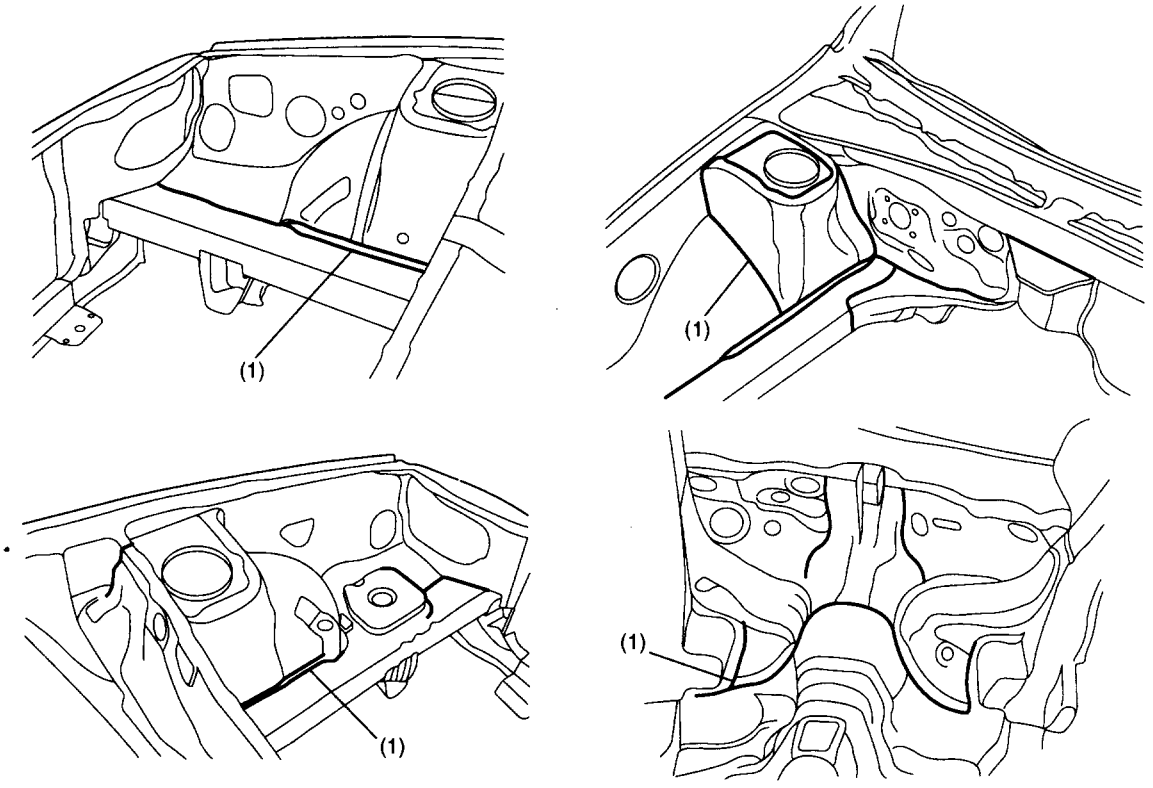
6. Stone Guard Coat (SGC) Application



NF0533

7. Sealer Application

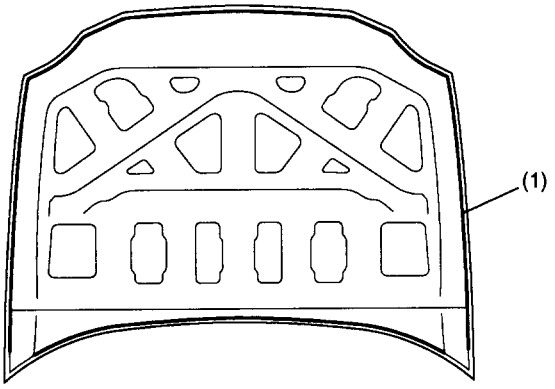
A: ENGINE COMPARTMENT



NF0501

(1) Sealer

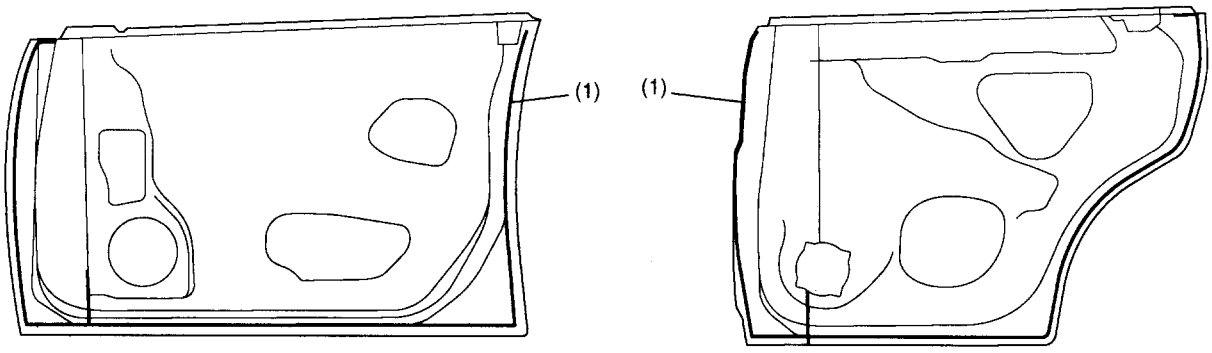
B: ENGINE HOOD



NF0502

(1) Sealer

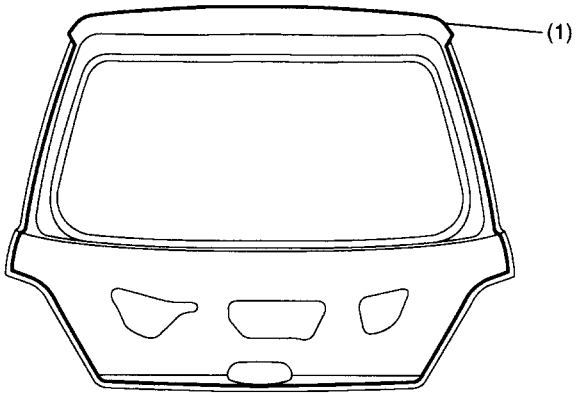
C: DOOR



NF0503

(1) Sealer

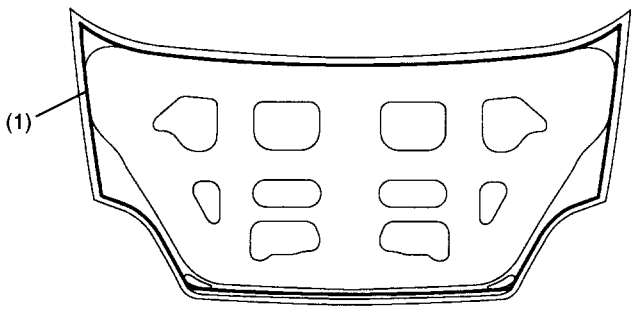
D: REAR GATE



NF0504

(1) Sealer

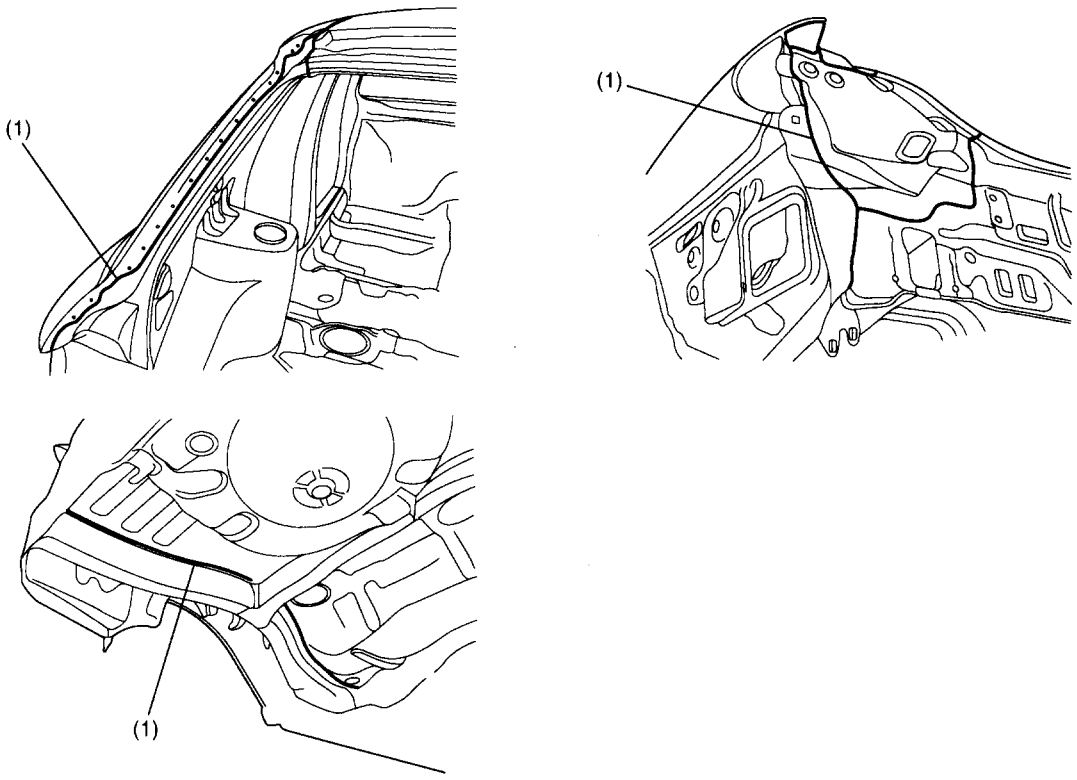
E: TRUNK LID



NF0505

(1) Sealer

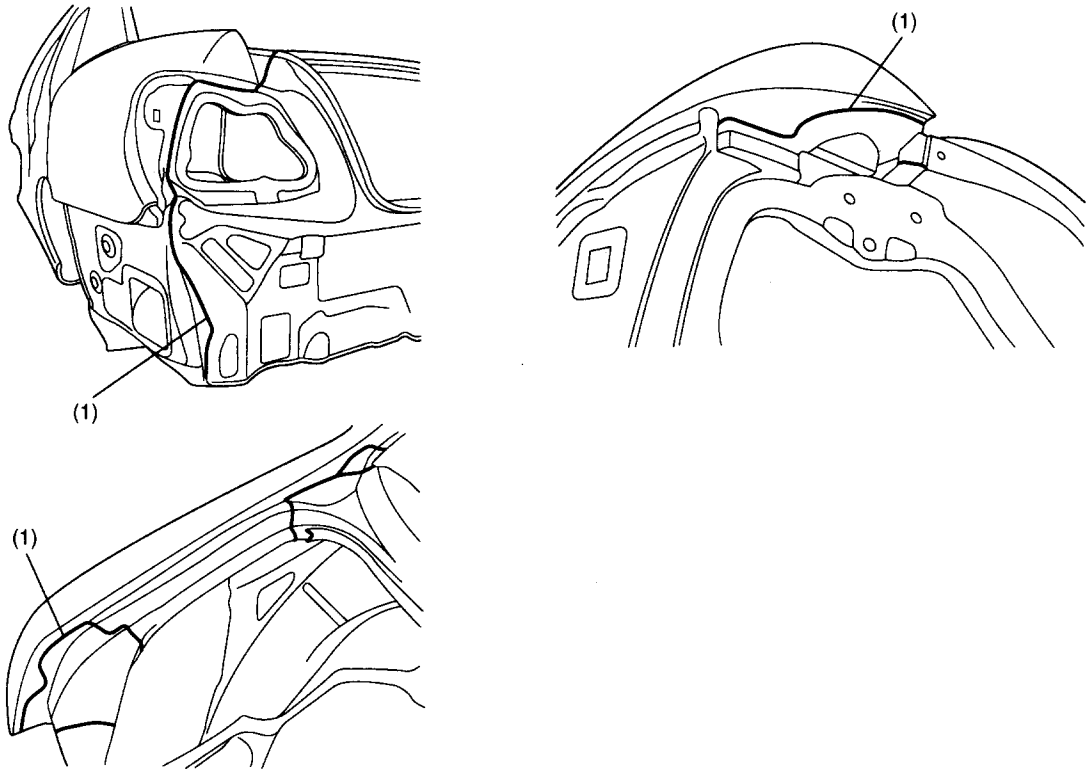
F: REAR END (WAGON)



NF0506

(1) Sealer

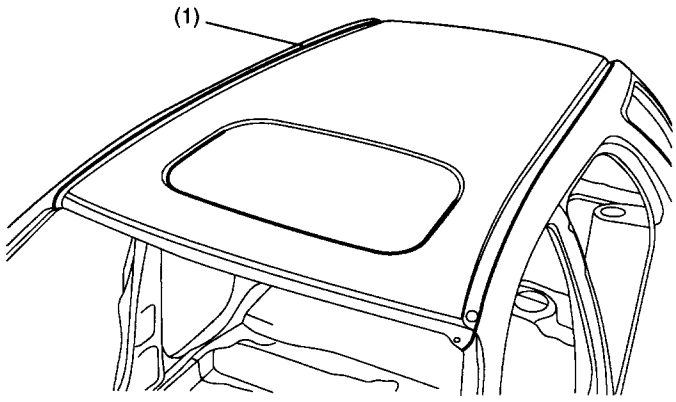
G: REAR END (SEDAN)



NF0507

(1) Sealer

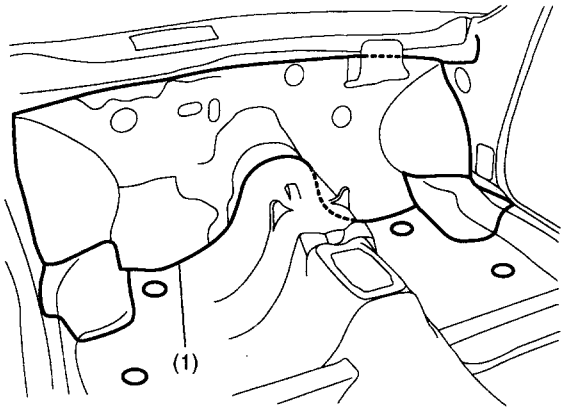
H: ROOF PANEL



NF0508

(1) Sealer

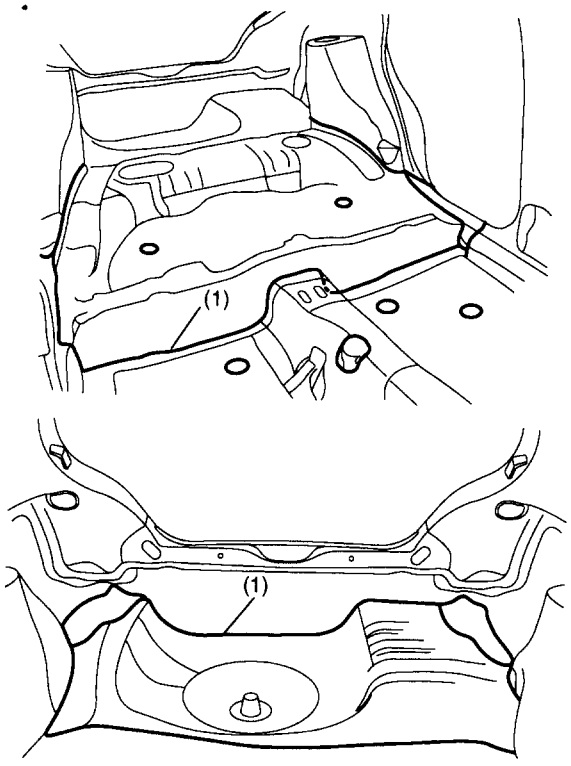
I: FRONT FLOOR

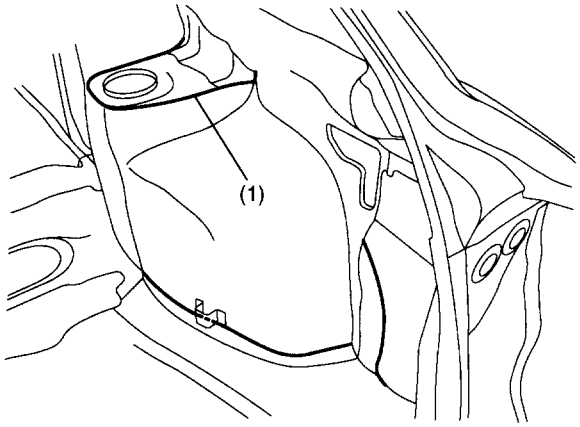


NF0509

(1) Sealer

J: REAR FLOOR (WAGON)

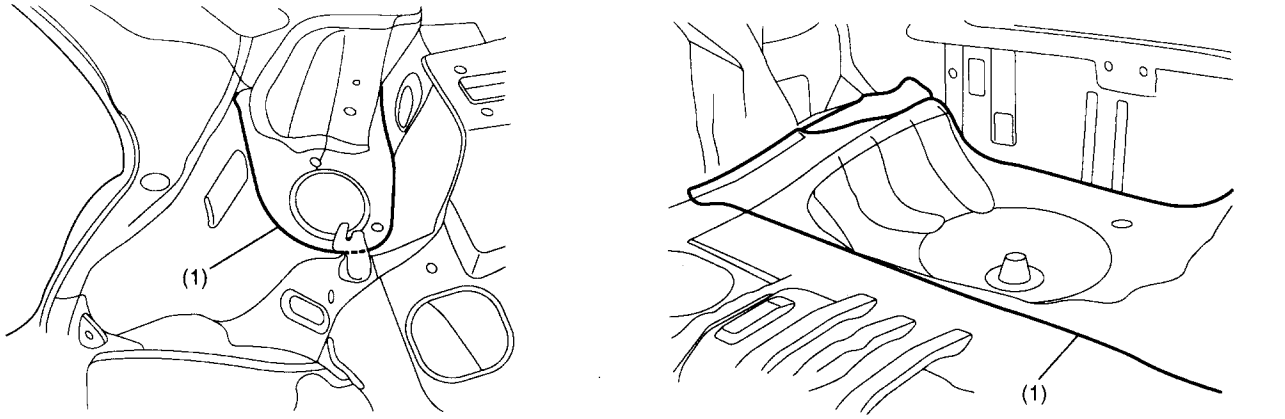




NF0510

(1) Sealer

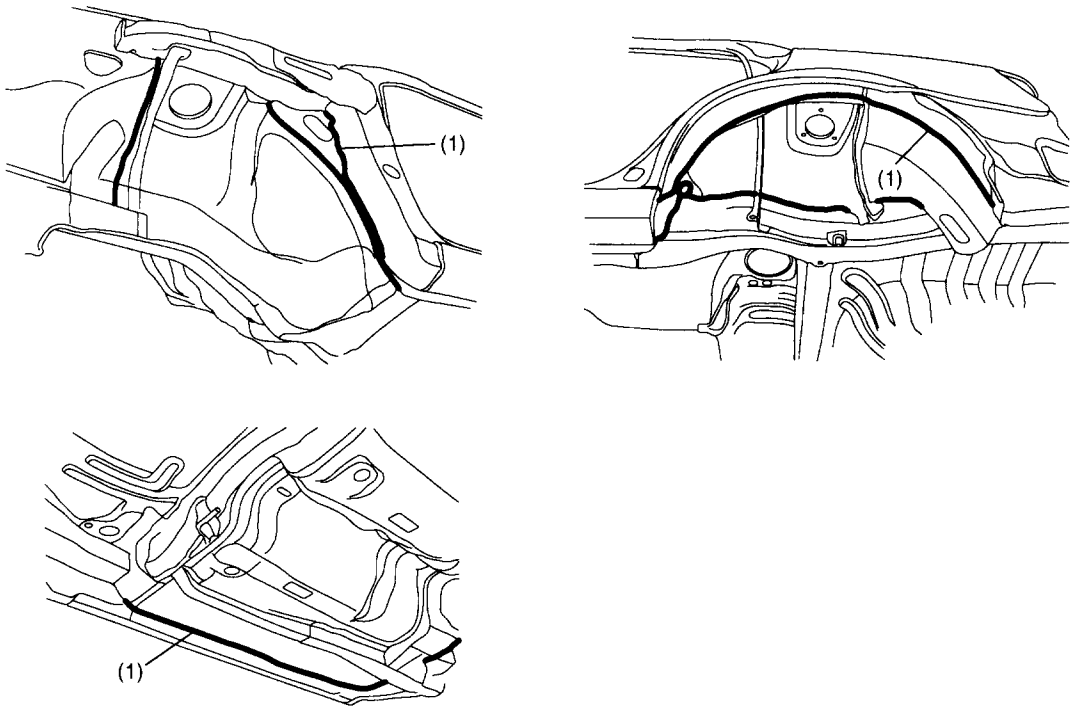
K: REAR FLOOR (SEDAN)



NF0511

(1) Sealer

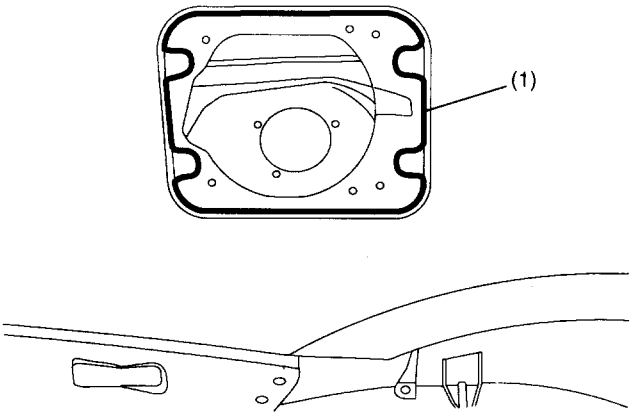
L: UNDER BODY



NF0524

(1) Sealer

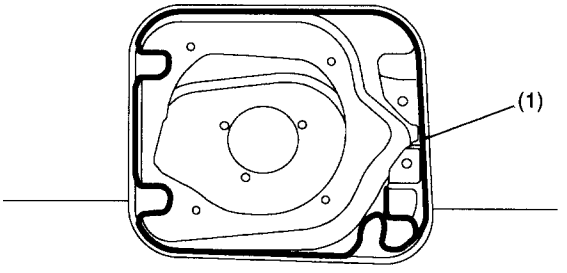
M: FUEL LID (WAGON)



NF0525

(1) Sealer

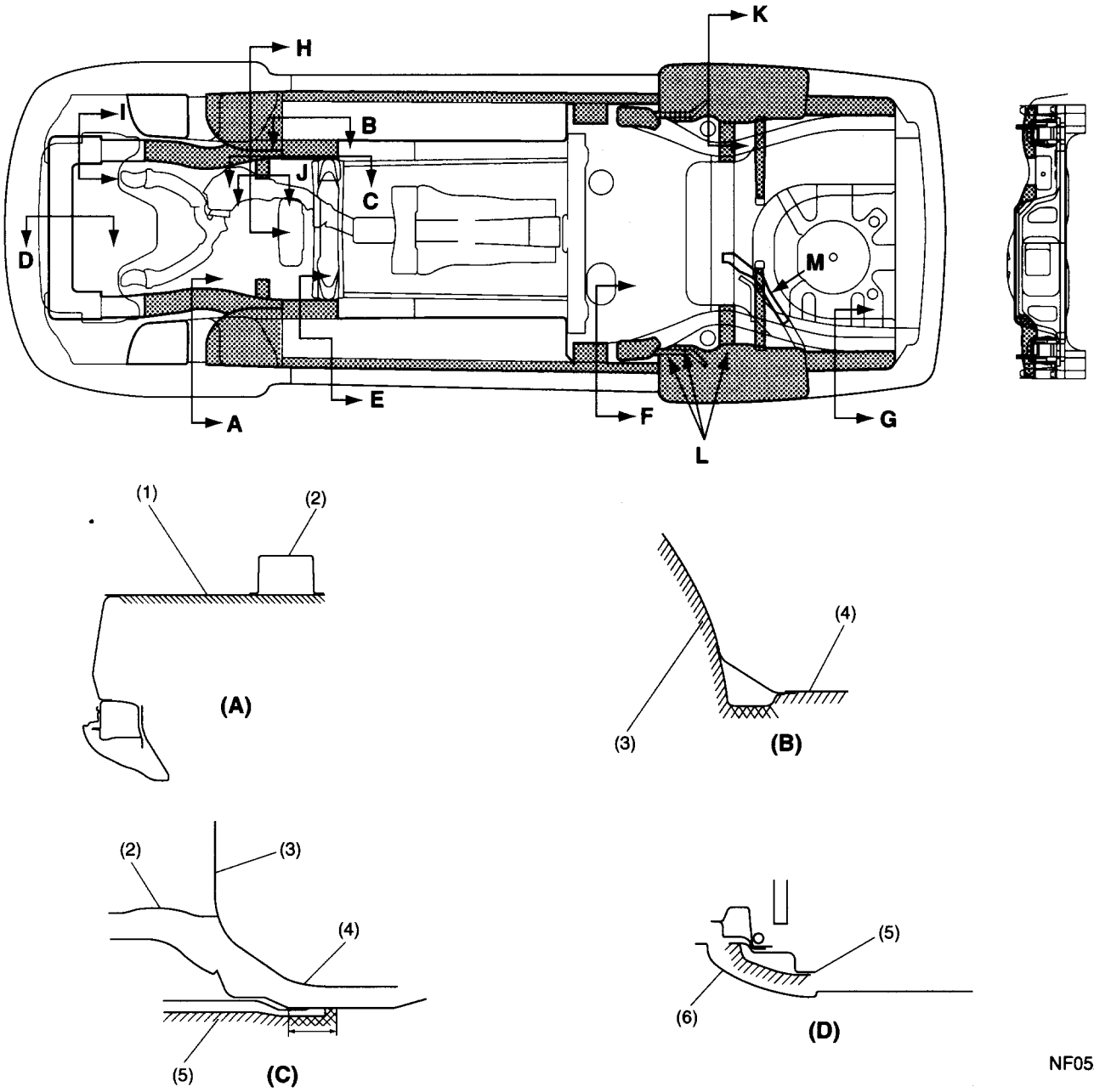
N: FUEL LID (SEDAN)



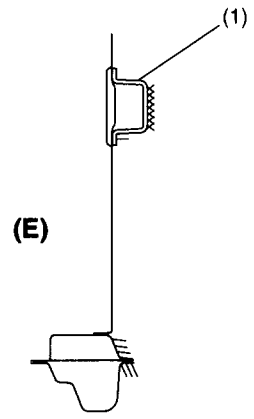
NF0526

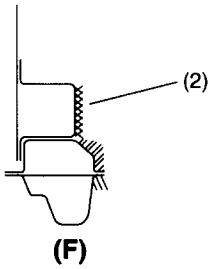
(1) Sealer

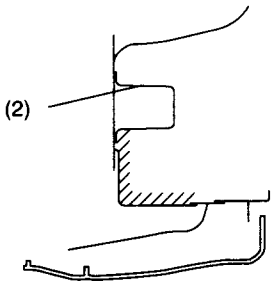
8. Anti-rust Wax (Bitumen Wax) Application

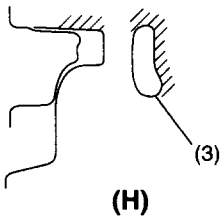


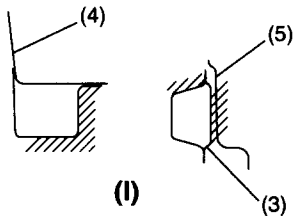
(1) Front suspension lower bracket
(2) Front side frame
(3) Toeboard
(4) Front floor pan
(5) Sub frame
(6) Under cover

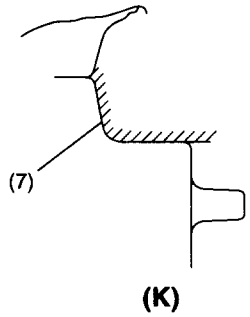


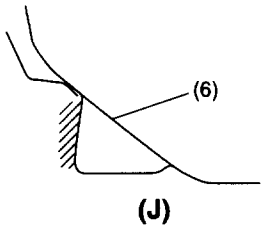








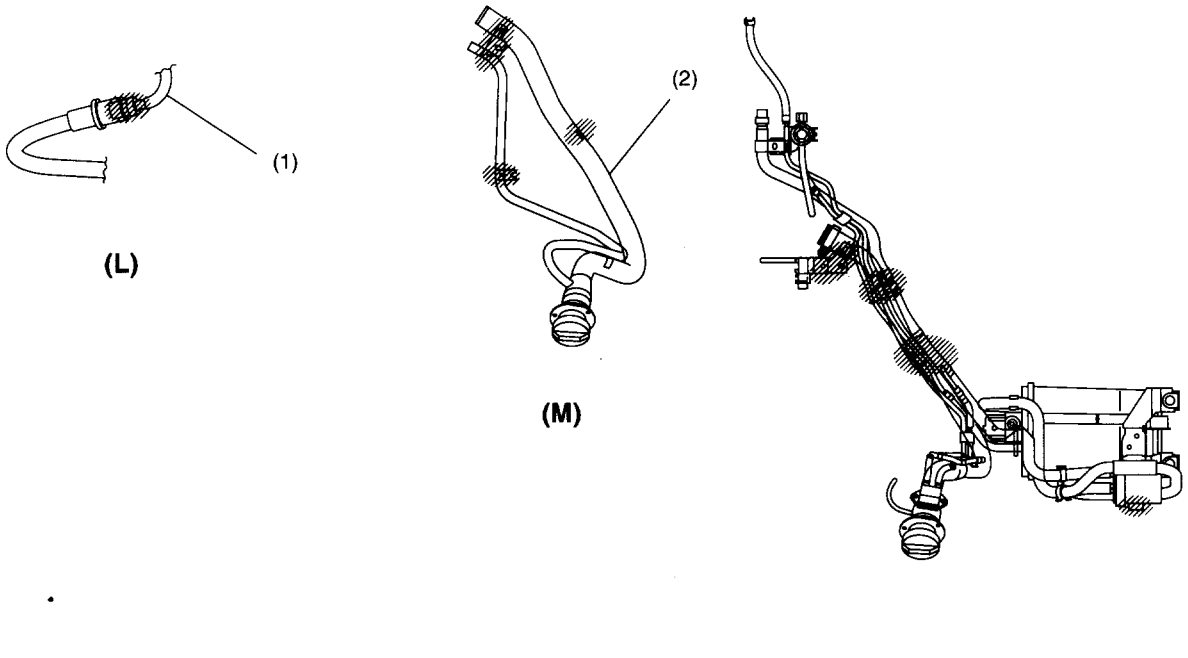




NF0529

(1) Front side frame
(2) Rear side frame
(3) Sub frame
(4) Front wheel apron
(5) Under cover
(6) Toeboard
(7) Rear wheel apron

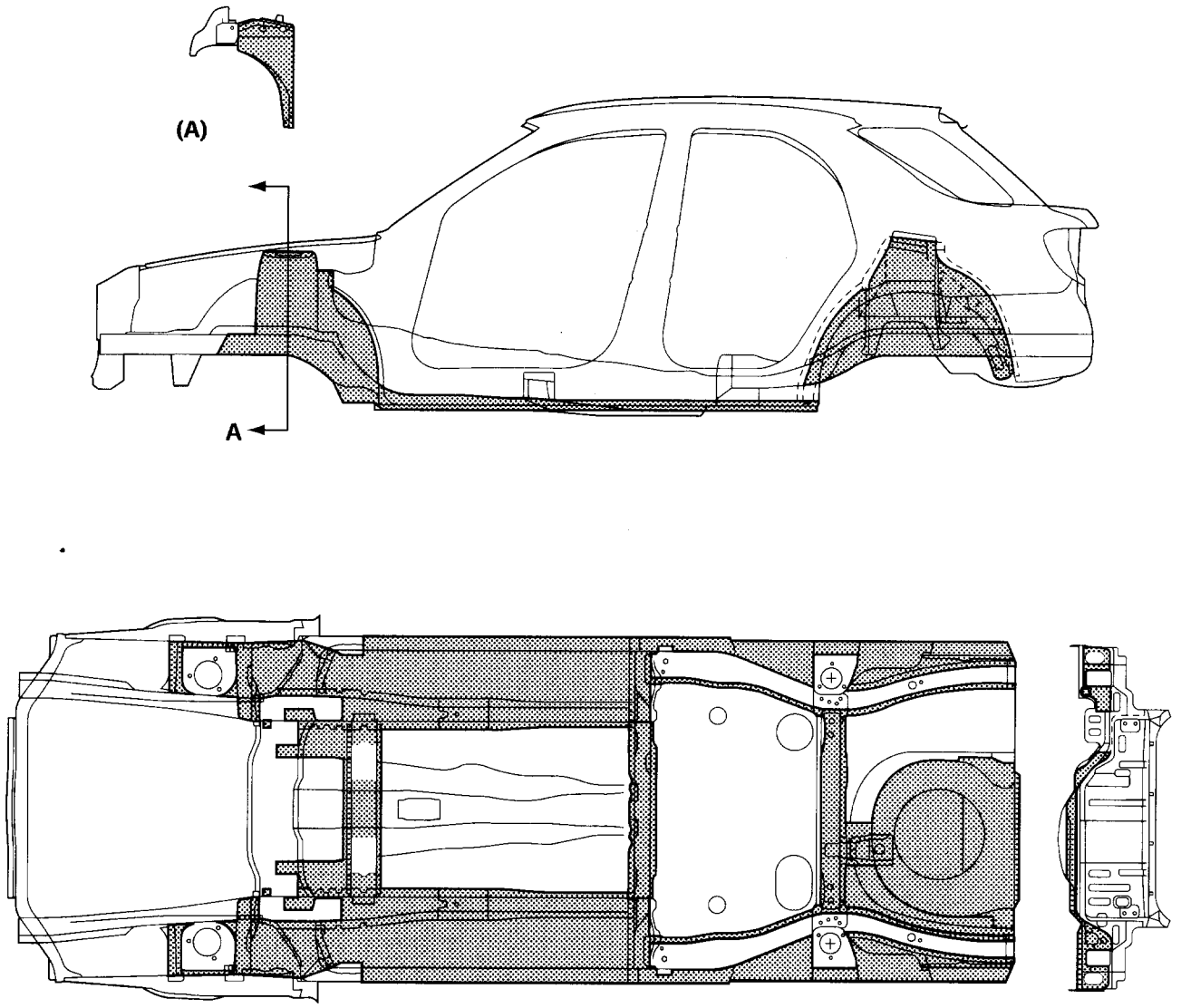
ANTI-RUST WAX (BITUMEN WAX) APPLICATION



NF0532

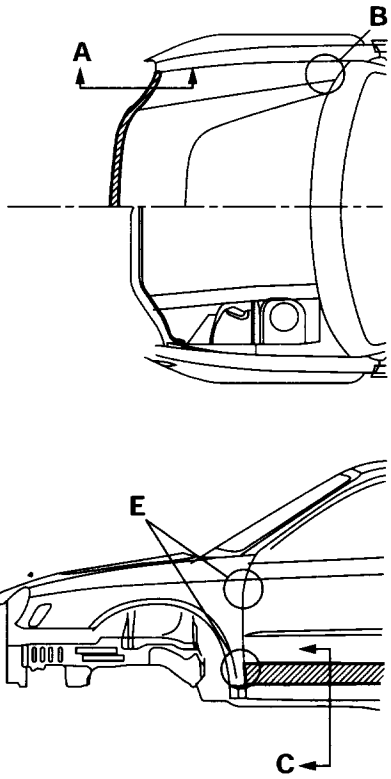
(1) Brake pipe
(2) Filler pipe

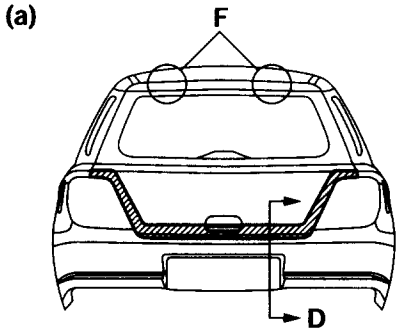
9. Polyvinyl Chloride (PVC) Application

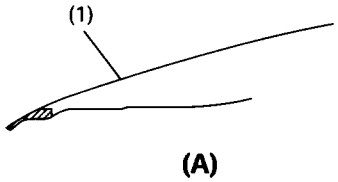


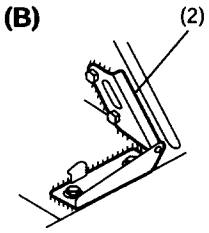
NF0514

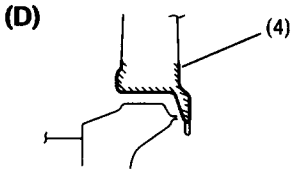
10. Hot Wax Application

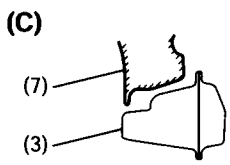


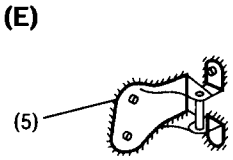


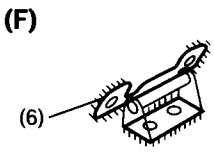








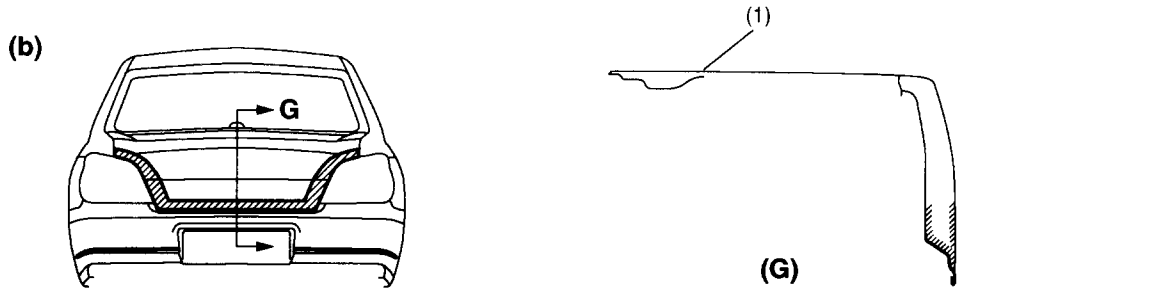




NF0515

(1) Front hood panel
(2) Front hood hinge
(3) Side sill
(4) Rear gate outer panel
(5) Front and rear door hinge
(6) Rear gate hinge
(7) Side door panel (include rear door panel)

(a) WAGON

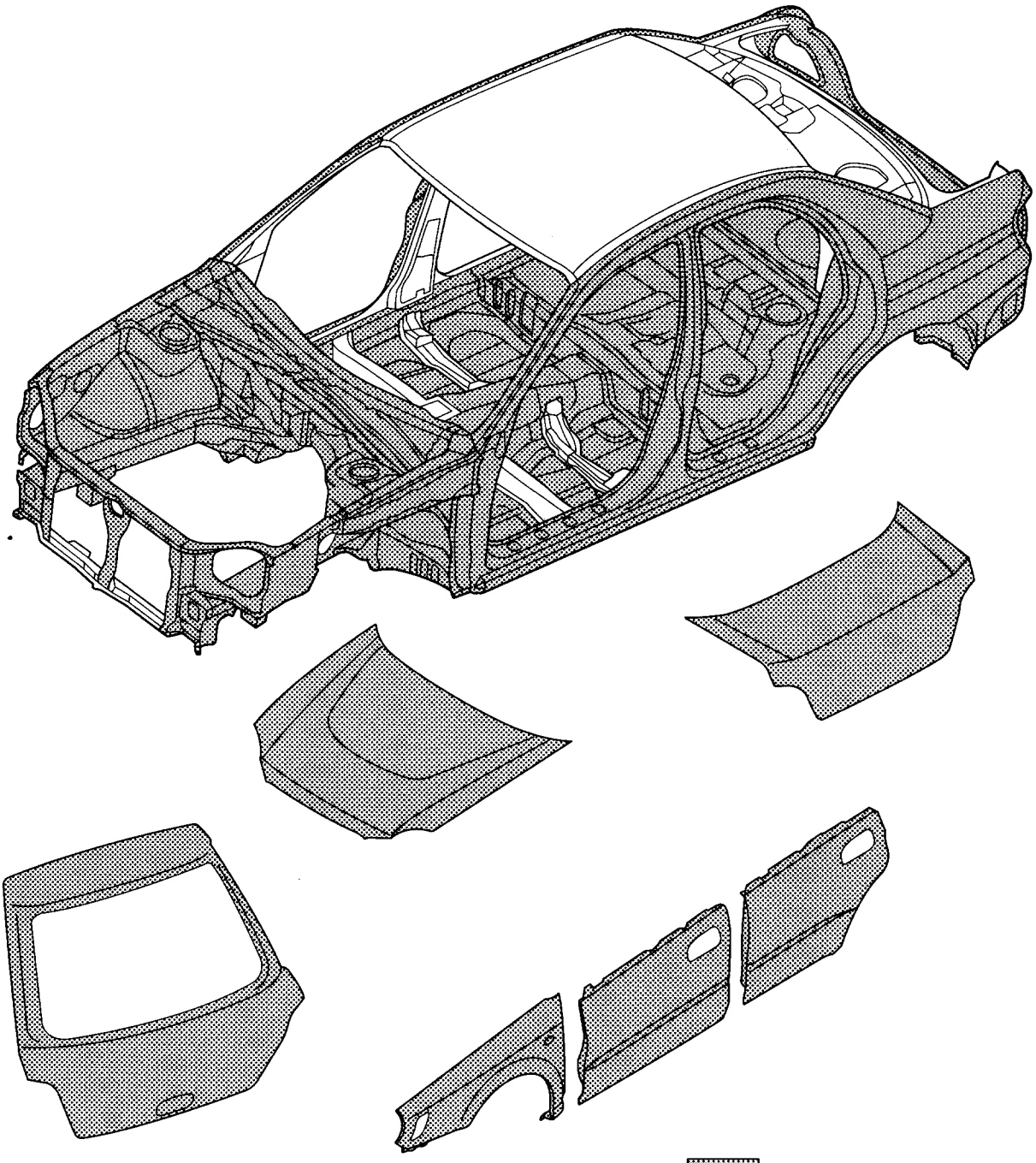


NF0516

(1) Trunk lid

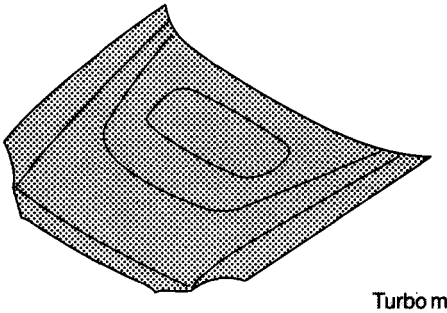
(b) SEDAN

11. Galvanized Sheet Metal Application



NF0517

12. Aluminium Sheet Metal Application

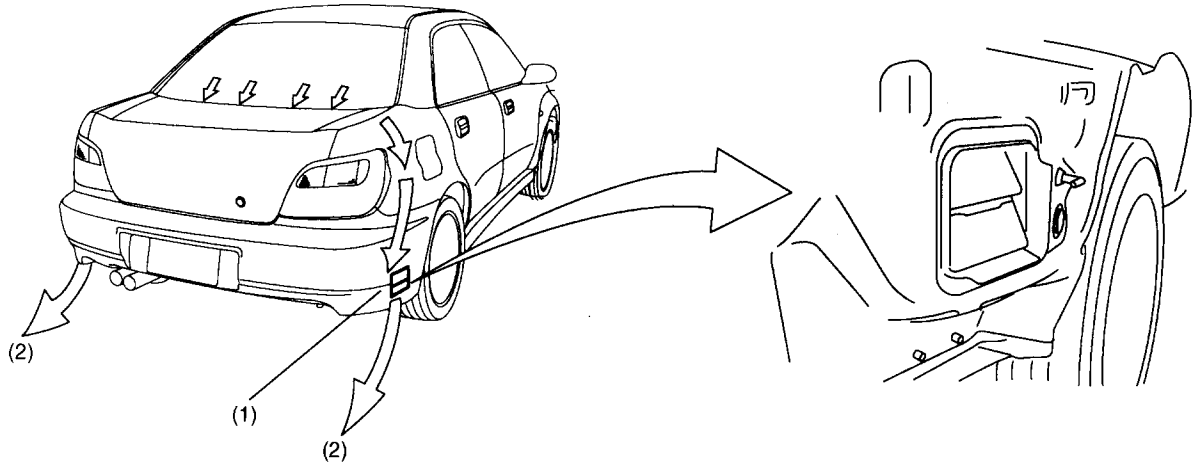


Turbo models

NF0531

13. Ventilation

A: AIR OUTLET PORT

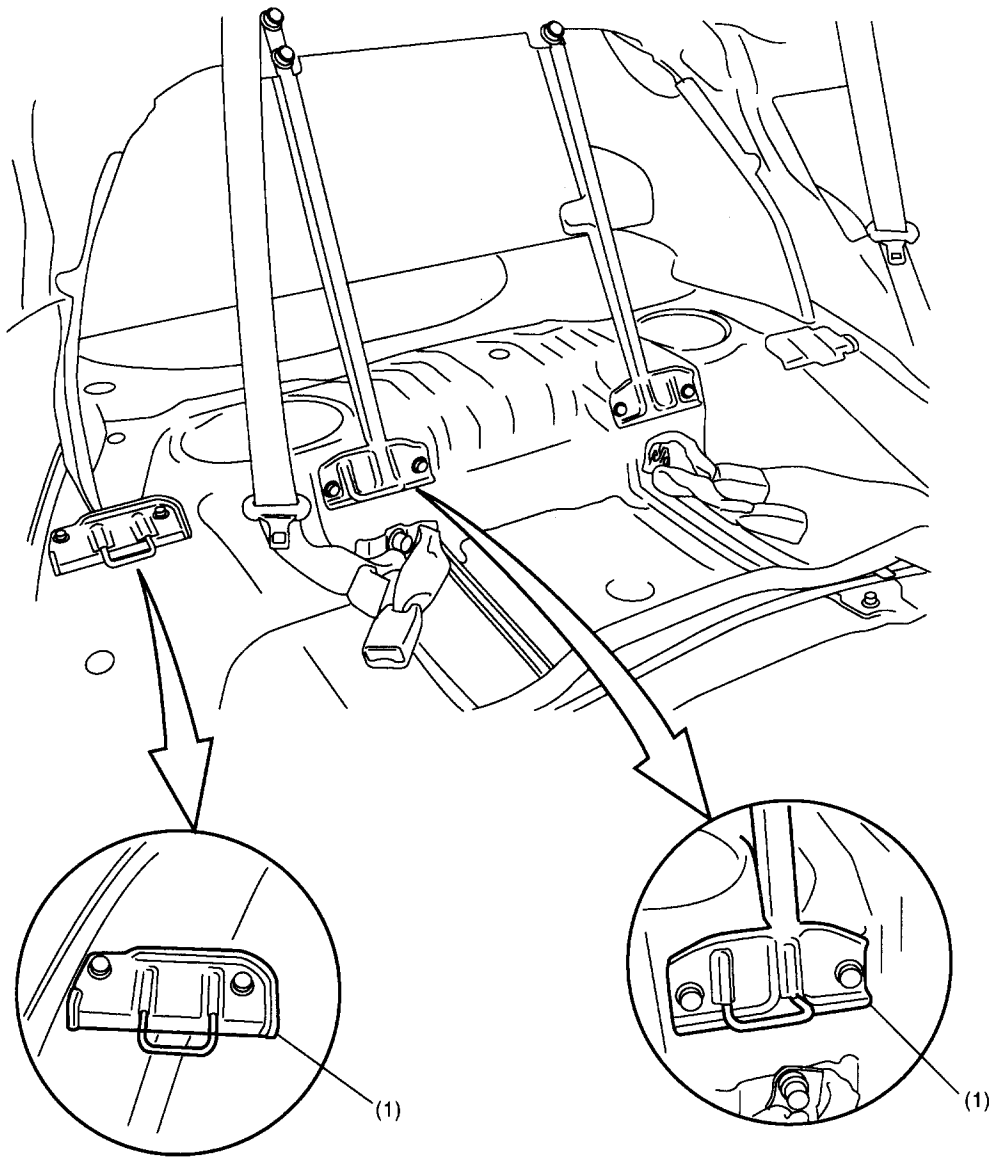


NF0518

- (1) Air outlet port
  (2) Air flow

14. Child Seat Anchors

Child seat anchors are added to the rear floor panel in order to conform with the FMVSS225 (ISO-FIX) requirements for child restraint anchorage systems.



NF0519

(1) Anchor

MEMO

INSTRUMENTATION/DRIVER INFO IDI

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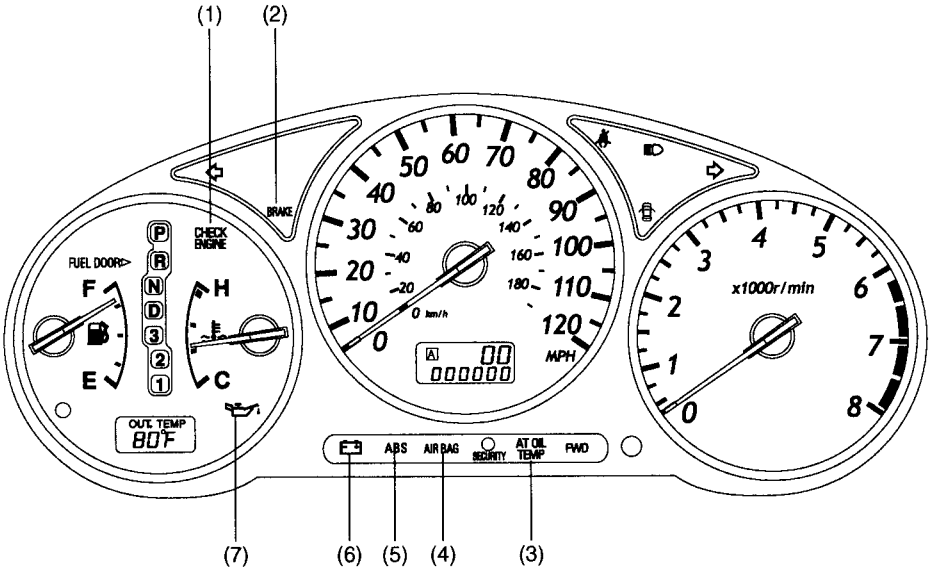
1. Combination Meter 2
2. Outside Air Temperature Display 14

1. Combination Meter

A: WARNING AND INDICATOR LIGHTS



NF0442

(1) CHECK ENGINE warning light
This light illuminates when a fault occurs in the MFI (Multiple point Fuel Injection) system.

(2) Brake fluid level warning / parking brake indicator light
This light illuminates when the fluid level in the brake reservoir tank lowers below the specified level and/or when the parking brake is applied.

(3) AT oil temperature warning light
This light illuminates when the ATF temperature exceeds 150°C (302°F); it blinks when a fault occurs in the AT control system.

(4) AIR BAG system warning light
This light illuminates when a fault occurs in the airbag system.

(5) ABS warning light
This light illuminates when a fault occurs in any electrical component of the ABS (Anti-lock Brake System).

(6) Charge indicator light
This light illuminates when a fault occurs in the charging system while the engine is running.

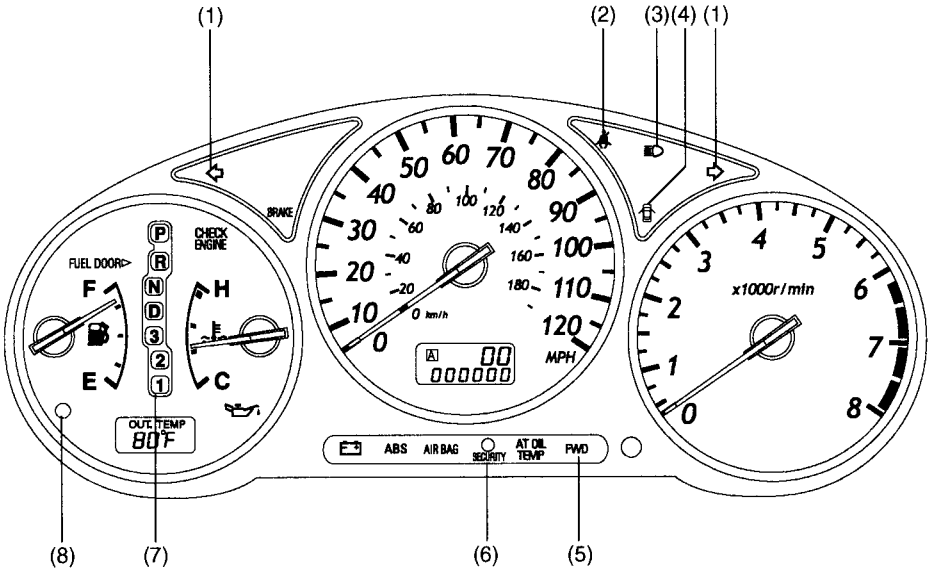
(7) Oil pressure warning light
This light illuminates when the engine oil pressure decreases below 14.7 kPa (0.15 kg/cm^2, 2.1 psi).

If everything is normal, the warning and indicator lights should be ON or OFF as shown below according to ignition switch positions.

Warning/Indicator light	Ignition switch position			
	LOCK/ACC	ON	ST	While engine is running
(1) CHECK ENGINE	OFF	ON	ON	OFF
(2) Brake fluid level / parking brake	OFF	ON	ON	*3
(3) AT oil temperature	OFF	ON	ON	OFF
(4) AIR BAG	OFF	*1	*1	*1
(5) ABS	OFF	*2	*2	*2
(6) Charge	OFF	ON	ON	OFF
(7) Oil pressure	OFF	ON	ON	OFF

*1:This light comes ON for about 7 seconds, and then goes out.
*2:This light comes ON for about 2 seconds, and then goes out.
*3:This light comes ON when the parking brake is applied.

B: TELLTALE (GRAPHIC MONITOR)



NF0443

(1) Turn signal indicator light
This light blinks in unison with the corresponding turn signal lights when the turn signal switch is operated.

(2) Seat belt warning light
This light stays illuminated for about 6 seconds after the ignition switch has been turned ON.

(3) Headlight beam indicator light
This light illuminates when the headlights are in the high-beam position.

(4) Door open warning light
This light illuminates when one or more doors and/or rear gate are not completely closed.

(5) FWD indicator light (non-turbo AT model)
This light illuminates when the drive mode is changed from AWD to FWD (with the fuse installed in the FWD switch).

(6) Security indicator light
This light illuminates when the security system is armed.

(7) AT selector lever position indicator
The light corresponding to the present AT select lever position illuminates when the ignition switch is in any position other than ACC and LOCK.

(8) Low fuel warning light
This light illuminates when the quantity of the fuel remaining in the tank has decreased to about 9 liters (2.4 US gal, 2.0 Imp gal) or smaller.

If everything is normal, the telltales should be ON, OFF or in other states as shown below according to ignition switch positions.

Telltale light		LOCK/ACC	ON	ST	While engine is running
(1) Turn signal		OFF	Blink	Blink	Blink
(2) Seat belt		OFF	*2	*2	*2
(3) Headlight beam	• High beam	OFF	ON	ON	ON
	• Low beam	OFF	OFF	OFF	OFF
(4) Door or rear gate open	• Open	ON	ON	ON	ON
	• Shut	OFF	OFF	OFF	OFF
(5) FWD	• FWD	OFF	ON	ON	ON
	• AWD	OFF	OFF	OFF	OFF
(6) Security		*3	OFF	OFF	OFF
(7) AT selector lever position		OFF	ON	ON	ON
(8) Low fuel		OFF	*1	*1	*1

*1:This light illuminates when quantity of the fuel remaining in the tank has decreased to about 9 liters (2.4 US gal, 2.0 Imp gal) or smaller.
*2:This light stays illuminated for about 6 seconds after the ignition switch has been turned ON.
*3:This light blinks when the security system is armed.

C: SPEEDOMETER

1. DESCRIPTION

- The speedometer system is an electrical type that uses electric signals from the speed sensor in the MT model or the transmission control module (TCM) in the AT model.
- The vehicle speed sensor is installed on the manual transmission.
- Since the system does not use mechanical components such as rotating cable, there are no opportunities of occurring such problems as meter needle vibration and cable disconnection. Also, it does not constitute any means of mechanical noise transmission.
- The odometer and tripmeter readings appear on a liquid crystal display (LCD).

2. OPERATION

MT model: The vehicle speed sensor sends vehicle speed signals (4 pulses per rotation of speed sensor's driven shaft) to the speedometer drive circuit and odometer/tripmeter drive circuit in the speedometer.

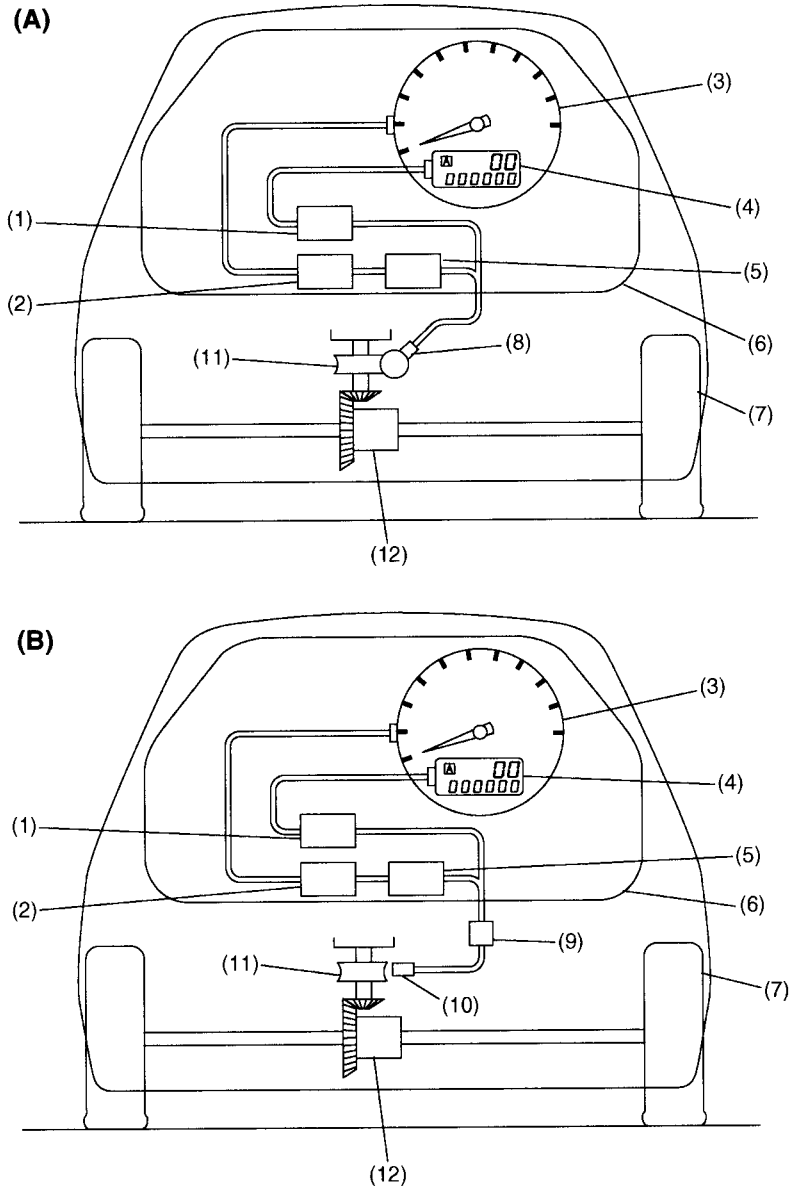
AT model: The TCM sends vehicle speed signals (4 pulses per rotation of output shaft) to the speedometer drive circuit and odometer/tripmeter drive circuit in the speedometer.

NOTE:
Signals from the speed sensor or TCM are also used by the engine control module, automatic transmission control module, etc.

3. SPECIFICATION

Speedometer	Type	Electric pulse type.
	Indication	Needle points to 60 km/h (37.3 miles) when 2,548 pulses are input per minute.
Odometer	Type	Pulse count type.
	Display	LCD/6 digits; 0 to 999,999 km (mile).
	Indication	Counts up 1 km per 2,548 pulses (1 mile per 4,104 pulses). (Count down is impossible.)
Tripmeter	Type	Pulse count type.
	Display	LCD/4 digits; 0 to 9999 km (mile).
	Indication	Counts up 1 km per 2,548 pulses (1 mile per 4,104 pulses). (To change the tripmeter from A to B or B to A, push the knob momentarily. To return the tripmeter to zero indication, keep the knob pushed for more than 1 second.)

4. SYSTEM DIAGRAM



NF0484

(A) MT model
(B) AT model
(1) Odometer/tripmeter drive circuit
(2) Speedometer movement
(3) Speedometer
(4) Odometer/tripmeter
(5) Speedometer drive circuit
(6) Combination meter
(7) Front wheel
(8) Speed sensor
(9) TCM
(10) Electromagnetic pick-up
(11) Gear for the speed sensor
(12) Differential

D: VEHICLE SPEED SENSOR

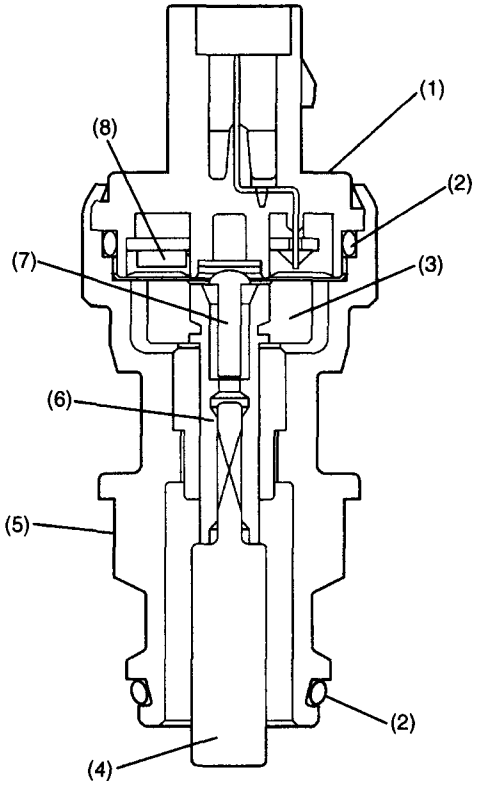
The vehicle speed sensor uses a Hall IC pick-up to generate speed signals. (MT model)

This sensor is installed on the transmission case and detects rotating speed of the transmission output gear.

The sensor generates 4 pulses per rotation of the speed sensor driven shaft and send them to the speedometer.

1. CONSTRUCTION

The speed sensor mainly consists of a Hall IC, magnet ring, driven shaft and spring.



NF0267

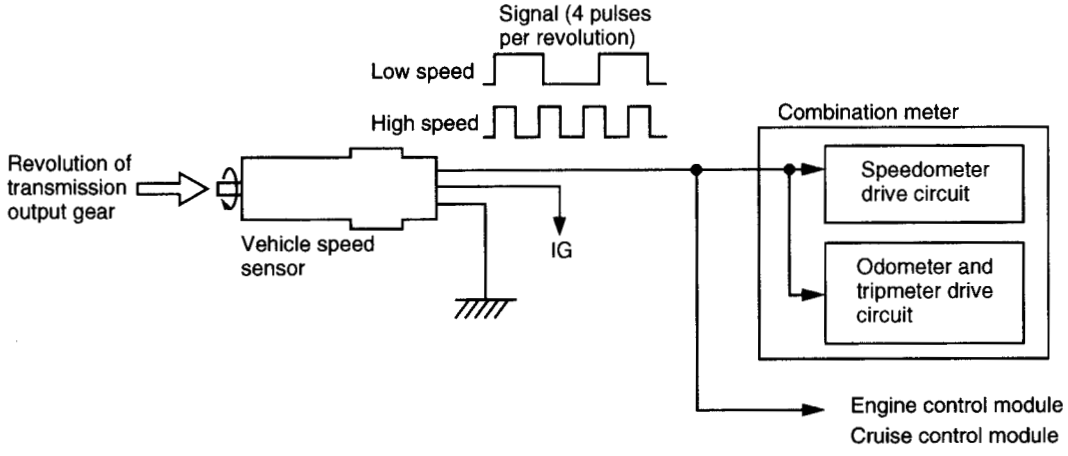
(1) Upper case
(2) O-ring
(3) Magnet ring
(4) Driven key
(5) Lower case
(6) Driven shaft
(7) Rivet
(8) Hall IC

2. OPERATION

As the driven key rotates, the magnet turns causing the magnetic field of the Hall IC to change.

The Hall IC generates a signal that corresponds to a change in the magnetic field.

One turn of the driven key in the speed sensor sends 4 pulses to the combination meter, engine control module and cruise control module.



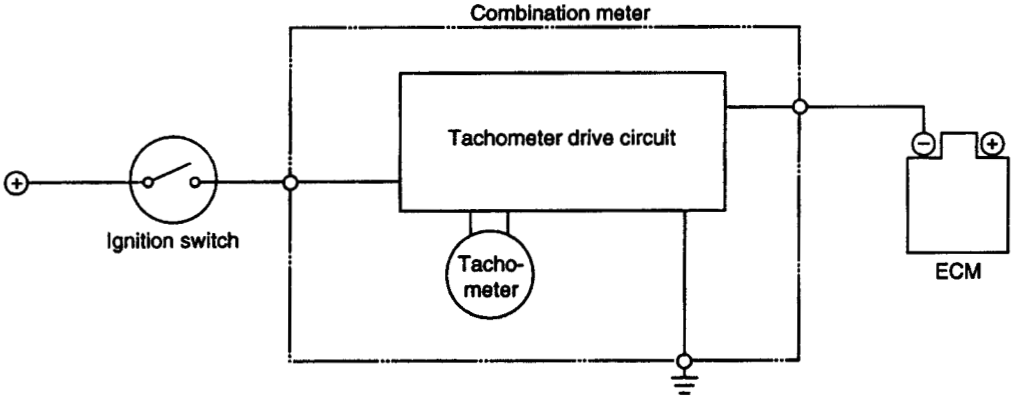
NF0268

E: TACHOMETER

The tachometer drive circuit is connected to the engine speed sensing circuit in the engine control module.

When the engine speed increases or decreases, the voltage of the circuit also increases or decreases, changing the magnetic force of the tachometer drive coil.

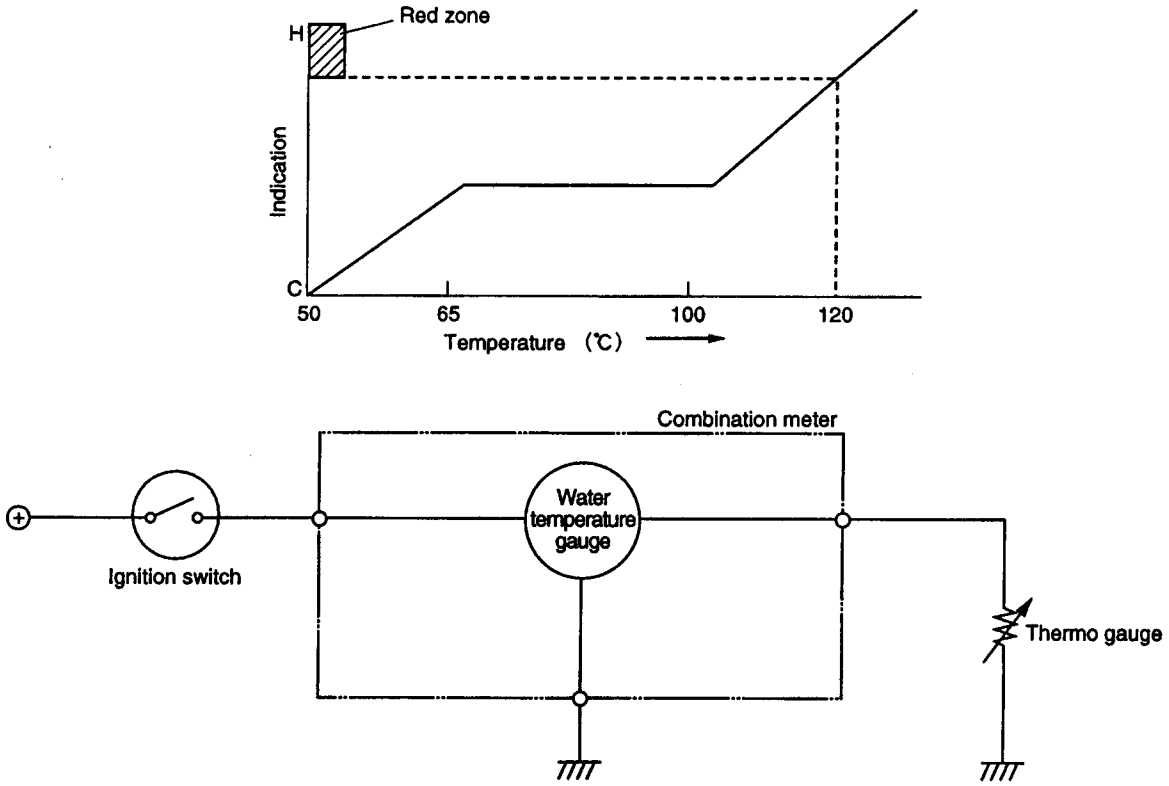
The tachometer needle then moves in accordance with change in the engine speed.



NF0269

F: WATER TEMPERATURE GAUGE

- The water temperature gauge is a cross-coil type.
- The water temperature signal is sent from the thermo gauge located on the engine.
- The resistance of the thermo gauge changes according to the engine coolant temperature. Therefore, the current sent to the water temperature gauge also changes according to the engine coolant temperature. As the change in current causes the magnetic force of the coil to change, the gauge's needle moves according to the engine coolant temperature.
- When the coolant is at a normal operating temperature of approx. 70 to 100 °C (158 to 212 °F), the gauge's needle stays in the middle of the indication range as shown below.



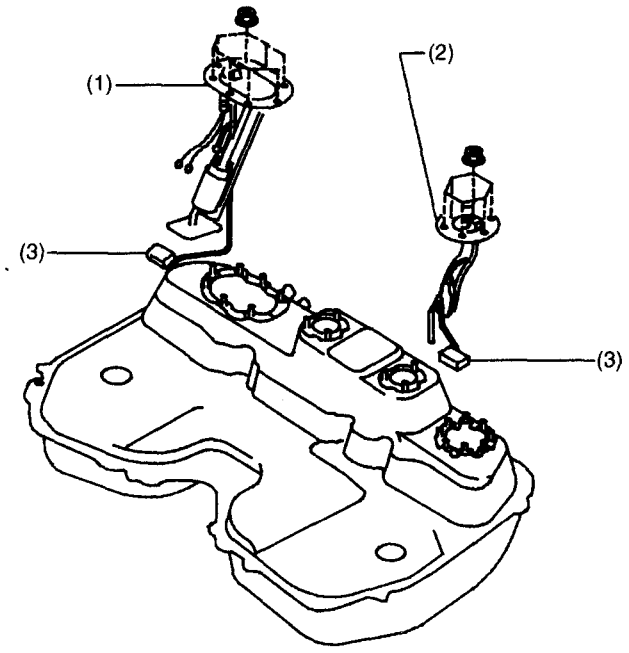
NF0270

G: FUEL GAUGE

1. GENERAL

• The fuel gauge unit consists of a float and a potentiometer whose resistance varies depending on movement of the float. It is located inside the fuel tank and forms an integral part of the fuel pump. The fuel gauge indicates the fuel level in the tank even when the ignition switch is in the LOCK position.

• All models are equipped with two fuel level sensors. These sensors are installed in the fuel tank, one on the right side and the other on the left side. Two sensors are necessary because the fuel tank is divided into main and sub tank compartments.



NF0362

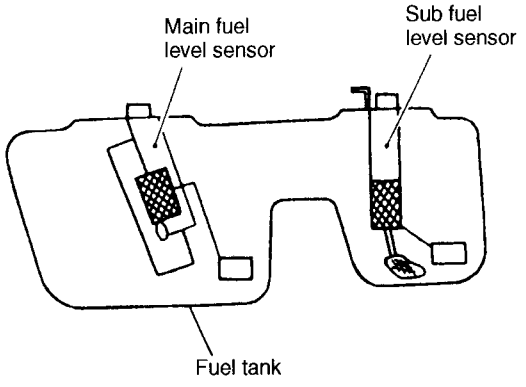
(1) Main fuel level sensor
(2) Sub fuel level sensor
(3) Float

2. OPERATION

The low fuel warning light operates as follows:

The combination meter CPU continually monitors the resistance signal from the fuel level sensor. It turns on the low fuel warning light if a resistance value corresponding to the critical fuel level (approx. 78 Ω) is detected successively for about 10 minutes or the period spent for driving a distance of 10 km.

This monitoring time has been decided to avoid false operation of the warning light which may happen when a large part of remaining fuel is collected temporarily in the sub tank compartment.

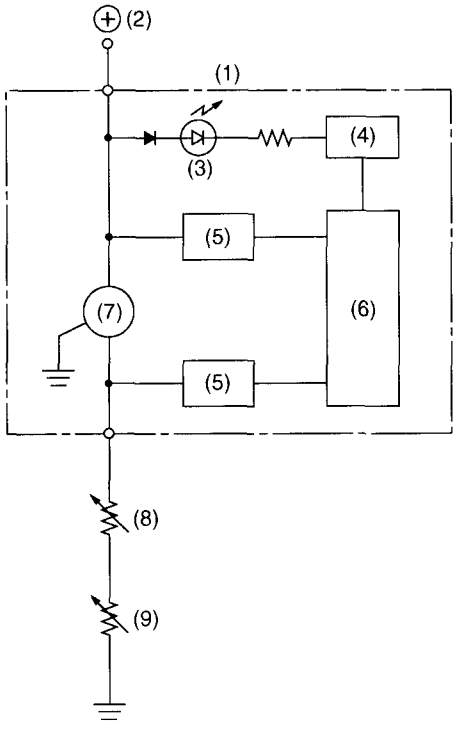


NF0273

3. SPECIFICATIONS

	Fuel amount	Resistance
Main fuel level sensor	FULL	0.5–2.5 Ω
	1/2	20.7–24.7 Ω
	EMPTY	50.0–52.0 Ω
Sub fuel level sensor	FULL	0.5–2.5 Ω
	1/2	19.5–23.5 Ω
	EMPTY	42.0–44.0 Ω

4. CIRCUIT DIAGRAM



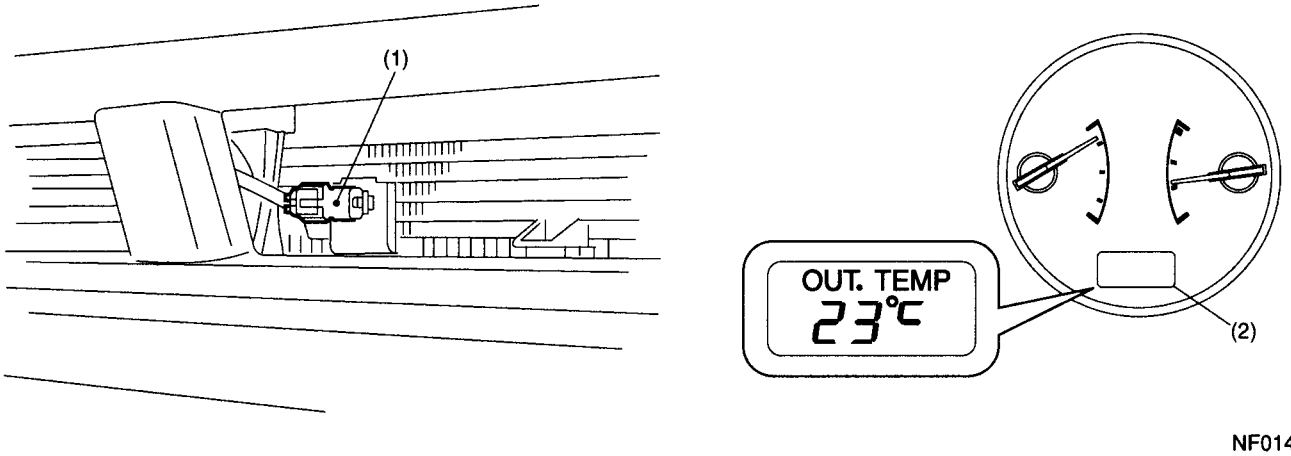
NF0485

(1) Combination meter
(2) Ignition
(3) Low fuel warning light
(4) Driver
(5) I/F
(6) CPU
(7) Fuel gauge
(8) Sub fuel level sensor
(9) Main fuel level sensor

2. Outside Air Temperature Display

A: CONSTRUCTION

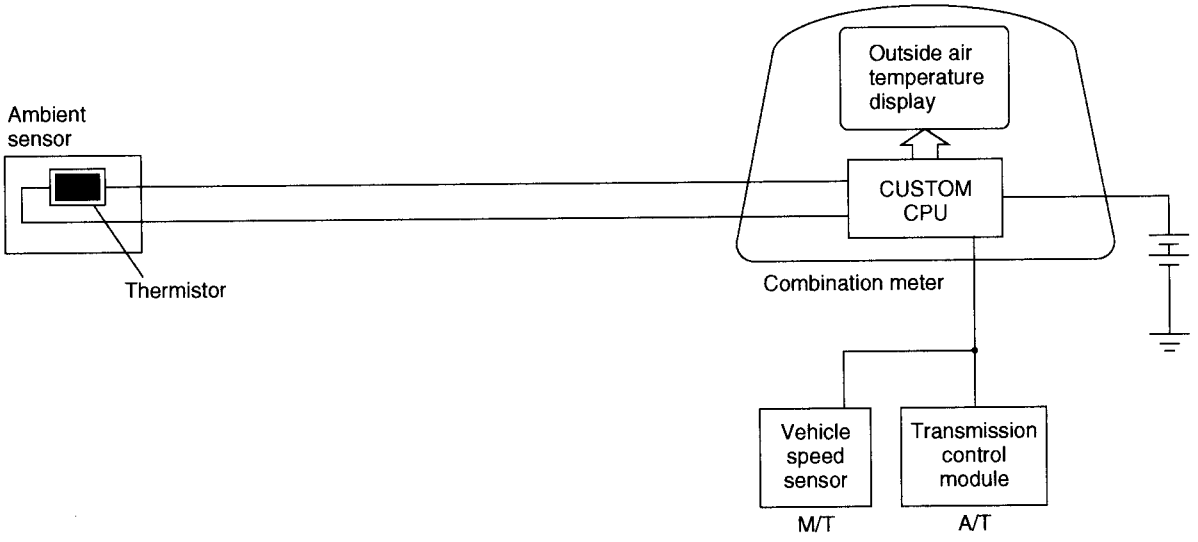
The outside air temperature display system consists of an ambient sensor, the CUSTOM CPU and a liquid crystal display installed in the combination meter. The ambient sensor detects the outside air temperature using the built-in thermistor which varies its resistance according to change in ambient temperature, and sends signals to the CUSTOM CPU.
As soon as the ignition switch is turned ON, the CUSTOM CPU compares the temperature data sent from the ambient sensor with the one that was stored in its memory when the ignition switch was turned OFF last time and it causes the lower of the temperatures to be displayed. However, if 60 minutes or more time has passed between the last turning OFF and the next turning ON of the ignition switch, the temperature that is displayed is a sensor-provided temperature.
When the vehicle is running slowly, the heat released from the engine compartment raises the temperature of the air around the ambient sensor and this affects the temperature data the sensor sends to the CUSTOM CPU. The CPU then makes a special control using the vehicle speed data, i.e., when the vehicle is running at a speed slower than 10 km/h, the CPU uses the temperature that was detected during the most recent vehicle's movement at a speed exceeding 10 km/h rather than a temperature currently being provided by the ambient sensor.



NF0140

(1) Ambient sensor
(2) Outside air temperature display

B: CIRCUIT DIAGRAM



NF0275

MEMO

SEATS SE

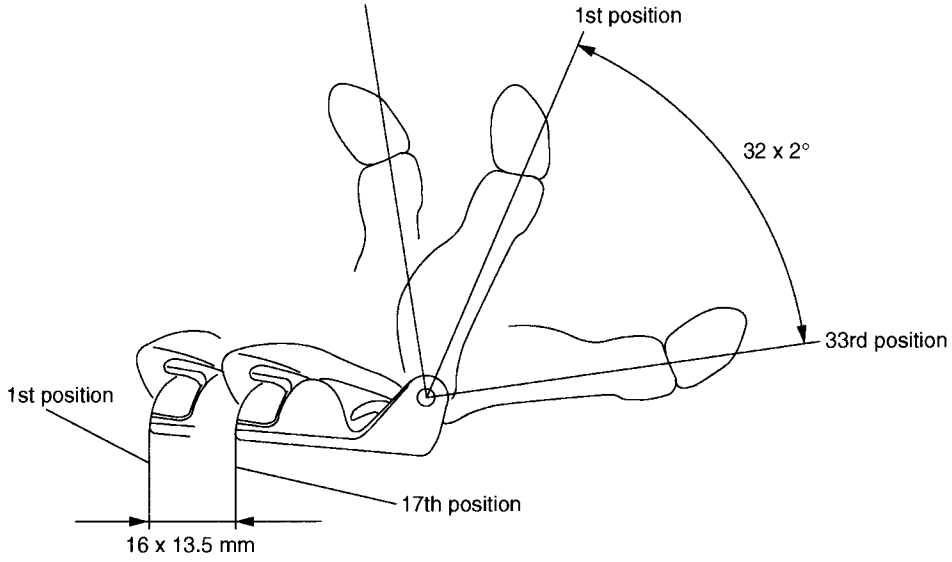
Page

1. Front Seat 2
2. Rear Seat 3

1. Front Seat

A: ADJUSTMENT

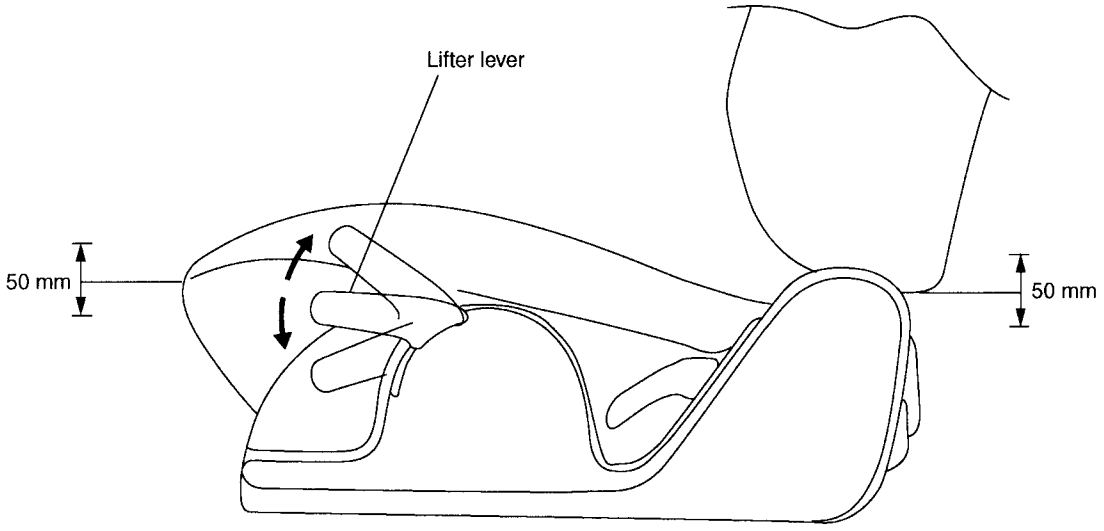
- The height of each headrest is adjustable to any of the 3 positions available.
- The angle of each backrest is adjustable to any of the 32 positions available at 2° steps.
- The front seat can be slid back and forth to one of the 16 positions available at 13.5 mm (0.53 in) steps.



NF0486

B: HEIGHT ADJUSTER

The driver's seat is provided with a height adjuster. It allows adjusting the seat height within a range of 50 mm (2 in).
Both the seat cushion and backrest rises every time the lifter lever is pulled up; they lowers every time the lever is pushed down.



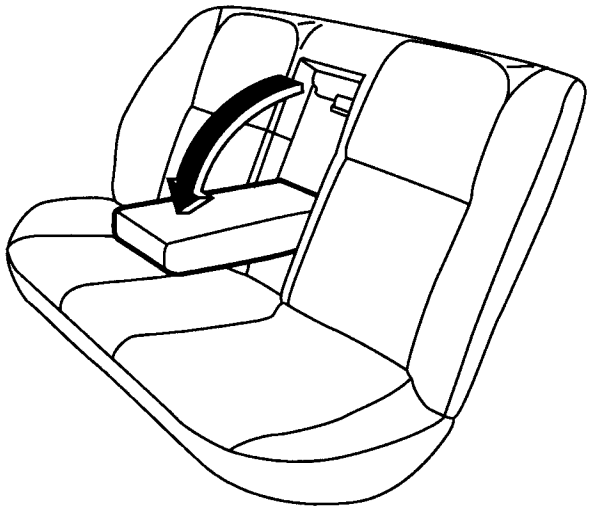
NF0146

2. Rear Seat

A: OPERATION

1. SEDAN

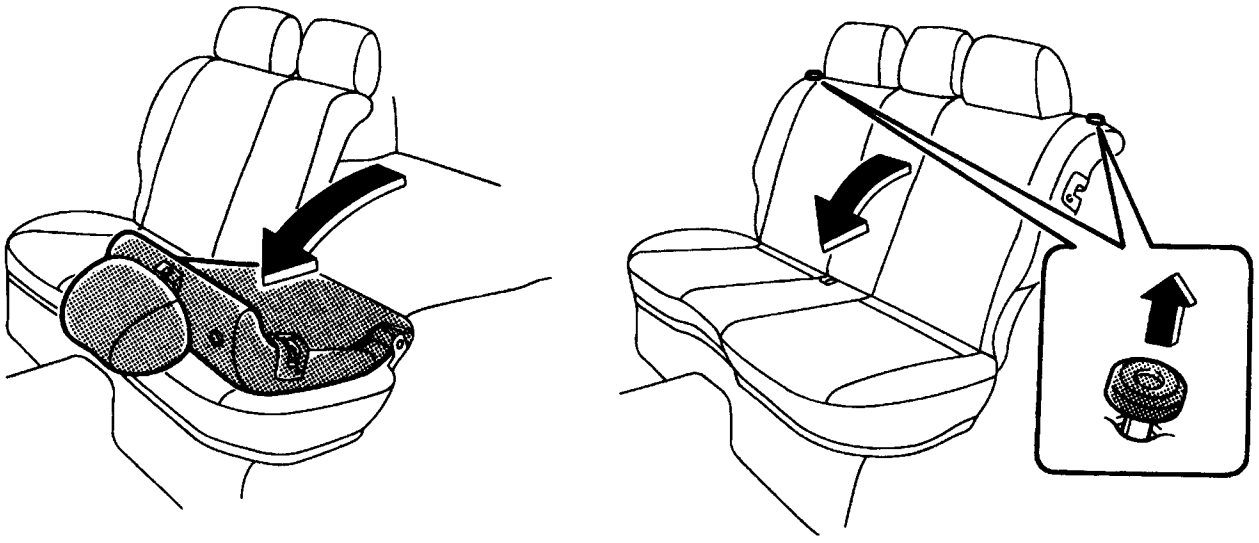
A trunk-through hatch is provided behind the seatback. It is accessed by folding down the central portion of the seatback which also serves as an armrest in its down position.



HG1008B

2. WAGON

Unlock the seatback by pulling the release knob and then fold the seatback down.



NF0147

MEMO

SECURITY AND LOCKS SL

		Page
1.	Ignition Switch	2
2.	Power Door Lock	3
3.	Keyless Entry System	4
4.	Security System	5
5.	Trunk Lid Release Handle	7

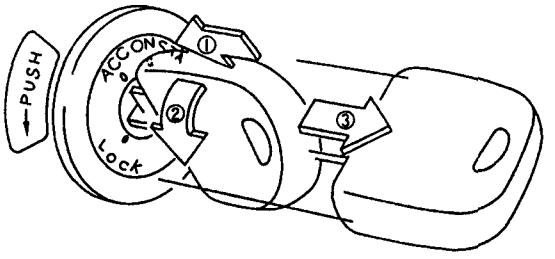
1. Ignition Switch

A: DESCRIPTION

1. IGNITION SWITCH

• The ignition switch has a function of giving the driver warning by sound if he or she opens the door with the key still in the "LOCK" or "ACC" position.

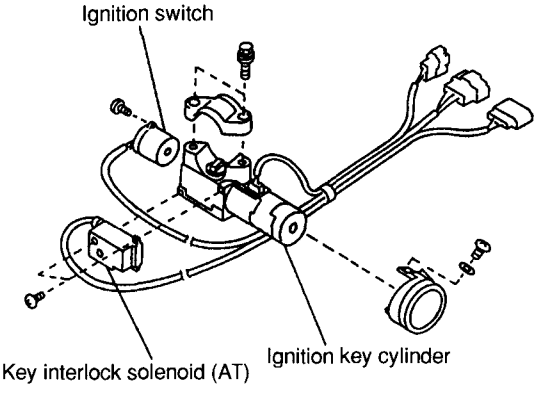
• The ignition switches on the MT models have a safety mechanism that prevents inadvertent locking of the steering wheel during driving. The driver cannot turn the ignition key from "ACC" to "LOCK" unless the key is pushed inward at the "ACC" position (arrow 1 in the drawing below).



NF0491

• The ignition switches on the AT models have a key interlock mechanism to avoid locking of the steering wheel during driving. The ignition key can be turned to the "LOCK" position only when the select lever is in the P position.

NOTE:
Should the key be impossible to turn to "LOCK" when the select lever is in the P position due to failure of the key interlock mechanism, the interlocking can be cancelled by operating the release lever located on the underside of the steering column.



NF0492

2. KEY REMINDER CHIME

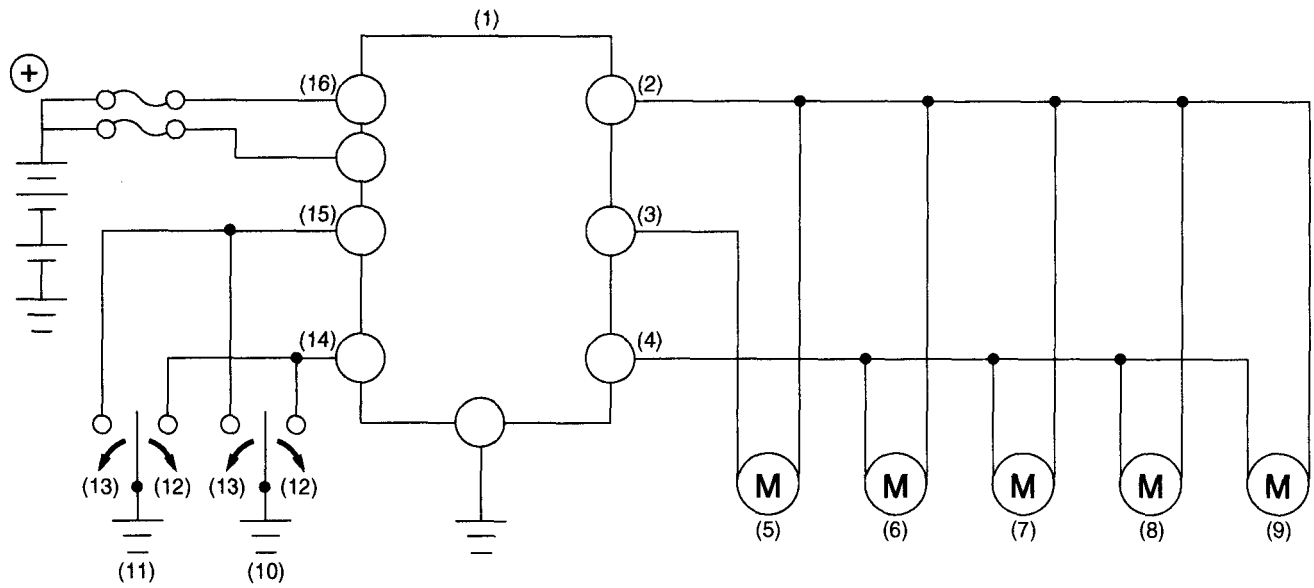
The reminder chime sounds when the driver's door opens and the ignition key is in the "LOCK" or "ACC" position. The chime stops when the key is removed from the ignition switch.

2. Power Door Lock

A: CONSTRUCTION

- The power door lock system consists of an integrated module, driver's and front passenger's door lock switches, a front door lock actuators, rear door lock actuators, and a rear gate lock actuator.
- When the driver's/front passenger's door is locked or unlocked using the door lock switch, the other doors and the rear gate are also locked or unlocked automatically.

B: CIRCUIT DIAGRAM



NF0444

(1) Integrated module
(2) Lock output
(3) Unlock output (Driver's door)
(4) Unlock output (Except driver's door)
(5) Front LH actuator
(6) Front RH actuator
(7) Rear LH actuator
(8) Rear RH actuator
(9) Rear gate lock actuator
(10) Front passenger's door lock switch
(11) Driver's door lock switch
(12) Unlock
(13) Lock
(14) Unlock switch
(15) Lock switch
(16) Battery

3. Keyless Entry System

A: CONSTRUCTION

• The keyless entry system consists of a transmitter, keyless entry control module (with a built-in antenna), integrated module, door lock actuators, door switches, horn and interior light.

• The keyless entry system operates on a radio frequency, so its transmitter can be used in almost all directions relative to the vehicle.

B: FUNCTION

1. DOOR LOCKING

1) Push the transmitter's LOCK button once.

2) All doors are locked.

3) Check that the horn chirps once.

2. DOOR UNLOCKING (DRIVER'S DOOR)

1) Push the transmitter's UNLOCK button once.

2) The driver's door is unlocked and the interior light turns ON (when the interior light switch is set at the DOOR position).

NOTE:
The interior light illuminates for 30 seconds and then goes out. (However, if a door locking procedure is performed again during this period, the light will go out immediately.)

3) Check that the horn chirps twice.

3. DOOR UNLOCKING (ALL DOORS)

1) Push the transmitter's UNLOCK button twice within 5 seconds.

2) All doors are unlocked.

3) No audible or visible sign is given even after all the doors are unlocked.

4. PANIC ALARM SETTING

1) Push the transmitter's LOCK button for more than 2 seconds.

2) The horn sounds continuously. To stop the horn, push any transmitter's button.

5. ANSWER BACK (HORN SIGNALING) ON/OFF SELECTION

1) Push the transmitter's UNLOCK button.

2) Push the transmitter's LOCK and UNLOCK buttons simultaneously for more than 2 seconds to activate the answer back function and push them again to deactivate it.

3) When the answer back function is activated, the horn will sound once. When it is deactivated, the horn will sound twice.

6. DOOR OPEN WARNING FUNCTION

The horn sounds three times if the transmitter's LOCK button is pressed with any door, rear gate or trunk lid opened.

4. Security System

A: FEATURES

• The security system protects the vehicle from a theft action (unauthorized entry into the vehicle). Upon detection of such an action, it gives audible and visible alarms by causing the horn to sound and the parking lights to flash. It also immobilizes the vehicle by disabling the starter circuit.

• Unauthorized entry is monitored through the switches on the doors, rear gate and trunk lid. If one of the switches is turned ON, the system interprets it as an attempt of unauthorized entry and gives alarms while disabling the starter circuit.

• Unauthorized entry is also monitored by the impact sensor. The system operates in the same manner as mentioned above whenever the sensor senses an abnormal impact on the vehicle.

1. ALARMS

• When activated, the security system causes the parking lights to flash and the horn to sound intermittently. In addition, the security indicator light on combination meter flashes fast and the starter motor circuit is disabled.

• The alarms automatically turn OFF after 30 seconds. However, they will be reactivated if the vehicle is tampered with again.

• The alarms are activated when a door, rear gate or trunk lid is opened without using the keyless entry transmitter. (When the system is armed, the alarms will be triggered even if a door is opened by releasing the inside door handle or the trunk lid is opened by operating the trunk lid release lever.)

• They are also activated when an impact on vehicle body is sensed.

2. HOW TO ARM THE SYSTEM

1) Remove the key from the ignition switch.

2) Make sure that the trunk lid is closed.

3) Close all the windows. Close and lock all the doors and rear gate.

4) Push the transmitter's LOCK button.

5) The horn will chirp once and the parking lights will flash once.

NOTE:
The system can be armed even if the windows are open.

6) Confirm that the security indicator light blinks slowly (once every two seconds). If any of the doors, rear gate or trunk lid is not properly closed, the system warns the driver of this by causing the horn to chirp three times, the parking lights to flash three times, and the security indicator to flash rapidly. When the door, rear gate or trunk lid is closed, it will be automatically locked and the security system starts working. The indicator light blinks every two seconds when the system is armed and continues to blink until the system is disarmed.

3. HOW TO DISARM THE SYSTEM

1) Push keyless entry transmitter's UNLOCK button.

2) The horn will chirp twice and the parking lights flash twice.

3) The security indicator light turns OFF.

4) The interior light will illuminate for 30 seconds and then turns OFF. (However, if a system arming procedure is performed during this period, the interior light will turn OFF.)

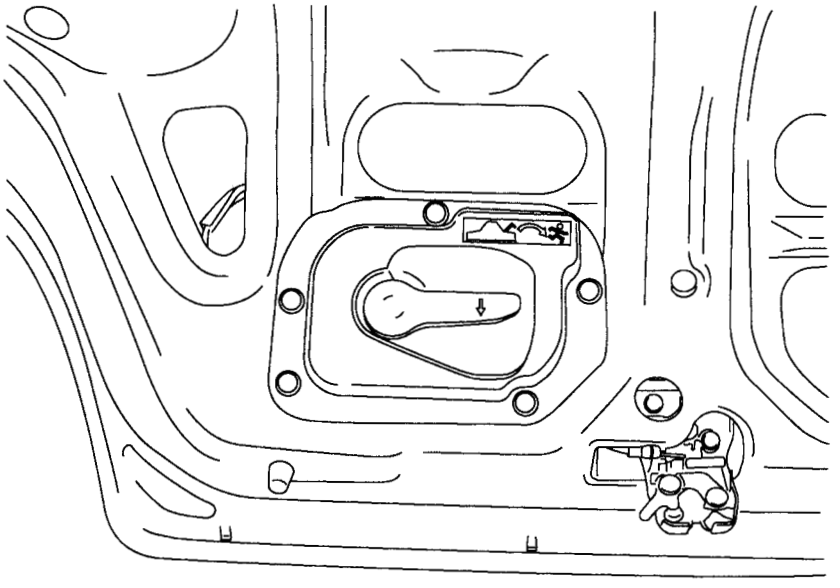
4. HOW TO STOP ALARMS

Push the transmitter's UNLOCK button or turn the ignition switch from "LOCK" to "ON" repeatedly three times at an interval shorter than five seconds.

5. Trunk Lid Release Handle

A: DESCRIPTION

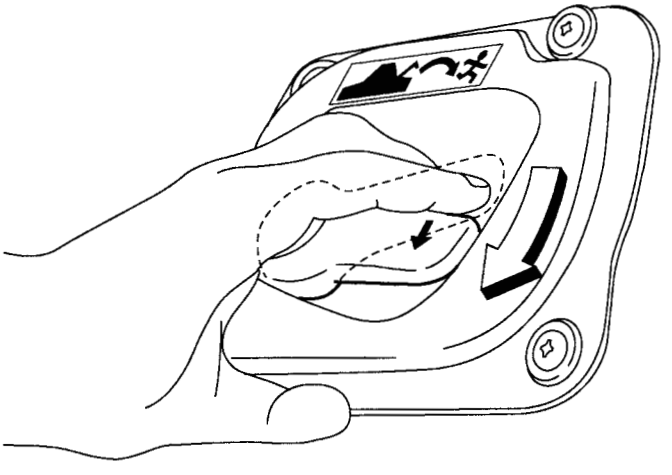
- The trunk lid release handle is a device designed to open the trunk lid from inside the trunk.
- In the event children or adults become locked inside the trunk, the handle allows them to open the lid.
- The handle is located on the inside of the trunk lid.
- The handle is made of material that remains luminescent for approximately an hour in the dark trunk space after it is exposed to ambient light event for a short time.



NF0479

B: OPERATION

To open the trunk lid from inside the trunk, press the yellow handle downward as indicated by the arrow on the handle, this operation unlocks the trunk lid. Then push up the lid.



NF0480

MEMO

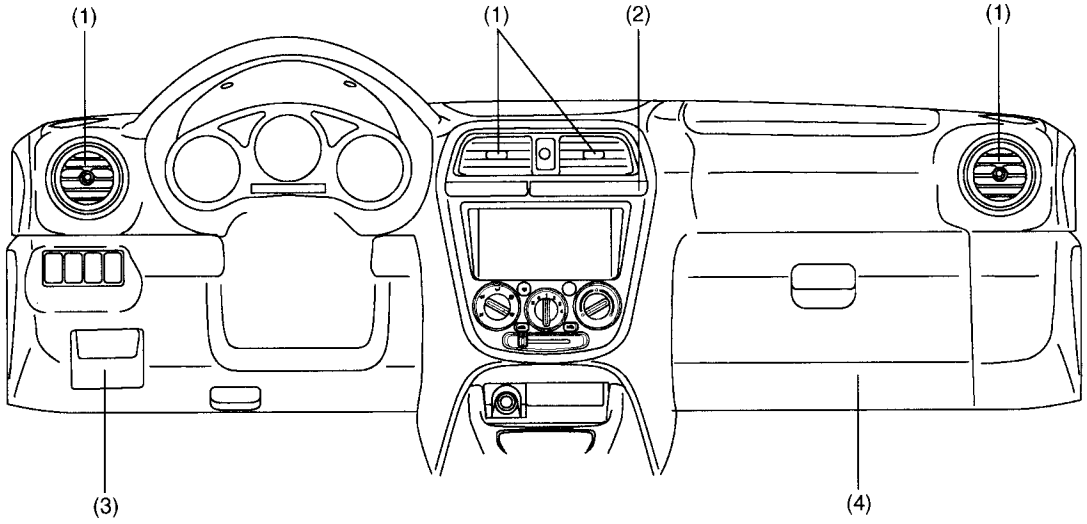
EXTERIOR/INTERIOR TRIM EI

Page

1. Instrument Panel 2

1. Instrument Panel

- A cup holder is provided on the dashboard.
- A coin tray is provided.
- The vent grills are barrel type.
- The dashboard lower cover is fitted with a knee cover.



NF0458

(1) Barrel type vent grill
(2) Cup holder
(3) Coin tray
(4) Glove compartment

EXTERIOR BODY PANELS EB

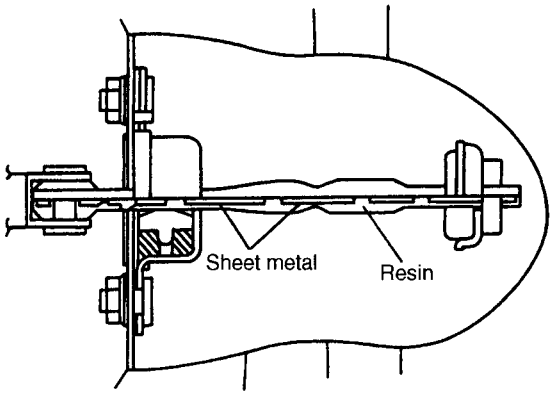
Page

1. Door 2

1. Door

A: DOOR CHECKER

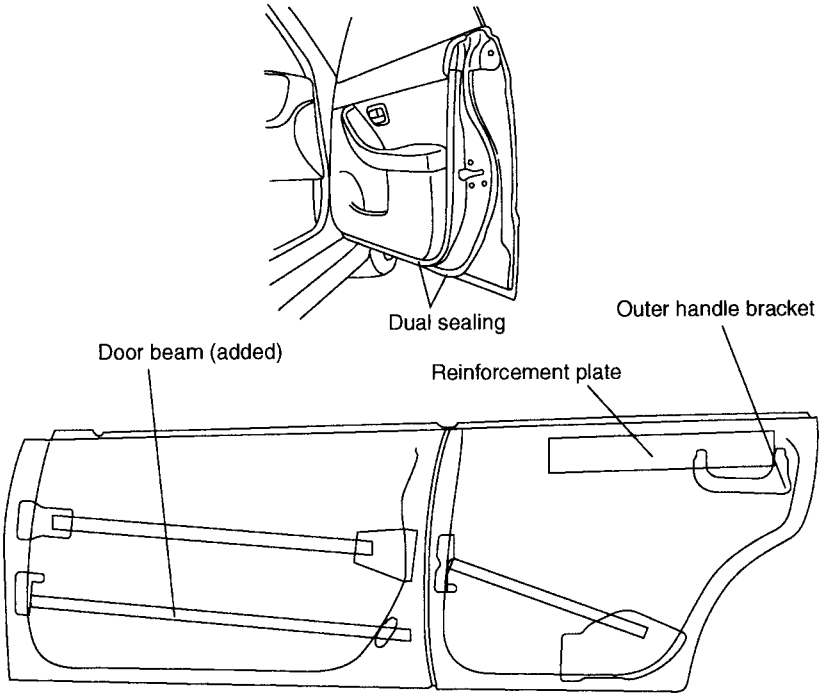
The door checkers are of a new type that uses a molded resin part.



NF0216

B: DOOR CONSTRUCTION

- All the front and rear doors have in their inside side door beams, inner reinforcements and reinforcement latches.
- Tight closure at the bottom of each door is ensured by dual sealing.



NF0144

CRUISE CONTROL SYSTEM CC

Page
1. Cruise Control 2

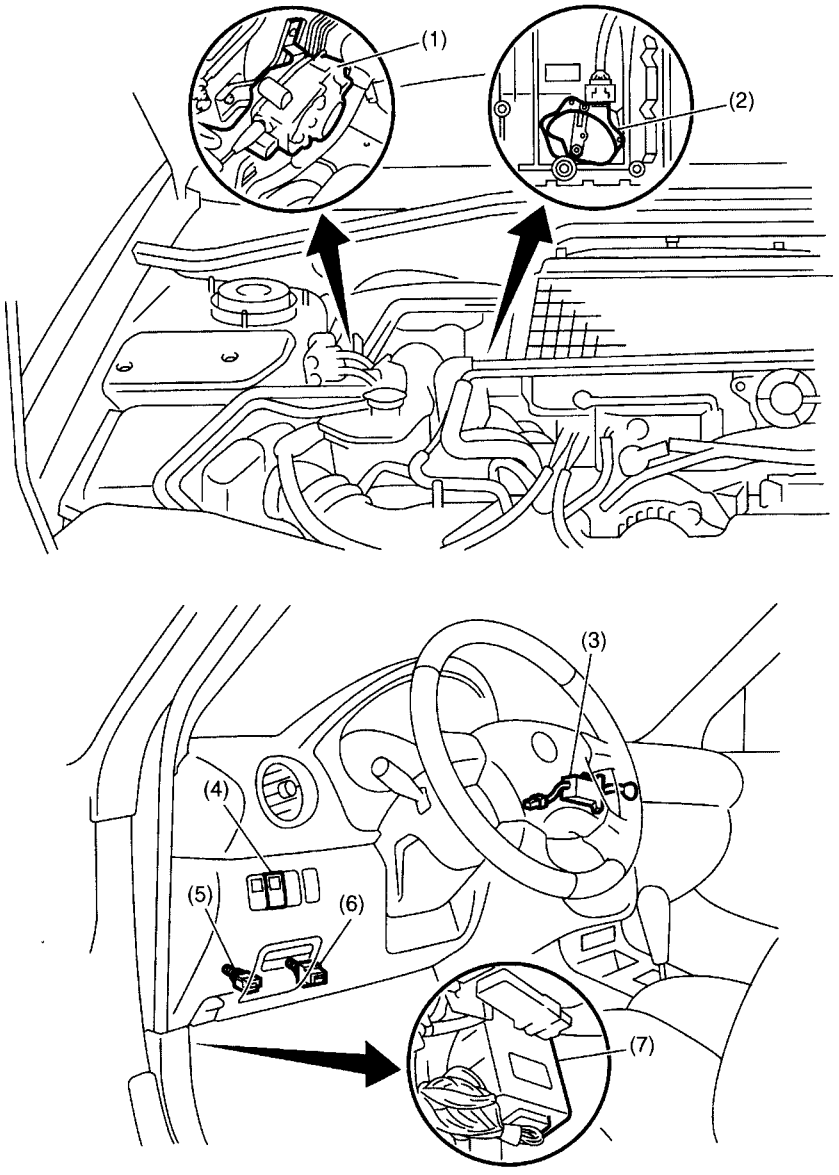
1. Cruise Control

A: OPERATION

- The cruise control system automatically controls the vehicle speed. It allows the vehicle to run at a constant speed without need for the driver to keep the accelerator pedal depressed.

- When the driver has activated the system and made a desired speed setting, the cruise control module compares the actual vehicle speed detected by the speed sensor (MT) or transmission control module (AT) with the preset speed in the memory, then generates a signal according to the difference between the two speeds.
This signal is transmitted to the actuator located in the engine compartment.
The actuator operates the throttle cam as necessary to keep the preset vehicle speed.

B: COMPONENT LOCATION



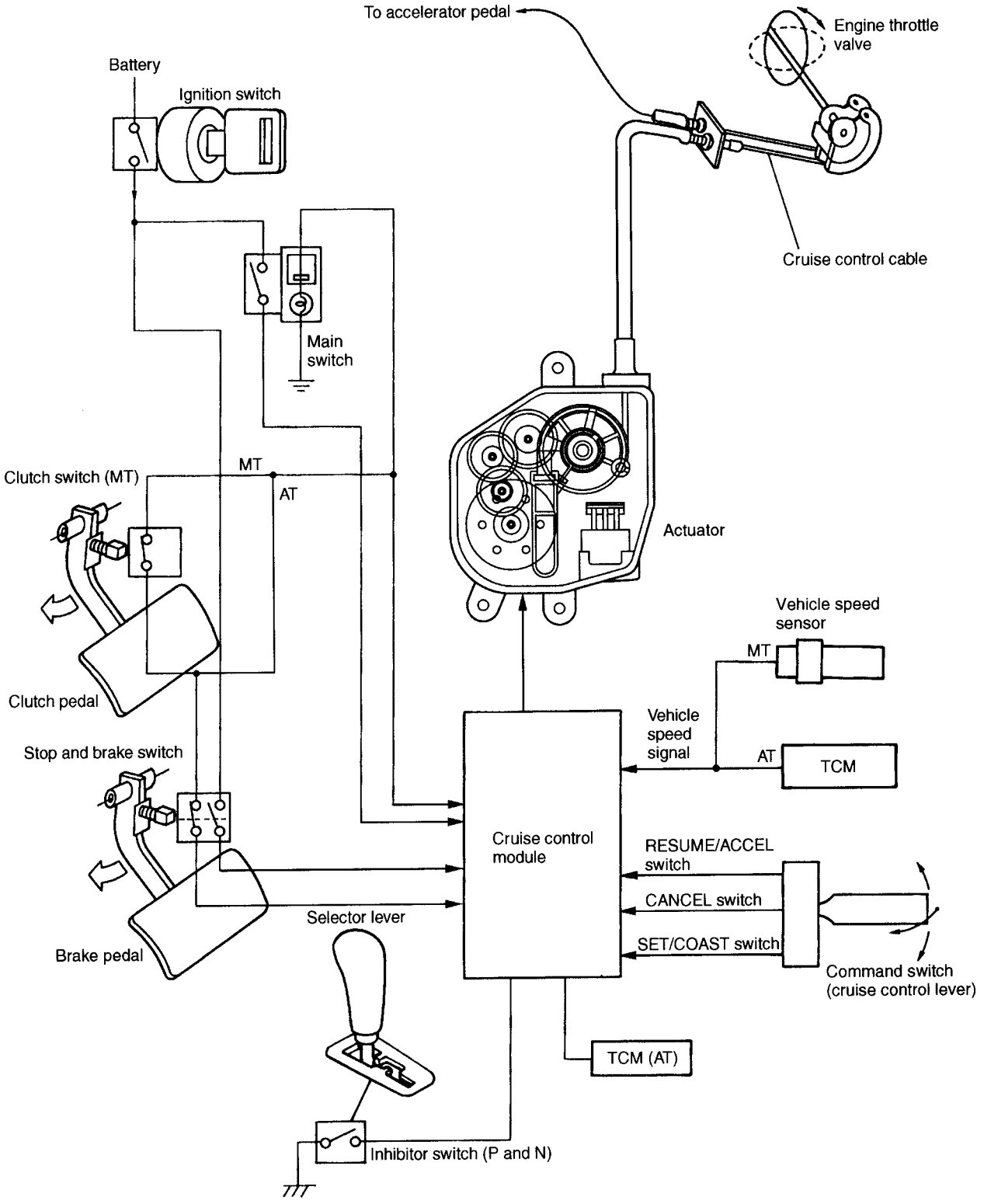
NF0462

(1) Actuator
(2) Inhibitor switch (AT)
(3) Command switch (cruise control lever)
(4) Main switch
(5) Clutch switch (MT)
(6) Stop and brake switch
(7) Control module

C: CONTROL AND OPERATION

Constant speed control	When actual vehicle speed is higher than the "set" speed, the motor in the actuator operates to move the throttle valve in the closing direction by the amount corresponding to the difference between the two speeds. When actual driving speed is lower than "set" speed, the motor operates to move the throttle valve in the opening enabling direction according to the difference in speed.
Speed setting control	When SET/COAST switch is pressed with main switch ON while the vehicle is being driven at a speed greater than 40 km/h (25 MPH), current flows to the actuator. This causes the clutch in the actuator to engage, enabling the motor to operate. The motor moves the throttle valve to the position corresponding to the accelerator pedal position. The vehicle is driven at the set speed.
Deceleration control	When SET/COAST switch is turned ON while the vehicle is cruising at a constant speed, the motor in the actuator rotates to move the throttle valve in the closing direction. This causes the vehicle to coast. When the switch is turned OFF, the vehicle speed is stored in memory and the vehicle maintains that speed thereafter.
Acceleration control	When RESUME/ACCEL switch is turned ON while the vehicle is cruising at a constant speed, the motor in the actuator rotates to move the throttle valve in the opening direction. This causes the vehicle to accelerate by a certain amount. When the switch is turned OFF, the vehicle speed is stored in memory and the vehicle maintains that speed thereafter.
Resume control	When RESUME/ACCEL switch is turned ON after the cruise control is temporarily cancelled, vehicle speed returns to that speed which was stored in memory just before the cruise control is cancelled. This occurs only when the vehicle is running at a speed greater than 32 km/h (20 MPH). In the following cases, however, the set vehicle speed is completely cleared. Therefore, no resume control is performed. (1) Ignition switch is turned OFF (2) Main switch is turned OFF
Manual cancel control	When any of the following signals is entered into the cruise control module, the clutch is disengaged and the cruise control is deactivated. (1) Stop light switch ON signal (Brake pedal depressed) (2) Brake switch OFF signal (Brake pedal depressed) (3) Clutch switch OFF signal (Clutch pedal depressed – MT) (4) Inhibitor switch ON signal (Selector lever set to "N" – AT) (5) CANCEL switch ON signal (Command switch cruise control lever pulled) (6) Ignition switch OFF signal (7) Main switch OFF signal
Low speed limit control	When the vehicle speed drops below 32 km/h (20 MPH), the cruise control is automatically cancelled. Cruise control at any speed lower than 40 km/h (25 MPH) cannot be effected.
Motor control	When the vehicle speed becomes 10 km/h (6 MPH) or more higher than the memorized speed while vehicle is running utilizing the cruise control (in a downgrade, for example), the actuator's clutch is turned OFF so that the vehicle decelerates. When the vehicle's speed becomes 8 km/h (5 MPH) or more lower than the memorized speed, the clutch is turned ON again so that the cruise control resumes.

D: SCHEMATIC



NF0258

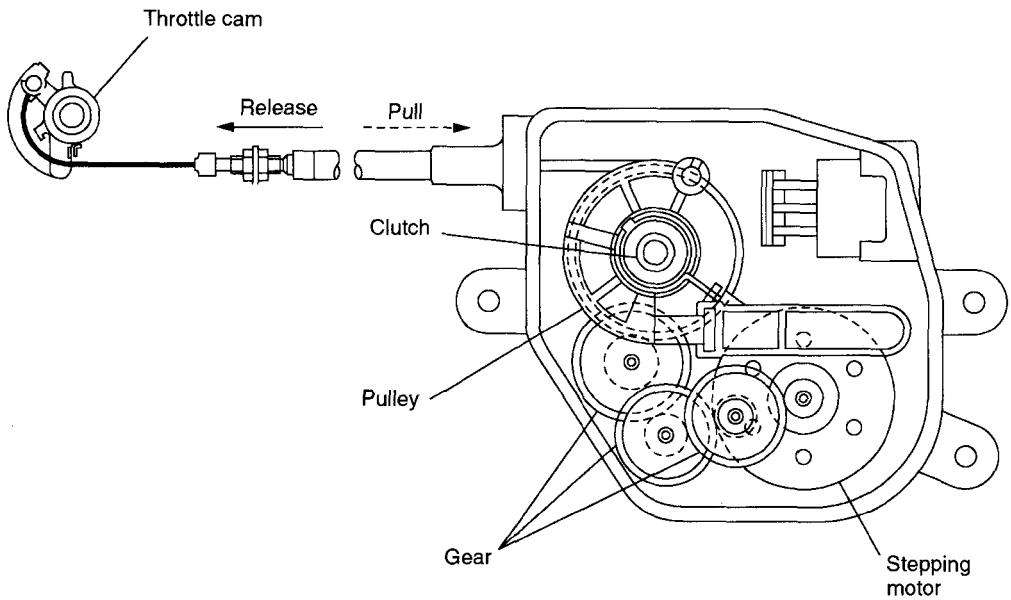
E: SYSTEM CONSTRUCTION

Unit	Name	Function	Set	Cancel	Resume	Coast	Vehicle speed
Input signal (sensors)	Main switch	Supplies battery voltage to control module after main switch is turned ON (with ignition switch ON).	○	○	○	○	○
	SET/ COAST switch	Sends a SET/COAST signal to control module.	○			○	
	RESUME/ ACCEL switch	Sends a RESUME/ACCEL signal to control module.			○		
	CANCEL switch	Simultaneously sends SET/ COAST and RESUME/ACCEL signals to control module.		○			
	Brake switch (NC)	Disconnects power supply to clutch and stepping motor.	○	○			
	Stop light switch (NO)	Sends a cancel signal to control module.	○	○			
	Clutch switch (NC) or inhibitor switch (NO)	Sends a cancel signal to control module.	○	○			
	Vehicle speed sensor	Detects vehicle speed.	○	○	○	○	○
Control section	Built-in relay	A safety device to protect system from damage.	○	○	○	○	○
Output signal	Stepping motor (PULL)	Controls vehicle speed.	○		○		○
	Stepping motor (RELEASE)	Controls vehicle speed.		○		○	○
	Clutch	Cancels cruise control setting.	○	○	○	○	○

NC:Normally close
NO:Normally open

F: ACTUATOR

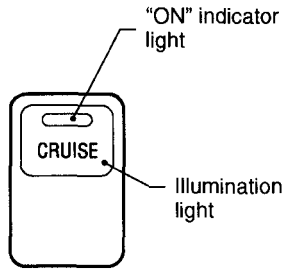
In response to a signal from the cruise control module, the clutch in the actuator is turned ON. This causes the stepping motor to operate, pulling the throttle cam for speed control.

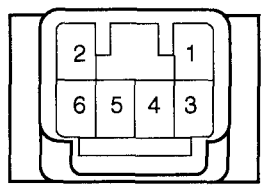


NF0260

G: MAIN SWITCH

- The main switch is the main power supply switch of the cruise control module. It has a built-in power indicator and night illumination light.
- When the ignition switch is placed in the OFF position with the main switch ON, the main switch is also turned OFF. Even if the ignition switch is turned ON again, the main switch will stay in the OFF state.



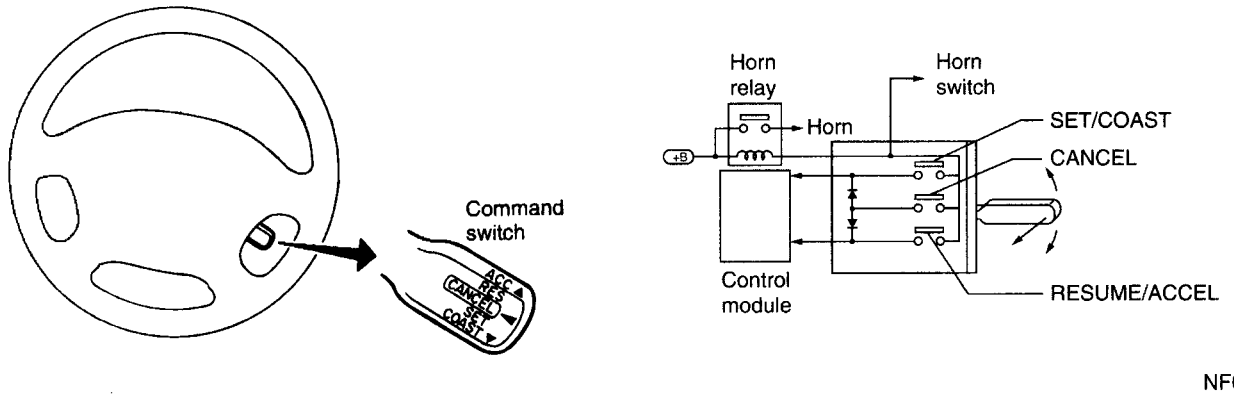


	3	5	1		6	4		2
ON	○	○		○	○	○	○	○
OFF								
	IG SW	Control module	Control module		Control module	Illumination power		Illumination control

NF0494

H: COMMAND SWITCH (CRUISE CONTROL LEVER)

• When the vehicle is driven with the cruise control activated, the command switch controls its operation. It inputs SET/COAST signal, ACCEL/RESUME signal or CANCEL signal to the cruise control module.



NF0262

• The command switch is located on the right side of the steering wheel, so the driver can operate it without releasing hands from the steering wheel.

• The command switch is a self-returning lever type.

1. RESUME/ACCEL AND SET/COAST SWITCH

Each switch contact is held closed as long as the lever is kept pressed in the relevant direction and resulting current is applied as a signal to the control module.

2. CANCEL SWITCH

All the switch contacts are closed as long as the lever is pulled toward the CANCEL position (toward the driver). This causes the RESUME/ACCEL and SET/COAST ON signals to be sent to the control module simultaneously.

I: CANCEL SIGNALS

The cancel signal deactivates the cruise control function. Operating any of the following switches results in generation of the cancel signal. On receiving the signal, the cruise control module cancels the cruise control function.

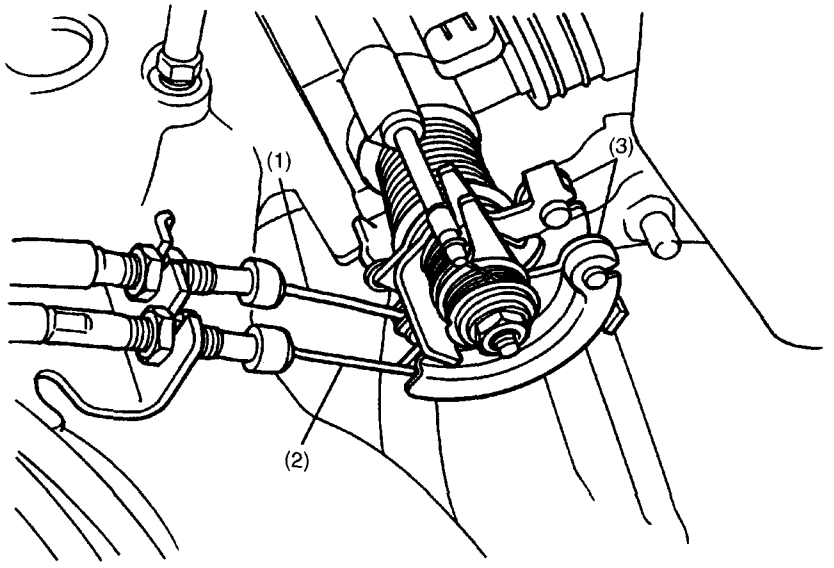
- Stop light switch
- Brake switch
- Clutch switch (MT model)
- Inhibitor switch (AT model)
- Main switch
- Command switch (CANCEL position)

J: VEHICLE SPEED SENSOR

Vehicle speed sensor is installed on the transmission, and sends signal to the cruise control module which uses it in controlling the cruise control function (MT model).

K: ENGINE THROTTLE

- The throttle body is equipped with two throttle cams. One is used during acceleration and the other during cruising in order to open or close the throttle valve.
- These cams operate independently of each other. In other words, when one cam operates, the other may not.

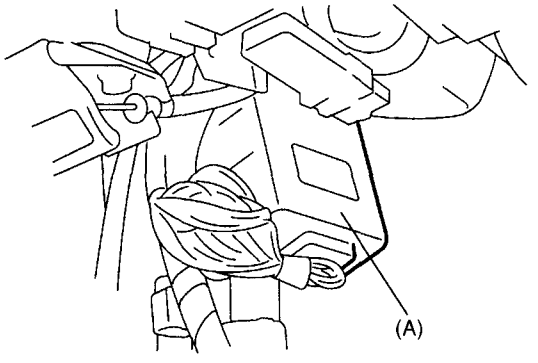


NF0263

(1) Accelerator cable
(2) Cruise control cable
(3) Throttle cam

L: CONTROL MODULE

- Based on signals from the related switches and sensors, the cruise control module controls all the following control functions:
Constant speed control; speed setting control; deceleration control; acceleration control; resume control; manual cancel control; low speed limit control; stepping motor control; clutch control
- The control module (A) is located inside of the front pillar lower portion (driver side).



NF0463

M: FAIL-SAFE FUNCTION

The cruise control system has a fail-safe function that cancels the cruise control operation when any of the following conditions occurs.

1. CONFLICT BETWEEN CRUISE CONTROL SWITCHES AND CANCELLATION SIGNAL GENERATING SWITCHES

1) The cruise control system is deactivated if any of the cruise control switches (SET/COAST, RESUME/ACCEL, and CANCEL switches) is turned ON while any of the cancellation signal generating switches (brake, stop lamp, clutch, and inhibitor switches) is being operated. The system is re-activated when the cruise control switch is turned OFF and then turn ON again after the cancellation signal generating switch has been returned to its released position.

2) The cruise control system becomes deactivated if the ignition switch is turned ON with any of the cruise control switches (including the main switch) in the ON position. The system deactivating function is retained until the main switch is turned OFF.

2. ABNORMALITIES IN ELECTRIC CIRCUITS

The cruise control system is deactivated and the set speed is also canceled if any of the following abnormalities occurs in the system's electric circuits.

The system deactivation function is retained until the ignition switch is turned OFF.

1) The stepping motor terminal is grounded; or the stepping motor drive circuit is broken due to a short- or open-circuit.

2) The stepping motor clutch drive circuit is shorted.

3) Vehicle speed variation in a 350 ms period exceeds ±10km/h.

4) Fusion has occurred in an internal relay and is detected while the vehicle is running with the cruise control deactivated.

5) The cruise control module becomes inoperative or its operation is faulty.

6) There is discrepancy between the values stored in the two RAMs of the control module.

7) An abnormality is detected as a result of the self-diagnosis performed after turning ON of the ignition switch.

3. ABNORMALITIES IN STEPPING MOTOR

The cruise control system is deactivated if either of the following abnormalities occurs in the stepping motor.

1) The stepping motor does not operate properly.

2) The stepping motor is energized for unduly long period and too frequently.
When the system is deactivated, it cannot be reactivated for 2 – 20 minutes after detection of the abnormal condition.

ENGINE2 SECTION

FUEL INJECTION (FUEL SYSTEMS)	FU(DOHC TURBO)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(DOHC TURBO)
INTAKE (INDUCTION)	IN(DOHC TURBO)
MECHANICAL	ME(DOHC TURBO)
EXHAUST	EX(DOHC TURBO)
IGNITION	IG(DOHC TURBO)
ENGINE (DIAGNOSTICS)	EN(DOHC TURBO)

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.

G1830BE3

FUEL INJECTION (FUEL SYSTEMS)

FU(DOHC TURBO)

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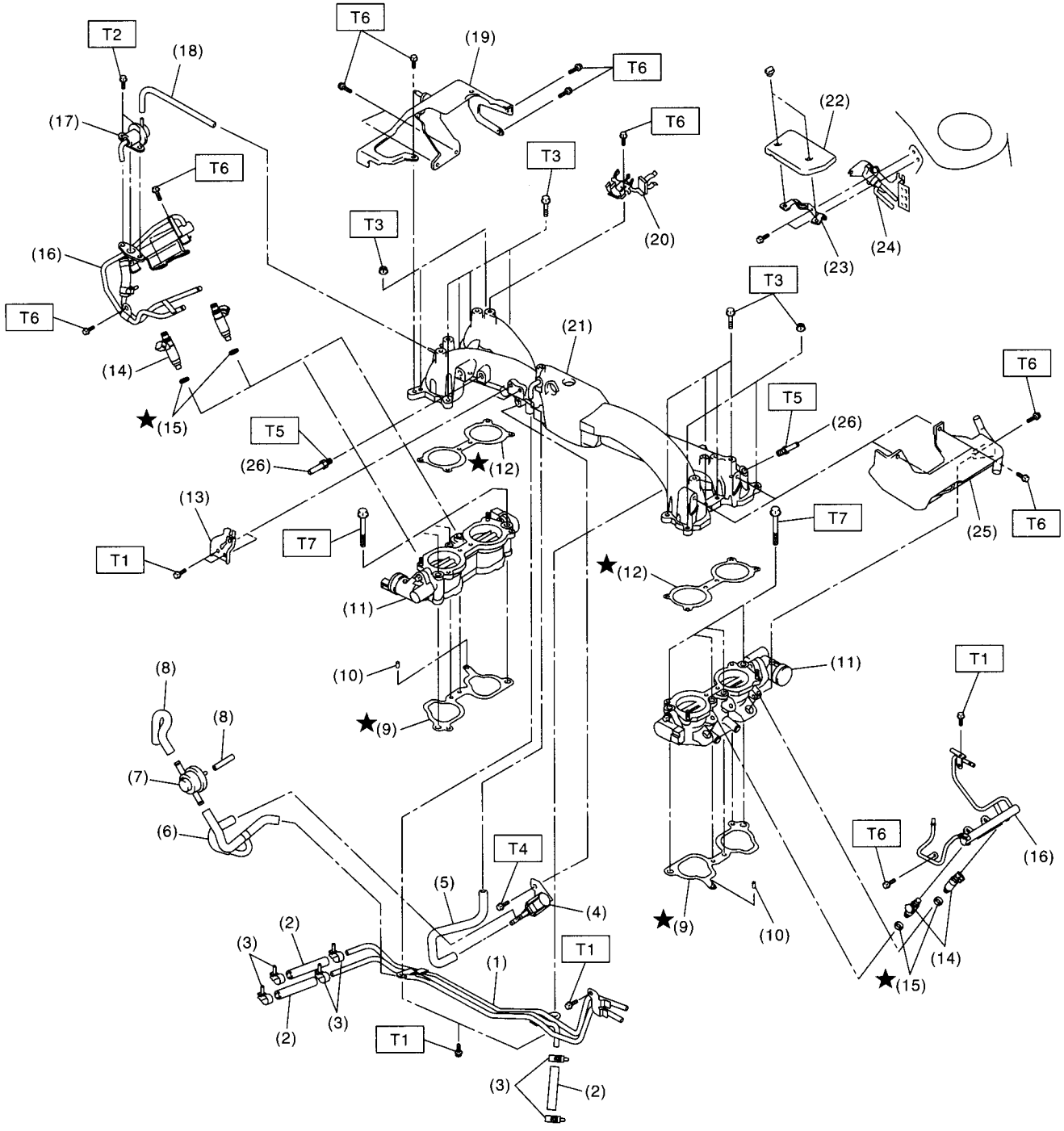
1. General Description

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

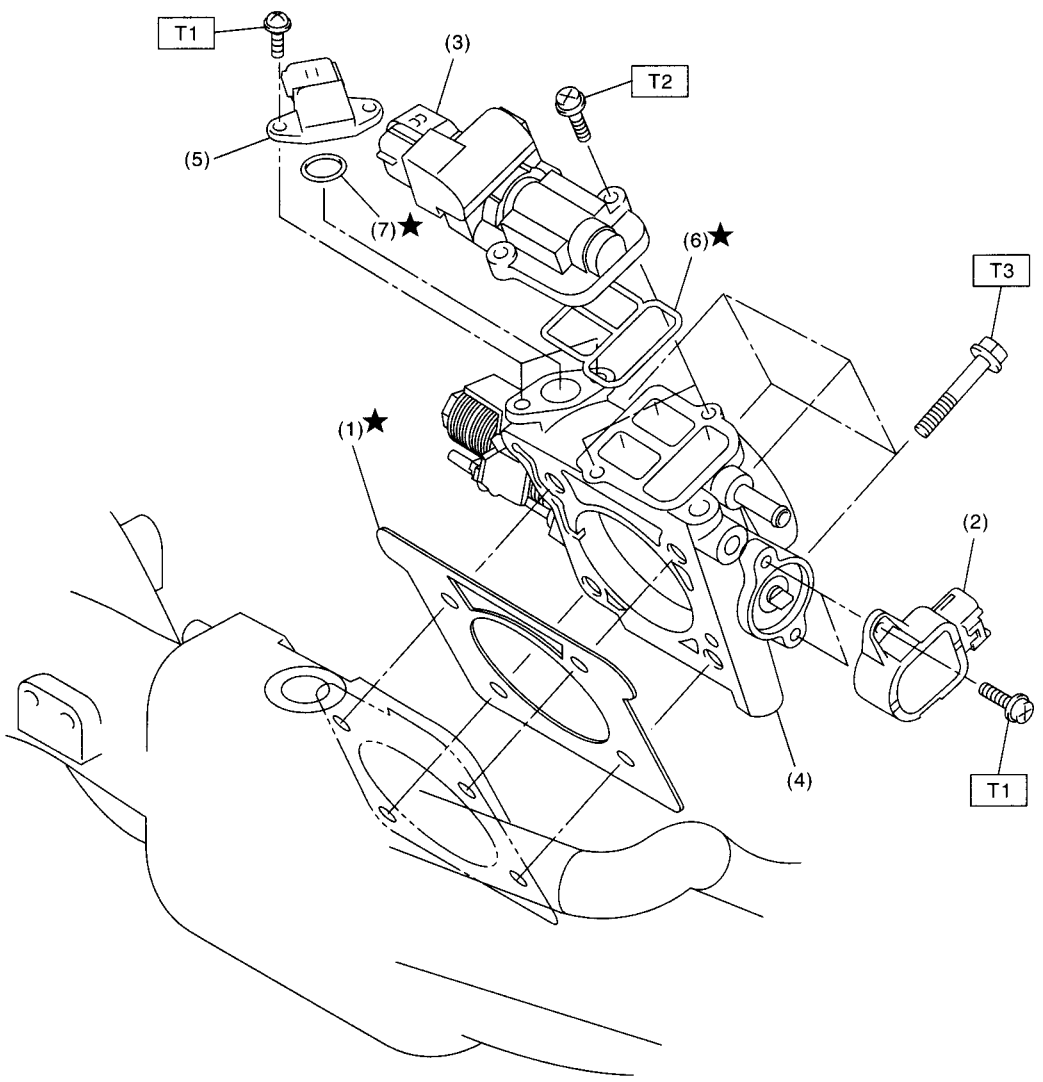


EN1135

(1) Fuel pipe ASSY
(2) Fuel hose
(3) Clip
(4) Purge control solenoid valve
(5) Vacuum hose
(6) Vacuum control hose
(7) Purge valve
(8) Purge hose
(9) Intake manifold gasket
(10) Guide pin
(11) Tumble generator valve ASSY
(12) Tumble generator valve gasket
(13) Accelerator cable bracket
(14) Fuel injector
(15) Insulator
(16) Fuel injector pipe
(17) Pressure regulator
(18) Pressure regulator hose
(19) Fuel pipe protector RH
(20) Blow-by hose stay
(21) Intake manifold
(22) Solenoid valve cover
(23) Solenoid valve cover stay
(24) Wastegate control solenoid valve ASSY
(25) Fuel pipe protector LH
(26) Nipple

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.9 (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 (1.73, 12.5)
T6: 19 (1.94, 13.7)
T7: 25 (2.5, 18.1)

2. AIR INTAKE SYSTEM

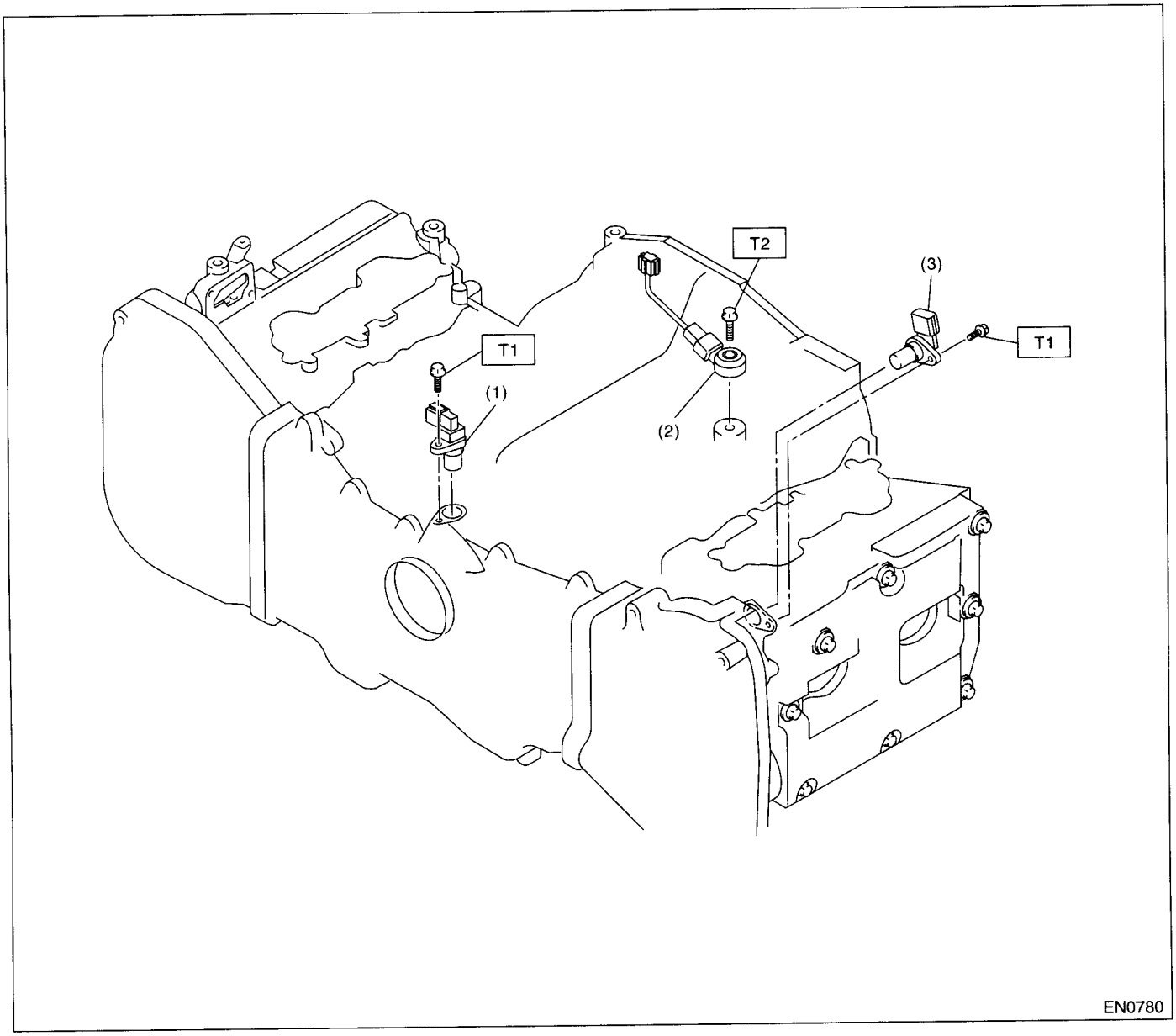


EN113

(1) Gasket
(2) Throttle position sensor
(3) Idle air control solenoid valve
(4) Throttle body
(5) Pressure sensor
(6) Gasket
(7) O-ring

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, 15.9)

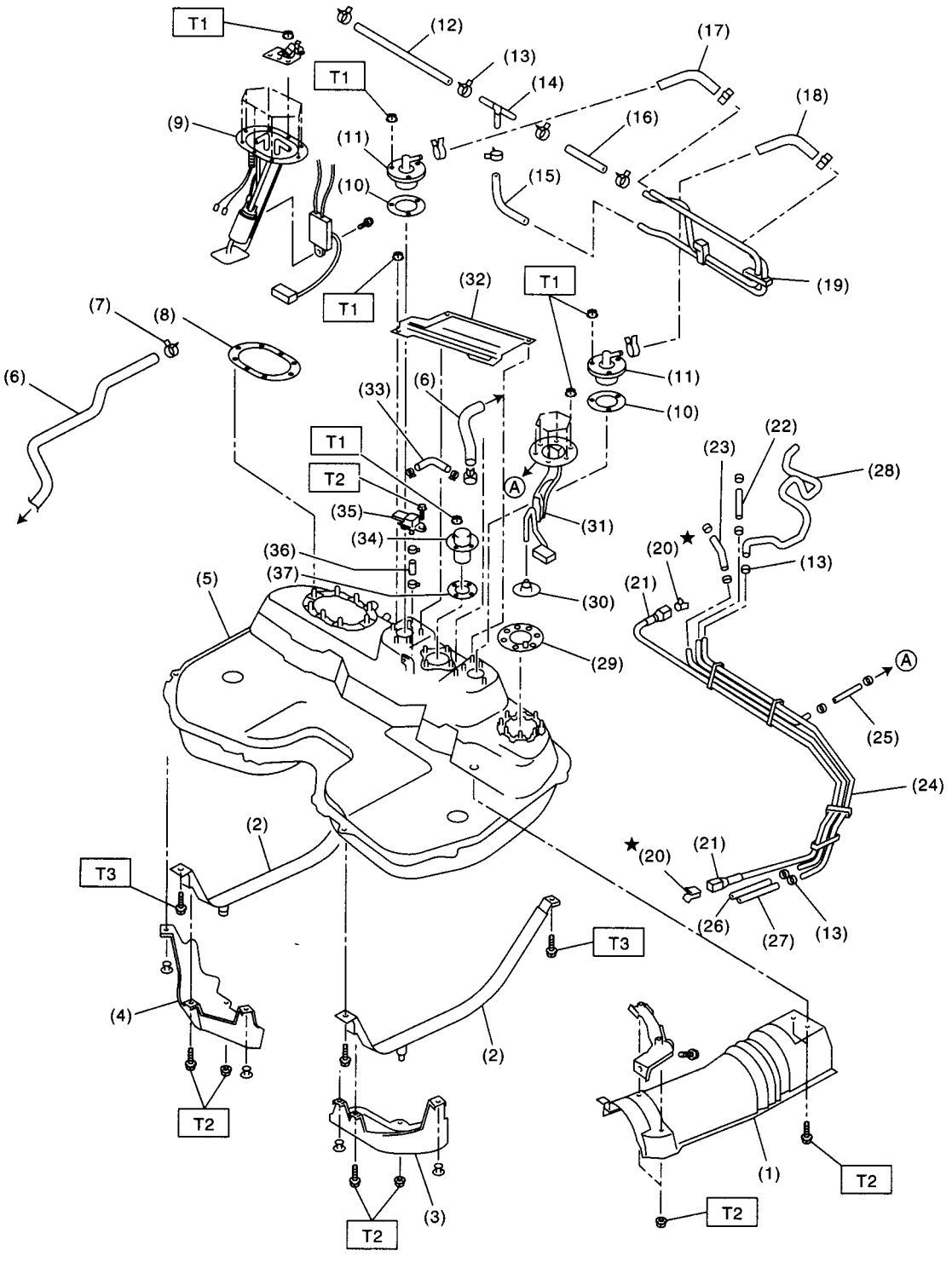
3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



(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


T1
(12)
(13)
(14)
(17)
(18)
(9)
(11)
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(32)
(7)
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T2
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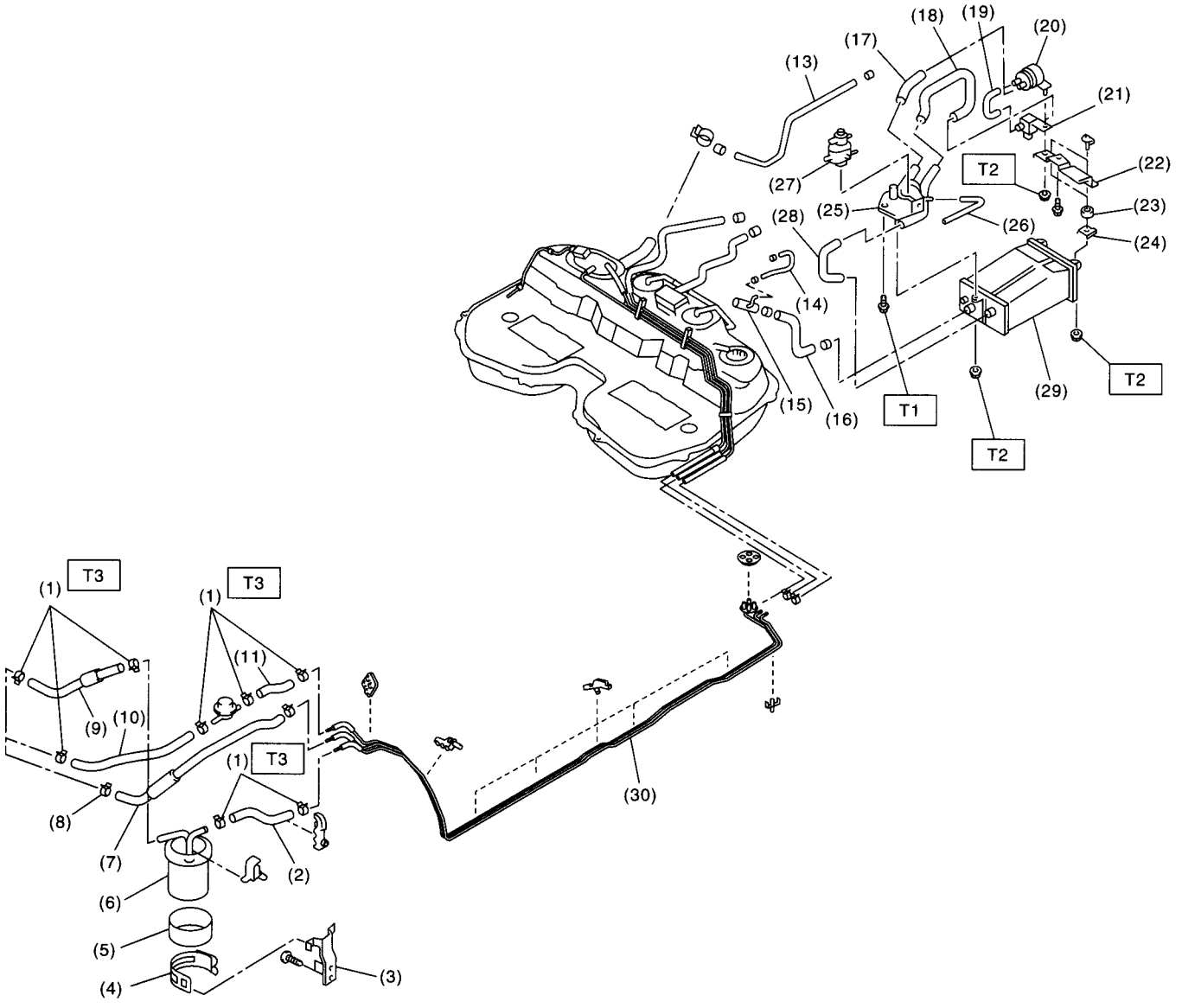
(34)
(20)
(36)
(37)
(5)
(21)
(30)
(29)
(25)
(24)
(2)
T3
(4)
(26)
(27)
(1)
(3)
EN1119

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

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, 25)

5. FUEL LINE

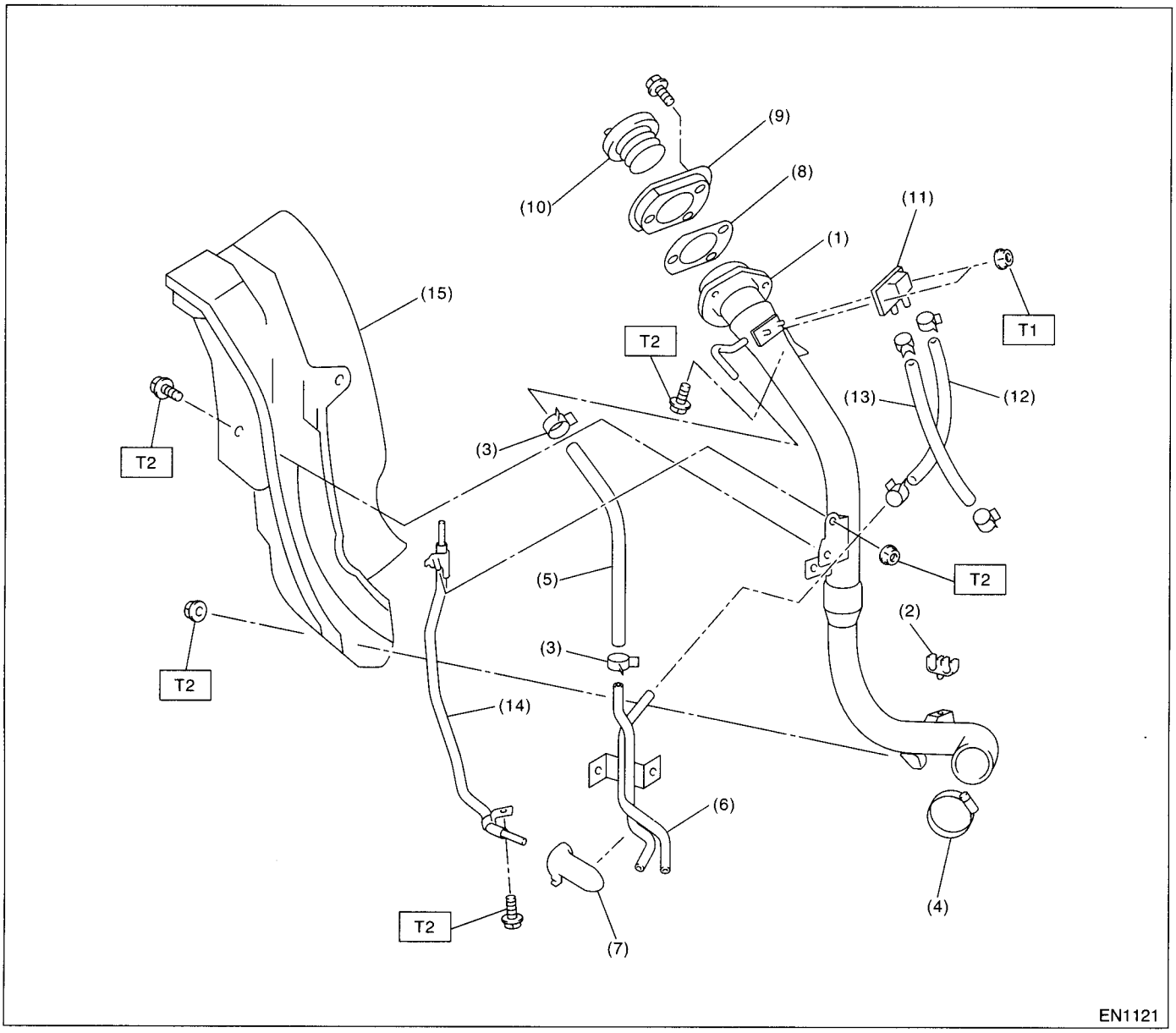


EN1120

(1) Clamp
(2) Fuel delivery hose A
(3) Fuel filter bracket
(4) Fuel filter holder
(5) Fuel filter cup
(6) Fuel filter
(7) Evaporation hose
(8) Clip
(9) Fuel delivery hose B
(10) Fuel return hose A
(11) Fuel return hose B
(12) Fuel damper
(13) Evaporation hose J
(14) Evaporation hose K
(15) Joint pipe
(16) Canister hose A
(17) Air filter hose A
(18) Drain valve hose
(19) Air filter hose B
(20) Drain filter
(21) Drain valve
(22) Canister upper bracket
(23) Cushion rubber
(24) Canister lower bracket
(25) Canister holder
(26) Evaporation hose L
(27) Pressure control solenoid valve
(28) Canister hose B
(29) Canister
(30) Fuel pipe ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.1)
T2: 23 (2.3, 16.6)
T3: 1.25 (0.13, 0.94)

6. FUEL FILLER PIPE



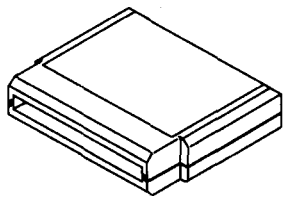
(1) Fuel filter pipe ASSY
(2) Evaporation hose holder
(3) Clamp
(4) Clamp
(5) Evaporation hose A
(6) Evaporation pipe
(7) Evaporation pipe holder
(8) Filler pipe packing
(9) Filler ring
(10) Filler cap
(11) Shut valve
(12) Evaporation hose B
(13) Evaporation hose C
(14) Joint pipe
(15) Fuel filler pipe protector

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 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.

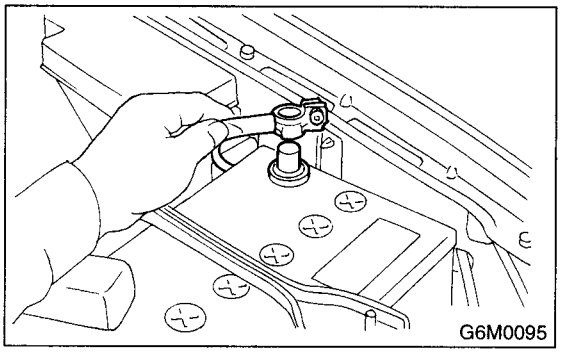
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3876	24082AA150 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical system.
B2M3877	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. Throttle Body

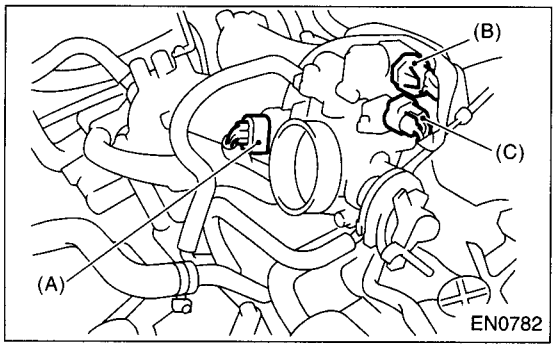
A: REMOVAL

1) Disconnect the battery ground cable.

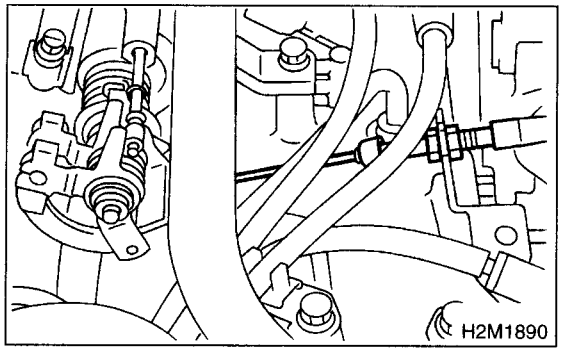


2) Remove the intercooler. <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>

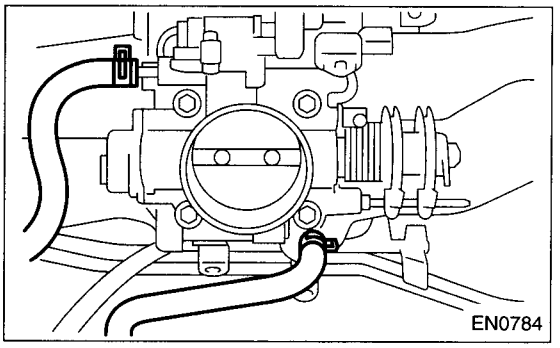
3) Disconnect the connector from the throttle position sensor (A) and idle air cotrol solenoid valve (B) and pressure sensor (C).



4) Disconnect the accelerator cable.



5) Disconnect the engine coolant hoses from the throttle body.



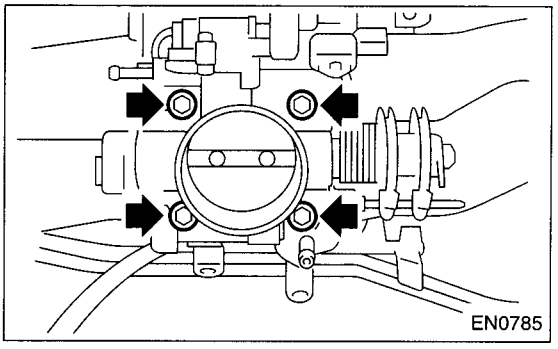
6) Remove the bolts which secure the throttle body to intake manifold.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Always use a new gasket.

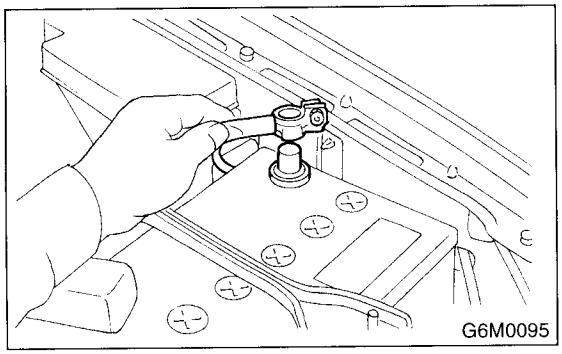
Tightening torque:
22 N·m (2.2 kgf-m, 15.9 ft-lb)



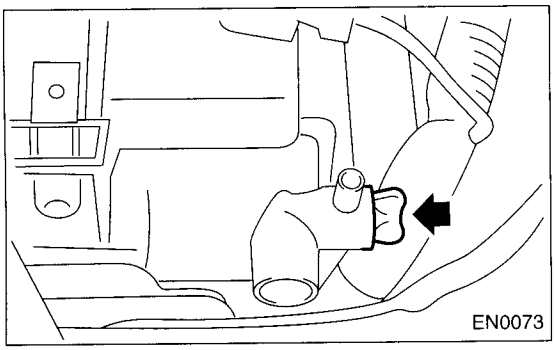
3. Intake Manifold

A: REMOVAL

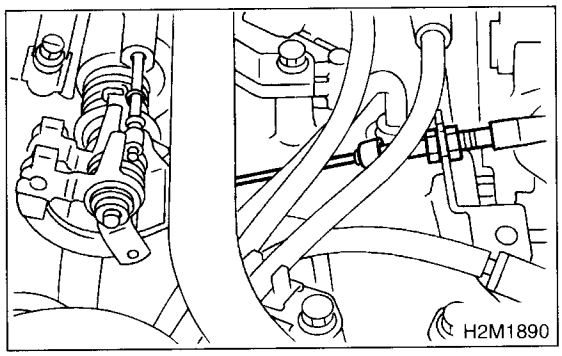
1) Release the fuel pressure. <Ref. to FU(DOHC TURBO)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Disconnect the battery ground cable.



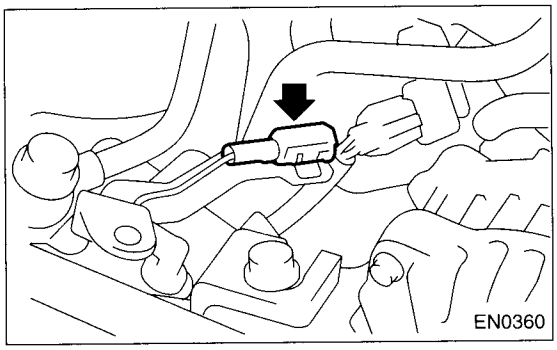
3) Lift up the vehicle.
4) Remove the under cover.
5) Drain the coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt).



6) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(DOHC TURBO)-7, REMOVAL, Air Cleaner.>
7) Remove the air cleaner element.
8) Remove the intercooler. <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>
9) Disconnect the accelerator cable.

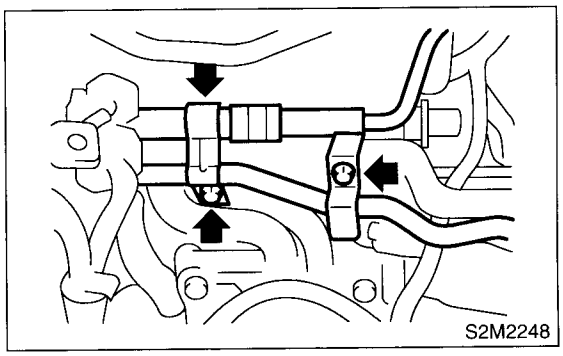


10) Remove the coolant filler tank. <Ref. to CO-51, REMOVAL, Coolant Filler Tank.>
11) Remove the power steering pump.
(1) Remove the front side V-belt.
<Ref. to ME(DOHC TURBO)-44, REMOVAL, V-belt.>
(2) Disconnect the power steering switch connector.

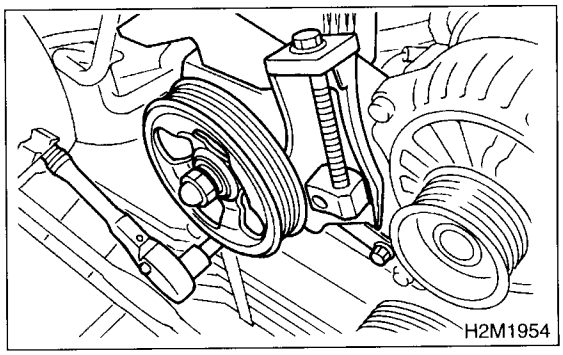


(3) Remove the bolts which secure the power steering pipe brackets to the intake manifold.

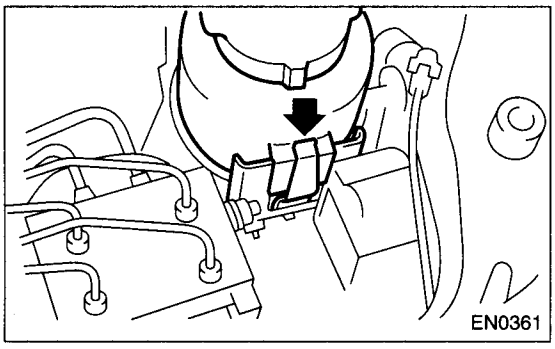
NOTE:
Do not disconnect the power steering hose.



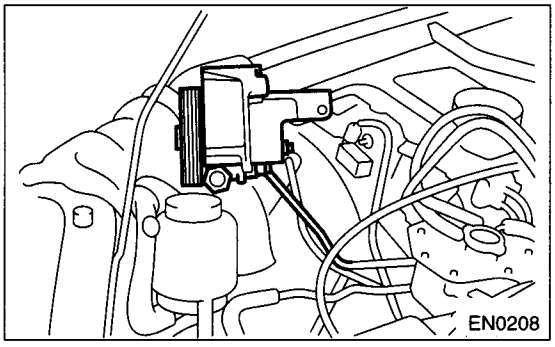
(4) Remove the bolts which secure the power steering pump bracket.



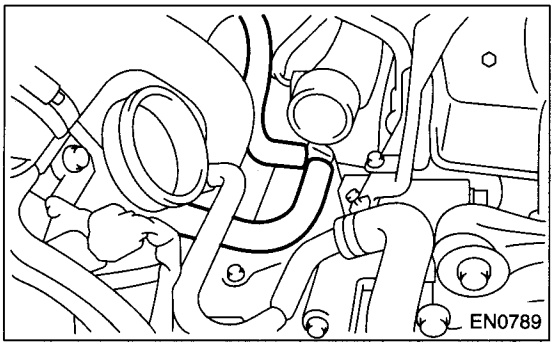
(5) Remove the power steering tank from the bracket by pulling it upward.



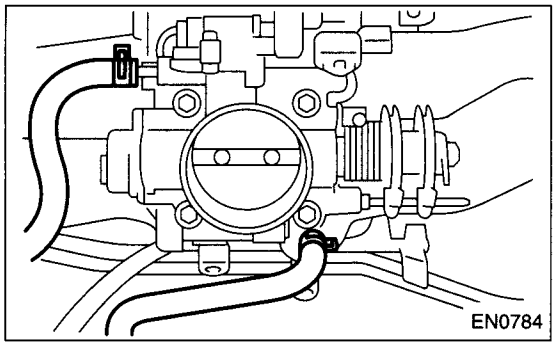
(6) Place the power steering pump on the right side wheel apron.



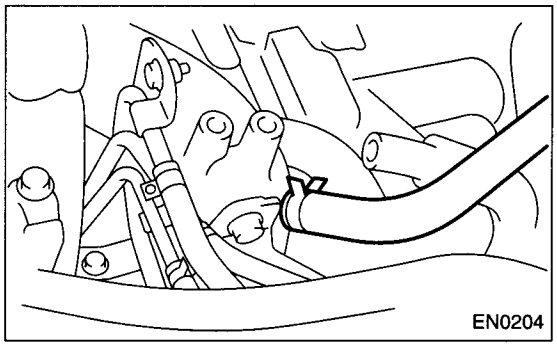
12) Disconnect the emission hose from the PCV valve.



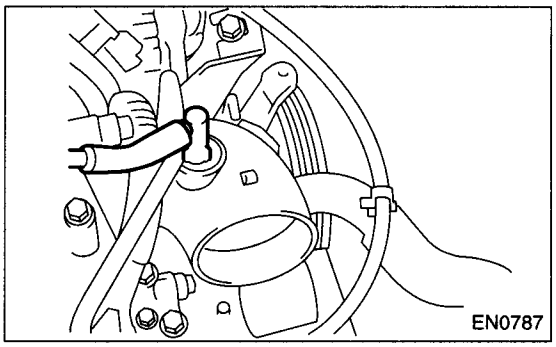
13) Disconnect the engine coolant hoses from the throttle body.



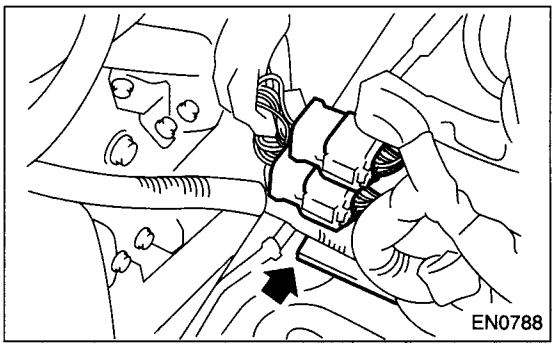
14) Disconnect the brake booster hose.

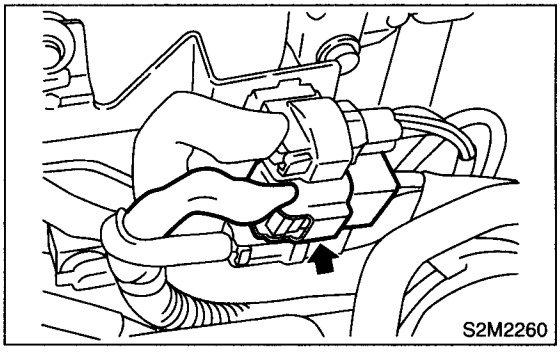


15) Disconnect the pressure hose from the intake duct.

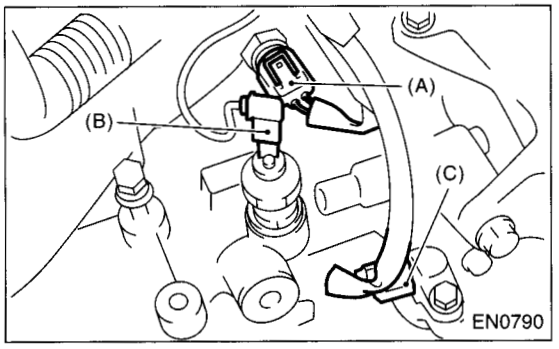


16) Disconnect the engine harness connectors from the bulkhead harness connectors.

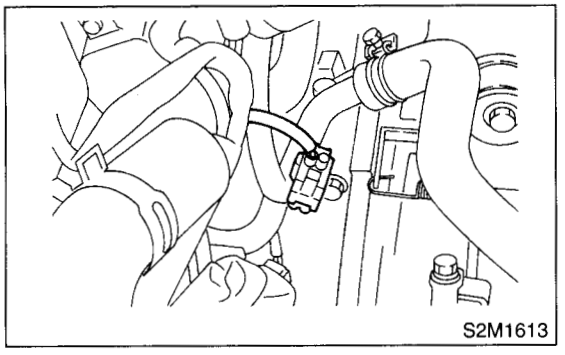




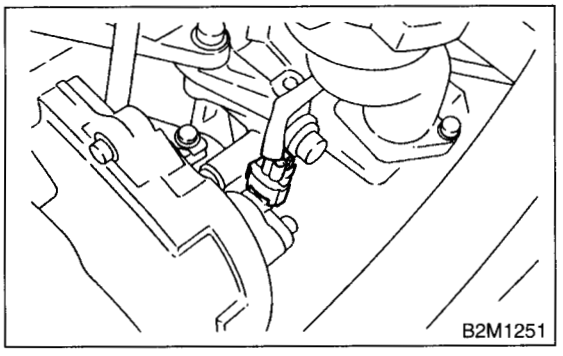
17) Disconnect the connectors from the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



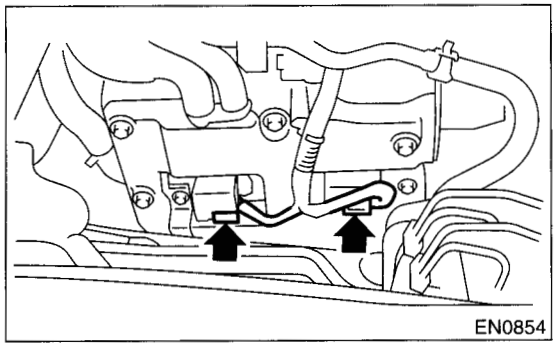
18) Disconnect the knock sensor connector.



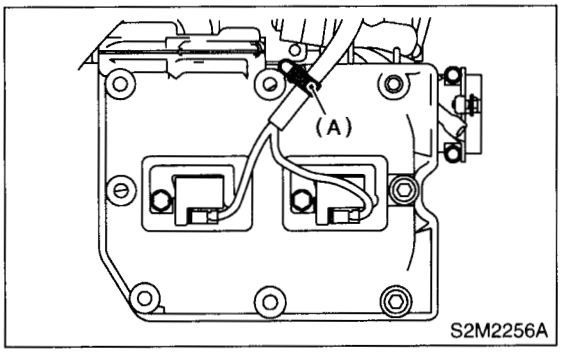
19) Disconnect the connector from the camshaft position sensor.



20) Disconnect the connector from the ignition coil.

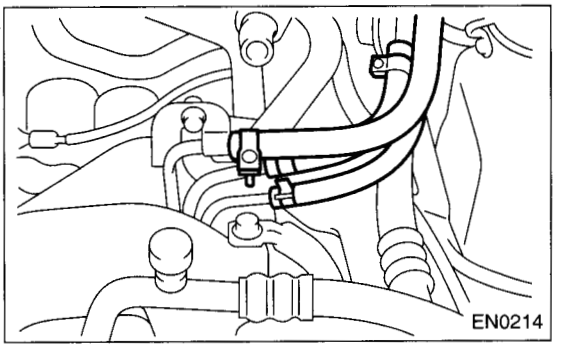


21) Disconnect the engine harness fixed by clip (A) from the bracket.

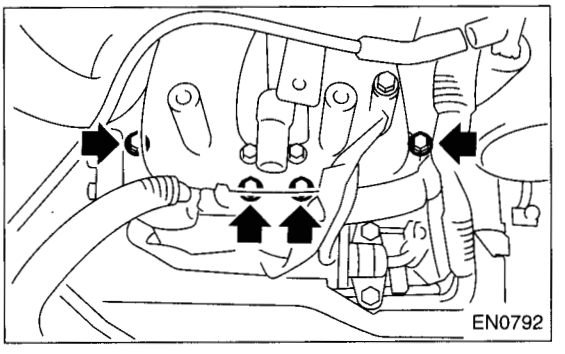


22) Disconnect the fuel delivery hose, return hose and evaporation hose.

WARNING:
Catch the fuel from hoses in a container.



23) Remove the bolts which secure the intake manifold to the cylinder heads.



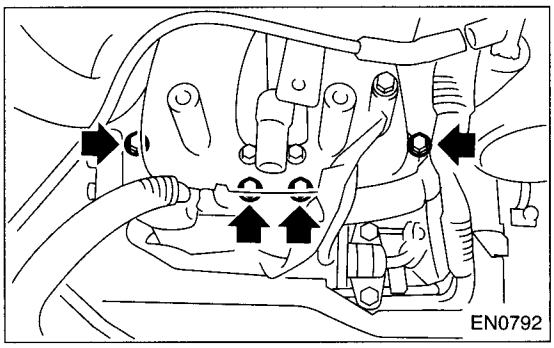
24) Remove the intake manifold.

B: INSTALLATION

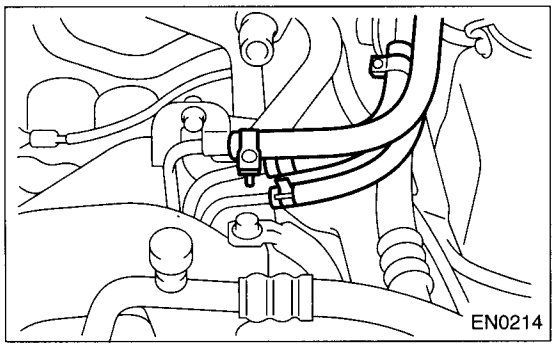
1) Install the intake manifold onto cylinder heads.

NOTE:
Always use new gaskets.

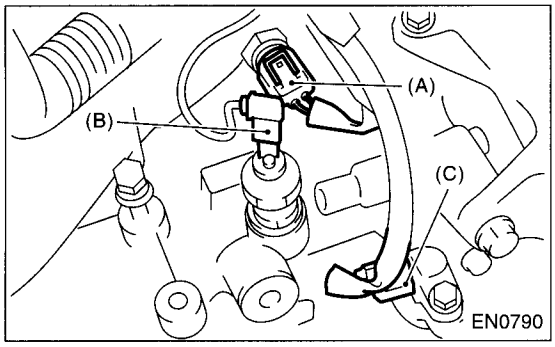
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



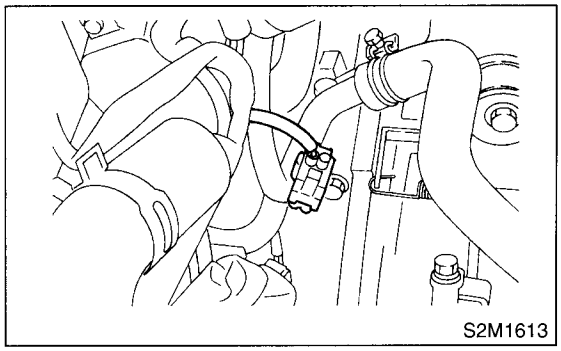
2) Connect the fuel delivery hose, return hose, and evaporation hose.



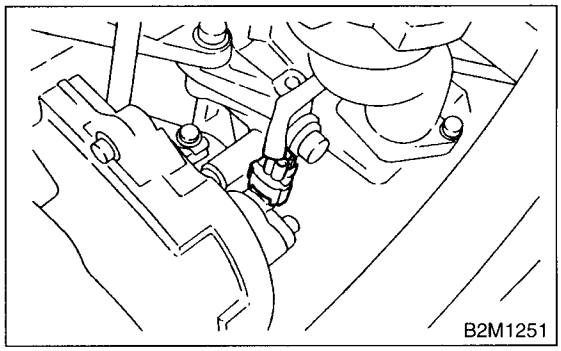
3) Connect the connector to the oil pressure switch (B), crankshaft position sensor (C) and engine coolant temperature sensor (A).



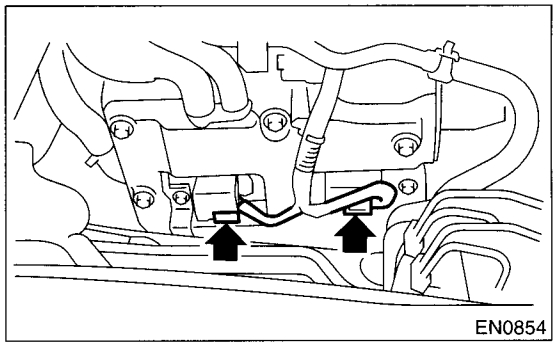
4) Connect the connector to the knock sensor.



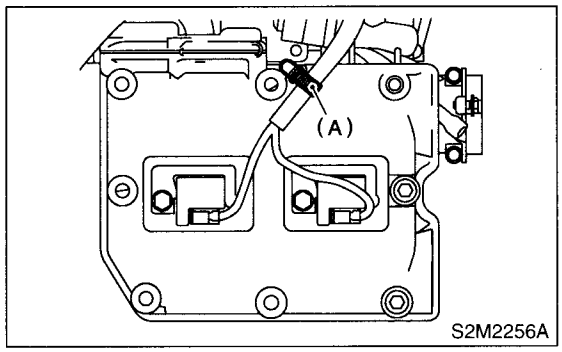
5) Connect the connector to the camshaft position sensor.



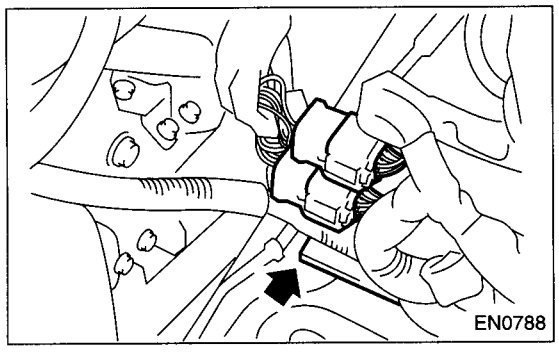
6) Connect the connector to the ignition coil.

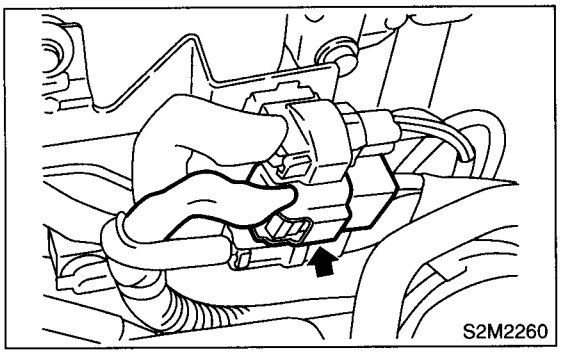


7) Connect the engine harness with clip (A) to the bracket.

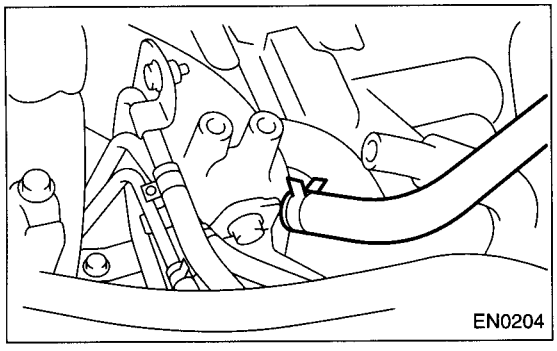


8) Connect the engine harness connector to the bulkhead harness connectors.

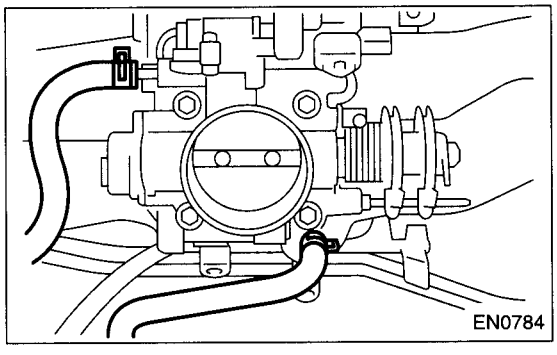




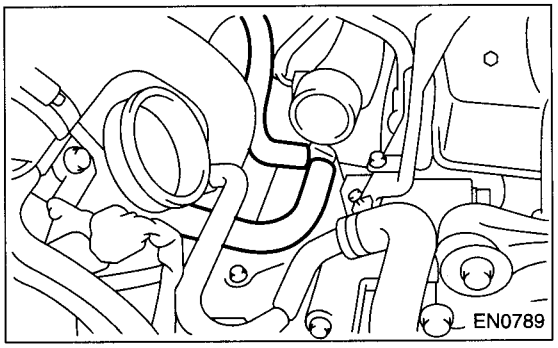
9) Connect the brake booster vacuum hose.



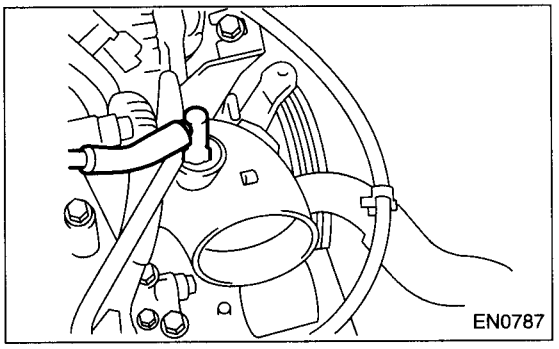
10) Connect the engine coolant hoses to the throttle body.



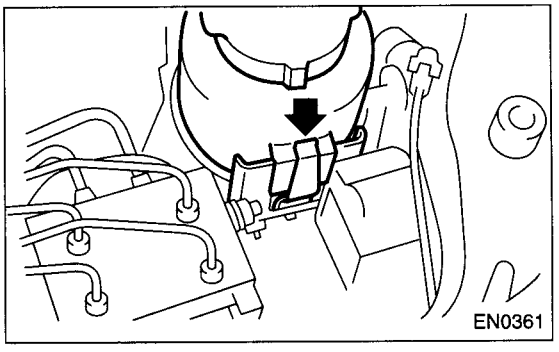
11) Connect the emission hose to the PCV valve.



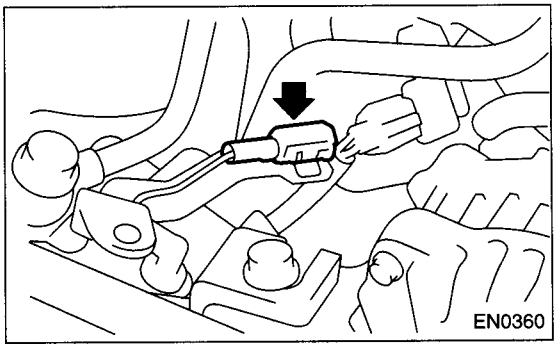
12) Connect the pressure hose to the intake duct.



13) Install the power steering pump.
(1) Install the power steering tank on the bracket.

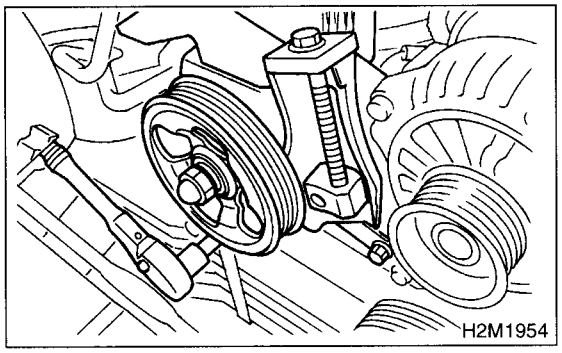


(2) Connect the connector to the power steering pump switch.

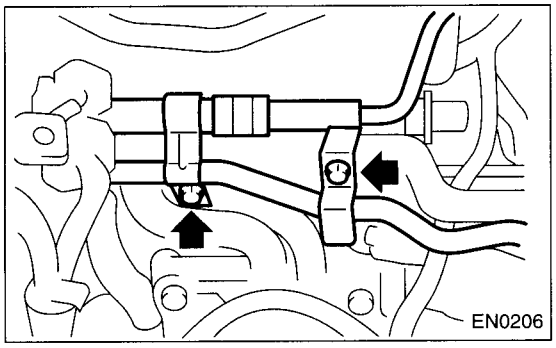


(3) Install the power steering pump, and tighten the bolts.

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

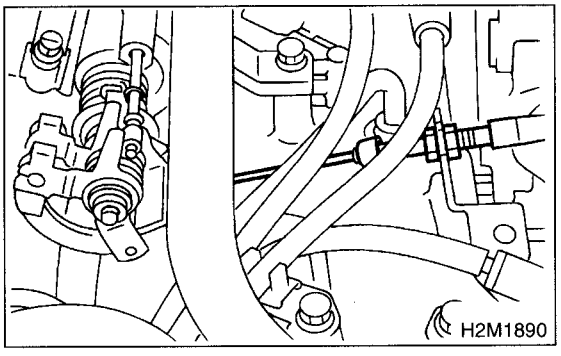


(4) Install the power steering pipe brackets on the right side intake manifold.

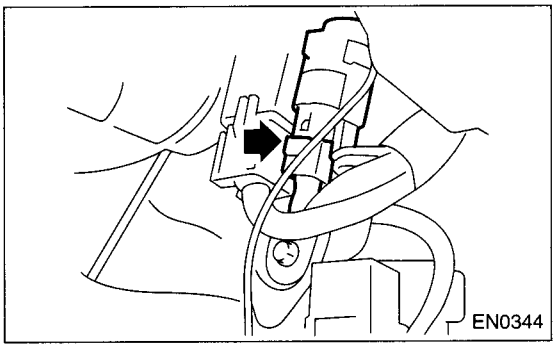


(5) Install the front side V-belt.
<Ref. to ME(DOHC TURBO)-44, REMOVAL, V-belt.>

14) Install the cooler filler tank. <Ref. to CO-51, INSTALLATION, Coolant Filler Tank.>
15) Connect the accelerator cable.



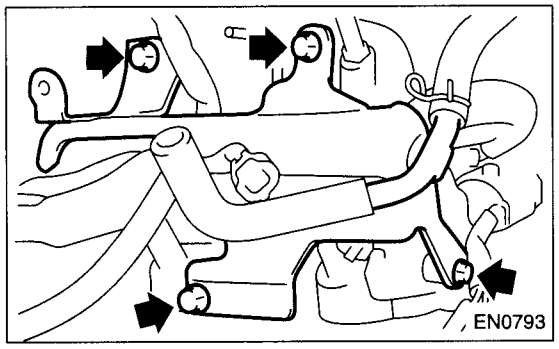
16) Install the intercooler. <Ref. to IN(DOHC TURBO)-11, INSTALLATION, Intercooler.>
17) Install the air cleaner element.
18) Install the air cleaner upper cover and air intake duct as a unit. <Ref. to IN(DOHC TURBO)-7, INSTALLATION, Air Cleaner.>
19) Connect the connector to the fuel pump relay.



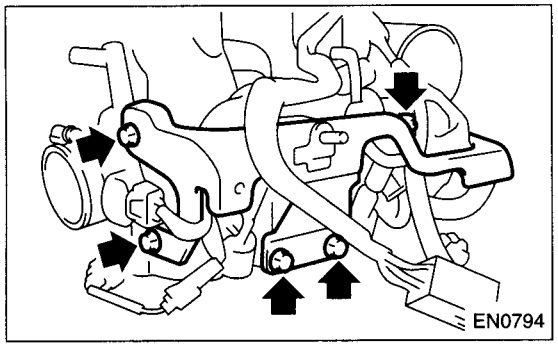
20) Connect the battery ground cable.
21) Lift up the vehicle.
22) Install the under cover.
23) Fill the coolant. <Ref. to CO-25, FILLING OF ENGINE COOLANT, Engine Coolant.>

C: DISASSEMBLY

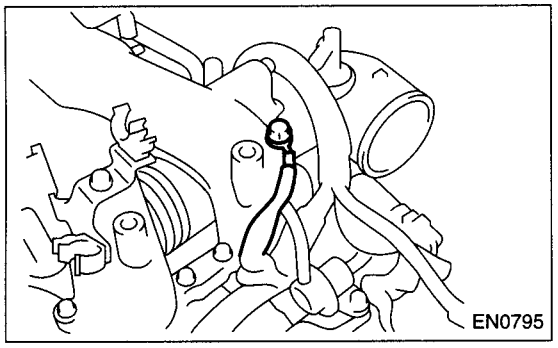
1) Remove the fuel pipe protector LH.

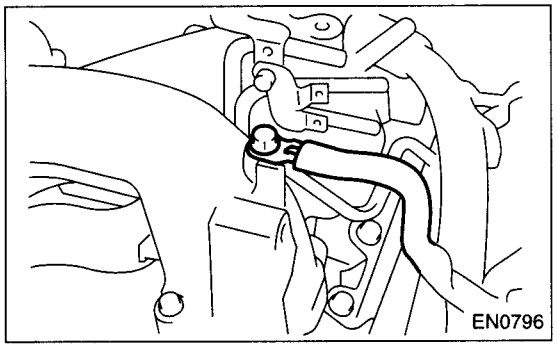


2) Remove the fuel pipe protector RH.



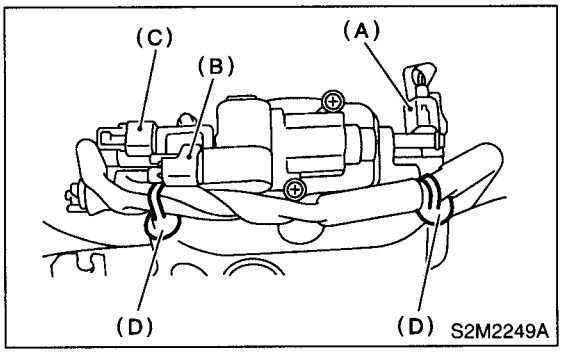
3) Remove the engine ground terminal from the intake manifold.



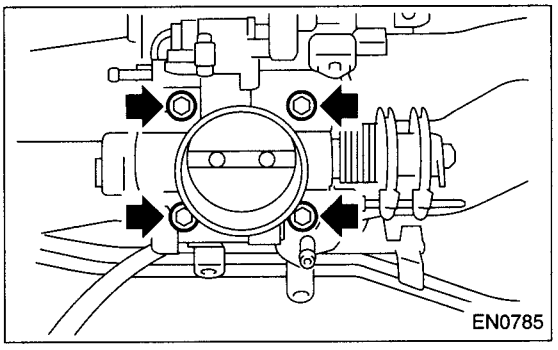


4) Disconnect the connector from the throttle position sensor (A), idle air control solenoid valve (B) and pressure sensor (C).

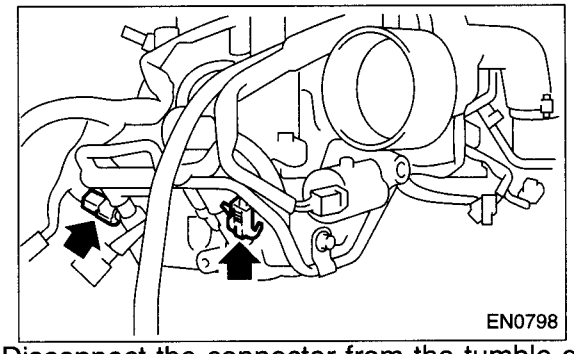
5) Disconnect the engine harness fixed by clip (D) from the intake manifold.



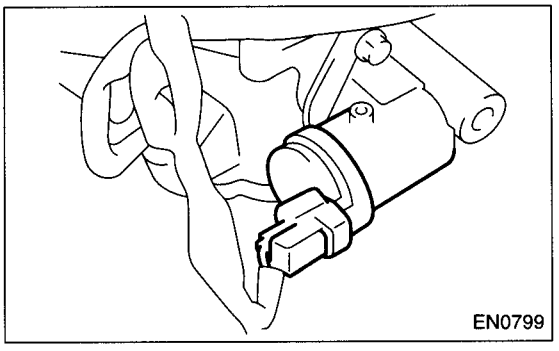
6) Remove the throttle body from the intake manifold.



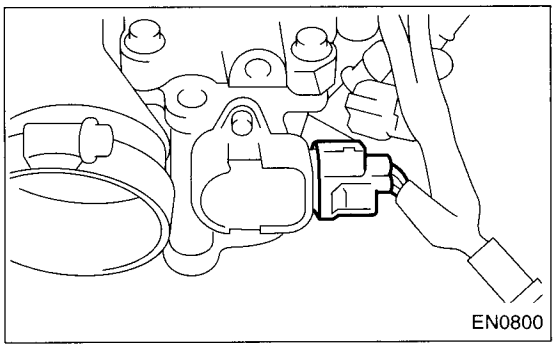
7) Disconnect the connector from the fuel injector.



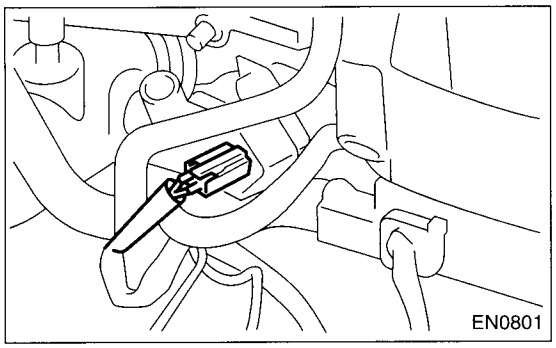
8) Disconnect the connector from the tumble generator valve actuator.



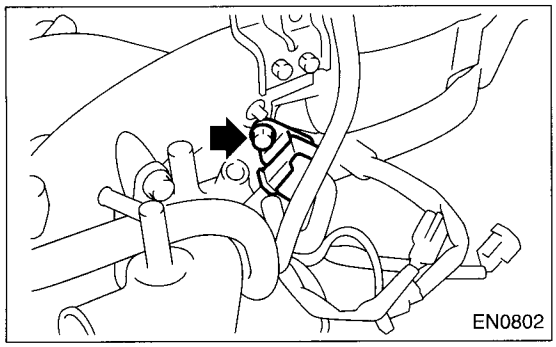
9) Disconnect the connector from the tumble generator valve sensor.



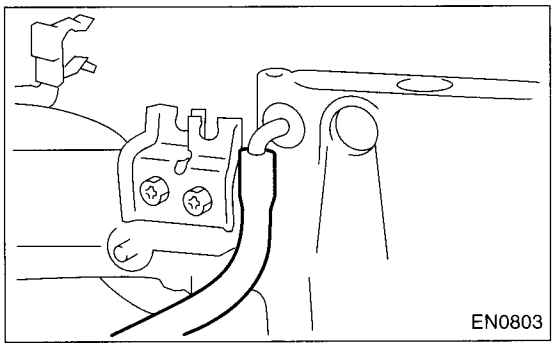
10) Disconnect the connector from the purge control solenoid valve.



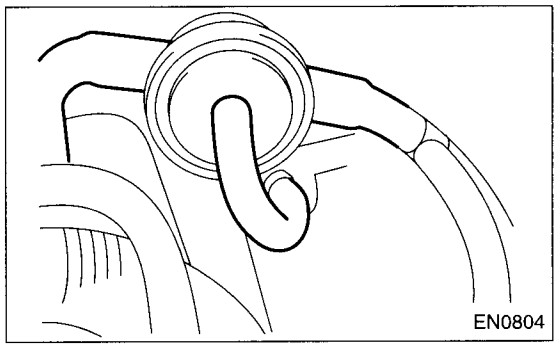
11) Remove the purge control solenoid valve.



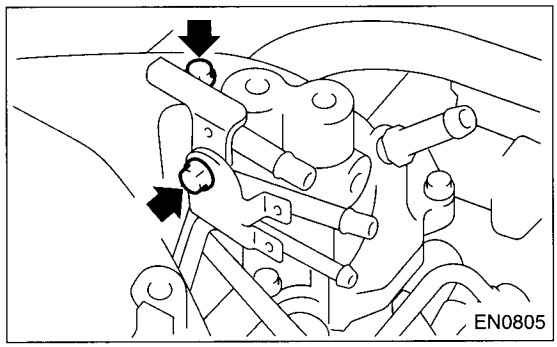
12) Disconnect the evaporation hose from the intake manifold.



13) Disconnect the evaporation hoses from the purge valve.

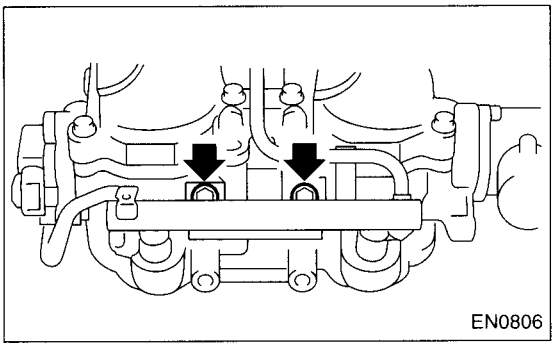


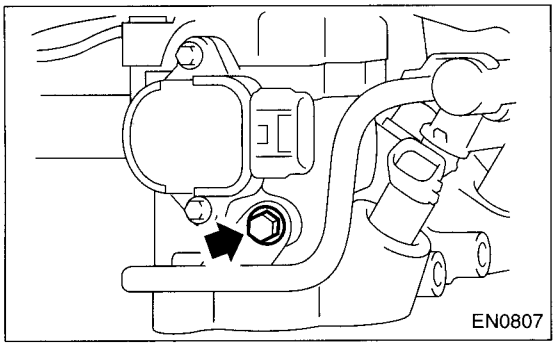
14) Remove the two bolts which hold the fuel pipes on the left side of intake manifold.



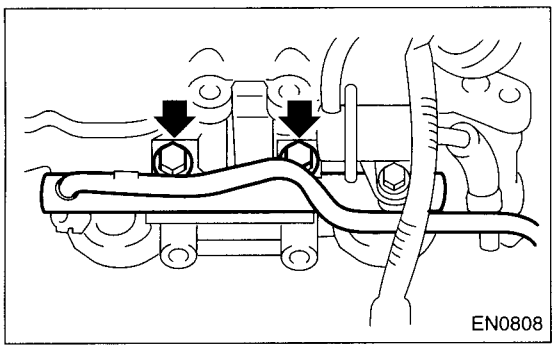
15) Remove the bolt which hold the fuel injector pipe onto intake manifold.

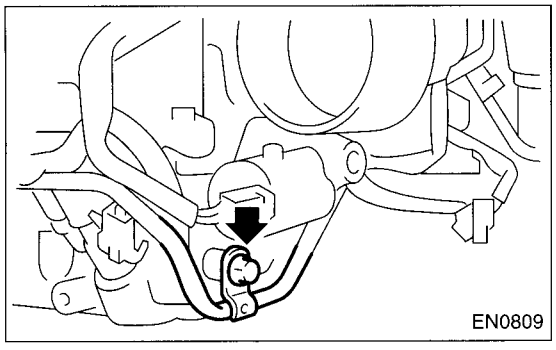
- LH SIDE



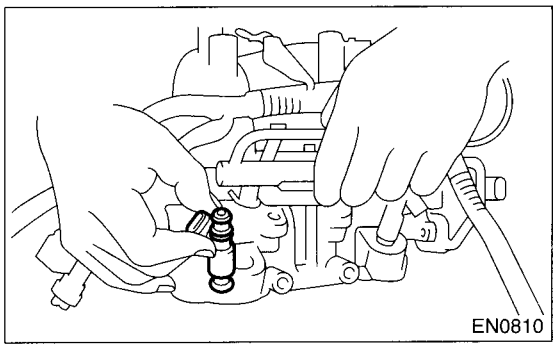


- RH SIDE

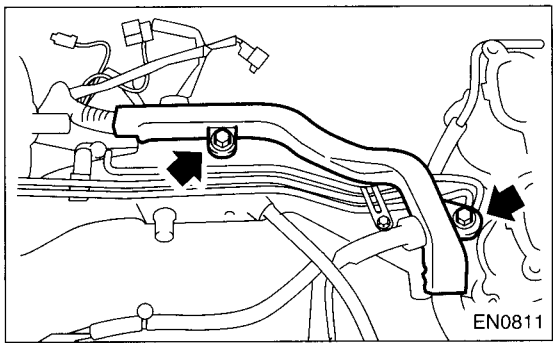




16) Remove the fuel injector.

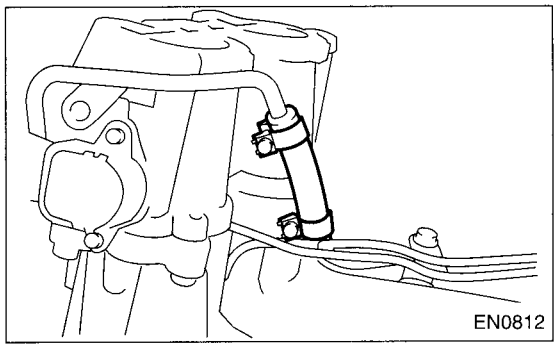


17) Remove the harness bracket which hold the engine harness onto intake manifold.



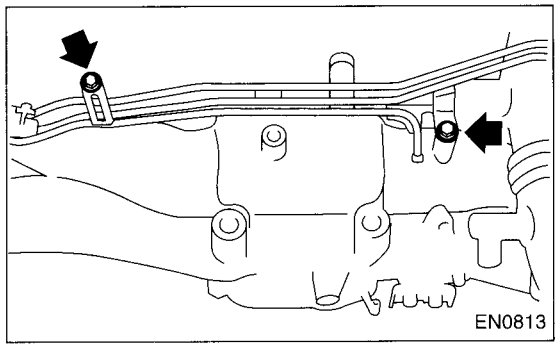
18) Remove the engine harness from the intake manifold.

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

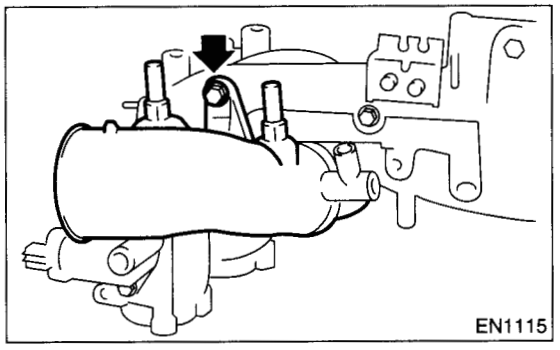


20) Remove the fuel injector pipe LH.

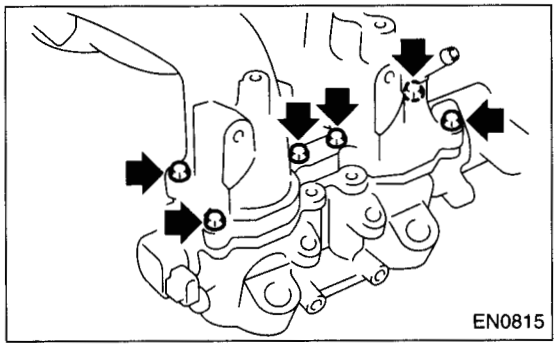
21) Remove the bolts which installs the fuel pipe on intake manifold.



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



24) Remove the tumble generator valve assembly from the intake manifold.

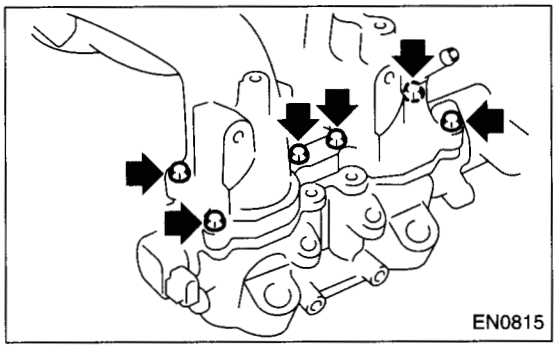


D: ASSEMBLY

NOTE:
Replace the gasket with a new one.

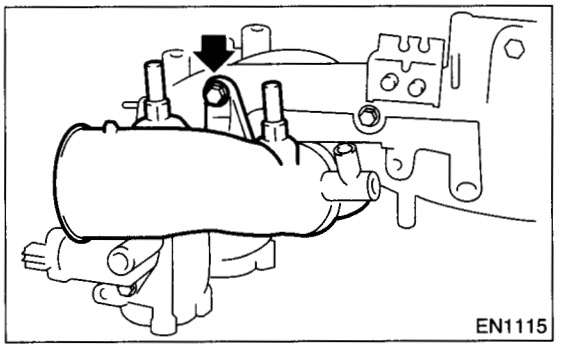
1) Install the tumble generator valve assembly to the intake manifold.

Tightening torque:
8.25 N·m (0.84 kgf-m, 6.08 ft-lb)



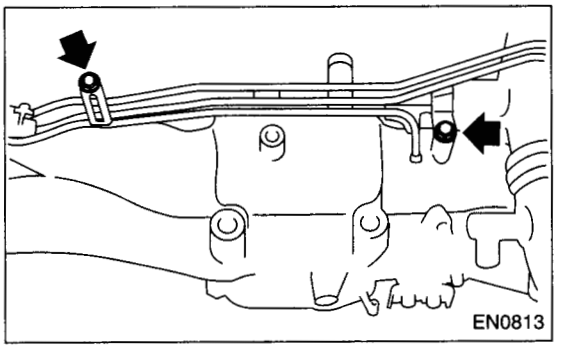
2) Install the air intake duct to the intake manifold.

Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)

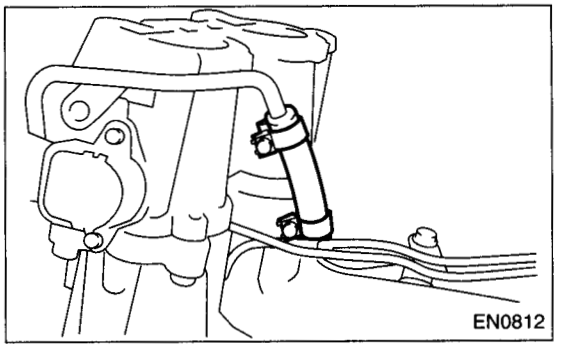


3) Install the fuel pipe assembly and pressure regulator, to the intake manifold.

Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)



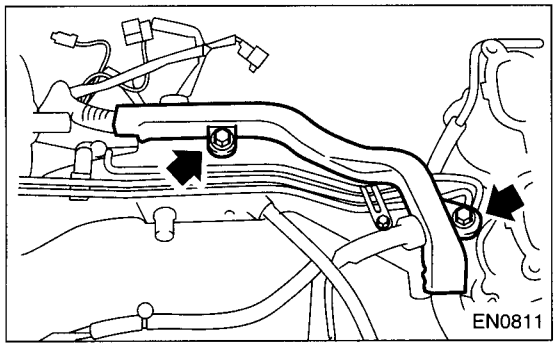
4) Install the fuel injector pipe LH.
5) Connect the left side fuel hose to injector pipe, and tighten the clamp screw.



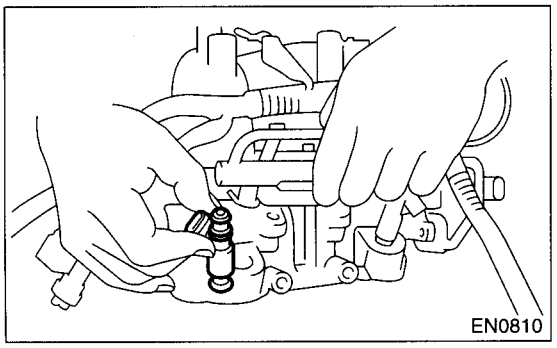
6) Install the engine harness to the intake manifold.

7) Install the harness bracket which hold the engine harness onto intake manifold.

Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



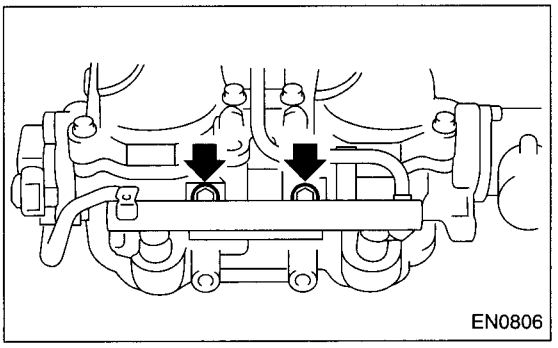
8) Install the fuel injector.

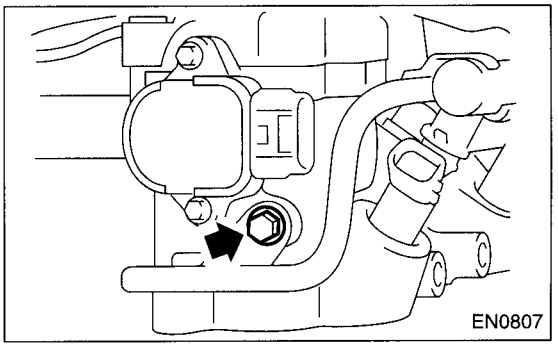


9) Tighten the bolt which install the fuel injector pipe onto intake manifold.

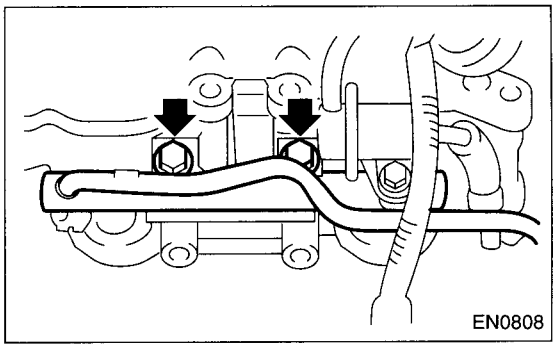
Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)

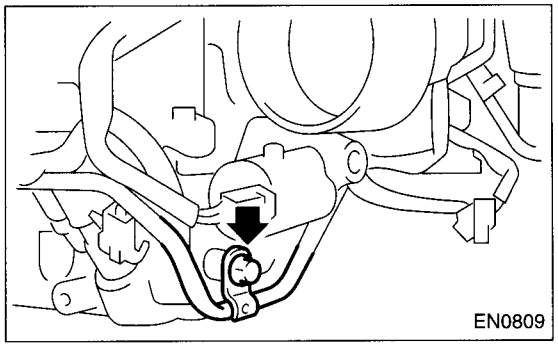
- LH SIDE





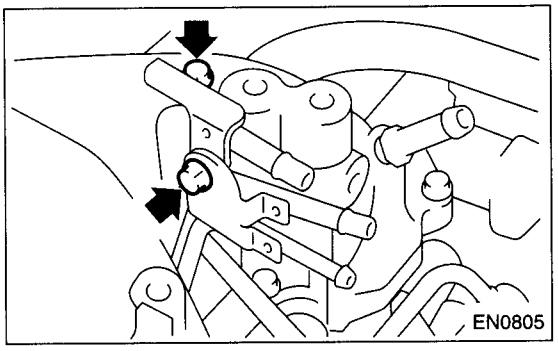
- RH SIDE





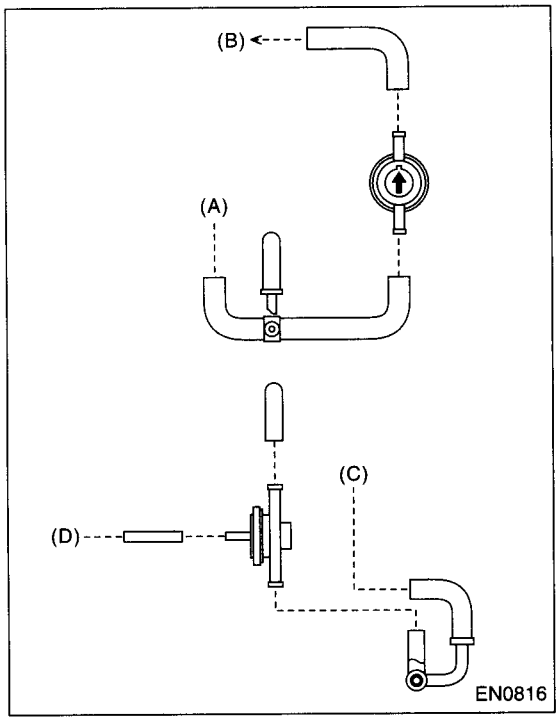
10) Tighten the two bolts which install the fuel pipes on the left side of intake manifold.

Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)



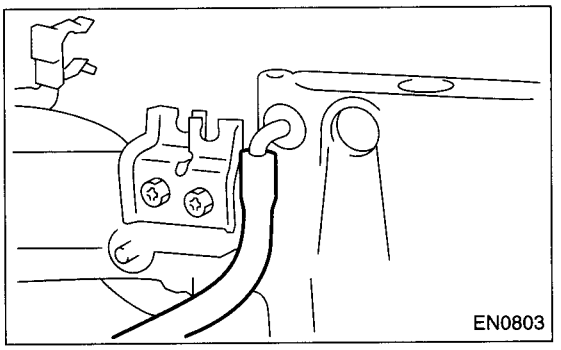
11) Connect the evaporation hoses to the purge valve.

CAUTION:
Carefully connect the evaporation hoses.



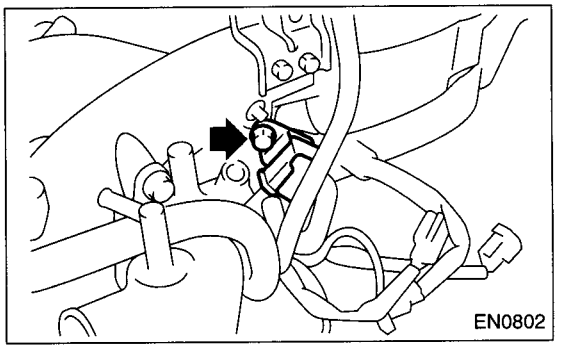
(A) To fuel pipe ASSY
(B) To intake duct
(C) To purge control solenoid valve
(D) To intake manifold

12) Connect the evaporation hose to the intake manifold.



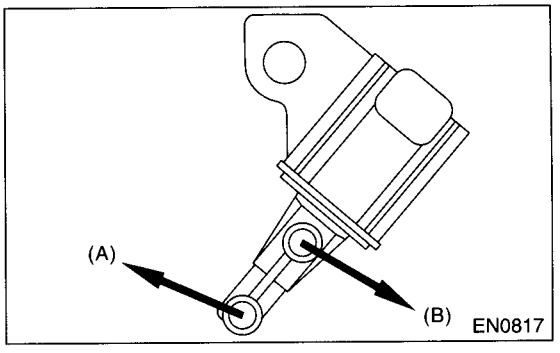
13) Install the purge control solenoid valve.

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



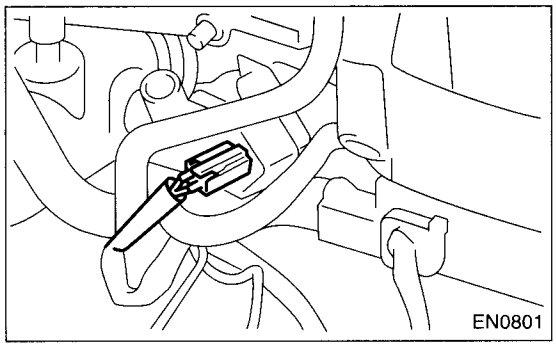
14) Connect the hoses to the purge control solenoid valve.

CAUTION:
Carefully connect the evaporation hoses.

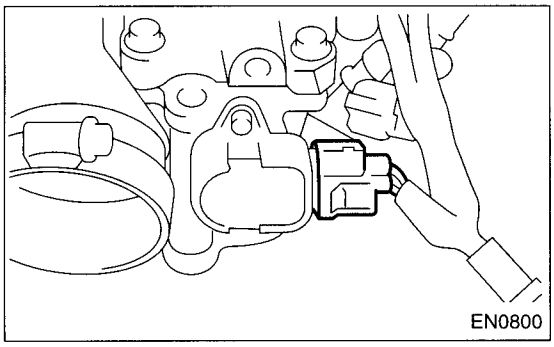


(A) To intake manifold
(B) To purge valve

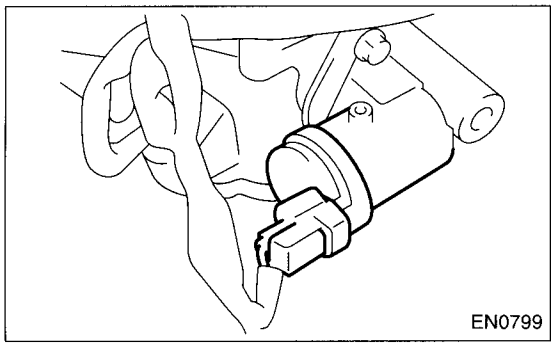
15) Connect the connector to the purge control solenoid valve.



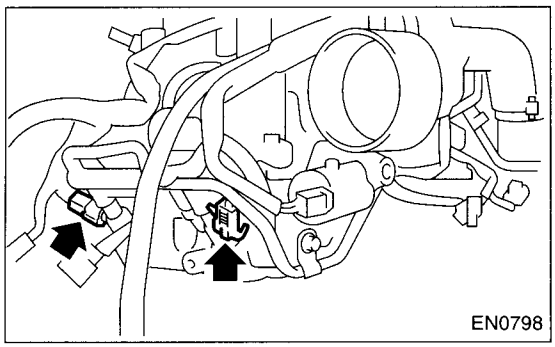
16) Connect the connector to the tumble generator valve sensor.



17) Connect the connector to the tumble generator valve actuator.



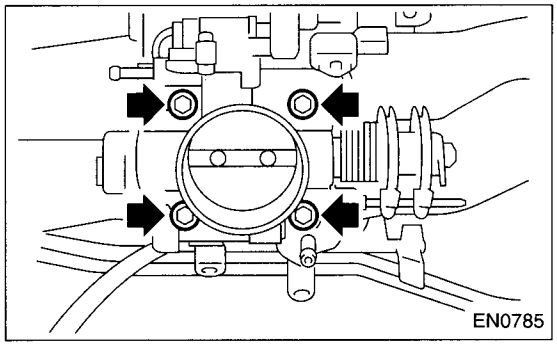
18) Connect the connector to the fuel injector.



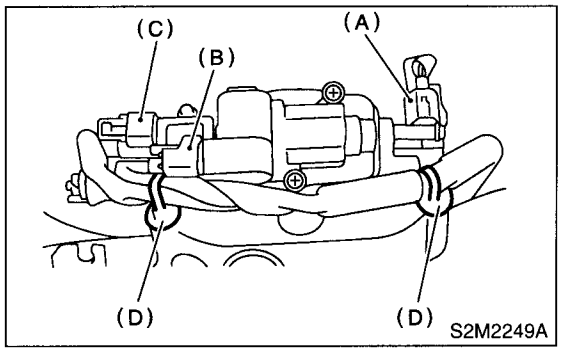
19) Install the throttle body to the intake manifold.

NOTE:
Replace gasket with a new one.

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

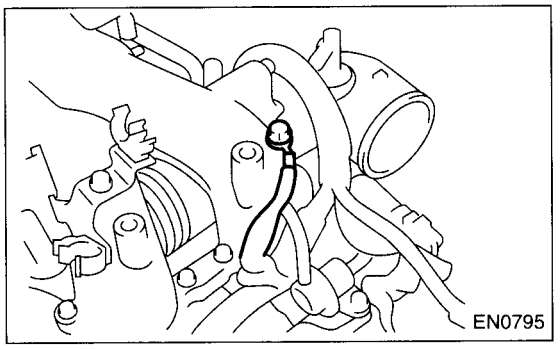


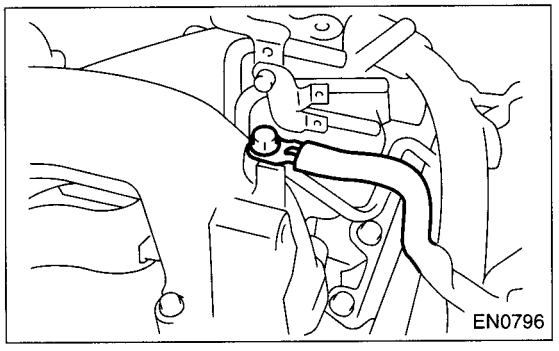
20) Connect the connector to the throttle position sensor (A), idle air control solenoid valve (B) and pressure sensor (C).
21) Connect the engine harness with clip (D) to the intake manifold.



22) Install the engine ground terminal to the intake manifold.

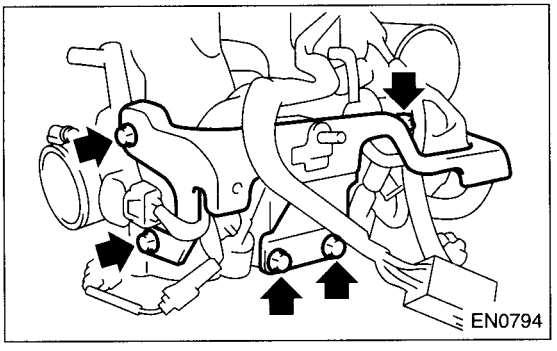
Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)





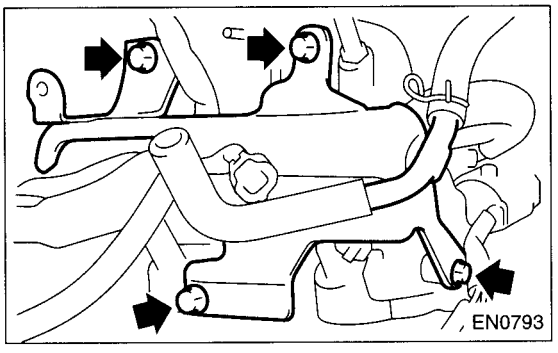
23) Install the fuel pipe protector RH.

Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



24) Install the fuel pipe protector LH.

Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



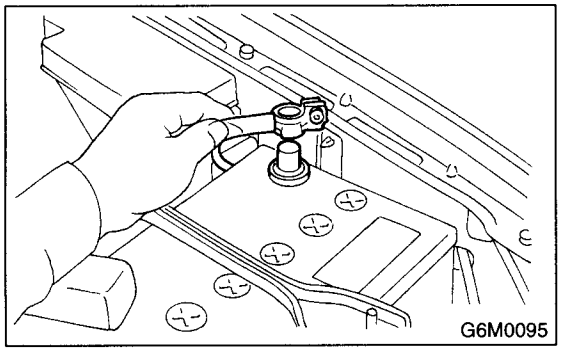
E: INSPECTION

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

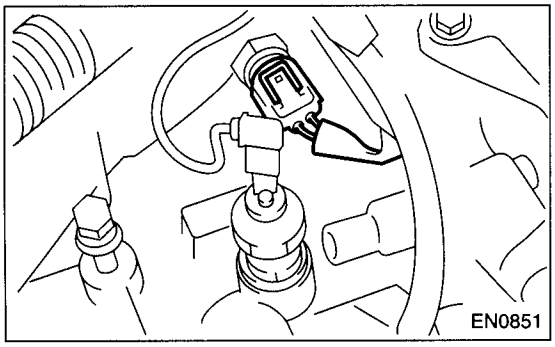
4. Engine Coolant Temperature Sensor

A: REMOVAL

1) Disconnect the battery ground cable.



2) Remove the generator <Ref. to SC-13, REMOVAL, Generator.>
3) Disconnect the connector from the engine coolant temperature sensor.



4) Remove the engine coolant temperature sensor.

B: INSTALLATION

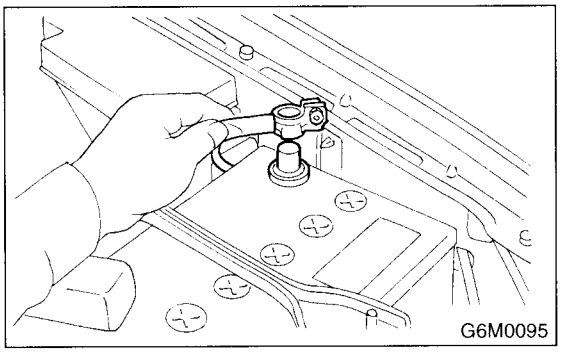
Install in the reverse order of removal.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

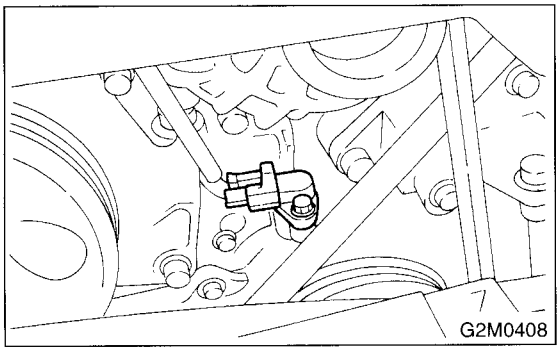
5. Crankshaft Position Sensor

A: REMOVAL

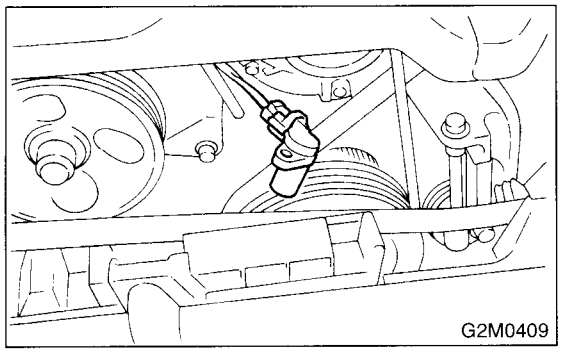
1) Disconnect the battery ground cable.



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



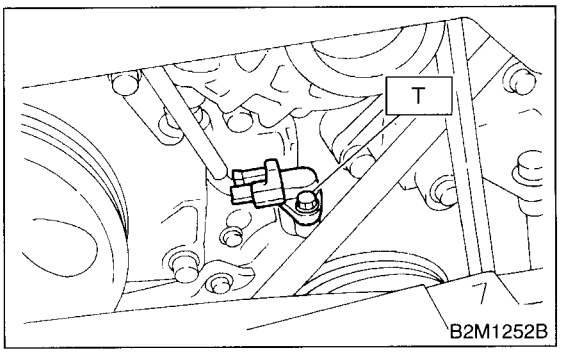
3) Remove the crankshaft position sensor, and disconnect the connector from it.



B: INSTALLATION

Install in the reverse order of removal.

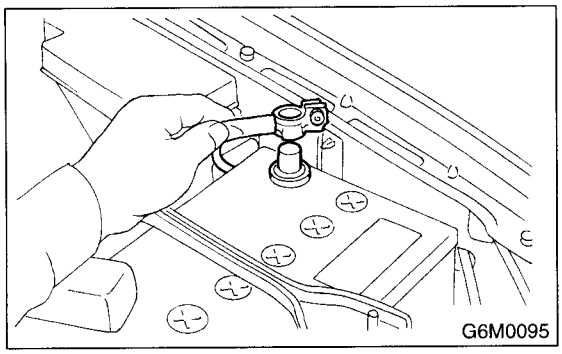
Tightening torque:
T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



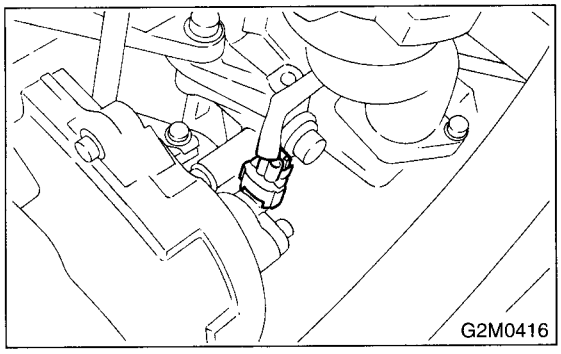
6. Camshaft Position Sensor

A: REMOVAL

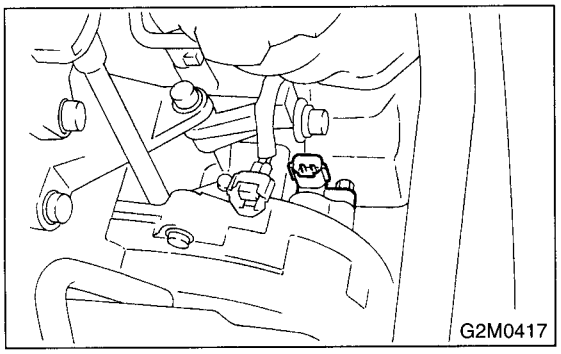
1) Disconnect the battery ground cable.



2) Disconnect the connector from the camshaft position sensor.



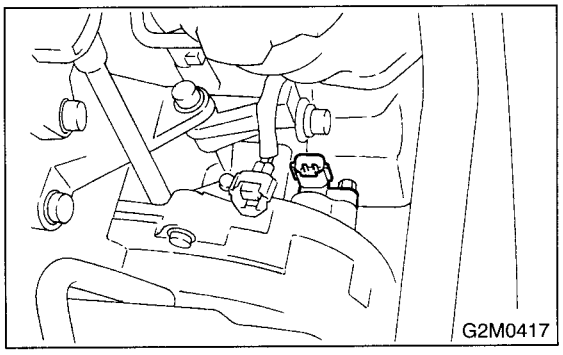
3) Remove the hcamshaft position sensor from the camshaft support LH.



B: INSTALLATION

Install in the reverse order of removal.

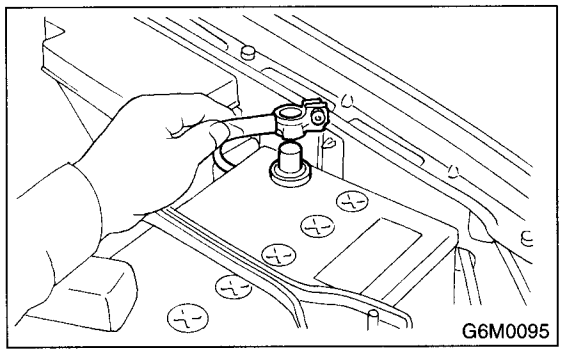
Tightening torque:
T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



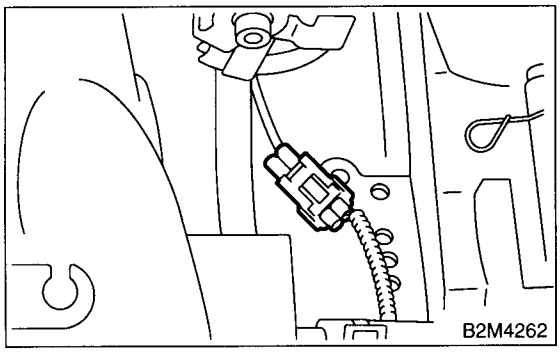
7. Knock Sensor

A: REMOVAL

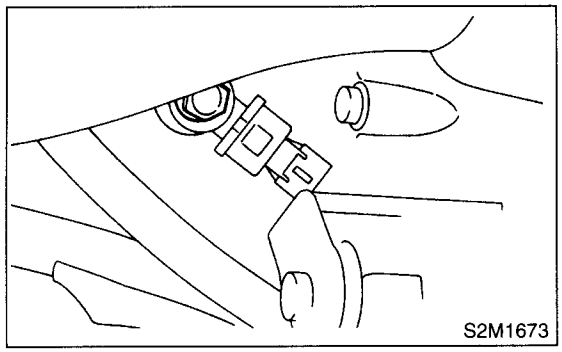
1) Disconnect the battery ground cable.



2) Remove the intercooler. <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>
3) Disconnect the knock sensor connector.



4) Remove the knock sensor from the cylinder block.

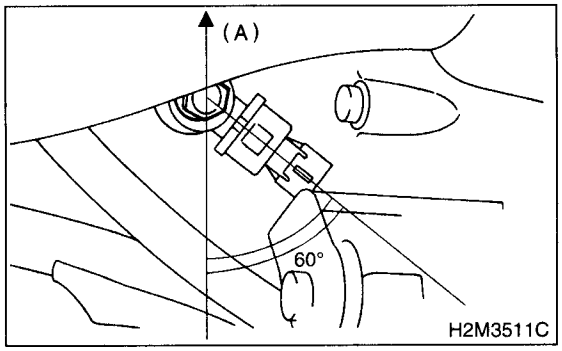


B: INSTALLATION

1) Install the knock sensor to the cylinder block.

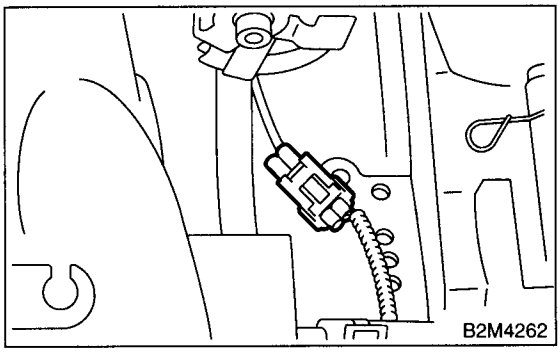
Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

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

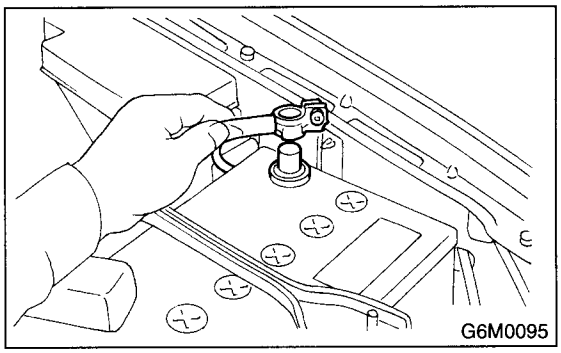


(A) Front side

2) Connect the knock sensor connector.



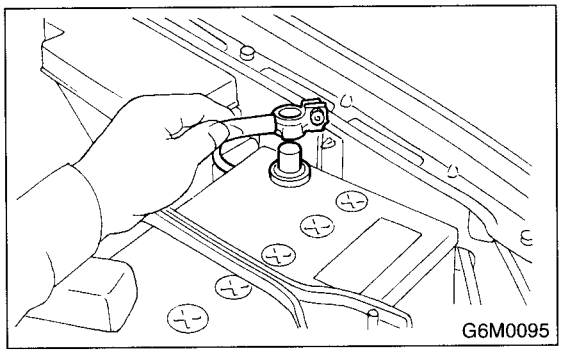
3) Install the intercooler. <Ref. to IN(DOHC TURBO)-11, INSTALLATION, Intercooler.>
4) Connect the battery ground cable.



8. Throttle Position Sensor

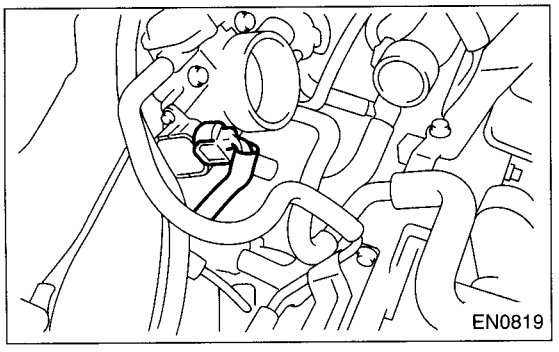
A: REMOVAL

1) Disconnect the battery ground cable.

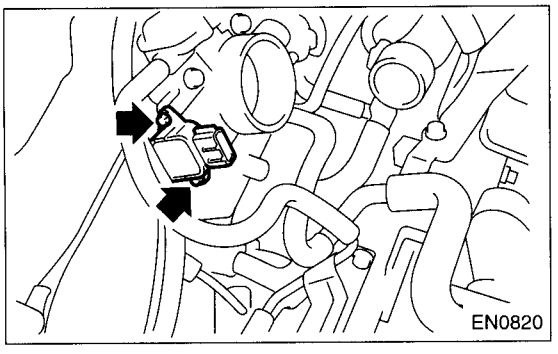


2) Remove the intercooler. <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>

3) Disconnect the connector from the throttle position sensor.



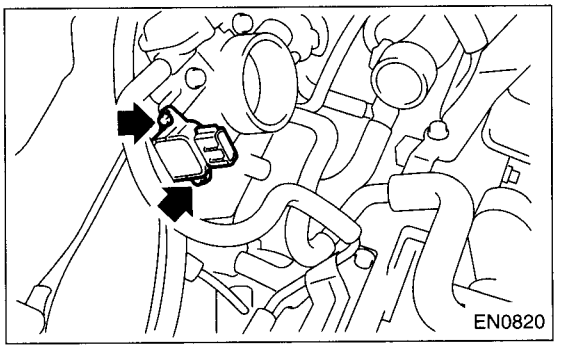
4) Remove the throttle position sensor holding screws, and remove it.



B: INSTALLATION

Install in the reverse order of removal.

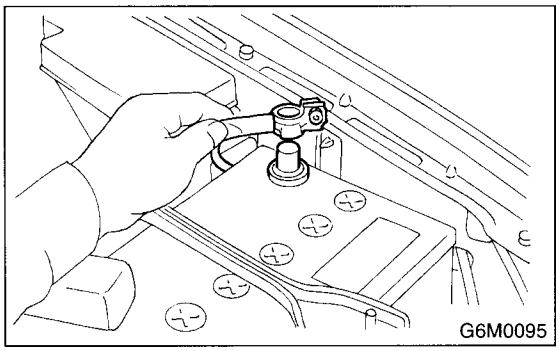
Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



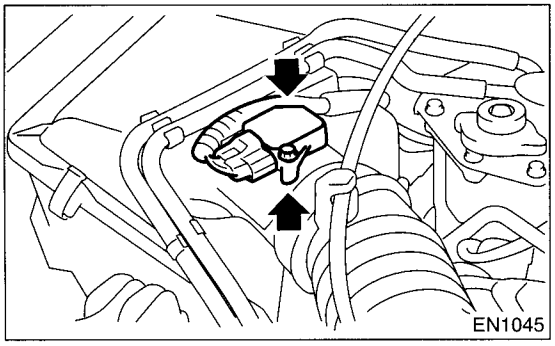
9. Mass Air Flow and Intake Air Temperature Sensor

A: REMOVAL

1) Disconnect the battery ground cable.



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

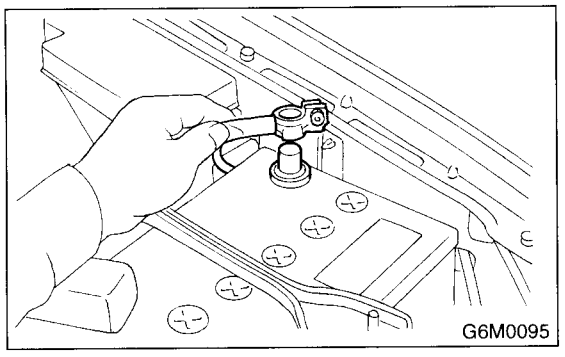
Install in the reverse order of removal.

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

10. Pressure Sensor

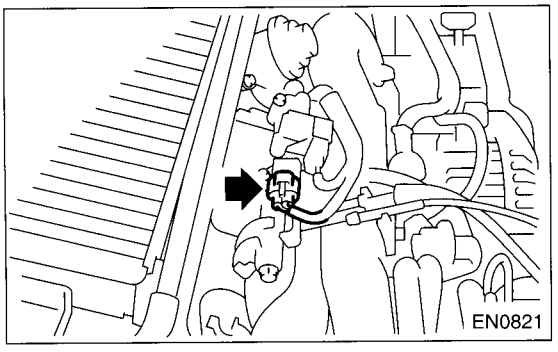
A: REMOVAL

1) Disconnect the battery ground cable.



2) Remove the idle air control solenoid valve. <Ref. to FU(DOHC TURBO)-36, REMOVAL, Idle Air Control Solenoid Valve.>

3) Disconnect the connectors from pressure sensor.



4) Remove the pressure sensor from the throttle body.

B: INSTALLATION

Install in the reverse order of removal.

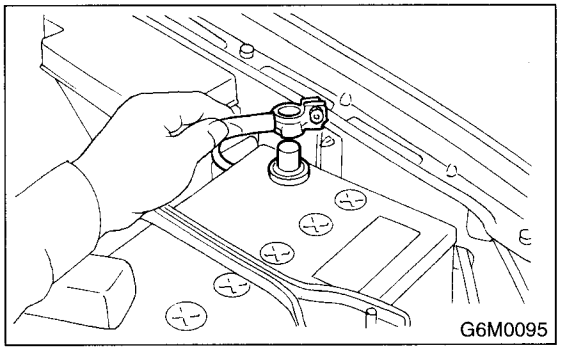
NOTE:
Replace the O-ring for the pressure sensor with new ones.

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

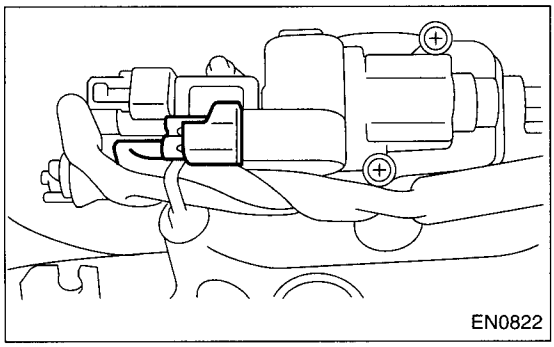
11. Idle Air Control Solenoid Valve

A: REMOVAL

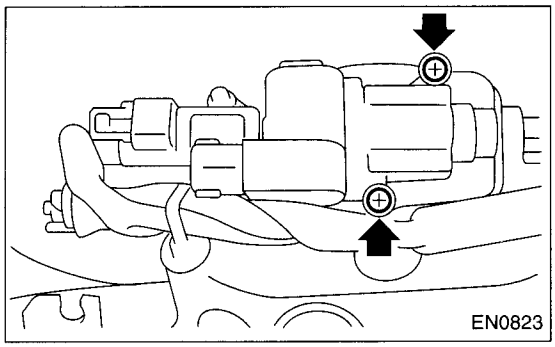
1) Disconnect the battery ground cable.



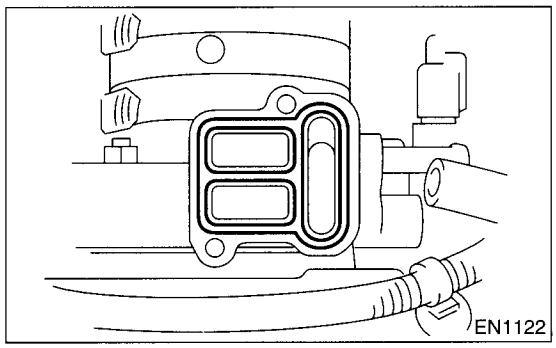
2) Disconnect the connector from the idle air control solenoid valve.



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



4) Remove the gasket from throttle body.

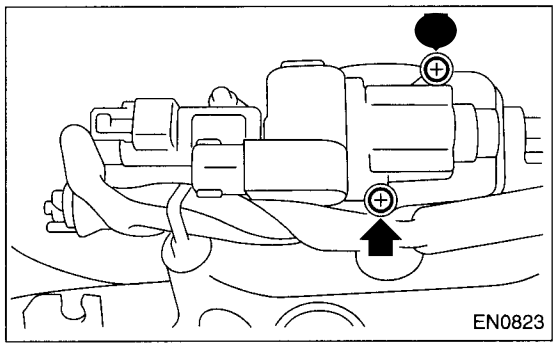


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Always use a new gasket.

Tightening torque:
2.8 N·m (0.29 kgf-m, 2.1 ft-lb)

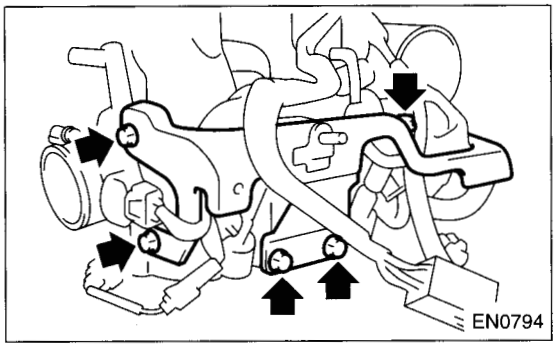


12.Fuel Injector

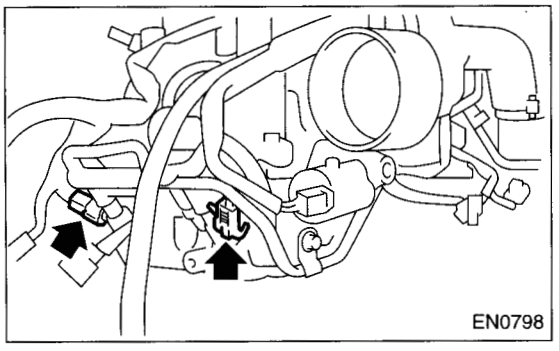
A: REMOVAL

1. RH SIDE

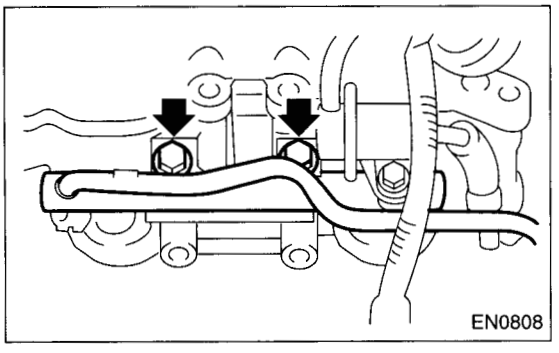
1) Remove the intake manifold. <Ref. to FU(DOHC TURBO)-15, REMOVAL, Intake Manifold.>
2) Remove the fuel pipe protector RH.

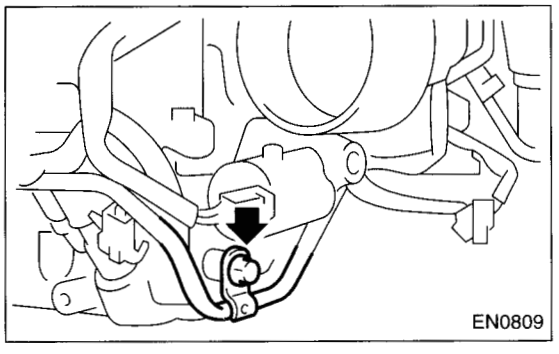


3) Disconnect the connector from the fuel injector.

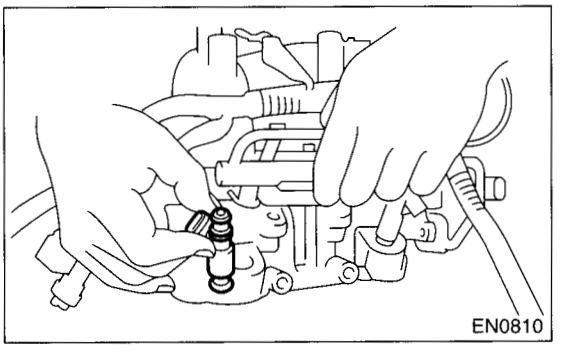


4) Remove the bolts which hold the injector pipe to intake manifold.



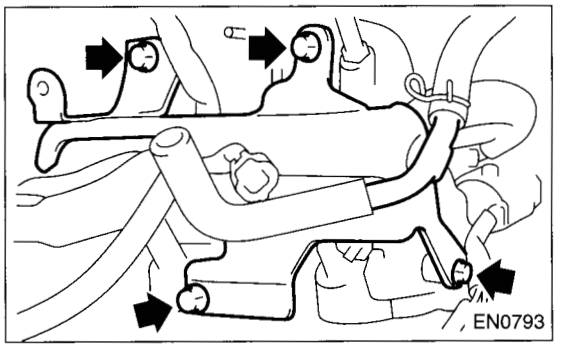


5) Remove the fuel injector while lifting up the fuel injector pipe.

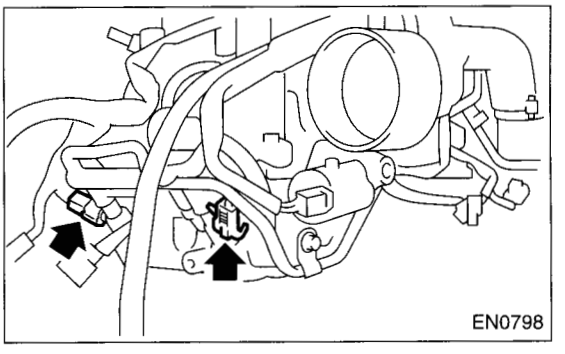


2. LH SIDE

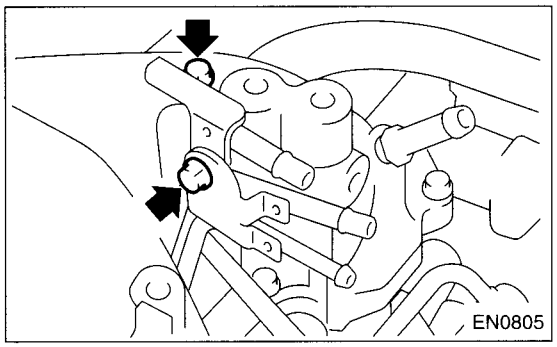
1) Remove the intake manifold. <Ref. to FU(DOHC TURBO)-15, REMOVAL, Intake Manifold.>
2) Remove the fuel pipe protector LH.

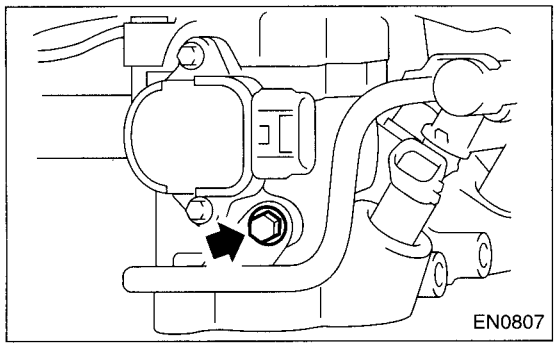


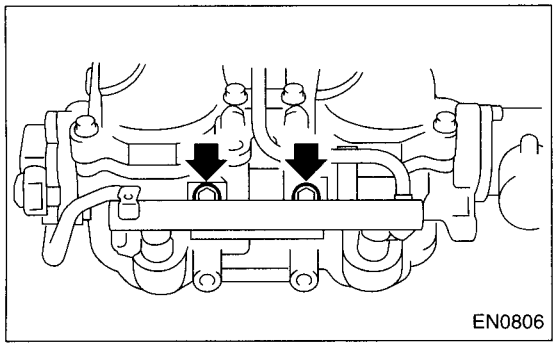
3) Disconnect the connector from the fuel injector.



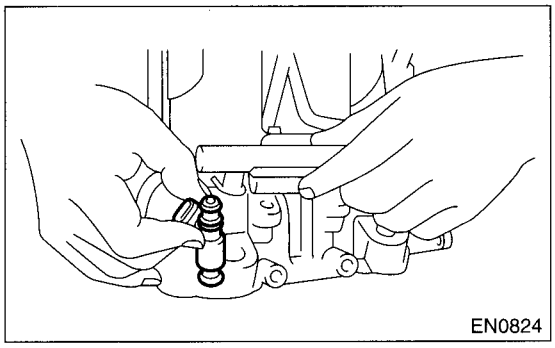
4) Remove the bolts which hold the injector pipe to intake manifold.







5) Remove the fuel injector while lifting up the fuel injector pipe.

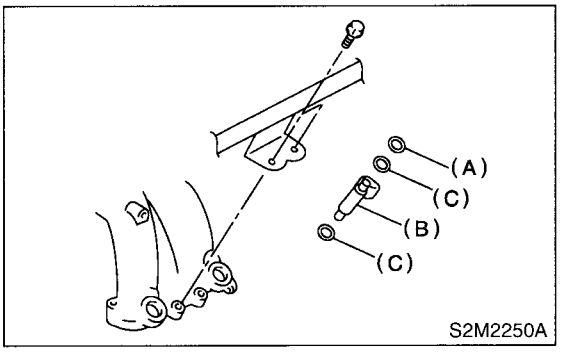


B: INSTALLATION

1. RH SIDE

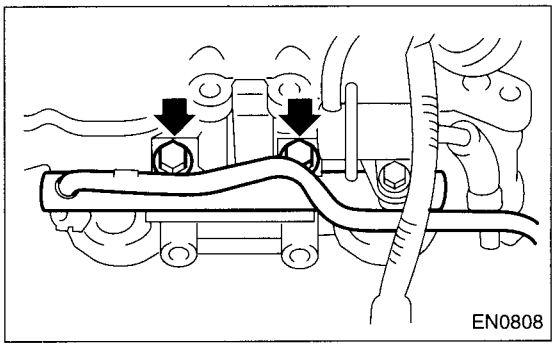
Install in the reverse order of removal.

NOTE:
Replace the O-ring and insulators with new ones.

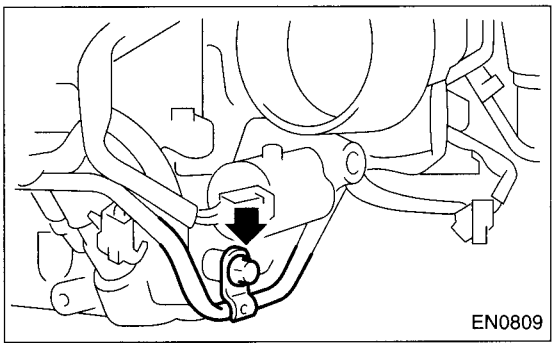


(A) O-ring
(B) Fuel injector
(C) Insulator

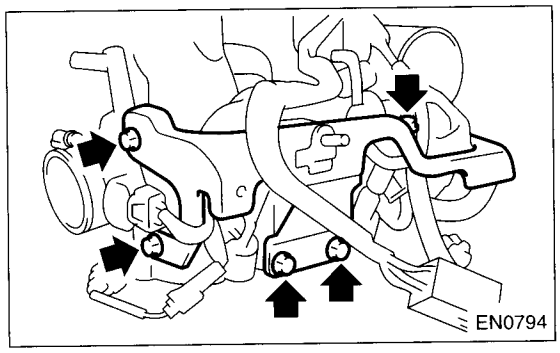
Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



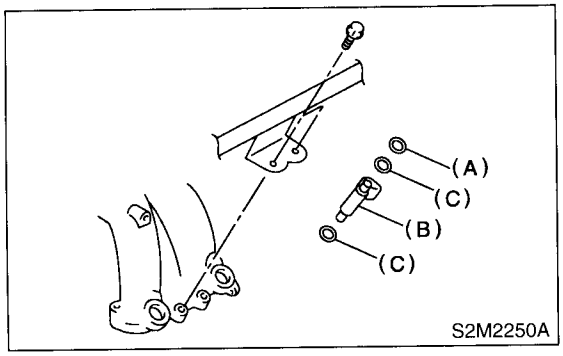
Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



2. LH SIDE

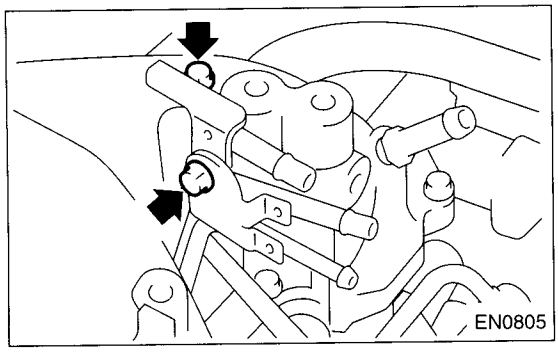
Install in the reverse order of removal.

NOTE:
Replace the O-ring and insulators with new ones.

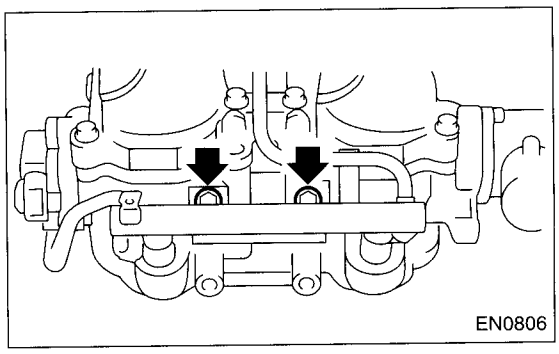


(A) O-ring
(B) Fuel injector
(C) Insulator

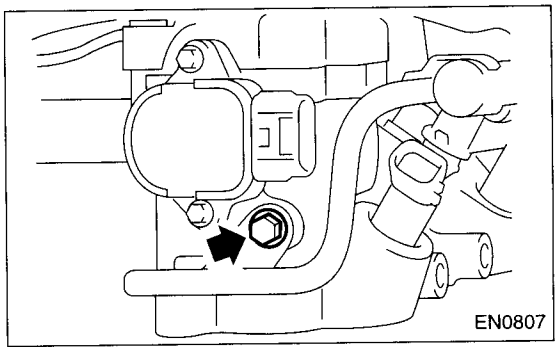
Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)



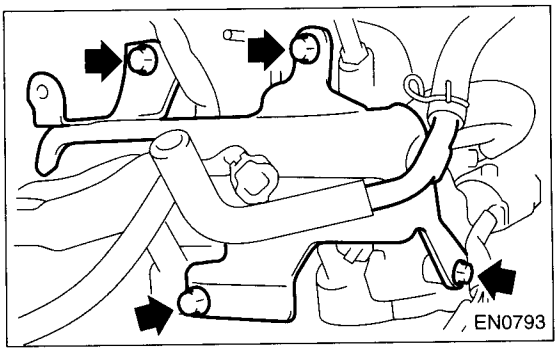
Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



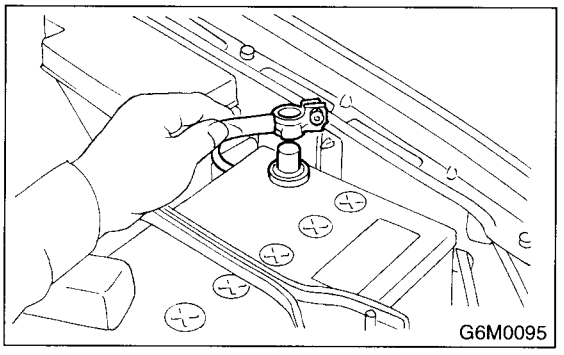
Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



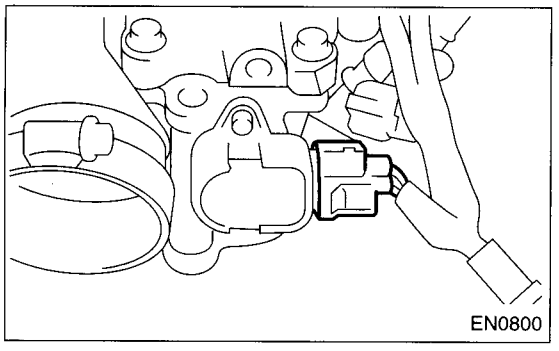
13. Tumble Generator Valve Assembly

A: REMOVAL

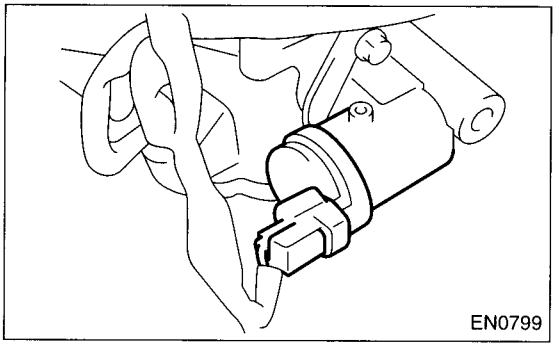
1) Disconnect the battery ground cable.



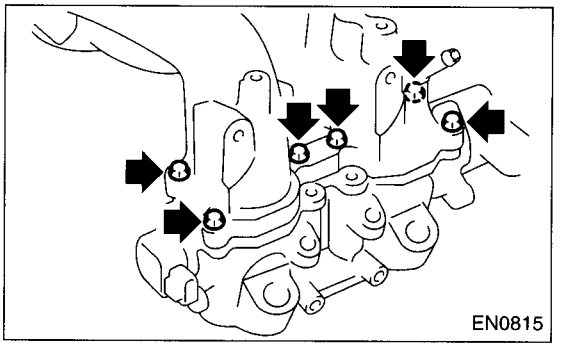
2) Remove the intake manifold. <Ref. to FU(DOHC TURBO)-15, REMOVAL, Intake Manifold.>
3) Disconnect the connector from the tumble generator valve sensor.



4) Disconnect the connector from the tumble generator valve actuator.



5) Remove the fuel injector. <Ref. to FU(DOHC TURBO)-37, REMOVAL, Fuel Injector.>
6) Remove the tumble generator valve body from the intake manifold.

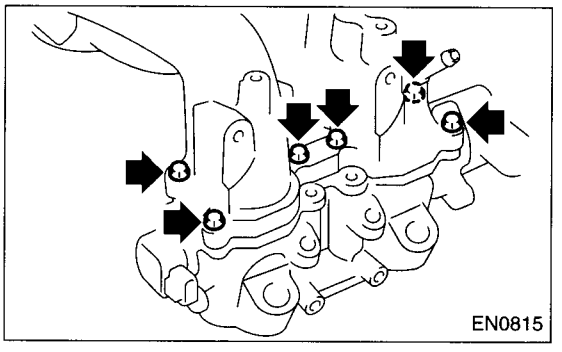


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Always use new gaskets.

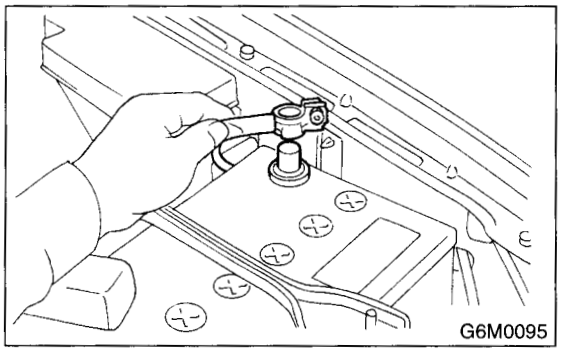
Tightening torque:
8.25 N·m (0.84 kgf-m, 6.1 ft-lb)



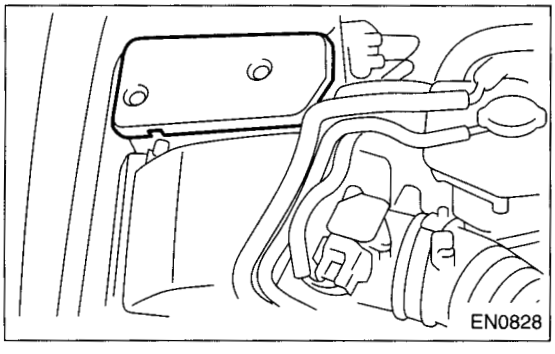
14. Wastegate Control Solenoid Valve

A: REMOVAL

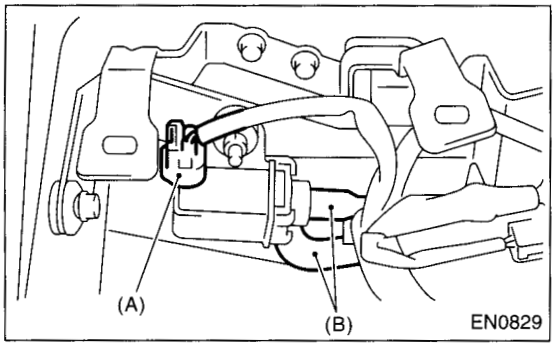
1) Disconnect the battery ground cable.



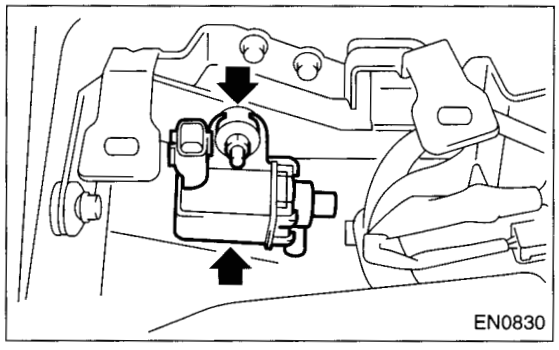
2) Remove the solenoid valve cover.



3) Disconnect the connector (A) from the wastegate control solenoid valve.
4) Disconnect the pressure hoses (B) from the wastegate control solenoid valve.



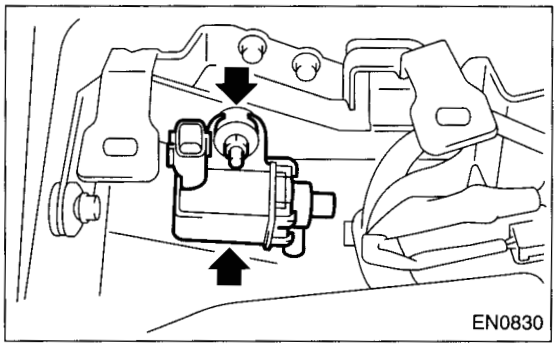
5) Remove the wastegate control solenoid valve from the bracket



B: INSTALLATION

Install in the reverse order of removal.

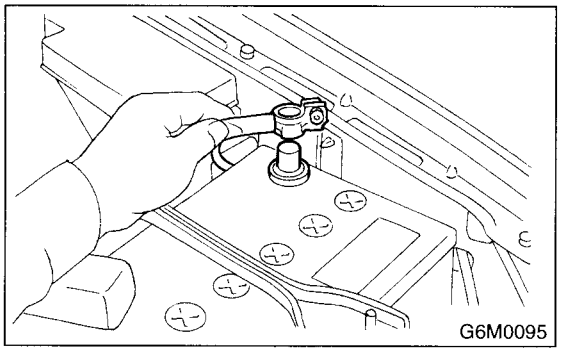
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



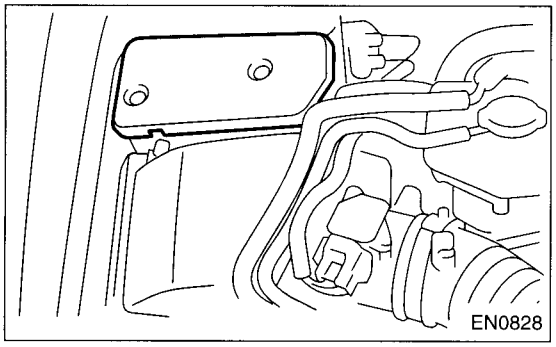
15.Front Oxygen (A/F) Sensor

A: REMOVAL

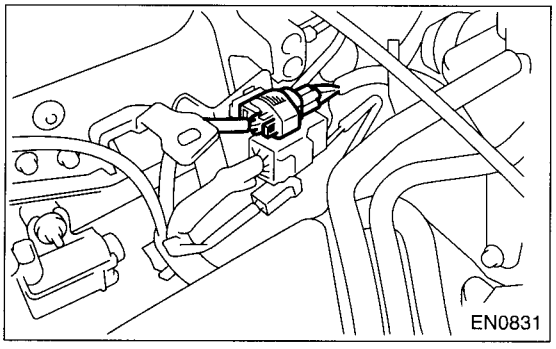
1) Disconnect the battery ground cable.



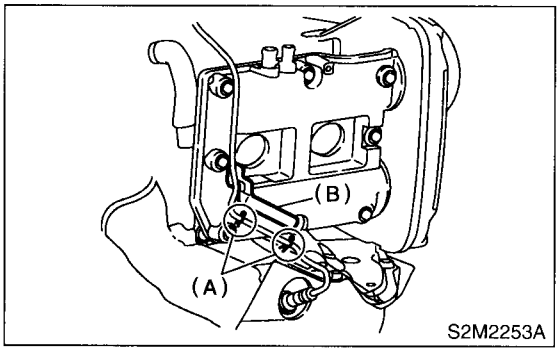
2) Remove the solenoid valve cover.



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



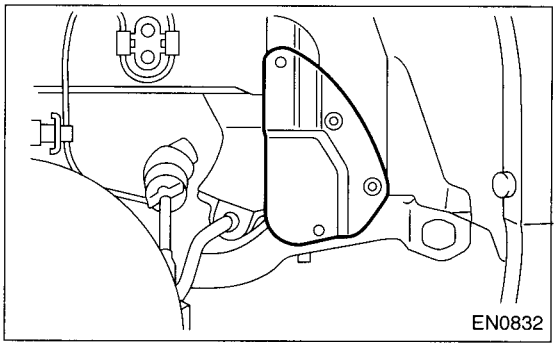
4) Disconnect the engine harness fixed by clip (A) from the bracket (B).



5) Remove the front right side wheel.

6) Lift-up the vehicle.

7) Remove the service hole cover.

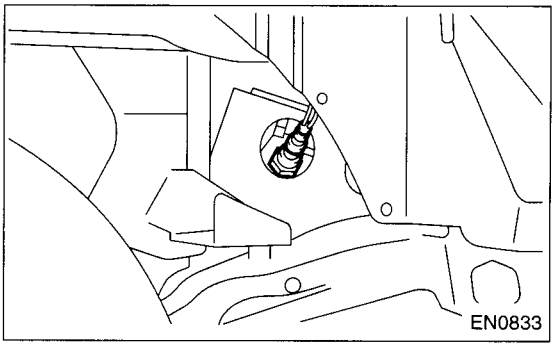


8) Apply SUBARU CRC or its equivalent to the threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

9) 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

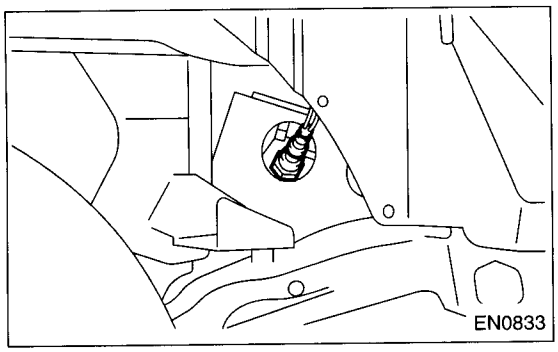
1) Before installing front oxygen (A/F) sensor, apply the anti-seize compound only to the threaded portion of front oxygen (A/F) sensor to make the next removal easier.

Anti-seize compound:
SS-30 by JET LUBE

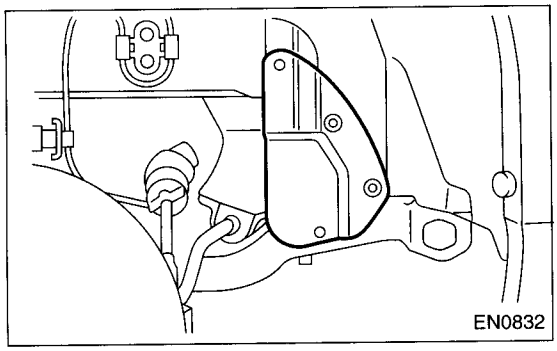
CAUTION:
Never apply anti-seize compound to protector of front oxygen (A/F) sensor.

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

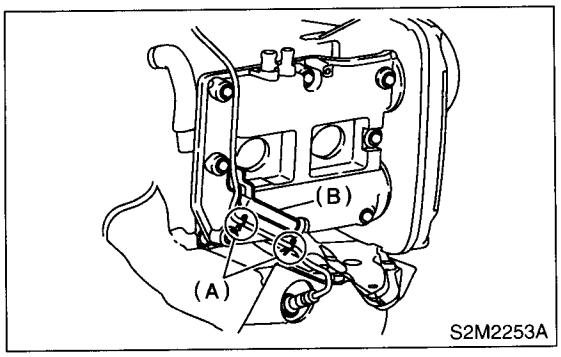
Tightening torque:
21N·m (2.1 kgf-m, 15.2 ft-lb)



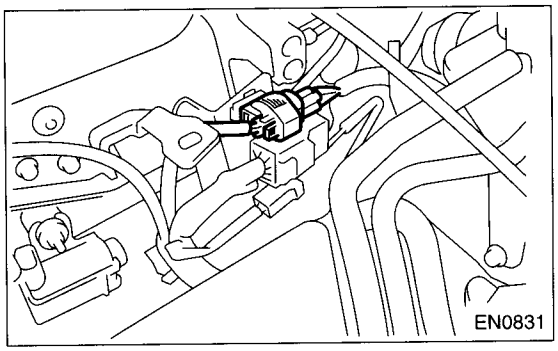
3) Install the service hole cover.



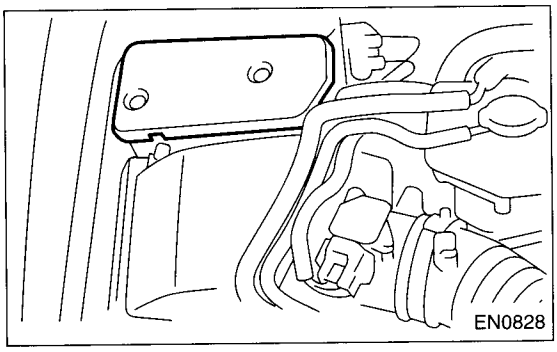
4) Lower the vehicle.
5) Install the front right side wheel.
6) Connect the engine harness with clip (A) to the bracket (B).



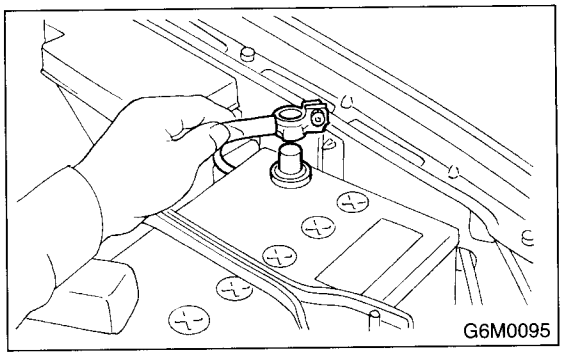
7) Connect the connector of front oxygen (A/F) sensor.



8) Install the solenoid valve cover.



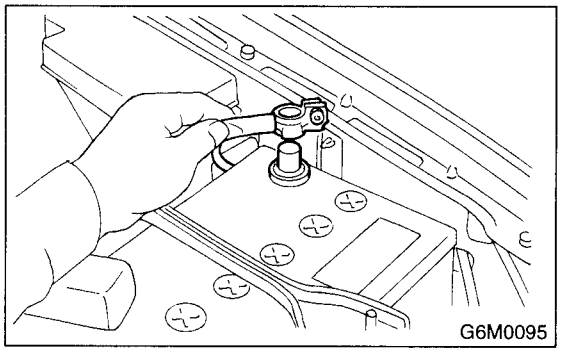
9) Connect the battery ground cable.



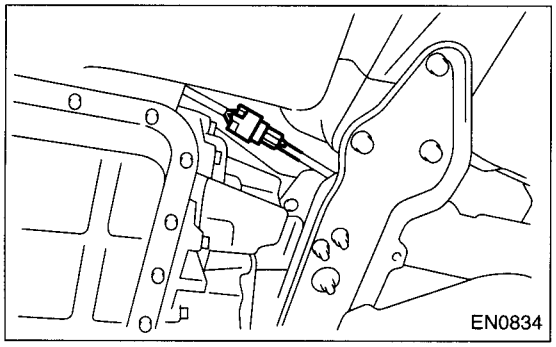
16. Rear Oxygen Sensor

A: REMOVAL

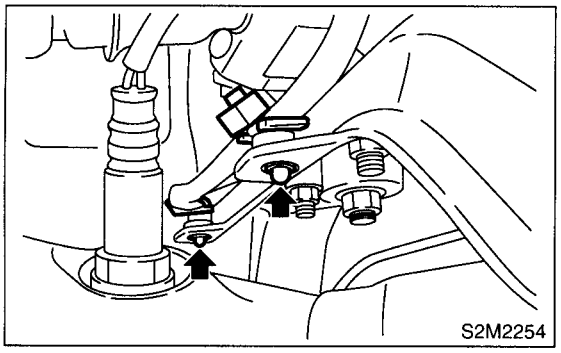
1) Disconnect the battery ground cable.



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



4) Remove the clip by pulling out from the upper side of crossmember.

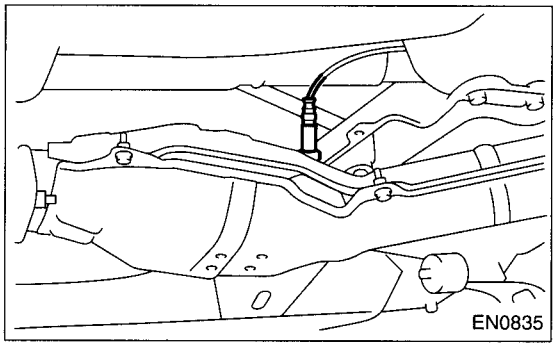


5) Apply SUBARU CRC or its equivalent to the threaded portion of rear oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

6) Remove the rear oxygen sensor.

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



B: INSTALLATION

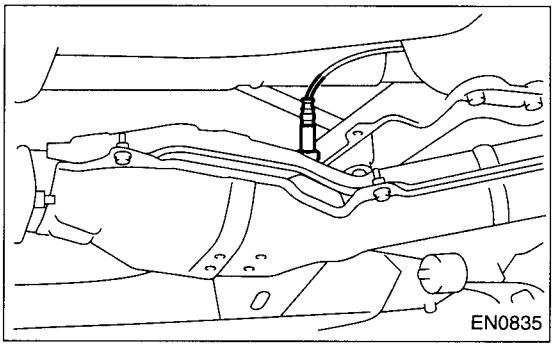
1) Before installing rear oxygen sensor, apply the anti-seize compound only to the threaded portion of rear oxygen sensor to make the next removal easier.

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

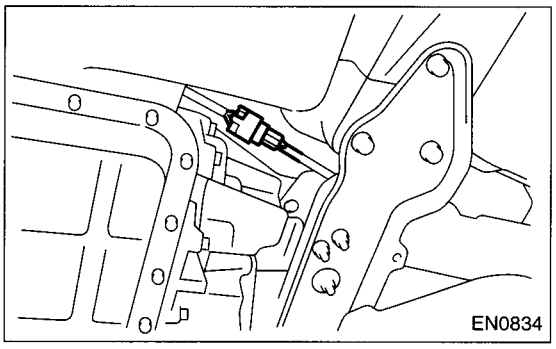
Anti-seize compound:
SS-30 by JET LUBE

2) Install the rear oxygen sensor.

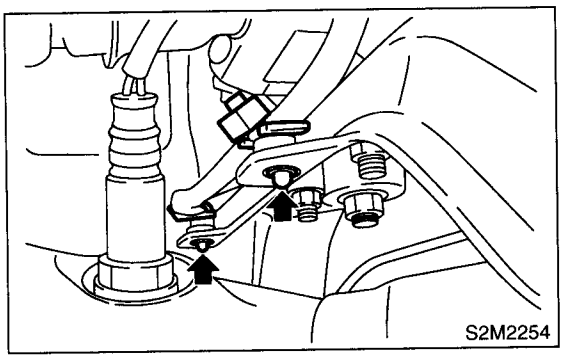
Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)



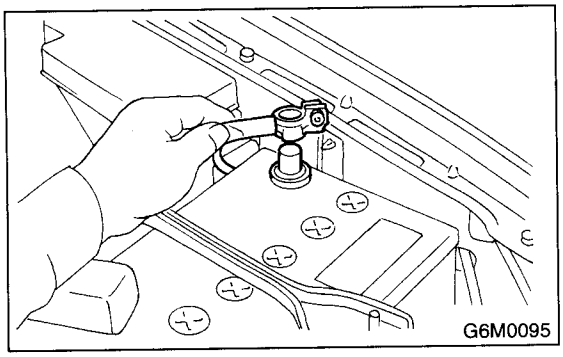
3) Connect the connector to the rear oxygen sensor.



4) Connect the clip to the crossmember.



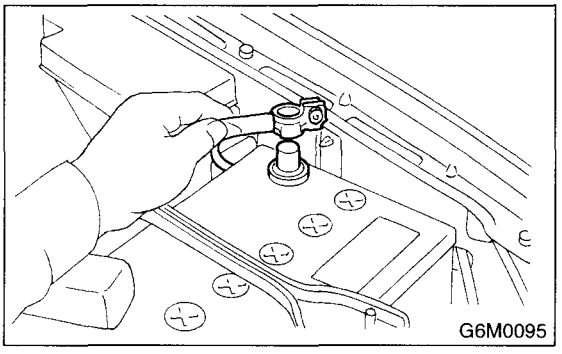
5) Lower the vehicle.
6) Connect the battery ground cable.



17.Exhaust Temperature Sensor

A: REMOVAL

1) Disconnect the battery ground cable.

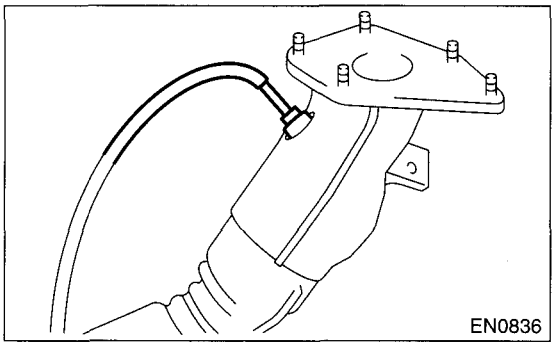


2) Remove the joint pipe. <Ref. to EX(DOHC TURBO)-12, REMOVAL, Joint Pipe.>
3) Apply SUBARU CRC or its equivalent to the threaded portion of exhaust temperature sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

4) Remove the exhaust temperature sensor.

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



B: INSTALLATION

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

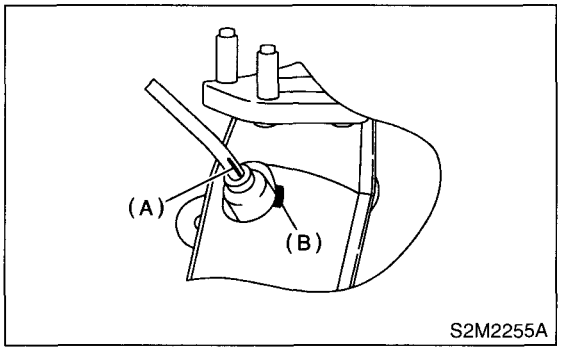
CAUTION:
Never apply anti-seize compound to protector of exhaust temperature sensor.

Anti-seize compound:
SS-30 by JET LUBE

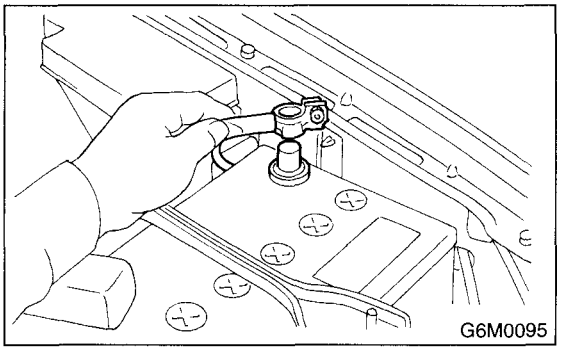
2) Install the exhaust temperature sensor.

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)



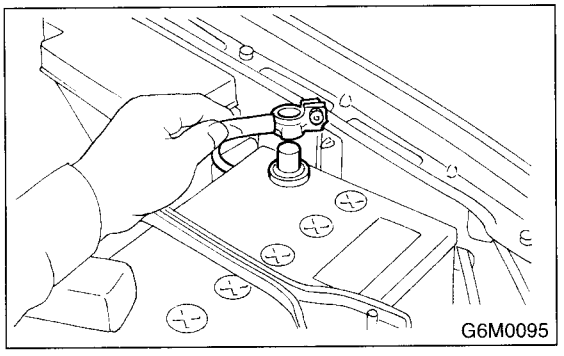
3) Install the joint pipe <Ref. to EX(DOHC TURBO)-12, INSTALLATION, Joint Pipe.>.
4) Connect the battery ground cable.



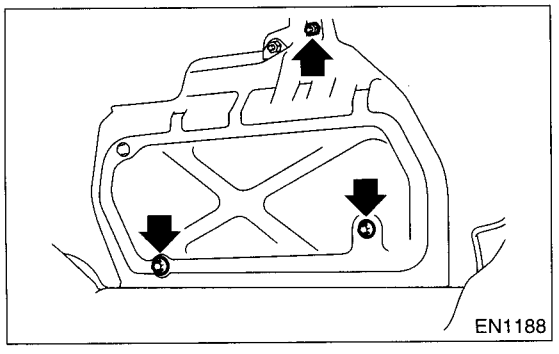
18.Engine Control Module

A: REMOVAL

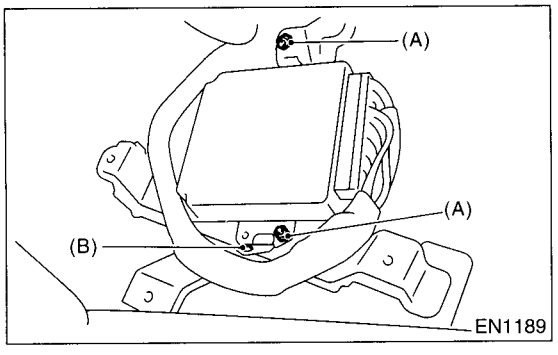
1) Disconnect the battery ground cable.



2) Remove the lower inner trim of the passenger side.
<Ref. to EI-46, REMOVAL, Lower Inner Trim.>
3) Detach the floor mat of the 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

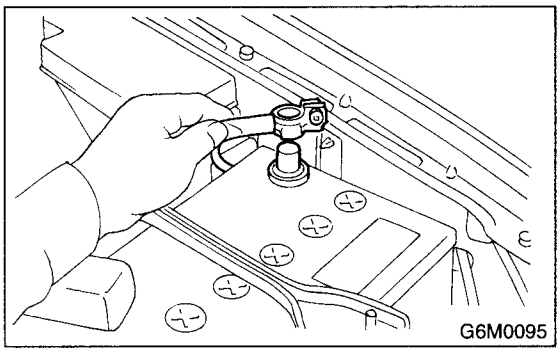
Install in the reverse order of removal.

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

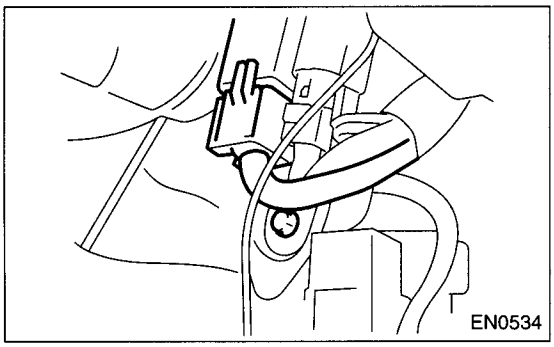
19.Main Relay

A: REMOVAL

1) Disconnect the battery ground cable.



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



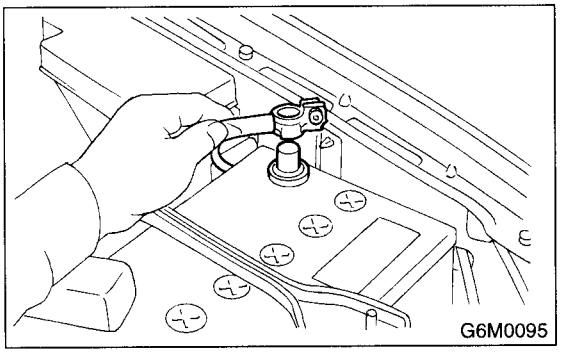
B: INSTALLATION

Install in the reverse order of removal.

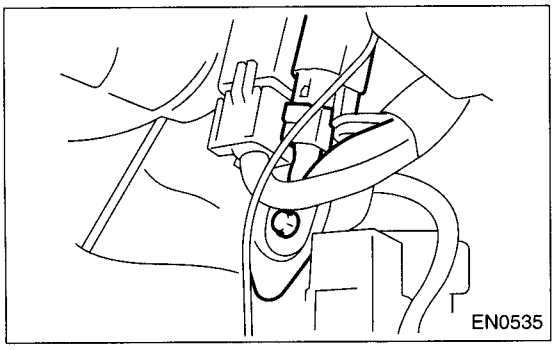
20.Fuel Pump Relay

A: REMOVAL

1) Disconnect the battery ground cable.



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 relay.



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

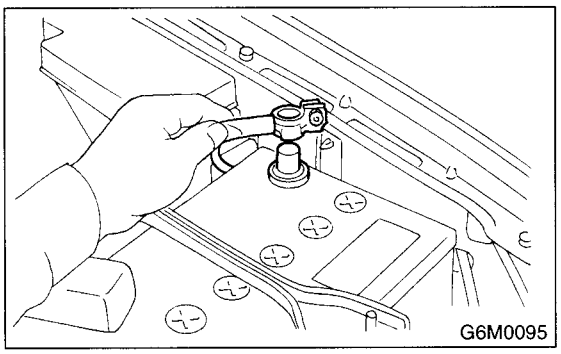
B: INSTALLATION

Install in the reverse order of removal.

21.Fuel Pump Controller

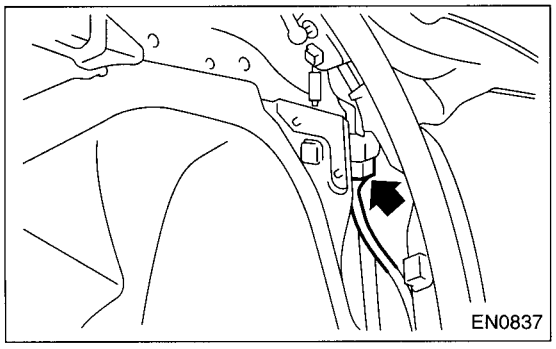
A: REMOVAL

1) Disconnect the battery ground cable.

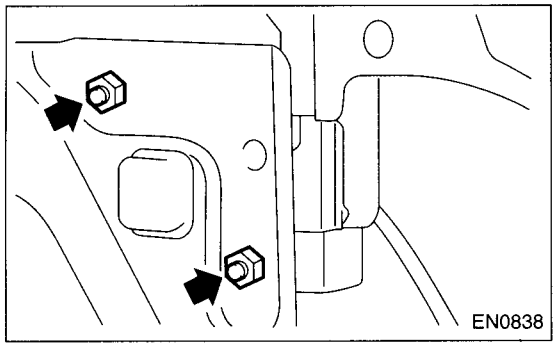


2) Remove the rear quarter trim. <Ref. to EI-47, REMOVAL, Rear Quarter Trim.>

3) Disconnect the connector from the fuel pump control unit.



4) Remove the fuel pump control unit.



B: INSTALLATION

Install in the reverse order of removal.

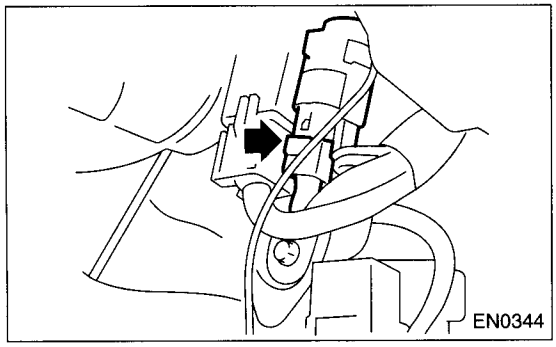
22.Fuel

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 the fuel pump relay.

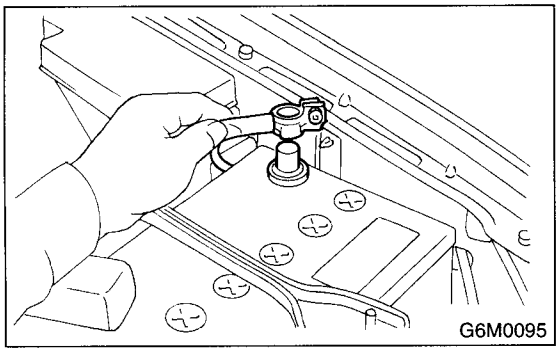


2) Start the engine and run it until it stalls.
3) After the engine stalls, crank it for five more seconds.
4) Turn the ignition switch to OFF.

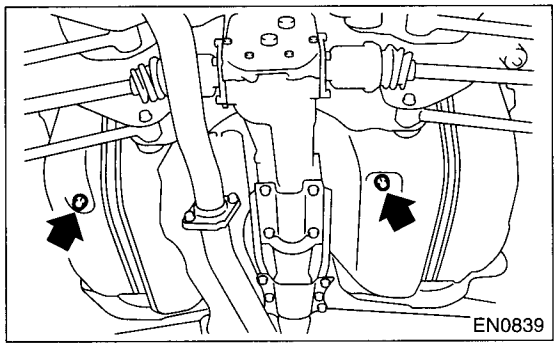
2. DRAINING FUEL

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

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

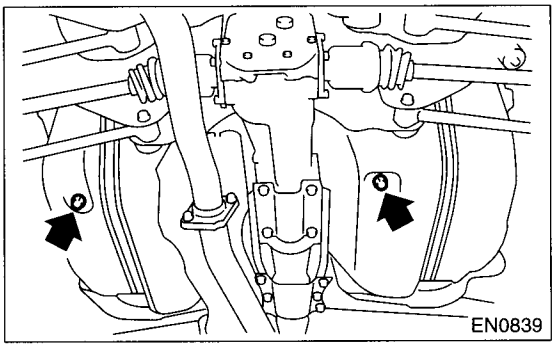


3) Lift-up the vehicle.
4) Drain the fuel from the fuel tank.
Set a container under the vehicle and remove drain plug from the fuel tank.



5) Tighten the fuel drain plug.

Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)

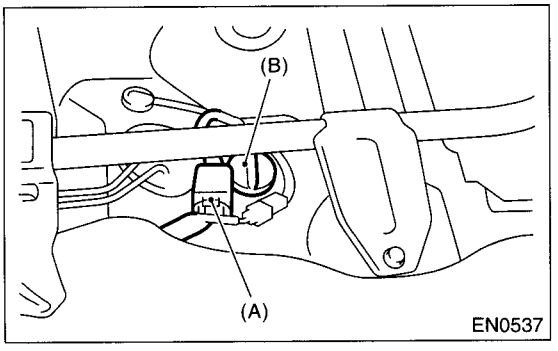


23.Fuel Tank

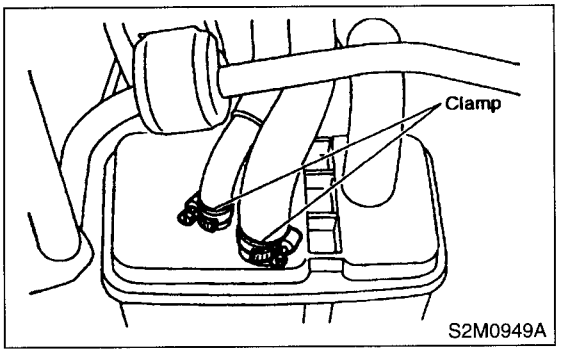
A: REMOVAL

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

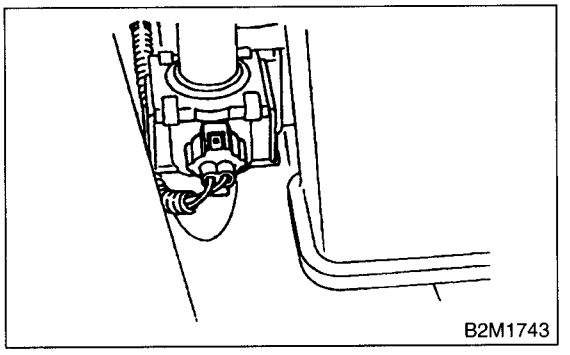
1) Set the vehicle on the lift.
2) Release the fuel pressure. <Ref. to FU(DOHC TURBO)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
3) Drain the fuel from the fuel tank. <Ref. to FU(DOHC TURBO)-51, DRAINING FUEL, OPERATION, Fuel.>
4) Remove the rear seat.
5) Disconnect the connector (A) of fuel tank cord to the rear harness.
6) Push the grommet (B) which holds the fuel tank cord on floor panel into under the body.



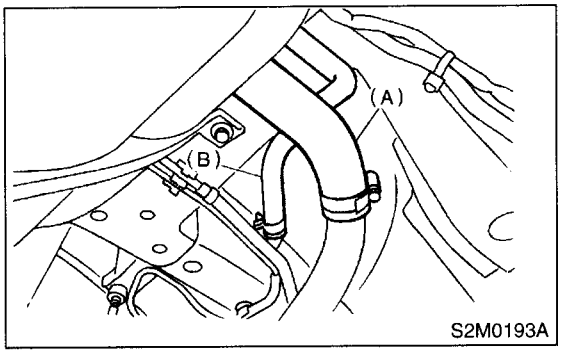
7) Remove the rear crossmember. <Ref. to RS-19, REMOVAL, Rear Crossmember.>
8) Move the clamp, and disconnect the evaporation hose from canister.



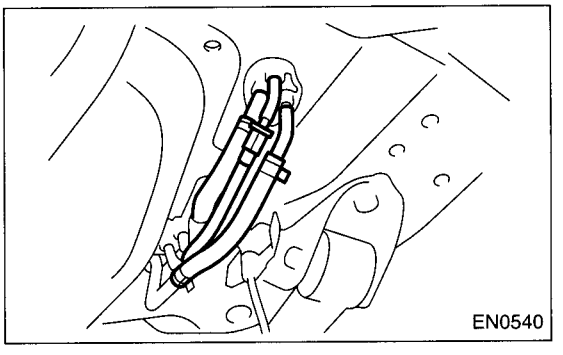
9) Disconnect the connector from the pressure control solenoid valve.
10) Disconnect the connector from the drain valve.



11) Loosen the clamp and disconnect the fuel filler hose (A) and air vent hose (B) from fuel filler pipe and air vent pipe.

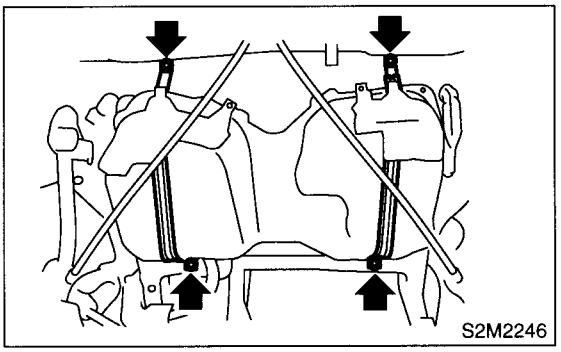


12) Move the clips, and disconnect the quick connector. <Ref. to FU(DOHC TURBO)-68, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
13) Disconnect the fuel hoses.



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

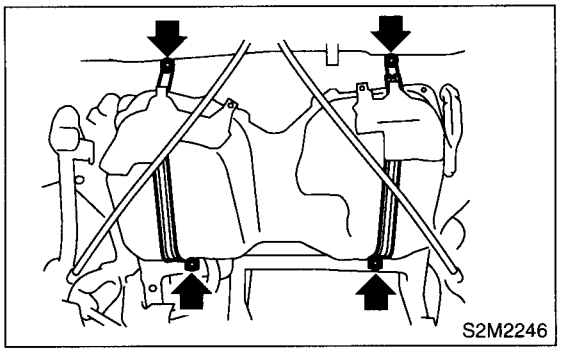
WARNING:
A helper is required to perform this work.



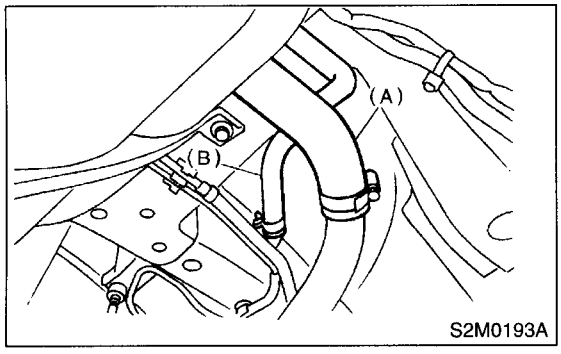
B: INSTALLATION

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

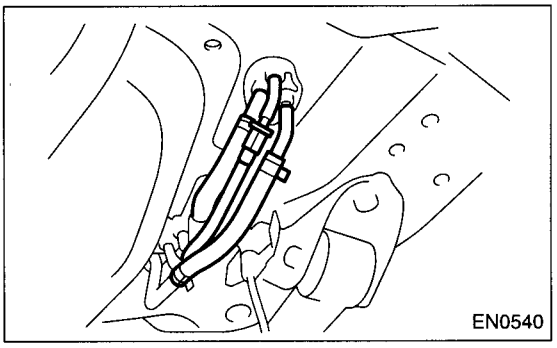
WARNING:
A helper is required to perform this work.



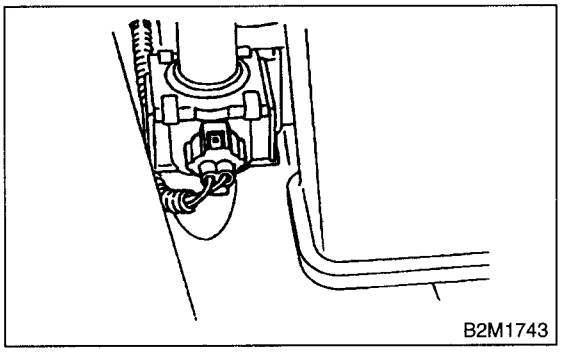
3) Connect the fuel filler hose and air vent hose.



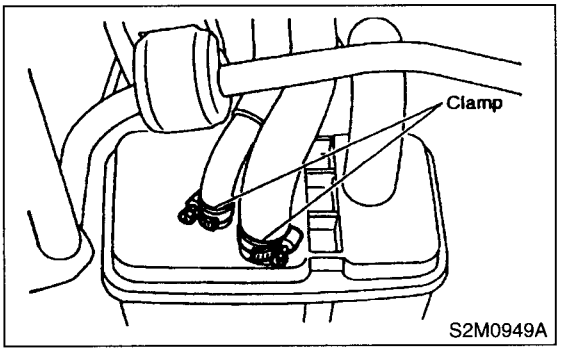
4) Connect the fuel hoses, and hold them with clips and quick connector. <Ref. to FU(DOHC TURBO)-69, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>



5) Connect the connector to the drain valve.

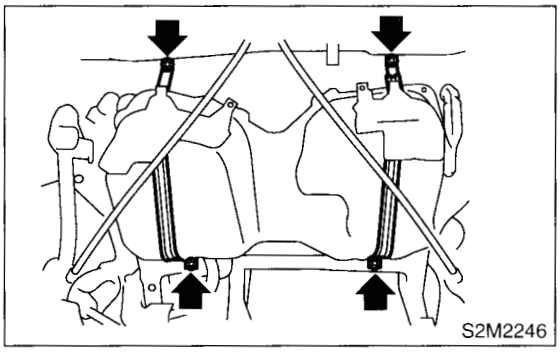


6) Connect the connector to the pressure control solenoid valve.
7) Connect the evaporation hose to the canister, and hold them with clamp.

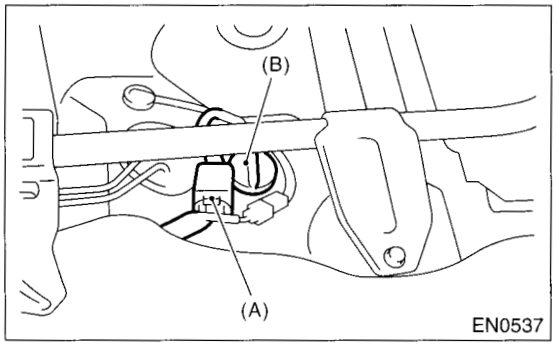


8) Tighten the band mounting bolts.

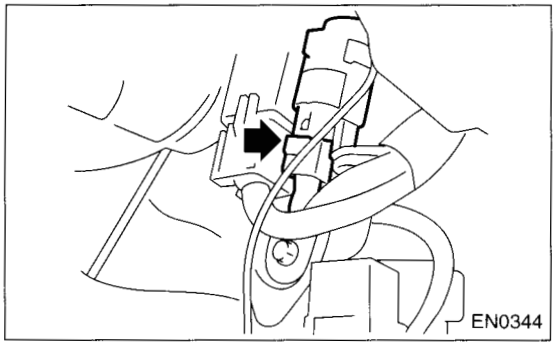
Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)



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



11) Set the rear seat and floor mat.
12) Connect the connector to the fuel pump relay.



C: INSPECTION

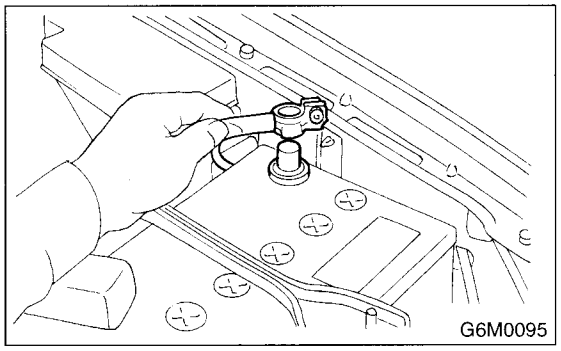
1) Make sure there are no cracks, holes, or other damage on the fuel tank.
2) Make sure that the fuel hoses and fuel pipes are not cracked and that connections are tight.

24.Fuel Filler Pipe

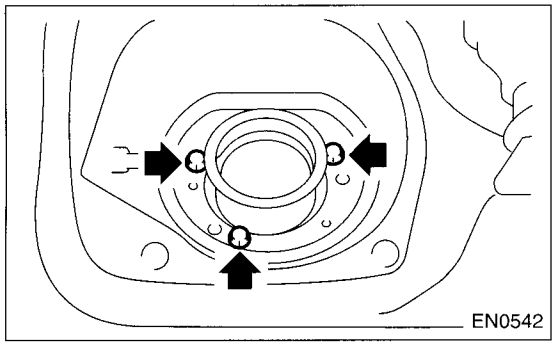
A: REMOVAL

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

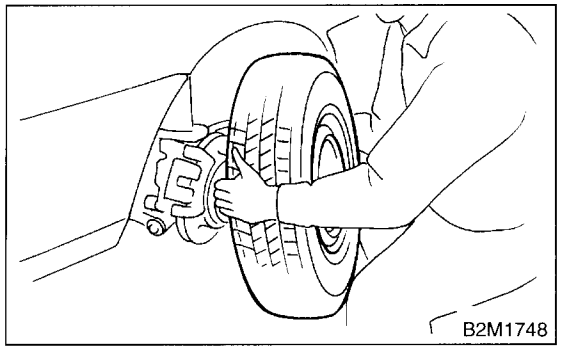
1) Release the fuel pressure. <Ref. to FU(DOHC TURBO)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid and remove the filler cap.
3) Disconnect the battery ground cable.


G6M0095

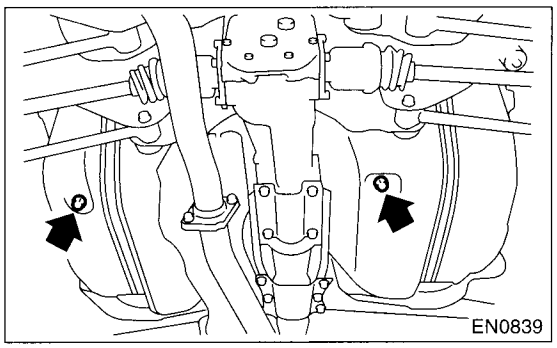
4) Remove the screws holding packing in place.


EN0542

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

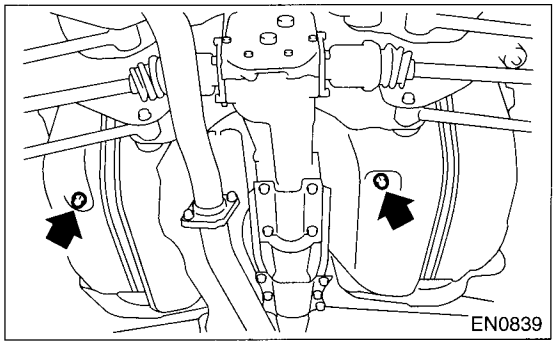

B2M1748

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

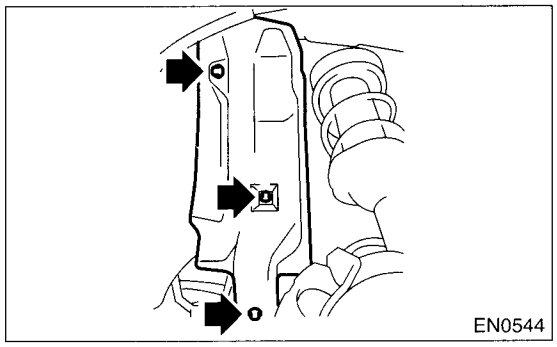

EN0839

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

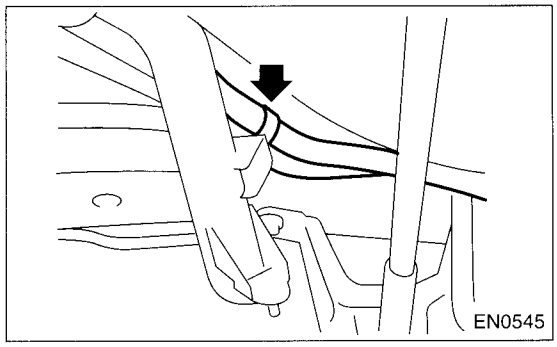
Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)


EN0839

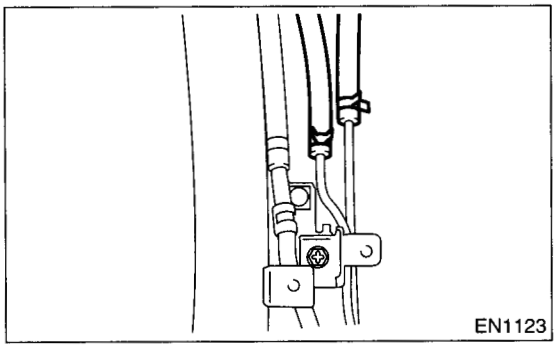
10) Remove the fuel filler pipe protector.


EN0544

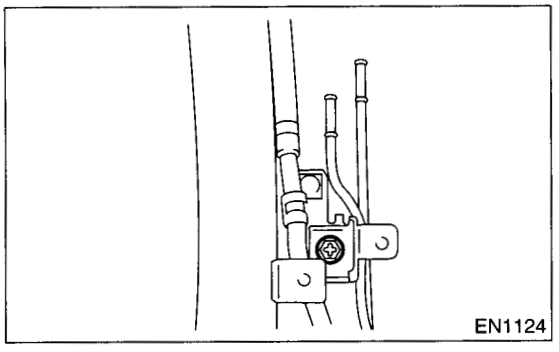
11) Separate the evaporation hoses from the clip of fuel filler pipe.


EN0545

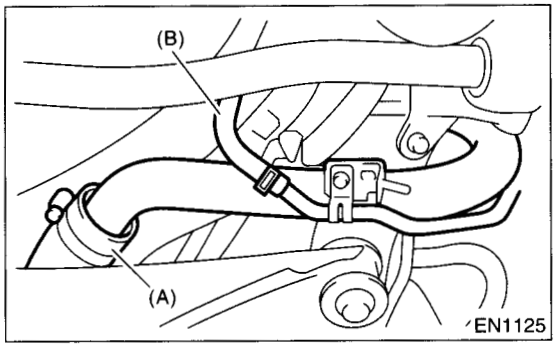
12) Disconnect the evaporation hoses from the pipes.



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

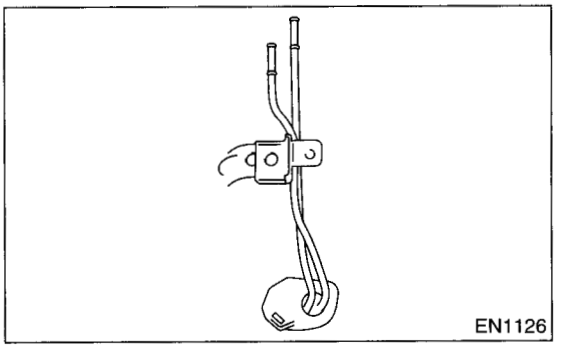


14) Loosen the clamp and separate the fuel filler hose (A) from fuel filler pipe.
15) Move the clip and separate the evaporation hose (B).



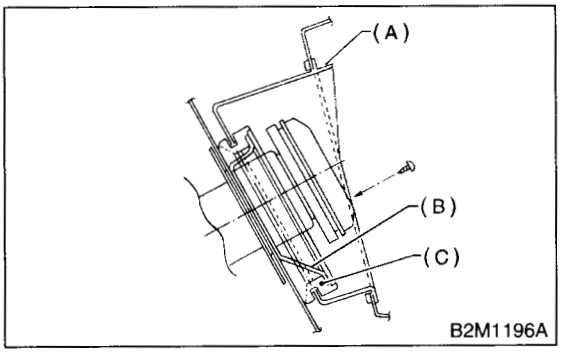
16) Remove the fuel filler pipe to under side of the vehicle.

17) Remove the air vent pipe together with clip from the body.



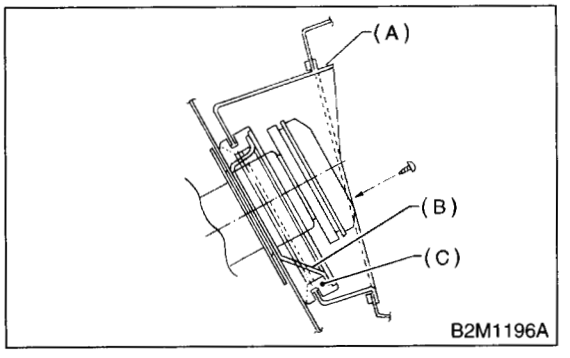
B: INSTALLATION

1) Hold the fuel filler flap open.
2) Set the fuel saucer (A) with rubber packing (C) and insert the fuel filler pipe into the hole from the inner side of apron.

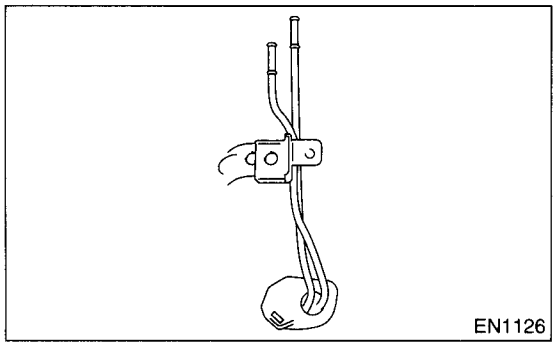


3) Align the holes in fuel filler pipe neck and set the cup (B), and tighten the screws.

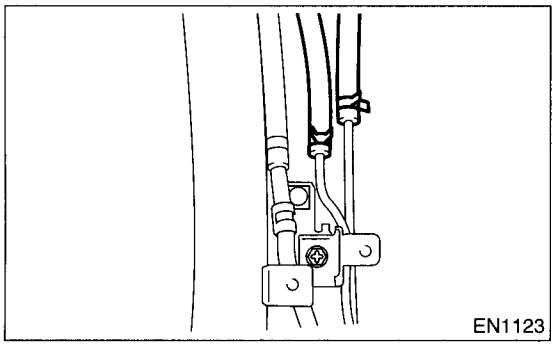
NOTE:
If edges of rubber packing are folded toward the inside, straighten it with a screwdriver.



4) Install the evaporation pipes.

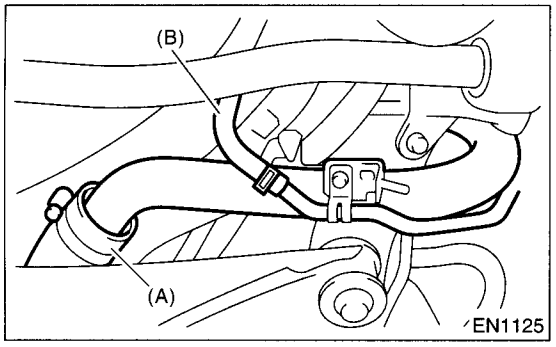


5) Connect the evaporation hose to pipes.



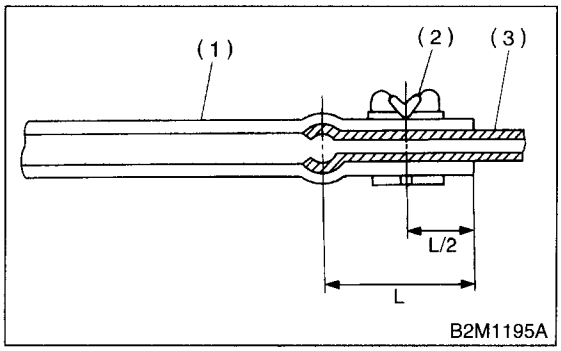
6) Insert the fuel filler hose (A) approximately 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten the clamp.

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



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

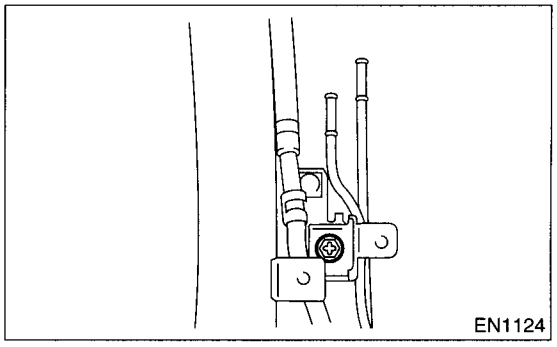
L = 27.5±2.5 mm (1.083±0.098 in)



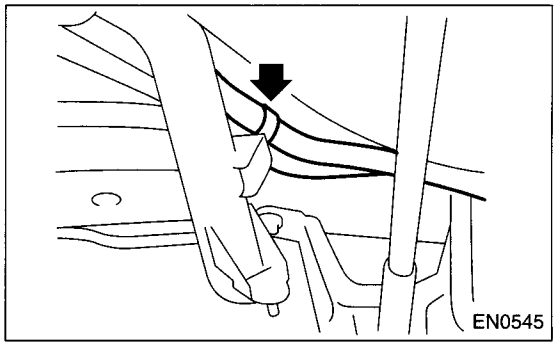
(1) Hose
(2) Clip
(3) Pipe

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

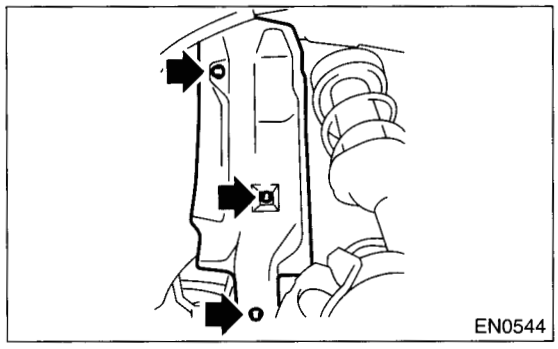
Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



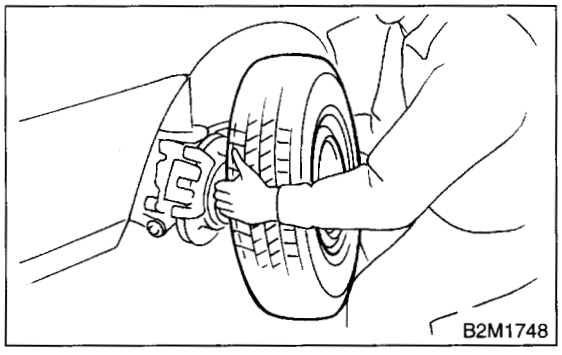
9) Tighten the bolts which hold evaporation hoses onto the clip of fuel filler pipe.



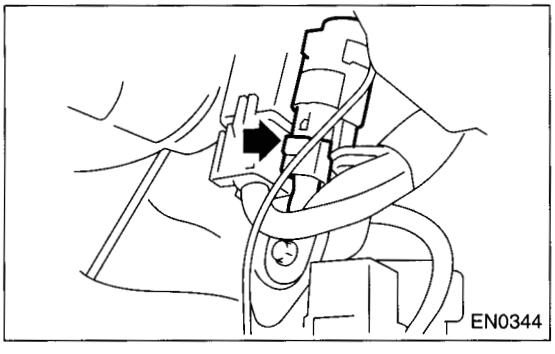
10) Install the fuel filler pipe protector.



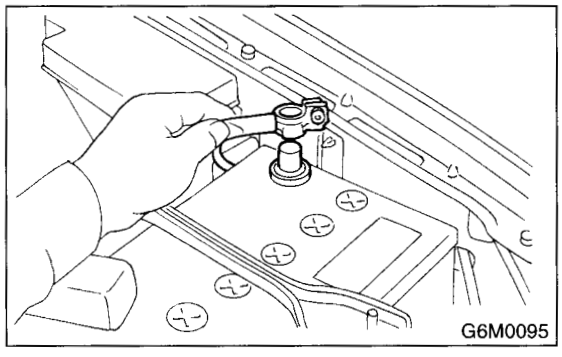
11) Install the rear right wheel.



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

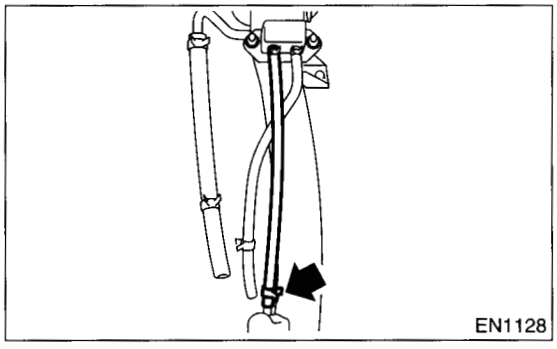


15) Connect the battery ground terminal.

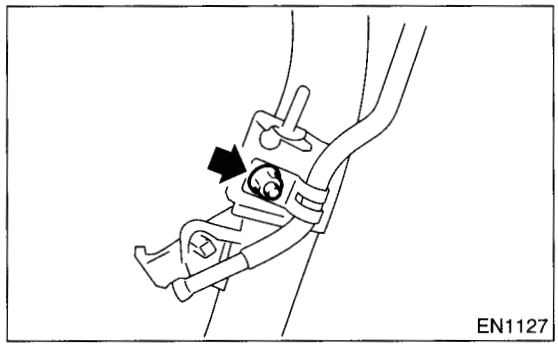


C: DISASSEMBLY

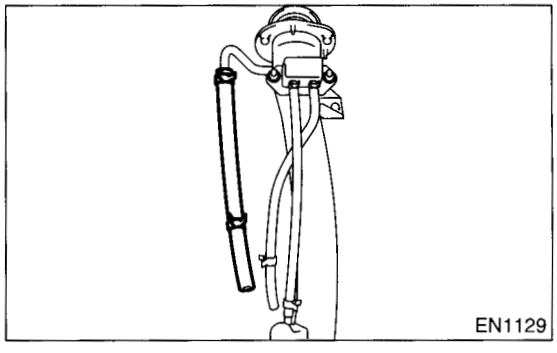
1) Move the clip, and disconnect the evaporation hose from joint pipe.



2) Remove the bolt which installs the joint pipe on fuel filler pipe.



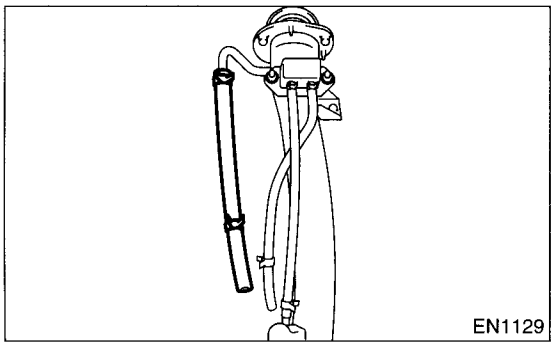
3) Disconnect the evaporation hose from the fuel filler pipe.



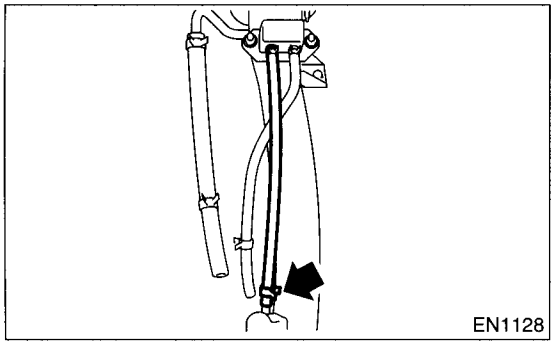
4) Remove the shut valve from the fuel filler pipe. <Ref. to EC(DOHC TURBO)-16, REMOVAL, Shut Valve.>

D: ASSEMBLY

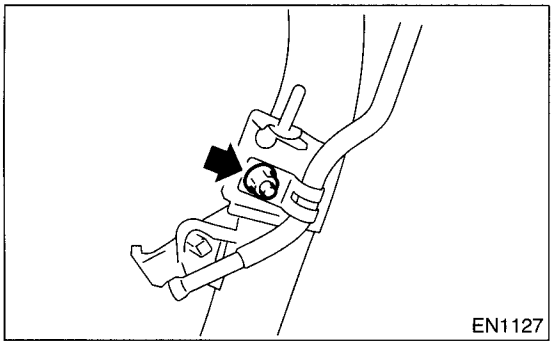
1) Install the shut valve on the fuel filler pipe. <Ref. to EC(DOHC TURBO)-16, INSTALLATION, Shut Valve.>
2) Connect the evaporation hose to the fuel filler pipe.



3) Connect the evaporation hose to the evaporation pipe.



4) Install the evaporation pipe to the fuel filler pipe.



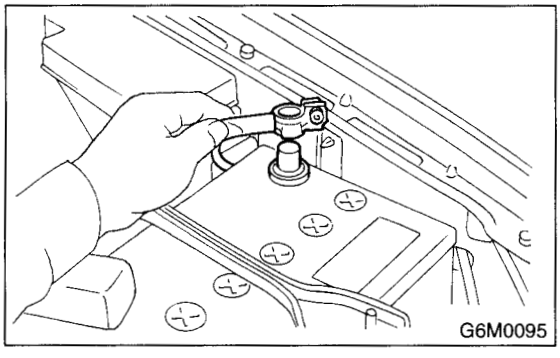
25.Fuel Pump

A: REMOVAL

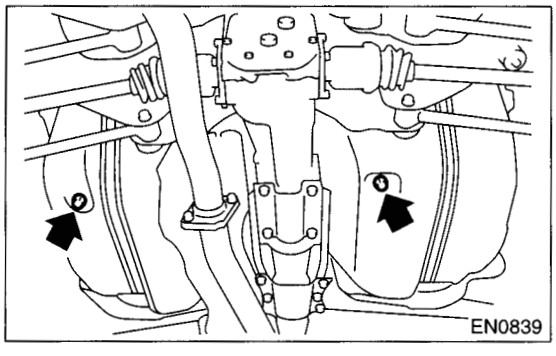
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

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

1) Release the fuel pressure. <Ref. to FU(DOHC TURBO)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid and remove the fuel filler cap.
3) Disconnect the battery ground cable.

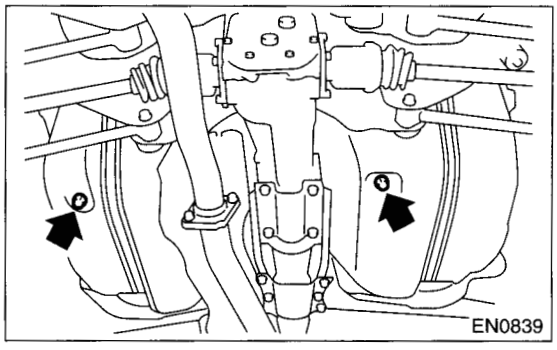

G6M0095

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

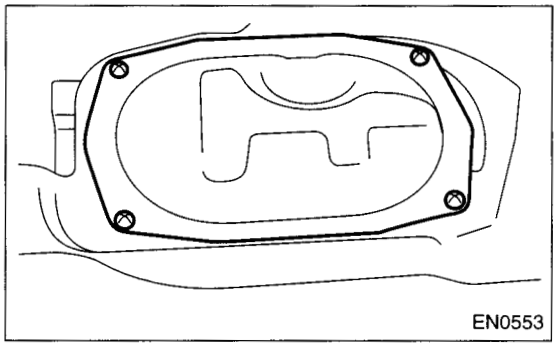

EN0839

6) Tighten the fuel drain plug.

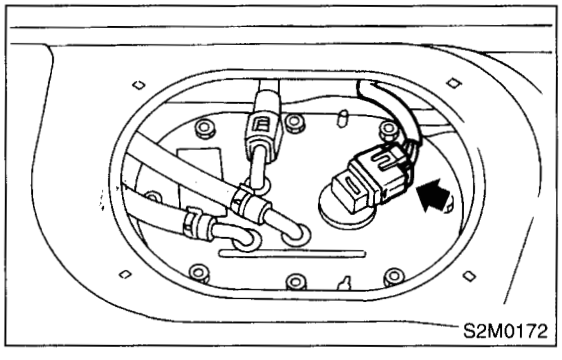
Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)


EN0839

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

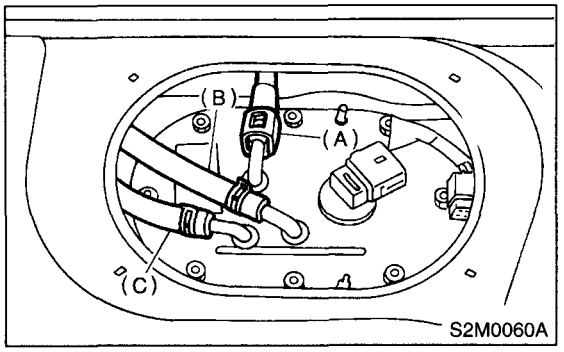

EN0553

9) Disconnect the connector from the fuel pump.

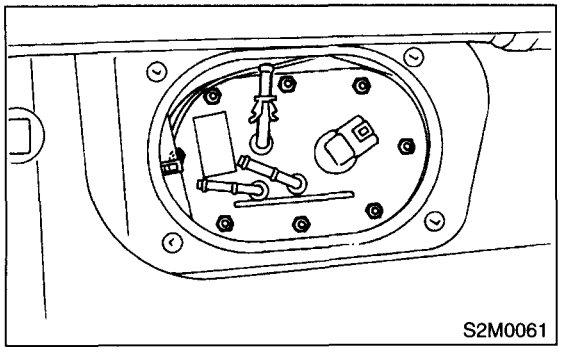

S2M0172

10) Disconnect the quick connector and then disconnect the fuel delivery hose (A). <Ref. to FU(DOHC TURBO)-68, Fuel Delivery, Return and Evaporation Lines.>

11) Move the clips, and then disconnect the fuel return hose (B) and jet pump hose (C).



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

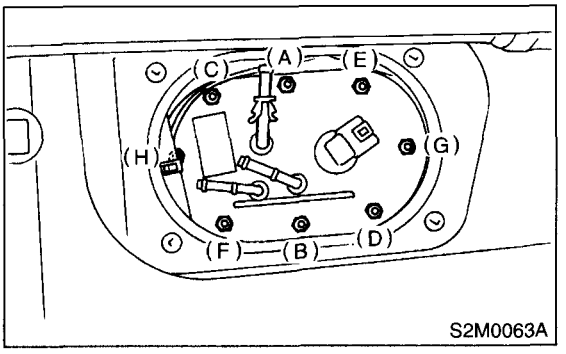


13) Take off the fuel pump assembly from the fuel tank.

B: INSTALLATION

Install in the reverse order of removal. Do the following:
(1) Always use new gaskets.
(2) Ensure the sealing portion is free from fuel or foreign particles before installation.
(3) Tighten the nuts in alphabetical sequence shown in figure to specified torque.

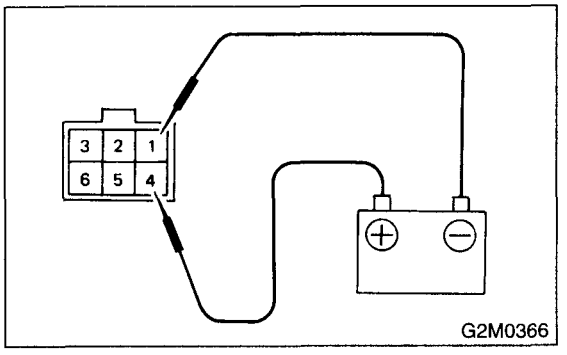
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



C: INSPECTION

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

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



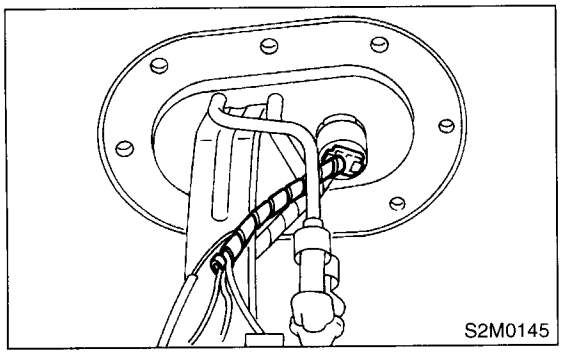
26.Fuel Level Sensor

A: REMOVAL

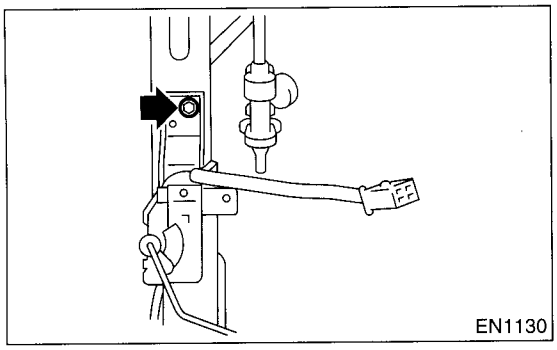
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

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

1) Remove the fuel pump assembly. <Ref. to FU(DOHC TURBO)-60, REMOVAL, Fuel Pump.>
2) Disconnect the connector from the fuel pump bracket.



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



B: INSTALLATION

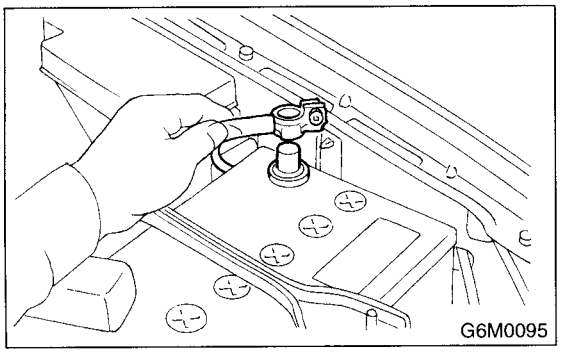
Install in the reverse order of removal.

27.Fuel Sub Level Sensor

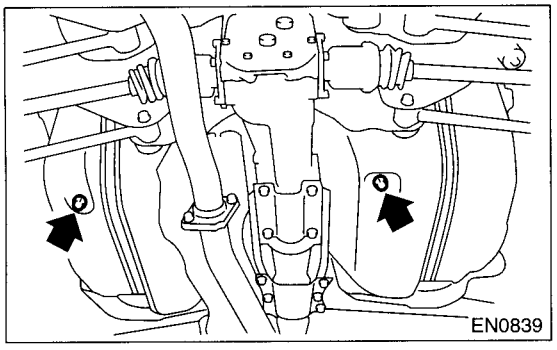
A: REMOVAL

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

1) Disconnect the battery ground cable.

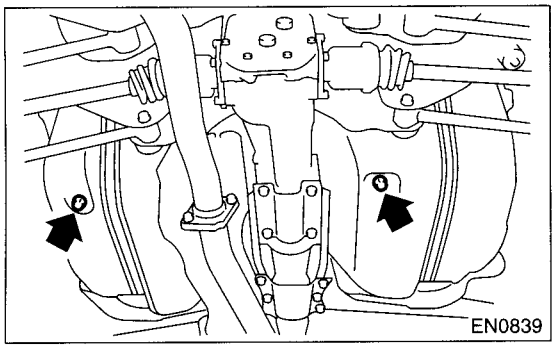


2) Lift-up the vehicle.
3) Drain the fuel from the fuel tank. Set a container under the vehicle and remove drain plug from fuel tank.

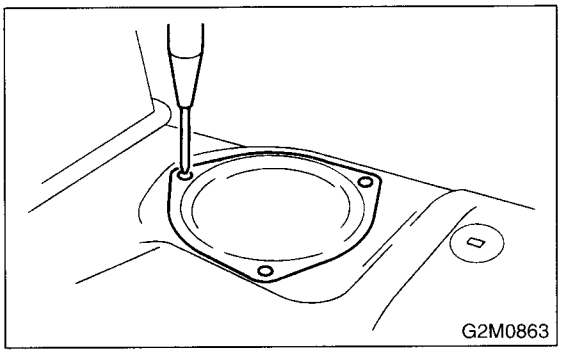


4) Tighten the fuel drain plug.

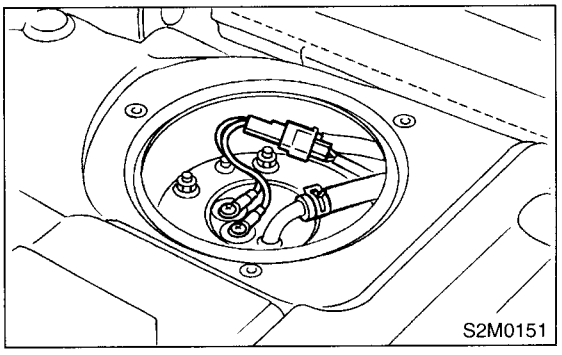
Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)



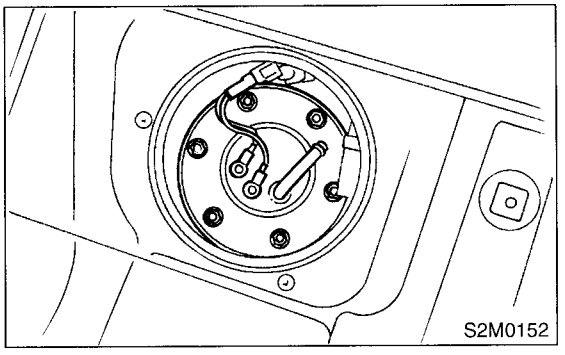
5) Remove the rear seat.
6) Remove the service hole cover.



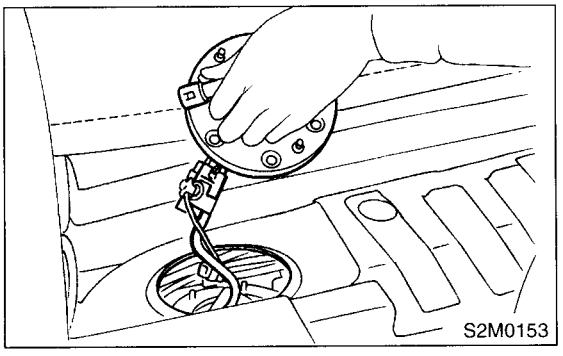
7) Disconnect the connector from the fuel sub meter.
8) Disconnect the fuel jet pump hose.



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



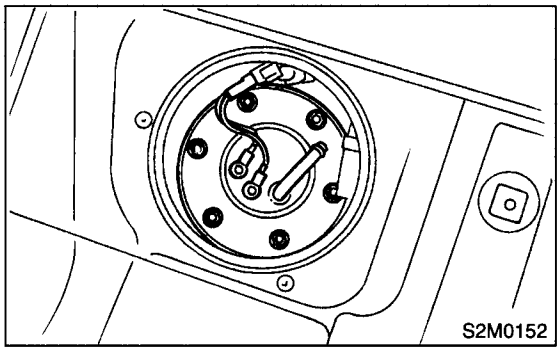
10) Remove the fuel sub meter unit.



B: INSTALLATION

Install in the reverse order of removal.

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

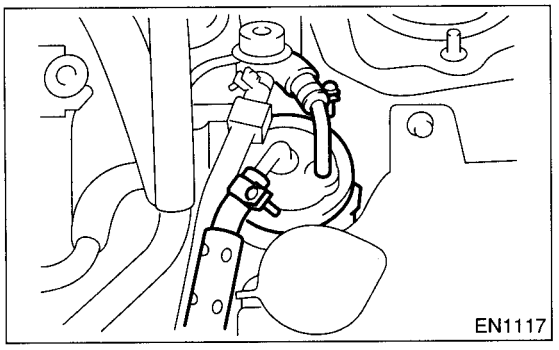


28.Fuel Filter

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(DOHC TURBO)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Disconnect the fuel delivery hoses from the fuel filter.



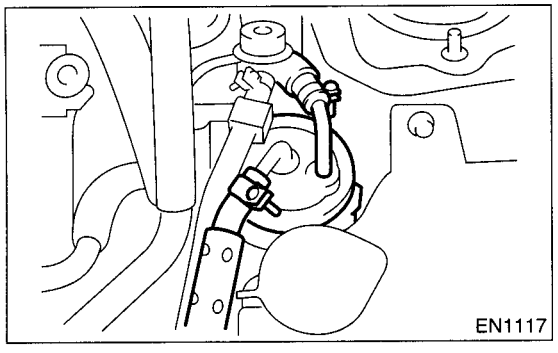
3) Remove the filter from the holder.

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)



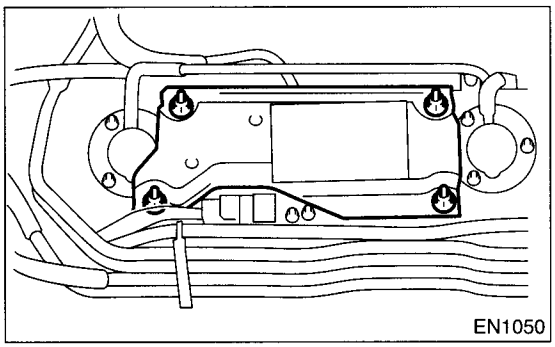
C: INSPECTION

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 the inlet port.

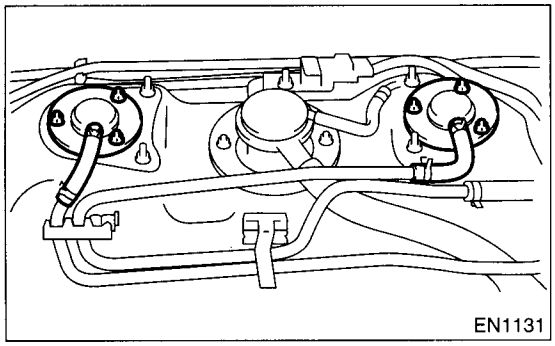
29.Fuel Cut Valve

A: REMOVAL

1) Remove the fuel tank. <Ref. to FU(DOHC TURBO)-52, REMOVAL, Fuel Tank.>
2) Remove the protect cover.



3) Move the clip and disconnect the evaporation hose from fuel cut valve.

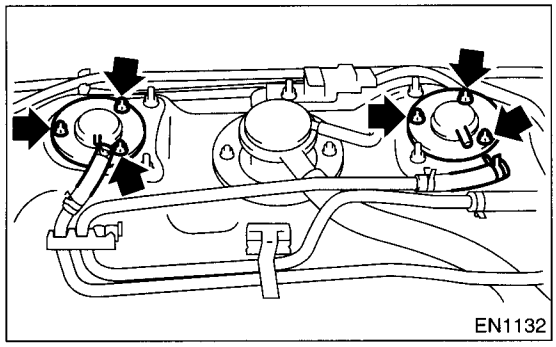


4) Remove the bolts which install the fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

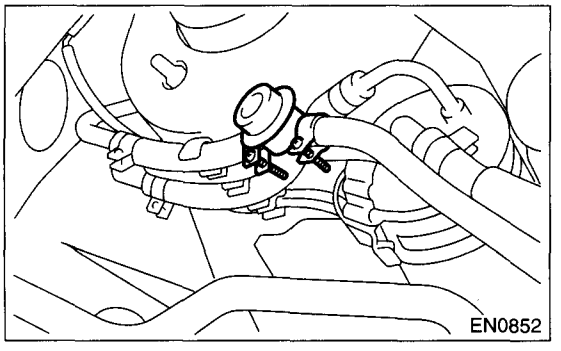
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



30.Fuel Damper Valve

A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(DOHC TURBO)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Remove the fuel damper valve from the fuel return line.



B: INSTALLATION

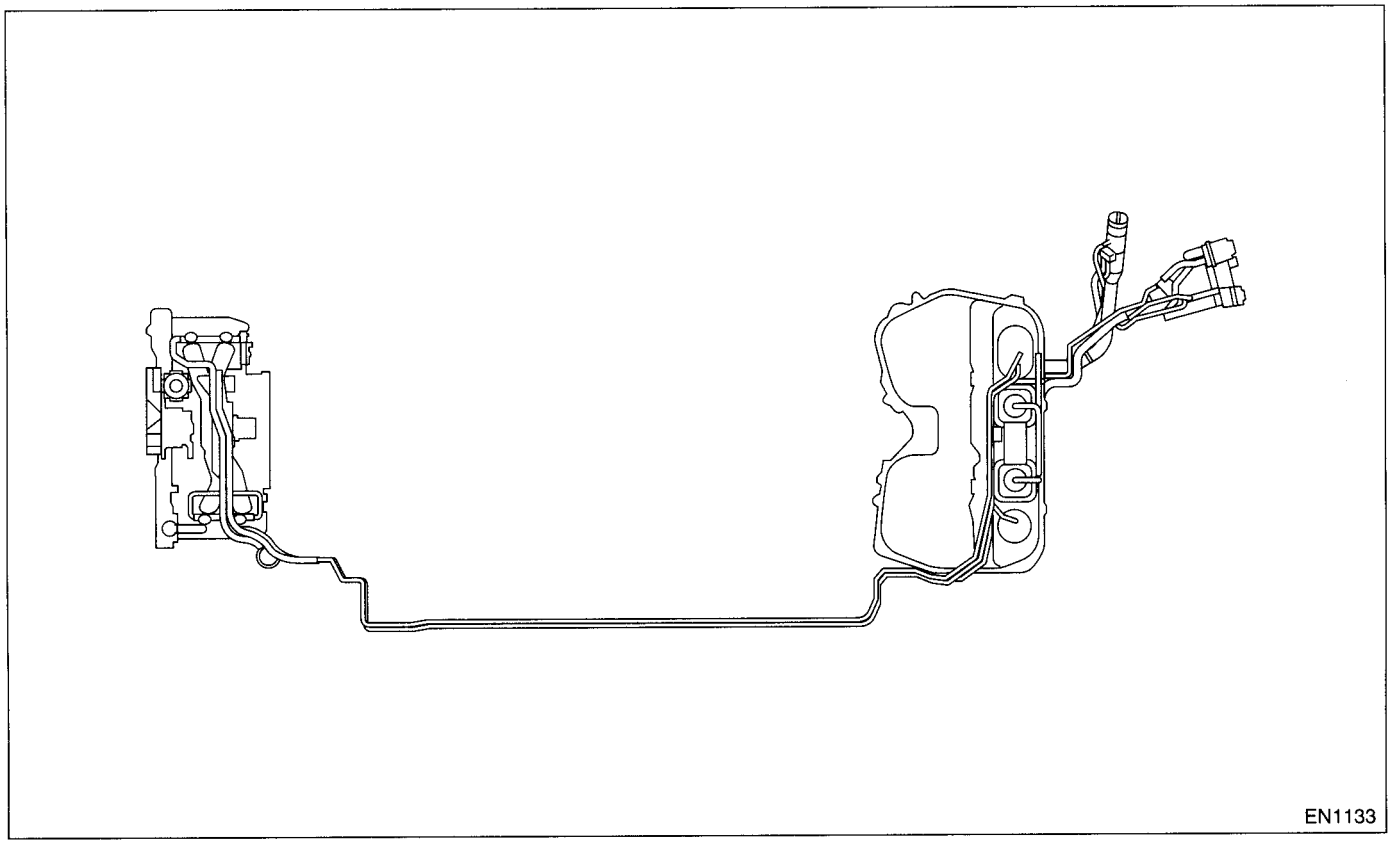
Install in the reverse order of removal.

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

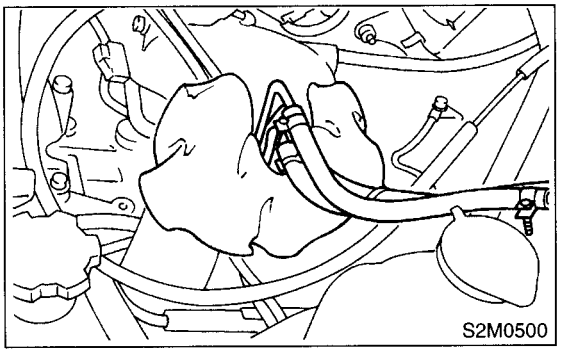
31.Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

1) Set the vehicle on the lift.
2) Release the fuel pressure. <Ref. to FU(DOHC TURBO)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
3) Open the fuel filler flap lid and remove the fuel filler cap.
4) Remove the floor mat. <Ref. to EI-55, REMOVAL, Floor Mat.>
5) Remove the fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.



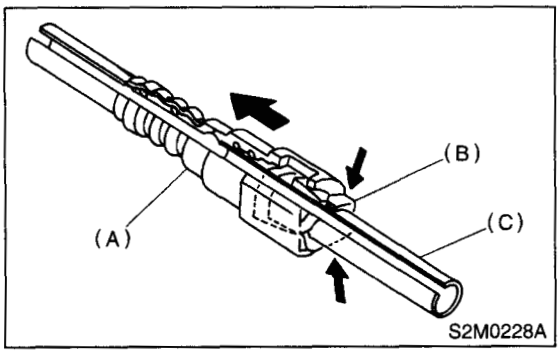
6) In engine compartment, detach the fuel delivery hoses, return hoses and evaporation hose.



7) Lift-up the vehicle.

8) Separate the quick connector on the fuel delivery and return 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).

CAUTION:
Replace retainer with new ones.

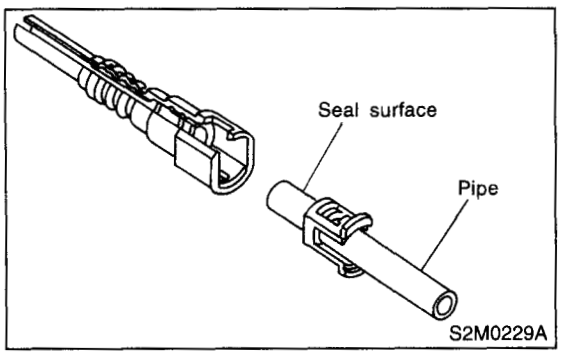


(A) Connector
(B) Retainer
(C) Pipe

B: INSTALLATION

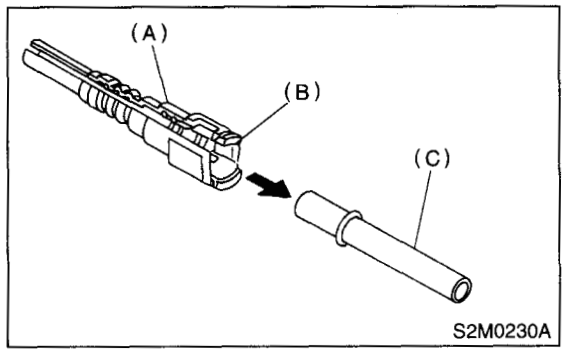
1) Connect the quick connector on the fuel delivery line.

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



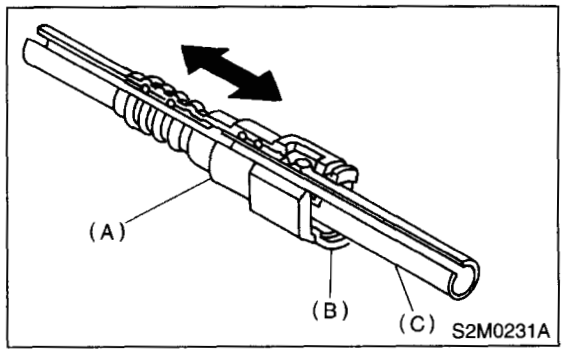
(1) Set the new retainer (B) to connector (A).
(2) Push the pipe into the connector completely.

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 hoses and their connections for any leakage of fuel.**

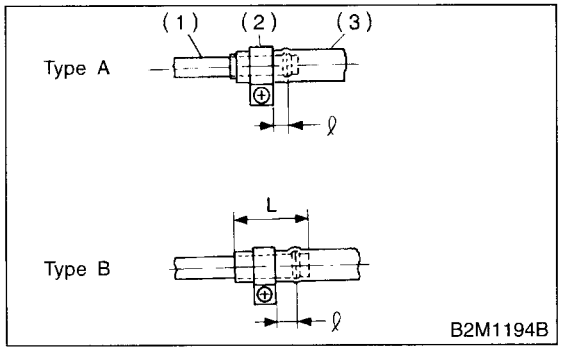


(A) Connector
(B) Retainer
(C) Pipe

2) Connect the fuel delivery hose to the 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)



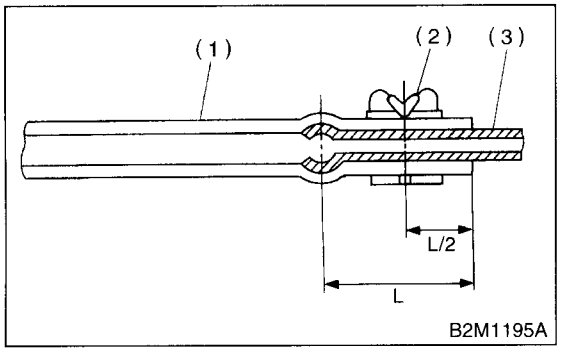
(1) Fitting
(2) Clamp
(3) Hose

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

Fuel return hose:
L = 22.5±2.5 mm (0.885±0.098 in)

Fuel evaporation hose:
L = 17.5±2.5 mm (0.689±0.098 in)

CAUTION:
Be sure to inspect 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.

32. 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 fuel pump.
2)		Lowering of fuel pump function.	Replace fuel pump.
3)		Clogged dust or water in the fuel filter.	Replace fuel filter, clean or replace fuel tank.
4)		Clogged or bent fuel pipe or hose.	Clean, correct or replace 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 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 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 packing.
3)		Cracked fuel separator.	Replace 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(DOHC TURBO)

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8.	Fuel Temperature Sensor	9
9.	Fuel Sub Level Sensor	10
10.	Fuel Tank Pressure Sensor	11
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13.	Vent Valve	15
14.	Shut Valve	16
15.	Drain Valve	17

1. General Description

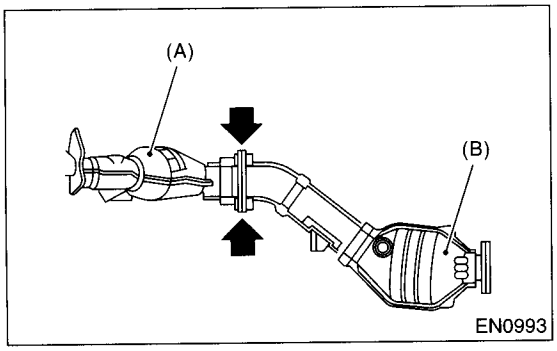
A: CAUTION

- 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 negative terminal from battery.

2. Front Catalytic Converter

A: REMOVAL

1) Remove the center exhaust pipe. <Ref. to EX(DOHC TURBO)-8, 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.

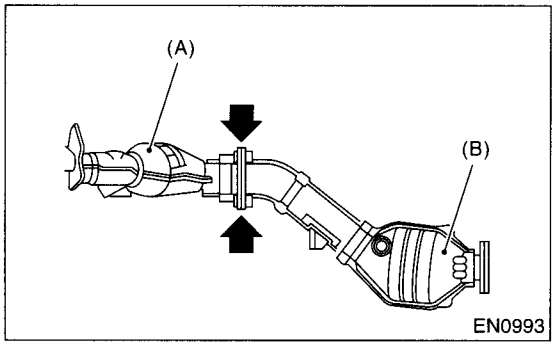
C: INSPECTION

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 center exhaust pipe. <Ref. to EX(DOHC TURBO)-8, 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.

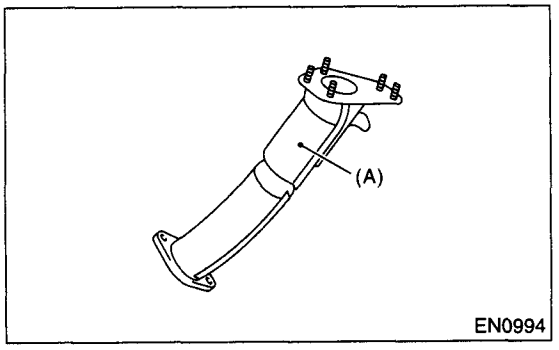
C: INSPECTION

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(DOHC TURBO)-12, 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(DOHC TURBO)-12, INSTALLATION, Joint Pipe.>

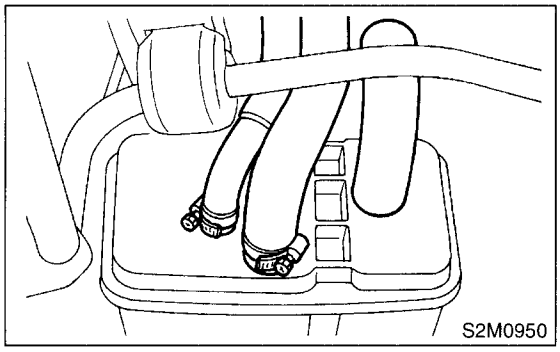
C: INSPECTION

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

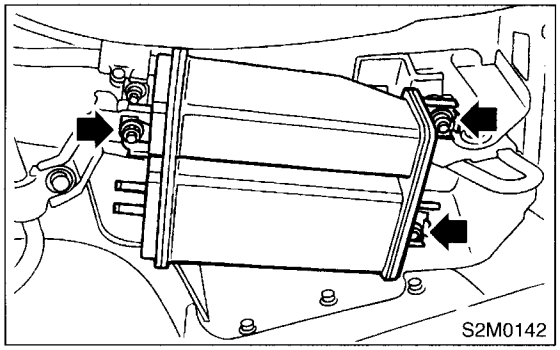
5. Canister

A: REMOVAL

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



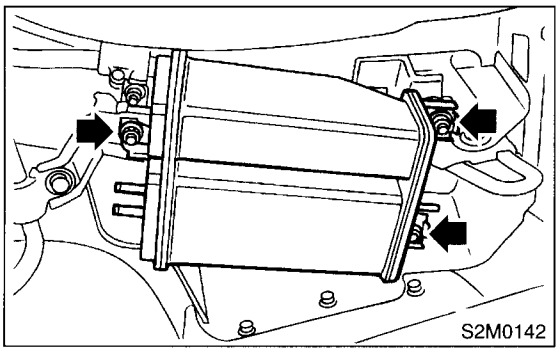
3) Remove the canister from body.



B: INSTALLATION

1) Install in the reverse order of removal.

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



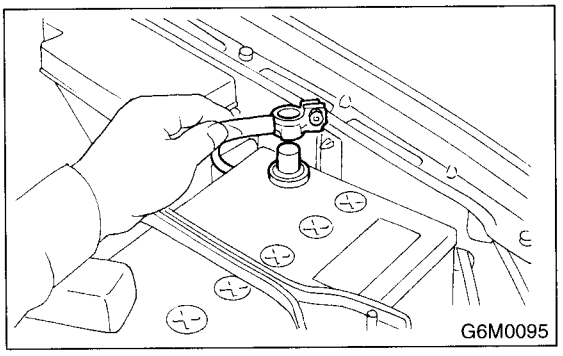
C: INSPECTION

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

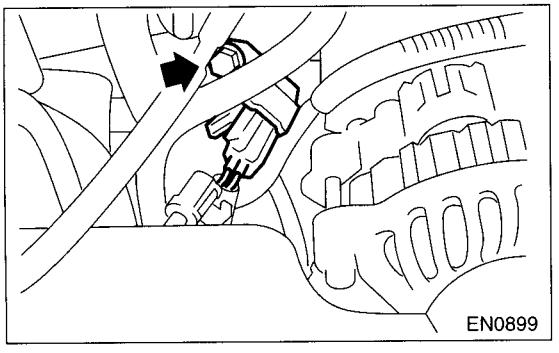
6. Purge Control Solenoid Valve

A: REMOVAL

1) Disconnect the ground terminal from battery.



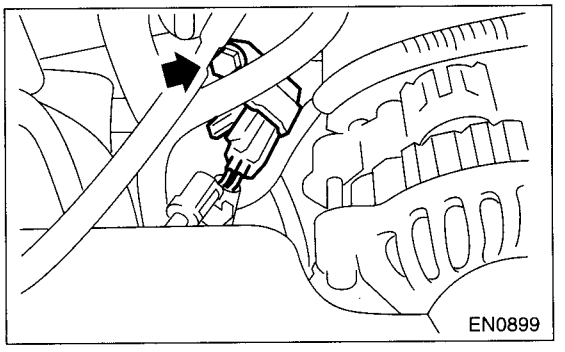
2) Disconnect the connector and hoses from purge control solenoid valve.
3) Remove the bolt which installs the purge control solenoid valve onto intake manifold.



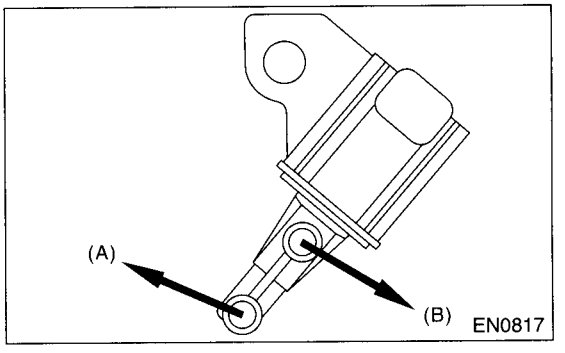
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



CAUTION:
Carefully connect the evaporation hoses.



(A) To intake manifold
(B) To purge value

C: INSPECTION

Make sure the hoses are not cracked or loose.

7. Main Fuel Level Sensor

A: REMOVAL

For work procedures, refer to "FU" section. <Ref. to FU(DOHC TURBO)-62, REMOVAL, Fuel Level Sensor.>

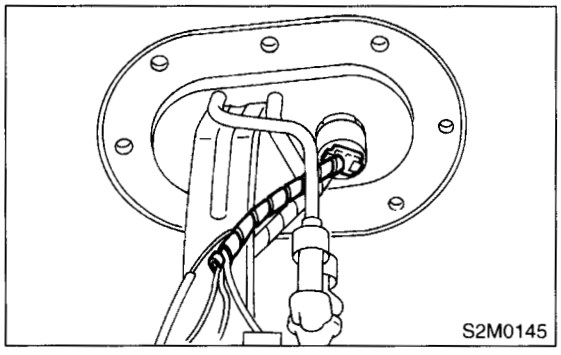
B: INSTALLATION

For work procedures, refer to "FU" section.
<Ref. to FU(DOHC TURBO)-62, INSTALLATION, Fuel Level Sensor.>

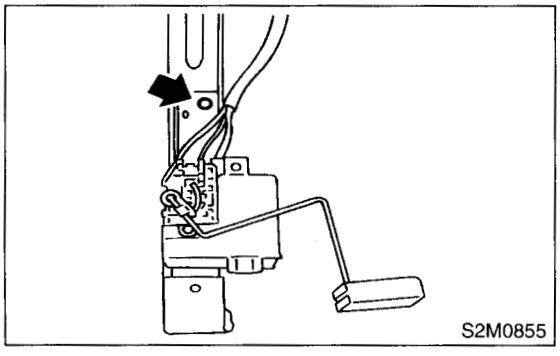
8. Fuel Temperature Sensor

A: REMOVAL

1) Remove the fuel pump assembly. <Ref. to FU(DOHC TURBO)-60, REMOVAL, Fuel Pump.>
2) Disconnect the connector from fuel pump bracket.



3) Remove the main fuel level sensor from fuel pump assembly. <Ref. to FU(DOHC TURBO)-62, REMOVAL, Fuel Level Sensor.>



NOTE:
Fuel temperature sensor is a unit with the fuel pump. If replacing it, replace as a fuel pump.

B: INSTALLATION

Install in the reverse order of removal.

WARNING:
Spark may occur and ignite if fuel is nearby.

9. Fuel Sub Level Sensor

A: REMOVAL

For work procedures, refer to "FU(DOHC TURBO)" section. <Ref. to FU(DOHC TURBO)-63, REMOVAL, Fuel Sub Level Sensor.>

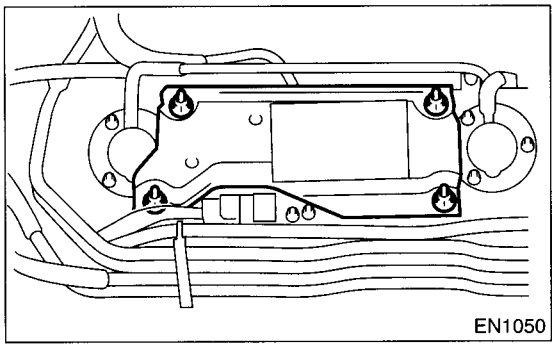
B: INSTALLATION

For work procedures, refer to "FU(DOHC TURBO)" section. <Ref. to FU(DOHC TURBO)-64, INSTALLATION, Fuel Sub Level Sensor.>

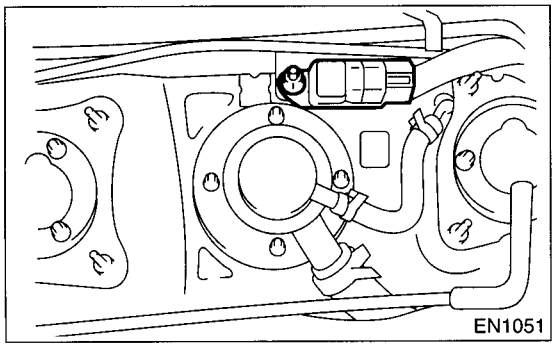
10.Fuel Tank Pressure Sensor

A: REMOVAL

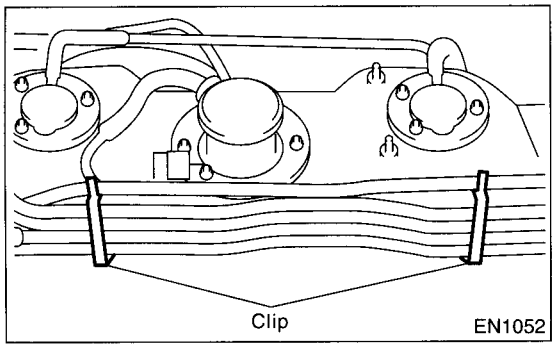
1) Remove the fuel tank. <Ref. to FU(DOHC TURBO)-52, REMOVAL, Fuel Tank.>
2) Remove the protector cover.



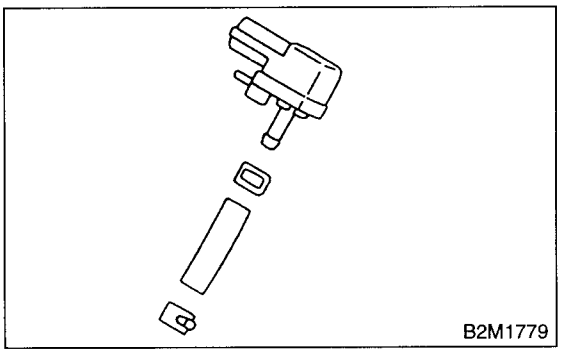
3) Disconnect the connector from fuel pressure sensor, then remove the fixing nut.



4) Release the clips which hold fuel pipes onto fuel tank.



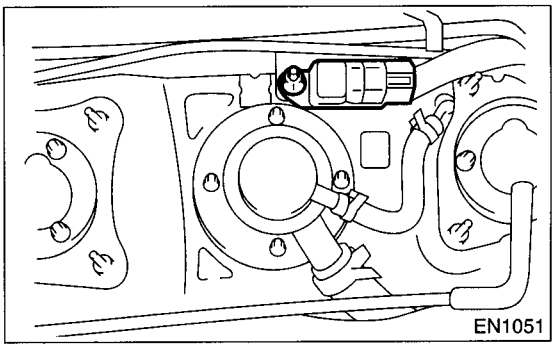
5) Remove the clip, and disconnect pressure hose from fuel tank.
6) Disconnect the pressure hose from fuel tank pressure sensor.



B: INSTALLATION

Install in the reverse order of removal.

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



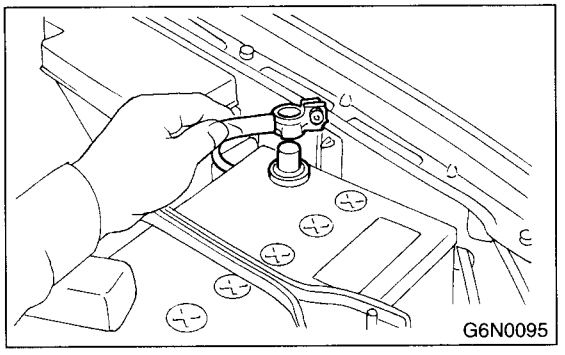
C: INSPECTION

Make sure the hoses are not cracked or loose.

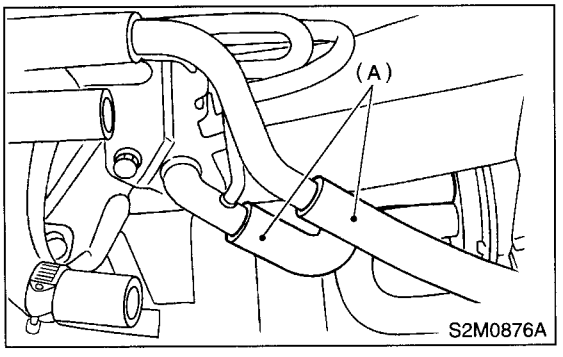
11.Pressure Control Solenoid Valve

A: REMOVAL

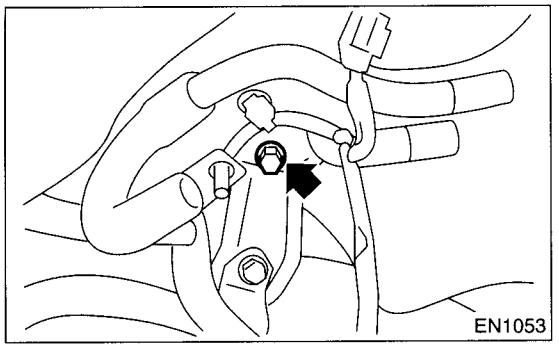
1) Disconnect the ground terminal from battery.



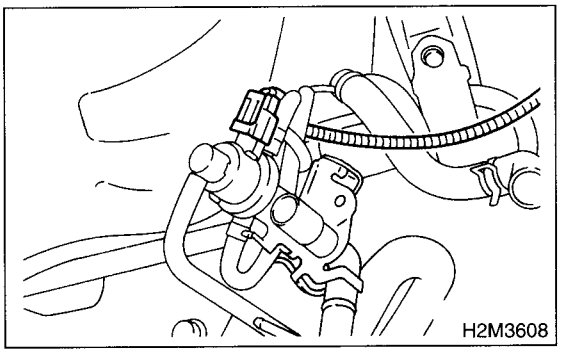
2) Remove the canister. <Ref. to EC(DOHC TURBO)-6, REMOVAL, Canister.>
3) Disconnect the evaporation hoses (A) from joint pipes.



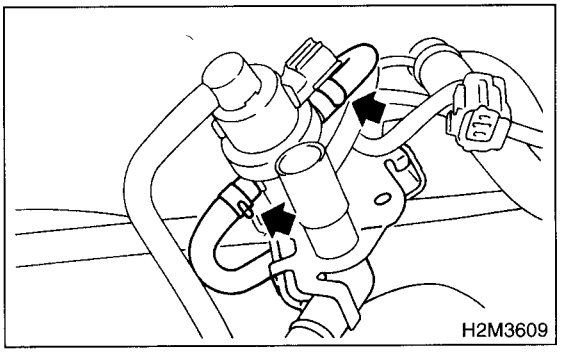
4) Remove the bolt which installs pressure control solenoid valve holding bracket on body.



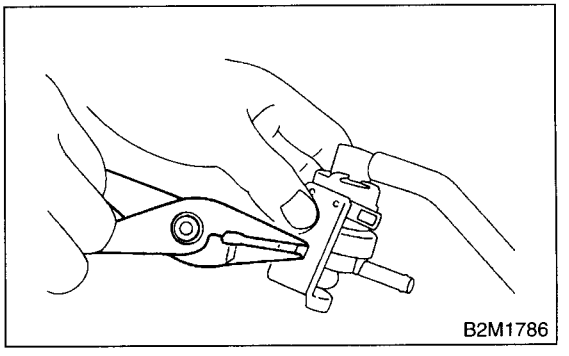
5) Disconnect the connector from pressure control solenoid valve.



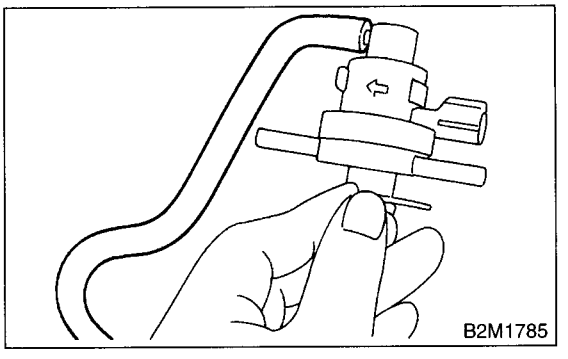
6) Disconnect the two evaporation hoses from pressure control solenoid valve.
7) Remove the pressure control solenoid valve with bracket.



8) Remove the pressure control solenoid valve from bracket.



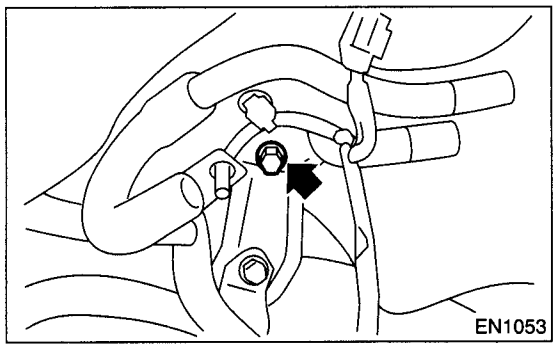
9) Disconnect the vacuum hose from pressure control solenoid valve.



B: INSTALLATION

Install in the reverse order of removal.

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



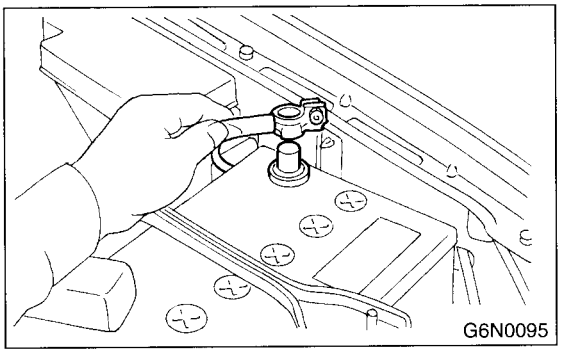
C: INSPECTION

Make sure the hoses are not cracked or loose.

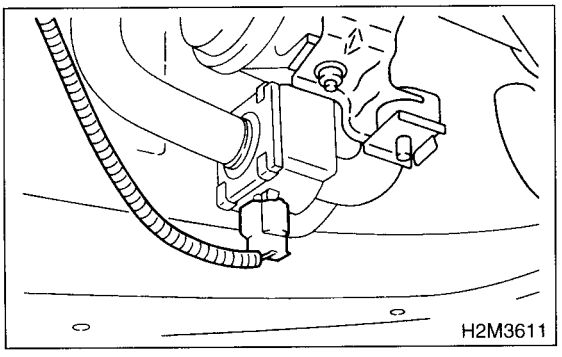
12.Drain Filter

A: REMOVAL

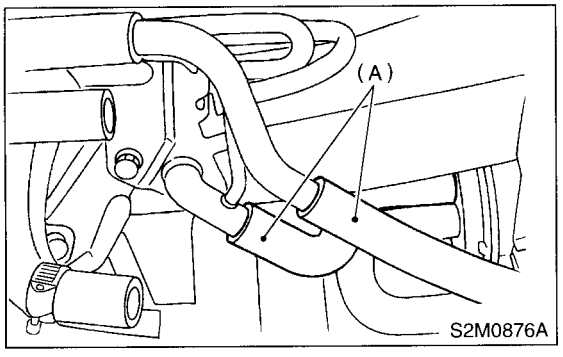
1) Disconnect the ground terminal from battery.



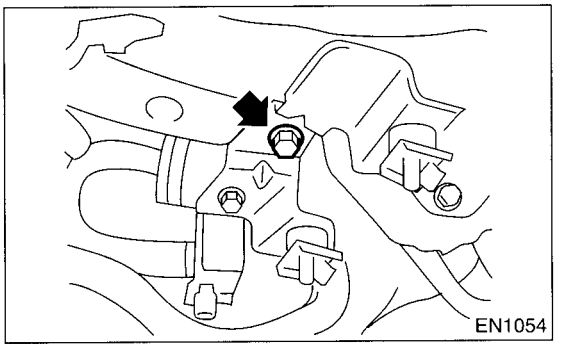
2) Lift-up the vehicle.
3) Remove the canister. <Ref. to EC(DOHC TURBO)-6, REMOVAL, Canister.>
4) Disconnect the connector from drain valve.



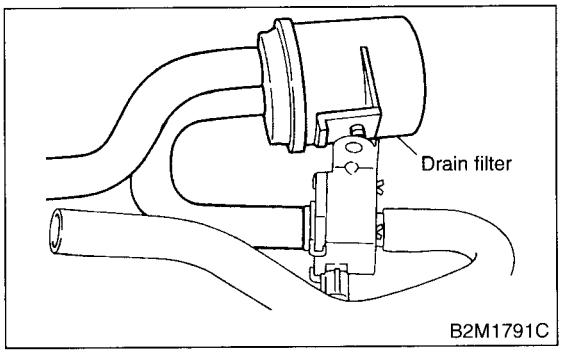
5) Disconnector the evaporation hoses (A) from joint pipes.



6) Remove the bolt which installs the drain filter and drain valve brackets on body, and remove them as a unit.



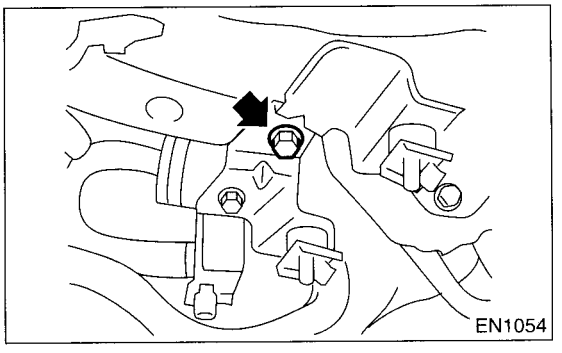
7) Disconnect the evaporation hoses, and remove the drain filter.



B: INSTALLATION

Install in the reverse order of removal.

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



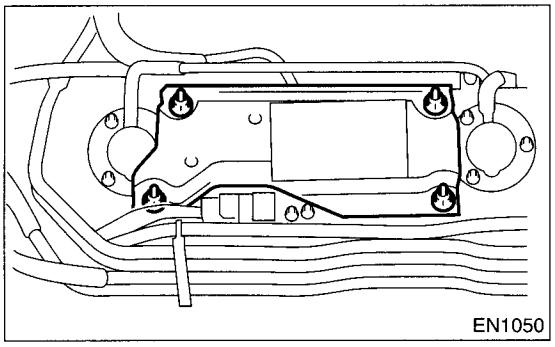
C: INSPECTION

1) Make sure all hoses are installed correctly.
2) Make sure the hoses are not cracked or loose.

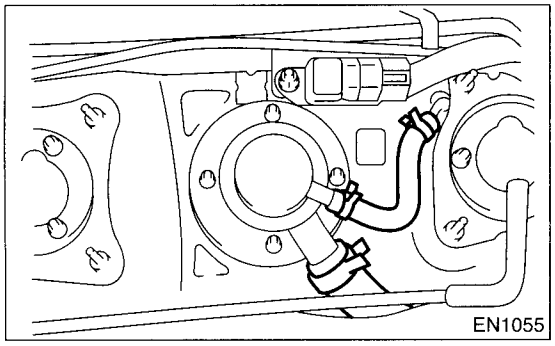
13.Vent Valve

A: REMOVAL

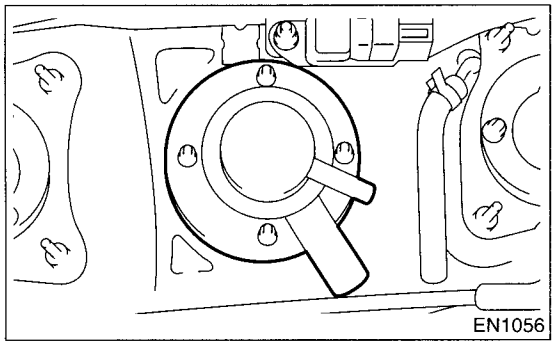
1) Remove the fuel tank. <Ref. to FU(DOHC TURBO)-52, REMOVAL, Fuel Tank.>
2) Remove the protector cover.



3) Remove the clips, and disconnect the hoses from vent valve.



4) Remove the nuts which install the vent on fuel tank.

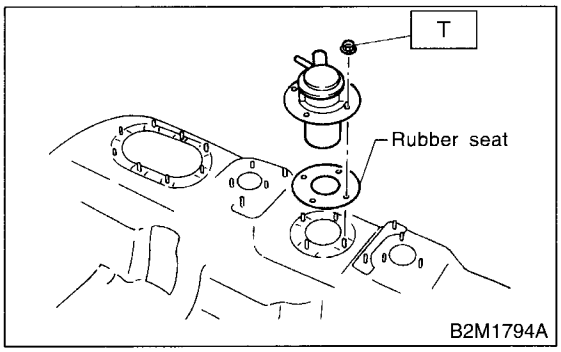


B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Replace the rubber seat with a new one.

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



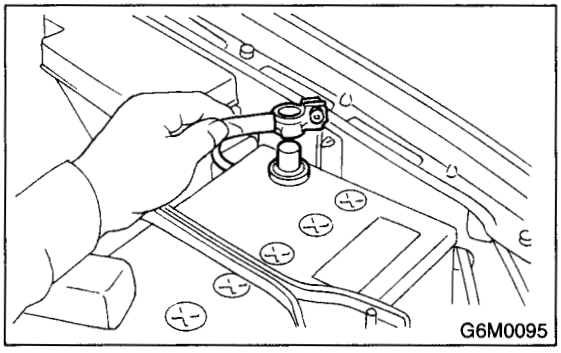
C: INSPECTION

Make sure the hoses are not cracked or loose.

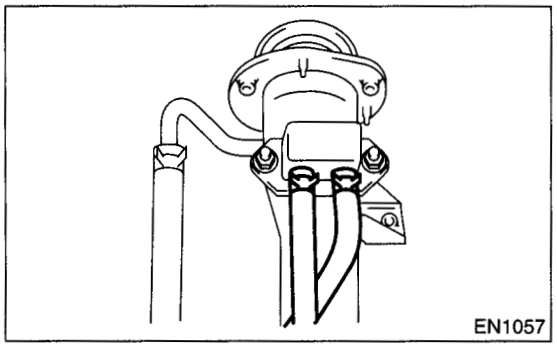
14.Shut Valve

A: REMOVAL

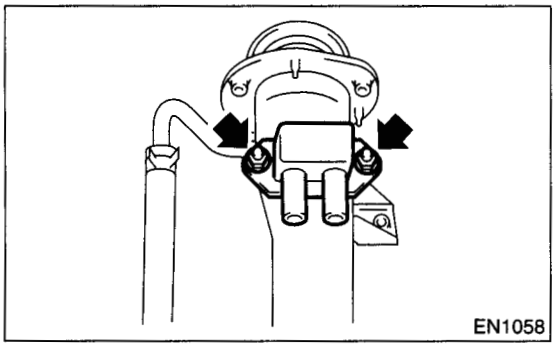
1) Disconnect the ground terminal from battery.



2) Drain fuel from the fuel tank. <Ref. to FU(DOHC TURBO)-52, REMOVAL, Fuel Tank.>
3) Remove the fuel filler pipe. <Ref. to FU(DOHC TURBO)-55, REMOVAL, Fuel Filler Pipe.>
4) Disconnect the evaporation hoses from shut valve.



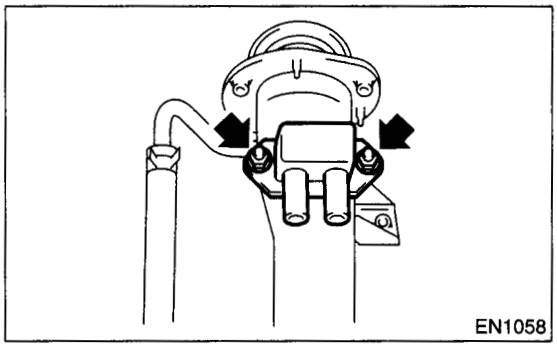
5) Remove the shut valve from fuel filler pipe.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
4.5 N·m (0.46 kgf-m, 3.3 ft-lb)



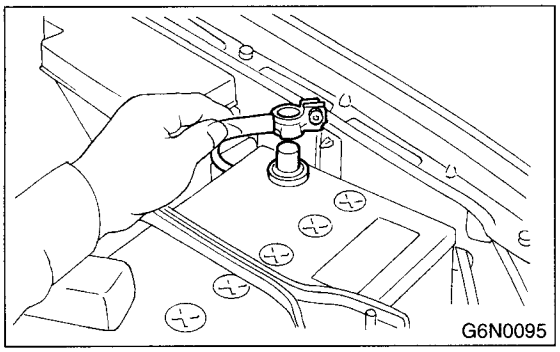
C: INSPECTION

Make sure the hoses are not cracked or loose.

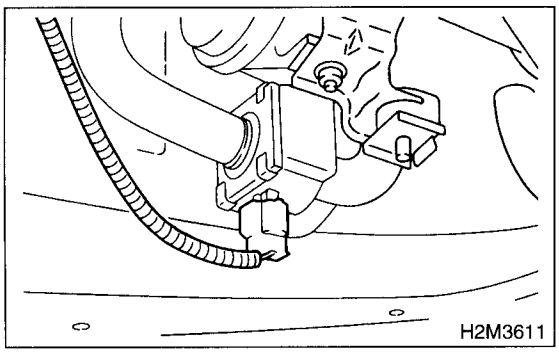
15.Drain Valve

A: REMOVAL

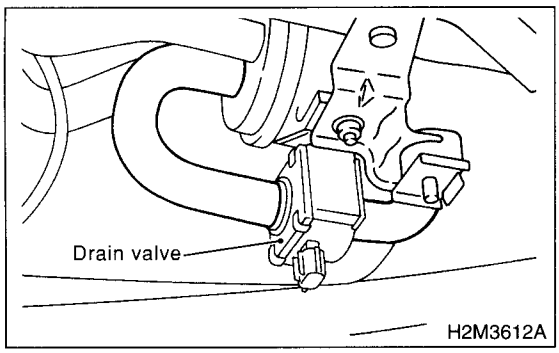
1) Disconnect the ground terminal from battery.



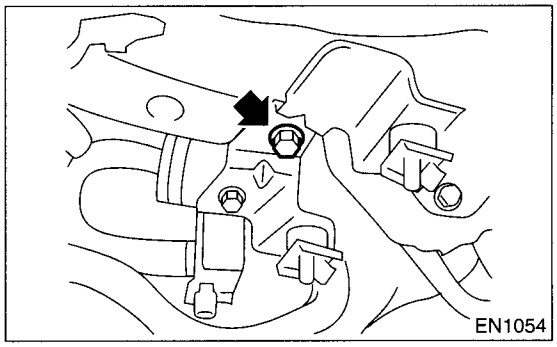
2) Lift-up the vehicle.
3) Remove the canister. <Ref. to EC(DOHC TURBO)-6, REMOVAL, Canister.>
4) Disconnect the connector from drain valve.



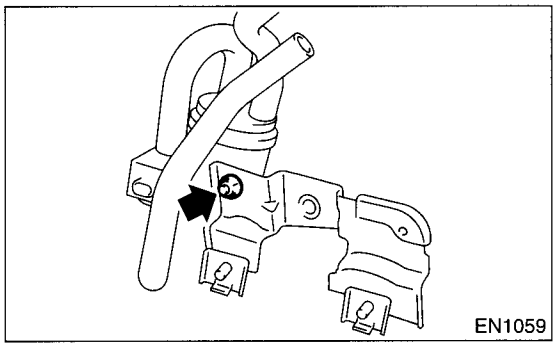
5) Disconnect the evaporation hoses from drain valve.



6) Remove the bolt which installs the drain filter and drain valve brackets on body, and remove them as a unit.



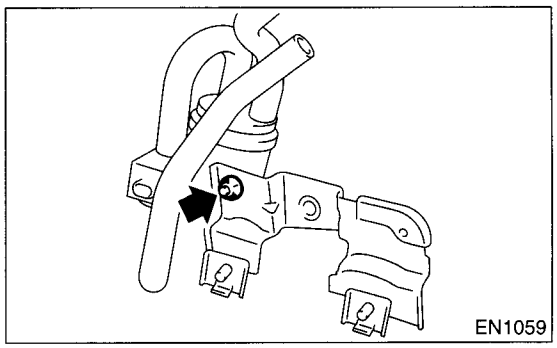
7) Remove the drain valve from bracket.



B: INSTALLATION

Install in the reverse order of removal.

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



C: INSPECTION

1) Make sure all hoses are installed correctly.
2) Make sure the hoses are not cracked or loose.

INTAKE (INDUCTION)

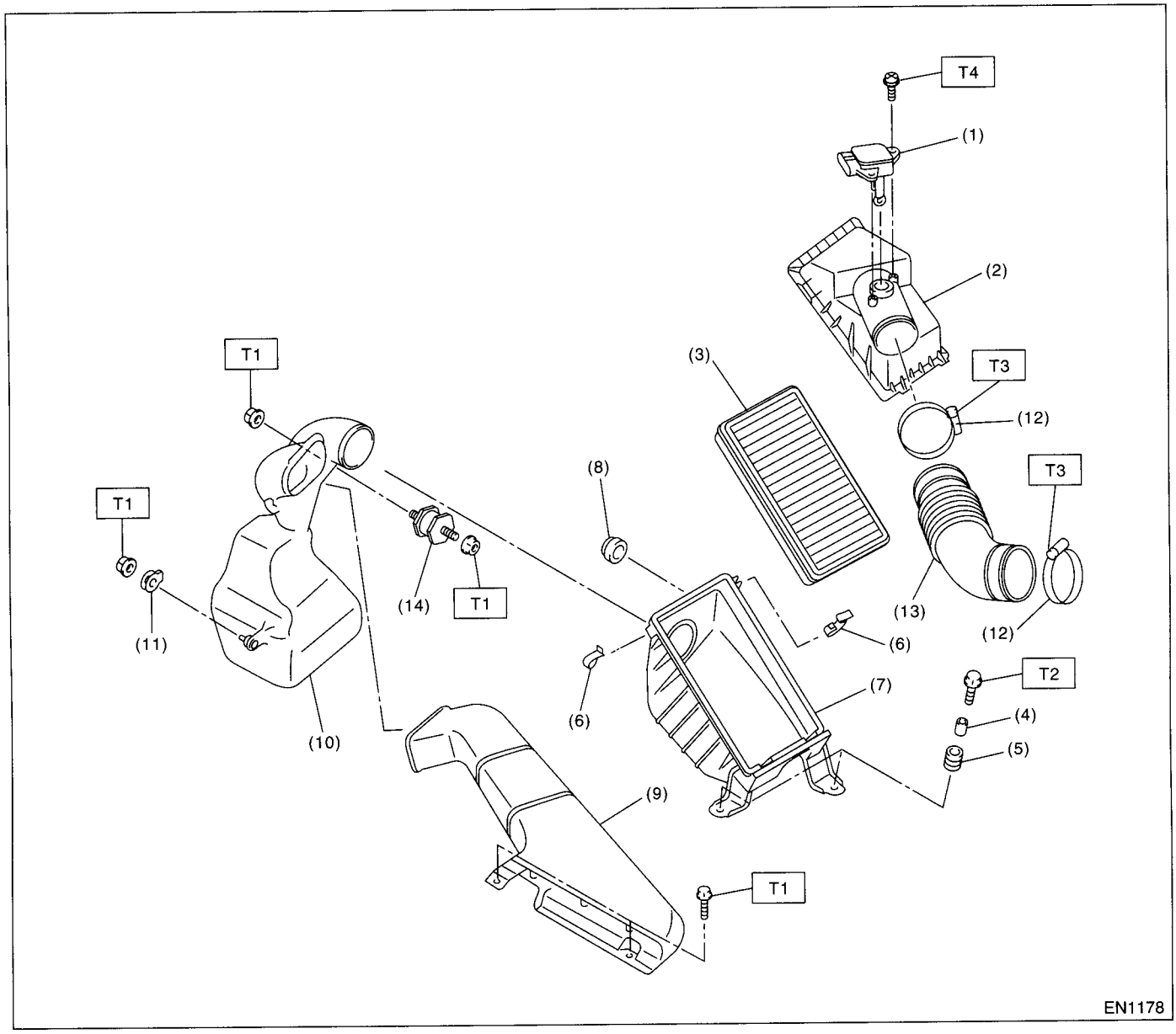
IN(DOHC TURBO)

		Page
1.	General Description	2
2.	Air Cleaner	7
3.	Air Intake Duct	8
4.	Intake Duct	9
5.	Intercooler	10
6.	Turbocharger	12
7.	Air By-pass Valve	14

1. General Description

A: COMPONENT

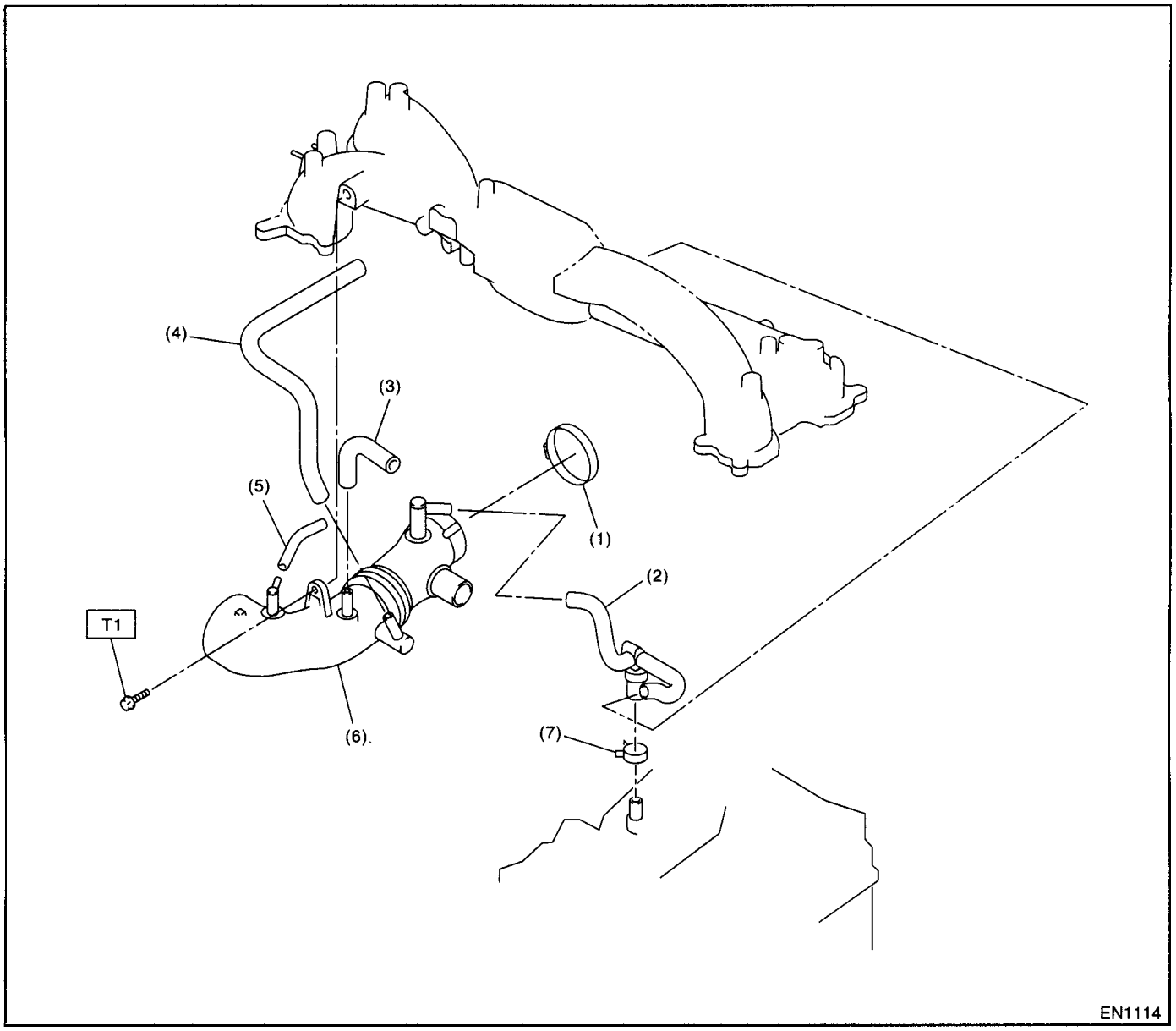
1. AIR CLEANER



(1) Mass air flow sensor
(2) Air cleaner upper cover
(3) Air cleaner element
(4) Spacer
(5) Bush
(6) Clip
(7) Air cleaner lower case
(8) Cushion rubber
(9) Air intake duct
(10) Resonator chamber ASSY
(11) Cushion rubber
(12) Clamp
(13) Air intake boot
(14) Cushion

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 33 (3.4, 25)
T3: 2.5 (0.25, 1.8)
T4: 1.7 (0.17, 1.2)

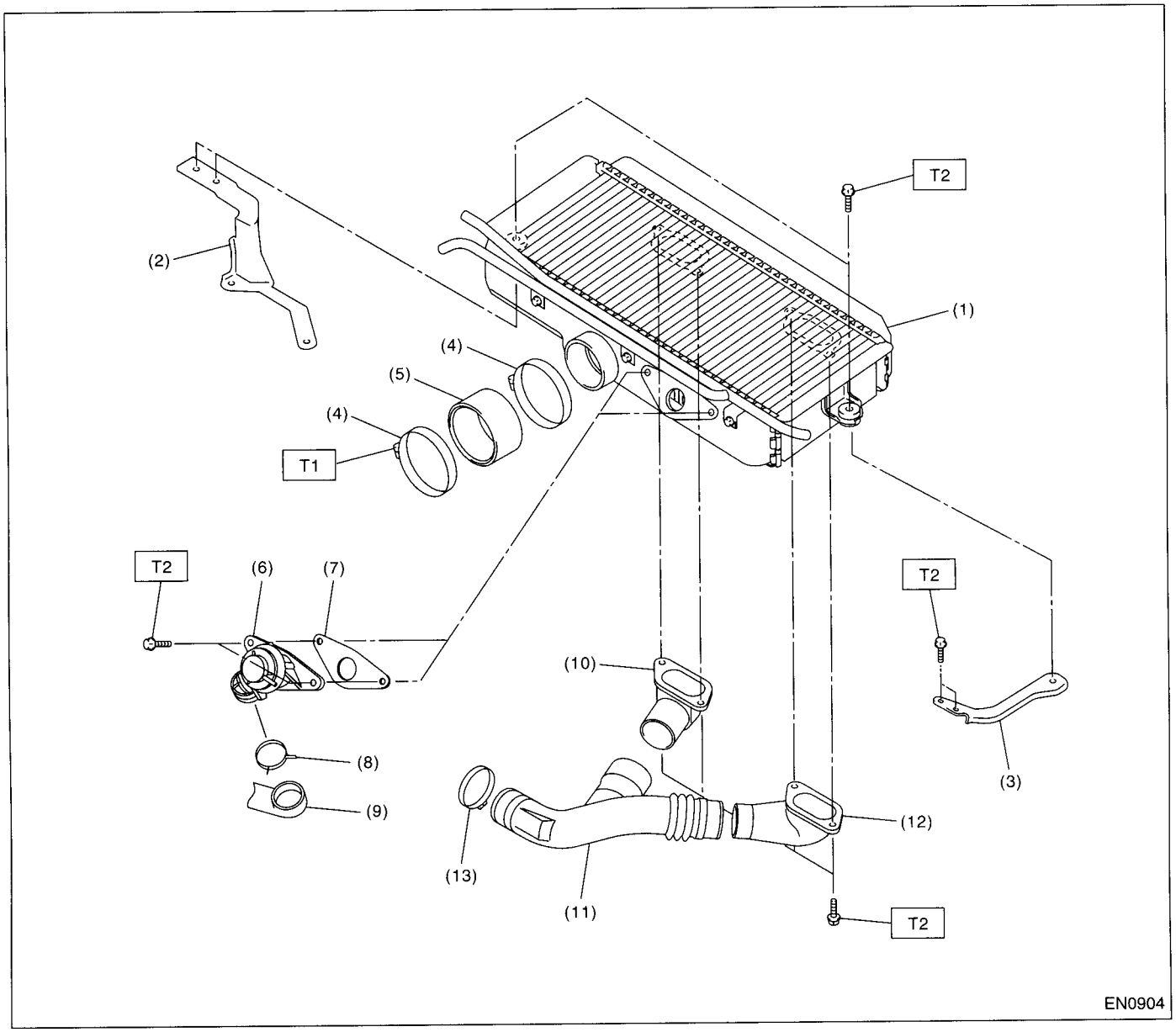
2. INTAKE DUCT



(1) Clamp
(2) PCV hose ASSY
(3) Air by-pass hose B
(4) Air by-pass hose C
(5) Air by-pass hose D
(6) Intake duct
(7) Clamp

Tightening torque: N·m (kgf-m, ft-lb)
T1: 16 (1.6, 11.7)

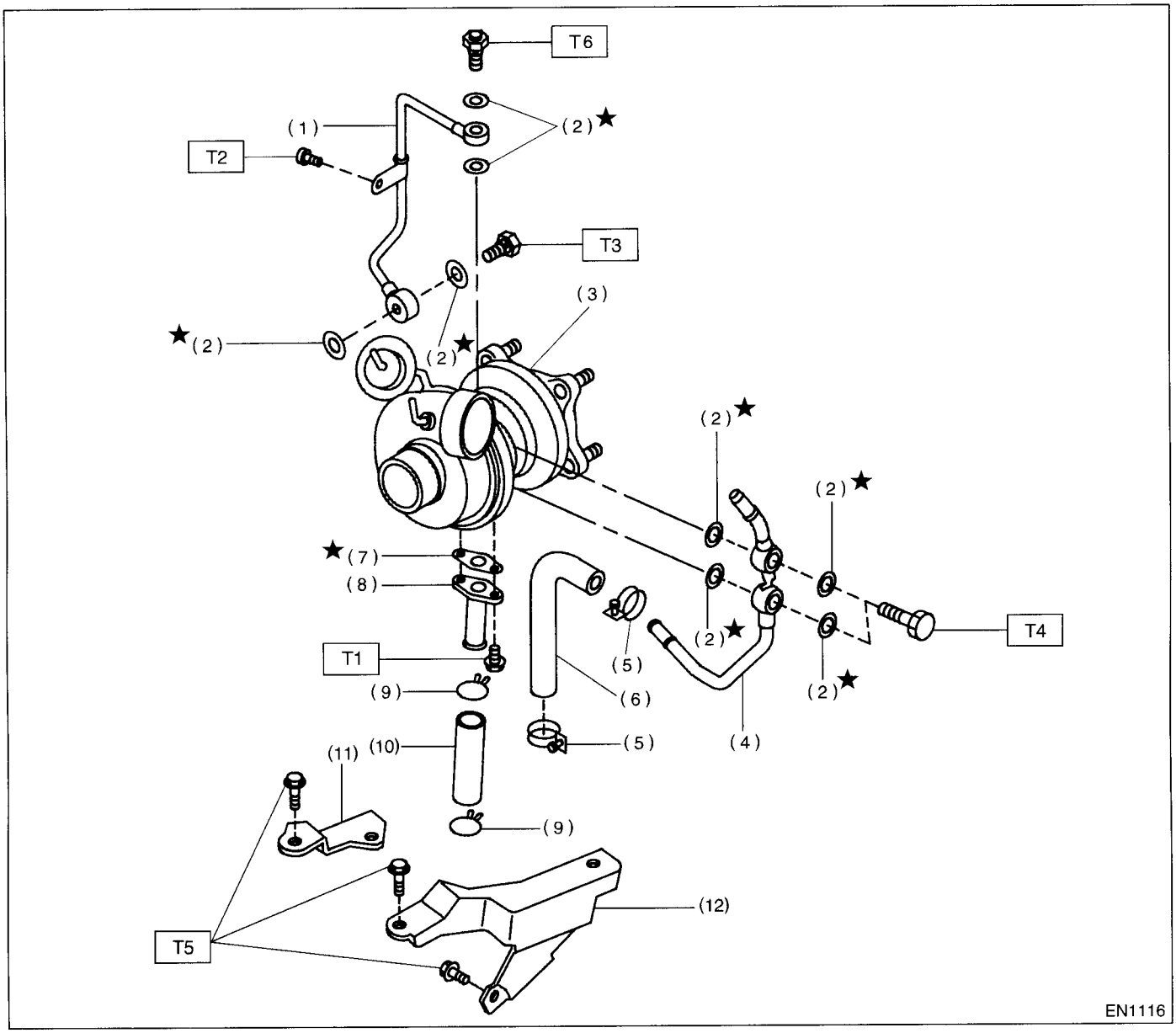
3. INTERCOOLER



(1) Intercooler
(2) Intercooler bracket RH
(3) Intercooler bracket LH
(4) Clamp
(5) Air intake duct
(6) Air by-pass valve
(7) Gasket
(8) Clamp
(9) Air by-pass hose A
(10) Intercooler duct A
(11) Intercooler duct B
(12) Intercooler duct C
(13) Clamp

Tightening torque: N·m (kgf-m, ft-lb)
T1: 3 (0.22, 1.6)
T2: 16 (1.6, 11.7)

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, 11.7)

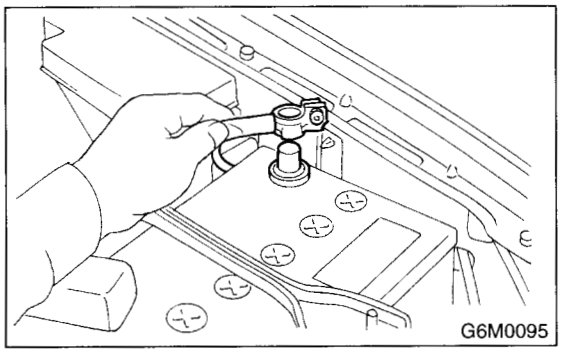
B: CAUTION

- 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 negative terminal from battery.

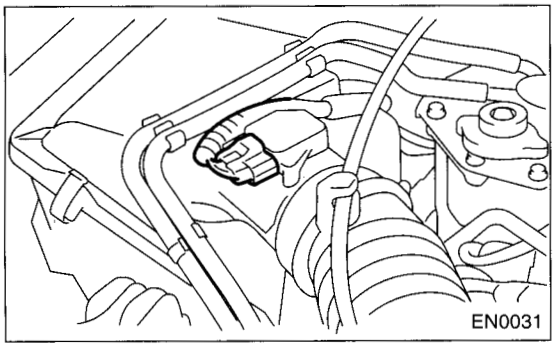
2. Air Cleaner

A: REMOVAL

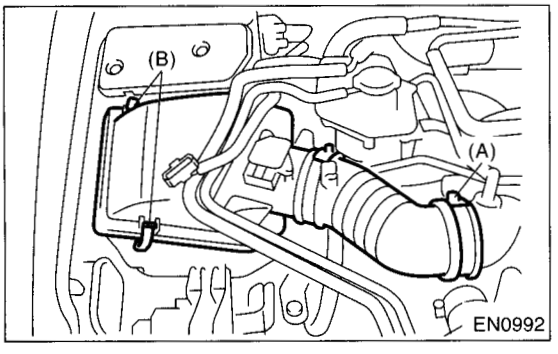
1) Disconnect the ground terminal from battery.



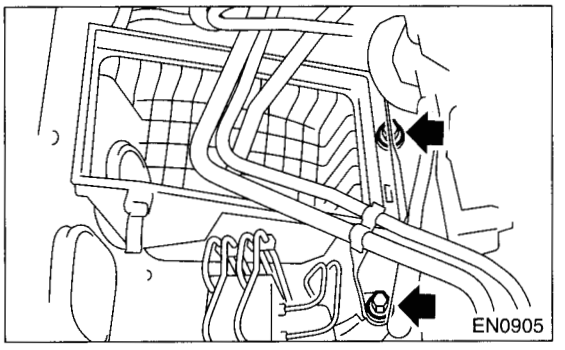
2) Disconnect the connector from mass air flow sensor.



3) Loosen the clamp (A) which connects air intake boot to intake duct.
4) Remove the two clips (B) from air cleaner upper cover.



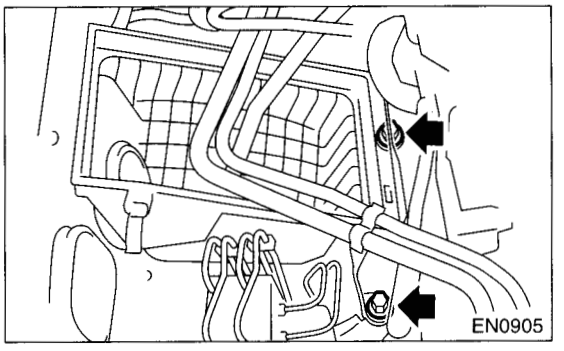
5) Remove the air cleaner upper cover.
6) Remove the air cleaner element.
7) Remove the air cleaner lower case.



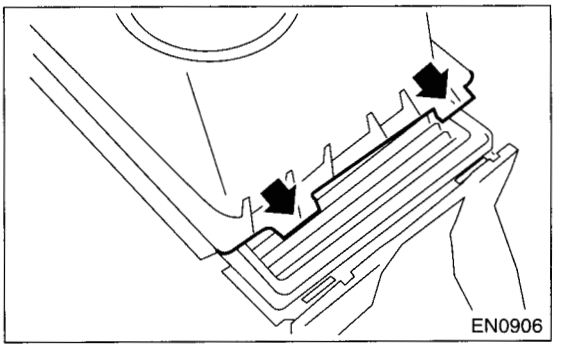
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)



CAUTION:
Before installing the air cleaner upper cover, align holes with protruding portions of air cleaner lower case, then secure the upper cover to lower case.



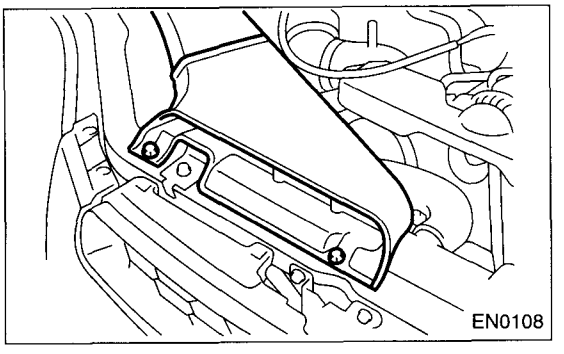
C: INSPECTION

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.

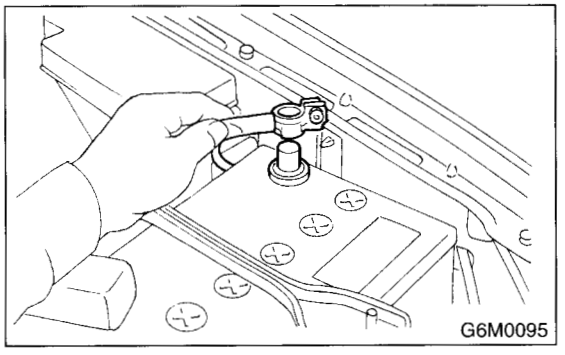
C: INSPECTION

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

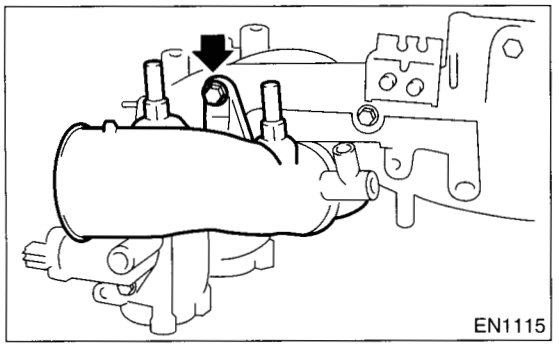
4. Intake Duct

A: REMOVAL

1) Disconnect the ground terminal from battery.



2) Remove the intake manifold. <Ref. to FU(DOHC TURBO)-15, REMOVAL, Intake Manifold.>
3) Remove the sensor, engine harness, and fuel pipe attached to the intake manifold. <Ref. to FU(DOHC TURBO)-21, DISASSEMBLY, Intake Manifold.>
4) Remove the intake duct from intake manifold.



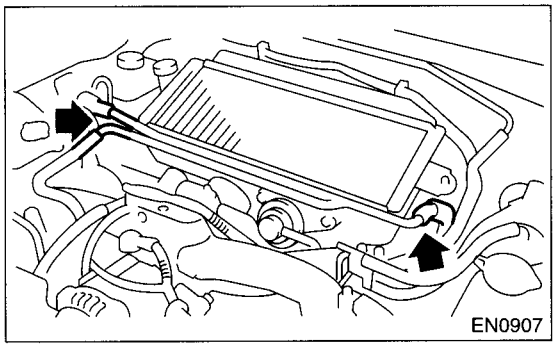
B: INSTALLATION

Install in the reverse order of removal.

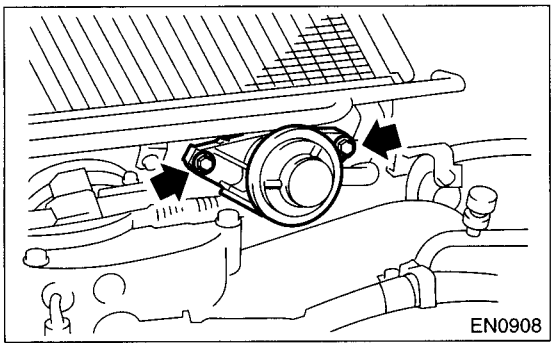
5. Intercooler

A: REMOVAL

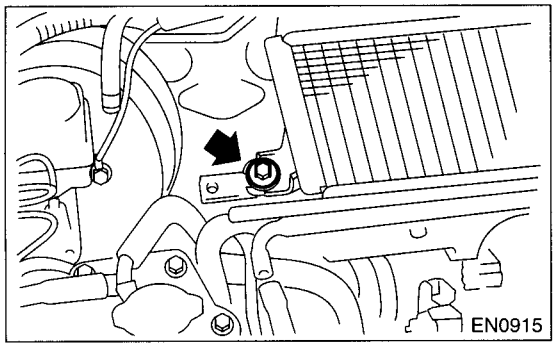
1) Disconnect the air by-pass hoses from intercooler.

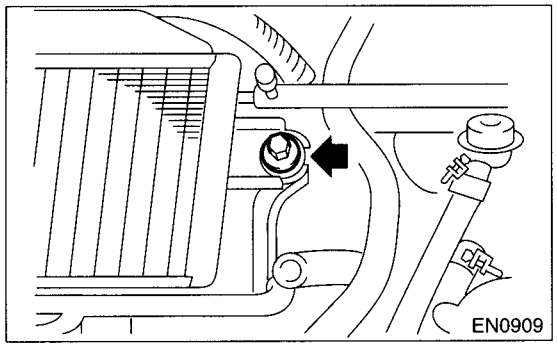


2) Separate the air by-pass valve from intercooler.



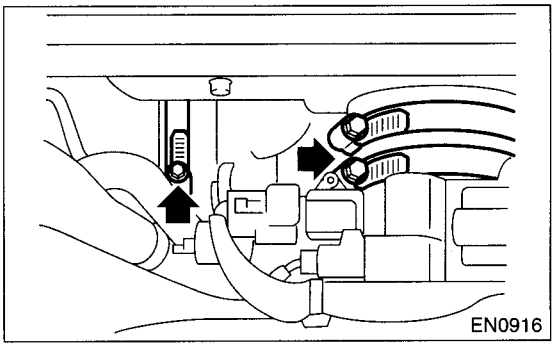
3) Remove the bolts which secure intercooler to bracket.





4) Separate the intercooler air duct from turbocharger.

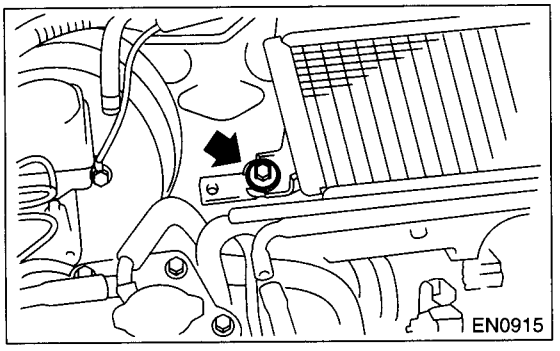
5) Separate the intercooler from throttle body.

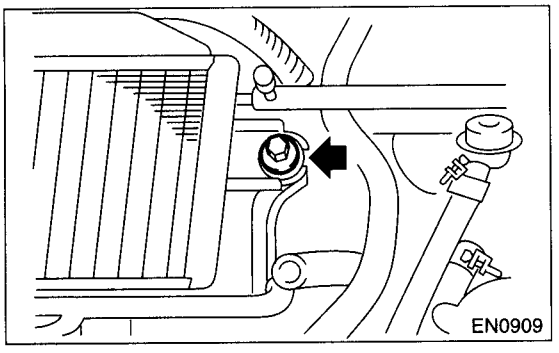


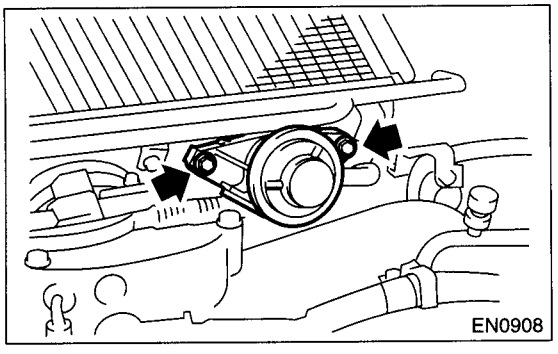
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
16 N·m (1.6 kgf-m, 11.7 ft-lb)

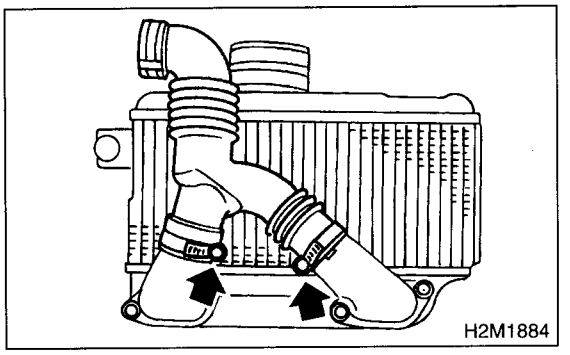




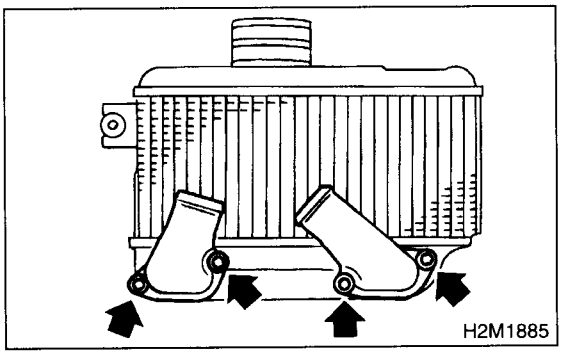


C: DISASSEMBLY

1) Loosen the clamps, then remove intercooler duct.



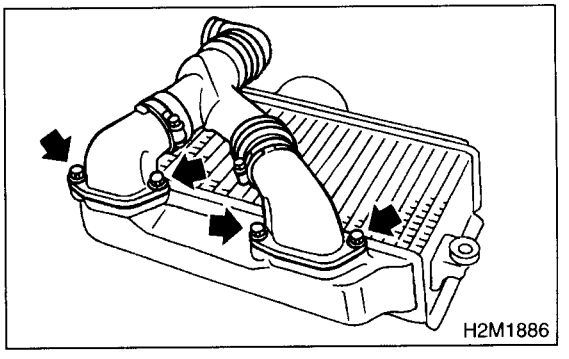
2) Remove the intercooler ducts from intercooler.



D: ASSEMBLY

Assemble in the reverse order of disassembly.

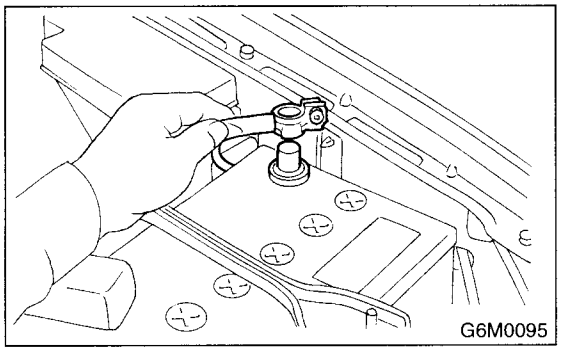
Tightening torque:
16 N·m (1.6 kgf-m, 11.7 ft-lb)



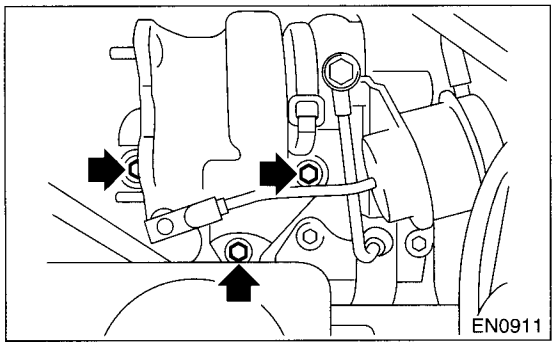
6. Turbocharger

A: REMOVAL

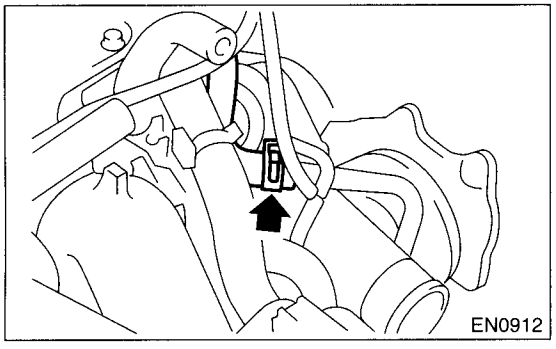
1) Set the vehicle on the lift.
2) Disconnect the ground terminal from battery.



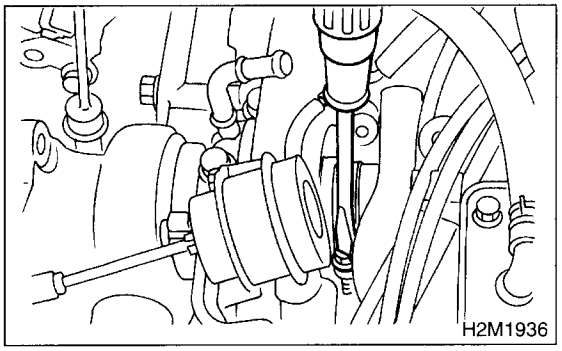
3) Remove the center exhaust pipe. <Ref. to EX(DOHC TURBO)-8, REMOVAL, Center Exhaust Pipe.>
4) Lower the vehicle.
5) Separate the turbocharger joint pipe from turbocharger.



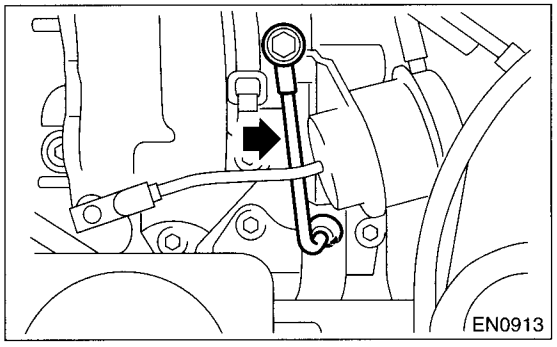
6) Disconnect the engine coolant hose which is connected to coolant filler tank.



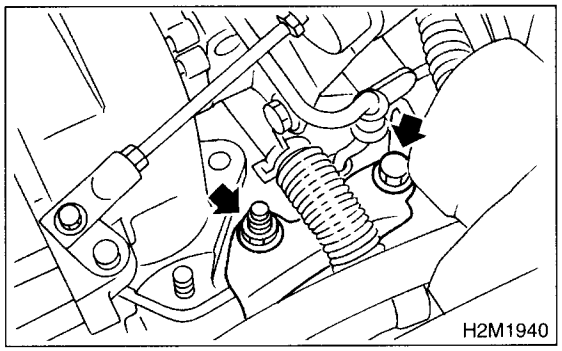
7) Loosen the clamp which secures turbocharger to air inlet duct.



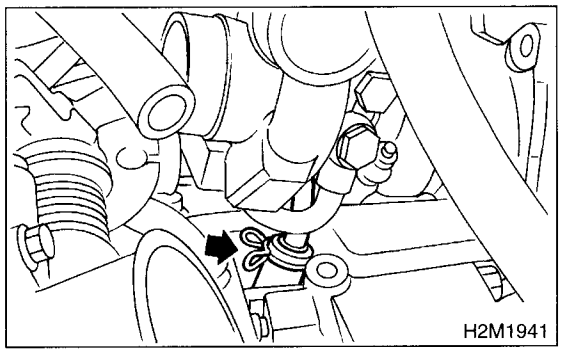
8) Remove the bolt which secures bracket of oil pipe to turbocharger.
9) Remove the oil pipe from turbocharger.



10) Remove the turbocharger bracket.



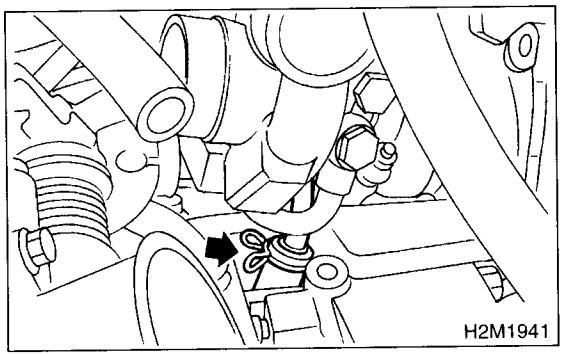
11) Disconnect the oil outlet hose from pipe.



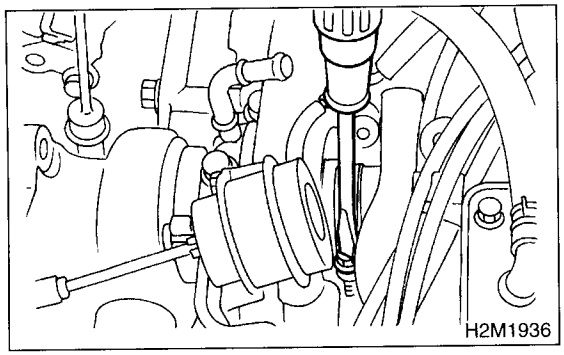
12) Take out the turbocharger from engine compartment.

B: INSTALLATION

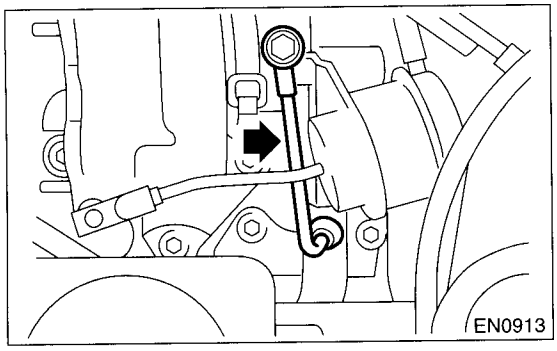
1) Connect the oil outlet hose to outlet pipe.



2) Install the turbocharger to air intake duct.



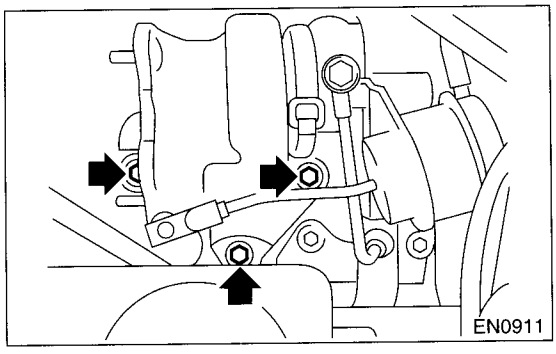
3) Install the oil pipe to turbocharger.



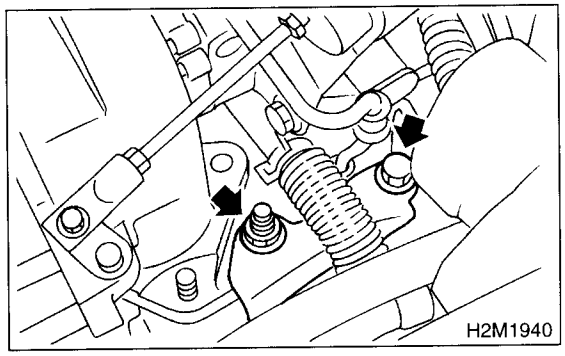
4) Install the joint pipe to turbocharger.

NOTE:
Replace the gasket with a new one.

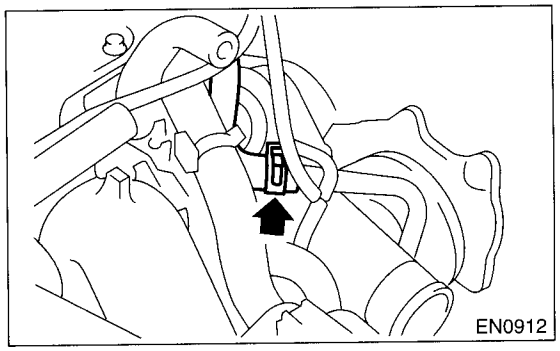
Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)



5) Install the turbocharger bracket.



6) Connect the engine coolant hose which is connected to coolant filler tank.

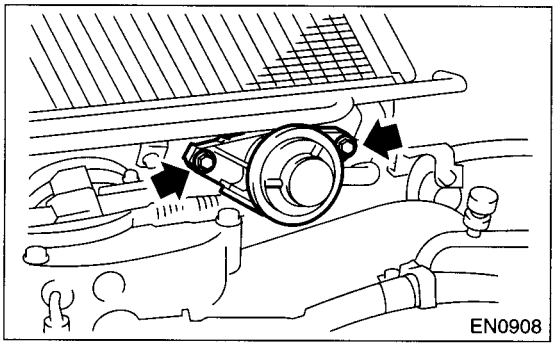


7) Lift-up the vehicle.
8) Install the center exhaust pipe. <Ref. to EX(DOHC TURBO)-9, INSTALLATION, Center Exhaust Pipe.>

7. Air By-pass Valve

A: REMOVAL

1) Remove the air by-pass valve from intercooler.

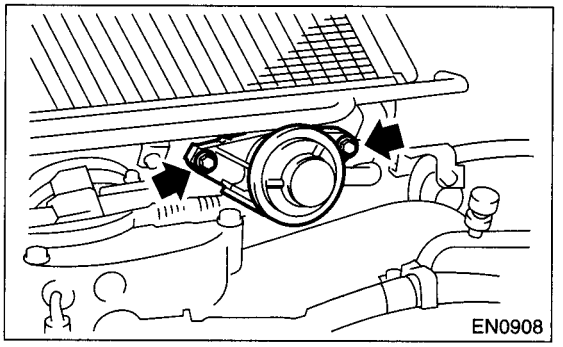


2) Disconnect the air by-pass hoses from air by-pass valve.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
16 N·m (1.6 kgf-m, 11.7 ft-lb)



MECHANICAL

ME(DOHC 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		10° BTDC	
		Closing		50° ABDC	
	Exhaust valve timing	Opening		53° BBDC	
		Closing		7° 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

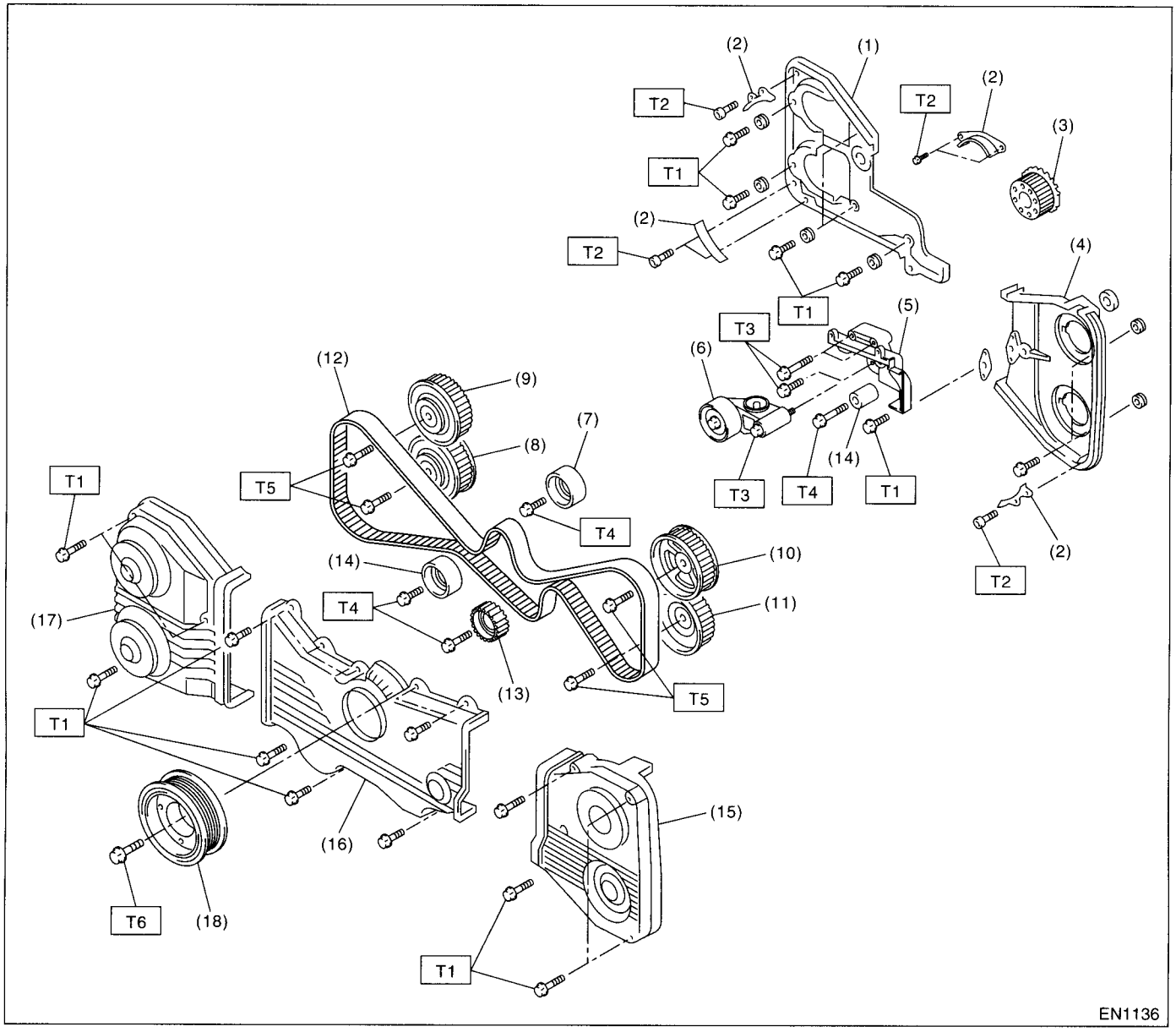
Belt tension adjuster	Protrusion of adjuster rod			5.2 — 6.2 mm (0.205 — 0.244 in)
Belt tensioner	Spacer O.D.			17.955 — 17.975 mm (0.7069 — 0.7077 in)
	Tensioner bush I.D.			18.0 — 18.08 mm (0.7087 — 0.7118 in)
	Clearance between spacer and bush		STD	0.025 — 0.125 mm (0.0010 — 0.0049 in)
			Limit	0.175 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	46.25 — 46.35 mm (1.821 — 1.825 in)
			Limit	46.15 mm (1.817 in)
		Exhaust	STD	46.15 — 46.25 mm (1.817 — 1.821 in)
			Limit	46.05 mm (1.813 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			12.0 — 12.4 mm (0.472 — 0.488 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	5.950 — 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	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			220.7±15.7 N (22.5±1.6 kgf, 49.6±3.5 lb)/36.0 mm (1.417 in) 510.9±25.5 N (52.1±2.6 kgf, 114.9±5.7 lb)/26.6 mm (1.0.47 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 — 0.35 mm (0.0079 — 0.0138 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 — 0.70 mm (0.0079 — 0.0276 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		STD	0.020 — 0.046 mm (0.0008 — 0.0018 in)
			Limit	0.05 mm (0.0020 in)
	Thickness at center portion		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)
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	47.984 — 48.000 mm (1.8891 — 1.8898)
			0.03 mm (0.0012 in) US	47.954 — 47.970 mm (1.8879 — 1.8886)
			0.05 mm (0.0020 in) US	47.934 — 47.950 mm (1.8872 — 1.8878)
			0.25 mm (0.0098 in) US	47.734 — 47.750 mm (1.8793 — 1.8799)
	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		STD	0.010 — 0.030 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

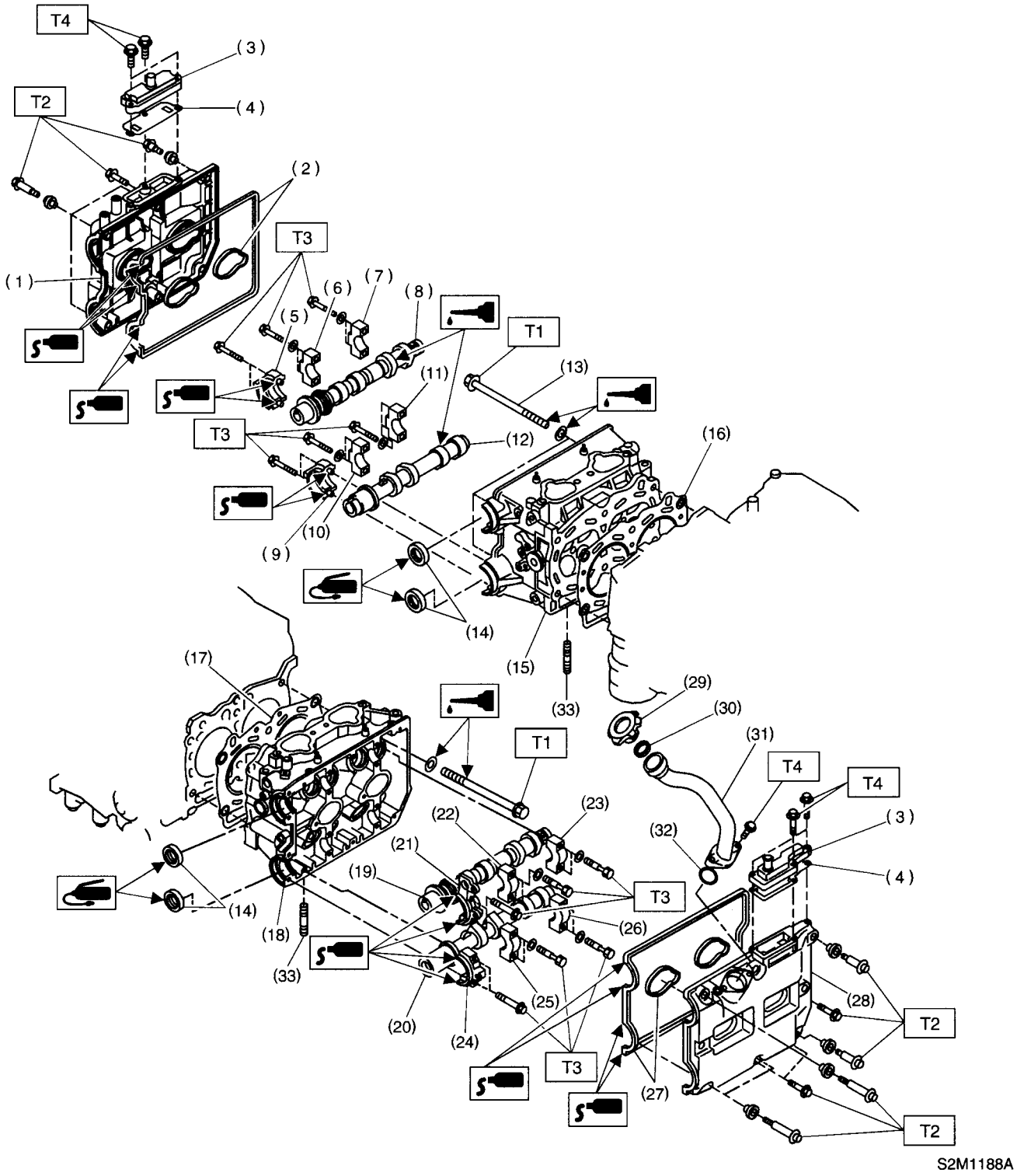


(1) Right-hand belt cover No. 2
(2) Timing belt guide (MT vehicles only)
(3) Crankshaft sprocket
(4) Left-hand belt cover No. 2
(5) Tensioner bracket
(6) Automatic belt tension adjuster ASSY
(7) Belt idler
(8) Right-hand exhaust camshaft sprocket
(9) Right-hand intake camshaft sprocket
(10) Left-hand intake camshaft sprocket
(11) Left-hand exhaust camshaft sprocket
(12) Timing belt
(13) Belt idler No. 2
(14) Belt idler
(15) Left-hand belt cover
(16) Front belt cover
(17) Right-hand belt cover
(18) Crankshaft pulley

Tightening torque: N·m (kgf-m, ft-lb)

T1: 5 (0.5, 3.6)
T2: 10 (1.0, 7)
T3: 25 (2.5, 18.1)
T4: 39 (4.0, 28.9)
T5: 98 (10, 72.4)
T6: <Ref. to ME(DOHC TURBO)-46, INSTALLATION, Crankshaft Pulley.>

2. CYLINDER HEAD AND CAMSHAFT

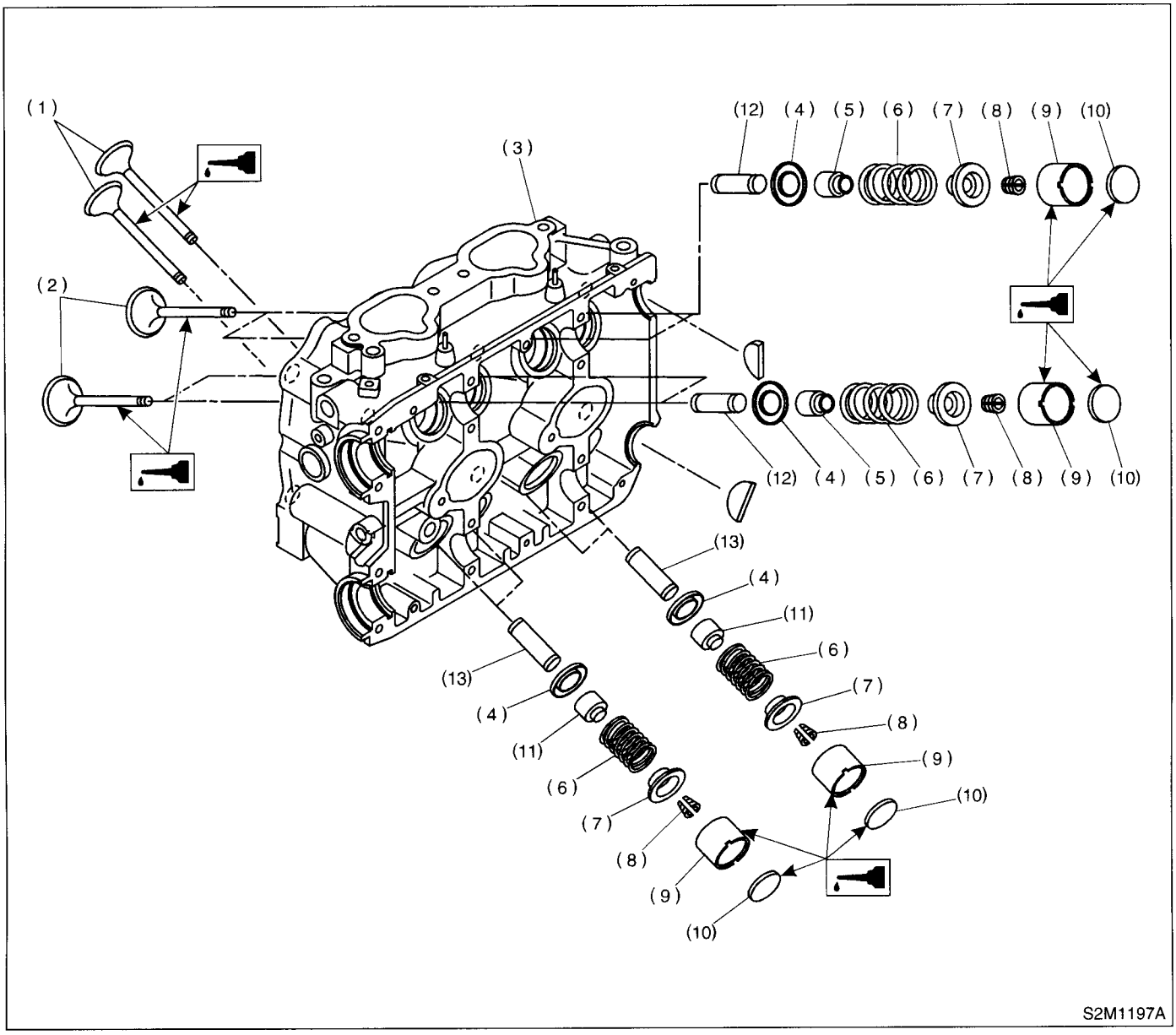


(1) Rocker cover (RH)
(2) Rocker cover gasket (RH)
(3) Oil separator cover
(4) Gasket
(5) Intake camshaft cap (Front RH)
(6) Intake camshaft cap (Center RH)
(7) Intake camshaft cap (Rear RH)
(8) Intake camshaft (RH)
(9) Exhaust camshaft cap (Front RH)
(10) Exhaust camshaft cap (Center RH)
(11) Exhaust 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 gasket (LH)
(18) Cylinder head (LH)
(19) Intake camshaft (LH)
(20) Exhaust camshaft (LH)
(21) Intake camshaft cap (Front LH)
(22) Intake camshaft cap (Center LH)
(23) Intake camshaft cap (Rear LH)
(24) Exhaust camshaft (Front LH)
(25) Exhaust camshaft cap (Center LH)
(26) Exhaust camshaft cap (Rear LH)
(27) Rocker cover gasket (LH)
(28) Rocker cover (LH)
(29) Oil filler cap
(30) Gasket
(31) Oil filler duct
(32) O-ring
(33) Stud bolt

Tightening torque: N·m (kgf-m, ft-lb)

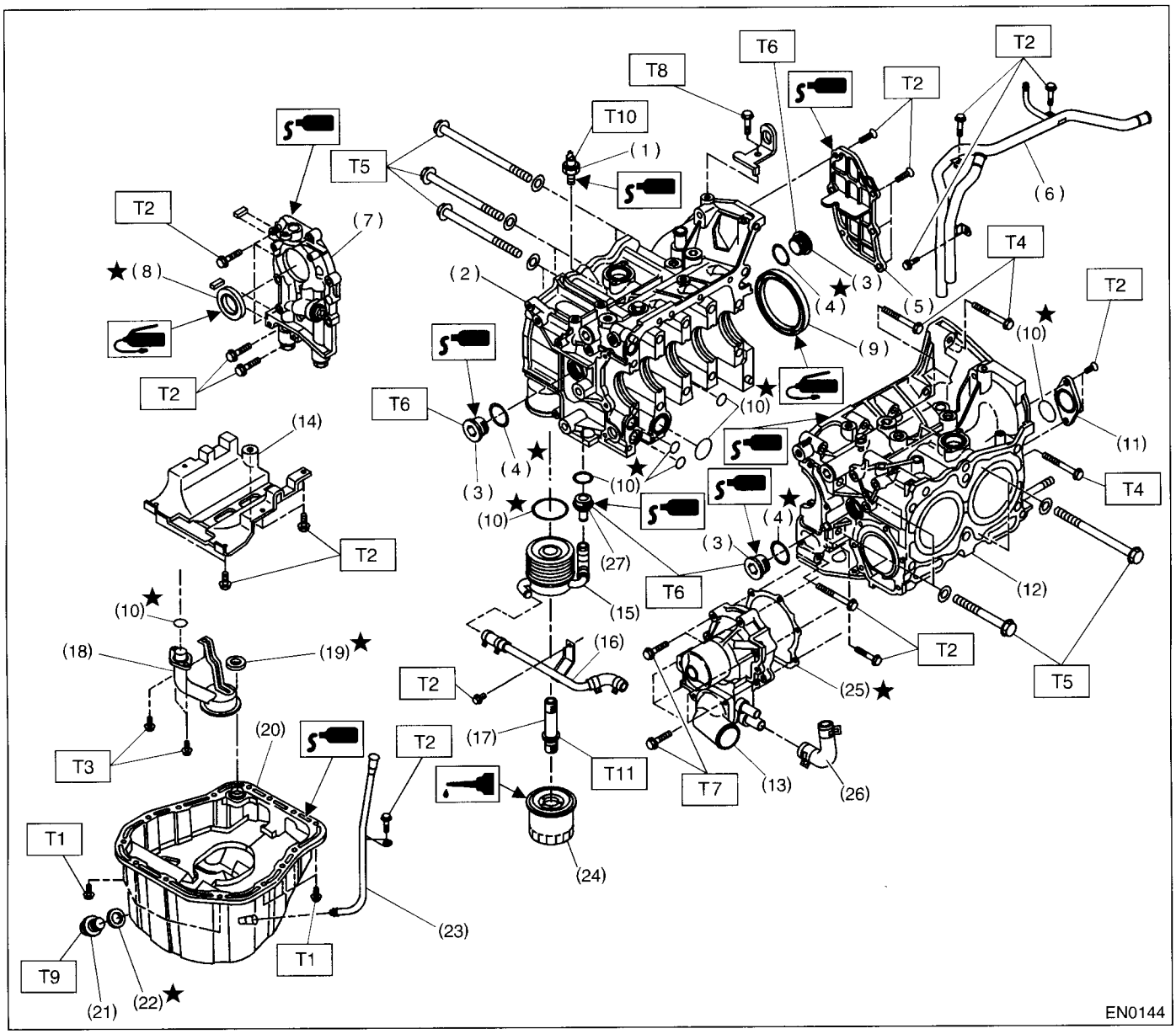
T1: ***<Ref. to ME(DOHC TURBO)-64, INSTALLATION, Cylinder Head Assembly.>***
T2: ***5 (0.5, 3.6)***
T3: ***10 (1.0, 7)***
T4: ***6.4 (0.65, 4.7)***

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) Shim
(11) Exhaust valve oil seal
(12) Intake valve guide
(13) Exhaust valve guide

4. CYLINDER BLOCK

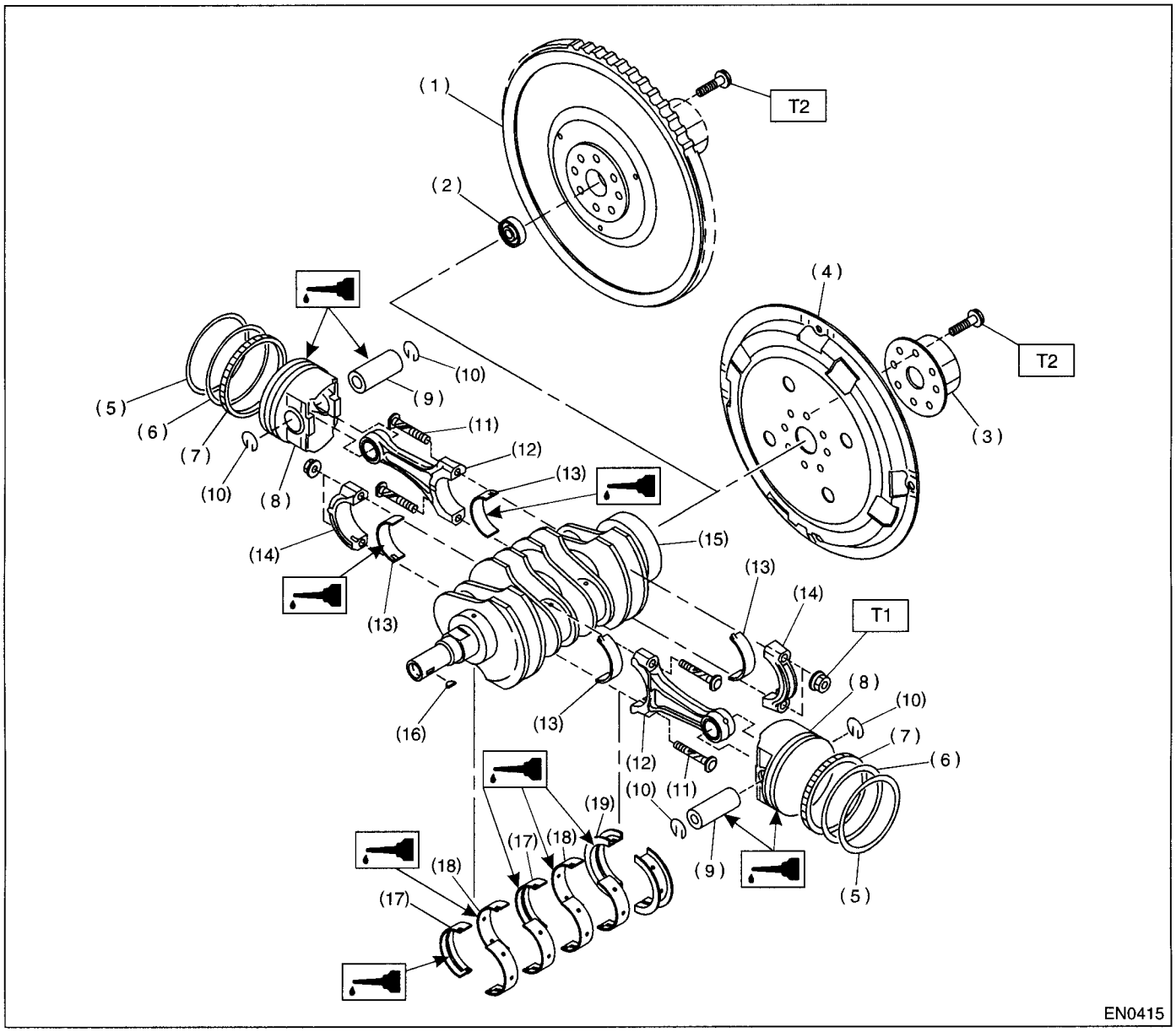


(1) Oil pressure switch
(2) Cylinder block (RH)
(3) Service hole plug
(4) Gasket
(5) Oil separator cover
(6) Water by-pass pipe
(7) Oil pump
(8) Front oil seal
(9) Rear oil seal
(10) O-ring
(11) Service hole cover
(12) Cylinder block (LH)
(13) Water pump
(14) Baffle plate
(15) Oil cooler
(16) Waster by-pass pipe
(17) Connector
(18) Oil strainer
(19) Gasket
(20) Oil pan
(21) Drain plug
(22) Metal gasket
(23) Oil level gauge guide
(24) Oil filter
(25) Gasket
(26) Water pump hose
(27) 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)
T4: 25 (2.5, 18.1)
T5: 47 (4.8, 34.7)
T6: 69 (7.0, 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: 55 (5.5, 40)

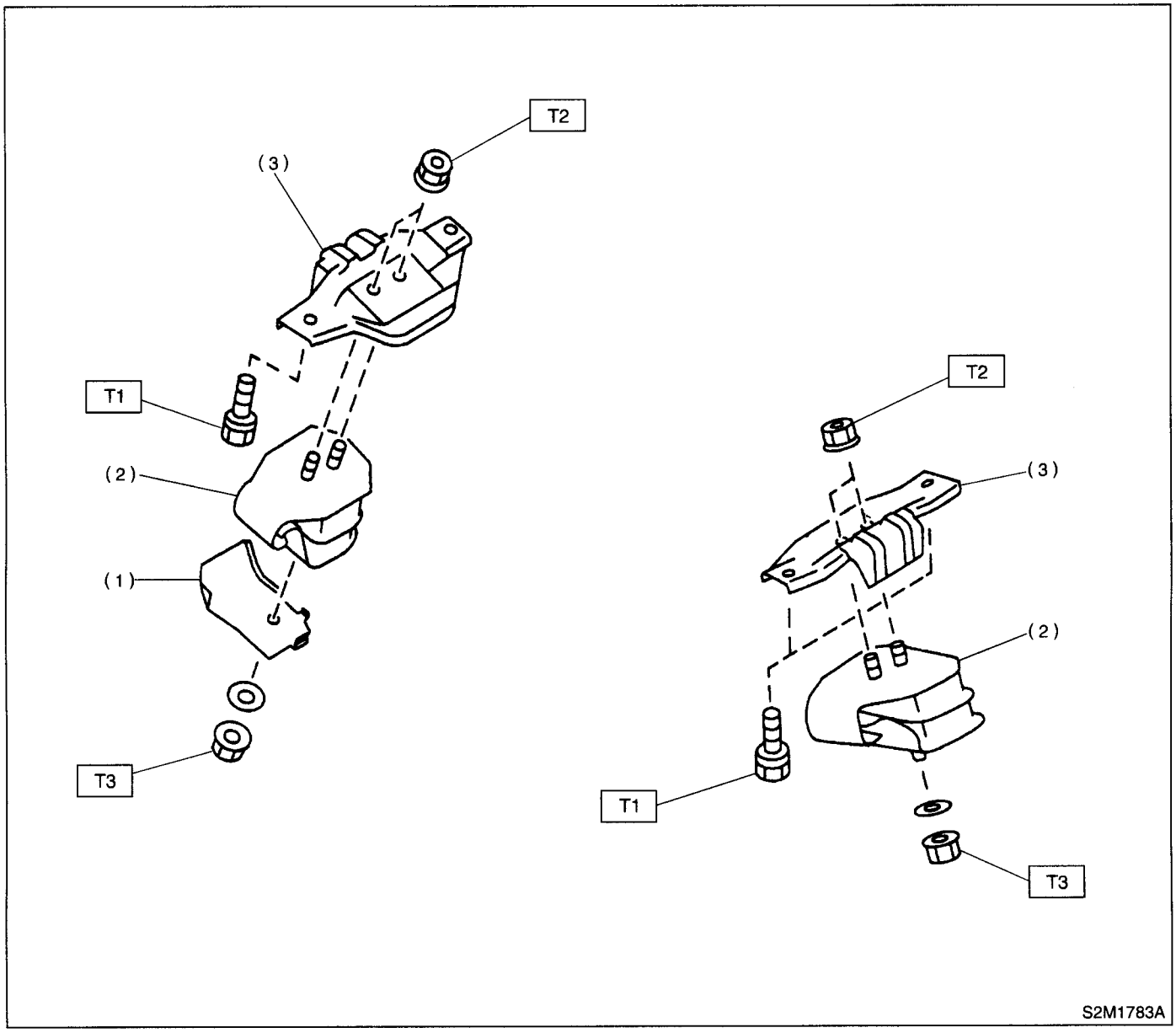
5. CRANKSHAFT AND PISTON



(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: 44.6 (4.55, 32.9)
T2: 72 (7.3, 52.8)

6. ENGINE MOUNTING



(1) Hear shield cover
(2) Front cushion rubber
(3) Front engine mounting bracket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 35 (3.6, 25.8)
T2: 42 (4.3, 30.9)
T3: 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 negative terminal 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

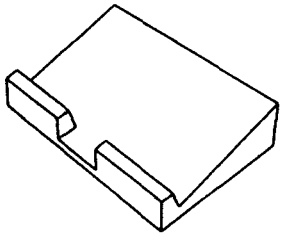
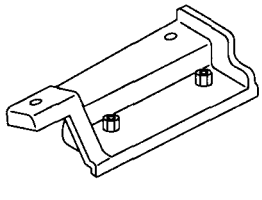
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 EN0147	498267600	CYLINDER HEAD TABLE	• Used for replacing valve guides. • Used for removing and installing valve springs.
 B2M3851	498457000	ENGINE STAND ADAPTER RH	Used with ENGINE STAND (499817000).

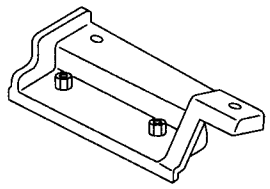
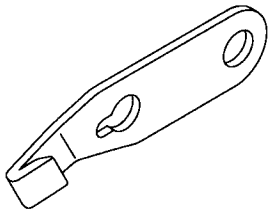
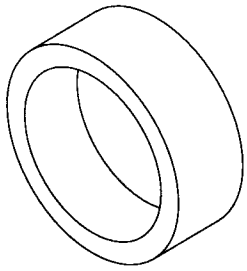
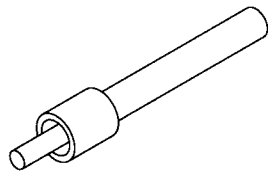
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3852	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817000).
 B2M3853	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening and tightening crankshaft pulley bolt, etc.
 B2M3854	398744300 (Newly adopted tool)	PISTON GUIDE	Used for installing piston in cylinder for 2000 cc engine.
 B2M3855	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.

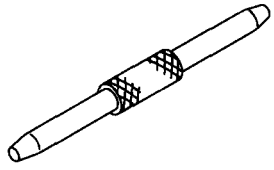
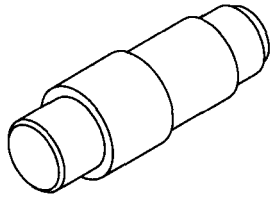
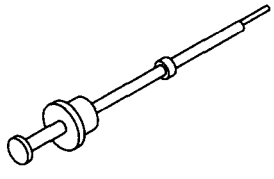
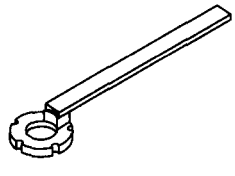
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3856	499017100	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.
 B2M3857	499037100	CONNECTING ROD BUSHING REMOVER & INSTALLER	Used for removing and installing connecting rod bushing.
 B2M3858	499097700	PISTON PIN REMOVER ASSY	Used for removing piston pin.
 B2M4158	499207400 (Newly adopted tool)	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket.

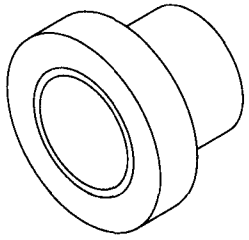
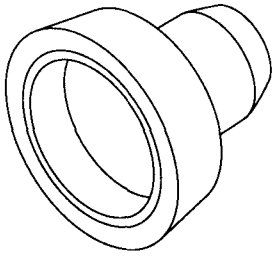
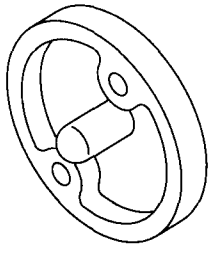
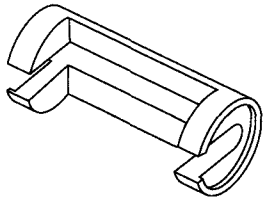
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3860	499587700 (Newly adopted tool)	CAMSHAFT OIL SEAL INSTALLER	Used for installing cylinder head plug for DOHC engine.
 B2M3861	499587200	CRANKSHAFT OIL SEAL INSTALLER	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL GUIDE (499597100).
 B2M3863	499597100	CRANKSHAFT OIL SEAL GUIDE	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).
 B2M3864	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.

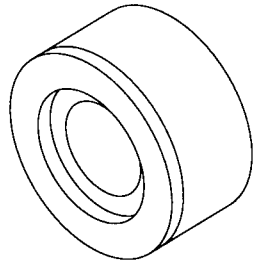
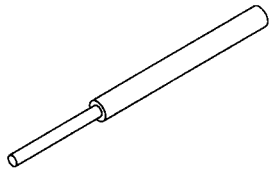
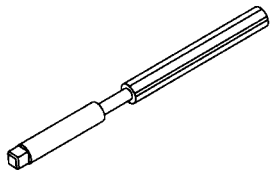
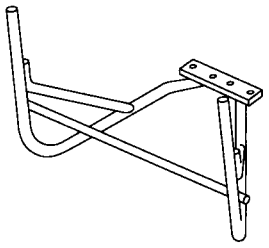
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3865	498267700	VALVE GUIDE ADJUSTER	Used for installing intake and exhaust valve guides.
 B2M3867	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.
 B2M3868	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 B2M3869	499817000	ENGINE STAND	• Stand used for engine disassembly and assembly. • Used with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).

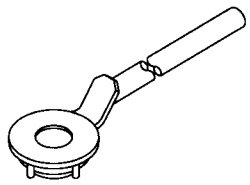
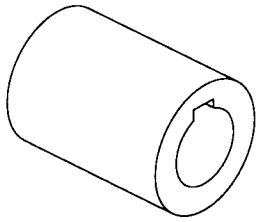
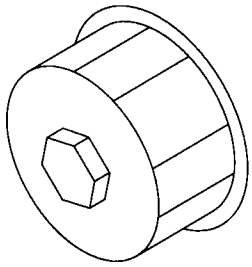
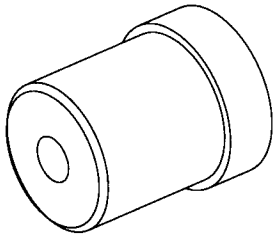
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M4157	499977300	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 B2M3871	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.
 B2M3872	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter.
 B2M3875	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.

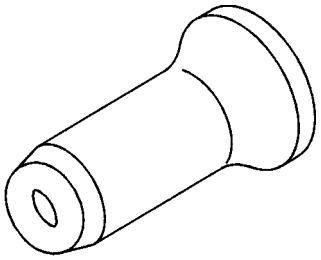
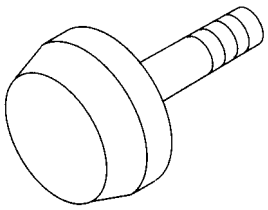
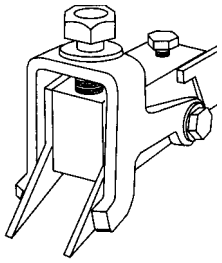
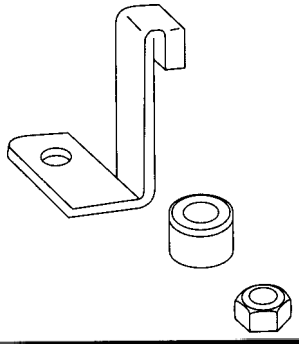
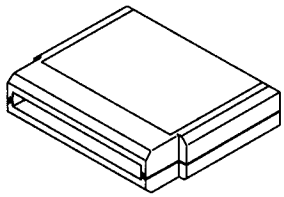
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 S1H0136	499587600 (Newly adopted tool)	OIL SEAL GUIDE	Used for installing camshaft oil seal for DOHC engine.
 EN0168	499597200 (Newly adopted tool)	OIL SEAL GUIDE	Used for installing camshaft oil seal for DOHC engine. Used with OIL SEAL GUIDE (499587600).
 EN0169	498187200 (Newly adopted tool)	SHIM REPLACER	Used for correct valve clearance.
 H1H0493	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3876	24082AA150	CARTRIDGE	Troubleshooting for electrical systems.
B2M3877	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.
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
- Camshaft
- Cylinder Head

2. Compression

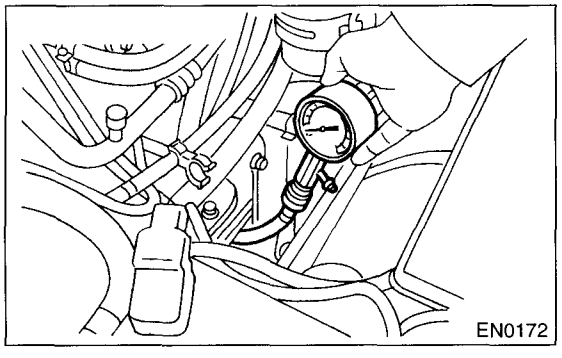
A: INSPECTION

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 fuel pressure. <Ref. to FU(DOHC TURBO)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
4) Remove all the spark plugs. <Ref. to IG(DOHC TURBO)-4, 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 the spark plug hole.

CAUTION:
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 the starter motor, and 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) 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 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 turn the ignition switch to OFF.
4) Insert the cartridge to the SUBARU SELECT MONITOR.
5) Connect the SUBARU SELECT MONITOR to the data link connector.
6) Turn the ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.
7) Select {2. Each System Check} in Main Menu.
8) Select {Engine Control System} in Selection Menu.
9) Select {1. Current Data Display & Save} in Engine Control System Diagnosis.
10) Select {1.12 Data Display} in Data Display Menu.
11) Start the engine, and read 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 one minute before measurement.)

Idle speed [A/C "ON", no load and gears in neutral]:
800±150 rpm (MT model)
825±150 rpm (AT model)

CAUTION:
Never rotate the idle adjusting screw. If the idle speed is out of specifications, refer to General On-board Diagnosis Table under "Engine Control System". <Ref. to EN(DOHC TURBO)-2, Basic Diagnostic Procedure.>

4. Ignition Timing

A: INSPECTION

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 turn the ignition switch to OFF.
4) Insert the cartridge to the SUBARU SELECT MONITOR.
5) Connect the SUBARU SELECT MONITOR to the data link connector.
6) Turn the ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.
7) Select {2. Each System Check} in Main Menu.
8) Select {Engine Control System} in Selection Menu.
9) Select {1. Current Data Display & Save} in Engine Control System Diagnosis.
10) Select {1.12 Data Display} in Data Display Menu.
11) Start the engine, at idle speed and check the ignition timing.

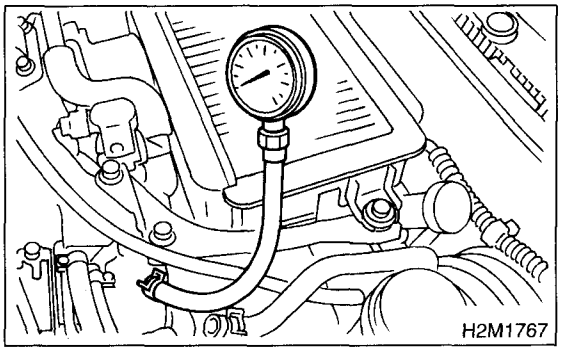
Ignition timing [BTDC/rpm]:
12°±3°/750

If the timing is not correct, check the ignition control system. Refer to Engine Control System. <Ref. to EN(DOHC TURBO)-2, Basic Diagnostic Procedure.>

5. Intake Manifold Vacuum

A: INSPECTION

1) Warm-up the engine.
2) Disconnect the brake vacuum hose and install the vacuum gauge to the hose fitting on the manifold.
3) Keep the engine at the idle speed and read the vacuum gauge indication.
By observing the gauge needle movement, the internal condition of the engine can be diagnosed as described below.



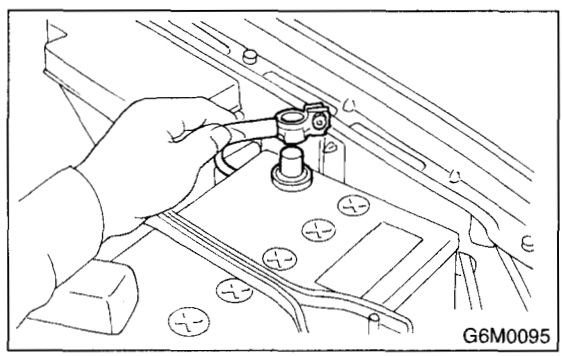
Vacuum pressure (at idling, A/C "OFF"):
Less than –60.0 kPa (–450 mmHg, –17.72 in-Hg)

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 or throttle chamber idle adjustment

6. Engine Oil Pressure

A: INSPECTION

1) Remove the oil pressure switch from engine cylinder block. <Ref. to LU-22, REMOVAL, Oil Pressure Switch.>
2) Connect the oil pressure gauge hose to cylinder block.
3) Connect the battery ground terminal to battery.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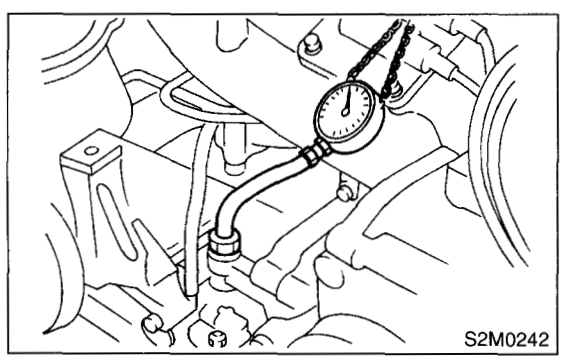
4) Start the engine, and measure oil pressure.


S2M0242

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

CAUTION:
• If the oil pressure is out of specification, check oil pump, oil filter and lubrication line. <Ref. to LU-28, 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-28, 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-23, INSTALLATION, Oil Pressure Switch.>

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

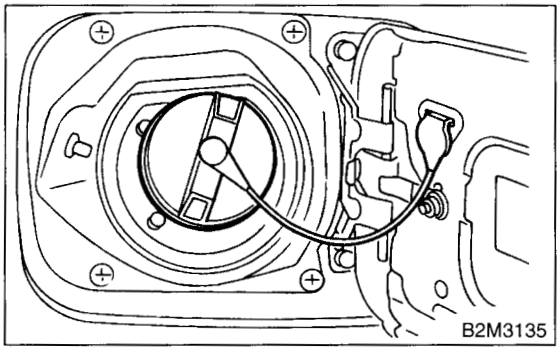
7. Fuel Pressure

A: INSPECTION

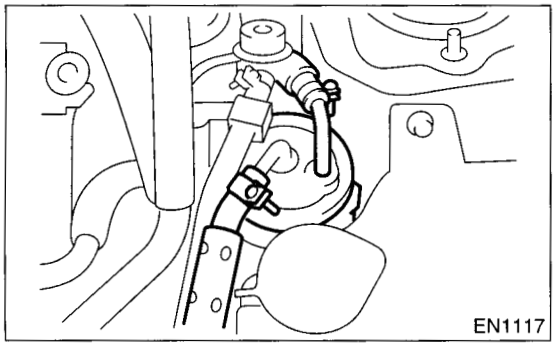
WARNING:
Before removing the fuel pressure gauge, release the fuel pressure.

NOTE:
If out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.

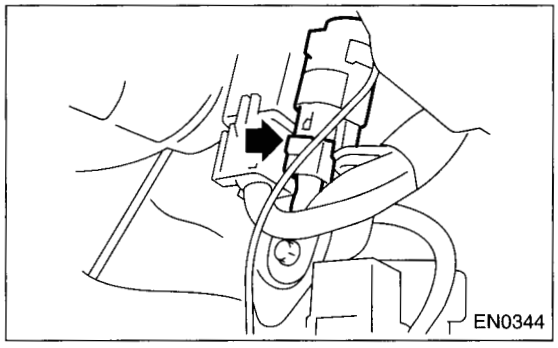
1) Release the fuel pressure. <Ref. to FU(DOHC TURBO)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel flap lid, and remove the fuel filler cap.



3) Disconnect the fuel delivery hoses from fuel filter, and connect the fuel pressure gauge.

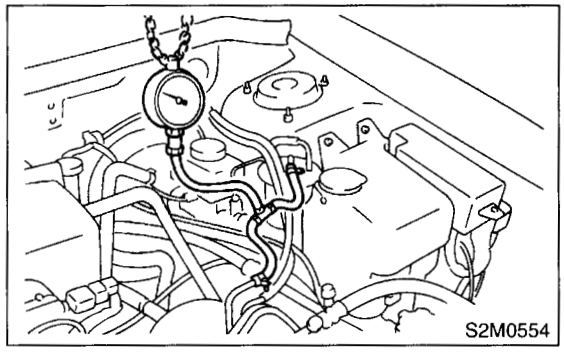


4) Connect the connector of fuel pump relay.



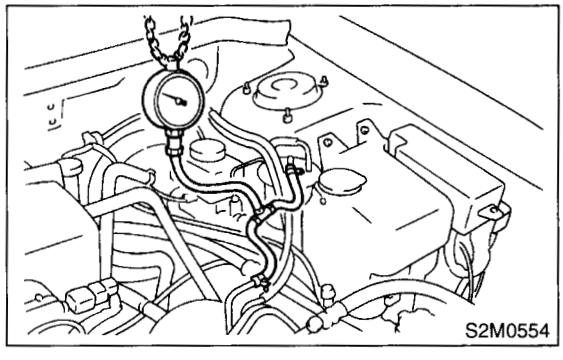
5) Start the engine.
6) Measure fuel pressure while disconnecting the pressure regulator vacuum hose from intake manifold.

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 fuel pressure.

Fuel pressure:
Standard; 230 — 260 kPa (2.35 — 2.65 kgf/cm^2, 33 — 38 psi)



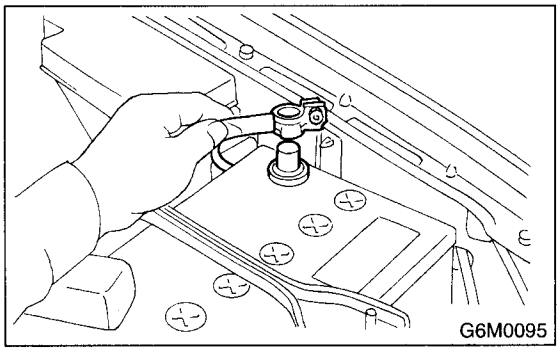
NOTE:
The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm^2, 1 to 3 psi) higher than standard values during high-altitude operations.

8. Valve Clearance

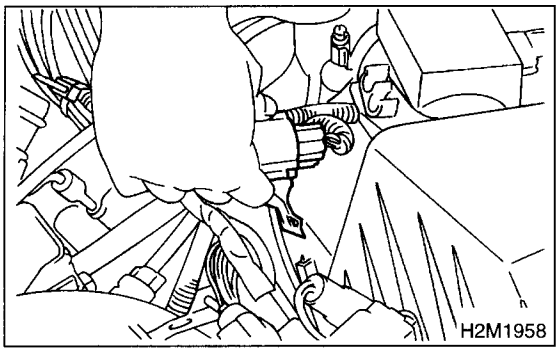
A: INSPECTION

CAUTION:
Inspection and adjustment of valve clearance should be performed while engine is cold.

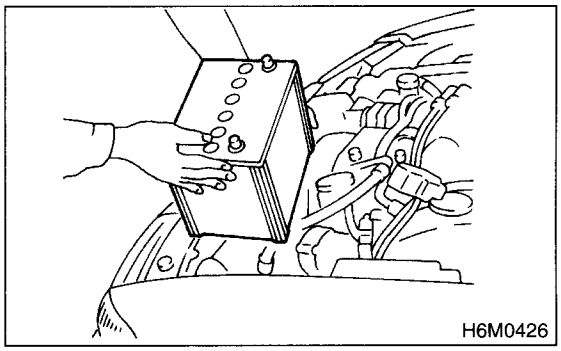
1) Set the vehicle onto the lift.
2) Disconnect the ground terminal from battery.


G6M0095

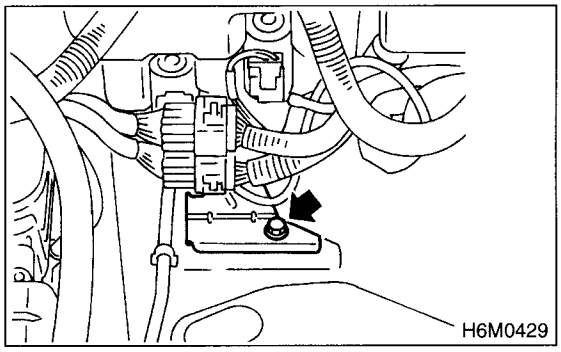
3) Remove the air intake duct. <Ref. to IN(DOHC TURBO)-8, REMOVAL, Air Intake Duct.>
4) Remove one bolt which secures the timing belt cover (RH).
5) Lift-up the vehicle.
6) Remove the under cover.
7) Loosen the remaining bolts which secure the timing belt cover (RH), then remove the belt cover.
8) Lower the vehicle.
9) When inspecting #1 and #3 cylinders:
   (1) Pull out the engine harness connector with bracket from air cleaner upper cover.


H2M1958

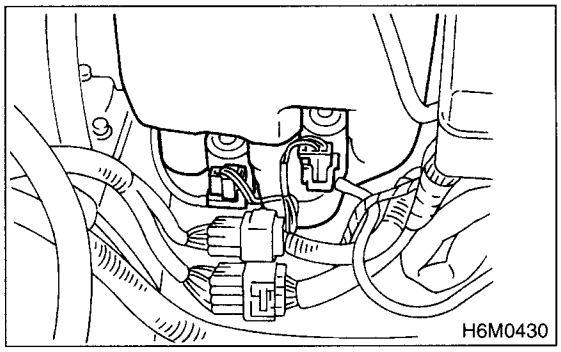
   (2) Remove the air cleaner case. <Ref. to IN(DOHC TURBO)-7, REMOVAL, Air Cleaner.>
   (3) Disconnect the spark plug cords from spark plugs (#1 and #3 cylinders).
   (4) Place a suitable container under the vehicle.
   (5) Disconnect the PCV hose from rocker cover (RH).
   (6) Remove the bolts, then remove the rocker cover (RH).
10) When inspecting #2 and #4 cylinders:
   (1) Disconnect the battery terminal, and then remove the battery and battery carrier.


H6M0426

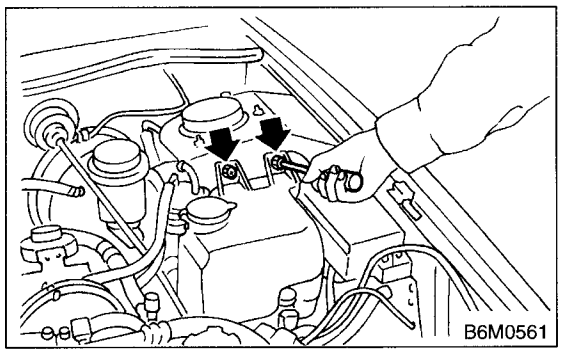
   (2) Remove the bolt which secures the engine harness bracket onto body.


H6M0429

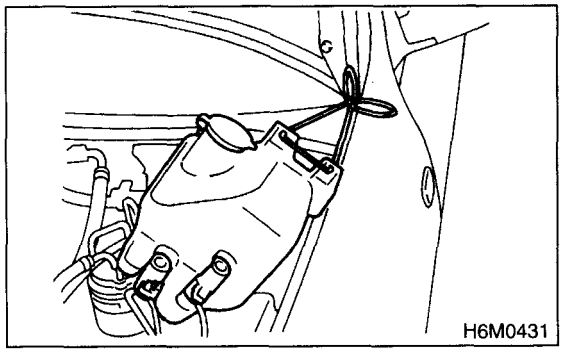
   (3) Disconnect the washer motor connectors.


H6M0430

   (4) Remove the washer tank mounting bolts.


B6M0561

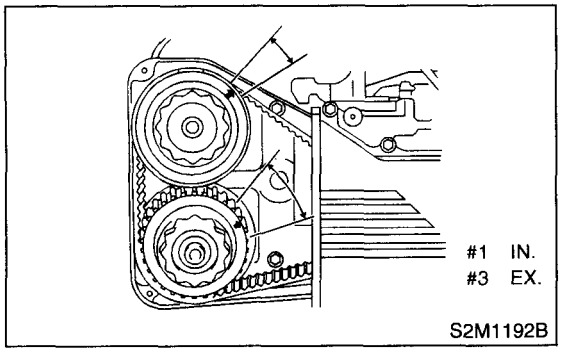
(5) Move the washer tank upward.



(6) Disconnect the spark plug cords from spark plugs (#2 and #4 cylinders).
(7) Place a suitable container under the vehicle.
(8) Disconnect the PCV hose from rocker cover (LH).
(9) Remove the bolts, 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 ST.
ST 499987500 CRANKSHAFT SOCKET

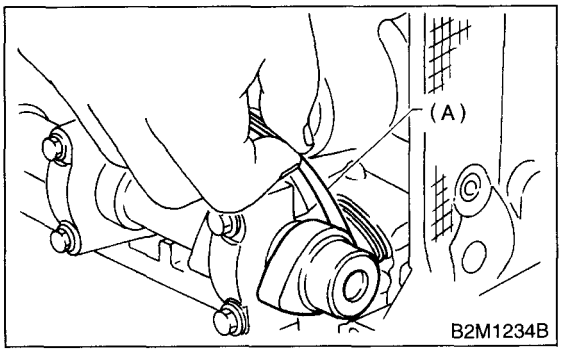


12) Measure #1 cylinder intake valve and #3 cylinder exhaust valve clearance by using thickness gauge (A).

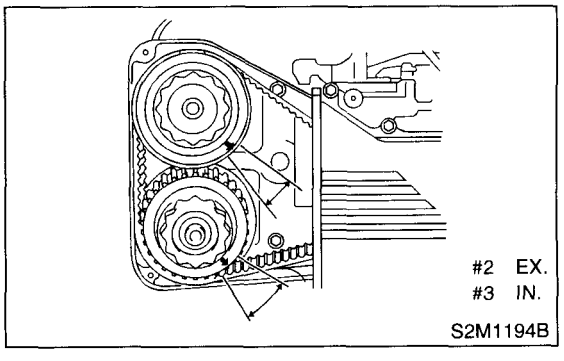
CAUTION:
• Insert the thickness gauge in as horizontal a direction as possible with respect to the shim.
• Measure the exhaust valve clearances while lifting-up the vehicle.

Valve clearance:
Intake: 0.20±0.02 mm (0.0079±0.0008 in)
Exhaust: 0.25±0.02 mm (0.0098±0.0008 in)

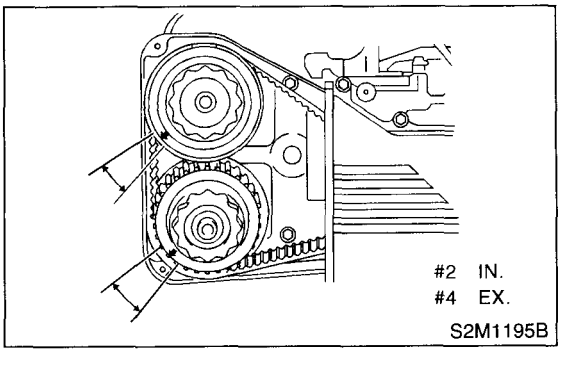
NOTE:
If the measured value is not within specification, take notes of the value in order to adjust the valve clearance later on.



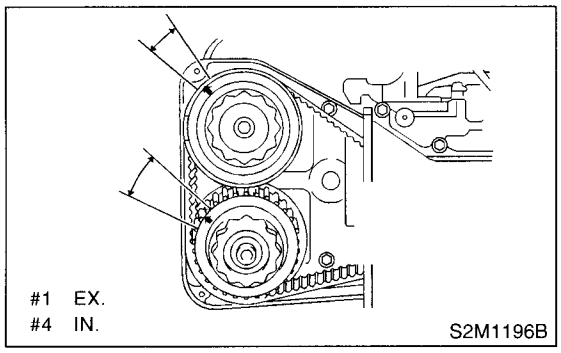
13) If necessary, adjust the valve clearance. <Ref. to ME(DOHC TURBO)-30, ADJUSTMENT, Valve Clearance.>
14) Further turn the crankshaft pulley clockwise.
Using the same procedures described previously, then measure valve clearances again.
(1) Set the arrow mark on camshaft sprocket to position shown in the figure, and measure #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 measure #2 cylinder intake valve and #4 cylinder exhaust valve clearances.

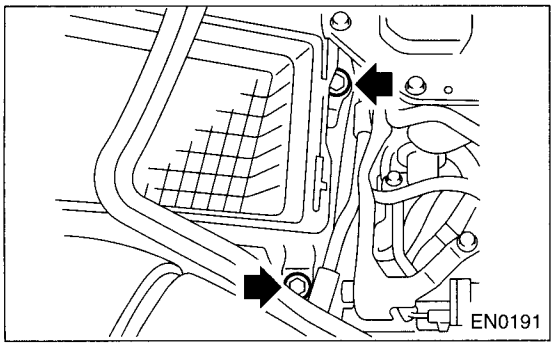


(3) Set the arrow mark on camshaft sprocket to position shown in the figure, and measure #1 cylinder exhaust valve and #4 cylinder intake valve clearances.



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)

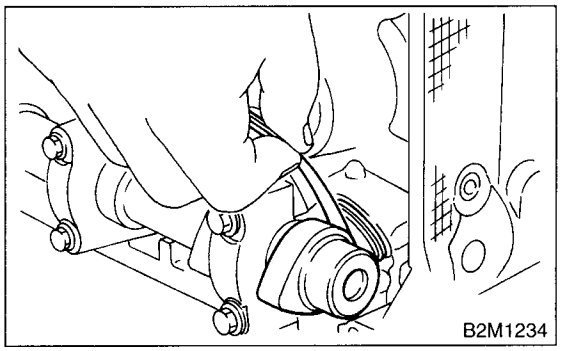


B: ADJUSTMENT

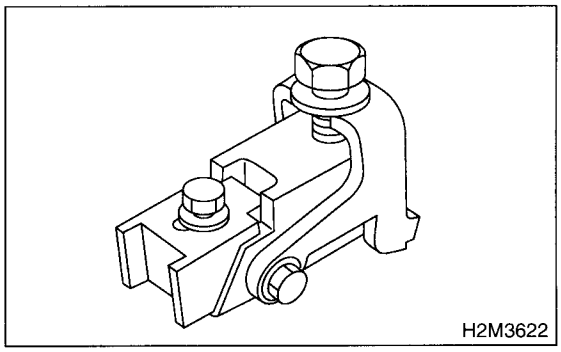
CAUTION:
Adjustment of valve clearance should be performed while engine is cold.

1) Measure all valve clearances. <Ref. to ME(DOHC TURBO)-28, INSPECTION, Valve Clearance.>

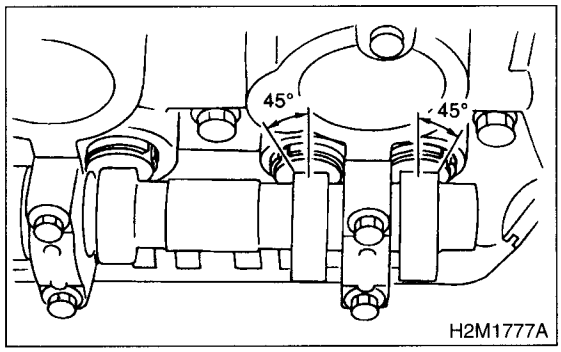
NOTE:
Record each valve clearance after it has been measured.



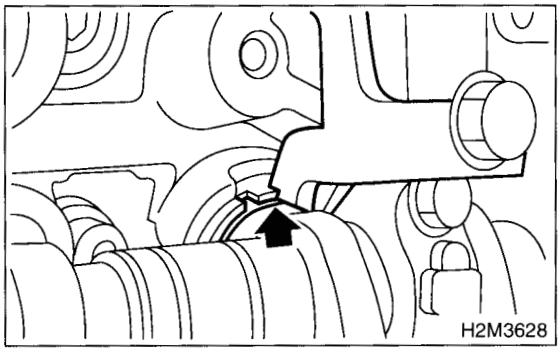
2) Remove the shim from valve lifter.
(1) Prepare the ST.
ST 498187200 SHIM REPLACER



(2) Rotate the notch of the valve lifter outward by 45°.



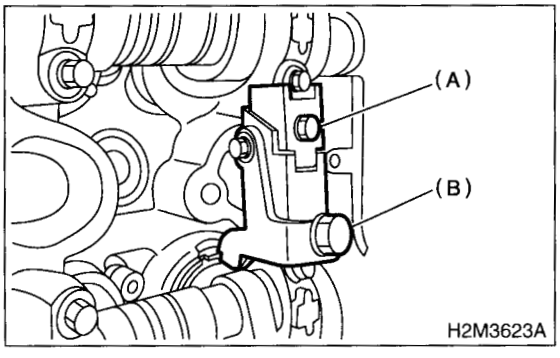
(3) Adjust the SHIM REPLACER notch to valve lifter and set it.



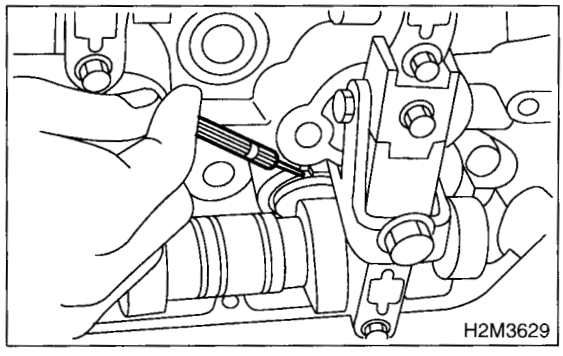
NOTE:
When setting, be careful the SHIM REPLACER edge does not touch shim.

(4) Tighten bolt (A) and install it to the cylinder head.

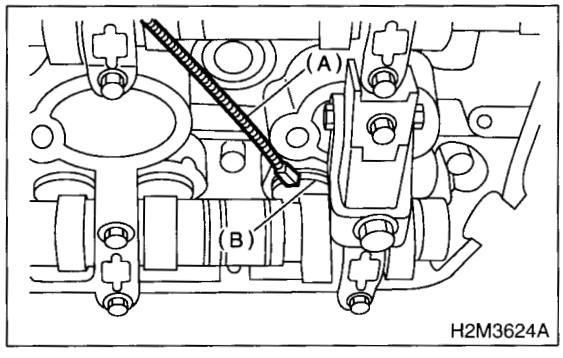
(5) Tighten bolt (B) and insert the valve lifter.



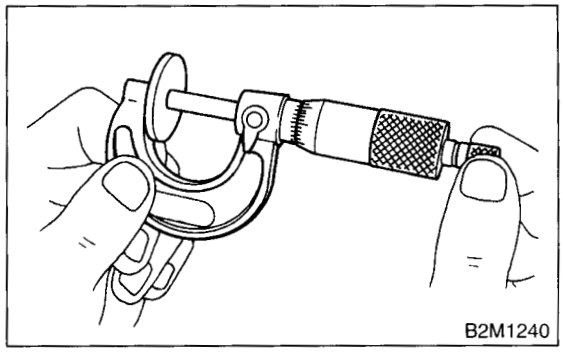
(6) Insert tweezers into the notch of the valve lifter, and take the shim out.



NOTE:
By using a magnet (A), the shim (B) can be taken out without dropping it.



3) Measure the thickness of shim with a micrometer.



4) Select a shim of suitable thickness using measured valve clearance and shim thickness, by referring to the following table.

5) 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: Shim thickness to be used V: Measured valve clearance T: Shim thickness required

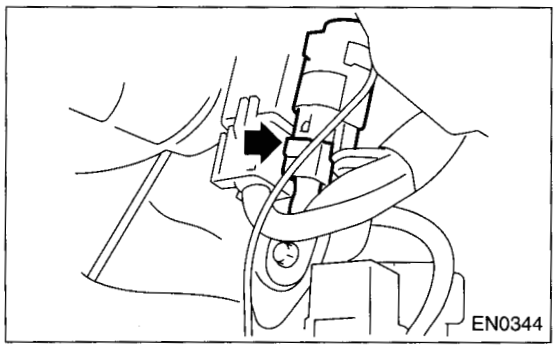
Part No.	Thickness mm (in)
13218 AK010	2.00 (0.0787)
13218 AK020	2.02 (0.0795)
13218 AK030	2.04 (0.0803)
13218 AK040	2.06 (0.0811)
13218 AK050	2.08 (0.0819)
13218 AK060	2.10 (0.0827)
13218 AK070	2.12 (0.0835)
13218 AK080	2.14 (0.0843)
13218 AK090	2.16 (0.0850)
13218 AK100	2.18 (0.0858)
13218 AK110	2.20 (0.0866)
13218 AE710	2.22 (0.0874)
13218 AE730	2.24 (0.0882)
13218 AE750	2.26 (0.0890)
13218 AE770	2.28 (0.0898)
13218 AE790	2.30 (0.0906)
13218 AE810	2.32 (0.0913)
13218 AE830	2.34 (0.0921)
13218 AE850	2.36 (0.0929)
13218 AE870	2.38 (0.0937)
13218 AE890	2.40 (0.0945)
13218 AE910	2.42 (0.0953)
13218 AE920	2.43 (0.0957)
13218 AE930	2.44 (0.0961)
13218 AE940	2.45 (0.0965)
13218 AE950	2.46 (0.0969)
13218 AE960	2.47 (0.0972)
13218 AE970	2.48 (0.0976)
13218 AE980	2.49 (0.0980)
13218 AE990	2.50 (0.0984)
13218 AF000	2.51 (0.0988)
13218 AF010	2.52 (0.0992)
13218 AF020	2.53 (0.0996)
13218 AF030	2.54 (0.1000)
13218 AF040	2.55 (0.1004)
13218 AF050	2.56 (0.1008)
13218 AF060	2.57 (0.1012)
13218 AF070	2.58 (0.1016)
13218 AF090	2.60 (0.1024)
13218 AF110	2.62 (0.1031)
13218 AF130	2.64 (0.1039)
13218 AF150	2.66 (0.1047)
13218 AF170	2.68 (0.1055)
13218 AF190	2.70 (0.1063)

6) 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.
7) After inspection, install the related parts in the reverse order of removal.

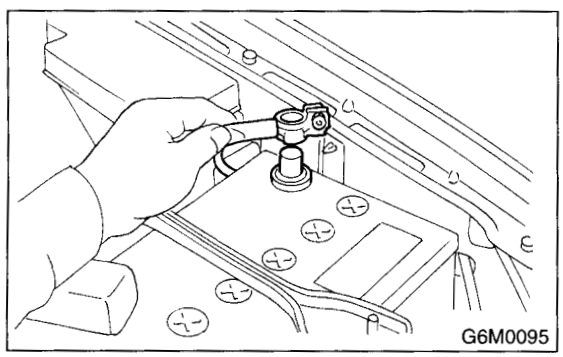
9. Engine Assembly

A: REMOVAL

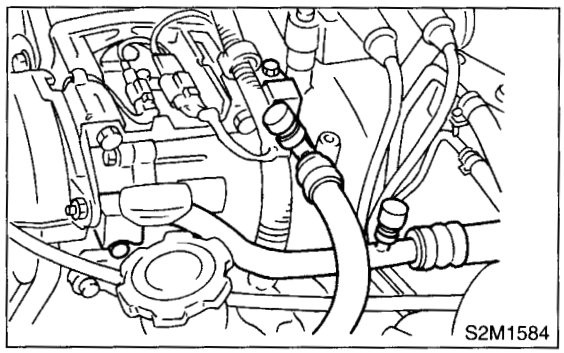
1) Set the vehicle on lift arms.
2) Open the front hood fully and support with stay.
3) Raise the rear seat, and turn the floor mat up.
4) Release the fuel pressure.
   (1) Disconnect the fuel pump relay connector.



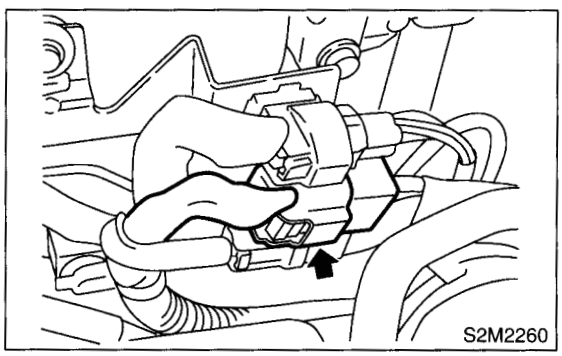
   (2) Start the engine, and run until stalls.
   (3) After the engine stalls, crank it for five seconds more.
   (4) Turn the ignition switch to "OFF".
5) Remove the filler cap.
6) Disconnect the ground terminal from battery.



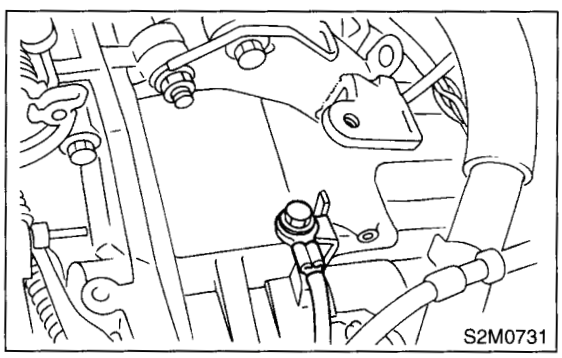
7) Remove the radiator from vehicle. <Ref. to CO-37, REMOVAL, Radiator.>
8) Remove the coolant filler tank. <Ref. to CO-51, REMOVAL, Coolant Filler Tank.>
9) Collect refrigerant, and remove the pressure hoses.
   (1) Place and connect the attachment hose to the refrigerant recycle system.
   (2) Collect the refrigerant from A/C system.
   (3) Disconnect the A/C pressure hoses from A/C compressor.



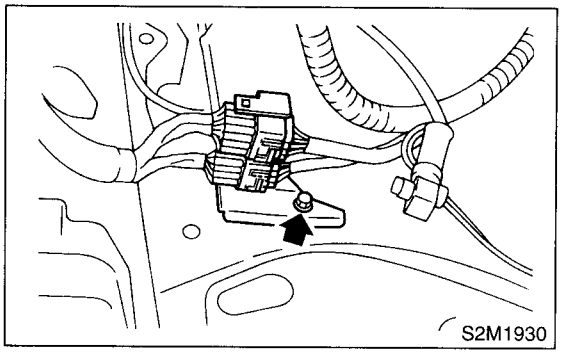
10) Remove the intercooler. <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>
11) Disconnect the following connectors and cable.
   (1) Engine harness connector



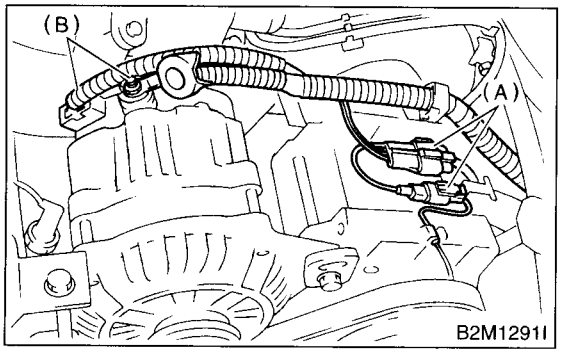
   (2) Engine ground terminal



(3) Engine harness connector

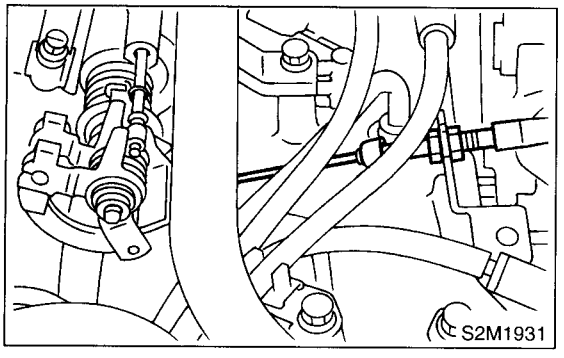


(4) Generator connector, terminal and A/C compressor connectors

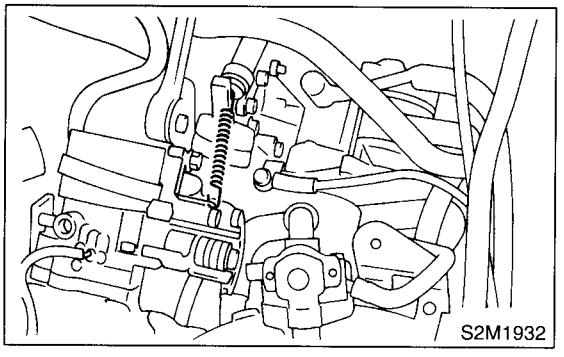


(A) A/C compressor connector
(B) Generator connector and terminal

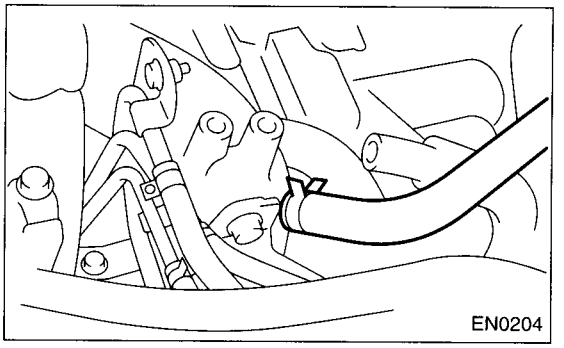
(5) Accelerator cable



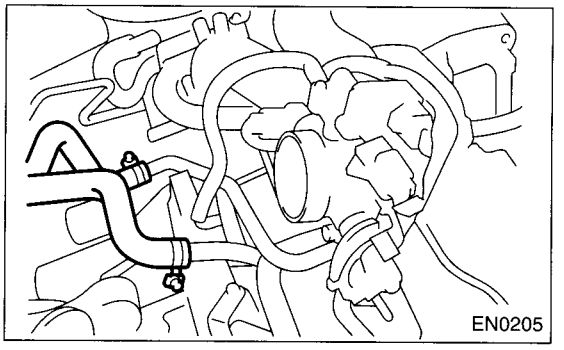
(6) Clutch release spring



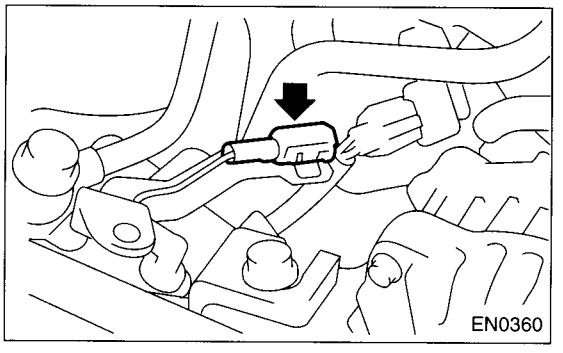
12) Disconnect the following hoses.
(1) Brake booster vacuum hose



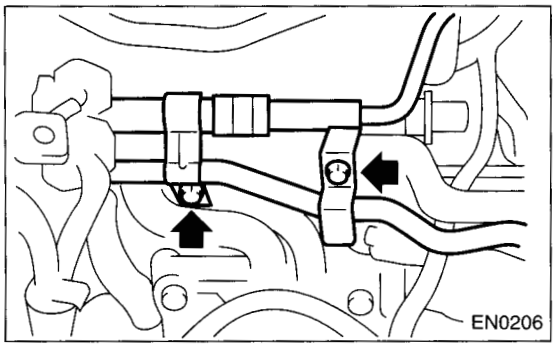
(2) Heater inlet outlet hose



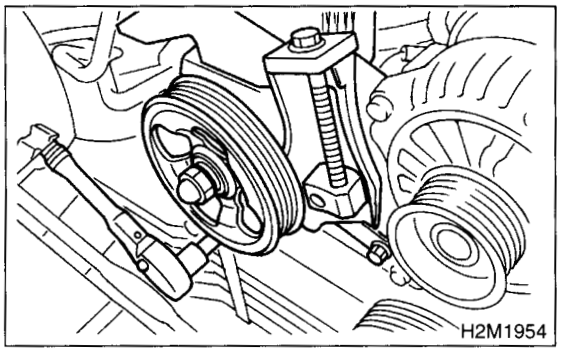
13) Remove the power steering pump from bracket.
(1) Loosen lock bolt and slider bolt, and remove the front side V-belt. <Ref. to ME(DOHC TURBO)-44, FRONT SIDE BELT, REMOVAL, V-belt.>
(2) Disconnect the power steering switch connector.



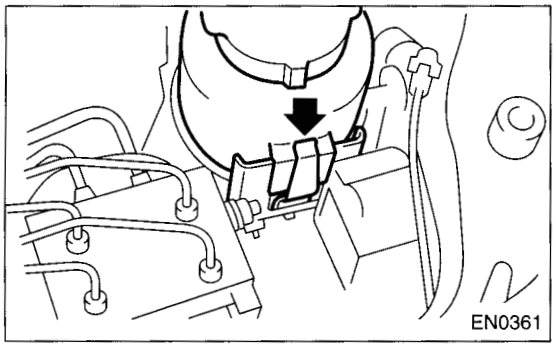
(3) Remove the pipe with bracket from intake manifold.



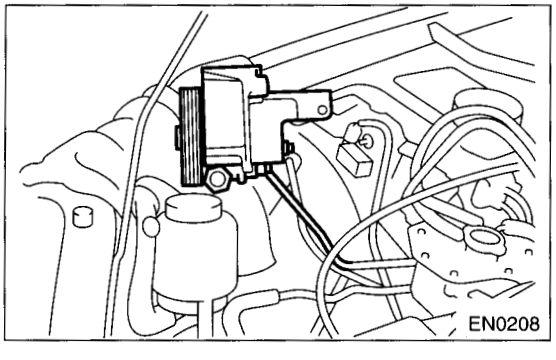
(4) Remove the power steering pump from engine.



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

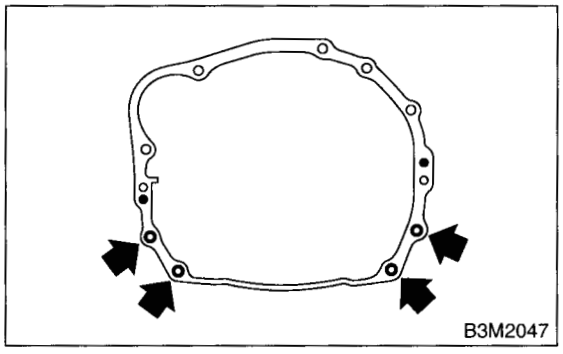


(6) Place the power steering pump on the right side wheel apron.

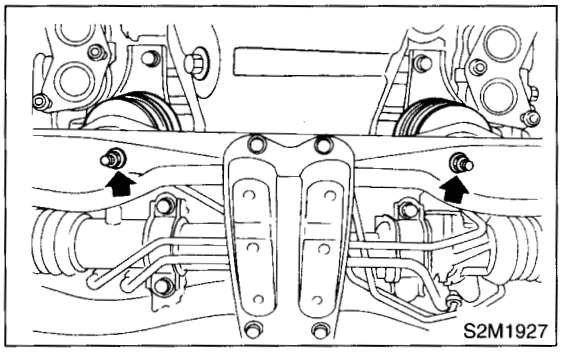


14) Remove the center exhaust pipe. <Ref. to EX(DOHC TURBO)-8, REMOVAL, Center Exhaust Pipe.>

15) Remove the nuts which hold lower side of transmission to engine.



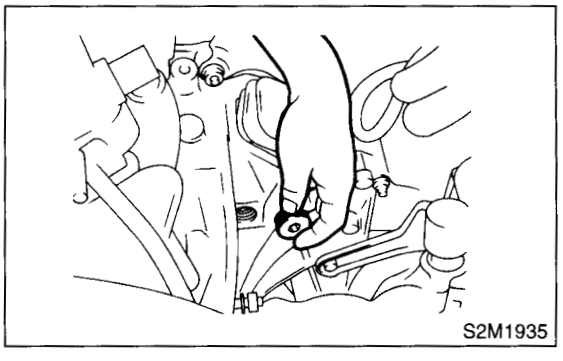
16) Remove the nuts which install the front cushion rubber onto front crossmember.



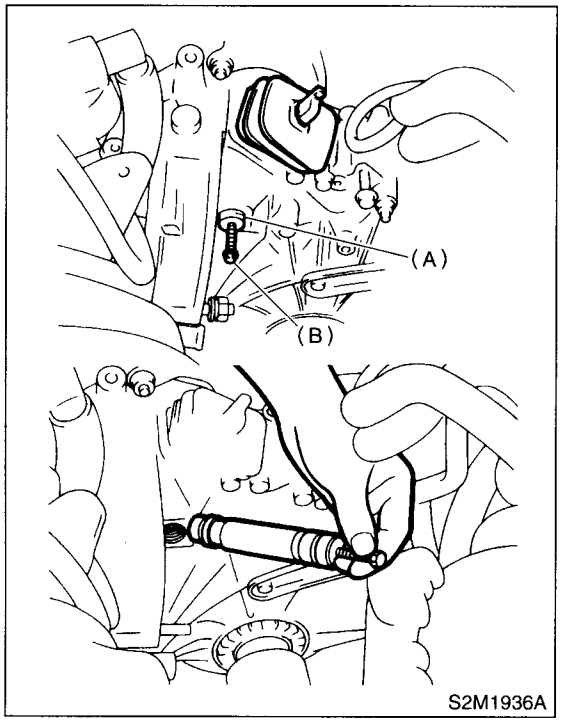
17) Separate the clutch release fork from release bearing. (MT vehicles)

(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.



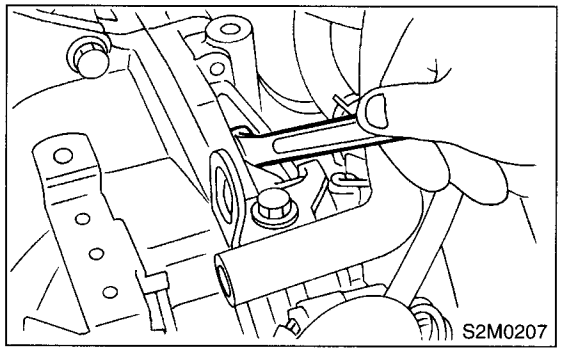
(A) Shaft
(B) Bolt

(4) Raise the release fork and unfasten the release bearing tabs to free release fork.

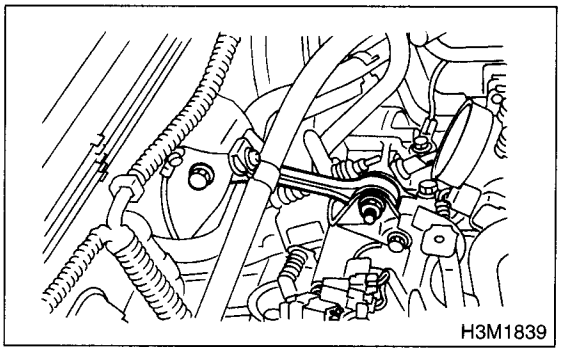
CAUTION:
Step (4) is required to prevent interference with engine when removing the engine from transmission.

18) 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 ST.

ST 499977300 CRANK PULLEY WRENCH

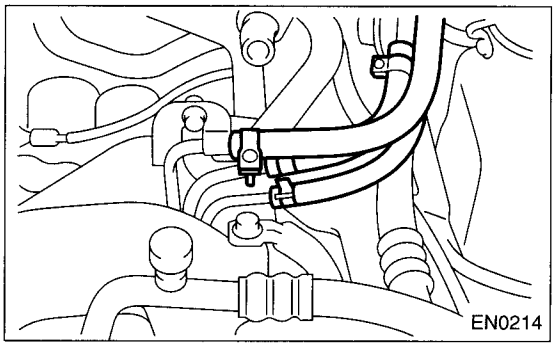


19) Remove the pitching stopper.

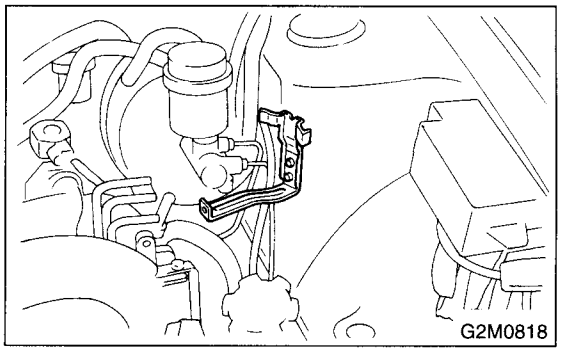


20) Disconnect the fuel delivery hose, return hose and evaporation hose.

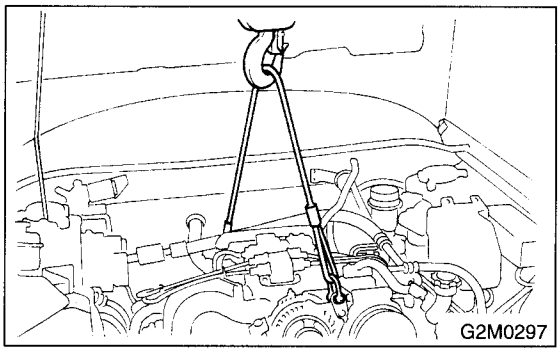
CAUTION:
- **Catch fuel from hose into container.**
- **Disconnect the hose with its end wrapped with cloth to prevent fuel from splashing.**



21) Remove the fuel filter and bracket.

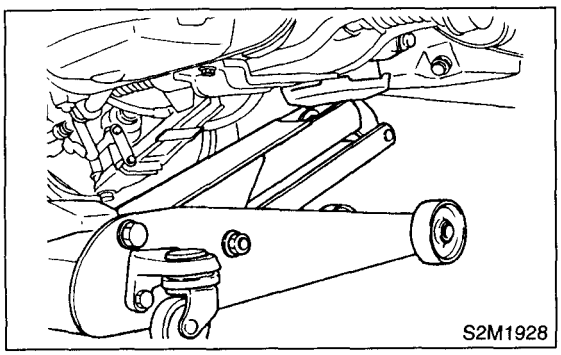


22) Support the engine with a lifting device and wire ropes.



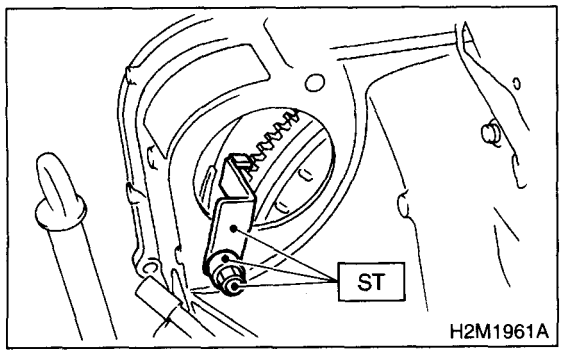
23) Support the transmission with a garage jack.

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 transmission lowers under its own weight.


S2M1928

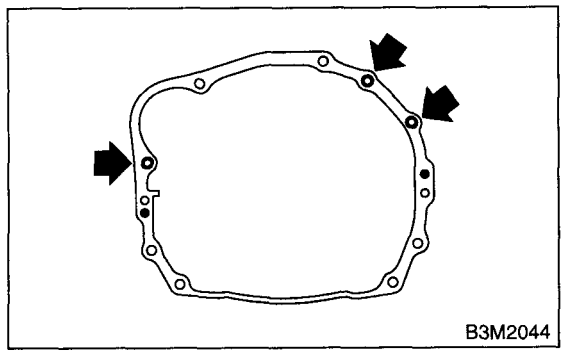
24) Separation of engine and transmission.
(1) Remove the starter. <Ref. to SC-6, REMOVAL, Starter.>
(2) Install the ST to torque converter clutch case. (AT vehicles)

ST 498277200 STOPPER SET



H2M1961A

(3) Remove the bolts which hold right upper side of transmission to engine.


B3M2044

25) 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.

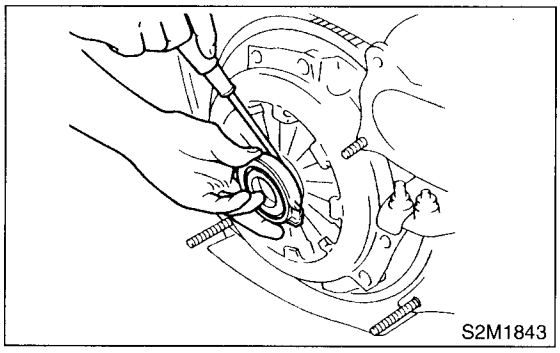
CAUTION:
Be careful not to damage adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

26) Remove the front cushion rubbers.

B: INSTALLATION

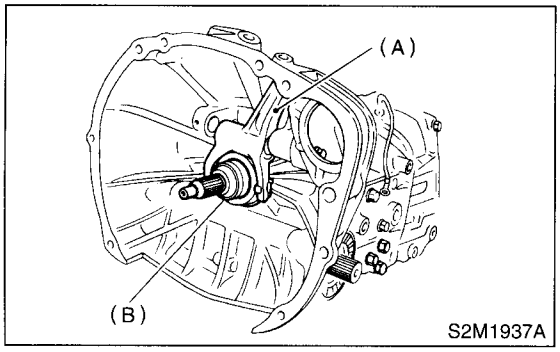
1) Install the clutch release fork and bearing onto transmission. (MT vehicles)

(1) Remove the release bearing from clutch cover with flat type screw driver.



(2) Install the release bearing on transmission.

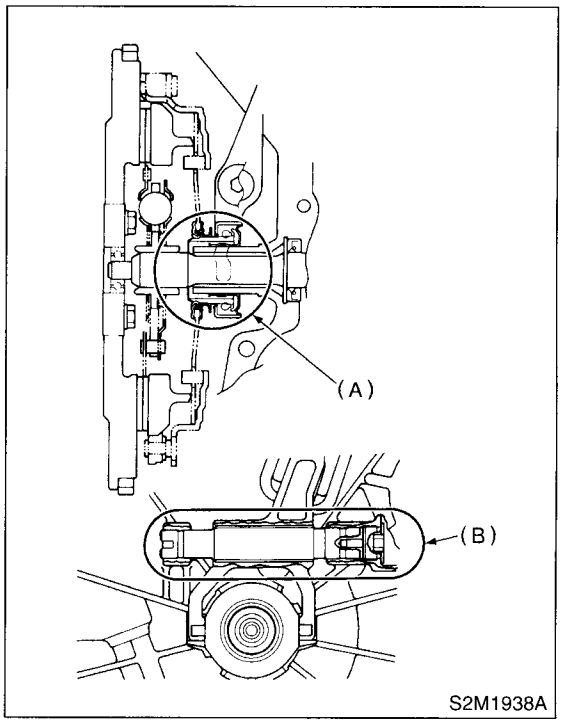
(3) Install the release fork into release bearing tab.



(A) Release fork
(B) Release bearing

(4) Apply grease to the specified points.

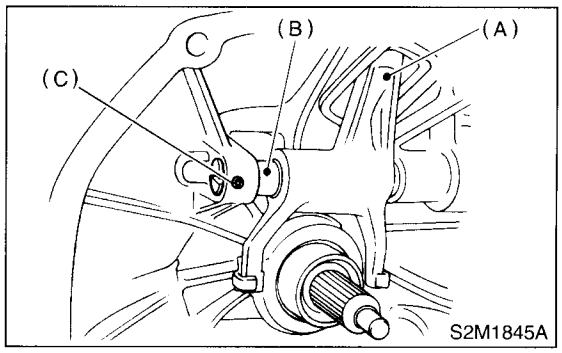
- Spline FX2200
- Shaft SUNLIGHT 2



(A) Spline (FX2200)
(B) Shaft (SUNLIGHT 2)

(5) Insert the release fork shaft into release fork.

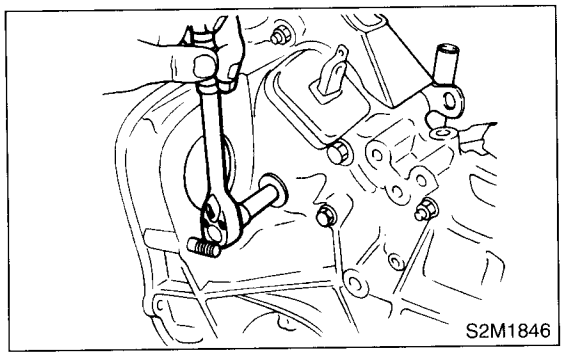
CAUTION:
Make sure the cutout portion of release fork shaft contacts spring pin.



(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)

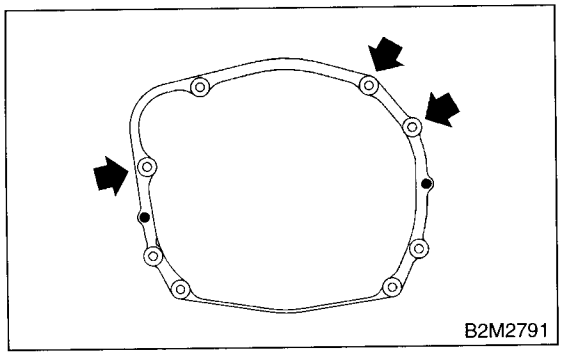
3) Install the engine onto transmission.
(1) Position the engine in engine compartment and align it with transmission.

CAUTION:
Be careful not to damage adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

(2) Apply a small amount of grease to splines of mainshaft. (MT vehicles)

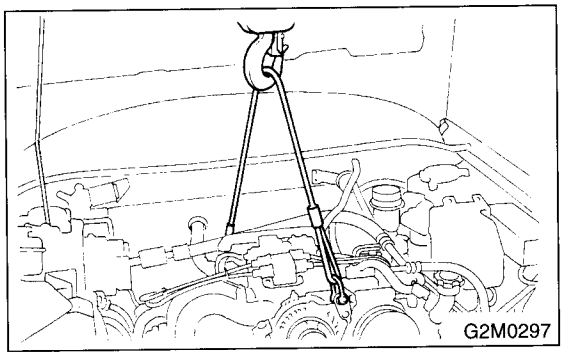
4) Tighten the bolts which hold right upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



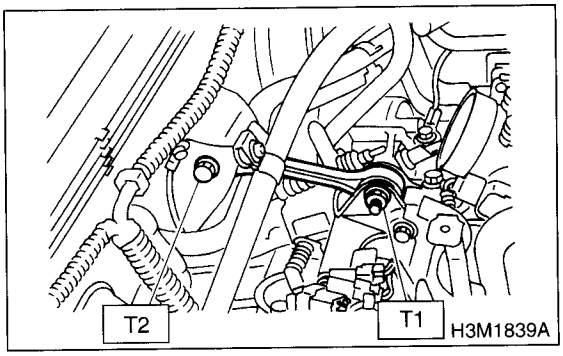
5) Remove the lifting device and wire ropes.

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)

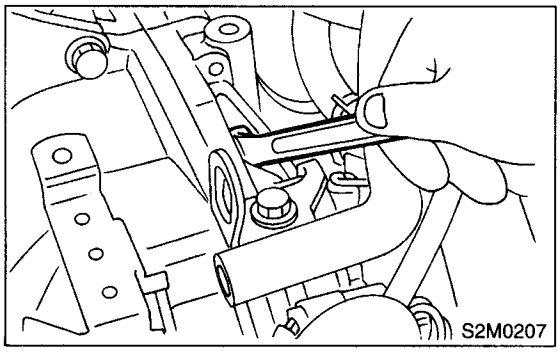
NOTE:
Be careful not to drop the ST into the torque converter clutch case when removing ST.
ST 498277200 STOPPER SET

9) Install the starter. <Ref. to SC-7, INSTALLATION, Starter.>

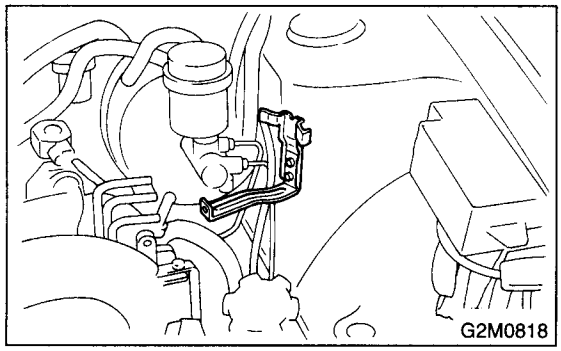
10) Install the torque converter clutch onto drive plate. (AT vehicles)
(1) Tighten the bolts which hold torque converter clutch to drive plate.
(2) Tighten other bolts while rotating the engine by using ST.

CAUTION:
Be careful not to drop bolts into the torque converter clutch housing.
ST 499977300 CRANK PULLEY WRENCH

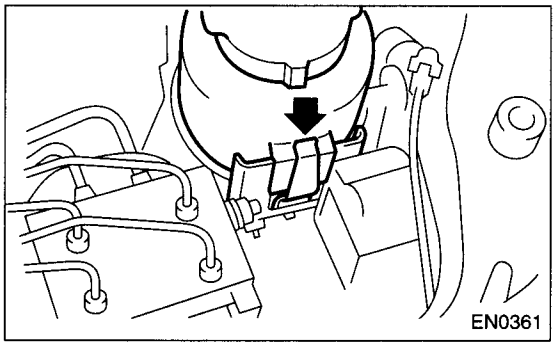
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(3) Clog the service hole with plug.
11) Install the fuel filter and bracket.

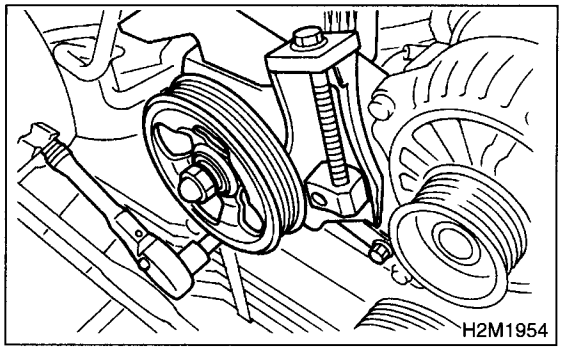


12) Install the power steering pump on bracket.
(1) Install the power steering tank on bracket.

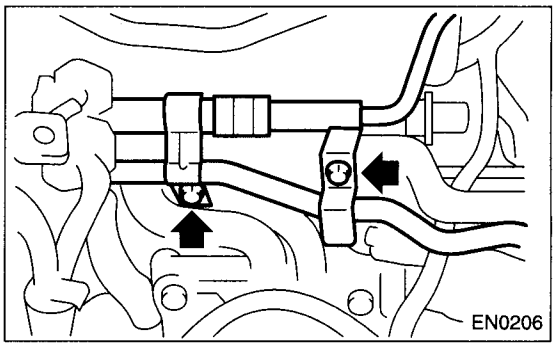


(2) Install the power steering pump.

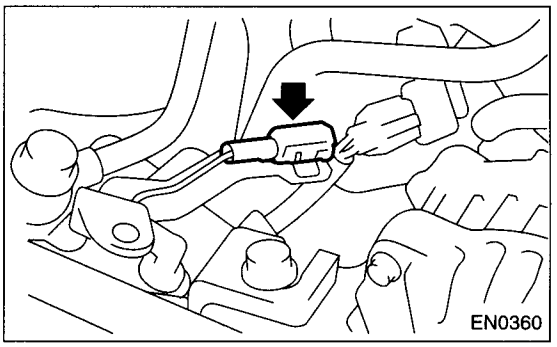
Tightening torque:
20.1 N·m (2.05 kgf-m, 14.8 ft-lb)



(3) Install the power steering pipe bracket on right side intake manifold, and install the spark plug codes.



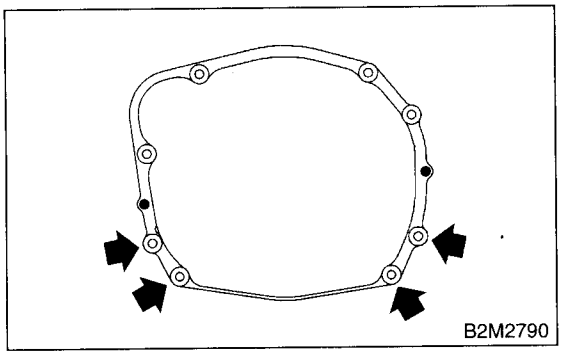
(4) Connect the power steering switch connector.



(5) Install the front side V-belt, and adjust it. <Ref. to ME(DOHC TURBO)-44, FRONT SIDE BELT, INSTALLATION, V-belt.>

13) Tighten the nuts which hold lower side of transmission to engine.

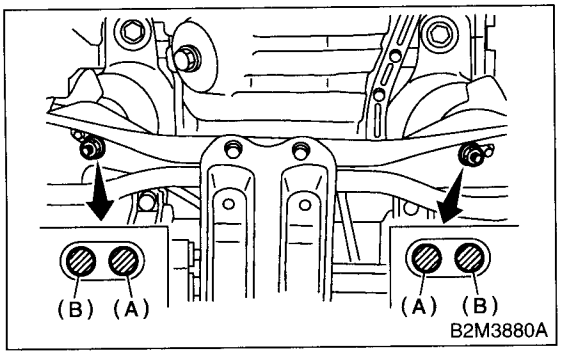
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



14) Tighten the nuts which install the front cushion rubber onto crossmember.

Tightening torque:
83 N·m (8.5 kgf-m, 61 ft-lb)

CAUTION:
Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



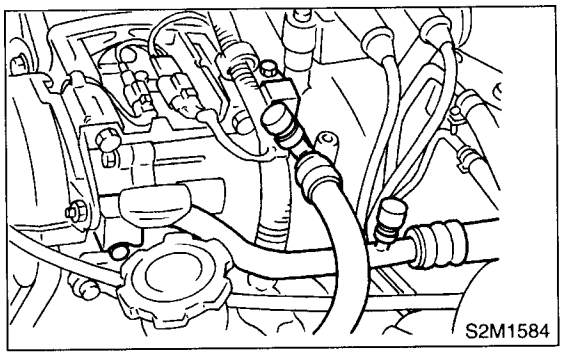
15) Install the center exhaust pipe.
<Ref. to EX(DOHC TURBO)-9, INSTALLATION, Center Exhaust Pipe.>
16) Connect the following hoses:
(1) Fuel delivery hose, return hose and evaporation hose
(2) Heater inlet and outlet hoses
(3) Brake booster vacuum hose
17) Connect the following connectors and terminals:
(1) Engine ground terminal
(2) Engine harness connectors
(3) Generator connector and terminal
(4) A/C compressor connectors
18) Connect the following cables:
(1) Accelerator cable
(2) Clutch release spring

CAUTION:
After connecting each cable, adjust them.

19) Install the air intake system.
(1) Install the intercooler. <Ref. to IN(DOHC 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.
20) Install the A/C pressure hoses.

CAUTION:
Use new O-rings.

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



21) Install the radiator. <Ref. to CO-41, INSTALLATION, Radiator.>
22) Install the coolant filler tank. <Ref. to CO-51, INSTALLATION, Coolant Filler Tank.>
23) Install the window washer tank.
24) Install the battery in the vehicle, and connect cables.
25) Fill coolant.
<Ref. to CO-25, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
26) Charge the A/C system with refrigerant.
<Ref. to AC-17, OPERATION, Refrigerant Charging Procedure.>
27) Remove the front hood stay, and close the front hood.
28) Take off the vehicle from lift arms.

10.Engine Mounting

A: REMOVAL

1) Remove the engine assembly. <Ref. to ME(DOHC 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;
35 N·m (3.6 kgf-m, 25.8 ft-lb)

C: INSPECTION

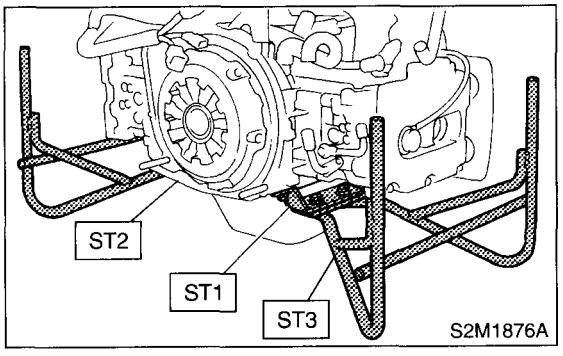
Make sure there are no cracks or other damage.

11.Preparation for Overhaul

A: PROCEDURE

1) After removing the engine from the 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.

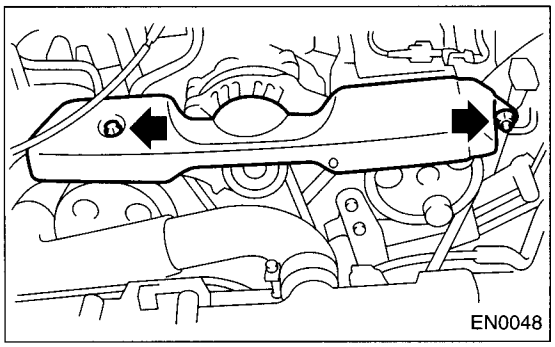
12.V-belt

A: REMOVAL

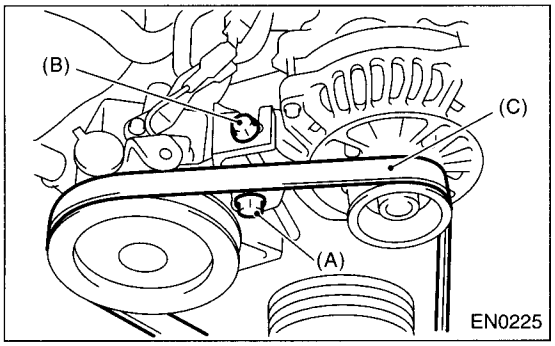
1. FRONT SIDE BELT

NOTE:
Perform the following procedures 1) to 4) with the engine installed to the body.

1) Remove the V-belt cover.

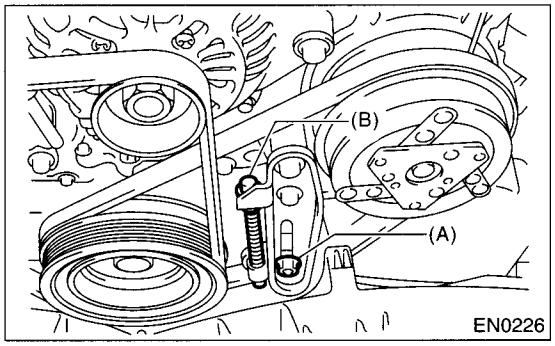


2) Loosen the lock bolt (A).
3) Loosen the slider bolt (B).
4) Remove the front side belt (C).

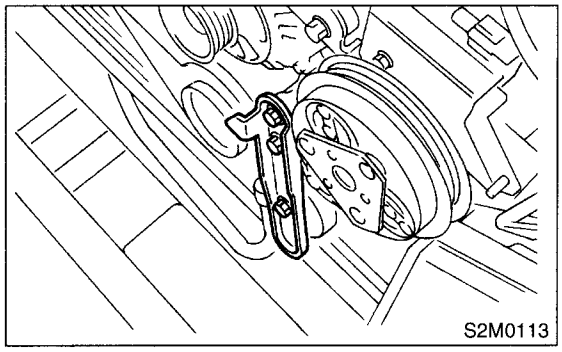


2. REAR SIDE BELT

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.



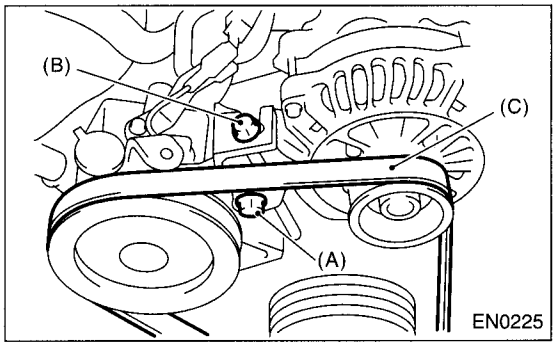
B: INSTALLATION

1. FRONT SIDE BELT

CAUTION:
Wipe off any oil or water on the belt and pulley.

1) Install a belt, and tighten the slider bolt so as to obtain the specified belt tension <Ref. to ME(DOHC TURBO)-45, INSPECTION, V-belt.>
2) Tighten the lock bolt (A)
3) Tighten the slider bolt (B).

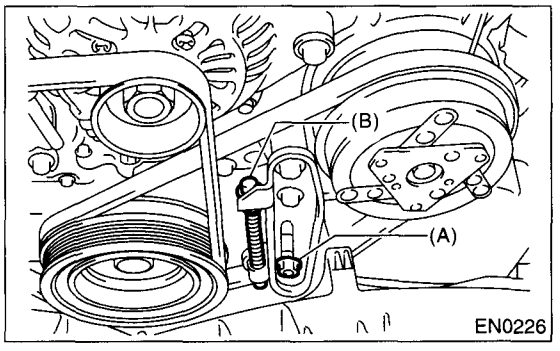
Tightening torque:
Lock bolt through bolt:
25 N·m (2.5 kgf-m, 18 ft-lb)
Slider bolt:
8 N·m (0.8 kgf-m, 5.5 ft-lb)



2. REAR SIDE BELT

1) Install a belt, and tighten the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME(DOHC TURBO)-45, INSPECTION, V-belt.>
2) Tighten the lock nut (A).

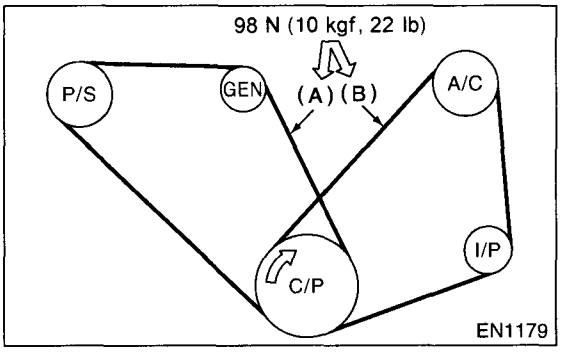
Tightening torque:
Lock nut (A);
22.6 N·m (2.3 kgf-m, 16.6 ft-lb)



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***

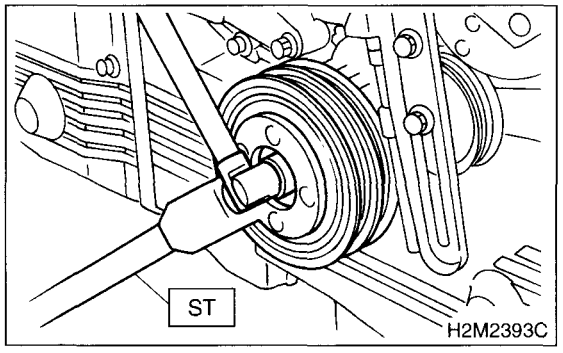


C/P Crankshaft pulley
GEN Generator
P/S Power steering oil pump pulley
A/C Air conditioning compressor pulley
I/P Idler pulley

13.Crankshaft Pulley

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(DOHC TURBO)-44, REMOVAL, V-belt.>
2) Remove the crankshaft pulley bolt. To lock crankshaft, use ST.
ST 499977300
CRANKSHAFT PULLEY WRENCH

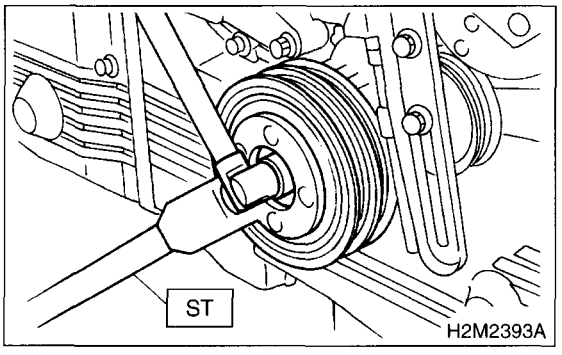


3) Remove the crankshaft pulley.

B: INSTALLATION

1) Install the crankshaft pulley.
2) Install the pulley bolt.
To lock the crankshaft, use ST.
ST 499977300 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 the 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.

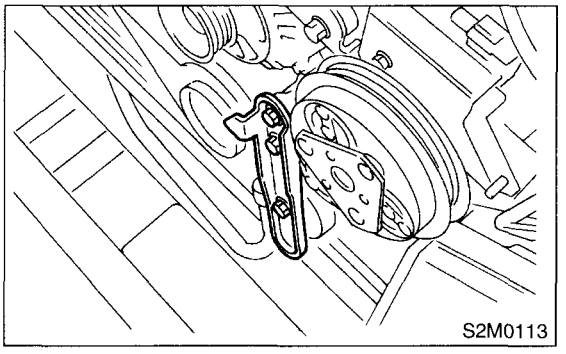
(1) Replace the crankshaft pulley bolts and clean them.

Crankshaft pulley bolt:
12369AA011

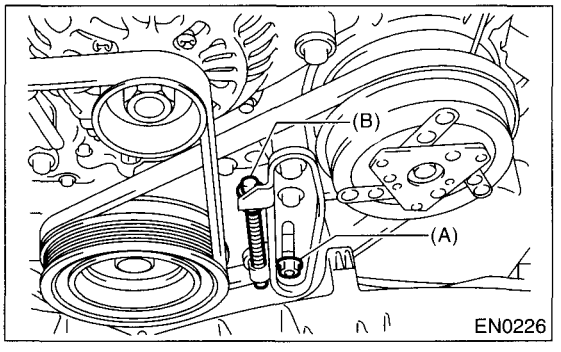
(2) Clean the crankshaft thread using an air gun.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(4) Tighten the crankshaft pulley bolts keeping them in an angle between 65 degrees and 75 degrees.

CAUTION:
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 A/C belt.



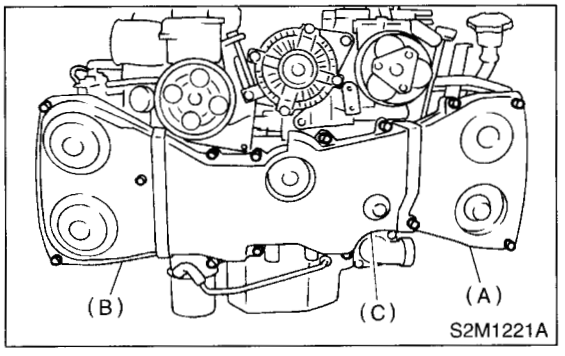
C: INSPECTION

1) Make sure the V-belt is not worn or otherwise damaged.
2) Check the tension of the belt. <Ref. to ME(DOHC TURBO)-45, INSPECTION, V-belt.>

14.Belt Cover

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(DOHC TURBO)-44, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(DOHC TURBO)-46, REMOVAL, Crankshaft Pulley.>
3) Remove the left-hand belt cover (A).
4) Remove the right-hand belt cover (B).
5) Remove the front belt cover (C).



B: INSTALLATION

1) Install the front belt cover (C).

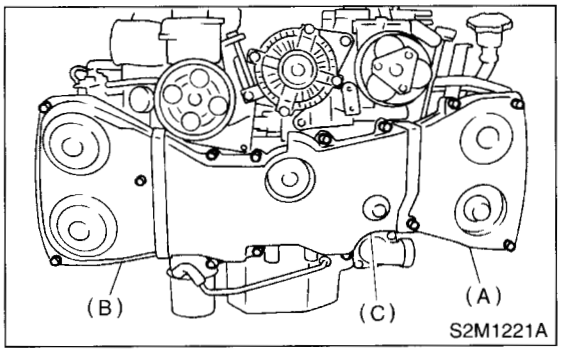
Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

2) Install the right-hand belt cover (B).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

3) Install the left-hand belt cover (A).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



4) Install the crankshaft pulley. <Ref. to ME(DOHC TURBO)-46, INSTALLATION, Crankshaft Pulley.>
5) Install the V-belt. <Ref. to ME(DOHC TURBO)-44, INSTALLATION, V-belt.>

C: INSPECTION

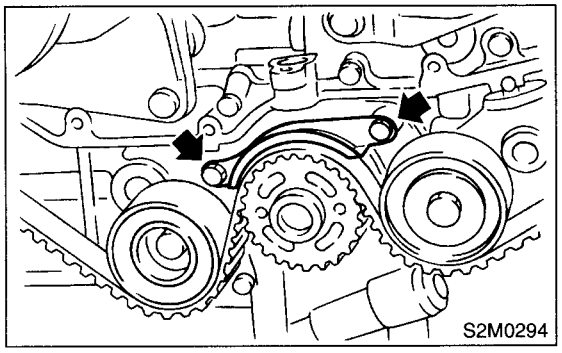
Make sure the cover is not damaged.

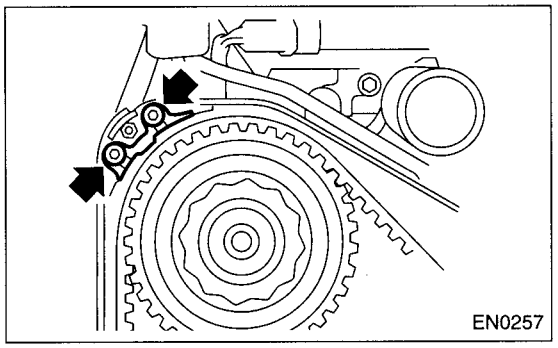
15.Timing Belt Assembly

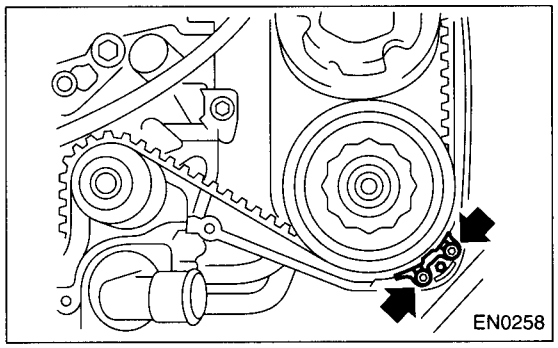
A: REMOVAL

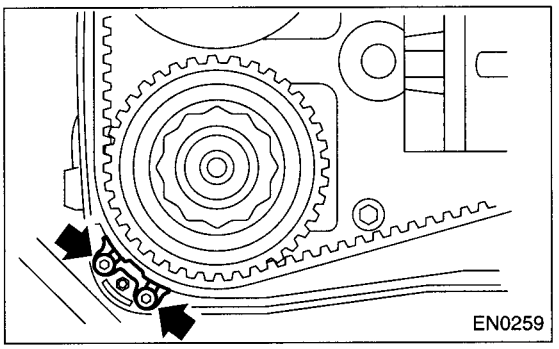
1. TIMING BELT

1) Remove the V-belt. <Ref. to ME(DOHC TURBO)-44, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(DOHC TURBO)-46, REMOVAL, Crankshaft Pulley.>
3) Remove the belt cover. <Ref. to ME(DOHC TURBO)-47, REMOVAL, Belt Cover.>
4) Remove the timing belt guides. (MT vehicle)


S2M0294

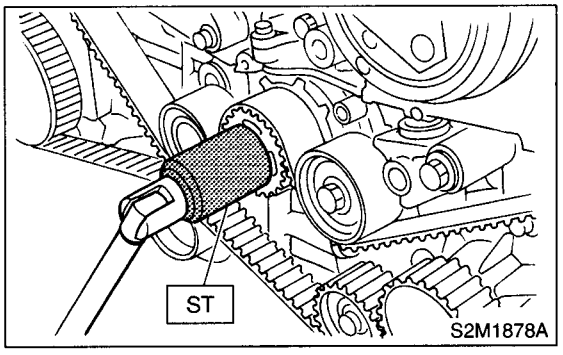

EN0257


EN0258


EN0259

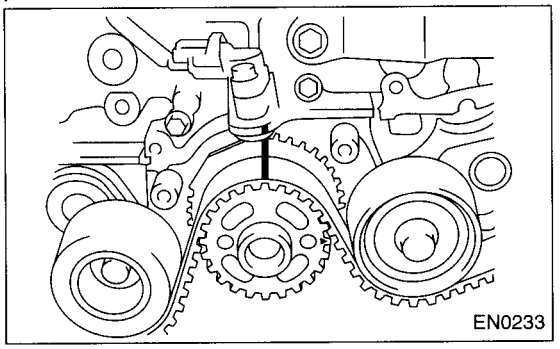
5) If the alignment mark and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing the timing belt as follows:
   (1) Turn the crankshaft using ST, and align alignment marks on crankshaft sprocket, left-hand intake camshaft sprocket, left-hand exhaust camshaft sprocket, right-hand intake camshaft sprocket and right hand exhaust camshaft sprocket with notches of belt cover and cylinder block.

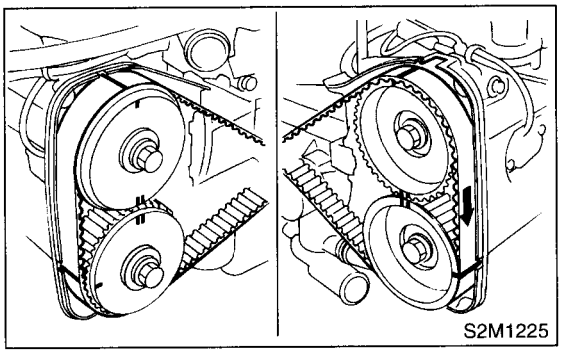
ST 499987500 CRANKSHAFT SOCKET



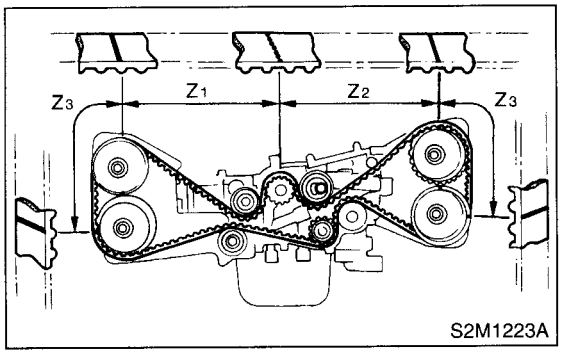
S2M1878A

(2) Using white paint, put alignment and/or arrow marks on the timing belts in relation to the sprockets.


EN0233

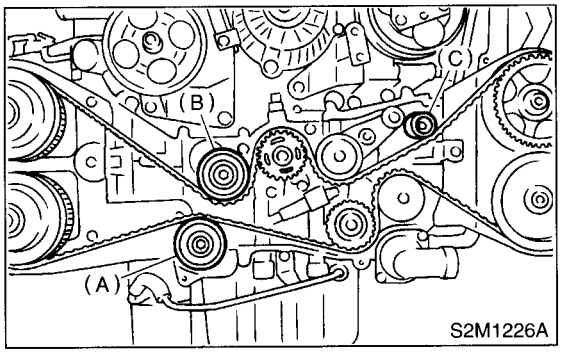

S2M1225

Z_1: 54.5 tooth length
Z_2: 51 tooth length
Z_3: 28 tooth length



S2M1223A

6) Remove the belt idler (A).



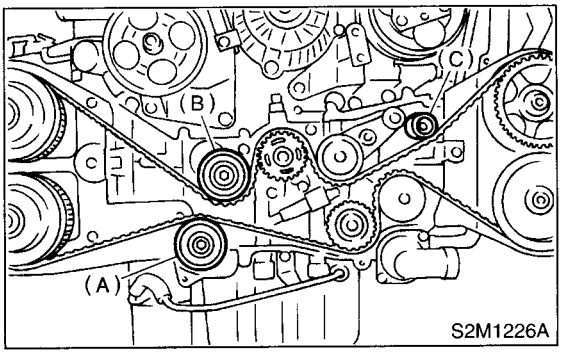
S2M1226A

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.

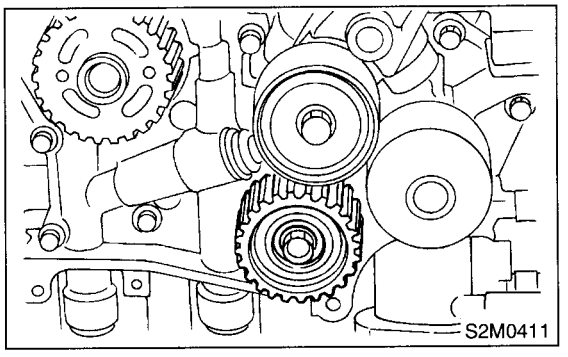
2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

1) Remove the belt idler (B) and (C).

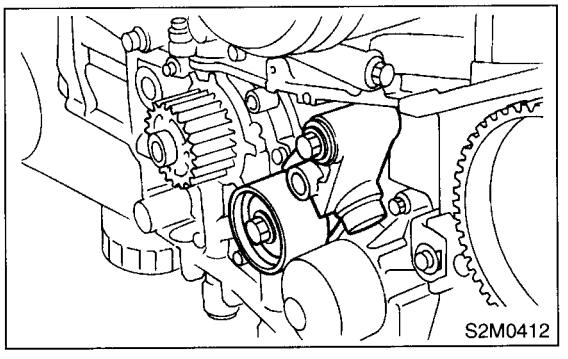


S2M1226A

2) Remove the belt idler No. 2.


S2M0411

3) Remove the automatic belt tension adjuster assembly.


S2M0412

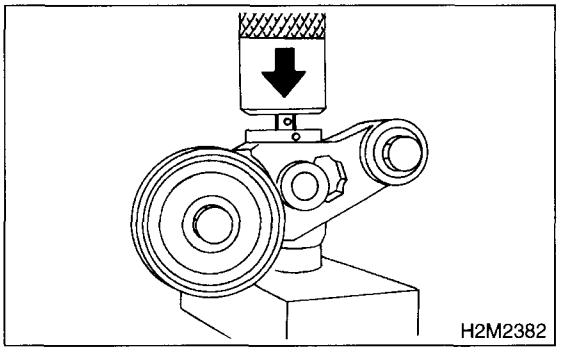
B: INSTALLATION

1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

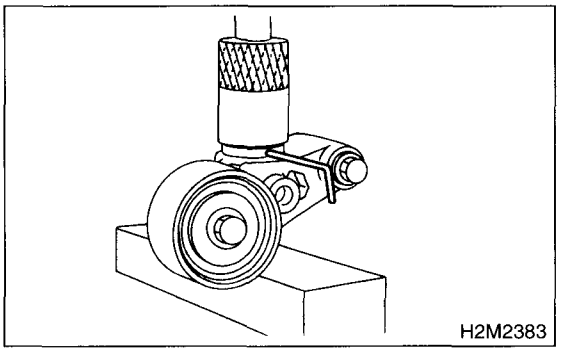
1) Preparation for installation of automatic belt tension adjuster assembly:

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.
• 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 three 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.
• 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.

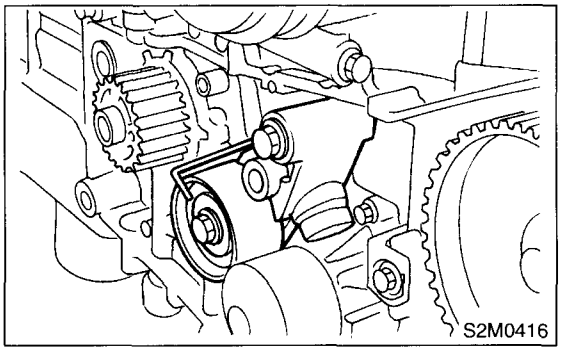

H2M2382

(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.


H2M2383

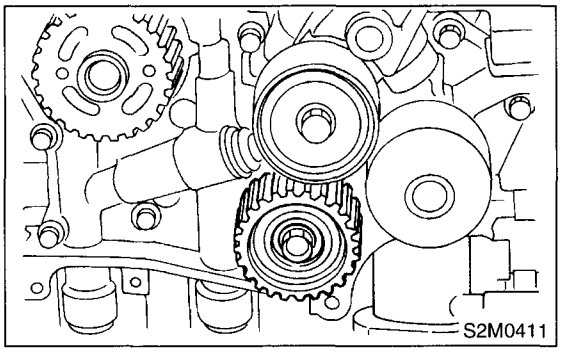
2) Install the automatic belt tension adjuster assembly.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)


S2M0416

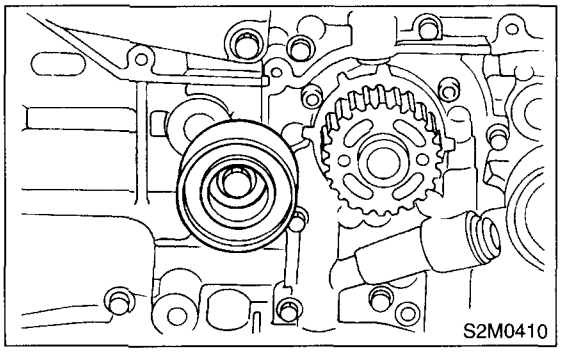
3) Install the belt idler No. 2.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)


S2M0411

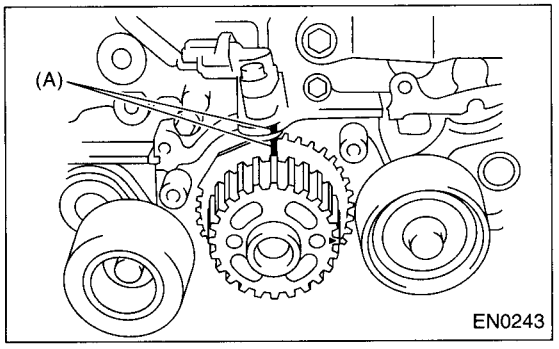
4) Install the belt idler.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

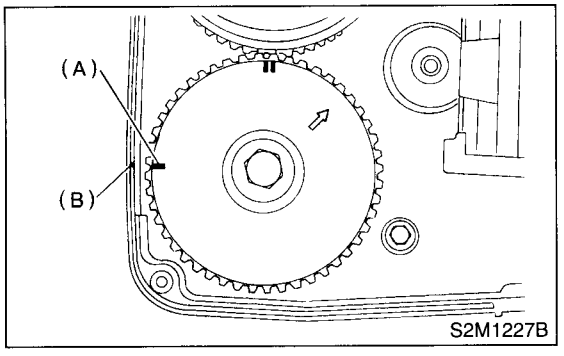

S2M0410

2. TIMING BELT

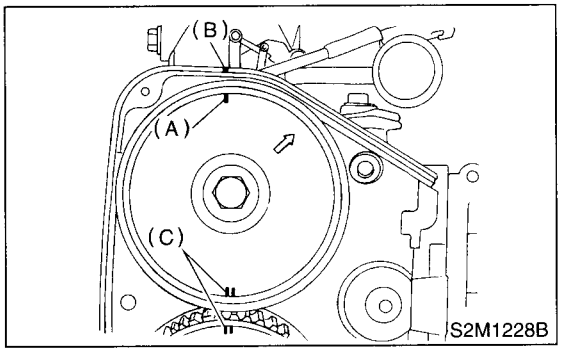
1) Preparation for installation of automatic belt tension adjuster assembly. <Ref. to ME(DOHC TURBO)-50, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, Timing Belt Assembly.>
2) Crankshaft and camshaft sprocket alignment.
(1) Align mark (A) on the crankshaft sprocket with mark on the oil pump cover at cylinder block.



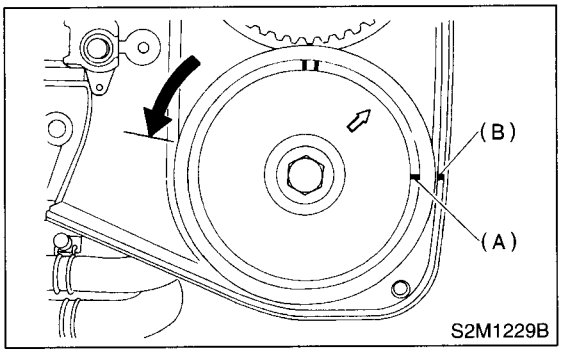
(2) Align single line mark (A) on the right-hand exhaust camshaft sprocket with notch (B) on belt cover.



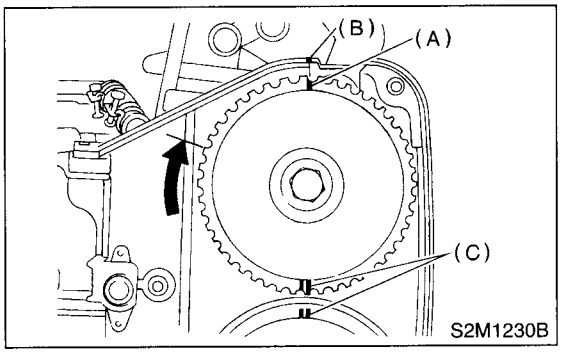
(3) Align single line mark (A) on the right-hand intake camshaft sprocket with notch (B) on belt cover.
(Make sure double lines (C) on intake camshaft and exhaust camshaft sprockets are aligned.)



(4) Align single line mark (A) on left-hand exhaust camshaft sprocket with notch (B) on belt cover by turning the sprocket counterclockwise (as viewed from front of engine).

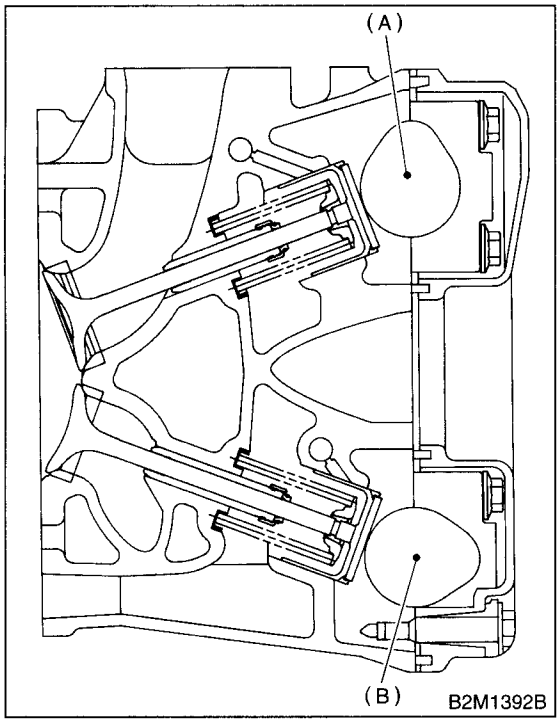


(5) Align single line mark (A) on left-hand intake camshaft sprocket with notch (B) on belt cover by turning the sprocket clockwise (as viewed from front of engine).
Ensure double lines (C) on intake and exhaust camshaft sprockets are aligned.



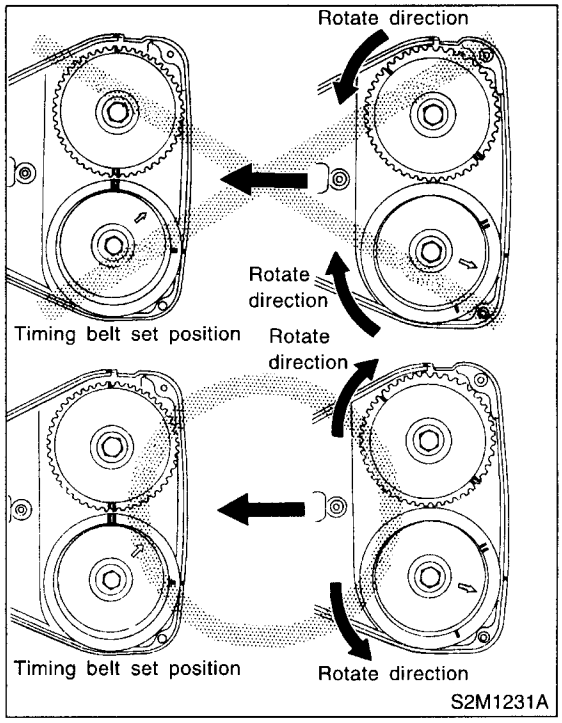
(6) Ensure camshaft and crankshaft sprockets are positioned properly.

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.

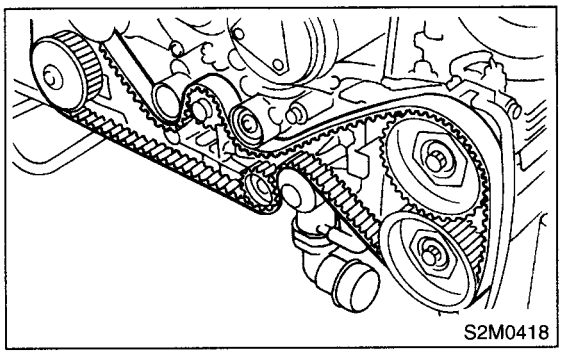


(A) Intake camshaft
(B) Exhaust camshaft

• 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.

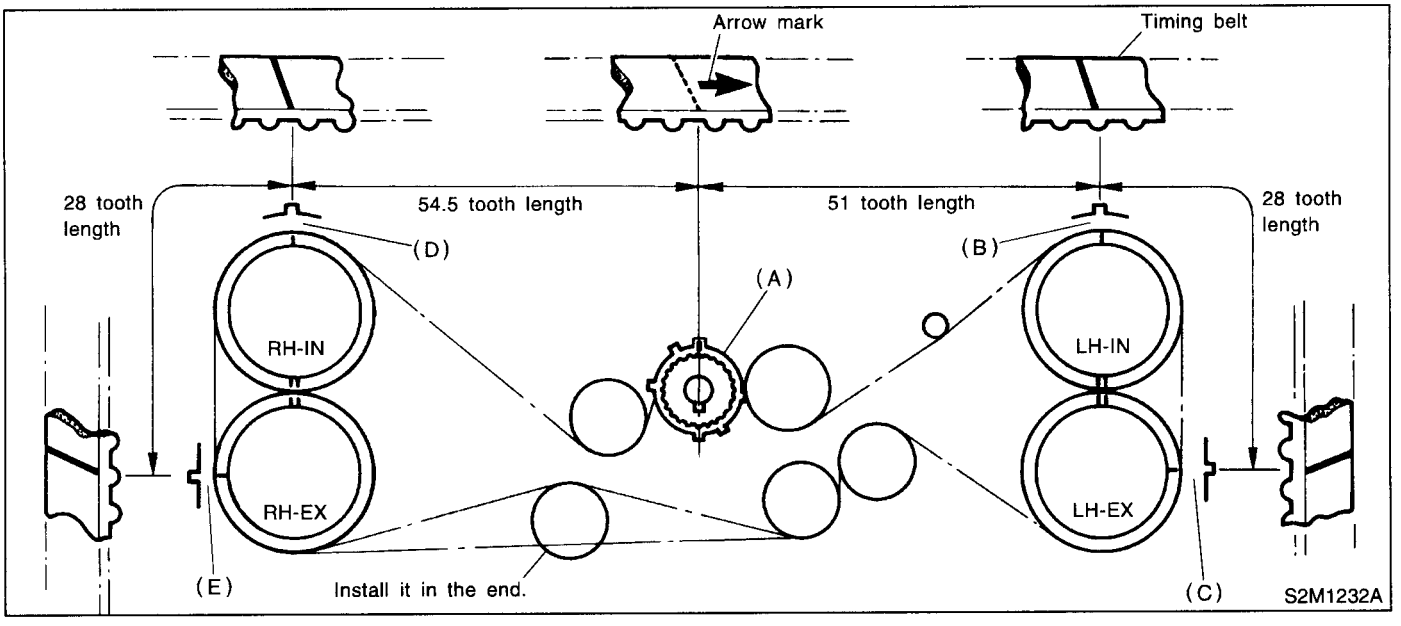


3) Installation of timing belt:



Align the alignment mark on the timing belt with marks on the sprockets in the alphabetical order shown in the figure. While aligning marks, position the timing belt properly.

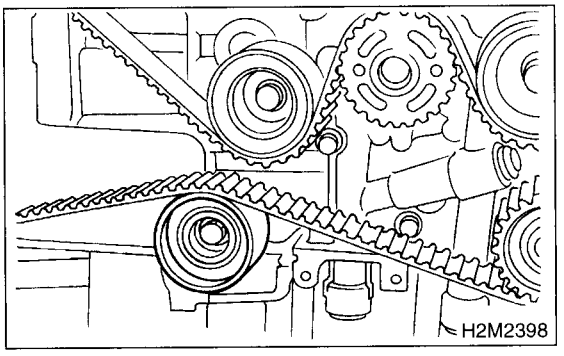
CAUTION:
- **Disengagement of more than three timing belt teeth may result in interference between the valve and piston.**
- **Ensure the belt's rotating direction is correct.**



4) Install the belt idlers.

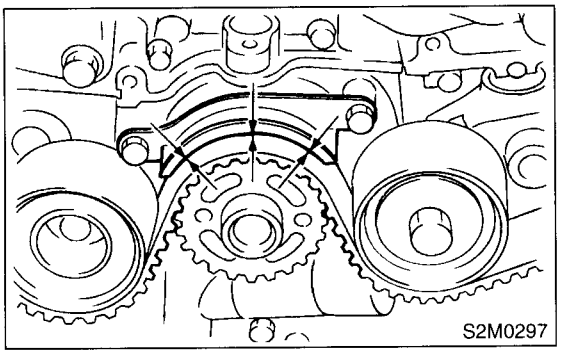
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

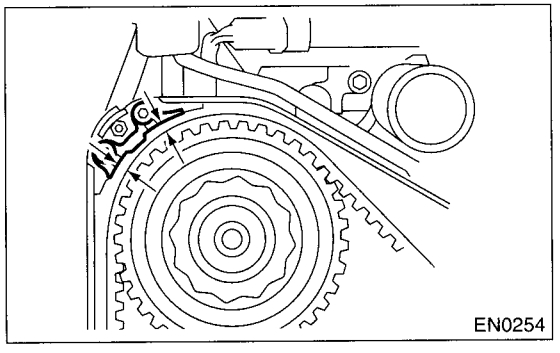
CAUTION:
Make sure that the marks on the timing belt and sprockets are aligned.

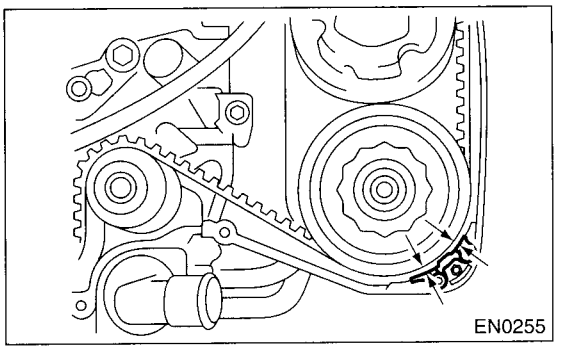


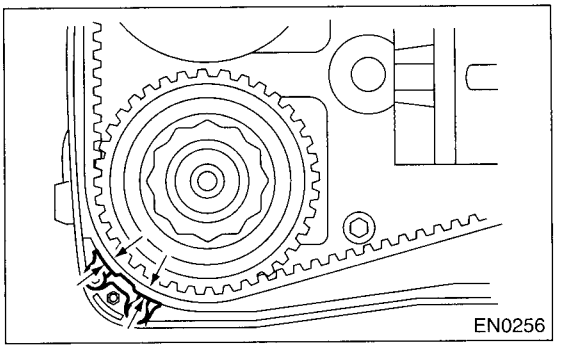
5) After ensuring that the marks on the timing belt and sprockets are aligned, remove the stopper pin from tensioner adjuster.
6) Install the timing belt guide. (MT vehicle)
(1) Temporarily tighten the remaining bolts.
(2) Check and adjust clearance between the timing belt and timing belt guide.

Clearance:
1.0±0.5 mm (0.039±0.020 in)



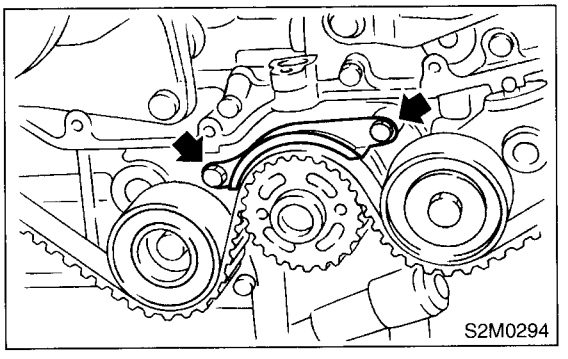


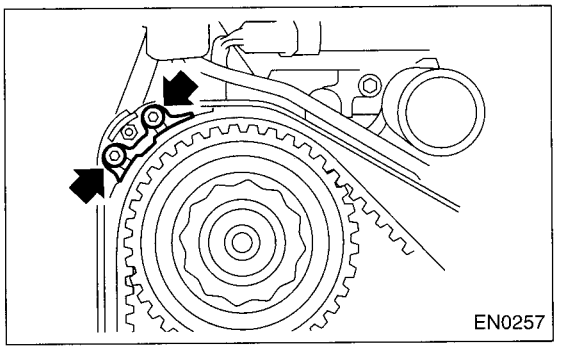


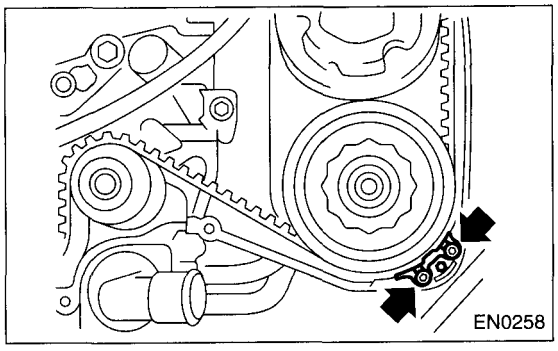


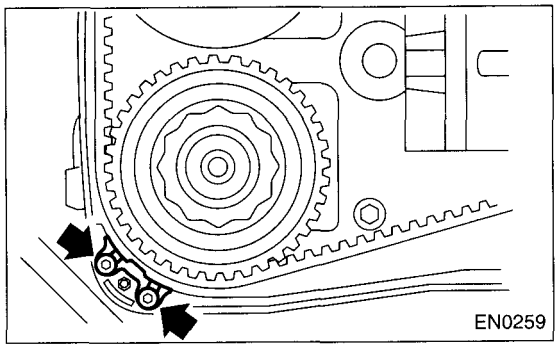
(3) Tighten the remaining bolts.

Tightening torque:
9.8 N·m (1.0 kgf-m, 7.2 ft-lb)









7) Install the belt cover. <Ref. to ME(DOHC TURBO)-47, INSTALLATION, Belt Cover.>
8) Install the crankshaft pulley. <Ref. to ME(DOHC TURBO)-46, REMOVAL, Crankshaft Pulley.>
9) Install the V-belt. <Ref. to ME(DOHC TURBO)-44, INSTALLATION, V-belt.>

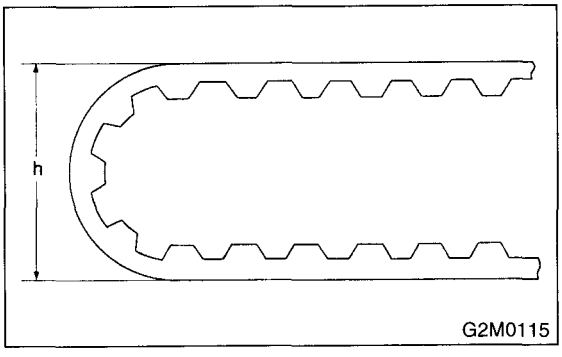
C: INSPECTION

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.

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



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.

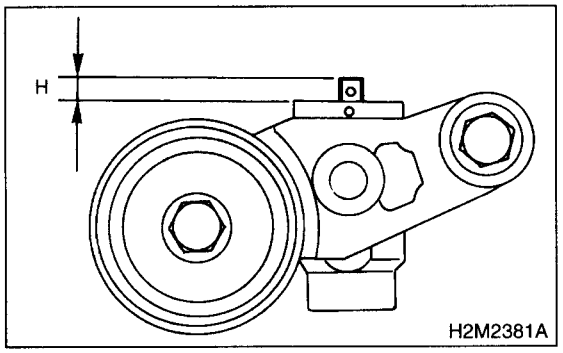
CAUTION:
Slight traces of oil at rod's oil seal does not indicate the a problem.

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.

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 three 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

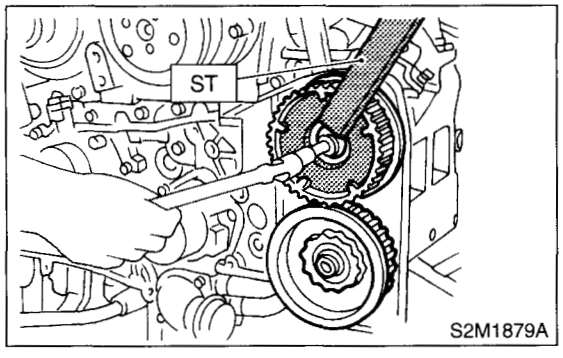
1) Check the idler for smooth rotation. Replace if noise or excessive play is noted.
2) Check the outer contacting surfaces of idler pulley for abnormal wear and scratches.
3) Check the idler for grease leakage.

16.Camshaft Sprocket

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(DOHC TURBO)-44, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(DOHC TURBO)-46, REMOVAL, Crankshaft Pulley.>
3) Remove the belt cover. <Ref. to ME(DOHC TURBO)-47, REMOVAL, Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(DOHC TURBO)-48, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft position sensor. <Ref. to FU(DOHC TURBO)-31, REMOVAL, Camshaft Position Sensor.>
6) Remove the camshaft sprockets. To lock the camshaft, use ST.

ST 499207400 CAMSHAFT SPROCKET WRENCH



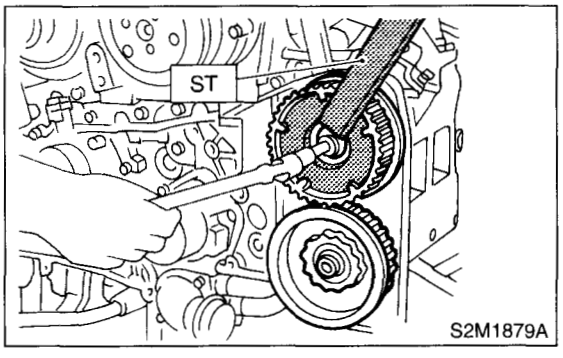
B: INSTALLATION

1) Install the camshaft sprocket No. 1. and No. 2. To lock camshaft, use ST.

ST 499207100 CAMSHAFT SPROCKET WRENCH

Tightening torque:
98 N·m (10 kgf-m, 72.4 ft-lb)

CAUTION:
Do not confuse left and right 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 position sensor. <Ref. to FU(DOHC TURBO)-31, INSTALLATION, Camshaft Position Sensor.>
3) Install the timing belt assembly. <Ref. to ME(DOHC TURBO)-50, INSTALLATION, Timing Belt Assembly.>
4) Install the belt cover. <Ref. to ME(DOHC TURBO)-47, INSTALLATION, Belt Cover.>
5) Install the crankshaft pulley. <Ref. to ME(DOHC TURBO)-46, INSTALLATION, Crankshaft Pulley.>
6) Install the V-belt. <Ref. to ME(DOHC TURBO)-44, INSTALLATION, V-belt.>

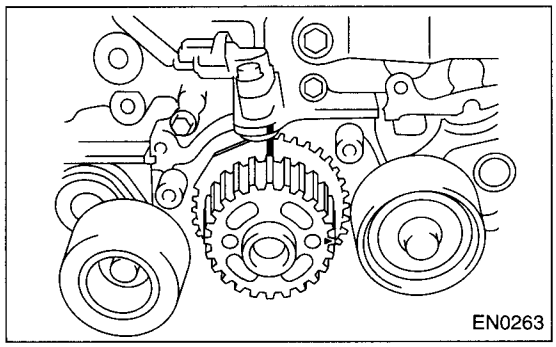
C: INSPECTION

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

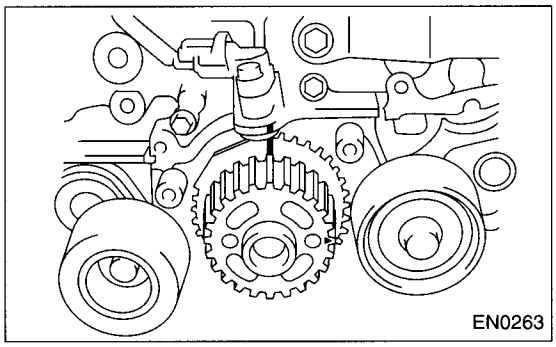
A: REMOVAL

1) Remove the V-belt. <Ref. to ME(DOHC TURBO)-44, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(DOHC TURBO)-46, REMOVAL, Crankshaft Pulley.>
3) Remove the belt cover. <Ref. to ME(DOHC TURBO)-47, REMOVAL, Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(DOHC TURBO)-48, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(DOHC TURBO)-57, REMOVAL, Camshaft Sprocket.>
6) Remove the crankshaft sprocket.



B: INSTALLATION

1) Install the crankshaft sprocket.



2) Install the camshaft sprocket. <Ref. to ME(DOHC TURBO)-57, INSTALLATION, Camshaft Sprocket.>
3) Install the timing belt assembly. <Ref. to ME(DOHC TURBO)-50, INSTALLATION, Timing Belt Assembly.>
4) Install the belt cover. <Ref. to ME(DOHC TURBO)-47, INSTALLATION, Belt Cover.>
5) Install the crankshaft pulley. <Ref. to ME(DOHC TURBO)-46, INSTALLATION, Crankshaft Pulley.>
6) Install the V-belt. <Ref. to ME(DOHC TURBO)-44, INSTALLATION, V-belt.>

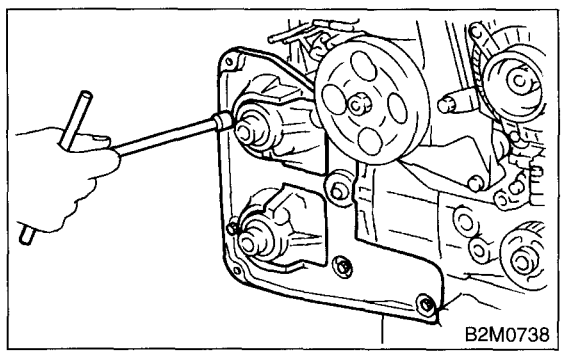
C: INSPECTION

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.

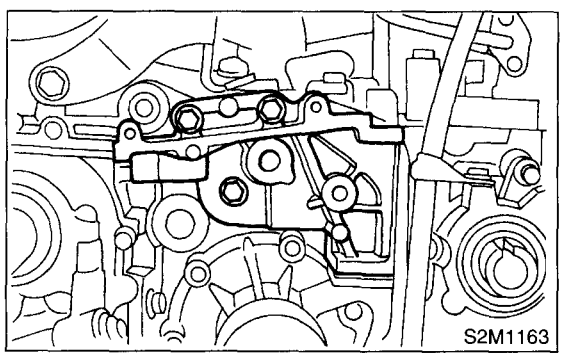
18.Camshaft

A: REMOVAL

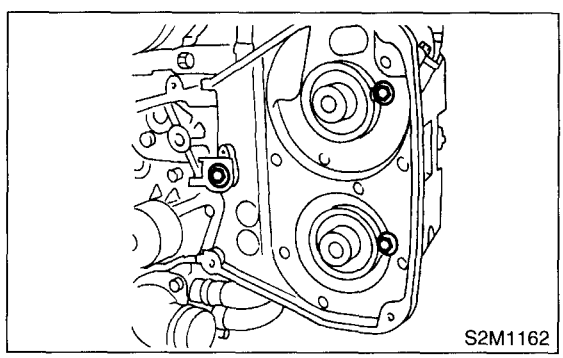
1) Remove the V-belt. <Ref. to ME(DOHC TURBO)-44, INSTALLATION, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(DOHC TURBO)-46, REMOVAL, Crankshaft Pulley.>
3) Remove the belt cover. <Ref. to ME(DOHC TURBO)-47, REMOVAL, Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(DOHC TURBO)-48, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(DOHC TURBO)-57, REMOVAL, Camshaft Sprocket.>
6) Remove the crankshaft sprocket. <Ref. to ME(DOHC TURBO)-58, REMOVAL, Crankshaft Sprocket.>
7) Remove the right-hand belt cover No.2.


B2M0738

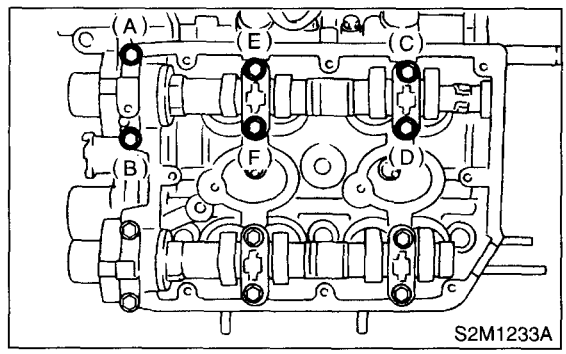
8) Remove the tensioner bracket.


S2M1163

9) Remove the left-hand belt cover No. 2.

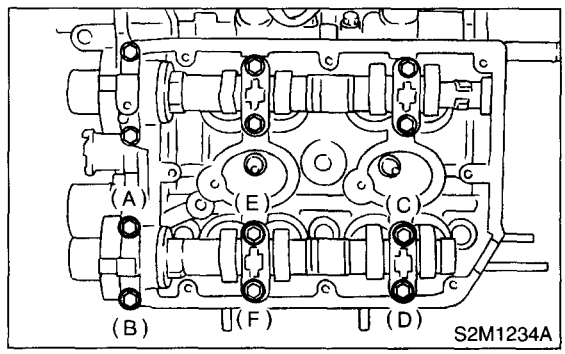

S2M1162

10) Remove the oil level gauge guide. (LH side only)
11) Remove the spark plug cord.
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.



S2M1233A

14) Remove the camshaft caps and intake camshaft.
15) Loosen the exhaust camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



S2M1234A

16) Remove the camshaft caps and exhaust camshaft.

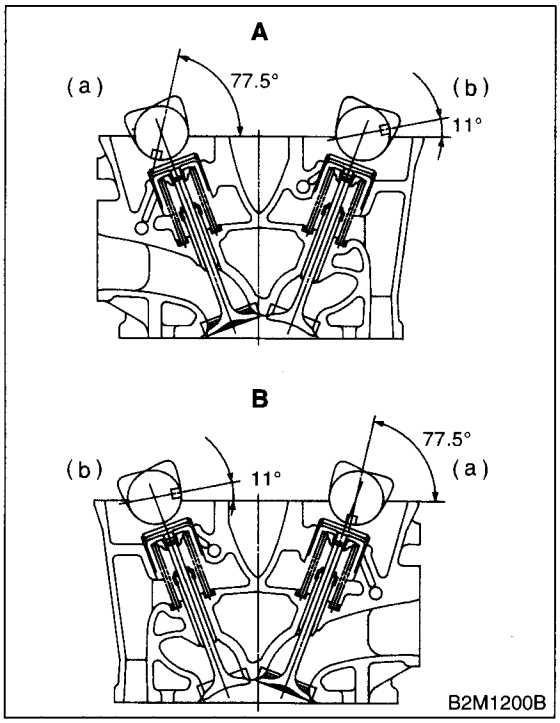
CAUTION:
Arrange camshaft caps in order so that they can be installed in their original positions.

17) Similarly, remove the right-hand camshafts 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.

CAUTION:
• 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.
• Right-hand camshaft need not be rotated when set at the position shown in the figure.
Left-hand intake camshaft: Rotate 80° clockwise.
Left-hand exhaust camshaft: Rotate 45° counterclockwise.

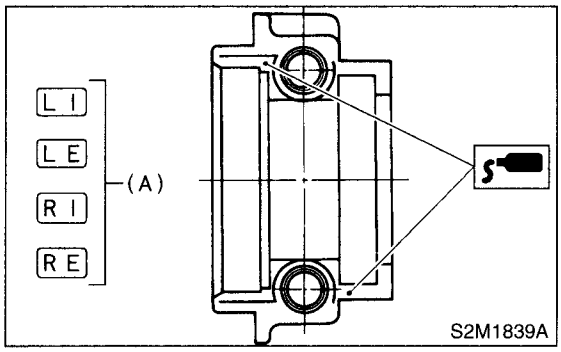


A Left side cylinder head
B Right side cylinder head
(a) Intake camshaft
(b) Exhaust camshaft

2) Camshaft cap installation:
(1) Apply fluid packing sparingly to the cap mating surface.

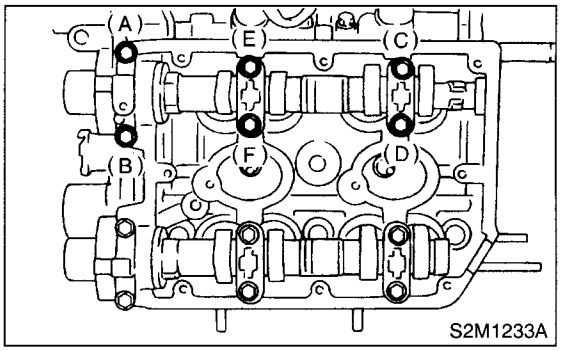
CAUTION:
Do not apply fluid packing excessively. Failure to do so may cause excess packing to come out and flow toward oil seal, resulting in oil leaks.

Fluid packing:
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 cap in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque.

Tightening torque:
20 N·m (2.0 kgf-m, 14.5 ft-lb)



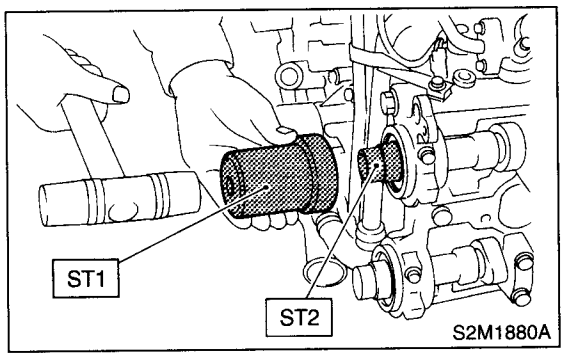
(4) Similarly, tighten the cap on exhaust side.
After tightening the cap, ensure the camshaft rotates only slightly while holding it at "base" circle.

Tightening torque:
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.

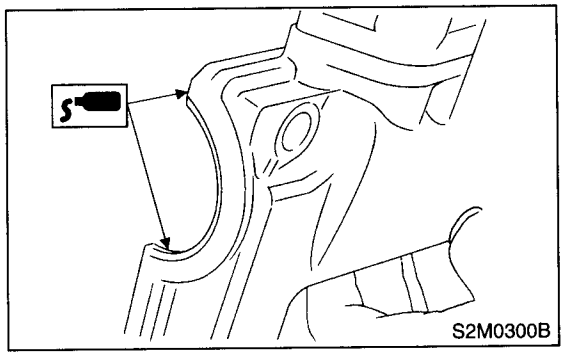
CAUTION:
Use a new oil seal.

ST1 499587600 OIL SEAL INSTALLER
ST2 499597200 OIL SEAL GUIDE



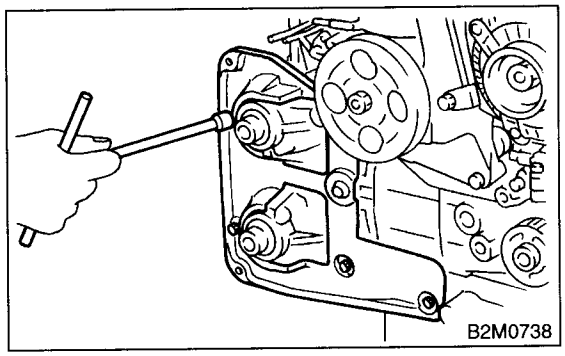
4) Rocker cover installation:
(1) Install the gasket on rocker cover.
Install the peripheral gasket and ignition coil gasket.
(2) Apply fluid packing to four front open edges of peripheral gasket.

Fluid packing:
THREE BOND 1215 or equivalent



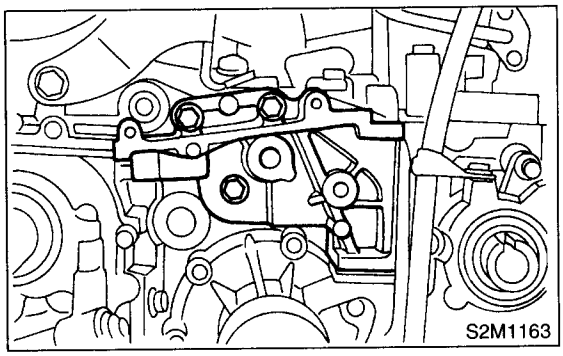
(3) Install the rocker cover on cylinder head.
Ensure the gasket is properly positioned during installation.
5) Install the spark plug cord.
6) Similarly, install the parts on right-hand side.
7) Install the right-hand belt cover No. 2.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



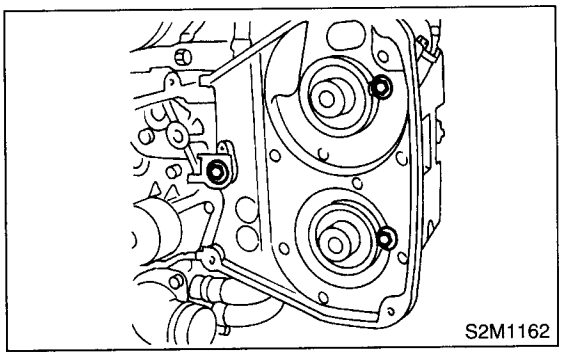
8) Install the tensioner bracket.

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



9) Install the left-hand belt cover No. 2.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



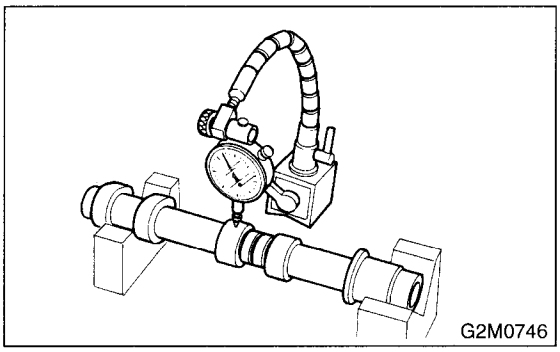
10) Install the crankshaft sprocket. <Ref. to ME(DOHC TURBO)-58, INSTALLATION, Crankshaft Sprocket.>
11) Install the camshaft sprockets. <Ref. to ME(DOHC TURBO)-57, INSTALLATION, Camshaft Sprocket.>
12) Install the timing belt assembly. <Ref. to ME(DOHC TURBO)-50, INSTALLATION, Timing Belt Assembly.>
13) Install the belt cover. <Ref. to ME(DOHC TURBO)-47, INSTALLATION, Belt Cover.>

14) Install the crankshaft pulley. <Ref. to ME(DOHC TURBO)-46, INSTALLATION, Crankshaft Pulley.>
15) Install the V-belt. <Ref. to ME(DOHC TURBO)-44, INSTALLATION, V-belt.>

C: INSPECTION

1) Measure the bend, and repair or replace if necessary.

Limit:
0.020 mm (0.0008 in)

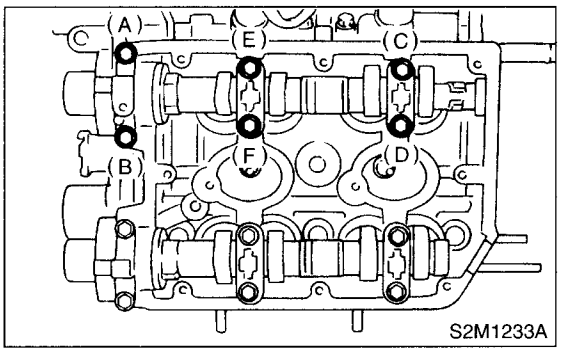


2) Check the journal for damage and wear. Replace if faulty.
3) Measure the outside diameter of camshaft journal. If the jounal diameter is not as specified, check the oil clearance.

	Camshaft journal	
	Front	Center, rear
Standard	37.946 — 37.9635 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 the cylinder head. (Without installing the valve rocker.)
(3) Place a plastigauge across each of the camshaft jounals.
(4) Gradually tighten the cap in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque.

Tightening torque:
20 N·m (2.0 kgf-m, 14.5 ft-lb)

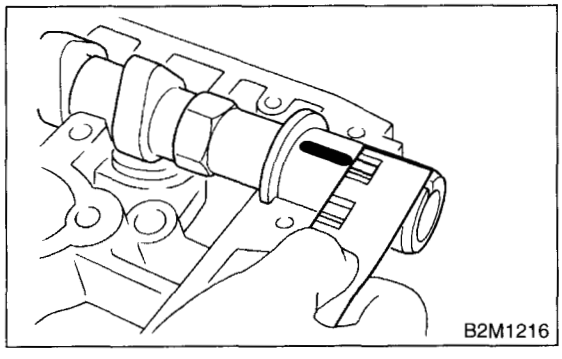


CAUTION:
Do not turn the camshaft.

(5) Remove the bearing caps.
(6) Measure the widest point of the 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)

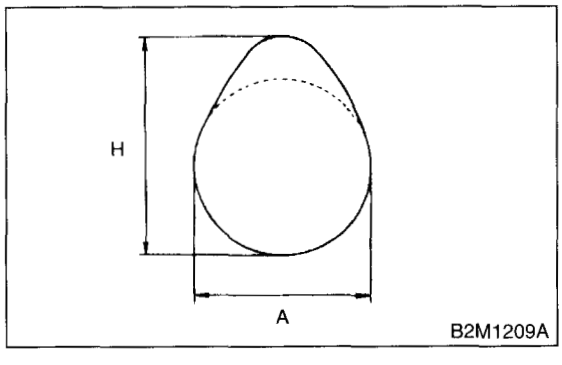

B2M1216

(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:
46.25 — 46.35 mm (1.821 — 1.825 in)
Exhaust:
46.15 — 46.25 mm (1.817 — 1.821 in)

Limit:
Intake:
46.15 mm (1.817 in)
Exhaust:
46.05 mm (1.813 in)

Cam base circle diameter A:
37.0 mm (1.457 in)

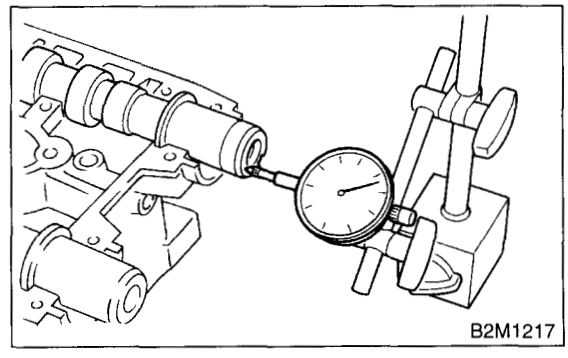


B2M1209A

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)

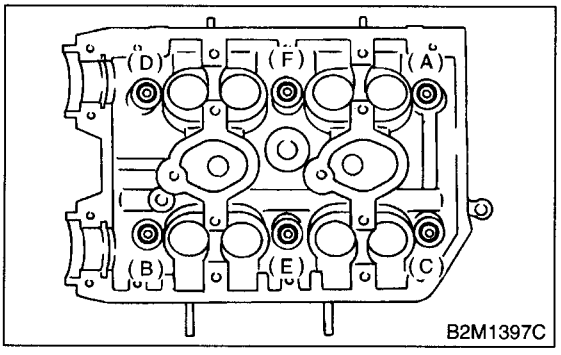

B2M1217

19.Cylinder Head Assembly

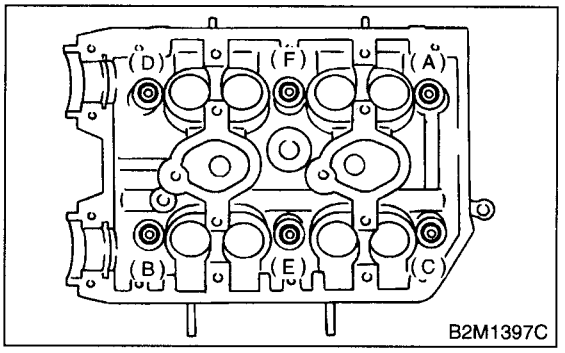
A: REMOVAL

1) Remove the V-belt. <Ref. to ME(DOHC TURBO)-44, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(DOHC TURBO)-46, REMOVAL, Crankshaft Pulley.>
3) Remove the belt cover. <Ref. to ME(DOHC TURBO)-47, REMOVAL, Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(DOHC TURBO)-48, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(DOHC TURBO)-57, REMOVAL, Camshaft Sprocket.>
6) Remove the intake manifold. <Ref. to FU(DOHC TURBO)-15, REMOVAL, Intake Manifold.>
7) Remove the bolt which installs the A/C compressor bracket on cylinder head.
8) Remove the camshaft. <Ref. to ME(DOHC TURBO)-59, REMOVAL, Camshaft.>
9) Remove the cylinder head bolts in alphabetical sequence shown in the figure.

CAUTION:
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 the cylinder head.



11) Remove the cylinder head gasket.

CAUTION:
Do not scratch the mating surface of cylinder head and cylinder block.

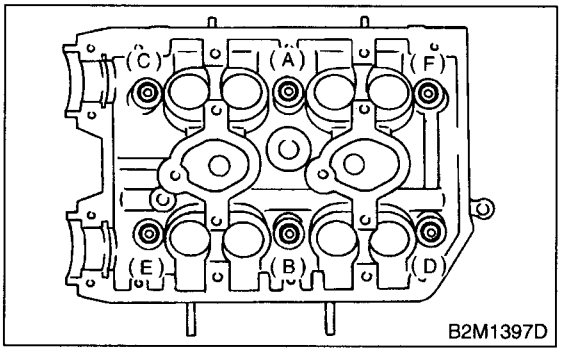
12) Similarly, remove the right side cylinder head.

B: INSTALLATION

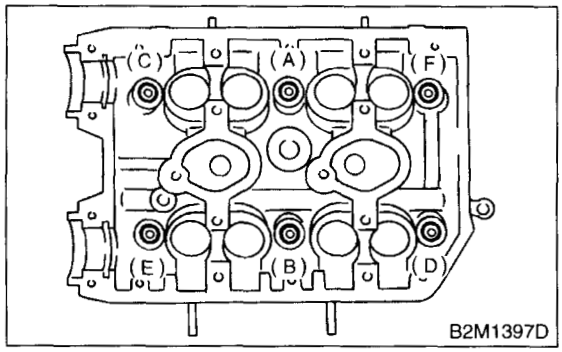
1) Install the cylinder head and gaskets on cylinder block.

CAUTION:
- **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 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 the bolts more than 90°.

(7) Further tighten all bolts by 80 to 90° in alphabetical sequence.

CAUTION:
Ensure the total "re-tightening angle" [in the two previous steps] do not exceed 180°.

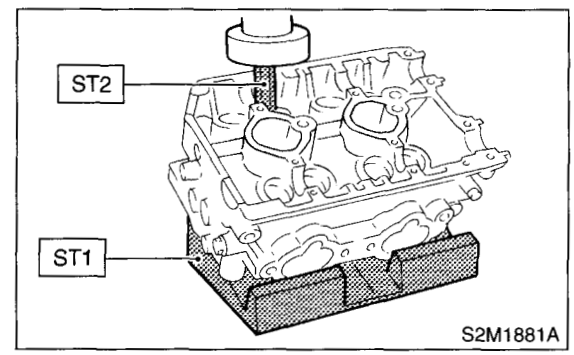
3) Install the camshaft. <Ref. to ME(DOHC TURBO)-60, INSTALLATION, Camshaft.>
4) Install the A/C compressor bracket on cylinder head.
5) Install the intake manifold. <Ref. to FU(DOHC TURBO)-18, INSTALLATION, Intake Manifold.>
6) Install the camshaft sprocket. <Ref. to ME(DOHC TURBO)-57, INSTALLATION, Camshaft Sprocket.>
7) Install the timing belt assembly. <Ref. to ME(DOHC TURBO)-50, INSTALLATION, Timing Belt Assembly.>
8) Install the belt cover. <Ref. to ME(DOHC TURBO)-47, INSTALLATION, Belt Cover.>
9) Install the crankshaft pulley. <Ref. to ME(DOHC TURBO)-46, INSTALLATION, Crankshaft Pulley.>
10) Install the V-belt. <Ref. to ME(DOHC 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.

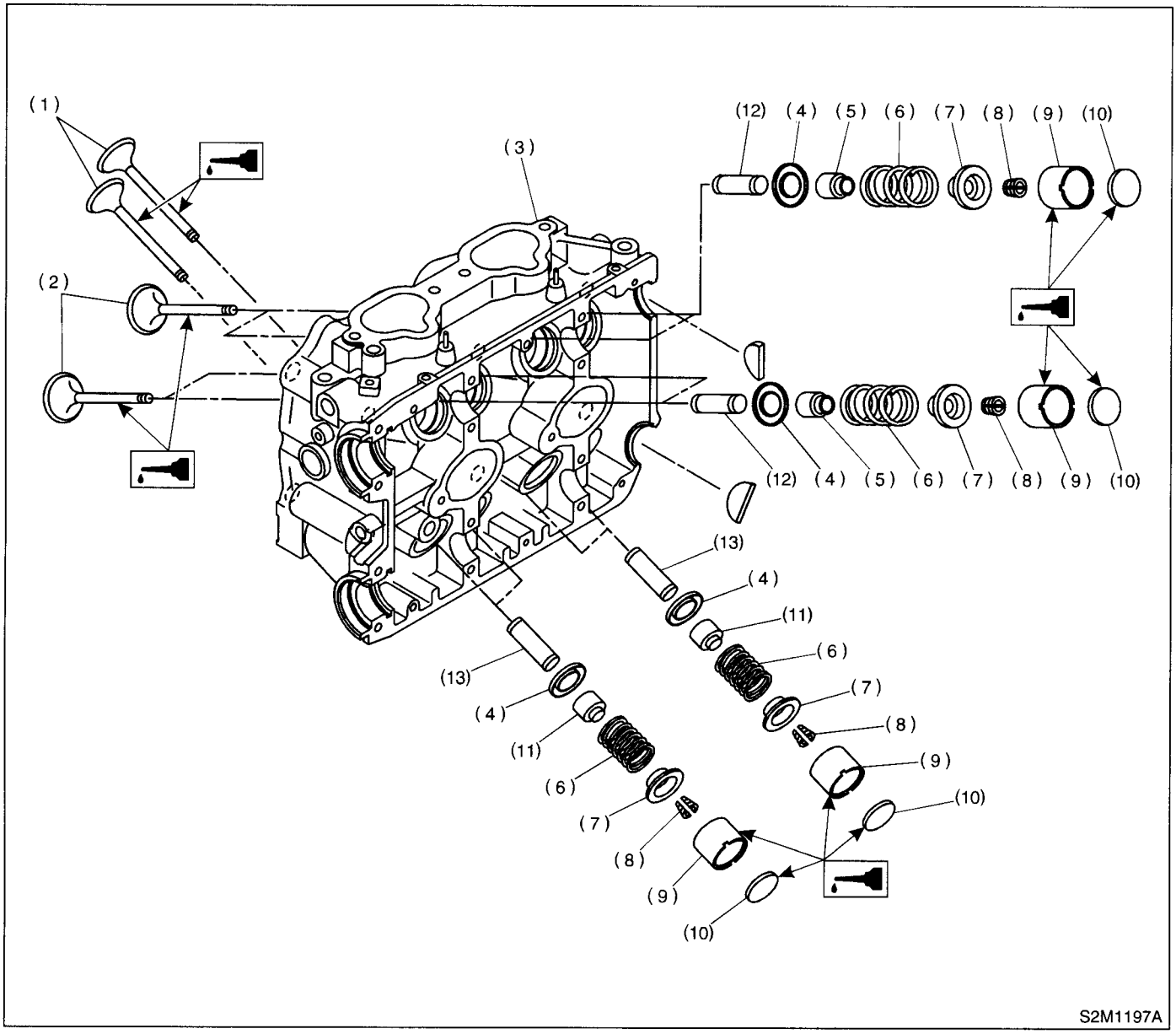
ST1 498267600 CYLINDER HEAD TABLE
ST2 499718000 VALVE SPRING REMOVER

CAUTION:
- **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.**



CYLINDER HEAD ASSEMBLY

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) Shim
(11) Exhaust valve oil seal
(12) Intake valve guide
(13) Exhaust valve guide

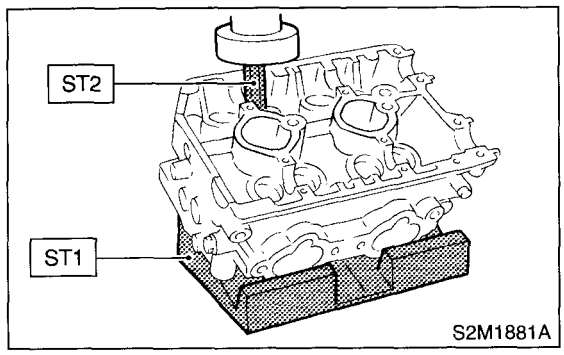
1) Installation of valve spring and valve:
(1) Coat the stem of each valve with engine oil and insert the valve into valve guide.

CAUTION:
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

CAUTION:
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 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 and valve shim.
3) Install the valve lifter and valve shim.

E: INSPECTION

1. CYLINDER HEAD

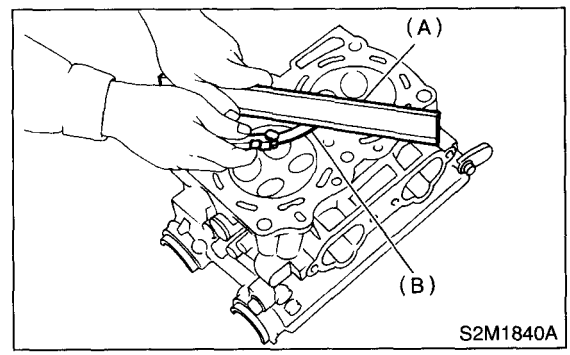
1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect the important areas by means of red check.
2) Measure the warping of the cylinder head surface that mates with crankcase by using a straight edge (A) and thickness gauge (B).
If the warping exceeds 0.05 mm (0.0020 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)

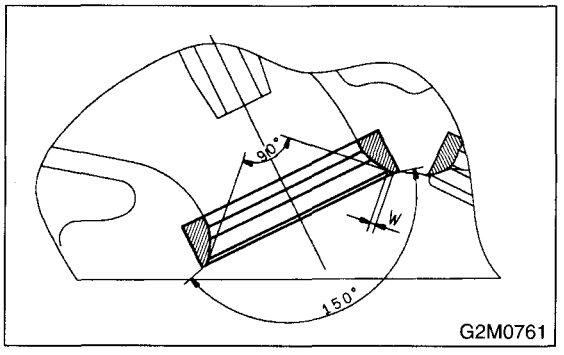
CAUTION:
Uneven torque for the cylinder head nuts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.



2. VALVE SEAT

Inspect the intake and exhaust valve seats, and 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
0.035 — 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)

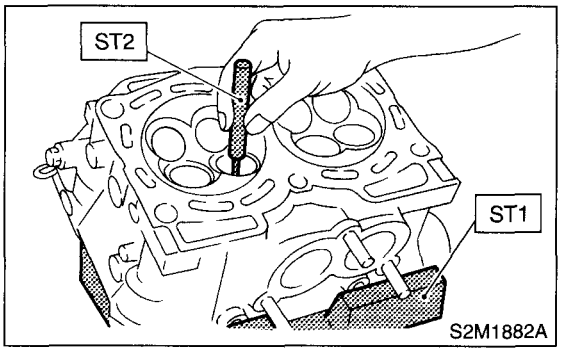
2) If the clearance between valve guide and stem exceeds the limit, replace the valve guide or valve itself whichever shows greater amount of wear. See the following procedure for valve guide replacement.

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)

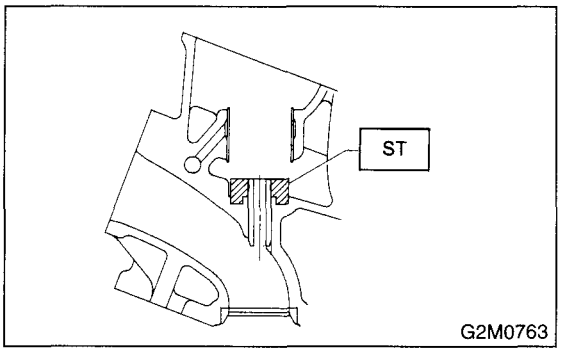
(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.
(2) Insert the ST2 into valve guide and press it down to remove the valve guide.

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.

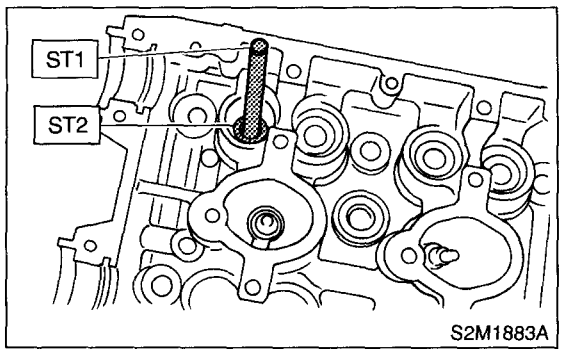
ST 498767700 VALVE GUIDE ADJUSTER



(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 498267700 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion: L
12.0 — 12.4 mm (0.472 — 0.488 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

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.

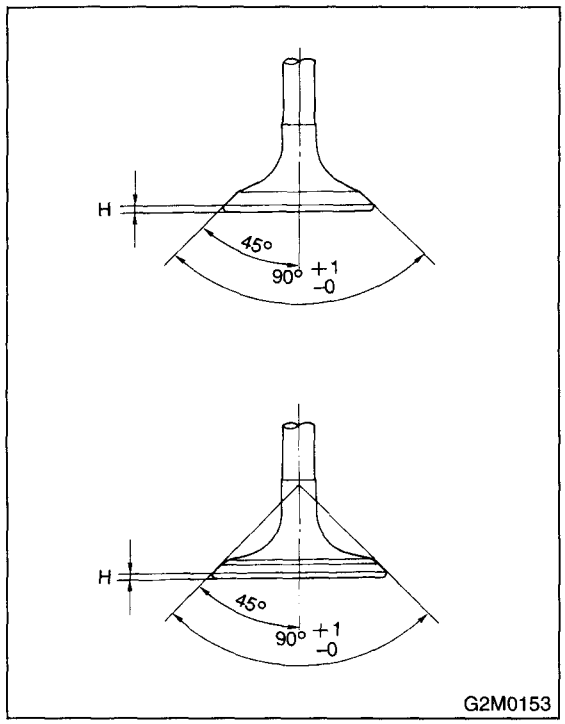
(8) Recheck the contact condition between valve and valve seat after replacing the valve guide.

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)

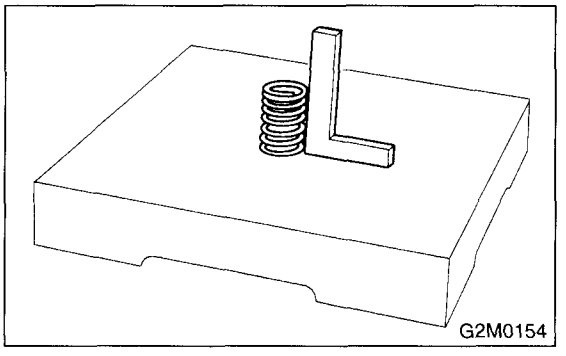


2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. Install a new intake valve oil seal after lapping.

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 the 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	220.7±15.7 N (22.5 ± 1.6 kgf, 49.6±3.5 lb)/36.0 mm (1.417 in)
	510.9±25.5 N (52.1±2.6 kgf, 114.9±5.7 lb)/26.6 mm (1.047 in)
Squareness	2.5°, 2.0 mm (0.079 in)



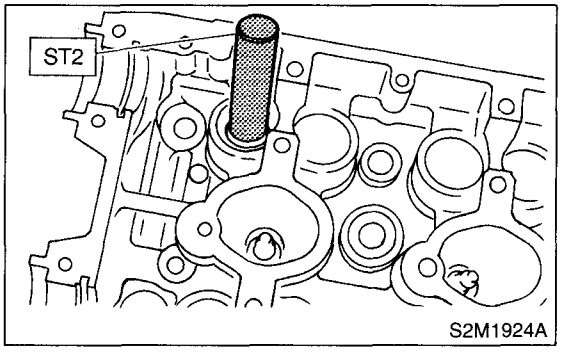
6. INTAKE AND EXHAUST VALVE OIL SEAL

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 GUIDE REMOVER

CAUTION:
• Apply engine oil to oil seal before force-fitting.
• Differentiate between the intake valve oil seal and exhaust valve oil seal by noting their difference in color.

Color of rubber part:
Intake [Black]
Exhaust [Brown]

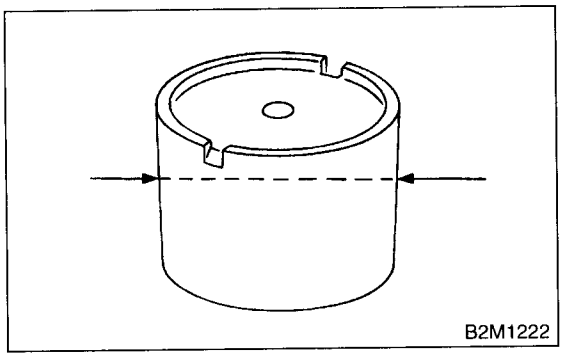
Color of spring part:
Intake [Silver]
Exhaust [Silver]



7. VALVE LIFTER

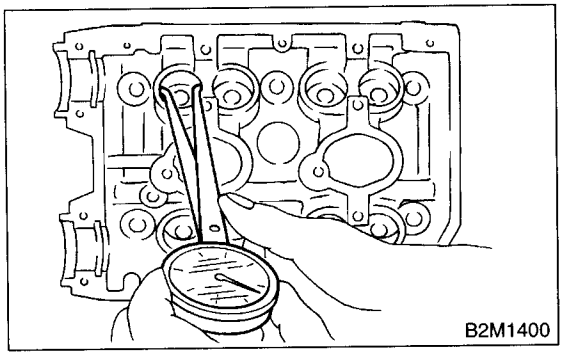
1) Check the valve lifter visually.
2) Measure the outer diameter of valve lifter.

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)



CAUTION:
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)

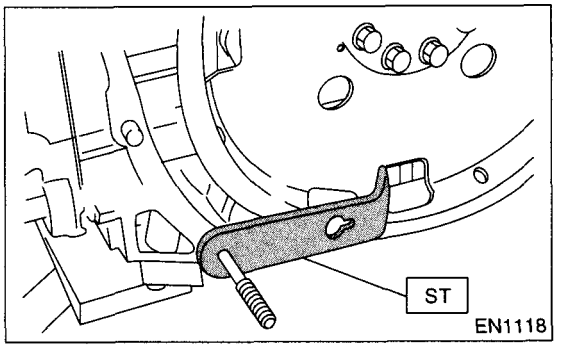
Limit:
0.100 mm (0.0039 in)

20.Cylinder Block

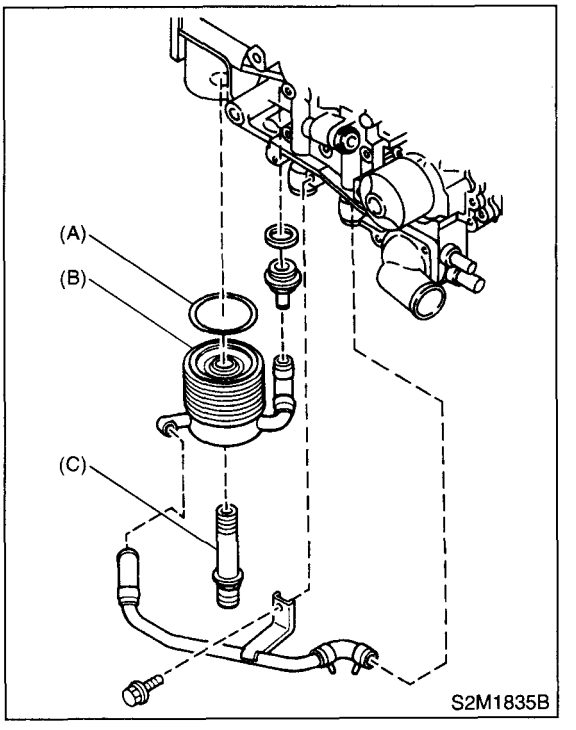
A: REMOVAL

NOTE:
Before conducting this procedure, drain the engine oil completely if applicable.

1) Remove the intake manifold. <Ref. to FU(DOHC TURBO)-15, REMOVAL, Intake Manifold.>
2) Remove the V-belt. <Ref. to ME(DOHC TURBO)-44, REMOVAL, V-belt.>
3) Remove the crankshaft pulley. <Ref. to ME(DOHC TURBO)-46, REMOVAL, Crankshaft Pulley.>
4) Remove the belt cover. <Ref. to ME(DOHC TURBO)-47, REMOVAL, Belt Cover.>
5) Remove the timing belt assembly. <Ref. to ME(DOHC TURBO)-48, REMOVAL, Timing Belt Assembly.>
6) Remove the camshaft sprocket. <Ref. to ME(DOHC TURBO)-57, REMOVAL, Camshaft Sprocket.>
7) Remove the crankshaft sprocket. <Ref. to ME(DOHC TURBO)-58, REMOVAL, Crankshaft Sprocket.>
8) Remove the generator and A/C compressor with their brackets.
9) Remove the cylinder head assembly. <Ref. to ME(DOHC TURBO)-64, REMOVAL, Cylinder Head Assembly.>
10) Remove the clutch disc and cover. (MT vehicles) <Ref. to CL-11, REMOVAL, Clutch Disc and Cover.>
11) Remove the flywheel. (MT vehicles) <Ref. to CL-14, REMOVAL, Flywheel.>
12) Remove the drive plate. (AT vehicles)
Using the ST, lock crankshaft.
ST 498497100 CRANKSHAFT STOPPER



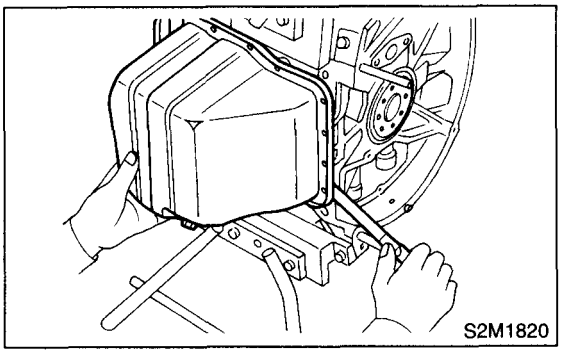
13) Remove the oil separator cover.
14) Remove the water by-pass pipe for heater.
15) Remove the oil filter.
16) Remove the oil cooler.



(a) Gasket
(b) Oil cooler
(c) 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 remove the oil pan.

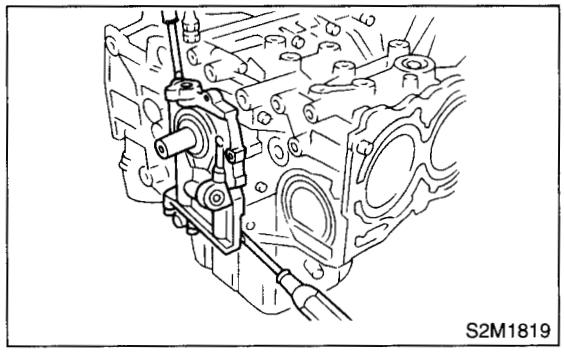
CAUTION:
Do not use a screwdriver or similar tool in place of oil pan cutter.

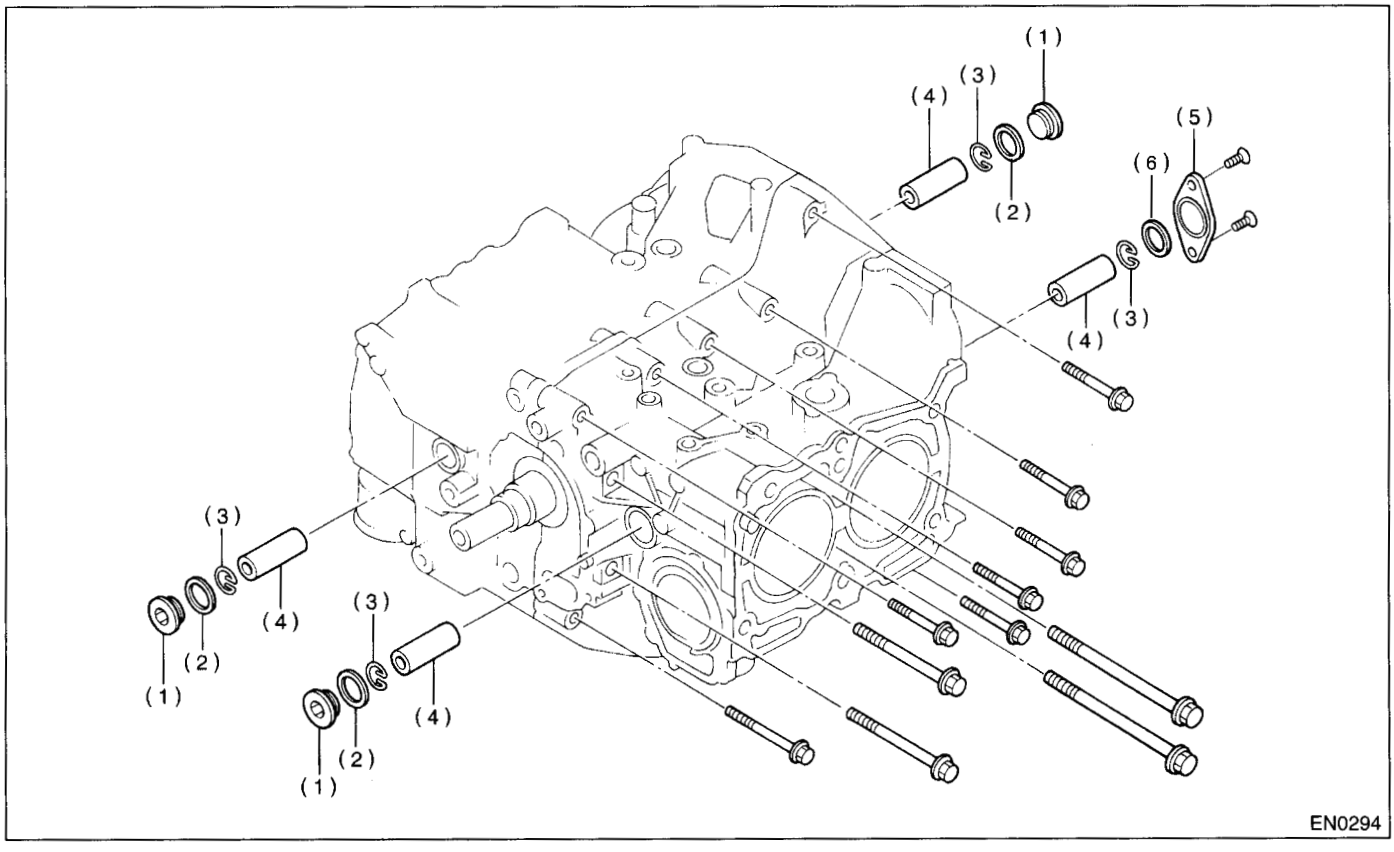


18) Remove the oil strainer stay.
19) Remove the oil strainer.
20) Remove the baffle plate.
21) Remove the water pipes.
22) Remove the water pump.

23) Remove the oil pump from cylinder block.
Use a flat-bladed screwdriver as shown in the figure when removing the oil pump.

CAUTION:
Be careful not to scratch the mating surface of cylinder block and oil pump.

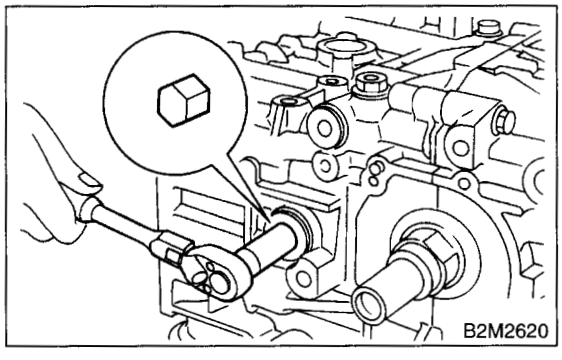

S2M1819



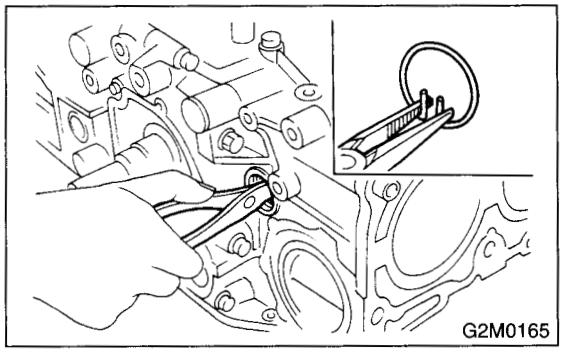
EN0294

(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 the hexagon wrench [14 mm (0.55 in)].

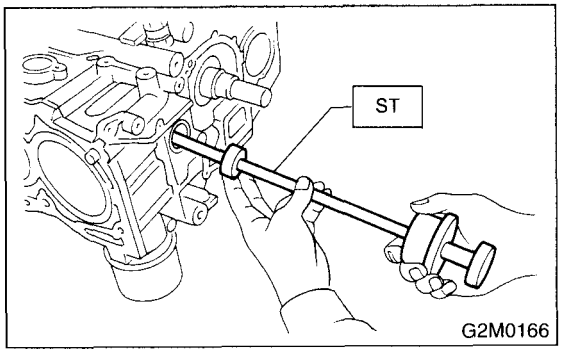

B2M2620

25) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, then remove the piston circlip through service hole of #1 and #2 cylinders.


G2M0165

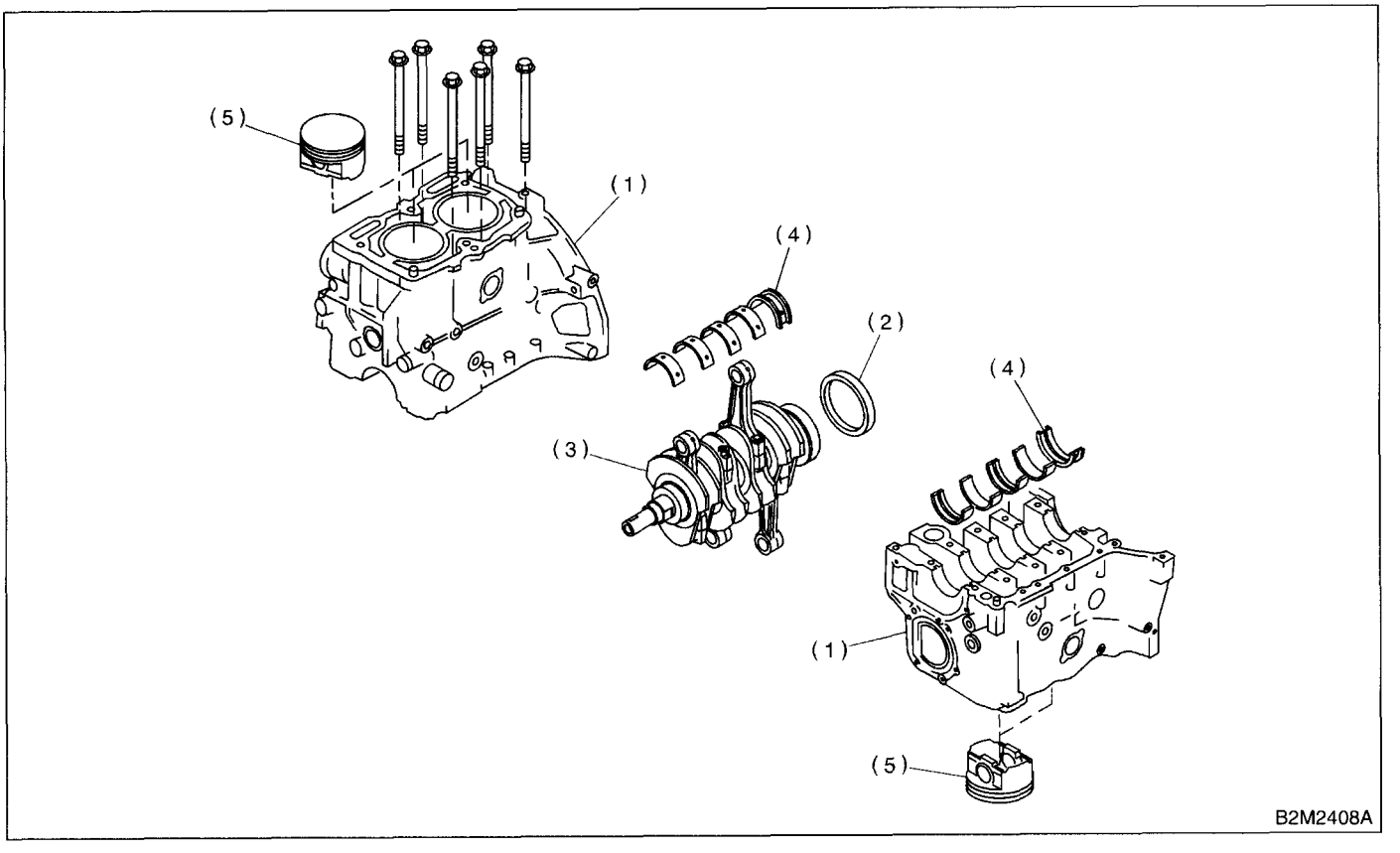
26) Draw out the piston pin from #1 and #2 pistons using ST.
ST 499097700 PISTON PIN REMOVER

CAUTION:
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 left-hand and right-hand cylinder blocks.

CAUTION:
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.

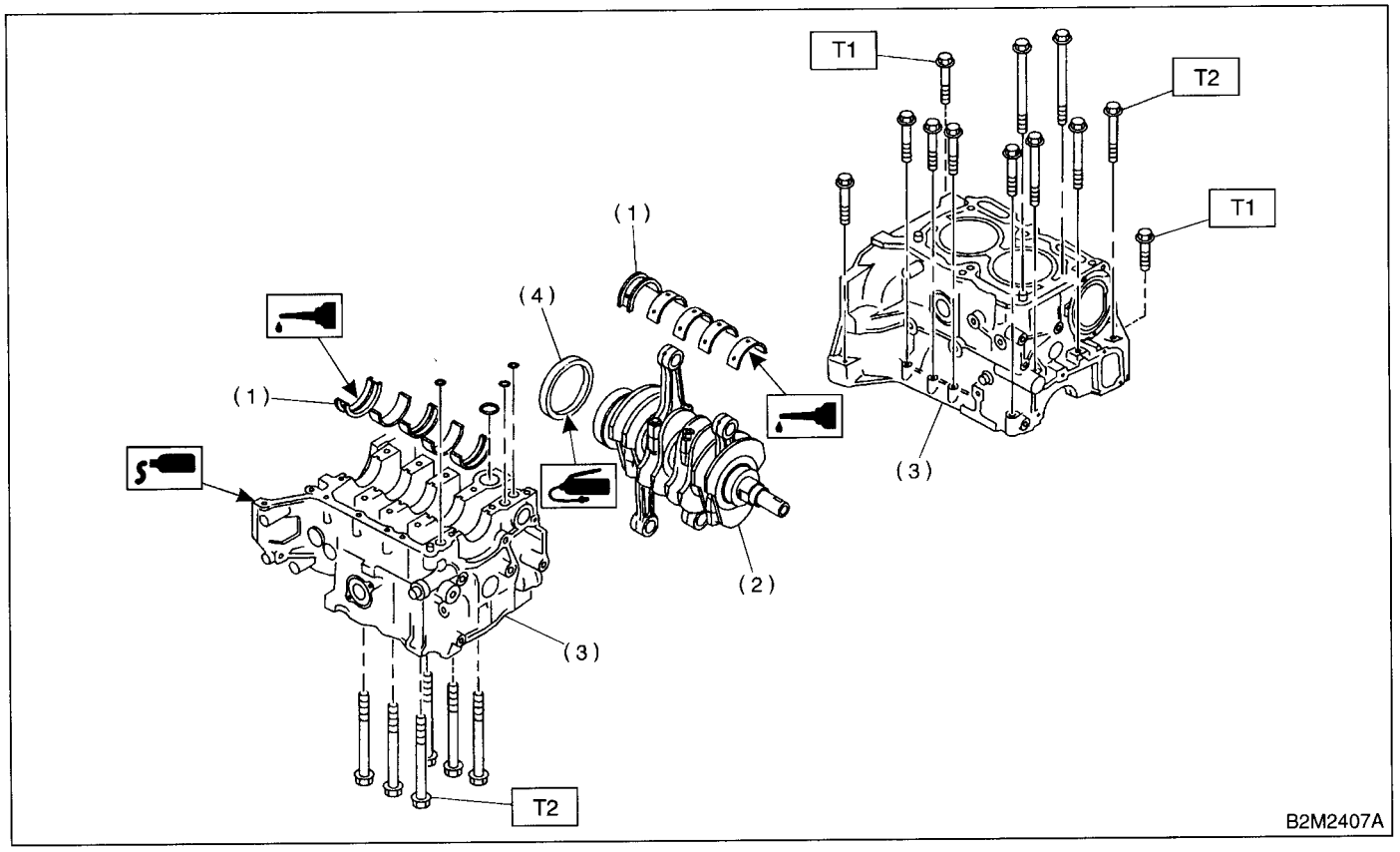
CAUTION:
Do not confuse the combination of crankshaft bearings.

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.

CAUTION:
Do not confuse the combination of piston and cylinder.

B: INSTALLATION



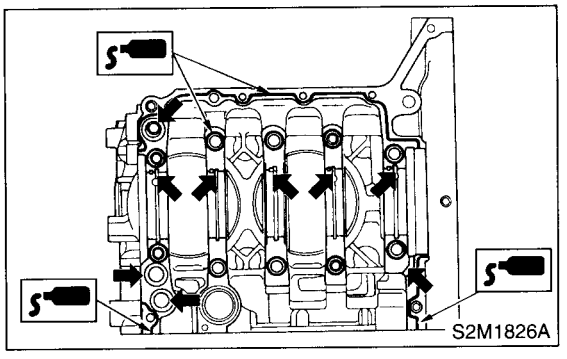
(1) Crankshaft bearing
(2) Crankshaft
(3) Cylinder block
(4) Rear oil seal

Tightening torque: N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.1)
T2: 47 (4.8, 34.7)

CAUTION:
Remove oil in the mating surface of bearing and cylinder block before installation. Also apply a coat of engine oil to crankshaft pins.

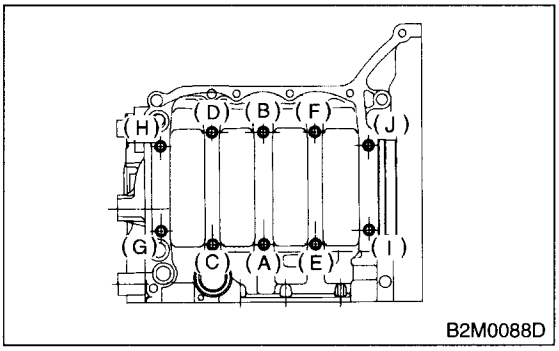
1) Position the crankshaft on the #2 and #4 cylinder block.
2) Apply fluid packing to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

Fluid packing:
THREE BOND 1215 or equivalent



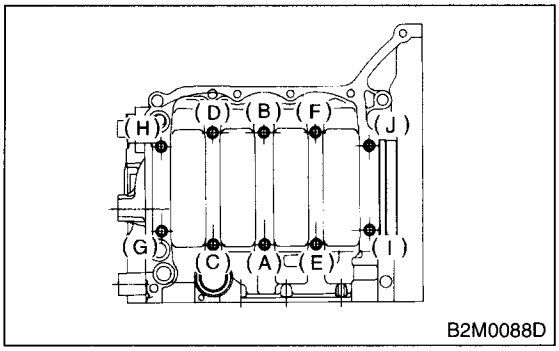
CAUTION:
Do not allow fluid packing to jut into O-ring grooves, oil passages, bearing grooves, etc.

3) Temporarily tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.



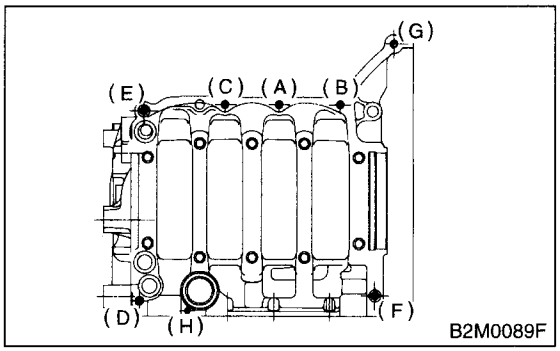
4) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence.

Tightening torque:
47 N·m (4.8 kgf-m, 34.7 ft-lb)

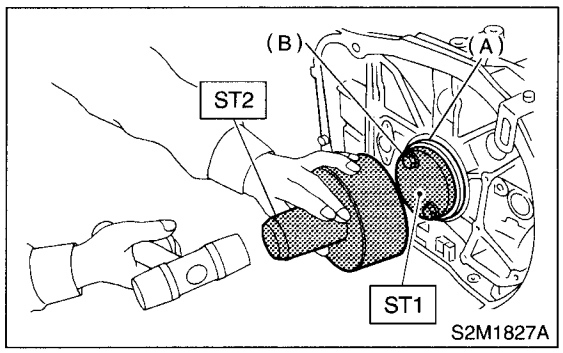


5) Tighten the 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.

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)

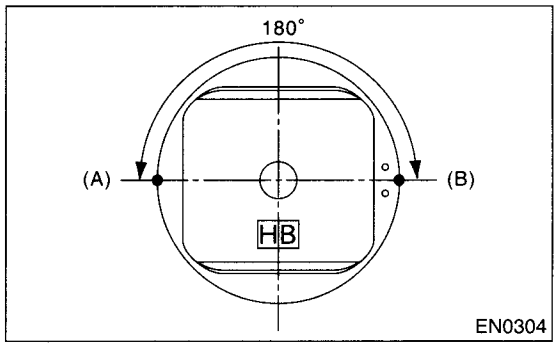


6) Install the rear oil seal using ST1 and ST2.
ST1 499597100 OIL SEAL GUIDE
ST2 499587200 OIL SEAL INSTALLER

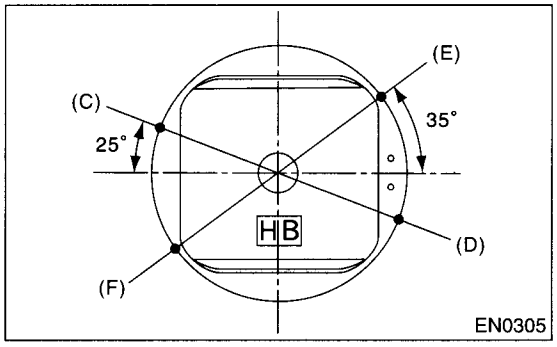


(A) Rear oil seal
(B) Flywheel attaching bolt

7) Position the top ring gap at (A) or (B) in the figure.



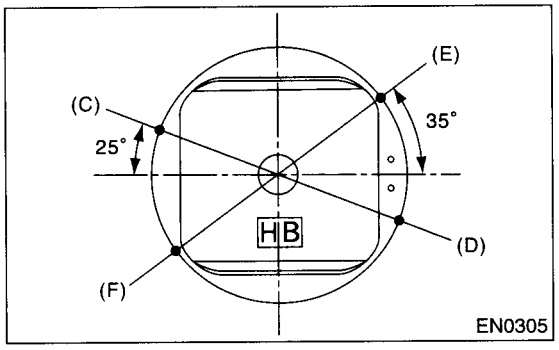
8) Position the second ring gap at 180° on the reverse side for the top ring gap.
9) Position the upper rail gap at (C) or (D) in the figure.



10) Position the expander gap at 180° of the reverse side for the upper rail gap.

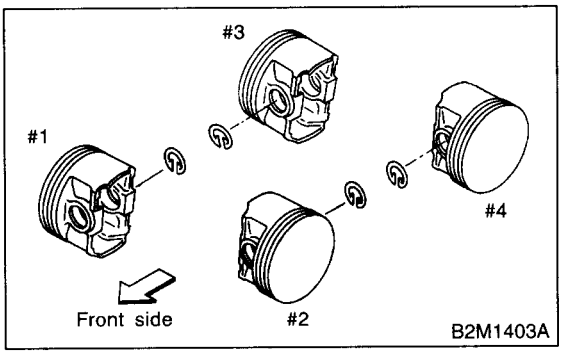
11) Position the lower rail gap at (E) or (F) in the figure.

CAUTION:
• Ensure ring gaps do not face the same direction.
• Ensure ring gaps are not within the piston skirt area.

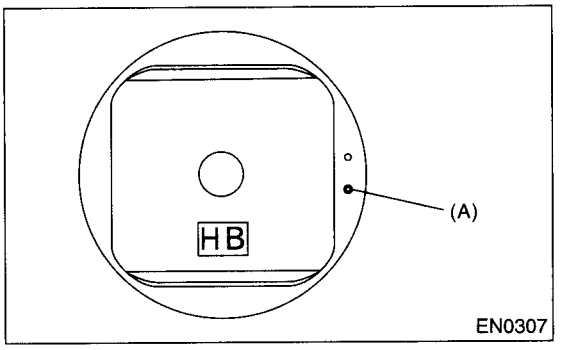


12) Installing the circlip:
Install the circlips in piston holes located opposite of the service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

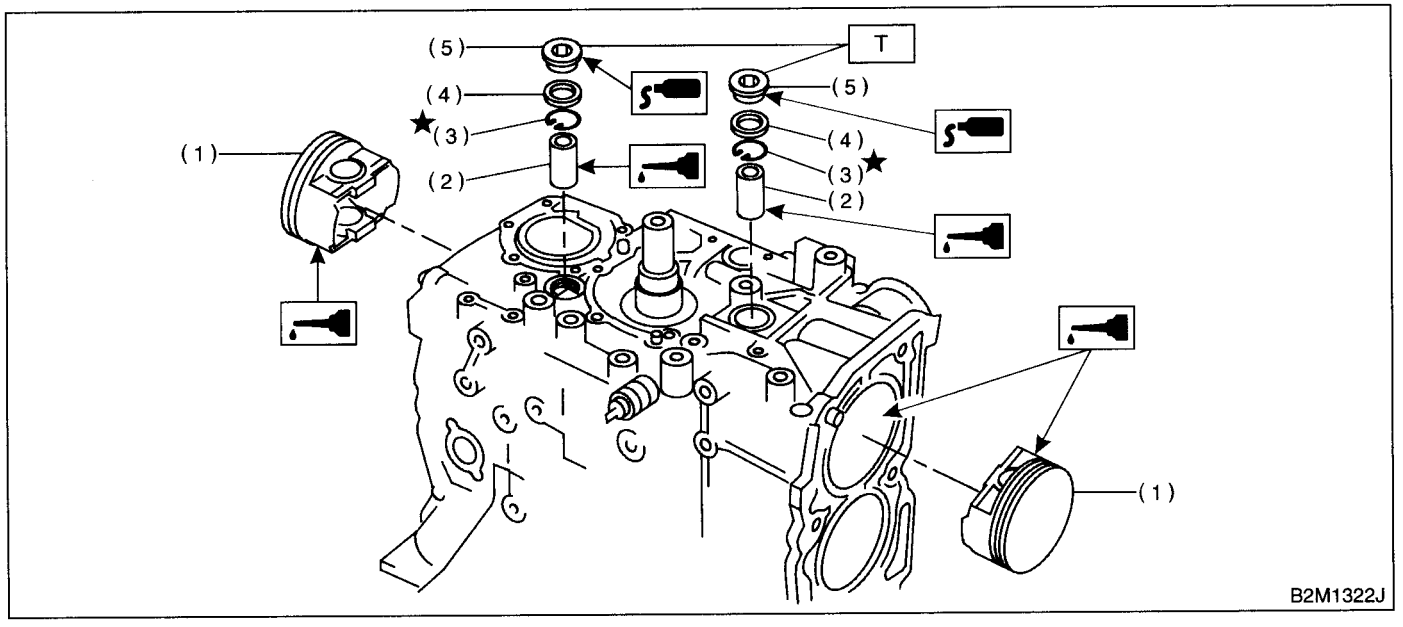
CAUTION:
Use new circlips.



CAUTION:
Piston front mark faces towards the front of the engine.



(A) Front mark



(1) Piston
(2) Piston pin
(3) Circlip
(4) Gasket
(5) Service hole plug

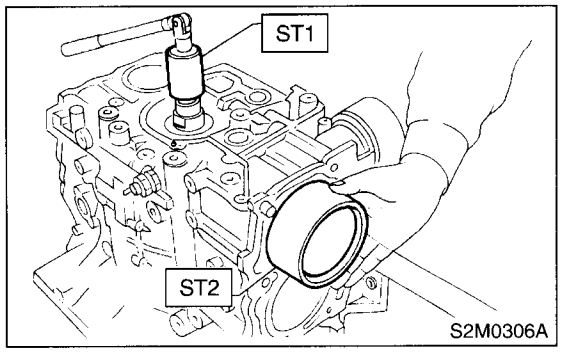
Tightening torque: N·m (kgf-m, ft-lb)
T: 69 (7.0, 50.6)

13) Installing the piston:
(1) Turn the cylinder block so that #1 and #2 cylinders face upward.
(2) Using 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.

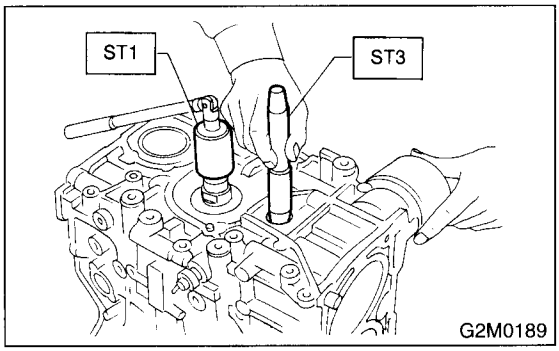
ST2 498744300 PISTON GUIDE



14) Installing piston pin:
(1) Insert ST3 into service hole to align piston pin hole with connecting rod small end.

CAUTION:
Apply a coat of engine oil to ST3 before insertion.

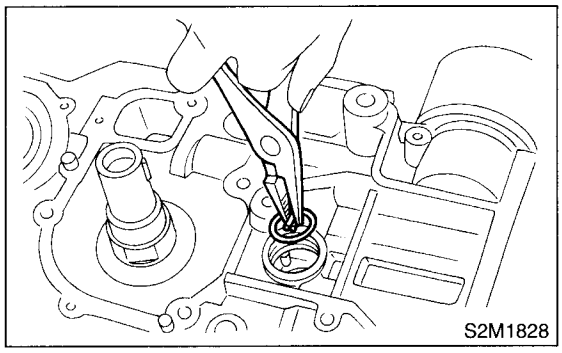
ST3 499017100 PISTON PIN GUIDE



(2) Apply a coat of engine oil to the piston pin and insert piston pin into piston and connecting rod through service hole.

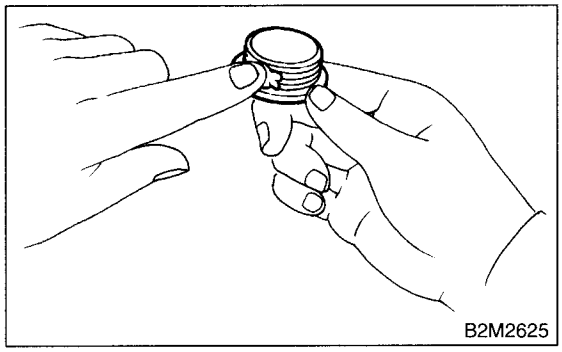
(3) Install the circlip.

CAUTION:
Use new circlips.



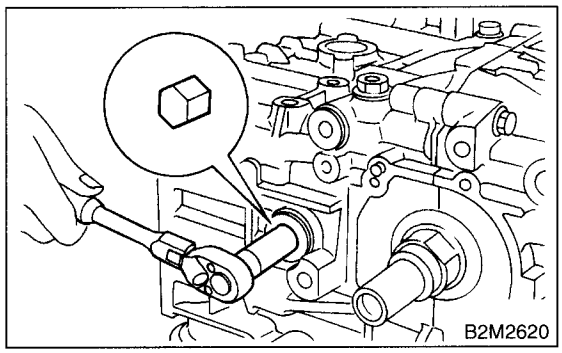
(4) Apply fluid packing around the service hole plug.

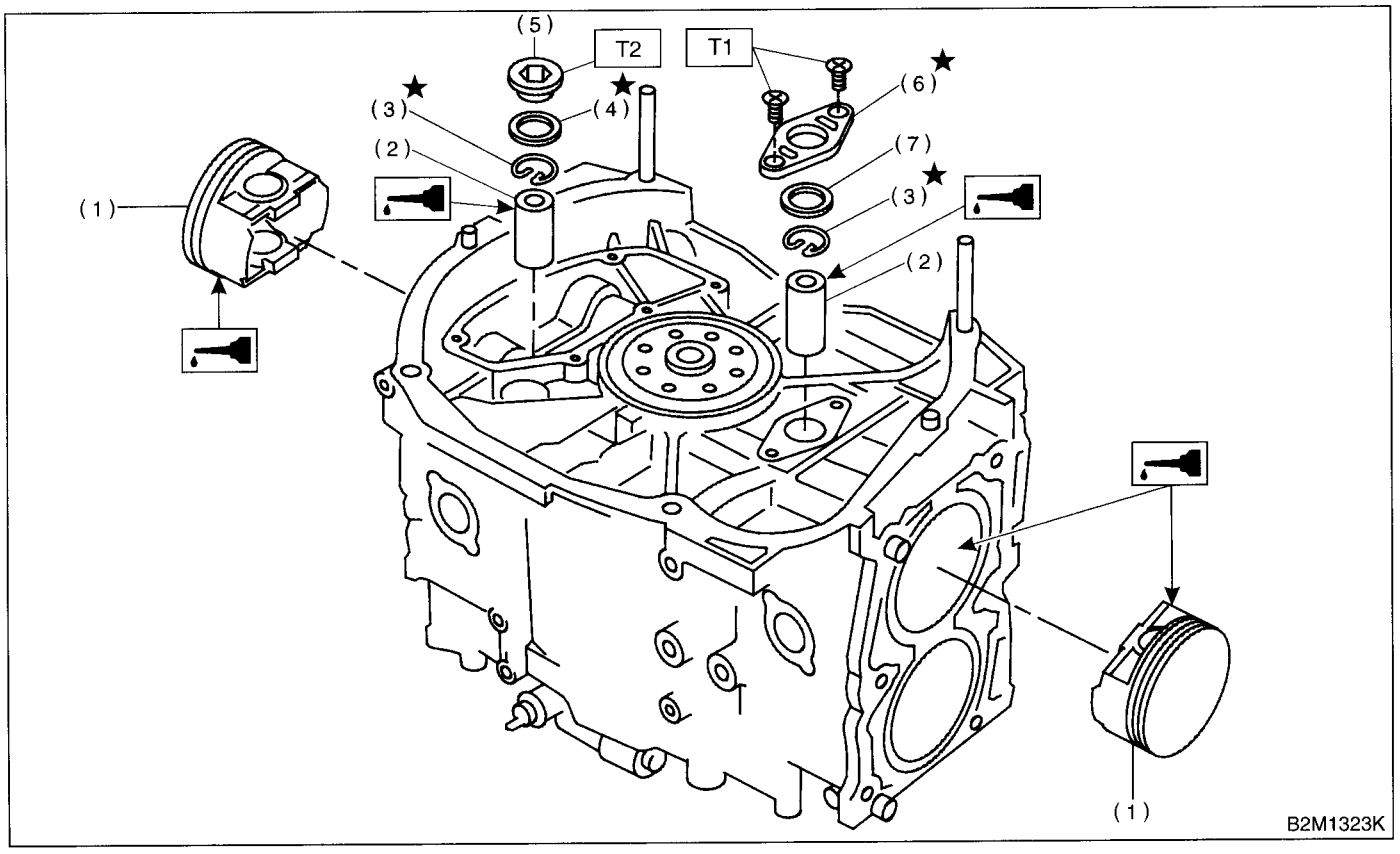
Fluid packing:
THREE BOND 1215 or equivalent



(5) Install the service hole plug and gasket.

CAUTION:
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: 69 (7.0, 50.6)

(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.

15) Install the water pipe.

16) Install the baffle plate.

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

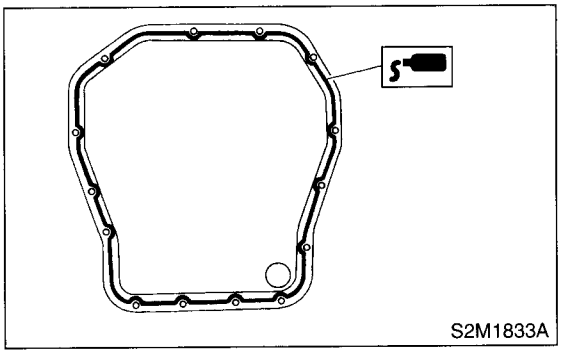
17) Install the oil strainer and O-ring

Tightening torque:
10 N·m (1.0 kgf-m, 7 ft-lb)

18) Install the oil strainer stay.

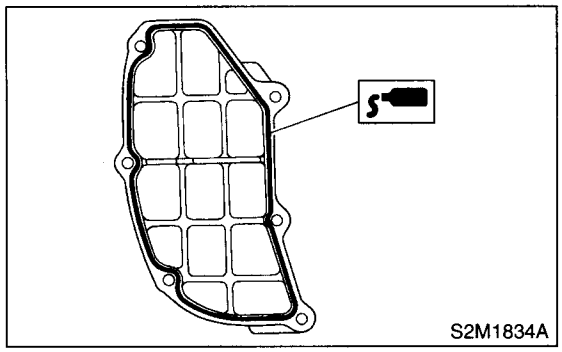
19) Apply fluid packing to matching surfaces and install the oil pan.

Fluid packing:
THREE BOND 1215 or equivalent



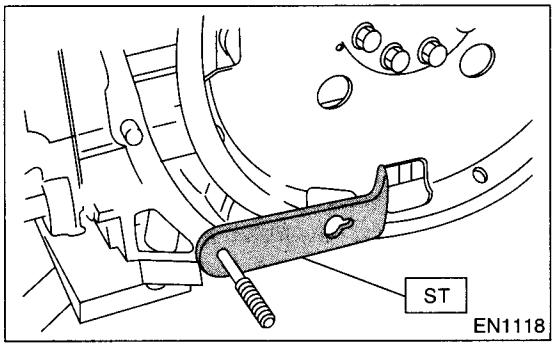
20) Apply fluid packing to matching surfaces and install the oil separator cover.

Fluid packing:
THREE BOND 1215 or equivalent

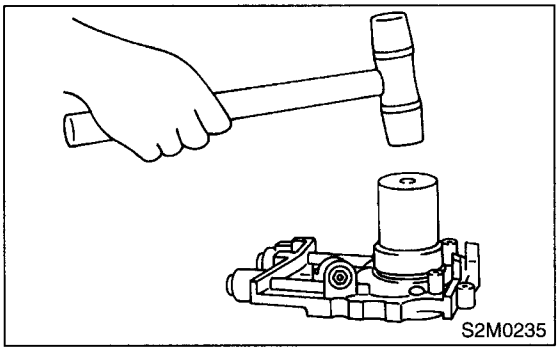


21) Install the drive plate. (AT vehicles)
To lock the crankshaft, use ST.
ST 498497100 CRANKSHAFT STOPPER

Tightening torque:
72 N·m (7.3 kgf-m, 52.8 ft-lb)

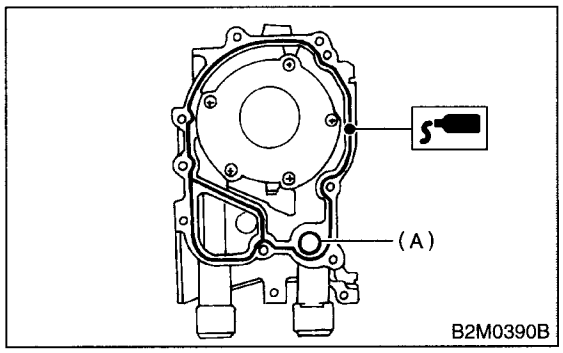


22) Install the flywheel. (MT vehicles) <Ref. to CL-14, INSTALLATION, Flywheel.>
23) Install the clutch disc and cover. (MT vehicles) <Ref. to CL-11, INSTALLATION, Clutch Disc and Cover.>
24) Installation of oil pump:
(1) Discard the front oil seal after removal. Replace with a new one using ST.
ST 499587100 OIL SEAL INSTALLER



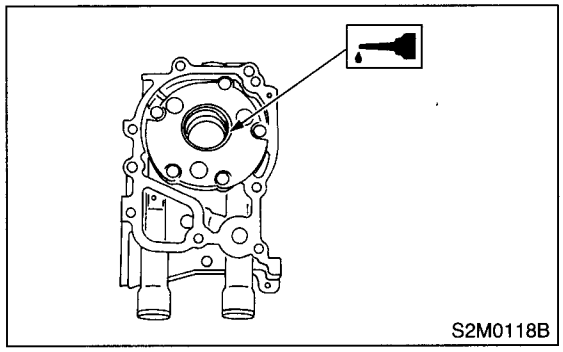
(2) Apply fluid packing to the matching surface of oil pump.

Fluid packing:
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.

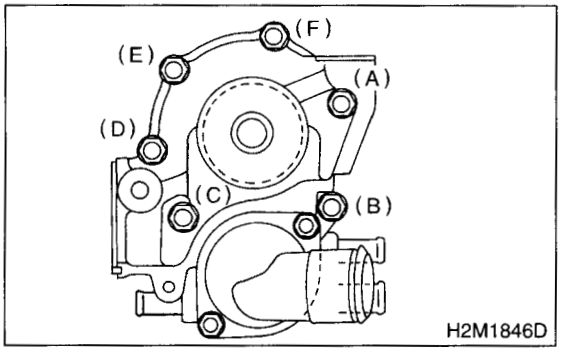
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

CAUTION:
• 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.

25) Install the water pump and gasket.

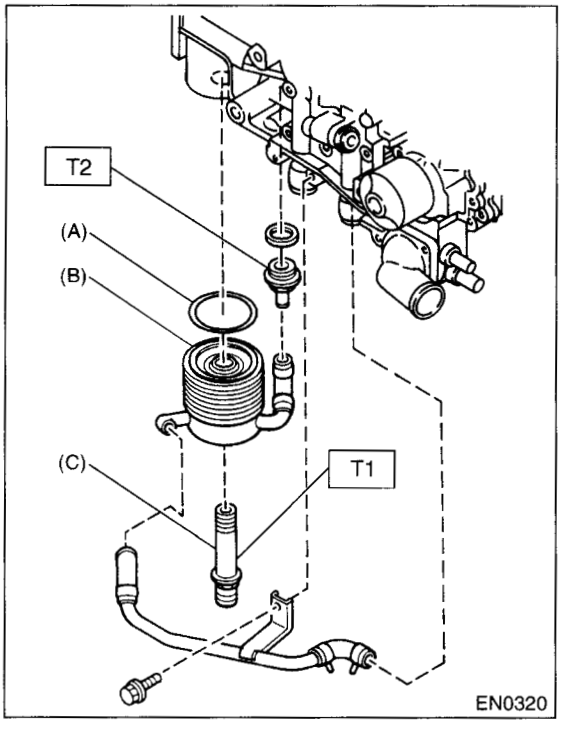
Tightening torque:
First; 12 N·m (1.2 kgf-m, 8.7 ft-lb)
Second; 12 N·m (1.2 kgf-m, 8.7 ft-lb)

CAUTION:
- **Be sure to use a new gasket.**
- **When installing the water pump, tighten bolts in two stages in alphabetical sequence as shown in the figure.**



26) Install the water by-pass pipe for heater.
27) Install the oil cooler.

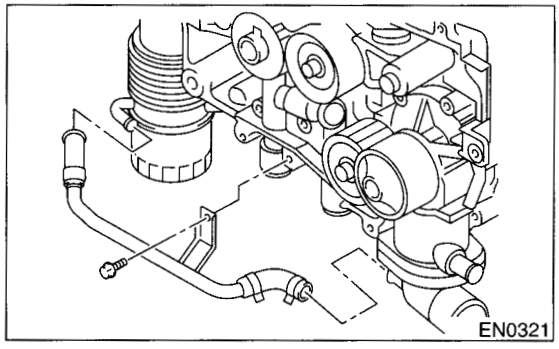
Tightening torque:
T1: 55 N·m (5.5 kgf-m, 40 ft-lb)
T2: 69 N·m (7.0 kgf-m, 50.6 ft-lb)



(A) O-ring
(B) Oil cooler
(C) Connector

28) Install the oil filter using ST.
ST 498547000 OIL FILTER WRENCH

29) Install the water by-pass pipe between oil cooler and water pump.

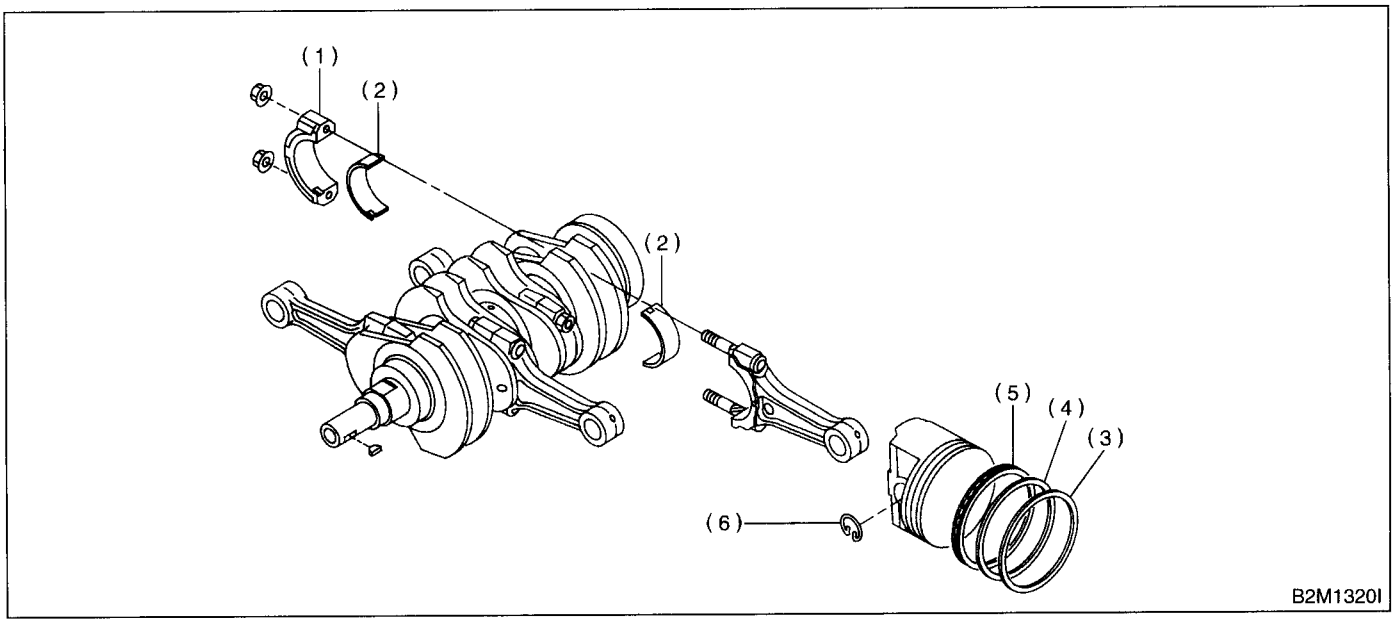


30) Install the water pipe.

NOTE:
Always use a new O-ring.

31) Install the cylinder head assembly. <Ref. to ME(DOHC TURBO)-64, INSTALLATION, Cylinder Head Assembly.>
32) Install the oil level gauge guide and tighten the attaching bolt (left side only).
33) Install the rocker cover.
34) Install the crankshaft sprocket. <Ref. to ME(DOHC TURBO)-58, INSTALLATION, Crankshaft Sprocket.>
35) Install the camshaft sprocket. <Ref. to ME(DOHC TURBO)-57, INSTALLATION, Camshaft Sprocket.>
36) Install the timing belt assembly. <Ref. to ME(DOHC TURBO)-50, INSTALLATION, Timing Belt Assembly.>
37) Install the belt cover. <Ref. to ME(DOHC TURBO)-47, INSTALLATION, Belt Cover.>
38) Install the crankshaft pulley. <Ref. to ME(DOHC TURBO)-46, INSTALLATION, Crankshaft Pulley.>
39) Install the generator and A/C compressor brackets on cylinder head.
40) Install the V-belt. <Ref. to ME(DOHC TURBO)-44, INSTALLATION, V-belt.>
41) Install the intake manifold. <Ref. to FU(DOHC TURBO)-15, 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.

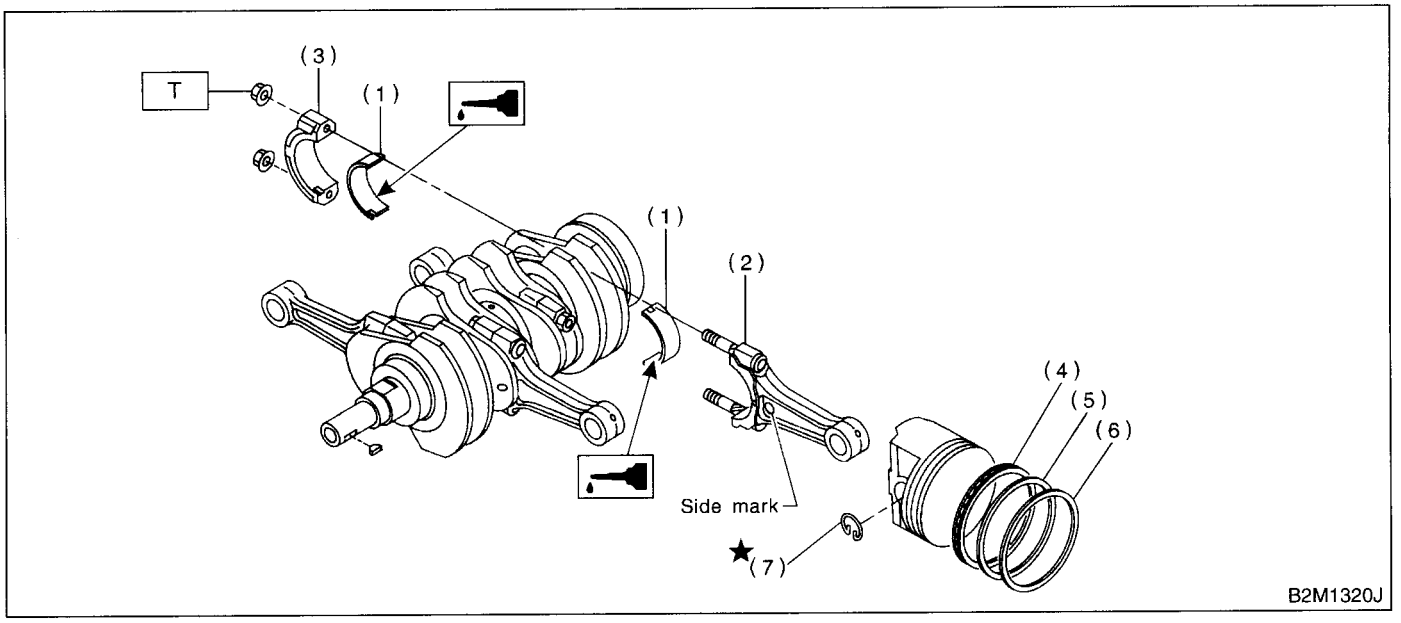
CAUTION:
Arrange the removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

3) Remove the piston rings using the piston ring expander.
4) Remove the oil ring by hand.

CAUTION:
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

Tightening torque: N·m (kgf-m, ft-lb)
T: 44.6 (4.55, 32.9)

1) Install the connecting rod bearings on connecting rods and connecting rod caps.

CAUTION:
Apply oil to the surfaces of the connecting rod bearings.

2) Install the connecting rod on crankshaft.

CAUTION:
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.

CAUTION:
- **Each the 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)

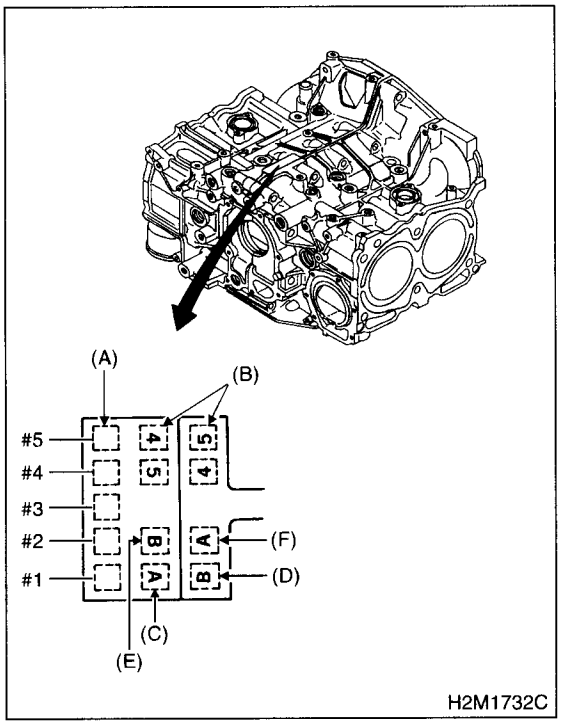
2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on the cylinder block's front upper surface.

CAUTION:
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)



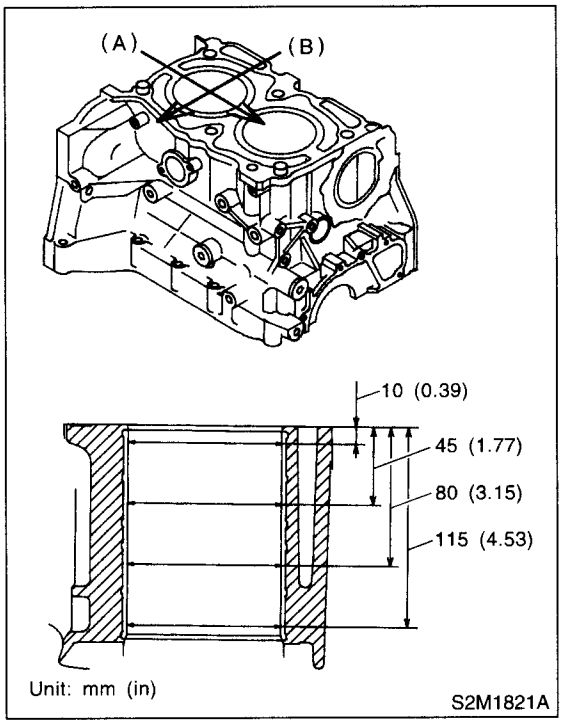
(A) Main journal size mark
(B) Cylinder block RH-LH combination mark
(C) #1 cylinder bore size mark
(D) #2 cylinder bore size mark
(E) #3 cylinder bore size mark
(F) #4 cylinder bore size mark

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.

CAUTION:
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

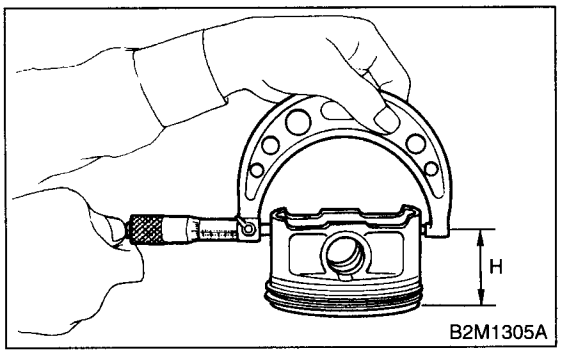
3) When the piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

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)

CAUTION:
Measurement should be performed at a temperature of 20°C (68°F).

Piston grade point H:
37.0 mm (1.457 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.

CAUTION:
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.

CAUTION:
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(DOHC 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.

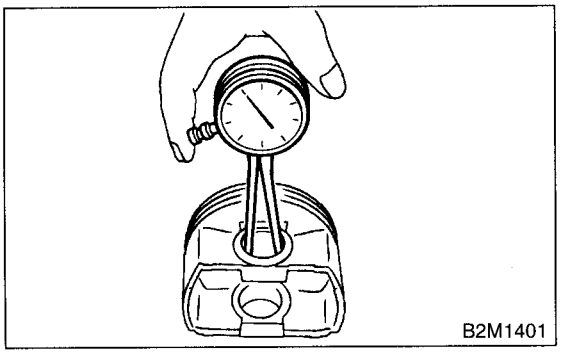
Standard clearance between piston pin and hole in piston:

Standard

0.004 — 0.008 mm (0.0002 — 0.0003 in)

Limit

0.020 mm (0.0008 in)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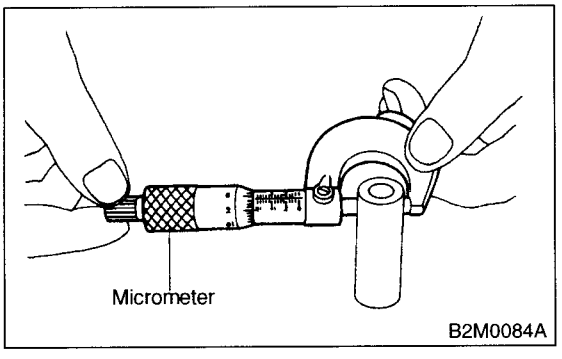
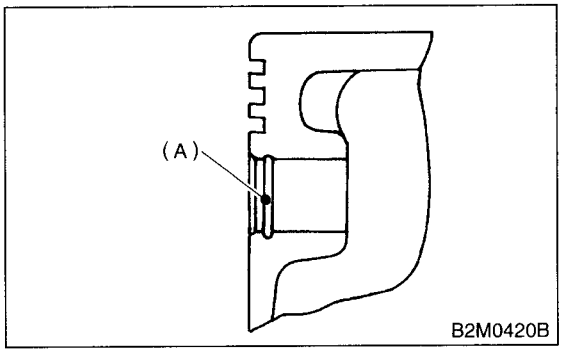


B2M0084A

4) Check the circlip installation groove on the piston for burr (A). If necessary, remove burr from the groove so that the piston pin can lightly move.



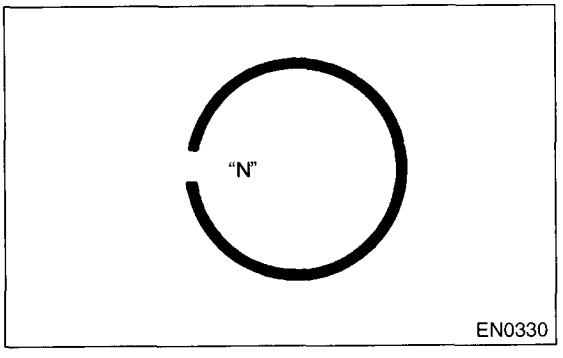
B2M0420B

5) Check the piston pin circlip for distortion, cracks and wear.

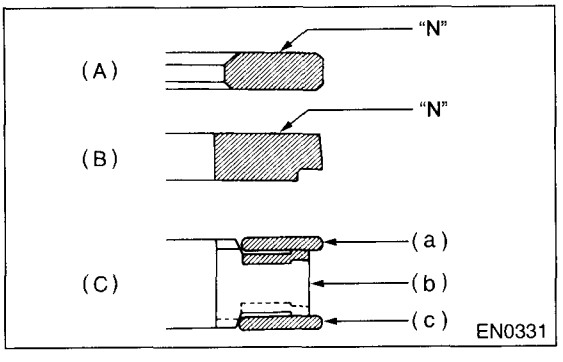
4. PISTON RING

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:
• "N" is marked on the end of the top and second rings. When installing the rings to the piston, face this mark upward.



• The oil ring is a combined ring consisting of two rails and a spacer in between. When installing, be careful to assemble correctly.

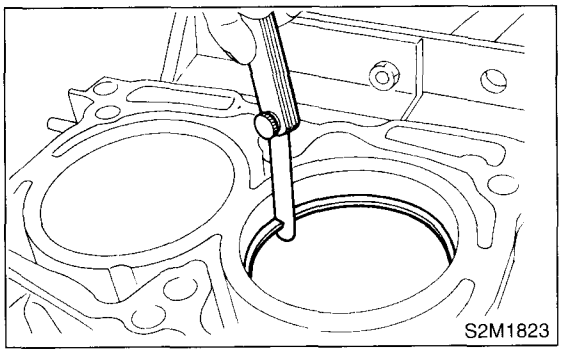


(A) Top ring
(B) Second ring
(C) Oil ring
(a) Upper rail
(b) Spacer
(c) Lower rail

2) Squarely place the piston ring and oil ring in cylinder, and 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	0.35 — 0.50 (0.0138 — 0.0197)	1.0 (0.039)
	Oil ring rail	0.20 — 0.70 (0.0079 — 0.0276)	1.5 (0.059)

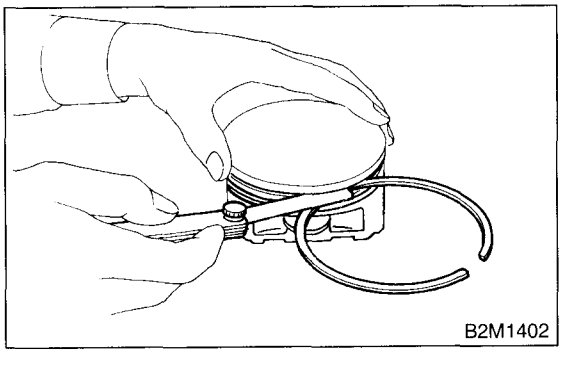


3) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

CAUTION:
Before measuring the clearance, clean the piston ring groove and piston ring.

Unit: mm (in)

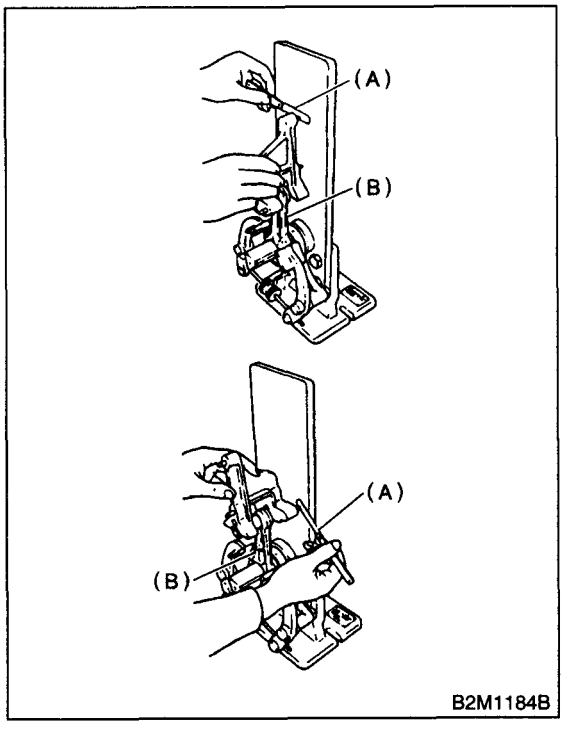
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	0.15 (0.0059)



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.

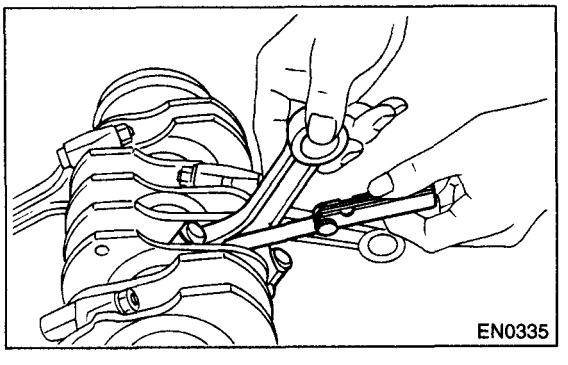
Limit of bend or twist per 100 mm (3.94 in) in length:
0.10 mm (0.0039 in)



(A) Thickness gauge
(B) Connecting rod

3) Install the connecting rod fitted with bearing to crankshaft and 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.)

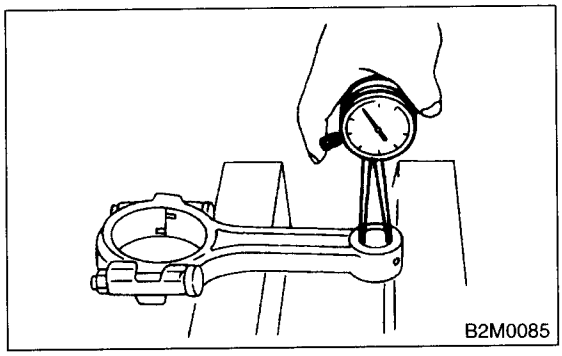
Connecting rod oil clearance:
Standard
0.020 — 0.046 mm (0.0008 — 0.0018 in)
Limit
0.05 mm (0.0020 in)

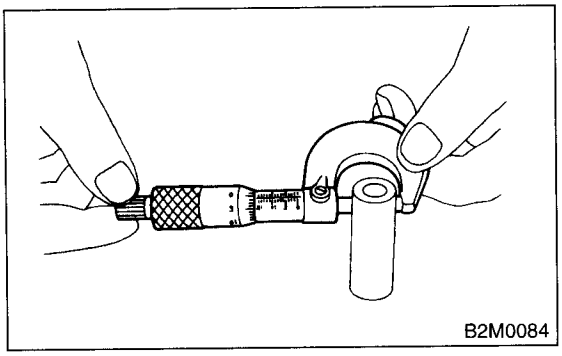
Unit: mm (in)

Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.492 — 1.501 (0.0587 — 0.0591)	47.984 — 48.000 (4.8891 — 1.8898)
0.03 (0.0012) undersize	1.510 — 1.513 (0.0594 — 0.0596)	47.954 — 47.970 (1.8879 — 1.8886)
0.05 (0.0020) undersize	1.520 — 1.523 (0.0598 — 0.0600)	47.934 — 47.950 (1.8872 — 1.8878)
0.25 (0.0098) undersize	1.620 — 1.623 (0.0638 — 0.0639)	47.734 — 47.750 (1.8793 — 1.8799)

6) Inspect the bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at the 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)


B2M0085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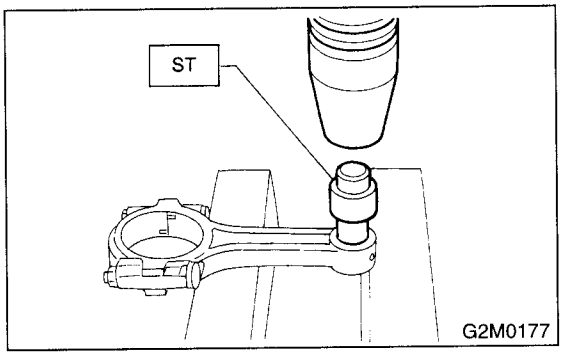
7) Replacement procedure is as follows:
(1) Remove the bushing from connecting rod with ST and press.
(2) Press the bushing with ST after applying oil on the periphery of bushing.

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



G2M0177

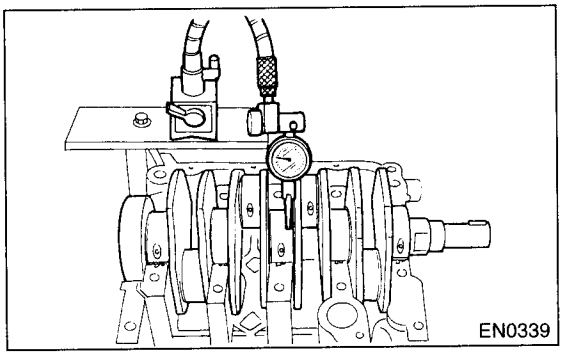
(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
(4) After completion of reaming, clean the bushing to remove chips.

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.

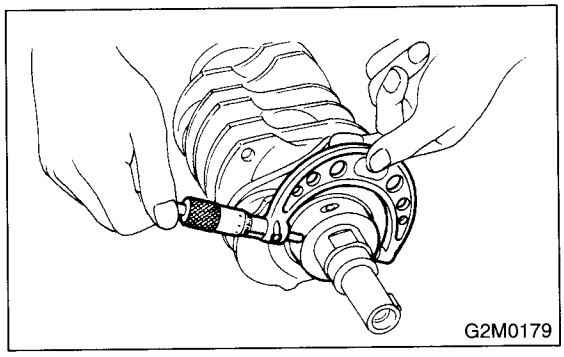
CAUTION:
If a suitable V-block is not available, install #1 and #5 crankshaft bearing on cylinder block, position crankshaft on these bearings and measure the crankshaft bend using a dial gauge.

Crankshaft bend limit:
0.035 mm (0.0014 in)


EN0339

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 replace or recondition crankshaft as necessary. When grinding the crank journal or crank pin, finish them to the 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)


G2M0179

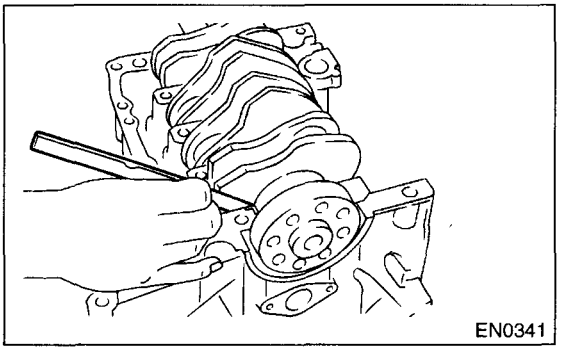
Unit: mm (in)

		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)	47.984 — 48.000 (1.8891 — 1.8898)
	Bearing size (Thickness at center)	1.998 — 2.011 (0.0787 — 0.0792)	2.000 — 2.013 (0.0787 — 0.0793)	1.492 — 1.510 (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)	47.954 — 47.970 (1.8879 — 1.8886)
	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)
0.05 (0.0020) undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	47.934 — 47.950 (1.8872 — 1.8878)
	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)
0.25 (0.0098) undersize	Journal O.D.	59.742 — 59.758 (2.3520 — 2.3527)	59.742 — 59.758 (2.3520 — 2.3527)	47.734 — 47.750 (1.8793 — 1.8799)
	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)

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)


EN0341

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	
Standard	0.010 — 0.030 (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(DOHC 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(DOHC 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(DOHC 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(DOHC 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(DOHC 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(DOHC 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

ENGINE TROUBLE IN GENERAL

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
5. Engine does not return to idle.	• Engine control system <Ref. to EN(DOHC 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(DOHC 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(DOHC 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(DOHC 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(DOHC 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(DOHC TURBO)-46, OPERATION, Inspection Mode.> after connecting the fuel injector connector.

EXHAUST

EX(DOHC TURBO)

		Page
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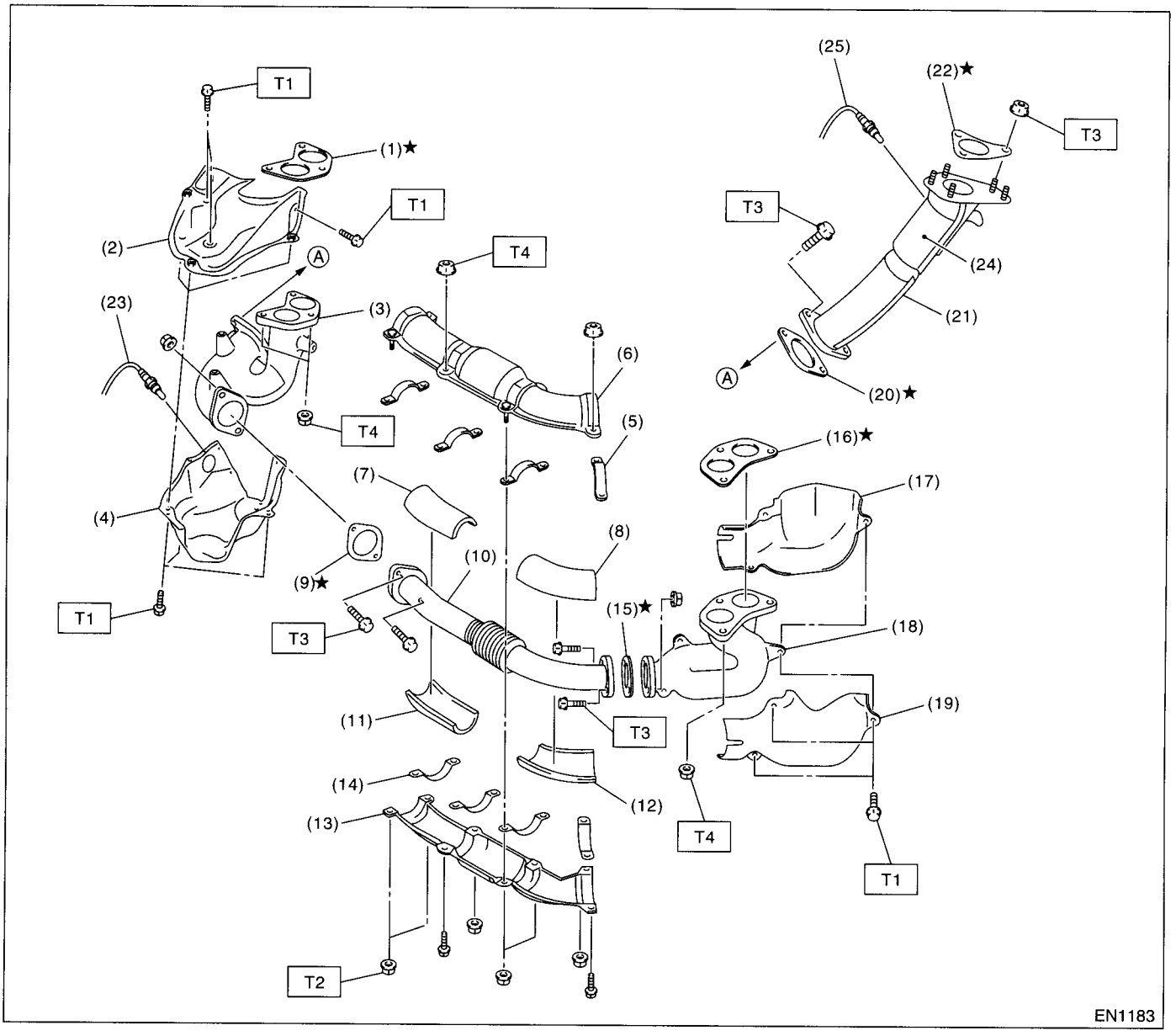
2.	Front Exhaust Pipe	6
3.	Center Exhaust Pipe	8
4.	Joint Pipe	12
5.	Rear Exhaust Pipe	13
6.	Muffler	14

1. General Description

A: COMPONENT

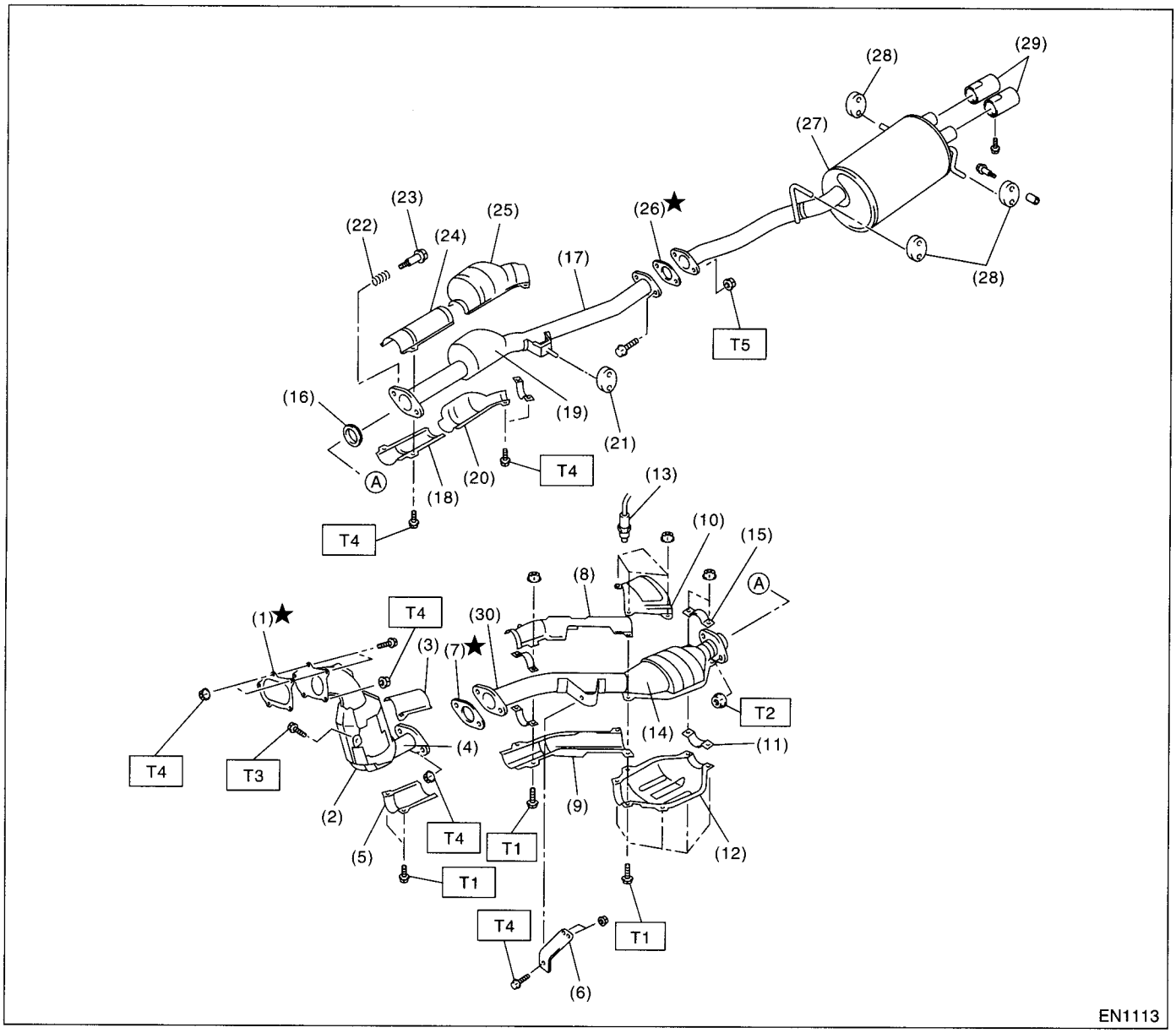
1. FRONT EXHAUST PIPE



(1) Gasket
(2) Upper exhaust manifold cover (RH)
(3) Exhaust manifold (RH)
(4) Lower exhaust manifold cover (RH)
(5) Front exhaust pipe upper clamp
(6) Front exhaust pipe upper cover
(7) Front exhaust pipe upper insulator (RH)
(8) Front exhaust pipe upper insulator (LH)
(9) Gasket
(10) Front exhaust pipe
(11) Front exhaust pipe lower insulator (RH)
(12) Front exhaust pipe lower insulator (LH)
(13) Front exhaust pipe lower cover
(14) Front exhaust pipe lower clamp
(15) Gasket
(16) Gasket
(17) Upper exhaust manifold cover (LH)
(18) Exhaust manifold (LH)
(19) Lower exhaust manifold cover (LH)
(20) Gasket
(21) Turbocharger joint pipe
(22) Gasket
(23) Front oxygen (A/F) sensor
(24) Precatalytic converter
(25) Exhaust temperature sensor

Tightening torque: N·m (kgf-m, ft-lb)
T1: 19 (1.9, 13.7)
T2: 25 (2.5, 18.1)
T3: 35 (3.6, 26.0)
T4: 40 (4, 28.9)

2. CENTER AND REAR EXHAUST PIPE, AND MUFFLER



(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 clamp
(12) Lower rear catalytic converter cover
(13) Rear oxygen sensor
(14) Rear catalytic converter
(15) Upper clamp
(16) Gasket
(17) Rear exhaust pipe
(18) Lower rear exhaust pipe cover (Front)
(19) Chamber
(20) Lower rear exhaust pipe cover (Rear)
(21) Cushion
(22) Spring
(23) Bolt
(24) Upper rear exhaust pipe cover (Front)
(25) Upper rear exhaust pipe cover (Rear)
(26) Gasket
(27) Muffler
(28) Cushion
(29) Muffler cutter
(30) 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)

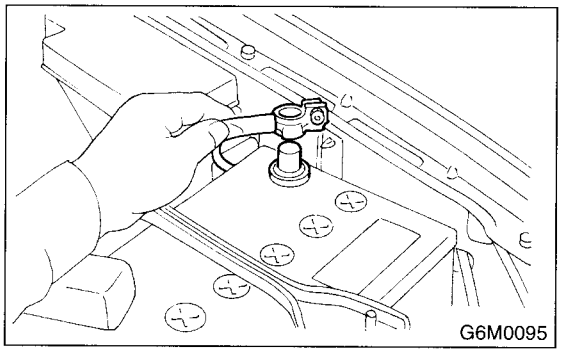
B: CAUTION

- 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 negative terminal from battery.

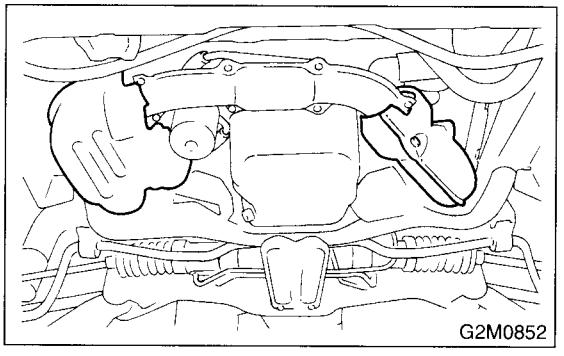
2. Front Exhaust Pipe

A: REMOVAL

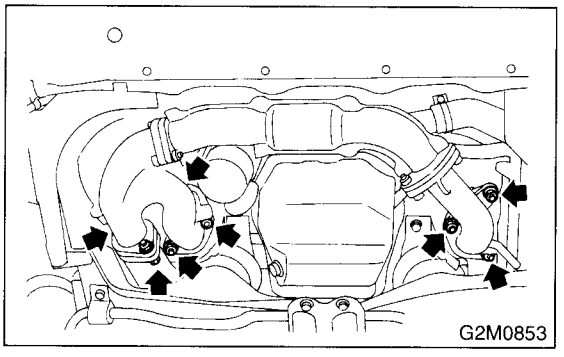
1) Disconnect the ground terminal from battery.



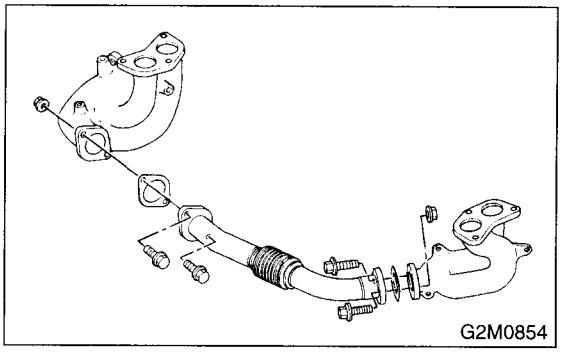
2) Remove the front oxygen (A/F) sensor. <Ref. to FU(DOHC TURBO)-42, REMOVAL, Front Oxygen (A/F) Sensor.>
3) Remove the under cover.
4) Remove the lower exhaust manifold cover (RH).
5) Remove the lower and upper exhaust manifold covers (LH).



6) Remove the bolts and nuts which hold the front exhaust pipe assembly to turbocharger joint pipe.
7) While holding the front exhaust pipe assembly with one hand, remove the nuts which hold the front exhaust pipe assembly to cylinder head exhaust port.



8) Remove the front exhaust pipe assembly.
9) Remove the covers from exhaust manifold and front exhaust pipe.
10) Separate the front exhaust pipe from exhaust manifolds.

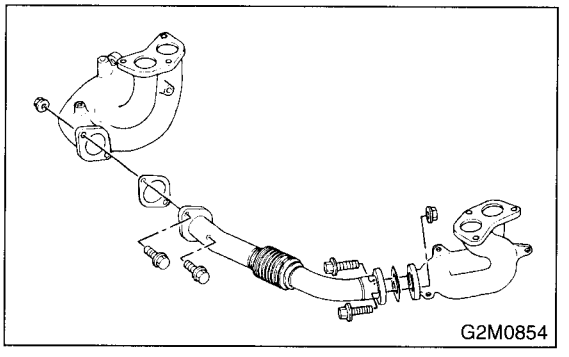


B: INSTALLATION

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

3) Install the upper exhaust manifold cover (RH).

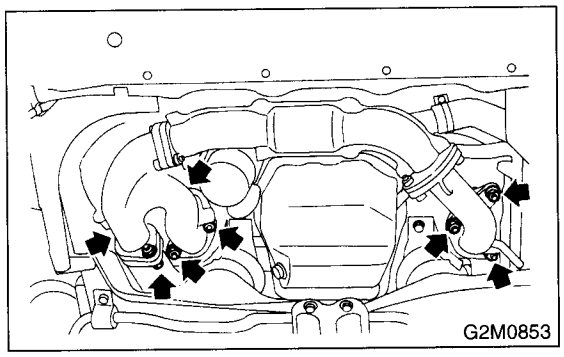
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)

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 turbo-charger joint pipe.

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

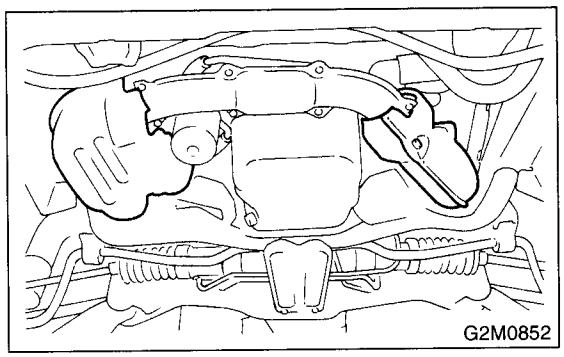


6) Install the upper and lower exhaust manifold covers (LH).

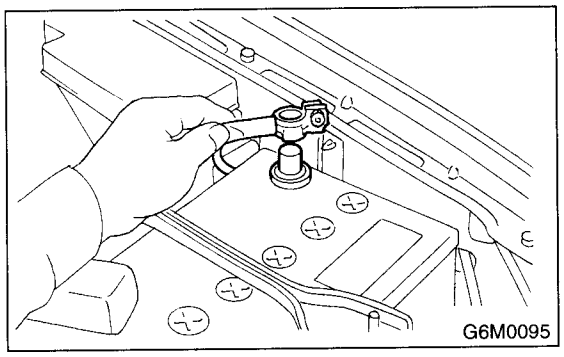
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)

7) Install the lower exhaust manifold cover (RH).

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



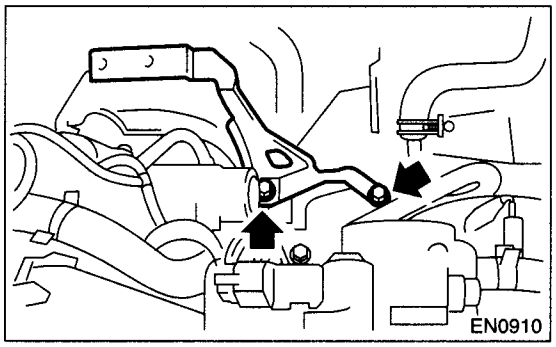
8) Install the front oxygen (A/F) sensor. <Ref. to FU(DOHC TURBO)-43, INSTALLATION, Front Oxygen (A/F) Sensor.>
9) Install the under cover.
10) Connect the battery ground terminal to battery.



3. Center Exhaust Pipe

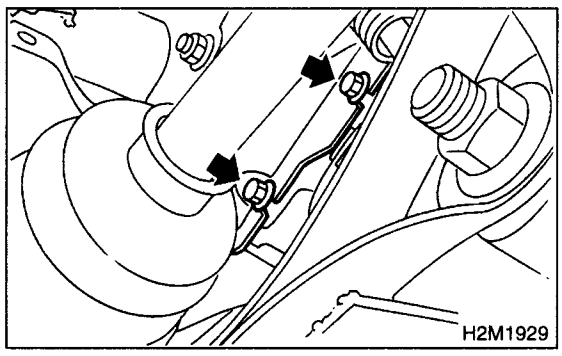
A: REMOVAL

1) Set the vehicle on the lift.
2) Disconnect the ground terminal from battery.
3) Remove the intercooler. <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>
4) Remove the intercooler bracket.

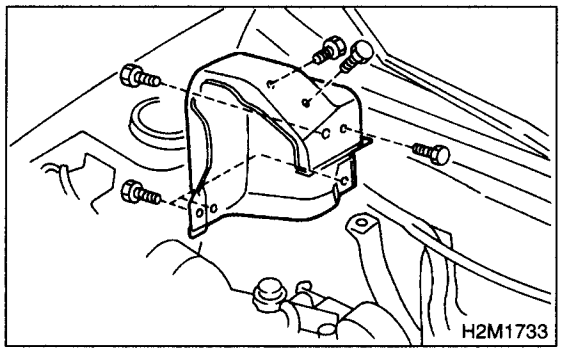


5) Lift-up the vehicle.
6) Remove the under cover.
7) Remove the bolts which install the lower side of turbocharger upper cover.

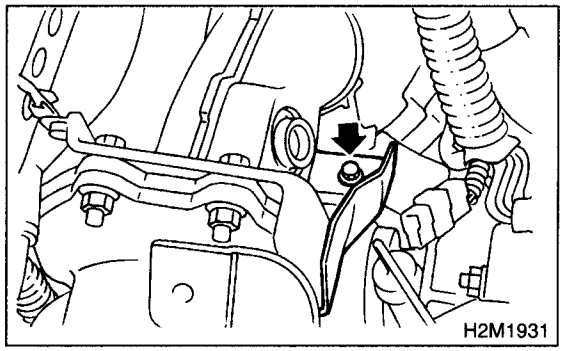
CAUTION:
Be careful, the turbocharger and exhaust pipe are hot.



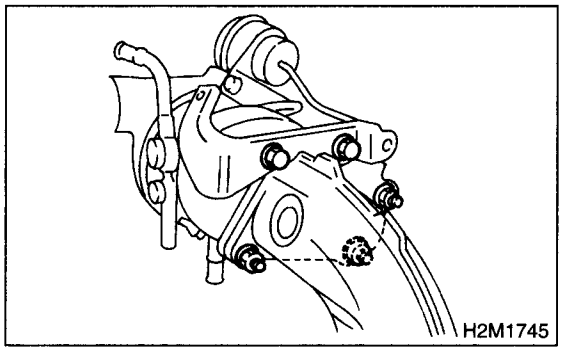
8) Lower the vehicle.
9) Remove the turbocharger upper cover.



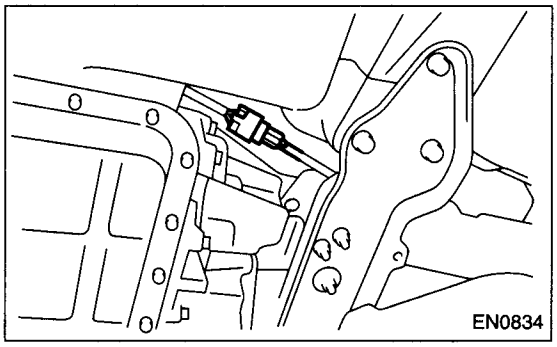
10) Remove the bolts which install the lower upper side of turbocharger upper cover, and remove it.



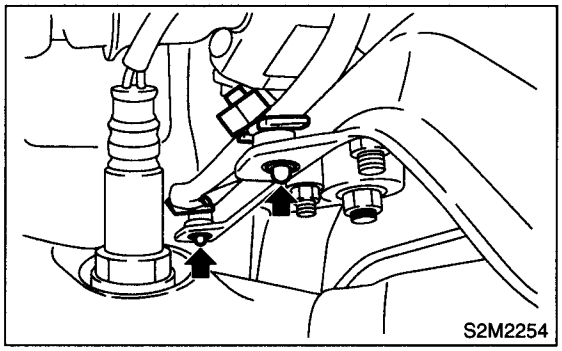
11) Separate the center exhaust pipe from turbocharger.



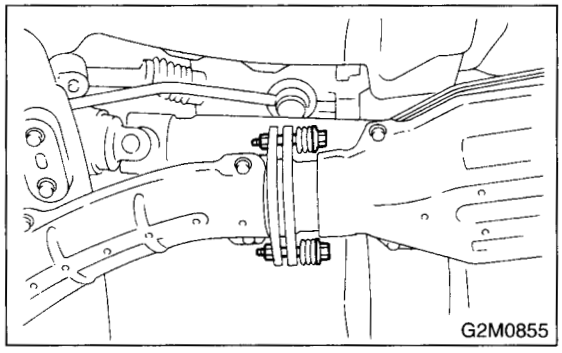
12) Lift-up the vehicle.
13) Disconnect the connector from rear oxygen sensor.



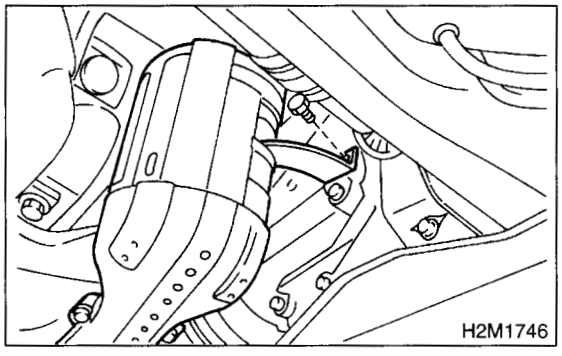
14) Vertically draw out clip from crossmember.



15) Separate the center exhaust pipe from rear exhaust pipe.

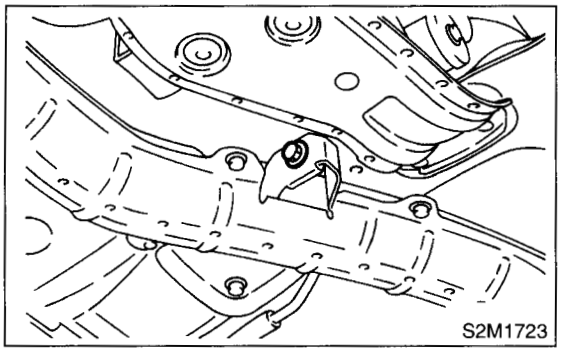


16) Remove the bolt which holds center exhaust pipe bracket to transmission.

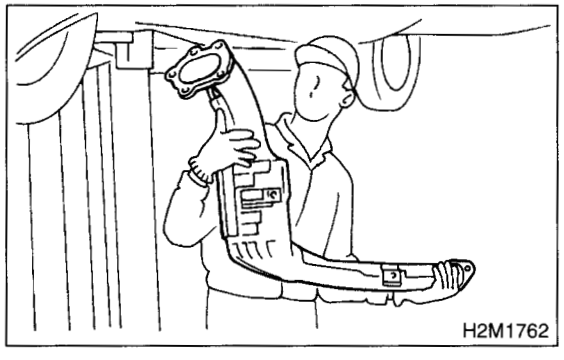


17) Remove the intercooler bracket.
18) Remove the bolt which holds center exhaust pipe to hanger bracket.

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



19) Remove the center exhaust pipe.

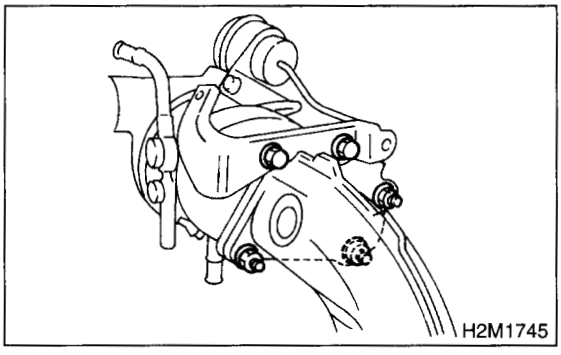


B: INSTALLATION

CAUTION:
Replace the gaskets with new ones.

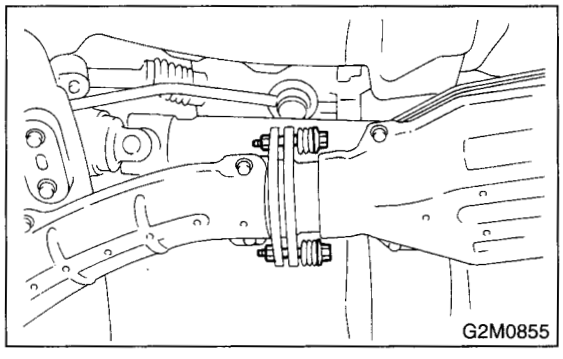
1) Install the center exhaust pipe and temporarily tighten the bolt which holds center exhaust pipe to hanger bracket.
2) Temporarily tighten the bolt which holds the center pipe to transmission.
3) Connect the center exhaust pipe to turbocharger.

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

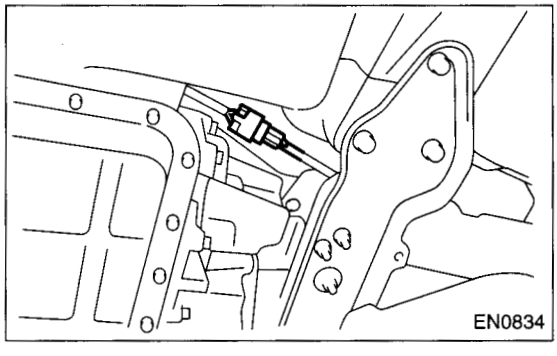


4) Install the center exhaust pipe to rear exhaust pipe.

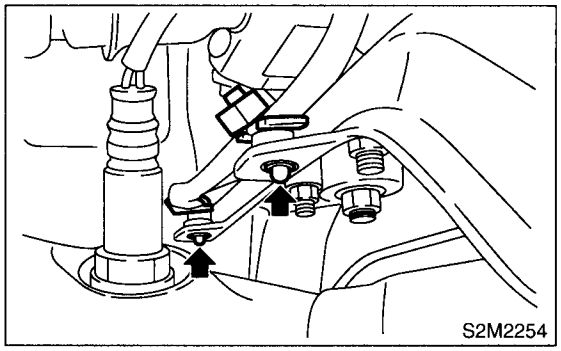
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



5) Connect the connector to rear oxygen sensor.

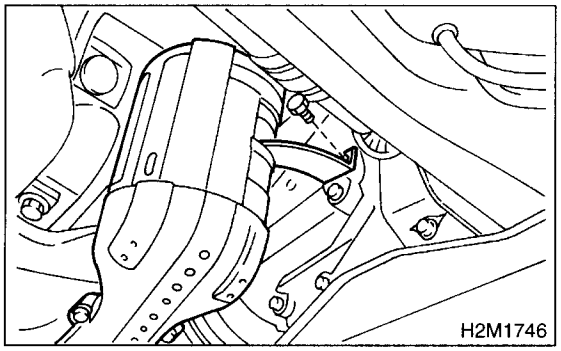


6) Secure clip on the crossmember.



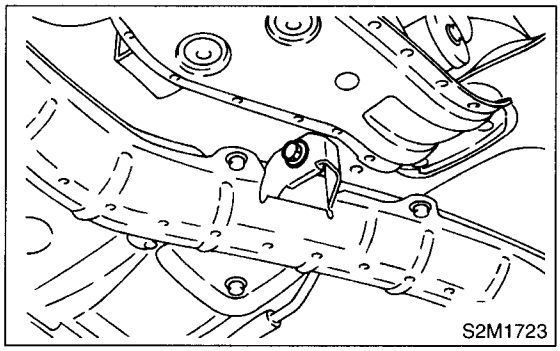
7) Tighten the bolt which holds the center exhaust pipe bracket to transmission.

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



8) Tighten the bolt which holds the center exhaust pipe to hanger bracket.

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



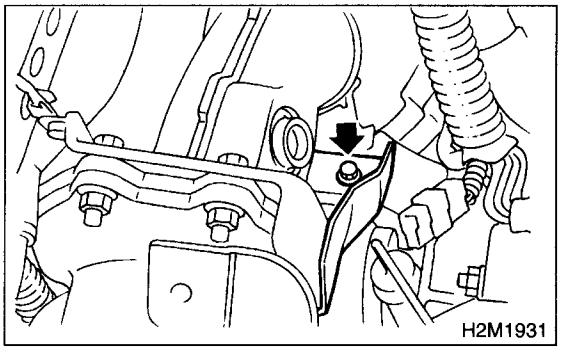
9) Tighten the bolts which hold the intercooler bracket.

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

10) Lower the vehicle.

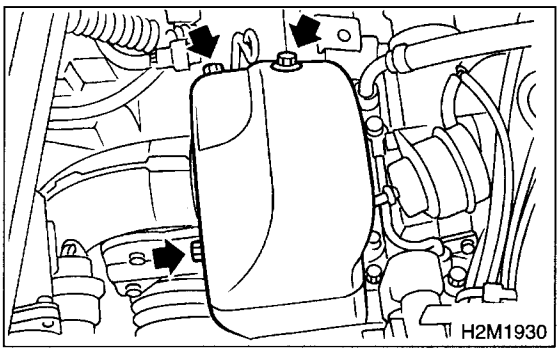
11) Place the turbocharger lower cover, and tighten the bolts which install the upper side of lower cover.

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



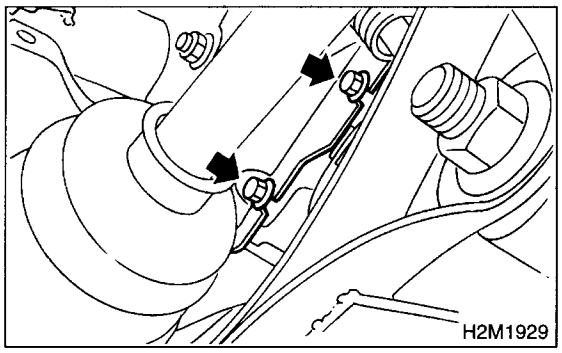
12) Place the turbocharger upper cover, and tighten the bolts which install the upper side of upper cover.

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



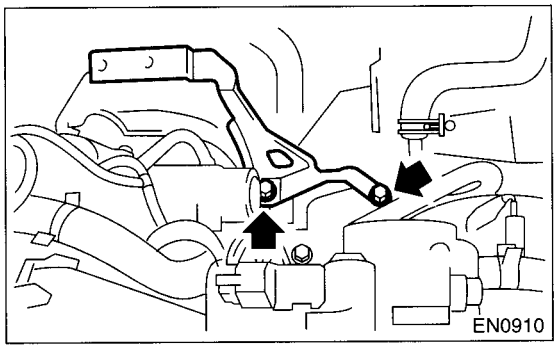
13) Lift-up the vehicle.
14) Tighten the bolts which install the under side of turbocharger upper cover.

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



15) Install the under cover.
16) Lower the vehicle.

17) Install the intercooler bracket.

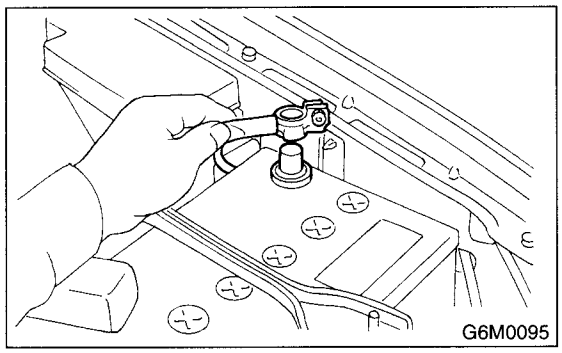


18) Install the intercooler. <Ref. to IN(DOHC TURBO)-11, INSTALLATION, Intercooler.>

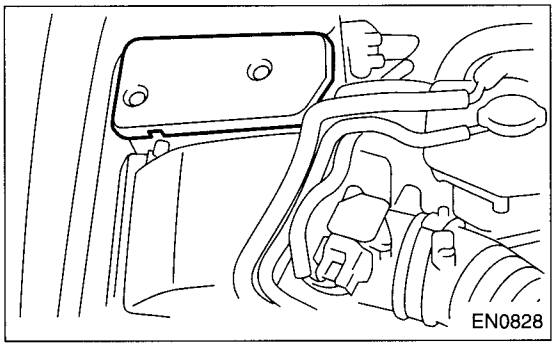
4. Joint Pipe

A: REMOVAL

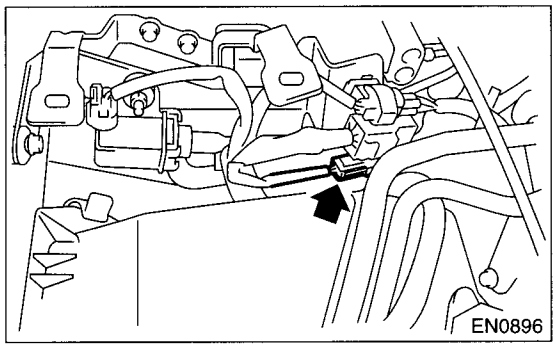
1) Disconnect the ground terminal from battery.



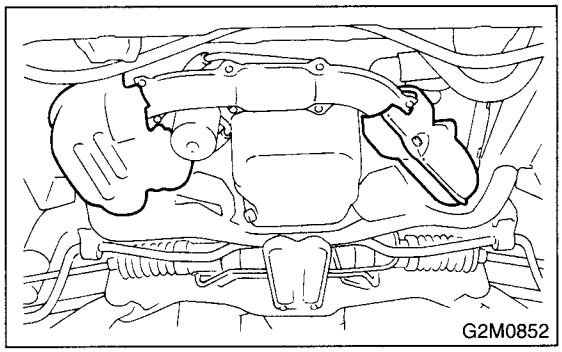
2) Remove the solenoid valve cover.



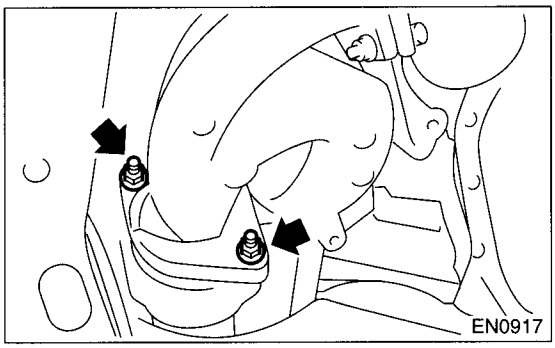
3) Disconnect the exhaust temperature sensor connector.



4) Remove the front oxygen (A/F) sensor. <Ref. to FU(DOHC TURBO)-42, REMOVAL, Front Oxygen (A/F) Sensor.>
5) Remove the under cover.
6) Remove the lower exhaust manifold cover (RH).



7) Remove the nuts which hold the front exhaust manifold to joint pipe.

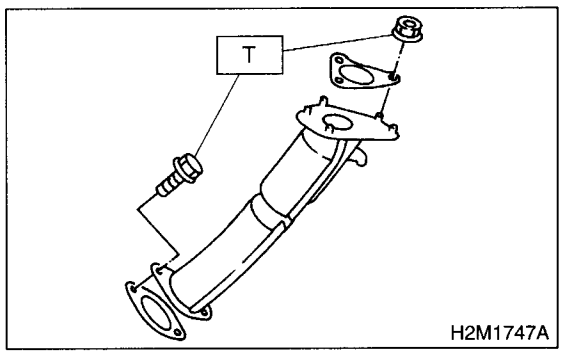


8) Remove the center exhaust pipe. <Ref. to EX(DOHC TURBO)-8, REMOVAL, Center Exhaust Pipe.>
9) Remove the turbocharger. <Ref. to IN(DOHC TURBO)-12, REMOVAL, Turbocharger.>
10) Take off the joint pipe in the upward direction.

B: INSTALLATION

Install in the reverse order of removal.

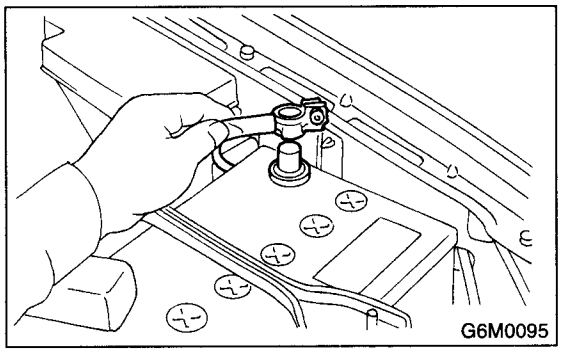
Tightening torque:
T: 35 N·m (3.6 kgf-m, 26.0 ft-lb)



5. Rear Exhaust Pipe

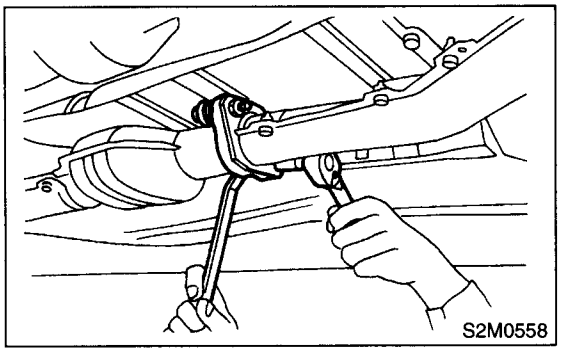
A: REMOVAL

1) Disconnect the ground terminal from battery.



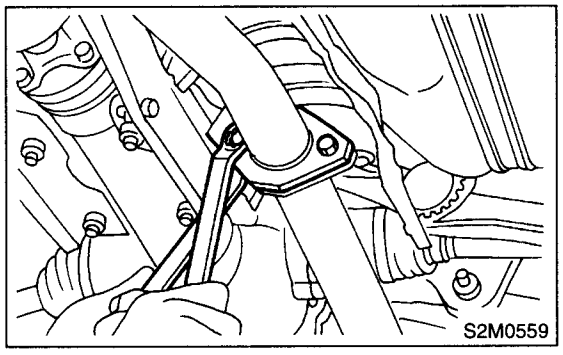
2) Lift up the vehicle.
3) Separate the rear exhaust pipe from center exhaust pipe.

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.



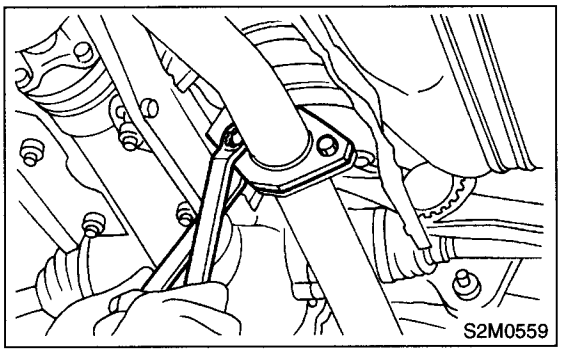
5) Remove the rear exhaust pipe.

B: INSTALLATION

CAUTION:
Replace the gaskets with new ones.

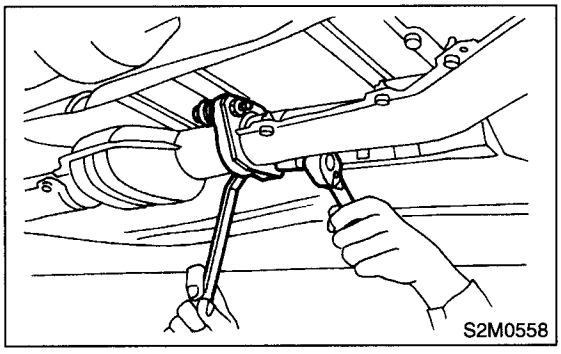
1) Install the rear exhaust pipe to muffler.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)

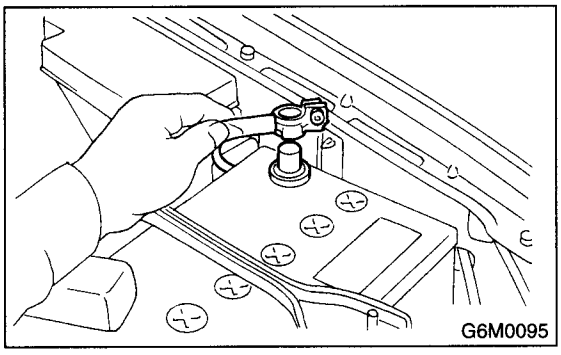


2) Install the rear exhaust pipe to center exhaust pipe.

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



3) Lower the vehicle.
4) Connect the battery ground terminal to battery.



C: INSPECTION

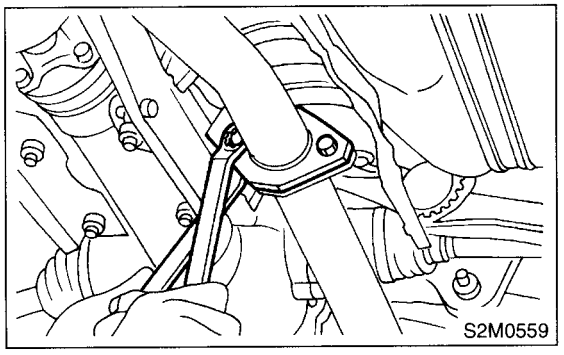
1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.
3) Make sure the cushion rubber is not worn or cracked.

6. Muffler

A: REMOVAL

1) Separate the muffler from rear exhaust pipe.

CAUTION:
Be careful, the exhaust pipe is hot.

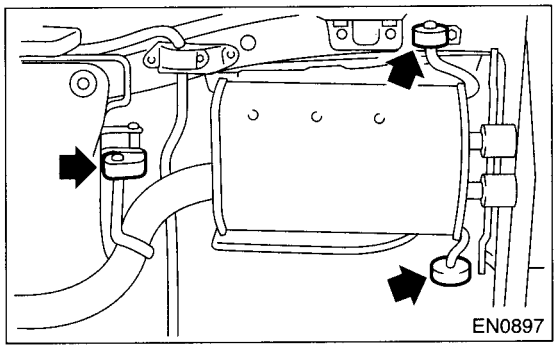


2) Remove the rubber cushions, and detach muffler.

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)

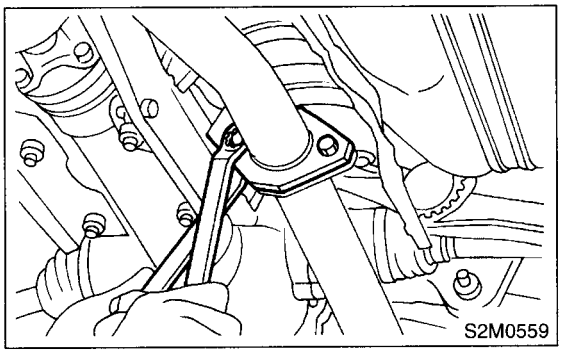


B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
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.

IGNITION

IG(DOHC TURBO)

Page

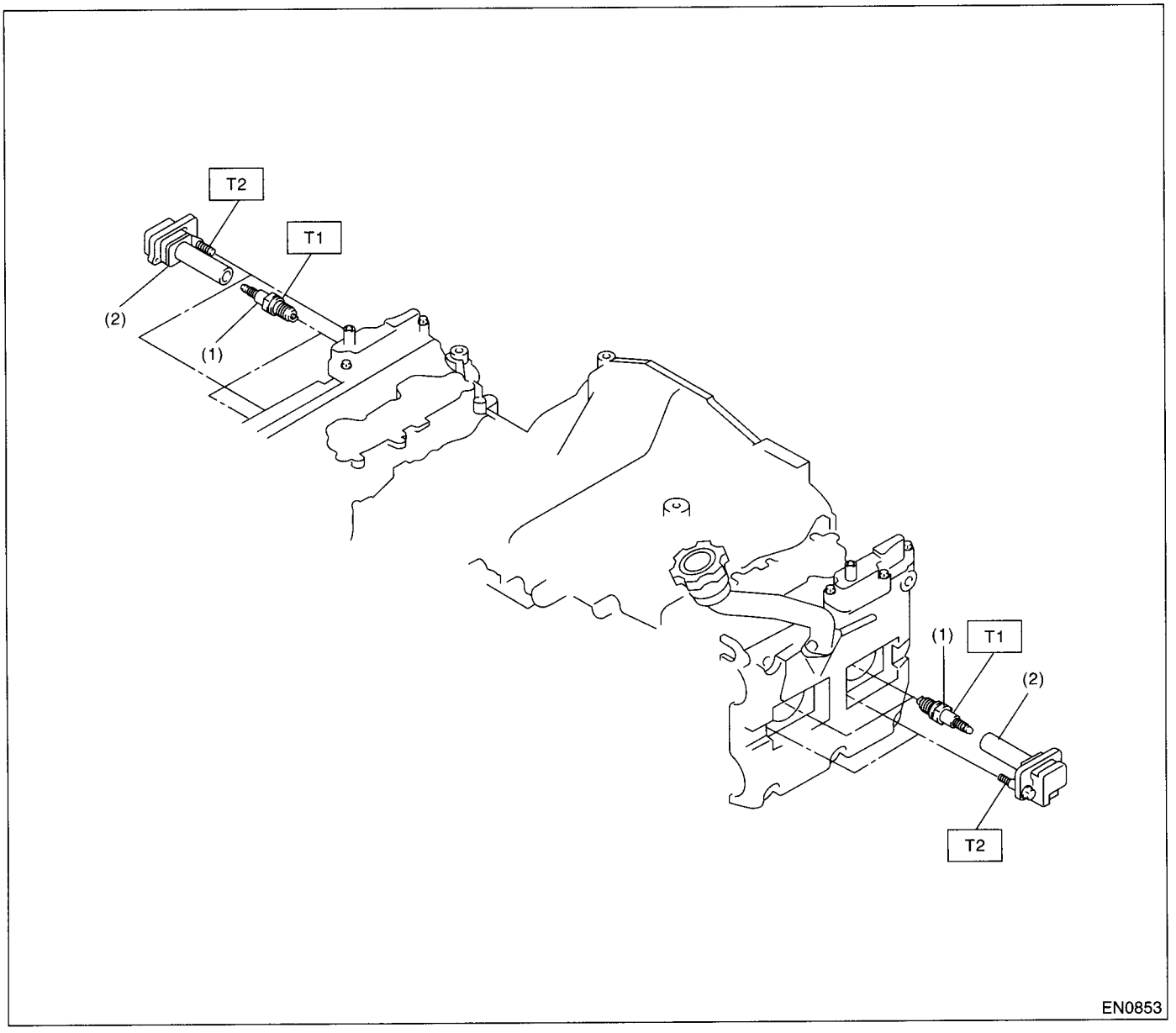
1. General Description 2
2. Spark Plug 4
3. Ignition Coil and Ignitor Assembly 8

1. General Description

A: SPECIFICATIONS

Item		Designation
Ignition coil and ignitor assembly	Model	FK0140
	Manufacturer	DIAMOND
Spark plug	Type and manufacturer	PFR6G: NGK
	Thread size mm	14, P = 1.25
	Spark gap mm (in)	0.7 — 0.8 (0.028 — 0.031)

B: COMPONENT



(1) Spark plug
(2) Ignition coil and ignitor ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 21 (2.1, 15)
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 negative terminal from battery.

2. Spark Plug

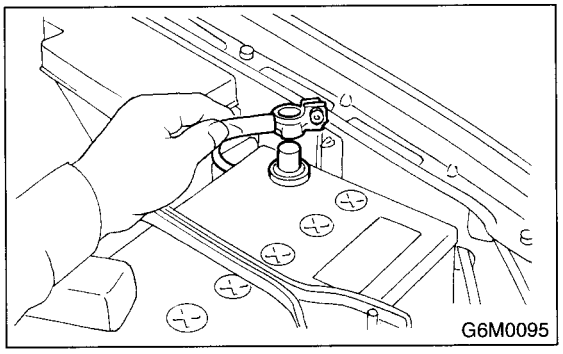
A: REMOVAL

CAUTION:
All spark plugs installed on an engine, must be of the same heat range.

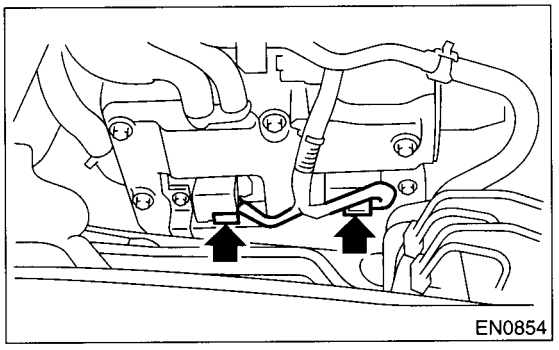
Spark plug:
NGK: PFR6G

1. RH SIDE

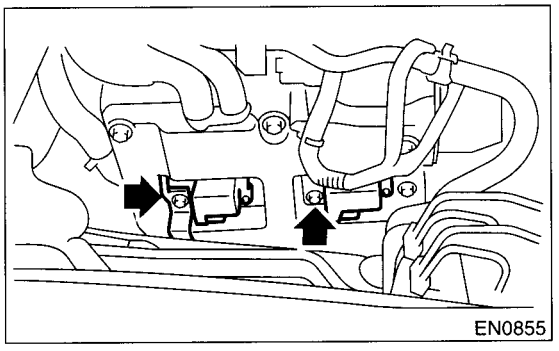
1) Disconnect the ground terminal from battery.


G6M0095

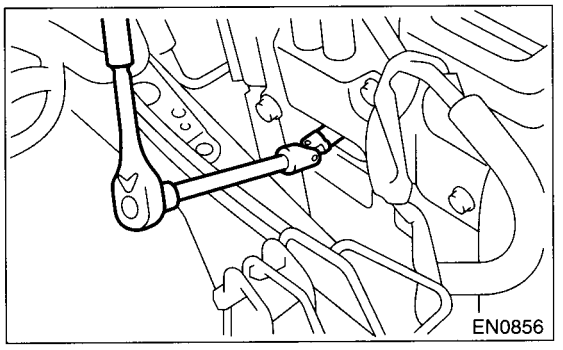
2) Remove the air cleaner lower case. <Ref. to IN(DOHC TURBO)-7, REMOVAL, Air Cleaner.>
3) Disconnect the connector from ignition coil.


EN0854

4) Remove the ignition coil.

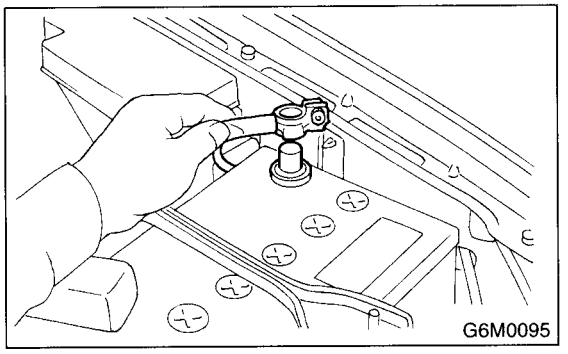

EN0855

5) Remove the spark plugs with the spark plug sockets.

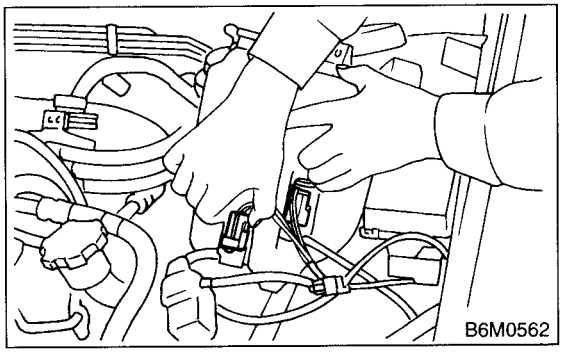

EN0856

2. LH SIDE

1) Disconnect the battery terminals, and then remove the battery and battery carrier.

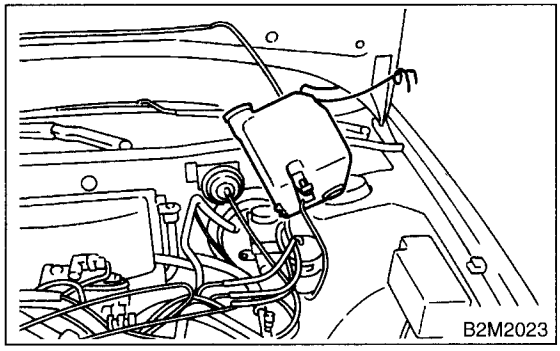

G6M0095

2) Disconnect the washer motor connector.

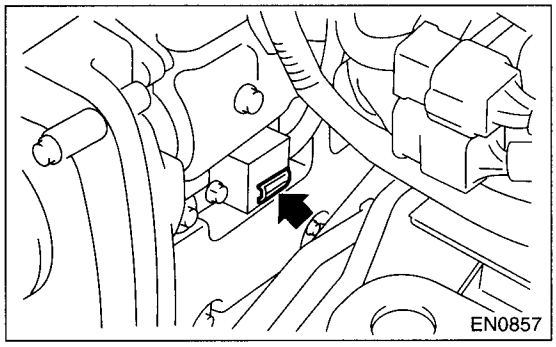

B6M0562

3) Disconnect the rear window glass washer hose from washer motor, then plug connection with a suitable cap.

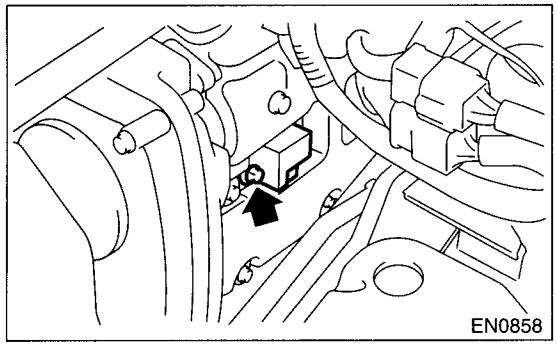
4) Remove the two bolts which hold the washer tank, then take the tank away from the working area.



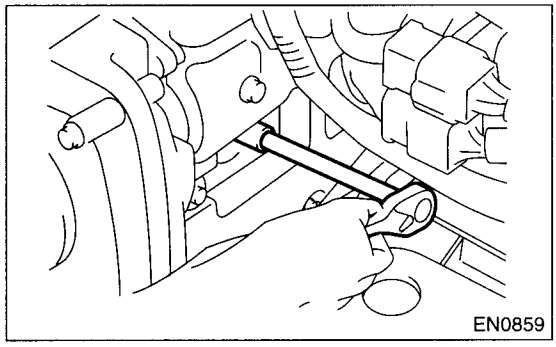
5) Disconnect the connector from ignition coil.



6) Remove the ignition coil.



7) Remove the spark plug 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 ft-lb)

Tightening torque (Ignition coil):
16 N·m (1.63 kgf-m, 11.8 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 approximately 1/3 of the specified torque in order to avoid over-stressing.

2. LH SIDE

1) Install in the reverse order of removal.

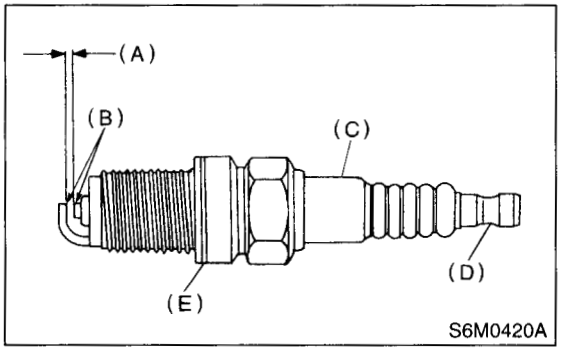
Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15 ft-lb)

Tightening torque (Ignition coil):
16 N·m (1.63 kgf-m, 11.8 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 approximately 1/3 of the specified torque in order to avoid over-stressing.

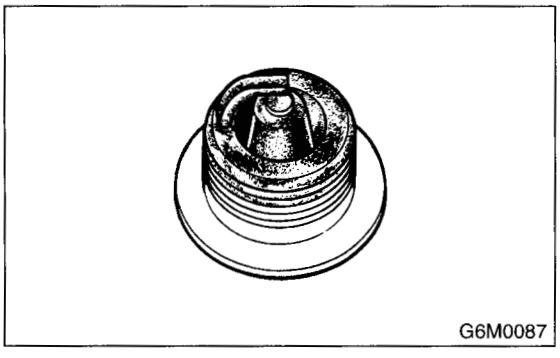
C: INSPECTION

Check the electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion.

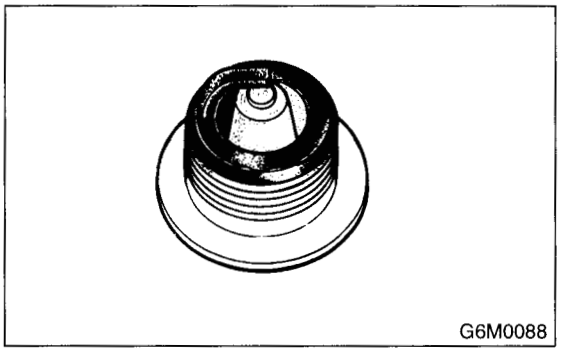


(A) Electrode gap
(B) Carbon accumulation or wear
(C) Cracks
(D) Damage
(E) Damaged gasket

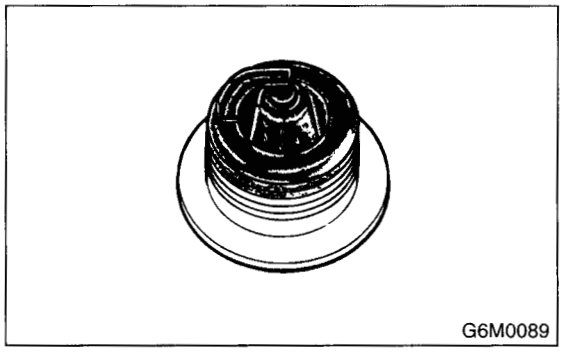
1) Normal:
Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.



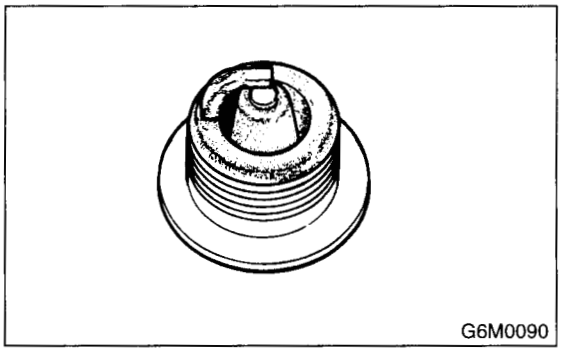
2) Carbon fouled:
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.
It is advisable to replace with plugs having hotter heat range.



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.



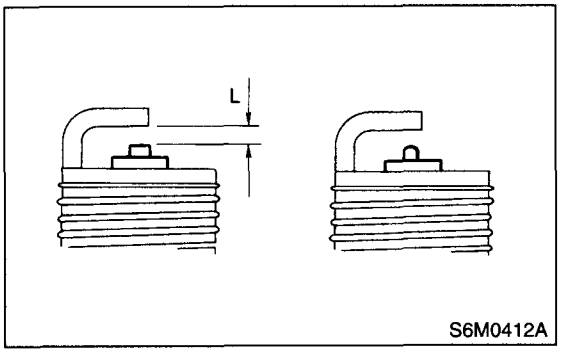
4) Overheating:
White or light gray insulator with black or gray brown spots and bluish burnt electrodes indicate engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc. It is advisable to replace with plugs having colder heat range.



D: ADJUSTMENT

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 plugs.
After cleaning the spark plugs, recondition the firing surface of electrodes with file. Then correct the spark plug gap using a gap gauge.

Spark plug gap: L
0.7 — 0.8 mm (0.028 — 0.031 in)



NOTE:
Replace with a new spark plug if this area 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(DOHC TURBO)-4, REMOVAL, Spark Plug.>

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
16 N·m (1.63 kgf-m, 11.8 ft-lb)

C: INSPECTION

Ignitor is integrated with the coil. Therefore resistance cannot be measured.

ENGINE (DIAGNOSTICS)

EN(DOHC 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 the trouble occurred using the interview check list. <Ref. to EN(DOHC TURBO)-4, CHECK, Check List for Interview.> 2)Start the engine.	Does the engine start?	Go to step **2.**	Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(DOHC TURBO)-63, Diagnostics for Engine Starting Failure.>
2	**CHECK ILLUMINATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).**	Does CHECK ENGINE malfunction indicator lamp illuminate?	Go to step **3.**	Inspection using "General Diagnostics Table". <Ref. to EN(DOHC TURBO)-372, 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?	Record the diagnostic trouble code. Repair the trouble cause. <Ref. to EN(DOHC TURBO)-80, 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(DOHC TURBO)-52, Engine Malfunction Indicator Lamp (MIL).>
4	**PERFORM THE DIAGNOSIS.** 1)Perform the clear memory mode. <Ref. to EN(DOHC TURBO)-49, Clear Memory Mode.> 2)Perform the inspection mode. <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-88, 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-9, Automatic Transmission Fluid.>
2) Differential gear oil level check <Ref. to AT-11, Differential Gear Oil.>
3) ATF leak check <Ref. to AT-9, Automatic Transmission Fluid.>
4) Differential gear oil leak check <Ref. to AT-11, Differential Gear Oil.>
5) Stall test <Ref. to AT-13, Stall Test.>
6) Line pressure test <Ref. to AT-16, Line Pressure Test.>
7) Transfer clutch pressure test <Ref. to AT-18, Transfer Clutch Pressure Test.>
8) Time lag test <Ref. to AT-15, Time Lag Test.>
9) Road test <Ref. to AT-12, Road Test.>
10) Shift characteristics <Ref. to AT-18, 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.

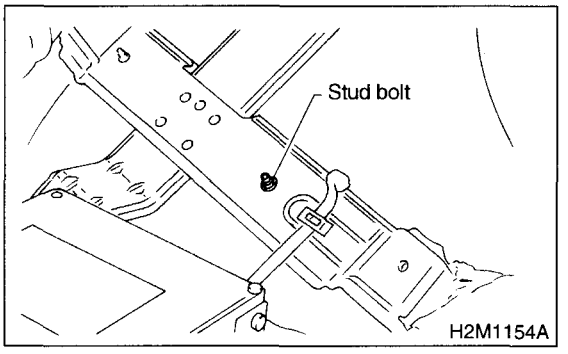
5) Poor contact has been identified as a primary cause of this problem. To measure the voltage and/or resistance of individual sensors or all electrical control modules at the harness side connector, use a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.

6) Before removing the ECM from the located position, disconnect two cables on battery.
• Otherwise, the the ECM may be damaged.

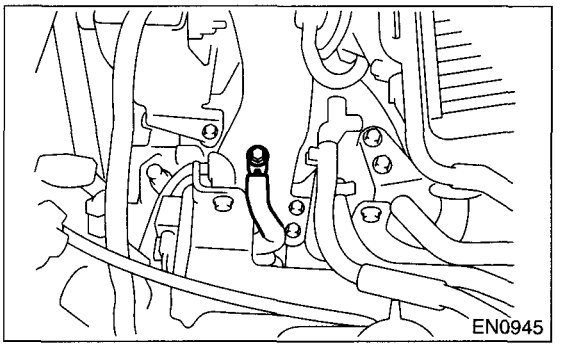
CAUTION:
When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage on fuel injection system.

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.

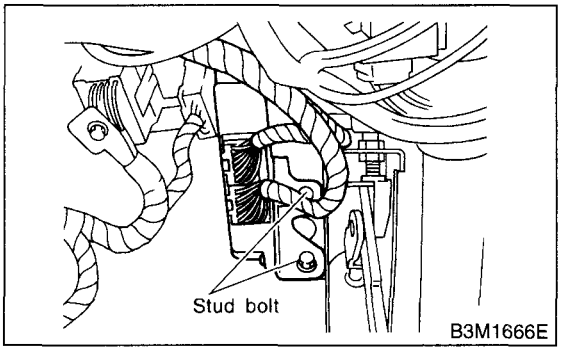
8) Use ECM mounting stud bolts at the body head grounding point when measuring voltage and resistance inside the passenger compartment.



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.



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) 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.

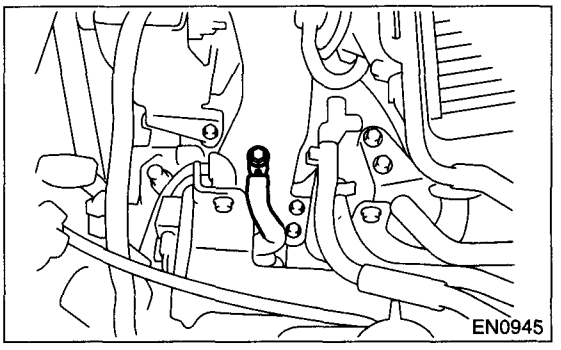
Standard voltage: 12 V

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

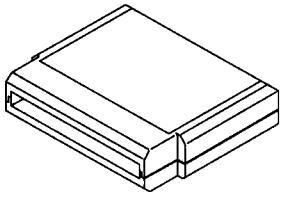
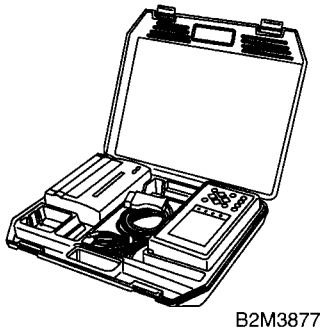
• The on-board diagnostics (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. CHECK ENGINE malfunction indicator lamp (MIL) in the combination meter indicates occurrence of a fault or trouble.
• Further, against such a failure or sensors as may 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.

D: PREPARATION TOOL

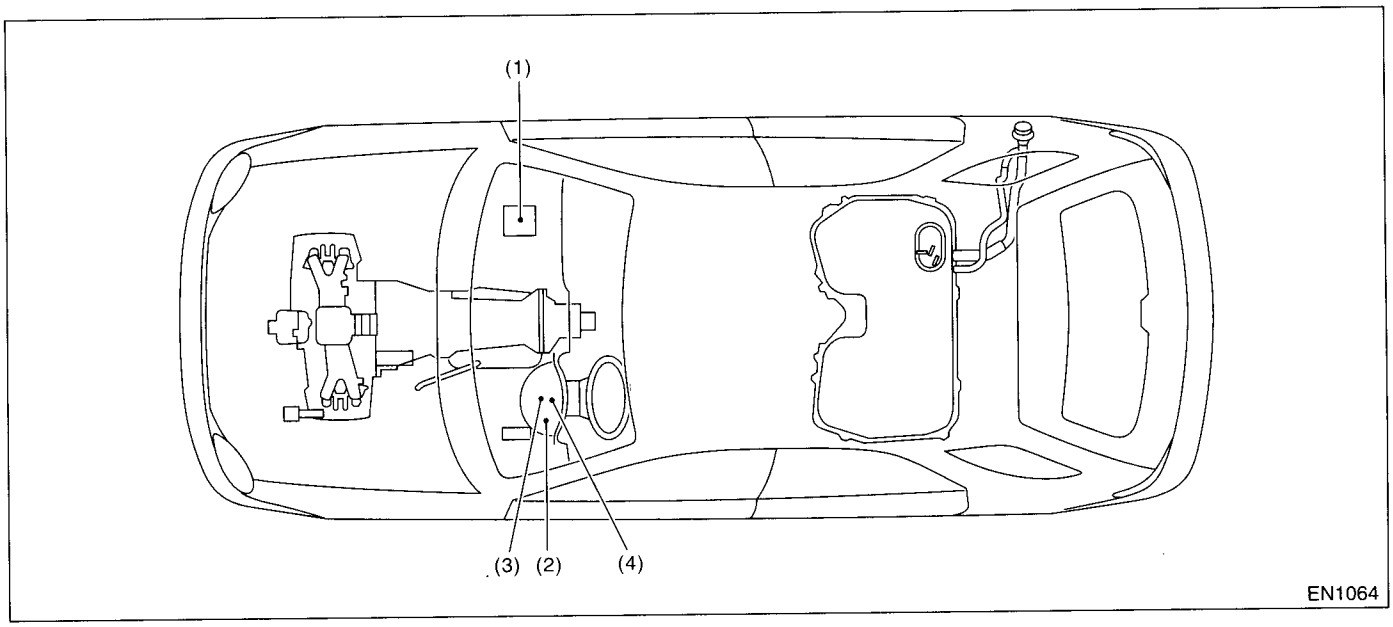
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3876	24082AA150 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

4. Electrical Components Location

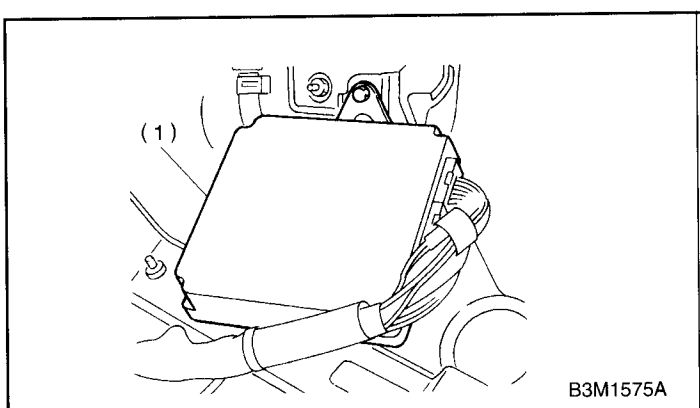
A: LOCATION

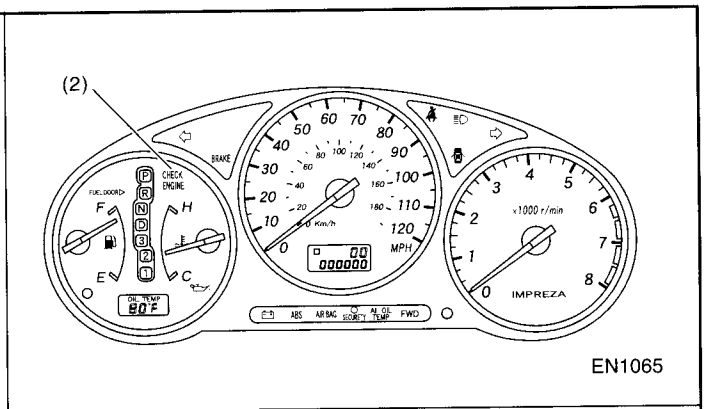
1. ENGINE

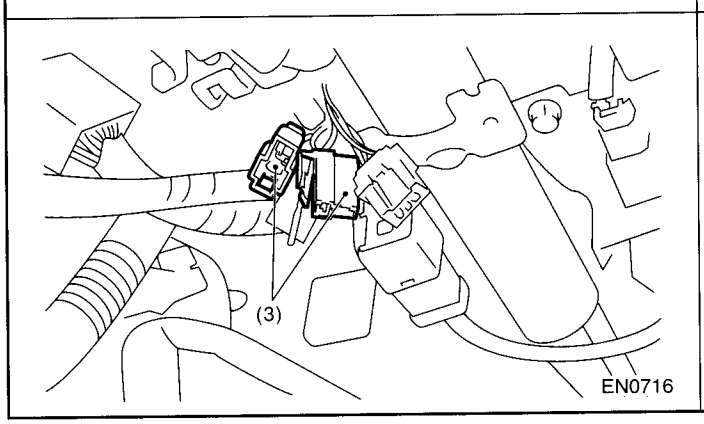
• MODULE

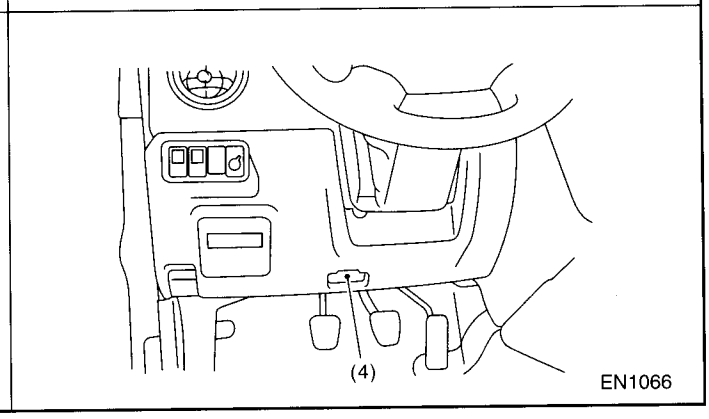


(1) Engine control module (ECM)
(2) CHECK ENGINE malfunction indicator lamp (MIL)
(3) Test mode connector
(4) Data link connector

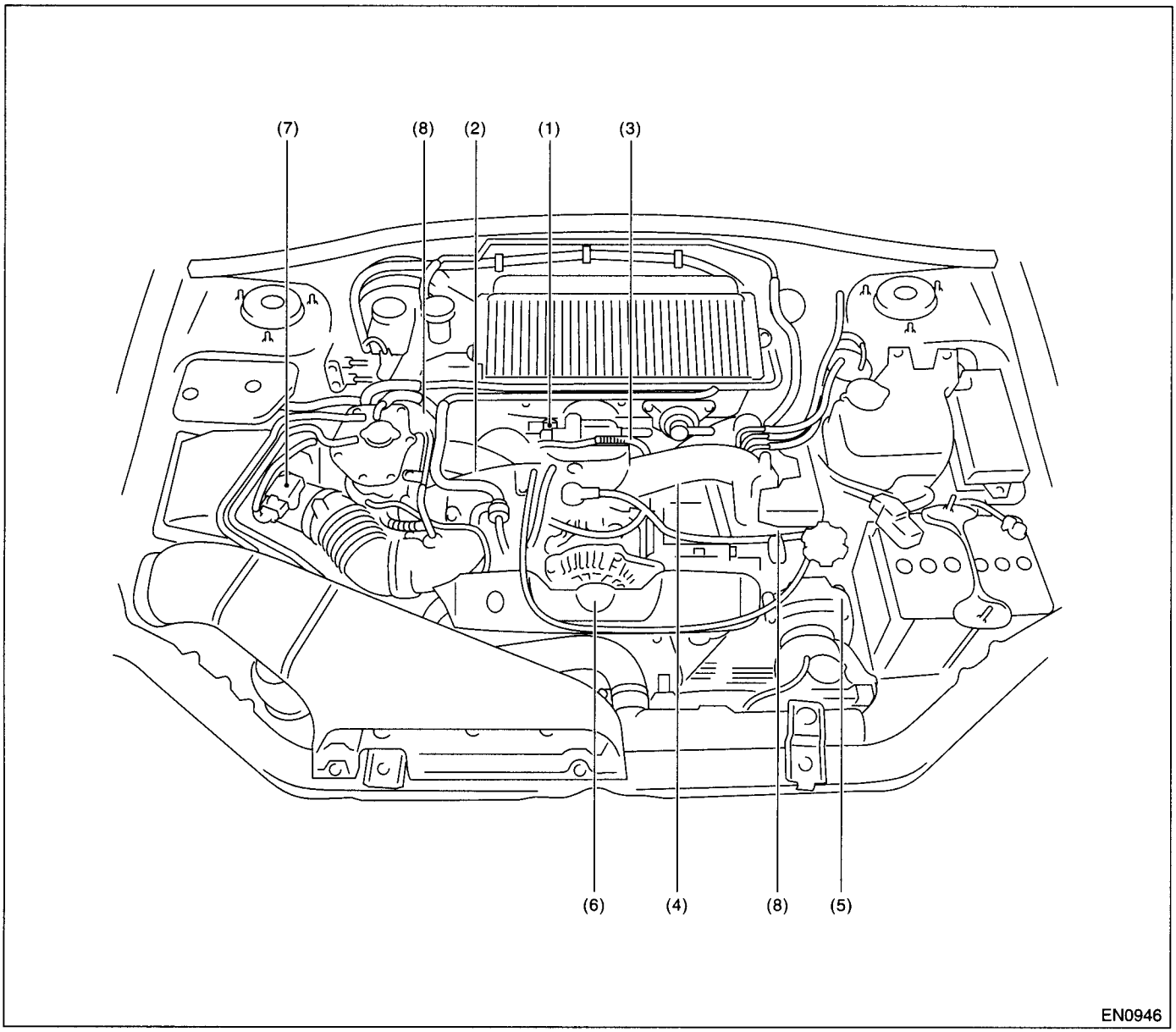




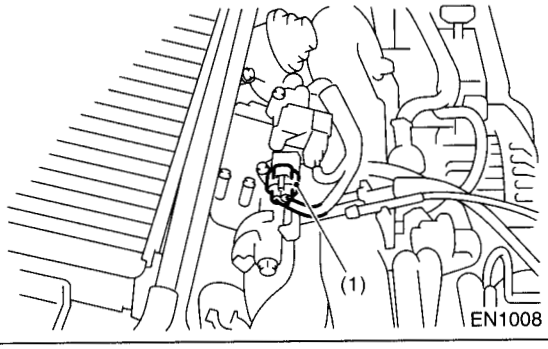


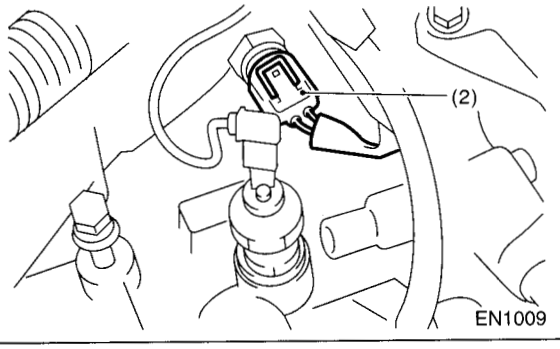


• SENSOR



(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)
EN1008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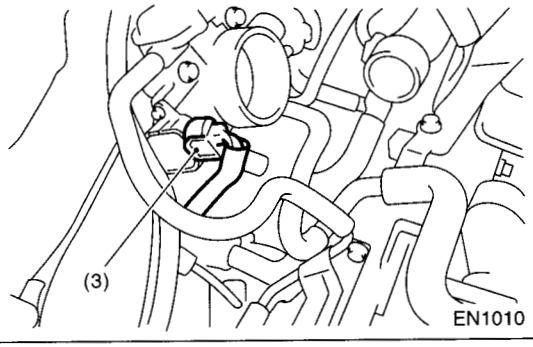
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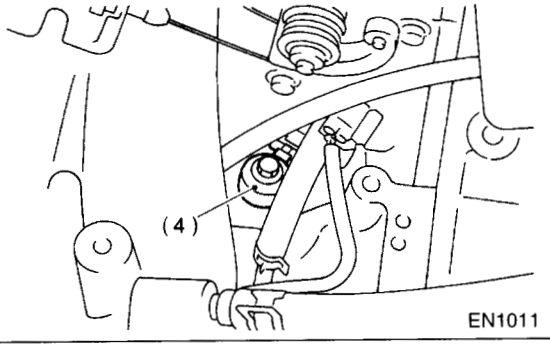
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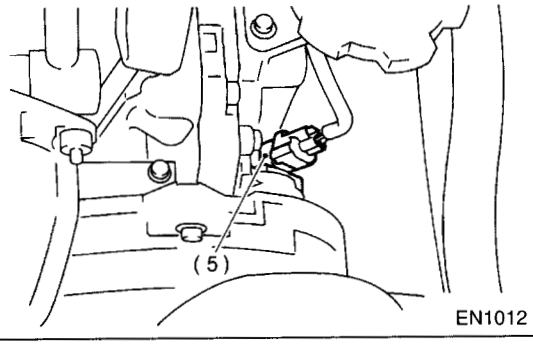
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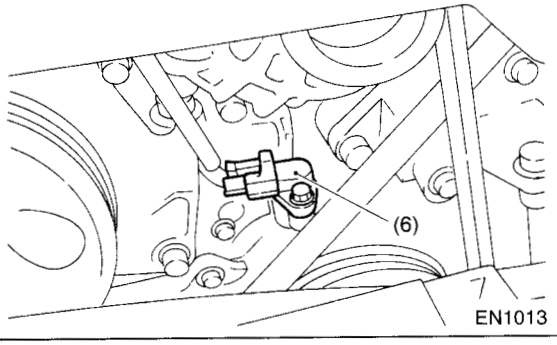
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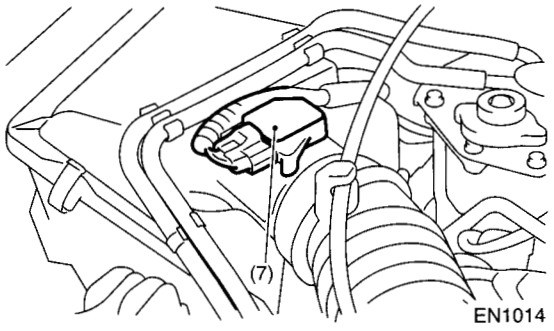
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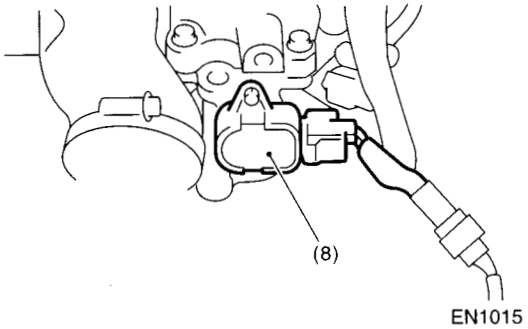
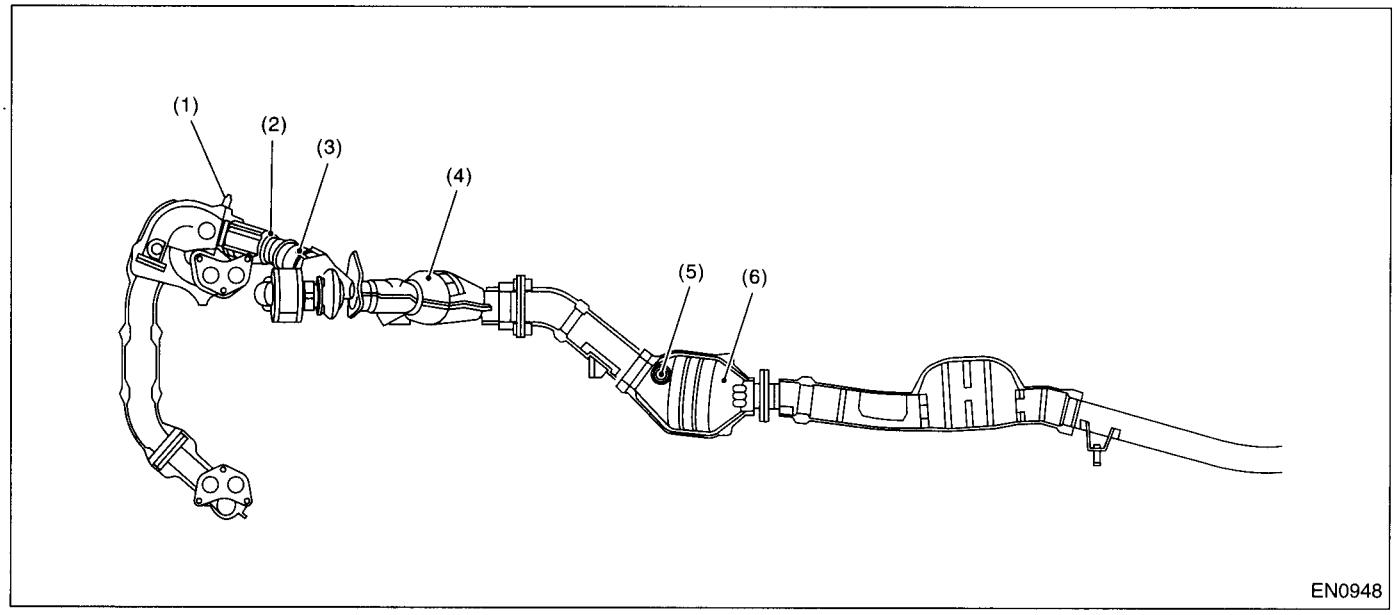
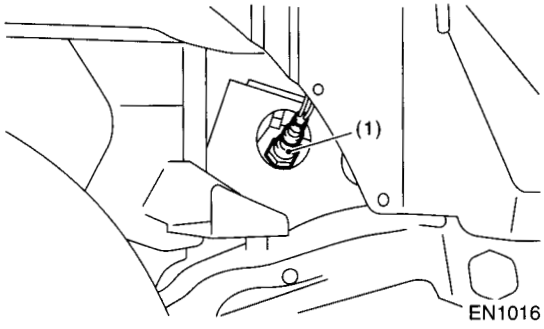

(8)
EN1015

ELECTRICAL COMPONENTS LOCATION



(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



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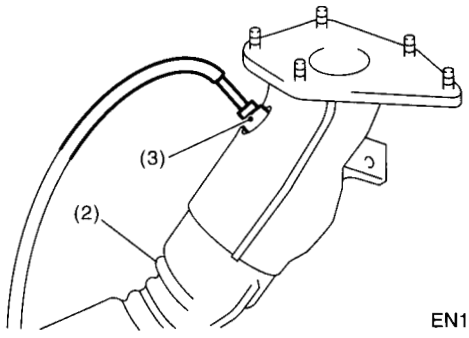
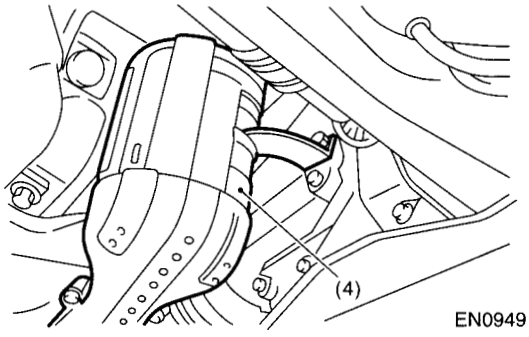
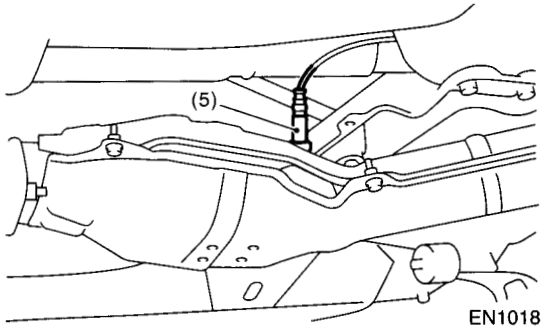


EN1017



EN0949



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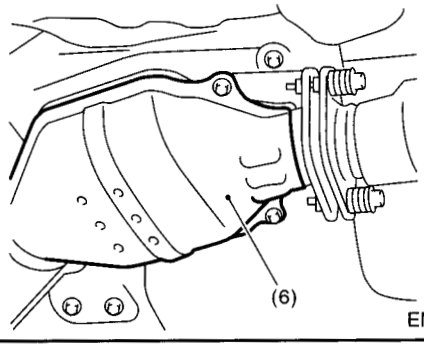
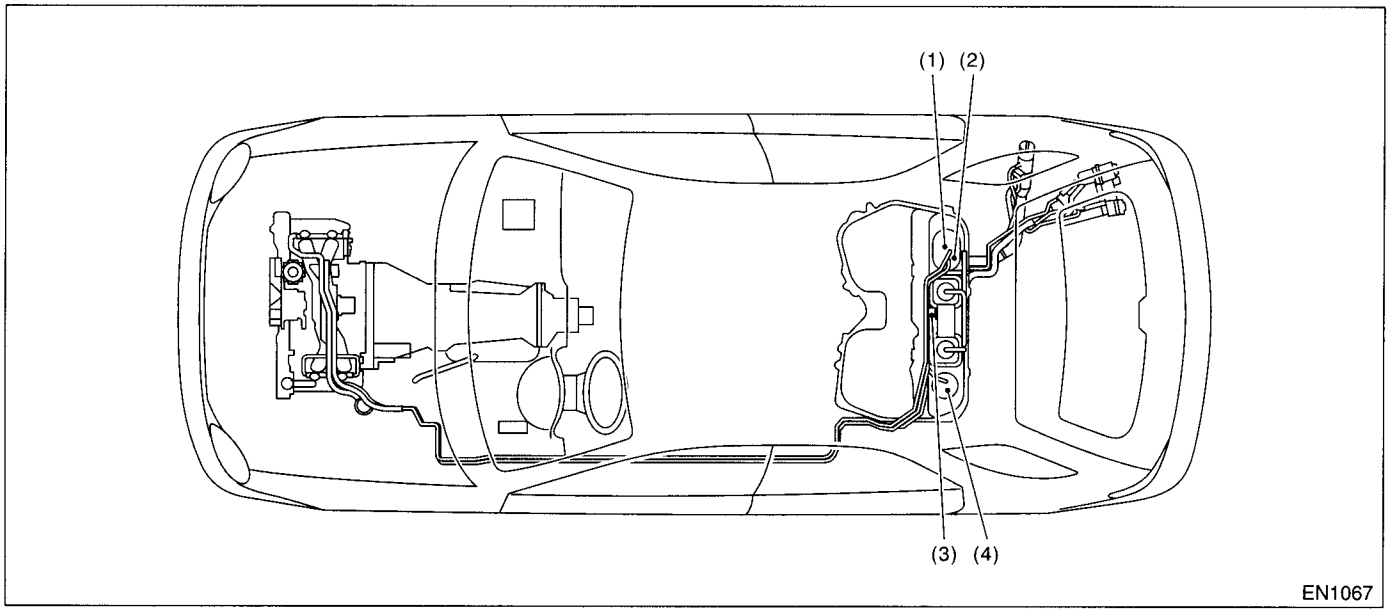


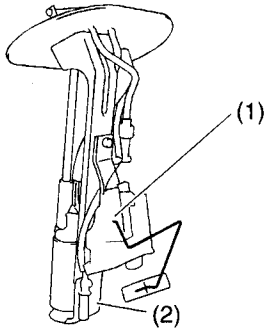
EN0950

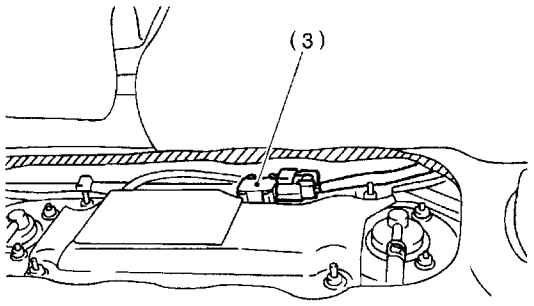
SUBARU

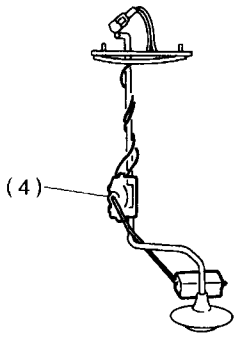
ELECTRICAL COMPONENTS LOCATION



(1) Fuel level sensor
(2) Fuel temperature sensor
(3) Fuel tank pressure sensor
(4) Fuel sub level sensor

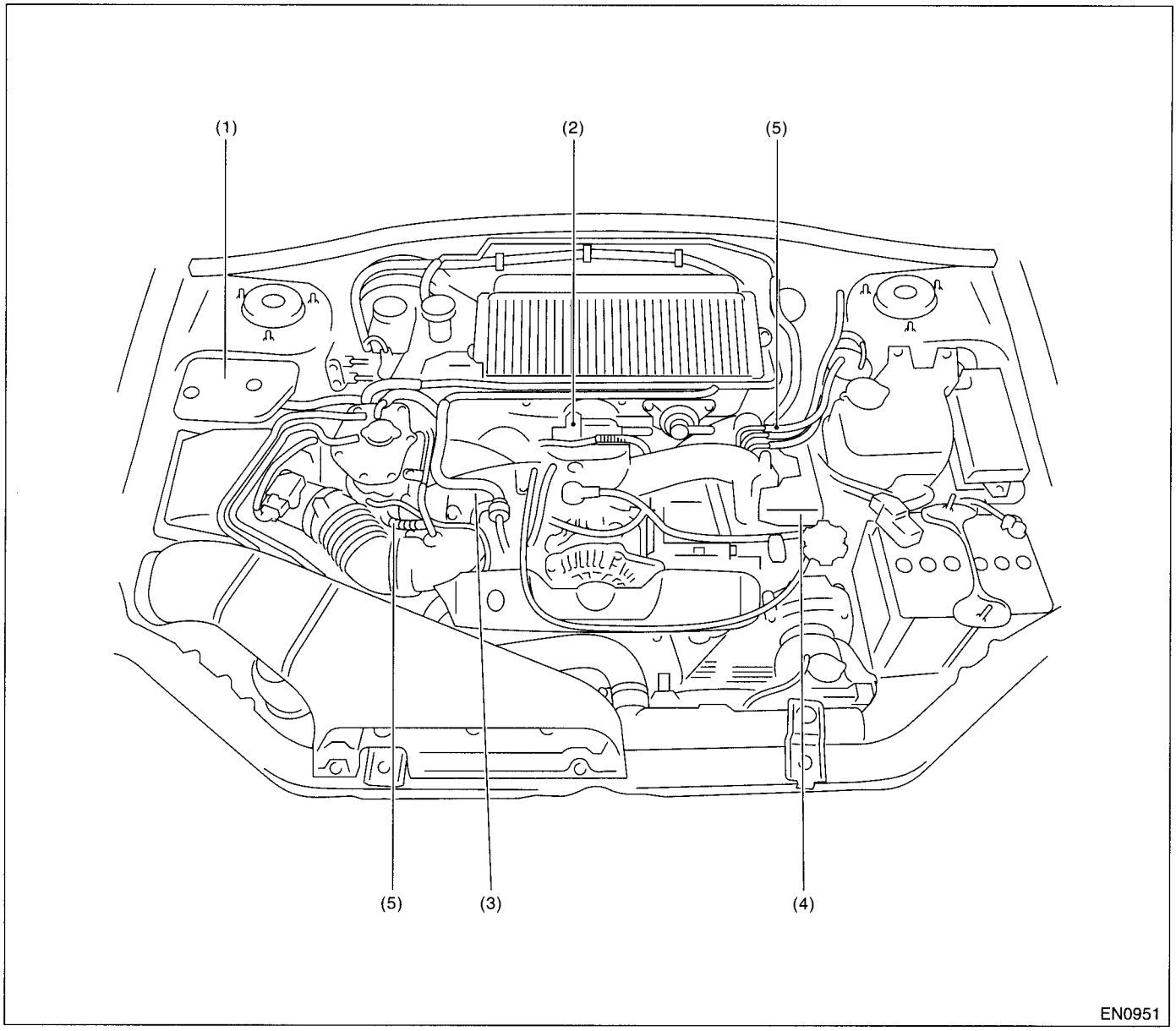




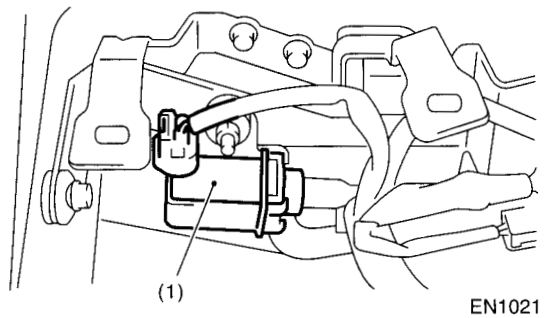


SUBARU

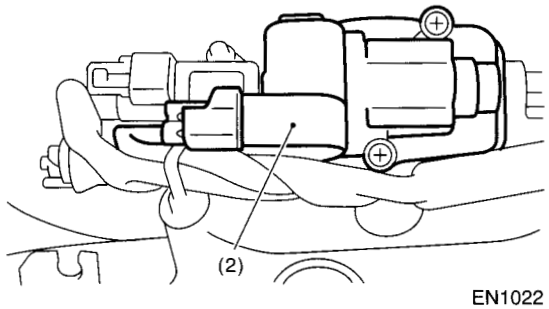
• SOLENOID VALVE, ACTUATOR, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS



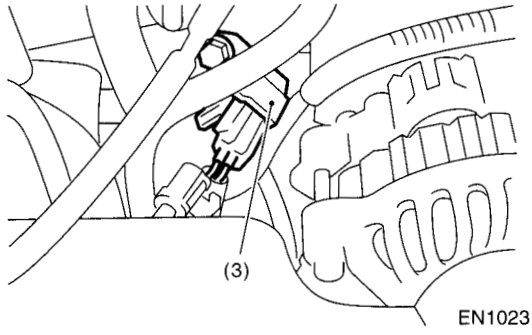
(1) Wastegate control solenoid valve
(2) Idle air control solenoid valve
(3) Purge control solenoid valve
(4) Ignition coil
(5) Tumble generator valve actuator



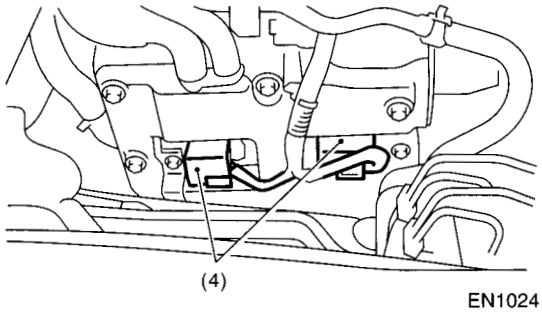
EN1021



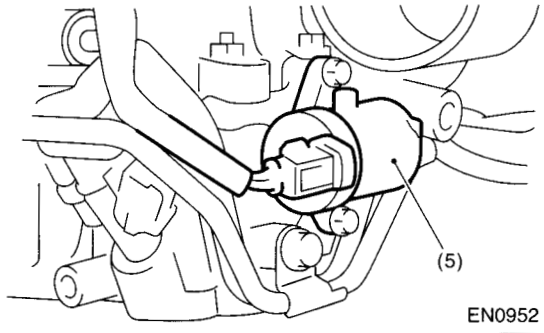
EN1022



EN1023

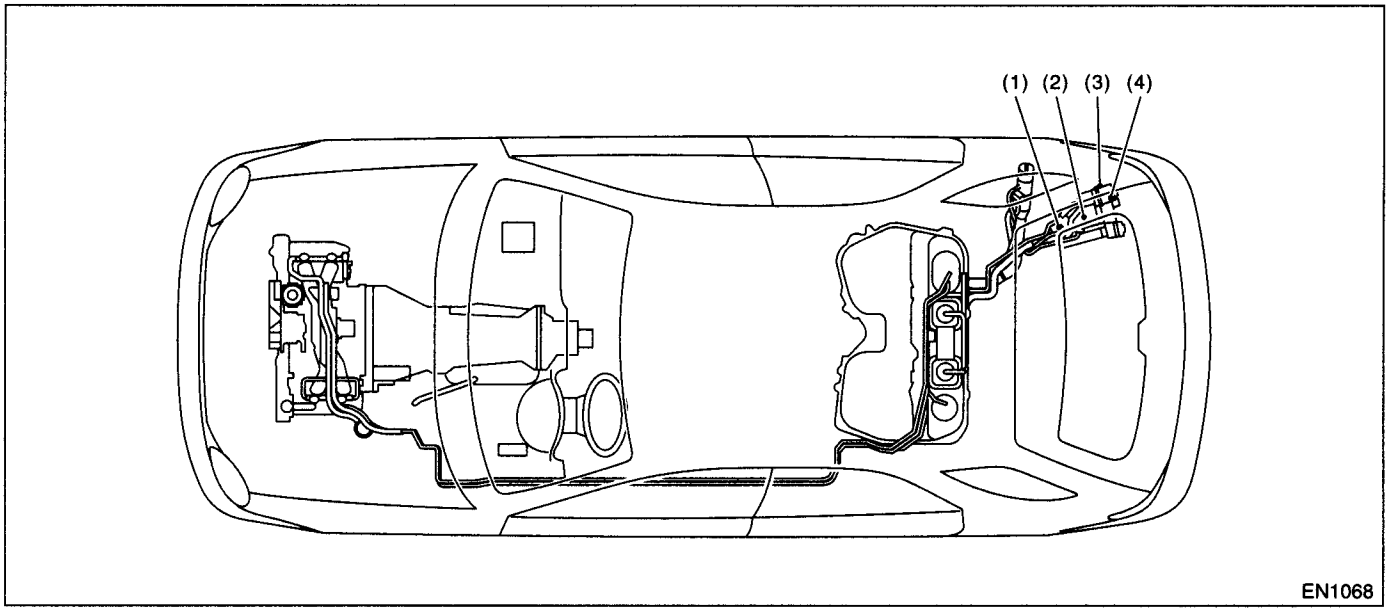


EN1024

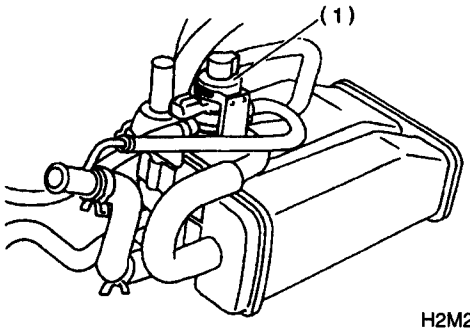


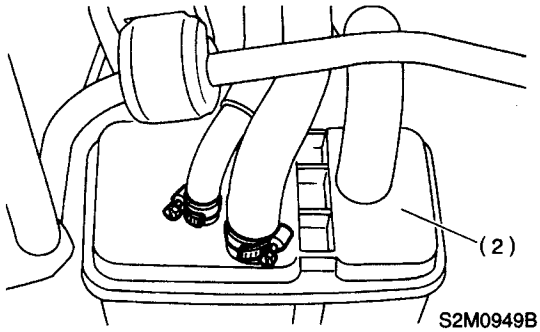
EN0952

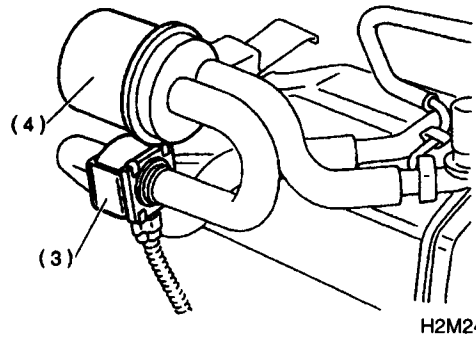
ELECTRICAL COMPONENTS LOCATION



(1) Pressure control solenoid valve
(2) Canister
(3) Drain valve
(4) Drain filter

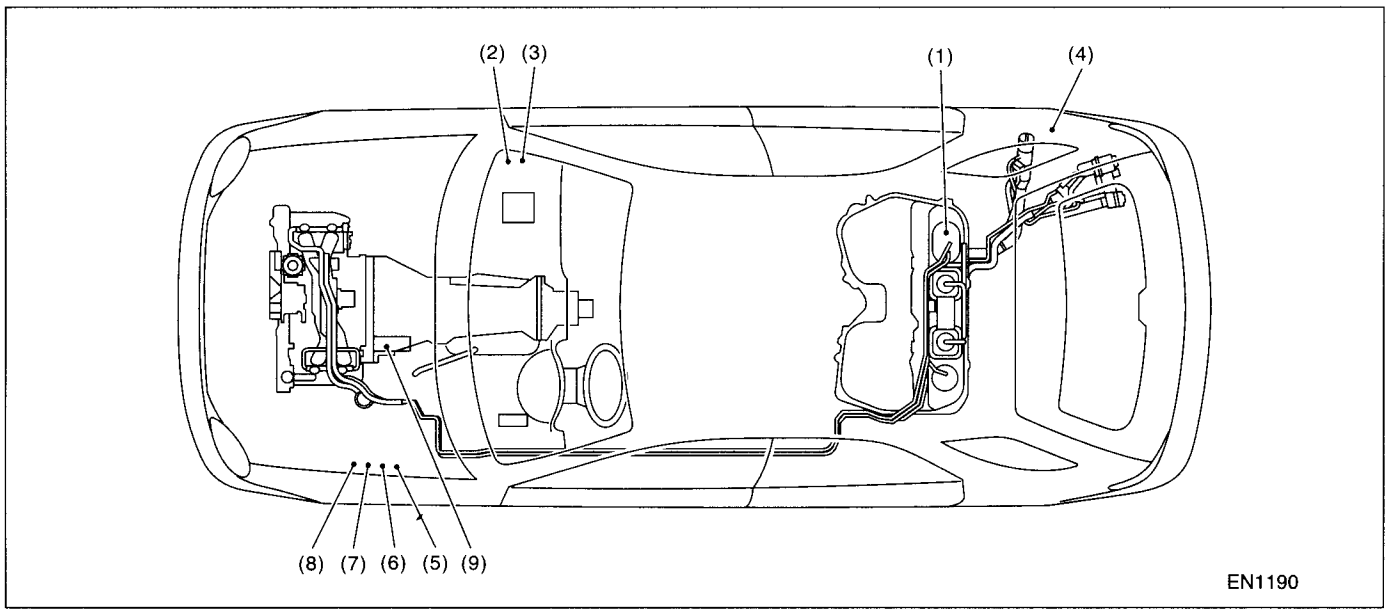




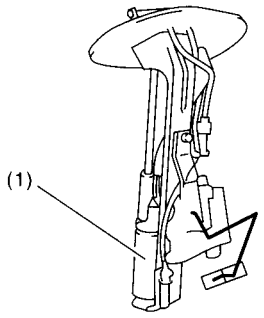


SUBARU

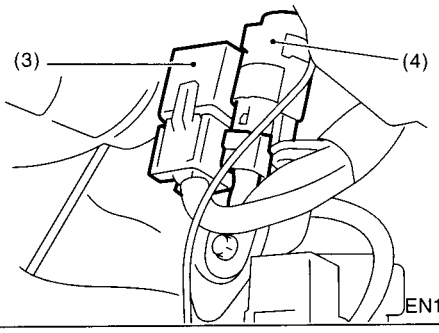
ELECTRICAL COMPONENTS LOCATION



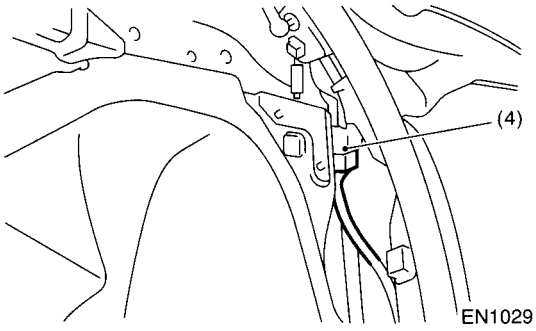
(1) Fuel pump
(2) Main relay
(3) Fuel pump relay
(4) Fuel pump controller
(5) Radiator main fan relay 1
(6) Radiator main fan relay 2
(7) Radiator sub fan relay 1
(8) Radiator sub fan relay 2
(9) Starter



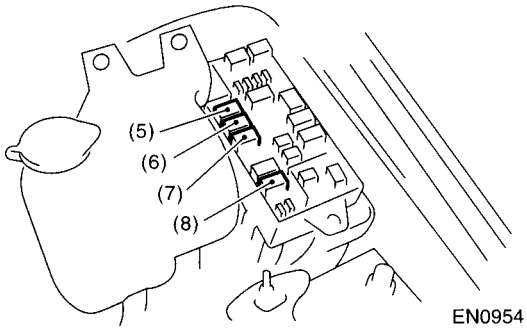
EN1191



EN1070



EN1029



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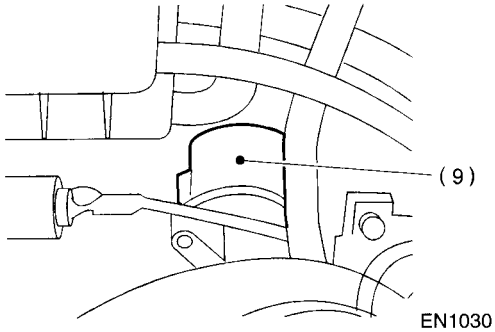
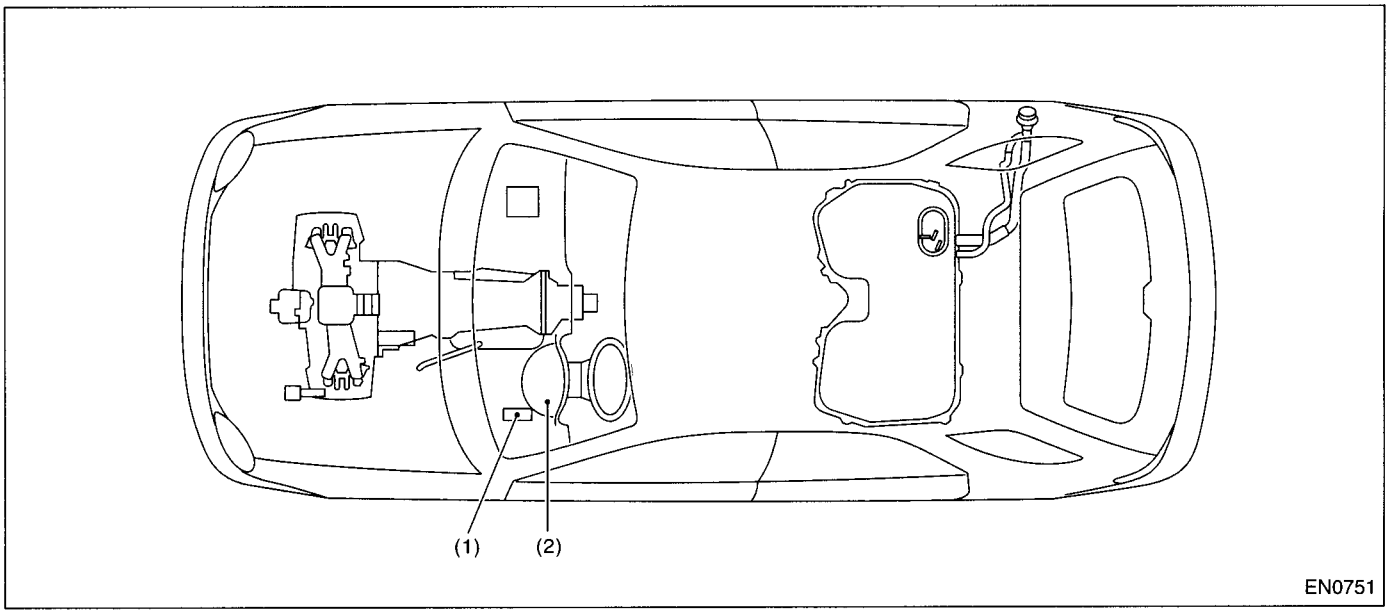


EN1030

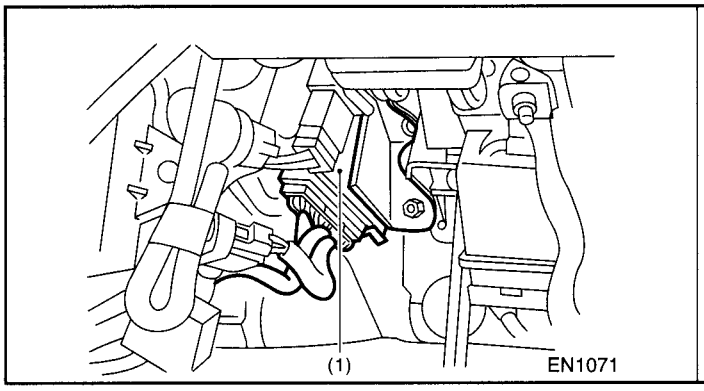
2. TRANSMISSION

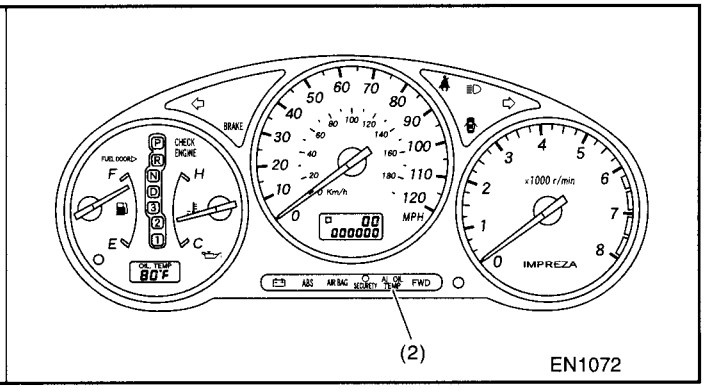
• Module



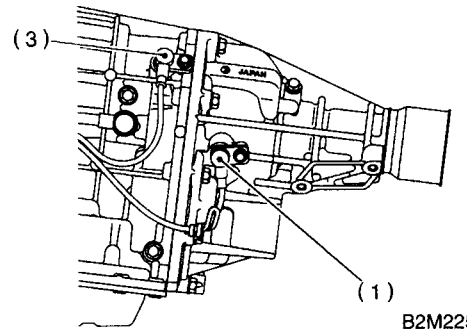
(1) Transmission Control Module (TCM) (for AT vehicles)

(2) AT diagnostic indicator light (for AT vehicles)





• **Sensor**



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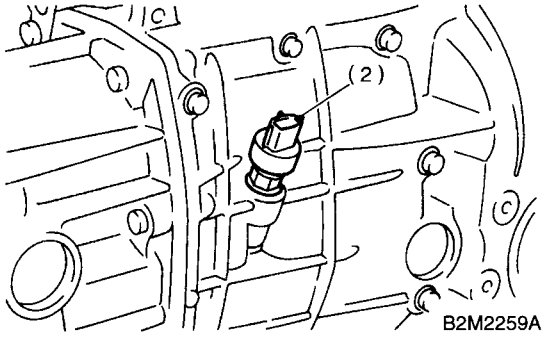

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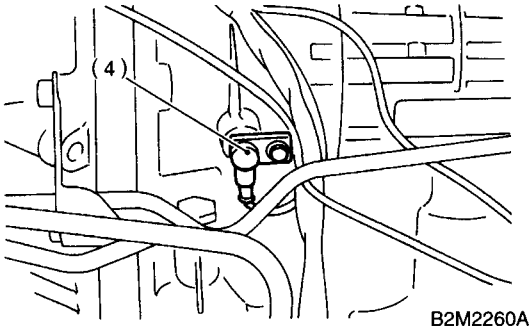

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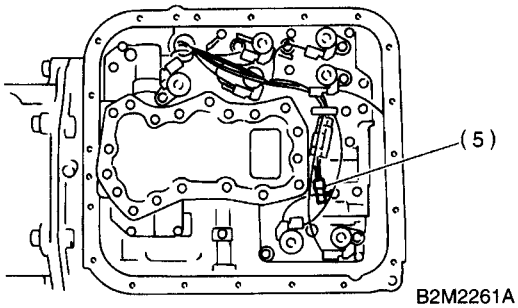

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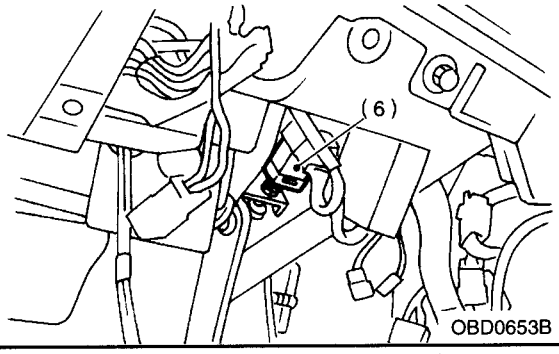
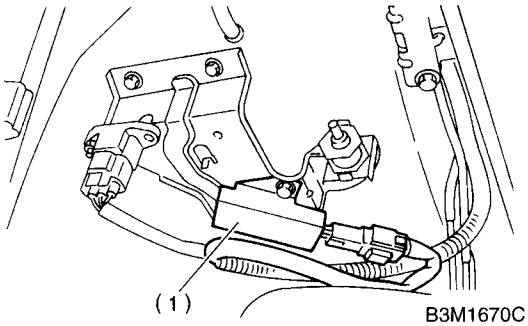
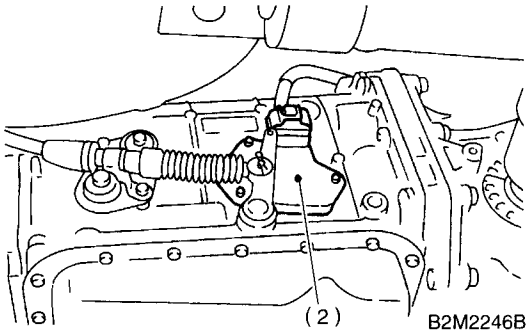


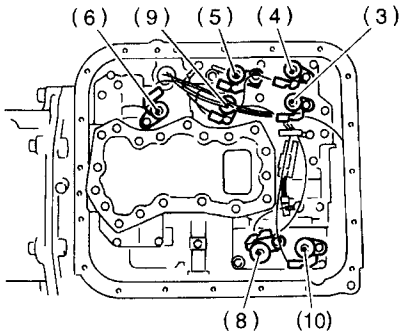
OBD0653B

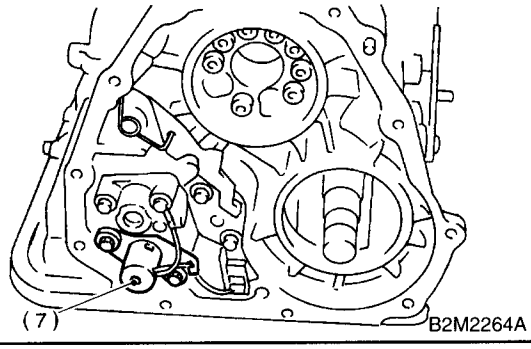
(1) Vehicle speed sensor 1 (for AT vehicles)
(2) Vehicle speed sensor 2 (for MT vehicles)
(3) Vehicle speed sensor 2 (for AT vehicles)
(4) Torque converter turbine speed sensor (for AT vehicles)
(5) ATF temperature sensor (for AT vehicles)
(6) Brake light switch

• Solenoid Valve And Switch (AT Vehicles)



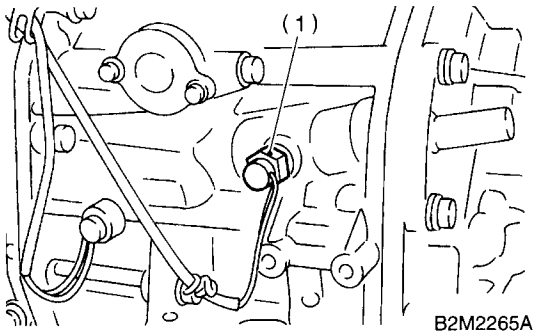






(1) Dropping resistor
(2) Inhibitor switch
(3) Shift solenoid valve 1
(4) Shift solenoid valve 2
(5) Line pressure duty solenoid
(6) Lock-up duty solenoid
(7) Transfer duty solenoid
(8) 2-4 brake duty solenoid
(9) Low clutch timing solenoid valve
(10) 2-4 brake timing solenoid valve

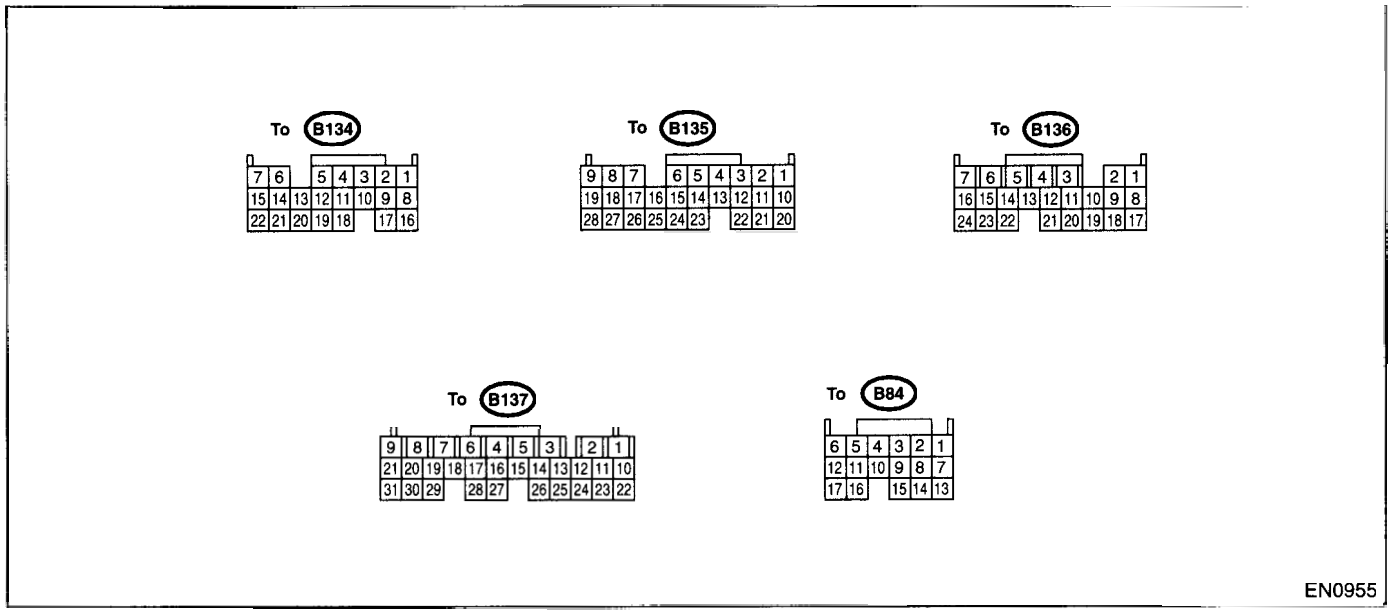
• Solenoid Valve And Switch (MT Vehicles)



(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			
	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	4	0 — 1.0	0 — 1.0	—
	Signal 2	B137	5	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)	
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	B84	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	B84	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	11	0 or 5	0 or 5	—
Tumble generator valve LH (close)		B84	10	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	2	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch		B134	5	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	14	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	15	—	—	—
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	—
Torque control 1 signal		B134	19	5	5	—
Torque control 2 signal		B134	18	5	5	—
Torque control cut signal		B136	14	8	8	—
Fuel temperature sensor		B135	6	2.5 — 3.8	2.5 — 3.8	Ambient temperature: 25°C (75°F)
Fuel tank pressure sensor	Signal	B135	15	2.3 — 2.7	2.3 — 2.7	The value obtained after the fuel filler cap was removed once and recapped.
	GND (sensor)	B134	19	0	0	—
Fuel tank pressure control solenoid valve		B137	22	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
Drain valve		B137	11	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
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	—
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	—

Content	Connector No.	Terminal No.	Signal (V)		Note
			Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Front oxygen (A/F) sensor signal (+)	B137	19	2.8 — 3.2	2.8 — 3.2	—
Front oxygen (A/F) sensor signal (–)	B137	29	2.4 — 2.7	2.4 — 2.7	—
Front oxygen (A/F) sensor shield	B136	7	0	0	—
SSM/GST communication line	B134	21	Less than 1 ←→ More than 4	Less than 1 ←→ More than 4	—
GND (sensors)	B135	19	0	0	—
GND (injectors)	B136	8	0	0	—
GND (ignition system)	B136	18	0	0	—
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

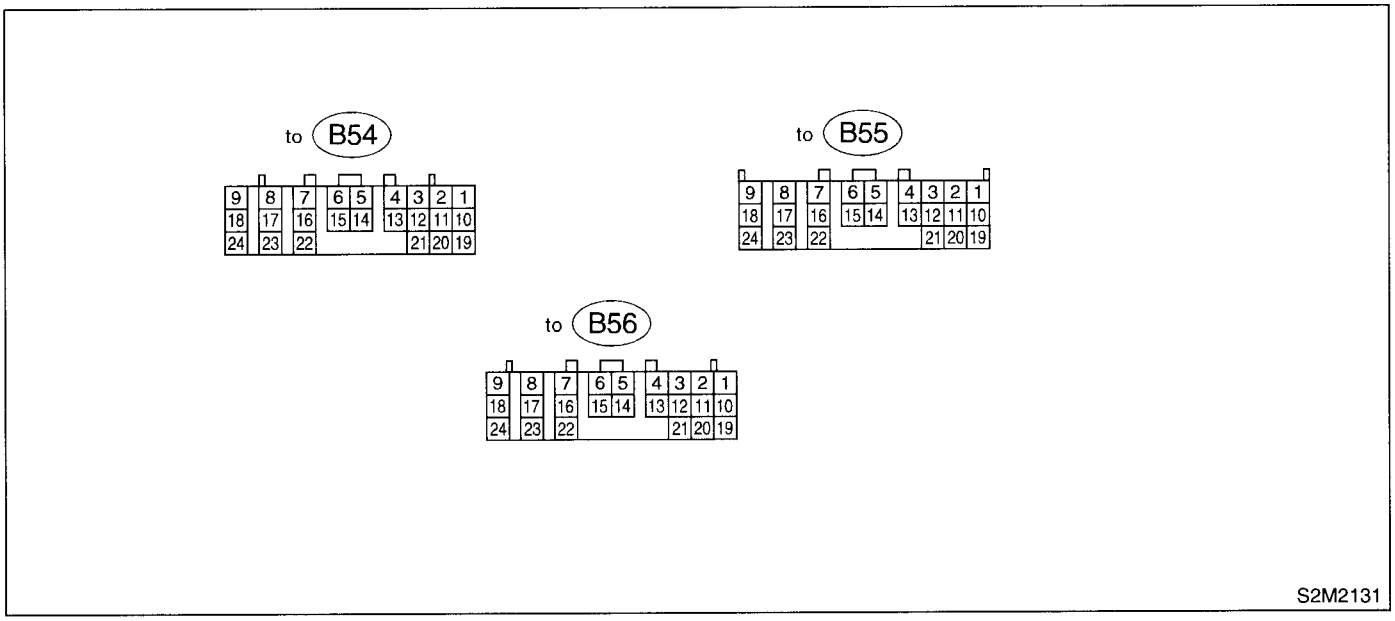
A: ELECTRICAL SPECIFICATION

Content	Specified data
Engine load	1.6 — 2.9 (%): Idling
	6.4 — 12.8 (%): 2,500 rpm racing

Measuring condition:
- After engine is warmed-up.
- Gear position is in neutral position. (MT vehicle)
- Gear position is in "N" or "P" position. (AT vehicle)
- 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		B56	1	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	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	
AT OIL TEMP warning light		B56	11	Light ON	Less than 1	—
				Light OFF	More than 9	

Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Throttle position sensor	B54	3	Throttle fully closed.	Approx. 0.5	—
			Throttle fully open.	Approx. 4.3	
Throttle position sensor power supply	B54	2	Ignition switch ON (With engine OFF)	Approx. 5.0	—
ATF temperature sensor	B54	11	ATF temperature 20°C (68°F)	2.9 — 4.0	2.1 — 2.9 k
			ATF temperature 80°C (176°F)	0.5 — 0.8	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 5	—
Engine speed signal	B55	17	Ignition switch ON (with engine OFF)	0	—
			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 4.8	—
Torque control signal 2	B56	14	Ignition switch ON (with engine ON)	More than 4.8	—
Torque control cut signal	B55	10	Ignition switch ON	8	—
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	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	
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	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	
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	

TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

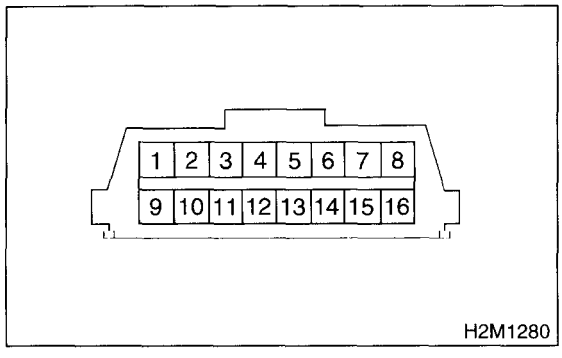
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
2-4 brake dropping resistor	B54	17	Throttle fully closed (with engine OFF) after warm-up.	More than 8.5	9 — 15
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
2-4 brake timing solenoid	B54	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	
Sensor ground line 1	B54	19	—	0	Less than 1
Sensor ground line 2	B55	9	—	0	Less than 1
System ground line	B56	19	—	0	Less than 1
	B54	20			
AT diagnosis signal	B56	21	Ignition switch ON	Less than 1 ← → More than 4	—
Data link signal (Subaru Select Monitor)	B56	15	—	—	—
		6	—	—	

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.



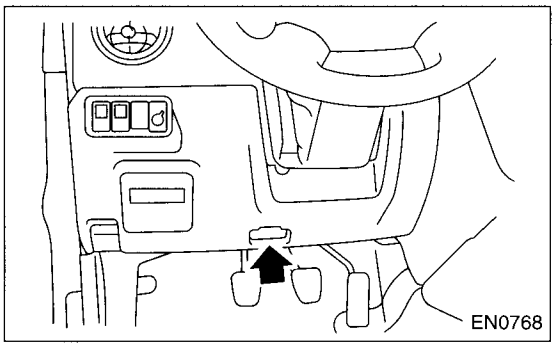
Terminal No.	Contents	Terminal No.	Contents
1	Power supply	9	Blank
2	Blank	10	K line of ISO 9141 CARB
3	Blank	11	Blank
4	Blank	12	Ground
5	Blank	13	Ground
6	Line end check signal 1	14	Blank
7	Blank	15	Blank
8	Line end check signal 2	16	Blank

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) Open the cover and 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(DOHC TURBO)-80, 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(DOHC TURBO)-45, 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).

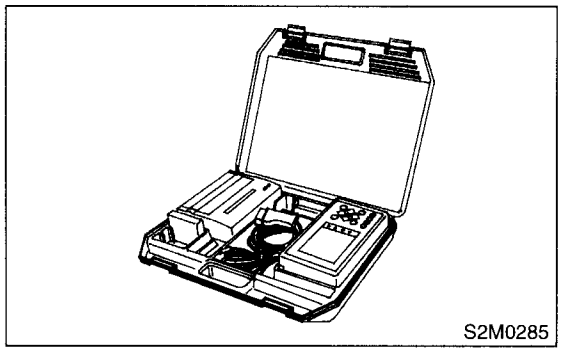
NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to clear or reset emission-related diagnostic information (MODE $04).

10.Subaru Select Monitor

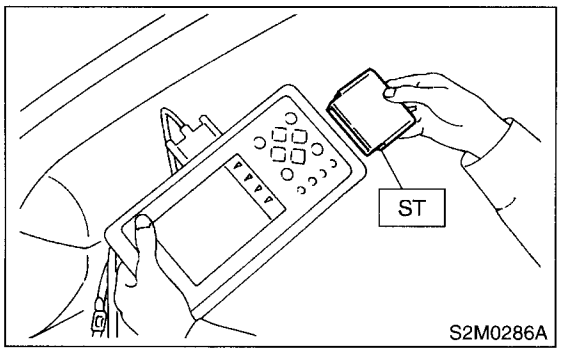
A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(DOHC TURBO)-8, PREPARATION TOOL, General Description.>

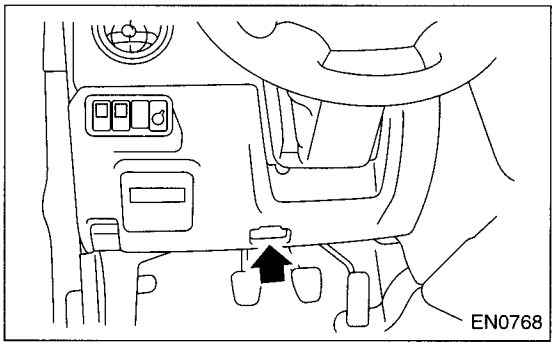

S2M0285

2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(DOHC TURBO)-8, PREPARATION TOOL, General Description.>



S2M0286A

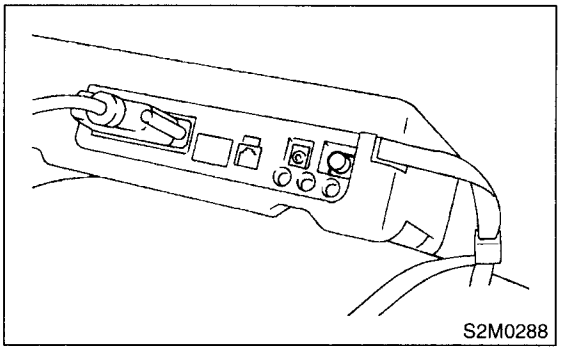
4) Connect the Subaru Select Monitor to data link connector.
(1) Data link connector located in the lower portion of the instrument panel (on the driver's side).


EN0768

(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.


S2M0288

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(DOHC TURBO)-45, 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(DOHC TURBO)-45, 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 Duty Ratio	%
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 O2 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 O2 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
Fuel tank pressure signal	Fuel Tank Pressure	mmHg or kPa or inHg or psi
Fuel temperature signal	Fuel Temp	°C or °F
Exhaust gas temperature signal	Exhaust Gas Temperature	°C or °F
MT/AT identification signal	AT Vehicle ID Signal	ON or OFF
Fuel pressure control solenoid valve signal	PCV Solenoid Valve	ON or OFF

Contents	Display	Unit of measure
Drain valve signal	Vent. Solenoid Valve	ON or OFF
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
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 O2 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

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	O2 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 signal	A/F sensor #11	V
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 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	Calculated load valve	%
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 Compressor Signal	ON or OFF	When air conditioning compressor 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 Permission	ON or OFF	When engine torque control permission signal is entered.
Rear oxygen sensor rich signal	Rear O2 Rich Signal	ON or OFF	When rear oxygen sensor mixture ratio is rich.
Starter switch signal	Starter Switch	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 Signal	ON or OFF	When crankshaft position sensor signal is entered.
Camshaft position sensor signal	Camshaft Position Signal	ON or OFF	When camshaft position sensor signal is entered.
Power steering switch signal	P/S Switch	ON or OFF	When power steering switch is entered.
Rear defogger switch signal	Rear Defogger Switch	ON or OFF	When rear defogger switch is turned ON.
Blower fan switch signal	Blower Fan Switch	ON or OFF	When blower fan switch is turned ON.
Light switch signal	Light Switch	ON or OFF	When small light switch is turned ON.
Tumble generator valve actuator signal	TGV Output	ON or OFF	When TGV actuator signal is entered.
Tumble generator valve drive signal	TGV Drive	OPEN or CLOSE	When TGV moves and valve opens.
Fuel pressure control solenoid valve signal	PCV Solenoid Valve	ON or OFF	When fuel pressure control solenoid valve is in function.
Drain valve signal	Vent. Solenoid Valve	ON or OFF	When drain valve is in function.

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	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 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(DOHC TURBO)-80, 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(DOHC TURBO)-80, 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(DOHC TURBO)-80, 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).

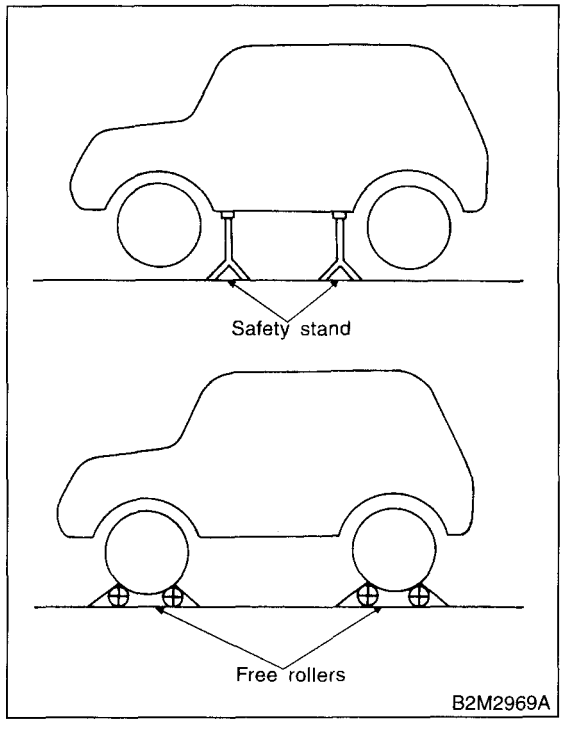
12.Inspection Mode

A: OPERATION

1. PREPARATION FOR THE INSPECTION MODE

Raise the vehicle using a garage jack and place on safety stands or drive the vehicle onto free rollers.

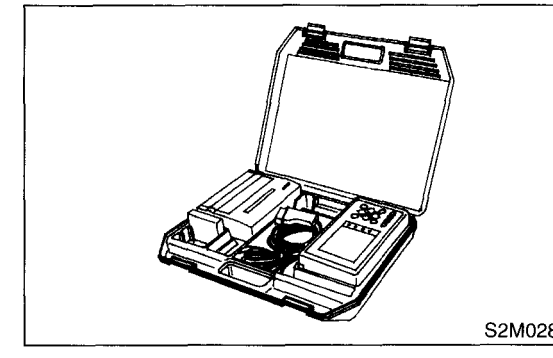
WARNING:
• Before raising the vehicle, ensure parking brakes are applied.
• Do not use a pantograph jack in place of a safety stand.
• Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
• Do not abruptly depress/release the clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause the 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.



2. SUBARU SELECT MONITOR

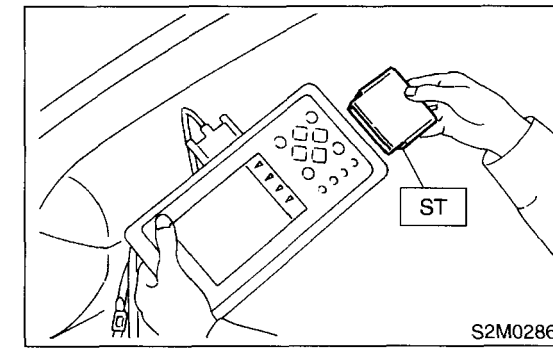
After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data.

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(DOHC TURBO)-8, PREPARATION TOOL, General Description.>

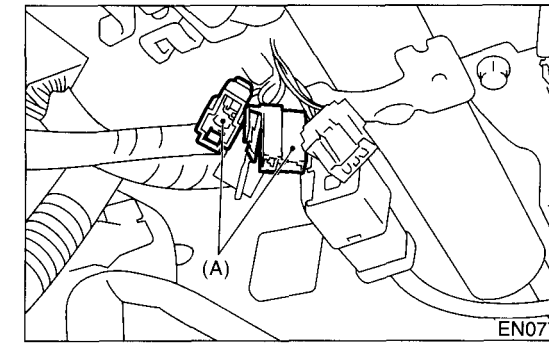


2) Connect the diagnosis cable to Subaru Select Monitor.

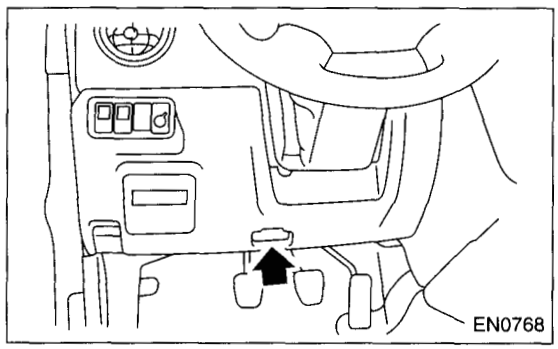
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(DOHC TURBO)-8, PREPARATION TOOL, General Description.>



4) Connect the test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box.



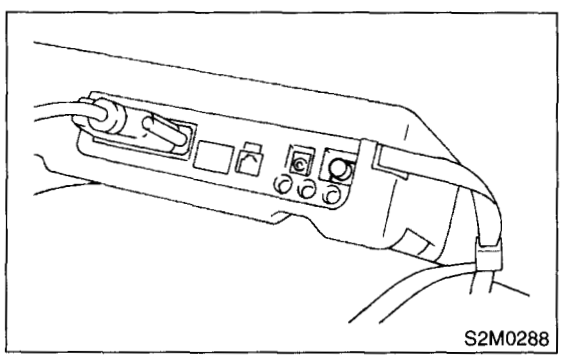
5) Connect the Subaru Select Monitor to data link connector.
(1) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



(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.

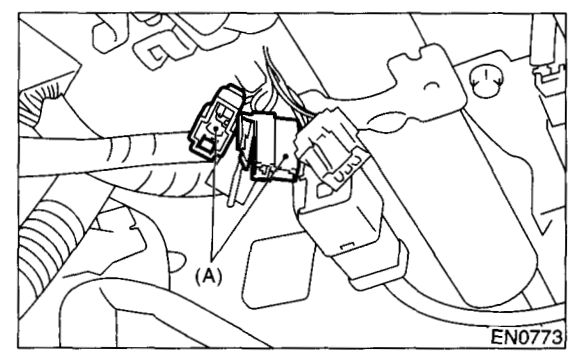


7) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
8) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
9) Press the [YES] key after displayed the information of engine type.
10) On the «Engine Diagnosis» display screen, select the {Dealer Check Mode Procedure} and press the [YES] key.
11) When the "Perform Inspection (Dealer Check) Mode?" is shown on the display screen, press the [YES] key.
12) 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 diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(DOHC TURBO)-80, 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 engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

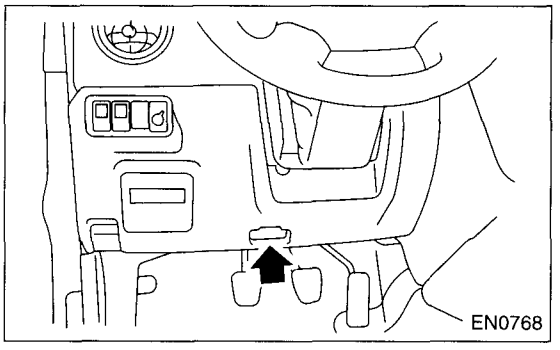
3. OBD-II GENERAL SCAN TOOL

After performing the diagnostics and clearing the memory, check for any remaining unresolved trouble data:
1) Connect the test mode connector (A) at the lower side of the instrument panel (on the driver's side), to the side of the center console box.



2) Connect the OBD-II general scan tool to its data link connector in the lower portion of the instrument panel (on the driver's side).

CAUTION:
Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.



3) Start the engine.

NOTE:
Depress the clutch pedal when starting the engine.

4) Using the shift lever, turn the "N" position switch to ON.

5) Keep the engine speed in the 2,500 — 3,000 rpm range for 40 seconds.

6) Place the shift lever in the "1st" gear and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:
The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

7) Using the OBD-II general scan tool, check for diagnostic trouble code(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(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).>

13.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:
• 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:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

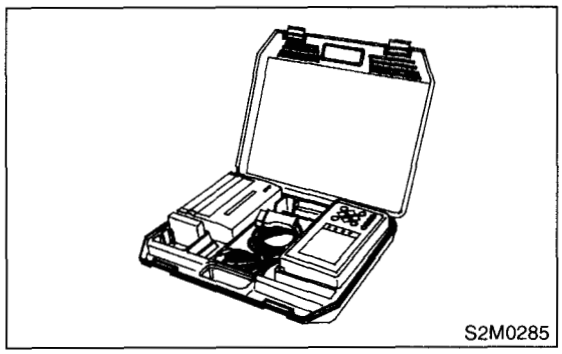
3. OBD-II GENERAL SCAN TOOL

For clear memory procedures using the OBD-II general scan tool, refer to the OBD-II General Scan Tool Instruction Manual.

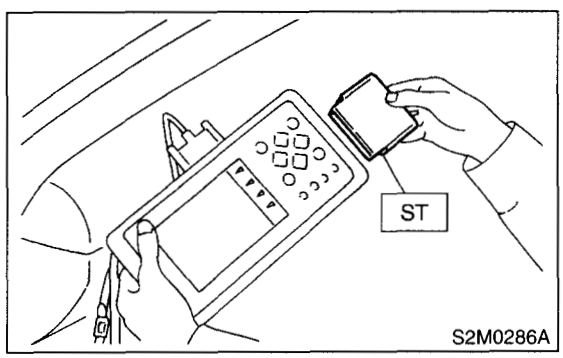
14.Compulsory Valve Operation Check Mode

A: OPERATION

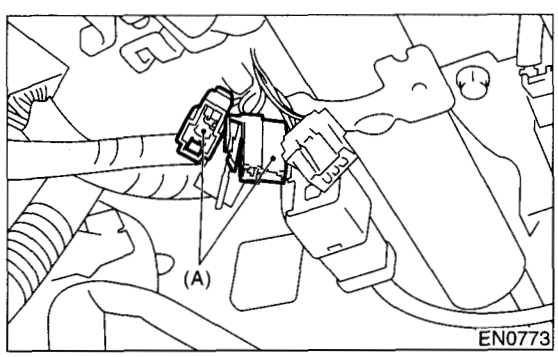
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(DOHC TURBO)-8, PREPARATION TOOL, General Description.>



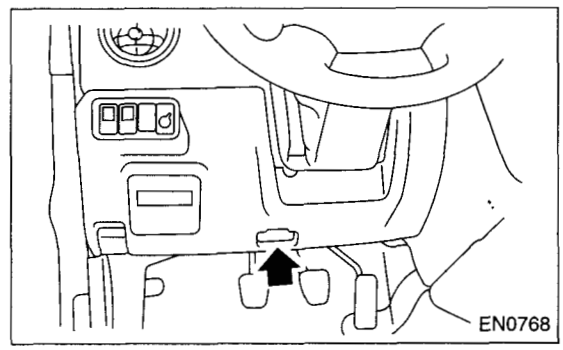
2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(DOHC TURBO)-8, PREPARATION TOOL, General Description.>



4) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side), to the side of the center console box.



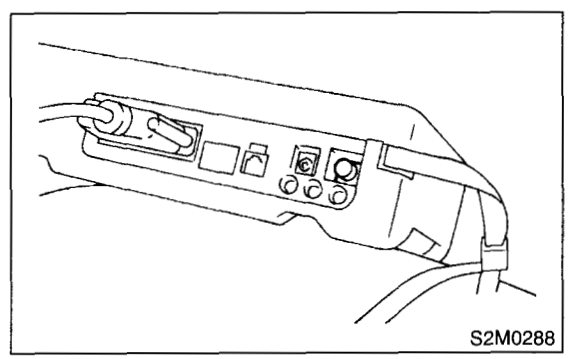
5) Connect the Subaru Select Monitor to data link connector.
(1) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



(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.



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
Compulsory fuel pressure control solenoid valve operation check	PCV Solenoid Valve
Compulsory drain valve operation check	Vent Control Solenoid Valve
Compulsory fuel tank pressure sensor control valve operation check	Fuel Tank Sensor Control 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
FICD Solenoid
Pressure Switching Sol. 1
Pressure Switching Sol. 2
AAI Solenoid Valve

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

15.Engine Malfunction Indicator Lamp (MIL)

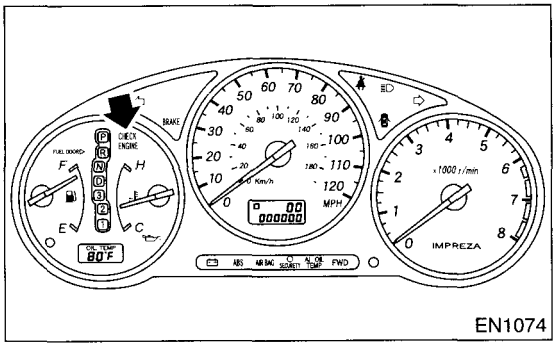
A: PROCEDURE

1. Activation of check engine malfunction indicator lamp (MIL). <Ref. to EN(DOHC TURBO)-53, 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(DOHC TURBO)-54, 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(DOHC TURBO)-56, 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(DOHC TURBO)-57, 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(DOHC TURBO)-60, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) REMAINS BLINKING AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MIL).>

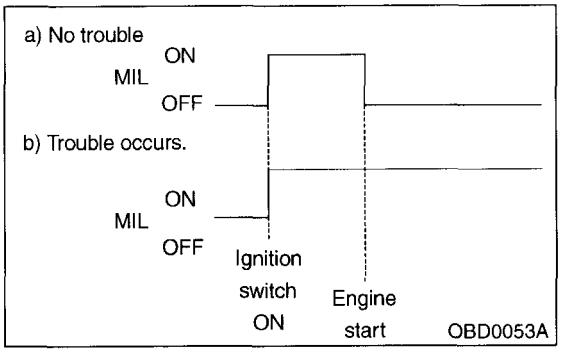
B: ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL)

1) When the ignition switch is turned to ON (engine off), the CHECK ENGINE malfunction indicator lamp (MIL) in the combination meter illuminates.

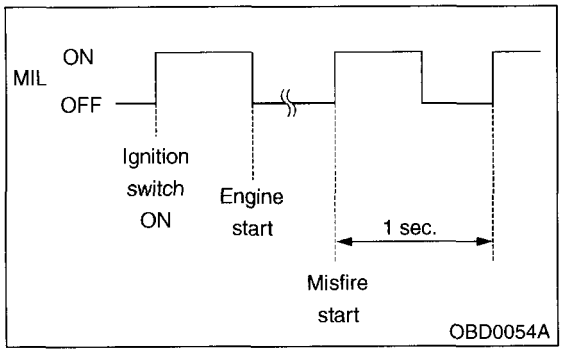
NOTE:
If the MIL does not illuminate, perform diagnostics of the CHECK ENGINE light circuit or the combination meter circuit. <Ref. to EN(DOHC TURBO)-54, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>



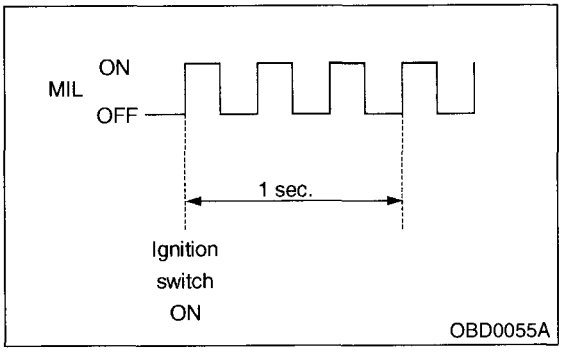
2) After starting the engine, the MIL goes out. If it does not, either the engine or the emission control system is malfunctioning.



3) If the diagnosis system senses a misfire which could damage the catalyzer, the MIL will blink at a cycle of 1 Hz.

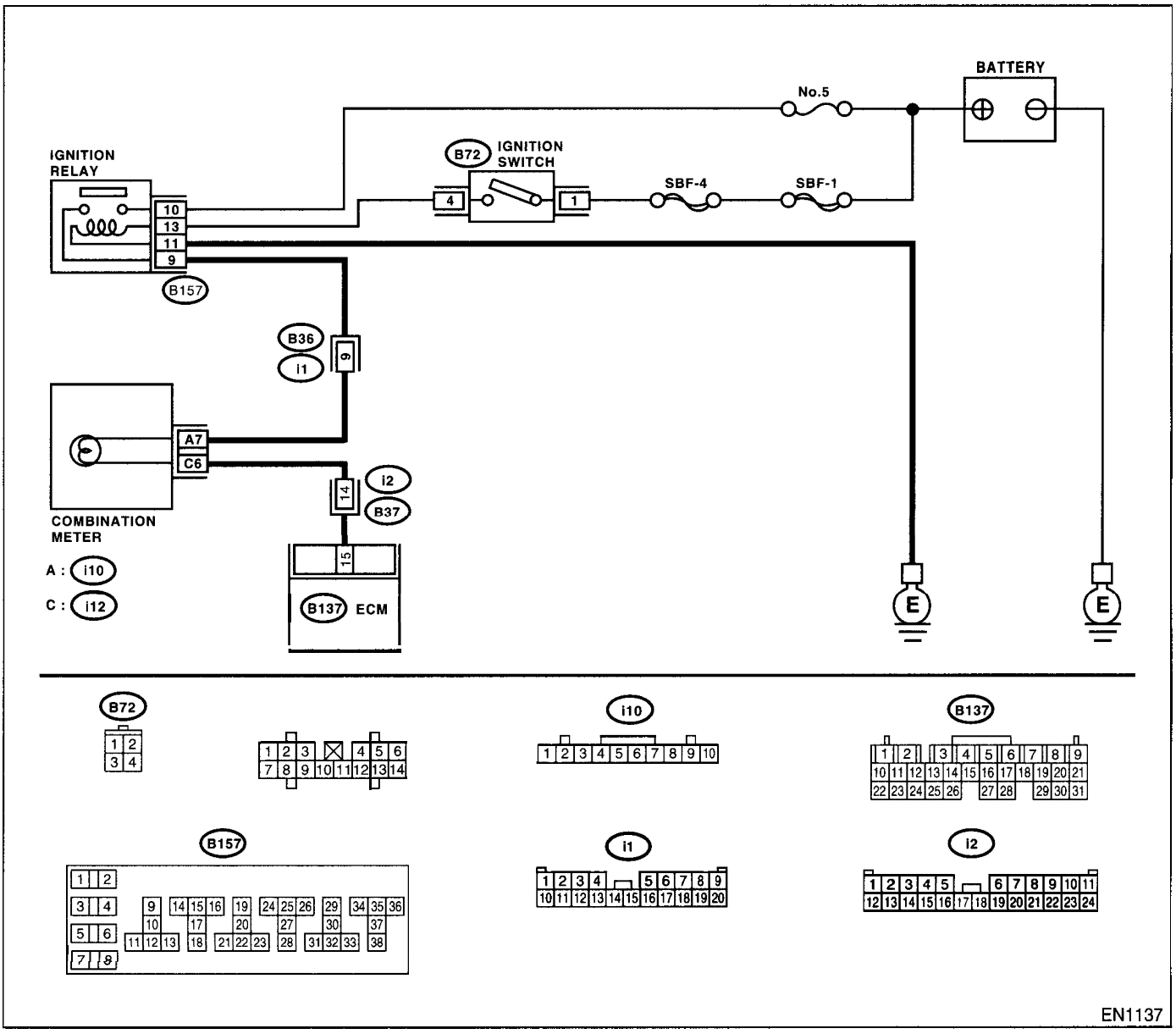


4) When the ignition switch is turned to ON (engine off) or to "START" with the test mode connector connected, the MIL blinks at a cycle of 3 Hz.



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:**

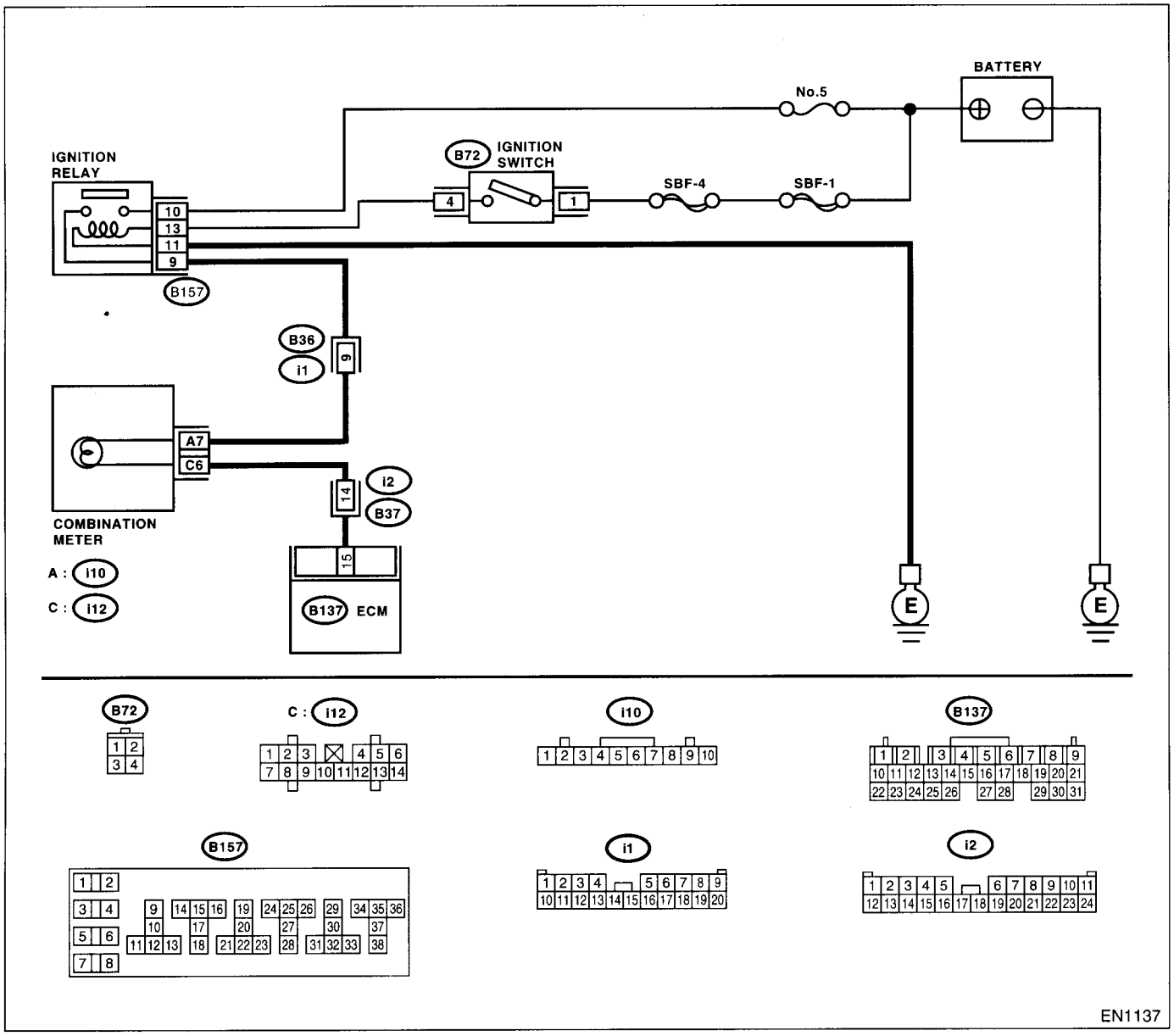


Step		Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 15 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **4.**	Go to step **2.**

Step	Check	Yes	No
CHECK POOR CONTACT.	)oes the MIL come on when haking or pulling ECM con-ector and harness?	Repair poor con-act in ECM con-ector.	Go to step **3.**
CHECK ECM CONNECTOR.	s the ECM connector correctly onnected?	Replace the ECM. :Ref. to FU(DOHC URBO)-47, Engine Control Module.>	Repair connection of ECM connector.
CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. 1)Turn the ignition switch to OFF. 2)Remove the combination meter. <Ref. to IDI-11, 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. 6:***	s the resistance less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repai the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connecto
CHECK POOR CONTACT. Check poor contact in combination meter connector.	s there poor contact in combi-ation meter connector?	Repair poor con-act in combination neter connector.	Go to step **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. 7 (+) — Chassis ground (–):***	s the voltage more than 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 cor nector
CHECK LAMP BULB. Remove the engine malfunction indicator lamp bulb.	s the lamp bulb condition OK?	Repair combina-ion meter connec-or.	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:**

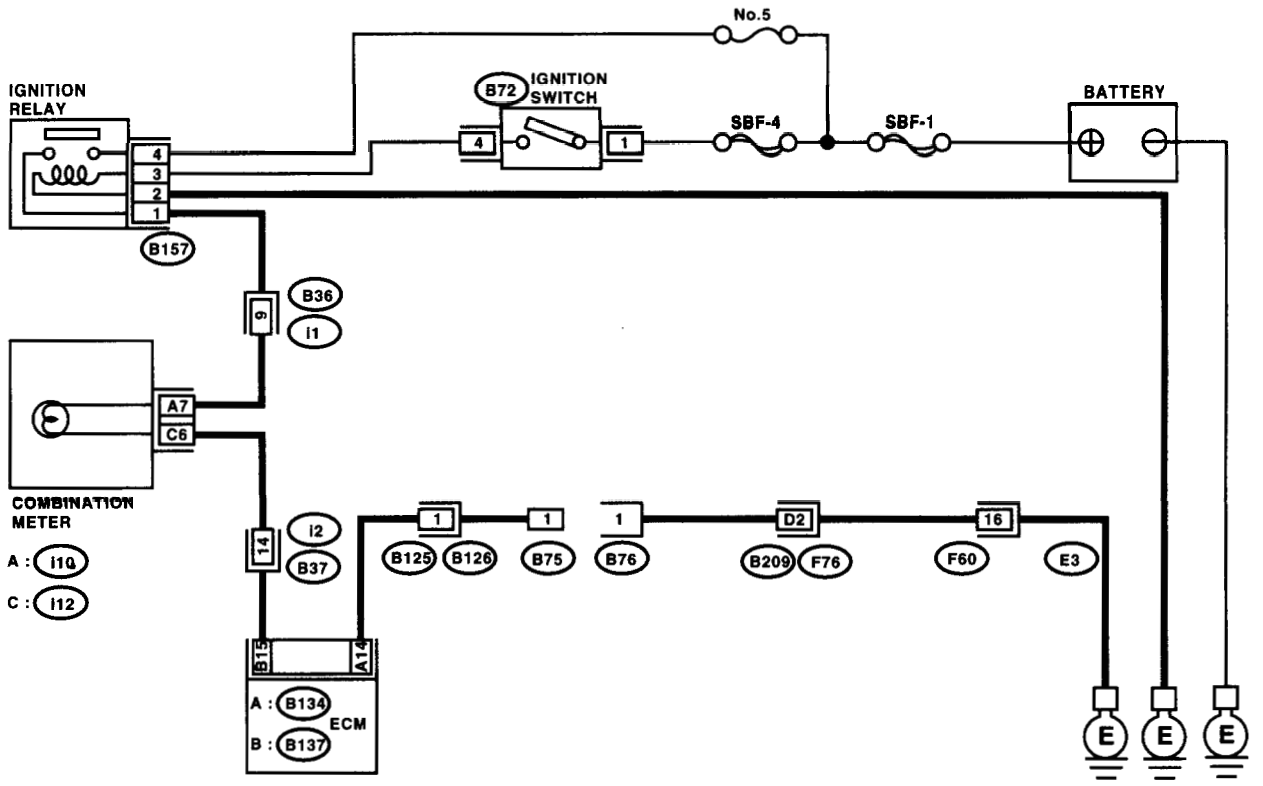


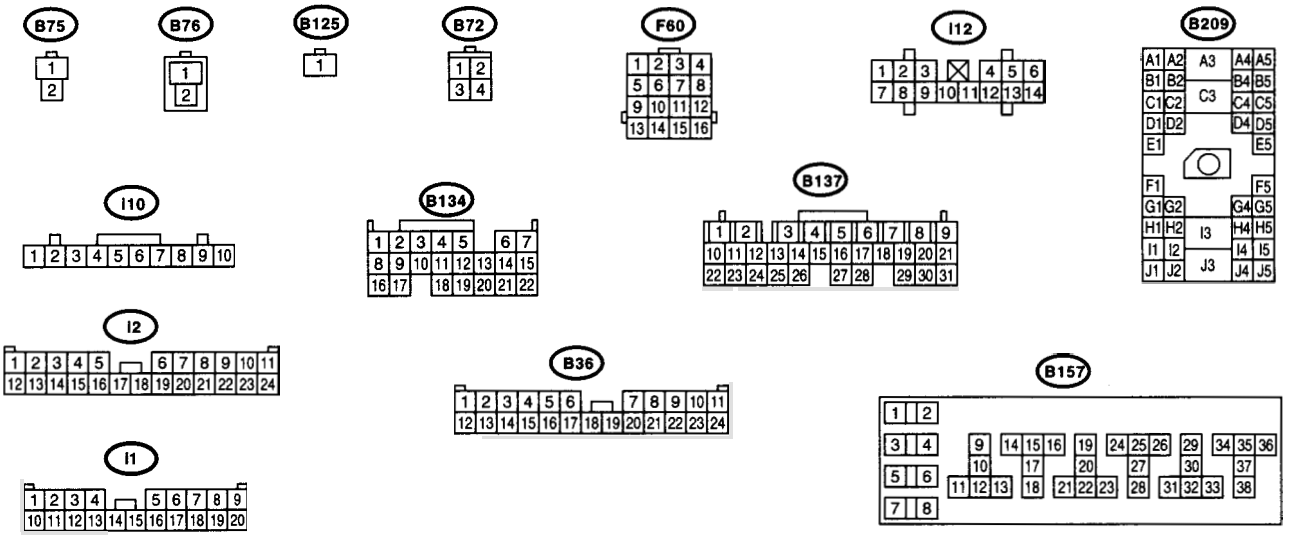
Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Turn the ignition switch to ON.	Does the MIL come on?	Repair short circuit in harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(DOHC TURBO)-47, 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:**



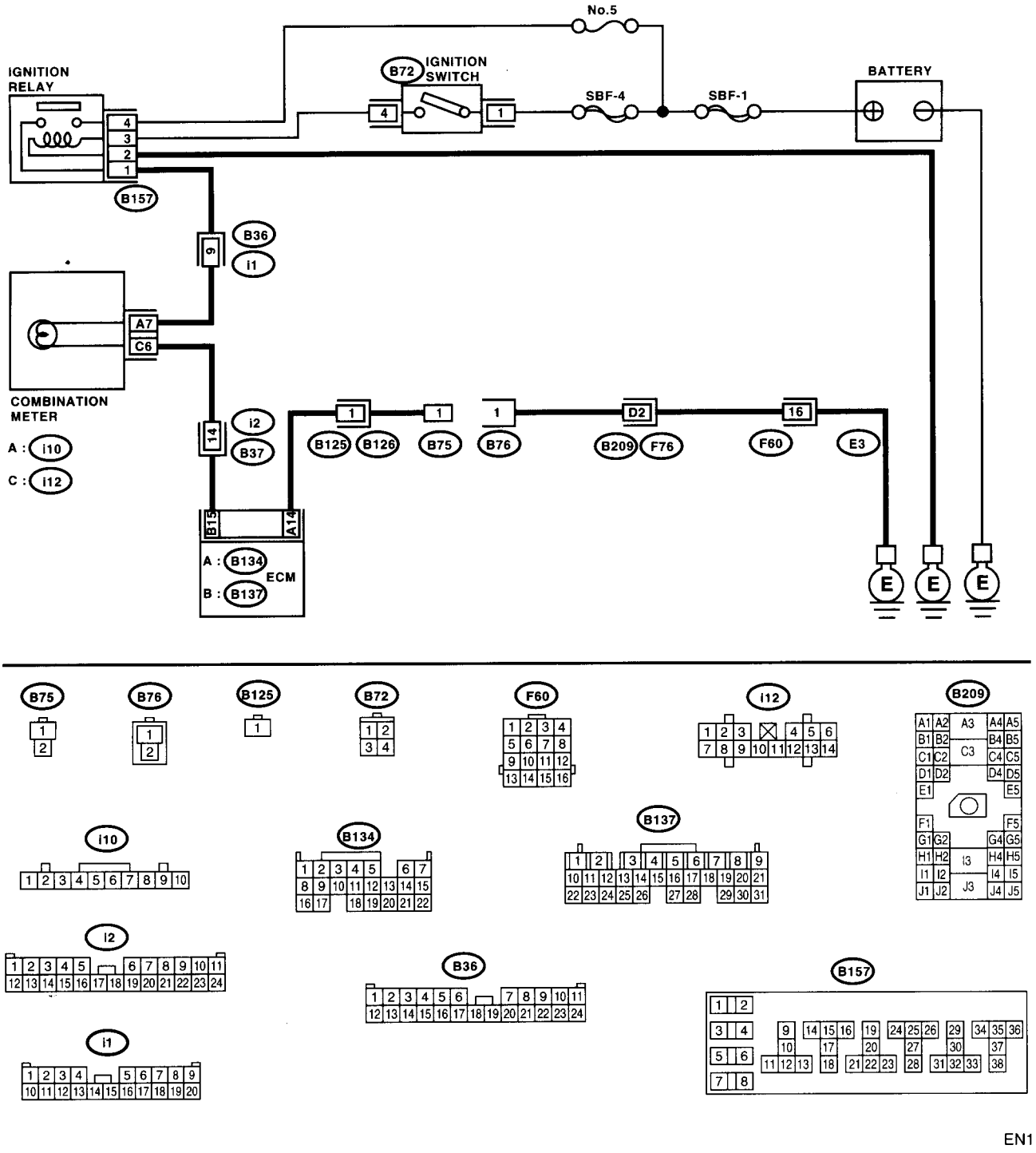


EN1138

	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?	Go to step **2.**	Repair the MIL circuit. <Ref. to EN(DOHC 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?	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 resistance less than 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?	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*** ***(B134) No. 14 — Chassis ground:***	Is the resistance less than 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?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(DOHC TURBO)-47, 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:**



EN1138

	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?	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. 14 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair short circuit in harness between ECM and test mode connector.	Replace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>

16.Diagnostics for Engine Starting Failure

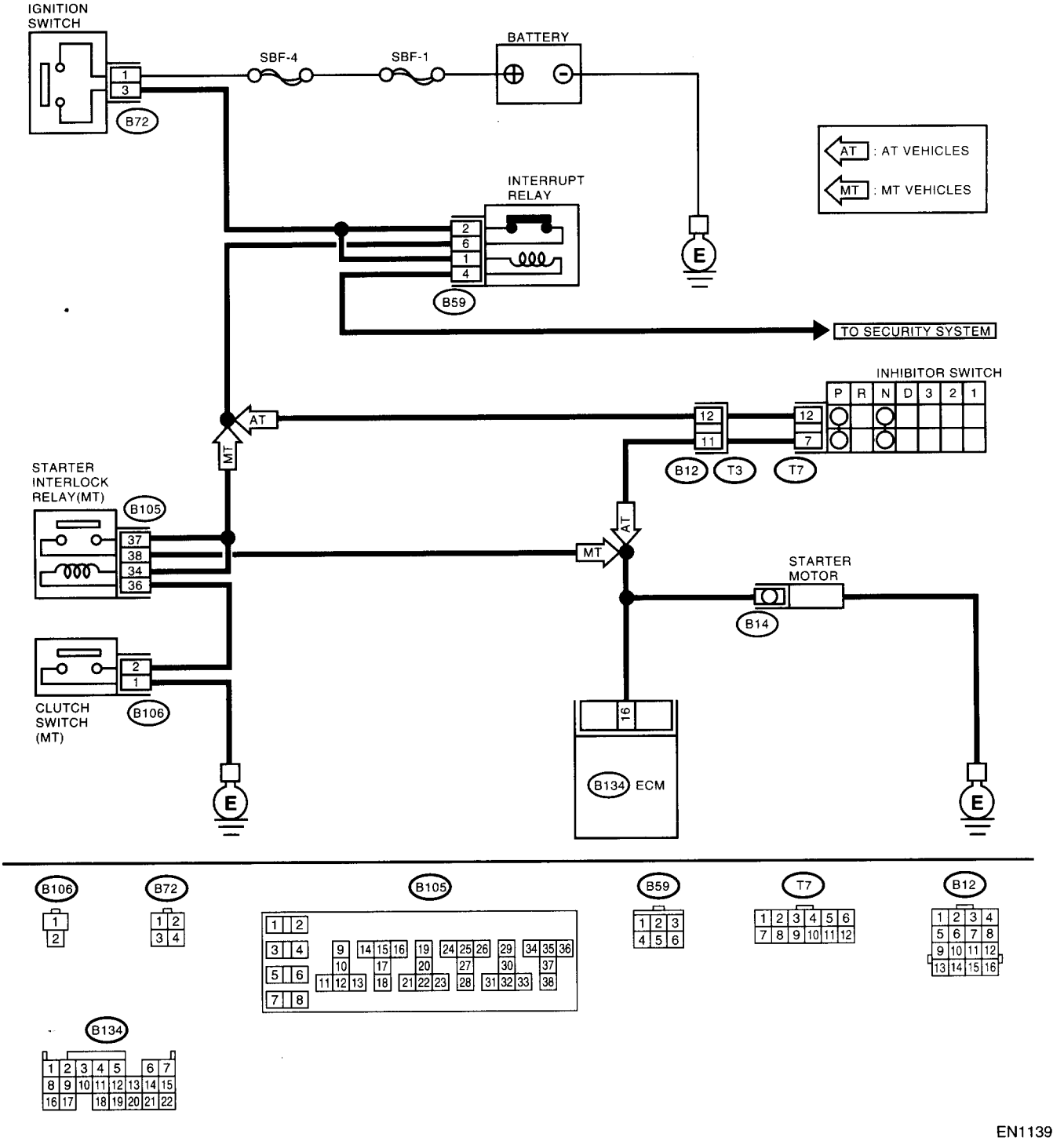
A: PROCEDURE

1. Inspection of starter motor circuit. <Ref. to EN(DOHC TURBO)-64, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
2. Inspection of ECM power supply and ground line. <Ref. to EN(DOHC TURBO)-68, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ignition control system. <Ref. to EN(DOHC TURBO)-72, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
4. Inspection of fuel pump circuit. <Ref. to EN(DOHC TURBO)-76, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel injector circuit. <Ref. to EN(DOHC TURBO)-78, 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(DOHC TURBO)-49, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN1139

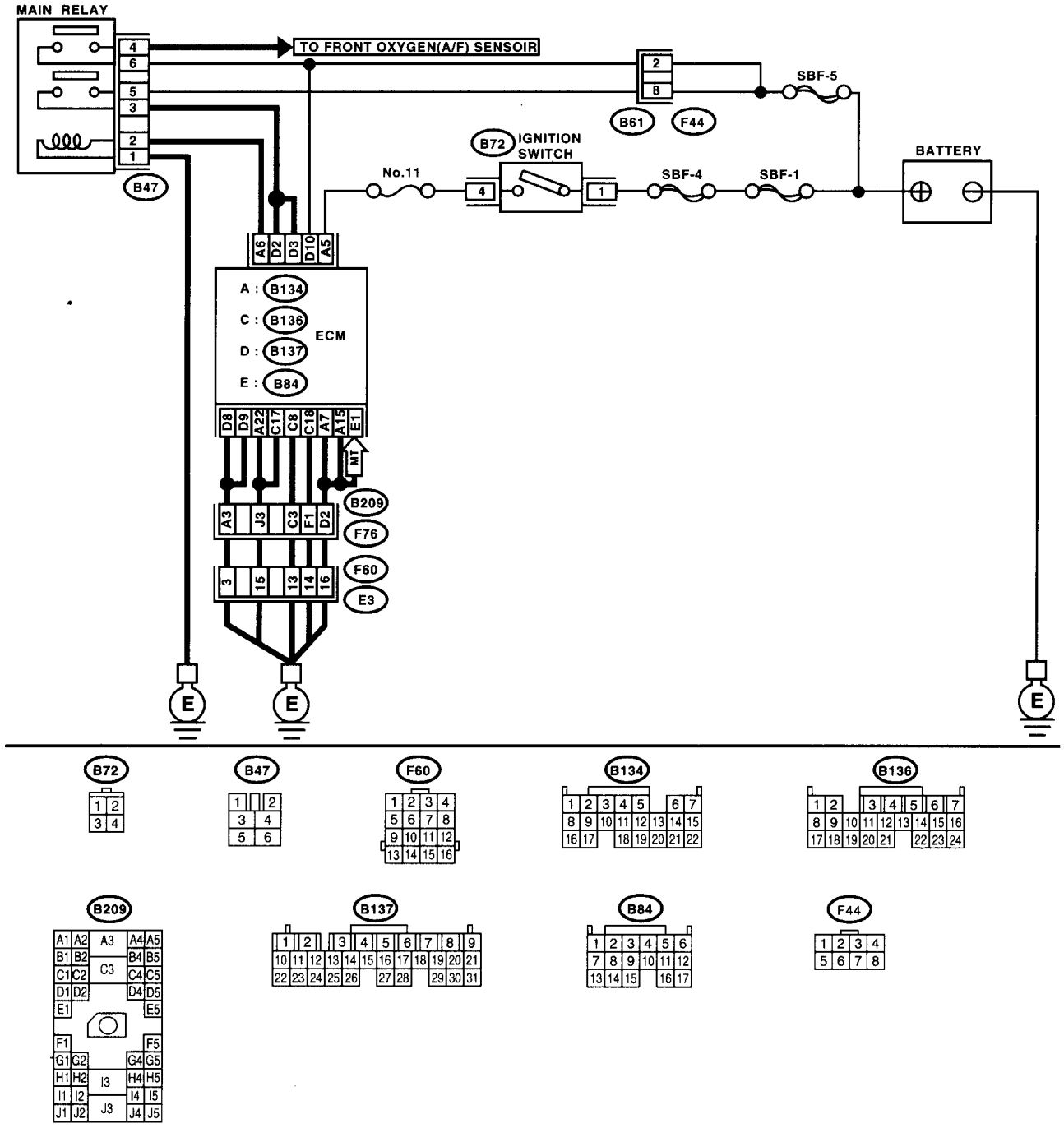
	Step	Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.**	Does the starter motor operate when the switch starts?	Go to step **2.**	Go to step **3.**
2	**CHECK DTC.** <Ref. to EN(DOHC TURBO)-45, OPERATION, Read Diagnostic Trouble Code.>	Is the trouble code stored in memory? <Ref. to EN(DOHC TURBO)-80, LIST, List of Diagnostic Trouble Code (DTC).>	Record the DTC. Repair the trouble case. <Ref. to EN(DOHC TURBO)-88, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step **3.**
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 ST. 4)Measure the power supply voltage between starter motor connector terminal and engine ground. ***Connector & terminal*** ***(B14) No. 1 (+) — Engine ground (–):***	Is the voltage more than 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)Disconnect the terminal from starter motor. 3)Measure the resistance of ground cable between ground cable terminal and engine ground.	Is the resistance less than 5 Ω?	Check the starter motor. <Ref. to SC-6, Starter.>	Repair open circuit of ground cable.
5	**CHECK HARNESS BETWEEN ECM AND STARTER MOTOR CIRCUIT.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between starter motor and ECM. ***Connector & terminal*** ***(B14) No. 1 — Engine ground:***	Is the resistance less than 1 Ω?	Repair ground short circuit.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND STARTER MOTOR CIRCUIT.** 1)Turn the ignition switch to START. 2)Measure the resistance of fuse. ***Connector & terminal*** ***(B14) No. 1 — Engine ground:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair ground short circuit.
7	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ignition switch. 3)Measure the power supply voltage between ignition switch the connector and chassis ground. ***Connector & terminal*** ***(B72) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **8.**	Repair open circuit in harness between ignition switch and battery.
8	**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 voltage more than 10 V?	Repair open circuit between ignition switch and starter motor circuit.	Go to step **9.**

	Step	Check	Yes	No
9	**CHECK POOR CONTACT.** Check poor contact in ignition switch connector.	Is there poor contact in ignition switch connector?	Repair 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(DOHC TURBO)-49, Clear Memory Mode.> and INSPECTION MODE. <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>

- **WIRING DIAGRAM:**



EN1171

Step	Check	Yes	No
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:***	s the resistance less than 10 Ω?	ɜo to step **2.**	Replace the main relay.
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: (MT vehicle)***	s the resistance less than 5 Ω?	ɜo to step **3.**	Repair open circuit in harness between ECM connector and engine grounding terminal.
CHECK INPUT VOLTAGE OF ECM. Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 10 (+) — Chassis ground (–):*** ***(B134) No. 5 (+) — Chassis ground (–):***	s the voltage more than 10 V?	ɜo to step **4.**	Repair open or ground short circuit of power supply circuit.
CHECK HARNESS BETWEEN ECM AND MAIN RELAY CONNECTOR. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 6 — Chassis ground:***	s the resistance more than 1 MΩ?	ɜo to step **5.**	Repair ground short circuit in harness between ECM connector and main relay connector, then replace the ECM.
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. 6 (+) — Chassis ground (–):***	s the voltage more than 10 V?	ɜo to step **6.**	Replace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>
CHECK INPUT VOLTAGE OF MAIN RELAY. Check the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 2 (+) — Chassis ground (–):***	s the voltage more than 10 V?	ɜo to step **7.**	Repair open circuit in harness between ECM connector and main relay connector.
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:***	s the resistance less than 5 Ω?	ɜo to step **8.**	Repair open circuit between main relay and chassis ground.

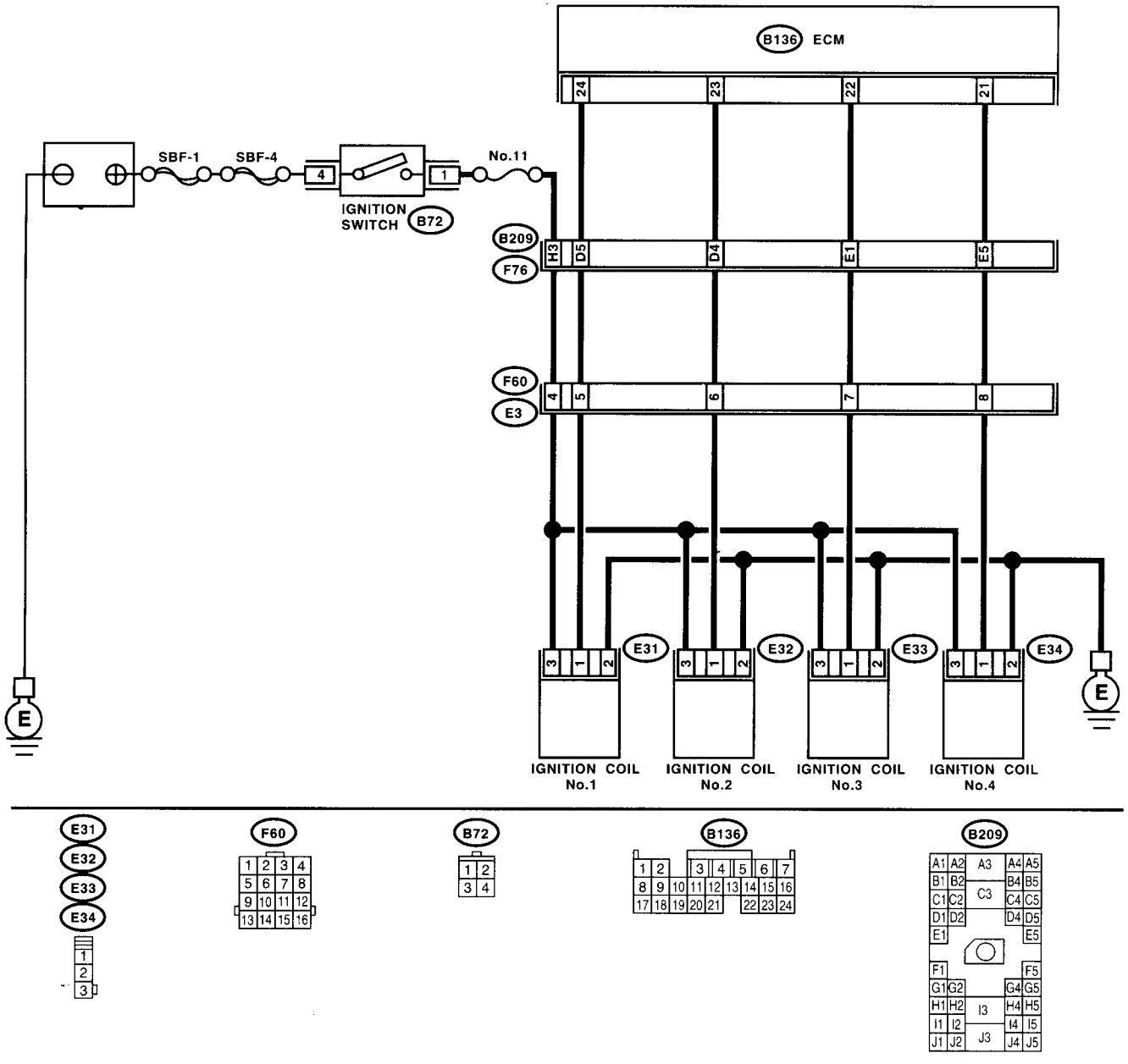
DIAGNOSTICS FOR ENGINE STARTING FAILURE

	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 voltage more than 10 V?	Go to step **9.**	Repair open or ground short circuit in harness of power supply circuit.
	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 voltage more than 10 V?	Check ignition control system. <Ref. to EN(DOHC TURBO)-72, 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(DOHC TURBO)-49, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN1140

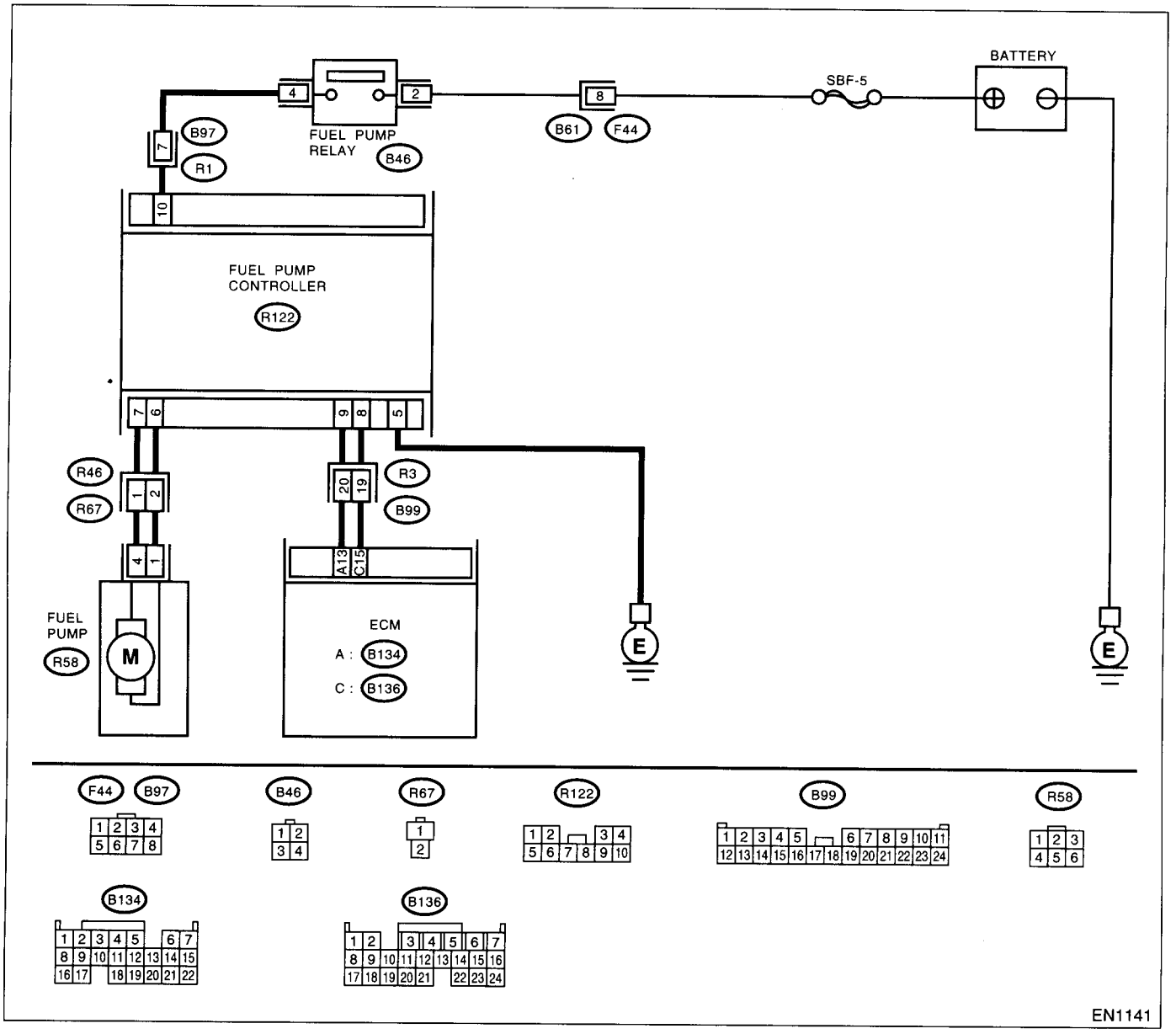
	Step	Check	Yes	No
	CHECK SPARK PLUG CONDITION. 1)Remove the spark plug. <Ref. to IG(DOHC TURBO)-5, INSTALLATION, Spark Plug.> 2)Check the spark plug condition. <Ref. to IG(DOHC TURBO)-6, INSPECTION, Spark Plug.>	s the spark plug's status OK?	Go to step **2.**	Replace the spark plug.
	CHECK IGNITION SYSTEM FOR SPARKS. 1)Connect the spark plug to ignition coil. 2)Release the fuel pressure. <Ref. to FU(DOHC TURBO)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.> 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?	Check fuel pump system. <Ref. to EN(DOHC TURBO)-76, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **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 (–):***	s the voltage more than 10 V?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repai the following: • Open circuit in harness between ignition coil & ignitor assembly, and ignition switch connector • Poor contact in coupling connectors
	CHECK HARNESS OF IGNITION COIL & IGNITOR ASSEMBLY GROUND CIRCUIT. 1)Turn the ignition switch to OFF. 2)Measure the resistance between ignition coi & 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:***	s the resistance between less han 5 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repai the following: • Open circuit in harness between ignition coil & ignitor assembly connector and engine grounding termina
	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:***	s the resistance less than 1 Ω?	Go to step **6.**	Repair harness and connector. NOTE: In this case, repai the following: • Open circuit in harness between ECM and ignition coil & ignitor assembly connector • Poor contact in coupling connecto

	Step	Check	Yes	No
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 resistance more than 1 MΩ?	Go to step **7**.	Repair ground short circuit in harness between ECM and ignition coil & ignitor assembly connector.
7	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair 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(DOHC TURBO)-49, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

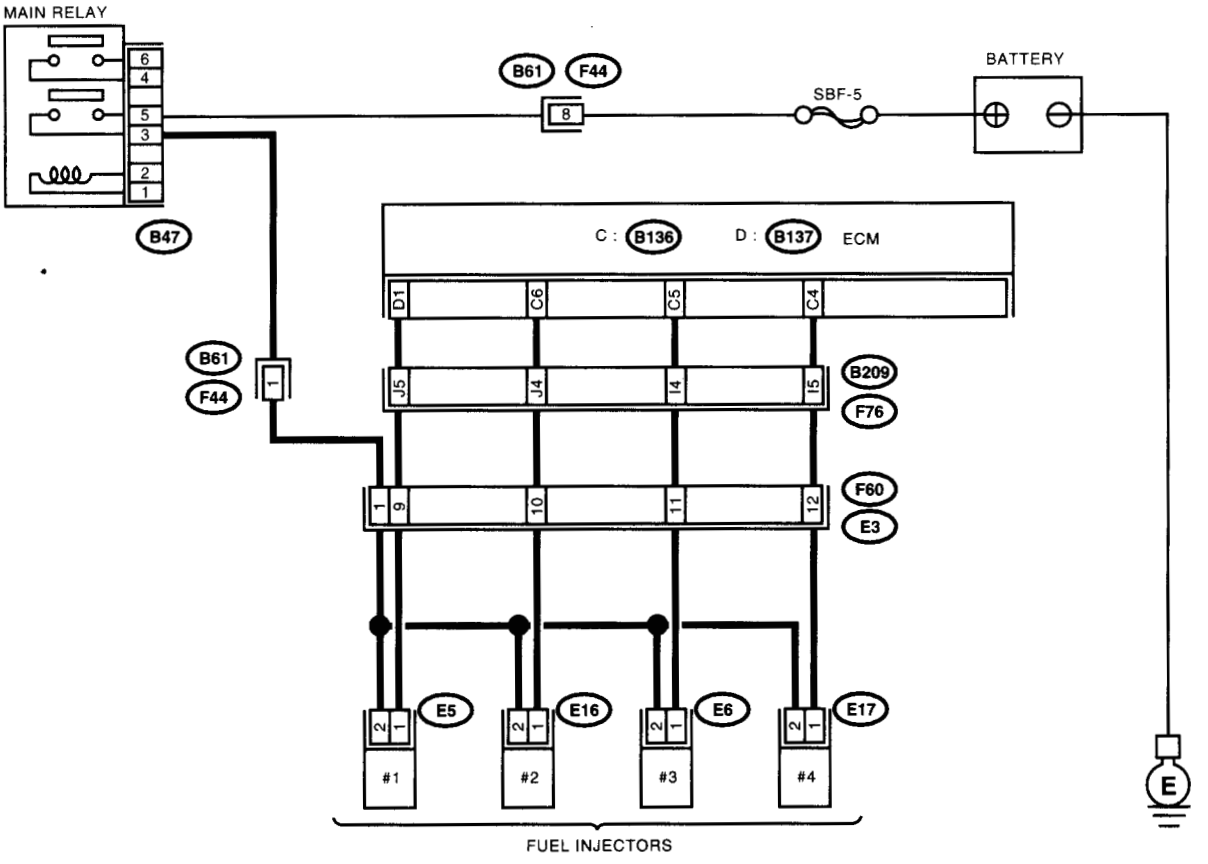
- **WIRING DIAGRAM:**



	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. 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(DOHC TURBO)-50, Compulsory Valve Operation Check Mode.>	Does the fuel pump produce operating sound?	Check the fuel injector circuit. <Ref. to EN(DOHC TURBO)-78, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Record the DTC. Repair the trouble case. <Ref. to EN(DOHC TURBO)-88, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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(DOHC TURBO)-49, Clear Memory Mode.> and INSPECTION MODE. <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>**
- **WIRING DIAGRAM:**



EN1142

DIAGNOSTICS FOR ENGINE STARTING FAILURE

	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.	Is the fuel injector emits "operating" sound?	Check the fuel pressure. <Ref. to ME(DOHC TURBO)-27, INSPECTION, Fuel Pressure.>	Go to step **2.**
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 voltage more than 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 • 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 resistance less than 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*** ***(B137) No. 1 — Chassis ground:*** ***(B136) No. 6 — Chassis ground:*** ***(B136) No. 5 — Chassis ground:*** ***(B136) No. 4 — Chassis ground:***	Is the resistance less than 1 Ω?	Repair 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 resistance between 5 and 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?	Repair poor contact in ECM connector.	Inspection using "General Diagnostic Table". <Ref. to EN(DOHC TURBO)-372, INSPECTION, General Diagnostic Table.>

17.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC No.	Item	Index
P0031	Front oxygen (A/F) sensor heater circuit low input	<Ref. to EN(DOHC TURBO)-88, DTC P0031 — FRONT OXYGEN (A/F) SENSOR HEATER CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	Front oxygen (A/F) sensor heater circuit high input	<Ref. to EN(DOHC TURBO)-92, DTC P0032 — FRONT OXYGEN (A/F) SENSOR HEATER CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	Rear oxygen sensor heater circuit malfunction	<Ref. to EN(DOHC TURBO)-94, DTC P0037 — REAR OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	Rear oxygen sensor heater circuit high input	<Ref. to EN(DOHC TURBO)-98, DTC P0038 — REAR OXYGEN SENSOR HEATER CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0101	Mass air flow sensor circuit range/performance problem (high input)	<Ref. to EN(DOHC TURBO)-100, DTC P0101 — MASS AIR FLOW SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0102	Mass air flow sensor circuit low input	<Ref. to EN(DOHC TURBO)-102, DTC P0102 — MASS AIR FLOW SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0103	Mass air flow sensor circuit high input	<Ref. to EN(DOHC TURBO)-106, DTC P0103 — MASS AIR FLOW SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0106	Pressure sensor circuit range/performance problem (low input)	<Ref. to EN(DOHC TURBO)-108, DTC P0106 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Pressure sensor circuit low input	<Ref. to EN(DOHC TURBO)-110, DTC P0107 — PRESSURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Pressure sensor circuit high input	<Ref. to EN(DOHC TURBO)-114, DTC P0108 — PRESSURE SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0111	Intake air temperature sensor circuit range/performance problem	<Ref. to EN(DOHC TURBO)-118, DTC P0111 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake air temperature sensor circuit low input	<Ref. to EN(DOHC TURBO)-120, DTC P0112 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake air temperature sensor circuit high input	<Ref. to EN(DOHC TURBO)-122, DTC P0113 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine coolant temperature sensor circuit low input	<Ref. to EN(DOHC TURBO)-126, DTC P0117 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine coolant temperature sensor circuit high input	<Ref. to EN(DOHC TURBO)-128, DTC P0118 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0121	Throttle position sensor circuit range/performance problem (high input)	<Ref. to EN(DOHC TURBO)-132, DTC P0121 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0122	Throttle position sensor circuit low input	<Ref. to EN(DOHC TURBO)-134, DTC P0122 — THROTTLE POSITION SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P0123	Throttle position sensor circuit high input	<Ref. to EN(DOHC TURBO)-138, DTC P0123 — THROTTLE POSITION SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0125	Insufficient coolant temperature for closed loop fuel control	<Ref. to EN(DOHC TURBO)-140, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0128	Thermostat malfunction	<Ref. to EN(DOHC TURBO)-142, DTC P0128 — THERMOSTAT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0131	Front oxygen (A/F) sensor circuit range/performance problem (low input)	<Ref. to EN(DOHC TURBO)-143, DTC P0131 — FRONT OXYGEN (A/F) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0132	Front oxygen (A/F) sensor circuit range/performance problem (high input)	<Ref. to EN(DOHC TURBO)-144, DTC P0132 — FRONT OXYGEN (A/F) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	Front oxygen (A/F) sensor circuit slow response	<Ref. to EN(DOHC TURBO)-146, DTC P0133 — FRONT OXYGEN (A/F) SENSOR CIRCUIT SLOW RESPONSE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0136	Rear oxygen sensor circuit malfunction	<Ref. to EN(DOHC TURBO)-148, DTC P0136 — REAR OXYGEN SENSOR CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	Rear oxygen sensor circuit slow response	<Ref. to EN(DOHC TURBO)-150, DTC P0139 — REAR OXYGEN SENSOR CIRCUIT SLOW RESPONSE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	Fuel trim malfunction (A/F too lean)	<Ref. to EN(DOHC TURBO)-152, DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	Fuel trim malfunction (A/F too rich)	<Ref. to EN(DOHC TURBO)-153, DTC P0172 — FUEL TRIM MALFUNCTION (A/F TOO RICH) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0181	Fuel temperature sensor A circuit range/performance problem	<Ref. to EN(DOHC TURBO)-156, DTC P0181 — FUEL TEMPERATURE SENSOR A CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0182	Fuel temperature sensor A circuit low input	<Ref. to EN(DOHC TURBO)-158, DTC P0182 — FUEL TEMPERATURE SENSOR A CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0183	Fuel temperature sensor A circuit high input	<Ref. to EN(DOHC TURBO)-160, DTC P0183 — FUEL TEMPERATURE SENSOR A CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0244	Wastegate control solenoid valve malfunction (high input)	<Ref. to EN(DOHC TURBO)-164, DTC P0244 — WASTEGATE CONTROL SOLENOID VALVE MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0245	Wastegate control solenoid valve circuit low input	<Ref. to EN(DOHC TURBO)-166, DTC P0245 — WASTEGATE CONTROL SOLENOID VALVE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0246	Wastegate control solenoid valve circuit high input	<Ref. to EN(DOHC TURBO)-170, DTC P0246 — WASTEGATE CONTROL SOLENOID VALVE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 misfire detected	<Ref. to EN(DOHC TURBO)-172, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 misfire detected	<Ref. to EN(DOHC TURBO)-172, DTC P0302 — CYLINDER 2 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 misfire detected	<Ref. to EN(DOHC TURBO)-172, DTC P0303 — CYLINDER 3 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 misfire detected	<Ref. to EN(DOHC TURBO)-173, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

DTC No.	Item	Index
P0327	Knock sensor circuit low input	<Ref. to EN(DOHC TURBO)-182, DTC P0327 — KNOCK SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock sensor circuit high input	<Ref. to EN(DOHC TURBO)-184, DTC P0328 — KNOCK SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft position sensor circuit malfunction	<Ref. to EN(DOHC TURBO)-186, DTC P0335 — CRANKSHAFT POSITION SENSOR CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0336	Crankshaft position sensor circuit range/performance problem	<Ref. to EN(DOHC TURBO)-188, DTC P0336 — Crankshaft Position Sensor Circuit Range/Performance Problem —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft position sensor circuit malfunction	<Ref. to EN(DOHC TURBO)-190, DTC P0340 — CAMSHAFT POSITION SENSOR CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0341	Camshaft position sensor circuit range/performance problem	<Ref. to EN(DOHC TURBO)-192, DTC P0341 — CAMSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst system efficiency below threshold	<Ref. to EN(DOHC TURBO)-196, DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0442	Evaporative emission control system malfunction	<Ref. to EN(DOHC TURBO)-199, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0444	Evaporative emission control system purge control valve circuit low input	<Ref. to EN(DOHC TURBO)-204, DTC P0444 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0445	Evaporative emission control system purge control valve circuit high input	<Ref. to EN(DOHC TURBO)-208, DTC P0445 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0447	Evaporative emission control system vent control low input	<Ref. to EN(DOHC TURBO)-210, DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0448	Evaporative emission control system vent control high input	<Ref. to EN(DOHC TURBO)-214, DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0451	Evaporative emission control system pressure sensor range/performance problem	<Ref. to EN(DOHC TURBO)-216, DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0452	Evaporative emission control system pressure sensor low input	<Ref. to EN(DOHC TURBO)-218, DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0453	Evaporative emission control system pressure sensor high input	<Ref. to EN(DOHC TURBO)-222, DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0461	Fuel level sensor circuit range/performance problem	<Ref. to EN(DOHC TURBO)-225, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel level sensor circuit low input	<Ref. to EN(DOHC TURBO)-228, 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(DOHC TURBO)-232, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P0464	Fuel level sensor intermittent input	<Ref. to EN(DOHC TURBO)-236, DTC P0464 — FUEL LEVEL SENSOR INTERMITTENT INPUT—, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0480	Cooling fan relay 1 circuit low input	<Ref. to EN(DOHC TURBO)-239, DTC P0480 — COOLING FAN RELAY 1 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Cooling fan function problem	<Ref. to EN(DOHC TURBO)-243, DTC P0483 — COOLING FAN FUNCTION PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0500	Vehicle speed sensor malfunction	<Ref. to EN(DOHC TURBO)-246, DTC P0500 — VEHICLE SPEED SENSOR MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle control system RPM lower than expected	<Ref. to EN(DOHC TURBO)-248, 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(DOHC TURBO)-250, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0508	Idle control system circuit low input	<Ref. to EN(DOHC TURBO)-252, DTC P0508 — IDLE CONTROL SYSTEM CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0509	Idle control system circuit high input	<Ref. to EN(DOHC TURBO)-254, DTC P0509 — IDLE CONTROL SYSTEM CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter switch circuit high input	<Ref. to EN(DOHC TURBO)-257, DTC P0512 — STARTER SWITCH CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0545	Exhaust gas temperature sensor circuit low input	<Ref. to EN(DOHC TURBO)-260, DTC P0545 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0546	Exhaust gas temperature sensor circuit high input	<Ref. to EN(DOHC TURBO)-262, DTC P0546 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal control module memory check sum error	<Ref. to EN(DOHC TURBO)-266, DTC P0604 — INTERNAL CONTROL MODULE MEMORY CHECK SUM ERROR —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0703	Brake switch input malfunction	<Ref. to EN(DOHC TURBO)-268, DTC P0703 — BRAKE SWITCH INPUT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0705	Transmission range sensor circuit malfunction	<Ref. to AT-115, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-Diagnostic Trouble Code (DTC).>
P0710	Transmission fluid temperature sensor circuit malfunction	<Ref. to AT-48, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0715	Torque converter turbine speed sensor circuit malfunction	<Ref. to AT-62, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0720	Output speed sensor (vehicle speed sensor 2) circuit malfunction	<Ref. to AT-57, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0725	Engine speed input circuit malfunction	<Ref. to AT-44, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0731	Gear 1 incorrect ratio	<Ref. to EN(DOHC TURBO)-270, DTC P0731 — GEAR 1 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0732	Gear 2 incorrect ratio	<Ref. to EN(DOHC TURBO)-270, DTC P0732 — GEAR 2 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0733	Gear 3 incorrect ratio	<Ref. to EN(DOHC TURBO)-270, DTC P0733 — GEAR 3 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

DTC No.	Item	Index
P0734	Gear 4 incorrect ratio	<Ref. to EN(DOHC TURBO)-270, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0741	Torque converter clutch system malfunction	<Ref. to EN(DOHC TURBO)-272, DTC P0741 — TORQUE CONVERTER CLUTCH SYSTEM MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0743	Torque converter clutch system (Lock-up duty solenoid) electrical	<Ref. to AT-94, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0748	Pressure control solenoid (Line pressure duty solenoid) electrical	<Ref. to AT-86, DTC 75 LINE PRESSURE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0753	Shift solenoid A (Shift solenoid 1) electrical	<Ref. to AT-70, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0758	Shift solenoid B (Shift solenoid 2) electrical	<Ref. to AT-74, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0778	2-4 brake pressure control solenoid valve (2-4 brake duty solenoid) circuit malfunction	<Ref. to AT-90, DTC 76 2–4 BRAKE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0785	2-4 brake timing control solenoid valve (2-4 brake timing solenoid) circuit malfunction	<Ref. to AT-82, DTC 74 2-4 BRAKE TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1086	Tumble generator valve #2 (LH) position sensor circuit low input	<Ref. to EN(DOHC TURBO)-274, DTC P1086 — TUMBLE GENERATOR VALVE #2 (LH) POSITION SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1087	Tumble generator valve #2 (LH) position sensor circuit high input	<Ref. to EN(DOHC TURBO)-278, DTC P1087 — TUMBLE GENERATOR VALVE #2 (LH) POSITION SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1088	Tumble generator valve #1 (RH) position sensor circuit low input	<Ref. to EN(DOHC TURBO)-280, DTC P1088 — TUMBLE GENERATOR VALVE #1 (RH) POSITION SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1089	Tumble generator valve #1 (RH) position sensor circuit high input	<Ref. to EN(DOHC TURBO)-284, DTC P1089 — TUMBLE GENERATOR VALVE #1 (RH) POSITION SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1090	Tumble generator valve #1(RH) malfunction (stuck open)	<Ref. to EN(DOHC TURBO)-286, DTC P1090 — TUMBLE GENERATOR VALVE SYSTEM #1 (RH) MALFUNCTION (STUCK OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1091	Tumble generator valve #1(RH) malfunction (stuck close)	<Ref. to EN(DOHC TURBO)-287, DTC P1091 — TUMBLE GENERATOR VALVE SYSTEM #1 (RH) MALFUNCTION (STUCK CLOSE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1092	Tumble generator valve #2(LH) malfunction (stuck open)	<Ref. to EN(DOHC TURBO)-288, DTC P1092 — TUMBLE GENERATOR VALVE SYSTEM #2 (LH) MALFUNCTION (STUCK OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1093	Tumble generator valve #2(LH) malfunction (stuck close)	<Ref. to EN(DOHC TURBO)-289, DTC P1093 — TUMBLE GENERATOR VALVE SYSTEM #2 (LH) MALFUNCTION (STUCK CLOSE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1094	Tumble generator valve circuit #1 (opencircuit)	<Ref. to EN(DOHC TURBO)-290, DTC P1094 — TUMBLE GENERATOR VALVE CIRCUIT #1 (OPEN CIRCUIT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1095	Tumble generator valve circuit #1 (overcurrent)	<Ref. to EN(DOHC TURBO)-292, DTC P1095 — TUMBLE GENERATOR VALVE CIRCUIT #1 (OVERCURRENT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1096	Tumble generator valve circuit #2 (opencircuit)	<Ref. to EN(DOHC TURBO)-294, DTC P1096 — TUMBLE GENERATOR VALVE CIRCUIT #2 (OPEN CIRCUIT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1097	Tumble generator valve circuit #2 (overcurrent)	<Ref. to EN(DOHC TURBO)-296, DTC P1097 — TUMBLE GENERATOR VALVE CIRCUIT #2 (OVERCURRENT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P1110	Atmospheric pressure sensor low input	<Ref. to EN(DOHC TURBO)-297, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1111	Atmospheric pressure sensor high input	<Ref. to EN(DOHC TURBO)-297, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1112	Atmospheric pressure sensor range/performance problem	<Ref. to EN(DOHC TURBO)-298, DTC P1112 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1130	Front oxygen sensor circuit malfunction (open circuit)	<Ref. to EN(DOHC TURBO)-300, DTC P1130 — FRONT OXYGEN (A/F) SENSOR CIRCUIT MALFUNCTION (OPEN CIRCUIT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1131	Front oxygen sensor circuit malfunction (short circuit)	<Ref. to EN(DOHC TURBO)-302, DTC P1131 — FRONT OXYGEN (A/F) SENSOR CIRCUIT MALFUNCTION (SHORT CIRCUIT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1134	Front oxygen (A/F) sensor micro-computer problem	<Ref. to EN(DOHC TURBO)-304, DTC P1134 — FRONT OXYGEN (A/F) SENSOR MICRO-COMPUTER PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1139	Front oxygen (A/F) sensor #1 heater circuit perfomance/range problem	<Ref. to EN(DOHC TURBO)-306, DTC P1139 — FRONT OXYGEN (A/F) SENSOR #1 HEATER CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1141	Mass air flow sensor circuit range/perfomance problem (low input)	<Ref. to EN(DOHC TURBO)-308, DTC P1141 — MASS AIR FLOW SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1142	Throttle position sensor circuit range/performance problem (low input)	<Ref. to EN(DOHC TURBO)-310, DTC P1142 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1146	Pressure sensor circuit range/performance problem (high input)	<Ref. to EN(DOHC TURBO)-312, DTC P1146 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1230	Fuel pump control unit maifunction	<Ref. to EN(DOHC TURBO)-314, DTC P1230 — FUEL PUMP CONTROLLER MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1244	Wastegate control solenoid valve malfunction (low input)	<Ref. to EN(DOHC TURBO)-318, DTC P1244 — WASTEGATE CONTROL SOLENOID VALVE RANGE/PERFORMANCE PROBLEM (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1245	Wastegate control solenoid valve malfunction (fail-safe)	<Ref. to EN(DOHC TURBO)-320, DTC P1245 — WASTEGATE CONTROL SOLENOID VALVE MALFUNCTION (FAIL-SAFE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1301	Fire due to increased exhaust temperature	<Ref. to EN(DOHC TURBO)-322, DTC P1301 — FIRE DUE TO INCREASED EXHAUST TEMPERATURE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1312	Exhaust temperature sensor malfunction	<Ref. to EN(DOHC TURBO)-324, DTC P1312 — EXHAUST GAS TEMPERATURE CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1400	Fuel tank pressure control solenoid valve circuit low input	<Ref. to EN(DOHC TURBO)-326, DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1420	Fuel tank pressure control solenoid valve circuit high input	<Ref. to EN(DOHC TURBO)-330, DTC P1420 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1443	Evaporative emission control system vent control function problem	<Ref. to EN(DOHC TURBO)-332, DTC P1443 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL FUNCTION PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1480	Cooling fan relay 1 circuit high input	<Ref. to EN(DOHC TURBO)-335, DTC P1480 — COOLING FAN RELAY 1 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

DTC No.	Item	Index
P1507	Idle control system malfunction (fail-safe)	<Ref. to EN(DOHC TURBO)-338, DTC P1507 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter switch circuit low input	<Ref. to EN(DOHC TURBO)-341, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1544	High exhaust temperature detected	<Ref. to EN(DOHC TURBO)-344, DTC P1544 — HIGH EXHAUST TEMPERATURE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-up voltage circuit malfunction	<Ref. to EN(DOHC TURBO)-347, DTC P1560 — Back-up Voltage Circuit Malfunction —.>
P1590	Neutral position switch circuit high input	<Ref. to EN(DOHC TURBO)-350, DTC P1590 — NEUTRAL POSITION SWITCH CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1591	Neutral position switch circuit low input	<Ref. to EN(DOHC TURBO)-354, DTC P1591 — NEUTRAL POSITION SWITCH CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1594	Automatic transmission diagnosis input signal circuit malfunction	<Ref. to EN(DOHC TURBO)-356, DTC P1594 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1595	Automatic transmission diagnosis input signal circuit low input	<Ref. to EN(DOHC TURBO)-358, DTC P1595 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1596	Automatic transmission diagnosis input signal circuit high input	<Ref. to EN(DOHC TURBO)-360, DTC P1596 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1698	Engine torque control cut signal circuit low input	<Ref. to EN(DOHC TURBO)-362, DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1699	Engine torque control cut signal circuit high input	<Ref. to EN(DOHC TURBO)-364, DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1700	Throttle position sensor circuit malfunction for automatic transmission	<Ref. to AT-52, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1701	Cruise control set signal circuit malfunction for automatic transmission	<Ref. to EN(DOHC TURBO)-366, DTC P1701 — CRUISE CONTROL SET SIGNAL CIRCUIT MALFUNCTION FOR AUTOMATIC TRANSMISSION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1703	Low clutch timing control solenoid valve circuit malfunction	<Ref. to AT-78, DTC 73 LOW CLUTCH TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1711	Engine torque control signal 1 circuit malfunction	<Ref. to EN(DOHC TURBO)-368, 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(DOHC TURBO)-370, DTC P1712 — ENGINE TORQUE CONTROL SIGNAL 2 CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

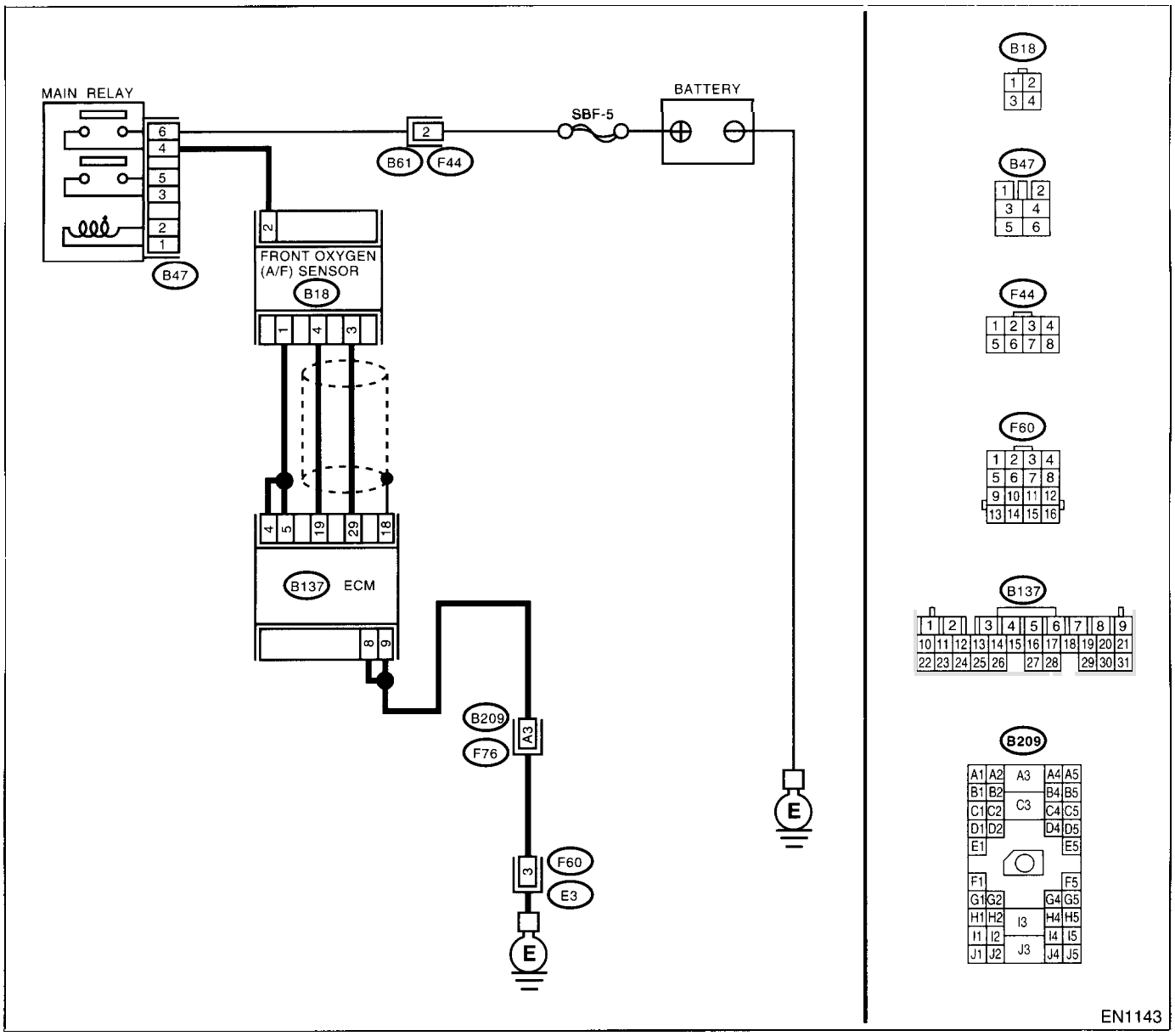
18. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0031 — FRONT OXYGEN (A/F) SENSOR HEATER 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, 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 indicate DTC P0031 and P0037 at the same time?	Go to step **2.**	Go to step **5.**
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. 2 (+) — Engine ground (–):***	Is the voltage more than 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*** ***(B137) No. 8 — Chassis ground:*** ***(B137) No. 9 — Chassis ground:***	Is the resistance less than 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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 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 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 (–):*** ***(B137) No. 5 (+) — Chassis ground (–):***	Is the voltage less than 1.0 V?	Go to step **7.**	Go to step **6.**
6	**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 (–):***	Does the voltage change less than 1.0 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Go to step **7.**

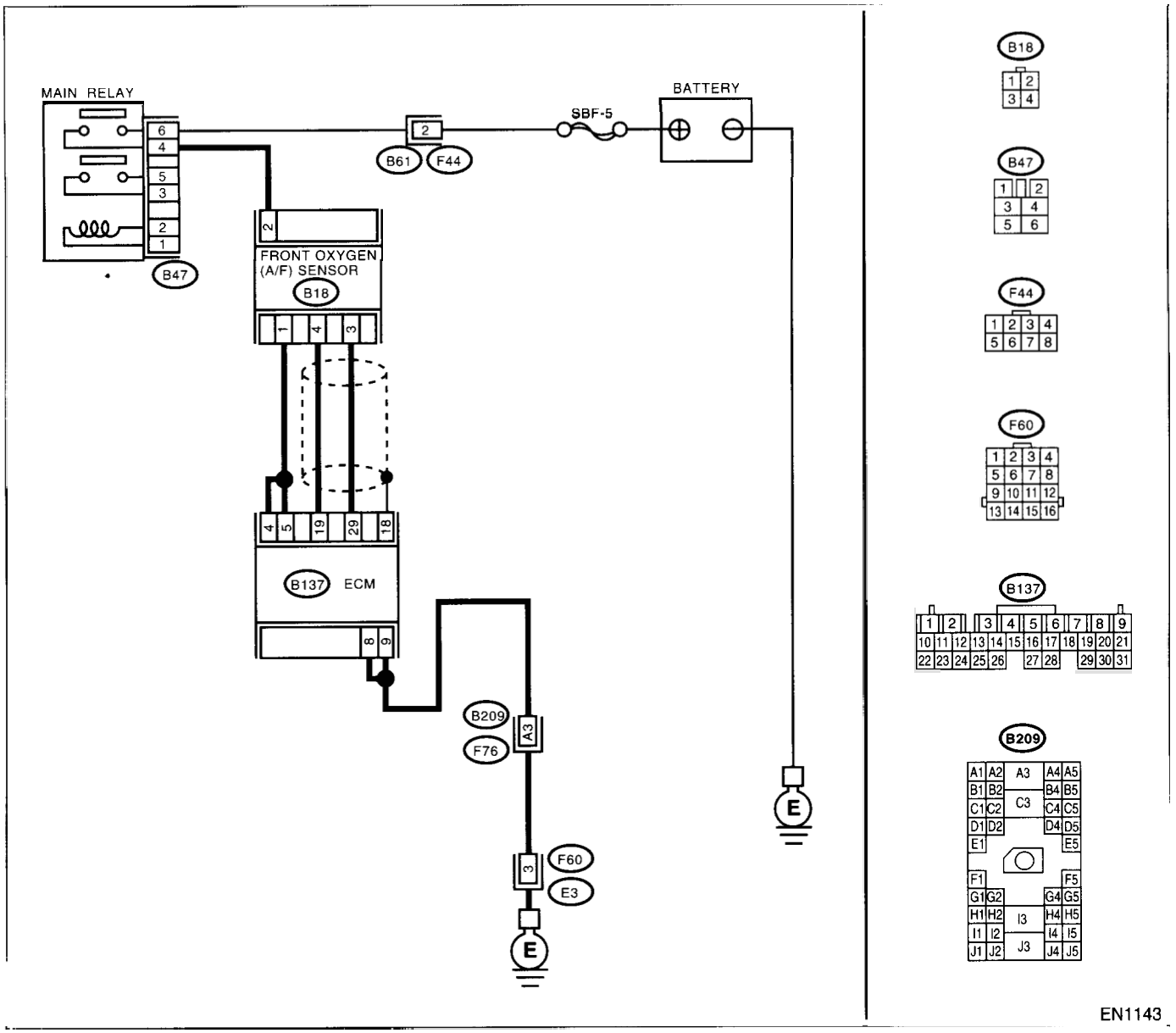
	Step	Check	Yes	No
7	**CHECK FRONT OXYGEN (A/F) SENSOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the resistance less than 10 Ω?	Repair harness and connector. NOTE: In this case, repair the 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(DOHC TURBO)-42, Front Oxygen (A/F) Sensor.>

B: DTC P0032 — FRONT OXYGEN (A/F) SENSOR HEATER 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN1143

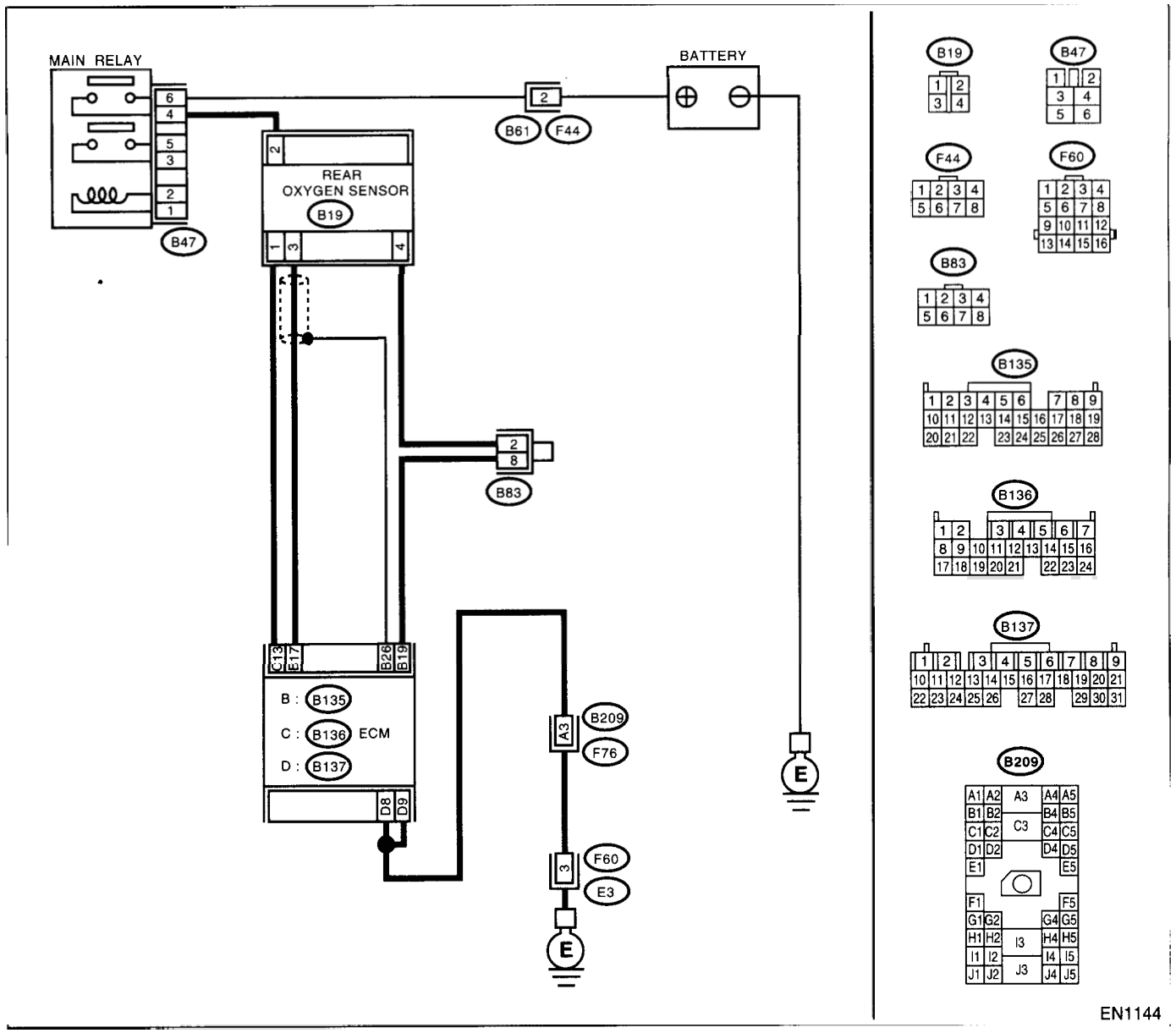
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 4 (+) — Chassis ground (–):*** ***(B137) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go 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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 2.3 A?	Replace the ECM. <Ref. to FU(DOHC TURBO)-47, 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 (–):***	Does the voltage change more than 8 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END

C: DTC P0037 — REAR OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN1144

	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 resistance less than 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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 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 voltage less than 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 (–):***	Does the voltage change less than 1.0 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	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. 13 (+) — Chassis ground (–):***	Is the voltage less than 1.0 V?	Replace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>	Repair battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>

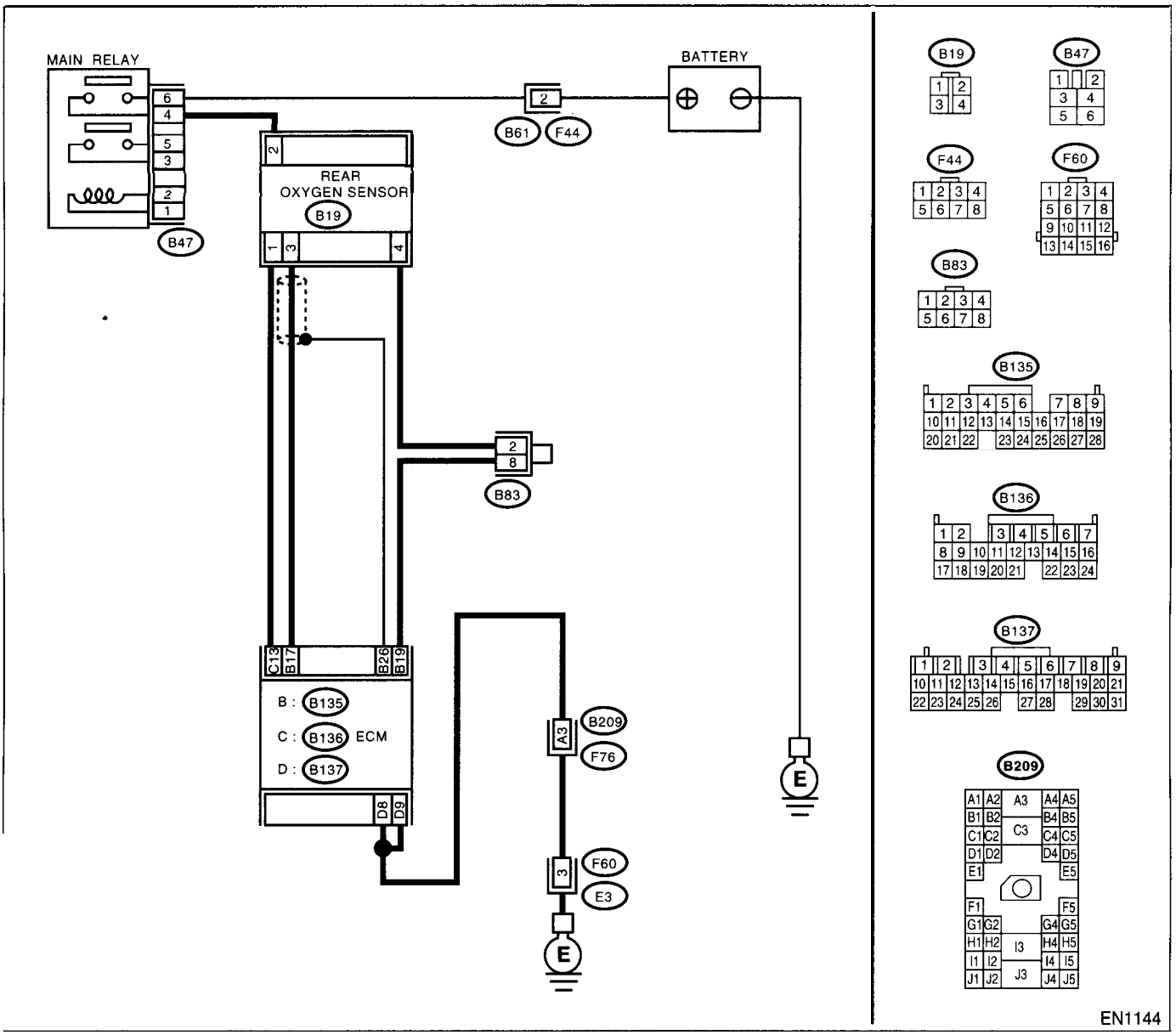
	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from rear oxygen sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between rear oxygen sensor connector and engine ground or chassis ground. ***Connector & terminal*** ***(B19) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 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 resistance less than 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(DOHC TURBO)-44, Rear Oxygen Sensor.>

D: DTC P0038 — REAR OXYGEN SENSOR HEATER 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, 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. 13 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **2.**	Go to step **3.**

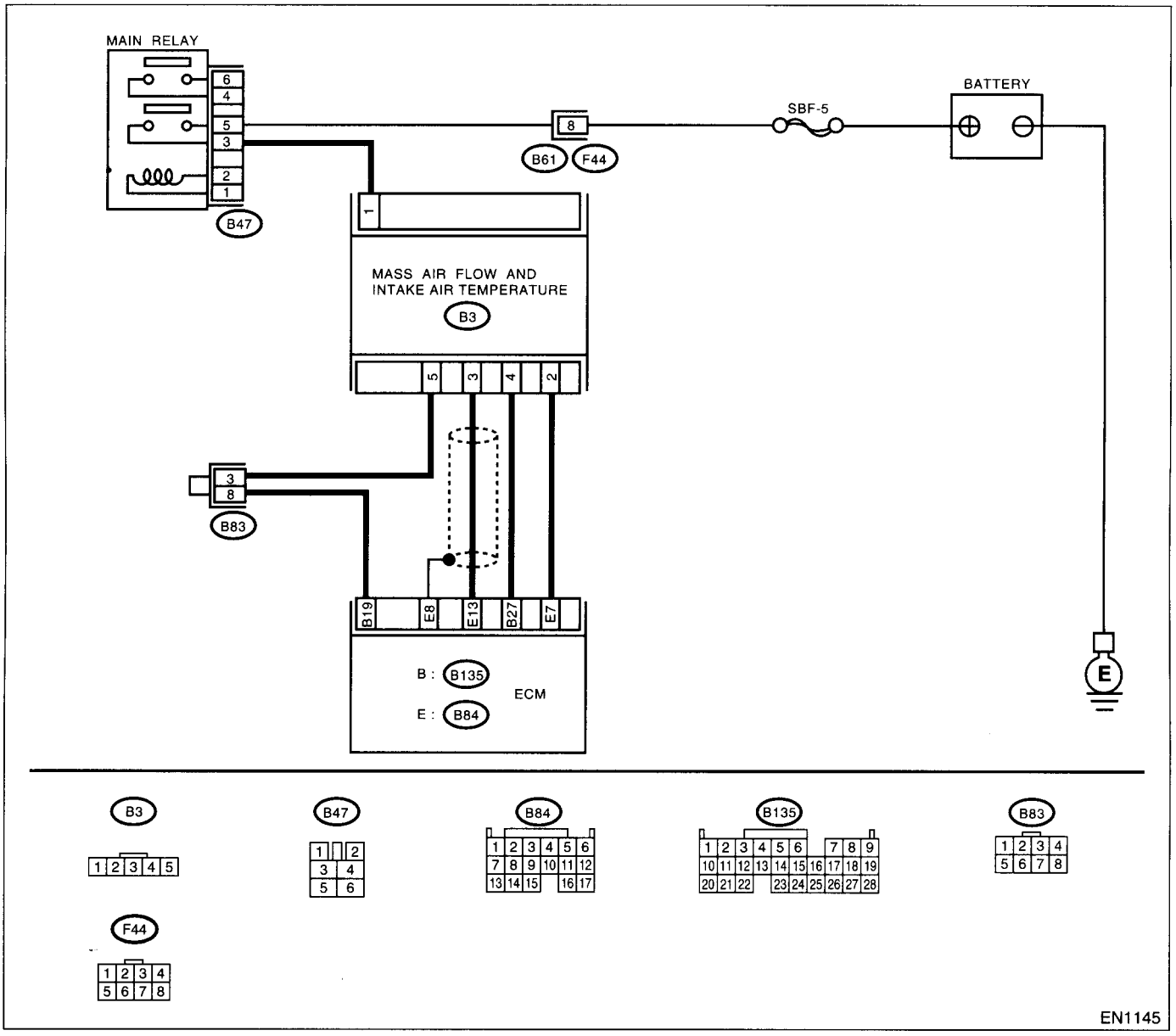
	Step	Check	Yes	No
2	**CHECK CURRENT DATA.** 1)Turn the ignition switch to OFF. 2)Repair the battery short circuit in harness between ECM and rear oxygen sensor connector. 3)Turn the ignition switch to ON. 4)Read the data of rear oxygen sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 7 A?	Replace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>	END
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	END

E: DTC P0101 — MASS AIR FLOW SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —

- **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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

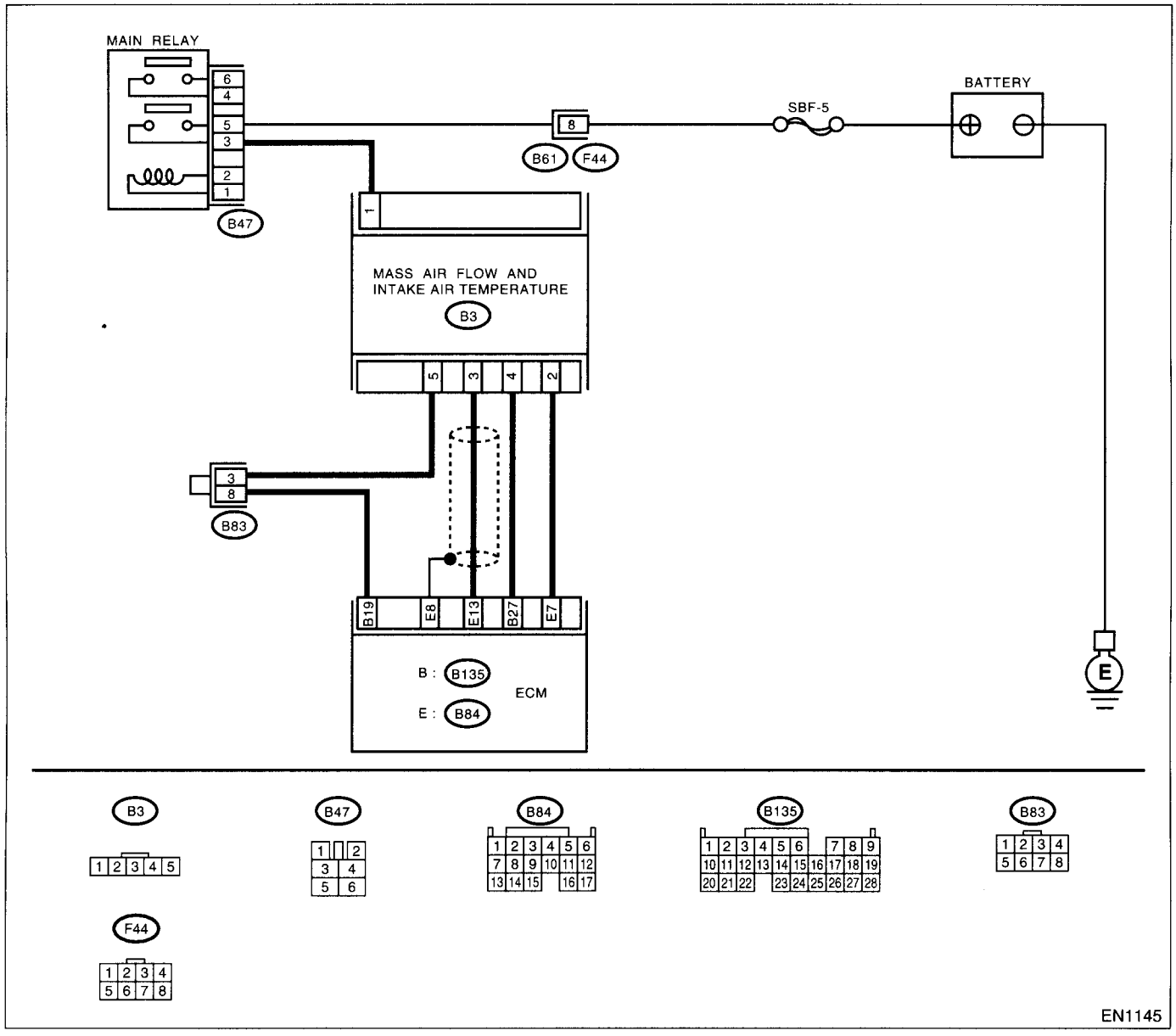
- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0102 or P0103?	Inspect DTC P0102 or P0103 using "Diagnostics Chart with Trouble Code". NOTE: In this case, it is not necessary to inspect DTC P0101.	Replace the mass air flow and intake air temprature sensor. <Ref. to FU(DOHC TURBO)-34, Mass Air Flow and Intake Air Temperature Sensor.>

F: DTC P0102 — MASS AIR FLOW SENSOR CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performanc
- **WIRING DIAGRAM:**



Step	Check	Yes	No
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 the 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 data of mass air flow sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	s the value equal to or more han 1.3 g/sec (0.172 lb/min) or .3 V and equal to or less than 40 g/sec (32 lb/min) or 4.58 /?	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 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.**
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 (–):***	s the voltage less than 0.2 V?	Go to step **4.**	Go to step **3.**
CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR). Measure the voltage between ECM connector and chassis ground while engine is idling.	Does the voltage change more han 0.2 V by shaking harness nd connector of ECM while nonitoring the value with Subaru select monitor?	Repair poor contact in ECM connector.	Contact with SOA (distributor) service. NOTE: nspection by DTM s required, because probable cause is deteriora ion of multiple parts.
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 voltage between mass air flow sensor connector and chassis ground. ***Connector & terminal*** ***(B3) No. 1 (+) — Chassis ground (–):***	s the voltage more than 10V?	Go to step **5.**	Repair open circuit between mass air low sensor and main relay
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:*** ***(B135) No. 27 — (B3) No. 4:*** ***(B135) No. 19 — (B3) No. 5:***	s the resistance less than 1Ω?	Go to step **6.**	Repair open circuit between ECM and mass air flow sensor connector.

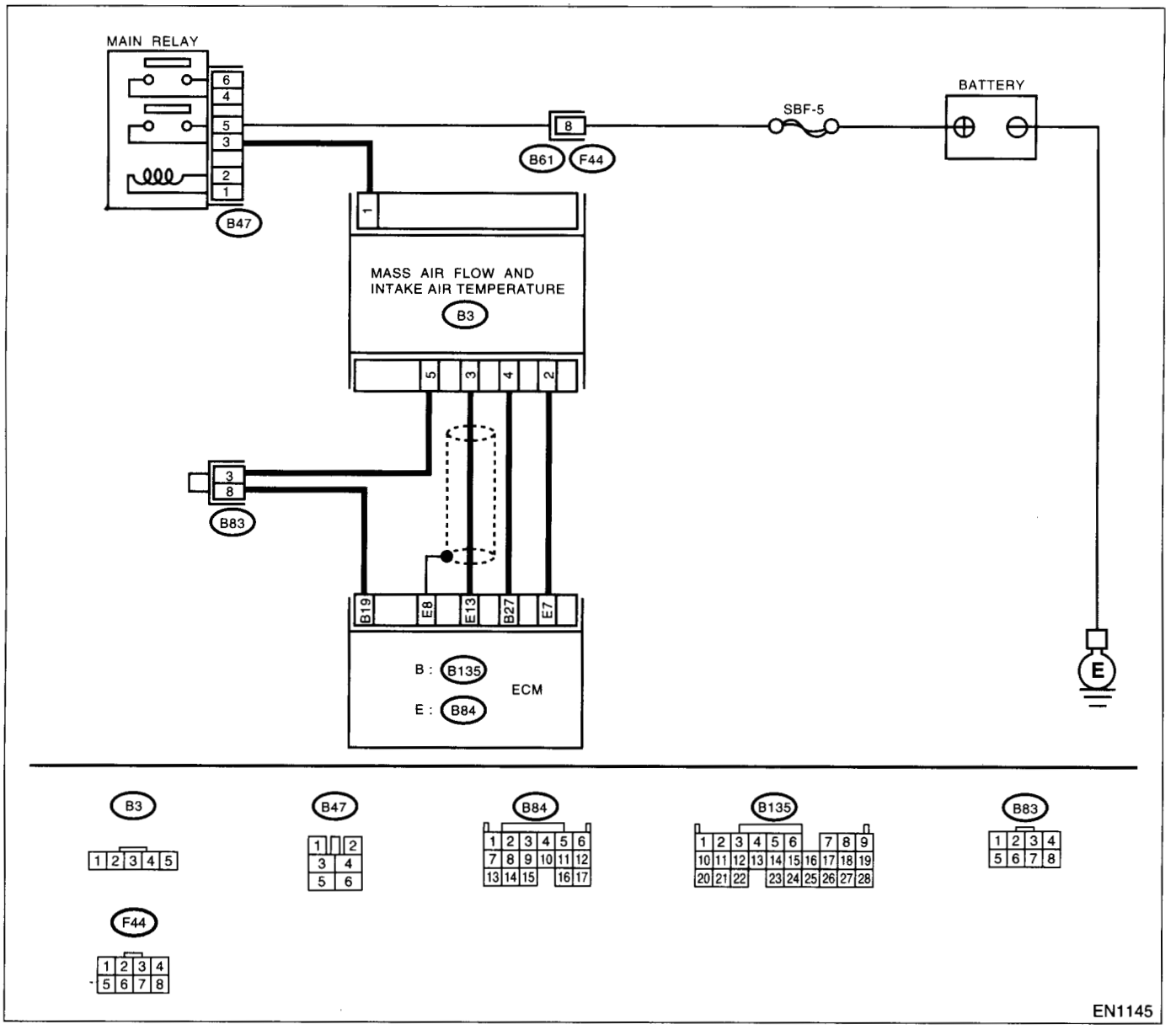
	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 13 — Chassis ground:*** ***(B135) No. 27 — Chassis ground:*** ***(B135) No. 19 — Chassis ground:***	Is the resistance more than 1MΩ?	Go to step **7.**	Repair 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?	Repair poor contact in mass air flow sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(DOHC TURBO)-34, Mass Air Flow and Intake Air Temperature Sensor.>

G: DTC P0103 — MASS AIR FLOW SENSOR 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**

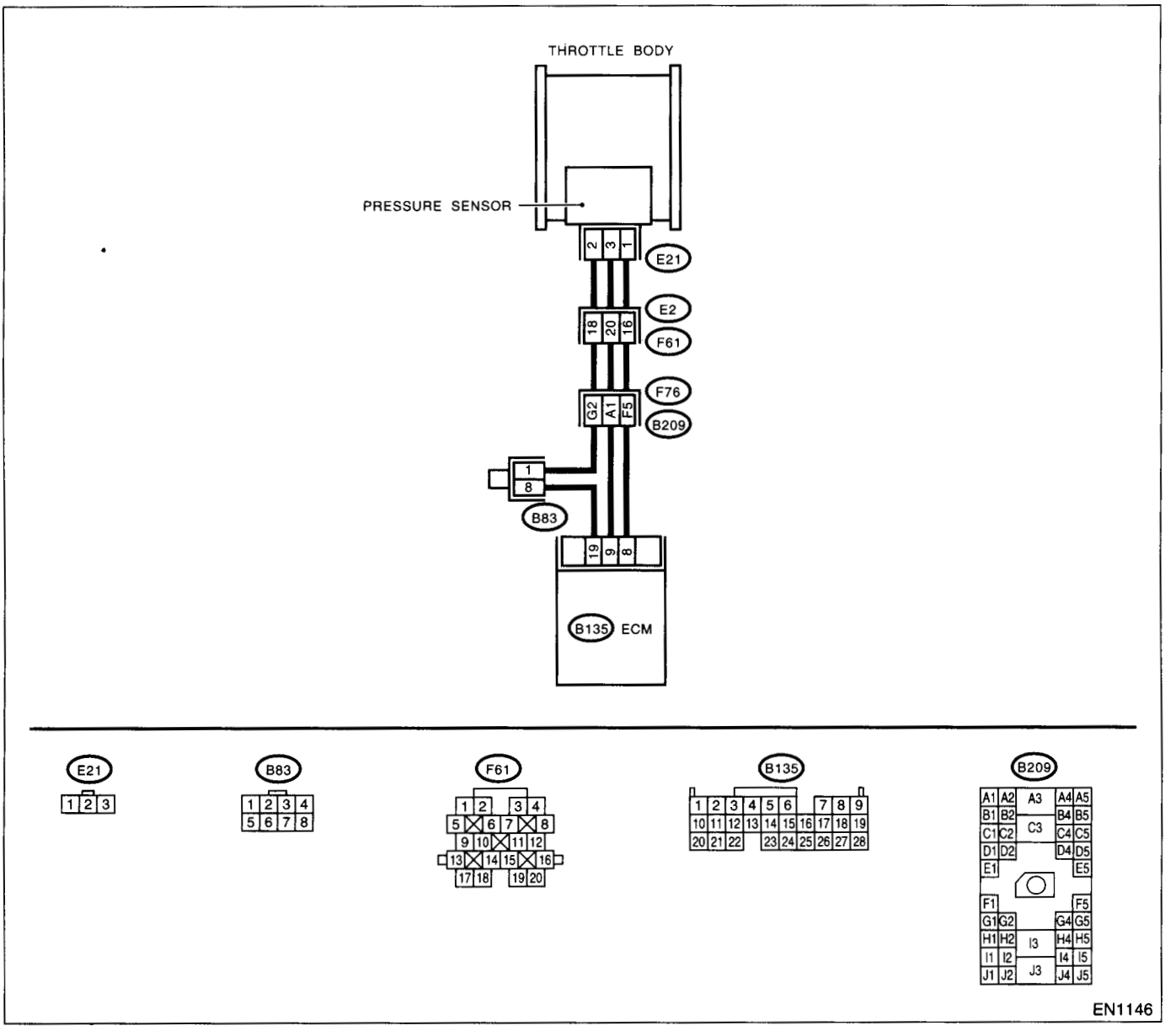


	Step	Check	Yes	No
1	**CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.** 1)Turn the ignition switch to OFF. 2)Connect the Subaru Select Monitor or the OBD-II general scan tool to data link connector. 3)Turn the ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON. 4)Start the engine. 5) Read the data of mass air flow sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value equal to or more than 1.3 g/sec (0.172 lb/min) or 0.3 V and equal to or less than 240 g/sec (32 lb/min) or 4.58 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 and Subaru Select Monitor or the OBD-II general scan tool switch to OFF. 2)Disconnect the connector from mass air flow 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 mass air flow sensor signal using Subaru select monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 240 g/sec (32 lb/min) or 4.58 V in function mode F06?	Repair battery short circuit in harness between mass air flow sensor and ECM connector. After repair, replace the ECM.	Replace the mass air flow sensor.

H: DTC P0106 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.



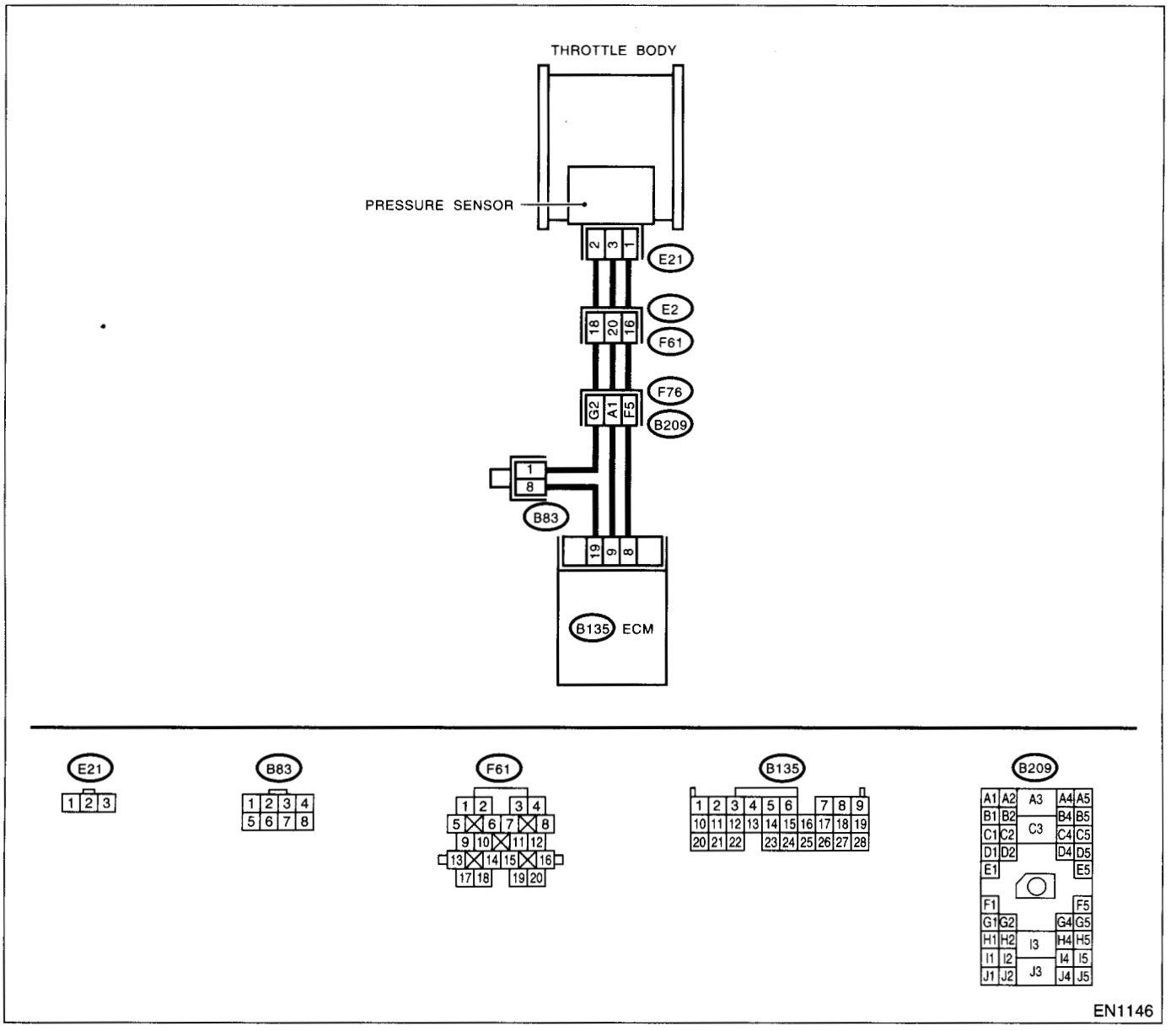
	Step	Check	Yes	No
	CHECK IDLE SWITCH SIGNAL. 1)Turn the ignition switch to ON. 2)Operate the LED operation mode for engine using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.>	Does the LED of {Idle Switch Signal} come on?	Go to step **2.**	Check the throttle position sensor circuit. <Ref. to EN(DOHC TURBO)-132, DTC P0121 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0106.
2	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0107 or P0108?	Inspect DTC P0107 or P0108 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, 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 PRESSURE SENSOR.**	Is the pressure sensor installation bolt tightened securely?	Go to step **4.**	Tighten pressure sensor installation bolt securely.
4	**CHECK CONDITION OF THROTTLE BODY.**	Is the throttle body installation bolt tightened securely?	Replace the pressure sensor. <Ref. to FU(DOHC TURBO)-35, Pressure Sensor.>	Tighten throttle body installation bolt securely.

I: DTC P0107 — PRESSURE 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
	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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	s the value less than −7.2 kPa (−54 mmHg, −2.1 inHg)?	Go to step **3.**	Go to step **2.**
	CHECK POOR CONTACT. Check poor contact in ECM and pressure sensor connector.	s there poor contact in ECM or pressure sensor connector?	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.
	CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (−):***	s the voltage more than 4.5 V?	Go to step **5.**	Go to step **4.**
	CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (−):***	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	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.
	CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 8 (+) — Chassis ground (−):***	s the voltage less than 0.7 V?	Go to step **6.**	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deteriora tion of multiple parts.
	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 (−):***	s the voltage more than 4.5 V?	Go to step **7.**	Repair open circuit in harness between ECM and pressure sensor connector.

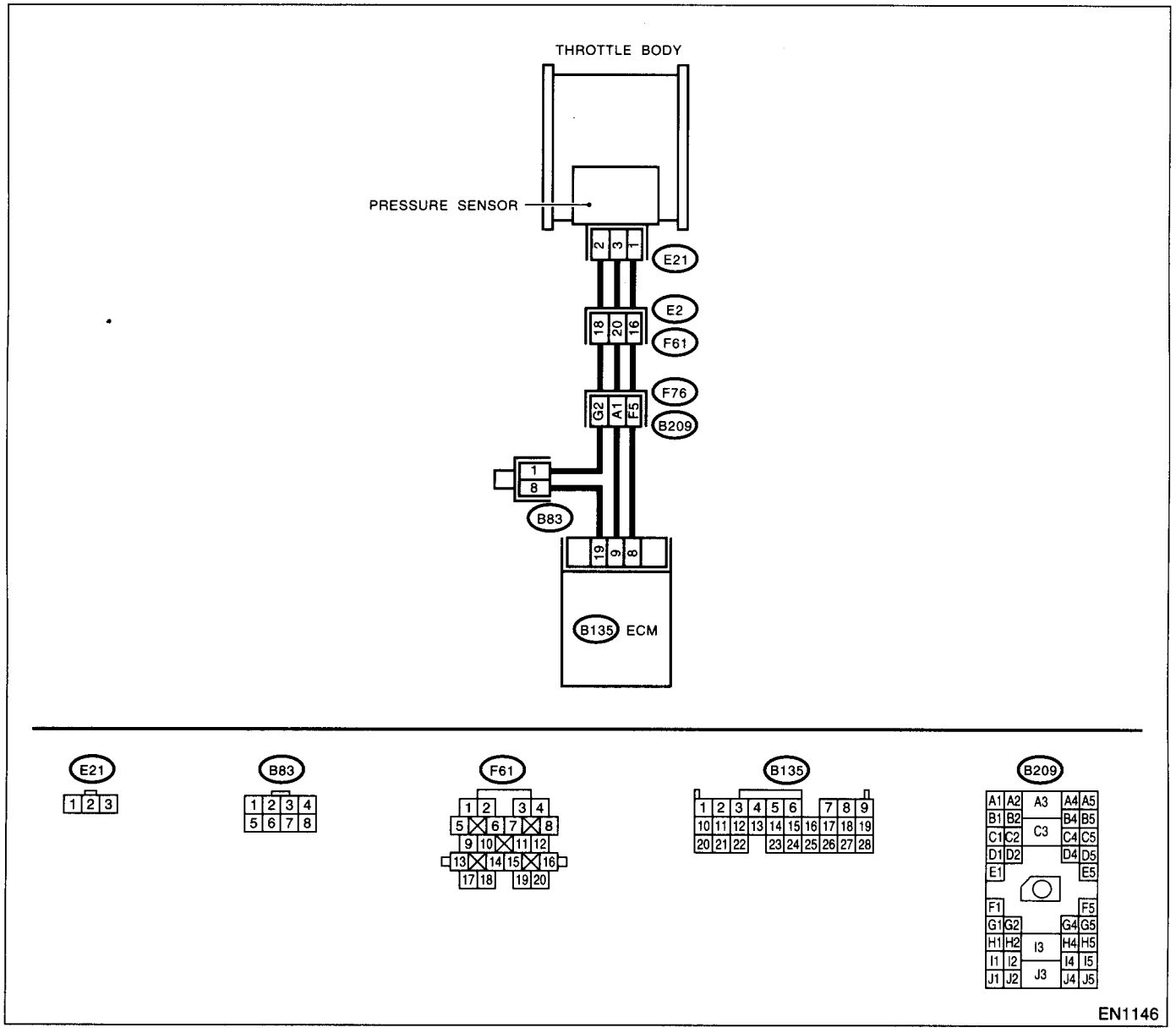
	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM and pressure sensor connector. ***Connector & terminal*** ***(B135) No. 19 — (E21) No. 2:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair open circuit in harness between ECM and pressure sensor connector.
8	**CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.** Measure the resistance of harness between pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair ground short 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?	Repair poor contact in pressure sensor connector.	Replace the pressure sensor. <Ref. to FU(DOHC TURBO)-35, Pressure Sensor.>

J: DTC P0108 — PRESSURE 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN1146

	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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 282 kPa (2121 mmHg, 83.50 inHg)?	Go to step **9.**	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 (–):***	Is the voltage more than 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 (–):***	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	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. 8 (+) — Chassis ground (–):***	Is the voltage less than 0.7 V?	Go to step **5.**	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 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 voltage more than 4.5 V?	Go to step **6.**	Repair open circuit in harness between ECM and pressure sensor connector.
6	**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 resistance less than 1 Ω?	Go to step **7.**	Repair open circuit in harness between ECM and pressure sensor connector.

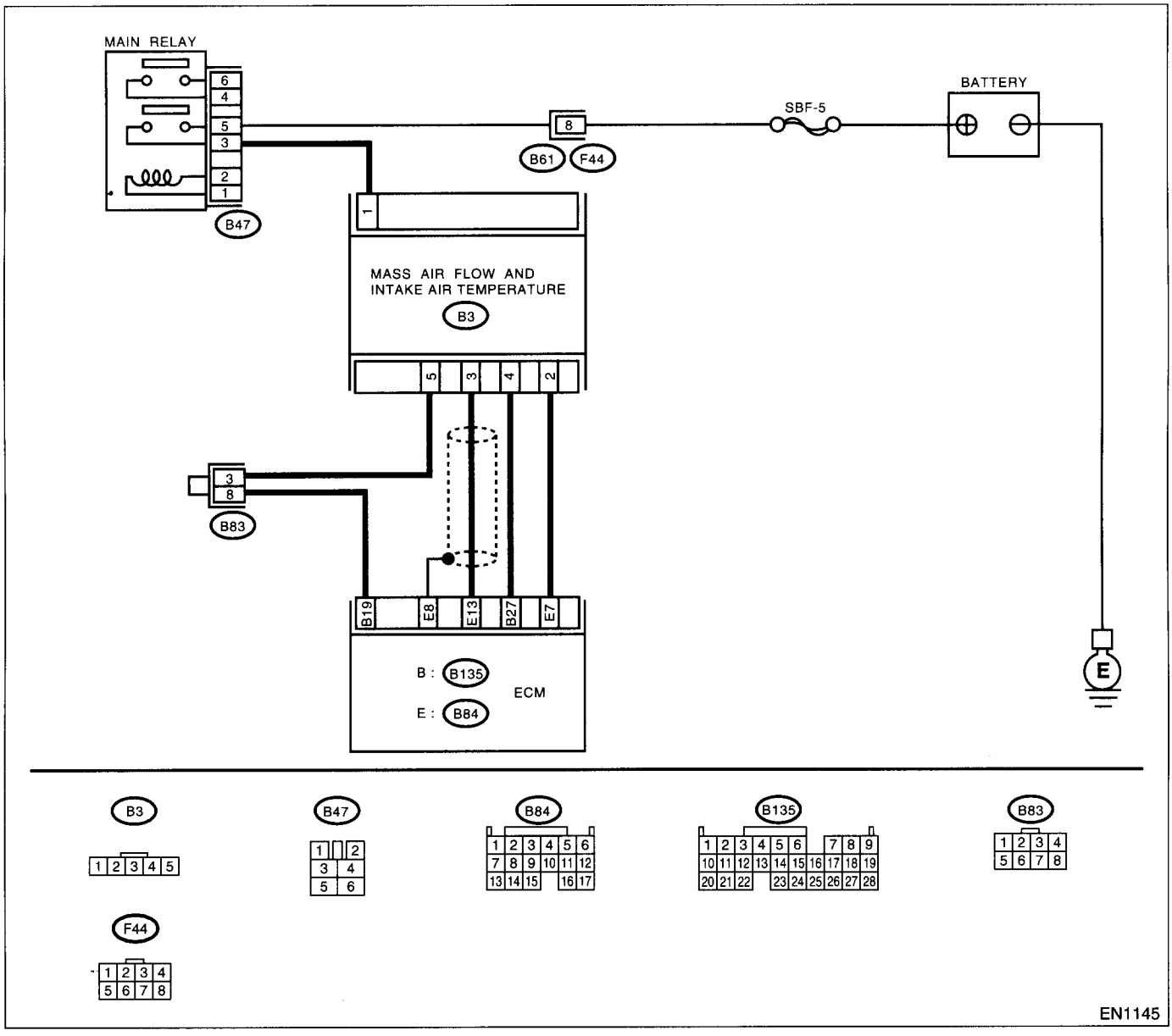
	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.** Measure the resistance of harness between ECM and pressure sensor connector. ***Connector & terminal (B135) No. 19 — (E21) No. 2:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair open circuit in harness between ECM and pressure sensor connector.
8	**CHECK POOR CONTACT.** Check poor contact in pressure sensor connector.	Is there poor contact in pressure sensor connector?	Repair poor contact in pressure sensor connector.	Replace the pressure sensor. <Ref. to FU(DOHC TURBO)-35, Pressure Sensor.>
9	**CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR 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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 282 kPa (2121 mmHg, 83.50 inHg)?	Repair battery short circuit in harness between ECM and pressure sensor connector.	Replace the pressure sensor. <Ref. to FU(DOHC TURBO)-35, Pressure Sensor.>

K: DTC P0111 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



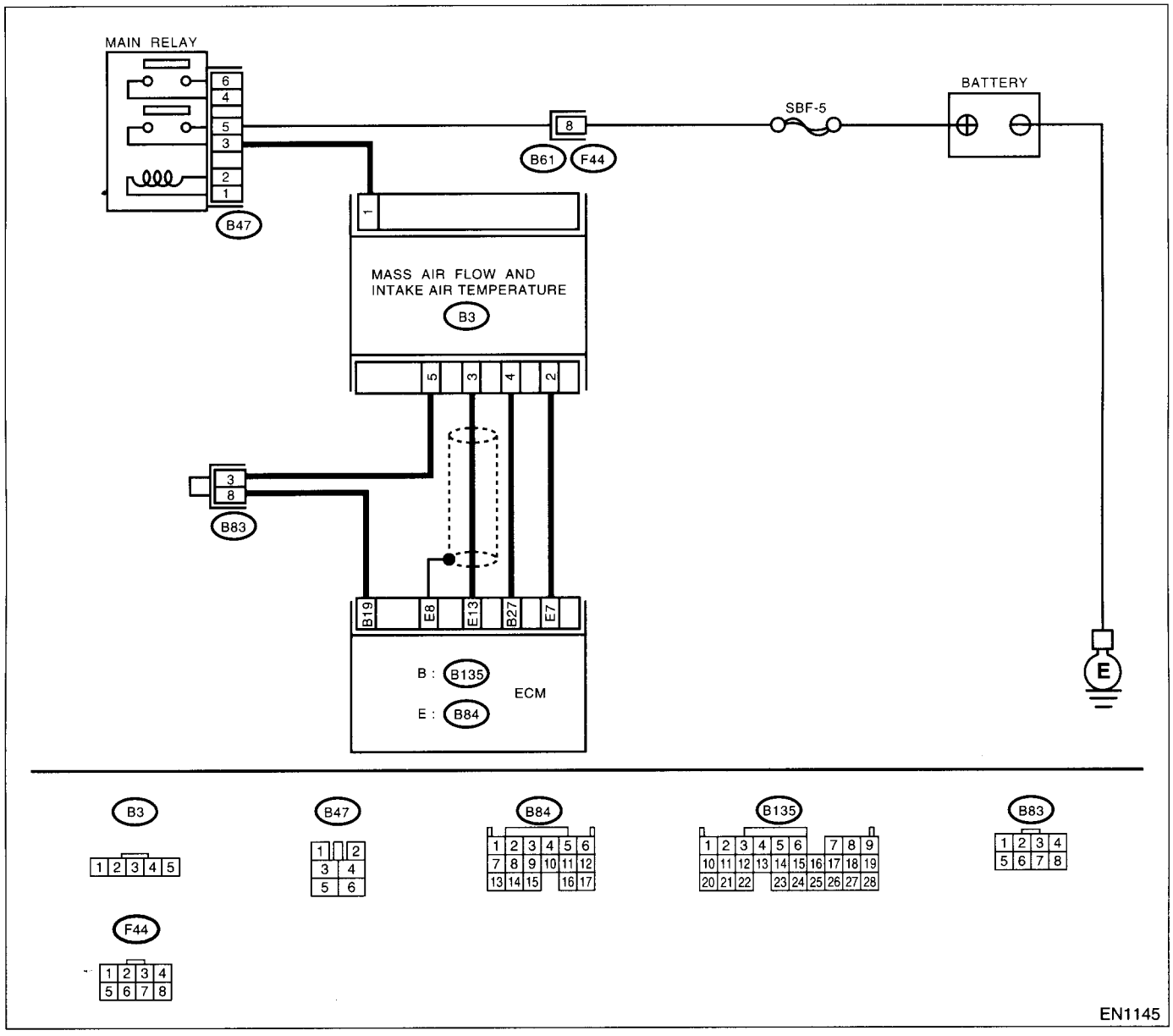
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0112, P0113, P0117, P0118 or P0125?	Inspect DTC P0112, P0113, P0117, P0118 or P0125 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, List of Diagnostic 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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the engine coolant temperature between 75°C (167°F) and 95°C (203°F)?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(DOHC TURBO)-34, Mass Air Flow and Intake Air Temperature Sensor.>	Inspect DTC P0125 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).>

L: DTC P0112 — INTAKE AIR TEMPERATURE SENSOR 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



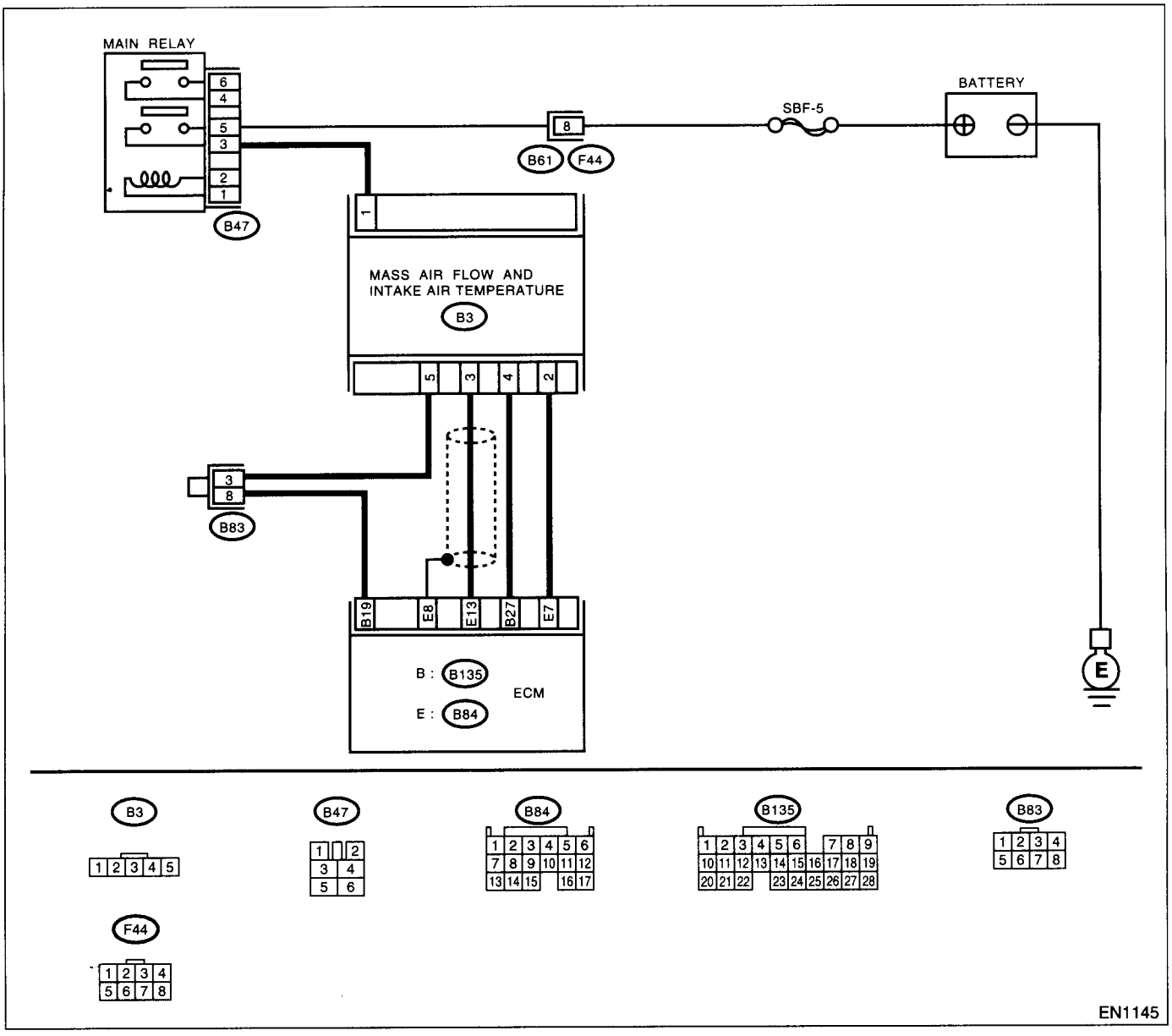
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value greater than 55°C (131°F)?	Go to step **2.**	Repair 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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than –36°C (–97°F)?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(DOHC TURBO)-34, Mass Air Flow and Intake Air Temperature Sensor.>	Repair ground short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.

M: DTC P0113 — INTAKE AIR TEMPERATURE SENSOR 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, 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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than –36°C (–97°F)?	Go to step **2.**	Repair 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. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair 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 INTAKE AIR TEMPERATURE AND PRESSURE 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. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair 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. 2 (+) — Engine ground (–):***	Is the voltage more than 3 V?	Go to step **5.**	Repair 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

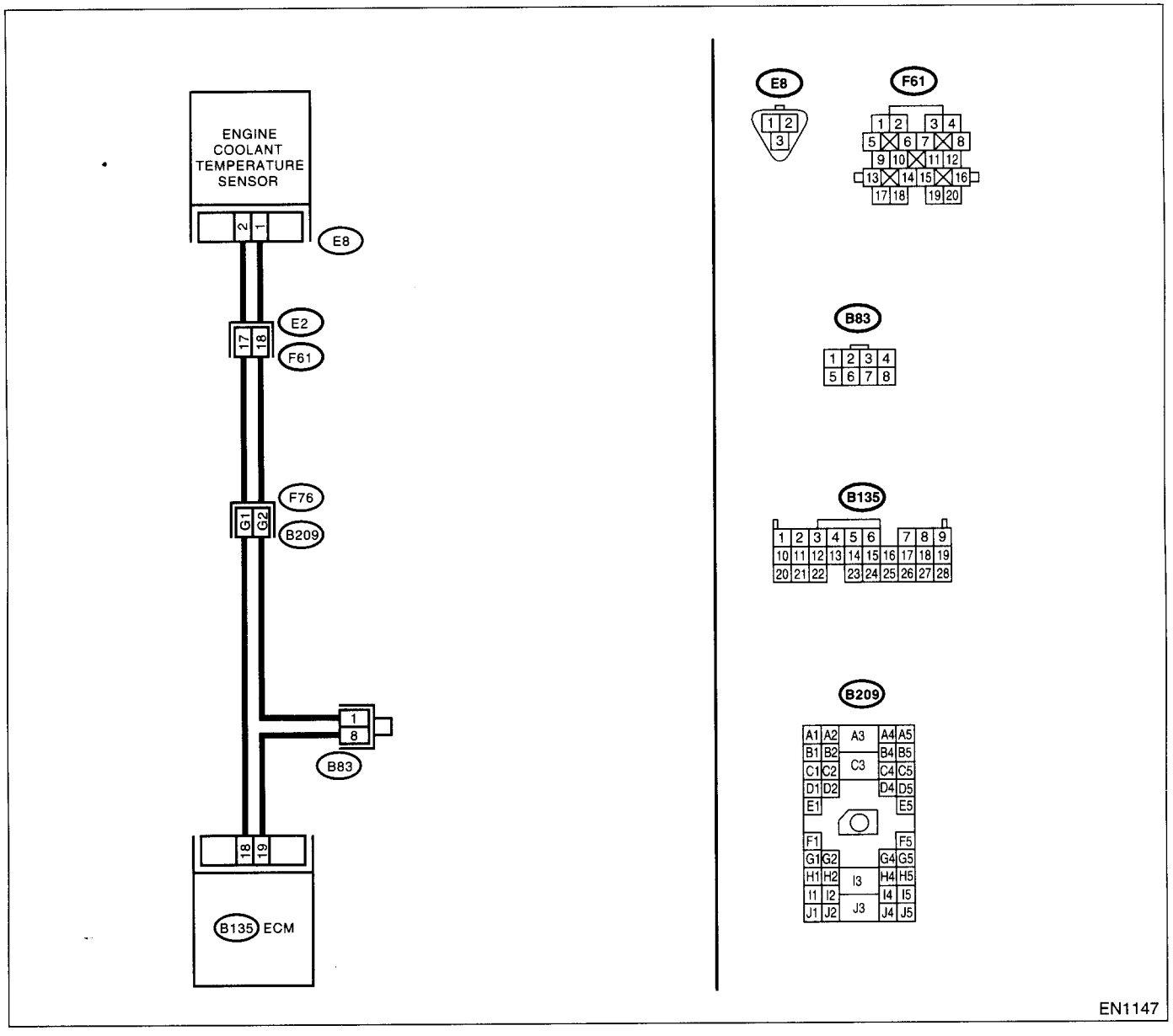
	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of harness between mass air flow and intake air temperature sensor and engine ground. ***Connector & terminal*** ***(B3) No. 5 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(DOHC TURBO)-34, Mass Air Flow and Intake Air Temperature Sensor.>	Repair 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 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



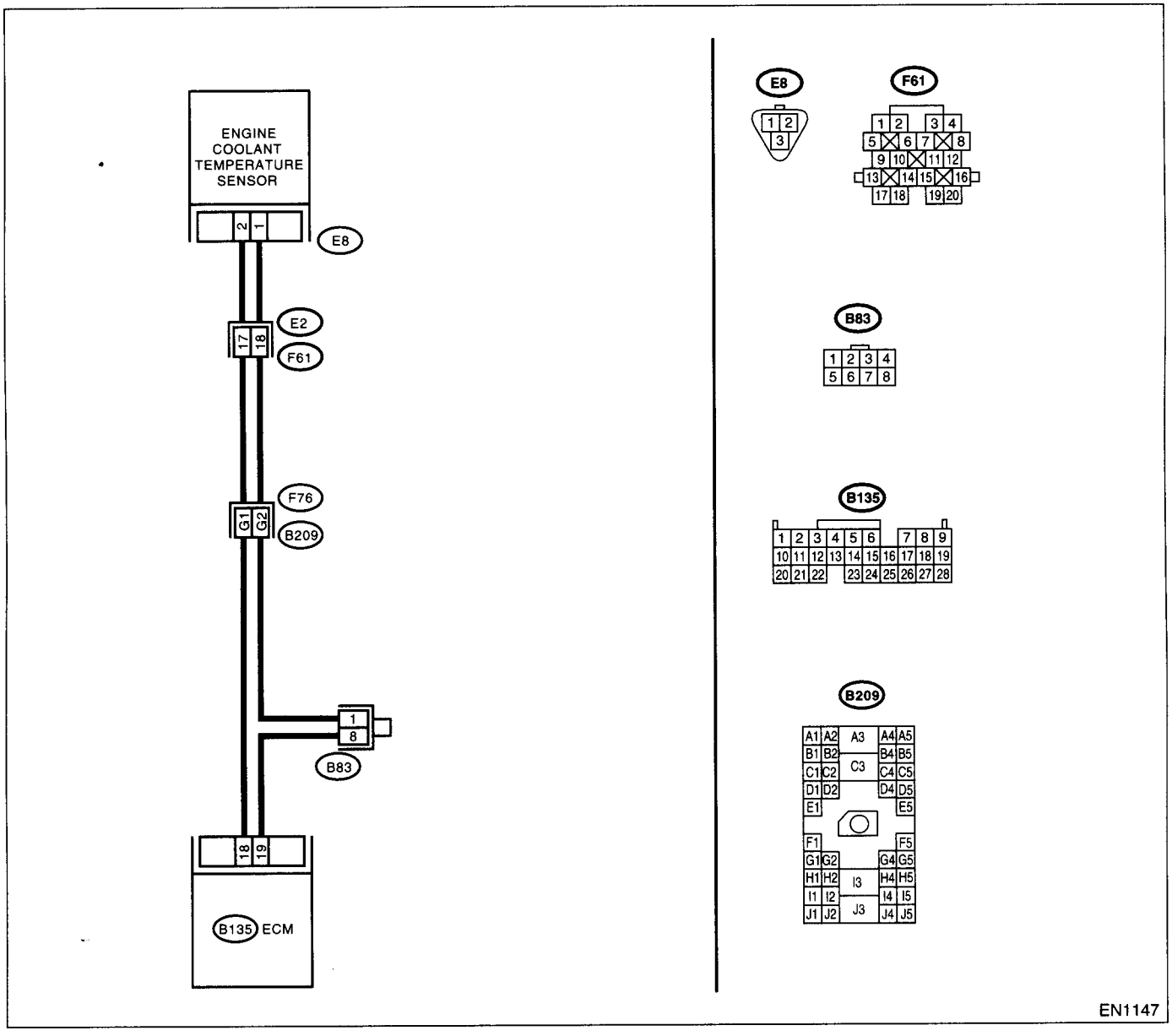
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value greater than 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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than –40°C (–40°F)?	Replace the engine coolant temperature sensor. <Ref. to FU(DOHC TURBO)-29, Engine Coolant Temperature Sensor.>	Repair ground short circuit in harness between engine coolant temperature sensor and ECM connector.

O: DTC P0118 — ENGINE COOLANT 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, 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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than –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. 2 (+) — Engine ground (–):***	Is the voltage more than 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. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **4.**
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 voltage more than 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

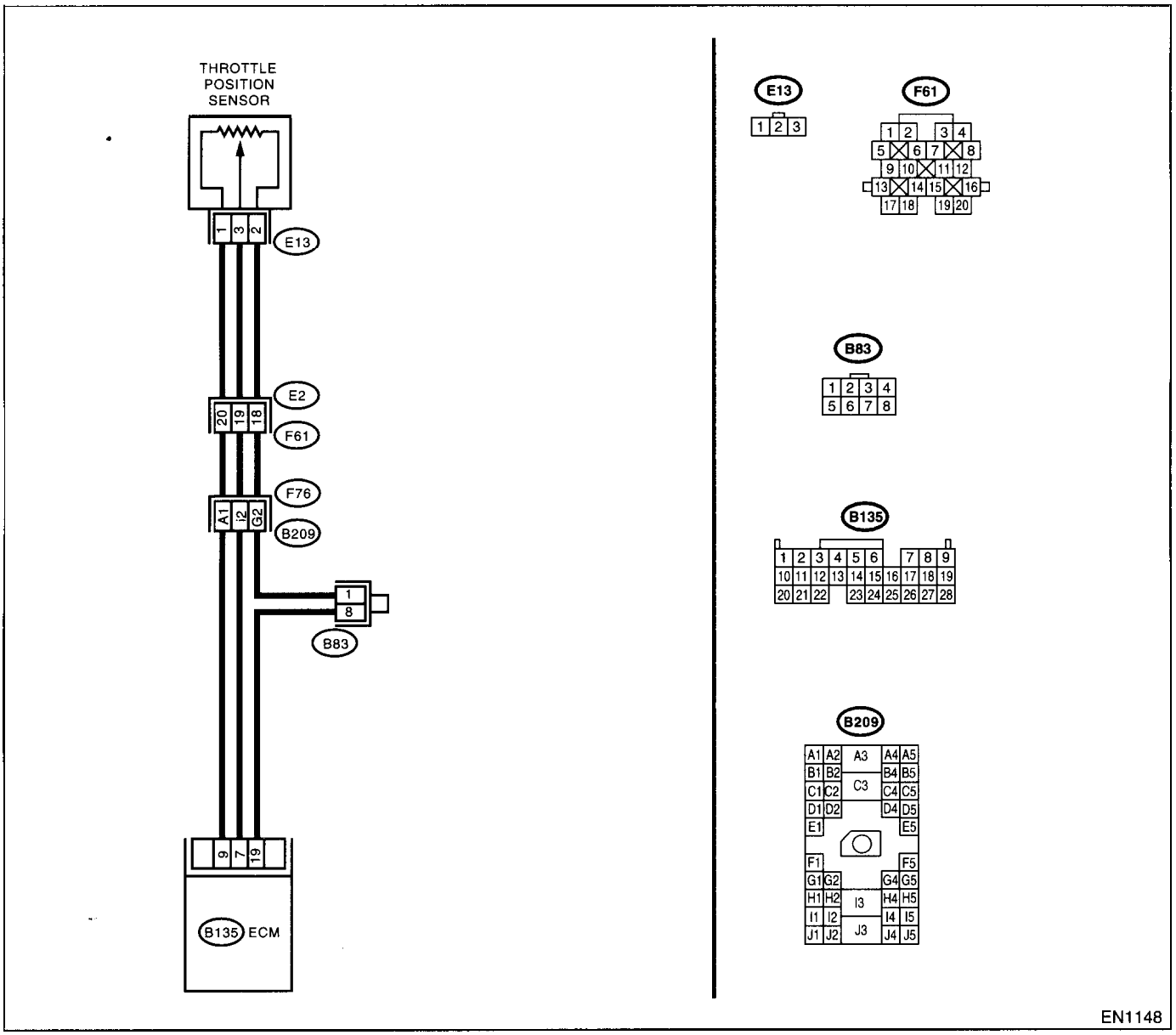
	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of harness between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the engine coolant temperature sensor. <Ref. to FU(DOHC TURBO)-29, 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

P: DTC P0121 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —

- **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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



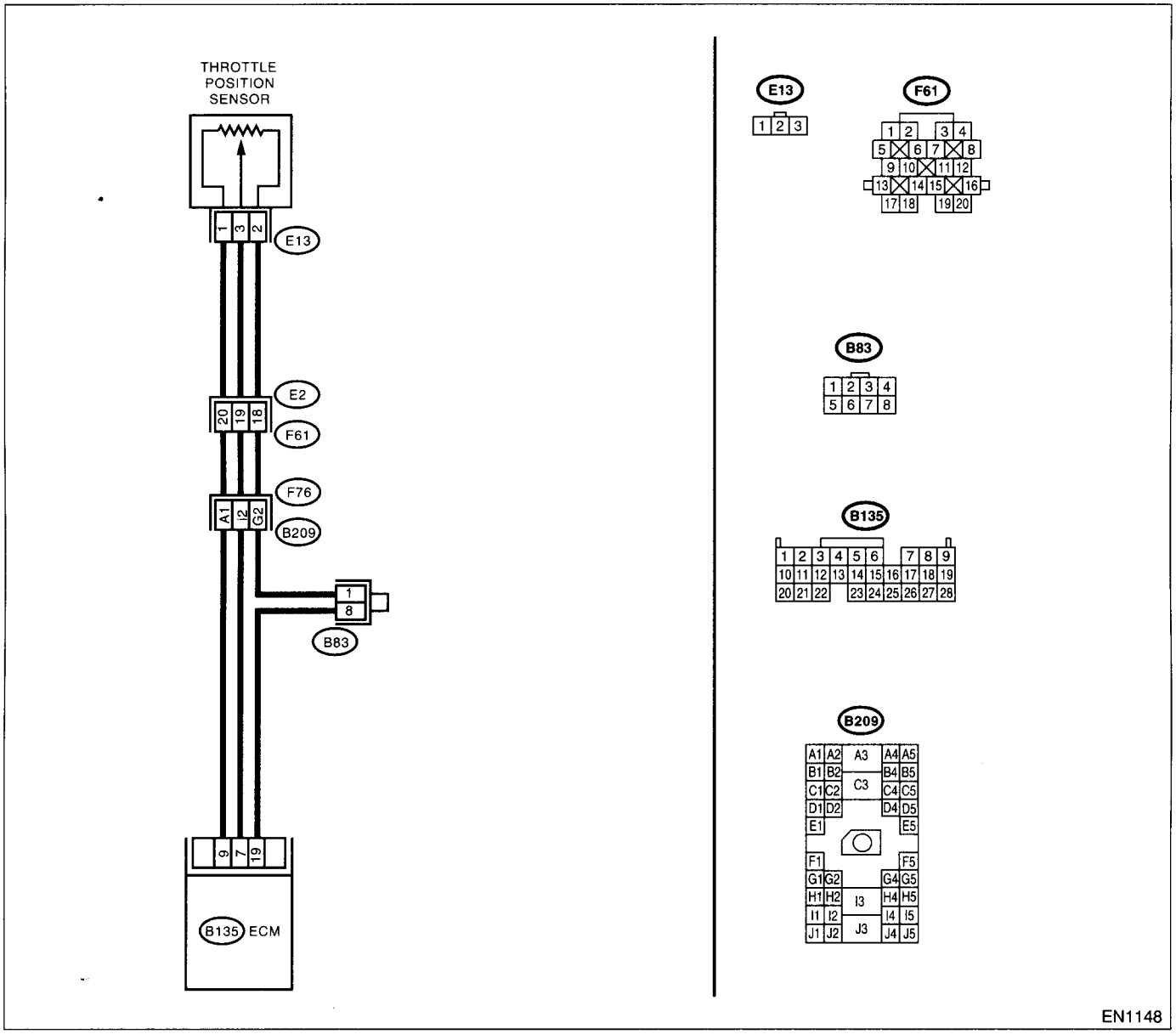
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0122, P0123 or P1507?	Inspect DTC P0122, P0123 or P1507 using " List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0121.	Replace the throttle position sensor. <Ref. to FU(DOHC TURBO)-33, Throttle Position Sensor.>

Q: DTC P0122 — THROTTLE POSITION SENSOR 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
	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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	s the value less than 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 throttle valve is fully closed. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	s the voltage more than 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 (–):***	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	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. 7 (+) — Chassis ground (–):***	s the voltage less than 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.	Does the voltage change more than 0.1 V by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector.	Go to step **6.**

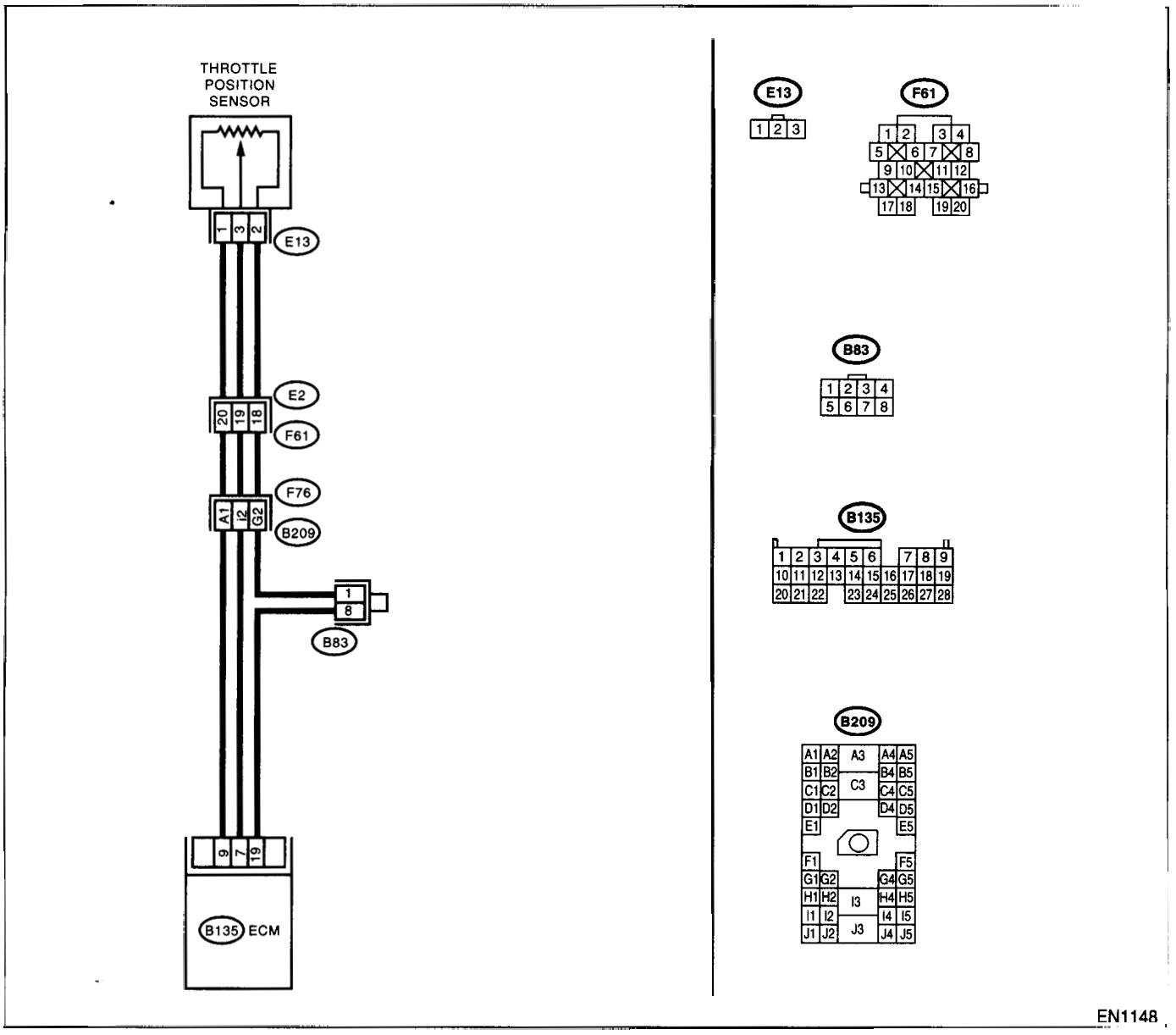
	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from throttle position sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 1 (+) — Engine ground (–):***	Is the voltage more than 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. 7 — (E13) No. 3:***	Is the resistance less than 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 resistance less than 10 Ω?	Repair 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?	Repair poor contact in throttle position sensor connector.	Replace the throttle position sensor. <Ref. to FU(DOHC TURBO)-33, Throttle Position Sensor.>

R: DTC P0123 — THROTTLE POSITION SENSOR 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



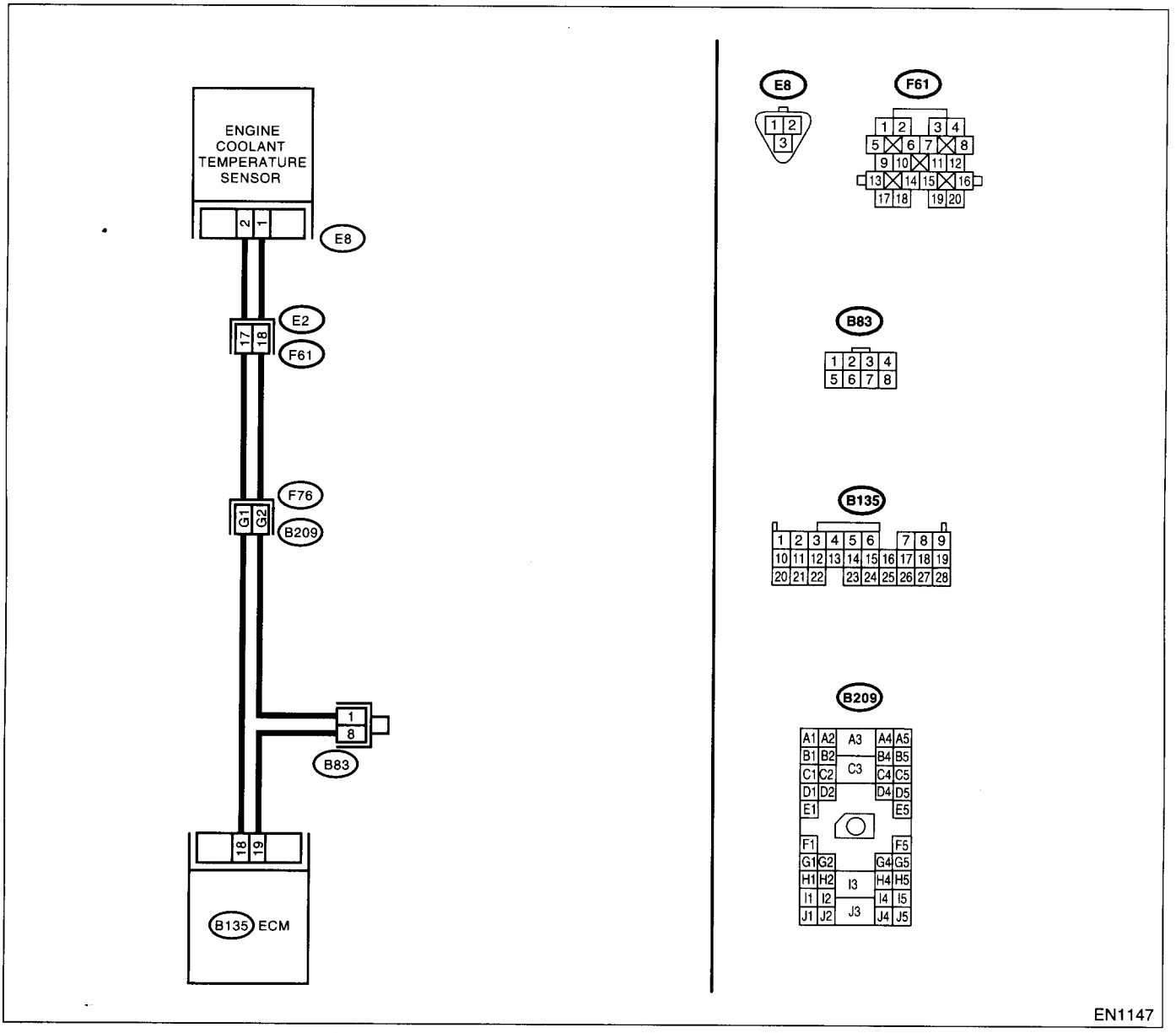
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 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 resistance less than 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 voltage more than 4.9 V?	Repair battery short circuit in harness between throttle position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>	Replace the throttle position sensor. <Ref. to FU(DOHC TURBO)-33, 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 would not return to idling.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, 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 indicate DTC P0117 or P0118?	Inspect DTC P0117 or P0118 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, 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?	Replace the thermostat. <Ref. to CO-35, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(DOHC TURBO)-29, Engine Coolant Temperature Sensor.>

T: DTC P0128 — THERMOSTAT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Thermostat remains open.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK VEHICLE CONDITION.**	Has engine operated at idle or has vehicle been driven with part of engine submerged under water?	In this case, it is not necessary to inspect DTC P0128.	Go to step **2.**
2	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0125, P0301, P0302, P0303, P0304, P0305 and P0306 at same time?	Go to step **3.**	Inspect DTC P0125, P0301, P0302, P0303, P0304, P0305 and P0306 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).>
3	**CHECK ENGINE COOLANT.**	Are coolant level and mixture ratio of cooling water to antifreeze solution correct?	Go to step **4.**	Replace the engine coolant. <Ref. to CO-25, REPLACEMENT, Engine Coolant.>
4	**CHECK RADIATOR FAN.** 1)Start the engine. 2)Check radiator fan operation.	Does the radiator fan continuously rotate for more than 3 minutes during idling?	Repair radiator fan circuit. <Ref. to CO-46, Radiator Main Fan and Fan Motor.> and <Ref. to CO-48, Radiator Sub Fan and Fan Motor.>	Replace the thermostat. <Ref. to CO-35, Thermostat.>

U: DTC P0131 — FRONT OXYGEN (A/F) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —

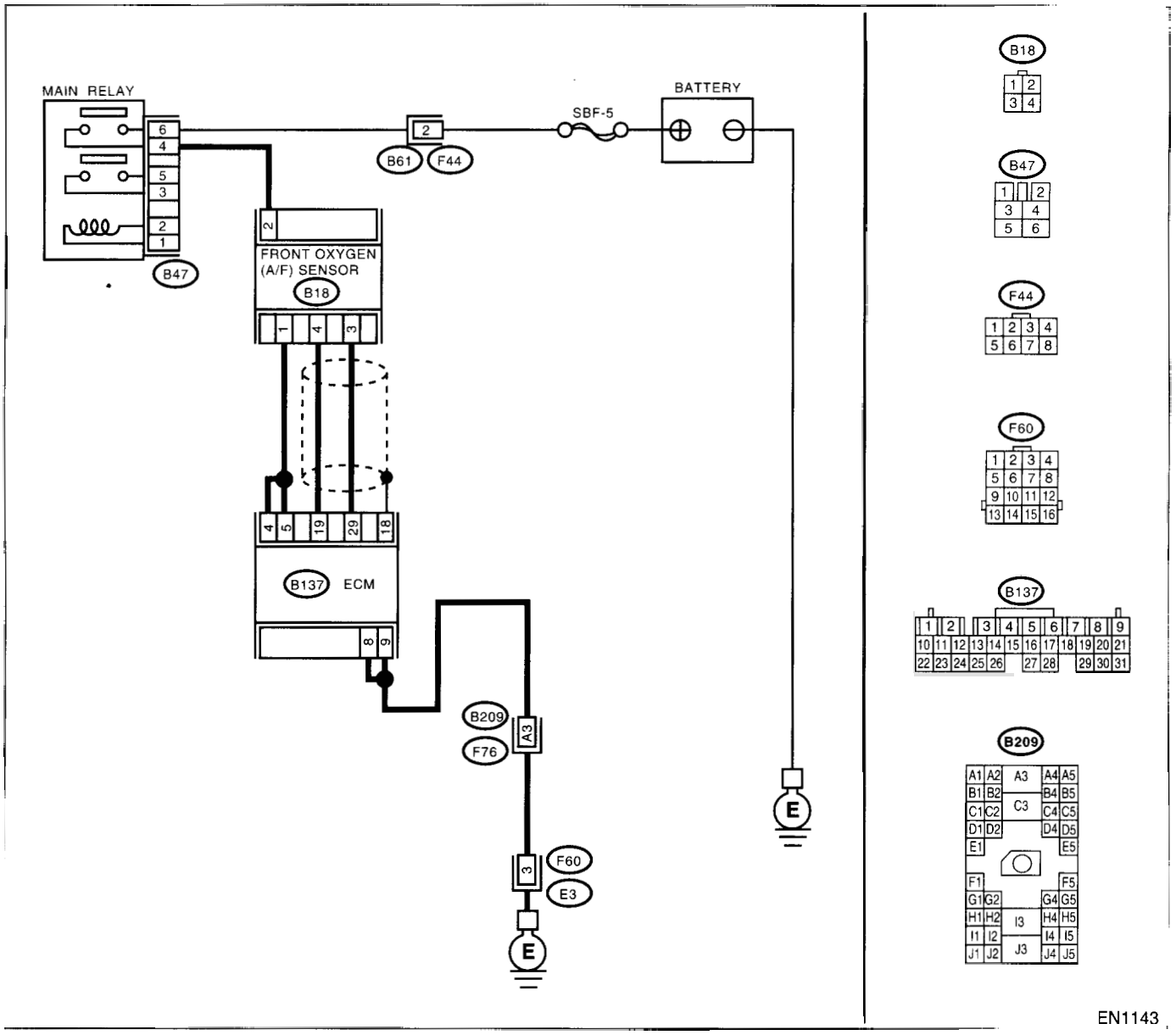
NOTE:
For the diagnostic procedure, refer to DTC P0132. <Ref. to EN(DOHC TURBO)-144, DTC P0132 — FRONT OXYGEN (A/F) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

V: DTC P0132 — FRONT OXYGEN (A/F) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step	Check	Yes	No
CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0031, P0032, P1131, P1134 or P1139?	Inspect DTC P0031, P0032, P1131, P1134 or P1139 using "List of Diagnostic Trouble Code (DTC)".<Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).>	Go to step **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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value equal to or more than 0.85 and equal to less than 1.15 in idling?	Go to step **3.**	Go to step **4.**
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 engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed. 2)Operate the LED operation mode for engine. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.>	Does the LED of {Rear O2 Rich Signal} blink?	Repair poor contact in front oxygen (A/F) sensor and rear oxygen sensor connector.	Check rear oxygen sensor circuit. <Ref. to FU(DOHC TURBO)-44, Rear Oxygen Sensor.>
CHECK EXHAUST SYSTEM. Check 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?	Repair or replace faulty parts.	Replace the front oxygen (A/F) sensor. <Ref. to FU(DOHC TURBO)-42, Front Oxygen (A/F) Sensor.>

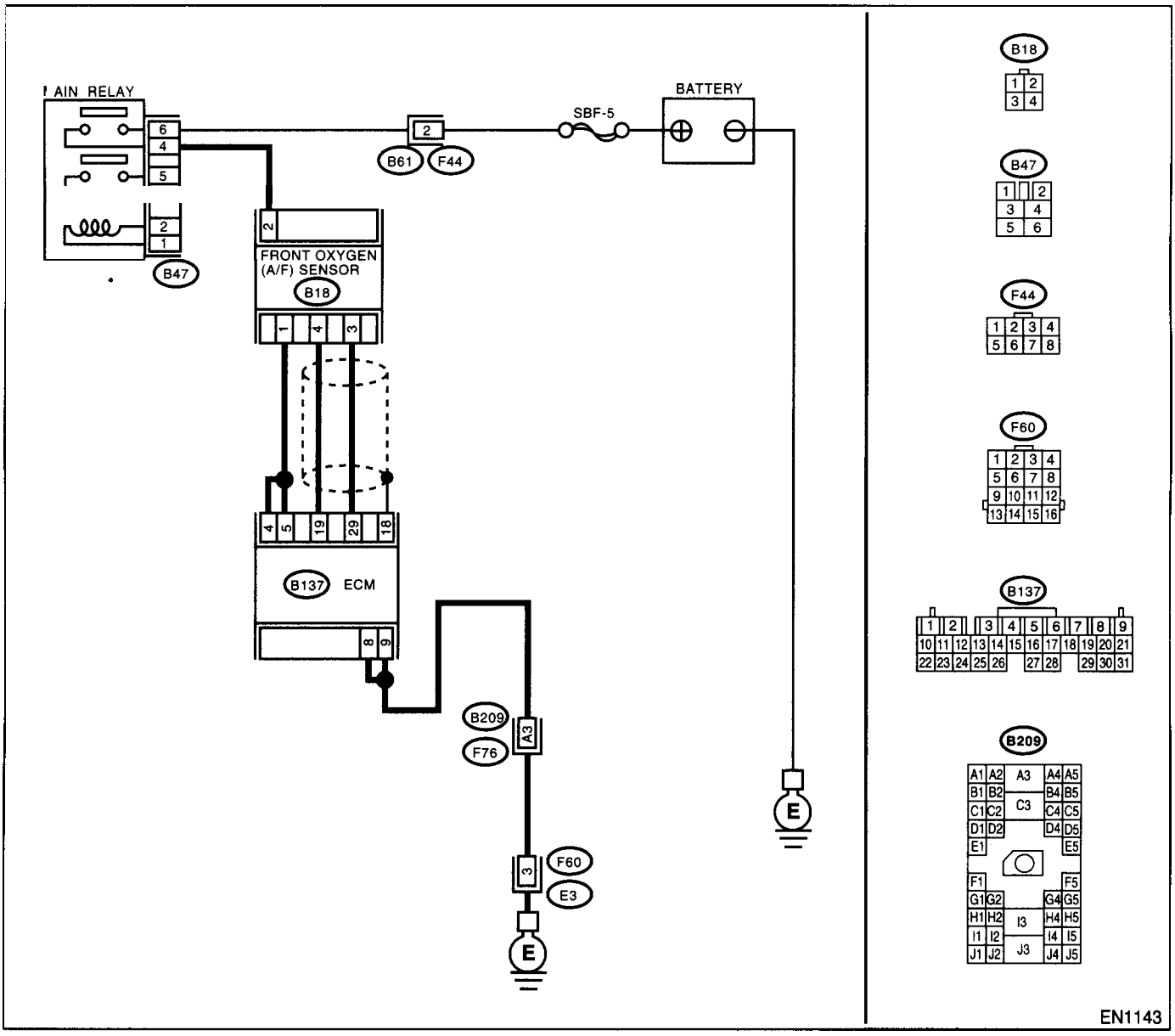
W: DTC P0133 — FRONT OXYGEN (A/F) SENSOR CIRCUIT SLOW RESPONSE

—

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



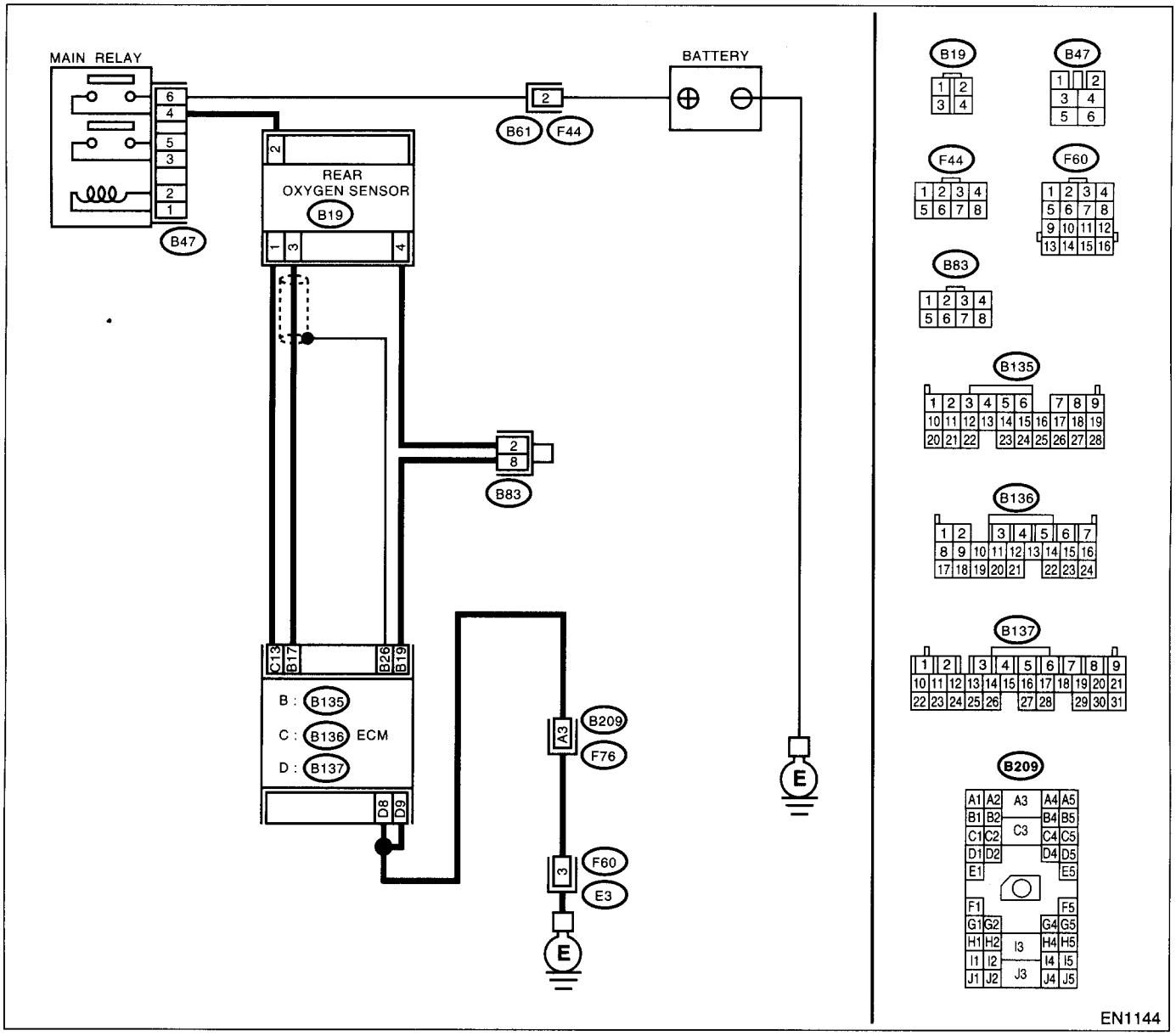
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0031, P0032, P0131, P0132, P1130, P1131, P1134 or P1139?	Inspect DTC P0031, P0032, P0131, P0132, P1130, P1131, P1134 or P1139 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, 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?	Repair exhaust system.	Replace the front oxygen (A/F) sensor. <Ref. to FU(DOHC TURBO)-42, Front Oxygen (A/F) Sensor.>

X: DTC P0136 — REAR OXYGEN SENSOR CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, 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 indicate DTC P0131 or P0132?	Go to step **2.**	Go to step **3.**

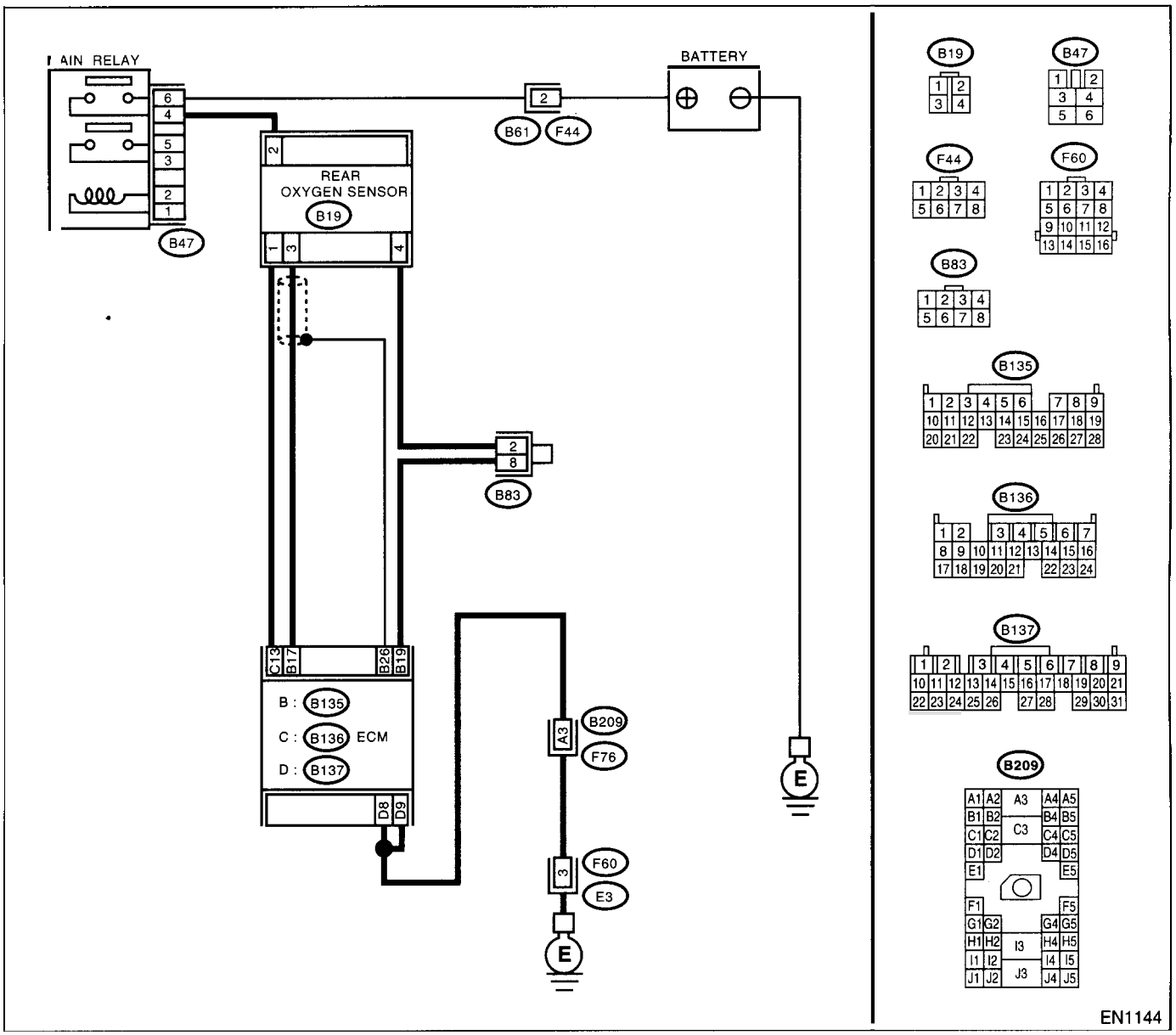
Step	Check	Yes	No
CHECK FAILURE CAUSE OF P0131 or P0132. Inspect DTC P0131 or P0132 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).>	s the failure cause of P0131 or '0132 in the fuel system?	Check fuel system. NOTE: n this case, it is not necessary to nspect DTC P0136.	Go to step **3.**
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 two minutes. 2)Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Does the value fluctuate?	Go to step **7.**	Go to step **4.**
CHECK REAR OXYGEN SENSOR DATA. Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II General Scan Tool.	s the value fixed between 0.2 nd 0.4 V?	Go to step **5.**	Replace the rear oxygen sensor. <Ref. to FU(DOHC TURBO)-44, Rear Oxygen Sensor.>
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. 26 — (B19) No. 4:***	s the resistance more than 3 Ω?	Repair open circuit n harness between ECM and rear oxygen sensor connector.	Go to step **6.**
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 voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(B19) No. 3 (+) — Engine ground (–):***	s the voltage more than 0.2 V?	Replace the rear oxygen sensor. <Ref. to FU(DOHC TURBO)-44, Rear Oxygen Sensor.>	Repair harness and connector. NOTE: n this case, repai he following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector
CHECK EXHAUST SYSTEM. Check 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	s there a fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(DOHC TURBO)-44, Rear Oxygen Sensor.>

Y: DTC P0139 — REAR OXYGEN SENSOR CIRCUIT SLOW RESPONSE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, 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 indicate DTC P0136?	Inspect DTC P0136 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, 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(DOHC TURBO)-44, Rear Oxygen Sensor.>

Z: DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —

NOTE:
For the diagnostic procedure, refer to DTC P0172. <Ref. to EN(DOHC TURBO)-153, DTC P0172 — FUEL TRIM MALFUNCTION (A/F TOO RICH) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AA:DTC P0172 — FUEL TRIM MALFUNCTION (A/F TOO RICH) —

- **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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair exhaust system.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair air intake system.	Go to step **3.**
3	**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. **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.	Is fuel pressure between 284 and 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. **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.	Is fuel pressure between 206 and 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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is temperature greater than 60°C (140°F)?	Go to step **6.**	Replace the engine coolant temperature sensor. <Ref. to FU(DOHC TURBO)-29, Engine Coolant Temperature Sensor.>
6	**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 neutral 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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual. Specification: •Intake manifold absolute pressure ***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)***	Is the value within the specifications?	Go to step **7.**	Replace the mass air flow and pressure sensor. <Ref. to FU(DOHC TURBO)-34, Mass Air Flow and Intake Air Temperature Sensor.>

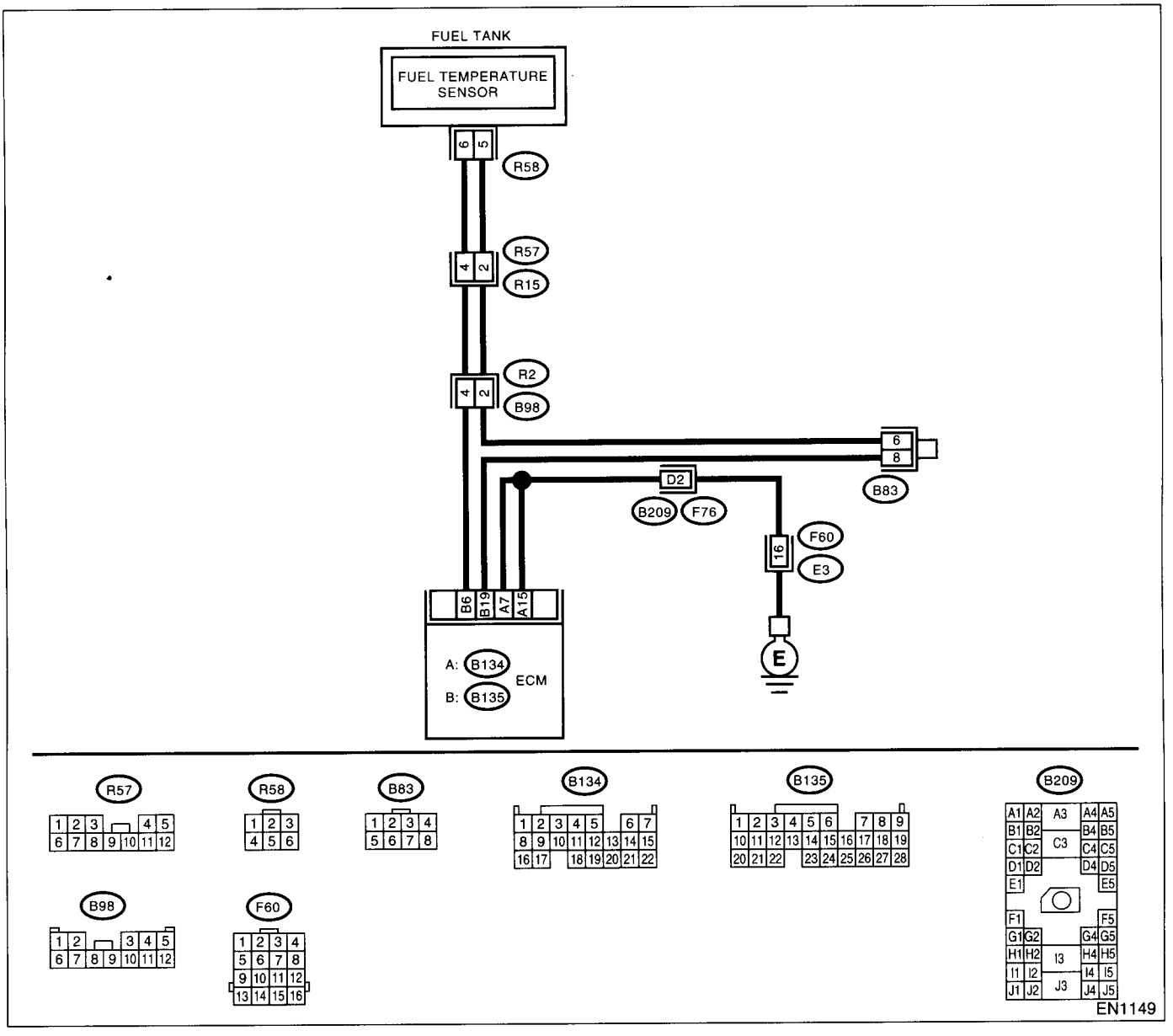
	Step	Check	Yes	No
7	**CHECK INTAKE AIR TEMPERATURE SENSOR.** 1)Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2)Place the shift lever in neutral position. 3)Turn the A/C switch to OFF. 4)Turn all accessory switches to OFF. 5)Open the front hood. 6)Measure the ambient temperature. 7)Read the data of pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is value obtained when ambient temperature is subtracted from intake air temperature greater than −10°C (14°F) and less than 50°C (122°F)?	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Check mass air flow and intake air temperature sensor. <Ref. to FU(DOHC TURBO)-34, Mass Air Flow and Intake Air Temperature Sensor.>

AB:DTC P0181 — FUEL TEMPERATURE SENSOR A CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



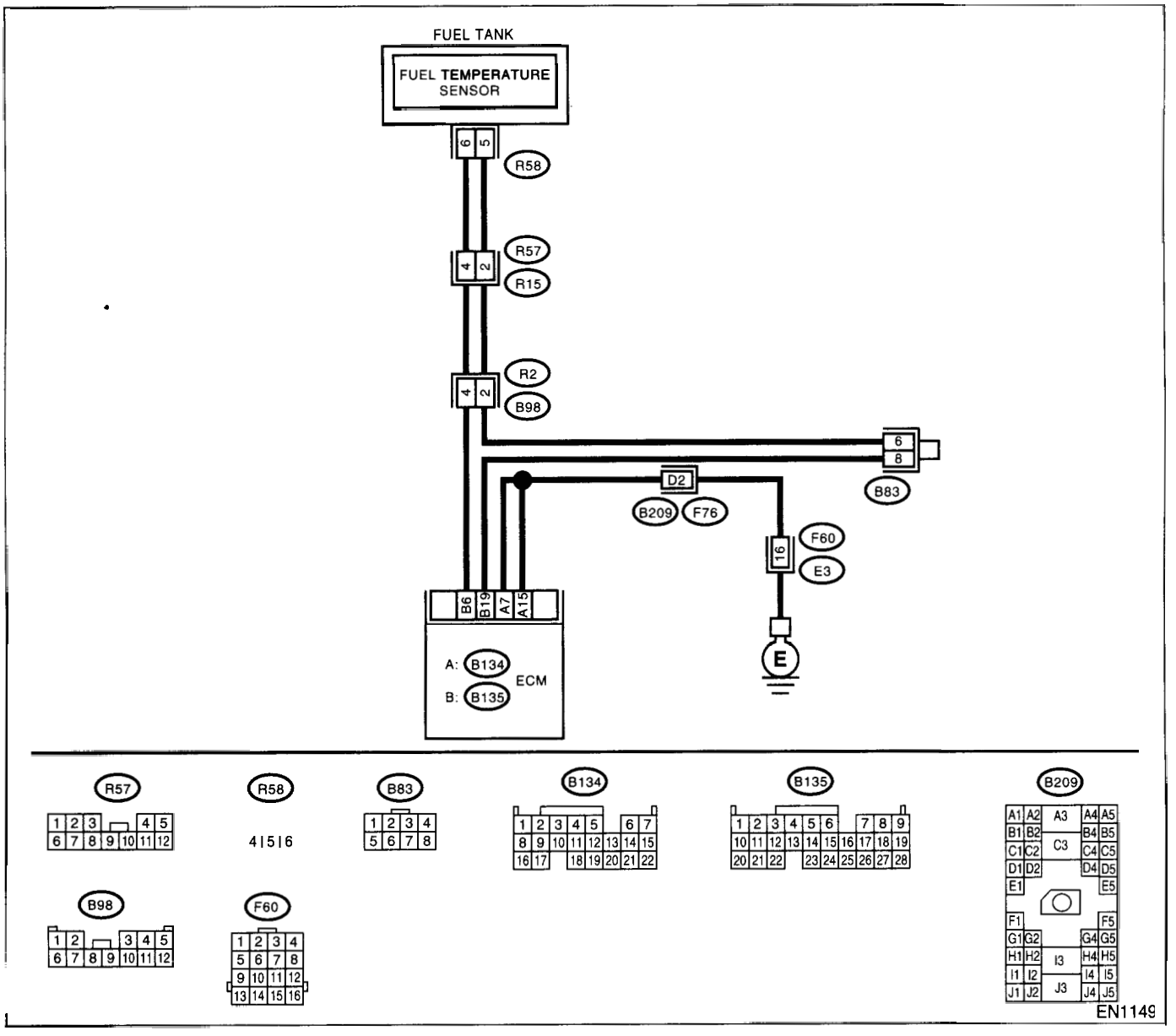
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0182 or P0183?	Inspect DTC P0182 or P0183 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0181.	Replace the fuel temperature sensor. <Ref. to EC(DOHC TURBO)-9, Fuel Temperature Sensor.>

AC:DTC P0182 — FUEL TEMPERATURE SENSOR A 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



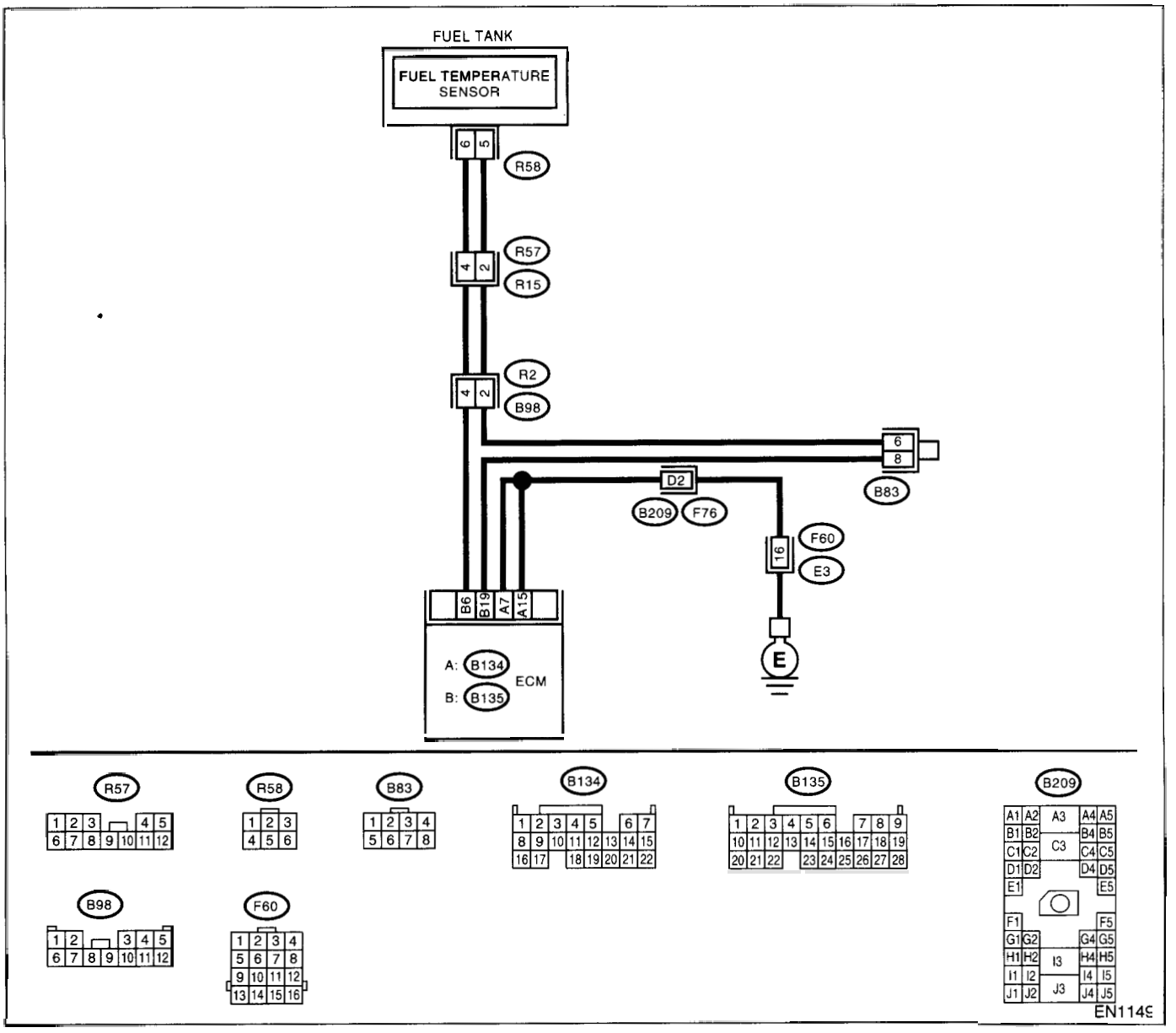
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value greater than 120°C (248°F)?	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time.
2	**CHECK CURRENT DATA.** 1)Turn the ignition switch to OFF. 2)Remove the access hole lid. 3)Disconnect the connector from fuel pump. 4)Turn the ignition switch to ON. 5)Read the data of fuel temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than –40°C (–40°F)?	Replace the fuel temperature sensor. <Ref. to EC(DOHC TURBO)-9, Fuel Temperature Sensor.>	Repair ground short circuit in harness between fuel pump and ECM connector.

AD:DTC P0183 — FUEL TEMPERATURE SENSOR A 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than –40°C (–40°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connectors • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Remove the access hole lid. 3)Disconnect the connector from fuel pump. 4)Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and fuel pump connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and fuel pump connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 4 V?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connectors

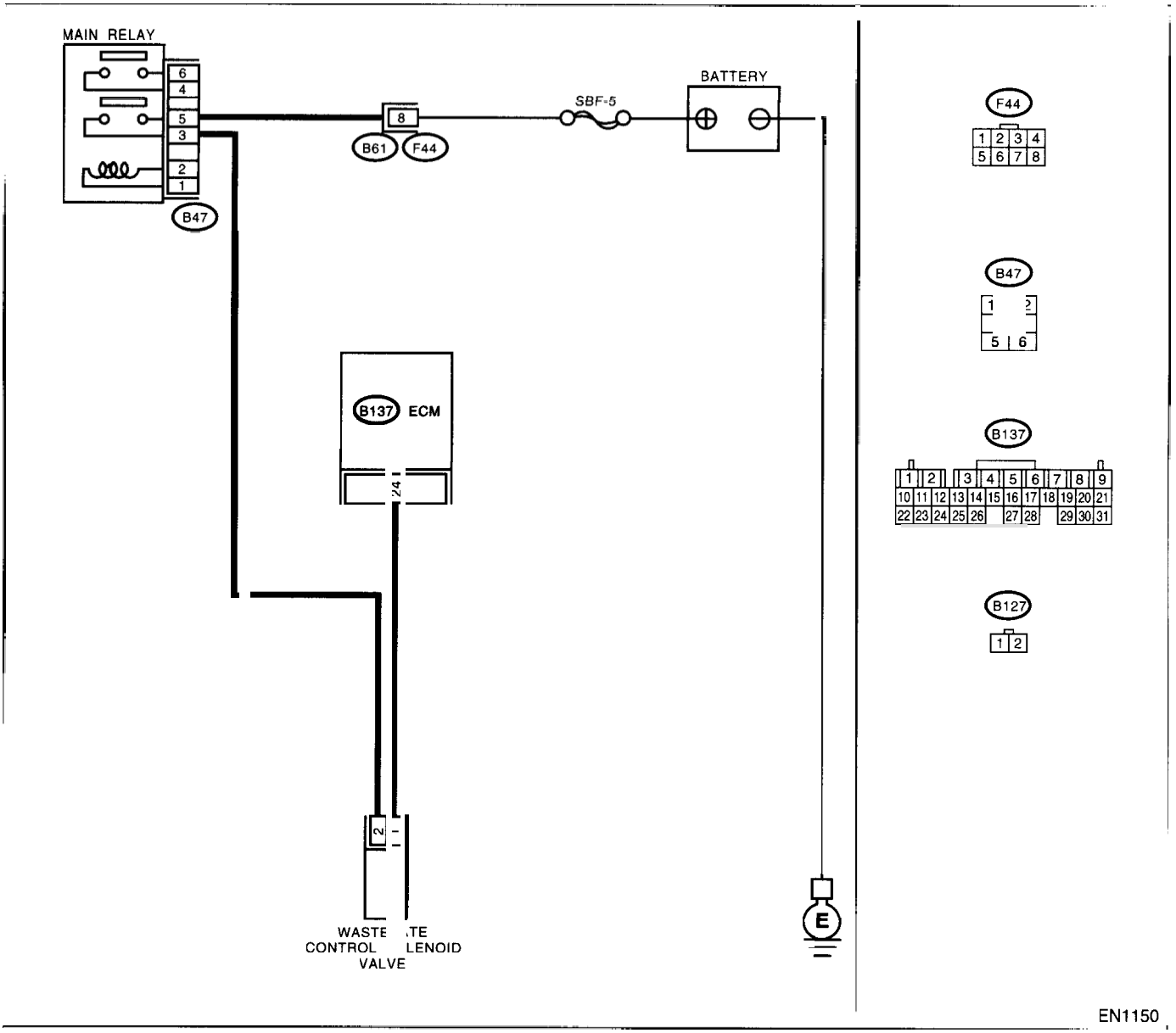
	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of harness between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 4 — Chassis ground:***	Is the resistance less than 5 Ω?	Replace the fuel temperature sensor. <Ref. to EC(DOHC TURBO)-9, Fuel Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connectors • Poor contact in joint connector

AE:DTC P0244 — WASTEGATE CONTROL SOLENOID VALVE MALFUNCTION (HIGH INPUT) —

- **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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN1150

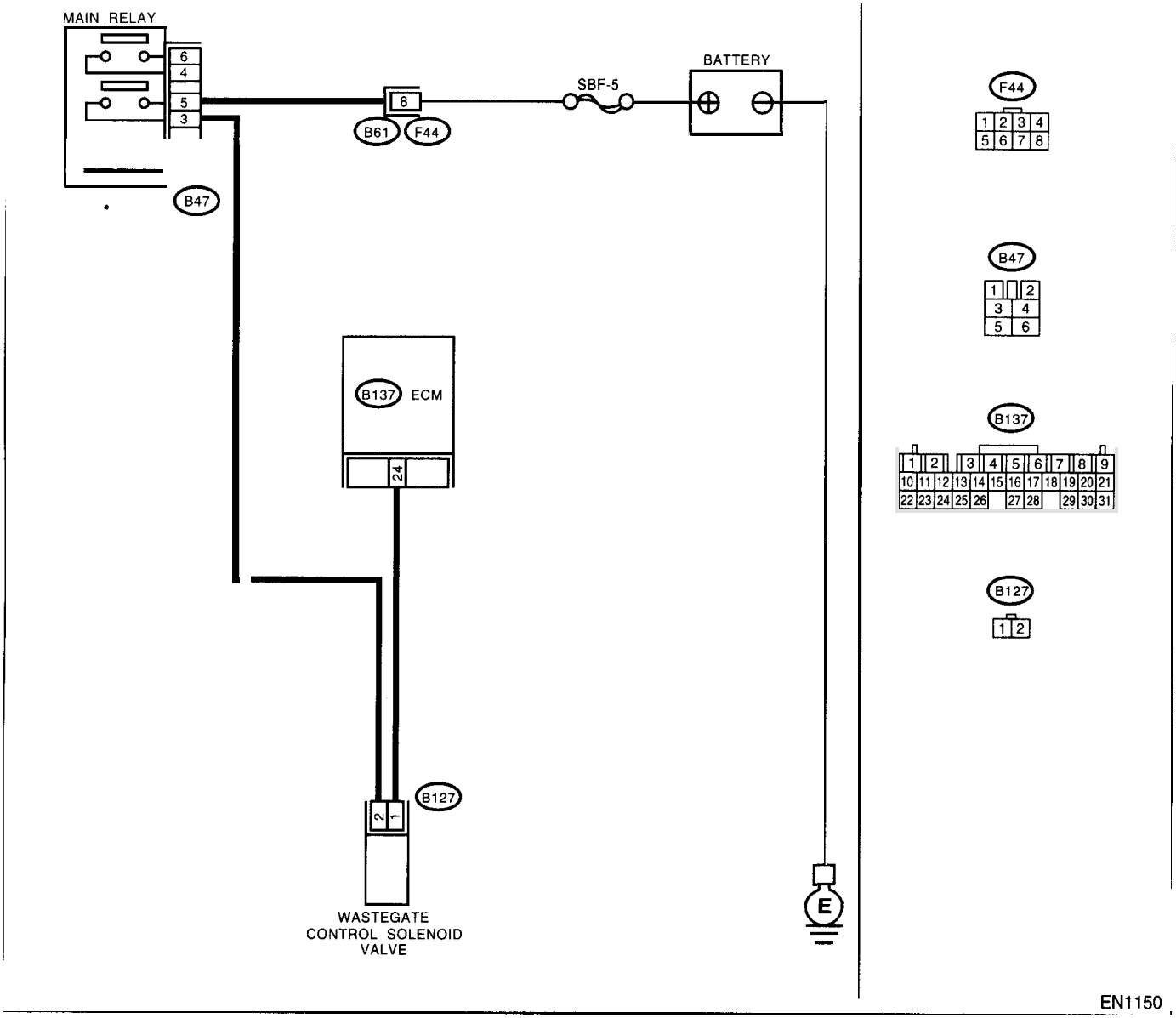
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0245 or P0246?	Inspect DTC P0245 or P0246 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0244.	Replace the wastegate control solenoid valve. <Ref. to FU(DOHC TURBO)-41, Wastegate Control Solenoid Valve.>

AF:DTC P0245 — WASTEGATE CONTROL SOLENOID VALVE CIRCUIT LOW INPUT —

- **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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN1150

	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 voltage more than 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 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 resistance less than 10 Ω?	Repair 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 resistance less than 1 Ω?	Go to step **4.**	Repair 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 purge control solenoid valve. 2)Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 30 and 34 Ω?	Go to step **5.**	Replace the wastegate control solenoid valve. <Ref. to FU(DOHC TURBO)-41, Wastegate Control Solenoid Valve.>
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 voltage more than 10 V?	Go to step **6.**	Repair open circuit in harness between main relay and wastegate control solenoid valve connector.

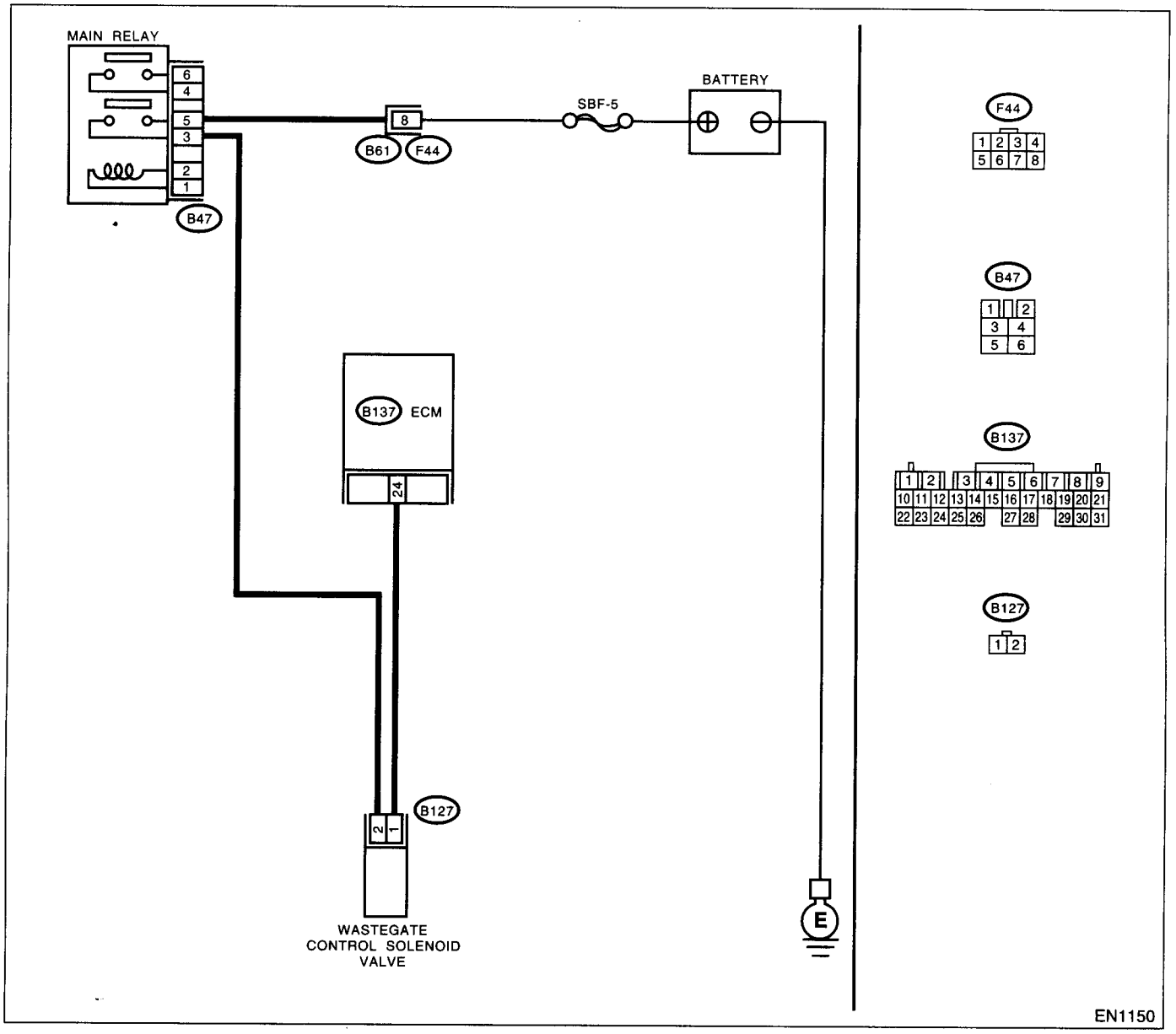
	Step	Check	Yes	No
6	**CHECK POOR CONTACT.** Check poor contact in wastegate control solenoid valve connector.	Is there poor contact in wastegate control solenoid valve connector?	Repair poor contact in wastegate control solenoid valve connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AG:DTC P0246 — WASTEGATE CONTROL SOLENOID VALVE CIRCUIT HIGH INPUT —

- **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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, 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 voltage more than 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?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(DOHC TURBO)-47, 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 voltage more than 10 V?	Repair battery short circuit in harness between ECM and wastegate control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(DOHC TURBO)-47, 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 resistance less than 1 Ω?	Replace the wastegate control solenoid valve <Ref. to FU(DOHC TURBO)-41, Wastegate Control Solenoid Valve.> and ECM <Ref. to FU(DOHC TURBO)-47, 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 poor contact in ECM connector.	Replace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>

AH:DTC P0301 — CYLINDER 1 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(DOHC TURBO)-173, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AI: DTC P0302 — CYLINDER 2 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(DOHC TURBO)-173, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AJ:DTC P0303 — CYLINDER 3 MISFIRE DETECTED —

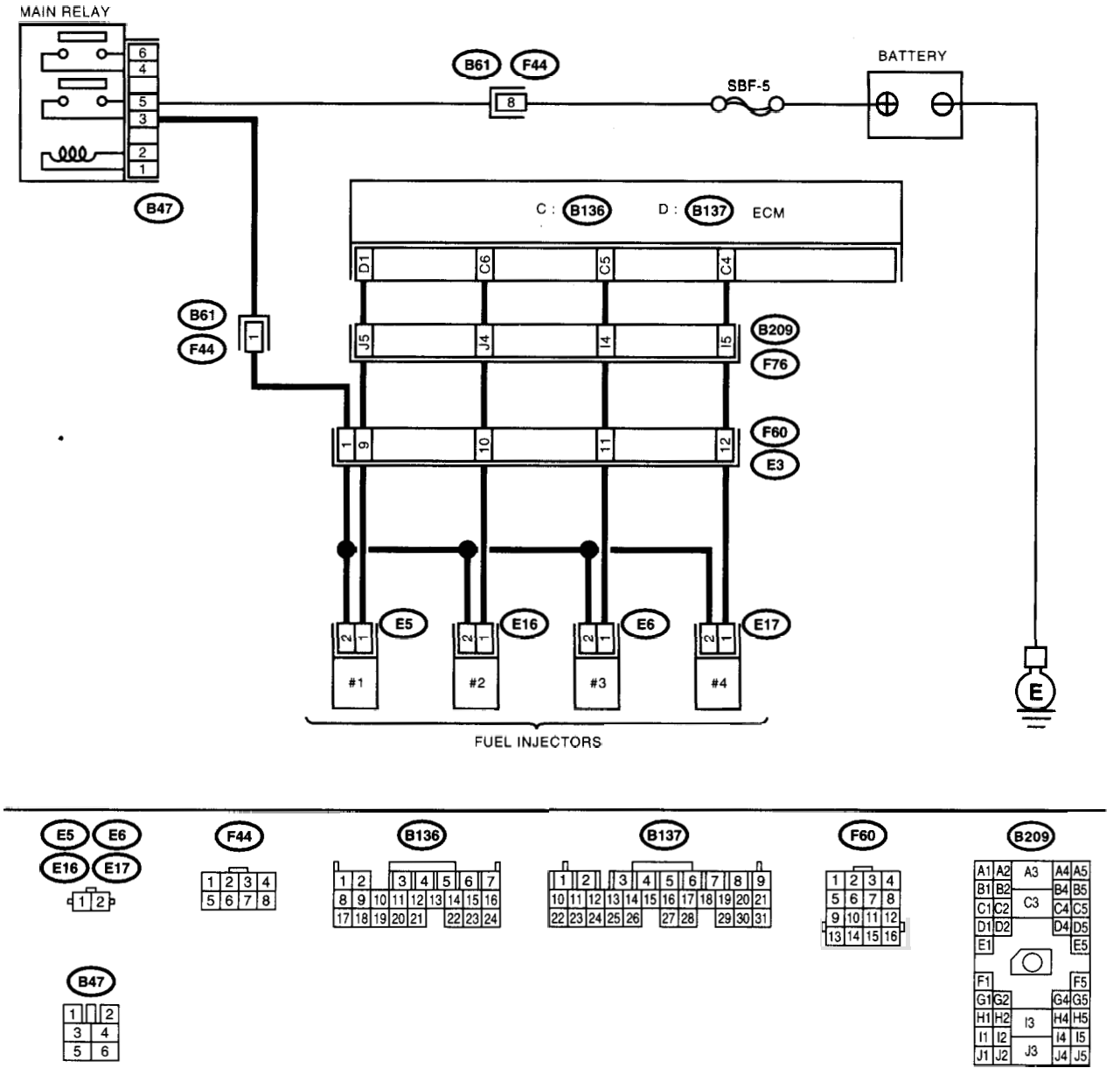
NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(DOHC TURBO)-173, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AK: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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN1142

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0106, P0107, P0108, P0117, P0118 or P0125?	Inspect DTC P0106, P0107, P0108, P0117, P0118 or P0125 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, 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 (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 voltage more than 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 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 resistance less than 10 Ω?	Repair 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 resistance less than 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
5	**CHECK FUEL INJECTOR.** Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 5 and 20 Ω?	Go to step **6.**	Replace the faulty fuel injector. <Ref. to FU(DOHC TURBO)-37, 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 voltage more than 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 (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 voltage more than 10 V?	Repair battery short circuit in harness between ECM and fuel injector. After repair, replace the ECM. <Ref. to FU(DOHC TURBO)-47, 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 resistance less than 1 Ω?	Replace the faulty fuel injector <Ref. to FU(DOHC TURBO)-37, Fuel Injector.> and ECM <Ref. to FU(DOHC TURBO)-47, 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?	Tighten 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?	Replace the crankshaft sprocket. <Ref. to ME(DOHC TURBO)-58, Crankshaft Sprocket.>	Go to step **11.**

	Step	Check	Yes	No
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 499987500 CRANKSHAFT SOCKET	Is the timing belt dislocated from its proper position?	Repair installation condition of timing belt. <Ref. to ME(DOHC TURBO)-48, Timing Belt Assembly.>	Go to step **12.**
12	**CHECK FUEL LEVEL.**	Is the fuel meter indication 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(DOHC TURBO)-49, Clear Memory Mode.> 2)Start the engine, and drive the vehicle more than 10 minutes.	Is the MIL 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?	Finish diagnostics operation, if the engine has no abnormality. NOTE: Ex. Remove the spark plug cord, etc.	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
15	**CHECK AIR INTAKE SYSTEM.**	Is there a fault in air intake system?	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(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual. NOTE: Perform diagnosis according to the items listed below.	Does the Subaru Select Monitor or OBD-II general scan tool indicate only one DTC?	Go to step **21.**	Go to step **17.**
17	**CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0301 and P0302?	Go to step **22.**	Go to step **18.**
18	**CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0303 and P0304?	Go to step **23.**	Go to step **19.**
19	**CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0301 and P0303?	Go to step **24.**	Go to step **20.**
20	**CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0302 and P0304?	Go to step **25.**	Go to step **26.**
21	**ONLY ONE CYLINDER**	Is there a fault in that cylinder?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Spark plug cord • Fuel injector • Compression ratio	Go to DTC P0171 and P0172. <Ref. to EN(DOHC TURBO)-152, DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Step		Check	Yes	No
22	GROUP OF #1 AND #2 CYLINDERS	Are there faults in #1 and #2 cylinders?	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(DOHC TURBO)-72, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Go to DTC P0171 and P0172. <Ref. to EN(DOHC TURBO)-152, DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
23	GROUP OF #3 AND #4 CYLINDERS	Are there faults in #3 and #4 cylinders?	Repair or replace faulty parts. NOTE: • Check the following items. • Spark plugs • Fuel injectors • Ignition coil • If no abnormal is discovered, check for "IGNITION CONTROL SYSTEM" of #3 and #4 cylinders side. <Ref. to EN(DOHC TURBO)-72, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Go to DTC P0171 and P0172. <Ref. to EN(DOHC TURBO)-152, DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	GROUP OF #1 AND #3 CYLINDERS	Are there faults in #1 and #3 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Skipping timing belt teeth	Go to DTC P0171 and P0172. <Ref. to EN(DOHC TURBO)-152, DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

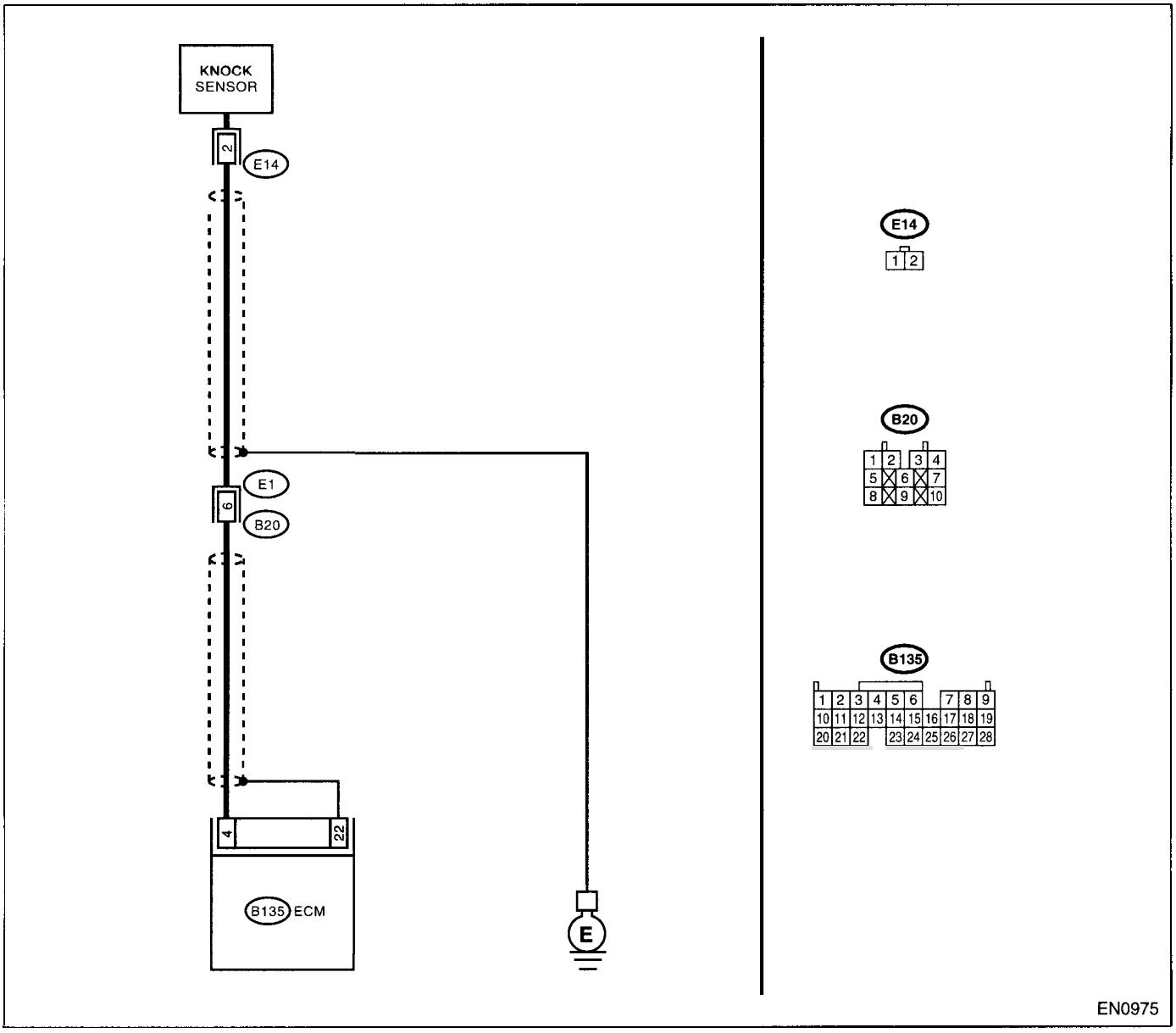
Step		Check	Yes	No
25	GROUP OF #2 AND #4 CYLINDERS	Are there faults in #2 and #4 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Compression ratio • Skipping timing belt teeth	Go to DTC P0171 and P0172. <Ref. to EN(DOHC TURBO)-152, DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
26	CYLINDER AT RANDOM	Is the engine idle rough?	Go to DTC P0171 and P0172. <Ref. to EN(DOHC TURBO)-152, DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Compression ratio

AL:DTC P0327 — KNOCK SENSOR CIRCUIT LOW INPUT —

- **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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



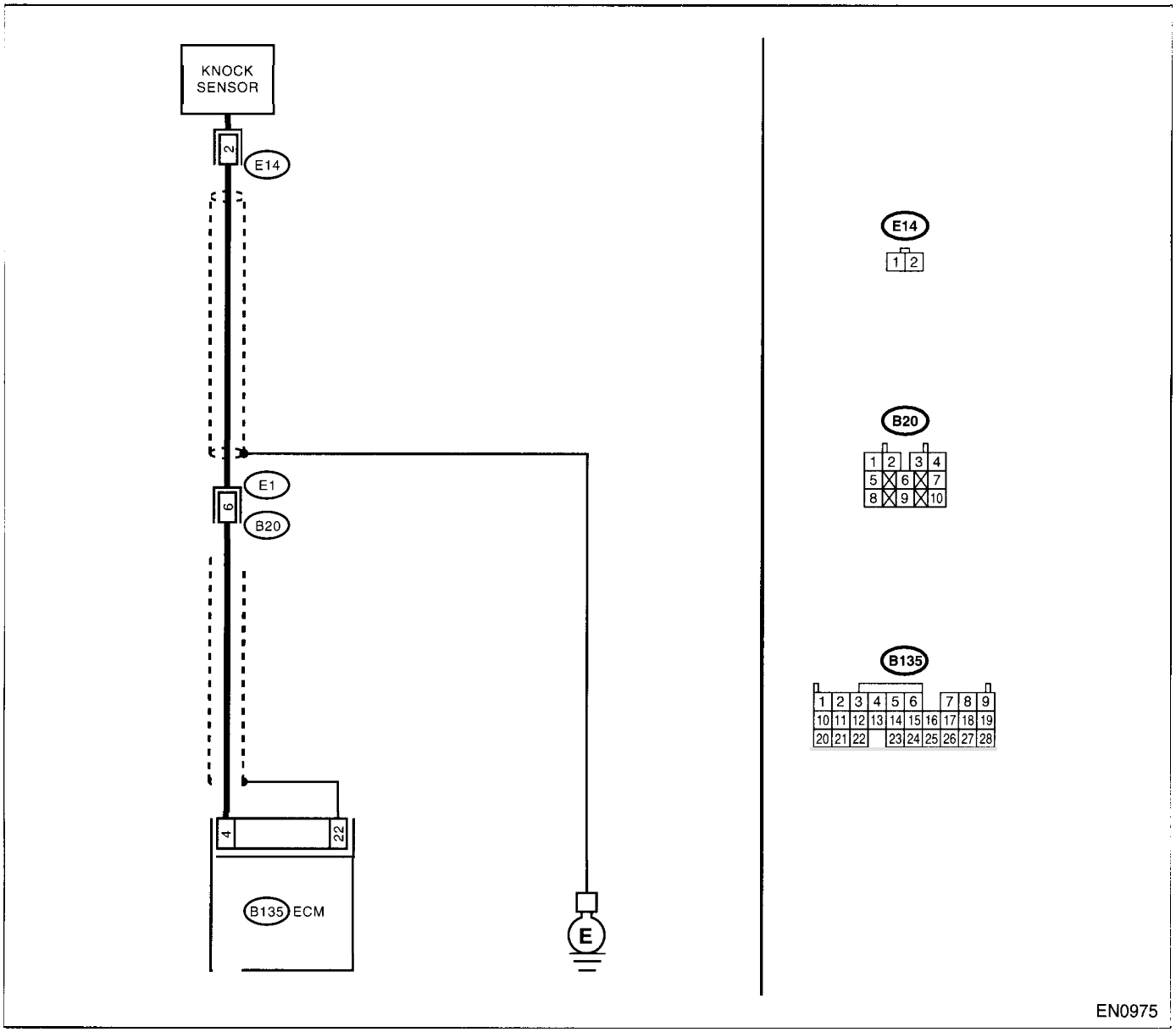
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance between ECM harness connector and chassis ground. ***Connector & terminal*** ***(B135) No. 4 — Chassis ground:***	Is the resistance more than 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 resistance more than 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?	Replace the knock sensor. <Ref. to FU(DOHC TURBO)-32, Knock Sensor.>	Tighten knock sensor installation bolt securely.

AM:DTC P0328 — KNOCK SENSOR CIRCUIT HIGH INPUT —

- **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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, 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 resistance less than 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 resistance less than 400 kΩ?	Replace the knock sensor. <Ref. to FU(DOHC TURBO)-32, 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. 4 (+) — Chassis ground (–):***	Is the voltage more than 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.

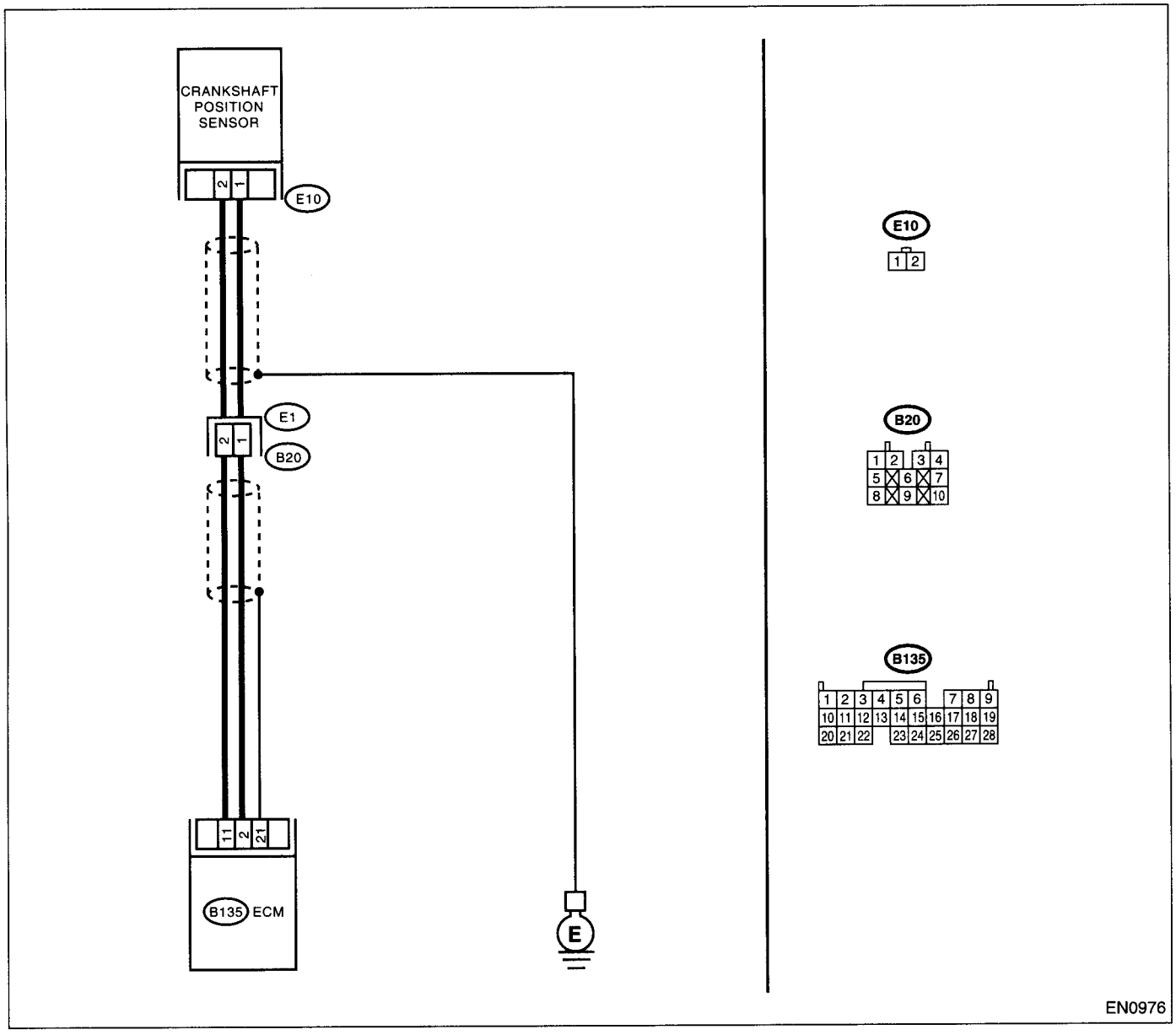
AN:DTC P0335 — CRANKSHAFT POSITION SENSOR CIRCUIT MALFUNCTION

—

- **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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



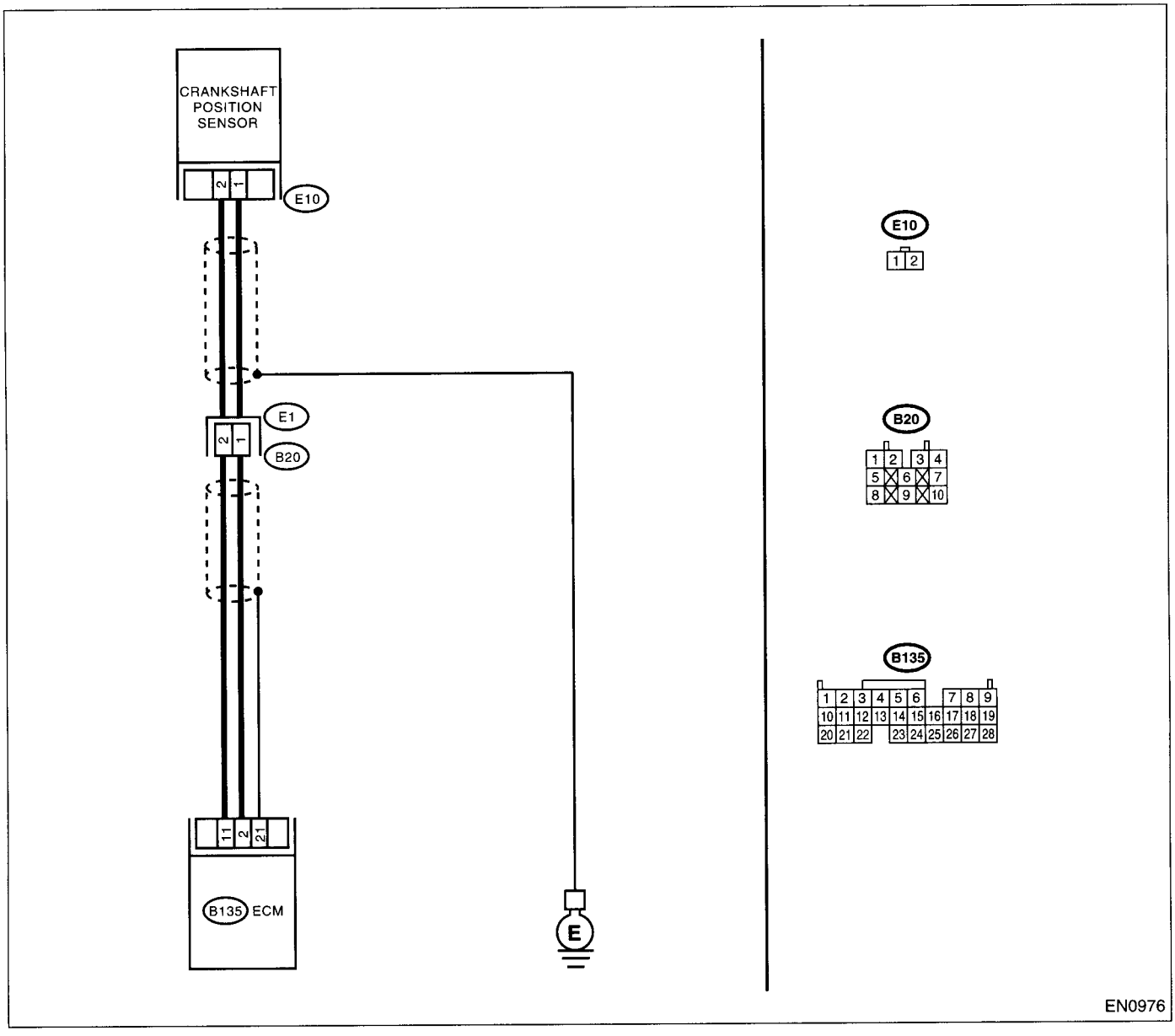
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from crankshaft position sensor. 3)Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:***	Is the resistance more than 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 resistance less than 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 resistance less than 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?	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 resistance between 1 and 4 kΩ?	Repair poor contact in crankshaft position sensor connector.	Replace the crankshaft position sensor. <Ref. to FU(DOHC TURBO)-30, Crankshaft Position Sensor.>

AO:DTC P0336 — CRANKSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



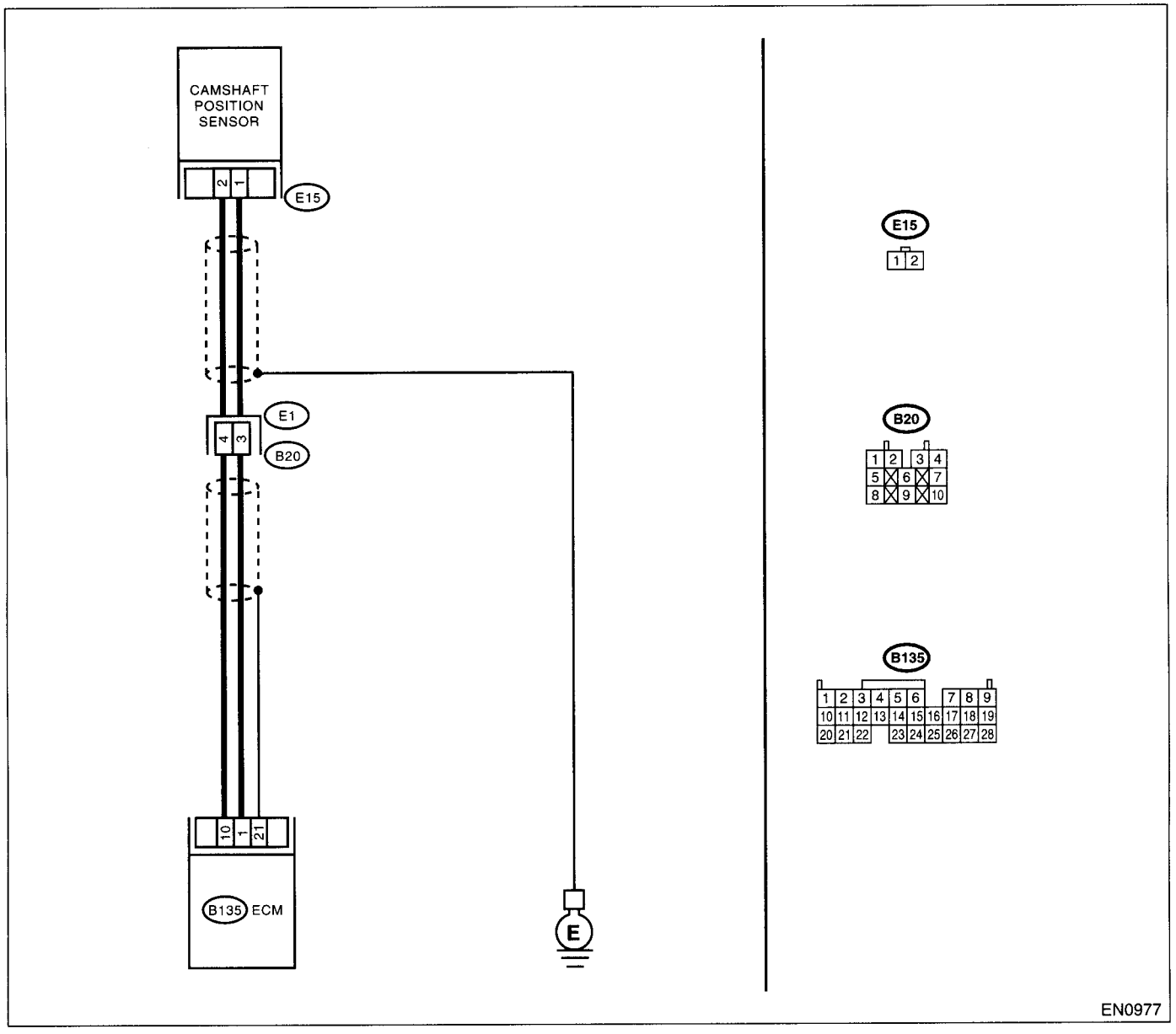
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0335?	Inspect DTC P0335 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.** Turn the ignition switch to OFF.	Is the crankshaft position sensor installation bolt tightened securely?	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?	Replace the crankshaft sprocket. <Ref. to FU(DOHC TURBO)-30, Crankshaft Position Sensor.>	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 499987500 CRANKSHAFT SOCKET	Is the timing belt dislocated from its proper position?	Repair installation condition of timing belt. <Ref. to ME(DOHC TURBO)-48, Timing Belt Assembly.>	Replace the crankshaft position sensor. <Ref. to FU(DOHC TURBO)-30, Crankshaft Position Sensor.>

AP:DTC P0340 — CAMSHAFT POSITION SENSOR CIRCUIT MALFUNCTION —

- **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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



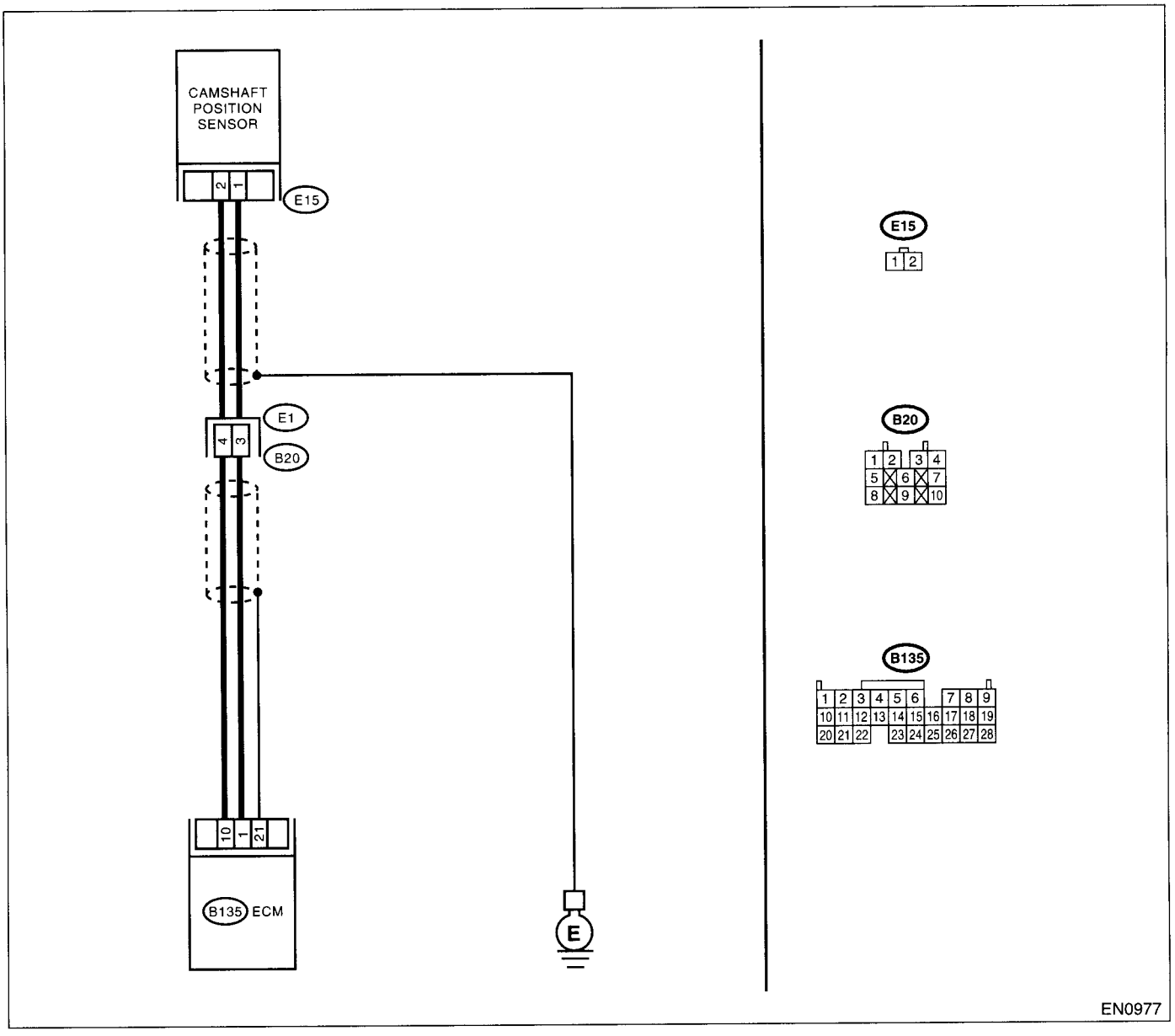
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from camshaft position sensor. 3)Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the resistance more than 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 resistance less than 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 resistance less than 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?	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 resistance between 1 and 4 kΩ?	Repair poor contact in camshaft position sensor connector.	Replace the camshaft position sensor. <Ref. to FU(DOHC TURBO)-31, Camshaft Position Sensor.>

AQ:DTC P0341 — CAMSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, 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 indicate DTC P0340?	Inspect DTC P0340 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, 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 resistance more than 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 resistance less than 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 resistance less than 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?	Go to step **6.**	Tighten camshaft position sensor installation bolt securely.

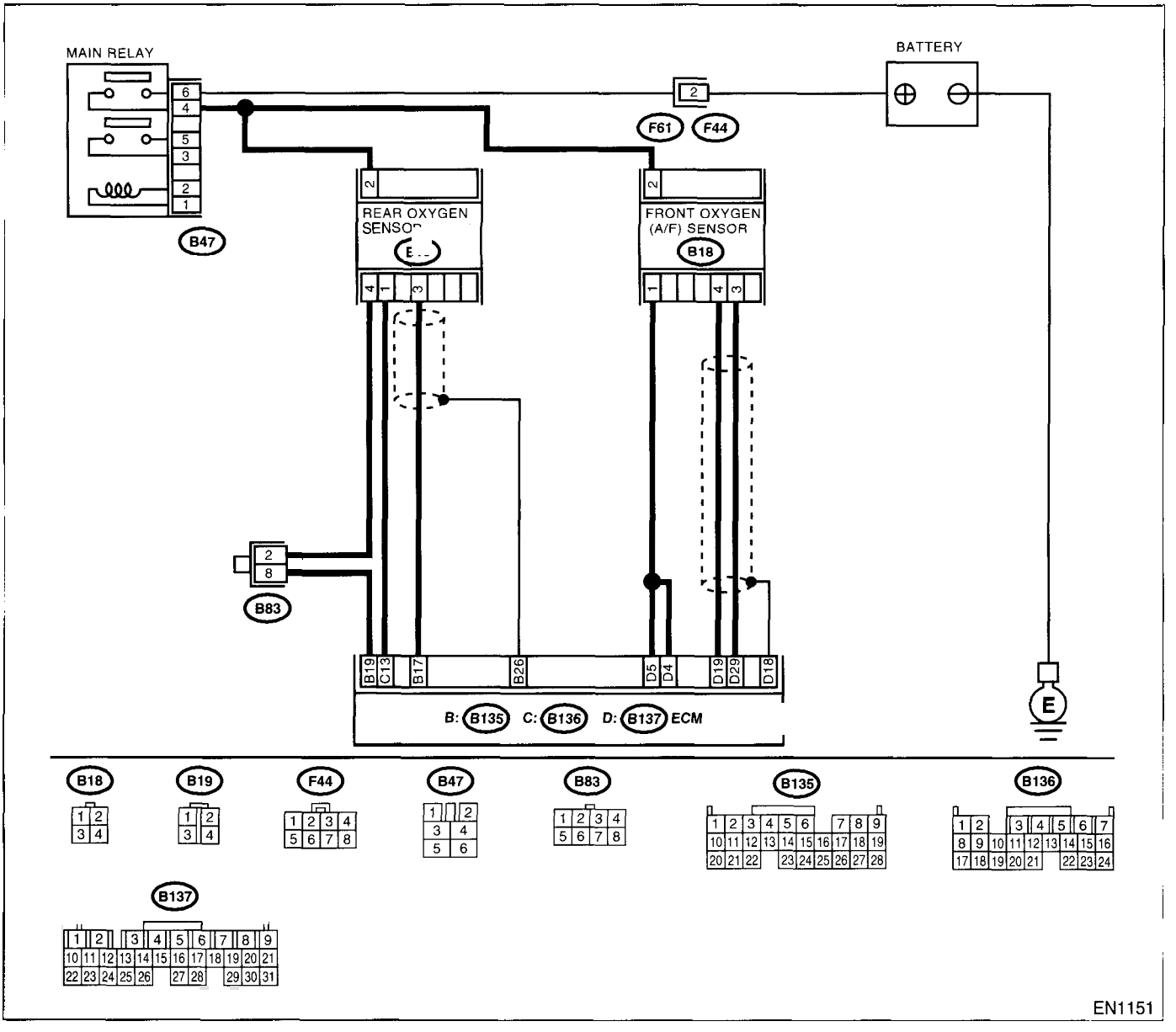
	Step	Check	Yes	No
6	**CHECK CAMSHAFT POSITION SENSOR.** 1)Remove the camshaft position sensor. 2)Measure the resistance between connector terminals of camshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 1 and 4 kΩ?	Go to step **7.**	Replace the camshaft position sensor. <Ref. to FU(DOHC TURBO)-31, 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?	Go to step **8.**	Tighten camshaft position sensor installation bolt securely.
8	**CHECK CAMSHAFT SPROCKET.** Remove the front belt cover. <Ref. to ME(SOHC)-46, Belt Cover.>	Are camshaft sprocket teeth cracked or damaged?	Replace the camshaft sprocket. <Ref. to ME(DOHC TURBO)-57, 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?	Repair installation condition of timing belt. <Ref. to ME(DOHC TURBO)-48, Timing Belt Assembly.>	Replace the camshaft position sensor. <Ref. to FU(DOHC TURBO)-31, Camshaft Position Sensor.>

AR:DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD —

- **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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



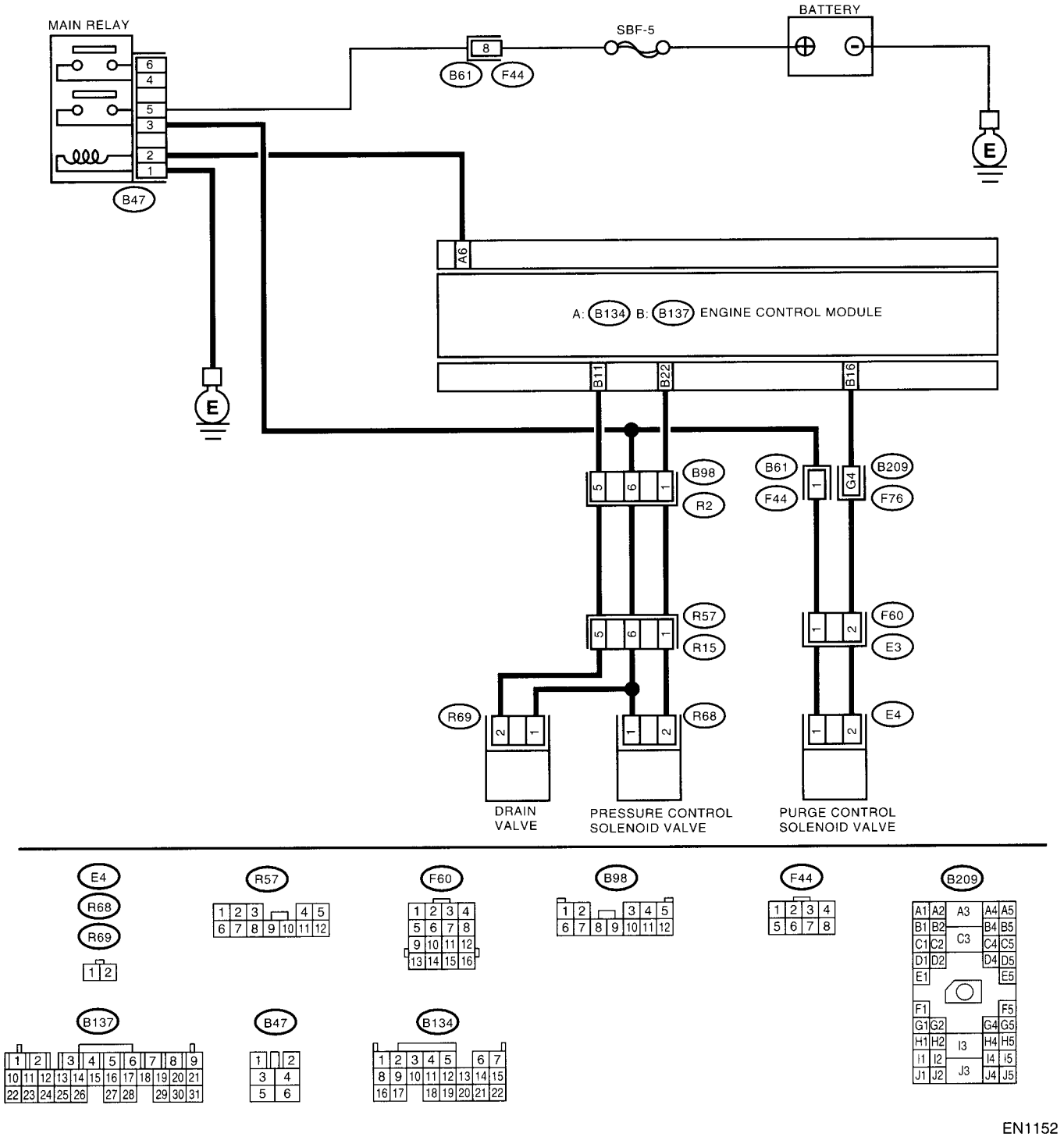
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0031, P0032, P0131, P0132, P0133, P1130, P1131, P1134, P1139, P0037, P0038, P0136 and P0139?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, 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?	Repair or replace the exhaust system. <Ref. to EX(DOHC TURBO)-2, General Description.>	Go to step **3.**
3	**CHECK REAR CATALYTIC CONVERTER.** Separate rear catalytic converter from rear exhaust pipe.	Is there damage at rear face of rear catalyst?	Replace the front catalytic converter <Ref. to EC(DOHC TURBO)-3, Front Catalytic Converter.> and rear catalytic converter <Ref. to EC(DOHC 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?	Replace the front catalytic converter. <Ref. to EC(DOHC TURBO)-3, Front Catalytic Converter.>	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AS:DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Gasoline smell
  - There is a hole of more than 1.0 mm (0.04 in) dia. in evaporation system or fuel tank.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, Operation.> OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN1152

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is there any other DTC on display?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1)Turn the ignition switch to OFF. 2)Check the fuel filler cap. NOTE: The DTC code is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(DOHC TURBO)-55, Fuel Filler Pipe.>	Go to step **4.**
4	**CHECK DRAIN VALVE.** 1)Connect the test mode connector. 2)Turn the ignition switch to ON. 3)Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(DOHC TURBO)-50, Compulsory Valve Operation Check Mode.>	Does the drain valve produce operating sound?	Go to step **5.**	Replace the drain valve. <Ref. to EC(DOHC TURBO)-17, Drain Valve.>
5	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(DOHC TURBO)-50, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve produce operating sound?	Go to step **6.**	Replace the purge control solenoid valve. <Ref. to EC(DOHC TURBO)-7, Purge Control Solenoid Valve.>
6	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(DOHC TURBO)-50, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve produce operating sound?	Go to step **7.**	Replace the pressure control solenoid valve. <Ref. to EC(DOHC TURBO)-12, Pressure Control Solenoid Valve.>
7	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** Turn the ignition switch to OFF.	Is there a hole of more than 1.0 mm (0.04 in) dia. on fuel line?	Repair or replace the fuel line. <Ref. to FU(DOHC TURBO)-68, Fuel Delivery, Return and Evaporation Lines.>	Go to step **8.**

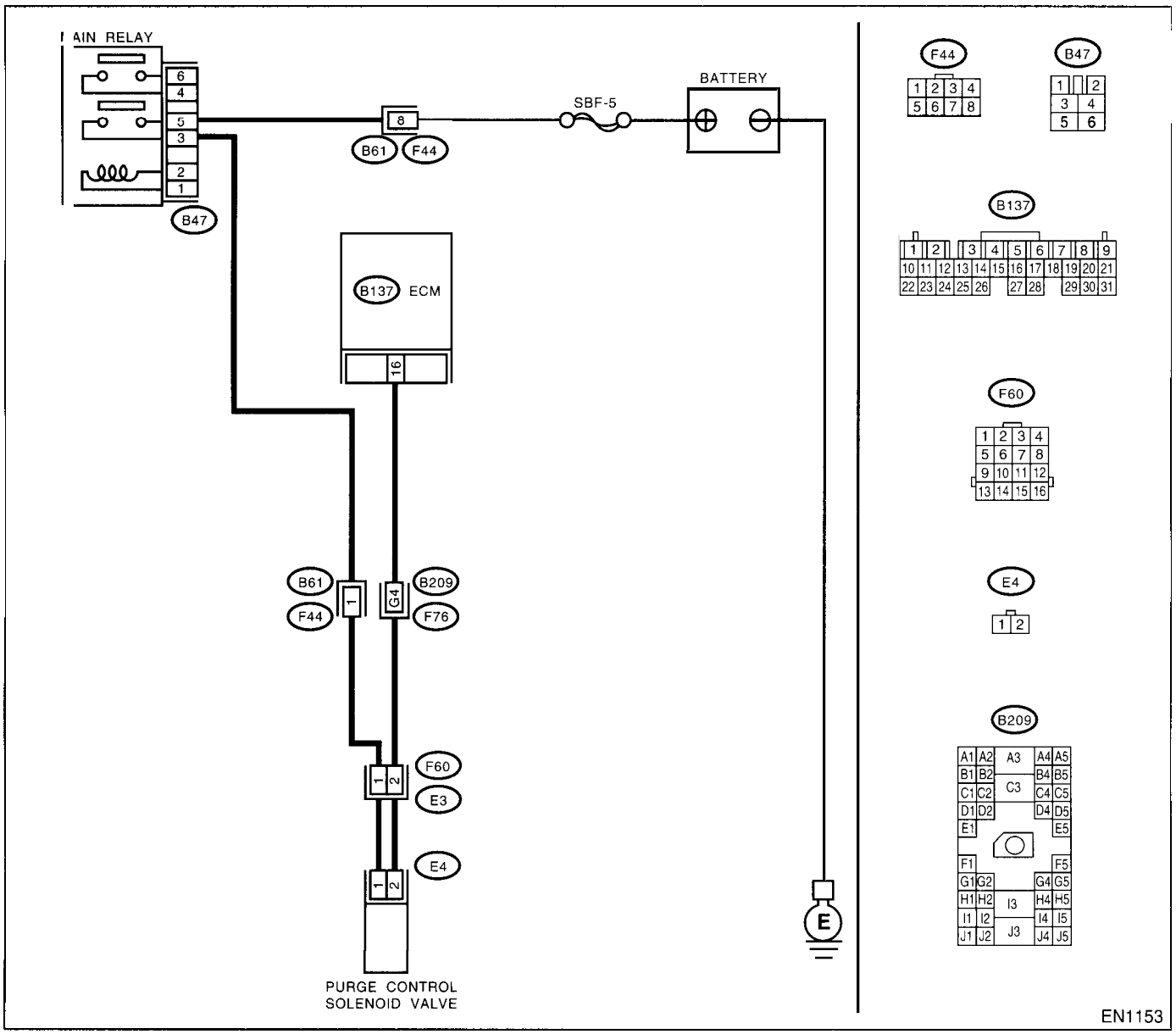
	Step	Check	Yes	No
8	**CHECK CANISTER.**	Is the canister damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the canister. <Ref. to EC(DOHC TURBO)-6, Canister.>	Go to step **9.**
9	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(DOHC TURBO)-52, Fuel Tank.>	Is the fuel tank damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the fuel tank. <Ref. to FU(DOHC TURBO)-52, Fuel Tank.>	Go to step **10.**
10	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 1.0 mm (0.04 in) dia., cracks, clogging or disconnections of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AT:DTC P0444 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW INPUT —

- **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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, 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 voltage more than 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 resistance less than 10 Ω?	Repair 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 resistance less than 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 resistance between 10 and 100 Ω?	Go to step **5.**	Replace the purge control solenoid valve. <Ref. to EC(DOHC TURBO)-7, Purge Control Solenoid Valve.>
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 voltage more than 10 V?	Go to step **6.**	Repair open circuit in harness between main relay and purge control solenoid valve connector.

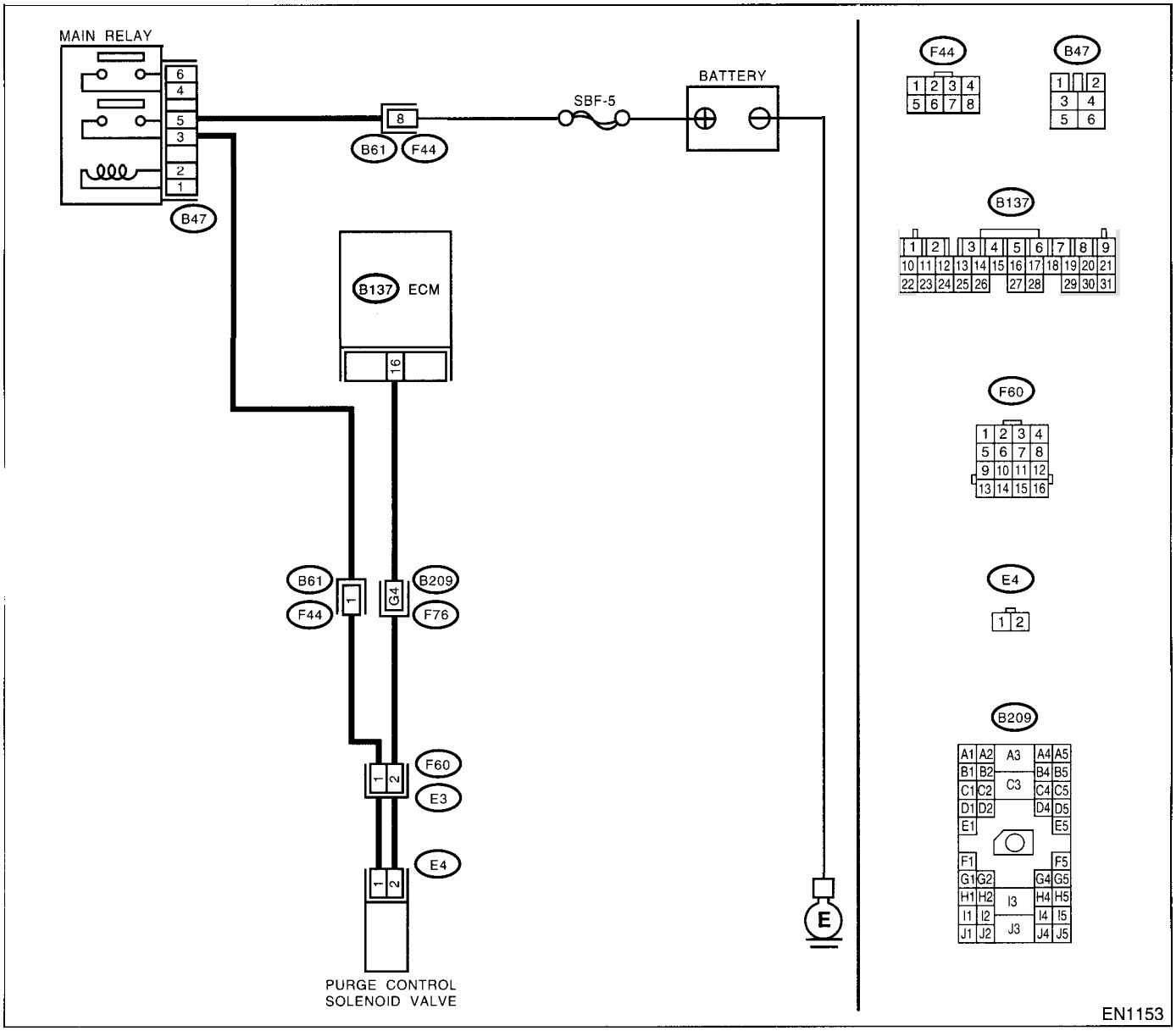
	Step	Check	Yes	No
6	**CHECK POOR CONTACT.** *Check poor contact in purge control solenoid valve connector.*	Is there poor contact in purge control solenoid valve connector?	Repair poor contact in purge control solenoid valve connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AU:DTC P0445 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH INPUT —

- **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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



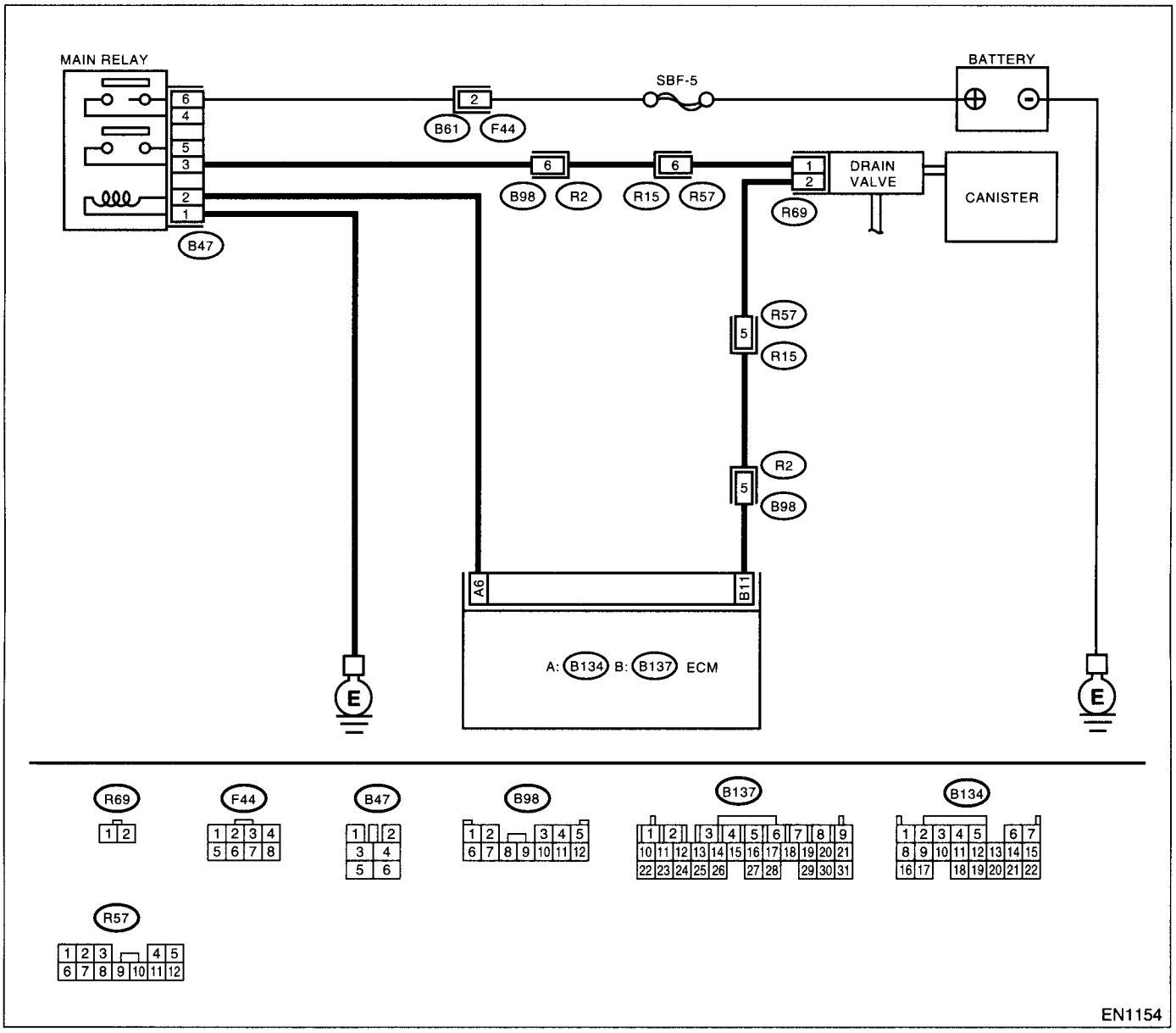
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to OFF. 2)Connect the test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box. 3)Turn the ignition switch to ON. 4)While operating the purge control solenoid valve, measure voltage between ECM and chassis ground. 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(DOHC TURBO)-50, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B137) No. 16 (+) — Chassis ground (–):***	Does the voltage change between 0 and 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. 16 (+) — Chassis ground (–):***	Is the voltage more than 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?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(DOHC TURBO)-47, 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 voltage more than 10 V?	Repair battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(DOHC TURBO)-47, 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 resistance less than 1 Ω?	Replace the purge control solenoid valve <Ref. to EC(DOHC TURBO)-7, Purge Control Solenoid Valve.> and ECM <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>

AV:DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, 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. 11 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **3.**

	Step	Check	Yes	No
2	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	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 drain valve connector • Poor contact in ECM connector • Poor contact in coupling connectors
3	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from drain valve and ECM. 3)Measure the resistance of harness between drain valve connector and chassis ground. ***Connector & terminal*** ***(R69) No. 2 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between ECM and drain valve connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and drain valve connector. ***Connector & terminal*** ***(B137) No. 11 — (R69) No. 2:***	Is the voltage less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and drain valve connector • Poor contact in coupling connectors
5	**CHECK DRAIN VALVE.** Measure the resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 10 and 100 Ω?	Go to step **6.**	Replace the drain valve. <Ref. to EC(DOHC TURBO)-17, Drain Valve.>
6	**CHECK POWER SUPPLY TO DRAIN VALVE.** 1)Turn the ignition switch to ON. 2)Measure the voltage between drain valve and chassis ground. ***Connector & terminal*** ***(R69) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and drain valve • Poor contact in coupling connectors • Poor contact in main relay connector

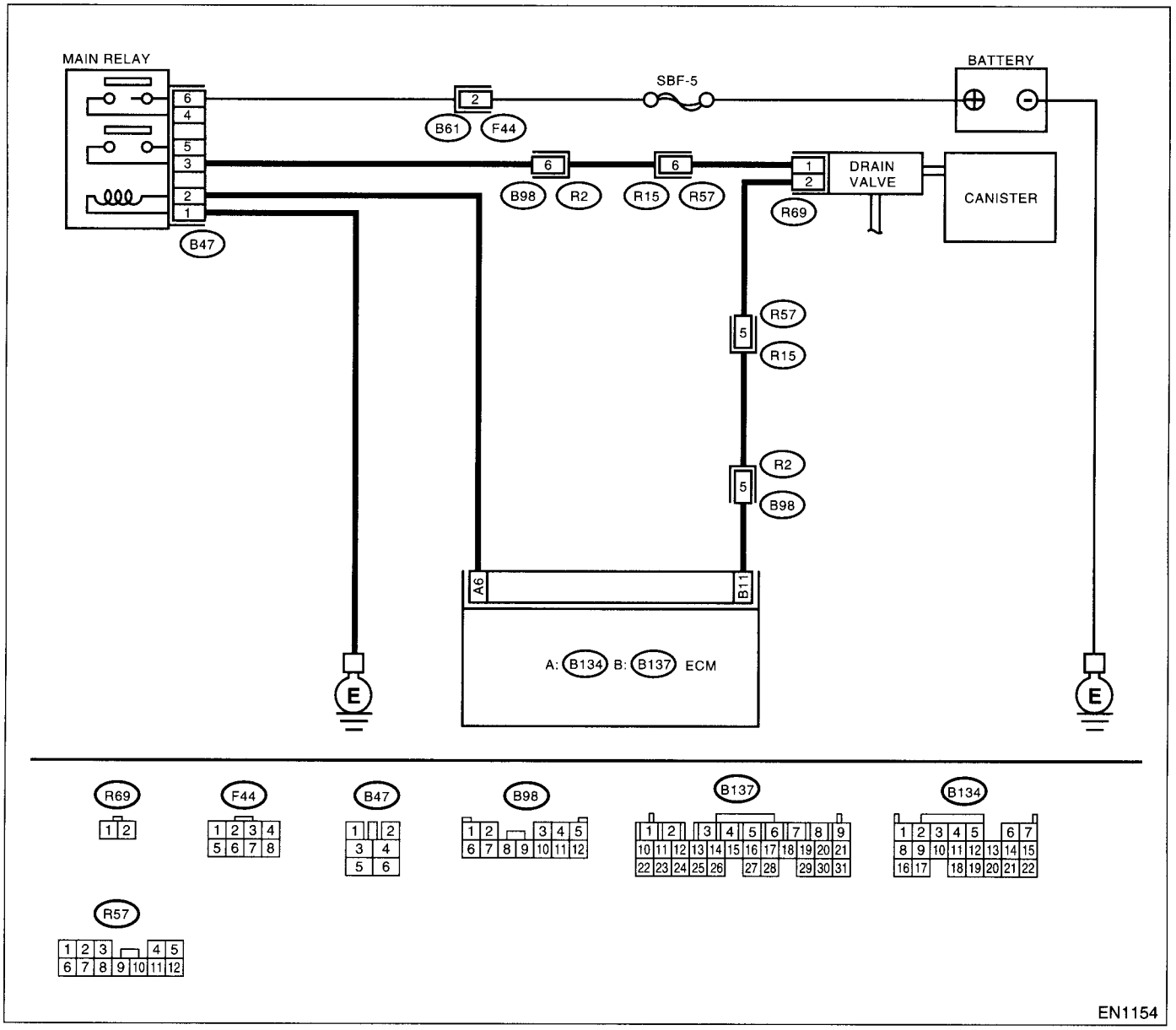
	Step	Check	Yes	No
7	**CHECK POOR CONTACT.** Check poor contact in drain valve connector.	Is there poor contact in drain valve connector?	Repair poor contact in drain valve connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AW:DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



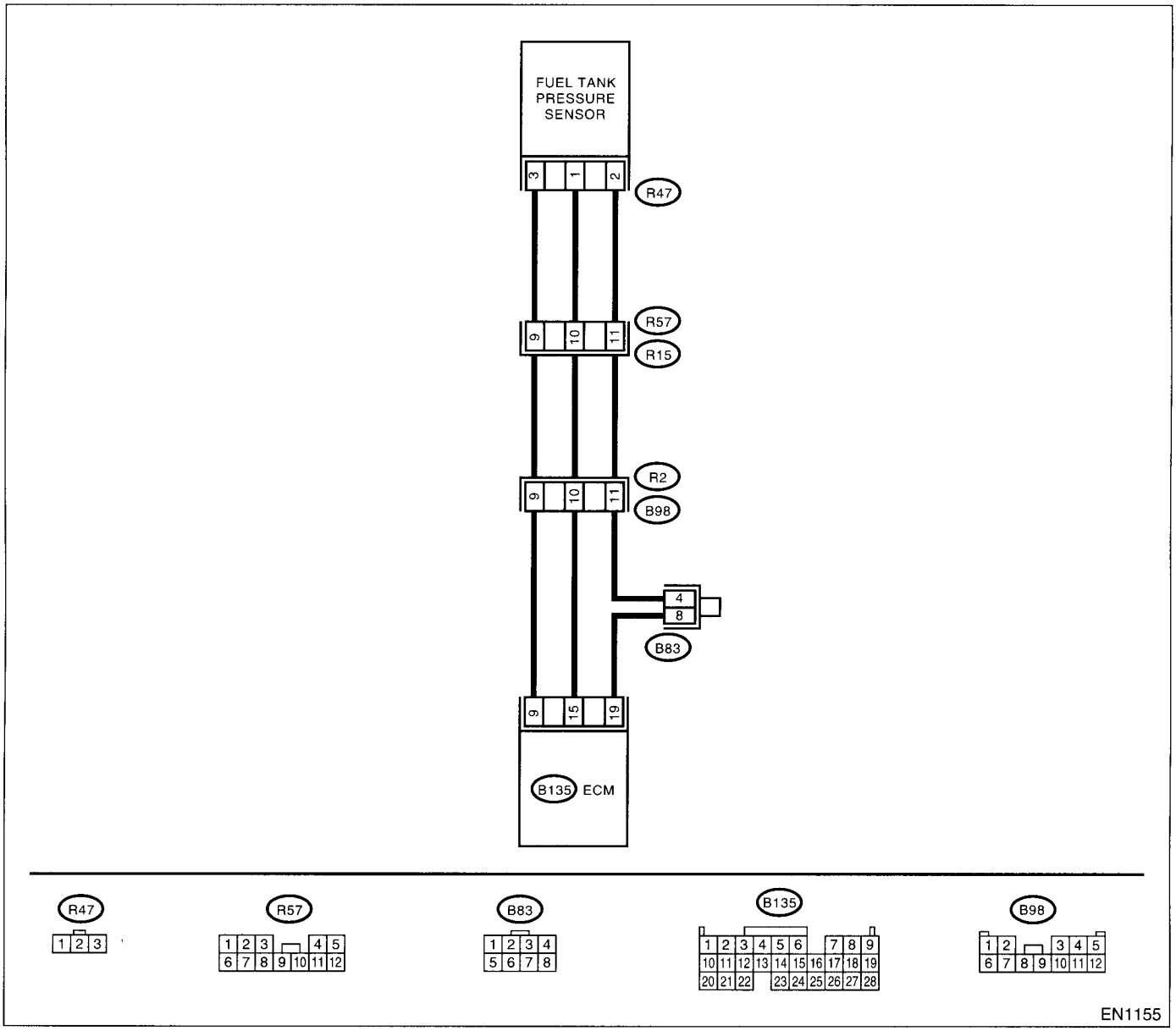
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to OFF. 2)Connect the test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box. 3)Turn the ignition switch to ON. 4)While operating the drain valve, measure voltage between ECM and chassis ground. NOTE: Drain valve operation can be excecuted using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(DOHC TURBO)-50, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B137) No. 11 (+) — Chassis ground (–):***	Does the voltage change between 0 and 10 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 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. 11 (+) — Chassis ground (–):***	Is the voltage more than 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?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>
4	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from drain valve. 3)Turn the ignition switch to ON. 4)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 11 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and drain valve connector. After repair, replace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the drain valve <Ref. to EC(DOHC TURBO)-17, Drain Valve.> and ECM <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>

AX:DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE PROBLEM —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



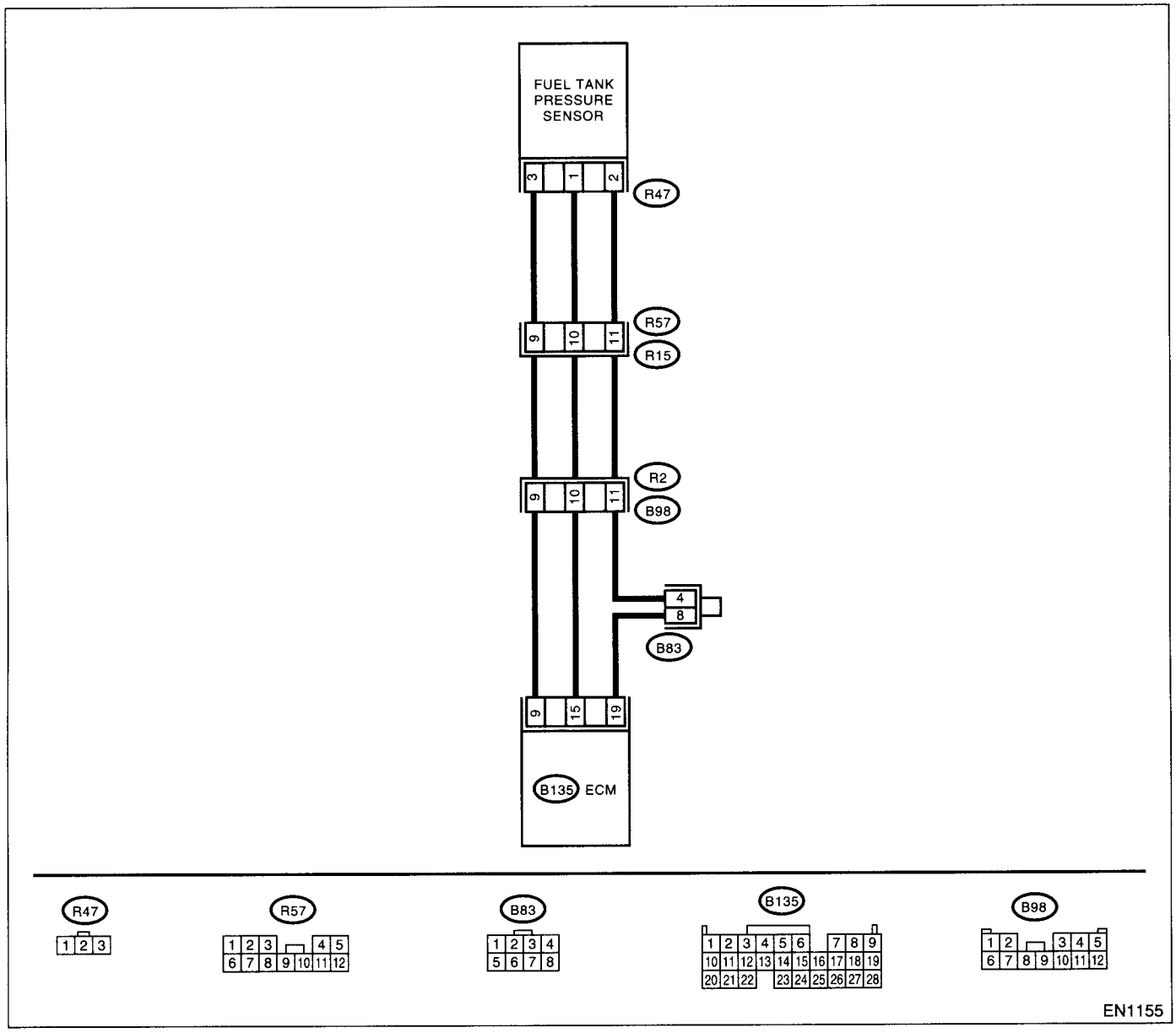
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is there any DTC on display?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1)Turn the ignition switch to OFF. 2)Open the fuel flap.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK PRESSURE/VACUUM LINE.** NOTE: Check the following items. •Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank •Disconnection, leakage and clogging of air ventilation hoses and pipes between fuel filler pipe and fuel tank	Is there a fault in pressure/vacuum line?	Repair or replace the hoses and pipes.	Replace the fuel tank pressure sensor. <Ref. to EC(DOHC TURBO)-11, Fuel Tank Pressure Sensor.>

AY:DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Turn the ignition switch to OFF. 2)Remove the fuel filler cap. 3)Install the fuel filler cap. 4)Turn the ignition switch to ON. 5)Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than –2.8 kPa (–21.0 mmHg, –0.827 inHg)?	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time.
2	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	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 and chassis ground. ***Connector & terminal*** ***(B135) No. 15 (+) — Chassis ground (–):***	Is the voltage less than 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 fuel tank pressure 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(DOHC TURBO)-38, Subaru Select Monitor.>	Does the value change more than –2.8 kPa (–21.0 mmHg, –0.827 inHg) by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector.	Go to step **6.**

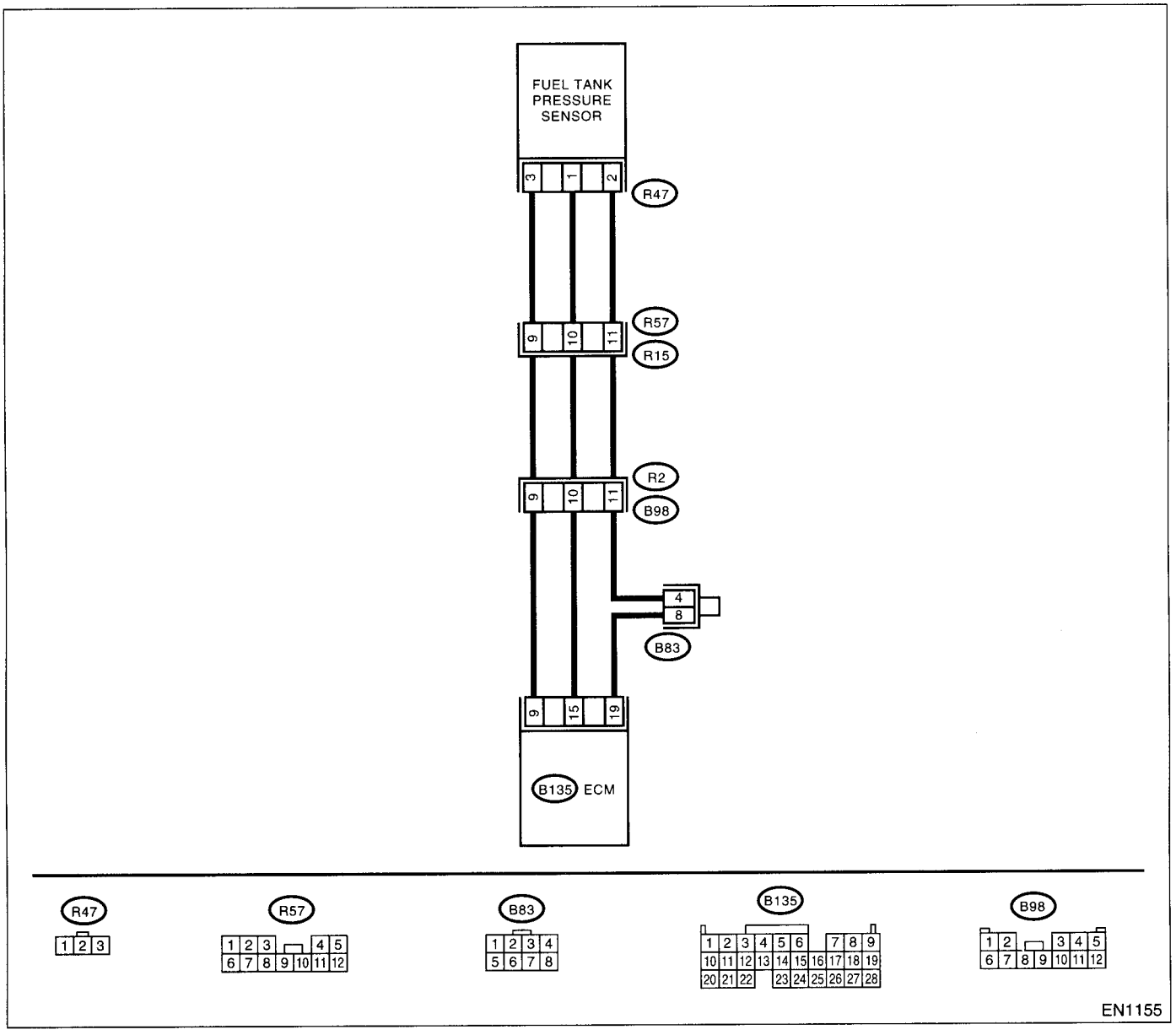
	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1)Turn the ignition switch to OFF. 2)Remove the rear seat cushion (Sedan) or move rear seat cushion (Wagon). 3)Separate rear wiring harness and fuel tank cord. 4)Turn the ignition switch to ON. 5)Measure the voltage between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R15) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector
7	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM and rear wiring harness connector. ***Connector & terminal*** ***(B135) No. 19 — (R15) No. 11:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector • Poor contact in joint connector
8	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** Measure the resistance of harness between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R15) No. 11 — Chassis ground:***	Is the resistance more than 500 kΩ?	Go to step **9.**	Repair ground short circuit in harness between ECM and rear wiring harness connector.
9	**CHECK FUEL TANK CORD.** 1)Disconnect the connector from fuel tank pressure sensor. 2)Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R57) No. 9 — (R47) No. 3:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair open circuit in fuel tank cord.
10	**CHECK FUEL TANK CORD.** Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R57) No. 11 — (R47) No. 1:***	Is the resistance less than 1 Ω?	Go to step **11.**	Repair open circuit in fuel tank cord.
11	**CHECK FUEL TANK CORD.** Measure the resistance of harness between fuel tank pressure sensor connector and chassis ground. ***Connector & terminal*** ***(R47) No. 2 — Chassis ground:***	Is the resistance more than 500 kΩ?	Go to step **12.**	Repair ground short circuit in fuel tank cord.
12	**CHECK POOR CONTACT.** Check poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(DOHC TURBO)-11, Fuel Tank Pressure Sensor.>

AZ:DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Turn the ignition switch to OFF. 2)Remove the fuel filler cap. 3)Install the fuel filler cap. 4)Turn the ignition switch to ON. 5)Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)?	Go to step **12.**	Go to step **2.**
2	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 15 (+) — Chassis ground (–):***	Is the voltage less than 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 fuel tank pressure 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(DOHC TURBO)-38, Subaru Select Monitor.>	Does the value change more than –2.8 kPa (–21.0 mmHg, –0.827 inHg) by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1)Turn the ignition switch to OFF. 2)Remove the rear seat cushion (Sedan) or move rear seat cushion (Wagon). 3)Separate rear wiring harness and fuel tank cord. 4)Turn the ignition switch to ON. 5)Measure the voltage between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R15) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector

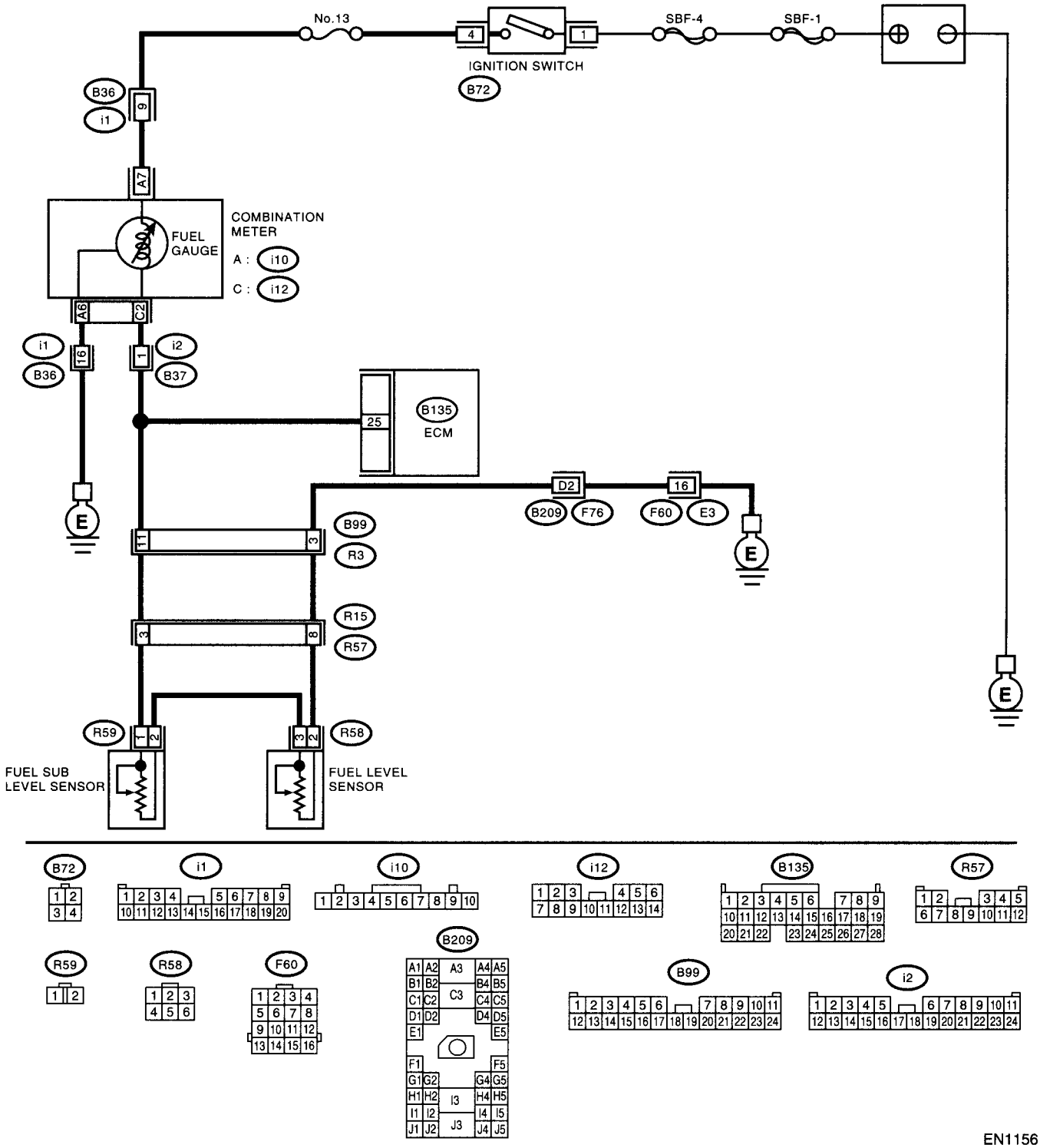
	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM and rear wiring harness connector. ***Connector & terminal*** ***(B135) No. 15 — (R15) No. 10:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** Measure the resistance of harness between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 — (R15) No. 9:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair ground short circuit in harness between ECM and rear wiring harness connector.
9	**CHECK FUEL TANK CORD.** 1)Disconnect the connector from fuel tank pressure sensor. 2)Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R57) No. 11 — (R47) No. 2:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair open circuit in fuel tank cord.
10	**CHECK FUEL TANK CORD.** Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R57) No. 10 — (R47) No. 1:***	Is the resistance less than 1 Ω?	Go to step **11.**	Repair open circuit in fuel tank cord.
11	**CHECK POOR CONTACT.** Check poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(DOHC TURBO)-11, Fuel Tank Pressure Sensor.>
12	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from fuel tank pressure sensor. 3)Turn the ignition switch to ON. 4)Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)?	Repair battery short circuit in harness between ECM and fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <<Ref. to EC(DOHC TURBO)-11, Fuel Tank Pressure Sensor.>

BA:DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN1156

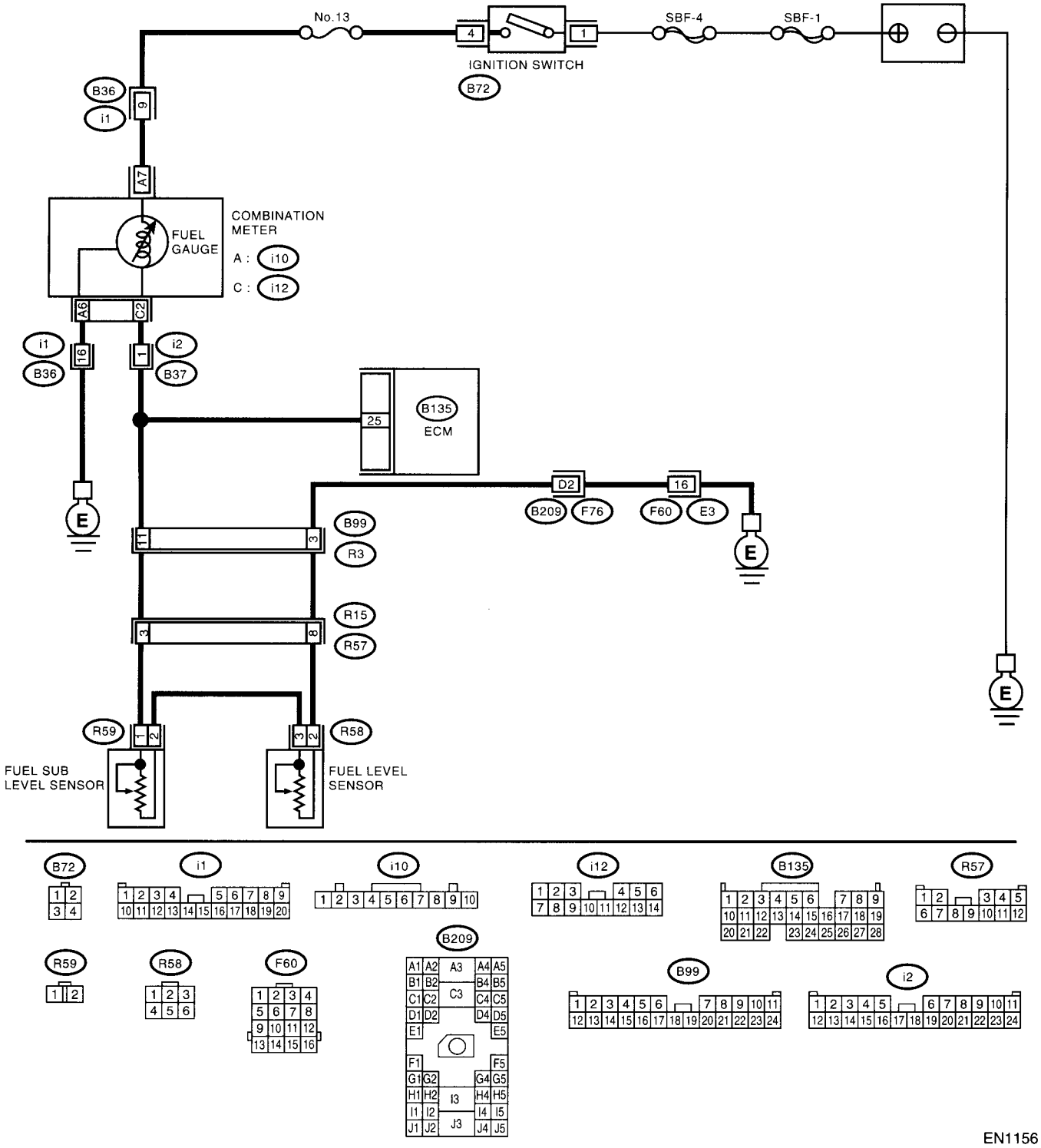
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0462 or P0463?	Inspect DTC P0462 or P0463 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect this trouble.	Replace the fuel level sensor <Ref. to FU(DOHC TURBO)-62, Fuel Level Sensor.> and fuel sub level sensor <Ref. to FU(DOHC TURBO)-63, Fuel Sub Level Sensor.>

BB: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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN1156

	Step	Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.**	Does the speedometer and tachometer operate normally?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-4, 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 voltage less than 0.12 V?	Go to step **6.**	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(DOHC TURBO)-38, Subaru Select Monitor.>	Does the value change less than 0.12 V by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?	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 voltage more than 0.12 V?	Go to step **4.**	Go to step **7.**
5	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from connector (i10), (i12) and ECM connector. 3)Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 25 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	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 — (i12) No. 2:***	Is the resistance less than 10 Ω?	Repair or replace the combination meter. <Ref. to IDI-4, Combination Meter System.>	Repair open circuit between ECM and combination meter connector. NOTE: In this case, repair the following: Poor contact in coupling connector

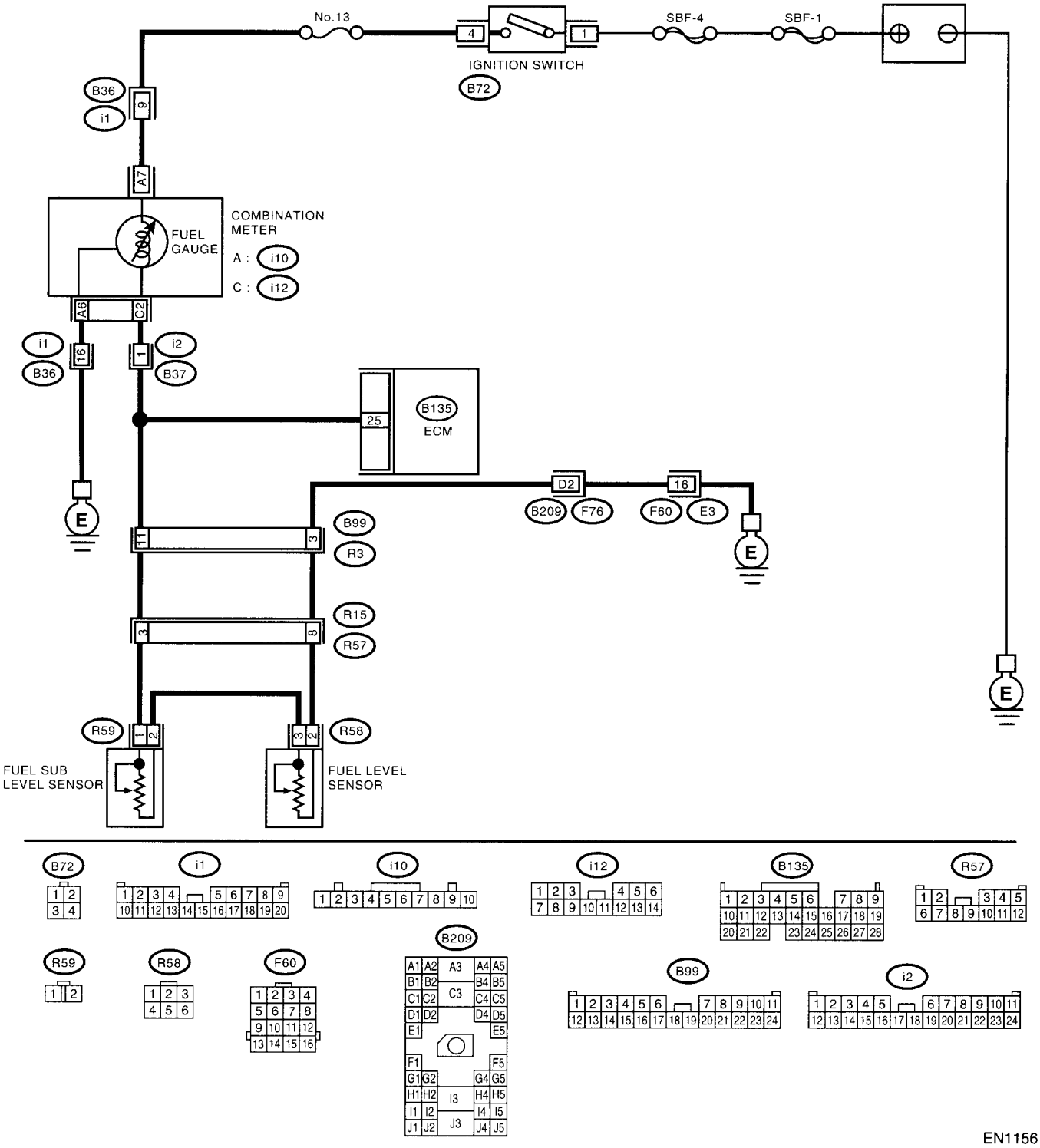
	Step	Check	Yes	No
7	**CHECK FUEL TANK CORD.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from fuel sub level sensor. 3)Measure the resistance between fuel sub level sensor and chassis ground. ***Connector & terminal*** ***(R59) No. 1 — Chassis ground:***	Is the resistance more than 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*** ***(R59) No. 2 — Chassis ground:***	Is the resistance more than 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(DOHC TURBO)-60, Fuel Pump.> 2)Measure the resistance between fuel level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 2 — No. 3:***	Is the resistance between 0.5 and 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(DOHC TURBO)-63, 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 resistance between 0.5 and 2.5 Ω?	Repair poor contact in harness between ECM and combination meter connector.	Replace the fuel sub level sensor.

BC: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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN1156

	Step	Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.**	Does the speedometer and tachometer operate normally?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-4, 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 voltage more than 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 (i10) 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 voltage more than 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 resistance less than 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. 8 — Chassis ground:***	Is the resistance less than 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
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. 8 — (R58) No. 2:***	Is the resistance less than 10 Ω?	Go to step **7.**	Repair open circuit between coupling connector and fuel level sensor.

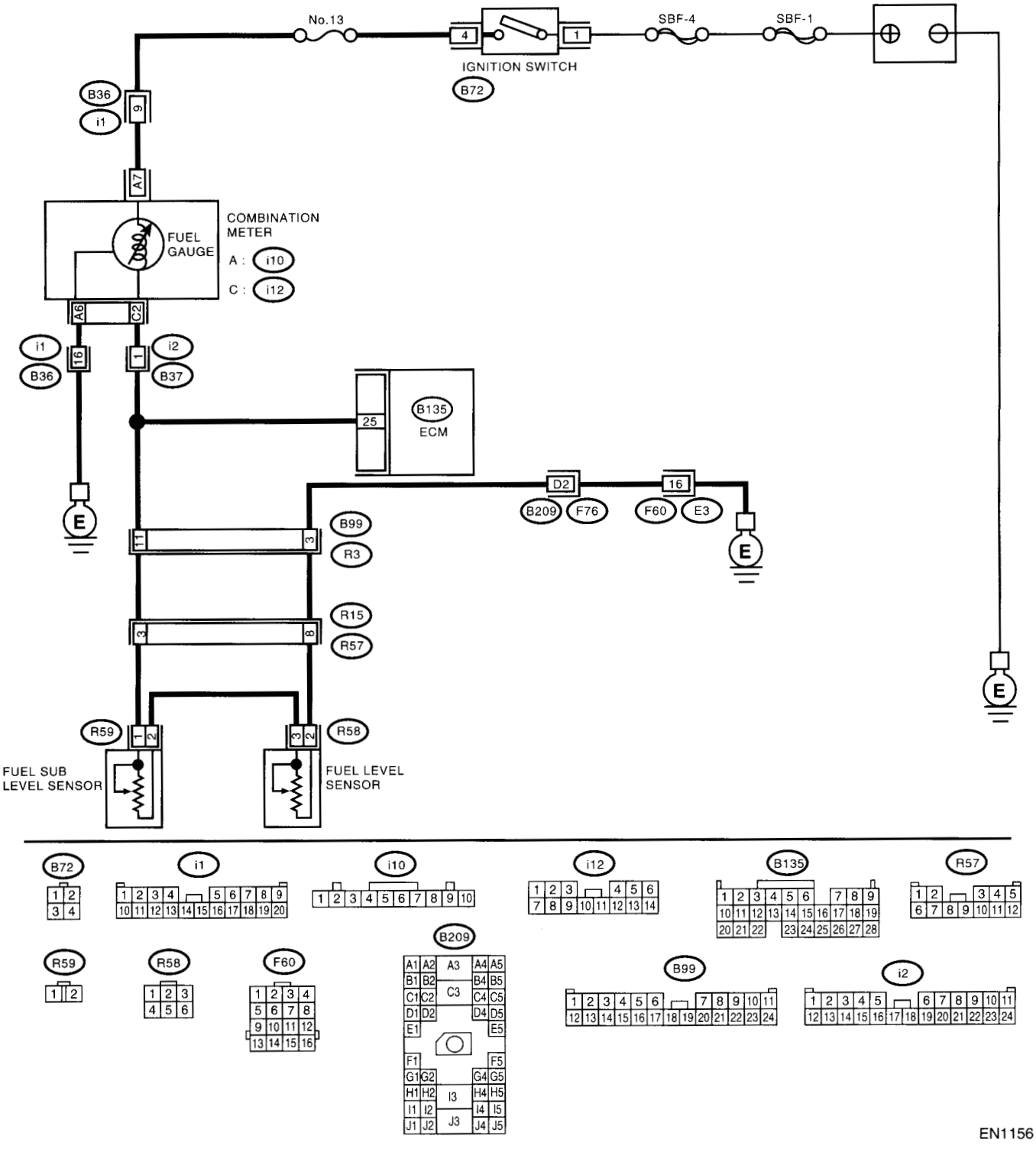
	Step	Check	Yes	No
7	**CHECK FUEL TANK CORD.** 1)Disconnect the connector from fuel sub level sensor. 2)Measure the resistance between fuel level sensor and fuel sub level sensor. ***Connector & terminal*** ***(R58) No. 3 — (R59) No. 2:***	Is the resistance less than 10 Ω?	Go to step **8.**	Repair open 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. 3 — (R59) No. 1:***	Is the resistance less than 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(DOHC TURBO)-60, Fuel Pump.> 2)While moving the fuel level sensor float up and down, measure resistance between fuel level sensor terminals. ***Terminals*** ***No. 2 — No. 3:***	Is the resistance more than 53 Ω?	Replace the fuel level sensor. <Ref. to FU(DOHC TURBO)-62, Fuel Level Sensor.>	Go to step **10.**
10	**CHECK FUEL SUB LEVEL SENSOR.** 1)Remove the fuel sub level sensor. <Ref. to FU(DOHC TURBO)-63, 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 resistance more than 45 Ω?	Replace the fuel sub level sensor. <Ref. to FU(DOHC TURBO)-63, Fuel Sub Level Sensor.>	Replace the combination meter. <Ref. to IDI-11, Combination Meter Assembly.>

BD:DTC P0464 — FUEL LEVEL SENSOR INTERMITTENT 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN1156

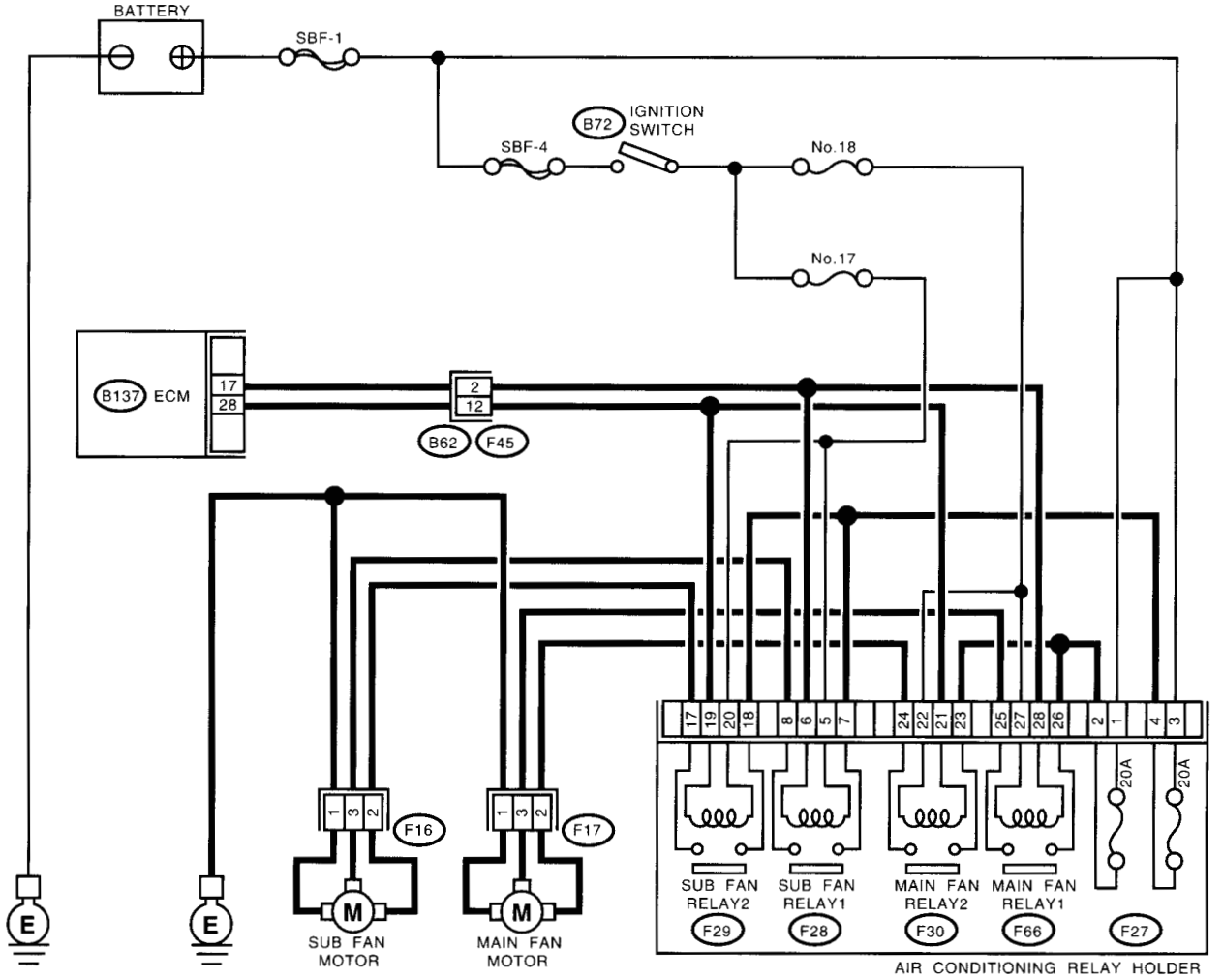
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0462 or P0463?	Inspect DTC P0462 or P0463 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL LEVEL SENSOR.** 1)Remove the fuel pump assembly. <Ref. to FU(DOHC TURBO)-60, 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*** ***No. 2 — No. 3:***	Does the resistance change smoothly between approx. 0.5 Ω and approx. 52 Ω?	Go to step **3.**	Replace the fuel level sensor. <Ref. to FU(DOHC TURBO)-62, Fuel Level Sensor.>
3	**CHECK FUEL SUB LEVEL SENSOR.** 1)Remove the fuel sub level sensor. <Ref. to FU(DOHC TURBO)-63, Fuel Sub 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 between approx. 0.5 Ω and approx. 44 Ω?	Repair poor contact in ECM, combination meter and coupling connectors.	Replace the fuel sub level sensor. <Ref. to FU(DOHC TURBO)-63, Fuel Sub Level Sensor.>

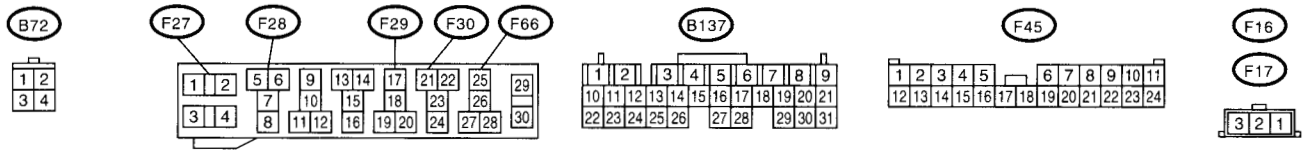
BE:DTC P0480 — COOLING FAN RELAY 1 CIRCUIT LOW INPUT —

- **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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN1157

	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), to the side of the center console box. 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(DOHC TURBO)-38, Subaru Select Monitor.> ***Connector & terminal*** ***(B137) No. 17 (+) — Chassis ground (–):*** ***(B137) No. 28 (+) — Chassis ground (–):***	Does the voltage change between 0 and 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*** ***(B137) No. 17 — Chassis ground:*** ***(B137) No. 28 — Chassis ground:***	Is the resistance less than 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 1 and 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*** ***(F66) No. 27 (+) — Chassis ground (–):*** ***(F30) No. 22 (+) — Chassis ground (–):***	Is the voltage more than 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. 27 — No. 28:(Main fan relay 1)*** ***No. 22 — No. 21:(Main fan relay 2)***	Is the resistance between 87 and 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*** ***(B137) No. 17 — (F66) No. 28:*** ***(B137) No. 28 — (F30) No. 21:***	Is the resistance less than 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
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?	Repair poor contact in ECM or main fan relay connector.	Contact with SOA (distributor) service.

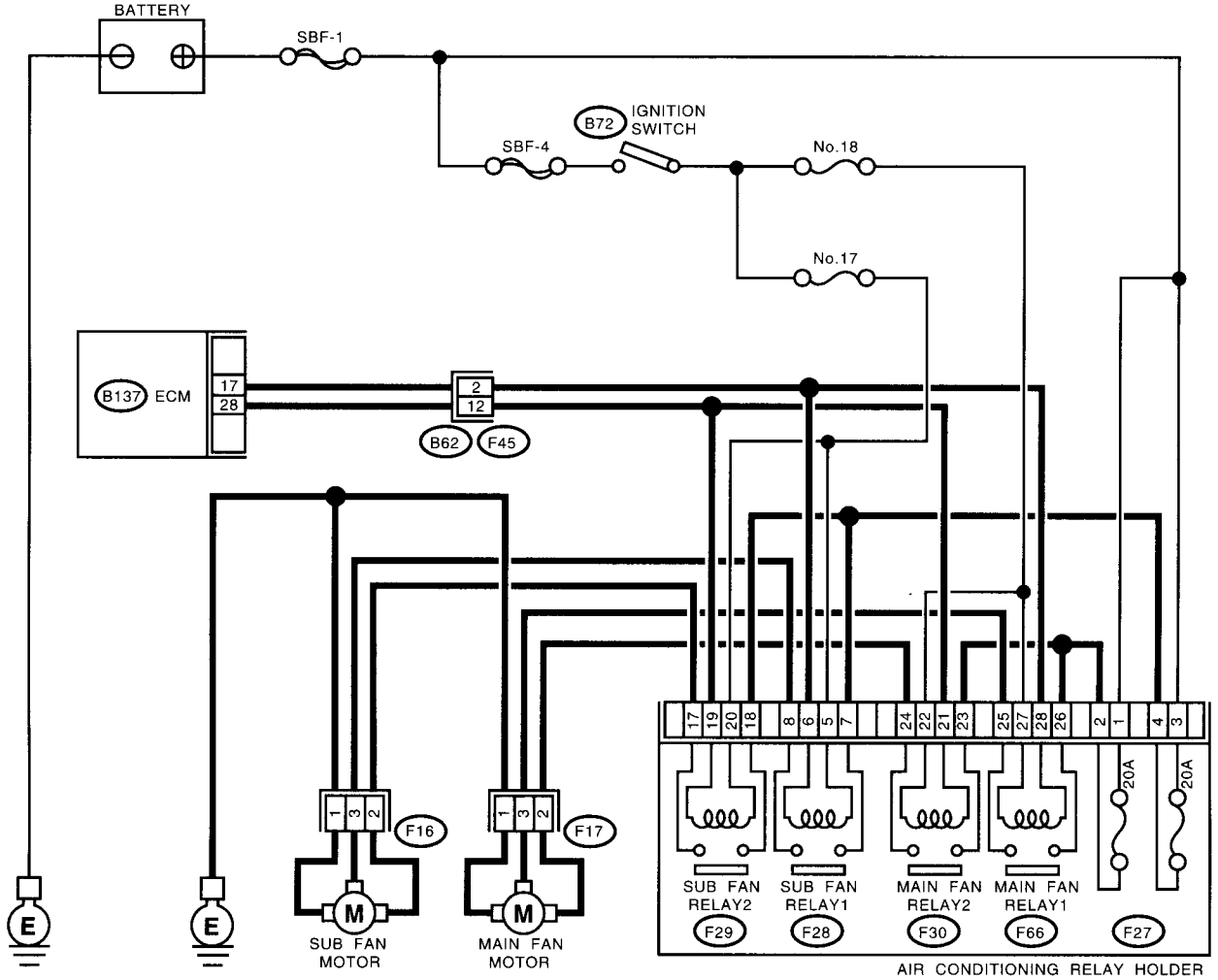
BF:DTC P0483 — COOLING FAN FUNCTION PROBLEM —

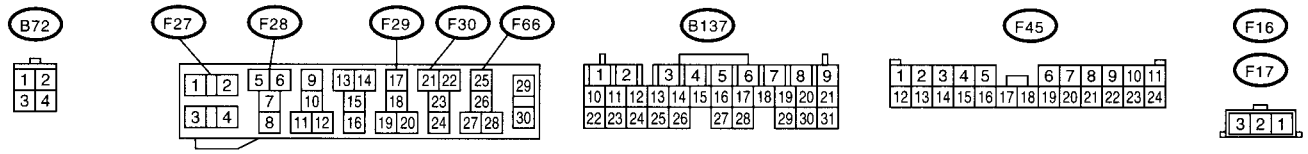
- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Occurrence of noise
  - Overheating

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, 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:**





EN1157

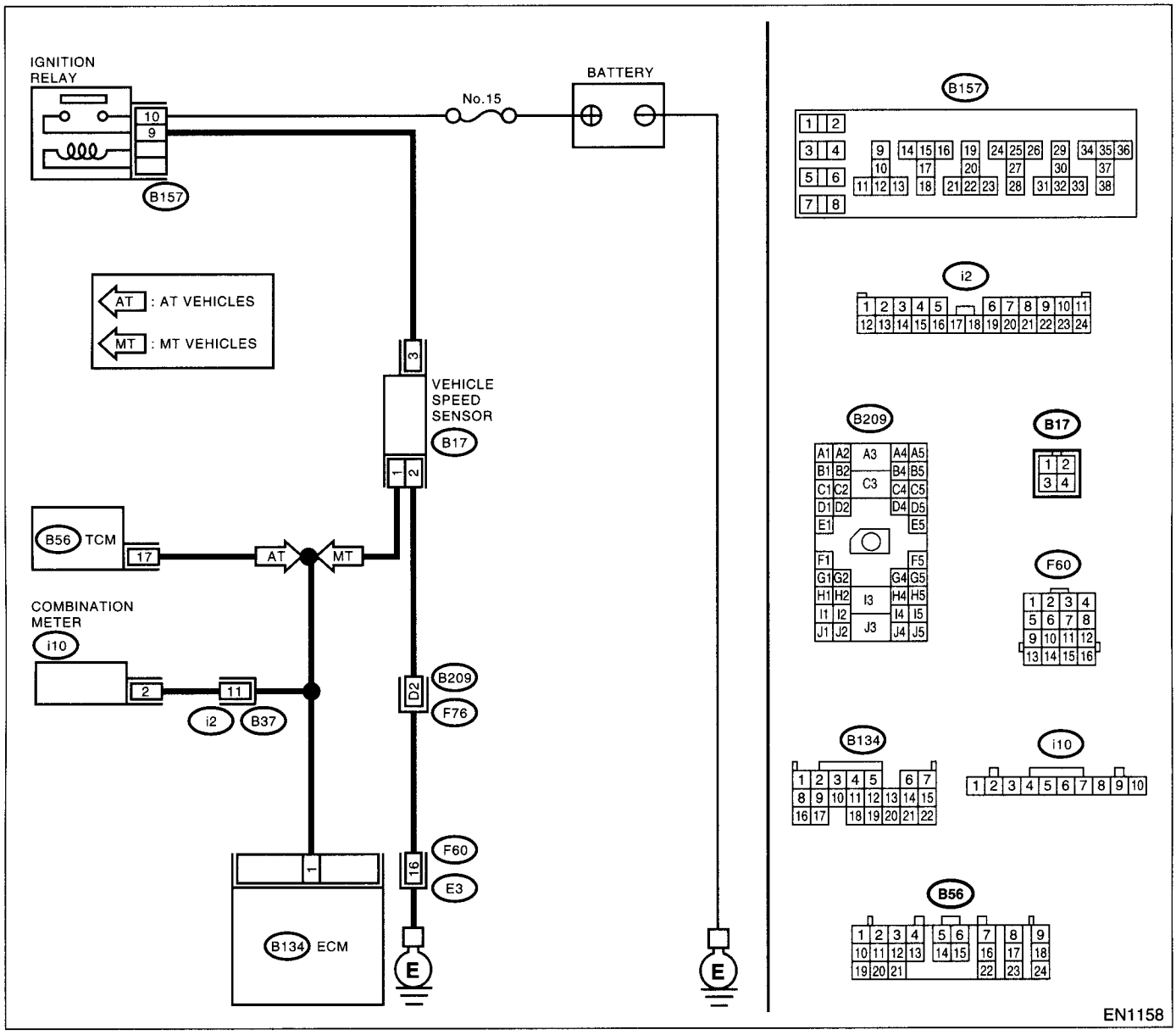
Step		Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is there any other DTC on display?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).>	Check radiator fan, fan motor and thermostat. <Ref. to CO-9, Radiator Main Fan System.> and <Ref. to CO-17, Radiator Sub Fan System.> If thermostat is stuck, replace thermostat.

BG:DTC P0500 — VEHICLE SPEED SENSOR MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK TRANSMISSION TYPE.**	Is the transmission type AT?	Go to step **2.**	Go to step **3.**

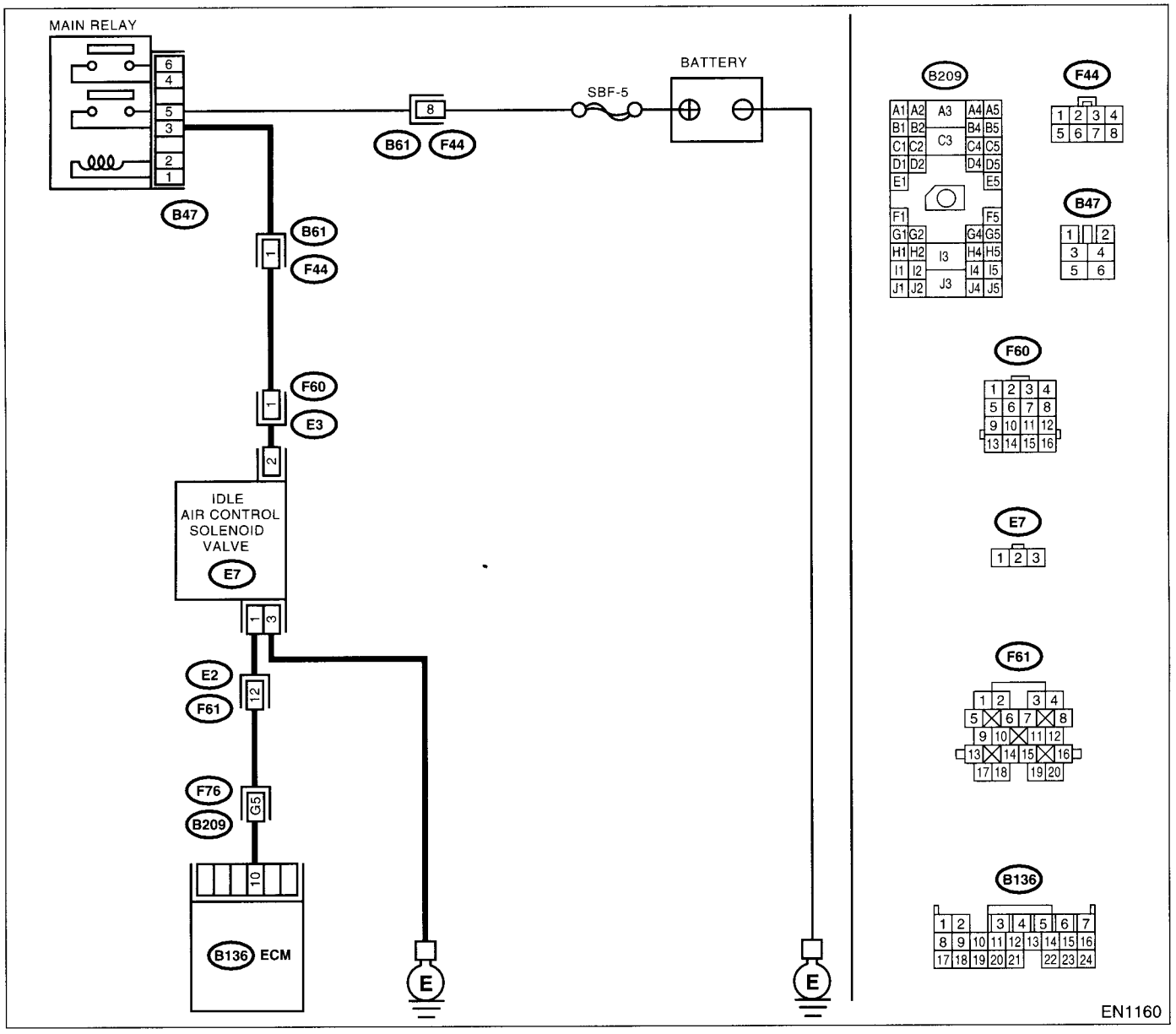
	Step	Check	Yes	No
2	**CHECK DTC P0720 ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0720?	Check front vehicle speed sensor signal circuit. <Ref. to AT-57, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK SPEEDOMETER OPERATION IN COMBINATION METER.**	Does speedometer operate normally?	Go to step **4.**	Check speedometer and vehicle speed sensor. <Ref. to IDI-13, Speedometer.> and <Ref. to AT-32, Front Vehicle Speed Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** 1)Turn ignition switch to OFF. 2)Disconnect connector from combination meter. 3)Measure resistance between ECM and combination meter. ***Connector & terminal*** ***(B134) No. 1 — (i10) No. 2:***	Is the resistance less than 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

BH: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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



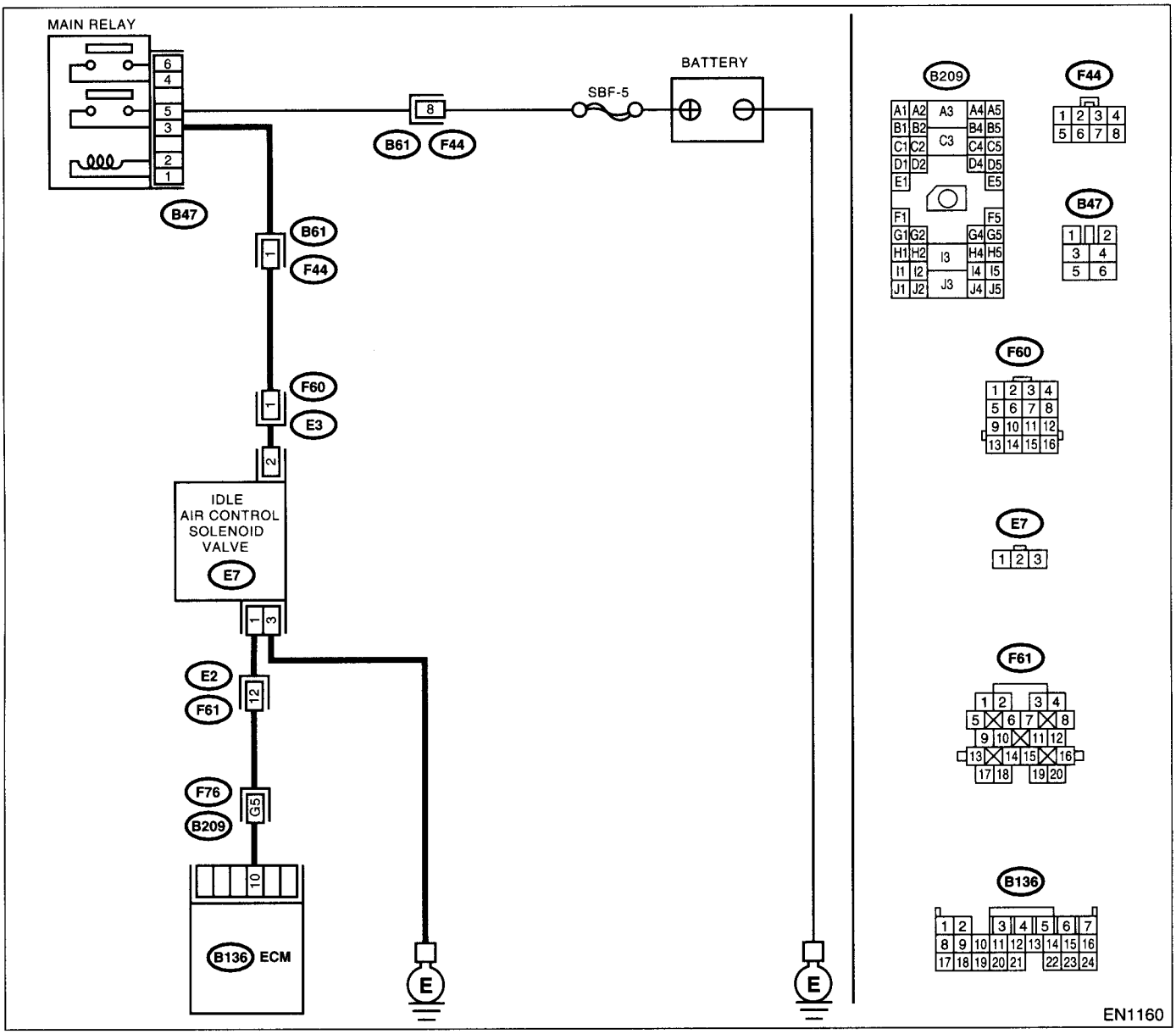
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0508 or P509?	Inspect DTC P0505 or P1505 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, 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(DOHC TURBO)-36, 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?	Go to step **4.**	Replace the idle air control solenoid valve. <Ref. to FU(DOHC TURBO)-36, 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. NOTE: •Subaru Select Monitor For detailed operation procedures, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 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(DOHC TURBO)-36, REMOVAL, Idle Air Control Solenoid Valve.> 3)Remove the throttle body to intake manifold. <Ref. to FU(DOHC TURBO)-14, 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?	Replace the idle air control solenoid valve. <Ref. to FU(DOHC TURBO)-36, Idle Air Control Solenoid Valve.>	Replace the throttle body. <Ref. to FU(DOHC TURBO)-14, Throttle Body.>

BI: 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



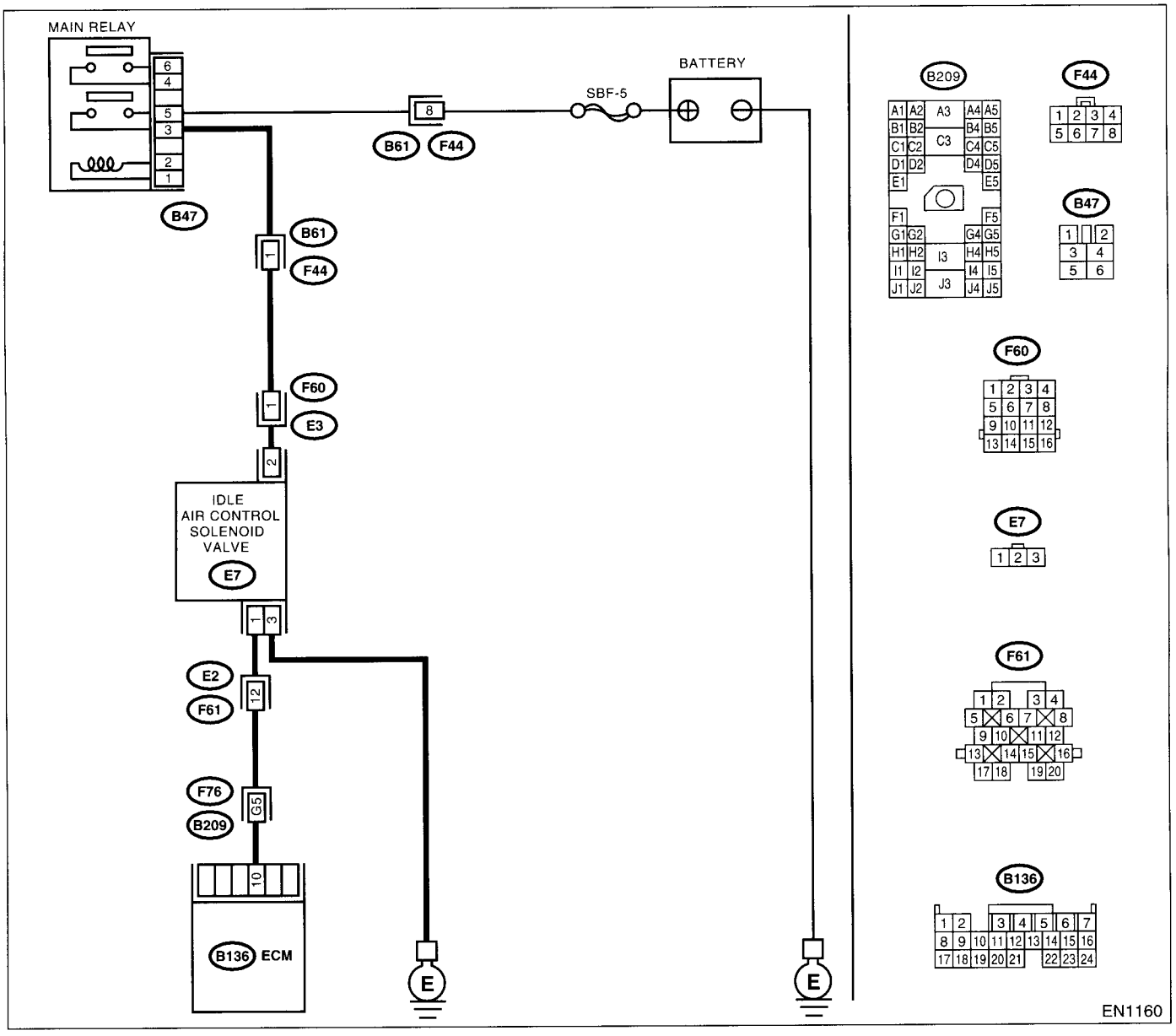
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0508 or P0509?	Inspect DTC P0508 or P0509 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Go to step **2.**
2	**CHECK THROTTLE CABLE.**	Does the throttle cable have play for adjustment?	Go to step **3.**	Adjust throttle cable. <Ref. to SP-7, 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?	Repair air suction and leaks.	Replace the idle air control solenoid valve. <Ref. to FU(DOHC TURBO)-36, Idle Air Control Solenoid Valve.>

BJ:DTC P0508 — IDLE CONTROL SYSTEM 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



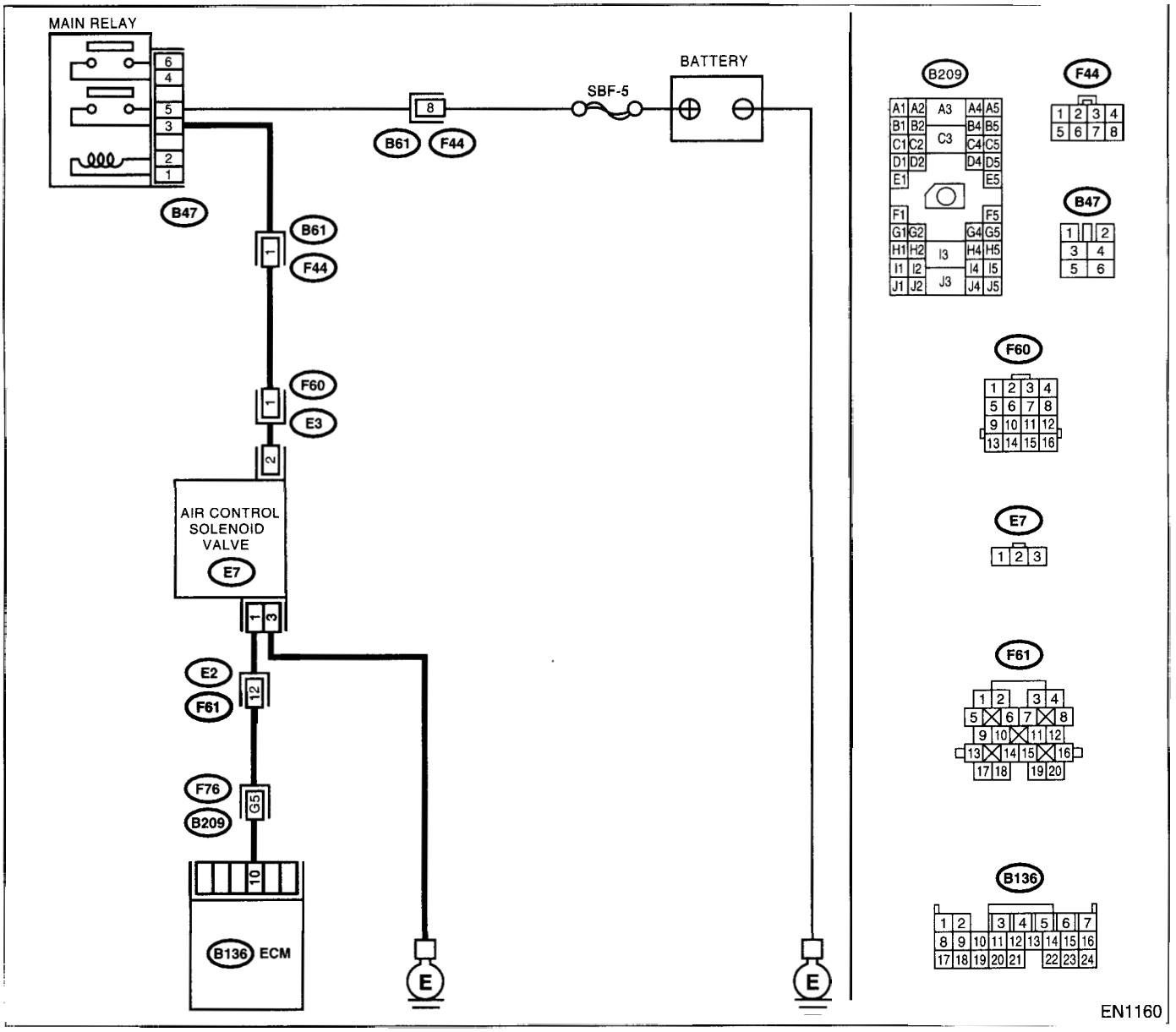
	Step	Check	Yes	No
	CHECK OUTPUT SIGNAL FROM ECM. 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 10 (+) — Chassis ground (–):***	s the voltage more than 3 V?	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK 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 (–):***	s the voltage more than 10 V?	Go to step **3.**	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
3	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE**	Is the resistance less than 1 Ω?	Go to step **4.**	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
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 resistance less than 10 Ω?	Repair 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 resistance less than 5 Ω?	Go to step **6.**	Repair open circuit in harness between idle air control solenoid valve connector and engine ground terminal.
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?	Repair poor contact in ECM and idle air control solenoid valve connectors.	Replace the idle air control solenoid valve. <Ref. to FU(DOHC TURBO)-36, Idle Air Control Solenoid Valve.>

BK:DTC P0509 — IDLE CONTROL SYSTEM 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



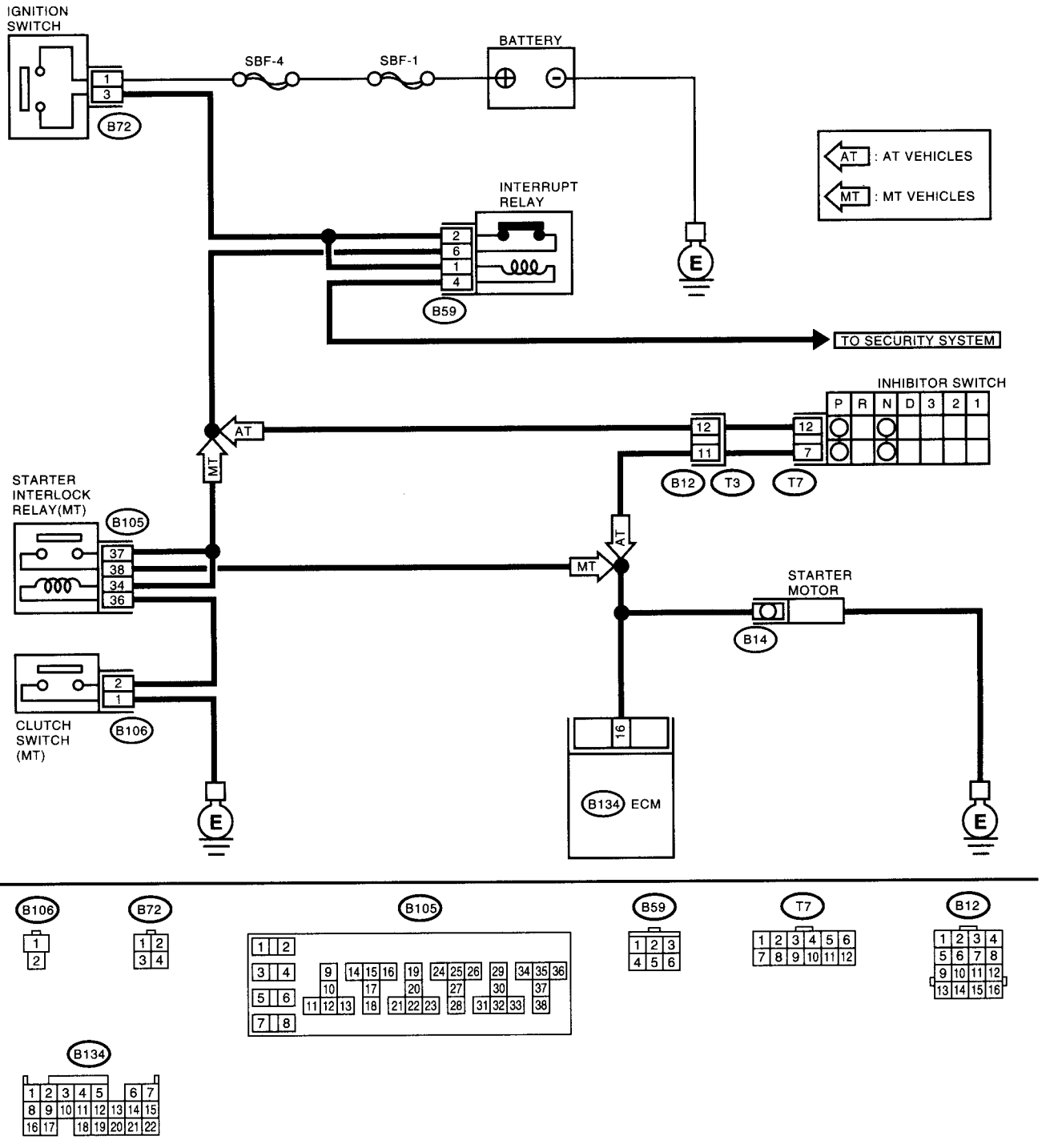
	Step	Check	Yes	No
1	**CHECK THROTTLE CABLE.**	Does the throttle cable have play for adjustment?	Go to step **2.**	Adjust throttle cable. <Ref. to SP-7, INSTALLATION, Accelerator Control Cable.>
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 10 (+) — Chassis ground (–):***	Is the voltage more than 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 voltage more than 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(DOHC TURBO)-47, Engine Control Module.>	Replace the idle air control solenoid valve <Ref. to FU(DOHC TURBO)-36, Idle Air Control Solenoid Valve.> and ECM <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>.
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 10 (+) — Chassis ground (–):***	Does the voltage change more than 10 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>	Contact with SOA (distributor) service. NOTE: Insepction by DTM is required, because probable cause is deterioration of multiple parts.

BL:DTC P0512 — STARTER SWITCH CIRCUIT HIGH 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN1139

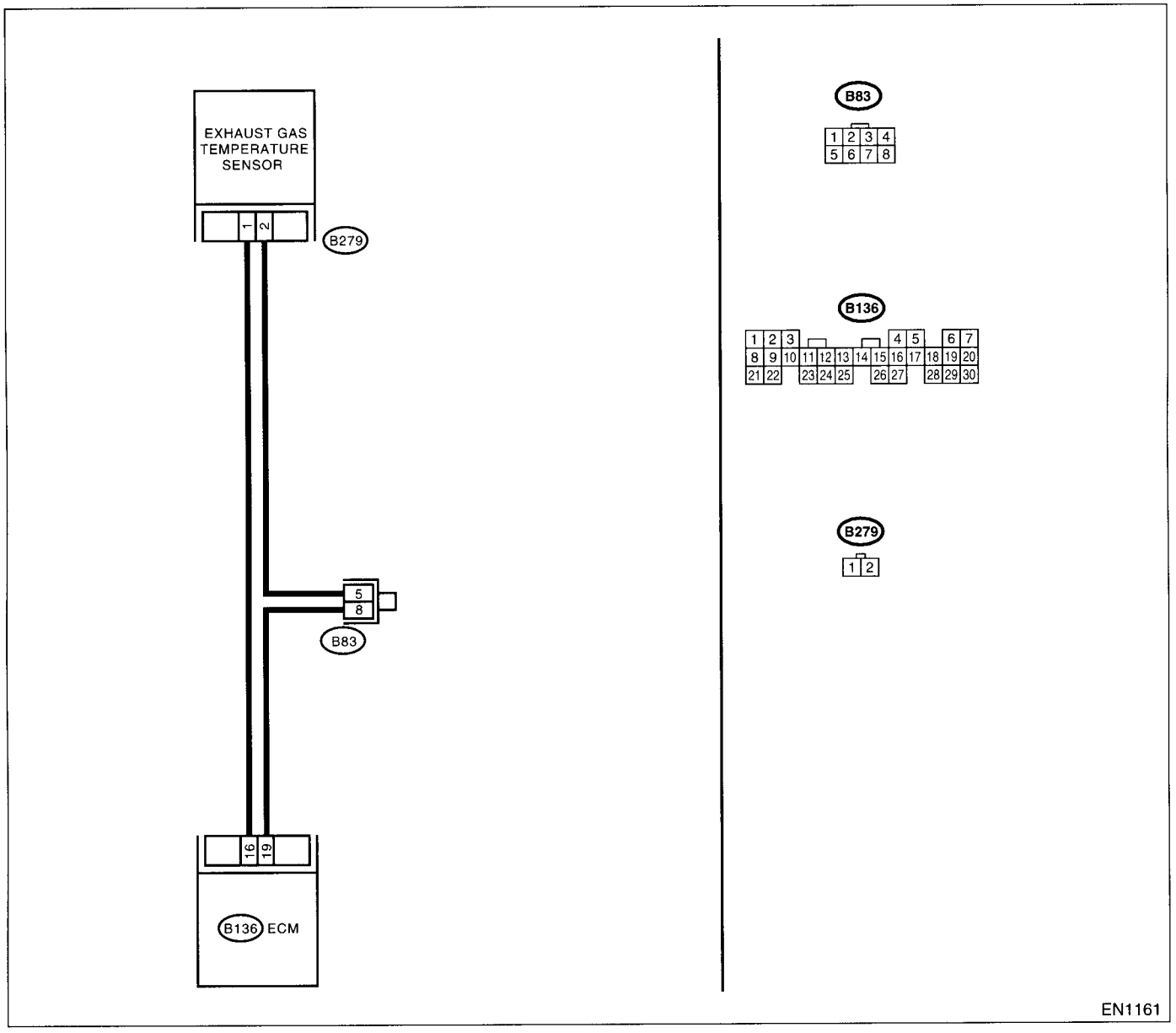
	Step	Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.** NOTE: Place the inhibitor switch in each position.	Does the starter motor operate when ignition switch to "ON"?	Repair battery short circuit in starter motor circuit. After repair, replace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>	Check starter motor circuit. <Ref. to EN(DOHC TURBO)-64, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

BM: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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



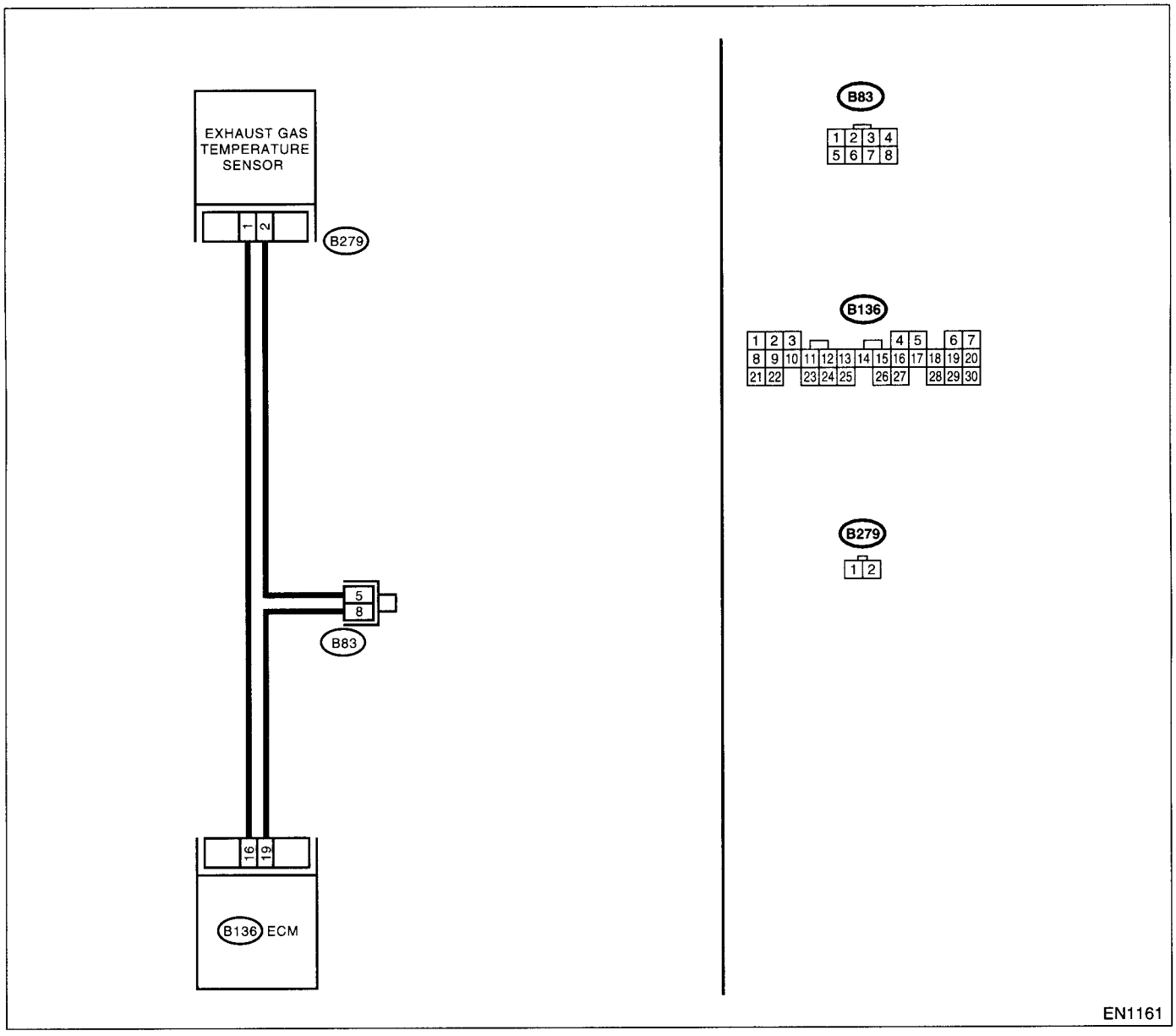
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of exhaust gas temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value greater than 1200°C (2192°F)?	Go to step **2.**	Repair 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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than 372°C (702°F)?	Replace the exhaust gas temperature sensor. <Ref. to FU(DOHC TURBO)-46, Exhaust Temperature Sensor.>	Repair ground short circuit in harness between exhaust gas temperature sensor and ECM connector.

BN: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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
	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. NOTE: •Subaru Select Monitor *For detailed operation procedure, refer to the* "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	s the value less than 372°C 702°F)?	3o to step **2.**	Repair poor contact. NOTE: n this case, repair he following: Poor contact in xhaust gas temperature sensor Poor contact in ECM Poor contact in oint connector
!	**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 (–):***	s the voltage more than 10 V?	Repair battery short circuit in harness *between* ECM and exhaust gas temperature sensor connector.	3o to step **3.**
I	**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 (–):***	s the voltage more than 10 V?	Repair battery short circuit in harness between ECM and exhaust gas temperature sensor connector.	3o to step **4.**
I	**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 (–):***	s the voltage more than 4 V?	3o to step **5.**	Repair harness and connector. NOTE: n this case, repair *he following:* Open circuit in harness between ECM and exhaust gas temperature sensor connector Poor contact in xhaust gas temperature sensor *connector* Poor contact in ECM connector Poor contact in oint connector

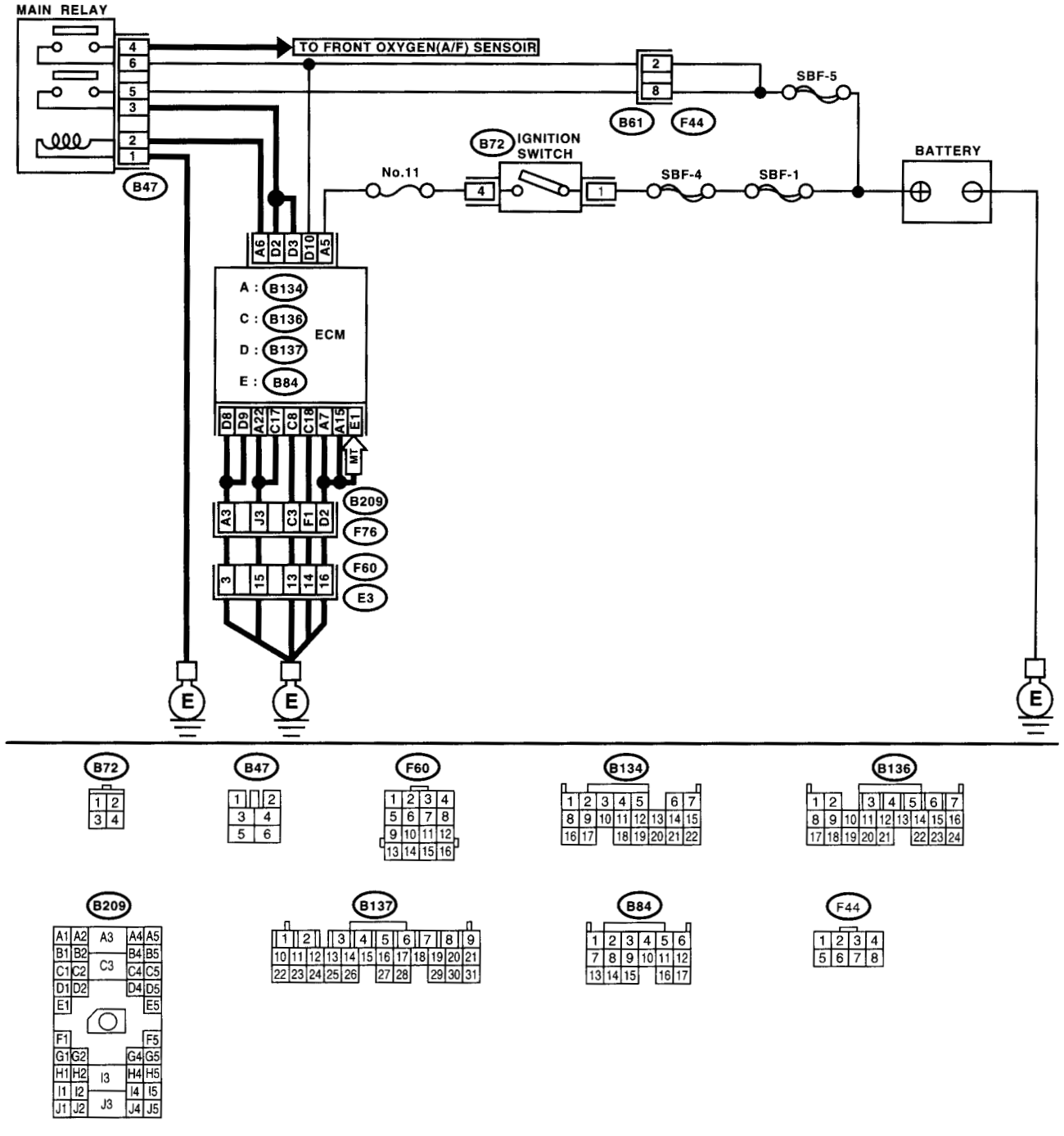
	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of harness between exhaust gas temperature sensor connector and engine ground. ***Connector & terminal*** ***(B279) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the exhaust gas temperature sensor. <Ref. to FU(DOHC TURBO)-46, Exhaust Temperature Sensor.>	Repair 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

BO:DTC P0604 — INTERNAL CONTROL MODULE MEMORY CHECK SUM 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN1171

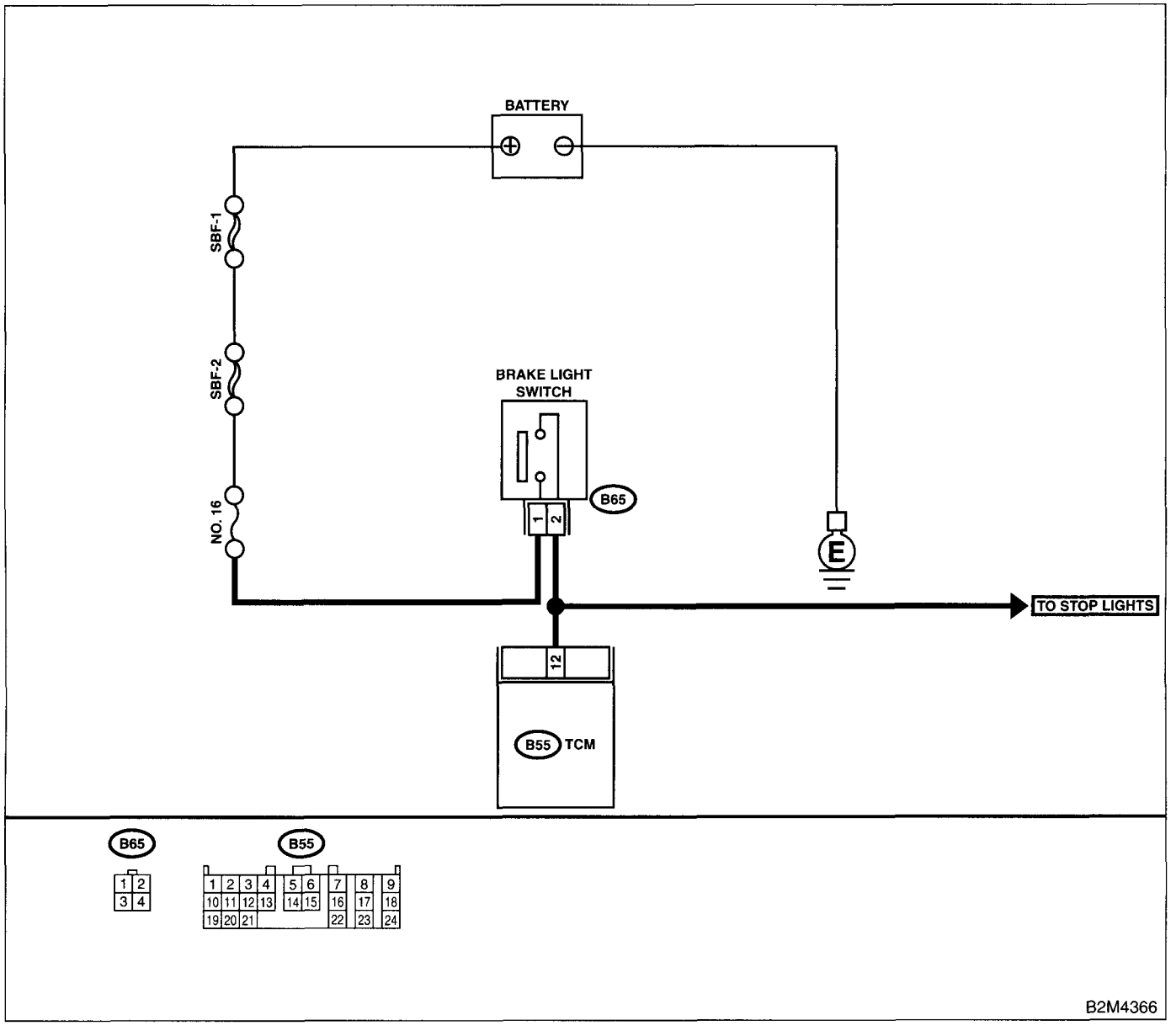
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0604?	Replace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>	It is not necessary to inspect DTC P0604.

BP:DTC P0703 — BRAKE SWITCH INPUT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, 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?	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*** ***(B55) No. 12 — (B65) No. 3:***	Is the resistance less than 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 resistance more than 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 voltage less than 1 V when releasing the brake pedal?	Go to step **5.**	Adjust or replace the brake light switch. <Ref. to LI-7, 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 voltage more than 10 V when depressing the brake pedal?	Go to step **6.**	Adjust or replace the brake light switch. <Ref. to LI-7, STOP LIGHT SWITCH, INSPECTION, Stop Light System.>
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

BQ:DTC P0731 — GEAR 1 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(DOHC TURBO)-270, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BR:DTC P0732 — GEAR 2 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(DOHC TURBO)-270, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BS:DTC P0733 — GEAR 3 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(DOHC TURBO)-270, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BT: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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is there any other DTC on display?	Inspect relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK THROTTLE POSITION SENSOR CIRCUIT.** Check throttle position sensor circuit. <Ref. to AT-52, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in throttle position sensor circuit?	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-57, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in vehicle speed sensor 2 circuit?	Repair or replace the vehicle speed sensor 2 circuit.	Go to step **4.**
4	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT.** Check torque converter turbine speed sensor circuit. <Ref. to AT-62, 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?	Repair or replace the torque converter turbine speed sensor circuit.	Go to step **5.**

	Step	Check	Yes	No
5	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	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?	Repair or replace the automatic transmission. <Ref. to AT-12, INSPECTION, Road Test.>	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

BU:DTC P0741 — TORQUE CONVERTER CLUTCH SYSTEM MALFUNCTION —

- **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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is there any other DTC on display?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, 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-94, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in lock-up duty solenoid circuit?	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-52, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in throttle position sensor circuit?	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-62, 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?	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-44, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in engine speed input circuit?	Repair or replace the engine speed input circuit.	Go to step **6.**
6	**CHECK INHIBITOR SWITCH CIRCUIT.** Check inhibitor switch circuit. <Ref. to AT-115, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-Diagnostic Trouble Code (DTC).>	Is there any trouble in inhibitor switch circuit?	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-112, CHECK BRAKE SWITCH., Diagnostic Procedure for No-Diagnostic Trouble Code (DTC).>	Is there any trouble in brake light switch circuit?	Repair or replace the brake light switch circuit.	Go to step **8.**

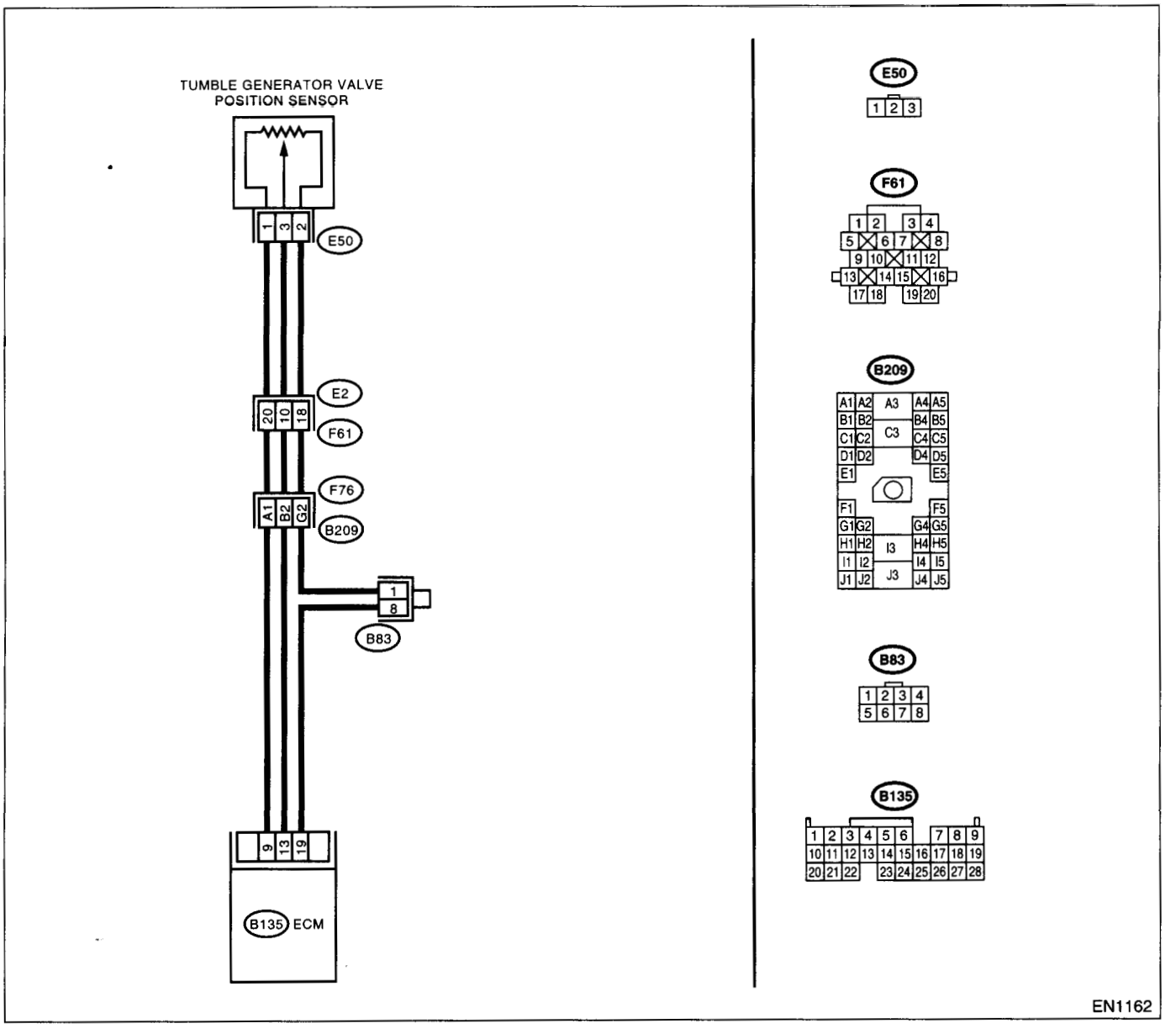
	Step	Check	Yes	No
8	**CHECK ATF TEMPERATURE SENSOR CIRCUIT.** Check ATF temperature sensor circuit. <Ref. to AT-48, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in ATF temperature sensor circuit?	Repair or replace the ATF temperature sensor circuit.	Go to step **9.**
9	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	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?	Repair or replace the automatic transmission. <Ref. to AT-12, INSPECTION, Road Test.>	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

BV: DTC P1086 — TUMBLE GENERATOR VALVE #2 (LH) POSITION SENSOR 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
	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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	s the value less than 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, repai the following: • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connecto
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 (–):***	s the voltage more than 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 (–):***	Does the voltage change more han 4.5 V by shaking harness and connector of ECM while nonitoring the value with voltage meter?	Repair poor contact in ECM connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deteriora tion 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 (–):***	s the voltage less than 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.	Does the voltage change more han 0.1 V by shaking harness and connector of ECM while nonitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector.	Go to step **6.**

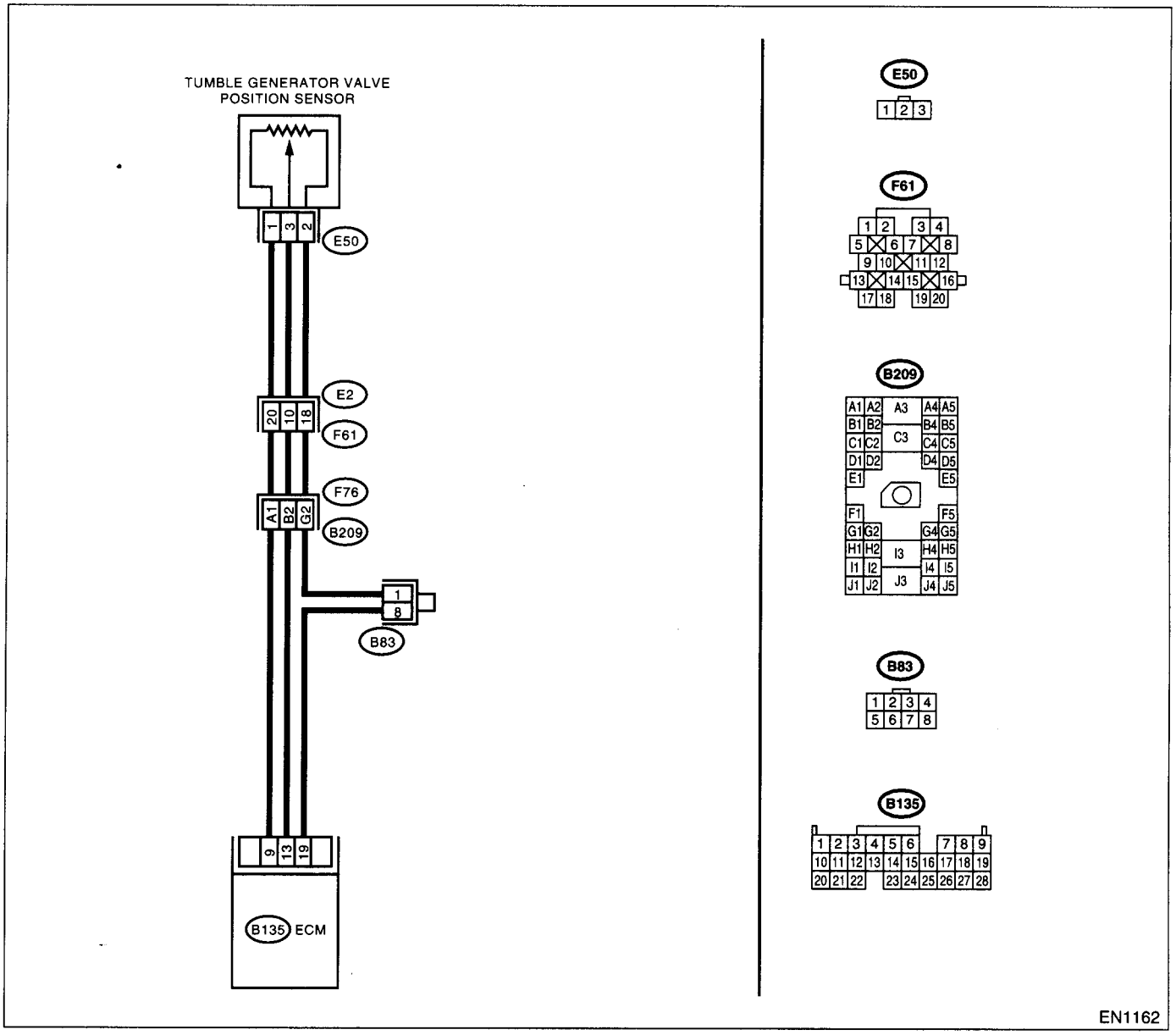
	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from tumble generator valve position sensor. 3)Turn the ignition switch to ON. 4)Measure voltage between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 1 (+) — Engine ground (–):***	s the voltage more than 4.5 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repai the following: • Open circuit in harness between tumble generator valve position sen sor and ECM connector • Poor contact in tumble generator valve position sen sor connector • Poor contact in ECM connector • Poor contact in coupling connecto • 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:***	s the resistance less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repa the following: • Open circuit in harness between tumble generator valve position sen sor and ECM connector • Poor contact in ECM connector • Poor contact in tumble generator valve position sen sor connector • Poor contact in coupling connecto
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:***	s the resistance less than 10 Ω?	Repair ground short circuit in har- ness between tum- ble generator valve position sensor and ECM connec- tor.	Go to step **9.**
9	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve position sensor connector.	s there poor contact in tumble generator valve position sensor connector?	Repair poor con- tact in tumble gen- erator valve position sensor connector.	Replace the tum- ble generator valve assembly. <Ref. to FU(DOHC TURBO)-40, Tum- ble Generator Valve Assembly.>

BW:DTC P1087 — TUMBLE GENERATOR VALVE #2 (LH) POSITION SENSOR 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



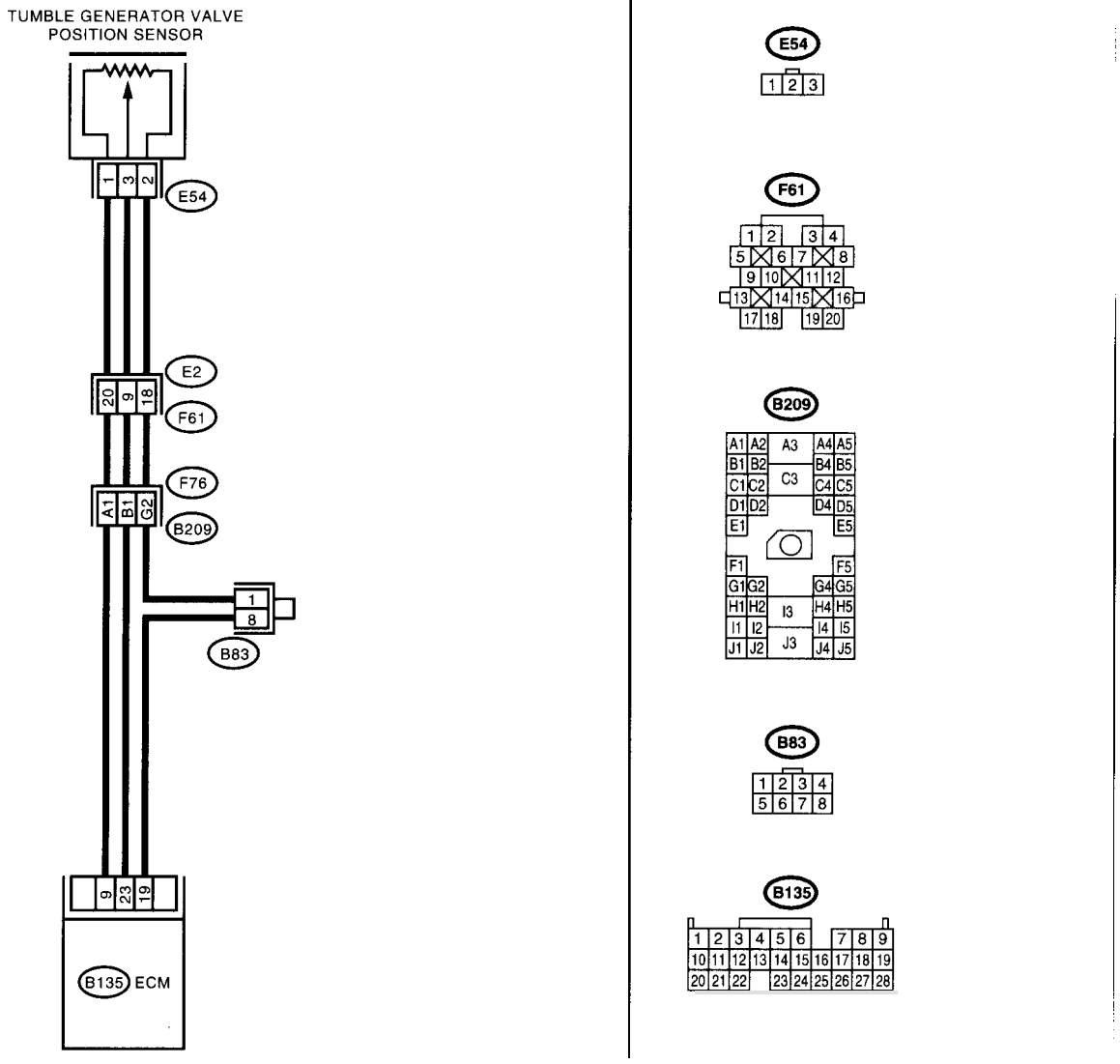
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 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 tumble generator valve 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 resistance less than 5 Ω?	Go to step **3.**	Repair 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*** ***(E50) No. 3 (+) — Engine ground (–):***	Is the voltage more than 4.9 V?	Repair battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>	Replace the tumble generator valve assembly. <Ref. to FU(DOHC TURBO)-40, Tumble Generator Valve Assembly.>

BX: DTC P1088 — TUMBLE GENERATOR VALVE #1 (RH) POSITION SENSOR 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN1163

	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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than 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 voltage more than 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 (–):***	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	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. 23 (+) — Chassis ground (–):***	Is the voltage less than 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.	Does the voltage change more than 0.1 V by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector.	Go to step **6.**

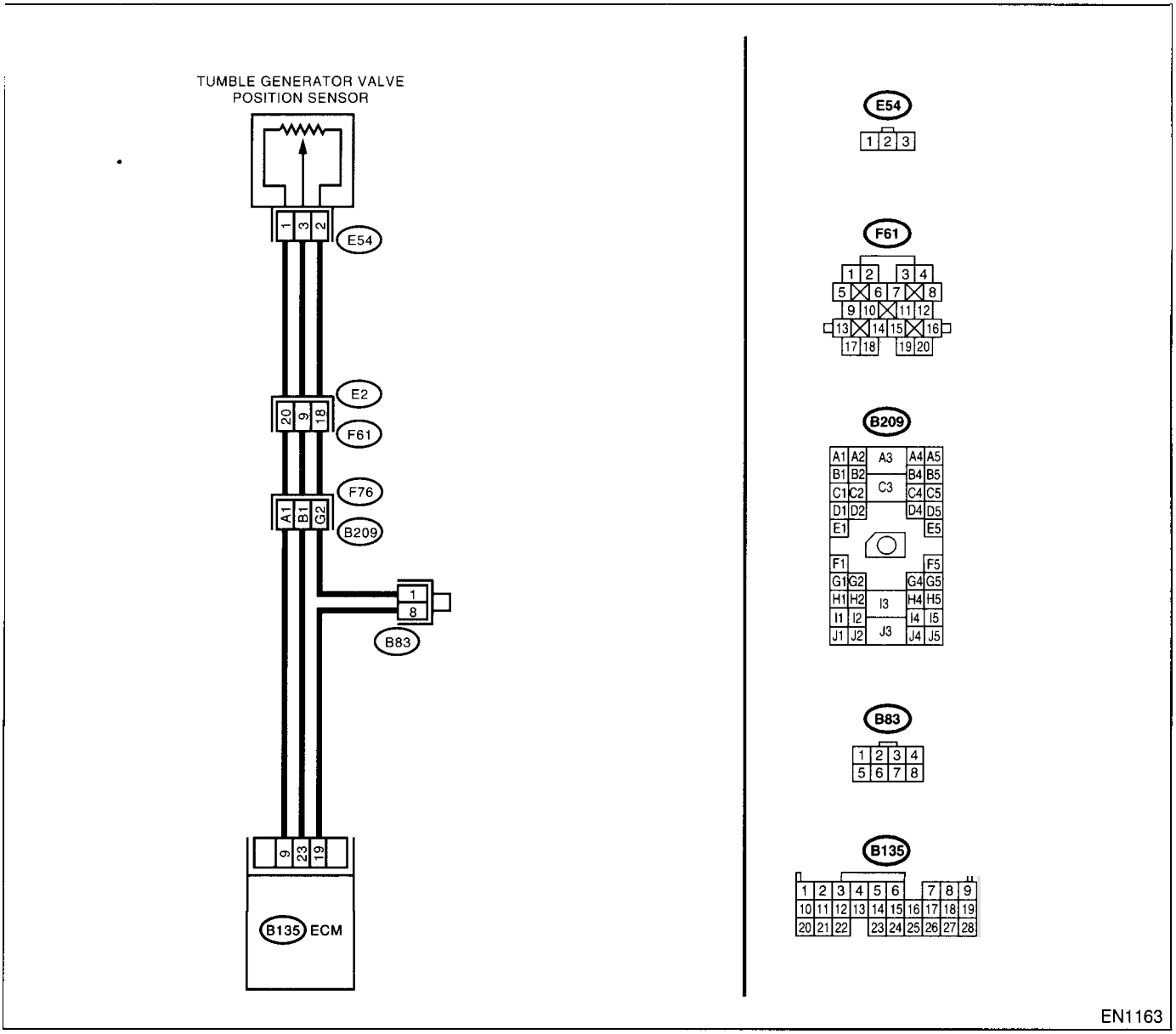
	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from tumble generator valve position sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 1 (+) — Engine ground (–):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair 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. 23 — (E54) No. 3:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair 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 resistance less than 10 Ω?	Repair 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?	Repair poor contact in tumble generator valve position sensor connector.	Replace the tumble generator valve assembly. <Ref. to FU(DOHC TURBO)-40, Tumble Generator Valve Assembly.>

BY:DTC P1089 — TUMBLE GENERATOR VALVE #1 (RH) POSITION SENSOR 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



	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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	s the value more than 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, repai the following: • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connecto
2	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from tumble generator valve 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:***	s the resistance less than 5 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repai the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in coupling connecto • 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 tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 3 (+) — Engine ground (–):***	s the voltage more than 4.9 V?	Repair battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, eplace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>	Replace the tumble generator valve assembly. <Ref. to FU(DOHC TURBO)-40, Tumble Generator Valve Assembly.>

BZ:DTC P1090 — TUMBLE GENERATOR VALVE SYSTEM #1 (RH) MALFUNCTION (STUCK OPEN) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate P1088, P1089, P1094 or P1095?	Inspect DTC P1088, P1089, P1094 or P1095 using List of Diagnostic Trouble Code (DTC) <Ref. to EN(DOHC TURBO)-80, 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 tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(DOHC TURBO)-40, Tumble Generator Valve Assembly.>	Clean tumble generator valve.

CA:DTC P1091 — TUMBLE GENERATOR VALVE SYSTEM #1 (RH) MALFUNCTION (STUCK CLOSE) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate P1088, P1089, P1094 or P1095?	Inspect DTC P1088, P1089, P1094 or P1095 using List of Diagnostic Trouble Code (DTC) <Ref. to EN(DOHC TURBO)-80, 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 tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(DOHC TURBO)-40, Tumble Generator Valve Assembly.>	Clean tumble generator valve.

CB:DTC P1092 — TUMBLE GENERATOR VALVE SYSTEM #2 (LH) MALFUNCTION (STUCK OPEN) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate P1086, P1087, P1096 or P1097?	Inspect DTC P1086, P1087, P1096 or P1097 using List of Diagnostic Trouble Code (DTC) <Ref. to EN(DOHC TURBO)-80, 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 tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(DOHC TURBO)-40, Tumble Generator Valve Assembly.>	Clean tumble generator valve.

CC:DTC P1093 — TUMBLE GENERATOR VALVE SYSTEM #2 (LH) MALFUNCTION (STUCK CLOSE) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate P1086, P1087, P1096 or P1097?	Inspect DTC P1086, P1087, P1096 or P1097 using List of Diagnostic Trouble Code (DTC) <Ref. to EN(DOHC TURBO)-80, 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 tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(DOHC TURBO)-40, Tumble Generator Valve Assembly.>	Clean tumble generator valve.

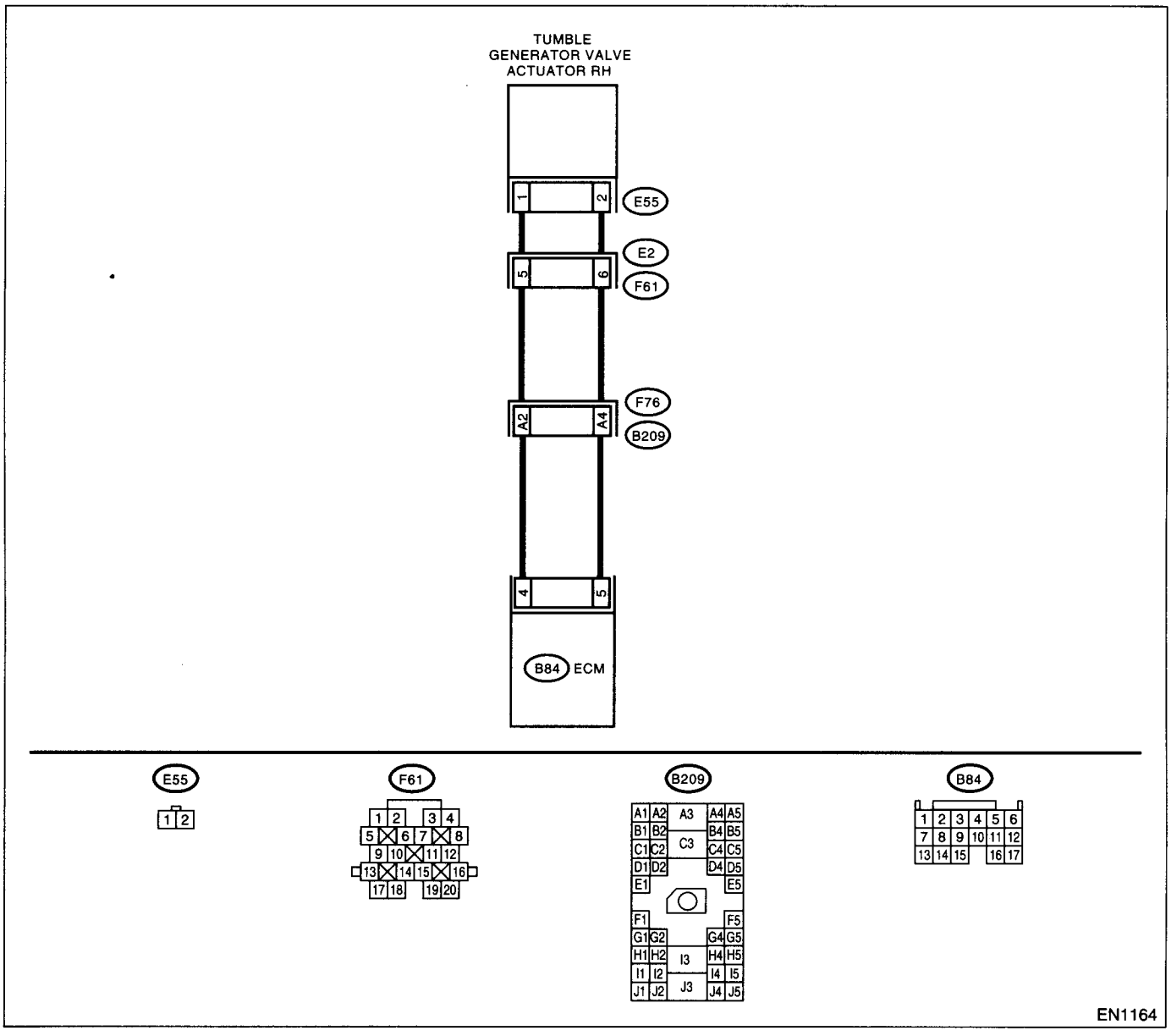
CD:DTC P1094 — TUMBLE GENERATOR VALVE CIRCUIT #1 (OPEN CIRCUIT)

—

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, 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 resistance less than 1Ω?	Go to step **2.**	Repair 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.	Repair poor contact in tumble generator valve actuator connector.	Replace the tumble generator valve assembly. <Ref. to FU(DOHC TURBO)-40, Tumble Generator Valve Assembly.>

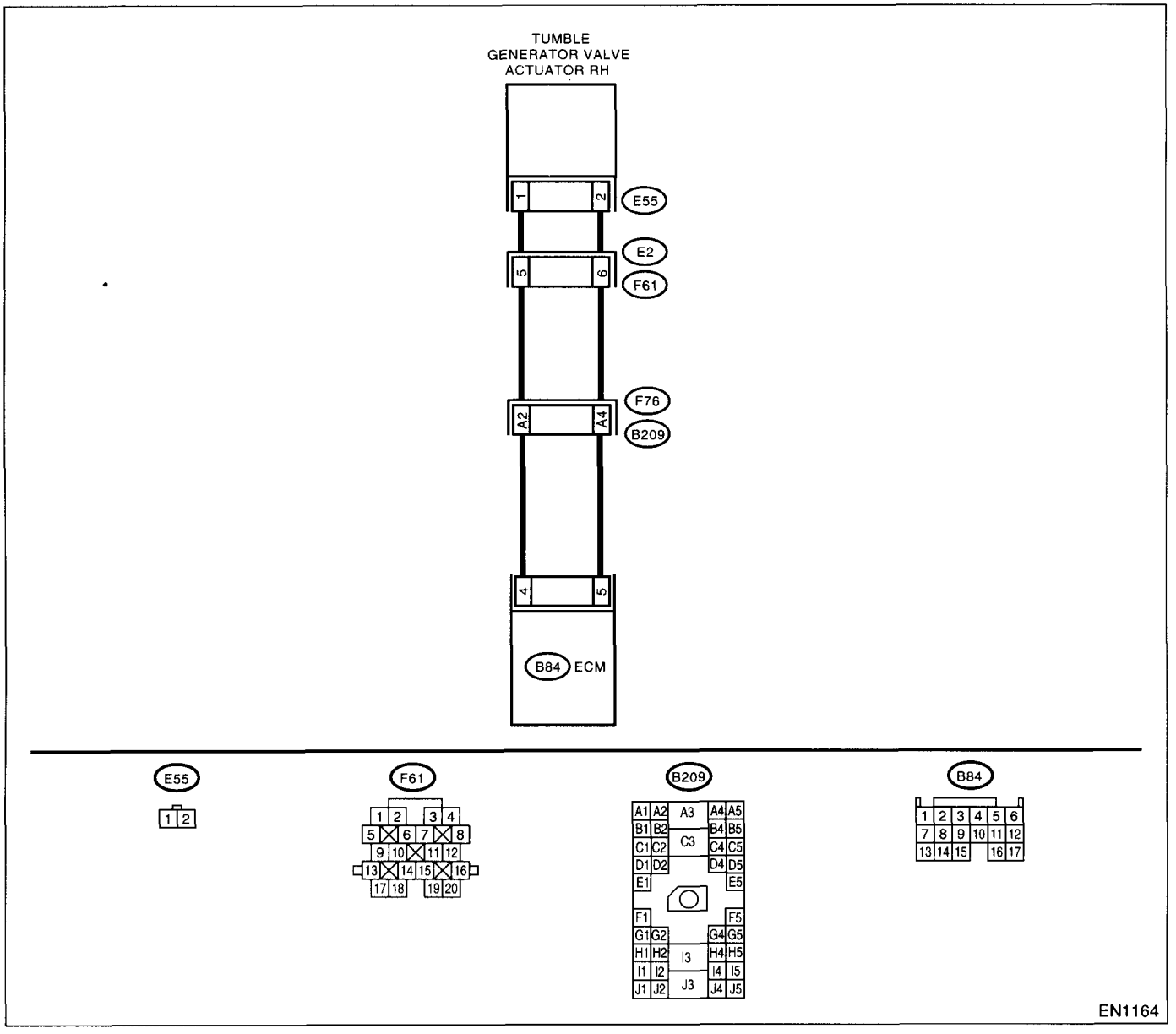
CE:DTC P1095 — TUMBLE GENERATOR VALVE CIRCUIT #1 (OVERCURRENT)

—

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, 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 voltage less than 5V?	Replace the tumble generator valve assembly. <Ref. to FU(DOHC TURBO)-40, Tumble Generator Valve Assembly.>	Repair battery short circuit between ECM and tumble generator valve actuator.

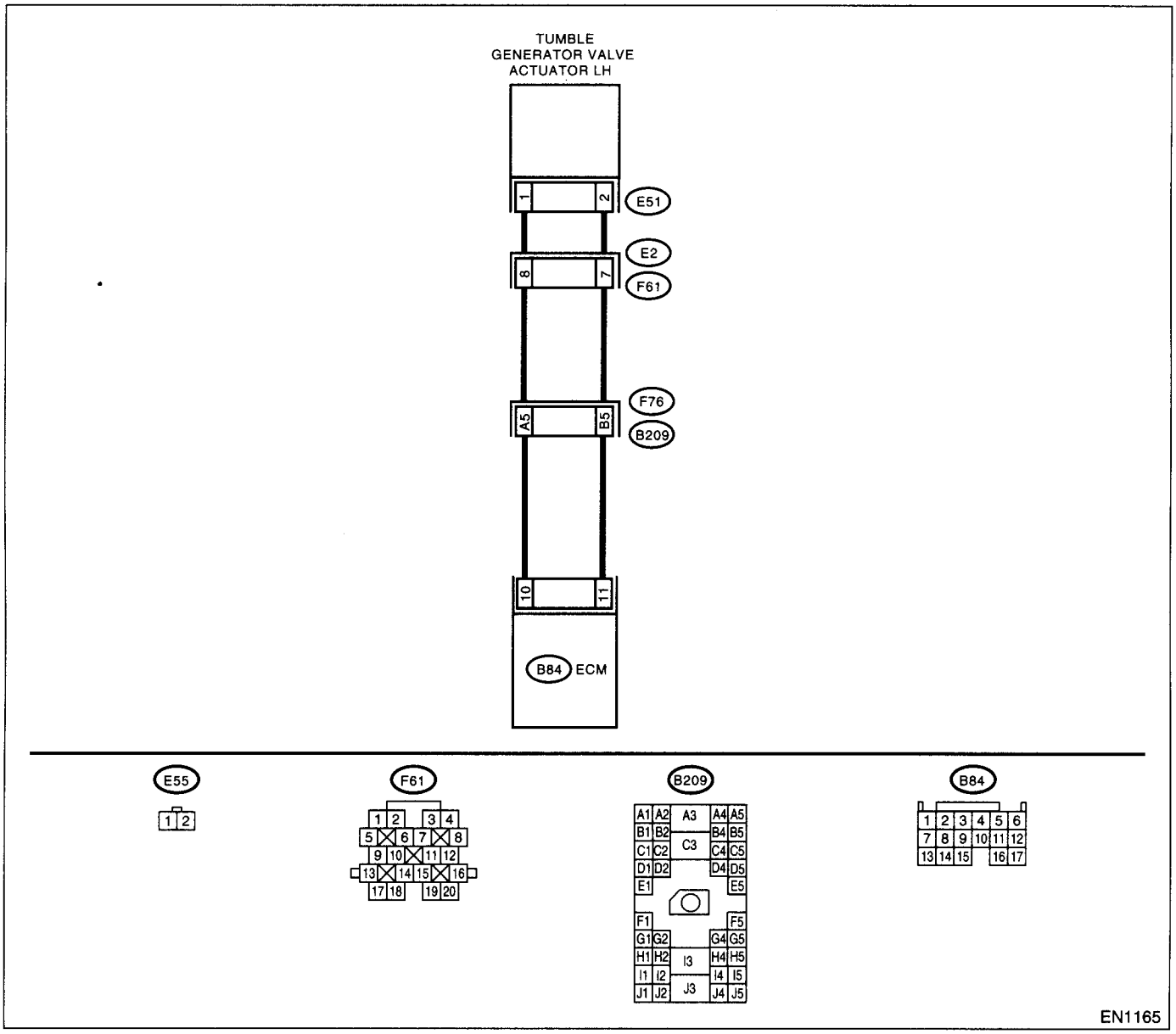
CF:DTC P1096 — TUMBLE GENERATOR VALVE CIRCUIT #2 (OPEN CIRCUIT)

—

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



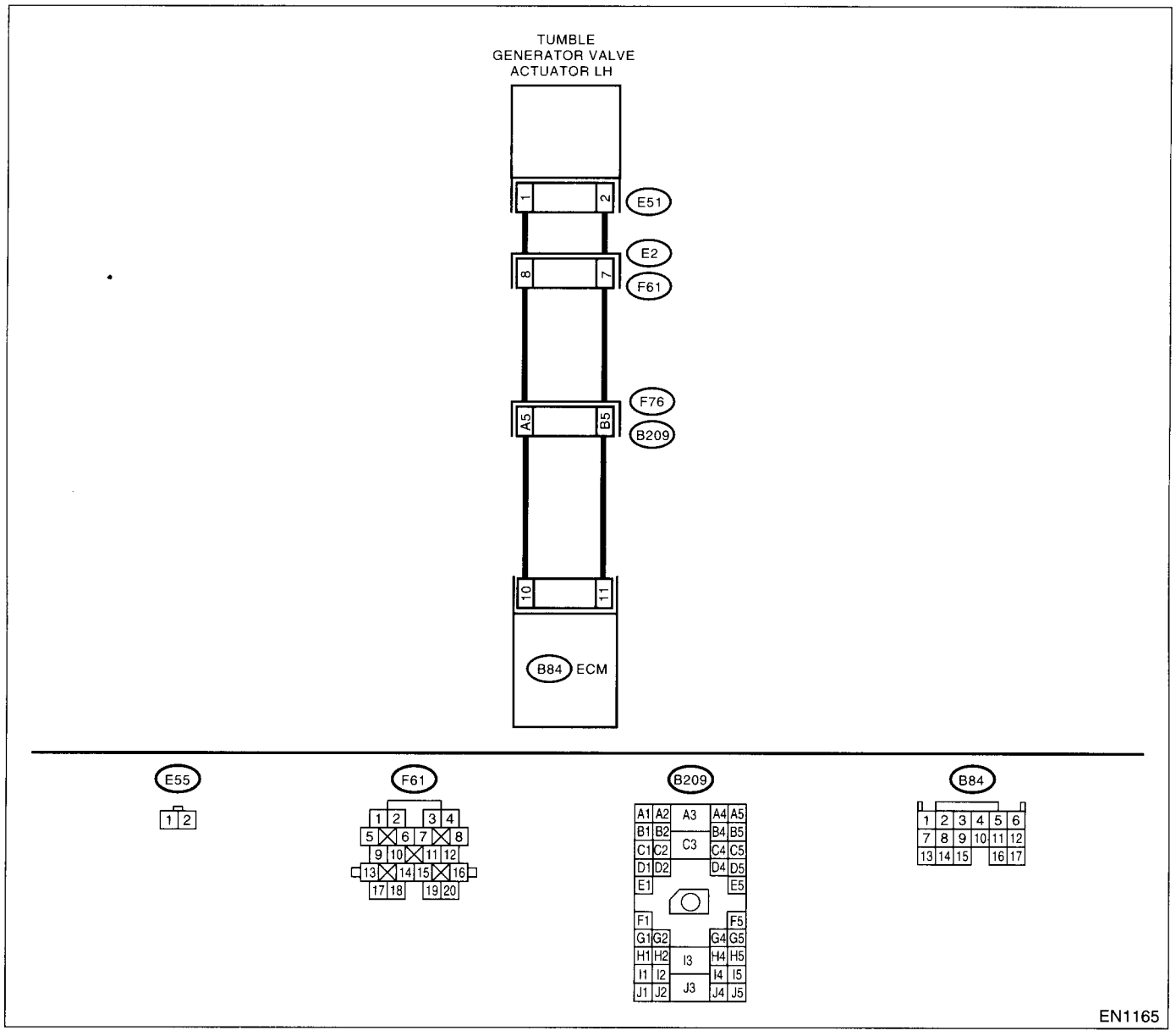
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from tumble generator valve and ECM connector. 3)Measure the resistance between tumble generator valve actuator and ECM connector. ***Connector & terminal*** ***(E51) No. 1 — (B84) No. 10:*** ***(E51) No. 2 — (B84) No. 11:***	Is the resistance less than 1Ω?	Go to step **2.**	Repair 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.	Repair poor contact in tumble generator valve actuator connector.	Replace the tumble generator valve assembly. <Ref. to FU(DOHC TURBO)-40, Tumble Generator Valve Assembly.>

CG:DTC P1097 — TUMBLE GENERATOR VALVE CIRCUIT #2 (OVERCURRENT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, 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 voltage less than 5V?	Replace the tumble generator valve assembly. <Ref. to FU(DOHC TURBO)-40, Tumble Generator Valve Assembly.>	Repair battery short circuit between ECM and tumble generator valve actuator.

CH:DTC P1110 — ATMOSPHERIC PRESSURE 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1110?	Replace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.	It is not necessary to inspect DTC P1110.

CI: DTC P1111 — ATMOSPHERIC PRESSURE 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1111?	Replace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.	It is not necessary to inspect DTC P1111.

CJ:DTC P1112 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

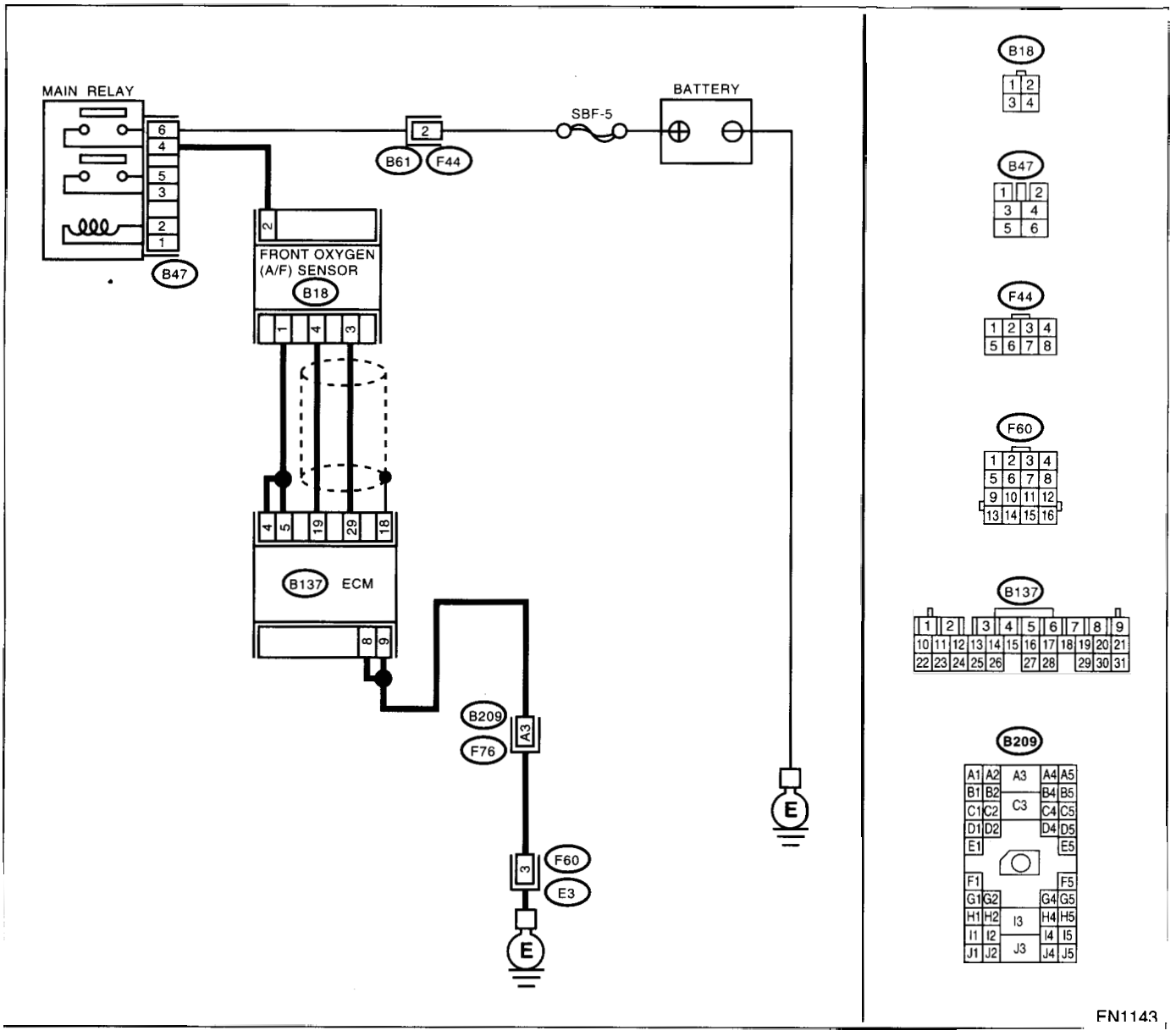
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0106, P0107, P0108, P1110 or P1111?	Inspect DTC P0106, P0107, P0108, P1110 or P1111 using "List of Diagnostic Trouble Code (DTC)".<Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).>	Replace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.

CK: DTC P1130 — FRONT OXYGEN (A/F) SENSOR CIRCUIT MALFUNCTION (OPEN CIRCUIT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



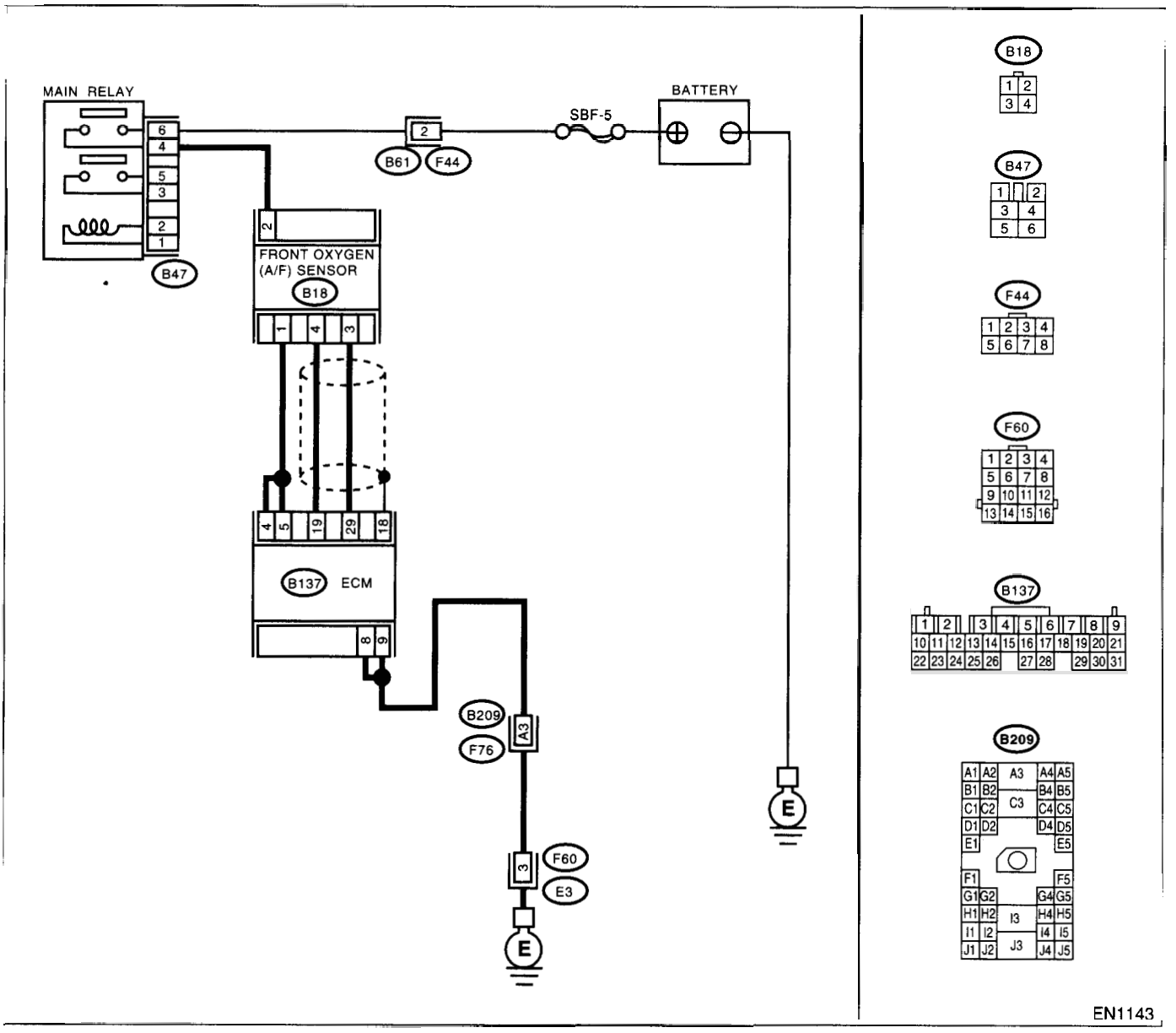
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3)Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 29 — (B18) No. 3:*** ***(B137) No. 19 — (B18) No. 4:***	Is the resistance less than 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?	Repair poor contact in front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(DOHC TURBO)-42, Front Oxygen (A/F) Sensor.>

CL: DTC P1131 — FRONT OXYGEN (A/F) SENSOR CIRCUIT MALFUNCTION (SHORT CIRCUIT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN1143

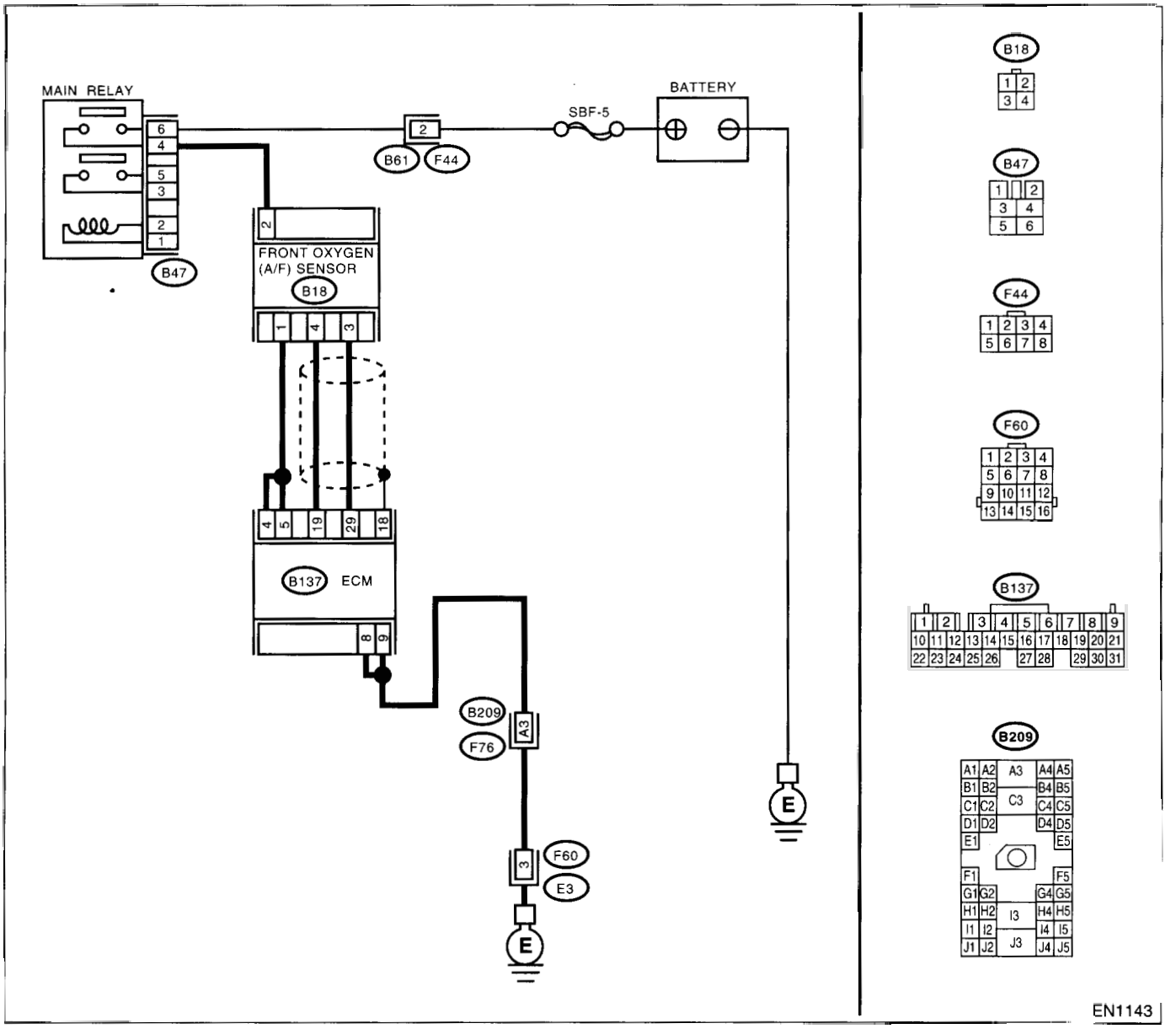
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 19 — Chassis ground:***	Is the resistance more than 10 Ω?	Go to step **2.**	Repair 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 resistance more than 10 Ω?	Go to step **3.**	Repair 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 voltage more than 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 voltage more than 10 V?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Repair 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 voltage more than 4.95 V?	Go to step **6.**	Replace the front oxygen (A/F) sensor. <Ref. to FU(DOHC TURBO)-42, Front Oxygen (A/F) Sensor.>
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 29 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Repair poor contact in ECM connector.

CM:DTC P1134 — FRONT OXYGEN (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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN1143

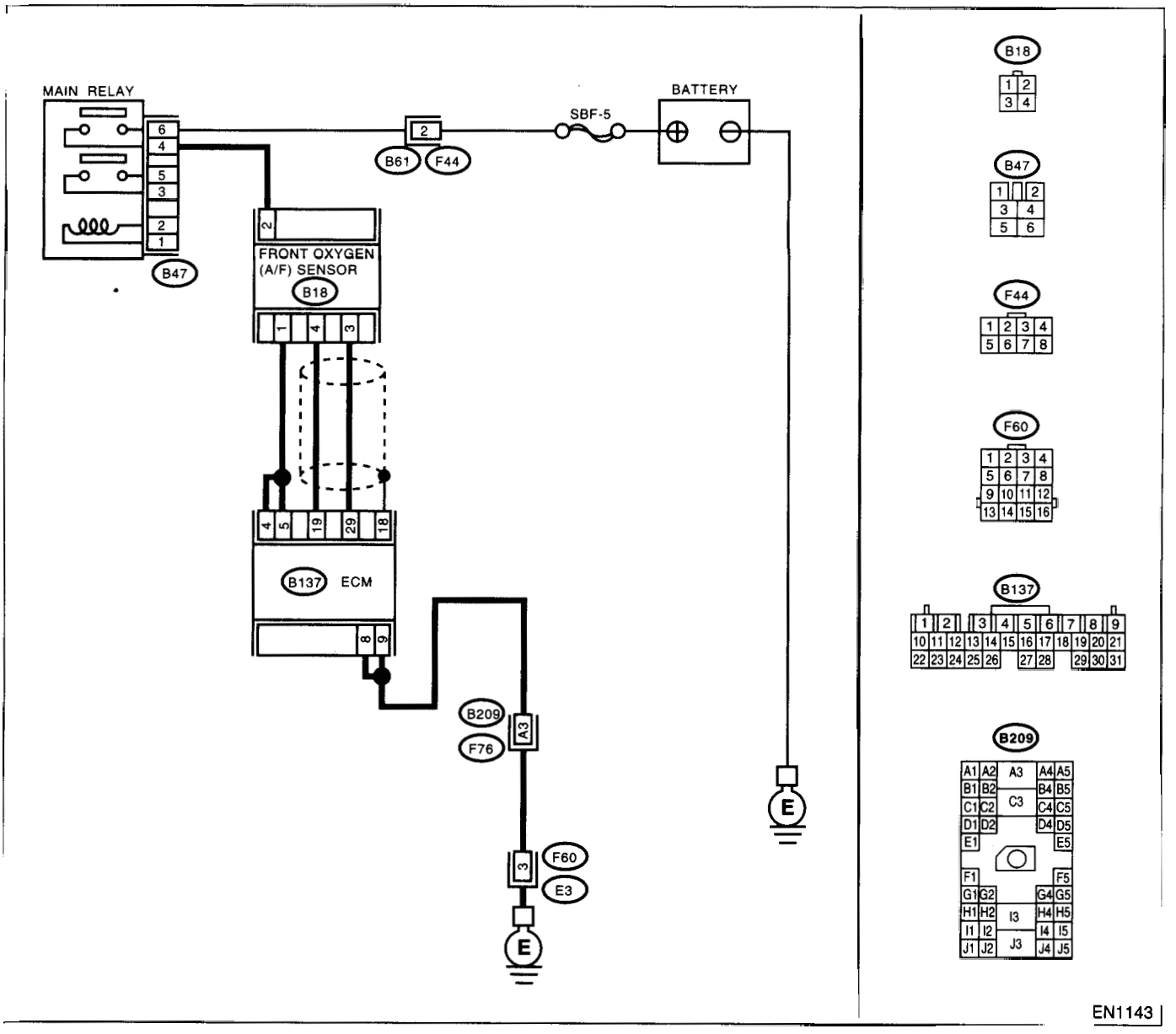
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1134?	Replace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>	It is not necessary to inspect DTC P1134.

CN: DTC P1139 — FRONT OXYGEN (A/F) SENSOR #1 HEATER CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN1143

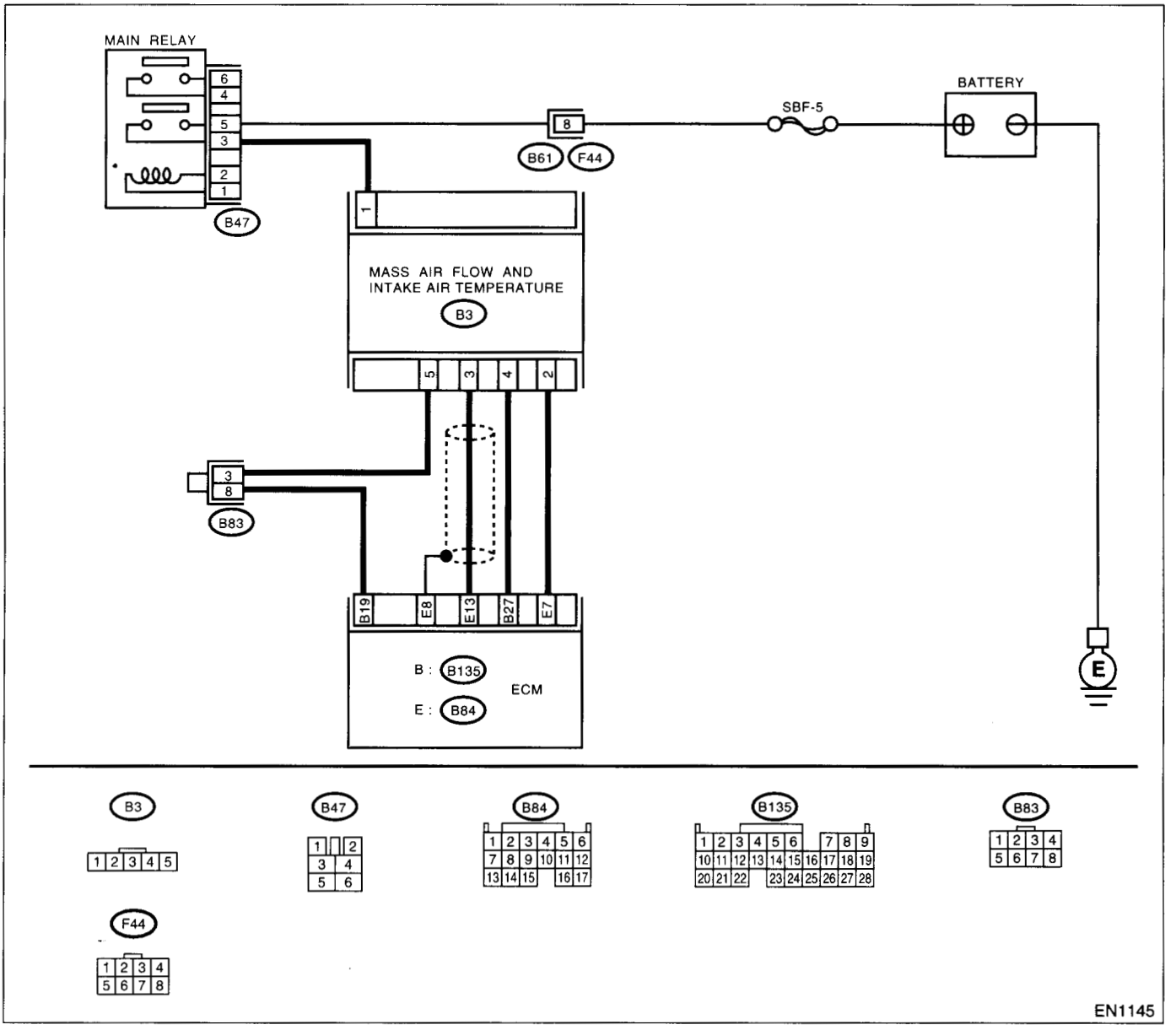
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1)Start the engine, and warm-up the engine. 2)Turn the ignition switch to OFF. 3)Disconnect the connectors from ECM and front oxygen (A/F) sensor. 4)Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 5 — (B18) No. 1:*** ***(B137) No. 4 — (B18) No. 1:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair 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 resistance less than 1 Ω?	Go to step **3.**	Repair 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 — (B18) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair 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 resistance less than 5 Ω?	Go to step **5.**	Replace the front oxygen (A/F) sensor. <Ref. to FU(DOHC TURBO)-42, Front Oxygen (A/F) Sensor.>
5	**CHECK POOR CONTACT.** Check 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 poor contact in ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(DOHC TURBO)-42, Front Oxygen (A/F) Sensor.>

CO:DTC P1141 — MASS AIR FLOW SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —

- **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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



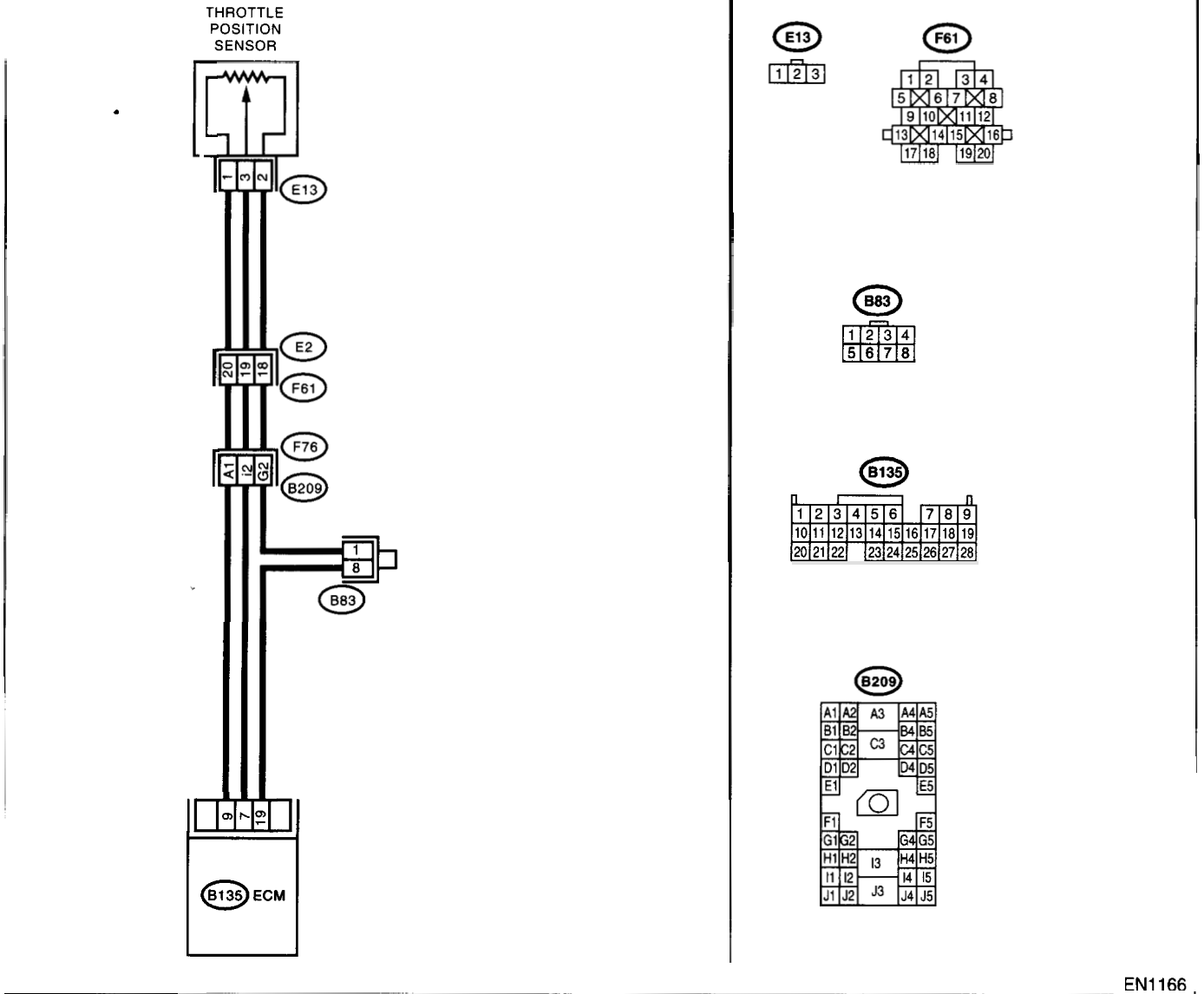
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does Subaru select monitor or OBD-II general scan tool indicate DTC P0102 or P0103?	Inspect DTC P0102 or P0103 using "Diagnostics Chart with Trouble Code" <Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1141.	Replace the mass air flow and intake air temperature sensor.

CP:DTC P1142 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —

- **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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN1166

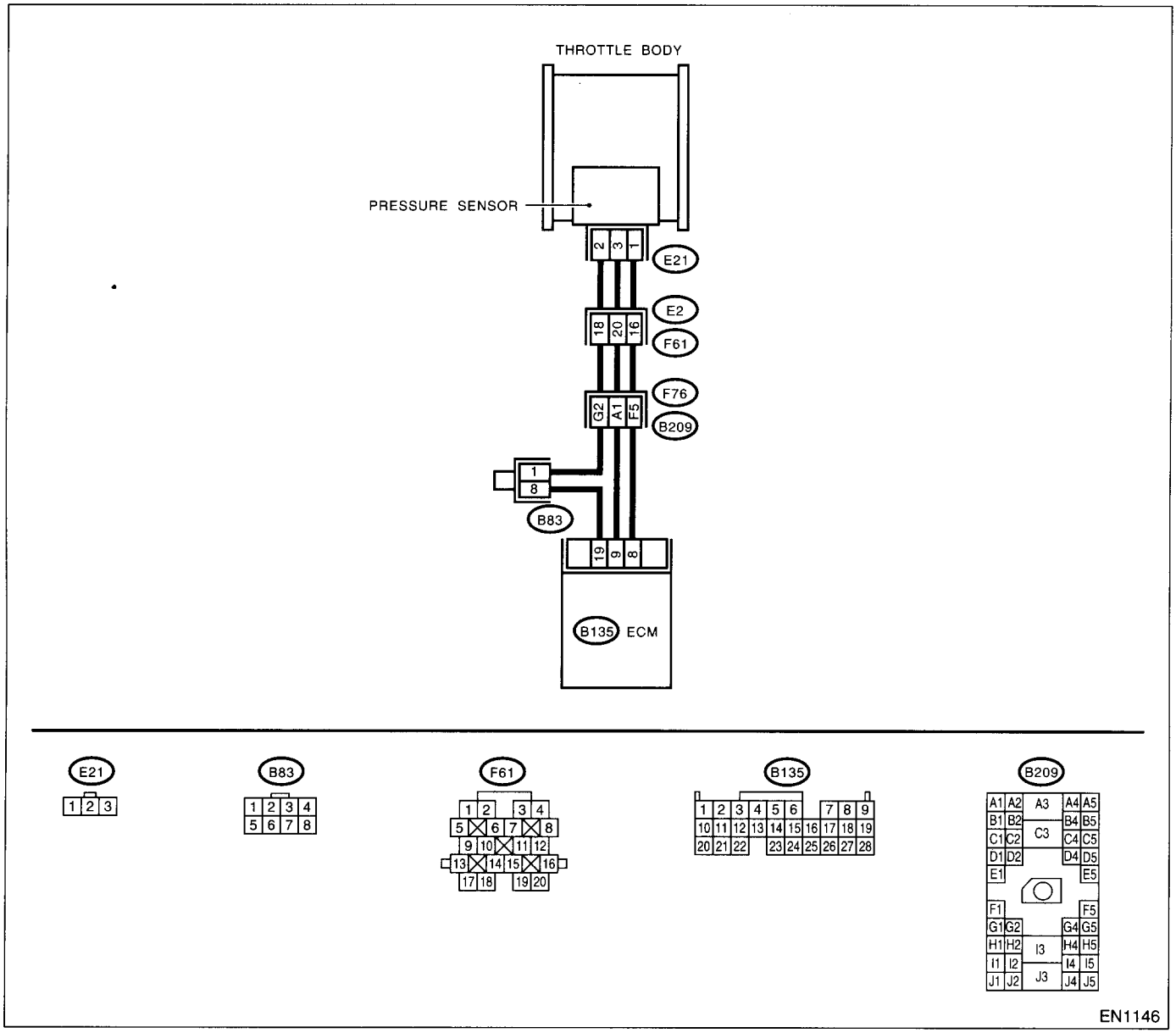
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0122 or P0123?	Inspect DTC P0122 or P0123 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1142.	Replace the throttle position sensor. <Ref. to FU(DOHC TURBO)-33, Throttle Position Sensor.>

CQ:DTC P1146 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



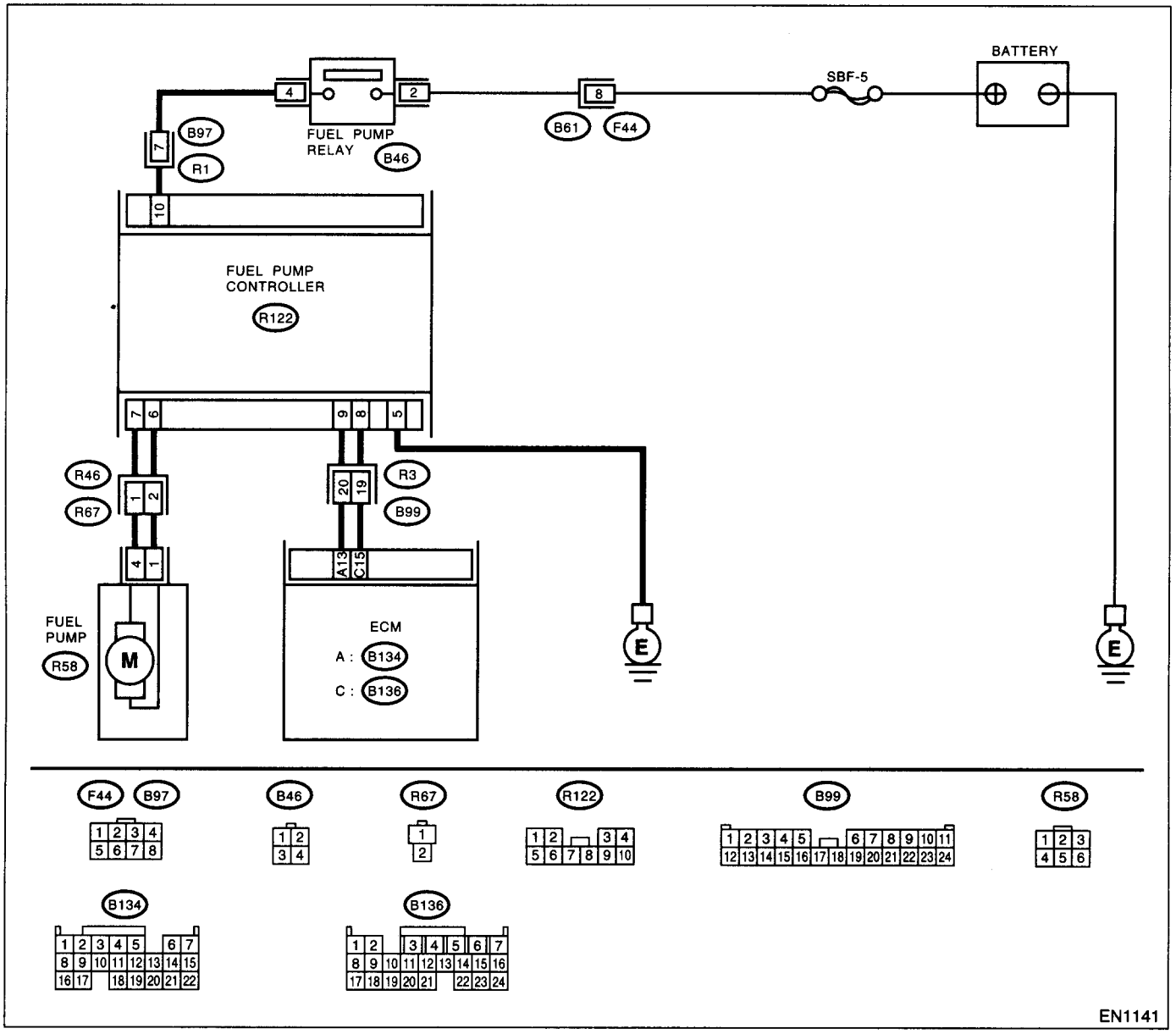
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** NOTE: In this case, it is not necessary to inspect DTC P0106.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0107, P0108 or P1112?	Inspect DTC P0107, P0108 or P1112 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, 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?	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 pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual. Specification: •Intake manifold absolute pressure ***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)***	Is the value within the specifications?	Go to step **4.**	Replace the pressure sensor. <Ref. to FU(DOHC TURBO)-35, Pressure Sensor.>
4	**CHECK THROTTLE POSITION.** Read the data of throttle position signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-38, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the throttle positioning ratio equal to or less than 5% when throttle is fully closed?	Go to step **5.**	Adjust or replace the throttle position sensor. <Ref. to FU(DOHC TURBO)-33, Throttle Position Sensor.>
5	**CHECK THROTTLE POSITION.**	Is the throttle positioning ratio equal to or more than 85% when throttle is fully open?	Replace the pressure sensor. <Ref. to FU(DOHC TURBO)-35, Pressure Sensor.>	Replace the throttle position sensor. <Ref. to FU(DOHC TURBO)-33, Throttle Position Sensor.>

CR:DTC P1230 — FUEL PUMP CONTROLLER MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step	Check	Yes	No
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 (-):***	the voltage more than 10V?	Go to step **2.**	Repair 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.
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:***	the resistance less than 5 ?	Go to step **3.**	Repair 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.
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. 2:*** ***(R122) No. 6 — (R58) No. 1:***	the resistance less than 1 ?	Go to step **4.**	Repair open circuit between fuel pump controller and fuel pump.
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:***	the resistance more than 1M ?	Go to step **5.**	Repair ground short circuit between fuel pump controller and fuel pump.
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:***	the resistance less than 1 ?	Go to step **6.**	Repair 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.

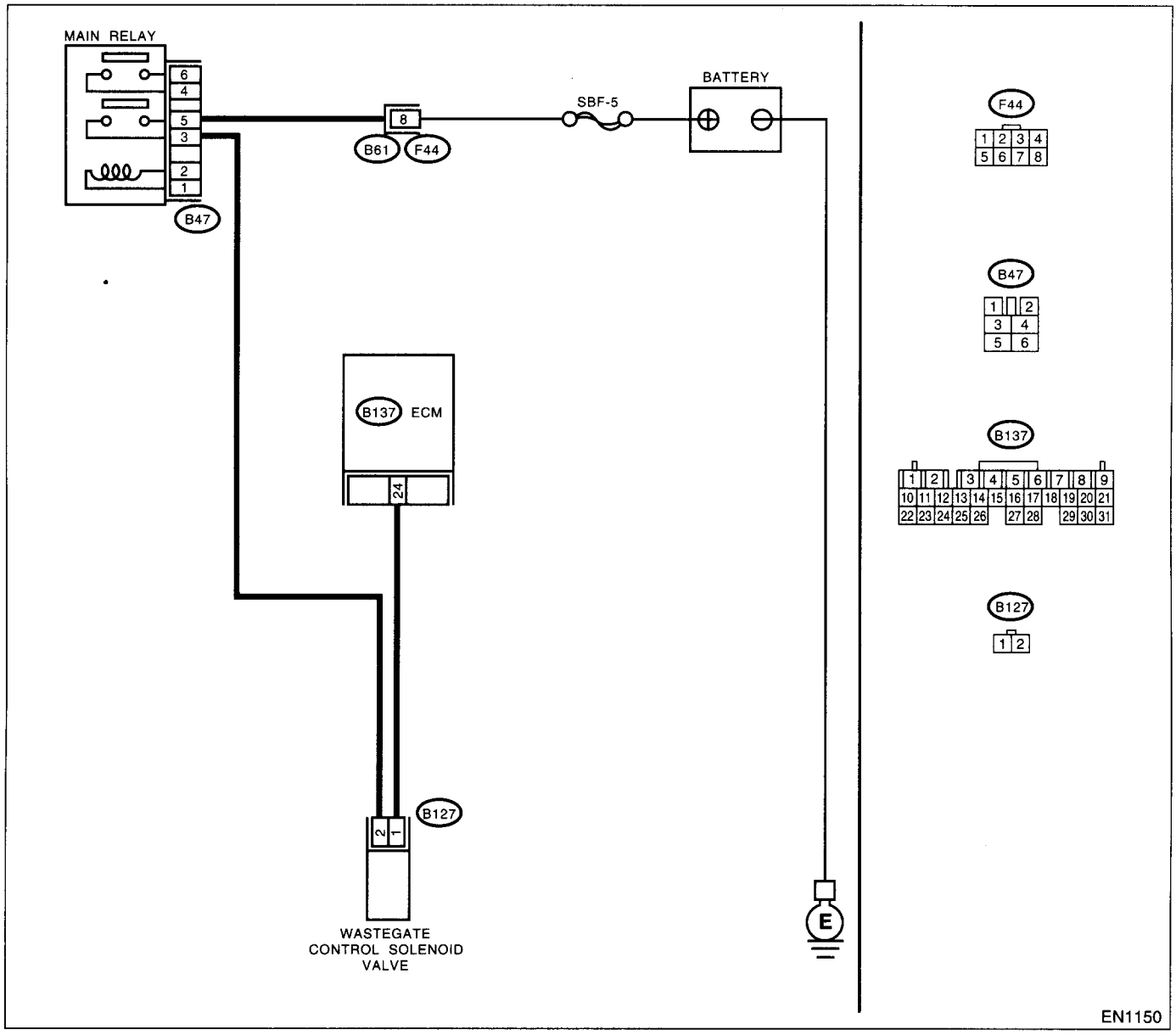
	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND ECM CONNECTOR.** Measure the resistance of harness between fuel pump controller and chassis ground. ***Connector & terminal*** ***(R122) No. 9 — Chassis ground:*** ***(R122) No. 8 — Chassis ground:***	Is the resistance more than 1M Ω?	Go to step **7.**	Repair 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.	Repair poor contact in ECM and fuel pump controller.	Replace the fuel pump controller. <Ref. to FU(DOHC TURBO)-50, Fuel Pump Controller.>

CS:DTC P1244 — WASTEGATE CONTROL SOLENOID VALVE RANGE/PERFORMANCE PROBLEM (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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



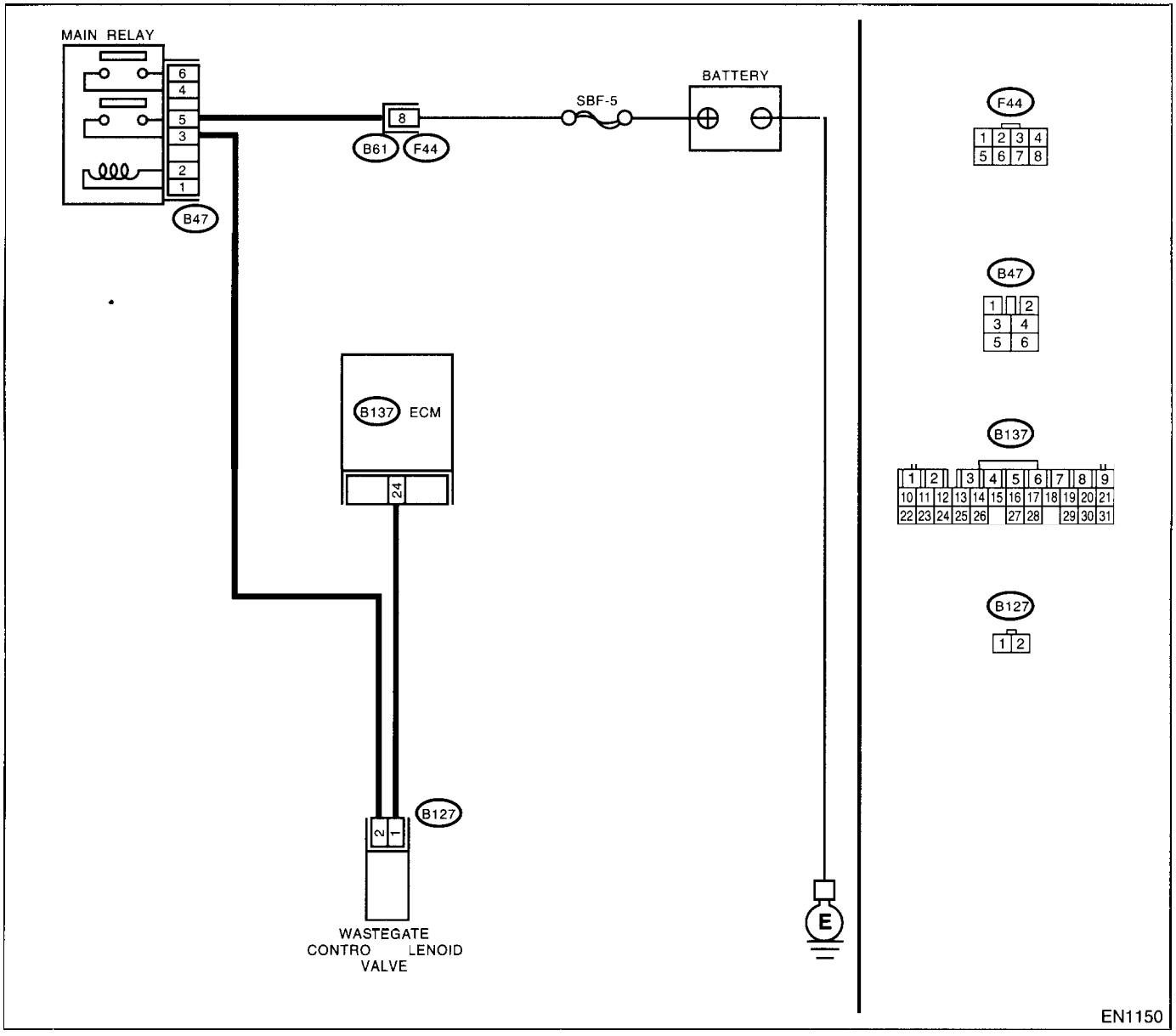
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0245 or P0246?	Inspect DTC P0245 or P0246 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1244.	Replace the wastegate control solenoid valve. <Ref. to FU(DOHC TURBO)-41, Wastegate Control Solenoid Valve.>

CT:DTC P1245 — WASTEGATE CONTROL SOLENOID VALVE MALFUNCTION (FAIL-SAFE) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, Operation.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



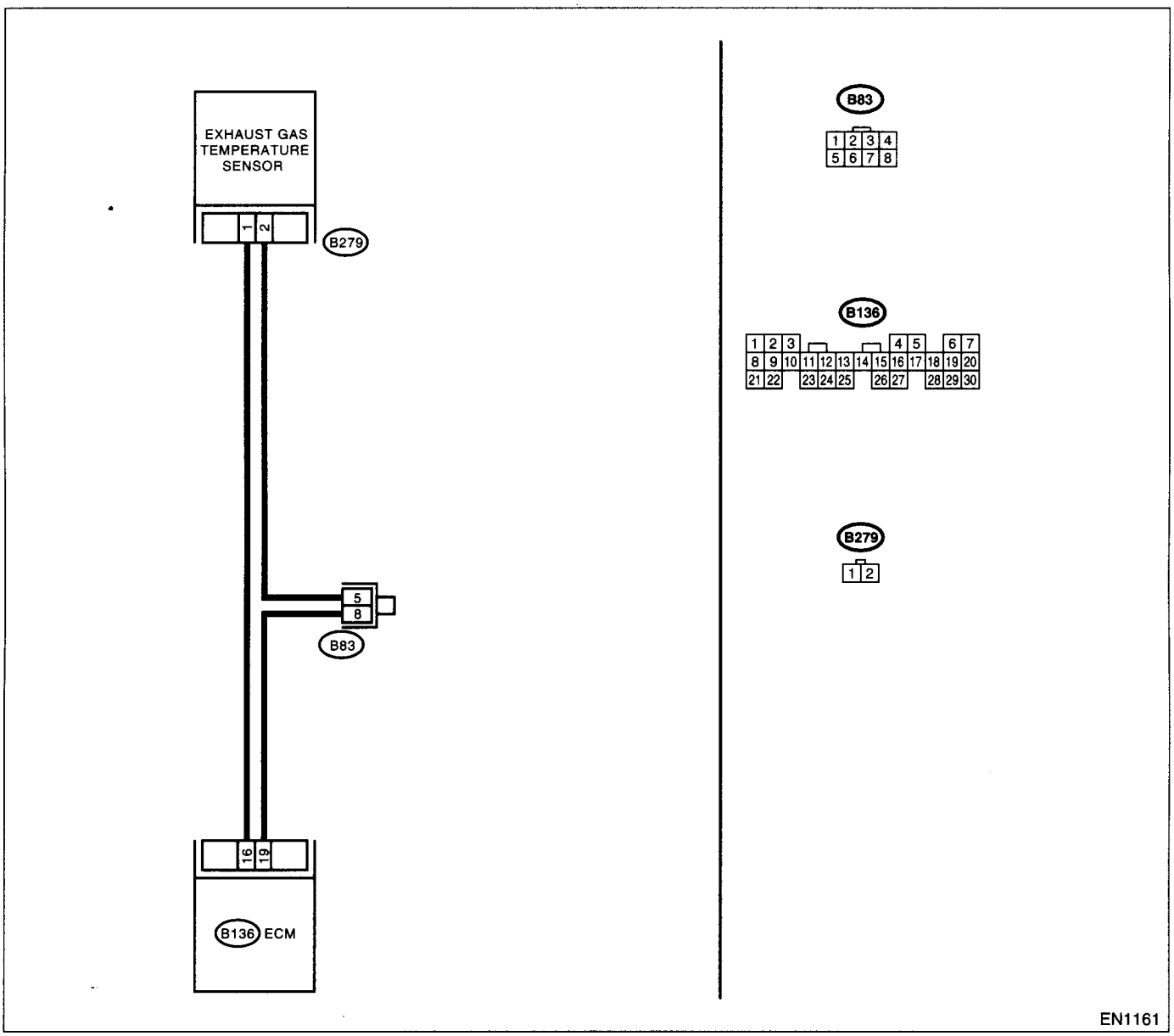
Step		Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0244, P0245, P0246 or P1244?	Inspect DTC P0244, P0245, P0246 or P1244 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1245.	Replace the wastegate control solenoid valve. <Ref. to FU(DOHC TURBO)-41, Wastegate Control Solenoid Valve.>

CU:DTC P1301 — FIRE DUE TO INCREASED EXHAUST TEMPERATURE —

- **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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



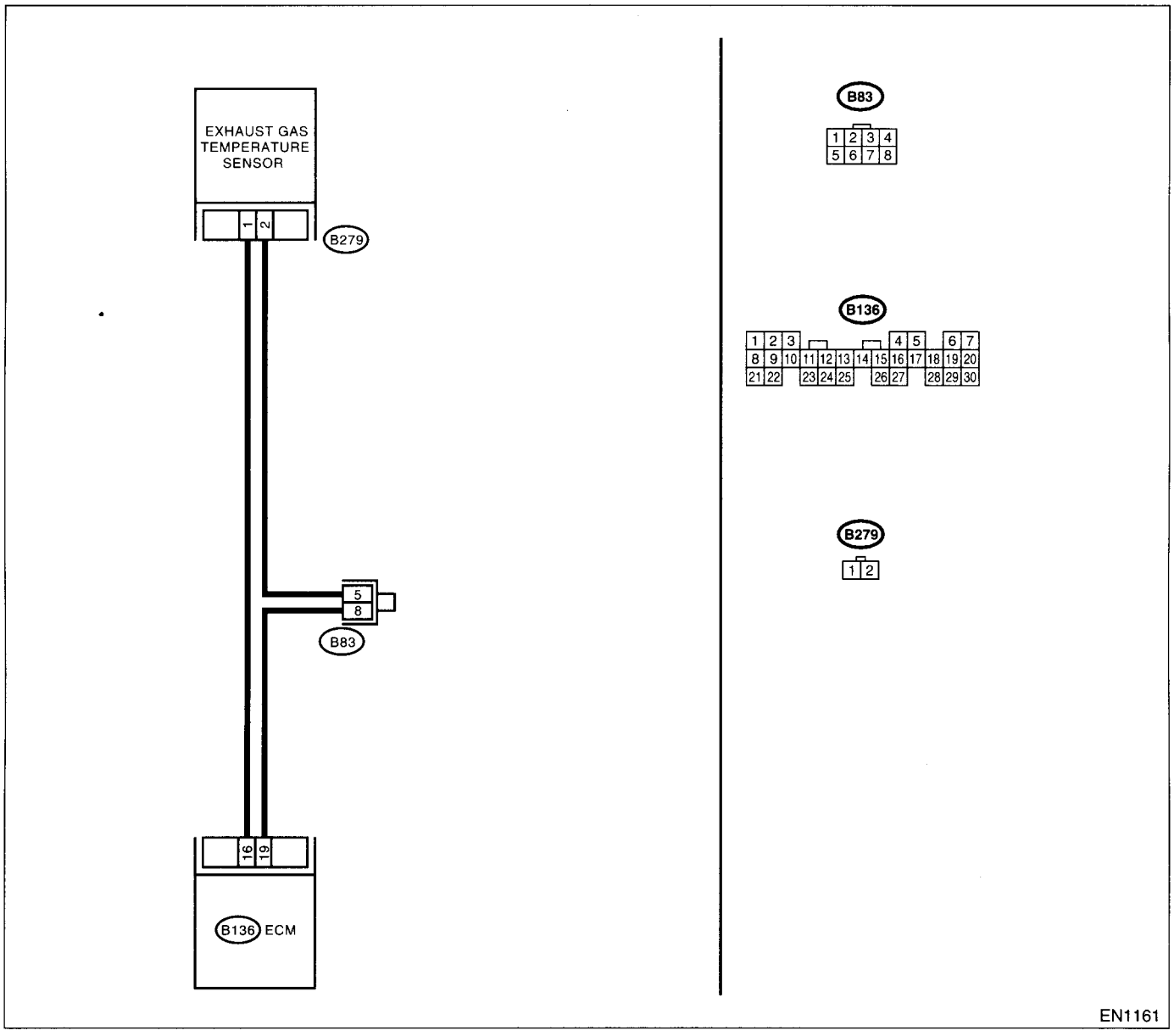
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC.** Conduct the troubleshooting for all DTC P0301, P0302, P0303 and P0304. <Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).>	Does failure for repair or replacement exist?	Repair or replace failure, then replace the precatalytic converter.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

CV:DTC P1312 — EXHAUST GAS TEMPERATURE CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



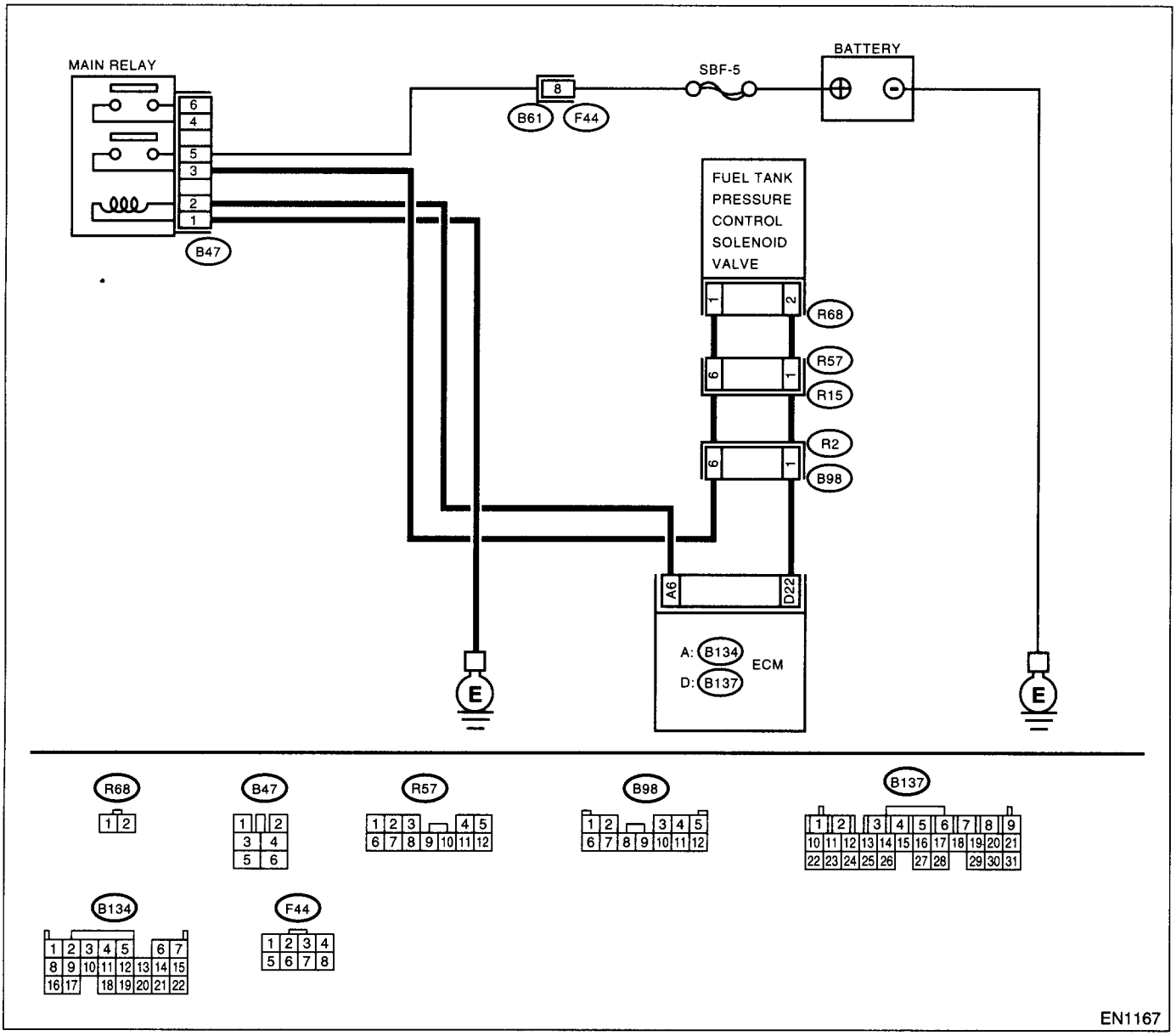
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0545, P0546 or P1544?	Inspect DTC P0545, P0546 or P1544 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1312.	Replace the exhaust gas temperature sensor. <Ref. to FU(DOHC TURBO)-46, Exhaust Temperature Sensor.>

CW:DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, 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. 22 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **3.**

Step	Check	Yes	No
CHECK POOR CONTACT. Check poor contact in ECM connector.	s there poor contact in ECM :onnector?	lepair poor con-act in ECM con-ector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, be cause probable cause is deteriora tion of multiple parts.
CHECK HARNESS BETWEEN FUEL TANK PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from fuel tank pressure control solenoid valve and ECM. 3)Measure the resistance of harness between fuel tank pressure control solenoid valve connector and chassis ground. ***Connector & terminal*** ***(R68) No. 2 — Chassis ground:***	s the resistance less than 10 Ω?	lepair ground hort circuit in har-ess between :CM and fuel tank ressure control olenoid valve onnector.	Go to step **4.**
CHECK HARNESS BETWEEN FUEL TANK PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR. Measure the resistance of harness between ECM and fuel tank pressure control solenoid valve connector. ***Connector & terminal*** ***(B137) No. 22 — (R68) No. 2:***	s the voltage less than 1 Ω?	;o to step **5.**	Repair harness and connector. NOTE: In this case, repai the following: • Open circuit in harness between ECM and fuel tank pressure control solenoid valve connector • Poor contact in coupling connec-tors
CHECK FUEL TANK PRESSURE CONTROL SOLENOID VALVE. Measure the resistance between fuel tank pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	s the resistance between 10 and 100 Ω?	;o to step **6.**	Replace the fuel tank pressure con trol solenoid valve. <Ref. to EC(DOHC TURBO)-12, Pres sure Control Sole-noid Valve.>
CHECK POWER SUPPLY TO FUEL TANK PRESSURE CONTROL SOLENOID VALVE. 1)Turn the ignition switch to ON. 2)Measure the voltage between fuel tank pres sure control solenoid valve and chassis ground. ***Connector & terminal*** ***(R68) No. 1 (+) — Chassis ground (–):***	s the voltage more than 10 V?	;o to step **7.**	Repair harness and connector. NOTE: In this case, repai the following: • Open circuit in harness between main relay and fuel tank pressure con trol solenoid valve connector • Poor contact in coupling connec-tors • Poor contact in main relay connec tor

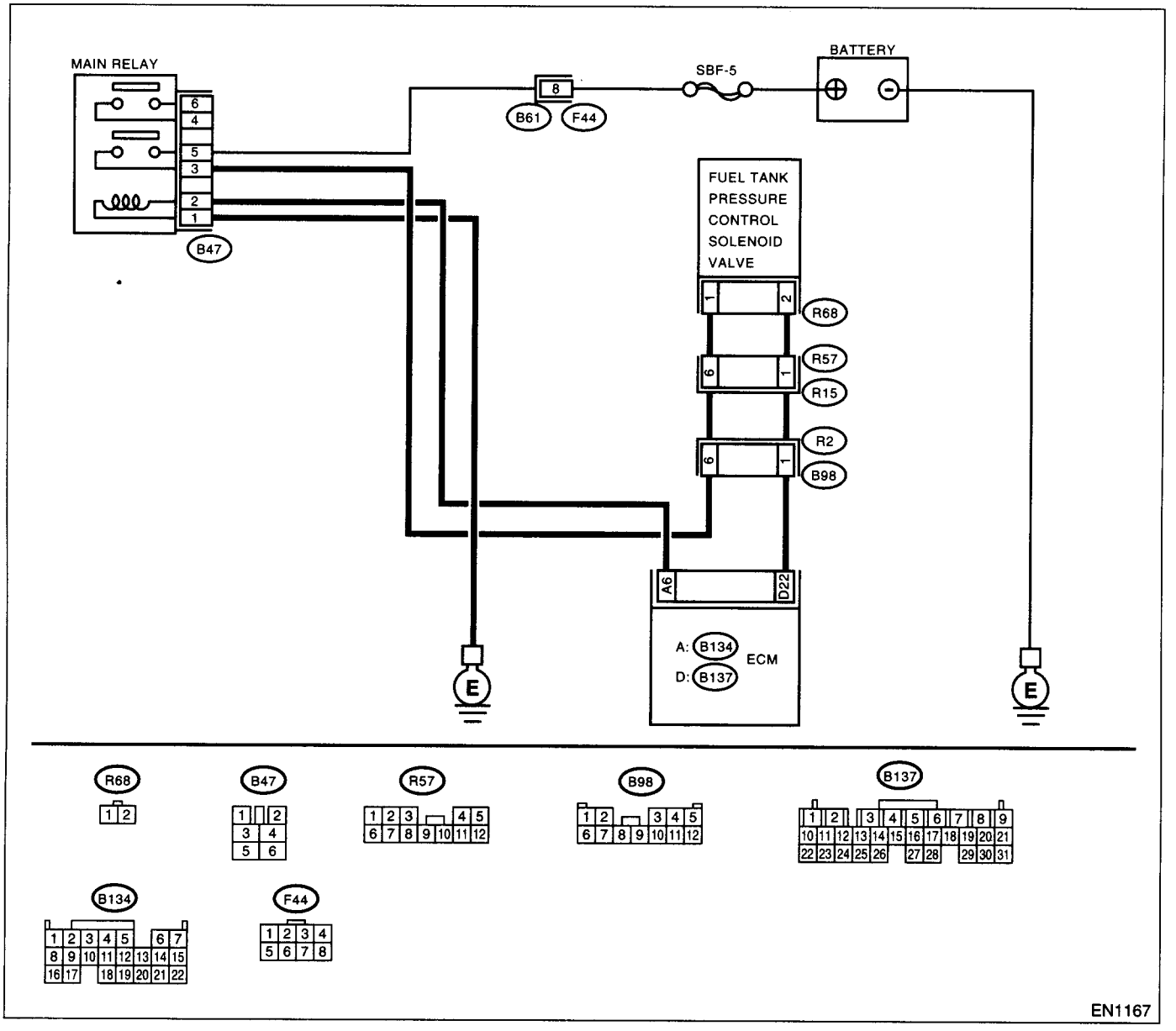
	Step	Check	Yes	No
7	**CHECK POOR CONTACT.** Check poor contact in fuel tank pressure control solenoid valve connector.	Is there poor contact in fuel tank pressure control solenoid valve connector?	Repair poor contact in fuel tank pressure control solenoid valve connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

CX:DTC P1420 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



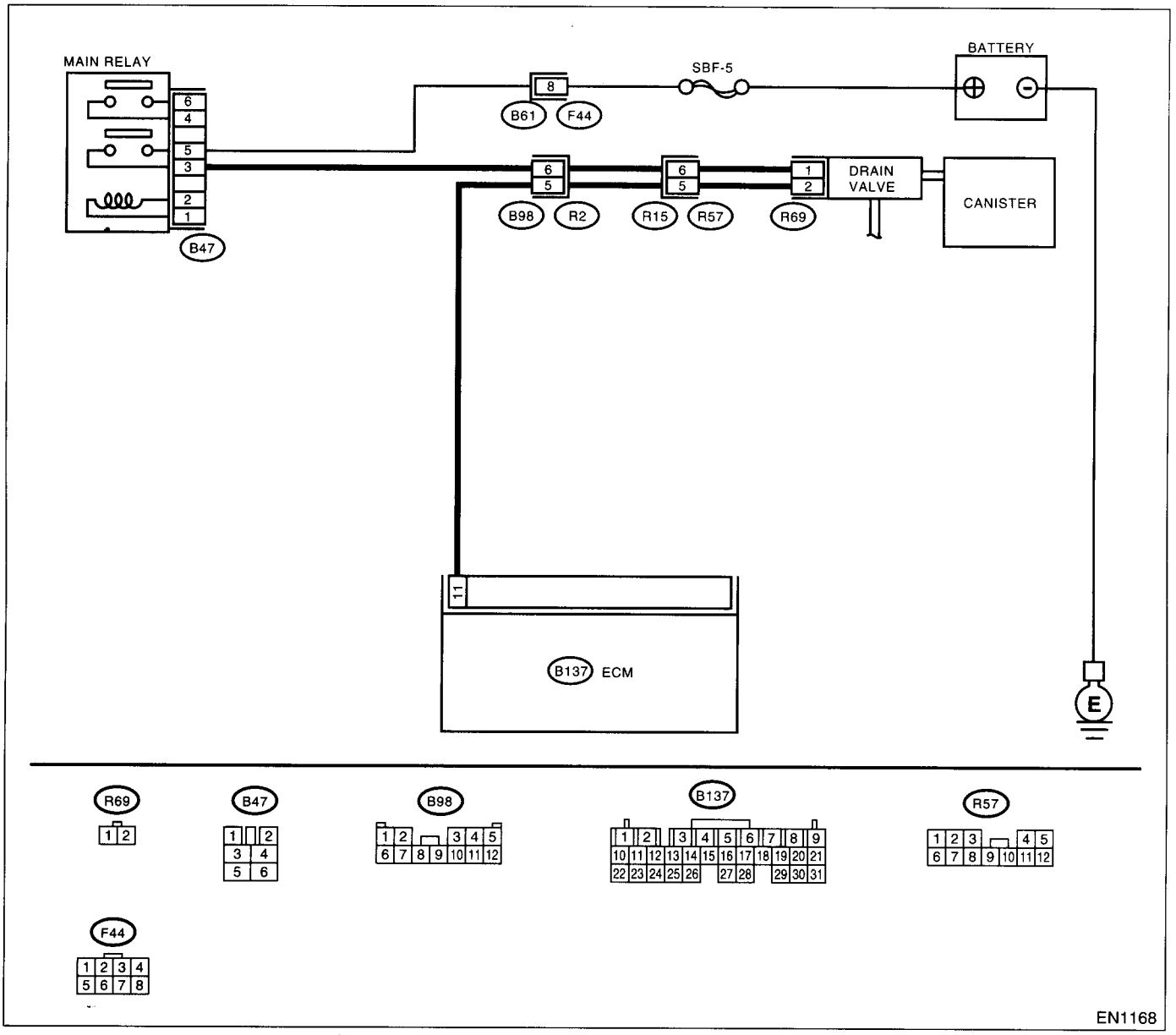
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to OFF. 2)Connect the test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box. 3)Turn the ignition switch to ON. 4)While operating the fuel tank pressure control solenoid valve, measure voltage between ECM and chassis ground. NOTE: Fuel tank pressure control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(DOHC TURBO)-50, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B137) No. 22 (+) — Chassis ground (–):***	Does voltage change between 0 and 10 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 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. 22 (+) — Chassis ground (–):***	Is the voltage more than 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?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>
4	**CHECK HARNESS BETWEEN FUEL TANK PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from fuel tank pressure control solenoid valve. 3)Turn the ignition switch to ON. 4)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 22 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and fuel tank pressure control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>	Go to step **5.**
5	**CHECK FUEL TANK PRESSURE CONTROL SOLENOID VALVE.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between fuel tank pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the fuel tank pressure control solenoid valve <Ref. to EC(DOHC TURBO)-12, Pressure Control Solenoid Valve.> and ECM <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>

CY:DTC P1443 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL FUNCTION PROBLEM —

- **DTC DETECTING CONDITION:**
  - Immediately after fault occurrence
- **TROUBLE SYMPTOM:**
  - Improper fuel supply

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



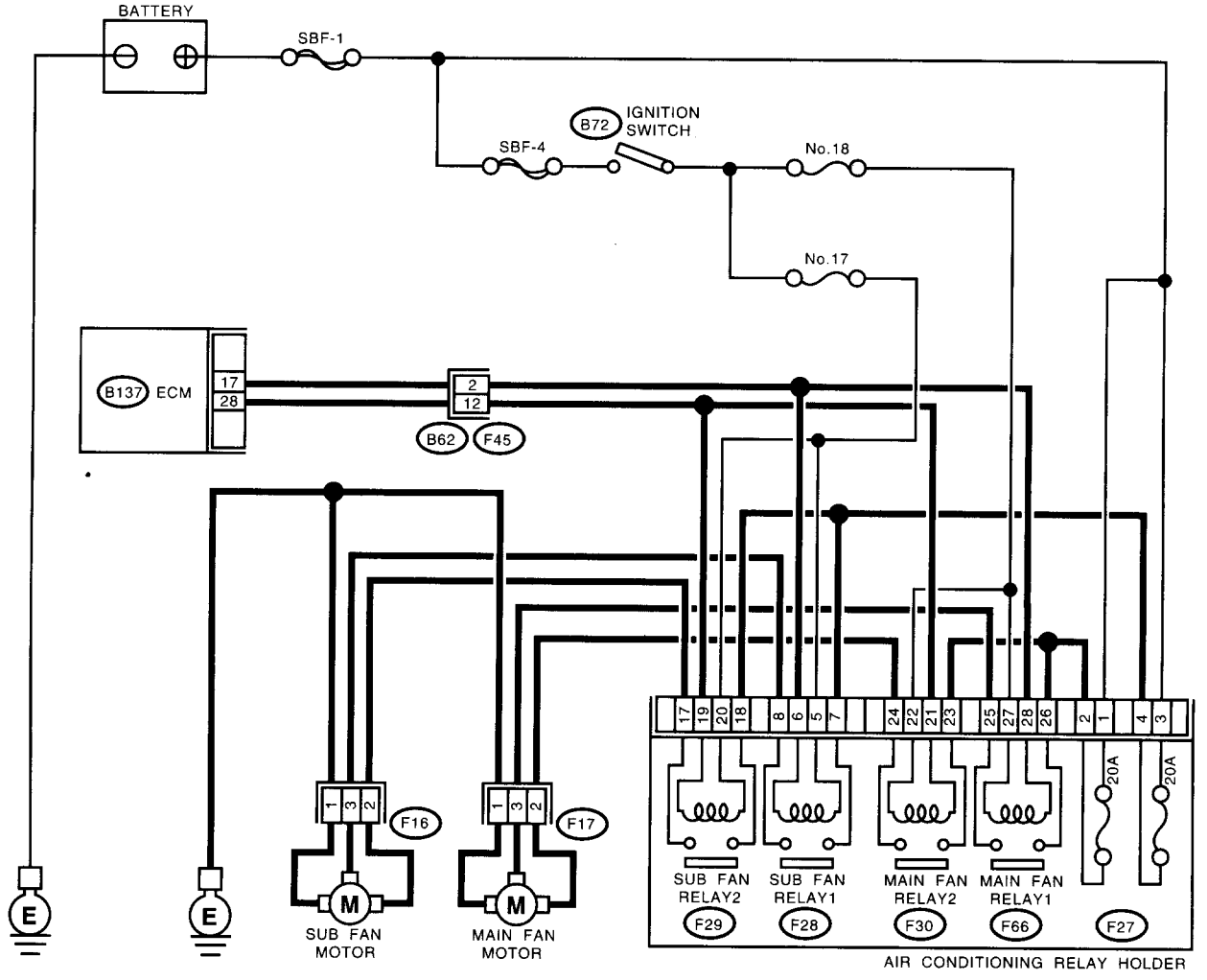
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is there any other DTC on display?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK VENT LINE HOSES.** Check the following items. •Clogging of vent hoses between canister and drain valve •Clogging of vent hose between drain valve and air filter •Clogging of drain filter	Is there a fault in vent line?	Repair or replace the faulty part.	Go to step **3.**
3	**CHECK DRAIN VALVE OPERATION.** 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), to the side of the center console box. 3)Turn the ignition switch to ON. 4)Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to the "Compulsory Valve Operation Check Mode". <Ref. to EN(DOHC TURBO)-50, Compulsory Valve Operation Check Mode.>	Does the drain valve produce operating sound?	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Replace the drain valve. <Ref. to EC(DOHC TURBO)-17, Drain Valve.>

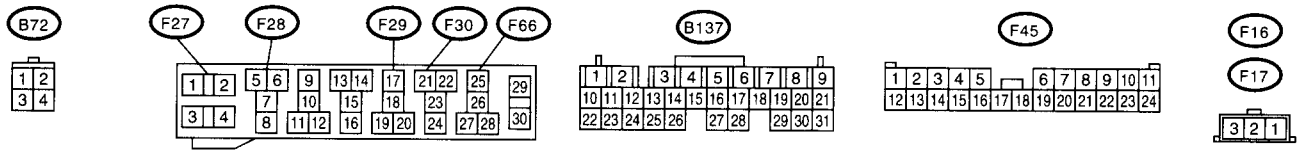
CZ:DTC P1480 — COOLING FAN RELAY 1 CIRCUIT HIGH INPUT —

- **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(DOHC TURBO)-49, Operation.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN1157

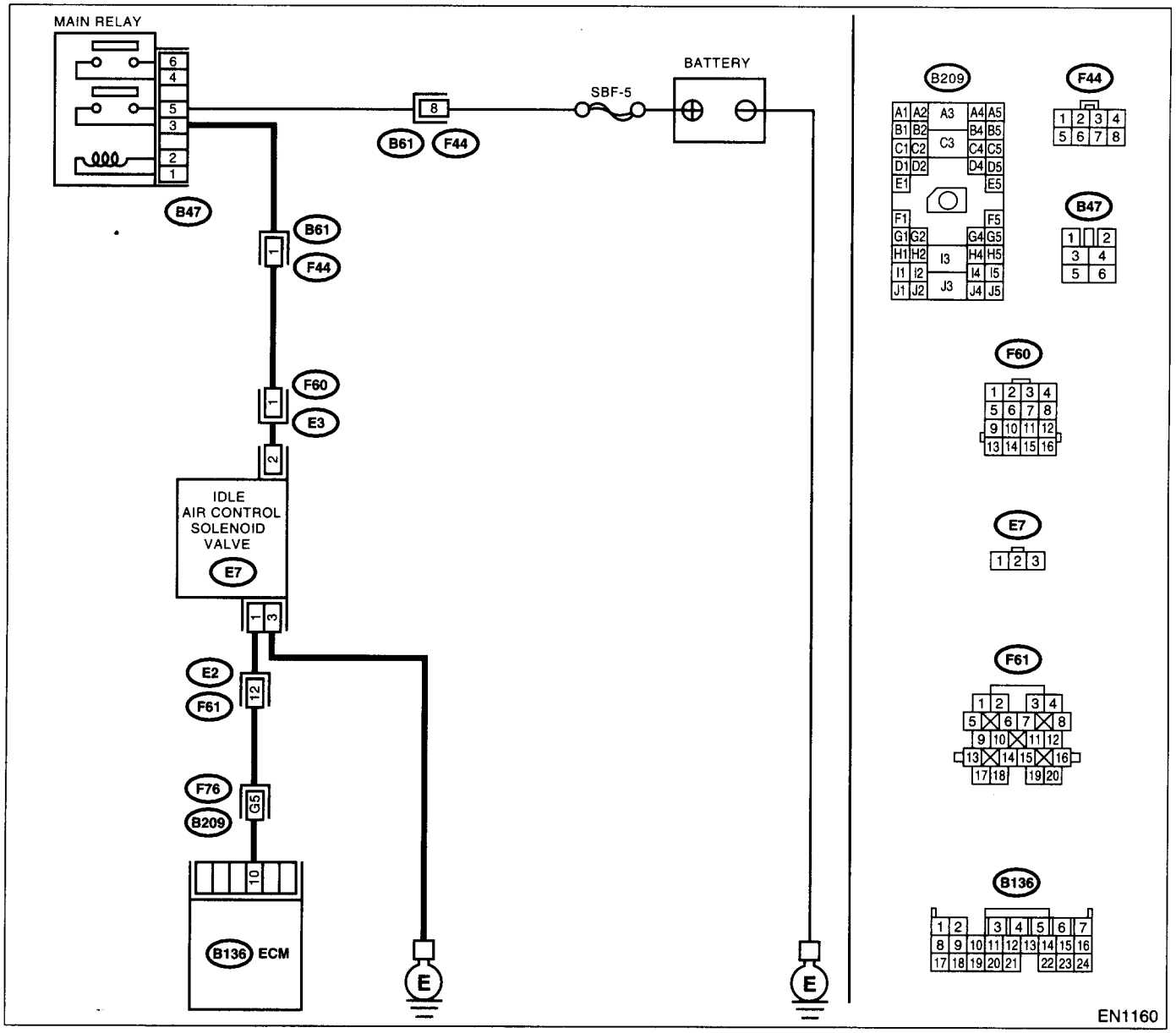
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to OFF. 2)Connect the test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box. 3)Turn the ignition switch to ON. 4)While operating the radiator fan relay, 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(DOHC TURBO)-50, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B137) No. 17 (+) — Chassis ground (–):*** ***(B137) No. 28 (+) — Chassis ground (–):***	Does the voltage change between 0 and 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*** ***(B137) No. 17 (+) — Chassis ground (–):*** ***(B137) No. 28 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in radiator fan relay control circuit. After repair, replace the ECM. <Ref. to FU(DOHC TURBO)-47, 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 1 and 2. 3)Measure the resistance between main fan relay terminals. ***Terminal*** ***No. 25 — No. 26 (Main fan relay 1)*** ***No. 23 — No. 24 (Main fan relay 2)***	Is the resistance less than 1 Ω?	Replace the main fan relay and ECM. <Ref. to FU(DOHC TURBO)-47, 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. 7 — No. 8 (Sub fan relay 1)*** ***No. 17 — No. 18 (Sub fan relay 2)***	Is the resistance less than 1 Ω?	Replace the sub fan relay and ECM. <Ref. to FU(DOHC TURBO)-47, 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 poor contact in ECM connector.	Replace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>

DA:DTC P1507 — 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



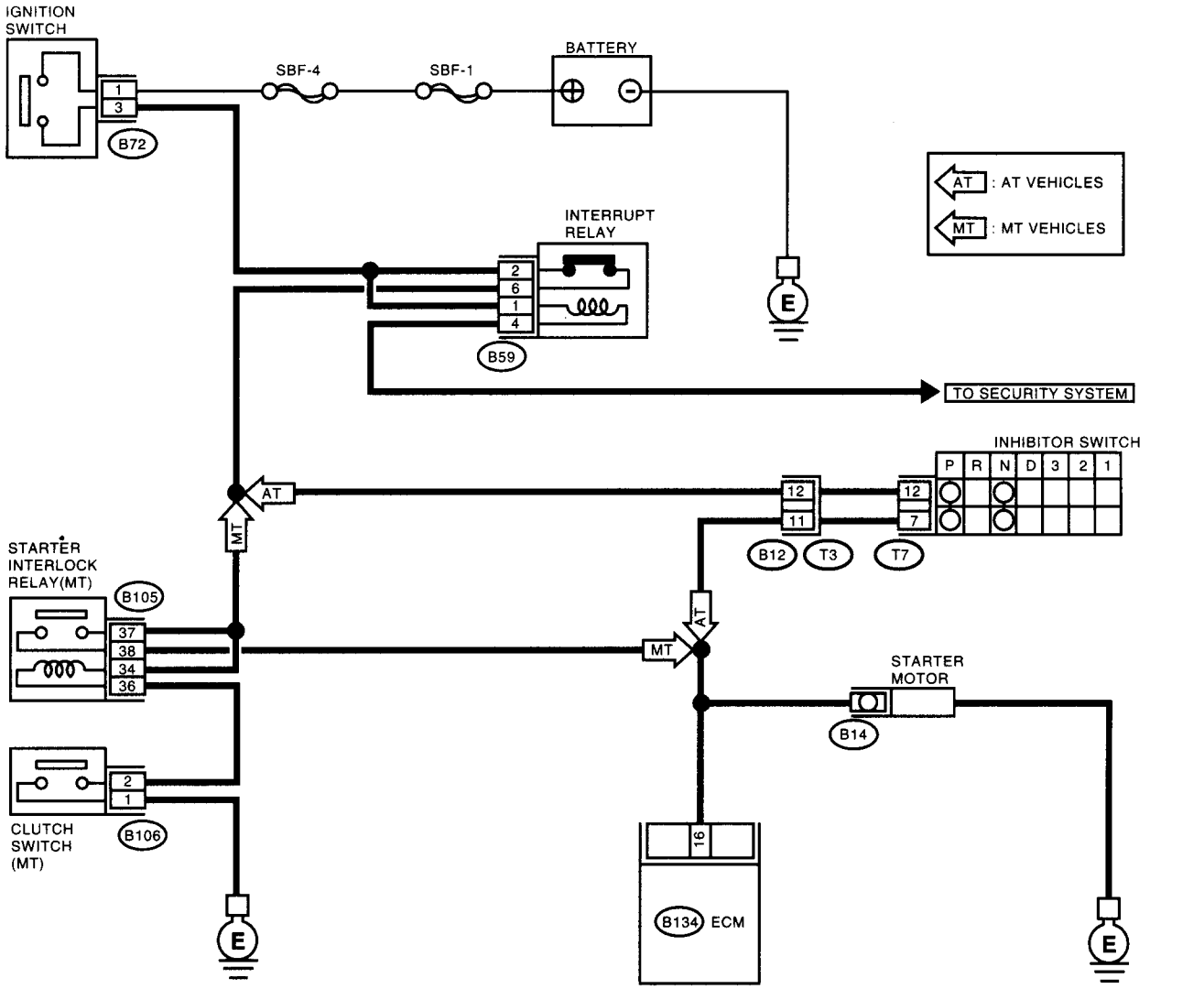
Step	Check	Yes	No
CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0506, P0507, P0508, P0509 or P1142?	Inspect DTC P0506, P0507, P0508, P0509 or P1142 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1507.	Go to step **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?	Repair air suction and leaks.	Go to step **3.**
CHECK THROTTLE CABLE.	Does the throttle cable have play for adjustment?	Go to step **4.**	Adjust throttle cable. <Ref. to SP-7, INSTALLATION, Accelerator Control Cable.>
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(DOHC TURBO)-36, 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?	Remove foreign particles from by-pass air line.	Replace the idle air control solenoid valve. <Ref. to FU(DOHC TURBO)-36, Idle Air Control Solenoid Valve.>

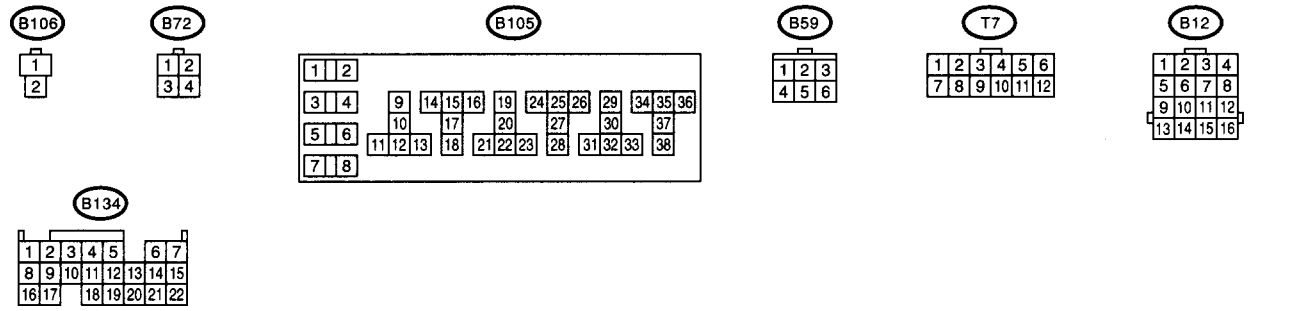
DB:DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —

- **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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN1139

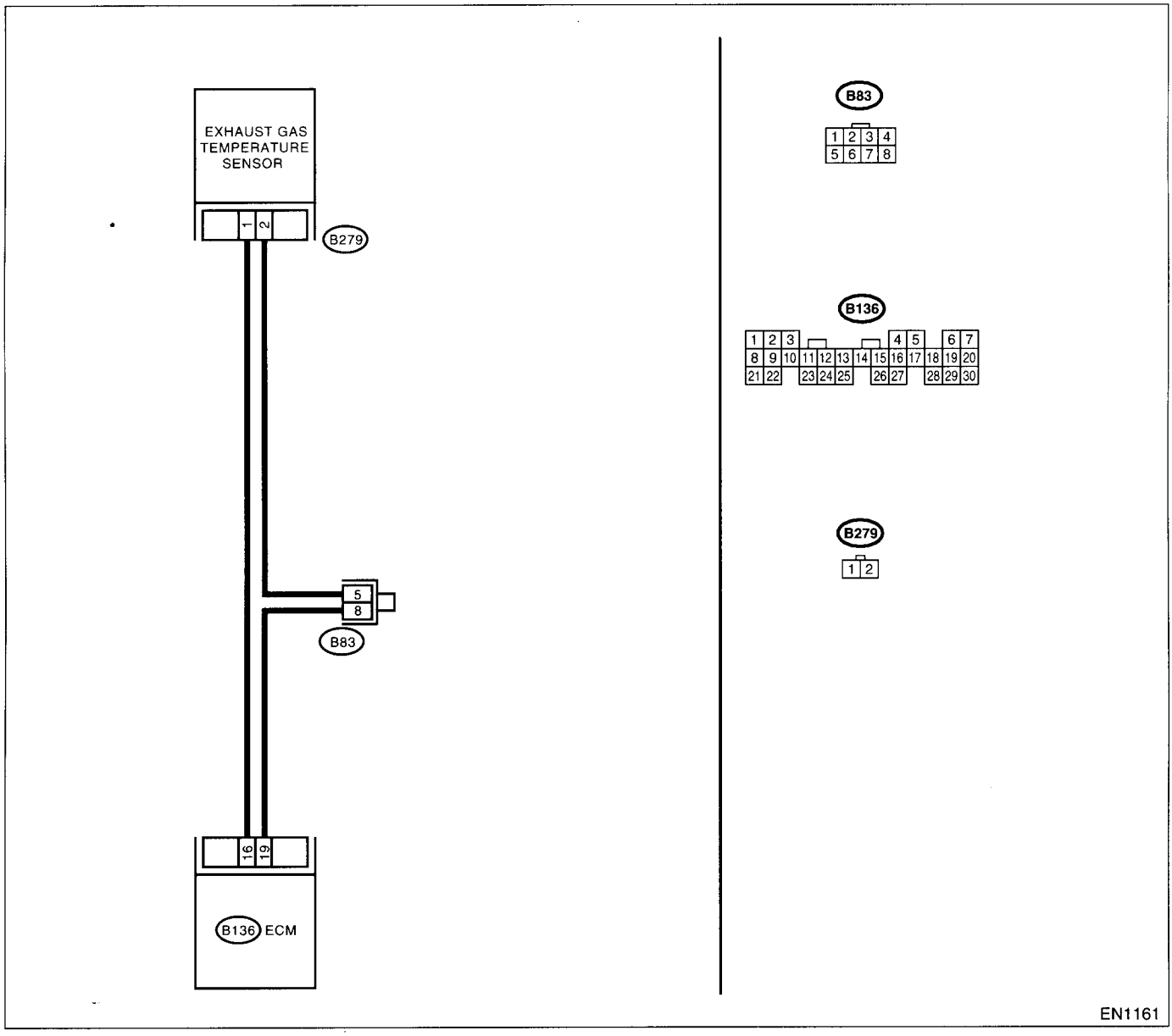
Step		Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.**	Does the starter motor operate when ignition switch to "ST"?	Repair harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between ECM and starter motor connector. • Poor contact in ECM connector.	Check starter motor circuit. <Ref. to EN(DOHC TURBO)-64, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

DC:DTC P1544 — HIGH EXHAUST TEMPERATURE DETECTED —

- **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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



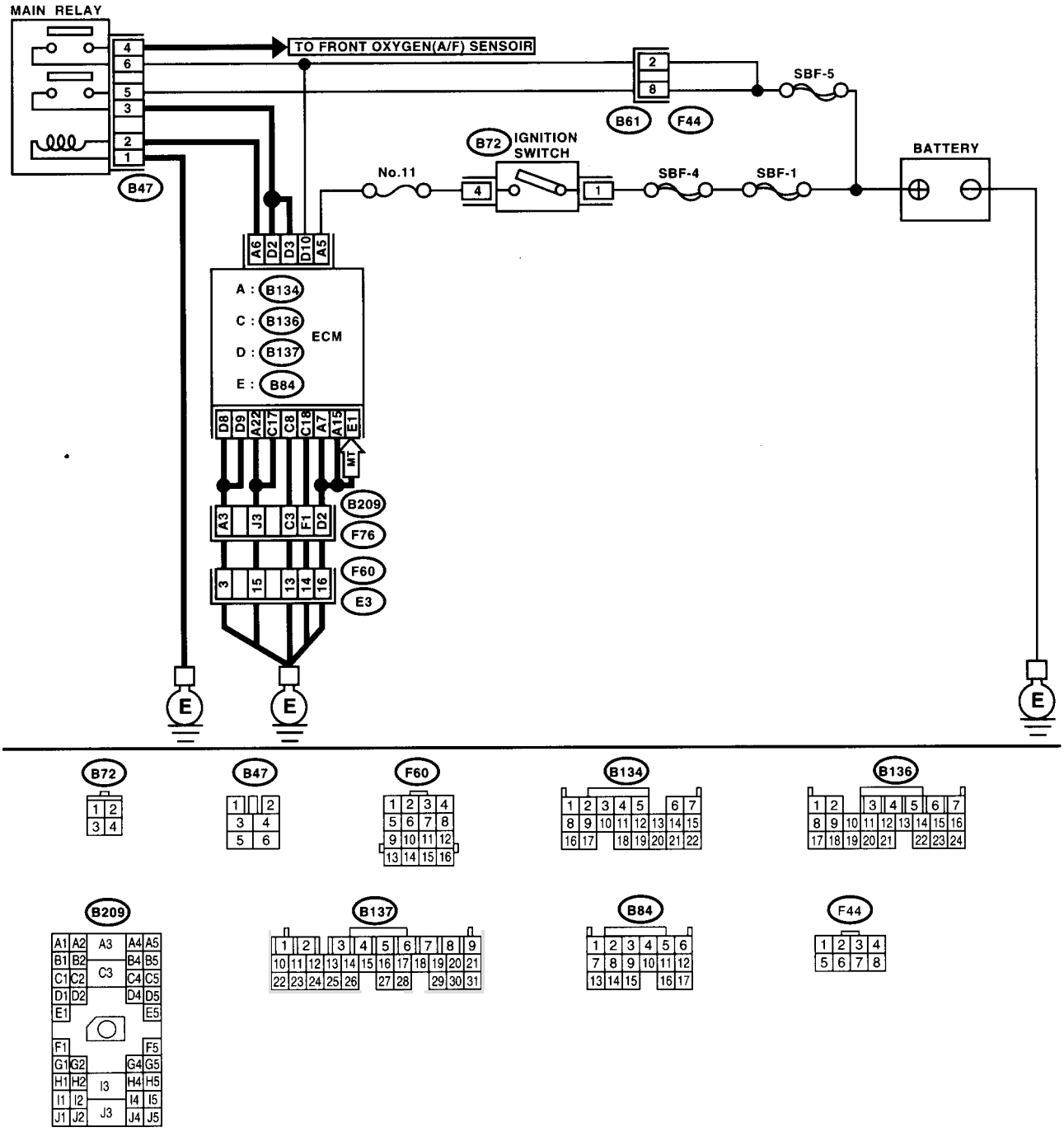
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0335, P0336, P0340, P0341, P0545, P0546, P1312, P0102, P0103, P0101, P1141, P0301, P0302, P0303, P0304, P1301, P0171, P0133, P1134, P0131, P0132, P1130, P1131, P1139, P0031, P0032, P0139, P0136, P0039 or P0037?	Inspect DTC P0335, P0336, P0340, P0341, P0545, P0546, P1312, P0102, P0103, P0101, P1141, P0301, P0302, P0303, P0304, P1301, P0171, P0133, P1134, P0131, P0132, P1130, P1131, P1139, P0031, P0032, P0139, P0136, P0039 or P0037 using List of Diagnostic Trouble Code (DTC). <Ref. to EN(DOHC TURBO)-80, 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 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?	Repair or replace failure, then replace the precatalytic converter.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DD: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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, 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*** ***(B137) No. 10 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair poor contact in ECM connector.	Go to step **2.**

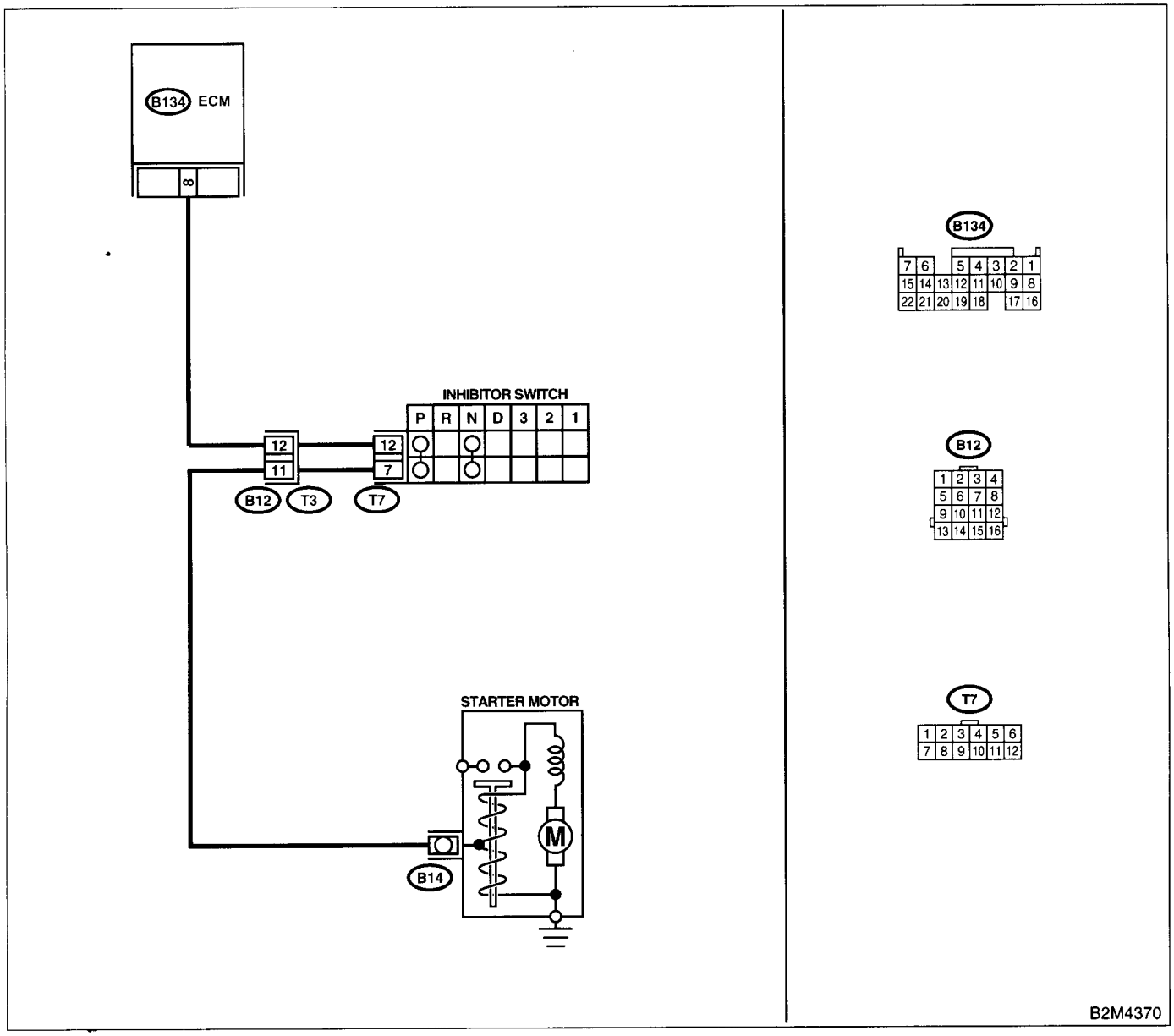
	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.** 1)Disconnect the connector from ECM. 2)Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 10 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between ECM connector and battery terminal.	Go to step **3**.
3	**CHECK FUSE SBF-5.**	Is fuse blown?	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

DE:DTC P1590 — NEUTRAL POSITION SWITCH CIRCUIT HIGH INPUT —

- **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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK DTC P0705 ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0705?	Inspect DTC P0705 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, 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 voltage less than 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 voltage between 4.5 and 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?	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 voltage more than 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 resistance less than 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

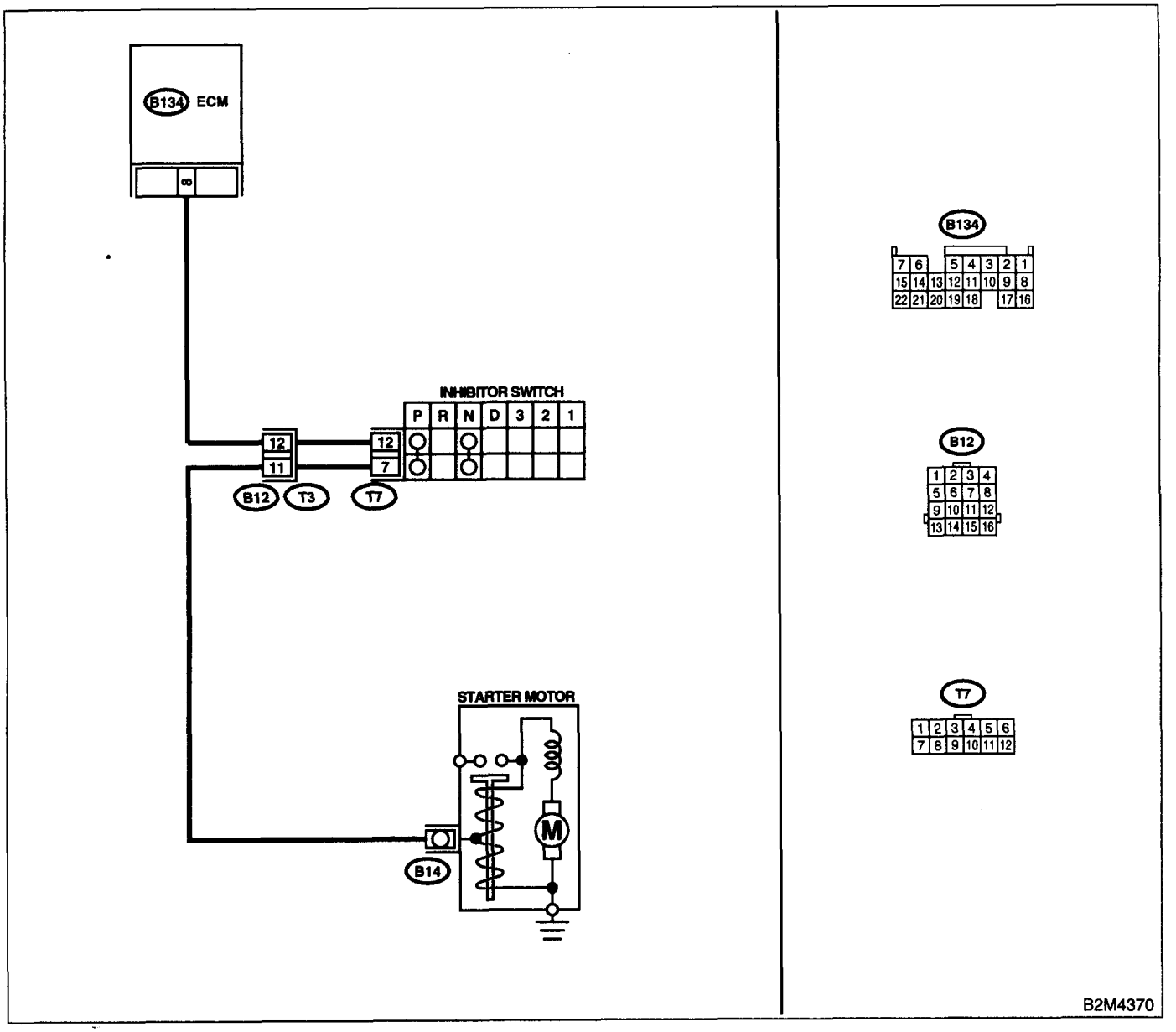
	Step	Check	Yes	No
7	**CHECK INHIBITOR SWITCH GROUND LINE.** Measure the resistance of harness between inhibitor switch connector and engine ground. ***Connector & terminal*** ***(T7) No. 7 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **8.**	Repair open circuit in harness between inhibitor 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 resistance less than 1 Ω?	Go to step **9.**	Replace the inhibitor switch. <Ref. to AT-28, Inhibitor Switch.>
9	**CHECK SELECTOR CABLE CONNECTION.**	Is there any fault in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-27, INSPECTION, Select Cable.>	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DF:DTC P1591 — NEUTRAL POSITION SWITCH CIRCUIT LOW INPUT —

- **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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



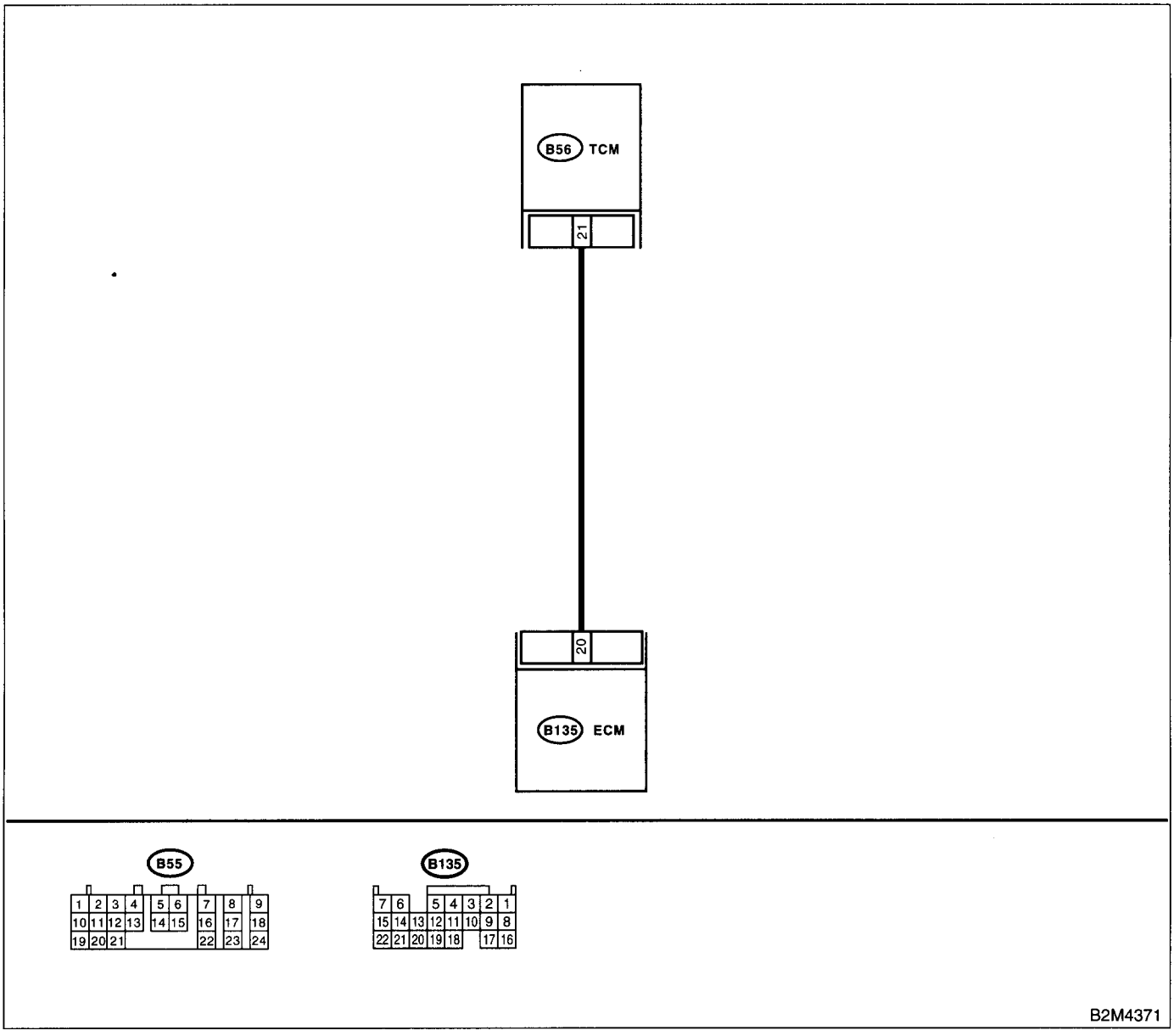
Step	Check	Yes	No
CHECK DTC P0705 ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0705?	Inspect DTC P0705 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-80, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
CHECK INPUT SIGNAL FOR ECM. 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (–):***	Is the voltage between 4.5 and 5.5 V at except "N" and "P" positions?	Even if MIL lights up, the circuit has returned to a normal condition at this time.	Go to step **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 resistance less than 10 Ω?	Repair ground short circuit in harness between ECM and transmission harness connector.	Go to step **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 resistance less than 10 Ω?	Repair ground short circuit in harness between transmission harness and inhibitor switch connector.	Go to step **5.**
CHECK INHIBITOR SWITCH. Measure the resistance between inhibitor switch connector receptacle's terminals in selector lever except for "N" position. ***Terminals*** ***No. 7 — No. 12:***	Is the resistance more than 1 MΩ at except "N" and "P" positions?	Go to step **6.**	Replace the inhibitor switch. <Ref. to AT-28, Inhibitor Switch.>
CHECK SELECTOR CABLE CONNECTION.	Is there any fault in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-27, INSPECTION, Select Cable.>	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DG:DTC P1594 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, 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?	Go to step **2.**	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

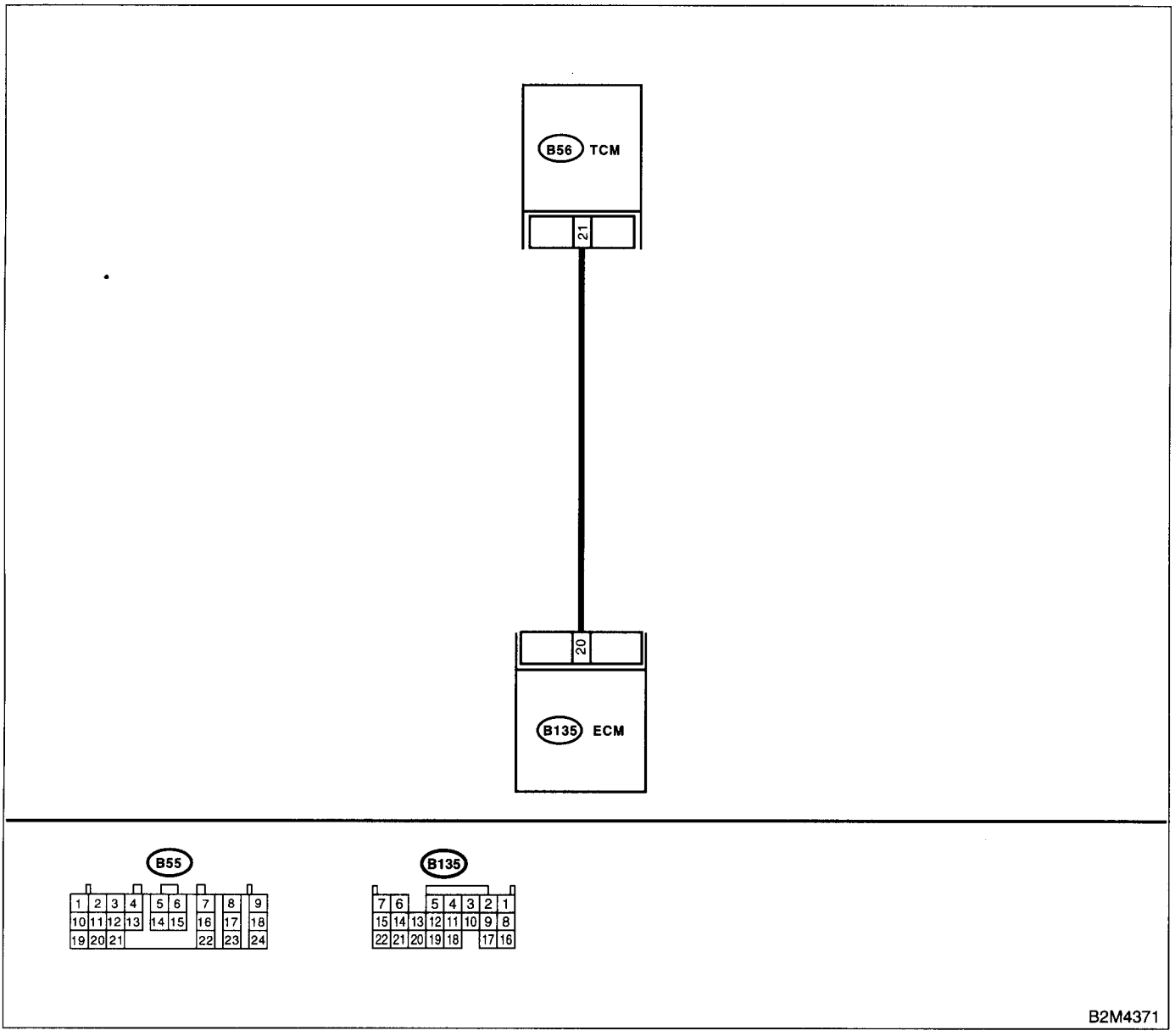
Step		Check	Yes	No
2	CHECK ACCESSORY.	Are car phone and/or CB installed on vehicle?	Repair grounding line of car phone or CB system.	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

DH:DTC P1595 — AUTOMATIC TRANSMISSION 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



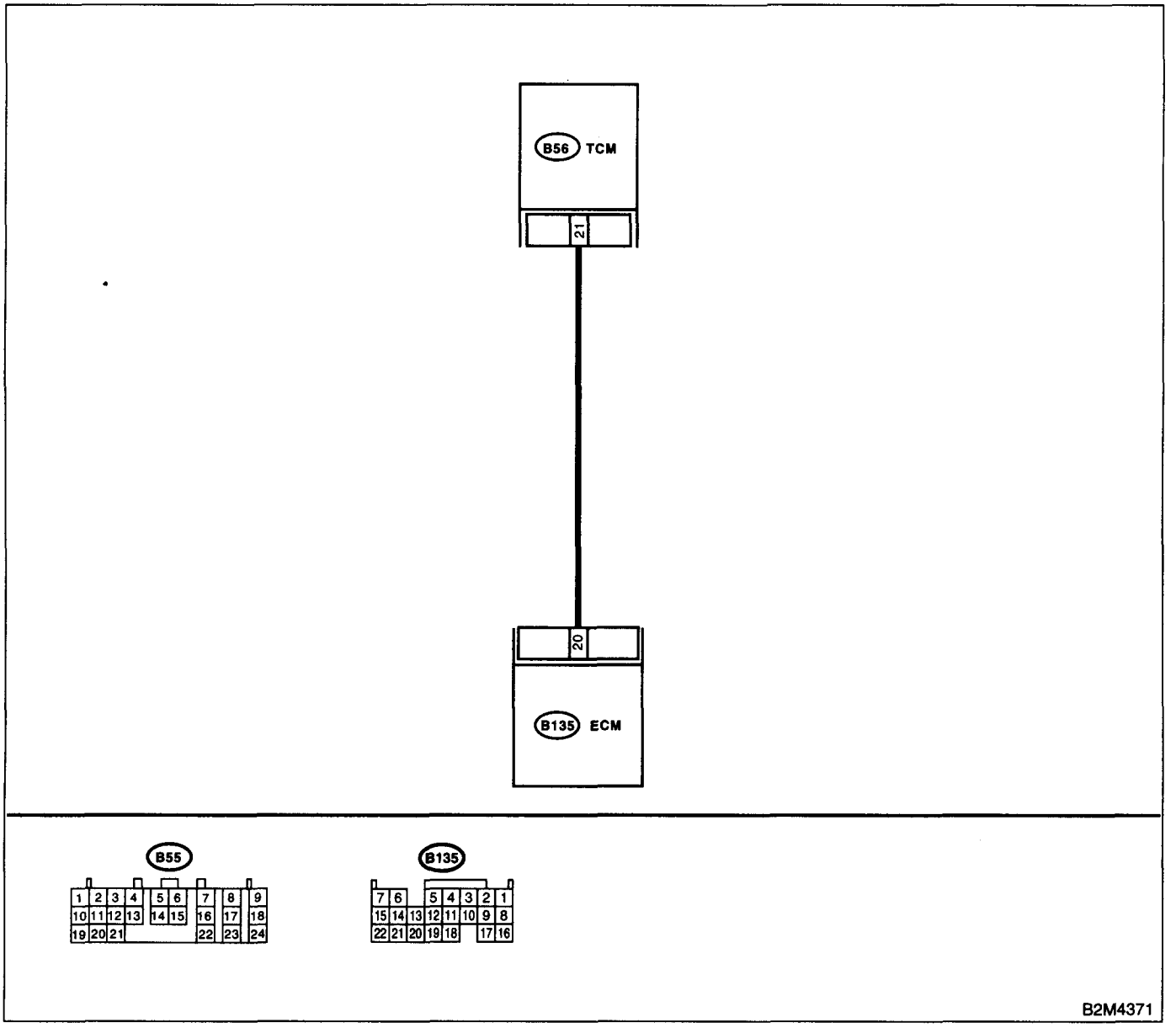
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **2.**	Even if MIL lights up, 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 resistance less than 10 Ω?	Repair 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 voltage more than 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-24, Read Diagnostic Trouble Code (DTC).>	Does the trouble code appear for automatic transmission?	Inspect trouble code for automatic transmission. <Ref. to AT-44, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

DI: DTC P1596 — AUTOMATIC TRANSMISSION 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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



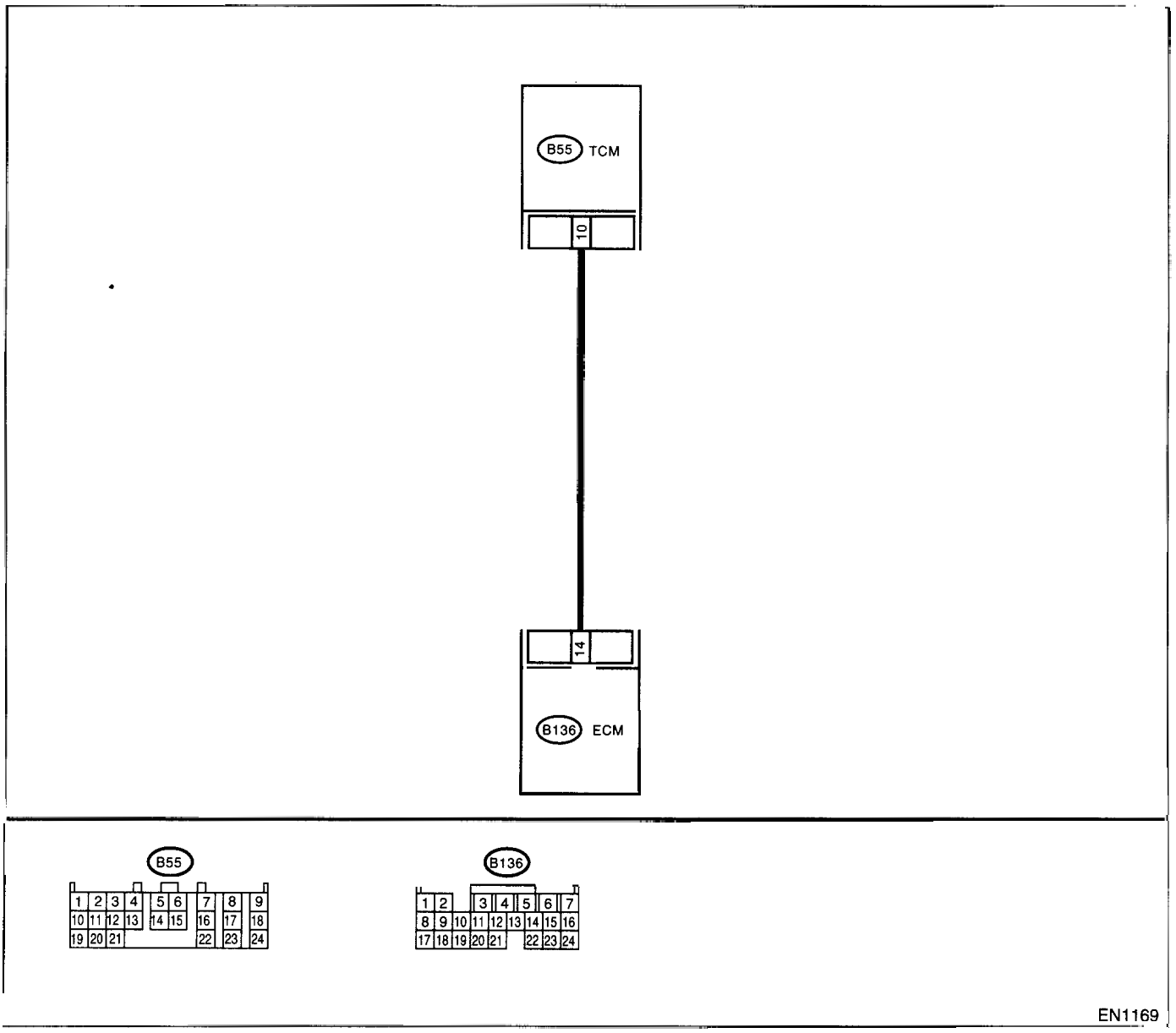
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace the ECM. <Ref. to FU(DOHC TURBO)-47, 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 voltage more than 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 voltage less than 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*** ***(B135) No. 20 (+) — Chassis ground (–):***	Does the voltage change from 1 V to 4 V while monitoring the value with voltage meter?	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*** ***(B54) No. 20 (+) — Chassis ground (–):***	Is the voltage more than 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?	Repair poor contact in TCM connector.	Check TCM power supply line and grounding line.

DJ: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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



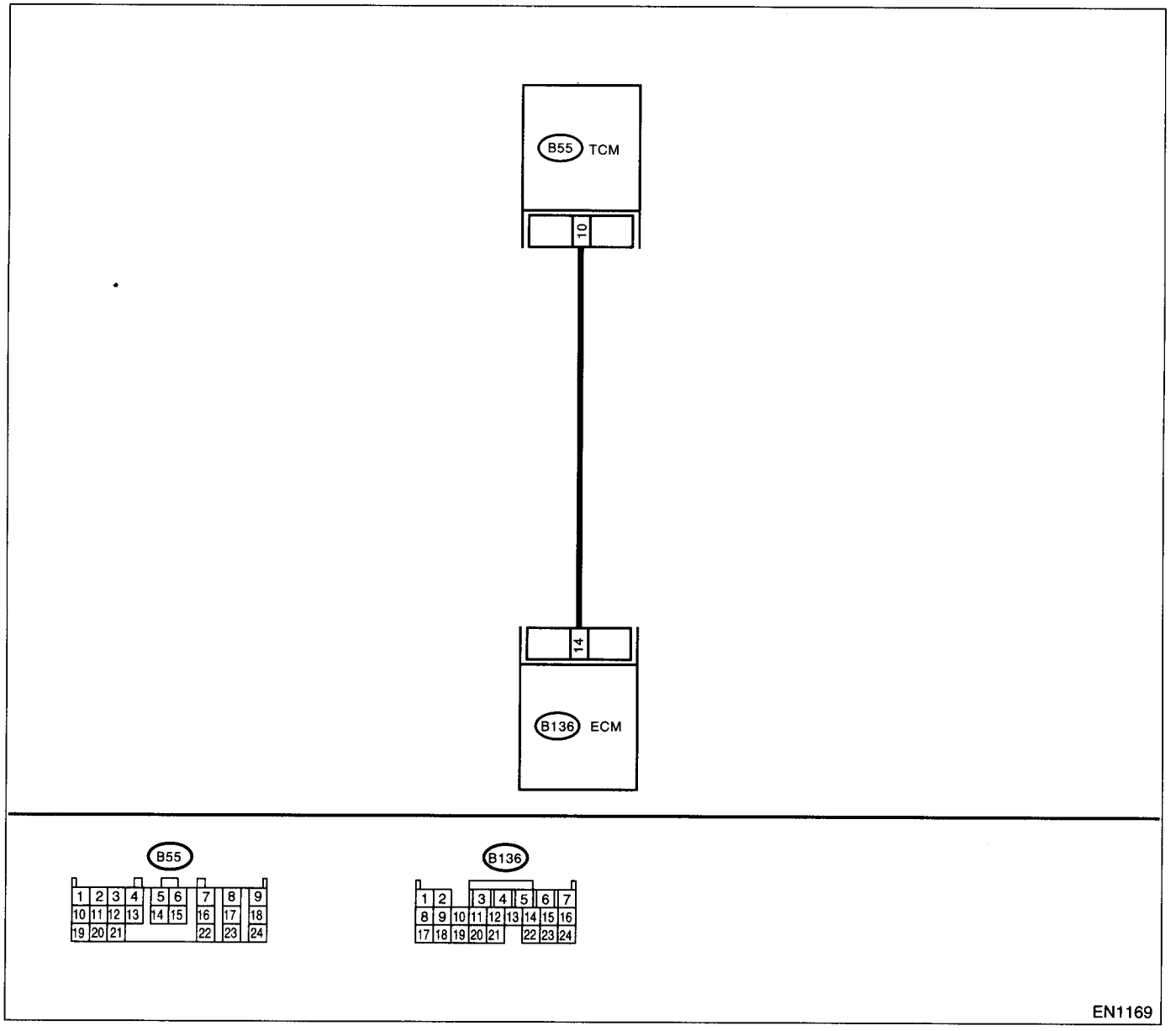
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Start the engine, and warm-up the engine. 2)Turn the ignition switch to OFF. 3)Turn the ignition switch to ON. 4)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 14 (+) — Chassis ground (–):***	Is the voltage more than 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. 14 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair 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 resistance less than 1 Ω?	Repair poor contact in ECM or TCM connector.	Repair open circuit in harness between ECM and TCM connector.

DK: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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



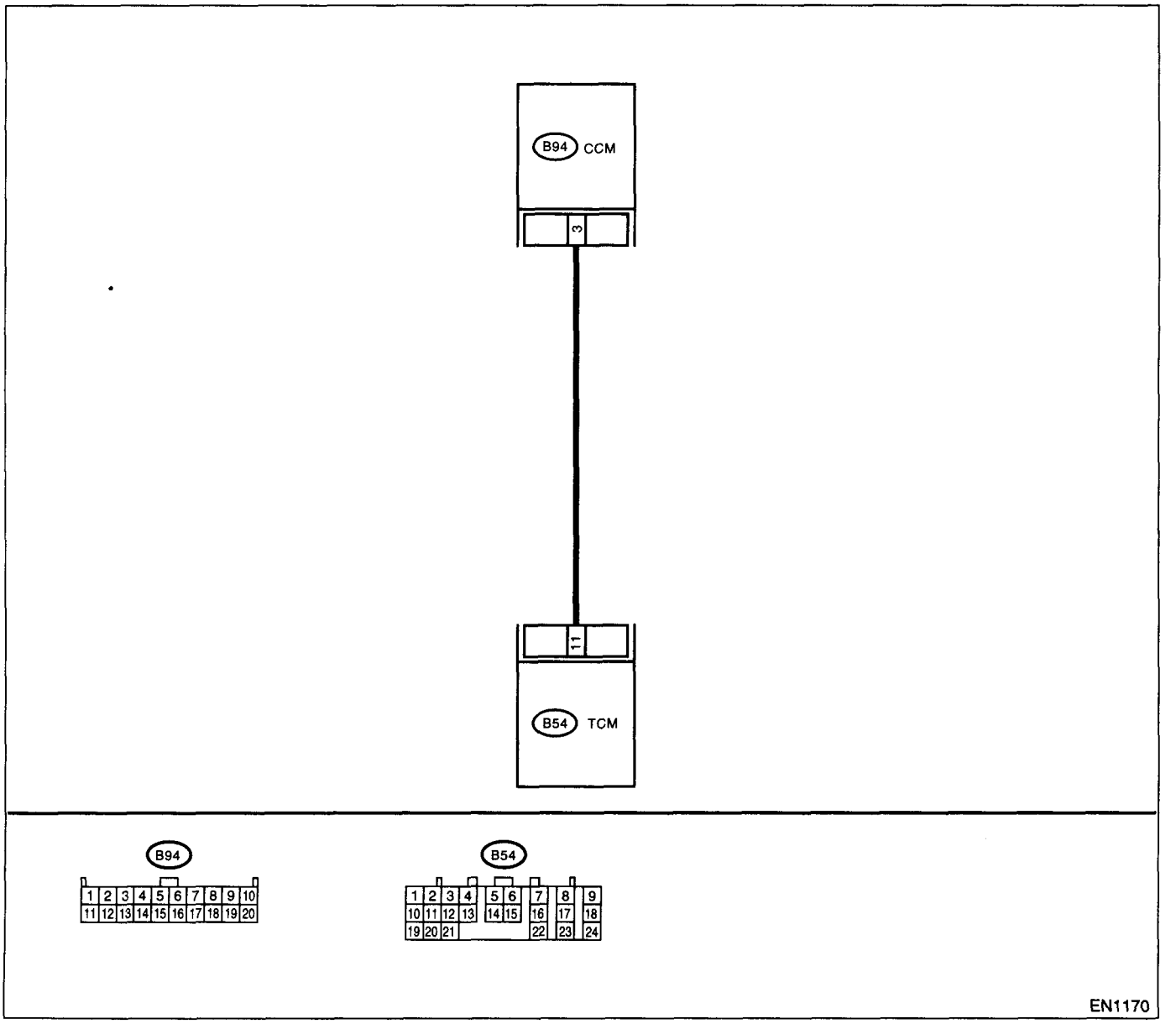
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Start the engine, and warm-up the engine. 2)Turn the ignition switch to OFF. 3)Disconnect the connector from TCM. 4)Turn the ignition switch to ON. 5)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 14 (+) — Chassis ground (–):***	Is the voltage less than 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(DOHC TURBO)-47, 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 (–):***	Does the voltage change more than 10 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace the ECM. <Ref. to FU(DOHC TURBO)-47, Engine Control Module.>	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DL: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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



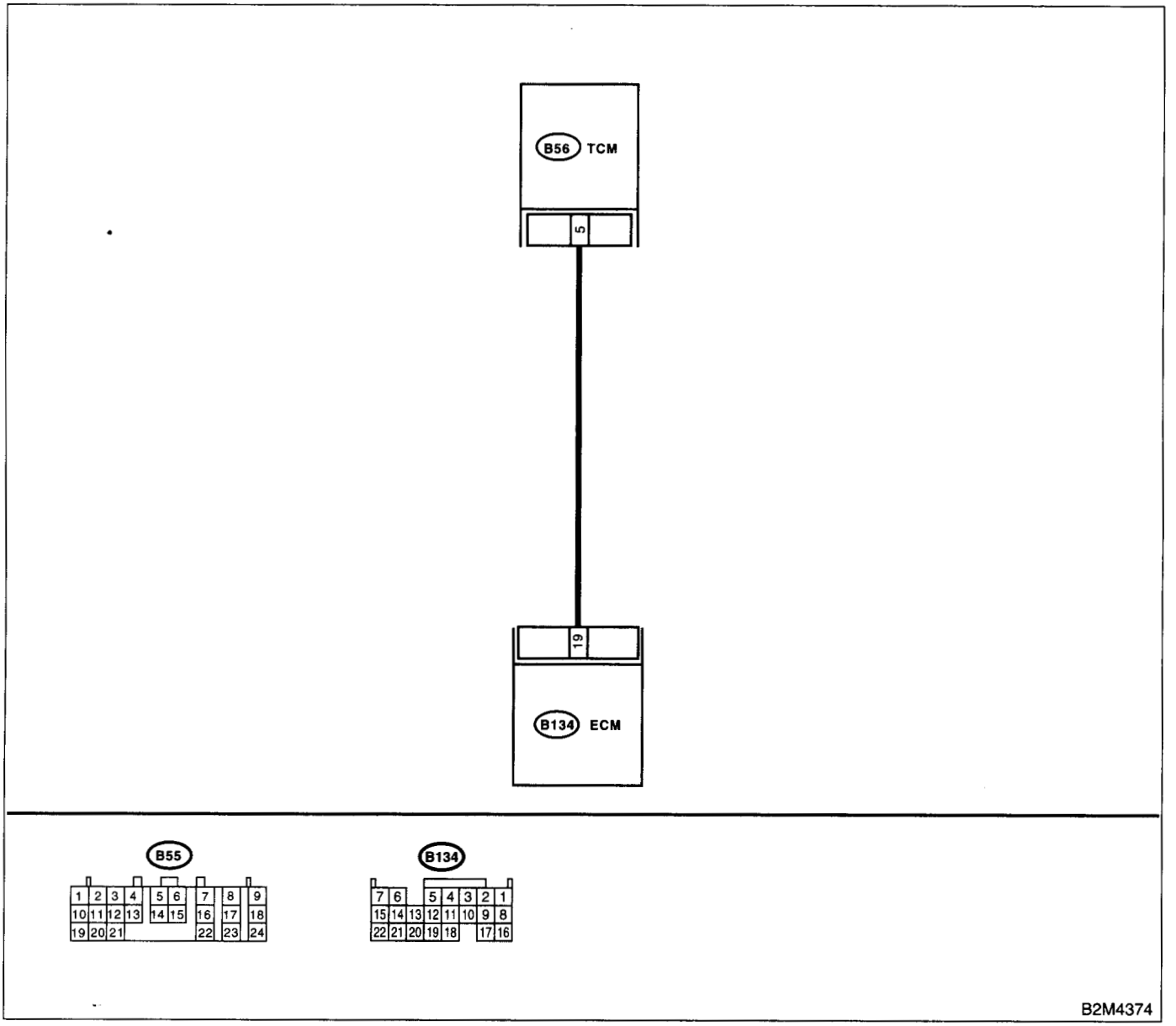
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from TCM and CCM. 3)Measure the resistance of harness between TCM and CCM connector. ***Connector & terminal*** ***(B55) No. 22 — (B94) No. 3:***	Is the resistance less than 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*** ***(B55) No. 22 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair 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 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*** ***(B55) No. 11 (+) — Chassis ground (–):***	Is the resistance less than 1 V?	Go to step **4.**	Check cruise control command switch circuit. <Ref. to CC-7, INSPECTION, Cruise Control Command Switch.>
4	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

DM: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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, Inspection Mode.>.

- **WIRING DIAGRAM:**



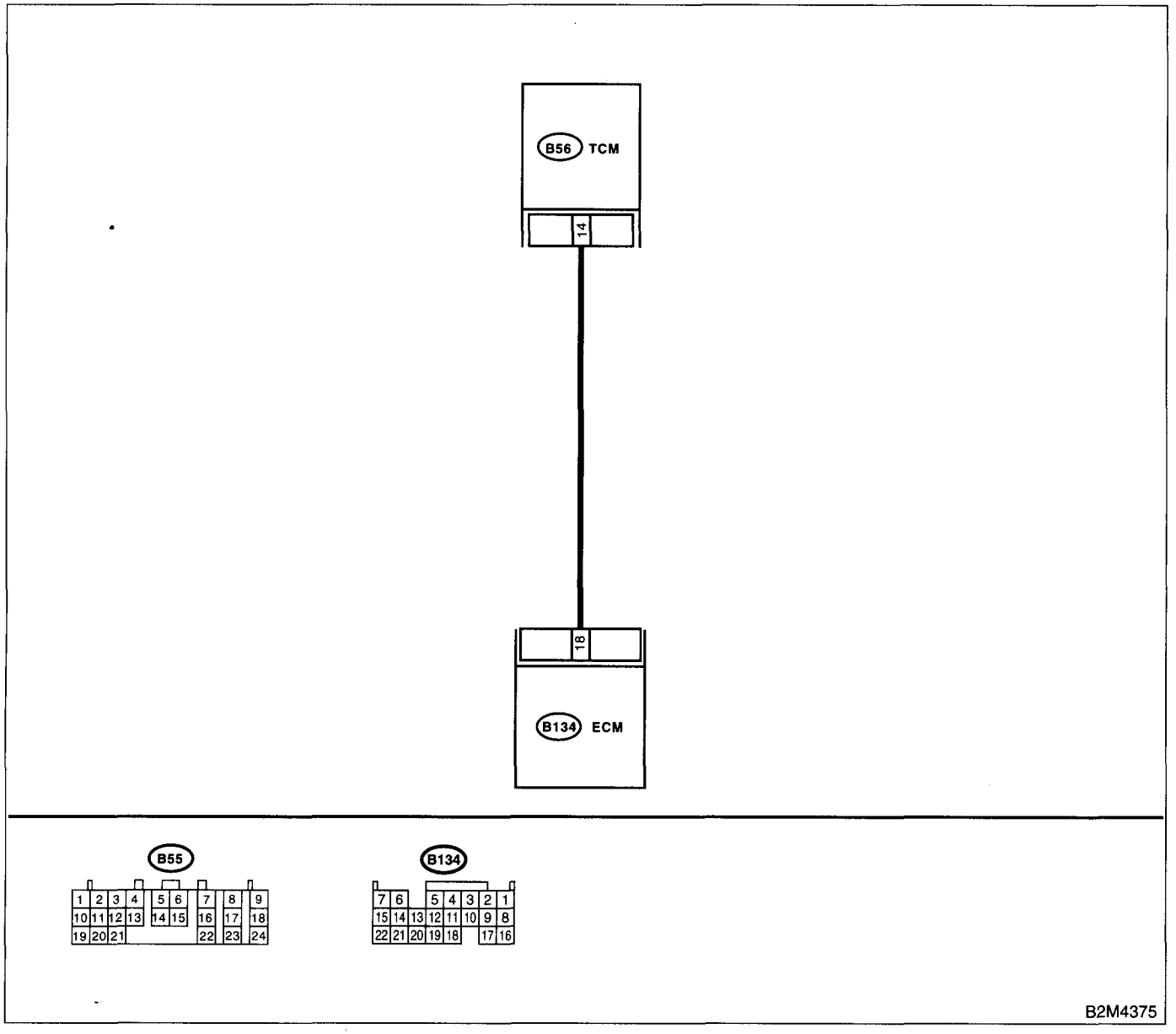
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 19 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 19 (+) — Chassis ground (–):***	Is the voltage more than 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?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(DOHC TURBO)-47, 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*** ***(B135) No. 19 — (B54) No. 13:***	Is the resistance less than 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*** ***(B135) No. 19 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair 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?	Repair poor contact in TCM connector.	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

DN: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(DOHC TURBO)-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-46, 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 voltage more than 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 voltage more than 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?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(DOHC TURBO)-47, 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 resistance less than 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*** ***(B134) No. 18 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair 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?	Repair poor contact in TCM connector.	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

19.General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(DOHC 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.

G1830BE4

CONTROL SYSTEMS

CS

		Page
1.	General Description	2
2.	Electrical Component	6
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4.	Select Lever	23
5.	Select Cable	26
6.	AT Shift Lock Solenoid and "P" Position Switch	29
7.	Integrated Module	31
8.	MT Gear Shift Lever	32
9.	General Diagostic	38

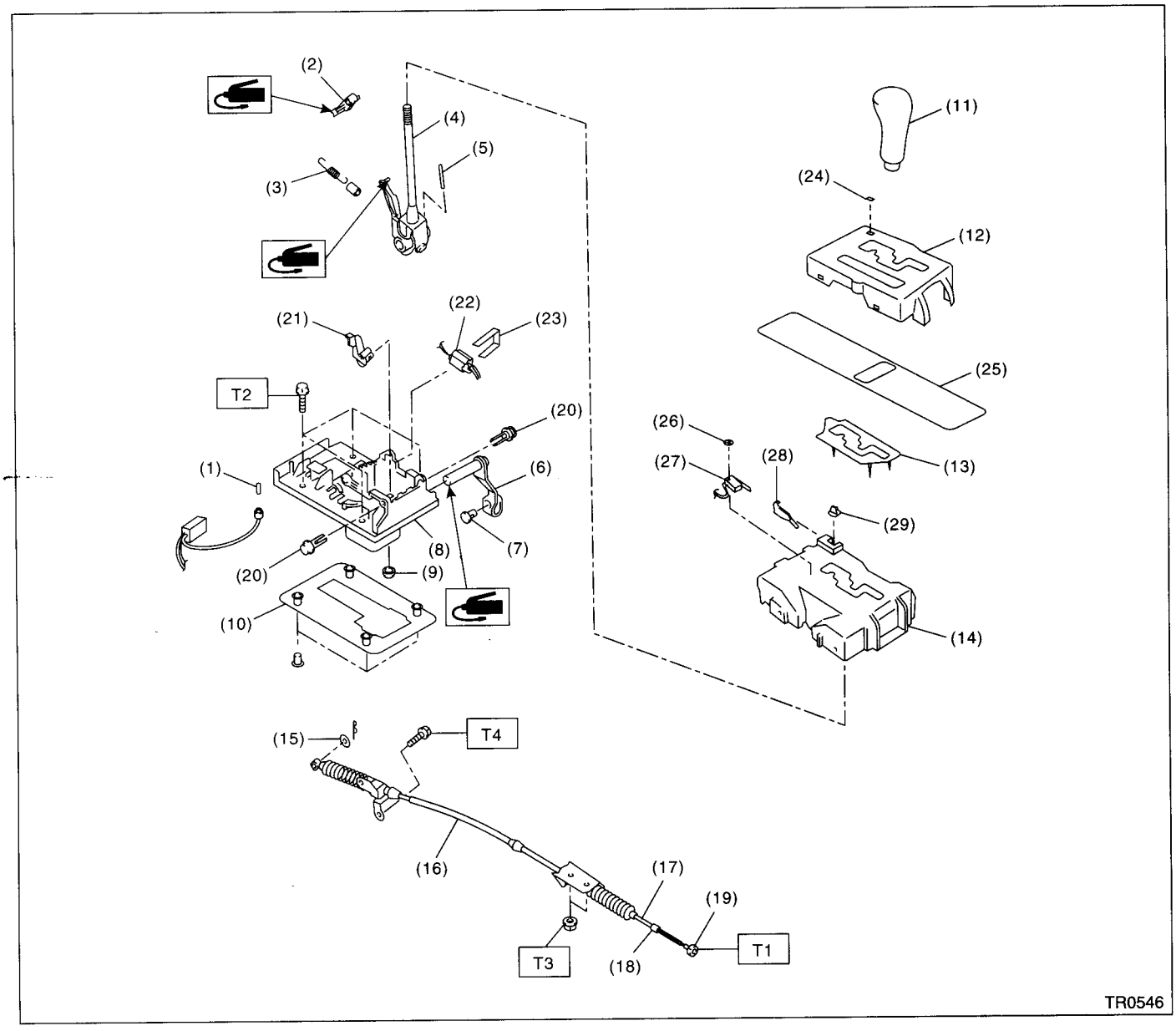
1. General Description

A: SPECIFICATIONS

Item		Specification
Vibration torque of rod against lever	N·m (kgf-m, ft-lb)	0.7 (0.07, 0.5) or less

B: COMPONENT

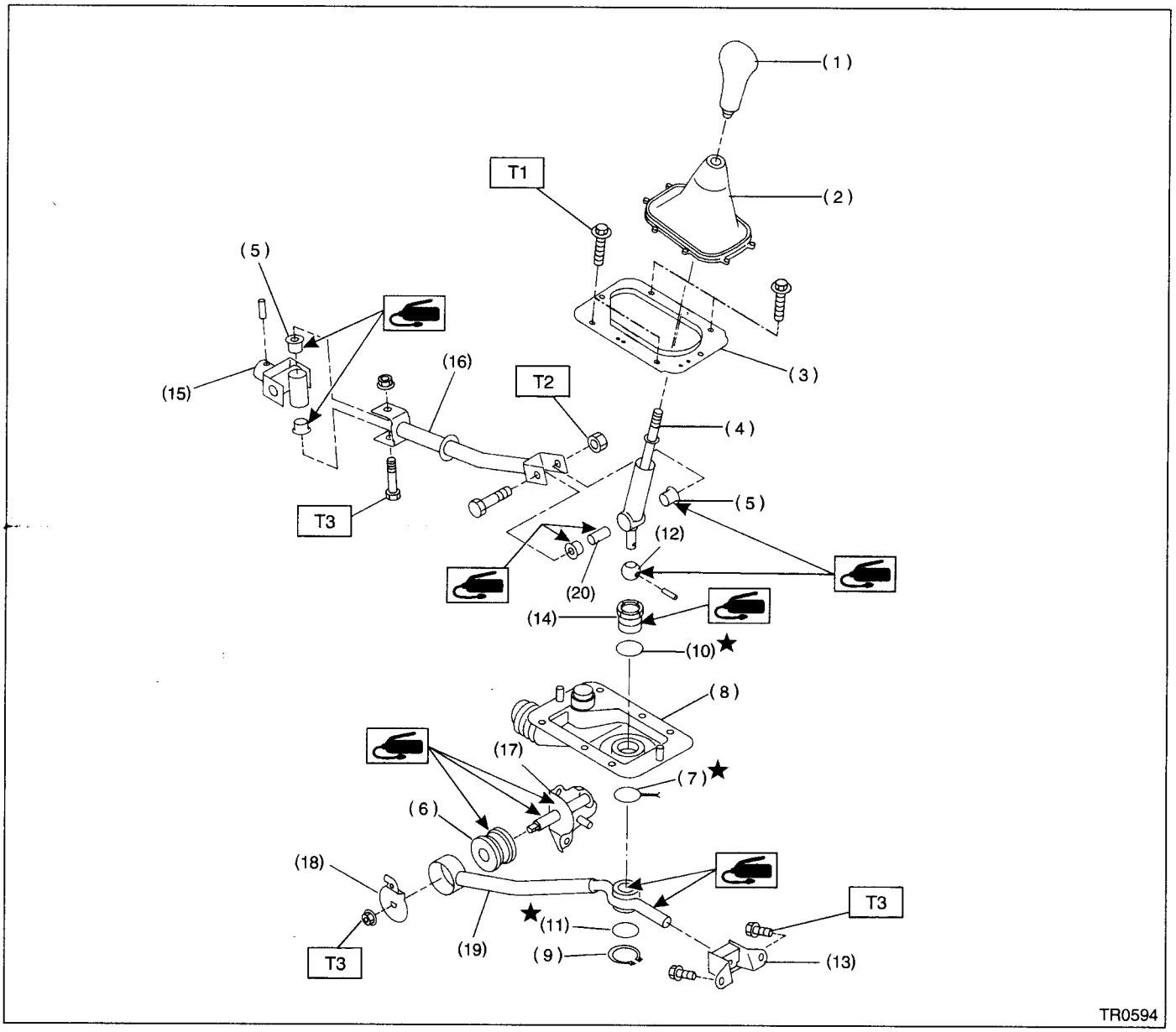
1. AT SELECT LEVER



(1) Indicator light bulb
(2) Detent arm
(3) Detent spring
(4) Select lever
(5) Spring pin
(6) Arm
(7) Pin
(8) Plate
(9) Grommet
(10) Packing
(11) Grip
(12) Indicator cover
(13) Cushion
(14) Guide plate
(15) Snap pin
(16) Outer cable
(17) Inner cable
(18) Nut B
(19) Nut A
(20) Clip
(21) Lock plate
(22) Shift lock solenoid
(23) Clamp
(24) Cover
(25) Slider
(26) Clip
(27) "P" position switch
(28) Spring
(29) Button

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: 33 (3.4, 25)

2. MT GEAR SHIFT LEVER



(1) Gear shift knob
(2) Console boot
(3) Plate complete
(4) Lever
(5) Bush
(6) Bush
(7) Locking wire
(8) Boot
(9) Snap ring
(10) O-ring A
(11) O-ring B
(12) Bush A
(13) Cushion rubber
(14) Bush B
(15) Joint
(16) Rod
(17) Bracket
(18) Washer
(19) Stay
(20) Spacer

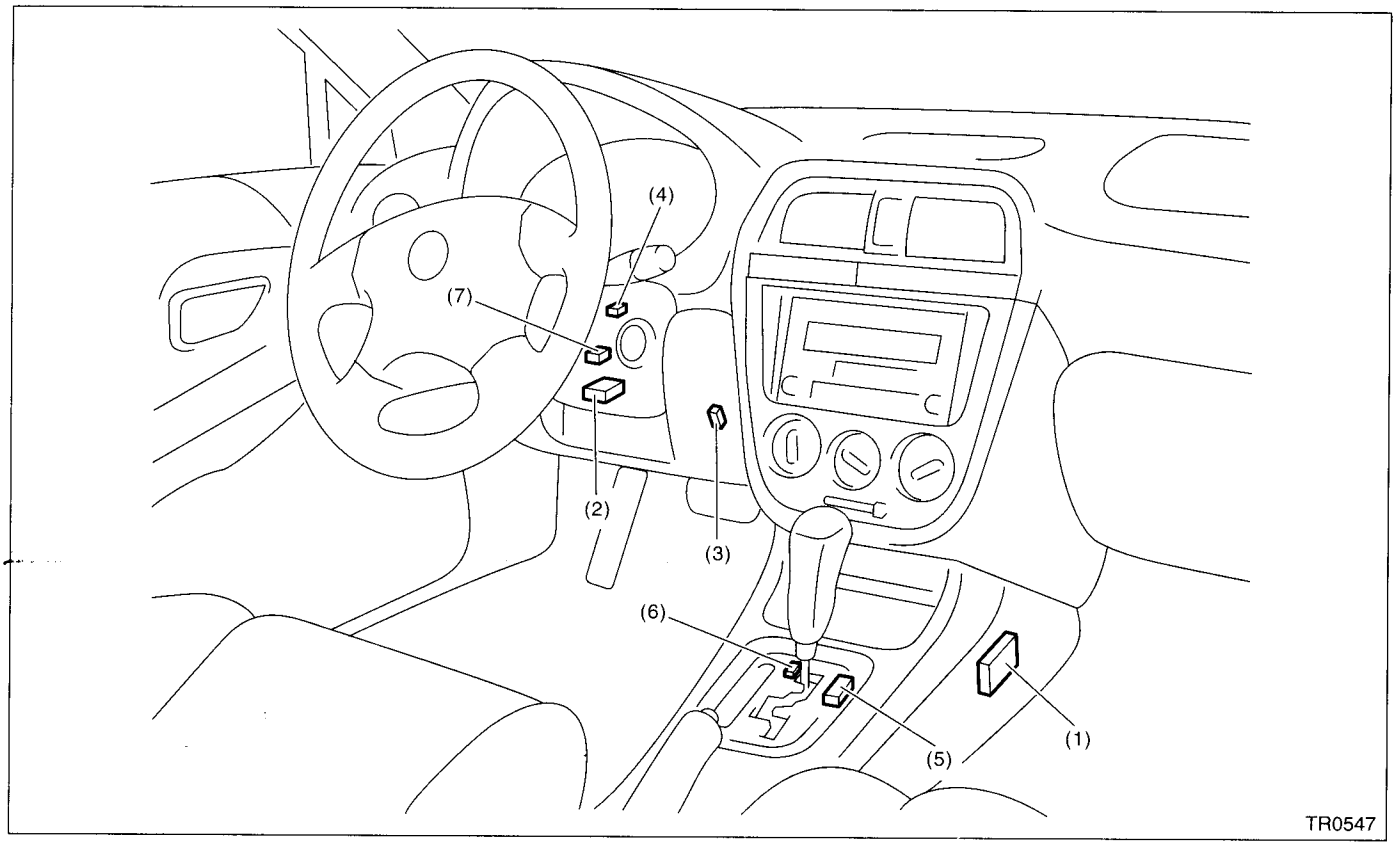
Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 12 (1.2, 8.7)
T3: 18 (1.8, 13.0)

C: CAUTION

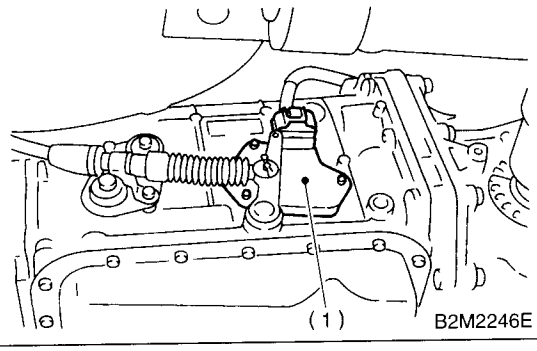
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation 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 vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.
- Before disconnecting electrical connectors, be sure to disconnect the negative terminal from battery.

2. Electrical Component

A: LOCATION



(1) Inhibitor switch
(2) Integrated module
(3) Stop light switch
(4) Key warning switch
(5) Shift lock solenoid
(6) "P" position switch
(7) Key lock solenoid



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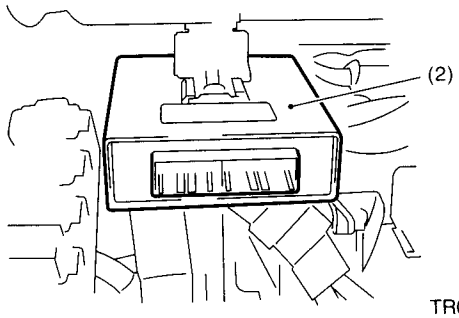

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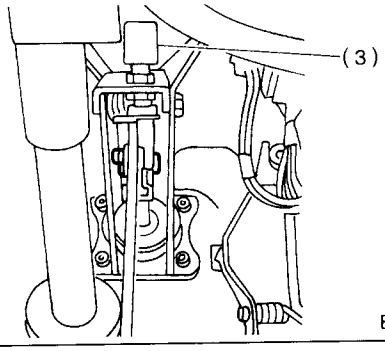

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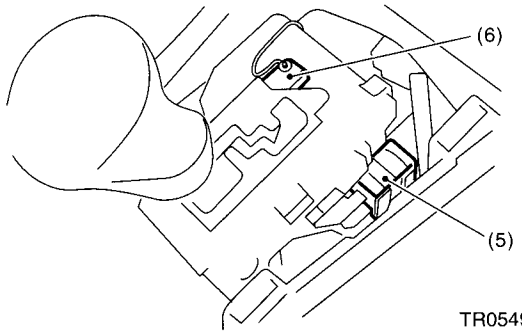

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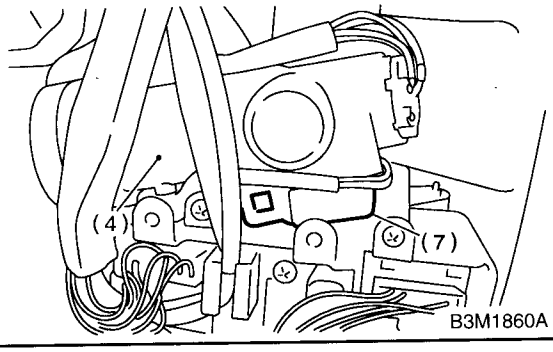
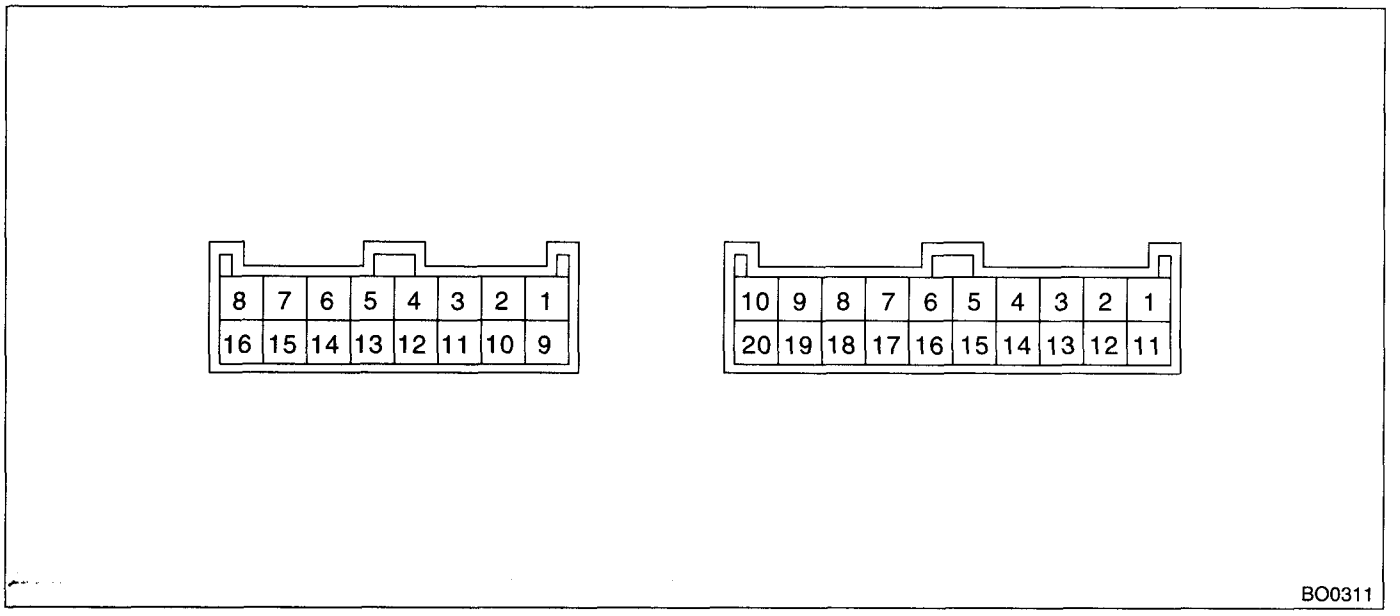


B3M1860A

SUBARU

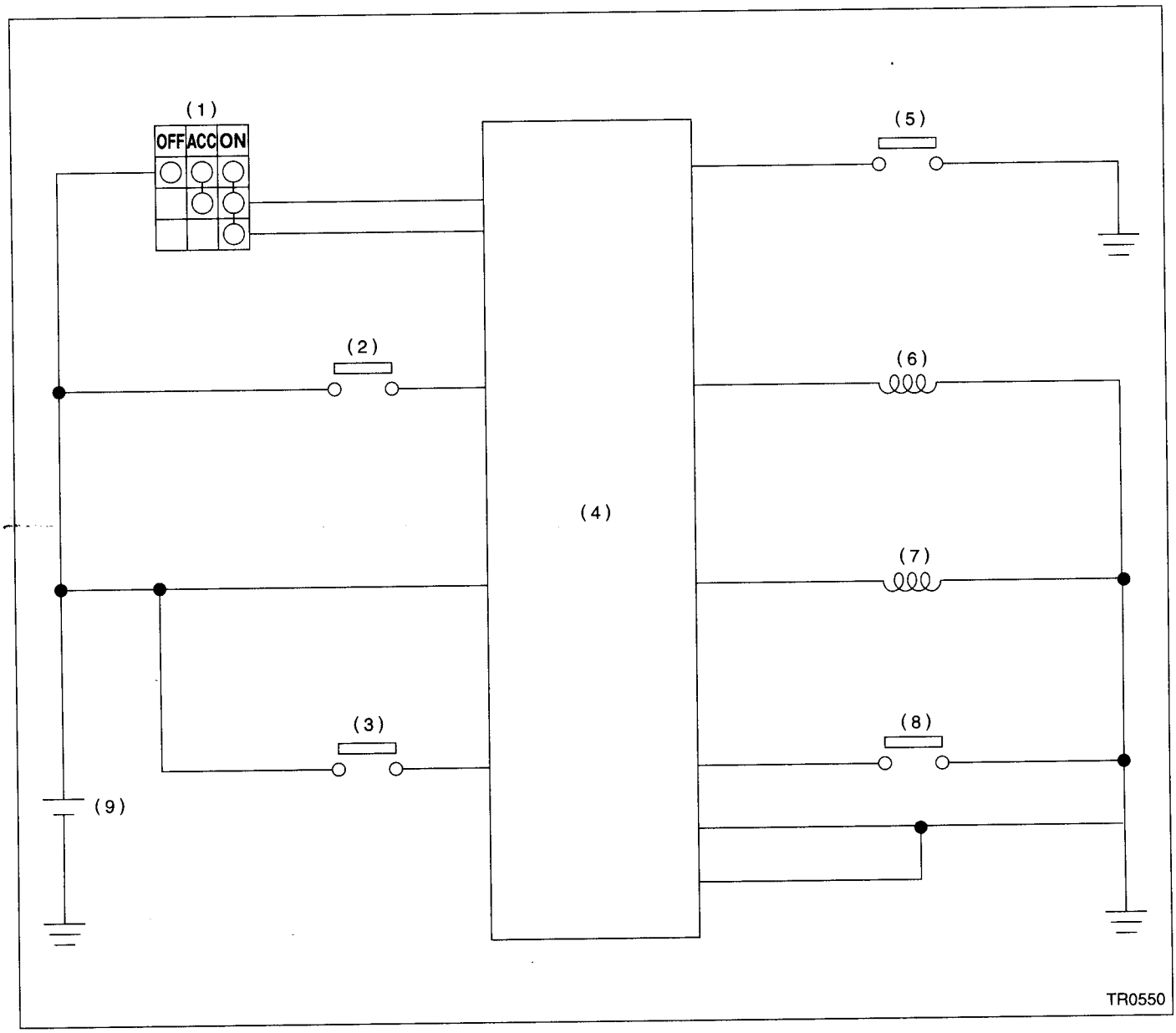
3. AT Shift Lock System

A: ELECTRICAL SPECIFICATION



Contents	Connector No.	Terminal No.	Input/Output signal Measured value and measuring conditions
Battery power supply	B281	2	9 — 16 V
Ignition power supply	B280	19	10 — 15 V when ignition switch is at ON or START.
Ignition power supply	B280	10	10 — 15 V when ignition switch is at ACC.
Inhibitor Switch ("P" position)	B280	5	0 V when select lever is in "P" position. 9 — 16 V when select lever is in other positions than "P" position.
Stop light switch	B280	9	9 — 16 V when stop light switch is ON. 0 V when stop light switch is OFF.
"P" position switch	B280	6	0 V when select lever is in "P" position. 9 — 16 V when select lever is in other positions than "P" position.
Shift lock solenoid signal	B281	9	8.5 — 16 V when shift lock is released. 0 V when shift lock is operating.
Key warning switch signal	B280	20	9 — 16 V when key is inserted. 0 V when key is removed.
Key lock solenoid signal	B281	3	7.5 — 16 V when turning ignition switch to ON, select lever is in "P" position and brake switch is ON. 0 V at other conditions than above.
Ground	B281	4	—
Ground	B281	13	—

B: SCHEMATIC

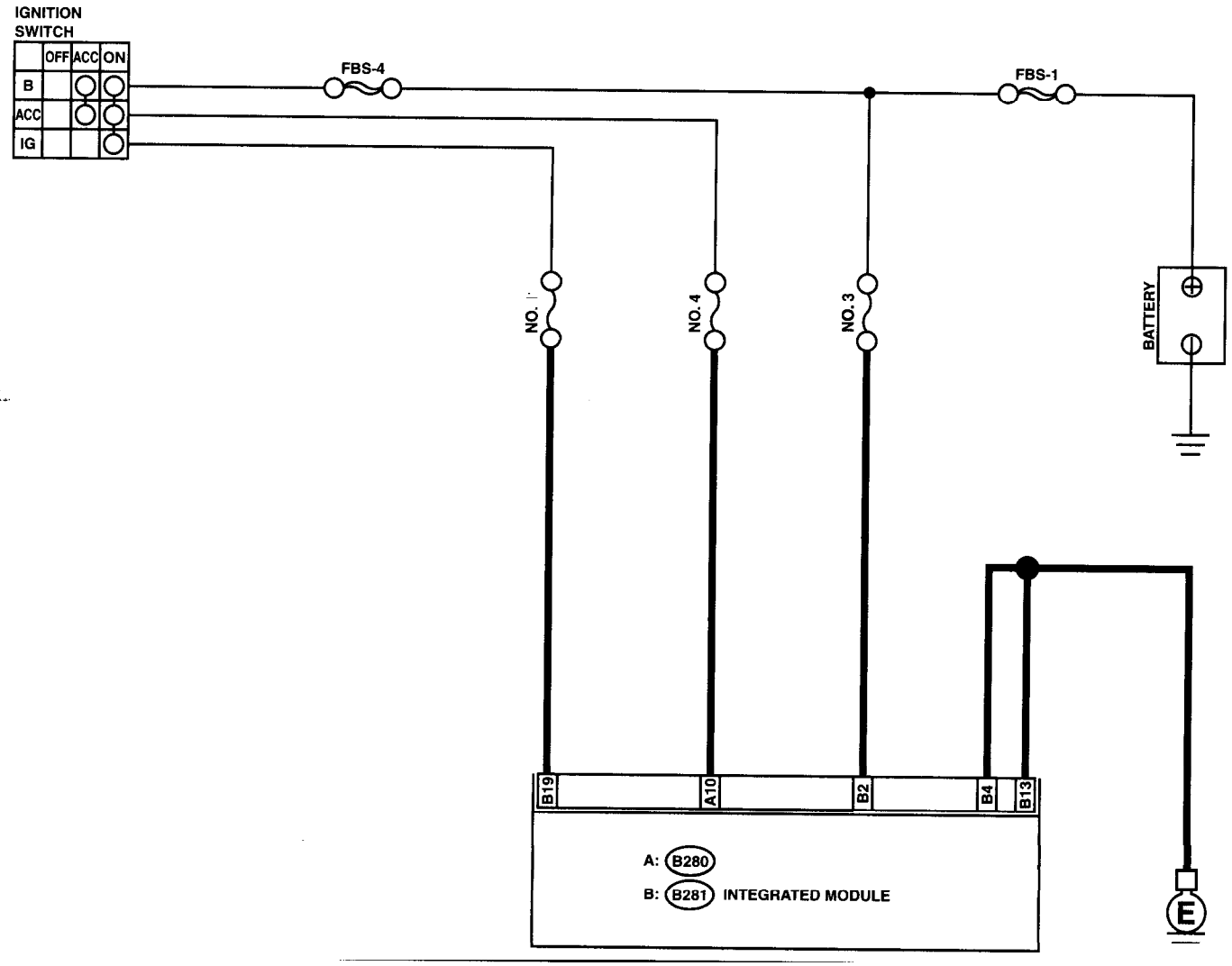


(1) Ignition switch
(2) Stop light switch
(3) Key warning switch
(4) Integrated module
(5) Inhibitor switch
(6) Key lock solenoid
(7) Shift lock solenoid
(8) "P" position switch
(9) Battery

C: INSPECTION

	Step	Check	Yes	No
1	**CHECK SHIFT LOCK.** 1)Turn the ignition switch ON. 2)Move the select lever to "P" position.	While brake pedal is depressed, can select lever move from "P" range to other positions?	Go to step **2.**	Inspect "SELECT LEVER CANNOT BE SHIFT LOCKED". <Ref. to CS-14, SELECT LEVER CANNOT BE SHIFT LOCKED, INSPECTION, AT Shift Lock System.>
2	**CHECK SHIFT LOCK.**	While brake pedal is not depressed, can select lever move from "P" range to other positions?	Inspect "SELECT LEVER SHIFT LOCK CANNOT BE RELEASED". <Ref. to CS-16, SELECT LEVER SHIFT LOCK CANNOT BE RELEASED, INSPECTION, AT Shift Lock System.>	Go to step **3.**
3	**CHECK KEY INTERLOCK.**	When select lever is in other than "P" position, does ignition switch turn to "LOCK" position? Or when select lever is in "P" position, does ignition switch turn to "LOCK" position?	Inspect "KEY INTERLOCK DOES NOT BE LOCKED OR RELEASED. <Ref. to CS-20, KEY INTERLOCK DOES NOT LOCK OR RELEASE, INSPECTION, AT Shift Lock System.>	AT shift lock system is normal.

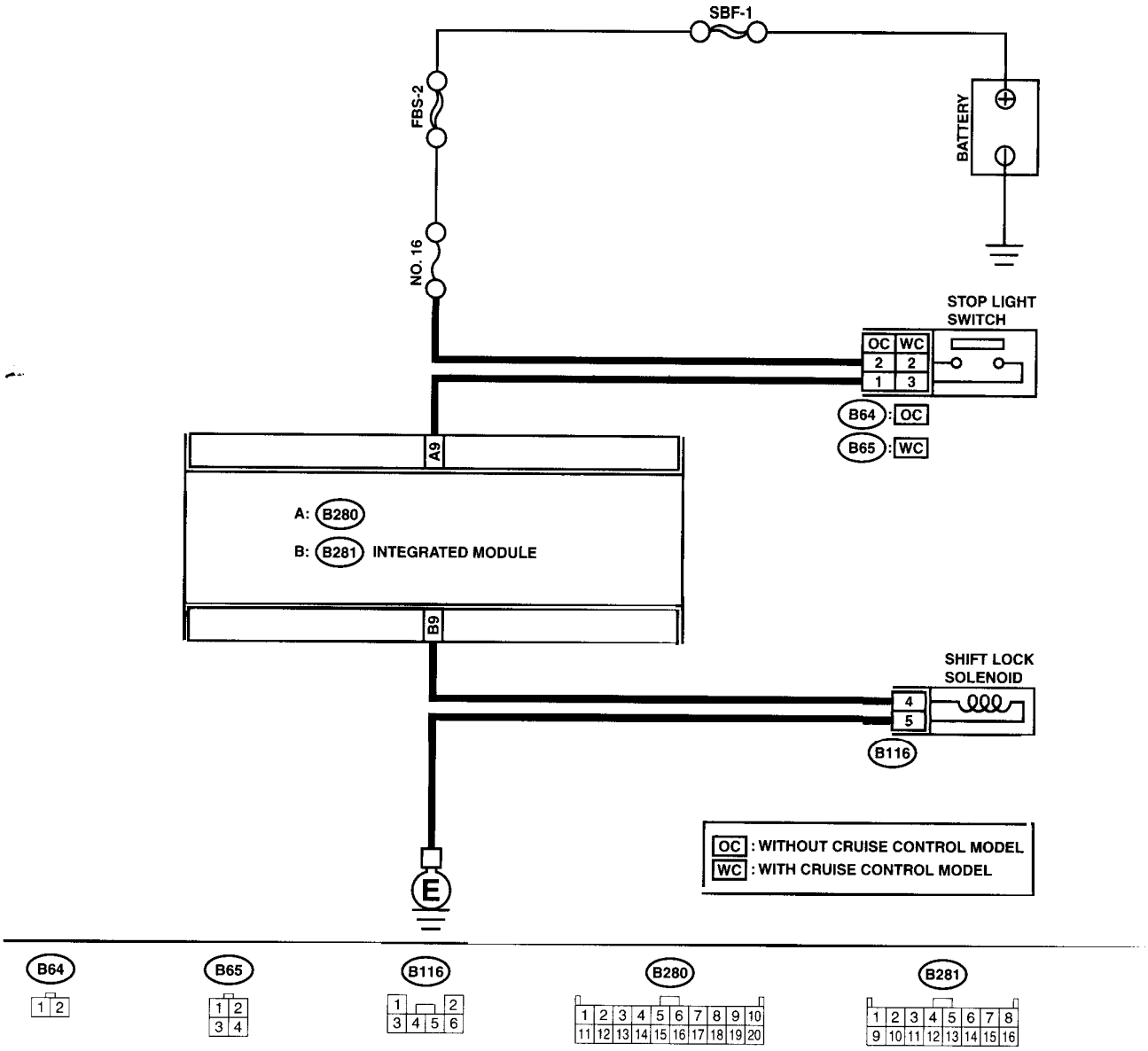
1. INTEGRATED MODULE POWER SUPPLY AND GROUND LINE WIRING DIAGRAM:



TR0551

	Step	Check	Yes	No
1	**CHECK FUSE (No. 3, 4 and 11).** 1)Remove the fuse (No. 3, 4 and 11).	Is the fuse (No. 3, 4 or 11) blown out?	Replace the fuse (No. 3, 4 or 11). If the replaced fuse (No. 3, 4 or 11) has blown out easily, repair short circuit in harness between fuse and integrated module.	Go to step **2.**
2	**CHECK HARNESS CONNECTOR BETWEEN INTEGRATED MODULE AND BODY GROUND.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of harness between integrated module and chassis ground. ***Connector & terminal*** ***(B281) No. 4 — Chassis ground:*** ***(B281) No. 13 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair open circuit in harness between integrated module and body ground.
3	**CHECK BATTERY POWER SUPPLY.** 1)Turn the ignition switch to ON (engine OFF). 2)Measure the voltages between integrated module and chassis ground. ***Connector & terminal*** ***(B281) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 9 V?	Go to step **4.**	Repair open circuit harness between battery and integrated module, and poor contact in coupling connector.
4	**CHECK IGNITION POWER SUPPLY CIRCUIT.** 1)Turn the ignition switch to ACC. 2)Measure the voltage between integrated module and chassis ground. ***Connector & terminal*** ***(B280) No. 10 (+) — Chassis ground (–):***	Is the voltage more than 9 V?	Go to step **5.**	Repair open circuit harness between battery and integrated module, and poor contact in coupling connector.
5	**CHECK IGNITION POWER SUPPLY CIRCUIT.** 1)Turn the ignition switch to ON (engine OFF). 2)Measure the voltage between integrated module and chassis ground. ***Connector & terminal*** ***(B281) No. 19 (+) — Chassis ground (–):***	Is the voltage more than 9 V?	Go to step **6.**	Repair open circuit harness between battery and integrated module, and poor contact in coupling connector.
6	**CHECK POOR CONTACT.**	Is there poor contact in power supply and ground line circuit?	Repair poor contact.	Replace the integrated module.

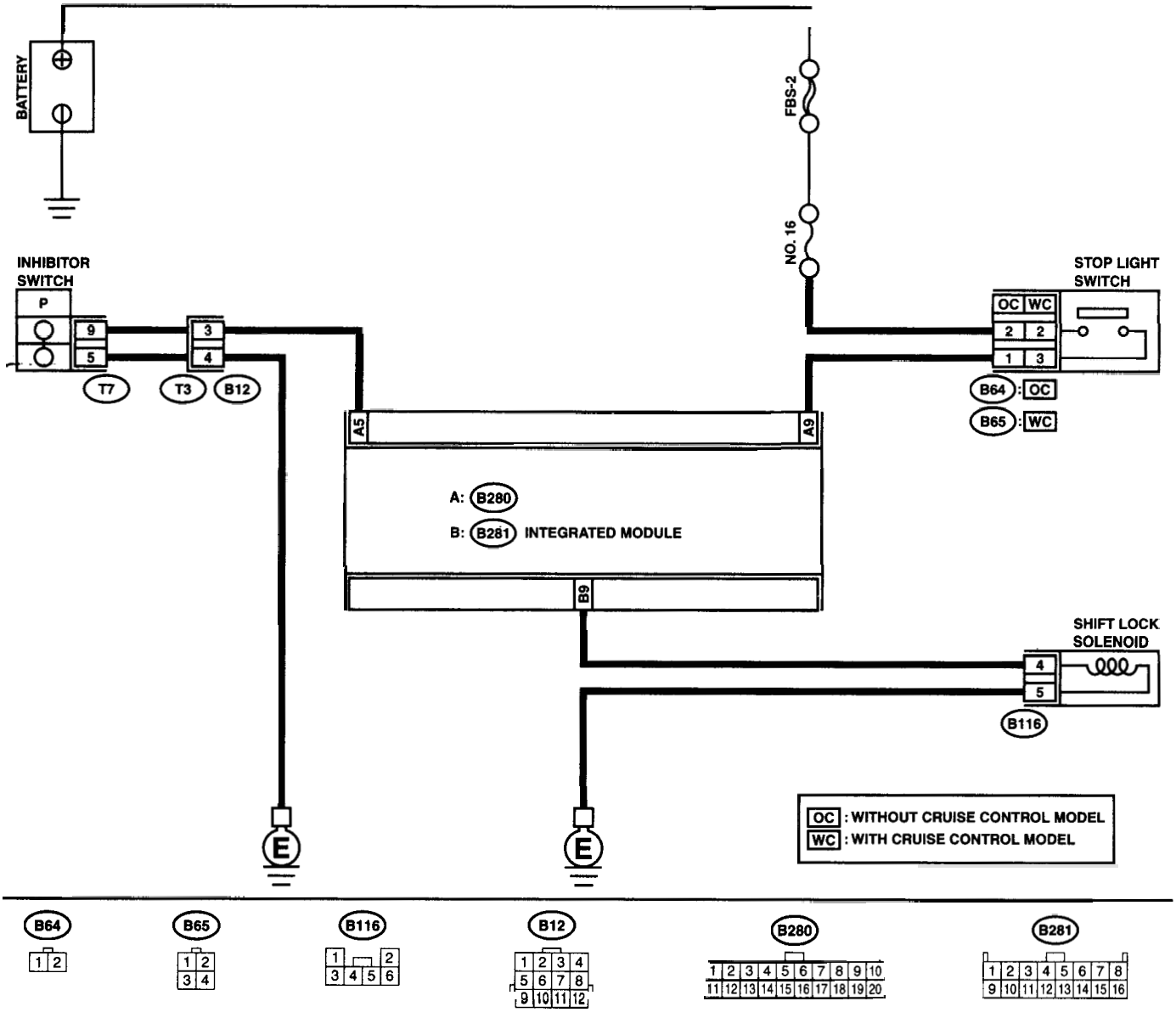
2. SELECT LEVER CANNOT BE SHIFT LOCKED
WIRING DIAGRAM:



TR0552

	Step	Check	Yes	No
1	**CHECK STOP LIGHT SWITCH.** Depress the brake pedal.	Does the stop light turn ON?	Go to step **2.**	Inspect the stop light system.
2	**CHECK HARNESS BETWEEN STOP LIGHT SWITCH AND INTEGRATED MODULE.** 1)Turn the ignition switch to OFF. 2)Disconnect the integrated and stoplight switch connector. 3)Measure the resistance of harness between stop light switch and integrated module. ***Connector & terminal*** ***Without cruise control model (B64) No. 1 — (B280) No. 9:*** ***Without cruise control model (B65) No. 3 — (B280) No. 9:***	Is the resistance more than 1 MΩ?	Repair open circuit in harness between integrated module and stop light switch.	Go to step **3.**
3	**CHECK HARNESS BETWEEN STOP LIGHT SWITCH AND INTEGRATED MODULE.** Measure the resistance of harness between stop light switch and chassis ground. ***Connector & terminal*** ***Without cruise control model (B64) No. 1 — Chassis ground:*** ***Without cruise control model (B65) No. 3 — Chassis ground:***	Is the resistance less than 1 Ω?	Repair short circuit in harness between integrated module and stop light switch.	Go to step **4.**
4	**CHECK HARNESS BETWEEN INTEGRATED MODULE AND SHIFT LOCK SOLENOID.** 1)Disconnect the shift lock solenoid connector. 2)Measure the resistance of harness between integrated module and shift lock solenoid. ***Connector & terminal*** ***(B116) No. 4 — (B281) No. 9:***	Is the resistance more than 1 MΩ?	Repair open circuit in harness between integrated module and shift lock solenoid.	Go to step **5.**
5	**CHECK HARNESS BETWEEN INTEGRATED MODULE AND SHIFT LOCK SOLENOID.** Measure the resistance of harness between shift lock solenoid and chassis ground. ***Connector & terminal*** ***(B116) No. 4 — Chassis ground:***	Is the resistance less than 1 Ω?	Repair short circuit in harness between integrated module and shift lock solenoid.	Go to step **6.**
6	**CHECK HARNESS BETWEEN SHIFT LOCK SOLENOID AND CHASSIS GROUND.** Measure the resistance of harness between shift lock solenoid and chassis ground. ***Connector & terminal*** ***(B116) No. 5 — Chassis ground:***	Is the resistance more than 1 MΩ?	Repair open circuit in harness between shift lock solenoid and body ground.	Go to step **7.**
7	**CHECK SHIFT LOCK SOLENOID.** Measure the resistance of shift lock solenoid connector terminals. ***Terminal*** ***No. 4 — No. 5:***	Is the resistance between 10 and 20 Ω?	Go to step **8.**	Replace the shift lock solenoid.
8	**CHECK SHIFT LOCK SOLENOID.** Connect the battery with shift lock solenoid connector terminal and operate solenoid. ***Terminal*** ***No. 4 (+) — No. 5 (–):***	Does the shift lock solenoid operate properly?	Go to step **9.**	Replace the shift lock solenoid.
9	**CHECK POOR CONTACT.**	Is there poor contact in key lock circuit?	Repair poor contact.	Replace the integrated module.

3. SELECT LEVER SHIFT LOCK CANNOT BE RELEASED
WIRING DIAGRAM:

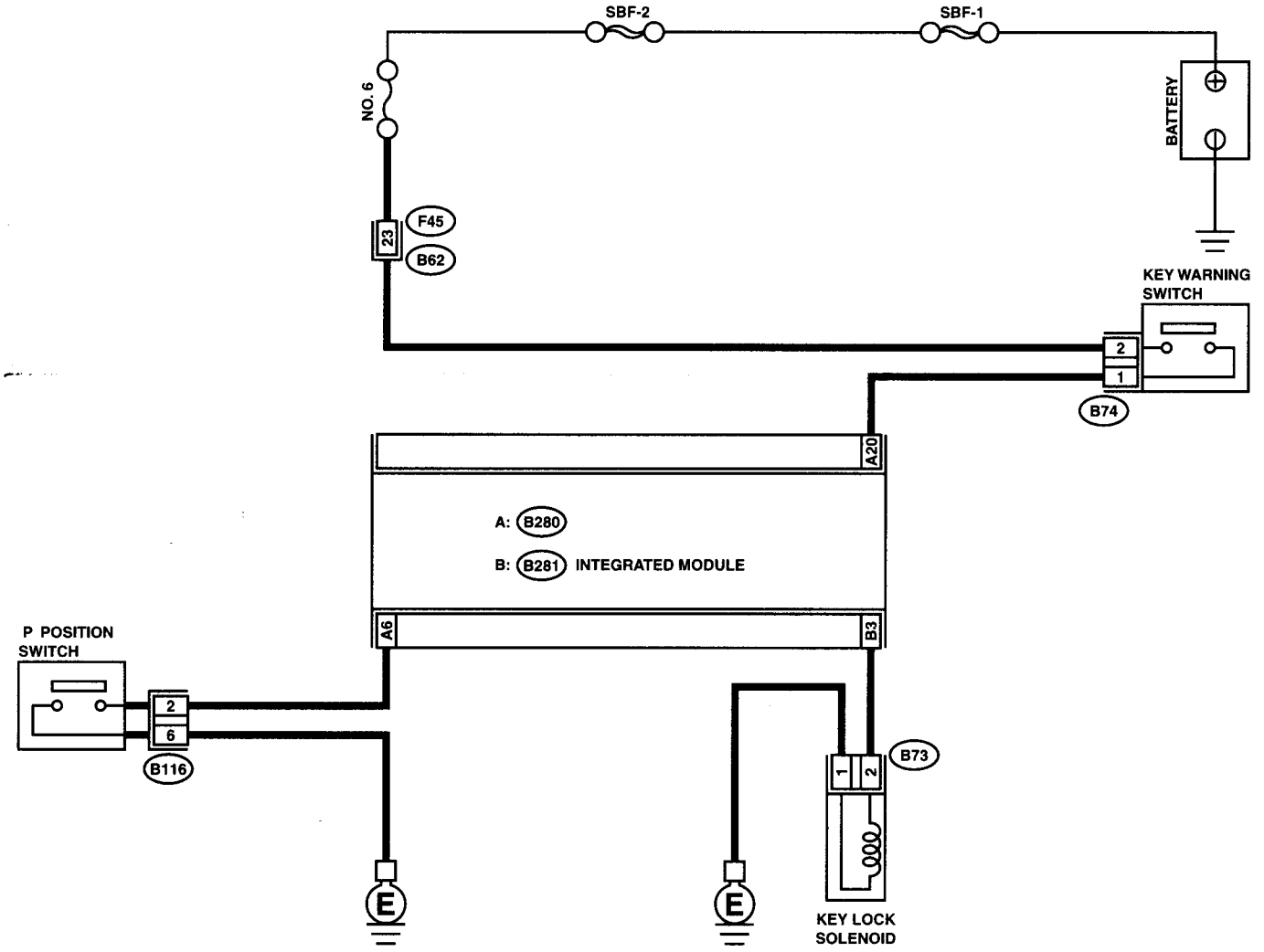


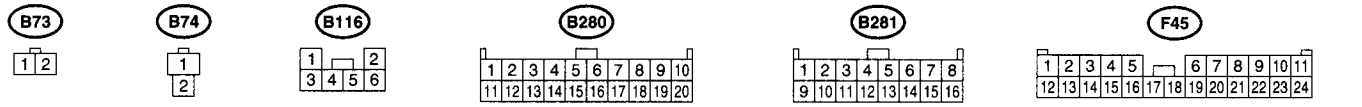
TR0553

	Step	Check	Yes	No
1	**CHECK INHIBITOR SWITCH.** 1)Turn the ignition switch to ON (engine OFF). 2)Move the select lever from "P" to "1" range.	Combination meter indicator lamp and select lever "P", "R", "N", "3", "2" and "1" are correctly matched?	Go to step **2.**	Adjust inhibitor switch and select cable.
2	**CHECK HARNESS BETWEEN INHIBITOR SWITCH AND INTEGRATED MODULE.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector transmission harness and intgrated module. 3)Measure the resistance of harness between integrated module and chassis ground. ***Connector & terminal*** ***(B280) No. 5 — Chassis ground:***	Is the resistance less than 1 Ω?	Repair short circuit in harness between integrated module and transmission connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN INHIBITOR SWITCH AND INTEGRATED MODULE.** Measure the resistance of harness between integrated module and inhibitor switch. ***Connector & terminal*** ***(B12) No. 3 — (B280) No. 5:***	Is the resistance more than 1 MΩ?	Repair open circuit in harness between integrated module and transmission connector	Go to step **4.**
4	**CHECK HARNESS BETWEEN INHIBITOR SWITCH AND CHASSIS GROUND.** Measure the resistance of harness between integrated module and chassis ground. ***Connector & terminal*** ***(B12) No. 4 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair open circuit in harness between integrated module and chassis ground.
5	**CHECK INHIBITOR SWITCH.** 1)Move the select lever to "P" position. 2)Measure the resistance of transmission harness connector terminals. ***Connector & terminal*** ***(T3) No. 3 — No. 4:***	Is the resistance more than 1 MΩ?	Repair or replace inhibitor switch.	Go to step **6.**
6	**CHECK OUTPUT SIGNAL FOR INTEGRATED MODULE.** 1)Connect all connectors. 2)Turn the ignition switch to ON. 3)Measure the voltage between integrated module and chassis ground. ***Connector & terminal*** ***(B280) No. 5 (+) — Chassis ground (–):***	Is the voltage between 9 and 16 V?	Go to step **7.**	Go to step **15.**
7	**CHECK STOP LIGHT SWITCH.** Depress the brake pedal.	Does the stop light turn on?	Go to step **8.**	Inspect stop light system.
8	**CHECK HARNESS BETWEEN STOP LIGHT SWITCH AND AT SHIFT LOCK CONTROL MODULE.** 1)Depress the brake pedal. 2)Measure the voltage between integrated module and chassis ground. ***Connector & terminal*** ***(B280) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 9 V?	Go to step **9.**	Repair open or short circuit in harness between integrated module and stop light switch.
9	**CHECK HARNESS BETWEEN INTEGRATED MODULE AND SHIFT LOCK SOLENOID.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from shift lock solenoid and integrated module. 3)Measure the resistance of harness between integrated module and shift lock solenoid. ***Connector & terminal*** ***(B281) No. 9 — (B116) No. 4:***	Is the resistance more than 1 MΩ?	Repair open circuit in harness between integrated module and shift lock solenoid.	Go to step **10.**

	Step	Check	Yes	No
10	**CHECK HARNESS BETWEEN INTEGRATED MODULE AND SHIFT LOCK SOLENOID.** Measure the resistance of harness between shift lock solenoid and chassis ground. ***Connector & terminal*** ***(B281) No. 9 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **11.**	Repair short circuit in harness between integrated module and shift lock solenoid.
11	**CHECK HARNESS BETWEEN SHIFT LOCK SOLENOID AND CHASSIS GROUND.** Measure the resistance of harness between shift lock solenoid and chassis ground. ***Connector & terminal*** ***(B116) No. 5 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **12.**	Repair open circuit in harness between shift lock solenoid and chassis ground.
12	**CHECK SHIFT LOCK SOLENOID.** Measure the resistance of shift lock solenoid connector terminals. ***Terminal*** ***No. 4 — No. 5:***	Is the resistance between 10 and 20 Ω?	Go to step **13.**	Replace the shift lock solenoid.
13	**CHECK SHIFT LOCK SOLENOID.** Connect the battery with shift lock solenoid connector terminal and operate solenoid. ***Terminal*** ***No. 4 (+) — No. 5 (–):***	Is shift lock solenoid operating properly?	Go to step **14.**	Replace the shift lock solenoid.
14	**CHECK OUTPUT SIGNAL FOR AT SHIFT LOCK CONTROL MODULE.** 1)Turn the ignition switch to ON (engine OFF). 2)Measure the voltage between integrated module and chassis ground. ***Connector & terminal*** ***(B281) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 8.5 V?	Go to step **15.**	Replace the integrated module.
15	**CHECK POOR CONTACT.**	Is there poor contact in key lock circuit?	Repair poor contact.	Replace the integrated module.

4. KEY INTERLOCK DOES NOT LOCK OR RELEASE
WIRING DIAGRAM:





TR0554

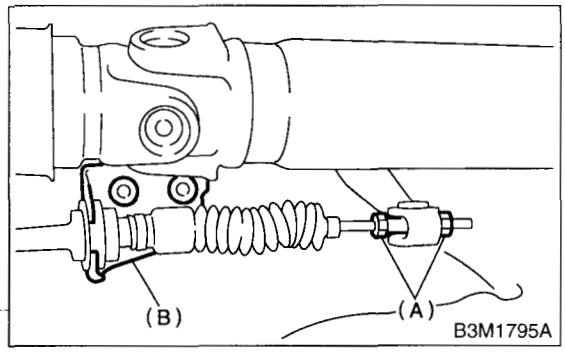
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN BATTERY AND KEY WARNING SWITCH.** 1)Disconnect the connector key warning switch. 2)Measure the voltage of harness between key warning switch and chassis ground. ***Connector & terminal*** ***(B74) No. 2 — Chassis ground:***	Is the voltage between 9 and 16 V?	Go to step **2.**	Repair open or short circuit in harness between battery and key warning switch.
2	**CHECK KEY WARNING SWITCH.** Measure the resistance of stop light switch connector terminals. ***Terminal*** ***No. 1 — No. 2:***	Is the resistance more than 1 MΩ?	Replace key warning switch.	Go to step **4.**
3	**CHECK KEY WARNING SWITCH.** 1)Remove the key. 2)Measure the resistance of stop light switch connector terminals. ***Terminal*** ***No. 1 — No. 2:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace key warning switch.
4	**CHECK HARNESS BETWEEN AT SHIFT LOCK CONTROL MODULE AND KEY WARNING SWITCH.** 1)Disconnect the integrated module connector. 2)Measure the voltage of harness integrated module and chassis ground. ***Connector & terminal*** ***(B280) No. 20 — Chassis ground:***	Is the resistance more than 9 V?	Go to step **5.**	Repair open circuit in harness between integrated module and key warning switch.
5	**CHECK HARNESS BETWEEN INTEGRATED MODULE AND KEY LOCK SOLENOID.** 1)Disconnect the connector key lock solenoid. 2)Measure the resistance of harness between integrated module and key lock solenoid. ***Connector & terminal*** ***(B73) No. 2 — (B281) No. 3:***	Is the resistance more than 1 MΩ?	Repair open circuit in harness between integrated module and key lock solenoid.	Go to step **6.**
6	**CHECK HARNESS BETWEEN INTEGRATED MODULE AND KEY LOCK SOLENOID.** Measure the resistance of harness between integrated module and chassis ground. ***Connector & terminal*** ***(B281) No. 3 — Chassis ground:***	Is the resistance more than 1 Ω?	Go to step **7.**	Repair short circuit in harness between integrated module and key lock solenoid.
7	**CHECK HARNESS BETWEEN KEY LOCK SOLENOID AND CHASSIS GROUND.** Measure the resistance of harness between key lock solenoid and chassis ground. ***Connector & terminal*** ***(B73) No. 1 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **8.**	Repair open circuit in harness between key lock solenoid and chassis ground.
8	**CHECK KEY LOCK SOLENOID.** Measure the resistance of key lock solenoid connector terminals. ***Connector & terminal*** ***(B73) No. 1 — No. 2:***	Is the resistance between 4 and 8 Ω?	Go to step **14.**	Replace the key lock solenoid.
9	**CHECK HARNESS BETWEEN "P" POSITION SWITCH AND CHASSIS GROUND.** Measure the resistance of harness between "P" position switch and chassis ground. ***Connector & terminal*** ***(B116) No. 2 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair short circuit in harness between "P" position switch and integrated module.

	Step	Check	Yes	No
10	**CHECK HARNESS BETWEEN AT SHIFT LOCK CONTROL MODULE AND "P" POSITION SWITCH.** 1)Disconnect the connector from "P" position switch. 2)Measure the resistance of harness between integrated module and "P" position switch. ***Connector & terminal*** ***(B116) No. 2 — (B280) No. 6:***	Is the resistance more than 1 MΩ?	Repair open circuit in harness between integrated module and "P" position switch.	Go to step **11.**
11	**CHECK HARNESS BETWEEN "P" POSITION SWITCH AND CHASSIS GROUND.** Measure the resistance of harness "P"position switch and chassis ground. ***Connector & terminal*** ***(B116) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **12.**	Repair open circuit in harness between "P" position switch and chassis ground.
12	**CHECK "P" POSITION SWITCH.** 1)Move the select lever to "P" position. 2)Measure resistance between "P" position switch connector terminals. ***Terminal*** ***No. 2 — No. 6:***	Is the resistance less than 1 Ω?	Go to step **13.**	Replace the "P" position switch.
13	**CHECK "P" POSITION SWITCH.** 1)Move the select lever to other than "P" position. 2)Measure resistance between "P" position switch connector terminals. ***Terminal*** ***No. 2 — No. 6:***	Is the resistance more than 1 MΩ?	Go to step **14.**	Replace the "P" position switch.
14	**CHECK OUTPUT SIGNAL FOR INTEGRATED MODULE.** 1)Connect all connectors. 2)Turn the ignition switch to ON (engine OFF). 3)Move the select lever to "P" position. 4)Press the brake pedal. 5)Measure the voltage between integrated module connector and chassis ground. ***Connector & terminal*** ***(B281) No. 3 (+) — Chassis ground (–):***	Is the voltage 7.5 and 16 V?	Go to step **15.**	Replace the integrated module.
15	**CHECK POOR CONTACT.**	Is there poor contact in AT shift lock circuit?	Repair poor contact.	Replace the integrated module.

4. Select Lever

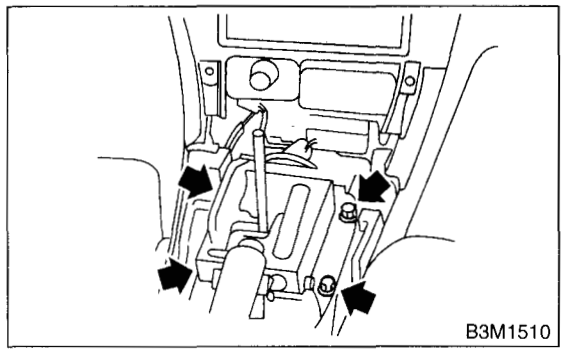
A: REMOVAL

1) Set the vehicle on the lift.
2) Disconnect the ground terminal from battery.
3) Move the select lever to the "N" position.
4) Lift-up the vehicle.
5) Remove the rear exhaust pipe and 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

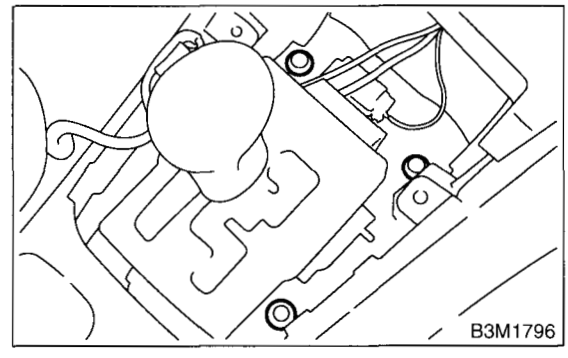
8) Lower the vehicle.
9) Remove the console box. <Ref. to EI-41, REMOVAL, Console Box.>
10) Disconnect the connectors, then remove the four bolts to take out the select lever assembly from the body.



B: INSTALLATION

1) Mount the select lever onto the vehicle body.
2) Tighten the four bolts to install the select lever to the vehicle body, then connect the connector.

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

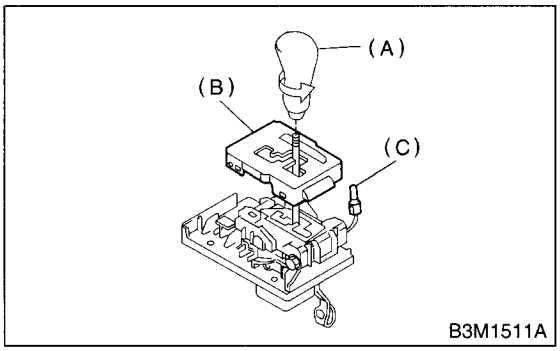


3) Install the console box. <Ref. to EI-39, INSTALLATION, Glove Box.>
4) Set the location of select lever at "N" position.
5) Lift-up the vehicle.
6) Set the location of range select lever to "N" position.
7) Insert the thread portion of the other inner cable and into the connector hole of the select lever, and fix the other outer cable end to the bracket.
8) Adjust the select cable position. <Ref. to CS-27, ADJUSTMENT, Select Cable.>
9) After completion of fitting, make sure that the select lever operates smoothly all across the operating range.
10) Inspect the following items. If the following inspection reveals problems, adjust the select cable and inhibitor switch. <Ref. to CS-27, ADJUSTMENT, Select Cable.> and <Ref. to AT-28, 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 are matched.
11) Check the shift-lock system.
    (1) Ensure the ignition switch rotates from "ACC" to "LOCK" when the select lever is set at "P". Also check that ignition key can be removed only from the "LOCK" position.
    (2) Ensure the select lever moves from "P" to any other position when the brake pedal is depressed with ignition key set at "ON" or "START".
12) Install heat shield cover. (If equipped)
13) Install rear exhaust pipe and muffler.

C: DISASSEMBLY

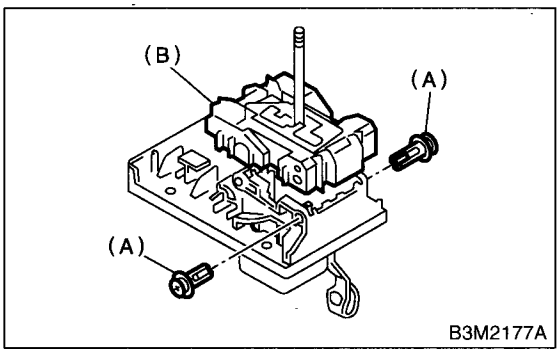
1) Remove the grip.
2) Remove the indicator light and then remove the indicator cover.

NOTE:
Be careful not to break the indicator light during removal.



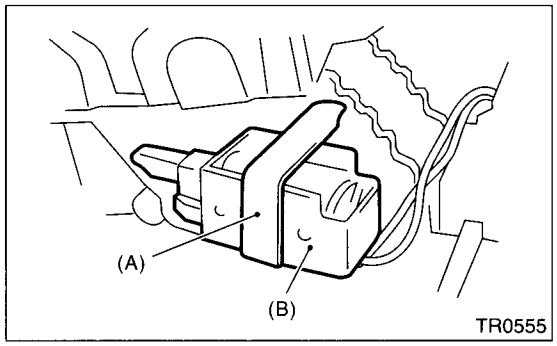
(A) Grip
(B) Indicator cover
(C) Indicator light

3) Remove the slider.
4) Remove the clips and then remove the guide plate.



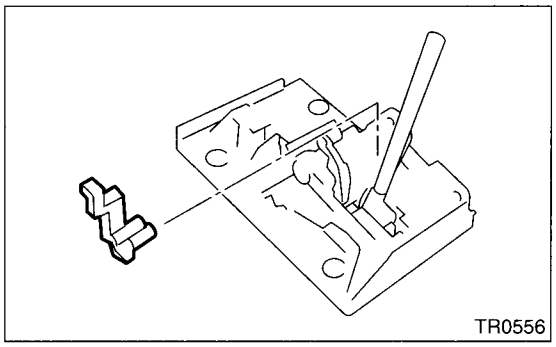
(A) Clips
(B) Guide plate

5) Remove the clamp, and shift lock solenoid.

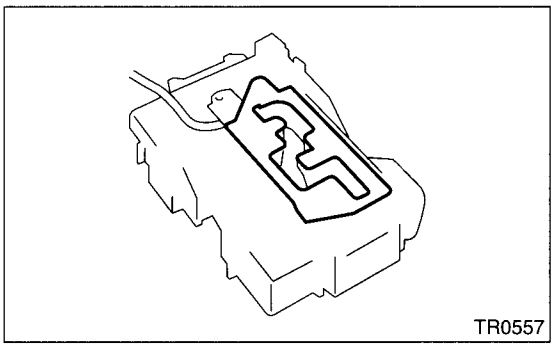


(A) Clamp
(B) Shift lock solenoid

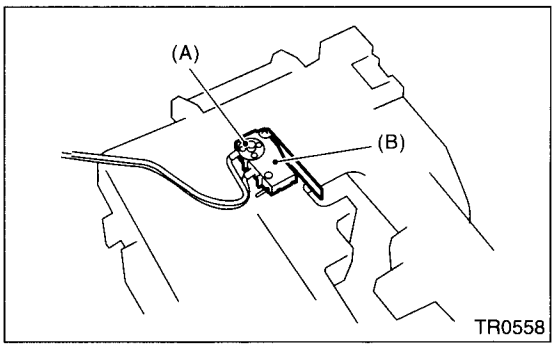
6) Remove the lock plate.



7) Remove the pattern plate.

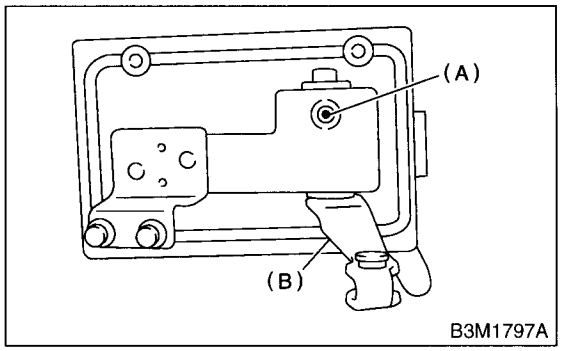


8) Remove the clip and remove the "P" position switch.



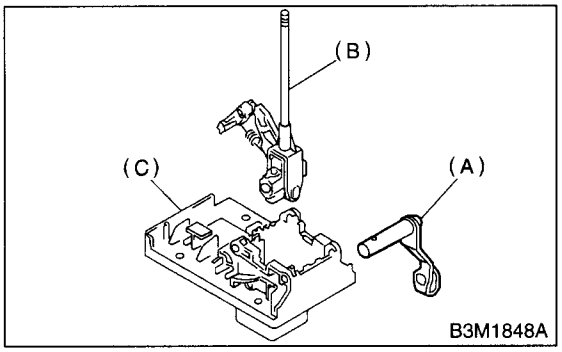
(A) Clip
(B) "P" position switch

9) Remove the cap and then extract straight pin.



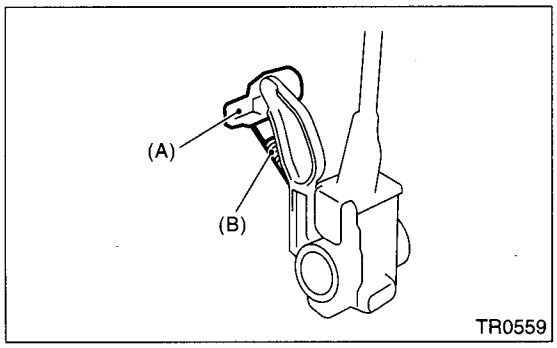
(A) Straight pin
(B) Select lever lower

10) Remove the select lever lower then take away the select lever upper from plate.



(A) Select lever lower
(B) Select lever upper
(C) Plate

11) Remove the spring and remove the detent arm.



(A) Detent arm
(B) Spring

12) Remove the cushion.

D: ASSEMBLY

1) Clean all parts before assembly.
2) Apply grease [NIGTIGHT LYW No. 2 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 the following parts for operating condition before assembly. Moving condition of the selector lever upper, it should move smoothly.

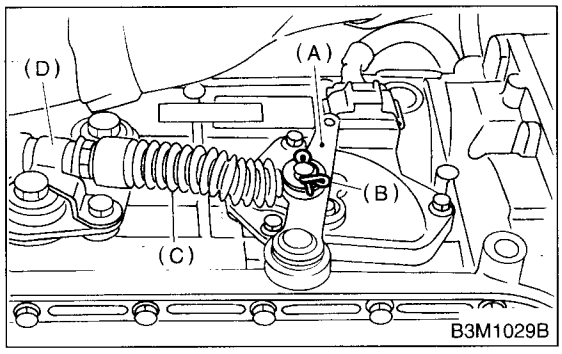
5. Select Cable

A: REMOVAL

1) Set the vehicle on the lift.
2) Disconnect the ground terminal 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)-5, REMOVAL, Front Exhaust Pipe.>

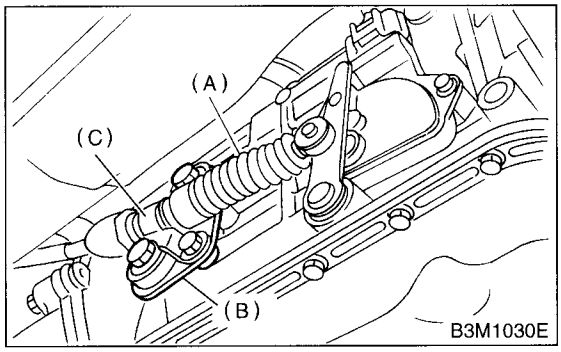
CAUTION:
When removing the exhaust pipes, be careful each exhaust pipe does not drop out.

6) Remove the center exhaust pipe. (Turbo model) <Ref. to EX(DOHC TURBO)-8, REMOVAL, Center Exhaust Pipe.>
7) Remove the heat shield cover. (If equipped)
8) Remove the snap pin from range select lever.



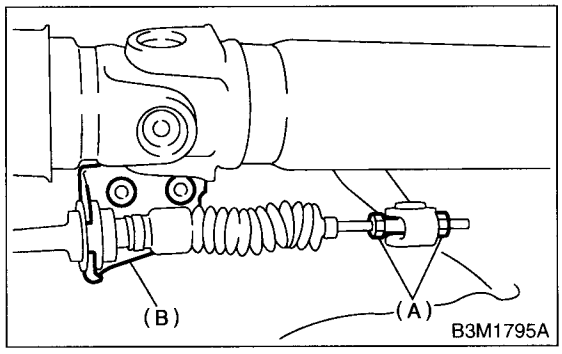
(A) Range select lever
(B) Snap pin
(C) Select cable
(D) Clamp

9) Remove the plate assembly from transmission case.



(A) Select cable
(B) Plate ASSY
(C) Clamp

10) Disconnect the cable from select lever and then remove the cable bracket.



(A) Adjusting nuts
(B) Cable bracket

11) Remove the select cable from plate assembly.

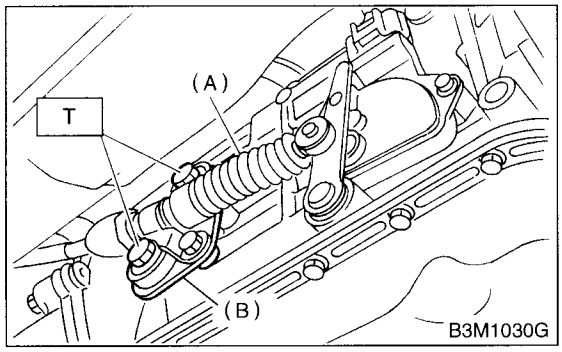
B: INSTALLATION

1) Install the select cable to plate assembly.

Tightening torque:
32 N·m (3.3 kgf-m, 24 ft-lb)

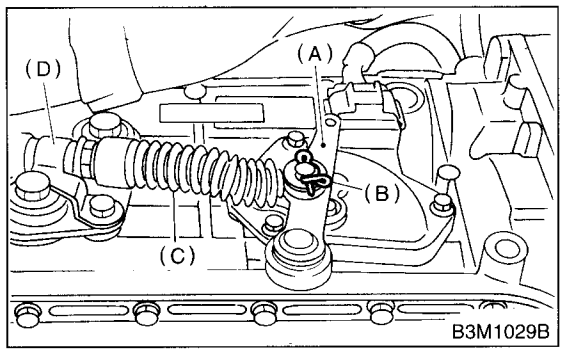
2) Install the select cable to range select lever.
3) Install the plate assembly to transmission.

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

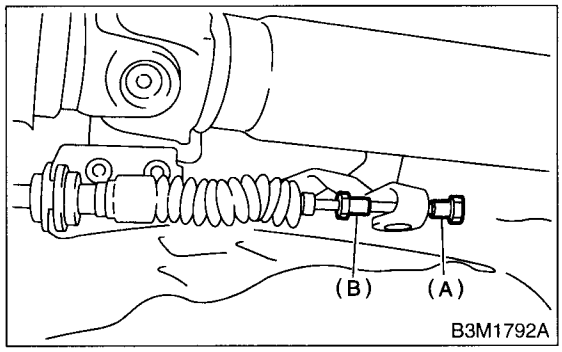
5) Move the select lever to the "N" position, then adjust the select cable position. <Ref. to CS-27, ADJUSTMENT, Select Cable.>
6) Install the heat shield cover. (If equipped)
7) Install the front and center exhaust pipe. (Non-turbo model) <Ref. to EX(SOHC)-6, INSTALLATION, Front Exhaust Pipe.>
8) Install the center exhaust pipe. (Turbo model) <Ref. to EX(DOHC TURBO)-9, 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.

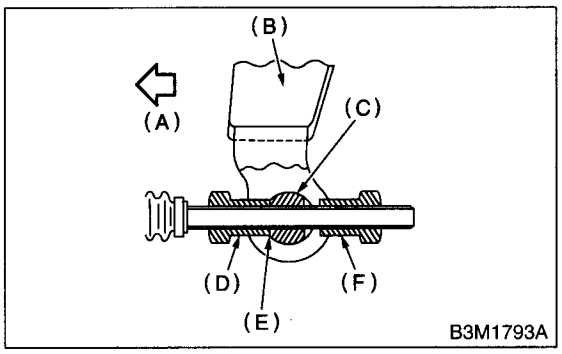
D: ADJUSTMENT

1) Set the vehicle on the lift.
2) Disconnect the ground terminal from battery.
3) Set the lever to "N" position.
4) Lift-up the vehicle.
5) Remove the rear exhaust pipe and muffler.
6) Remove the heat shield cover. (If equipped)
7) Loosen the adjusting nut on each side.



(A) Adjusting nut A
(B) Adjusting nut B

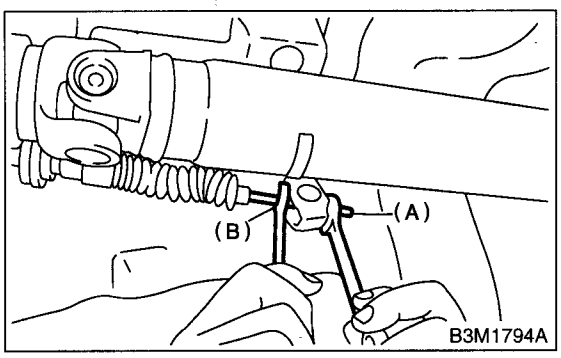
8) Turn the adjusting nut B until it lightly touches the connector.



(A) Front side
(B) Select lever
(C) Connector
(D) Adjusting nut B
(E) Contact point
(F) Adjusting nut A

9) While preventing the adjusting nut B from moving with a wrench, tighten adjusting nut A.

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



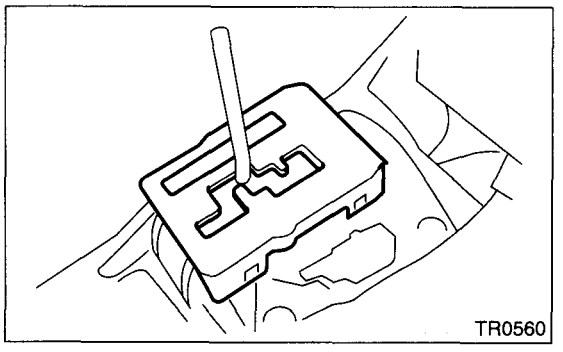
(A) Adjusting nut A
(B) Adjusting nut B

10) After completion of fitting, make sure that the select lever operates smoothly all across the operating range.
11) Install in the reverse order of removal.

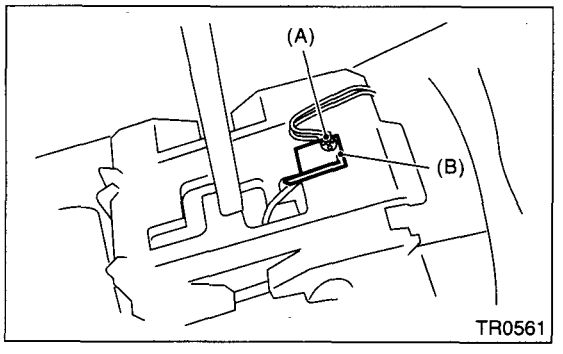
6. AT Shift Lock Solenoid and "P" Position Switch

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the console box. <Ref. to EI-41, REMOVAL, Console Box.>
3) Disconnect the connector.
4) Remove the grip.
5) Remove the indicator cover.

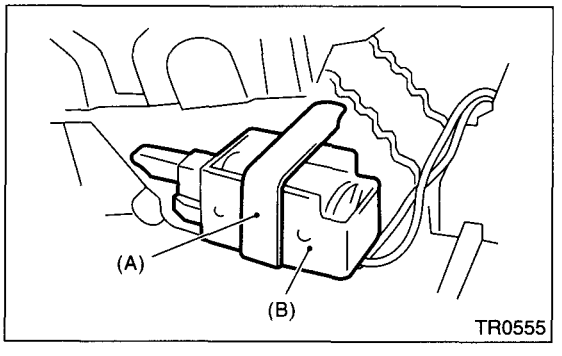


6) Remove the slider.
7) Remove the cushion.
8) Remove the clip and remove the "P" position switch.



(A) Clip
(B) "P" position switch

9) Remove the clamp and remove the shift lock solenoid.



(A) Clamp
(B) Shift lock solenoid

B: INSTALLATION

Install in the reverse order of removal.

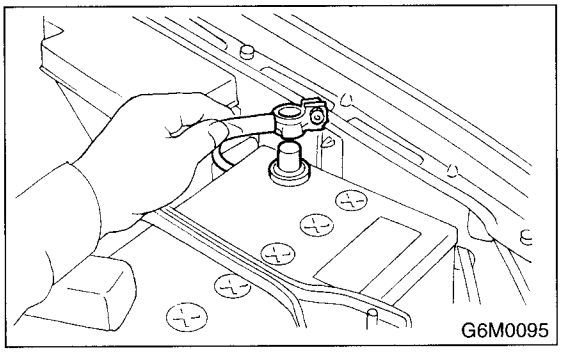
C: INSPECTION

	Step	Check	Yes	No
1	**CHECK SHIFT LOCK SOLENOID.** Measure the resistance of shift lock solenoid connector terminals. ***Terminal*** ***No. 4 — No. 5***	Is the resistance between 10 and 20 Ω?	Go to step **2.**	Replace the shift lock solenoid and "P" position switch assembly.
2	**CHECK SHIFT LOCK SOLENOID.** Connect the battery with shift lock solenoid connector terminal, operate solenoid. ***Terminal*** ***No. 4 (+) — No. 5 (–)***	Is the shift lock solenoid operating properly?	Go to step **3.**	Replace the shift lock solenoid and "P" position switch assembly.
3	**CHECK "P" POSITION SWITCH.** 1)Move the select lever to "P" position. 2)Measure resistance between "P" position switch connector terminals.	Is the resistance less than 1 Ω?	Go to step **4.**	Replace the "P" position switch.
4	**CHECK "P" POSITION SWITCH.** 1)Move the select lever to other than "P" position. 2)Measure resistance between "P" position switch connector terminals.	Is the resistance more than 1 MΩ?	Normal	Replace the "P" position switch.

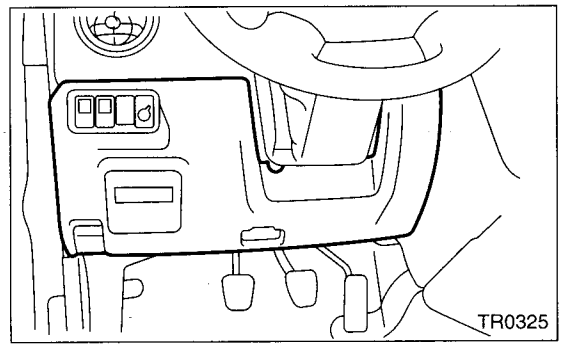
7. Integrated Module

A: REMOVAL

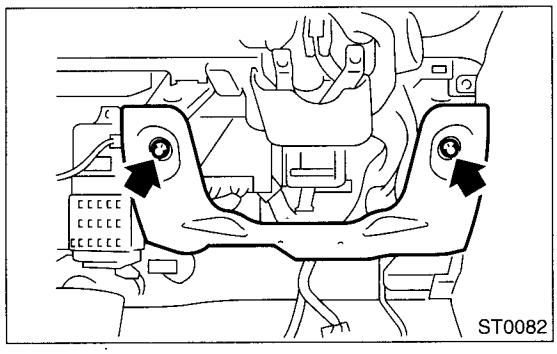
1) Disconnect the ground terminal from battery.



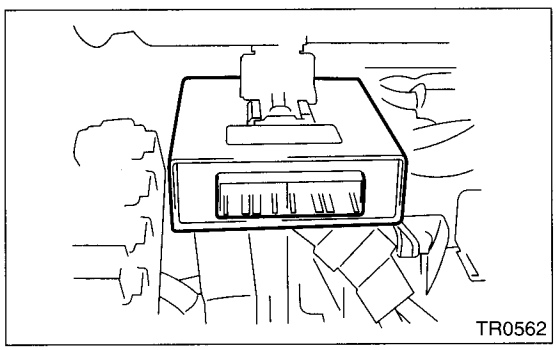
2) Remove the lower cover.



3) Remove the knee bolster.



4) Disconnect the connector from integrated module.
5) Remove the integrated module.



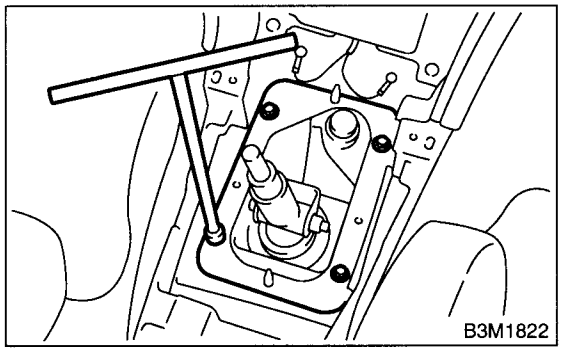
B: INSTALLATION

Install in the reverse order of removal.

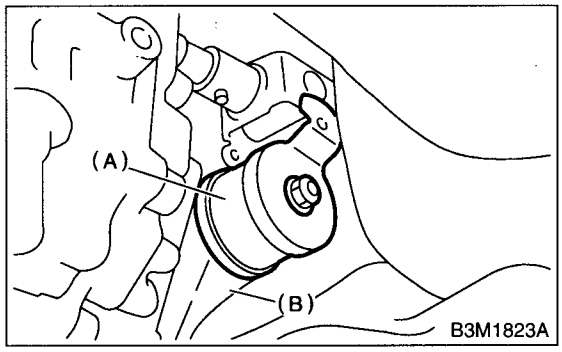
8. MT Gear Shift Lever

A: REMOVAL

1) Set the vehicle on the lift.
2) Remove the gear shift knob.
3) Disconnect the ground terminal from battery.
4) Remove the console box. <Ref. to EI-41, REMOVAL, Console Box.>
5) Remove the boot plate from body.

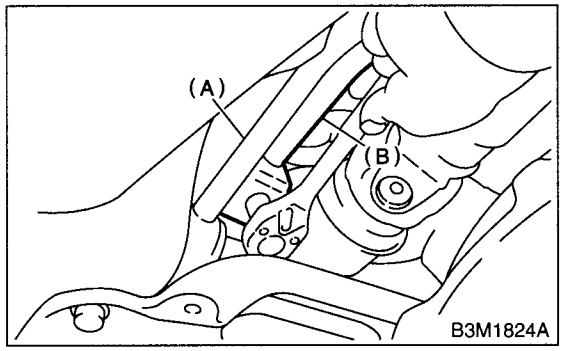


6) Lift-up the vehicle.
7) Remove the rear exhaust pipe and muffler.
8) Remove the heat shield cover. (If equipped)
9) Remove the stay from transmission bracket.



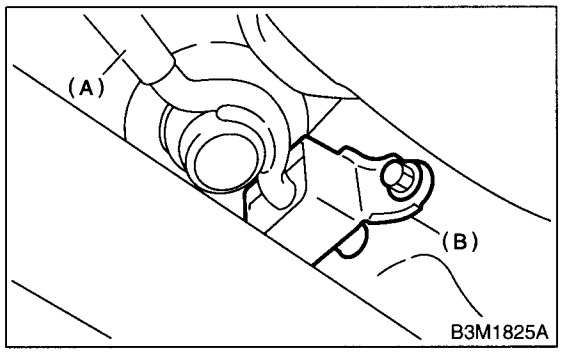
(A) Stay
(B) Transmission bracket

10) Remove the rod from joint.



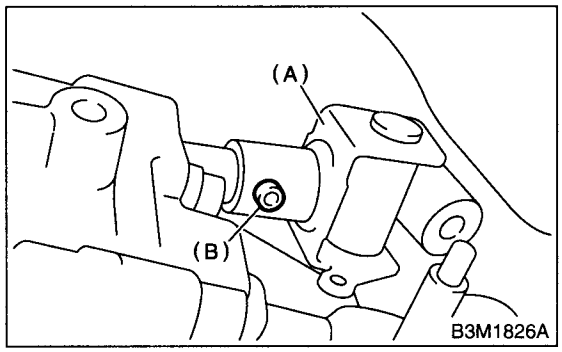
(A) Stay
(B) Rod

11) Remove the cushion rubber from body.



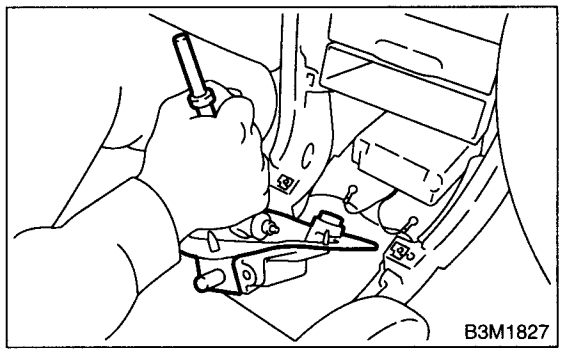
(A) Stay
(B) Cushion rubber

12) Remove the joint and then extract the spring pin.



(A) Joint
(B) Spring pin

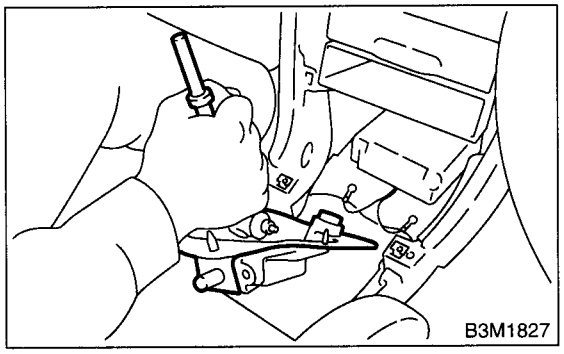
13) Lower the vehicle.
14) Remove the gear shift lever.



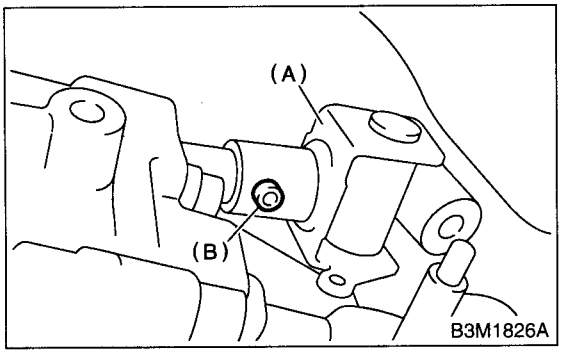
B: INSTALLATION

1) Install the joint to the transmission and secure with the straight pin.
2) Insert the gear shift lever from room side.

NOTE:
After inserting the rod and stay, temporarily put them onto transmission mount.



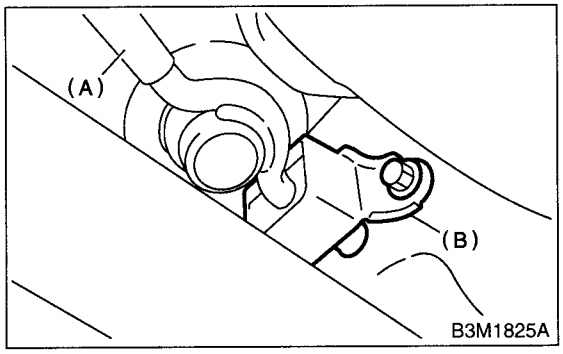
3) Lift-up the vehicle.
4) Install the joint to shifter arm.
5) Insert the spring pin.



(A) Joint
(B) Spring pin

6) Mount the cushion rubber on the body.

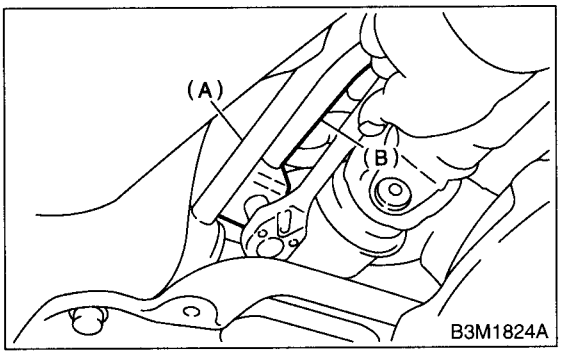
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



(A) Stay
(B) Cushion rubber

7) Connect the rod to the joint.

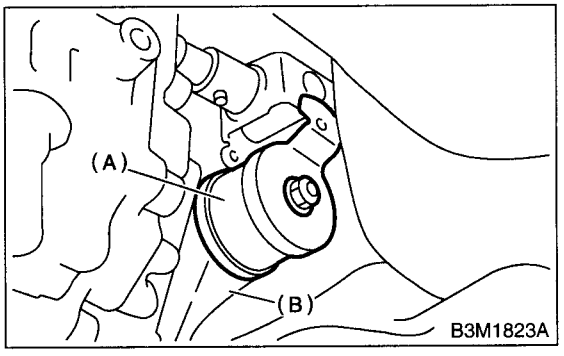
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



(A) Stay
(B) Rod

8) Connect the stay to transmission bracket.

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



(A) Stay
(B) Transmission bracket

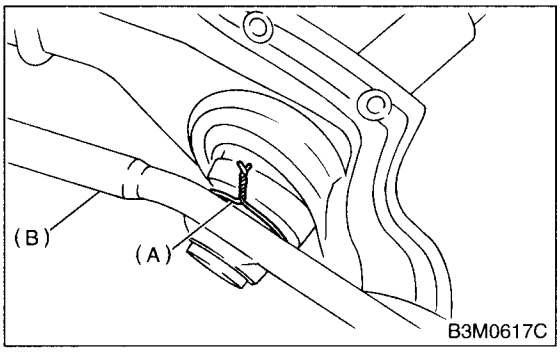
9) Install the heat shield cover. (If equipped)
10) Install the rear exhaust pipe and muffler.
11) Lower the vehicle.
12) Install the boot plate to body.

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

13) Install the consol box. <Ref. to EI-41, INSTALLATION, Console Box.>

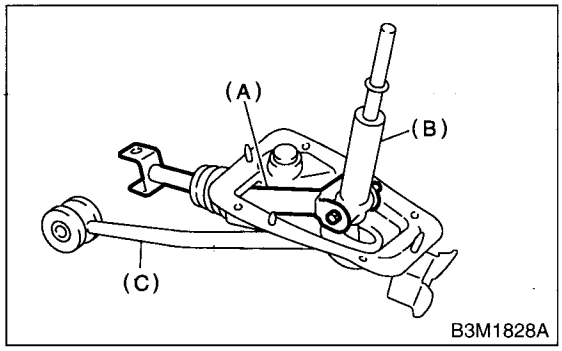
C: DISASSEMBLY

1) Disassemble the locking wire.



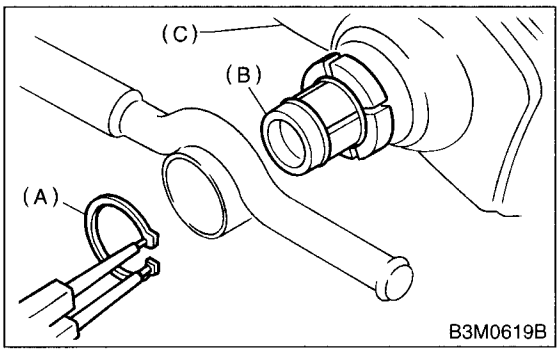
(A) Locking wire
(B) Stay

2) Remove the rod from gear shift lever.



(A) Rod
(B) Gear shift lever
(C) Stay

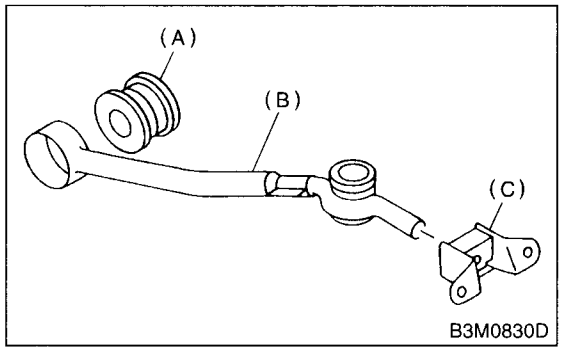
3) Remove the snap ring from bush B, then disconnect the stay.



(A) Snap ring
(B) Bushing B
(C) Boot

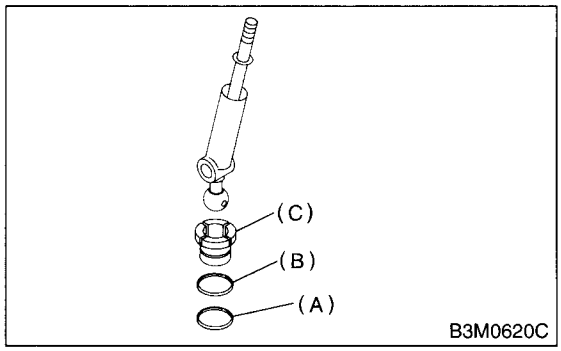
4) Remove the boot from gear shift lever.

5) Remove the bush and cushion rubber from stay.



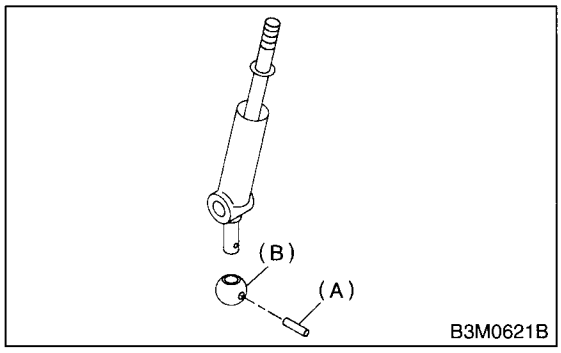
(A) Bushing
(B) Stay
(C) Cushion rubber

6) Remove the O-ring, then disconnect the bush D.



(A) O-ring B
(B) O-ring A
(C) Bushing B

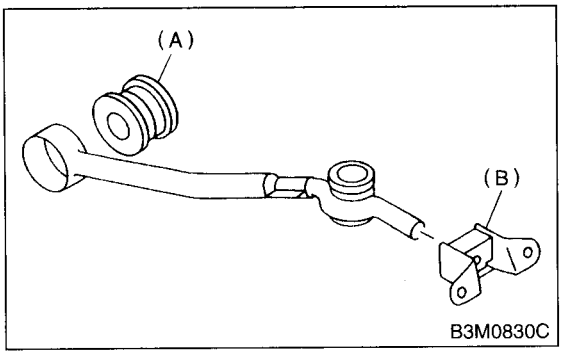
7) Draw out the spring pin, then remove the bush C from gear shift lever.



(A) Spring pin
(B) Bushing A

D: ASSEMBLY

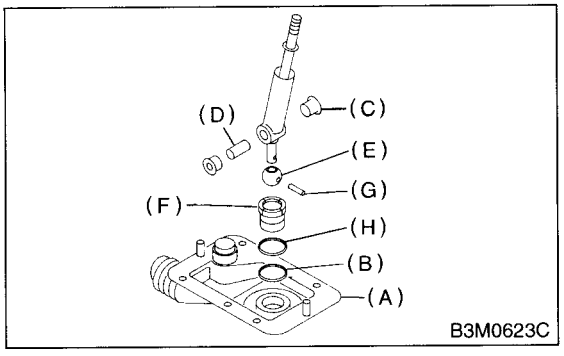
1) Clean all parts before assembly.
2) Mount the bushing B and cushion rubber on the stay.



(A) Bushing
(B) Cushion rubber

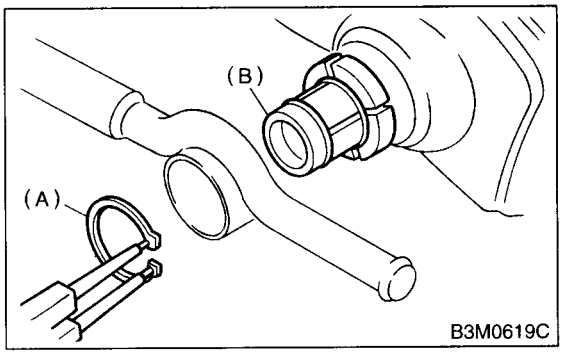
3) Mount each part; boot, O-ring, bush, spacer, bush A, bush B and straight pin on the gear shift lever.

CAUTION:
• Always use new O-rings.
• Apply grease [DNIGTIGHT LYW No. 2 or equivalent] to the inner and side surfaces of the bushing when installing the spacer.



(A) Boot
(B) O-ring B
(C) Bushing
(D) Spacer
(E) Bushing A
(F) Bushing B
(G) Spring pin
(H) O-ring A

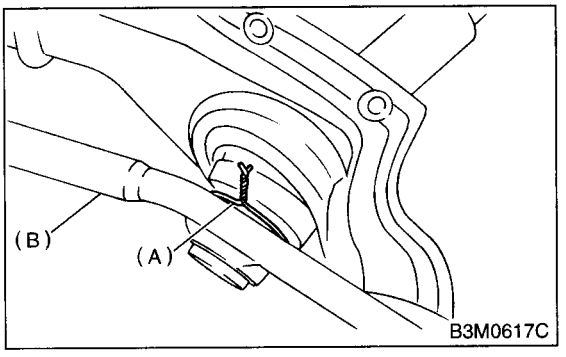
4) Insert the gear shift lever into the boot hole.
5) Install the snap ring and stay to the bushing B.



(A) Snap ring
(B) Bushing B

6) Tighten with locking wire to the extent that the boot will not come off.

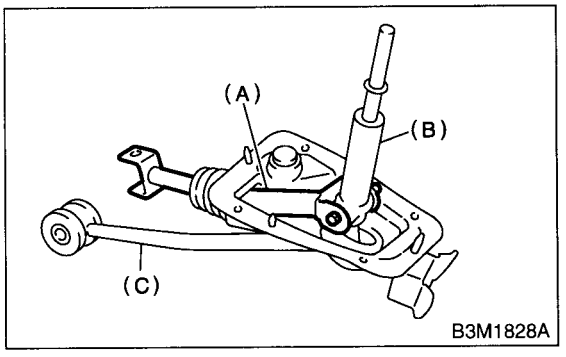
CAUTION:
Always use new locking wire.



(A) Locking wire
(B) Stay

7) Insert the rod into the boot hole.
8) Connect the rod to gear shift lever.

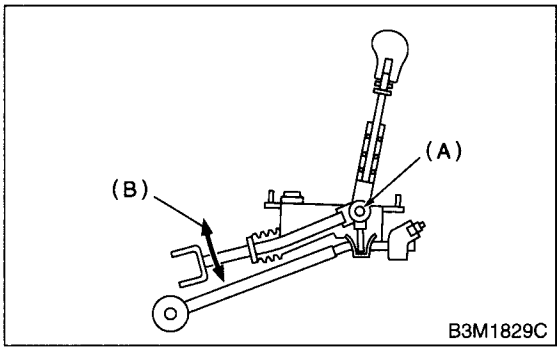
Tightening torque:
11.8 N·m (1.2 kgf-m, 8.7 ft-lb)



(A) Rod
(B) Shift lever
(C) Stay

9) Check the swing torque of the rod in relation to the gear shift lever.
If the torque exceeds the specification, replace the bushing or retighten nuts.

Rocking torque:
0.7 N·m (0.07 kgf-m, 0.5 ft-lb) or less

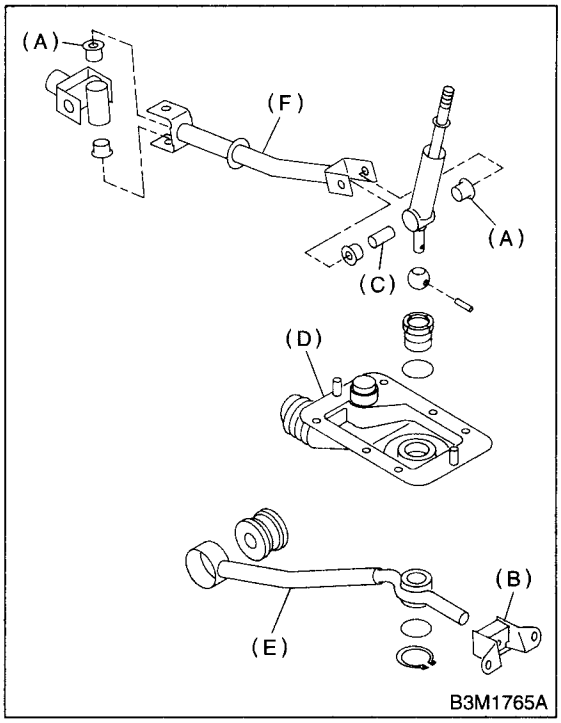


(A) Center of rotation
(B) Swing torque

10) Check that there is no excessive play and that parts move smoothly.

E: INSPECTION

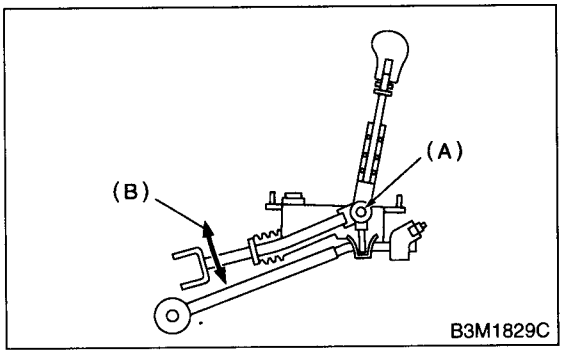
1) Check each part (bushing, cushion rubber, spacer, boot, stay and rod, etc.) for deformation, damage and wear. Repair or replace any defective part. Determine defective parts by comparing with new parts.



(A) Bushing
(B) Cushion rubber
(C) Spacer
(D) Boot
(E) Stay
(F) Rod

2) Check the swing torque of the rod in relation of the gear shift lever.
If the torque exceeds the specification, replace the bushing or retighten nuts.

Rocking torque:
0.7 N·m (0.07 kgf-m, 0.5 ft-lb) or less



(A) Center of rotation
(B) Swing torque

9. General Diagostic

A: INSPECTION

Symptom	Problem parts
Shift lock does not function.	• Stop light switch • Shift lock solenoid • Integrated module
Shift lock cannot be released.	• Stop light switch • Shift lock solenoid • Integrated module • Inhibitor switch
Key interlock does not function.	• Key warning switch • "P" position switch • Key lock solenoid • Integrated module
Key interlock cannot be released.	• Key warning switch • "P" position switch • Key lock solenoid • Integrated module
Starter does not run.	• Inhibitor switch • Select cable • Starter circuit
Back-up light does not light up.	• Inhibitor switch • Select cable • Back-up light circuit

AUTOMATIC TRANSMISSION

AT

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1. General Description

A: SPECIFICATIONS

1. TORQUE CONVERTER CLUTCH

Model	Non-turbo	Turbo
Type	Symmetric, 3 element, single stage, 2 phase torque converter	
Stall torque ratio	1.9 — 2.1	1.85 — 2.15
Nominal diameter	246 mm (9.69 in)	
Stall speed (at sea level)	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

Model	Sedan non-turbo	Except sedan non-turbo
1st	3.027	2.785
2nd	1.619	1.545
3rd	1.000	
4th	0.694	
Rev	2.272	

5. PLANETARY GEAR AND PLATE

Model	Non-turbo		Turbo
	Sedan	Wagon	
Front sun gear number of teeth	33		
Front pinion number of teeth	21		
Front internal gear number of teeth	75		
Rear sun gear number of teeth	37	42	
Rear pinion number of teeth	19	17	
Tooth number of rear internal gear	75		
Drive & driven plate number of high clutch	4		5
Drive & driven plate number of low clutch	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	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)	2nd gear locked (Deceleration possible 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	9.3 — 9.6 ℓ (9.8 — 10.1 US qt, 7.4 — 7.7 Imp qt)
Lubrication system	Forced feed lubrication with oil pump
Oil	Automatic transmission fluid (above mentioned)

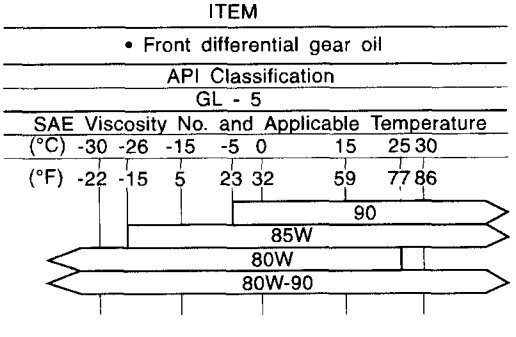
8. COOLING AND HARNESS

Cooling system	Liquid-cooled cooler incorporated in radiator
Inhibitor switch	12 poles
Transmission harness	20 poles

9. TRANSFER

Model	Non-turbo	Turbo
Transfer type	Multi-plate transfer (MPT)	Variable torque distribution (VTD)
Drive & driven plate number of transfer clutch	5	3
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

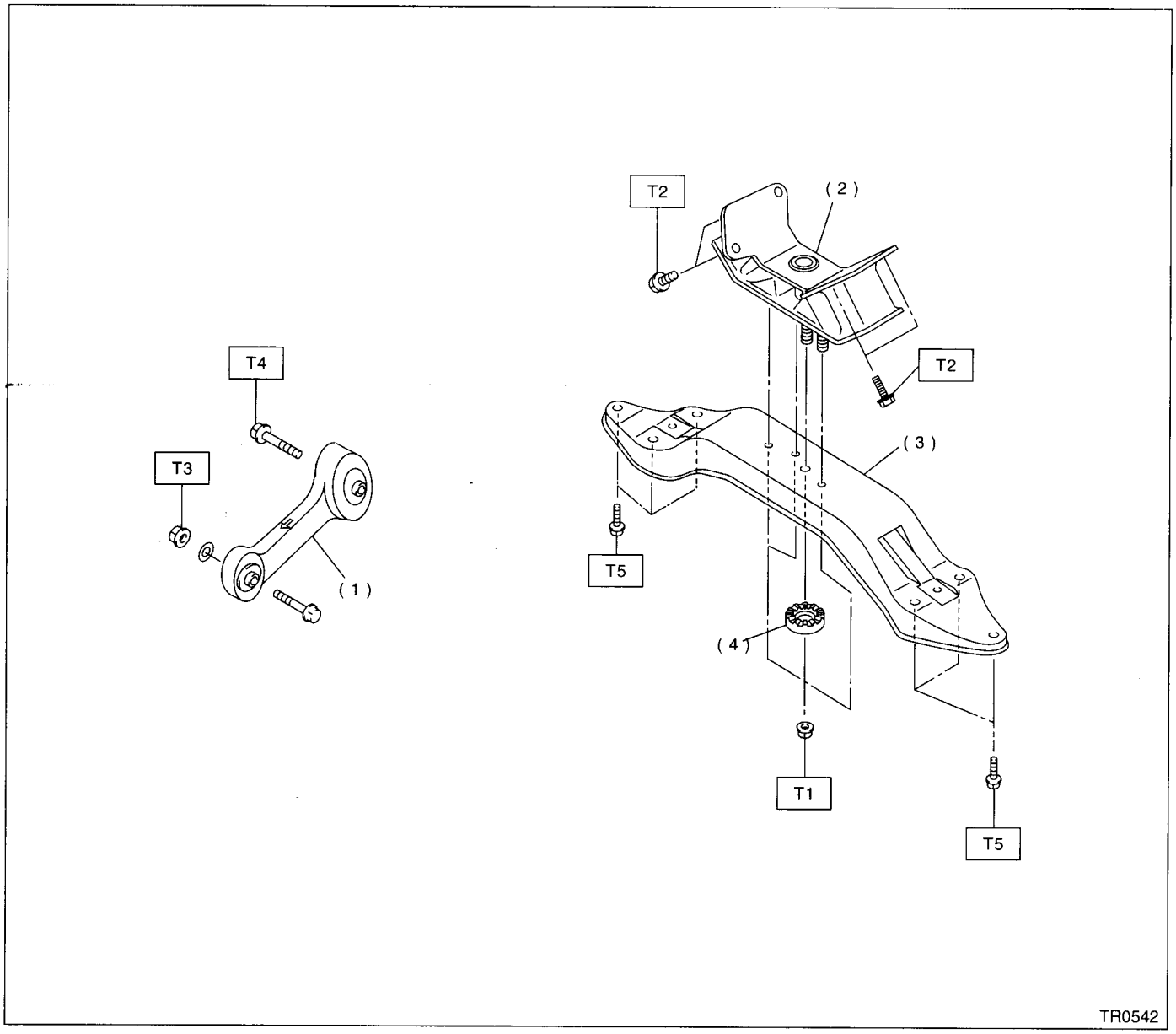
Model	Sedan non-turbo	Except sedan non-turbo
Front final gear ratio	4.444 (40/9)	4.111 (37/9)
Lubrication oil		
Front differential oil capacity	1.2 ℓ (1.3 US qt, 1.1 Imp qt)	

H3M1235A

B: COMPONENT

NOTE:
For information about other transmission mounting components, refer to "AUTOMATIC TRANSMISSION" <Pub. No. G0853ZE> a separate publication.

1. TRANSMISSION MOUNTING



(1) Pitching stopper
(2) Rear cushion rubber
(3) 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 vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.
- Avoid damaging the mating surface of the case.
- Before applying sealant, completely remove the old seal.

D: PREPARATION TOOL

1. SPECIAL TOOLS

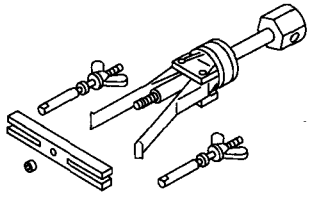
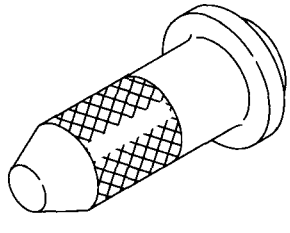
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1977	398527700	PULLER ASSY	Used for removing and installing extension case roller bearing.
 B3M1972	498057300	INSTALLER	Used for installing extension oil seal.

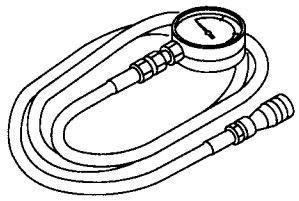
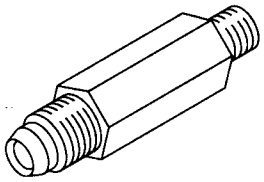
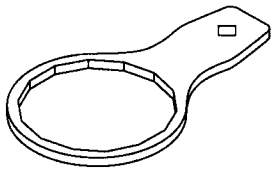
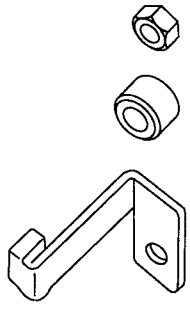
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M2040	498575400	OIL PRESSURE GAUGE ASSY	Used for measuring oil pressure.
 B3M2041	498897200	ADAPTER	Used for oil pump housing when measuring reverse clutch pressure and line pressure.
 B3M2042	498545400	FILTER WRENCH	Used for removing and installing ATF filter.
 B3M2043	498277200	STOPPER SET	Used for removing and installing automatic transmission assembly to engine.

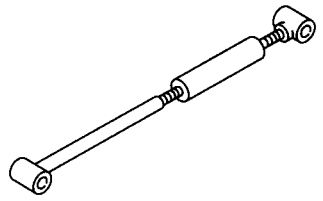
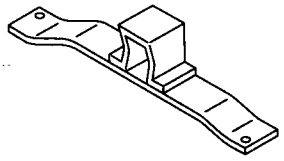
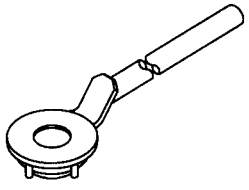
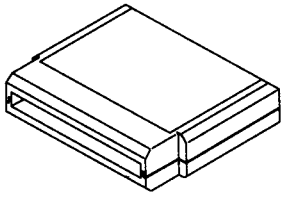
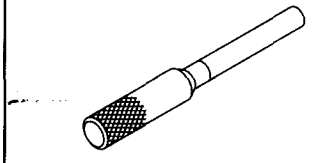
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1976	41099AA020	ENGINE SUPPORT	Used for supporting engine.
 B3M1975	41099AA010	ENGINE SUPPORT BRACKET	Used for supporting engine.
 B2M4157	Turbo model 499977300 Non-turbo model 499977100	CRANK PULLEY WRENCH	Used for removing and installing bolts which hold torque converter clutch and drive plate.
 B2M3876	24082AA150 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)
 B3M2008	499267300	STOPPER PIN	Used for installing and adjusting inhibitor switch.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.

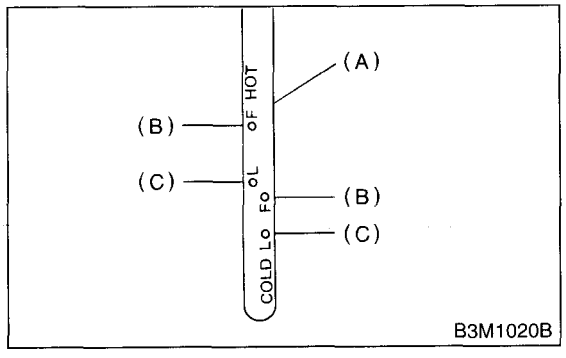
2. Automatic Transmission Fluid

A: INSPECTION

1) Check the level of the ATF.

(1) Raise the ATF temperature to 60 to 80°C (140 to 176°F) from 40 to 60°C (104 to 140°F) (when cold) by driving a distance of 5 to 10 km (3 to 6 miles).

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



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

(2) Make sure the vehicle is level. After selecting all positions (P, R, N, D, 3, 2, 1), set the select leveler in "P" range. Measure fluid level with the engine idling.

NOTE:
After running, idle the engine for one or two minutes before measurement.

(3) If the fluid level is below the center between upper and lower marks, add the recommended ATF until the fluid level is found within the specified range (above the center between upper and lower marks). 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.

CAUTION:
- **Use care not to exceed the upper limit level.**
- **ATF level varies with temperature. Remember that the addition of fluid to the upper limit mark when the transmission is cold will result in overfilling of fluid.**

(4) Fluid temperature rising speed:
- By idling the engine

Time for temperature rise to 60°C (140°F) with atmospheric temperature of 0°C (32°F): More than 25 minutes
<Reference>
Time for temperature rise to 30°C (86°F) with atmospheric temperature of 0°C (32°F): Approx. 8 minutes
- By running the vehicle

Time for temperature rise to 60°C (140°F) with atmospheric temperature of 0°C (32°F): More than 10 minutes

(5) Method for checking fluid level upon delivery or at periodic inspection:
Check fluid level after a warm-up run of approx. 10 minutes. During the warm-up period, the automatic transmission functions can also be checked.

2) Check the fluid 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.

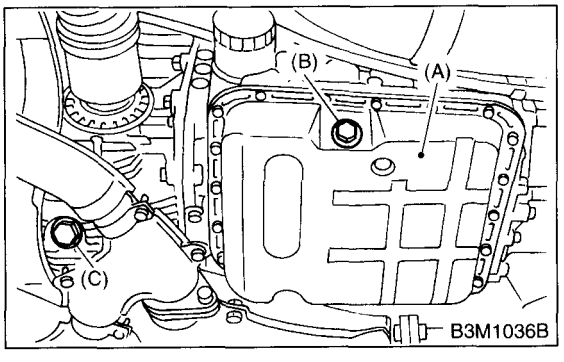
B: REPLACEMENT

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.

NOTE:
Tighten the ATF drain plug after draining the ATF.

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



(A) Oil pan
(B) Drain plug
(C) Differential oil drain plug

3) Lower the vehicle.

4) Pour ATF into the oil charge pipe.

Recommended fluid:
Dexron III type automatic transmission fluid

Capacity:
Fill the same amount of fluid drained from the drain plug hole.

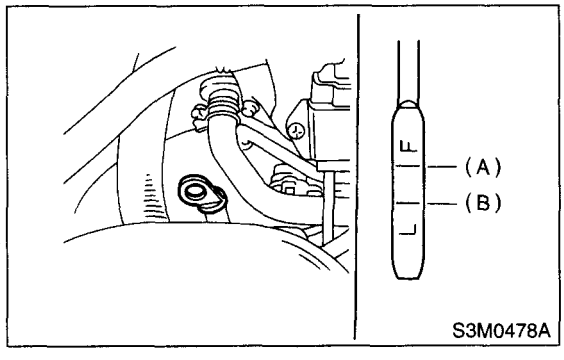
Capacity when transmission is overhauled:
9.3 — 9.6 ℓ (9.8 — 10.1 US qt, 8.2 — 8.4 Imp qt)

5) Check the level and leaks of the ATF.
<Ref. to AT-9, INSPECTION, 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

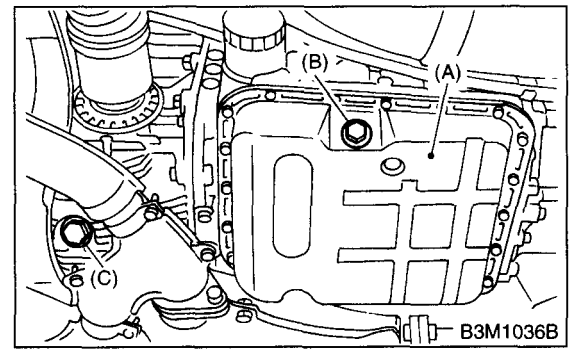
B: REPLACEMENT

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.

NOTE:
Tighten the differential gear oil drain plug after draining the differential gear oil.

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



(A) Oil pan
(B) Drain plug
(C) Differential oil drain plug

3) Lower the vehicle.
4) Pour gear oil into the gauge hole.

Recommended fluid:
Use GL-5 or equivalent.

Gear oil capacity:
1.2 ℓ (1.3 US qt, 1.1 Imp qt)

5) Check the level of the differential gear oil.
<Ref. to AT-11, 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.

CAUTION:
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 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 axle 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.OIL LEAKS

After the driving test, inspect for oil leaks.

5. Stall Test

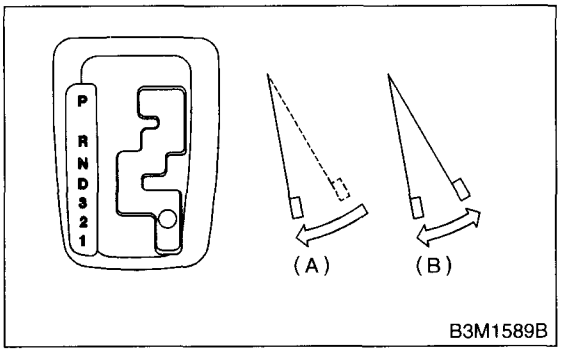
A: INSPECTION

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 engine performance.

2. TEST METHODS

1) Preparations before 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 approximately 30 minutes (with select lever set to "N" or "P").
2) Install an engine tachometer at a location visible from the driver's compartment and mark the stall speed range on the tachometer scale.
3) Place the wheel chocks at the front and rear of all wheels and engage the parking brake.
4) Move the manual linkage to ensure it operates properly, and shift the select lever to the "2" range.
5) 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

6) When the engine speed is stabilized, read that speed quickly and release the accelerator pedal.
7) Shift the select lever to Neutral, and cool down the engine by idling it for more than one minute.
8) Record the stall speed.
9) 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 D range.
10) Perform the stall tests with the select lever in the R range.

NOTE:
• Do not continue the stall test for MORE THAN FIVE 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 one 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):
Non-turbo model: 2,100 — 2,600 rpm
Turbo model: 2,600 — 3,300 rpm

3. EVALUATION

Stall speed (at sea level)	Position	Cause
Less than specifications	2, 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 malfunctioning
	R	• Line pressure too low • Reverse clutch slipping • Low & reverse brake slipping
	2	• Line pressure too low • Low clutch slipping • 2-4 brake slipping

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.

CAUTION:
• Perform the test at normal operation fluid temperature 60 to 80°C (140 to 176°F).
• Be sure to allow a one 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.
3) Check the idling speed (A/C OFF).
4) 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
5) 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):

CAUTION:

- **Before measuring line pressure, jack-up all wheels.**
- **Maintain temperature of ATF at approximately 50°C (122°F) during measurement.**

(ATF will reach the above temperature after idling the engine for approximately 30 minutes with select lever in "N" or "P".)

2) Line pressure measurement (under heavy load):

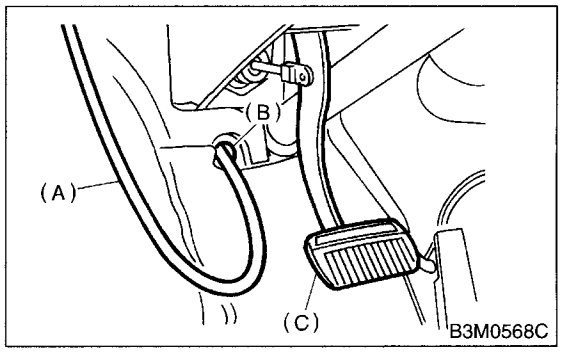
CAUTION:

- **Before measuring line pressure, apply both foot and parking brakes with all wheels chocked (Same as for "stall" test conditions).**
- **Measure the line pressure when the select lever is in "R", "2" with engine under stall conditions.**
- **Measure the line pressure within 5 the seconds after shifting the select lever to each position. (If the line pressure needs to be measured again, allow the engine to idle and then stop. Wait for at least one minute before measurement.)**
- **Maintain the temperature of ATF at approximately 50°C (122°F) during measurement. (ATF will reach the above temperature after idling the engine for approximately 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 the engine compartment.

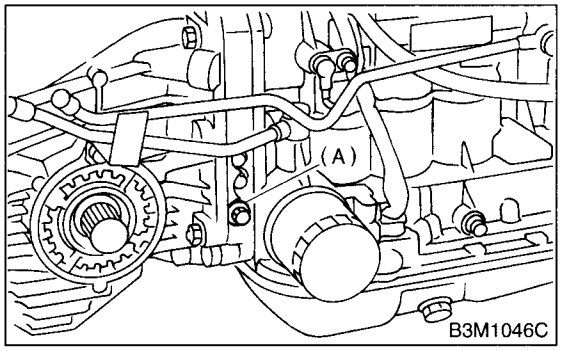
ST 498575400 OIL PRESSURE GAUGE ASSY



(A) Pressure gauge hose
(B) Hole in toe board (blind plug hole)
(C) Brake pedal

2) Remove the test plug and install the ST instead.

ST 498897200 OIL PRESSURE GAUGE ADAPTER



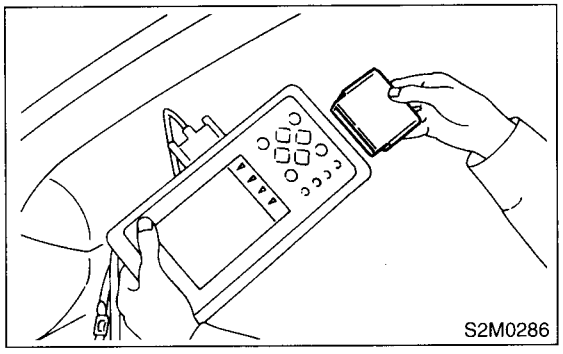
(A) Test plug

3) Connect 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 the Subaru Select Monitor.

(1) Insert the cartridge to the Subaru Select Monitor. <Ref. to AT-5, 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	100	Full closed	304 — 412 (3.1 — 4.2, 44 — 60)

8. Transfer Clutch Pressure Test

A: INSPECTION

1. TEST METHODS

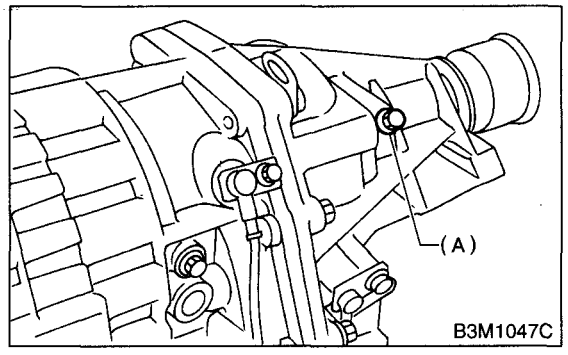
• MPT model

Check the transfer clutch pressure in accordance with the following chart in the same manner as with line pressure. <Ref. to AT-16, 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

CAUTION:
Before setting in FWD mode, install the spare fuse on FWD mode switch.

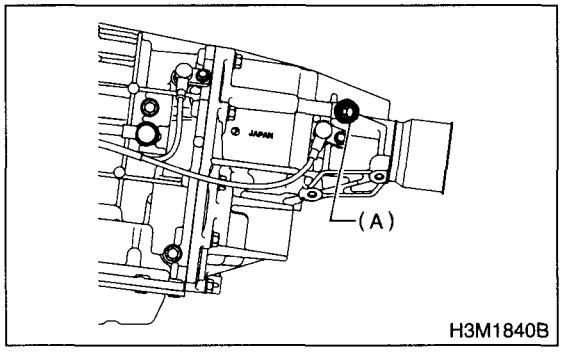


(A) Test plug

• VTD model

Check the transfer clutch pressure in accordance with the following chart in the same manner as with line pressure.

ST 498897700 OIL PRESSURE ADAPTER SET
ST 498575400 OIL PRESSURE GAUGE ASSY



(A) Test plug

2. EVALUATION

• MTP model

NOTE:
If the 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 the 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)			
Duty ratio (%)	Throttle position	AWD mode	FWD mode
5	Full closed	932 — 1,089 (9.5 — 11.1, 135 — 158)	—
60	2/3 throttle	216 — 294 (2.2 — 3.0, 31 — 43)	—
95	Full open	—	0 (0, 0)

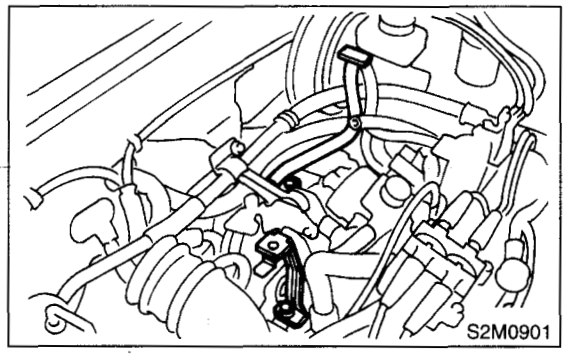
• VTD model

Duty ratio (%)	Throttle position	Standard transfer clutch pressure kPa (kg/cm^2, psi)
5	Full closed	932 — 1,089 (9.5 — 11.1, 135 — 158)
60	2/3 throttle	216 — 294 (2.2 — 3.0, 31 — 43)

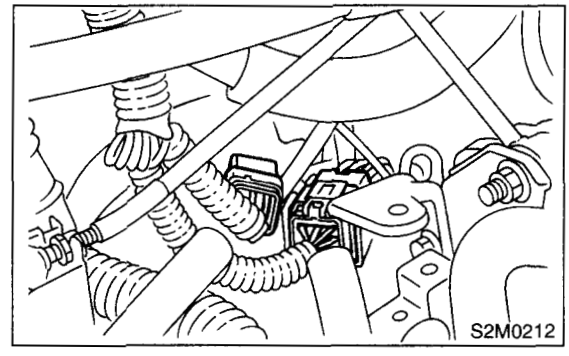
9. Automatic Transmission Assembly

A: REMOVAL

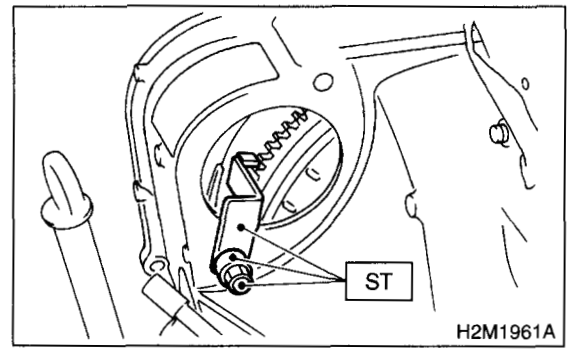
1) Set the vehicle on the lift.
2) Open the front hood fully, and support it with stay.
3) Disconnect the ground terminal from battery.
4) Remove the air intake duct. (Non-turbo model) <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
5) Remove the air cleaner case. (Non-turbo model) <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
6) Remove the air cleaner case stay. (Non-turbo model)



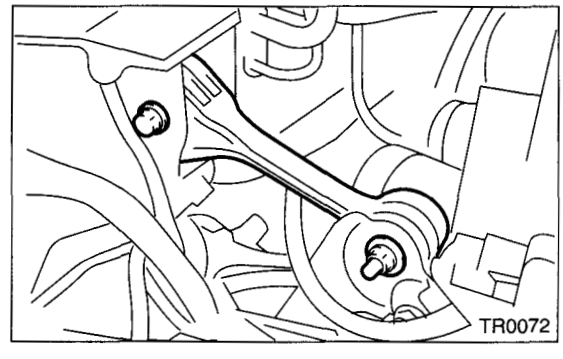
7) Remove the intercooler. (Turbo model) <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>
8) Remove the front, center, rear exhaust pipe and muffler. (Non-turbo model)
<Ref. to EX(SOHC)-5, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(SOHC)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-11, REMOVAL, Muffler.>
9) Remove the center, rear exhaust pipe and muffer. (Turbo model) <Ref. to EX(DOHC TURBO)-8, REMOVAL, Center Exhaust Pipe.>, <Ref. to EX(DOHC TURBO)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(DOHC TURBO)-14, REMOVAL, Muffler.>
10) Disconnect the following connectors:
(1) Transmission harness connector



(2) Transmission ground terminal
11) Remove the starter. <Ref. to SC-6, REMOVAL, Starter.>
12) Install the ST to torque converter clutch case.
ST 498277200 STOPPER SET



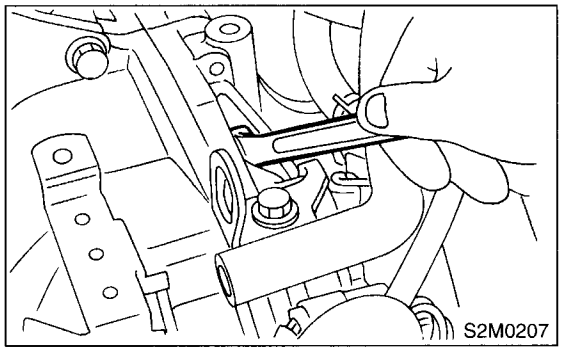
13) Remove the pitching stopper.



14) Separate the torque converter clutch from drive plate.
(1) Remove the service hole plug.
(2) Remove the bolts which hold torque converter clutch to drive plate.
(3) While rotating the engine, remove the other bolts using ST.

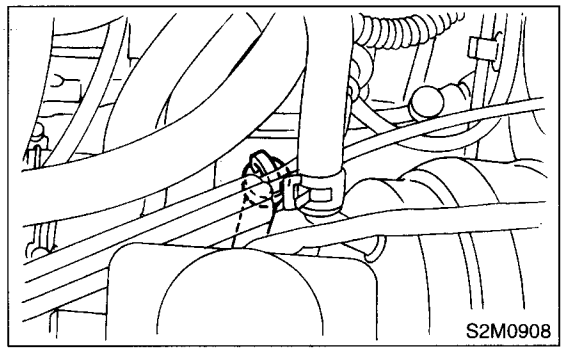
CAUTION:
Be careful not to drop bolts into the torque converter clutch housing.

Turbo model
ST 499977300 CRANK PULLEY WRENCH
Non-turbo model
ST 499977100 CRANK PULLEY WRENCH



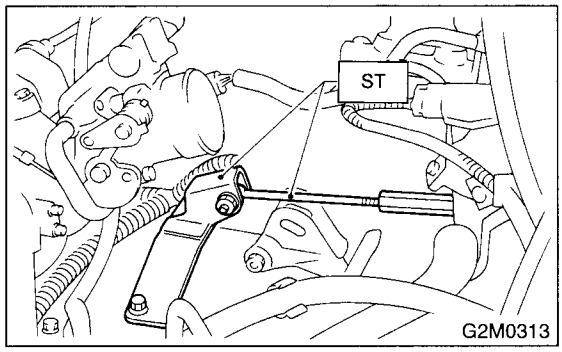
15) Remove the ATF level gauge.

CAUTION:
Plug the opening to prevent entry of foreign particles into transmission fluid.

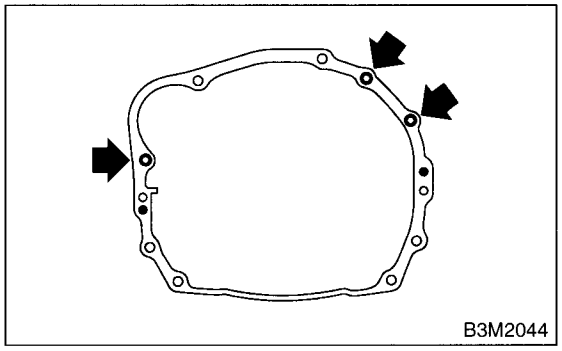


16) Set the ST.

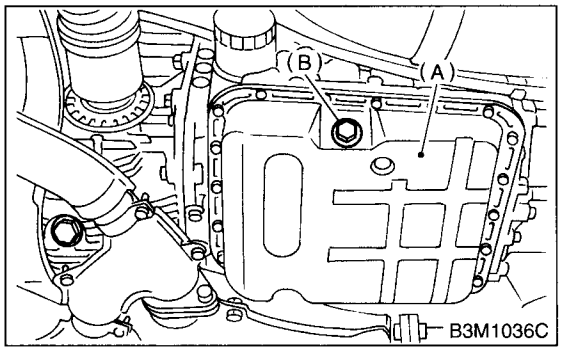
NOTE:
Also is available Part No. 41099AA010.
ST 41099AA020 ENGINE SUPPORT ASSY



17) Remove the bolt which holds right upper side of transmission to engine.

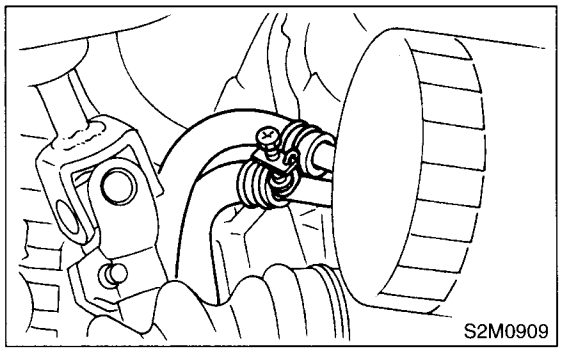


18) Lift-up the vehicle.
19) Remove the under cover.
20) Remove the heat shield cover. (If equipped)
21) Drain the ATF to remove the ATF drain plug.



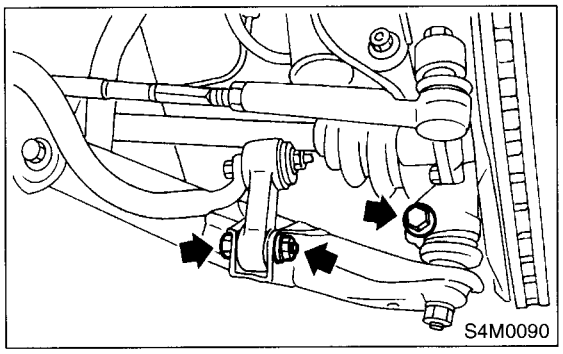
(A) Oil pan
(B) Drain plug

22) Disconnect the ATF cooler hoses from pipes of transmission side, and remove the ATF level gauge guide.

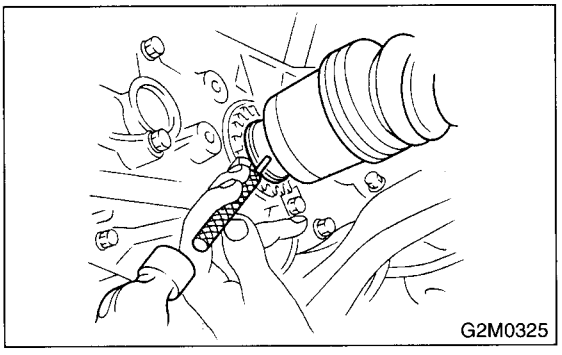


23) Remove the propeller shaft.
<Ref. to DS-14, REMOVAL, Propeller Shaft.>
24) Remove the shift select cable. <Ref. to CS-26, REMOVAL, Select Cable.>
25) Disconnect the stabilizer link from transverse link.

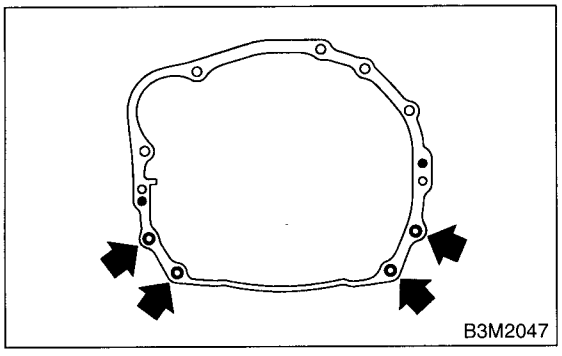
26) Remove the bolt securing ball joint of transverse link to housing.



27) Remove the spring pins and separate front drive shafts from each side of the transmission.



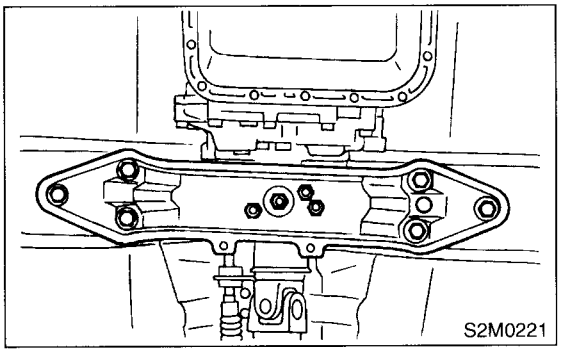
28) Remove the nuts which hold lower side of transmission to engine.



29) Place the transmission jack under transmission.

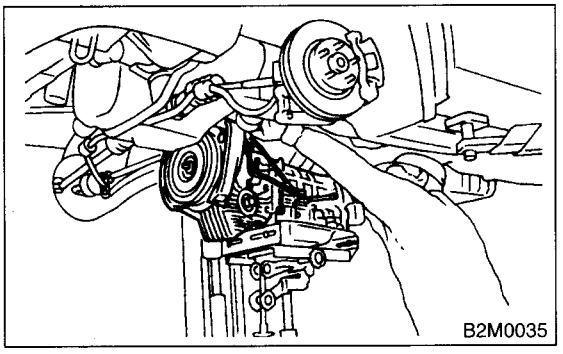
CAUTION:
• Make sure that the support plates of transmission jack don't touch the oil pan.

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.



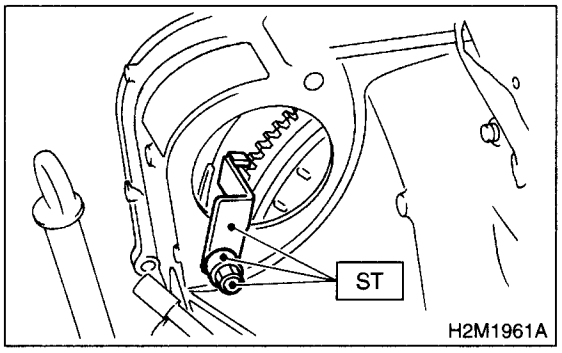
32) Separate transmission assembly and rear cushion rubber.

B: INSTALLATION

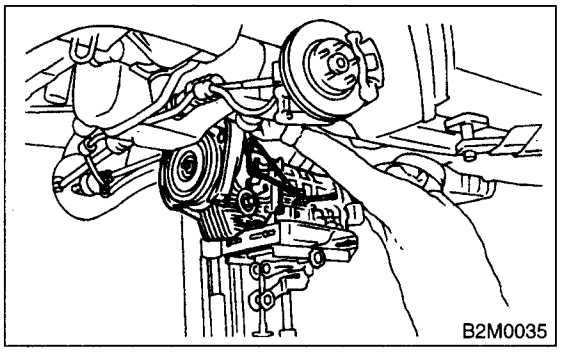
1) Install the rear cushion rubber to transmission assembly.

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

2) Install the ST to torque converter clutch case.
ST 498277200 STOPPER SET



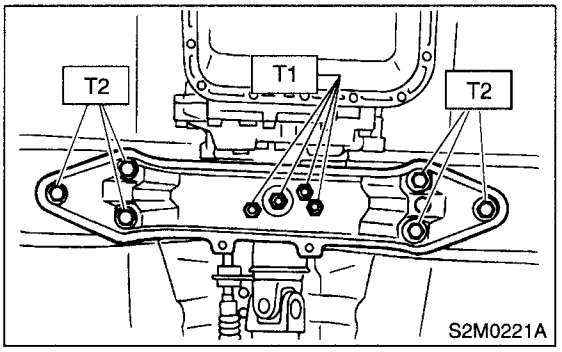
3) Install the transmission onto engine.
(1) Gradually raise the transmission with transmission jack.



(2) Engage them at splines.

4) Install the transmission rear crossmember.

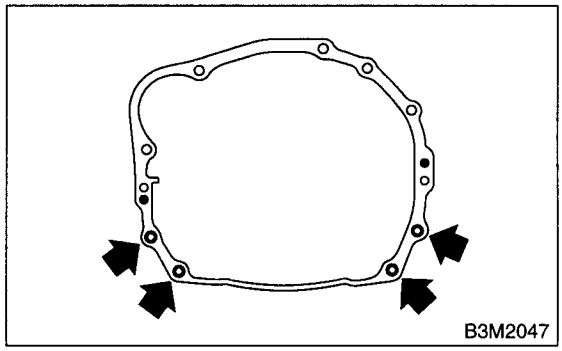
Tightening torque:
T1: 35 N·m (3.6 kgf-m, 26 ft-lb)
T2: 70 N·m (7.1 kgf-m, 51.4 ft-lb)



5) Take off the transmission jack.

6) 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)



7) Lower the vehicle.

8) Connect the engine and transmission.
(1) Remove the ST from torque converter clutch case.

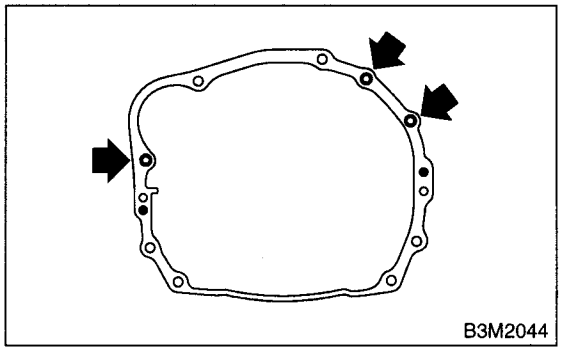
NOTE:
Be careful not to drop the ST into the torque converter clutch case when removing the ST.

ST 498277200 STOPPER SET

(2) Install the starter.
<Ref. to SC-7, INSTALLATION, Starter.>

(3) Tighten the bolt which holds right upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

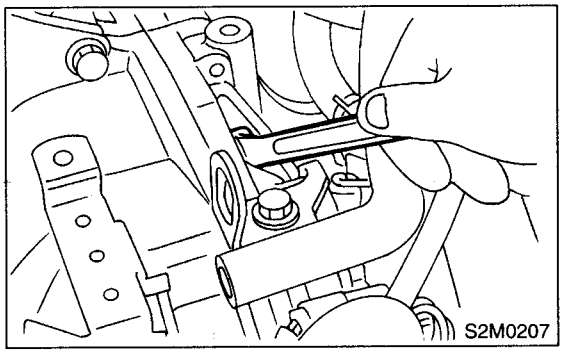


9) Install the torque converter clutch to drive plate.
(1) Tighten the bolts which hold torque converter clutch to drive plate.
(2) Tighten the other bolts while rotating the engine by using ST.

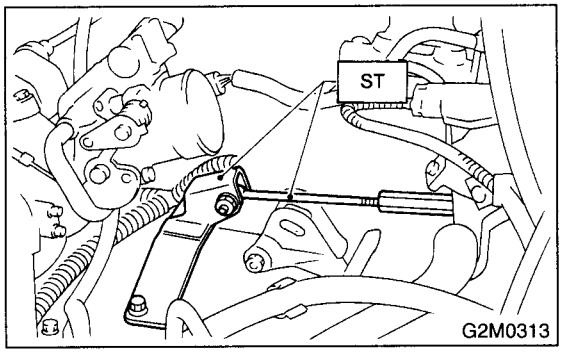
CAUTION:
Be careful not to drop bolts into the torque converter clutch housing.

Turbo model
ST 499977300 CRANK PULLEY WRENCH
Non-turbo model
ST 499977100 CRANK PULLEY WRENCH

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

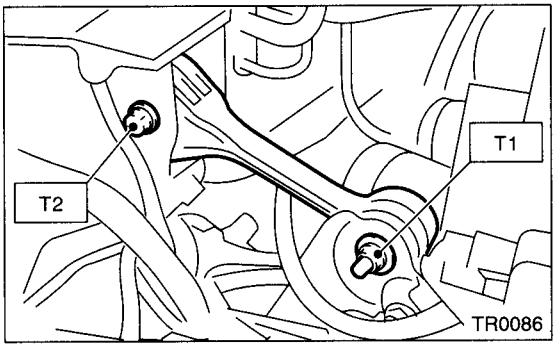


(3) Clog the service hole with a plug.
10) Remove the ST.



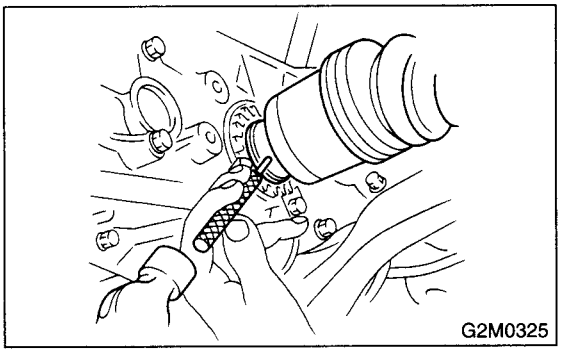
11) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



12) Lift-up the vehicle.
Install the front drive shafts into transmission.
(1) Lift-up the vehicle.
(2) Install the front drive shaft into transmission.
(3) Drive the spring pin into chamfered hole of drive shaft.

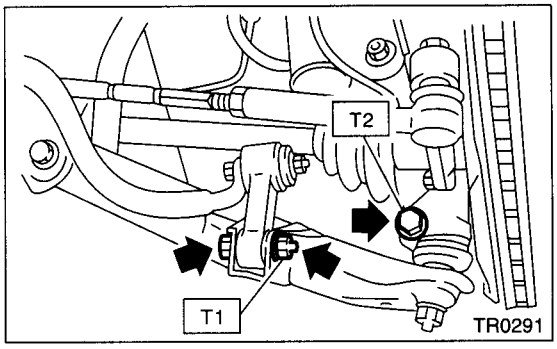
CAUTION:
Always use a new spring pin.



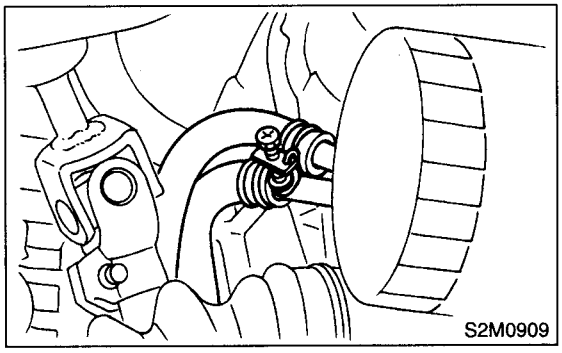
13) Install the ball joint into housing.
14) Connect the stabilizer link to transverse link, and temporarily tighten the bolts.

CAUTION:
Discard the loosened self-locking nut and replace with a new one.

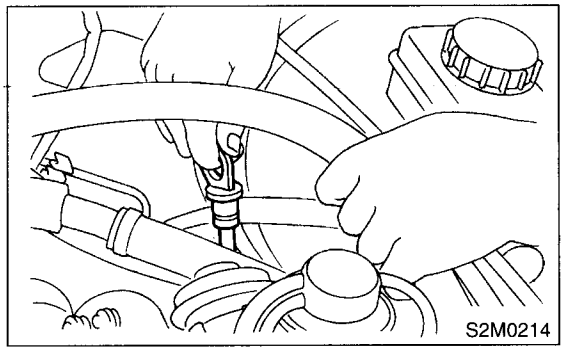
Tightening torque:
T1: 30 N·m (3.1 kgf-m, 22.4 ft-lb)
T2: 50 N·m (5.1 kgf-m, 37 ft-lb)



15) Install the shift select cable onto select lever.
<Ref. to CS-27, INSTALLATION, Select Cable.>
16) Install the ATF level gauge guide, and connect the ATF cooler hoses to pipe.



17) Install the propeller shaft.
<Ref. to DS-15, INSTALLATION, Propeller Shaft.>
18) Install the heat shield cover. (If equipped)
19) Install the front, center, rear exhaust pipes and muffler. (Non-turbo model)
<Ref. to EX(SOHC)-6, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(SOHC)-9, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-11, INSTALLATION, Muffler.>
20) Install the center, rear exhaust pipes and muffler. (Turbo model) <Ref. to EX(DOHC TURBO)-9, INSTALLATION, Center Exhaust Pipe.>, <Ref. to EX(DOHC TURBO)-13, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX(DOHC TURBO)-14, INSTALLATION, Muffler.>
21) Install the under cover.
22) Lower the vehicle.
23) Install the ATF level gauge.



24) Connect the following connectors:
(1) Transmission harness connectors
(2) Transmission ground terminal
25) Install the air cleaner case stay. (Non-turbo model)

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)

26) Install the air cleaner case. (Non-turbo model) <Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.>
27) Install the air intake duct. (Non-turbo model) <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.>
28) Install the intercooler. (Turbo model) <Ref. to IN(DOHC TURBO)-11, INSTALLATION, Intercooler.>
29) Connect the battery ground terminal.
30) 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:
9.3 — 9.6 ℓ (9.8 — 10.1 US qt, 7.4 — 7.7 Imp qt)

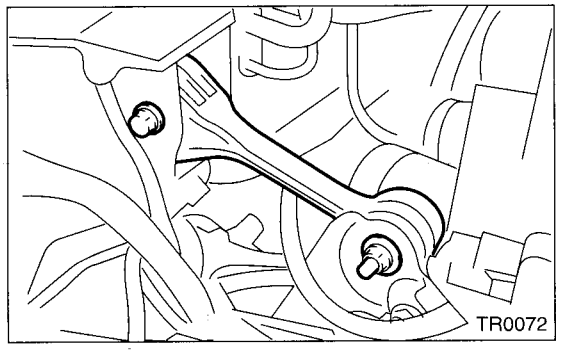
31) Take off the vehicle from lift arms.
32) Check the select lever operation.
<Ref. to AT-28, INSPECTION, Inhibitor Switch.>
33) Check the ATF level. <Ref. to AT-9, Automatic Transmission Fluid.>
34) Check the vehicle on the road tester.
<Ref. to AT-12, Road Test.>

10.Transmission Mounting System

A: REMOVAL

1. PITCHING STOPPER

1) Disconnect the ground terminal from battery.
2) Remove the air intake duct. (Non-turbo model) <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
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(DOHC TURBO)-10, REMOVAL, Intercooler.>
5) Remove the pitching stopper.



2. CROSSMEMBER AND CUSHION RUBBER

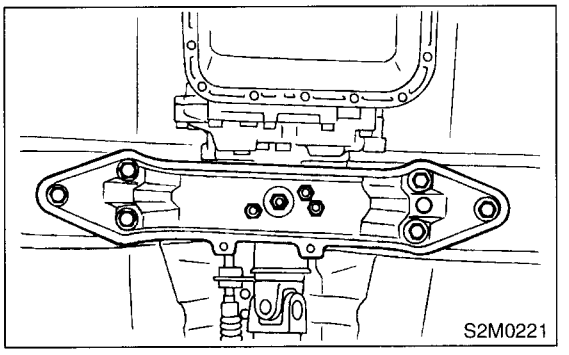
1) Disconnect the ground terminal from battery.
2) Jack-up the vehicle and support it with sturdy racks.
3) Remove the front, center, rear exhaust pipes and muffler. (Non-turbo model)
<Ref. to EX(SOHC)-5, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(SOHC)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-11, REMOVAL, Muffler.>
4) Remove the center, rear exhaust pipes and muffler. (Turbo model) <Ref. to EX(DOHC TURBO)-8, REMOVAL, Center Exhaust Pipe.>, <Ref. to EX(DOHC TURBO)-13, REMOVAL, Rear Exhaust Pipe.>, <Ref. to EX(DOHC TURBO)-14, REMOVAL, Muffler.>

CAUTION:
When removing the exhaust pipes, be careful each exhaust pipe does not drop out.

5) Remove the heat shield cover. (If equipped)
6) Set the transmission jack under the transmission.

CAUTION:
• Make sure that the support plates of transmission jack don't touch the oil pan.

7) Remove the crossmember.



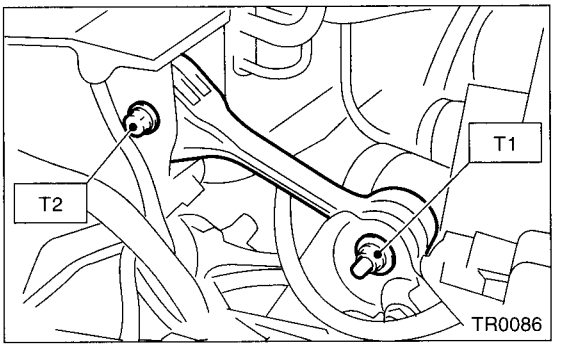
8) Remove the rear cushion rubber.

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 intake duct and cleaner case. (Non-turbo model) <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>, <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
3) Install the intercooler. (Turbo model) <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>

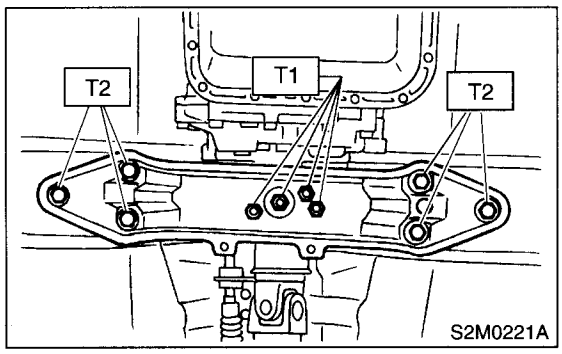
2. CROSSMEMBER AND CUSHION RUBBER

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, 51.4 ft-lb)



3) Remove the transmission jack.
4) Install the heat shield cover. (If equipped)
5) Install the front, center, rear exhaust pipes and the muffler. (Non-turbo model)
<Ref. to EX(SOHC)-6, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(SOHC)-9, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-11, INSTALLATION, Muffler.>
6) Install the center, rear exhaust pipes and muffler. (Turbo model) <Ref. to EX(DOHC TURBO)-14, INSTALLATION, Muffler.>, <Ref. to EX(DOHC TURBO)-13, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX(DOHC TURBO)-9, INSTALLATION, Center Exhaust Pipe.>

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

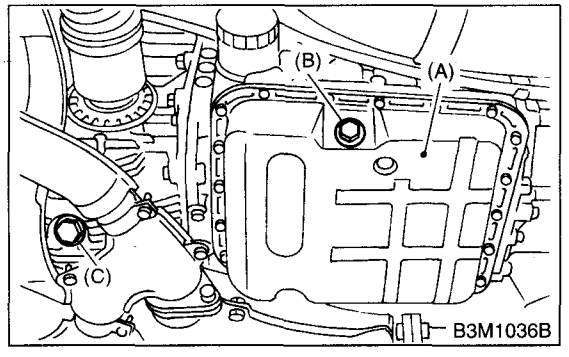
Make sure that the ATF does not leak from the joint of the transmission and propeller shaft. If so, replace the oil seal. <Ref. to AT-27, REPLACEMENT, Extension Case Oil Seal.>

B: REPLACEMENT

1) Set the vehicle on the lift.
2) Disconnect the ground terminal from battery.
3) Lift up the vehicle.
4) Clean the transmission exterior.
5) Drain the ATF completely.

NOTE:
Tighten the ATF drain plug after draining the ATF.

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



(A) Oil pan
(B) Drain plug
(C) Differential oil drain plug

6) Remove the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(SOHC)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-11, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(DOHC TURBO)-13, REMOVAL, Rear Exhaust Pipe.>, <Ref. to EX(DOHC TURBO)-14, REMOVAL, Muffler.>
7) Remove the heat shield cover. (If equipped)
8) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
9) Using the ST, remove the oil seal.
ST 398527700 PULLER ASSY
10) Using the ST, install the oil seal.
ST 498057300 INSTALLER
11) Install the propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>
12) Install the heat shield cover. (If equipped)
13) Install the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(SOHC)-9, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-11, INSTALLATION, Muffler.>
Turbo model
<Ref. to EX(DOHC TURBO)-14, INSTALLATION, Muffler.>, <Ref. to EX(DOHC TURBO)-13, INSTALLATION, Rear Exhaust Pipe.>
14) Pour ATF and check the ATF level. <Ref. to AT-9, Automatic Transmission Fluid.>

12.Inhibitor Switch

A: INSPECTION

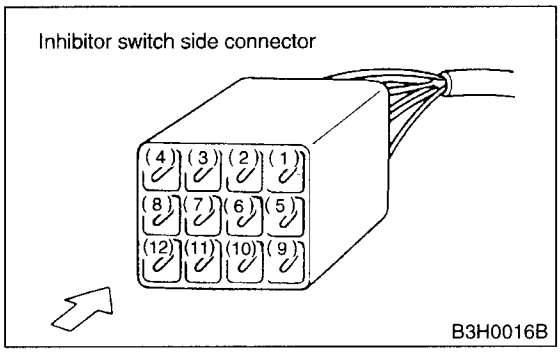
When the driving condition or starter motor operation is erroneous, first check the shift linkage for improper operation. If the shift linkage is functioning properly, check the inhibitor switch.

1) Disconnect the inhibitor switch connector.
2) Check continuity in inhibitor switch circuits with the select lever moved to each position.

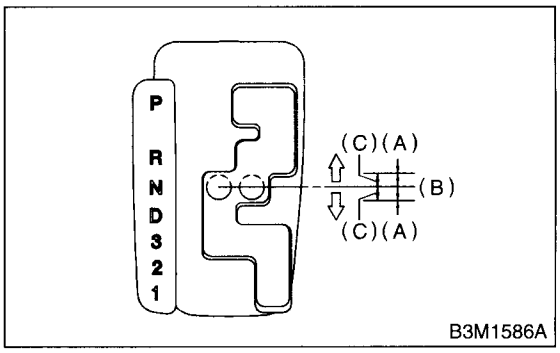
CAUTION:
Also check that continuity in ignition circuit does not exist when the select lever is in R, D, 3, 2 and 1 ranges.

NOTE:
If the inhibitor switch is inoperative, check for poor contact of connector on transmission side.

	Position	Pin No.
Signal sent to TCM	P	4 — 3
	R	4 — 2
	N	4 — 1
	D	4 — 8
	3	4 — 7
	2	4 — 6
	1	4 — 5
Starter 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 the 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-28, ADJUSTMENT, Inhibitor Switch.>

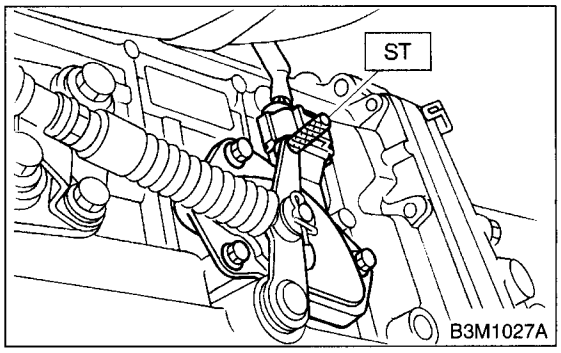


(A) Continuity does not exist.
(B) Continuity exists.
(C) 1.5°

4) Repeat the above checks. If there are abnormalities, adjust the select cable. <Ref. to CS-27, ADJUSTMENT, Select Cable.>

B: ADJUSTMENT

1) Shift the select lever to the N range.
2) Loosen the three inhibitor switch securing bolts.
3) Insert the ST as vertical as possible into the holes in the inhibitor switch lever and switch body.
ST 499267300 STOPPER PIN



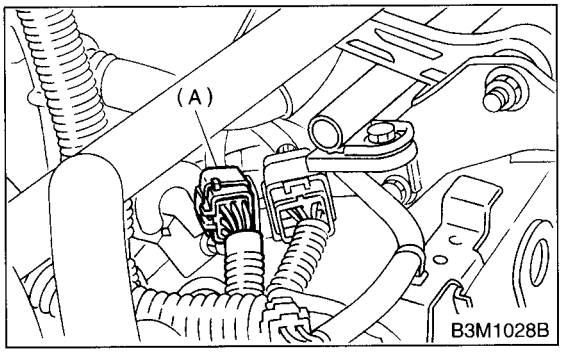
4) Tighten the three inhibitor switch bolts.

Tightening torque:
3.4 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.

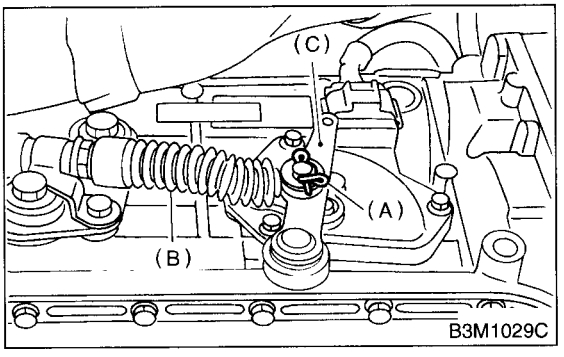
C: REMOVAL

1) Set up the vehicle on the lift.
2) Move the select lever to neutral position.
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(DOHC TURBO)-10, REMOVAL, Intercooler.>
5) Disconnect the inhibitor switch connector.



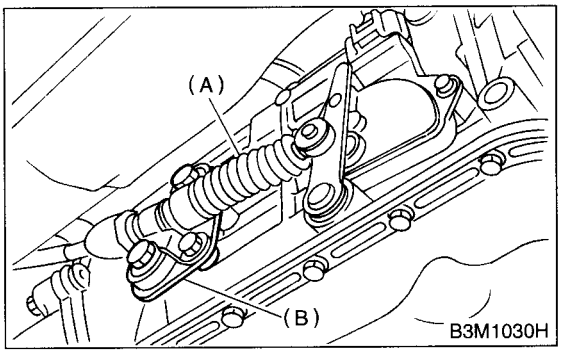
(A) Inhibitor switch

6) Remove the inhibitor switch connector from stay.
7) Lift-up the vehicle.
8) Remove the front exhaust pipe with center exhaust pipe. (Non-turbo model)
<Ref. to EX(SOHC)-5, REMOVAL, Front Exhaust Pipe.>
9) Remove the center exhaust pipe. (Turbo model) <Ref. to EX(DOHC TURBO)-8, REMOVAL, Center Exhaust Pipe.>
10) Remove the snap pin from range select lever.



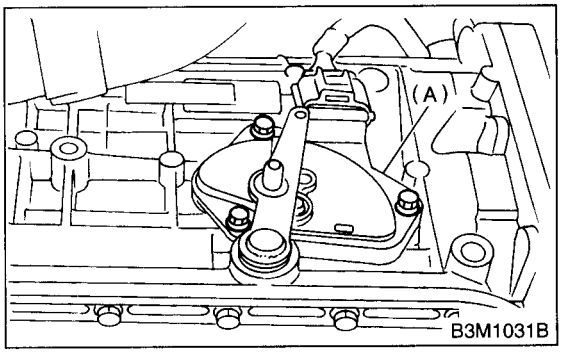
(A) Snap pin
(B) Select cable
(C) Range select lever

11) Remove the plate assembly from transmission case.



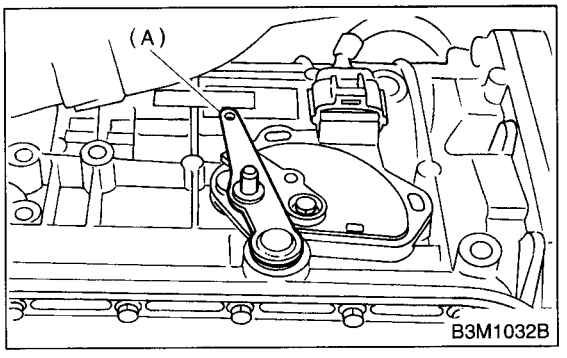
(A) Select cable
(B) Plate ASSY

12) Remove the bolts.



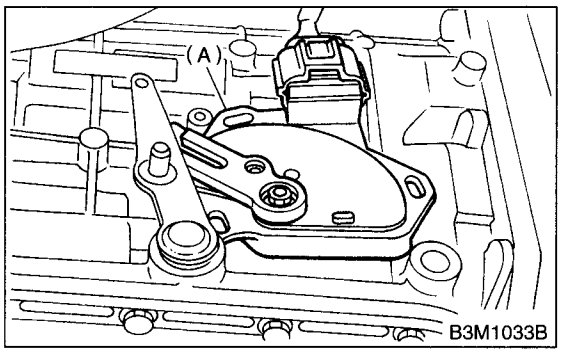
(A) Inhibitor switch

13) Move the range select lever to parking position (left side).



(A) Range select lever

14) Remove the inhibitor switch from transmission.

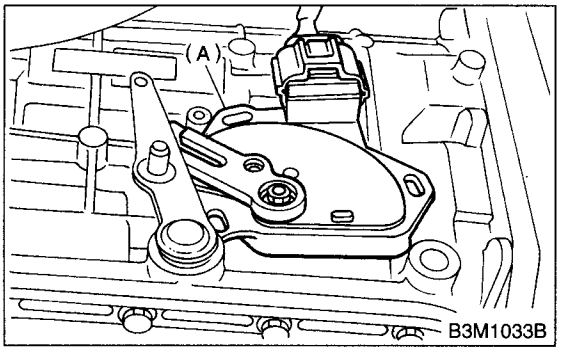


(A) Inhibitor switch

15) Disconnect the inhibitor switch harness from inhibitor switch.

D: INSTALLATION

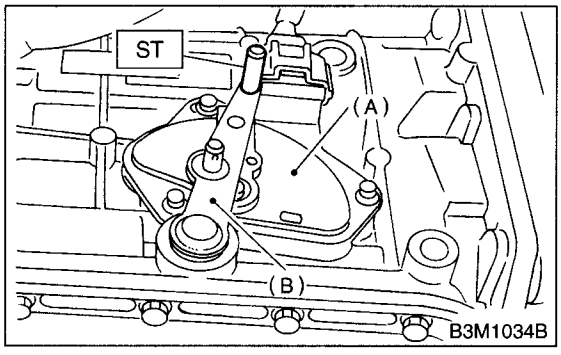
1) Connect the inhibitor switch harness to inhibitor switch.
2) Install the inhibitor switch to transmission case.



(A) Inhibitor switch

3) Move the range select lever to neutral position.
4) Using the ST, tighten bolts of inhibitor switch.
ST 499267300 STOPPER PIN

Tightening torque:
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)

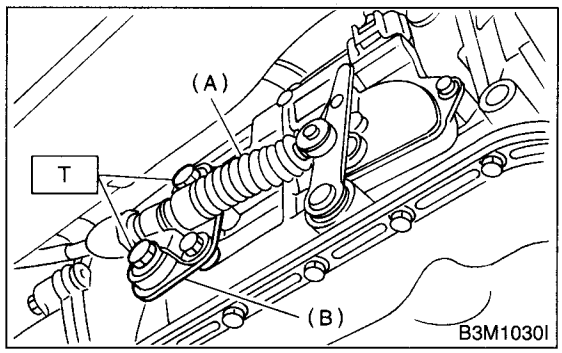


(A) Inhibitor switch
(B) Range select lever

5) Install the select cable to range select lever.

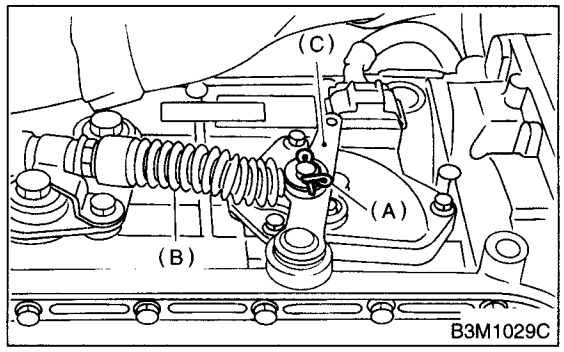
6) Install the plate assembly to transmission.

Tightening torque:
T: 24.5 N·m (2.50 kgf-m, 18.1 ft-lb)



(A) Select cable
(B) Plate ASSY

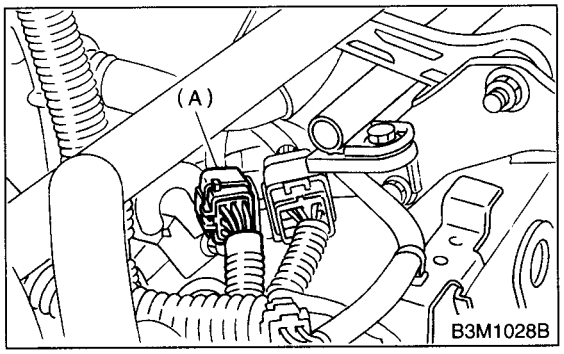
7) Install the snap pin to range select lever.



(A) Snap ring
(B) Select cable
(C) Range select lever

8) Install the front exhaust pipe with center exhaust pipe. (Non-turbo model)
<Ref. to EX(SOHC)-6, INSTALLATION, Front Exhaust Pipe.>
9) Install the center exhaust pipe. (Turbo model)
<Ref. to EX(DOHC TURBO)-9, INSTALLATION, Center Exhaust Pipe.>
10) Lower the vehicle.
11) Install the inhibitor switch connector from stay.

12) Connect the inhibitor switch connector.



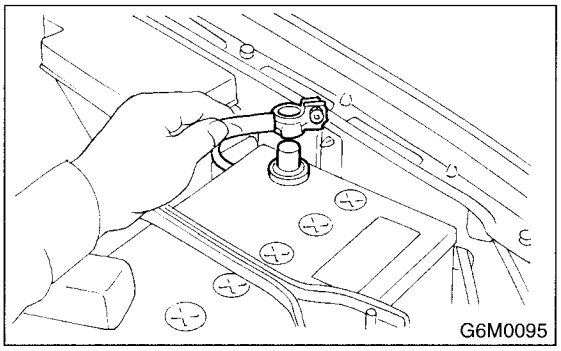
(A) Inhibitor switch

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(DOHC TURBO)-11, INSTALLATION, Intercooler.>
15) Inspect the inhibitor switch. <Ref. to AT-28, INSPECTION, Inhibitor Switch.>

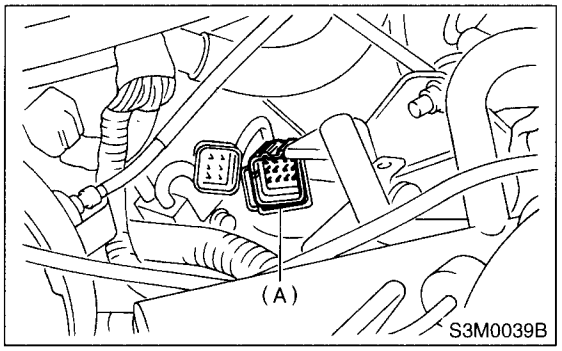
13.Front Vehicle Speed Sensor

A: REMOVAL

1) Set up the vehicle on the lift.
2) Disconnect the ground terminal 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(DOHC TURBO)-10, REMOVAL, Intercooler.>
5) Disconnect the transmission connector.

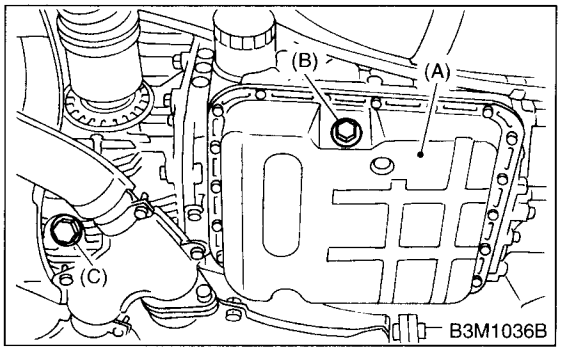


(A) Transmission connector

6) Remove the transmission connector from stay.
7) Lift-up the vehicle.
8) Clean the transmission exterior.
9) Drain the ATF completely.

NOTE:
Tighten the ATF drain plug after draining the ATF.

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

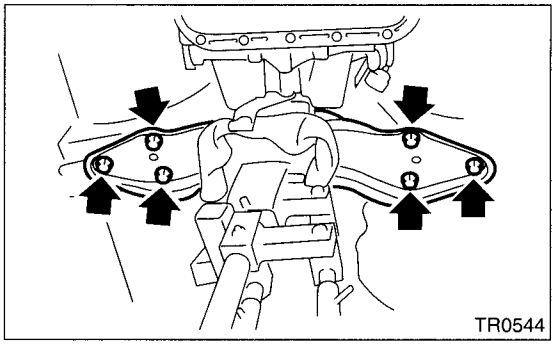


(A) Oil pan
(B) Drain plug
(C) Differential oil drain plug

10) Remove the front, center, rear, exhaust pipes and muffler.
<Ref. to EX(SOHC)-5, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(SOHC)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-11, REMOVAL, Muffler.>
11) Remove the center, rear exhaust pipes and muffler. (Turbo model) <Ref. to EX(DOHC TURBO)-8, REMOVAL, Center Exhaust Pipe.>, <Ref. to EX(DOHC TURBO)-13, REMOVAL, Rear Exhaust Pipe.>, <Ref. to EX(DOHC TURBO)-14, REMOVAL, Muffler.>
12) Remove the shield cover.
13) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
14) Place the transmission jack under crossmember.

NOTE:
Place a shop cloth or equivalent between the crossmember and transmission.

15) Remove the transmission rear crossmember bolts.



16) Lower the AT jack.

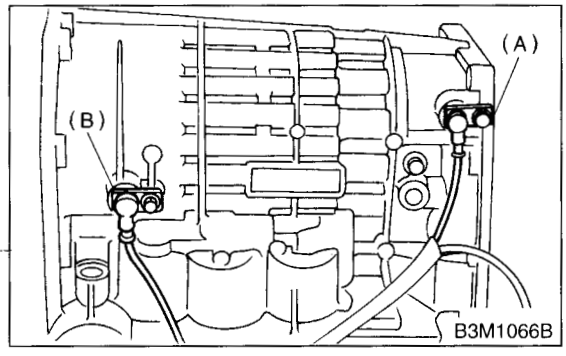
NOTE:
Do not separate the AT jack and transmission.

17) Remove the oil cooler outlet pipe.

CAUTION:
When removing the outlet pipe, be careful not to lose the balls and springs used with retaining screws.

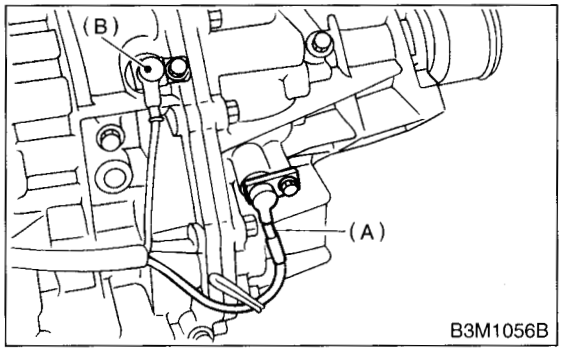
18) Remove the front and rear vehicle speed sensor and torque converter turbine speed sensor.

• Front vehicle speed sensor and torque converter turbine speed sensor



(A) Front vehicle speed sensor
(B) Torque converter turbine speed sensor

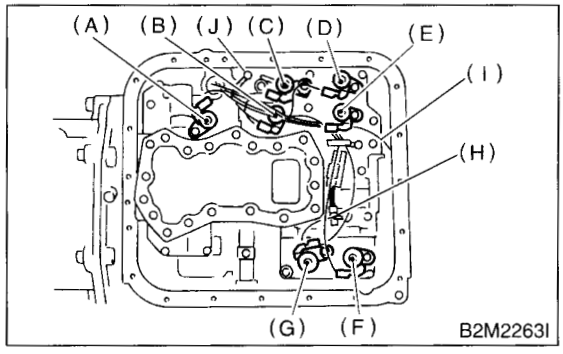
• Rear vehicle speed sensor



(A) Rear vehicle speed sensor
(B) Front vehicle speed sensor

19) Remove the oil pan.

20) Disconnect the duty solenoids and ATF temperature sensor connectors. Remove the connectors from clip and disconnect the connectors.

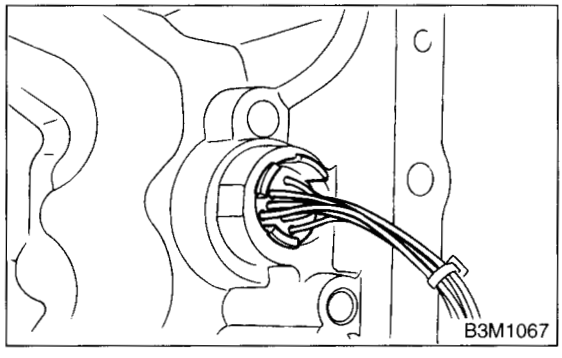


(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) ATF temperature sensor
(I) Transfer duty solenoid (Brown)
(J) Transmission ground

21) Remove the harness assembly.

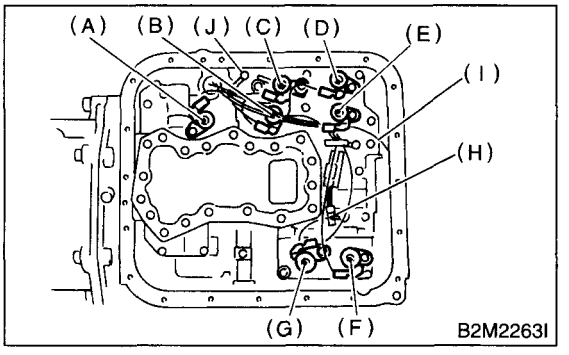
B: INSTALLATION

1) Pass the harness assembly through the hole in the transmission case.



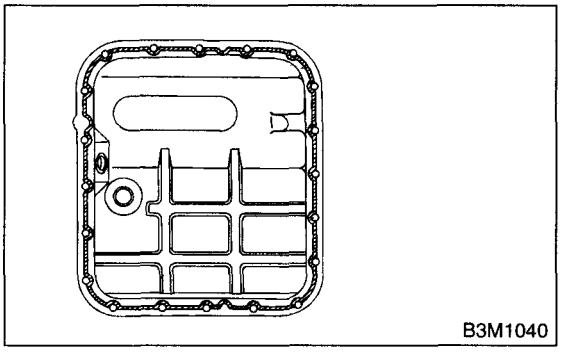
2) Connect the harness connectors.
Connect the connectors of same color, and secure the connectors to valve body sing clips.

Tightening torque (Transmission ground terminal):
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



4) Install the oil pan.

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

5) 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)

6) Install the oil cooler outlet pipe.

CAUTION:
Be sure to use a new aluminum washer.

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

7) Install the transmission rear crossmember bolts.

Tightening torque:
75 N·m (7.6 kgf-m, 55 ft-lb)

8) Install the propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>
9) Install the shield cover. (If equipped)
10) Install the front, center, rear exhaust pipes and muffler. (Non-turbo model)
<Ref. to EX(SOHC)-6, INSTALLATION, Front Exhaust Pipe.> and <Ref. to EX(SOHC)-9, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-11, INSTALLATION, Muffler.>
11) Install the center, rear exhaust pipes and muffler. (Turbo model) <Ref. to EX(DOHC TURBO)-14, INSTALLATION, Muffler.>, <Ref. to EX(DOHC TURBO)-13, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX(DOHC TURBO)-9, INSTALLATION, Center Exhaust Pipe.>
12) Lower the vehicle.
13) Install the transmission connector to the stay.
14) Install the air cleaner case. (Non-turbo model) <Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.>
15) Install the intercooler. (Turbo model). <Ref. to IN(DOHC TURBO)-11, INSTALLATION, Intercooler.>

14.Rear Vehicle Speed Sensor

A: REMOVAL

When removing the rear vehicle speed sensor, refer to "Front Vehicle Speed Sensor." <Ref. to AT-32, REMOVAL, Front Vehicle Speed Sensor.>

B: INSTALLATION

When installing the rear vehicle speed sensor, refer to "Front Vehicle Speed Sensor." <Ref. to AT-33, INSTALLATION, Front Vehicle Speed Sensor.>

15. Torque Converter Turbine Speed Sensor

A: REMOVAL

When removing the torque converter turbine speed sensor, refer to "Front Vehicle Speed Sensor." <Ref. to AT-32, REMOVAL, Front Vehicle Speed Sensor.>

B: INSTALLATION

When installing the torque converter turbine speed sensor, refer to "Front Vehicle Speed Sensor." <Ref. to AT-33, INSTALLATION, Front Vehicle Speed Sensor.>

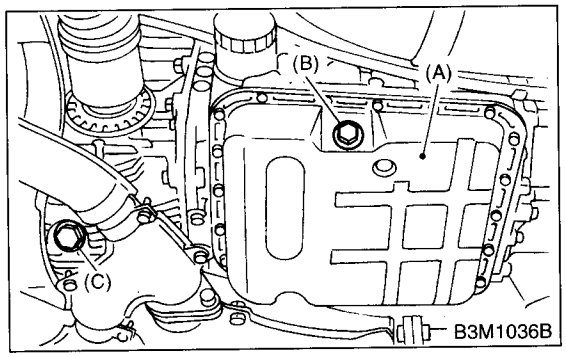
16.Control Valve Body

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.

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

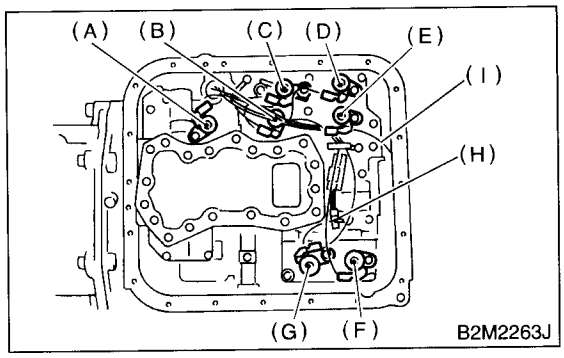


(A) Oil pan
(B) Drain plug
(C) Differential oil drain plug

4) Remove the oil pan.

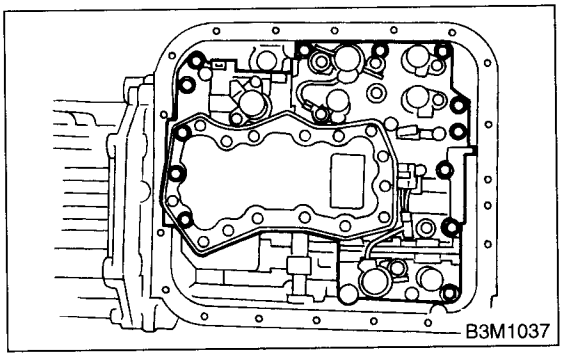
NOTE:
- Remove and clean the magnet.
- Remove the old gasket on the oil pan and transmission case completely.

5) 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)

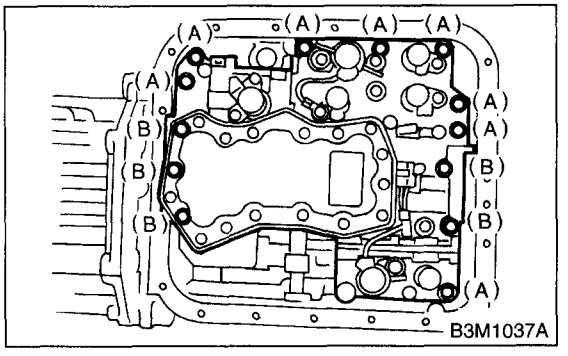
6) Remove the control valve. When removing the control valve body, be careful not to interfere with transfer duty solenoid wiring.



B: INSTALLATION

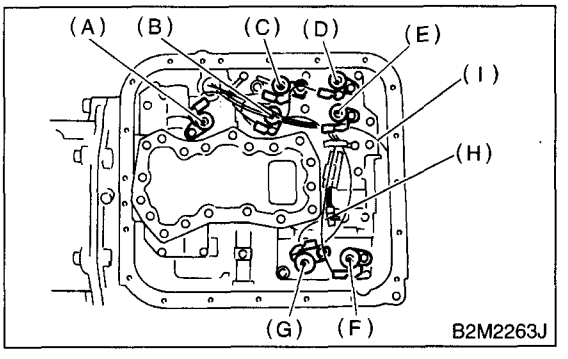
1) Set the range select lever in "N" position.
2) Install the control valve and ground earth connectors.

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



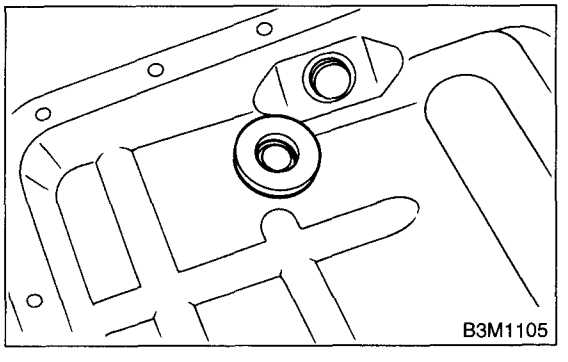
(A) Short bolts
(B) Long bolts

3) Connect all connector.

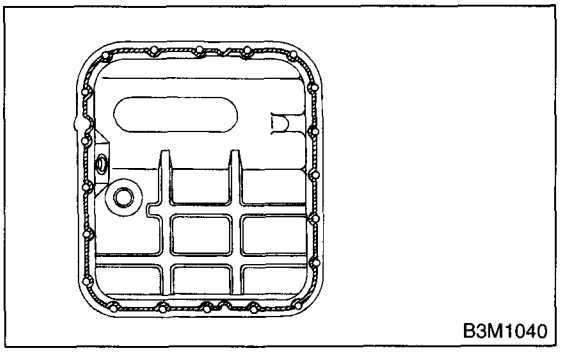


(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) ATF temperature sensor
(I) Transfer duty solenoid (Brown)

4) Attach the magnet at the specified position.



5) Apply proper amount of liquid gasket to the entire oil pan mating surface.
Fluid packing:
Tree Bond 1217B



6) Install the oil pan.

Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)

7) Pour ATF into the oil charge pipe. <Ref. to AT-9, Automatic Transmission Fluid.>
8) Check the level of the ATF.
<Ref. to AT-9, Automatic Transmission Fluid.>

C: DISASSEMBLY

Refer to "AUTOMATIC TRANSMISSION" <Pub. No. G0853ZE> a separate publication.

D: ASSEMBLY

Refer to "AUTOMATIC TRANSMISSION" <Pub. No. G0853ZE> a separate publication.

E: INSPECTION

Refer to "AUTOMATIC TRANSMISSION" <Pub. No. G0853ZE> a separate publication.

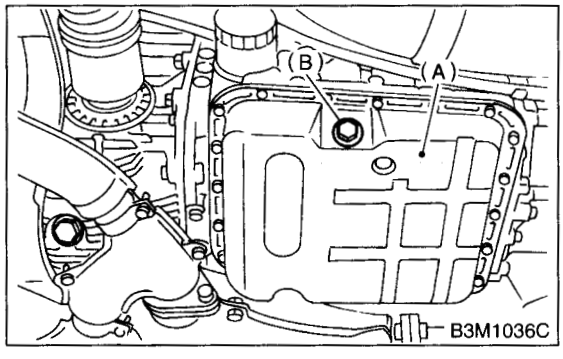
17.Shift Solenoids, Duty Solenoids and ATF Temperature Sensor

A: REMOVAL

1) Set the vehicle on the lift.
2) Disconnect the ground terminal from battery.
3) Lift-up the vehicle.
4) Clean the transmission exterior.
5) Drain the ATF completely.

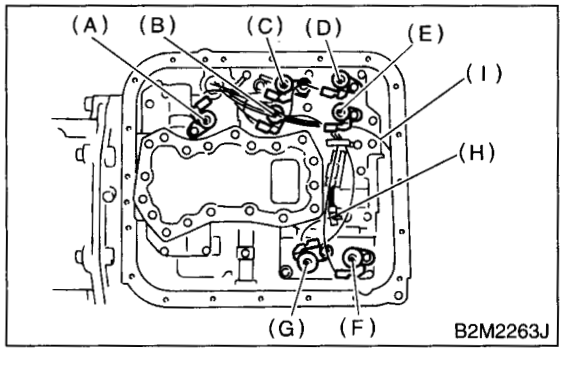
NOTE:
Tighten the ATF drain plug after draining the ATF.

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



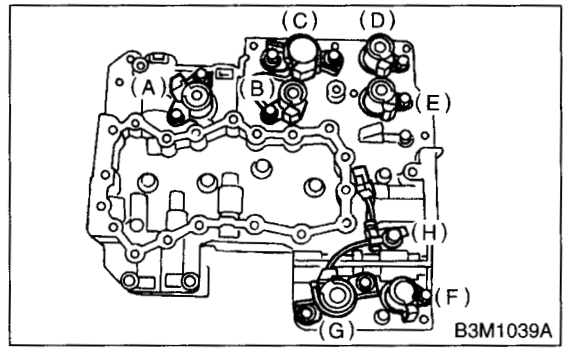
(A) Oil pan
(B) Drain plug

6) Remove the oil pan.
7) 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)

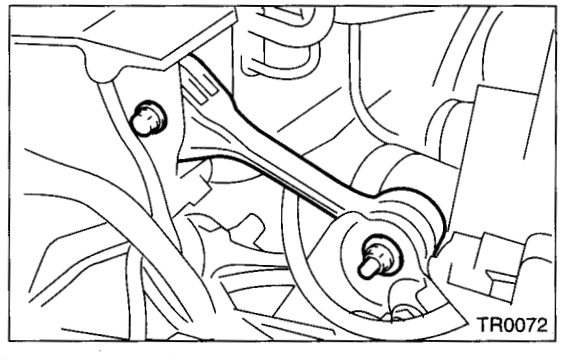
8) Remove the solenoids, duty solenoids and ATF temperature sensor.



(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

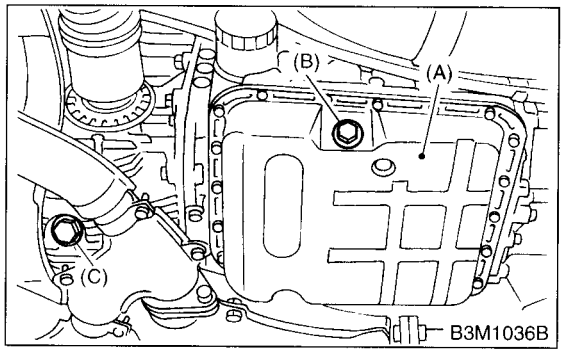
1. TRANSFER DUTY SOLENOID AND TRANSFER VALVE BODY

1) Set up the vehicle on the lift.
2) Disconnect the ground terminal from battery.
3) Remove the air intake duct. <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
4) Remove the air cleaner case. <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
5) Remove the intercooler. (Turbo model) <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>
6) Remove the pitching stopper.



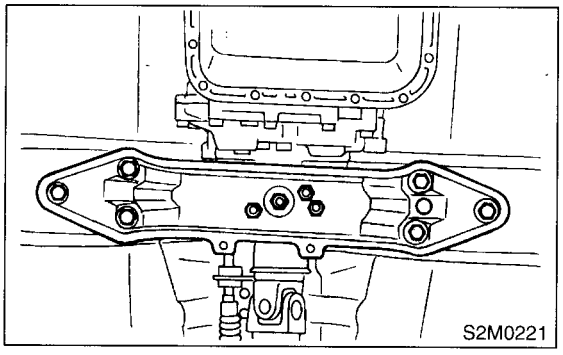
7) Remove the front exhaust pipe with center exhaust pipe. (Non-turbo model)
With OBD
<Ref. to EX(SOHC)-5, REMOVAL, Front Exhaust Pipe.>
8) Remove the center exhaust pipe. (Turbo model) <Ref. to EX(DOHC TURBO)-8, REMOVAL, Center Exhaust Pipe.>

9) Raise the vehicle and drain the ATF.

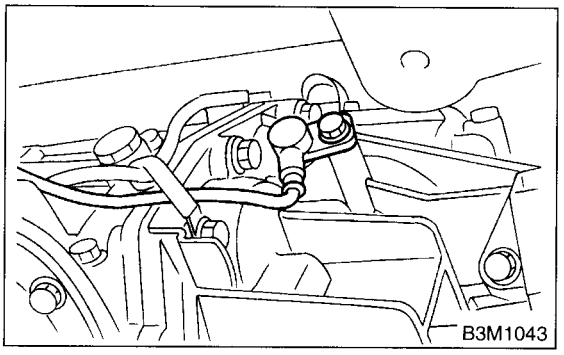


(A) Oil pan
(B) Drain plug
(C) Defferential oil drain plug

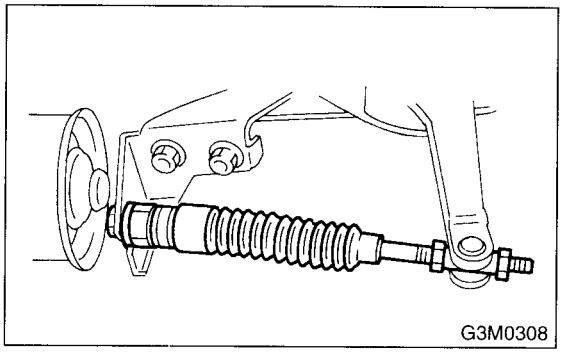
10) Remove the heat shield cover. (If equipped)
11) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
12) Remove the rear crossmember.
(1) Support the transmission using a transmission jack and raise slightly.
(2) Remove the bolts and nuts as shown in the figure.



13) Remove the rear vehicle speed sensor.

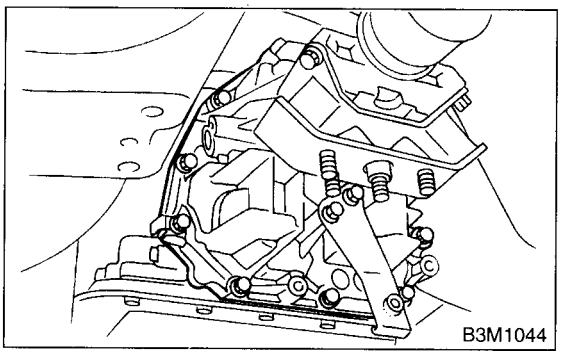


14) Remove the select cable nut.

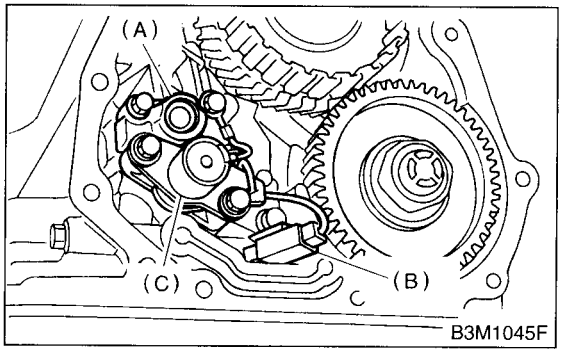


15) Move the gear select cable so that extension bolts can be removed.
16) Remove the bolts.
17) Remove the extension case.

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.

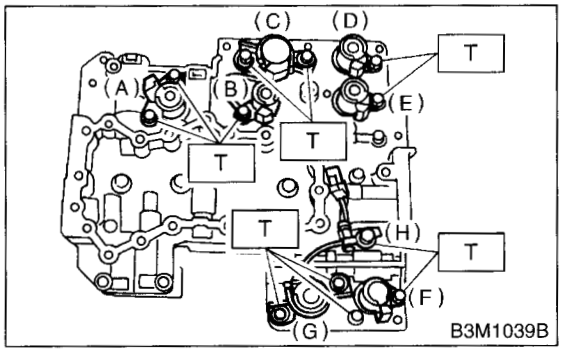


(A) Transfer valve body
(B) Transfer duty solenoid connector
(C) Transfer duty solenoid

B: INSTALLATION

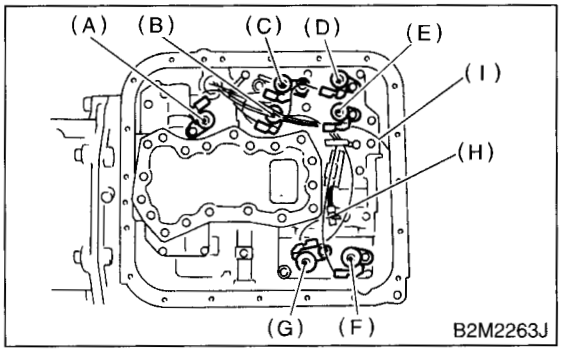
1) Install the solenoids and ATF temperature sensor.

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



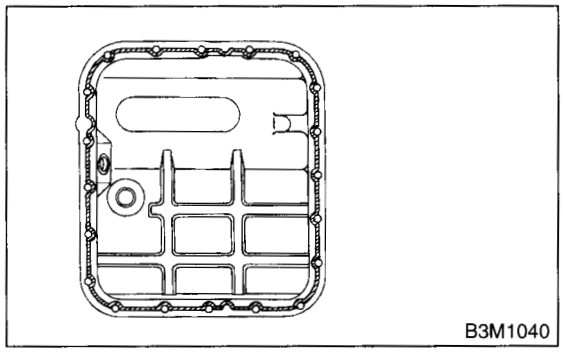
(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) ATF temperature sensor

2) Connect the harness connectors.
Connect the connectors of same color, and secure the connectors to valve body using clips.



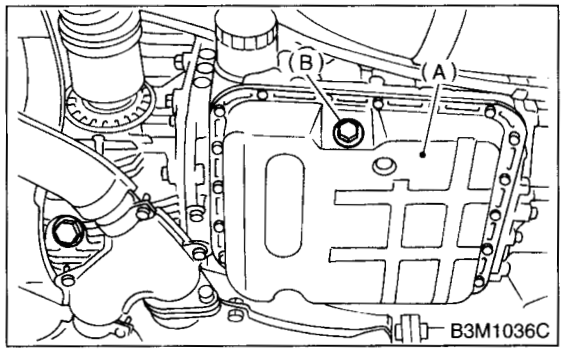
(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) ATF temperature sensor
(I) Transfer duty solenoid (Brown)

3) Apply proper amount of liquid gasket to the entire oil pan mating surface.
Fluid packing:
Tree Bond 1217B



4) Install the oil pan.

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)



(A) Oil pan
(B) Drain plug

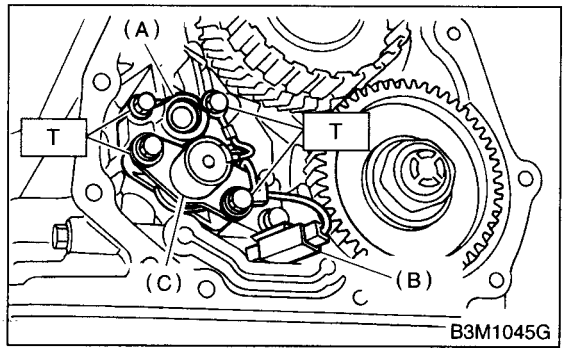
5) Fill ATF up to the middle of the "COLD" side on level gauge by using the gauge hole. <Ref. to AT-9, Automatic Transmission Fluid.>
6) Check the ATF level. <Ref. to AT-9, Automatic Transmission Fluid.>

1. TRANSFER DUTY SOLENOID AND TRANSFER VALVE BODY

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.



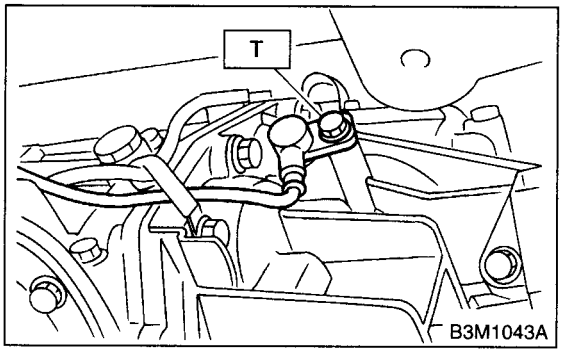
(A) Transfer valve body
(B) Transfer duty solenoid connector
(C) Transfer duty solenoid

2) Install the extension case to transmission case.
   (1) Tighten eleven bolts.

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

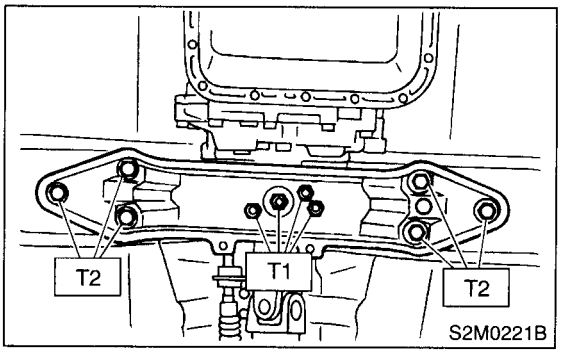
   (2) Adjust the select cable. <Ref. to CS-27, ADJUSTMENT, Select Cable.>
3) Install the rear vehicle speed sensor.

Tightening torque:
T: 7 N·m (0.7 kgf-m, 5.1 ft-lb)

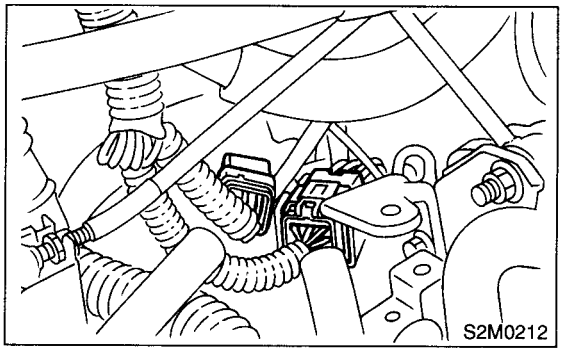


4) Install the rear crossmember.
   (1) Tighten the bolts.

Tightening torque:
T1: 35 N·m (3.6 kgf-m, 26 ft-lb)
T2: 70 N·m (7.1 kgf-m, 51.4 ft-lb)

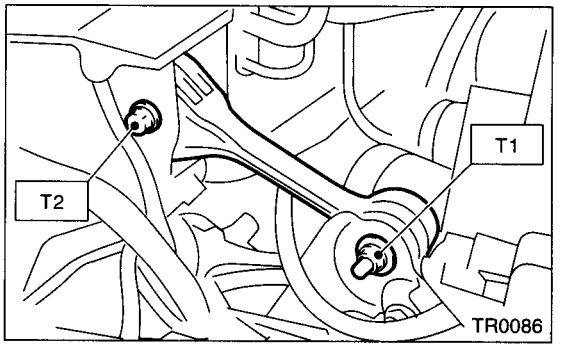


   (2) Lower and remove the transmission jack.
5) Install the propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>
6) Install the front exhaust pipe and center exhaust pipe.
7) Lower and remove the jack.
8) Connect the transmission harness connector.



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 and duct.

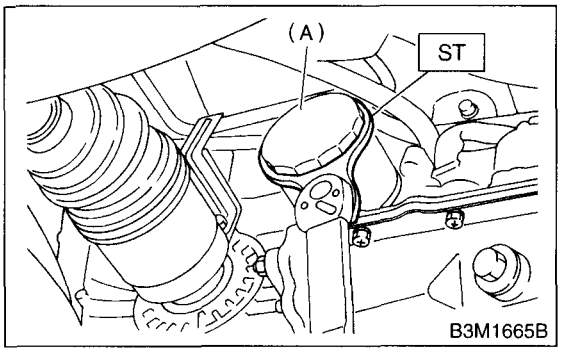
11) Fill ATF up to the middle of the "COLD" side on level gauge by using the gauge hole. <Ref. to AT-9, Automatic Transmission Fluid.>
12) Check the ATF level. <Ref. to AT-9, Automatic Transmission Fluid.>

18.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



(A) ATF filter

3) Get a new ATF filter and apply a thin coat of ATF to the oil seal.

B: INSTALLATION

1) Install the ATF filter. Turn it by hand, being careful not to damage oil seal.
2) Using the ST, tighten the ATF filter to transmission case.
Calculate the ATF filter torque specifications using the following formula.
$T2 = L1/(L1 + L2) \times T1$
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)	6 (0.6, 4.3)
150 (5.91)	5 (0.5, 3.6)
200 (7.87)	4 (0.4, 2.9)
250 (9.84)	3 (0.3, 2.2)

CAUTION:
Align the ST with torque wrench while tightening the ATF filter.

ST 498545400 OIL FILTER WRENCH
3) Add ATF.
4) Inspect the level of ATF. <Ref. to AT-9, Automatic Transmission Fluid.>

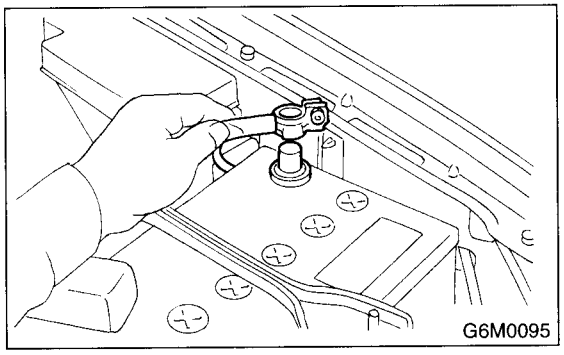
C: INSPECTION

Replace the part if any defect is found from the inspection.
Check for rust, hole, ATF leaks, and other damage.

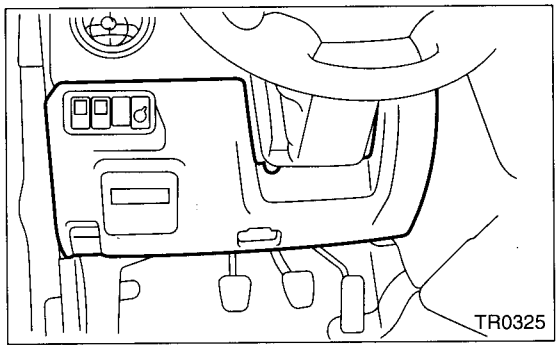
19. Transmission Control Module (TCM)

A: REMOVAL

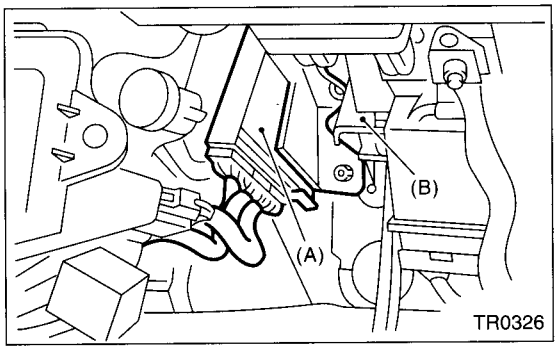
1) Disconnect the ground terminal from battery.



2) Remove the lower cover and then disconnect the connector.



3) Disconnect the connectors from transmission control module.



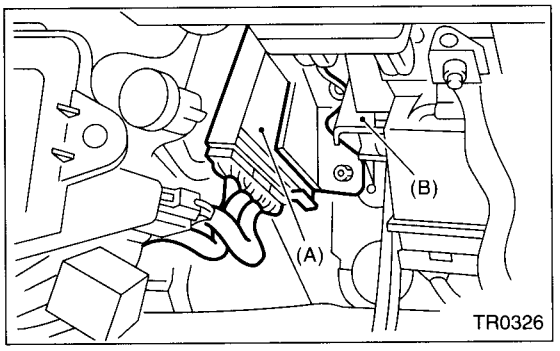
(A) Transmission control module
(B) Brake pedal bracket

4) Remove the transmission control module.

B: INSTALLATION

1) Install the transmission control module.

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



(A) Transmission control module
(B) Brake pedal bracket

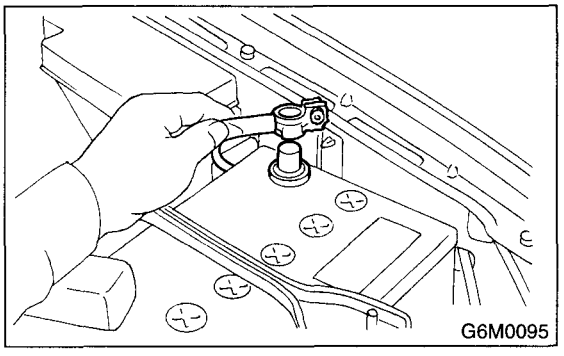
2) Connect the connectors to transmission control module.
3) Install in the reverse order of removal.

20.Dropping Resistor

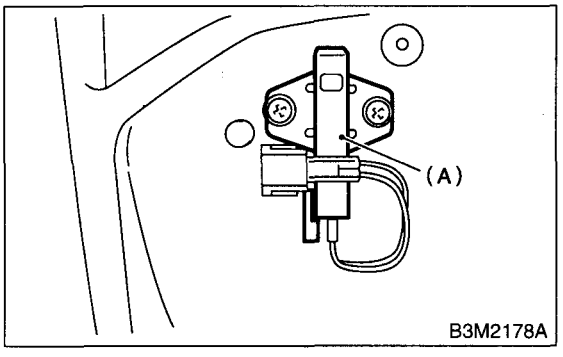
A: REMOVAL

NOTE:
The dropping resister is only equipped to Non-turbo models.

1) Disconnect the ground terminal from battery.



2) Remove the air intake duct. <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
3) Disconnect the connector from dropping resistor.
4) Remove the dropping resistor.

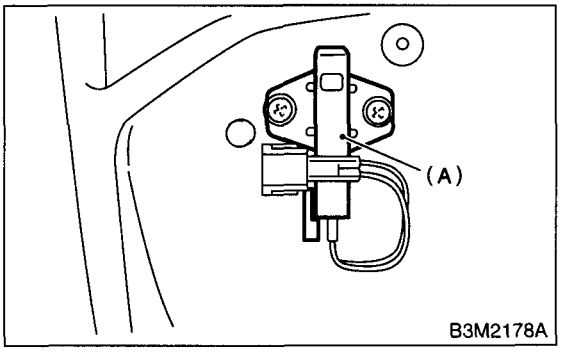


(A) Dropping resistor

B: INSTALLATION

1) Install in the reverse order of removal.

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



(A) Dropping resistor

C: INSPECTION

	Step	Check	Yes	No
1	**CHECK RESISTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from dropping resistor. 3)Measure the resistance between dropping resistor terminal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 9 and 15 Ω?	Go to step **2.**	Replace the dropping resistor. <Ref. to AT-46, Dropping Resistor.>
2	**CHECK RESISTOR.** Measure the resistance between dropping resistor terminal. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance between 9 and 15 Ω?	Dropping resistor is normal.	Replace the dropping resistor. <Ref. to AT-46, Dropping Resistor.>

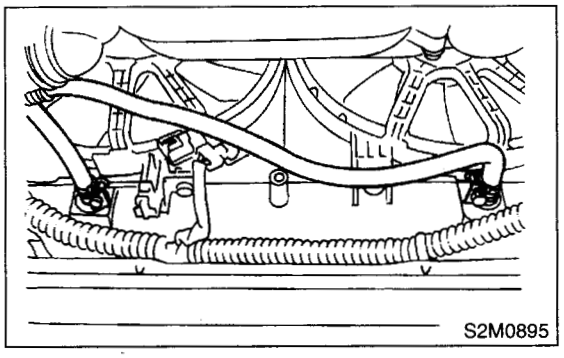
21.ATF Cooler Pipe and Hose

A: REMOVAL

1. NON-TURBO MODEL

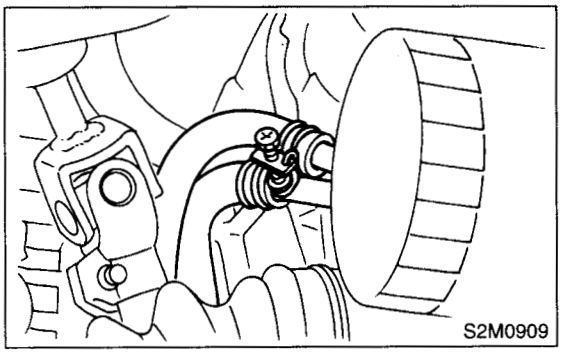
1) Set the vehicle on the lift.
2) Lift-up the vehicle.
3) Remove the under cover.
4) Disconnect the ATF cooler hose from radiator.

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.

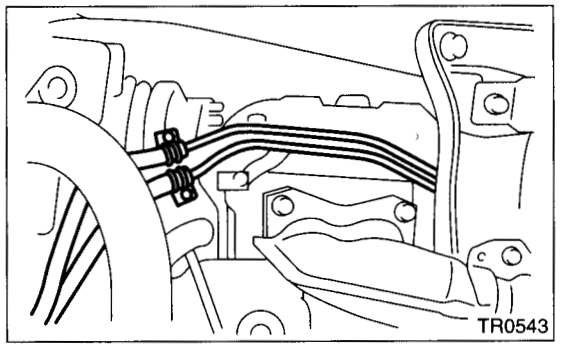


5) Disconnect the ATF cooler hoses from pipes.

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.

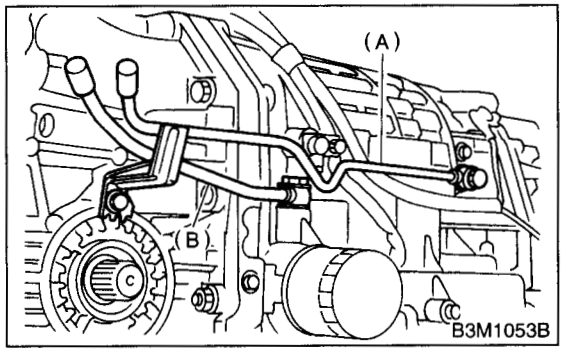


6) Remove the ATF cooler pipe from cylinder head.



7) Remove the oil cooler inlet and outlet pipes.

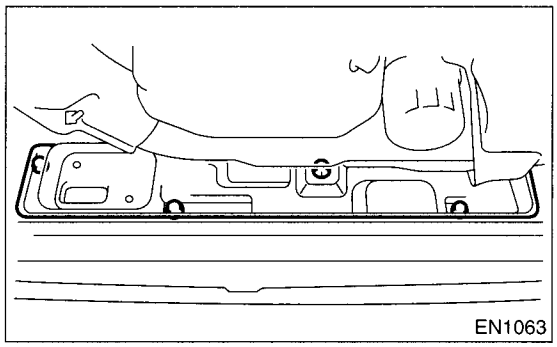
CAUTION:
When removing the outlet pipe, be careful not to lose the ball and spring used with retaining screw.



(A) Inlet pipe
(B) Outlet pipe

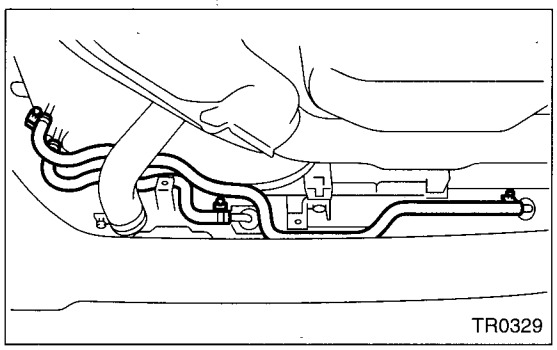
2. TURBO MODEL

1) Set the vehicle on the lift.
2) Remove the battery and washer tank.
3) Lift-up the vehicle.
4) Remove the under cover.
5) Remove the radiator under cover.



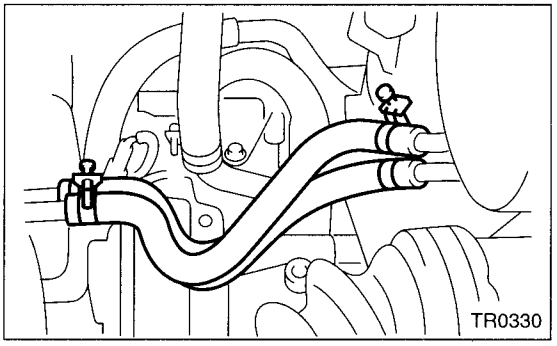
6) Disconnect the ATF cooler hose from radiator.

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.

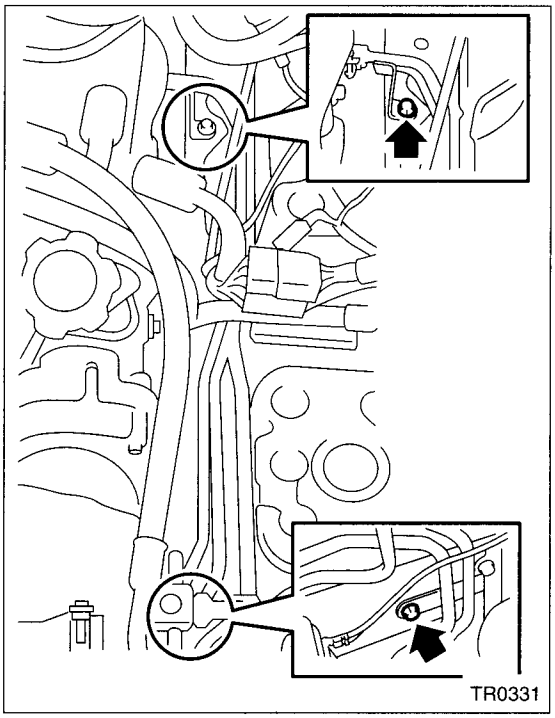


7) Disconnect the ATF cooler hoses from pipes.

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.

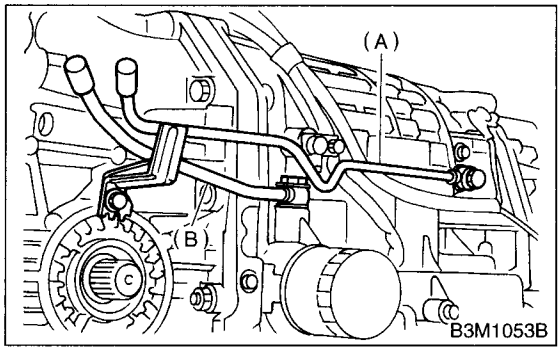


8) Remove the ATF cooler pipe from frame.



9) Remove the oil cooler inlet and outlet pipes.

CAUTION:
When removing the outlet pipe, be careful not to lose the ball and spring used with retaining screw.



(A) Inlet pipe
(B) Outlet pipe

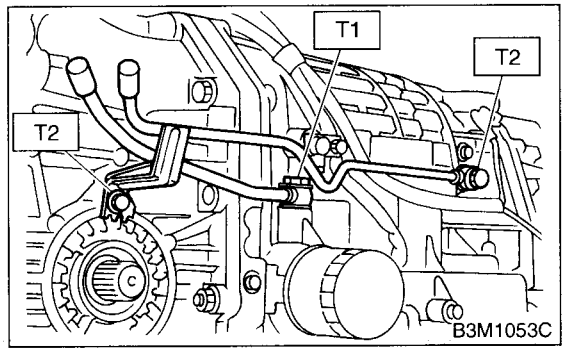
B: INSTALLATION

1. NON-TURBO MODEL

1) Install the oil cooler outlet and inlet pipes.

CAUTION:
Be sure to use a new aluminum washer.

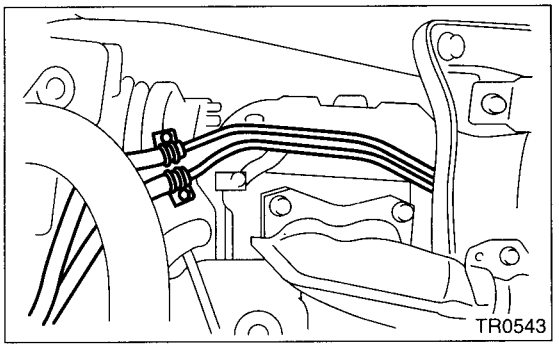
Tightening torque:
T1: 44 N·m (4.5 kgf-m, 32.5 ft-lb)
T2: 25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Inlet pipe
(B) Outlet pipe

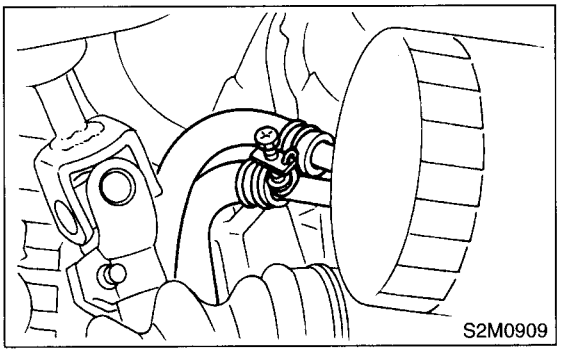
2) Install the ATF cooler pipe to cylinder head.

Tightening torque:
7.35 N·m (0.75 kgf-m, 5.42 ft-lb)



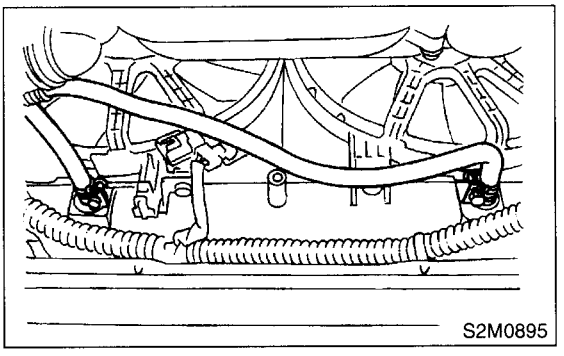
3) Connect the ATF cooler hose to pipe transmission side.

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 pipe of radiator 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.



5) Install the under cover.
6) Fill ATF. <Ref. to AT-9, Automatic Transmission Fluid.>

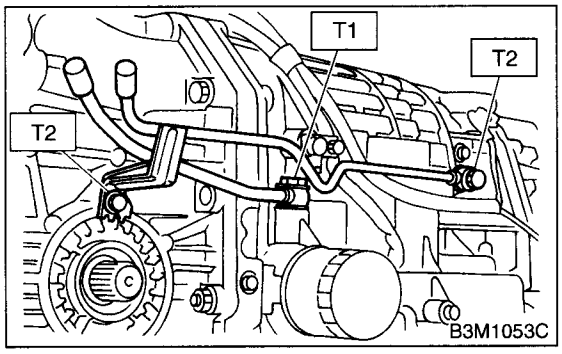
NOTE:
Make sure there are no ATF leaks in joints between the transmission, radiator, pipes, and hoses.

2. TURBO MODEL

1) Install the oil cooler outlet and inlet pipes.

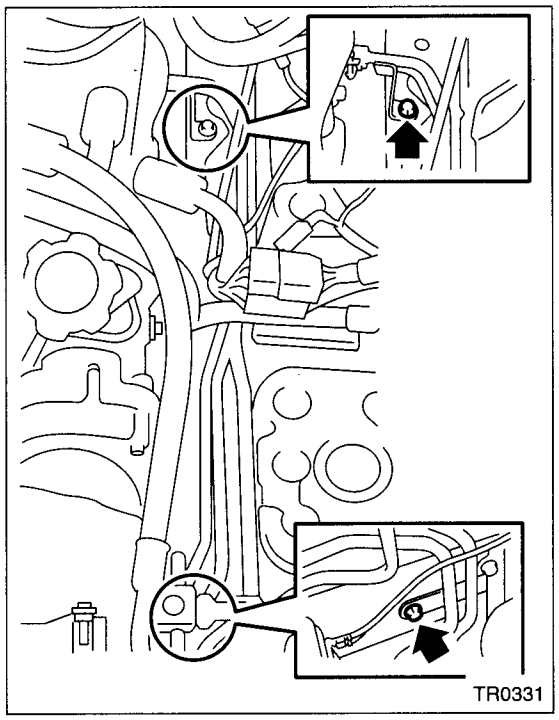
CAUTION:
Be sure to use a new aluminum washer.

Tightening torque:
T1: 44 N·m (4.5 kgf-m, 32.5 ft-lb)
T2: 25 N·m (2.5 kgf-m, 18.1 ft-lb)



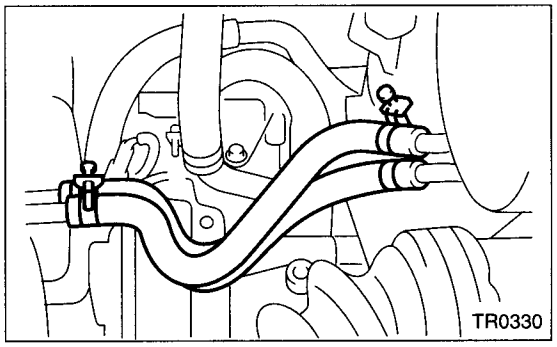
(A) Inlet pipe
(B) Outlet pipe

2) Install the ATF cooler pipe to frame.



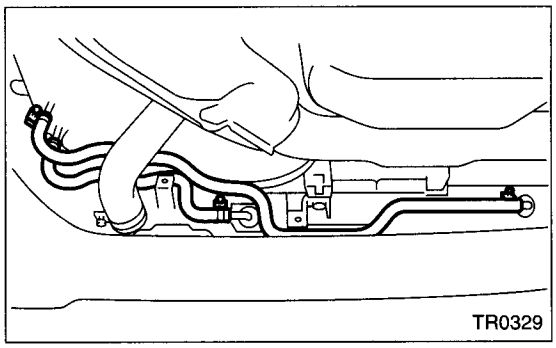
3) Connect the ATF cooler hose to pipe transmission side.

NOTE:
• Install so that the hose is not folded over, excessively bent, or twisted.
• Be careful to insert the hose to the specified position.



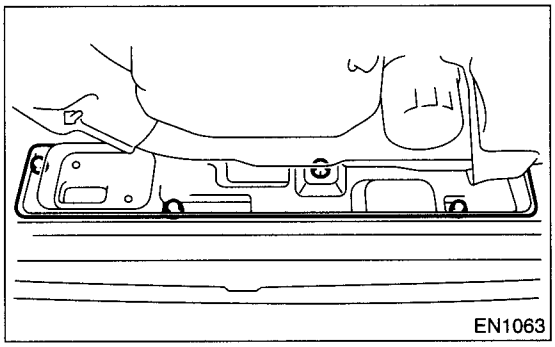
4) Connect the ATF cooler hose to pipe of radiator side.

NOTE:
• Install so that the hose is not folded over, excessively bent, or twisted.
• Be careful to insert the hose to the specified position.



5) Install the radiator under cover.

Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)



6) Install the under cover.
7) Install the battery and washer tank.

8) Fill ATF. <Ref. to AT-9, 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 installed by pressing with your fingernail.
5) Check for peeling, cracks, and deformation at the tip of the hose.

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

AT

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1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1)Ask the customer when and how the trouble occurred using the interview checklist. <Ref. to AT-4, Check List for Interview.> 2)Before performing diagnosis, inspect the 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-13, Stall Test.> •Line pressure test <Ref. to AT-16, Line Pressure Test.> •Transfer clutch pressure test <Ref. to AT-18, Transfer Clutch Pressure Test.> •Time lag test <Ref. to AT-15, Time Lag Test.> •Road test <Ref. to AT-12, Road Test.> •Inhibitor switch <Ref. to AT-28, Inhibitor Switch.>	Is the unit that might influence the AT problem normal?	Go to step **2.**	Repair or replace each item.
2	**CHECK AT OIL TEMP WARNING LIGHT.** Turn the ignition switch to ON.	Does not the AT OIL TEMP warning light light up?	Go to step **3.**	Go to step **4.**
3	**CHECK AT OIL TEMP WARNING LIGHT.** 1)Turn the ignition switch to OFF. 2)Repair the AT OIL TEMP warning light circuit or power supply and ground line circuit. <Ref. to AT-31, Diagnostic Procedure for AT OIL TEMP Warning Light.> 3)Turn the ignition switch to ON.	Is the AT OIL TEMP warning light flashing?	Go to step **4.**	Go to step **5.**
4	**CHECK INDICATION OF DTC.** Calling up the diagnostic trouble code (DTC). Without SUBARU SELECT MONITOR <Ref. to AT-24, WITHOUT SUBARU SELECT MONITOR, Read Diagnostic Trouble Code (DTC).> With SUBARU SELECT MONITOR <Ref. to AT-25, WITH SUBARU SELECT MONITOR, Read Diagnostic Trouble Code (DTC).> NOTE: If the communication function of the select monitor cannot be executed normally, check the communication circuit. <Ref. to AT-39, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostic Procedure for Select Monitor Communication.>	Is the diagnostic trouble code (DTC) displayed?	Go to step **6.** NOTE: Record all diagnostic trouble code (DTC).	Go to step **5.**

	Step	Check	Yes	No
5	**PERFORM THE GENERAL DIAGNOSTICS.** 1)Inspect using the "Diagnostic Procedure for No-Diagnostic trouble Code".<Ref. to AT-108, Diagnostic Procedure for No-Diagnostic Trouble Code (DTC).> 2)Inspect using the "Symptom Related Diagnostic". <Ref. to AT-127, Symptom Related Diagnostic.> 3)Perform the clear memory mode. With SUBARU SELECT MONITOR <Ref. to AT-27, WITH SUBARU SELECT MONITOR, Clear Memory Mode.> Without SUBARU SELECT MONITOR <Ref. to AT-27, WITHOUT SUBARU SELECT MONITOR, Clear Memory Mode.> 4)Perform the inspection mode. <Ref. to AT-26, Inspection Mode.> Calling up the diagnostic trouble code (DTC). Without SUBARU SELECT MONITOR <Ref. to AT-24, WITHOUT SUBARU SELECT MONITOR, Read Diagnostic Trouble Code (DTC).> With SUBARU SELECT MONITOR <Ref. to AT-25, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is the diagnostic trouble code (DTC) displayed?	Go to step **6.**	Complete the diagnosis.
6	**PERFORM THE DIAGNOSIS.** 1)Inspect using the "Diagnostics Chart with Diahnostic Trouble Code".<Ref. to AT-44, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: For trouble code table, refer to the "List of Diagnostic Trouble Code".<Ref. to AT-29, List of Diagnostic Trouble Code (DTC).> 2)Repair the trouble cause. 3)Perform the clear memory mode. With SUBARU SELECT MONITOR <Ref. to AT-27, WITH SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> Without SUBARU SELECT MONITOR <Ref. to AT-27, WITHOUT SUBARU SELECT MONITOR, Clear Memory Mode.> 4)Perform the inspection mode. <Ref. to AT-26, Inspection Mode.> 5)Calling up the diagnostic trouble code (DTC). Without SUBARU SELECT MONITOR <Ref. to AT-24, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> With SUBARU SELECT MONITOR <Ref. to AT-25, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is the diagnostic trouble code (DTC) displayed?	Inspect using the "Diagnostics Chart with Diagnostic Connector". <Ref. to AT-44, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnosis.

2. Check List for Interview

NOTE:
Use copies of this page for interviewing customers.

A: CHECK

Check the following items when problem has occurred.

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
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 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 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 6.5 mm (0.256 in).

B: INSPECTION

1. BATTERY

Measure the battery voltage and specific gravity of electrolyte.

Standard voltage: 12V or more

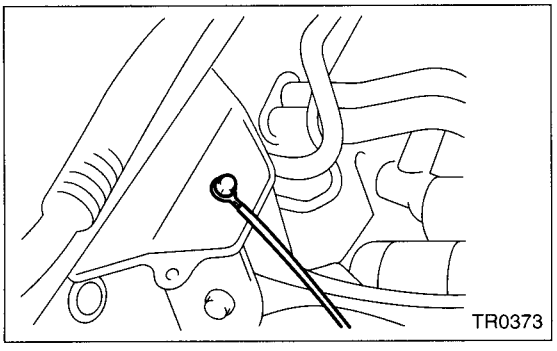
Specific gravity: Above 1.260

2. TRANSMISSION GROUND

Make sure that the ground terminal bolt is tightened securely.

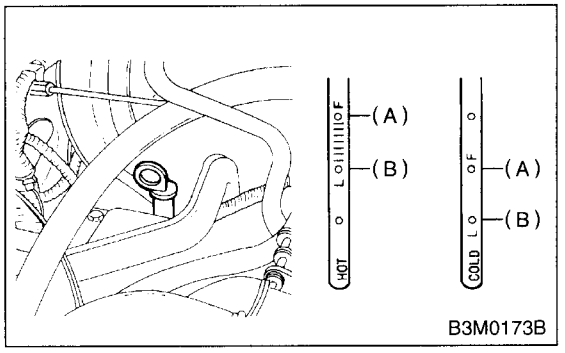
• Chassis side

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)



3. ATF LEVEL

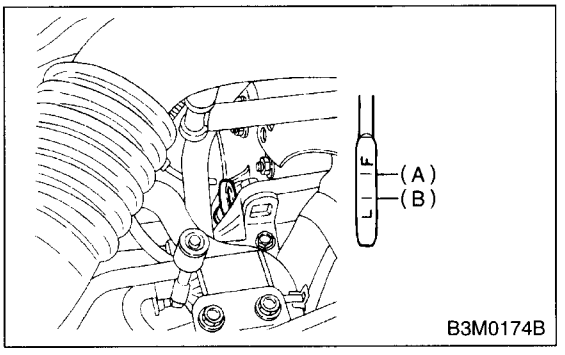
Make sure the ATF level is in the specification.



(A) Upper level
(B) Lower level

4. FRONT DIFFERENTIAL OIL LEVEL

Make sure the front differential oil level is in the specification.

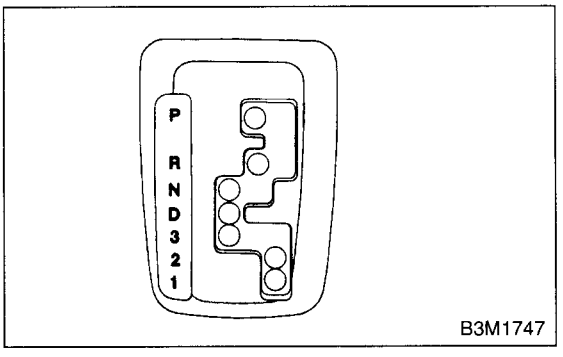


(A) Upper level
(B) Lower level

5. OPERATION OF SHIFT SELECT LEVER

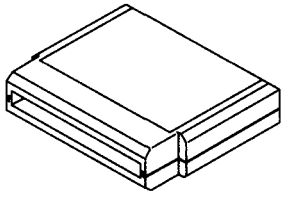
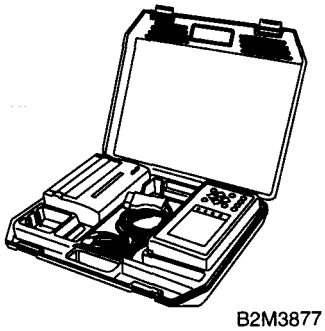
Make sure there is no abnormal noise, dragging or contact pattern in each select lever range.

WARNING:
Stop the engine while checking operation of the selector lever.



C: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3876	24082AA150 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

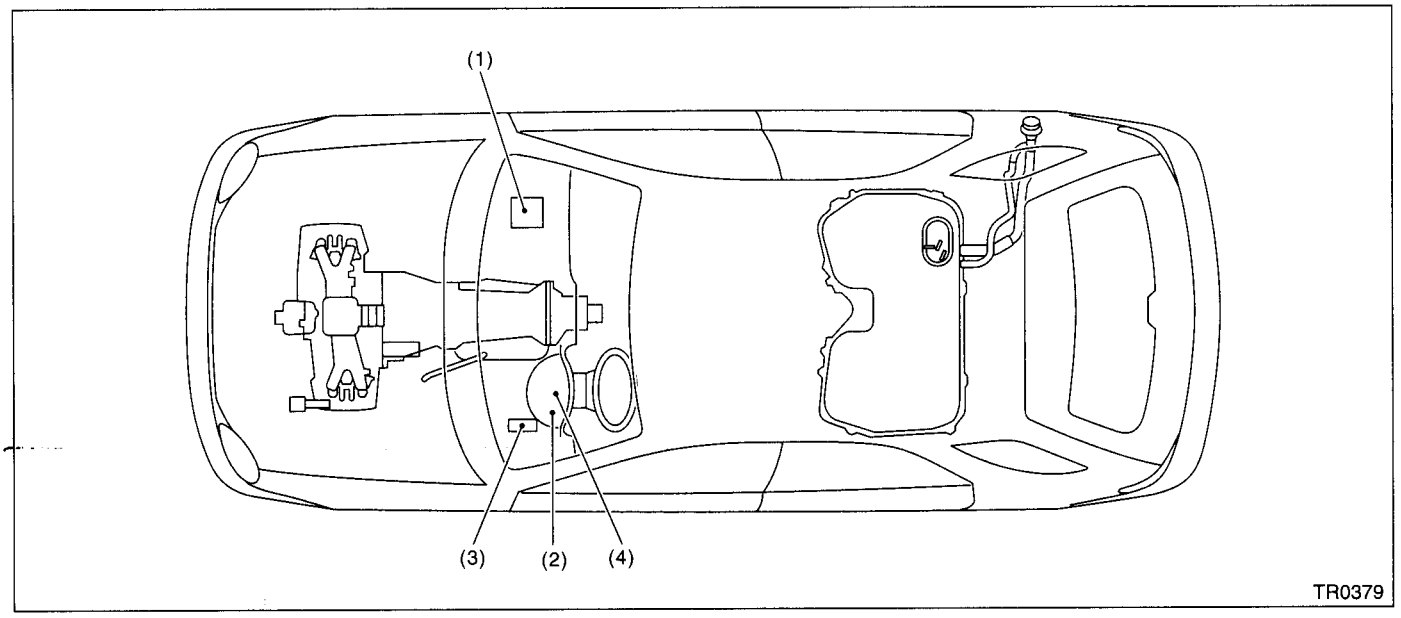
2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Oscilloscope	Used for measuring sensor.

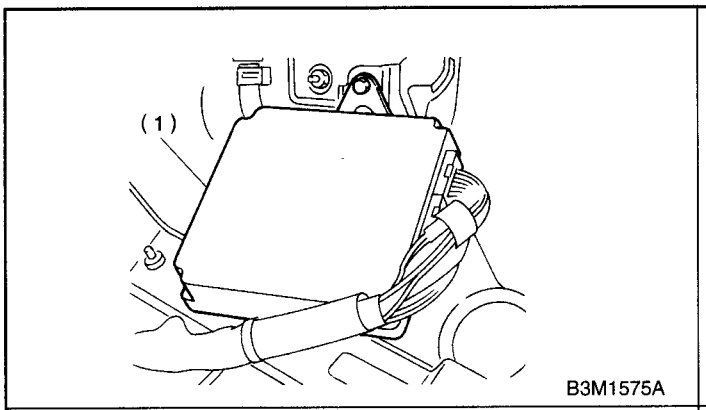
4. Electrical Components Location

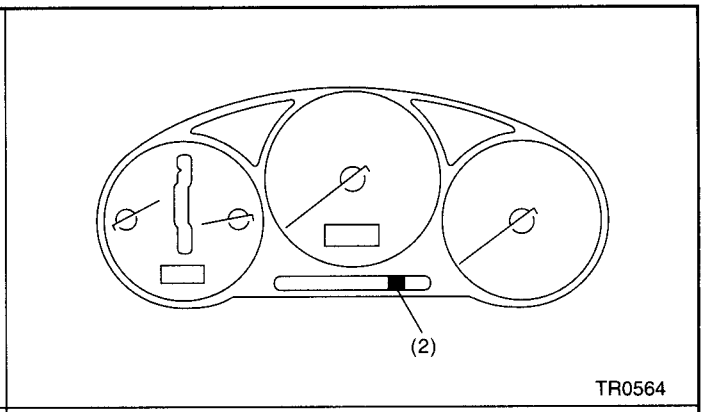
A: LOCATION

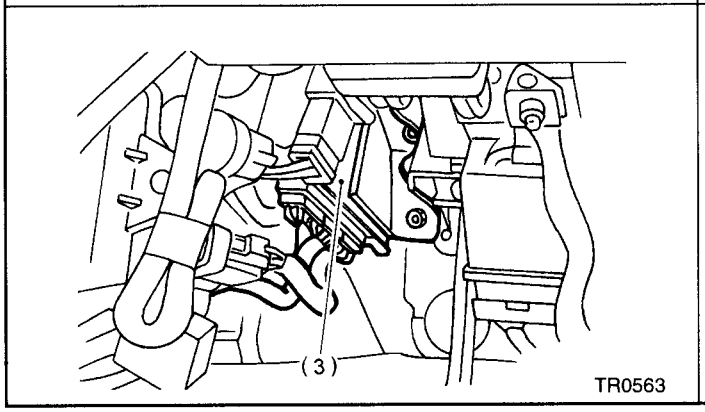
1. CONTROL MODULE

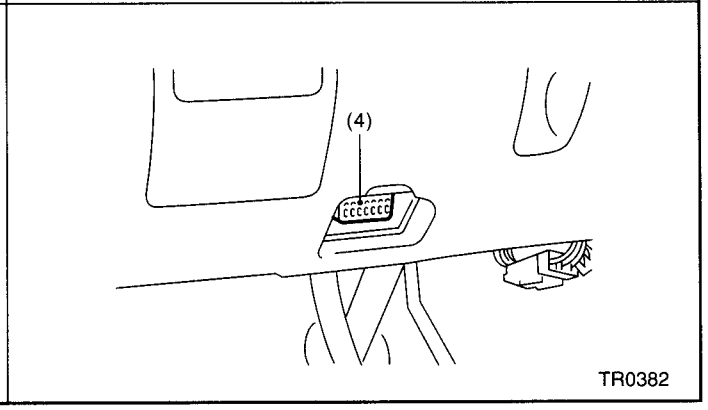


(1) Engine control module (ECM)
(2) ATF temperature warning light (AT diagnostic indicator light)
(3) Transmission control module (TCM)
(4) Data link connector

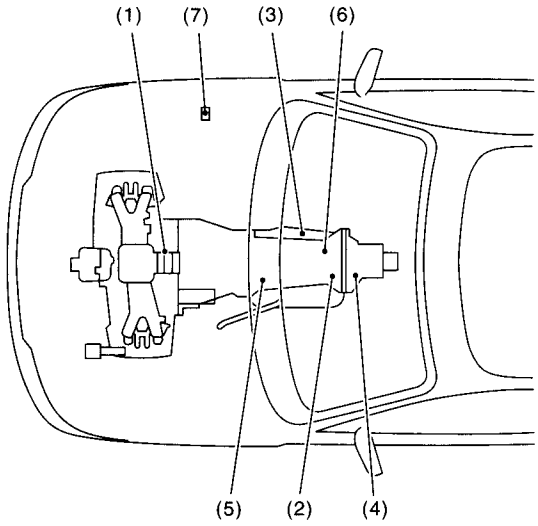




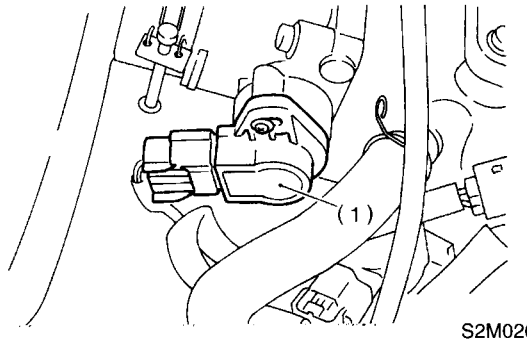




2. SENSOR

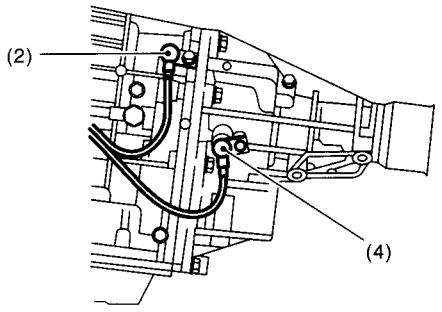


(1) Throttle position sensor
(2) Front vehicle speed sensor
(3) Inhibitor switch
(4) Rear vehicle speed sensor
(5) Torque converter turbine speed sensor
(6) ATF temperature sensor
(7) Dropping resistor (Non-turbo model)



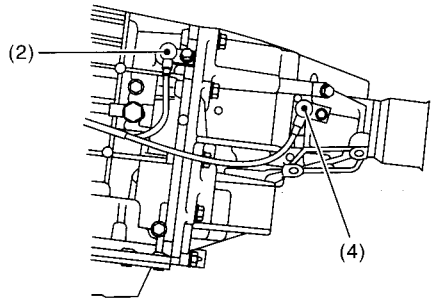
S2M0262B

Non-turbo model

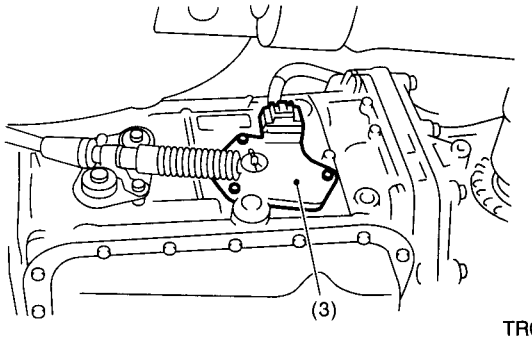


TR0387

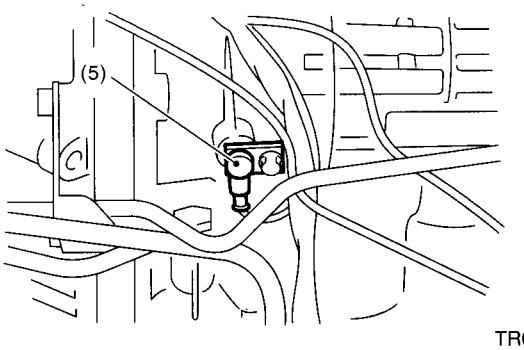
Turbo model



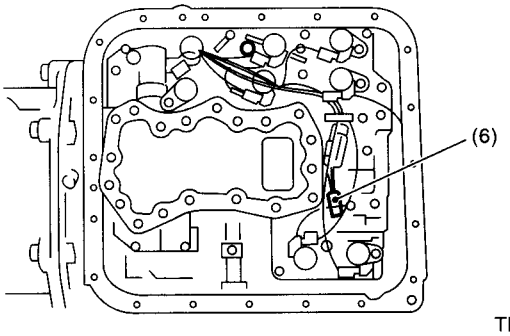
TR0592



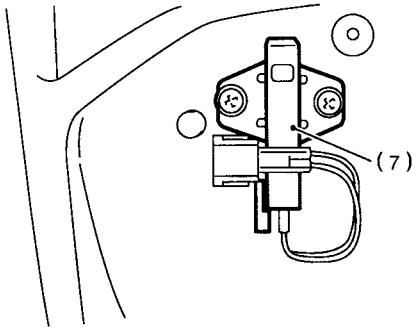
TR0388



TR0390



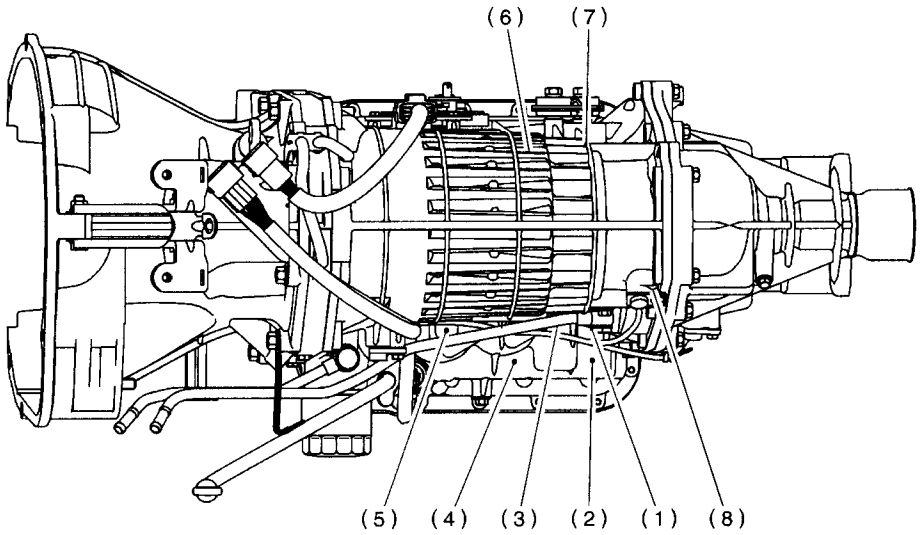
TR0389



TR0593

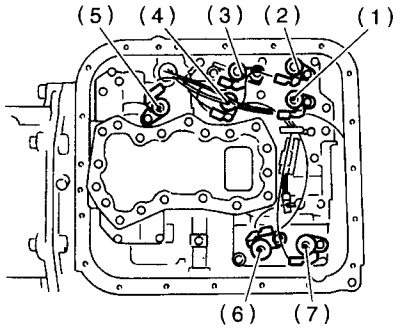
SUBARU

3. SOLENOID

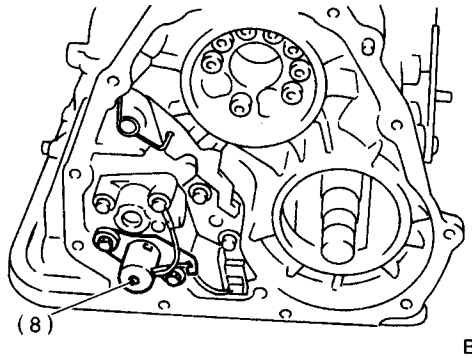


B3M1186A

(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



B2M2263D

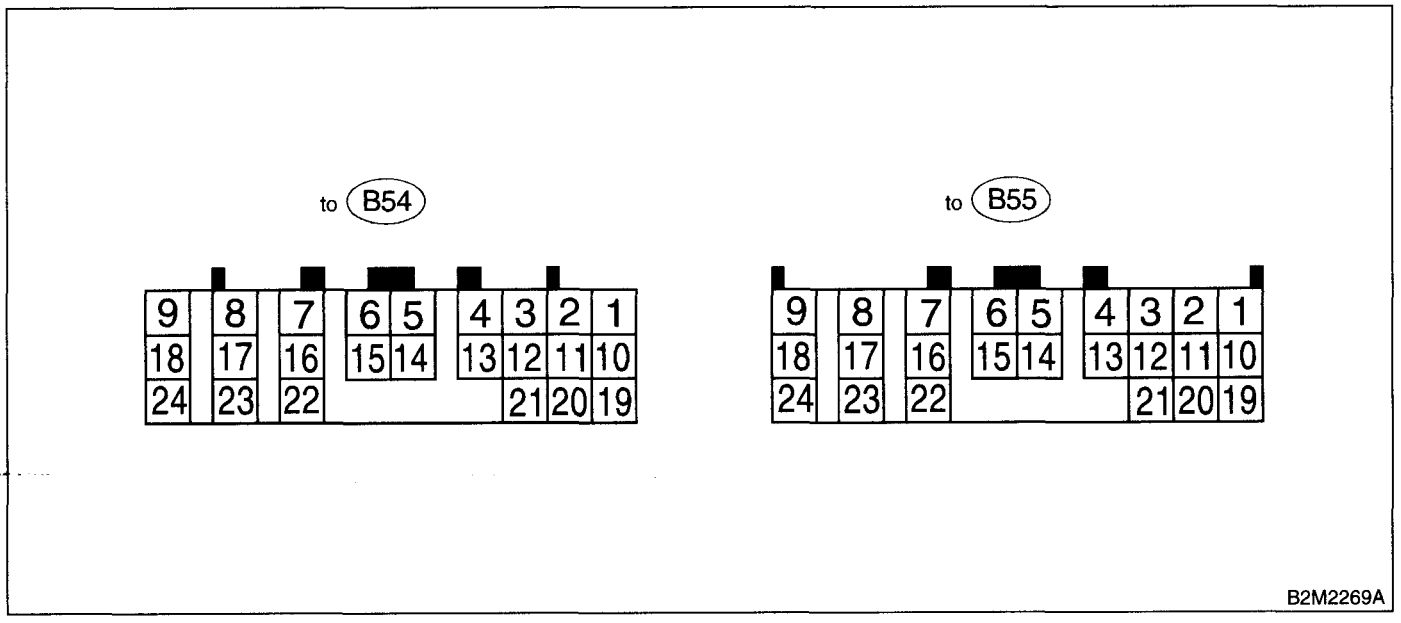


B2M2264E

5. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION

1. NON-TURBO MODEL

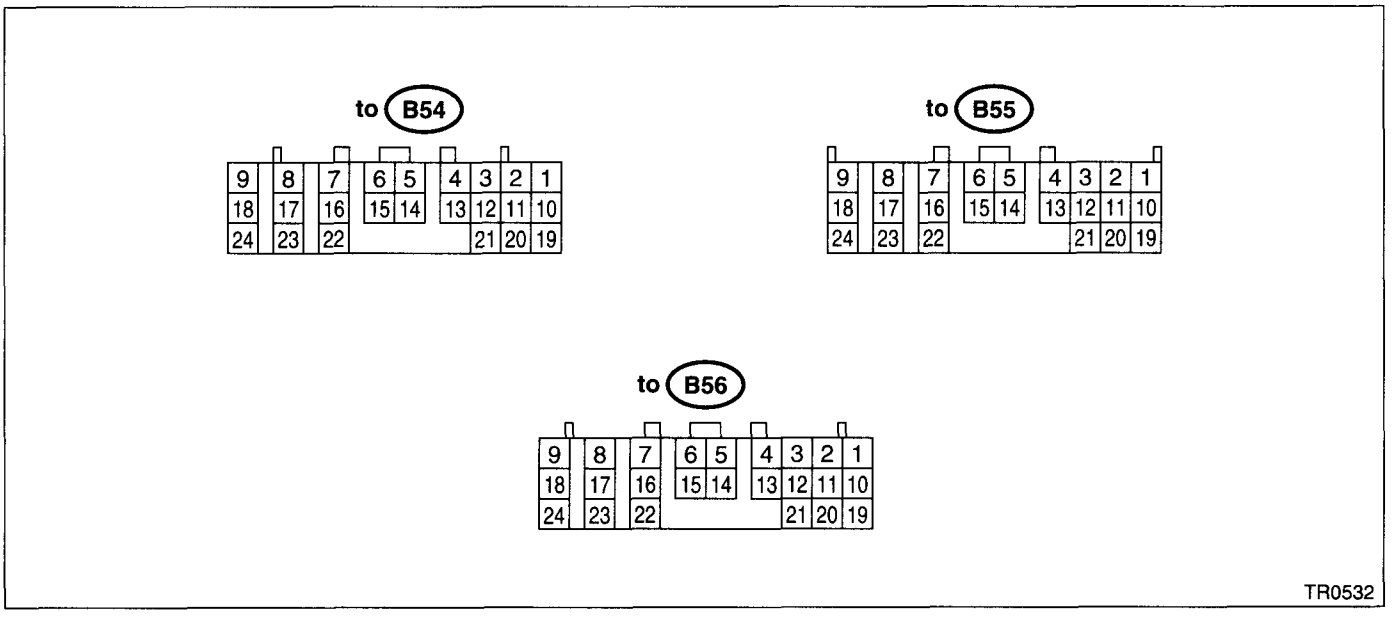


Check with ignition switch ON.						
Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Back-up power supply		B55	6	Ignition switch OFF	10 — 13	—
Ignition power supply		B54	23	Ignition switch ON (with engine OFF)	10 — 13	—
		B54	24			
Inhibitor switch	"P" range switch	B55	23	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	22	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	17	Select lever in "R" range	Less than 1	—
				Select lever in any other than "R" range	More than 8	
	"D" range switch	B55	8	Select lever in "D" range	Less than 1	—
				Select lever in any other than "D" range	More than 8	
	"3" range switch	B55	18	Select lever in "3" range	Less than 1	—
				Select lever in any other than "3" range	More than 8	
	"2" range switch	B54	10	Select lever in "2" range	Less than 1	—
				Select lever in any other than "2" range	More than 8	
	"1" range switch	B54	1	Select lever in "1" range	Less than 1	—
				Select lever in any other than "1" range	More than 8	

Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Brake switch	B55	24	Brake pedal depressed.	More than 10.5	—
			Brake pedal released.	Less than 1	
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 light ON)	Less than 1	—
			When cruise control is not set (SET light OFF)	More than 6.5	
Torque control signal 1	B54	13	Ignition switch ON (with engine ON)	More than 4.8	—
Torque control signal 2	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.	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	

Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
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	
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 1	B55	10	—	0	Less than 1
Sensor ground line 2	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 ONFWD switch	Less than 1	—
			Fuse removed from FWD switch	More than 9	
AT diagnosis signal	B54	4	Ignition switch ON	Less than 1← →More than 4	—
Data link signal (Subaru Select Monitor)	B55	7	—	—	—
		16	—	—	

2. TURBO MODEL



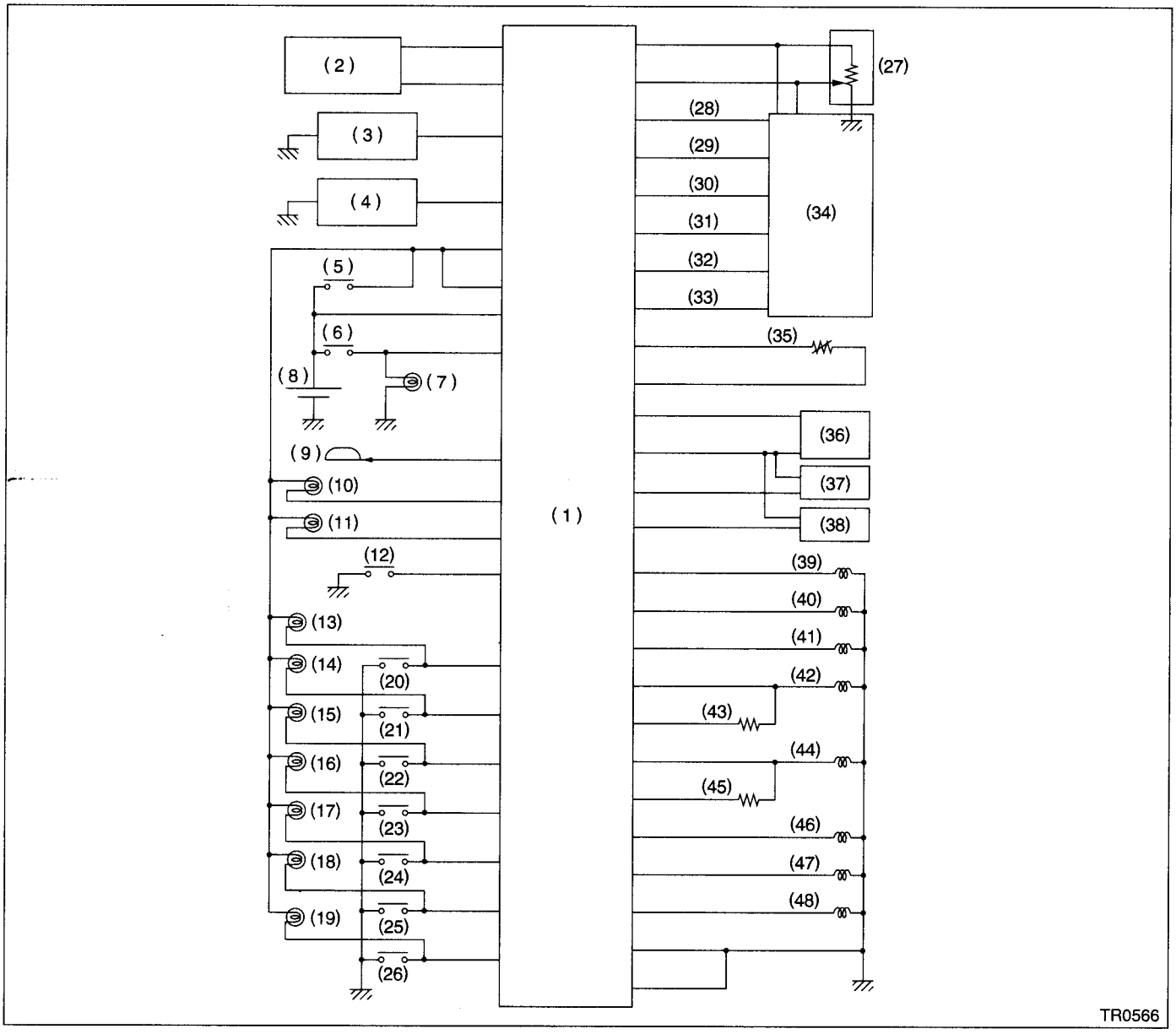
Check with ignition switch ON.						
Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Back-up power supply		B56	1	Ignition switch OFF	10 — 13	—
Ignition power supply		B54	23	Ignition switch ON (with engine OFF)	10 — 13	—
		B54	24			
Inhibitor switch	"P" range 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	
AT OIL TEMP warning light		B56	10	Light ON	Less than 1	—
				Light OFF	More than 9	

Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Throttle position sensor	B54	3	Throttle fully closed.	Approx. 0.5	—
			Throttle fully open.	Approx. 4.3	
Throttle position sensor power supply	B54	2	Ignition switch ON (With engine OFF)	Approx. 5.0	—
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 5	—
Engine speed signal	B55	17	Ignition switch ON (with engine OFF)	0	—
			Ignition switch ON (with engine ON)	0 — 13 or more	
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	—
Mass air flow signal	B54	1	Engine idling after warm-up.	0.5 — 1.2	—
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 — 5.0	2.0 — 4.5
			Ignition switch ON (with engine OFF) Throttle fully open after warm-up.	Less than 1	
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	B54	6	—	More than 8.5	10 — 17
			Throttle fully open and with select lever in 1st gear.	Less than 0.5	

Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
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 1	
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	
ABS signal	B55	21	ABS switch ON	Less than 1	—
			ABS switch OFF	More than 6.5	—
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	—	—	—
		6	—	—	

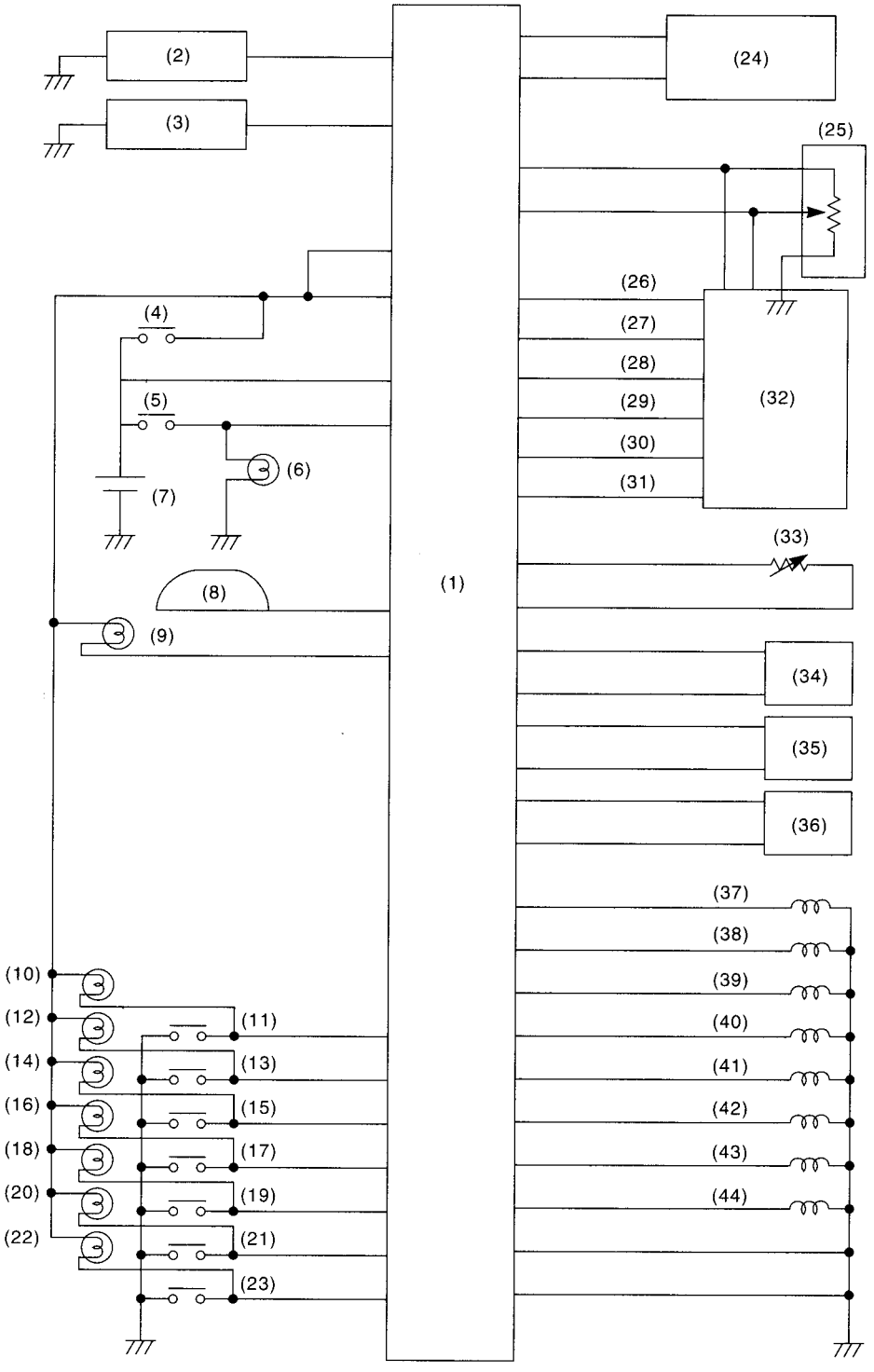
B: SCHEMATIC

1. NON-TURBO MODEL



(1) Transmission control module
(2) Data link connector
(3) Cruise set switch
(4) ABS control module
(5) Ignition switch
(6) Brake switch
(7) Brake light
(8) Battery
(9) Combination meter
(10) AT OIL TEMP warning light
(11) FWD indicator light
(12) FWD switch
(13) "P" range indicator light
(14) "R" range indicator light
(15) "N" range indicator light
(16) "D" range indicator light
(17) "3" range indicator light
(18) "2" range indicator light
(19) "1" range indicator light
(20) "P" range switch
(21) "R" range switch
(22) "N" range switch
(23) "D" range switch
(24) "3" range switch
(25) "2" range switch
(26) "1" range switch
(27) Throttle position sensor
(28) Engine speed signal
(29) Torque control cut signal
(30) Torque control signal 2
(31) Torque control signal 1
(32) AT load signal
(33) AT diagnostics signal
(34) Engine control module
(35) ATF temperature sensor
(36) Torque converter turbine speed sensor
(37) Front vehicle speed sensor
(38) Rear vehicle speed sensor
(39) Shift solenoid 1
(40) Shift solenoid 2
(41) 2-4 brake timing solenoid
(42) Line pressure duty solenoid
(43) Line pressure dropping resistor
(44) 2-4 brake duty solenoid
(45) 2-4 brake dropping resistor
(46) Lock-up duty solenoid
(47) Low clutch timing solenoid
(48) Transfer duty solenoid

2. TURBO MODEL



TR0567

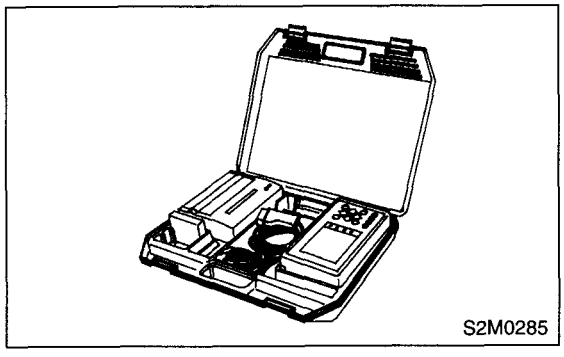
(1) Transmission control module
(2) Cruise control module
(3) ABS control module
(4) Ignition switch
(5) Brake switch
(6) Brake light
(7) Battery
(8) Combination meter (Speedometer circuit)
(9) AT OIL TEMP light
(10) "P" range indicator light
(11) "P" range switch
(12) "R" range indicator light
(13) "R" range switch
(14) "N" range indicator light
(15) "N" range switch
(16) "D" range indicator light
(17) "D" range switch
(18) "3" range indicator light
(19) "3" range switch
(20) "2" range indicator light
(21) "2" range switch
(22) "1" range indicator light
(23) "1" range switch
(24) Data link connector
(25) Throttle position sensor
(26) Engine speed signal
(27) Torque control cut signal
(28) Torque control signal 2
(29) Torque control signal 1
(30) Mass air flow signal
(31) AT diagnostics signal
(32) Engine control module
(33) ATF temperature sensor
(34) Torque converter turbine speed sensor
(35) Rear vehicle speed sensor
(36) Front vehicle speed sensor
(37) Shift solenoid 1
(38) Shift solenoid 2
(39) 2-4 brake timing solenoid
(40) Line pressure duty solenoid
(41) 2-4 brake duty solenoid
(42) Lock-up duty solenoid
(43) Low clutch timing solenoid
(44) Transfer duty solenoid

6. Subaru Select Monitor

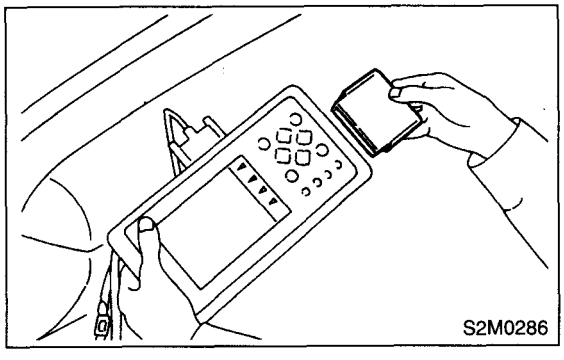
A: OPERATION

1. READ DIAGNOSTIC TROUBLE CODE (DTC)

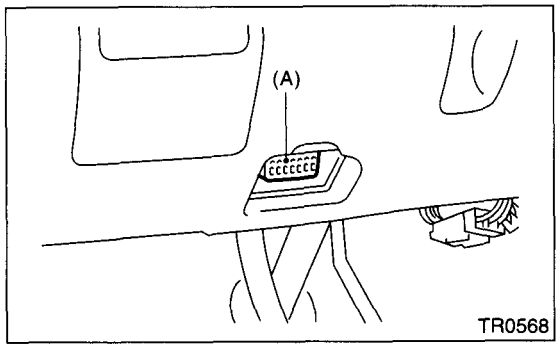
1) Prepare the Subaru Select Monitor kit.


S2M0285

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.>


S2M0286

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).



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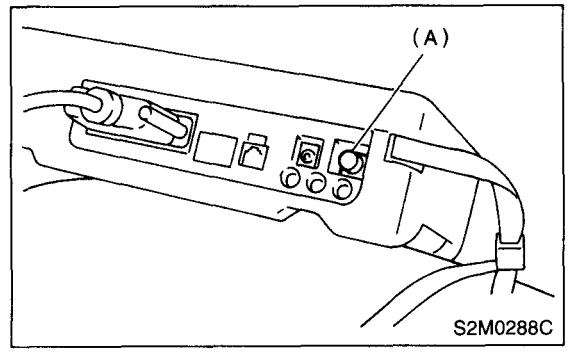
(A) Data link connector

(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.



S2M0288C

(A) Power switch

6) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
7) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
8) Press the [YES] key after displayed the information of transmission type.
9) On the «Transmission Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press the [YES] key.
10) On the «Diagnostic Code(s) Display» display screen, select the {Latest Diagnostic Code(s)} or {Memorized 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 DIAGNOSTIC TROUBLE CODE LIST (DTC). <Ref. to AT-29, List of Diagnostic Trouble Code (DTC).>

2. READ CURRENT DATA

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	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 (Non-turbo model)	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
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.

3. CLEAR MEMORY 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 {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 {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:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

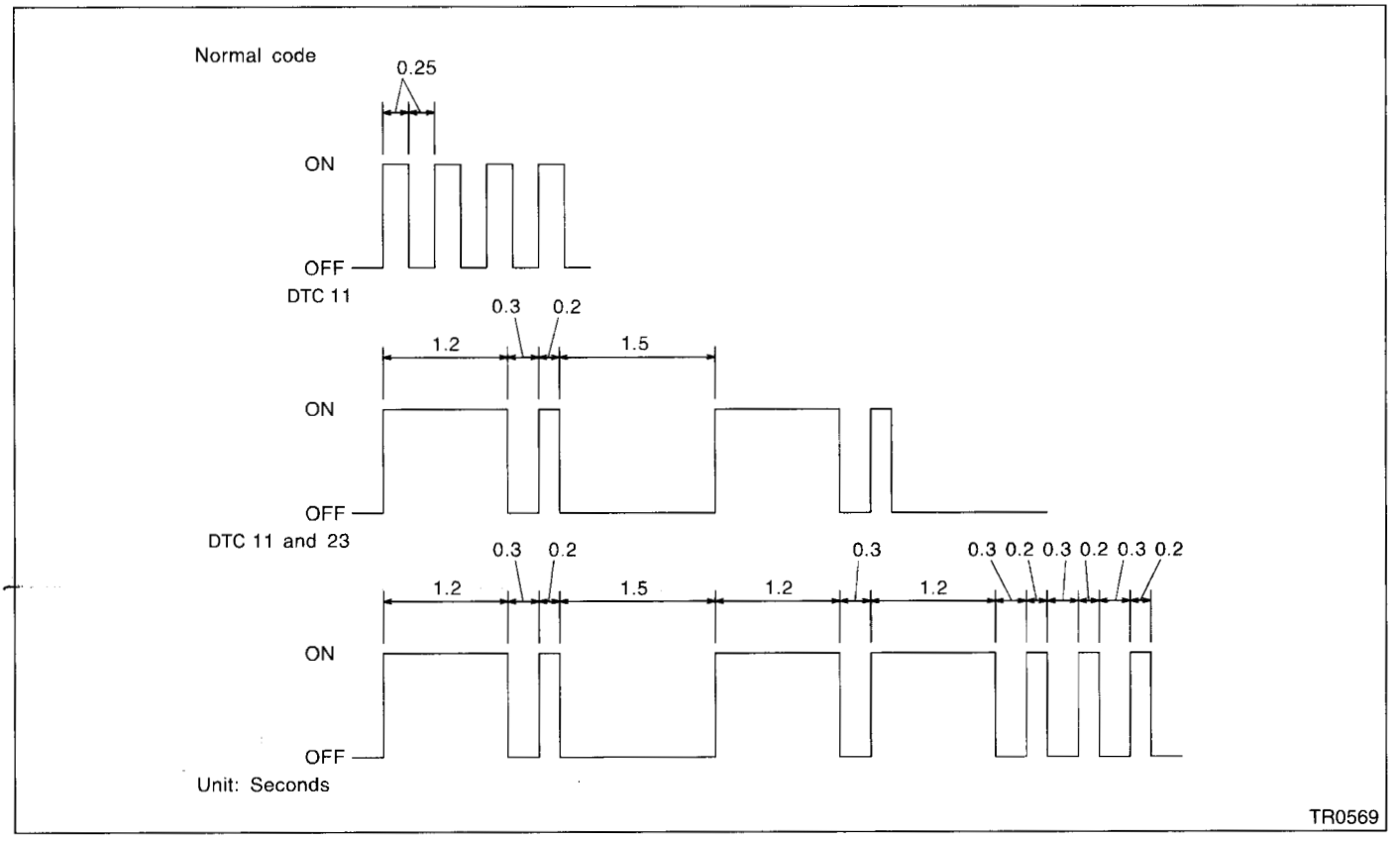
7. Read Diagnostic Trouble Code (DTC)

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)Brake pedal depressed and move the 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 ignition switch is turned OFF).	Repair power supply and ground circuit.<Ref. to AT-36, CHECK POWER SUPPLY AND GROUND LINE, Diagnostic Procedure for AT OIL TEMP Warning 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 OFF).	AT system is normal.	Go to step **3.**
3	**CHECK INDICATOR LIGHT.**	Is a trouble code outputted?	Inspect the problem corresponding with diagnostic trouble code (DTC). NOTE: Record all diagnostic trouble code (DTC).	Go to step **4.**
4	**CHECK INDICATOR LIGHT.**	Does the indicator light remain illuminated?	Repair the AT OIL TEMP warning light circuit <Ref. to AT-31, Diagnostic Procedure for AT OIL TEMP Warning Light.>, or Inspect inhibitor switch, wiring, TCM, etc.	Calling up the diagnostic trouble code (DTC) again.

The AT OIL TEMP warning light flashes the code corresponding to the 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 trouble codes. <Ref. to AT-22, 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 brakes are applied.

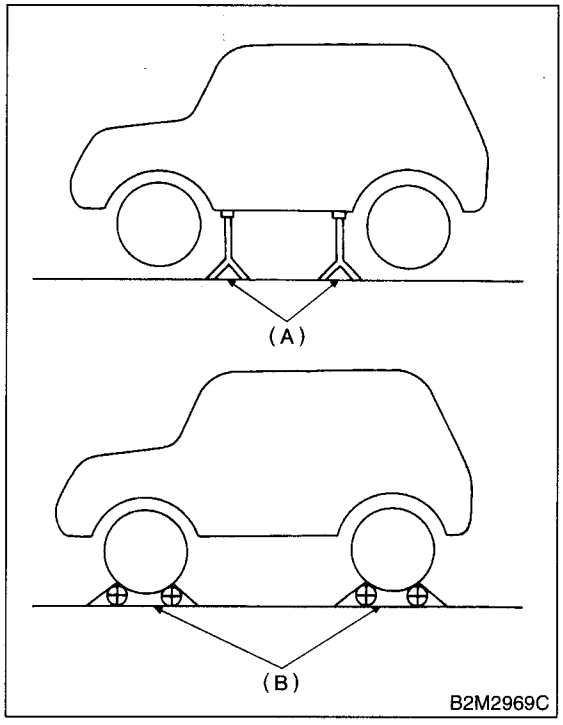
• Do not use a pantograph jack in place of a safety stand.

• 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 clutch pedal or accelerator pedal during works even when the 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

9. Clear Memory Mode

A: OPERATION

1. WITHOUT SUBARU SELECT MONITOR

Current trouble codes shown on the display are cleared by turning the ignition switch OFF after conducting the on-board diagnostics operation. Previous trouble codes, however, cannot be cleared since they are stored in the TCM memory which is operating on the back-up power supply. These trouble codes can be cleared by removing the specified fuse (located under the light or left lower position of the instrument panel).

CLEAR MEMORY:

Removal of No. 4 fuse (for at least one minute)

- The No. 4 fuse is located in the line to the memory back-up power supply of the TCM. Removal of this fuse clears the previous trouble codes stored in the TCM memory.
- Be sure to remove the No. 4 fuse for at least the specified length of time. Otherwise, trouble codes may not be cleared.

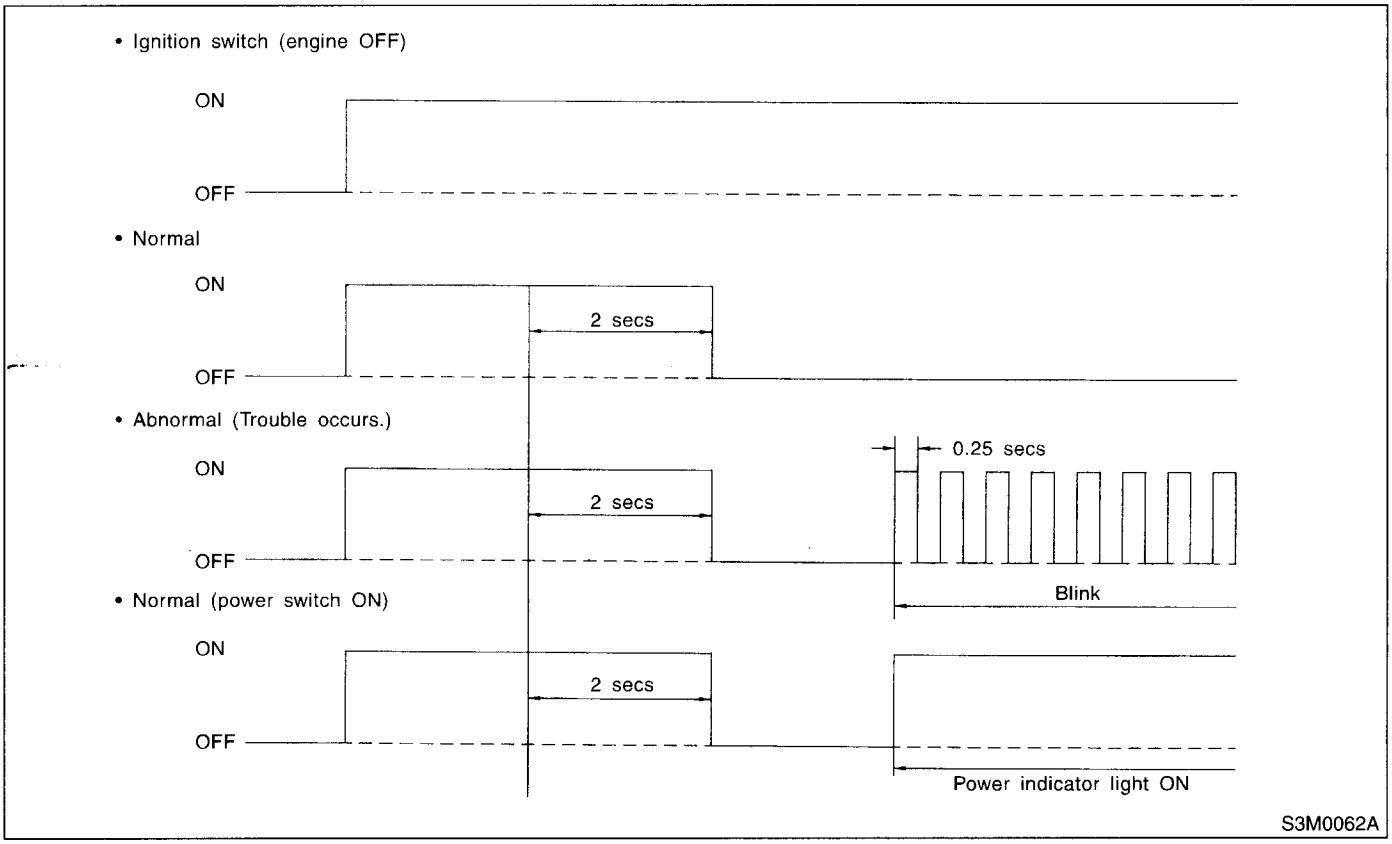
2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to clear trouble codes.
<Ref. to AT-23, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.>

10.AT OIL TEMP Warning Light Display

A: INSPECTION

When any on-board diagnostics item is malfunctioning, the display on the power indicator light blinks from the time the malfunction is detected after starting the engine until the ignition switch is turned OFF. The malfunctioning part or unit can be determined by a trouble code during the on-board diagnostics operation. Problems which occurred previously can also be identified through the memory function. If the AT OIL TEMP warning does not show a problem (although a problem is occurring), the problem can be determined by checking the performance characteristics of each sensor using the select monitor. 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-44, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
23	Mass air flow signal	Detects open or shorted input signal circuit.	<Ref. to AT-46, DTC 23 MASS AIR FROW SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
27	ATF temperature sensor	Detects open or shorted input signal circuit.	<Ref. to AT-48, 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-52, 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-57, 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-62, 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-66, 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-68, DTC 45 INTAKE MANIFOLD PRESSURE SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
71	Shift solenoid 1	Detects open or shorted output signal circuit.	<Ref. to AT-70, 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-74, 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-78, 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-82, 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-86, 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-90, 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-94, 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-100, 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-104, DTC 93 REAR VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

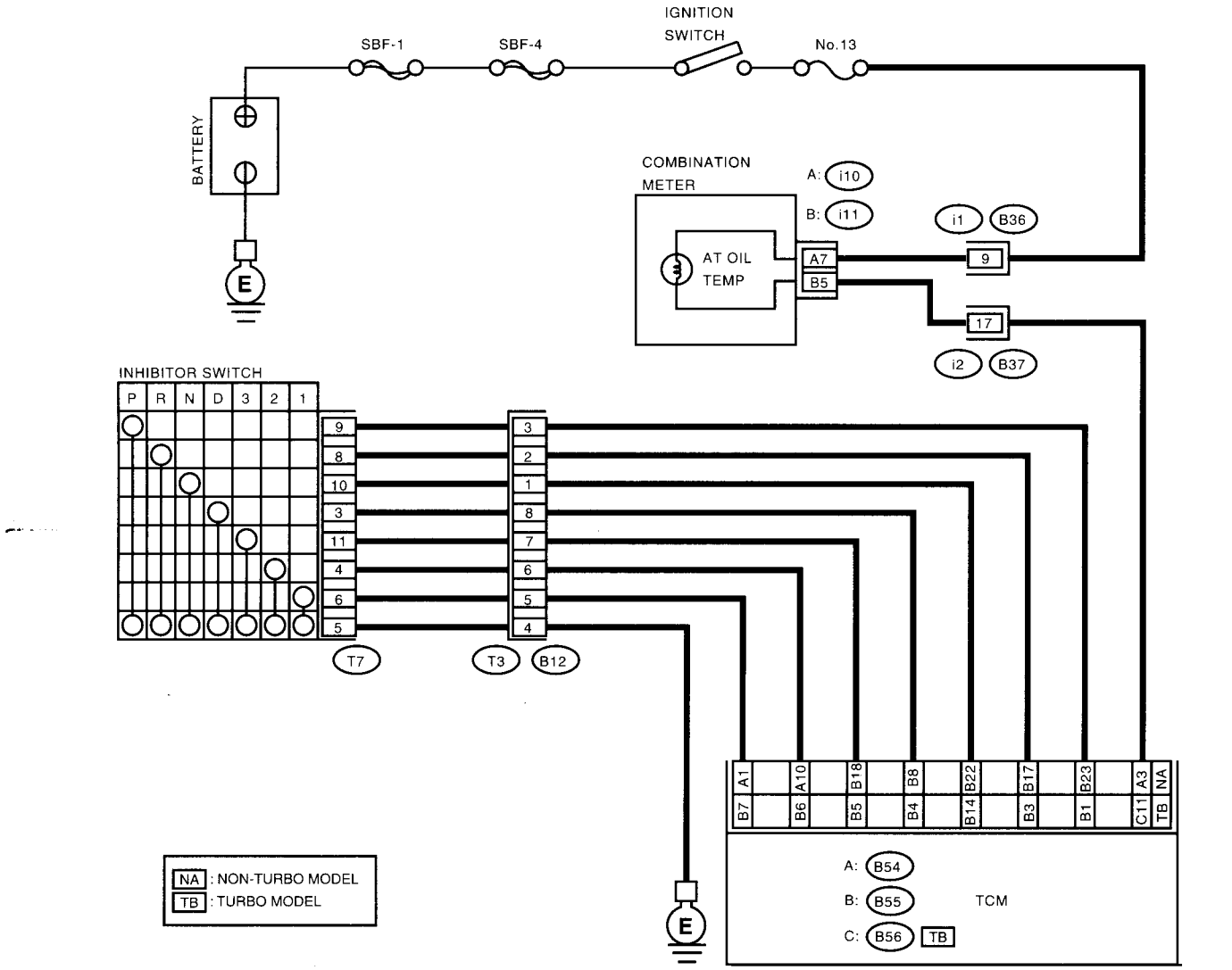
12.Diagnostic Procedure for AT OIL TEMP Warning Light

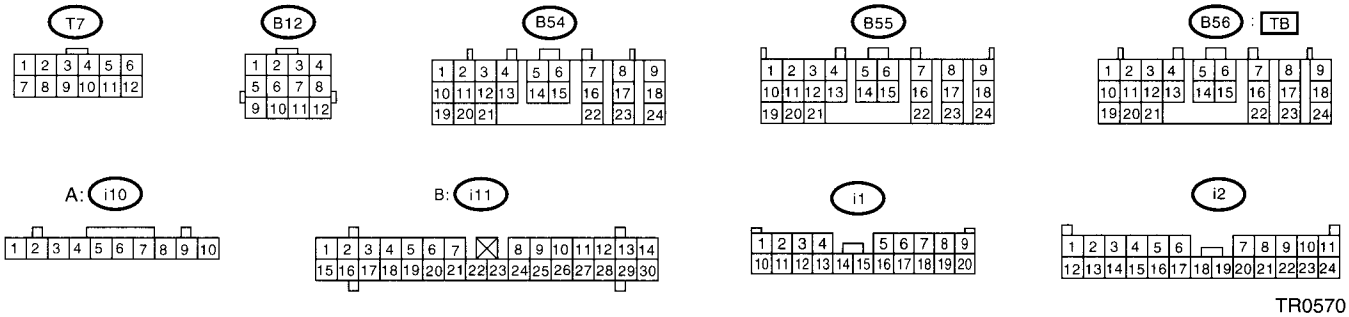
A: AT OIL TEMP WARNING LIGHT DOES NOT COME ON OR GO OFF

DIAGNOSIS:
The AT OIL TEMP warning light circuit is open or shorted.
TROUBLE SYMPTOM:
- When the ignition switch is turned to ON (engine OFF), AT OIL TEMP warning light does not illuminate.
- When the on-board diagnostics is performed, AT OIL TEMP warning light remains illuminated.

DIAGNOSTIC PROCEDURE FOR AT OIL TEMP WARNING LIGHT

WIRING DIAGRAM:





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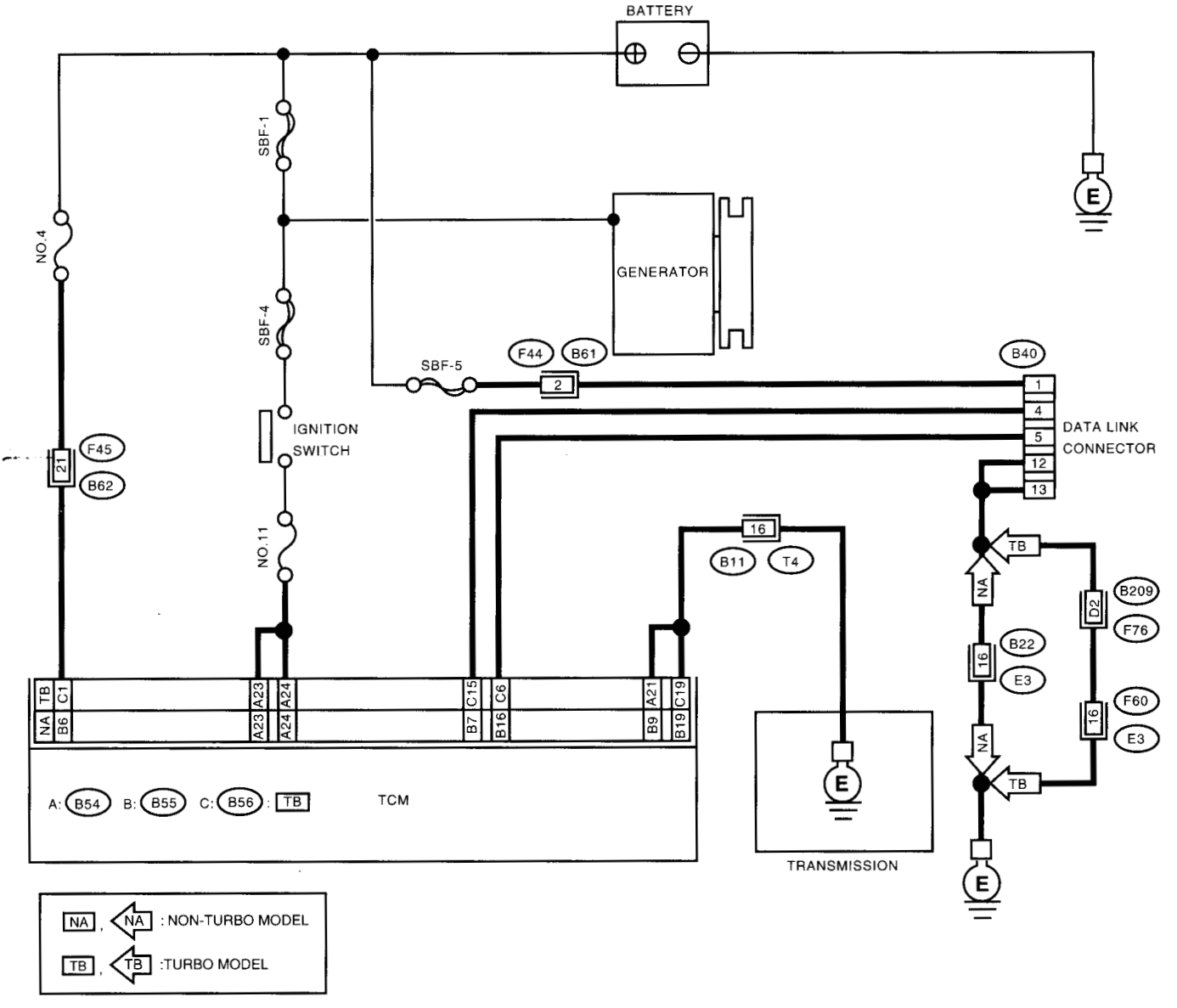
DIAGNOSTIC PROCEDURE FOR AT OIL TEMP WARNING LIGHT

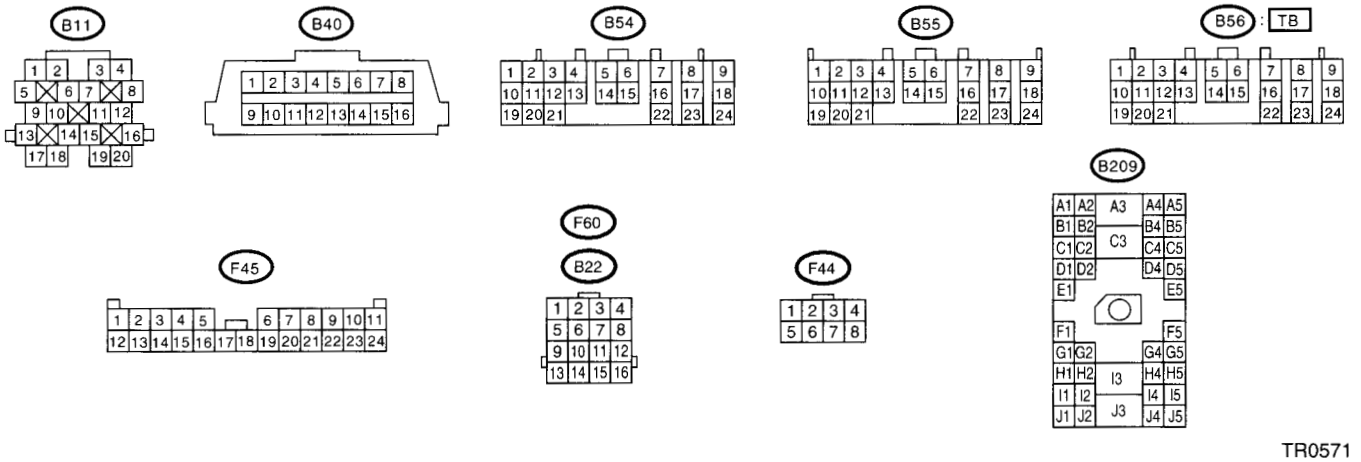
	Step	Check	Yes	No
1	**CHECK AT OIL TEMP WARNING LIGHT.** Turn the ignition switch to ON (engine OFF).	Does the AT OIL TEMP warning light illuminate?	Go to step **3.**	Go to step **2.**
2	**CHECK AT OIL TEMP WARNING LIGHT.** 1)Turn the ignition switch to OFF. 2)Remove the combination meter. 3)Remove the ATF temp warning light bulb from combination meter.	Is the AT OIL TEMP warning light bulb OK?	Go to step **4.**	Replace the AT OIL TEMP warning light bulb.
3	**CHECK AT OIL TEMP WARNING LIGHT.** Perform "Read Diagnostic Trouble Code". <Ref. to AT-24, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).>	Does the AT OIL TEMP warning light blink?	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 **10.**
4	**CHECK FUSE (No. 13).** Remove the fuse (No. 13).	Is the fuse (No. 13) blown out?	Replace the fuse (No. 13). If the replaced fuse (No. 13) is blown out easily, repair short circuit in harness between fuse (No. 13) 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. 7 (+) — Chassis ground (–):***	Is the voltage more than 9 V?	Go to step **6.**	Repair open or short 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. 5 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **7.**	Repair the combination meter. <Ref. to IDI-11, Combination Meter Assembly.>
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*** ***Non-turbo model*** ***(B54) No. 3 — (i11) No. 5:*** ***Turbo model*** ***(B56) No. 11 — (i11) No. 5:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair 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*** ***Non-turbo model*** ***(B54) No. 3 (+) — Chassis ground (–):*** ***Turbo model*** ***(B56) No. 11 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Even if the AT OIL TEMP warning 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-45, Transmission Control Module (TCM).>
9	**CHECK SUBARU SELECT MONITOR.**	Do you have a SUBARU SELECT MONITOR?	Go to step **10.**	Go to step **11.**
10	**CHECK INHIBITOR SWITCH.** 1)Connect the Subaru Select Monitor to data link connector. 2)Turn the ignition switch to ON. 3)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?	Go to step **11.**	Check the inhibitor switch circuit. <Ref. to AT-115, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-Diagnostic Trouble Code (DTC).>
11	**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*** ***Non-turbo model*** ***(B54) No. 3 (+) — Chassis ground (–):*** ***Turbo model*** ***(B56) No. 11 (+) — Chassis ground (–):***	Is the resistance less than 1 MΩ?	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>	Repair short circuit in harness between combination meter connector and TCM connector.

B: CHECK POWER SUPPLY AND GROUND LINE

WIRING DIAGRAM:





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DIAGNOSTIC PROCEDURE FOR AT OIL TEMP WARNING LIGHT

	Step	Check	Yes	No
1	**CHECK IGNITION SWITCH.**	Is the ignition switch ON?	Go to step **2.**	Turn the ignition switch ON.
2	**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 voltage between 10 and 15 V?	Go to step **3.**	Repair the generator. <Ref. to SC-13, Generator.>
3	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Is there poor contact at battery terminal?	Repair the battery terminal.	Go to step **4.**
4	**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*** ***Non-turbo model*** ***(B54) No. 6 (+) — Chassis ground (–):*** ***Turbo model*** ***(B56) No. 1 (+) — Chassis ground (–):***	Is the voltage between 10 and 15 V?	Go to step **6.**	Go to step **5.**
5	**CHECK FUSE (NO. 4).** Remove fuse (No. 4).	Is the fuse (No. 4) blown out?	Replace the fuse (No. 4). If the replaced fuse (No. 4) has blown out easily, repair short circuit in harness between fuse (No. 4) and TCM.	Repair open circuit in harness between fuse (No. 4) and TCM, or fuse (No. 4) and battery, and poor contact in coupling connector.
6	**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 voltage more than 10 V?	Go to step **8.**	Go to step **7.**
7	**CHECK FUSE (NO. 11).** Remove the fuse (No. 11).	Is the fuse (No. 11) blown out?	Replace the fuse (No. 11). If the replaced fuse (No. 11) has blown out easily, repair short circuit in harness between fuse (No. 11) and TCM.	Repair open circuit in harness between fuse (No. 4) and TCM, or fuse (No. 4) and battery, and poor contact in coupling connector.
8	**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*** ***Non-turbo model*** ***(B55) No. 9 — (B11) No. 16*** ***(B55) No. 19 — (B11) No. 16*** ***Turbo model*** ***(B56) No. 19 — (B11) No. 16*** ***(B54) No. 21 — (B11) No. 16***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair open circuit in harness between TCM, transmission harness connector, and poor contact in coupling connector.

	Step	Check	Yes	No
9	**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 resistance less than 1 Ω?	Go to step **10.**	Repair open circuit in harness between transmission and transmission ground.
10	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in control module power supply, ground line and data link connector?	Repair the connector.	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

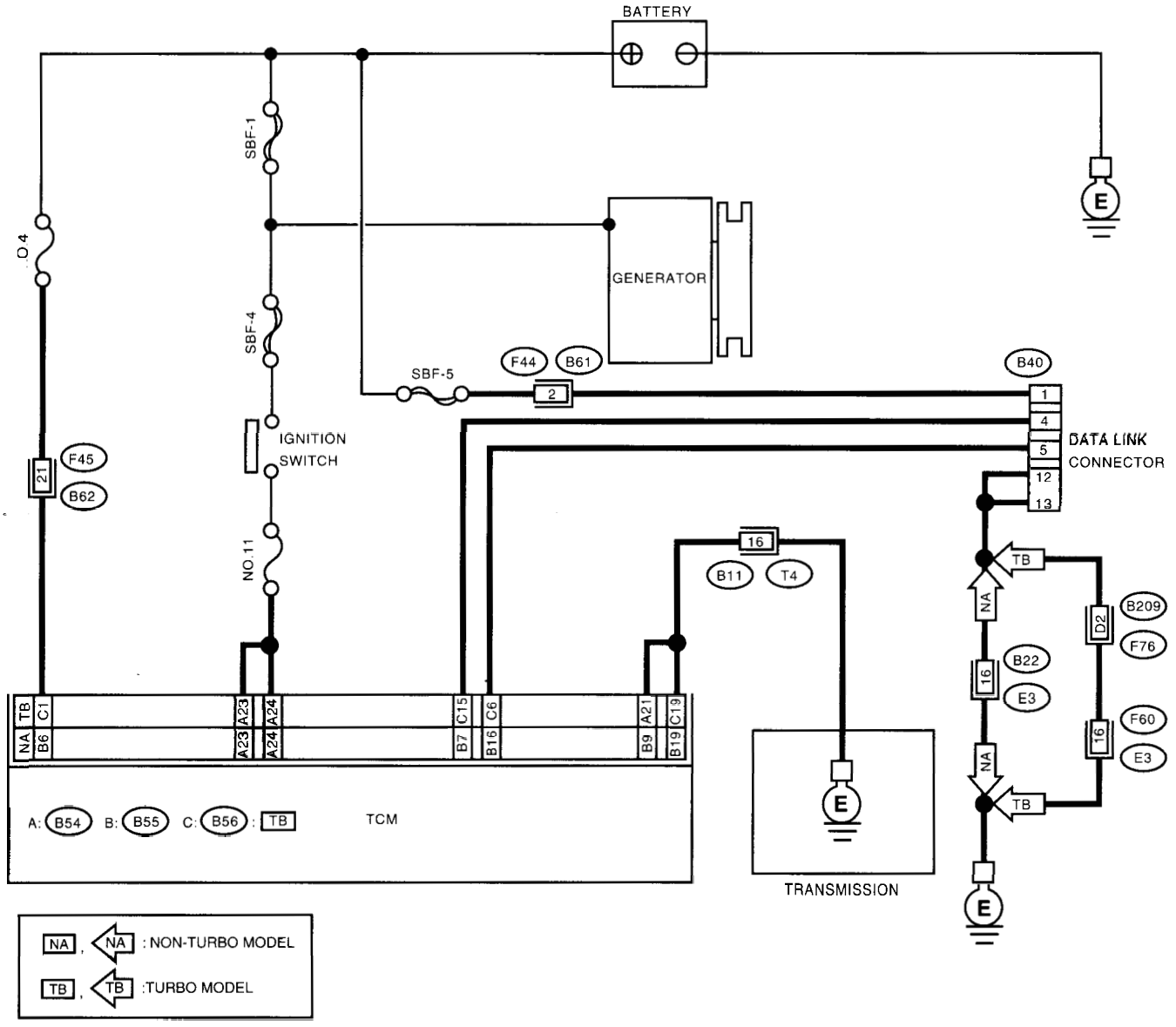
13.Diagnostic Procedure for Select Monitor Communication

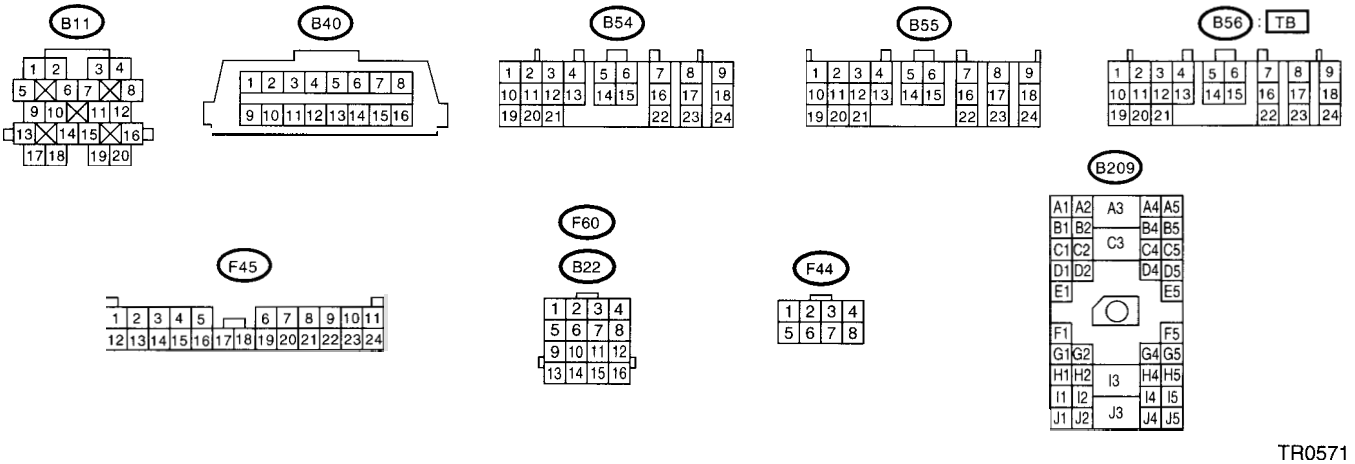
A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DIAGNOSIS:
- Faulty harness connector

TROUBLE SYMPTOM:
- Select the monitor communication failure

WIRING DIAGRAM:





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DIAGNOSTIC PROCEDURE FOR SELECT MONITOR COMMUNICATION

	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 voltage more than 10V?	Go to step **2.**	Repair 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 resistance less than 1Ω?	Go to step **3.**	Repair 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 select monitor, check whether communication to other systems (such as engine, ABS etc.) can be executed normally.	Are the name and year of the system displayed on the select monitor?	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 other systems (such as ABS etc.) can be executed normally.	Are the name and year of the system displayed on the select monitor?	Go to step **10.**	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 other systems (such as ABS etc.) can be executed normally.	Are the name and year of the system displayed on the select monitor?	Inspect the ECM.	Go to step **6.**
6	**CHECK COMMUNICATION OF SELECT MONITOR.** 1)Turn the ignition switch to OFF. 2)Connect the ECM connector. 3)Disconnect the ABSCM&H/U connector. 4)Check whether communication to other systems (such as engine etc.) can be executed normally.	Are the name and year of the system displayed on the select monitor?	Inspect the ABSCM&H/U.	Go to step **7.**
7	**CHECK COMMUNICATION OF SELECT MONITOR.** 1)Turn the ignition switch to OFF. 2)Connect the ABSCM&H/U module connector. 3)Disconnect the cruise control module connector. 4)Check whether communication to other systems (such as engine etc.) can be executed normally. NOTE: If the vehicle is not equipped with cruise control, Go to step **8.**	Are the name and year of the system displayed on the select monitor?	Inspect the cruise control module.	Go to step **8.**

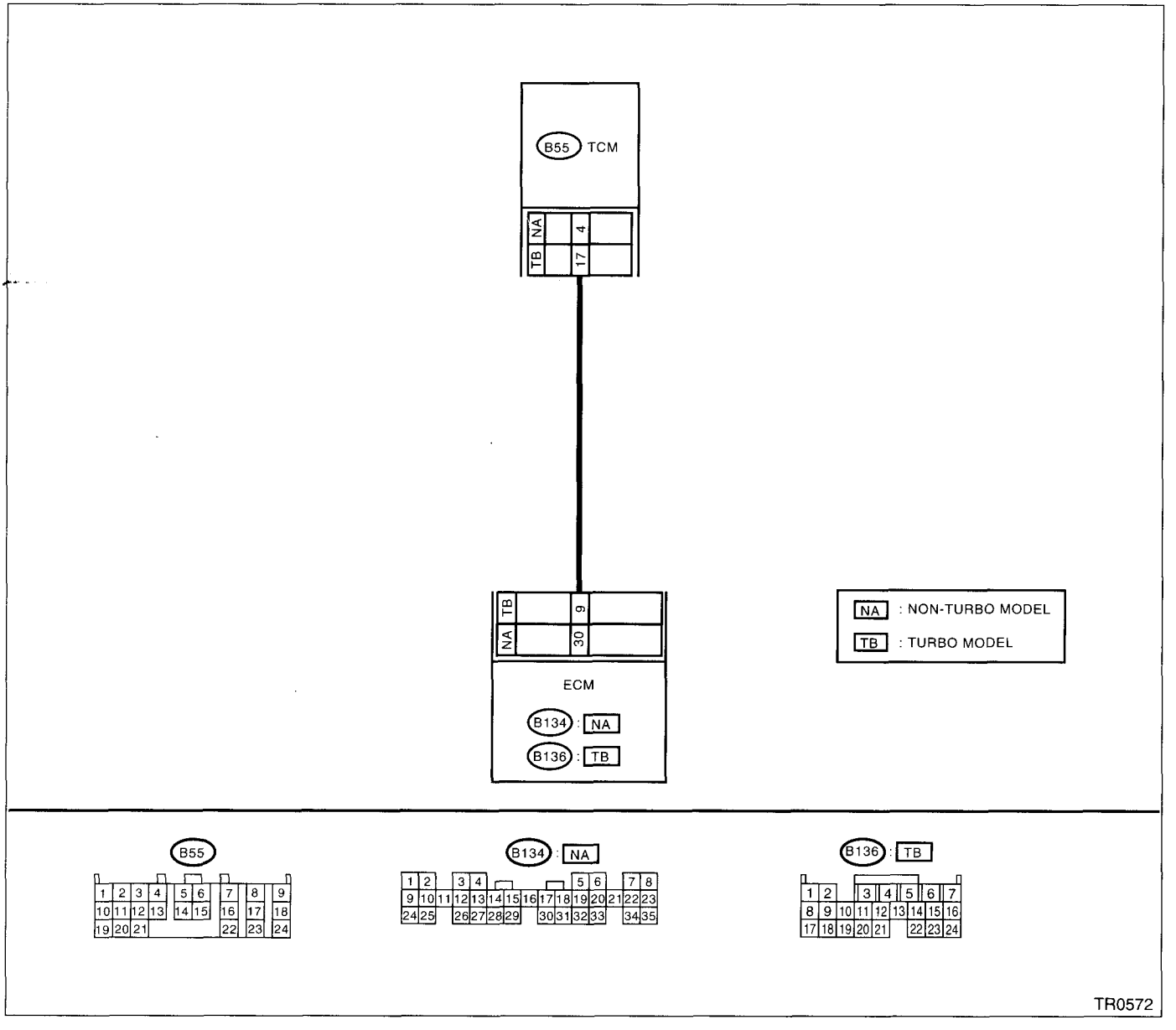
Step		Check	Yes	No
	(B40) No. 4 — Chassis ground:	Ω?	Go to step **9.**	Repair harness and connector between each control module and data link connector.
1	**CHECK OUTPUT SIGNAL FOR TCM.**	Is the voltage more than 1 V?	Repair harness and connector between each control module and data link connector.	A temporary poor contact or harness may be the case. Repair harness or connector in the select monitor communication circuit.
10	**CHECK HARNESS/CONNECTOR BETWEEN TCM AND DATA LINK CONNECTOR.** Measure the resistance between TCM connector and data link connector. ***Connector & terminal*** ***Non-turbo model*** ***(B55) No. 7 — (B40) No. 5:*** ***(B55) No. 16 — (B40) No. 4:*** ***Turbo model*** ***(B56) No. 6 — (B40) No. 5:*** ***(B56) No. 15 — (B40) No. 4:***	Is the resistance less than 0.5 Ω?	Go to step **11.**	Repair harness and connector between TCM and data link connector.
11	**CHECK INSTALLATION OF TCM CONNECTOR.** Turn the ignition switch to OFF.	Is TCM connector inserted into TCM?	Go to step **12.**	Insert the TCM connector into TCM.
12	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in control module and data link connector?	Repair the poor contact.	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

14.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC 11 ENGINE SPEED SIGNAL

DIAGNOSIS:
Engine speed input signal circuit is open or shorted.
TROUBLE SYMPTOM:
- No lock-up (after engine warm-up).
- AT OIL TEMP warning light remains on when the vehicle speed is "0".

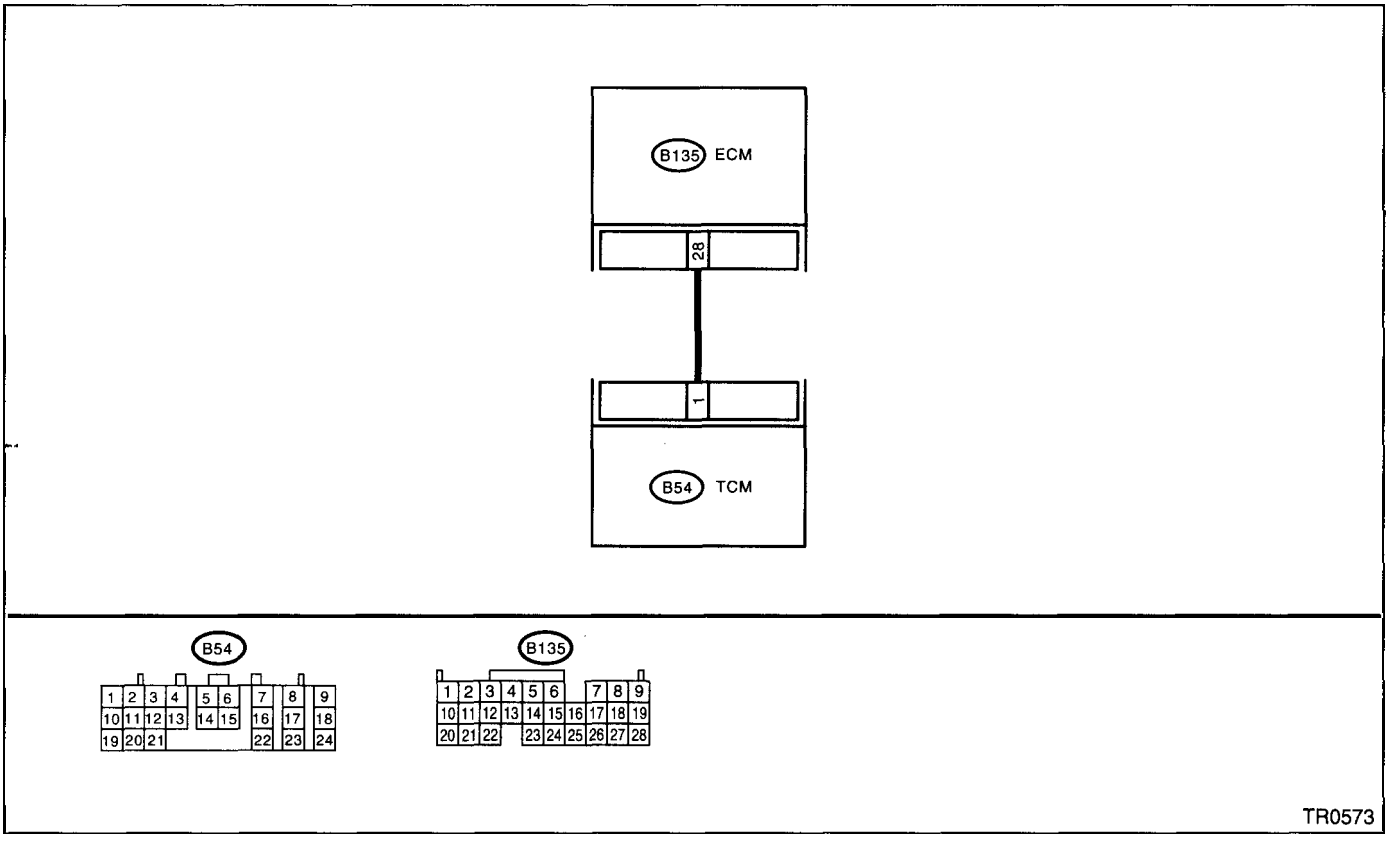
WIRING DIAGRAM:



	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. 4 — (B134) No. 30:*** ***Turbo model*** ***(B55) No. 17 — (B136) No. 9:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair 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*** ***Non-turbo model*** ***(B55) No. 4 — Chassis ground:*** ***Turbo model*** ***(B55) No. 17 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair short circuit in harness between TCM and ECM connector.
3	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	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*** ***Non-turbo model*** ***(B55) No. 4 (+) — Chassis ground (–):*** ***Turbo model*** ***(B55) No. 17 (+) — Chassis ground (–):***	Is the voltage 0 V?	Even if the AT OIL TEMP warning 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 **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 the Subaru Select Monitor switch to ON. 4)Warm-up the engine until engine coolant temperature is above 80°C (176°F). 5)Engine idling. 6)Read the data of engine speed using the Subaru Select Monitor. •Display shows engine speed signal value sent from ECM.	Is the revolution value the same as the tachometer reading shown on the combination meter?	Even if the AT OIL TEMP warning 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 **6.**
6	**CHECK POOR CONTACT.**	Is there poor contact in engine speed signal circuit?	Repair poor contact.	Go to step **7.**
7	**CONFIRM DTC 11.**	Replace the ECM with a new one. Does the trouble code appear again, after the memory has been cleared?	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>	Replace the ECM.

B: DTC 23 MASS AIR FROW SIGNAL

DIAGNOSIS:
Input signal circuit of TCM from ECM is open or shorted.
TROUBLE SYMPTOM:
Excessive shift shock.
WIRING DIAGRAM:

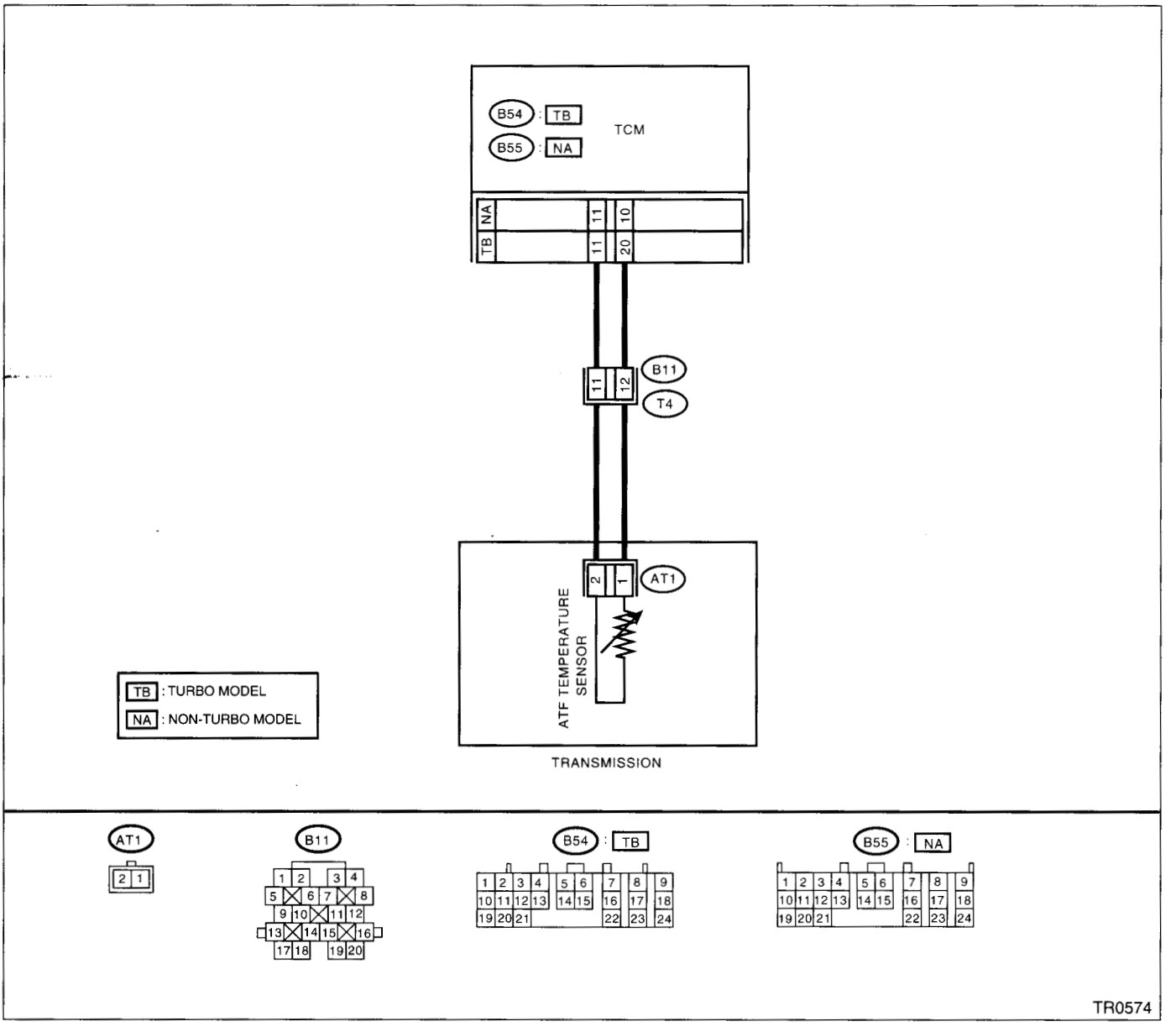


	Step	Check	Yes	No
	GROUND CIRCUIT OF ECM <Ref. to AT-52, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>		Repair ground terminal and/or ground circuit of ECM.	Go to step **2.**
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** 1)Turn the ignition switch to 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:***	s the resistance less than 1 Ω?	Go to step **3.**	Repair open circuit in harness between TCM and ECM connector.
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:***	s the resistance more than 1 MΩ?	Go to step **4.**	Repair short circuit in harness between TCM and ECM connector.
4	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **6.**	Go to step **5.**

	Step	Check	Yes	No
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 the ATF reaches its operating temperature. 3)Engine idling. 4)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 1 (+) — Chassis ground (–):***	Is the voltage between 0.4 and 1.8 V?	Even if the AT OIL TEMP warning 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 the engine coolant temperature is above 80°C (176°F). 5)Engine idling. 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 value between 0.4 and 1.8 V?	Even if the AT OIL TEMP warning 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?	Repair the poor contact.	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

C: DTC 27 ATF TEMPERATURE SENSOR

DIAGNOSIS:
Input signal circuit of TCM to ATF temperature sensor is open or shorted.
TROUBLE SYMPTOM:
Excessive shift shock.
WIRING DIAGRAM:



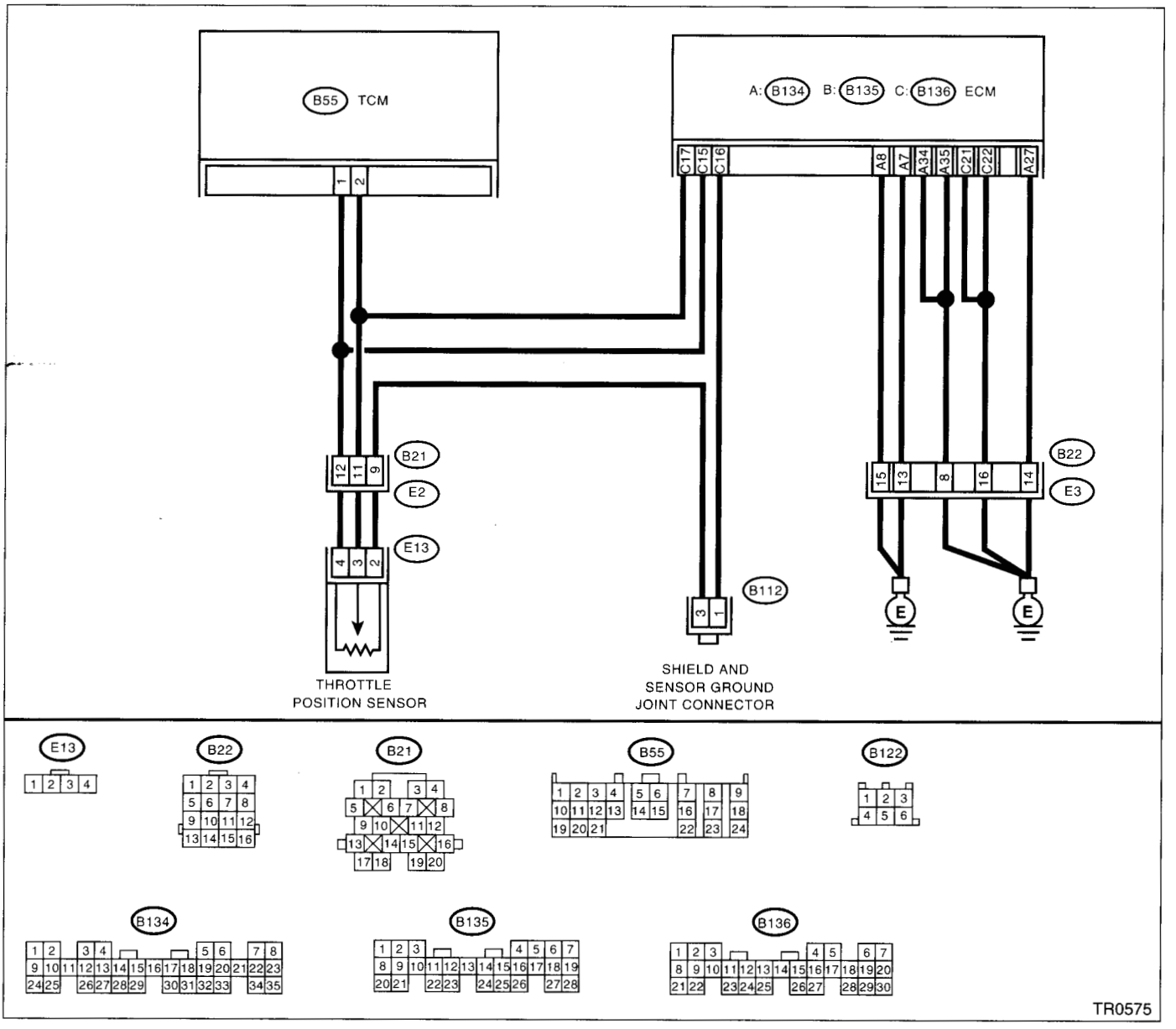
	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from transmission and TCM. 3)Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***Non-turbo model*** ***(B55) No. 10 — (B11) No. 12:*** ***Turbo mode*** ***(B54) No. 20 — (B11) No. 12:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***Non-turbo model*** ***(B55) No. 11 — (B11) No. 11:*** ***Turbo mode*** ***(B54) No. 11 — (B11) No. 11:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair 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*** ***Non-turbo model*** ***(B55) No. 10 — Chassis ground:*** ***Turbo mode*** ***(B54) No. 20 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair 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*** ***Non-turbo model*** ***(B55) No. 11 — Chassis ground:*** ***Turbo mode*** ***(B54) No. 11 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair 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 the ATF temperature reaches to 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until the 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 resistance between 275 and 375 Ω?	Go to step **6.**	Go to step **11.**

	Step	Check	Yes	No
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 the ATF temperature decreases?	Go to step **7.**	Go to step **11.**
7	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **9.**	Go to step **8.**
8	**CHECK INPUT SIGNAL FOR TCM.** 1)Connect the connector to transmission. 2)Warm-up the transmission until the ATF temperature is about 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature. 3)Measure the voltage between TCM connector terminal. ***Connector & terminal*** ***Non-turbo model*** ***(B55) No. 11 (+) — No. 10 (–):*** ***Turbo model*** ***(B54) No. 11 (+) — No. 20 (–):***	Is the voltage between 0.4 and 0.9 V?	Even if the AT OIL TEMP warning lights up, the circuit has returned to a normal condition at this time. Temporary poor contact of the connector or harness may be the case. Repair harness or contact in the 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?	Even if the AT OIL TEMP warning lights up, the circuit has returned to a normal condition at this time. Temporary poor contact of the connector or harness may be the case. Repair harness or contact in the ATF temperature sensor and transmission connector.	Go to step **10.**
10	**CHECK POOR CONTACT.**	Is there poor contact in ATF temperature sensor circuit?	Repair poor contact.	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

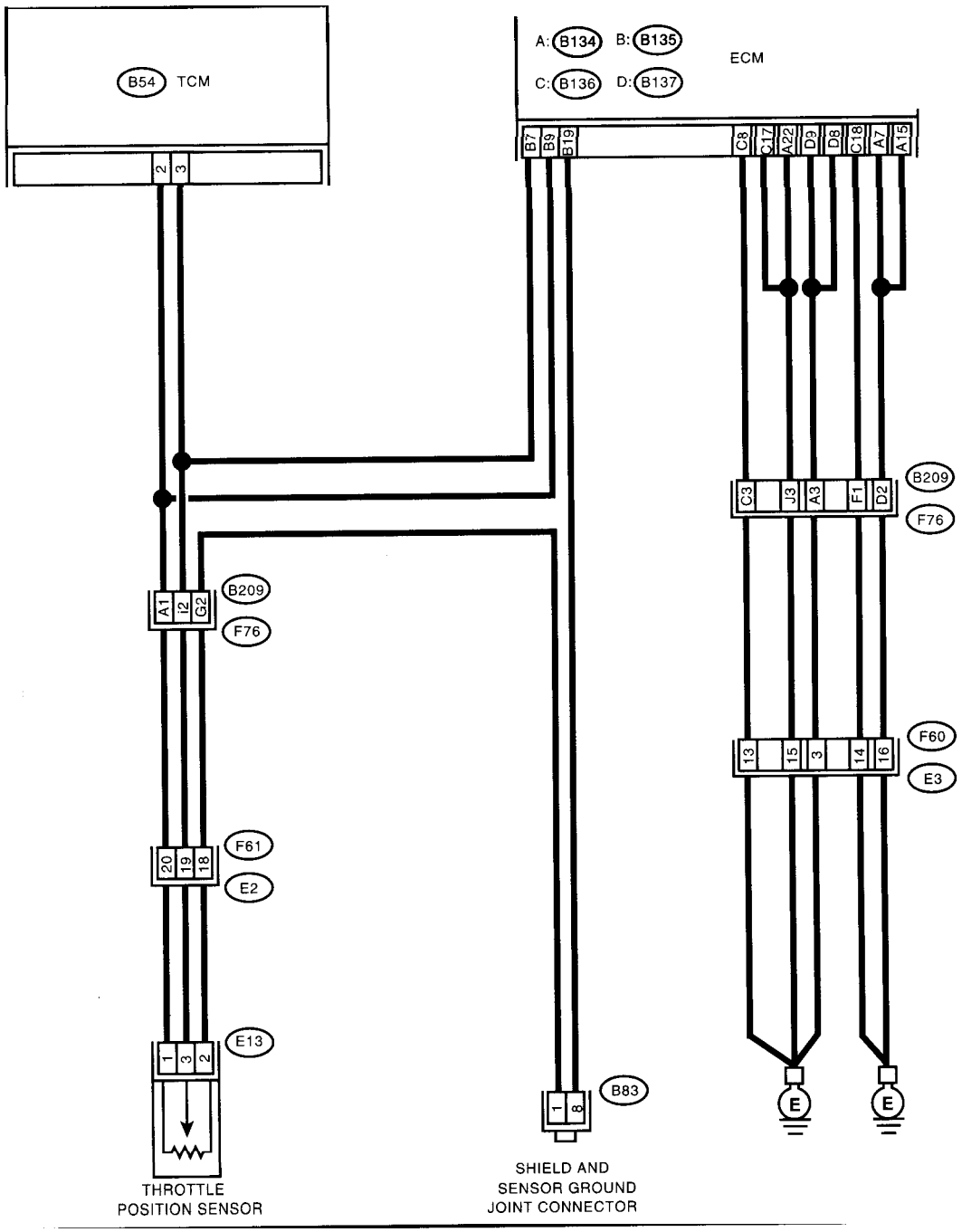
	Step	Check	Yes	No
11	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from transmission. 3)Remove the transmission connector from bracket. 4)Lift-up the vehicle and place safety stand. **CAUTION:** **On AWD models, raise all wheels off ground.** 5)Drain the automatic transmission fluid. **CAUTION:** ***Do not drain the automatic transmission fluid 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 resistance less than 1 Ω?	Go to step **12.**	Repair open circuit in harness between ATF temperature sensor and transmission connector.
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 resistance less than 1 Ω?	Go to step **13.**	Repair 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 resistance more than 1 MΩ?	Go to step **14.**	Repair 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 resistance more than 1 MΩ?	Replace the ATF temperature sensor. <Ref. to AT-39, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>	Repair short circuit in harness between ATF temperature sensor and transmission connector.

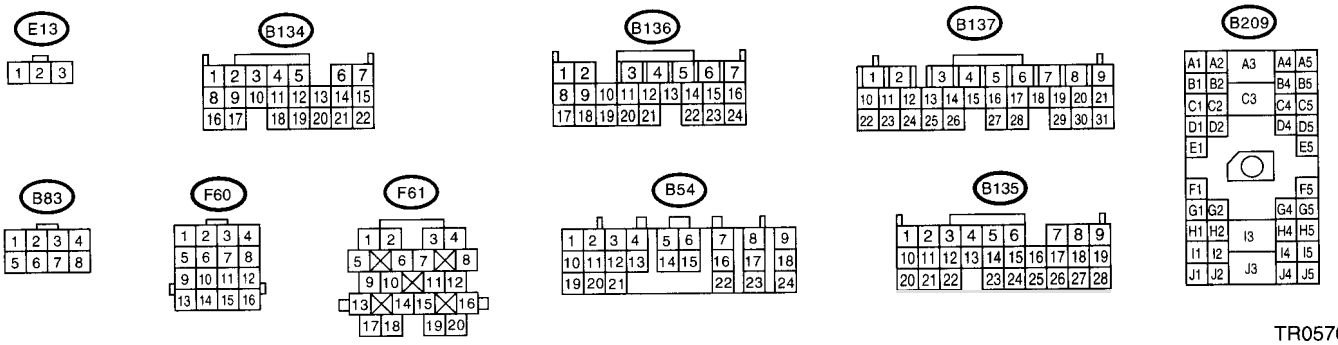
D: DTC 31 THROTTLE POSITION SENSOR

DIAGNOSIS:
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



TURBO MODEL





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	Step	Check	Yes	No
1	**CHECK ENGINE GROUND TERMINALS.**	Have engine ground terminals been 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. 27 — Engine ground:*** ***(B134) No. 8 — Engine ground:*** ***(B134) No. 7 — Engine ground:*** ***(B136) No. 21 — Engine ground:*** ***(B136) No. 22 — Engine ground:*** ***(B134) No. 35 — Engine ground:*** ***(B134) No. 34 — 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 resistance less than 5 Ω?	Go to step **3.**	Repair 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 resistance between 3.0 and 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 resistance between 0.35 and 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*** ***Non-turbo model*** ***(B55) No. 2 — (E13) No. 3:*** ***Turbo model*** ***(B54) No. 3 — (E13) No. 3:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair open circuit in harness between TCM and throttle position sensor connector, and poor contact in coupling connector.
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*** ***(B55) No. 1 — (E13) No. 4:*** ***Turbo model*** ***(B54) No. 2 — (E13) No. 4:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair open circuit in harness between TCM and throttle position sensor connector, and poor contact in coupling connector.

	Step	Check	Yes	No
7	**CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B55) No. 2 — Chassis ground:*** ***Turbo model*** ***(B54) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair 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*** ***Non-turbo model*** ***(B55) No. 1 — Chassis ground:*** ***Turbo model*** ***(B54) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair 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*** ***(B55) No. 2 — (B136) No. 17:*** ***Turbo model*** ***(B54) No. 3 — (B135) No. 7:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair 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*** ***(B55) No. 1 — (B136) No. 15:*** ***Turbo model*** ***(B54) No. 2 — (B135) No. 9:***	Is the resistance less than 1 Ω?	Go to step **11.**	Repair open circuit in harness between TCM and ECM connector.
11	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **14.**	Go to step **12.**
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*** ***Non-turbo model*** ***(B55) No. 2 (+) — Chassis ground (–):*** ***Turbo model*** ***(B54) No. 3 (+) — Chassis ground (–):***	Is the voltage between approx. 0.5 V in throttle fully closed?	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*** ***Non-turbo model*** ***(B55) No. 2 (+) — Chassis ground (–):*** ***Turbo model*** ***(B54) No. 3 (+) — Chassis ground (–):***	Is the voltage between approx. 4.3 V with throttle fully open?	Go to step **16.**	Go to step **18.**

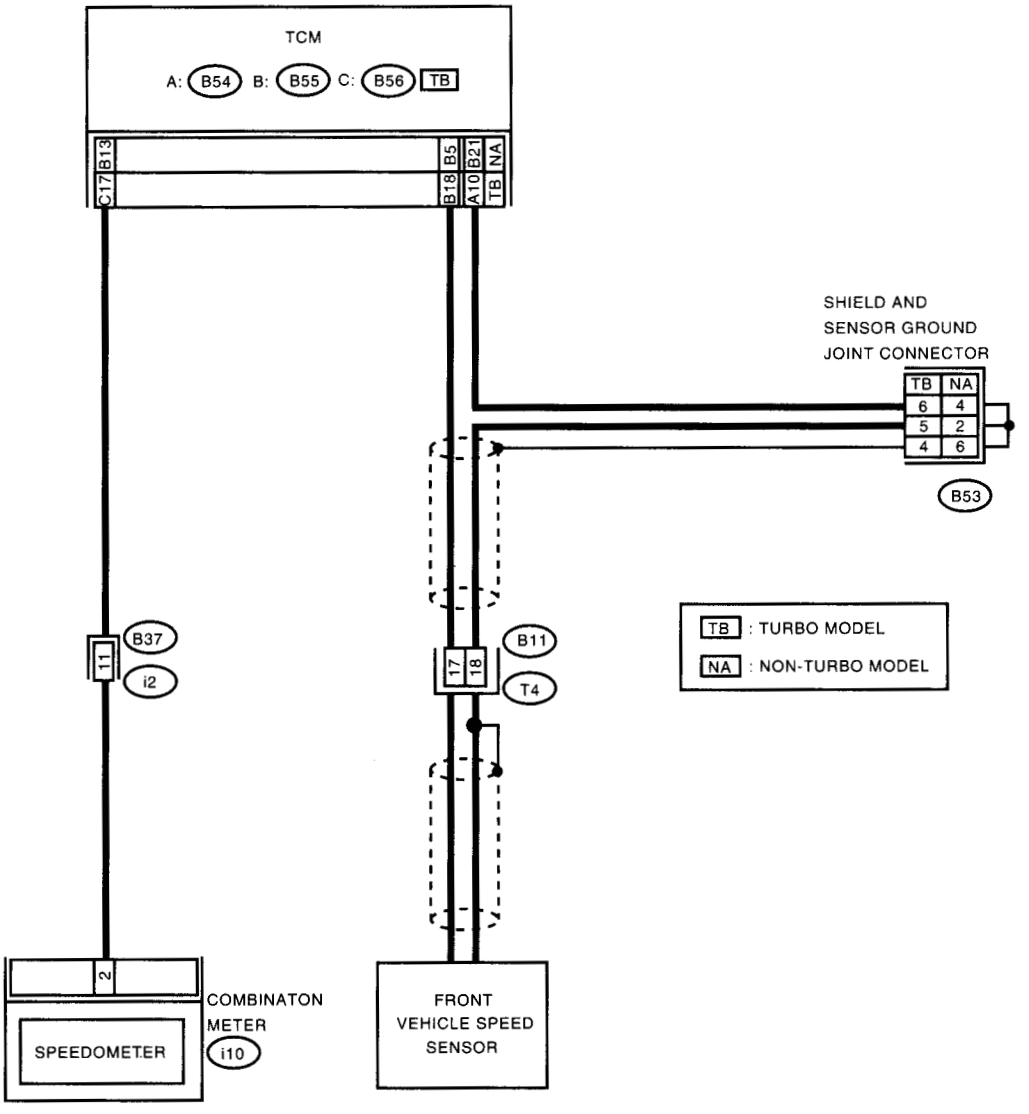
	Step	Check	Yes	No
14	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1)Connect the connectors to TCM, throttle position sensor and ECM. 2)Connect the Subaru Select Monitor to data link connector. 3)Turn the ignition switch to ON (engine OFF). 4)Turn the Subaru Select Monitor switch to ON. 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 value voltage between approx. 0.5 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 accelerator pedal operation (from "released" to "depressed" position).	Is the value voltage between approx. 4.3 V?	Go to step **17.**	Go to step **18.**
16	**CHECK INPUT SIGNAL FOR TCM (THROTTLE POSITION SENSOR POWER SUPPLY).** Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B55) No. 1 (+) — Chassis ground (–):*** ***Turbo model*** ***(B54) No. 2 (+) — Chassis ground (–):***	Is the voltage between 4.8 and 5.3 V?	Even if the AT OIL TEMP warning 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 throttle position sensor circuit.	Go to step **18.**
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 value voltage between 4.8 and 5.3 V?	Even if the AT OIL TEMP warning 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 throttle position sensor circuit.	Go to step **18.**
18	**CHECK POOR CONTACT.**	Is there poor contact in throttle position sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

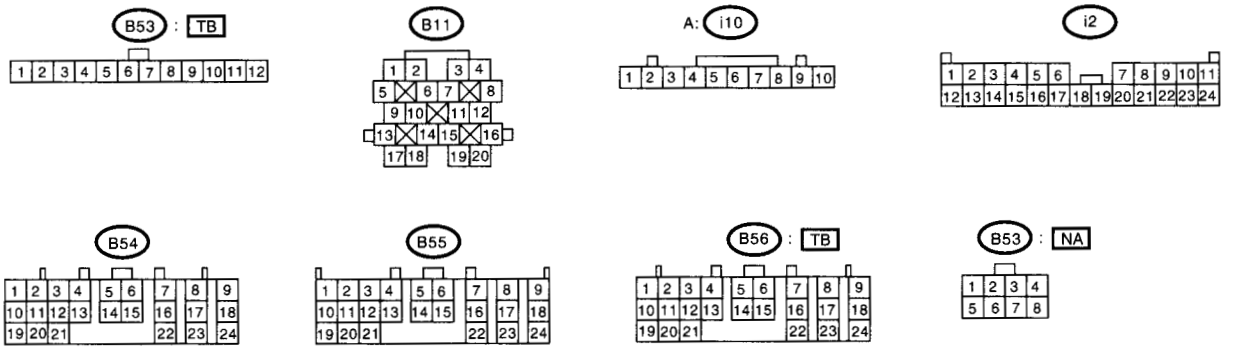
E: DTC 33 FRONT VEHICLE SPEED SENSOR

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:





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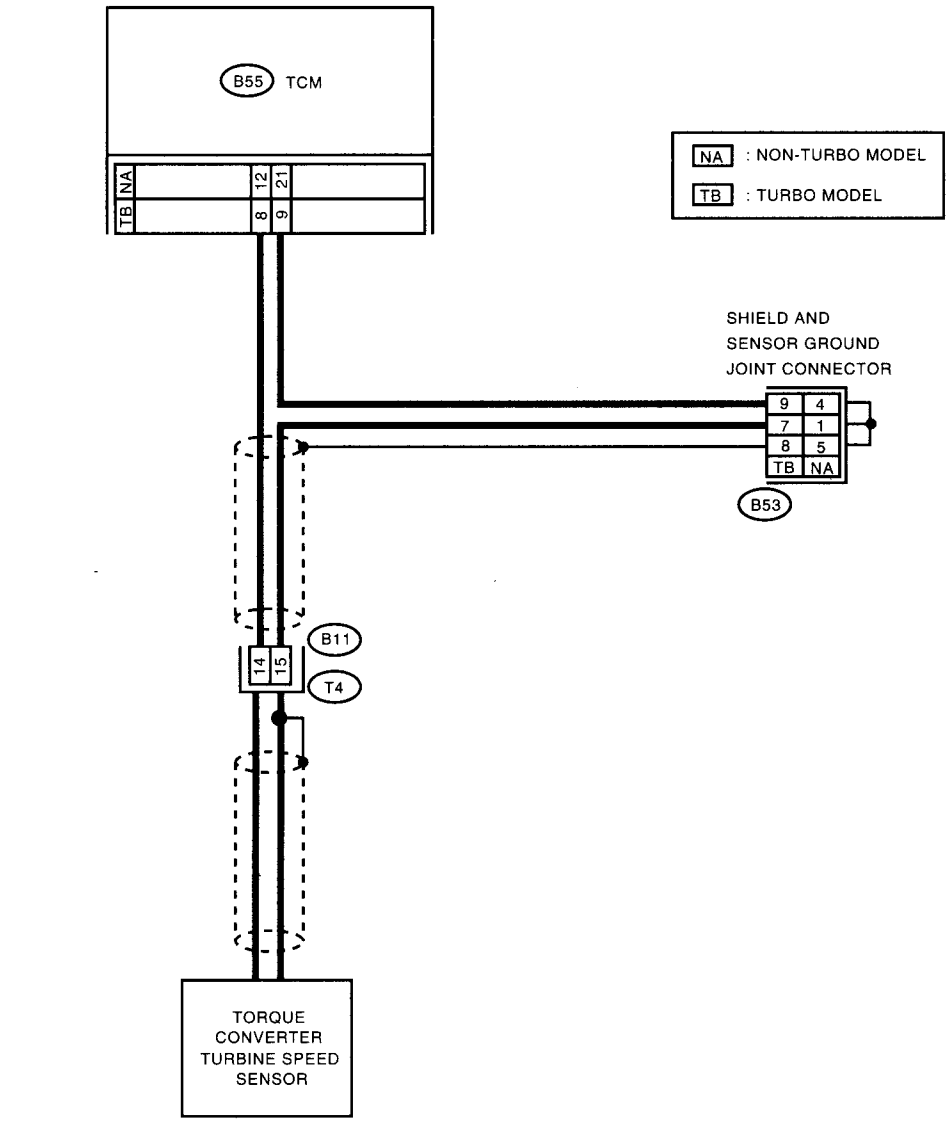
	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from TCM and transmission. 3)Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***Non-turbo model*** ***(B55) No. 5 — (B11) No. 17:*** ***Turbo model*** ***(B55) No. 18 — (B11) No. 17:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair 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*** ***Non-turbo model*** ***(B55) No. 21 — (B11) No. 18:*** ***Turbo model*** ***(B54) No. 10 — (B11) No. 18:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair 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*** ***Non-turbo model*** ***(B55) No. 21 — Chassis ground:*** ***Turbo model*** ***(B54) No. 10 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair 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*** ***Non-turbo model*** ***(B55) No. 5 — Chassis ground:*** ***Turbo model*** ***(B55) No. 18 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair 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 resistance between 450 and 650 Ω?	Go to step **6.**	Replace the front vehicle speed sensor. <Ref. to AT-32, Front Vehicle Speed Sensor.>
6	**PREPARE OSCILLOSCOPE.**	Do you have an oscilloscope?	Go to step **9.**	Go to step **7.**
7	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **10.**	Go to step **8.**

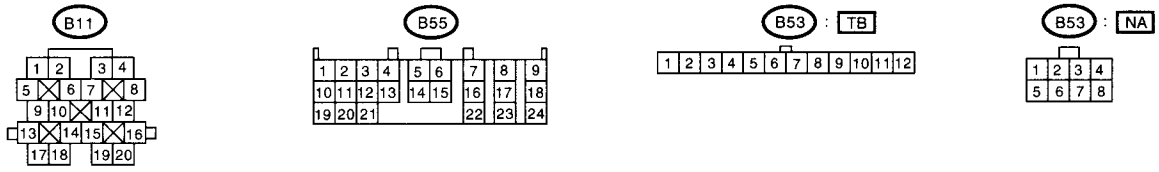
	Step	Check	Yes	No
8	**CHECK INPUT SIGNAL FOR TCM.** 1)Connect all connectors. 2)Lift-up or raise the vehicle and place safety stands. **CAUTION:** **On AWD models, raise all wheels off floor.** 3)Start the engine and set the vehicle in 20 km/h (12 MPH) condition. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When the AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> 4)Measure the voltage between TCM connector terminals. ***Connector & terminal*** ***Non-turbo model*** ***(B55) No. 5 (+) — (B54) No. 21 (–):*** ***Turbo model*** ***(B55) No. 18 (+) — (B54) No. 10 (–):***	Is the voltage more than AC 1 V?	Even if the AT OIL TEMP warning lights up, the circuit has returned to a normal condition at this time. A temporary poor contactor or harness may be the case. Repair 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 stands. **CAUTION:** **On AWD models, raise all wheels off ground.** 3)Set the oscilloscope to TCM connector terminals. **Non-turbo model** Positive probe; (B55) No. 18 Earth lead; (B54) No. 10 **Turbo model** Positive probe; (B55) No. 5 Earth lead; (B54) No. 21 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 the AT control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system. <Ref. to ABS-22, Clear Memory Mode.> 5)Measure the signal voltage indicated on oscilloscope.	Is the voltage more than AC 4 V?	Even if the AT OIL TEMP warning lights up, the circuit has returned to a normal condition at this time. A temporary poor contactor or harness may be the case. Repair harness or connector in the 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. **CAUTION:** **On AWD models, raise all wheels off floor.** 4)Turn the ignition switch to ON and turn the 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". 1)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 the AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.>	Does the speedometer indication increase as the Subaru Select Monitor data increases?	Even if the AT OIL TEMP warning lights up, the circuit has returned to a normal condition at this time. A temporary poor connector or harness may be the case. Repair harness or connector in the front vehicle speed sensor circuit.	Go to step **11.**
11	**CHECK POOR CONTACT.**	Is there poor contact in front vehicle speed sensor circuit?	Repair poor contact.	Replace the TCM. <Ref. to AT-45, *Transmission Control Module (TCM).*>

F: DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR

DIAGNOSIS:
Input signal circuit of TCM is open or shorted.
TROUBLE SYMPTOM:
Excessive shift shock.
WIRING DIAGRAM:





TR0578

	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 resistance between 450 and 650 Ω?	Go to step **2.**	Replace the turbine speed sensor. <Ref. to AT-36, 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*** ***Non-turbo model*** ***(B55) No. 12 — (B11) No. 14:*** ***Turbo model*** ***(B55) No. 8 — (B11) No. 14:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair 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*** ***Non-turbo model*** ***(B55) No. 21 — (B11) No. 15:*** ***Turbo model*** ***(B55) No. 9 — (B11) No. 15:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair 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*** ***Non-turbo model*** ***(B55) No. 21 — Chassis ground:*** ***Turbo model*** ***(B55) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair 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*** ***Non-turbo model*** ***(B55) No. 12 — Chassis ground:*** ***Turbo model*** ***(B55) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair short circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
6	**PREPARE OSCILLOSCOPE.**	Do you have an oscilloscope?	Go to step **10.**	Go to step **7.**
7	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	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*** ***Non-turbo model*** ***(B55) No. 12 (+) — No. 21 (–):*** ***Turbo model*** ***(B55) No. 8 (+) — No. 9 (–):***	Is the voltage more than AC 1 V?	Even if the AT OIL TEMP warning 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 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 the 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?	Even if the AT OIL TEMP warning 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 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. **Turbo model** Positive probe; (B55) No. 8 Earth lead; (B55) No. 9 **Non-turbo model** Positive probe; (B55) No. 12 Earth lead; (B55) No. 21 3)Start the engine and move the select lever to "P" or "N" range.	Is the signal voltage more than AC 1 V?	Even if the AT OIL TEMP warning 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 transmission.	Go to step **11.**
11	**CHECK POOR CONTACT.**	Is there poor contact in torque converter turbine speed sensor circuit?	Repair poor contact.	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

G: DTC 38 TORQUE CONTROL SIGNAL

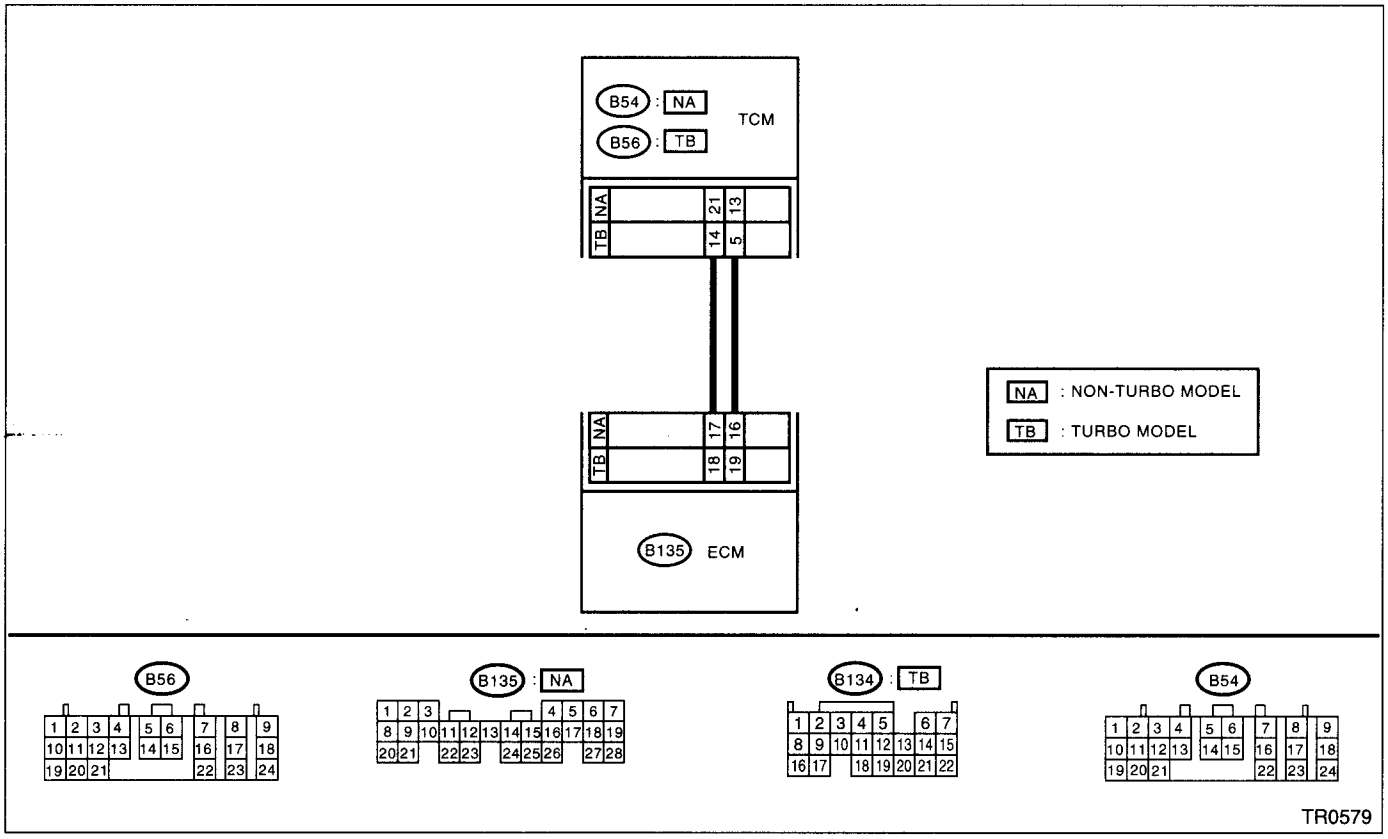
DIAGNOSIS:

- The signal circuit is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:

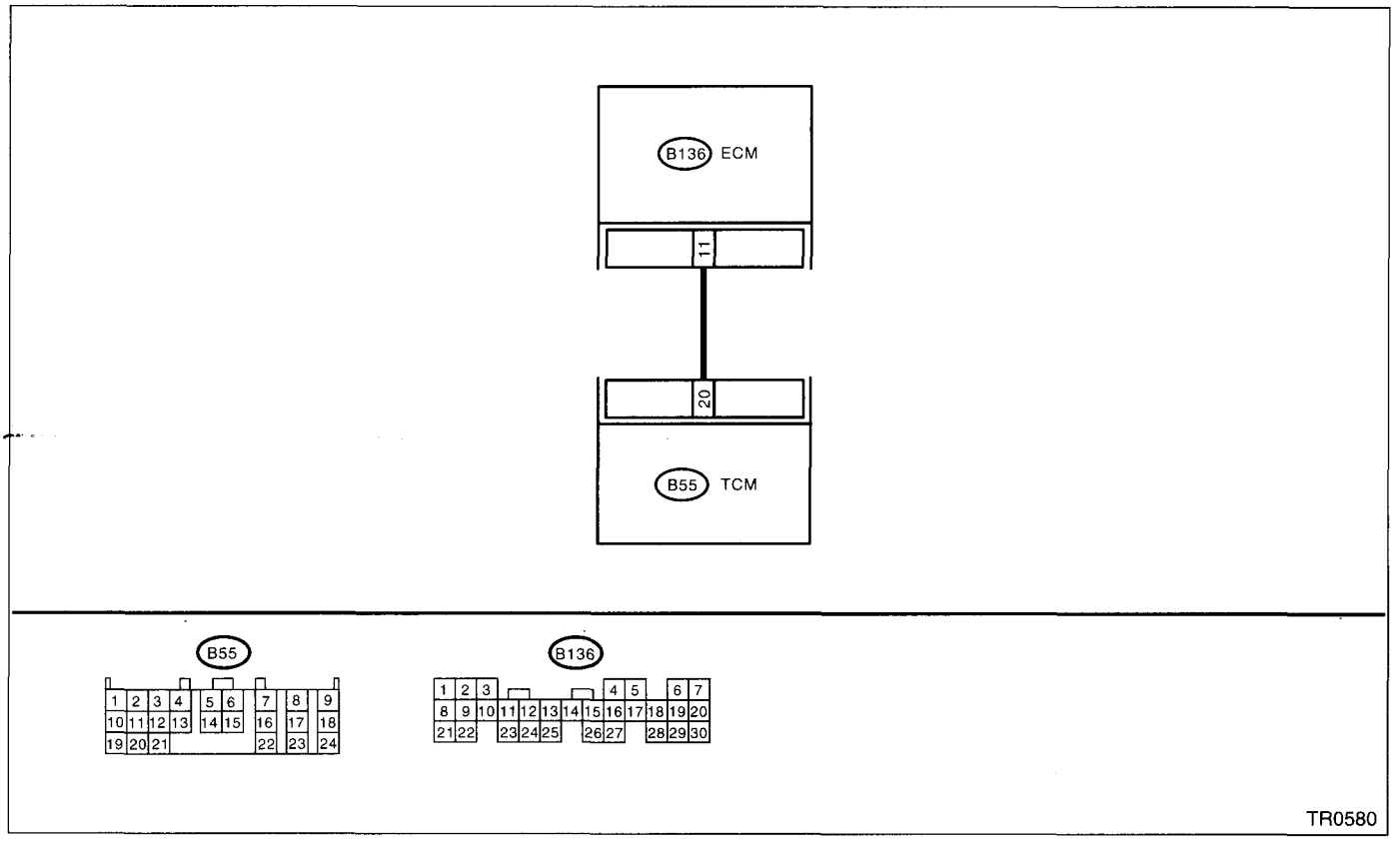


Step		Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from TCM and ECM. 3)Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 21 — (B134) No. 17:*** ***(B54) No. 13 — (B134) No. 16:*** ***Turbo model*** ***(B56) No. 14 — (B135) No. 18:*** ***(B56) No. 5 — (B135) No. 19:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between TCM and ECM connector.

	Step	Check	Yes	No
	CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM. Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B56) No. 21 — Chassis ground:*** ***(B54) No. 13 — Chassis ground:*** ***Turbo model*** ***(B56) No. 14 — Chassis ground:*** ***(B56) No. 5 — Chassis ground:***	s the resistance more than 1 MΩ?	Go to step **3.**	Repair short circuit n harness etween TCM and CM connector.
	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*** ***Non-turbo model*** ***(B54) No. 21 (+) — Chassis ground (–):*** ***(B54) No. 13 (+) — Chassis ground (–):*** ***Turbo model*** ***(B56) No. 14 (+) — Chassis ground (–):*** ***(B56) No. 5 (+) — Chassis ground (–):***	s the voltage more than 4.8 V'	Even if the AT OIL TEMP warning 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 **4.**
	CHECK POOR CONTACT.	s there poor contact in torque ontrol signal circuit?	Repair poor contact.	Go to step **5.**
	CHECK GROUND LINE BETWEEN TRANSMISSION AND BODY. Check the installing condition of ground line in transmission and body.	s there any dirt or rust at round line installing point?	Remove dirt and rust.	Go to step **6.**
	CHECK GROUND LINE BETWEEN TRANSMISSION AND BODY. Check the installing condition of ground line in transmission and body. ***Tightening torque:*** ***13±3 N·m (1.3±0.3 kgf-m, 9.4±2.2 ft-lb)***	s the tightening torque value vithin specification?	Go to step **7.**	ighten to specified torque.
	CHECK GROUND LINE INSIDE TRANSMISSION. 1)Drain the AT fluid and remove the oil pan. 2)Check the tightening torque value of ground line installing bolt. ***Tightening torque:*** ***T: 8±1 N·m (0.8±0.1 kgf-m, 5.8±0.7 ft-lb)***	s the tightening torque value vithin specification?	Go to step **9.**	ighten to specified torque.
	CHECK GROUND CIRCUIT OF ECM. <Ref. to AT-52, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	s there any trouble?	Repair ground terminal and/or ground circuit of ECM.	Go to step **9.**
	RECHECK OUTPUT SIGNAL EMITTED FROM TCM. Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 21 (+) — Chassis ground (–):*** ***(B54) No. 13 (+) — Chassis ground (–):*** ***Turbo model*** ***(B56) No. 14 (+) — Chassis ground (–):*** ***(B56) No. 5 (+) — Chassis ground (–):***	s each voltage more than 4.8 /?	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>	Replace the ECM.

H: DTC 45 INTAKE MANIFOLD PRESSURE SIGNAL

DIAGNOSIS:
Input signal circuit of TCM from ECM is open or shorted.
TROUBLE SYMPTOM:
Excessive shift shock.
WIRING DIAGRAM:

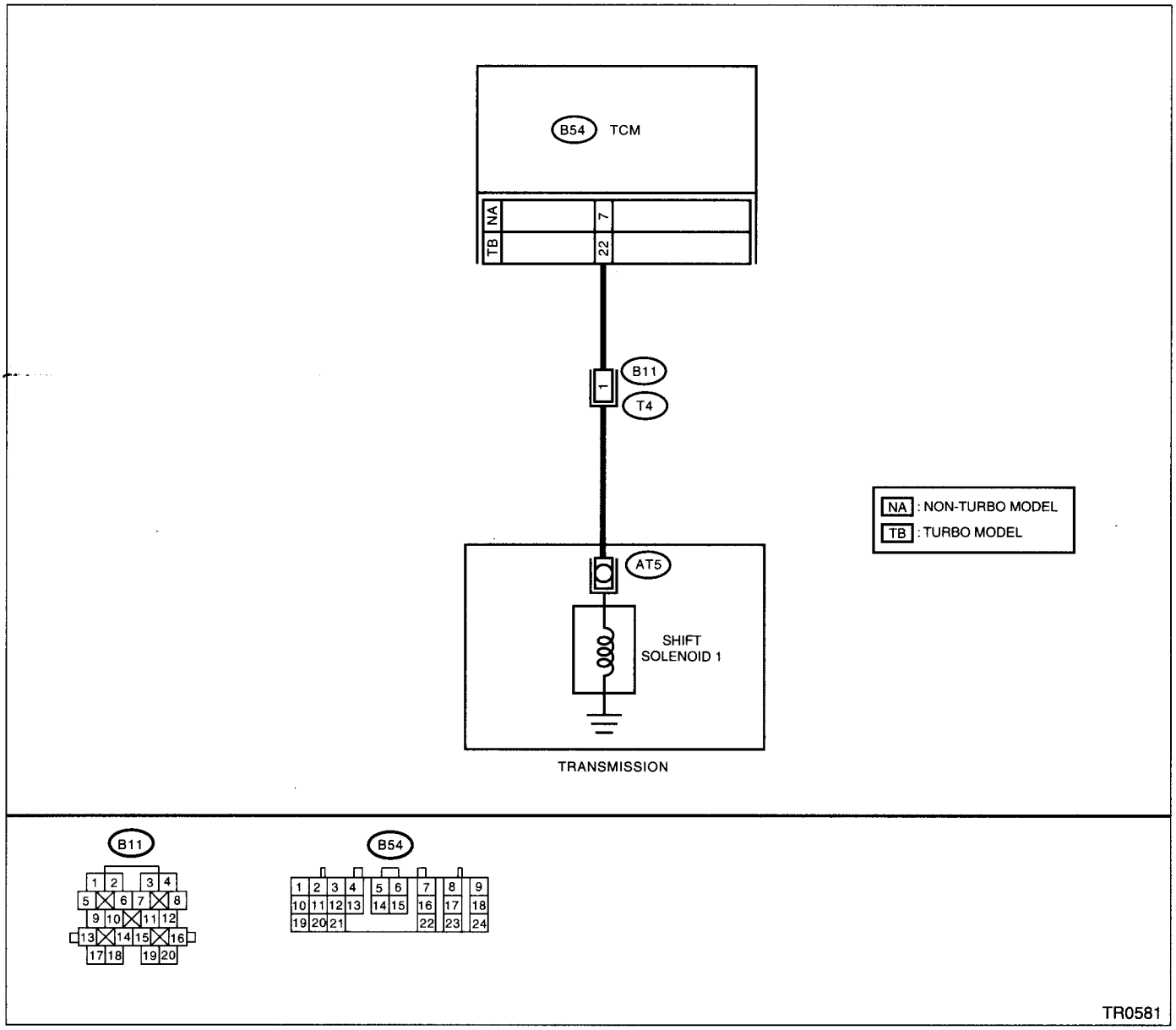


	Step	Check	Yes	No
1	**CHECK ENGINE GROUND TERMINALS AND GROUND CIRCUIT OF ECM** <Ref. to AT-52, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble?	Repair ground terminal and/or ground circuit of ECM.	Go to step **2.**
2	**CHECK HARNESS CONNECTOR 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*** ***(B55) No. 20 — (B136) No. 11:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair open circuit in harness between TCM and ECM connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 20 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair short circuit in harness between TCM and ECM connector.
4	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **6.**	Go to step **5.**

	Step	Check	Yes	No
5	**CHECK INPUT SIGNAL FOR TCM.** 1)Connect the connectors to TCM and ECM. 2)Start the engine, and warm-up the transmission until the ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature. 3)Engine idling. 4)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 20 (+) — Chassis ground (–):***	Is the voltage between 1.2 and 1.8 V?	Even if the AT OIL TEMP warning 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 the engine coolant temperature is above 80°C (176°F). 5)Engine idling. 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 value between 1.2 and 1.8 V?	Even if the AT OIL TEMP warning 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?	Repair poor contact.	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

I: DTC 71 SHIFT SOLENOID 1

DIAGNOSIS:
Output signal circuit of shift solenoid 1 is open or shorted.
TROUBLE SYMPTOM:
Does not shift.
WIRING DIAGRAM:

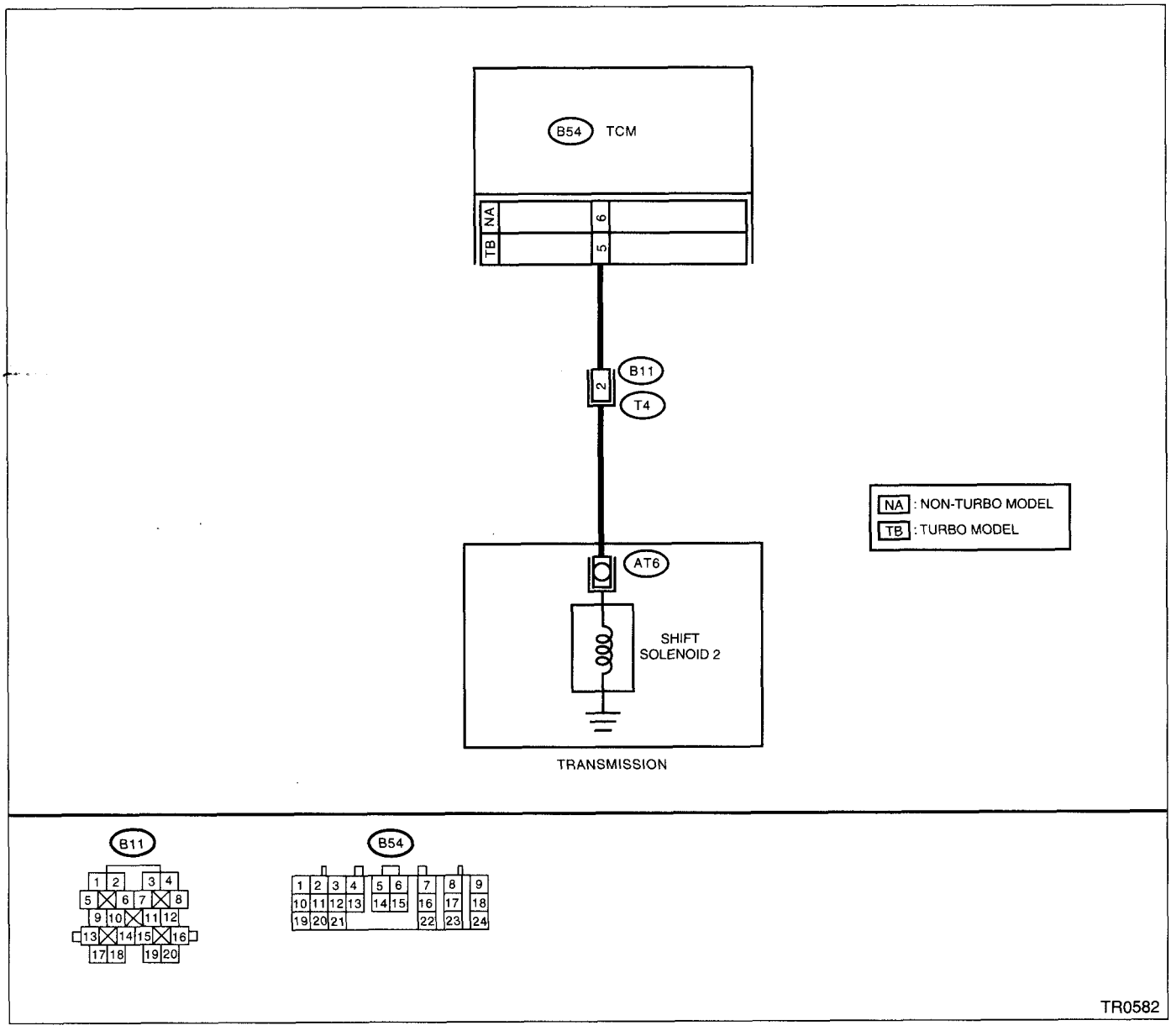


	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from TCM and transmission. 3)Measure the resistance of harness between TCM and shift solenoid 1 connector. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 7 — (B11) No. 1:*** ***Turbo model*** ***(B54) No. 22 — (B11) No. 1:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 7 — Chassis ground:*** ***Turbo model*** ***(B54) No. 22 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair 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 resistance between 10 and 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*** ***Non-turbo model*** ***(B54) No. 7 (+) — Chassis ground (–):*** ***Turbo model*** ***(B54) No. 22 (+) — Chassis ground (–):***	Is the voltage more than 9V?	Go to step **5.**	Go to step **6.**
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1)Move the select lever to "2" range. 2)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 7 (+) — Chassis ground (–):*** ***Turbo model*** ***(B54) No. 22 (+) — Chassis ground (–):***	Is the voltage less than 1V?	Even if the AT OIL TEMP warning 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 contact in the TCM.	Go to step **6.**
6	**CHECK POOR CONTACT.**	Is there poor contact in shift solenoid 1 circuit?	Repair poor contact.	Replace the TCM. <Ref. to AT-45, 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. **CAUTION:** **On AWD models, raise all wheels off ground.** 3)Drain the automatic transmission fluid. **CAUTION:** **Do not drain the automatic transmission fluid until it cools down.** 4)Remove the oil pan, and disconnect the connector from shift solenoid 1. 5)Measure the resistance between shift solenoid 1 connector and transmission ground. ***Terminal*** ***No. 1 — Transmission ground:***	Is the resistance between 10 and 16 Ω?	Go to step **8.**	Replace the shift solenoid 1. <Ref. to AT-39, 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 resistance less than 1 Ω?	Go to step **9.**	Repair 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 resistance more than 1 MΩ?	Even if the AT OIL TEMP warning 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 shift solenoid 1 and transmission.	Repair short circuit harness between shift solenoid 1 and transmission connector.

J: DTC 72 SHIFT SOLENOID 2

DIAGNOSIS:
Output signal circuit of shift solenoid 2 is open or shorted.
TROUBLE SYMPTOM:
Does not shift.
WIRING DIAGRAM:



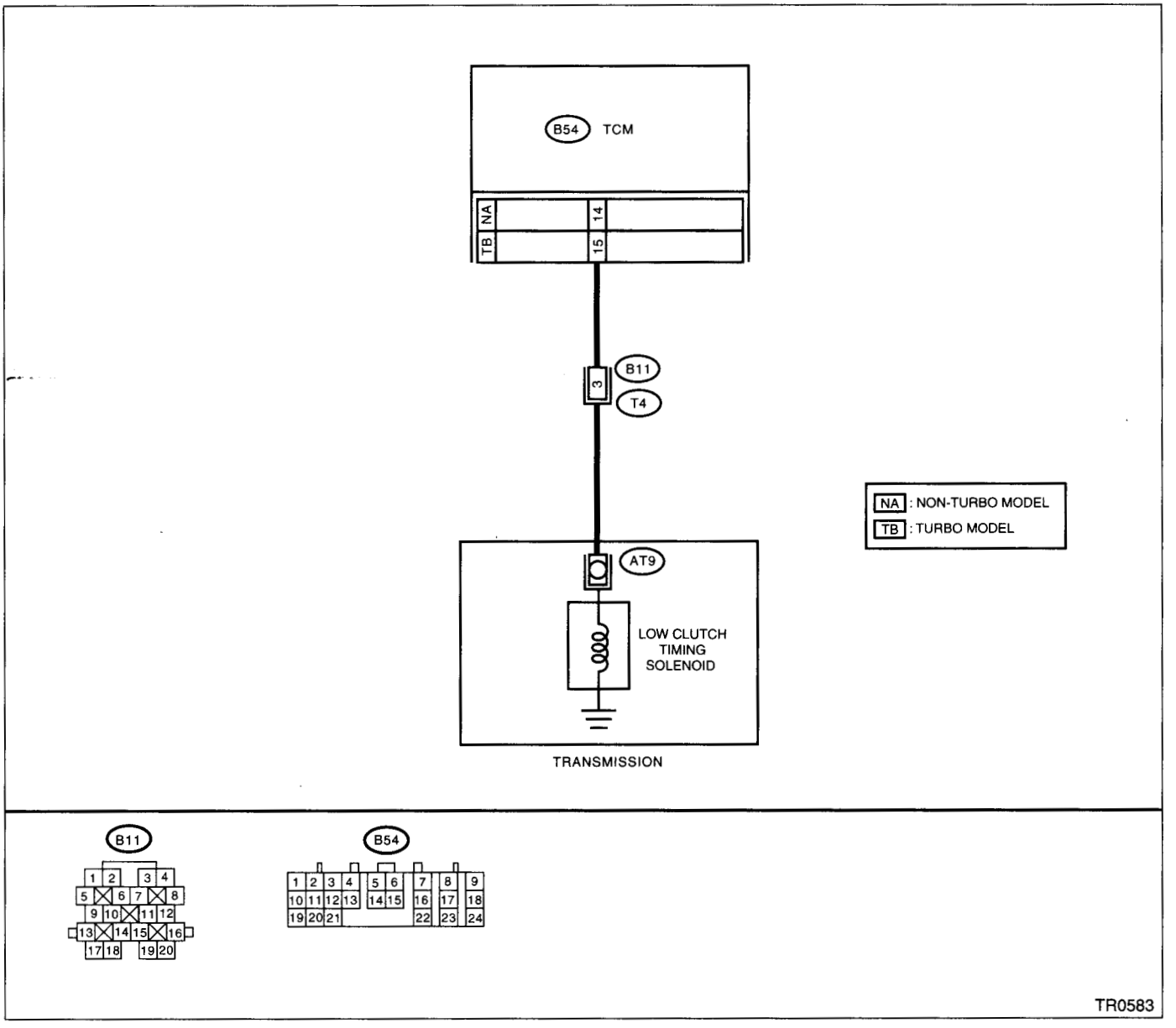
	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from TCM and transmission. 3)Measure the resistance of harness between TCM and shift solenoid 2 connector. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 6 — (B11) No. 2:*** ***Turbo model*** ***(B54) No. 5 — (B11) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 6 — Chassis ground:*** ***Turbo model*** ***(B54) No. 5 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair 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 resistance between 10 and 16 Ω?	Go to step **4.**	Go to step **6.**

	Step	Check	Yes	No
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. **CAUTION:** **On AWD models, raise all wheels off ground.** 3)Start the engine and warm-up the transmission until the ATF temperature is above 80°C (176°F). NOTE: If the ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature. 4)Move the selector lever to "D", and slowly increase the 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 the AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> 5)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 6 (+) — Chassis ground (–):*** ***Turbo model*** ***(B54) No. 5 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Even if the AT OIL TEMP warning 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 transmission.	Go to step **5.**
5	**CHECK POOR CONTACT.**	Is there poor contact in shift solenoid 2 circuit?	Repair poor contact.	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>
6	**CHECK SHIFT SOLENOID 2 (IN TRANSMISSION).** 1)Remove the transmission connector from bracket. 2)Drain the automatic transmission fluid. **CAUTION:** **Do not drain the automatic transmission fluid until it cools down.** 3)Remove the oil pan, and disconnect the 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 resistance between 10 and 16 Ω?	Go to step **7.**	Replace the shift solenoid 2 assembly. <Ref. to AT-39, 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 resistance less than 1 Ω?	Go to step **8.**	Repair open circuit in harness between shift solenoid 2 and transmission connector.

	Step	Check	Yes	No
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 resistance more than 1 MΩ?	Even if the AT OIL TEMP warning 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 shift solenoid 2 and transmission.	Repair short circuit harness between shift solenoid 2 and transmission connector.

K: DTC 73 LOW CLUTCH TIMING SOLENOID

DIAGNOSIS:
Output signal circuit of low clutch timing solenoid is open or shorted.
TROUBLE SYMPTOM:
Excessive shift shock.
WIRING DIAGRAM:

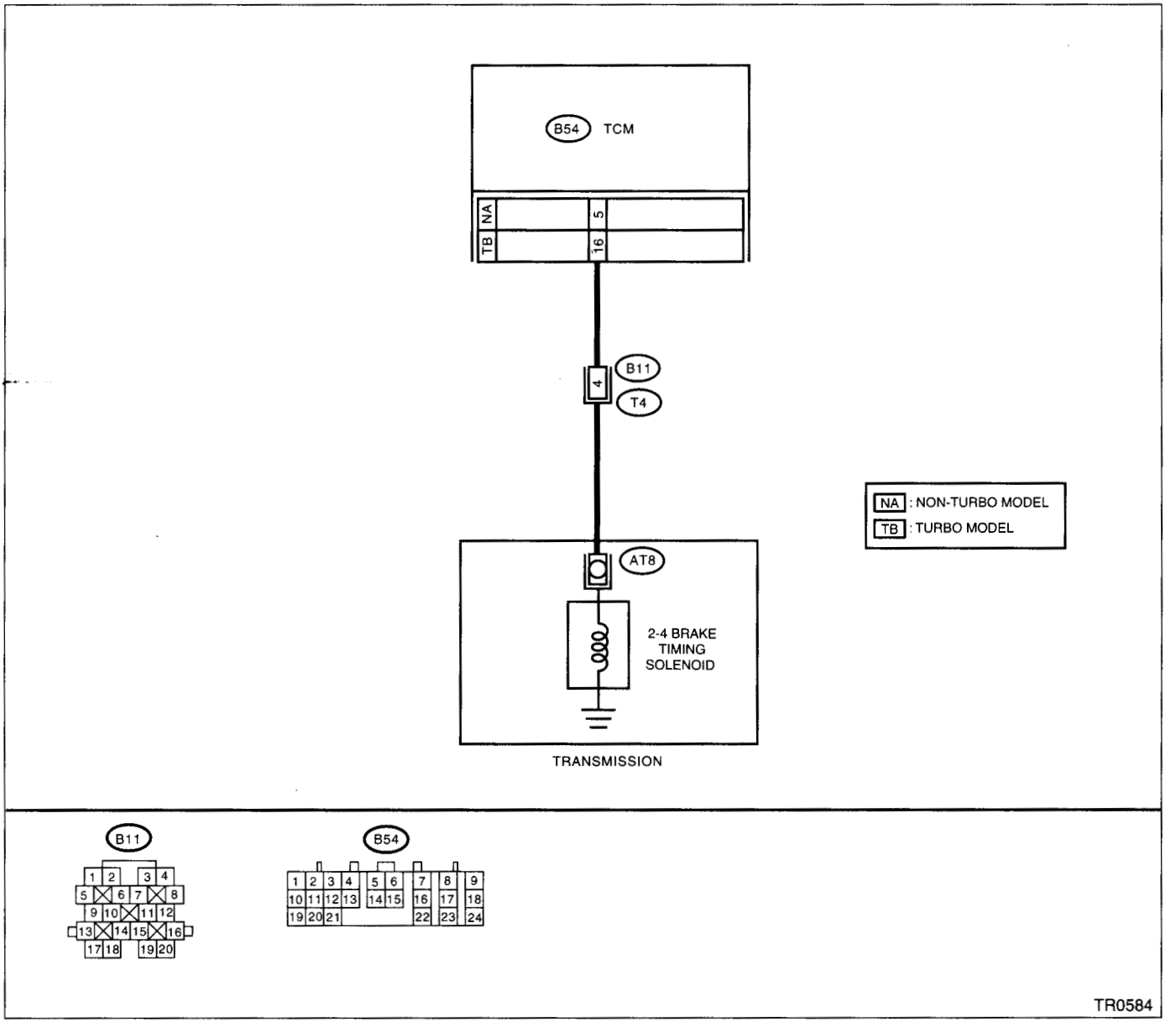


	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from TCM and transmission. 3)Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 14 — (B11) No. 3:*** ***Turbo model*** ***(B54) No. 15 — (B11) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM connector and transmission ground. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 14 — Chassis ground:*** ***Turbo model*** ***(B54) No. 15 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair 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 resistance between 10 and 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*** ***Non-turbo model*** ***(B54) No. 14 (+) — Chassis ground (–):*** ***Turbo model*** ***(B54) No. 15 (+) — Chassis ground (–):***	Is the voltage more than 9V?	Go to step **5.**	Go to step **6.**
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1)Move the select lever to "2" range. 2)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 14 (+) — Chassis ground (–):*** ***Turbo model*** ***(B54) No. 15 (+) — Chassis ground (–):***	Is the voltage less than 1V?	Even if the AT OIL TEMP warning 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 contact in the TCM and transmission.	Go to step **6.**
6	**CHECK POOR CONTACT.**	Is there poor contact in low clutch timing solenoid circuit?	Repair poor contact.	Replace the TCM. <Ref. to AT-45, 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 stands. **CAUTION:** **On AWD models, raise all wheels off ground.** 3)Drain the automatic transmission fluid. **CAUTION:** **Do not drain the automatic transmission fluid until it cools down.** 4)Remove the oil pan, and disconnect the 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 resistance between 10 and 16 Ω?	Go to step **8.**	Replace the low clutch timing solenoid. <Ref. to AT-39, 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 resistance less than 1 Ω?	Go to step **9.**	Repair 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 resistance more than 1 MΩ?	Even if the AT OIL TEMP warning 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 low clutch timing solenoid and transmission.	Repair short circuit harness between low clutch timing solenoid and transmission connector.

L: DTC 74 2-4 BRAKE TIMING SOLENOID

DIAGNOSIS:
Output signal circuit of 2-4 brake timing solenoid is open or shorted.
TROUBLE SYMPTOM:
Excessive shift shock.
WIRING DIAGRAM:



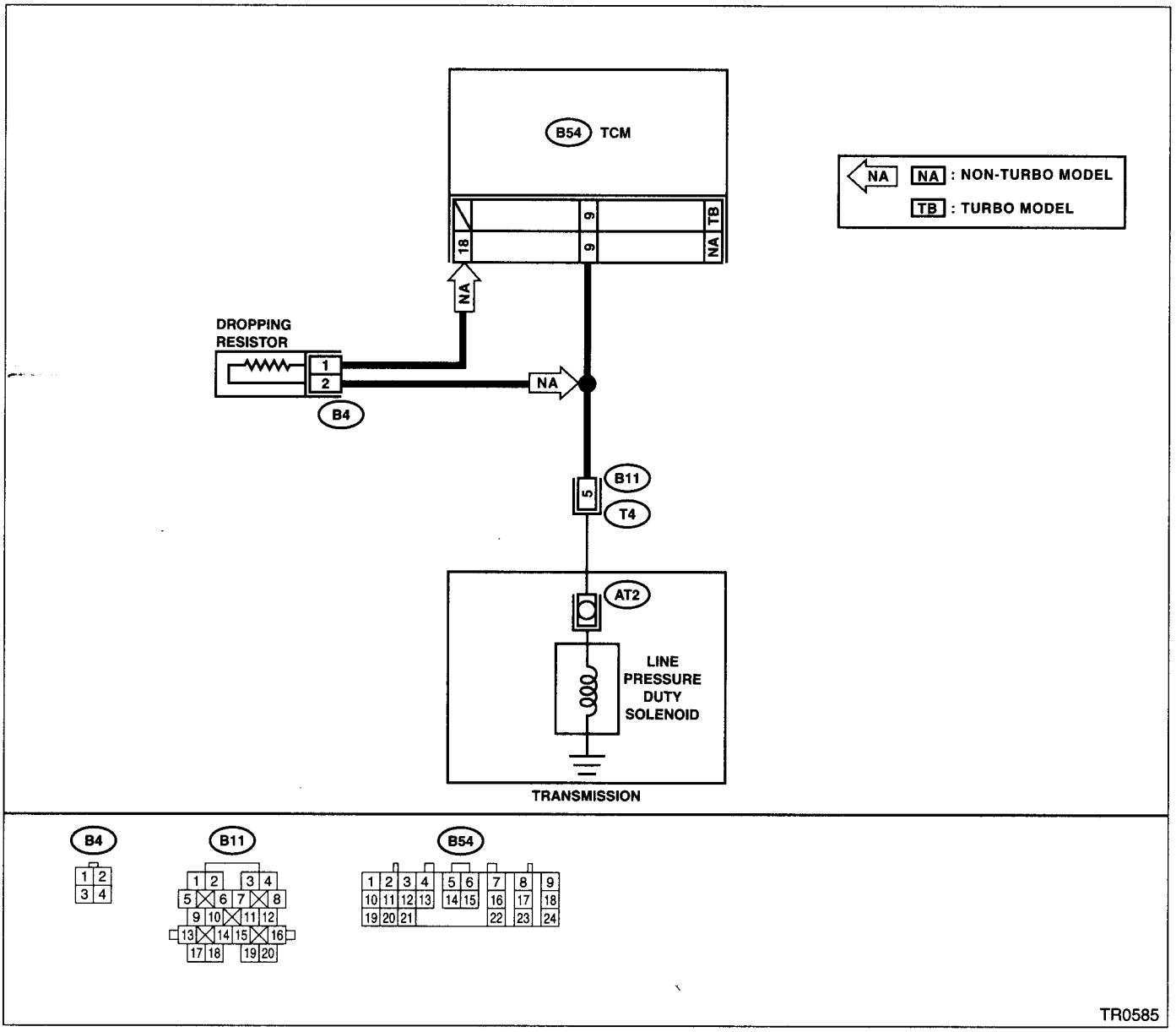
	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from TCM and transmission. 3)Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 5 — (B11) No. 4:*** ***Turbo model*** ***(B54) No. 16 — (B11) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM connector and transmission ground. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 5 — Chassis ground:*** ***Turbo model*** ***(B54) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair 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 resistance between 10 and 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 stands. **CAUTION:** **On AWD models, raise all wheels off ground.** 3)Start the engine and warm-up the transmission until the ATF temperature is above 80°C (176°F). NOTE: If the ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature. 4)Move the select lever to "1", 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 the AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> 5)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 5 (+) — Chassis ground (–):*** ***Turbo model*** ***(B54) No. 16 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **5.**	Go to step **6.**

	Step	Check	Yes	No
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1)Move the select lever to "D", 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 the AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> 2)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 5 (+) — Chassis ground (–):*** ***Turbo model*** ***(B54) No. 16 (+) — Chassis ground (–):***	Is the voltage more than 9 V?	Even if the AT OIL TEMP warning 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 contact in the transmission.	Go to step **6.**
6	**CHECK POOR CONTACT.**	Is there poor contact in 2-4 brake timing solenoid circuit?	Repair poor contact.	Replace the TCM. <Ref. to AT-45, 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 stands. **CAUTION:** **On AWD models, raise all wheels off ground.** 3)Drain the automatic transmission fluid. **CAUTION:** **Do not drain the automatic transmission fluid until it cools down.** 4)Remove the oil pan, and disconnect the 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 resistance between 10 and 16 Ω?	Go to step **8.**	Replace the 2-4 brake timing solenoid. <Ref. to AT-39, 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 resistance less than 1 Ω?	Go to step **9.**	Repair 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 resistance more than 1 MΩ?	Even if the AT OIL TEMP warning 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 2-4 brake timing solenoid and transmission.	Repair short circuit harness between 2-4 brake timing solenoid and transmission connector.

M: DTC 75 LINE PRESSURE DUTY SOLENOID

DIAGNOSIS:
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 VEHICLE.**	Is the target non-turbo model?	Go to step **2.**	Go to step **7.**
2	**CHECK RESISTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from dropping resistor. 3)Measure the resistance between dropping resistor terminal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 9 and 15 Ω?	Go to step **3.**	Replace the dropping resistor. <Ref. to AT-46, Dropping Resistor.>

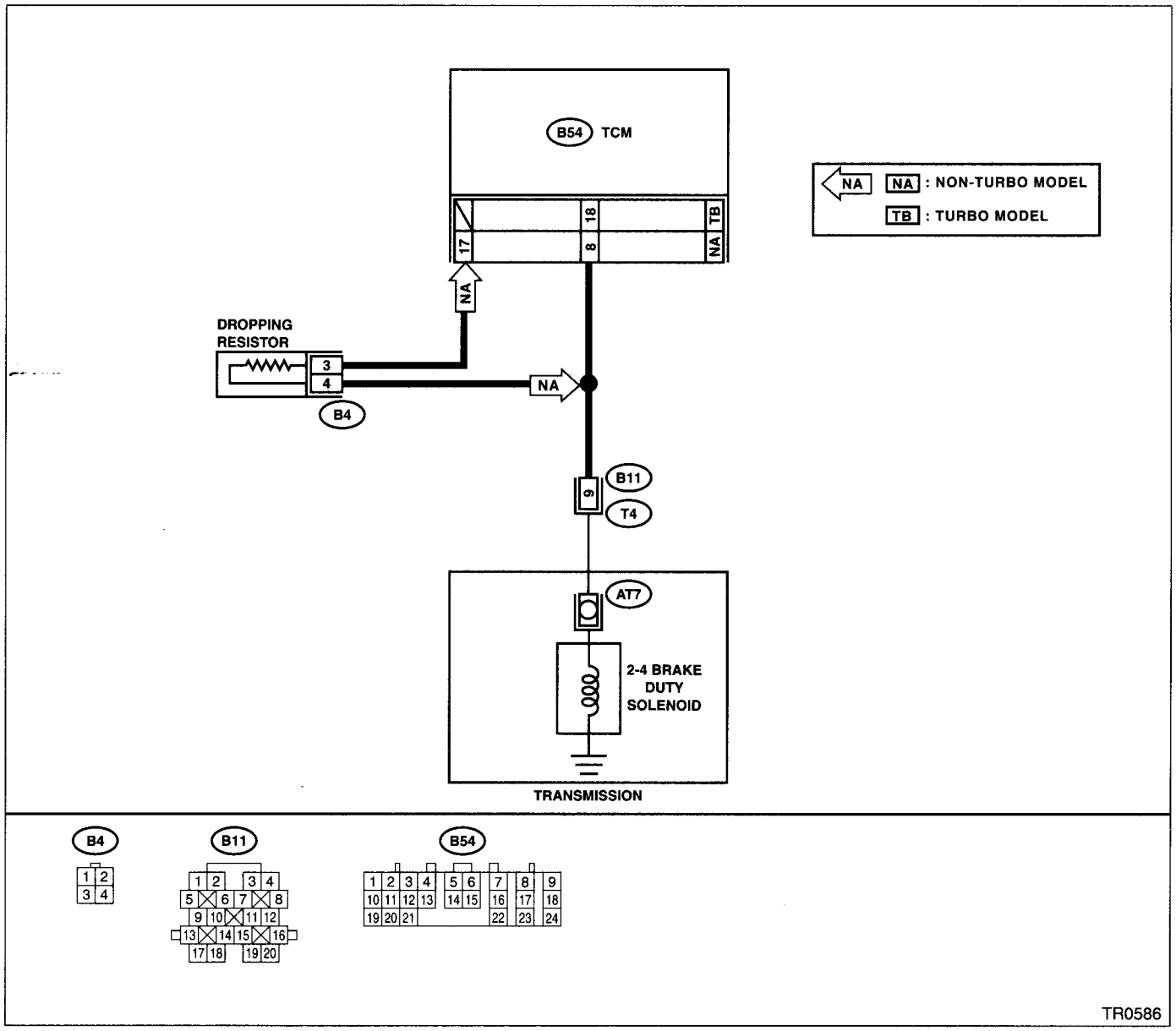
	Step	Check	Yes	No
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND DROPPING RESISTOR.** 1)Disconnect the connector from TCM. 2)Measure the resistance of harness between TCM connector and dropping resistor connector. ***Connector & terminal*** ***(B54) No. 18 — (B4) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair open circuit in harness between TCM and dropping resistor connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND DROPPING RESISTOR.** Measure the resistance of harness between dropping resistor connector and chassis ground. ***Connector & terminal*** ***(B4) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair short circuit in harness between TCM and dropping resistor connector.
5	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND DROPPING RESISTOR.** 1)Disconnect the connector from transmission. 2)Measure the resistance of harness between transmission and dropping resistor connector. ***Connector & terminal*** ***(B4) No. 2 — (B11) No. 5:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair open circuit in harness between dropping resistor and transmission connector.
6	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND DROPPING RESISTOR.** Measure the resistance of harness between dropping resistor connector and chassis ground. ***Connector & terminal*** ***(B4) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair short circuit in harness between dropping resistor and transmission connector.
7	**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 resistance less than 1 Ω?	Go to step **8.**	Repair open circuit in harness between TCM and transmission connector.
8	**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 resistance more than 1 MΩ?	Go to step **9.**	Repair short circuit in harness between TCM and transmission connector.
9	**CHECK LINE PRESSURE DUTY SOLENOID.** Measure the resistance between transmission connector receptacle's terminals. ***Terminal*** ***(T4) No. 5 — No. 16:***	Is the resistance between 2.0 and 4.5 Ω?	Go to step **10.**	Go to step **16.**
10	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **13.**	Go to step **11.**

	Step	Check	Yes	No
11	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1)Connect all connectors. 2)Start the engine and warm-up the transmission until the ATF temperature is above 80°C (176°F). NOTE: If the ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature. 3)Turn the ignition switch to ON (engine OFF). 4)Move the select lever to "N". 5)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 9 (+) — Chassis ground (–):***	Is the voltage between 1.5 and 5.0 V with throttle fully closed?	Go to step **12.**	Go to step **15.**
12	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 9 (+) — Chassis ground (–):***	Is the voltage less than 1 V with throttle fully open?	Even if the AT OIL TEMP warning 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 transmission.	Go to step **15.**
13	**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 the Subaru Select Monitor switch to ON. 4)Warm-up the transmission until the ATF temperature is above 80°C (176°F). NOTE: If the ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature. 5)Stop the engine and turn the ignition switch to ON (engine OFF). 6)Move the select lever to "N". 7)Read the data of line pressure duty solenoid using Subaru Select Monitor. •Line pressure duty solenoid is indicated in "%". 1)Throttle is fully closed.	Is the value 100%?	Go to step **14.**	Go to step **15.**

	Step	Check	Yes	No
14	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1)Turn the ignition switch to ON (Engine OFF). 2)Throttle is fully open.	Is the value less than 25%?	Even if the AT OIL TEMP warning 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 transmission.	Go to step **15.**
15	**CHECK POOR CONTACT.**	Is there poor contact in line pressure duty solenoid circuit?	Repair poor contact.	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>
16	**CHECK LINE PRESSURE DUTY SOLENOID (IN TRANSMISSION).** 1)Remove the transmission connector from bracket. 2)Drain the automatic transmission fluid. **CAUTION:** **Do not drain the automatic transmission fluid until it cools down.** 3)Remove the oil pan, and disconnect the 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 resistance between 2.0 and 4.5 Ω?	Go to step **17.**	Replace the line pressure duty solenoid. <Ref. to AT-39, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
17	**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 resistance less than 1 Ω?	Go to step **18.**	Repair open circuit in harness between line pressure duty solenoid and transmission connector.
18	**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 resistance more than 1 MΩ?	Even if the AT OIL TEMP warning 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 line pressure duty solenoid and transmission.	Repair short circuit in harness between line pressure duty solenoid and transmission connector.

N: DTC 76 2–4 BRAKE DUTY SOLENOID

DIAGNOSIS:
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 VEHICLE.**	Is the target non-turbo model?	Go to step **2.**	Go to step **7.**
2	**CHECK RESISTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from dropping resistor. 3)Measure the resistance between dropping resistor terminal. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance between 9 and 15 Ω?	Go to step **3.**	Replace the dropping resistor. <Ref. to AT-46, Dropping Resistor.>

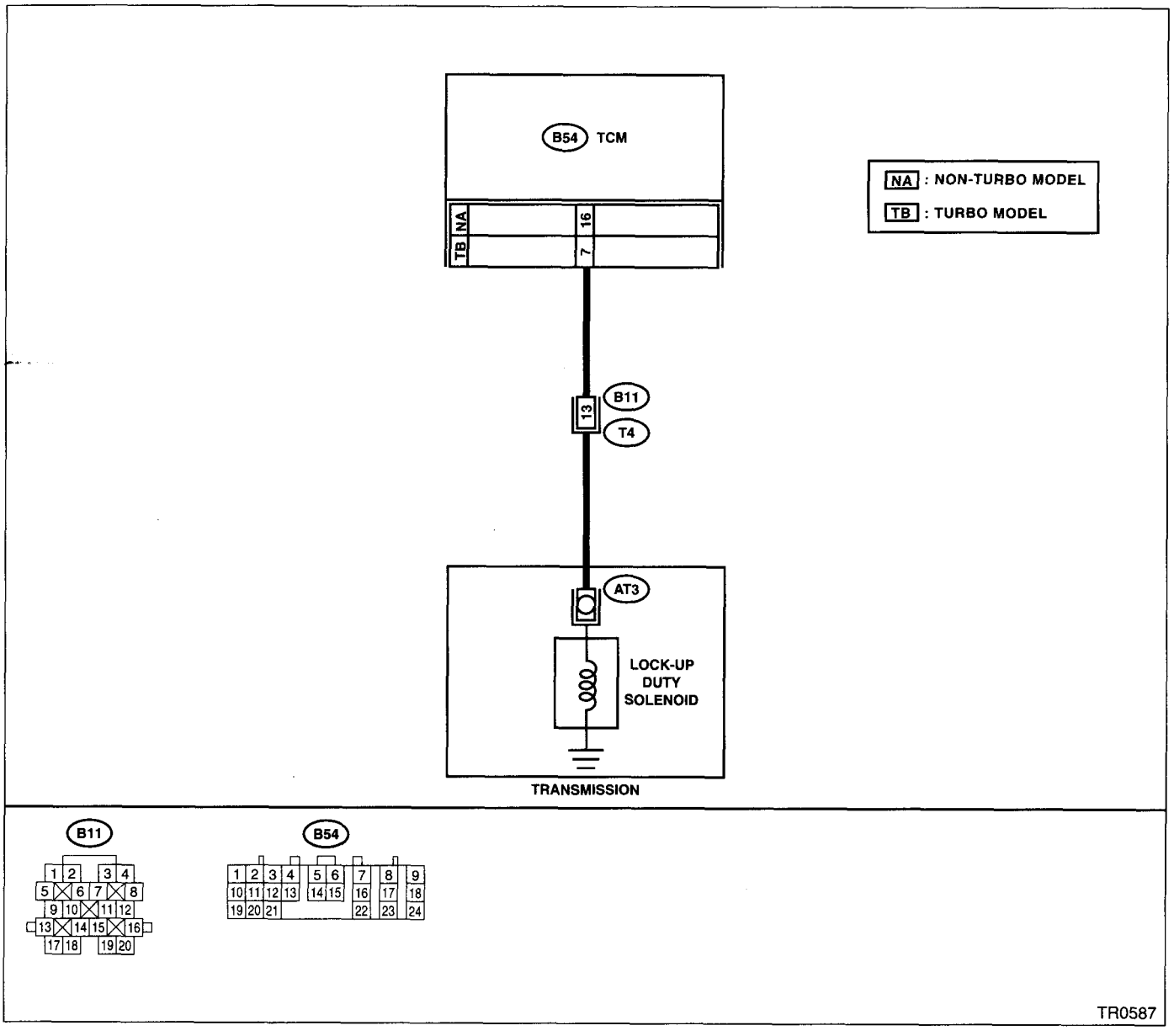
	Step	Check	Yes	No
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND DROPPING RESISTOR.** 1)Disconnect the connector from TCM. 2)Measure the resistance of harness between TCM connector and dropping resistor connector. ***Connector & terminal*** ***(B54) No. 17 — (B4) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair open circuit in harness between TCM and dropping resistor connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND DROPPING RESISTOR.** Measure the resistance of harness between dropping resistor connector and chassis ground. ***Connector & terminal*** ***(B4) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair short circuit in harness between TCM and dropping resistor connector.
5	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND DROPPING RESISTOR.** 1)Disconnect the connector from transmission. 2)Measure the resistance of harness between transmission and dropping resistor connector. ***Connector & terminal*** ***(B4) No. 4 — (B11) No. 9:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair open circuit in harness between dropping resistor and transmission connector.
6	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND DROPPING RESISTOR.** Measure the resistance of harness between dropping resistor connector and chassis ground. ***Connector & terminal*** ***(B4) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair short circuit in harness between dropping resistor and transmission connector.
7	**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*** ***Non-turbo model*** ***(B54) No. 8 — (B11) No. 9:*** ***Turbo model*** ***(B54) No. 18 — (B11) No. 9:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair open circuit in harness between TCM and transmission connector.
8	**CHECK HARNESS CONNECTOR BETWEEN TCM AND CHASSIS GROUND.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 8 — Chassis ground:*** ***Turbo model*** ***(B54) No. 18 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair short circuit in harness between TCM and transmission connector.
9	**CHECK 2-4 BRAKE DUTY SOLENOID.** Measure the resistance between transmission connector receptacle's terminals. ***Terminal*** ***(T4) No. 16 — No. 9:***	Is the resistance between 2.0 and 4.5 Ω?	Go to step **10.**	Go to step **16.**
10	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **13.**	Go to step **11.**

	Step	Check	Yes	No
11	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1)Connect all connectors. 2)Start the engine and warm-up the transmission until the ATF temperature is above 80°C (176°F). NOTE: If the ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature. 3)Turn the ignition switch to ON (engine OFF). 4)Move the select lever to "N". 5)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 8 (+) — Chassis ground (–):*** ***Turbo model*** ***(B54) No. 18 (+) — Chassis ground (–):***	Is the voltage between 1.5 and 5.0 V with throttle fully closed?	Go to step **12.**	Go to step **15.**
12	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 8 (+) — Chassis ground (–):*** ***Non-turbo model*** ***(B54) No. 18 (+) — Chassis ground (–):***	Is the voltage less than 1 V with throttle fully open?	Even if the AT OIL TEMP warning 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 TCM and transmission.	Go to step **15.**
13	**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 the Subaru Select Monitor switch to ON. 4)Warm-up the transmission until the ATF temperature is above 80°C (176°F). NOTE: If the ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature. 5)Stop the engine and turn the ignition switch to ON (engine OFF). 6)Move the select lever to "N". 7)Read the data of 2-4 brake duty solenoid using Subaru Select Monitor. •2-4 brake duty solenoid is indicated in "%". 1)Throttle is fully closed.	Is the value 100%?	Go to step **14.**	Go to step **15.**

	Step	Check	Yes	No
14	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1)Turn the ignition switch to ON (Engine OFF). 2)Throttle is fully open.	Is the value less than 25%?	Even if the AT OIL TEMP warning 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 TCM and transmission.	Go to step **15.**
15	**CHECK POOR CONTACT.**	Is there poor contact in 2-4 brake duty solenoid circuit?	Repair poor contact.	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>
16	**CHECK 2-4 BRAKE DUTY SOLENOID (IN TRANSMISSION).** 1)Remove the transmission connector from bracket. 2)Drain the automatic transmission fluid. **CAUTION:** **Do not drain the automatic transmission fluid until it cools down.** 3)Remove the oil pan, and disconnect the 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 resistance between 2.0 and 4.5 Ω?	Go to step **17.**	Replace the 2-4 brake duty solenoid. <Ref. to AT-39, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
17	**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 resistance less than 1 Ω?	Go to step **18.**	Repair open circuit in harness between 2-4 brake duty solenoid and transmission connector.
18	**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 resistance more than 1 MΩ?	Even if the AT OIL TEMP warning 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 line pressure duty solenoid and transmission.	Repair short circuit in harness between 2-4 brake duty solenoid and transmission connector.

O: DTC 77 LOCK-UP DUTY SOLENOID

DIAGNOSIS:
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 DTC.**	Do multiple trouble codes appear in the on-board diagnostics test mode?	Go to another trouble code.	Go to step **2.**
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*** ***Non-turbo model*** ***(B54) No. 16 — (B11) No. 13:*** ***Turbo model*** ***(B54) No. 7 — (B11) No. 13:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair 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*** ***Non-turbo model*** ***(B54) No. 16 — Chassis ground:*** ***Turbo model*** ***(B54) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair 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 resistance between 10 and 17 Ω?	Go to step **5.**	Go to step **11.**
5	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **8.**	Go to step **6.**

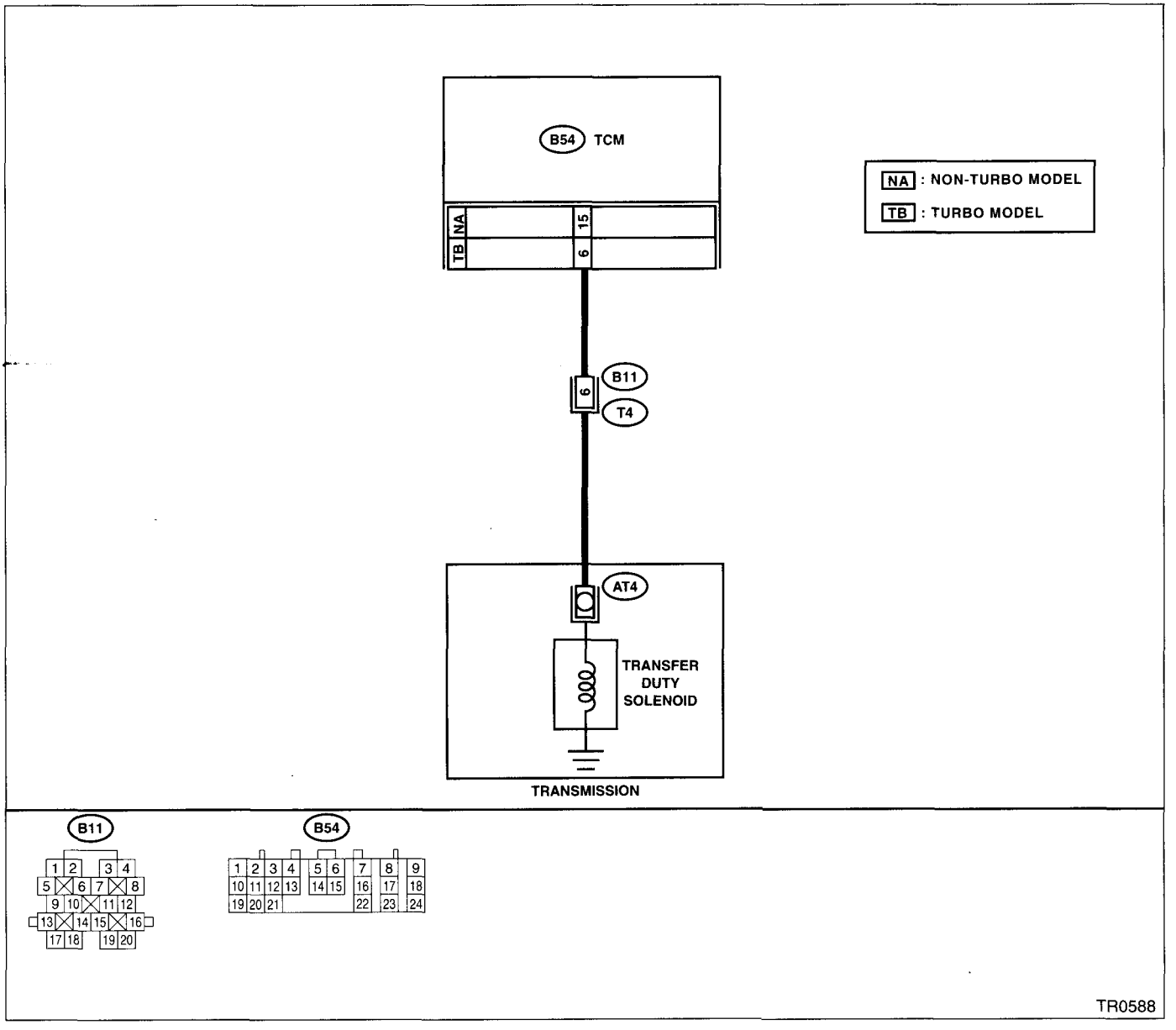
	Step	Check	Yes	No
6	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1)Connect the connectors to TCM and transmission. 2)Lift-up the vehicle and place safety stand. **CAUTION:** **On AWD models, raise all wheels off ground.** 3)Start the engine and warm-up the transmission until the ATF temperature is above 80°C (176°F). NOTE: If the ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature. 4)Move the select lever to "D" and slowly increase the 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 the AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> 5)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 16 (+) — Chassis ground (–):*** ***Turbo model*** ***(B54) No. 7 (+) — Chassis ground (–):***	Is the voltage more than 8.5 V?	Go to step **7.**	Go to step **10.**
7	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1)Return the engine to idling speed and move the select lever to "N". 2)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 16 (+) — Chassis ground (–):*** ***Turbo model*** ***(B54) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 0.5 V?	Even if the AT OIL TEMP warning 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 TCM and transmission.	Go to step **10.**

	Step	Check	Yes	No
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. **CAUTION:** **On AWD models, raise all wheels off ground.** 3)Connect the Subaru Select Monitor to data link connector. 4)Start the engine, and turn the Subaru Select Monitor switch to ON. 5)Start the engine and warm-up the transmission until the ATF temperature is above 80°C (176°F). NOTE: If the ambient temperature is below 0°C (32°F), drive the vehicle until the 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 "%". 1)Move the select lever to "D" and slowly increase the 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 the AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.>	Is the value 95%?	Go to step **9.**	Go to step **10.**
9	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** Return the engine to idling speed and move the select lever to "N". 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-22, Clear Memory Mode.>	Is the value 5%?	Even if the AT OIL TEMP warning 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 TCM and transmission.	Go to step **10.**
10	**CHECK POOR CONTACT.**	Is there poor contact in lock-up duty solenoid circuit?	Repair poor contact.	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

	Step	Check	Yes	No
11	**CHECK LOCK-UP DUTY SOLENOID (IN TRANSMISSION).** 1)Remove the transmission connector from bracket. 2)Drain the automatic transmission fluid. **CAUTION:** **Do not drain the automatic transmission fluid until it cools down.** 3)Remove the oil pan, and disconnect the 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 resistance between 10 and 17 Ω?	Go to step **12.**	Replace the lock-up duty solenoid. <Ref. to AT-39, 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 resistance less than 1 Ω?	Go to step **13.**	Repair open circuit in harness between TCM and transmission connector.
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 resistance more than 1 MΩ?	Even if the AT OIL TEMP warning 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 lock-up duty solenoid and transmission.	Repair short circuit in harness between lock-up duty solenoid and transmission connector.

P: DTC 79 TRANSFER DUTY SOLENOID

DIAGNOSIS:
Output signal circuit of transfer duty solenoid is open or shorted.
TROUBLE SYMPTOM:
Excessive "braking" in tight corners.
WIRING DIAGRAM:



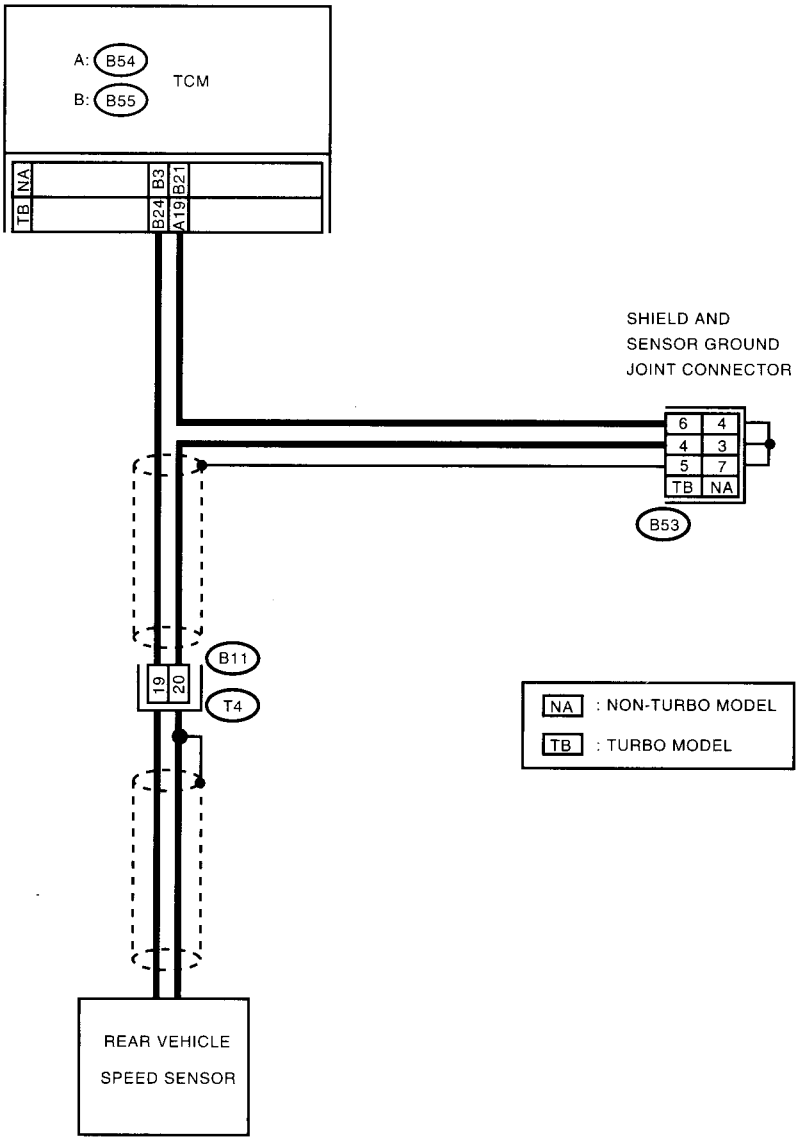
	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from TCM and transmission. 3)Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 15 — (B11) No. 6:*** ***Turbo model*** ***(B54) No. 6 — (B11) No. 6:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance harness connector between TCM and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 15 — Chassis ground:*** ***Turbo model*** ***(B54) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair 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 resistance between 10 and 17 Ω?	Go to step **4.**	Go to step **13.**
4	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	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)Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 15 (+) — Chassis ground (–):*** ***Turbo model*** ***(B54) No. 6 (+) — Chassis ground (–):***	Is the voltage less than 1 V in "P" range?	Go to step **6.**	Go to step **12.**
6	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 15 (+) — Chassis ground (–):*** ***Turbo model*** ***(B54) No. 6 (+) — Chassis ground (–):***	Is the voltage between 5 and 7 V in "D" range?	Even if the AT OIL TEMP warning 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 transmission.	Go to step **12.**
7	**CHECK VEHICLE**	Is the target non-turbo model ?	Go to step **8.**	Go to step **10.**

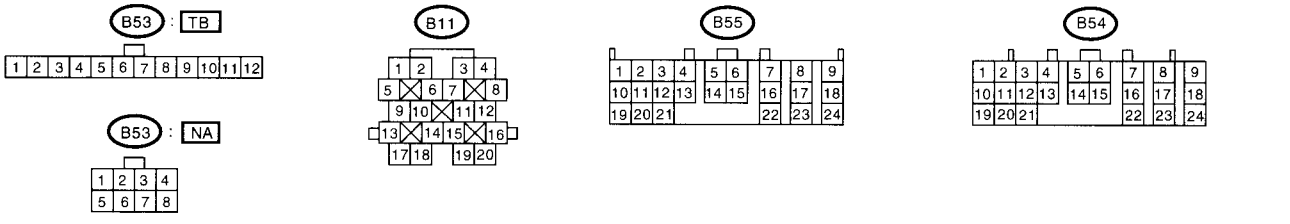
	Step	Check	Yes	No
8	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1)Connect the connectors to TCM and transmission. 2)Connect the Subaru Select Monitor to data link connector. 3)Turn the ignition switch to ON (engine OFF) and turn the Subaru Select Monitor switch to ON. 4)Move the select lever to "D" with throttle fully open (vehicle speed 0 km/h or 0 MPH). 5)Read the data of transfer duty solenoid using Subaru Select Monitor. •Transfer duty solenoid is indicated in "%".	Is the value between 5 and 10%?	Go to step **9.**	Go to step **12.**
9	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1)Move the select lever to "D" with throttle fully closed (vehicle speed 0 km/h or 0 MPH). 2)Rear the data of transfer duty solenoid using Subaru Select Monitor. •Transfer duty solenoid is indicated in "%".	Is the value between approx. 60% and approx. 70%?	Even if the AT OIL TEMP warning 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 transmission.	Go to step **12.**
10	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1)Connect connectors to TCM and transmission. 2)Connect Subaru Select Monitor to data link connector. 3)Turn ignition switch to ON (engine OFF) and turn Subaru Select Monitor switch to ON. 4)Move select lever to "D" 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 value between 80 and 95%?	Go to step **11.**	Go to step **12.**
11	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1)Move select lever to "N" with throttle fully close (vehicle speed 0 km/h or 0 MPH). 2)Rear data of transfer duty solenoid using Subaru Select Monitor. •Transfer duty solenoid is indicated in "%".	Is the value approx. 40%?	Even if the AT OIL TEMP warning 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 transfer duty solenoid and TCM connector.	Go to step **12.**

	Step	Check	Yes	No
12	**CHECK POOR CONTACT.**	Is there poor contact in transfer duty solenoid circuit?	Repair poor contact.	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>
13	**CHECK TRANSFER DUTY SOLENOID (IN TRANSMISSION).** 1)Lift-up the vehicle and place safety stand. **CAUTION:** **On AWD models, 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 the 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 resistance between 10 and 17 Ω?	Go to step **14.**	Replace the transfer duty solenoid.
14	**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 resistance less than 1 Ω?	Go to step **15.**	Repair open circuit in harness between transfer duty solenoid and transmission connector.
15	**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 resistance more than 1 MΩ?	Even if the AT OIL TEMP warning 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 contact in the transfer duty solenoid and transmission.	Repair short circuit in harness between transfer duty solenoid and transmission connector.

Q: DTC 93 REAR VEHICLE SPEED SENSOR

DIAGNOSIS:
Input signal circuit of TCM is open or shorted.
TROUBLE SYMPTOM:
No lock-up or excessive tight corner “braking”.
WIRING DIAGRAM:





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Step	Check	Yes	No
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*** ***Non-turbo model*** ***(B55) No. 3 — (B11) No. 19:*** ***Turbo model*** ***(B55) No. 24 — (B11) No. 19:***	s the resistance less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between TCM and transmission connector.
CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***Non-turbo model*** ***(B55) No. 21 — (B11) No. 20:*** ***Turbo model*** ***(B54) No. 19 — (B11) No. 20:***	s the resistance less than 1 Ω?	Go to step **3.**	Repair open circuit in harness between TCM and transmission, and poor contact in coupling connector.
CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B55) No. 3 — Chassis ground:*** ***Turbo model*** ***(B55) No. 24 — Chassis ground:***	s the resistance more than 1 MΩ?	Go to step **4.**	Repair short circuit in harness between TCM and transmission connector.
CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B55) No. 21 — Chassis ground:*** ***Turbo model*** ***(B54) No. 19 — Chassis ground:***	s the resistance more than 1 MΩ?	Go to step **5.**	Repair short circuit in harness between TCM and transmission connector.
CHECK REAR VEHICLE SPEED SENSOR. Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 19 — No. 20:***	s the resistance between 450 and 650 Ω?	Go to step **6.**	Replace the rear vehicle speed sensor. <Ref. to AT-35, Rear Vehicle Speed Sensor.>
PREPARE OSCILLOSCOPE.	Do you have an oscilloscope?	Go to step **10.**	Go to step **7.**
PREPARE SUBARU SELECT MONITOR.	Do you have a Subaru Select Monitor?	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. **CAUTION:** **On AWD models, 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 the AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> 4)Measure the voltage between TCM connector terminals. ***Connector & terminal*** ***Non-turbo model*** ***(B55) No. 3 (+) — (B54) No. 21 (–):*** ***Turbo model*** ***(B55) No. 24 (+) — (B54) No. 19 (–):***	Is the voltage more than AC 1 V?	Even if the AT OIL TEMP warning 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 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. **CAUTION:** **Raise all wheels off floor.** 4)Turn the ignition switch to ON and turn the 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". 1)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 the AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.>	Does the speedometer indication increase as the Subaru Select Monitor data increases?	Even if the AT OIL TEMP warning 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 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. **CAUTION:** **Raise all wheels off floor.** 3)Set the oscilloscope to TCM connector terminals. **Turbo model** Positive probe; (B55) No. 24 Earth lead; (B55) No. 19 **Non-turbo model** Positive probe; (B55) No. 3 Earth lead; (B55) No. 21 4)Start the engine and set the 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 the AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> 5)Measure the signal voltage indicated on oscilloscope.	Is the signal voltage more than AC 1 V?	Even if the AT OIL TEMP warning 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 transmission.	Go to step **11.**
11	**CHECK POOR CONTACT.**	Is there poor contact in rear vehicle speed sensor circuit?	Repair poor contact.	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

15.Diagnostic Procedure for No-Diagnostic Trouble Code (DTC)

A: CHECK GEAR POSITION.

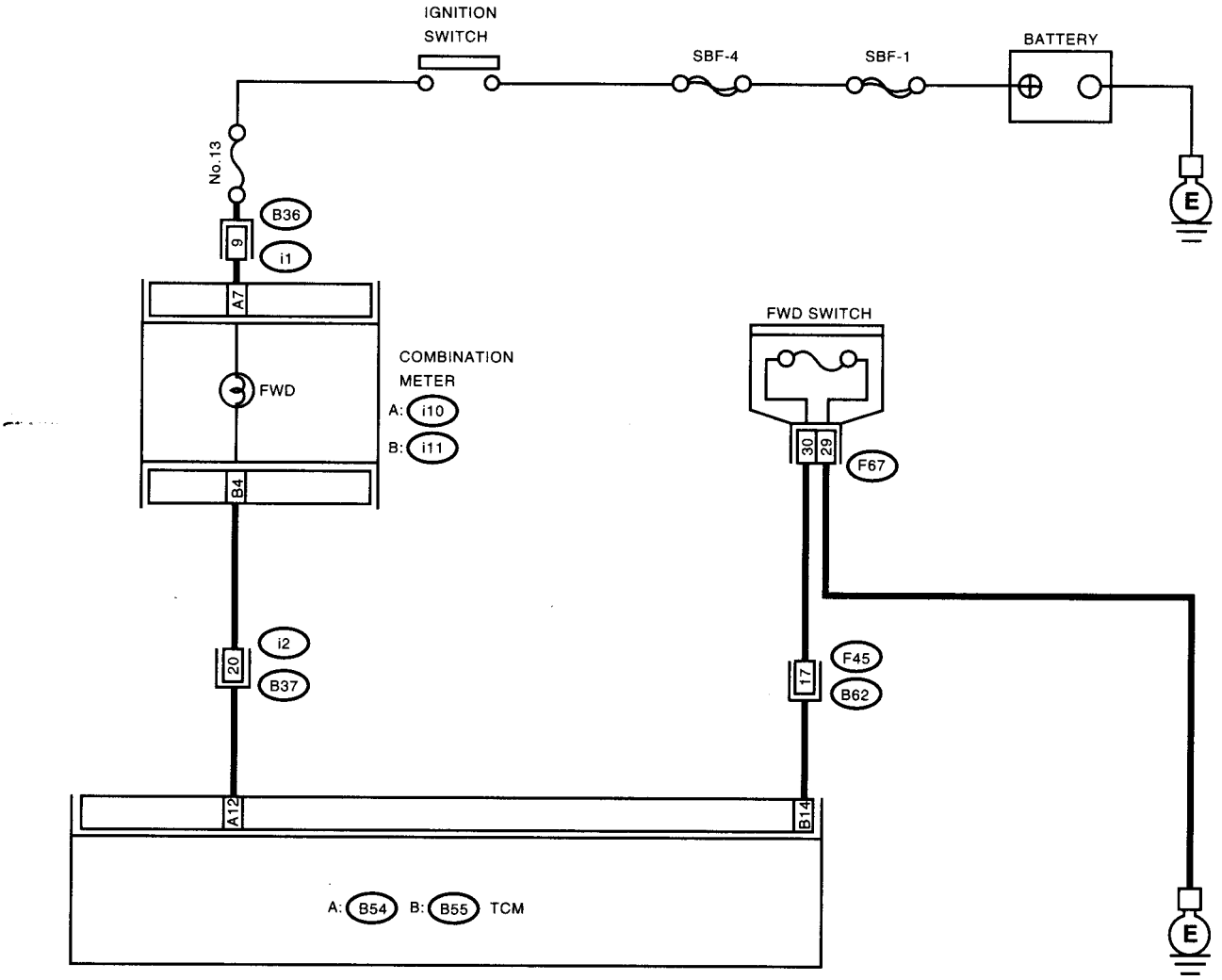
	Step	Check	Yes	No
1	**CHECK GEAR POSITION.** 1)Lift-up the vehicle and place safety stand. **CAUTION:** **On AWD models, raise all wheels off ground.** 2)Start the engine. 3)Move the select lever to "D", and drive the vehicle. 4)Read the data of gear position using Subaru Select Monitor. •Gear position is indicated. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When the AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.>	Does the transmission gear correspond to the gear which is shown on display?	Go to step **2.**	Check shift solenoid 1 and shift solenoid 2 signal circuit. <Ref. to AT-70, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> and <Ref. to AT-74, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
2	**CHECK VEHICLE.**	Is the target non-turbo model?	Go to step CHECK FWD SWITCH.<Ref. to AT-110, CHECK FWD SWITCH., Diagnostic Procedure for No-Diagnostic Trouble Code (DTC).>	Go to step CHECK BRAKE SWITCH. <Ref. to AT-112, CHECK BRAKE SWITCH., Diagnostic Procedure for No-Diagnostic Trouble Code (DTC).>

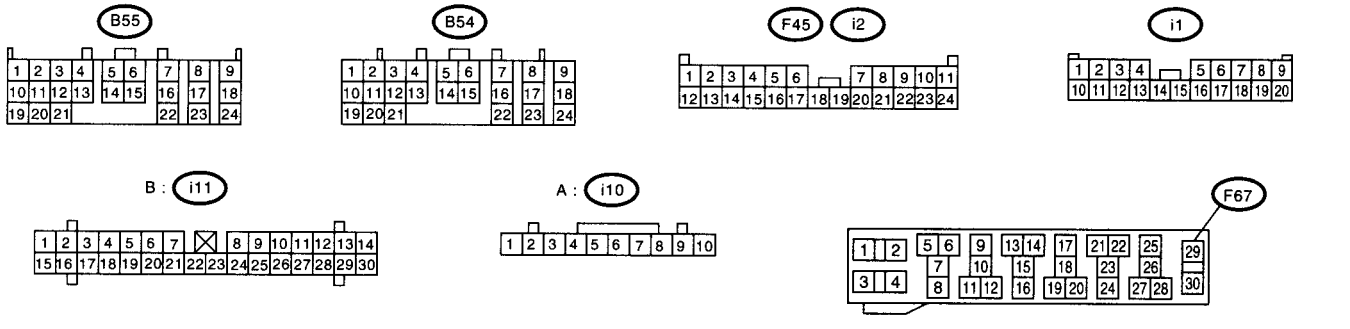
B: CHECK FWD SWITCH.

DIAGNOSIS:

- LED does not come on even if FWD switch is ON.
- FWD switch circuit is open or short.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK FWD SWITCH.**	When the fuse is inserted to FWD switch, does the LED light up?	Go to step CHECK BRAKE SWITCH.<Ref. to AT-112, 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?	Go to step **3.**	Replace the FWD indicator light bulb. <Ref. to IDI-11, 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. 14 — (F67) No. 30:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair open circuit in harness between TCM and FWD switch connector.
4	**CHECK HARNESS CONNECTOR BETWEEN FWD SWITCH AND CHASSIS GROUND.** Measure the resistance of harness between FWD switch and chassis ground. ***Connector & terminal*** ***(F67) No. 29 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair open circuit in harness between FWD switch connector and chassis ground.
5	**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. 14 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair short circuit in harness between TCM and FWD switch connector.
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. 14 (+) — Chassis ground (–):***	Is the voltage less than 1 V in FWD switch while installing?	Go to step **7.**	Go to step **12.**
7	**CHECK INPUT SIGNAL FOR TCM.** Measure the signal voltage for TCM while removing the fuse from FWD switch connector. ***Connector & terminal*** ***(B55) No. 14 (+) — Chassis ground (–):***	Is the voltage more than 6 V in FWD switch while removing?	Go to step **8.**	Replace the TCM. <Ref. to AT-45, 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*** ***(B54) No. 12 — (i11) No. 4:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair 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 COMBINATION METER.** Measure the resistance of harness connector between TCM and chassis ground to make sure that circuit does not short. ***Connector & terminal*** ***(B54) No. 12 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **10.**	Repair 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*** ***(B54) No. 12 — Chassis ground:***	Is the voltage less than 1 V in FWD switch while installing?	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*** ***(B54) No. 12 — Chassis ground:***	Is the voltage more than 9 V in FWD switch while removing?	Go to step **12.**	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>
12	**CHECK POOR CONTACT.**	Is there poor contact in FWD switch circuit?	Repair poor contact.	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

C: CHECK BRAKE SWITCH.

	Step	Check	Yes	No
1	**CHECK BRAKE SWITCH.**	When the brake pedal is depressed, does the LED light up?	Go to step CHECK ABS SWITCH. <Ref. to AT-113, CHECK ABS SWITCH., Diagnostic Procedure for No-Diagnostic Trouble Code (DTC).>	Check the brake switch circuit.

D: CHECK ABS SWITCH.

Step		Check	Yes	No
1	CHECK ABS SWITCH.	Does the LED of ABS switch light up?	Check the ABS switch circuit. <Ref. to ABS-138, DTC 44 ABS-AT CONTROL (NON CONTROLLED), Diagnostics Chart with Subaru Select Monitor.> and <Ref. to ABS-140, DTC 44 ABS-AT CONTROL (CONTROLLED), Diagnostics Chart with Subaru Select Monitor.>	Go to step CHECK CRUISE CONTROL SWITCH. <Ref. to AT-113, CHECK CRUISE CONTROL SWITCH., Diagnostic Procedure for No-Diagnostic Trouble Code (DTC).>

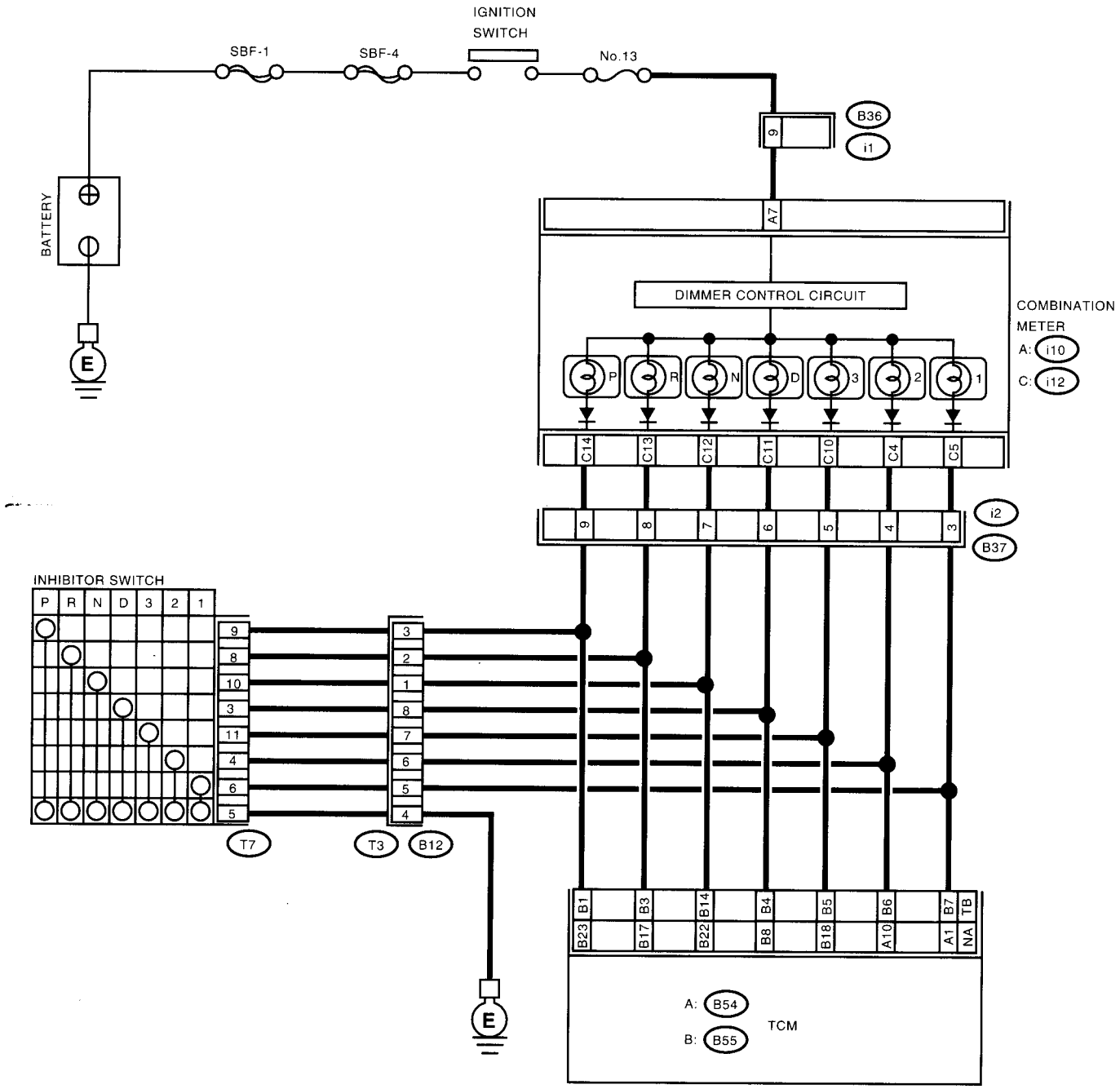
E: CHECK CRUISE CONTROL SWITCH.

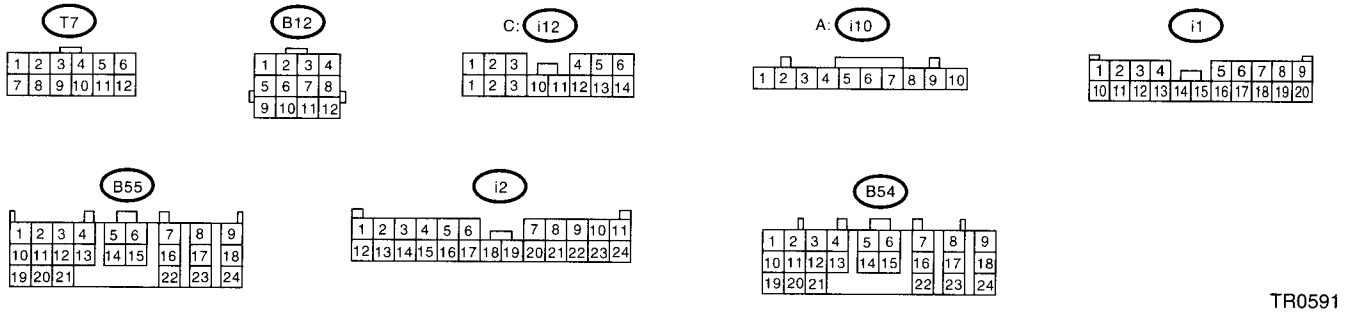
Step		Check	Yes	No
1	CHECK CRUISE CONTROL SWITCH.	When cruise control is set, does the LED light up?	Go to step CHECK INHIBITOR SWITCH. <Ref. to AT-115, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-Diagnostic Trouble Code (DTC).>	Check the cruise control. <Ref. to CC-28, Diagnostics Chart with Diagnostic Trouble Code.>

F: CHECK INHIBITOR SWITCH.

DIAGNOSIS:
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:





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	Step	Check	Yes	No
1	**CHECK "P" RANGE SWITCH.**	When "P" range is selected, does the LED light up?	Go to step **2.**	Go to step **22.**
2	**CHECK INDICATOR LIGHT.**	Does the combination meter "P" range indicator illuminate?	Go to step **3.**	Go to step **26.**
3	**CHECK "P" RANGE SWITCH.**	When the "R" range is selected, does the "P" range LED light up?	Go to step **28.**	Go to step **4.**
4	**CHECK "R" RANGE SWITCH.**	When the "R" range is selected, does the LED light up?	Go to step **5.**	Go to step **29.**
5	**CHECK INDICATOR LIGHT.**	Does the combination meter "R" range indicator illuminate?	Go to step **6.**	Go to step **32.**
6	**CHECK "R" RANGE SWITCH.**	When the "N" range is selected, does the "R" range LED light up?	Go to step **34.**	Go to step **7.**
7	**CHECK "N" RANGE SWITCH.**	When the "N" range is selected, does the LED light up?	Go to step **8.**	Go to step **35.**
8	**CHECK INDICATOR LIGHT.**	Does the combination meter "N" range indicator illuminate?	Go to step **9.**	Go to step **38.**
9	**CHECK "N" RANGE SWITCH.**	When the "D" range is selected, does the "N" range LED light up?	Go to step **40.**	Go to step **10.**
10	**CHECK "D" RANGE SWITCH.**	When the "D" range is selected, does the LED light up?	Go to step **11.**	Go to step **41.**
11	**CHECK INDICATOR LIGHT.**	Does the combination meter "D" range indicator illuminate?	Go to step **12.**	Go to step **44.**
12	**CHECK "D" RANGE SWITCH.**	When the "3" range is selected, does the "D" range LED light up?	Go to step **46.**	Go to step **13.**
13	**CHECK "3" RANGE SWITCH.**	When the "3" range is selected, does the LED light up?	Go to step **14.**	Go to step **47.**
14	**CHECK INDICATOR LIGHT.**	Does the combination meter "3" range indicator illuminate?	Go to step **15.**	Go to step **50.**
15	**CHECK "3" RANGE SWITCH.**	When the "2" range is selected, does the "3" range LED light up?	Go to step **52.**	Go to step **16.**
16	**CHECK "2" RANGE SWITCH.**	When the "2" range is selected, does the LED light up?	Go to step **17.**	Go to step **53.**
17	**CHECK INDICATOR LIGHT.**	Does the combination meter "2" range indicator illuminate?	Go to step **18.**	Go to step **56.**
18	**CHECK "2" RANGE SWITCH.**	When the "1" range is selected, does the "2" range LED light up?	Go to step **58.**	Go to step **19.**
19	**CHECK "1" RANGE SWITCH.**	When the "1" range is selected, does the LED light up?	Go to step **20.**	Go to step **59.**
20	**CHECK INDICATOR LIGHT.**	Does the combination meter "1" range indicator illuminate?	Go to step **21.**	Go to step **62.**
21	**CHECK "1" RANGE SWITCH.**	When the "P" range is selected, does the "1" range LED light UP?	Go to step **64.**	Go to step Symptom Related Diagnostic. <Ref. to AT-127, Symptom Related Diagnostic.>

	Step	Check	Yes	No
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 resistance less than 1 Ω?	Go to step **23.**	Repair 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*** ***Non-turbo model*** ***(B55) No. 23 — (T7) No. 9*** ***Turbo model*** ***(B55) No. 1 — (T7) No. 9***	Is the resistance less than 1 Ω?	Go to step **24.**	Repair 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)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B55) No. 23 (+) — Chassis ground (–):*** ***Turbo model*** ***(B55) No. 1 (+) — Chassis ground (–):***	Is the voltage less than 1 V in "P" range?	Go to step **25.**	Go to step **65.**
25	**CHECK INPUT SIGNAL FOR TCM.** Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B55) No. 23 (+) — Chassis ground (–):*** ***Turbo model*** ***(B55) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 8 V in other ranges?	Go to step **65.**	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>
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?	Go to step **27.**	Replace the "P" range indicator light bulb. <Ref. to IDI-11, 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*** ***Non-turbo model*** ***(B55) No. 23 — (i12) No. 14:*** ***Turbo model*** ***(B55) No. 1 — (i12) No. 14:***	Is the resistance more than 1 Ω?	Go to step **65.**	Repair open circuit in harness between TCM connector and combination meter, and poor contact in coupling connector.

	Step	Check	Yes	No
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*** ***Non-turbo model*** ***(B55) No. 23 — Chassis ground:*** ***Turbo model*** ***(B55) No. 1 — Chassis ground:***	s the resistance less than 1 MΩ?	3o to step **29.**	Repair ground short circuit in "P" ange 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*** ***Non-turbo model*** ***(B55) No. 17 — (T7) No. 8:*** ***Turbo model*** ***(B55) No. 3 — (T7) No. 8:***	s the resistance less than 1 2?	3o to step **30.**	Repair open circui n harness ıetween TCM anc nhibitor switch :onnector, and ıoor contact in :oupling connec- or.
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)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B55) No. 17 (+) — Chassis ground (–):*** ***Turbo model*** ***(B55) No. 3 (+) — Chassis ground (–):***	s the voltage less than 1 V in R" range?	3o to step **31.**	3o to step **65.**
31	**CHECK INPUT SIGNAL FOR TCM.** Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B55) No. 17 (+) — Chassis ground (–):*** ***Turbo model*** ***(B55) No. 3 (+) — Chassis ground (–):***	s the voltage more than 8 V in ıther ranges?	3o to step **65.**	Replace the TCM. :Ref. to AT-45, Transmission Con rol 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.	s the "R" range indicator light ıulb OK?	3o to step **33.**	Replace the "R" ange indicator ght bulb. <Ref. tc DI-11, Combina- ion Meter Assem- ıly.>

	Step	Check	Yes	No
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*** ***Non-turbo model*** ***(B55) No. 17 — (i12) No. 13:*** ***Turbo model*** ***(B55) No. 3 — (i12) No. 13:***	Is the resistance less than 1 Ω?	Go to step **65.**	Repair 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*** ***Non-turbo model*** ***(B55) No. 17 — Chassis ground:*** ***Turbo model*** ***(B55) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **35.**	Repair 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*** ***Non-turbo model*** ***(B55) No. 22 — (T7) No. 10:*** ***Turbo model*** ***(B55) No. 14 — (T7) No. 10:***	Is the resistance less than 1 Ω?	Go to step **36.**	Repair open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
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)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B55) No. 22 (+) — Chassis ground (–):*** ***Turbo model*** ***(B55) No. 14 (+) — Chassis ground (–):***	Is the voltage less than 1 V in "N" range?	Go to step **37.**	Go to step **65.**
37	**CHECK INPUT SIGNAL FOR TCM.** Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B55) No. 22 (+) — Chassis ground (–):*** ***Turbo model*** ***(B55) No. 14 (+) — Chassis ground (–):***	Is the voltage more than 8 V in other ranges?	Go to step **65.**	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

	Step	Check	Yes	No
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?	Go to step **39.**	Replace the "N" range indicator light bulb. <Ref. to IDI-11, 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*** ***Non-turbo model*** ***(B55) No. 22 — (i12) No. 12:*** ***Turbo model*** ***(B55) No. 14 — (i12) No. 12:***	Is the resistance less than 1 Ω?	Go to step **65.**	Repair 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*** ***Non-turbo model*** ***(B55) No. 22 — Chassis ground:*** ***Turbo model*** ***(B55) No. 14 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **41.**	Repair ground short circuit in "N" range circuit.
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*** ***Non-turbo model*** ***(B55) No. 8 — (T7) No. 3:*** ***Turbo model*** ***(B55) No. 4 — (T7) No. 3:***	Is the resistance less than 1 Ω?	Go to step **42.**	Repair 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)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B55) No. 8 (+) — Chassis ground (–):*** ***Turbo model*** ***(B55) No. 4 (+) — Chassis ground (–):***	Is the voltage less than 1 V in "D" range?	Go to step **43.**	Go to step **65.**

	Step	Check	Yes	No
43	**CHECK INPUT SIGNAL FOR TCM.** Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B55) No. 8 (+) — Chassis ground (–):*** ***Turbo model*** ***(B55) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 8 V in other ranges?	Go to step **65.**	Replace the TCM. <Ref. to AT-45, 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?	Go to step **45.**	Replace the "D" range indicator light bulb. <Ref. to IDI-11, 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*** ***Non-turbo model*** ***(B55) No. 8 — (i12) No. 11:*** ***Turbo model*** ***(B55) No. 4 — (i12) No. 11:***	Is the resistance less than 1 Ω?	Go to step **65.**	Repair open circuit in harness between TCM connector and combination meter, and TCM connector.
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*** ***Non-turbo model*** ***(B55) No. 8 — Chassis ground:*** ***Turbo model*** ***(B55) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **47.**	Repair 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*** ***Non-turbo model*** ***(B55) No. 18 — (T7) No. 11:*** ***Turbo model*** ***(B55) No. 5 — (T7) No. 11:***	Is the resistance less than 1 Ω?	Go to step **48.**	Repair open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.

	Step	Check	Yes	No
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)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B55) No. 18 (+) — Chassis ground (–):*** ***Turbo model*** ***(B55) No. 5 (+) — Chassis ground (–):***	Is the voltage less than 1 V in "3" range?	Go to step **49.**	Go to step **65.**
49	**CHECK INPUT SIGNAL FOR TCM.** Measure the hvoltage between TCM and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B55) No. 18 (+) — Chassis ground (–):*** ***Turbo model*** ***(B55) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 8 V in other ranges?	Go to step **65.**	Replace the TCM. <Ref. to AT-45, 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?	Go to step **51.**	Replace the "3" range indicator light bulb. <Ref. to IDI-11, Combination Meter Assembly.>
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*** ***Non-turbo model*** ***(B55) No. 18 — (i12) No. 10:*** ***Turbo model*** ***(B55) No. 5 — (i12) No. 10:***	Is the resistance more than 1 Ω?	Go to step **65.**	Repair 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*** ***Non-turbo model*** ***(B55) No. 18 — Chassis ground:*** ***Turbo model*** ***(B55) No. 5 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **53.**	Repair ground short circuit in "3" range circuit.

	Step	Check	Yes	No
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*** ***Non-turbo model*** ***(B54) No. 10 — (T7) No. 4:*** ***Turbo model*** ***(B55) No. 6 — (T7) No. 4:***	Is the resistance less than 1 Ω?	Go to step **54.**	Repair 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)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 10 (+) — Chassis ground (–):*** ***Turbo model*** ***(B55) No. 6 (+) — Chassis ground (–):***	Is the voltage less than 1 V in "2" range?	Go to step **55.**	Go to step **65.**
55	**CHECK INPUT SIGNAL FOR TCM.** Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 10 (+) — Chassis ground (–):*** ***Turbo model*** ***(B55) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 8 V in other ranges?	Go to step **65.**	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>
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?	Go to step **57.**	Replace the "2" range indicator light bulb. <Ref. to IDI-11, 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*** ***Non-turbo model*** ***(B54) No. 10 — (i12) No. 4:*** ***Turbo model*** ***(B55) No. 6 — (i12) No. 4:***	Is the resistance less than 1 Ω?	Go to step **65.**	Repair open circuit in harness between TCM and combination meter, and poor contact in TCM connector.

	Step	Check	Yes	No
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*** ***Non-turbo model*** ***(B54) No. 10 — Chassis ground:*** ***Turbo model*** ***(B55) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **59.**	Repair 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*** ***Non-turbo model*** ***(B54) No. 1 — (T7) No. 6:*** ***Turbo model*** ***(B55) No. 7 — (T7) No. 6:***	Is the resistance less than 1 Ω?	Go to step **60.**	Repair 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)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 1 (+) — Chassis ground (–):*** ***Turbo model*** ***(B55) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 1 V in "1" range?	Go to step **61.**	Go to step **65.**
61	**CHECK INPUT SIGNAL FOR TCM.** Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 1 (+) — Chassis ground (–):*** ***Turbo model*** ***(B55) No. 7 (+) — Chassis ground (–):***	Is the voltage more than 8 V in other ranges?	Go to step **65.**	Replace the TCM. <Ref. to AT-45, 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?	Go to step **63.**	Replace the "1" range indicator light bulb. <Ref. to IDI-11, Combination Meter Assembly.>

	Step	Check	Yes	No
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*** ***Non-turbo model*** ***(B54) No. 1 — (i12) No. 5:*** ***Turbo model*** ***(B55) No. 7 — (i12) No. 5:***	Is the resistance less than 1Ω?	Go to step **65.**	Repair open circuit in harnes 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*** ***Non-turbo model*** ***(B54) No. 1 — Chassis ground:*** ***Turbo model*** ***(B55) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **65.**	Repair ground short circuit in "1" range circuit.
65	**CHECK POOR CONTACT.**	Is there poor contact in inhibitor switch circuit?	Repair poor contact.	Adjust the inhibitor switch and select cable. <Ref. to AT-28, ADJUSTMENT, Inhibitor Switch.> and <Ref. to CS-26, Select Cable.>

16.Symptom Related Diagnostic

A: INSPECTION

Symptom	Problem parts
Starter does not rotate when the select lever is in "P" or "N"; starter rotates when the select lever is in "R", "D", "3" or "2".	• Inhibitor switch • Select cable • Select lever • Starter motor and harness
Abnormal noise when the select lever is in "P" or "N".	• 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 the select lever is in "N".	• TCM • Low clutch
Shock occurs when the select lever is moved from "N" to "D".	• TCM • Harness • Control valve • ATF deterioration
Excessive time lag occurs when the select lever is moved from "N" to "D".	• Control valve • Low clutch • Line pressure duty solenoid • Seal ring • Front gasket transmission case
Shock occurs when the select lever is moved from "N" to "R".	• TCM • Harness • Control valve • ATF deterioration
Excessive time lag occurs when the select lever is moved from "N" to "R".	• 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 the 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 the 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 the select lever is in "3" range.	• Inhibitor switch • TCM • Throttle position sensor • Control valve
Engine brake is not effected when the select lever is in "3" or "2" range.	• Control valve
Engine brake is not effected when the 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 the 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 the 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 the 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 the 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
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
Front wheel slippage occurs during standing starts.	• TCM • Front vehicle speed sensor • 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 • Transfer clutch • Transfer valve • Transfer duty solenoid
Select lever is hard to move.	• Select cable • Select lever • Detent spring • Manual plate
Select lever is too high to move (unreasonable resistance).	• Detent spring • Manual plate
Select lever slips out of operation during acceleration or while driving on rough terrain.	• Select cable • Select lever • Detent spring • Manual plate

MANUAL TRANSMISSION AND DIFFERENTIAL

MT

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1. General Description

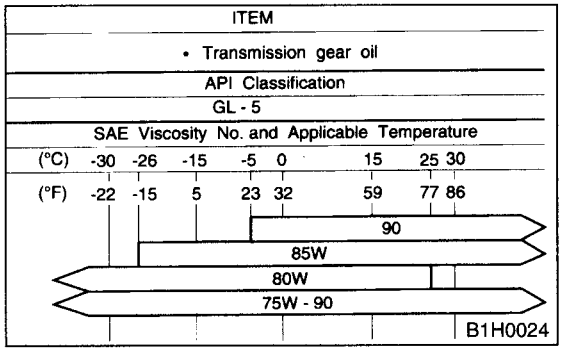
A: SPECIFICATIONS

1. MANUAL TRANSMISSION AND DIFFERENTIAL

Item			Model		
			Non-turbo		Turbo
			Sedan	Wagon	
Type			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	0.780		0.738
		Reverse	3.333		
Front reduction gear	Final	Type of gear	Hypoid		
		Gear ratio	4.111	3.900	
Rear reduction gear	Transfer	Type of gear	Helical		
		Gear ratio	1.000		1.100
	Final	Type of gear	Hypoid		
		Gear ratio	4.111	3.900	3.545
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 gear oil capacity			3.5 ℓ (3.7 US qt, 3.1 Imp qt)		

2. TRANSMISSION GEAR OIL

Recommended oil



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

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. 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)

6. 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 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)	—	—

7. SHIFTER FORK AND ROD

Select 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	4	Approach to 5th gear by 0.2 mm (0.008 in)
32812AA211	5	Standard
32812AA221	6	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)

8. TRANSFER 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	3	Neutral position is closer to 1st.
32188AA100	0	Standard
32188AA110	1	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.

9. 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:
T: Tight

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)

10.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)	—	—

Pinion shaft to axle drive shaft clearance
0 — 0.2 mm (0 — 0.008 in)

Snap ring (Outer-28)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
805028011	1.05 (0.0413)	805028012	1.20 (0.0472)

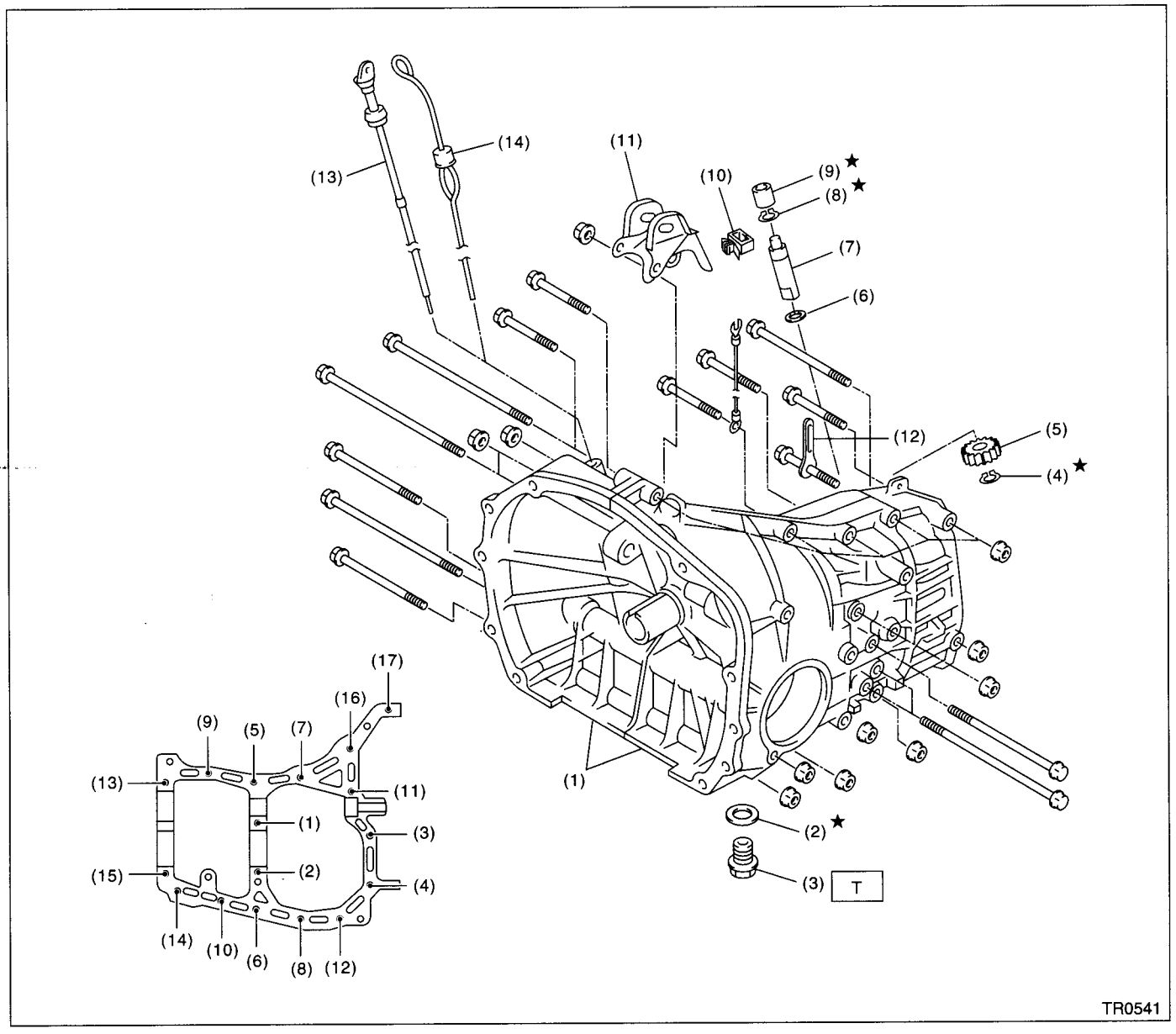
11.TRANSFER DRIVE GEAR

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

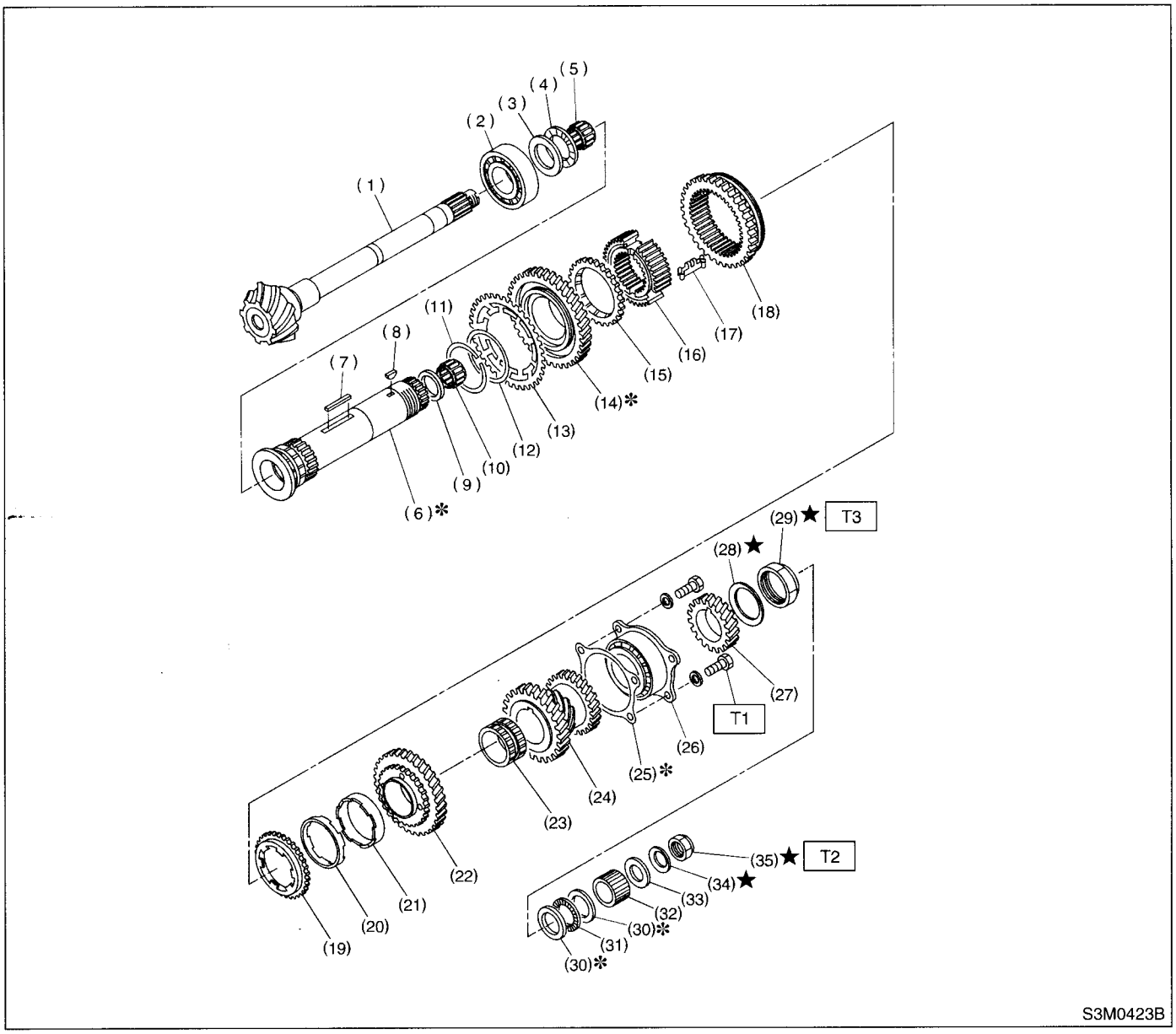


(1) Transmission case ASSY
(2) Gasket
(3) Drain plug
(4) Snap ring (Outer)
(5) Speedometer driven gear
(6) Washer
(7) Speedometer shaft
(8) Snap ring (Outer)
(9) Oil seal
(10) Clamp
(11) Pitching stopper bracket
(12) Clip
(13) Oil level gauge (Non-turbo model)
(14) Oil level gauge (Turbo model)

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

Size	All models	Tightening torque: N·m (kgf-m, ft-lb)
8 mm bolt	<5> — <15>	25 (2.5, 18.1)
10 mm bolt	<1> — <4> <16> — <17>	39 (4.0, 28.9)

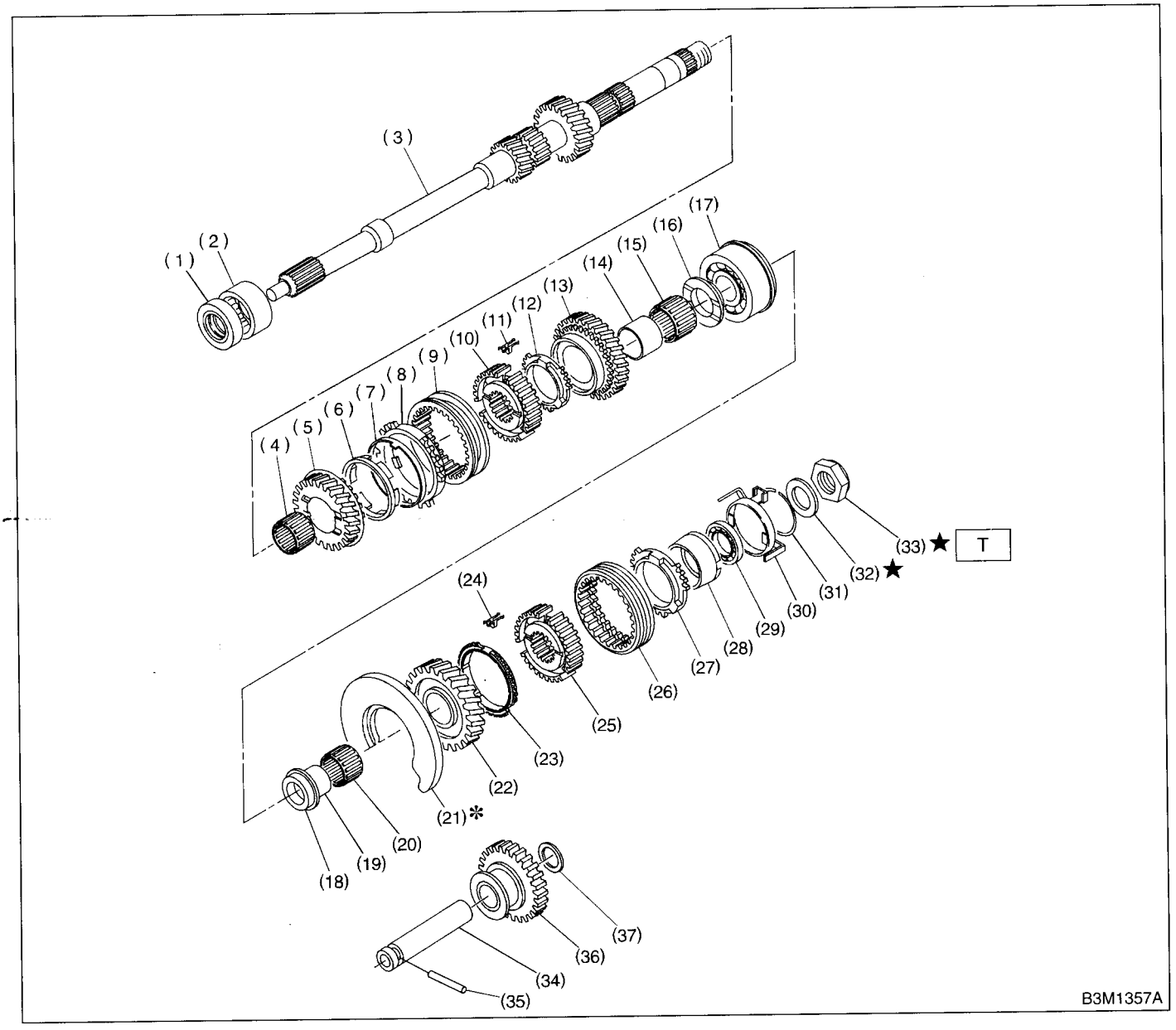
2. DRIVE PINION ASSEMBLY



(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)
(12) Washer
(13) Sub gear
(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: 29 (3.0, 21.7)
T2: 118 (12.0, 86.8)
T3: 265 (27, 195)

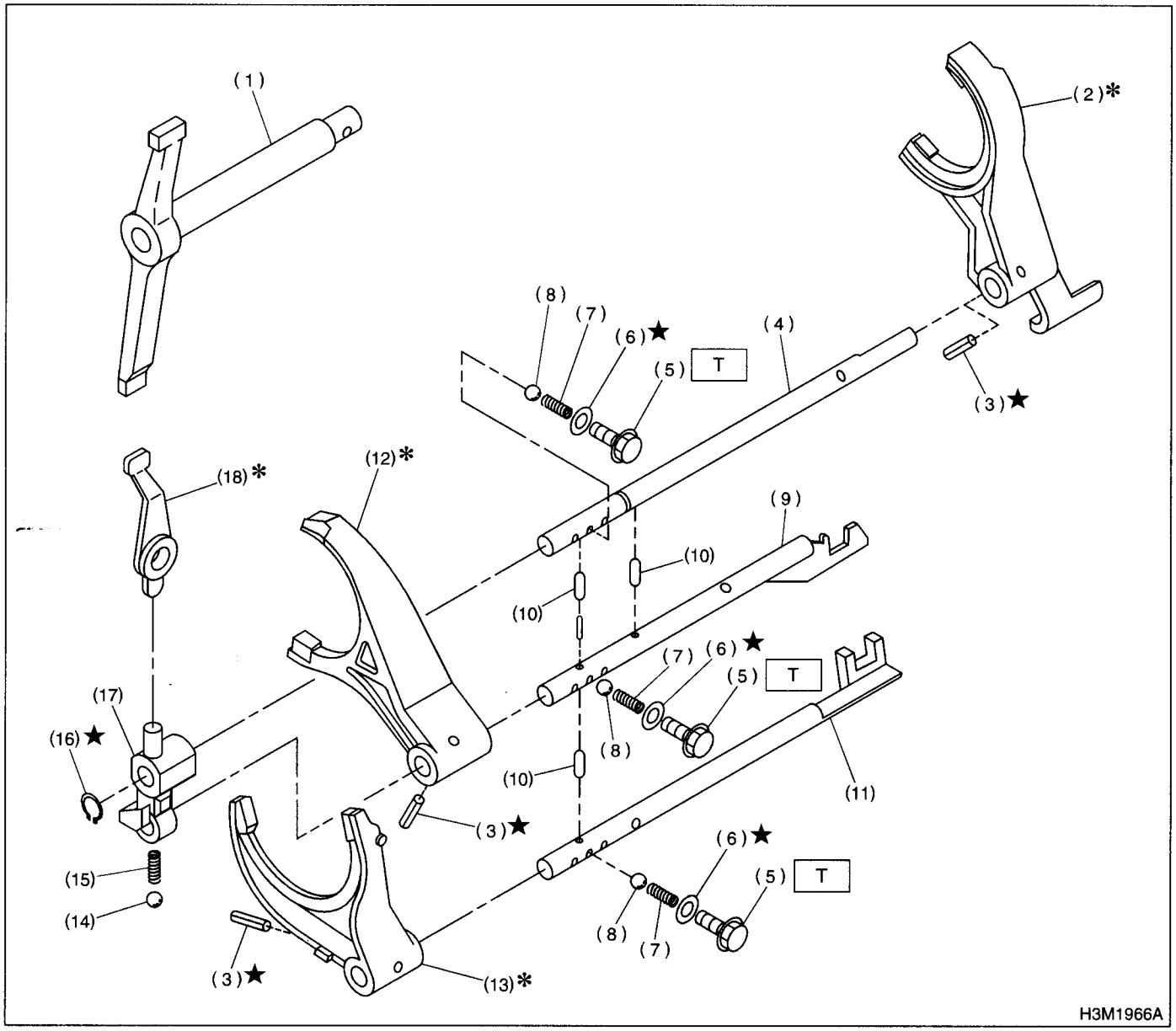
3. MAIN SHAFT ASSEMBLY



(1) Oil seal
(2) Needle bearing
(3) Transmission main shaft
(4) Needle bearing
(5) 3rd drive gear
(6) Inner baulk ring
(7) Synchro cone (3rd)
(8) Outer baulk ring
(9) Coupling sleeve (3rd-4th)
(10) Synchronizer hub (3rd-4th)
(11) Shifting insert key (3rd-4th)
(12) 4th baulk ring
(13) 4th drive gear
(14) 4th needle bearing race
(15) Needle bearing
(16) 4th gear thrust washer
(17) Ball 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) Shifting insert key (5th-Rev)
(25) Synchronizer hub (5th-Rev)
(26) Coupling sleeve (5th-Rev)
(27) Rev baulk ring
(28) Synchro cone (Rev)
(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: 118 (12.0, 86.8)

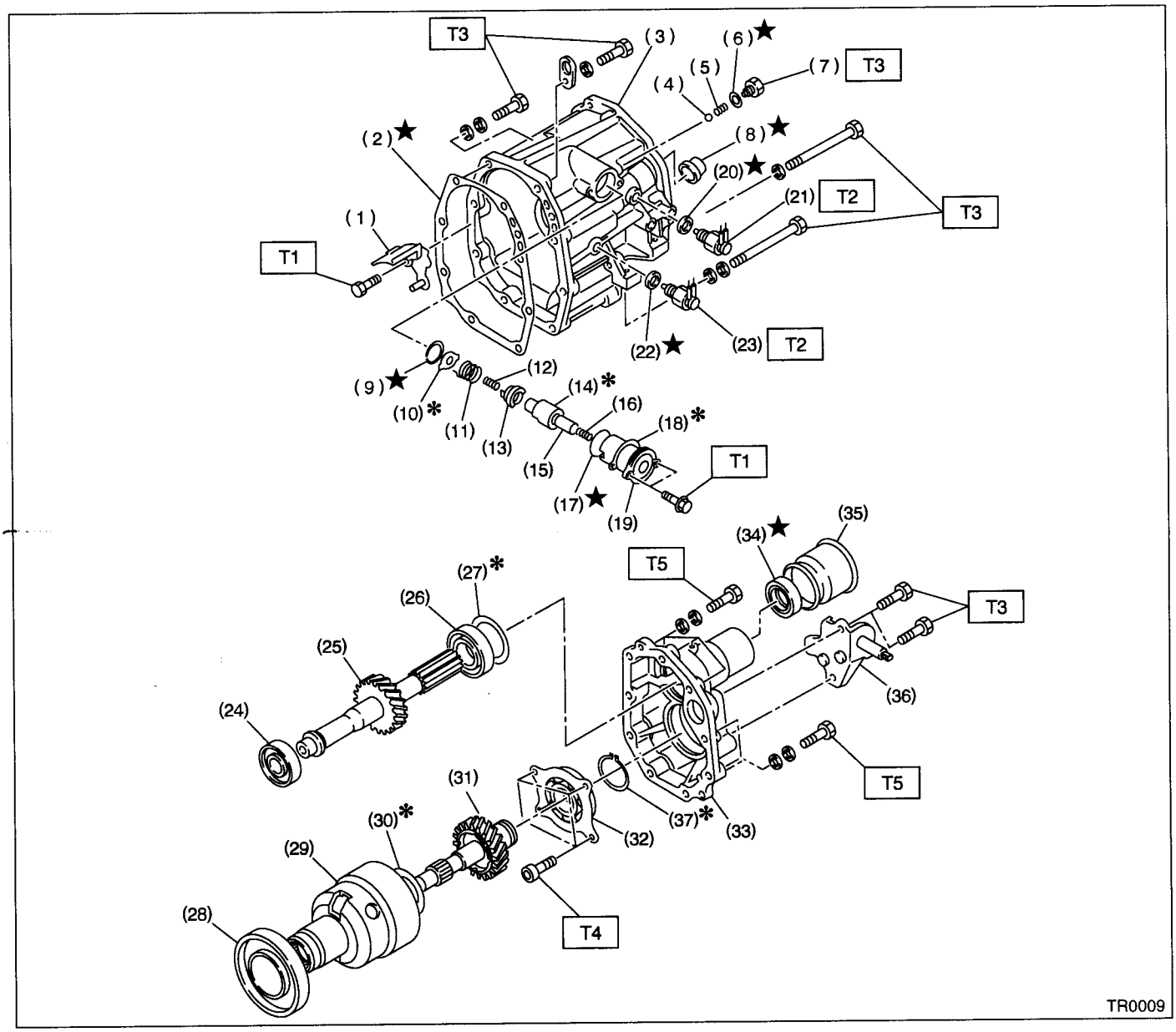
4. SHIFTER FORK AND SHIFTER ROD



(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: 19.6 (2.0, 14.5)

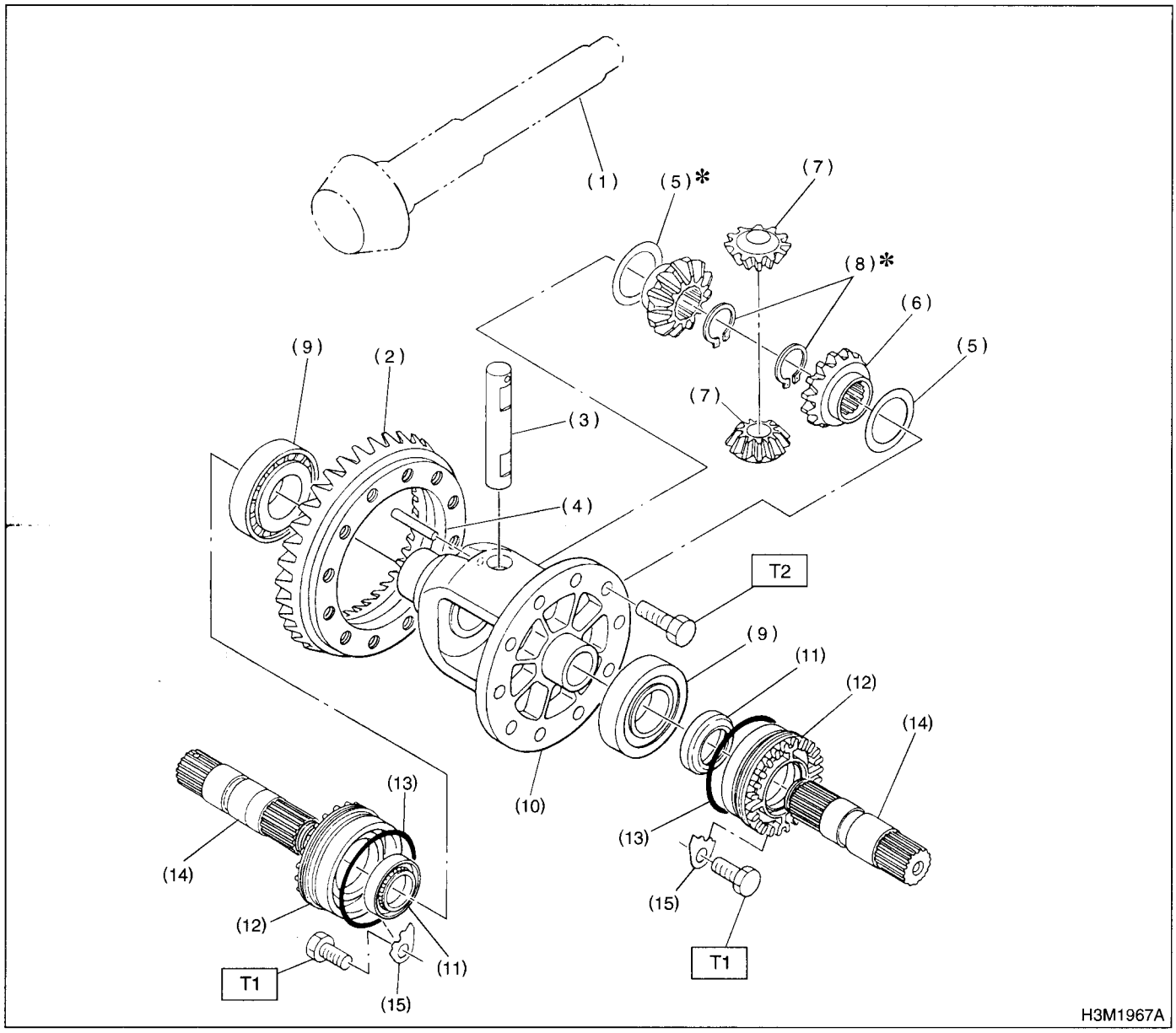
5. TRANSFER CASE AND EXTENSION



(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
(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: 10 (1.0, 7.2)
T3: 25 (2.5, 18.1)
T4: 26 (2.7, 20)
T5: 40 (4.1, 29.7)

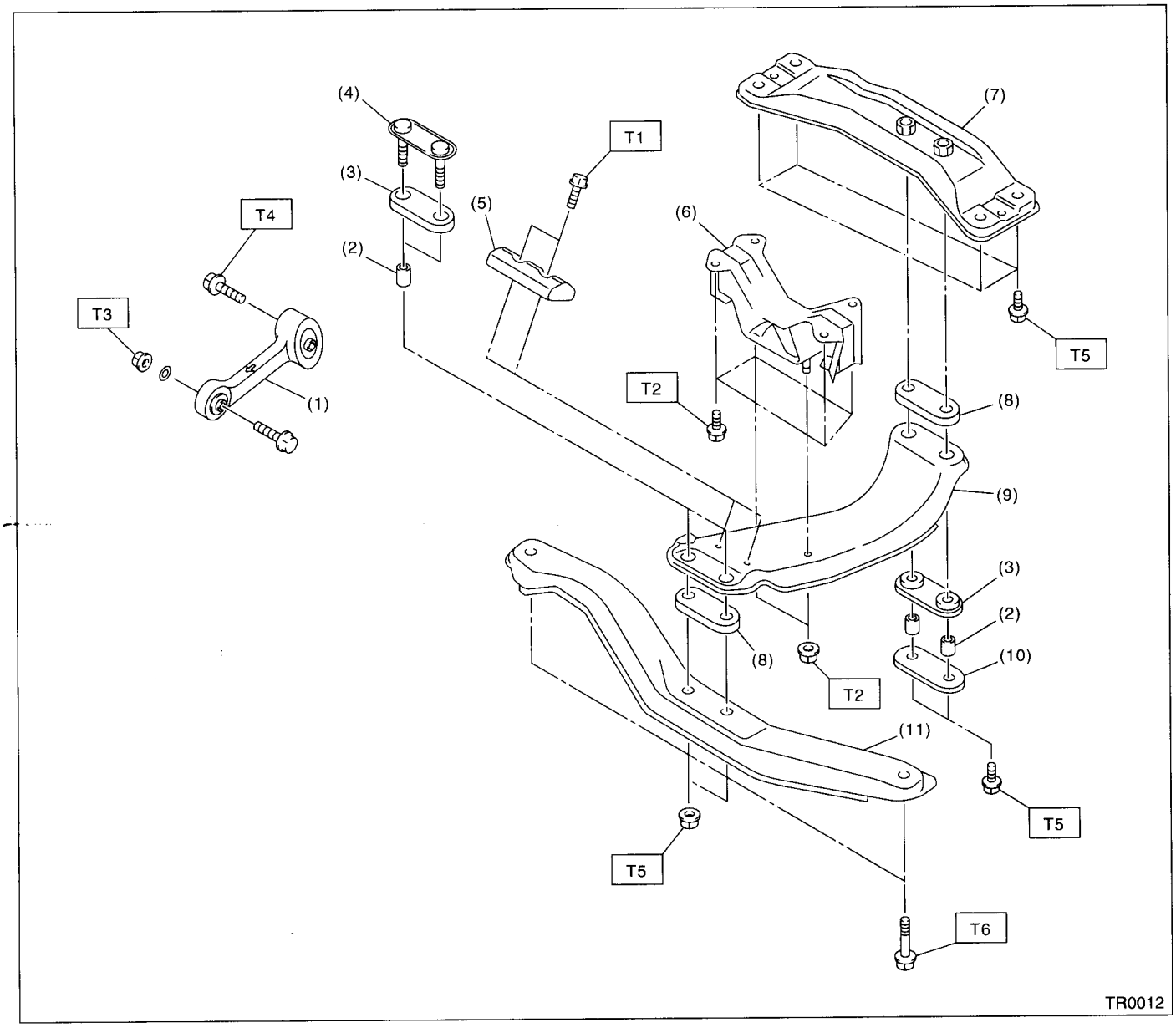
6. FRONT DIFFERENTIAL



(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) Snap ring (Outer)
(9) Roller bearing
(10) Differential case
(11) Oil seal
(12) Differential side retainer
(13) O-ring
(14) Axle drive shaft
(15) Retainer lock plate

Tightening torque: N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.1)
T2: 62 (6.3, 45.6)

7. TRANSMISSION MOUNTING



(1) Pitching stopper
(2) Spacer
(3) Cushion C
(4) Front plate
(5) 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 vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.
- Avoid damaging the mating surface of the case.
- Before applying sealant, completely remove the old seal.

D: PREPARATION TOOL

1. SPECIAL TOOLS

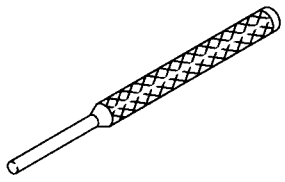
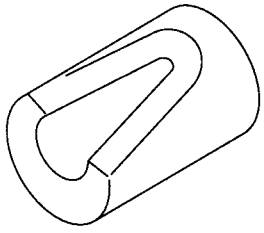
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1938	398791700	REMOVER	Used for removing and installing spring pin (6 mm).
 B3M1939	399411700	ACCENT BALL INSTALLER	Used for installing reverse shifter rail arm.

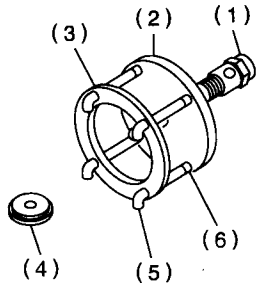
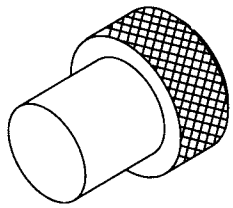
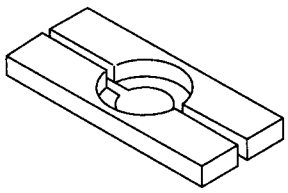
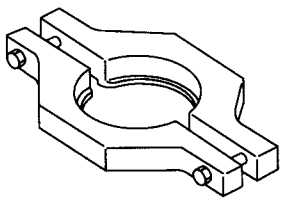
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1940A	399527700	PULLER SET	Used for removing and installing roller bearing (Differential). (1) BOLT (899521412) (2) PULLER (399527702) (3) HOLDER (399527703) (4) ADAPTER (398497701) (5) BOLT (899520107) (6) NUT (021008000)
 B3M1941	399780104	WEIGHT	Used for measuring preload on roller bearing.
 B3M1942	498077000	REMOVER	Used for removing roller bearing of drive pinion shaft.
 B3M1943	498077300	CENTER DIFFERENTIAL BEARING REMOVER	Used for removing the center differential cover ball bearing.

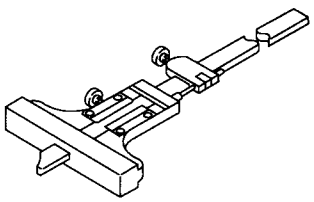
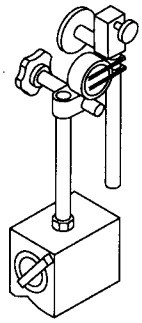
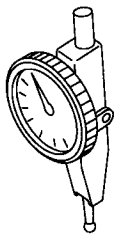
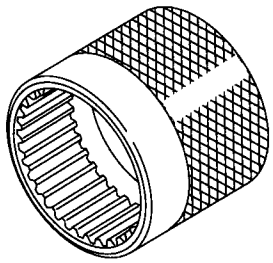
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1944	498147000	DEPTH GAUGE	Used for adjusting main shaft axial end play.
 B3M1945	498247001	MAGNET BASE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with DIAL GAUGE (498247100).
 B3M1946	498247100	DIAL GAUGE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with MAGNET BASE (498247001).
 B3M1947	498427100	STOPPER	Used for securing the drive pinion shaft assembly and driven gear assembly when removing the drive pinion shaft assembly lock nut.

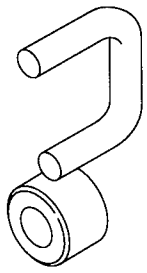
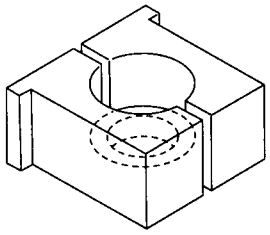
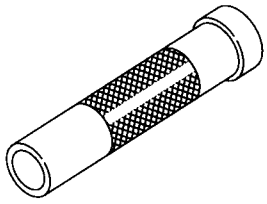
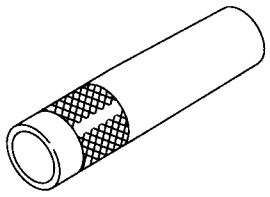
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1948	498787100	MAIN SHAFT STOPPER	Used for removing and installing transmission main shaft lock nut.
 B3M1949	498937000	TRANSMISSION HOLDER	Used for removing and installing transmission main shaft lock nut.
 B3M1950	499277100	BUSH 1-2 INSTALLER	• Used for installing 1st driven gear thrust plate and 1st-2nd driven gear bush. • Used for installing roller bearing outer races to differential case.
 B3M1951	499277200	INSTALLER	Used for press-fitting the 2nd driven gear, roller bearings, and 5th driven gear onto the driven shaft.

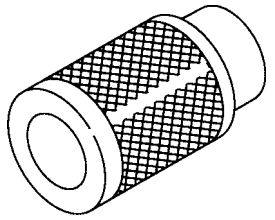
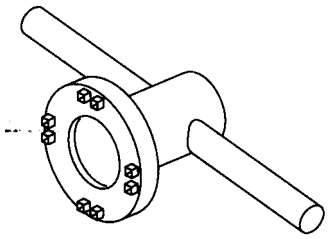
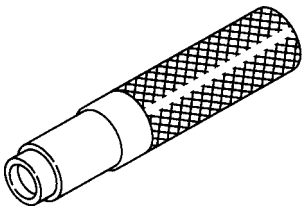
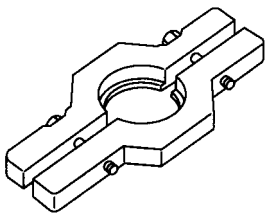
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1952	499757002	INSTALLER	• Used for installing snap ring (OUT 25), and ball bearing (25 x 26 x 17). • Used for installing bearing cone of transfer driven gear (extension core side).
 B3M1953	499787000	WRENCH ASSY	Used for removing and installing differential side retainer.
 B3M1954	499827000	PRESS	Used for installing speedometer oil seal when installing speedometer cable to transmission.
 B3M1955	499857000	5TH DRIVEN GEAR REMOVER	Used for removing 5th driven gear.

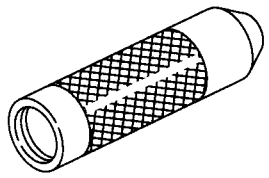
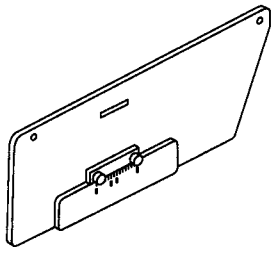
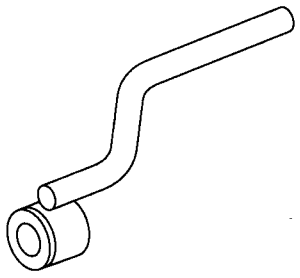
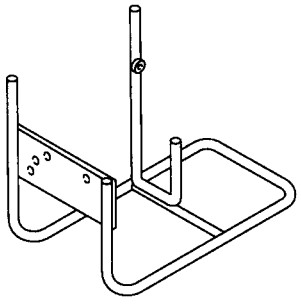
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1956	499877000	RACE 4-5 INSTALLER	• Used for installing 4th needle bearing race and ball bearing onto transmission main shaft. • Used with REMOVER (899714110).
 B3M1957	499917500	DRIVE PINION GAUGE ASSY	Used for adjusting drive pinion shim.
 B3M1958	499927100	HANDLE	Used for fitting transmission main shaft.
 B3M1959	499937100	TRANSMISSION STAND SET	Stand used for transmission disassembly and assembly.

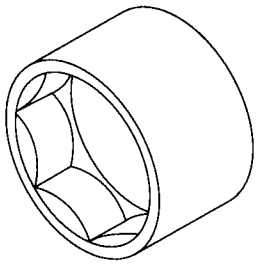
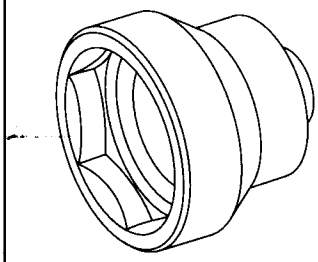
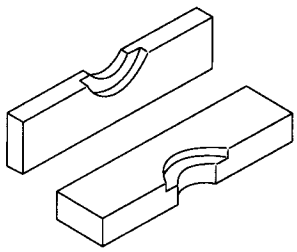
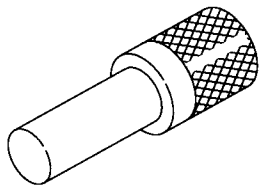
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1960	499987003	SOCKET WRENCH (35)	Used for removing and installing driven pinion lock nut and main shaft lock nut.
 B3M1961	499987300	SOCKET WRENCH (50)	Used for removing and installing driven gear assembly lock nut.
 B3M1962	899714110	REMOVER	Used for fixing transmission main shaft, drive pinion, rear drive shaft.
 B3M1963	899864100	REMOVER	Used for removing parts on transmission main shaft and drive pinion.

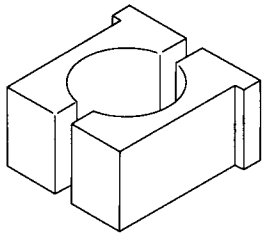
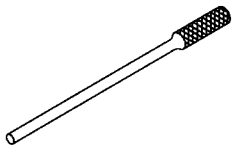
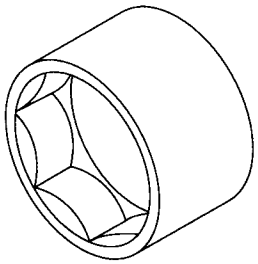
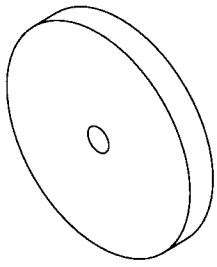
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1964	899884100	HOLDER	Used for tightening lock nut on sleeve.
 B3M1965	899904100	REMOVER	Used for removing and installing straight pin.
 B3M1966	899988608	SOCKET WRENCH (27)	Used for removing and installing drive pinion lock nut.
 B3M1967	398497701	ADAPTER	• Used for installing roller bearing onto differential case. • Used with INSTALLER (499277100).

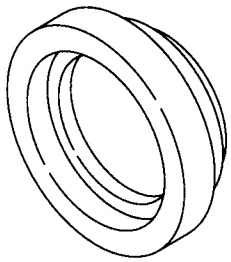
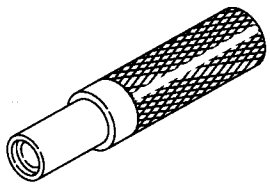
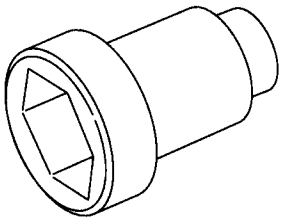
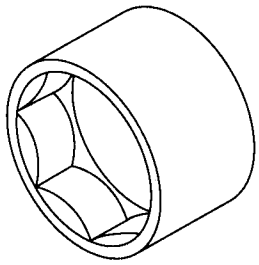
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1968	499587000	INSTALLER	Used for installing driven gears to driven shaft.
 B3M1969	899824100	PRESS	Used for installing speedometer shaft oil seal.
 B3M1970	499987100	SOCKET WRENCH (35)	Used for removing and installing drive pinion lock nut.
 B3M1971	899984103	SOCKET WRENCH (35)	Used for removing and installing drive pinion lock nut.

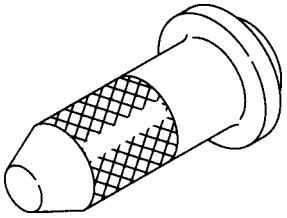
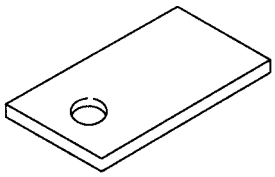
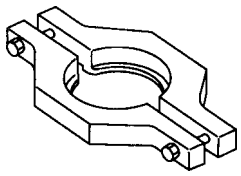
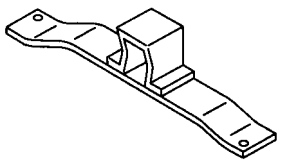
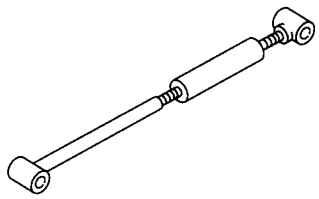
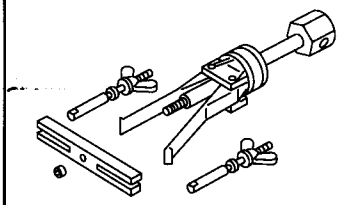
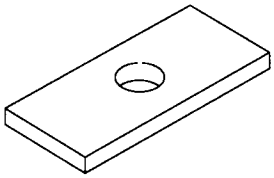
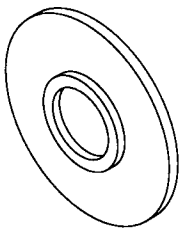
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1972	498057300	NSTALLER	Jsed for installing extension oil seal.
 B3M1973	498255400	PLATE	Used for measuring backlash.
 B3M1974	498077400	REMOVER	• Used for removing synchronizer cone of main shaft. • Used for removing 5th driven gear of drive pinion shaft.
 B3M1975	41099AA010	ENGINE SUPPORT BRACKET	Used for supporting engine.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1976	41099AA020	ENGINE SUPPORT	Used for supporting engine.
 B3M1977	398527700	PULLER ASSY	Used for removing and installing extension case roller bearing.
 B3M1978	398643600	GAUGE	Used for measuring total end play, extension end play and drive pinion height.
 B3M1905	38177700	INSTALLER	• Used for installing bearing cone of transfer driven gear (transfer case side). • Used for installing ball bearing of transfer drive gear.

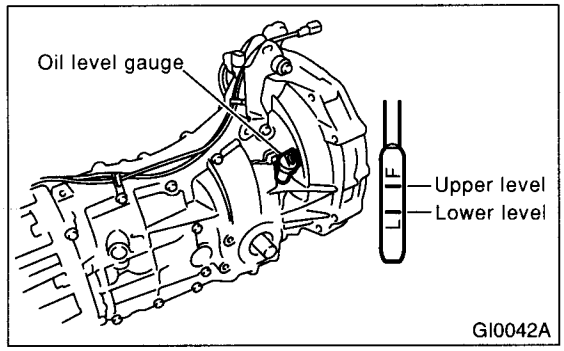
2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.

2. Transmission Gear Oil

A: INSPECTION

1) Park 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.



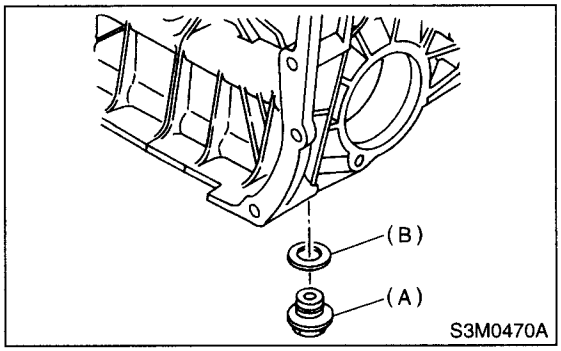
B: REPLACEMENT

1) Pull out 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.

NOTE:
Tighten the transmission gear oil drain plug after draining transmission gear oil.

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



(A) Drain plug
(B) Gasket

4) Lower the vehicle.
5) Pour the gear oil into the gauge hole.

Recommended gear oil:
Use GL-5 or equivalent.

Gear oil capacity:
3.5 ℓ (3.7 US qt, 3.1 Imp qt)

6) Check the level of the transmission gear oil.

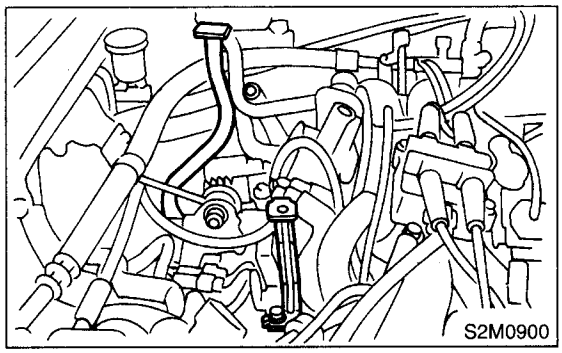
CAUTION:
When inserting the level gauge into transmission gear, align the protrusion on the side of the top part of the level gauge with the notch in the gauge hole.

NOTE:
The level should be within the specified range marked on the gauge.

3. Manual Transmission Assembly

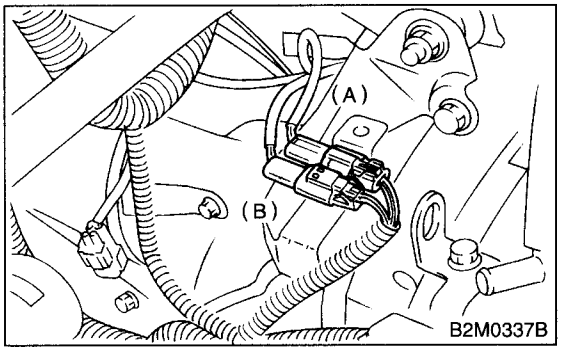
A: REMOVAL

1) Open the front hood fully, and support with stay.
2) Disconnect the battery ground terminal.
3) Remove the air intake duct and cleaner case. (Non-turbo model) <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
4) Remove the air cleaner case stay. (Non-turbo model)



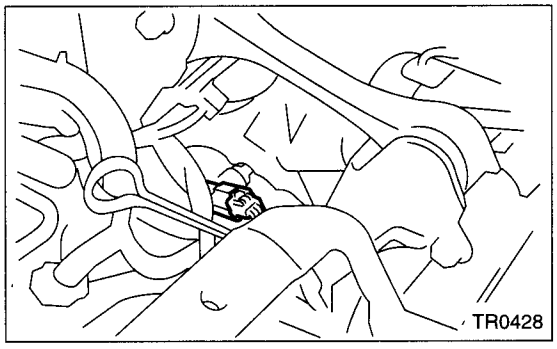
5) Remove the intercooler (Turbo model) <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>
6) Disconnect the following connectors.
   (1) Neutral position switch connector
   (2) Back-up light switch connector

- Non-turbo model

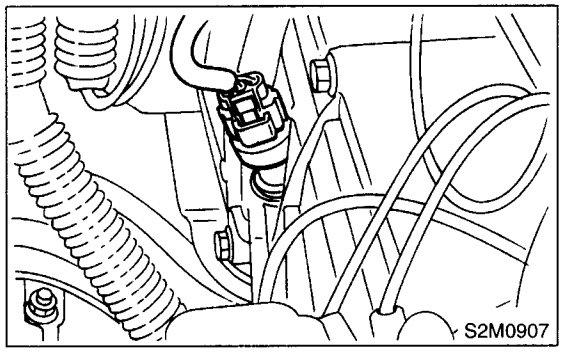


(A) Neutral switch (Brown)
(B) Back-up light switch (Gray)

- Turbo model

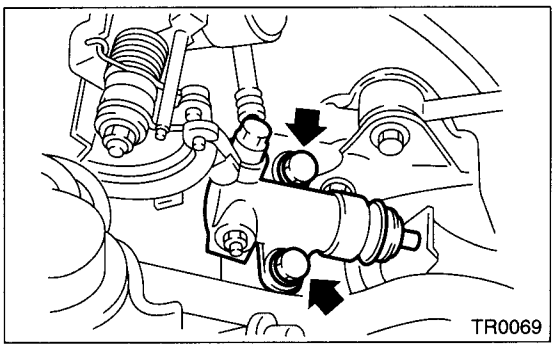


(3) Vehicle speed sensor

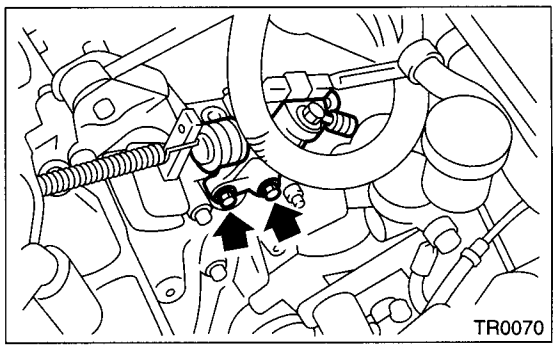


7) Remove the starter. <Ref. to SC-6, REMOVAL, Starter.>
8) Remove the operating cylinder from the transmission.

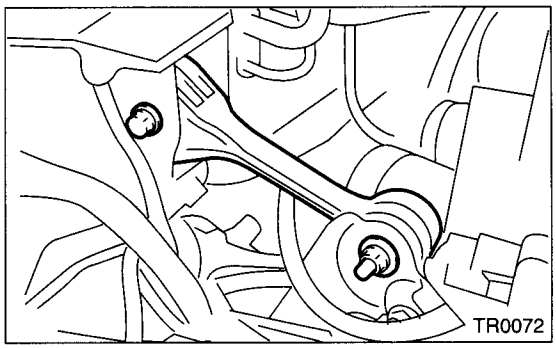
- Non-turbo model



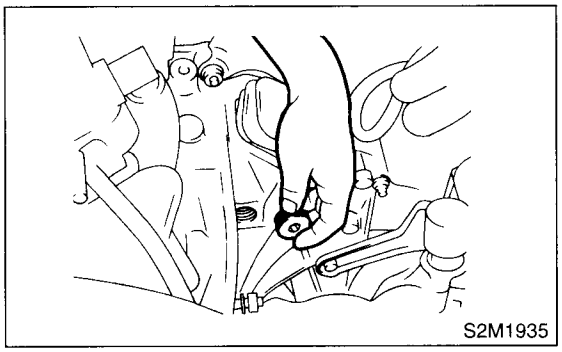
- Turbo model



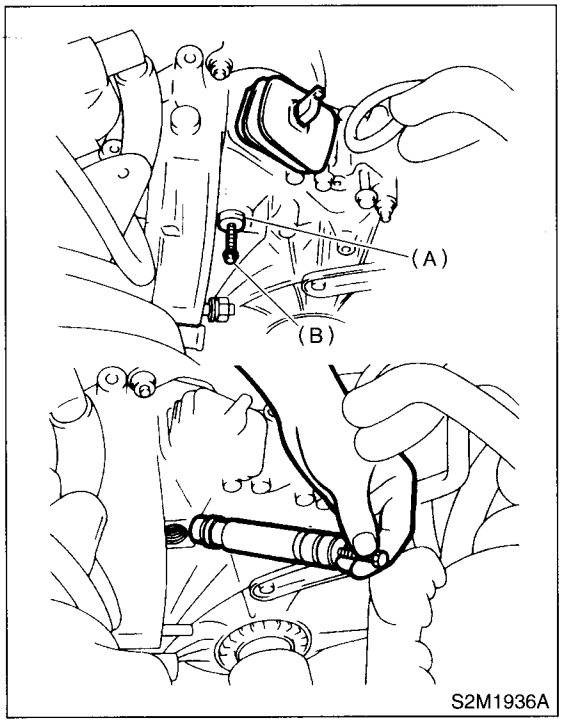
9) Remove the pitching stopper.



10) Separate the clutch release fork from the release bearing. (Turbo model)
(1) Remove the clutch operating cylinder from the transmission.
(2) Remove the plug using 10 mm hexagon wrench.


S2M1935

(3) Screw the 6 mm dia. bolt into the release fork shaft, and remove it.



S2M1936A

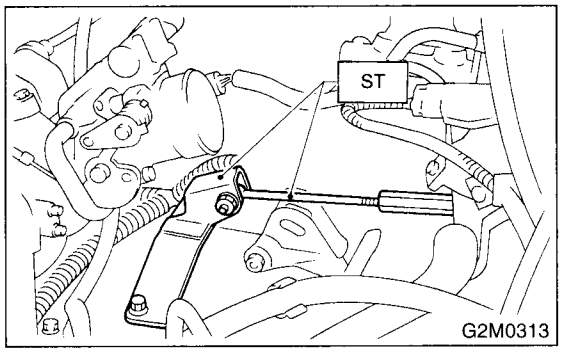
(A) Shaft
(B) Bolt

(4) Raise the release fork and unfasten the release bearing tabs to free release fork.

CAUTION:
Step (4) is required to prevent interference with engine when removing engine from transmission.

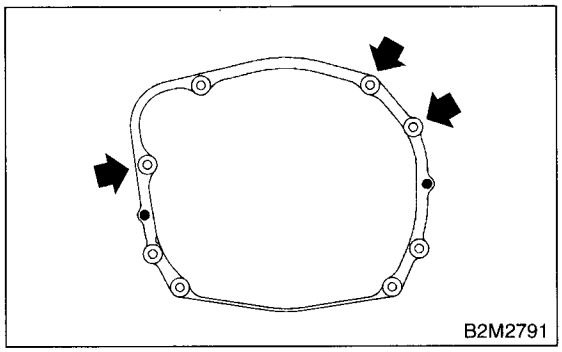
11) Set ST.

NOTE:
Also is available Part No. 927670000.
ST 41099AA020 ENGINE SUPPORT ASSY



G2M0313

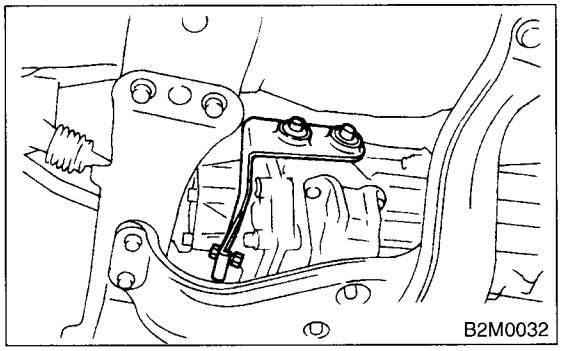
12) Remove the bolt which holds right upper side of transmission to the engine.


B2M2791

13) Remove the front and center exhaust pipes. (Non-turbo model) with OBD <Ref. to EX(SOHC)-5, REMOVAL, Front Exhaust Pipe.>
14) Remove the center exhaust pipe. (Turbo model). <Ref. to EX(DOHC TURBO)-8, REMOVAL, Center Exhaust Pipe.>
15) Remove the rear exhaust pipe and muffler.

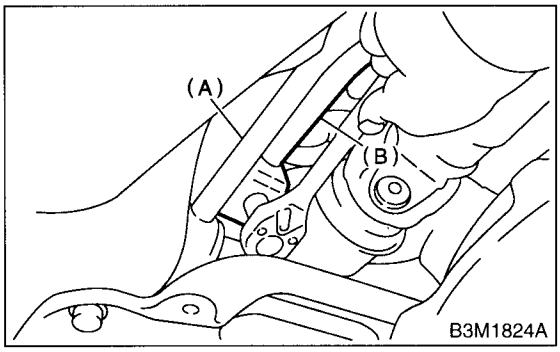
CAUTION:
When removing exhaust pipes, be careful each exhaust pipe does not drop out.

16) Remove the heat shield cover. (If equipped)
17) Remove the hanger bracket from right side of transmission.


B2M0032

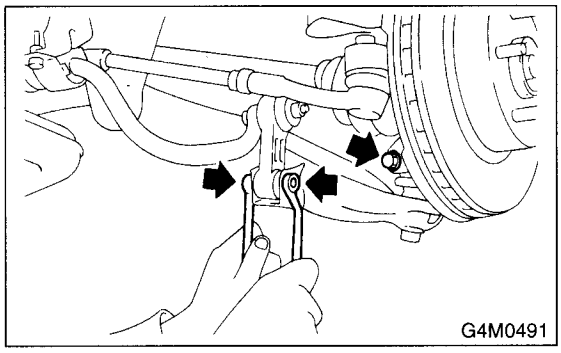
18) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>

19) Remove the gear shift rod and stay from transmission.
(1) Disconnect the stay from the transmission.
(2) Disconnect the rod from the transmission.

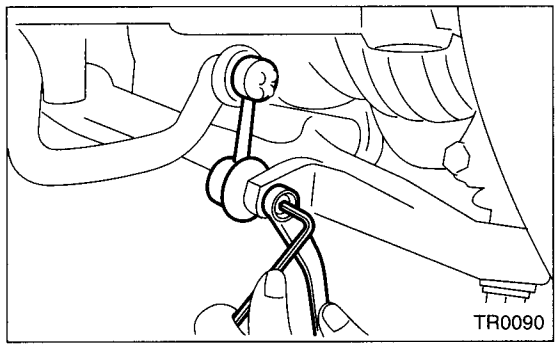


(A) Stay
(B) Rod

20) Disconnect the stabilizer link from the transverse link.
21) Remove the bolt securing ball joint of transverse link to housing.
• Except sedan turbo model

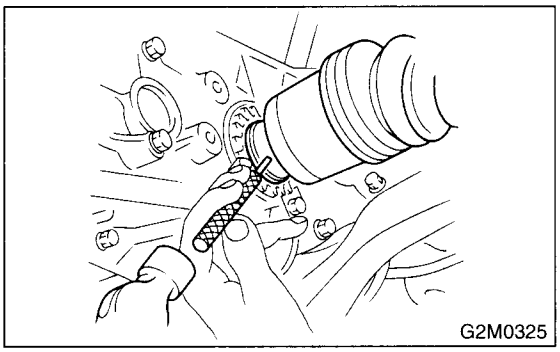


• Sedan turbo model

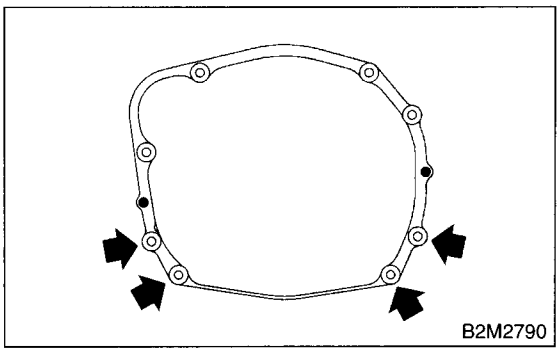


22) Remove the spring pins and separate front drive shafts from each side of the transmission.

CAUTION:
Discard removing spring pin. Replace with a new one.

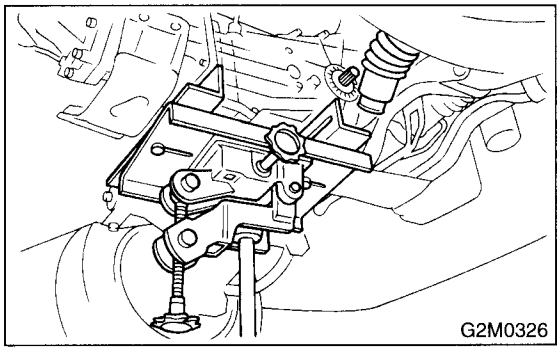


23) Remove the nuts which hold lower side of transmission to the engine.

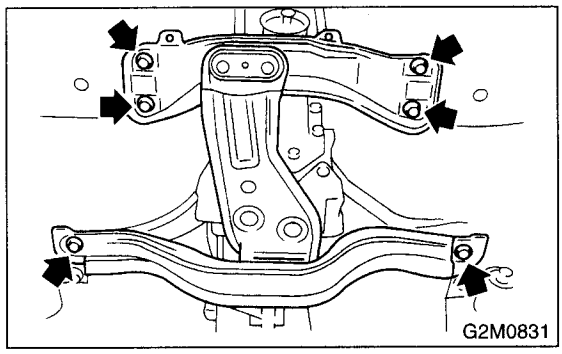


24) Place the transmission jack under transmission.

CAUTION:
Always support transmission case with a transmission jack.



25) Remove the transmission rear crossmember from the vehicle.



26) Remove the transmission.

CAUTION:
Move transmission jack toward rear until main shaft is withdrawn from clutch cover.

27) Separate the transmission assembly and rear cushion rubber.

B: INSTALLATION

1) Install the rear cushion rubber to the transmission assembly.

Tightening torque:
35 N·m (3.6 kgf-m, 26.3 ft-lb)

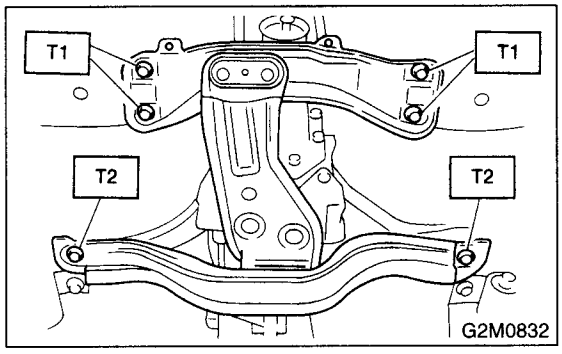
2) Install the clutch release lever and bearing onto the transmission. (Turbo model) <Ref. to CL-15, INSTALLATION, Release Bearing and Lever.>

3) Install the transmission onto the engine.
   (1) Gradually raise the transmission with transmission jack.
   (2) Engage them at splines.

CAUTION:
Be careful not to strike main shaft against clutch cover.

4) Install the transmission rear crossmember.

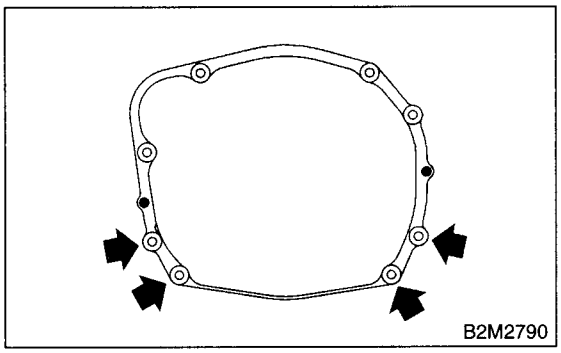
Tightening torque:
T1: 70 N·m (7.1 kgf-m, 51 ft-lb)
T2: 140 N·m (14.3 kgf-m, 103 ft-lb)



5) Take off the transmission jack.

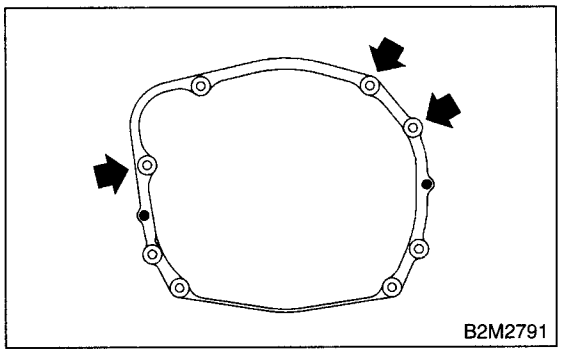
6) Tighten the nuts which hold lower side of transmission to the engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

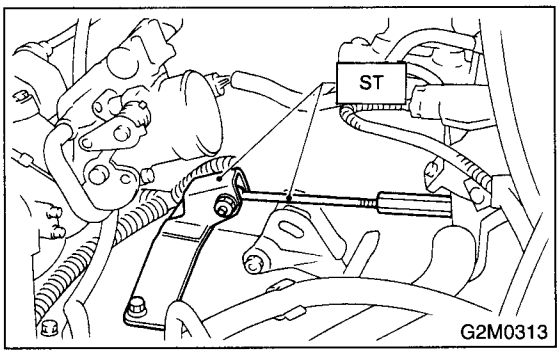


7) Connect the engine and transmission.
   (1) Install the starter.
   <Ref. to SC-7, INSTALLATION, Starter.>
   (2) Tighten the bolt which holds right upper side of transmission to the engine.

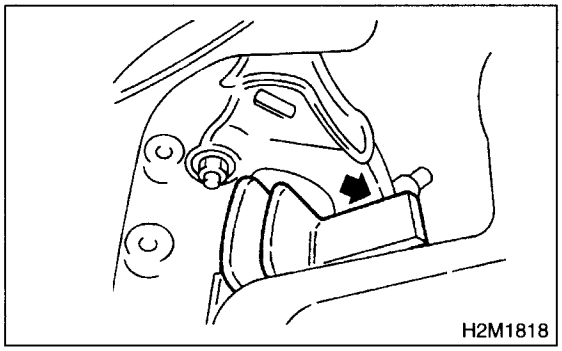
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



8) Remove ST.

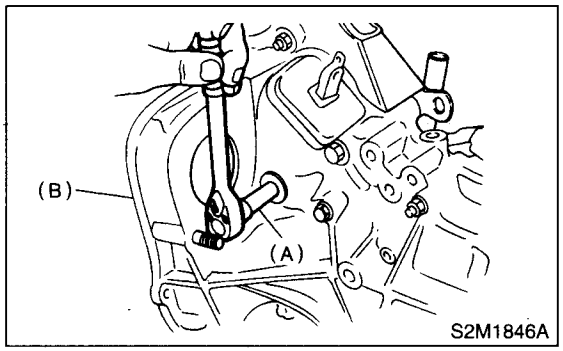


9) Push the clutch release lever to fit bearing into clutch cover.



10) Install the plug.

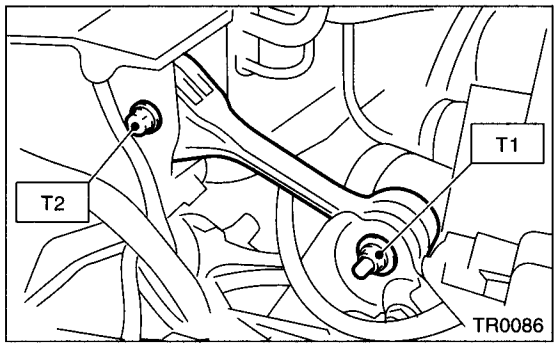
Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)



(A) Plug
(B) Transmission ASSY

11) Install the pitching stopper.

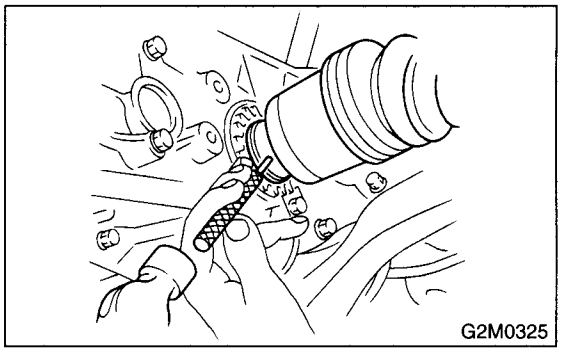
Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



12) Lift-up the vehicle.
13) Install the front drive shaft into the transmission.

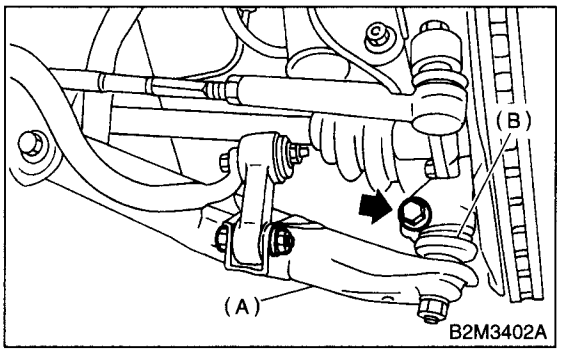
14) Drive the spring pin into the chamfered hole of drive shaft.

CAUTION:
Always use a new spring pin.



15) Install the ball joints of lower arm into knuckle arm of housing, and tighten the installing bolts.

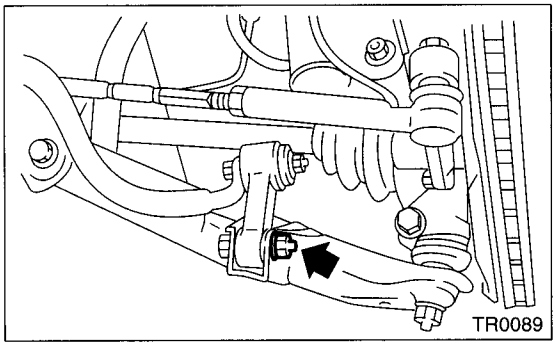
Tightening torque:
49 N·m (5.0 kgf-m, 36 ft-lb)



(A) Transverse link
(B) Ball joint

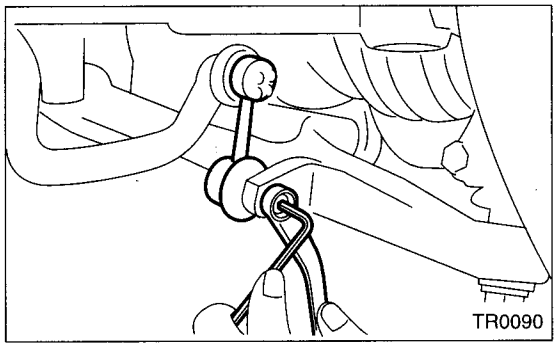
16) Install the stabilizer link from the transverse link.
- Except sedan turbo model

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)



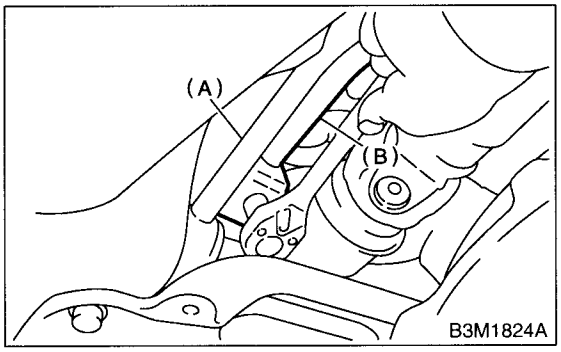
- Sedan turbo model

Tightening torque:
45 N·m (4.6 kgf-m, 33.2 ft-lb)



17) Install the gear shift rod and stay.
(1) Connect the rod to the joint.

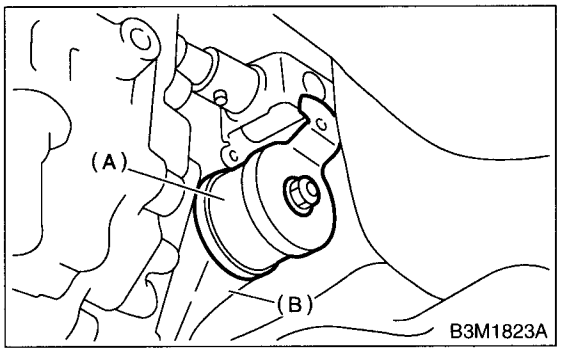
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



(A) Stay
(B) Rod

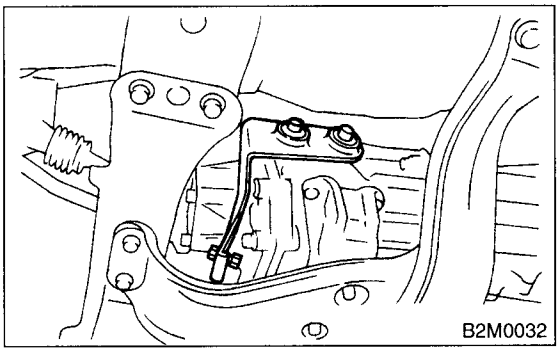
(2) Connect the stay to the transmission bracket.

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



(A) Stay
(B) Transmission bracket

18) Install the propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>
19) Install the heat shield cover. (If equipped)
20) Install the rear exhaust pipe and muffler.
21) Install the hanger bracket on the right side of transmission.

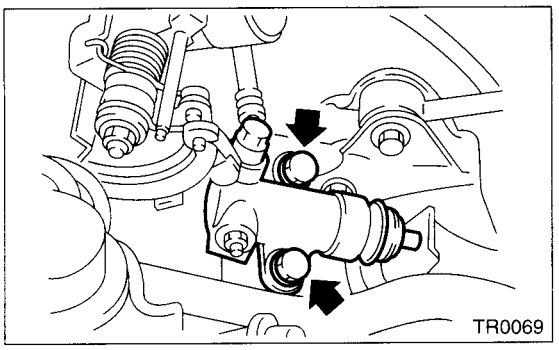


22) Install the front exhaust pipe and center exhaust pipe. (Non-turbo model)
<Ref. to EX(SOHC)-6, INSTALLATION, Front Exhaust Pipe.>
23) Install the center exhaust pipe. (Turbo model)
<Ref. to EX(DOHC TURBO)-9, INSTALLATION, Center Exhaust Pipe.>
24) Install the under cover.

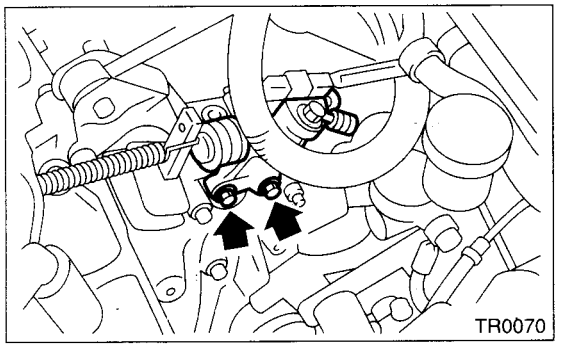
25) Install the operating cylinder.

Tightening torque:
37 N·m (3.8 kgf-m, 27.5 ft-lb)

- Non-turbo model



- Turbo model



26) Connect the following connectors.
(1) Transmission ground terminal

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

27) Install the air cleaner case stay.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)

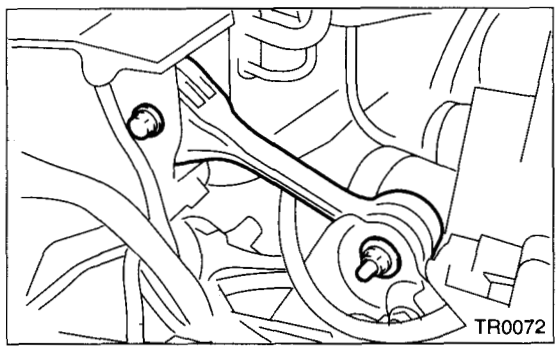
28) Install the air cleaner case and intake duct. (Non-turbo model) <Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.>
29) Install the intercooler. (Turbo model) <Ref. to IN(DOHC TURBO)-11, INSTALLATION, Intercooler.>
30) Connect the battery ground terminal.
31) Take off the vehicle from lift arms.

4. Transmission Mounting System

A: REMOVAL

1. PITCHING STOPPER

1) Disconnect the battery ground terminal.
2) Remove the air intake duct and cleaner case.
3) Remove the air intake duct (Non-turbo model). <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
4) Remove the air cleaner case (Non-turbo model). <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
5) Remove the inter cooler (Turbo model). <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>
6) Remove the pitching stopper.



2. CROSSMEMBER AND CUSHION RUBBER

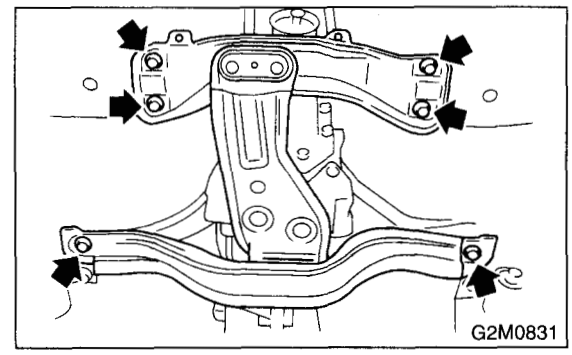
1) Disconnect the battery ground terminal.
2) Jack-up the vehicle and support it with sturdy racks.
3) Remove the front, center exhaust pipes. (Non-turbo model)
<Ref. to EX(SOHC)-5, REMOVAL, Front Exhaust Pipe.>

CAUTION:
When removing exhaust pipes, be careful each exhaust pipe does not drop out.

4) Remove the center exhaust pipe. (Turbo model)
<Ref. to EX(DOHC TURBO)-8, 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 transmission case with a transmission jack.

8) Remove the rear crossmember.



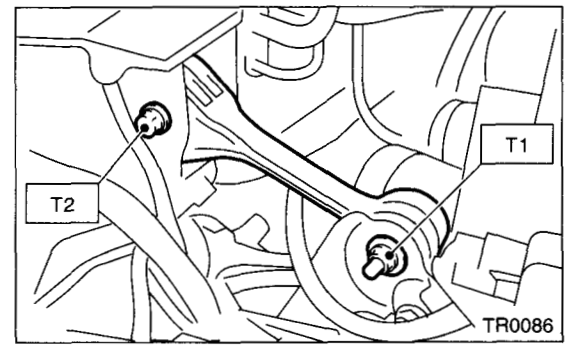
9) Remove the rear cushion rubber.

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(DOHC TURBO)-11, INSTALLATION, Intercooler.>
4) Connect the battery ground terminal.

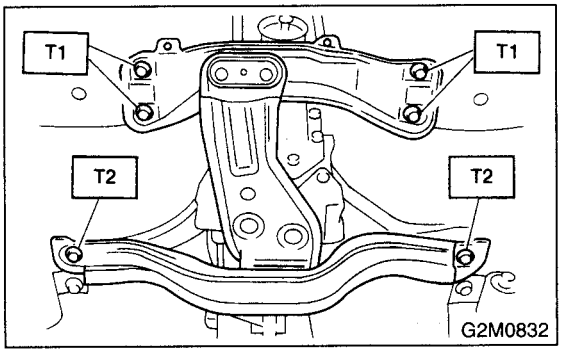
2. CROSSMEMBER AND CUSHION RUBBER

1) Install for rear cushion rubber.

Tightening torque:
35 N·m (3.6 kgf-m, 26 ft-lb)

2) Install the 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)-6, INSTALLATION, Front Exhaust Pipe.>
6) Install the center exhaust pipe. (Turbo model)
<Ref. to EX(DOHC TURBO)-9, 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

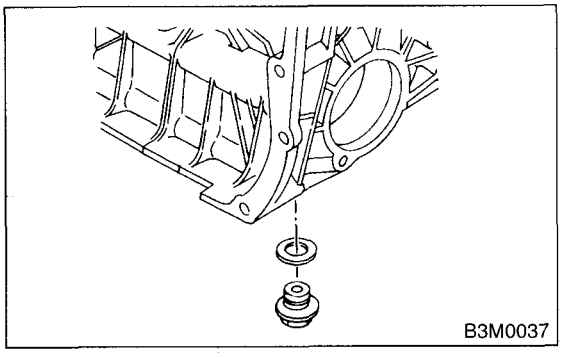
Inspect for oil leakage from the oil seal. Replace the oil seal if the lips is deformed, hardened, damaged, worn or defective if any.

B: REPLACEMENT

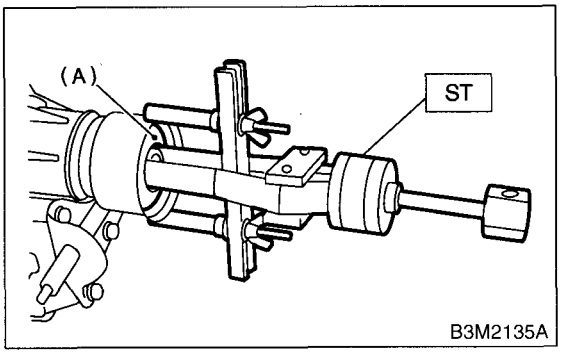
1) Clean the transmission exterior.
2) Drain the gear oil completely.

NOTE:
Tighten the drain plug after draining gear oil.

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

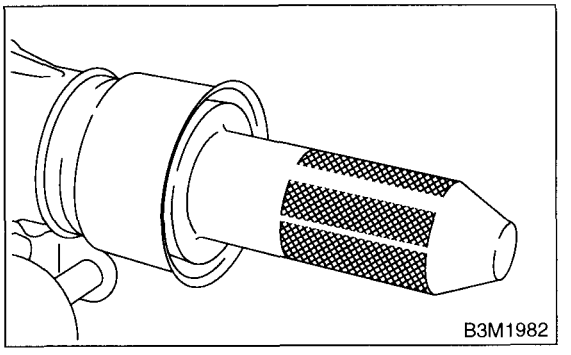


3) Remove the rear exhaust pipe and muffler.
4) Remove the heat shield cover. (If equipped)
5) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
6) Using ST, remove the oil seal.
ST 398527700 PULLER ASSY



(A) Oil seal

7) Using ST, install the oil seal.
ST 498057300 INSTALLER



8) Install the propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>
9) Install the heat shield cover. (If equipped)
10) Install the rear exhaust pipe and muffler.
11) Pour the gear oil and check the oil level. <Ref. to MT-26, Transmission Gear Oil.>

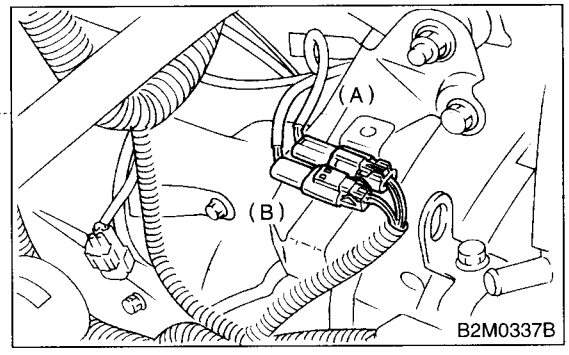
6. Switches and Harness

A: REMOVAL

1. BACK-UP LIGHT AND NEUTRAL POSITION SWITCH

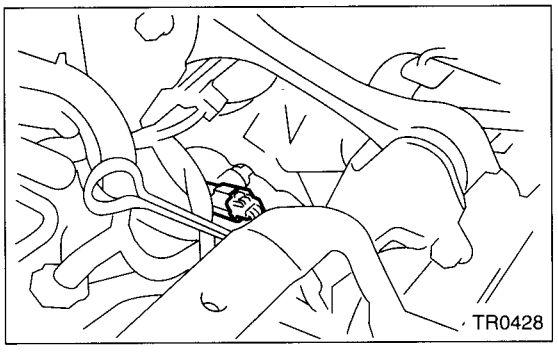
1) Disconnect the connector battery ground terminal.
2) Remove the air intake duct and cleaner case. (Non-turbo model) <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
3) Remove the intercooler (Turbo model). <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>
4) Disconnect the connector back-up light switch and neutral position switch.

- Non-turbo model

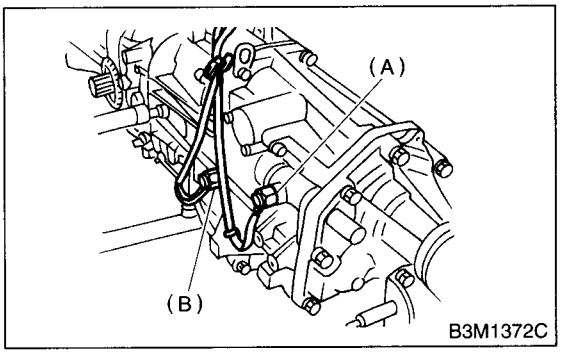


(A) Neutral switch (Brown)
(B) Back-up light switch (Gray)

- Turbo model



5) Lift-up the vehicle.
6) Remove the back-up light switch and neutral position switch with harness.



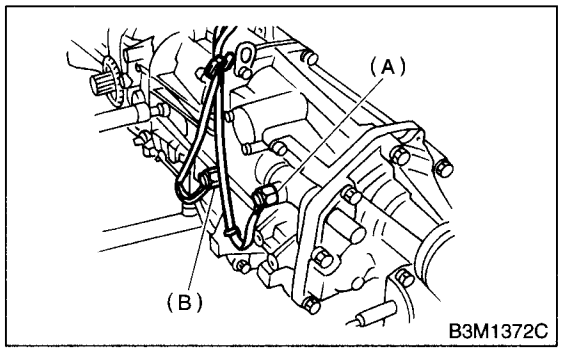
(A) Neutral switch (Brown connector)
(B) Back-up light switch (Gray connector)

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:
24.5 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(DOHC TURBO)-11, INSTALLATION, Intercooler.>
5) Connect the battery ground terminal.

C: INSPECTION

1. BACK-UP LIGHT SWITCH

Inspect the back-up light switch. <Ref. to LI-6, INSPECTION, Back-up Light System.>

2. NEUTRAL POSITION SWITCH

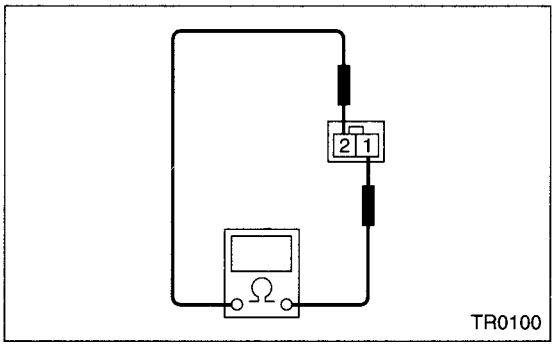
1) Turn the ignition switch to OFF.
2) Disconnect the connector neutral position switch.
3) Measure the resistance between neutral position switch terminal.
Non-turbo model

Gear shift position	Terminal No.	Specified resistance
Neutral position	1 and 2	Less than 1Ω
Other positions		More than 1MΩ

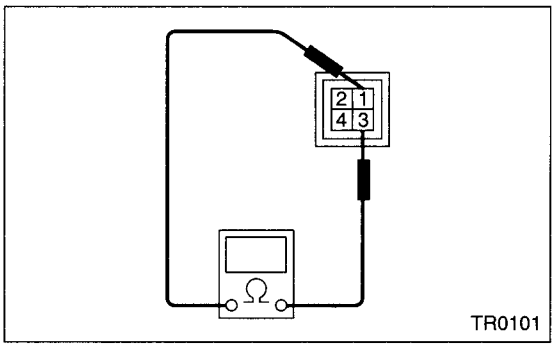
Turbo model

Gear shift position	Terminal No.	Specified resistance
Neutral position	1 and 3	Less than 1Ω
Other positions		More than 1MΩ

- Non-turbo model



- Turbo model

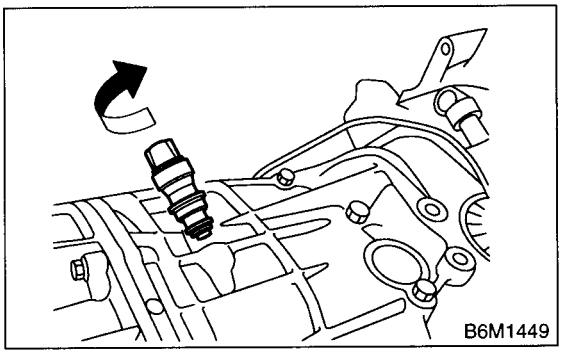


4) Replace defective parts.

7. Vehicle Speed Sensor

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Lift-up the vehicle.
3) Remove the front and center exhaust pipes.
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 the 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 and center exhaust pipes.
5) Lower the vehicle.
6) Connect the battery ground terminal.

C: INSPECTION

Inspect the vehicle speed sensor.
Non-Turbo model
<Ref. to EN(SOHC)-238, DTC P0500 — VEHICLE SPEED SENSOR MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
Turbo model
<Ref. to EN(DOHC TURBO)-246, DTC P0500 — VEHICLE SPEED SENSOR MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

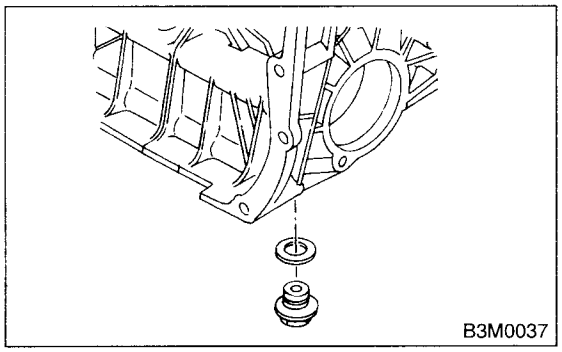
8. Preparation for Overhaul

A: PROCEDURE

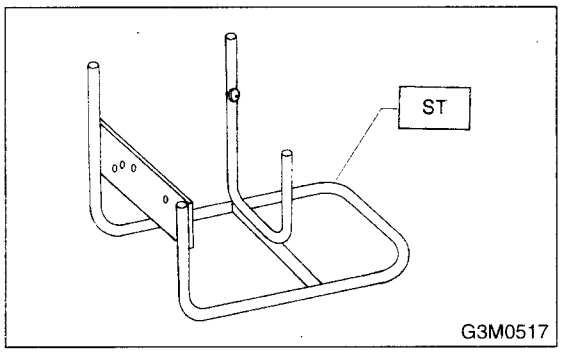
1) Clean the oil, grease, dirt and dust from transmission.
2) Remove the drain plug to drain oil. After draining, retighten it as before.

CAUTION:
Replace gasket with a new one.

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



3) Attach the transmission to ST.
ST 499937100 TRANSMISSION STAND

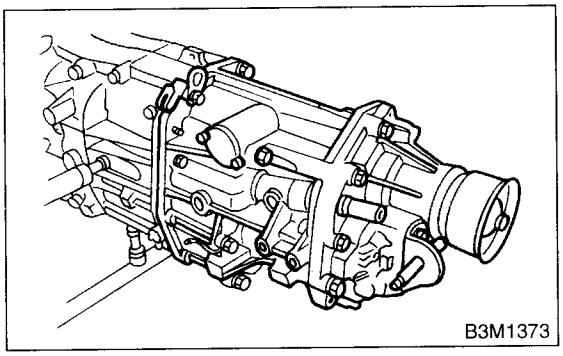


4) Rotating parts should be coated with oil prior to assembly.
5) All disassembled parts, if to be reused, should be reinstalled in the original positions and directions.
6) Gaskets, lock washers and lock nut must be replaced with new ones.
7) Liquid gasket should be used where specified to prevent leakage.

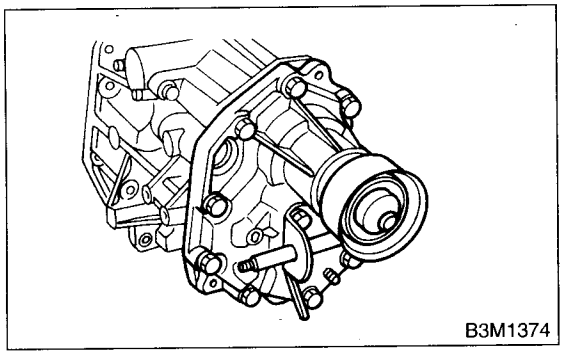
9. Transfer Case and Extension Case Assembly

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to MT-37, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly.


B3M1373

4) Remove the shifter arm.
5) Remove the extension case assembly.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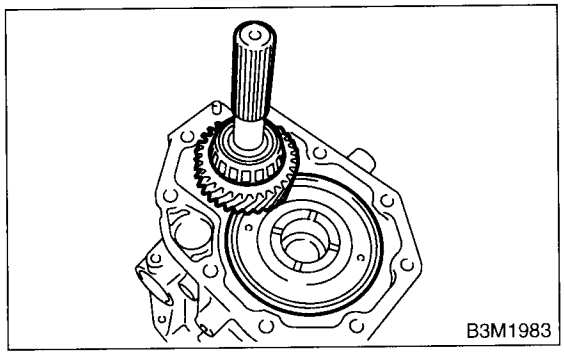
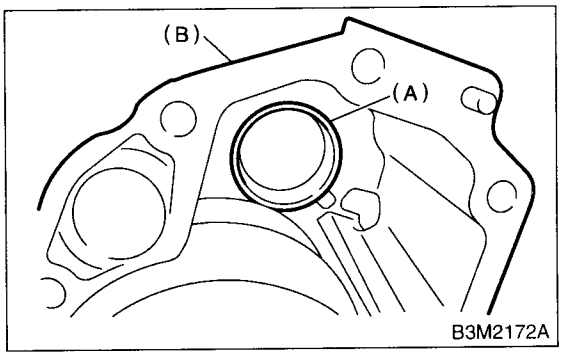
B: INSTALLATION

1) Install the center differential and transfer driven gear into transfer case.


B3M1983

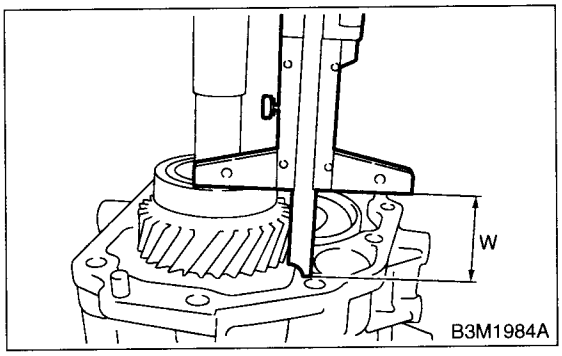
2) Remove the bearing cone from the extension case assembly, and install to taper roller bearing of the transfer driven gear.



B3M2172A

(A) Bearing cone (Extension case)
(B) Extension case

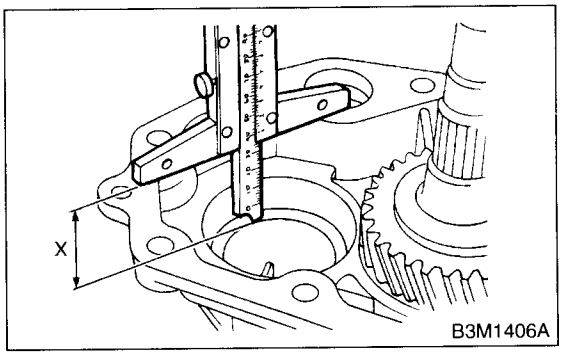
3) While pressing the bearing cone horizontally, turn the driven shaft ten rotations.
4) Measure the height "W" between transfer case and taper roller bearing on the transfer driven gear.



B3M1984A

5) Measure the depth "X".

NOTE:
Measure with bearing cone and thrust washer removed.



B3M1406A

6) Calculate space "t" using the following equation:
t = X − W + 0.2 to 0.3 mm (0.008 to 0.012 in)

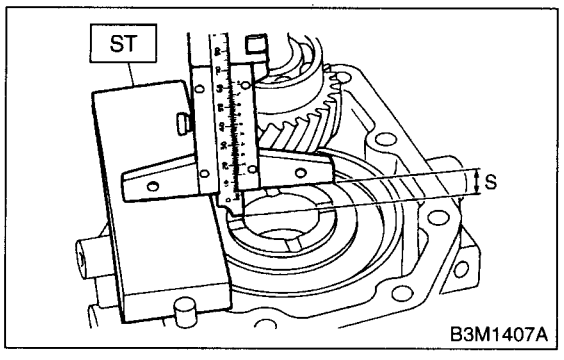
7) Select the nearest washer in the following table:

Standard clearance between thrust washer and taper roller bearing:
0.2 — 0.3 mm T (0.008 — 0.012 in T)

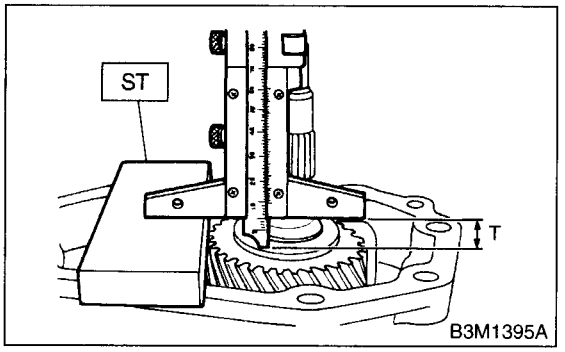
NOTE:
T: Tight

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) Measure the depth "S" between transfer case and center differential.
ST 398643600 GAUGE



10) Measure the depth "T" between extension case and transfer drive gear.
ST 398643600 GAUGE



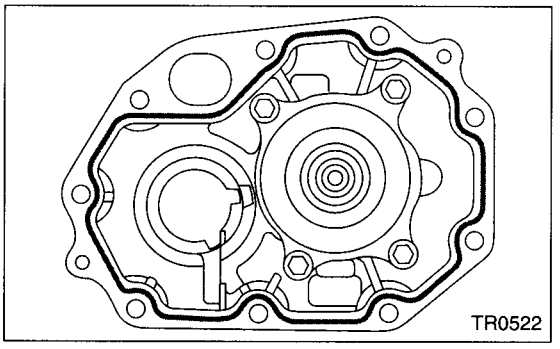
11) Calculate the space "U" using the following equation: U = S – T
12) Select the suitable washer in the following table:

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)

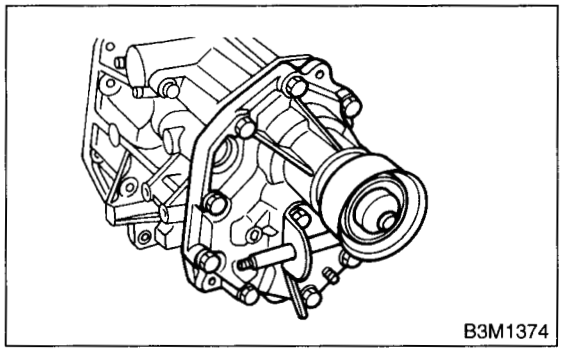
13) Fit the thrust washer on center differential.
14) Install the bearing cone into extention case.
15) Apply proper amount of liquid gasket to the transfer case mating surace.

Liquid gasket:
THREE BOND 1215B

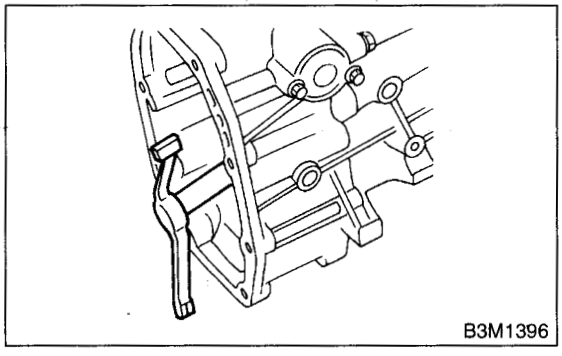


16) Install the extension assembly into the transfer case.

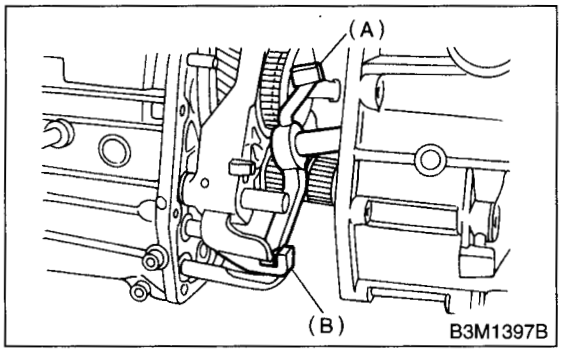
Tightening torque:
40N·m (4.1 kgf-m, 29.7 ft-lb)


B3M1374

17) Install the shifter arm to the transfer case.


B3M1396

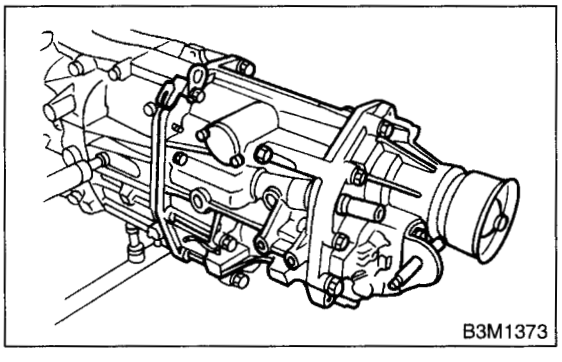
18) Hang the shifter arm on the 3rd-4th fork rod.



B3M1397B

19) Install the transfer case with extension case assembly to the transmission case.

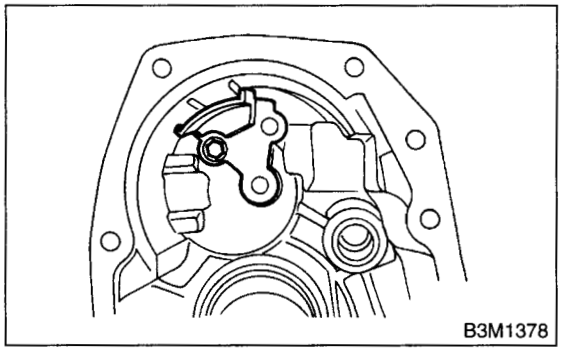
Tightening torque:
25N·m (2.5 kgf-m, 18.1 ft-lb)


B3M1373

C: DISASSEMBLY

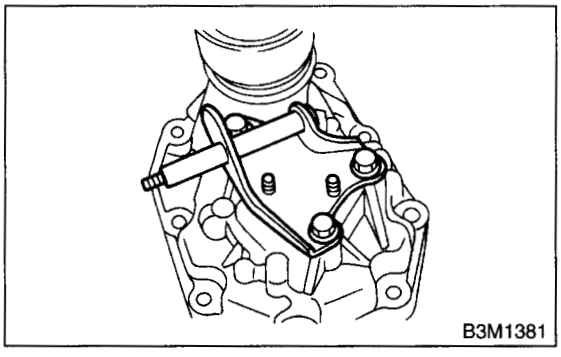
1. TRANSFER CASE

1) Remove the reverse check assembly. <Ref. to MT-50, REMOVAL, Reverse Check Sleeve.>
2) Remove the oil guide.


B3M1378

2. EXTENSION CASE

1) Remove the transfer drive gear assembly. <Ref. to MT-45, REMOVAL, Transfer Drive Gear.>
2) Remove the shift bracket.


B3M1381

3) Remove the oil seal from the extension case. <Ref. to MT-36, OIL SEAL, .>

D: ASSEMBLY

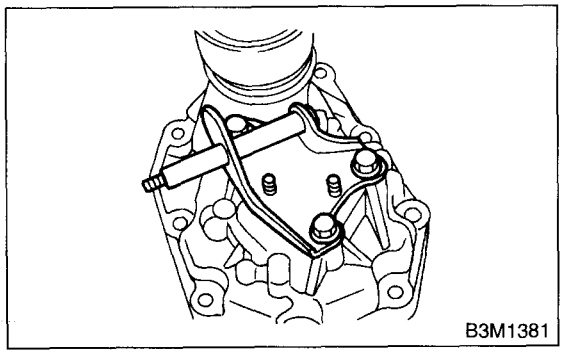
1. EXTENSION CASE

1) Using ST, install the oil seal to the extension case. <Ref. to MT-36, Oil Seal.>

CAUTION:
Use new oil seal.

2) Install the shift bracket to the extension case.

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

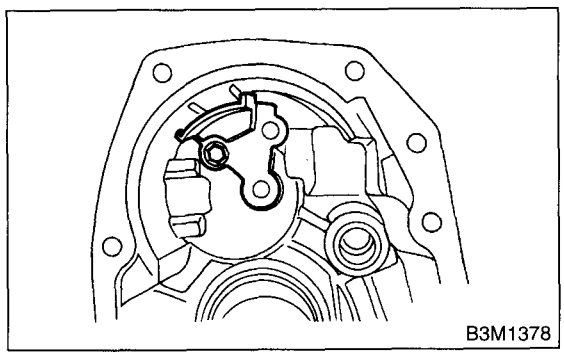


3) Install the transfer drive gear to the extension case. <Ref. to MT-45, INSTALLATION, Transfer Drive Gear.>

2. TRANSFER CASE

1) Install the oil guide to the transfer case.

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

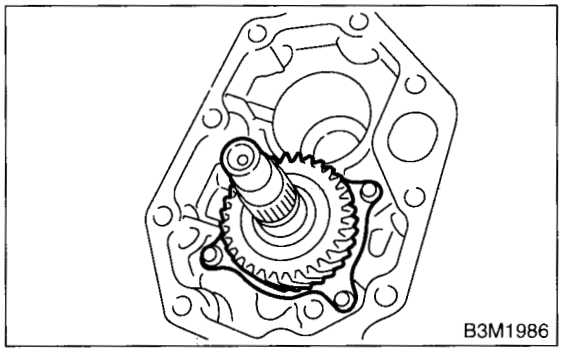


2) Install the reverse check sleeve assembly to the transfer case. <Ref. to MT-50, INSTALLATION, Reverse Check Sleeve.>

10.Transfer Drive Gear

A: REMOVAL

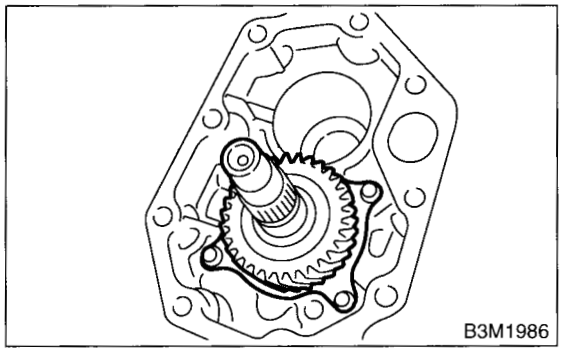
1) Remove the manual transmission assembly from vehicle. <Ref. to MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to MT-37, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly. <Ref. to MT-41, REMOVAL, 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.

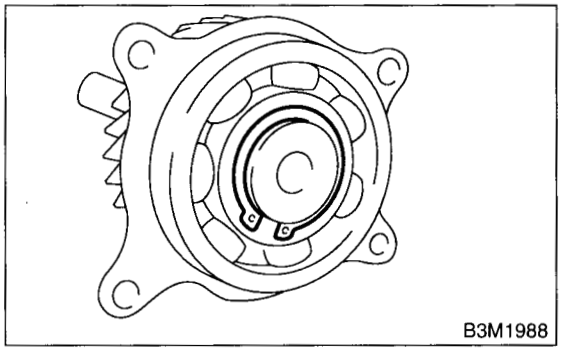
Tightening torque:
26 N·m (2.7 kgf-m, 20 ft-lb)



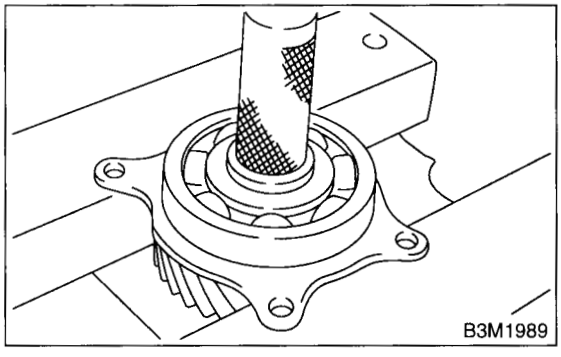
2) Install the transfer driven gear.
3) Install the extension case assembly.
4) Install the transfer case and extension case assembly. <Ref. to MT-41, INSTALLATION, Transfer Case and Extension Case Assembly.>
5) Install the back-up light switch and neutral position switch. <Ref. to MT-38, INSTALLATION, Switches and Harness.>
6) Install the manual transmission assembly from vehicle. <Ref. to MT-30, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

1) Remove the snap ring.



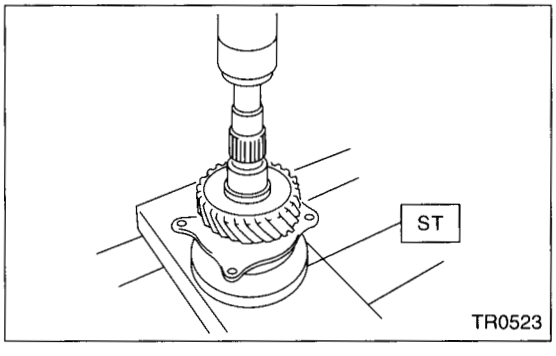
2) Remove the ball bearing.



D: ASSEMBLY

1) Set the ST applying to inner race of bearing and instal to drive shaft.
ST 398177700 INSTALLER

CAUTION:
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) Inspect the clearance between snap ring and inner race of ball bearing. <Ref. to MT-46, INSPECTION, Transfer Drive Gear.>

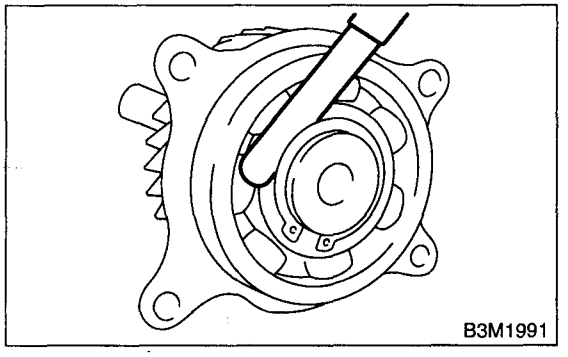
E: INSPECTION

1) Bearings
Replace 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 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)



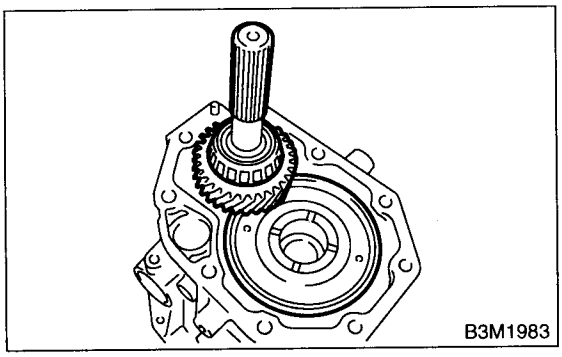
If the measurement is not within the specification, select suitable snap ring.

Snap ring (Outer-30)	
Part No.	Thickness mm (in)
805030041	1.53 (0.0602)
805030042	1.65 (0.0650)
805030043	1.77 (0.0697)

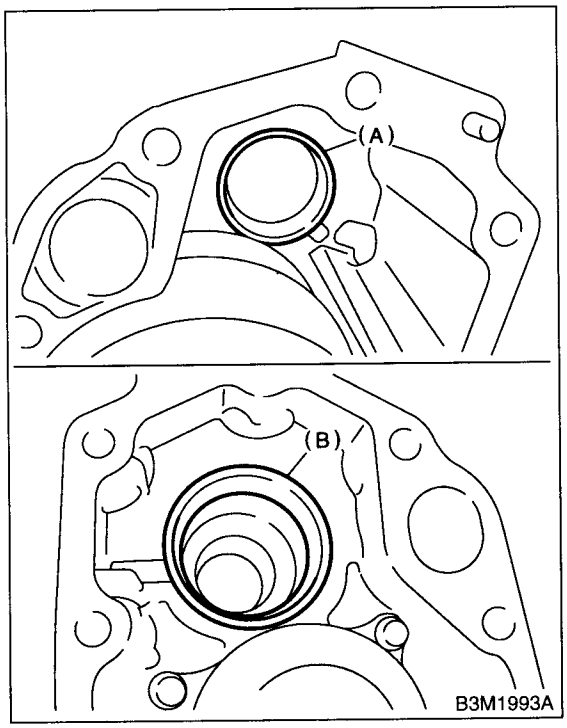
11.Transfer Driven Gear

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to MT-37, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly. <Ref. to MT-41, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the extension case assembly.
5) Remove the transfer driven gear.



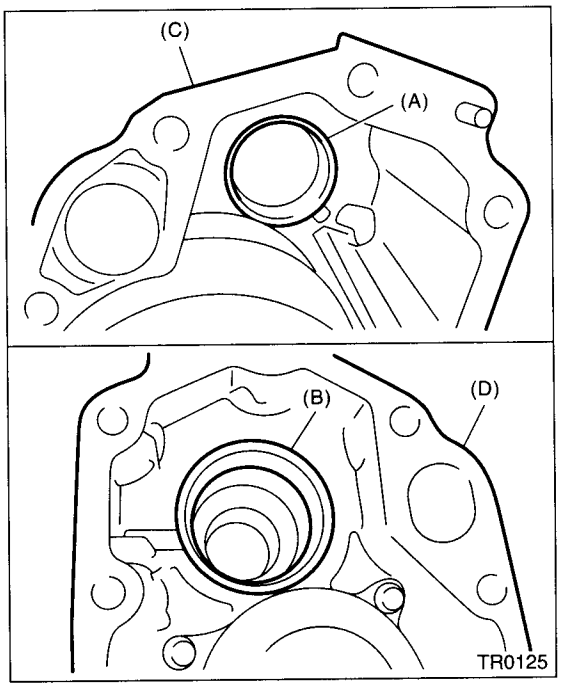
6) Remove the bearing cup from extension case and transfer case.



(A) Bearing cup (transfer case)
(B) Bearing cup (extension case)

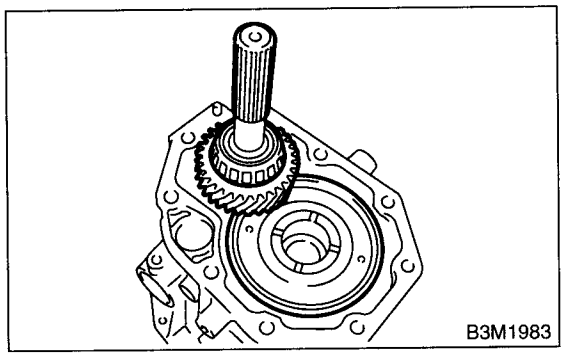
B: INSTALLATION

1) Install the bearing cup to extension case and transfer case.



(A) Bearing cup
(B) Bearing cup
(C) Transfer case
(D) Extension case

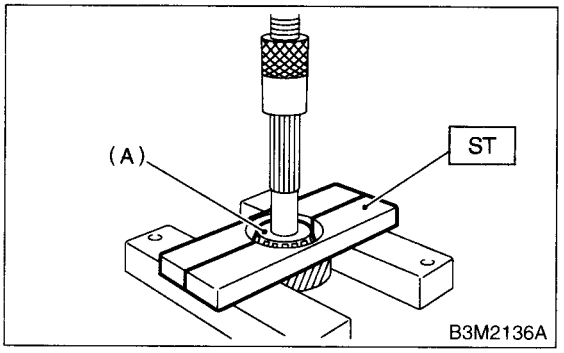
2) Install the transfer driven gear.



3) Install the transfer case and extension case assembly.<Ref. to MT-41, INSTALLATION, Transfer Case and Extension Case Assembly.>
4) Install the back-up light switch and neutral position switch. <Ref. to MT-38, INSTALLATION, Switches and Harness.>
5) Install the manual transmission assembly to vehicle. <Ref. to MT-30, INSTALLATION, Manual Transmission Assembly.>

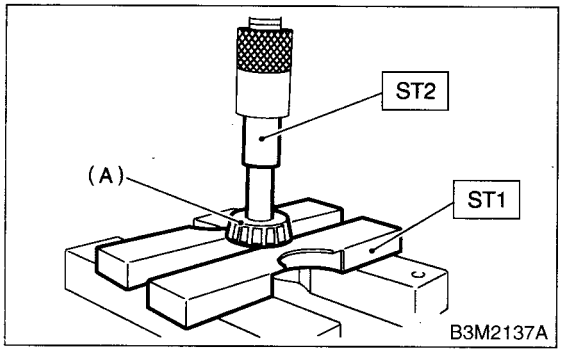
C: DISASSEMBLY

1) Using ST, remove the roller bearing (extension case side).
ST 498077000 REMOVER



(A) Roller bearing

2) Using ST1 and ST2, remove the roller bearing (transfer case side).
ST1 498077000 REMOVER
ST2 899864100 REMOVER

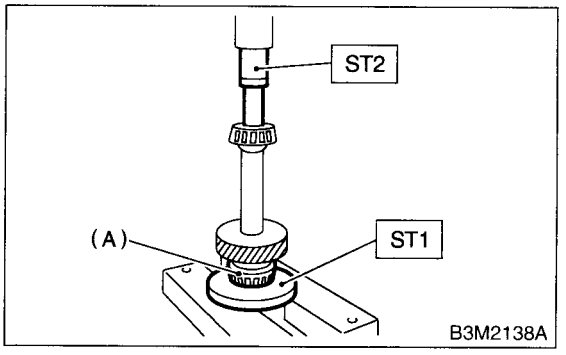


(A) Roller bearing

D: ASSEMBLY

1) Using ST, install the roller bearing (extension case side).
ST1 398177700 INSTALLER
ST2 899864100 REMOVER

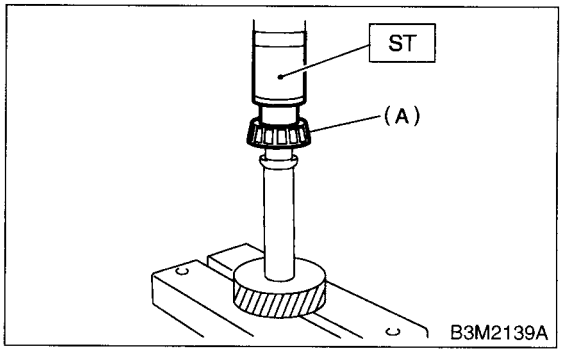
CAUTION:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton)



(A) Roller bearing

2) Using ST, install the roller bearing (transfer case side).
ST 499757002 INSTALLER

CAUTION:
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 drive gear in the following cases:
- If their tooth surfaces and shaft are excessively broken or damaged.

12.Center Differential

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly.<Ref. to MT-41, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the extension case assembly. <Ref. to MT-41, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the transfer driven gear. <Ref. to MT-47, 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-47, INSTALLATION, Transfer Driven Gear.>
3) Install the extension case assembly. <Ref. to MT-41, INSTALLATION, Transfer Case and Extension Case Assembly.>
4) Install the transfer case with extension case assembly. <Ref. to MT-41, REMOVAL, Transfer Case and Extension Case Assembly.>
5) Install the back-up light switch and neutral position switch. <Ref. to MT-37, REMOVAL, Switches and Harness.>
6) Install the manual transmission assembly to vehicle. <Ref. to MT-30, INSTALLATION, Manual Transmission Assembly.>

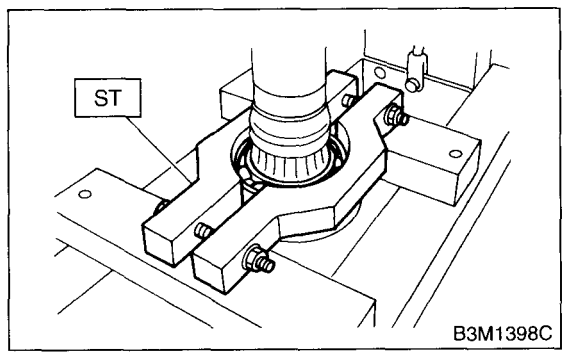
C: DISASSEMBLY

NOTE:
Do not disassemble center differential because it is a non-disassemble part.

Remove ball bearing using ST.

CAUTION:
Do not reuse ball bearing.

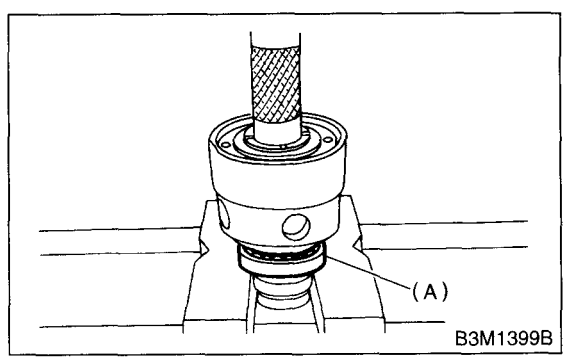
ST 498077300 CENTER DIFFERENTIAL BEARING REMOVER



D: ASSEMBLY

Install the ball bearing to center differential assembly.

CAUTION:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).



(A) Ball bearing

E: INSPECTION

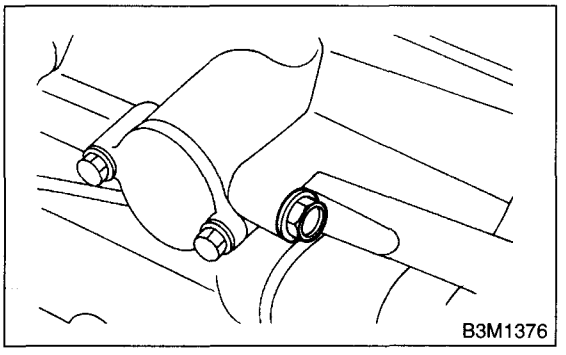
1) Bearings
Replace the bearings in the following cases:
- Broken or rusty bearings
- Worn or damaged
- Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.
- Bearings having other defects

2) Center differential
Replace the center differential assembly in the following case:
- Worn or damaged

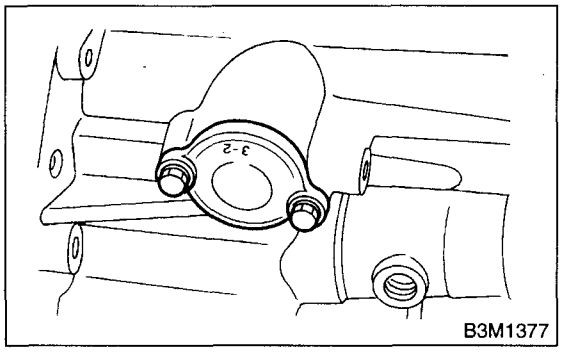
13.Reverse Check Sleeve

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to MT-41, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the shifter arm.
4) Remove the plug, spring washer and reverse check ball.


B3M1376

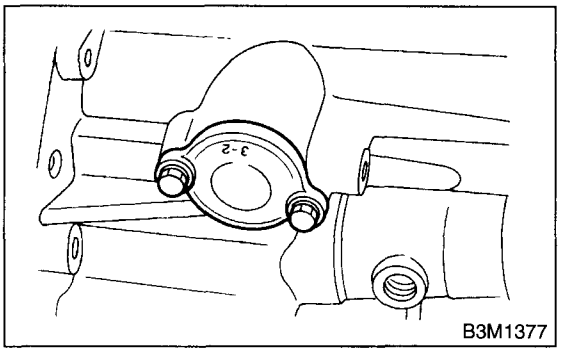
5) Remove the reverse check sleeve.


B3M1377

B: INSTALLATION

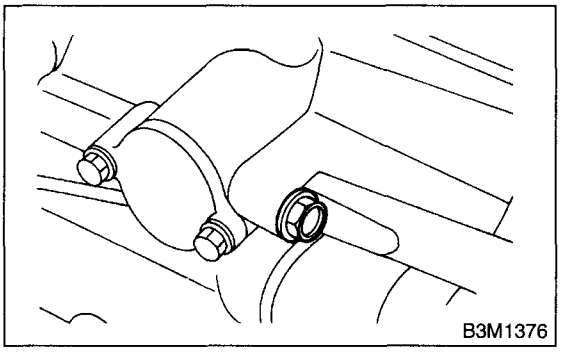
1) Install the reverse check sleeve.

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


B3M1377

2) Install the ball, spring, washer and plug to transfer case.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)

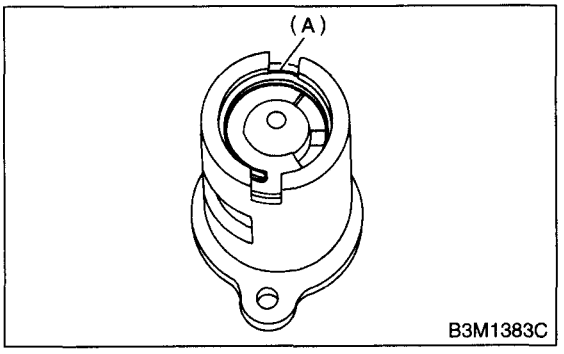

B3M1376

3) Install the shifter arm to transfer case assembly.
4) Install the transfer case with extension case assembly. <Ref. to MT-41, INSTALLATION, Transfer Case and Extension Case Assembly.>
5) Install the manual transmission assembly to vehicle. <Ref. to MT-30, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

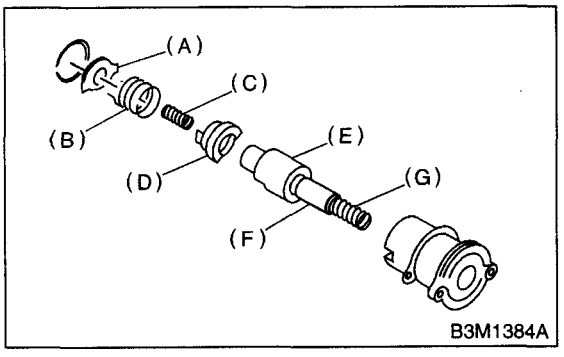
1) Cover the reverse check sleeve with a rag, and remove snap ring using a screwdriver.

NOTE:
Replace the snap ring with a new one if deformed or weakened.



(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)

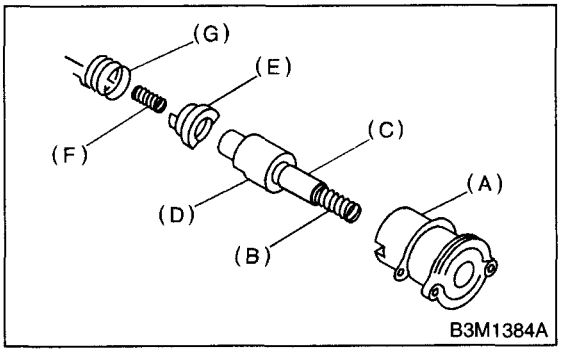
3) Remove O-ring.

NOTE:
- Reverse check sleeve assembly uses an O-ring which should not be scratched.
- Be careful not to break 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.

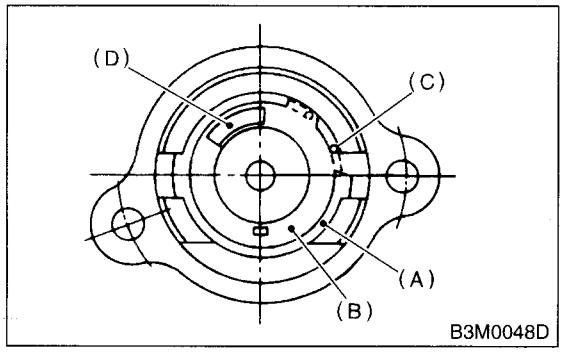


(A) Reverse check spring
(B) Reverse check cam
(C) Return spring (5th-Rev)
(D) Reverse accent shaft
(E) Return spring cap
(F) Return spring (1st-2nd)
(G) Reverse check sleeve

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 cam held in that position, install plate onto reverse check sleeve and hold with snap ring.
5) Position 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 cam by hand for smooth rotation.
• Move cam and shaft all the way toward plate and release.
If the cam does not return properly, replace reverse check spring; if the shaft does not, check for scratches on the inner surface of sleeve. If the sleeve is in good order, replace 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-52, 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 the 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 bolts holding reverse check sleeve assembly to the case, move sleeve assembly outward, and place adjustment shim (0 to 1 ea.) between sleeve assembly and case to adjust the clearance.

CAUTION:
Be careful not to break O-ring when placing shim(s).

NOTE:
• When the shim is removed, the neutral position will move closer to reverse; when the shim is added, the neutral position will move closer to 1st gear.
• If the shims alone cannot adjust the clearance, replace the reverse accent shaft and re-adjust.

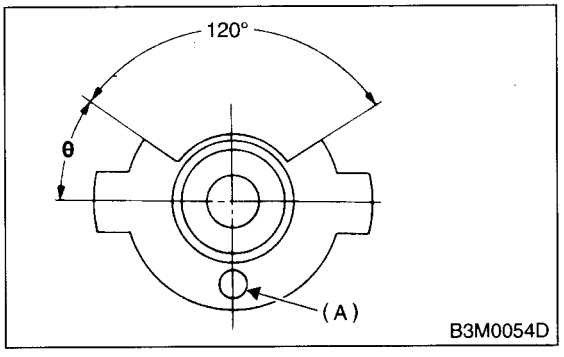
Adjustment shim	
Part No.	Thickness mm (in)
32190AA000	0.15 (0.0059)
32190AA010	0.30 (0.0118)

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 the reverse position. If the arm does not return properly, replace reverse check plate.

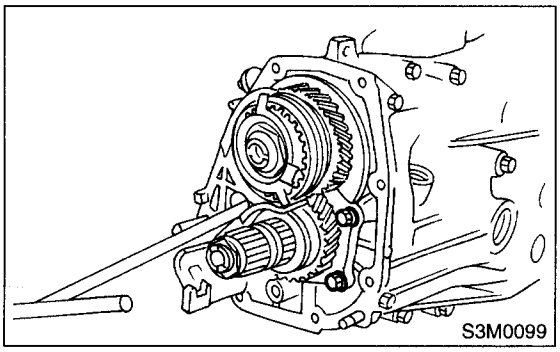
Reverse check plate			
Part No.	(A): No.	Angle θ	Remarks
32189AA000	0	28°	Arm stops closer to 5th gear.
32189AA010	1	31°	Arm stops closer to 5th gear.
32189AA020	2	34°	Arm stops in the center.
32189AA030	3	37°	Arm stops closer to reverse gear.
32189AA040	4	40°	Arm stops closer to reverse gear.



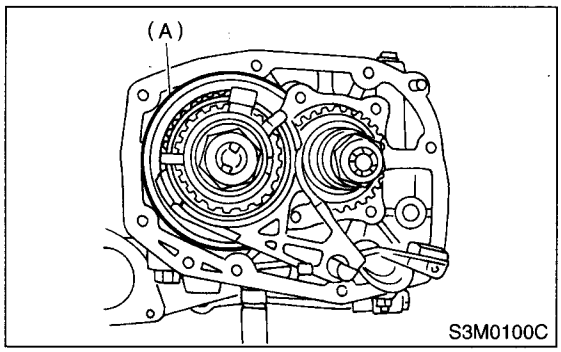
14.Transmission Case

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the clutch release lever. <Ref. to CL-15, REMOVAL, Release Bearing and Lever.>
3) Remove the transfer case with extension case assembly. <Ref. to MT-41, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the bearing mounting bolts.


S3M0099

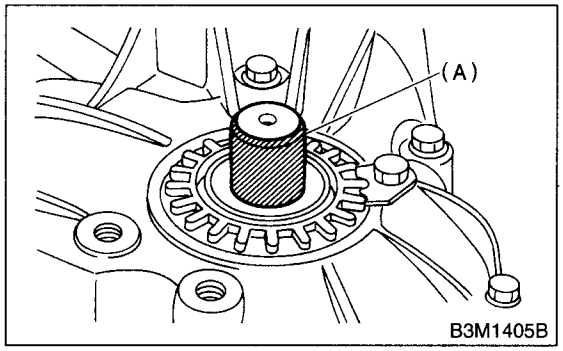
5) Remove the main shaft rear plate.



S3M0100C

(A) Main shaft rear plate

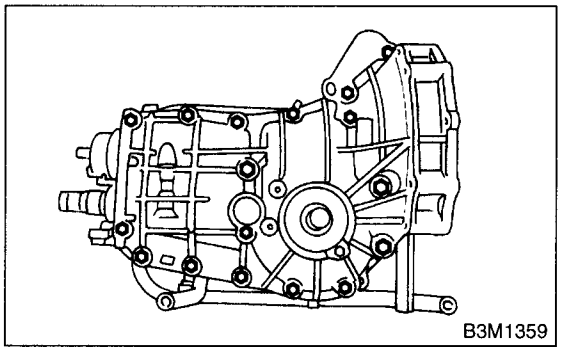
6) Put the vinyl tape around splines of the right and left axle drive shafts to prevent damage to oil seal.



B3M1405B

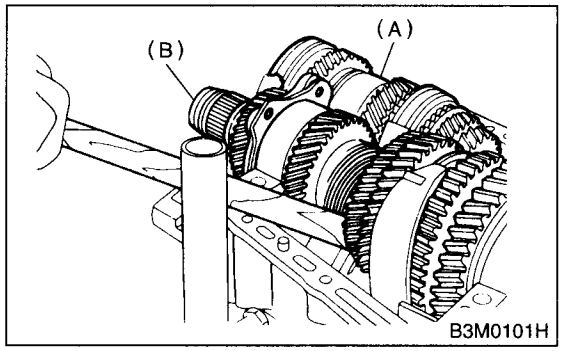
(A) Vinyl tape

7) Separate the transmission case into the right and left cases by loosening coupling bolts and nuts.


B3M1359

8) Remove the drive pinion shaft assembly from left side transmission case.

NOTE:
Use a hammer handle, etc. to remove if too tight.

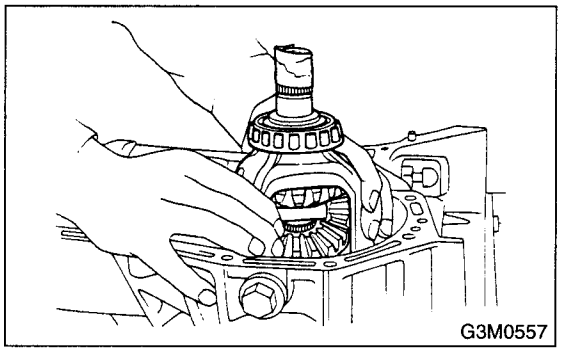


B3M0101H

(A) Main shaft assembly
(B) Drive pinion shaft assembly

9) Remove the main shaft assembly.
10) Remove the differential assembly.

CAUTION:
- **Be careful not to confuse right and left roller bearing outer races.**
- **Be careful not to damage retainer oil seal.**


G3M0557

B: INSTALLATION

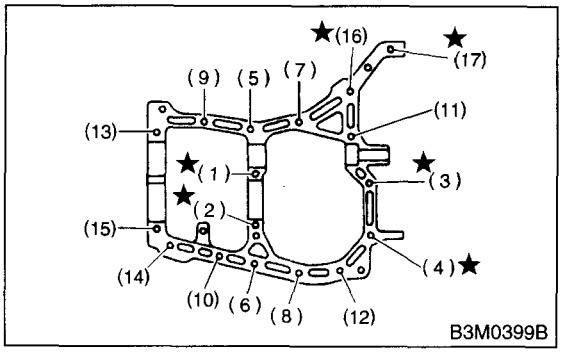
1) Wipe off grease, oil and dust on the mating surfaces of transmission cases with white gasoline.
2) Install the front differential assembly.
3) Install the main shaft assembly.
Install the needle bearing knock pin hole into transmission case knock pin.
4) Install the drive pinion shaft assembly.
Install the roller bearing knock pin hole into transmission case knock pin.
5) Apply the liquid gasket, and then put the case right side and left side together.

Liquid gasket:
THREE BOND 1215 or equivalent

6) Tighten seventeen bolts with bracket, clip, etc. as shown in the figure.

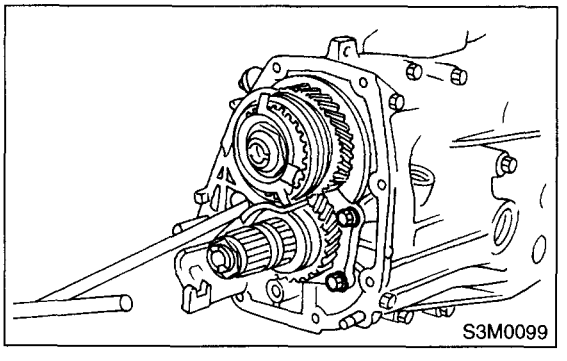
NOTE:
• Insert the bolts from the bottom and tighten nuts at the top.
• Put the cases together so that the drive pinion shim and input shaft holder shim are not caught up in between.
• Confirm that speedometer gear is meshed.

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)



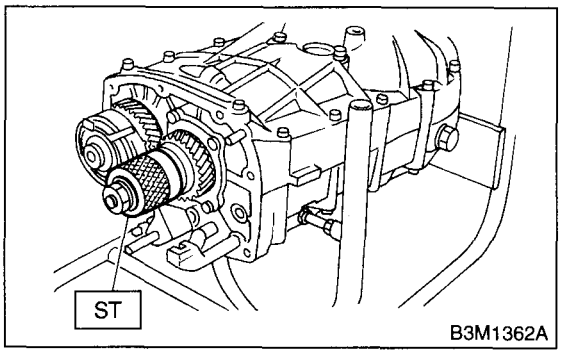
7) Tighten the ball bearing attachment bolts.

Tightening torque:
29 N·m (3.0 kgf-m, 21.7 ft-lb)

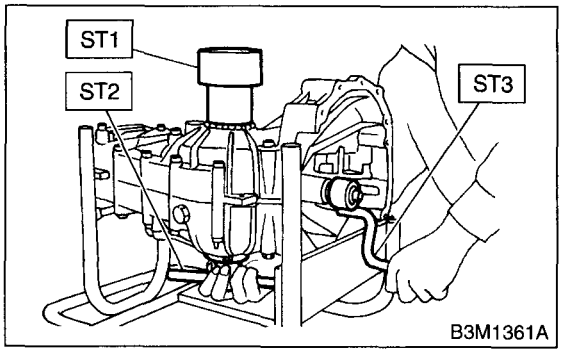


8) Backlash adjustment of hypoid gear and preload adjustment of roller bearing

NOTE:
Support the drive pinion assembly with ST. (AWD model)
ST 498427100 STOPPER



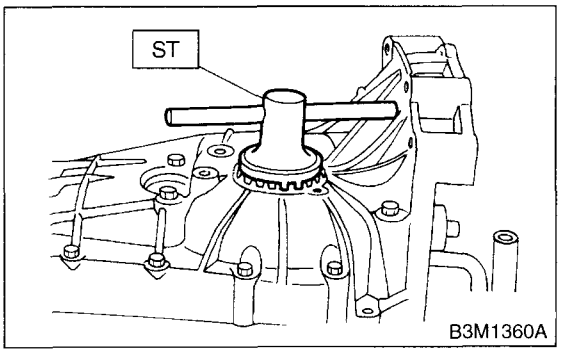
9) Place the transmission with case left side facing downward and put ST1 on bearing cup.
10) Screw the retainer assembly into left case from the bottom with ST2. Fit ST3 on the transmission main shaft. Shift gear into 4th or 5th and turn the shaft several times. Screw in the retainer while turning ST3 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 weight and screw in retainer without O-ring on the upper side and stop at the point where slight resistance is felt.

NOTE:
At this point, the backlash between the hypoid gear and drive pinion shaft is zero.

ST 499787000 WRENCH ASSY



12) Fit lock plate. Loosen the retainer on the lower side by 1-1/2 notches of lock plate and turn in the retainer on the 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.

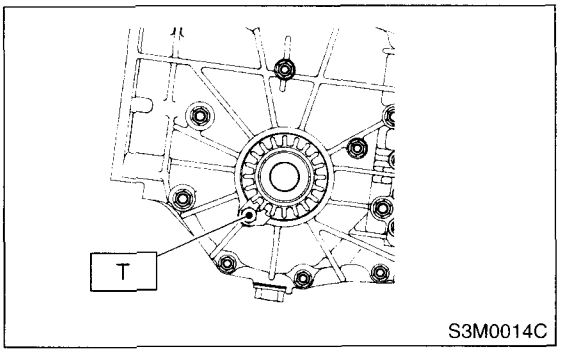
15) Turn the transmission main shaft several times while tapping around retainer lightly with plastic hammer.

16) Inspect and adjust backlash and tooth contact of hypoid gear. <Ref. to MT-74, 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 O-ring into the 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-62, ADJUSTMENT, Main Shaft Assembly for Single-Range.>

19) Install the clutch release lever and bearing. <Ref. to CL-15, INSTALLATION, Release Bearing and Lever.>

20) Install the transfer case with extension case assembly. <Ref. to MT-41, INSTALLATION, Transfer Case and Extension Case Assembly.>

21) Install the manual transmission assembly into the vehicle.<Ref. to MT-30, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

Check the transmission case for cracks, damage, and oil leaks.

15.Main Shaft Assembly for Single-Range

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to MT-41, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the transmission case. <Ref. to MT-41, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the drive pinion shaft assembly. <Ref. to MT-63, REMOVAL, Drive Pinion Shaft Assembly.>
5) Remove the main shaft assembly.

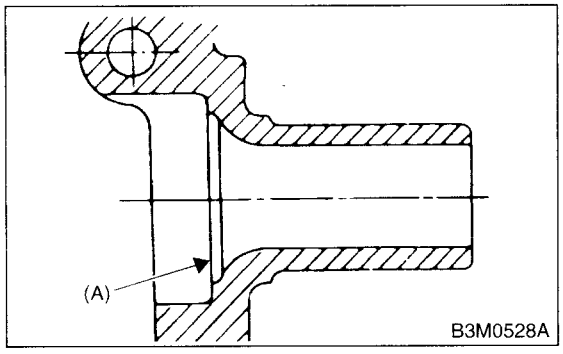
B: INSTALLATION

1) Install the needle bearing and oil seal onto the front of transmission main shaft assembly.

CAUTION:
- **Wrap clutch splined section with vinyl tape to prevent damage to oil seal.**
- **Apply grease (Unilube #2 or equivalent) to the sealing lip of oil seal.**
- **Use a new one.**

2) 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.



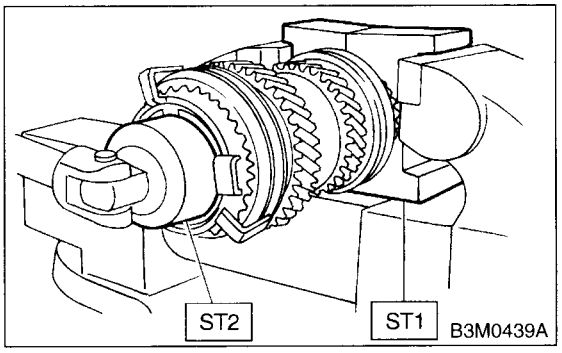
3) Install the drive pinion assembly. <Ref. to MT-63, INSTALLATION, Drive Pinion Shaft Assembly.>
4) Install the transmission case. <Ref. to MT-55, INSTALLATION, Transmission Case.>
5) Install the transfer case with extension case assembly. <Ref. to MT-41, INSTALLATION, Transfer Case and Extension Case Assembly.>
6) Install the manual transmission assembly to vehicle. <Ref. to MT-30, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

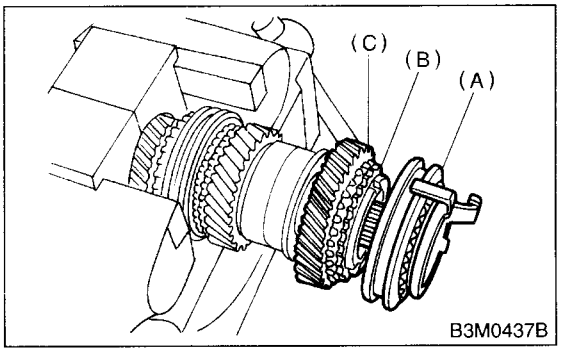
1) Put the vinyl tape around main shaft splines to protet oil seal from damage. Then pull out the oil seal and needle bearing by hand.
2) Remove the lock nut from transmission main shaft assembly.

NOTE:
Remove the caulking before off lock nut.

ST1 499987000 TRANSMISSION HOLDER
ST2 498937003 SOCKET WRENCH (35)

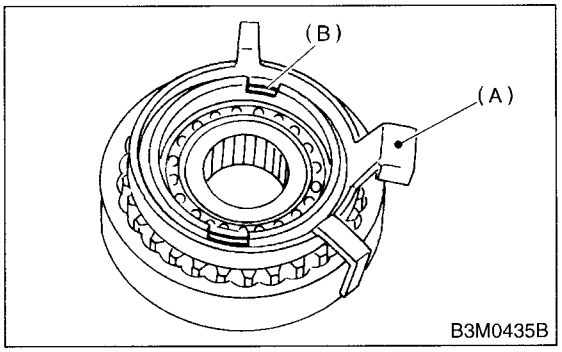


3) Remove the 5th-Rev sleeve and hub assembly, baulk ring, 5th drive gear and needle bearing.



(A) 5th-Rev sleeve and hub ASSY
(B) Baulk ring
(C) 5th drive gear

4) Remove the snap ring and synchro cone stopper from 5th-Rev sleeve and hub assembly.

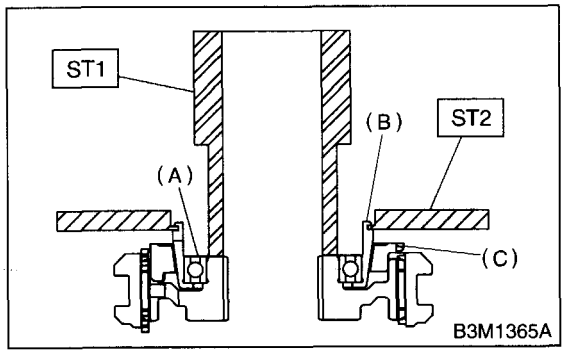


(A) Synchro cone stopper
(B) Snap ring

5) Using 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 the splines beforehand.
• Do not reuse the ball bearing.

ST1 499757002 INSTALLER
ST2 498077400 SYNCHRO CONE REMOVER

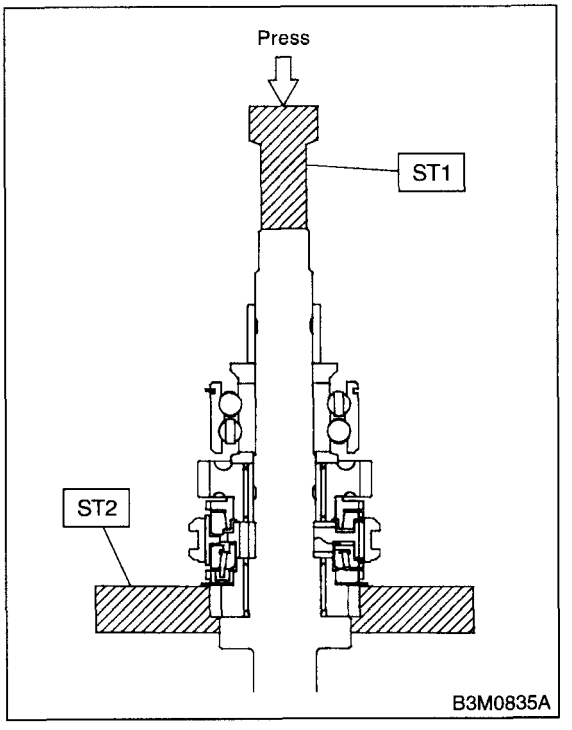


(A) Ball bearing
(B) Synchro cone
(C) Baulk ring

6) Using ST1 and ST2, remove the rest of parts.

NOTE:
Replace 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.

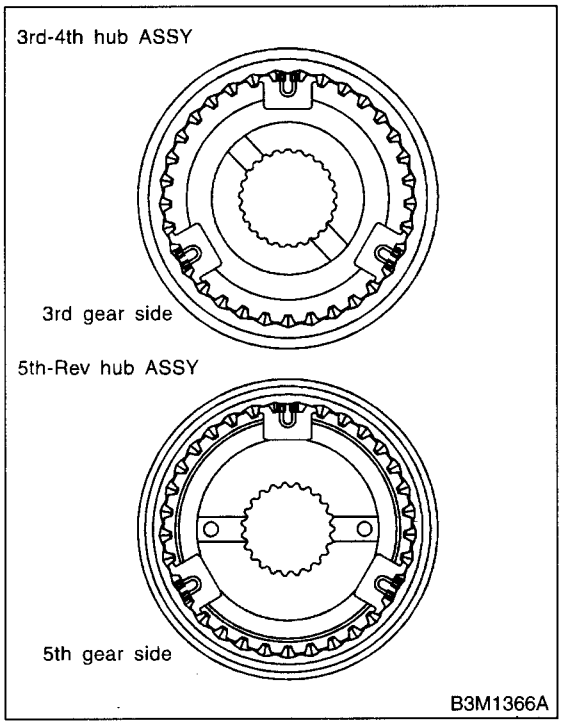
ST1 899864100 REMOVER
ST2 899714110 REMOVER



D: ASSEMBLY

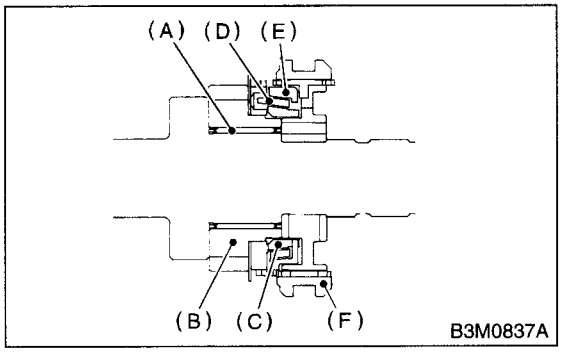
1) Assemble each sleeve and hub assembly.

NOTE:
Position open ends of spring 120° apart.



2) Install the 3rd drive gear, outer baulk ring, synchro cone, inner baulk ring, sleeve and hub assembly for 3rd needle bearing on the transmission main shaft.

NOTE:
Align the groove in baulk ring with shifting insert.

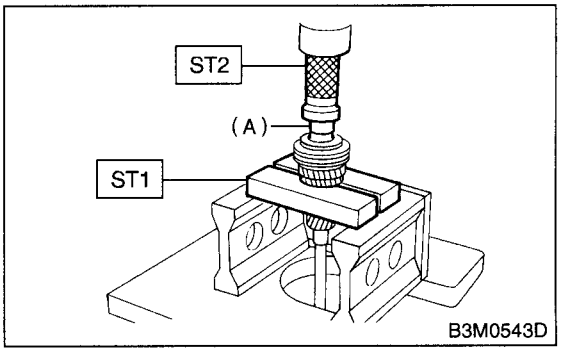


(A) 3rd needle bearing
(B) 3rd drive gear
(C) Inner baulk ring
(D) Synchro cone
(E) Outer baulk ring
(F) Sleeve and hub ASSY

3) Install the 4th needle bearing race onto transmission main shaft using ST1, ST2 and a press.

CAUTION:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

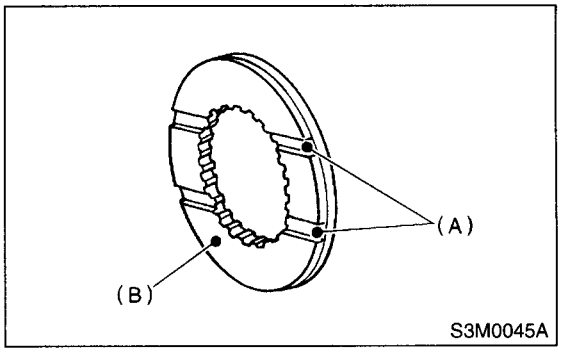
ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



(A) 4th needle bearing race

4) Install the baulk ring, needle bearing, 4th drive gear and 4th gear thrust washer to the transmission main shaft.

NOTE:
Align the baulk ring and gear & hub assembly with key groove.

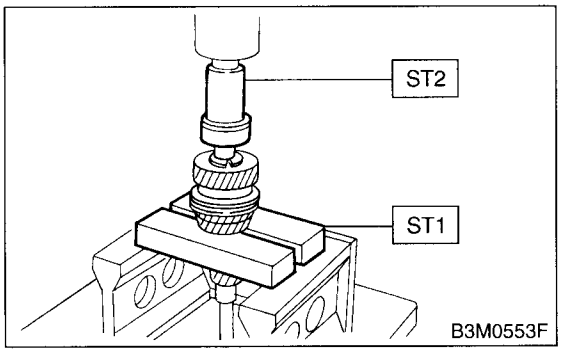


(A) Groove
(B) 4th gear side

5) Drive the ball bearing onto the rear section of transmission main shaft using ST1, ST2 and a press.

CAUTION:
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

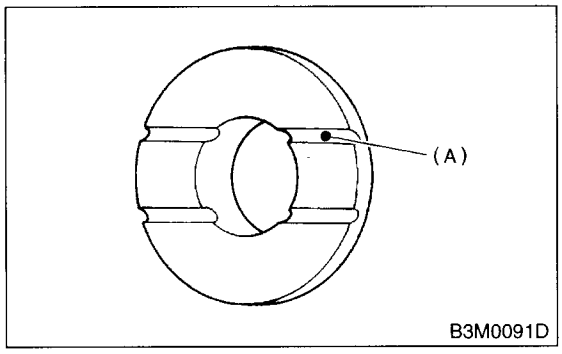


6) Using ST1 and ST2, install the 5th gear thrust washer and 5th needle bearing race onto the rear section of transmission main shaft.

CAUTION:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:
Face the thrust washer in the correct direction.

ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



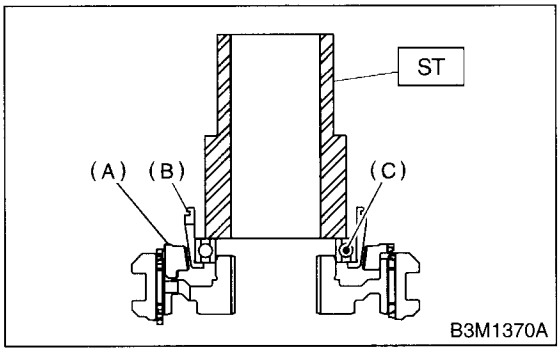
(A) Face this surface to 5th gear side.

7) Install the bearing onto synchro cone.
8) Install the baulk ring and synchro cone onto 5th-Rev sleeve and hub assembly using ST and a press.

CAUTION:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

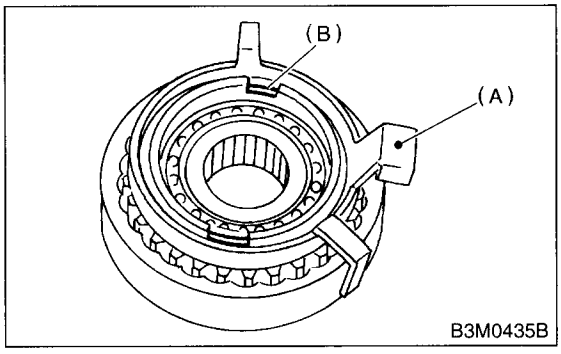
NOTE:
- Use new ball bearing.
- After press fitting, make sure synchro cone rotates freely.

ST 499757002 INSTALLER



(A) Baulk ring
(B) Synchro cone
(C) Ball bearing

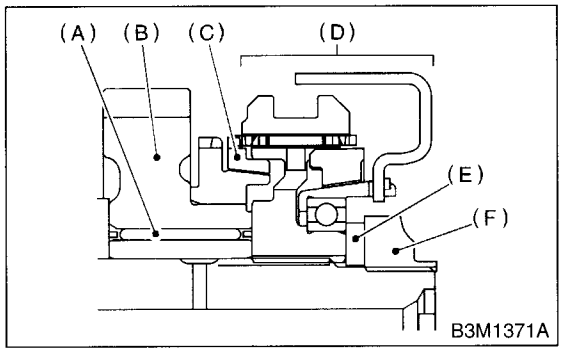
9) Install the synchro cone stopper and snap ring to 5th-Rev sleeve and hub assembly.



(A) Synchro cone stopper
(B) Snap ring

10) 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

11) 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:
118 N·m (12.0 kgf-m, 86.8 ft-lb)

E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.

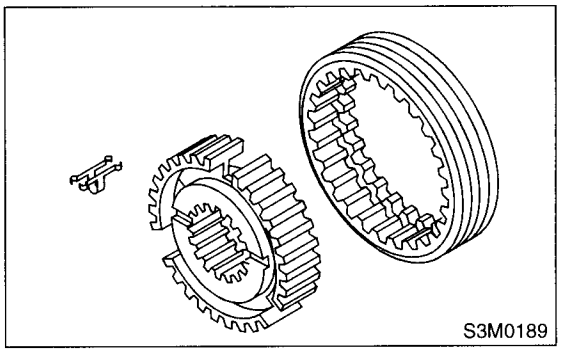
1) Bearings
Replace the bearings in the following cases:
- Bearings whose balls, outer races and inner races are broken or rusty.
- Worn bearings
- Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.
- Bearings having other defects

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.

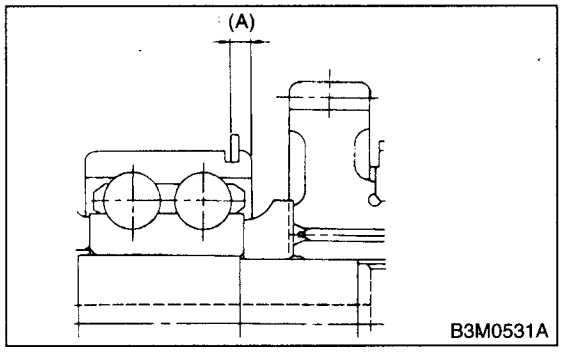
F: ADJUSTMENT

Selection of main shaft rear plate
Using 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

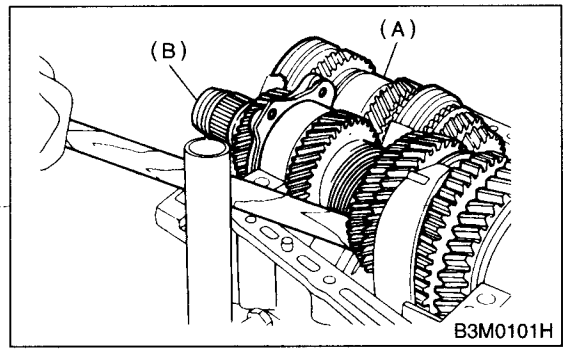


16.Drive Pinion Shaft Assembly

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to MT-41, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove transmission case. <Ref. to MT-54, REMOVAL, Transmission Case.>
4) Remove the drive pinion shaft assembly.

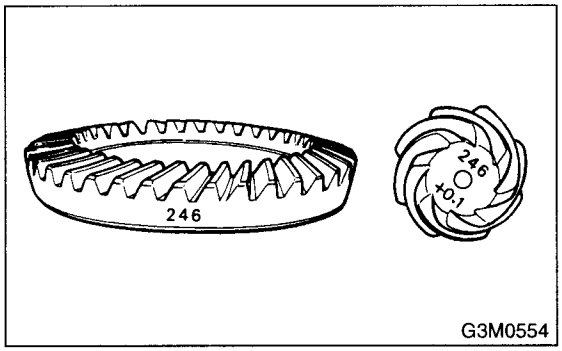
NOTE:
Use a hammer handle, etc. to remove if too tight.



(A) Main shaft assembly
(B) Drive pinion shaft assembly

B: INSTALLATION

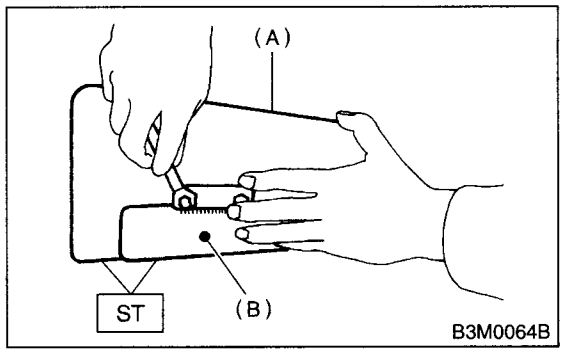
1) Remove the differential assembly.
2) Alignment marks/numbers on hypoid gear set
The upper number on driven pinion is the match number for combining it with hypoid driven gear. The lower number is for shim adjustment. If no lower number is shown, the value is zero. The number on hypoid driven gear indicates a number for combination with drive pinion.



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

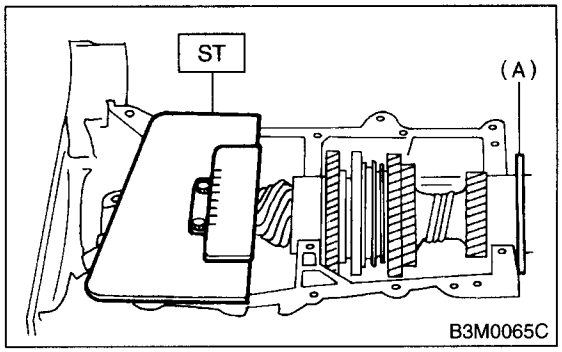
NOTE:
- Loosen the two bolts and adjust so that the scale indicates 0.5 correctly when the plate end and the scale end are on the same level.
- Tighten the two bolts.

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 the 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 the 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 said value.

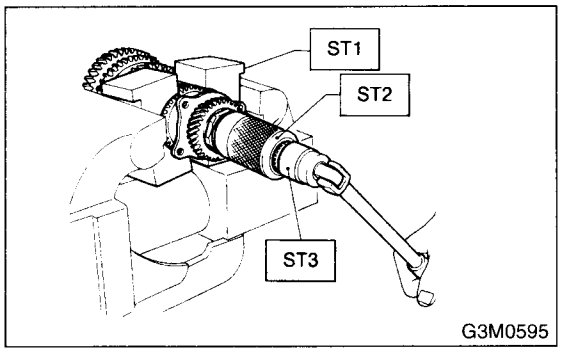
Drive pinion shim	
Part No.	Thickness mm (in)
32295AA031	0.150 (0.0059)
32295AA041	0.175 (0.0069)
32295AA051	0.200 (0.0079)
32295AA061	0.225 (0.0089)
32295AA071	0.250 (0.0098)
32295AA081	0.275 (0.0108)
32295AA091	0.300 (0.0118)
32295AA101	0.500 (0.0197)

9) Install the differential assembly. <Ref. to MT-71, 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 the coupling sleeve and reverse driven gear are positioned in the center of their cynchronizing mechanisms. <Ref. to MT-68, INSPECTION, Drive Pinion Shaft Assembly.>
11) Install the transmission case. <Ref. to MT-55, INSTALLATION, Transmission Case.>
12) Install the transfer case with extension case assembly. <Ref. to MT-41, INSTALLATION, Transfer Case and Extension Case Assembly.>
13) Install the manual transmission assembly to vehicle.<Ref. to MT-27, Manual Transmission Assembly.>

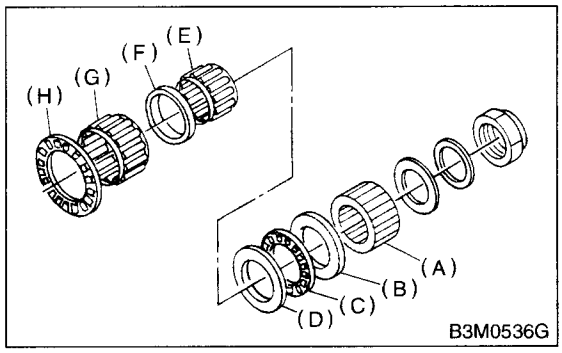
C: DISASSEMBLY

CAUTION:
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.

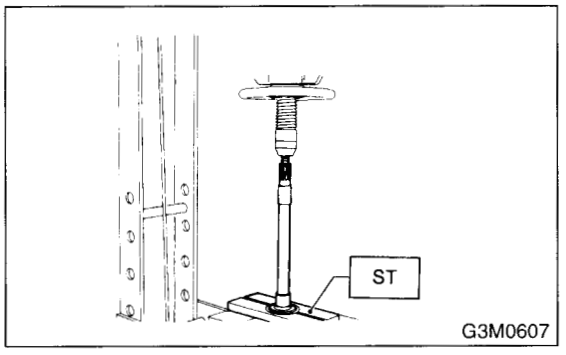


(A) Differential bevel gear sleeve
(B) Washer No. 1 (25 × 37.5 × t)
(C) Thrust bearing (25 × 37.5 × 3)
(D) Washer No. 2 (25 × 37.5 × 4)
(E) Needle bearing (25 × 30 × 20)
(F) Drive pinion collar
(G) Needle bearing (30 × 37 × 23)
(H) Thrust bearing (33 × 50 × 3)

3) Remove the roller bearing and washer using ST and press.

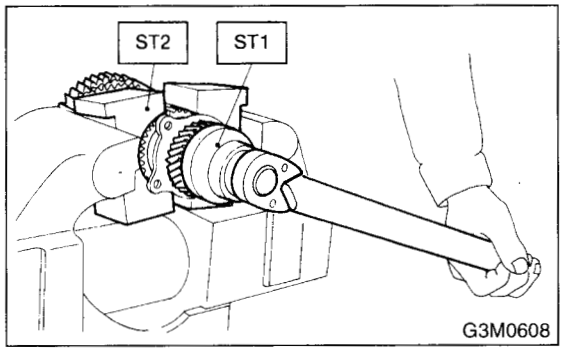
CAUTION:
Do not reuse roller bearing.

ST 498077000 REMOVER



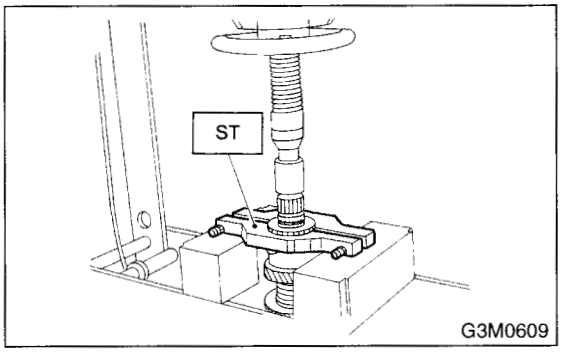
4) Straighten the lock nut at staked portion. Remove the lock nut using ST1 and ST2.

ST1 499987300 SOCKET WRENCH (50)
ST2 899884100 HOLDER



5) Remove the 5th driven gear using ST.

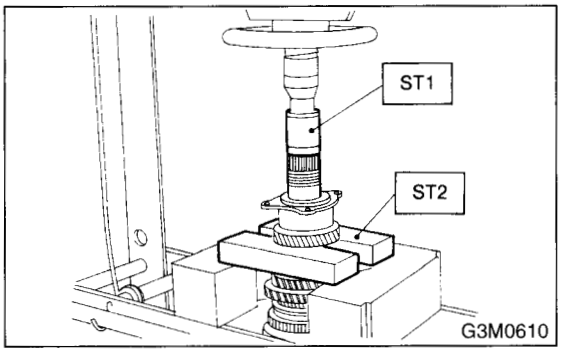
ST 499857000 5TH DRIVEN GEAR REMOVER



6) Remove the woodruff key.

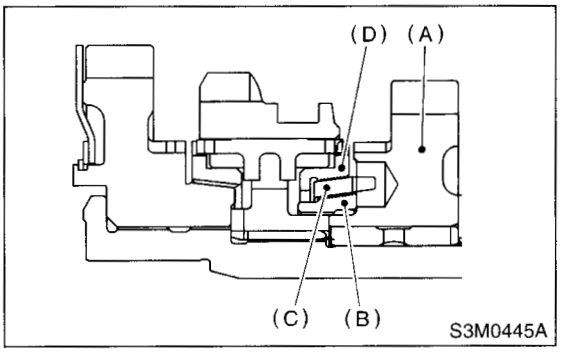
7) Remove the roller bearing, 3rd-4th driven gear using ST1 and ST2.

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.

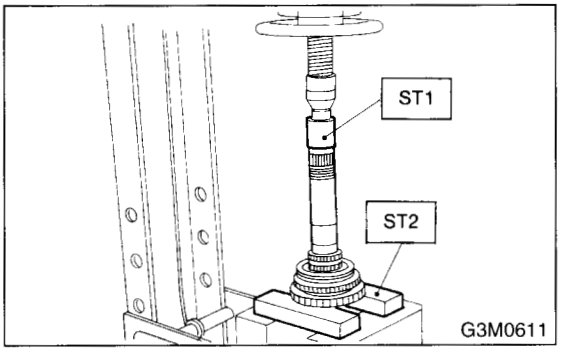


(A) 2nd driven gear
(B) Inner baulk ring
(C) Synchro cone
(D) Outer baulk ring

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 have to be disassembled, mark the engaging point beforehand.

ST1 499757002 INSTALLER
ST2 899714110 REMOVER

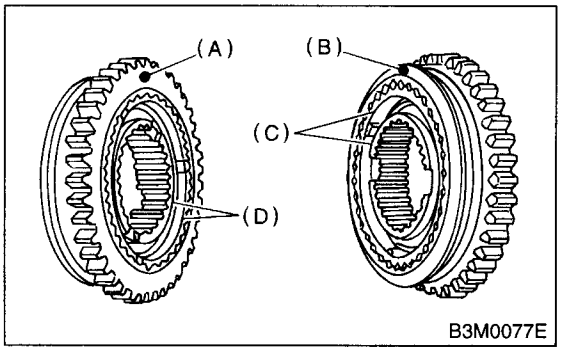


11) Remove the sub gear for 1st driven gear.

D: ASSEMBLY

1) Install the sleeve and assembly by matching alignment marks.

NOTE:
• Use the new gear and hub assembly, if the 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.

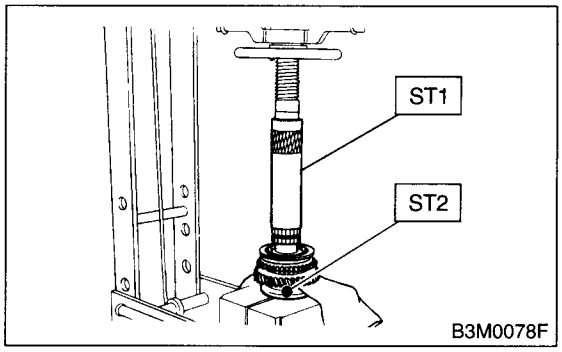
NOTE:
• Take care to install gear and hub assembly in proper direction.
• Align the baulk ring and gear & hub assembly with key groove.

4) Install the 2nd driven gear bushing onto driven shaft using ST1, ST2 and press.

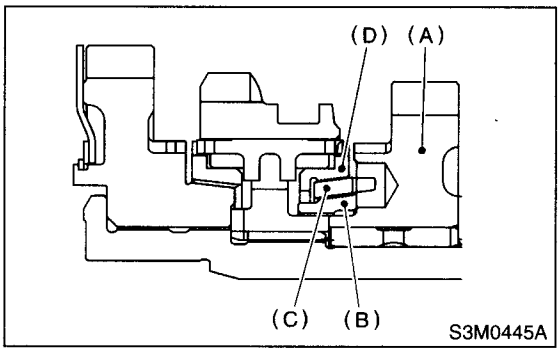
CAUTION:
• Attach a cloth to the end of driven shaft to prevent damage.
• Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:
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.

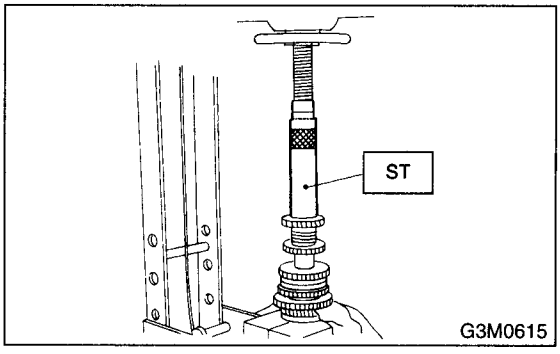


(A) 2nd driven gear
(B) Inner baulk ring
(C) Synchro cone
(D) Outer baulk ring

6) After installing key on driven shaft, install the 3rd-4th driven gear using ST and press.

CAUTION:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

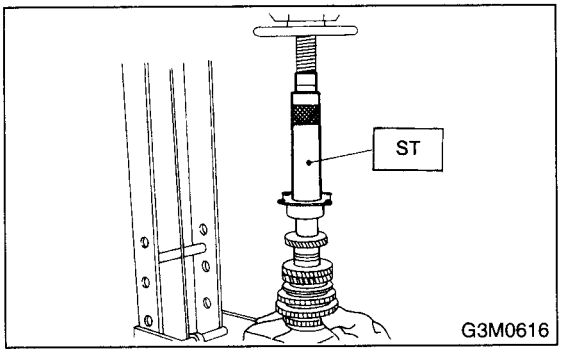
NOTE:
Align the groove in baulk ring with insert.
ST 499277200 INSTALLER



7) Install a set of roller bearings onto the driven shaft using ST and press.

CAUTION:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

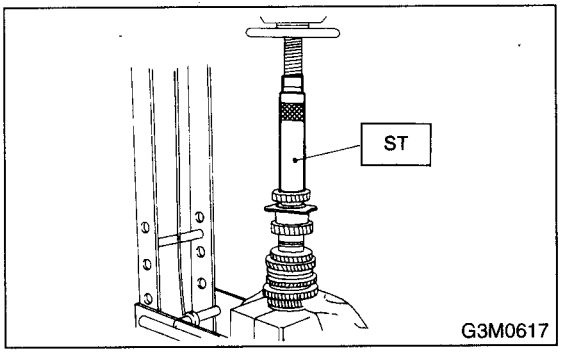
ST 499277200 INSTALLER



8) Position the woodruff key in groove on the rear of driven shaft. Install 5th driven gear onto drive shaft using ST and press.

CAUTION:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

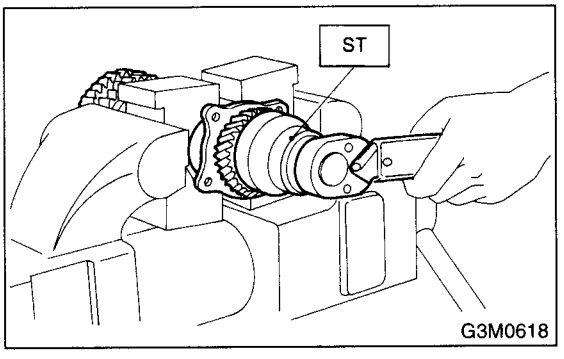
ST 499277200 INSTALLER



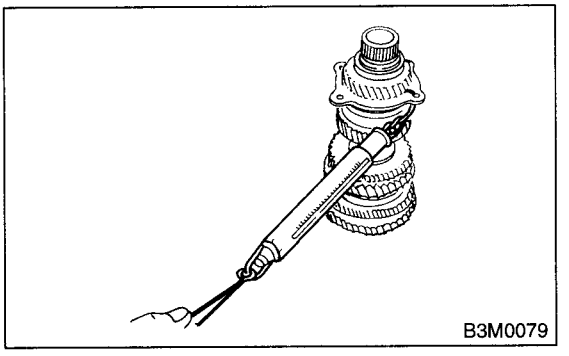
9) Install the lock washer. Install lock nut and tighten to the specified torque using ST.

ST 499987300 SOCKET WRENCH (50)

Tightening torque:
265 N·m (27 kgf-m, 195 ft-lb)

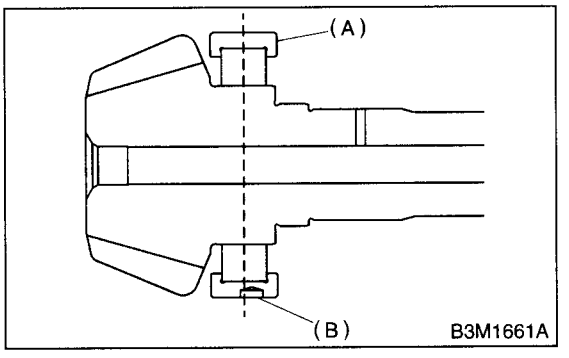


NOTE:
- Stake the lock nut at two points.
- Using spring balancer, check that starting torque of roller bearing is 0.1 to 1.5 N (0.01 to 0.15 kgf, 0.02 to 0.33ft).



10) Install the roller bearing onto drive pinion.

NOTE:
When installing roller bearing, note its directions (front and rear) because the knock pin hole in outer race is offset.

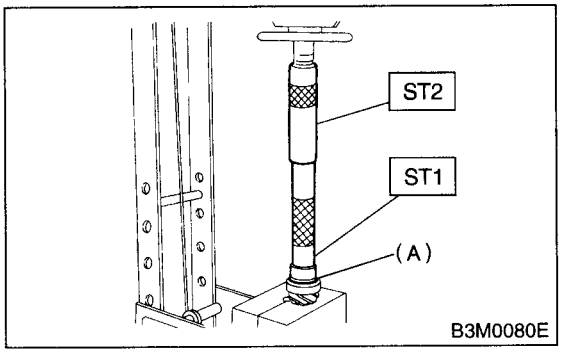


(A) Roller bearing
(B) Knock pin hole

11) Install the washer using ST1, ST2 and press.

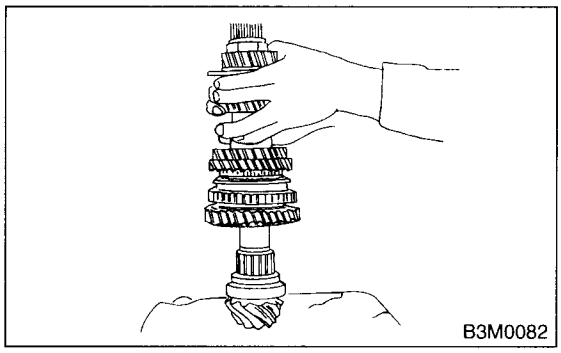
CAUTION:
- **Discard old lock nuts, replace with new ones.**
- **Secure lock nut in four places.**

ST1 499277100 BUSH 1-2 INSTALLER
ST2 499277200 INSTALLER



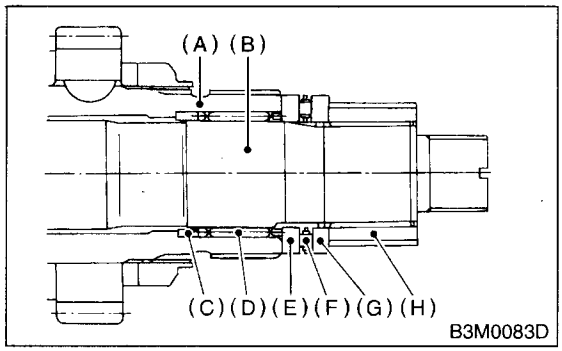
(A) Washer

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.

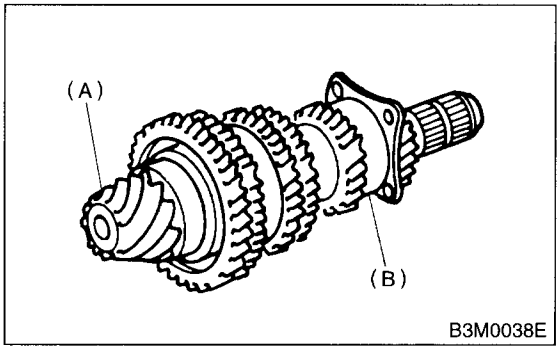
NOTE:
Be careful because the spacer must be installed in proper direction.



(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

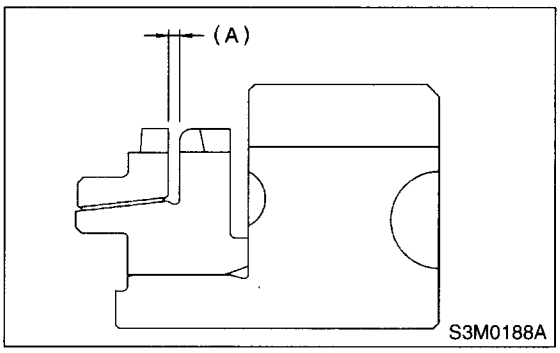
Disassembled parts should be washed clean first and then inspected carefully.
1) Bearings
Replace bearings in the following cases:
• Bearings whose balls, outer races and inner races are broken or rusty.
• Worn bearings
• Bearings that fail to turn smoothly or make abnormal noise when turned after gear 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 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.

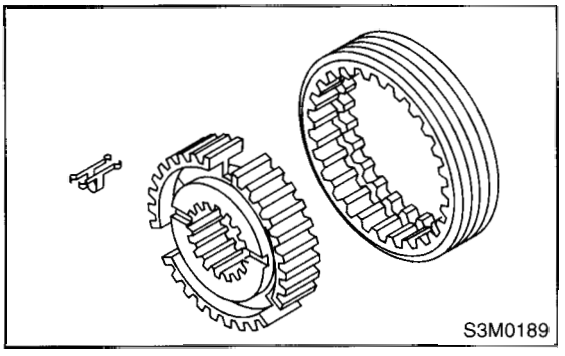
Clearance (A):
0.5 — 1.0 mm (0.020 — 0.040 in)



• 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.

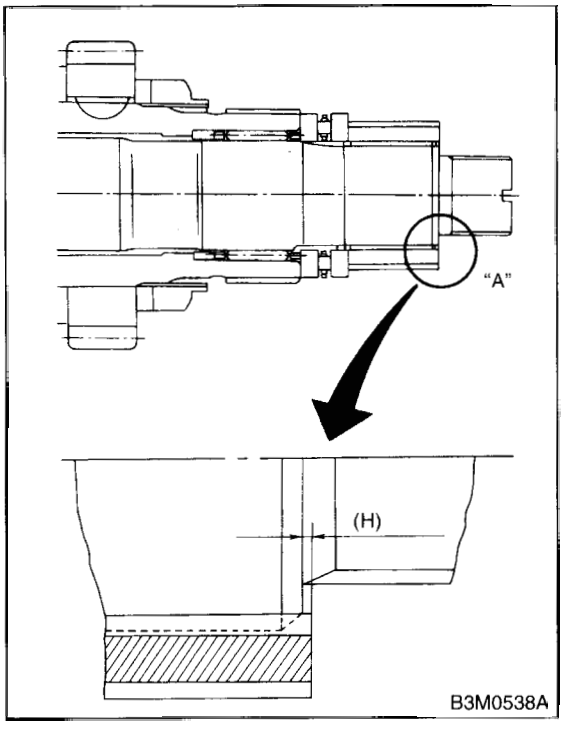
7) O-ring

Replace the O-ring if the sealing face is deformed, hardened, damaged, worn, or defective in any way.

F: ADJUSTMENT

1. THRUST BEARING PRELOAD

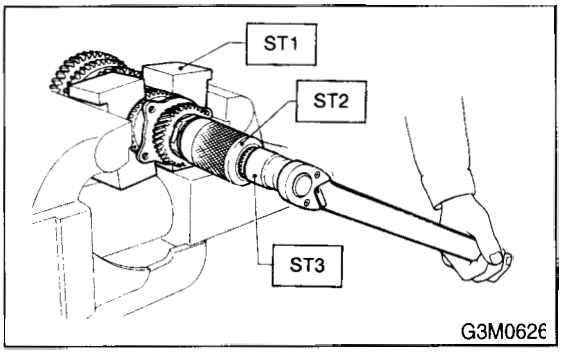
1) After completing the preceding steps 1) through 3), select adjusting washer No. 1 so that the dimension (H) is zero through visual check. Position washer (18.3 × 30 × 4) and lock washer (18 × 30 × 2) and install lock nut (18 × 13.5).



2) Using ST1, ST2 and ST3, tighten the lock nut to the specified torque.

ST1 899884100 HOLDER
ST2 498427100 STOPPER
ST3 899988608 SOCKET WRENCH (27)

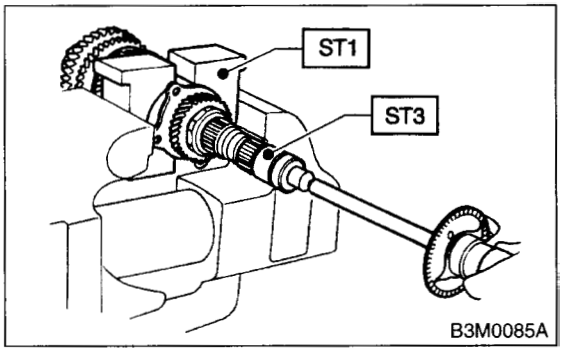
Tightening torque:
118 N·m (12 kgf-m, 86.8 ft-lb)



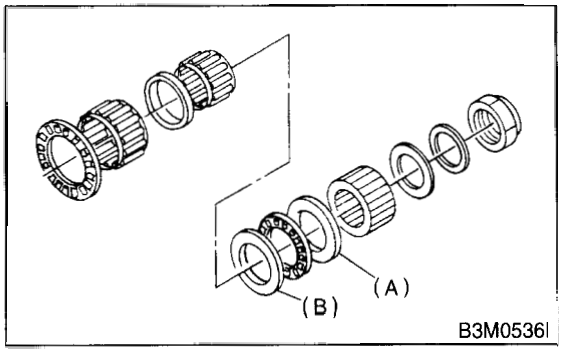
3) After removing ST2, measure the starting torque using torque driver.

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)



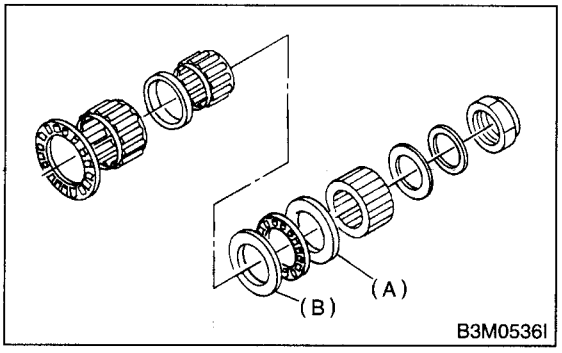
4) If starting torque is not within specified limit, select new adjusting washer No. 1 and recheck starting torque.



(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 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)

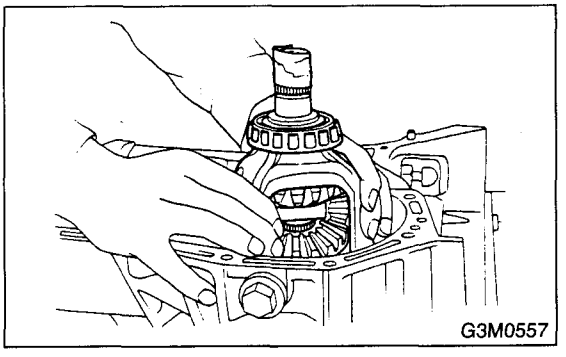
6) Recheck that the starting torque is within specified range, then clinch the lock nut at four positions.

17.Front Differential Assembly

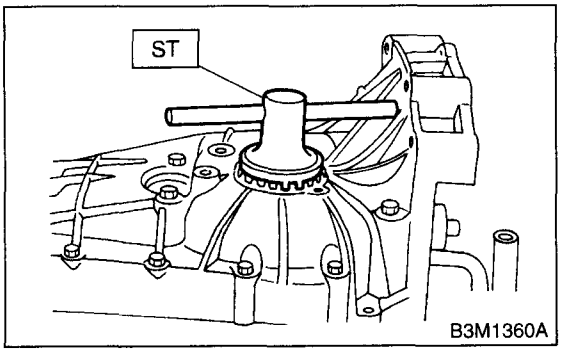
A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to MT-41, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the transmission case. <Ref. to MT-54, REMOVAL, Transmission Case.>
4) Removes the drive pinion shaft assembly. <Ref. to MT-63, REMOVAL, Drive Pinion Shaft Assembly.>
5) Remove the main shaft assembly.
<Ref. to MT-57, REMOVAL, Main Shaft Assembly for Single-Range.>
6) Remove the differential assembly.

CAUTION:
- **Be careful not to confuse right and left roller bearing outer races.**
- **Be careful not to damage retainer oil seal.**


G3M0557

7) Remove the differential side retainers using ST.
ST 499787000 WRENCH ASSY



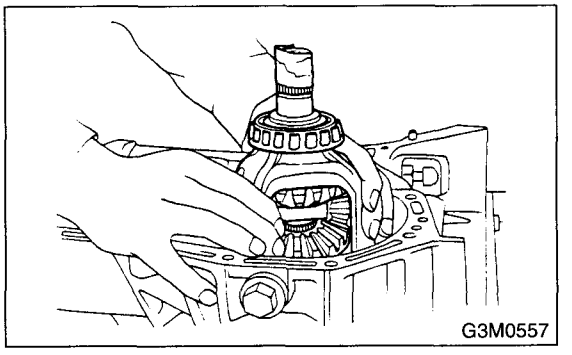
B3M1360A

B: INSTALLATION

1) Install the differential side retainers using ST.
ST 499787000 WRENCH ASSY
2) Install the differential assembly.

CAUTION:
Be careful not to fold the sealing lip of oil seal.

NOTE:
Wrap the left and right splines sections of axle shaft with vinyl tape to prevent scratches.


G3M0557

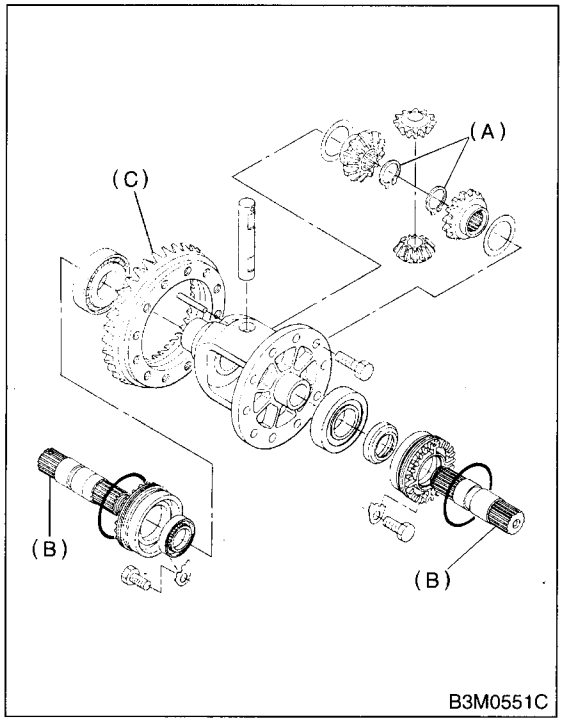
3) Install the main shaft assembly. <Ref. to MT-57, INSTALLATION, Main Shaft Assembly for Single-Range.>
4) Install the drive pinion assembly. <Ref. to MT-63, INSTALLATION, Drive Pinion Shaft Assembly.>
5) Install the transmission case. <Ref. to MT-55, INSTALLATION, Transmission Case.>
6) Install the transfer case with extension case assembly. <Ref. to MT-41, INSTALLATION, Transfer Case and Extension Case Assembly.>
7) Install the manual transmission assembly to vehicle. <Ref. to MT-30, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

1) Remove the right and left snap rings from differential, and then remove the two axle drive shafts.

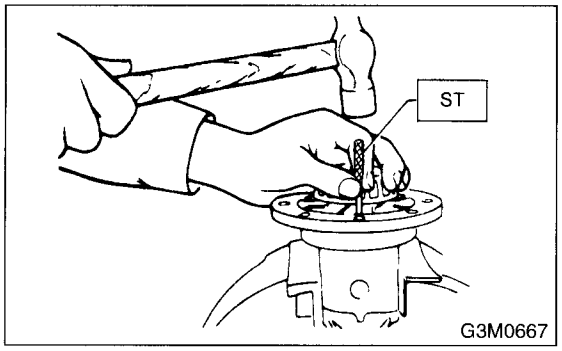
NOTE:
During reassembly, reinstall each axle drive shaft in the same place from which it was removed.

2) Loosen the twelve bolts and remove hypoid driven gear.

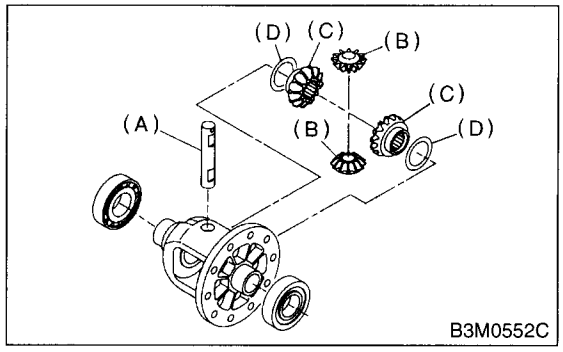


(A) Snap ring
(B) Axle drive shaft
(C) Hypoid driven gear

3) Drive out the straight pin from differential assembly toward hypoid driven gear.
ST 899904100 REMOVER

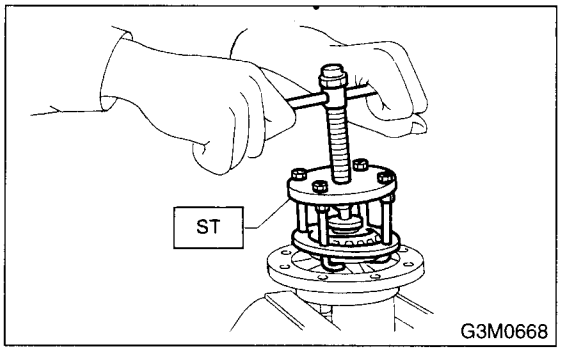


4) Pull out the pinion shaft, and remove the differential bevel pinion and gear and washer.



(A) Pinion shaft
(B) Bevel pinion
(C) Bevel gear
(D) Washer

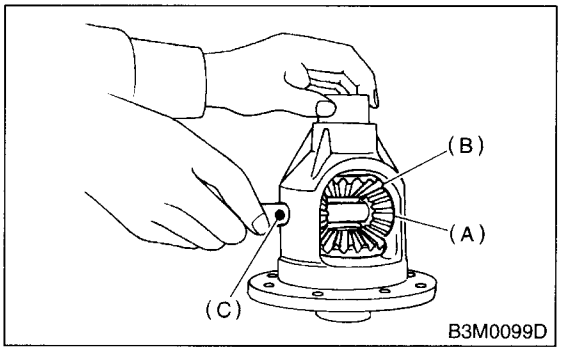
5) Remove the roller bearing using ST.
ST 399527700 PULLER SET



D: 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.



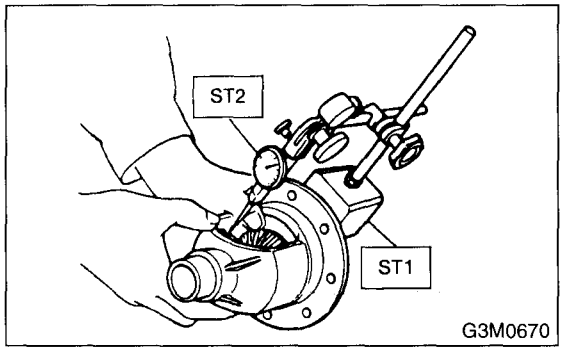
(A) Bevel pinion
(B) Bevel gear
(C) Pinion shaft

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-75, 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

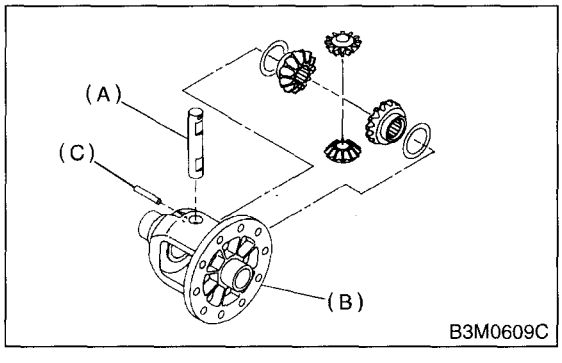
Standard backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)



3) Align the pinion shaft and differential case at their holes, and drive straight pin into holes from the hypoid driven gear side, using ST.

NOTE:
Lock the straight pin after installing.

ST 899904100 REMOVER



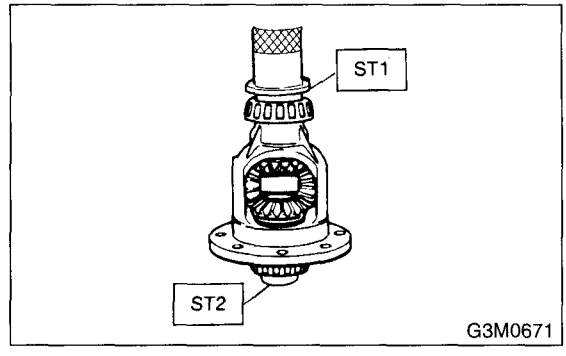
(A) Pinion shaft
(B) Differential case
(C) Straight pin

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).

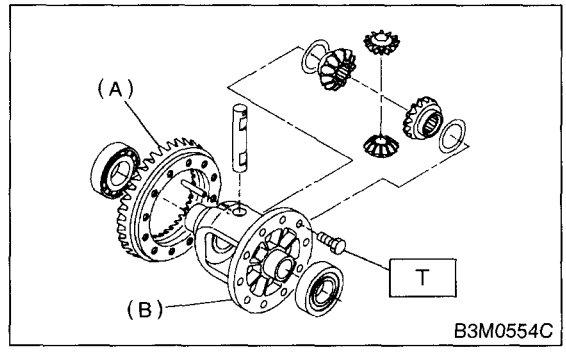
NOTE:
Be careful because roller bearing outer races are used as a set.

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)

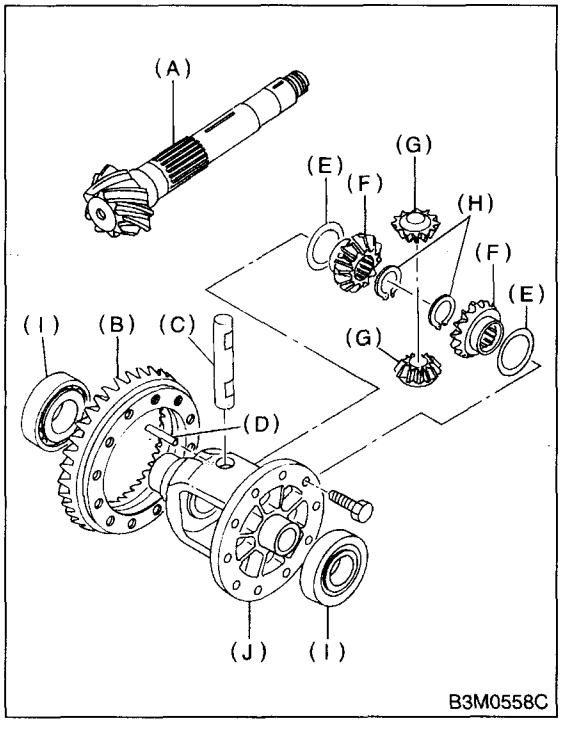


(A) Hypoid driven gear
(B) Differential case

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) Snap ring
(I) Roller bearing
(J) Differential case

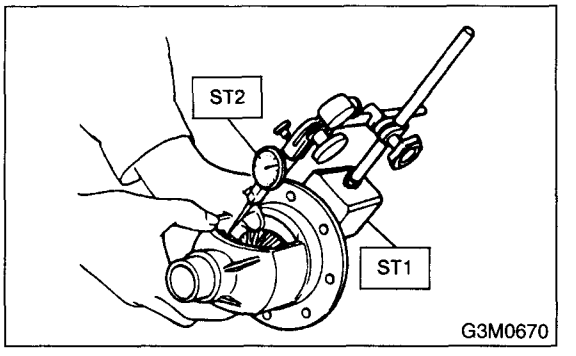
1. BEVEL PINION GEAR BACKLASH

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)

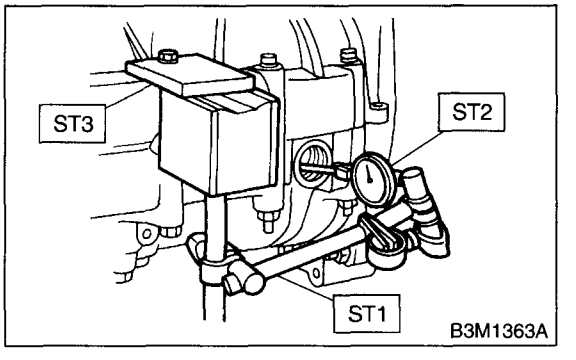


2. HYPOID GEAR BACKLASH

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 and check the backlash.

ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE
ST3 498255400 PLATE

Backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)

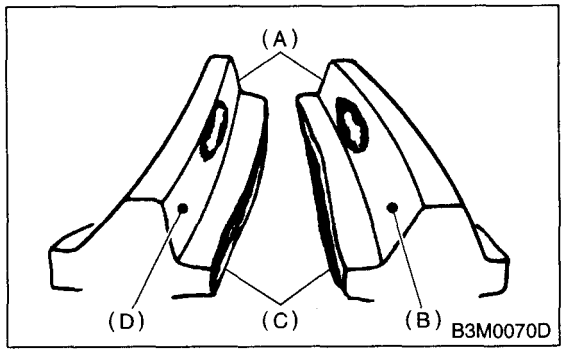


NOTE:
If the backlash is outside specified range, adjust it by turning holder in right side case.

3. TOOTH CONTACT OF HYPOID GEAR

Check 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-75, 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-71, REMOVAL, Front Differential Assembly.>
2) Select a different washer from the table and install.

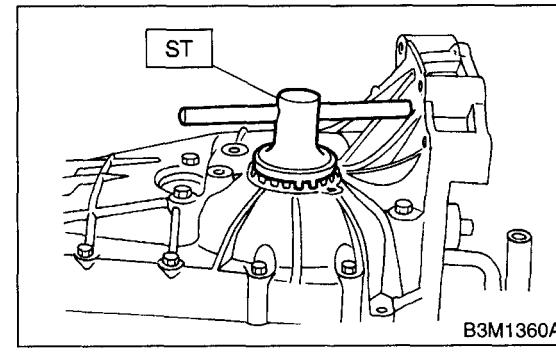
Washer	
Part No.	Thickness mm (in)
803038021	0.925 — 0.950 (0.0364 — 0.0374)
803038022	0.975 — 1.000 (0.0384 — 0.0394)
803038023	1.025 — 1.050 (0.0404 — 0.0413)

3) Adjust until the specified value is obtained.

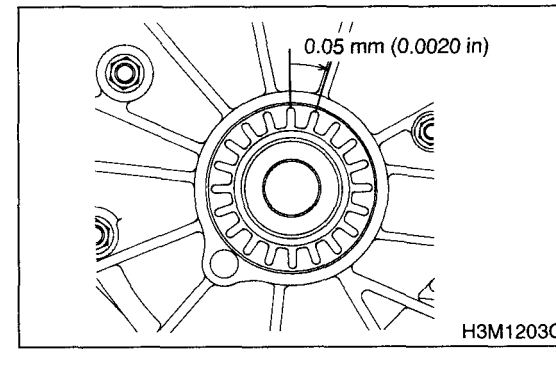
Standard backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)

2. HYPOID GEAR BACKLASH

Adjust the backlash by turning holder in right side case.
ST 499787000 WRENCH ASSY



NOTE:
Each time holder rotates one tooth, backlash changes by 0.05 mm (0.020 in).

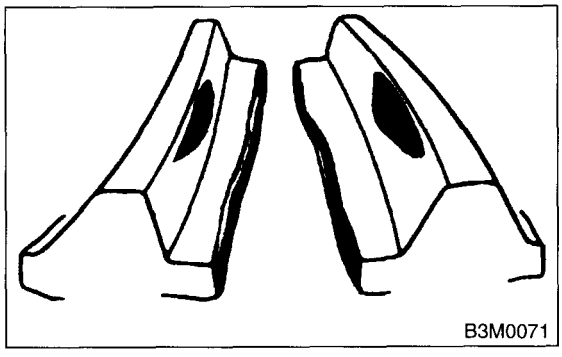


3. TOOTH CONTACT OF HYPOID GEAR

Adjust until the teeth contact is correct.

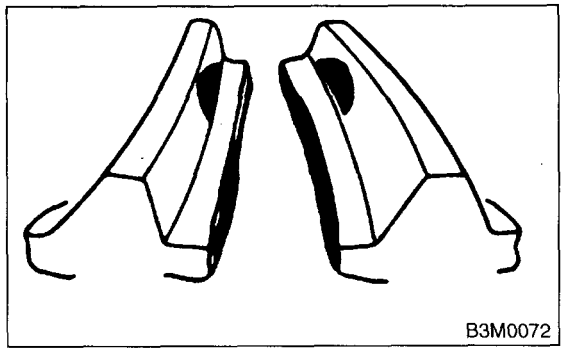
- Backlash is excessive.

To reduce backlash, loosen holder on the upper side (case right side) and turn in the holder on the lower side (case left side) by the same amount.



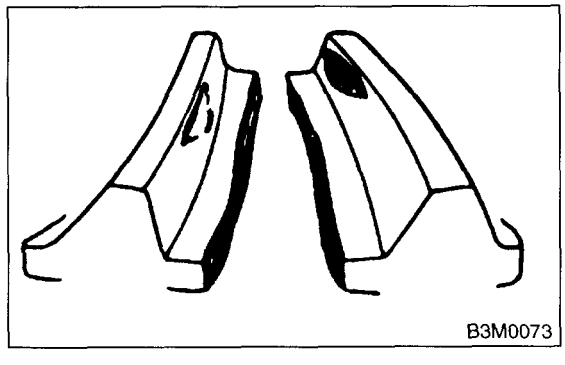
- Backlash is insufficient.

To increase backlash, loosen holder on the lower side (case left side) and turn in the holder on the upper side (case right side) by the same amount.



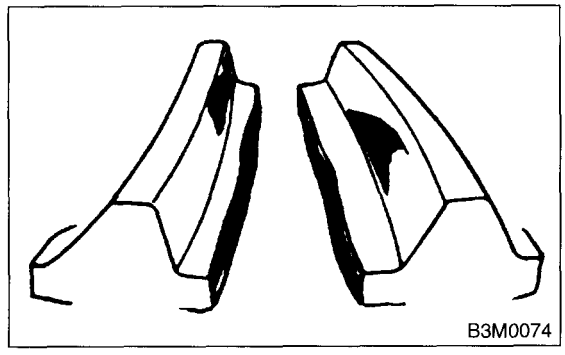
- The drive pinion shim selected before is too thick.

Reduce its thickness.



- The drive pinion shim selected before is too thin.

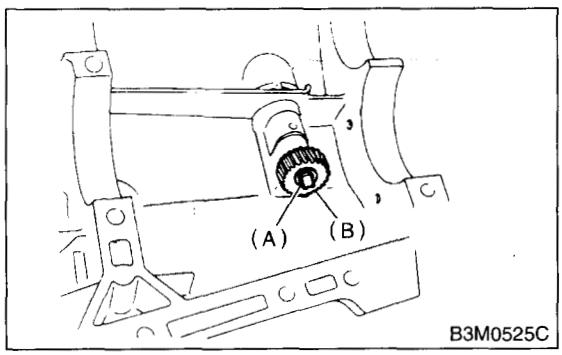
Increase its thickness.



18.Speedometer Gear

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to MT-37, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly. <Ref. to MT-41, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the transmission case. <Ref. to MT-54, REMOVAL, Transmission Case.>
5) Remove the vehicle speed sensor. <Ref. to MT-39, REMOVAL, Vehicle Speed Sensor.>
6) Remove the outer snap ring and pull out the speedometer driven gear. Next, remove the oil seal, speedometer shaft and washer.



(A) Outer snap ring
(B) Speedometer driven gear

B: INSTALLATION

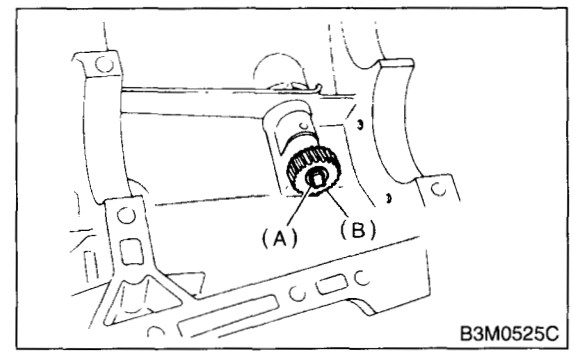
1) Install the washer and speedometer shaft, and press fit oil seal with ST.

CAUTION:
Use new oil seal, if it has been removed.

ST 899824100 or 499827000PRESS

2) Install the vehicle speed sensor. <Ref. to MT-39, INSTALLATION, Vehicle Speed Sensor.>
3) Install the speedometer driven gear and snap ring.

CAUTION:
Use new snap ring, if it has been removed.



(A) Outer snap ring
(B) Speedometer driven gear

4) Install the transmission case. <Ref. to MT-55, INSTALLATION, Transmission Case.>
5) Install the transfer case with extension case assembly. <Ref. to MT-41, INSTALLATION, Transfer Case and Extension Case Assembly.>
6) Install the back-up light switch and neutral position switch. <Ref. to MT-38, INSTALLATION, Switches and Harness.>
7) Install the manual transmission assembly to vehicle.<Ref. to MT-30, INSTALLATION, Manual Transmission Assembly.>

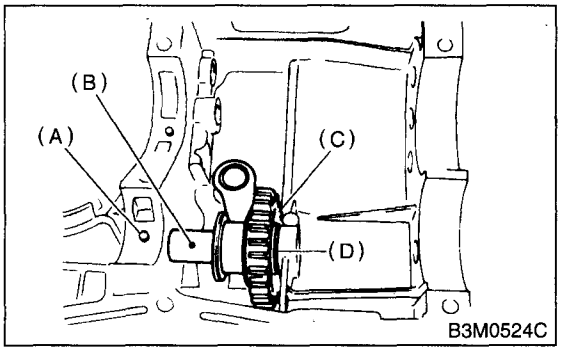
C: INSPECTION

Check the speedometer gear, oil seal and speedometer shaft for damage. Replace if damaged.

19.Reverse Idler Gear

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to MT-37, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly. <Ref. to MT-41, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the transmission case. <Ref. to MT-63, REMOVAL, Drive Pinion Shaft Assembly.>
5) Remove the drive pinion shaft assembly. <Ref. to MT-63, REMOVAL, Drive Pinion Shaft Assembly.>
6) Remove the main shaft assembly.
<Ref. to MT-57, REMOVAL, Main Shaft Assembly for Single-Range.>
7) Remove the differential assembly. <Ref. to MT-71, REMOVAL, Front Differential Assembly.>
8) Remove the shifter forks and rods. <Ref. to MT-80, REMOVAL, Shifter Fork and Rod.>
9) Pull out the straight pin, and remove the idler gear shaft, reverse idler gear and washer.



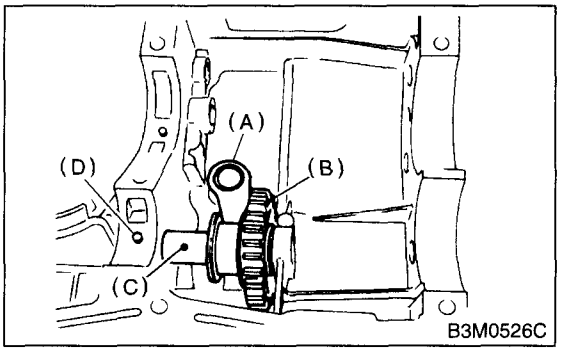
(A) Straight pin
(B) Idler gear shaft
(C) Idler gear
(D) Washer

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 the rear side.



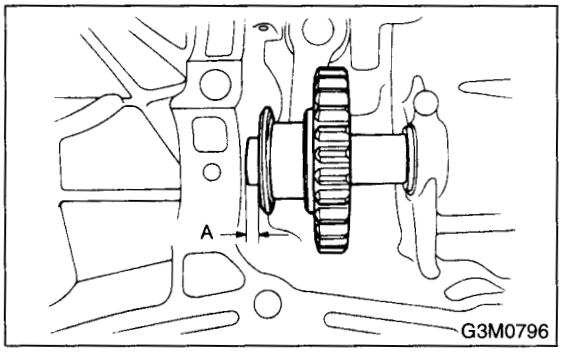
(A) Reverse shifter lever
(B) Reverse idler gear
(C) Reverse idler gear shaft
(D) Straight pin

2) Inspect and adjust the clearance between reverse idler gear and transmission case wall. <Ref. to MT-78, INSTALLATION, Reverse Idler Gear.> and <Ref. to MT-79, ADJUSTMENT, Reverse Idler Gear.>
3) Install the shifter forks and rods. <Ref. to MT-80, INSTALLATION, Shifter Fork and Rod.>
4) Install the differential assembly. <Ref. to MT-71, INSTALLATION, Front Differential Assembly.>
5) Install the main shaft assembly.
<Ref. to MT-57, INSTALLATION, Main Shaft Assembly for Single-Range.>
6) Install the drive pinion shaft assembly. <Ref. to MT-63, INSTALLATION, Drive Pinion Shaft Assembly.>
7) Install the transmission case. <Ref. to MT-55, INSTALLATION, Transmission Case.>
8) Install the transfer case with extension case assembly. <Ref. to MT-41, INSTALLATION, Transfer Case and Extension Case Assembly.>
9) Install the back-up light switch and neutral position switch. <Ref. to MT-38, INSTALLATION, Switches and Harness.>
10) Install the manual transmission assembly to vehicle. <Ref. to MT-30, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

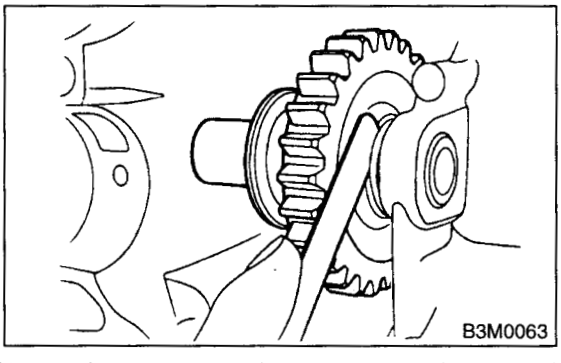
1) Move the reverse shifter rod toward the reverse side. Inspect the clearance between reverse idler gear and transmission case wall.
If out of specification, select the appropriate reverse shifter lever and adjust.

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)

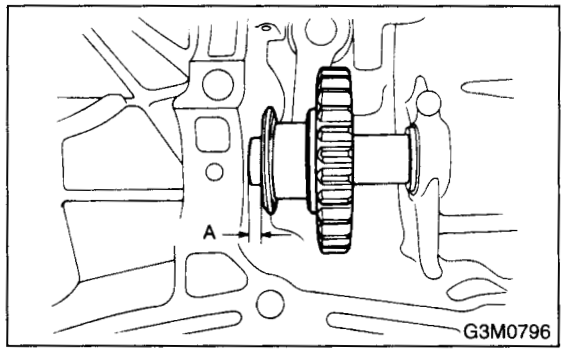


3) Check the reverse idler gear and shaft for damage. Replace if damaged.

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.

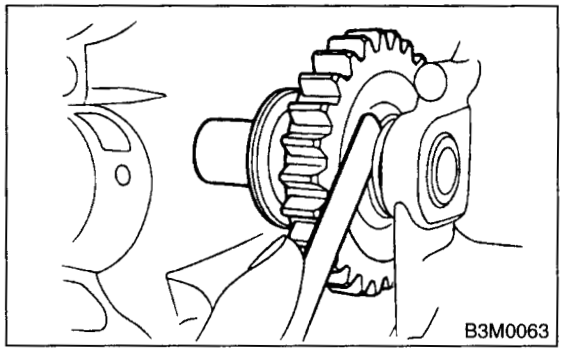
Clearance A:
6.0 — 7.5 mm (0.236 — 0.295 in)



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)

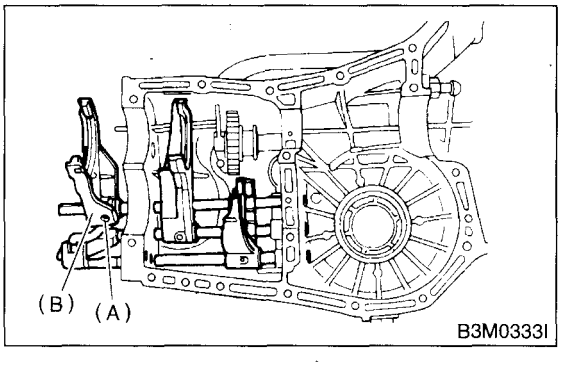


Washer	
Part No.	Thickness mm (in)
803020151	0.4 (0.016)
803020152	1.1 (0.043)
803020153	1.5 (0.059)
803020154	1.9 (0.075)
803020155	2.3 (0.091)

20.Shifter Fork and Rod

A: REMOVAL

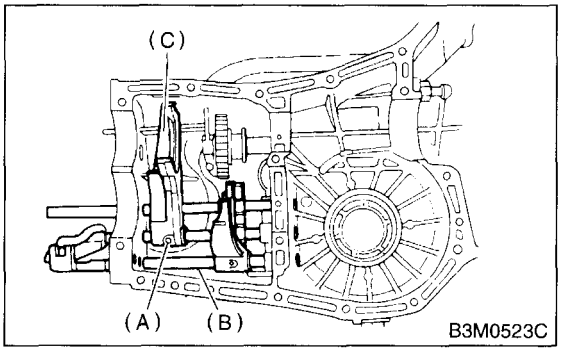
1) Remove the manual transmission assembly from vehicle. <Ref. to MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to MT-37, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly. <Ref. to MT-41, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the transmission case. <Ref. to MT-54, REMOVAL, Transmission Case.>
5) Removes the drive pinion shaft assembly. <Ref. to MT-63, REMOVAL, Drive Pinion Shaft Assembly.>
6) Remove the main shaft assembly.
<Ref. to MT-57, REMOVAL, Main Shaft Assembly for Single-Range.>
7) Remove the differential assembly. <Ref. to MT-71, 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 rod, keep other rods in neutral. Also, when pulling out straight pin, remove it toward the inside of the case so that it does not hit against the case.



(A) Straight pin
(B) 3-4 fork rod
(C) Shifter fork

11) Drive out the straight pin, and pull out the 1-2 fork rod and shifter fork.
12) Remove the outer snap ring, and pull out 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 reverse shifter rod arm, be careful not to let ball pop out of arm.

13) Remove the reverse shifter lever.

B: INSTALLATION

1) 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.

CAUTION:
Apply grease to plunger to prevent it from falling.

ST 399411700 ACCENT BALL INSTALLER
2) Position the ball, spring and gasket in reverse shifter rod hole, on left side transmission case, and tighten the checking ball plug.

CAUTION:
Replace gasket with a new one.

3) Install the 1-2 fork rod into 1-2 shifter fork via the hole on the rear of the transmission case.

4) Align the holes in rod and fork, and drive straight pin into these holes using ST.

CAUTION:
Replace straight pin with a new one.

NOTE:
- Set other rods to neutral.
- Make sure interlock plunger is on the 3-4 fork rod side.

ST 398791700 STRAIGHT PIN REMOVER

5) Install the interlock plunger onto 3-4 fork rod.

CAUTION:
Apply a coat of grease to plunger to prevent it from falling.

6) Install the 3-4 fork rod into 3-4 shifter fork via the hole on the rear of transmission case.

7) Align the holes in rod and fork, and drive straight pin into these holes.

CAUTION:
Replace straight pin with a new one.

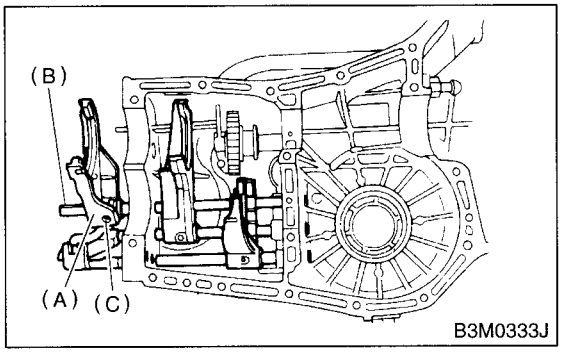
NOTE:
- Set the reverse fork rod to neutral.
- Make sure the interlock plunger (installing before) is on the reverse fork rod side.

ST 398791700 STRAIGHT PIN REMOVER

8) Install the 5th shifter fork onto the rear of reverse fork rod. Align the holes in the two parts and drive straight pin into place.

CAUTION:
Replace straight pin with a new one.

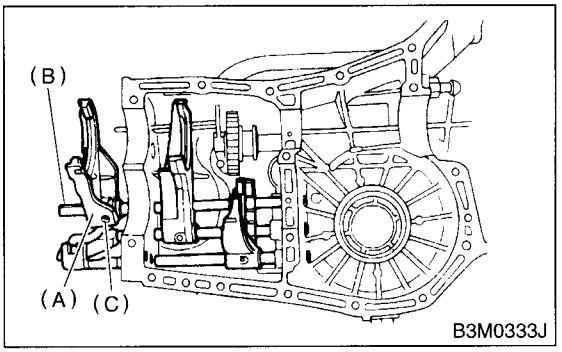
ST 398791700 STRAIGHT PIN REMOVER



(A) 5th shifter fork
(B) Reverse fork rod
(C) Straight pin

9) Position the balls, checking ball springs and gaskets into 3-4 and 1-2 rod holes, and install plugs.

CAUTION:
Replace gasket with a new one.



(A) 5th shifter fork
(B) Reverse fork rod
(C) Straight pin

10) Install the differential assembly. <Ref. to MT-71, INSTALLATION, Front Differential Assembly.>

11) Install the main shaft assembly.
Single-range model:
<Ref. to MT-57, INSTALLATION, Main Shaft Assembly for Single-Range.>

12) Install the drive pinion shaft assembly. <Ref. to MT-63, INSTALLATION, Drive Pinion Shaft Assembly.>

13) Install the transmission case. <Ref. to MT-55, INSTALLATION, Transmission Case.>

14) Install the transfer case with extension case assembly. <Ref. to MT-41, INSTALLATION, Transfer Case and Extension Case Assembly.>

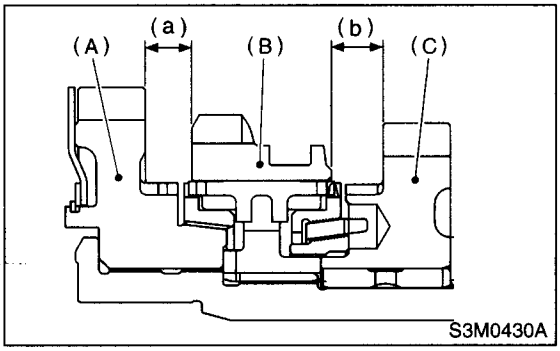
15) Install the back-up light switch and neutral position switch. <Ref. to MT-38, INSTALLATION, Switches and Harness.>

16) Install the manual transmission assembly to vehicle. <Ref. to MT-30, 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)

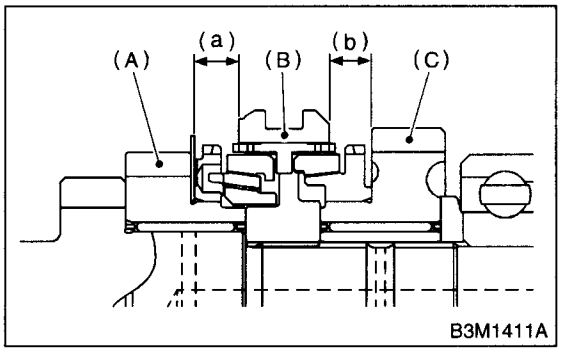


(A) 1st driven gear
(B) Reverse driven gear
(C) 2nd driven gear

1st-2nd shifter fork		
Part No.	Mark	Remarks
32804AA060	1	Approach to 1st gear by 0.2 mm (0.008 in).
32804AA070	—	Standard
32804AA080	3	Become distant 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 shifter fork as required.

Clearance (a) and (b):
9.3 mm (0.366 in)

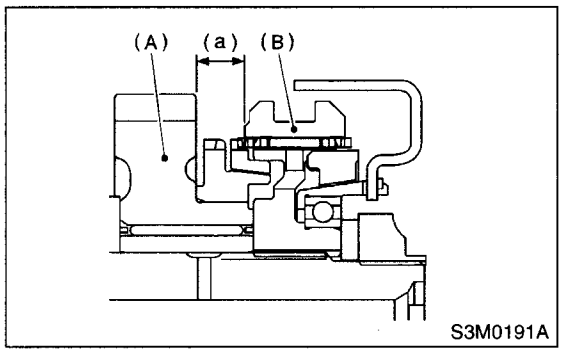


(A) 3rd drive gear
(B) Coupling sleeve
(C) 4th drive gear

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 distant 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 shifter fork as required.

Clearance (a):
9.3 mm (0.366 in)



(A) 5th drive gear
(B) Coupling sleeve

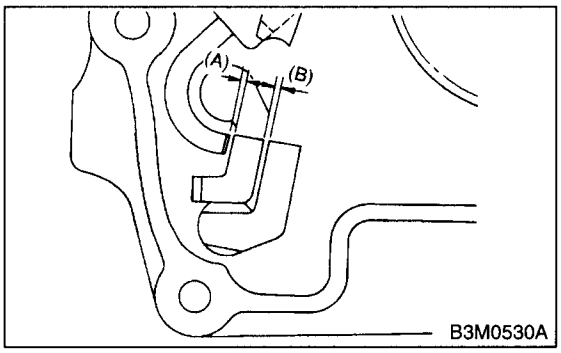
5th shifter fork (Non-turbo)		
Part No.	Mark	Remarks
32812AA201	4	Approach to 5th gear by 0.2 mm (0.008 in).
32812AA211	5	Standard
32812AA221	6	Become distant from 5th gear by 0.2 mm (0.008 in).

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)



21.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 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 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 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 bearing preload.
	(d) Loose roller bearing	Readjust 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

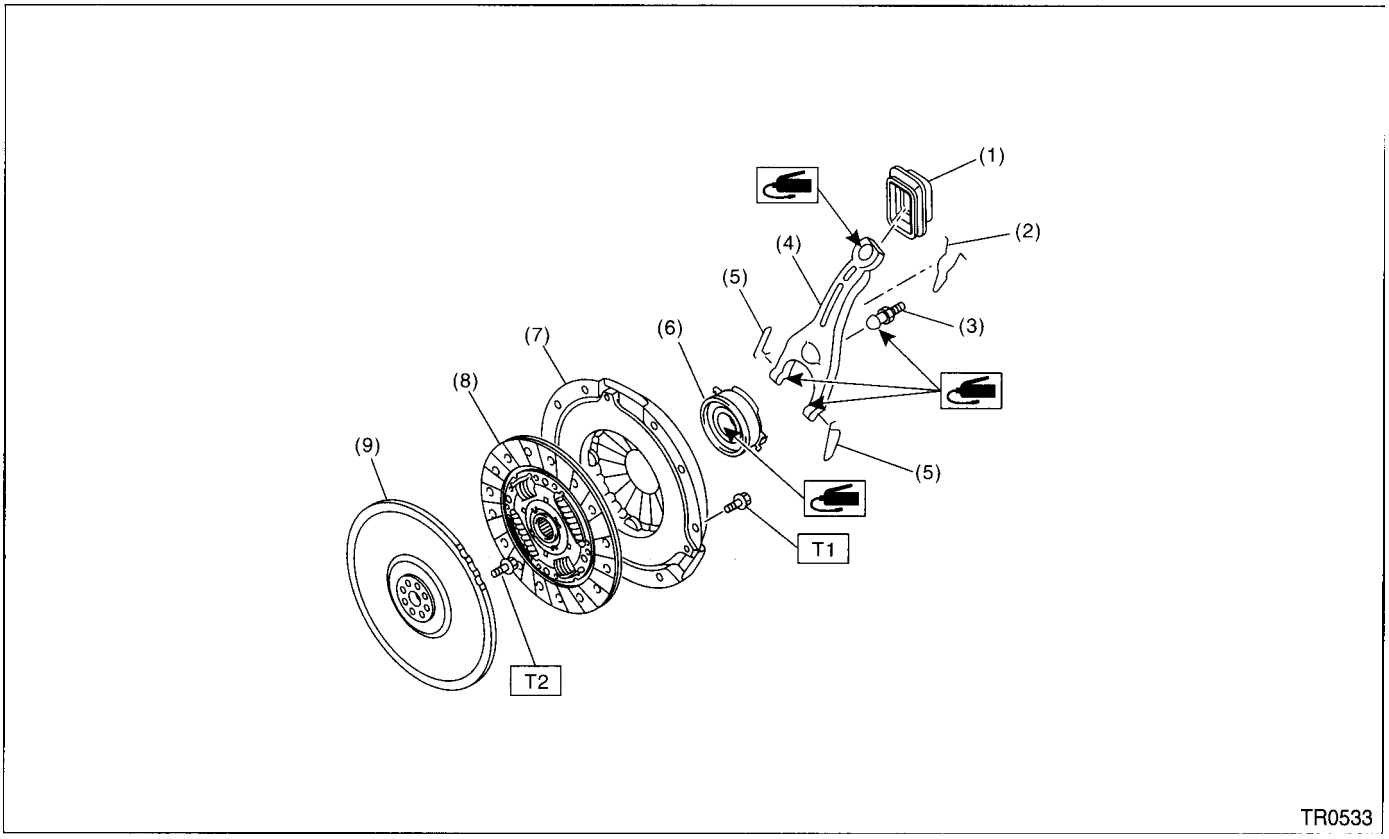
A: SPECIFICATIONS

Model			NON-TURBO	TURBO
Clutch cover	Type		Push type	Pull type
	Diaphragm set load	kg (lb)	580 (1,279)	830 (1,830)
Clutch disk	Facing material		Woven (Non asbestos)	
	O.D. x I.D. x thickness	mm (in)	225 x 150 x 3.5 (8.86 x 5.91 x 0.138)	230 x 150 x 3.5 (9.06 x 5.91 x 0.138)
	Spline O.D.	mm (in)	25.2 (0.992), (No. of teeth: 24)	
Clutch release lever ratio			1.6	1.7
Release bearing			Grease-packed self-aligning	
Clutch pedal	Full stroke	mm (in)	130 — 135 (5.12 — 5.31)	
	Free play	mm (in)	10 — 20 (0.39 — 0.79)	3 — 13 (0.12 — 0.51)
Clutch disk	Stroke	mm (in)	12 — 13.6 (0.473 — 0.535)	13.3 — 14.7 (0.524 — 0.579)
Clutch disk	Depth of rivet head mm (in)	Standard	1.3 — 1.9 (0.051 — 0.075)	
		Limit of sinking	0.3 (0.012)	
	Limit for deflection	mm (in)	1.0 (0.039) at R = 107 (4.21)	0.8 (0.031) at R = 110 (4.33)

I.D.: Inner diameter
O.D.: Outer diameter

B: COMPONENT

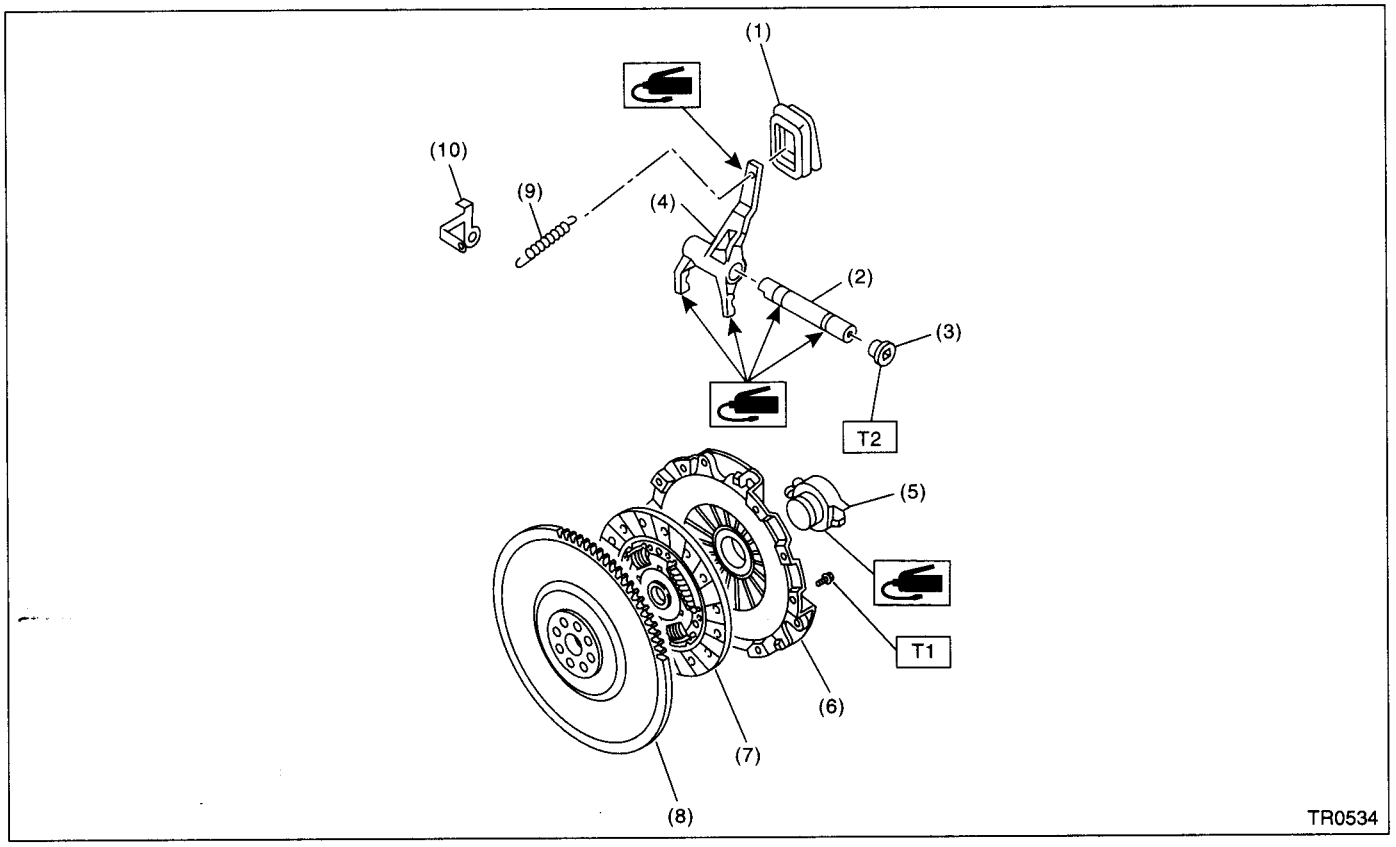
1. CLUTCH ASSEMBLY FOR NON-TURBO MODEL



(1) Clutch release lever sealing
(2) Retainer spring
(3) Pivot
(4) Release lever
(5) Clip
(6) Release bearing
(7) Clutch cover
(8) Clutch disc
(9) Flywheel

Tightening torque: N·m (kgf-m, ft-lb)
T1: 15.7 (1.6, 11.6)
T2: 72 (7.3, 52.8)

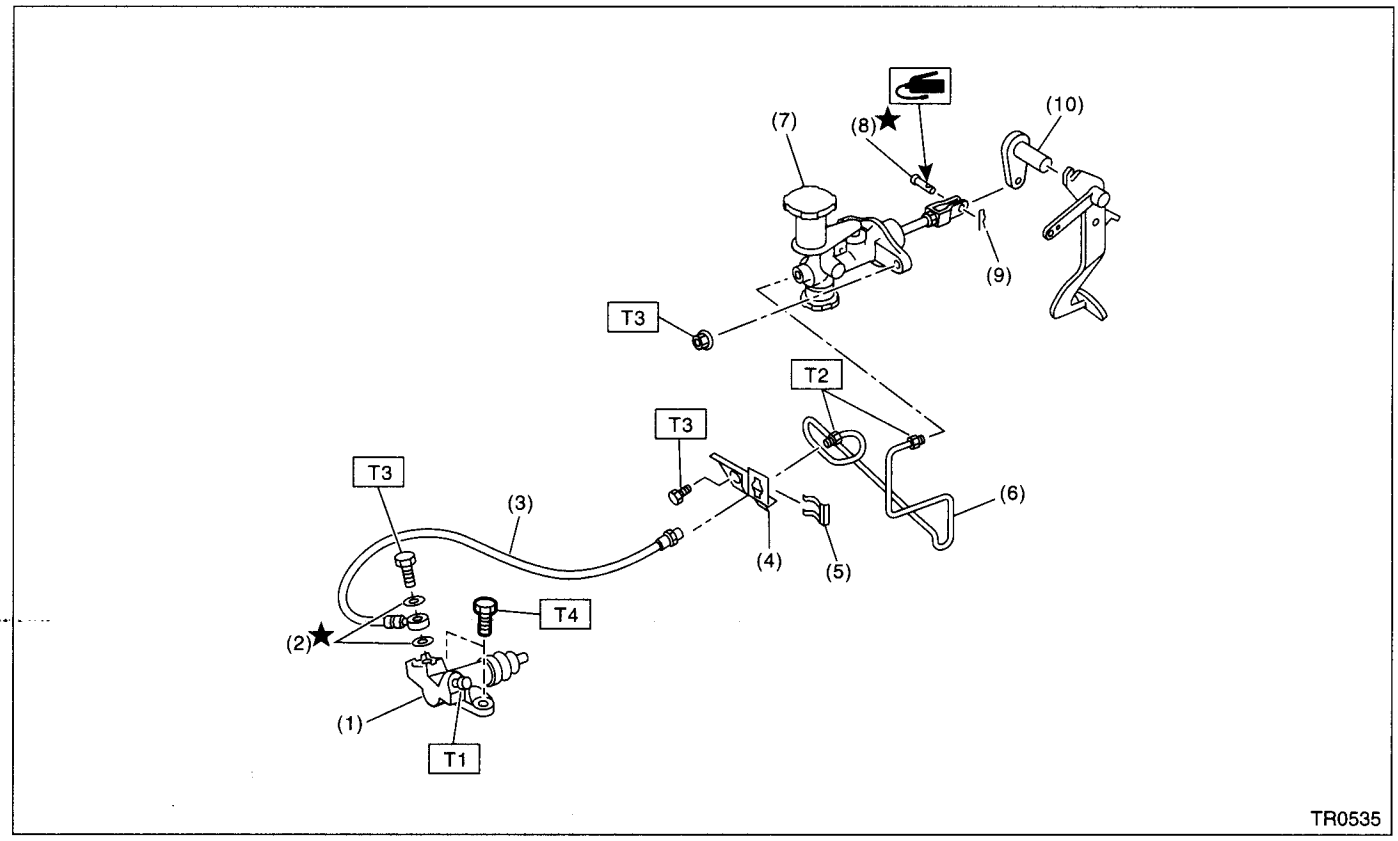
2. CLUTCH ASSEMBLY FOR TURBO MODEL



(1) Clutch release lever sealing
(2) Release lever shaft
(3) Plug
(4) Release lever
(5) Release bearing
(6) Clutch cover
(7) Clutch disc
(8) Flywheel
(9) Spring
(10) Bracket

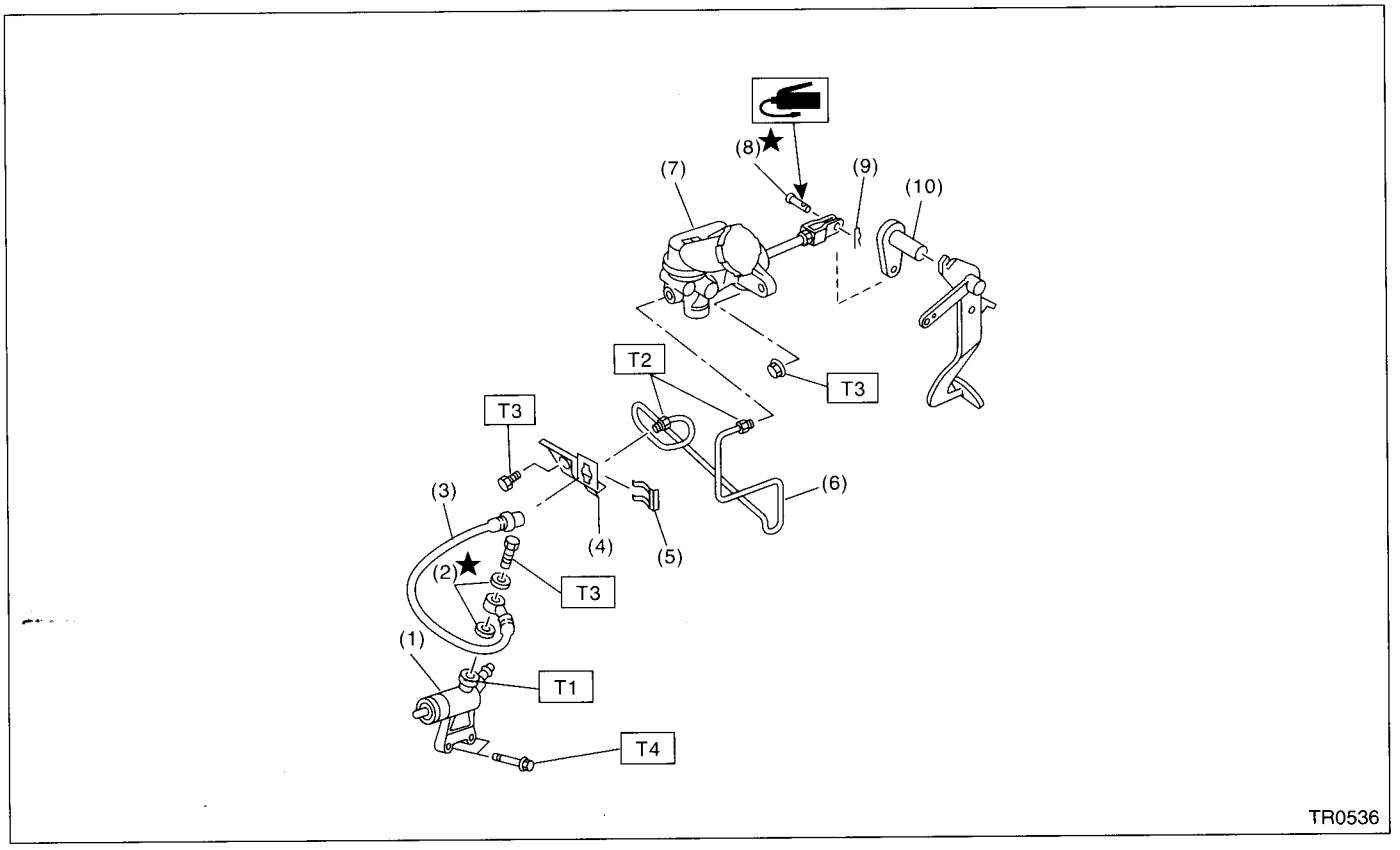
Tightening torque: N·m (kgf-m, ft-lb)
T1: 15.7 (1.6, 11.6)
T2: 44 (4.5, 32.5)

3. CLUTCH PIPE AND HOSE FOR NON-TURBO MODEL



(1)	Operating cylinder	(6)	Pipe	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	Washer	(7)	Master cylinder ASSY	***T1: 8 (0.8, 5.8)***
(3)	Clutch hose	(8)	Clevis pin	***T2: 15 (1.5, 11)***
(4)	Bracket	(9)	Snap pin	***T3: 18 (1.8, 13.0)***
(5)	Clip	(10)	Lever	***T4: 37 (3.8, 27.5)***

4. CLUTCH PIPE AND HOSE FOR TURBO MODEL

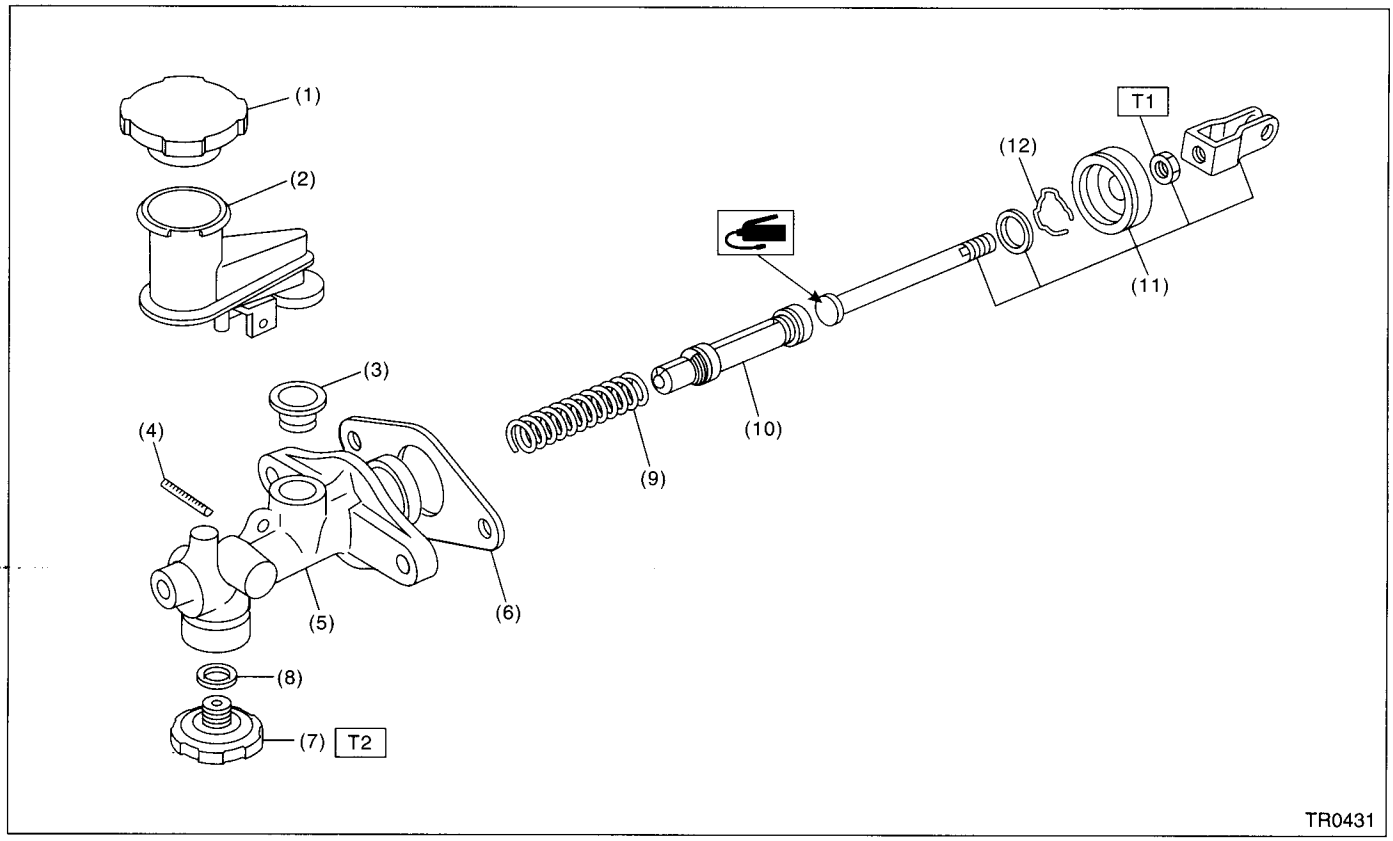


(1)	Operating cylinder	(6)	Pipe
(2)	Washer	(7)	Master cylinder ASSY
(3)	Clutch hose	(8)	Clevis pin
(4)	Bracket	(9)	Snap pin
(5)	Clip	(10)	Lever

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 15 (1.5, 11)
T3: 18 (1.8, 13.0)
T4: 37 (3.8, 27.5)

5. MASTER CYLINDER

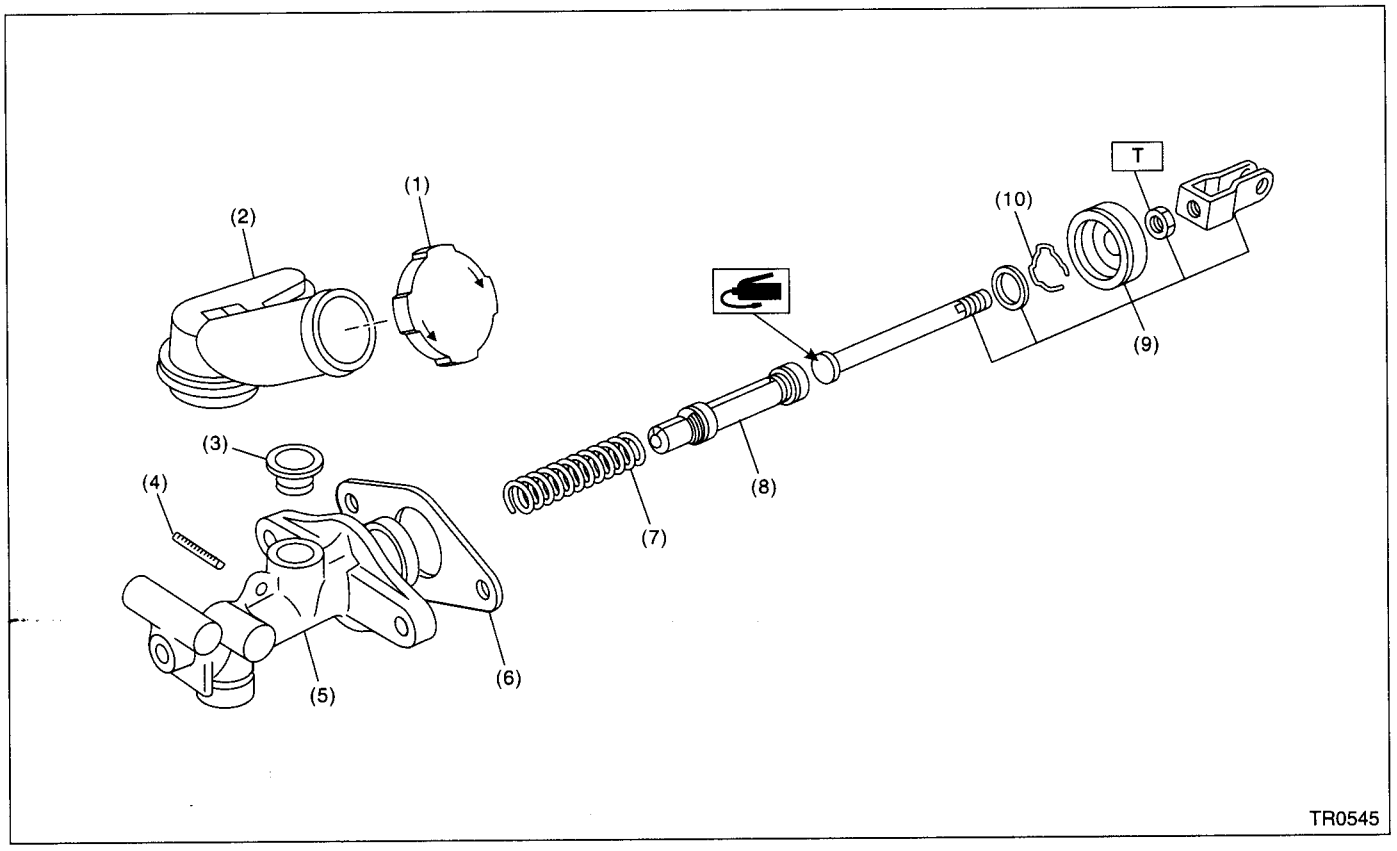
• NON-TURBO MODEL



(1) Reservoir cap
(2) Reservoir tank
(3) Oil seal
(4) Straight pin
(5) Master cylinder
(6) Seat
(7) Diaphragm spring
(8) Gasket
(9) Return spring
(10) Piston
(11) Push rod
(12) Piston stop ring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 10 (1.0, 7)
T2: 46.6 (4.75, 34.4)

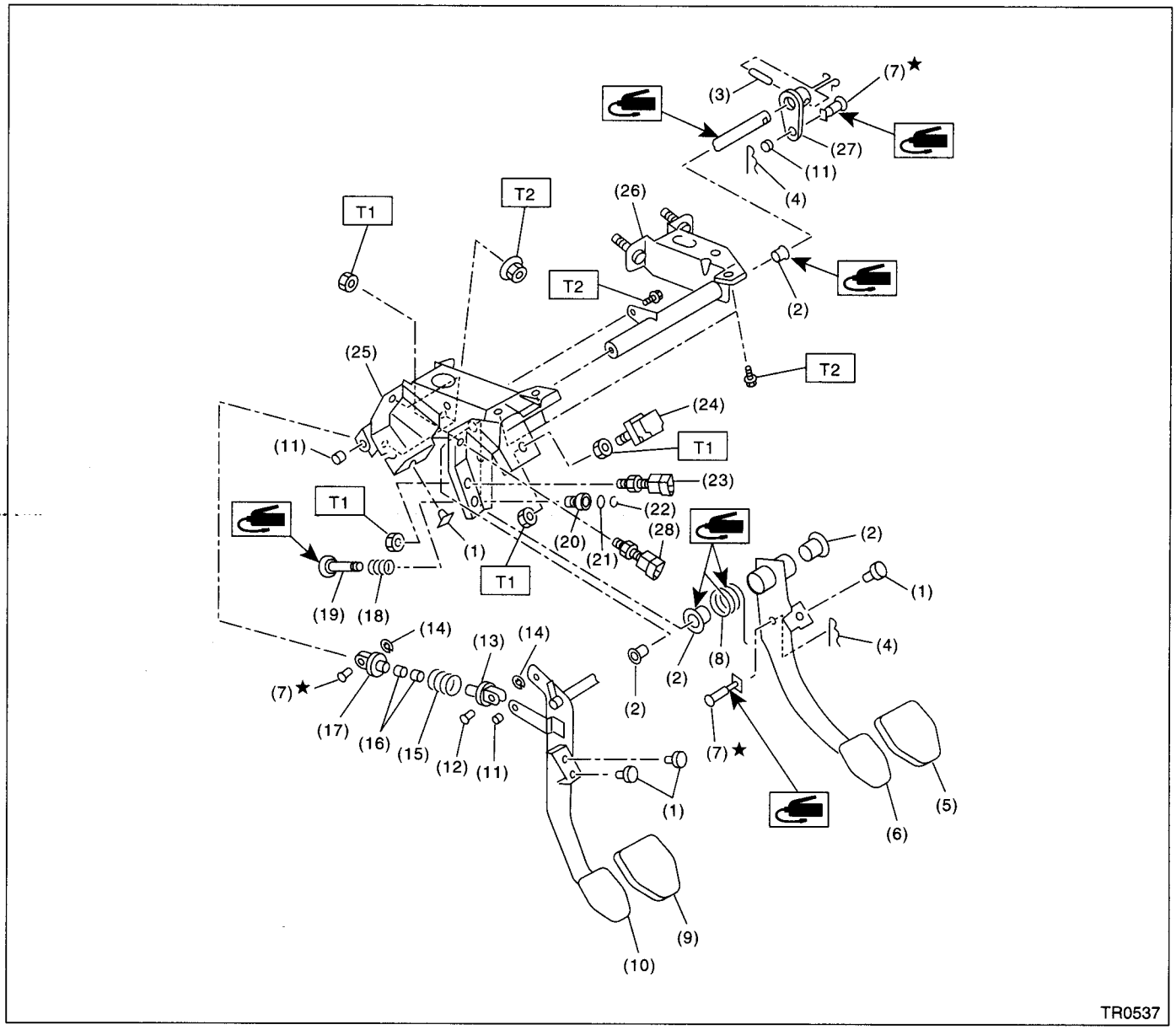
• TURBO MODEL



(1) Reservoir cap
(2) Reservoir tank
(3) Oil seal
(4) Straight pin
(5) Master cylinder
(6) Seat
(7) Return spring
(8) Piston
(9) Push rod
(10) Piston stop ring

Tightening torque: N·m (kgf-m, ft-lb)
T: 10 (1.0, 7)

6. CLUTCH PEDAL



(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) O-ring
(22) Clip
(23) Clutch switch (With cruise control)
(24) Stop light switch
(25) Pedal bracket
(26) Clutch master cylinder bracket
(27) Lever
(28) Clutch switch (Starter interlock)

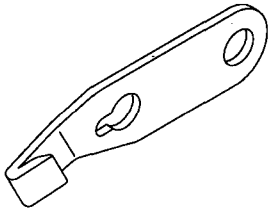
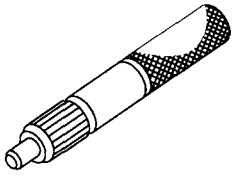
Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)
T3: 30 (3.1, 22.4)

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 vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.
- 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
 B2M3853	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening/tightening bolt, etc.
 B2M4112	499747100	CLUTCH DISC GUIDE	Used when installing clutch disc to flywheel.

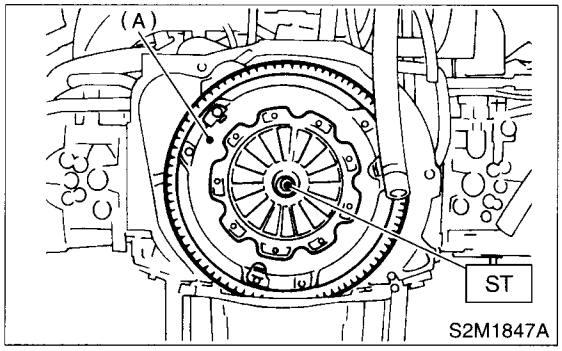
2. GENERAL PURPOSE TOOLS

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) Remove the transmission assembly from vehicle body. <Ref. to MT-27, REMOVAL, Manual Transmission Assembly.>
2) Install the ST on flywheel.
ST 499747100 CLUTCH DISC GUIDE



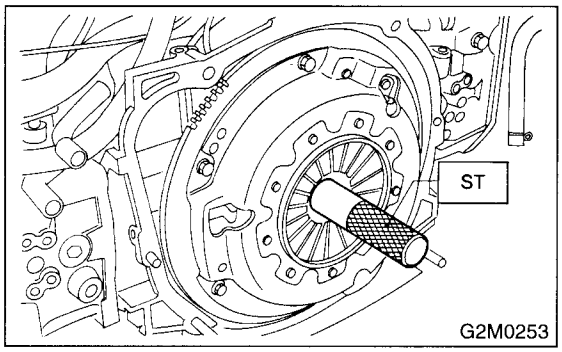
(A) Clutch cover

3) Remove the clutch cover and clutch disc.

CAUTION:
• Take care not to allow oil on the clutch disc facing.
• Do not disassemble either the clutch cover or clutch disc.

B: INSTALLATION

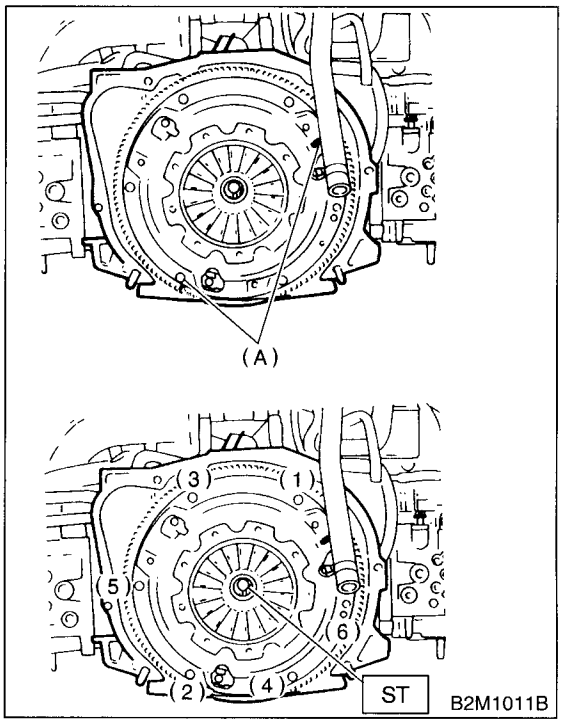
1) Insert the ST into the clutch disc and install them on the flywheel by inserting the ST end into the pilot bearing.
ST 499747100 CLUTCH DISC GUIDE



2) Install the clutch cover on flywheel and tighten bolts to the specified torque.

NOTE:
• When installing the clutch cover on the flywheel, position the clutch cover so that there is a gap of 120° or more between "0" marks on the flywheel and clutch cover. ("0" marks indicate the directions of residual unbalance.)
• Note the front and rear of the clutch disc when installing.
• Temporarily tighten the bolts by hand. Each bolt should be tightened to the specified torque in a crisscross method.

Tightening torque:
15.7 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-30, INSTALLATION, Manual Transmission Assembly.>

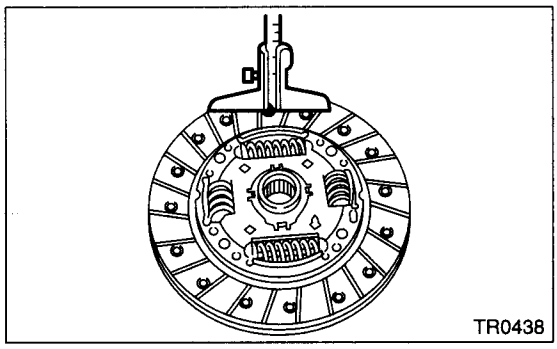
C: INSPECTION

1. CLUTCH DISC

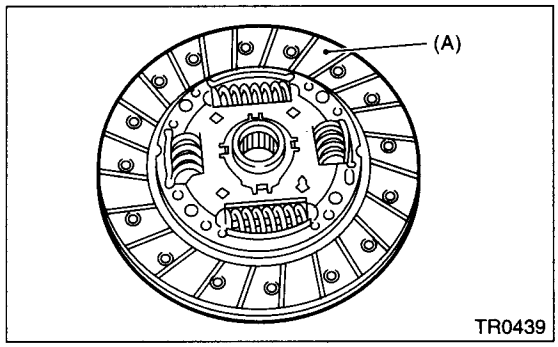
1) Facing wear:
Measure the depth of rivet head from the surface of facing. Replace if the facings are worn locally or worn down to less than the specified value.

Depth of rivet head:
Limit of sinking
0.3 mm (0.012 in)

CAUTION:
Do not wash the clutch disc with any cleaning fluid.



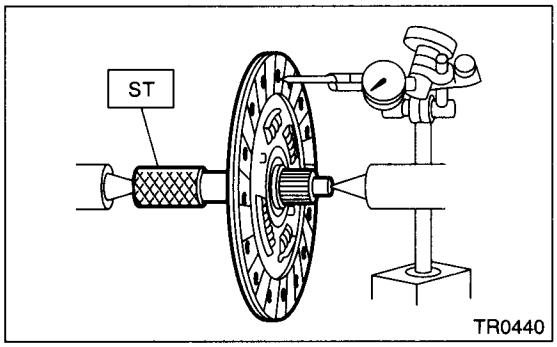
2) Hardened facing:
Correct by using emery paper or replace.
3) Oil soakage on facing:
Replace the clutch disc and inspect transmission front oil seal, transmission case mating surface, engine rear oil seal and other points for oil leakage.



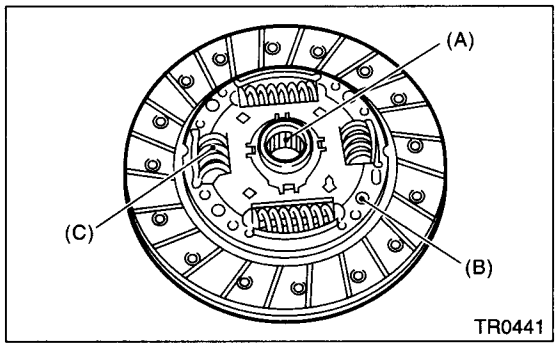
(A) Facing

4) Deflection on facing:
If deflection exceeds the specified value at the outer circumference of facing, repair or replace.
ST 499747100 CLUTCH DISC GUIDE

Limit for deflection:
Non-turbo model:
1.0 mm (0.039 in) at R = 107 mm (4.21 in)
Turbo model:
0.8 mm (0.031 in) at R = 110 mm (4.33 in)



5) Worn spline, loose rivets and torsion spring failure:
Replace defective parts.

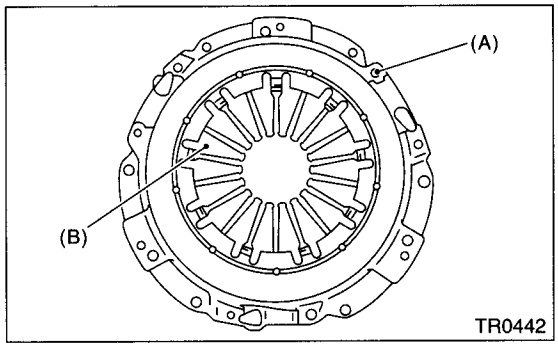


(A) Spline
(B) Rivet
(C) Torsion spring

2. CLUTCH COVER

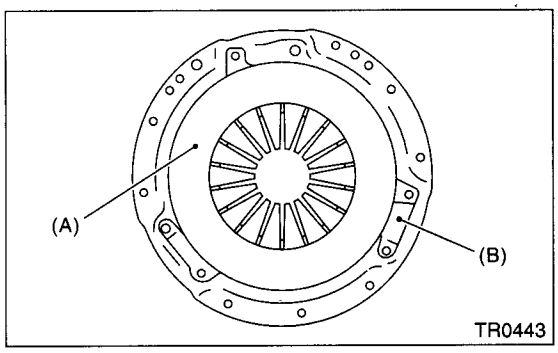
NOTE:
Visually check for the following items without disassembling, and replace or repair if defective.

1) Loose thrust rivet.
2) Damaged or worn bearing contact area at the center of diaphragm spring.



(A) Thrust rivet
(B) Diaphragm spring

3) Damaged or worn disc contact surface of pressure plate.
4) Loose strap plate setting bolt.
5) Worn diaphragm sliding surface.



(A) Pressure plate
(B) Strap plate

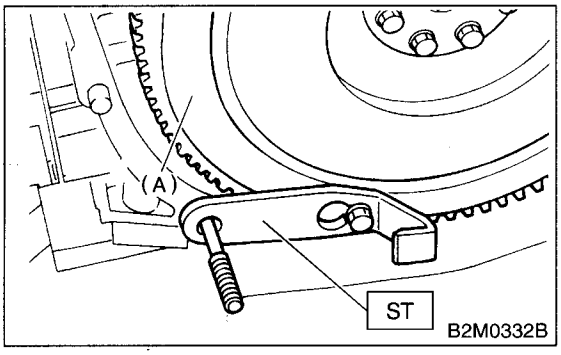
3. Flywheel

A: REMOVAL

1) Remove the transmission assembly. <Ref. to MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the clutch cover and clutch disc. <Ref. to CL-11, REMOVAL, Clutch Disc and Cover.>

CAUTION:
• Take care not to allow oil on the clutch disc facing.
• Do not disassemble either the clutch cover or clutch disc.

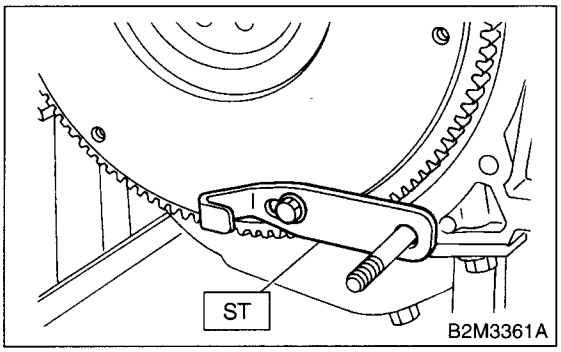
3) Using ST, remove the flywheel.
ST 498497100 CRANKSHAFT STOPPER



(A) Flywheel

B: INSTALLATION

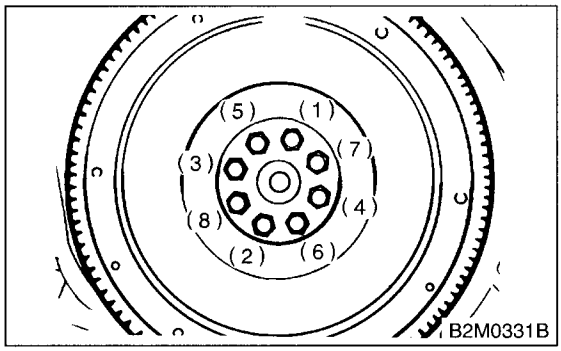
1) Install the flywheel and ST.
ST 498497100 CRANKSHAFT STOPPER



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 method.

Tightening torque:
72 N·m (7.3 kgf-m, 52.8 ft-lb)

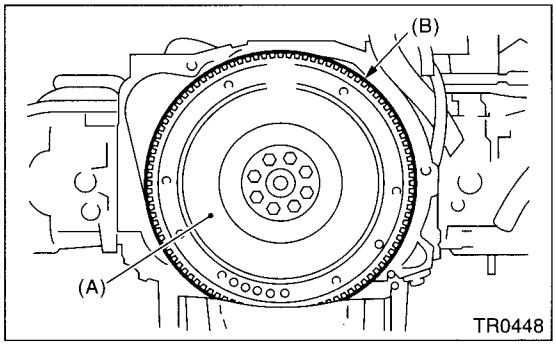


3) Install the clutch disc and cover. <Ref. to CL-11, INSTALLATION, INSTALLATION, Clutch Disc and Cover.>
4) Install the transmission assembly. <Ref. to MT-30, INSTALLATION, Manual Transmission Assembly.>

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.



(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

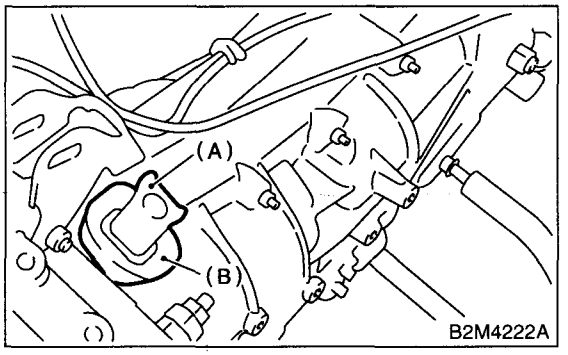
A: REMOVAL

1. NON-TURBO MODEL

1) Remove the transmission assembly from vehicle body.
<Ref. to MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the two clips from clutch release lever and remove the release bearing.

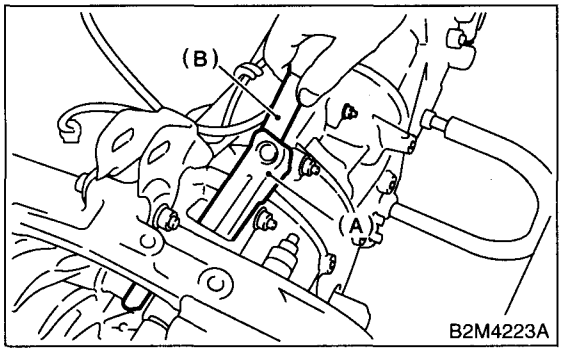
CAUTION:
Be careful not to deform the clips.

3) Remove the release lever seal.



(A) Clutch release lever
(B) Release lever seal

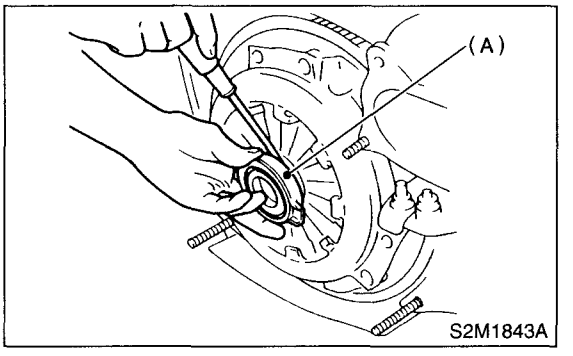
4) Remove the release lever retainer spring from release lever pivot with a screwdriver by accessing it through the clutch housing release lever hole. Then remove the release lever.



(A) Clutch release lever
(B) Screwdriver

2. TURBO MODEL

1) Remove the transmission assembly from vehicle body. <Ref. to MT-27, 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 clutch cover using a flat-type screwdriver.



(A) Clutch release bearing

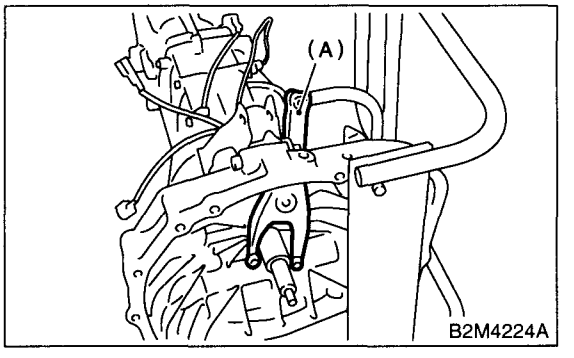
B: INSTALLATION

1. NON-TURBO MODEL

CAUTION:
Before or during assembling, lubricate the following points with a light coat of grease.
- **Contact surface of lever and pivot**
- **Contact surface of lever and bearing**
- **Transmission main shaft spline (Use grease containing molybdenum disulphide.)**
- **Contact surface of lever and operating cylinder**

1) While pushing the release lever to pivot and twisting it to both sides, fit the retainer spring onto the constricted portion of pivot.

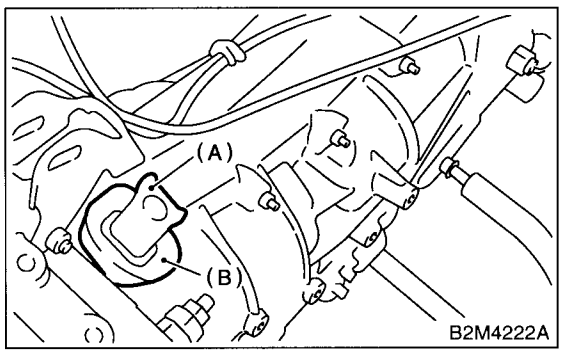
NOTE:
- Apply grease (SUNLIGHT 2: P/N 003602010) to the contact point of release lever and operating cylinder.
- Confirm that the retainer spring is securely fitted by observing it through the main case hole.



(A) Release lever

2) Install the release bearing and fasten it with two clips.

3) Install the release lever seal.

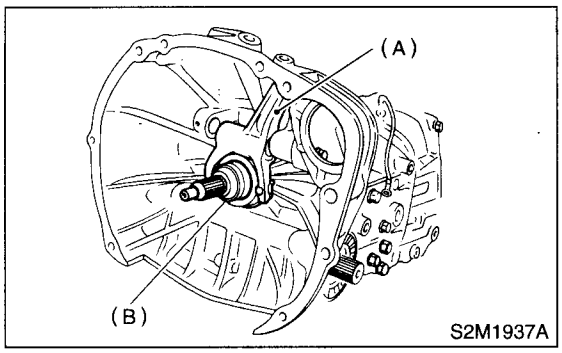


(A) Release lever
(B) Release lever seal

4) Install the transmission assembly.
<Ref. to MT-30, INSTALLATION, Manual Transmission Assembly.>

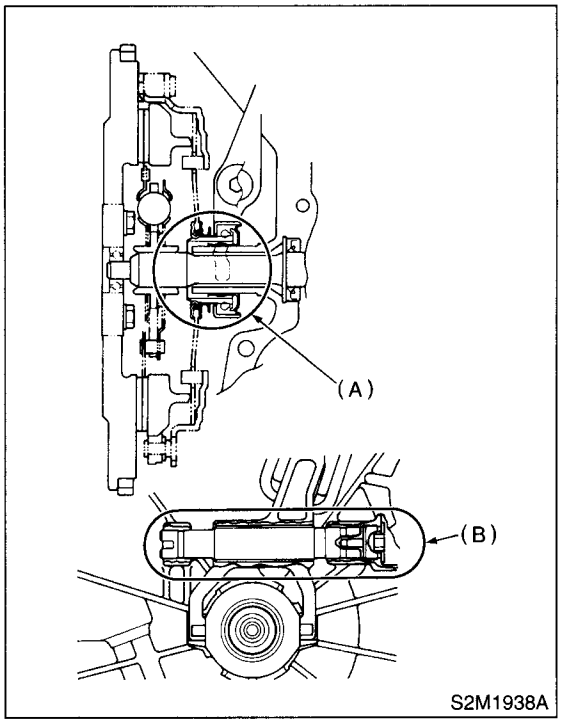
2. TURBO MODEL

1) Install the release bearing on transmission.
2) Insert the release fork into release bearing tab.



(A) Release fork
(B) Release bearing

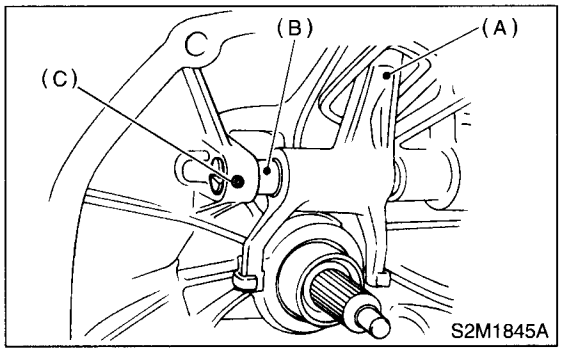
3) Apply grease to the specified points:
- Spline FX2200
- Shaft SUNLIGHT 2



(A) Spline (FX2200)
(B) Shaft (SUNLIGHT 2)

4) Insert the release fork shaft into release fork.

CAUTION:
Make sure the cutout portion of the release fork shaft contacts spring pin.



(A) Release fork
(B) Release shaft
(C) Spring pin

5) Install the transmission assembly. <Ref. to MT-30, INSTALLATION, Manual Transmission Assembly.>

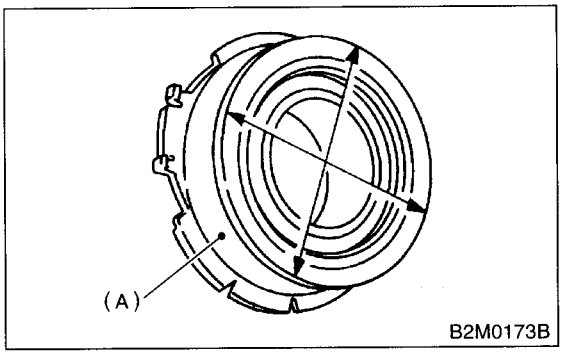
C: INSPECTION

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.

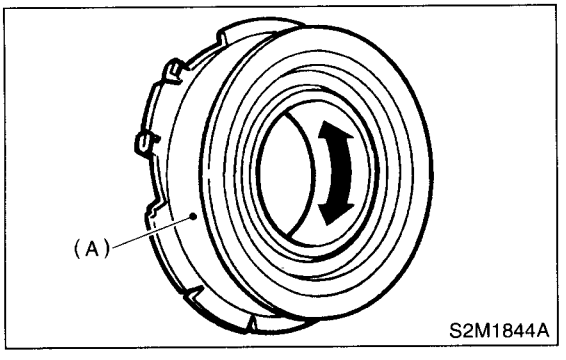
1) Check the bearing for smooth movement by applying force in the radial direction.

Radial direction stroke:
1.4 mm (0.055 in)



(A) Bearing case

2) Check the bearing for smooth rotation by applying pressure in the thrust direction.

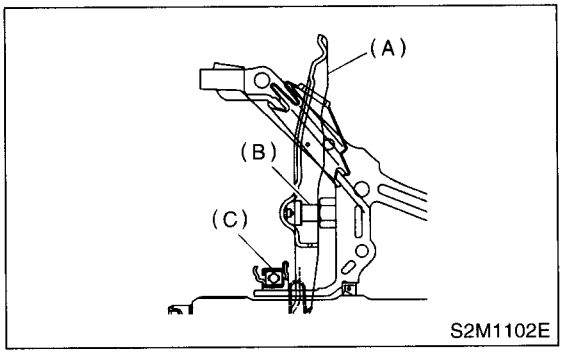


(A) Bearing case

3) Check wear and damage of 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

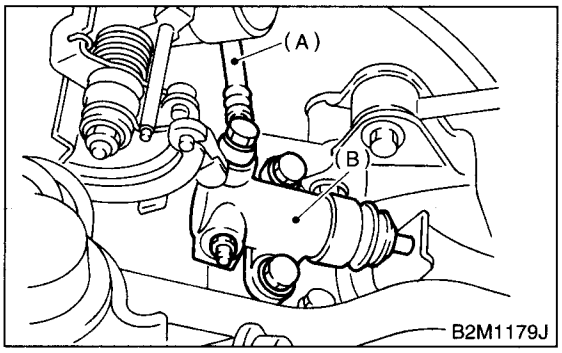
5. Operating Cylinder

A: REMOVAL

1) Remove the air cleaner case and air intake duct (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(DOHC TURBO)-10, REMOVAL, Intercooler.>
3) Remove the clutch hose from operating cylinder.

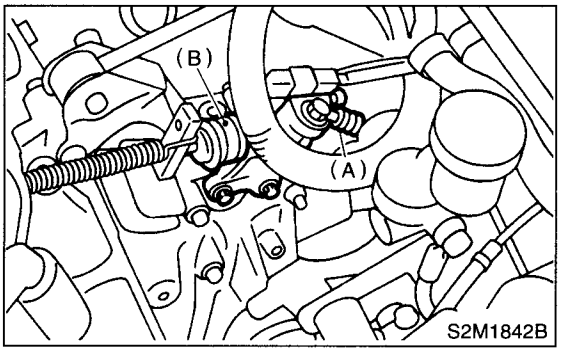
CAUTION:
Cover the hose joint to prevent clutch fluid from flowing out.

Non-turbo model



(A) Clutch hose
(B) Operating cylinder

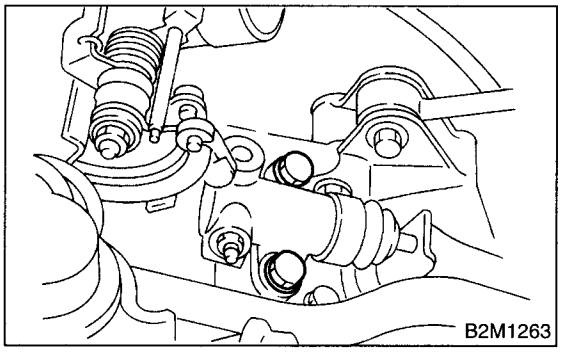
Turbo model



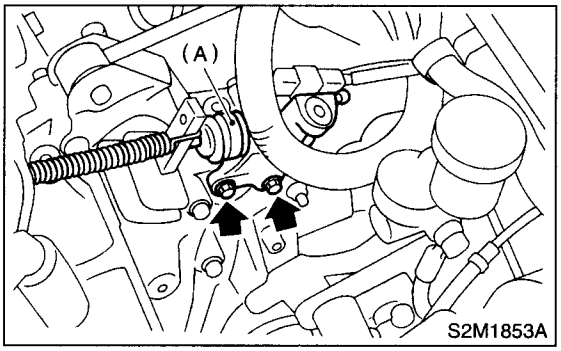
(A) Clutch hose
(B) Operating cylinder

4) Remove the operating cylinder from transmission.

Non-turbo model



Turbo model



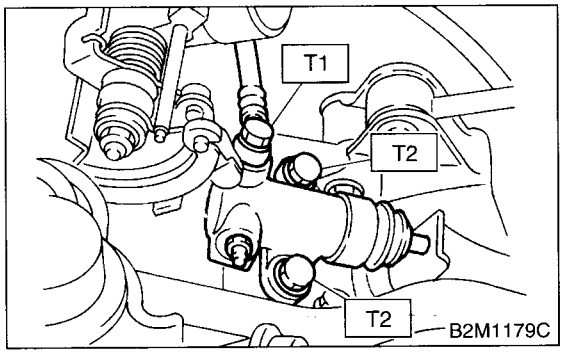
B: INSTALLATION

1) Install in the reverse order of removal.

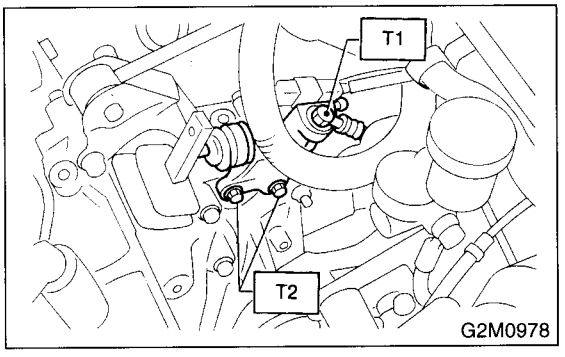
NOTE:
Before installing the operating cylinder, apply grease (SUNLIGHT 2: P/N 003602010) to the contact point of release lever and operating cylinder.

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)

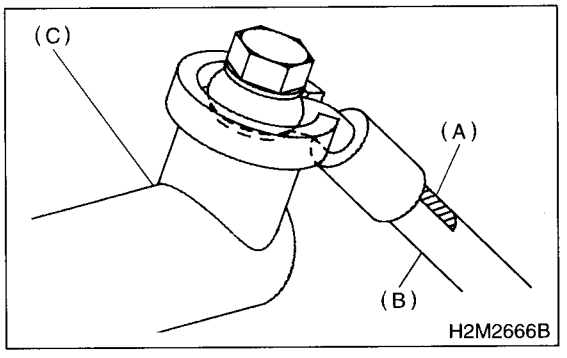
Non-turbo model



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

2) After bleeding air from the operating cylinder, ensure that the clutch operates properly.
<Ref. to CL-24, Clutch Fluid Air Bleeding.>

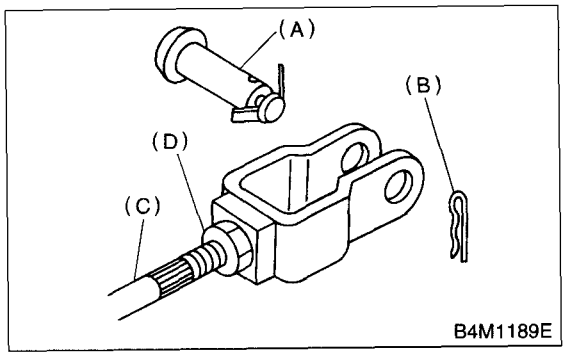
C: INSPECTION

1) Check the operating cylinder for damage. If the 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

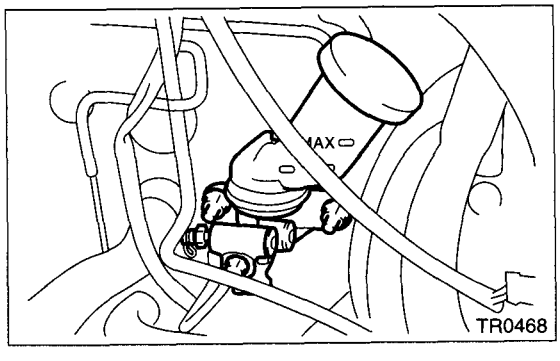
1) Thoroughly drain the brake fluid from reservoir tank.
2) Remove the snap pin, clevis pin and separate the push rod of master cylinder from clutch pedal.



(A) Clevis pin
(B) Snap pin
(C) Push rod
(D) Lock nut

3) Remove the air cleaner case and air intake duct (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(DOHC 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 the brake fluid. Brake fluid spilt on the vehicle body will harm the paint surface; wipe it off quickly if spilt.



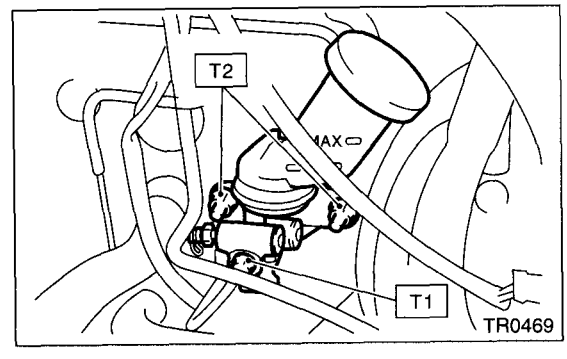
(A) Master cylinder
(B) Clutch pipe

B: INSTALLATION

1) Install the master cylinder to body, and install the clutch pipe to master cylinder.

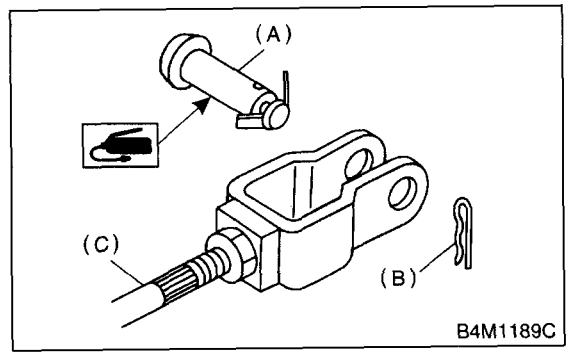
CAUTION:
Check that the pipe is routed properly.

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) Connect the push rod of master cylinder to clutch pedal, and install the clevis pin and snap pin.

NOTE:
Apply grease to the clevis pin.

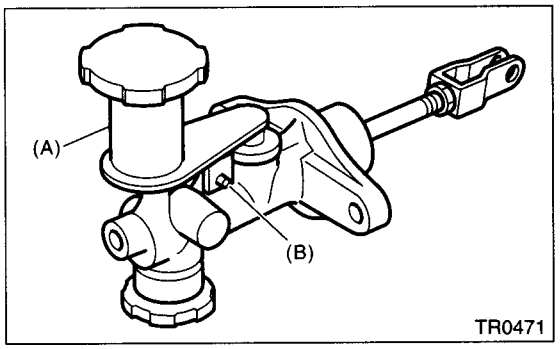


(A) Clevis pin
(B) Snap pin
(C) Push rod

3) After bleeding air from the system, ensure that the clutch operates properly.
<Ref. to CL-24, Clutch Fluid Air Bleeding.>
4) Install the air cleaner case and air intake duct (Non-turbo model). <Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.>
5) Install the intercooler (Turbo model). <Ref. to IN(DOHC TURBO)-11, INSTALLATION, Intercooler.>

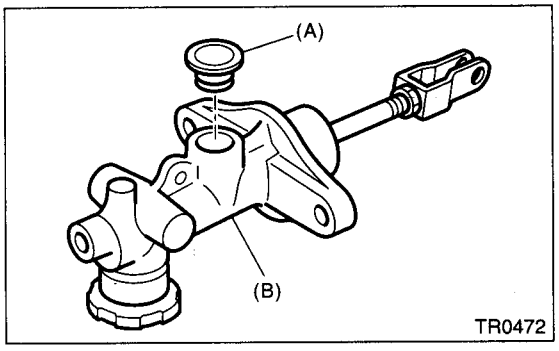
C: DISASSEMBLY

1) Remove the straight pin and reservoir tank.



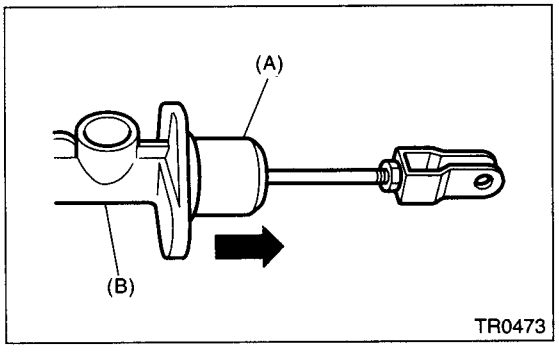
(A) Reservoir tank
(B) Straight pin

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.

5) Remove the clutch damper. (Non-turbo model)

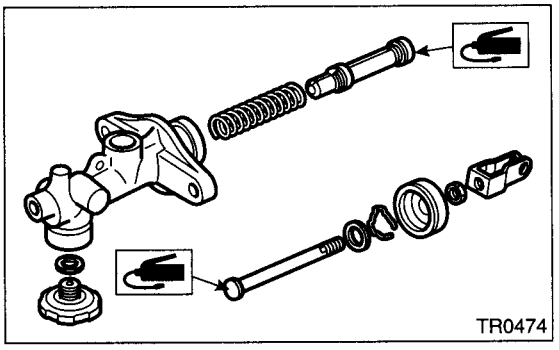
D: ASSEMBLY

1) Install the clutch damper. (Non-turbo model)

Tightening torque:
46.6 N·m (4.75 kgf-m, 34.4 ft-lb)

2) Apply a coat of grease to the contacting surfaces of the push rod and piston before installation.

Grease:
SILICONE GREASE G40M (Part No. 004404003)

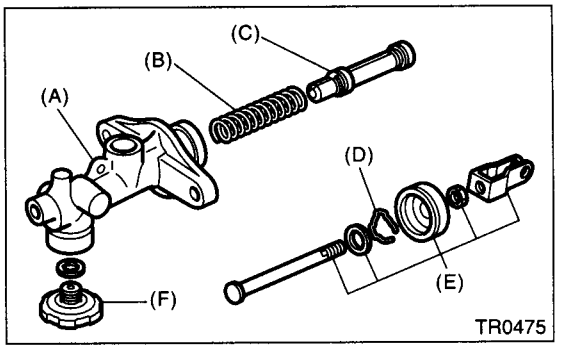


3) To assemble the master cylinder, reverse the sequence of disassembly procedure.

Tightening torque:
10 N·m (1.0 kgf-m, 7 ft-lb)

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, clutch damper and hose replace the faulty part.

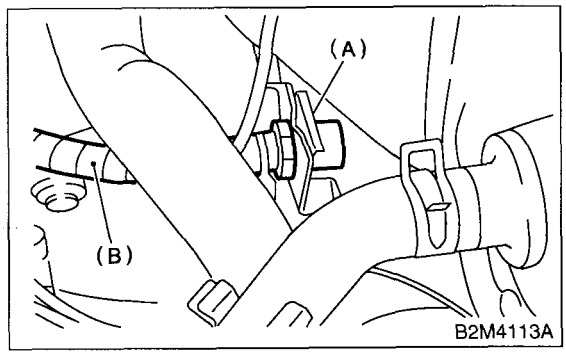


(A) Master cylinder body
(B) Return spring
(C) Piston
(D) Stop ring
(E) Rod ASSY
(F) Clutch damper (Non-turbo model)

7. Clutch Pipe and 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(DOHC TURBO)-10, REMOVAL, Intercooler.>
3) Drain the clutch fluid. <Ref. to CL-23, Clutch Fluid.>
4) Remove the clutch pipe from the clutch hose and master cylinder.
5) Pull out the clamp, then remove the clutch hose from bracket.



(A) Clamp
(B) Clutch hose

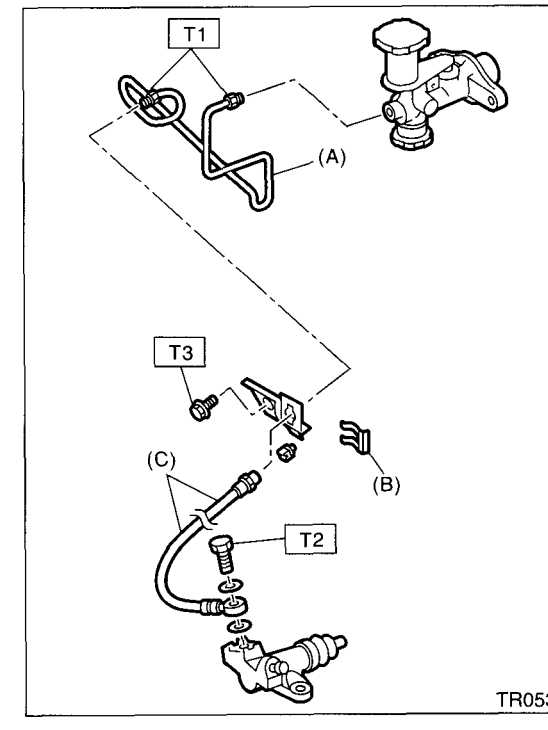
6) Remove the hose from operating cylinder.
7) Remove the bracket.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Bleed the clutch fluid. <Ref. to CL-24, Clutch Fluid Air Bleeding.>

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
(B) Clip
(C) Clutch hose

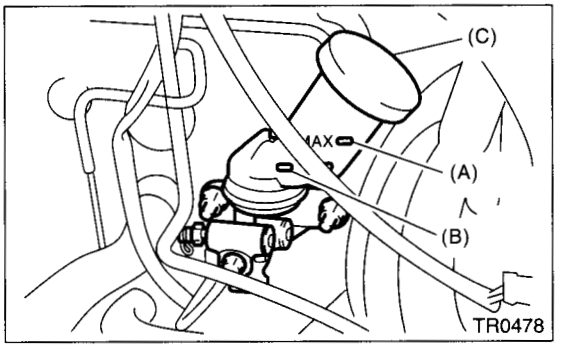
C: INSPECTION

Check pipes and hoses for cracks, breakage or damage. Check 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 the 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) Max. level
(B) Min. level
(C) Reservoir tank

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:
• During bleeding operation, keep the clutch reservoir tank filled with brake fluid to eliminate entry of air.
• Clutch pedal operating must be very slow.
• For convenience and safety, it is advisable to have two men working.
• The amount of brake fluid required is approximately 70 m ℓ (2.4 US fl oz, 2.5 Imp fl oz) for total clutch system.

1) Remove the air cleaner case and air duct.
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 recommended brake fluid.

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

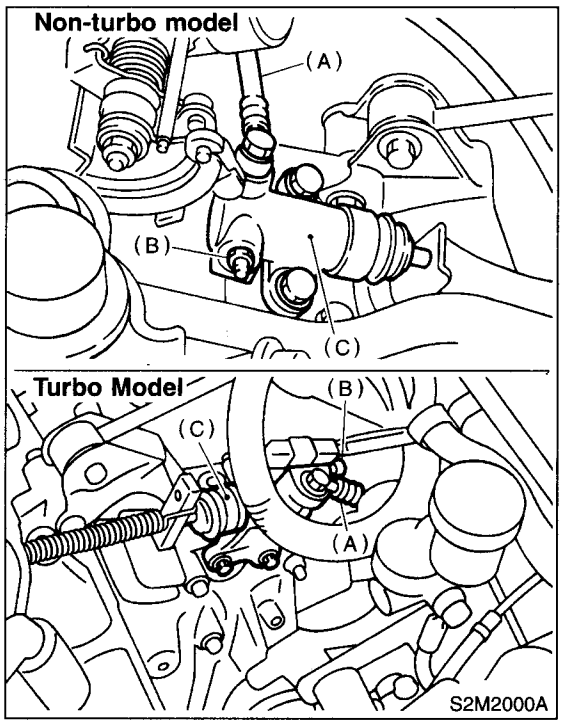
5) Drain fluid in the same method as the air bleeding.
6) Refill the brake fluid before reservoir tank becomes empty, and drain the contaminated fluid again.
7) Repeat the above procedure until the contaminated fluid is completely drained.

9. Clutch Fluid Air Bleeding

A: PROCEDURE

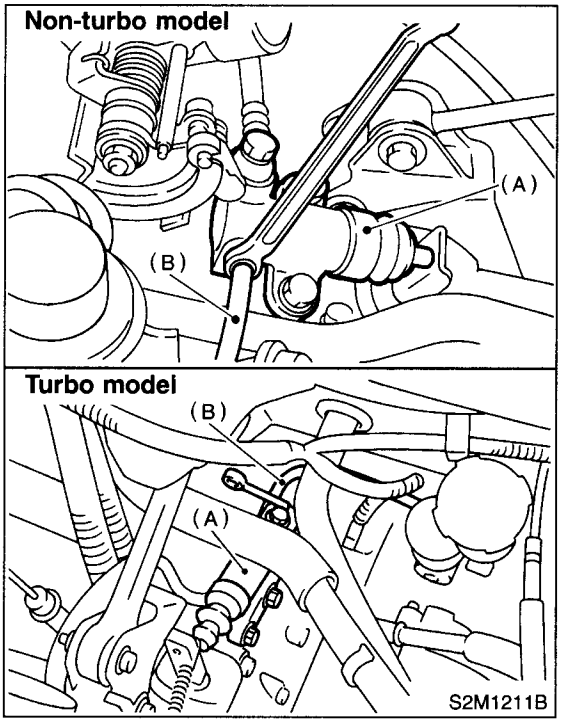
NOTE:
Bleed air from the oil line with the help of a co-worker.

1) Remove the air cleaner case and air intake duct. (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(DOHC TURBO)-10, REMOVAL, Intercooler.>
3) 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
(C) Operating cylinder

4) 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.



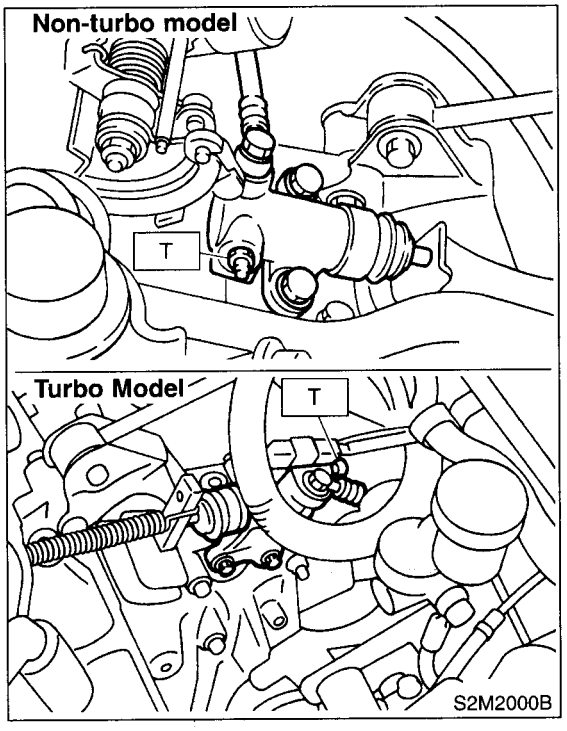
(A) Operating cylinder
(B) Vinyl tube

5) 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.

6) Tighten the air bleeder.

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



7) Repeat steps 2) through 4) using the air bleeder on operating cylinder.
8) Tighten the air bleeder.

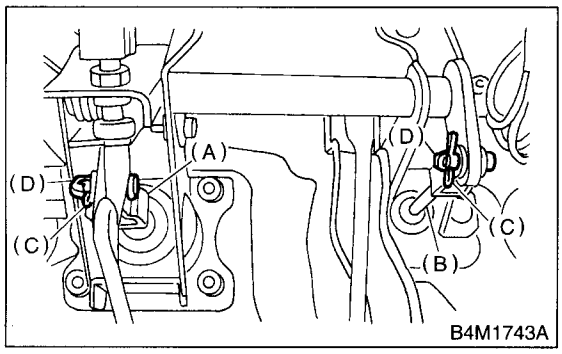
Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

9) After depressing the clutch pedal, make sure that there are no leaks evident in the entire system.
10) After bleeding air from the system, ensure that the clutch operates properly.

10.Clutch Pedal

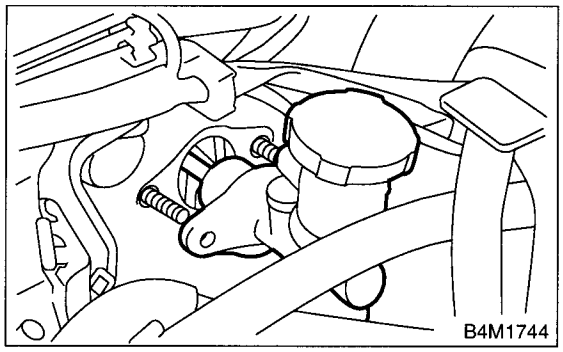
A: REMOVAL

1) Remove the steering column. <Ref. to PS-23, 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 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.>
6) Remove intercooler. (Turbo model) <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>
7) Remove the nut which secures clutch master cylinder.



8) Remove the bolts and nuts which secure brake and clutch pedals, and remove pedal assembly.

B: INSTALLATION

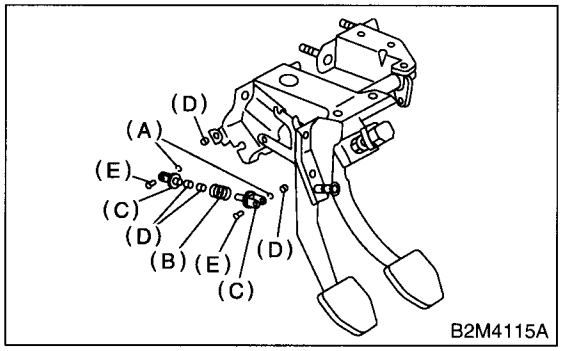
1) Install in the reverse order of removal.

CAUTION:
- **If the cable clamp is damaged, replace it with a new one.**
- **Never fail to cover outer cable end with boot.**
- **Be careful not to kink the accelerator cable.**
- **Always use a new clevis pins.**

2) Adjust the clutch pedal after installation.<Ref. to CL-27, ADJUSTMENT, Clutch Pedal.>

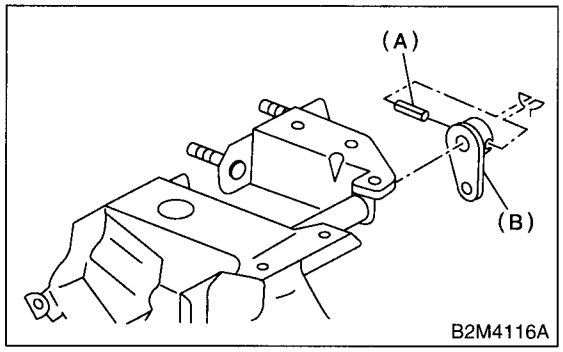
C: DISASSEMBLY

1) Remove the clutch switches.
2) Remove the clips, assist spring, rod and bushing.



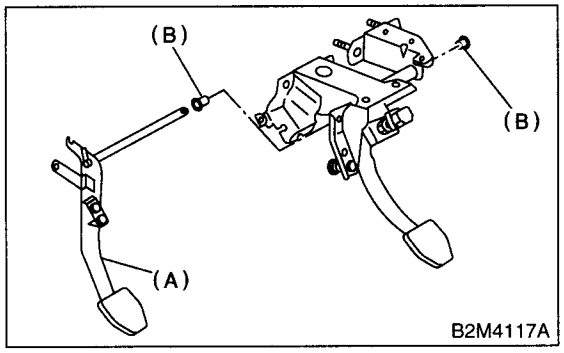
(A) Clip
(B) Assist spring
(C) Assist rod
(D) Bushing
(E) Clevis pin

3) Remove the spring pin and lever.



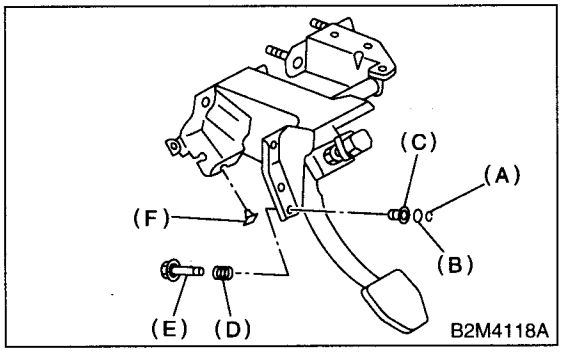
(A) Pin
(B) Lever

4) Remove the clutch pedal and bushings.



(A) Clutch pedal
(B) Bushing

5) Remove the stopper, clip, O-ring, rod S, and then remove the spring and bushing S.



(A) Clip
(B) O-ring
(C) Bushing S
(D) Spring S
(E) Rod S
(F) Stopper

6) Remove the stoppers from clutch pedal.
7) Remove the clutch pedal pad. (Non-turbo model)

D: ASSEMBLY

1) Attach the clutch switch, etc. to pedal bracket temporarily.
2) Clean the inside of bores of clutch pedal and brake pedal, apply grease, and set bushings into bores.
3) Align the bores of pedal bracket, clutch pedal and brake pedal, attach brake pedal return spring, assist rods, and spring, and bushing.

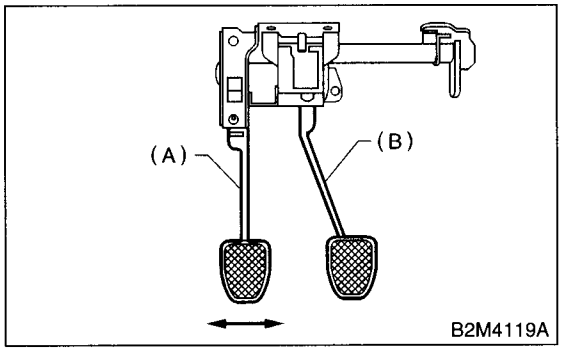
NOTE:
Clean up inside of bushings and apply grease before installing the spacer.

E: INSPECTION

Move the clutch pedal pads in the lateral direction with a force of approximately 10 N (1 kgf, 2 lb) to ensure the pedal deflection is in specified range.

CAUTION:
If excessive deflection is noted, replace the bushings with new ones.

Deflection of clutch pedal:
Service limit
5.0 mm (0.197 in) or less



(A) Clutch pedal
(B) Brake pedal

F: ADJUSTMENT

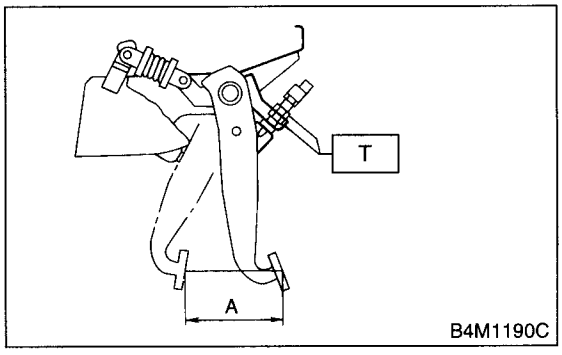
1) Turn the lock nuts until clutch pedal full stroke length is within specifications.

CAUTION:
Do not attempt to turn the clutch switch to adjust clutch pedal full stroke length.

NOTE:
If the lock nuts cannot adjust the clutch pedal full stroke length to specifications, turn the master cylinder push rod to adjust it.

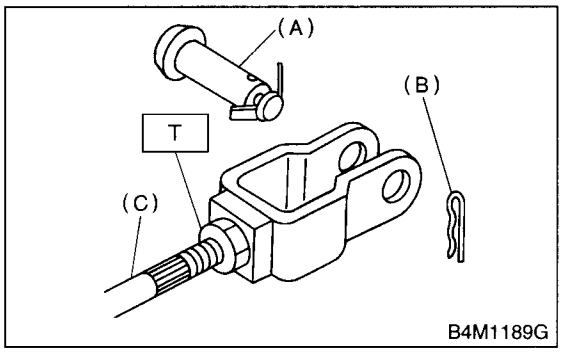
Specified clutch pedal full stroke: A
130 — 135 mm (5.12 — 5.31 in)

Tightening torque (Clutch switch lock nut):
T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)



2) Turn the master cylinder push rod so that the clevis pin moves to the left and then to the right. Clevis pin must move without resistance while it is rattling.

Tightening torque (Push rod lock nut):
T: 10 N·m (1.0 kgf-m, 7 ft-lb)



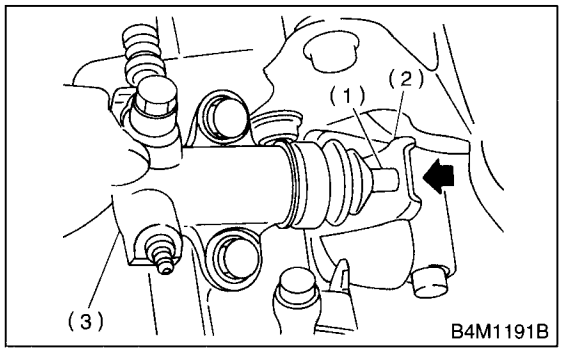
(A) Clevis pin
(B) Snap pin
(C) Push rod
(D) Lock nut

3) Depress and release the clutch pedal 2 to 3 times to ensure that the clutch pedal and release fork operates smoothly. If the clutch pedal and release fork do not operate smoothly, bleed air from the clutch hydraulic system. <Ref. to CL-24, Clutch Fluid Air Bleeding.>
4) Measure the clutch pedal full stroke length again to ensure that it is within specifications. If it is not, repeat adjustment procedures again from the beginning.

Specified clutch pedal full stroke:
130 — 135 mm (5.12 — 5.31 in)

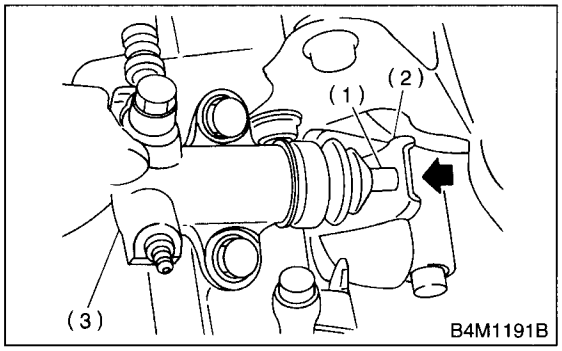
5) Move the clevis pin to the left and then to the right. It should move without resistance while it is rattling. If resistance is felt, repeat adjustment procedures again from the beginning.

6) Push the release lever until operating cylinder push rod retracts. Ensure that the clutch fluid level in reservoir tank increases. If the clutch fluid level increases, hydraulic clutch is properly adjusted; if fluid level does not increase or push rod does not retract, replace the master cylinder with a new one.<Ref. to CL-20, Master Cylinder.>



(1) Push rod
(2) Release lever
(3) Operating cylinder

7) Push the release lever until operating cylinder push rod retracts. Check that the clutch fluid level in reservoir tank increases.

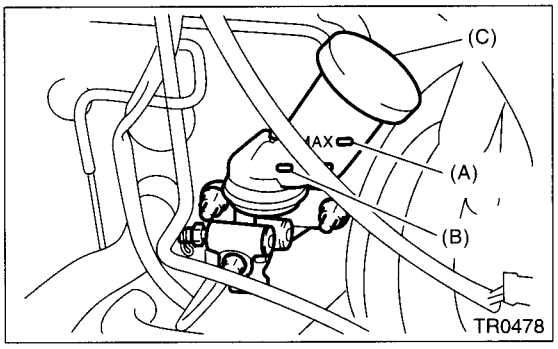


(1) Push rod
(2) Release lever
(3) Operating cylinder

8) If the clutch fluid level increases, hydraulic clutch play is correct.
9) If the clutch fluid level does not increase or push rod does not retract, clutch pedal must be readjusted.

10) Check the fluid level on the outside of the reservoir tank. If the level is below "MIN", add clutch fluid to bring it up to "MAX".

Recommended clutch fluid:
FMVSS No. 116, fresh DOT 3 or DOT 4 brake fluid



(A) Max. level
(B) Min. level
(C) Reservoir tank

11.Clutch Switch

A: REMOVAL

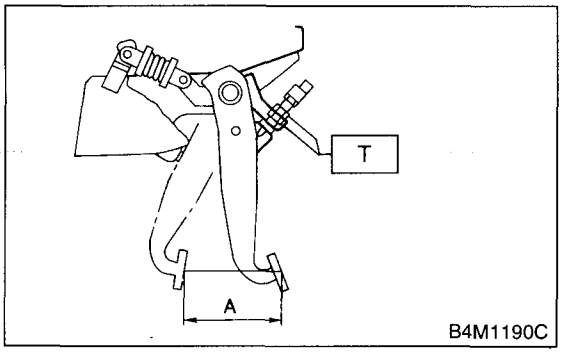
1) Disconnect the ground terminal from battery.
2) Disconnect the connector from clutch switch.
3) Remove the clutch switch.

B: INSTALLATION

1) Move the clevis pin of the push rod right and left and hold where it moves smoothly, then measure stroke of clutch pedal.

Specified clutch pedal full stroke:A
130 — 135 mm (5.12 — 5.31 in)

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

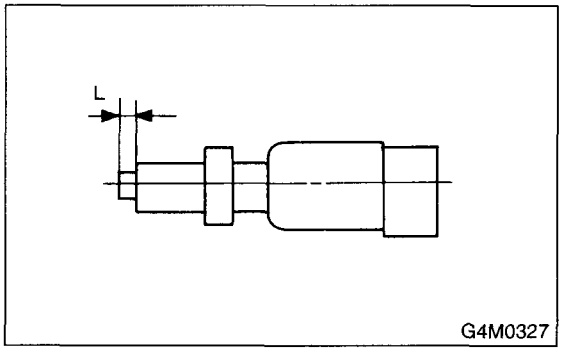


2) If the clutch pedal stroke is out of specification, adjust the stroke. <Ref. to CL-27, ADJUSTMENT, Clutch Pedal.>
3) Connect the clutch switch connector.

C: INSPECTION

1) If the clutch switch does not operate properly (or if it does not stop at the specified position), replace with a new one.

Specified position: L
$2^{+1.5}_{0}$mm ($0.079^{+0.059}_{0}$ in)

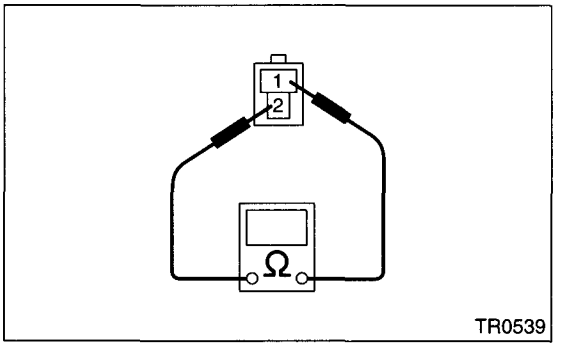


2) Check the clutch switch continuity. If continuity is not as specified, replace the switch.
(1) Disconnect the clutch switch connector.
(2) Measure the resistance between 1 and 2 of clutch switch terminal.

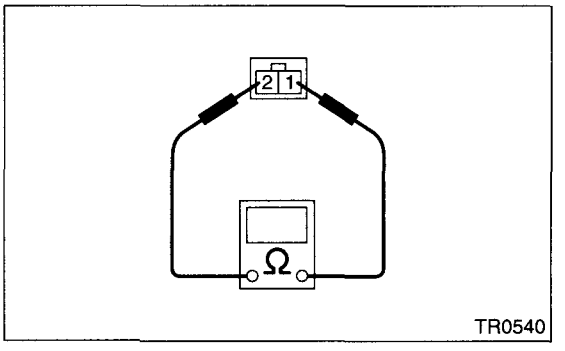
Terminals/Specified resistance
When clutch pedal depressed:
1 — 2/Less than 1Ω

Terminals/Specified resistance
When clutch pedal not depressed:
1 — 2/More than 1MΩ

Clutch switch (Starter interlock)



Clutch switch (With cruise control)



(3) If not as specified, replace the clutch switch.

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 speeds up when shifting. • High speeds 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 a 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-32, 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 clutch disc.
	(b) Excessive deflection of clutch disc facing	Correct or replace.
	(c) Seized crankshaft pilot needle bearing	Replace.
	(d) Cracked clutch disc facing	Replace.
	(e) Sticked 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 clutch disc.
	(b) Weak or broken torsion spring	Replace clutch disc.
	(c) Defective facing contact or excessive disc	Replace clutch disc defection.
	(d) Warped pressure plate or flywheel	Correct or replace.
	(e) Loose disc rivets	Replace clutch disc.
	(f) Loose engine mounting	Retighten or replace 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 release bearing.
	(b) Insufficient lubrication of pilot bearing	Apply grease.
	(c) Loose clutch disc hub	Replace clutch disc.
	(d) Loose torsion spring retainer	Replace clutch disc.
	(e) Deteriorated or broken torsion spring	Replace 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 clutch disc.
	(b) Deteriorated cushioning spring	Replace clutch disc.
	(c) Worn or rusted spline of clutch disc or main shaft	Take off rust, apply grease or replace clutch disc or main shaft.
	(d) Deteriorated or broken torsion spring	Replace clutch disc.
	(e) Loose engine mounting	Retighten or replace 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 bushing and/or shaft with new one.

3. DIAGNOSTIC DIAGRAM OF CLUTCH DRAG

	Step	Check	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?	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?	Go to step **3.**	Defective transmission or excessive clutch drag torque. Inspect 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?	Defect in clutch disengaging. Inspect clutch disc, clutch cover, clutch release, and clutch pedal free play.	Clutch and flywheel seizure. Inspect clutch disc, spline of clutch disc hub.

CHASSIS SECTION

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

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.

G1830BE5

FRONT SUSPENSION

FS

		Page
1.	General Description	2
2.	Wheel Alignment	8
3.	Sub Frame	16
4.	Front Transverse Link	17
5.	Front Ball Joint	19
6.	Front Strut	20
7.	Front Stabilizer	24
8.	Front Crossmember	25
9.	General Diagnostic Table	26

1. General Description

A: SPECIFICATIONS

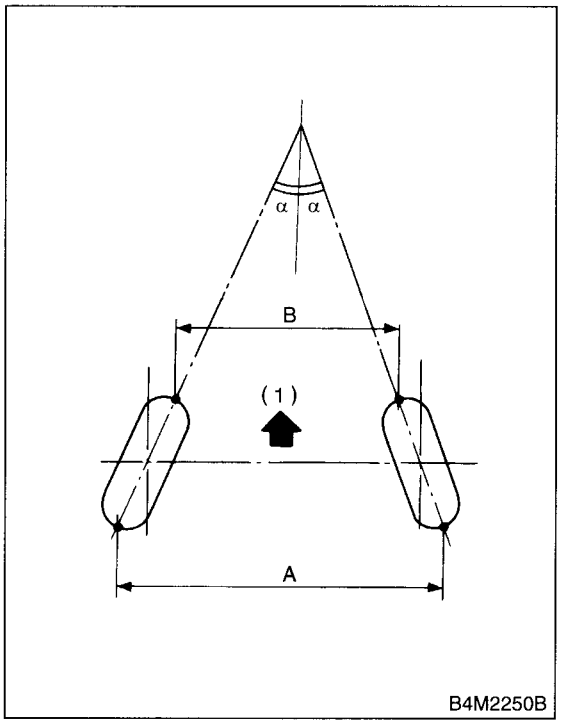
1. STABILIZER

Model	Bar diameter.
ALL MODEL	20 mm (0.79 in)

2. WHEEL ALIGNMENT

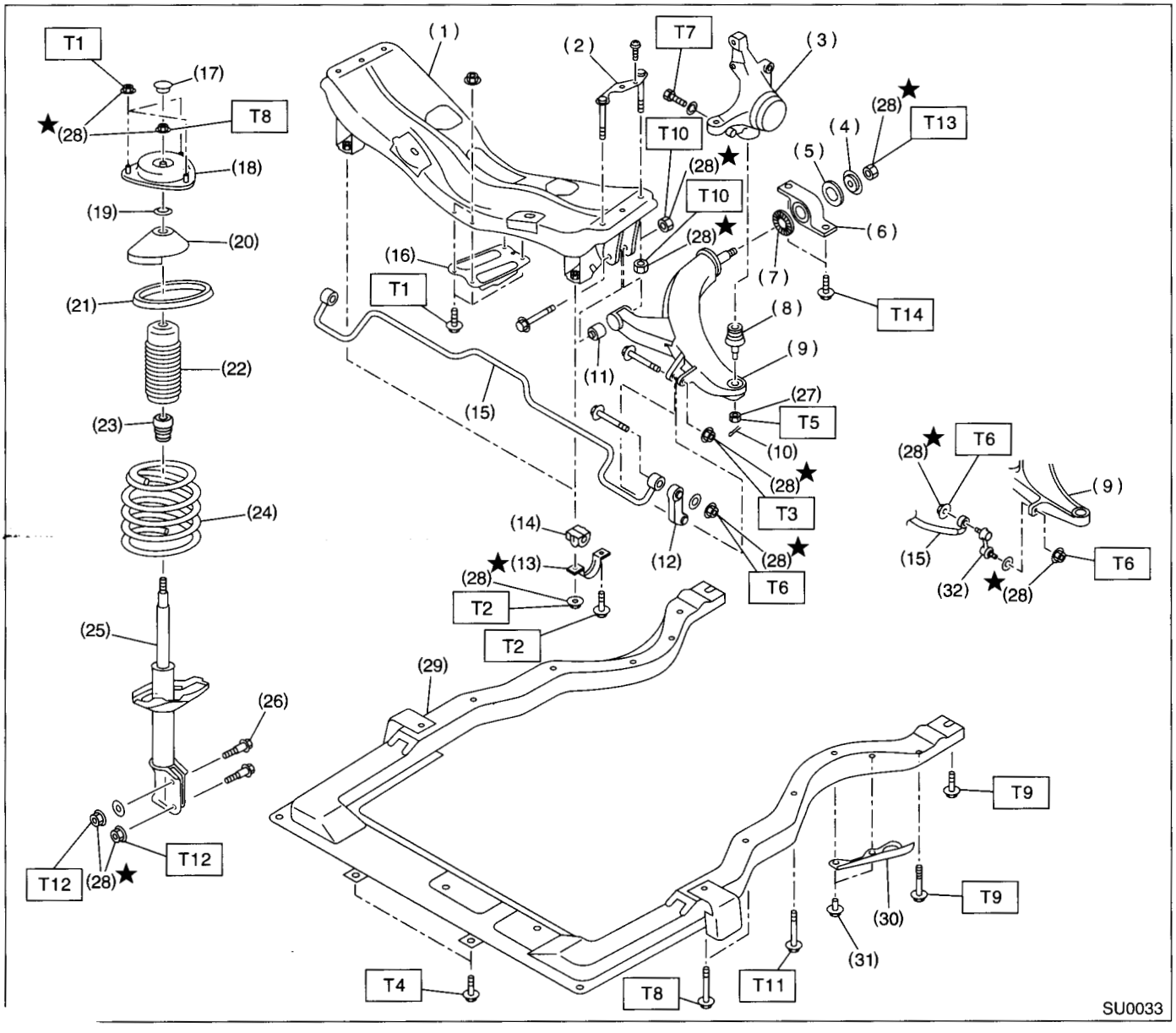
Model	Sedan		Wagon		OUTBACK
	Turbo	Non-turbo	Turbo	Non-turbo	
Camber (tolerance: ±0°45′)	–0°25′	–0°15′	–0°20′	–0°10′	–0°05′
Caster (common difference: ±0°45′)	3°35′	3°25′	3°35′	3°25′	3°25′
Toe-in	0±3 mm (0±0.12 in) Each toe angle: ±0°07′30" (Total toe angle: ±0°15′)				
Kingpin angle (tolerance: ±0°45′)	14°35′	14°20′	13°45′	13°30′	13°20′
Wheel arch height [tolerance: ±12 mm (±0.47 in)]	396 mm (15.59 in)	406 mm (15.98 in)	387 mm (15.24 in)	397 mm (15.63 in)	402 mm (15.83 in)

NOTE:
- Front and rear toe-ins and front camber can be adjusted. If the 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
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T12
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T12
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(31)
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T6
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(28)
T6
SU0033

(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 (Except sedan turbo model)
(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
(32) Stabilizer link (Sedan turbo model)

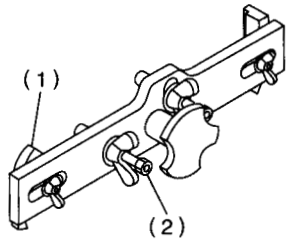
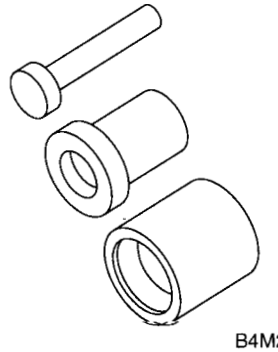
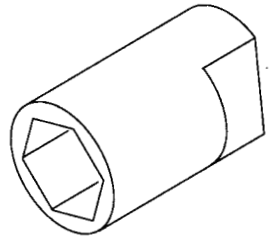
Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*20 (2.0, 14.5)*
T2:	*25 (2.5, 18.1)*
T3:	*30 (3.1, 22)*
T4:	*34 (3.5, 25)*
T5:	*40 (4.1, 30)*
T6:	*45 (4.6, 33)*
T7:	*50 (5.1, 37)*
T8:	*55 (5.6, 41)*
T9:	*71 (7.2, 52)*
T10:	*100 (10.2, 74)*
T11:	*<Ref. to FS-17, INSPECTION, Sub Frame.>*
T12:	*175 (17.8, 129)*
T13:	*190 (19.4, 140)*
T14:	*250 (25.5, 184)*

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 vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2378A	927380002	ADAPTER	Used as an adapter for camber & caster gauge when measuring camber and caster. (1) 28199AC000 PLATE (2) 28199AC010 BOLT
 B4M2385	927680000	INSTALLER & REMOVER SET	Used for replacing transverse link bushing.
 B4M2384	927760000	STRUT MOUNT SOCKET	Used for disassembling and assembling strut and shock mount.

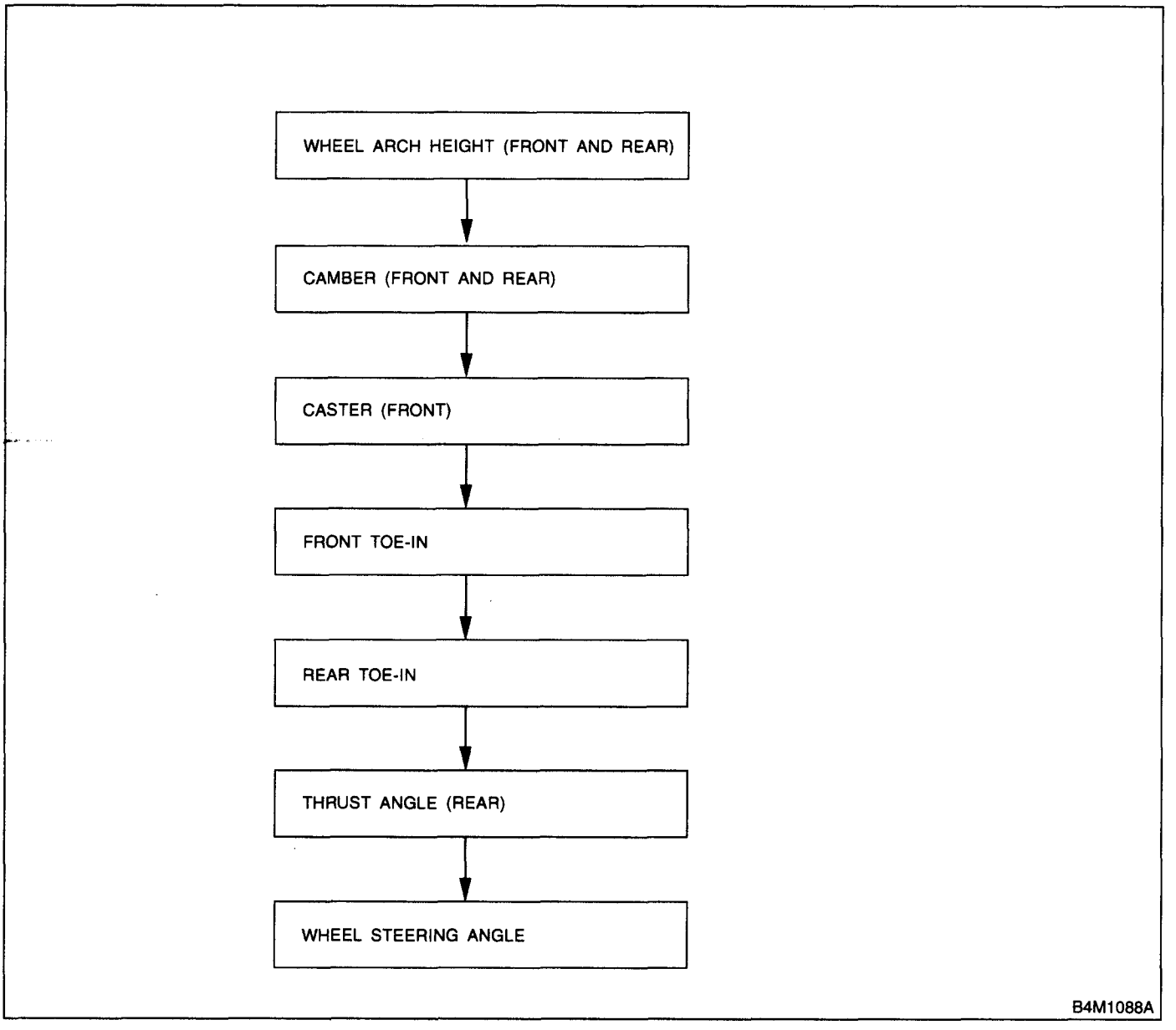
2. GENERAL PURPOSE TOOLS

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.

2. Wheel Alignment

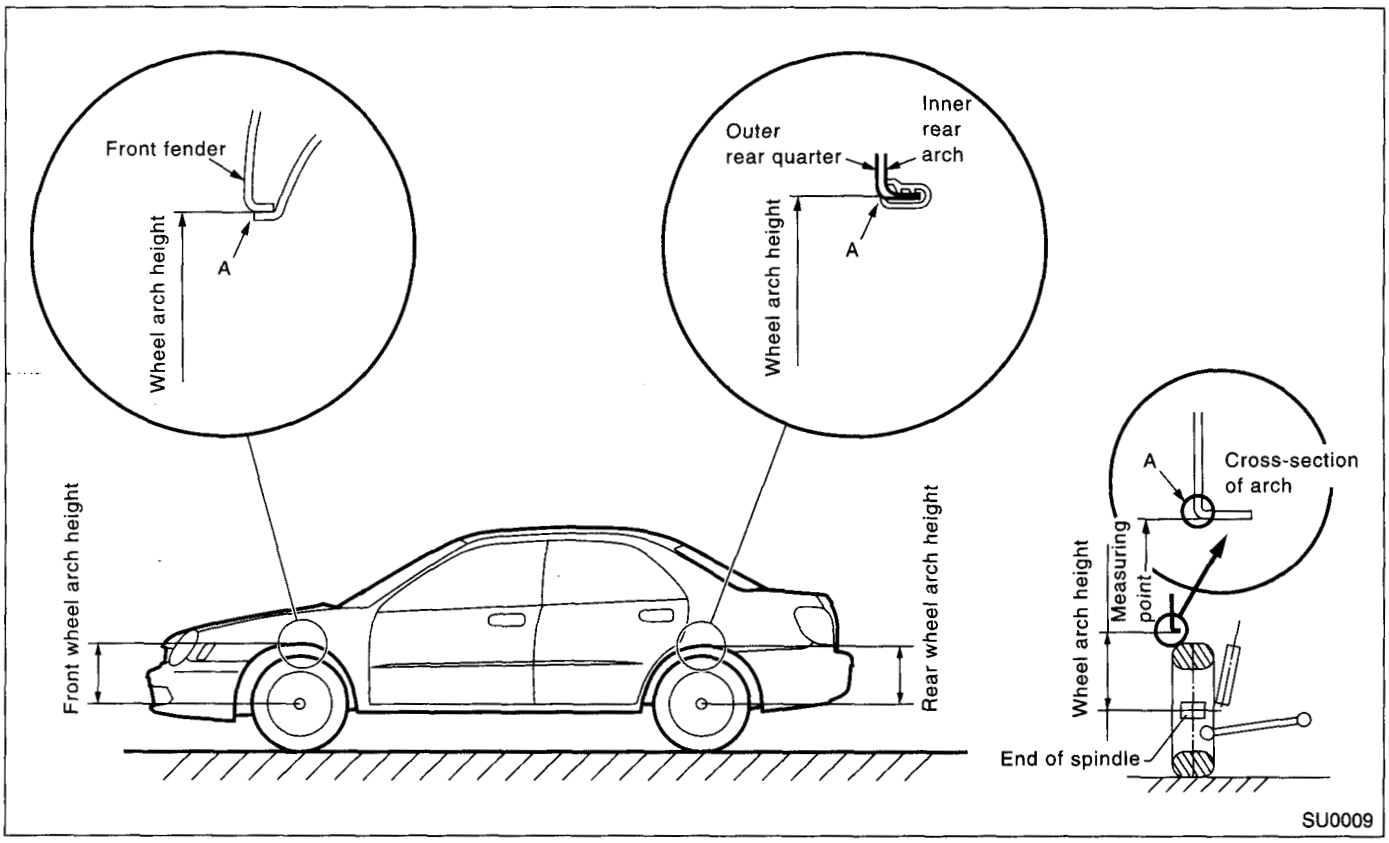
A: INSPECTION

Check, adjust and/or measure wheel alignment in accordance with procedures indicated in figure:



1. WHEEL ARCH HEIGHT

1) Adjust the tire pressure to specifications.
2) Set the vehicle under "curb weight" conditions. (Empty luggage compartment, install spare tire, jack, service tools, and top up fuel tank.)
3) Set the steering wheel in a wheel-forward position.
4) Suspend a thread from wheel arch (point "A" in figure below) to determine the point directly above center of spindle.
5) Measure the distance between measuring point "A" and center of spindle.

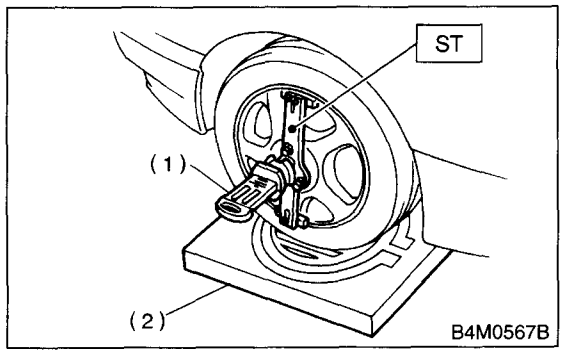


Model		Specified wheel arch height	
		Turbo	Non-turbo
Sedan	Front	396±12 mm (15.59±0.47 in)	406±12 mm (15.98±0.47 in)
	Rear	376±12 mm (14.80±0.47 in)	381±12 mm (15.0±0.47 in)
Wagon	Front	387±12 mm (15.24±0.47 in)	397±12 mm (15.63±0.47 in)
	Rear	376±12 mm (14.80±0.47 in)	381±12 mm (15.0±0.47 in)
OUTBACK	Front	—	402±12 mm (15.83±0.47 in)
	Rear	—	386±12 mm (15.20±0.47 in)

2. CAMBER

• Inspection

1) Place the front wheel on turning radius gauge. Make sure the ground contacting surfaces of front and rear wheels are set at the same height.
2) Set the ST into the center of the wheel, and then install the wheel alignment gauge.
ST 927380002 ADAPTER



(1) Alignment gauge
(2) Turning radius gauge

NOTE:
Refer to the "SPECIFICATIONS" for the camber values.
Front: <Ref. to FS-2, SPECIFICATIONS, General Description.>
Rear: <Ref. to RS-2, SPECIFICATIONS, General Description.>

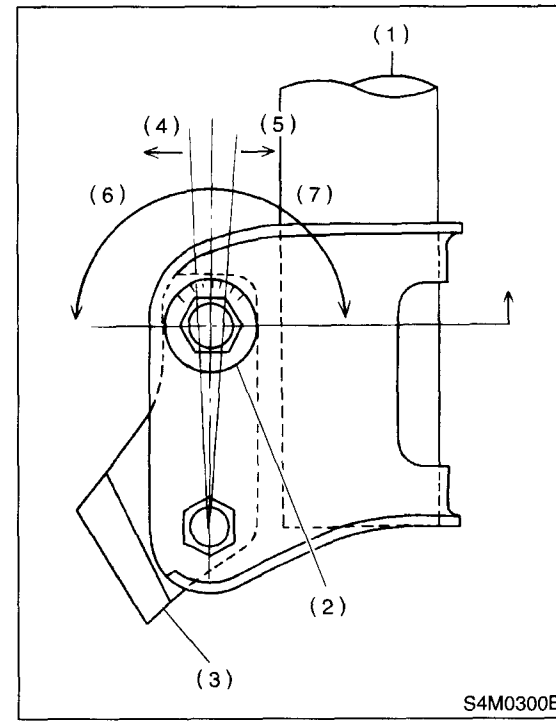
• Front camber adjustment

1) Loosen the two self-locking nuts located at the lower front portion of strut.

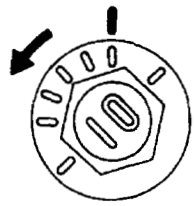
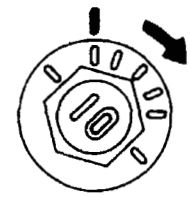
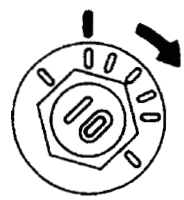
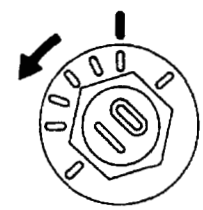
CAUTION:
• When the adjusting bolt needs to be loosened or tightened, hold its head with a wrench and turn the self-locking nut.
• Discard the loosened self-locking nut and replace with a new one.

2) Turn the camber adjusting bolt so that the camber is set at the specification.

NOTE:
Moving the adjusting bolt by one scale graduation changes the camber by approximately 0°10′.



(1) Strut
(2) Adjusting bolt
(3) Housing
(4) Outer
(5) Inner
(6) Camber is increased.
(7) Camber is decreased.

	Left side	Right side
Camber is increased.	 B4M0190 Rotate counterclockwise.	 B4M0350 Rotate clockwise.
Camber is decreased.	 B4M0350 Rotate clockwise.	 B4M0190 Rotate counterclockwise.

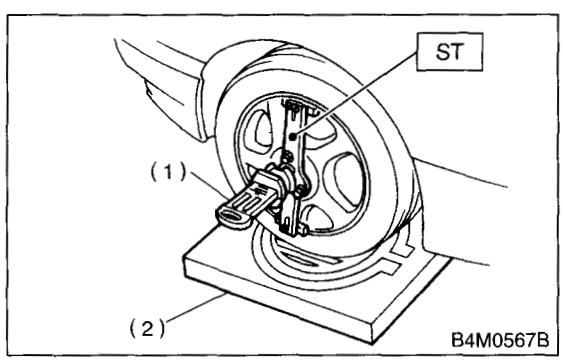
3) Tighten the two self-locking nuts.

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 the ground contacting surfaces of front and rear wheels are set at the same height.
2) Set the ST into the center of the wheel, and then install the wheel alignment gauge.
ST 927380002 ADAPTER



(1) Alignment gauge
(2) Turning radius gauge

NOTE:
Refer to the "SPECIFICATIONS" for the caster values. <Ref. to FS-2, SPECIFICATIONS, General Description.>

4. FRONT WHEEL TOE-IN

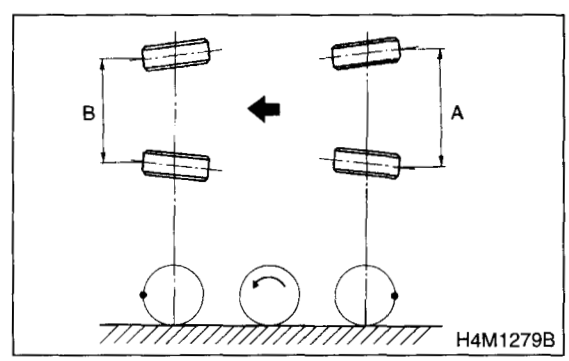
• Inspection

1) Using a toe gauge, measure the front wheel toe-in.

Toe-in:
0±3 mm (0±0.12 in)

2) Mark the rear sides of left and right tires at height corresponding to the center of spindles and measure distance "A" between marks.
3) Move the vehicle forward so that the marks line up with front sides at height corresponding to the center of spindles.
4) Measure the distance "B" between left and the right marks. Toe-in can then be obtained by the following equation:

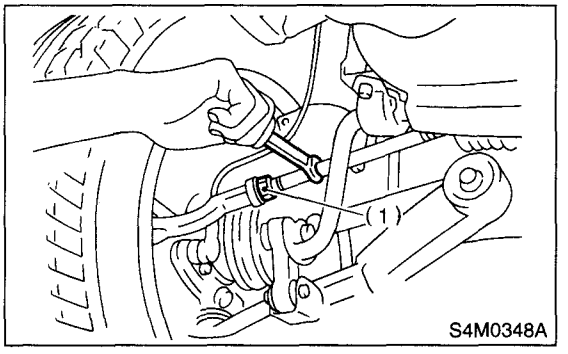
A – B = Toe-in



• Adjustment

1) Loosen the left and right side steering tie-rods lock nuts.

2) Turn the left and right tie rods equal amounts until the toe-in is at the specification.
Both the left and right tie-rods are right-hand threaded. To increase toe-in, turn both tie-rods clockwise equal amounts (as viewed from the inside of the vehicle).



(1) Lock nut

3) Tighten the tie-rod lock nut.

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

CAUTION:
Correct the tie-rod boot, if it is twisted.

NOTE:
Check that the left and right wheel steering angle is within specifications.

5. REAR WHEEL TOE-IN

• Inspection

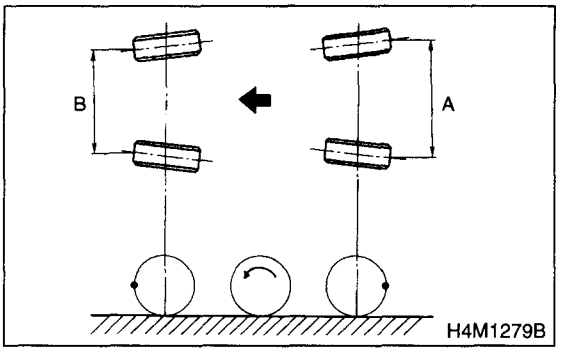
1) Using a toe-in gauge, measure the rear wheel toe-in.

Toe-in:
–1±2 mm (–0.039±0.079 in)

2) Mark the rear sides of left and right tires at height corresponding to the center of spindles and measure distance "A" between marks.
3) Move the vehicle forward so the that marks line up with front sides at height corresponding to the center of spindles.

4) Measure the distance "B" between left and right marks. Toe-in can then be obtained by the following equation:

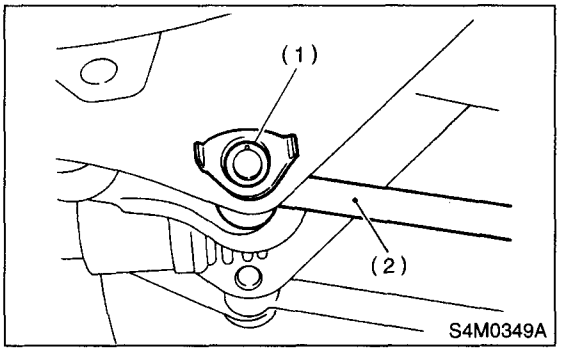
A – B = Toe-in



• Adjustment

1) Loosen the self-locking nut on inner side of link rear.

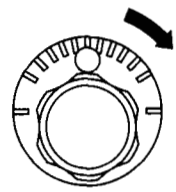
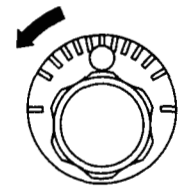
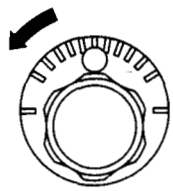
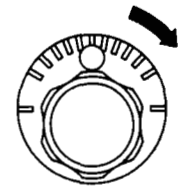
CAUTION:
• When loosening or tightening the adjusting bolt, hold the bolt head and turn self-locking nut.
• Discard the loosened self-locking nut and replace with a new one.



(1) Adjusting bolt
(2) Link rear

2) Turn the adjusting bolt head until toe-in is at the specification.

NOTE:
When the left and right wheels are adjusted for toe-in at the same time, the movement of one scale graduation changes toe-in by approximately 1.5 mm (0.12 in).

	Left side	Right side
Toe-in is increased.	 B4M0192 Rotate clockwise.	 B4M0352 Rotate counterclockwise.
Toe-in is decreased.	 B4M0352 Rotate counterclockwise.	 B4M0192 Rotate clockwise.

3) Tighten the self-locking nut.

Tightening torque:
100 N·m (10.2 kgf-m, 74 ft-lb)

6. 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 left and right. With the steering wheel held at each fully turned position, measure both the inner and outer wheel steering angle.

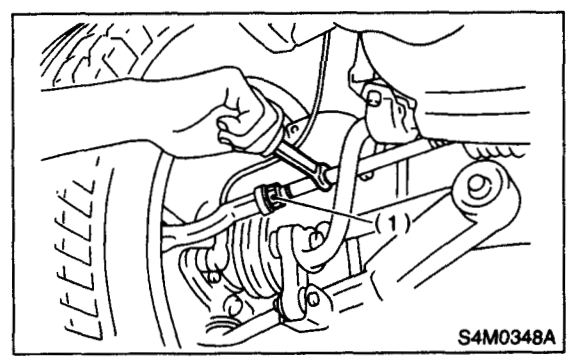
Steering angle:

Model	*Turbo, sedan and OUTBACK*	*Others*
Inner wheel	*34°05'±1.5°*	*36°55'±1.5°*
Outer wheel	*29°35'±1.5°*	*31°35'±1.5°*

• Adjustment

Turn the tie-rod to adjust the steering angle of both inner and outer wheels.

CAUTION:
• Check the toe-in.
• Correct the boot if it is twisted.



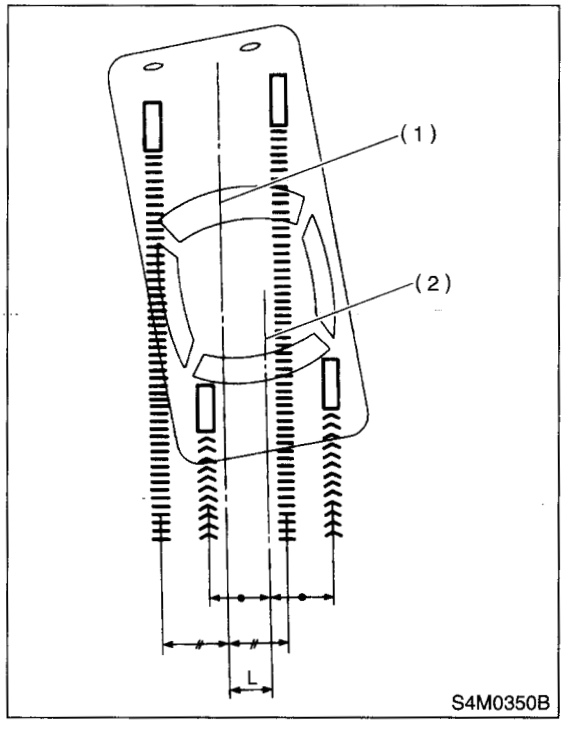
(1) Lock nut

7. THRUST ANGLE

• Inspection

1) Position the vehicle on a level surface.
2) Move the vehicle 3 to 4 meters directly forward.
3) Determine the locus of both front and rear axles.
4) Measure the distance "L" between center line of loci of the axles.

Thrust angle:
Less than 20′ when "L" is equal to or less than 15 mm (59 in).

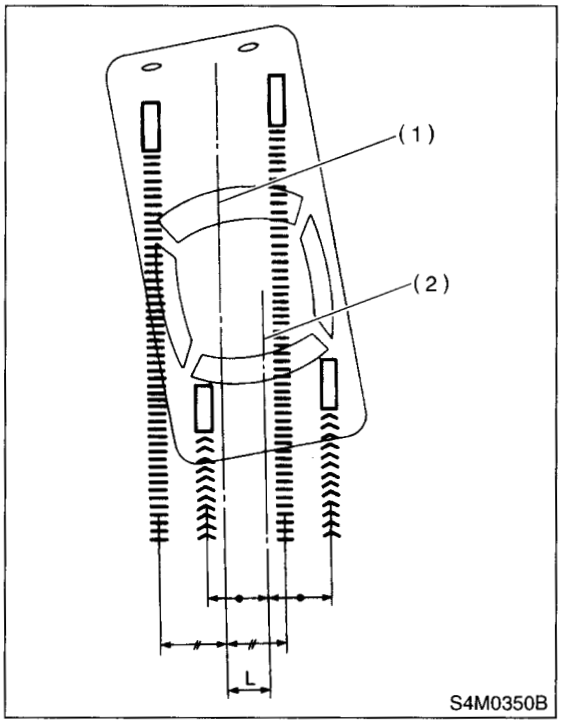


(1) Center line of loci (front axle)
(2) Center line of loci (rear axle)

• Adjustment

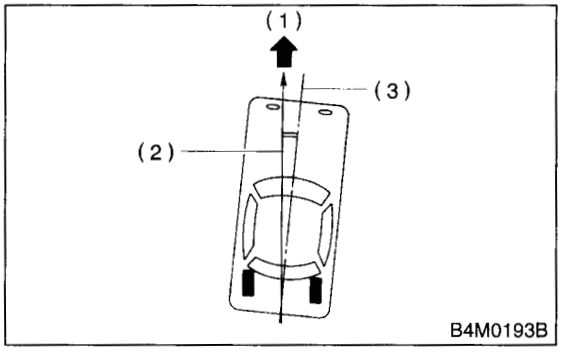
1) Make the thrust angle adjustments by turning toe-in adjusting bolts of rear suspension equally in the same direction.
2) When one rear wheel is adjusted in a toe-in direction, adjust the other rear wheel equally in toe-out direction, in order to make the thrust angle adjustment.
3) When the left and right adjusting bolts are turned incrementally by one graduation in the same direction, the thrust angle will change approximately 16′ ["L" is almost equal to 12 mm (0.472 in)].

Thrust angle:
0°±20′



(1) Center line of loci (front axle)
(2) Center line of loci (rear axle)

NOTE:
Thrust angle refers to a mean value of left and right 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.

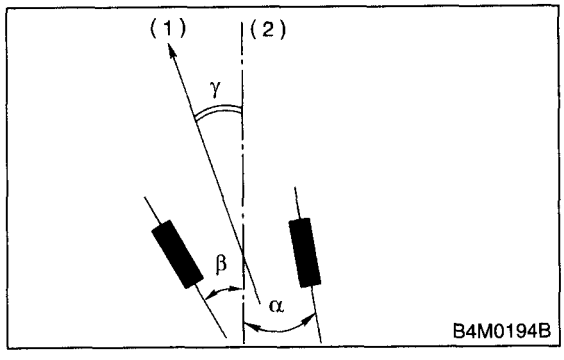


(1) Front
(2) Thrust angle
(3) Body center line

Thrust angle: r = (α – β)/2

α: Right rear wheel toe-in angle
β: Left rear wheel toe-in angle

NOTE:
Here, use only positive toe-in values from each wheel to substitute for α and β in the equation.

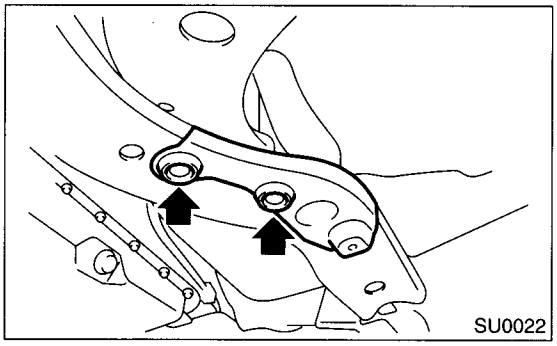


(1) Front
(2) Body center line

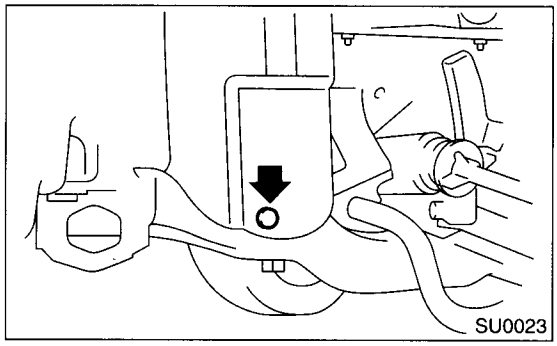
3. Sub Frame

A: REMOVAL

1) Lift-up the vehicle.
2) Remove the under cover.
3) Remove the bolt cover.

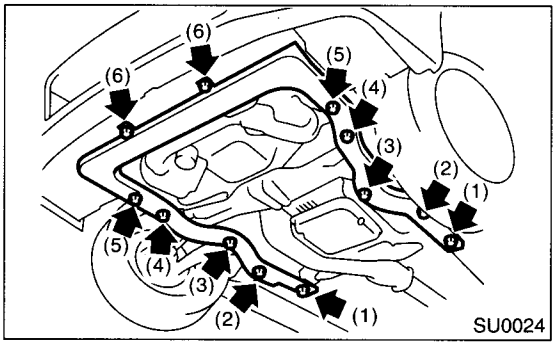


4) Remove the clip.



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).

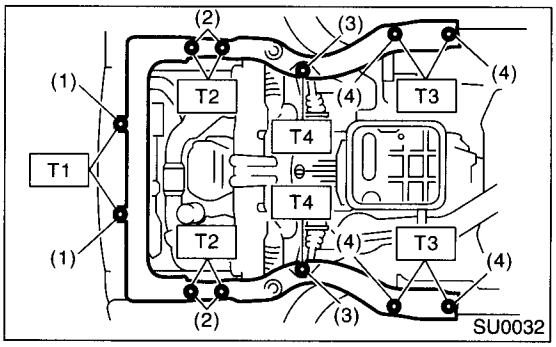


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace the M12 bolt with a new one.

Tightening torque:
T1: 34 N·m (3.5 kgf-m, 25 ft-lb)
T2: 55 N·m (5.6 kgf-m, 41 ft-lb)
T3: 71 N·m (7.2 kgf-m, 52 ft-lb)
T4: 105 N·m (10.7 kgf-m, 77 ft-lb)



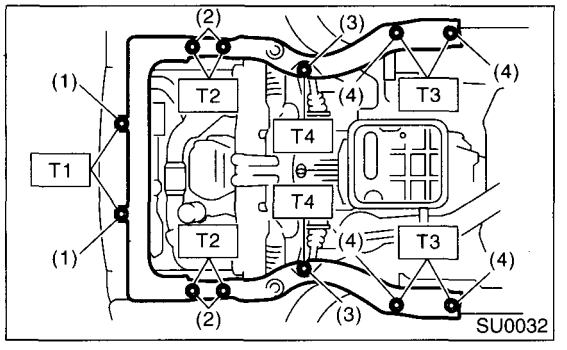
(1) M8 bolt
(2) M12 bolt (with max)
(3) M12 bolt (with oil)
(4) M10 bolt

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.

NOTE:
The tightening torque differs by the color for bolt (3). Always verify the bolt color before checking tightening torque.

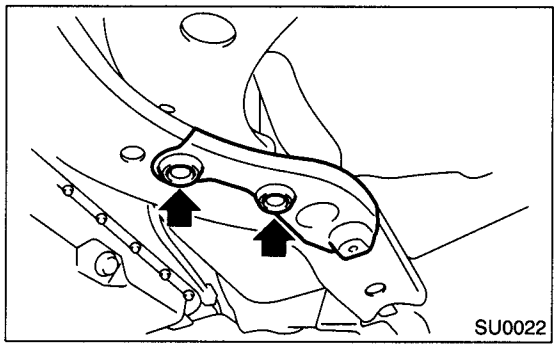
Tightening torque:
T1: 34 N·m (3.5 kgf-m, 25 ft-lb)
T2: 55 N·m (5.6 kgf-m, 41 ft-lb)
T3: 71 N·m (7.2 kgf-m, 52 ft-lb)
T4: Dark green bolt
105 N·m (10.7 kgf-m, 77 ft-lb)
T4: Except dark green bolt
55 N·m (5.6 kgf-m, 41 ft-lb)



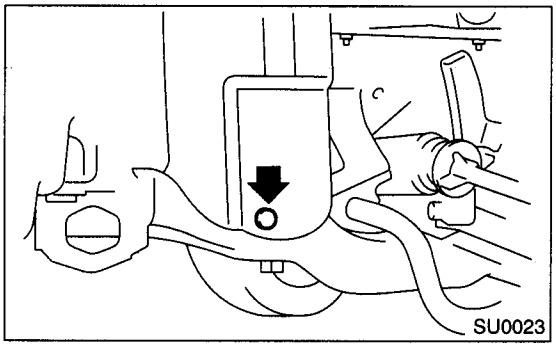
3. Sub Frame

A: REMOVAL

1) Lift-up the vehicle.
2) Remove the under cover.
3) Remove the bolt cover.

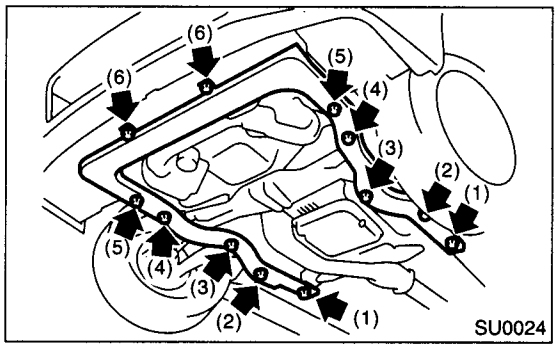


4) Remove the clip.



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).

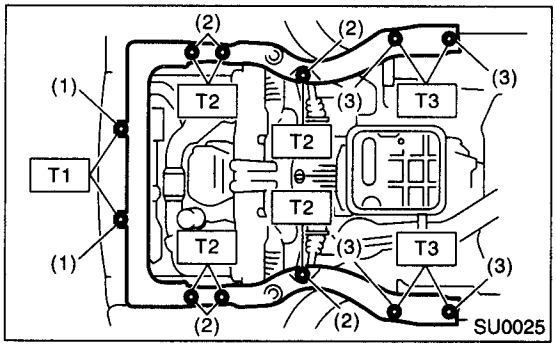


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace the M12 bolt with a new one.

Tightening torque:
T1: 34 N·m (3.5 kgf-m, 25 ft-lb)
T2: 55 N·m (5.6 kgf-m, 41 ft-lb)
T3: 71 N·m (7.2 kgf-m, 52 ft-lb)



(1) M8 bolt
(2) M12 bolt
(3) M10 bolt

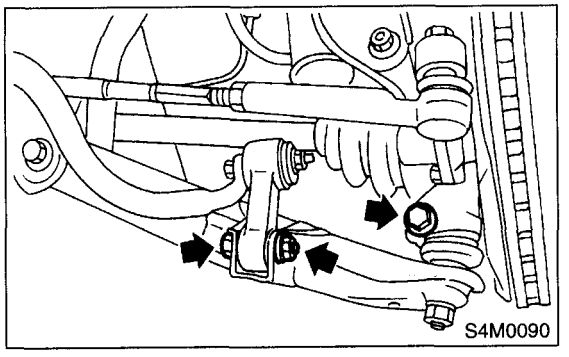
C: INSPECTION

Check that there is no damage and distortion at the sub frame.

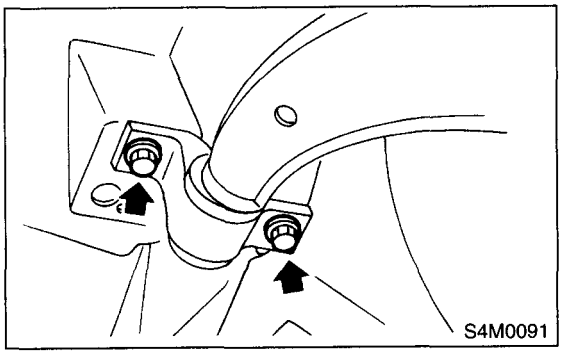
4. Front Transverse Link

A: REMOVAL

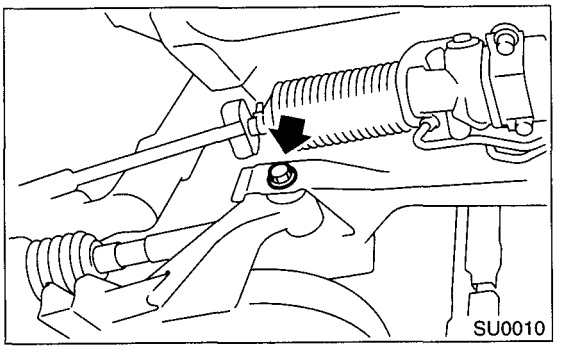
1) Set the vehicle on the lift.
2) Disconnect the ground terminal from battery.
3) Lift-up the vehicle and remove the wheel.
4) Remove the sub frame. <Ref. to FS-16, REMOVAL, Sub Frame.>
5) Disconnect the stabilizer link from transverse link.
6) Remove the bolt securing the ball joint of transverse link to housing.



7) Remove the nut (do not remove bolt.) securing the transverse link to crossmember.
8) Remove the two bolts securing the bushing bracket of transverse link to vehicle body at rear bushing location.



9) Extract the ball joint from housing.
10) Remove the bolt securing the transverse link to crossmember and extract the transverse link from crossmember.



B: INSTALLATION

1) Temporarily tighten the two bolts used to secure the rear bushing of the transverse link to body.

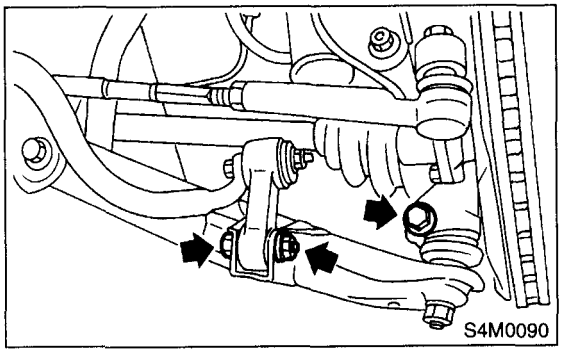
NOTE:
These bolts should be tightened to such an extent that they can still move back and forth in the oblong shaped hole in the bracket (which holds the bushing).

2) Install the bolts used to connect the transverse link to crossmember and temporarily tighten with nut.

CAUTION:
Discard the loosened self-locking nut and replace with a new one.

3) Insert the ball joint into housing.
4) Connect the stabilizer link to transverse link, and temporarily tighten bolts.

CAUTION:
Discard the loosened self-locking nut and replace with a new one.



5) Tighten the following points in the order shown below when the wheels are in full contact with the ground and vehicle is curb weight.
(1) Transverse link and stabilizer

Tightening torque:
Sedan Turbo model:
45 N·m (4.6 kgf-m, 33 ft-lb)
Except sedan Turbo model:
30 N·m (3.1 kgf-m, 22 ft-lb)

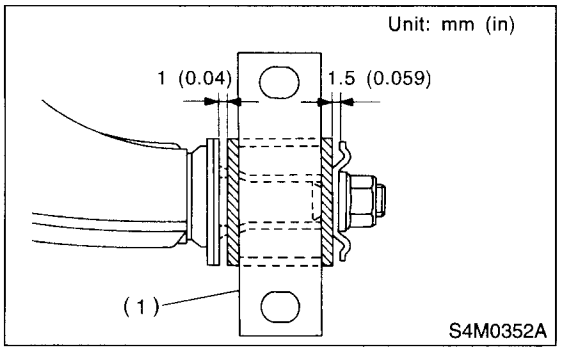
(2) Transverse link and crossmember

Tightening torque:
100 N·m (10.2 kgf-m, 74 ft-lb)

(3) Transverse link rear bushing and body

Tightening torque:
250 N·m (25.5 kgf-m, 184 ft-lb)

NOTE:
• Move the rear bushing back and forth until transverse link-to-rear bushing clearance is established (as indicated in figure.) before tightening.



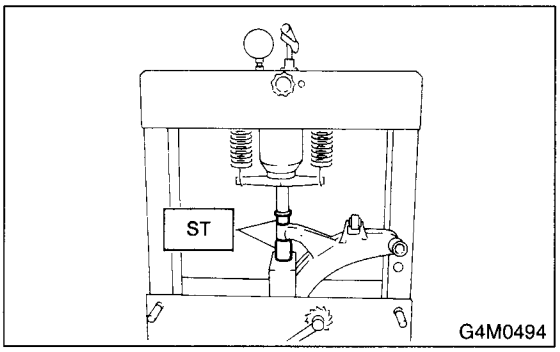
(1) Rear bushing

6) Install the sub frame. <Ref. to FS-16, INSTALLATION, Sub Frame.>
7) Inspect the wheel alignment and adjust if necessary. <Ref. to FS-8, Wheel Alignment.>

C: DISASSEMBLY

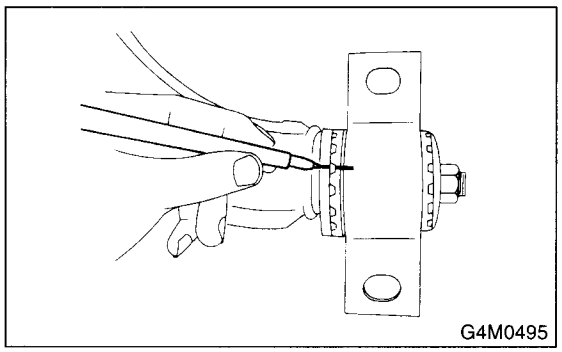
1. FRONT BUSHING

Using 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 the rear bushing.

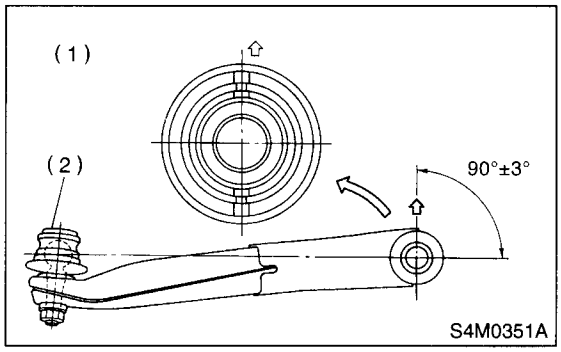


D: ASSEMBLY

1. FRONT BUSHING

To reassemble, reverse disassembly procedures.

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. REAR BUSHING

1) Install the rear bushing to transverse link and align the aligning marks scribed on the two.
2) Tighten the self-locking nut.

CAUTION:
• Discard the loosened self-locking nut and replace with a new one.
• 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)

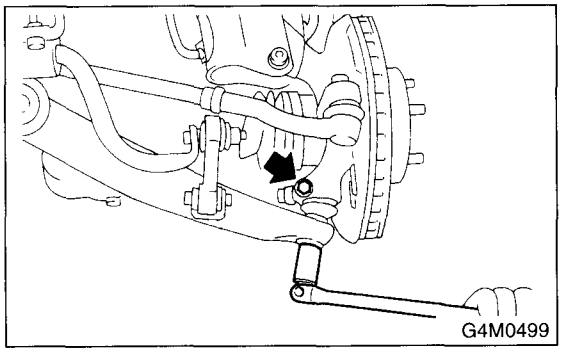
E: INSPECTION

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.

5. Front Ball Joint

A: REMOVAL

1) Remove the front wheel.
2) Pull out the cotter pin from the ball stud, remove the castle nut, and extract the ball stud from the transverse link.
3) Remove the bolt securing the ball joint to the housing.



4) Extract the ball joint from the housing.

B: INSTALLATION

1) Install the ball joint onto the housing.

Torque (Bolt):
50 N·m (5.1 kgf-m, 37 ft-lb)

CAUTION:
Do not apply grease to the tapered portion of ball stud.

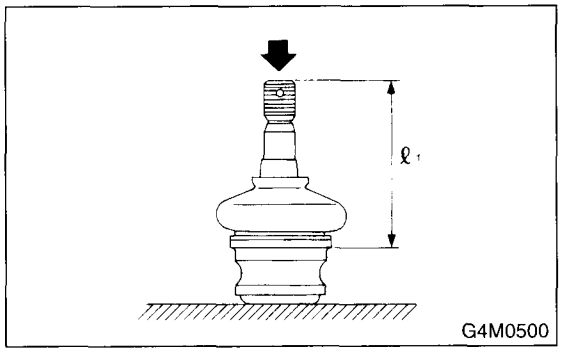
2) Connect the ball joint to transverse link.

Torque (Castle nut):
Sedan turbo model:
30 N·m (3.1 kgf-m, 22ft-lb)
Except sedan turbo model:
45 N·m (4.6 kgf-m, 33ft-lb)

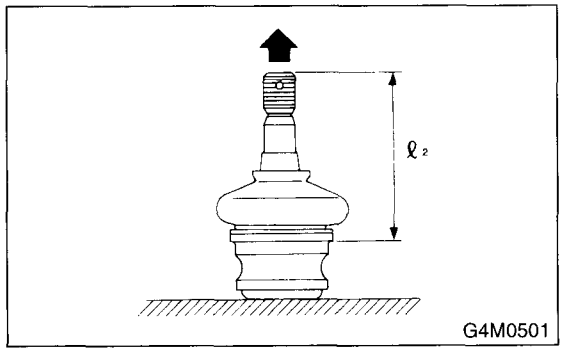
3) Retighten the castle nut further within 60° until a slot in castle nut is aligned with the hole in ball stud end, then insert the new cotter pin and bend it around castle nut.
4) Install the front wheel.

C: INSPECTION

1) Measure the play of ball joint by the following procedures. Replace with a new one when the play exceeds the specified value.
(1) With 686 N (70 kgf, 154 lb) loaded in the direction shown in the figure, measure dimension ℓ_1.



(2) With 686 N (70 kgf, 154 lb) loaded in the opposite direction shown in the figure, measure 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.

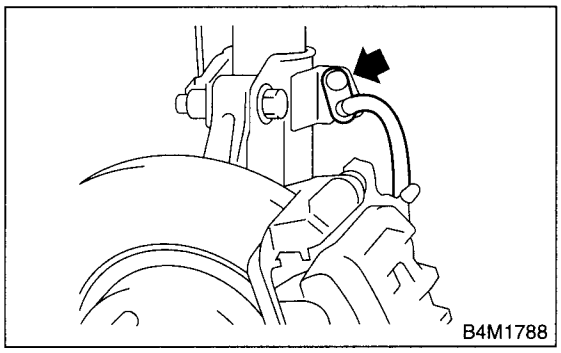
FRONT BALL JOINT
Specified play for replacement: S
Less than 0.3 mm (0.012 in)

2) When the play is smaller than the specified value, visually inspect the dust cover.
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.
4) If the dust cover is damaged, replace with a new ball joint.

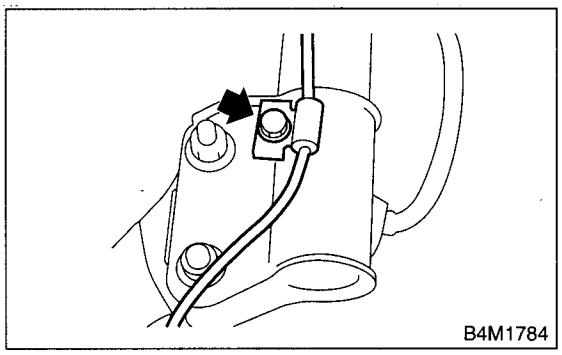
6. Front Strut

A: REMOVAL

1) Remove the front wheel.
2) Remove the bolt securing brake hose from strut.



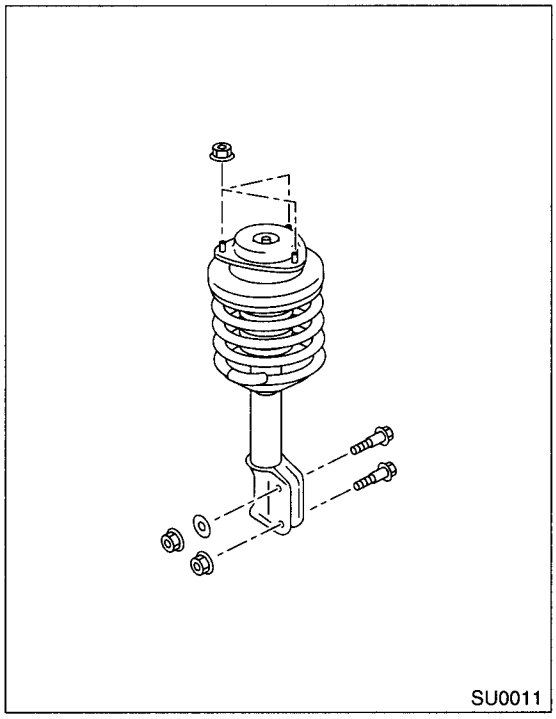
3) Scribe an alignment mark on the camber adjusting bolt which secures strut to housing.
4) Remove the bolt securing the ABS sensor harness.



5) Remove the two bolts securing housing to strut.

CAUTION:
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 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.

CAUTION:
• While holding the head of adjusting bolt, tighten self-locking nut.
• Be sure to use a new 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 bolts which secure the brake hose to strut.

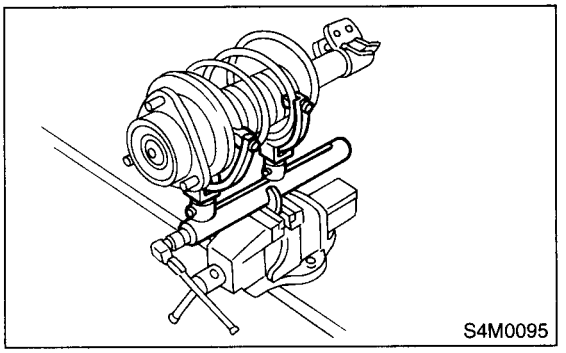
Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)

5) Install the front wheels.

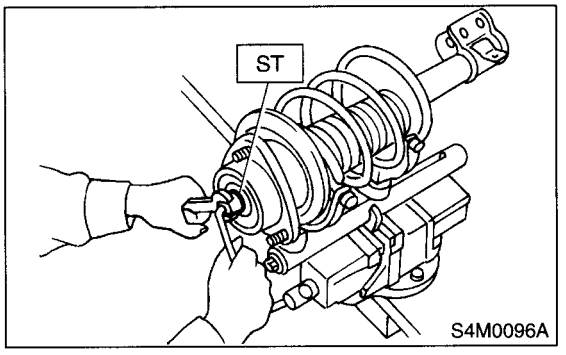
NOTE:
Check wheel alignment and adjust if necessary.

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, and remove the coil spring.
5) Remove the dust cover and helper spring.

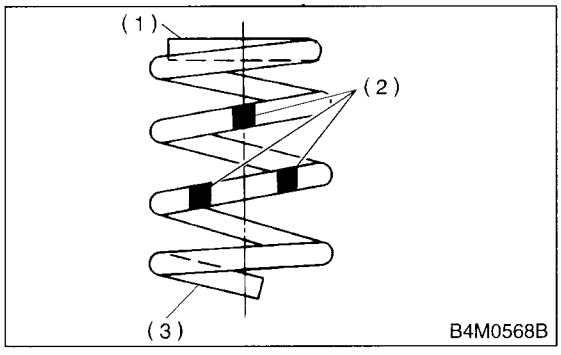
D: ASSEMBLY

1) Before installing the coil spring, strut mount, etc., on the strut, check for the presence of air in the dampening force generating mechanism of the strut since air prevents proper dampening force from being produced.
2) Checking for the presence of air:
   (1) Place the strut vertically with the piston rod facing up.
   (2) Move the piston rod to the center of its entire stroke.
   (3) While holding the piston rod end with finger-tips, 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 the 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 3 or 4 times from the first step.

NOTE:
After completely purging air from the strut, be sure to place the strut with the 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".

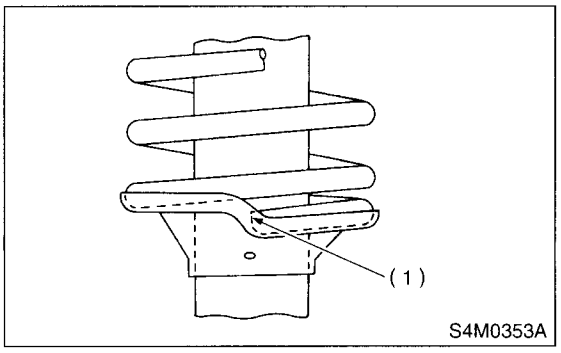
4) Using a coil spring compressor, compress the coil spring.

NOTE:
Make sure that the vertical installing direction of coil spring is as shown in the figure.



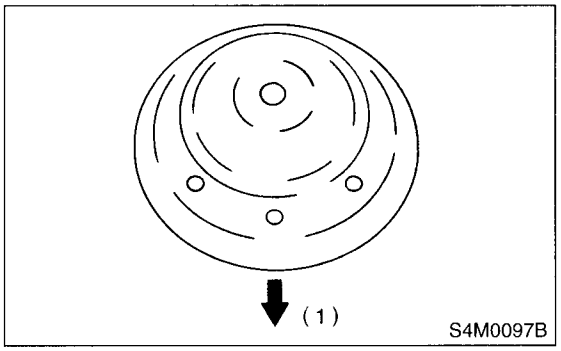
(1) Flat (top side)
(2) Identification paint
(3) Inclined (bottom side)

5) Set the coil spring correctly so that its end face fits well into the spring seat as shown.



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 the upper spring seat is positioned as shown in the figure.



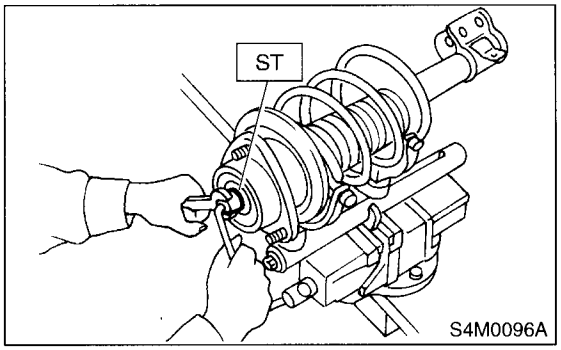
(1) Outside of body

8) Install the strut mount to the piston rod, and tighten the self-locking nut temporarily.

CAUTION:
Be sure to use a new self-locking nut.

9) Using a hexagon wrench to prevent strut rod from turning, tighten self-locking nut with ST.
ST 927760000 STRUT MOUNT SOCKET

Tightening torque:
55 N·m (5.6 kgf-m, 41 ft-lb)



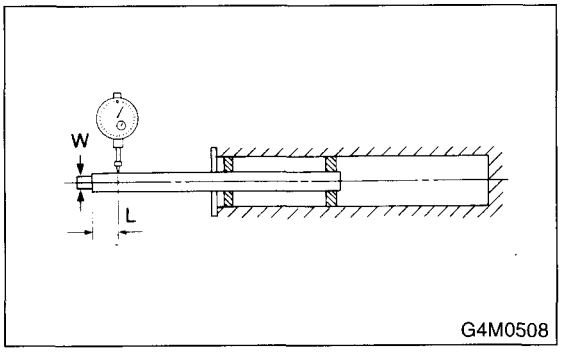
10) Loosen the coil spring carefully.

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 the outer shell and fully extend the rod. Set a dial gauge at the end of the 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 the dial gauge indication: P_1. Apply a force of 20 N (2 kgf, 4 lb) in the opposite direction of "W", then read the dial gauge indication: P_2.



G4M0508

The free play is determined by the following equation:

Play = P_1, P_2

Limit of play:
Less than 0.8 mm (0.031 in)

If the play is greater, 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

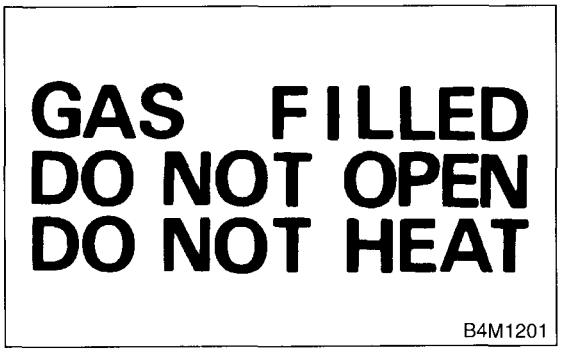
One having permanent strain should be replaced with a new one. When the vehicle posture is uneven, although there are no considerable reasons like tire puncture, uneven loading, etc., check the coil spring for its free length referring to specifications, cracks, etc., and replace it with a new one if defective.

5. HELPER

Replace it with a new one if cracked or damaged.

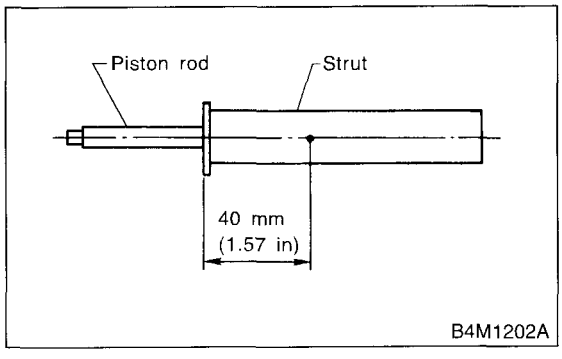
F: DISPOSAL

CAUTION:
• On struts which have "GAS FILLED" marked on the outer housing under spring seat, completely discharge the gas before disposing, following the methods below.
• Do not disassemble the strut damper or place into a fire.
• Drill holes before disposing of gas filled struts.
• Before handling gas filled struts, be sure to wear goggles to protect eyes from gas, oil and/or filings.



B4M1201

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.

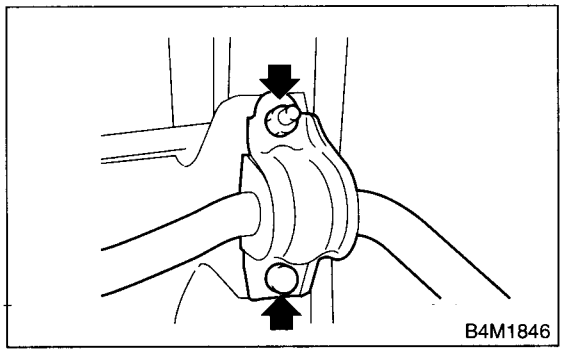


B4M1202A

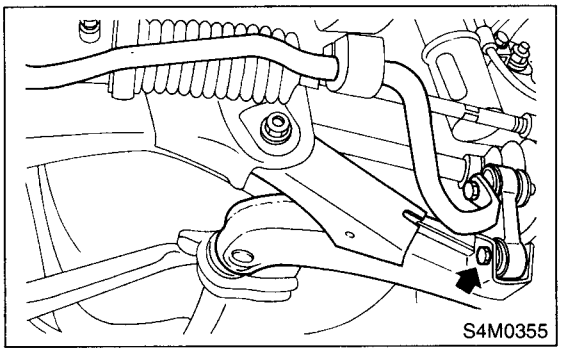
7. Front Stabilizer

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-16, REMOVAL, Sub Frame.>
4) Remove the bolt and nut which secure the stabilizer to crossmember.



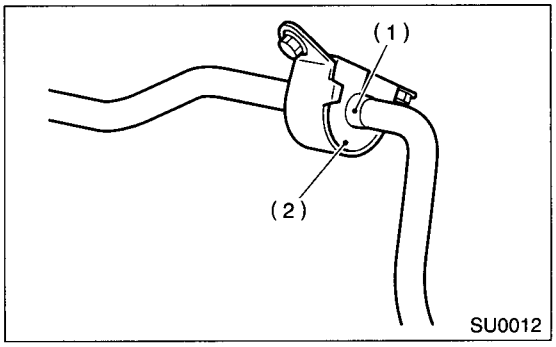
5) Remove the bolts which secure the stabilizer link to front transverse link.



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 the 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 (Sedan turbo model):
Jack-up plate to crossmember:
20 N·m (2.0 kgf-m, 14.5 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)

Tightening torque (Except sedan turbo model):
Jack-up plate to crossmember:
20 N·m (2.0 kgf-m, 14.5 ft-lb)
Stabilizer link to front transverse link:
30 N·m (3.1 kgf-m, 22 ft-lb)
Stabilizer to crossmember:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

3) Install the sub frame. <Ref. to FS-16, INSTALLATION, Sub Frame.>

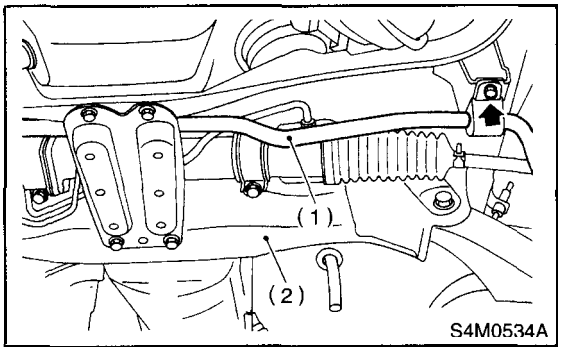
C: INSPECTION

1) Check the bushing for cracks, fatigue or damage.
2) Check the stabilizer link for deformities, cracks or damage, and bushing for protrusions from the hole of stabilizer link.

8. Front Crossmember

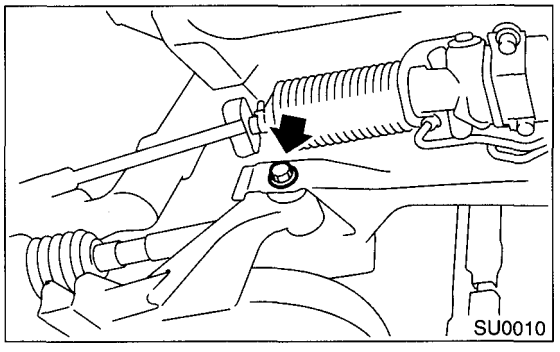
A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Lift-up the vehicle and remove the front tires and wheels.
3) Remove the sub frame. <Ref. to FS-16, REMOVAL, Sub Frame.>
4) Remove both 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. (Non-turbo model) <Ref. to EX(SOHC)-5, REMOVAL, 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. <Ref. to PS-26, REMOVAL, Steering Gearbox.>
10) Disconnect the power steering pipe from steering gear box.
11) Lift the engine by approx. 10 mm (0.39 in) by using a chain block.
12) Support the crossmember with a jack, remove the nuts securing crossmember to body and lower crossmember gradually along with the steering gearbox.

CAUTION:
When removing the crossmember downward, be careful that the tie-rod end does not interfere with SFJ boot.

13) Remove the steering gearbox from crossmember.

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
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.

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 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 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) Unsuitability of maximum and/or minimum length of damper strut and/or shock absorber	Replace with proper parts.
(7) Deformation or loss 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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4.	Rear Trailing Link	11
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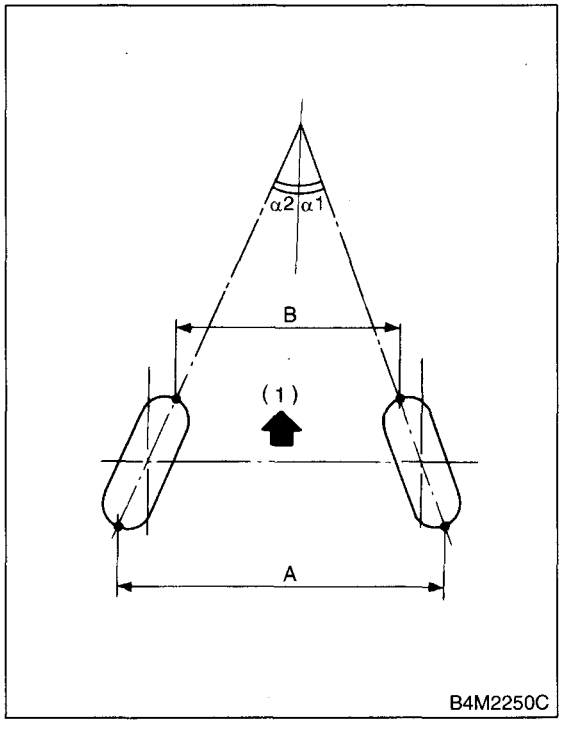
1. General Description

A: SPECIFICATIONS

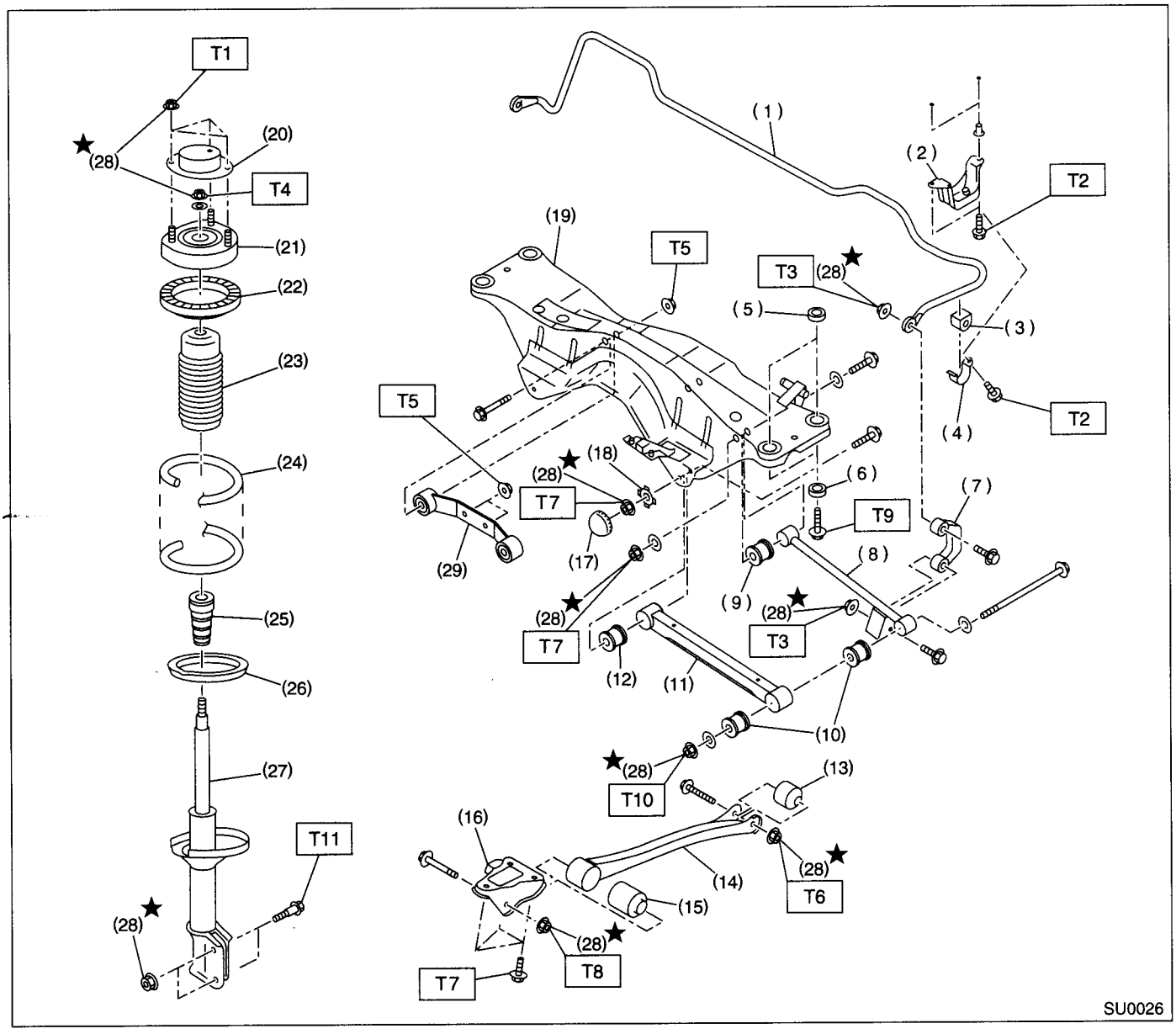
Item	Sedan		Wagon		OUTBACK
	Turbo	Non-turbo	Turbo	Non-turbo	
Camber (tolerance: ±0°45′)	−1°30′	−1°25′	−1°20′	−1°15′	−1°10′
Toe-in	-1±2 mm (-0.039±0.079 in) Each toe-in angle: ±0°07′30" (Total toe-in angle 0°±15′)				
Wheel arch height [tolerance: ±12 mm (±0.47 in)]	376 mm (14.80 in)	381 mm (15.0 in)	376 mm (14.80 in)	381 mm (15.0 in)	386 mm (15.20 in)
Thrust angle	0°±20′				
Diameter of stabilizer	20 mm (0.79 in)	13 mm (0.51 in)	17 mm (0.67 in)	13mm (0.51 in)	

NOTE:
• Front and rear toe-ins and front camber can be adjusted. If the toe-in or camber tolerance exceeds specifications, adjust the 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 the 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


T1
(28)
(20)
T4
(21)
(22)
(23)
(24)
(25)
(26)
(27)
T11
(28)
(1)
(2)
T2
(19)
T5
T3
(28)
(5)
(3)
T5
T2
(4)
(18)
(28)
T7
(6)
(7)
T9
(29)
(17)
(8)
(9)
(28)
T7
(28)
T3
(12)
(11)
(10)
(28)
T10
(13)
(16)
(14)
(28)
T6
(15)
(28)
T8
T7
SU0026

(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) Rubber seat upper
(23) Dust cover
(24) Coil spring
(25) Helper
(26) Rubber seat lower
(27) Damper strut
(28) Self-locking nut
(29) Rear differential member rear

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:	*55 (5.6, 41)*
T5:	*70 (7.1, 52)*
T6:	*90 (9.2, 66)*
T7:	*100 (10.2, 74)*
T8:	*115 (11.7, 85)*
T9:	*130 (13.3, 96)*
T10:	*135 (13.8, 100)*
T11:	*220 (22.4, 162)*

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 vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.
- Before disposing shock absorbers, be sure to bleed gas completely. Also, do not throw away in fire.

D: PREPARATION TOOL

1. SPECIAL TOOLS

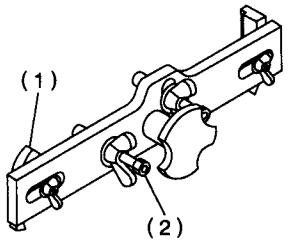
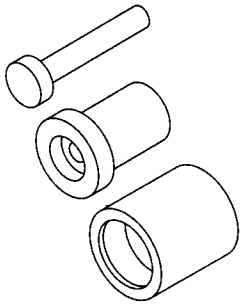
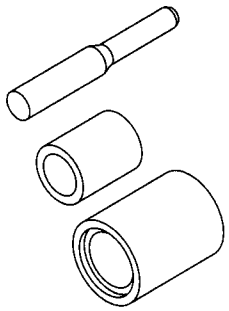
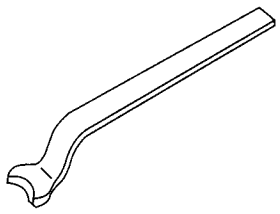
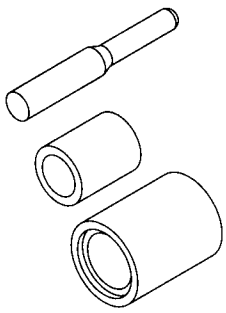
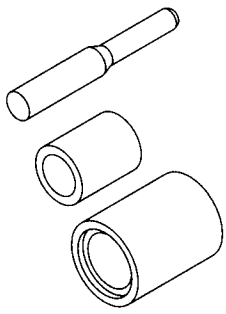
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2378A	927380002	ADAPTER	Used as an adapter for camber & caster gauge when measuring camber and caster. (1) 28199AC000 PLATE (2) 28199AC010 BOLT
 SU0014	927720000	INSTALLER & REMOVER	Used for replacing front bushing.
 SU0015	927730000	INSTALLER & REMOVER	Used for replacing rear bushing.
 SU0016	28099PA100	REMOVER	Used for removing DOJ.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 SU0015	92770000	INSTALLER & REMOVER	Used for replacing lateral link bushing.
 SU0015	927690000	HELPER SOCKET WRENCH	Used for replacing lateral link bushing.

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 assembly/disassembly.
Bearing puller	Used for removing bushings.

2. Wheel Alignment

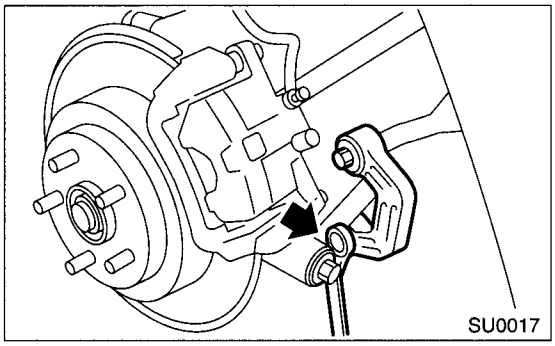
A: INSPECTION

NOTE:
The front and rear wheel alignment must be measured and/or adjusted at once to obtain accuracy. Measure and/or adjust the rear wheel alignment together with the front. Follow the procedure in "FS" section "Wheel Alignment" for measurement and/or adjustment of wheel alignment. <Ref. to FS-8, INSPECTION, Wheel Alignment.>

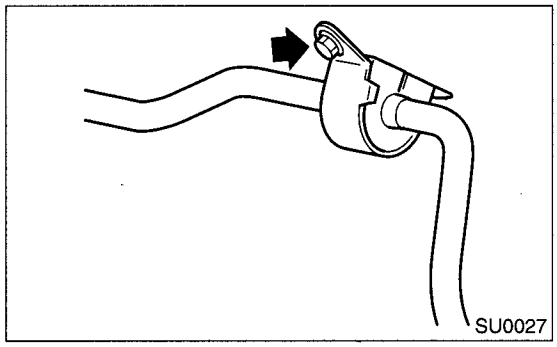
3. Rear Stabilizer

A: REMOVAL

1) Jack-up the rear part of the vehicle, support it with safety stands (rigid racks).
2) Remove the bolts which secure stabilizer link to rear lateral link.



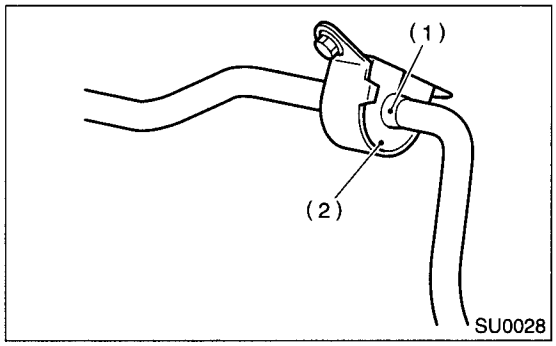
3) Remove the bolt which secures stabilizer to stabilizer bracket.



B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
- Install the bushing while aligning it with paint mark on stabilizer.
- Ensure that the 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)

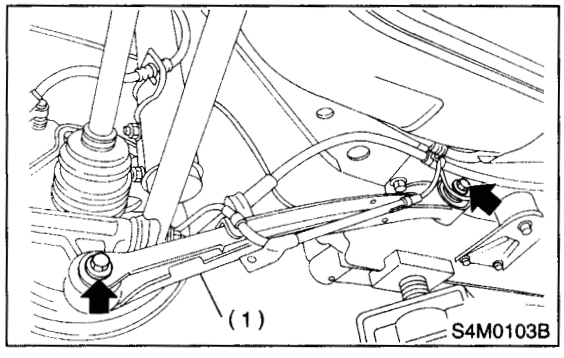
C: INSPECTION

1) Check the bushing for cracks, fatigue or damage.
2) Check the stabilizer links for deformities, cracks, or damage, and bushing for protrusions from the hole of stabilizer link.

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 remove the rear wheels.
3) Remove both rear parking brake clamp and ABS sensor harness. (Models equipped with ABS)
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

Install in the reverse order of removal.

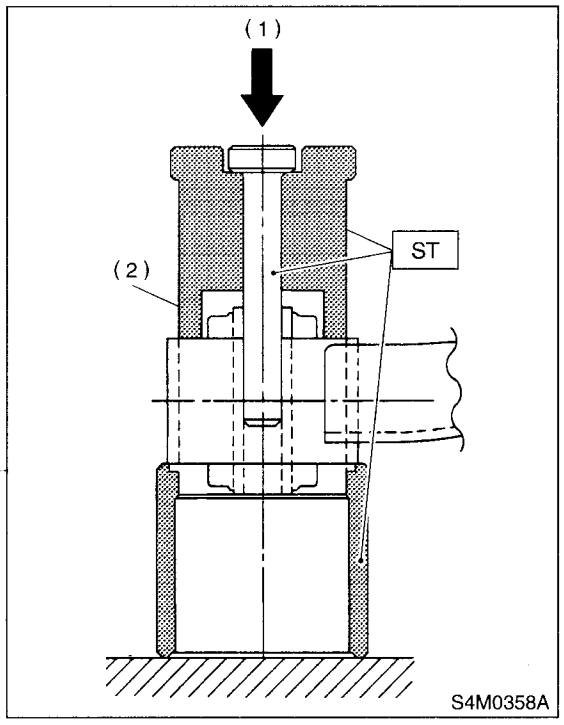
CAUTION:
Always tighten the rubber bushing location when wheels are in full contact with the ground and vehicle is at curb weight condition.

NOTE:
Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

1. FRONT BUSHING

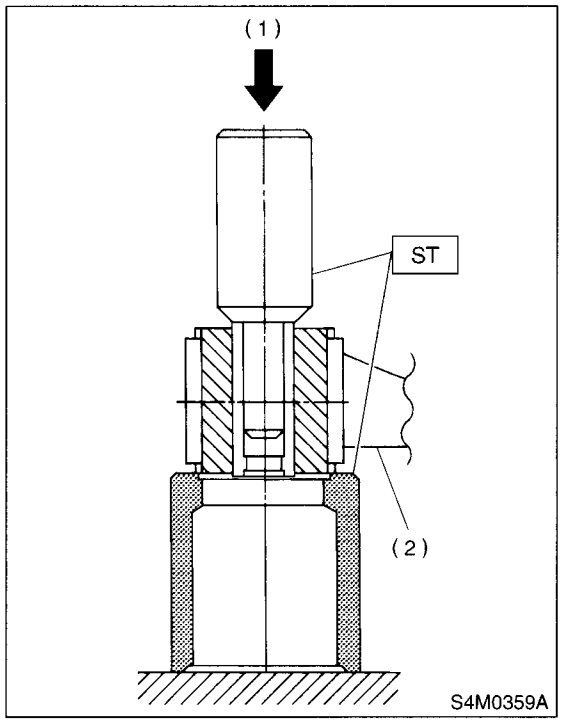
Using ST, press the front bushing out of place.
ST 927720000 INSTALLER & REMOVER SET



(1) Press
(2) Trailing link

2. REAR BUSHING

1) Remove the housing. <Ref. to DS-23, REMOVAL, Rear Axle.>
2) Using ST, press the rear bushing out of place.
ST 927730000 INSTALLER & REMOVER SET



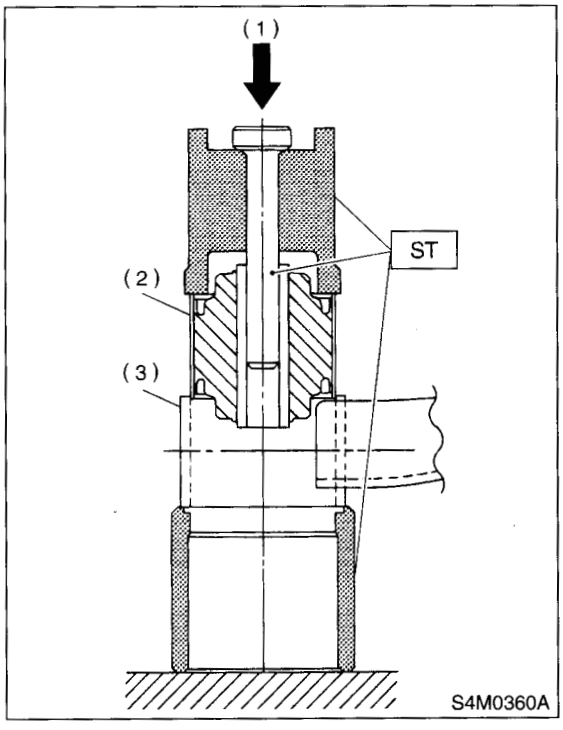
(1) Press
(2) Housing

D: ASSEMBLY

1. FRONT BUSHING

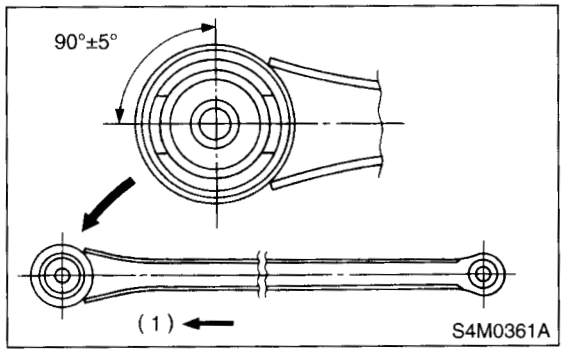
Using ST, press the bushing into trailing link.
ST 927720000 INSTALLER & REMOVER SET

CAUTION:
When installing the bushing, turn ST plunger upside down and press it until plunger end surface contacts trailing link end surface.



(1) Press
(2) Front bushing
(3) Trailing link

CAUTION:
Install the front bushing in proper direction, as shown in the figure.



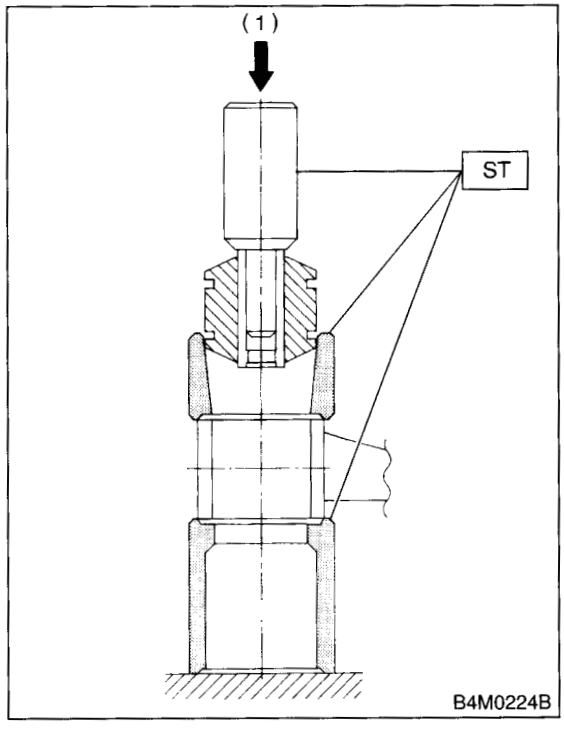
(1) Front

2. REAR BUSHING

1) Using ST, press the bushing into trailing link.
ST 927730000 INSTALLER & REMOVER SET

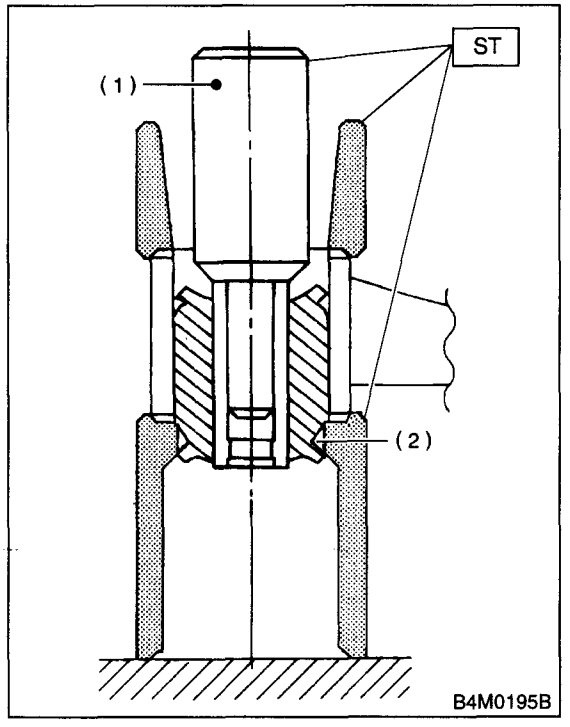
NOTE:
If it is difficult to press the bushing into trailing link, apply water-diluted TIRE LUBE to the inner surface of ST as a lubricant.

SPECIFIED lubricant:
TIRE LUBE : water = 1 : 3



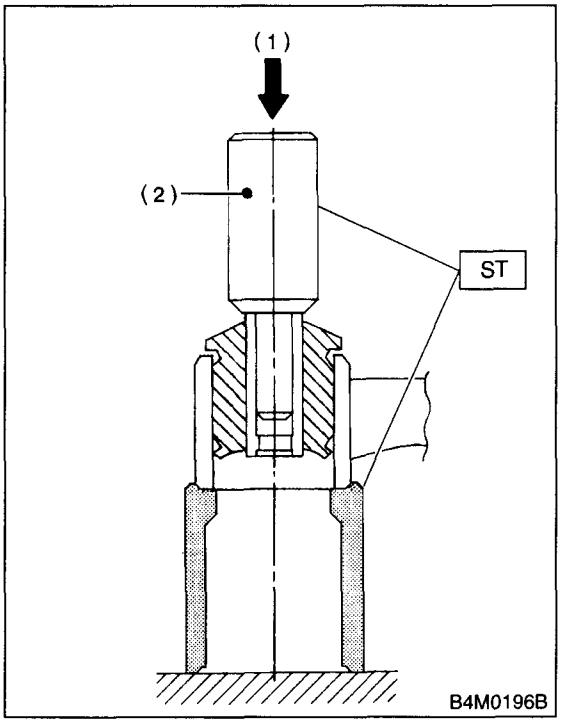
(1) Press

2) Press the ST pluger 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 direction opposite 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.>

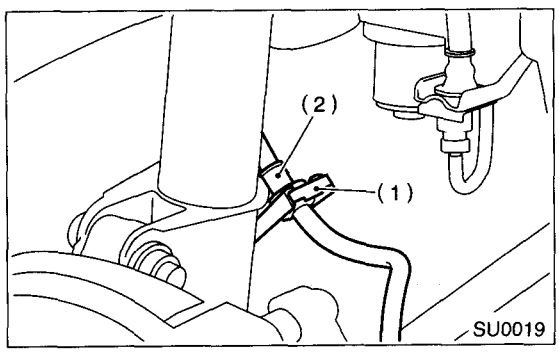
E: INSPECTION

Check the trailing links for bends, corrosion or damage.

5. Rear Strut

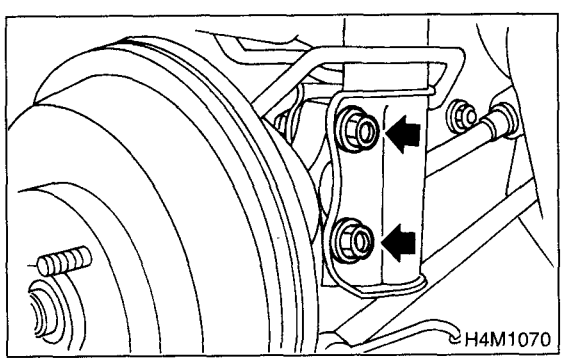
A: REMOVAL

1) Remove the rear seat cushion and backrest. (Sedan model)
2) Remove the strut cap of quarter trim. (Wagon model)
3) Loosen the rear wheel nuts.
4) Jack-up the vehicle, support it with safety stands (rigid racks) and remove the rear wheels.
5) Remove the brake hose clip and remove the brake hose from rear strut.



(1) Brake hose clip
(2) Brake hose

6) Remove the bolts which secure rear strut to housing.



7) Remove the nuts securing strut mount to body.

B: INSTALLATION

1) Tighten the self-locking nut used to secure strut mount to car body.

CAUTION:
Discard the loosened self-locking nut, and replace with a new one.

Tightening torque:
20 N·m (2.0 kgf-m, 14.5 ft-lb)

2) Tighten the bolts which secure rear strut to housing.

Tightening torque:
220 N·m (22.4 kgf-m, 162 ft-lb)

CAUTION:
Discard the loosened self-locking nut, and replace with a new one.

3) Install the brake hose to lower side of strut, then insert brake hose clip.

CAUTION:
- **Check that the hose clip is positioned properly.**
- **Check the brake hose for twisting, or excessive tension.**
- **(Model equipped with ABS)**

Do not subject the ABS sensor harness to excessive tension.

4) Lower the vehicle and tighten wheel nut.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

5) Sedan model:
Install the rear seat backrest and rear seat cushion.
Wagon model:
Install the strut cap to rear quarter trim.

NOTE:
Check 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-21, DISASSEMBLY, Front Strut.>

D: ASSEMBLY

Refer to Front Strut as a guide for assembly procedures.
<Ref. to FS-22, ASSEMBLY, Front Strut.>

E: INSPECTION

Refer to Front Strut as a guide for inspection procedures.
<Ref. to FS-23, INSPECTION, Front Strut.>

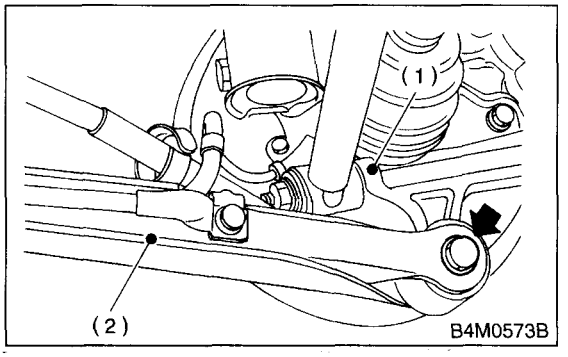
F: DISPOSAL

Refer to Front Strut as a guide for disposal procedures.<Ref. to FS-23, DISPOSAL, Front Strut.>

6. Lateral link

A: REMOVAL

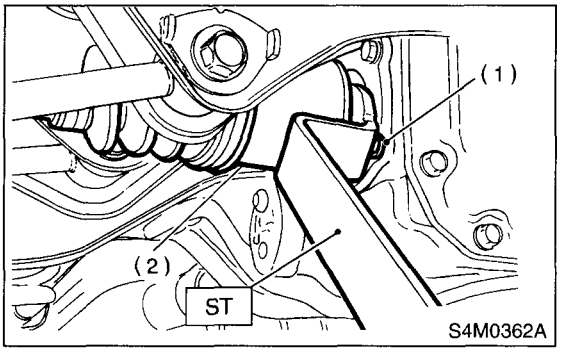
1) Loosen the wheel nuts. Lift-up the vehicle and remove wheel.
2) Remove the stabilizers. (Turbo model)
3) Remove the ABS sensor harness from trailing link.
(Models eqipped with ABS)
4) Remove the bolt securing trailing link to housing.



(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

NOTE:
The side spline shaft circlip comes out together with the shaft.



(1) Bolt
(2) DOJ

CAUTION:
Be careful not to damage the side bearing retainer. Always use bolt shown in 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.

CAUTION:
To loosen the adjusting bolt, always loosen the nut while holding the 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-40, INSTALLATION, Rear Drive Shaft.>

CAUTION:
• Do not allow the DOJ splines to damage side oil seal.
• Always tighten the rubber bushing location when wheels are in full contact with the ground and vehicle is curb weight.
• Tighten the nut when installing adjusting bolt.
• Replace the self-locking nut and DOJ circlip with new ones.

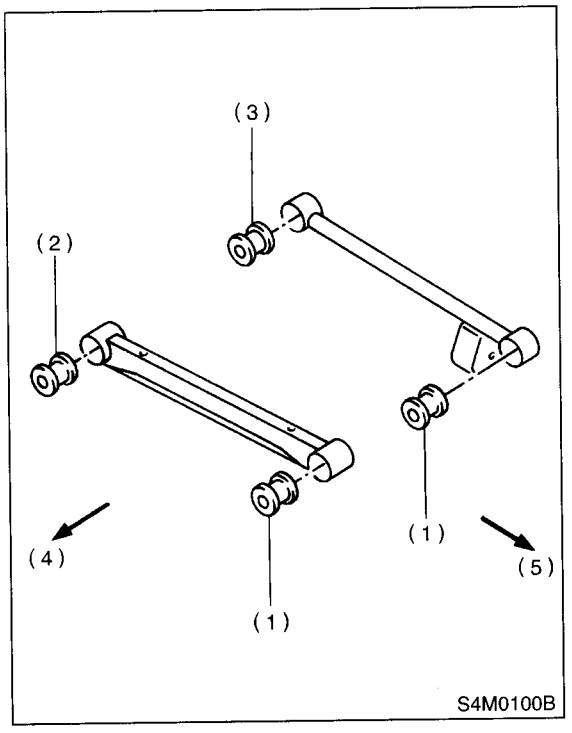
NOTE:
Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

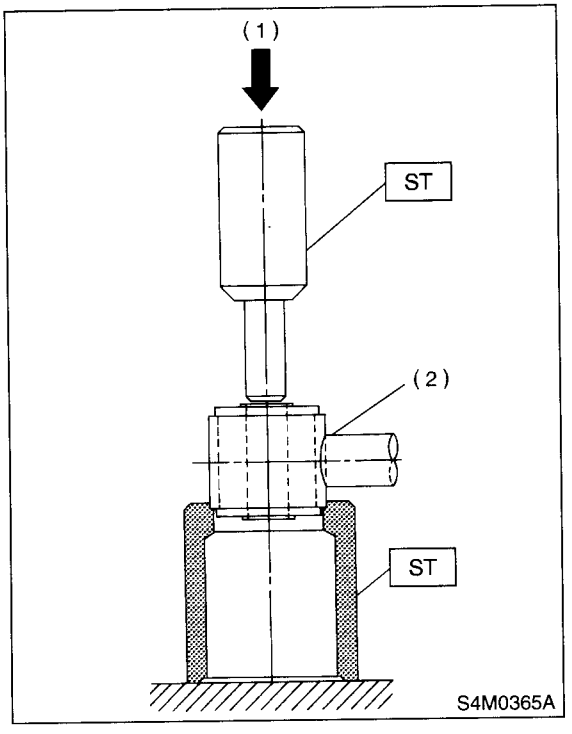
Using ST, press the bushing out of place.

NOTE:
• Using the following table as a guide, verify the type of bushings.
• Select the ST according to the 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



(1) Press
(2) Lateral link

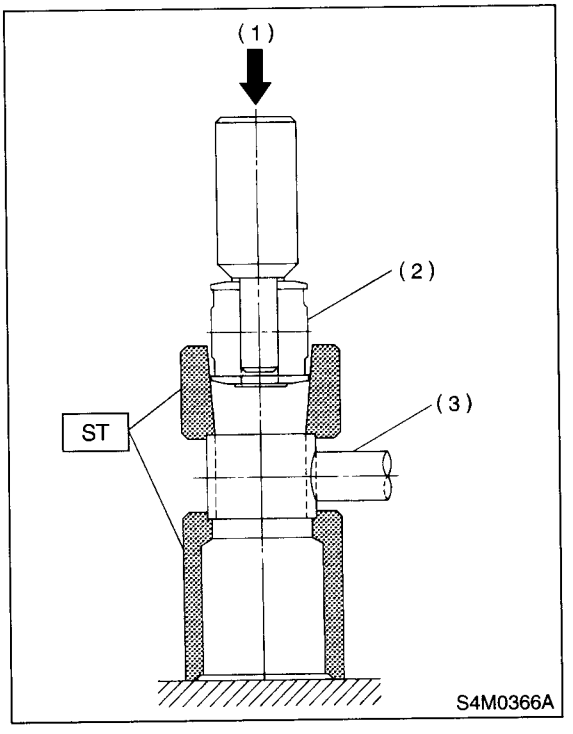
D: ASSEMBLY

1) Using ST, press the bushing into place.

CAUTION:
Select the ST according to the type of bushings used.

NOTE:
- Use the same ST as that used during disassembly.
- 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.

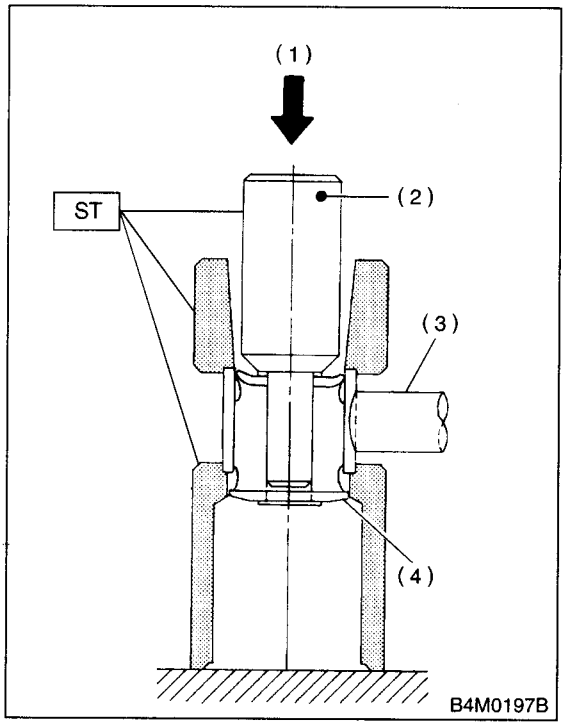
Specified lubricant:
TIRE LUBE : water = 1 : 3



(1) Press
(2) Bushing
(3) Lateral link

2) Press the ST plunger until bushing flange protrudes beyond lateral link.

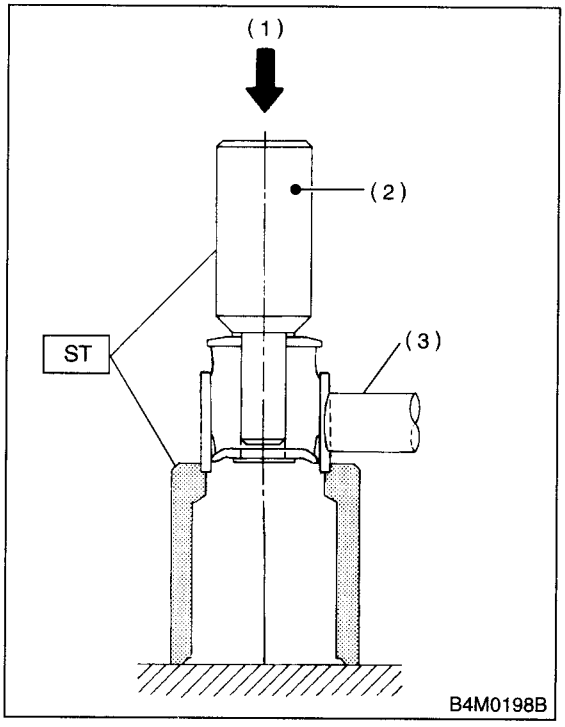
NOTE:
Use the same ST as that used during disassembly.



(1) Press
(2) Plunger
(3) Lateral link
(4) Flange

3) Turn the lateral link upside down. Press the ST plunger in the direction opposite that outlined in the former procedure until bushing is correctly positioned in trailing link.

NOTE:
Using the same ST as that used during dissassembly.



(1) Press
(2) Plunger
(3) Lateral link

E: INSPECTION

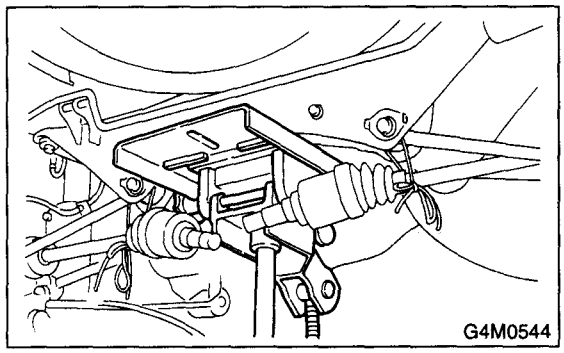
Visually check the lateral links for damage or bends.

7. Rear Crossmember

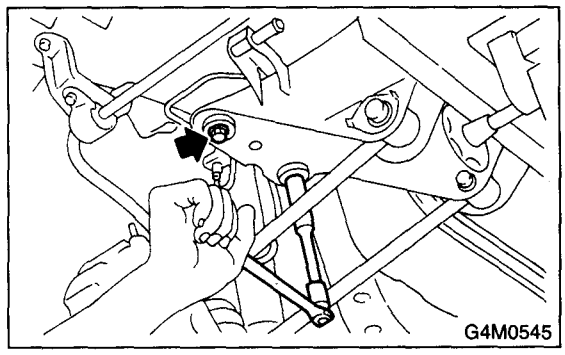
A: REMOVAL

CAUTION:
Do not subject the ABS sensor harness to excessive tension. (Models equipped with ABS)

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-19, REMOVAL, Rear Differential.>
4) Place a transmission jack under rear crossmember.


G4M0544

5) Remove the bolts securing crossmember to vehicle body, and remove the crossmember.


G4M0545

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.
2) For installation and tightning torque of rear differential:
<Ref. to DI-20, INSTALLATION, Rear Differential.>
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 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 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) Unsuitability of maximum and/or minimum length of damper strut and/or shock absorber	Replace with proper parts.
(7) Deformation or loss 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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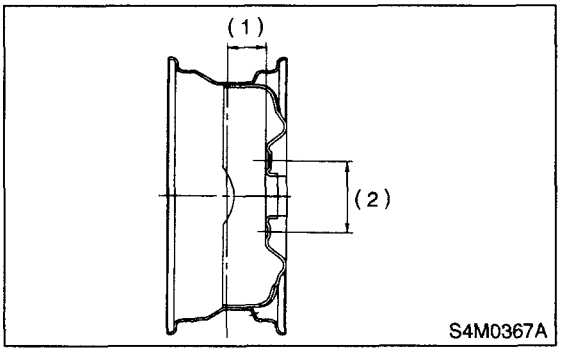
1. General Description

A: SPECIFICATIONS



(1) Offset
(2) P.C.D.

	Tire size	Rim size	Rim offset mm (in)	P.C.D. mm (in)
Front and rear	P195/60R15 87H	15 × 6JJ	55 (2.17)	100 (3.94) Dia.
	P205/55 R16 89V	16 × 6 1/2JJ		
	215/45 R17 87W	17 × 7JJ		
T-Type tire	T135/70 D16 100M	16 × 4T	50 (1.97)	

	Tire size	Tire inflation pressure kPa (kg/cm^2, psi)
Front and rear	P195/60 R15 87H	Fr: 220 (2.2, 32) Rr: 200 (2.0, 29)
	P205/55 R16 89V	Fr: 220 (2.2, 32) Rr: 200 (2.0, 29)
	215/45 R17 87W	Fr: 230 (2.3, 33) Rr: 220 (2.2, 32)
T-Type tire	T135/70 D16 100M	420 (4.2, 60)

NOTE:
• "T-type" tire for temporary use is supplied as a spare tire.

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
723141290	5 g (0.18 oz)
723141300	10 g (0.35 oz)
723141310	15 g (0.53 oz)
723141320	20 g (0.71 oz)
723141330	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
23141GA462	5 g (0.18 oz)
23141GA472	10 g (0.35 oz)
23141GA482	15 g (0.53 oz)
23141GA492	20 g (0.71 oz)
23141GA502	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.

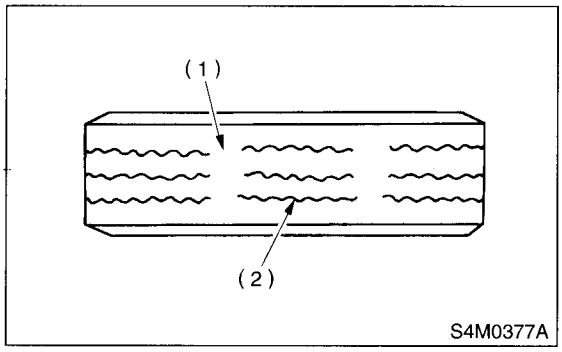
2. Tire

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.
• Avoid mixing radial, belted bias or bias tires on the vehicle.

(1) when large crack on side wall, damage or crack on tread is found.
(2) when the "tread wear indicator" appears as a solid band across the tread.

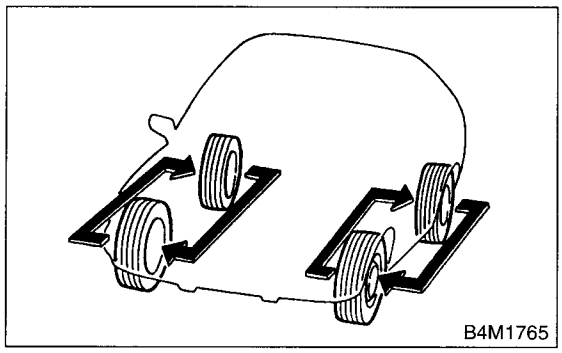


(1) Tread wear indicator
(2) Tire tread

1. TIRE ROTATION

If tires are maintained at the same positions for a long period of time, uneven wear results. Therefore, they should be periodically rotated.
This lengthens service life of tires.

CAUTION:
When rotating tires, replace unevenly worn or damaged tires with new ones.



3. Steel Wheel

A: REMOVAL

1) Apply the parking brake, and position select lever to "P" or "LOW".
2) Set the 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.

NOTE:
• Place the wheels with their outer sides facing upward to prevent wheels from damage.

B: INSTALLATION

1) Attach the wheel to the hub by aligning the wheel bolt hole with the hub bolt.
2) Temporarily attach the wheel nuts to the hub bolts. (In the case of aluminum wheel, use SUBARU genuine wheel nut for aluminum wheel.)
3) Manually tighten the nuts making sure the wheel hub hole is aligned correctly to the guide portion of hub.
4) Tighten the wheel nuts in a diagonal selection to the specified torque. Use a wheel nut wrench.

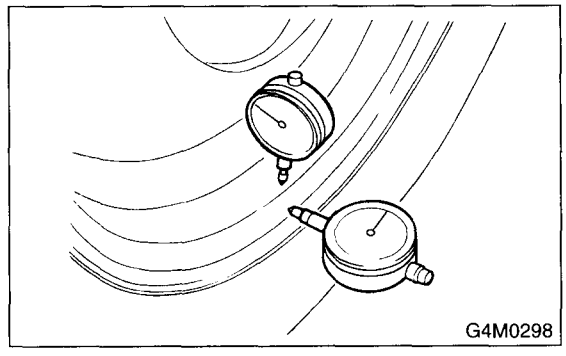
Wheel nut tightening torque:
90 N·m (9.1 kgf-m, 65.7 ft-lb)

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 a foot; Always use both hands when tightening.
• Make sure the bolt, nut and the nut seating surface of the wheel are free from oils.

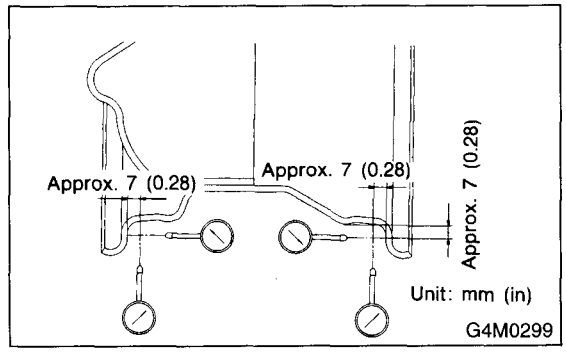
5) If a wheel is removed for replacement or for repair of a puncture, retighten the wheel nuts to the specified torque after running 1,000 km (600 miles).

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)	



4) If the rim runout exceeds specifications, remove the tire from rim and check runout while attaching dial gauge to positions shown in figure.
5) If the 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, disassembly, 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 aluminum wheels to contact the shoulder of the road.
3) When installing a tire chain, be sure to install it properly not to have a 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 the dynamic balancing, measure wheel balance.
3) Select a weight close to the value measured by dynamic balancing.

Balance weight part number (For steel wheel)	Weight
723141290	5 g (0.18 oz)
723141300	10 g (0.35 oz)
723141310	15 g (0.53 oz)
723141320	20 g (0.71 oz)
723141330	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)

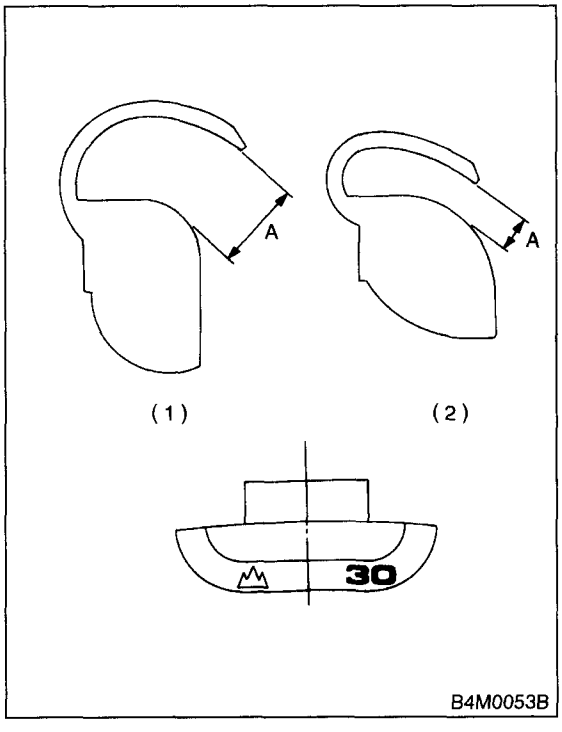
Balance weight part number (For aluminum wheel)	Weight
23141GA462	5 g (0.18 oz)
23141GA472	10 g (0.35 oz)
23141GA482	15 g (0.53 oz)
23141GA492	20 g (0.71 oz)
23141GA502	25 g (0.88 oz)
23141GA512	30 g (1.06 oz)
23141GA522	35 g (1.23 oz)
23141GA532	40 g (1.41 oz)
23141GA542	45 g (1.59 oz)
23141GA552	50 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 the dynamic balancing, measure wheel balance again. Check that 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.

CAUTION:
• 55 g (1.94 oz) weight used with 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;
2.16 mm (0.085 in)
Weight for aluminum wheel;
4.5 mm (0.177 in)

6. "T-type" Tire

A: NOTE

"T-type" tire for temporary use is prepared as a spare tire.

CAUTION:
• Do not use a tire chain with the "T-type" tire. Because of the smaller tire size, a tire chain will not fit properly and will result in damage to the vehicle and the tire.
• Do not drive at a speed greater than 80 km/h (50 MPH).
• Drive as slowly as possible and avoid passing over bumps.

B: REPLACEMENT

Refer to Removal and Installation of Steel Wheel for removal/installation of "T-type" tires. <Ref. to WT-5, Steel Wheel.>

CAUTION:
Replace with a conventional tire as soon as possible since the "T-type" tire is only for temporary use.

C: INSPECTION

1) Check the tire inflation pressure.

Specification:
420 kPa (4.2 kg/cm^2, 60 psi)

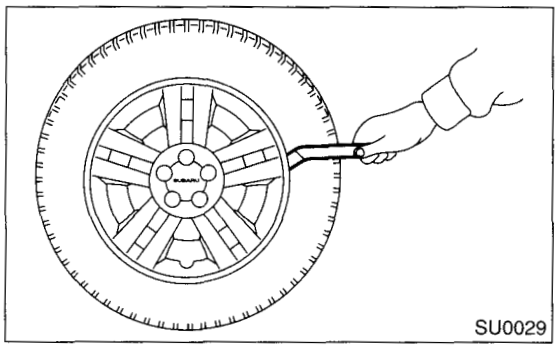
2) Take the stones, glass, nails, etc. out of the tread groove.
3) Check the tires for deformation, cracks, partial wear, or wear.

CAUTION:
Replace the tire with a new one.

7. Full Wheel Cap

A: REMOVAL

Pry off the full wheel cap with a wheel cap remover inserted between openings in the cap.



B: INSTALLATION

Align the valve hole in the wheel cap with the valve on the wheel and secure the wheel cap by tapping four points by hand.

C: INSPECTION

1) Check the wheels for missing wheel caps.
2) Check the pawls of wheel caps for damage or bend.
3) Check the wheel caps for cracks.

8. 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

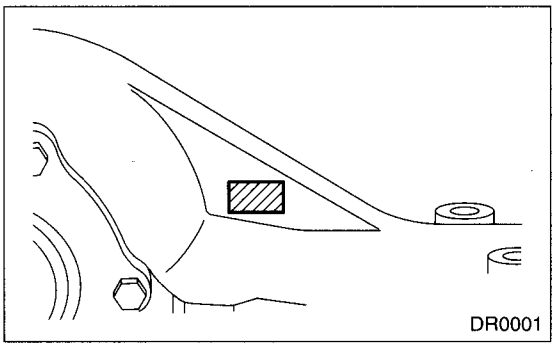
A: SPECIFICATIONS

MODEL	Non-Turbo				Turbo	
	MT		AT			
	Wagon	Sedan	Wagon	Sedan	MT	AT
Rear differential type	EG	EH		EL	EF (with LSD)	EJ (with LSD)
Type of gear	Hypoid gear					
Gear ratio (Number of gear teeth)	3.900 (39/10)	4.111 (37/9)		4.444 (40/9)	3.545 (39/11)	4.111 (37/9)
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)					
Rear differential gear oil	GL-5					

• Identification

When replacing a rear differential assembly, select the correct one according to the following figure.

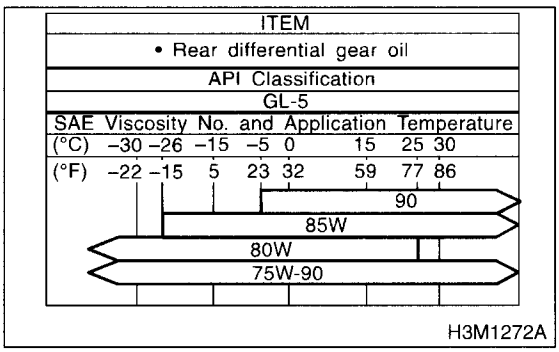
CAUTION:
Using the different rear differential assembly causes the drive line and tires to "drag" or emit abnormal noise when AWD is selected.



• 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. SERVICE DATA

Front and rear bearing preload at companion flange bolt hole N (kgf, lb)	New bearing	19.6 — 28.4 (2.0 — 2.9, 4.4 — 6.4)
	Used bearing	8.34 — 16.67 (0.85 — 1.7, 1.87 — 3.75)
Side gear backlash mm (in)		0.10 — 0.20 (0.0039 — 0.0079)
Side bearing standard width mm (in)		20.00 (0.7874)
Crown gear to drive pinion backlash mm (in)		0.10 — 0.20 (0.0039 — 0.0079)
Crown gear runout on its back surface mm (in)		Less than 0.05 (0.0020)

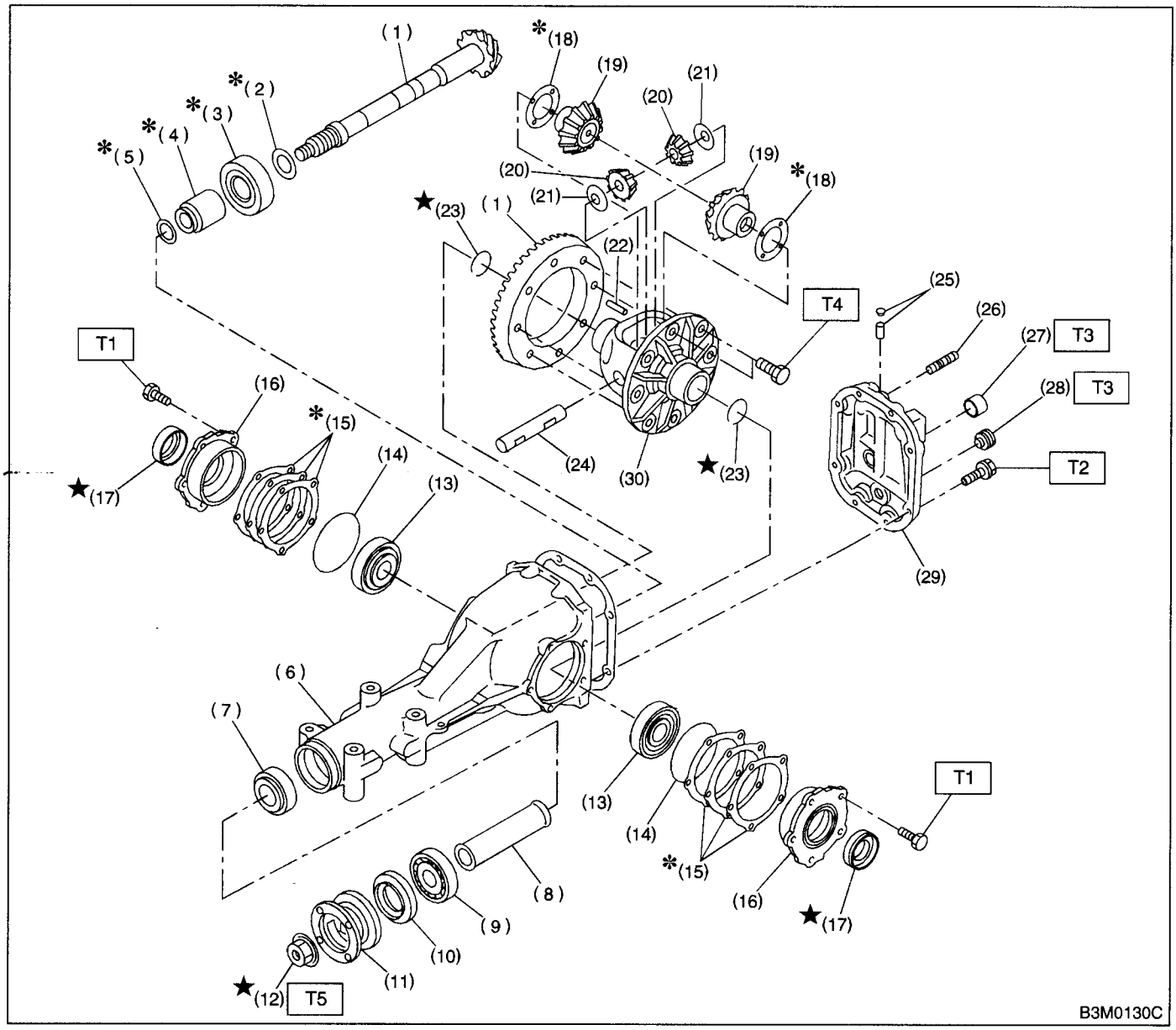
2. ADJUSTING PARTS

Front and rear bearing preload at companion flange bolt hole	New bearing	19.6 — 28.4 N (2.0 — 2.9 kgf, 4.4 — 6.4 lb)
	Used bearing	8.34 — 16.67 N (0.85 — 1.7 kgf, 1.87 — 3.75 lb)
Preload adjusting spacer	Part No.	Length
	383695201	56.2 mm (2.213 in)
	383695202	56.4 mm (2.220 in)
	383695203	56.6 mm (2.228 in)
	383695204	56.8 mm (2.236 in)
	383695205	57.0 mm (2.244 in)
	383695206	57.2 mm (2.252 in)

Preload adjusting washer	Part No.	Length
	383705200	2.59 mm (0.1020 in)
	383715200	2.57 mm (0.1012 in)
	383725200	2.55 mm (0.1004 in)
	383735200	2.53 mm (0.0996 in)
	383745200	2.51 mm (0.0988 in)
	383755200	2.49 mm (0.0980 in)
	383765200	2.47 mm (0.0972 in)
	383775200	2.45 mm (0.0965 in)
	383785200	2.43 mm (0.0957 in)
	383795200	2.41 mm (0.0949 in)
	383805200	2.39 mm (0.0941 in)
	383815200	2.37 mm (0.0933 in)
	383825200	2.35 mm (0.0925 in)
	383835200	2.33 mm (0.0917 in)
	383845200	2.31 mm (0.0909 in)
Pinion height adjusting shim	Part No.	Thickness
	383495200	3.09 mm (0.1217 in)
	383505200	3.12 mm (0.1228 in)
	383515200	3.15 mm (0.1240 in)
	383525200	3.18 mm (0.1252 in)
	383535200	3.21 mm (0.1264 in)
	383545200	3.24 mm (0.1276 in)
	383555200	3.27 mm (0.1287 in)
	383565200	3.30 mm (0.1299 in)
	383575200	3.33 mm (0.1311 in)
	383585200	3.36 mm (0.1323 in)
	383595200	3.39 mm (0.1335 in)
	383605200	3.42 mm (0.1346 in)
	383615200	3.45 mm (0.1358 in)
	383625200	3.48 mm (0.1370 in)
	383635200	3.51 mm (0.1382 in)
	383645200	3.54 mm (0.1394 in)
	383655200	3.57 mm (0.1406 in)
	383665200	3.60 mm (0.1417 in)
	383675200	3.63 mm (0.1429 in)
	383685200	3.66 mm (0.1441 in)
Side gear backlash	0.1 — 0.2 mm (0.0039 — 0.0079 in)	
Side gear thrust washer (Non-Turbo model)	Part No.	Thickness
	383445201	0.75 — 0.80 mm (0.0295 — 0.0315 in)
	383445202	0.80 — 0.85 mm (0.0315 — 0.0335 in)
	383445203	0.85 — 0.90 mm (0.0335 — 0.0354 in)
Side bearing standard width	—	20.00 mm (0.7874 in)
Side bearing retainer shim	Part No.	Thickness
	383475201	0.20 mm (0.0079 in)
	383475202	0.25 mm (0.0098 in)
	383475203	0.30 mm (0.0118 in)
	383475204	0.40 mm (0.0157 in)
	383475205	0.50 mm (0.0197 in)
Crown gear to drive pinion backlash	Limit	0.10 — 0.20 mm (0.0039 — 0.0079 in)
Crown gear runout on its back sunface		0.05 mm (0.0020 in)

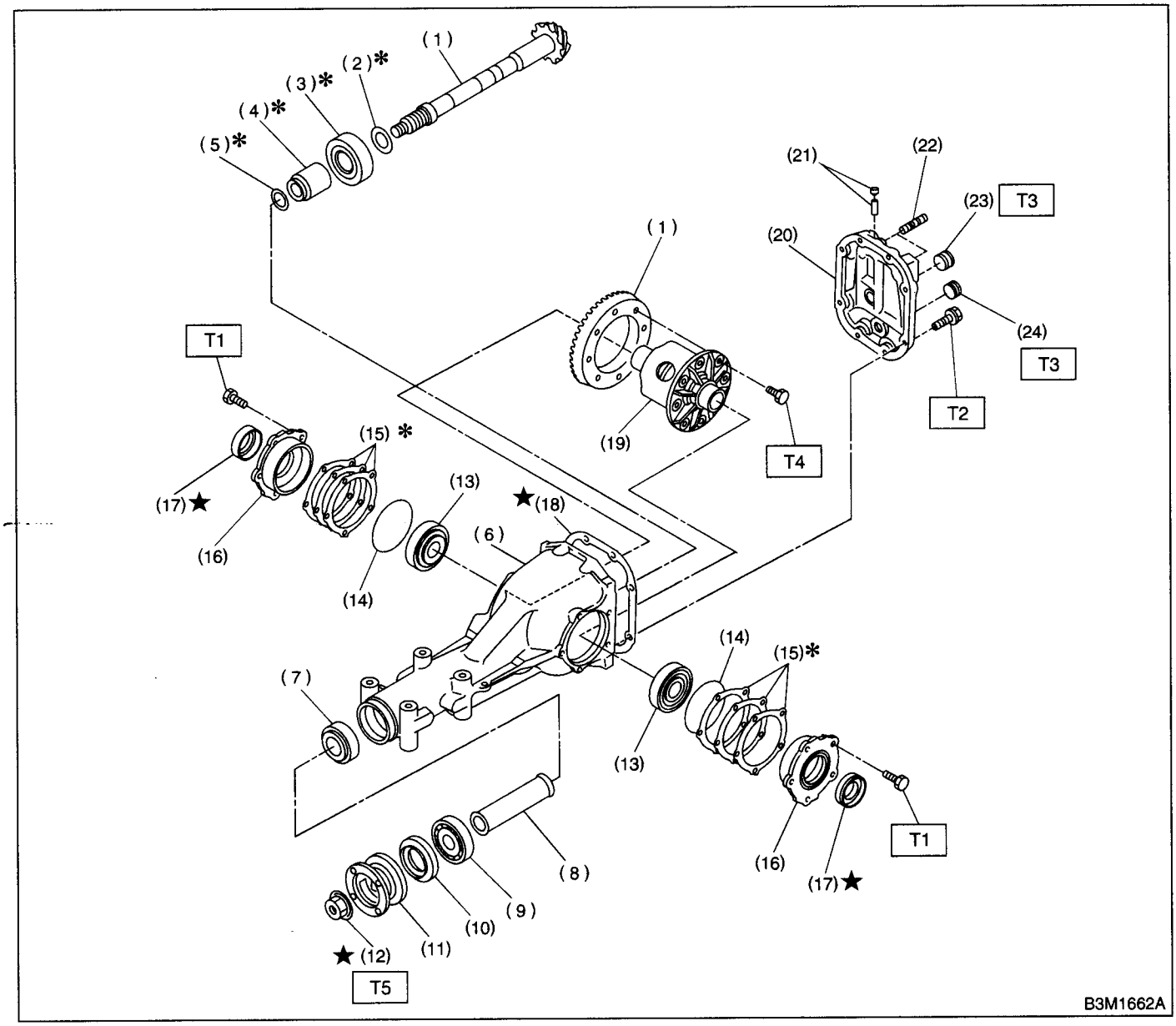
B: COMPONENT

1. REAR DIFFERENTIAL WITHOUT LSD



(1)	Pinion crown gear set	(13)	Side bearing	(25)	Air breather cap
(2)	Pinion height adjusting washer	(14)	O-ring	(26)	Stud bolt
(3)	Rear bearing	(15)	Side bearing retainer shim	(27)	Oil filler plug
(4)	Bearing preload adjusting spacer	(16)	Side bearing retainer	(28)	Oil drain plug
(5)	Bearing preload adjusting washer	(17)	Side oil seal	(29)	Rear cover
(6)	Differential carrier	(18)	Side gear thrust washer	(30)	Differential case
(7)	Front bearing	(19)	Side gear	***Tightening torque: N·m (kgf-m, ft-lb)***	
(8)	Spacer	(20)	Pinion mate gear	***T1:***	***10.3 (1.05, 7.6)***
(9)	Pilot bearing	(21)	Pinion mate gear washer	***T2:***	***29.4 (3.00, 21.7)***
(10)	Front oil seal	(22)	Pinion shaft lock pin	***T3:***	***49.0 (5.0, 36.2)***
(11)	Companion flange	(23)	Circlip	***T4:***	***103.0 (10.50, 75.9)***
(12)	Self-locking nut	(24)	Pinion mate shaft	***T5:***	***181.4 (18.50, 133.8)***

2. REAR DIFFERENTIAL WITH LSD

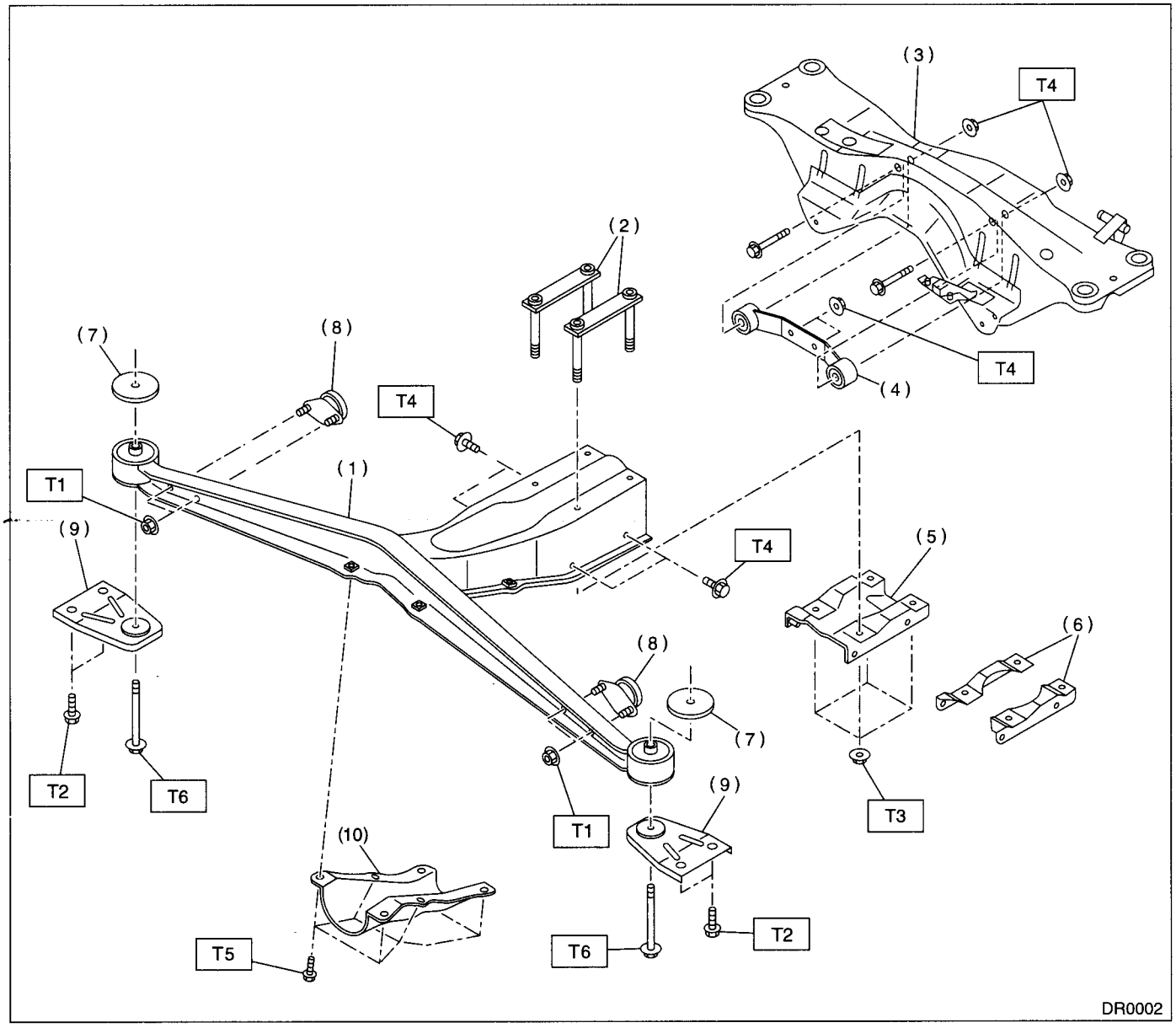


(1) Pinion crown gear set
(2) Pinion height adjusting shim
(3) Rear bearing
(4) Bearing preload adjusting spacer
(5) Bearing preload adjusting washer
(6) Differential carrier
(7) Front bearing
(8) Collar
(9) Pilot bearing
(10) Front oil seal
(11) Companion flange
(12) Self-locking nut
(13) Side bearing
(14) O-ring
(15) Side bearing retainer shim
(16) Side bearing retainer
(17) Side oil seal
(18) Gasket
(19) Differential case
(20) Rear cover
(21) Air breather cap
(22) Stud bolt
(23) Oil filler plug
(24) Oil drain plug

Tightening torque: N·m (kgf-m, ft-lb)

T1:	***10.3 (1.05, 7.6)***
T2:	***29.4 (3.00, 21.7)***
T3:	***49.0 (5.00, 36.2)***
T4:	***103.0 (10.50, 75.9)***
T5:	***181.4 (18.50, 133.8)***

3. REAR DIFFERENTIAL MOUNTING SYSTEM



(1) Differential front member
(2) Plate
(3) Crossmember
(4) Differential rear member
(5) Differential mount lower bracket (TURBO model)
(6) Differential mount lower bracket (Non-turbo model)
(7) Stopper
(8) Dynamic damper
(9) Differential mount bracket
(10) Differential mount front cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 20 (2.0, 14.5)
T2: 33 (3.4, 24.3)
T3: 65 (6.6, 47.9)
T4: 70 (7.1, 51.6)
T5: 90 (9.2, 66.4)
T6: 100 (10.2, 73.8)

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 vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.
- Avoid damaging the mating face of the case.

D: PREPARATION TOOL

1. SPECIAL TOOLS

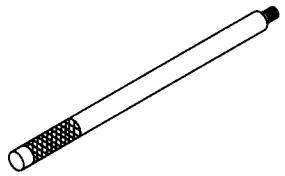
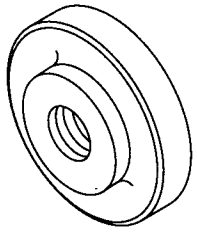
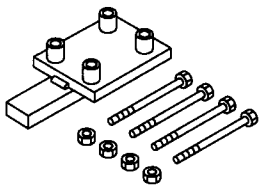
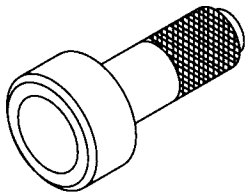
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1893	398477701	HANDLE	Used for installing front and rear bearing cone.
 B3M1894	398477702	DRIFT	Used for press-fitting the bearing cone of differential carrier (rear).
 B3M1895	398217700	ATTACHMENT SET	Stand for rear differential carrier disassembly and assembly.
 B3M1896	498447120	DRIFT	Used for installing front oil seal.

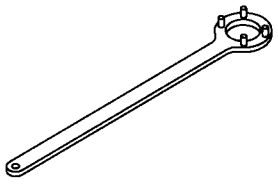
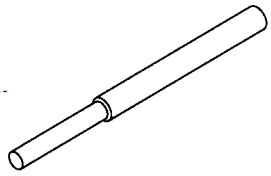
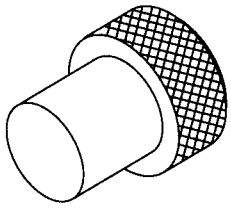
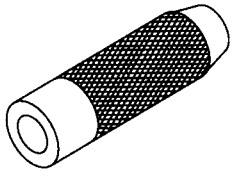
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1897	498427200	FLANGE WRENCH	Used for stopping rotation of companion flange when loosening and tightening self-lock nut.
 B3M1898	398467700	DRIFT	Used for removing pinion, pilot bearing and front bearing cone.
 B3M1899	399780104	WEIGHT	Used for installing front bearing cone, pilot bearing companion flange.
 B3M1900	899580100	INSTALLER	Used for press-fitting the front bearing cone, pilot bearing.

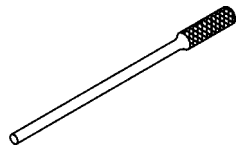
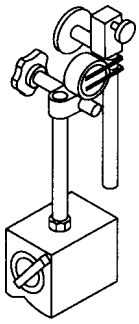
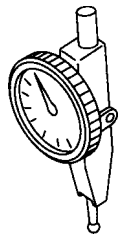
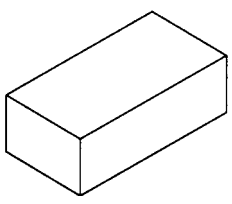
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1901	899904100	STRAIGHT PIN REMOVER	Used for driving out differential pinion shaft lock pin.
 B3M1902	498247001	MAGNET BASE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with DIAL GAUGE (498247100).
 B3M1903	498247100	DIAL GAUGE	• Used for measurng backlash between side gear and pinion, and hypoid gear. • Used with MAGNET BASE (498247001).
 B3M1904	398507704	BLOCK	Used for adjusting pinion height and preload.

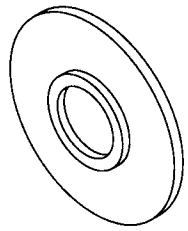
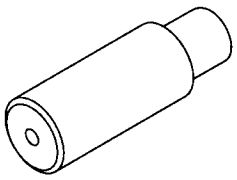
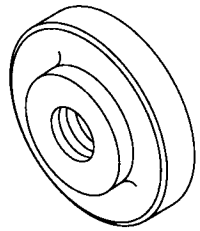
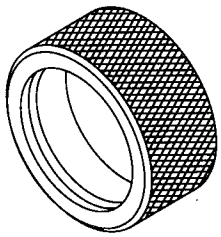
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1905	398177700	INSTALLER	• Used for installing rear bearing cone.
 B3M1906	398457700	ATTACHMENT	• Used for removing side bearing retainer.
 B3M1907	398477703	DRIFT2	• Used for press-fitting the bearing race (rear) of differential carrier.
 B3M1908	398437700	DRIFT	• Used for installing side oil seal.

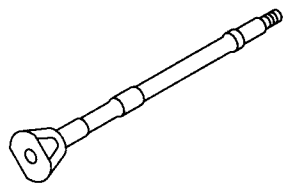
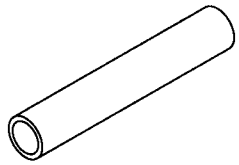
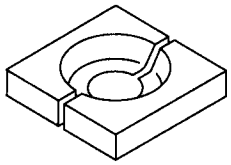
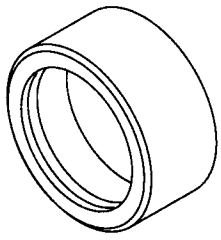
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1909	398507702	DUMMY SHAFT	• Used for adjusting pinion height and preload.
 B3M1910	398507703	DUMMY COLLAR	• Used for adjusting pinion height and preload.
 B3M1911	398517700	REPLACER	• Used for removing rear bearing cone.
 B3M1912	398487700	DRIFT	• Used for press-fitting the side bearing cone.

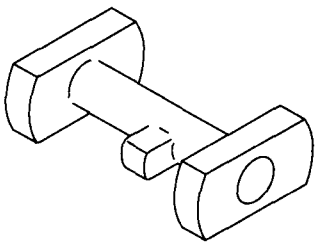
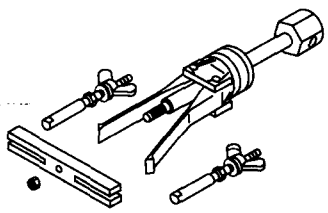
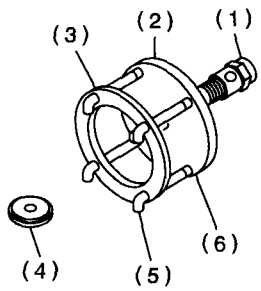
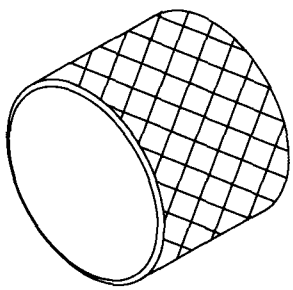
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1913	398507701	DIFFERENTIAL CARRIER GAUGE	• Used for adjusting pinion height.
 B3M1914	398527700	PULLEY ASSY	• Used for removing front oil seal. • Used for removing side bearing cup. (T-type)
 B3M1915A	399527700	PULLER SET	• Used for extracting side bearing cone. (1) BOLT (899521412) (2) PULLER (399527702) (3) HOLDER (399527703) (4) ADAPTER (398497701) (5) BOLT (899520107) (6) NUT (021008000)
 B3M1916	398227700	WEIGHT	• Used for installing side bearing.

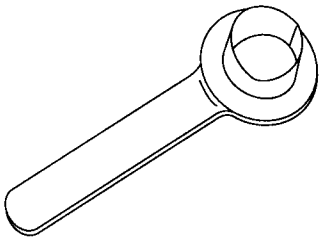
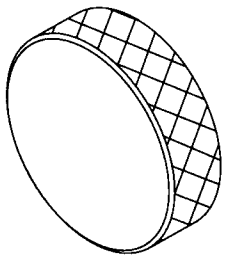
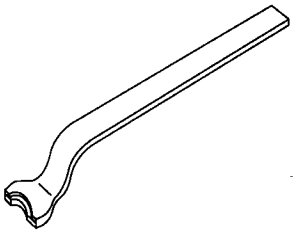
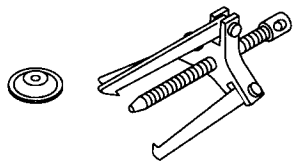
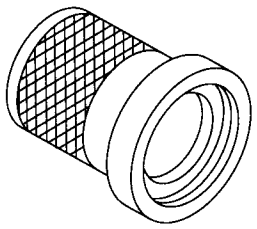
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1917	28099PA090	OIL SEAL PROTECTOR	• Used for installing rear drive shaft into rear differential. • For protecting oil seal.
 B3M1918	398237700	GAUGE	• Used for installing side bearing.
 B3M1919	28099PA100	DRIVE SHAFT REMOVER	• Used for removing rear drive shaft from rear differential.
 B3M1930	399703602	PULLEY ASSY	• Used for removing companion flange

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1931	899874100	INSTALLER	• Used for installing companion flange.

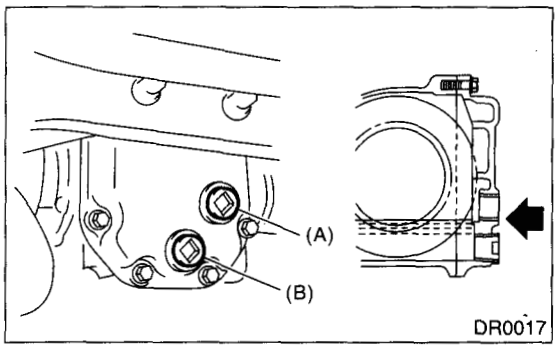
2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Transmission jack	Used for assembly/disassembly of rear differential.
Puller	Used for removal of side bearing retainer.
Thickness gauge	Used for measuring clearance.

2. Differential Gear Oil

A: INSPECTION

1) Take out the filler plug, and replace gear oil if it is contaminated or deteriorated. <Ref. to DI-17, REPLACEMENT, Differential Gear Oil.>
2) Check gear oil level is up to the bottom part of filler bolt. If the level is low, refill up to the bottom of filler bolt.

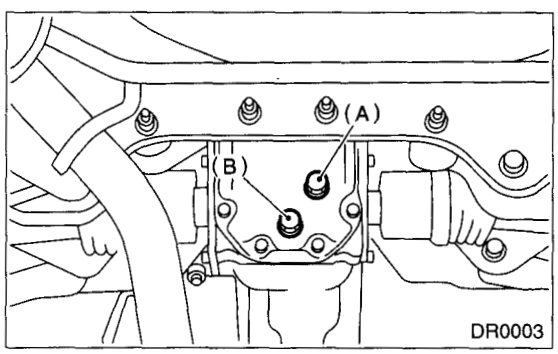


(A) Filler plug
(B) Drain plug

B: REPLACEMENT

1) Disconnect the ground terminal from battery.
2) Jack-up the vehicle and support it with sturdy racks.
3) Remove the oil drain plug and filler plug, 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.

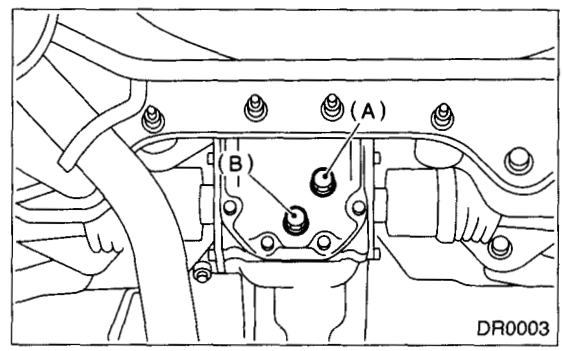
Fluid packing:
THREE BOND 1105 or equivalent

Tightening torque:
49.0 N·m (5.0 kgf-m, 36.2 ft-lb)

5) Fill differential carrier with gear oil to the upper plug level.

CAUTION:
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.
NOTE:
Apply fluid packing to the filler plug.

Fluid packing:
THREE BOND 1105 or equivalent

Tightening torque:
49.0 N·m (5.0 kgf-m, 36.2 ft-lb)

3. Front Differential

A: NOTE

1. AT MODEL

Refer to AUTOMATIC TRANSMISSION in separate publication "AUTOMATIC TRANSMISSION" for Front Differential. <Pub. No. G0853ZE>

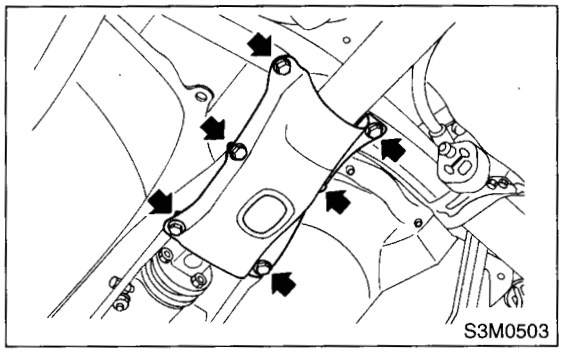
2. MT MODEL

For front differential of manual transmission, refer to "MT" section. <Ref. to MT-71, Front Differential Assembly.>

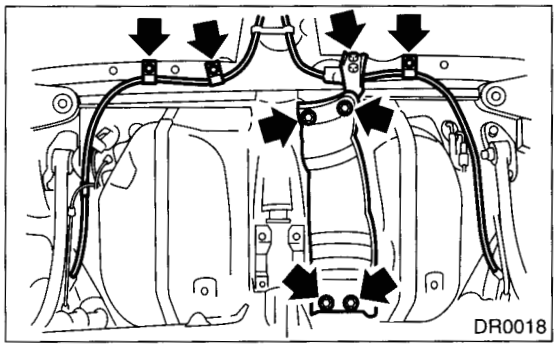
4. Rear Differential

A: REMOVAL

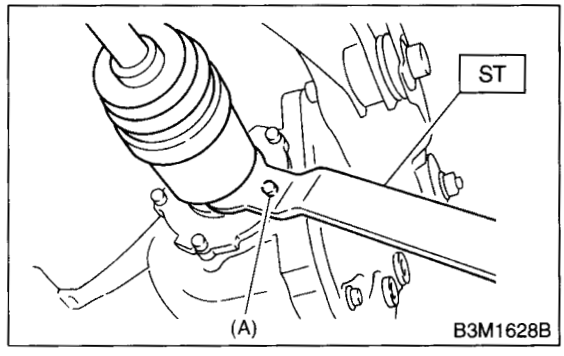
1) Set the vehicle on the lift.
2) Disconnect the ground terminal from battery.
3) Move the select lever or gear shift lever to "N".
4) Release the parking brake.
5) Loosen the wheel nuts.
6) Jack-up the vehicle and support it with sturdy racks.
7) Remove the wheels.
8) Remove the rear exhaust pipe and muffler.
Non-turbo model:
<Ref. to EX(SOHC)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-11, REMOVAL, Muffler.>
Turbo model:
<Ref. to EX(DOHC TURBO)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(DOHC TURBO)-14, REMOVAL, Muffler.>
9) Remove the rear differential protector. (If equipped)
10) Remove the front cover of rear differential mount.


S3M0503

11) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
12) Remove the heat shield cover.
13) Remove the clamps and bracket of parking brake cable.

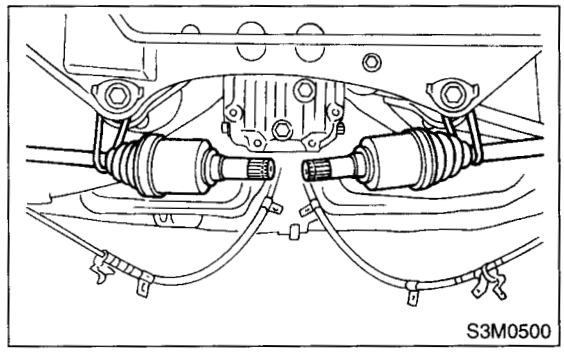

DR0018

14) Remove the DOJ of rear drive shaft from rear differential using ST. <Ref. to DI-37, REPLACEMENT, Rear Differential Side Oil Seal.>
ST 28099PA100 DRIVE SHAFT REMOVER

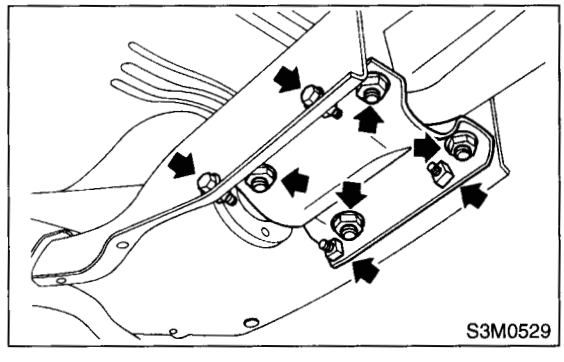


(A) Bolt

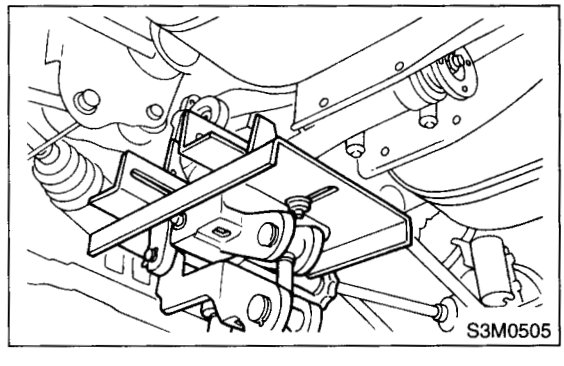
15) Secure the rear drive shaft to rear crossmember using wire.


S3M0500

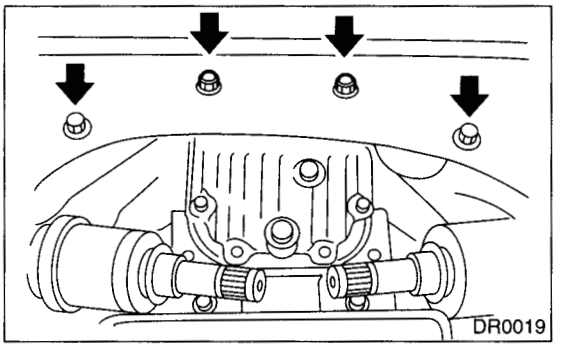
16) Remove the lower differential bracket.


S3M0529

17) Support the rear differential with transmission jack.

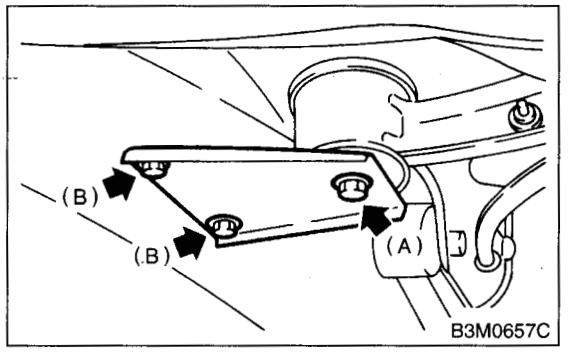

S3M0505

18) Remove the self-locking nuts and bolts.



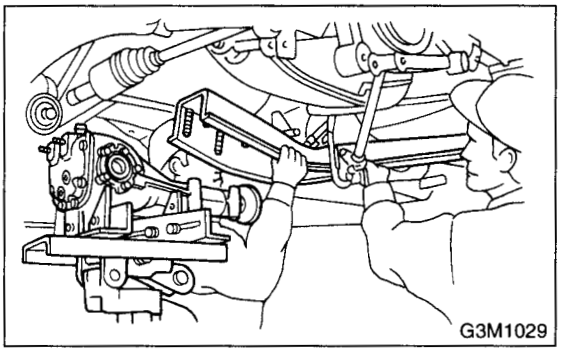
19) Remove the bolts which secure rear differential front member to body.
Loosen bolt A first, then remove bolts B.

NOTE:
Support the front member with the use of a helper to prevent it from dropping.

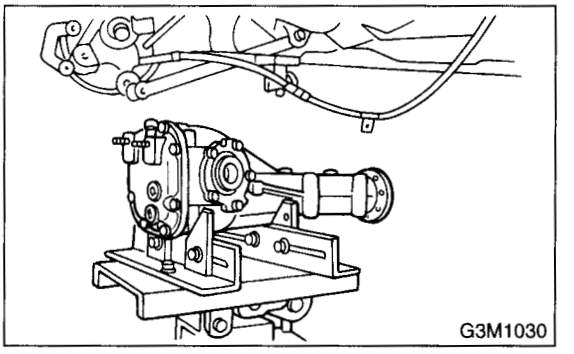


(A) Bolt A
(B) Bolt B

20) Remove bolt A.
21) While slowly lowering the transmission jack, move rear differential forward and remove front member and rear differential from body.



22) Remove the rear differential from front member, and remove rear member.



B: INSTALLATION

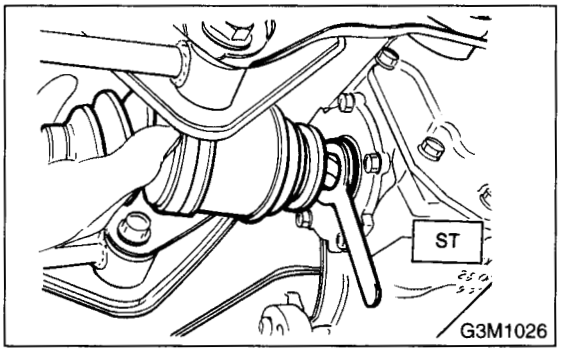
To install, reverse the removal sequence.
1) Install the air breather cap tapping with a plastic hammer.

CAUTION:
Be sure to install a new air breather cap.

2) Position the front member on body by passing it under 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.

3) Install the DOJ of drive shaft into rear differential.<Ref. to DI-37, REPLACEMENT, Rear Differential Side Oil Seal.>
ST 28099PA090 SIDE OIL SEAL PROTECTOR



4) Install in the reverse order of removal.
5) After installation, fill the differential carrier with gear oil to the filler plug level. <Ref. to DI-17, Differential Gear Oil.>

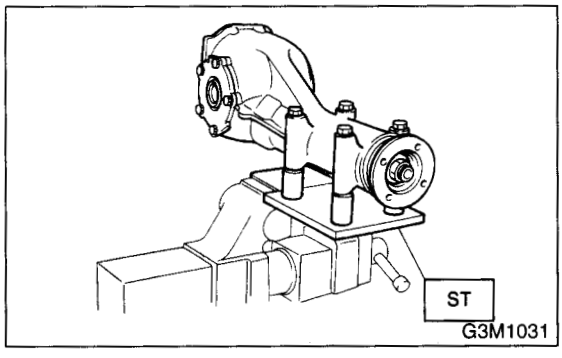
C: DISASSEMBLY

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.

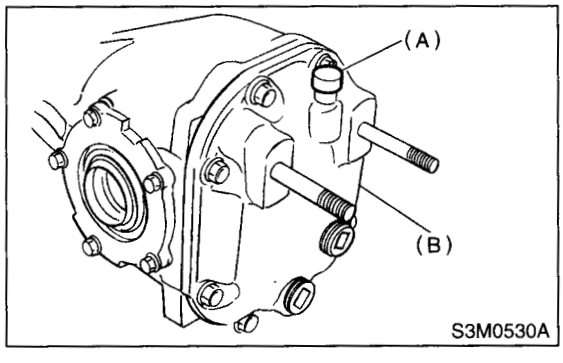
ST 398217700 ATTACHMENT



2) Drain the gear oil by removing plug.

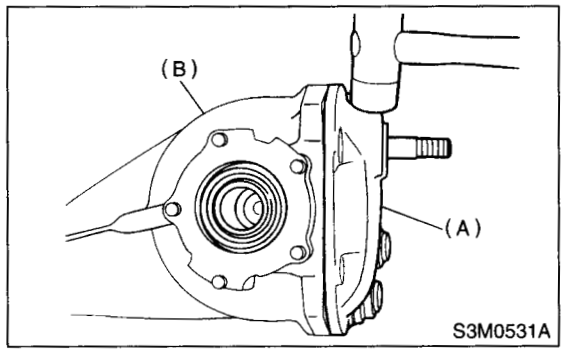
3) Remove the air breather cap.

NOTE:
Do not attempt to replace the air breather cap unless necessary.



(A) Air breather cap
(B) Rear cover

4) Remove the rear cover by loosening retaining bolts.

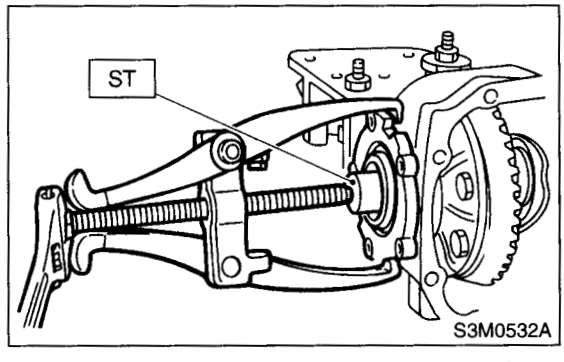


(A) Rear cover
(B) Differential carrier

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.

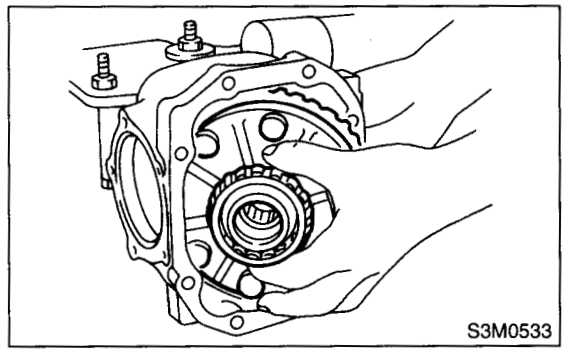
CAUTION:
Each shim, which is installed to adjust the side bearing preload, should be kept together with its mating retainer.

ST 398457700 ATTACHMENT

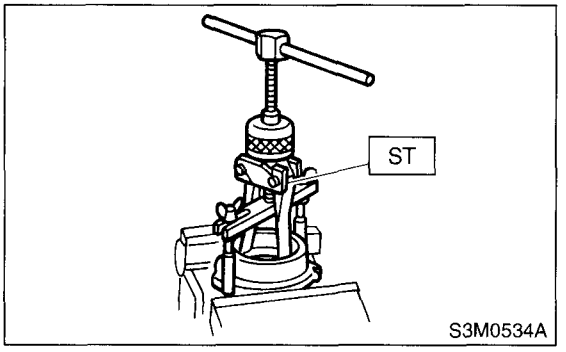


6) Pull out the differential case assembly from differential carrier.

CAUTION:
Be careful not to hit the teeth against the case.



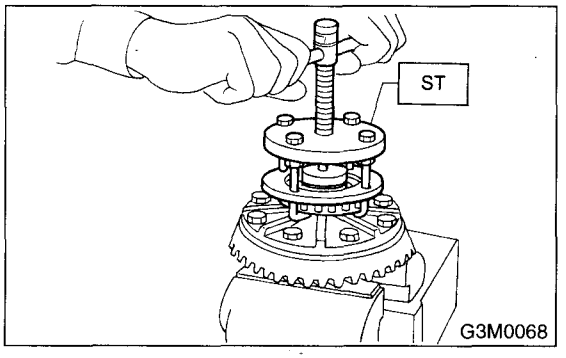
7) When replacing the side bearing, pull the bearing cup from side bearing retainer using ST.
ST 398527700 PULLER ASSY



8) Extract the bearing cone with ST.

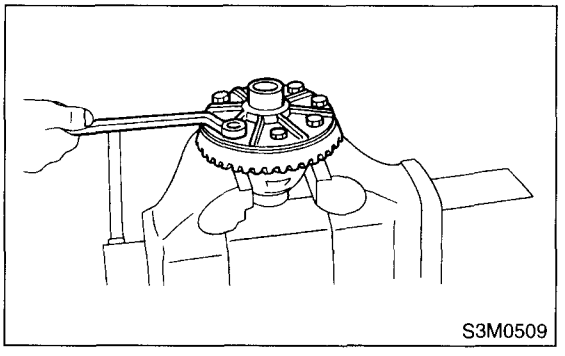
CAUTION:
Do not attempt to disassemble the parts unless necessary.

NOTE:
• Set the puller so that its claws catch the edge of the bearing cone.
• Never mix up the right and left hand bearing races and cones.
ST 398527700 PULLER SET



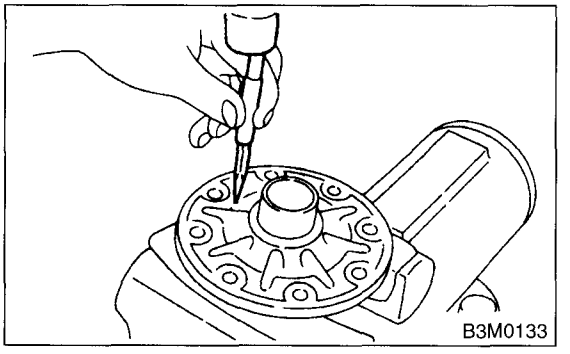
9) Remove the crown gear by loosening crown gear bolts.

CAUTION:
Further disassembling is not allowed.



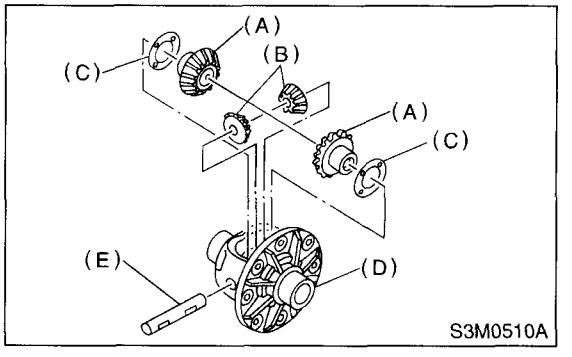
10) Drive out the pinion shaft lock pin from crown gear side. (Without LSD)

NOTE:
The lock pin is staked at the pin hole end on the differential carrier; do not drive it out forcibly before unstaking it.
ST 899904100 STRAIGHT PIN REMOVER



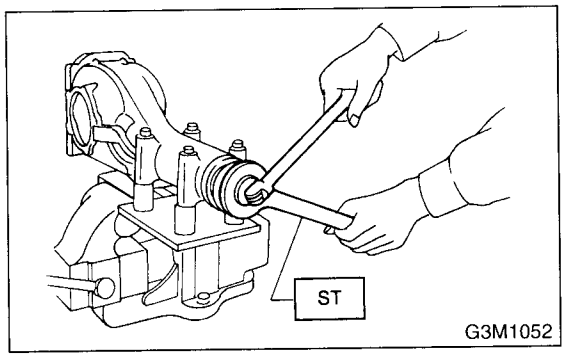
11) Draw out the pinion mate shaft and remove pinion mate gears, side gears and thrust washers. (Without LSD)

NOTE:
The gears as well as thrust washers should be marked or kept separated right and left, and front and rear.

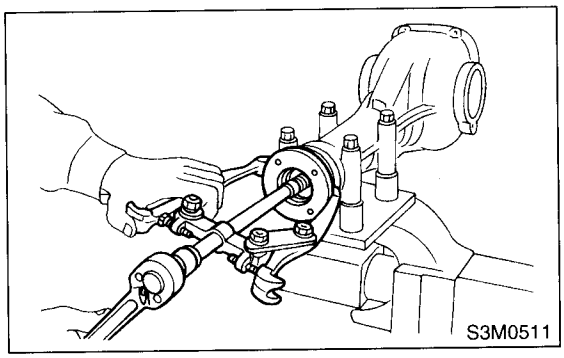


(A) Side gear
(B) Pinion mate gear
(C) Thrust washer
(D) Differential case
(E) Pinion mate shaft

12) Hold the companion flange with ST and remove drive pinion nut.
ST 498427200 FLANGE WRENCH

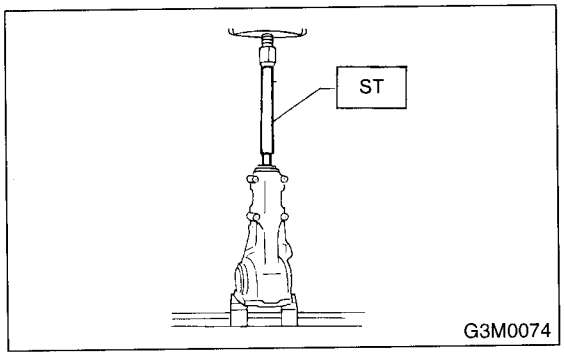


13) Extract the companion flange with a puller.



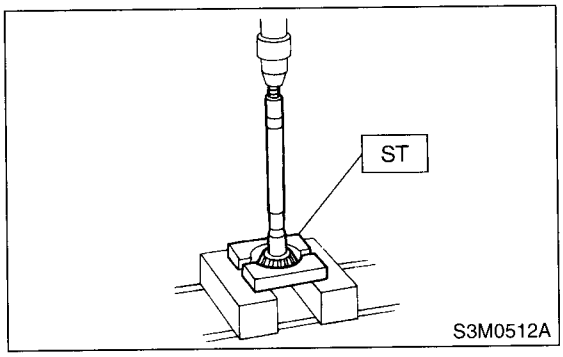
14) Press the end of drive pinion shaft and extract it together with rear bearing cone, preload adjusting spacer and washer.

NOTE:
Hold the drive pinion so as not to drop it.
ST 398467700 DRIFT

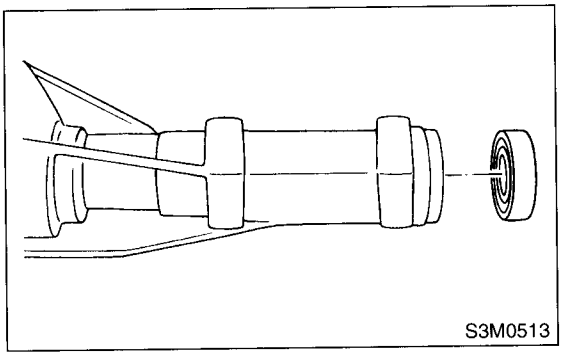


15) Remove the rear bearing cone from drive pinion by supporting cone with ST.

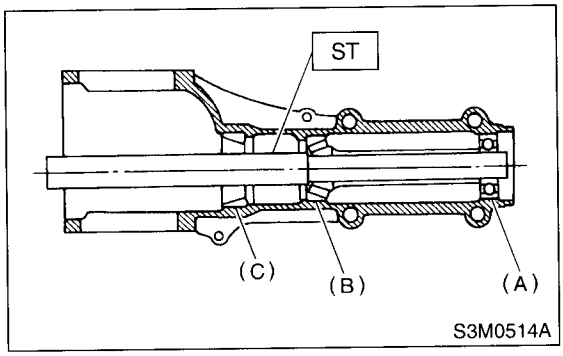
NOTE:
Place the replacer so that its center-recessed side faces the pinion gear.
ST 398517700 REPLACER



16) Remove the front oil seal from differential carrier using ST.
ST 398527700 PULLER ASSY

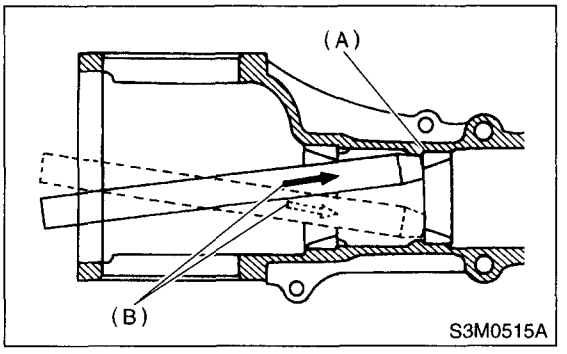


17) Remove the pilot bearing together with front bearing cone using ST.
ST 398467700 DRIFT



(A) Pinion bearing
(B) Front bearing
(C) Rear bearing cup

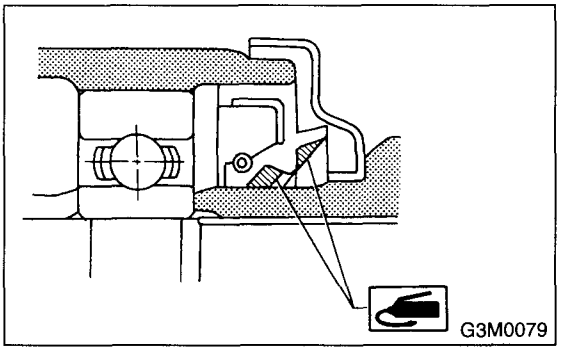
18) When replacing the bearings, tap front bearing cup and rear bearing cup in this order out of case by using a brass bar.



(A) 2 cutouts along diagonal lines
(B) Tap alternately with brass bar.

D: ASSEMBLY

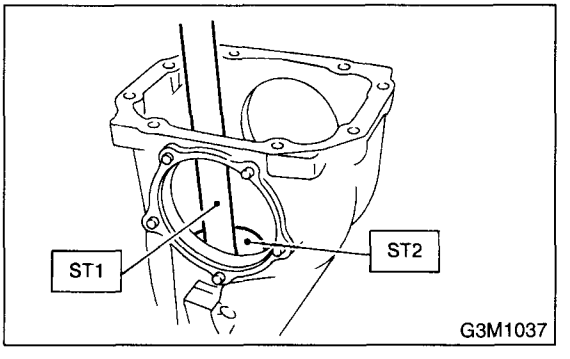
1) Precautions for assembling:
- Assemble in the reverse order of disassembling.
- Check and adjust each part during assembly.
- Keep the shims and washers in order, so that they are not misinstalled.
- Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
- Apply 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.



2) 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 into differential carrier with ST1 and ST2.

ST1 398477701 HANDLE
ST2 398477703 DRIFT 2

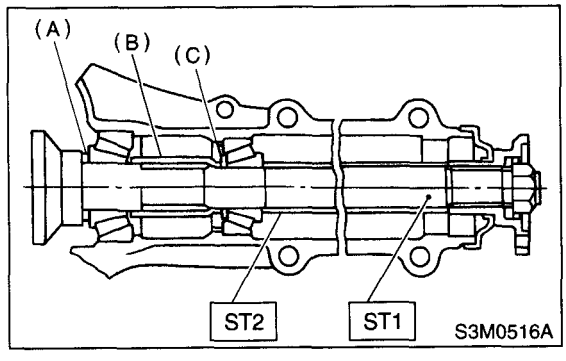


(2) Insert the ST1 into carrier with pinion height adjusting washer and rear bearing cone fitted onto it.

CAUTION:
- **Re-use the used washer if not deformed.**
- **Use a new rear bearing cone.**

(3) 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

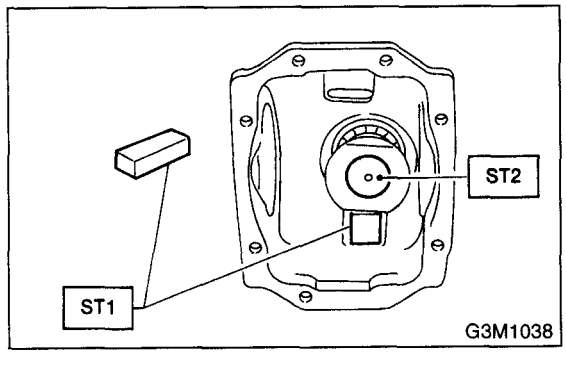
(4) Turn the ST1 with hand to make it seated, and tighten the drive pinion nut while measuring the preload with spring balance. Select the preload adjusting washer and spacer so that the specified preload is obtained when nut is tightened to the specified torque.

CAUTION:
Use a new lock nut.

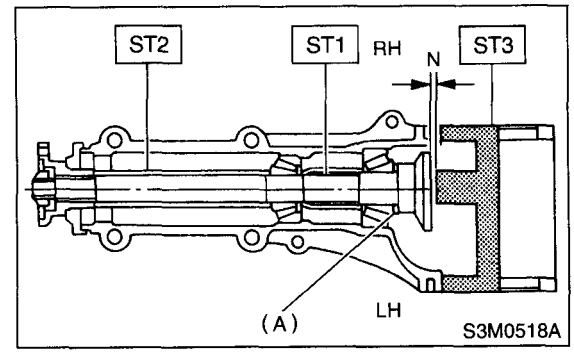
NOTE:
- Be careful not to give excessive preload.
- When tightening the drive pinion nut, lock ST1 with ST2 as shown in the figure.

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: 19.6 — 28.4 N (2.0 — 2.9 kgf, 4.4 — 6.4 lb) at companion flange bolt hole
For used bearing: 8.34 — 16.67 N (0.85 — 1.7 kgf, 1.87 — 3.75 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)

3) Adjusting drive pinion height:
Adjust the drive pinion height with shim installed between rear bearing cone and the back of pinion gear.

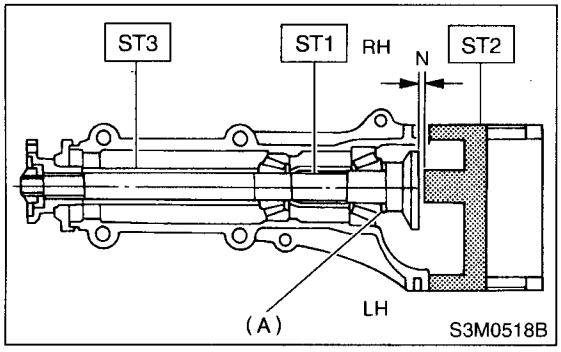
(1) Install ST1, ST2 and ST3, as shown in the figure, and apply the specified preload on the bearings.

Front and rear bearing preload
For new bearing: 19.6 — 28.4 N (2.0 — 2.9 kgf, 4.4 — 6.4 lb) at companion flange bolt hole
For used bearing: 8.34 — 16.67 N (0.85 — 1.7 kgf, 1.87 — 3.75 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

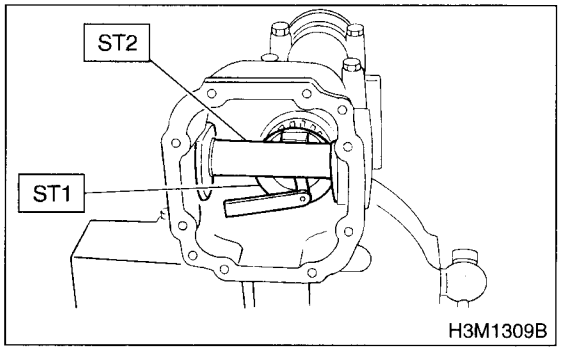


(A) Pinion height adjusting shim

(2) Measure the clearance N between the end of ST2 and the 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 x 0.01) – 0.20 mm (0.0079 in)

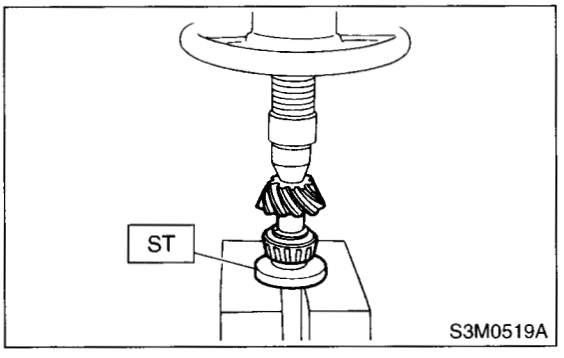
NOTE:
Use copies of this page.

T	Thickness of shim temporarily inserted mm (in)	
To	Thickness of pinion height adjusting shim mm (in)	
N	Reading of thickness gauge mm (in)	
H	Figure marked on drive pinion head	
Memo:		

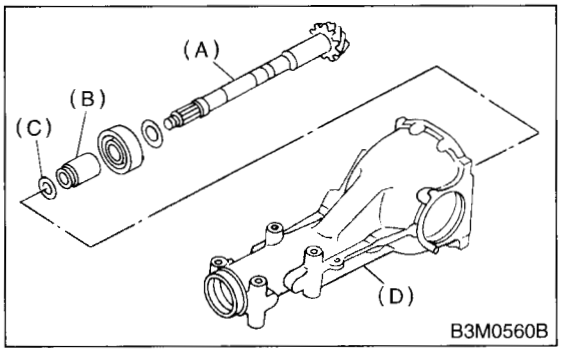
(Example of calculation)
To = 2.20 + 1.20 = 3.40 mm
N = 0.23 mm H = + 1,
T = 3.40 + 0.23 – 0.01 – 0.20 = 3.42
Result: Thickness = 3.42 mm
Therefore use the shim 383605200.

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)

4) Install the selected pinion height adjusting shim on drive pinion, and press the rear bearing cone into position with ST.
ST 398177700 INSTALLER

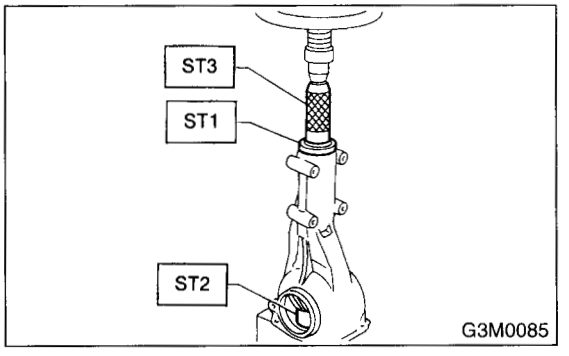


5) Insert the drive pinion into differential carrier, install the previously selected bearing preload adjusting spacer and washer.

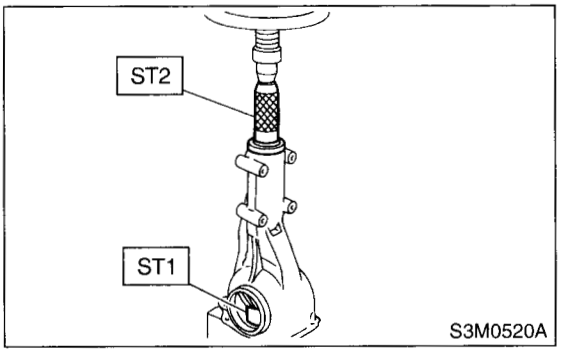


(A) Drive pinion
(B) Bearing adjusting spacer
(C) Washer
(D) Differential carrier

6) Press-fit the front bearing cone into case with ST1, ST2 and ST3.
ST1 398507703 DUMMY COLLAR
ST2 399780104 WEIGHT
ST3 899580100 INSTALLER



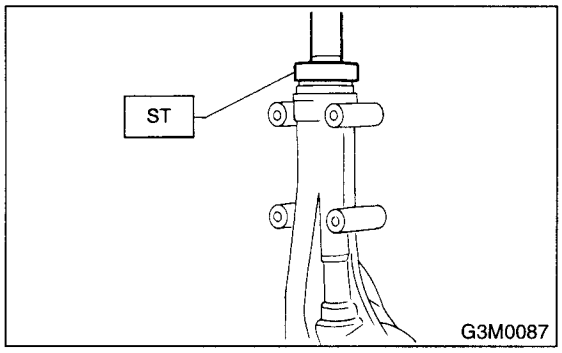
7) Insert the spacer, then press-fit pilot bearing with ST1 and ST2.
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER



8) Fit a new oil seal with ST.

NOTE:
- Press-fit until end of oil seal is 1 mm (0.04 in) inward from end of carrier.
- Apply grease between the oil seal lips.

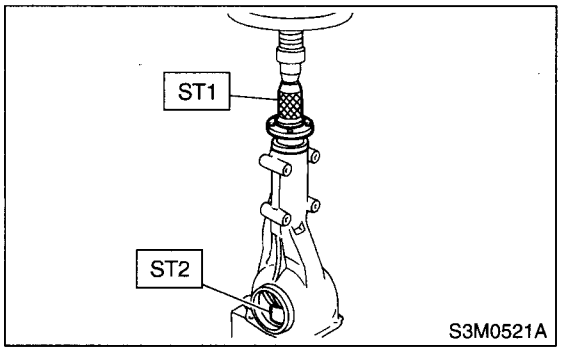
ST 498447120 DRIFT



9) Press-fit the companion flange with ST1 and ST2.

CAUTION:
Be careful not to damage the bearing.

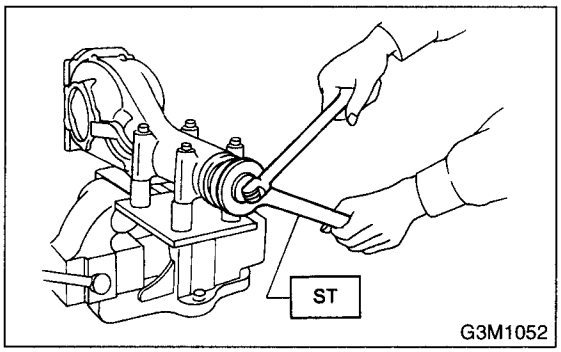
ST1 899874100 INSTALLER
ST2 399780104 WEIGHT



10) Install the self-locking nut. Then tighten it with ST.

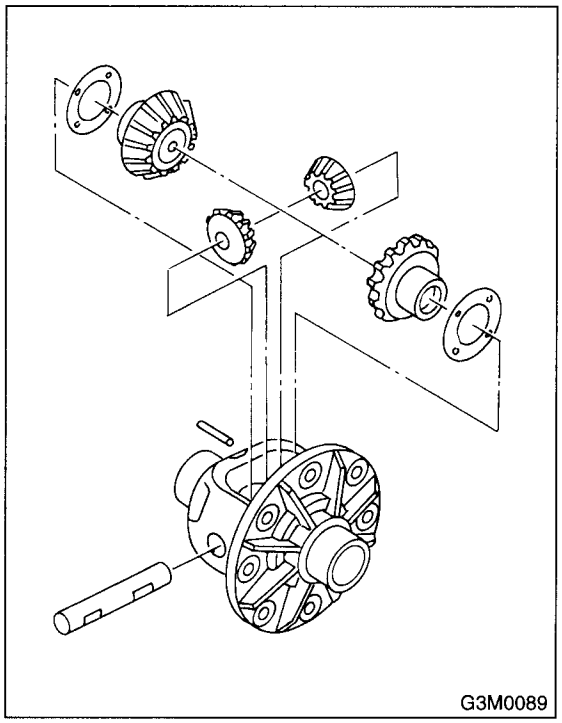
ST 498427200 FLANGE WRENCH

Tightening torque:
181 N·m (18.5 kgf-m, 134 ft-lb)



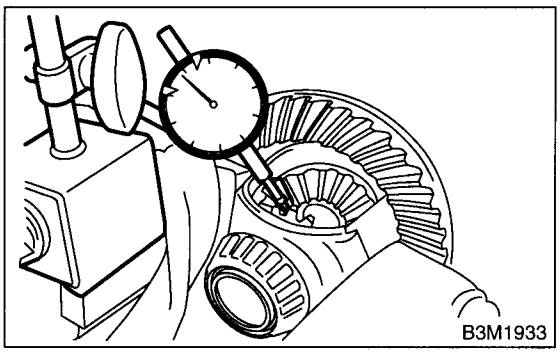
11) Assembling differential case:
Install the side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into differential case. (Without LSD)

CAUTION:
- **Apply gear oil on both sides of the washer and on the side gear shaft before installing.**
- **Insert the pinion mate shaft into the differential case by aligning the lock pin holes.**



(1) Measure the side gear backlash.

Side gear back clearance:
0.10 — 0.20 mm (0.0039 — 0.0079 in)



(2) Adjust the backlash as specified by selecting side gear thrust washer.

Side gear thrust washer	
Part No.	Thickness mm (in)
383445201	0.75 — 0.80 (0.0295 — 0.0315)
383445202	0.80 — 0.85 (0.0315 — 0.0335)
383445203	0.85 — 0.90 (0.0335 — 0.0354)

(3) Check the condition of rotation after applying oil to the gear tooth surfaces and thrust surfaces.
(4) After inserting the pinion shaft lock pin into differential case, stake the both sides of the hole to prevent pin from falling off.

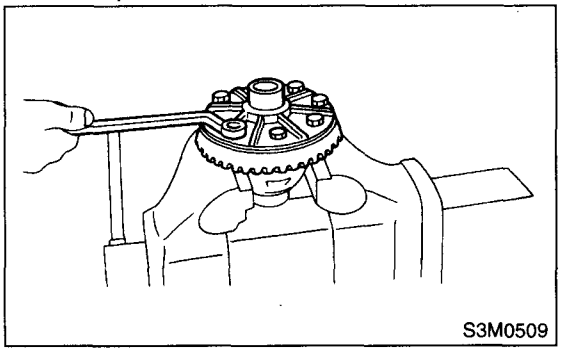
12) Install the crown gear on differential case.

CAUTION:
Before installing bolts, apply Lock Tite to bolt threads.

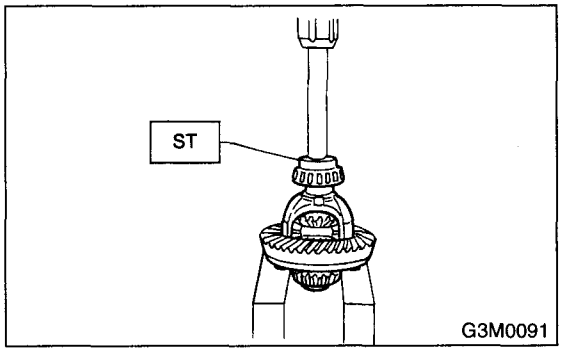
Lock Tite:
THREE BOND 1324 or equivalent

NOTE:
Tighten diagonally while tapping the bolt heads.

Tightening torque:
103 N·m (10.5 kgf-m, 76 ft-lb)

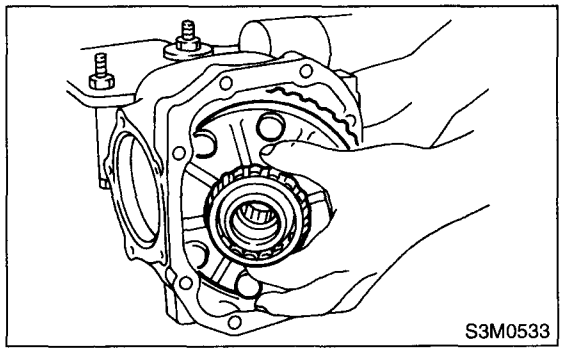

S3M0509

13) Press the side bearing cone onto differential case with ST.
ST 398487700 DRIFT



G3M0091

14) Adjusting the 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.


S3M0533

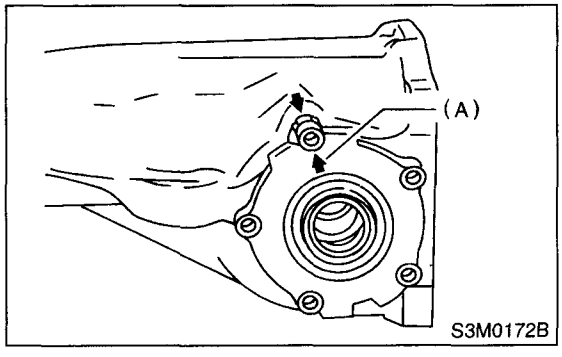
(3) Install the side retainer shims and O-rings to the left and right retainers from which they were removed.

NOTE:
• Replace the broken or cracked O-ring with a new one.
• 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 that marked on side retainer during installation.

CAUTION:
Be careful that side bearing outer race is not damaged by bearing roller.



S3M0172B

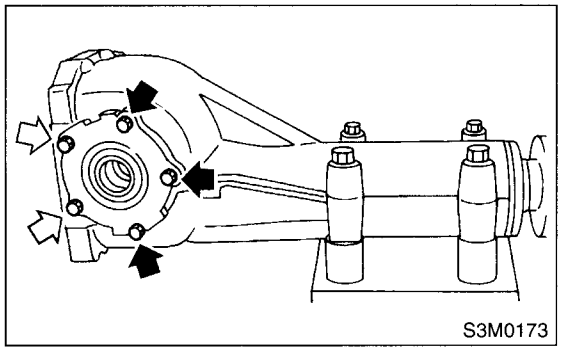
(A) Arrow mark

(5) Tighten the side bearing retainer bolts.

CAUTION:
Before tightening the two side bearing retainer bolts, apply Lock Tite to bolt threads.

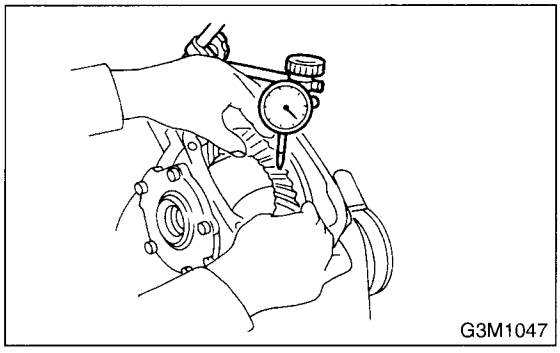
⇨Lock Tite:
THREE BOND 1105 or equivalent

Tightening torque:
10.3 N·m (1.05 kgf-m, 7.6 ft-lb)


S3M0173

(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 crown gear while holding drive pinion still. Read the value indicated on dial gauge.

Backlash:
0.10 — 0.20 mm (0.0039 — 0.0079 in)

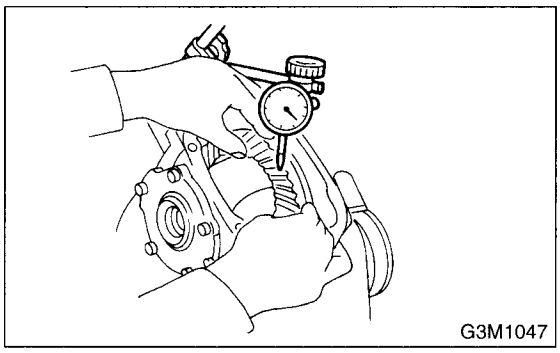

G3M1047

(7) At the same time, measure the turning resistance of drive pinion. Compared with the resistance when differential case is not installed, if the increase of the resistance is not within the specified range, readjust side bearing retainer shims.

Turning resistance increase:
2.9 — 10.8 N (0.3 — 1.1 kgf, 0.7 — 2.4 lb)

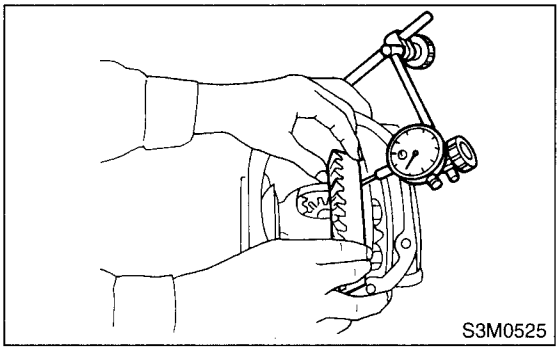
15) Recheck the crown gear-to-pinion backlash.

Backlash:
0.10 — 0.20 mm (0.0039 — 0.0079 in)


G3M1047

16) Check the crown gear runout on its back surface, and make sure pinion and crown gear rotates smoothly.

Limit of runout:
Less than 0.05 mm (0.0020 in)

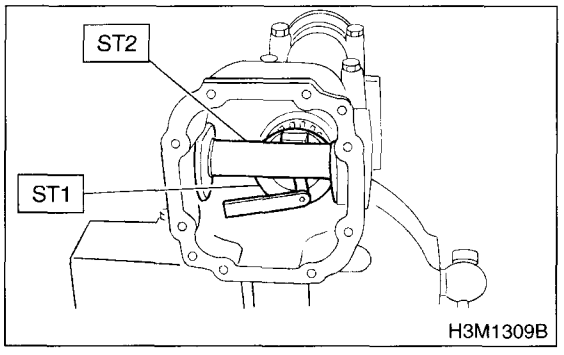

S3M0525

17) Checking and adjusting the tooth contact of crown gear:
(1) Apply an even coat of red lead on both sides of three or four teeth on the 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.

18) If proper tooth contact is not obtained, once again adjust the drive pinion height 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

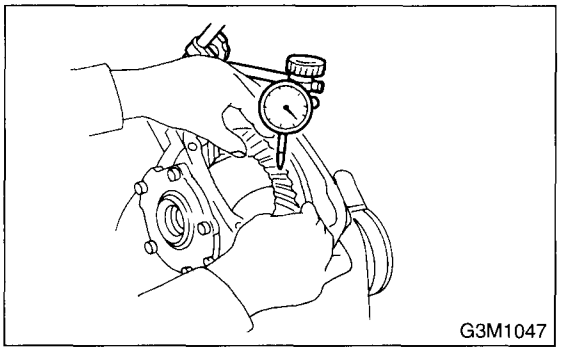


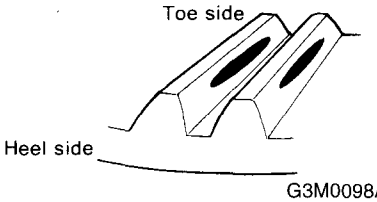
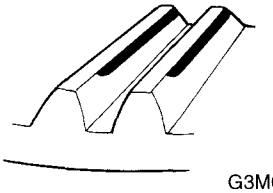
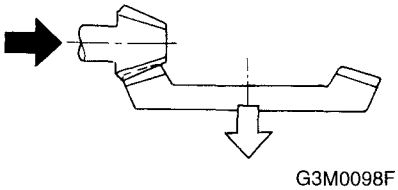
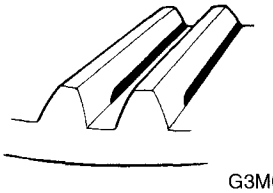
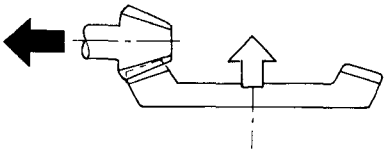
$T = To + N - (H \times 0.01) - 0.20$ (mm)

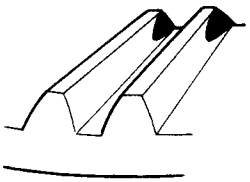
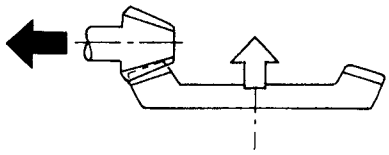
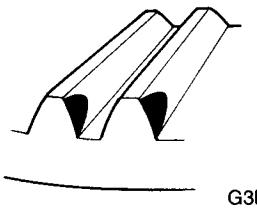
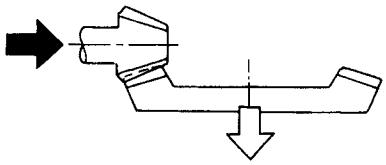
Where:
T = Thickness of pinion height adjusting shim (mm)
To = Thickness of shim temporarily inserted (mm)
N = Reading of thickness gauge (mm)
H = Figure marked on drive pinion head

(2) Hypoid gear backlash

Backlash:
0.10 — 0.20 mm (0.0039 — 0.0079 in)



TOOTH CONTACT PATTERN		
Condition	Contact pattern	Adjustment
Correct tooth contact Tooth contact pattern slightly shifted towards toe under no load rotation. (When loaded, contact pattern moves toward heel.)		—
Face contact Backlash is too large.	*This may cause noise and chipping at tooth ends.* 	*Increase thickness of drive pinion height adjusting shim in order to bring drive pinion closer to crown gear center.* 
Flank contact Backlash is too small.	This may cause noise and stepped wear on surfaces. 	Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear. 

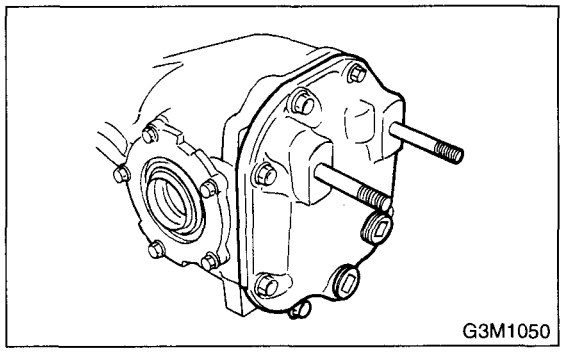
TOOTH CONTACT PATTERN		
Condition	Contact pattern	Adjustment
Toe contact Contact area is small.	This may cause chipping at toe ends.  G3M0098D	Adjust as for flank contact.  G3M0098G
Heel contact Contact area is small.	This may cause chipping at heel ends.  G3M0098E	Adjust as for face contact.  G3M0098F

➡ : Adjusting direction of drive pinion
⇨ : Adjusting direction of crown gear

19) Install the rear cover and tighten bolts to specified torque.

CAUTION:
Securely connect the ground terminal of rear differential temperature sensor.

Tightening torque:
29 N·m (3.0 kgf-m, 21.7 ft-lb)


G3M1050

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) Side gear and pinion mate gear:
- Replace if crack, score or other defects are evident on tooth surface.
- Replace if thrust washer contacting surface is worn or seized. Slight damage of the surface can be corrected by oil stone or the like.

3) Bearing:
Replace if seizure, peeling, wear, rust, dragging during rotation, abnormal noise or other defect is evident.

4) Thrust washers of side gear and pinion mate gear:
Replace if seizure, flaw, abnormal wear or other defect is evident.

5) Oil seal:
Replace if deformed or damaged, and at every disassembling.

6) Differential carrier:
Replace if the bearing bores are worn or damaged.

7) Differential case:
Replace if its sliding surfaces are worn or cracked.

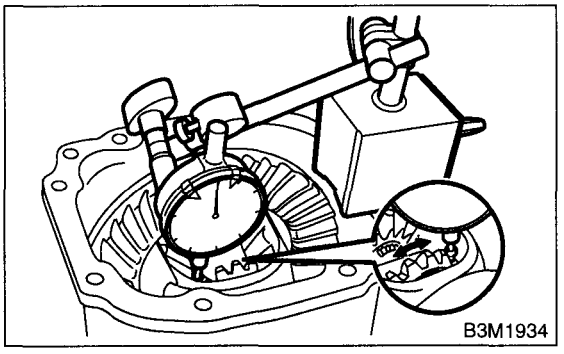
8) Companion flange:
Replace if the oil seal lip contacting surfaces have flaws.

1. SIDE GEAR BACKLASH

Using a dial gauge, check the backlash of the side gear.

Side gear backlash:
0.1 — 0.2 mm (0.004 — 0.008 in)

If the side gear backlash is not within the specification, adjust clearance as specified by selecting side gear thrust washer.

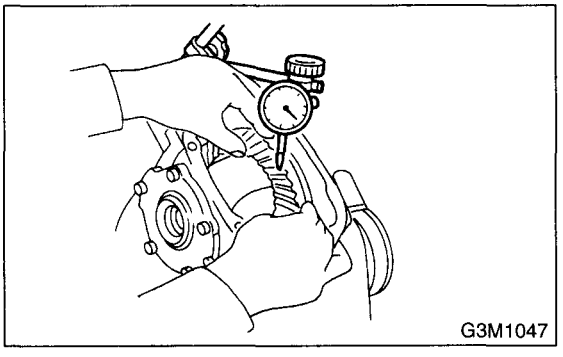

B3M1934

2. 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.

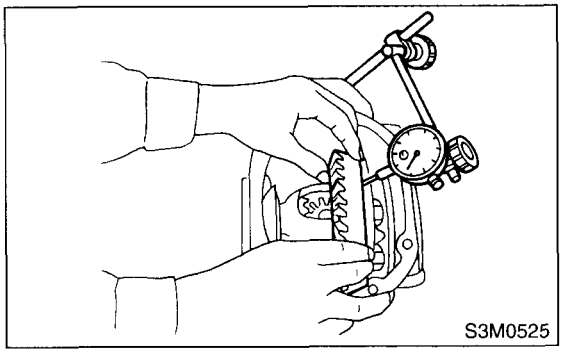

G3M1047

3. 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.


S3M0525

4. TOOTH CONTACT BETWEEN CROWN GEAR AND DRIVE PINION

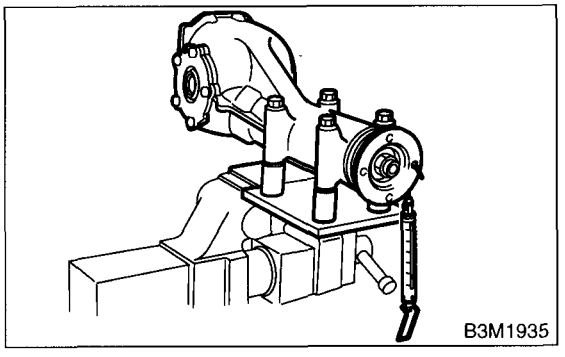
Inspect the tooth contact between crown gear and driven pinion. <Ref. to DI-24, ASSEMBLY, Rear Differential.>

5. TOTAL PRELOAD

Using a gauge, check the turning resistance increase.

Total preload:
2.9 — 10.8 N·m (0.3 — 1.1 kgf, 0.7 — 2.4 lb)

If the increase of the resistance is not within the specification, adjust the side bearing retainer shims.


B3M1935

F: ADJUSTMENT

1. SIDE GEAR BACKLASH

Adjust the side gear backlash.
<Ref. to DI-24, ASSEMBLY, Rear Differential.>

2. CROWN GEAR BACKLASH

Adjust the crown gear backlash.
<Ref. to DI-24, ASSEMBLY, Rear Differential.>

3. TOOTH CONTACT BETWEEN CROWN GEAR AND DRIVE PINION

Adjust the tooth contact between crown gear and drive pinion gear.
<Ref. to DI-24, ASSEMBLY, Rear Differential.>

4. TOTAL PRELOAD

Adjust the side bearing shim.
<Ref. to DI-24, ASSEMBLY, Rear Differential.>

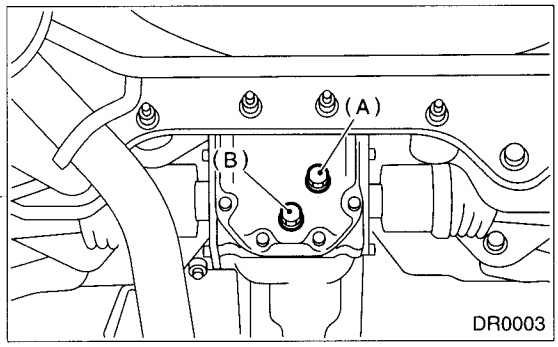
5. Rear Differential Front Oil Seal

A: INSPECTION

Make sure that there is no oil leakage from front oil seal.
If there is any oil leakage, replace the oil seal.

B: REPLACEMENT

1) Set the vehicle on the lift.
2) Disconnect the ground terminal 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 gear oil.



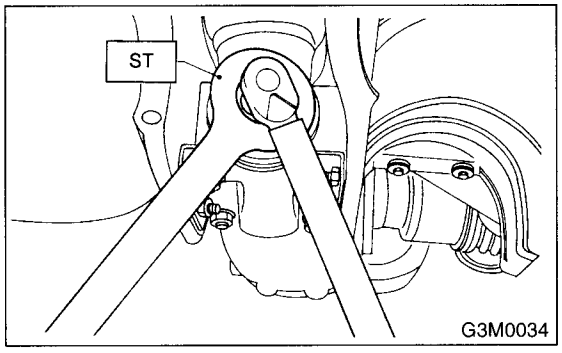
(A) Filler plug
(B) Drain plug

6) Install the oil drain plug.

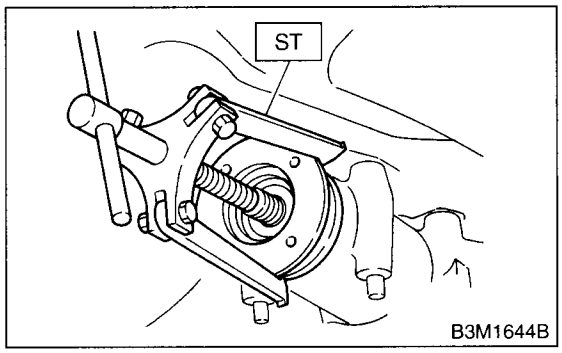
NOTE:
- Apply fluid packing to drain plug.

Tightening torque:
49 N·m (5.0 kgf-m, 36.2 ft-lb)

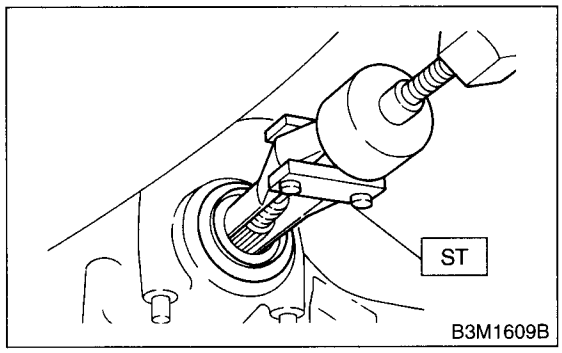
7) Remove the rear exhaust pipe and muffler.
8) Remove the rear differential protector. (If equipped)
9) Remove the propeller shaft from body. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
10) Remove the self-locking nut while holding companion flange with ST.
ST 498427200 FLANGE WRENCH



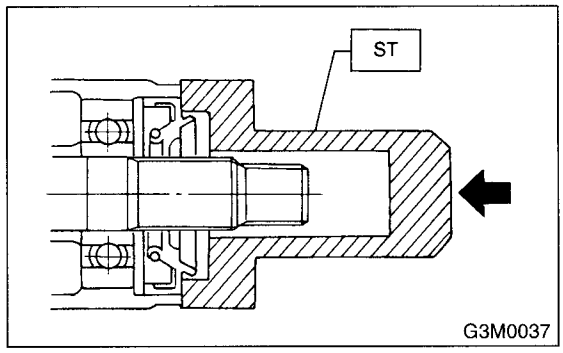
11) Extract the companion flange using ST.
ST 399703602 PULLEY ASSY



12) Remove the oil seal using ST.
ST 499705401 PULLER ASSY



13) Fit a new oil seal using ST.
ST 498447120 DRIFT



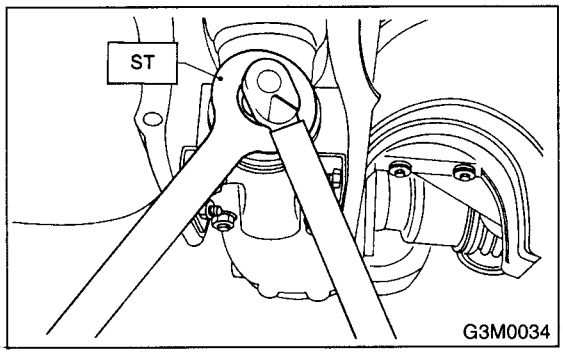
14) Install the companion flange.

NOTE:
Use a plastic hammer to install 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:
181.4 N·m (18.50 kgf-m, 133.8 ft-lb)



16) Reassembling procedure hereafter is the reverse of the disassembling.
17) Fill the differential carrier with gear oil to the filler plug level. <Ref. to DI-17, Differential Gear Oil.>

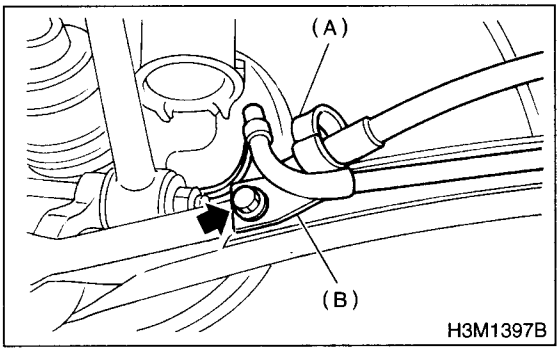
6. Rear Differential Side Oil Seal

A: INSPECTION

Make sure that there is no oil leakage from side oil seal.
If there is any oil leakage, replace the oil seal.

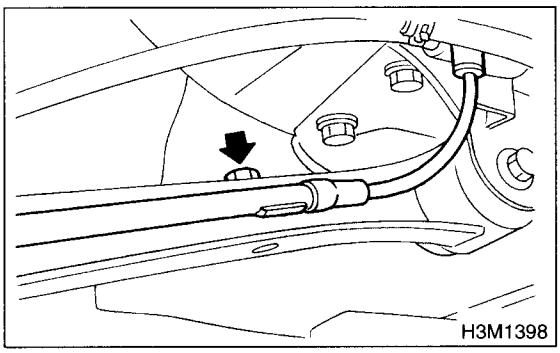
B: REPLACEMENT

1) Disconnect the ground terminal 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)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-11, REMOVAL, Muffler.>
Turbo model:
<Ref. to EX(DOHC TURBO)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(DOHC 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.

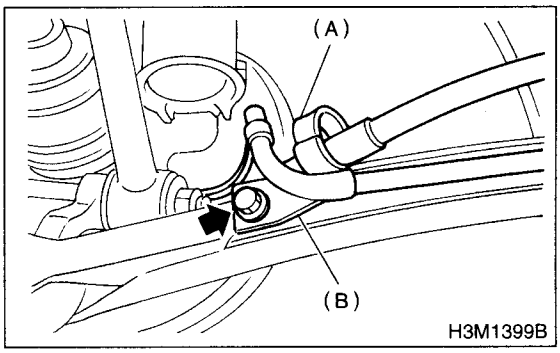


(A) ABS sensor cable clamp
(B) Parking brake cable guide

(2) Remove the ABS sensor cable clamp from the trailing link.

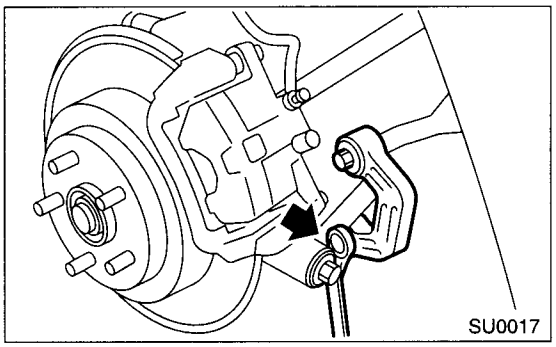


(3) Remove the ABS sensor cable clamp and parking brake cable guide from the trailing link.

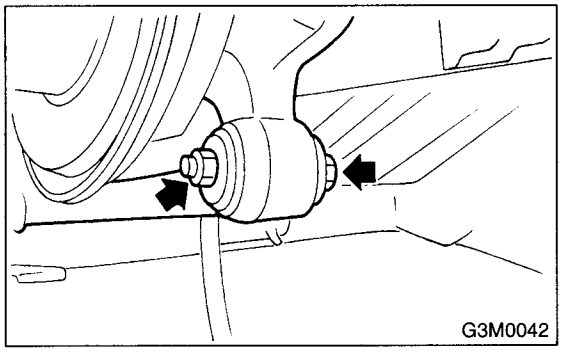


(A) ABS sensor cable clamp
(B) Parking brake cable guide

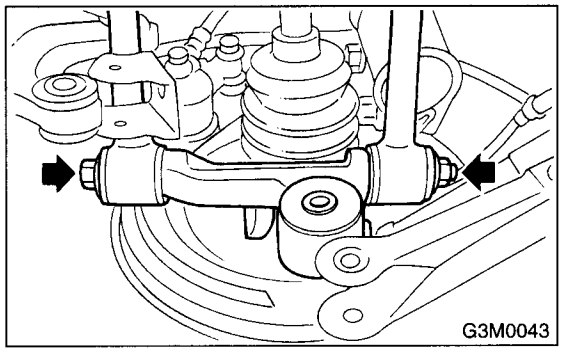
(4) Remove the rear stabilizer link.



(5) Remove the bolts which secure the trailing link to the housing.



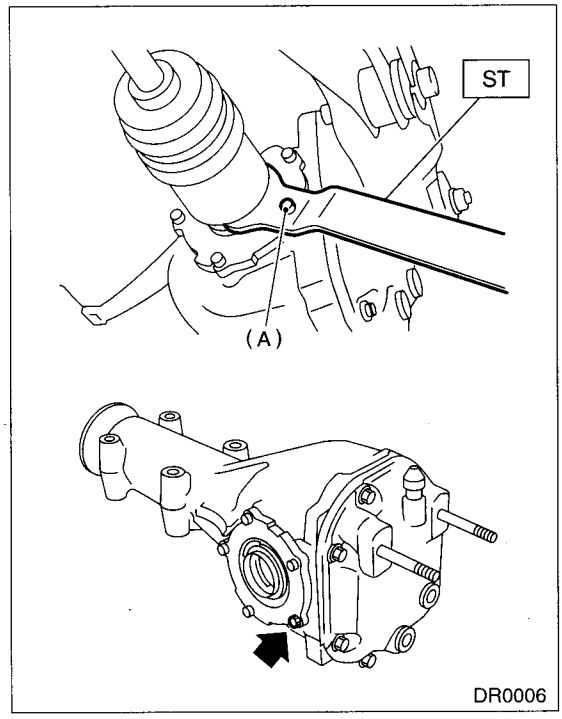
(6) Remove the bolts which secure the front and rear lateral link to the rear housing.



(7) Remove the DOJ from the rear differential by using ST.

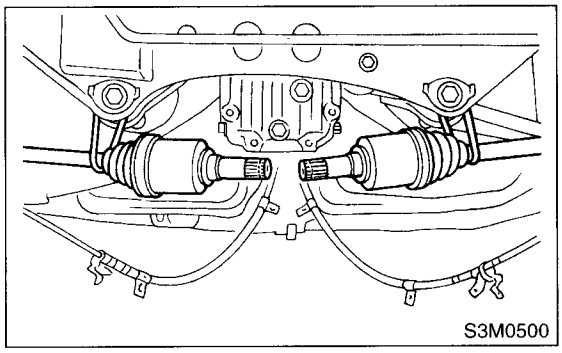
CAUTION:
When removing the DOJ from the rear differential, fit ST to the bolts as shown in figure so as not to damage the side bearing retainer.

ST 208099PA100 DRIVE SHAFT REMOVER



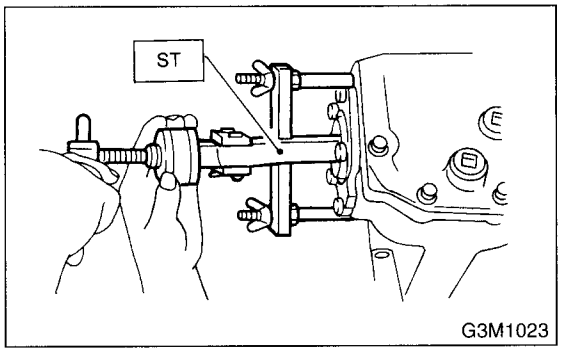
(A) Bolt

9) Remove the rear drive shaft to rear crossmember using wire.



10) Remove the nut of protector.

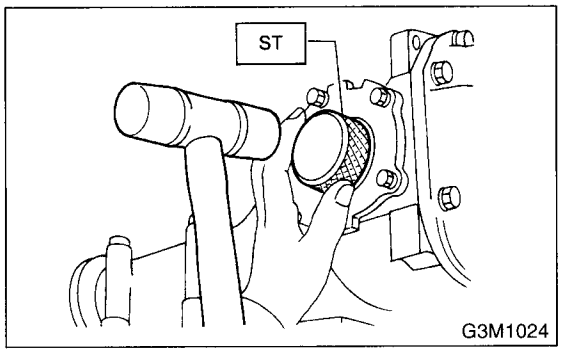
ST 398527700 PULLER ASSY



11) Drive in a new side oil seal with ST.

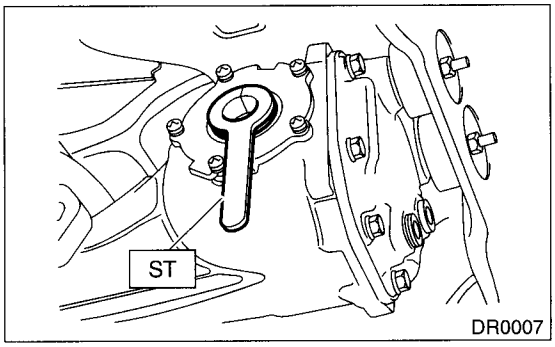
CAUTION:
Apply chassis grease between the oil seal lips.

ST 398437700 DRIFT



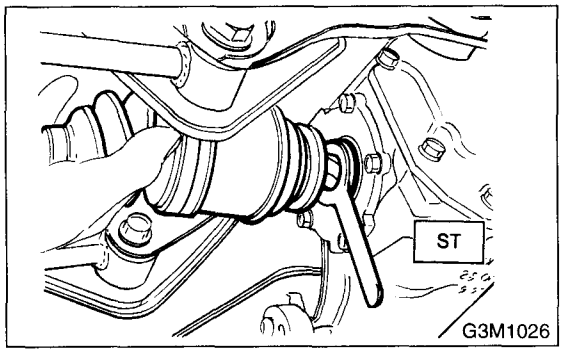
12) Insert the DOJ into rear differential.
(1) Install the ST to rear differential.

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 ST.

ST 28099PA090 SIDE OIL SEAL PROTECTOR

13) Hereafter, reassemble in the reverse order of disassembly.

14) Fill differential carrier with gear oil to the filler plug level. <Ref. to DI-17, Differential Gear Oil.>

7. Rear Differential Member

A: REMOVAL

1) Set the vehicle on the lift.
2) Disconnect the ground terminal 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)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-11, REMOVAL, Muffler.>
Turbo model:
<Ref. to EX(DOHC TURBO)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(DOHC TURBO)-14, REMOVAL, Muffler.>
9) Remove the rear differential protector. (If equipped)
10) Remove the rear differential front member.

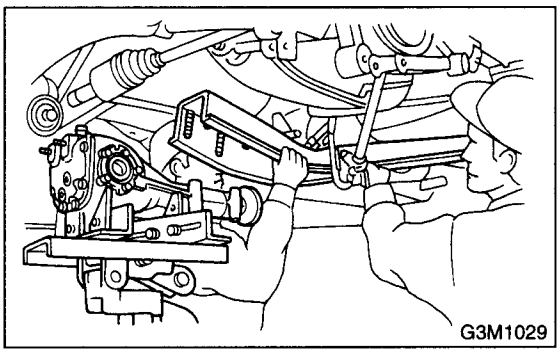
NOTE:
When removing the rear differential front member, work the removal procedure as rear differential.
<Ref. to DI-19, REMOVAL, Rear Differential.>

11) Remove the differential rear member.

B: INSTALLATION

To install, reverse the removal sequence.
1) Position the front member on body by passing it under parking brake cable and securing to rear differential.

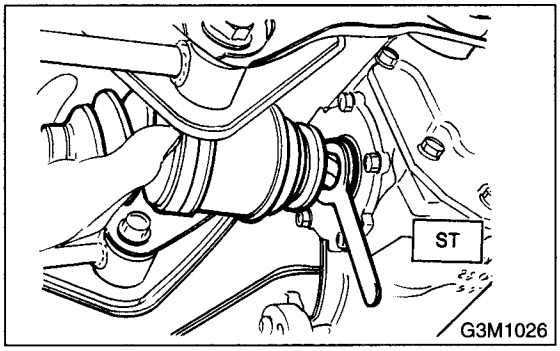
NOTE:
When installing the rear differential front member, do not confuse the installation seqence of the stopper.


G3M1029

2) Insert the DOJ of rear drive shaft into rear differential.<Ref. to DI-37, REPLACEMENT, Rear Differential Side Oil Seal.>

CAUTION:
Before inserting, replace the differential side oil seal with a new one.

ST 28099PA090 SIDE OIL SEAL PROTEXTOR



G3M1026

3) Installing procedure hereafter is in the reverse order of removal.

C: 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 bushings of rear differential member for cracking, hardening or damage.
If cracking, hardening or damage is excessive, replace rear differential member.

8. 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 differential spindle or side retainer or incorrectly fitted O-ring.	Tighten bolts to specified torque. Replace O-ring.
	(4) Loose rear cover attaching bolts or damaged gasket.	Tighten bolts to specified torque. Replace gasket and apply liquid packing.
	(5) Loose oil filler or drain plug.	Retighten and apply liquid packing.
	(6) Wear, damage or incorrectly fitting for spindle, 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 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 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 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.

GENERAL DIAGNOSTIC TABLE

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 hypoid gear set.
	(2) Improper backlash for hypoid gear.	Readjust.
	(3) Scored or chipped teeth of hypoid gear.	Replace hypoid gear set.
	(4) Seized hypoid gear.	Replace 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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1. General Description

A: NOTE

For removal, installation and inspection work, 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-41, Transfer Case and Extension Case Assembly.>

3. Transfer Clutch and Extension for AT

A: NOTE

For removal, installation and inspection work, refer to "AUTOMATIC TRANSMISSION" (a separate publication: Pub. No. G0853ZE).

4. Oil Seal

A: NOTE

For removal, installation and inspection work, refer to "AT" or "MT" section.
AT model:
<Ref. to AT-27, Extension Case Oil Seal.>
MT model:
<Ref. to MT-36, Oil Seal.>

5. Transfer Drive Gear (MT)

A: NOTE

For removal, installation and inspection work, refer to "MT" section. <Ref. to MT-45, Transfer Drive Gear.>

6. Transfer Driven Gear (MT)

A: NOTE

For removal, installation and inspection work, refer to "MT" section. <Ref. to MT-47, Transfer Driven Gear.>

7. Reduction Drive Gear without VTD

A: NOTE

For removal, installation and inspection work, refer to "AUTOMATIC TRANSMISSION" (a separate publication: Pub. No. G0853ZE).

8. Reduction Drive Gear with VTD

A: NOTE

For removal, installation and inspection work, refer to "AUTOMATIC TRANSMISSION" (a separate publication: Pub. No. G0853ZE)

9. Reduction Driven Gear without VTD

A: NOTE

For removal, installation and inspection work, refer to "AUTOMATIC TRANSMISSION" (a separate publication: Pub. No. G0853ZE).

10. Reduction Driven Gear with VTD

A: NOTE

For removal, installation and inspection work, refer to "AUTOMATIC TRANSMISSION" (a separate publication: Pub. No. G0853ZE)

11.Center Differential

A: NOTE

For removal, installation and inspection work, refer to "AUTOMATIC TRANSMISSION" (a separate publication) or "MT" section.
AT model:
Pub No. G0853ZE
MT model:
<Ref. to MT-49, Center Differential.>

12. Transfer Clutch Pressure Test

A: NOTE

For inspection work, refer to "AT" section. <Ref. to AT-18, Transfer Clutch Pressure Test.>

13.Transfer Duty Solenoid and Valve Body

A: NOTE

For removal, installation and inspection work, refer to "AUTOMATIC TRANSMISSION" (a separate publication: Pub. No. G0853ZE) or "AT" section. <Ref. to AT-39, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>

DRIVE SHAFT SYSTEM

DS

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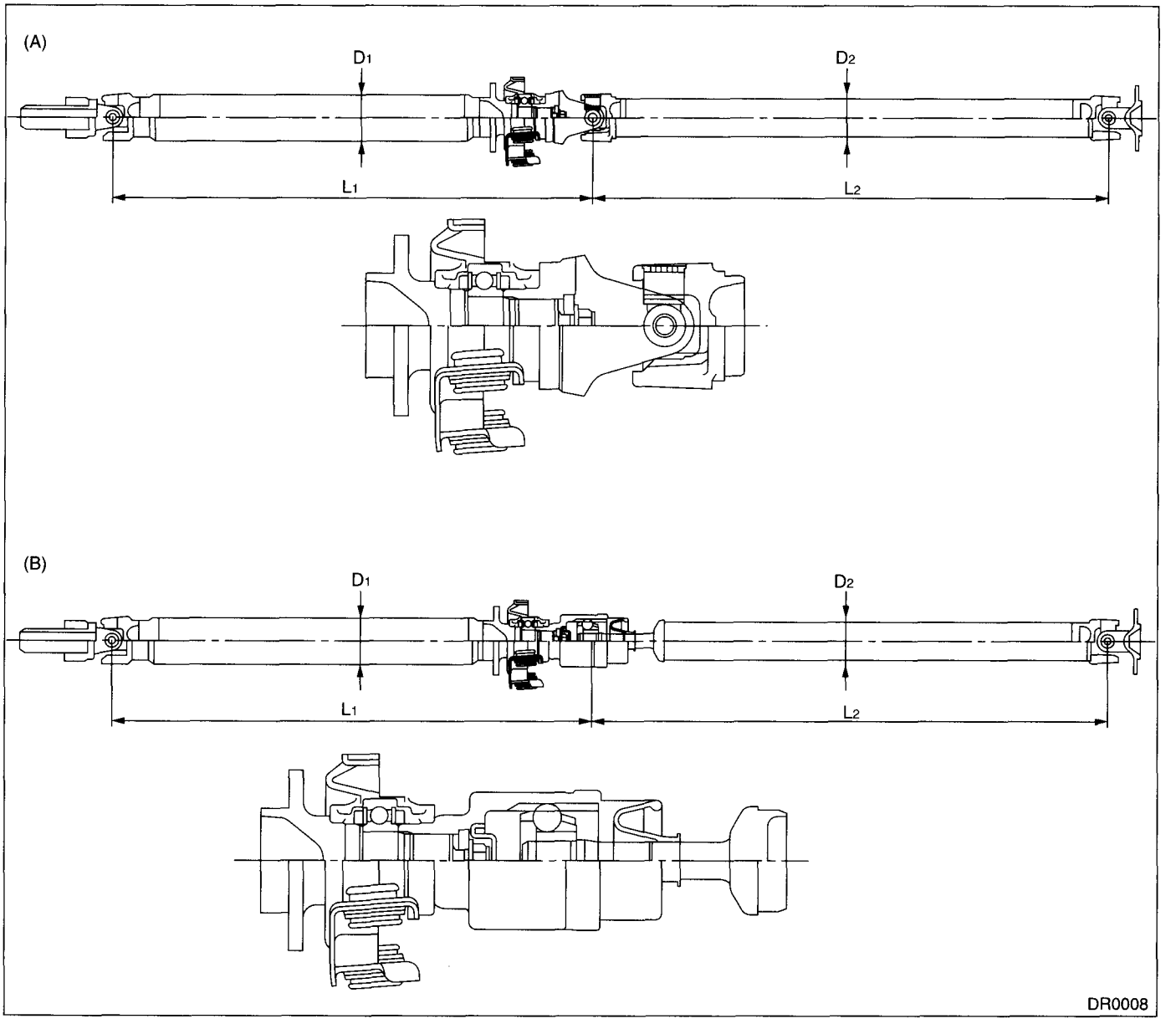
1. General Description

A: SPECIFICATIONS

1. PROPELLER SHAFT

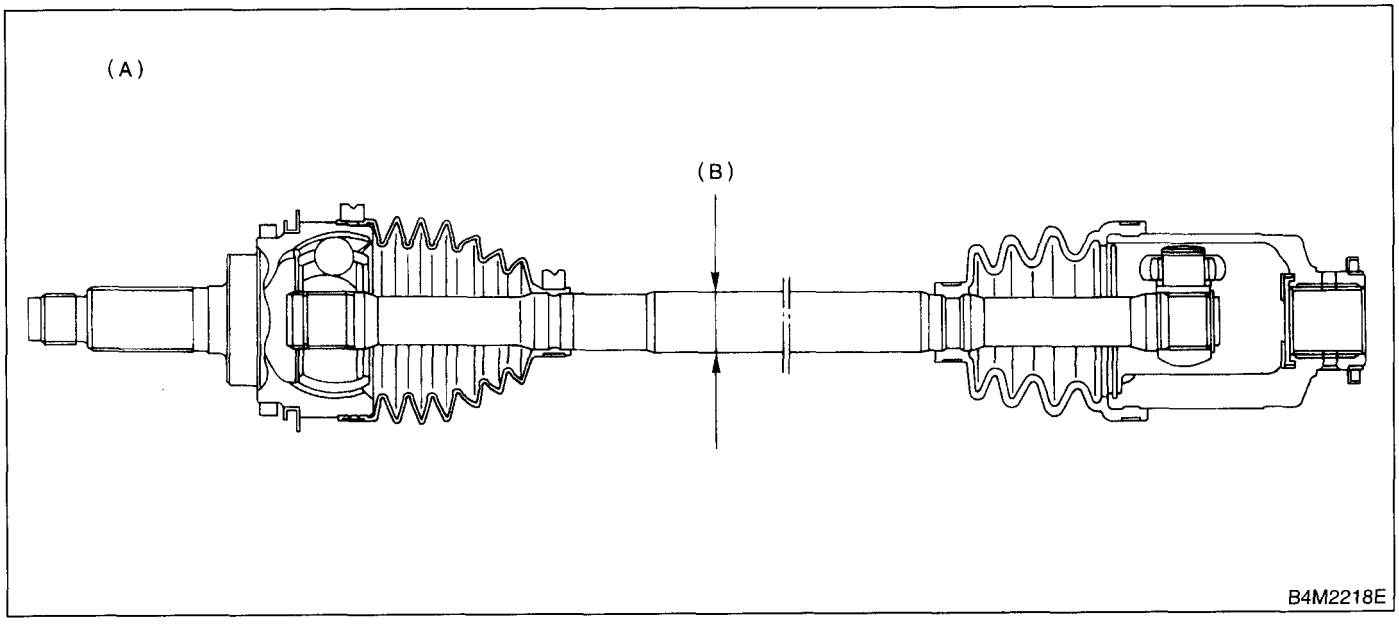
Model		Turbo	Non-turbo
Propeller shaft type		DOJ type	UJ type
Front propeller shaft Joint-to-joint length: L_1 mm (in)	AT	579 (22.79)	584 (22.99)
	MT	638 (25.12)	643 (25.32)
Rear propeller shaft Joint-to-joint length: L_2 mm (in)		713 (28.07)	708 (27.87)
Outside diameter of tube: mm (in)	D_1	63.5 (2.500)	
	D_2	57.0 (2.244)	



(A) UJ type (B) DOJ type

2. FRONT DRIVE SHAFT ASSEMBLY

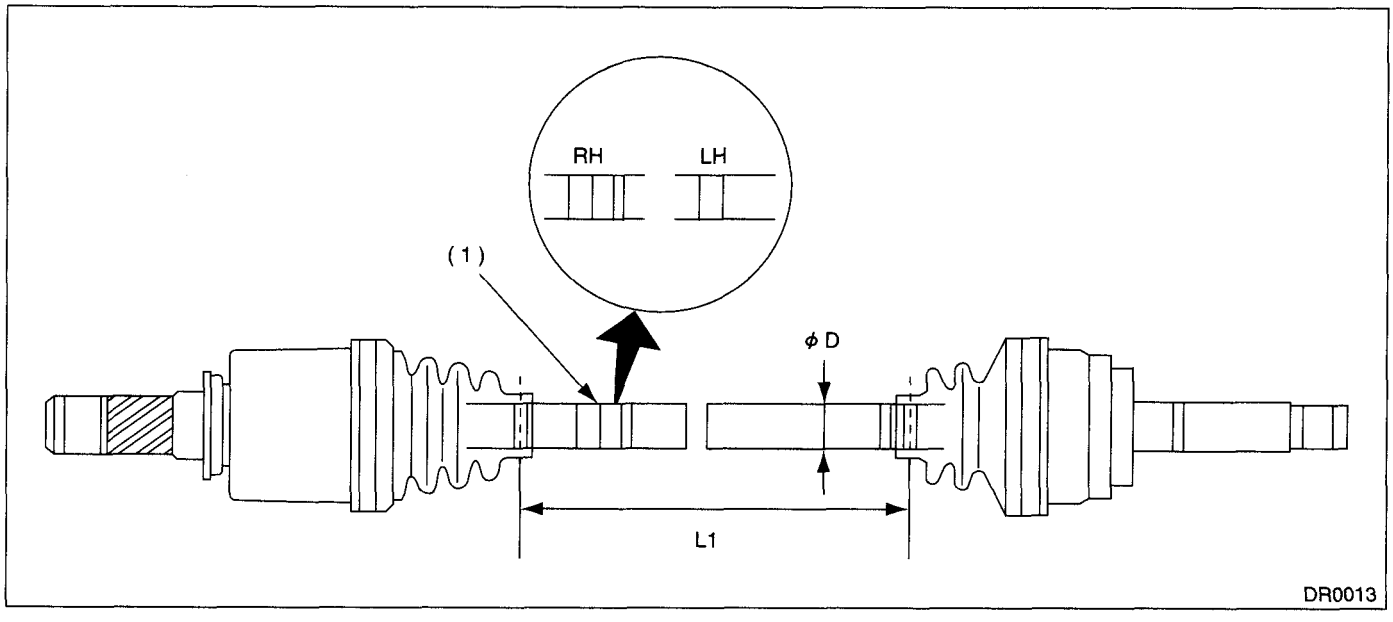
Type of drive shaft assembly	Model	Shaft diameter
EBJ87+SFJ82	Except turbo MT model	26 mm (1.02 in)
	Turbo MT model	28 mm (1.10 in)



(A) EBJ87+SFJ82 (B) Measuring point

3. REAR DRIVE SHAFT ASSEMBLY

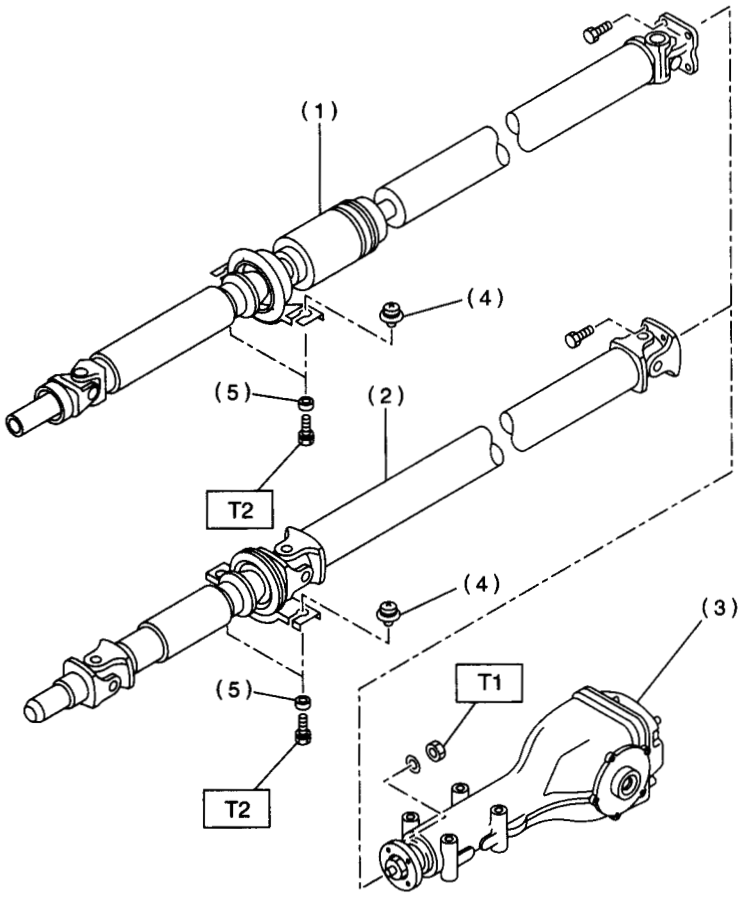
Type of drive shaft assembly	Model	No. of identification protrusion on shaft	L1 (mm)	ϕ D (mm)
EBJ82/DOJ82 RH	Sedan Turbo	2 (Two)	363	24
EBJ82/DOJ82 LH		1 (One)	353	24
BJ79/DOJ79 RH	Sedan Non-turbo	2 (Two)	368	23
BJ79/DOJ79 LH		1 (One)	358	23
EBJ82/DOJ82 RH	Wagon Turbo	2 (Two)	353	24
EBJ82/DOJ82 LH		1 (One)	343	24
BJ79/DOJ79 RH	Wagon Non-turbo	2 (Two)	358	23
BJ79/DOJ79 LH		1 (One)	348	23



(1) Identification protrusion

B: COMPONENT

1. PROPELLER SHAFT

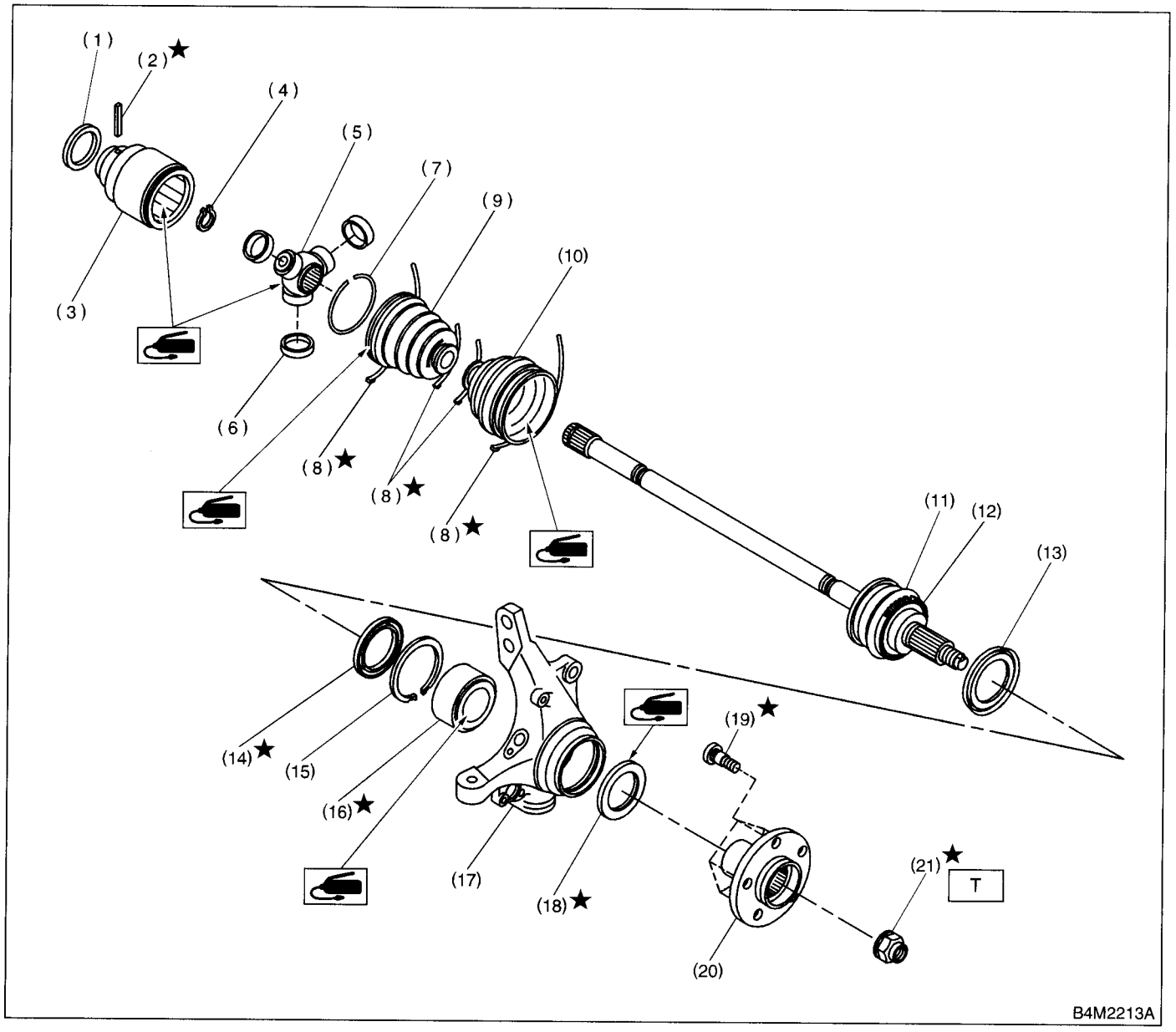


DR0014

(1) Propeller shaft (Turbo model)
(2) Propeller shaft (Non-Turbo model)
(3) Rear differential
(4) Bush
(5) Bush

Tightening torque: N·m (kgf-m, ft-lb)
T1: 31 (3.2, 23.1)
T2: 52 (5.3, 38.3)

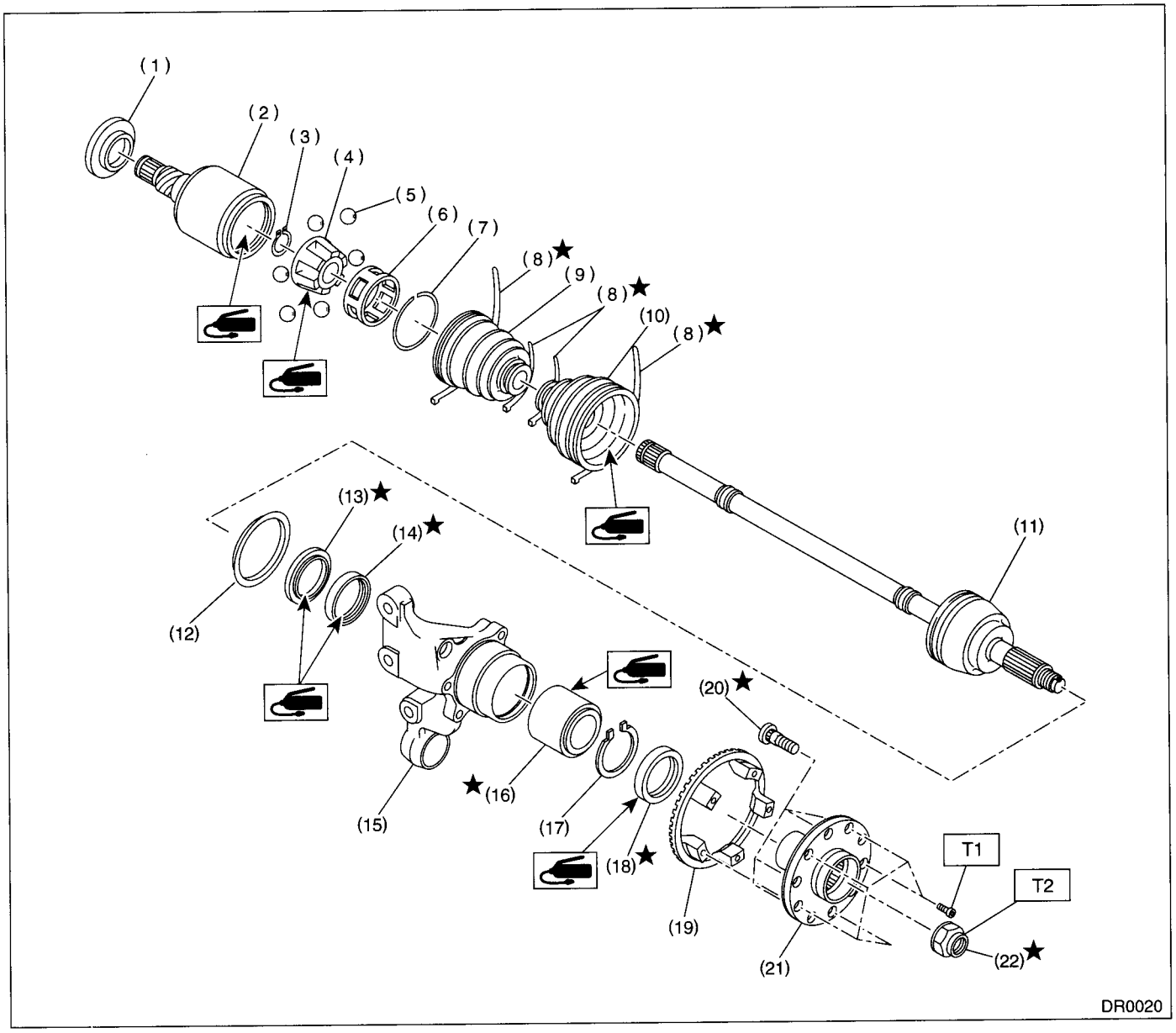
2. FRONT AXLE



(1) Baffle plate (SFJ)
(2) Spring pin
(3) Outer race (SFJ)
(4) Snap ring
(5) Trunnion
(6) Free ring
(7) Circlip
(8) Boot band
(9) Boot (SFJ)
(10) Boot (EBJ)
(11) EBJ ASSY
(12) Tone wheel (With ABS)
(13) Baffle plate
(14) Oil seal (IN)
(15) Snap ring
(16) Bearing
(17) Housing
(18) Oil seal (OUT)
(19) Hub bolt
(20) Hub
(21) Axle nut

Tightening torque: N·m (kgf-m, ft-lb)
T: 186 (19, 137)

3. REAR AXLE



(1) Baffle plate (DOJ)
(2) Outer race (DOJ)
(3) Snap ring
(4) Inner race
(5) Ball
(6) Cage
(7) Circlip
(8) Boot band
(9) Boot (DOJ)
(10) Boot (*)
(11) Non-Turbo: BJ ASSY
Turbo: EBJ ASSY
(12) Baffle plate
(13) Oil seal (IN. No. 2)
(14) Oil seal (IN. No. 3)
(15) Housing
(16) Bearing ASSY
(17) Snap ring
(18) Oil seal (OUT)
(19) Tone wheel (With ABS)
(20) Hub bolt
(21) Hub
(22) Axle nut

Tightening torque: N·m (kgf-m, ft-lb)
T1: 13 (1.3, 9.4)
T2: 186 (19, 137)

* Non-Turbo model: BJ
Turbo model: EBJ

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 O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation.
- Before securing a part on a vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.

D: PREPARATION TOOL

1. SPECIAL TOOLS

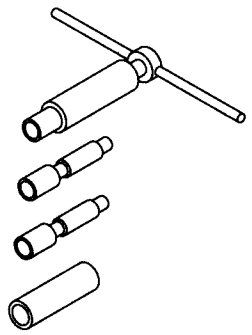
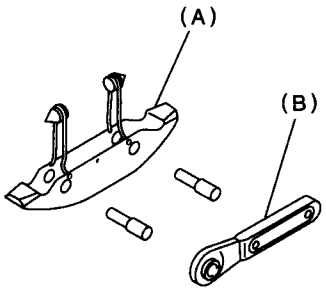
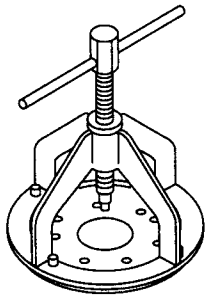
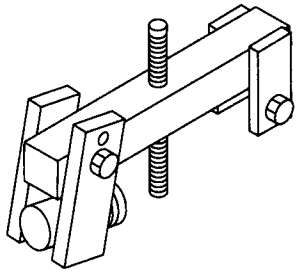
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2386	922431000	AXLE SHAFT INSTALLER	• Used for installing axle shaft into housing. • Used with ADAPTER (927390000).
 B4N2387A	925091000	BAND TIGHTENING TOOL	• Used for tightening boot band. (Except front axle housing side) (A) Jig for band (B) Ratchet wrench
 B4M2388	926470000	AXLE SHAFT PULLER	Used for removing axle shaft.
 B4M2389	927060000	HUB REMOVER	• Used for removing front hub. • Used with HUB STAND (927080000).

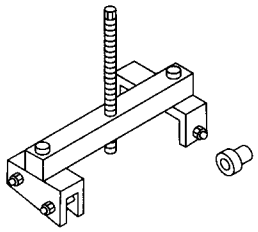
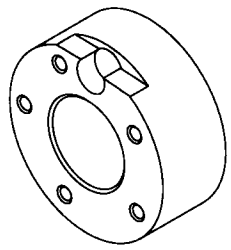
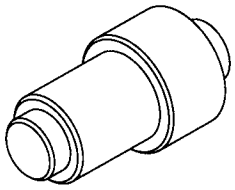
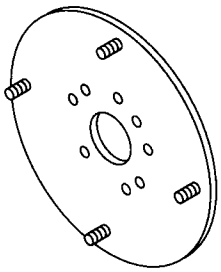
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 H5M0981	927420000	HUB REMOVER	• Used for removing rear hub. • Used with HUB STAND (927080000).
 B4M2390	927080000	HUB STAND	Used for disassembling and assembling hub bolt in hub.
 B4M2391	927100000	BEARING PULLER	• Used for disassembling and assembling front housing bearing. • Used with HOUSING STAND (927400000).
 B4M2392	927140000	AXLE SHAFT PULLER PLATE	Same as plate 2 included in AXLE SHAFT PULLER (926470000).

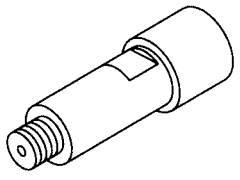
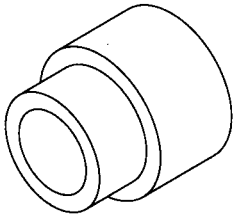
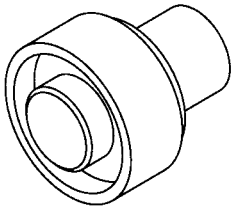
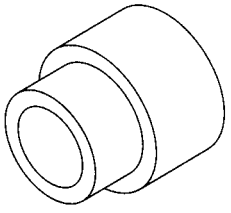
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2393	927390000	ADAPTER	Used as an adapter for AXLE SHAFT INSTALLER (922431000).
 B4M2394	927400000	HOUSING STAND	• Used for disassembling and assembling front housing bearing. • Used with BEARING PULLER (927100000).
 B4M2395	927410000	OIL SEAL INSTALLER	• Used for installing oil seal into front housing. • Used with HOUSING STAND (927400000).
 H5M0982	927430000	HOUSING STAND	• Used for disasembling and assembling rear housing bearing. • Used with BEARING PULLER (927440000).

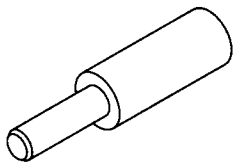
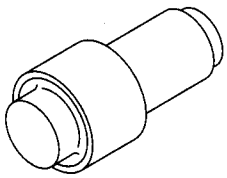
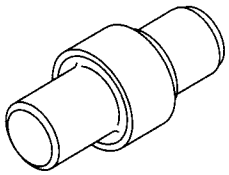
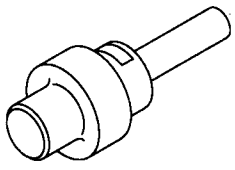
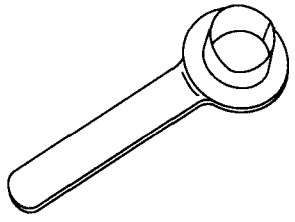
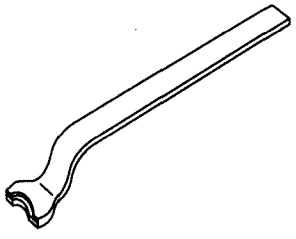
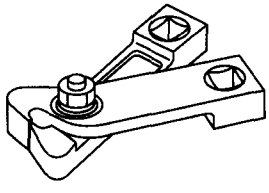
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2399	927120000	HUB INSTALLER	Used for installing hub.
 H5M0983	927440000	BEARING REMOVER	• Used for disassembling and assembling rear housing bearing. • Used with HOUSING STAND (927430000).
 H5M0984	927460000	OIL SEAL INSTALLER	• Used for installing outer bearing and sub bearing into houding. • Used with HOUSING STAND (927430000).
 B4M2400	927450000	HUB INSTALLER	• Used for installing hub unit into hub ASSY. • Used with BEARING SPACER (28499AE000) and HUB STAND (927080000).

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2401	28099PA090	OIL SEAL PROTECTOR	• Used for installing rear drive shaft into rear differential. • For potecting oil seal.
 B4M2402	28099PA100	DRIVE SHAFT REMOVER	Used for removing rear drive shaft from rear differential.
 B4M2403	28099AC000	BOOT BAND PLIERS	Used for tightening front EBJ boot band. (Front axle housing side)

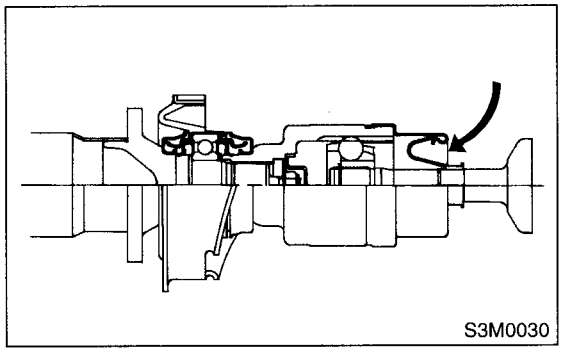
2. GENERAL PURPOSE TOOLS

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.

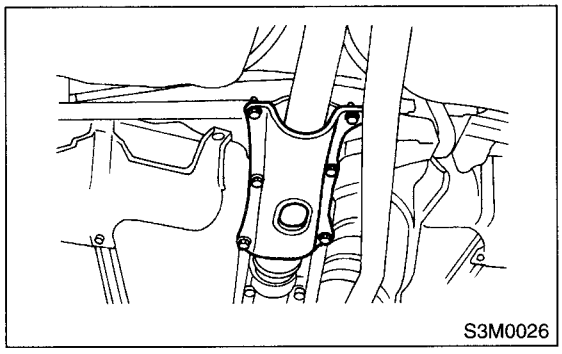
2. Propeller Shaft

A: REMOVAL

NOTE:
• Before removing propeller shaft, wrap metal parts with a cloth or rubber material.
• In case of DOJ type, before removing propeller shaft, wrap 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.

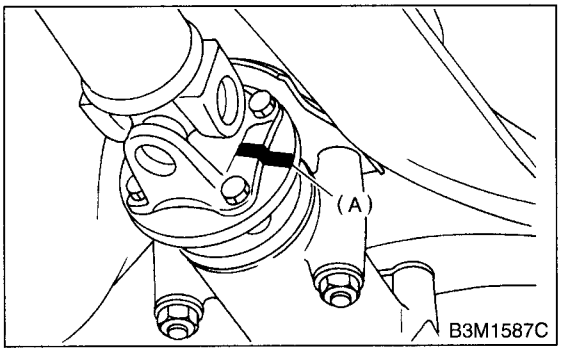


1) Set the vehicle on a lift.
2) Disconnect the ground terminal from battery.
3) Move the select lever or gear shift lever to "N".
4) Release the parking brake.
5) Jack-up the vehicle and support it with the safety stands. (rigid racks)
6) Remove the rear exhaust pipe and muffler.
7) Remove the rear differential protector.
(If equipped)
8) Remove the differential mount front cover.



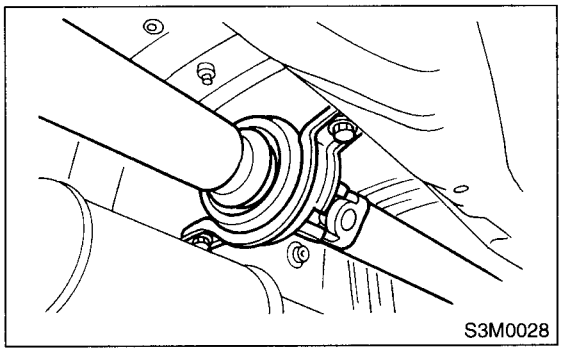
9) Remove the four bolts which hold propeller shaft to rear differential.

NOTE:
• Put matching mark on affected parts before removal.
• Remove all but one bolt.



(A) Matching mark

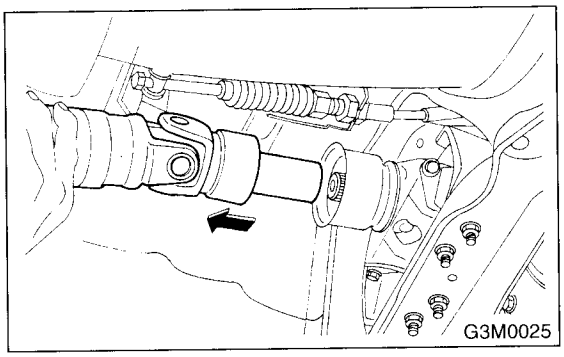
10) Remove the two bolts which hold center bearing to the vehicle body.



11) Remove the propeller shaft from the transmission.

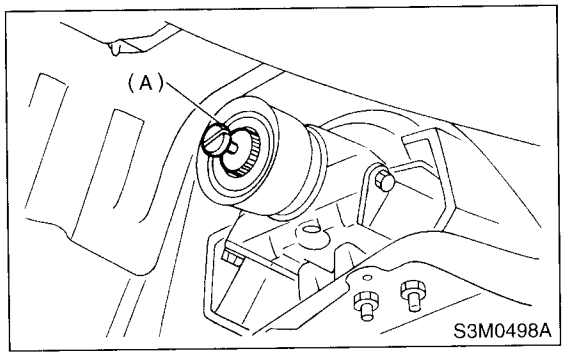
CAUTION:
- **not to damage oil seals and frictional surface of sleeve yoke.**
- **Cover the center exhaust pipe with a cloth to keep off any ATF or oil spilled from transmission when removing propeller shaft.**

NOTE:
- Be sure to use an empty oil can to catch oil flowing out when removing propeller shaft.
- Be sure to plug the opening in transmission after removal of propeller shaft.



12) Install the extension cap to transmission.

NOTE:
If extension cap is not available, place vinyl bag over opening and fasten with string to prevent gear oil or ATF from leaking.

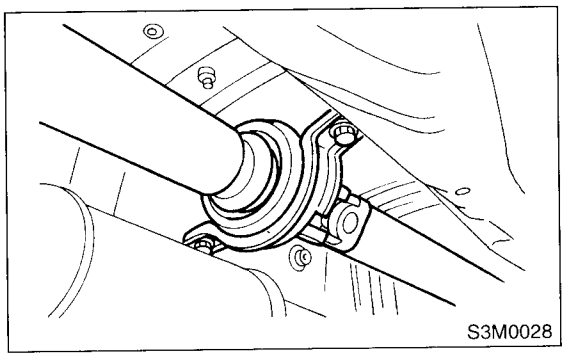


(A) Extension cap

B: INSTALLATION

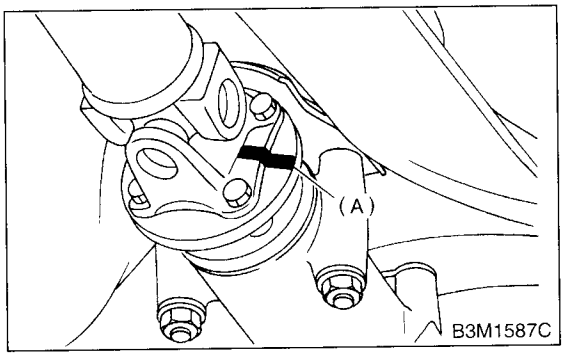
1) Insert the sleeve yoke into the transmission and attach center bearing to body.

Tightening torque:
52 N·m (5.3 kgf-m, 38.3 ft-lb)



2) Align the matching marks and connect the flange yoke and rear differential.

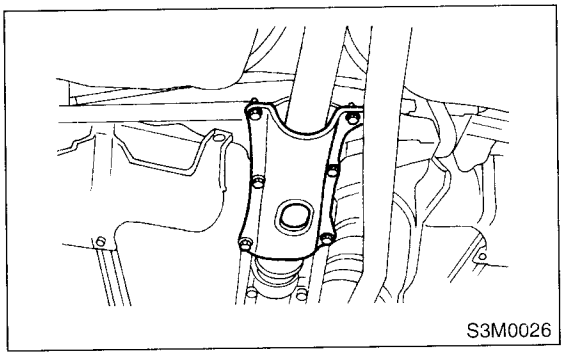
Tightening torque:
31 N·m (3.2 kgf-m, 23.1 ft-lb)



(A) Matching mark

3) Install the differential mount front cover.

Tightening torque:
88 N·m (9.0 kgf-m, 65 ft-lb)



4) Install the rear differential protector. (If equipped)
5) Install the rear exhaust pipe and muffler.

C: INSPECTION

NOTE:
Do not disassemble 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

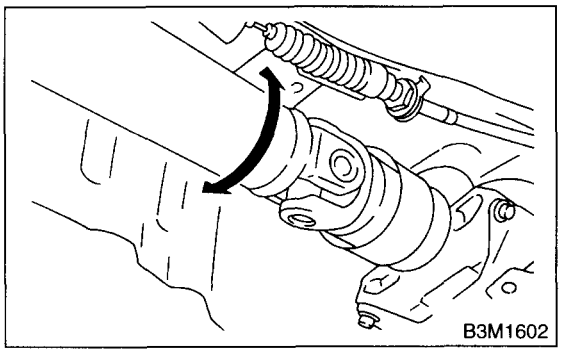
Check the following points with propeller shaft installed in vehicle.

1. JOINTS AND CONNECTIONS

1) Remove the rear exhaust pipes and muffler.
2) Remove the heat shield cover. (If equipped)
3) Check for any looseness of yoke flange connecting bolts and center bearing retaining bolts.

2. SPLINES AND BEARING LOCATIONS

1) Remove the rear exhaust pipe and muffler.
2) Remove the heat shield cover. (If equipped)
3) Turn the propeller shaft by hand to see if abnormal free play exists at splines. Also move yokes to see if the abnormal free play exists at spiders and bearings.

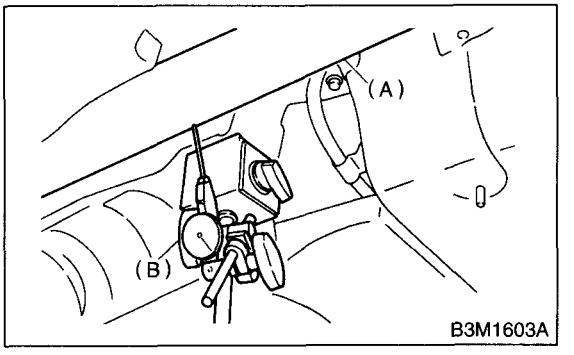


3. RUNOUT OF PROPELLER SHAFT

1) Remove the rear exhaust pipe and muffler.
2) Remove the heat shield cover. (If equipped)
3) Turn the rear wheels by hand to check for "runout" of propeller shaft.

NOTE:
Measure runout with a dial gauge at the center of front and rear propeller shaft tubes.

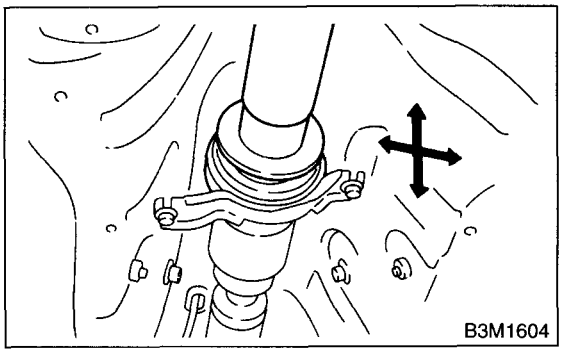
Runout:
Limit 0.6 mm (0.024 in)



(A) Propeller shaft
(B) Dial gauge

4. CENTER BEARING FREE PLAY

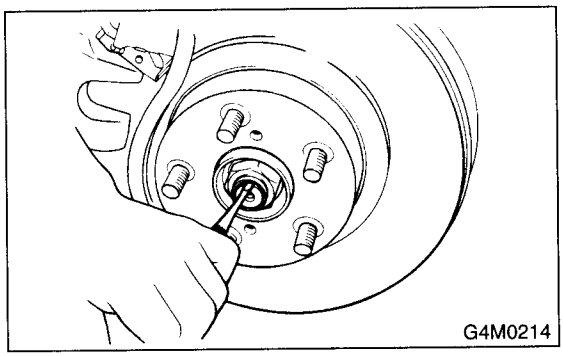
1) Remove the rear exhaust pipe and muffler.
2) Remove the heat shield cover. (If equipped)
3) While holding propeller shaft near center bearing with your hand, move it up and down, and left and right to check for any abnormal bearing free play.



3. Front Axle

A: REMOVAL

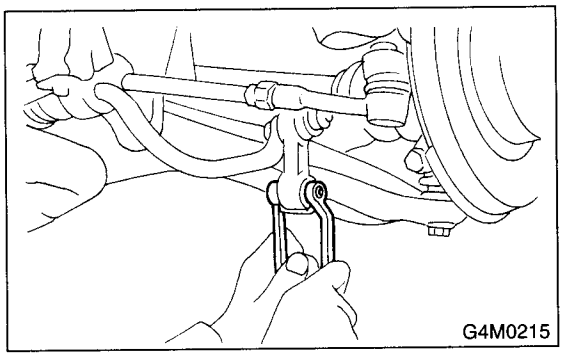
1) Disconnect the ground cable from battery.
2) Jack-up the vehicle, support it with safety stands, and remove the front wheels.
3) Unlock the axle nut.



4) Remove the axle nut using a socket wrench.

CAUTION:
Be sure to loose and retighten axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.

5) Remove the stabilizer link.

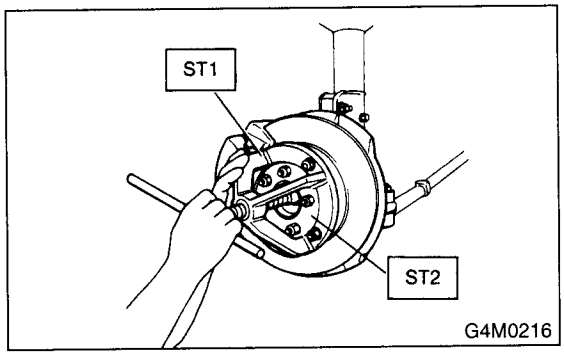


6) Remove the disc brake caliper from the housing, and suspend it from strut using a wire.

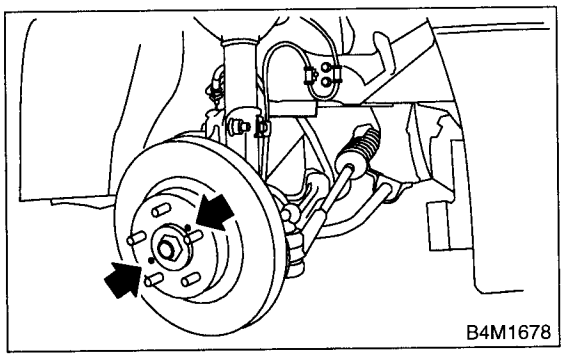
7) Remove the front drive shaft assembly from the hub. If it is hard to remove, use STs.

ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE

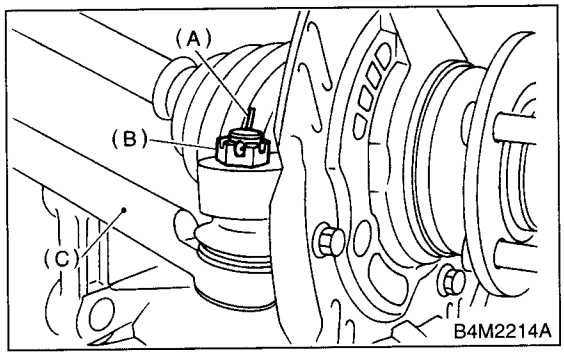
CAUTION:
- **Be careful not to damage oil seal lip when removing front drive shaft.**
- **When replacing front drive shaft, also replace inner oil seal.**



8) Remove the disc rotor from the hub.
If disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in screw hole on the rotor.

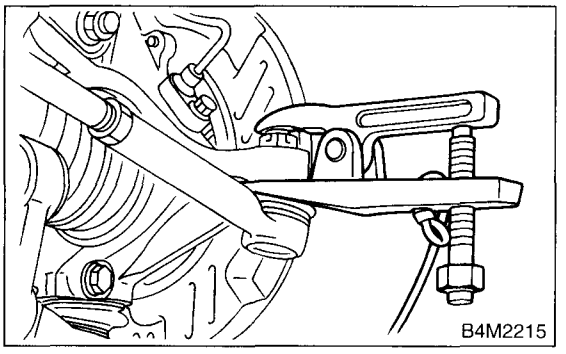


9) Remove the cotter pin and castle nut which secure tie-rod end to housing knuckle arm.

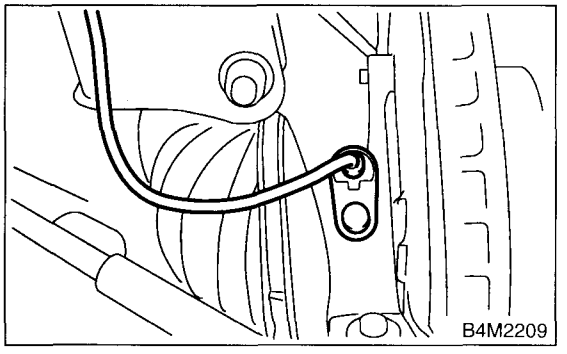


(A) Cotter pin
(B) Castle nut
(C) Tie-rod

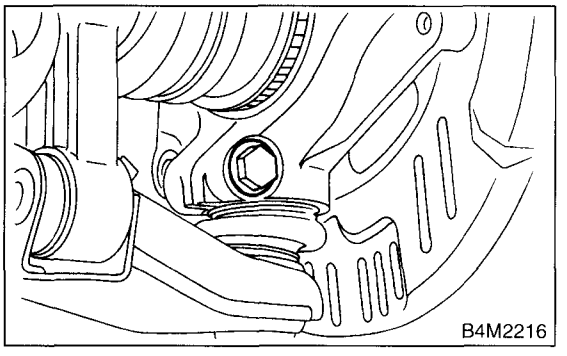
10) Using a puller, remove the tie-rod ball joint from the knuckle arm.



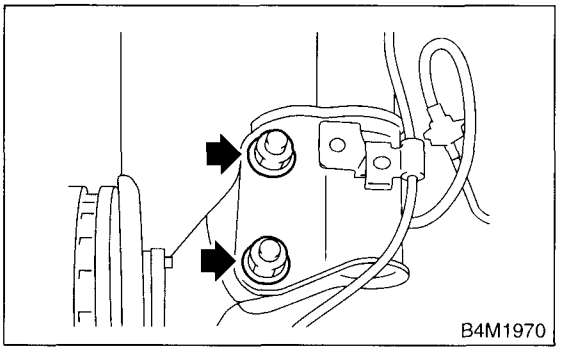
11) On ABS equipped models, remove the ABS sensor assembly and harness in advance.



12) Remove the transverse link ball joint from the housing.



13) After scribing an alignment mark on camber adjusting bolt head, remove bolts which connect housing and strut, and disconnect the housing from the strut.



B: INSTALLATION

1) Install the transverse link ball joint to the housing.

Tightening torque:
49 N·m (5.0 kgf-m, 36 ft-lb)

2) While aligning alignment mark on camber adjusting bolt head, connect the housing and strut.

CAUTION:
Use a new self-locking nut.

Tightening torque:
152 N·m (15.5 kgf-m, 112 ft-lb)

3) Install the ABS sensor on the housing (only vehicle equipped with ABS).

Tightening torque:
32 N·m (3.3 kgf-m, 24 ft-lb)

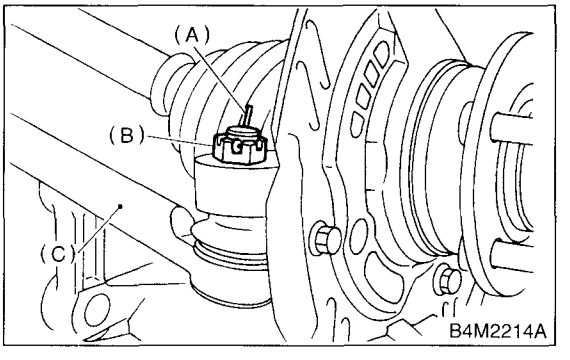
4) Install the disc rotor on the hub.
5) Install the disc brake caliper on the housing.

Tightening torque:
78 N·m (8 kgf-m, 57.9 ft-lb)

6) Install the front drive shaft. <Ref. to DS-32, INSTALLATION, Front Drive Shaft.>
7) Connect the stabilizer link.
8) Connect the tie-rod end ball joint and knuckle arm with a castle nut, and insert the cotter pin into the tie-rod end.

Castle nut tightening torque:
Tighten to 27.0 N·m (2.75 kgf-m, 19.9 ft-lb), and tighten further within 60° until cotter pin hole is aligned with a slot in the nut.

CAUTION:
When connecting, do not hit cap at the bottom of tie-rod end with hammer.



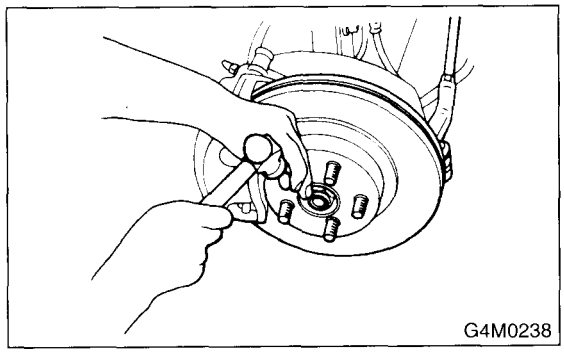
(A) Cotter pin
(B) Castle nut
(C) Tie-rod

9) While depressing brake pedal, tighten the axle nut and lock it securely.

Tightening torque:
186 N·m (19 kgf-m, 137 ft-lb)

CAUTION:
• Use a new axle nut.
• Always tighten axle nut before installing wheel on vehicle. If wheel is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.
• Be sure to tighten axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.

10) After tightening the axle nut, lock it securely.

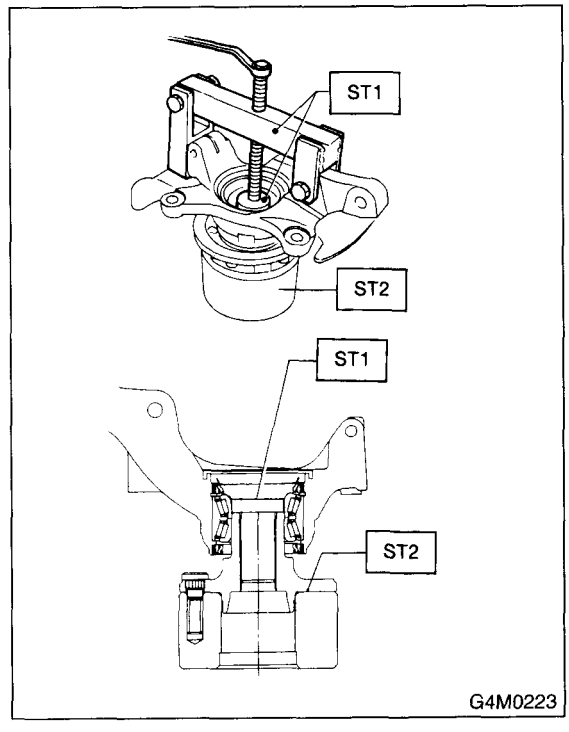

G4M0238

11) Install the wheel and tighten the wheel nuts to specified torque.

Tightening torque:
90 N·m (9.2 kgf-m, 66.5 ft-lb)

C: DISASSEMBLY

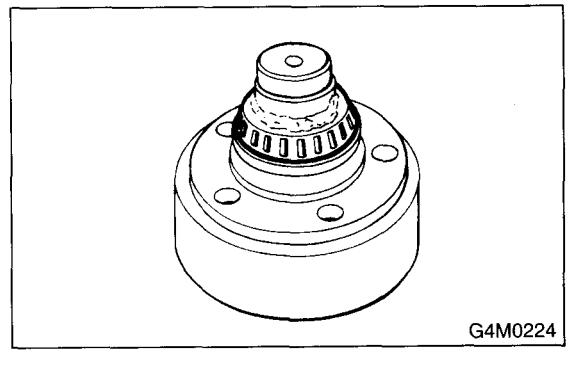
1) Using ST1, support housing and hub securely.
2) Attach ST2 to housing and drive hub out.
ST1 927060000 HUB REMOVER
ST2 927080000 HUB STAND



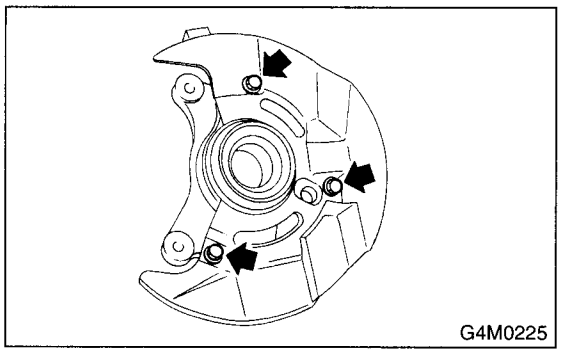
G4M0223

If inner bearing race remains in the hub, remove it with a suitable tool (commercially available).

CAUTION:
• Be careful not to scratch polished area of hub.
• Be sure to install inner race on the side of outer race from which it was removed.


G4M0224

3) Remove the disc cover from the housing.

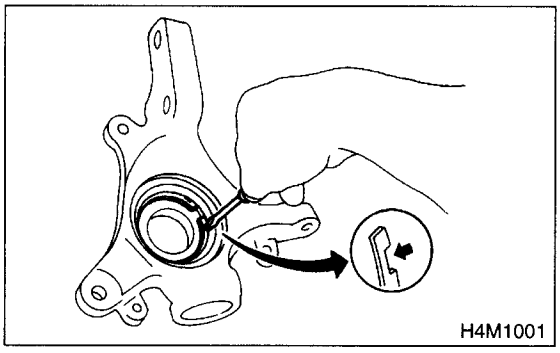


4) Using a standard screwdriver, remove the outer and inner oil seals.

CAUTION:
Do not use old oil seals.

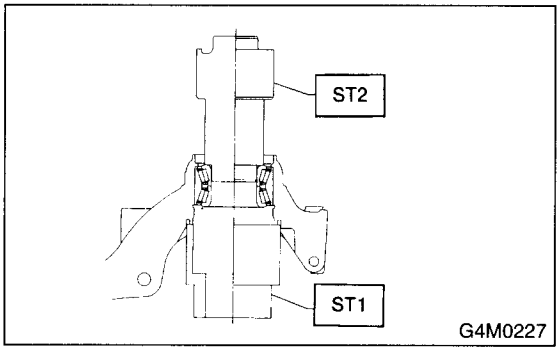
5) Using flat bladed screwdriver, remove the snap ring.

CAUTION:
Be careful not to damage housing at removal.



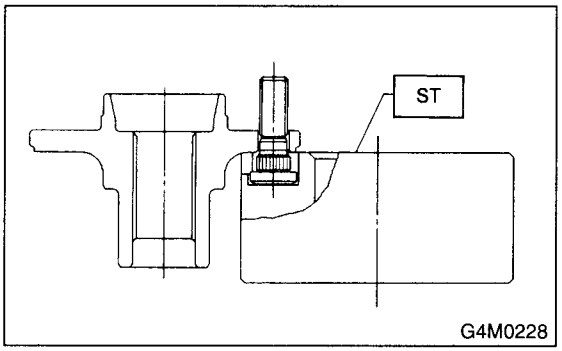
6) Using ST1, support housing securely.
7) Using ST2, press inner race to drive out outer bearing.
ST1 927400000 HOUSING STAND
ST2 927100000 BEARING PULLER

CAUTION:
- **Do not remove outer race unless it is faulty.**
- **Discard outer race after removal.**
- **Do not replace inner or outer race separately; always replace as a unit.**



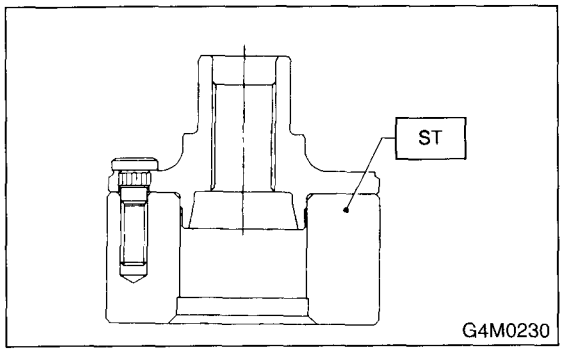
8) Using ST and a hydraulic press, drive hub bolts out.
ST 927080000 HUB STAND

CAUTION:
Be careful not to hammer the hub bolts. This may deform hub.



D: ASSEMBLY

1) Attach the hub to ST securely.
ST 927080000 HUB STAND



2) Using a hydraulic press, press the new hub bolts into place.

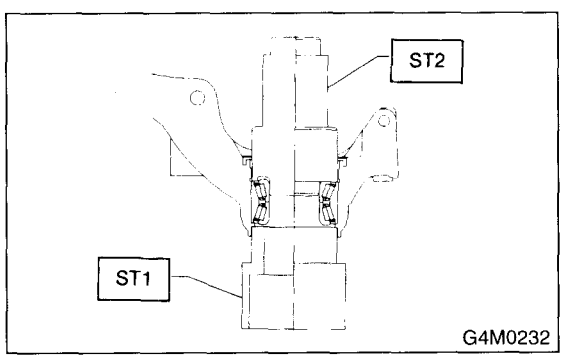
CAUTION:
Be sure to press hub bolts until their seating surfaces contact the hub.

NOTE:
Use 12 mm (0.47 in) dia. holes in HUB STAND to prevent bolts from tilting.

3) Clean the dust or foreign particles from inside the housing.
4) Using ST1 and ST2, press a new bearing into place.
ST1 927400000 HOUSING STAND
ST2 927100000 BEARING PULLER

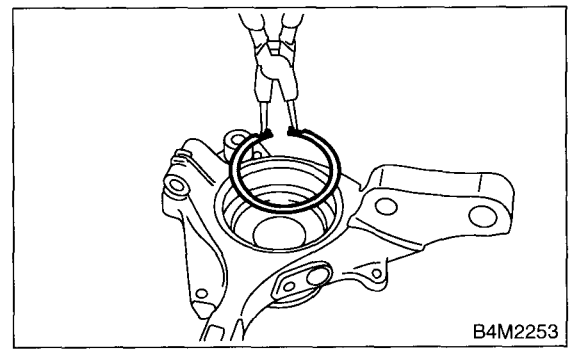
CAUTION:
- **Always press outer race when installing bearing.**
- **Be careful not to remove the plastic lock from inner race when installing bearing.**
- **Charge bearing with new grease when outer race is not removed.**
- **Do not apply pressure more than 30 kN (3.1 ton, 2.8 US ton, 3.1 Imp ton).**

Specified grease:
SHELL 6459N



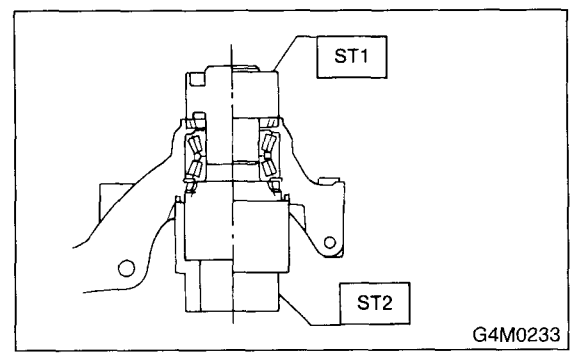
5) Using pliers, install the snap ring in its groove.

CAUTION:
Make sure to install it firmly to groove.



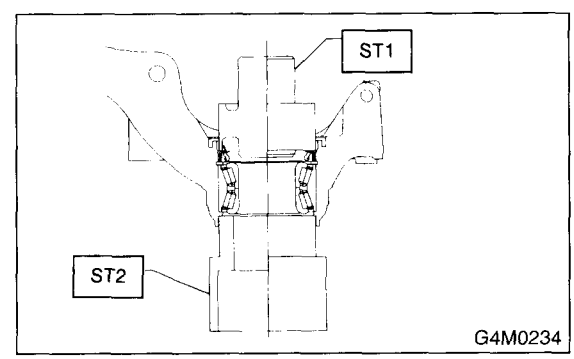
6) Using ST1 and ST2, press the outer oil seal until it contacts the bottom of housing.
ST1 927410000 OIL SEAL INSTALLER
ST2 927400000 HOUSING STAND

CAUTION:
Do not apply pressure more than 3.92 kN (0.4 ton, 0.4 US ton, 0.4 Imp ton).



7) Using ST1 and ST2, press the inner oil seal until it contacts circlip.
ST1 927410000 OIL SEAL INSTALLER
ST2 927400000 HOUSING STAND

CAUTION:
Do not apply pressure more than 3.92 kN (0.4 ton, 0.4 US ton, 0.4 Imp ton).



8) Invert the ST and housing.
ST 927400000 HOUSING STAND

9) Apply the sufficient grease to oil seal lip.

Specified grease
SHELL 6459N

CAUTION:
• If specified grease is not available, remove bearing grease and apply Auto Rex A instead.
• Do not mix different types of grease.

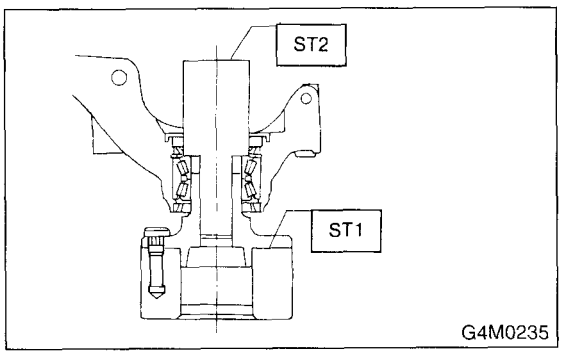
10) Install the disc cover to housing the three bolts.

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

11) Attach the hub to ST1 securely.
12) Clean the dust or foreign particles from the polished surface of hub.
13) Using ST2, press the bearing into hub by driving inner race.

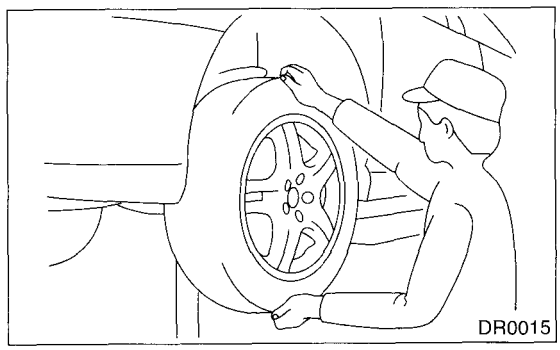
ST1 927080000 HUB STAND
ST2 927120000 HUB INSTALLER

CAUTION:
Do not apply pressure more than 25 kN (2.5 ton, 2.3 US ton, 2.5 Imp ton).



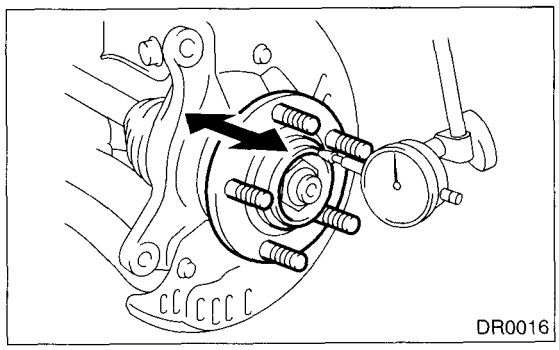
E: INSPECTION

1) Inspect the rattle of bearing, give the tires a shake with grasping both the upper and lower sides of the tire. And also inspect to rotate the wheel smoothly.



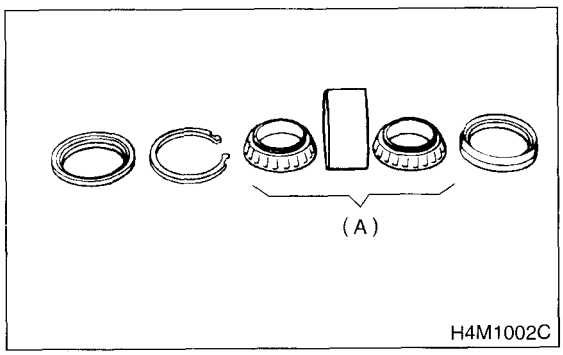
2) Inspect the lean of axis direction using a dial gauge. Replace the hub bearing if the load range exceed the limitation.

Limit:
Maximum: 0.05mm (0.0020in)



3) Inspect the removed parts for wear and damage. If defective, replace with new ones.

CAUTION:
• If bearing is faulty, replace it as the bearing set.
• Be sure to replace oil seal at every overhaul.



(A) Replace as a set.

4. Rear Axle

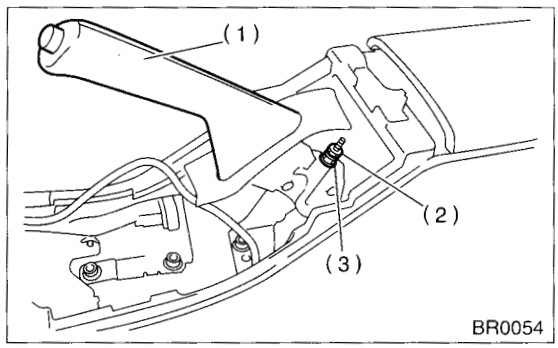
A: REMOVAL

1. DISC BRAKE

1) Disconnect the ground cable from battery.
2) Jack-up the vehicle, and remove the rear wheel cap and wheels.

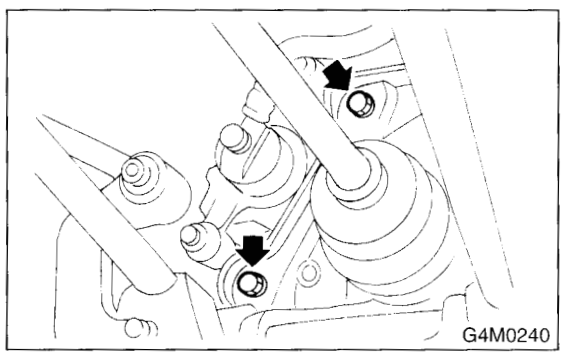
CAUTION:
Be sure to loosen and retighten the axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.

3) Unlock the axle nut.
4) Remove the axle nut using a socket wrench.
5) Return the parking brake lever and loosen the adjusting nut.



(1) Parking brake lever
(2) Lock nut
(3) Adjusting nut

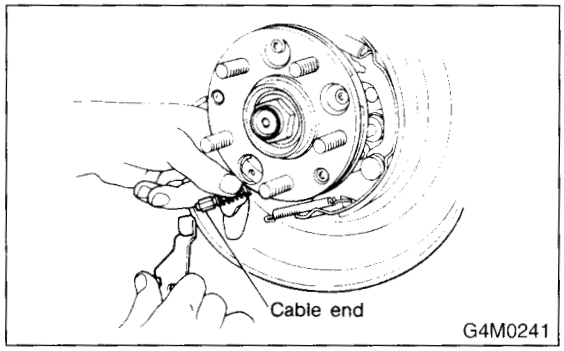
6) Remove the disc brake caliper from the back plate, and suspend it from strut using a piece of wire.



7) Remove the disc rotor from the hub.

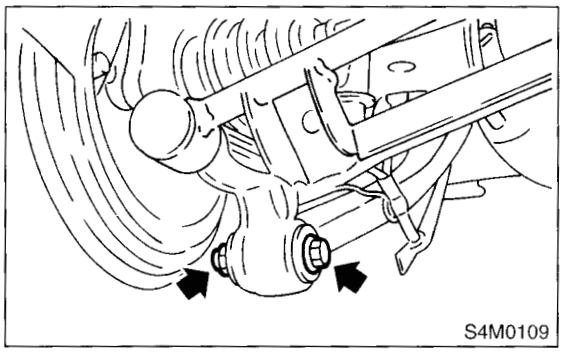
NOTE:
If disc rotor seizes up within hub, drive it out by installing an 8-mm bolt into bolt hole in disc rotor.

8) Disconnect the parking brake cable end.



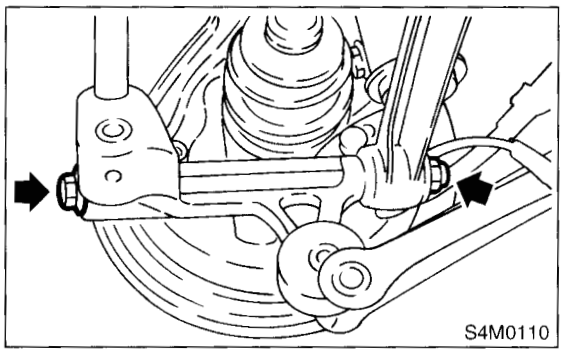
9) Disconnect the rear stabilizer from rear lateral link.
10) Remove the bolts which secure trailing link assembly to the rear housing.

CAUTION:
Discard old self-locking nut. Relpace with a new one.



11) Remove the bolts which secure lateral assembly to the rear housing.

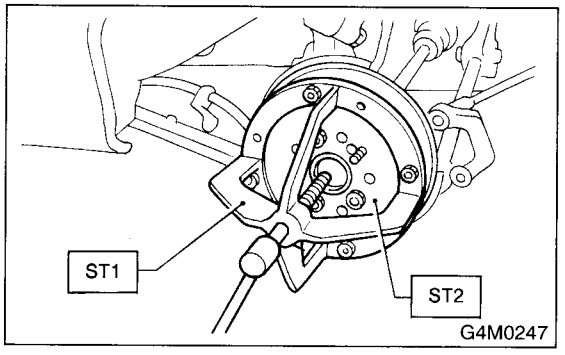
CAUTION:
Discard old self-locking nut. Relpace with a new one.



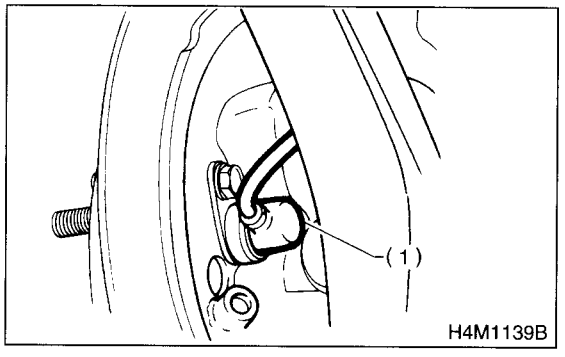
12) Disengage the BJ from the housing splines, and remove the rear drive shaft assembly.
If it is hard to remove, use STs.

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 rear drive shaft is to be replaced, also replace inner oil seal with a new one.**

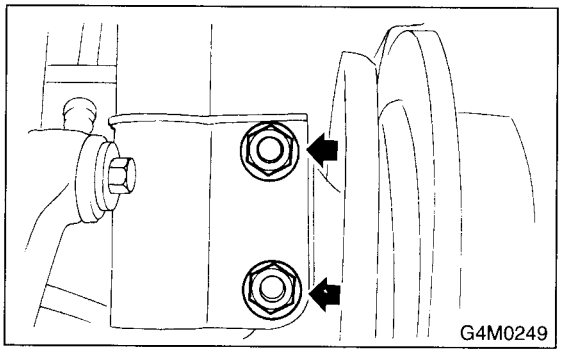


13) Remove the rear ABS sensor from the back plate (only vehicle equipped with ABS).



(1) ABS sensor

14) Remove the bolts which secure rear housing to strut, and separate the two.

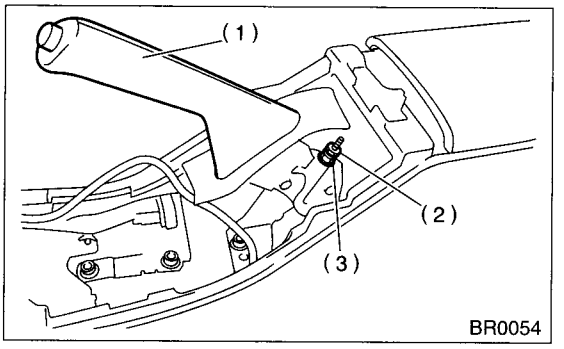


2. DRUM BRAKE

1) Disconnect the ground cable from battery.
2) Jack-up the vehicle, and remove the rear wheel cap and wheels.

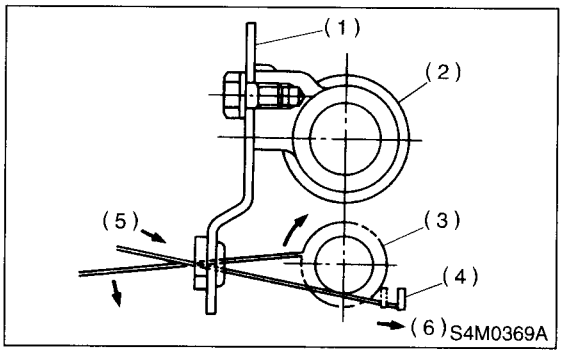
CAUTION:
Be sure to loosen and retighten the axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.

3) Unlock the axle nut.
4) Remove the axle nut using a socket wrench.
5) Return the parking brake lever and loosen the adjusting nut.



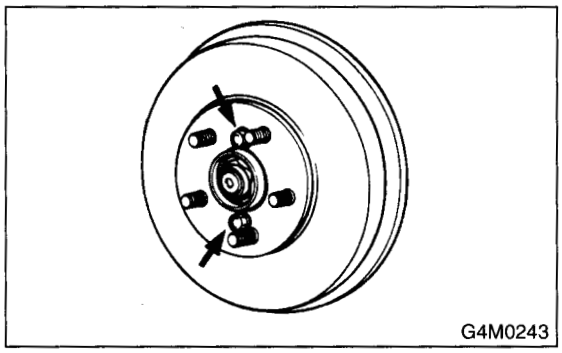
(1) Parking brake lever
(2) Lock nut
(3) Adjusting nut

6) Remove the brake drum from hub.
7) If it is difficult to remove brake drum, remove the adjusting hole cover from the back plate, and then turn the adjusting screw using a slot-type screwdriver until the brake shoe separates from the drum.



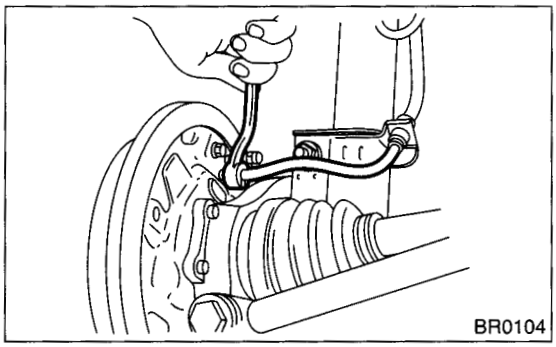
(1) Back plate
(2) Wheel cylinder
(3) Adjuster ASSY pawls
(4) Adjusting lever
(5) Tightening direction
(6) Push

NOTE:
If brake drum is difficult to remove, drive it out by installing an 8-mm bolt into bolt hole in brake drum.

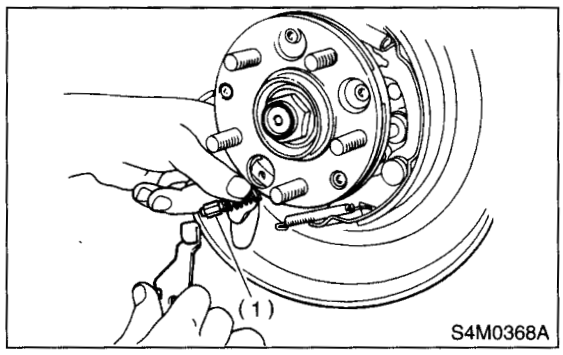

G4M0243

8) Using a flare-net wrench, disconnect the brake hose from the wheel cylinder.

CAUTION:
Cover open end of wheel cylinder to prevent entry of foreign particles.


BR0104

9) Disconnect the parking brake cable end.



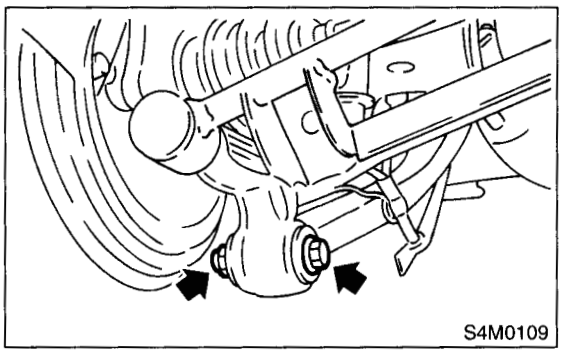
S4M0368A

(1) Cable end

10) Disconnect the rear stabilizer from the rear lateral link.

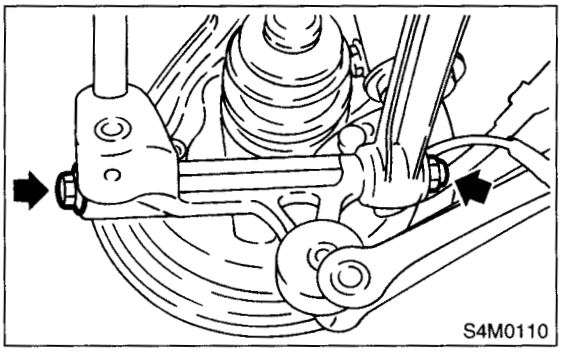
11) Remove the bolts which secure trailing link assembly to the rear housing.

CAUTION:
Discard old self-locking nut. Replace with a new one.


S4M0109

12) Remove the bolts which secure lateral link assembly to the rear housing.

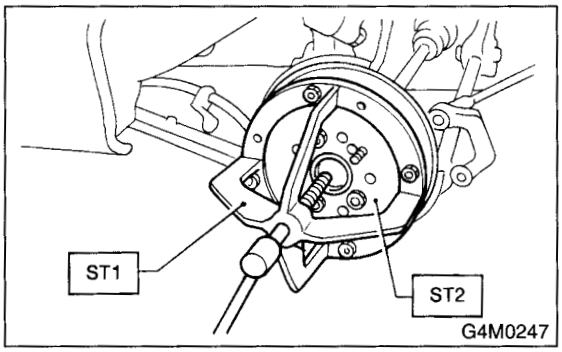
CAUTION:
Discard old self-locking nut. Replace with a new one.


S4M0110

13) Disengage the BJ from the housing splines, and remove the rear drive shaft assembly.
If it is hard to remove, use STs.

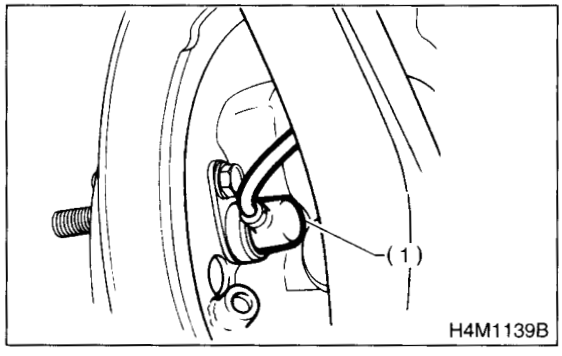
ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE

CAUTION:
- **Be careful not to damage the oil seal lip when removing rear drive shaft.**
- **When rear drive shaft is to be replaced, also replace inner oil seal with a new one.**



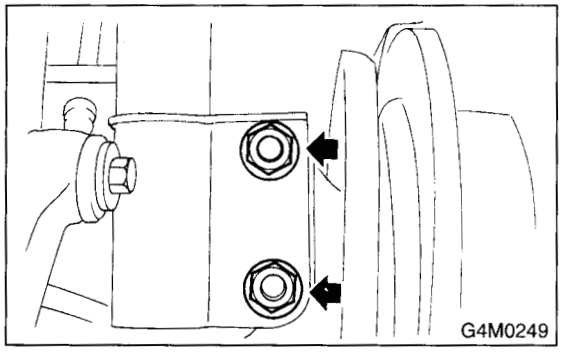
G4M0247

14) Remove the rear ABS sensor from the back plate (only vehicle equipped with ABS).



(1) ABS sensor

15) Remove the bolts which secure rear housing to strut, and separate the two.



B: INSTALLATION

1. DISC BRAKE

1) Connect the rear housing assembly and strut assembly.

CAUTION:
Use a new self-locking nut.

Tightening torque:
196 N·m (20 kgf-m, 145 ft-lb)

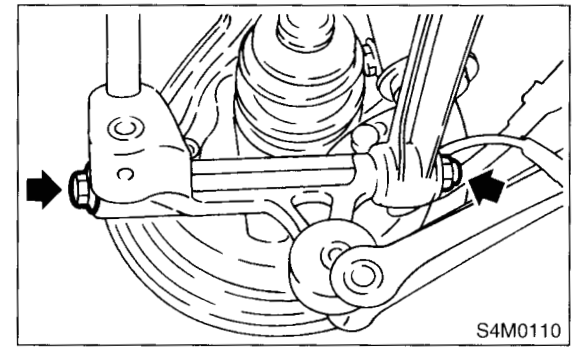
2) Fit the BJ (bell joint) to the rear housing splines.

CAUTION:
Be careful not to damage inner oil seal lip.

3) Connect the rear housing assembly to the lateral link assembly.

CAUTION:
Use a new self-locking nut.

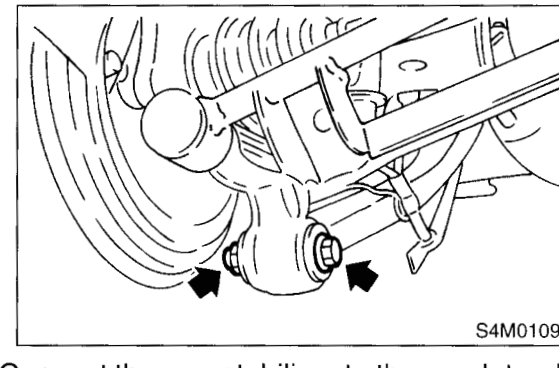
Tightening torque:
137 N·m (14 kgf-m, 101 ft-lb)



4) Connect the rear housing assembly to the trailing link assembly.

CAUTION:
Use a new self-locking nut.

Tightening torque:
113 N·m (11.5 kgf-m, 83 ft-lb)



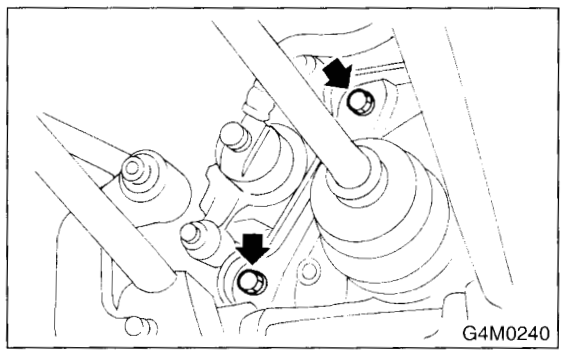
5) Connect the rear stabilizer to the rear lateral link.

CAUTION:
Use a new self-locking nut.

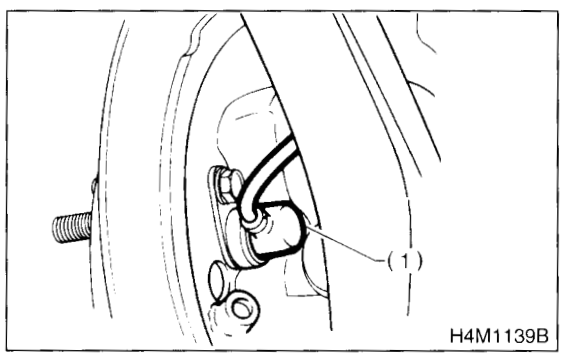
Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)

6) Connect the parking brake cable to the parking brake.
7) Install the disc rotor on the rear housing assembly.
8) Install the disc brake caliper on the back plate.

Tightening torque:
52 N·m (5.3 kgf-m, 38.3 ft-lb)



9) Install the rear ABS sensor and brake cable bracket (only vehicle equipped with ABS).



(1) ABS sensor

10) Bleed air from brake system. <Ref. to BR-44, REPLACEMENT, Brake Fluid.>
11) Adjust the parking brake lever stroke by turning adjuster.
12) Move the brake lever back to apply brakes. While depressing brake pedal, tighten the axle nut using a socket wrench. Lock the axle nut after tightening.

Tightening torque:
186 N·m (19 kgf-m, 137 ft-lb)

CAUTION:
• Use a new axle nut.
• Always tighten axle nut before installing wheel on vehicle. If wheel is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.
• Be sure to tighten axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.

13) Install the wheel and tighten the wheel nuts to specified torque.

Tightening torque:
88 N·m (9 kgf-m, 65 ft-lb)

2. DRUM BRAKE

1) Connect the rear housing assembly and strut assembly.

CAUTION:
Use a new self-locking nut.

Tightening torque:
196 N·m (20 kgf-m, 145 ft-lb)

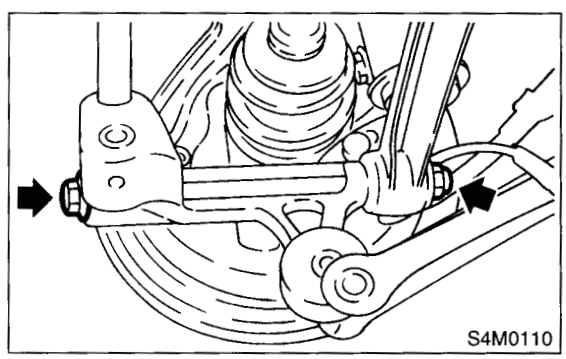
2) Fit the BJ (bell joint) to rear housing splines.

CAUTION:
Be careful not to damage inner oil seal lip.

3) Connect the rear housing assembly to the lateral link assembly.

CAUTION:
Use a new self-locking nut.

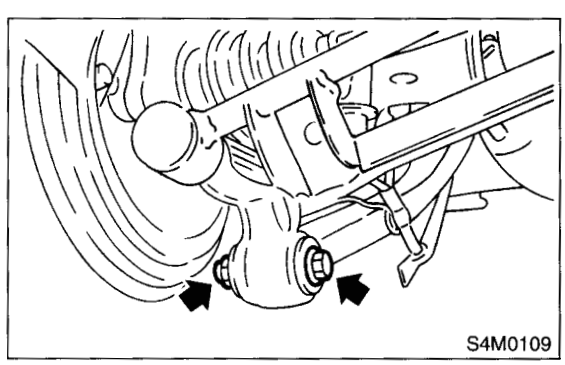
Tightening torque:
137 N·m (14 kgf-m, 101 ft-lb)



4) Connect the rear housing assembly to the trailing link assembly.

CAUTION:
Use a new self-locking nut.

Tightening torque:
113 N·m (11.5 kgf-m, 83 ft-lb)

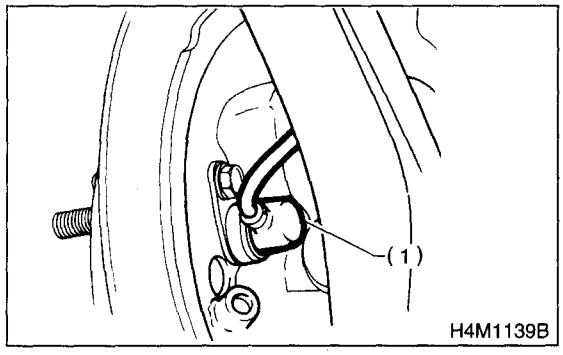


5) Connect the rear stabilizer to the rear lateral link.

CAUTION:
Use a new self-locking nut.

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

6) Connect the parking brake cable to the parking brake.
7) Clean the brake pipe connection. Using a flare-nut wrench, connect the brake pipe to the wheel cylinder.
8) Connect the rear ABS sensor to the back plate (only vehicle equipped with ABS).



(1) ABS sensor

9) Connect the parking brake cable to the lever.
10) Install the brake drum on the rear housing assembly.
11) Bleed air from brake system. <Ref. to BR-44, REPLACEMENT, Brake Fluid.>
12) Adjust the parking brake lever stroke by turning adjuster.
13) Move the brake lever back to apply brakes. While depressing brake pedal, tighten the axle nut using a socket wrench. Lock the axle nut after tightening.

Tightening torque:
186 N·m (19 kgf-m, 137 ft-lb)

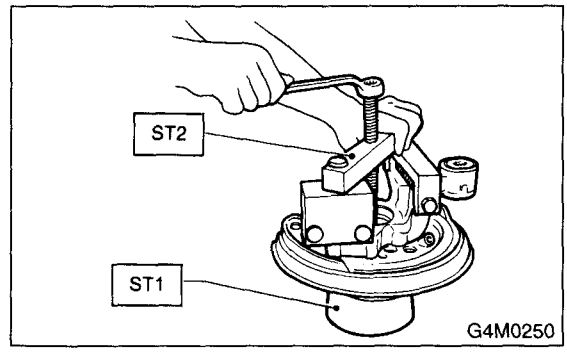
CAUTION:
- **Use a new axle nut.**
- **Always tighten axle nut before installing wheel on vehicle. If wheel is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.**
- **Be sure to tighten axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.**

14) Install the wheel and tighten the wheel nuts to specified torque.

Tightening torque:
90 N·m (9.2 kgf-m, 66.5 ft-lb)

C: DISASSEMBLY

1) Using ST1 and ST2, remove the hub from the rear housing.
ST 927080000 HUB STAND
ST 927420000 HUB REMOVER

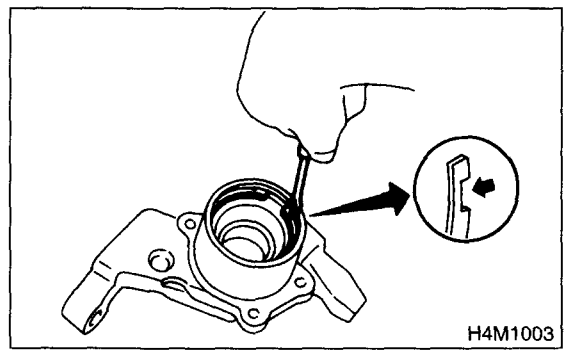


2) Remove the back plate from the rear housing
3) Using a standard screwdriver, remove the outer and inner oil seals.

CAUTION:
Use new oil seals.

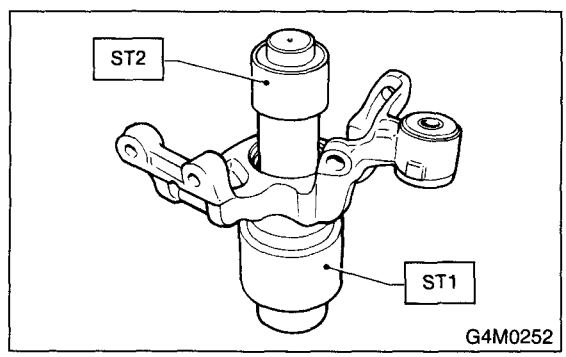
4) Using flat bladed screwdriver, remove the snap ring.

CAUTION:
Be careful not to damage housing at removal.



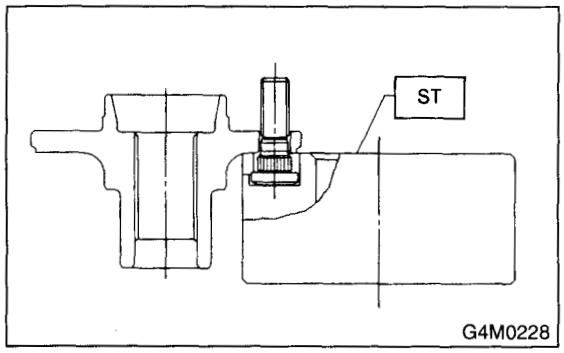
5) Using ST1 and ST2, remove the bearing by pressing inner race.
ST1 927430000 HOUSING STAND
ST2 927440000 BEARING REMOVER

CAUTION:
- **Do not remove bearing unless damaged.**
- **Do not re-use bearing after removal.**



6) Remove the tone wheel bolts and remove the tone wheel from the hub (only vehicle equipped with ABS).
7) Using ST, press the hub bolt out.
ST 927080000 HUB STAND

CAUTION:
Be careful not to hammer the hub bolts. This may deform hub.

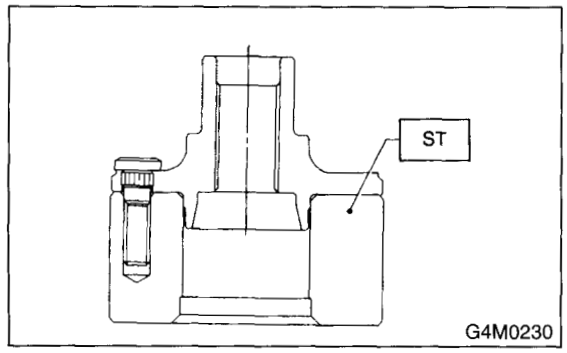


D: ASSEMBLY

1) Using ST, press the new hub bolt into place.

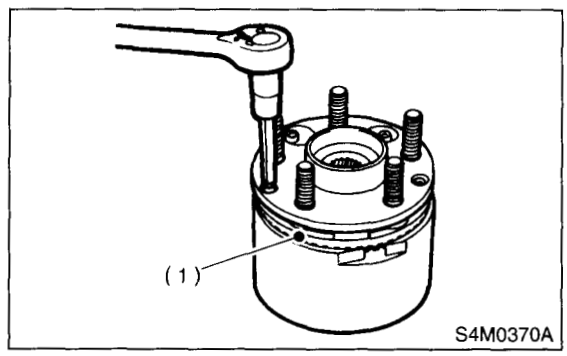
CAUTION:
- **Ensure hub bolt closely contacts hub.**
- **Use a 12 mm (0.47 in) hole in the ST to prevent hub bolt from tilting during installation.**

ST 927080000 HUB STAND



2) Remove the foreign particles (dust, rust, etc.) from the mating surfaces of hub tone wheel, and install the tone wheel to hub (only vehicle equipped with ABS).

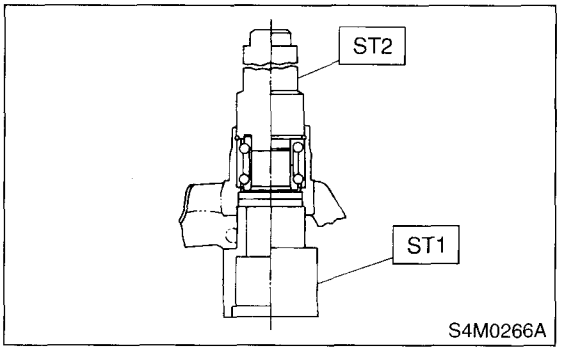
CAUTION:
- **Ensure tone wheel closely contacts hub.**
- **Be careful not to damage tone wheel teeth.**



(1) Tone wheel

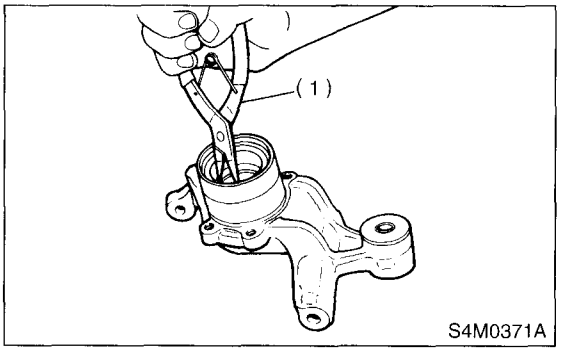
3) Clean the housing interior completely. Using ST1 and ST2, press the bearing into the housing.
ST1 927430000 HOUSING STAND
ST2 927440000 BEARING REMOVER

CAUTION:
• Always press iouter race when installing bearing.
• Be careful not to remove plastic lock from inner race when installing bearing.
• Charge bearing with new grease when outer race is not removed.
• Do not apply pressure more than 30 kN (3.1 ton, 2.8 US ton, 3.1 Imp ton).



4) Using plier, install the snap ring.

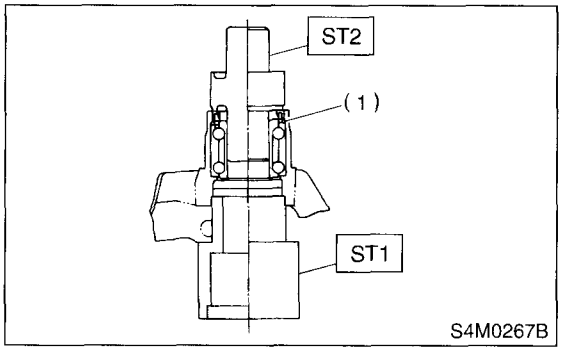
CAUTION:
Ensure snap ring fits in groove properly.



(1) Plier

5) Using 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

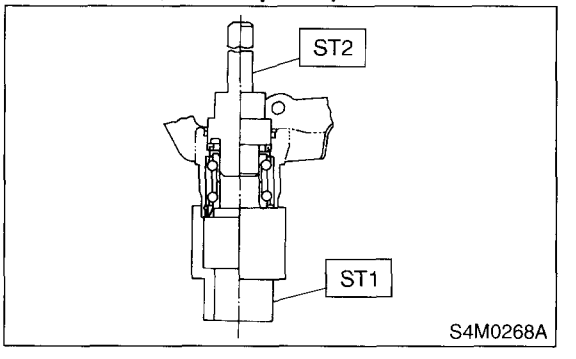
CAUTION:
Do not apply pressure more than 3.92 kN (0.4 ton, 0.4 US ton, 0.4 Imp ton).



(1) Snap ring

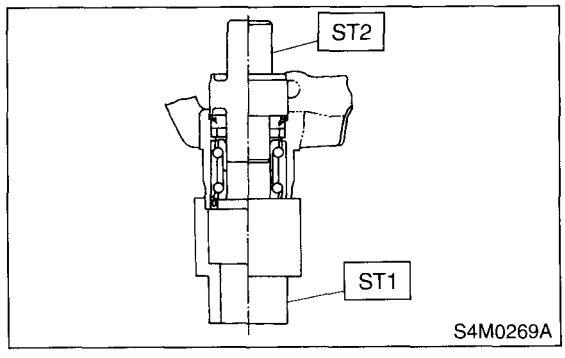
6) Invert both ST1 and housing.
7) Using ST2, press the inner oil seal into the housing until it touches bottom.
ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER

CAUTION:
Do not apply pressure more than 3.92 kN (0.4 ton, 0.4 US ton, 0.4 Imp ton).



8) Using ST1 and ST2, press the sub seal into place.
ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER

CAUTION:
Do not apply pressure more than 3.92 kN (0.4 ton, 0.4 US ton, 0.4 Imp ton).



9) Apply the sufficient grease to oil seal lip.

Specified grease:
SHELL 6459N

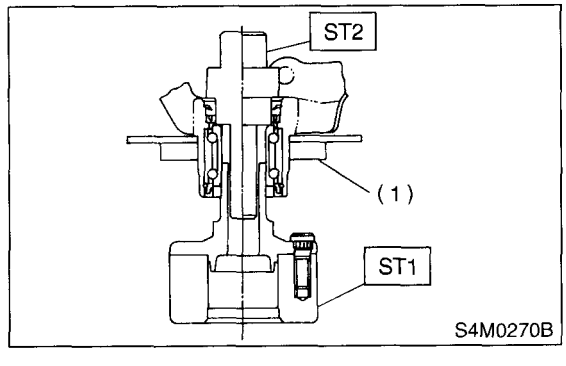
CAUTION:
- **If specification grease is not available, remove bearing grease and apply Auto Rex A instead.**
- **Do not mix different types of grease.**

10) Install back plate to rear housing.

Tightening torque:
52 N·m (5.3 kgf-m, 38 ft-lb)

11) Using ST1 and ST2, press the baring into hub.
ST1 927080000 HUB STAND
ST2 927450000 HUB INSTALLER

CAUTION:
Do not apply pressure more than 25 kN (2.5 ton, 2.3 US ton, 2.5 Imp ton).



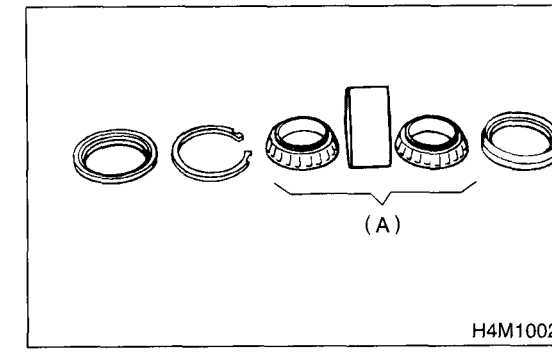
E: INSPECTION

1) Inspect the rattle and lean of axis direction of the removed parts as the same procedure of Front Axle <Ref. to DS-22, INSPECTION, Front Axle.>

The lean of axis direction
Maximum: 0.05mm (0.0020in)

2) Inspect the removed parts for wear and damage. If defective, replace with a new one.

CAUTION:
- **If a bearing is faulty, replace it as the bearing set.**
- **Be sure to replace oil seal at every overhaul.**



(A) Replace as a set.

5. Front Drive Shaft

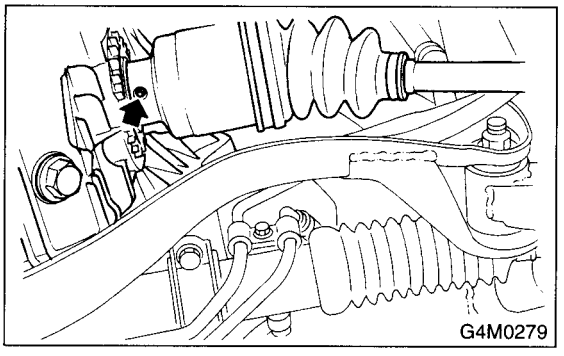
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Jack-up the vehicle, support it with safety stands (rigid racks), and remove the front wheel cap and wheels.
3) Unlock the axle nut.
4) Depress the brake pedal and remove the axle nut using a socket wrench.

CAUTION:
Be sure to loosen and retighten axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.

5) Remove the stabilizer link from the transverse link.
6) Disconnect the transverse link from the housing.
7) Remove the spring pin which secures transmission spindle to SFJ.

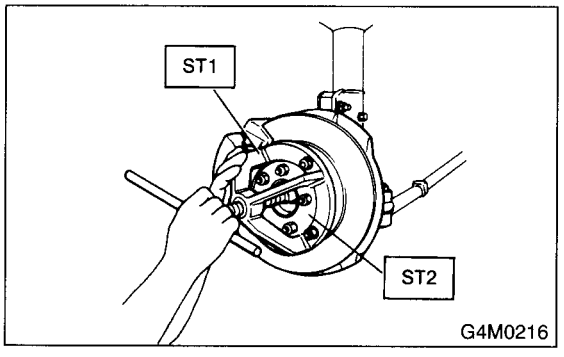
CAUTION:
Use a new spring pin.



8) Remove the front drive shaft assembly. If it is hard to remove, use ST1 and ST2.

ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE

CAUTION:
- **Be careful not to damage the oil seal lip and tone wheel when removing front drive shaft.**
- **When front drive shaft is to be replaced, also replace inner oil seal.**



B: INSTALLATION

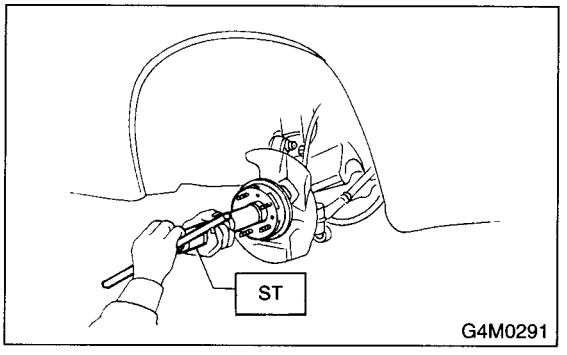
1) Insert the BJ into hub splines.

CAUTION:
Be careful not to damage inner oil seal lip and tone wheel.

2) Using ST1 and ST2, pull the drive shaft into place.

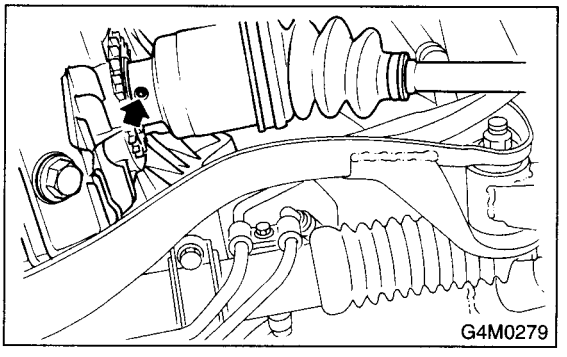
ST1	922431000	AXLE SHAFT INSTALLER
ST2	927390000	ADAPTER

CAUTION:
Do not hammer drive shaft when installing it.



3) Tighten the axle nut temporarily.
4) Install the SFJ on transmission spindle and drive spring pin into place.

CAUTION:
Always use a new spring pin.



5) Connect the transverse link to the housing.

Tightening torque (self-locking nut):
49 N·m (5.0 kgf-m, 36 ft-lb)

CAUTION:
Use a new self-locking nut.

6) Install the stabilizer bracket.

7) While depressing brake pedal, tighten the axle nut to the specified torque.

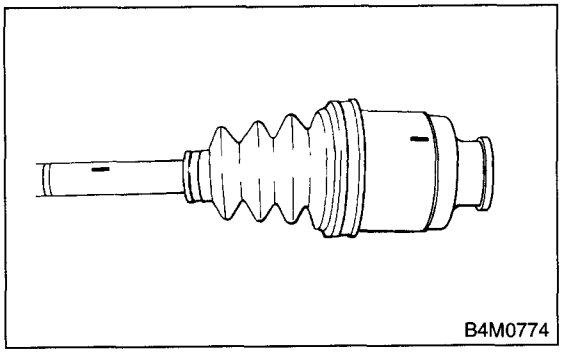
Tightening torque:
186 N·m (19 kgf-m, 137 ft-lb)

CAUTION:
- **Use a new axle nut.**
- **Always tighten axle nut before installing wheel on vehicle. If wheel is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.**
- **Be sure to tighten axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.**

8) After tightening axle nut, lock it securely.

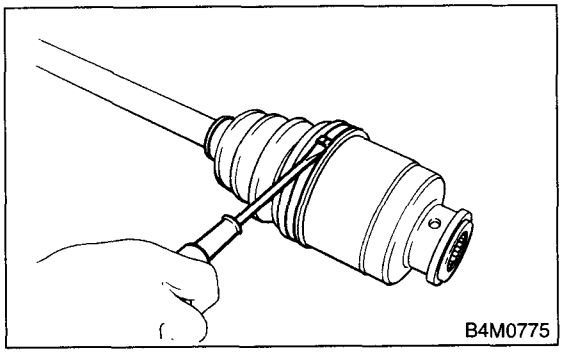
C: DISASSEMBLY

1) Place alignment marks on the shaft and outer race.

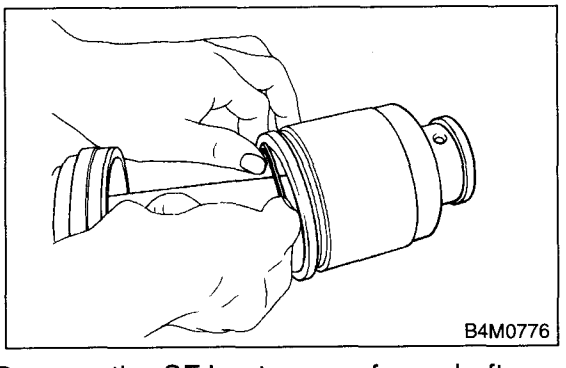


2) Remove the SFJ boot band and boot.

CAUTION:
Be careful not to damage boot.



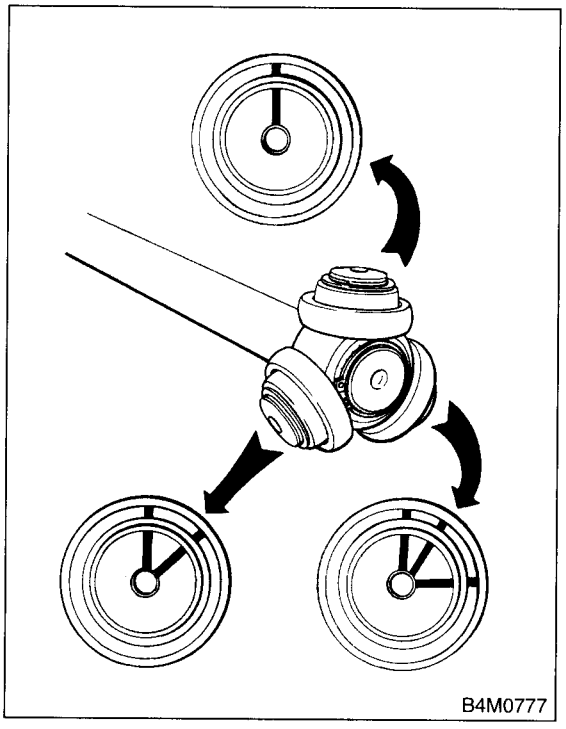
3) Remove the circlip from SFJ outer race using screwdriver.



4) Remove the SFJ outer race from shaft assembly.
5) Wipe off grease.

CAUTION:
The grease is a special grease. Do not confuse with other greases.

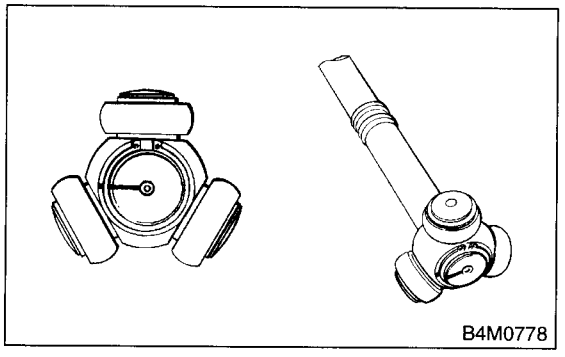
6) Place alignment mark on free ring and trunnion.


B4M0777

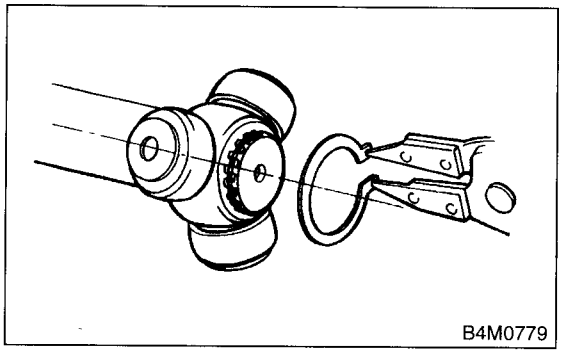
7) Remove the free ring from trunnion.

CAUTION:
Be careful with the free ring position.

8) Place alignment mark on trunnion and shaft.


B4M0778

9) Remove the snap ring and trunnion.


B4M0779

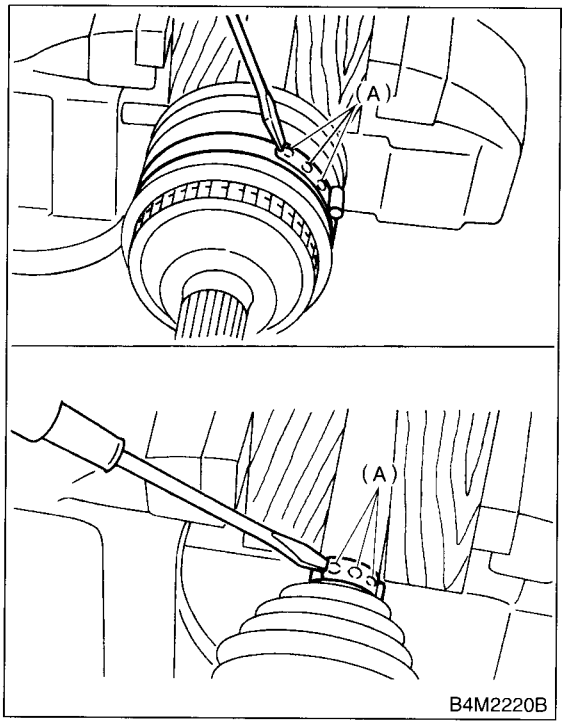
CAUTION:
Be sure to wrap shaft splines with vinyl tape to prevent boot from scratches.

10) Remove the SFJ boot.

11) Place the drive shaft in a vise between wooden blocks.

CAUTION:
Do not place drive shaft directly in the vise; use wooden block.

12) Raise the boot band claws by means of screwdriver and hammer.

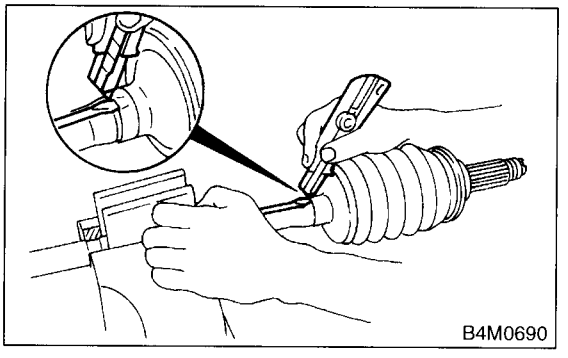


B4M2220B

(A) Boot band claws

13) Cut and remove the boot.

CAUTION:
The boot must be replaced with a new one whenever it is removed.


B4M0690

14) Thus, disassembly of axle is completed, but BJ cannot be disassembled.

D: ASSEMBLY

CAUTION:
Use specified grease.

EBJ side:
NTG2218 (Part No. 28093AA000)

SFJ side:
SSG6003 (Part No. 28093TA000)

1) Place the EBJ boot and small boot band on the BJ side of shaft.

CAUTION:
Be sure to wrap shaft splines with vinyl tape to prevent boot from scratches.

2) Place the drive shaft in a vise.

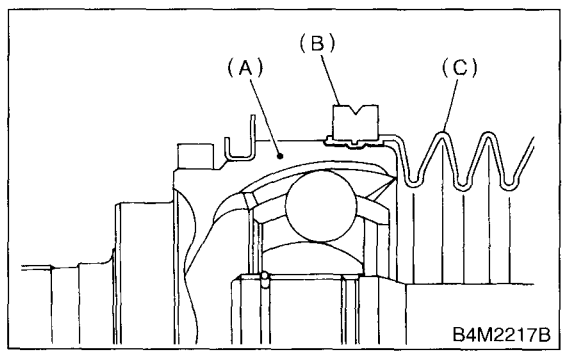
CAUTION:
Do not place drive shaft directly in the vise; use wooden blocks.

3) Apply a coat of specified grease [60 to 70 g (2.12 to 2.47 oz)] to EBJ.

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 the grease to the shaft.

NOTE:
The inside of the larger end of BJ boot and the boot groove shall be cleaned so as to be free from grease and other substances.

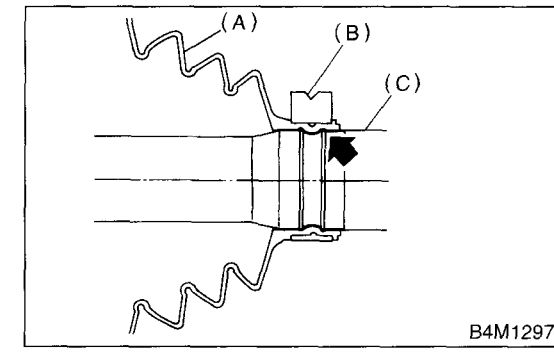
5) Install the boot projecting portion to the EBJ groove.



(A) EBJ
(B) Lorge boot band
(C) Boot

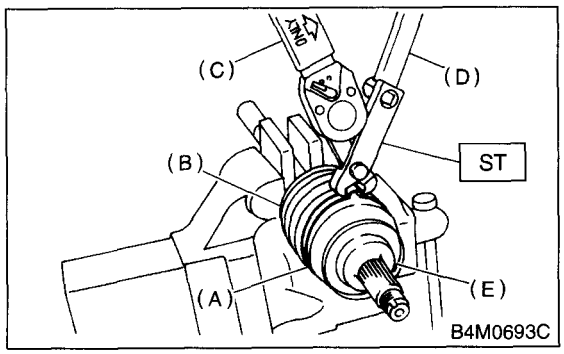
6) Set the large boot band in place.

7) Install the boot projecting portion to shaft groove.



(A) Boot
(B) Small boot band
(C) Shaft

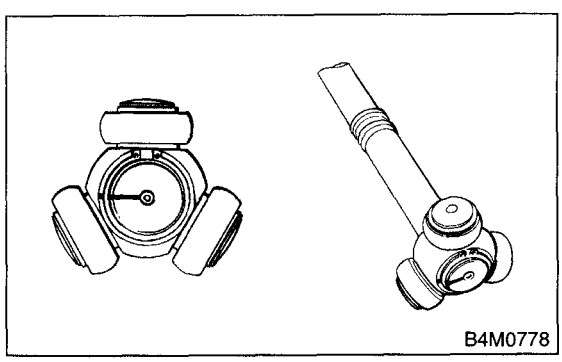
8) Tighten the boot bands using ST, torque wrench and socket flex handle.
ST 28099AC000 BOOT BAND PLIER



(A) Large boot band
(B) Boot
(C) Torque wrench
(D) Socket flex handle
(E) BJ

Tightening torque:
Large boot band
157 N·m (16.0 kgf-m, 116 ft-lb) or more
Small boot band
133 N·m (13.6 kgf-m, 98 ft-lb) or more

9) Place the SFJ boot at the center of shaft.
10) Align alignment marks and install the trunnion on the shaft.



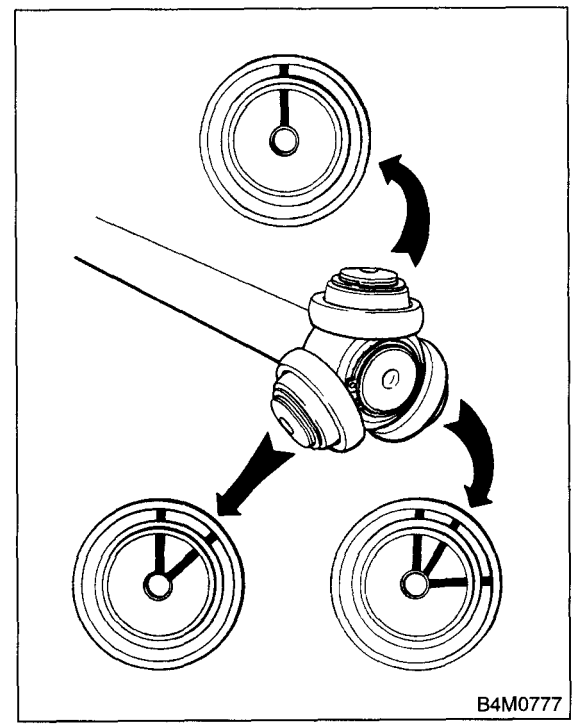
11) Install the snap ring to the shaft.

CAUTION:
Confirm that the snap ring is completely fitted in the shaft groove.

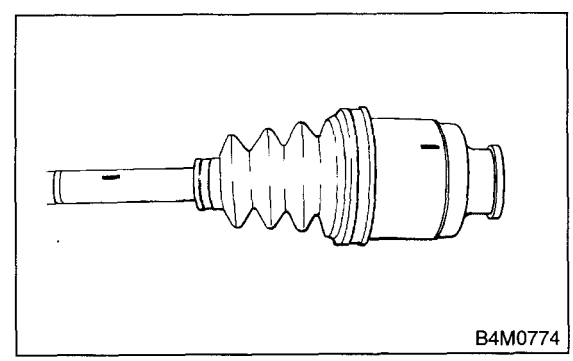
12) Fill 100 to 110 g (3.53 to 3.88 oz) of specified grease into the interior of SFJ outer race.
13) Apply a coat of specified grease to the free ring and trunnion.

14) Align alignment marks on free ring and trunnion and install the free ring.

CAUTION:
Be careful with the free ring position.



15) Align alignment marks on shaft and outer race, and install outer race.



16) Install the circlip in the groove on the SFJ outer race.

CAUTION:
Pull the shaft lightly and assure that the circlip is completely fitted in the groove.

17) 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.
18) Install the SFJ boot taking care not to twist it.

CAUTION:
- **The inside of the larger end of SFJ boot and the boot groove shall be cleaned so as to be free from grease and other substances.**
- **When installing SFJ boot, position outer race of SFJ at center of its travel.**

19) Put a band through the clip and wind twice in alignment with band groove of boot.

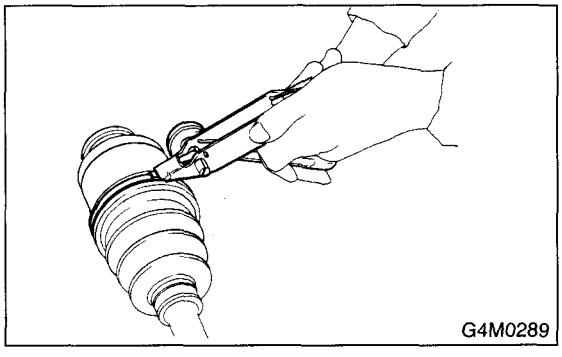
CAUTION:
Use a new band.

20) Pinch the end of band with pliers. Hold the clip and tighten securely.

NOTE:
When tightening boot, exercise care so that the air within the boot is appropriate.

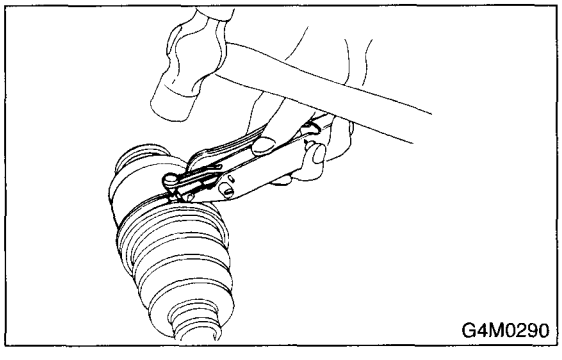
21) Tighten the band by using ST.
ST 925091000 BAND TIGHTENING TOOL

NOTE:
Tighten the band until it cannot be moved by hand.



22) Tap on the clip with the punch provided at the end of ST.
ST 925091000 BAND TIGHTENING TOOL

CAUTION:
Tap to an extent that the boot underneath is not damaged.



23) Cut off band with an allowance of about 10 mm (0.39 in) left from the clip and bend this allowance over the clip.

CAUTION:
Be careful so that the end of the band is in close contact with clip.

24) Fix up boot on the EBJ in the same manner.

NOTE:
Extend and retract the SFJ to provide equal grease coating.

E: INSPECTION

Check the removed parts for damage, wear, corrosion etc. If faulty, repair or replace.
1) SFJ (Shudder-less Freering tripod Joint)
Check seizure, corrosion, damage and excessive play.
2) Shaft
Check excessive bending, twisting, damage and wear.
3) EBJ (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.

6. Front Drive Shaft Boots

A: INSPECTION

Inspect the wear, warping, breakage or scratches for boot. If faulty, repair or replace.

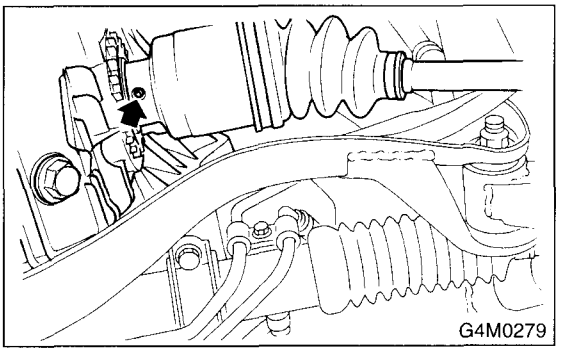
B: REPLACEMENT

1) Disconnect the ground terminal from battery.
2) Jack-up the vehicle, support it with safety stands (rigid racks), and remove the front wheel cap and wheels.

NOTE:
Do not remove the axle nut.

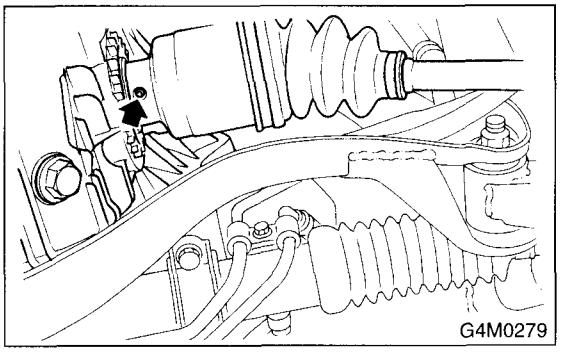
3) Remove the stabilizer link.
4) Disconnect the transverse link from the housing.
5) Remove the spring pin which secures transmission spindle to the SFJ.

CAUTION:
Use a new spring pin.



6) Remove the EBJ and SFJ boots from the drive shaft. <Ref. to DS-33, DISASSEMBLY, Front Drive Shaft.>
7) Install the EBJ and SFJ boots to the drive shaft. <Ref. to DS-35, ASSEMBLY, Front Drive Shaft.>
8) Install the SFJ on transmission spindle and drive spring pin into the place.

CAUTION:
Always use a new spring pin.



9) Connect the transverse link to the housing.
10) Install the stabilizer link.

7. Rear Drive Shaft

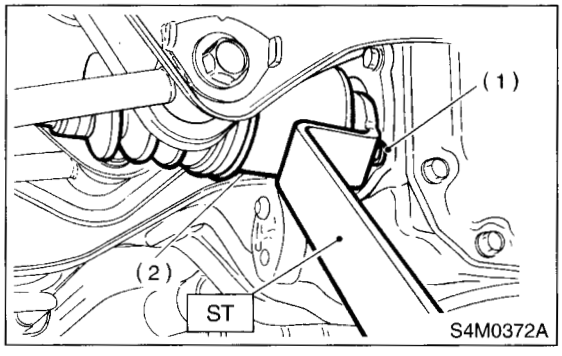
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and remove the rear wheel cap and wheels.

CAUTION:
Be sure to loosen and retighten axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.

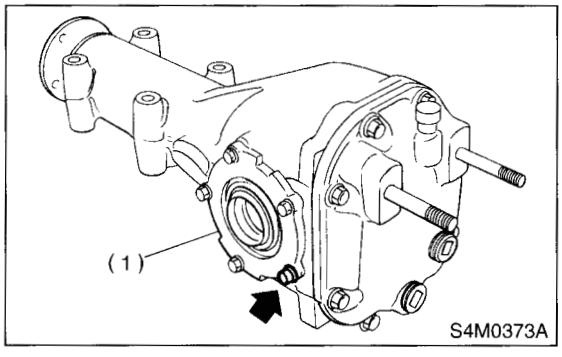
3) Unlock the axle nut.
4) Remove the DOJ from rear differential using ST.
ST 28099PA100 DRIVE SHAFT REMOVER

NOTE:
The side spline shaft circlip comes out together with the shaft.



(1) Bolt
(2) DOJ

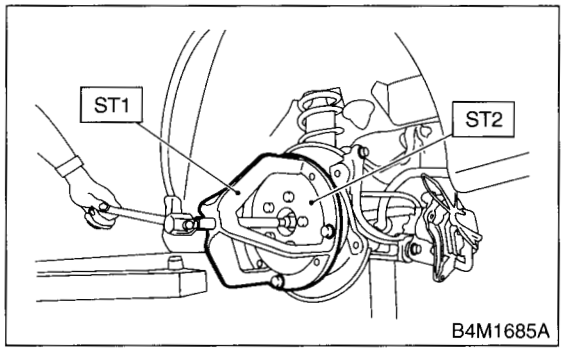
CAUTION:
Be careful not to damage the side bearing retainer. Always use bolt as shown in figure, as supporting point for ST during removal.
ST 28099PA100 DRIVE SHAFT REMOVER



(1) Side bearing retainer

5) Remove the axle nut and drive shaft. If it is hard to remove, use ST1 and ST2.
ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 AXLE SHAFT PULLER PLATE

CAUTION:
Be careful not to damage tone wheel when removing rear drive shaft.



B: INSTALLATION

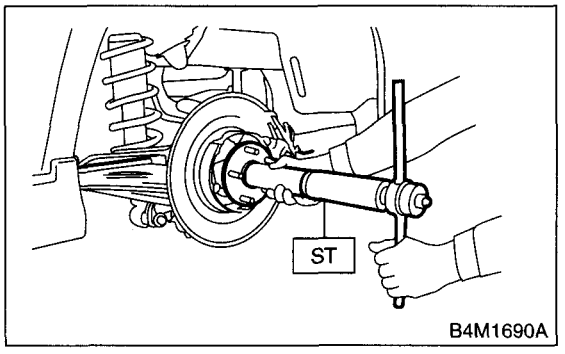
1) Insert the BJ or EBJ into the rear hub splines.

CAUTION:
Be careful not to damage tone wheel.

2) Using ST1 and ST2, pull the drive shaft into the place.

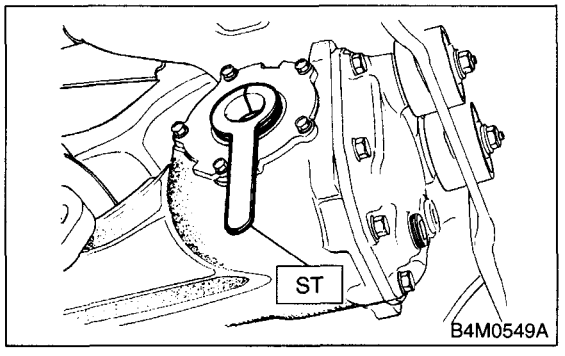
ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADAPTER

CAUTION:
Do not hammer drive shaft when installing it.



3) Tighten the axle nut temporarily.
4) Using ST, install the DOJ into differential.

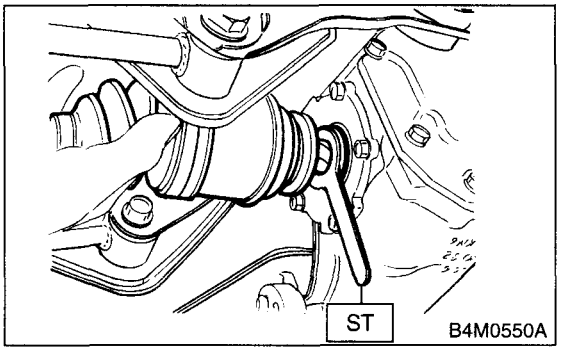
ST 28099PA090 SIDE OIL SEAL PROTECTOR



5) Insert the DOJ spline end into the bore of side oil seal, and remove ST.

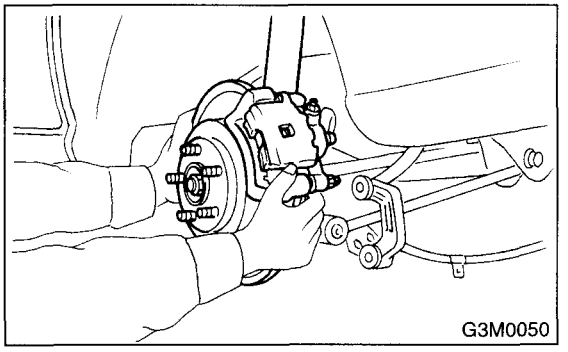
CAUTION:
Do not allow DOJ splines to damage side oil seal.

ST 28099PA090 SIDE OIL SEAL PROTECTOR



6) Align the DOJ and differential splines.
7) Push the housing to insert DOJ into the differential.

NOTE:
Make sure the DOJ is inserted properly.



CAUTION:
Discard old self-locking nut. Replace with a new one.

8) While depressing brake pedal, tighten the axle nut using a socket wrench.

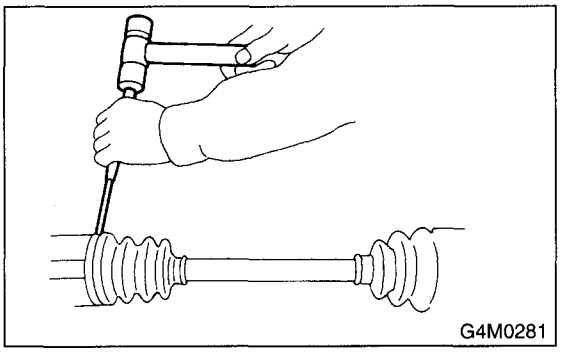
Tightening torque:
235 N·m (24 kgf-m, 174 ft-lb)

CAUTION:
- **Use a new axle nut for rear use only.**
- **Always tighten axle nut before installing wheel on vehicle. If wheel is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.**
- **Be sure to tighten axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.**

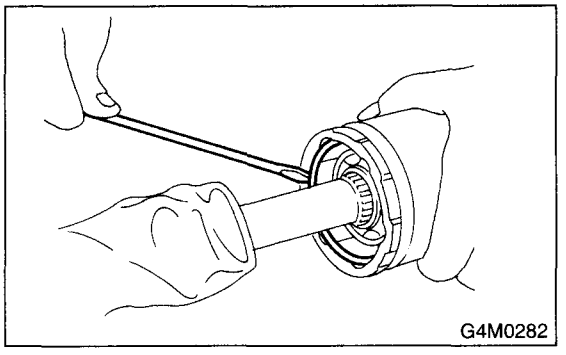
9) After tightening axle nut, lock it securely.

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.


G4M0281

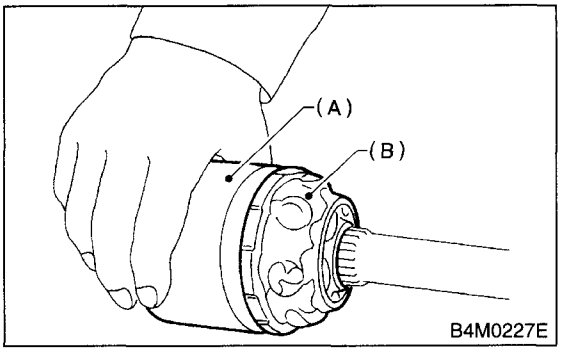
3) Remove the boot band on the small end of DOJ boot in the same manner.
4) Remove the larger end of DOJ boot from DOJ outer race.
5) Pry and remove the round circlip located at the neck of DOJ outer race with a screwdriver.


G4M0282

6) Take out the DOJ outer race from shaft assembly.
7) Wipe off the grease and take out balls.

CAUTION:
The grease is a special grease (grease for constant velocity joint). Do not confuse with other greases.

NOTE:
Disassemble exercising care not to lose balls (6 pcs).



B4M0227E

(A) Outer race
(B) Grease

8) To remove the cage from the inner race, turn the cage by a half pitch to the track groove of the inner race and shift the cage.
9) Remove 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.

CAUTION:
Be sure to wrap shaft splines with vinyl tape to prevent boot from scratches.

12) Remove the BJ or EBJ boot in the same procedure as DOJ boot.
13) Thus, disassembly of axle is completed, but BJ or EBJ is unable to be disassembled.

D: ASSEMBLY

CAUTION:
Use specified grease.

BJ side (Non-turbo model):
Molylex No. 2 (Part No. 723223010)

EBJ side (Turbo model):
NTG 2218 (Part No. 28093AA000)

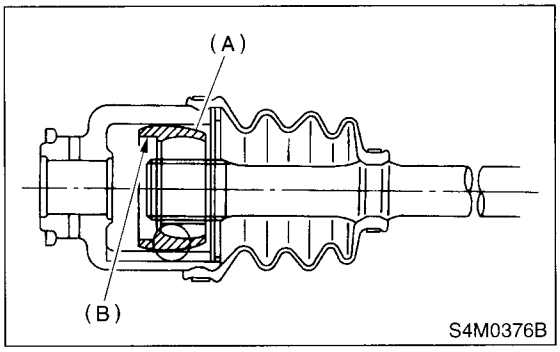
DOJ side:
VU-3A702 (Yellow) (Part No. 23223GA050)

1) Install the BJ or EBJ 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.

CAUTION:
Be sure to wrap shaft splines with vinyl tape to prevent boot from scratches.

3) Insert the DOJ cage onto shaft.

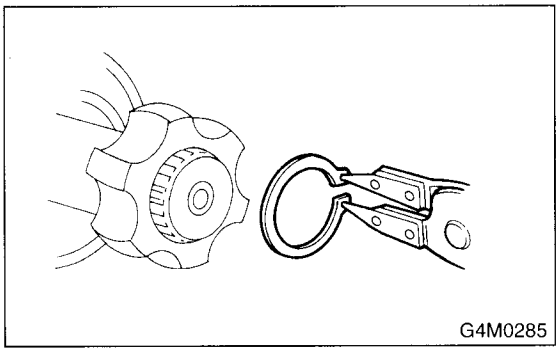
NOTE:
Insert the cage with the cut-out portion facing the shaft end, since the cage has an orientation.



(A) Cage
(B) Cut-out portion

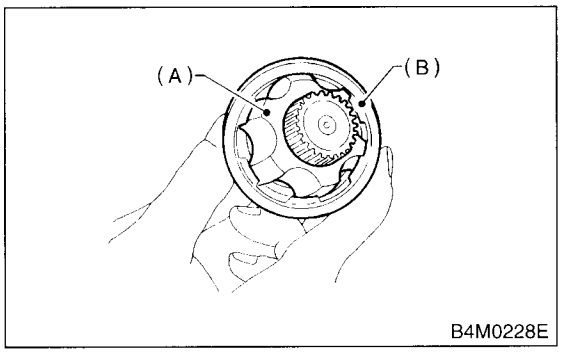
4) Install the DOJ inner race on shaft and fit snap ring with pliers.

NOTE:
Confirm that the snap ring is completely fitted in the shaft groove.



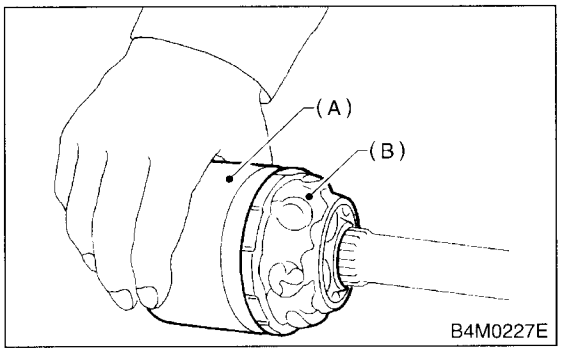
5) Install the cage, which was previously fitted, to inner race fixed upon shaft.

NOTE:
Fit the cage with the protruded part aligned with the track on the inner race and then turn by a half pitch.



(A) Inner race
(B) Cage

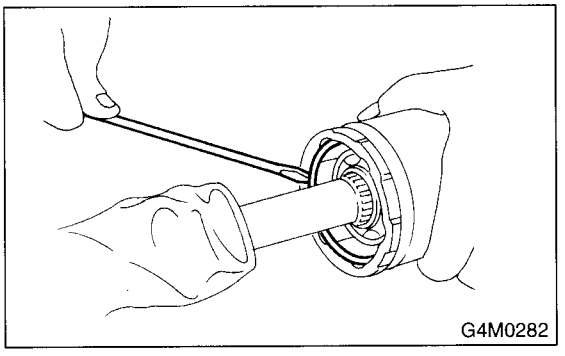
6) Fill 80 to 90 g (2.82 to 3.17 oz) of specified grease into the interior of DOJ outer race.
7) Apply a coat of specified grease to the cage pocket and six balls.
8) Insert six balls into the cage pocket.
9) Align the outer race track and ball positions and place in the part where shaft, inner race, cage and balls are previously installed, and then fit outer race.



(A) Outer race
(B) Grease

10) Install the circlip in the groove on the 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.


G4M0282

11) 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.
12) Install the DOJ boot taking care not to twist it.

NOTE:
• The inside of the larger end of DOJ boot and the boot groove shall be cleaned so as to be free from grease and other substances.
• When installing DOJ boot, position outer race of DOJ at center of its travel.

13) Put a band through the clip and wind twice in alignment with band groove of boot.

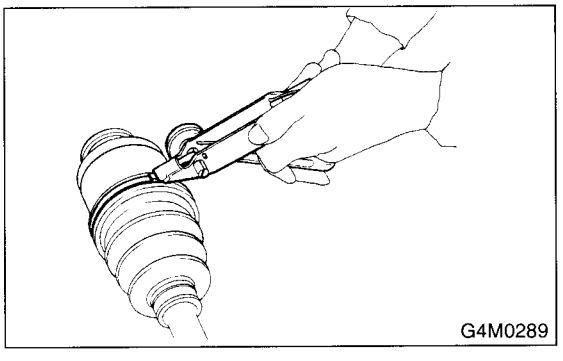
CAUTION:
Use a new band.

14) Pinch the end of band with pliers. Hold the clip and tighten securely.

NOTE:
When tightening boot, exercise care so that the air within the boot is appropriate.

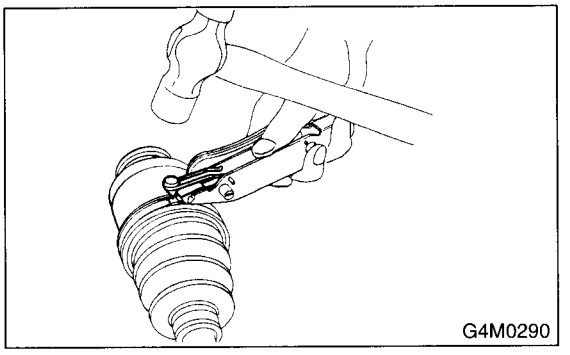
15) Tighten the band by using ST.
ST 925091000 BAND TIGHTENING TOOL

NOTE:
Tighten the band until it cannot be moved by hand.


G4M0289

16) Tap on the clip with the punch provided at the end of ST.
ST 925091000 BAND TIGHTENING TOOL

CAUTION:
Tap to an extent that the boot underneath is not damaged.


G4M0290

17) 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.

CAUTION:
Be careful so that the end of the band is in close contact with clip.

18) Fix up the boot on the BJ or EBJ in the same manner.

NOTE:
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) and EBJ (Eightball 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.

8. Rear Drive Shaft Boots

A: INSPECTION

Inspect the wear, warping, breakage or scratches for boot. If faulty, repair or replace.

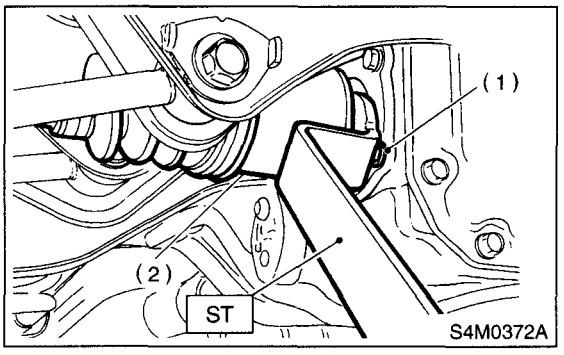
B: REPLACEMENT

1) Disconnect the ground terminal from battery.
2) Lift-up the vehicle, and remove the rear wheel cap and wheels.

NOTE:
Axle nut need not be removed.

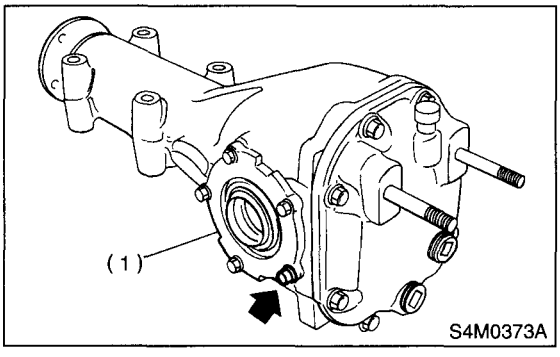
3) Remove the ABS sensor clamps and parking brake cable bracket.
4) Disconnect the stabilizer link from the lateral link.
5) Remove the bolts which secure lateral link assembly to the rear housing.
6) Remove the bolts which secure trailing link assembly to the rear housing.
7) Remove the DOJ from rear differential using ST.
ST 28099PA100 DRIVE SHAFT REMOVER

NOTE:
The side spline shaft circlip comes out together with the shaft.



(1) Bolt
(2) DOJ

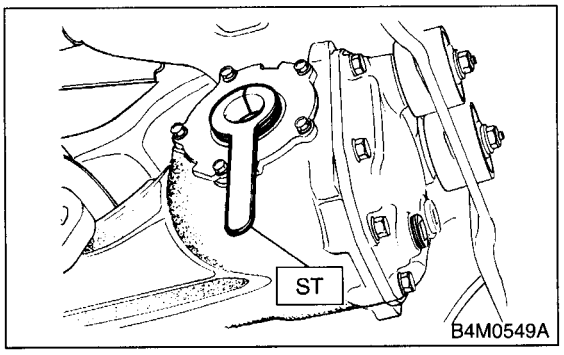
CAUTION:
Be careful not to damage the side bearing retainer. Always use bolt as shown in figure, as supporting point for ST during removal.
ST 28099PA100 DRIVE SHAFT REMOVER



(1) Side bearing retainer

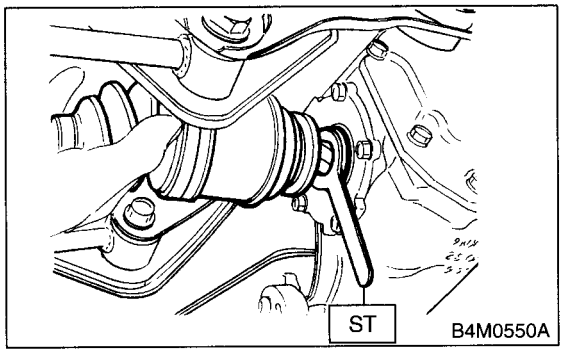
8) Remove the DOJ and BJ or EBJ boots from the drive shaft. <Ref. to DS-41, DISASSEMBLY, Rear Drive Shaft.>
9) Install the DOJ and BJ or EBJ boots to the drive shaft. <Ref. to DS-42, ASSEMBLY, Rear Drive Shaft.>

10) Using ST, install the DOJ into differential.
ST 28099PA090 SIDE OIL SEAL PROTECTOR



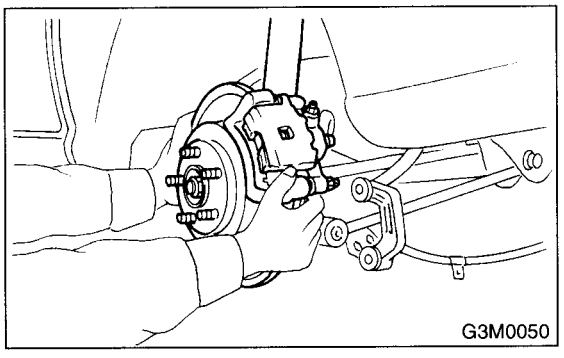
11) Insert the DOJ spline end into the bore of side oil seal, and remove ST.

CAUTION:
Do not allow DOJ splines to damage side oil seal.
ST 28099PA090 SIDE OIL SEAL PROTECTOR



12) Align the DOJ and differential splines.
13) Push the housing to insert DOJ into the differential.

NOTE:
Make sure the DOJ is inserted properly.



CAUTION:
Discard old self-locking nut. Replace with a new one.

14) Connect the rear housing assembly to the trailing link assembly, and tighten the self-locking nut.
15) Connect the rear housing assembly to the lateral link assembly, and tighten the self-locking nut.
16) Connect the stabilizer link to the lateral link.
17) Install the ABS sensor clamps and parking brake cable bracket.

9. 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.
3. Front wheel shimmy	(1) Worn or damaged hub bearing	Repair or replace.
4. Wander or pulling	(1) Worn or damaged hub bearing	Repair or replace.

ABS

		Page
1.	General Description	2
2.	ABS Control Module and Hydraulic Control Unit (ABSCM&H/U)	7
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4.	Front ABS Sensor	14
5.	Rear ABS Sensor	18
6.	Front Tone Wheel	21
7.	Rear Tone Wheel	22
8.	G Sensor	23

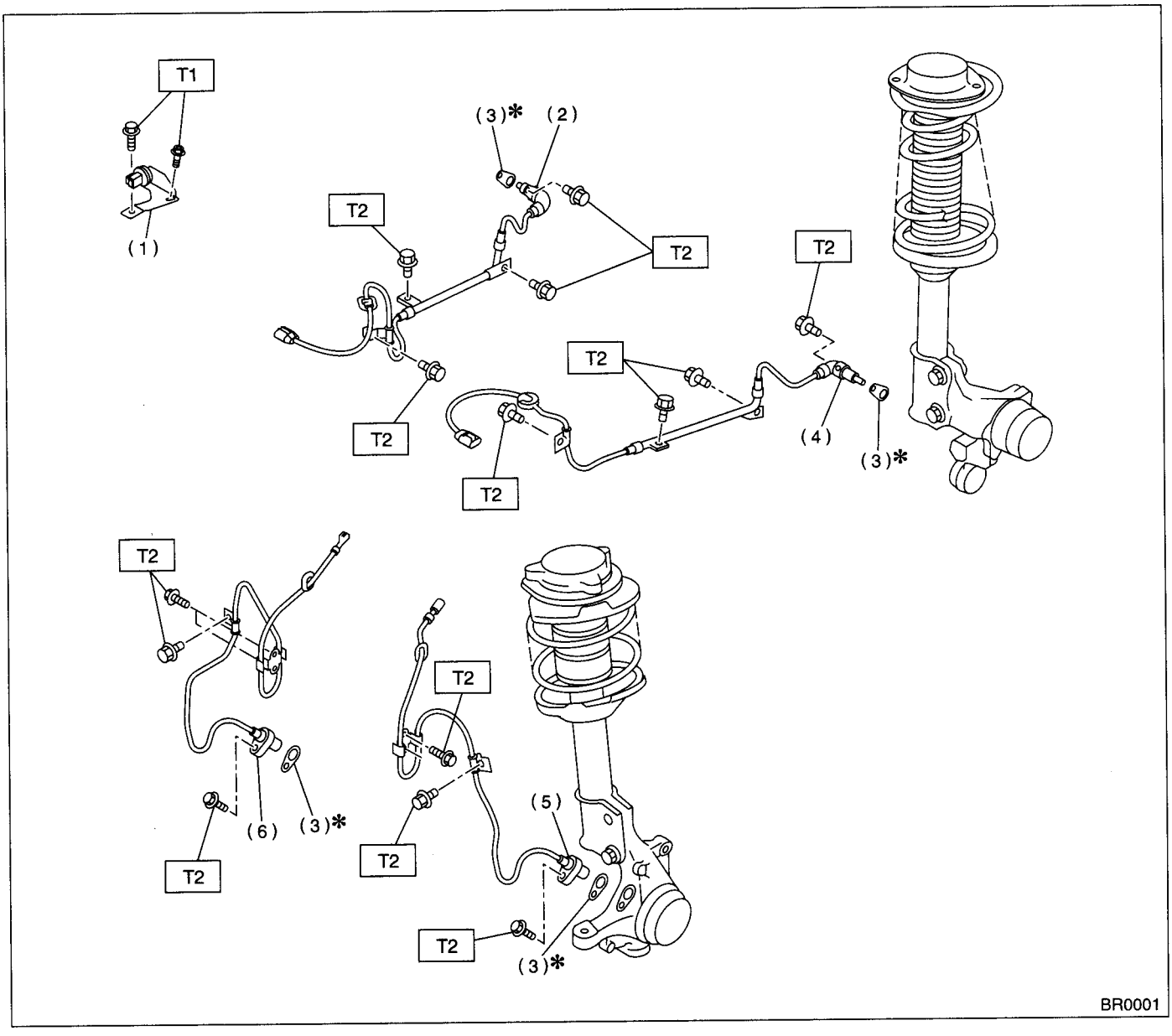
1. General Description

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	1.0±0.2 kΩ
	Marks of the harness	Front	RH	White
			LH	Yellow
		Rear	RH	Light blue
			LH	Brown
G sensor	G sensor voltage			2.3±0.2 V
ABS control module and hydraulic control unit (ABSCM&H/U) marks			AT	CC
			MT	CD

B: COMPONENT

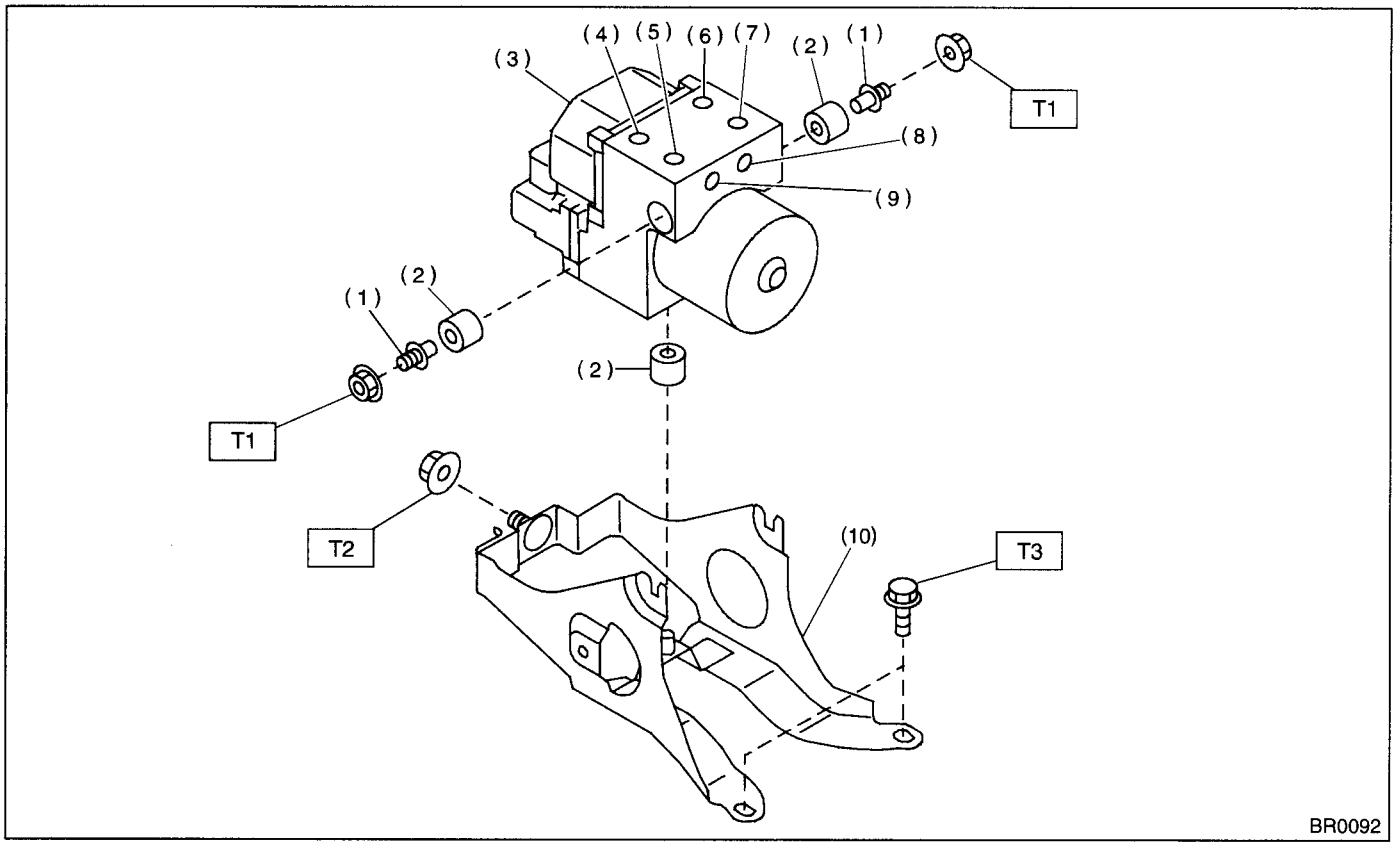
1. SENSOR



(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: 7.4 (0.75, 5.4)
T2: 32 (3.3, 24)

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

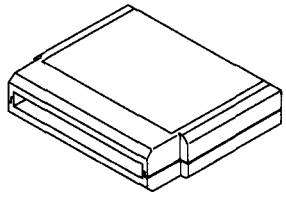
Tightening torque: N·m (kgf-m, ft-lb)
T1: 18 (1.8, 13.0)
T2: 29 (3.0, 21.7)
T3: 32 (3.3, 24)

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 negative terminal from battery.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3876	24082AA150 (New apopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
B2M3877	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
Circuit tester	Used for measuring resistance, voltage and ampere.
Pressure gauge	Used for measuring oil pressure.
Oscilloscope	Used for measuring sensor.

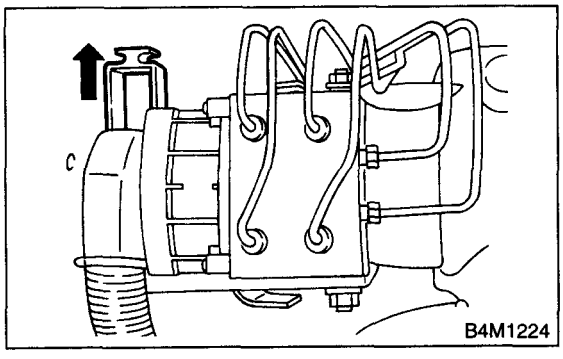
2. ABS Control Module and Hydraulic Control Unit (ABSCM&H/U)

A: REMOVAL

1) Disconnect the ground terminal 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.

CAUTION:
The contact will be insufficient if the terminal gets wet.

4) Pull off the lock of the ABSCM&H/U connector to remove it.



5) Disconnect the connector from ABSCM&H/U.

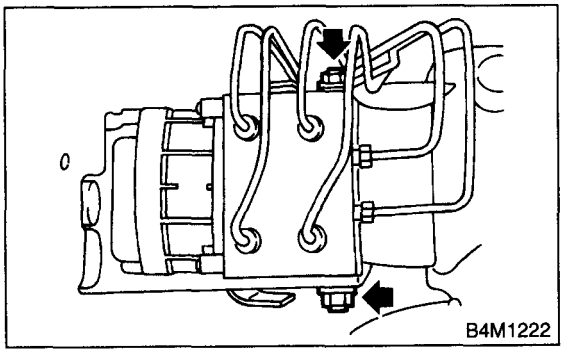
CAUTION:
Be careful not to let water or other foreign matter contact the ABSCM&H/U terminal.

6) Unlock the cable clip.
7) Disconnect the brake pipes from ABSCM&H/U.

CAUTION:
Wrap the brake pipes with vinyl bag to avoid spilling brake fluid on vehicle body.

8) Remove the ABSCM&H/U from engine compartment.

CAUTION:
- **ABSCM&H/U cannot be disassembled. Do not attempt to loosen the 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 the ABSCM&H/U.**
- **Apply a coat of rust-preventive wax (Nippeco LT or GB) to bracket attaching bolt after tightening.**
- **Do not pull the harness when disconnecting connector.**



B: INSTALLATION

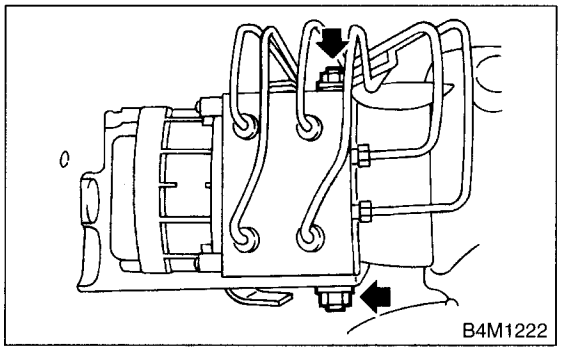
1) Install the ABSCM&H/U bracket.

Tightening torque:
32 N·m (3.3 kgf-m, 24 ft-lb)

2) Install the ABSCM&H/U.

CAUTION:
Confirm that the specifications of the ABSCM&H/U conforms to the vehicle specifications.

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



3) Connect the brake pipes to their correct ABSCM&H/U connections.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

4) Using cable clip, secure the ABSCM&H/U harness to bracket.
5) Connect the connector to the ABSCM&H/U.

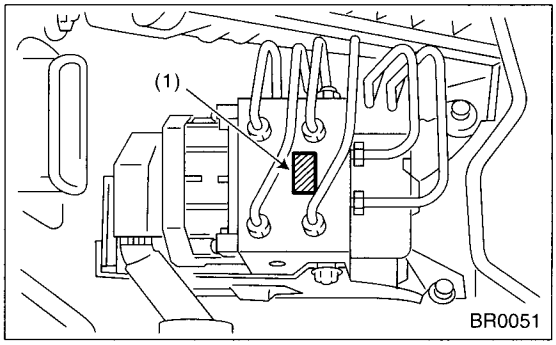
CAUTION:
• Be sure to remove all foreign matter from inside the connector before connecting.
• Ensure that the ABSCM&H/U connector is securely locked.

6) Install the air intake duct.
Non-turbo model:
<Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.>
Turbo model:
<Ref. to IN(DOHC TURBO)-8, INSTALLATION, Air Intake Duct.>
7) Bleed air from the brake system. <Ref. to BR-46, Air Bleeding.>

C: INSPECTION

1) Check the connected and fixed condition of connector.
2) Check the specifications of the mark with ABSCM&H/U.

Mark	Model
CC	AT
CD	MT



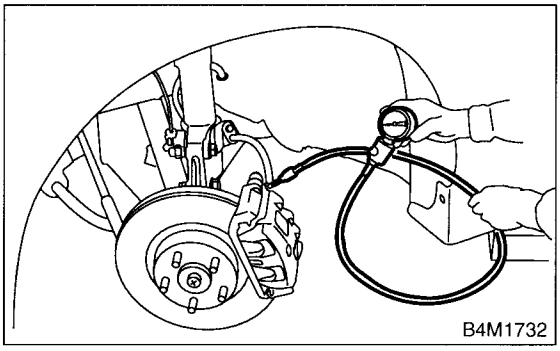
(1) Mark

1. CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE

1) Lift-up the vehicle and remove 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 the pressure gauge previously used for transmission since the piston seal is expanded and may lead to malfunction of the brake.

NOTE:
Wrap a sealing tape around the pressure gauge.



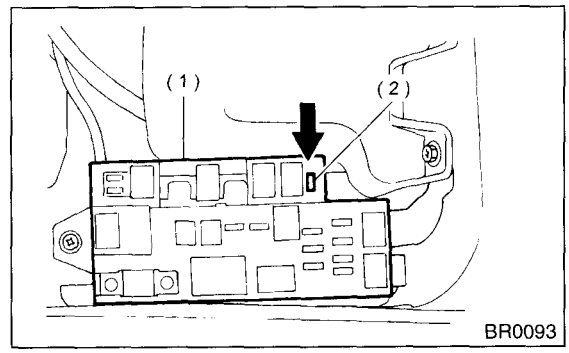
4) Bleed air from the pressure gauges.
5) Perform the ABS sequence control.
<Ref. to ABS-11, ABS Sequence Control.>
6) When the hydraulic unit begins to work, and first the FL side performs decompression, holding, and compression, and then the FR side performs decompression, holding, and compression.
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	3,432 kPa (35 kgf/cm^2, 498 psi)	3,432 kPa (35 kgf/cm^2, 498 psi)
When decompressed	490 kPa (5 kgf/cm^2, 71 psi) or less	490 kPa (5 kgf/cm^2, 71 psi) or less
When compressed	3,432 kPa (35 kgf/cm^2, 498 psi) or more	3,432 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 the 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.

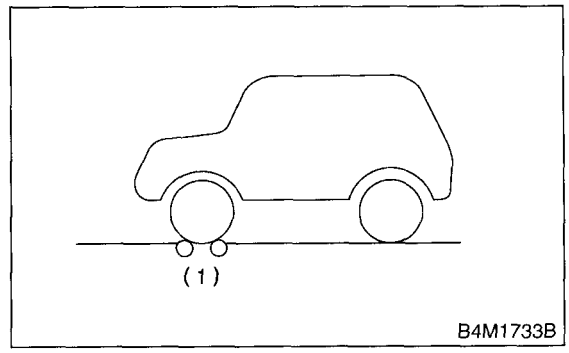
2. CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER

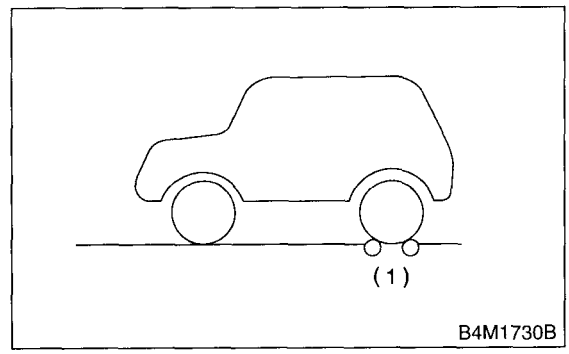
1) In the case of AWD AT Non-turbo vehicles, install a spare fuse with the FWD connector in the main fuse box to simulate FWD vehicles.



(1) Main fuse box
(2) FWD connector

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 "neutral".





(1) Brake tester

4) Operate the brake tester.
5) Perform 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 the 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	981 N (100 kgf, 221 lb)	981 N (100 kgf, 221 lb)
When decompressed	490 N (50 kgf, 110 lb) or less	490 N (50 kgf, 110 lb) or less
When compressed	981 N (100 kgf, 221 lb) or more	981 N (100 kgf, 221 lb) or more

8) After checking, also check if any irregular brake pedal tightness is felt.

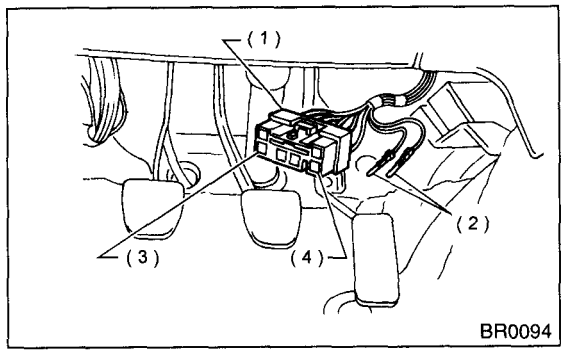
3. ABS Sequence Control

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 select monitor.

1. ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR

1) Connect the diagnosis terminals to terminals No. 3 and No. 6 of the diagnosis connector beside driver's seat heater unit.



(1) Diagnosis connector
(2) Diagnosis terminals
(3) 3 terminal
(4) 6 terminal

2) Set the speed of all wheels at 4 km/h (2 MPH) or less.
3) Turn the ignition switch OFF.
4) Within 0.5 seconds after the ABS warning light goes out, depress the brake pedal and hold it immediately after the ignition switch is turned to ON.

CAUTION:
Do not depress the clutch pedal.

NOTE:
• When the ignition switch is set to on, the brake pedal must not be depressed.
• Engine must not operate.

5) After completion of ABS sequence control, turn the ignition switch OFF.

2. ABS SEQUENCE CONTROL WITH 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.

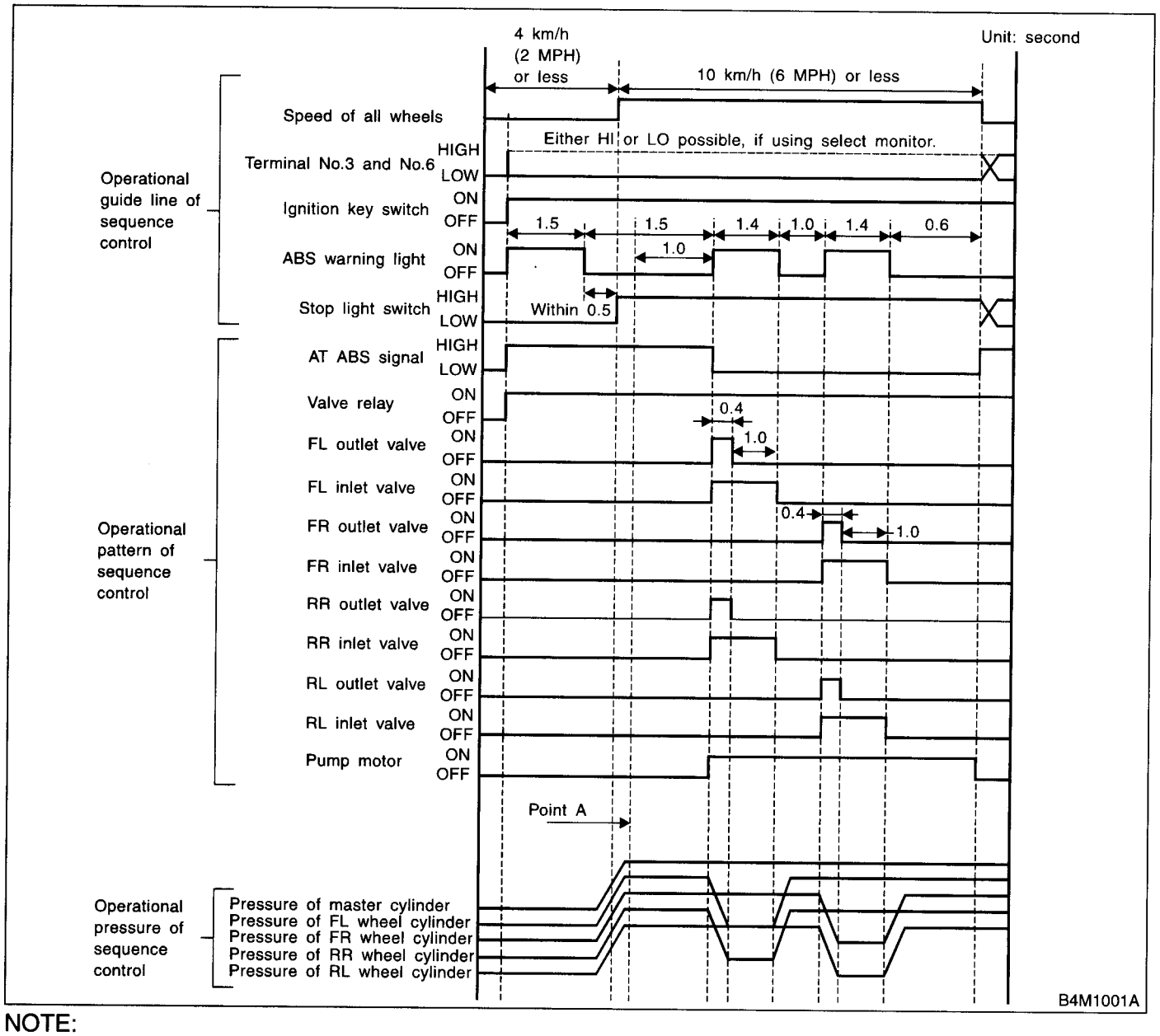
1) Connect the select monitor to data link connector under the driver's seat instrument panel lower cover.
2) Turn the ignition switch ON.
3) Turn the select monitor switch ON.
4) Put the select monitor to "BRAKE CONTROL" mode.
5) When "Function check sequence" is selected, 'ABS sequence control' will start.
6) The message 'Press Brake Pedal Firmly' is displayed as follows:
(1) When using the brake tester, depress the brake pedal with braking force of 981 N (100 kgf, 221 lb).
(2) When using the pressure gauge, depress the brake pedal so as to make the pressure gauge indicate 3,432 kPa (35 kg/cm^2, 498 psi).

CAUTION:
Do not depress the clutch pedal.

7) When the message "Press YES" is displayed, press the YES key.
8) Operation points will be displayed on the select monitor.

ABS SEQUENCE CONTROL

3. CONDITIONS FOR ABS SEQUENCE CONTROL



NOTE:

- When the 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.
- HIGH means high voltage.
- LOW means low voltage.

4. CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL

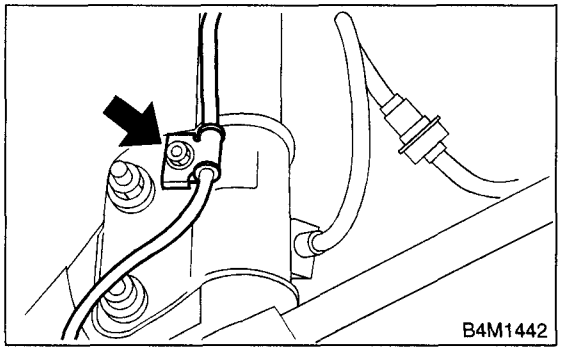
When the following conditions develop, the ABS sequence control stops and ABS operation is returned to the normal control mode.

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 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 the ignition key is turned to ON, and before ABS warning light goes out. (When the select monitor is not used.)
5) When the brake pedal is not depressed after the ignition key is turned to ON, and within 0.5 seconds after ABS warning light goes out. (When the select monitor is not used.)
6) After completion of the sequence control.
7) When malfunction is detected. (When the select monitor is used.)

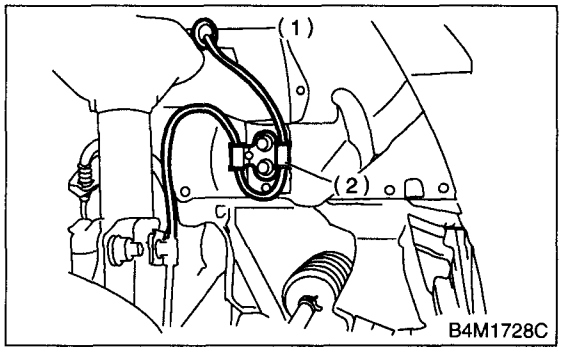
4. Front ABS Sensor

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Jack-up the vehicle, support it with rigid racks, and remove the wheel.
3) Disconnect the front ABS sensor connector located next to the front strut mounting house in engine compartment.
4) Remove the bolts which secure sensor harness to strut.



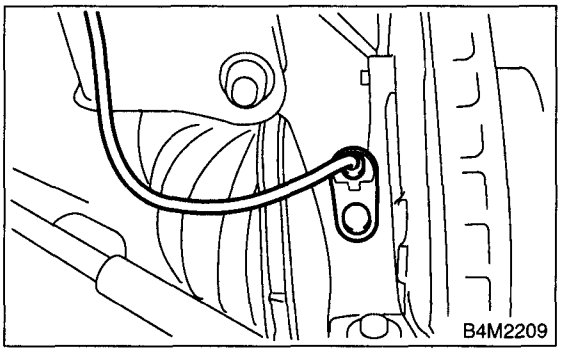
5) Remove the bolts which secure sensor harness to body.



(1) To front ABS sensor connector
(2) Bracket

6) Remove the bolts which secure front ABS sensor to housing, and remove the front ABS sensor.

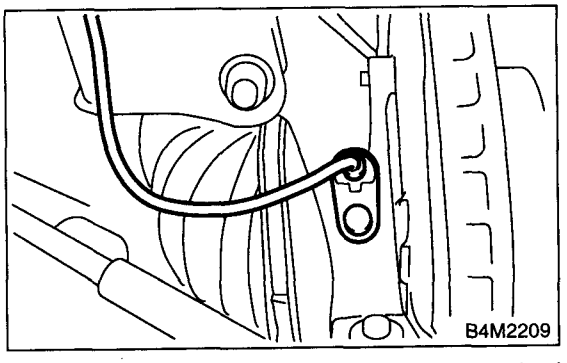
CAUTION:
- **Be careful not to damage the pole piece located at tip of the sensor and teeth faces during removal.**
- **Do not pull the sensor harness during removal.**



B: INSTALLATION

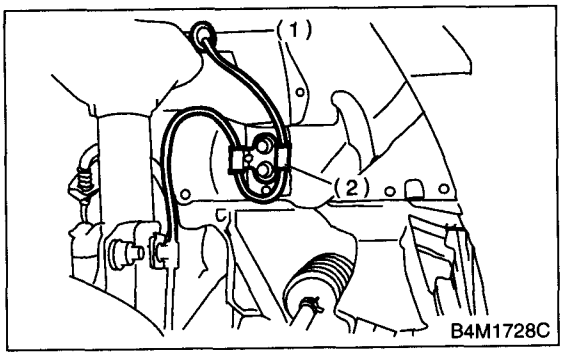
1) Temporarily install the front ABS sensor on housing.

CAUTION:
Be careful not to strike the ABS sensor's pole piece and tone wheel's teeth against adjacent metal parts during installation.



2) Install the front ABS sensor on strut and wheel apron bracket.

Tightening torque:
32 N·m (3.3 kgf-m, 24 ft-lb)

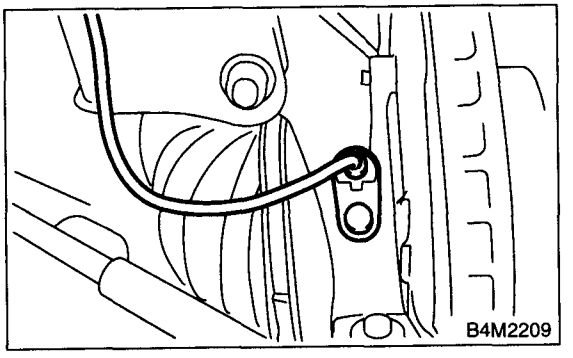


(1) To front ABS sensor connector
(2) Bracket

3) Place a thickness gauge between the ABS sensor's and tone wheel's tooth face. After standard clearance is obtained over the entire perimeter, tighten the ABS sensor on housing to specified torque.

ABS sensor standard clearance:
0.3 — 0.8 mm (0.012 — 0.031 in)

Tightening torque:
32 N·m (3.3 kgf-m, 24 ft-lb)



CAUTION:
Check the marks on the harness to make sure that no distortion exists.
RH: White
LH: Yellow

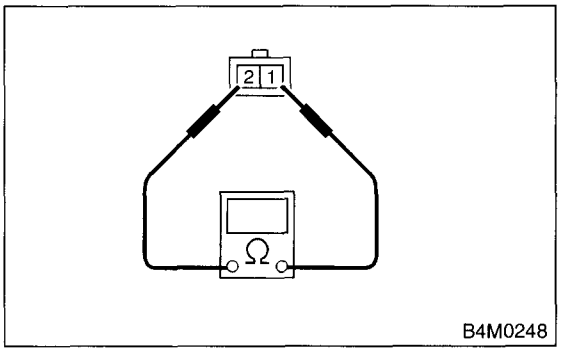
NOTE:
If the clearance is outside specifications, readjust.

4) After confirmation of the ABS sensor clearance, connect the connector to ABS sensor.
5) Install the wheel.
6) Connect the battery ground terminal to battery.

C: INSPECTION

1. ABS SENSOR

1) Check the pole piece of the ABS sensor for foreign particles or damage. If necessary, clean the pole piece or replace the ABS sensor.
2) Measure the ABS sensor resistance.



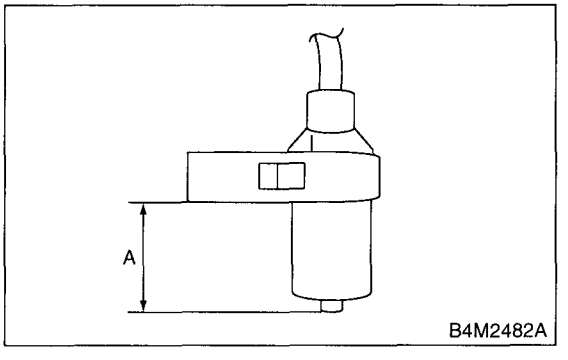
Terminal No.	Standard
1 and 2	1.25±0.25 kΩ

CAUTION:
If resistance is outside the standard value, replace the ABS sensor with a new one.

NOTE:
Check the ABS sensor cable for discontinuity. If necessary, replace with a new one.

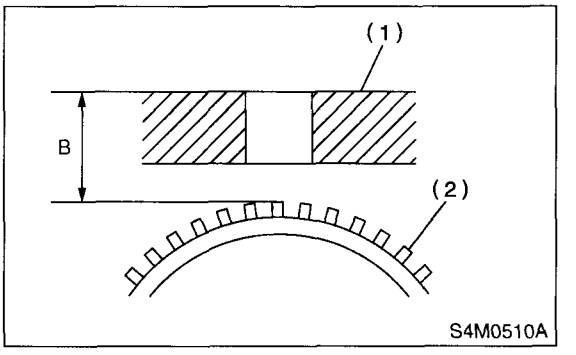
2. SENSOR GAP

1) Measure the distance "A" between ABS sensor surface and sensor pole face.



2) Measure the distance "B" between the surface where 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

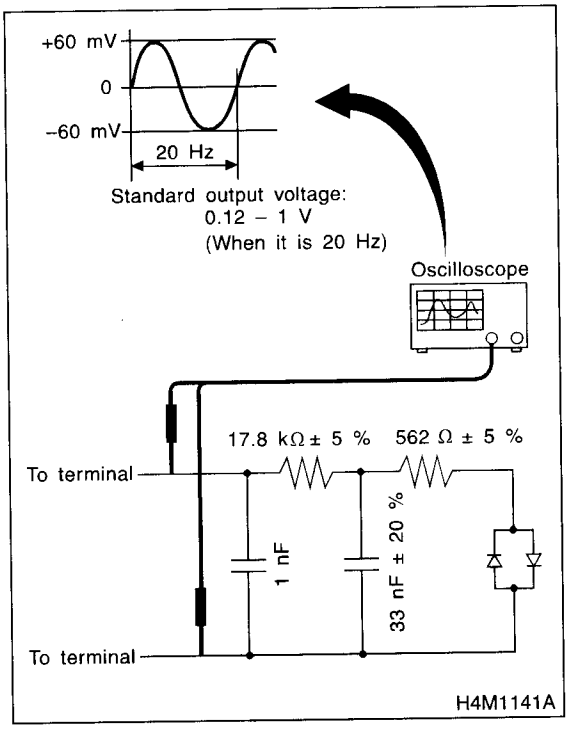
ABS sensor standard clearance:
0.3 — 0.8 mm (0.012 — 0.031 in)

NOTE:
If the clearance is outside specifications, readjust.

3. OUTPUT VOLTAGE

Output voltage can be checked by the following method. Install a resistor and condenser, then rotate the wheel about 2.75 km/h (2 MPH) or equivalent.

NOTE:
Regarding terminal No., please refer to item 1. ABS SENSOR.



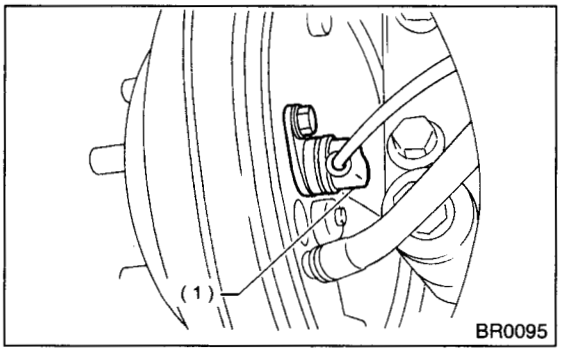
D: ADJUSTMENT

Adjust the gap using spacer (Part No. 26755A000).

5. Rear ABS Sensor

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Jack-up the vehicle, support it with rigid racks, and remove the wheel.
3) Remove the rear seat and disconnect the rear ABS sensor connector.
4) Remove the rear sensor harness bracket from rear trailing link and bracket.
5) Remove the rear ABS sensor from back plate.

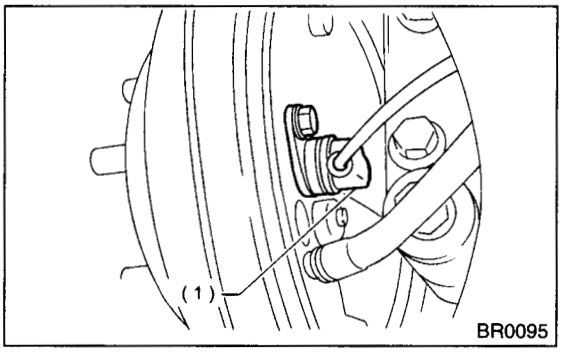


(1) Rear ABS sensor

B: INSTALLATION

1) Temporarily install the rear ABS sensor on back plate.

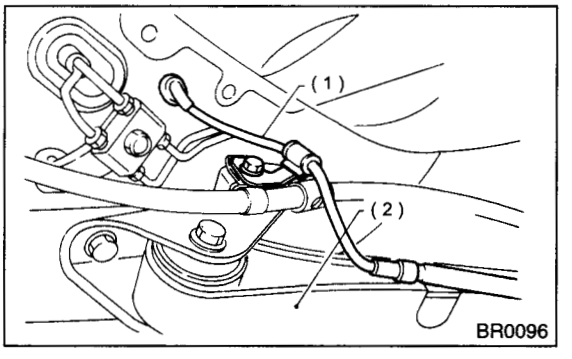
CAUTION:
Be careful not to strike the ABS sensor's pole piece and tone wheel's teeth against adjacent metal parts during installation.



(1) Rear ABS sensor

2) Install the rear sensor harness on rear trailing link.

Tightening torque:
32 N·m (3.3 kgf-m, 24 ft-lb)



(1) Rear sensor harness
(2) Trailing link

3) Place a thickness gauge between the ABS sensor's and tone wheel's tooth face. After standard clearance is obtained over the entire perimeter, tighten the ABS sensor on rear arm to specified torque.

ABS sensor standard clearance:
0.7 — 1.2 mm (0.028 — 0.047 in)

Tightening torque:
32 N·m (3.3 kgf-m, 24 ft-lb)

CAUTION:
Check the marks on the harness to make sure that no distortion exists.
RH: White
LH: Yellow

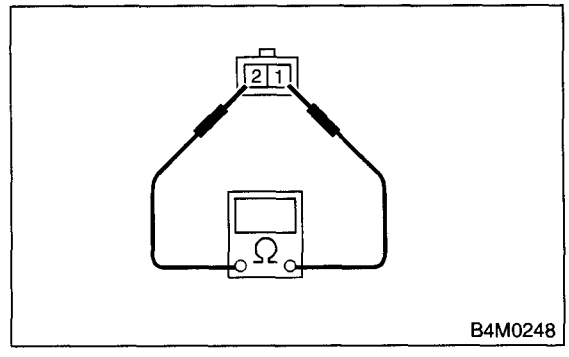
NOTE:
If the clearance is outside specifications, readjust.

4) After confirmation of the ABS sensor clearance, connect the connector to ABS sensor.
5) Connect the battery ground terminal to battery.

C: INSPECTION

1. ABS SENSOR

1) Check the pole piece of the ABS sensor for foreign particles or damage. If necessary, clean the pole piece or replace the ABS sensor.
2) Measure the ABS sensor resistance.



Terminal No.	Standard
1 and 2	1.0±0.2 kΩ

CAUTION:
• If resistance is outside the standard value, replace the ABS sensor with a new one.
• Check the marks on the harness to make sure that no distortion exists.
RH: Light blue
LH: Brown

NOTE:
Check the ABS sensor cable for discontinuity. If necessary, replace with a new one.

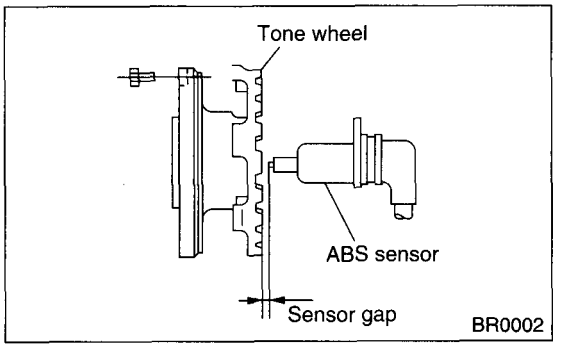
2. SENSOR GAP

Clearances (sensor gaps) should be measured one by one to ensure the tone wheel and speed sensor are installed correctly.

NOTE:

- If clearance is narrow, adjust by using the 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 the specification.

ABS sensor clearance:
0.7 — 1.2 mm (0.028 — 0.047 in)

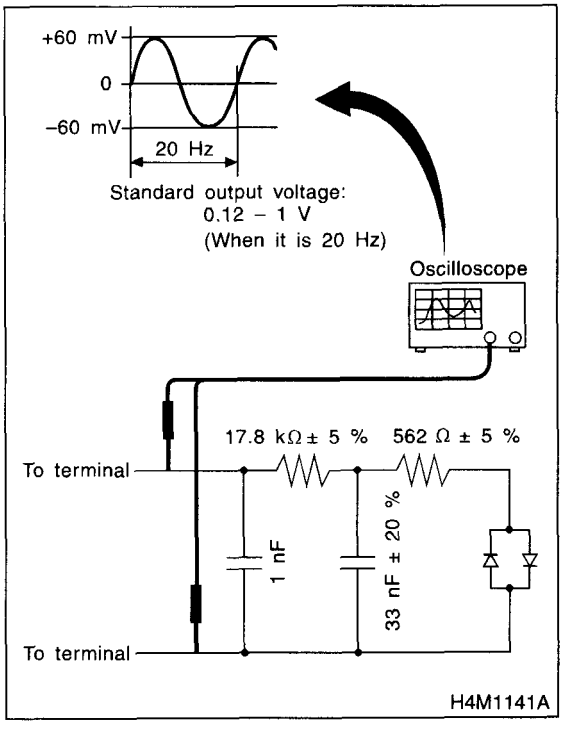


3. OUTPUT VOLTAGE

Output voltage can be checked by the following method. Install a resistor and condenser, then rotate the wheel about 2.75 km/h (2 MPH) or equivalent.

NOTE:

Regarding terminal No., please refer to item 1. ABS SENSOR.



D: ADJUSTMENT

Adjust the gap using spacer (Part No. 26755AA000).

6. Front Tone Wheel

A: REMOVAL

Refer to Front Drive Shaft, because the front tone wheel is integrated with front drive shaft.
<Ref. to DS-32, REMOVAL, Front Drive Shaft.>

B: INSTALLATION

Refer to Front Drive Shaft, because the front tone wheel is integrated with front drive shaft.
<Ref. to DS-32, INSTALLATION, Front Drive Shaft.>

C: INSPECTION

Visually check the tone wheels 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 is any defect found on the tone wheel, since it is unitized with the BJ assembly of drive shaft.

7. Rear Tone Wheel

A: REMOVAL

Refer to Rear Drive Shaft, because the rear tone wheel is integrated with hub.
<Ref. to DS-23, REMOVAL, Rear Axle.>

B: INSTALLATION

Refer to Rear Drive Shaft, because the rear tone wheel is integrated with hub.
<Ref. to DS-26, INSTALLATION, Rear Axle.>

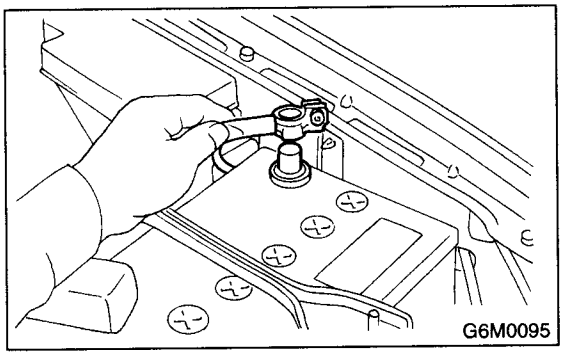
C: INSPECTION

Visually check the tone wheels teeth (44 pieces) for cracks or dents. If necessary, replace the tone wheel with a new one.

8. G Sensor

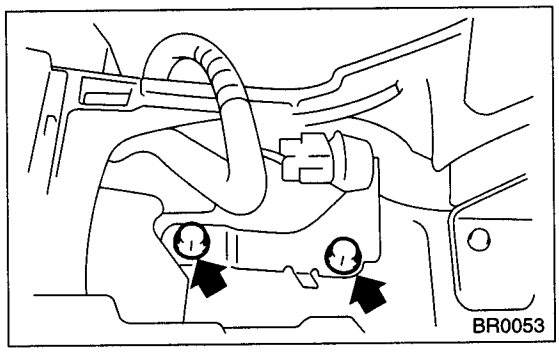
A: REMOVAL

1) Disconnect the ground terminal from battery.



2) Remove the console cover.
<Ref. to EI-41, 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.



B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
Do not drop or bump the G sensor.

Tightening torque (G sensor):
32 N·m (3.3 kgf-m, 24 ft-lb)

C: INSPECTION

	Step	Check	Yes	No
1	**CHECK SUBARU SELECT MONITOR.**	Do you have the 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 2.3±0.2 V when G sensor is horizontal?	Go to step **3.**	Replace G sensor.
3	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal:*** ***(B292) No. 2 (+) — No. 3 (–)***	Is the voltage 3.9±0.2 V when G sensor is inclined forwards to 90°?	Go to step **4.**	Replace G sensor.
4	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal:*** ***(B292) No. 2 (+) — No. 3 (–)***	Is the voltage 0.7±0.2 V when G sensor is inclined backwards to 90°?	G sensor is normal.	Replace G sensor.
5	**CHECK G SENSOR.** 1)Turn the ignition switch to OFF. 2)Connect the select monitor connector to data link connector. 3)Turn the 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 2.3±0.2 V when the vehicle is in horizontal position?	Go to step **6.**	Replace G sensor.
6	**CHECK G SENSOR.** 1)Remove the console box. 2)Remove the G sensor from vehicle. (Do not disconnect connector.) 3)Read the select monitor display.	Is the indicated reading 3.9±0.2 V when G sensor is inclined forwards to 90°?	Go to step **7.**	Replace G sensor.
7	**CHECK G SENSOR.** Read the select monitor display.	Is the indicated reading 0.7±0.2 V when G sensor is inclined backwards to 90°?	G sensor is normal.	Replace G sensor.

ABS (DIAGNOSTICS)

ABS

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5.	Control Module I/O Signal	14
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10.	ABS Warning Light Illumination Pattern	23
11.	List of Diagnostics Trouble Code (DTC)	24
12.	Diagnostics Chart with Diagnosis Connector	29
13.	Diagnostics Chart with Subaru Select Monitor	96
14.	General Diagnostics Table	183

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 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	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1)Ask the customer when and how the 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-9, INSPECTION, General Description.>	Is unit that might influence the ABS problem normal?	Go to step **2.**	Repair or replace each unit.
2	**CHECK INDICATION OF DIAGNOSTIC TROUBLE CODE (DTC).** Calling up diagnostic trouble code (DTC). <Ref. to ABS-20, Read Diagnostic Trouble Code (DTC).>	Is the diagnostic trouble code (DTC) readable?	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 diagnostic trouble code (DTC) again after inspecting ABS warning light. <Ref. to ABS-20, Read Diagnostic Trouble Code (DTC).>
3	**CHECK DIAGNOSTIC TROUBLE CODE (DTC).** NOTE: Record all diagnostic trouble codes (DTC).	Is only the start code issued?	Go to step **4.**	Go to step **5.**
4	**PERFORM THE GENERAL DIAGNOSTICS.** 1)Inspect using "General Diagnostics Table". <Ref. to ABS-183, General Diagnostics Table.> 2)Perform the clear memory mode. <Ref. to ABS-22, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 3)Perform the inspection mode. <Ref. to ABS-21, Inspection Mode.> Calling up the diagnostic trouble code (DTC). <Ref. to ABS-20, Read Diagnostic Trouble Code (DTC).>	Is only the start code issued?	Complete the diagnosis.	Go to step **5.**

	Step	Check	Yes	No
5	**PERFORM THE DIAGNOSIS.** 1)Inspect using "Diagnostics Chart with Diagnostic Connector".<Ref. to ABS-29, Diagnostics Chart with Diagnosis Connector.> NOTE: For diagnostic trouble code (DTC) list, refer to "List of Diagnostics Trouble Code (DTC)".<Ref. to ABS-24, WITHOUT SUBARU SELECT MONITOR, LIST, List of Diagnostics Trouble Code (DTC).> 2)Repair the trouble cause. 3)Perform the clear memory mode. <Ref. to ABS-22, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 4)Perform the inspection mode. <Ref. to ABS-21, Inspection Mode.> 5)Calling up the diagnostic trouble code (DTC). <Ref. to ABS-20, Read Diagnostic Trouble Code (DTC).>	Is only the start code issued?	Complete the diagnosis.	Inspect using "Diagnostics Chart with Diagnostic Connector". <Ref. to ABS-29, Diagnostics Chart with Diagnosis Connector.>

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 harness for broken wires or short circuits, shake it while holding it or the connector.
- Check the list for interview. <Ref. to ABS-26, WITH SUBARU SELECT MONITOR, LIST, List of Diagnostics Trouble Code (DTC).>

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1)Ask the customer when and how the 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-9, INSPECTION, General Description.>	Is unit that might influence the ABS problem normal?	Go to step **2.**	Repair or replace each unit.
2	**CHECK INDICATION OF TROUBLE CODE 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 the select monitor cannot be executed normally, check the communication circuit. <Ref. to ABS-96, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostics Chart with Subaru Select Monitor.> 4)Read the diagnostic trouble code (DTC). <Ref. to ABS-19, READ CURRENT DATA, OPERATION, Subaru Select Monitor.> 5)Record all diagnostic trouble codes (DTC) and frame data.	Is the corresponding trouble encoding?	Go to step **3.**	Go to step **4.**
3	**PERFORM THE GENERAL DIAGNOSTICS.** 1)Inspect using "General Diagnostics Table". <Ref. to ABS-183, 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-21, Inspection Mode.> 4)Calling up the diagnostic trouble code (DTC). <Ref. to ABS-18, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>	Is no diagnostic trouble code (DTC) designated and ABS warning light goes out after turning on?	Complete the diagnosis.	Go to step **4.**

	Step	Check	Yes	No
4	**PERFORM THE DIAGNOSIS.** 1)Inspect using "Diagnostics Chart with Subaru Select Monitor".<Ref. to ABS-96, Diagnostics Chart with Subaru Select Monitor.> NOTE: For diagnostic trouble code (DTC) list, refer to "List of Diagnostics Trouble Code (DTC)".<Ref. to ABS-24, WITHOUT SUBARU SELECT MONITOR, LIST, List of Diagnostics Trouble Code (DTC).> 2)Repair the 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-21, Inspection Mode.> 5)Calling up the diagnostic trouble code (DTC). <Ref. to ABS-18, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>	Is no diagnostic trouble code (DTC) designated and does ABS warning light go out after turning on?	Complete the diagnosis.	Inspect using "Diagnostics Chart with Subaru Select Monitor". <Ref. to ABS-96, 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. SYMPTOMS

<table>
<tr><td rowspan="8">ABS operating condition</td><td colspan="3">❑ Performs no work.</td></tr>
<tr><td>❑ Operates only when abruptly applying brakes.</td><td>Vehicle speed :</td><td>km/h
MPH</td></tr>
<tr><td colspan="3">• How to step on brake pedal :</td></tr>
<tr><td>a) Operating time :</td><td colspan="2">sec</td></tr>
<tr><td colspan="3">b) Operating noise : ❑ Produce / ❑ Does not produce</td></tr>
<tr><td>• What kind of noise?</td><td colspan="2">❑ Knock
❑ Gong gong
❑ Bong
❑ Buzz
❑ Gong gong buzz
❑ Others :</td></tr>
<tr><td colspan="3">c) Reaction force of brake pedal</td></tr>
<tr><td></td><td colspan="2">❑ Stick
❑ Press down once with a clunk
❑ Press and released
❑ Others :</td></tr>
<tr><td rowspan="18">Behavior of vehicle</td><td colspan="3">a) Directional stability cannot be obtained or steering arm refuses to work when applying brakes :
❑ Yes / ❑ No</td></tr>
<tr><td>• When :</td><td colspan="2">❑ Vehicle turns to right
❑ Vehicle turns to left
❑ Spins
❑ Others :</td></tr>
<tr><td colspan="3">b) Directional stability cannot be obtained or steering arm refuses to work when accelerating :
❑ Yes / ❑ No</td></tr>
<tr><td>• When :</td><td colspan="2">❑ Vehicle turns to right
❑ Vehicle turns to left
❑ Spins
❑ Others :</td></tr>
<tr><td colspan="3">c) Brakes are out of order : ❑ Yes / ❑ No</td></tr>
<tr><td>• What :</td><td colspan="2">❑ Braking distance is long
❑ Brakes lock or drag
❑ Pedal stroke is long
❑ Pedal sticks
❑ Others :</td></tr>
<tr><td colspan="3">d) Poor acceleration : ❑ Yes / ❑ No</td></tr>
<tr><td>• What :</td><td colspan="2">❑ Fails to accelerate
❑ Engine stalls
❑ Others :</td></tr>
<tr><td colspan="3">e) Occurrence of vibration : ❑ Yes / ❑ No</td></tr>
<tr><td colspan="3">• Where
• What kind :</td></tr>
<tr><td colspan="3">f) Occurrence of abnormal noise : ❑ Yes / ❑ No</td></tr>
<tr><td colspan="3">• Where
• What kind :</td></tr>
<tr><td colspan="3">g) Occurrence of other phenomena : ❑ Yes / ❑ No</td></tr>
<tr><td colspan="3">• What kind :</td></tr>
</table>

CHECK LIST FOR INTERVIEW

3. 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"

The 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 for 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

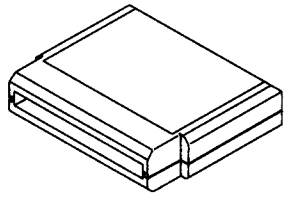
Check the brake pad and rotor.
• Front <Ref. to BR-17, INSPECTION, Front Brake Pad.> and <Ref. to BR-18, INSPECTION, Front Disc Rotor.>
• Rear <Ref. to BR-24, INSPECTION, Rear Brake Pad.> and <Ref. to BR-26, INSPECTION, Rear Disc Rotor.> or <Ref. to BR-31, INSPECTION, Rear Drum Brake Shoe.> and <Ref. to BR-32, 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

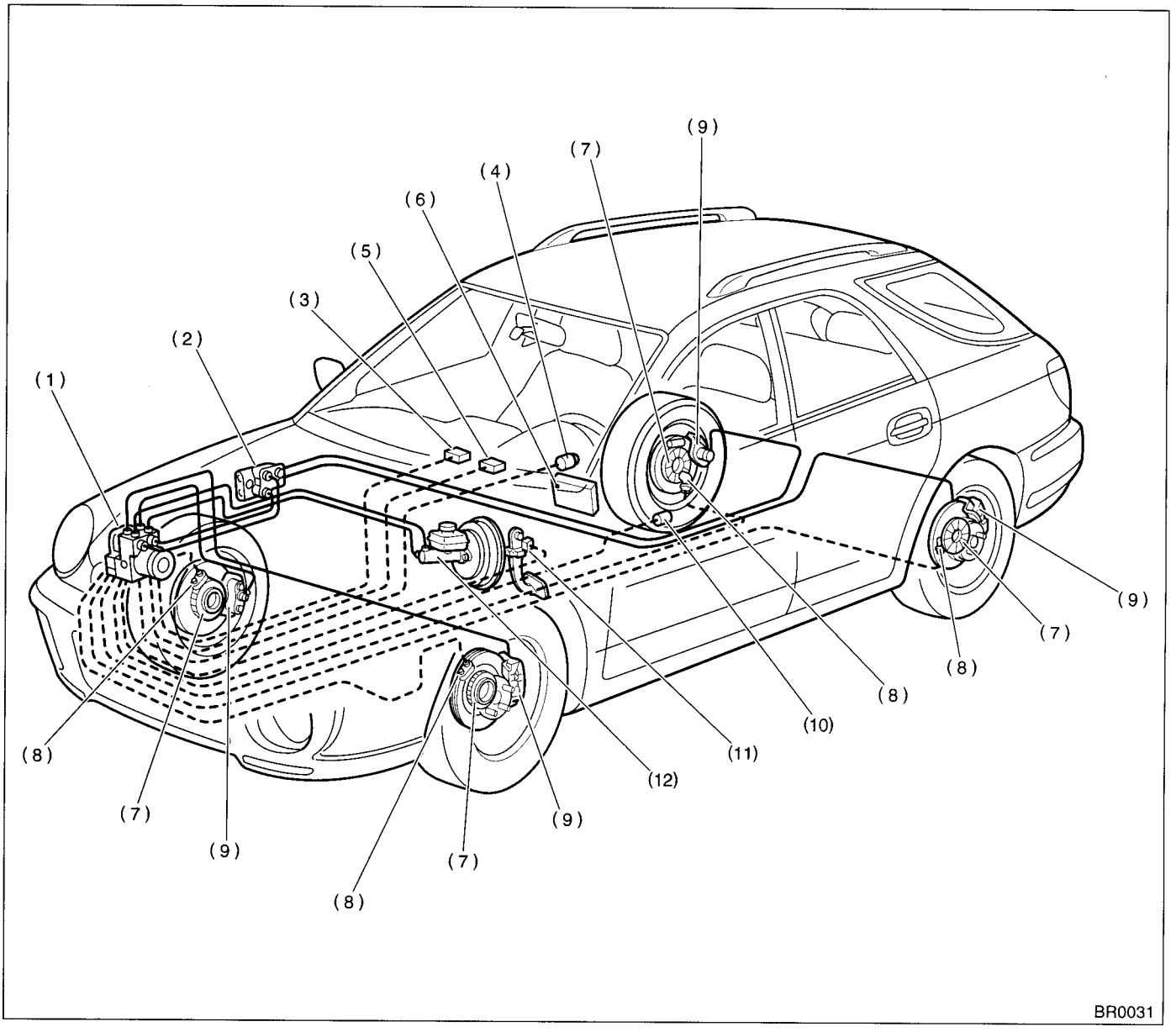
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3876	24082AA150 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL PURPOSE TOOLS

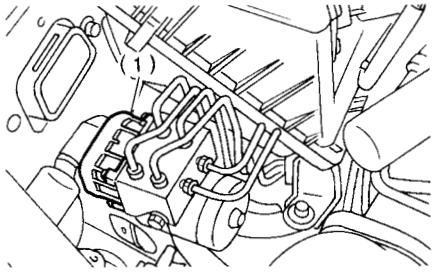
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and ampere.
Oscilloscope	Used for measuring sensor.

4. Electrical Components Location

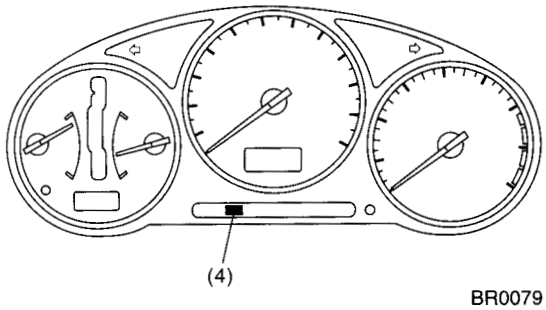
A: LOCATION



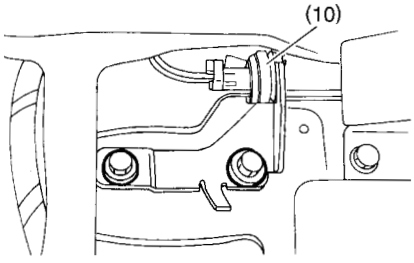
(1)	ABS control module and hydraulic control unit (ABSCM&H/U)	(5)	Data link connector (for Subaru select monitor)	(8)	ABS sensor
(2)	Proportioning valve	(6)	Transmission control module (only AT vehicle)	(9)	Wheel cylinder
(3)	Diagnosis connector	(7)	Tone wheel	(10)	G sensor
(4)	ABS warning light			(11)	Stop light switch
				(12)	Master cylinder



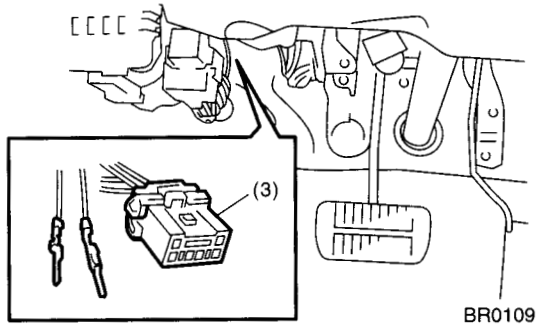
B4M1226B



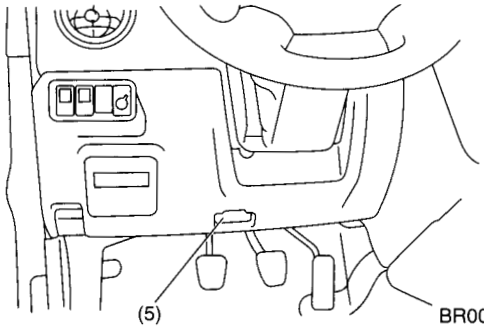
BR0079



BR0056

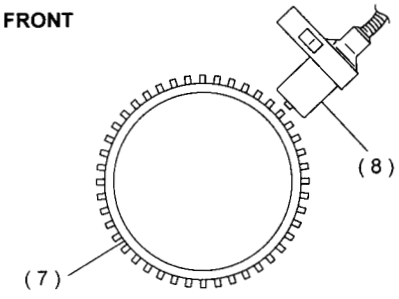


BR0109



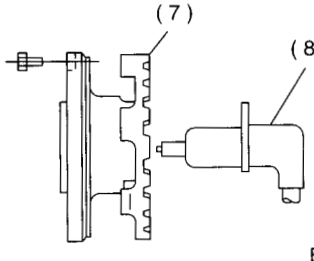
BR0080

FRONT



BR0057

REAR

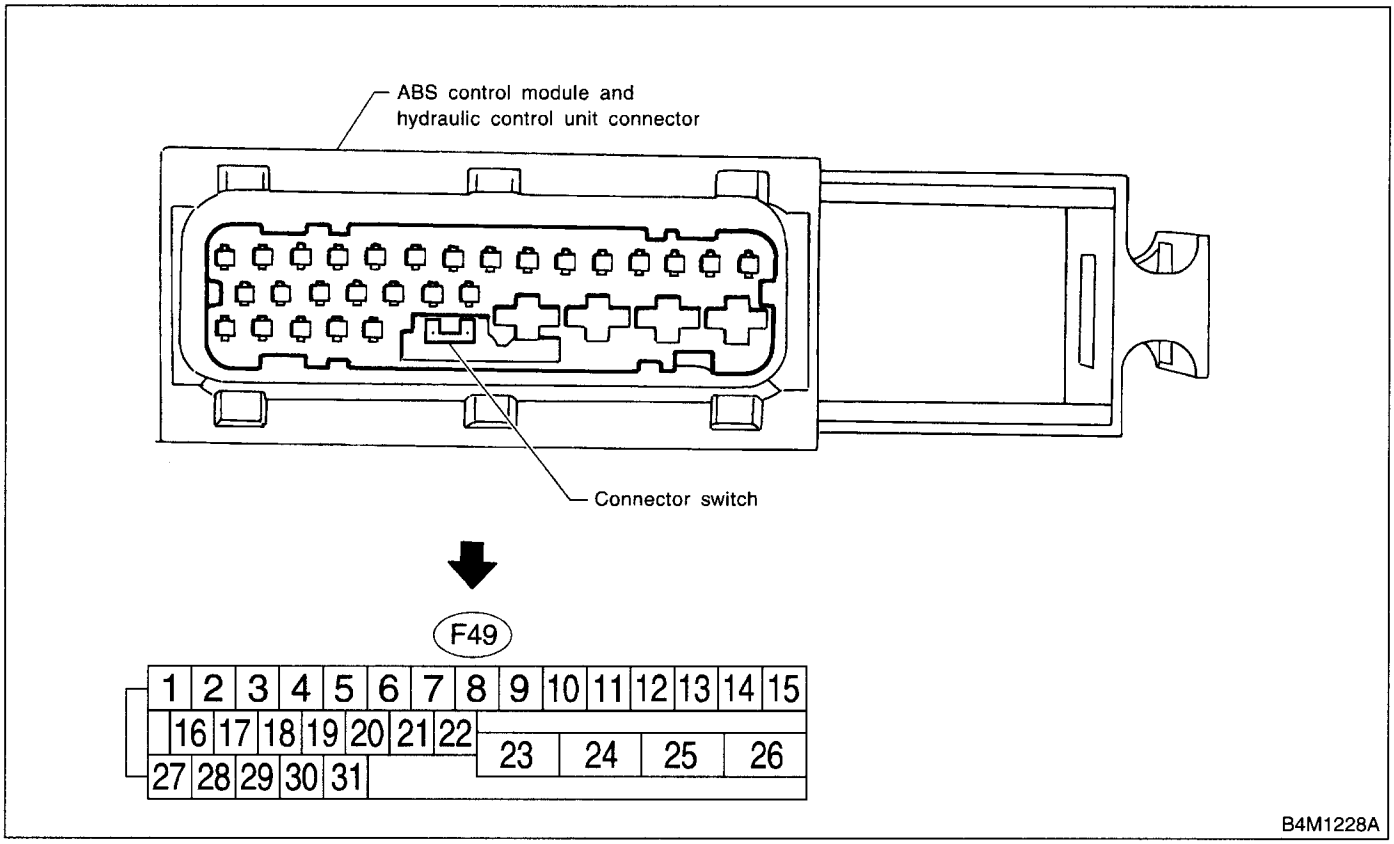


BR0058

SUBARU

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION

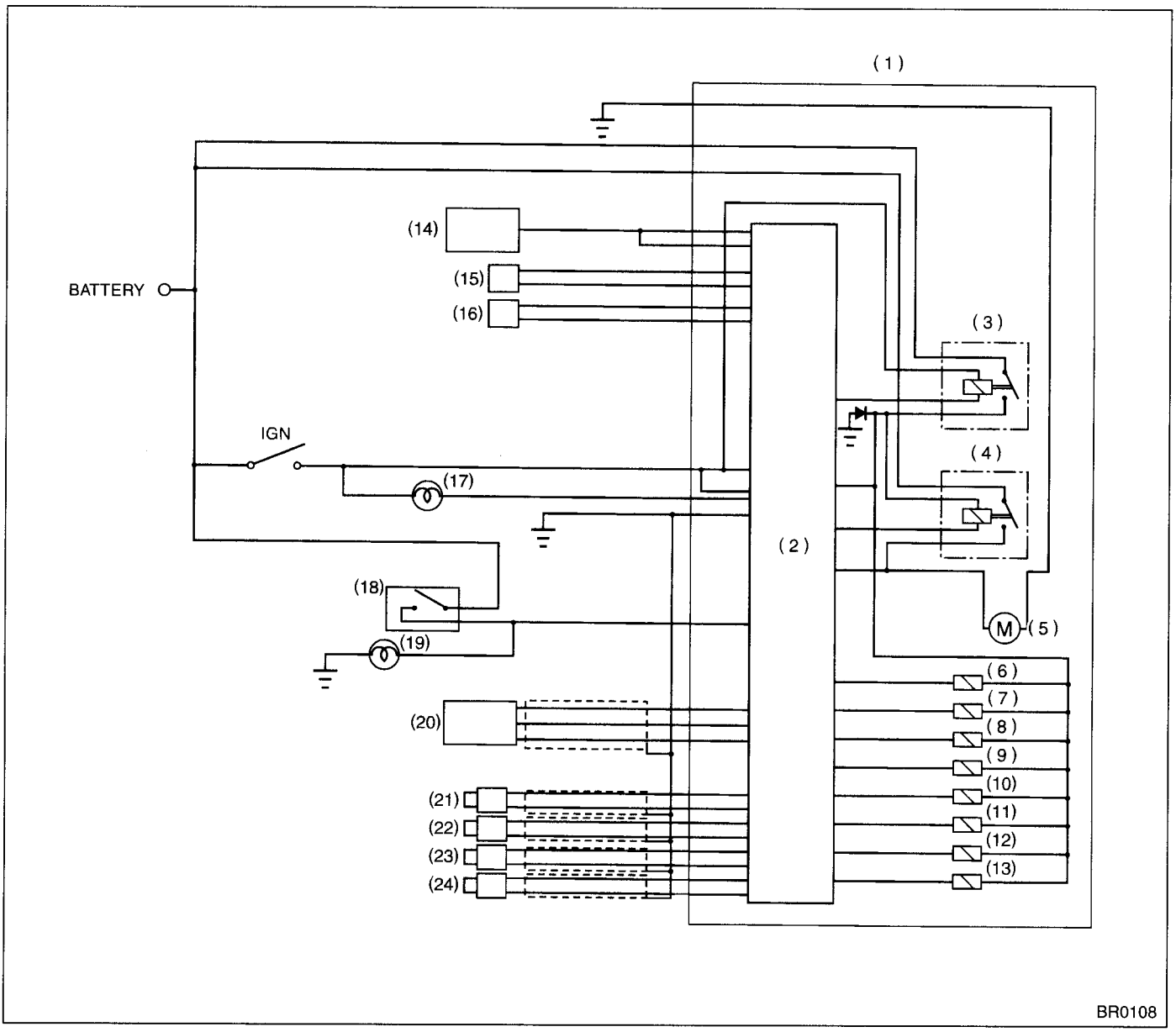


NOTE:
- The terminal numbers in the ABS control module and hydraulic control unit connector are as shown in the figure.
- When the connector is removed from the ABSCM&H/U, the connector switch closes the circuit between terminal No. 22 and No. 23. The ABS warning light illuminates.

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		24—23	10 — 15 V
Motor relay power supply		25—23	10 — 15 V
G sensor*2	power supply	30—28	4.75 — 5.25 V
	ground	28	—
	output	6—28	2.3±0.2 V when the 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 during 1.5 seconds when ignition switch is ON, and 10 — 15 V after 1.5 seconds.
AT ABS signal*2 (AT model 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*2		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*2	Terminal No. 3	29—23	10 — 15 V when the ignition switch is ON.
	Terminal No. 6	4—23	10 — 15 V when the ignition switch is ON.
Power supply*1		1—23	10 — 15 V when the ignition switch is ON.
Grounding line		23	—
Grounding line		26	—

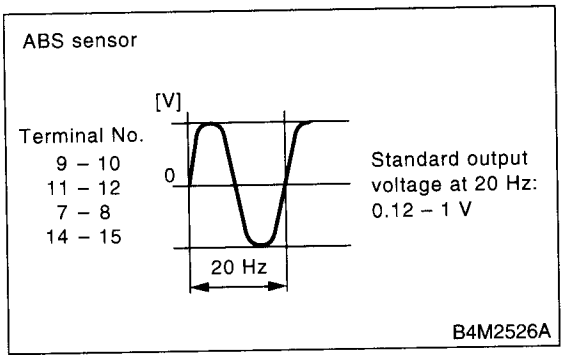
*1: Measure the I/O signal voltage after removing the connector from the ABSCM&H/U terminal.
*2: Measure the I/O signal voltage at connector (B200) or (F74).

B: SCHEMATIC



(1) ABS control module and hydraulic control unit (ABSCM&H/U)
(2) ABS control module area
(3) Valve relay
(4) Motor relay
(5) Motor
(6) Front left inlet solenoid valve
(7) Front left outlet solenoid valve
(8) Front right inlet solenoid valve
(9) Front right outlet solenoid valve
(10) Rear left inlet solenoid valve
(11) Rear left outlet solenoid valve
(12) Rear right inlet solenoid valve
(13) Rear right outlet solenoid valve
(14) Transmission control module (only AT model)
(15) Diagnosis connector
(16) Data link connector
(17) ABS warning light
(18) Stop light switch
(19) Stop light
(20) G sensor
(21) Front left ABS sensor
(22) Front right ABS sensor
(23) Rear left ABS sensor
(24) Rear right ABS sensor

C: WAVEFORM

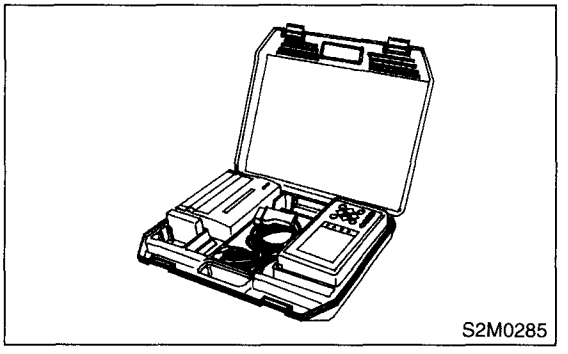

ABS sensor
[V]
Terminal No.
9 – 10
11 – 12
7 – 8
14 – 15
0
20 Hz
Standard output voltage at 20 Hz: 0.12 – 1 V
B4M2526A

6. Subaru Select Monitor

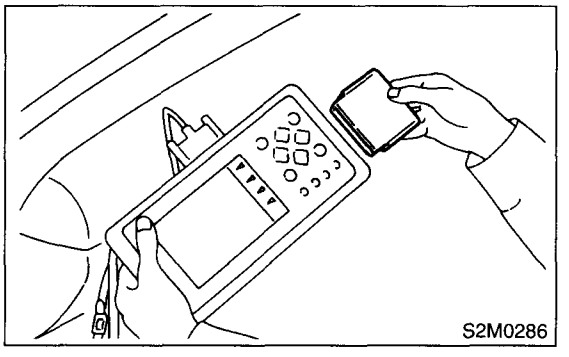
A: OPERATION

1. READ DIAGNOSTIC TROUBLE CODE (DTC)

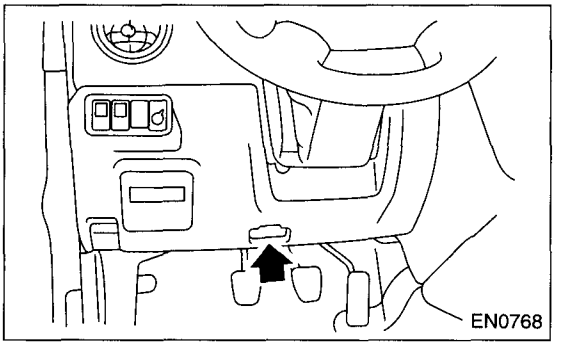
1) Prepare the Subaru Select Monitor kit.



2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to ABS-10, SPECIAL TOOLS, PREPARATION TOOL, General Description.>

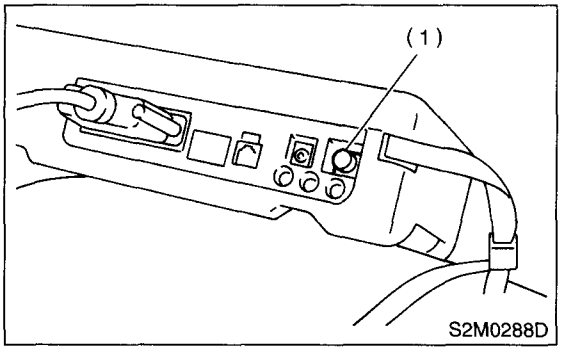


4) Connect the Subaru Select Monitor to data link connector.
(1) Data link connector is located in the lower portion of the instrument panel (on the driver's side).



(2) Connect the diagnosis cable to data link connector.

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 the [YES] key.
7) On the «System Selection Menu» display screen, select the {Brake Control System} and press the [YES] key.
8) Press the [YES] key after displayed the information of engine type.
9) On the «ABS Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press the [YES] key.
10) 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 (DTC), refer to the LIST OF DIAGNOSTICS TROUBLE CODE (DTC). <Ref. to ABS-24, List of Diagnostics Trouble Code (DTC).>

2. READ CURRENT DATA

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 {Brake Control System} and press the «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 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.

Display screen	Contents to be monitored	Unit of measure
FR Wheel Speed	Wheel speed detected by the Front Right ABS sensor is displayed	km/h or MPH
FL Wheel Speed	Wheel speed detected by the Front Left ABS sensor is displayed	km/h or MPH
RR Wheel Speed	Wheel speed detected by the Rear Right ABS sensor is displayed	km/h or MPH
RL Wheel Speed	Wheel speed detected by the Rear Left ABS sensor 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	Refers to vehicle acceleration detecting by the analog G sensor. It appears on the select monitor display in volts.	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 the ABS warning light is displayed.	ON or OFF
Motor Relay Monitor	Operating condition of the 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 the «YES» key.
2) On the «System Select Menu» display screen, select {Brake System} and press the «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 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.

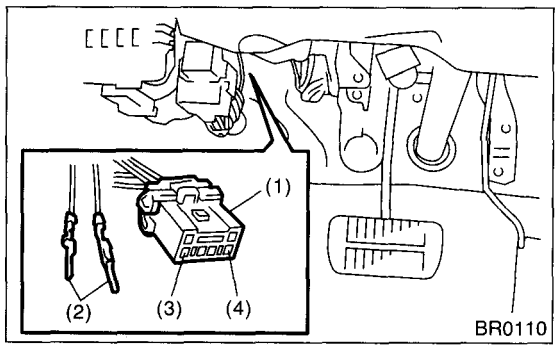
NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. WITHOUT SUBARU SELECT MONITOR

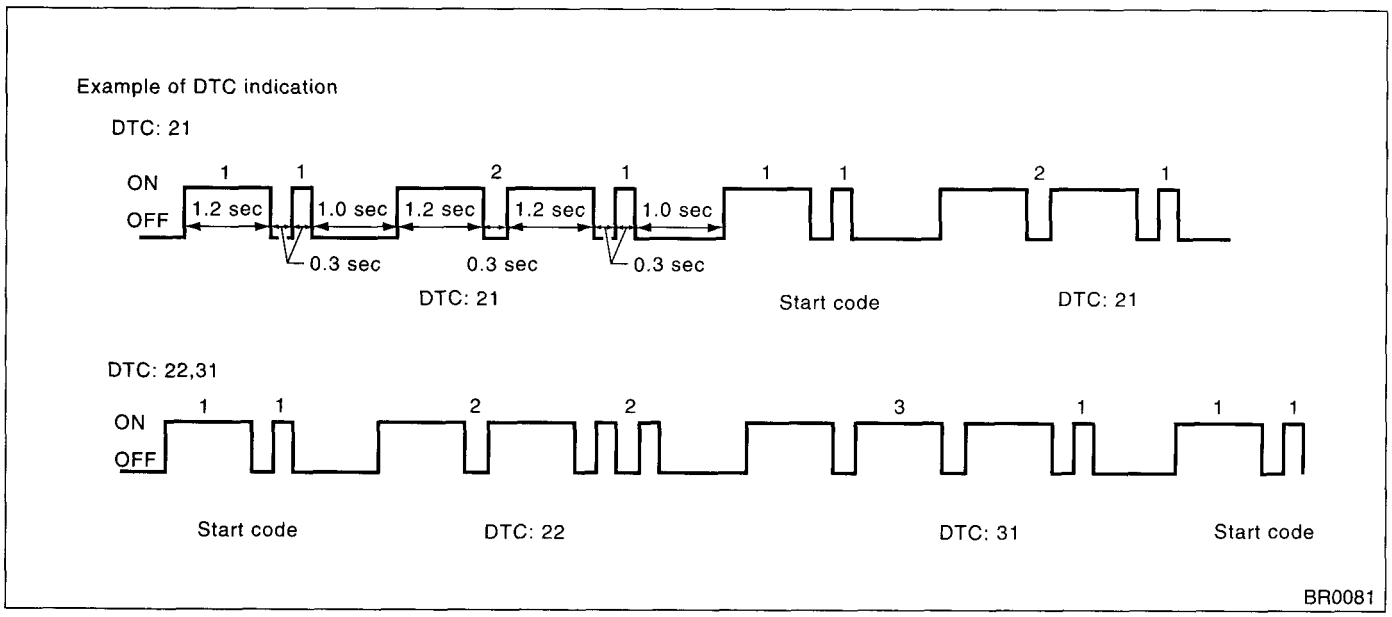
1) Take out the diagnosis connector from side of driver's seat heater unit.



(1) Diagnosis connector
(2) Diagnosis terminals
(3) 3 terminal
(4) 6 terminal

2) Turn the ignition switch OFF.
3) Connect the diagnosis connector terminal 6 to diagnosis terminal.
4) Turn the ignition switch ON.
5) ABS warning light is set in the diagnostic mode and blinks to identify diagnostic trouble code (DTC).
6) After the start code (11) is shown, the diagnostic trouble code (DTC) will be shown in order of the last information first.
These repeat for a maximum of 3 minutes.

NOTE:
• When there are no diagnostic trouble code (DTC) 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 the EEP ROM as a diagnostic trouble code (DTC). When there are more than three, the most recent three will be stored. (Stored codes will stay in memory until they are cleared.)



2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to obtain and understand the diagnostic trouble code (DTC). <Ref. to ABS-18, Subaru Select Monitor.>

8. Inspection Mode

A: OPERATION

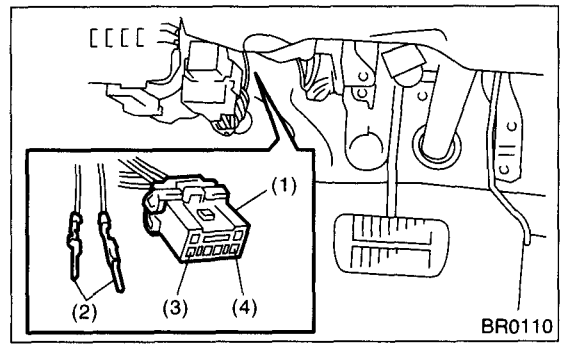
Reproduce the condition under which the problem has occurred as much as possible.
Drive the vehicle at a speed more than 40 km/h (25 MPH) for at least one minute.

9. Clear Memory Mode

A: OPERATION

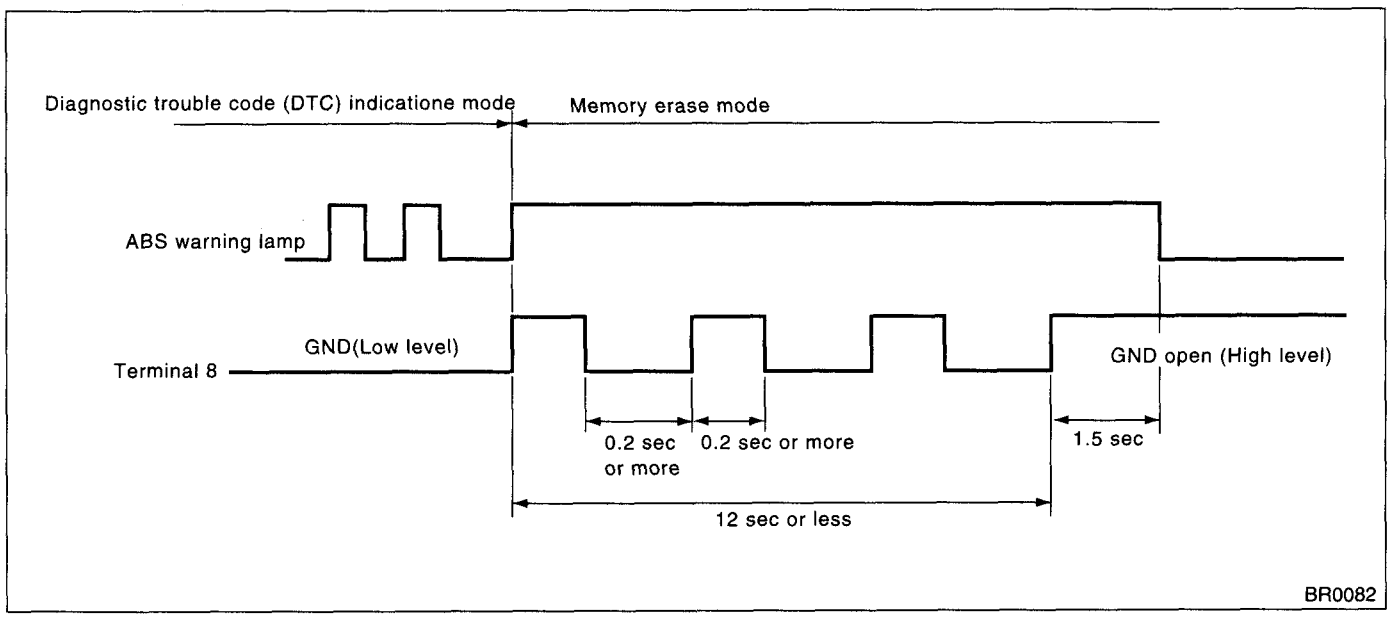
1. WITHOUT SUBARU SELECT MONITOR

1) After calling up a diagnostic trouble code (DTC), disconnect the diagnosis connector terminal 6 from diagnosis terminal.



(1) Diagnosis connector
(2) Diagnosis terminals
(3) 3 terminal
(4) 6 terminal

2) Repeat 3 times within approx. 12 seconds; connecting and disconnecting terminal 6 and diagnosis terminal for at least 0.2 seconds each time.



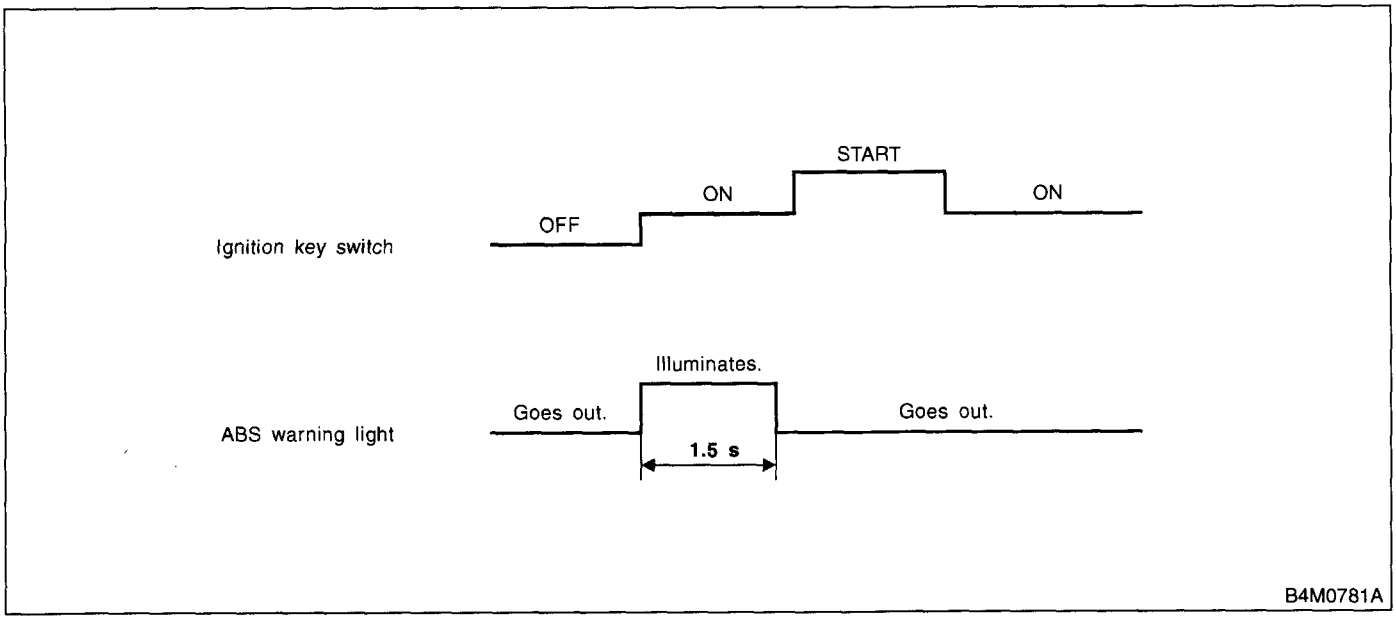
NOTE:
After diagnostics is completed, make sure to clear memory. Make sure only start code (11) is shown after memory is cleared.

2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to clear the diagnostic trouble code (DTC). <Ref. to ABS-18, Subaru Select Monitor.>

10.ABS Warning Light Illumination Pattern

A: INSPECTION



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 approximately 12 km/h (7 MPH). However, the Anti-lock brakes do not work while the 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 right ABS sensor	<Ref. to ABS-40, DTC 21 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT RH), Diagnostics Chart with Diagnosis Connector.>
23		Front left ABS sensor	<Ref. to ABS-40, DTC 23 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT LH), Diagnostics Chart with Diagnosis Connector.>
25		Rear right ABS sensor	<Ref. to ABS-40, DTC 25 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR RH), Diagnostics Chart with Diagnosis Connector.>
27		Rear left ABS sensor	<Ref. to ABS-41, 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 right ABS sensor	<Ref. to ABS-46, DTC 22 ABNORMAL ABS SENSOR (FRONT RH), Diagnostics Chart with Diagnosis Connector.>
24		Front left ABS sensor	<Ref. to ABS-46, DTC 24 ABNORMAL ABS SENSOR (FRONT LH), Diagnostics Chart with Diagnosis Connector.>
26		Rear right ABS sensor	<Ref. to ABS-46, DTC 26 ABNORMAL ABS SENSOR (REAR RH), Diagnostics Chart with Diagnosis Connector.>
28		Rear left ABS sensor	<Ref. to ABS-47, DTC 28 ABNORMAL ABS SENSOR (REAR LH), Diagnostics Chart with Diagnosis Connector.>
29		Any one of four	<Ref. to ABS-53, DTC 29 ABNORMAL ABS SENSOR SIGNAL (ANY ONE OF FOUR), Diagnostics Chart with Diagnosis Connector.>
31	Abnormal solenoid valve circuit(s) in ABS control module and hydraulic unit	Front right inlet valve	<Ref. to ABS-57, DTC 31 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH), Diagnostics Chart with Diagnosis Connector.>
32		Front right outlet valve	<Ref. to ABS-61, DTC 32 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH), Diagnostics Chart with Diagnosis Connector.>
33		Front left inlet valve	<Ref. to ABS-57, DTC 33 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH), Diagnostics Chart with Diagnosis Connector.>
34		Front left outlet valve	<Ref. to ABS-61, DTC 34 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH), Diagnostics Chart with Diagnosis Connector.>
35		Rear right inlet valve	<Ref. to ABS-57, DTC 35 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH), Diagnostics Chart with Diagnosis Connector.>
36		Rear right outlet valve	<Ref. to ABS-61, DTC 36 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH), Diagnostics Chart with Diagnosis Connector.>
37		Rear left inlet valve	<Ref. to ABS-57, DTC 37 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>
38		Rear left outlet valve	<Ref. to ABS-61, DTC 38 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

DTC No.	Contents of diagnosis	Index No.
41	Abnormal ABS control module	<Ref. to ABS-66, DTC 41 ABNORMAL ABS CONTROL MODULE, Diagnostics Chart with Diagnosis Connector.>
42	Source voltage is abnormal.	<Ref. to ABS-69, DTC 42 SOURCE VOLTAGE IS ABNORMAL., Diagnostics Chart with Diagnosis Connector.>
44	A combination of AT control abnormal	<Ref. to ABS-74, DTC 44 A COMBINATION OF AT CONTROL ABNORMAL, Diagnostics Chart with Diagnosis Connector.>
51	Abnormal valve relay	<Ref. to ABS-77, DTC 51 ABNORMAL VALVE RELAY, Diagnostics Chart with Diagnosis Connector.>
52	Abnormal motor and/or motor relay	<Ref. to ABS-81, DTC 52 ABNORMAL MOTOR AND/OR MOTOR RELAY, Diagnostics Chart with Diagnosis Connector.>
54	Abnormal stop light switch	<Ref. to ABS-86, DTC 54 ABNORMAL STOP LIGHT SWITCH, Diagnostics Chart with Diagnosis Connector.>
56	Abnormal G sensor output voltage	<Ref. to ABS-89, DTC 56 ABNORMAL G SENSOR OUTPUT VOLTAGE, Diagnostics Chart with Diagnosis Connector.>

LIST OF DIAGNOSTICS TROUBLE CODE (DTC)

2. WITH SUBARU SELECT MONITOR

DTC No.	Display screen	Contents of diagnosis	Index No.
—	Communication for initializing impossible	Select monitor communication failure	<Ref. to ABS-96, 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-101, NO TROUBLE CODE, Diagnostics Chart with Subaru Select Monitor.>
21	Open or short circuit in front right ABS sensor circuit	Open or short circuit in front right ABS sensor circuit	<Ref. to ABS-104, DTC 21 OPEN OR SHORT CIRCUIT IN FRONT RIGHT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
22	Front right ABS sensor abnormal signal	Front right ABS sensor abnormal signal	<Ref. to ABS-110, DTC 22 FRONT RIGHT ABNORMAL ABS SENSOR SIGNAL, Diagnostics Chart with Subaru Select Monitor.>
23	Open or short circuit in front left ABS sensor circuit	Open or short circuit in front left ABS sensor circuit	<Ref. to ABS-104, DTC 23 OPEN OR SHORT CIRCUIT IN FRONT LEFT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
24	Front left ABS sensor abnormal signal	Front left ABS sensor abnormal signal	<Ref. to ABS-110, DTC 24 FRONT LEFT ABNORMAL ABS SENSOR SIGNAL, Diagnostics Chart with Subaru Select Monitor.>
25	Open or short circuit in rear right ABS sensor circuit	Open or short circuit in rear right ABS sensor circuit	<Ref. to ABS-104, DTC 25 OPEN OR SHORT CIRCUIT IN REAR RIGHT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
26	Rear right ABS sensor abnormal signal	Rear right ABS sensor abnormal signal	<Ref. to ABS-110, DTC 26 REAR RIGHT ABNORMAL ABS SENSOR SIGNAL, Diagnostics Chart with Subaru Select Monitor.>
27	Open or short circuit in rear left ABS sensor circuit	Open or short circuit in rear left ABS sensor circuit	<Ref. to ABS-105, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
28	Rear left ABS sensor abnormal signal	Rear left ABS sensor abnormal signal	<Ref. to ABS-111, DTC 28 REAR LEFT ABNORMAL ABS SENSOR SIGNAL, Diagnostics Chart with Subaru Select Monitor.>
29	Abnormal ABS sensor signal on any one of four sensor	Abnormal ABS sensor signal on any one of four	<Ref. to ABS-117, DTC 29 ABNORMAL ABS SENSOR SIGNAL ON ANY ONE OF FOUR SENSOR, Diagnostics Chart with Subaru Select Monitor.>
31	Front right inlet valve malfunction	Front right inlet valve malfunction	<Ref. to ABS-121, DTC 31 FRONT RIGHT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
32	Front right outlet valve malfunction	Front right outlet valve malfunction	<Ref. to ABS-125, DTC 32 FRONT RIGHT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
33	Front left inlet valve malfunction	Front left inlet valve malfunction	<Ref. to ABS-121, DTC 33 FRONT LEFT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
34	Front left outlet valve malfunction	Front left outlet valve malfunction	<Ref. to ABS-125, DTC 34 FRONT LEFT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
35	Rear right inlet valve malfunction	Rear right inlet valve malfunction	<Ref. to ABS-121, DTC 35 REAR RIGHT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
36	Rear right outlet valve malfunction	Rear right outlet valve malfunction	<Ref. to ABS-125, DTC 36 REAR RIGHT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
37	Rear left inlet valve malfunction	Rear left inlet valve malfunction	<Ref. to ABS-121, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
38	Rear left outlet valve malfunction	Rear left outlet valve malfunction	<Ref. to ABS-125, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
41	ABS control module malfunction	ABS control module and hydraulic control unit malfunction	<Ref. to ABS-130, DTC 41 ABS CONTROL MODULE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
42	Power supply voltage too low	Power supply voltage too low	<Ref. to ABS-132, DTC 42 POWER SUPPLY VOLTAGE TOO LOW, Diagnostics Chart with Subaru Select Monitor.>
42	Power supply voltage too high	Power supply voltage too high	<Ref. to ABS-134, DTC 42 POWER SUPPLY VOLTAGE TOO HIGH, Diagnostics Chart with Subaru Select Monitor.>

DTC No.	Display screen	Contents of diagnosis	Index No.
44	ABS-AT control (Non Controlled)	ABS-AT control (Non Controlled)	<Ref. to ABS-138, DTC 44 ABS-AT CONTROL (NON CONTROLLED), Diagnostics Chart with Subaru Select Monitor.>
44	ABS-AT control (Controlled)	ABS-AT control (Controlled)	<Ref. to ABS-140, DTC 44 ABS-AT CONTROL (CONTROLLED), Diagnostics Chart with Subaru Select Monitor.>
51	Valve relay malfunction	Valve relay malfunction	<Ref. to ABS-143, DTC 51 VALVE RELAY MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
51	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	Open circuit in motor relay circuit	Open circuit in motor relay circuit	<Ref. to ABS-151, DTC 52 OPEN CIRCUIT IN MOTOR RELAY CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
52	Motor relay ON failure	Motor relay ON failure	<Ref. to ABS-155, DTC 52 MOTOR RELAY ON FAILURE, Diagnostics Chart with Subaru Select Monitor.>
52	Motor malfunction	Motor malfunction	<Ref. to ABS-159, DTC 52 MOTOR MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
54	Stop light switch signal circuit malfunction	Stop light switch signal circuit malfunction	<Ref. to ABS-162, DTC 54 STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
56	Open or short circuit in G sensor circuit	Open or short circuit in G sensor circuit	<Ref. to ABS-165, DTC 56 OPEN OR SHORT CIRCUIT IN G SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
56	Battery short in G sensor circuit	Battery short in G sensor circuit	<Ref. to ABS-169, DTC 56 BATTERY SHORT IN G SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
56	Abnormal G sensor high μ output	Abnormal G sensor high μ output	<Ref. to ABS-175, DTC 56 ABNORMAL G SENSOR HIGH M OUTPUT, Diagnostics Chart with Subaru Select Monitor.>
56	Detection of G sensor stick	Detection of G sensor stick	<Ref. to ABS-179, 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

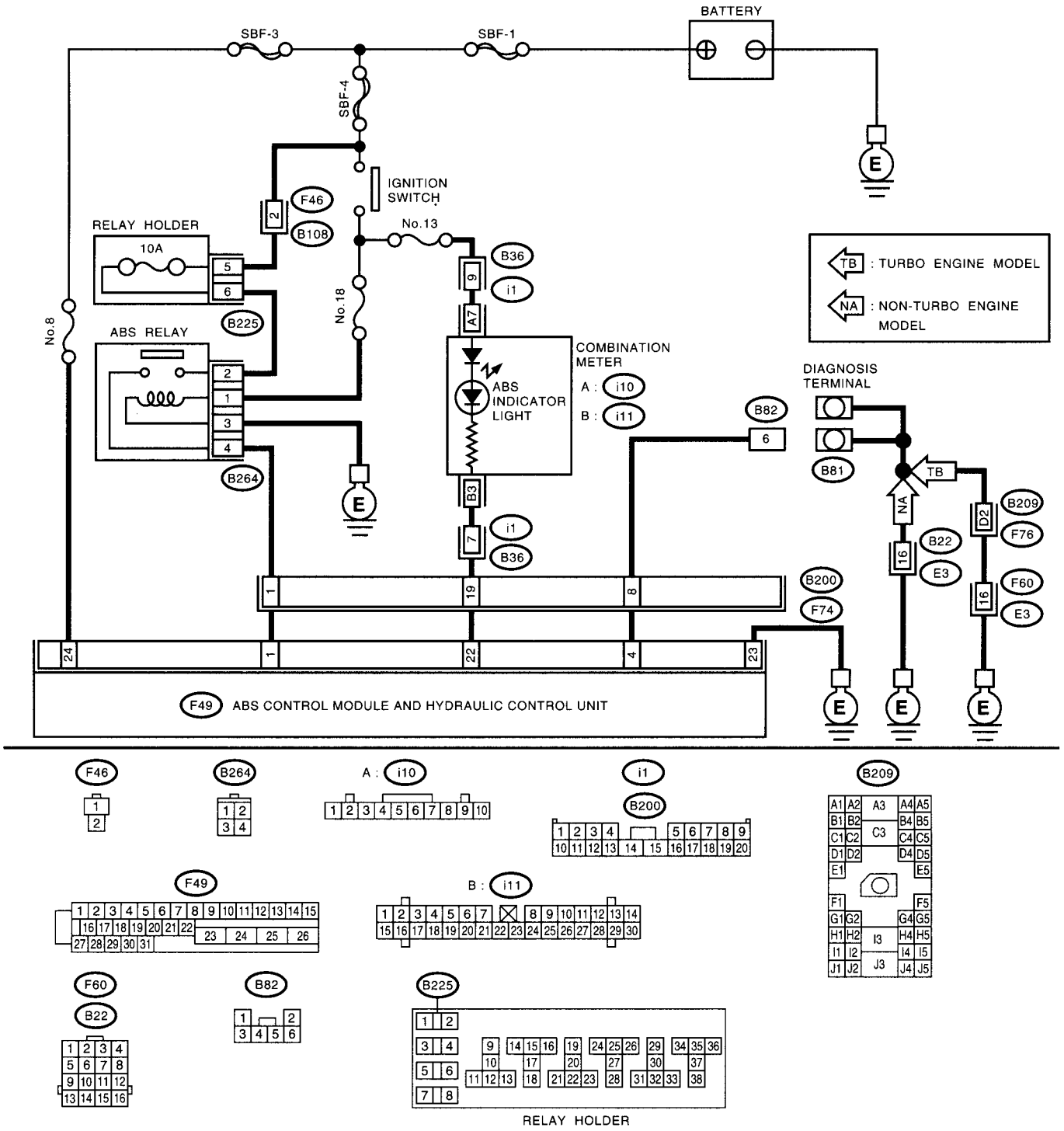
A: ABS WARNING LIGHT DOES NOT COME ON.

DIAGNOSIS:
- ABS warning light circuit is open or shorted.

TROUBLE SYMPTOM:
- When the ignition switch is turned ON (engine OFF), ABS warning light does not come on.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Check	Yes	No
1	**CHECK IF OTHER WARNING LIGHTS TURN ON.** Turn the ignition switch to ON (engine OFF).	Do other warning lights turn on?	Go to step **2.**	Repair the combination meter. <Ref. to IDI-11, Combination Meter Assembly.>
2	**CHECK ABS WARNING LIGHT BULB.** 1)Turn the ignition switch to OFF. 2)Remove the combination meter. 3)Remove the ABS warning light bulb from combination meter.	Is the ABS warning light bulb OK?	Go to step **3.**	Replace the ABS warning light bulb. <Ref. to IDI-11, Combination Meter Assembly.>
3	**CHECK BATTERY SHORT OF ABS WARNING LIGHT HARNESS.** 1)Disconnect the connector (B200) from connector (F74). 2)Measure the voltage between connector (B200) and chassis ground. ***Connector & terminal*** ***(B200) No. 19 (+) — Chassis ground (–):***	Is the voltage less than 3 V?	Go to step **4.**	Repair the warning light harness.
4	**CHECK BATTERY SHORT OF ABS WARNING LIGHT HARNESS.** 1)Turn the ignition switch to ON. 2)Measure the voltage between connector (B200) and chassis ground. ***Connector & terminal*** ***(B200) No. 19 (+) — Chassis ground (–):***	Is the voltage less than 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 ABS warning light bulb from combination meter. 3)Install the combination meter. 4)Turn the ignition switch to ON. 5)Measure the voltage between connector (B200) and chassis ground. ***Connector & terminal*** ***(B200) No. 19 (+) — Chassis ground (–):***	Is the voltage between 10 and 15 V?	Go to step **6.**	Repair the wiring harness.
6	**CHECK BATTERY SHORT OF ABS WARNING LIGHT HARNESS.** 1)Turn the ignition switch to OFF. 2)Measure the voltage between connector (F74) and chassis ground. ***Connector & terminal*** ***(F74) No. 19 (+) — Chassis ground (–):***	Is the voltage less than 3 V?	Go to step **7.**	Repair the wiring harness.
7	**CHECK BATTERY SHORT OF ABS WARNING LIGHT HARNESS.** 1)Turn the ignition switch to ON. 2)Measure the voltage between connector (F74) and chassis ground. ***Connector & terminal*** ***(F74) No. 19 (+) — Chassis ground (–):***	Is the voltage less than 3 V?	Go to step **8.**	Repair the wiring harness.
8	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** Measure the resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — GND:***	Is the resistance less than 0.5 Ω?	Go to step **9.**	Repair the ABSCM&H/U ground harness.
9	**CHECK WIRING HARNESS.** Measure the resistance between connector (F74) and chassis ground. ***Connector & terminal*** ***(F74) No. 19 (+) — Chassis ground (–):***	Is the resistance less than 0.5 Ω?	Go to step **10.**	Repair the harness/connector.

	Step	Check	Yes	No
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?	Repair the connector.	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

B: ABS WARNING LIGHT DOES NOT GO OFF.

DIAGNOSIS:

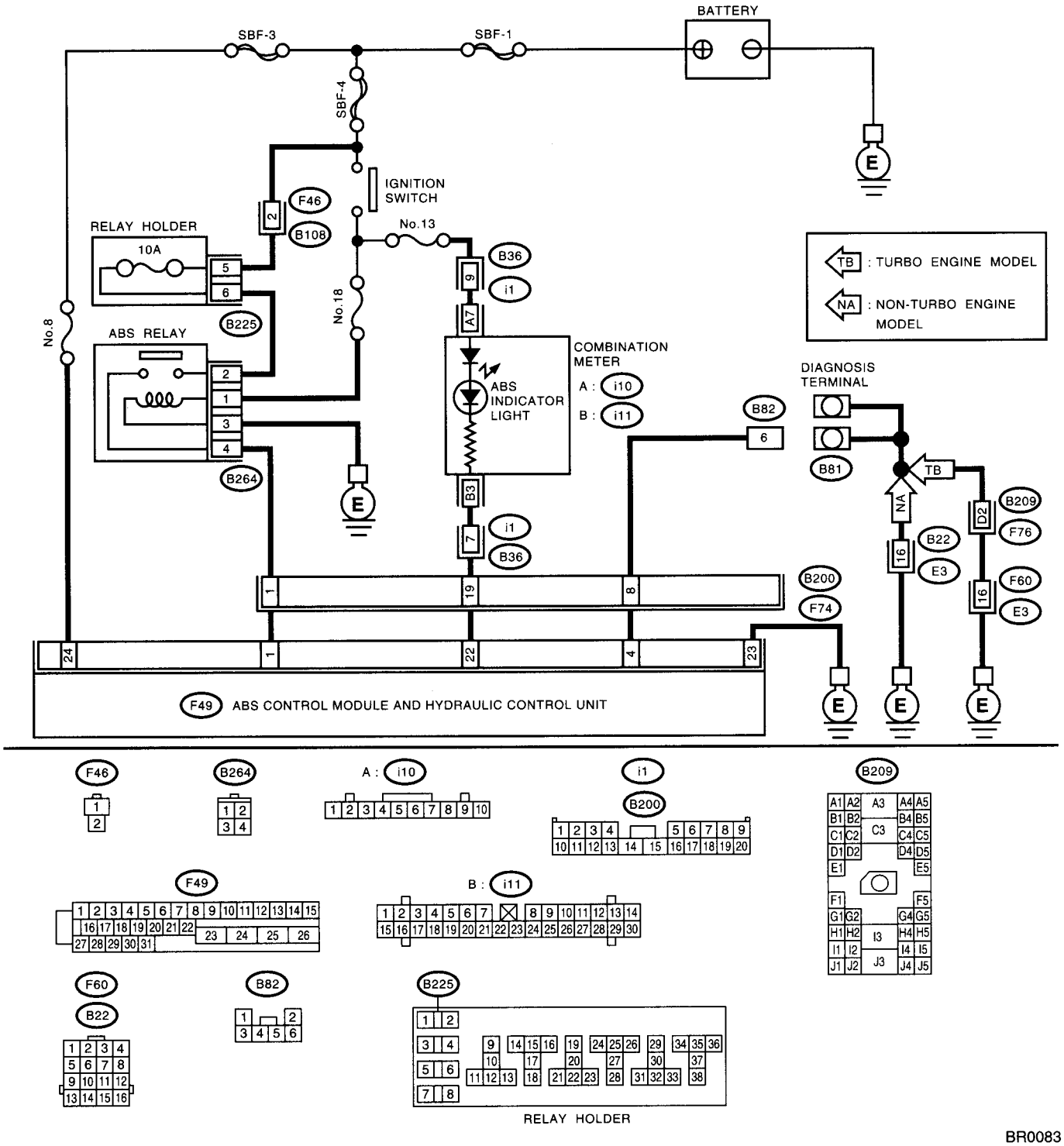
- ABS warning light circuit is open or shorted.

TROUBLE SYMPTOM:

- When starting the engine and while the ABS warning light is kept ON.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

WIRING DIAGRAM:



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DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Check	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?	Go to step **2.**	Insert ABSCM&H/U connector into ABSCM&H/U until the clamp locks onto it.
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 resistance less than 0.5 Ω?	Go to step **3.**	Repair the diagnosis terminal harness.
3	**CHECK DIAGNOSIS LINE.** 1)Turn the ignition switch to OFF. 2)Connect the diagnosis terminal (B81) to diagnosis connector (B82) No. 6. 3)Disconnect the connector from ABSCM&H/U. 4)Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 4 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **4.**	Repair 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 voltage between 10 and 15 V?	Go to step **5.**	Repair the generator. <Ref. to SC-13, Generator.>
5	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Is there poor contact at battery terminal?	Repair the battery terminal.	Go to step **6.**
6	**CHECK POWER SUPPLY OF ABSCM.** 1)Disconnect the connector from ABSCM&H/U. 2)Start the engine. 3)Idle the engine. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):***	Is the voltage between 10 and 15 V?	Go to step **7.**	Repair the ABSCM&H/U power supply circuit.
7	**CHECK WIRING HARNESS.** 1)Disconnect the connector (F74) from connector (B200). 2)Turn the ignition switch to ON.	Does the ABS warning light remain off?	Go to step **8.**	Repair the front wiring harness.
8	**CHECK PROJECTION AT ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Check for broken projection at the ABSCM&H/U terminal.	Are the projection broken?	Go to step **9.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Check	Yes	No
9	**CHECK ABSCM&H/U.** Measure the resistance between ABSCM&H/U terminals. ***Terminal*** ***No. 22 — No. 23:***	Is the resistance more than 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 (F74) and chassis ground. ***Connector & terminal*** ***(F74) No. 20 — Chassis ground:***	Is the resistance less than 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 (F74) and chassis ground. ***Connector & terminal*** ***(F74) No. 20 — Chassis ground:***	Is the resistance more than 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?	Repair the connector.	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

C: DIAGNOSTIC TROUBLE CODE (DTC) DOES NOT APPEAR.

DIAGNOSIS:

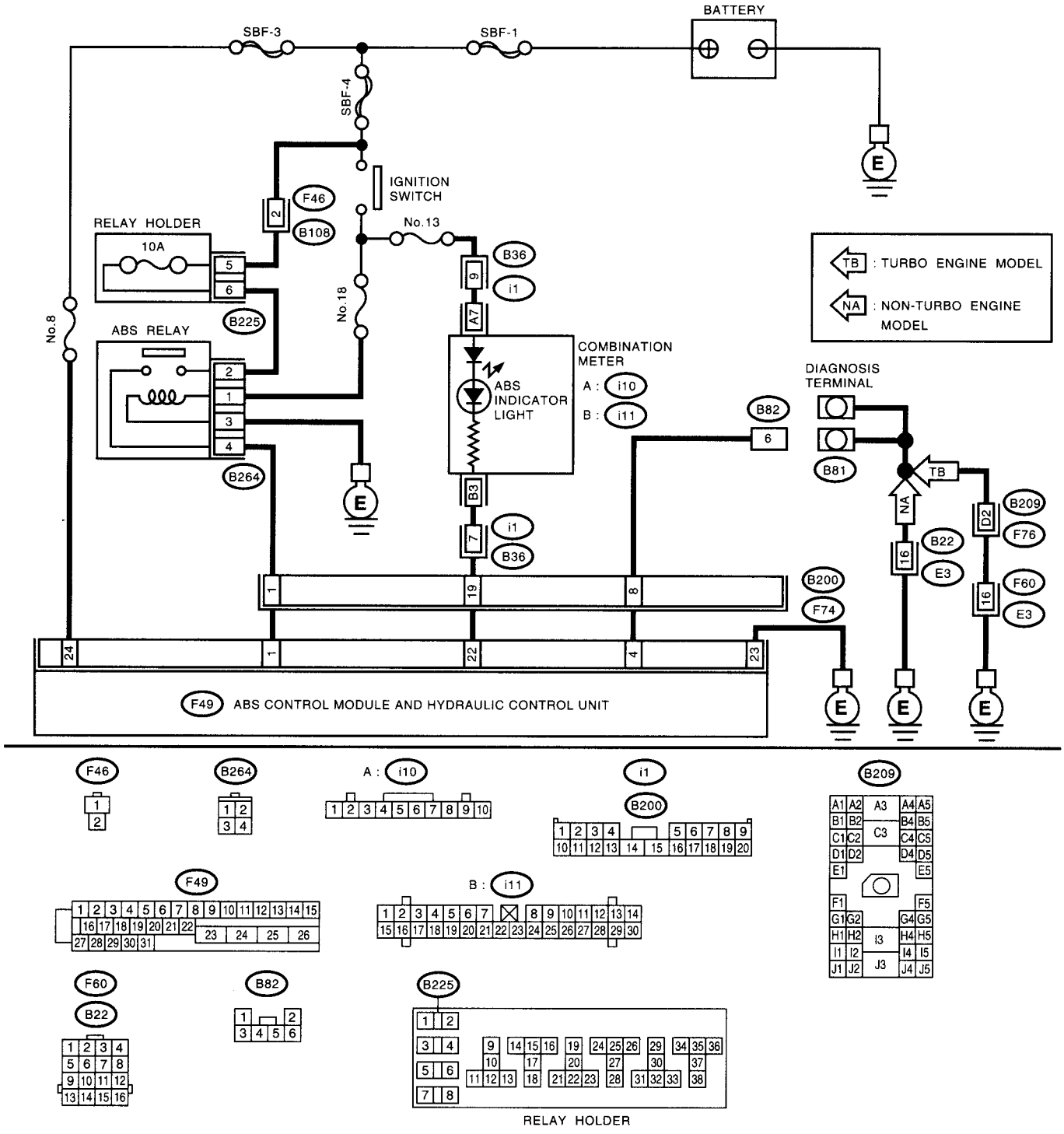
- Diagnosis circuit is open.

TROUBLE SYMPTOM:

- The ABS warning light turns on or off normally but the start code cannot be read out in the diagnostic mode.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

WIRING DIAGRAM:



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DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Check	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 resistance less than 0.5 Ω?	Go to step **2.**	Repair the diagnosis terminal harness.
2	**CHECK DIAGNOSIS LINE.** 1)Turn the ignition switch to OFF. 2)Connect the diagnosis terminal (B81) to diagnosis connector (B82) No. 6. 3)Disconnect the connector from ABSCM&H/U. 4)Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 4 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair 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?	Repair the connector.	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

D: 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-41, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

E: 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-41, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

F: 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-41, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

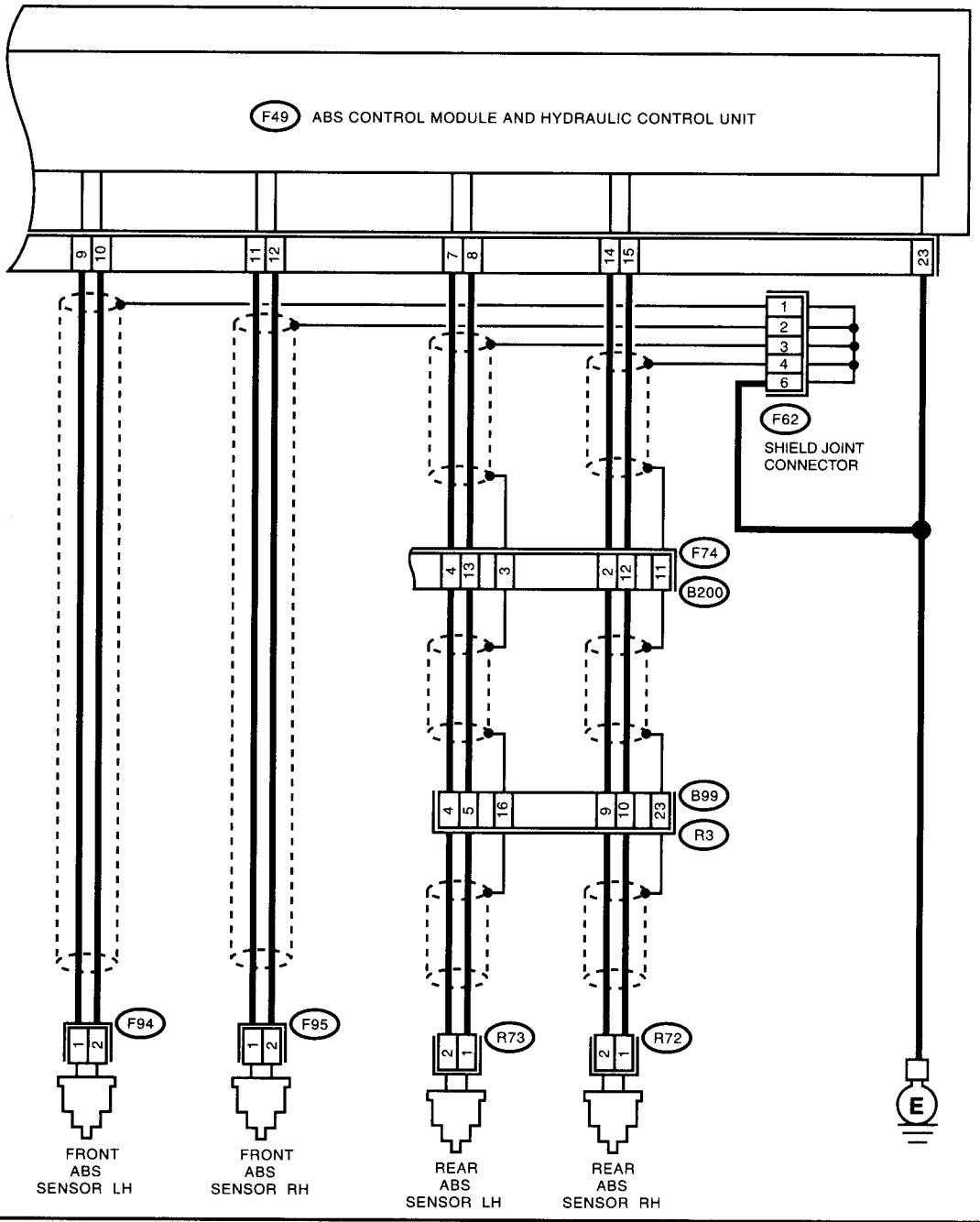
G: DTC 27
ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH)

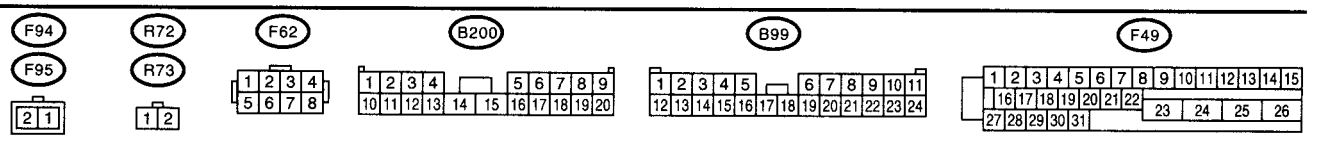
DIAGNOSIS:
- Faulty ABS sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:
- ABS does not operate.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

WIRING DIAGRAM:





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DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Check	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. ***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 resistance between 1 and 1.5 kΩ?	Go to step **2.**	Replace the ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-18, 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. 2 (+) — Chassis ground (–):*** ***Rear LH No. 2 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **3.**	Replace the ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-18, 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. 2 (+) — Chassis ground (–):*** ***Rear LH No. 2 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **4.**	Replace the ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-18, 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 / (F49) No. 11 — No. 12:*** ***DTC 23 / (F49) No. 9 — No. 10:*** ***DTC 25 / (F49) No. 14 — No. 15:*** ***DTC 27 / (F49) No. 7 — No. 8:***	Is the resistance between 1 and 1.5 kΩ?	Go to step **5.**	Repair harness/connector between ABSCM&H/U and ABS sensor.
5	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 21 / (F49) No. 11 (+) — Chassis ground (–):*** ***DTC 23 / (F49) No. 9 (+) — Chassis ground (–):*** ***DTC 25 / (F49) No. 14 (+) — Chassis ground (–):*** ***DTC 27 / (F49) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **6.**	Repair harness between ABSCM&H/U and ABS sensor.

	Step	Check	Yes	No
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 / (F49) No. 11 (+) — Chassis ground (–):*** ***DTC 23 / (F49) No. 9 (+) — Chassis ground (–):*** ***DTC 25 / (F49) No. 14 (+) — Chassis ground (–):*** ***DTC 27 / (F49) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **7.**	Repair harness between ABSCM&H/U and ABS sensor.
7	**CHECK INSTALLATION OF ABS SENSOR.** Turn the ignition switch to OFF. ***Tightening torque:*** ***32 N·m (3.3 kgf-m, 24 ft-lb)***	Are the ABS sensor installation bolts tightened securely?	Go to step **8.**	Tighten the ABS sensor installation bolts securely.
8	**CHECK ABS SENSOR GAP.** Measure the tone wheel to ABS sensor piece gap over entire perimeter of the wheel. ***Front wheel*** ***0.3 — 0.8 mm (0.012 — 0.031 in)*** ***Rear wheel*** ***0.7 — 1.2 mm (0.028 — 0.047 in)***	Is the gap within the specifications?	Go to step **9.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
9	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **10.**	Replace the tone wheel. Front: <Ref. to ABS-21, Front Tone Wheel.> Rear: <Ref. to ABS-22, 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 resistance more than 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-18, Rear ABS Sensor.> and <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

	Step	Check	Yes	No
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 / (F49) No. 11 — Chassis ground:*** ***DTC 23 / (F49) No. 9 — Chassis ground:*** ***DTC 25 / (F49) No. 14 — Chassis ground:*** ***DTC 27 / (F49) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **12.**	Repair harness between ABSCM&H/U and ABS sensor. Replace 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?	Repair the connector.	Go to step **13.**
13	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **14.**
14	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact. NOTE: Check harness and connectors between ABSCM&H/U and ABS sensor.

H: DTC 22
ABNORMAL ABS SENSOR (FRONT RH)

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-47, DTC 28 ABNORMAL ABS SENSOR (REAR LH), Diagnostics Chart with Diagnosis Connector.>

I: DTC 24
ABNORMAL ABS SENSOR (FRONT LH)

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-47, DTC 28 ABNORMAL ABS SENSOR (REAR LH), Diagnostics Chart with Diagnosis Connector.>

J: DTC 26
ABNORMAL ABS SENSOR (REAR RH)

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-47, DTC 28 ABNORMAL ABS SENSOR (REAR LH), Diagnostics Chart with Diagnosis Connector.>

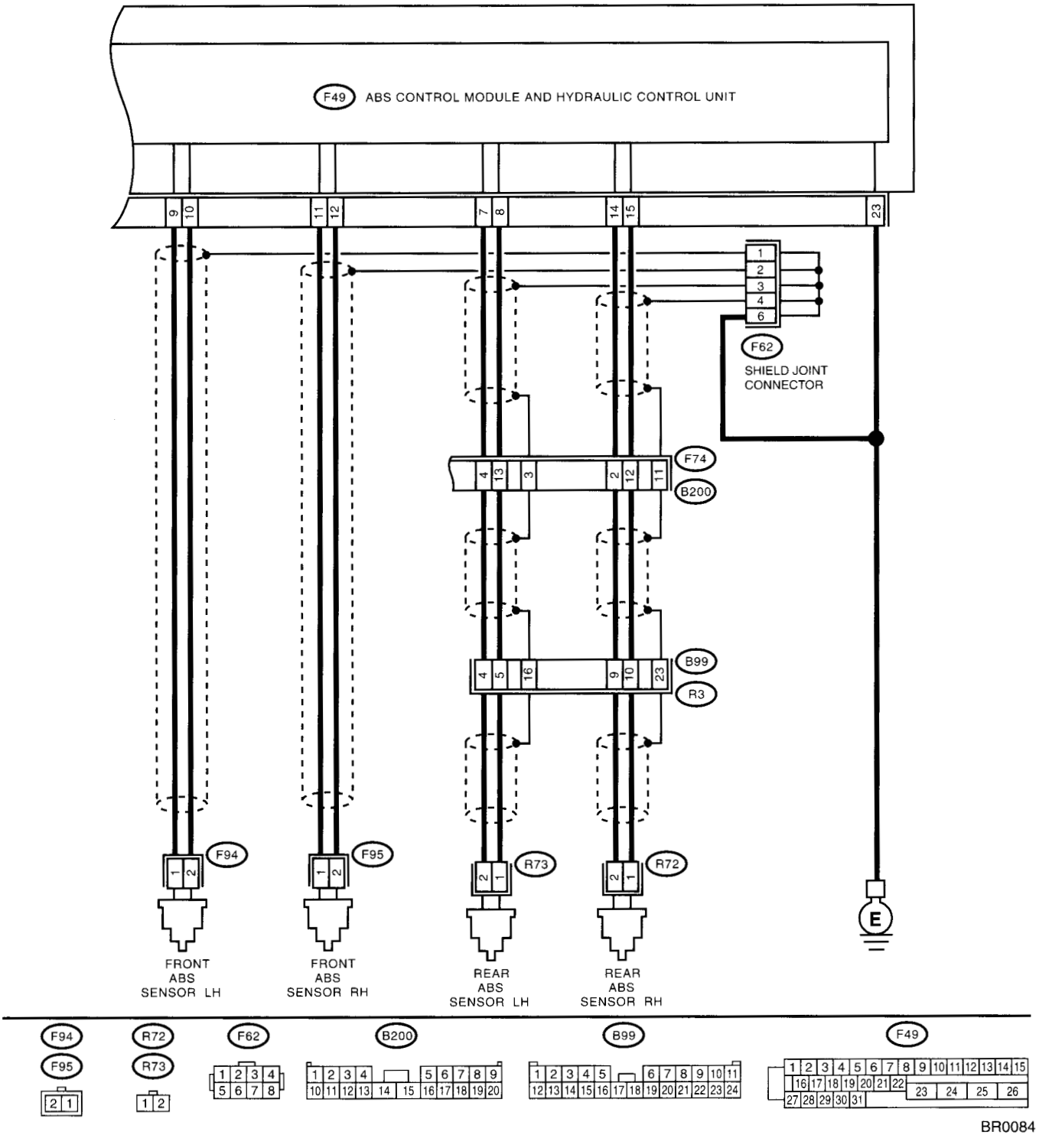
K: DTC 28
ABNORMAL ABS SENSOR (REAR LH)

DIAGNOSIS:
- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

TROUBLE SYMPTOM:
- ABS does not operate.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INSTALLATION OF ABS SENSOR.** Turn the ignition switch to OFF. ***Tightening torque:*** ***32 N·m (3.3 kgf-m, 24 ft-lb)***	Are the ABS sensor installation bolts tightened securely?	Go to step **2.**	Tighten the ABS sensor installation bolts securely.
2	**CHECK ABS SENSOR GAP.** Measure the tone wheel to ABS sensor piece gap over entire perimeter of the wheel. ***Front wheel*** ***0.3 — 0.8 mm (0.012 — 0.031 in)*** ***Rear wheel*** ***0.7 — 1.2 mm (0.028 — 0.047 in)***	Is the gap within the specifications?	Go to step **3.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
3	**PREPARE OSCILLOSCOPE.**	Is an oscilloscope 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 OFF. 3)Connect the oscilloscope to the connector. 4)Turn the ignition switch 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 the DTC 29. ***Connector & terminal*** ***DTC 22 /*** ***(F95) No. 1 (+) — No. 2 (–):*** ***DTC 24 /*** ***(F94) No. 1 (+) — No. 2 (–):*** ***DTC 26 /*** ***(B99) No. 9 (+) — No. 10 (–):*** ***DTC 28 /*** ***(B99) No. 4 (+) — No. 5 (–):***	Is the oscilloscope pattern 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 diagnostic trouble code.	Is the ABS sensor piece or the tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step **6.**
6	**CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.**	Are there broken or damaged in the ABS sensor piece or the tone wheel?	Replace the ABS sensor or tone wheel. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-18, Rear ABS Sensor.> and Front: <Ref. to ABS-21, Front Tone Wheel.> Rear: <Ref. to ABS-22, Rear Tone Wheel.>	Go to step **7.**

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Check	Yes	No
9	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **8.**	Replace the tone wheel. Front: <Ref. to ABS-21, Front Tone Wheel.> Rear: <Ref. to ABS-22, Rear Tone Wheel.>
8	**CHECK RESISTANCE OF ABS SENSOR.** 1)Turn the ignition switch OFF. 2)Disconnect the connector from ABS sensor. 3)Measure the resistance between ABS sensor connector terminals. ***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 resistance between 1 and 1.5 kΩ?	Go to step **9.**	Replace the ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-18, Rear ABS Sensor.>
	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 resistance more than 1 MΩ?	Go to step **10.**	Replace the ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-18, 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 / (F49) No. 11 — No. 12:*** ***DTC 24 / (F49) No. 9 — No. 10:*** ***DTC 26 / (F49) No. 14 — No. 15:*** ***DTC 28 / (F49) No. 7 — No. 8:***	Is the resistance between 1 and 1.5 kΩ?	Go to step **11.**	Repair harness/ connector between ABSCM&H/U and ABS sensor.
11	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 22 / (F49) No. 11 — Chassis ground:*** ***DTC 24 / (F49) No. 9 — Chassis ground:*** ***DTC 26 / (F49) No. 14 — Chassis ground:*** ***DTC 28 / (F49) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **12.**	Repair 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*** ***(F49) No. 23 — GND:***	Is the resistance less than 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?	Repair the connector.	Go to step **14.**
14	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car telephone or the wireless transmitter properly installed?	Go to step **15.**	Properly install the car telephone or the wireless transmitter.

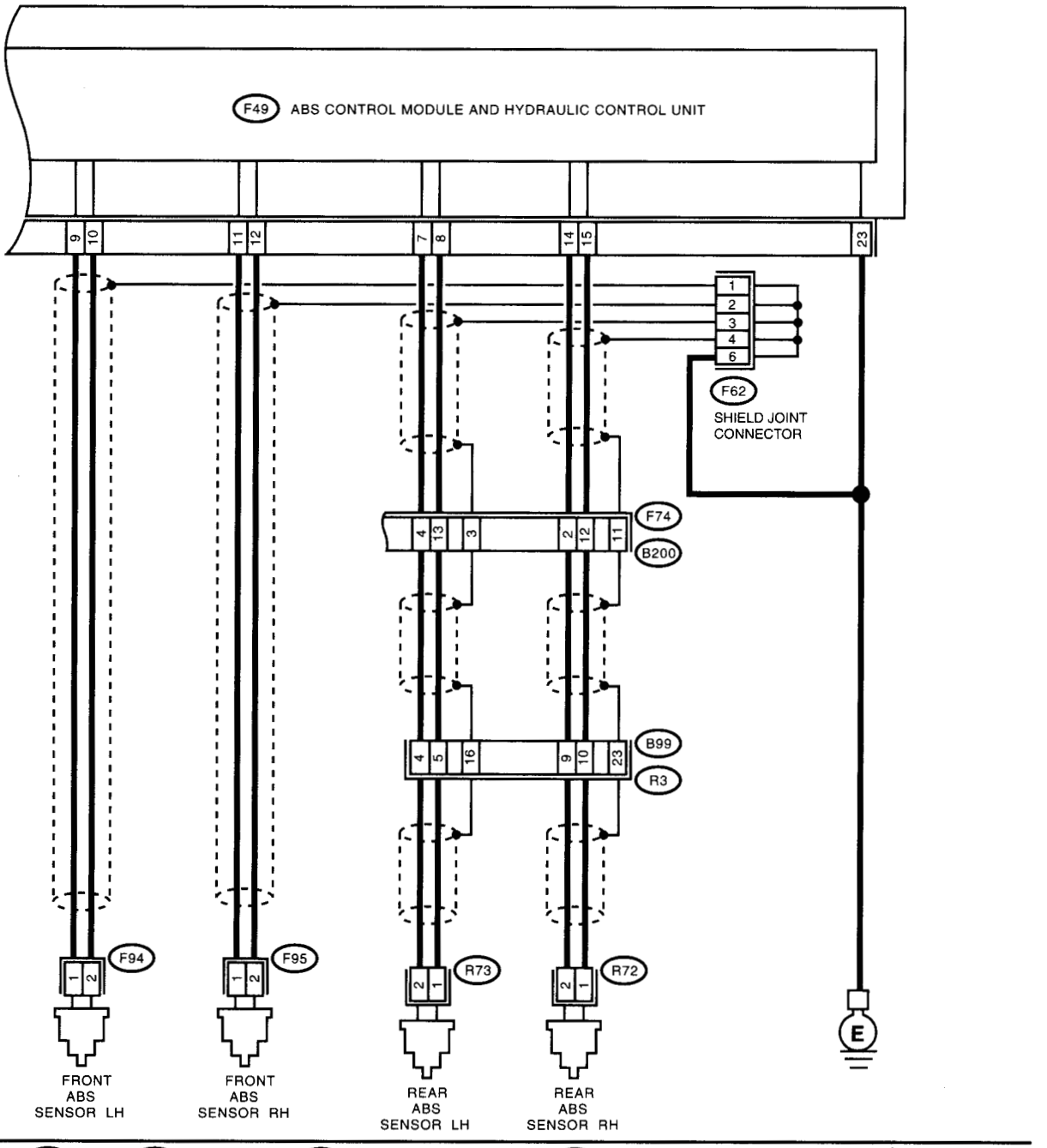
	Step	Check	Yes	No
5	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	nstall the noise sources apart from he sensor harness.	Go to step **16.**
6	**CHECK SHIELD CIRCUIT.** 1)Connect all connectors. 2)Measure the resistance between shield connector and chassis ground. ***Connector & terminal*** ***DTC 26 / (B200) No. 11 — Chassis ground:*** ***DTC 28 / (B200) No. 3 — Chassis ground*** NOTE: For the **DTC 22** and **24**: Go to step **17.**	Is the resistance less than 0.5 Ω?	Go to step **17.**	Repair the shield harness.
7	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **18.**
8	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary noise interference.

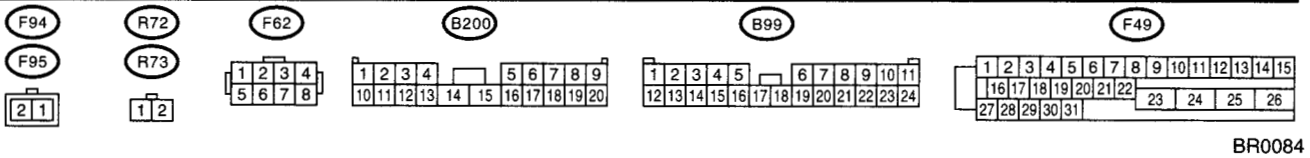
L: DTC 29
ABNORMAL ABS SENSOR SIGNAL (ANY ONE OF FOUR)

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.

WIRING DIAGRAM:





BR0084

	Step	Check	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 the vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface.	The ABS is normal. Erase the diagnostic trouble code. 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 trouble code may sometimes occur.	Go to step **2.**
2	**CHECK TIRE SPECIFICATIONS.** Turn the ignition switch to OFF.	Are the tire specifications correct?	Go to step **3.**	Replace the tire.
3	**CHECK WEAR OF TIRE.**	Is the tire worn excessively?	Replace the tire.	Go to step **4.**
4	**CHECK TIRE PRESSURE.**	Is the tire pressure correct?	Go to step **5.**	Adjust the tire pressure.
5	**CHECK INSTALLATION OF ABS SENSOR.** ***Tightening torque:*** ***32 N·m (3.3 kgf-m, 24 ft-lb)***	Are the ABS sensor installation bolts tightened securely?	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. ***Specifications*** ***Front wheel*** ***0.3 — 0.8 mm (0.012 — 0.031 in)*** ***Rear wheel*** ***0.7 — 1.2 mm (0.028 — 0.047 in)***	Is the gap within the specifications?	Go to step **7.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
7	**PREPARE OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **8.**	Go to step **9.**
8	**CHECK ABS SENSOR SIGNAL.** 1)Raise all four wheels off ground. 2)Turn the ignition switch OFF. 3)Connect the oscilloscope to the connector. 4)Turn the ignition switch 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*** ***(F95) No. 1 (+) — No. 2 (–):*** ***Front LH*** ***(F94) No. 1 (+) — No. 2 (–):*** ***Rear RH*** ***(B99) No. 9 (+) — No. 10 (–):*** ***Rear LH*** ***(B99) No. 4 (+) — No. 5 (–):***	Is the oscilloscope pattern smooth, as shown in figure?	Go to step **12.**	Go to step **9.**

	Step	Check	Yes	No
9	**CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.** Remove the disc rotor from hub.	Is the ABS sensor piece or the tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step **10.**
10	**CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.**	Are there broken or damaged teeth in the ABS sensor piece or the tone wheel?	Replace the ABS sensor or tone wheel. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-18, Rear ABS Sensor.> and Front: <Ref. to ABS-21, Front Tone Wheel.> Rear: <Ref. to ABS-22, Rear Tone Wheel.>	Go to step **11.**
11	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **12.**	Replace the tone wheel. Front: <Ref. to ABS-21, Front Tone Wheel.> Rear: <Ref. to ABS-22, Rear Tone Wheel.>
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 diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13.**
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

M: 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-57, DTC 37 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

N: 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-57, DTC 37 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

O: DTC 35
ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH)

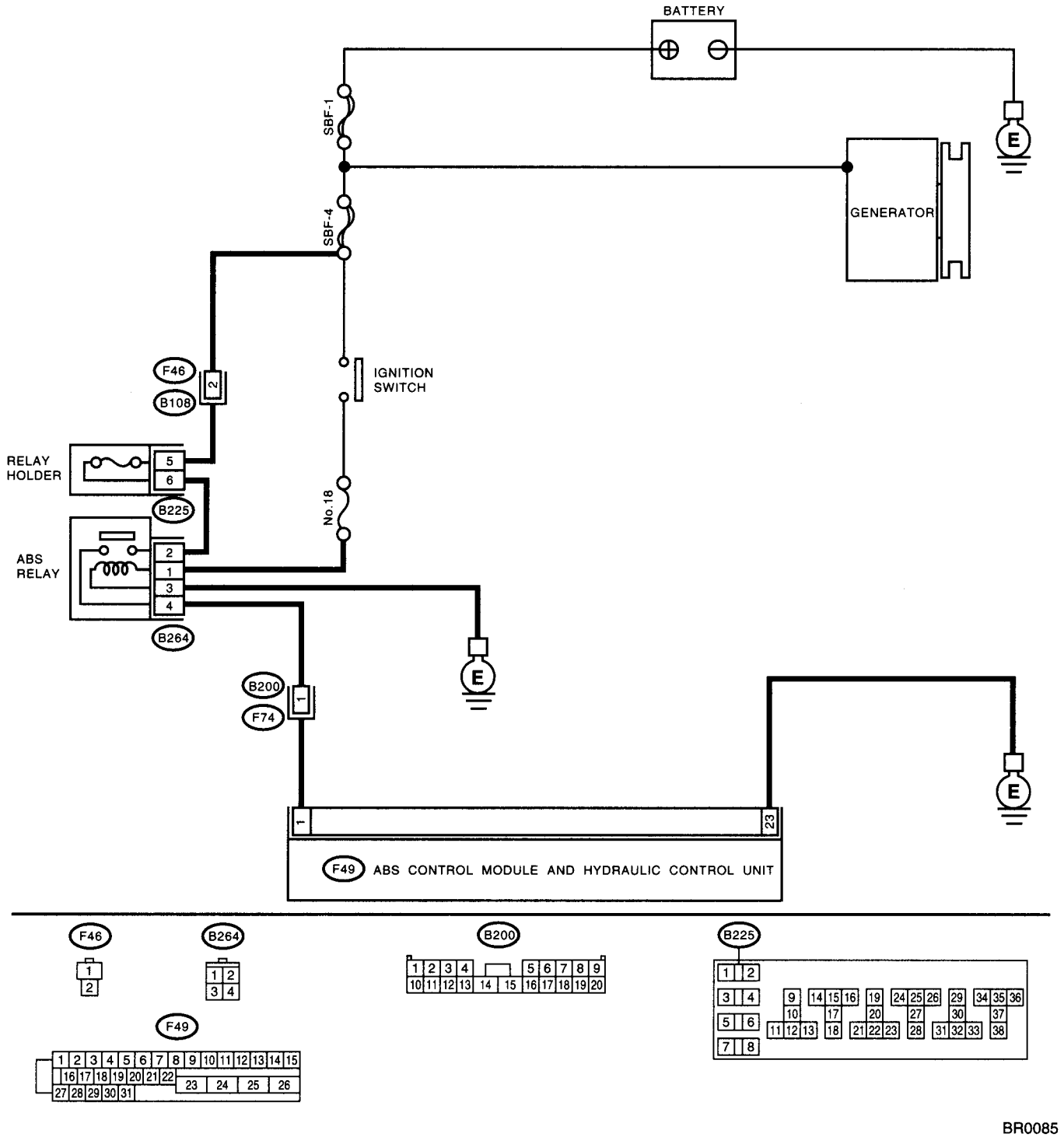
NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-57, DTC 37 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

P: 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.

WIRING DIAGRAM:



BR0085

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF RELAY HOLDER.** 1)Turn the ignition switch to OFF. 2)Remove the fuse. 3)Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B225) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Repair open circuit in harness between battery and Relay holder connector.
2	**CHECK RELAY HOLDER.**	Is the fuse blown out?	Replace the fuse.	Go to step **3.**
3	**CHECK INPUT VOLTAGE OF ABS RELAY.** 1)Install the fuse. 2)Remove the ABS relay. 3)Turn the ignition switch to ON. 4)Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Repair open circuit in harness between battery and Relay holder connector.
4	**CHECK INPUT VOLTAGE OF ABS RELAY.** Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **5.**	Repair harness connector between battery, ignition switch and ABS relay.
5	**CHECK GROUND CIRCUIT OF ABS RELAY.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 3 (+) — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **6.**	Repair open circuit between ABS relay and chassis ground.
6	**CHECK the ABS RELAY.** 1)Connect the battery to ABS relay terminal No. 1 and 3. 2)Measure the resistance between ABS relay terminals.	Is the resistance less than 10 Ω?	Go to step **7.**	Replace the ABS relay.
7	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1)Disconnect the connector from ABSCM&H/U. 2)Run the engine at idle. 3)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):***	Is the voltage between 10 and 15 V?	Go to step **8.**	Repair harness connector between ABS relay and ABSCM&H/U.
8	**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*** ***(F49) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **9.**	Repair the ABSCM&H/U ground harness.
9	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **10.**
10	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnositc trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **11.**

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Check	Yes	No
11	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

Q: 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-61, DTC 38 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

R: 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-61, DTC 38 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

S: DTC 36
ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH)

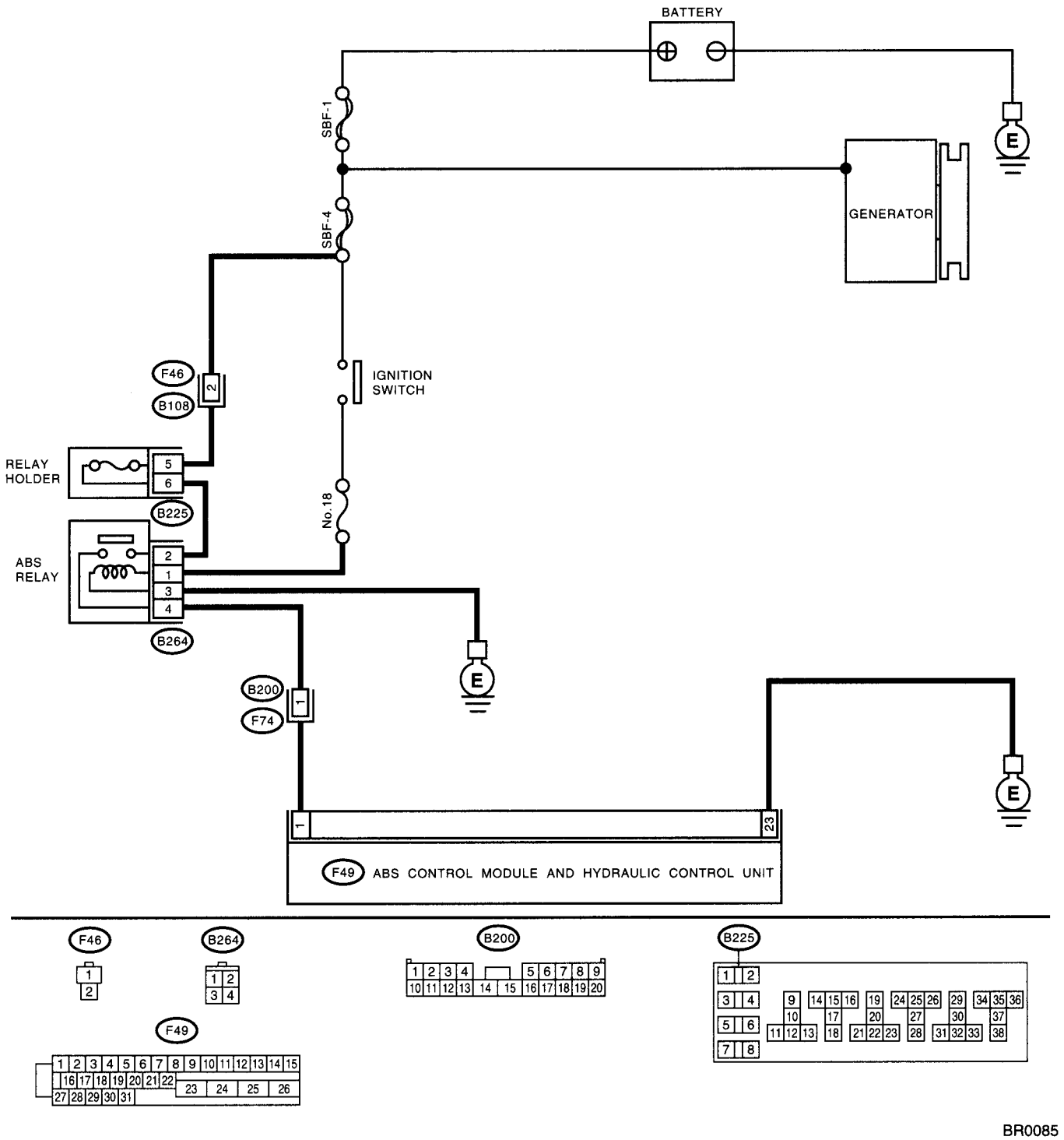
NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-61, DTC 38 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

T: 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.

WIRING DIAGRAM:



BR0085

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF RELAY HOLDER.** 1)Turn the ignition switch to OFF. 2)Remove the fuse. 3)Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B225) No. 5 (+) — Chassis ground (–):***	s the voltage more than 10 V?	Go to step **2.**	Repair open circuit n harness between battery and Relay holder connector.
2	**CHECK RELAY HOLDER.**	s the fuse blown out?	Replace the fuse.	Go to step **3.**
3	**CHECK INPUT VOLTAGE OF ABS RELAY.** 1)Install the fuse. 2)Remove the ABS relay. 3)Turn the ignition switch to ON. 4)Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 2 (+) — Chassis ground (–):***	s the voltage more than 10 V?	Go to step **4.**	Repair open circuit n harness between battery and Relay holder connector.
4	**CHECK INPUT VOLTAGE OF ABS RELAY.** Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 1 (+) — Chassis ground (–):***	s the voltage more than 10 V?	Go to step **5.**	Repair harness connector between battery, ignition switch and ABS relay.
5	**CHECK GROUND CIRCUIT OF ABS RELAY.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 3 (+) — Chassis ground:***	s the resistance less than 5 Ω?	Go to step **6.**	Repair open circuit between ABS relay and chassis ground.
6	**CHECK ABS RELAY.** 1)Connect the battery to ABS relay terminal No. 1 and 3. 2)Measure the resistance between ABS relay terminals.	s the resistance less than 10 Ω?	Go to step **7.**	Replace the ABS relay.
7	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1)Disconnect the connector from ABSCM&H/U. 2)Run the engine at idle. 3)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):***	s the voltage between 10 and 15 V?	Go to step **8.**	Repair harness connector between battery, ignition switch and ABSCM&H/U.
8	**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*** ***(F49) No. 23 — Chassis ground:***	s the resistance less than 0.5 Ω?	Go to step **9.**	Repair the ABSCM&H/U ground harness.
9	**CHECK POOR CONTACT IN CONNECTORS**	s there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **10.**
10	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	s the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **11.**

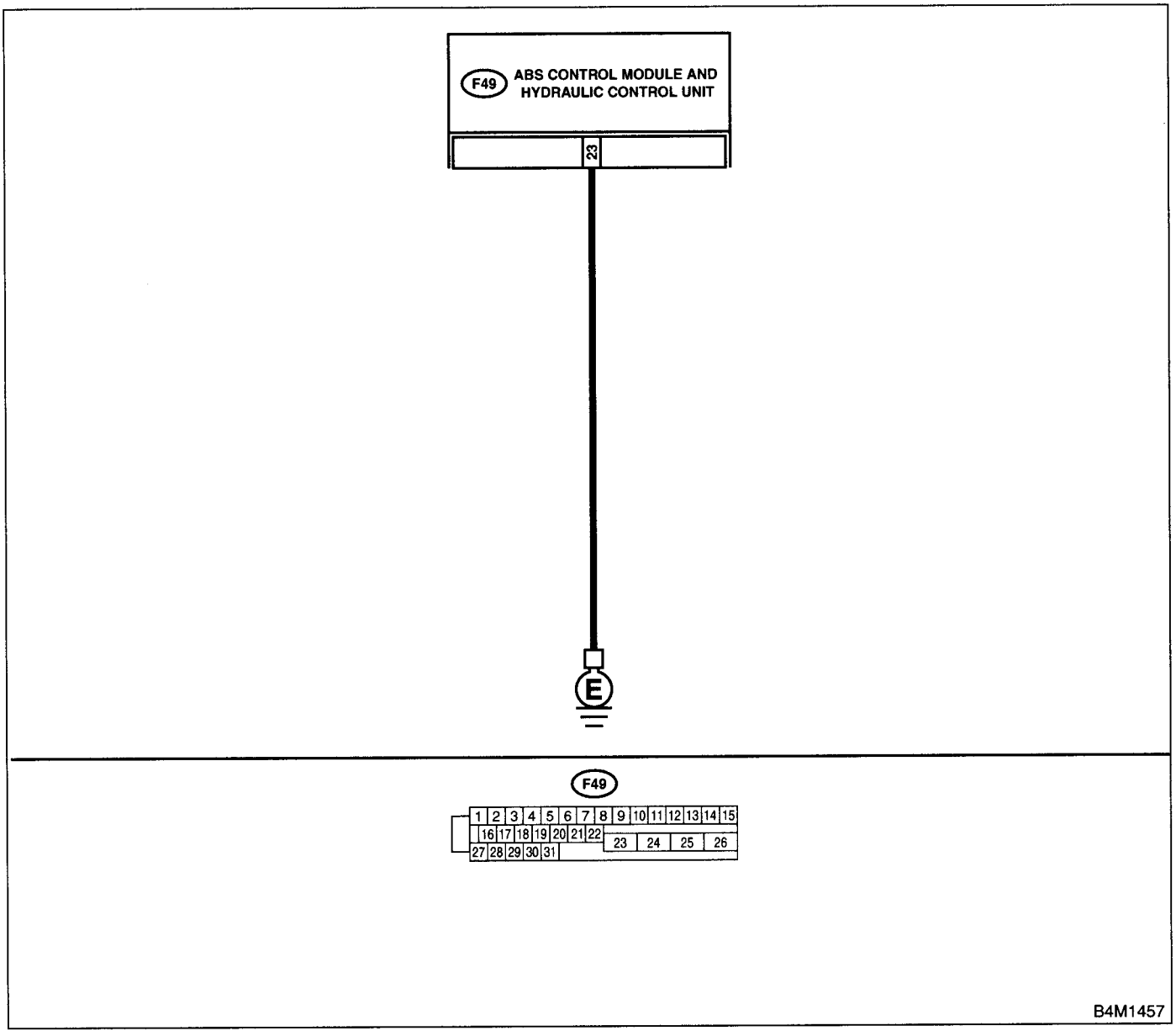
	Step	Check	Yes	No
11	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

U: DTC 41
ABNORMAL ABS CONTROL MODULE

DIAGNOSIS:
- Faulty ABSCM&H/U.

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:



	Step	Check	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*** ***(F49) No. 23 — Chassis ground:***	Is the resistance less than 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?	Repair the connector.	Go to step **3.**
3	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car telephone or the wireless transmitter properly installed?	Go to step **4.**	Properly install the car telephone or the wireless transmitter.
4	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from the sensor harness.	Go to step **5.**
5	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

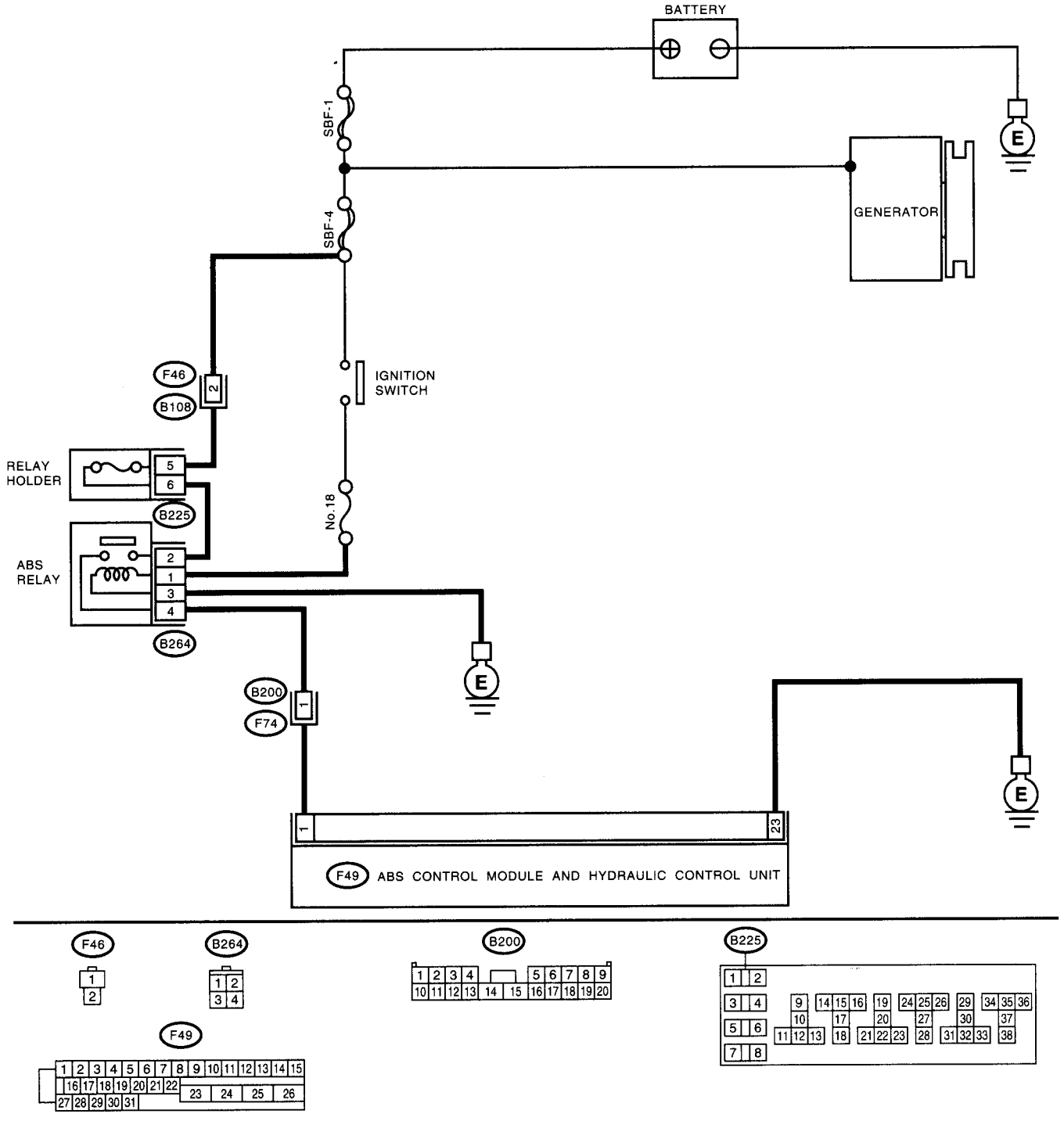
V: DTC 42
SOURCE VOLTAGE IS ABNORMAL

DIAGNOSIS:
- Power source voltage of the ABSCM&H/U is low or high.

TROUBLE SYMPTOM:
- ABS does not operate.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

WIRING DIAGRAM:



BR0085

Step	Check	Yes	No
CHECK GENERATOR. 1)Start the engine. 2)Idling after warm-up. 3)Measure the voltage between generator B terminal and chassis ground. ***Terminal*** ***Generator B terminal — Chassis ground:***	s the voltage between 10 and 7 V?	Go to step **2.**	Repair the generator. <Ref. to SC-13, Generator.>
CHECK BATTERY TERMINAL. Turn the ignition switch to OFF.	re the positive and negative attery terminals tightly lamped?	Go to step **3.**	Tighten the clamp of terminal.
CHECK INPUT VOLTAGE OF RELAY HOLDER. 1)Turn the ignition switch to OFF. 2)Remove the fuse. 3)Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B225) No. 5 (+) — Chassis ground (–):***	s the voltage more than 10 V?	Go to step **4.**	Repair open circuit n harness between battery and Relay holder connector.
CHECK RELAY HOLDER.	s the fuse blown out?	Replace the fuse.	Go to step **5.**
CHECK INPUT VOLTAGE OF ABS RELAY. 1)Install the fuse. 2)Remove the ABS relay. 3)Turn the ignition switch to ON. 4)Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 2 (+) — Chassis ground (–):***	s the voltage more than 10 V?	Go to step **6.**	Repair open circuit in harness between battery and Relay holder connector.
CHECK INPUT VOLTAGE OF ABS RELAY. Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 1 (+) — Chassis ground (–):***	s the voltage more than 10 V?	Go to step **7.**	Repair harness connector between battery, ignition switch and ABS relay.
CHECK GROUND CIRCUIT OF ABS RELAY. 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 3 (+) — Chassis ground:***	s the resistance less than 5 Ω?	Go to step **8.**	Repair open circuit between ABS relay and chassis ground.
CHECK ABS RELAY. 1)Connect the battery to ABS relay terminal No. 1 and 3. 2)Measure the resistance between ABS relay terminals.	s the resistance less than 10 Ω?	Go to step **9.**	Replace the ABS relay.
CHECK INPUT VOLTAGE OF ABSCM&H/U. 1)Disconnect the connector from ABSCM&H/U. 2)Run the engine at idle. 3)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):***	s the voltage between 10 and 17 V?	Go to step **10.**	Repair harness connector between battery, ignition switch and ABSCM&H/U.
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*** ***(F49) No. 23 — Chassis ground:***	s the resistance less than 0.5 Ω?	Go to step **11.**	Repair the ABSCM&H/U ground harness.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

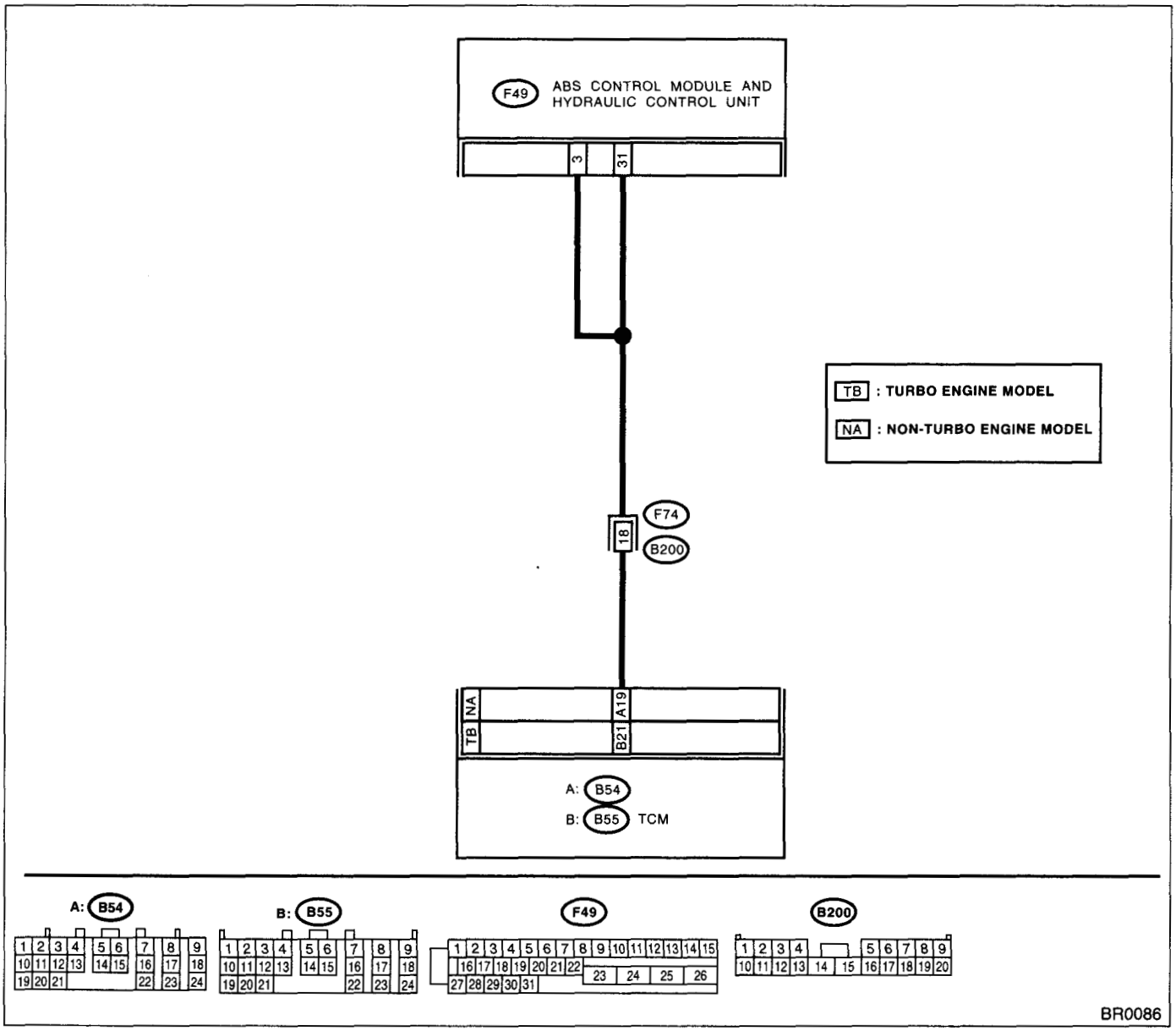
	Step	Check	Yes	No
11	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **12.**
12	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13.**
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

W: DTC 44
A COMBINATION OF AT CONTROL ABNORMAL

DIAGNOSIS:
- Combination of AT control faults

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Check	Yes	No
1	**CHECK SPECIFICATIONS OF THE ABSCM&H/U.** Check specifications of the mark to the ABSCM&H/U. ***CC: AT*** ***CD: MT***	Is an ABSCM&H/U for AT model installed on a MT model?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **2.**
2	**CHECK GROUND SHORT OF HARNESS.** 1)Turn the ignition switch to OFF. 2)Disconnect 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*** ***(F49) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair 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*** ***(F49) No. 3 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **4.**	Repair 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*** ***(F49) No. 3 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **5.**	Repair 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*** ***NON-TURBO MODEL*** ***(B54) No. 19 (+) — Chassis ground (–):*** ***TURBO MODEL*** ***(B55) No. 21 (+) — Chassis ground (–):***	Is the voltage between 10 and 15 V?	Go to step **7.**	Go to step **6.**
6	**CHECK AT.**	Is the AT functioning normally?	Replace the TCM.	Repair the AT.
7	**CHECK OPEN CIRCUIT OF HARNESS.** Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 3 (+) — Chassis ground (–):*** ***(F49) No. 31 (+) — Chassis ground (–):***	Is the voltage between 10 and 15 V?	Go to step **8.**	Repair 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?	Repair the connector.	Go to step **9.**
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 diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **10.**

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

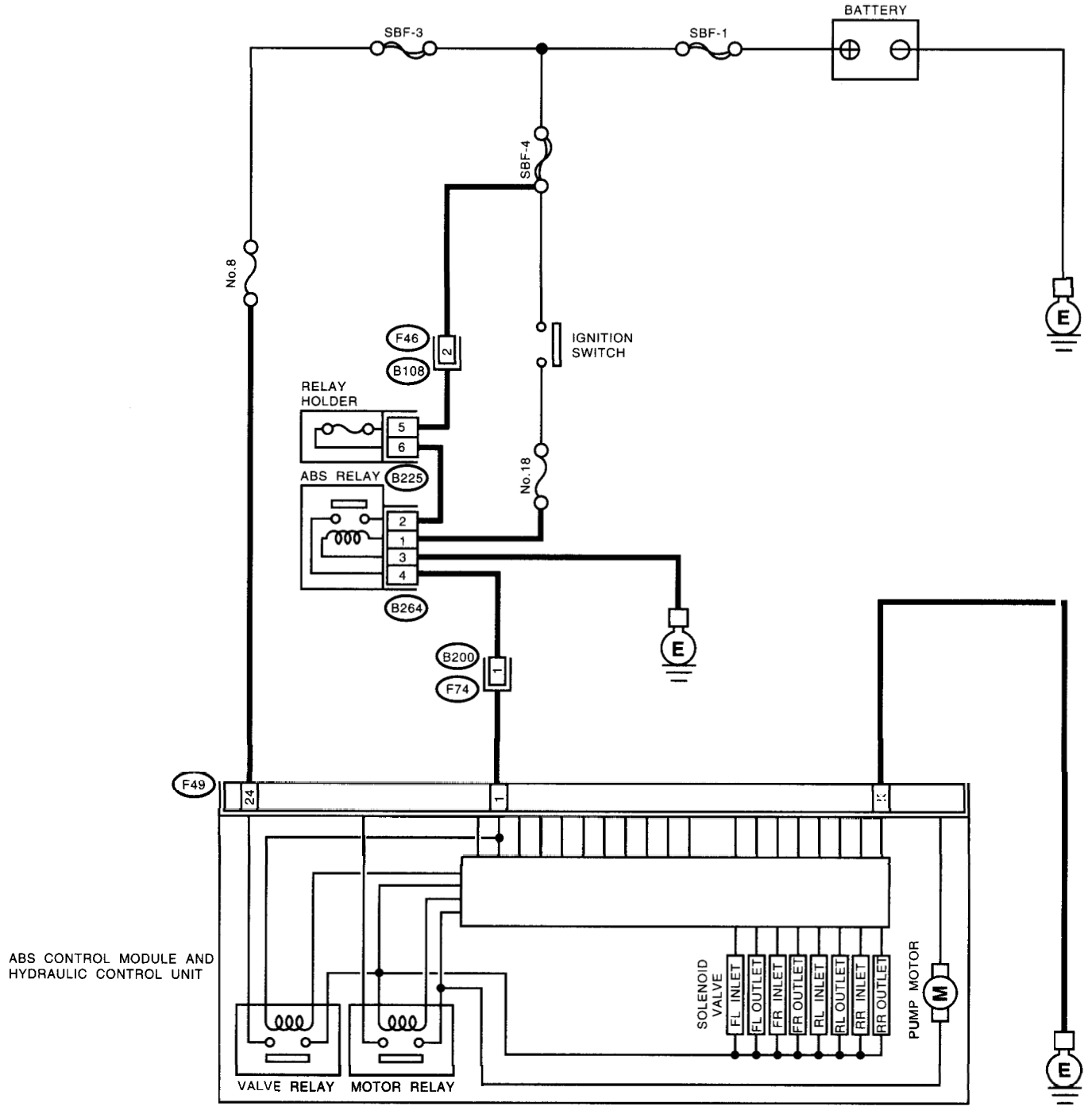
	Step	Check	Yes	No
10	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

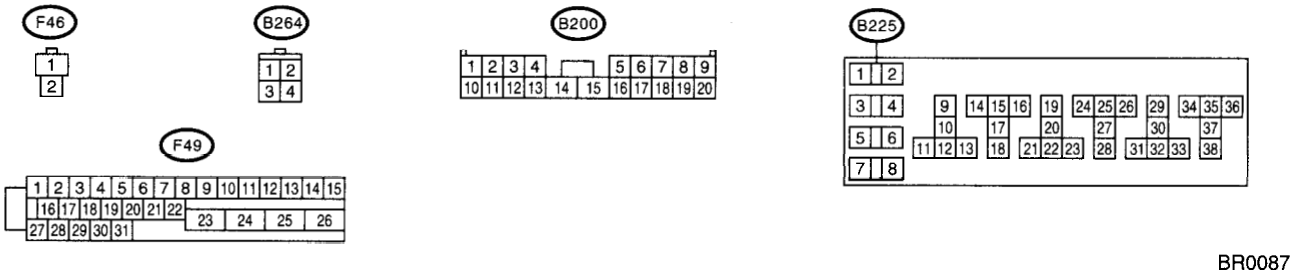
X: DTC 51
ABNORMAL VALVE RELAY

DIAGNOSIS:
- Faulty valve relay

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:





BR0087

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF RELAY HOLDER.** 1)Turn the ignition switch to OFF. 2)Remove the fuse. 3)Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B225) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Repair open circuit in harness between battery and relay holder connector.
2	**CHECK RELAY HOLDER.**	Is the fuse blown out?	Replace fuse.	Go to step **3.**
3	**CHECK INPUT VOLTAGE OF ABS RELAY.** 1)Install the fuse. 2)Remove the ABS relay. 3)Turn the ignition switch to ON. 4)Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Repair open circuit in harness between battery and relay holder connector.
4	**CHECK INPUT VOLTAGE OF ABS RELAY.** Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **5.**	Repair harness connector between battery, ignition switch and ABS relay.
5	**CHECK GROUND CIRCUIT OF ABS RELAY.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 3 (+) — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **6.**	Repair open circuit between ABS relay and chassis ground.
6	**CHECK ABS RELAY.** 1)Connect the battery to ABS relay terminal No. 1 and 3. 2)Measure the resistance between ABS relay terminals.	Is the resistance less than 10 Ω?	Go to step **7.**	Replace the ABS relay.
7	**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*** ***(F49) No. 1 (+) — Chassis ground (–):*** ***(F49) No. 24 (+) — Chassis ground (–):***	Is the voltage between 10 and 15 V?	Go to step **8.**	Repair harness connector between battery, ABS relay and ABSCM&H/U.
8	**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*** ***(F49) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **9.**	Repair the ABSCM&H/U ground harness.
9	**CHECK VALVE RELAY IN ABSCM&H/U.** Measure the resistance between ABSCM&H/U and terminals. ***Terminals*** ***No. 23 (+) — No. 24 (–):***	Is the resistance more than 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 POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **11.**

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Check	Yes	No
11	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **12.**
12	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

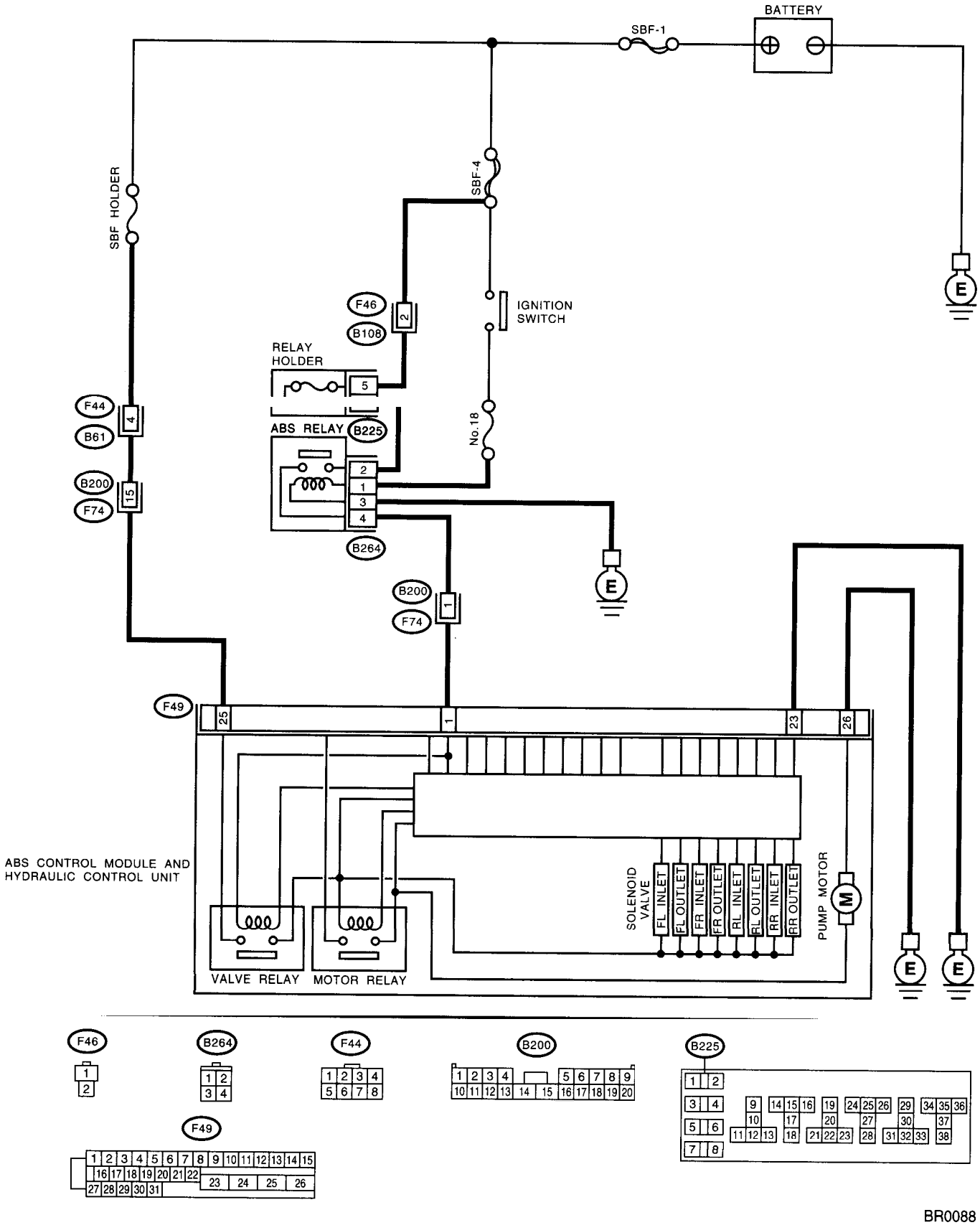
Y: DTC 52
ABNORMAL MOTOR AND/OR MOTOR RELAY

DIAGNOSIS:
- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:
- ABS does not operate.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

WIRING DIAGRAM:



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DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Check	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*** ***(F49) No. 25 (+) — Chassis ground (–):***	Is the voltage between 10 and 15 V?	Go to step **2.**	Repair 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*** ***(F49) No. 26 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK INPUT VOLTAGE OF RELAY HOLDER.** 1)Turn the ignition switch to OFF. 2)Remove the fuse. 3)Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B225) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Repair open circuit in harness between battery and Relay holder connector.
4	**CHECK RELAY HOLDER.**	Is the fuse blown out?	Replace the fuse.	Go to step **5.**
5	**CHECK INPUT VOLTAGE OF ABS RELAY.** 1)Install the fuse. 2)Remove the ABS relay. 3)Turn the ignition switch to ON. 4)Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **6.**	Repair open circuit in harness between battery and Relay holder connector.
6	**CHECK INPUT VOLTAGE OF ABS RELAY.** Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **7.**	Repair harness connector between battery, ignition switch and ABS relay.
7	**CHECK GROUND CIRCUIT OF ABS RELAY.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 3 (+) — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **8.**	Repair open circuit between ABS relay and chassis ground.
8	**CHECK ABS RELAY.** 1)Connect the battery to ABS relay terminal No. 1 and 3. 2)Measure the resistance between ABS relay terminals.	Is the resistance less than 10 Ω?	Go to step **9.**	Replace the ABS relay.
9	**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*** ***(F49) No. 1 (+) — Chassis ground (–):***	Is the voltage between 10 and 15 V?	Go to step **10.**	Repair harness connector between battery, ignition switch and ABSCM&H/U.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

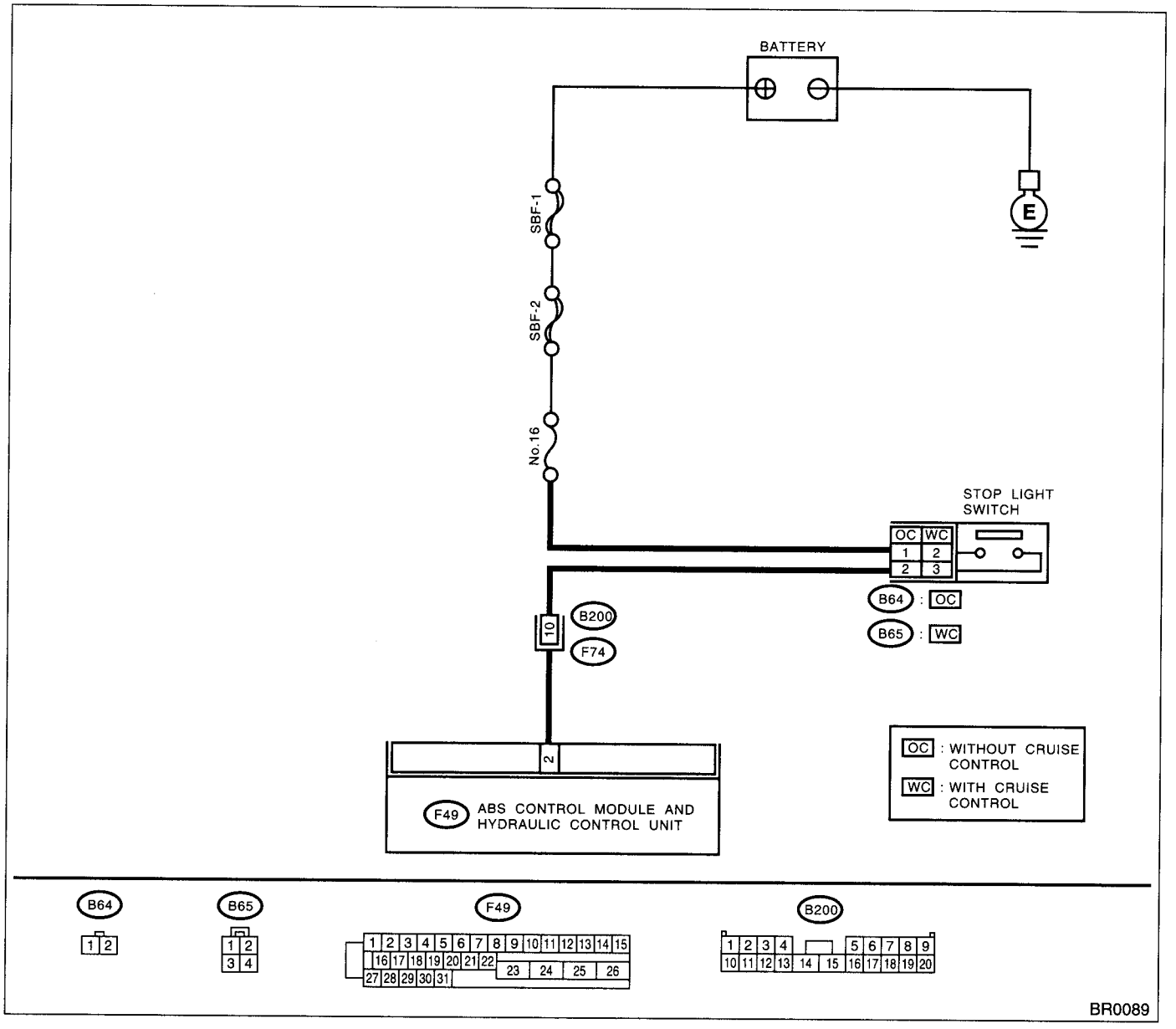
	Step	Check	Yes	No
10	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **11.**	Repair the ABSCM&H/U ground harness.
11	**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?	Go to step **12.**	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.** Turn the ignition switch to OFF.	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **13.**
13	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **14.**
14	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

Z: DTC 54
ABNORMAL STOP LIGHT SWITCH

DIAGNOSIS:
- Faulty stop light switch

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

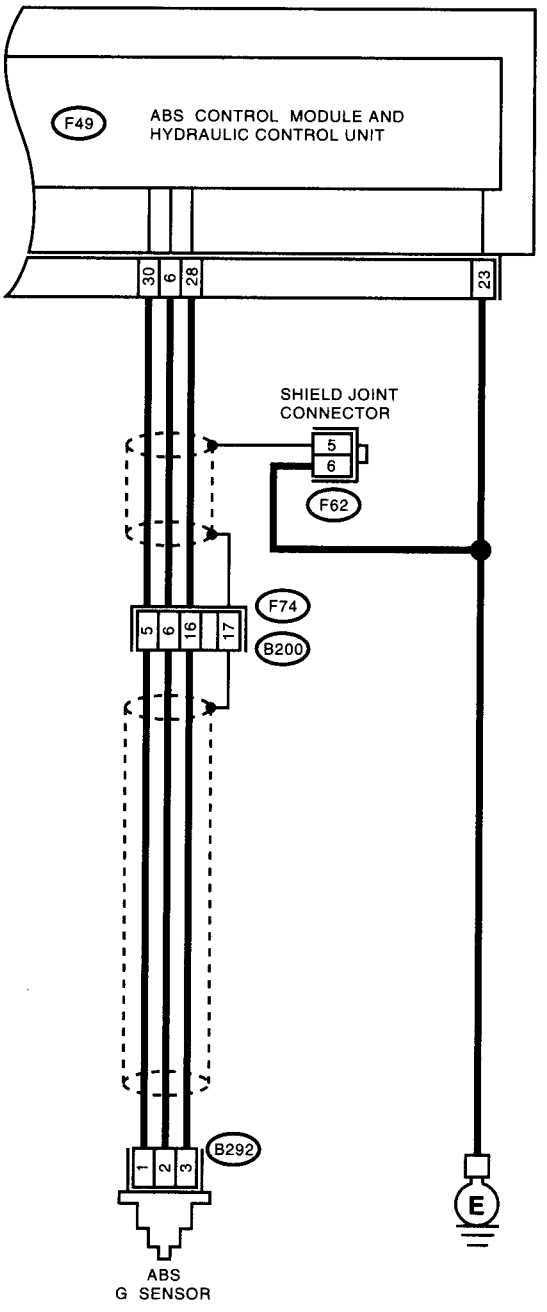
	Step	Check	Yes	No
1	**CHECK STOP LIGHTS COME ON.** Depress the brake pedal.	Do the stop lights come on?	Go to step **2.**	Repair the stop lights circuit.
2	**CHECK OPEN CIRCUIT IN HARNESS.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM& H/U. 3)Depress the brake pedal. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 2 (+) — Chassis ground (–):***	Is the voltage between 10 and 15 V?	Go to step **3.**	Repair 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?	Repair the connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

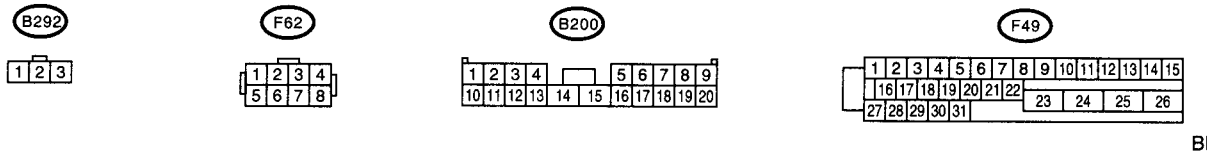
AA:DTC 56
ABNORMAL G SENSOR OUTPUT VOLTAGE

DIAGNOSIS:
- Faulty G sensor output voltage

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:





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DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Check	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 rolling road?	The ABS is normal. Erase the diagnostic trouble code.	Go to step **2.**
2	**CHECK SPECIFICATIONS OF ABSCM&H/U.** Check specifications of the mark to the ABSCM&H/U. ***CC: AT*** ***CD: MT***	Does the vehicle specification and the ABSCM&H/U specification match?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> **CAUTION:** **Be sure to turn ignition switch to OFF when removing ABSCM&H/U.**	Go to step **3.**
3	**CHECK INPUT VOLTAGE OF G SENSOR.** 1)Turn the ignition switch to OFF. 2)Remove the console box. 3)Disconnect the G sensor from body. (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 voltage between 4.75 and 5.25 V?	Go to step **4.**	Repair 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*** ***(F49) No. 6 — No. 28:***	Is the resistance between 4.3 and 4.9 kΩ?	Go to step **5.**	Repair 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*** ***(F49) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair 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*** ***(F49) No. 6 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **7.**	Repair harness between G sensor and ABSCM&H/U.
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*** ***(F49) No. 6 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **8.**	Repair harness between G sensor and ABSCM&H/U.

	Step	Check	Yes	No
8	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 28 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair 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 voltage between 2.1 and 2.4 V when G sensor is horizontal?	Go to step **10.**	Replace the G sensor. <Ref. to ABS-23, G Sensor.>
10	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage between 3.7 and 4.1 V when G sensor is inclined forwards to 90°?	Go to step **11.**	Replace the G sensor. <Ref. to ABS-23, G Sensor.>
11	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage between 0.5 and 0.9 V when G sensor is inclined backwards to 90°?	Go to step **12.**	Replace the G sensor. <Ref. to ABS-23, G Sensor.>
12	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair connector.	Go to step **13.**
13	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **14.**
14	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

AB:SELECT MONITOR

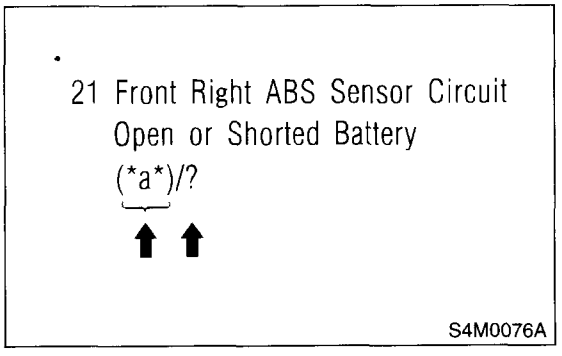
Applicable cartridge of select monitor: <Ref. to ABS-10, SPECIAL TOOLS, PREPARATION TOOL, General Description.>

NOTE:
For basic handling of the select monitor, refer to its Operation Manual.

AC:DIAGNOSTIC TROUBLE CODES (DTC) ARE DISPLAYED.

A maximum of 3 diagnostic trouble codes (DTC) are displayed in order of occurrence.

- If a particular diagnostic trouble code (DTC) is not properly stored in memory (due to a drop in ABSCM&H/U power supply, etc.) when a problem occurs, the diagnostic trouble code (DTC), followed by a question mark "?", appears on the select monitor display. This shows it may be an unreliable reading.



- *a* refers to the troubles in order of occurrence (Latest, Old, Older and Reference).

Display screen	Contents to be monitored
Latest	The most recent diagnostic trouble code (DTC) appears on the select monitor display.
Old	The second most recent diagnostic trouble code (DTC) appears on the select monitor display.
Older	The third most recent diagnostic trouble code (DTC) appears on the select monitor display.
Reference	A specified period of time proceeding diagnostic trouble code (DTC) appears on the select monitor display.

AD:CLEAR MEMORY

Display screen	Contents to be monitored
Clear memory?	Function of clearing diagnostic trouble code (DTC) and freeze frame data.

AE:ANALOG DATA ARE DISPLAYED.

Display screen	Contents to be monitored
FR wheel speed	Wheel speed detected by the Front Right ABS sensor is displayed in km/h or mile/h.
FL wheel speed	Wheel speed detected by the Front Left ABS sensor is displayed in km/h or mile/h.
RR wheel speed	Wheel speed detected by the Rear Right ABS sensor is displayed in km/h or mile/h.
RL wheel speed	Wheel speed detected by the Rear Left ABS sensor 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 the analog G sensor. It appears on the select monitor display in volts.

AF: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

AG: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.>

AH: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 diagnostic trouble code (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 the Front Right ABS sensor is displayed in km/h or mile/h.
FL wheel speed	Wheel speed detected by the Front Left ABS sensor is displayed in km/h or mile/h.
RR wheel speed	Wheel speed detected by the Rear Right ABS sensor is displayed in km/h or mile/h.
RL wheel speed	Wheel speed detected by the Rear Left ABS sensor 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	Refers to vehicle acceleration detected by the analog G sensor. It appears on the select monitor display in volts.
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

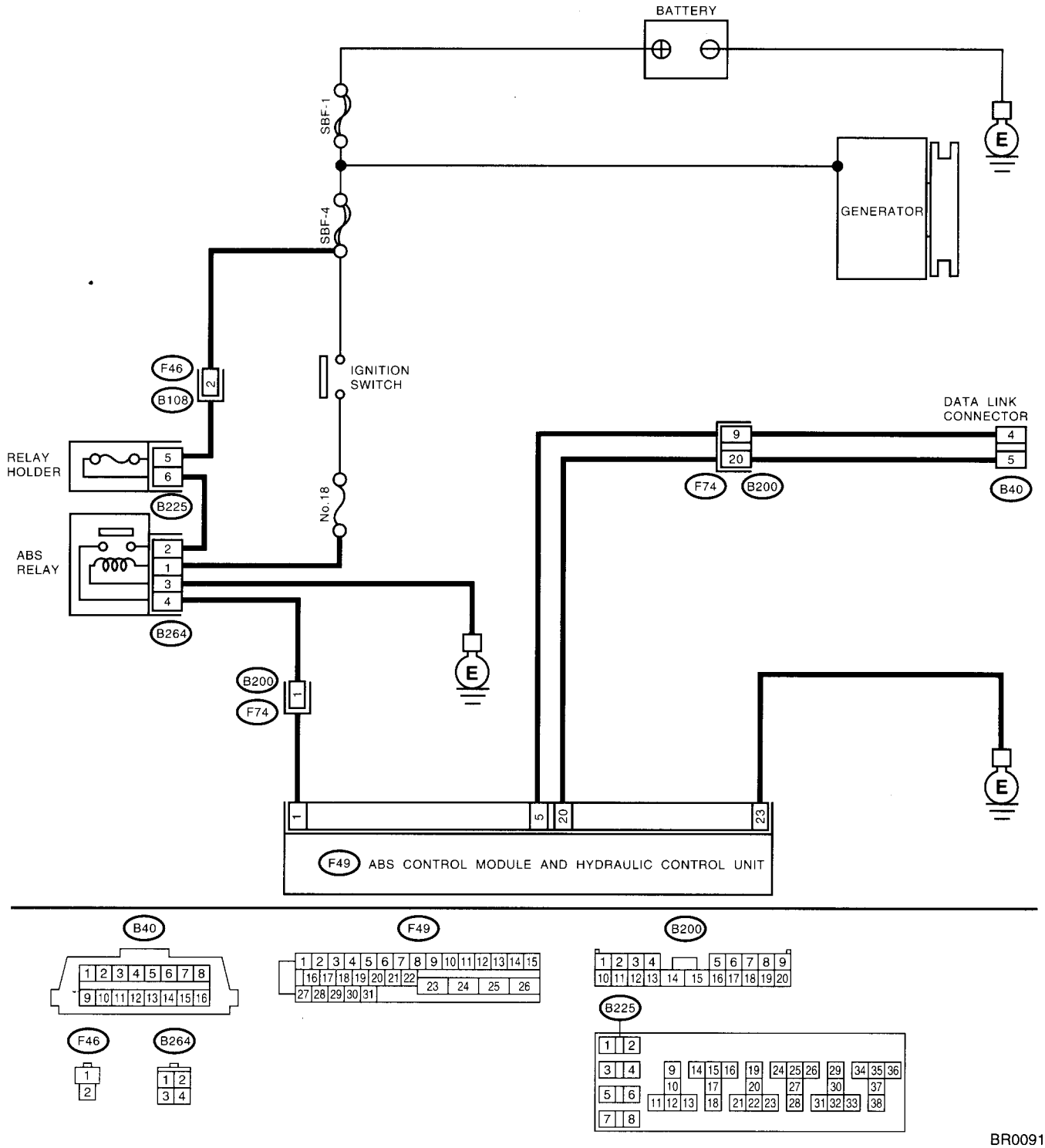
13.Diagnostics Chart with Subaru Select Monitor

A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DIAGNOSIS:
- Faulty harness connector

TROUBLE SYMPTOM:
- ABS warning light remains on.

WIRING DIAGRAM:



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	Step	Check	Yes	No
1	**CHECK IGNITION SWITCH.**	Is the ignition switch ON?	Go to step **2.**	Turn the ignition switch to ON, and select ABS mode using the select monitor.
2	**CHECK BATTERY.** 1)Turn the ignition switch to OFF. 2)Measure the battery voltage.	Is the voltage more than 11 V?	Go to step **3.**	Charge or replace bettery.
3	**CHECK BATTERY TERMINAL.**	Is there poor contact at battery terminal?	Repair or tighten the battery terminal.	Go to step **4.**
4	**CHECK COMMUNICATION OF SELECT MONITOR.** 1)Turn the ignition switch to OFF. 2)Using the select monitor, check whether communication to other system (such as engine, TCM, etc.) can be executed normally.	Are the name and year of the system displayed on the select monitor?	Go to step **10.**	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)Check whether communication to other systems (such as TCM, engine etc.) can be executed normally.	Are the name and year of the system displayed on the select monitor?	Go to step **10.**	Go to step **6.**
6	**CHECK COMMUNICATION OF SELECT MONITOR.** 1)Turn the ignition switch to OFF. 2)Connect the ABSCM&H/U connector. 3)Disconnect the ECM connector. 4)Check whether communication to other systems (such as TCM, engine etc.) can be executed normally.	Are the name and year of the system displayed on the select monitor?	Inspect the ECM.	Go to step **7.**
7	**CHECK COMMUNICATION OF SELECT MONITOR.** 1)Turn the ignition switch to OFF. 2)Connect the ECM connector. 3)Disconnect the TCM connector. 4)Check whether communication to other systems (such as engine etc.) can be executed normally.	Are the name and year of the system displayed on the select monitor?	Inspect the TCM.	Go to step **8.**
8	**CHECK COMMUNICATION OF SELECT MONITOR.** 1)Turn the ignition switch to OFF. 2)Connect the TCM connector. 3)Disconnect the cruise control module connector. 4)Check whether communication to other systems (such as engine, TCM etc.) can be executed normally. NOTE: If the vehicle is not equipped with cruise control: Go to step **9.**	Are the name and year of the system displayed on the select monitor?	Inspect the cruise control module.	Go to step **9.**

	Step	Check	Yes	No
9	**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, and, cruise control module connectors. 3)Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B40) No. 5 — Chassis ground:*** ***(B40) No. 4 — Chassis ground:***	s the resistance less than 1 Ω?	Go to step **10.**	Repair harness and connector between each control module and data link connector.
10	**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 (–):***	s the voltage more than 1 V?	Repair harness and connector between each control module and data link connector.	Go to step **11.**
11	**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*** ***(F49) No. 20 — (B40) No. 5:*** ***(F49) No. 5 — (B40) No. 4:***	s the resistance less than 0.5 Ω?	Repair harness and connector between ABSCM&H/U and data link connector.	Go to step **12.**
12	**CHECK INSTALLATION OF ABSCM&H/U CONNECTOR.** Turn the ignition switch to OFF.	s the ABSCM&H/U connector nserted into ABSCM&H/U until he clamp locks onto it?	Go to step **13.**	nsert ABSCM&H/U connector into ABSCM&H/U.
13	**CHECK INPUT VOLTAGE OF RELAY HOLDER.** 1)Turn the ignition switch to OFF. 2)Remove the fuse. 3)Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B225) No. 5 (+) — Chassis ground (–):***	s the voltage more than 10 V?	Go to step **14.**	Repair open circuit n harness between battery and Relay holder connector.
14	**CHECK RELAY HOLDER.**	s the fuse blown out?	Replace the fuse.	Go to step **15.**
15	**CHECK INPUT VOLTAGE OF ABS RELAY.** 1)Install the fuse. 2)Remove the ABS relay. 3)Turn the ignition switch to ON. 4)Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 2 (+) — Chassis ground (–):***	s the voltage more than 10 V?	Go to step **16.**	Repair open circuit n harness between battery and Relay holder connector.
16	**CHECK INPUT VOLTAGE OF ABS RELAY.** Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 1 (+) — Chassis ground (–):***	s the voltage more than 10 V?	Go to step **17.**	Repair harness connector between battery, gnition switch and ABS relay.
17	**CHECK GROUND CIRCUIT OF ABS RELAY.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 3 (+) — Chassis ground:***	s the resistance less 5 Ω?	Go to step **18.**	Repair open circuit between ABS relay and chassis ground.

	Step	Check	Yes	No
18	**CHECK ABS RELAY.** 1)Connect the battery to ABS relay terminal No. 1 and 3. 2)Measure the resistance between ABS relay terminals.	Is the resistance less than 10 Ω?	Go to step **19.**	Replace the ABS relay.
19	**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*** ***(F49) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **20.**	Repair open circuit in harness between ABSCM&H/U and battery.
20	**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*** ***(F49) No. 23 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **21.**	Repair open circuit in harness between ABSCM&H/U and inhibitor side connector, and poor contact in coupling connector.
21	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in control module power supply, ground line and data link connector?	Repair the connector.	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

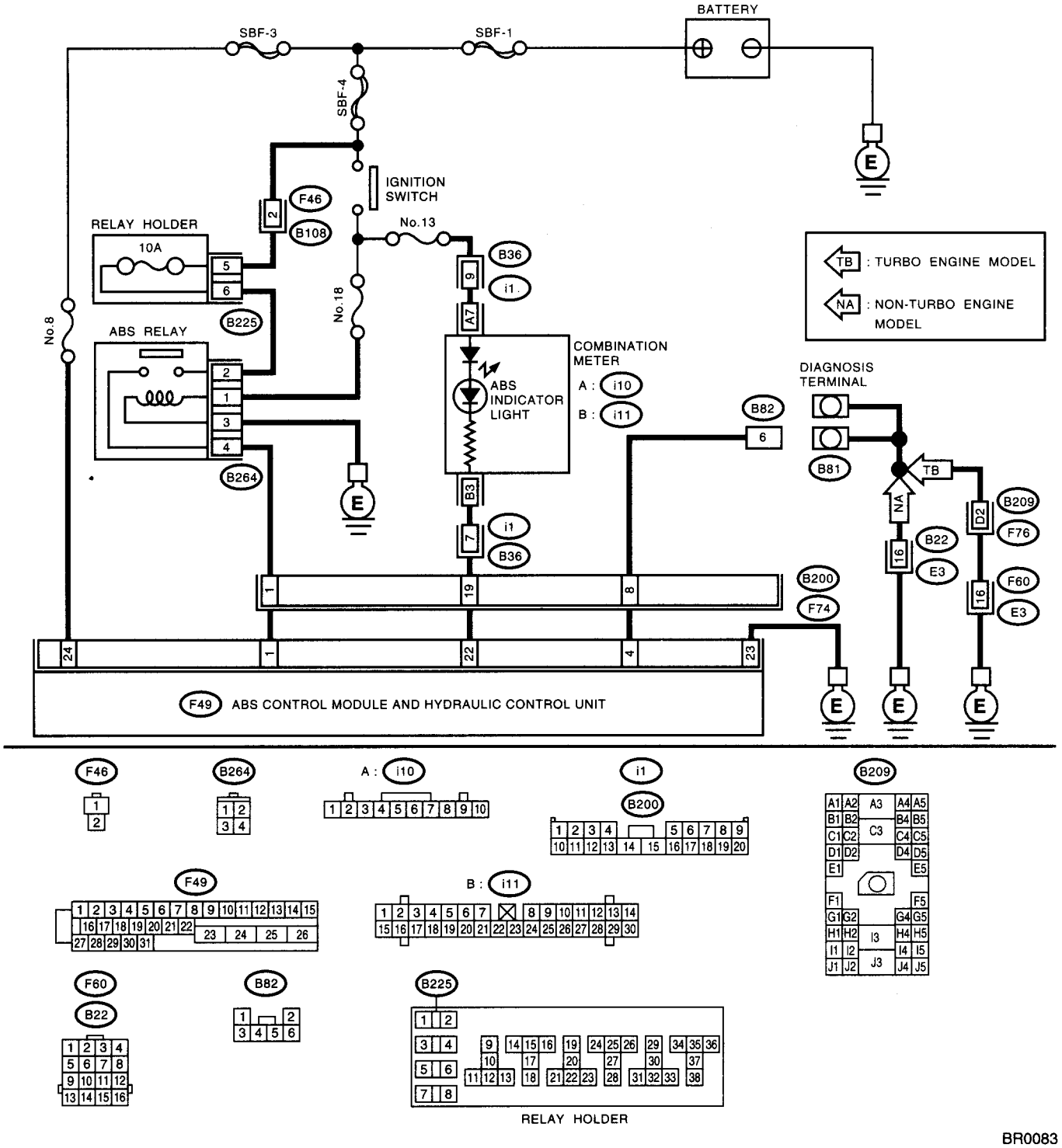
B: NO TROUBLE CODE

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 the select monitor, the system is in normal condition.

WIRING DIAGRAM:



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	Step	Check	Yes	No
1	**CHECK WIRING HARNESS.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector (F74) from connector (B200). 3)Turn the ignition switch to ON.	Does the ABS warning light remain off?	Go to step **2.**	Repair the front wiring harness.
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 projection at the ABSCM&H/U terminal.	Are the projection 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 resistance more than 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 (F74) and chassis ground. ***Connector & terminal*** ***(F74) No. 19 — Chassis ground:***	Is the resistance less than 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 (F74) and chassis ground. ***Connector & terminal*** ***(F74) No. 19 — Chassis ground:***	Is the resistance more than 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?	Repair the connector.	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

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-105, 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-105, 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-105, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>

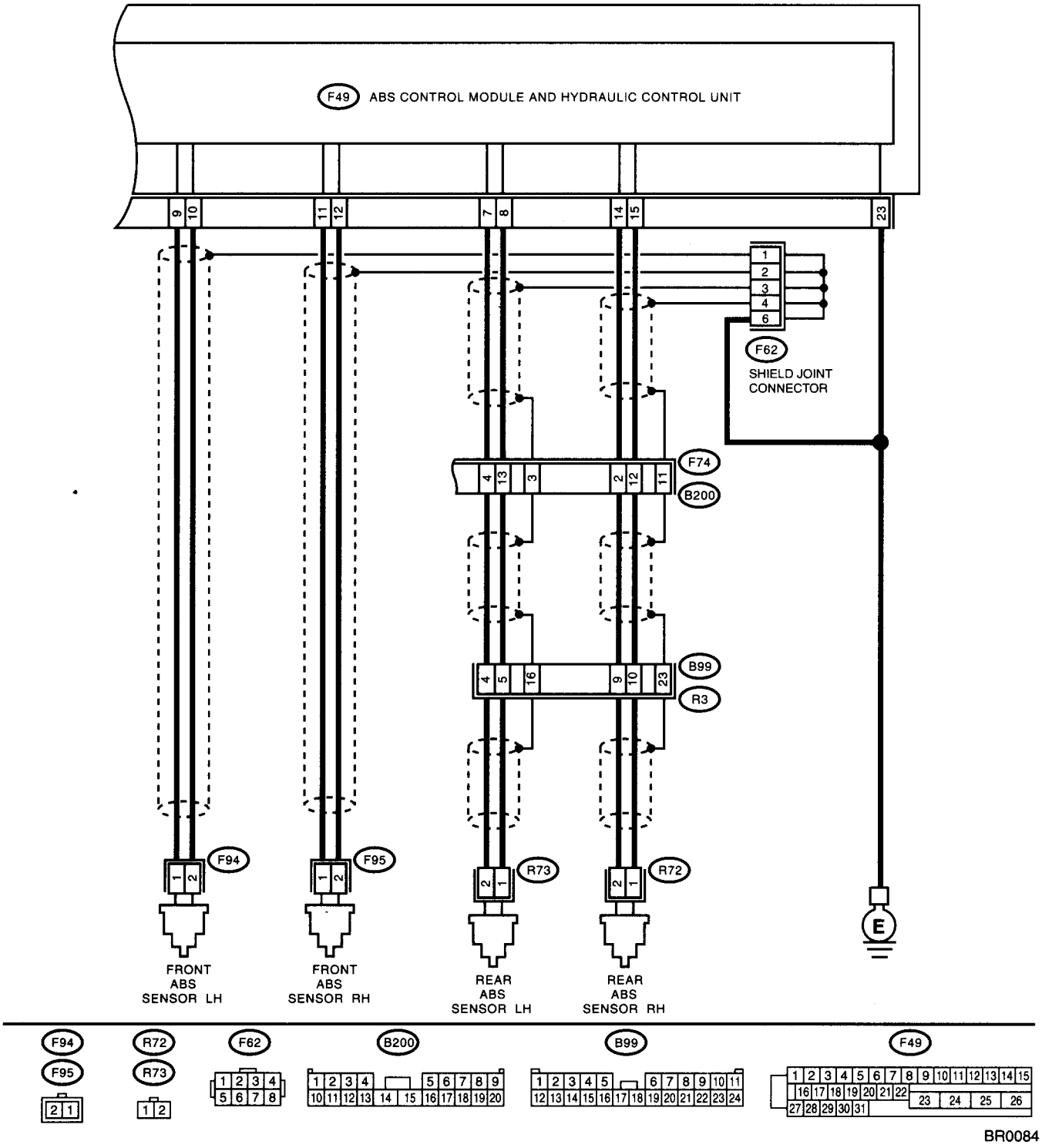
F: DTC 27
OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT

DIAGNOSIS:
- Faulty ABS sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:
- ABS does not operate.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

WIRING DIAGRAM:



Step	Check	Yes	No
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 the faulty system in the select monitor data display mode.	)oes the speed indicated on he display change in response o the speedometer reading luring acceleration/decelera-ion when the steering wheel is n the straight-ahead position?	3o to step **2.**	Go to step **8.**
CHECK INSTALLATION OF ABS SENSOR. ***Tightening torque:*** ***32 N·m (3.3 kgf-m, 24 ft-lb)***	\re the ABS sensor installation)olts tightened securely?	3o to step **3.**	Tighten the ABS sensor installation bolts securely.
CHECK ABS SENSOR GAP. Measure the tone wheel to ABS sensor piece gap over entire perimeter of the wheel. ***Front wheel*** ***0.3 — 0.8 mm (0.012 — 0.031 in)*** ***Rear wheel*** ***0.7 — 1.2 mm (0.028 — 0.047 in)***	s the gap within the specifica-ions?	3o to step **4.**	Adjust the gap. NOTE: Adjust the gap us ing spacers (Pai No. 26755AA000) If spacers cannc correct the gap, re place the wori sensor or wori tone wheel.
.CHECK TONE WHEEL RUNOUT. Measure the tone wheel runout.	s the runout less than 0.05 nm (0.0020 in)?	3o to step **5.**	Replace the tone wheel. Front: <Ref. to ABS-21, Front Tone Wheel.> Rear: <Ref. to ABS-22, Rear Tone Wheel.>
CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	s there poor contact in con-iectors between ABSCM&H/U ind ABS sensor?	Repair the con-nector.	Go to step **6.**
CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	s the same diagnostic trouble :ode as in the current diagno-sis still being output?	Replace the \BSCM&H/U. <Ref. to ABS-7, \BS Control Mod-ule and Hydraulic Control Unit ABSCM&H/U).>	Go to step **7.**
CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.	\re other diagnostic trouble :odes being output?	Proceed with the diagnosis corre-sponding to the diagnostic trouble :ode.	A temporary poor contact. NOTE: Check harnes and connector between AE SCM&H/U an ABS sensor.
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. ***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:***	s the resistance between 1 ind 1.5 kΩ?	3o to step **9.**	Replace the ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-18, Rear ABS Sensor.>

	Step	Check	Yes	No
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 voltage less than 1 V?	Go to step **10.**	Replace the ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-18, 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 voltage less than 1 V?	Go to step **11.**	Replace the ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-18, 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 / (F49) No. 11 — No. 12:*** ***DTC 23 / (F49) No. 9 — No. 10:*** ***DTC 25 / (F49) No. 14 — No. 15:*** ***DTC 27 / (F49) No. 7 — No. 8:***	Is the resistance between 1 and 1.5 kΩ?	Go to step **12.**	Repair harness/ connector between ABSCM&H/U and ABS sensor.
12	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 21 / (F49) No. 11 (+) — Chassis ground (–):*** ***DTC 23 / (F49) No. 9 (+) — Chassis ground (–):*** ***DTC 25 / (F49) No. 14 (+) — Chassis ground (–):*** ***DTC 27 / (F49) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **13.**	Repair 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 / (F49) No. 11 (+) — Chassis ground (–):*** ***DTC 23 / (F49) No. 9 (+) — Chassis ground (–):*** ***DTC 25 / (F49) No. 14 (+) — Chassis ground (–):*** ***DTC 27 / (F49) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **14.**	Repair harness between ABSCM&H/U and ABS sensor.
14	**CHECK INSTALLATION OF ABS SENSOR.** ***Tightening torque:*** ***32 N·m (3.3 kgf-m, 24 ft-lb)***	Are the ABS sensor installation bolts tightened securely?	Go to step **15.**	Tighten the ABS sensor installation bolts securely.

	Step	Check	Yes	No
15	**CHECK ABS SENSOR GAP.** Measure the tone wheel to ABS sensor piece gap over entire perimeter of the wheel. ***Front wheel*** ***0.3 — 0.8 mm (0.012 — 0.031 in)*** ***Rear wheel*** ***0.7 — 1.2 mm (0.028 — 0.047 in)***	Is the gap within the specifications?	Go to step **16.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace the worn sensor or worn tone wheel.
16	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **17.**	Replace the tone wheel. Front: <Ref. to ABS-21, Front Tone Wheel.> Rear: <Ref. to ABS-22, 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 resistance more than 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-18, 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 / (F49) No. 11 — Chassis ground:*** ***DTC 23 / (F49) No. 9 — Chassis ground:*** ***DTC 25 / (F49) No. 14 — Chassis ground:*** ***DTC 27 / (F49) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **19.**	Repair 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?	Repair the connector.	Go to step **20.**
20	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U.	Go to step **21.**
21	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact. NOTE: Check harness and connectors between ABSCM&H/U and ABS sensor.

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.>

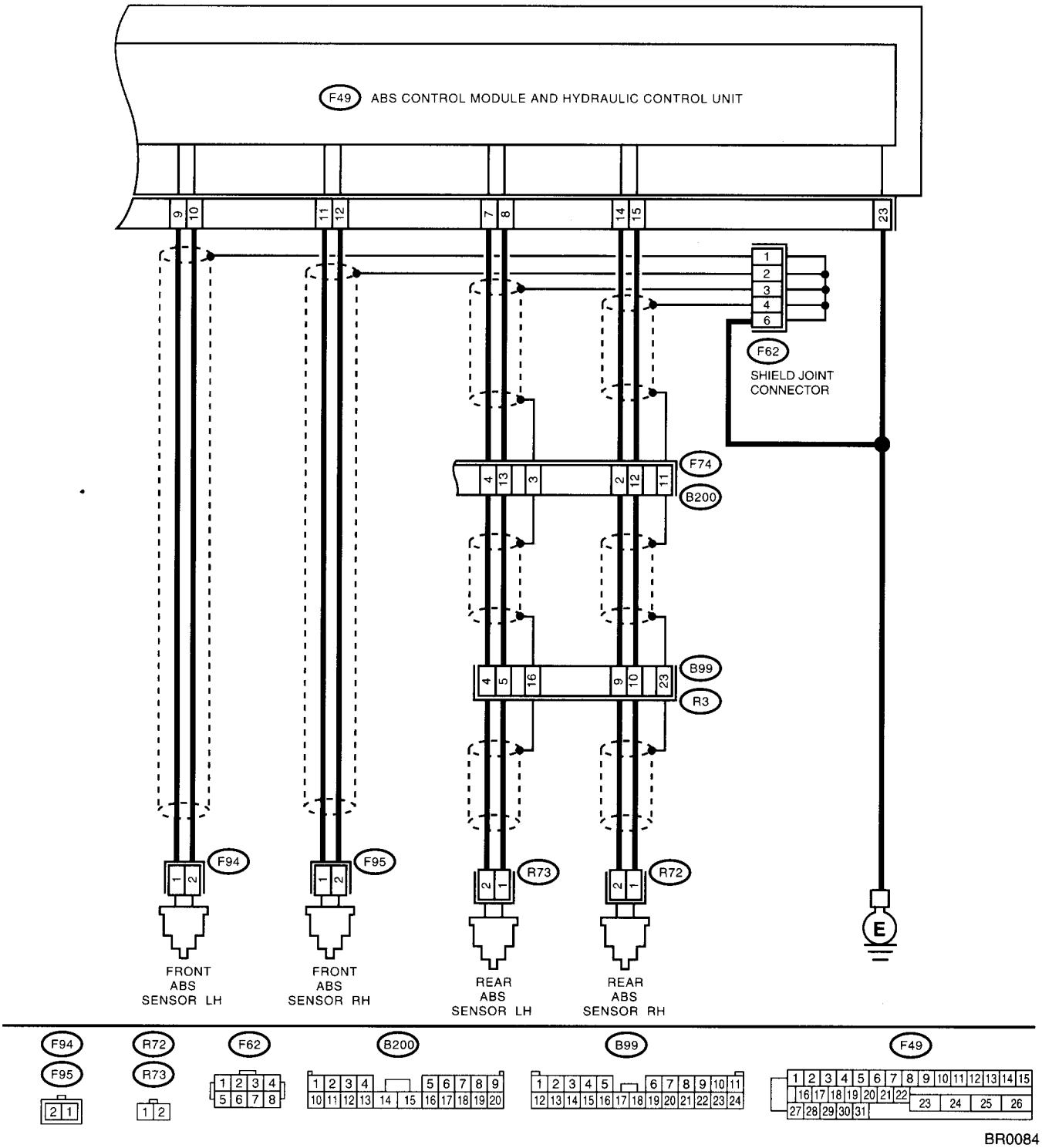
J: DTC 28
REAR LEFT ABNORMAL ABS SENSOR SIGNAL

DIAGNOSIS:
- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

TROUBLE SYMPTOM:
- ABS does not operate.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

WIRING DIAGRAM:



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	Step	Check	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 the faulty system in the select monitor data display mode.	Does the speed indicated on the display change in response to the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position?	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?	Repair the connector.	Go to step **3.**
3	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car telephone or the wireless transmitter properly installed?	Go to step **4.**	Properly install the car telephone or the wireless transmitter.
4	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from the sensor harness.	Go to step **5.**
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 26 / (B200) No. 11 — Chassis ground:*** ***DTC 28 / (B200) No. 3 — Chassis ground:*** NOTE: For the **DTC 22** and **24**: Go to step **6.**	Is the resistance less than 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 diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary noise interference.
8	**CHECK INSTALLATION OF ABS SENSOR.** ***Tightening torque:*** ***32 N·m (3.3 kgf-m, 24 ft-lb)***	Are the ABS sensor installation bolts tightened securely?	Go to step **9.**	Tighten the ABS sensor installation bolts securely.
9	**CHECK ABS SENSOR GAP.** Measure the tone wheel to ABS sensor piece gap over entire perimeter of the wheel. ***Front wheel*** ***0.3 — 0.8 mm (0.012 — 0.031 in)*** ***Rear wheel*** ***0.7 — 1.2 mm (0.028 — 0.047 in)***	Is the gap within the specifications?	Go to step **10.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace the worn sensor or worn tone wheel.
10	**PREPARE OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **11.**	Go to step **12.**

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

	Step	Check	Yes	No
11	**CHECK ABS SENSOR SIGNAL.** 1)Raise all four wheels of ground. 2)Turn the ignition switch OFF. 3)Connect the oscilloscope to the connector. 4)Turn the ignition switch 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*** ***DTC 22 / (F95) No. 1 (+) — No. 2 (–):*** ***DTC 24 / (F94) No. 1 (+) — No. 2 (–):*** ***DTC 26 / (B99) No. 9 (+) — No. 10 (–):*** ***DTC 28 / (B99) No. 4 (+) — No. 5 (–):***	Is the oscilloscope pattern 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 diagnostic trouble code.	Is the ABS sensor piece or the tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step **13.**
13	**CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.**	Are there broken or damaged in the ABS sensor piece or the tone wheel?	Replace the ABS sensor or tone wheel. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-18, Rear ABS Sensor.> and Front: <Ref. to ABS-21, Front Tone Wheel.> Rear: <Ref. to ABS-22, Rear Tone Wheel.>	Go to step **14.**
14	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **15.**	Replace the tone wheel. Front: <Ref. to ABS-21, Front Tone Wheel.> Rear: <Ref. to ABS-22, Rear Tone Wheel.>
15	**CHECK RESISTANCE OF ABS SENSOR.** 1)Turn the ignition switch OFF. 2)Disconnect the connector from ABS sensor. 3)Measure the resistance between ABS sensor connector terminals. ***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 resistance between 1 and 1.5 kΩ?	Go to step **16.**	Replace the ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-18, 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 resistance more than 1 MΩ?	Go to step **17.**	Replace the ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-18, Rear ABS Sensor.>

	Step	Check	Yes	No
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 / (F49) No. 11 — No. 12:*** ***DTC 24 / (F49) No. 9 — No. 10:*** ***DTC 26 / (F49) No. 14 — No. 15:*** ***DTC 28 / (F49) No. 7 — No. 8:***	Is the resistance between 1 and 1.5 kΩ?	Go to step **18.**	Repair harness/ connector between ABSCM&H/U and ABS sensor.
18	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 22 / (F49) No. 11 — Chassis ground:*** ***DTC 24 / (F49) No. 9 — Chassis ground:*** ***DTC 26 / (F49) No. 14 — Chassis ground:*** ***DTC 28 / (F49) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **19.**	Repair 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*** ***(F49) No. 23 — GND:***	Is the resistance less than 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?	Repair the connector.	Go to step **21.**
21	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car telephone or the wireless transmitter properly installed?	Go to step **22.**	Properly install the car telephone or the wireless transmitter.
22	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from the sensor harness.	Go to step **23.**
23	**CHECK SHIELD CIRCUIT.** 1)Connect all connectors. 2)Measure the resistance between shield connector and chassis ground. ***Connector & terminal*** ***DTC 26 / (B200) No. 11 — Chassis ground:*** ***DTC 28 / (B200) No. 3 — Chassis ground:*** NOTE: For the **DTC 22** and **24**: Go to step **24.**	Is the resistance less than 0.5 Ω?	Go to step **24.**	Repair the shield harness.
24	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **25.**
25	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary noise interference.

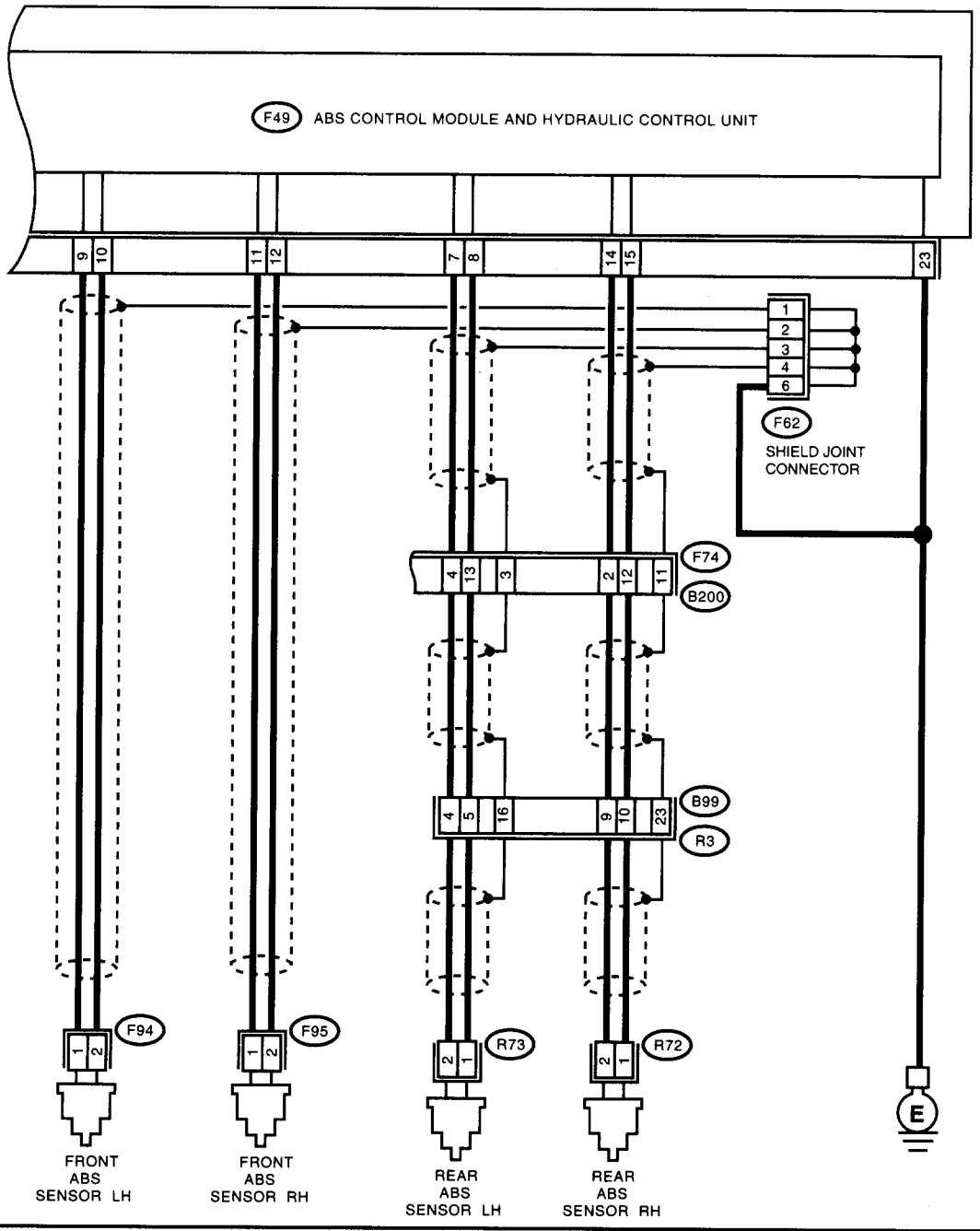
K: DTC 29
ABNORMAL ABS SENSOR SIGNAL ON ANY ONE OF FOUR SENSOR

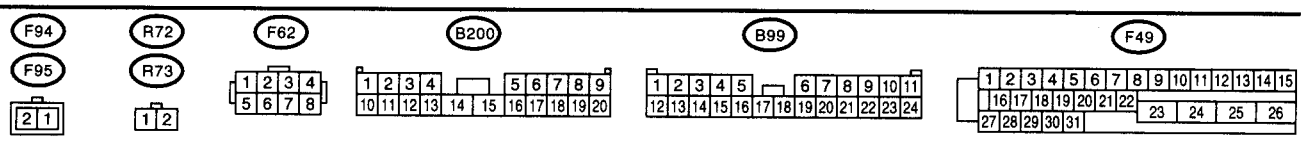
DIAGNOSIS:
- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Wheels turning freely for a long time

TROUBLE SYMPTOM:
- ABS does not operate.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

WIRING DIAGRAM:





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	Step	Check	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 the vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface.	The ABS is normal. Erase the diagnostic trouble code. 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 diagnostic trouble code may sometimes occur.	Go to step **2.**
2	**CHECK TIRE SPECIFICATIONS.** Turn the ignition switch to OFF.	Are the tire specifications correct?	Go to step **3.**	Replace the tire.
3	**CHECK WEAR OF TIRE.**	Is the tire worn excessively?	Replace the tire.	Go to step **4.**
4	**CHECK TIRE PRESSURE.**	Is the tire pressure correct?	Go to step **5.**	Adjust the tire pressure.
5	**CHECK INSTALLATION OF ABS SENSOR.** ***Tightening torque:*** ***32 N·m (3.3 kgf-m, 24 ft-lb)***	Are the ABS sensor installation bolts tightened securely?	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. ***Front wheel*** ***0.3 — 0.8 mm (0.012 — 0.031 in)*** ***Rear wheel*** ***0.7 — 1.2 mm (0.028 — 0.047 in)***	Is the gap within the specifications?	Go to step **7.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace the worn sensor or worn tone wheel.
7	**PREPARE OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **8.**	Go to step **9.**

	Step	Check	Yes	No
8	**CHECK ABS SENSOR SIGNAL.** 1)Raise all four wheels of ground. 2)Turn the ignition switch OFF. 3)Connect the oscilloscope to the connector (B99), (F95) or (F94) in accordance with trouble code. 4)Turn the ignition switch 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*** ***(F95) No. 1 (+) — No. 2 (–):*** ***Front LH*** ***(F94) No. 1 (+) — No. 2 (–):*** ***Rear RH*** ***(B99) No. 9 (+) — No. 10 (–):*** ***Rear LH*** ***(B99) No. 4 (+) — No. 5 (–):***	Is oscilloscope pattern 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 from hub.	Is the ABS sensor piece or the tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step **10.**
10	**CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.**	Are there broken or damaged teeth in the ABS sensor piece or the tone wheel?	Replace the ABS sensor or tone wheel. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-18, Rear ABS Sensor.> and Front: <Ref. to ABS-21, Front Tone Wheel.> Rear: <Ref. to ABS-22, Rear Tone Wheel.>	Go to step **11.**
11	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **12.**	Replace the tone wheel. Front: <Ref. to ABS-21, Front Tone Wheel.> Rear: <Ref. to ABS-22, Rear Tone Wheel.>
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 diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13.**
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

L: DTC 31
FRONT RIGHT INLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-121, 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-121, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>

N: DTC 35
REAR RIGHT INLET VALVE MALFUNCTION

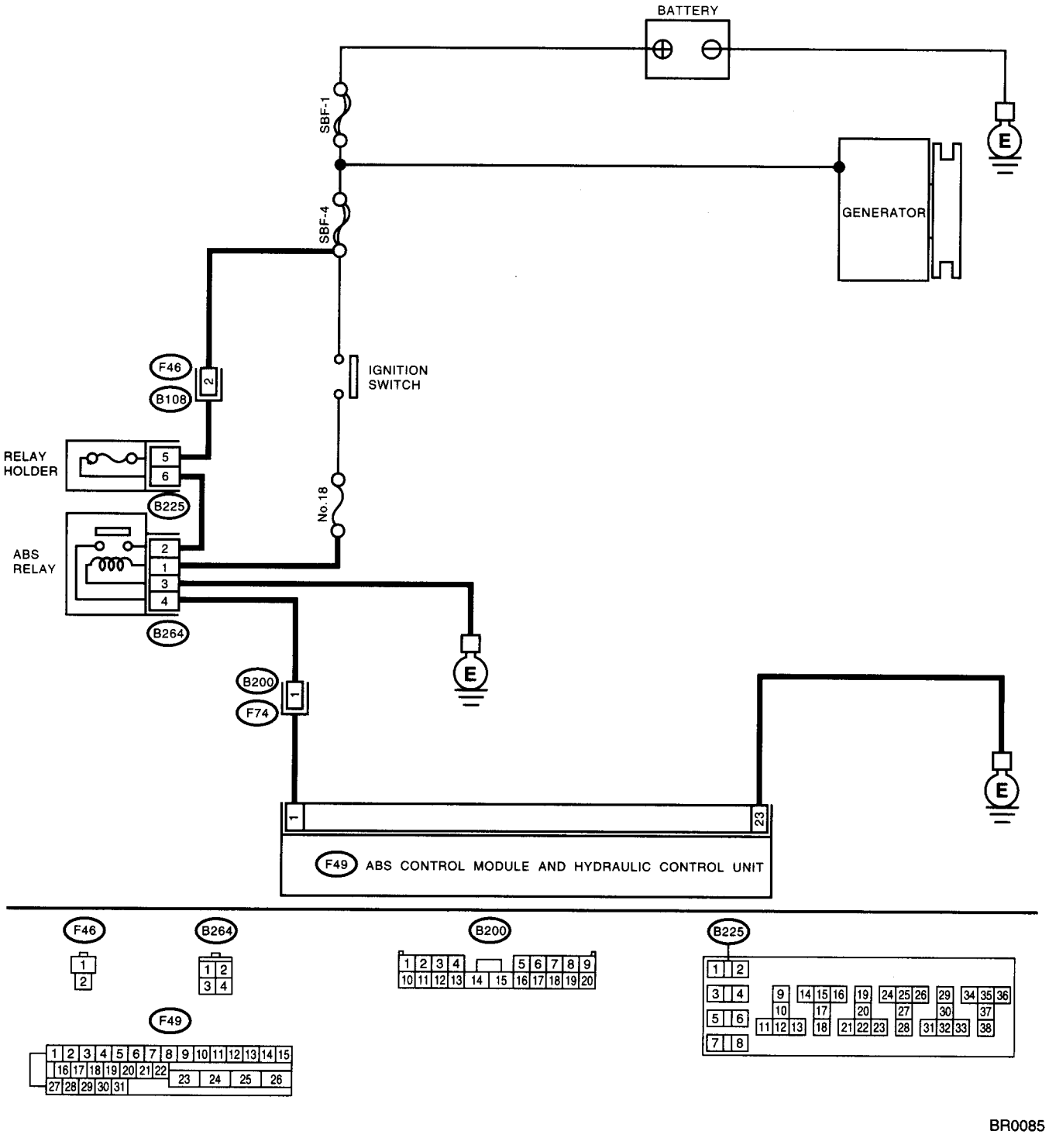
NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-121, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>

O: DTC 37
REAR LEFT INLET VALVE MALFUNCTION

DIAGNOSIS:
- Faulty harness/connector
- Faulty inlet solenoid valve

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF RELAY HOLDER.** 1)Turn the ignition switch to OFF. 2)Remove the fuse. 3)Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B225) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Repair open circuit in harness between battery and relay holder connector.
2	**CHECK RELAY HOLDER.**	Is the fuse blown out?	Replace the fuse.	Go to step **3.**
3	**CHECK INPUT VOLTAGE OF ABS RELAY.** 1)Install the fuse. 2)Remove the ABS relay. 3)Turn the ignition switch to ON. 4)Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Repair open circuit in harness between battery and relay holder connector.
4	**CHECK INPUT VOLTAGE OF ABS RELAY.** Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **5.**	Repair harness connector between battery, ignition switch and ABS relay.
5	**CHECK GROUND CIRCUIT OF ABS RELAY** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 3 (+) — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **6.**	Repair open circuit between ABS relay and chassis ground.
6	**CHECK ABS RELAY.** 1)Connect the battery to ABS relay terminal No. 1 and 3. 2)Measure the resistance between ABS relay terminals.	Is the resistance less than 10 Ω?	Go to step **7.**	Replace the ABS relay.
7	**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*** ***(F49) No. 1 (+) — Chassis ground (–):***	Is the voltage between 10 and 15 V?	Go to step **8.**	Repair harness connector between battery, ignition switch and ABSCM&H/U.
8	**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*** ***(F49) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **9.**	Repair the ABSCM&H/U ground harness.
9	**CHECK POOR CONTACT IN CONNECTORS**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **10.**
10	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **11.**

	Step	Check	Yes	No
11	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

P: DTC 32
FRONT RIGHT OUTLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-125, 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-125, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>

R: DTC 36
REAR RIGHT OUTLET VALVE MALFUNCTION

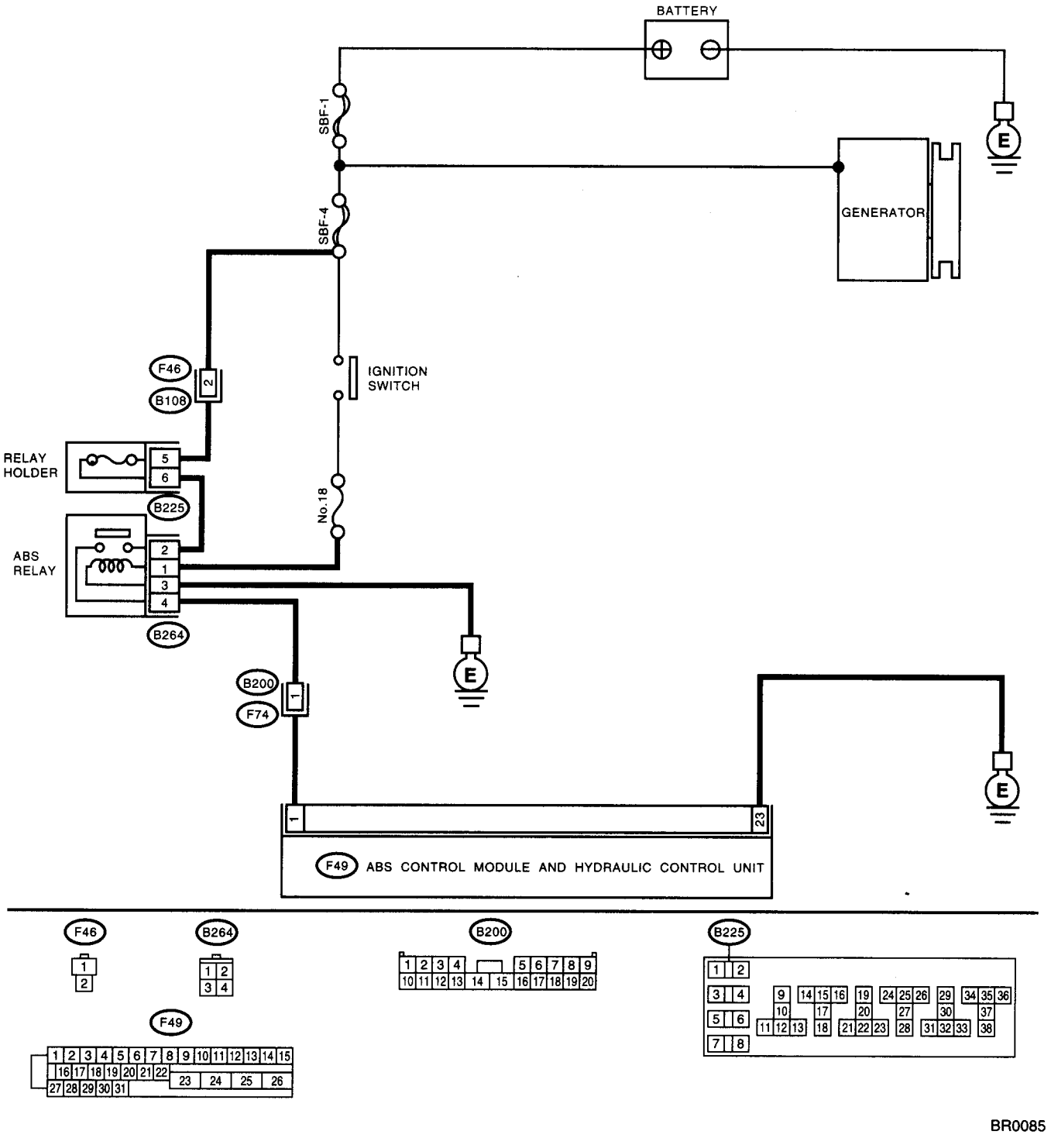
NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-125, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>

S: DTC 38
REAR LEFT OUTLET VALVE MALFUNCTION

DIAGNOSIS:
- Faulty harness/connector
- Faulty outlet solenoid valve

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF RELAY HOLDER.** 1)Turn the ignition switch to OFF. 2)Remove the fuse. 3)Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B225) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Repair open circuit in harness between battery and relay holder connector.
2	**CHECK RELAY HOLDER.**	Is the fuse blown out?	Replace the fuse.	Go to step **3.**
3	**CHECK INPUT VOLTAGE OF ABS RELAY.** 1)Install the fuse. 2)Remove the ABS relay. 3)Turn the ignition switch to ON. 4)Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Repair open circuit in harness between battery and relay holder connector.
4	**CHECK INPUT VOLTAGE OF ABS RELAY.** Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **5.**	Repair harness connector between battery, ignition switch and ABS relay.
5	**CHECK GROUND CIRCUIT OF ABS RELAY.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 3 (+) — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **6.**	Repair open circuit between ABS relay and chassis ground.
6	**CHECK ABS RELAY.** 1)Connect the battery to ABS relay terminal No. 1 and 3. 2)Measure the resistance between ABS relay terminals.	Is the resistance less than 10 Ω?	Go to step **7.**	Replace the ABS relay.
7	**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*** ***(F49) No. 1 (+) — Chassis ground (–):***	Is the voltage between 10 and 15 V?	Go to step **8.**	Repair harness connector between battery, ignition switch and ABSCM&H/U.
8	**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*** ***(F49) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **9.**	Repair the ABSCM&H/U ground harness.
9	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **10.**
10	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **11.**

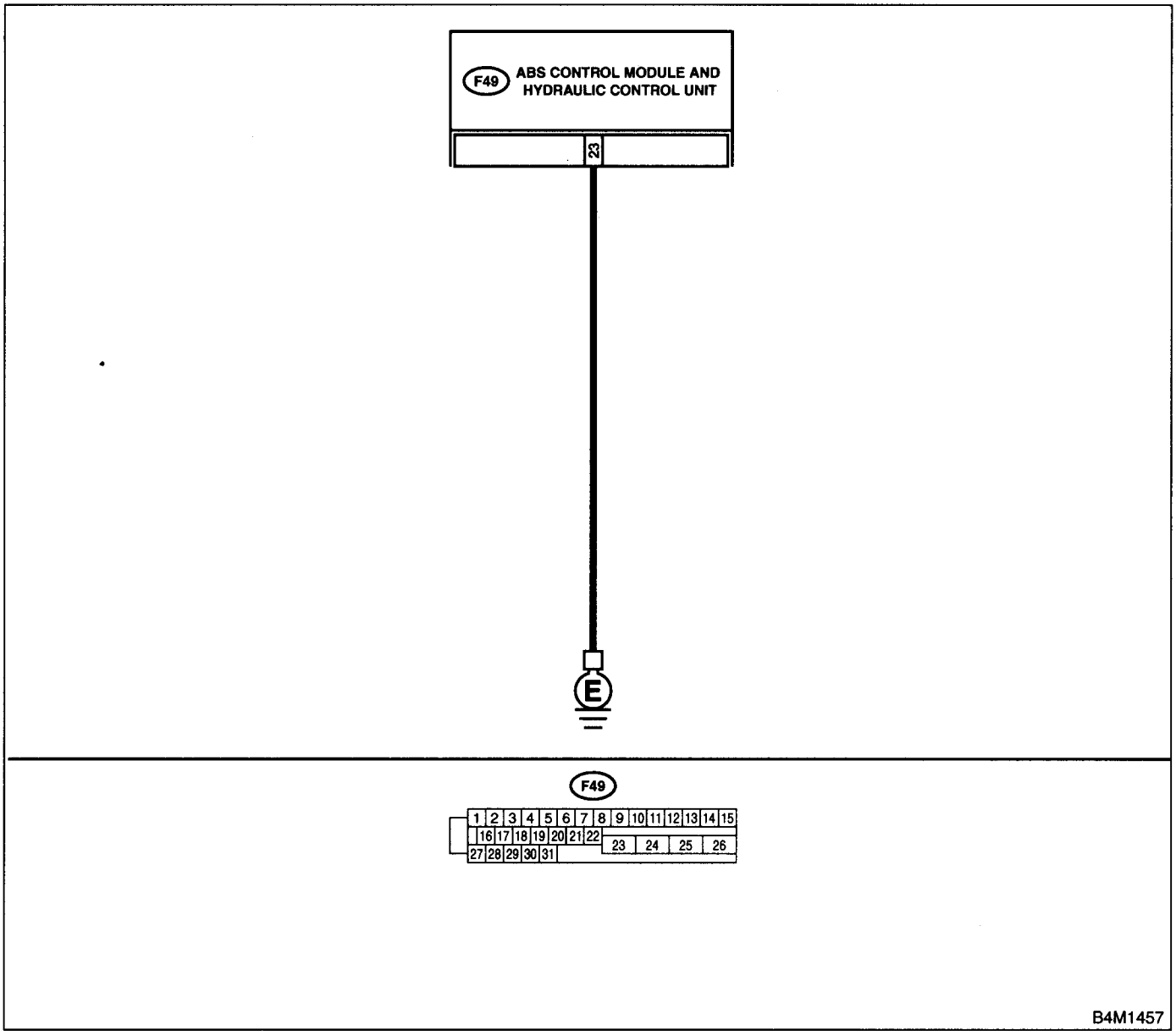
	Step	Check	Yes	No
11	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

T: DTC 41
ABS CONTROL MODULE MALFUNCTION

DIAGNOSIS:
- Faulty ABSCM&H/U

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:



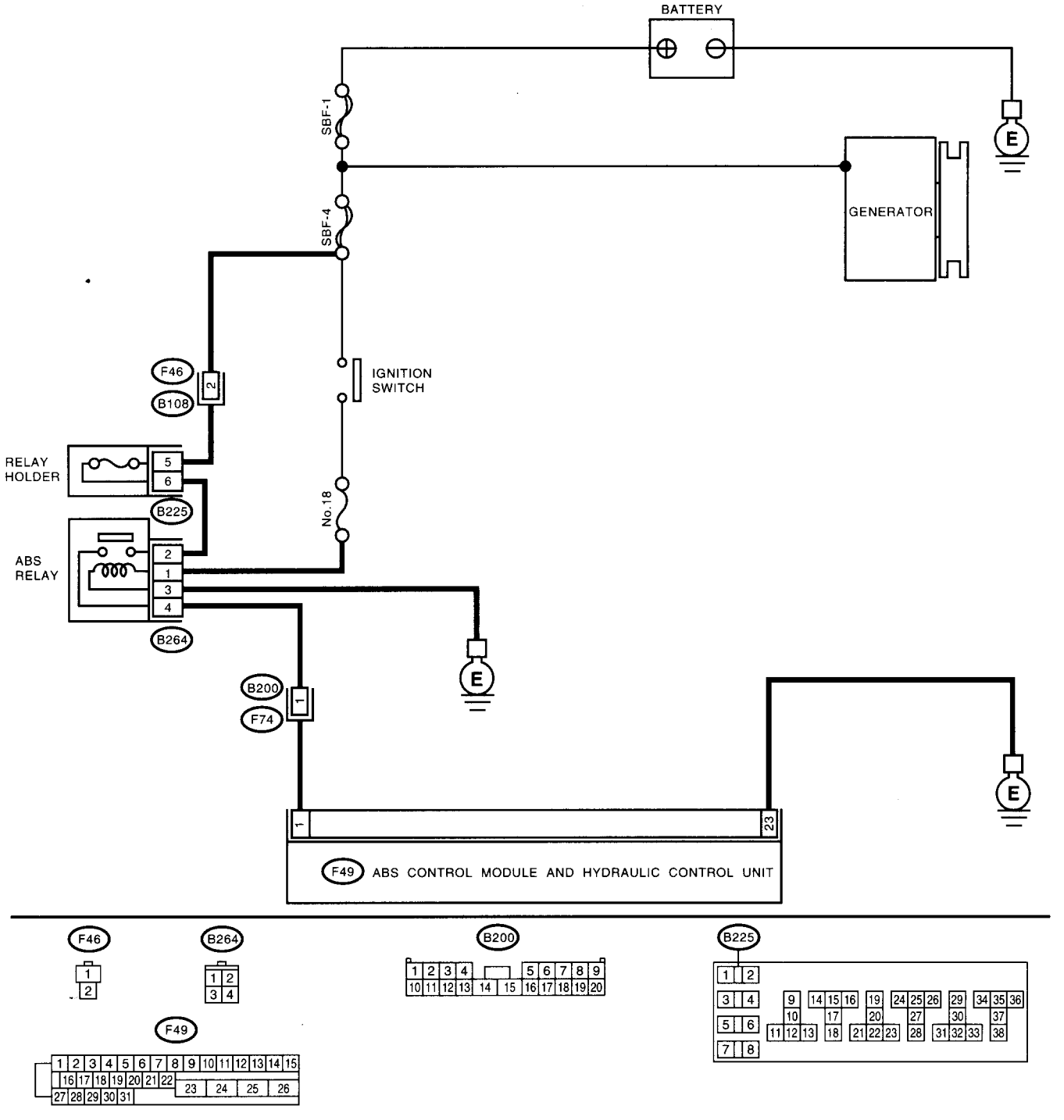
	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go 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?	Repair the connector.	Go to step **3.**
3	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car telephone or the wireless transmitter properly installed?	Go to step **4.**	Properly install the car telephone or the wireless transmitter.
4	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from the sensor harness.	Go to step **5.**
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 diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

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.

WIRING DIAGRAM:



BR0085

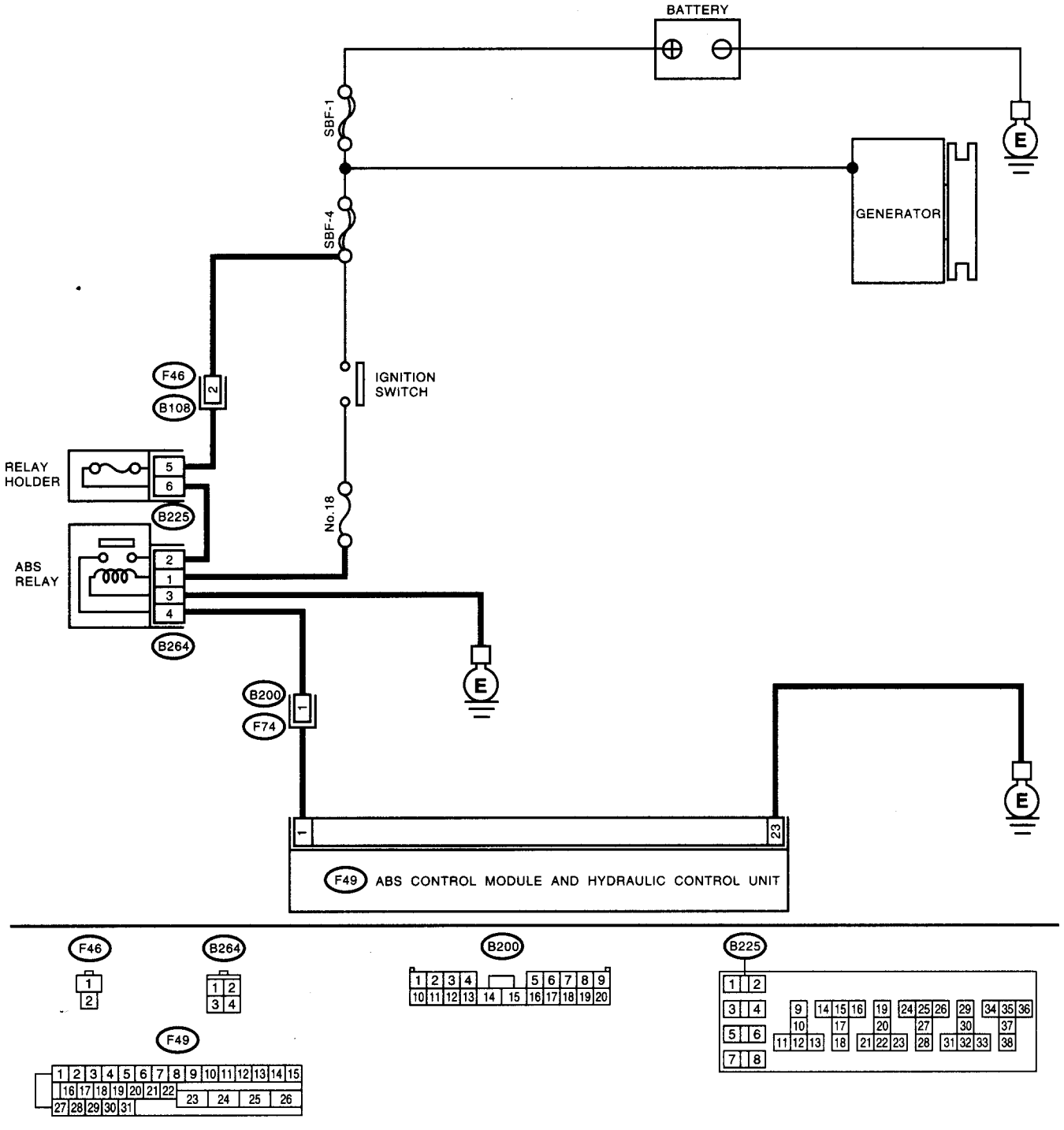
	Step	Check	Yes	No
1	**CHECK GENERATOR.** 1)Start the engine. 2)Idling after warm-up. 3)Measure the voltage between generator B terminal and chassis ground. ***Terminal*** ***Generator B terminal — Chassis ground***	s the voltage between 10 and 15 V?	Go to step **2.**	Repair the genera tor. <Ref. to SC-13, Generator.>
2	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Are the positive and negative battery terminals 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)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):***	s the voltage between 10 and 15 V?	Go to step **4.**	Repair harness connector between battery, ignition switch anc 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*** ***(F49) No. 23 — Chassis ground:***	s the resistance less than 0.5 Ω?	Go to step **5.**	Repair the ABSCM&H/U ground harness.
5	**CHECK POOR CONTACT IN CONNECTORS**	s there poor contact in con-nectors between generator, battery and ABSCM&H/U?	Repair the con-nector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	s the same diagnostic trouble code as in the current diagno-sis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Mod-ule and Hydraulic Control Unit ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DIAGNOSTIC TROU-BLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corre-sponding to the diagnostic trouble code.	A temporary poor contact.

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.

WIRING DIAGRAM:



BR0085

	Step	Check	Yes	No
1	**CHECK GENERATOR.** 1)Start the engine. 2)Idling after warm-up. 3)Measure the voltage between generator B terminal and chassis ground. ***Terminal*** ***Generator B terminal — Chassis ground:***	Is the voltage between 10 and 17 V?	Go to step **2.**	Repair the generator. <Ref. to SC-13, Generator.>
2	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Are the positive and negative battery terminals tightly clamped?	Go to step **3.**	Tighten the clamp of terminal.
3	**CHECK INPUT VOLTAGE OF RELAY HOLDER.** 1)Turn the ignition switch to OFF. 2)Remove the fuse. 3)Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B225) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Repair open circuit in harness between battery and Relay holder connector.
4	**CHECK RELAY HOLDER.**	Is the fuse blown out?	Replace the fuse.	Go to step **5.**
5	**CHECK INPUT VOLTAGE OF ABS RELAY.** 1)Install the fuse. 2)Remove the ABS relay. 3)Turn the ignition switch to ON. 4)Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **6.**	Repair open circuit in harness between battery and Relay holder connector.
6	**CHECK INPUT VOLTAGE OF ABS RELAY.** Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **7.**	Repair harness connector between battery, ignition switch and ABS relay.
7	**CHECK GROUND CIRCUIT OF ABS RELAY.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 3 (+) — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **8.**	Repair open circuit between ABS relay and chassis ground.
8	**CHECK ABS RELAY.** 1)Connect the battery to ABS relay terminal No. 1 and 3. 2)Measure the resistance between ABS relay terminals.	Is the resistance less than 10 Ω?	Go to step **9.**	Replace the ABS relay.
9	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1)Disconnect the connector from ABSCM&H/U. 2)Run the engine at idle. 3)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):***	Is the voltage between 10 and 17 V?	Go to step **10.**	Repair harness connector between battery, ignition switch and ABSCM&H/U.
10	**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*** ***(F49) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **11.**	Repair the ABSCM&H/U ground harness.

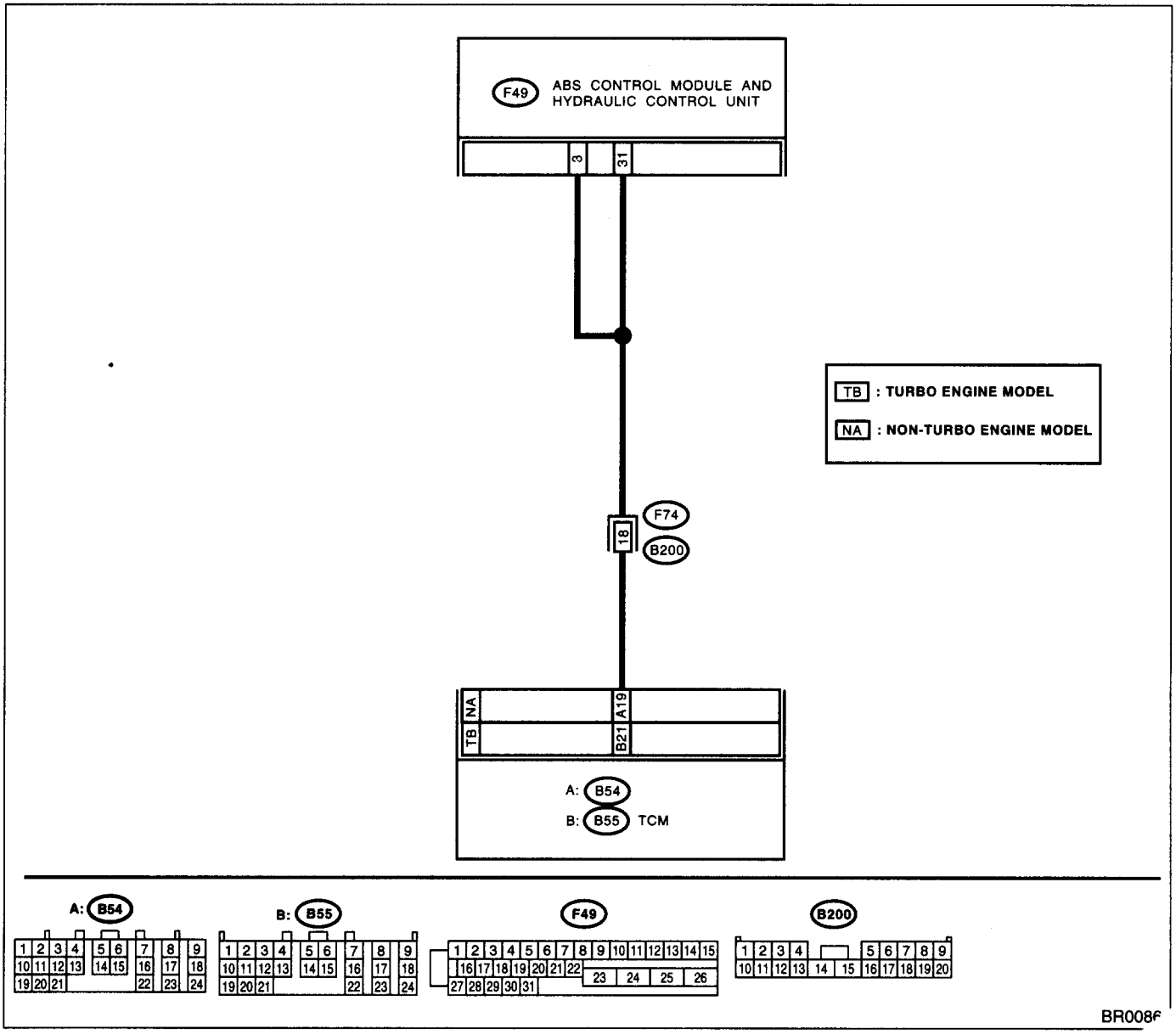
	Step	Check	Yes	No
11	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **12.**
12	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13.**
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

W: DTC 44
ABS-AT CONTROL (NON CONTROLLED)

DIAGNOSIS:
- Combination of AT control faults

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:



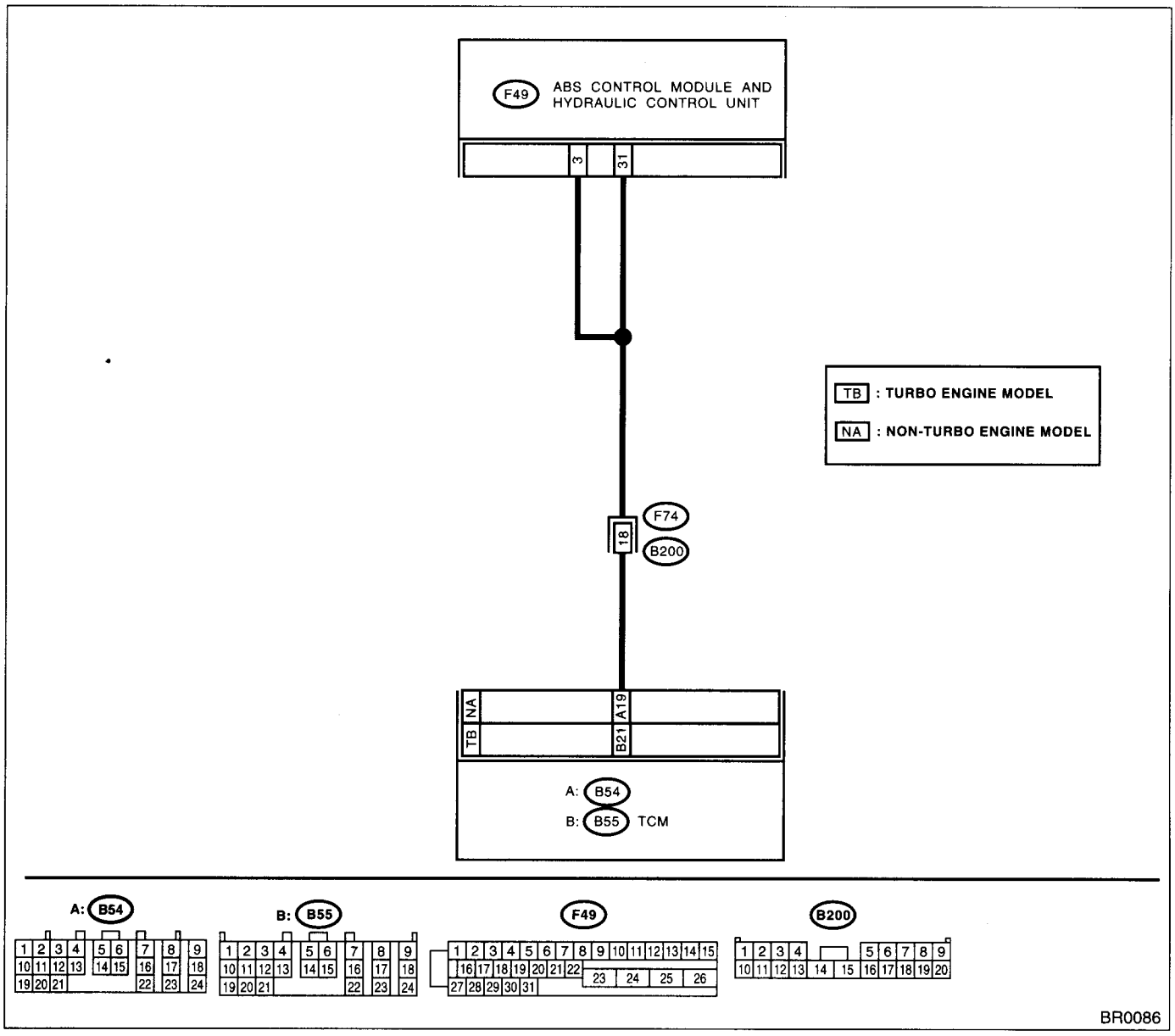
	Step	Check	Yes	No
1	**CHECK SPECIFICATIONS OF THE ABSCM&H/U.** Check specifications of the mark to the ABSCM&H/U. ***CC: AT*** ***CD: MT***	Is an ABSCM&H/U for AT model installed on a MT model?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **2.**
2	**CHECK GROUND SHORT OF HARNESS.** 1)Turn the ignition switch to OFF. 2)Disconnect 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*** ***(F49) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair 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*** ***NON-TURBO MODEL:*** ***(B54) No. 19 (+) — Chassis ground (–):*** ***TURBO MODEL:*** ***(B55) No. 21 (+) — Chassis ground (–):***	Is the voltage between 10 and 15 V?	Go to step **5.**	Go to step **4.**
4	**CHECK AT.**	Is the 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*** ***(F49) No. 3 (+) — Chassis ground (–):*** ***(F49) No. 31 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **6.**	Repair 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?	Repair the connector.	Go to step **7.**
7	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **8.**
8	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

X: DTC 44
ABS-AT CONTROL (CONTROLLED)

DIAGNOSIS:
- Combination of AT control faults

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:



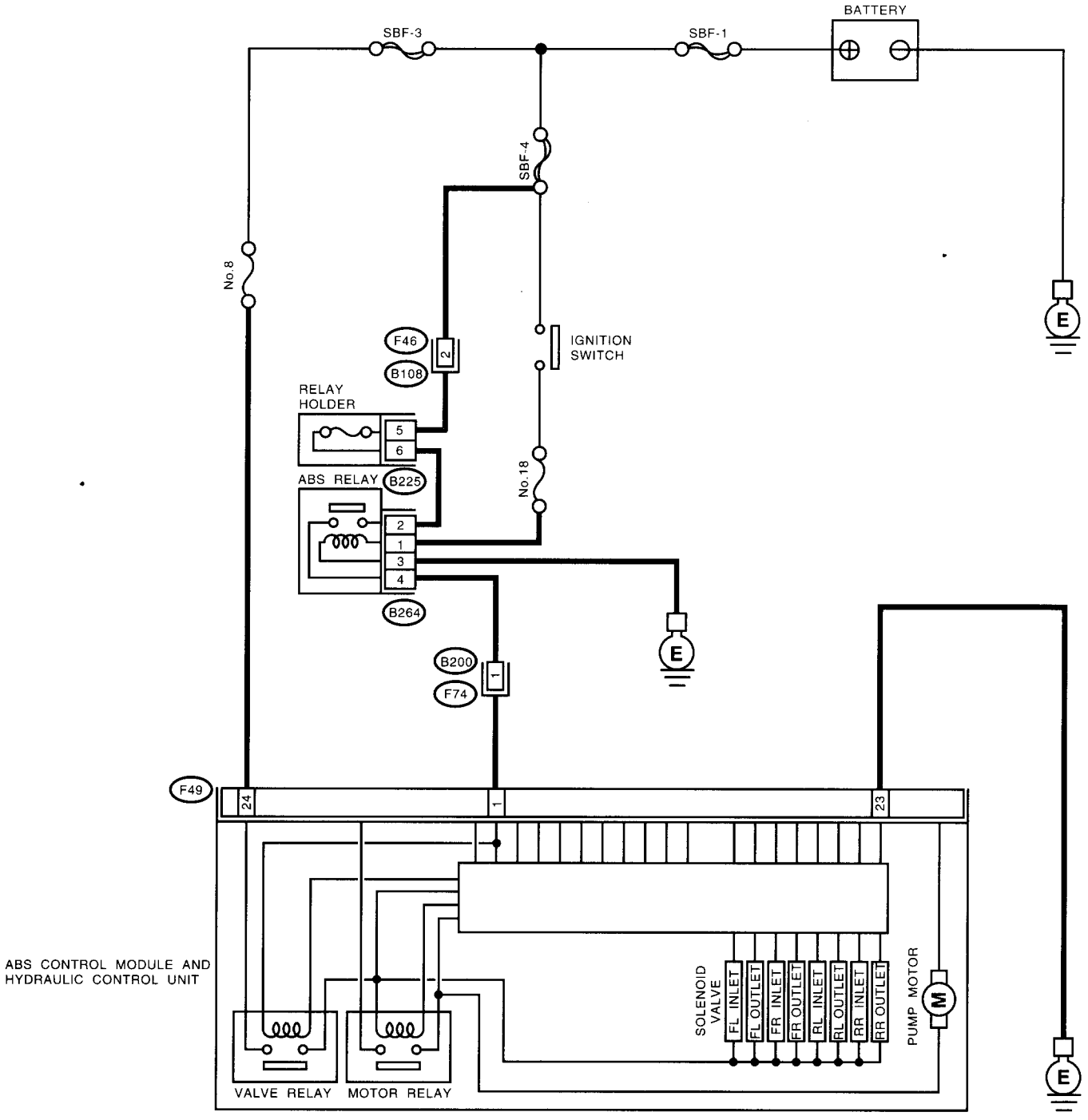
	Step	Check	Yes	No
1	**CHECK BATTERY SHORT OF HARNESS.** 1)Turn the ignition switch to OFF. 2)Disconnect two connectors from TCM. 3)Disconnect the connector from ABSCM&H/U. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 3 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **2.**	Repair 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*** ***(F49) No. 3 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **3.**	Repair 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*** ***(F49) No. 3 (+) — Chassis ground (–):*** ***(F49) No. 31 (+) — Chassis ground (–):***	Is the voltage between 10 and 13 V?	Go to step **4.**	Repair 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?	Repair the connector.	Go to step **5.**
5	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnositc trouble code.	A temporary poor contact.

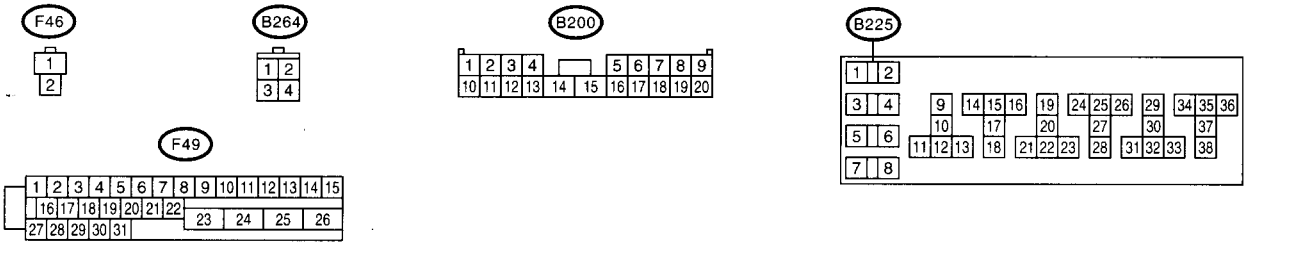
Y: DTC 51
VALVE RELAY MALFUNCTION

DIAGNOSIS:
- Faulty valve relay

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:





BR0087

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF RELAY HOLDER.** 1)Turn the ignition switch to OFF. 2)Remove the fuse. 3)Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B225) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Repair open circuit in harness between battery and Relay holder connector.
2	**CHECK RELAY HOLDER.**	Is the fuse blown out?	Replace the fuse.	Go to step **3.**
3	**CHECK INPUT VOLTAGE OF ABS RELAY.** 1)Install the fuse. 2)Remove the ABS relay. 3)Turn the ignition switch to ON. 4)Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Repair open circuit in harness between battery and Relay holder connector.
4	**CHECK INPUT VOLTAGE OF ABS RELAY.** Measure the voltage between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **5.**	Repair harness connector between battery, ignition switch and ABS relay.
5	**CHECK GROUND CIRCUIT OF ABS RELAY.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABS relay connector and chassis ground. ***Connector & terminal*** ***(B264) No. 3 (+) — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **6.**	Repair open circuit between ABS relay and chassis ground.
6	**CHECK ABS RELAY.** 1)Connect the battery to ABS relay terminal No. 1 and 3. 2)Measure the resistance between ABS relay terminals.	Is the resistance less than 10 Ω?	Go to step **7.**	Replace the ABS relay.
7	**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*** ***(F49) No. 1 (+) — Chassis ground (–):*** ***(F49) No. 24 (+) — Chassis ground (–):***	Is the voltage between 10 and 15 V?	Go to step **8.**	Repair harness connector between battery and ABSCM&H/U.
8	**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*** ***(F49) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **9.**	Repair the ABSCM&H/U ground harness.
9	**CHECK POOR CONTACT IN CONNECTORS**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **10.**
10	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **11.**

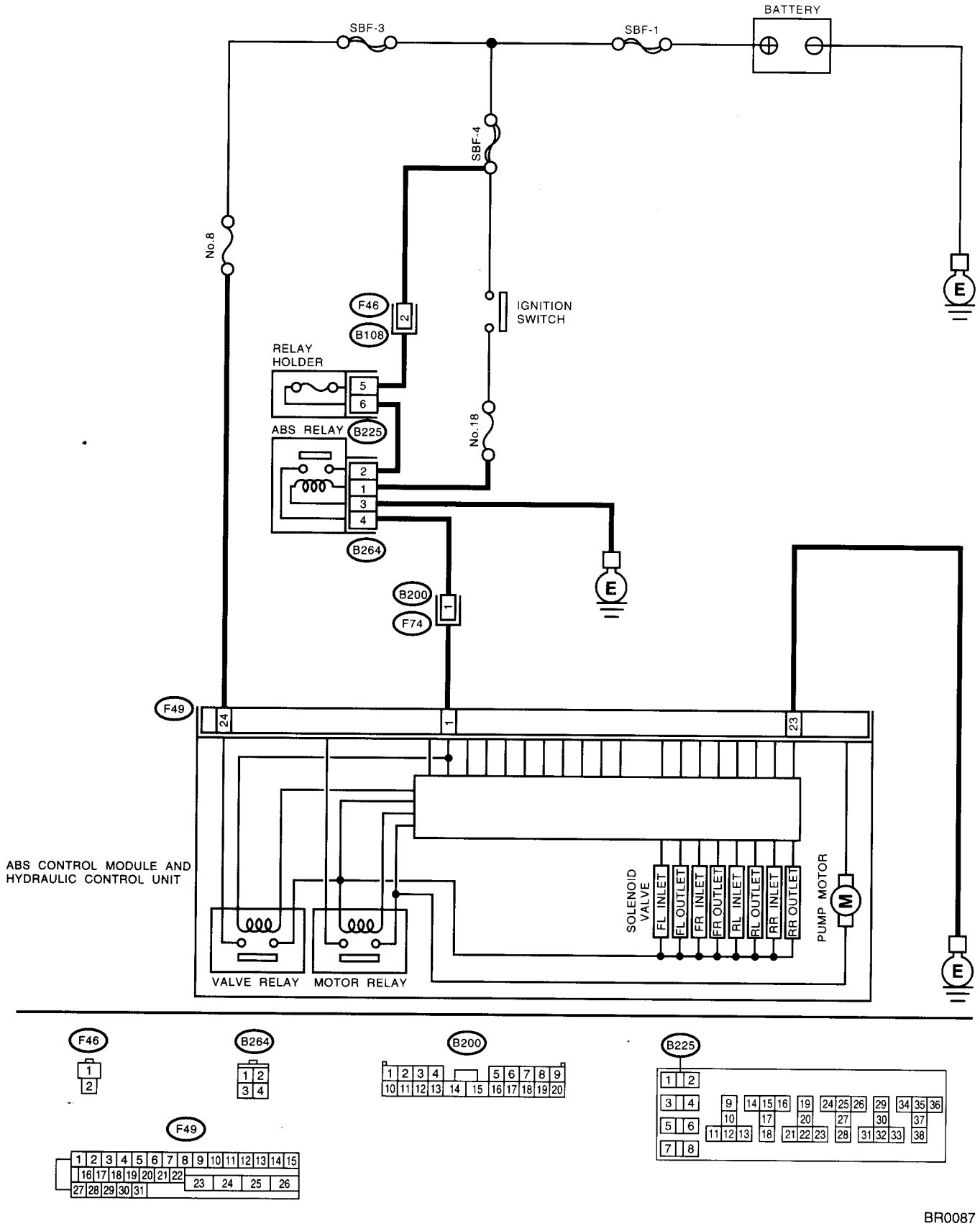
	Step	Check	Yes	No
11	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

Z: DTC 51
VALVE RELAY ON FAILURE

DIAGNOSIS:
- Faulty valve relay

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:



BR0087

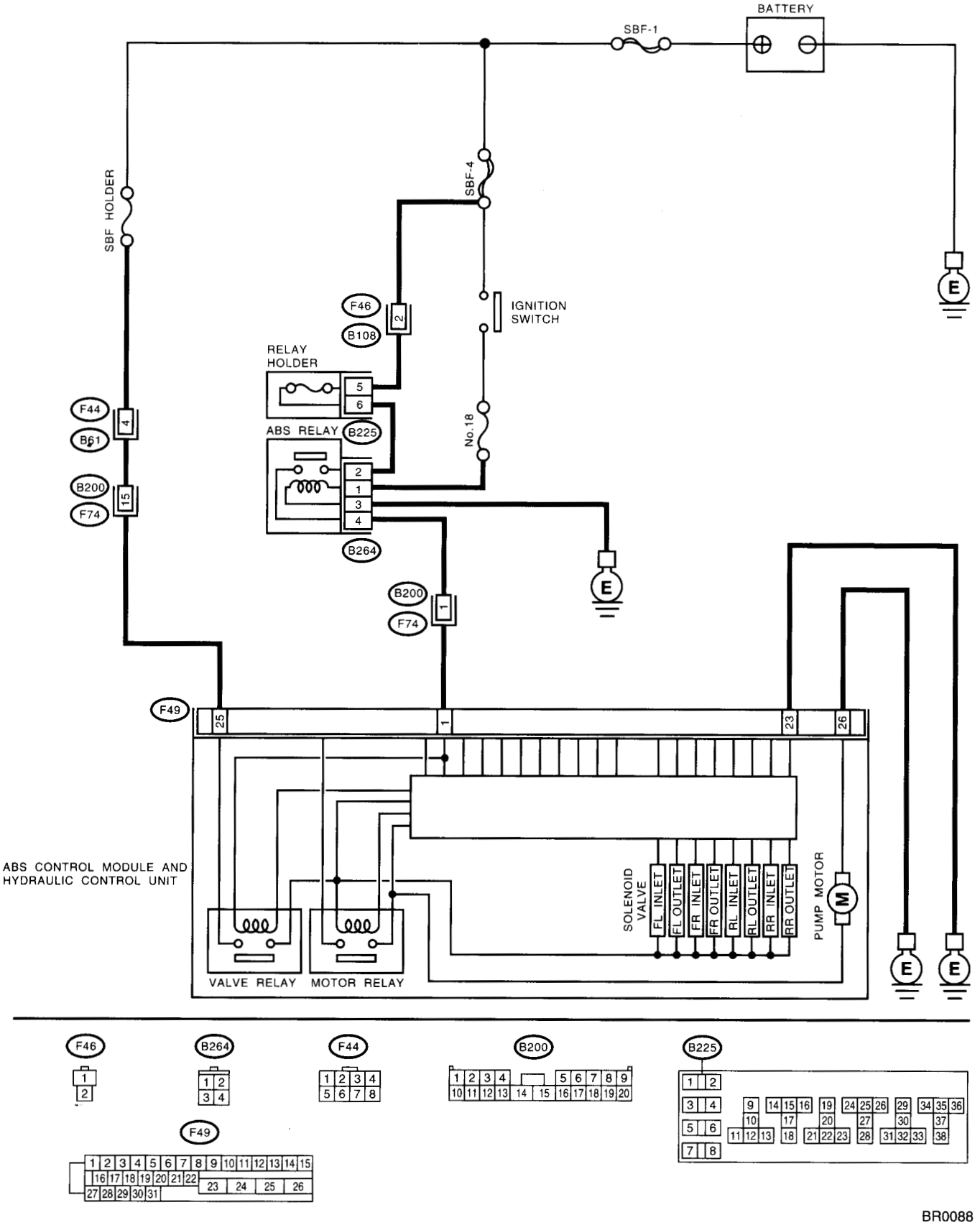
	Step	Check	Yes	No
1	**CHECK VALVE RELAY IN ABSCM&H/U.** Measure the resistance between ABSCM&H/U terminals. ***Terminals*** ***No. 23 (+) — No. 24 (–):***	Is the resistance more than 1 MΩ?	Go to step **2.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **3.**
3	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **4.**
4	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

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:



BR0088

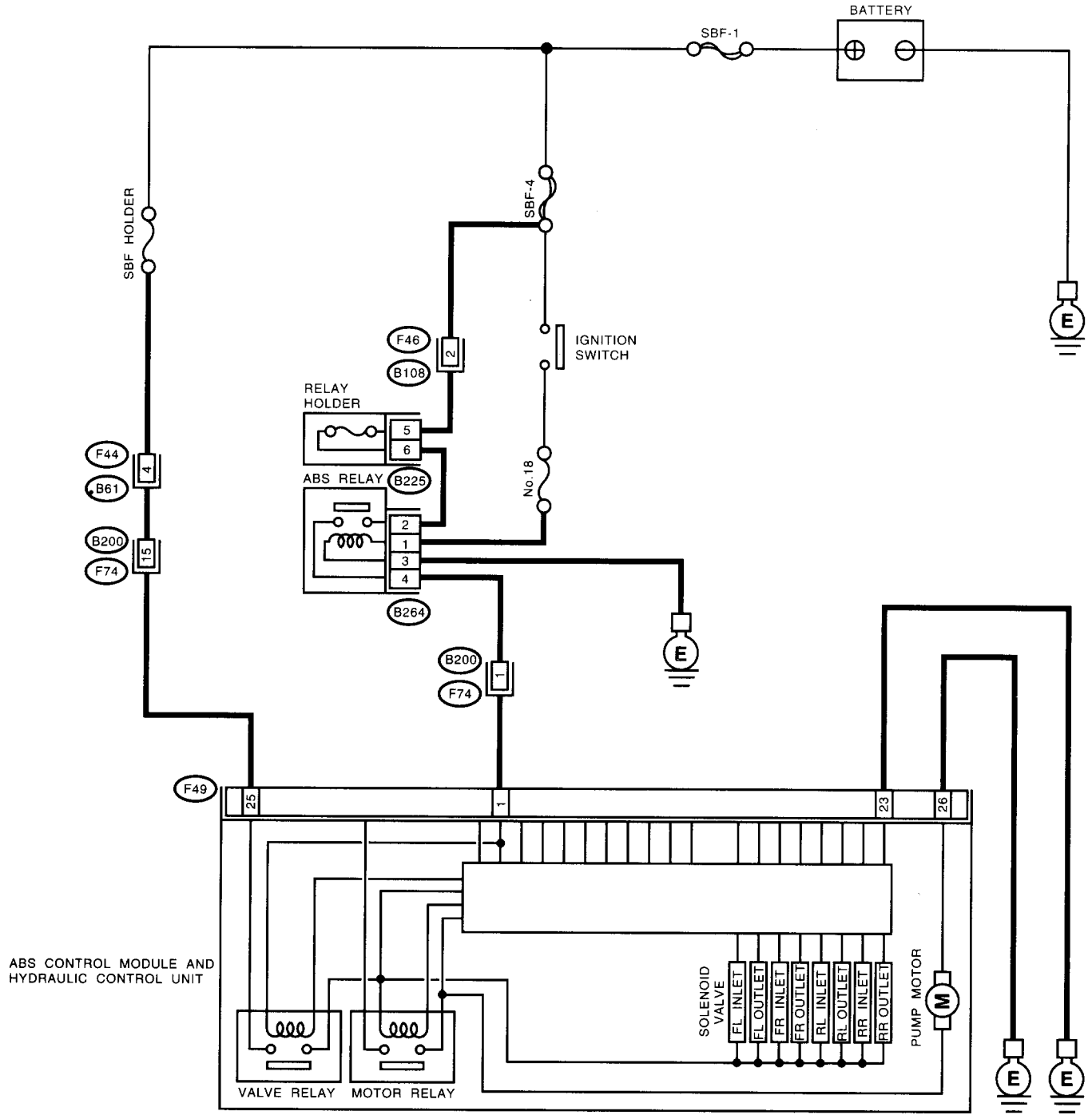
	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Turn the ignition switch to ON. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 25 (+) — Chassis ground (–):***	Is the voltage between 10 and 13 V?	Go to step **2.**	Repair harness/ connector between battery and ABSCM&H/U and check fuse SBF6.
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*** ***(F49) No. 26 — Chassis ground:***	Is the resistance less than 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 the sequence control.	Can the motor revolution noise (buzz) be heard when carrying out the check sequence?	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 hydraulic unit, relay box and ABSCM&H/U?	Repair the connector.	Go to step **5.**
5	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

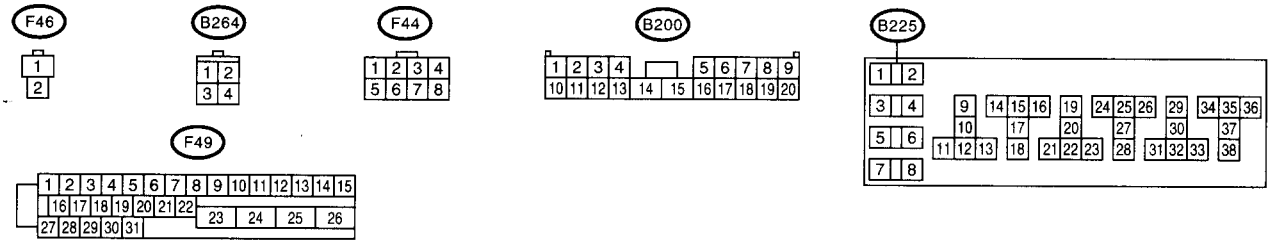
AB:DTC 52
MOTOR RELAY ON FAILURE

DIAGNOSIS:
- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:





BR0088

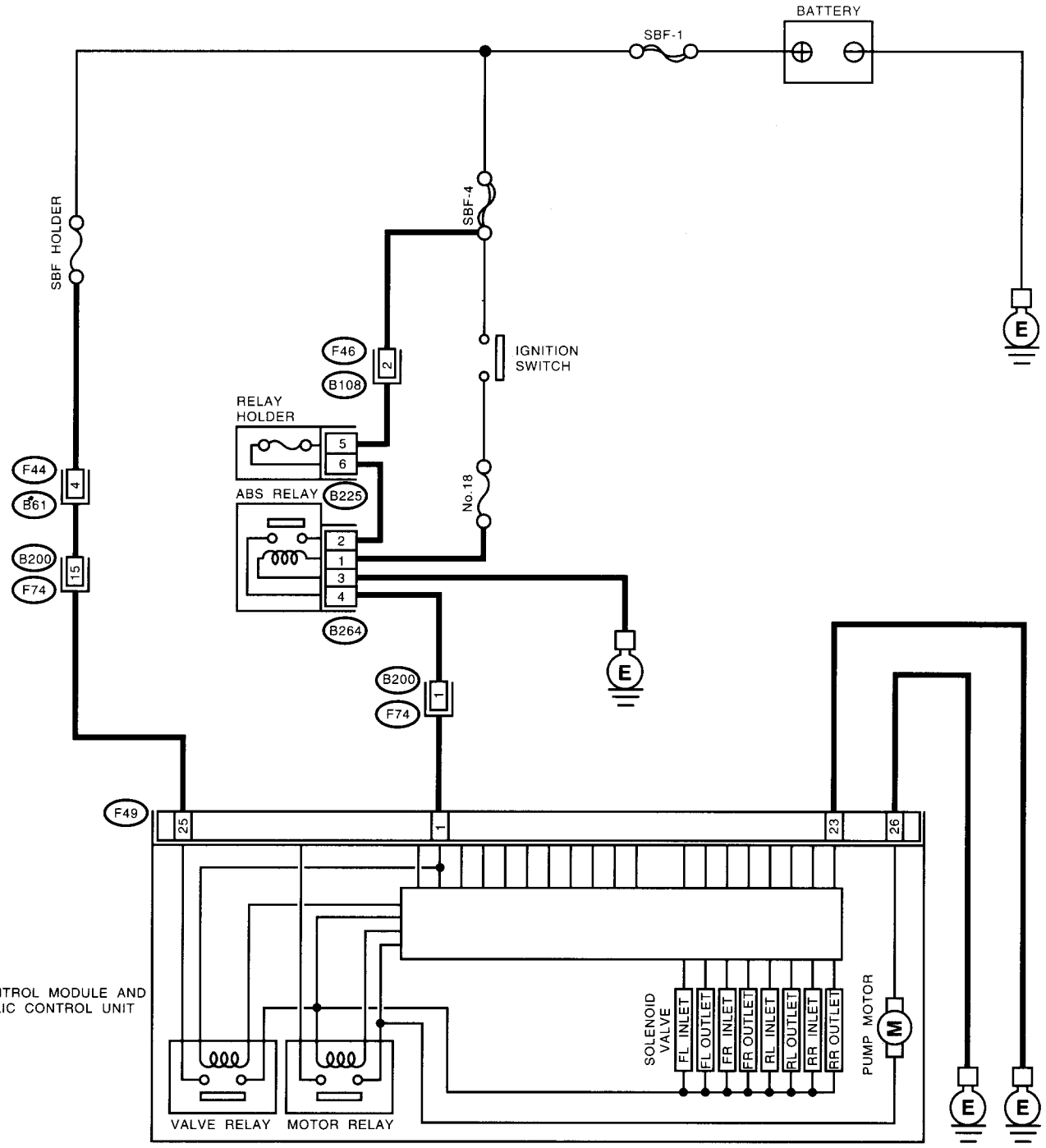
	Step	Check	Yes	No
1	**CHECK MOTOR RELAY IN ABSCM&H/U.** Measure the resistance between ABSCM&H/U terminals. ***Terminals*** ***No. 25 — No. 26:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2	**CHECK MOTOR OPERATION.** Operate the sequence control. <Ref. to ABS-11, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate the sequence control.	Can the motor revolution noise (buzz) be heard when carrying out the sequence control?	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 hydraulic unit, relay box and ABSCM&H/U?	Repair the connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

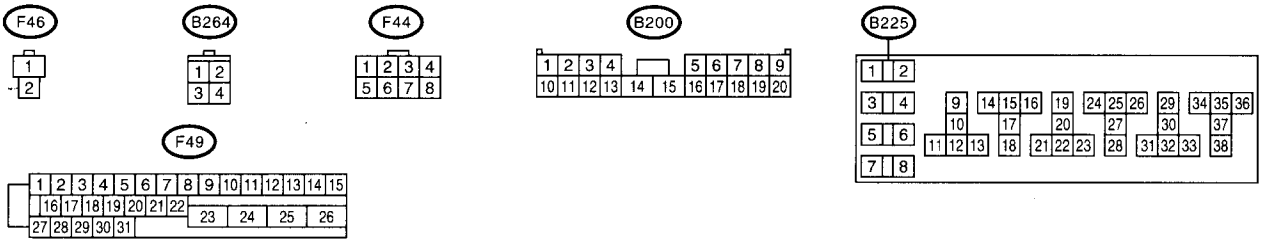
AC:DTC 52
MOTOR MALFUNCTION

DIAGNOSIS:
- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:





BR0088

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

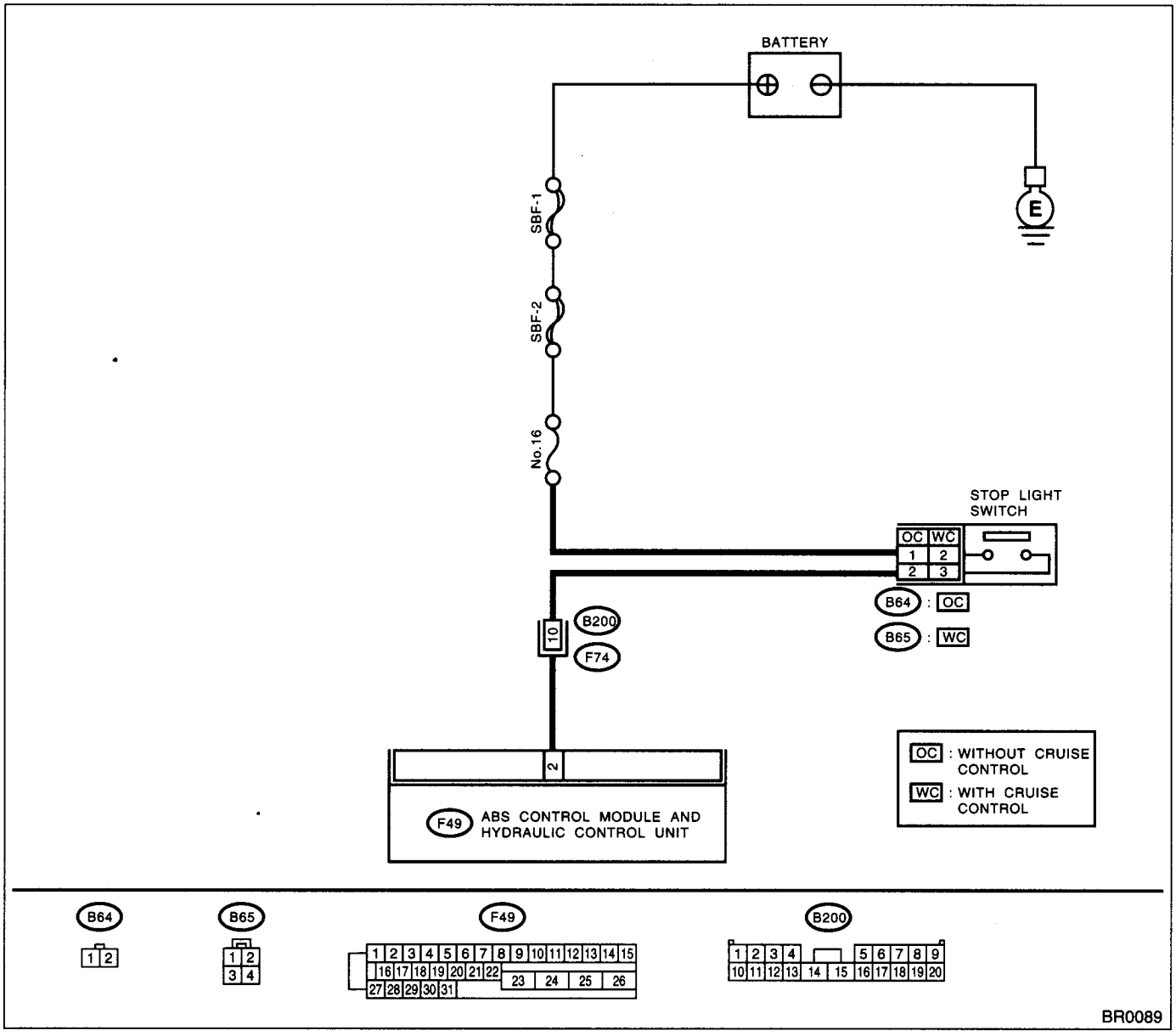
	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Turn the ignition switch to ON. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 25 (+) — Chassis ground (–):***	Is the voltage between 10 and 13 V?	Go to step **2.**	Repair harness/ connector between battery and ABSCM&H/U and check fuse SBF6.
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*** ***(F49) No. 26 — Chassis ground:***	Is the resistance less than 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*** ***(F49) No. 1 (+) — Chassis ground (–):***	Is the voltage between 10 and 15 V?	Go to step **4.**	Repair 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*** ***(F49) No. 23 — Chassis ground:***	Is the resistance less than 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 the motor revolution noise (buzz) be heard when carrying out the sequence control?	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?	Repair the connector.	Go to step **7.**
7	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **8.**
8	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

AD:DTC 54
STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION

DIAGNOSIS:
- Faulty stop light switch

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:



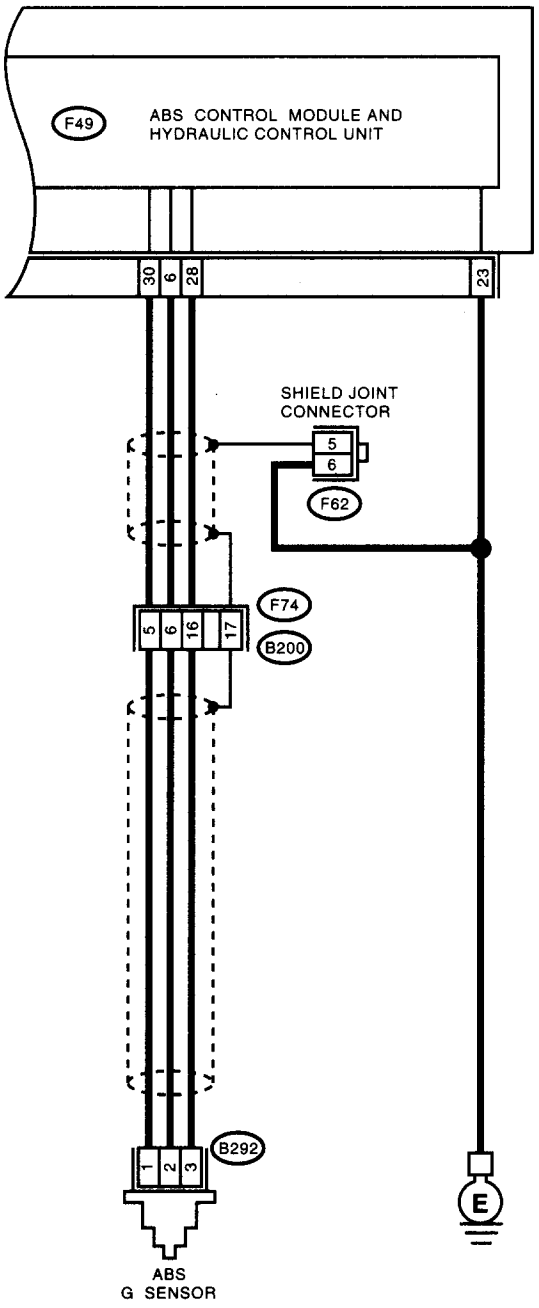
	Step	Check	Yes	No
1	**CHECK OUTPUT OF STOP LIGHT SWITCH USING SELECT MONITOR.** 1)Select "Current data display & Save" on the select monitor. 2)Release the brake pedal. 3)Read the stop light switch output in the select monitor data display.	Is the reading indicated on monitor display less than 1.5 V?	Go to step **2.**	Go to step **3.**
2	**CHECK OUTPUT OF STOP LIGHT SWITCH USING SELECT MONITOR.** 1)Depress the brake pedal. 2)Read the stop light switch output in the select monitor data display.	Is the reading indicated on monitor display between 10 and 15 V?	Go to step **5.**	Go to step **3.**
3	**CHECK IF STOP LIGHTS COME ON.** Depress the brake pedal.	Do 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*** ***(F49) No. 2 — Chassis ground:***	Is the voltage between 10 and 15 V?	Go to step **5.**	Repair 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?	Repair the connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

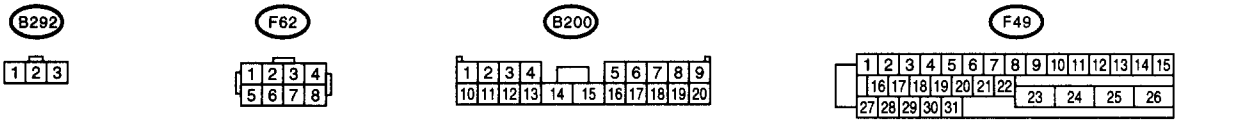
AE:DTC 56
OPEN OR SHORT CIRCUIT IN G SENSOR CIRCUIT

DIAGNOSIS:
- Faulty G sensor output voltage

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:





BR0090

	Step	Check	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 the monitor display between 2.1 and 2.5 V when the G sensor is in horizontal position?	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?	Repair the connector.	Go to step **3.**
3	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **4.**
4	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
5	**CHECK INPUT VOLTAGE OF G SENSOR.** 1)Turn the ignition switch to OFF. 2)Remove the console box. 3)Disconnect the G sensor from body. (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 voltage between 4.75 and 5.25 V?	Go to step **6.**	Repair 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*** ***(F49) No. 6 — No. 28:***	Is the resistance between 4.3 and 4.9 kΩ?	Go to step **7.**	Repair 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*** ***(F49) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair harness between G sensor and ABSCM&H/U.
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 voltage between 2.1 and 2.5 V when G sensor is horizontal?	Go to step **9.**	Replace the G sensor. <Ref. to ABS-23, G Sensor.>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

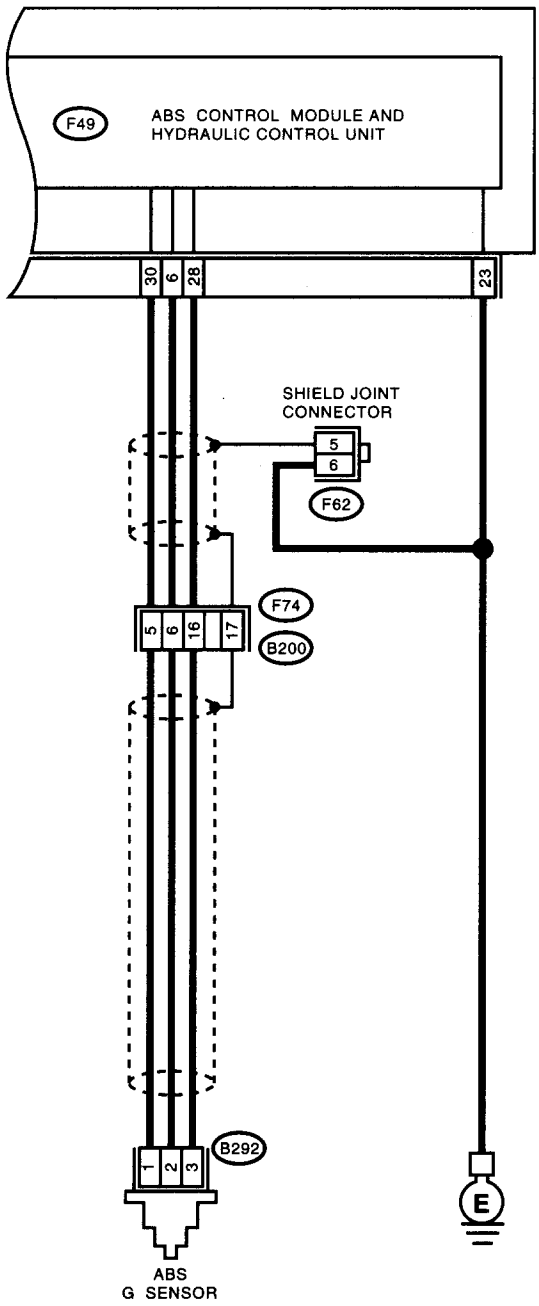
	Step	Check	Yes	No
9	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage between 3.7 and 4.1 V when G sensor is inclined forwards to 90°?	Go to step **10.**	Replace the G sensor. <Ref. to ABS-23, G Sensor.>
10	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage between 0.5 and 0.9 V when G sensor is inclined backwards to 90°?	Go to step **11.**	Replace the G sensor. <Ref. to ABS-23, 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?	Repair the connector.	Go to step **12.**
12	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13.**
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

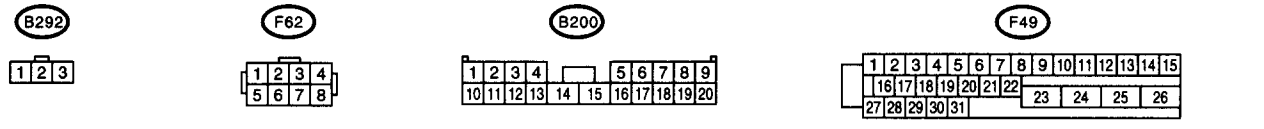
AF:DTC 56
BATTERY SHORT IN G SENSOR CIRCUIT

DIAGNOSIS:
- Faulty G sensor output voltage

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:





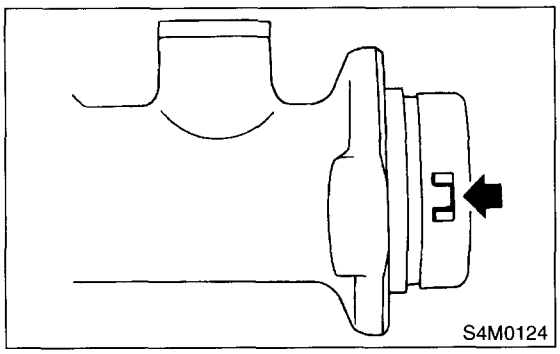
BR0090

	Step	Check	Yes	No
	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.	s the G sensor output on the nonitor display between 2.1 nd 2.5 V when the G sensor s in horizontal position?	Go to step **2.**	Go to step **5.**
2	**CHECK POOR CONTACT IN CONNECTORS.**	s there poor contact in connector between ABSCM&H/U nd G sensor?	Repair the connector.	Go to step **3.**
3	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	s the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit ABSCM&H/U).>	Go to step **4.**
4	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	re other diagnostic trouble odes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
5	**CHECK FREEZE FRAME DATA.** 1)Select "Freeze frame data" on the select monitor. 2)Read the front right wheel speed on the select monitor display.	s the front right wheel speed n monitor display 0 km?	Go to step **6.**	Go to step **16.**
6	**CHECK FREEZE FRAME DATA.** Read the front left wheel speed on the select monitor display.	s the front left wheel speed on nonitor display 0 km?	Go to step **7.**	Go to step **16.**
7	**CHECK FREEZE FRAME DATA.** Read the rear right wheel speed on the select monitor display.	s the rear right wheel speed n monitor display 0 km?	Go to step **8.**	Go to step **16.**
8	**CHECK FREEZE FRAME DATA.** Read the rear left wheel speed on the select monitor display.	s the rear left wheel speed on nonitor display 0 km?	Go to step **9.**	Go to step **16.**
9	**CHECK FREEZE FRAME DATA.** Read the G sensor output on the select monitor display.	s the G sensor output on monitor display more than 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*** ***(F49) No. 6 — No. 28:***	s the resistance between 4.3 nd 4.9 kΩ?	Go to step **11.**	Repair harness/ connector between G sensor and ABSCM&H/U
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*** ***(F49) No. 6 (+) — Chassis ground (–):***	s the voltage less than 1 V?	Go to step **12.**	Repair harness between G sensor and ABSCM&H/U

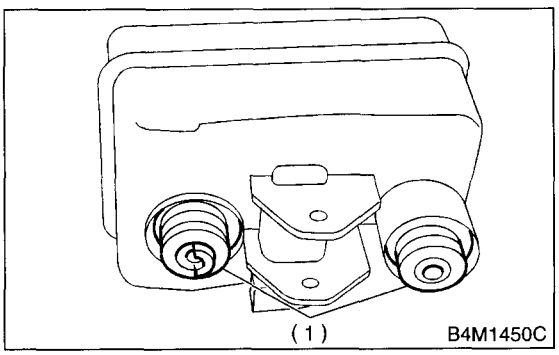
	Step	Check	Yes	No
12	**CHECK BATTERY SHORT OF HARNESS.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 6 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **13.**	Repair harness between 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?	Repair the connector.	Go to step **14.**
14	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **15.**
15	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
16	**CHECK INPUT VOLTAGE OF G SENSOR.** 1)Turn the ignition switch to OFF. 2)Remove the console box. 3)Disconnect the G sensor from body. (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 voltage between 4.75 and 5.25 V?	Go to step **17.**	Repair harness/ connector between G sensor and ABSCM&H/U.
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*** ***(F49) No. 6 — No. 28:***	Is the resistance between 4.3 and 4.9 kΩ?	Go to step **18.**	Repair 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 voltage between 2.1 and 2.5 V when G sensor is horizontal?	Go to step **19.**	Replace the G sensor. <Ref. to ABS-23, G Sensor.>
19	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage between 3.7 and 4.1 V when G sensor is inclined forwards to 90°?	Go to step **20.**	Replace the G sensor. <Ref. to ABS-23, G Sensor.>
20	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage between 0.5 and 0.9 V when G sensor is inclined backwards to 90°?	Go to step **21.**	Replace the G sensor. <Ref. to ABS-23, G Sensor.>

	Step	Check	Yes	No
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?	Repair the connector.	Go to step **22.**
22	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **23.**
23	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

inder.
2) Assembling cylinder pin:
3) Press the pawl and install the piston retainer into the master cylinder.



4) Install the seal to reservoir tank.



(1) Seal

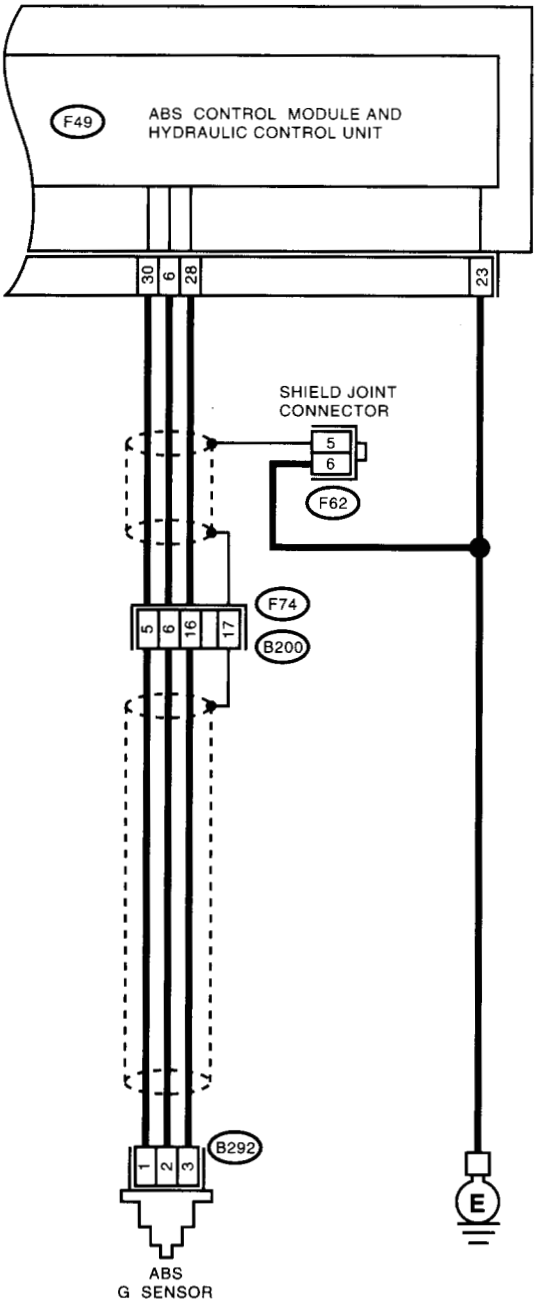
5) Install the pin with drift pins which secures the reservoir tank to master cylinder.

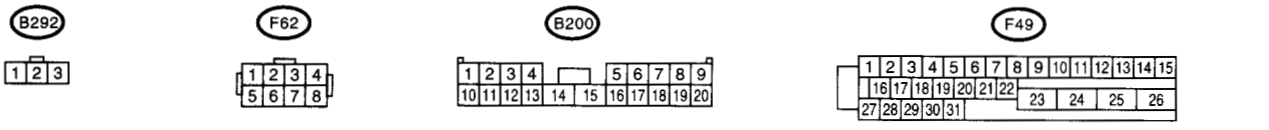
AH:DTC 56
DETECTION OF G SENSOR STICK

DIAGNOSIS:
- Faulty G sensor output voltage

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:





BR0090

	Step	Check	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 rolling road?	The ABS is normal. Erase the diagnostic trouble code.	Go to step **2.**
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 the monitor display between 2.1 and 2.5 V when the vehicle is in horizontal position?	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 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 G sensor output on the monitor display between 3.7 and 4.1 V when G sensor is inclined forwards to 90°?	Go to step **4.**	Replace the G sensor. <Ref. to ABS-23, G Sensor.>
4	**CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.** Read the select monitor display.	Is the G sensor output on the monitor display between 0.5 and 0.9 V when G sensor is inclined backwards to 90°?	Go to step **5.**	Replace the G sensor. <Ref. to ABS-23, 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?	Repair the connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
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*** ***(F49) No. 6 — No. 28:***	Is the resistance between 4.3 and 4.9 kΩ?	Go to step **9.**	Repair harness/ connector between G sensor and ABSCM&H/U.
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 voltage between 2.1 and 2.5 V when G sensor is horizontal?	Go to step **10.**	Replace the G sensor. <Ref. to ABS-23, G Sensor.>

	Step	Check	Yes	No
10	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal (B292) No. 2 (+) — No. 3 (–):***	Is the voltage between 3.7 and 4.1 V when G sensor is inclined forwards to 90°?	Go to step **11.**	Replace the G sensor. <Ref. to ABS-23, G Sensor.>
11	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal (B292) No. 2 (+) — No. 3 (–):***	Is the voltage between 0.5 and 0.9 V when G sensor is inclined backwards to 90°?	Go to step **12.**	Replace the G sensor. <Ref. to ABS-23, 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 diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13.**
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

14.General Diagnostics Table

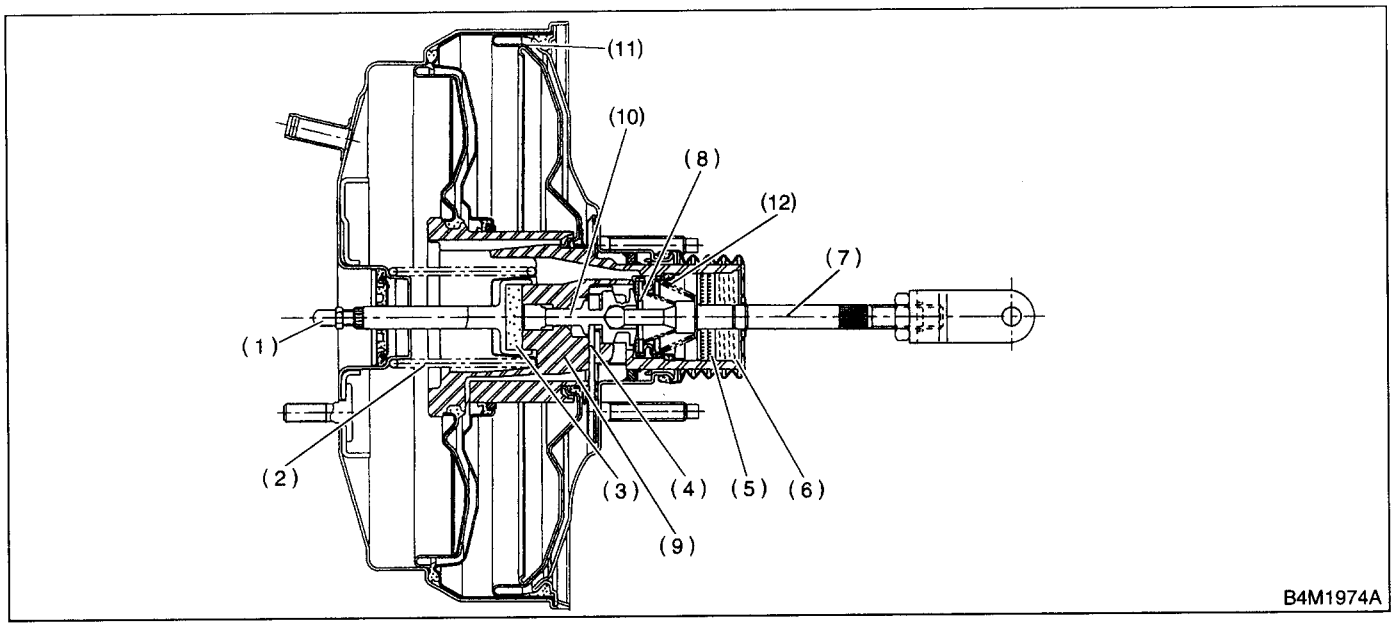
A: INSPECTION

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)

GENERAL DIAGNOSTICS TABLE

Symptom		Probable faulty units/parts
	Excessive pedal vibration	• Incorrect wiring or piping connections • Road surface (uneven)
		• ABSCM&H/U (mount bushing)

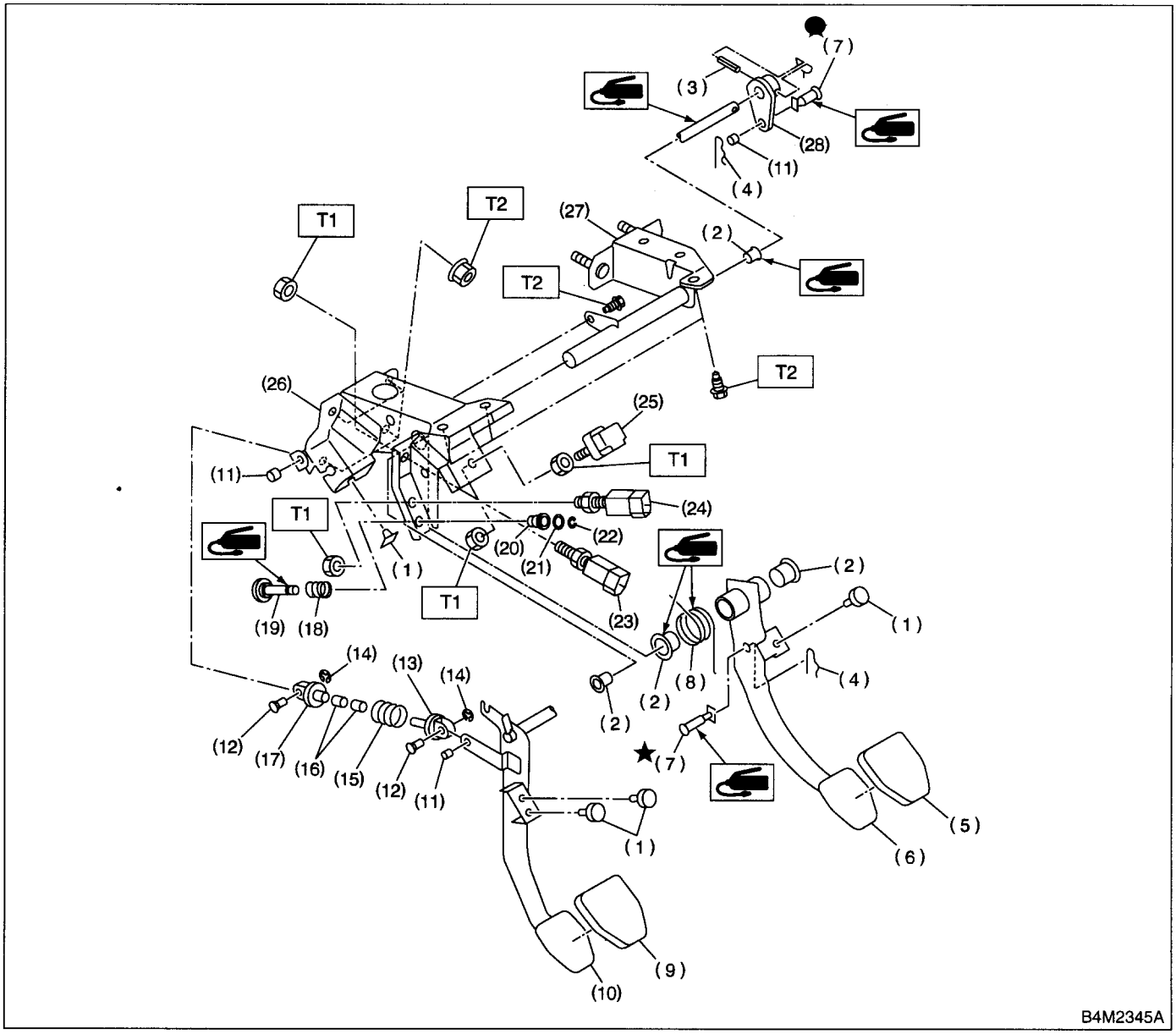
7. BRAKE BOOSTER



(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

8. BRAKE PEDAL

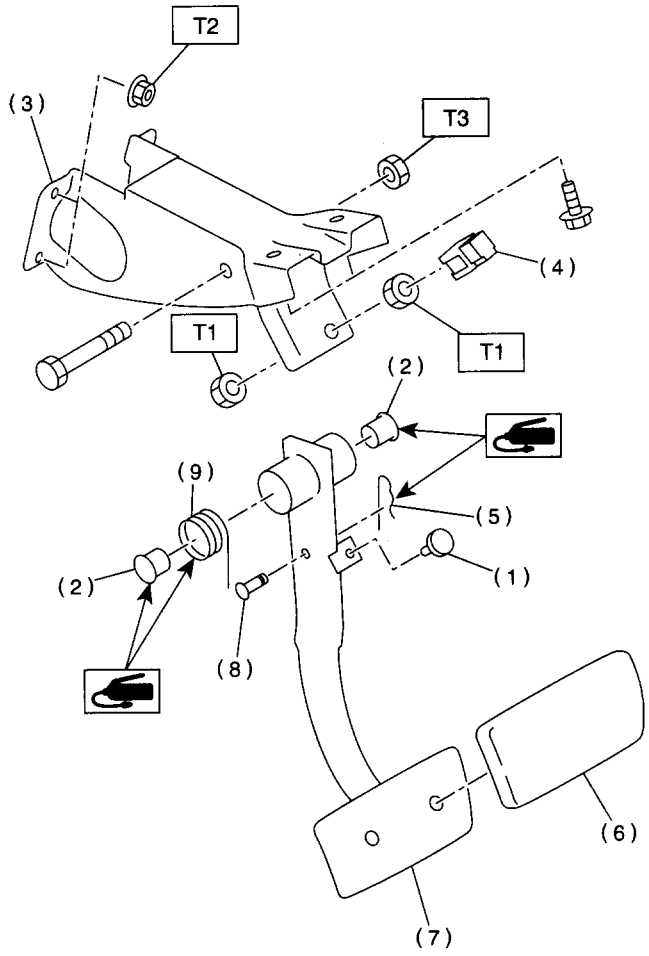
• MT Model



(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 S
(19) Rod S
(20) Bushing S
(21) O-ring
(22) Clip
(23) Clutch switch (Starter interlock)
(24) Clutch switch (With cruise control)
(25) Stop light switch
(26) Pedal bracket
(27) Clutch master cylinder bracket
(28) Lever

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)

• **AT Model**



BR0007

(1) Stopper
(2) Bushing
(3) Pedal bracket
(4) Stop light switch
(5) Snap pin
(6) Brake pedal pad
(7) Brake pedal
(8) Clevis pin
(9) Brake pedal spring

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*8 (0.8, 5.8)*
T2:	*18 (1.8, 13.0)*
T3:	*29 (3.0, 21.7)*

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.
- 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 vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.
- 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

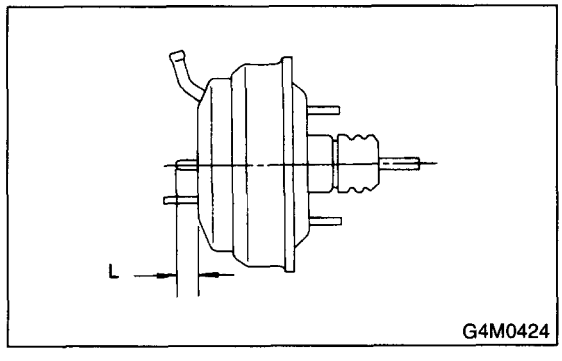
12.Brake Booster

A: REMOVAL

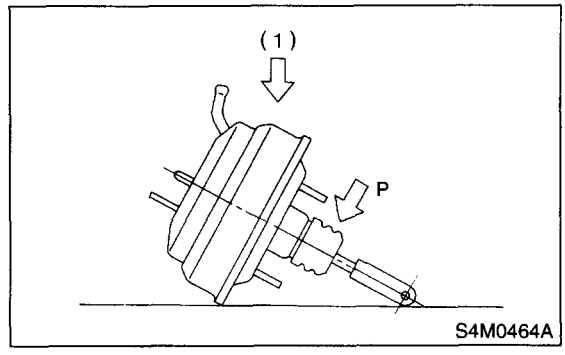
1) Remove or disconnect the following parts at engine compartment.
   (1) Disconnect the connector for brake fluid level indicator.
   (2) Remove the brake pipes from master cylinder.
   (3) Remove the master cylinder installing nuts.
   (4) Disconnect the vacuum hose from brake booster.
2) Remove the following parts from the pedal bracket.
   (1) Snap pin and clevis pin
   (2) Four brake booster installing nuts
3) Remove the brake booster while shunning brake pipes.

NOTE:
• Be careful not to drop the brake booster. Brake booster should be discarded if it has been dropped.
• Use spècial care when handling the operating rod.
If excessive force is applied to 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 the floor.
• Do not change the push rod length. If it has been changed, reset the projected length "L" to the standard length.

Standard:
L = 10.4 mm (0.41 in)



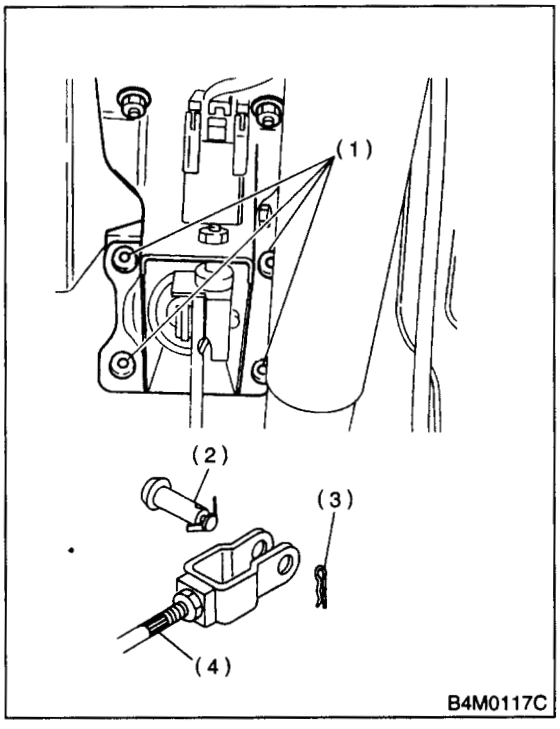
CAUTION:
If external force is applied from above when brake booster is placed in this position, the resin portion as indicated by "P", may be damaged.



(1) Force

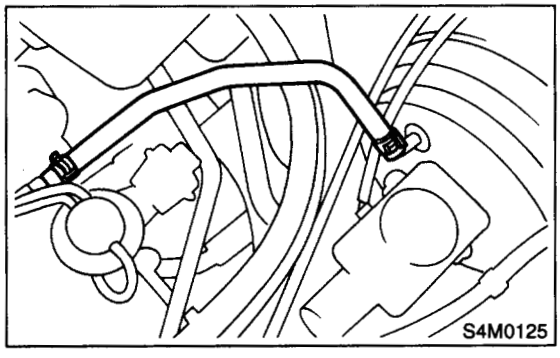
B: INSTALLATION

1) Mount the brake booster in position.
2) Connect the operating rod to brake pedal with clevis pin and snap pin.



(1) Nuts
(2) Clevis pin
(3) Snap pin
(4) Operating rod

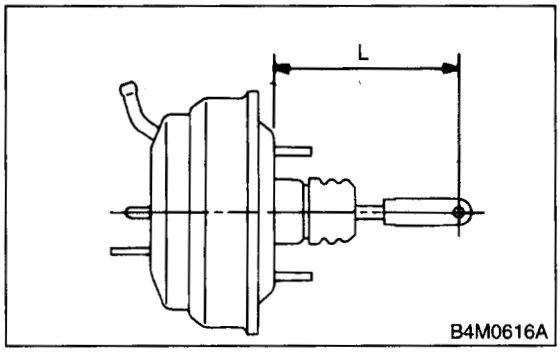
3) Connect the vacuum hose to brake booster.



4) Mount the master cylinder onto brake booster.
5) Connect the brake pipes to master cylinder.
6) Connect the electric connector for brake fluid level indicator.
7) 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)

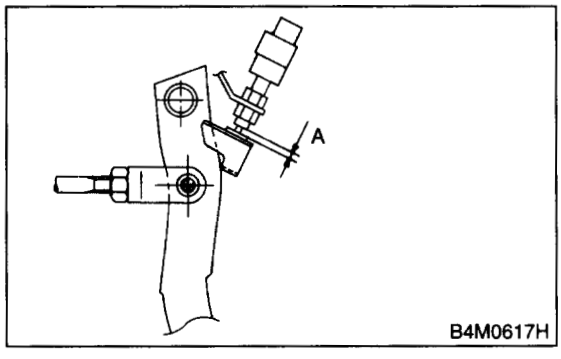
If it is not in specified value, adjust it by adjusting the brake booster operating rod.



8) Measure the clearance between threaded end of stop light switch and stopper.
If it is not in 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)

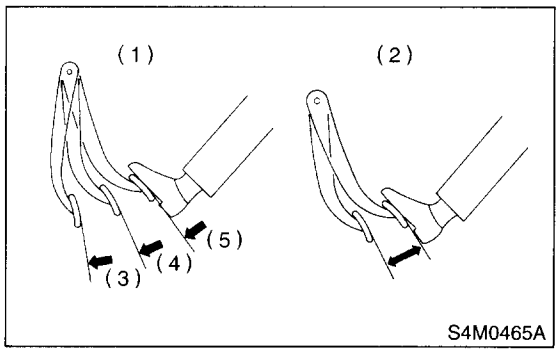
CAUTION:
When checking operation, be sure to securely apply the hand brake.

• Checking without gauges

This method cannot determine the exact portion which has failed, but it can provide a rough understanding of the nature of the 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 the same pedal force as that used in ordinary braking operations. The pedal stroke should be greatest on the 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.

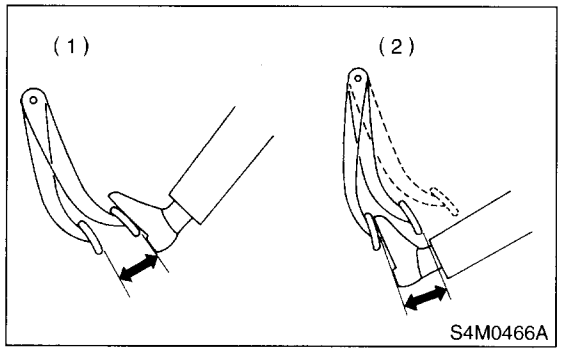


(1) OK
(2) NOT OK
(3) 1st
(4) 2nd
(5) 3rd

NOTE:
• In the event of defective operation, inspect the condition of the 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 the same pedal force and make sure that the pedal height does not vary with each depression of the pedal.



(1) When engine is stopped
(2) When engine is started

2) With the brake pedal depressed, start the engine.
3) As 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 the 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.

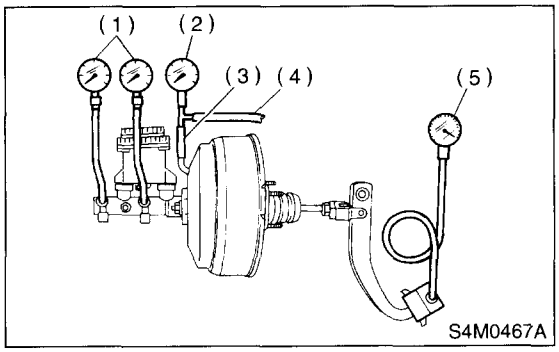
NOTE:
If faulty, check precisely with gauges.

2. OPERATION CHECK (WITH GAUGES)

CAUTION:
When checking operation, be sure to securely apply the hand brake.

• Checking with gauges

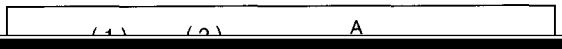
Connect gauges as shown in the figure. After bleeding air from pressure gauges, proceed to each check.



(1)• Pressure gauge
(2) Vacuum gauge
(3) Adapter hose
(4) Vacuum hose
(5) Pedal force gauge

• Air tightness check

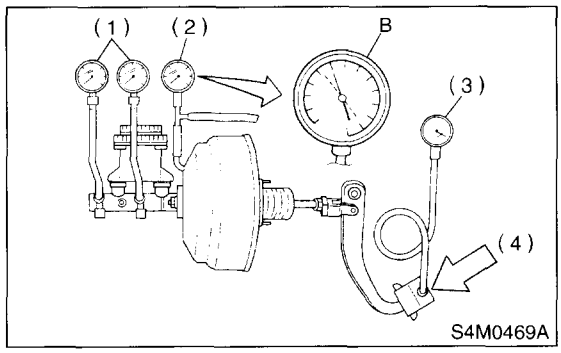
1) Start the engine and keep it running until a vacuum of 66.7 kPa (500 mmHg, 19.69 inHg) = point A is indicated on vacuum gauge. Do not depress the brake pedal.



• 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 the 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 the engine, brake booster is functioning properly.
If defective, refer to "AIR TIGHTNESS CHECK"

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 fluid level becomes close to "MIN", refill fluid.
2) Check the fluid for discoloration. If fluid color has excessively changed, drain the fluid and refill with new fluid.

B: REPLACEMENT

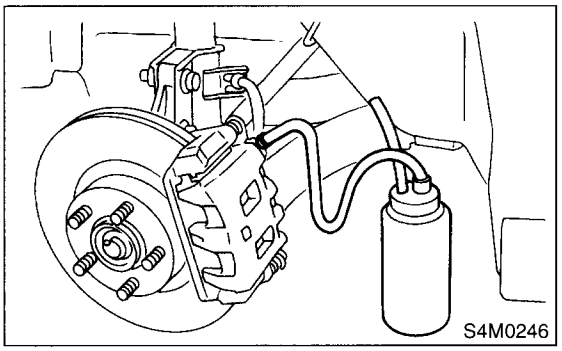
CAUTION:
• To always maintain the brake fluid characteristics, replace the brake fluid according to maintenance schedule or earlier than that when used in severe condition.
• The FMVSS No. 116, fresh DOT3 or 4 brake fluid must be used.
• Cover the bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
• 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.

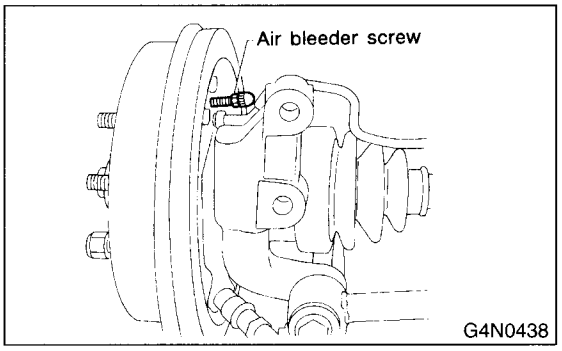
NOTE:
• During bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
• Brake pedal operating must be very slow.
• For convenience and safety, two people should do the work.
• The amount of brake fluid required is approximately 500 m ℓ (16.9 US fl oz, 17.6 Imp fl oz) for total brake system.

1) Either jack-up the vehicle and place a safety stand under it, or 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

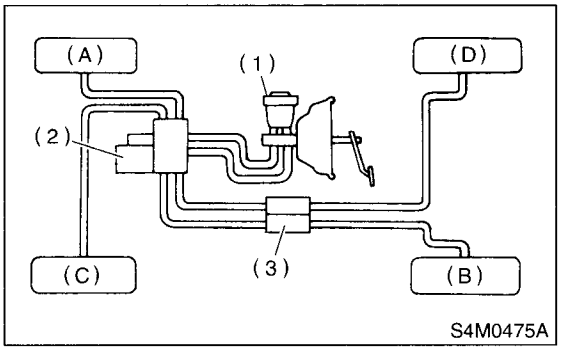
5) Install one end of a vinyl tube onto the air bleeder and insert the other end of the tube into a container to collect the brake fluid.


S4M0246



G4N0438

CAUTION:
Brake fluid replacement sequence; (A) Front right → (B) Rear left → (C) Front left → (D) Rear right



S4M0475A

(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 approximately 1/4 turn until a small amount of brake fluid drains into the container, and then quickly tighten the screw.

8) Repeat steps 6) and 7) above until there are no air bubbles in 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 the brake pedal depressed and tighten the 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 7) above.

11) Depress the brake pedal with a force of approximately 294 N (30 kgf, 66 lb) and hold it there for approximately 20 seconds. At this time check the pedal to see if it shows 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 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

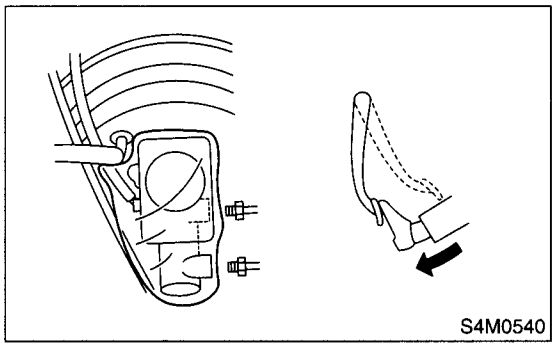
CAUTION:
• The FMVSS No. 116, fresh DOT3 or 4 brake fluid must be used.
• Cover the bleeder with waste cloth when loosening it to prevent brake fluid from being splashed over surrounding parts.
• Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.

NOTE:
• Start with the brakes (wheels) connected to the secondary chamber of the master cylinder.
• The time interval between two brake pedal operations (from the time when the pedal is released to the time when it is depressed another time) shall be approximately 3 seconds.
• The air bleeder on each brake shall be released for 1 to 2 seconds.

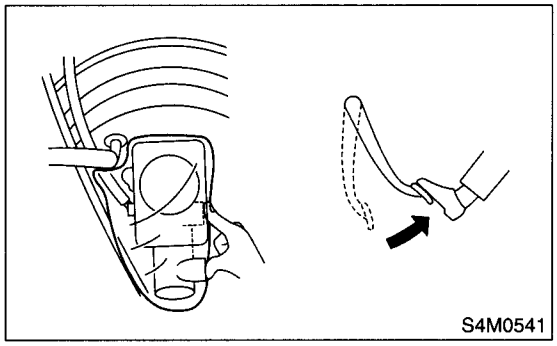
1. MASTER CYLINDER

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.
• Brake pedal operating must be very slow.
• For convenience and safety, two people should do the work.

1) Disconnect the brake line at primary and secondary sides.
2) Cover the master cylinder with vinyl bag.
3) Carefully depress and hold the brake pedal.


S4M0540

4) Close the outlet plug with your finger, and release the brake pedal.


S4M0541

5) Repeat the above step3) and 4) until brake fluid is completey bled from outlet plug.
6) Remove the vinyl bag, then connect the brake pipe to master cylinder.

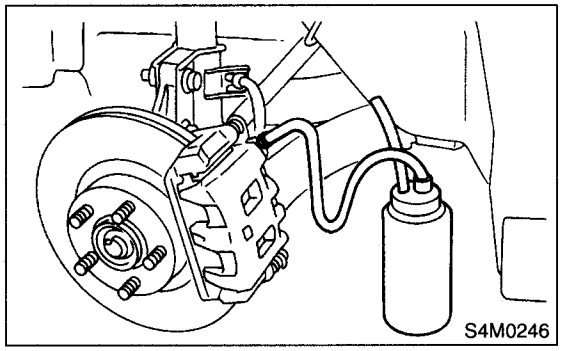
Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

7) Using water, wash off the spilt brake fluid at the master cylinder surrounding, then wipe up the water.
8) Bleed air from the brake line. <Ref. to BR-46, BRAKE LINE, PROCEDURE, Air Bleeding.>

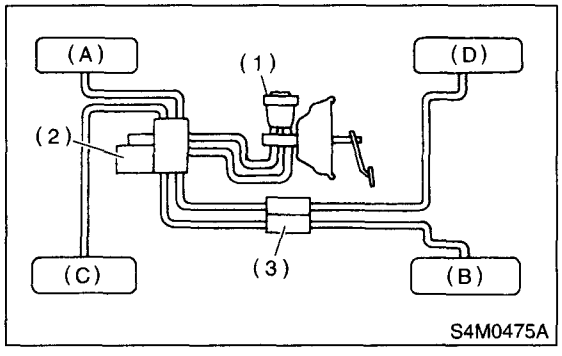
2. BRAKE LINE

NOTE:
• During the bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
• 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 joints and connections of the brake system.
2) Fit one end of vinyl tube into the air bleeder and put the other end into a brake fluid container.


S4M0246

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 is 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.

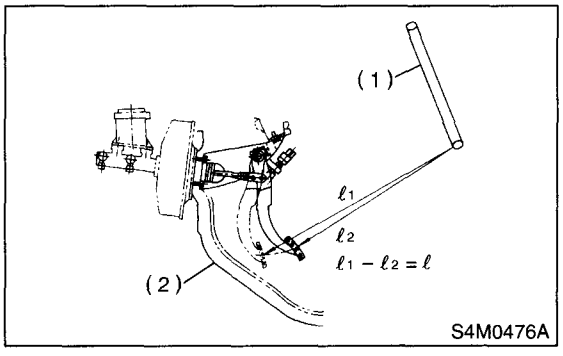
NOTE:
Brake pedal operating must be very slow.

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 the 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 approximately 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 the brake pedal and steering wheel. With the brake pedal released, measure the distance between the pedal and steering wheel again. The difference between the two measurements must be more than specified.



(1) Steering wheel
(2) Toe board

Specified pedal stroke:
Without ABS
90 mm (3.54 in)
With ABS
95 mm (3.74 in)
When depressing brake pedal with a 490 N (50 kg, 110 lb) load.

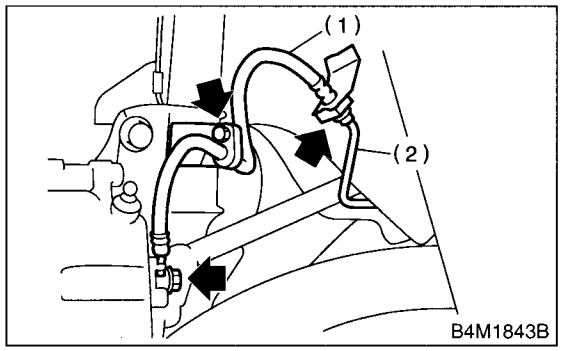
7) If the distance is more than specified, there is a possibility that air is in the brake line. Bleed the brake line until pedal stroke meets the specification.
8) Operate the hydraulic control unit in the sequence control mode. (With ABS)
<Ref. to ABS-11, ABS Sequence Control.>
9) Recheck the brake stroke.
10) If the distance is more than specified, there is a possibility air is in the inside of the hydraulic unit. Repeat above steps 2) to 9) 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 flare nut wrench and be careful not to deform flare nut.)



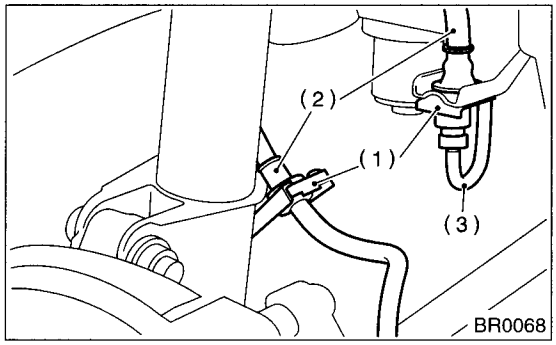
(1) Brake hose
(2) Brake pipe

2) Pull out the clamp to remove the brake hose.
3) Remove the bolt at strut and union bolt.

2. REAR BRAKE HOSE

1) Separate the brake pipe from brake hose.

NOTE:
Always use flare nut wrench and be careful not to deform flare nut.



(1) Brake hose clip
(2) Brake hose
(3) Brake pipe

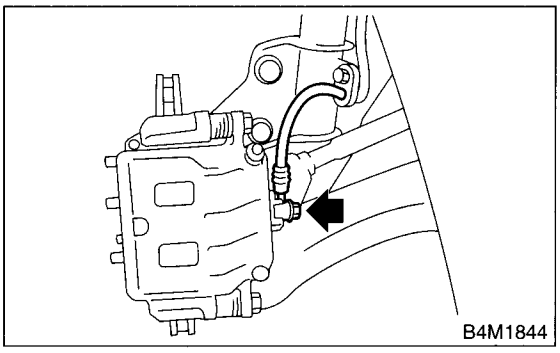
2) Unscrew the brake hose flare nut, and disconnect the brake hose.
3) Pull out the clamp to remove the brake hose.

B: INSTALLATION

1. FRONT BRAKE HOSE

1) Route the end of brake hose (on caliper side) through hole in brake hose bracket at strut location.
2) Tighten the end of brake hose at caliper using a union bolt.

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



3) Secure the middle fitting of brake hose to bracket at strut location using a clamp.
4) Position the disc in straight-forward direction and route the brake hose through hole in bracket on wheel apron side.

CAUTION:
Be sure the brake hose is not twisted.

5) Temporarily tighten the flare nut to connect brake pipe and hose.
6) Fix the brake hose with clamp at wheel apron bracket.
7) While holding the hexagonal part of brake hose fitting with a wrench, tighten the flare nut to the specified torque.

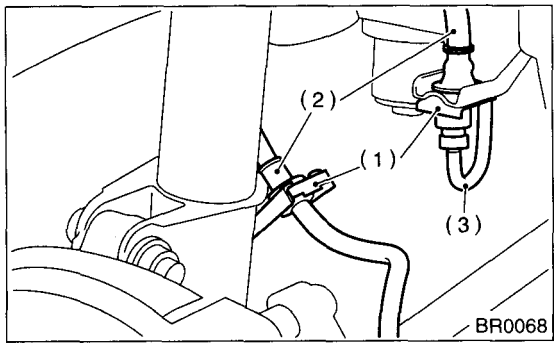
Tightening torque (Brake pipe flare nut):
15 N·m (1.5 kgf-m, 10.8 ft-lb)

8) Bleed air from the brake system. <Ref. to BR-46, Air Bleeding.>

2. REAR BRAKE HOSE

1) Pass the brake hose through the hole of bracket, and lightly tighten the flare nut to connect brake hose.
2) Insert the clamp upward to fix brake hose.
3) 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 hose clip
(2) Brake hose
(3) Brake pipe

4) Bleed air from the brake system. <Ref. to BR-46, Air Bleeding.>

C: INSPECTION

Ensure there are no cracks, breakage, or damage on 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 the low-visible part or back side.

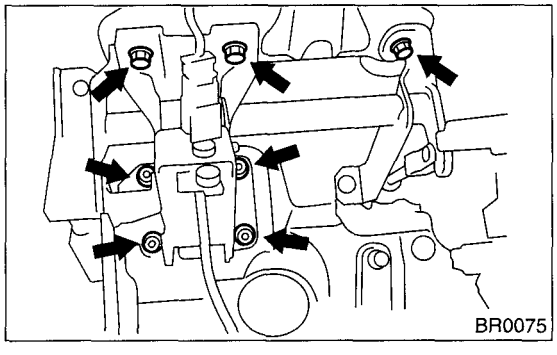
18.Brake Pedal

A: REMOVAL

1. MT MODEL

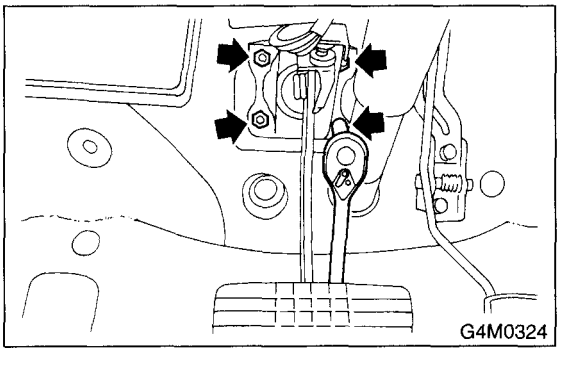
1) Remove the steering bolts.
2) Raise the vehicle on hoist and remove the two bolts which secure steering unit to underside of body.
3) Lower the vehicle to floor.
4) Remove the instrument panel lower cover from instrument panel.
5) Disconnect the following parts from pedal bracket.
- Operating rod 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.



2. AT MODEL

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 two bolts and four nuts which secure brake pedal to pedal.



B: INSTALLATION

1) Install in the reverse order of removal.

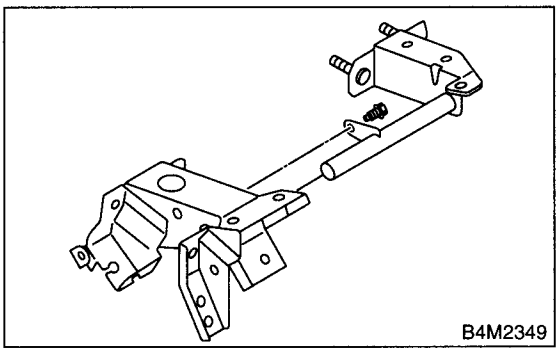
CAUTION:
- **If the cable clamp is damaged, replace it with a new one.**
- **Never fail to cover the outer cable end with boot.**
- **Be careful not to kink the accelerator cable.**
- **Always use new clevis pins.**

2) Adjust the clutch pedal <Ref. to CL-27, ADJUSTMENT, Clutch Pedal.>
3) Inspect after pedal installation <Ref. to BR-53, INSPECTION, Brake Pedal.>

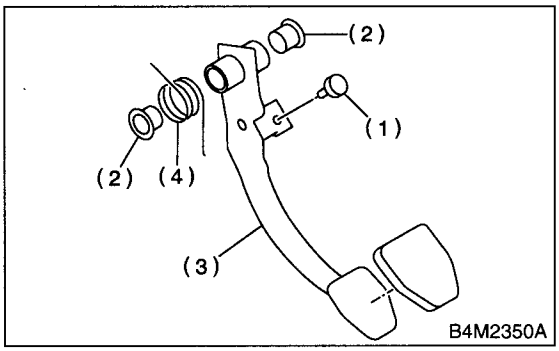
C: DISASSEMBLY

1. MT MODEL

1) Remove the brake switch.
<Ref. to BR-55, REMOVAL, Stop Light Switch.>
2) Remove the clutch pedal.
<Ref. to CL-26, DISASSEMBLY, Clutch Pedal.>
3) Remove the clutch master cylinder bracket.



4) Remove the bush, spring and stopper.

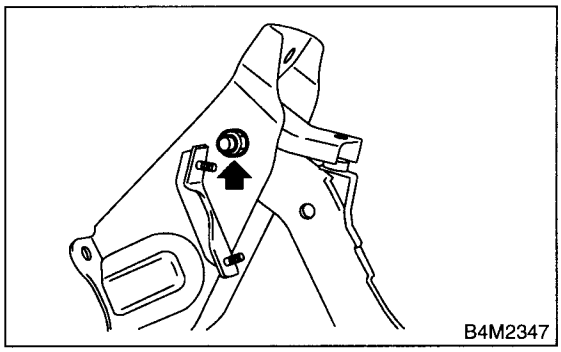


(1) Stopper
(2) Bushing
(3) Brake pedal
(4) Brake pedal spring

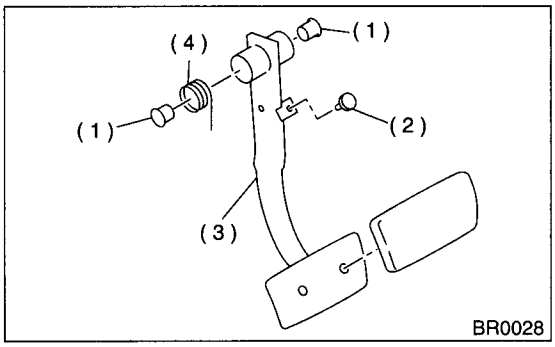
5) Remove the brake pedal pad.

2. AT MODEL

1) Remove the brake switch.
2) Unbolt, and then remove the brake pedal.



3) Remove the bush, spacer and spring.



(1) Plug
(2) Stopper
(3) Brake pedal
(4) Brake pedal spring

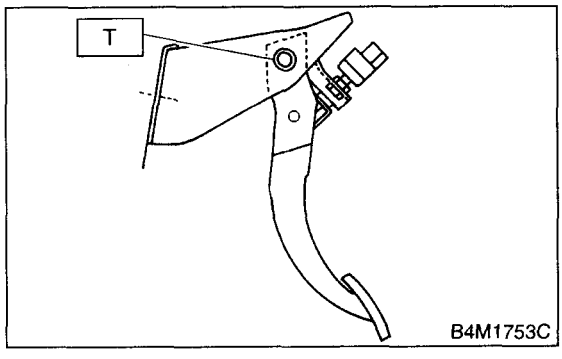
4) Remove the brake pedal pad.

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 bushings into bores.
3) Align bores of pedal bracket, clutch pedal and brake pedal, attach brake pedal return spring and clutch pedal effort reducing spring (vehicle with hill holder), and then install the pedal bolt.

NOTE:
Clean up inside of bushings and apply grease before installing the spacer.

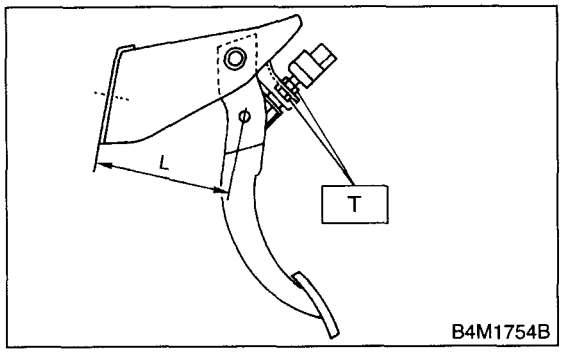
Tightening torque:
T: 29 N·m (3.0 kgf-m, 21.7 ft-lb)



4) Set the brake pedal position by adjusting the position of stop light switch.

Pedal position: L
125.9 mm (4.96 in)

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

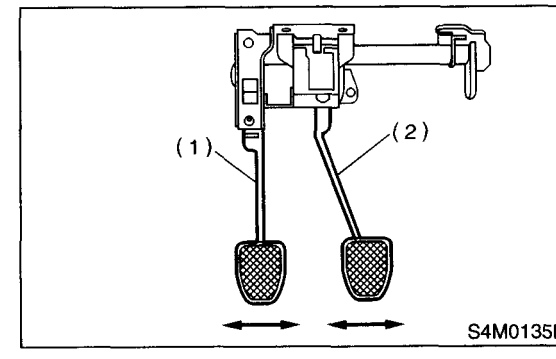


E: INSPECTION

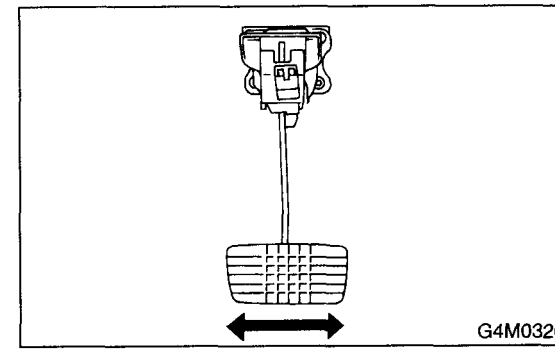
1) Move the brake and clutch pedal pads in the lateral direction with a force of approximately 10 N (1 kgf, 2 lb) to ensure pedal deflection is in specified range.

CAUTION:
If excessive deflection is noted, replace the bushings with new ones.

Deflection of brake and clutch pedal:
Service limit
5.0 mm (0.197 in) or less



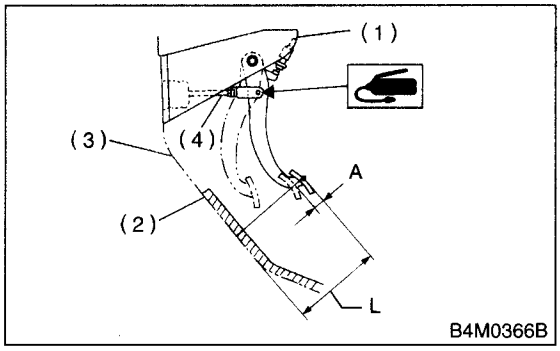
(1) Clutch pedal
(2) Brake pedal



2) Check the position of pedal pad.

Pedal height: L
148 mm (5.83 in)

Brake pedal free play: A
1 — 3 mm (0.04 — 0.12 in) [Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lb).]



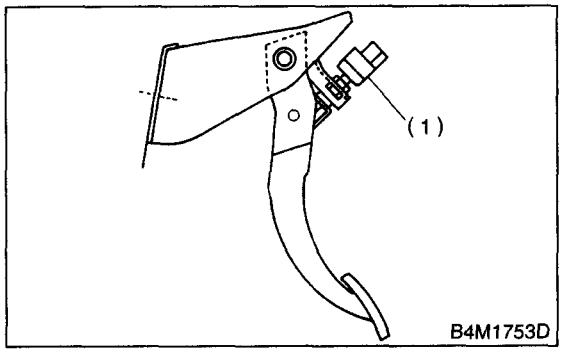
(1) Stop light switch
(2) Mat
(3) Toe board
(4) Brake booster operating rod

3) If it is not in specified value, adjust it by adjusting the brake booster operating rod length.

19.Stop Light Switch

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Disconnect the stop light switch connector.
3) Loosen the nuts, and unscrew stop light switch to remove.

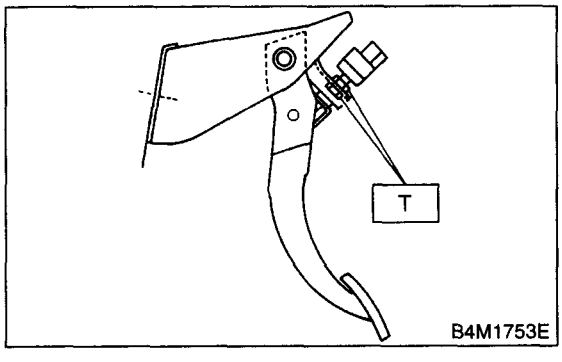


(1) Stop light switch

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-56, ADJUSTMENT, Stop Light Switch.>

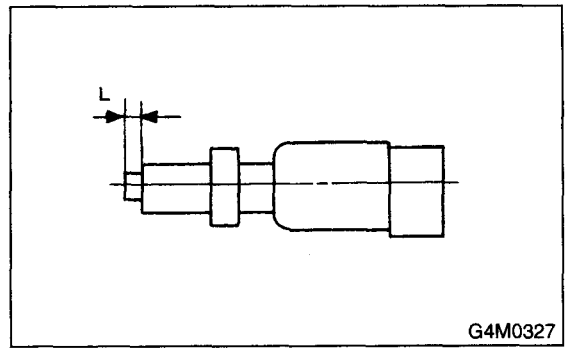
Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



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.

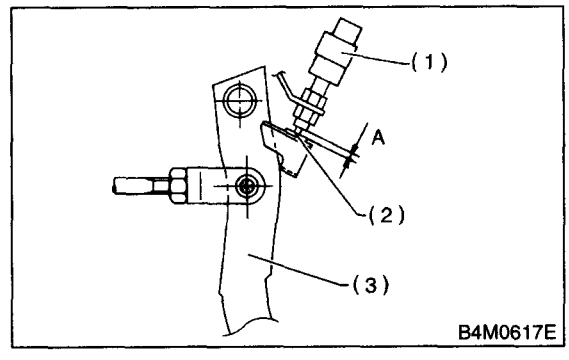
Specified position: L
2 mm (0.079 in)



2) Measure the clearance between threaded end of stop light switch and stopper.

CAUTION:
Be careful not to rotate the stop light switch.

Stop light switch clearance: A
0.3 mm (0.012 in)



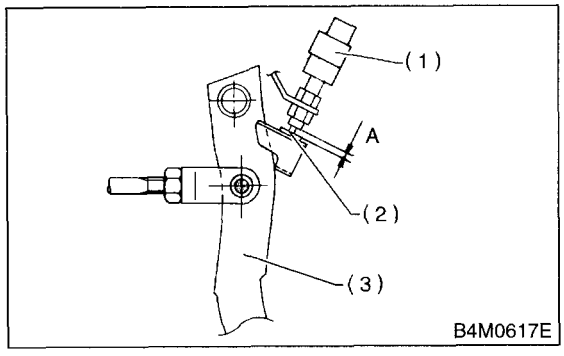
(1) Stop light switch
(2) Stopper
(3) Brake pedal

3) If it is not in specified value, adjust it by adjusting the 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 the stop light switch and the stopper becomes 0.3 mm (0.012 in). Then, tighten the lock nut.



20.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) Improper adjusted wheel bearing	Adjust or replace.
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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2. Parking Brake Lever 6
3. Parking Brake Cable 8
4. Parking Brake Assembly (Rear Disc Brake) 10
5. General Diagnostic Table 13

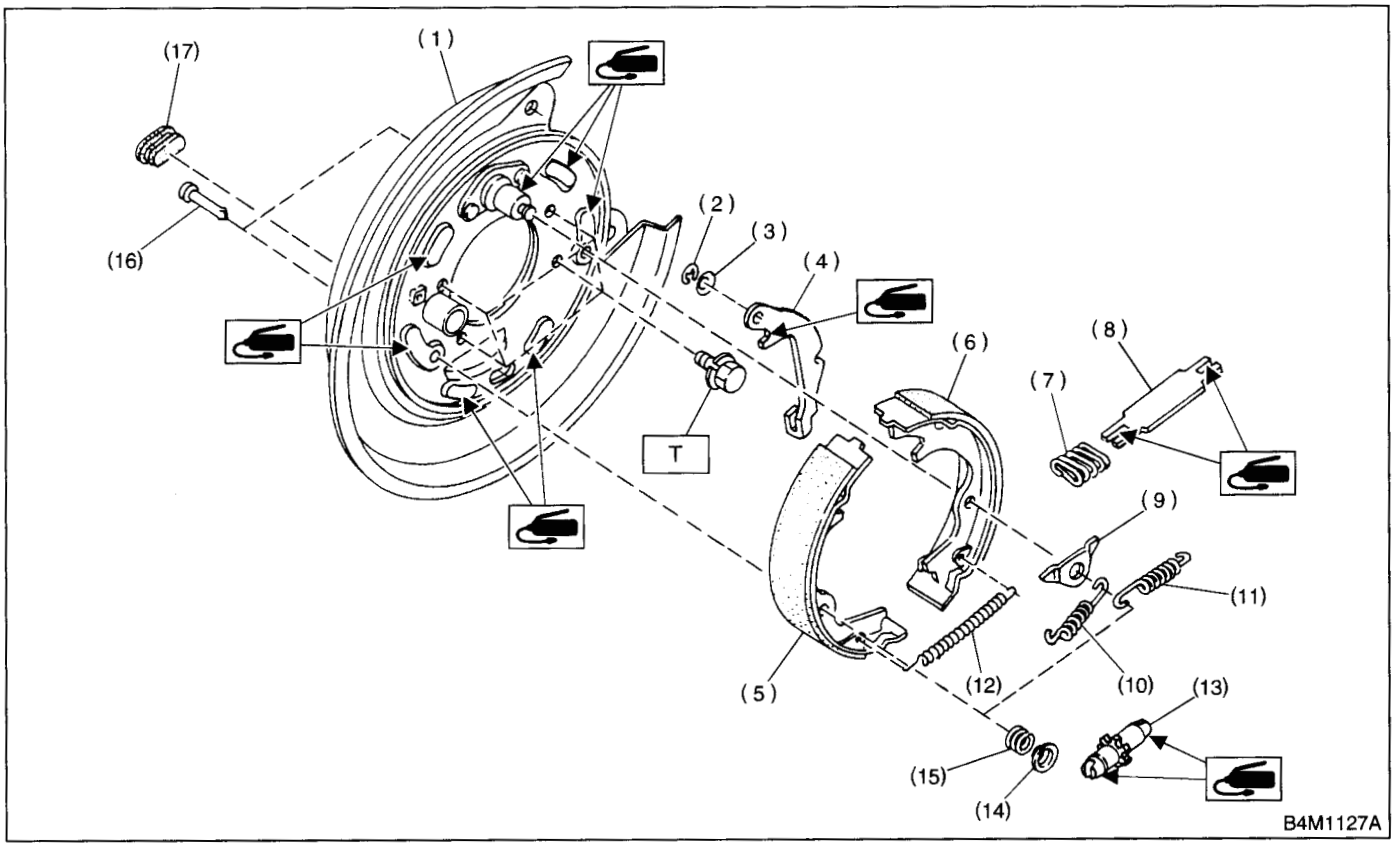
1. General Description

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)	219.3 × 35.0 × 4.1 (8.63 × 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

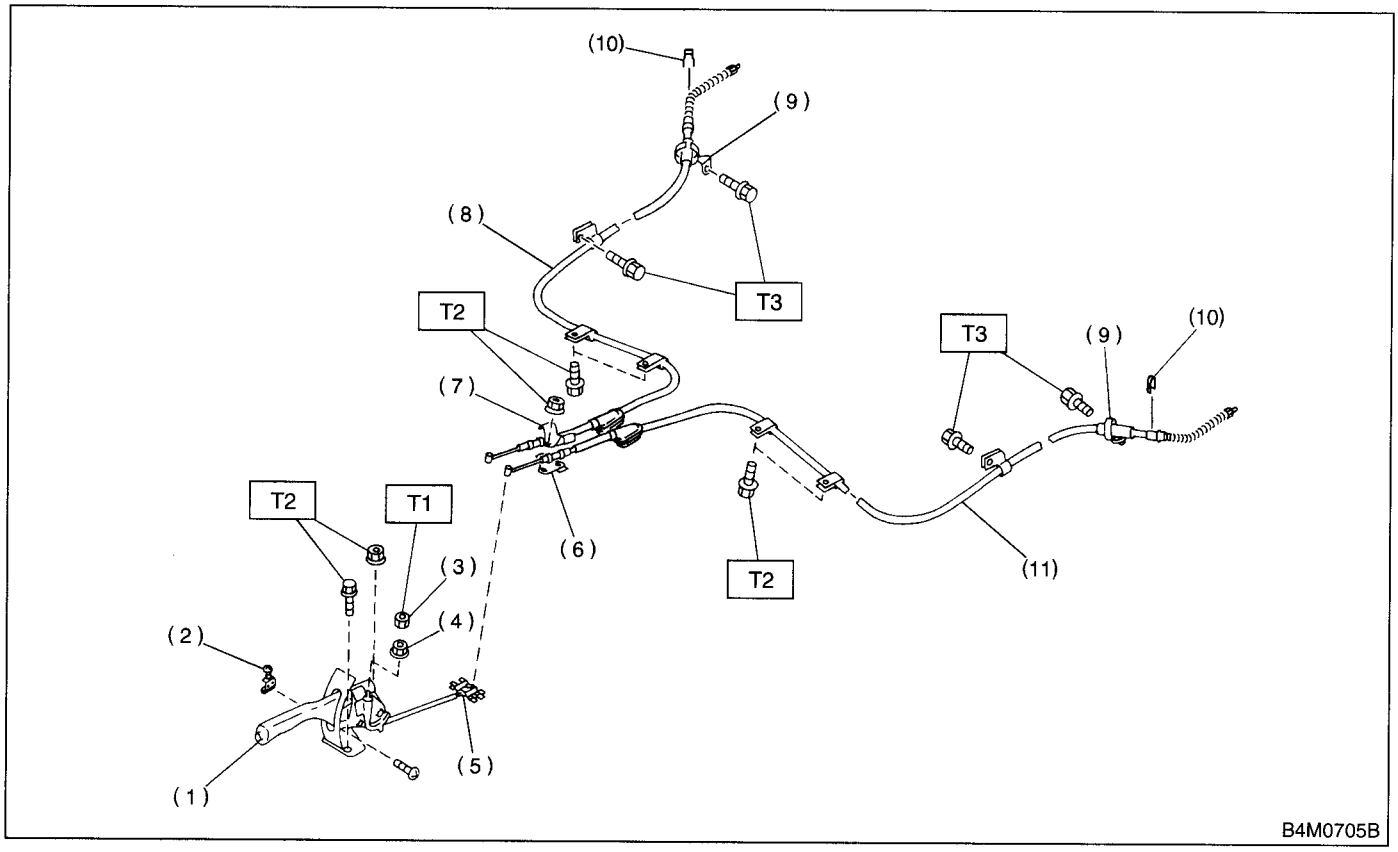
1. PARKING BRAKE (REAR DISC BRAKE)



(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)

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: 6 (0.6, 4.4)
T2: 18 (1.8, 13.0)
T3: 33 (3.4, 24)

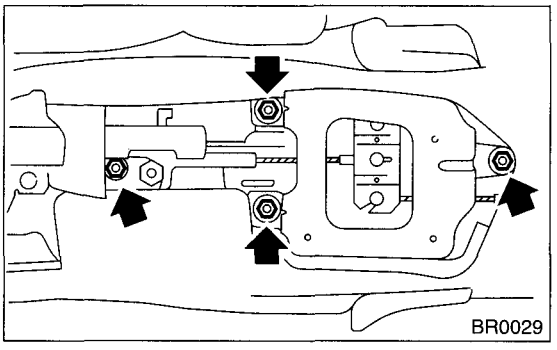
C: CAUTION

- 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 O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation.
- Before securing a part on a vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.
- Keep grease etc. away from parking brake shoes.

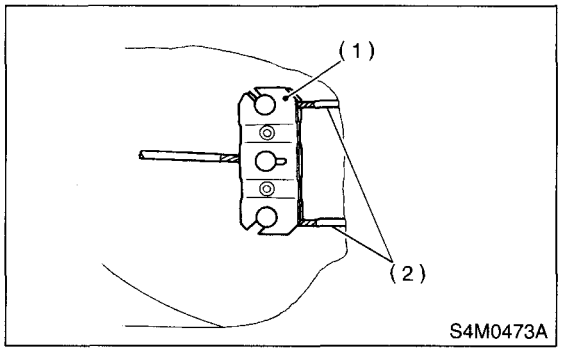
2. Parking Brake Lever

A: REMOVAL

1) Move the select lever to "P" position or gear shift lever to 1st gear, then block the wheels.
2) Disconnect the battery ground terminal from battery.
3) Remove the console box. <Ref. to EI-41, REMOVAL, Console Box.>
4) Disconnect the connector of parking brake switch.
5) Loosen the parking cable adjusting nut and console bracket.
6) Remove the parking brake lever.

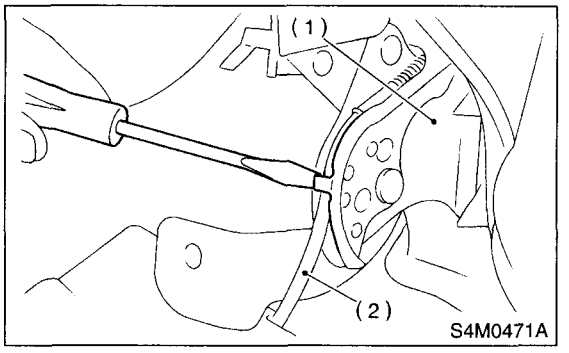


7) Remove the inner cable end from equalizer.



(1) Equalizer
(2) Inner cable end

8) Unbend the parking brake lever pawls and remove cable.



(1) Parking brake lever
(2) Cable

B: INSTALLATION

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;
6 N·m (0.6 kgf-m, 4.4 ft-lb)

NOTE:
• Be sure to pass the cable through the guide inside tunnel.
• Be sure to adjust the lever stroke. <Ref. to PB-7, 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 incorrect, adjust the parking brake.
<Ref. to PB-12, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

D: ADJUSTMENT

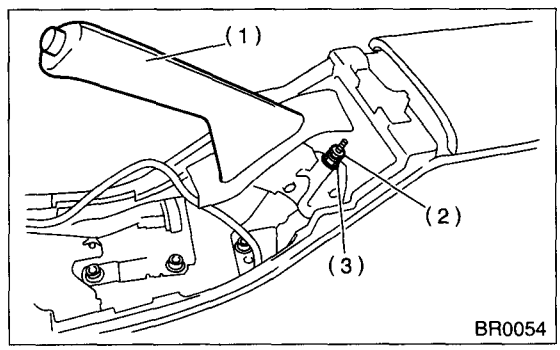
1) Remove the console box. <Ref. to EI-41, REMOVAL, Console Box.>
2) Forcibly pull the parking brake lever 3 to 5 times.
3) Adjust the parking brake lever by turning adjuster until the parking brake lever stroke is set at 7 to 8 notches with an operating force of 196 N (20 kgf, 44 lb).
4) Tighten the 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)



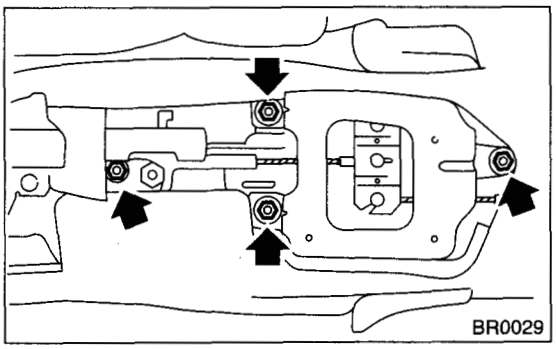
(1) Parking brake lever
(2) Lock nut
(3) Adjusting nut

5) Install the console box. <Ref. to EI-41, INSTALLATION, Console Box.>

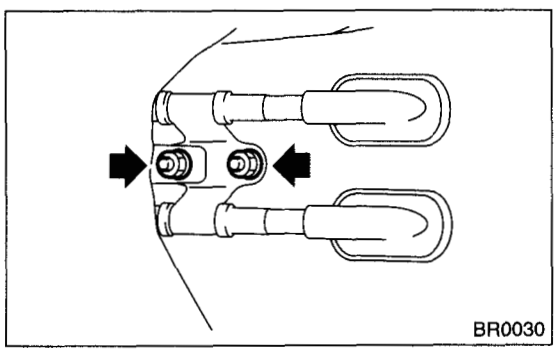
3. Parking Brake Cable

A: REMOVAL

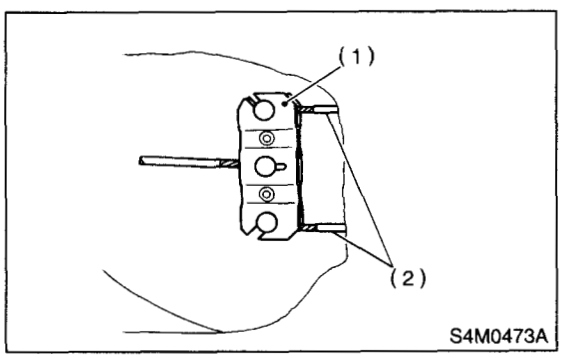
1) Lift-up the vehicle.
2) Remove the rear tires and wheels.
3) Remove the rear cushion.
4) Remove the console box. <Ref. to EI-41, REMOVAL, Console Box.>
5) Loosen the parking cable adjusting nut and console bracket.
6) Remove the parking brake lever.



7) Roll up the floor mat and remove clamps.

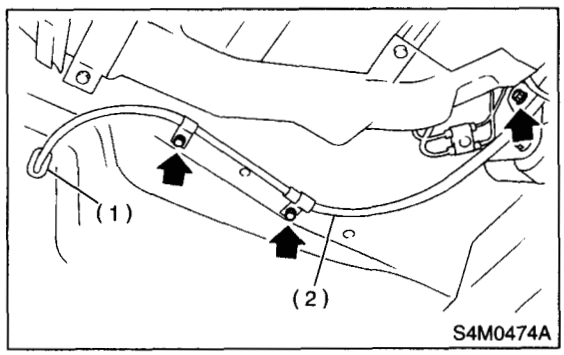


8) Remove the equalizer cover.
9) Remove the inner cable end from equalizer.



(1) Equalizer
(2) Inner cable end

10) Pull out the parking brake cable from rear brake.
Disc brake
<Ref. to PB-10, REMOVAL, Parking Brake Assembly (Rear Disc Brake).>
Drum brake
<Ref. to BR-33, Rear Drum Brake Assembly.>
11) Pull out the clamp from rear brake.
12) Remove the bolt and bracket from trailing link bracket.
13) Remove the bolt and clamp from rear floor.



(1) Grommet
(2) Parking brake cable

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

Install the (new) parking brake assembly in the reverse order of removal.

NOTE:

- Be sure to pass the cable through the cable guide inside tunnel.
- Be sure to adjust the lever stroke. <Ref. to PB-7, ADJUSTMENT, Parking Brake Lever.>

C: INSPECTION

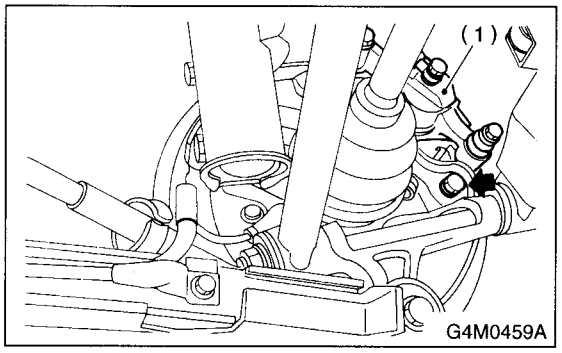
Check the removed cable and replace if damaged, rusty or malfunctioning.

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) Set the vehicle on a lift.
2) Disconnect the ground terminal from battery.
3) Loosen the wheel nuts.
4) Jack-up the vehicle, and remove wheel.
5) Remove the two mounting bolts and remove the disc brake assembly.

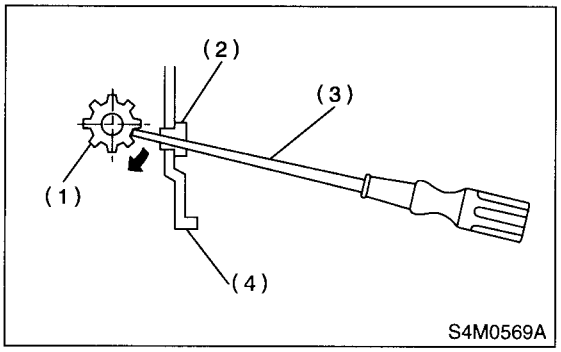


(1) Disc brake ASSY

6) Suspend the disc brake assembly so that the hose is not stretched.
7) Pull down and release the parking brake.
8) Remove the disc rotor.

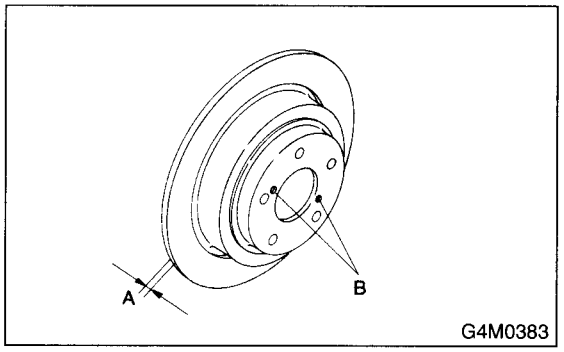
NOTE:
If the disc rotor is difficult to remove try the following two methods in order.

(1) Turn the adjusting screw using a slot-type screwdriver until the brake shoe gets away enough from the disc rotor.

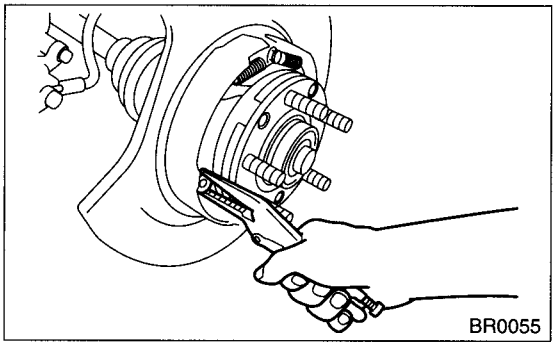


(1) Adjusting screw
(2) Cover (rubber)
(3) Slot-type screwdriver
(4) Back plate

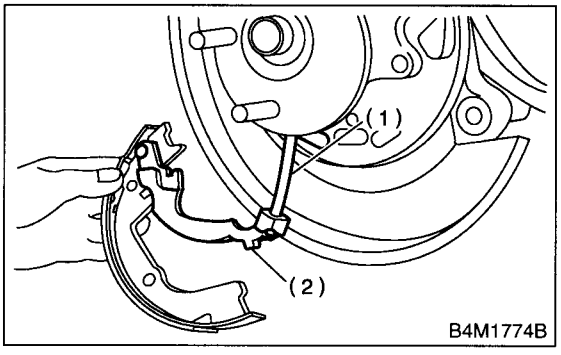
(2) If the disc rotor seizes up within the hub, drive the disc rotor out by installing an 8-mm bolt in holes B on the rotor.



9) Remove the primary and secondary return spring from parking brake assembly.
10) Remove the front shoe hold down spring and pin with pliers.



11) Remove the strut and strut spring.
12) Remove the rear shoe hold-down spring and pin with pliers.
13) Remove the adjuster assembly and adjusting spring from parking brake assembly.
14) Remove the parking cable from parking lever.
15) Remove the brake shoe.



(1) Parking brake cable
(2) Parking brake lever

16) Using a standard screwdriver, raise the retainer. Remove the parking lever and washer from brake shoe.

B: INSTALLATION

CAUTION:
Be sure the lining surface is free from oil contamination.

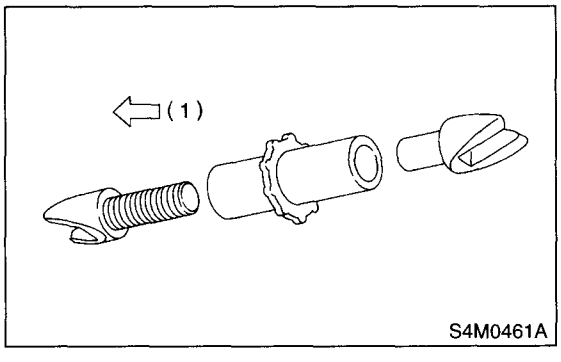
Brake grease:
Dow Corning Molykote No. 7439 (Part No. 725191460)

1) Apply brake grease to the following places.
- 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) Install in the reverse order of removal.

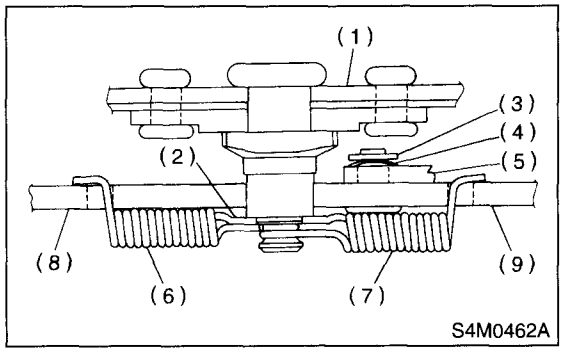
CAUTION:
- **Use new retainers and clinch them when installing the brake shoes to levers.**
- **Ensure that the parking lever moves smoothly.**
- **Do not confuse the left parking lever with right one.**
- **Do not confuse the left strut with right one.**

NOTE:
Ensure that the adjuster assembly is securely installed with the screw in the left side, facing vehicle front.



(1) LEFT

NOTE:
Ensure that the shoe return spring is installed as shown in Figure.



(1) Back plate
(2) Shoe guide plate
(3) Retainer
(4) Spring washer
(5) Lever
(6) Primary shoe return spring (Blue)
(7) Secondary shoe return spring (Yellow)
(8) Parking brake shoe (Primary)
(9) Parking brake shoe (Secondary)

3) Adjust the parking brakes. <Ref. to PB-12, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

CAUTION:
After replacing the parking brake lining, be sure to drive the vehicle for "break-in" purposes.
(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 inside diameter. If the disc is scored or worn, replace the brake disc.

Disc 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 shoe assembly.

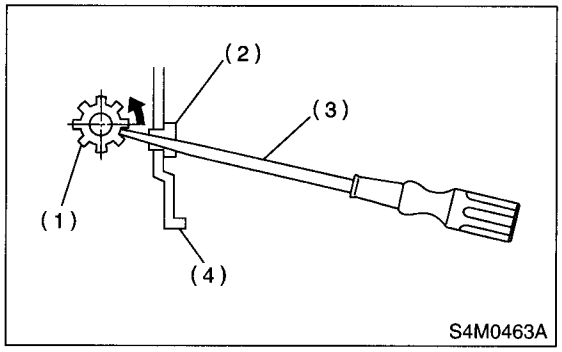
Lining thickness:
Standard
3.2 mm (0.126 in)
Service limit
1.5 mm (0.059 in)

CAUTION:
Replace the brake shoes on the right and left brake assembly 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 slot-type screwdriver until the brake shoe is in close contact with disc rotor.

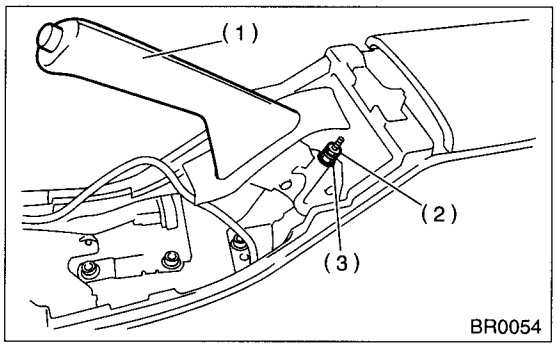


(1) Adjusting screw
(2) Cover (rubber)
(3) Slot-type screwdriver
(4) Back plate

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 the parking brake lever stroke is set at 6 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 (Adjuster lock nut):
6 N·m (0.6 kgf-m, 4.4 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

Model			Non-TURBO		TURBO
			Others	Sedan and OUTBACK	
Whole system	Minimum turning radius m (ft)		5.1 (16.7)	5.4 (17.7)	
	Steering angle (Inside-Outside)		36°55' — 31°35'	34°05' — 29°35'	
	Steering wheel diameter mm (in)		385 (15.16)		
	Overall gear ratio (Turns, lock to lock Gear box)		3.22	3.02	
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.		7.8 (0.476)		7.2 (0.439)
	Relief pressure kPa (kg/cm^2, psi)		7,164 — 7,840 (73 — 80, 1,040 — 1,165)		7,350 — 8,036 (75 — 82, 1,067 — 1,165)
	Hydraulic fluid control		Dropping in response to increased engine revolutions		
	Hydraulic fluid ℓ (US qt, Imp qt)		1,000 rpm: 7 (7.4, 6.2) 3,000 rpm: 5 (5.3, 4.4)		7.5 (7.9, 6.6)*1 7 (7.4, 6.2)*2
	Range of revolution rpm		700 — 9,000		
	Revolving direction		Clockwise		
Working fluid (Power steering system)	Name		ATF DEXRON III		
	Capacity ℓ (US qt, Imp qt)	Oil tank	0.3 (0.3, 0.3)		
		Total	0.7 (0.7, 0.6)		

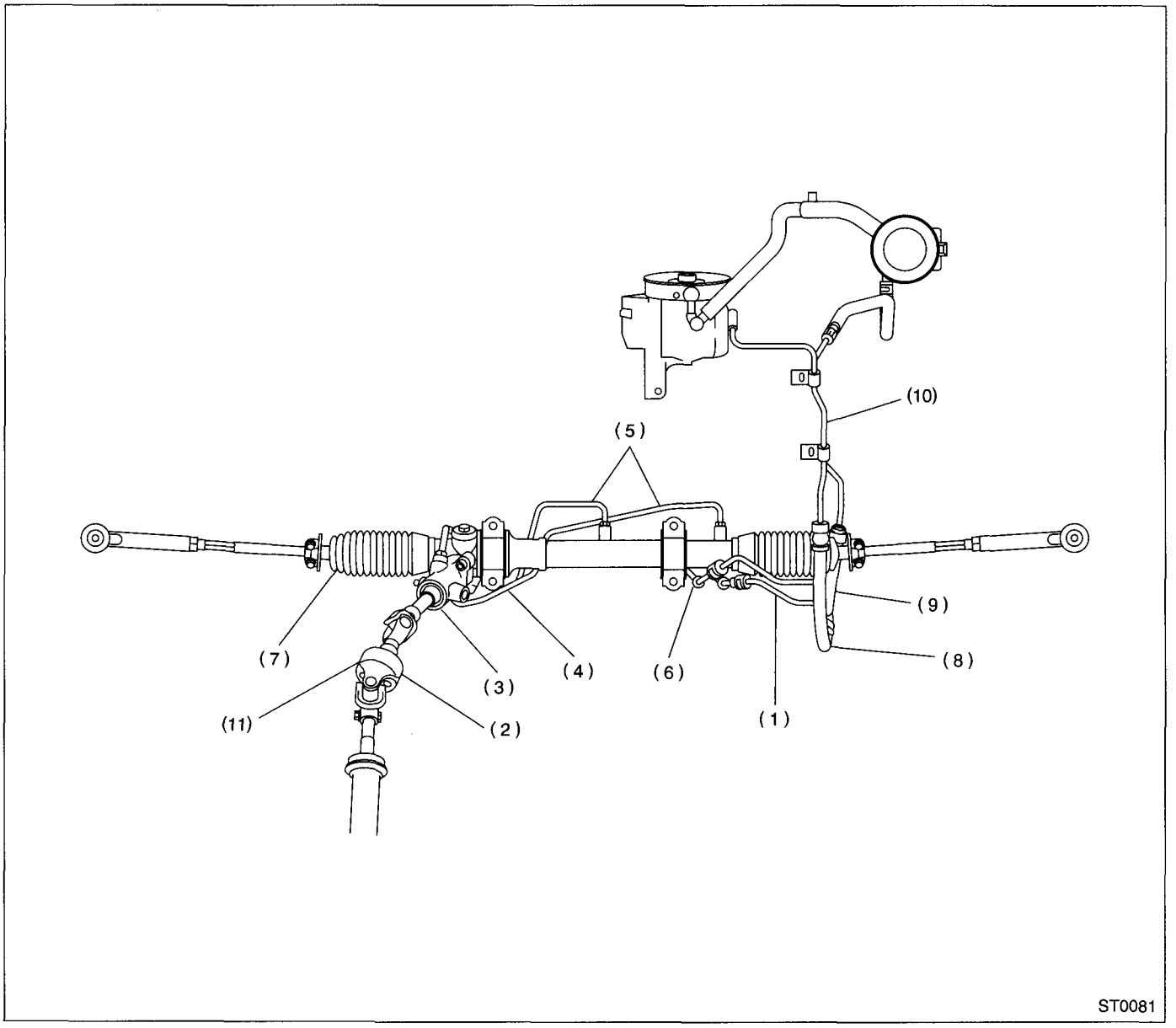
*1: With maximum load.
*2: With no load.

Steering wheel	Free play		mm (in)	17 (0.67)
Turning angle	Inner tire & wheel	TURBO, OUTBACK, Non-TURBO sedan		34°05'±1.5°
		other		36°55'±1.5°
	Outer tire & wheel	TURBO, OUTBACK, Non-TURBO sedan		29°35'±1.5°
		other		31°35'±1.5°
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)	340 (35, 76) or less
	Rack shaft play in radial direction	*Right-turn steering*	*mm (in)*	0.19 (0.0075) or less
		Left-turn steering	mm (in)	Horizontal movement: 0.15 (0.0059) or less Vertical movement: 0.3 (0.012) 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: 12 (1.2, 2.7)
Oil pump (Power steering system)	Pulley shaft	Radial play	mm (in)	0.4 (0.016) or less
		Axial play Non-TURBO	mm (in)	0.4 (0.016) or less
		Axial play TURBO	mm (in)	0.8 (0.031) 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
	Relief pressure	Non-TURBO	kPa (kg/cm^2, psi)	7,355 (75, 1,067)
		TURBO	kPa (kg/cm^2, psi)	7,845 (80, 1,138)
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	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

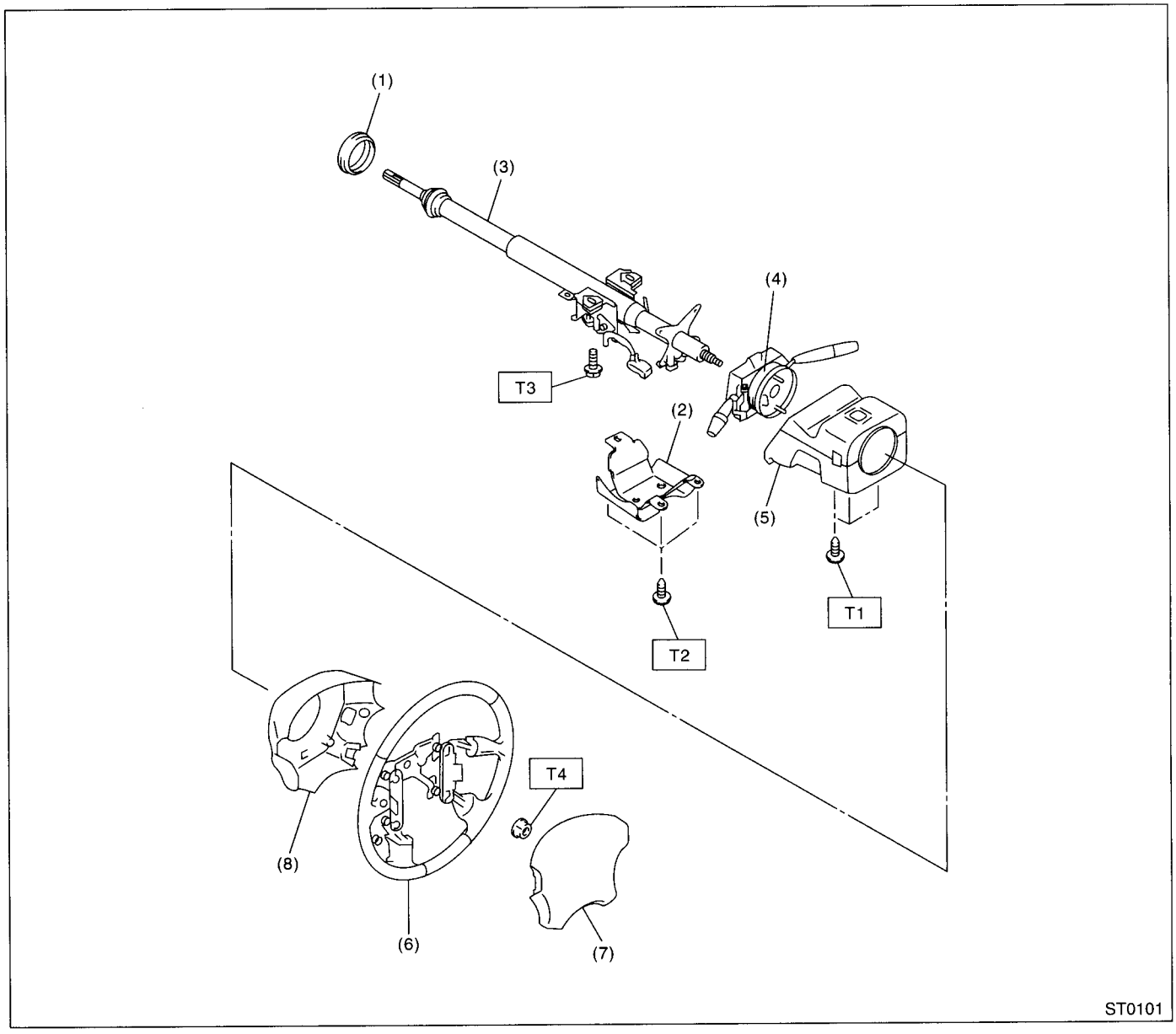
CAUTION:
This table lists various clearances that must be correctly adjusted to ensure normal vehicle driving without interfering noise, or any other faults.

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)
(11) AT cooling hose — Joint	20 mm (0.79 in)



B: COMPONENT

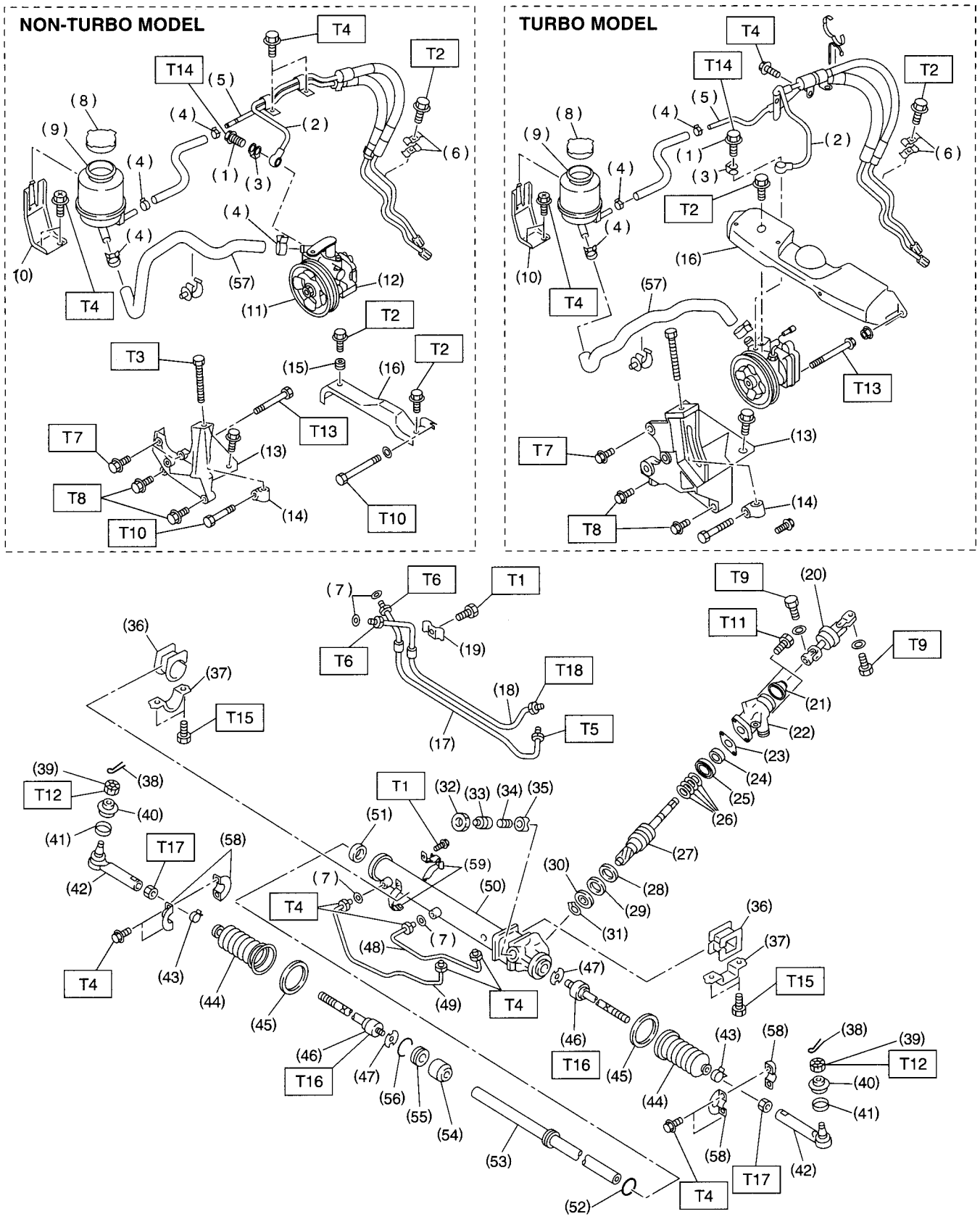
1. STEERING WHEEL AND COLUMN



(1) Bushing
(2) Knee protector
(3) Steering shaft
(4) Steering roll connector
(5) Column cover
(6) Steering wheel
(7) Airbag module
(8) Lower steering wheel cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.2 (0.12, 0.9)
T2: 3.4 (0.35, 2.5)
T3: 25 (2.5, 18.1)
T4: 44 (4.5, 32.5)

2. POWER ASSISTED SYSTEM



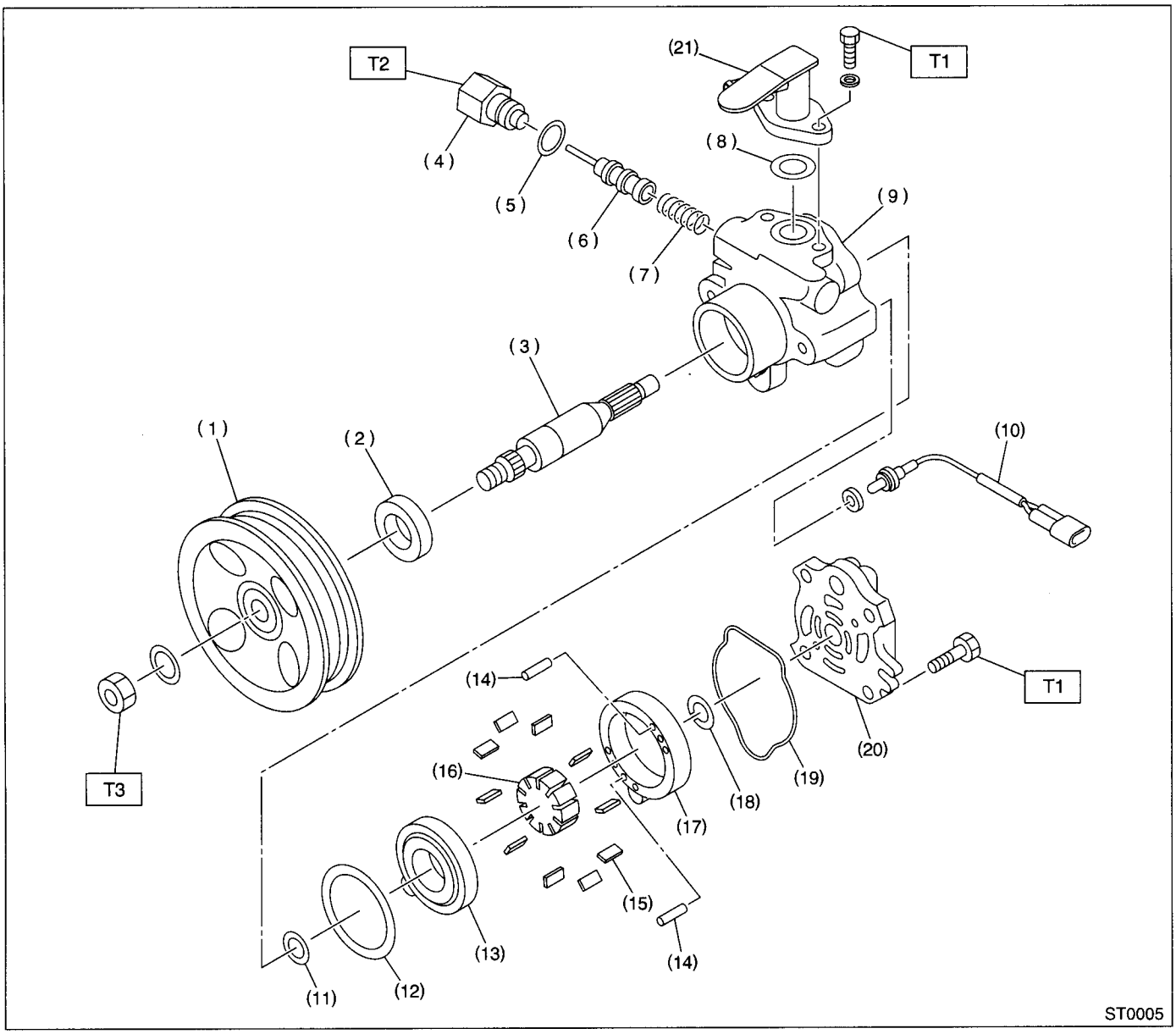
(1) Eye bolt
(2) Pipe C
(3) Gasket
(4) Clip
(5) Pipe D
(6) Clamp E
(7) O-ring
(8) Cap
(9) Reservoir tank
(10) Reservoir tank bracket
(11) Pulley
(12) Oil pump
(13) Bracket
(14) Belt tension nut
(15) Bush
(16) Belt cover
(17) Pipe E
(18) Pipe F
(19) Clamp plate
(20) Universal joint
(21) Dust seal
(22) 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) Tie-rod end plate
(59) Clamp plate

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 (1.5, 10.8)***
T7:	***15.7 (1.6, 11.6)***
T8:	***22 (2.2, 15.9)***
T9:	***24 (2.4, 17.4)***
T10:	***25 (2.5, 18.1)***
T11:	***25 (2.5, 18.1)***
T12:	***27 (2.75, 19.9)***
T13:	***37.3 (3.8, 27.5)***
T14:	***39 (4.0, 28.9)***
T15:	***59 (6.0, 43)***
T16:	***78 (8.0, 58)***
T17:	***83 (8.5, 61.5)***
T18:	***25 (2.5, 18.1)***

3. OIL PUMP

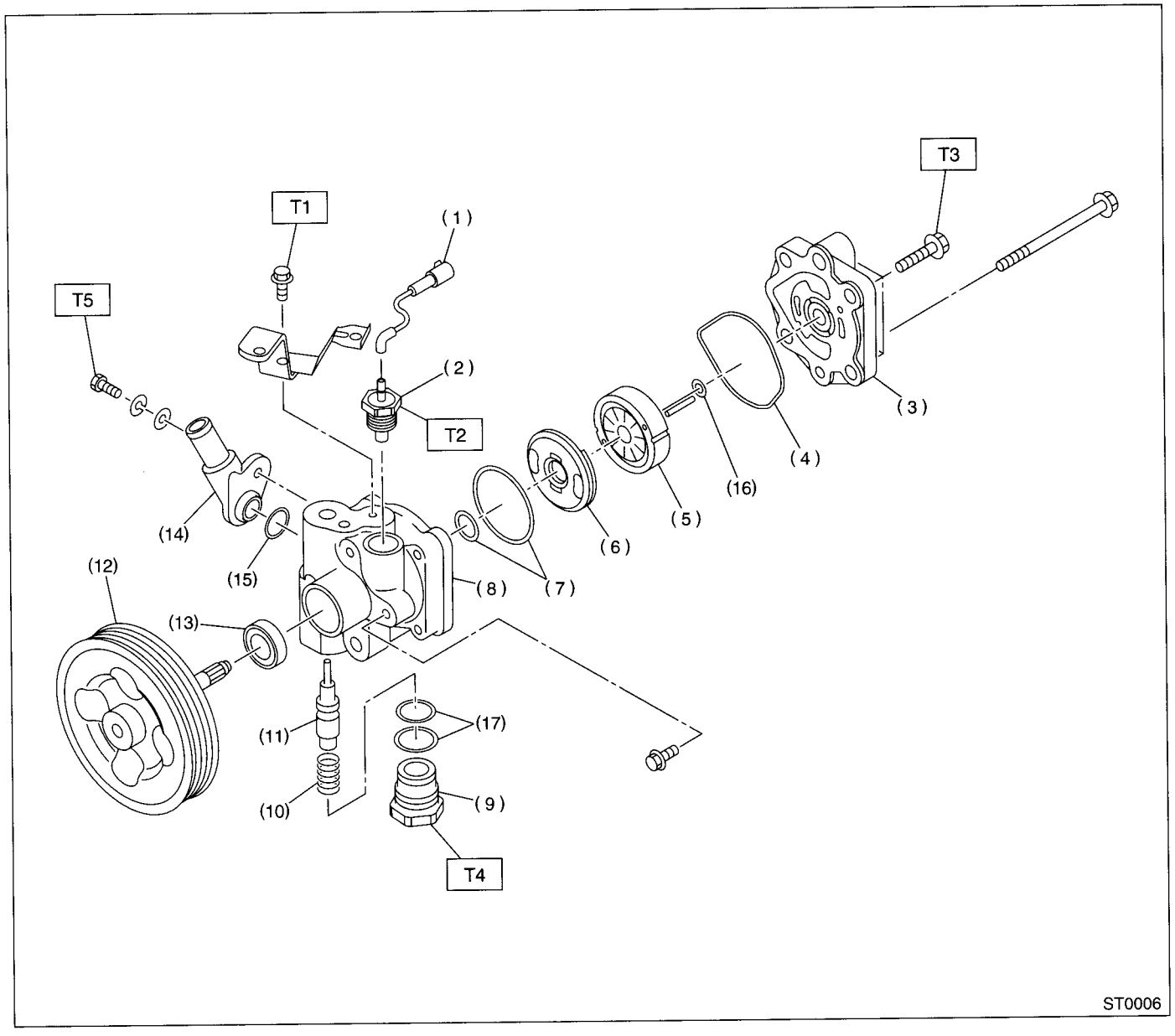
NON-TURBO MODEL



(1) Pulley
(2) Oil seal
(3) Shaft
(4) Connector
(5) O-ring
(6) Spool valve
(7) Spring
(8) O-ring
(9) Front casing
(10) Pressure switch
(11) O-ring
(12) O-ring
(13) Pressure plate
(14) Straight pin
(15) Vane
(16) Rotor
(17) Cam ring
(18) Retaining ring
(19) O-ring
(20) Rear cover
(21) Suction connector

Tightening torque: N·m (kgf-m, ft-lb)
T1: 21 (2.14, 15.5)
T2: 49 (5.0, 36.2)
T3: 52 (5.3, 38)

TURBO MODEL



(1) Lead wire
(2) Pump switch
(3) Rear cover
(4) O-ring
(5) Cam
(6) Pressure plate
(7) O-ring
(8) Front casing
(9) Front casing
(10) Flow control spring
(11) Flow control valve
(12) Pulley
(13) Oil seal
(14) Suction connector
(15) O-ring
(16) Retaining ring
(17) O-ring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 9.8 (1.0, 7.2)
T2: 27 (2.75, 19.9)
T3: 27.4 (2.8, 20.3)
T4: 59 (6.0, 43)
T5: 11.8 (1.2, 8.7)

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.
- Use SUBARU genuine 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.
- Apply steering fluid onto sliding or revolution surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of steering fluid to avoid damage and deformation.
- Before securing a part on a vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.

D: PREPARATION TOOL

1. SPECIAL TOOLS

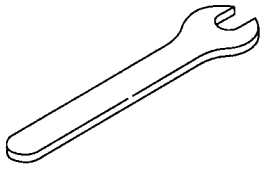
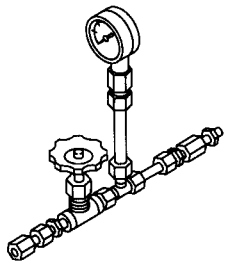
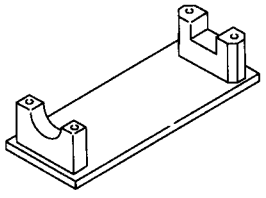
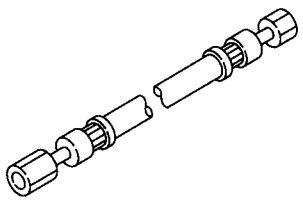
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2411	925700000	WRENCH	• Used for removing and installing tie-rod. • Apply this tool to rack.
 B4M2412	925711000	PRESSURE GAUGE	Used for measuring oil pump pressure.
 B4M2413	926200000	STAND	Used when inspecting characteristic of gearbox assembly and disassembling it.
 B4M2414	34099AC010	ADAPTER HOSE A	Used with PRESSURE GAUGE (925711000).

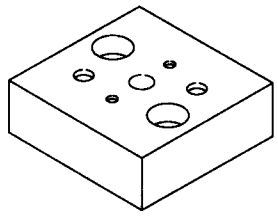
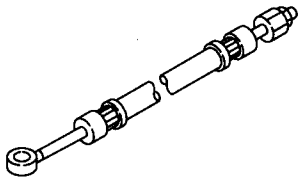
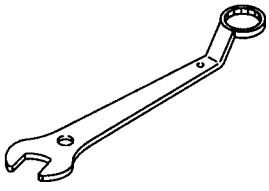
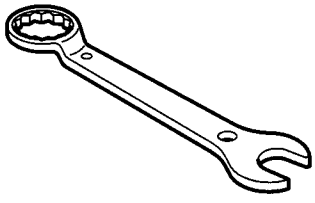
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 G1H0273	34099FA100	STAND BASE	• Used for assembling power steering gearbox. • For LHD model.
 B4M2415	34099AC020	ADAPTER HOSE B	Used with PRESSURE GAUGE (925711000).
 B4M2416	926230000	SPANNER	• For the lock nut when adjusting backlash of gearbox.
 ST0047	34099PA100	SPANNER	• Measurement of rotating resistance of gearbox assembly.

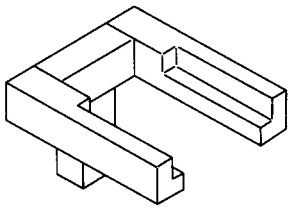
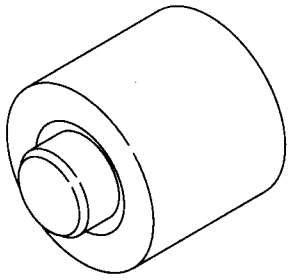
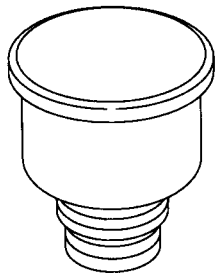
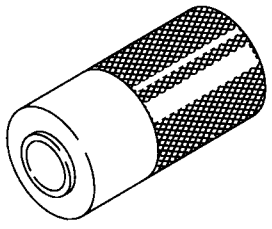
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2417	34199AE020	MOUNT	• Used for disassembling oil pump. • For TURBO model.
 B4M2418	34199AE030	INSTALLER	Used for installing oil seal into oil pump.
 B4M2419	34199AE040	OIL CHARGE GUIDE	Used for charging power steering oil.
 B4M2420	927640000	INSTALLER B	Used for installing ball bearing into housing.

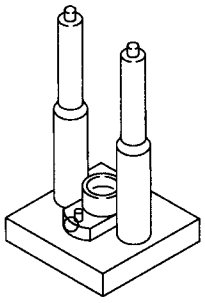
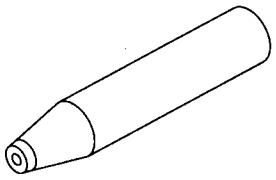
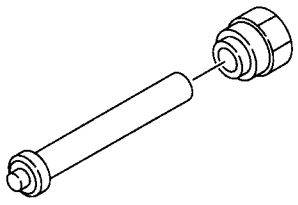
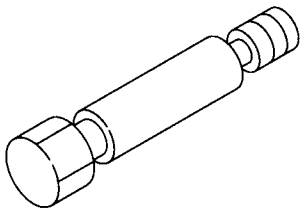
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2421	926370000	INSTALLER A	• Used for installing valve assembly into valve housing assembly. • Used with STAND BASE (927630000).
 B4M2422	926390001	COVER & REMOVER ASSY	• Used for assembling rack assembly.
 B4M2423	926420000	PLUG	When oil leaks from pinion side of gearbox assembly, remove pipe B from valve housing, attach this tool and check oil leaking points.
 B4M2424	926400000	GUIDE	• Right side of rack when installing rack bush. • Used with GUIDE (927660000).

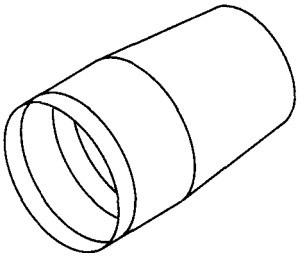
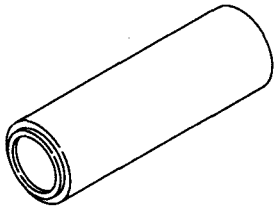
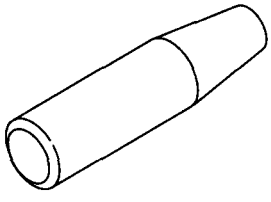
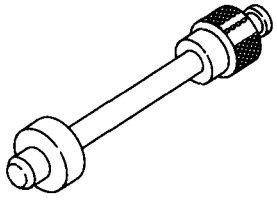
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2425	927660000	GUIDE	• Right side of rack when installing rack bush. • Used with GUIDE (926400000).
 B4M2426	927620000	INSTALLER B	• Used for installing oil seal of valve housing. • Used with INSTALLER A (926360000).
 B4M2428	926360000	INSTALLER A	• Used as a guide to install oil seal. • Used with INSTALLER B (927620000).
 B4M2429	34099FA110	INSTALLER	Used for installing oil seal.

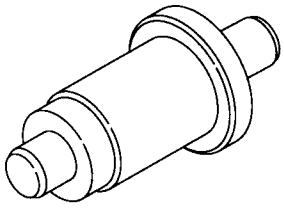
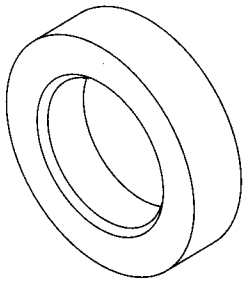
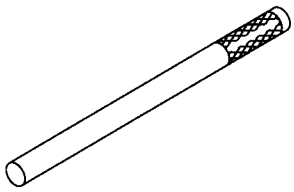
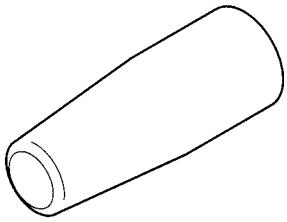
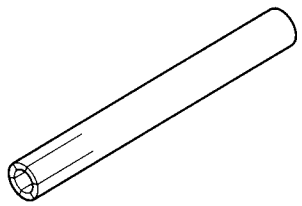
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 S1H0030	34099FA120	INSTALLER AND REMOVER SEAL	Used for installing and removing valve housing oil seal.
 ST0007	34099FA130	INSTALLER SEAL	• Used for installing valve housing oil seal. • Used with INSTALLER AND REMOVER SEAL (34099FA120).
 B4M2432	34199AE050	REMOVER OIL SEAL	Used for removing back-up ring and oil seal.
 H4M1408	34099AC030	INSTALLER A	• Used for installing retaining ring. • Used with INSTALLER B (34099AC040). • For non-turbo model.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 H4M1409	34099AC040	INSTALLER B	• Used for installing retaining ring. • Used with INSTALLER A (34099AC030). • For non-turbo 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

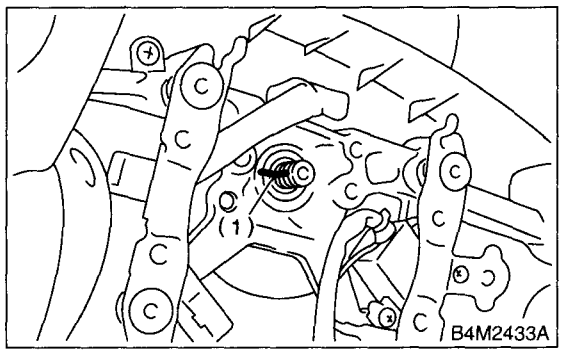
A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Set the tires to straight-ahead position.
3) Remove the airbag module. <Ref. to AB-12, REMOVAL, Driver's Airbag Module.>

WARNING:
Always refer to "Air Bag System" before performing airbag module service. <Ref. to AB-12, CAUTION, **Driver's Airbag Module.>**

4) Remove the steering wheel nut, and then draw out the steering wheel from the shaft using steering puller.

NOTE:
Make the matching marks on the steering wheel and steering column in advance.



(1) Matching mark

B: INSTALLATION

1) Align the center of roll connector. <Ref. to AB-17, ADJUSTMENT, Roll Connector.>
2) Install in the reverse order of removal.

NOTE:
Align the matching marks on the steering wheel and steering column.

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

Column cover-to-steering wheel clearance:
2 — 4 mm (0.08 — 0.16 in)

WARNING:
Always refer to "Air Bag System" before performing airbag module service. <Ref. to AB-12, CAUTION, Driver's Airbag Module.>

CAUTION:
Insert the roll connector guide pin into the guide hole on lower end of surface of steering wheel to prevent damage. Draw out the airbag system connector, horn connector and cruise control connectors from the guide hole of steering wheel lower end.

C: INSPECTION

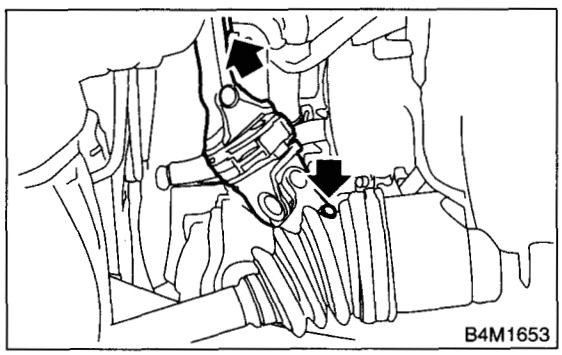
1) Check the steering wheel for deformation. If the deformation is excessive, replace the steering wheel.
2) Check the splines on the steering wheel for damage. If the damage is excessive, replace the steering wheel.

3. Universal Joint

A: REMOVAL

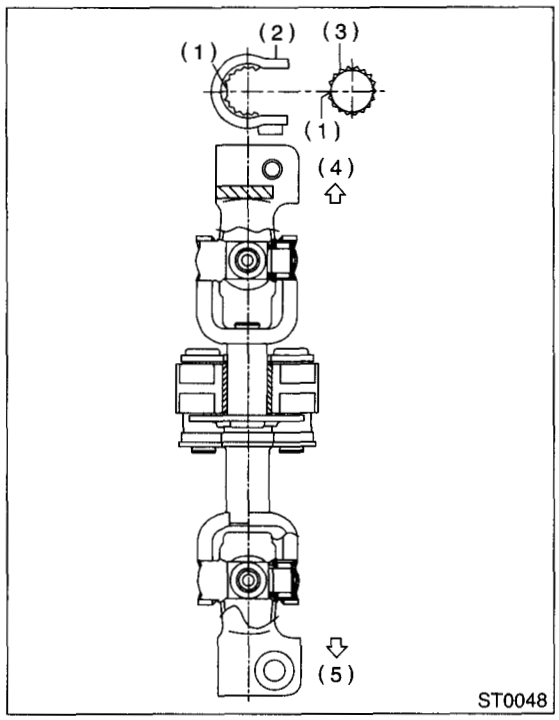
1) Remove the steering wheel. <Ref. to PS-19, REMOVAL, Steering Wheel.>
2) Remove the universal joint bolts and then remove the universal joint.

CAUTION:
Scribe alignment marks on universal joint so that it can be reassembled at the original serration.



B: INSTALLATION

1) Install the universal joint.
(1) Align the cutout at serrated section of the column shaft and yoke, then insert the universal joint into the column shaft.



(1) Cutout
(2) Yoke
(3) Column shaft
(4) Column shaft side
(5) Gearbox side

(2) Align the bolt hole on the gearbox side of universal joint with the cutout at the serrated section of gearbox assembly. Lower the universal joint completely.
(3) Temporarily tighten the bolt on the gearbox side. Raise the universal joint to make sure the bolt is properly passing through the cutout at the serrated section.
(4) Tighten the bolt.

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

CAUTION:
- **Make sure that universal joint bolt is tightened through notch 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 14 mm (0.55 in)

2) Align the center of roll connector. <Ref. to AB-17, ADJUSTMENT, Roll Connector.>

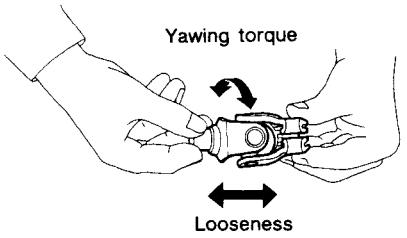
CAUTION:
Ensure that front wheel are set straight forward direction.

3) Install the steering wheel and airbag module. <Ref. to PS-19, INSTALLATION, Steering Wheel.>

WARNING:
Always refer to "Air Bag System" before performing airbag module service. <Ref. to AB-12, CAUTION, Driver's Airbag Module.> and <Ref. to AB-12, INSTALLATION, Driver's Airbag Module.>

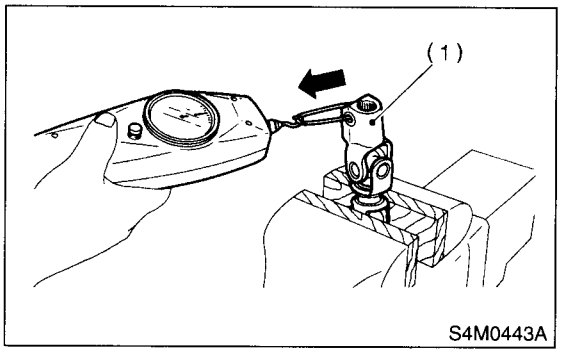
C: INSPECTION

Clean the disassembled parts with a cloth, and check for wear, damage, or any other faults. If necessary, repair or replace faulty parts.

Inspection	Corrective action
• Free play • Swinging torque Yawing torque Looseness  G4M0089 **Standard value of universal joint free play: 0 mm (0 in)** **Max. value of universal joint swinging torque: 0.3 N·m (0.03 kgf-m, 0.2 ft-lb)**	Replace if faulty.

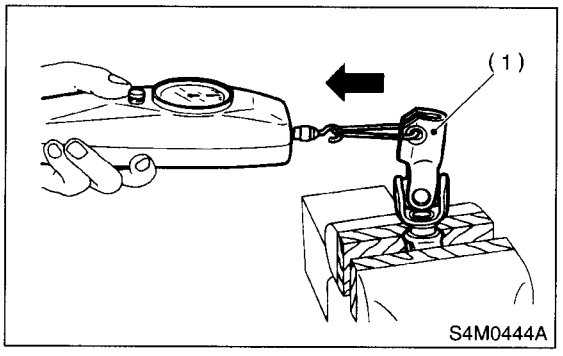
Measurement of folding torque of universal joint is as shown in the figures.

Service limit:
Maximum load; 7.3 N (0.74 kgf, 1.64 lb) or less



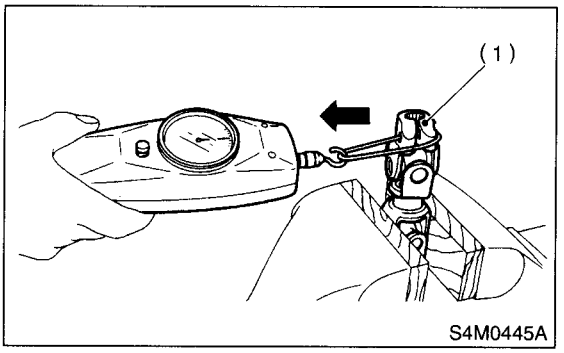
(1) Yoke (gearbox side)

Service limit:
Maximum load; 7.3 N (0.74 kgf, 1.64 lb) or less



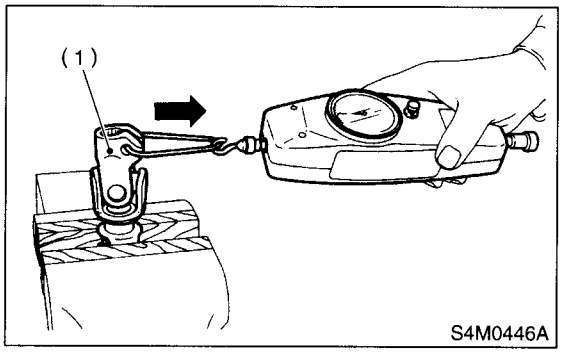
(1) Yoke (gearbox side)

Service limit:
Maximum load; 7.3 N (0.74 kgf, 1.64 lb) or less



(1) Yoke (Steering column side)

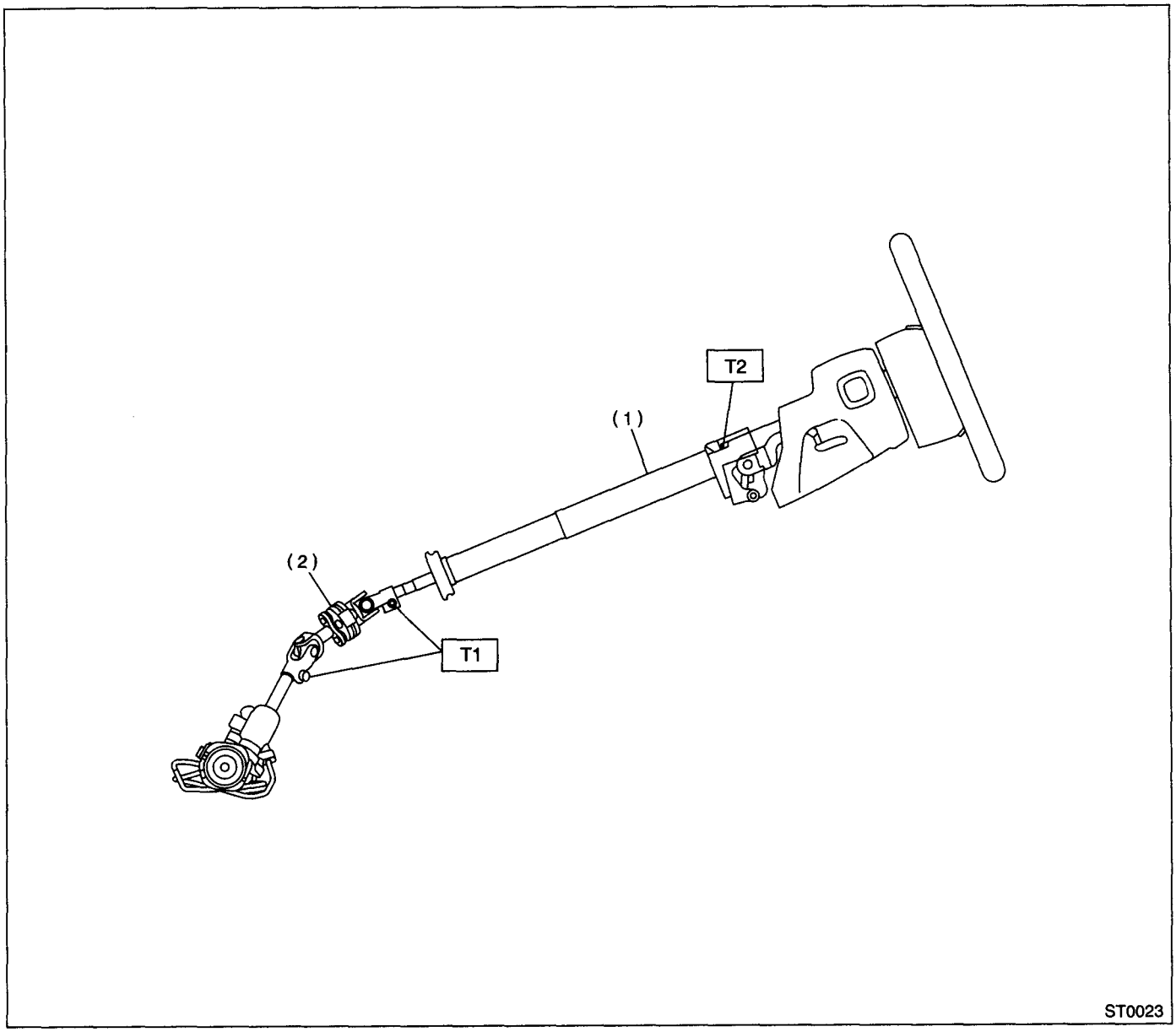
Service limit:
Maximum load; 7.3 N (0.74 kgf, 1.64 lb) or less



(1) Yoke (Steering column side)

4. Tilt Steering Column

A: REMOVAL



(1) Tilt steering column
(2) Universal joint

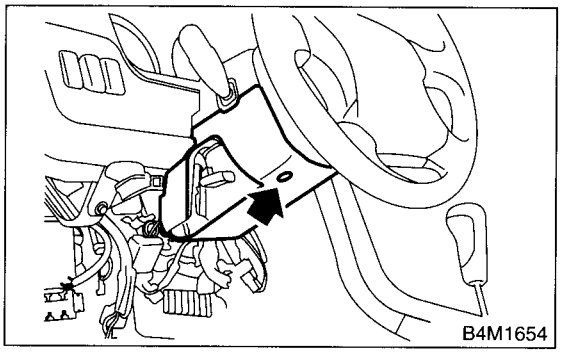
Tightening torque: N·m (kgf-m, ft-lb)
T1: 24 (2.4, 17.4)
T2: 25 (2.5, 18.1)

1) Set the vehicle on the lift.
2) Disconnect the battery ground terminal.
3) Remove the airbag module. <Ref. to AB-12, REMOVAL, Driver's Airbag Module.>

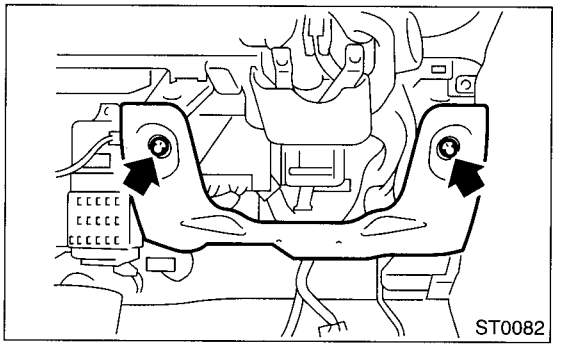
WARNING:
Always refer to "Air Bag System" before performing airbag module service. <Ref. to AB-12, CAUTION, Driver's Airbag Module.>

4) Remove the steering wheel. <Ref. to PS-19, REMOVAL, Steering Wheel.>
5) Remove the universal joint. <Ref. to PS-20, REMOVAL, Universal Joint.>
6) Remove the trim panel under instrument panel.

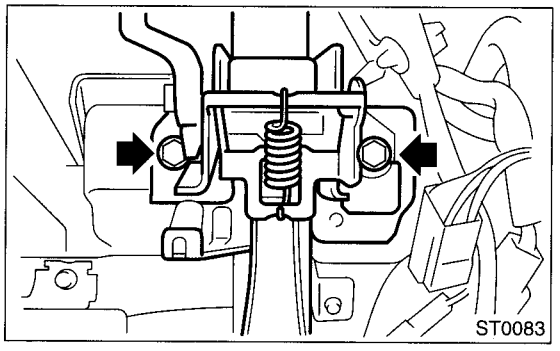
7) Remove the screw securing lower steering column cover.



8) Remove the knee bolster.



9) Remove all connectors from the steering column.
10) Remove the two bolts under instrument panel securing steering column.

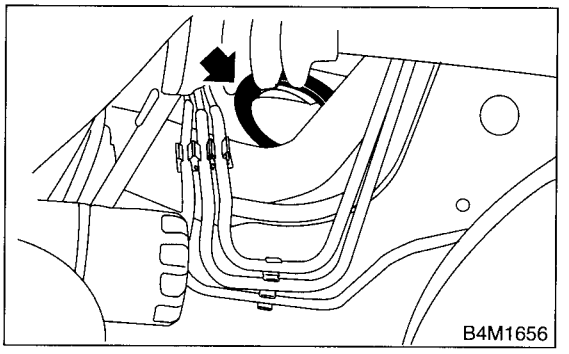


11) Pull out the steering shaft assembly from the hole on toe board.

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.

B: INSTALLATION

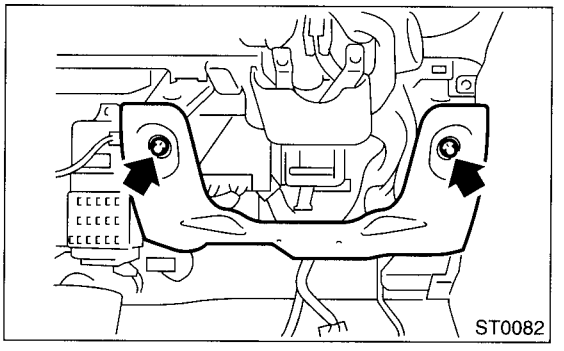
1) Set the grommet to the toe board.



2) Insert the end of steering shaft into the toe board grommet.
3) Tighten the steering shaft mounting bolts under instrument panel.

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

4) Install the knee bolster.



5) Connect all connectors under instrument panel.
6) Connect the airbag system connector at the harness spool.

NOTE:
Make sure to apply double lock.

7) Install the lower column cover with tilt lever held in the lowered position.
8) Install the universal joint. <Ref. to PS-20, INSTALLATION, Universal Joint.>
9) Align the center of roll connector. <Ref. to AB-17, ADJUSTMENT, Roll Connector.>

CAUTION:
Ensure that front wheels are set in straight forward direction.

10) Install the steering wheel. <Ref. to PS-19, INSTALLATION, Steering Wheel.>
Set the steering wheel to neutral and install it onto steering shaft.

CAUTION:
Insert roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage. Draw out airbag system connector, horn connector and cruise control connectors from guide hole of steering wheel lower end.

11) Install the airbag module to the steering wheel.

WARNING:
Always refer to "Air Bag System" before performing the service operation. <Ref. to AB-12, CAUTION, Driver's Airbag Module.>

C: DISASSEMBLY

Remove the two screws securing upper steering column covers, and the two screws securing combination switch, then remove the related parts.

D: ASSEMBLY

1) Insert the combination switch to the upper column shaft, and install the upper column cover. Then route the ignition key harness and combination switch harness between column cover mounting bosses.

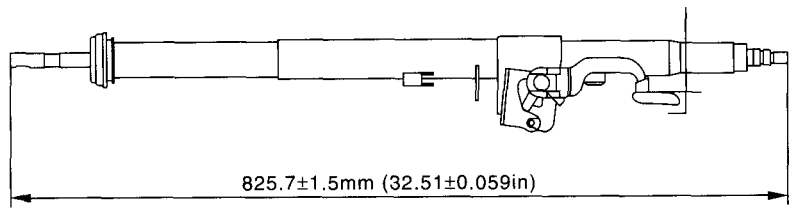
Tightening torque:
1.2 N·m (0.12 kgf-m, 0.9 ft-lb)

CAUTION:
Don't overtorque the screw.

E: INSPECTION

1. BASIC INSPECTION

Clean the disassembled parts with a cloth, and check for wear, damage, or any other faults. If necessary, repair or replace faulty parts.

Inspection	Corrective action
• Overall length of steering column Measure overall length of steering column. Standard overall length of steering column:  ST0024	Replace steering column assembly.

2. AIRBAG MODEL INSPECTION

WARNING:
For airbag model inspection procedures, refer to "Air Bag System". <Ref. to AB-12, CAUTION, Driver's Airbag Module.> and <Ref. to AB-12, INSPECTION, Driver's Airbag Module.>

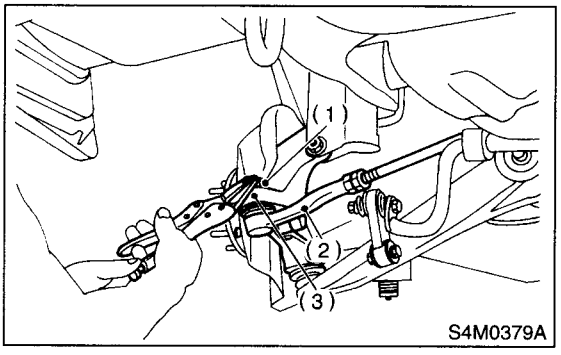
5. Steering Gearbox

A: REMOVAL

1) Set the vehicle on the lift.
2) Disconnect the battery ground terminal.
3) Loosen the front wheel nuts.
4) Lift the vehicle and remove the front wheels.
5) Remove the under cover.
6) Remove the sub frame. <Ref. to FS-16, REMOVAL, Sub Frame.>
7) Remove the front exhaust pipe assembly. (Non-TURBO model)
<Ref. to EX(SOHC)-5, REMOVAL, Front Exhaust Pipe.>

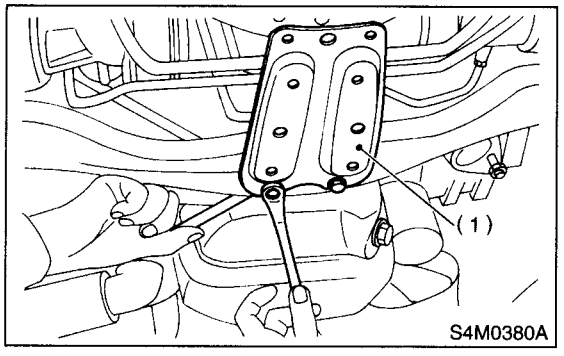
WARNING:
Be careful, exhaust pipe is hot.

8) Using a puller, remove the tie-rod end from the knuckle arm after pulling off cotter pin and removing castle nut.



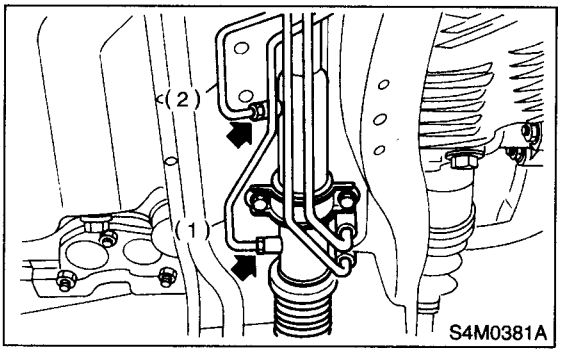
(1) Castle nut
(2) Tie-rod end
(3) Knuckle arm

9) Remove the jack-up plate and front stabilizer.



(1) Jack-up plate

10) Remove the one pipe joint at the center of gearbox, and connect the vinyl hose to the pipe and joint. Discharge the fluid by turning steering wheel fully clockwise and counterclockwise. Discharge the fluid similarly from the other pipe.

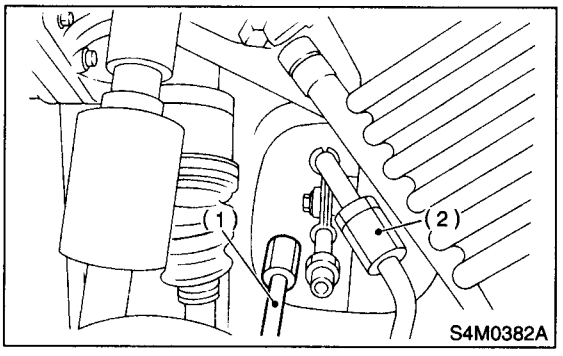


(1) Pipe A
(2) Pipe B

11) Remove the universal joint. <Ref. to PS-20, REMOVAL, Universal Joint.>
12) Disconnect the pipes C and D from the pipe of gearbox.

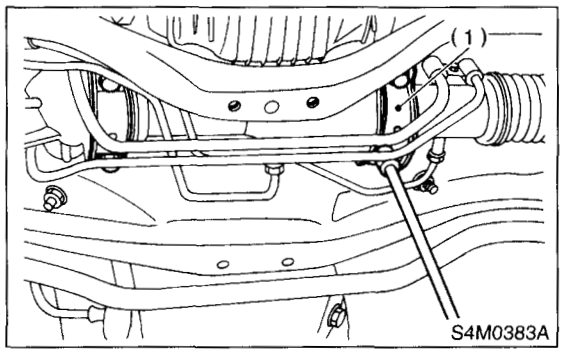
CAUTION:
Be careful not to damage these pipes.

NOTE:
Disconnect the upper pipe D first, and lower pipe C second.



(1) Pipe C
(2) Pipe D

13) Remove the clamp bolts securing gearbox to the crossmember, and remove the gearbox.

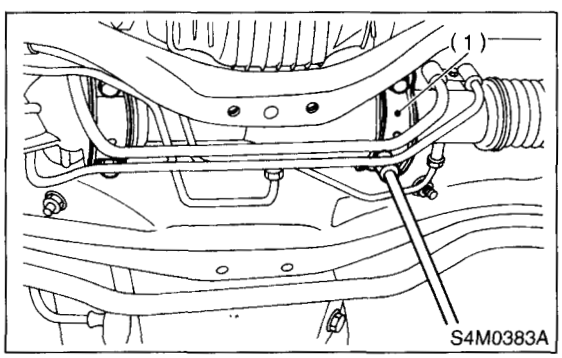


(1) Clamp

B: INSTALLATION

1) Insert the gearbox into the crossmember, being careful not to damage gearbox boot.
2) Tighten the gearbox to the crossmember bracket via clamp with bolt to the specified torque.

Tightening torque:
59 N·m (6.0 kgf-m, 43 ft-lb)



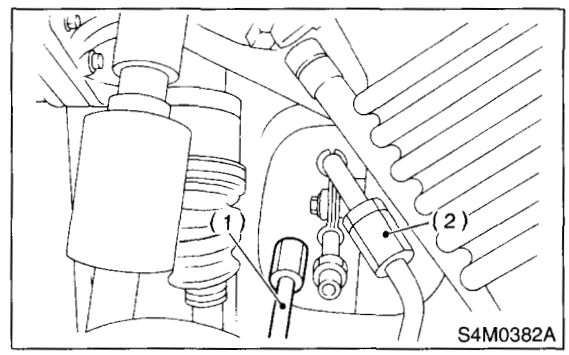
(1) Clamp

3) Install the four pipes on the gearbox.
(1) Connect the pipes A and B to the four pipe joints of gearbox. Connect the upper pipe B first, and lower pipe A.

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

(2) Connect the pipes C and D to the gearbox. Connect the upper pipe D first, and lower pipe C second.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

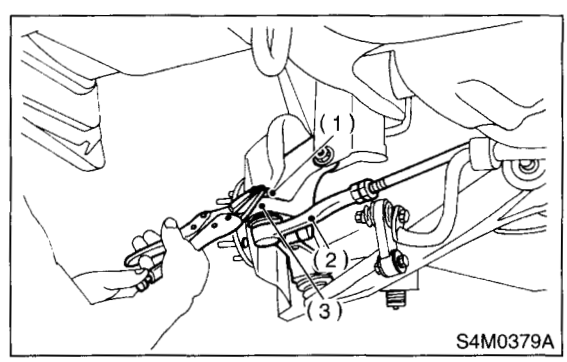


(1) Pipe C
(2) Pipe D

4) Install the universal joint. <Ref. to PS-20, INSTALLATION, Universal Joint.>
5) Connect the tie-rod end and knuckle arm, and tighten with castle nut. Fit the cotter pin into the nut and bend the pin to lock.

Castle nut tightening torque:
Tighten to 27.0 N·m (2.75 kgf-m, 19.9 ft-lb), and tighten further within 60° until cotter pin hole is aligned with a slot in the nut.

CAUTION:
When connecting, do not hit cap at the bottom of tie-rod end with hammer.



(1) Castle nut
(2) Tie-rod end
(3) Knuckle arm

6) Install the front stabilizer to vehicle.
7) Install the front exhaust pipe assembly.
8) Install the sub frame. <Ref. to FS-16, INSTALLATION, Sub Frame.>

9) Align the center of roll connector. <Ref. to AB-17, ADJUSTMENT, Roll Connector.>

CAUTION:
Ensure that front wheels are set in straight forward direction.

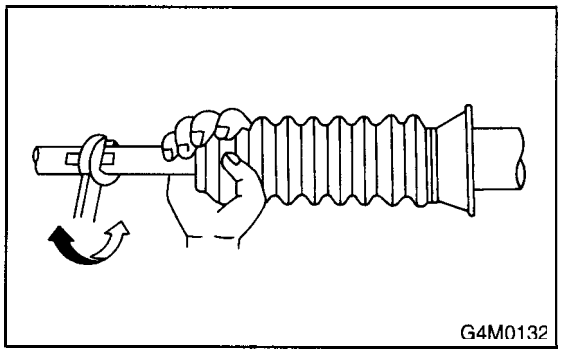
10) Install the steering wheel. <Ref. to PS-19, INSTALLATION, Steering Wheel.>
11) Install the tires.
12) Tighten the wheel nuts to the specified torque.

Tightening torque:
90 N·m (9.1 kgf-m, 66 ft-lb)

13) Connect the ground terminal to battery.
14) Pour the fluid into the oil tank, and bleed air. <Ref. to PS-72, Power Steering Fluid.>
15) Check for fluid leaks.
16) Install the jack-up plate.
17) Lower the vehicle.
18) Check the fluid level in oil tank.
19) After adjusting 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)

CAUTION:
When adjusting toe-in, hold the boot as shown to prevent it from being rotated or twisted. If twisted, straighten it.


G4M0132

C: DISASSEMBLY

NOTE:
Parts requiring replacement are described in the smallest unit of spare parts including damaged parts and spare parts damaged. In actual disassembly work, accidental damage as well as inevitable damage to some related parts must be taken into account, and spare parts for them must also be prepared. However, it is essential to pinpoint the cause of trouble, and limit the number of replacement parts as much as possible.

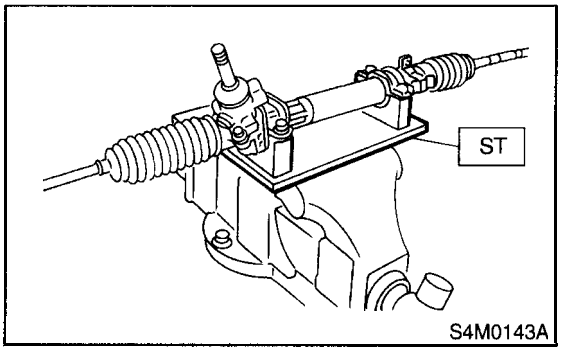
1. RACK HOUSING ASSEMBLY

1) Disconnect the four pipes from the gearbox.

NOTE:
Remove the pipes E and F as a single unit being fixed at the clamp plate.

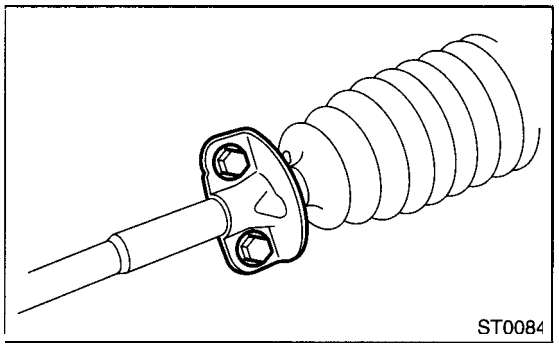
2) Secure the gearbox removed from the vehicle in vice using ST.
ST 926200000 STAND

CAUTION:
Secure the gearbox in a vice using the ST as shown. Do not attempt to secure it without this ST.

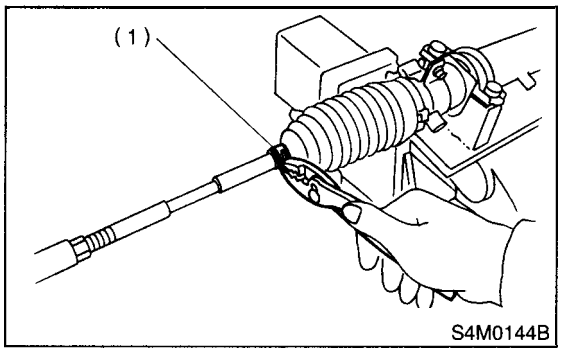


S4M0143A

3) Remove the tie-rod end plate.


ST0084

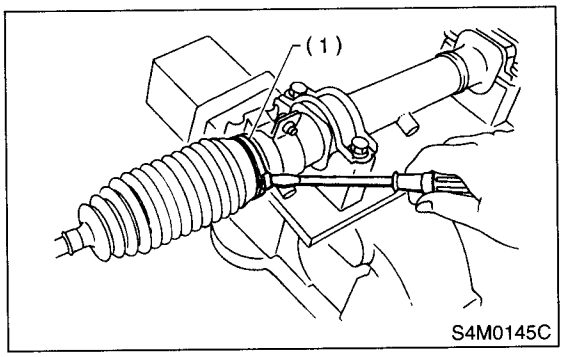
4) Remove the tie-rod end and lock nut from the gearbox.
5) Remove the small clip from the boot using pliers, and move the boot to the tie-rod end side.



S4M0144B

(1) Clip

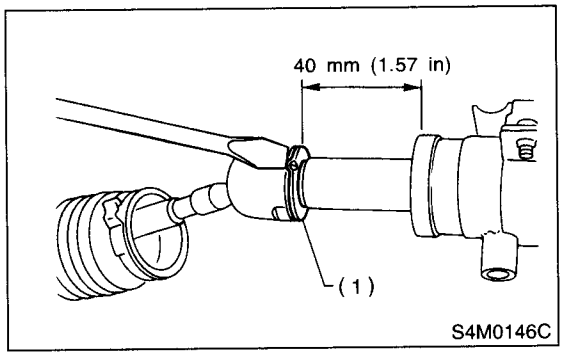
6) Using standard screwdriver, remove the band from the boot.



(1) Band

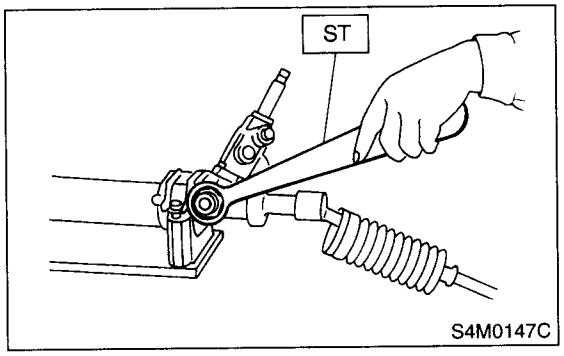
7) Extend the rack approximately 40 mm (1.57 in) out. Unlock the lock wire at lock washer on each side of tie-rod end using a standard screwdriver.

CAUTION:
Be careful not to scratch rack surface as oil leaks may result.

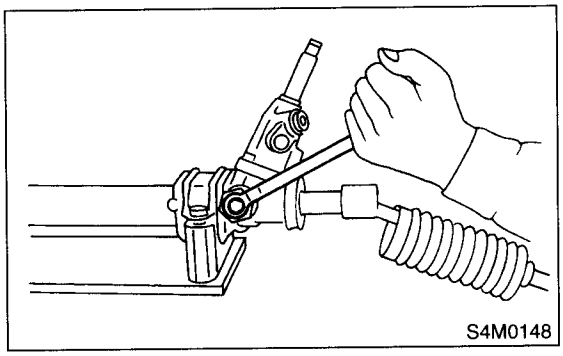


(1) Lock washer

8) Using ST, loosen the lock nut.
ST 926230000 SPANNER

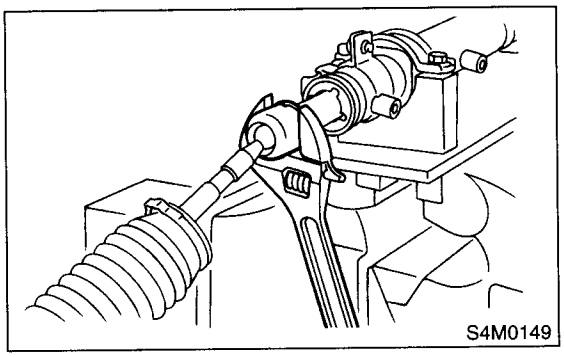


9) Tighten the adjusting screw until it no longer tightens.



10) Using a wrench [32 mm (1.26 in) width across flats] or adjustable wrench, remove the tie-rod.

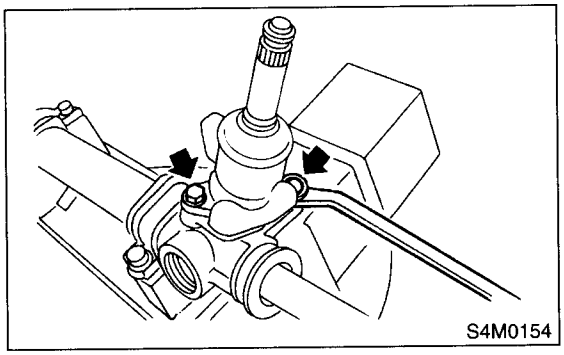
CAUTION:
- **Check ball joint for free play, and tie-rod for bends. Replace if necessary.**
- **Check dust seals used with tie-rod end ball joint for damage or deterioration. Replace if necessary.**



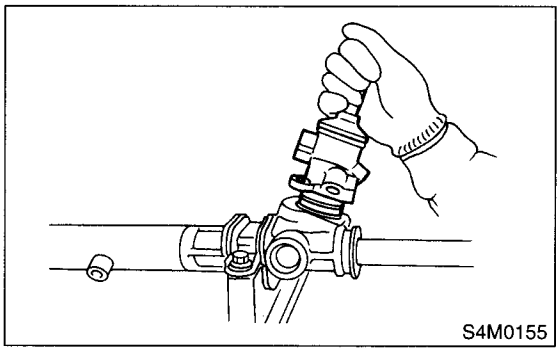
11) Loosen the adjusting screw and remove the spring and sleeve.

CAUTION:
Replace spring and/or sleeve if damaged.

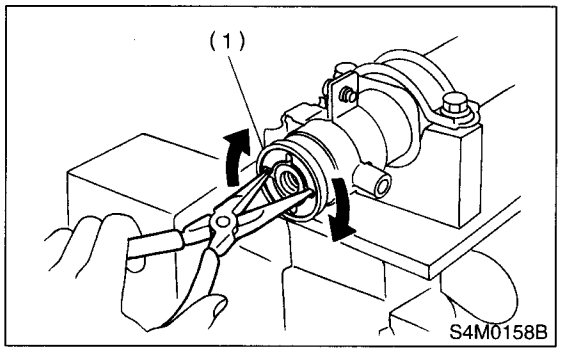
12) Remove the two bolts securing valve assembly.



13) Carefully draw out the input shaft and remove the valve assembly.



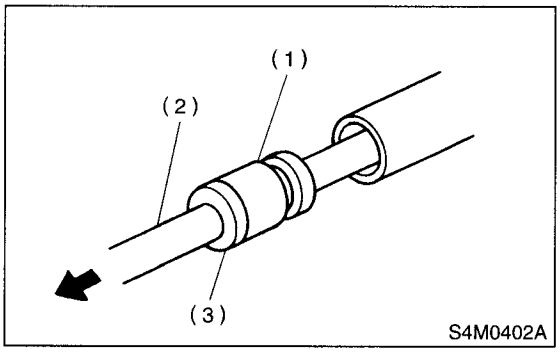
14) Using a sharp pointed pliers, rotate the rack stopper in the direction of the arrow until the end of the circlip comes out of the stopper. Rotate the circlip in the opposite direction and pull it out.



(1) Rack stopper

15) Pull the rack assembly from the cylinder side, and draw out the rack bushing and rack stopper together with the rack assembly.

CAUTION:
Be careful not to contact rack to inner wall of cylinder when drawing out. Any scratch on cylinder inner wall will cause oil leakage.

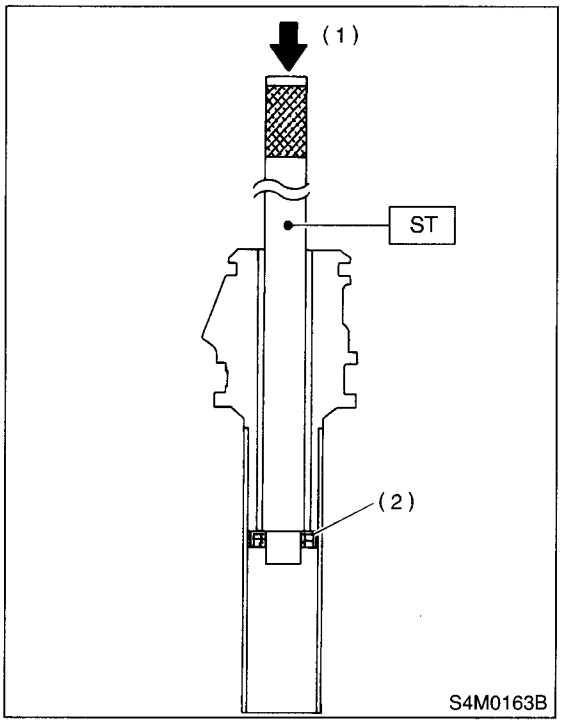


(1) Rack bushing
(2) Rack ASSY
(3) Rack stopper

16) Remove the rack bushing and rack stopper from the rack assembly.

CAUTION:
Do not reuse removed rack bushing and circlip.

17) Remove the oil seal from rack.
18) Insert ST from the pinion housing side and remove the oil seal using a press.
ST 34099FA110 INSTALLER



(1) Press
(2) Oil seal

NOTE:
Discard the removed the oil seal.

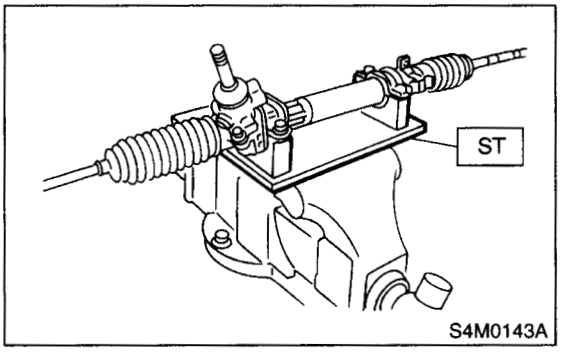
2. CONTROL VALVE

1) Disconnect the four pipes from the gearbox.

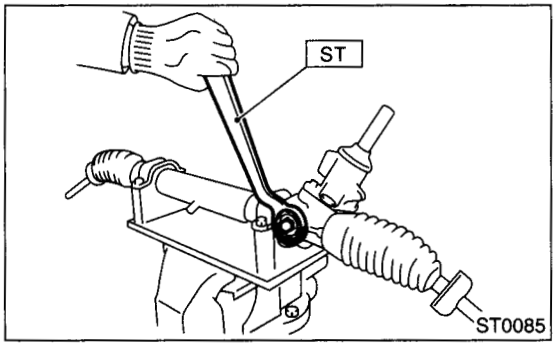
NOTE:
Remove the pipes E and F as a single unit being fixed at the clamp plate.

2) Secure the gearbox removed from the vehicle in vice using ST.
ST 926200000 STAND

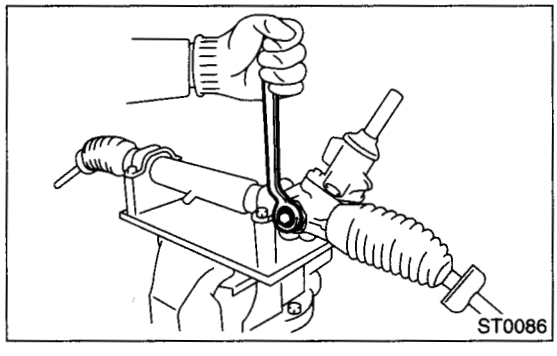
CAUTION:
Secure the gearbox in a vice using the ST as shown. Do not attempt to secure it without this ST.



3) Using ST, loosen the lock nut.
ST 926230000 SPANNER



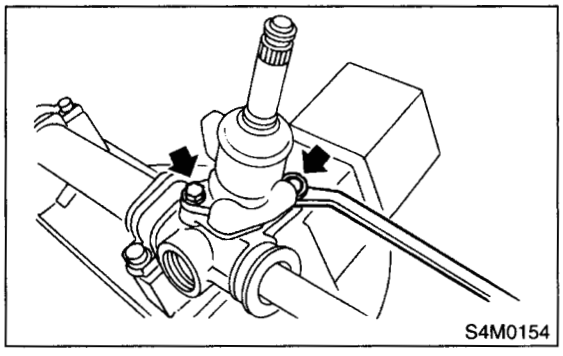
4) Tighten the adjusting screw until it no longer tightens.



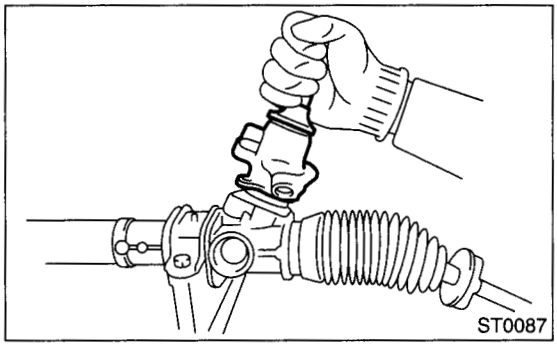
5) Loosen the adjusting screw and remove the spring and sleeve.

CAUTION:
Replace the spring and/or sleeve if damaged.

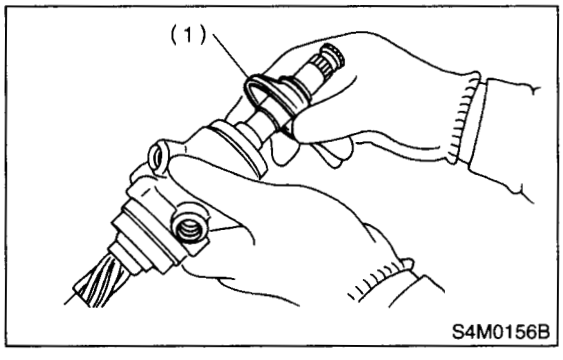
6) Remove the two bolts securing valve assembly.



7) Carefully draw out the input shaft and remove the valve assembly.

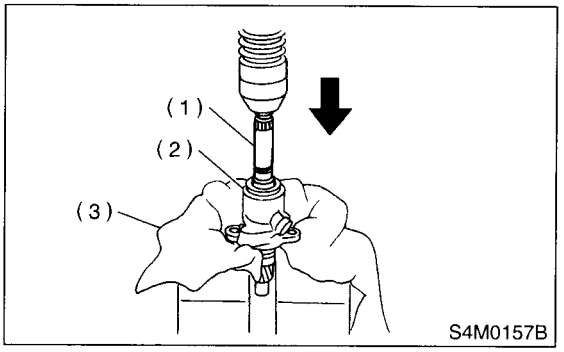


8) Slide the dust cover out.



(1) Dust cover

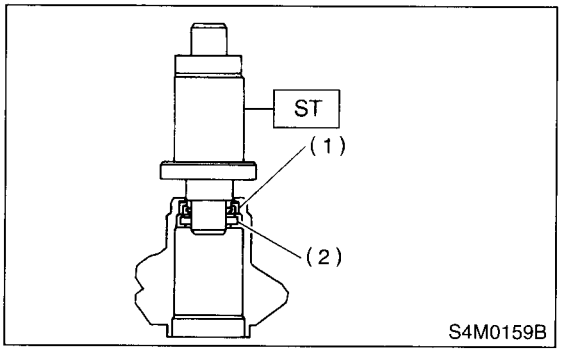
9) Using a press remove pinion and valve assembly from the valve housing.



(1) Valve ASSY
(2) Valve housing
(3) Cloth

10) Using ST and press, remove the dust seal, oil seal and special bearing from the valve housing.
ST 34099FA120 INSTALLER & REMOVER SEAL

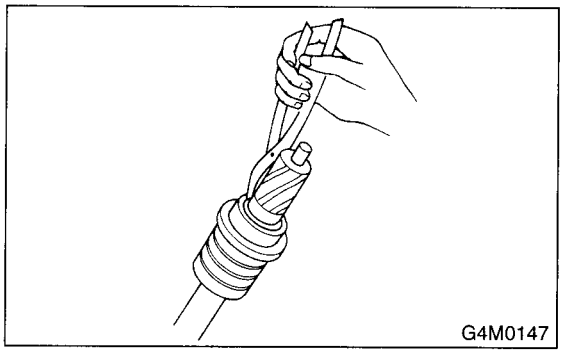
CAUTION:
- **Do not apply a force to end surface of valve housing.**
- **Do not reuse oil seal after removal.**



(1) Oil seal
(2) Special bearing

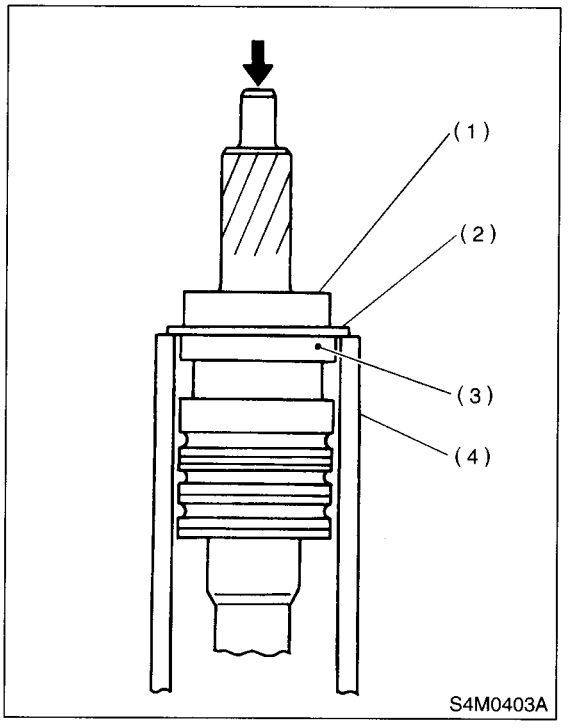
11) Remove the snap ring using snap ring pliers.

CAUTION:
- **Do not reuse removed snap ring.**
- **Be careful not to scratch 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.

CAUTION:
Do not reuse removed bearing.



(1) Bearing
(2) Backing washer
(3) Oil seal
(4) Pipe

13) Remove the oil seal.

CAUTION:
Do not reuse removed oil seal.

D: ASSEMBLY

1. RACK HOUSING ASSEMBLY

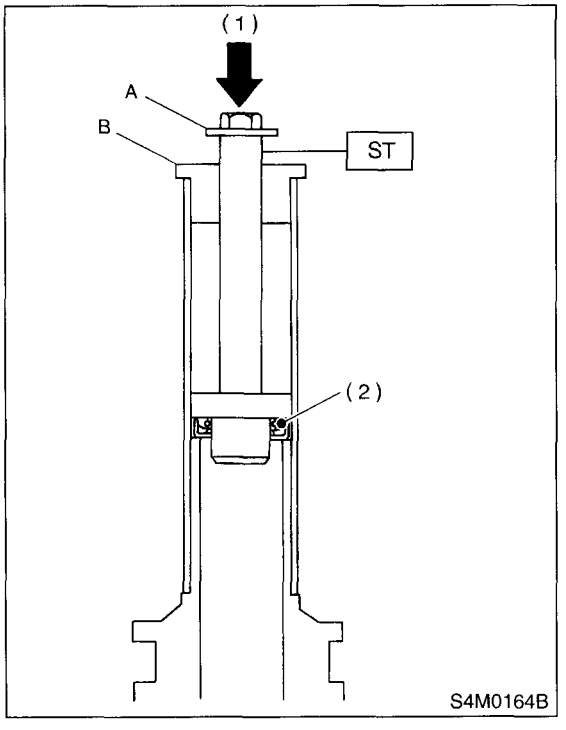
CAUTION:
Use only SUBARU genuine grease for gearbox.

Specified grease for gearbox:
VALIANT GREASE M2 (Part No. 003608001)

1) Clean all parts and tools before reassembling.
2) Force-fit oil seal using ST.
ST 34099FA110 INSTALLER

CAUTION:
Be careful not to damage or scratch cylinder inner wall.

NOTE:
- Apply specified power steering fluid to oil seal.
- Pay special attention not to install oil seal in wrong direction.
- Push oil seal until the stepped portion of A contacts end face of B.



(1) Press
(2) Oil seal

3) Apply grease to the teeth of rack so that the grease applied is about as high as teeth, and also apply a thin film of grease to the sliding portion of rack shaft.

CAUTION:
- **When moving rack to stroke end without tie-rod attached, prevent shocks from being applied at the end.**
- **Do not apply grease to threaded portion at end of rack shaft.**
- **Move rack shaft to stroke end two (2) or three (3) times to squeeze grease which accumulates on both ends. Remove grease to prevent it from choking air passage hole.**

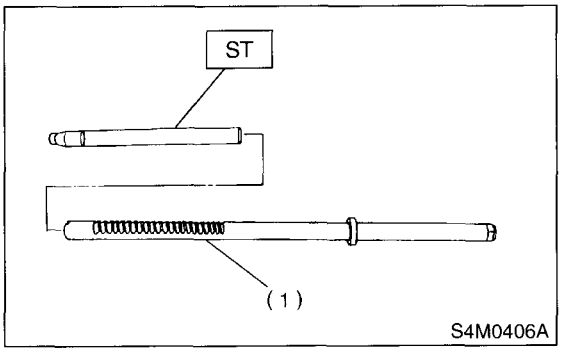
4) Apply grease to the sleeve insertion hole.
5) Apply grease to the dust seal insertion hole.

CAUTION:
Apply clean grease with clean hands. If material having a sharp edge is used for applying grease, oil seal at the inside might be damaged.

6) Fixing rack housing
Fix the rack housing in vice using ST.
ST 926200000 STAND

CAUTION:
- **When fixing rack housing in vice, be sure to use this special tool. Do not fix rack housing in vice using pad such as aluminum plates, etc.**
- **When using old rack housing, be sure to clean and remove rust before assembling. Check pinion housing bushing carefully.**

7) Install the oil seal to rack.
8) Fit 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 ASSY

9) Apply genuine grease to the teeth of thoroughly washed rack assembly, and fit ST over the toothed portion.

CAUTION:
- **Be careful not to block air passage with grease. Remove excessive grease.**
- **After fitting cover, check air passage hole for clogging. If clogged, open by removing grease from the hole.**
- **Check rack shaft for damage.**
- **Apply specified power steering fluid to this ST and surface of piston ring to prevent seal from being damaged.**

10) Insert the rack assembly into the rack housing from cylinder side, and remove ST after it has passed completely through oil seal.

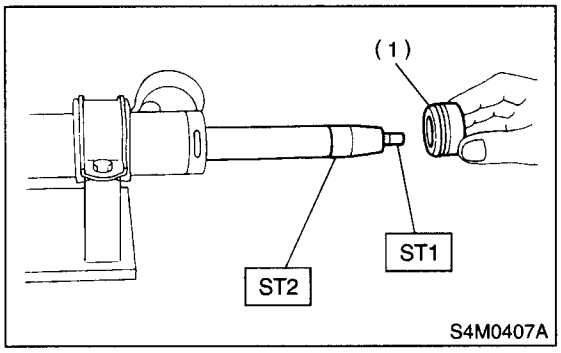
NOTE:
Before inserting rack assembly, apply a coat of specified power steering fluid to surfaces of ST and rack piston.

ST 926390001 COVER & REMOVER

11) Fit ST1 and ST2 over the end of rack, and install 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 rack bushing in specified power steering fluid before installing, and pay attention not to damage O-ring and oil seal.



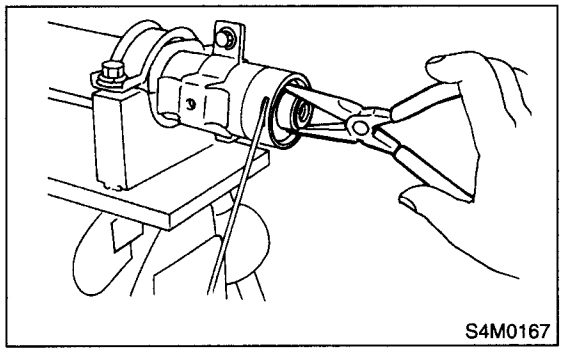
(1) Rack bushing ASSY

12) 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.

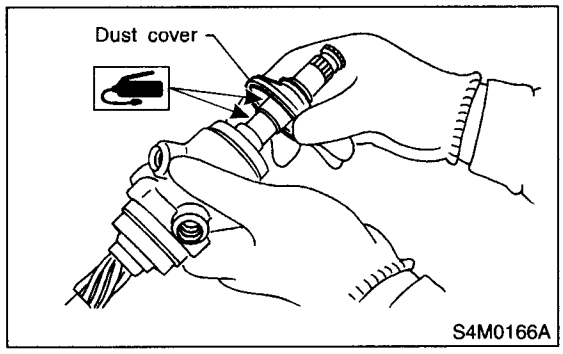
13) Insert the rack stopper into the rack housing, and wrap the circlip using a sharp pointed pliers to secure the rack stopper in position.

CAUTION:
Be careful not to scratch rack while winding circlip.

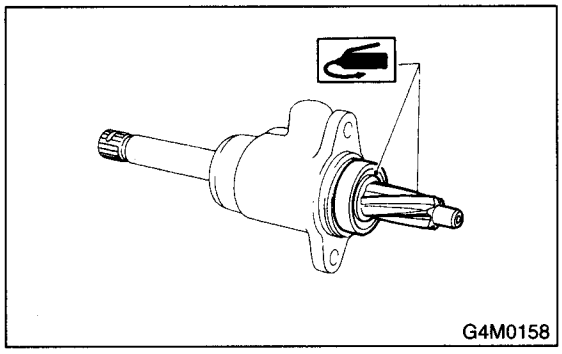
NOTE:
Rotate the wrench another 90 to 180° after the end of circlip has been wrapped in.



14) Fit the mounting rubber onto the rack housing.
15) Apply the specified grease to the dust cover.



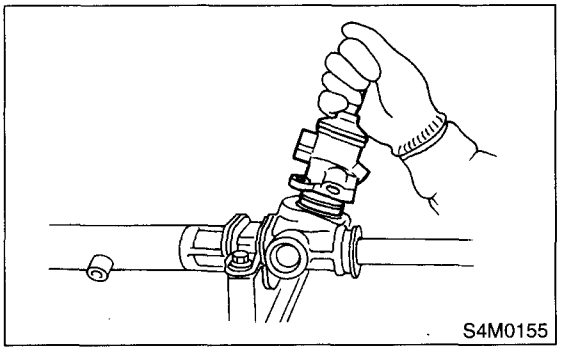
16) Install the dust cover on the valve assembly.
17) Apply genuine grease to the pinion gear and bearing of valve assembly.



18) Install the gasket on the valve assembly. Insert the valve assembly into the place while facing rack teeth toward pinion.

CAUTION:
Be sure to use a new gasket.

NOTE:
Do not allow packing to be caught when installing valve assembly.

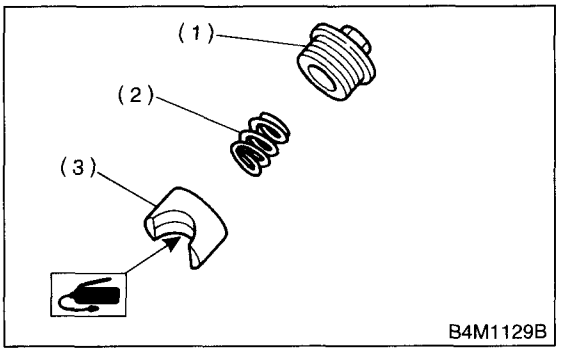


19) Tighten the bolts alternately to secure the valve assembly.

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

CAUTION:
Be sure to alternately tighten bolts.

20) Apply grease to the sliding surface of sleeve and spring seat, then insert the sleeve into the pinion housing. Fit the spring into the sleeve screw, pack grease inside of screw, then install the screw.

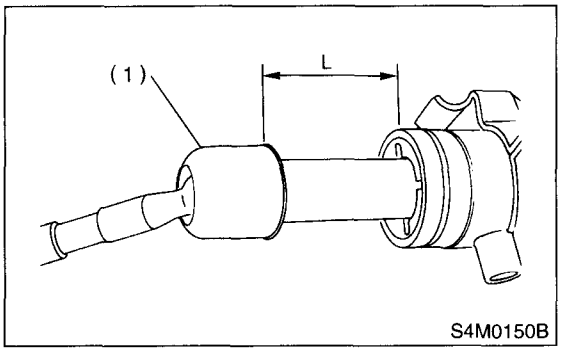


(1) Adjusting screw
(2) Spring
(3) Sleeve

21) Install the lock washers and tighten the left and right tie-rods into the rack ends.

On condition
L: Approximately 40 mm (1.57 in)

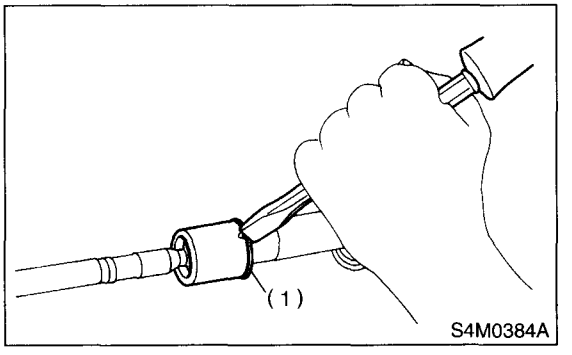
Tightening torque:
78 N·m (8.0 kgf-m, 58 ft-lb)



(1) Tie-rod

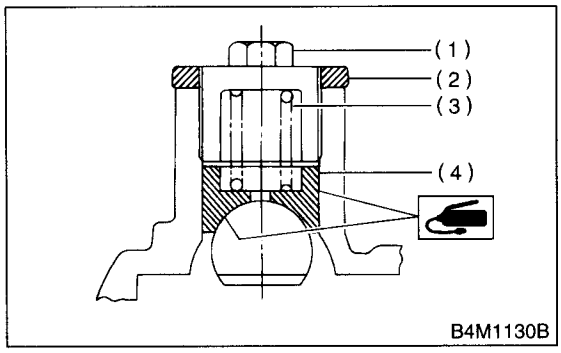
22) Bend the lock washer using a chisel.

CAUTION:
Be careful not to scratch rack when bending lock washer.



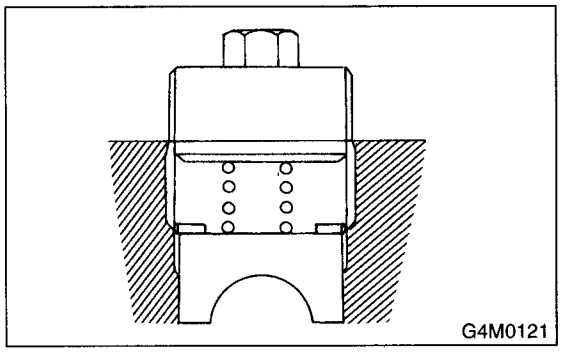
(1) Lock washer

23) Rack and pinion backlash adjustment
(1) Loosen the adjusting screw.
(2) Rotate the input shaft so that the rack is in the straight ahead direction.
(3) Apply grease to the sleeve.



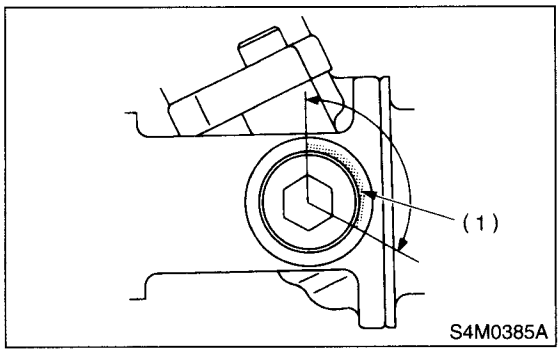
(1) Adjusting screw
(2) Lock nut
(3) Spring
(4) Sleeve

(4) Tighten the adjusting screw by two threads.



(5) Apply liquid packing to at least 1/3 of entire perimeter of adjusting screw thread.

Liquid packing:
THREE BOND 1141



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

(6) Tighten the adjusting screw to 7.4 N·m (0.75 kgf-m, 5.4 ft-lb) and back off 25°.

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

ST 926230000 SPANNER

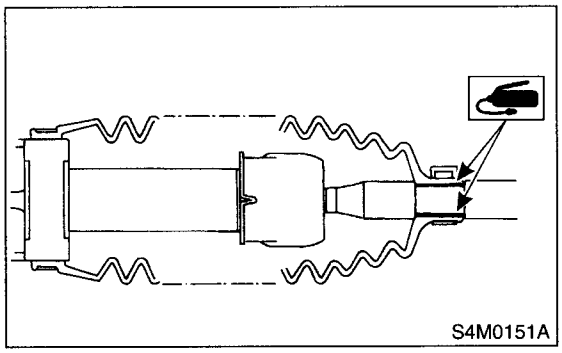
Tightening torque (Lock nut):
39 N·m (4.0 kgf-m, 29 ft-lb)

NOTE:
• Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.
• Make adjustment so that the steering wheel can be rotated fully from lock to lock without binding.

24) Check for service limit as per article of "Service limit".<Ref. to PS-42, INSPECTION, Steering Gearbox.> Make replacement and adjustment if necessary.

25) Install the boot to the housing.

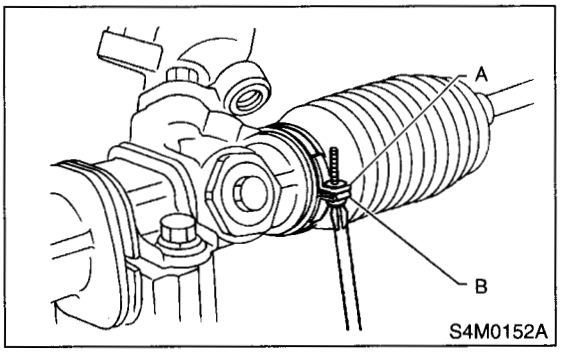
NOTE:
• Before installing boot, be sure to apply grease to the groove of tie-rod.
• Install fitting portions of boots to the following portions in both sides of assembled steering gearbox.
The groove on gearbox
The groove on the rod
• Make sure that the boot is installed without unusual inflation or deflation.



26) Using a screwdriver, tighten the screw until the ends "A" and "B" of the band come into contact with each other.

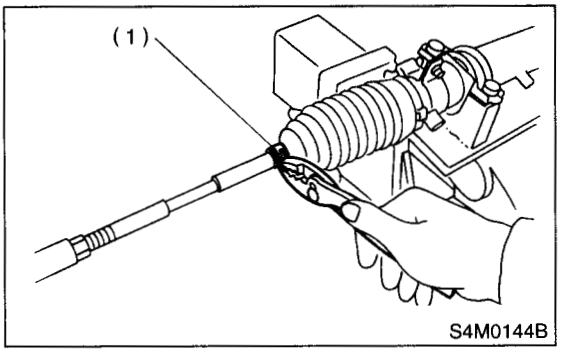
CAUTION:
Use a new band.

NOTE:
Always tighten the band from the underside of the gear box.



27) Fix the boot end with clip (small).

CAUTION:
After installing, check boot end is positioned into groove on tie-rod.

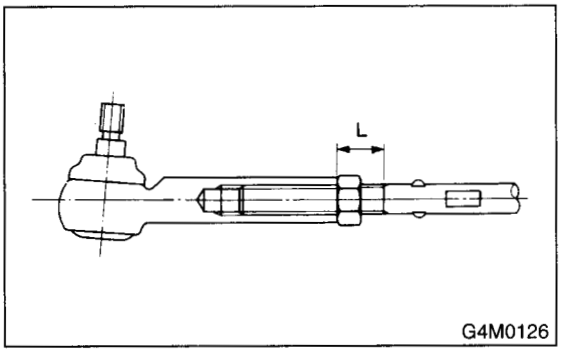


(1) Clip

28) If the tie-rod end was removed, screw in lock nut and tie-rod end to the screwed portion of tie-rod, and tighten the lock nut temporarily in a position as shown in figure.

Installed tie-rod length: L
15 mm (0.59 in)

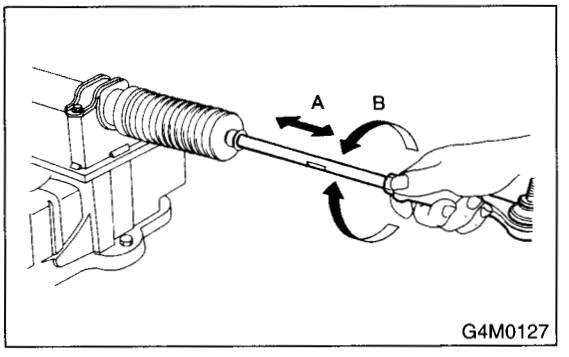
NOTE:
Pay attention to difference between right and left tie-rod ends.



29) Install the tie-rod end plate.

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

30) Inspect the gearbox as follows:
"A" Holding tie-rod end, repeat lock to lock two or three times as quickly as possible.
"B" Holding 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 the specified position without deflation.



31) Remove gearbox from ST.
ST 926200000 STAND

32) Install the four pipes on gearbox.
(1) Connect the pipe A and B to the four pipe joints of gearbox.

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

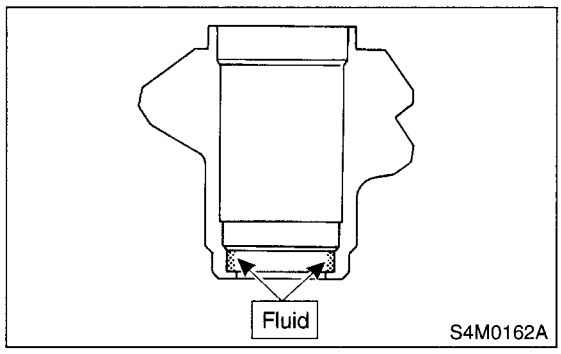
(2) Connect the pipe E and F to the gearbox.

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)

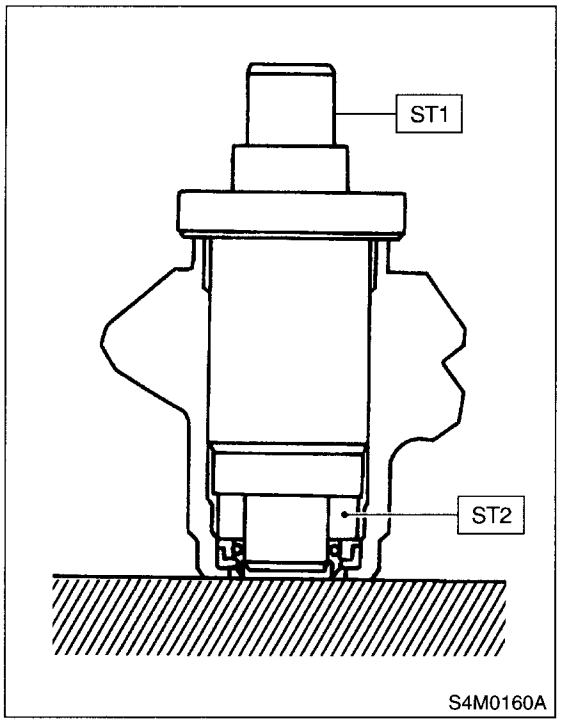
1) Clean all parts and tools before reassembling.
2) Apply a coat of specified power steering fluid to the inner wall of valve housing.



3) Attach ST2 to ST1, and press the oil seal into the place using a press.

ST1 34099FA120 INSTALLER & REMOVER SEAL
ST2 34099FA130 INSTALLER SEAL

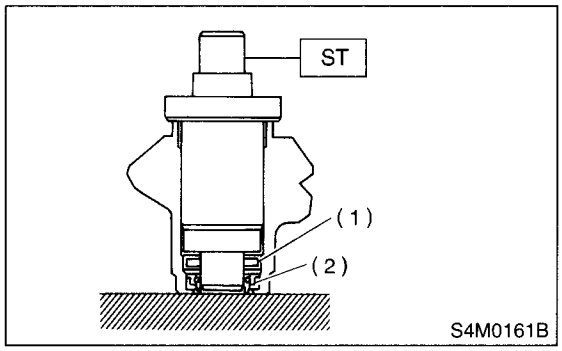
(1) Face oil seal in the direction shown in figure when installing.
(2) To avoid scratching oil seal, apply a coat of grease to the contact surface of installer and oil seal.
(3) To facilitate installation, attach oil seal to the installer and position in valve housing before pressing into place.



4) Using ST and press, install the special bearing in valve housing.

ST 34099FA120 INSTALLER & REMOVER SEAL

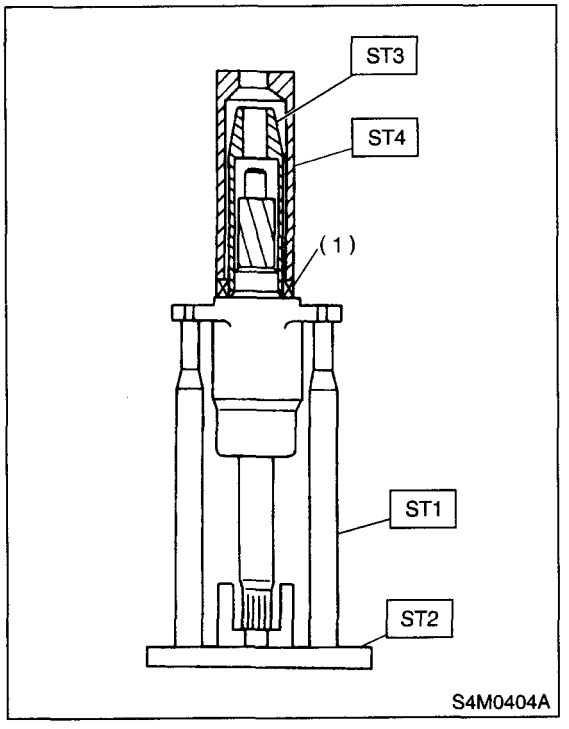
NOTE:
To facilitate installation, attach the ball bearing to the remover and position in valve housing before pressing it into place.



(1) Special bearing
(2) Oil seal

5) Put vinyl tape around pinion shaft splines to protect oil seal from damage.
6) Fit pinion and valve assembly into valve housing.
7) Secure valve assembly to ST1 and ST2.

8) Put ST3 over pinion, and insert oil seal, then force-fit oil seal into housing using ST4.
ST1 926370000 INSTALLER A
ST2 34099FA100 STAND BASE
ST3 926360000 INSTALLER A
ST4 927620000 INSTALLER B

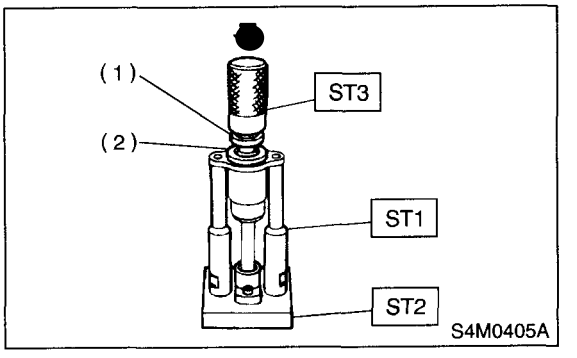


(1) Oil seal

NOTE:
• Apply the specified power steering fluid to the oil seal and ST3, being careful not to damage oil seal lip.
• Push the oil seal until ST3 contacts housing end face.

9) Remove ST3, and fit backing washer.

10) Force-fit ball bearing using ST3.
ST1 926370000 INSTALLER A
ST2 34099FA100 STAND BASE
ST3 927640000 INSTALLER B



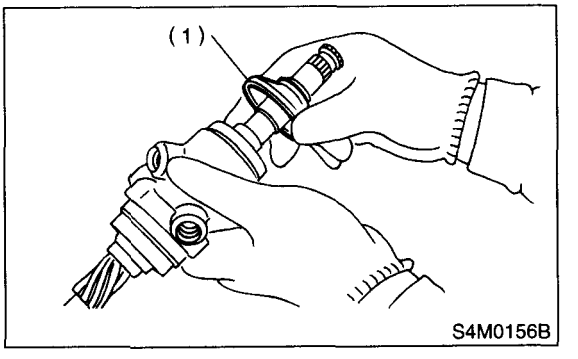
(1) Ball bearing
(2) Backing washer

NOTE:
Be careful not to tilt ball bearing during installation.

11) Install the snap ring using snap ring pliers.

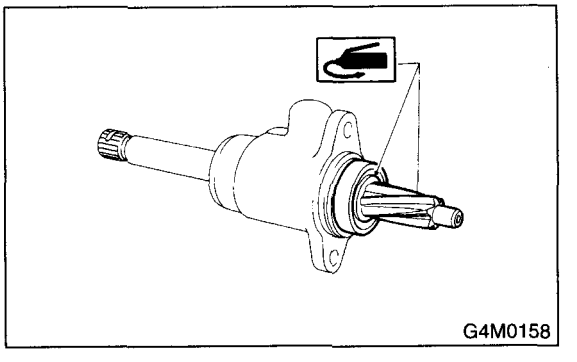
NOTE:
Rotate the snap ring to check for proper installation.

12) Apply the specified grease to the dust cover.



(1) Dust cover

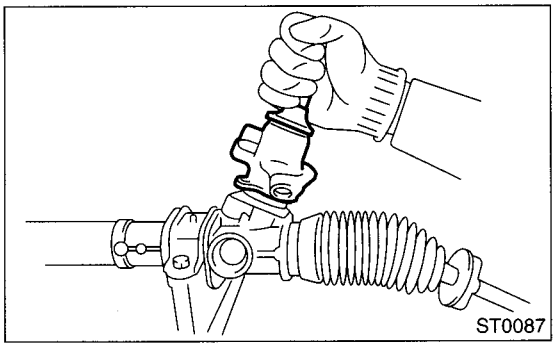
13) Install the dust cover on the valve assembly.
14) Apply genuine grease to the pinion gear and bearing of valve assembly.



15) Install the gasket on the valve assembly. Insert the valve assembly into the place while facing rack teeth toward pinion.

CAUTION:
Be sure to use a new gasket.

NOTE:
Do not allow packing to be caught when installing valve assembly.



16) Tighten the bolts alternately to secure the valve assembly.

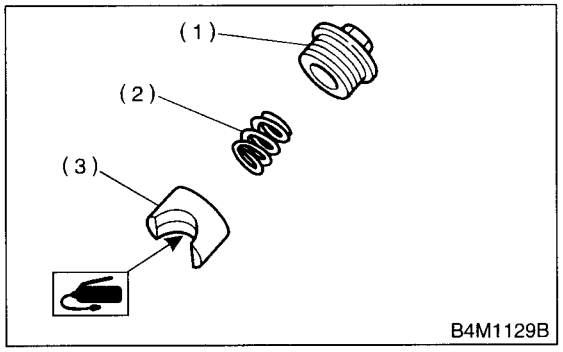
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

CAUTION:
Be sure to alternately tighten bolts.

17) Apply grease to the sleeve insertion hole.
18) Apply grease to the dust seal insertion hole.

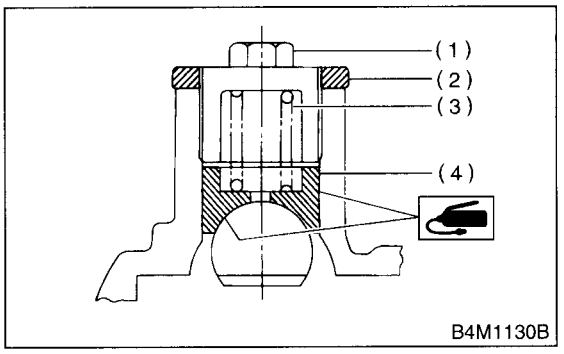
CAUTION:
Apply clean grease with clean hands. If material having a sharp edge is used for applying grease, oil seal at the inside might be damaged.

19) Apply grease to the sliding surface of sleeve and spring seat, then insert the sleeve into the pinion housing. Fit the spring into the sleeve the screw, pack grease inside of screw, then install the screw.



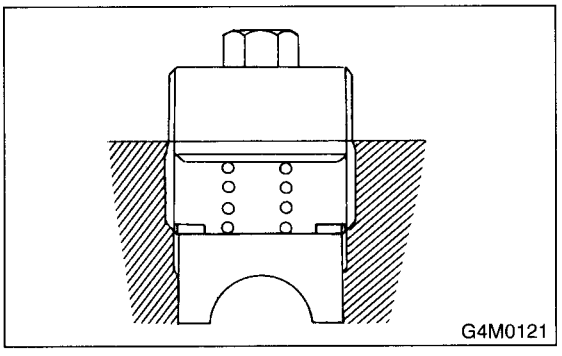
(1) Adjusting screw
(2) Spring
(3) Sleeve

20) Rack and pinion backlash adjustment
(1) Loosen the adjusting screw.
(2) Rotate the input shaft so that the rack is in the straight ahead direction.
(3) Apply grease to the sleeve.



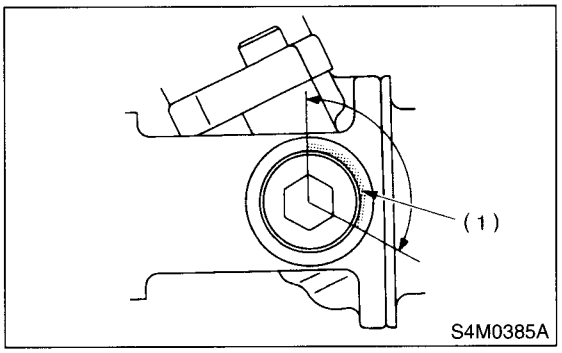
(1) Adjusting screw
(2) Lock nut
(3) Spring
(4) Sleeve

(4) Tighten the adjusting screw by two threads.



(5) Apply liquid packing to at least 1/3 of entire perimeter of adjusting screw thread.

Liquid packing:
THREE BOND 1141



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

(6) Tighten the adjusting screw to 7.4 N·m (0.75 kgf-m, 5.4 ft-lb) and back off 25°.

(7) Install the lock nut. While holding 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)

NOTE:
• Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.
• Make adjustment so that the steering wheel can be rotated fully from lock to lock without binding.

21) Check for service limit as per article of "Service limit".<Ref. to PS-42, INSPECTION, Steering Gearbox.> Make replacement and adjustment if necessary.
22) Take off the gearbox from ST.
23) Install the four pipes on the 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 the 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 inside of gearbox for water. If any water is found, carefully check 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 new one.
3	Rack and pinion	Poor mating of rack with pinion	(1) Adjust the backlash properly. By measuring 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 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 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 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 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.

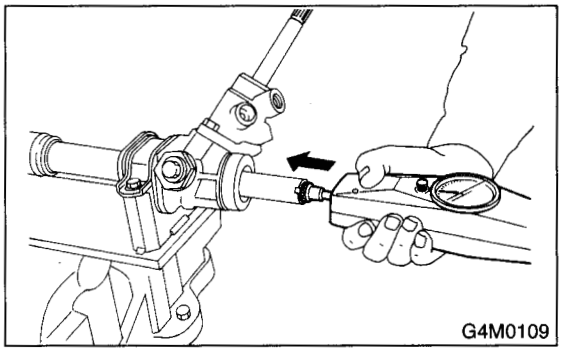
2. SERVICE LIMIT

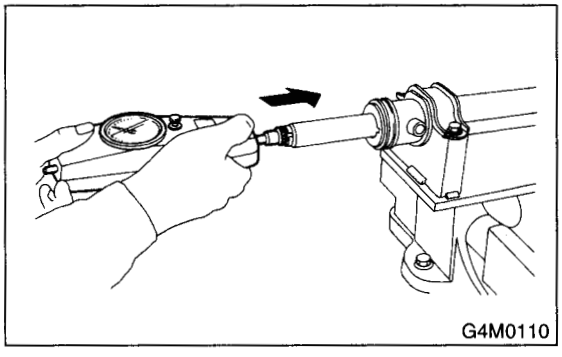
Make a measurement as follows. If it exceeds the specified service limit, adjust or replace.

NOTE:
When making a measurement, vise gearbox by using ST. Never vise gearbox by inserting aluminum plates, etc. between vise and gearbox.
ST 926200000 STAND

Sliding resistance of rack shaft:

Service limit
340 N (35 kgf, 76 lb) or less


G4M0109

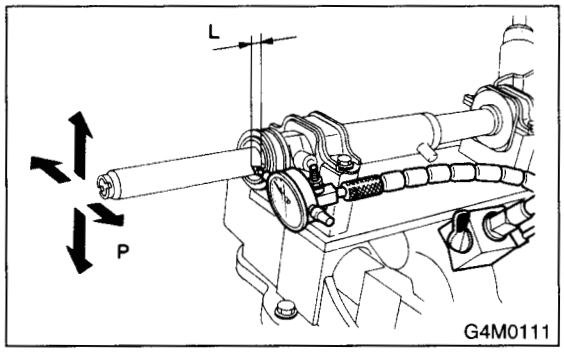

G4M0110

3. RACK SHAFT PLAY IN RADIAL DIRECTION

Right-turn steering:

Service limit
0.19 mm (0.0075 in) or less

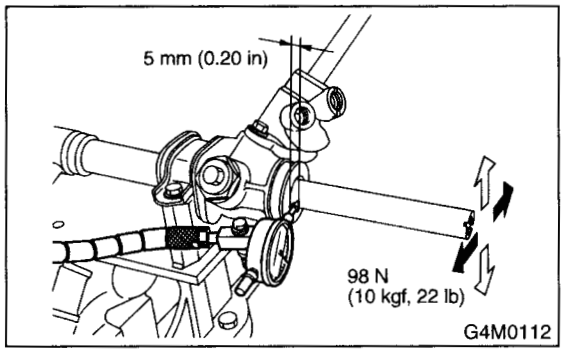
On condition
L: 5 mm (0.20 in)
P: 122.6 N (12.5 kgf, 27.6 lb)



G4M0111

Left-turn steering:

Service limit
Direction ⇦⇨
0.3 mm (0.012 in) or less
Direction ⬅➡
0.15 mm (0.0059 in) or less



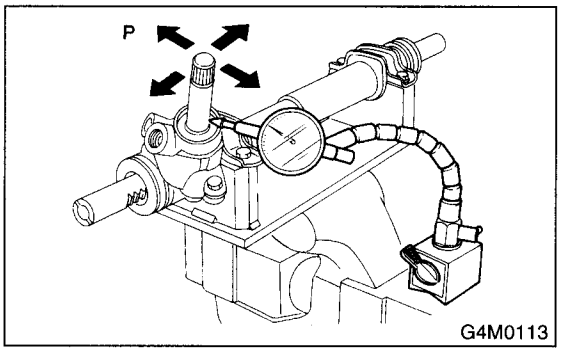
G4M0112

4. INPUT SHAFT PLAY

In radial direction:

Service limit
0.18 mm (0.0071 in) or less

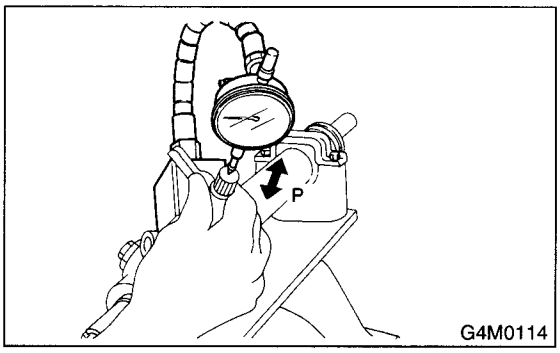
On condition
P: 98 N (10 kgf, 22 lb)



In axial direction:

Service limit
0.5 mm (0.020 in) or less

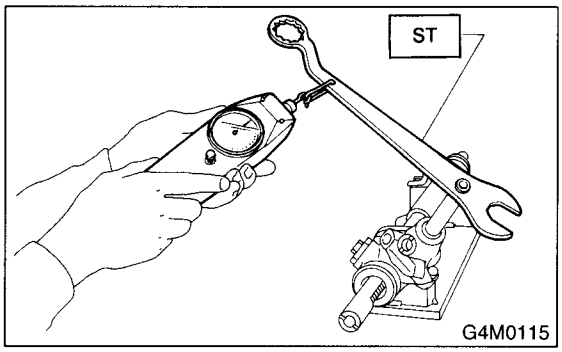
On condition
P: 20 — 49 N (2 — 5 kgf, 4 — 11 lb)



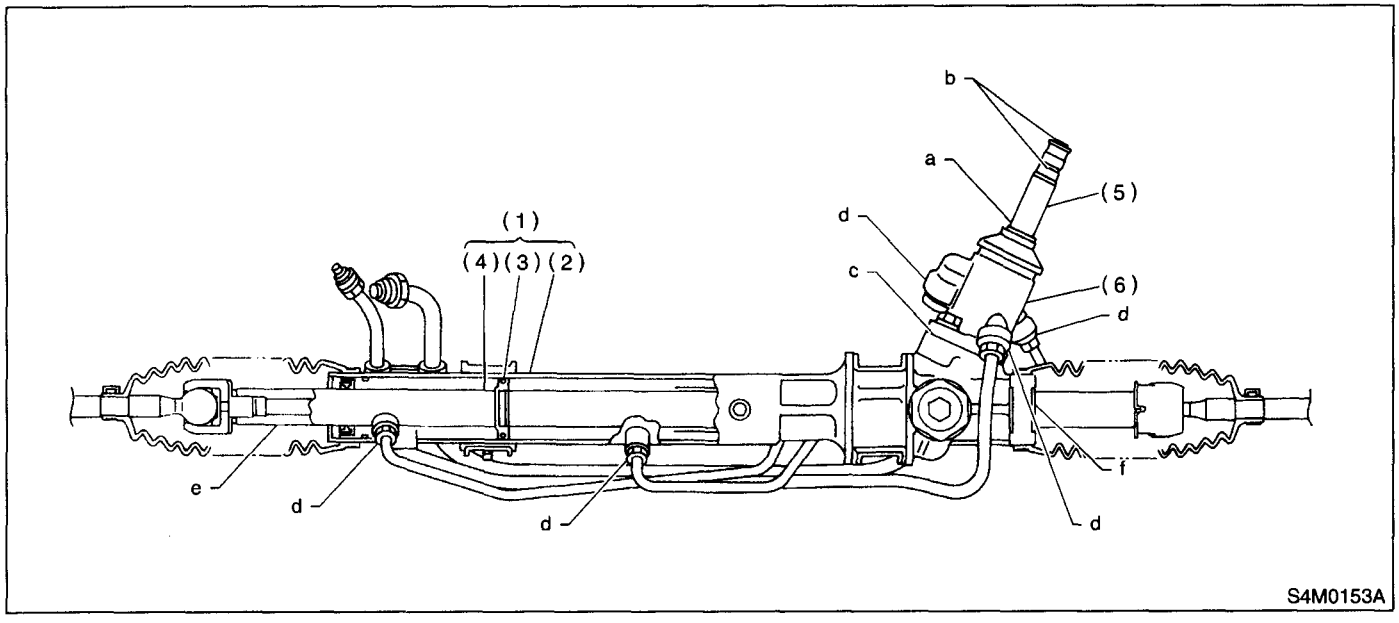
5. TURNING RESISTANCE OF GEARBOX

Using ST, measure gearbox turning resistance.
ST 34099PA100 SPANNER

Service limit
Maximum allowable resistance
Less than 12 N (1.2 kgf, 2.7 lb)



6. OIL LEAKING



(1) Power cylinder
(2) Cylinder
(3) Rack piston
(4) Rack axle
(5) Input shaft
(6) Valve housing

NOTE:
If the gearbox is dismounted without confirming where the leak is, it must be mounted again to locate the leak point.

1) Even if the location of the leak can be easily found by observing the leaking condition, it is necessary to thoroughly remove the oil from the suspected portion and turn the steering wheel from lock to lock about 30 to 40 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) If leak is other than a, b, c, or d, 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 oil from the surrounding portions. Then, turn the steering wheel from lock to lock 30 to 40 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 30 to 40 times with the engine running, then make comparison of the leaked portion between immediately after and several hours after this operation.

CAUTION:

- **If leakage from "f" is noted again:**

The oil seal of pinion and valve assembly is damaged. Replace pinion and valve assembly with a new one. Or replace the oil seal and the parts that are damaged during disassembly with new ones.

- **If oil stops leaking from "f":**

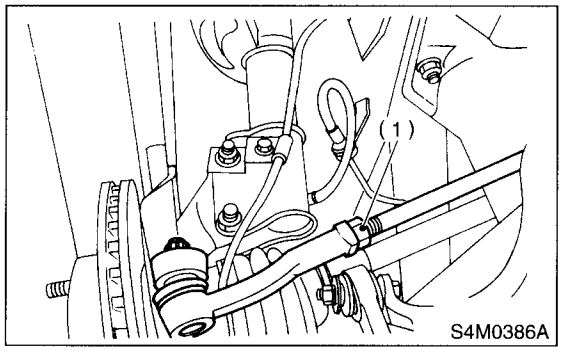
The oil seal of rack housing is damaged. Replace the oil seal and the parts that are damaged during disassembly with new ones.

F: ADJUSTMENT

1) Adjust the front toe.

Standard of front toe:

IN 3 — OUT 1 mm (IN 0.12 — OUT 0.039 in)



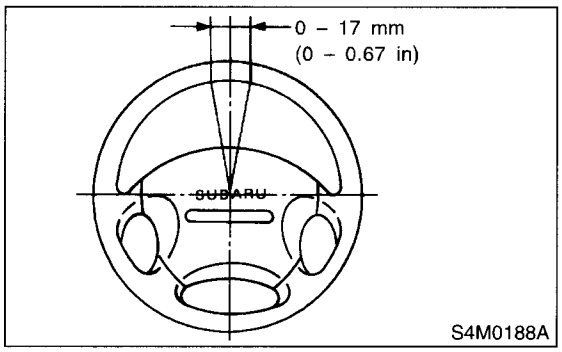
(1) Lock nut

2) Adjust the steering angle of wheels.

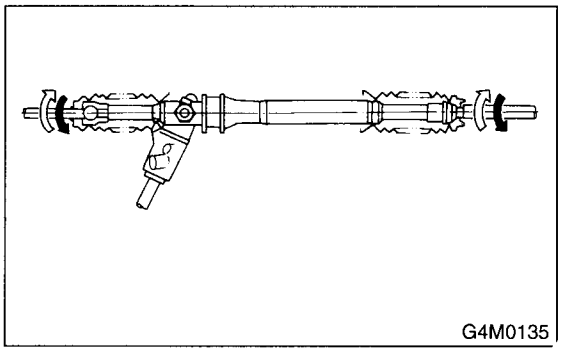
Standard of steering angle:

Model	TURBO, Sedan, OUTBACK	Others
Inner wheel	34°05' ± 1.5°	36°55' ± 1.5°
Outer wheel	29°35' ± 1.5°	31°35' ± 1.5°

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.



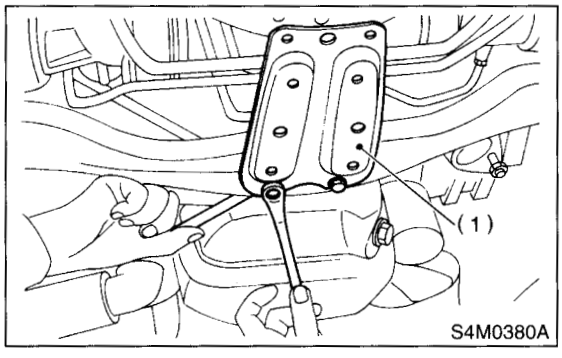
4) If the steering wheel spokes are not horizontal with vehicle set in the straight ahead position after this adjustment, correct it by turning the right and left tie-rods in the same direction by the same turns.



6. Pipe Assembly

A: REMOVAL

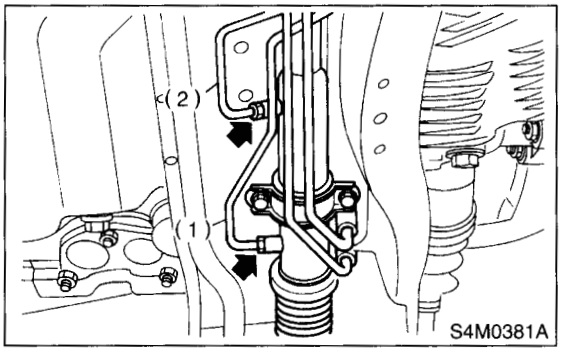
1) Disconnect the battery ground terminal.
2) Lift the vehicle and remove the jack-up plate.



(1) Jack-up plate

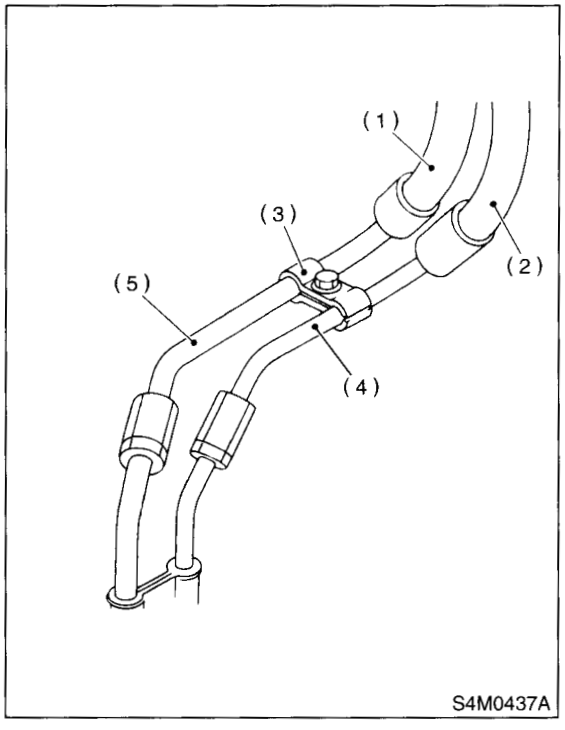
3) Remove one pipe joint at the center of gearbox, and connect a vinyl hose to the pipe and joint. Discharge the fluid by turning steering wheel fully clockwise and counterclockwise. Discharge the fluid similarly from the other pipe.

CAUTION:
Improper removal and installation of parts often causes fluid leak trouble. To prevent this, clean the surrounding portions before disassembly and reassembly, and pay special attention to keep dirt and other foreign matter from mating surfaces.



(1) Pipe A
(2) Pipe B

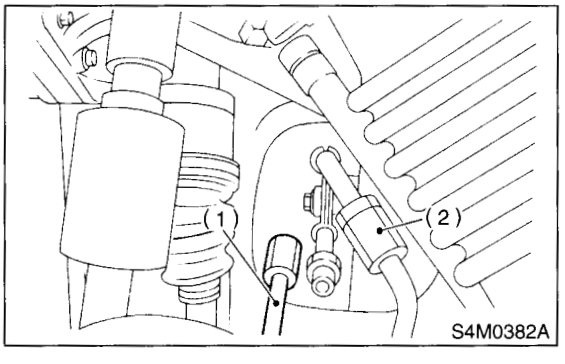
4) Remove the clamp E from pipes C and D.



(1) Return hose
(2) Pressure hose
(3) Clamp E
(4) Pipe C
(5) Pipe D

5) Disconnect the pipe C·D from the pipe (on the gearbox side).

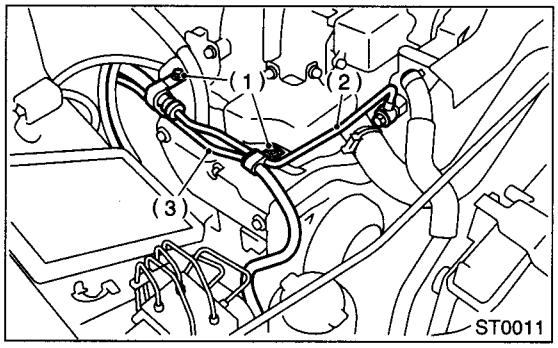
CAUTION:
• When disconnecting pipe C·D, use two wrenches to prevent deformities.
• Be careful to keep pipe connections free from foreign matter.



(1) Pipe C
(2) Pipe D

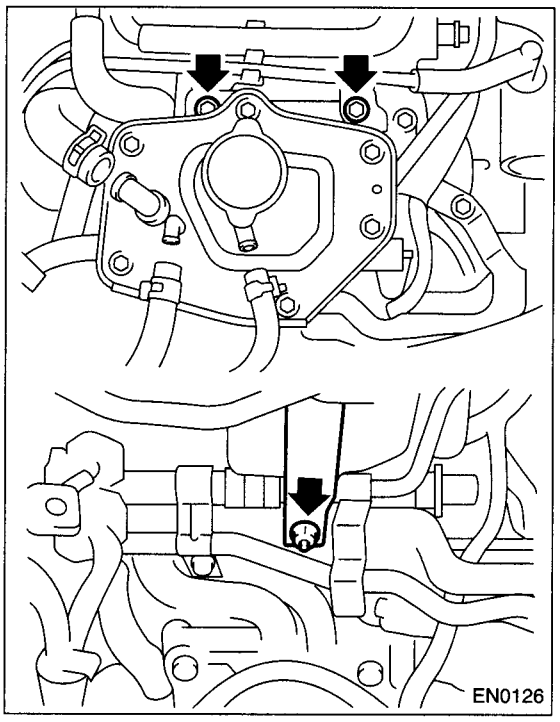
6) Non-TURBO model:
(1) Remove the air intake duct. <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
(2) Remove the bolt A.
(3) Disconnect the pipe C from the oil pump.
(4) Disconnect the pipe D from the return hose.

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.



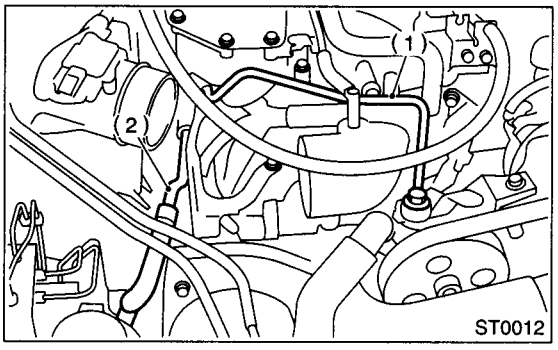
(1) Bolt A
(2) Pipe C
(3) Pipe D

7) TURBO model:
(1) Remove the air intake duct, air cleaner upper cover and air intake boot.
<Ref. to IN(DOHC TURBO)-8, REMOVAL, Air Intake Duct.> and <Ref. to IN(DOHC TURBO)-7, REMOVAL, Air Cleaner.>
(2) Remove the two bolts fixing pipe C and D.
(3) Remove the coolant filler tank.



(4) Disconnect the pipe C from oil pump.
(5) Disconnect the pipe D from the 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.



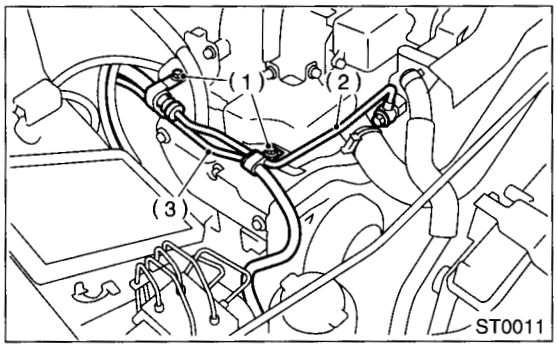
(1) Pipe C
(2) Pipe D

B: INSTALLATION

1) Temporarily tighten the bolts fixing pipe C and D.

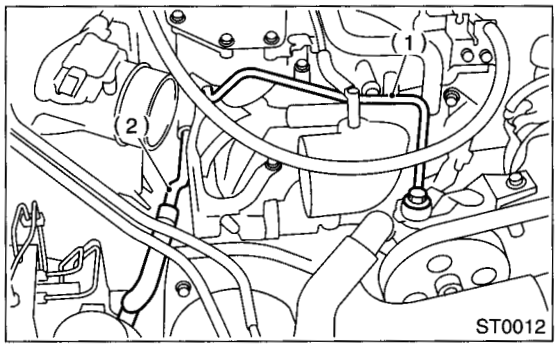
CAUTION:
Visually check that hose between tank and pipe D is free from bending or twisting.

- Non-TURBO model



(1) Bolt A
(2) Pipe C
(3) Pipe D

- TURBO model



(1) Pipe C
(2) Pipe D

(1) Connect the pipe D to oil tank.
(2) Install the pipe C to oil pump.

CAUTION:
Use a new gasket.

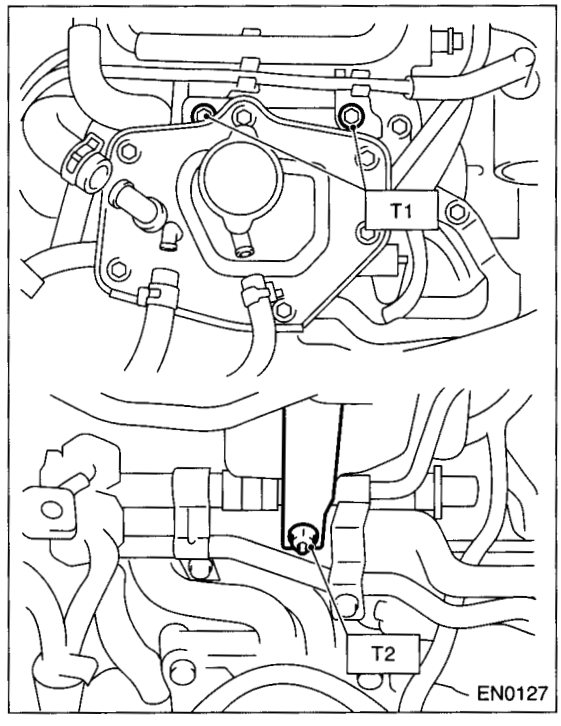
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

(3) Tighten bolts fixing pipe C and D.

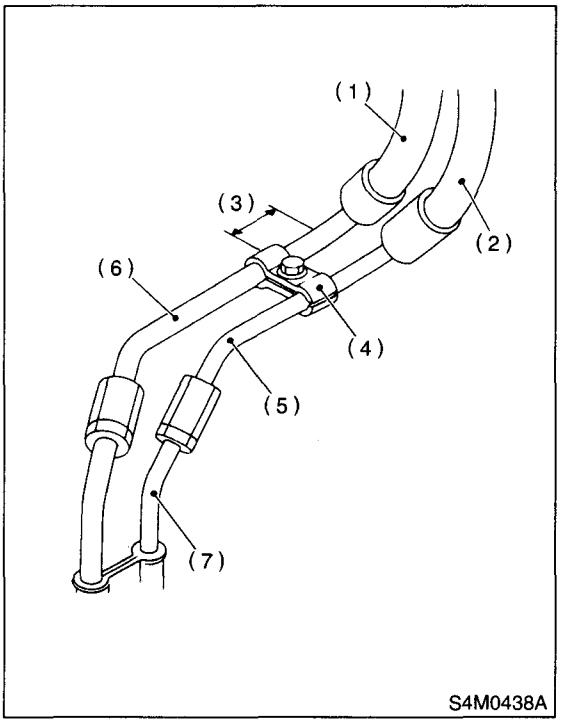
Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

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)



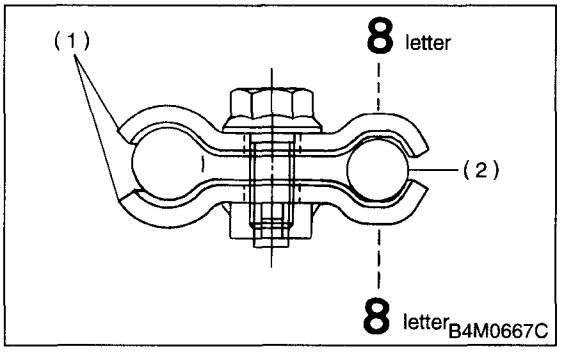
3) Temporarily connect the pipes C and D to the pipes (on the gearbox side).



(1) Return hose
(2) Pressure hose
(3) Approx. 30 mm (1.18 in)
(4) Clamp E
(5) Pipe C
(6) Pipe D
(7) Pipe (on gearbox side)

4) Temporarily install the clamp E on the pipes C and D.

CAUTION:
Ensure that the letter "8" on each clamp are diagonally opposite each other as shown in figure.



(1) Clamp E
(2) Pipe C

5) Tighten the clamp E firmly.

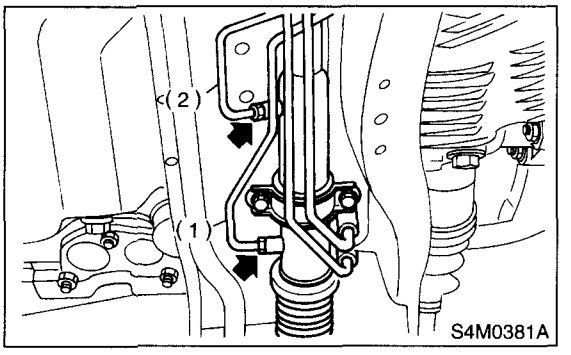
Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

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 the 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)

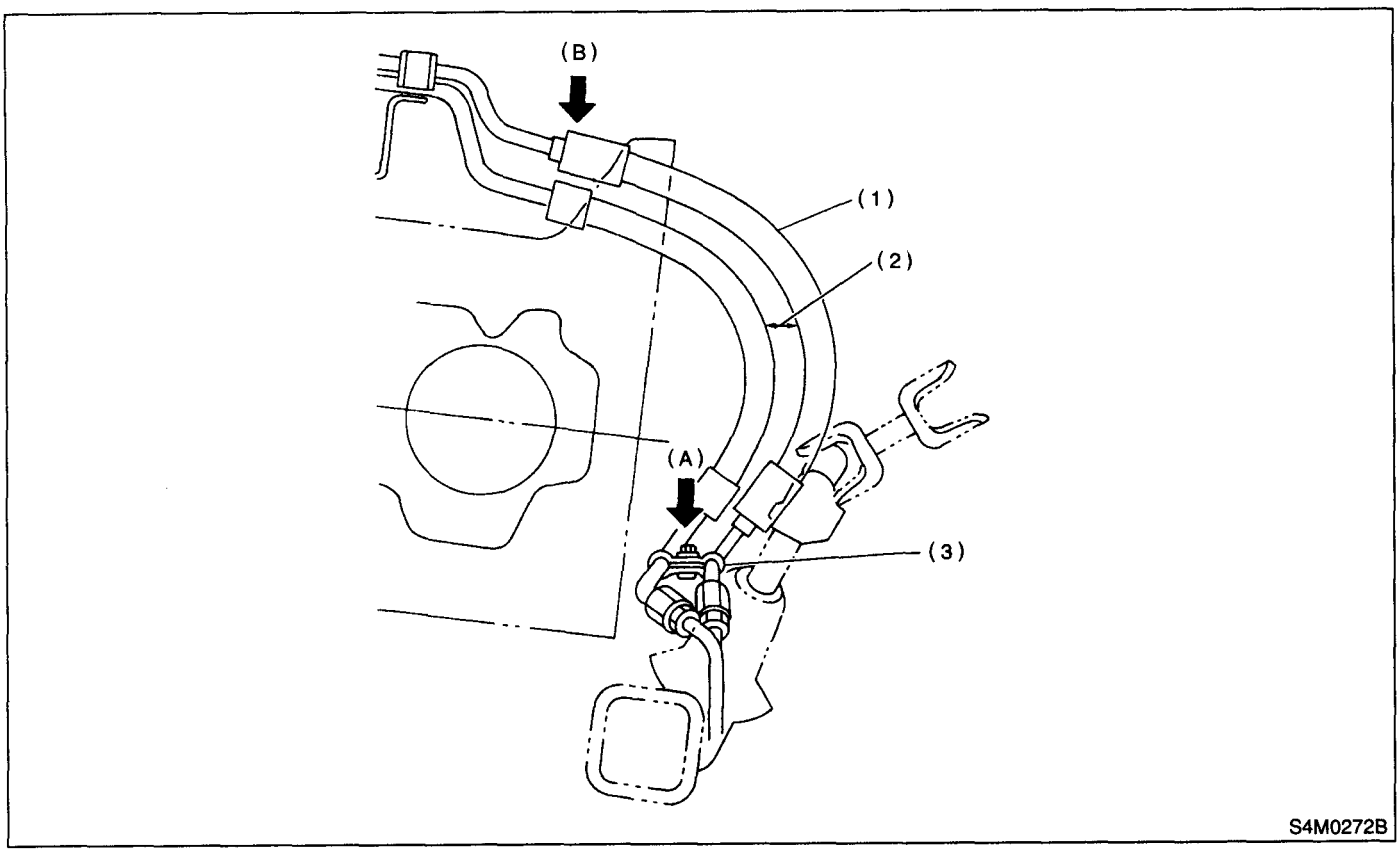


(1) Pipe A
(2) Pipe B

8) Install the jack-up plate.
9) Install the air intake duct. (Non-TURBO model). <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.>
10) Install the air intake duct, air intake boot and air cleaner upper cover. (TURBO model) <Ref. to IN(DOHC TURBO)-7, INSTALLATION, Air Cleaner.> and <Ref. to IN(DOHC TURBO)-8, INSTALLATION, Air Intake Duct.>
11) Connect the battery ground terminal.

12) Feed the specified fluid.

NOTE:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.



(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.
If the clearance between cruise control pump and power steering hose is less than 10 mm (0.39 in), proceed as follows:

(1) Move the clamped section (A) (refer to figure above.) down to a point where the pipe is close to crossmember.

Pipe-to-crossmember clearance:
10 mm (0.39 in), min.

(2) Check that clearance between cruise control pump and power steering hose is at least 10 mm (0.39 in). If it is not, bend section (B) down until a clearance of at least 10 mm (0.39 in) is obtained.

C: INSPECTION

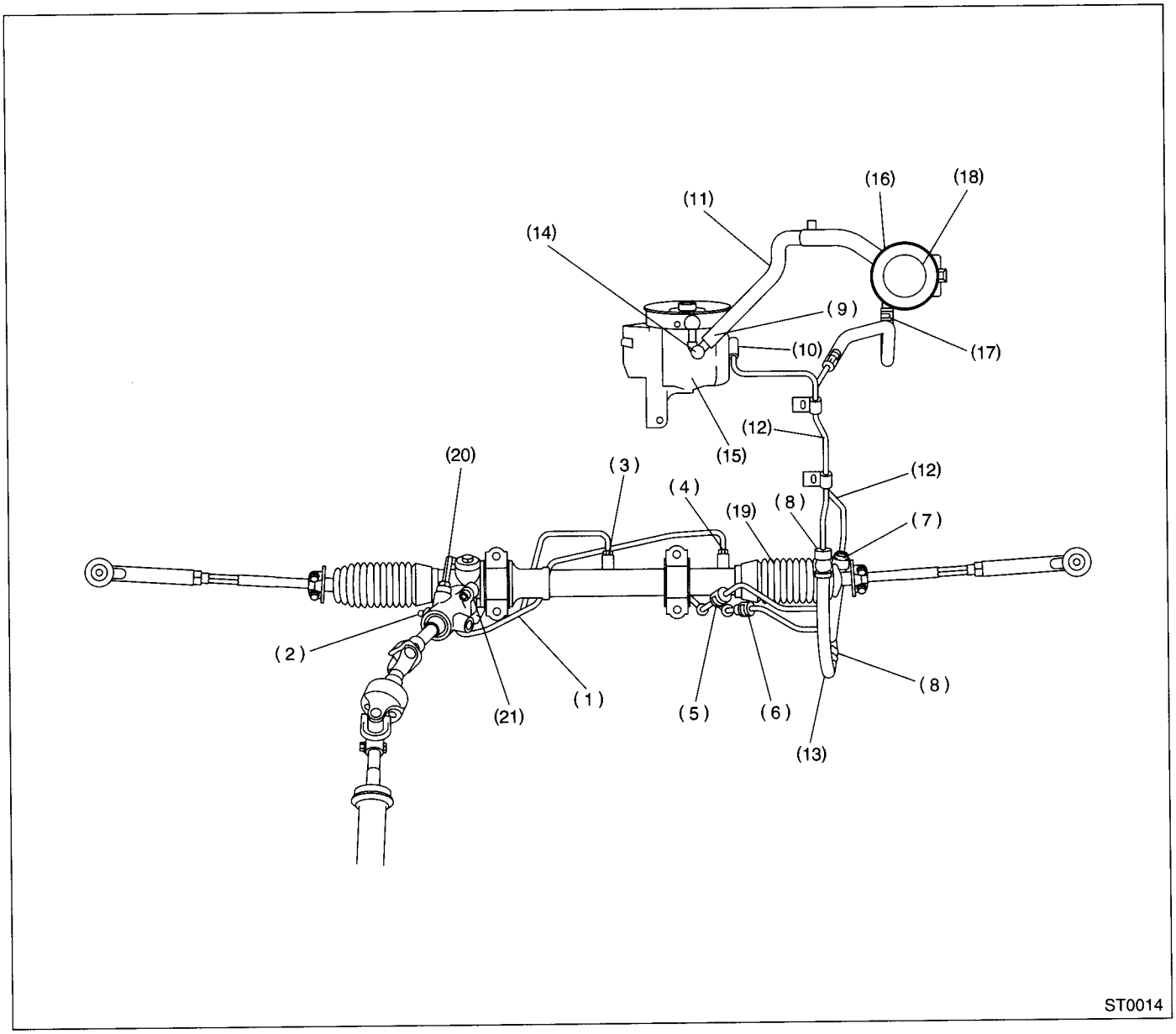
Check all disassembled parts for wear, damage or other abnormalities. Repair or replace faulty parts as required.

Part name	Inspection	Remedy
Pipe	• O-ring fitting surface for damage • Nut for damage • Pipe for damage	Replace with new one.
Clamp B	• Clamps for weak clamping force	Replace with new one.
Clamp C		
Clamp E		
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 new one.

CAUTION:
Although 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 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 careful inspection frequently when the vehicle is used in hot weather areas, cold weather area and/or 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.
So, avoid to keep this kind of condition when servicing as well as driving.

Trouble	Possible cause	Corrective action
Pressure hose burst	Excessive holding time of relief status	Instruct customers.
	Malfunction of relief valve	Replace oil pump.
	Poor cold characteristic of fluid	Replace fluid.
Forced out return hose	Poor connection	Correct.
	Poor holding of clip	Retighten.
	Poor cold characteristic of fluid	Replace fluid.
Fluid bleeding out of hose slightly	Wrong layout, tensioned	Replace hose.
	Excessive play of engine due to deterioration of engine mounting rubber	Replace defective parts.
	Improper stop position of pitching stopper	Replace 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 customers.

CAUTION:
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 O-ring or gasket pipe or hose with new one, if ineffective, replace the 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 gearbox (20) and (21) in figure	Damaged packing or oil seal	Replace the problem parts.
	Damage in control valve	Replace the control valve.

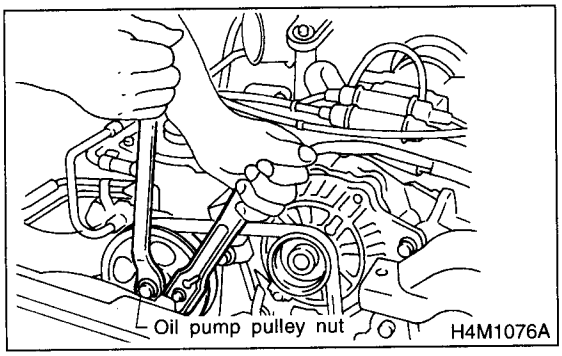
NOTE:
Fluid level is specified at optimum position (range) for ordinary use. Accordingly, if the vehicle is used often under hard conditions such as on very rough roads or in mountainous areas, fluid may bleed out from cap air vent hole. This is not a problem. If a customer complains strongly and is not likely to be satisfied with the leakage, lower the fluid level to the extent that fluid will not bleed out under the conditions described, and have the customer check the fluid level and its quality more frequency than usual.

7. Oil Pump

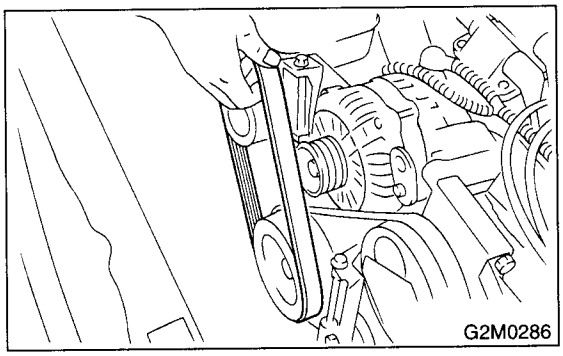
A: REMOVAL

1. NON-TURBO MODEL

1) Remove the ground terminal from battery.
2) Remove the pulley belt cover.
3) Loosen the oil pump pulley nut, then remove the bolts which secure alternator.



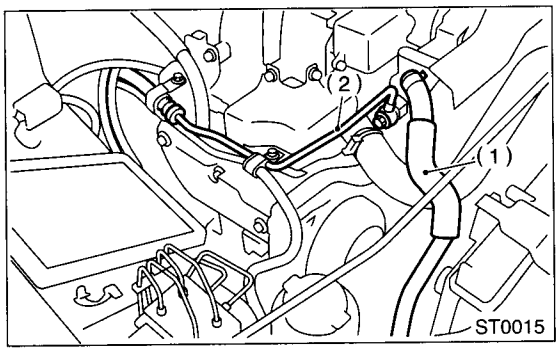
4) Loosen the lock bolt and slider bolt and remove the power steering pump drive V-belt.



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

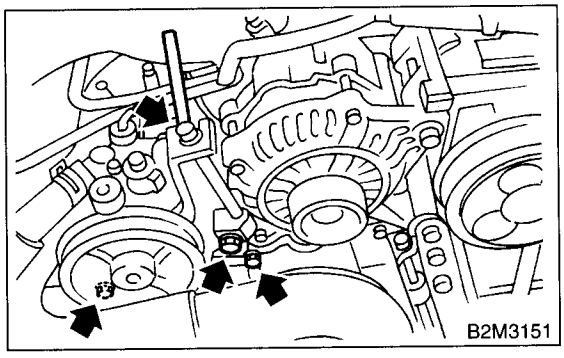
6) Disconnect the pipe C and suction hose from the oil pump.

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.



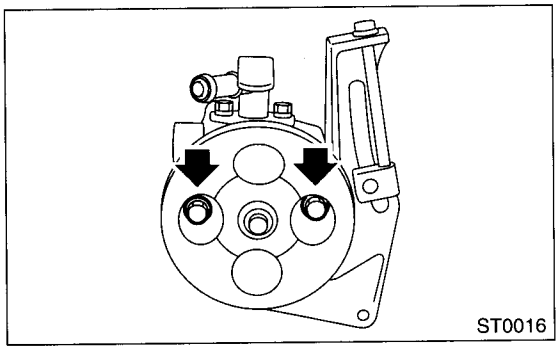
(1) Suction hose
(2) Pipe C

7) Remove the bolts, which install power steering pump bracket.



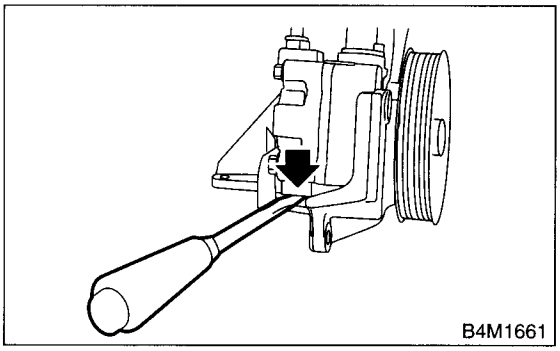
8) Place the oil pump bracket in a vise, remove the two bolts from the front side of oil pump.

CAUTION:
Do not place oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.



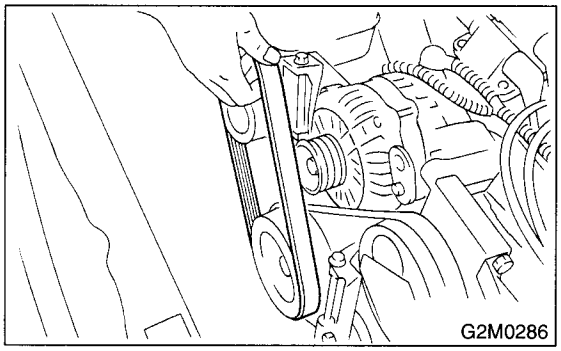
9) Remove the bolt from the rear side of oil pump.

10) Disassemble the oil pump and bracket by inserting a screwdriver as shown in the figure.



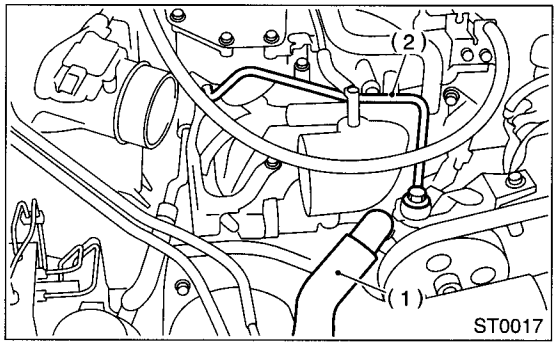
2. TURBO MODEL

1) Remove the ground terminal from battery.
2) Remove the pulley belt cover.
3) Loosen the lock bolt and slider bolt and remove the power steering pump drive V-belt.



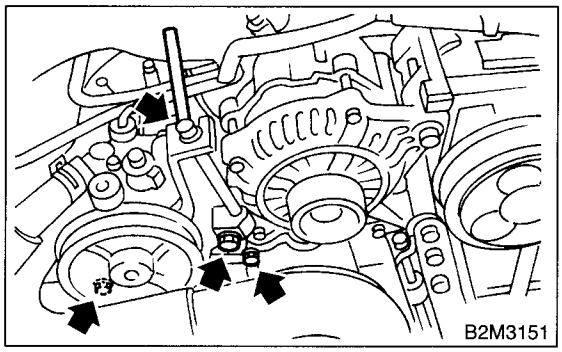
4) Disconnect the connector from the power steering pressure switch.
5) Disconnect the pipe C and suction hose from the oil pump.

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.



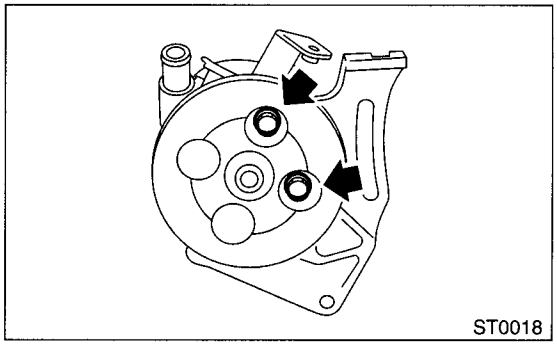
(1) Suction hose
(2) Pipe C

6) Remove the bolts which install power steering pump bracket.

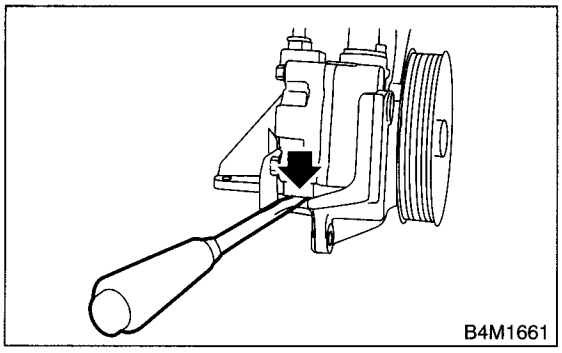


7) Place the oil pump bracket in a vise, remove the two bolts from the front side of oil pump.

CAUTION:
Do not place 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 screwdriver as shown in the figure.

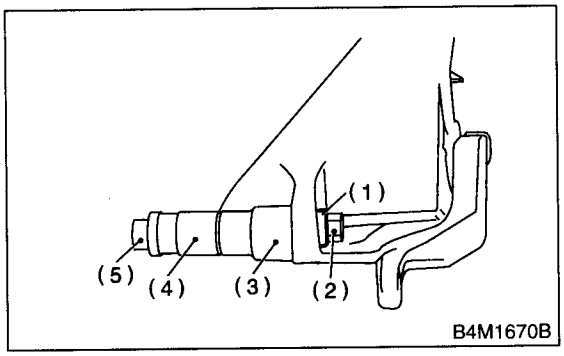


B: INSTALLATION

1. NON-TURBO MODEL

1) Install the oil pump to the 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 oil pump mounting surface.

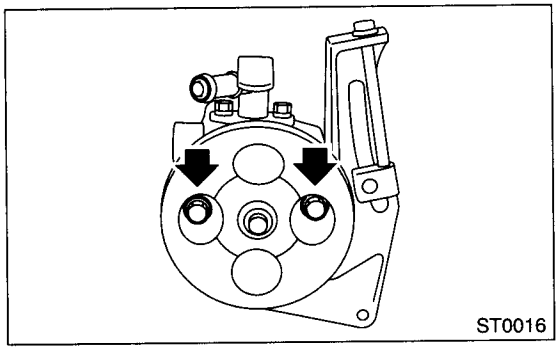
CAUTION:
Do not place oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.



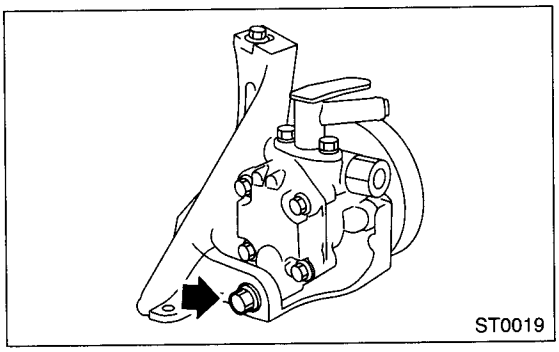
(1) Bush
(2) Nut
(3) 21 mm
(4) 14 mm
(5) Bolt

(2) Tighten the bolt which installs oil pump to the bracket.

Tightening torque:
15.7 N·m (1.6 kgf-m, 11.6 ft-lb)

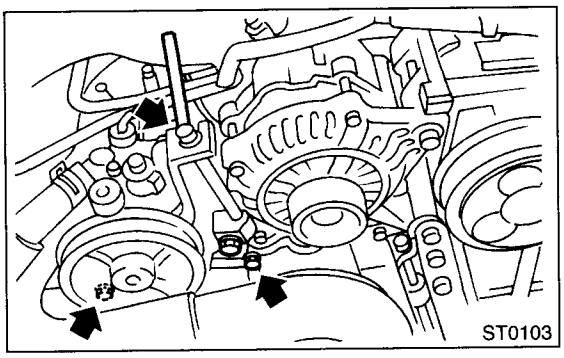


Tightening torque:
37.3 N·m (3.8 kgf-m, 27.5 ft-lb)



2) Tighten the bolt which installs power steering pump bracket.

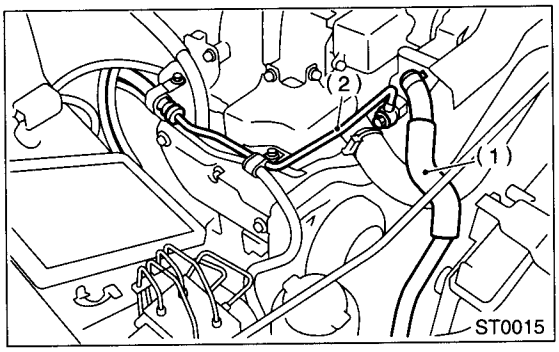
Tightening torque:
22 N·m (2.2 kgf-m, 15.9 ft-lb)



3) Interconnect the pipe C and suction hose.

Tightening torque:
Joint nut
39.2 N·m (4 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 the power steering pump switch.
5) Install the pulley belt to the 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(SOHC)-44, INSPECTION, V-belt.>
8) Tighten the bolt belt tension.

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

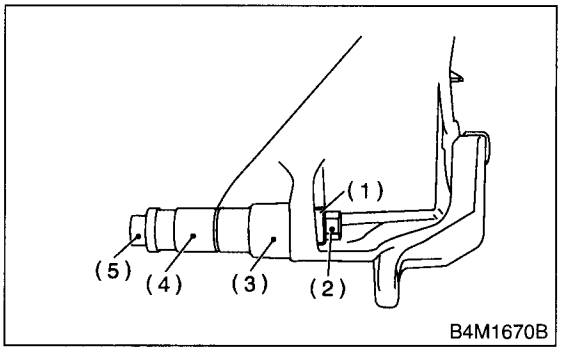
9) Install the pulley belt cover.
10) Connect the ground terminal of battery.
11) Feed the specified power steering fluid. <Ref. to PS-72, Power Steering Fluid.>

CAUTION:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

2. TURBO MODEL

1) Install the oil pump to the 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 oil pump mounting surface.

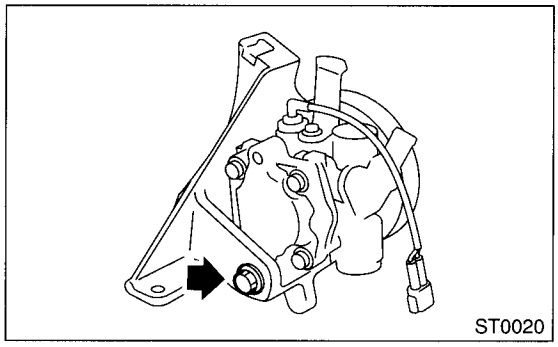
CAUTION:
Do not place oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.



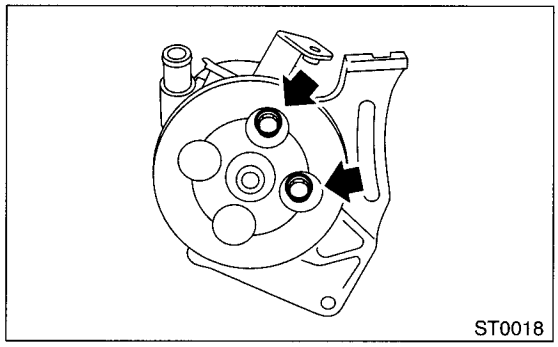
(1) Bush
(2) Nut
(3) 21 mm
(4) 14 mm
(5) Bolt

(2) Tighten the bolt which installs oil pump to the bracket.

Tightening torque:
37.3 N·m (3.8 kgf-m, 27.5 ft-lb)

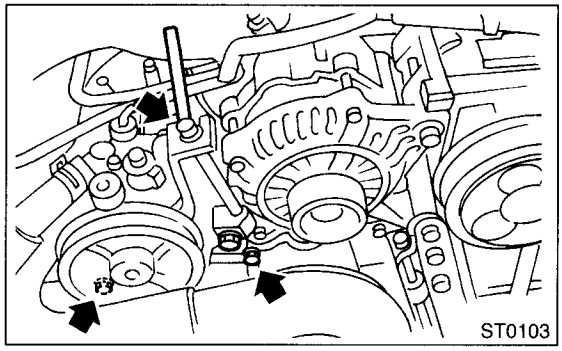


Tightening torque:
15.7 N·m (1.6 kgf-m, 11.6 ft-lb)



2) Tighten the bolt which install power steering pump bracket.

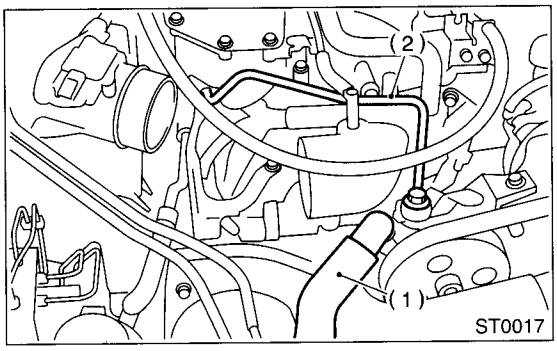
Tightening torque:
22 N·m (2.2 kgf-m, 15.9 ft-lb)



3) Interconnect the pipes C and suction hose.

Tightening torque:
Joint nut
39.2 N·m (4 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 the power steering oil pressure switch.
5) Install the pulley belt to the oil pump.
6) Check the pulley belt tension. <Ref. to ME(DOHC TURBO)-45, INSPECTION, V-belt.>
7) Tighten the bolt belt tension.

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

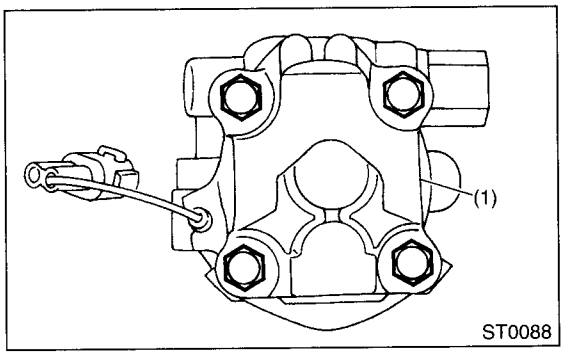
8) Install the pulley belt cover.
9) Connect the ground terminal of battery.
10) Feed the specified power steering fluid <Ref. to PS-72, Power Steering Fluid.>

CAUTION:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

C: DISASSEMBLY

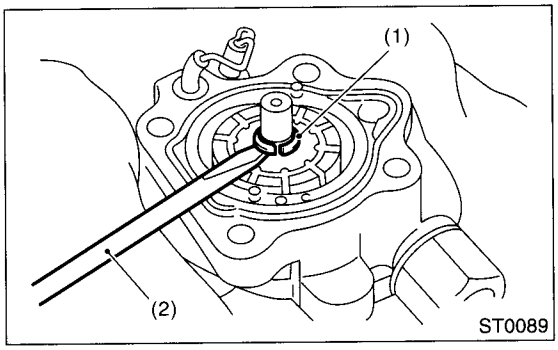
1. NON-TURBO MODEL

1) Remove the nut and detach oil pump pulley.
2) Remove the stay from the oil pump.
3) Remove the four bolts which secure rear cover.



(1) Rear cover

4) Using a screwdriver, pry the retaining ring off.

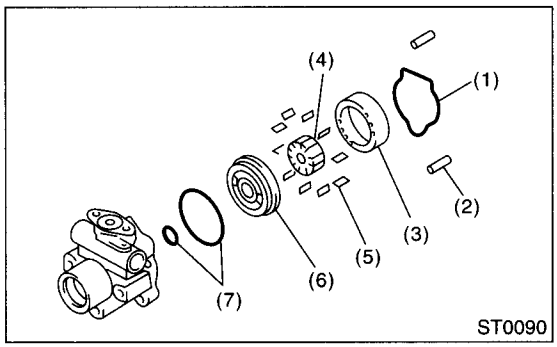


(1) Retaining ring
(2) Screwdriver

5) Extract the shaft from the front casing.

6) Remove the following parts from the front casing.

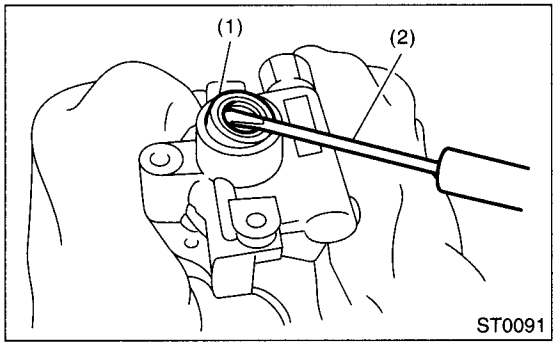
CAUTION:
Discard old seal washer; replace with a new one.



(1) O-ring
(2) Straight pin (2 ea.)
(3) Cam ring
(4) Rotor
(5) Vane (10 ea.)
(6) Pressure plate
(7) O-ring (2 ea.)

7) Pry the oil seal off using a screwdriver.

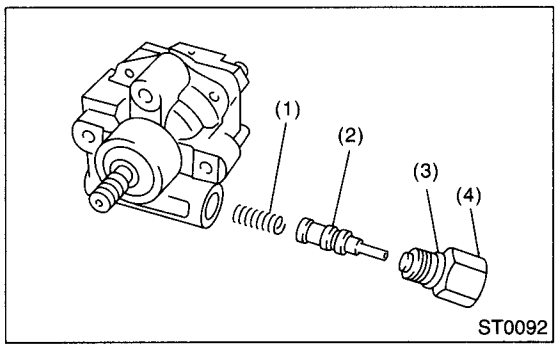
CAUTION:
Be careful not to scratch inner surface of casing.



(1) Oil seal
(2) Screwdriver

8) Remove the pressure switch.

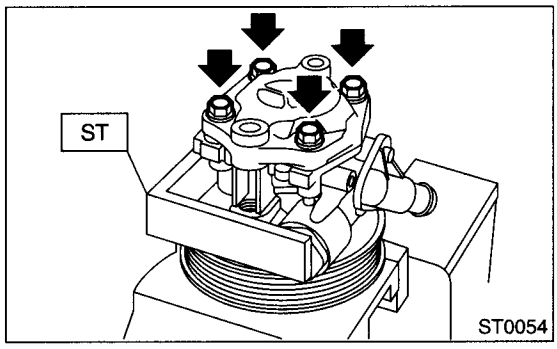
9) Slightly loosen the outlet connector, and remove the connector.



(1) Flow control spring
(2) Spool valve assembly
(3) O-ring
(4) Connector

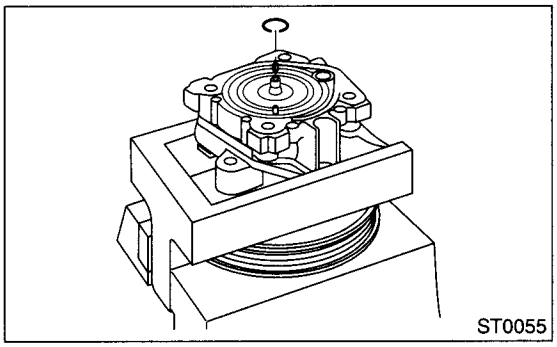
2. TURBO MODEL

1) Using ST, place the oil pump in a vise and remove the four bolts which secure rear cover.
ST 34199AE020 MOUNT



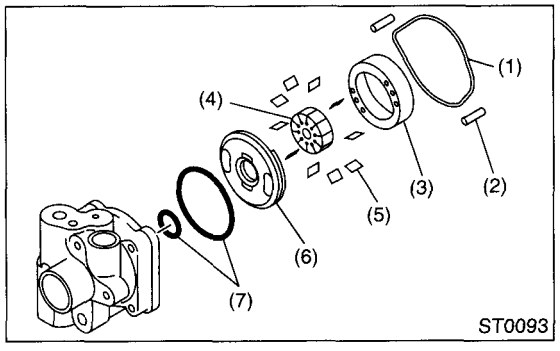
2) Using a screwdriver, pry the retaining ring off.

CAUTION:
Do not remove cam ring, rotor, etc.



3) Extract the oil pump pulley from the front casing.

4) Remove the following parts from the front casing.



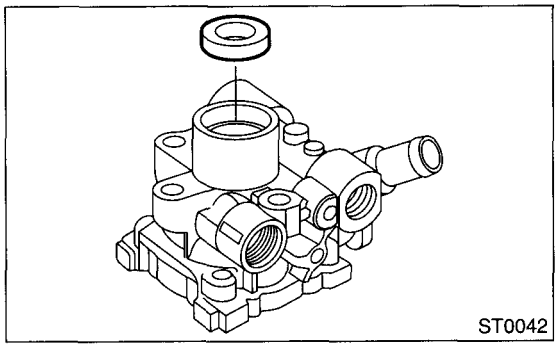
(1) O-ring
(2) Straight pin (2 ea.)
(3) Cam ring
(4) Rotor
(5) Vane (10 ea.)
(6) Pressure plate
(7) O-ring (2 ea.)

5) Place the oil pump in a vise.

CAUTION:
Do not place oil pump directly in the vise, use soft pads and hold oil pump lightly to protect the pump.

6) Pry the oil seal off using a screwdriver.

CAUTION:
Be careful not to scratch inner surface of casing.



D: ASSEMBLY

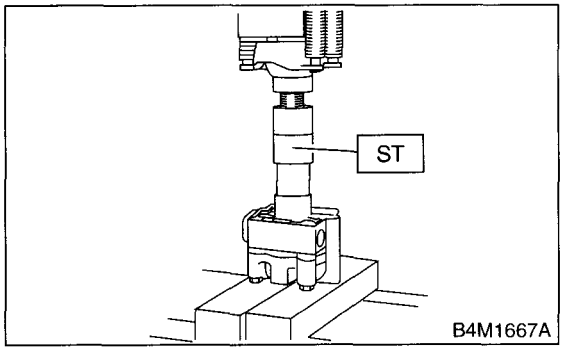
1. NON-TURBO MODEL

1) Reassembly precautions
(1) Whenever the O-rings, oil seals, and snap rings are removed, they must be replaced with new ones.
(2) Thoroughly wash the parts and allow to dry. They must be kept free from cleaning oil and dust.
(3) Reassembly procedure must be performed in clean place. Ensure that the parts are kept away from the waste threads or other dust particles.
(4) Cleaning oil tends to stay inside the front casing. Remove it completely by blowing compressed air.
(5) Ensure that the parts are free from rust. (Use specified hydraulic oil for rust prevention after cleaning and drying.)
(6) Reverse the sequence of disassembly procedures.

2) Apply the grease to the oil seal and inner surface of front casing (at bearing location).

CAUTION:
Make sure that the front body internal surfaces are free from damage.

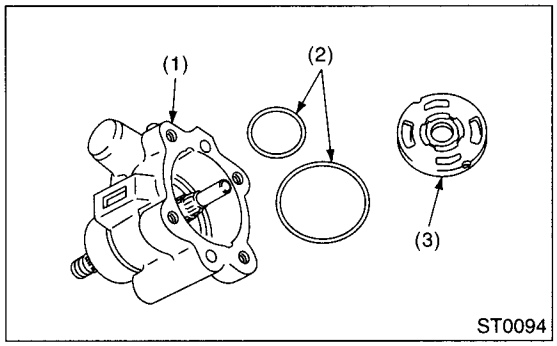
3) Attach ST to the front body. Using a press, install the oil seal.
ST 34199AE030



4) Press-fit the shaft assembly into the front body.
5) Apply the specified hydraulic oil to the O-rings and fit them into the front casing.

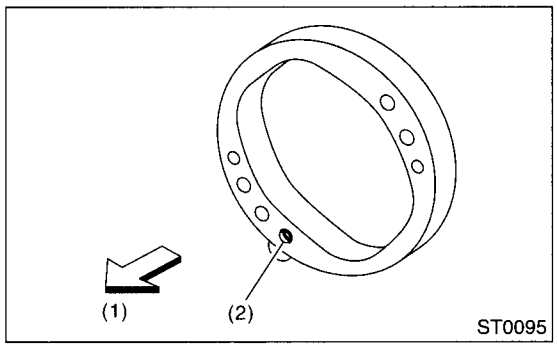
6) Install the side plate to the front casing.

CAUTION:
Use care not to let side plate gall.



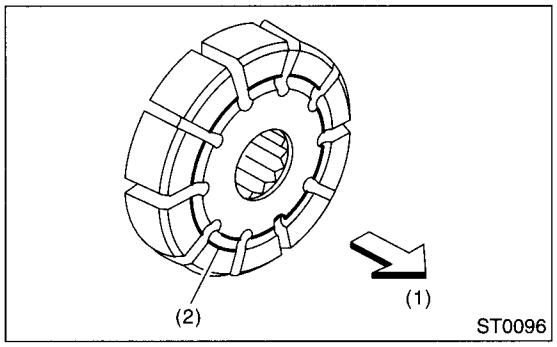
(1) Front casing
(2) O-ring
(3) Side plate

7) Install the cam ring to the front casing with alignment mark facing forward.



(1) Front
(2) Alignment mark

8) Install the rotor to the front casing with groove facing rearward.



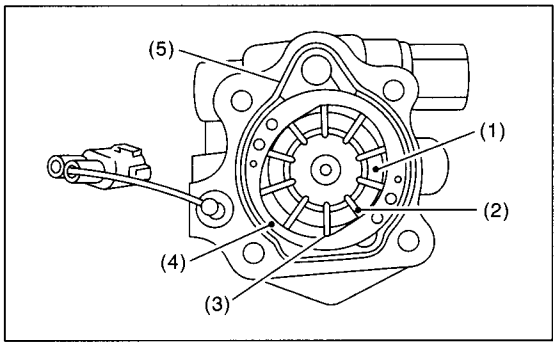
(1) Rear
(2) Groove

9) Install the 10 vanes into the rotor with their nose radius facing toward cam ring.

10) Install the cam ring to the front casing, securing with knock pins.

CAUTION:
Do not use hammer to fit knock pins in position.

11) Mount the O-ring on the front casing.



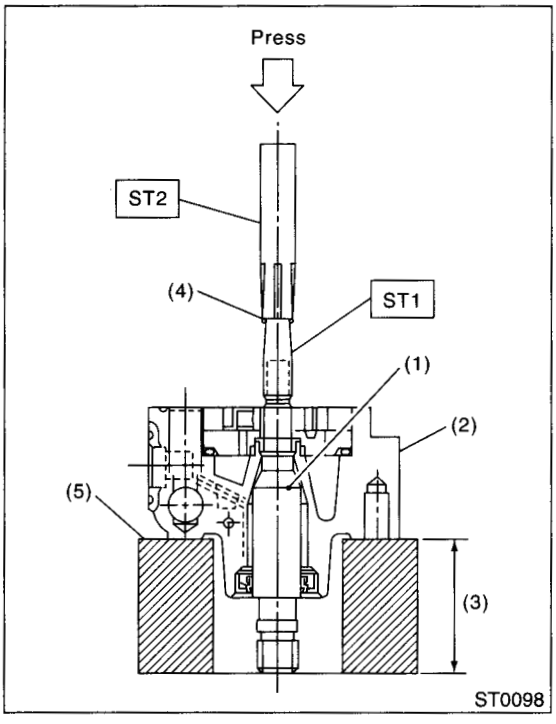
(1) Rotor
(2) Vane
(3) Radius facing
(4) Cam ring
(5) O-ring

12) Using STs, press the retaining ring into the shaft groove.

CAUTION:
Discard retaining ring and replace with a new one.

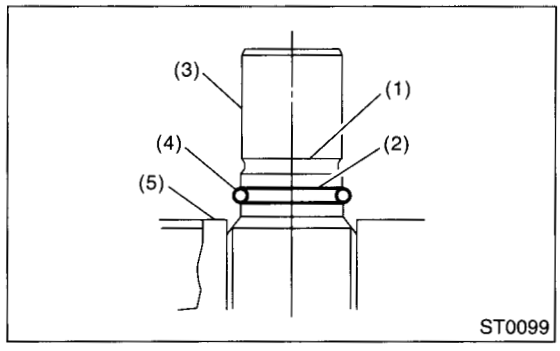
NOTE:
Use ST2, bending its top edge slightly toward the inside.

ST1 34099AC030 INSTALLER RETAINING RING CAP
ST2 34099AC040 INSTALLER RETAINING RING PIPE



(1) Shaft
(2) Front casing
(3) 48 mm (1.89 in)
(4) Retaining ring
(5) Block

CAUTION:
Make sure the retaining ring is fit in the second groove of the shaft.

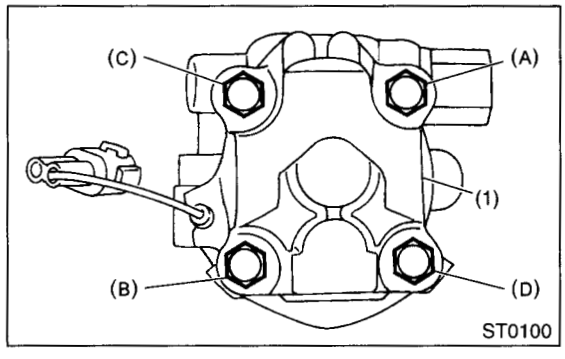


(1) First groove
(2) Second groove
(3) Shaft
(4) Retaining ring
(5) Rotor

13) Mount on pressure switch on front casing.
14) With knock pin positions aligned, install the rear cover.

CAUTION:
Loosely the tighten bolts in the sequence (A), (B), (C), and (D) shown in figure. Then, tighten in the same sequence.

Tightening torque:
21 N·m (2.14 kgf-m, 15.5 ft-lb)



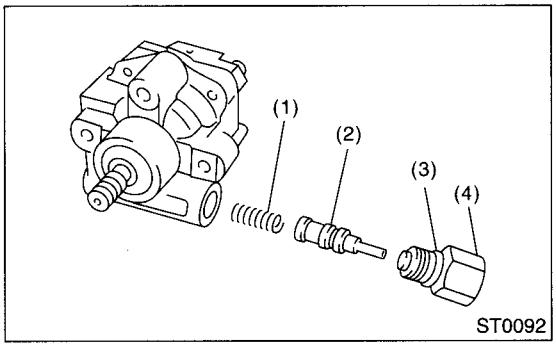
(1) Rear cover

15) Install the spring into the front casing. Then, with spool valve dipped in specified hydraulic oil, install it into the front casing.
16) Using a 5-mm dia. round bar, ensure that the valve moves smoothly.

17) Set the O-ring, with grease applied to it, onto the connector and secure connector to the front casing.

CAUTION:
• Use care to prevent damage to O-ring at installation.
• When tightening the connector, ensure that the O-ring does not protrude or get caught.

Tightening torque:
49 N·m (5.0 kgf-m, 36.2 ft-lb)



(1) Flow control spring
(2) Spool valve assembly
(3) O-ring
(4) Connector

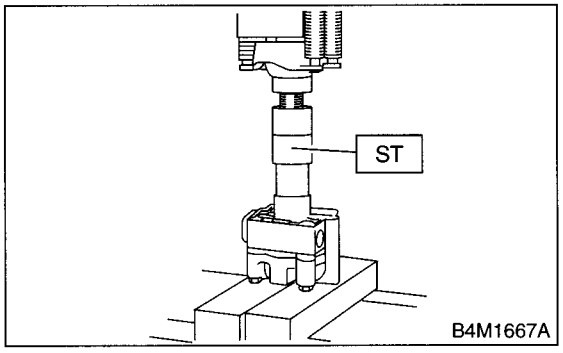
18) Fix the oil pump pulley temporarily.
19) When the reassembly procedures have been completed, turn the shaft by hand to ensure it turns smoothly. If it binds or other unusual conditions are evident, disassemble again and check for foreign matter trapped on sliding surfaces and improper installation. Eliminate the cause of trouble.
20) Check followings by referring to "CHECK" article.
• Excessive play in pulley shaft
• Ditch deflection of pulley
• Resistance to rotation of pulley
• Measurement of generated oil pressure

2. TURBO MODEL

1) Reassembly precautions
(1) Whenever the O-rings, oil seals, and snap rings are removed, they must be replaced with new ones.
(2) Thoroughly wash the parts and allow to dry. They must be kept free from cleaning oil and dust.
(3) Reassembly procedure must be performed in clean place. Ensure that the parts are kept away from the waste threads or other dust particles.
(4) Cleaning oil tends to stay inside the front casing. Remove it completely by blowing compressed air.
(5) Ensure that the parts are free from rust. (Use specified hydraulic oil for rust prevention after cleaning and drying.)
(6) Reverse the sequence of disassembly procedures.
2) Apply grease to the oil seal and inner surface of front casing (at bearing location).

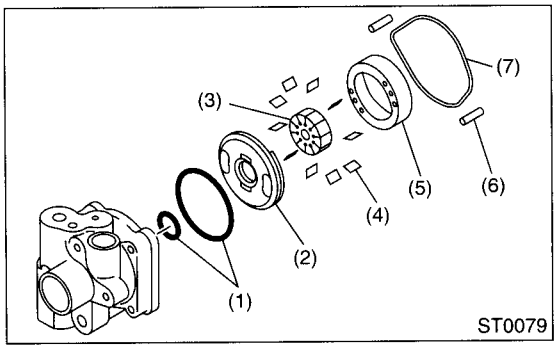
CAUTION:
Make sure that the front body internal surfaces are free from damage.

3) Attach ST to front body. Using a press, install the oil seal.
ST 34199AE030 INSTALLER



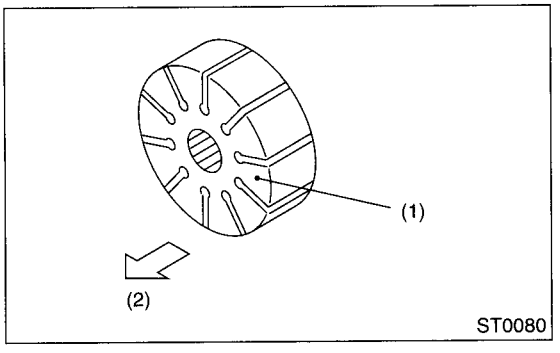
4) Install the pump pulley to front body.
5) Using ST, place the oil pump in a vise.
ST 34199AE020 MOUNT
6) Remove the rear cover.

7) Install the following parts to casing.



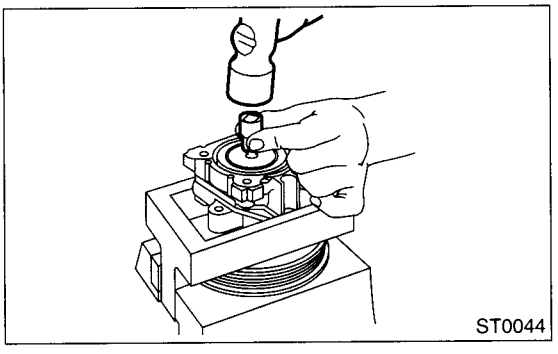
(1) O-ring
(2) Pressure plate
(3) Rotor
(4) Vane
(5) Cam ring
(6) Straight pin
(7) O-ring

NOTE:
Install the rotor with the mark facing the rear case side.



(1) Mark
(2) Rear

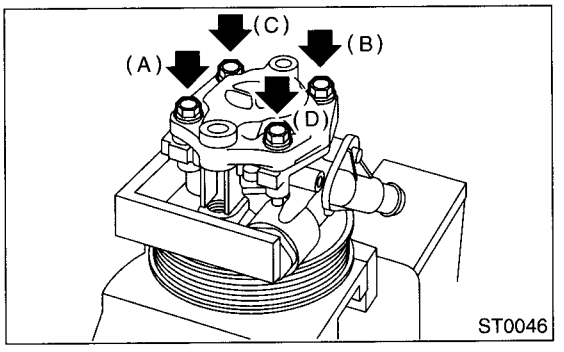
8) Using 8-mm box wrench, tap the retaining ring into the shaft groove.



9) Install the O-ring to the rear cover.
10) Install the rear cover.

Tightening torque:
27.5 N·m (2.8 kgf-m, 20.3 ft-lb)

CAUTION:
Loosely tighten the bolts in the sequence (A), (B), (C), and (D) shown in figure. Then, tighten in the same sequence.



11) When the reassembly procedures have been completed, turn the shaft by hand to ensure it turns smoothly. If it binds or other unusual conditions are evident, disassemble again and check for foreign matter trapped on sliding surfaces and improper installation. Eliminate the cause of trouble.
12) Check followings by referring to "CHECK" article.

- Excessive play in pulley shaft
- Ditch deflection of pulley
- Resistance to rotation of pulley
- Measurement of generated oil pressure

E: INSPECTION

1. BASIC INSPECTION

Perform the following inspection procedures and repair or replace defective parts.

Part name	Description	Remedy
1. Front casing	1) Damage on body surfaces 2) Excessive wear on hole, into which spool valve is inserted. 3) Wear and damage on cartridge assembly mounting surface 4) Wear and damage on surfaces in contact with shaft and oil seal	Replace with a new one together with spool valve as selective fit is made.
2. Rear cover	1) Damage on body surfaces 2) Wear and damage on sliding surfaces	Replace with a new one.
3. Shaft	1) Shaft bend 2) Wear and damage on surfaces in contact with bushing and oil seal 3) Wear and damage on rotor mounting surfaces 4) Bearing damage	Replace with a new one.
4. Pressure plate	Wear and damage on sliding surfaces	Replace with a new one.
5. Cam ring	Ridge wear on sliding surfaces	If the damage is serious, replace with a new cartridge assembly.
6. Vane	Excessive wear on nose radius and side surfaces	
7. Rotor	1) Wear and damage on sliding surfaces 2) Ridge wear on vane sliding grooves (If light leaks with vane in slit against light source)	
	3) Damage resulting from snap ring removal	Correct with oil stone. If the damage is serious, replace with a new cartridge assembly.
8. Connector	Damage on threads	Replace with a new one.
9. Spring	Damage	Replace with a new one.
10. Bolts and nuts	Damage on threads	Replace with a new one.

• In accordance with the following table, check all removed parts for wear and damage, and make repair or replacement if necessary.

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 the 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

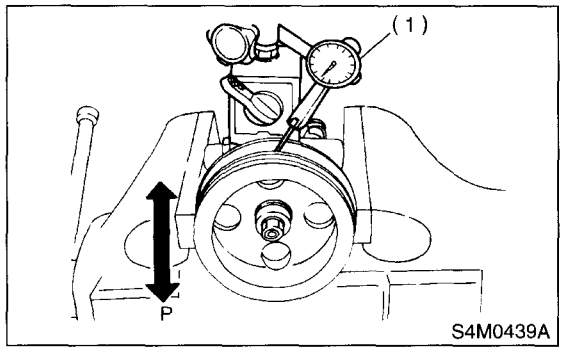
Make a measurement as follows. If it exceeds the specified service limit, replace the parts with new ones.

CAUTION:
• Fix oil pump on a vise to make a measurement. At this time, hold oil pump with the 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 pulley shaft

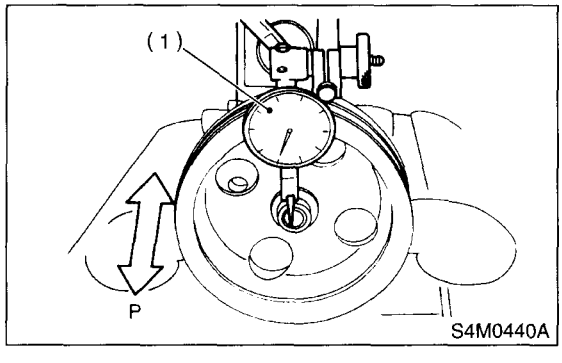
On condition:
P: 9.8 N (1.0 kgf, 2.2 lb)

Service limit:
Radial play (Direction ⟷)
0.4 mm (0.016 in) or less



(1) Dial indicator

Axial play (Direction ⟺)
Non-TURBO model
0.4 mm (0.016 in) or less
TURBO model
0.8 mm (0.031 in) or less

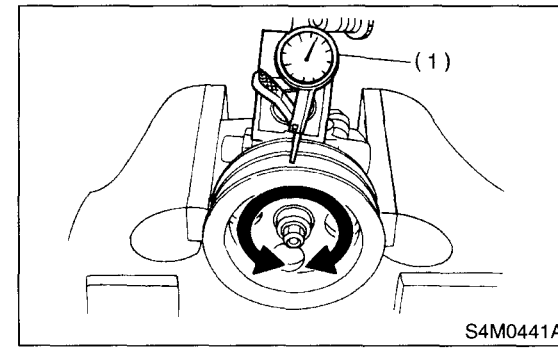


(1) Dial indicator

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.

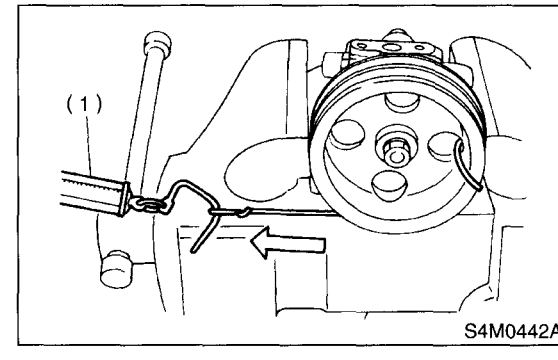


(1) Dial indicator

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

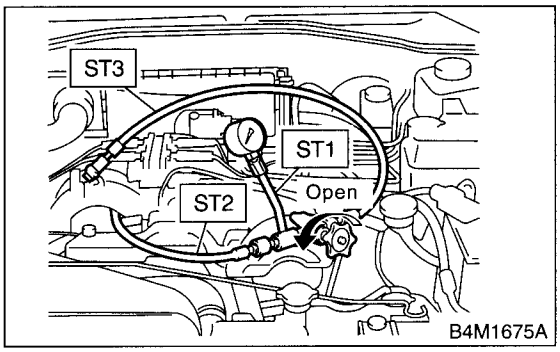
3. HYDRAULIC PRESSURE

CAUTION:
• Be sure to complete all items aforementioned in "INSPECTION", prior to measuring hydraulic pressure. Otherwise, pressure can not be measured correctly. <Ref. to PS-74, 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 cotton cloth waste at a place where fluid drops before pressure gauge is installed. Wipe off spilt fluid thoroughly after the measurement.

NOTE:
Keep engine idling during the measurement.

1) MEASURE REGULAR PRESSURE.
(1) Remove the two bolts securing power steering pipes to the engine.
(2) Install ST1, 2 and 3 between power steering pump and pipes using gasket (Part No. 34621AC021) and bolt (Part No. 34620AC010).
(3) Replenish the power steering fluid up to specified level.
(4) Open the valve, and start the engine.
(5) Measure the regular pressure.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A

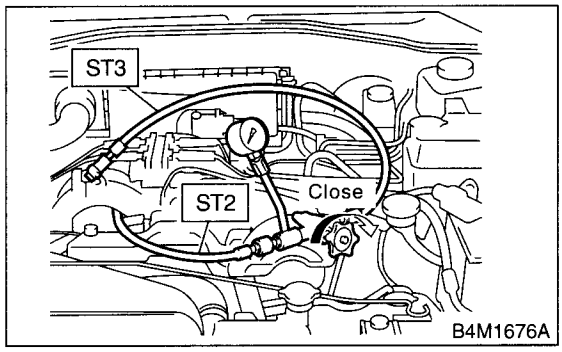


Service limit:
981 kPa (10 kg/cm², 142 psi) or less

(6) 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 relief pressure.
(1) Using 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

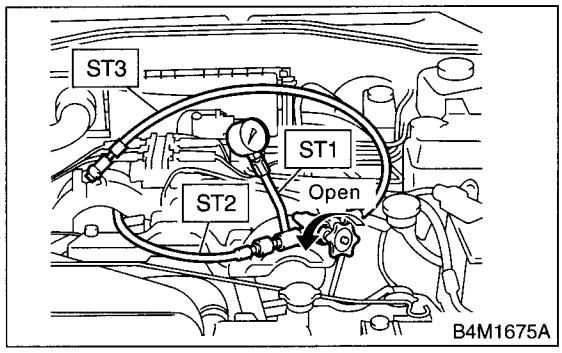


Service limit:
TURBO model
7,350 — 8,036 kPa
(75 — 82 kg/cm², 1,067 — 1,165 psi)
Non-TURBO model
7,164 — 7,840 kPa
(73 — 80 kg/cm², 1,040 — 1,137 psi)

(4) If it is not within the specified value, replace the oil pump.

3) Measure working pressure.
(1) Using 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:
TURBO model
7,350 — 8,036 kPa
(75 — 82 kg/cm², 1,067 — 1,165 psi)
Non-TURBO model
7,164 — 7,840 kPa
(73 — 80 kg/cm², 1,040 — 1,137 psi)

(4) If it is within the specified value, measure the steering effort. <Ref. to PS-78, 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.

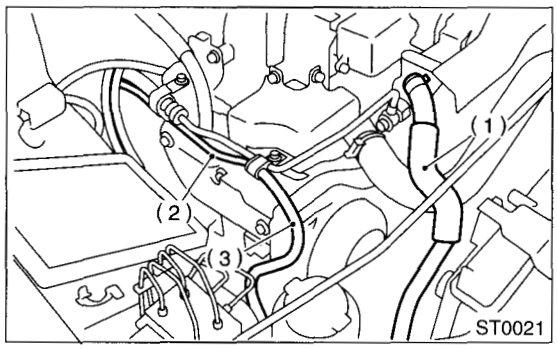
8. Reservoir Tank

A: REMOVAL

1. NON-TURBO MODEL

1) Remove the air intake duct. <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
2) Drain the fluid from the reservoir tank.
3) Disconnect the pipe D from the return hose and suction hose from the 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.



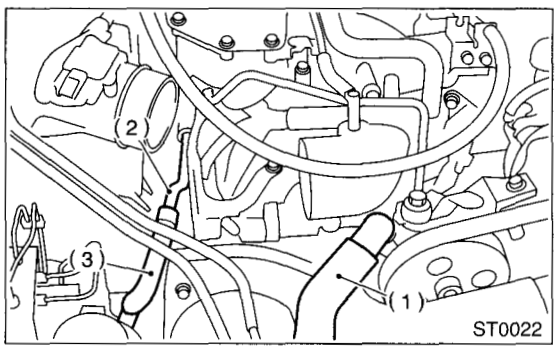
(1) Suction hose
(2) Pipe D
(3) Return hose

4) Remove the reservoir tank from the bracket by pulling it upwards.

2. TURBO MODEL

1) Remove the air intake duct. <Ref. to IN(DOHC TURBO)-9, REMOVAL, Intake Duct.>
2) Drain the fluid from the reservoir tank.
3) Disconnect the return hose and suction hose from the reservoir tank.

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.



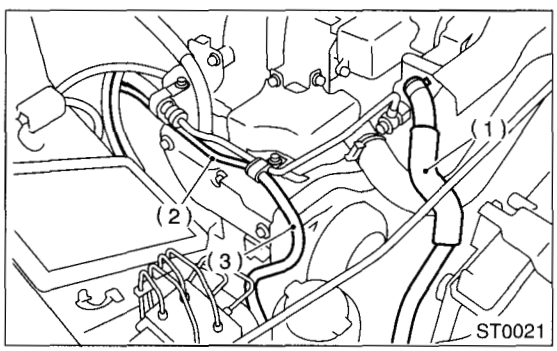
(1) Suction hose
(2) Pipe D
(3) Return hose

4) Remove the reservoir tank from the bracket by pulling it upwards.

B: INSTALLATION

1. NON-TURBO MODEL

1) Install the reservoir tank to the bracket.
2) Connect the pipes D to the return hose and suction hose to the oil pump.

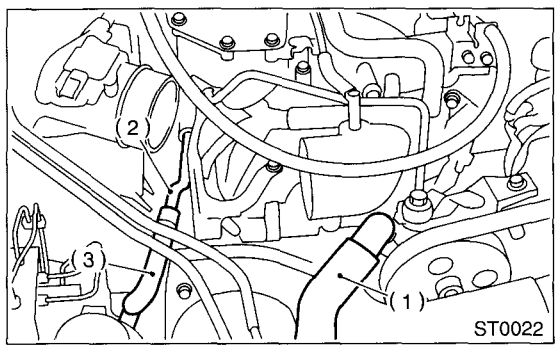


(1) Suction hose
(2) Pipe D
(3) Return hose

3) Feed the specified power steering fluid. <Ref. to PS-72, Power Steering Fluid.>

2. TURBO MODEL

1) Install the reservoir tank to the bracket.
2) Connect the pressure hose and suction hose to the oil pump.



(1) Suction hose
(2) Pipe D
(3) Return hose

3) Feed the specified power steering fluid. <Ref. to PS-72, 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.

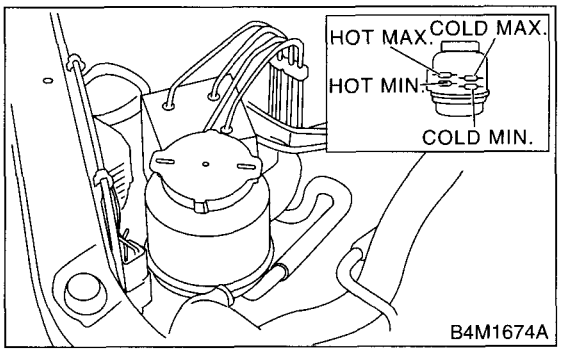
9. Power Steering Fluid

A: SPECIFICATION

Recommended power steering fluid	Manufacturer
DEXRON III	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

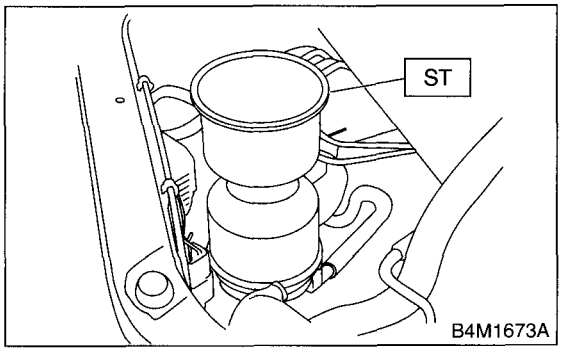
B: INSPECTION

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 lower point or below, add fluid to keep the level in the specified range of the indicator. If at upper point or above, drain the fluid by using a syringe or the like.
(1) Check at temperature 20°C (68°F) on reservoir surface of oil pump; read the fluid level on the "COLD" side.
(2) Check at temperature 80°C (176°F) on reservoir surface of oil pump; read the fluid level on the "HOT" side.



C: INSTALLATION

1) Set ST on the top of reservoir tank and fill it about half way with the specified fluid.
ST 34199AE040 OIL CHARGE



2) Continue to turn the steering wheel slowly from lock to lock until the bubbles stop appearing in the tank while keeping the fluid at that level.
3) In case air is absorbed to deliver bubbles into piping because the fluid level is lower, leave it about half an hour and then do the step 2) all over again.
4) Start, and idle the engine.
5) Continue to turn the steering wheel slowly from lock to lock again until the bubbles stop appearing in the tank while keeping the fluid at that level.
It is normal that bubbles stop appearing after three times turning of steering wheel.
6) In case bubbles do not stop appearing in the tank, leave it about half an hour and then do the step 5) all over again.
7) Stop the engine, and take out safety stands after jacking up vehicle again.
Then lower the vehicle, and idle the engine.
8) Continue to turn the steering wheel from lock to lock until the bubbles stop appearing and change of the fluid level is within 3 mm (0.12 in).
9) In case the following happens, leave it about half an hour and then do step 8) 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.

10) Check the fluid leakage at flare nuts after turning steering wheel from lock to lock with engine running.

CAUTION:
• Before checking, wipe off any fluid on flare nuts and piping.
• In case the fluid leaks from flare nut, it is caused by dust (or the like) and/or damage between flare and tapered seat in piping.
• So remove the flare nut, tighten again it to the specified torque after cleaning flare and tapered seat. If flare or tapered seat is damaged, replace it with a new one.

10.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 rim • Improper tires out of specification • Improper rims 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 customer.
	4. Idling speed • Lower idling speed • Excessive drop of idling speed at start or at turning steering wheel *3	Adjust or instruct customer.
	5. Measure hydraulic pressure.<Ref. to PS-66, INSPECTION, Oil Pump.>	Replace problem parts.
	6. Measure steering effort.<Ref. to PS-74, 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 rim • Flat tire • Mix use of different tires • Mix use of different rims • 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 customer.
	5. Measure steering effort.<Ref. to PS-74, INSPECTION, General Diagnostic Table.>	Adjust or replace.

*1 If the tires and/or rims 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 the 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 the 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 stopping with service brake and/or parking brake applied, power steering can be operated easily due to its light steering effort. If doing so, the disk rotates slightly and makes creaking noise. The noise is generated by creaking between the disk and pads. If the noise goes off when the brake is released, there is no abnormal function in the system.
• There may be a little vibration around the steering devices when turning steering wheel at standstill, even though the component parts are properly adjusted and 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-52, INSPECTION, Pipe Assembly.>
	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 bad parts of the 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, tie-rod end	Retighten or replace.
Grinding noise (continuous) While engine is running.	Vane pump aeration	Inspect and retighten the fluid line connection. Refill the fluid and vent air.
	Vane pump seizing	Replace oil pump.
	Pulley bearing seizing of oil pump	Replace 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.
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 cap.
Whistle (continuous) While engine is running.	Abnormal pipe of gearbox or abnormal inside of hose	Replace the bad 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 bad parts of gearbox.
	Abnormal bearing for steering shaft	Apply the 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.

Trouble	Possible cause	Corrective action
Vibration While engine is running with/ without steering turned.	Too low engine speed at start	Adjust and instruct customers.
	Vane pump aeration	Fix the wrong part. Vent air.
	Damaged valve in oil pump, gearbox	Replace the oil pump, bad parts of gearbox.
	Looseness of play of steering, suspension parts	Retighten.

2. MEASUREMENT OF STEERING EFFORT

	Step	Check	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 the steering wheel, and measure both right and left steering wheel effort. NOTE: When turning 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.	Is the steering effort 31.4 N (3.2 kgf, 7.1 lb) or less?	Go to step **2.**	Adjustment 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.	Is the steering effort 294.2 N (30 kgf, 66.2 lb) or less?	Go to step **3.**	Adjustment.
3	**CHECK STEERING WHEEL EFFORT.** 1)Remove the universal joint. 2)Measure the steering wheel effort.	Is the maximum force steering wheel effort 2.26 N (0.23 kgf, 0.51 lb) or less?	Go to step **4.**	Check, adjust and replace if necessary.
4	**CHECK STEERING WHEEL EFFORT.** Measure the steering wheel effort.	Is the fluctuation width 1.08 N (0.11 kgf, 0.24 lb) or less?	Go to step **5.**	Check, adjust and replace if necessary.
5	**CHECK UNIVERSAL JOINT.** Measure the folding torque of the joint (yoke of steering column side). <Ref. to PS-22, INSPECTION, Universal Joint.>	Is the folding torque 7.3 N (0.74 kgf, 1.64 lb) or less?	Go to step **6.**	Replace with new one.
6	**CHECK UNIVERSAL JOINT.** Measure the folding torque of the joint (yoke of gearbox side). <Ref. to PS-22, INSPECTION, Universal Joint.>	Is the folding torque 7.3 N (0.74 kgf, 1.64 lb) or less?	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?	Inspect, readjust and replace if necessary.	Go to step **8.**
8	**CHECK TIE-ROD ENDS.** Remove the tie-rod ends.	Are the tie-rod ends of suspension for unsteady revolution or ratting?	Inspect and replace if necessary.	Go to step **9.**
9	**CHECK BALL JOINT.**	Are the ball joints of suspension for unsteady revolution or ratting?	Inspect and replace if necessary.	Go to step **10.**
10	**CHECK GEARBOX.** Measure the rotating of gearbox. <Ref. to PS-44, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox.>	Is rotating resistance 12.7 N (1.3 kgf, 2.9 lb) or less in all positions within 20% difference between clockwise and counterclockwise?	Go to step **11.**	Readjust backlash, and if ineffective, replace bad parts.
11	**CHECK GEARBOX.** Measure sliding of gearbox. <Ref. to PS-43, SERVICE LIMIT, INSPECTION, Steering Gearbox.>	Is sliding resistance 340 N (35 kgf, 76 lb) or less with 20% difference between left and right direction?	Steering effort is normal.	Readjust backlash, and if ineffective, replace bad 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.

FUJI HEAVY INDUSTRIES LTD.

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)	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
EXTERIOR/INTERIOR TRIM	EI
EXTERIOR BODY PANELS	EB
CRUISE CONTROL SYSTEM	CC
CRUISE CONTROL SYSTEM (DIAGNOSTICS)	CC
OPTION PARTS	OP

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HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

AC

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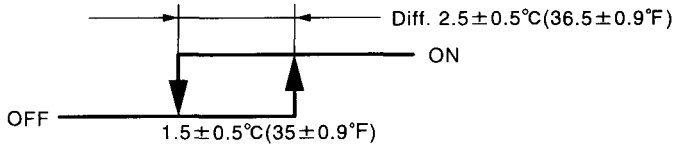
1. General Description

A: SPECIFICATIONS

1. HEATER SYSTEM

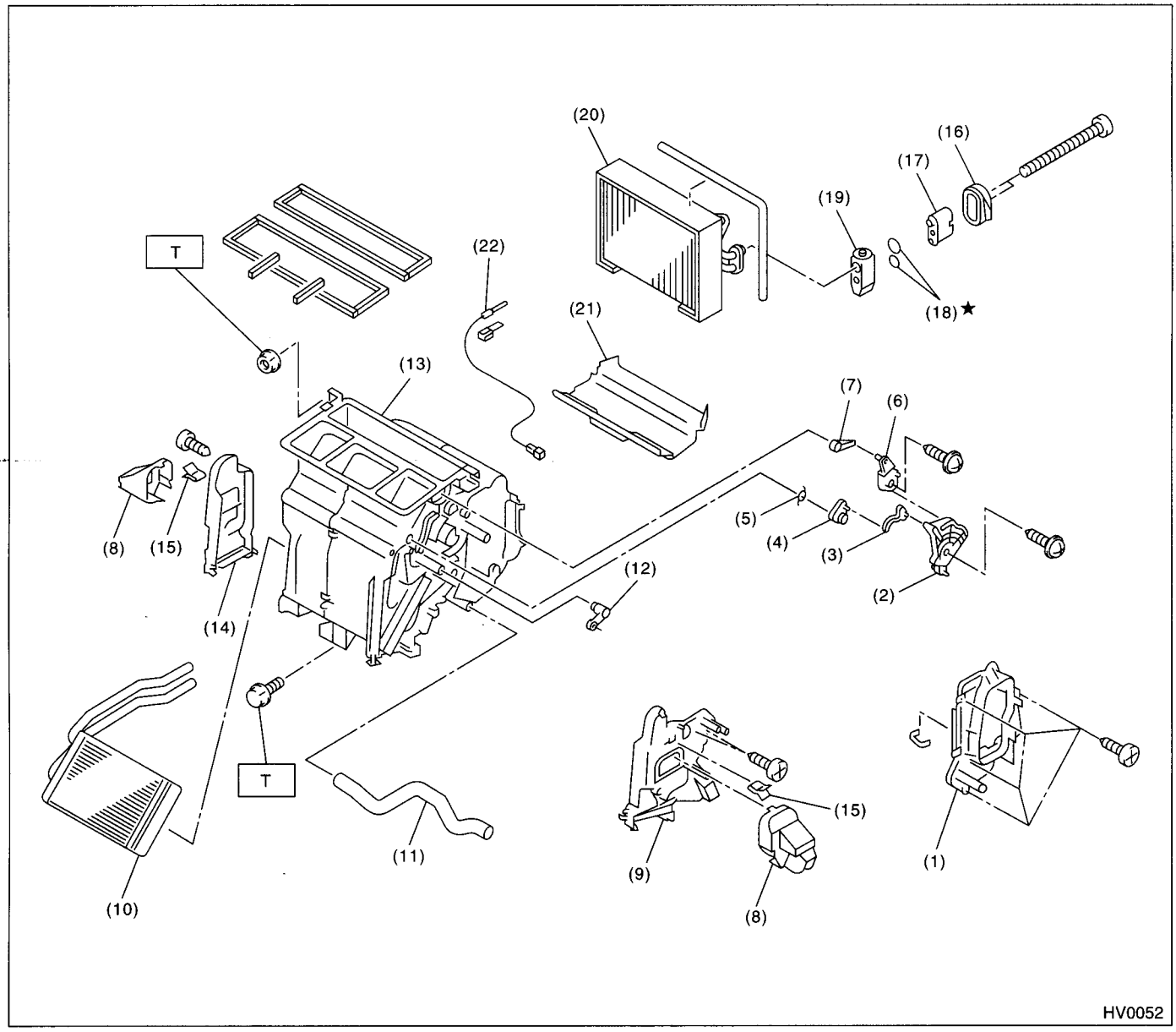
Item		Specifications	Condition
Heating capacity		5.0 kW (4,300 kcal/h, 17,062 BTU/h) or more	• Mode selector switch: HEAT • Temperature control switch: FULL HOT • Temperature difference between hot water and inlet air: 65°C (149°F) • Hot water flow rate: 360 ℓ (95.1 US gal, 79.2 Imp gal)/h
Air flow rate		280 m^3 (9,888 cu ft)/h	Heat mode (FRESH), FULL HOT at 12.5 V
Max air flow rate		450 m^3 (15,892 cu ft)/h	• Temperature control switch: FULL COLD • Blower fan speed: 4th position • Mode selector lever: RECIRC
Heater core size (height × length × width)		163.9 × 200 × 25.0 mm (6.45 × 7.87 × 0.984 in)	—
Blower motor	Type	Magnet motor 200 W or less	at 12 V
	Fan type and size (diameter × width)	Sirocco fan type 150 × 75 mm (5.91 × 2.95 in)	—

2. A/C SYSTEM

Item			Specifications
Type of air conditioner			Reheat air-mix type
Cooling capacity			5.1 kW (4,385 kcal/h, 17,402 BTU/h)
Refrigerant			HFC-134a (CH_2FCF_3) [0.5±0.05 kg (0.99±0.11 lb)]
Compressor		Type	Vane rotary, fix volume (CR-14)
		Discharge	144 cm^3 (8.79 cu in)/rev
		Max. permissible speed	7,000 rpm
Magnet clutch		Type	Dry, single-disc type
		Power consumption	47 W
		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	0.21 m^2 (2.26 sq ft)
		Core thickness	16 mm (0.63 in)
		Radiation area	5.34 m^2 (57.5 sq ft)
Receiver drier		Effective inner capacity	250 cm^3 (15.26 cu in)
Expansion valve		Type	Internal equalizing
Evaporator		Type	Single tank
		Dimensions (W × H × T)	255 × 200 × 48 mm (10 × 7.87 × 1.89 in)
Blower fan		Fan type	Sirocco fan
		Outer diameter × width	150 × 75 mm (5.91 × 2.95 in)
		Power consumption	200 W at 12 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	850±100 rpm
Dual switch (Pressure switch)	Low-pressure switch operating pressure	ON → OFF	278±29 kPa (2.83±0.3 kg/cm^2, 40.3±4.2 psi)
		OFF → ON	$287^{+39}/_{-25}$ kPa ($2.9^{+0.4}/_{-0.25}$ kg/cm^2, $42^{+5.7}/_{-3.6}$ psi)
	High-pressure switch operating pressure	ON → OFF	2,800±100 kPa (29±1 kg/cm^2, 406±15 psi)
		DIFF	600±200 kPa (6.12±2 kg/cm^2, 87±29 psi)
Thermo control amplifier working temperature (Evaporator outlet air)			 HV0045

B: COMPONENT

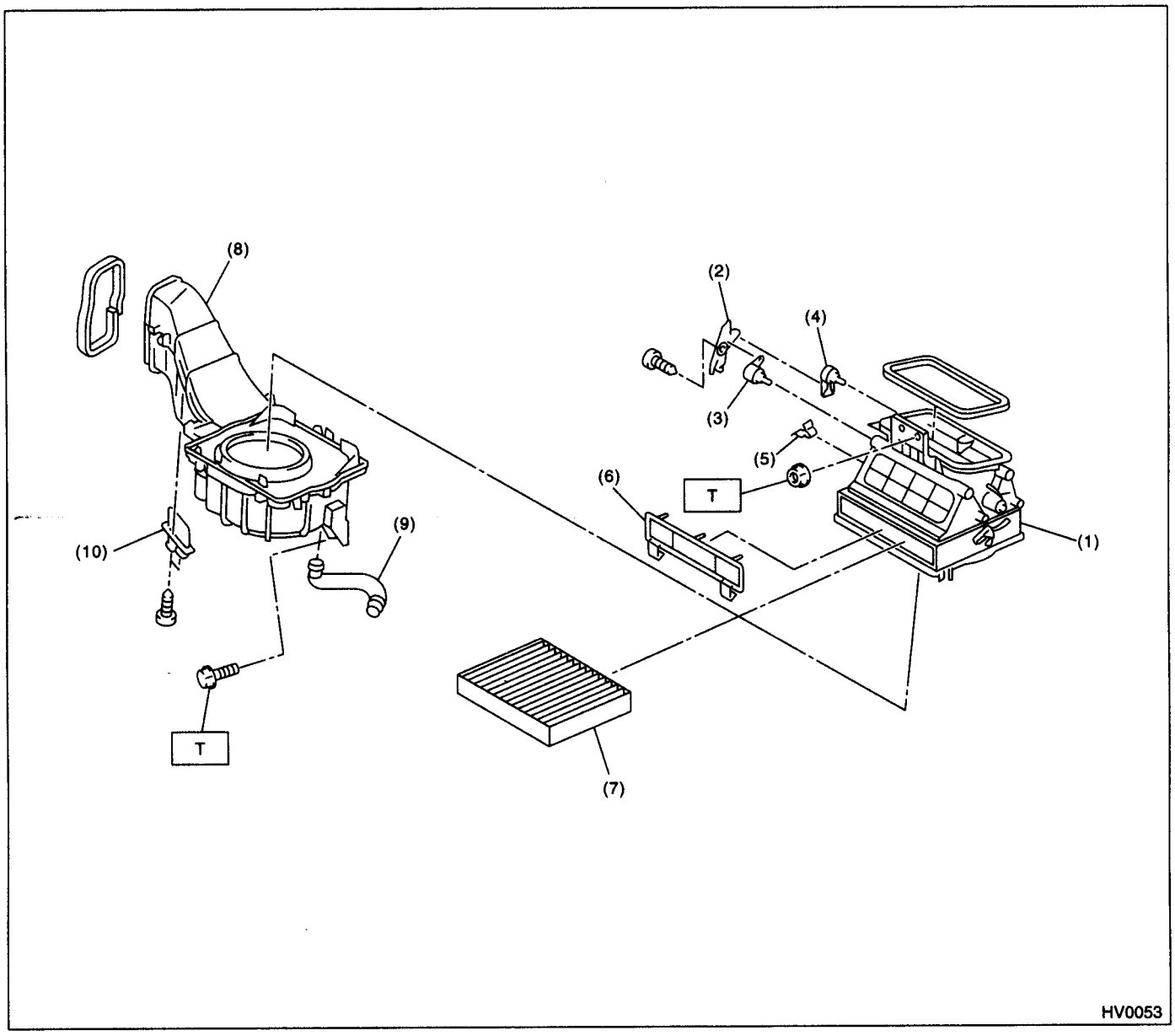
1. HEATER COOLING UNIT



(1) Unit cover
(2) Side link
(3) Mode acutuator lever
(4) Foot lever
(5) Spring
(6) Mode acutuator link
(7) Defroster lever
(8) Foot nozzle
(9) Unit duct cover
(10) Heater core
(11) Drain hose
(12) Mix acutuator lever
(13) Unit assembly
(14) Foot duct
(15) Clip
(16) Packing
(17) Cooling unit block
(18) O-ring
(19) Expansion valve
(20) Evaporator
(21) Evaporator cover
(22) Thermistor

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.35 (0.750, 5.421)

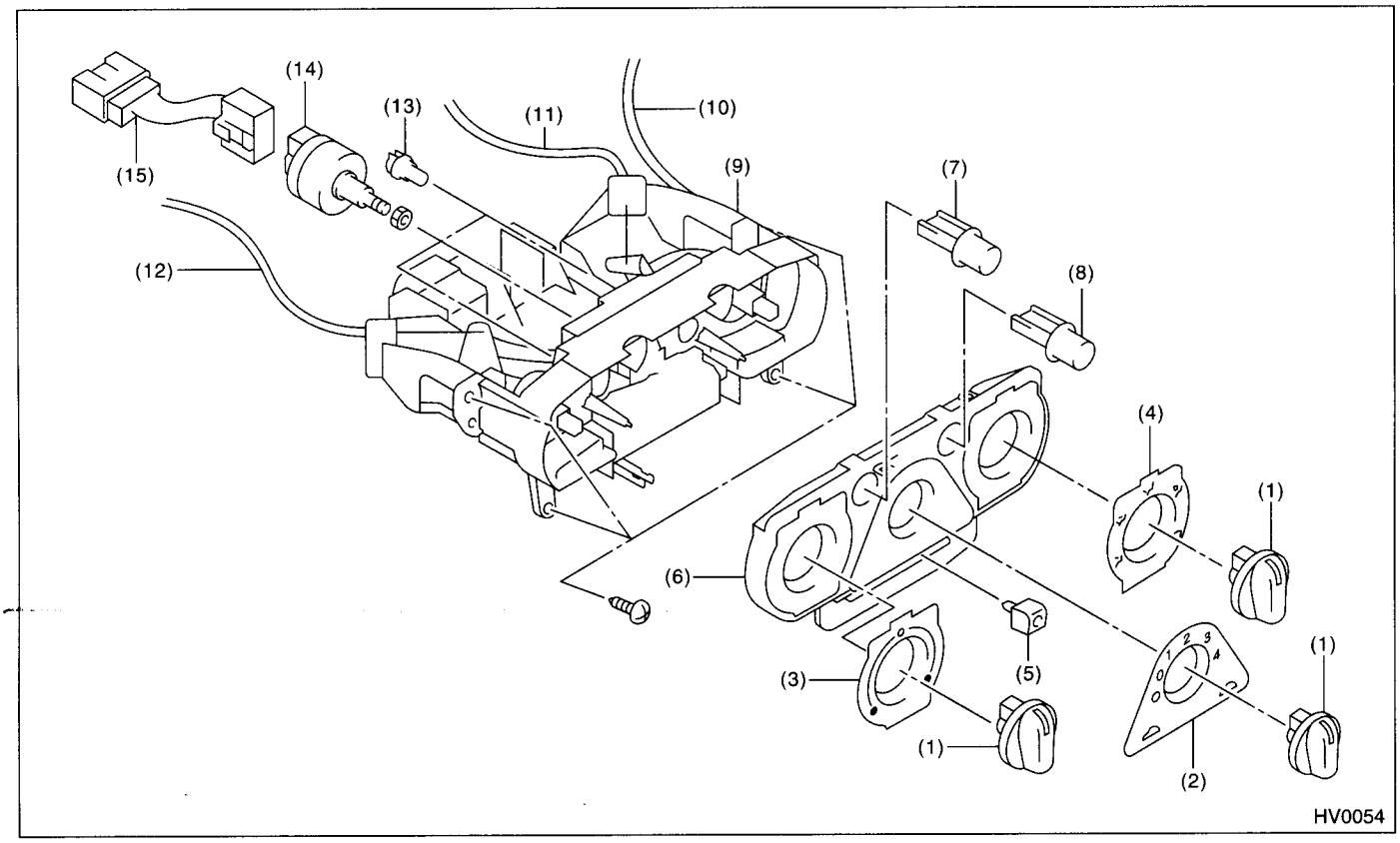
2. BLOWER MOTOR UNIT



(1) Upper case
(2) Blower link
(3) Blower link lever A
(4) Blower link lever B
(5) Clip
(6) Filter cover
(7) Filter
(8) Blower motor assembly
(9) Hose
(10) Blower resistor

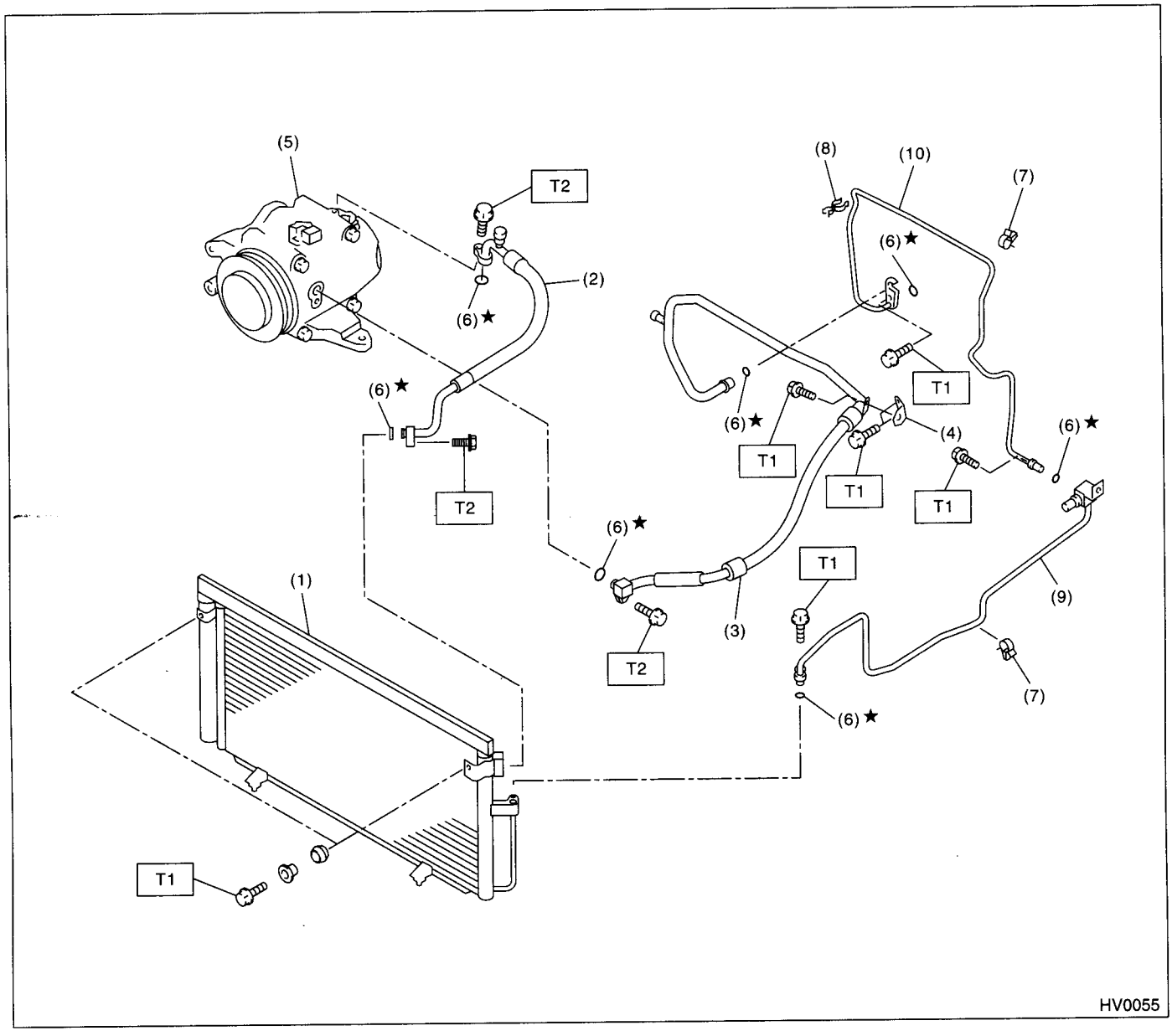
Tightening torque: N·m (kgf-m, ft-lb)
T: 7.35 (0.750, 5.421)

3. CONTROL UNIT



(1) Dial
(2) Fan control plate
(3) Temperature control plate
(4) Mode control plate
(5) Heater control knob
(6) Heater control panel
(7) Air conditioner knob
(8) Plug knob
(9) Heater control base
(10) Intake cable
(11) Mode cable
(12) Temperature cable
(13) Bulb
(14) Fan switch ASSY
(15) Harness

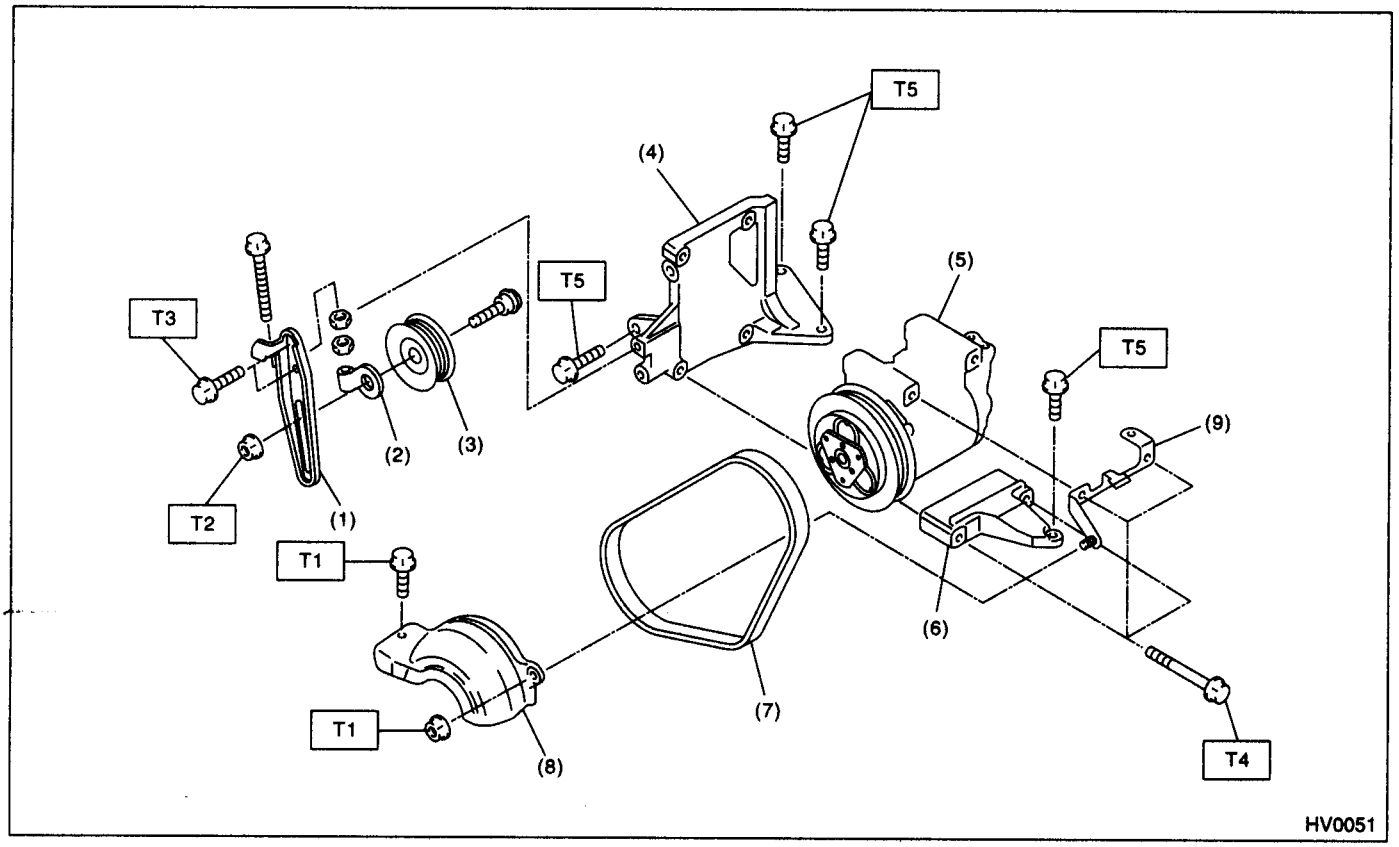
4. AIR CONDITIONING UNIT



(1) Condenser
(2) Hose (High-pressure)
(3) Hose (Low-pressure)
(4) Bracket
(5) Compressor
(6) O-ring
(7) Clamp A
(8) Clamp B
(9) Tube (To condenser)
(10) Tube (To evaporator)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.4 (0.75, 5.4)
T2: 15 (1.5, 10.8)

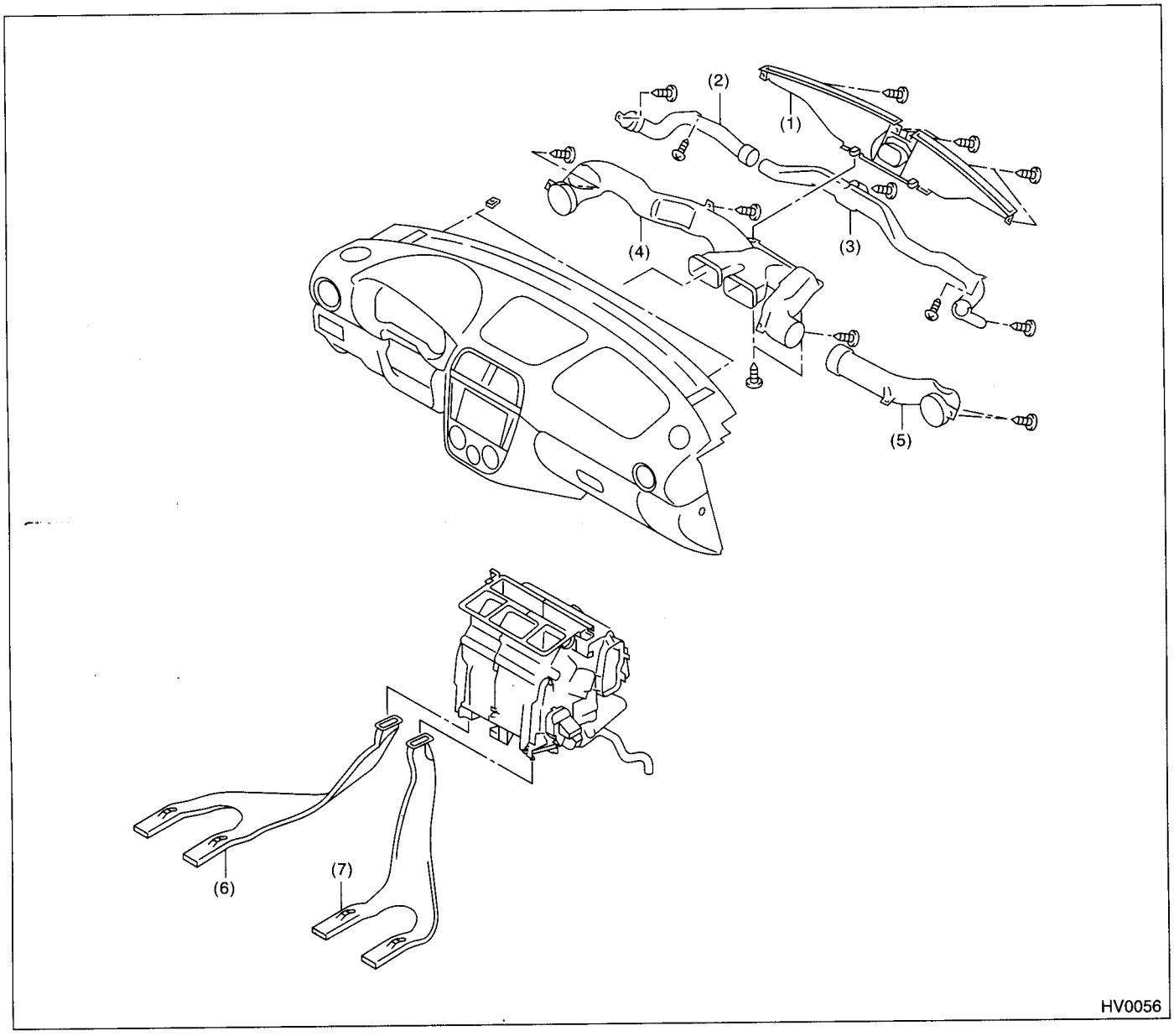
5. COMPRESSOR



(1) Idler pulley bracket
(2) Idler pulley adjuster
(3) Idler pulley
(4) Compressor bracket upper
(5) Compressor
(6) Compressor bracket lower
(7) V-belt
(8) Compressor belt cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.4 (0.75, 5.4)
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

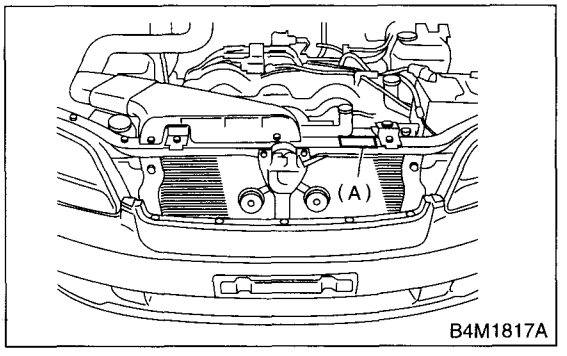


(1) Front defroster nozzle
(2) Side defroster duct (LH)
(3) Side defroster duct (RH)
(4) Side ventilation duct (LH)
(5) Side ventilation duct (RH)
(6) Rear heater duct (LH)
(7) Rear heater duct (RH)

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.



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2. COMPRESSOR OIL

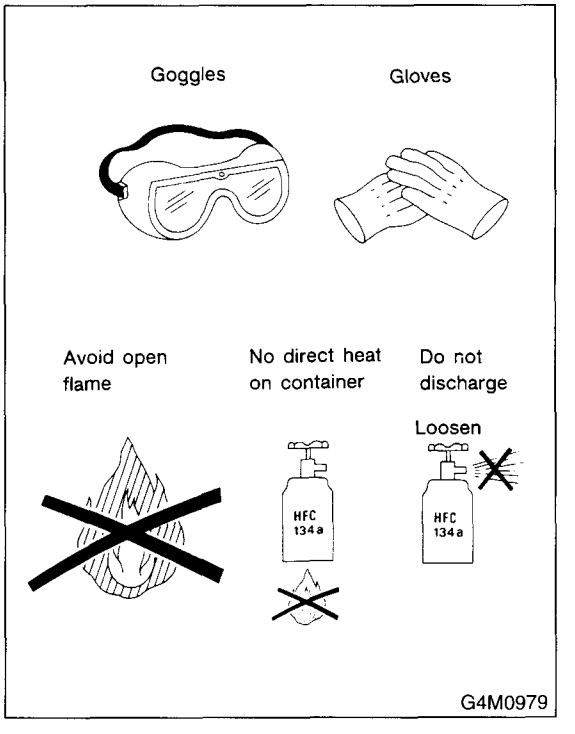
• HFC-134a compressor oil has no compatibility with that for R12 system.
• Use only the manufacturer-authorized compressor oil for the HFC-134a system; only use DH-PR.
• Do not mix multiple compressor oils.
If HFC-12 compressor oil is used in a HFC-134a A/C system, the compressor may become stuck due 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.
• The refrigerant is non-toxic and harmless under normal operating circumstance, but it may change to phosgene (a noxious fume) under open flames or high temperatures (caused by a cigarette or heater).
• Provide good ventilation and do not work in a closed area.
• Never perform a gas leak test using a halide torch-type leak tester.
• In order to avoid destroying the ozone layer, prevent HFC-134a from being released into the atmosphere. Using a refrigerant recovery system, discharge and reuse it.



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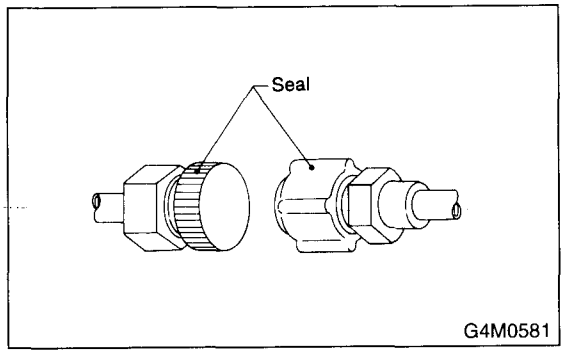
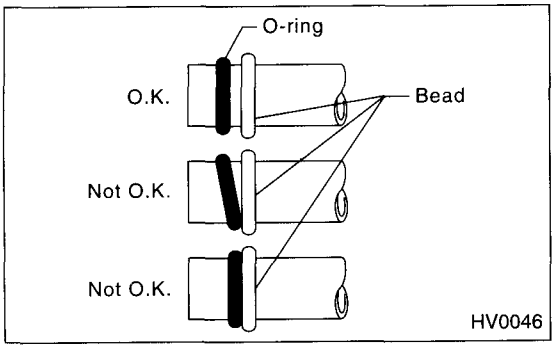
5. O-RING CONNECTIONS

- 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.



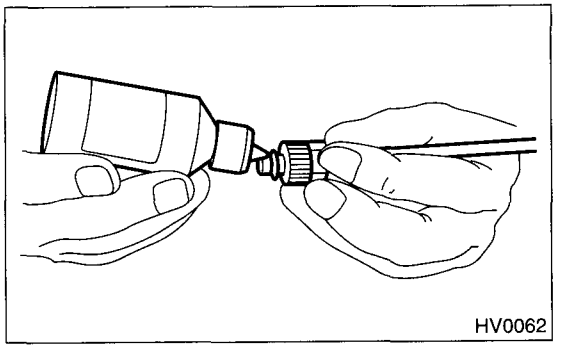
- Visually check the surfaces and mating surfaces of O-rings, threads, and connecting points. If a failure is found, replace the applicable parts.
- Install the O-rings at right angle to the tube beads.



- 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.



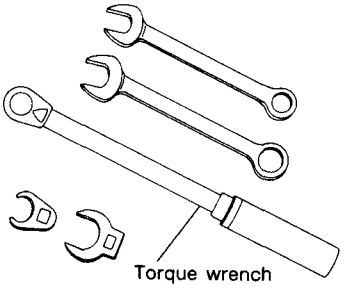
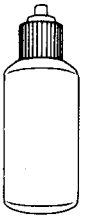
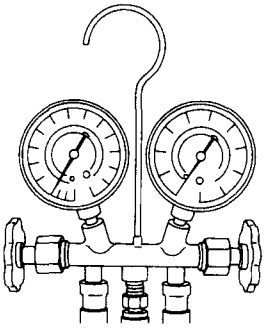
- After tightening, use a clean shop towel to remove excess oil from the connections and any oil which may have run on the vehicle body or other parts.
- If any leakage is suspected after tightening, do not retighten the connections, Disconnect the connections, remove the O-rings, and check the O-rings, threads, and connections.

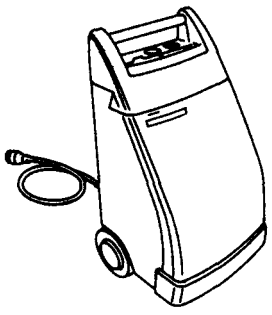
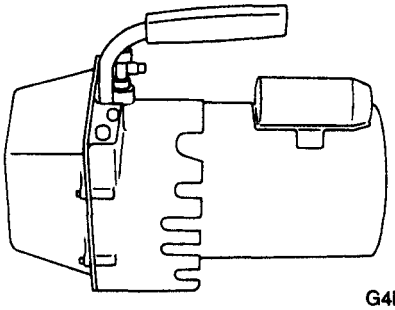
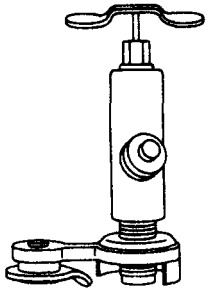
D: PREPARATION TOOL

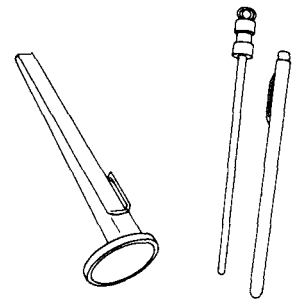
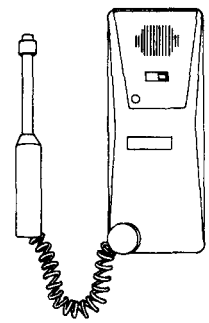
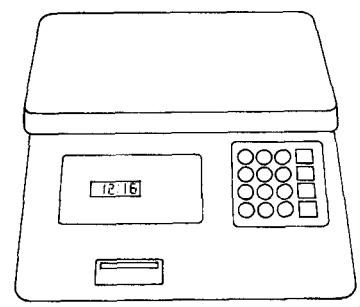
CAUTION:
When working on vehicles with the HFC-134a system, only use HFC-134a specified tools and parts. Do not mix with CFC-12 tools and parts. If HFC-134a and CFC-12 refrigerant or compressor oil is mixed, poor lubrication will result and the compressor itself may be destroyed.

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

Tools and Equipment	Description
Wrench Various **WRENCHES** will be required to service any A/C system. A 7 to 40 N·m (0.7 to 4.1 kg-m, 5 to 30 ft-lb) torque wrench with various crowfoot wrenches will be needed. Open end or flare nut wrenches will be needed for back-up on the tube and hose fittings.	 G4M0571
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.	 G4M0572
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.	 G4M0573

Tools and Equipment	Description
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.	 G4M0574
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.	 G4M0575
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.	 G4M0576
Can tap A **CAN TAP** for the 397 g (14 oz) can is available from an auto supply store.	 G4M0577

Tools and Equipment	Description
Thermometer Pocket **THERMOMETERS** are available from either industrial hardware store or commercial refrigeration supply houses.	 G4M0578
Electronic leak detector An **ELECTRONIC LEAK DETECTOR** can be obtained from either a specialty tool supply or an A/C equipment supplier.	 G4M0579
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.	 G4M0580

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

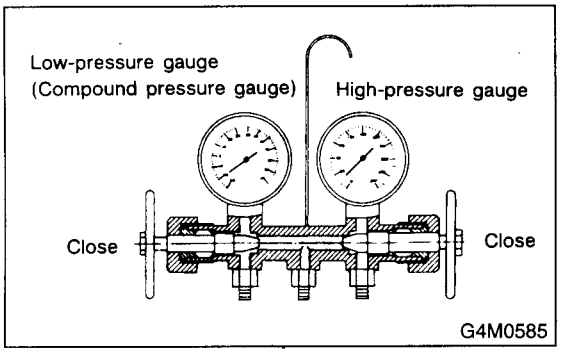
Symptom	Probable cause	Repair order
High-pressure side is unusually high.	• Defective condenser fan motor • Clogged condenser fan • Too much refrigerant • Air inside the system • Defective receiver dryer	• Replace the fan motor. • Clean the condenser fin. • Discharge refrigerant. • Replace the receiver dryer.
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.
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

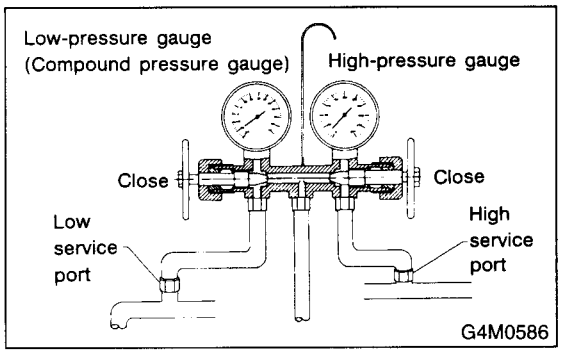
A: OPERATION

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-21, OPERATION, Compressor Oil.>
2) Stop the engine.
3) Close the valves on the low-/high-pressure sides of the manifold gauge set.



4) Install the low-/high-pressure hoses to the service ports on the low-/high-pressure sides of the vehicle respectively.



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:

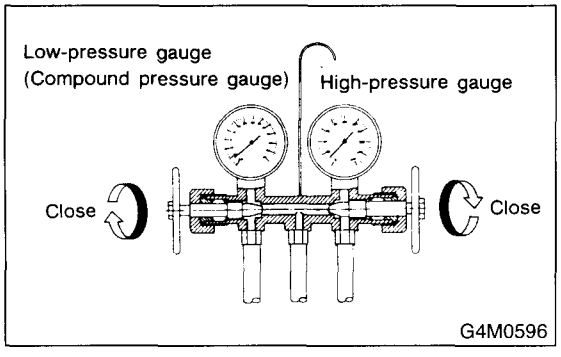
- **During operation, be sure to wear safety goggles and protective gloves.**
- **Before charging the refrigerant, evacuate the system to remove small amounts of moisture remaining in the system.**

The moisture in the system can be completely evacuated only under the minimum vacuum level. The minimum vacuum level affects the temperature in the system.

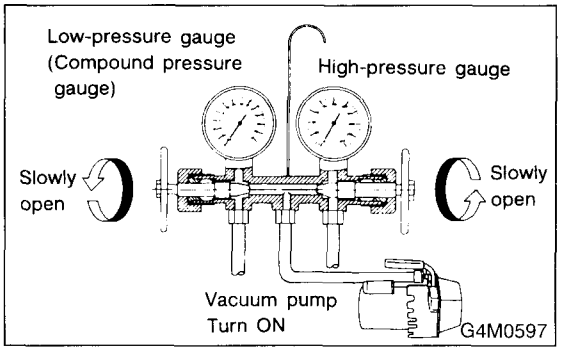
- **The list below shows the vacuum values necessary to boil water in various temperature. In addition, the vacuum levels indicated on the gauge are approx. 3.3 kPa (25 mmHg, 0.98 inHg) lower than those measured at 304.8 m (1,000 ft) above sea level.**

Vacuum level required to boil water (at sea level)	
Temperature	Vacuum
1.7°C (35°F)	100.9 kPa (757 mmHg, 29.8 inHg)
7.2°C (45°F)	100.5 kPa (754 mmHg, 29.7 inHg)
12.8°C (55°F)	99.8 kPa (749 mmHg, 29.5 inHg)
18.3°C (65°F)	99.2 kPa (744 mmHg, 29.3 inHg)
23.9°C (75°F)	98.5 kPa (739 mmHg, 29.1 inHg)
29.4°C (85°F)	97.2 kPa (729 mmHg, 28.7 inHg)
35°C (95°F)	95.8 kPa (719 mmHg, 28.3 inHg)

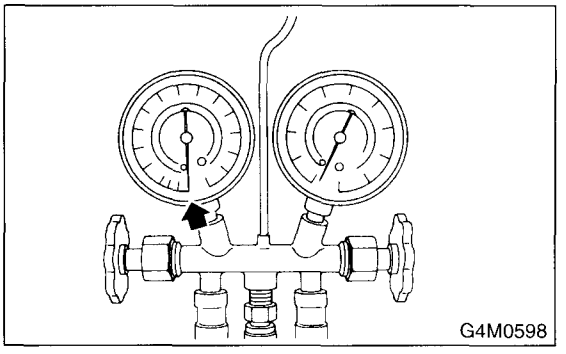
1) Close the valves on low-/high-pressure sides of the manifold gauge.



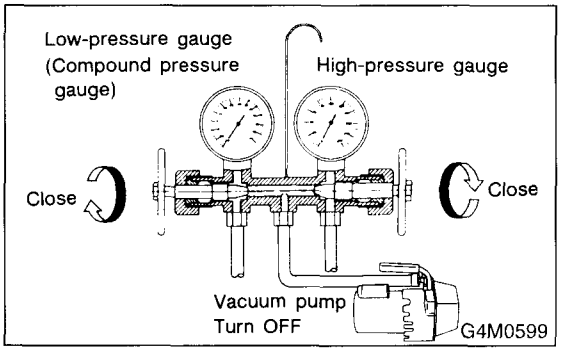
2) Install the low-/high-pressure hoses to the corresponding service ports on the vehicle respectively.
3) Connect the center hose of the manifold gauge set with the vacuum pump.
4) Carefully open the valves on the low-/high-pressure sides to activate the vacuum pump.



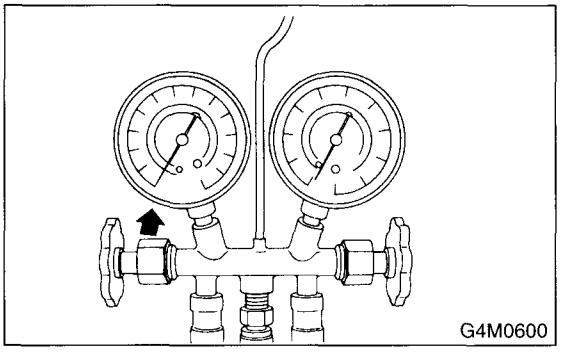
5) After the low-pressure gauge reaches 100.0 kPa (750 mmHg, 29.5 inHg) or higher, evacuate the system for approx. 15 minutes.



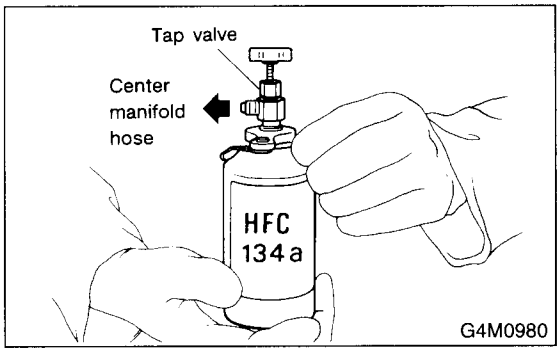
6) After 15 minutes of evacuation, if the reading shows 100.0 kPa (750 mmHg, 29.5 inHg) or higher, close the valves on the both sides to stop the vacuum pump.



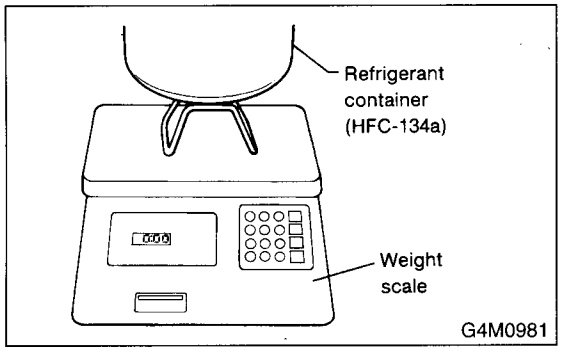
7) Note the low-pressure gauge reading.



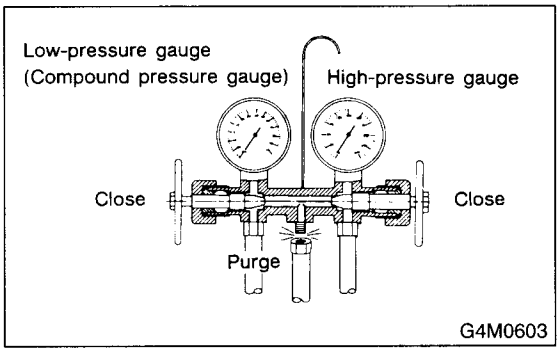
8) Leave it at least 5 minutes, and then check the low-pressure gauge reading for any changes.
When a gauge indicator shows near to zero point, this is a sign of leakage. Check pipe connector points, repair them, make sure there is no leakage by air bleeding.
9) Following the can tap operation manual instructions, install it to the refrigerant can.



10) Disconnect the center manifold hose from the vacuum pump, and connect the hose to the tap valve.
11) When a 13.6 kg (30 lb) refrigerant container is used, measure the refrigerant amount in use using a weight scale.

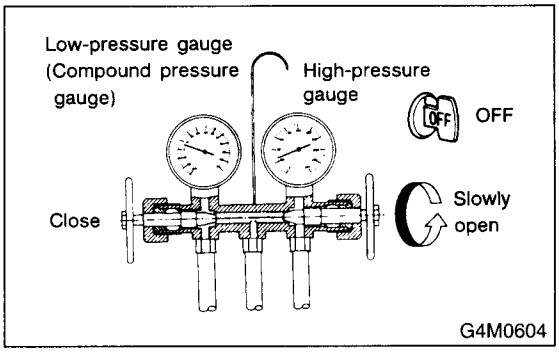


12) Confirm that all the 3 hoses are tightly connected to the manifold gauge set.



13) Open the valve on the HFC-134a source.
14) Loosen the center hose connection on the manifold gauge set (if applicable, press a purge valve on the manifold gauge set) only for a couple of seconds to allow the air in the center hose to escape by the refrigerant.
15) Carefully open the high-pressure valve with the engine stopping.

CAUTION:
Do not open the low-pressure valve.

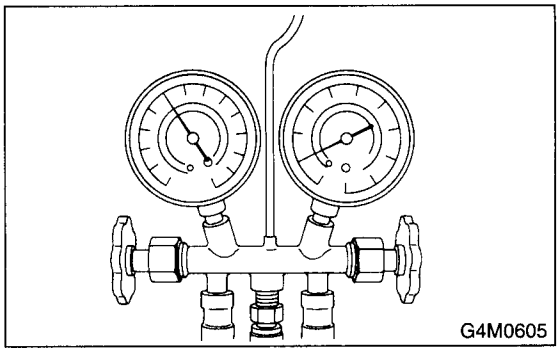


CAUTION:
Never run the engine during charging from the high-pressure side.

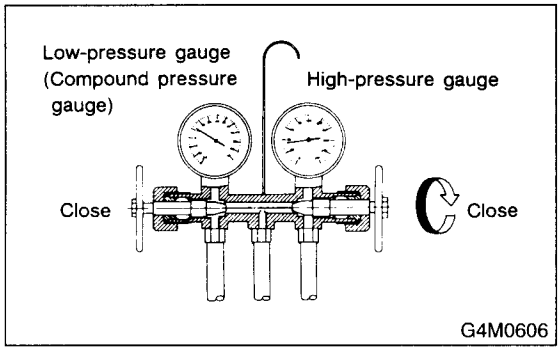
16) Close the high-pressure valve when the low-pressure gauge reaches 98 kPa (1 kg/cm^2, 14 psi).
Using a leak tester, check the system for leaks.
If any leakage is found after the refrigerant recovery is completed, repair the applicable area.
17) After confirming that there are no leaks with the leak test, charge the required amount of refrigerant.

CAUTION:
Never run the engine during charging from the high-pressure side.

18) Close the high-pressure valve when;
- the readings of low- / high-pressure gauges become almost equal, after the charging speed is reduced,
- the HFC-134a source becomes empty, or
- the system is filled with the gas.



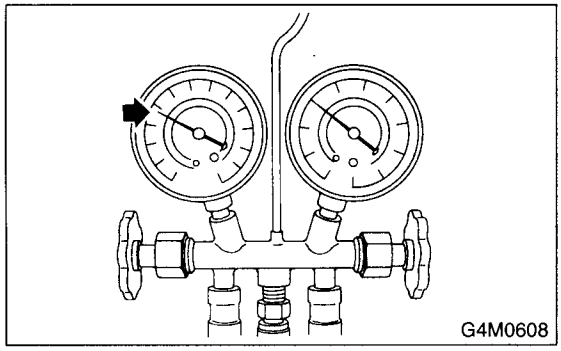
19) If the HFC-134a source is empty, close the high-pressure valve, close the valve on the can tap, and replace the HFC-134a source with a new one to restart the operation.



20) Confirm that both the low- / high-pressure valves can be closed. Start the engine with the A/C switch OFF.
21) Quickly repeat 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"
- Windows open

23) While reading the low-pressure gauge, carefully open the low-pressure valve with the refrigerant source connected and the service hose purged.

CAUTION:
Never open the high-pressure valve with the engine is running.



24) Adjust the refrigerant flow to maintain the pressure on the low-pressure side at 276 kPa (2.81 kg/cm^2, 40 psi) max.
25) After the system is fully charged, close the low-pressure valve.
26) Close the valve on the refrigerant source.

Refrigerant amount		
Refrigerant	Minimum	Maximum
HFC-134a	0.6 kg (1.3 lb)	0.7 kg (1.5 lb)

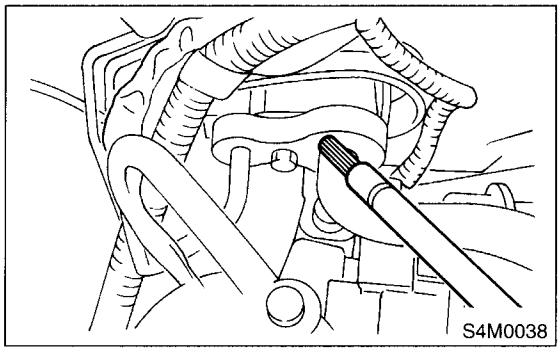
27) Disconnect the hose from the service port, and install the service port cap.

5. Refrigerant Leak Check

A: INSPECTION

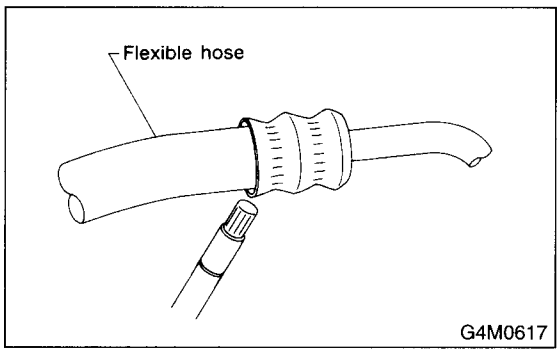
1) Operate the A/C system for approx. 10 minutes, and confirm that the high-side pressure shows at least 690 kPa (7.03 kg/cm^2, 100 psi). Then stop the engine to start the leak test.
2) Starting from the connection between the high-pressure tube and evaporator, check the system for leaks along the high-pressure side through the compressor. The following items must be checked thoroughly.
3) Check the joint and seam between the pressure switch (dual switch) and receiver dryer.
4) Check the connections between the condenser and tubes, 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 thermal limiter (if equipped) on the compressor housing.
8) 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.
9) Starting from the connection between the low-pressure tube and evaporator, check the system for leakage along the high-pressure side through the compressor. The following items must be checked thoroughly.

- Connection between the tube and tube fitting
- Connection between 2 parts
- Connection between the tube and nut


S4M0038

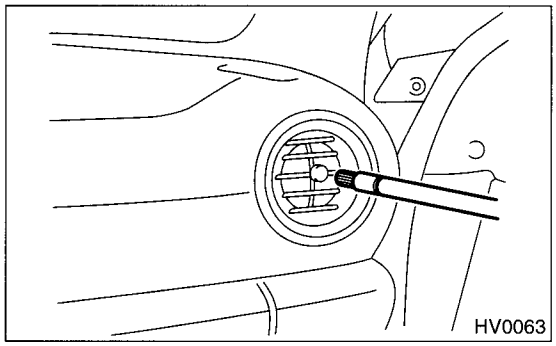
10) Visually check the rubber area of the flexible hose for cracks.
Check the entire length of the flexible hose, especially the connection with the metal hose end.

CAUTION:
Carefully check the external surface of hoses and tubes at approx. 25 mm (0.98 in) per second.



G4M0617

11) Disconnect the drain hose from the evaporator case, and check the hose end for at least 10 seconds.
After the test is finished, reconnect the drain hose.
12) 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.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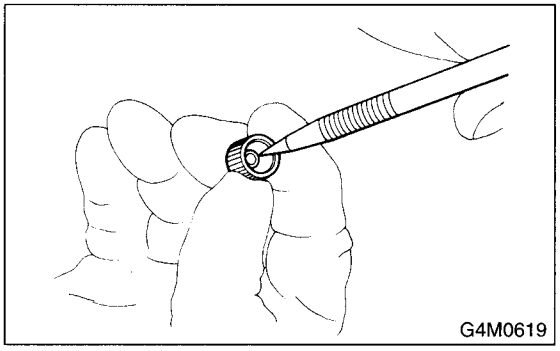
13) Check the valve in the service port.
14) Visually check the rubber seal in the service port cap.


G4M0619

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 the 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

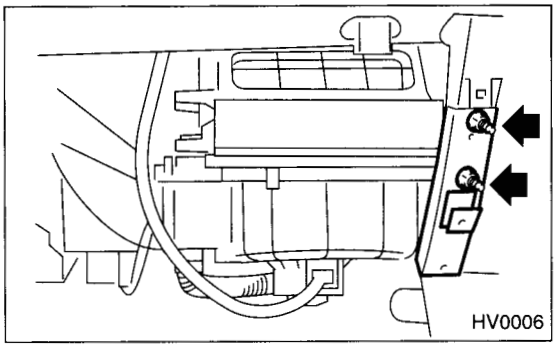
NOTE:
• If a component is replaced, add an appropriate amount of compressor oil.
• When replacing the compressor, the new compressor will already have the specified amount of oil in it. Install the new compressor after removing the same amount of oil that is remaining in the compressor removed.

Replacement parts	Amount of oil replenishment
Evaporator	114 mℓ (3.9 US fl oz, 4.0 Imp fl oz)
Condenser	7 mℓ (0.24 US fl oz, 0.25 Imp fl oz)
Hose	1 mℓ (0.03 US fl oz, 0.04 Imp fl oz)

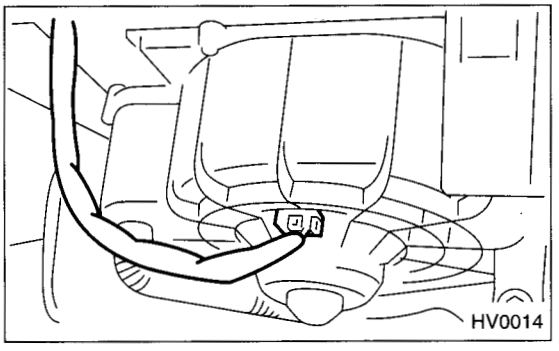
7. Blower Motor Unit Assembly

A: REMOVAL

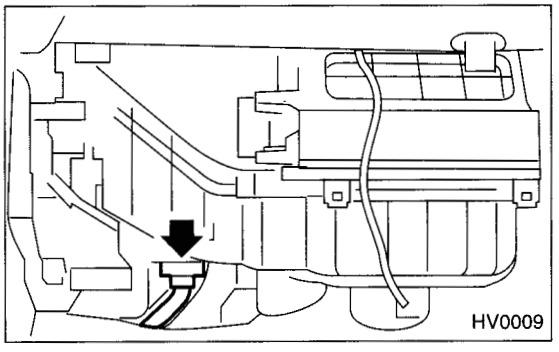
1) Disconnect the ground terminal from battery.
2) Remove the glove box. <Ref. to EI-39, REMOVAL, Glove Box.>
3) Loosen the nut to remove support beam stay.



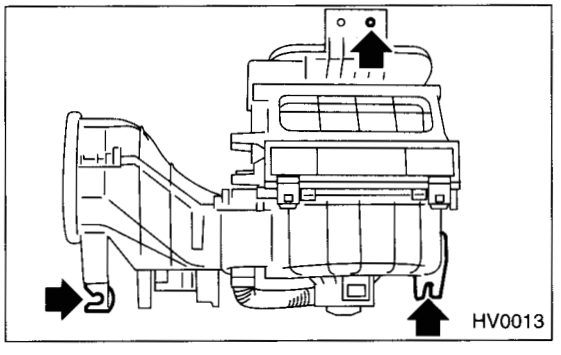
4) Disconnect the blower motor connector.



5) Disconnect the blower resistor connector.



6) Loosen the bolt and nut to remove blower motor unit assembly.

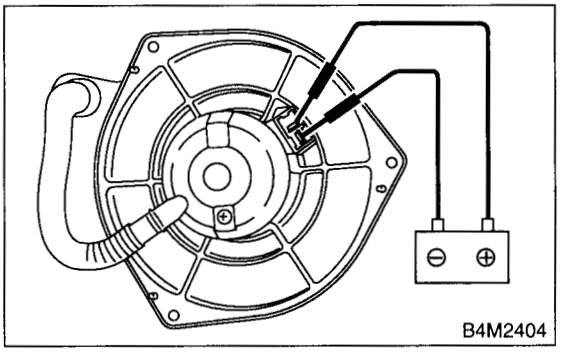


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

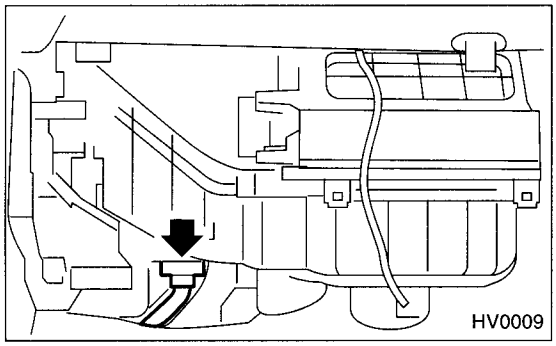
Connect the motor connector terminal 1 from the battery to the positive (+) lead and terminal 2 to the negative (–) lead. Make sure the motor runs smoothly.



8. Blower Resistor

A: REMOVAL

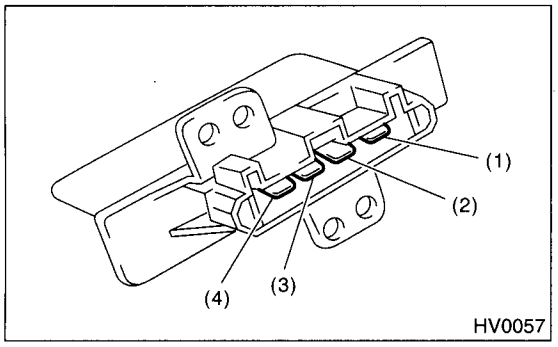
1) Remove the glove box. <Ref. to EI-39, REMOVAL, Glove Box.>
2) Disconnect the blower resistor connector.
3) Loosen two screws to remove the blower resistor.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION



Measure the blower resistor resistance.

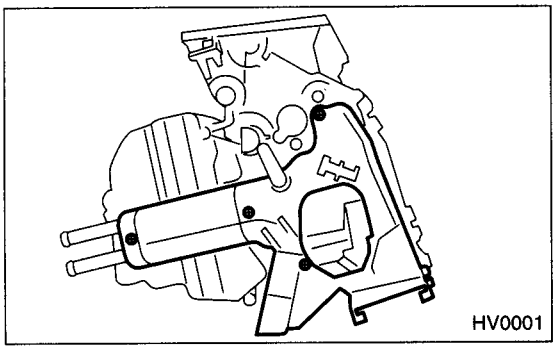
Terminal No.	Standard
3 and 1	Approx. 0.51 Ω
3 and 2	Approx. 2.70 Ω
3 and 4	Approx. 1.43 Ω

If NG, replace the blower resistor.

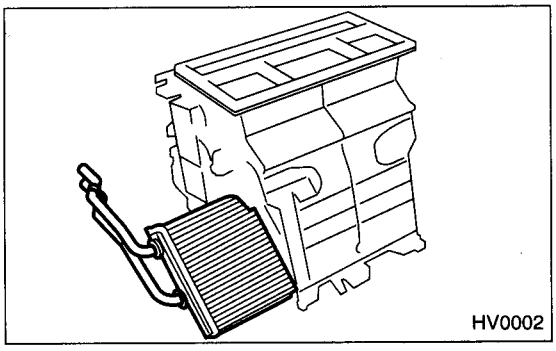
9. Heater Core

A: REMOVAL

1) Remove the heater and cooling unit. <Ref. to AC-28, REMOVAL, Heater and Cooling Unit.>
2) Loosen the screws to remove heater core cover.



3) Remove the heater core.



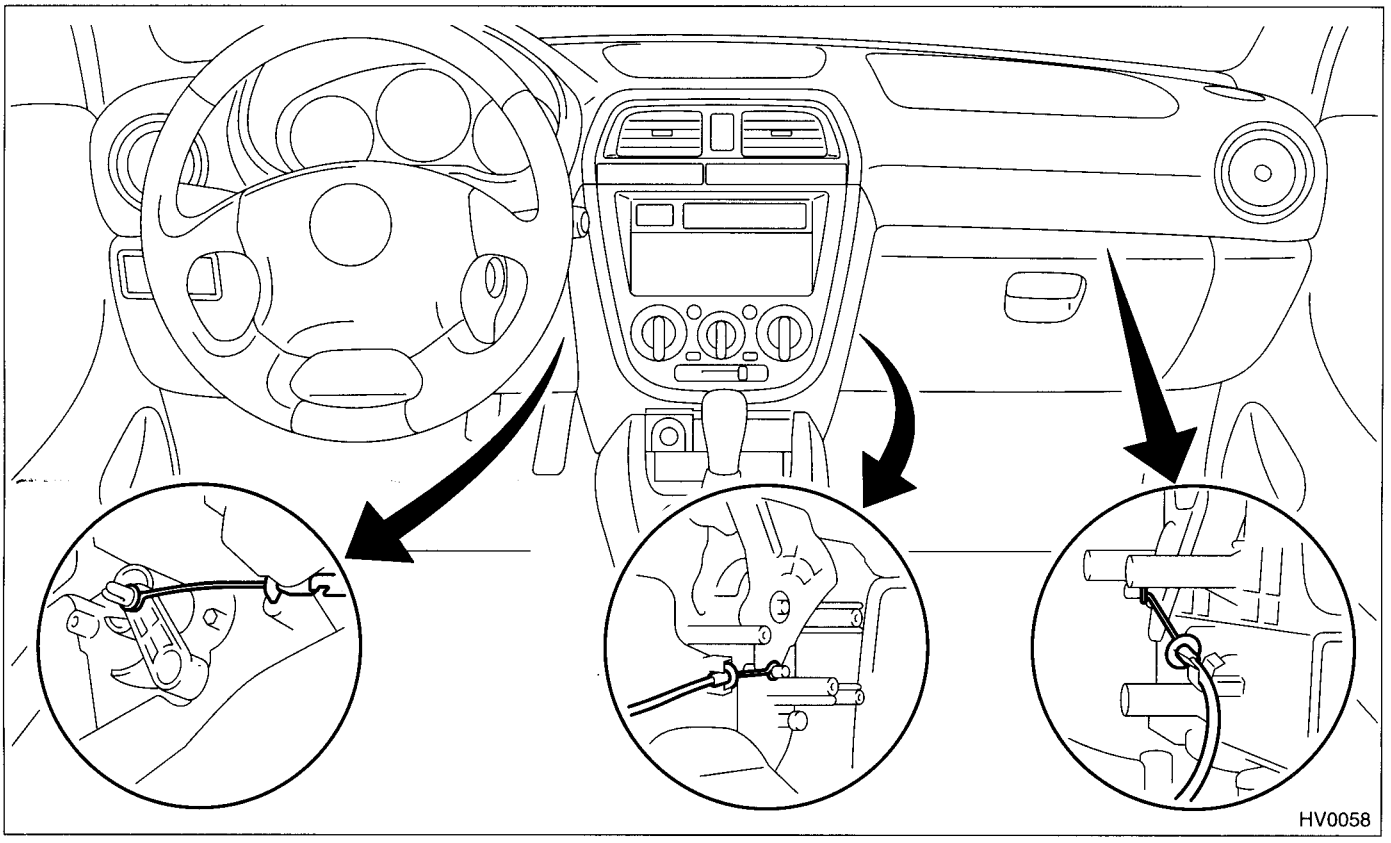
B: INSTALLATION

Install in the reverse order of removal.

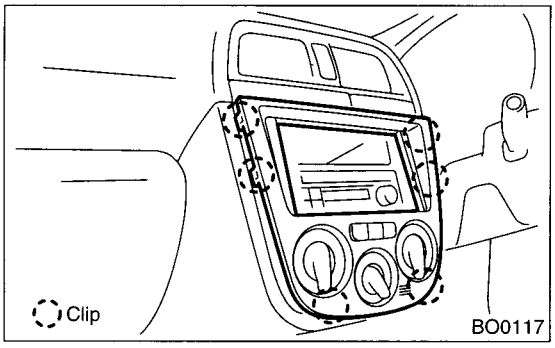
10.Control Unit

A: REMOVAL

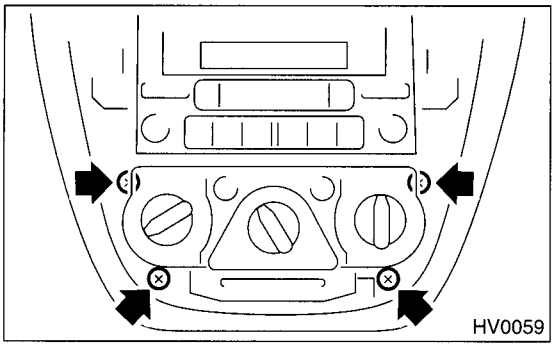
1) Disconnect the ground terminal from battery.
2) Remove the glove box. <Ref. to EI-39, REMOVAL, Glove Box.>
3) Remove the lower panel. <Ref. to EI-42, Instrument Panel Assembly.>
4) Remove the control wires.



5) Remove the center console panel.



6) Remove four screws.



7) Pull out the control unit and disconnect connectors.

B: INSTALLATION

Install in the reverse order of removal.

11.Compressor

A: INSPECTION

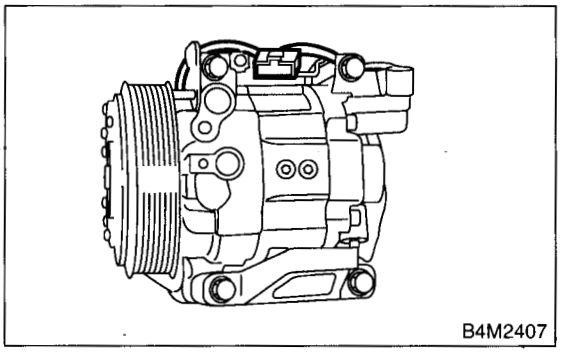
1. MAGNETIC CLUTCH CLEARANCE

1) Check the clearance of the entire circumference around the drive plate and pulley.

Standard:
0.45±0.15 mm (0.0177±0.0059 in)

2. MAGNETIC CLUTCH OPERATION

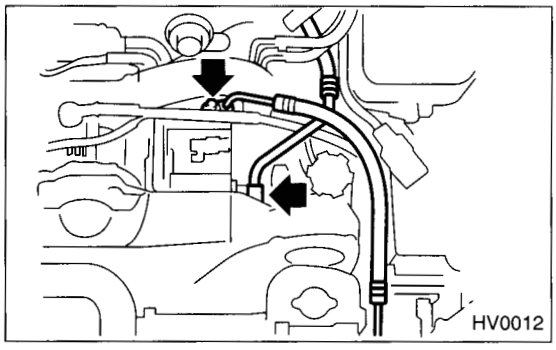
1) Disconnect the compressor connector.
2) Connect the battery positive terminal to the No.3 terminal of the compressor connector.
Ground the negative terminal to the body.



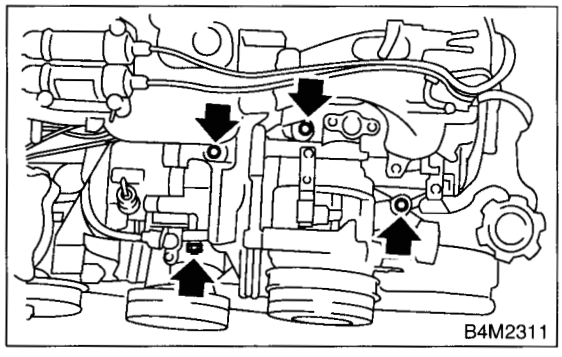
3) Make sure the magnet clutch engages.
If NG, replace the compressor.

B: REMOVAL

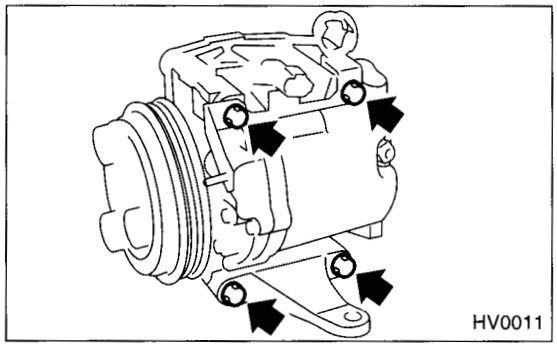
1) Perform the compressor oil return operation. <Ref. to AC-21, OPERATION, Compressor Oil.>
2) Turn A/C switch OFF and stop the engine.
3) Using refrigerant recovery system, discharge refrigerant. <Ref. to AC-16, OPERATION, Refrigerant Recovery Procedure.>
4) Disconnect the ground terminal from battery.
5) Remove the V-belt. <Ref. to ME(SOHC)-43, REMOVAL, V-belt.> or <Ref. to ME(DOHC TURBO)-44, REMOVAL, V-belt.>
6) Remove the generator. <Ref. to SC-13, REMOVAL, Generator.>
7) Remove the low-pressure hose and high-pressure hose.



8) Disconnect the compressor harness from body harness.
9) Loosen the bolts to remove compressor bracket.



10) Remove the bolts and then separate compressor and bracket.



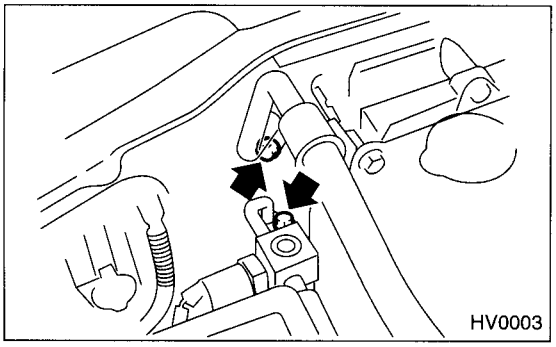
C: INSTALLATION

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 the compressor, adjust amount of compressor oil. <Ref. to AC-21, OPERATION, Compressor Oil.>
4) Charge refrigerant. <Ref. to AC-17, OPERATION, Refrigerant Charging Procedure.>

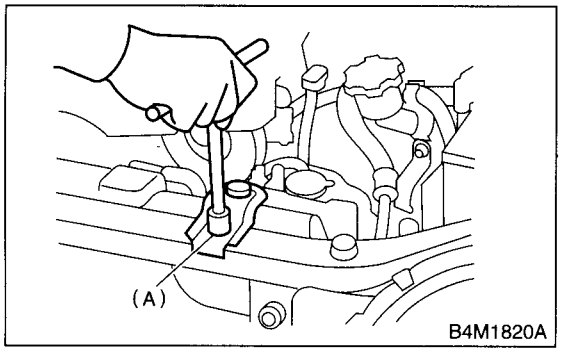
12.Condenser

A: REMOVAL

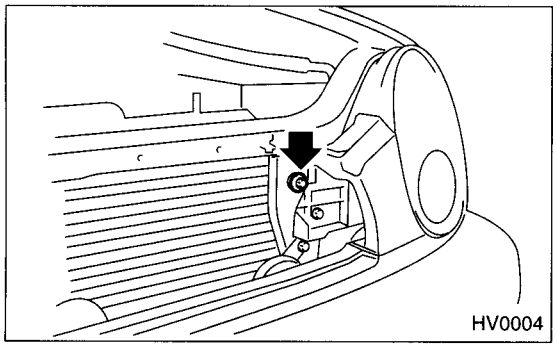
1) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-16, OPERATION, Refrigerant Recovery Procedure.>
2) Disconnect the ground terminal from battery.
3) Disconnect the pressure hose and pipe from condenser.



4) Remove the radiator bracket (A).



5) Remove two bolts. While lifting condenser, pull it out through space between the radiator and the radiator panel.

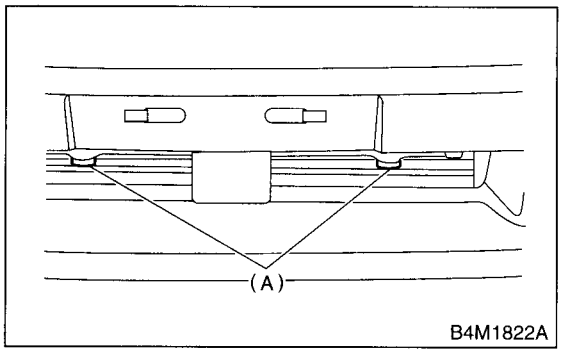


CAUTION:
Be careful not to damage the condenser fins. If a damaged fin is found, repair it using a thin screwdriver.
If the condenser is replaced, add appropriate amount of compressor oil to the compressor. <Ref. to AC-21, REPLACEMENT, Compressor Oil.>

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 (A) has been fitted into holes on radiator panel.



2) Charge refrigerant. <Ref. to AC-17, OPERATION, Refrigerant Charging Procedure.>

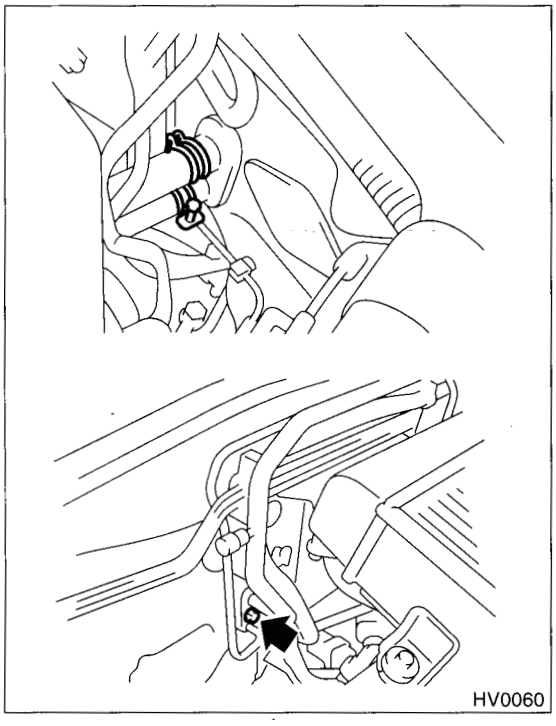
C: INSPECTION

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.

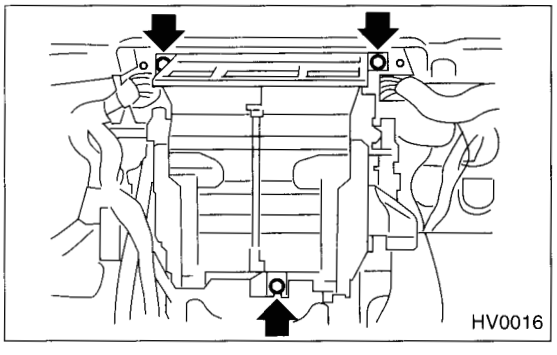
13.Heater and Cooling Unit

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-16, OPERATION, Refrigerant Recovery Procedure.>
3) Drain LLC from the radiator. <Ref. to CO-25, REPLACEMENT, Engine Coolant.>
4) Remove the bolts securing expansion valve and pipe in engine compartment. Release the heater hose clamps in engine compartment to remove the hoses.



5) Remove the instrument panel. <Ref. to EI-42, REMOVAL, Instrument Panel Assembly.>
6) Remove the support beam.
7) Remove the blower motor unit assembly. <Ref. to AC-22, REMOVAL, Blower Motor Unit Assembly.>
8) Loosen the bolt and nuts to remove the heater and cooling unit.



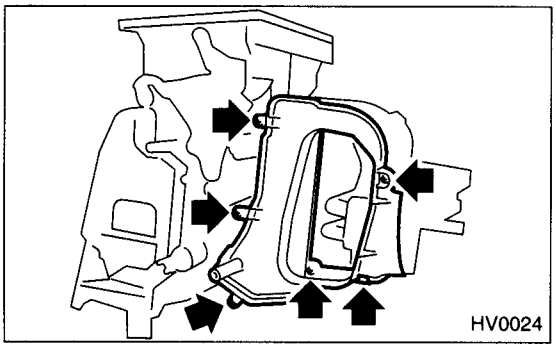
B: INSTALLATION

1) Install in the reverse order of removal.
2) Charge refrigerant. <Ref. to AC-17, OPERATION, Refrigerant Charging Procedure.>

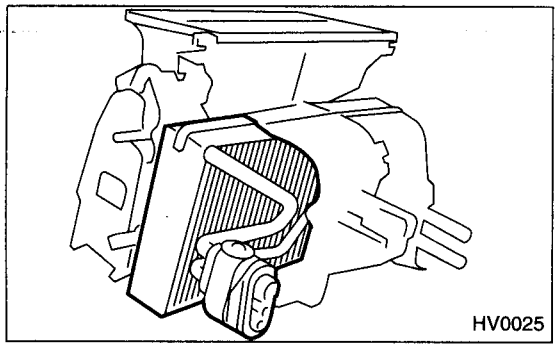
14.Evaporator

A: REMOVAL

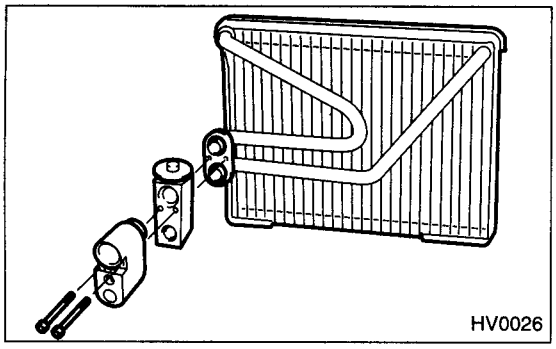
1) Remove the heater and cooling unit. <Ref. to AC-28, REMOVAL, Heater and Cooling Unit.>
2) Loosen the screws and clip to remove the evaporator cover.



3) Remove the evaporator.



4) Loosen two bolts to remove the expansion valve.



CAUTION:
If the evaporator is replaced, add appropriate amount of compressor oil to evaporator. <Ref. to AC-21, REPLACEMENT, Compressor Oil.>

B: INSTALLATION

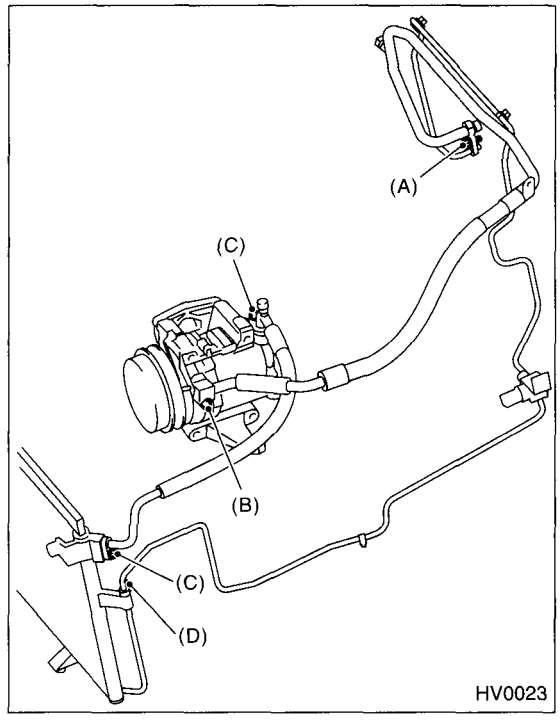
Install in the reverse order of removal.

15.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 terminal from battery.
2) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-16, 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 the 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 hose from the vehicle.
12) Remove the high-pressure tube attaching bolt (D).
13) Remove the high-pressure tube from the 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.

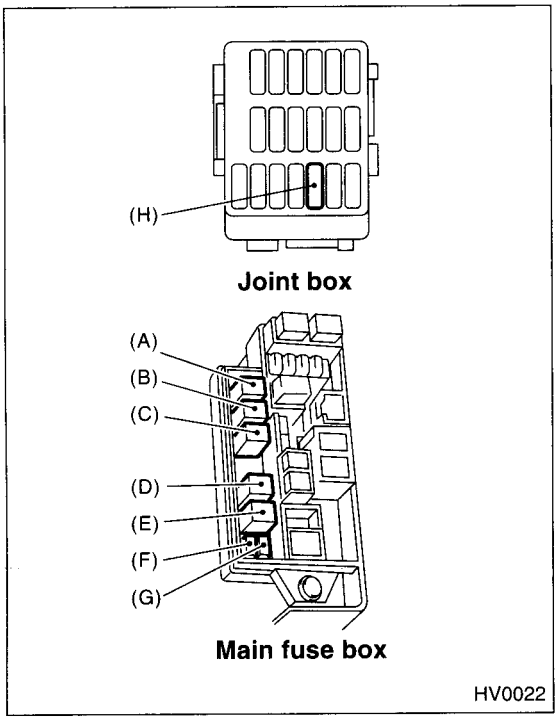
1) Install in the reverse order of removal.
2) Charge refrigerant. <Ref. to AC-17, OPERATION, Refrigerant Charging Procedure.>

C: INSPECTION

NOTE:
If cracking, damage, or swelling is found on a hose, replace it with a new one.

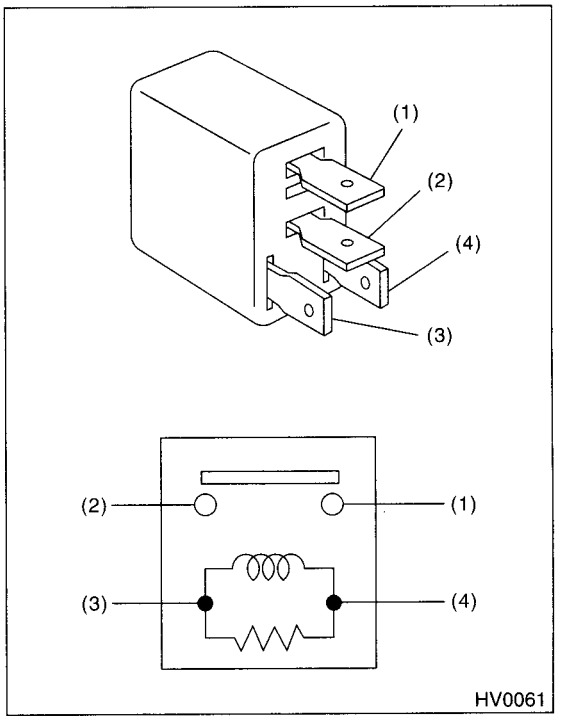
16.Relay and Fuse

A: LOCATION



Main Fan Relay 1	A
Main Fan Relay 2	B
Sub Fan Relay 1	C
Sub Fan Relay 2	E
A/C Relay	D
Main Fan Fuse	F
Sub Fan Fuse	G
A/C Fuse	H

B: INSPECTION

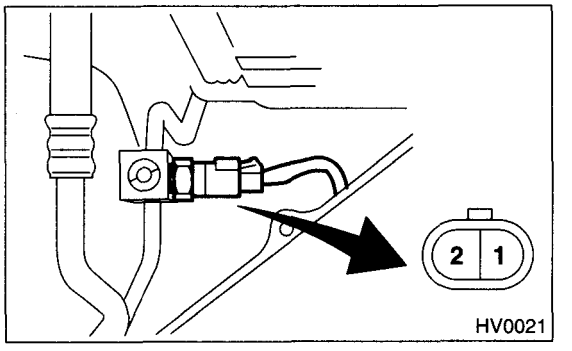


(3) — (4): Continuity exists.
(1) — (2): No continuity
While applying battery voltage to the cable between (3) and (4), check continuity between (1) and (2).
If no continuity exists, replace the relay with a new one.

17.Pressure Switch (Dual 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.



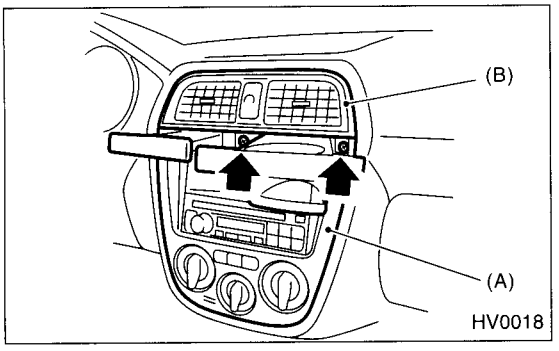
	Terminal No.	Operation	Standard kPa (kg/cm^2, psi)
High and low pressure switch	1 and 2	Turns OFF.	Increasing to 2,800±100 (29±1, 406±15)
			Decreasing to 278±29 (2.83±0.3, 40.3±4.2)
		Turns ON.	Increasing to $287^{+39}/_{-25}$ ($2.9^{+0.4}/_{-0.25}$, $42^{+5.7}/_{-3.6}$)
			Decreasing to 2,200±200 (22.4±2, 319±29)

18.Air Vent Grille

A: REMOVAL

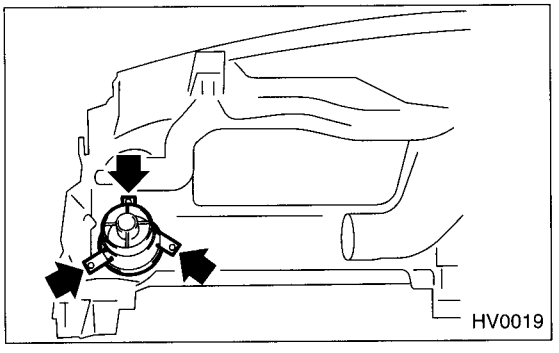
1. CENTER GRILLE

1) Disconnect the ground terminal from battery.
2) Remove the center console panel (A).
3) Loosen two screws to remove the center air vent grille (B).



2. SIDE GRILLE

1) Disconnect the ground terminal from battery.
2) Remove the heater vent duct. <Ref. to AC-35, REMOVAL, Heater Vent Duct.>
3) Loosen the screws to remove the side air vent grille.



B: INSTALLATION

Install in the reverse order of removal.

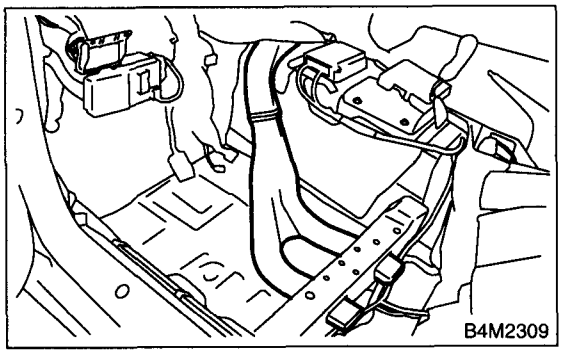
C: INSPECTION

The direction and amount of air should be adjusted smoothly.
The adjustment should be kept in each position.

19.Heater Duct

A: REMOVAL

1) Remove the heater unit. <Ref. to AC-28, Removal.>
2) Remove the front seat. <Ref. to SE-6, REMOVAL, Front Seat.>
3) Remove the front side sill cover.
4) Pull off the floor mat to remove the heater duct.



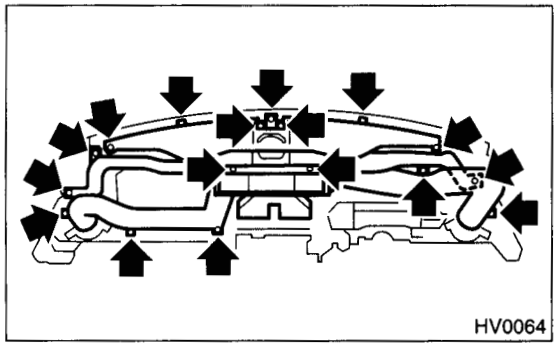
B: INSTALLATION

Install in the reverse order of removal.

20.Heater Vent Duct

A: REMOVAL

1) Remove the instrument panel. <Ref. to EI-42, REMOVAL, Instrument Panel Assembly.>
2) Remove the screws.
3) Remove the heater vent duct.



B: INSTALLATION

Install in the reverse order of removal.

21.General Diagnostics

A: INSPECTION

Symptom		Repair order
Blower motor	Doesn't move.	Fuse
		Blower motor relay
		Blower motor
		Blower motor resistor
		Blower switch
		Wire harness
	Strange noise.	Blower motor
Compressor	Doesn't move.	Refrigerant
		Fuse
		Air conditioning relay
		Magnet clutch
		Compressor
		Pressure switch
		A/C switch
		Blower switch
		Wire harness
	Strange noise	V-Belt
		Magnet clutch
		Compressor
Cold air not emitted.		Refrigerant
		V-Belt
		Magnet clutch
		Compressor
		Pressure switch
		A/C switch
		Blower switch
		Wire harness
		Heater duct
		Heater vent duct
Warm air not emitted.		Engine coolant
		Blower switch
		Heater core
Temperature of air from vents does not change.		Engine coolant
		Mode actuator
		Wire harness
Unable to switch blow vents.		Mode actuator
		Air flow switch
		Wire harness
Unable to switch suction vents.		Air inlet select switch
		FRESH/RECIRC actuator
		Wire harness

AIRBAG SYSTEM

AB

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3.	Inspection Locations After a Collision	10
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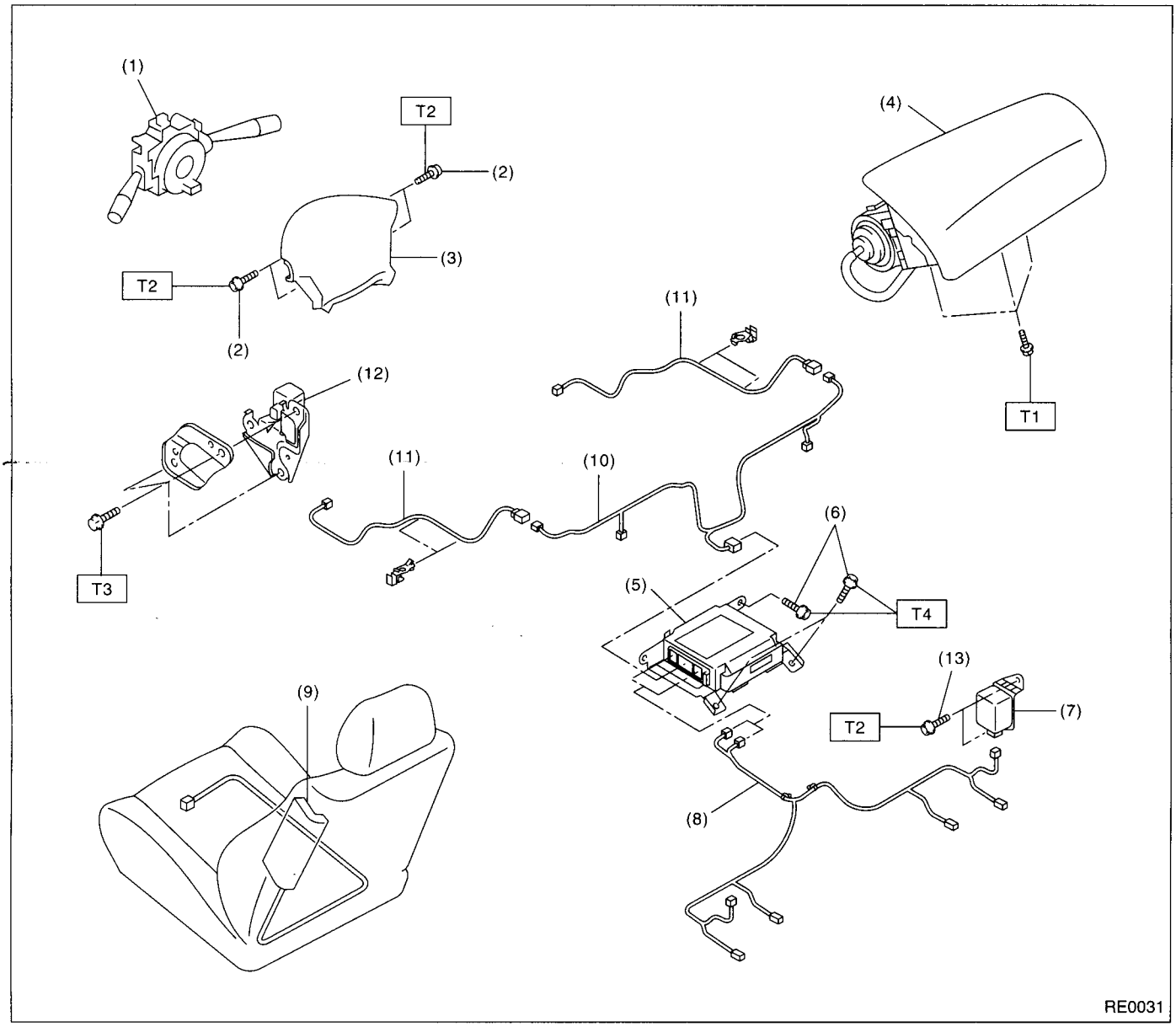
5.	Passenger's Airbag Module	13
6.	Side Airbag Module	14
7.	Airbag Control Module	15
8.	Side Airbag Sensor	16
9.	Roll Connector	17
10.	Front Sub Sensor	18

1. General Description

A: COMPONENT



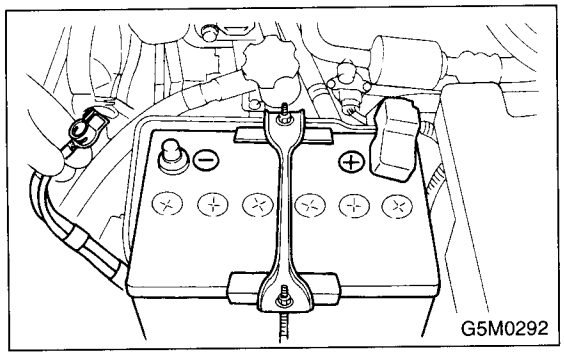
(1)	Combination switch ASSY with roll connector	(7)	Side airbag sensor
(2)	TORX® bolt T30	(8)	Side airbag harness
(3)	Airbag module ASSY (Driver)	(9)	Side airbag module
(4)	Airbag module ASSY (Passenger)	(10)	Airbag main harness
(5)	Airbag control module	(11)	Front sub sensor harness
(6)	TORX® bolt T40	(12)	Front sub sensor
		(13)	TORX® bolt T30

Tightening torque: N·m (kgf-m, ft-lb)

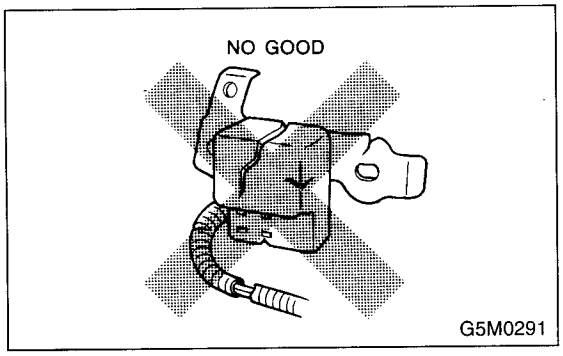
T1: 7.4 (0.75, 5.4)
T2: 10 (1.0, 7.2)
T3: 20 (2.0, 14.5)
T4: 25 (2.5, 18.1)

B: CAUTION

- When servicing a vehicle, be sure to turn the ignition switch OFF, disconnect the ground terminal 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 terminal is disconnected, it may inflate.



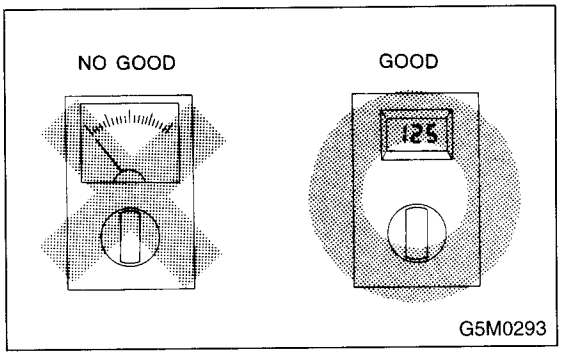
- If the sensors, airbag module, airbag control module, pretensioner and harness are deformed or damaged, replace them with new genuine parts.

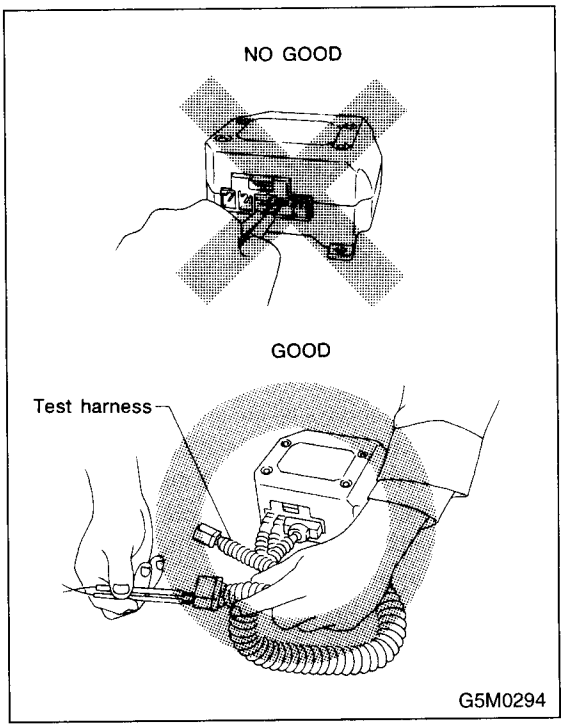


- Do not use the airbag or pretensioner parts from other vehicles. Always replace the defective parts with new parts.
- Never re-use a deployed airbag or pretensioner.
- When checking the system, be sure to use a digital circuit tester.

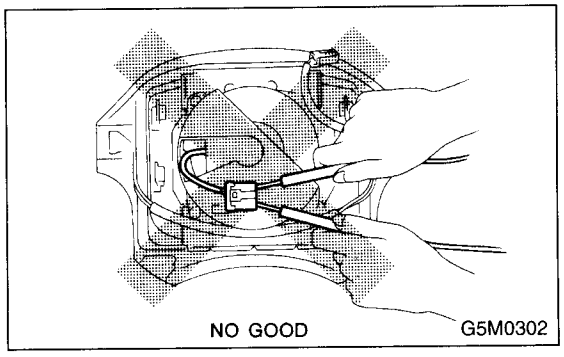
Use of an analog circuit tester may cause the airbag to activate erroneously.

- When checking, use a test harness. Do not directly apply the tester probe to any connector terminal of the airbag.

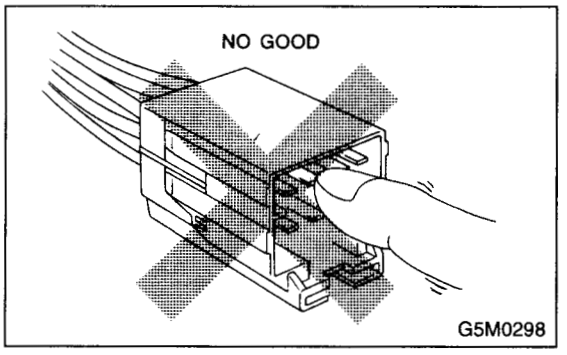




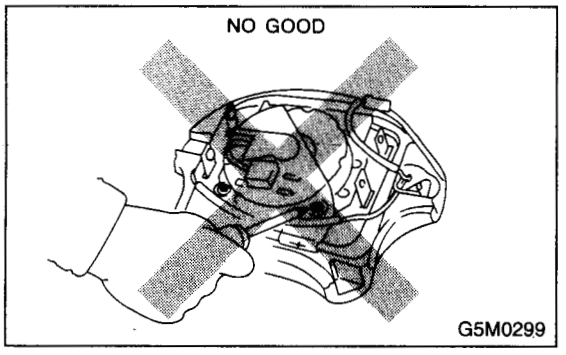
- Do not check continuity of the driver, passenger, side airbag modules and pretensioner.



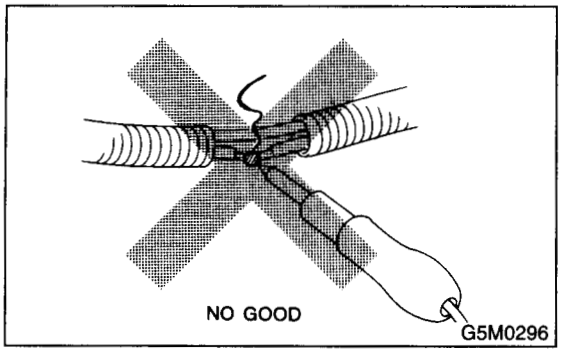
• Do not allow water or oil to come in contact with the connector terminals. Do not touch the connector terminals.



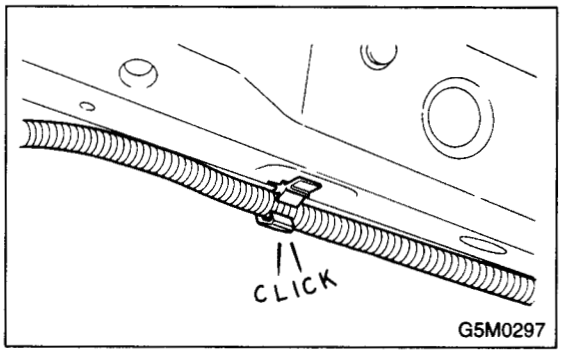
• The airbag module (driver, passenger and side) and pretensioner must not be disassembled.



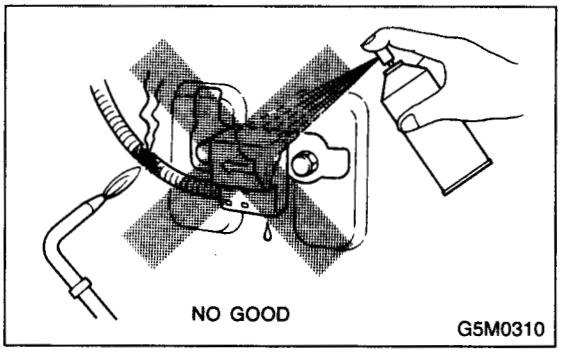
• If any damage, opening, or rust is found on the airbag system wire harness, do not attempt to repair using soldering equipment. Be sure to replace the faulty harness with a new genuine part.



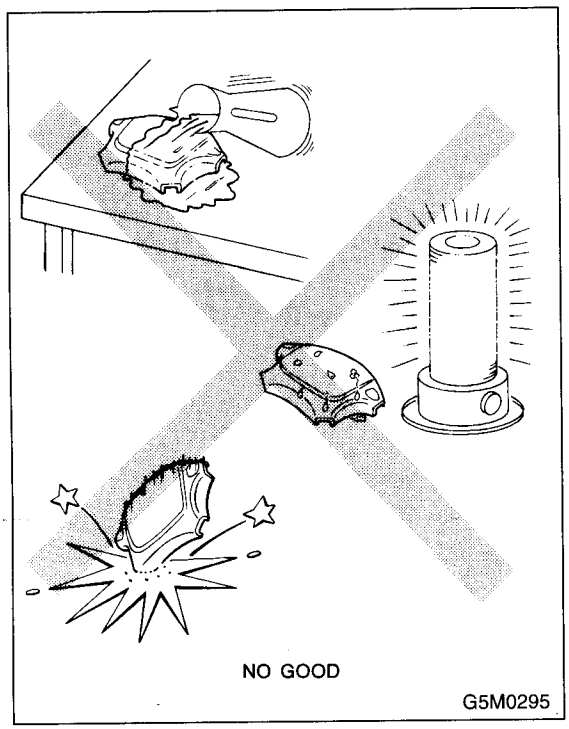
• Install the wire harness securely with the specified clips to avoid interference or tangled up with other parts.



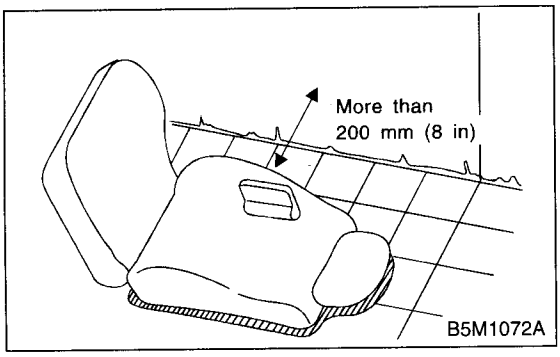
• When painting or performing sheet metal work on the front part of the vehicle, including the front wheel apron, front fender, and front side frame, remove the front sub sensors and wire harness of the airbag system.
• When painting or performing sheet metal work on the side of the vehicle, including the side sill, center pillar, and front and rear doors, remove the side airbag sensors and wire harness of the airbag system.



• 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.

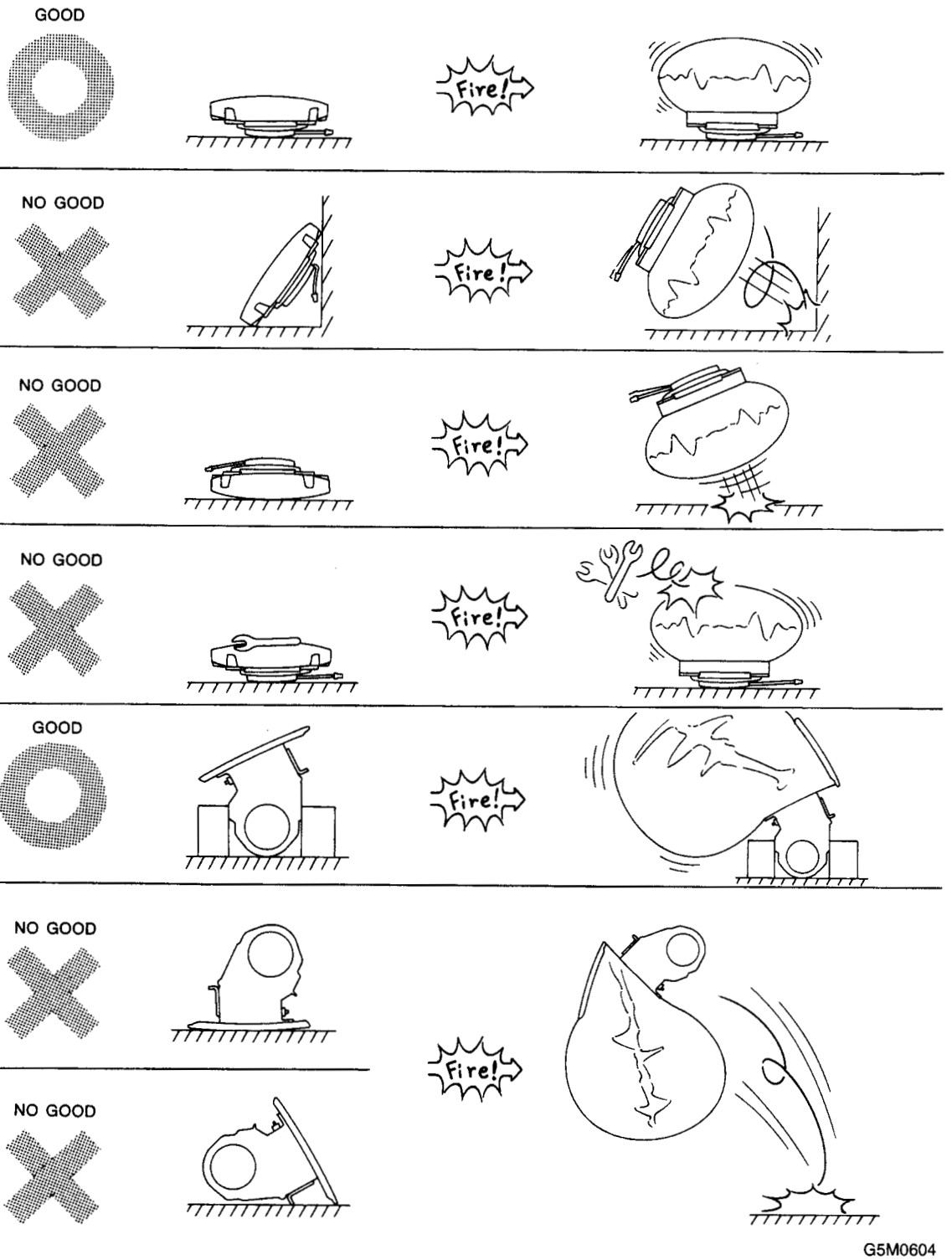


• The removed front seat with the airbag module must be kept at least 200 mm (8 in) away from walls and other objects.



• 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.

Driver side



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C: PREPARATION TOOL

1. GENERAL TOOL

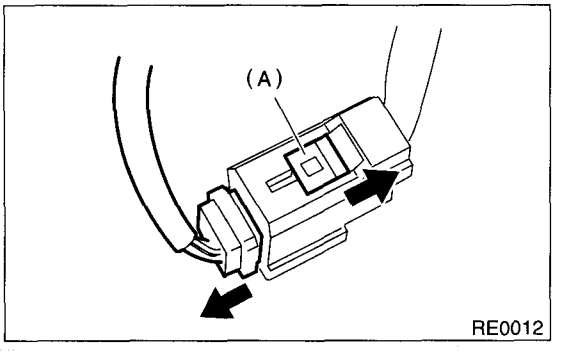
TOOL NAME	REMARKS
TORX® T30	Used for removal/installation of drivers airbag module
TORX® T40 (Tamper resistant type)	Used for removal/installation of airbag control module
TORX® T30 (Tamper resistant type)	Used for removal of side airbag sensor.

2. Airbag Connector

A: OPERATION

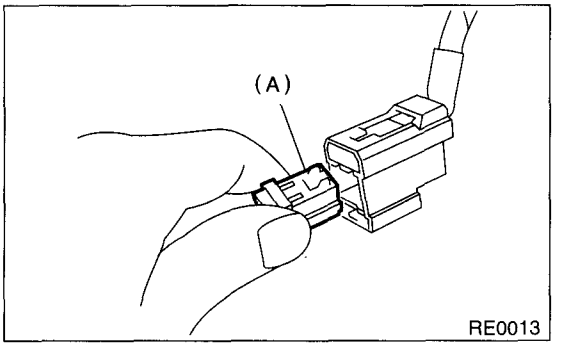
1. POWER SUPPLY

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.

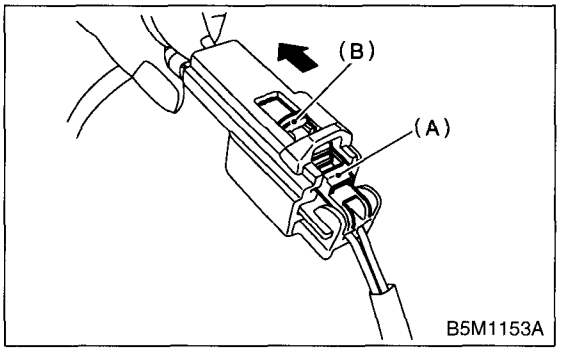
2) How to connect:
Holding the connector (A), and push it in carefully until a connecting sound is heard.



CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

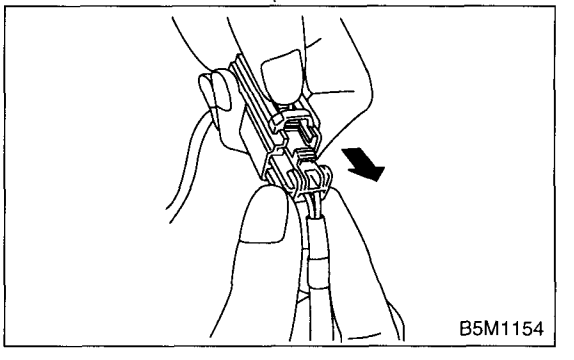
2. DRIVER'S AIRBAG, PASSENGER'S AIRBAG, SIDE AIRBAG

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.



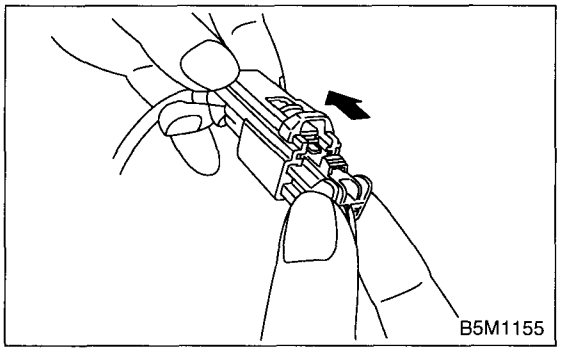
(3) With the slide lock (B) pulled, remove the lock arm (A) to its original position, and then pull in the direction of the arrow and separate the connector.

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.

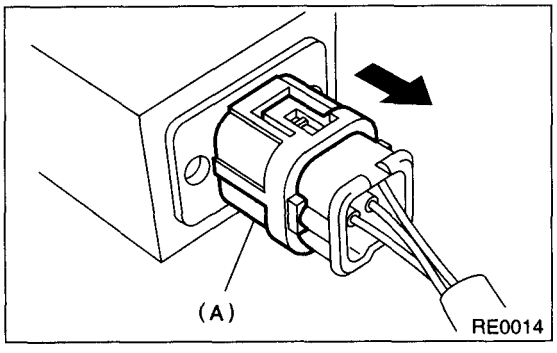
CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.



3. FRONT SUB-SENSOR, SIDE AIRBAG SENSOR

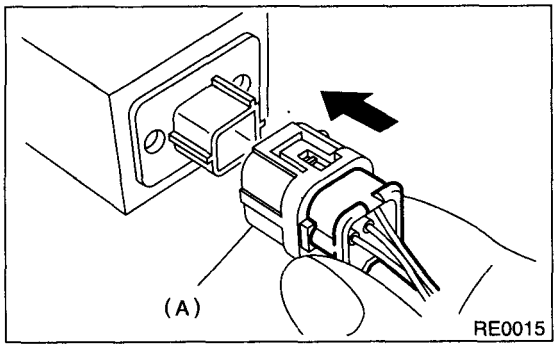
1) How to disconnect:
(1) Holding the outer part (A), pull it in the direction of the arrow.

CAUTION:
When pulling, be sure to hold onto the connector and not the wire.



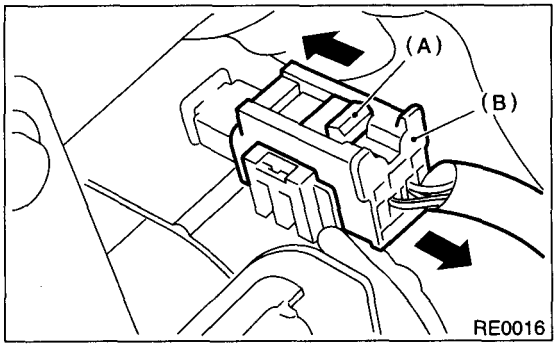
2) How to connect:
Holding the connector, and push it in carefully until a connecting sound is heard.

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.**



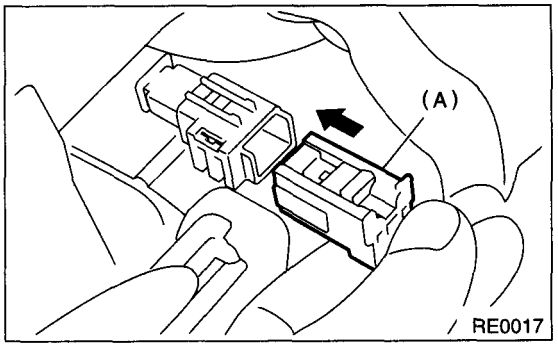
4. PRETENSIONER

1) How to disconnect:
(1) Move the slide lock (A) in the direction of the arrow.
(2) Pull the connector (B) 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.**

3. Inspection Locations After a Collision

A: 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 the 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.
- When steering wheel deformation in axial and radial directions exceed limits.

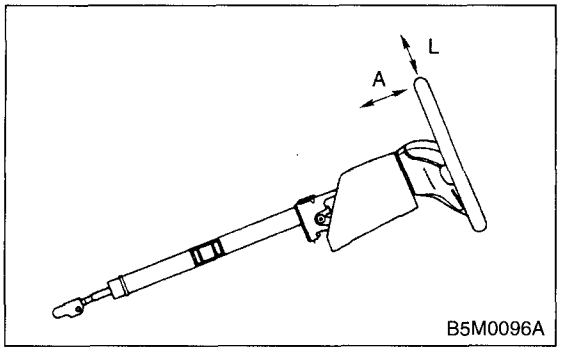
Specifications:

Axial direction play A

Less than 6 mm (0.24 in)

Radial direction play 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)

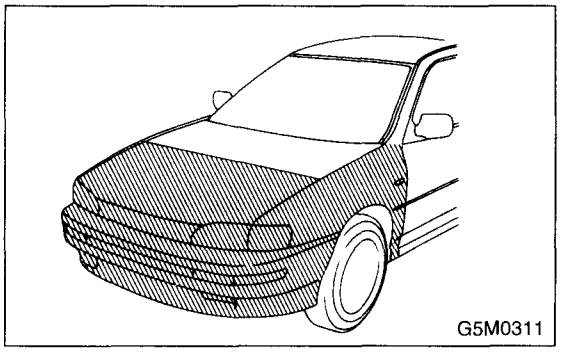
Check for the following, and replace damaged parts with new parts.
- Front seat is damaged or deformed.
- Harness and/or connector is cracked, deformed or open.
- Lead wire is exposed.

4. AIRBAG CONTROL MODULE

Check for the following, and replace the 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:



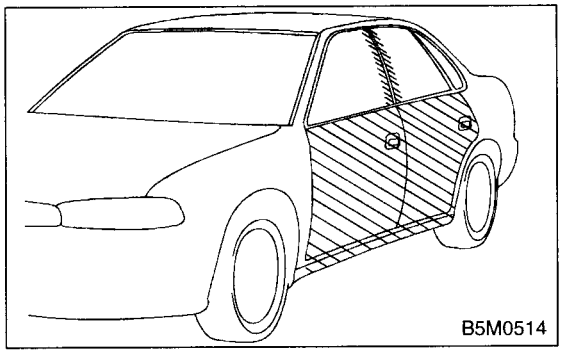
Check for the following, and replace the damaged parts with new parts.
- Front sub sensor is cracked or deformed.
- Mounting bracket is cracked or deformed.
- Connector is scratched or cracked.
- Airbag is deployed.

6. FRONT SUB SENSOR HARNESS

Check for the following, and replace the damaged parts with new parts.
- Harness is open, lead wire is exposed, and corrugated tube is noticeably cracked.
- Connector is scratched or cracked.

7. SIDE AIRBAG SENSOR

If the side section of vehicle as shown in the figure is damaged:



Check for the following, and replace the 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)

8. SIDE AIRBAG SENSOR HARNESS

Check for the following, and replace the damaged parts with new parts.
- Harness is open, lead wire is exposed, and corrugated tube is noticeably cracked.
- Connector is scratched or cracked.

9. MAIN HARNESS

Check for the following, and replace the damaged parts with new parts.
- Harness is open, lead wire is exposed, and corrugated tube is noticeably cracked.
- Connector is scratched or cracked.

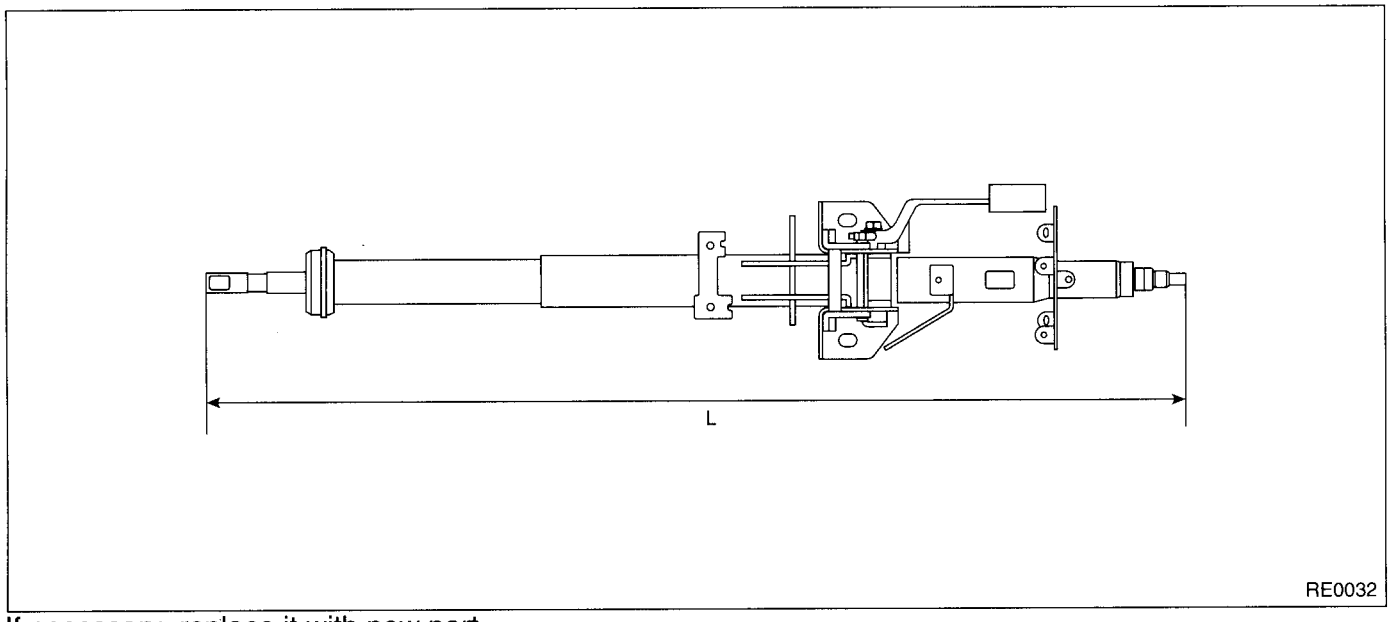
10.ROLL CONNECTOR

Check for the following, and replace the damaged parts with new parts.
- Combination switch or steering roll connector is cracked or deformed.

11.STEERING SHAFT

Check for the following, and replace the damaged parts with new parts.
Overall length of steering column should be within specifications.

Specifications:
Overall length L
825.7±1.5 mm (32.5±0.06 in)



If necessary, replace it with new part.

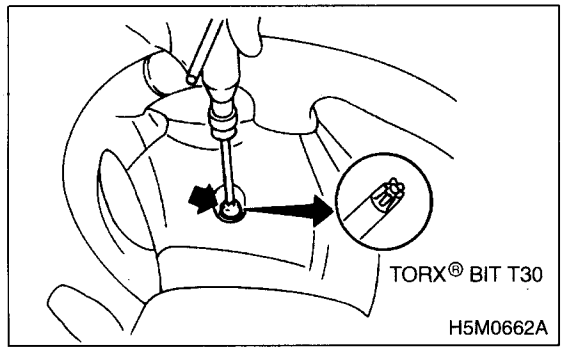
4. Driver's Airbag Module

A: CAUTION

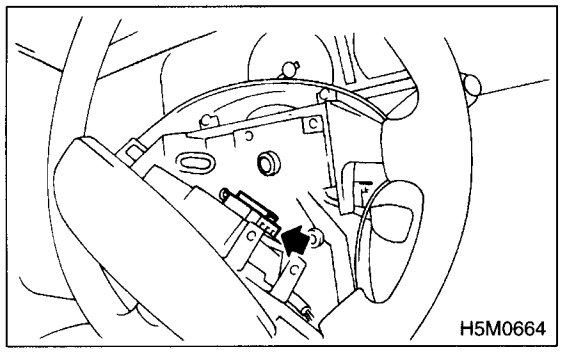
Refer to the "CAUTION" of General Description before handling the airbag module. <Ref. to AB-3, CAUTION, General Description.>

B: REMOVAL

1) Position the front wheels straight ahead. (After moving a 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 OFF.
3) Disconnect the ground terminal from battery, and wait for at least 20 seconds before starting work.
4) Using TORX® BIT T30, remove the two TORX® bolts on the side of steering wheel.



5) Disconnect the airbag connector on the back of airbag module, and then remove the airbag module.



6) Refer to the "CAUTION" for handling of a removed airbag module. <Ref. to AB-3, CAUTION, General Description.>

C: 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.

D: INSPECTION

Check for the following, and replace the damaged parts with new parts.
- Airbag module, harness, connector, and mounting bracket are damaged.

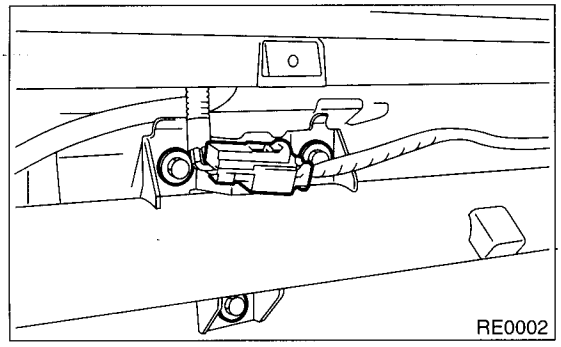
5. Passenger's Airbag Module

A: CAUTION

Refer to the "CAUTION" of General Description before handling the airbag module. <Ref. to AB-3, CAUTION, General Description.>

B: REMOVAL

1) Turn the ignition switch OFF.
2) Disconnect the ground terminal from battery, and wait for at least 20 seconds before starting work.
3) Remove the glove box. <Ref. to EI-39, REMOVAL, Glove Box.>
4) Detach the airbag connector from the support beam bracket, and then disconnect the airbag connector.
5) Remove the three bolts, and then carefully remove the airbag module.



6) Refer to the "CAUTION" for handling of a removed airbag module. <Ref. to AB-3, CAUTION, General Description.>

C: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Do not allow harness and connectors to interfere or get tangled up with other parts.

D: INSPECTION

Check for the following, and replace the damaged parts with new parts.
• Airbag module, harness, connector, and mounting bracket are damaged.

6. Side Airbag Module

A: CAUTION

Refer to the "CAUTION" of General Description before handling the airbag module. <Ref. to AB-3, CAUTION, General Description.>

B: REMOVAL

CAUTION:
• The side airbag module cannot be detached from the front seat assembly.
• When replacing side airbag module, replace front seat assembly.
<Ref. to SE-6, REMOVAL, Front Seat.>

C: INSTALLATION

<Ref. to SE-6, INSTALLATION, Front Seat.>

D: INSPECTION

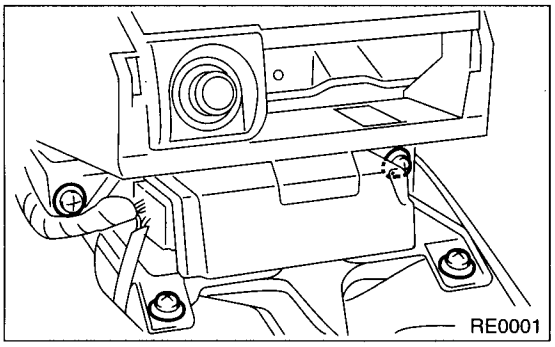
Check for the following, and replace the damaged parts with new parts.
- Front seat is deformed or damaged.
- Harness and/or connector is cracked, deformed or open.
- Lead wire is exposed.

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 OFF.
2) Disconnect the ground terminal from battery, and wait for at least 20 seconds before starting work.
3) Remove the console box. <Ref. to EI-41, REMOVAL, Console Box.>
4) Disconnect the connector from the airbag control module.
5) Using T40® TORX bit (Tamper resistant type), remove the four TORX® bolts.



B: INSTALLATION

CAUTION:
Use new TORX® bolts during re-assembly.
Install in the reverse order of removal.

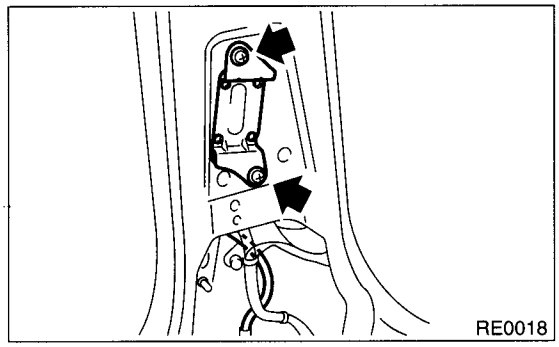
C: INSPECTION

Check for the following, and replace the 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 OFF.
2) Disconnect the ground terminal from battery, and wait for at least 20 seconds before starting work.
3) Remove the outer belt (FRONT). <Ref. to SB-8, OUTER BELT (FRONT), REMOVAL, Front Seat Belt.>
4) Using T30 TORX® bit (Tamper resistant type), remove the two TORX® bolts.
5) Detach the side airbag sensor, and then disconnect the airbag connector.



B: INSTALLATION

CAUTION:
Use new TORX® bolts during re-assembly.
Install in the reverse order of removal.

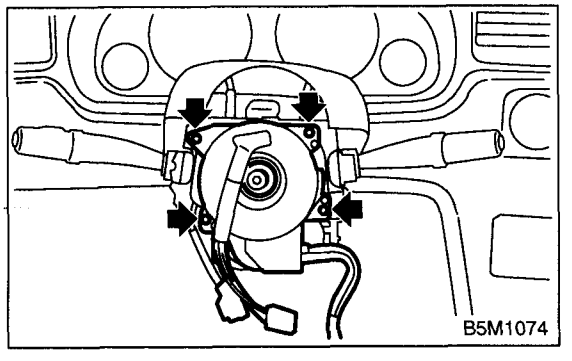
C: INSPECTION

Check for the following, and replace the damaged parts with new parts.
- Bracket connector for side airbag sensor is damaged.

9. Roll Connector

A: REMOVAL

1) Turn the ignition switch OFF.
2) Disconnect the ground terminal from battery, and wait for at least 20 seconds before starting work.
3) Remove the driver's airbag module. <Ref. to AB-12, Driver's Airbag Module.>
4) Remove the steering wheel. <Ref. to PS-19, REMOVAL, Steering Wheel.>
5) Remove the steering column cover.
6) Remove the screws, and then remove the roll connector.



B: INSTALLATION

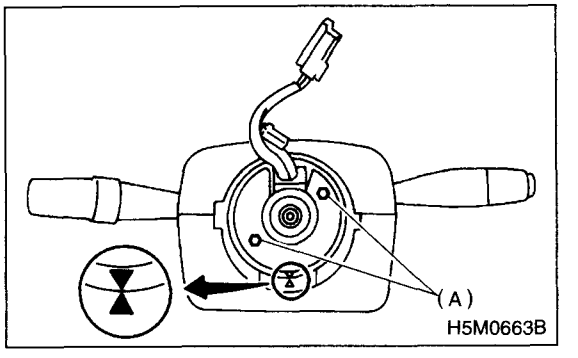
1) Install the roll connector and steering column cover in the reverse order of removal.
2) Before installing steering wheel, be sure the direction of roll connector is adjusted with steering. <Ref. to AB-17, ADJUSTMENT, Roll Connector.>
3) Install the steering wheel and airbag module.

C: INSPECTION

Check for the following, and replace the damaged parts with new parts.
• Combination switch and roll connector is cracked or deformed.

D: ADJUSTMENT

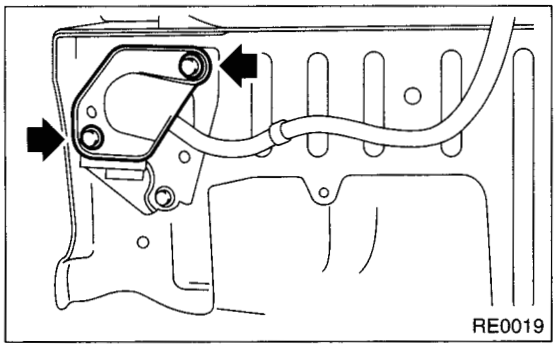
1) Check that front wheels are positioned in straight ahead direction.
2) Turn the roll connector pin (A) clockwise until it stops.
3) Turn the roll connector pin (A) counterclockwise approximately 2.65 turns until "▲" marks are aligned.



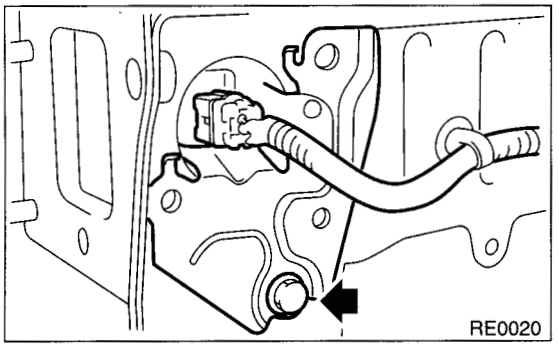
10.Front Sub Sensor

A: REMOVAL

1) Turn the ignition switch OFF.
2) Disconnect the ground cable from the battery, and wait for at least 20 seconds before starting work.
3) Remove the front bumper. <Ref. to EI-23, REMOVAL, Front Bumper.>
4) Loosen the two bolts to remove sensor cover.



5) Remove the bolt, and then detach the front sub sensor.
6) Disconnect the connector from the front sub sensor.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Check for the following, and replace the damaged parts with new parts.
• Front sub sensor, mounting bracket, and connector are damaged.

AIRBAG SYSTEM (DIAGNOSTICS)

AB

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1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	**Read Diagnostic Trouble Code.** <Ref. to AB-24, Read Diagnostic Trouble Code.>	Is the normal code being detected?	Finish the diagnosis.	Go to step **2.**
2	**Read Diagnostic Trouble Code.** <Ref. to AB-24, Read Diagnostic Trouble Code.>	Is the trouble code being detected?	Go to step **3.**	Go to "Airbag Warning Light Failure".<Ref. to AB-27, Airbag Warning Light Failure.>
3	**Perform the diagnosis.** 1)Judge the possible cause from "List of Diagnostic Trouble Code" <Ref. to AB-32, List of Diagnostic Trouble Code.> . 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-26, Clear Memory Mode.> 5)Perform the inspection mode. <Ref. to AB-25, Inspection Mode.> 6)Read diagnostic trouble code.	Is the trouble code being detected?	Perform the procedure 1) to 5) in step 3.	Finish the diagnosis.

2. Check List for Interview

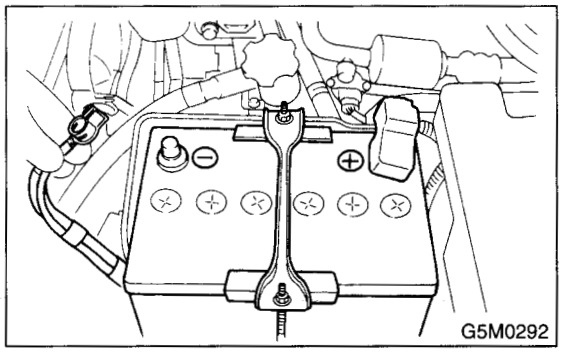
A: CHECK

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:)		

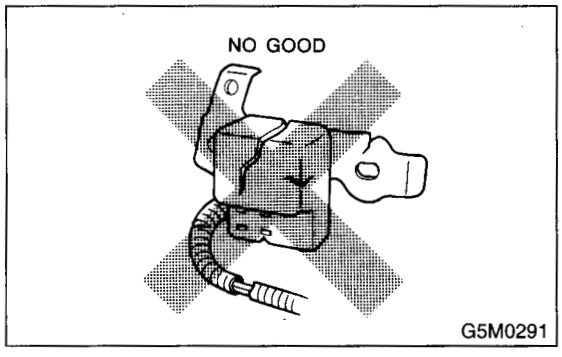
3. General Description

A: CAUTION

• When servicing a vehicle, be sure to turn the ignition switch OFF, disconnect the ground terminal from the 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 terminal is disconnected, it may inflate.

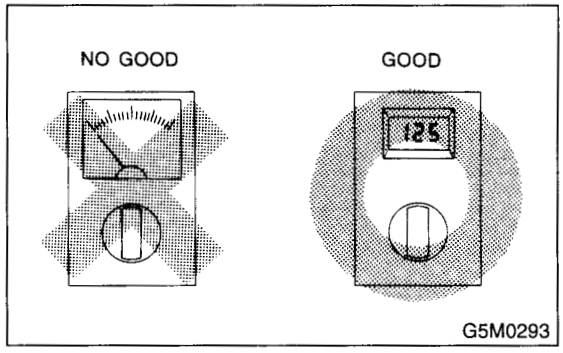


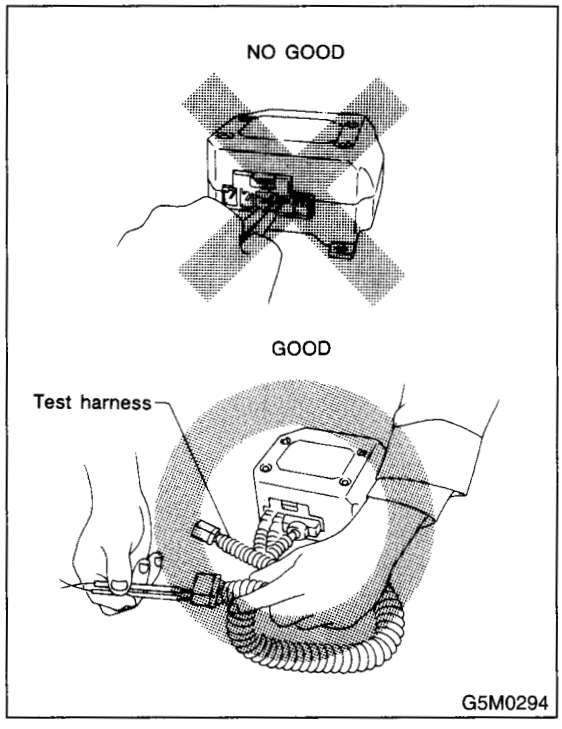
• If the sensors, airbag module, airbag control module pretensioner and harness are deformed or damaged, replace them with new genuine parts.



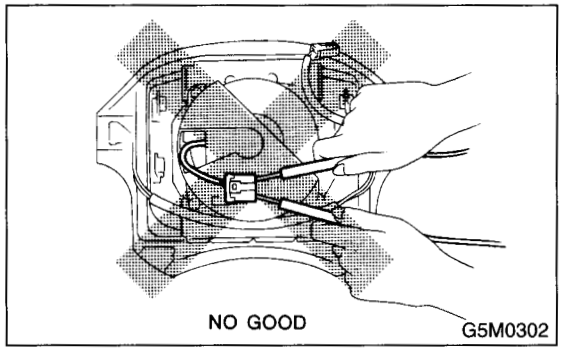
• Do not use the airbag system and pretensioners on other vehicles. When replacing parts, be sure to replace them with new parts.
• Never re-use a deployed airbag and pretensioner.
• When checking the system, be sure to use a digital circuit tester.
Use of an analog circuit tester may cause the airbag to activate erroneously.

• When checking, use a test harness. Do not directly apply the tester probe to any connector terminal of the airbag.

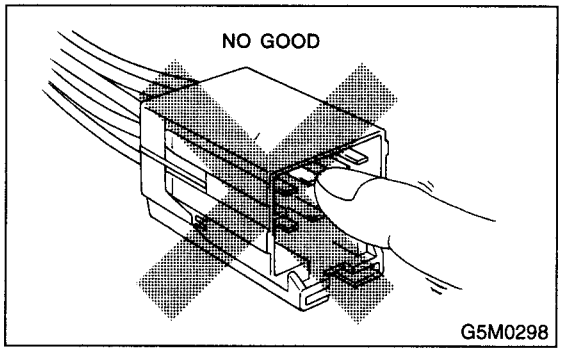




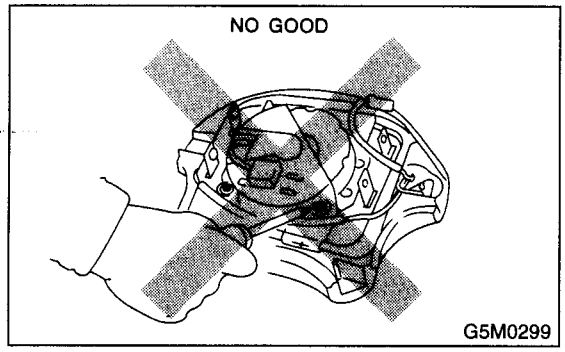
• Do not check continuity of the driver, passenger, side airbag modules and pretensioner.



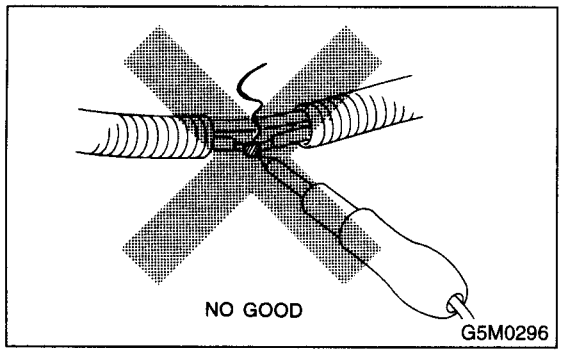
• Do not allow water or oil to come in contact with the connector terminals. Do not touch the connector terminals.



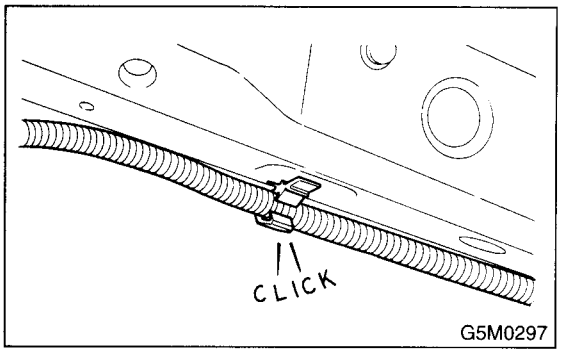
• The airbag module (driver, passenger, side) and pretensioner must not be disassembled.



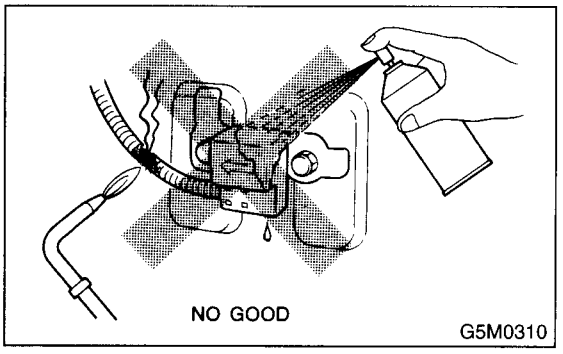
• If any damage, opening or rust is found on the airbag system wire harness, do not attempt to repair using soldering equipment. Be sure to replace the faulty harness with a new genuine part.



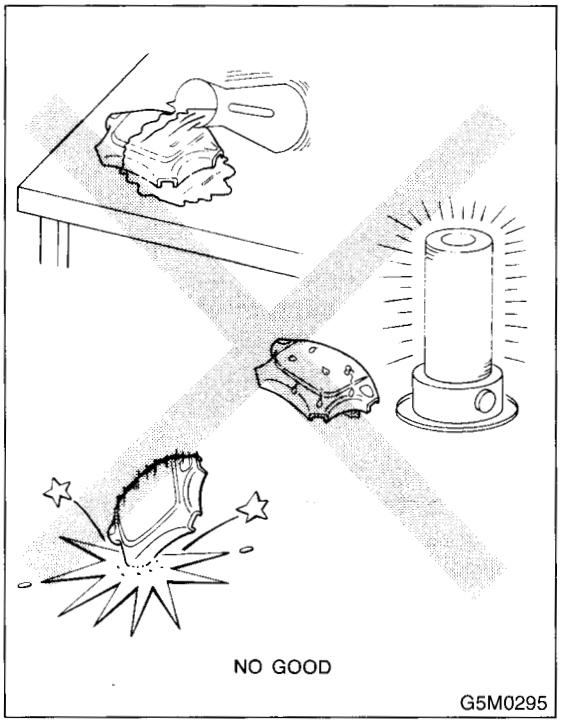
• Install the wire harness securely with the specified clips to avoid interference or tangled up with other parts.



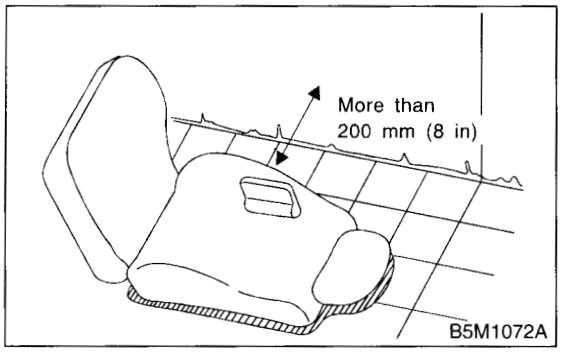
• When painting or performing sheet metal work on the front part of the vehicle, including the front wheel apron, front fender, and front side frame, remove the front sub sensors and wire harness of the airbag system.
• When painting or performing sheet metal work on the side of the vehicle, including the side sill, center pillar, and front and rear doors, remove the side airbag sensors and wire harness of the airbag system.



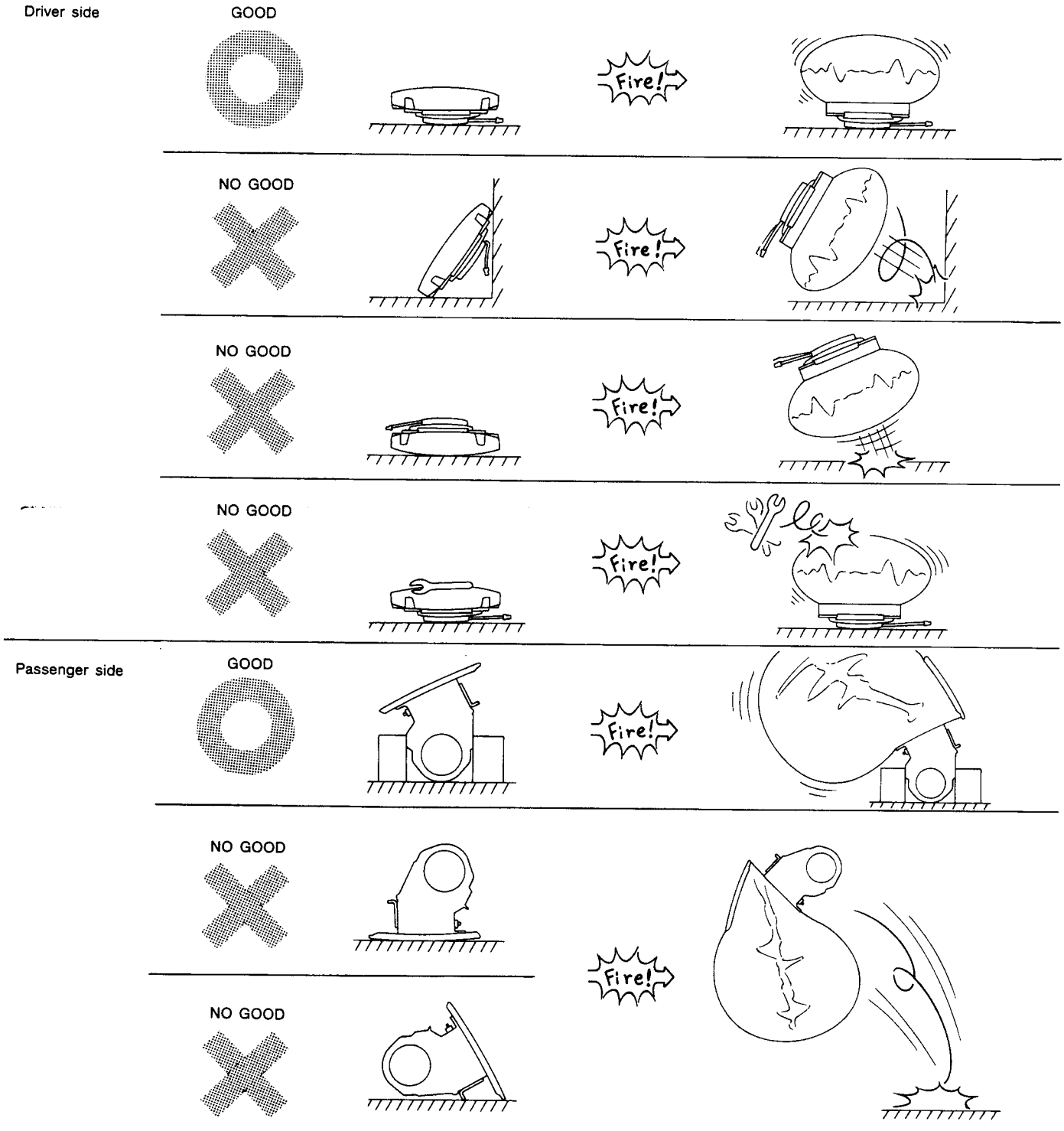
• Do not drop the airbag modulator parts, subject them to high temperature over 93°C (199°F), or let water, oil, or grease get on them; otherwise, the internal parts may be damaged and reliability greatly lowered.



• The removed front seat with the airbag module must be kept at least 200 mm (8 in) away from walls and other objects.



• 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.


Driver side
GOOD
Fire!
NO GOOD
Fire!
NO GOOD
Fire!
NO GOOD
Fire!
Passenger side
GOOD
Fire!
NO GOOD
Fire!
NO GOOD

G5M0604

• 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.

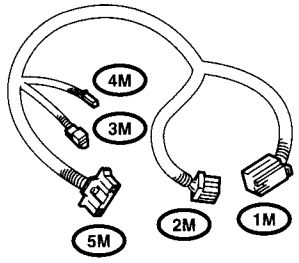
Standard voltage: 12V

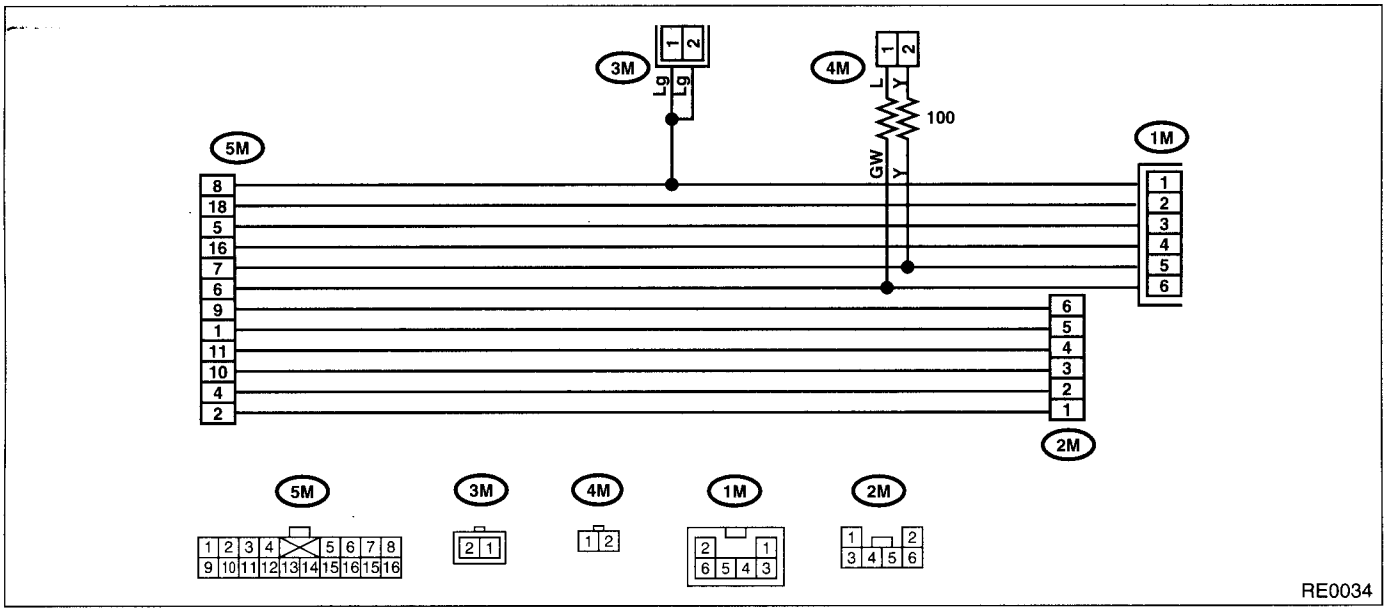
Specific gravity: Above 1.260

C: PREPARATION TOOL

1. SPECIAL TOOLS

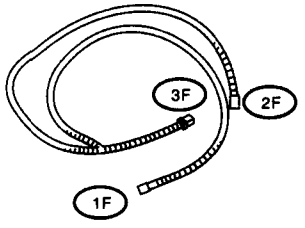
• TEST HARNESS M

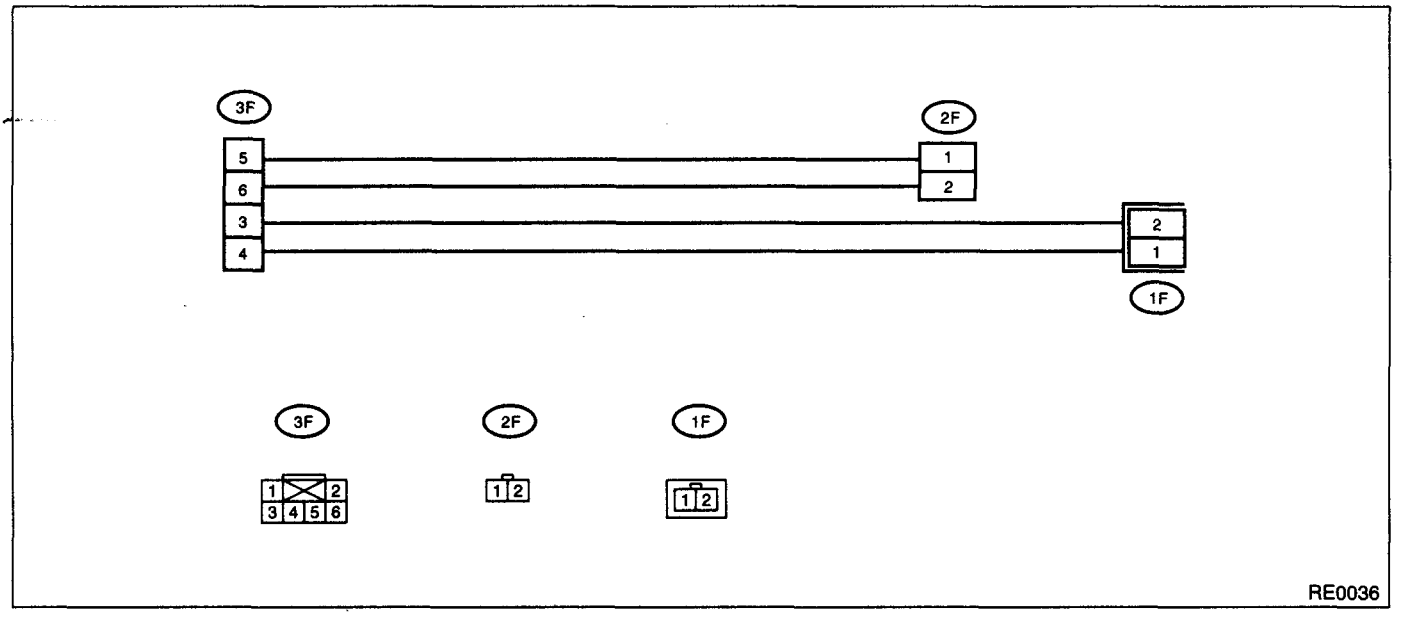
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 RE0033	98299FE020	TEST HARNESS M	Used when measuring voltage, resistance of air-bag system.



RE0034

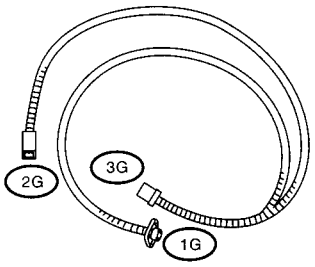
• TEST HARNESS F

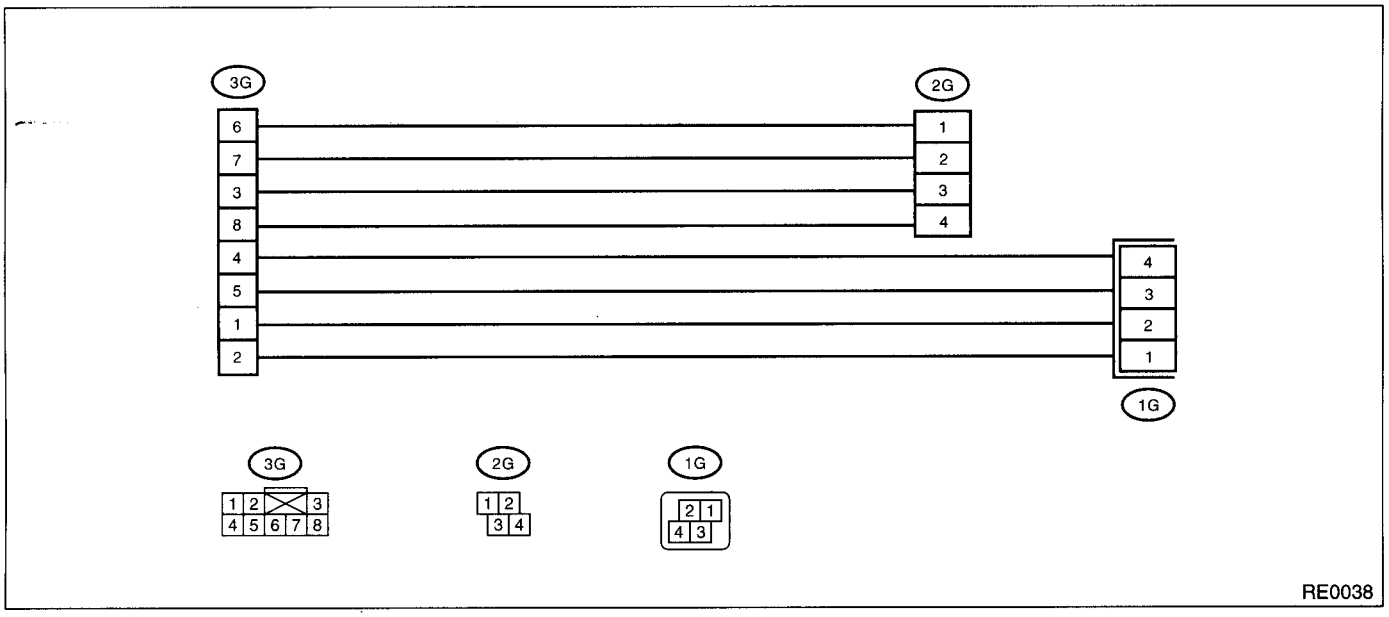
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 RE0035	98299FC010	TEST HARNESS F	Used when measuring voltage, resistance of air-bag module harnesses.



RE0036

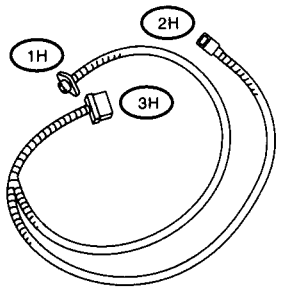
• TEST HARNESS G

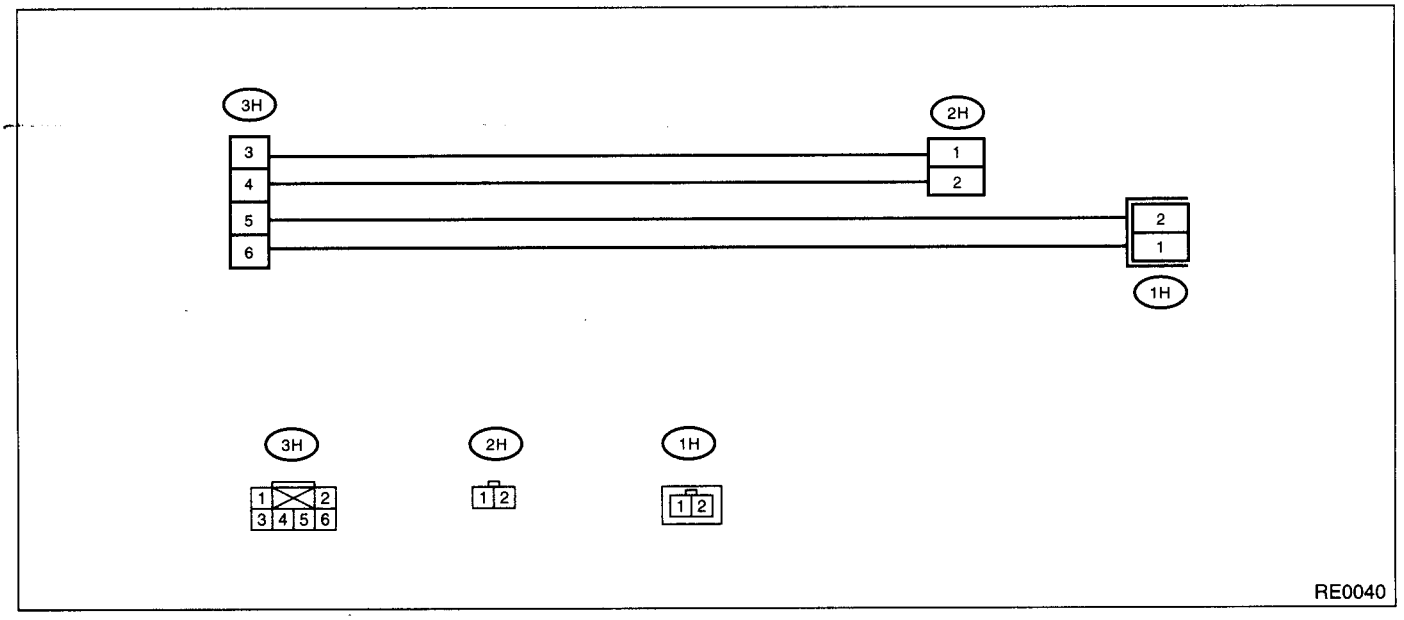
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 RE0037	98299FC020	TEST HARNESS G	Used when measuring voltage, resistance of side airbag sensor.



RE0038

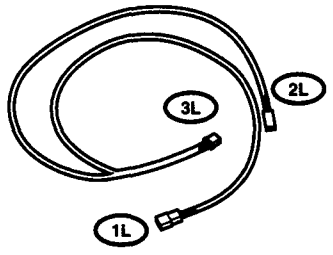
• TEST HARNESS H

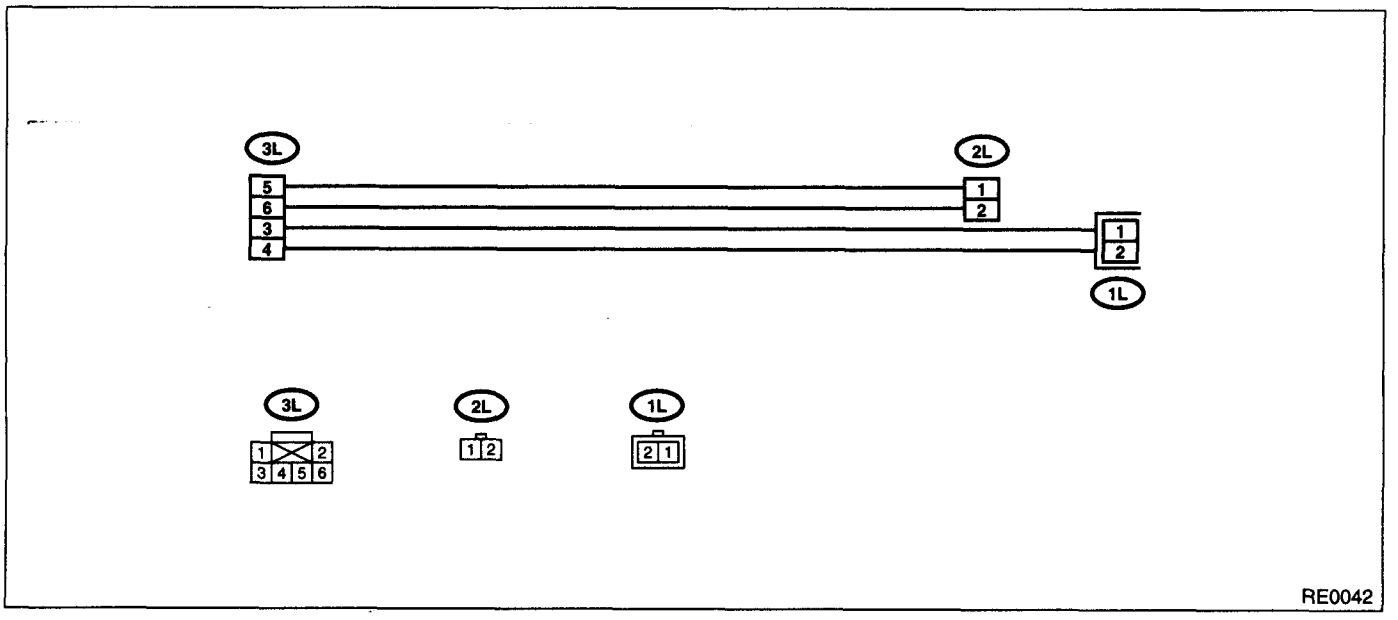
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 RE0039	98299FA030	TEST HARNESS H	Used when measuring voltage, resistance of front sub-sensor.



RE0040

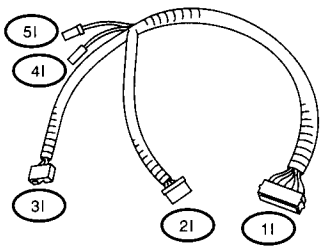
• TEST HARNESS L

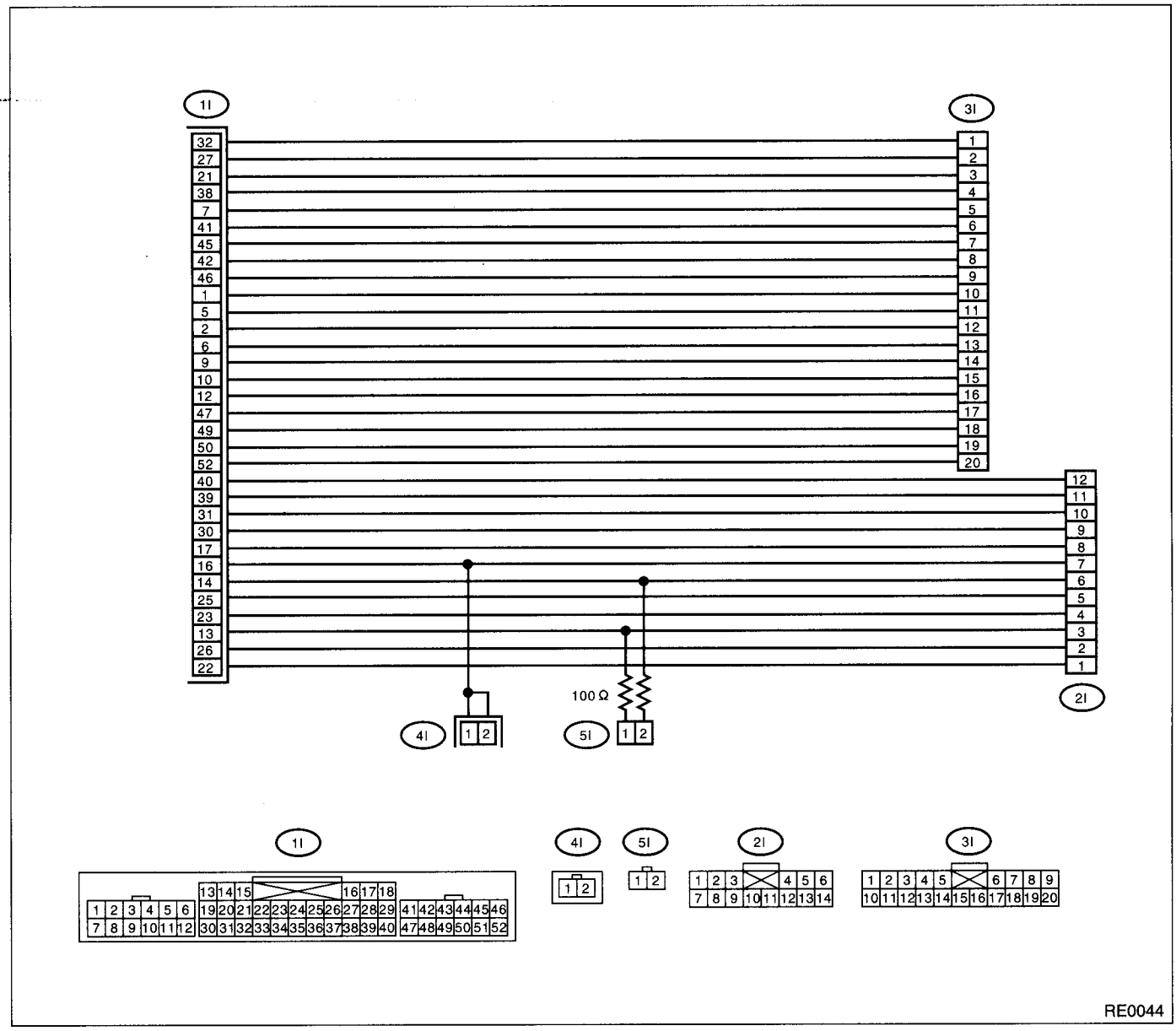
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 RE0041	98299FE000	TEST HARNESS L	Used when measuring voltage, resistance of seat belt pretensioner.



RE0042

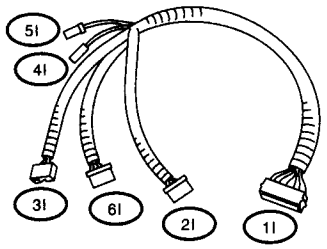
• TEST HARNESS I

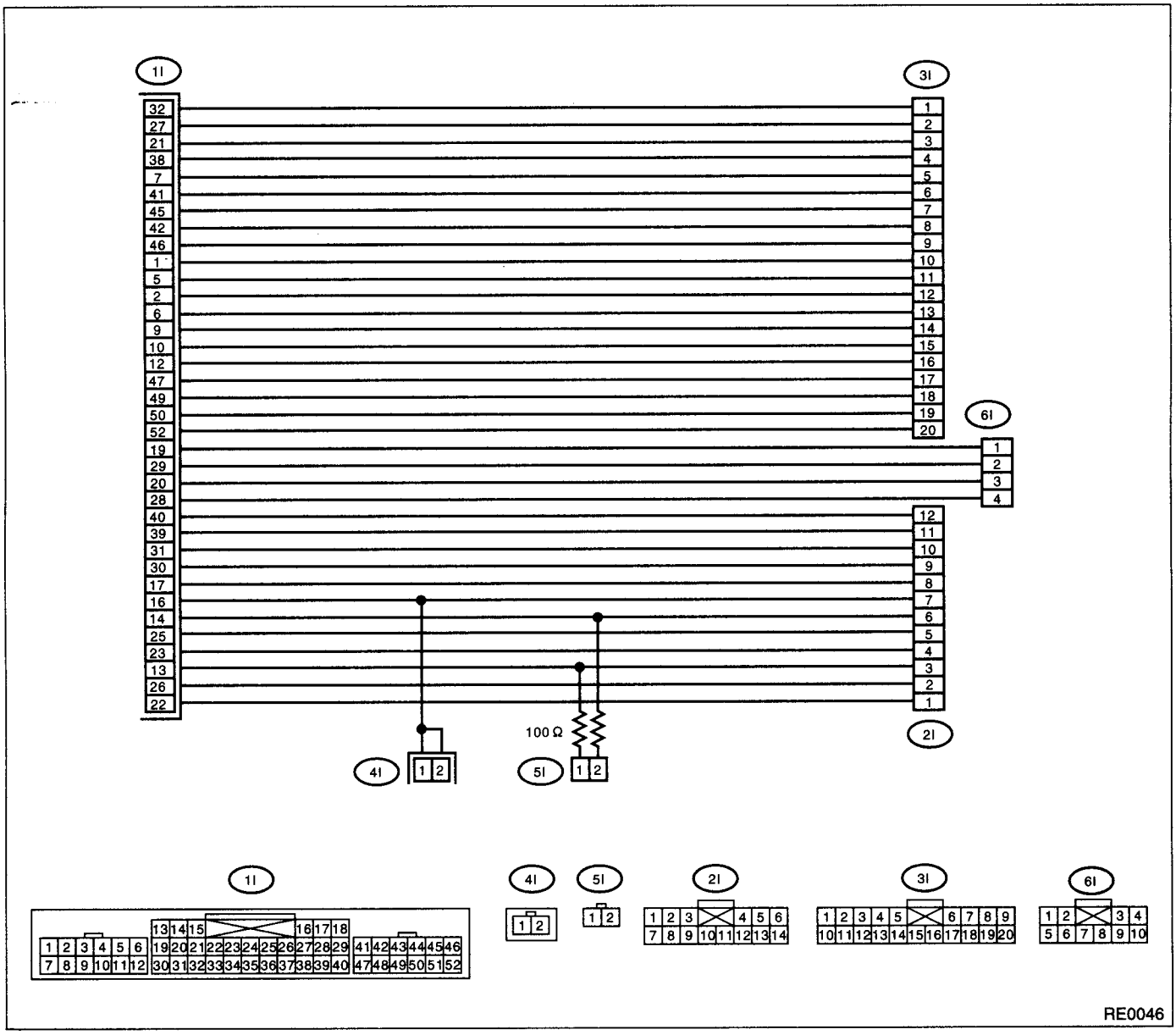
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 RE0043	98299FC040	TEST HARNESS I	Used when measuring voltage, resistance of air-bag control module.



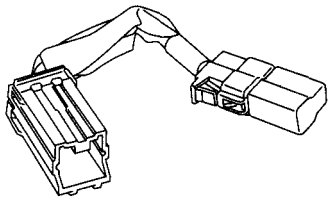
RE0044

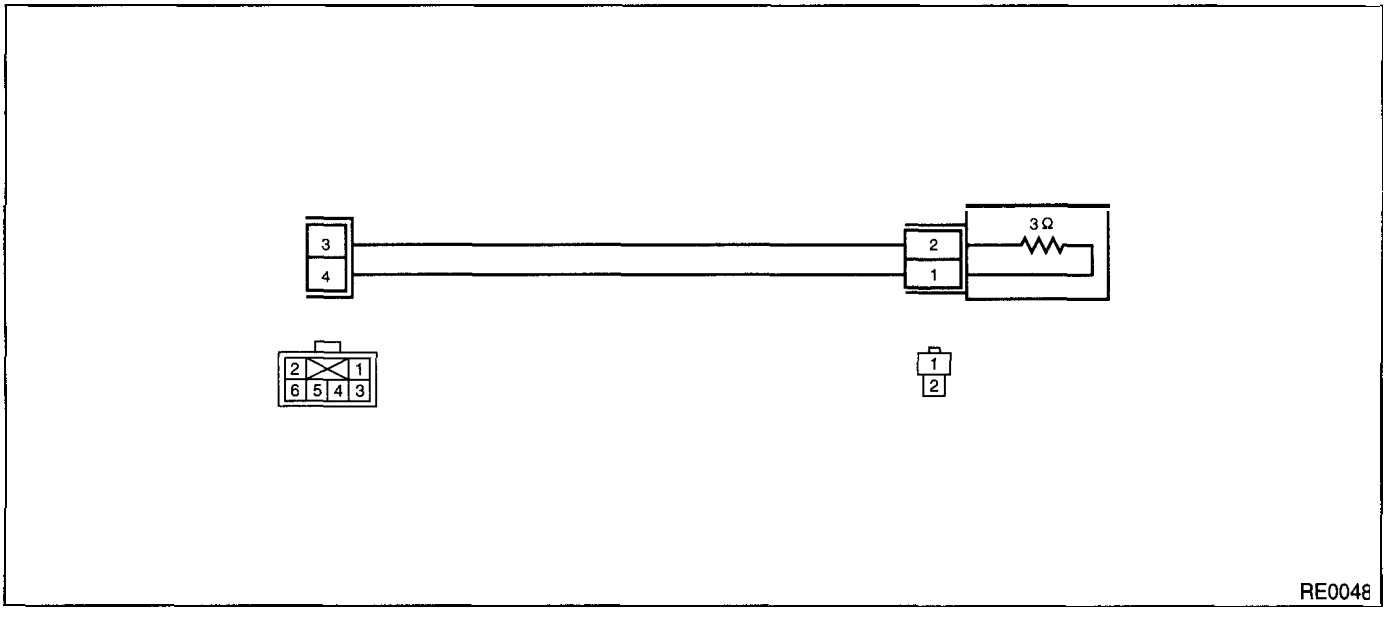
• TEST HARNESS I2

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 RE0045	98299FC041	TEST HARNESS I2	Used when measuring voltage, resistance of air-bag control module.



• AIRBAG RESISTOR

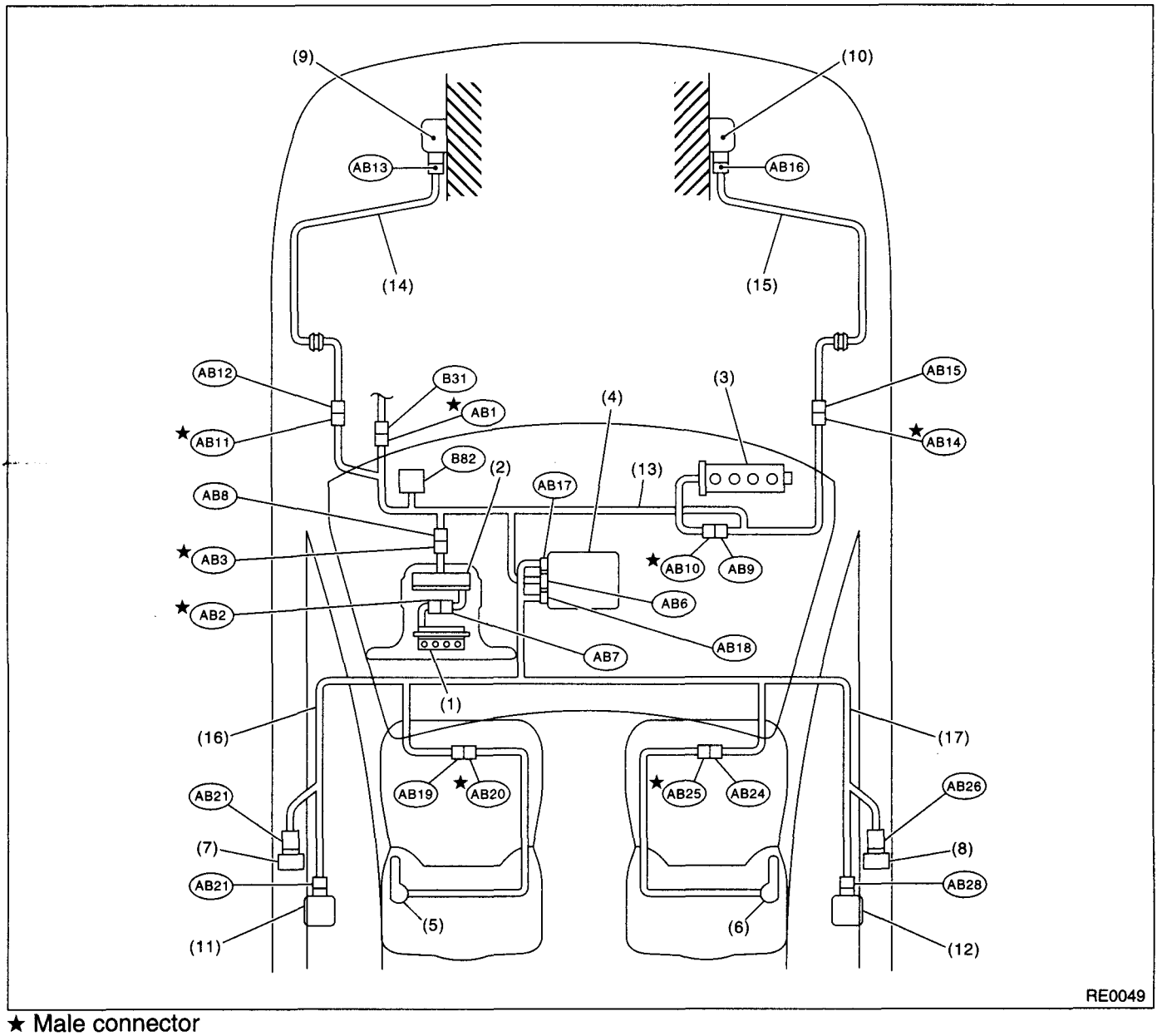
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 RE0047	98299PA040	AIRBAG RESISTOR	Used in replacement of airbag module which resistance value is same as airbag module.



RE0048

4. Electrical Components Location

A: LOCATION



★ Male connector

Connector No.	(AB1)	(AB2)	(AB3)	(AB6)	(AB7)	(AB8)	(AB9)	(AB10)	(AB11)	(AB12)	(AB13)	(AB14)
Pole	6	2	2	28	2	2	2	2	2	2	2	2
Color	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Blue	Blue	Yellow	Blue
Connector No.	(AB15)	(AB16)	(AB17)	(AB18)	(AB19)	(AB20)	(AB21)	(AB23)	(AB24)	(AB25)	(AB26)	(AB28)
Pole	2	2	12	12	2	2	2	4	2	2	2	4
Color	Blue	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow

(1) Driver's airbag module
(2) Roll connector
(3) Passenger's airbag module
(4) Airbag control module
(5) Side airbag module (LH)
(6) Side airbag module (RH)
(7) Seat belt pretensioner (LH)
(8) Seat belt pretensioner (RH)
(9) Front sub-sensor (LH)
(10) Front sub-sensor (RH)
(11) Side airbag sensor (LH)
(12) Side airbag sensor (RH)
(13) Airbag main harness
(14) Front sub-sensor harness (LH)
(15) Front sub-sensor harness (RH)
(16) Side airbag harness (LH)
(17) Side airbag harness (RH)

5. A/B Control Module I/O Signal

A: SCHEMATIC

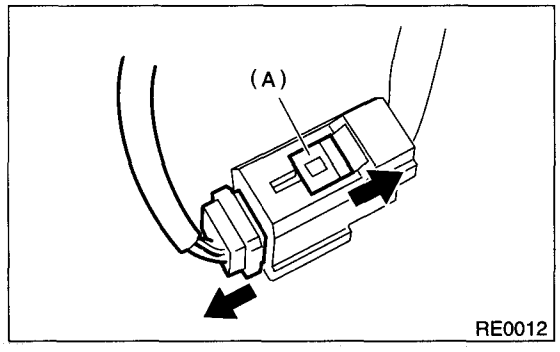
<Ref. to WI-31, Airbag System.>

6. Airbag Connector

A: OPERATION

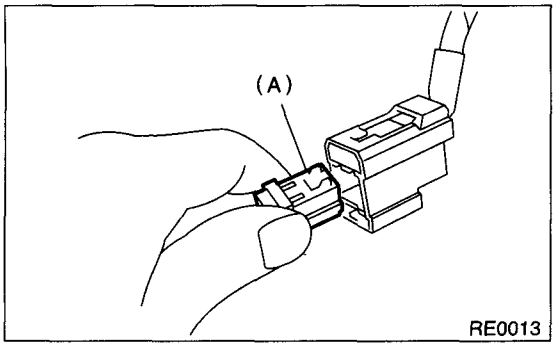
1. POWER SUPPLY

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.

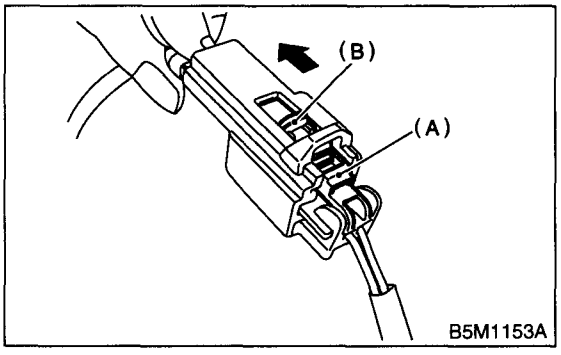
2) How to connect:
Holding the connector (A), and push it in carefully until a connecting sound is heard.



CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

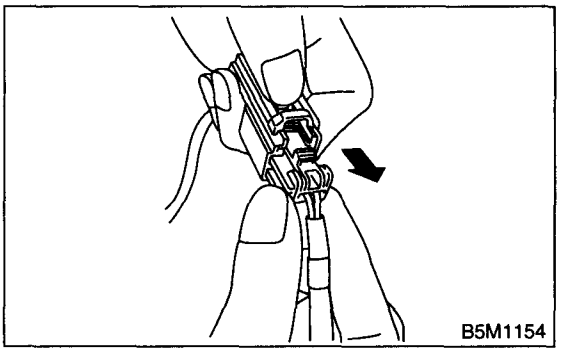
2. DRIVER'S AIRBAG, PASSENGER'S AIRBAG, AND SIDE AIRBAG

1) How to disconnect:
(1) Push the lock arm (A).
(2) With lock arm (A) pushed in, move the slide lock (B) in the direction of the arrow.



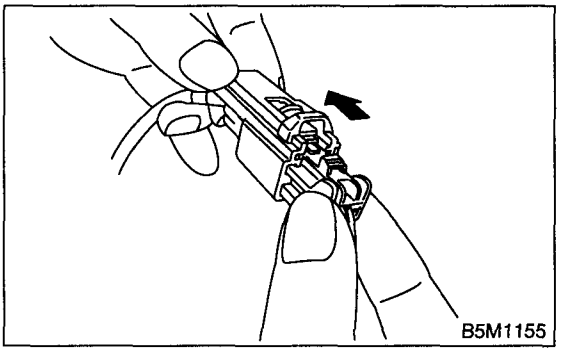
(3) With slide lock (B) pulled, remove the lock arm (A) to its original position, and then pull in the direction of the arrow and separate the connector.

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.

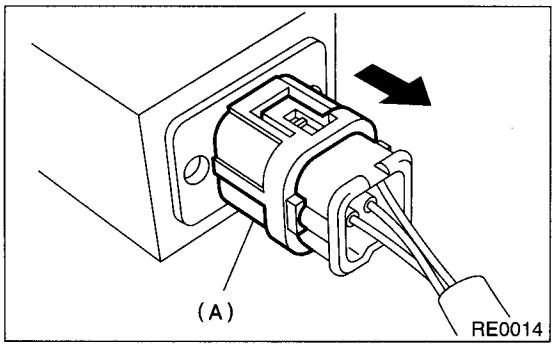
CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.



3. FRONT SUB-SENSOR, SIDE AIRBAG SENSOR

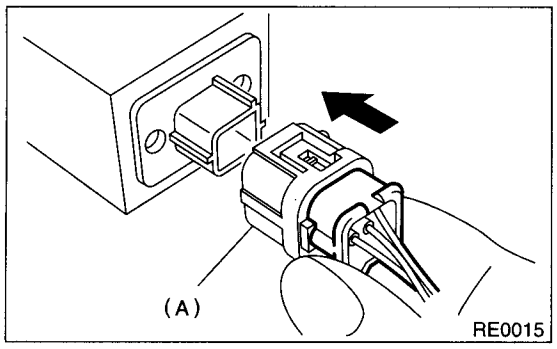
1) How to disconnect:
(1) Holding the outer part (A), pull it in the direction of the arrow.

CAUTION:
When pulling, be sure to hold onto the connector and not the wire.



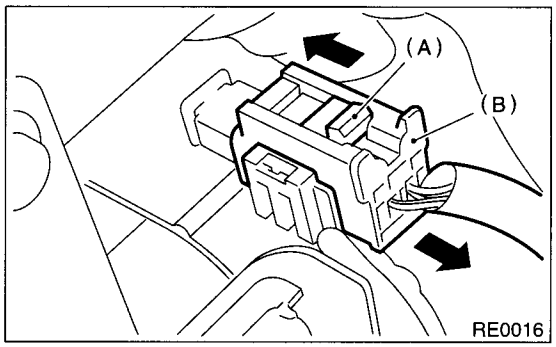
2) How to connect:
Holding the connector, and push it in carefully until a connecting sound is heard.

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.**



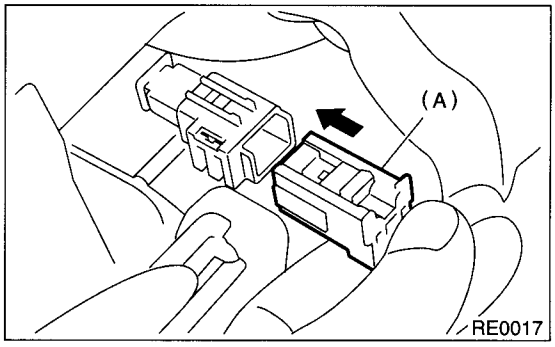
4. PRETENSIONER

1) How to disconnect:
(1) Move the slide lock (A) in the direction of the arrow.
(2) Pull the connector (B) 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.

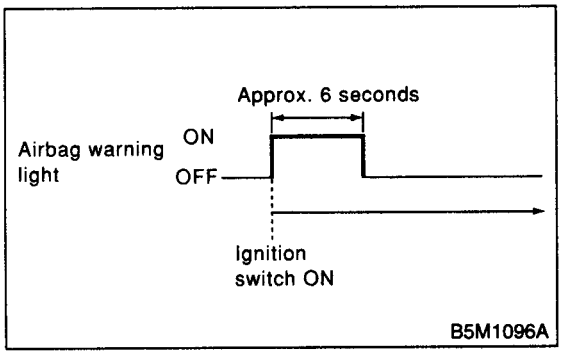


CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

7. Airbag Warning Light Illumination Pattern

A: INSPECTION

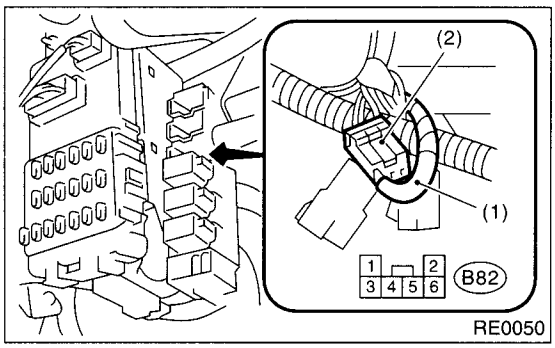
Keep the ignition switch ON, and confirm that the airbag warning light remains off approximately 6 seconds after being turned on.



8. Read Diagnostic Trouble Code

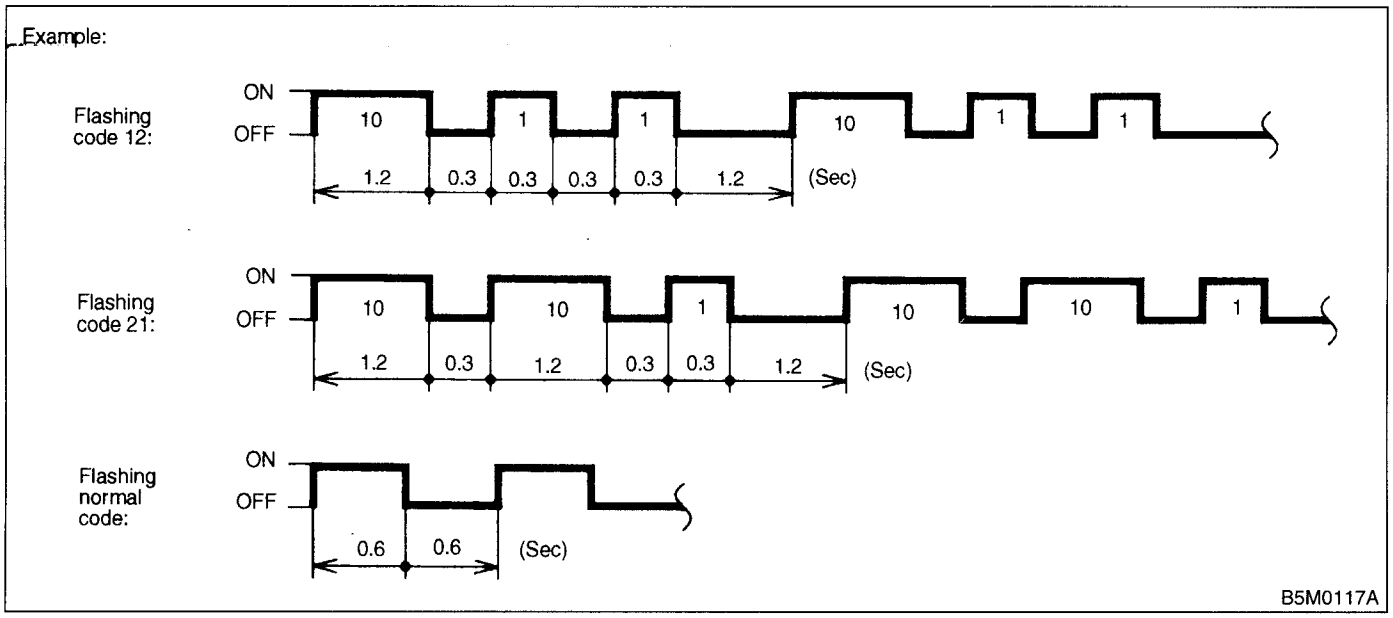
A: OPERATION

1) Turn the ignition switch ON.
2) Connect the diagnosis terminal (1) to the diagnosis connector (2) terminal No. 1 in the driver's seat lower cover area.



3) Read trouble code by identifying the way the air bag 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-32, List of Diagnostic Trouble Code.>
- "Airbag Warning Light Failure" <Ref. to AB-27, Airbag Warning Light Failure.>



4) Turn the ignition switch OFF, and disconnect the diagnosis terminal from the diagnosis connector terminal No 1.
5) Wind the tape around the diagnosis terminal and return it to its original position.

9. Inspection Mode

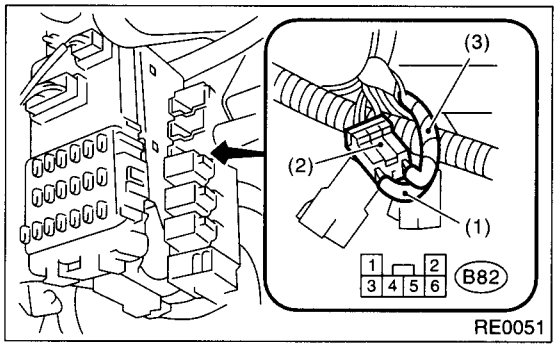
A: OPERATION

According to the contents of check list, reproduce the condition which problem has occurred as much as possible.

10.Clear Memory Mode

A: OPERATION

1) Turn the ignition switch ON.
2) Connect the diagnosis terminal (1) to the diagnosis connector (2) terminal No. 1 in the driver's seat lower cover area.



3) While the warning light flashes, connect another diagnosis terminal (3) to the 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 the tape around the diagnosis terminal and return it to its original position.

11.Airbag Warning Light Failure

A: AIRBAG WARNING LIGHT REMAINS ON.

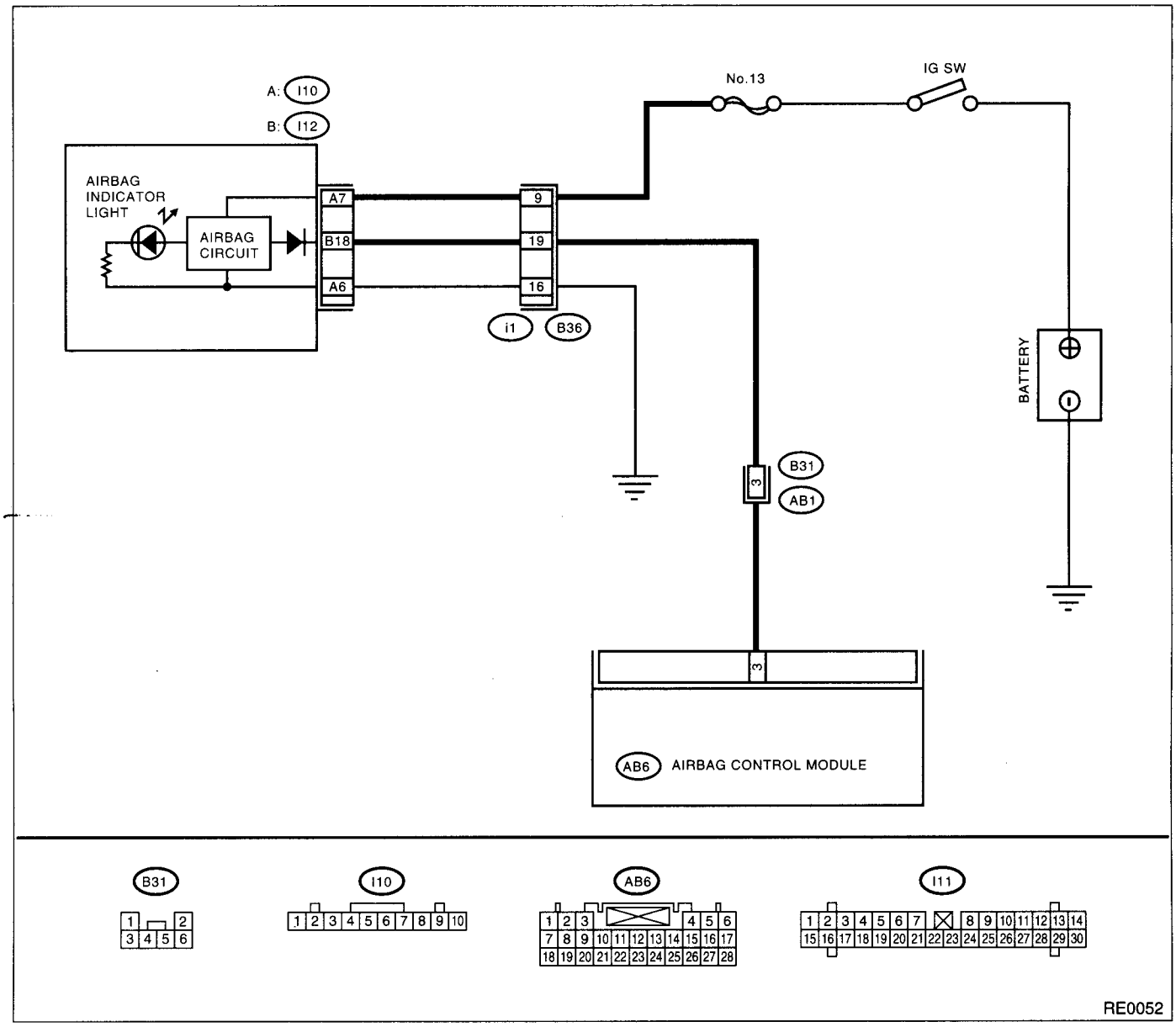
DIAGNOSIS:

- 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.
- (AB6) is not connected properly to airbag control module.

CAUTION:

- **Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground terminal from the battery, and wait more than 20 seconds before starting to work.**
- **Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.**
- **When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.**

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK POOR CONTACT IN CONNECTORS (AB1) AND (B31).** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, 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)?	Repair the body harness or replace the body harness with airbag main harness.	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK AIRBAG WARNING LIGHT.** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Connect the connector (1M) in the test harness M to the body harness connector (B31). 3)Connect the battery ground terminal and turn the ignition switch ON. 4)Connect two connectors, (3M) and (4M) in the test harness M.	Is the airbag warning light turned off?	Go to step **4.**	Go to step **3.**
3	**CHECK BODY HARNESS.** Check the body harness. NOTE: After problem has been eliminated, disconnect connectors (3M) and (4M).	Is the anything unusual to body harness?	Repair the body harness.	Replace combination meter printed circuit. <Ref. to IDI-11, Combination Meter Assembly.>
4	**CHECK POOR CONTACT.** Confirm that the firm contact is secured between the airbag control module and the connector (AB6). <Ref. to AB-15, Airbag Control Module.>	Is the poor contact in connector (AB6)?	Replace the body harness with airbag main harness or replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Go to step **5.**
5	**CHECK AIRBAG MAIN HARNESS.** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Connect the connector (AB1) to (B31). 3)Disconnect the connectors (AB3) and (AB8). 4)Remove the glove box and disconnect the connectors (AB10) and (AB9). 5)Disconnect the connector (AB6) from the airbag control module, and connect the connector (1I) in the test harness I or I2. <Ref. to AB-15, Airbag Control Module.> 6)Connect the battery ground terminal and turn the ignition switch ON. 7)Connect the connectors (4I) and (5I) in the test harness I or I2. NOTE: After problem has been eliminated, disconnect connectors (4I) and (5I).	Is the airbag warning light turned off?	Go to step **6.**	Replace the body harness with airbag main harness.
6	**CHECK GROUNDING CIRCUIT.** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the connector (AB6) from the airbag control module. 3)Connect the connector (1I) in the test harness I or I2 to body harness connector (AB6). 4)Measure the resistance between connector (2I) in the test harness I or I2 and the chassis ground. ***Connector & terminal*** ***(2I) No. 9 — Chassis ground:*** ***(2I) No. 10 — Chassis ground:***	Is the resistance less than 10 Ω?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Repair body-grounding circuit.

B: AIRBAG WARNING LIGHT REMAINS OFF.

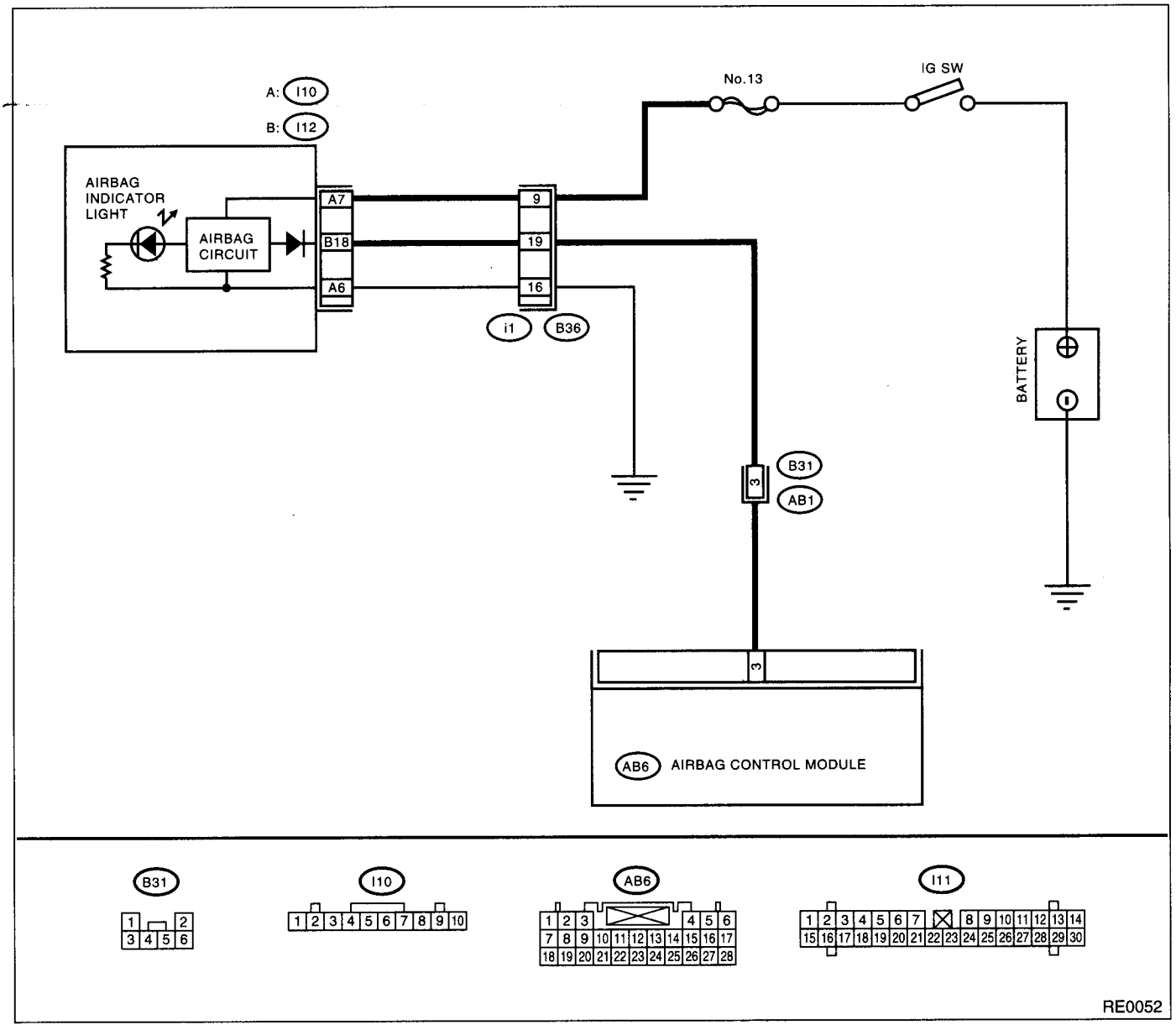
DIAGNOSIS:

- Fuse No. 13 (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 OFF, disconnect the ground terminal from the battery, and wait more than 20 seconds before starting to work.**
- **Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.**
- **When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.**

WIRING DIAGRAM:



AIRBAG WARNING LIGHT FAILURE

	Step	Check	Yes	No
1	**CHECK COMBINATION METER.** Turn the ignition switch ON, and confirm that warning lights equipped in the combination meter are turned on.	Do warning lights not for the airbag turn on?	Go to step **2.**	Repair the combination meter power supply. <Ref. to IDI-4, Combination Meter System.>
2	**CHECK FUSE NO. 13 (IN MAIN FUSE BOX).** Remove the fuse No. 13 and perform visual inspection.	Is the fuse No. 13 (in main fuse box) blown?	Replace the fuse No. 13. If the fuse No. 13 blows again, go to step 3.	Go to step **3.**
3	**CHECK AIRBAG WARNING LIGHT CIRCUIT (IN COMBINATION METER).** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the connector (AB1) from (B31). 3)Connect the battery ground terminal and turn the ignition switch ON.	Is the airbag warning light turned on?	Go to step **4.**	Replace the airbag warning light bulb or combination meter printed circuit. <Ref. to IDI-11, Combination Meter Assembly.>
4	**CHECK AIRBAG MAIN HARNESS.** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Connect the connector (AB1) to (B31). 3)Disconnect the connector (AB6) from the airbag control module. <Ref. to AB-15, Airbag Control Module.> 4)Connect the battery ground terminal and turn the ignition switch ON.	Is the airbag warning light turned on?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Replace the body harness with airbag main harness.

12. List of Diagnostic Trouble Code

A: LIST

Trouble code/ Contents of troubles	Memory function	Contents of diagnosis	Index No.
11	Provided.	• Airbag main harness circuit 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-36, TROUBLE CODE 11, Diagnostic Chart with Trouble Code.>
12	Provided.	• Airbag main harness circuit 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-38, TROUBLE CODE 12, Diagnostic Chart with Trouble Code.>
15	Provided.	• Airbag main harness circuit (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-40, TROUBLE CODE 15, Diagnostic Chart with Trouble Code.>
16	Provided.	• Airbag main harness circuit (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-42, TROUBLE CODE 16, Diagnostic Chart with Trouble Code.>
21	Provided.	Airbag control module is faulty.	<Ref. to AB-43, TROUBLE CODE 21, Diagnostic Chart with Trouble Code.>
22	Provided.	Front airbag module and seat belt pretensioner (LH/RH) are inflated.	<Ref. to AB-44, TROUBLE CODE 22, Diagnostic Chart with Trouble Code.>
23	Not provided.	(AB6), (AB17) and (AB18) are not connected properly to airbag control module.	<Ref. to AB-44, TROUBLE CODE 23, Diagnostic Chart with Trouble Code.>
24	Not provided.	• Airbag control module is faulty. • Airbag main harness circuit is open. • Fuse No. 11 (in joint box) is blown. • Body harness circuit is open.	<Ref. to AB-46, TROUBLE CODE 24, Diagnostic Chart with Trouble Code.>
25	Provided.	• Airbag control module is faulty. • Airbag main harness circuit is open. • Fuse No. 6 (in joint box) is blown. • Body harness circuit is open.	<Ref. to AB-48, TROUBLE CODE 25, Diagnostic Chart with Trouble Code.>
31	Provided.	• Front sub-sensor harness (RH) circuit is shorted. • Front sub-sensor harness (RH) circuit is open. • Front sub-sensor (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB-50, TROUBLE CODE 31, Diagnostic Chart with Trouble Code.>

Trouble code/ Contents of troubles	Memory function	Contents of diagnosis	Index No.
32	Provided.	• Front sub-sensor harness (LH) circuit is shorted. • Front sub-sensor harness (LH) circuit is open. • Front sub-sensor (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB-54, TROUBLE CODE 32, Diagnostic Chart with Trouble Code.>
41	Provided.	• Side airbag harness (RH) is faulty. • Side airbag module (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB-58, TROUBLE CODE 41, Diagnostic Chart with Trouble Code.>
42	Provided.	• Side airbag harness (LH) is faulty. • Side airbag module (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB-60, TROUBLE CODE 42, Diagnostic Chart with Trouble Code.>
45	Provided.	• Side airbag harness (RH) is shorted to power supply. • Airbag control module is faulty.	<Ref. to AB-62, TROUBLE CODE 45, Diagnostic Chart with Trouble Code.>
46	Provided.	• Side airbag harness (LH) is shorted to power supply. • Airbag control module is faulty.	<Ref. to AB-64, TROUBLE CODE 46, Diagnostic Chart with Trouble Code.>
51	Provided.	• Side airbag sensor (RH) is faulty. • Side airbag harness (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB-66, TROUBLE CODE 51, Diagnostic Chart with Trouble Code.>
52	Provided.	• Side airbag sensor (LH) is faulty. • Side airbag harness (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB-68, TROUBLE CODE 52, Diagnostic Chart with Trouble Code.>
53	Provided.	Side airbag sensor (RH) is faulty.	<Ref. to AB-69, TROUBLE CODE 53, Diagnostic Chart with Trouble Code.>
54	Provided.	Side airbag sensor (LH) is faulty.	<Ref. to AB-69, TROUBLE CODE 54, Diagnostic Chart with Trouble Code.>
55	Provided.	Side airbag module is inflated.	<Ref. to AB-70, TROUBLE CODE 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. • Pretensioner harness is faulty.	<Ref. to AB-72, TROUBLE CODE 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. • Pretensioner harness is faulty.	<Ref. to AB-74, Trouble Code 62, Diagnostic Chart with Trouble Code.>
65	Provided.	• Seat belt pretensioner (RH) circuit is shorted to power supply. • Pretensioner is faulty. • Pretensioner harness is faulty. • Airbag control module is faulty.	<Ref. to AB-76, TROUBLE CODE 65, Diagnostic Chart with Trouble Code.>

Trouble code/ Contents of troubles	Memory function	Contents of diagnosis	Index No.
66	Provided.	• Seat belt pretensioner (LH) circuit is shorted to power supply. • Pretensioner is faulty. • Pretensioner harness is faulty. • Airbag control module is faulty.	<Ref. to AB-78, TROUBLE CODE 66, Diagnostic Chart with Trouble Code.>

13.Diagnostic Chart with Trouble Code

A: TROUBLE CODE 11

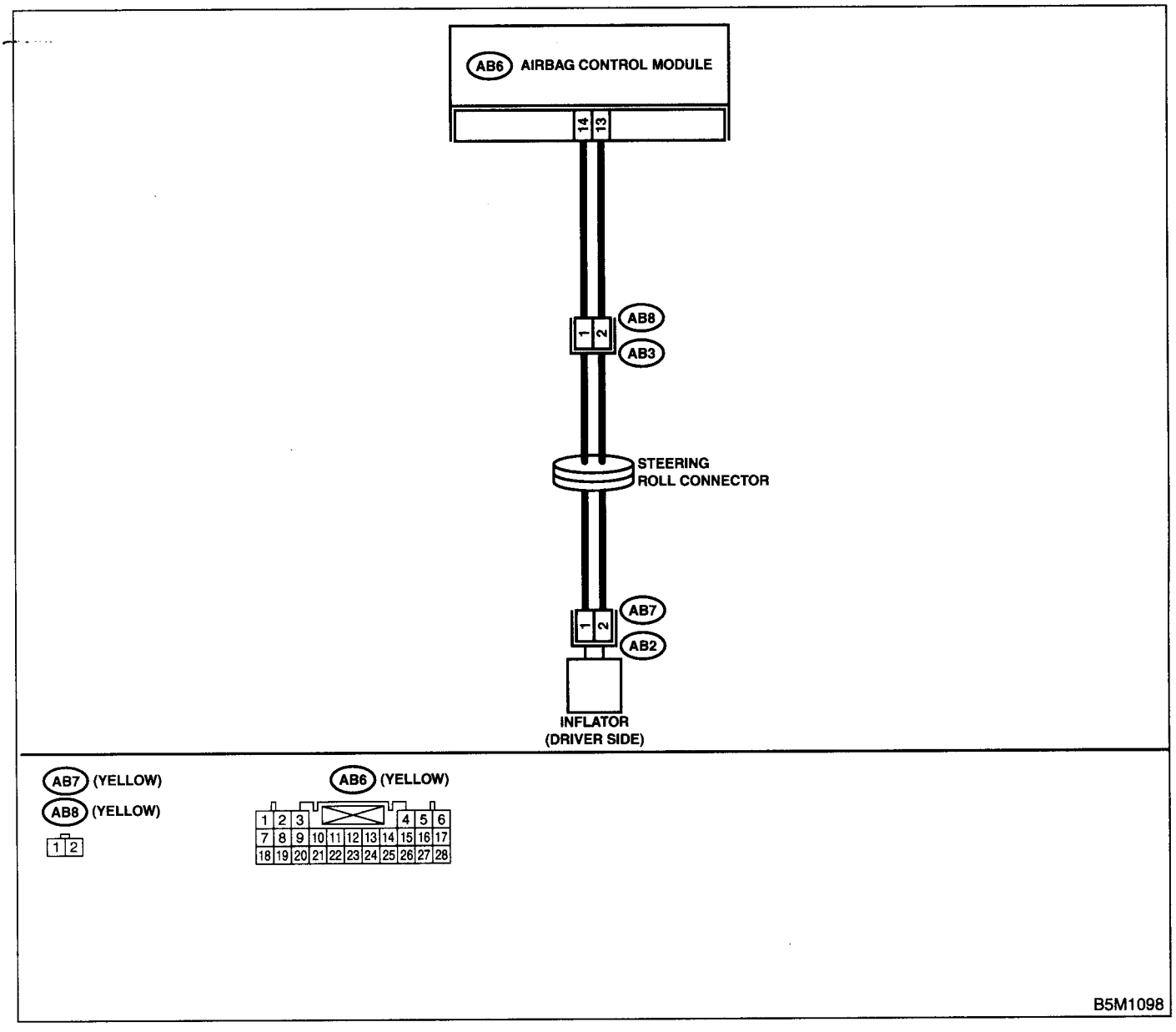
DIAGNOSIS:

- Airbag main harness circuit 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 OFF, disconnect the ground terminal from the battery, and wait more than 20 seconds before starting to work.**
- **Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.**
- **When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.**

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DRIVER'S AIRBAG MODULE.** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Remove the driver's airbag module. <Ref. to AB-12, Driver's Airbag Module.> 3)Connect the connector (1F) in the test harness F to connector (AB7). 4)Connect the airbag resistor to connector (3F) in the test harness F. 5)Connect the battery ground terminal and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace the driver's airbag module. <Ref. to AB-12, Driver's Airbag Module.>	Go to step **2.**
2	**CHECK ROLL CONNECTOR.** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the test harness F from the connector (AB7). 3)Remove the lower cover panel, disconnect the connector (AB3) from (AB8) and connect the connector (1F) in the test harness F to connector (AB8). 4)Connect the airbag resistor to connector (3F) in the test harness F. 5)Connect the battery ground terminal and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace the roll connector. <Ref. to AB-17, Roll Connector.>	Go to step **3.**
3	**CHECK AIRBAG MAIN HARNESS.** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the airbag resistor from the connector (3F) in the test harness F. 3)Remove the glove box, <Ref. to AB-13, Passenger's Airbag Module.> and disconnect the connectors (AB10) and (AB9). 4)Disconnect the connector (AB6) from the airbag control module, and connect the connector (1I) in the test harness I or I2. <Ref. to AB-15, Airbag Control Module.> 5)Measure the resistance between connector (2I) in the test harness I or I2 and the connector (3F) in the test harness F. ***Connector & terminal*** ***(2I) No. 1 — (3F) No. 4:*** ***(2I) No. 4 — (3F) No. 3:***	Is the resistance less than 10 Ω?	Go to step **4.**	Replace the body harness with airbag main harness.
4	**CHECK AIRBAG MAIN HARNESS.** Measure the resistance of the connector (2I) in the test harness I or I2. ***Connector & terminal*** ***(2I) No. 1 — No. 4:*** ***(2I) No. 4 — Chassis ground:*** ***(2I) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Replace the body harness with airbag main harness.

B: TROUBLE CODE 12

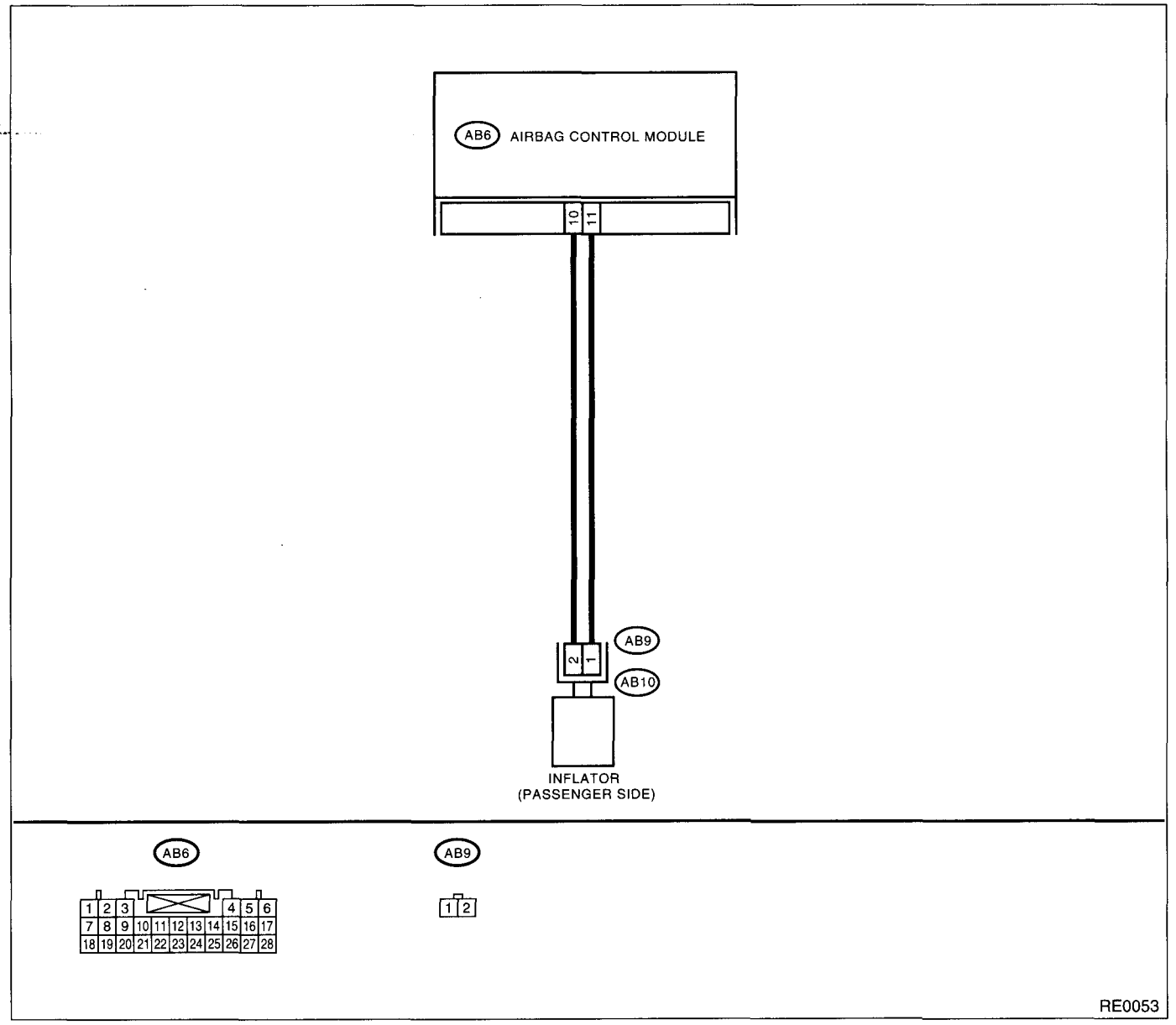
DIAGNOSIS:

- Airbag main harness circuit 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 terminal from the battery, and wait more than 20 seconds before starting to work.
• Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
• When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK PASSENGER'S AIRBAG MODULE.** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Remove the glove box. 3)Disconnect the connector (AB10) from (AB9). 4)Connect the connector (1F) in the test harness F to connector (AB9). 5)Connect the airbag resistor to connector (3F) in the test harness F. 6)Connect the battery ground terminal and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace the passenger airbag module. <Ref. to AB-13, Passenger's Airbag Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS.** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the airbag resistor from the connector (3F) in test harness F. 3)Remove lower cover and disconnect the connector (AB3) from (AB8). 4)Disconnect the connector (AB6) from the airbag control module, and connect the connector (1I) in the test harness I or I2. <Ref. to AB-15, Airbag Control Module.> 5)Measure the resistance between connector (2I) in the test harness I or I2 and the connector (3F) in the test harness F. ***Connector & terminal*** ***(2I) No. 2 — (3F) No. 3:*** ***(2I) No. 5 — (3F) No. 4:***	Is the resistance less than 10 Ω?	Go to step **3.**	Replace the body harness with airbag main harness.
3	**CHECK AIRBAG MAIN HARNESS.** Measure the resistance of the connector (2I) in the test harness I or I2. ***Connector & terminal*** ***(2I) No. 2 — No. 5:*** ***(2I) No. 2 — Chassis ground:*** ***(2I) No. 5 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace airbag control module. <Ref. to AB-15, Airbag Control Module.>	Replace the body harness with airbag main harness.

C: TROUBLE CODE 15

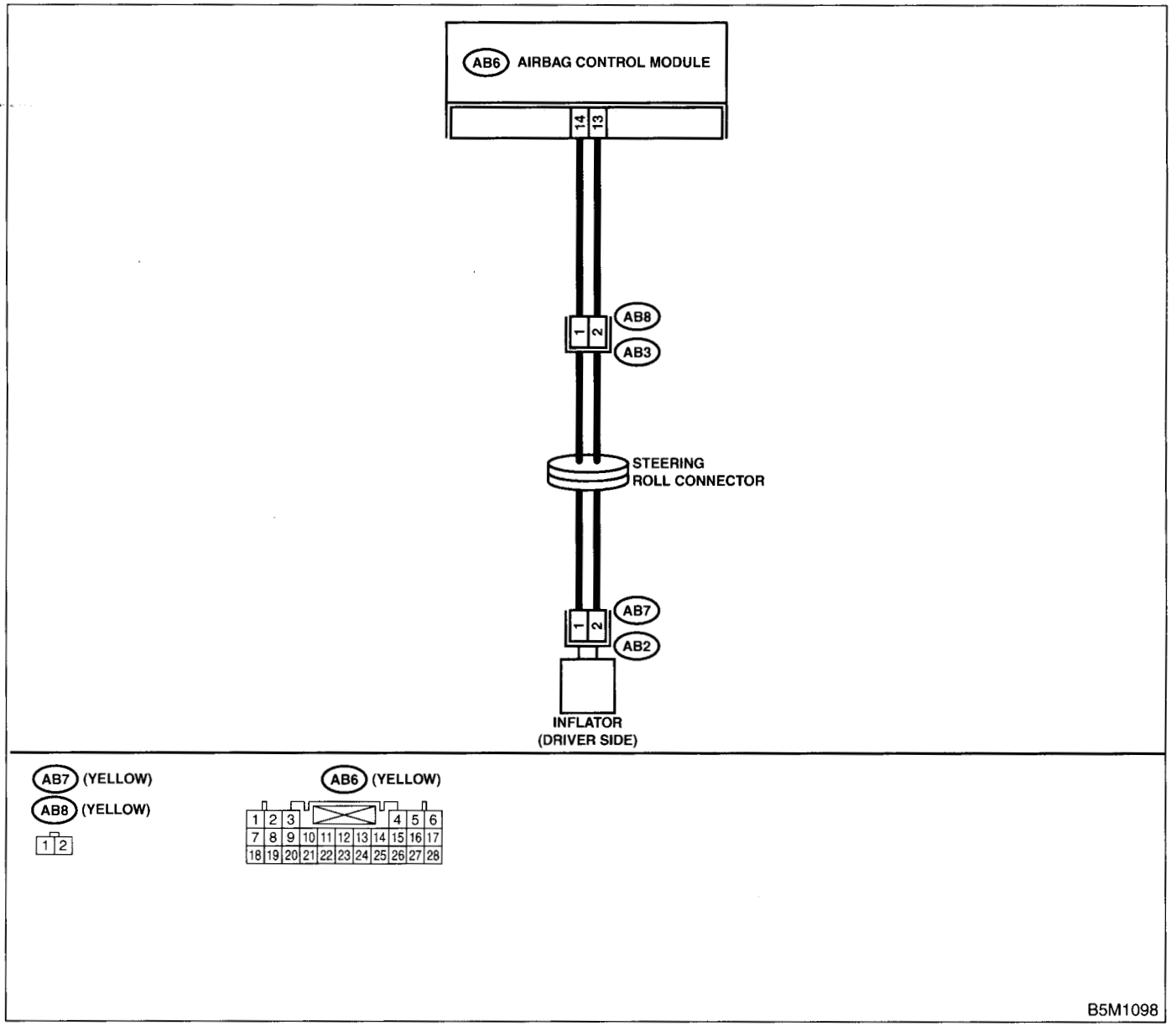
DIAGNOSIS:

- Airbag main harness circuit (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 OFF, disconnect the ground terminal from the battery, and wait more than 20 seconds before starting to work.**
- **Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.**
- **When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.**

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DRIVER'S AIRBAG MODULE.** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Remove the driver's airbag module. <Ref. to AB-12, Driver's Airbag Module.> 3)Connect the connector (AB7) to connector (1F) in the test harness F. 4)Connect the airbag resistor to connector (3F) in the test harness F. 5)Connect the battery ground terminal and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace the driver's airbag module. <Ref. to AB-12, Driver's Airbag Module.>	Go to step **2.**
2	**CHECK ROLL CONNECTOR.** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the test harness F from the connector (AB7). 3)Remove the lower cover panel and disconnect the connector (AB3) from (AB8). 4)Connect the connector (1F) in the test harness F to the connector (AB8). 5)Connect the airbag resistor to connector (3F) in the test harness F. 6)Connect the battery ground terminal and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace the roll connector. <Ref. to AB-17, Roll Connector.>	Go to step **3.**
3	**CHECK AIRBAG MAIN HARNESS.** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, 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 (AB10) and (AB9). 4)Disconnect the connector (AB6) from the airbag control module, and connect the connector (1I) in the test harness I or I2. <Ref. to AB-15, Airbag Control Module.> 5)Connect the battery ground terminal and turn the ignition switch ON. (Engine OFF) 6)Measure the voltage between connector (2I) in the test harness I or I2 and the chassis ground. ***Connector & terminal*** ***(2I) No. 4 (+) — Chassis ground (–):*** ***(2I) No. 1 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Replace the body harness with airbag main harness.

D: TROUBLE CODE 16

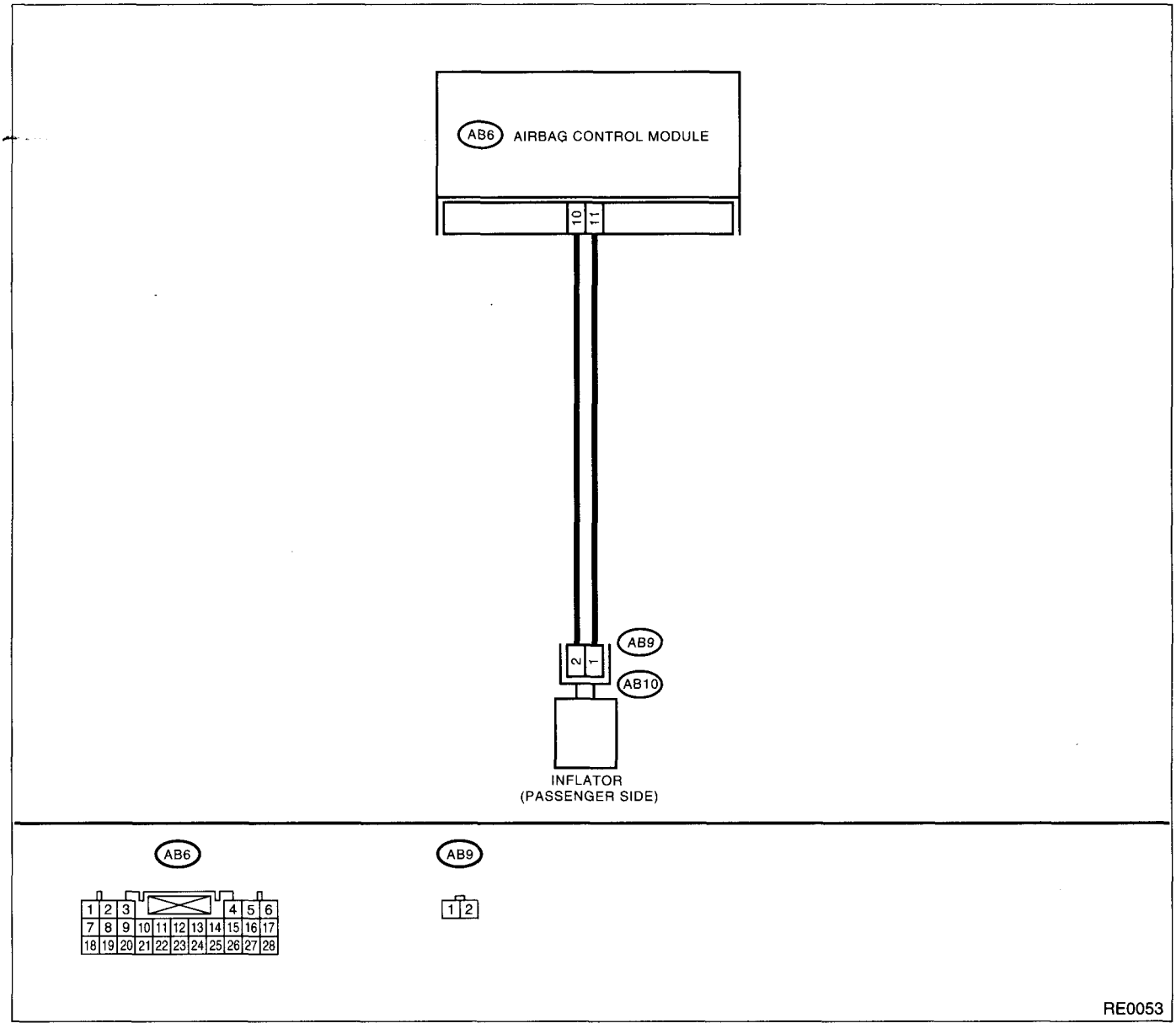
DIAGNOSIS:

- Airbag main harness circuit (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 OFF, disconnect the ground terminal from the battery, and wait more than 20 seconds before starting to work.
• Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
• When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK PASSENGER'S AIRBAG MODULE.** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Remve the glove box. 3)Disconnect the connector (AB10) from (AB9) 4)Connect the connector (1F) in the test harness F to the connector (AB9). 5)Connect the airbag resistor to connector (3F) in the test harness F. 6)Connect the battery ground terminal and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace the passenger airbag module. <Ref. to AB-13, Passenger's Airbag Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS.** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the airbag resistor from the connector (3F) in the test harness F. 3)Remove the lower cover and disconnect the connector (AB3) from (AB8). 4)Disconnect the connector (AB6) from the airbag control module, and connect the connector (1I) in the test harness I or I2. <Ref. to AB-15, Airbag Control Module.> 5)Measure the voltage between connector (2I) in the test harness I or I2 and the chassis ground. ***Connector & terminal*** ***(2I) No. 2 — Chassis ground:*** ***(2I) No. 5 — Chassis ground:***	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Replace the body harness with airbag main harness.

E: TROUBLE CODE 21

DIAGNOSIS:

- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground terminal from the battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

	Step	Check	Yes	No
1	**CHECK IF TROUBLE CODE 21 IS INDICATED.** Read Diagnostic Trouble Code. <Ref. to AB-24, Read Diagnostic Trouble Code.>	Is the airbag warning light trouble code 21 indicated?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Perform clear memory. <Ref. to AB-26, Clear Memory Mode.>

F: TROUBLE CODE 22

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-15, Airbag Control Module.>
- Driver's airbag module. <Ref. to AB-12, Driver's Airbag Module.>
- Passenger's airbag module. <Ref. to AB-13, Passenger's Airbag Module.>
- Front sub-sensor of both sides. <Ref. to AB-18, Front Sub Sensor.>
- Front seat belt outer with pretensioner of both sides. <Ref. to SB-8, Front Seat Belt.>

G: TROUBLE CODE 23

DIAGNOSIS:
(AB6), (AB17) and (AB18) are not connected properly to airbag control module.

CAUTION:
Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground terminal from the battery, and wait more than 20 seconds before starting to work.

	Step	Check	Yes	No
1	**CHECK POOR CONTACT IN CONECTORS (AB6), (AB17) and (AB18).** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the connectors (AB6), (AB17) and (AB18) from the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Check if the rust or damage appear on the harness connector and the control module connector.	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.> Replace the body harness with airbag main harness. Replace the body harness with side airbag harness.	Go to step **2.**
2	**CHECK POOR CONTACT IN CONECTORS (AB6), (AB17) and (AB18).** 1)Ensure that the connectors are firmly reconnected. 2)Connect the battery ground terminal and turn the ignition switch ON.	Does the airbag warning light operate properly?	Finish the diagnosis.	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>

H: TROUBLE CODE 24

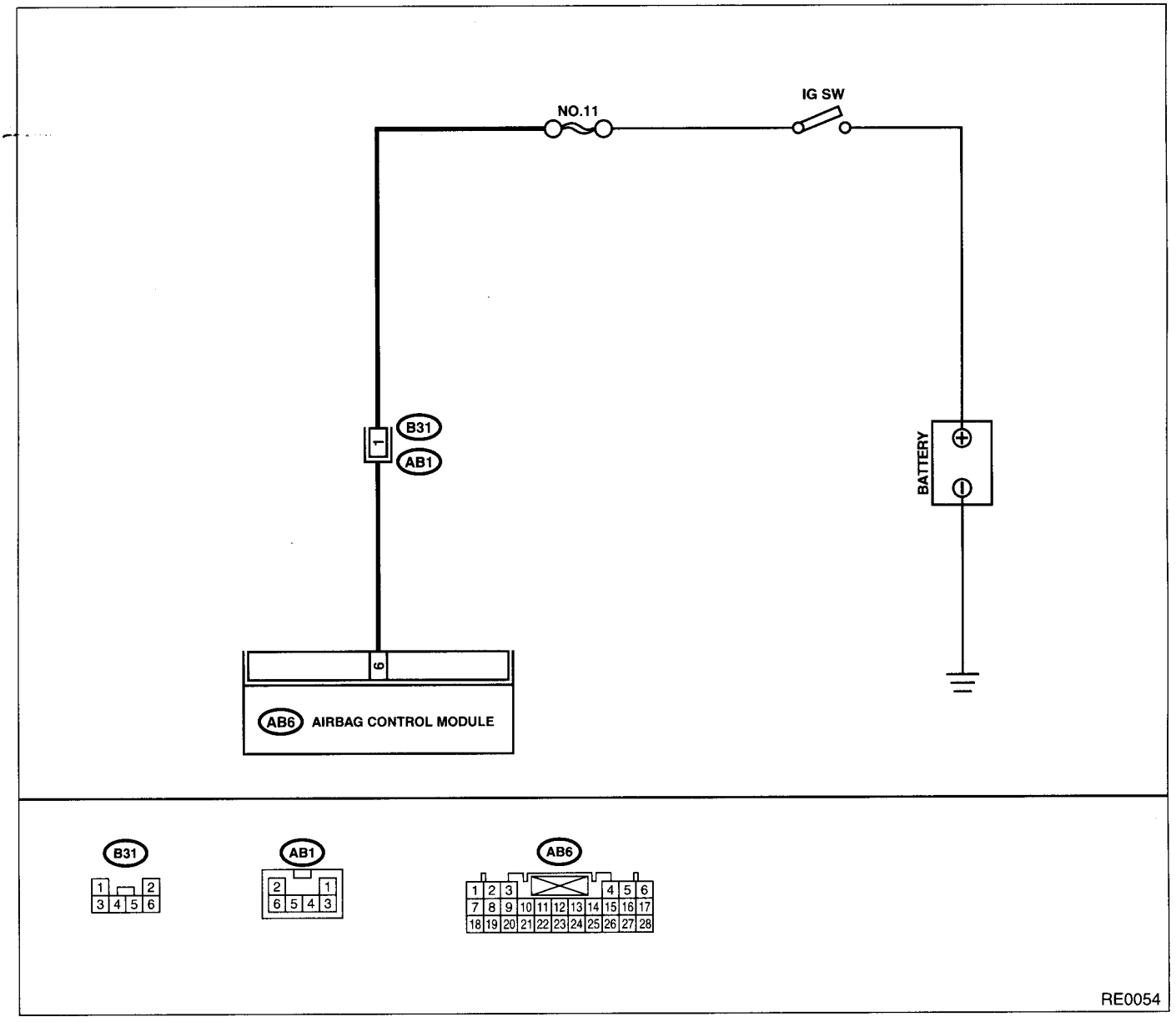
DIAGNOSIS:

- Airbag control module is faulty.
- Airbag main harness circuit 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 OFF, disconnect the ground terminal from the battery, and wait more than 20 seconds before starting to work.**
- **Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.**
- **When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.**

WIRING DIAGRAM:



Step	Check	Yes	No
CHECK AIRBAG CONTROL MODULE. 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the connector (AB6) from the airbag control module. <Ref. to AB-15, Airbag Control Module.> 3)Connect the connector (1I) in the test harness I or I2 to connector (AB6). 4)Connect the battery ground terminal and turn the ignition switch ON. 5)Measure the voltage between connector (2I) in the test harness I or I2 and chassis ground. ***Connector & terminal*** ***(2I) No. 3 (+) — Chassis ground (–):***	s the voltage more than 10 V?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	) to step **2.**
CHECK AIRBAG MAIN HARNESS. 1)While checking control module, turn the ignition switch OFF and disconnect the battery ground terminal. Wait more than 20 seconds before operation. 2)Disconnect the airbag connector (AB1) from the body harness (B31). 3)Connect the connector (2M) in the test harness M to connector (AB1). 4)Measure the resistance between connector (5M) in the test harness M and the connector (2I) in the test harness I or I2. ***Connector & terminal*** ***(5M) No. 2 — (2I) No. 3:***	s the resistance less than 10 Ω?	Go to step **3.**	Replace the body harness with airbag main harness.
CHECK AIRBAG MAIN HARNESS. Measure the following resistance with the above-mentioned condition maintained. ***Connector & terminal*** ***(5M) No. 2 — Chassis ground:*** ***(2I) No. 3 — Chassis ground:***	s the resistance more than 1 MΩ?	Go to step **4.**	Replace the body rness with air- g main harness
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.	s fuse No. 11 blown?	Replace fuse No. 11. If fuse No. 11 blows again, repair the body harness.	Repair the body rness.

I: TROUBLE CODE 25

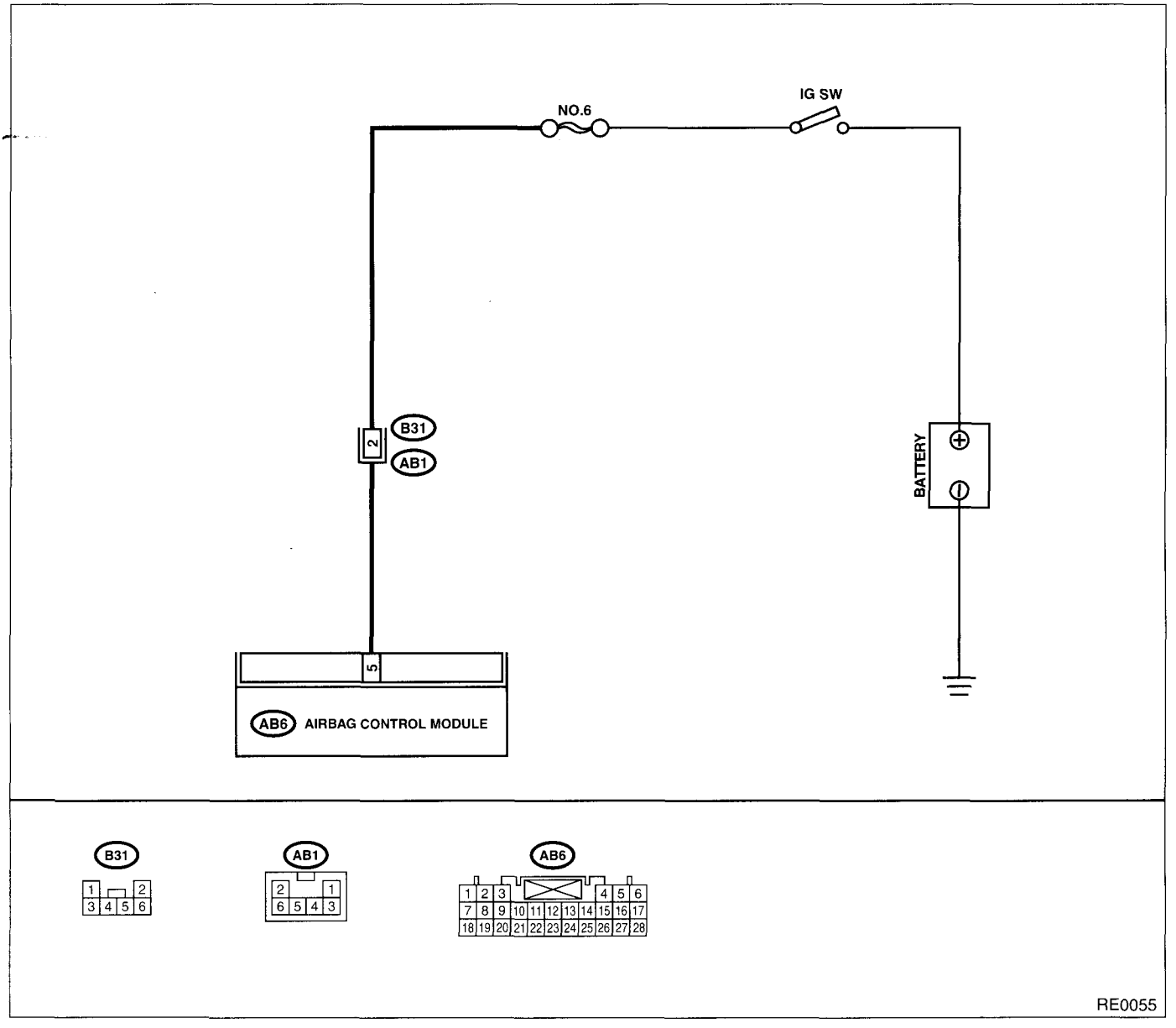
DIAGNOSIS:

- Airbag control module is faulty.
- Airbag main harness circuit 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 OFF, disconnect the ground terminal from the battery, and wait more than 20 seconds before starting to work.**
- **Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.**
- **When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.**

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK AIRBAG CONTROL MODULE.** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the connector (AB6) from airbag control module. <Ref. to AB-15, Airbag Control Module.> 3)Connect the connector (1I) in the test harness I or I2 to the connector (AB6). 4)Connect the battery ground cable, and turn the ignition switch ON. 5)Measure the voltage between the connector (2I) in the test harness I or I2 and the chassis ground. ***Connector & terminal*** ***(2I) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS.** 1) While checking control module, turn the ignition switch OFF and disconnect the battery ground terminal. Wait more than 20 seconds before operation. 2)Disconnect the airbag connector (AB1) from the body harness (B31). 3)Connect the connector (2M) in the test harness M to the airbag connector (AB1). 4)Measure the resistance between the connector (5M) in the test harness M and the connector (2I) in the test harness I or I2. ***Connector & terminal*** ***(5M) No. 2 — (2I) No. 6:***	Is the resistance less than 10 Ω?	Go to step **3.**	Replace the body harness with airbag main harness.
3	**CHECK AIRBAG MAIN HARNESS.** Measure the following resistance with the above-mentioned condition maintained. ***Connector & terminal*** ***(5M) No. 2 — Chassis ground:*** ***(2I) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the body harness with airbag main harness.
4	**CHECK FUSE NO. 6 (IN JOINT BOX).** 1)Confirm that the ignition switch is turned OFF. 2)Remove the fuse No. 6 (in joint box) and perform visual inspection.	Is the fuse No. 6 blown?	Replace the fuse No. 6. If the fuse No. 6 is blown again, repair the body harness.	Repair the body harness.

J: TROUBLE CODE 31

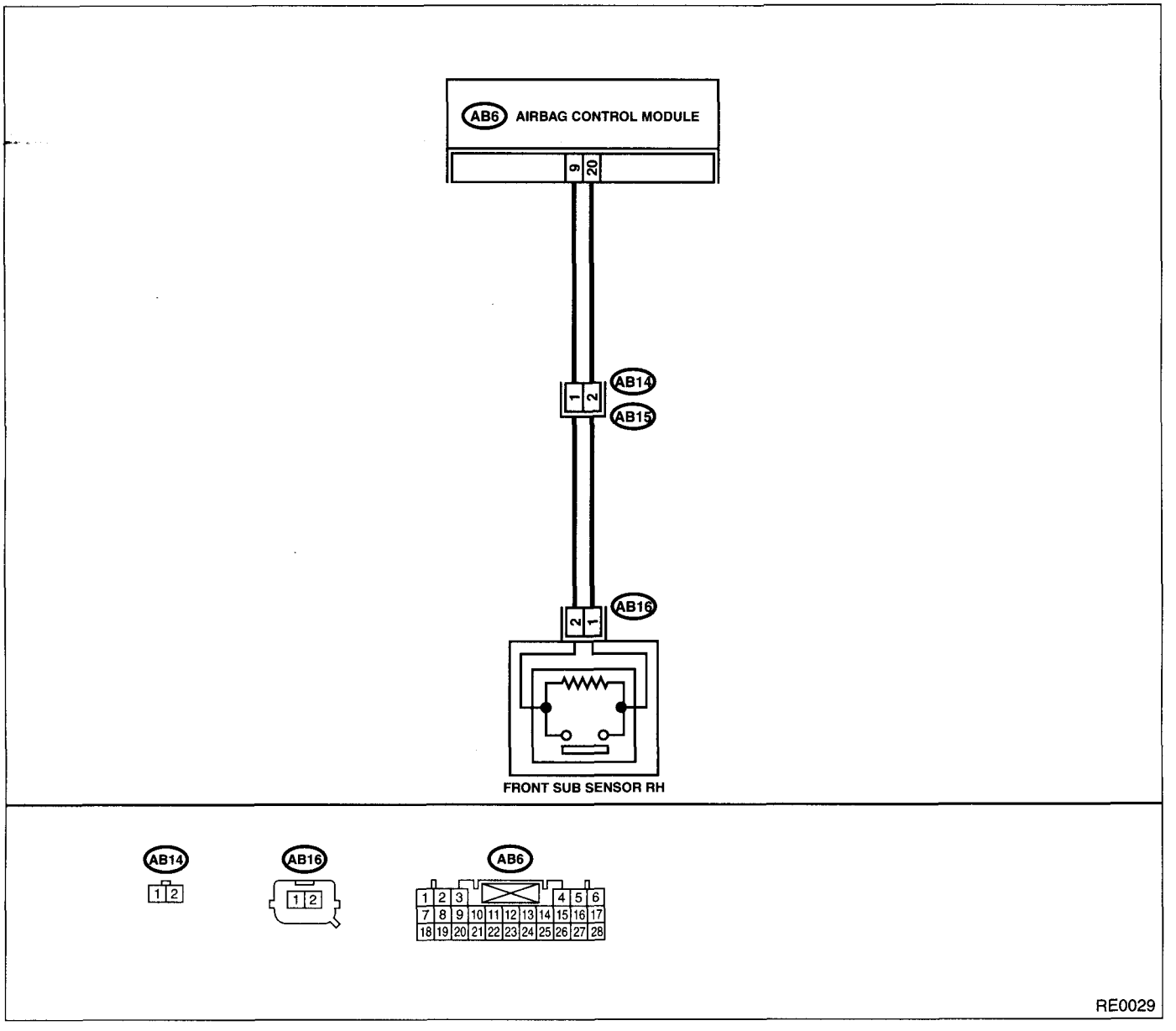
DIAGNOSIS:

- Front sub-sensor harness (RH) circuit is shorted.
- Front sub-sensor harness (RH) circuit is open.
- Front sub-sensor (RH) is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground terminal from the battery, and wait more than 20 seconds before starting to work.
• Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT SUB-SENSOR (RH) AND FRONT SUB-SENSOR HARNESS (RH).** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the connector (AB6) from the air-bag control module , and connect the connector (1I) in the test harness I or I2. <Ref. to AB-15, Airbag Control Module.> 3)Measure the resistance of the connector (3I) in the test harness I or I2. ***Connector & terminal*** ***(3I) No. 2 — No. 4:***	Is the resistance between 750Ω and 1 KΩ?	Go to step **2.**	Go to step **3.**
2	**CHECK FRONT SUB-SENSOR (RH) AND FRONT SUB-SENSOR HARNESS (RH).** Measure the resistance between connector (3I) in the test harness I or I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 2 — Chassis ground:*** ***(3I) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Go to step **3.**
3	**CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (RH).** 1)Disconnect the connector (AB16) from the front sub-sensor. <Ref. to AB-18, Front Sub Sensor.> 2)Connect the connector (IH) in test harness H to the connector (AB16). 3)Measure the resistance between connector (3I) in test harness I or I2 and connector (3H) in the test harness H. ***Connector & terminal*** ***(3I) No. 2 — (3H) No. 5:*** ***(3I) No. 4 — (3H) No. 6:***	Is the resistance less than 10Ω?	Go to step **4.**	Go to step **5.**
4	**CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (RH).** Measure the resistance between connector (3I) in the test harness I or I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 2 — Chassis ground:*** ***(3I) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **10.**	Go to step **5.**
5	**CHECK AIRBAG MAIN HARNESS** 1)Disconnect the connector (AB15) from (AB14), and connect the connector (1F) in test harness F to the connector (AB14). 2)Measure the resistance between connector (3I) in the test harness I or I2 and connector (3F) in the test harness F. ***Connector & terminal*** ***(3I) No. 2 — (3F) No. 4:*** ***(3I) No. 4 — (3F) No. 3:***	Is the resistance less than 10 Ω?	Go to step **6.**	Replace the body harness with air-bag main harness.
6	**CHECK AIRBAG MAIN HARNESS** Measure the resistance between connector (3I) in the test harness I or I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 2 — Chassis ground:*** ***(3I) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Replace the body harness with air-bag main harness.

	Step	Check	Yes	No
7	**CHECK FRONT SUB-SENSOR HARNESS (RH).** 1)Connect the connector (2F) in the test harness F to the connector (AB15). 2)Measure the resistance between connector (3H) in the test harness H and connector (3F) in the test harness F. ***Connector & terminal*** ***(3F) No. 5 — (3H) No. 5:*** ***(3F) No. 6 — (3H) No. 6:***	Is the resistance less than 10 Ω?	Go to step **8.**	Replace the body harness with front sub-sensor harness (RH).
8	**CHECK FRONT SUB-SENSOR HARNESS (RH).** Measure the resistance between connector (3H) in the test harness H and connector (3F) in the test harness F. ***Connector & terminal*** ***(3F) No. 6 — (3H) No. 6:*** ***(3F) No. 5 — (3H) No. 5:***	Is the resistance more than 1M Ω?	Go to step **9.**	Replace the body harness with front sub-sensor harness.
9	**CHECK FRONT SUB-SENSOR HARNESS (RH).** Measure the resistance between connector (3F) in the test harness F and the chassis ground. ***Connector & terminal*** ***(3F) No. 5 — Chassis ground:*** ***(3F) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **10.**	Replace the body harness with front sub-sensor harness (RH).
10	**CHECK FRONT SUB-SENSOR (RH).** 1)Connect the connector (2H) in test harness H to the front sub-sensor (RH). 2)Measure the resistance of the connector (3H) in the test harness H. ***Connector & terminal*** ***(3H) No. 3 — No. 4:***	Is the resistance between 750Ω and 1 KΩ?	Go to step **11.**	Replace the front sub-sensor (RH). <Ref. to AB-18, Front Sub Sensor.>
11	**CHECK FRONT SUB-SENSOR (RH).** Measure the resistance between connector (3H) in the test harness H and the chassis ground. ***Connector & terminal*** ***(3H) No. 3 — Chassis ground:*** ***(3H) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Finish the diagnosis.	Replace the front sub-sensor (RH). <Ref. to AB-18, Front Sub Sensor.>

K: TROUBLE CODE 32

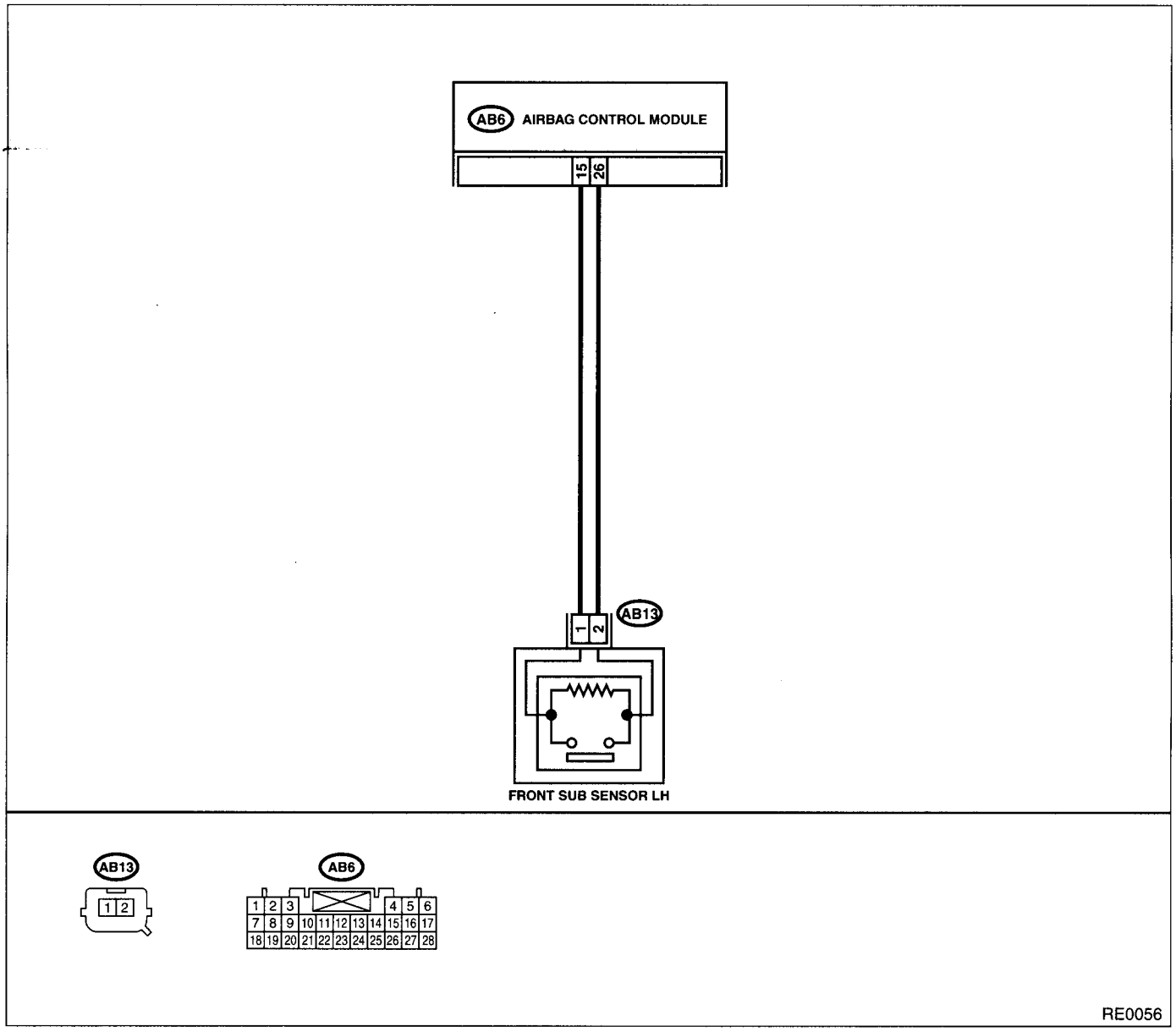
DIAGNOSIS:

- Front sub-sensor harness (LH) circuit is shorted.
- Front sub-sensor harness (LH) circuit is open.
- Front sub-sensor (LH) is faulty.
- Airbag control module is faulty.

CAUTION:

- **Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground terminal from the battery, and wait more than 20 seconds before starting to work.**
- **Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.**
- **When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.**

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT SUB-SENSOR (LH) AND FRONT SUB-SENSOR HARNESS (RH).** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the connector (AB6) from the air-bag control module, and connect connector (1I) in the test harness I or I2 to the connector (AB6). <Ref. to AB-15, Airbag Control Module.> 3)Measure the resistance of the connector (3I) in the test harness I or I2. ***Connector & terminal*** ***(3I) No. 1 — No. 3:***	s the resistance between '50Ω and 1 KΩ?	3o to step **2.**	Go to step **3.**
2	**CHECK FRONT SUB-SENSOR (LH) AND FRONT SUB-SENSOR HARNESS (RH).** Measure the resistance between connector (3I) in the test harness I or I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 1 — Chassis ground:*** ***(3I) No. 3 — Chassis ground:***	s the resistance more than 1 ΛΩ?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Go to step **3.**
3	**CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (LH).** 1)Disconnect the connector (AB13) from the front sub-sensor. <Ref. to AB-18, Front Sub Sensor.> 2)Connect the connector (1H) in the test harness H to the connector (AB13). 3)Measure the resistance between connector (3I) in the test harness I or I2 and connector (3H) in the test harness H. ***Connector & terminal*** ***(3I) No. 3 — (3H) No. 6:*** ***(3I) No. 1 — (3H) No. 5:***	s the resistance less than 10 Ω?	3o to step **4.**	Go to step **5.**
4	**CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (LH).** Measure the resistance between connector (3I) in the test harness I or I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 3 — Chassis ground:*** ***(3I) No. 1 — Chassis ground:***	s the resistance more than 1 ΛΩ?	3o to step **10.**	Go to step **5.**
5	**CHECK AIRBAG MAIN HARNESS.** 1)Disconnect the connector (AB11) from (AB12), and connect the connector (1F) in the test harness F to (AB11). 2)Measure the resistance between connector (3I) in the test harness I or I2 and connector (3F) in the test harness F. ***Connector & terminal*** ***(3I) No. 3 — (3F) No. 3:*** ***(3I) No. 1 — (3F) No. 4:***	s the resistance less than 10 Ω?	3o to step **6.**	Replace the body harness with air-bag main harness
6	**CHECK AIRBAG MAIN HARNESS.** Measure the resistance between connector (3I) in the test harness I or I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 3 — Chassis ground:*** ***(3I) No. 1 — Chassis ground:***	s the resistance more than 1 ΛΩ?	3o to step **7.**	Replace the body harness with air-bag main harness

	Step	Check	Yes	No
7	**CHECK FRONT SUB-SENSOR HARNESS (LH).** 1)Connect the connector (2F) in the test harness F to the connector (AB12). 2)Measure the resistance between connector (3H) in the test harness H and connector (3F) in the test harness F. ***Connector & terminal*** ***(3F) No. 5 — (3H) No. 5:*** ***(3F) No. 6 — (3H) No. 6:***	Is the resistance less than 10 Ω?	Go to step **8.**	Replace the body harness with front sub-sensor harness (LH).
8	**CHECK FRONT SUB-SENSOR HARNESS (LH).** Measure the resistance between connector (3H) in the test harness H and connector (3F) in the test harness F. ***Connector & terminal*** ***(3F) No. 6 — (3H) No. 6:*** ***(3F) No. 5 — (3H) No. 5:***	Is the resistance more than 1M Ω?	Go to step **9.**	Replace the body harness with front sub-sensor harness (LH).
9	**CHECK FRONT SUB-SENSOR HARNESS (LH).** Measure the resistance between connector (3F) in the test harness F and the chassis ground. ***Connector & terminal*** ***(3F) No. 5 — Chassis ground:*** ***(3F) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **10.**	Replace the body harness with front sub-sensor harness (LH).
10	**CHECK FRONT SUB-SENSOR (LH).** 1)Connect connector (2H) in the test harness H to the front sub-sensor (LH). 2)Measure the resistance of the connector (3H) in the test harness H. ***Connector & terminal*** ***(3H) No. 3 — No. 4:***	Is the resistance between 750Ω and 1 KΩ?	Go to step **11.**	Replace the front sub-sensor (LH). <Ref. to AB-18, Front Sub Sensor.>
11	**CHECK FRONT SUB-SENSOR (LH).** Measure the resistance between connector (3H) in the test harness H and the chassis ground. ***Connector & terminal*** ***(3H) No. 3 — Chassis ground:*** ***(3H) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Finish the diagnosis.	Replace the front sub-sensor (LH). <Ref. to AB-18, Front Sub Sensor.>

L: TROUBLE CODE 41

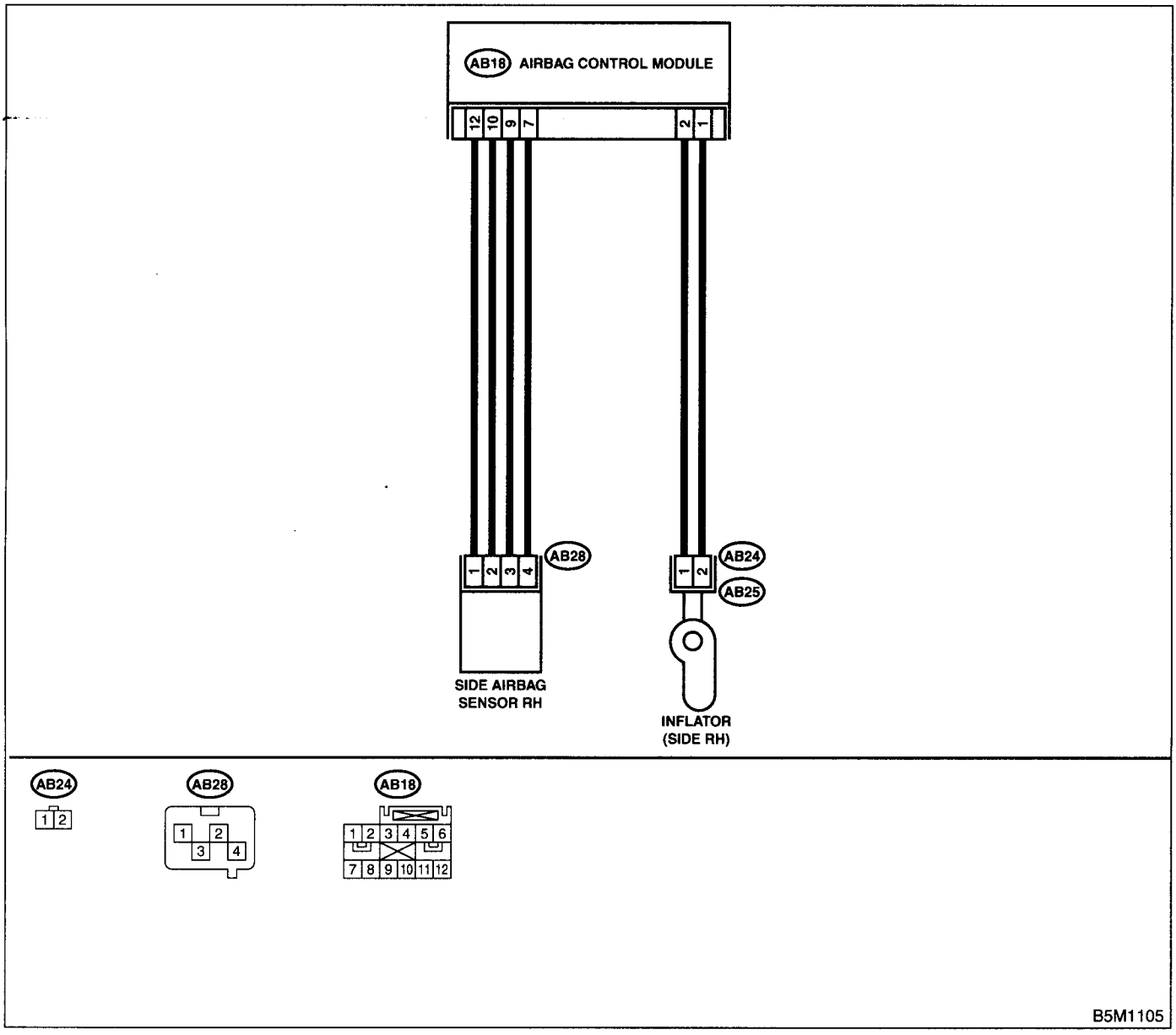
DIAGNOSIS:

- 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 OFF, disconnect the ground terminal from the battery, and wait more than 20 seconds before starting to work.
• Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
• 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	Check	Yes	No
1	**CHECK SIDE AIRBAG MODULE.** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the connector (AB26) from the seat belt pretensioner (RH). <Ref. to SB-8, Front Seat Belt.> 3)Disconnect the connector (AB25) from (AB24), and connect the connector (1F) in the test harness F to (AB24). 4)Connect the airbag resistor to the connector (3F) in the test harness F. 5)Connect the battery ground terminal, and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace the front seat with side airbag module (RH). <Ref. to SE-6, Front Seat.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (RH).** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the airbag resistor from the test harness F. 3)Disconnect the connector (AB18) from the air bag control module. <Ref. to AB-15, Airbag Control Module.> 4)Connect the connector (1I) in the test harness I or I2 to the connector (AB18). 5)Measure the resistance between connector (3I) in the test harness I or I2 and connector (3F) in the test harness F. ***Connector & terminal*** ***(3I) No. 7 — (3F) No. 4:*** ***(3I) No. 9 — (3F) No. 3:***	Is the resistance less than 10 Ω?	Go to step **3.**	Replace the body harness with side airbag harness.
3	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance of the connector (3I) in the test harness I or I2. ***Connector & terminal*** ***(3I) No. 7 — No. 9:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the body harness with side airbag harness.
4	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance of the connector (3F) in the test harness F. ***Connector & terminal*** ***(3F) No. 3 — No. 4:***	Is the resistance more 1MΩ?	Go to step **5.**	Replace the body harness with side airbag harness.
5	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance between connector (3F) in the test harness F and the chassis ground. ***Connector & terminal*** ***(3F) No. 3 — Chassis ground:*** ***(3F) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Replace the body harness with side airbag harness.
6	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance between connector (3I) in the test harness I or I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 7 — Chassis ground:*** ***(3I) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Replace the body harness with side airbag harness.

M: TROUBLE CODE 42

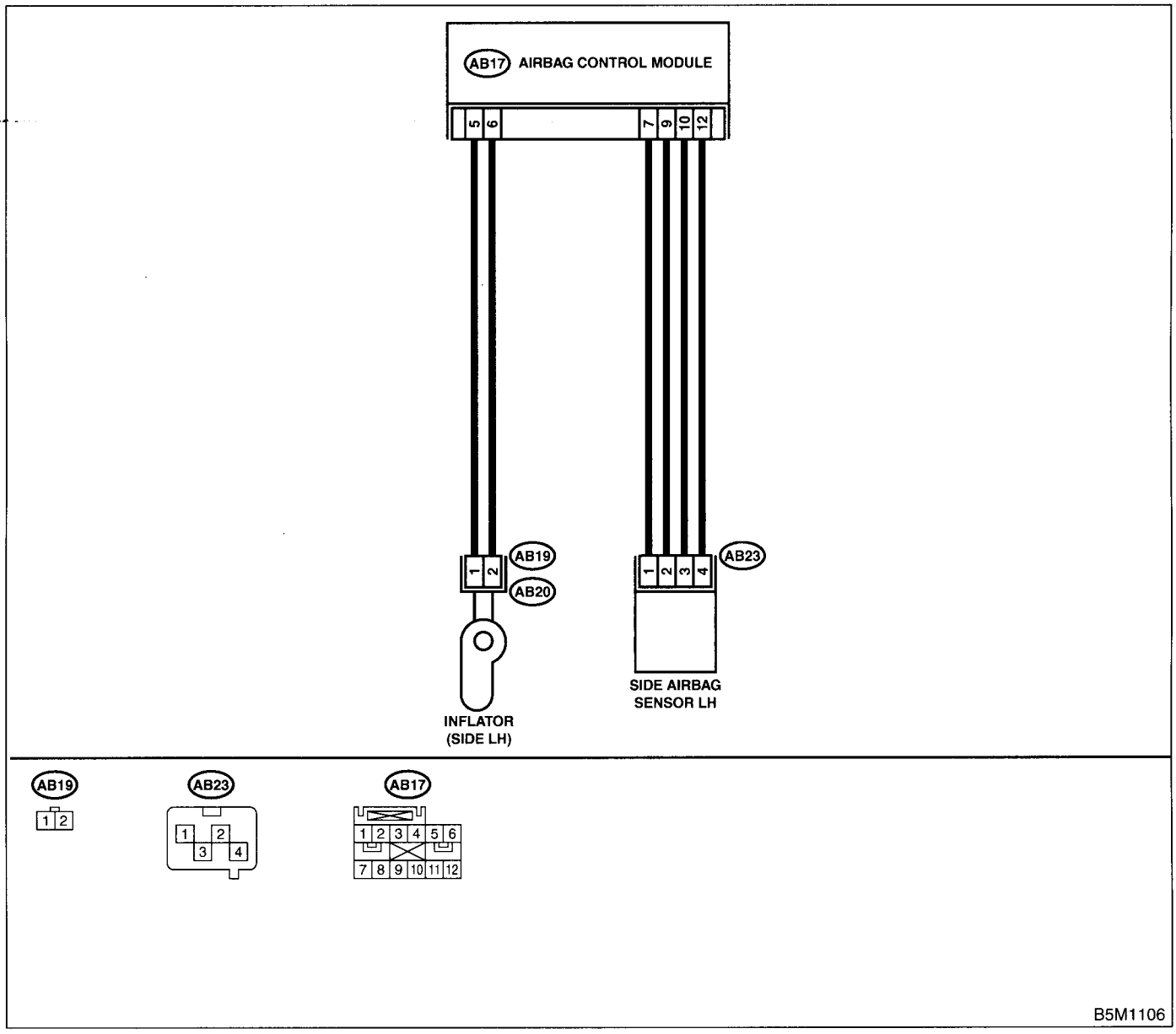
DIAGNOSIS:

- 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 OFF, disconnect the ground terminal from the battery, and wait more than 20 seconds before starting to work.
• Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
• 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	Check	Yes	No
1	**CHECK SIDE AIRBAG MODULE.** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the connector (AB21) from the seat belt pretensioner (LH). <Ref. to SB-8, Front Seat Belt.> 3)Disconnect the connector (AB20) from (AB19), and connect the connector (1F) in the test harness F to (AB19). 4)Connect the airbag resistor to the connector (3F) in the test harness F. 5)Connect the battery ground terminal, and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace the front seat with side airbag module (LH). <Ref. to SE-6, Front Seat.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (LH).** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the airbag resistor from the test harness F. 3)Disconnect the connector (AB17) from the airbag control module. <Ref. to AB-15, Airbag Control Module.> 4)Connect the connector (1I) in the test harness I or I2 to the connector (AB17). 5)Measure the resistance between connector (3I) in the test harness I or I2 and connector (3F) in the test harness F. ***Connector & terminal*** ***(3I) No. 10 — (3F) No. 3:*** ***(3I) No. 12 — (3F) No. 4:***	Is the resistance less than 10 Ω?	Go to step **3.**	Replace the body harness with side airbag harness.
3	**CHECK SIDE AIRBAG HARNESS (LH).** Measure the resistance of the connector (3I) in the test harness I or I2. ***Connector & terminal*** ***(3I) No. 10 — No. 12:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the body harness with side airbag harness.
4	**CHECK SIDE AIRBAG HARNESS (LH).** Measure the resistance of the connector (3F) in the test harness F. ***Connector & terminal*** ***(3F) No. 3 — No. 4:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Replace the body harness with side airbag harness.
5	**CHECK SIDE AIRBAG HARNESS (LH).** Measure the resistance between connector (3F) in the test harness F and the chassis ground. ***Connector & terminal*** ***(3F) No. 3 — Chassis ground:*** ***(3F) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Replace the body harness with side airbag harness.
6	**CHECK SIDE AIRBAG HARNESS (LH).** Measure the resistance between connector (3I) in the test harness I or I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 10 — Chassis ground:*** ***(3I) No. 12 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Replace the body harness with side airbag harness.

N: TROUBLE CODE 45

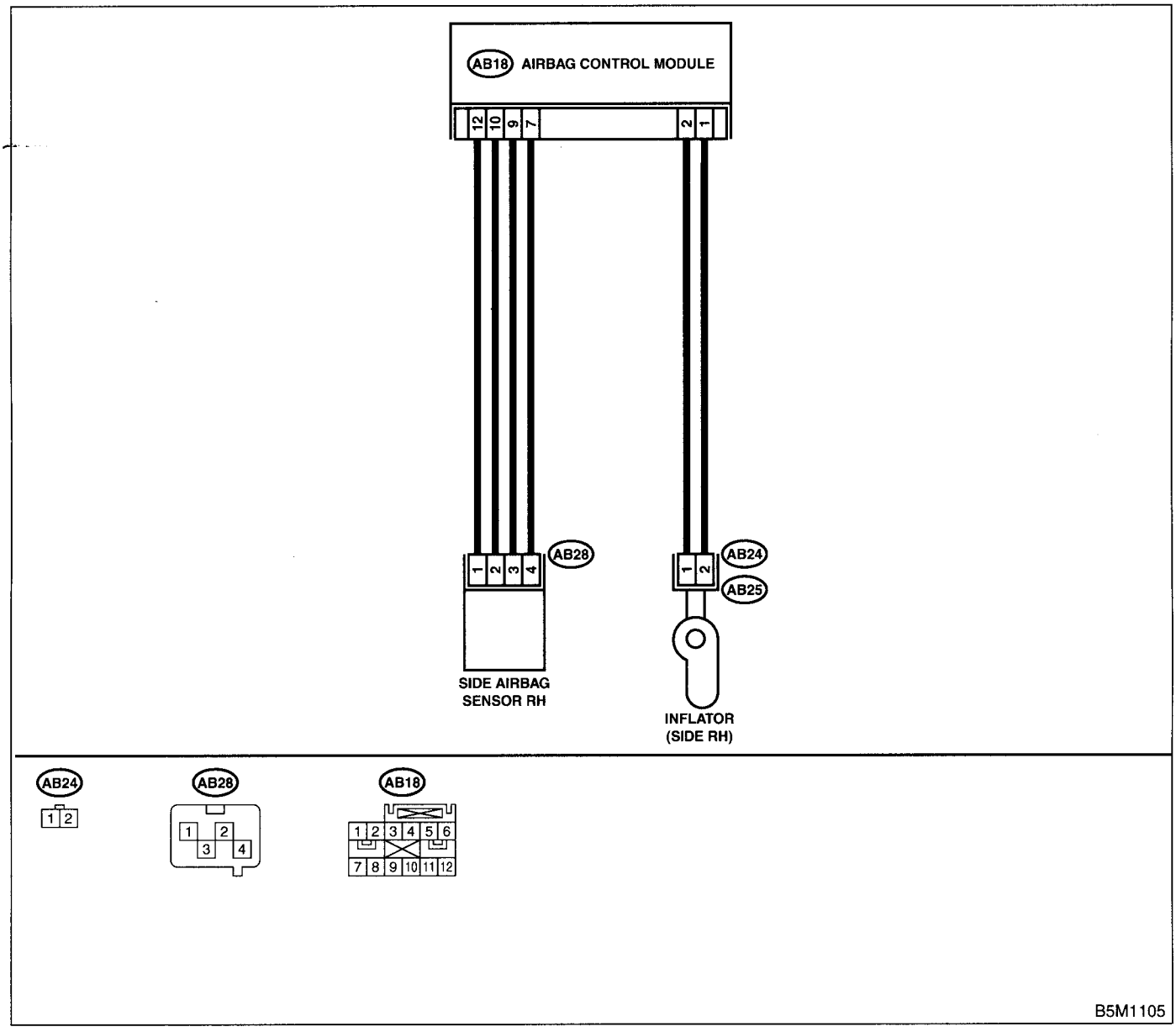
DIAGNOSIS:

- Side airbag harness (RH) is shorted to power supply.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground terminal from the battery, and wait more than 20 seconds before starting to work.
• Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
• 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	Check	Yes	No
1	**CHECK SIDE AIRBAG MODULE.** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the connector (AB26) from the seat belt pretensioner (RH). <Ref. to SB-8, Front Seat Belt.> 3)Disconnect the connector (AB25) from (AB24), and connect the connector (1F) in the test harness F to (AB24). 4)Connect the airbag resistor to the connector (3F) in the test harness F. 5)Connect the battery ground terminal, and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace the front seat with side airbag module (RH). <Ref. to SE-6, Front Seat.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (RH).** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the airbag resistor from the test harness F. 3)Disconnect the connector (AB18) from the airbag control module. <Ref. to AB-15, Airbag Control Module.> 4)Connect the connector (1I) in the test harness I or I2 to the connector (AB18). 5)Connect the battery ground terminal, and turn the ignition switch ON. 6)Measure the voltage between connector (3I) in the test harness I or I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 7 (+) — Chassis ground (–):*** ***(3I) No. 9 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Replace the body harness with side airbag harness.

O: TROUBLE CODE 46

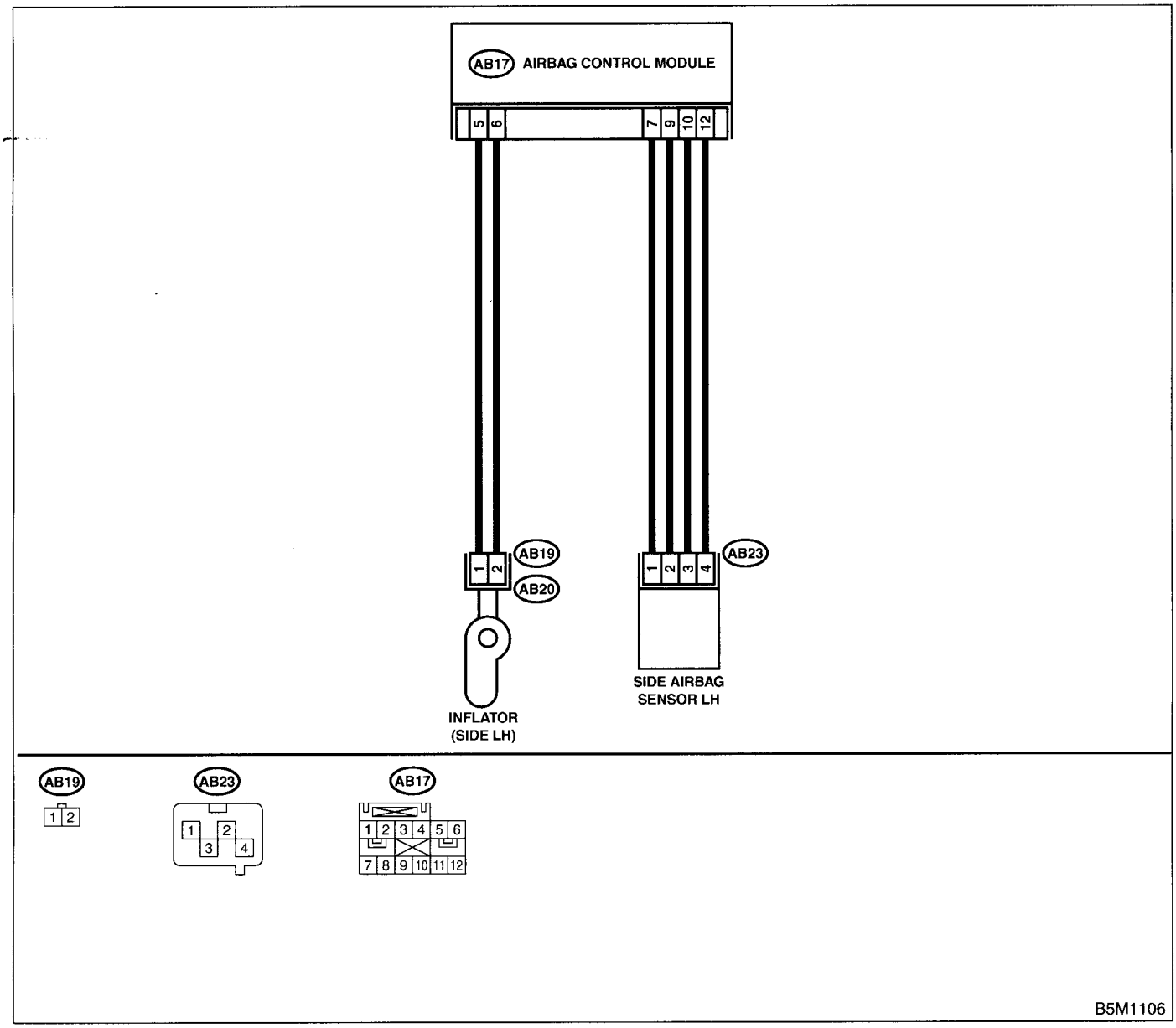
DIAGNOSIS:

- Side airbag harness (LH) is shorted to power supply.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground terminal from the battery, and wait more than 20 seconds before starting to work.
• Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
• 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	Check	Yes	No
1	**CHECK SIDE AIRBAG MODULE.** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the connector (AB21) from the seat belt pretensioner (LH). <Ref. to SB-8, Front Seat Belt.> 3)Disconnect the connector (AB20) from (AB19), and connect the connector (1F) in the test harness F to (AB19). 4)Connect the airbag resistor to the connector (3F) in the test harness F. 5)Connect the battery ground terminal and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace the front seat with side airbag module (LH). <Ref. to SE-6, Front Seat.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (LH).** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the airbag resistor from the test harness F. 3)Disconnect the connector (AB17) from the airbag control module. <Ref. to AB-15, Airbag Control Module.> 4)Connect the connector (1I) in the test harness I or I2 to the connector (AB17). 5)Connect the battery ground terminal, and turn the ignition switch ON. 6)Measure the voltage between connector (3I) in the test harness I or I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 10 (+) — Chassis ground (–):*** ***(3I) No. 12 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Replace the body harness with side airbag harness.

P: TROUBLE CODE 51

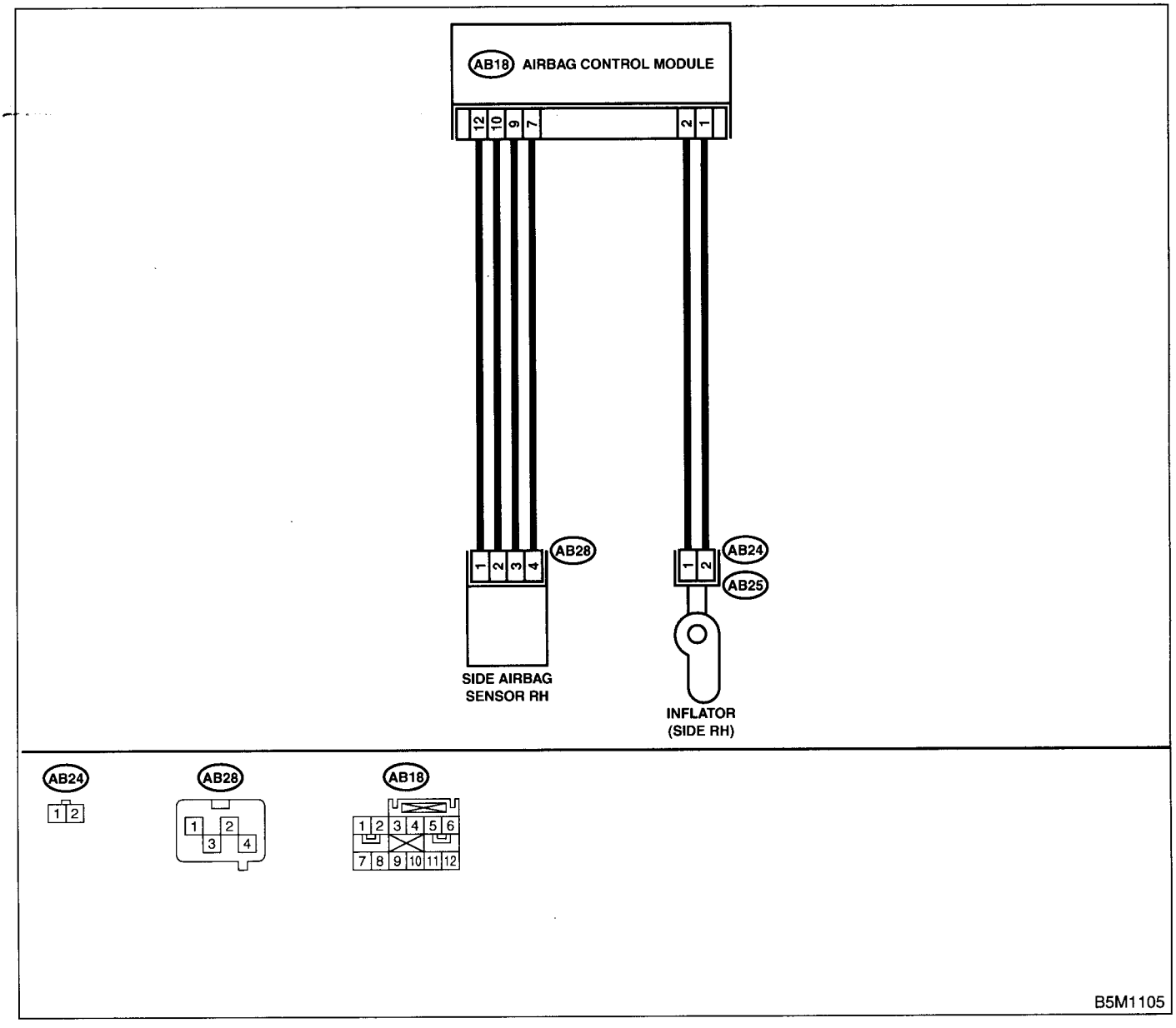
DIAGNOSIS:

- Side airbag sensor (RH) is faulty.
- Side airbag harness (RH) is faulty.
- Airbag control module is faulty.

CAUTION:

- **Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground terminal from the battery, and wait more than 20 seconds before starting to work.**
- **Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.**
- **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	Check	Yes	No
1	**CHECK SIDE AIRBAG HARNESS (RH).** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the connector (AB26) from the seat belt pretensioner (RH). <Ref. to SB-8, Front Seat Belt.> 3)Disconnect the connector (AB25) from (AB24). 4)Disconnect the connector (AB18) from the airbag control module. <Ref. to AB-15, Airbag Control Module.> 5)Connect the connector (1I) in the test harness I or I2 to the connector (AB18). 6)Disconnect the connector (AB28) from the side airbag sensor (RH), and connect the connector (1G) in the test harness G to the connector (AB28). 7)Measure the resistance between connector (3I) in the test harness I or I2 and connector (3G) in the test harness G. ***Connector & terminal*** ***(3I) No. 17 — (3G) No. 2:*** ***(3I) No. 18 — (3G) No. 1:*** ***(3I) No. 19 — (3G) No. 5:*** ***(3I) No. 20 — (3G) No. 4:***	Is the resistance less than 10 Ω?	Go to step **2.**	Replace the body harness with side airbag harness.
2	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance between connector (3I) in the test harness I or I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 17 — Chassis ground:*** ***(3I) No. 18 — Chassis ground:*** ***(3I) No. 19 — Chassis ground:*** ***(3I) No. 20 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the side airbag sensor (RH). <Ref. to AB-16, Side Airbag Sensor.> When the sensor replacement is not OK, replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Replace the body harness with side airbag harness.

Q: TROUBLE CODE 52

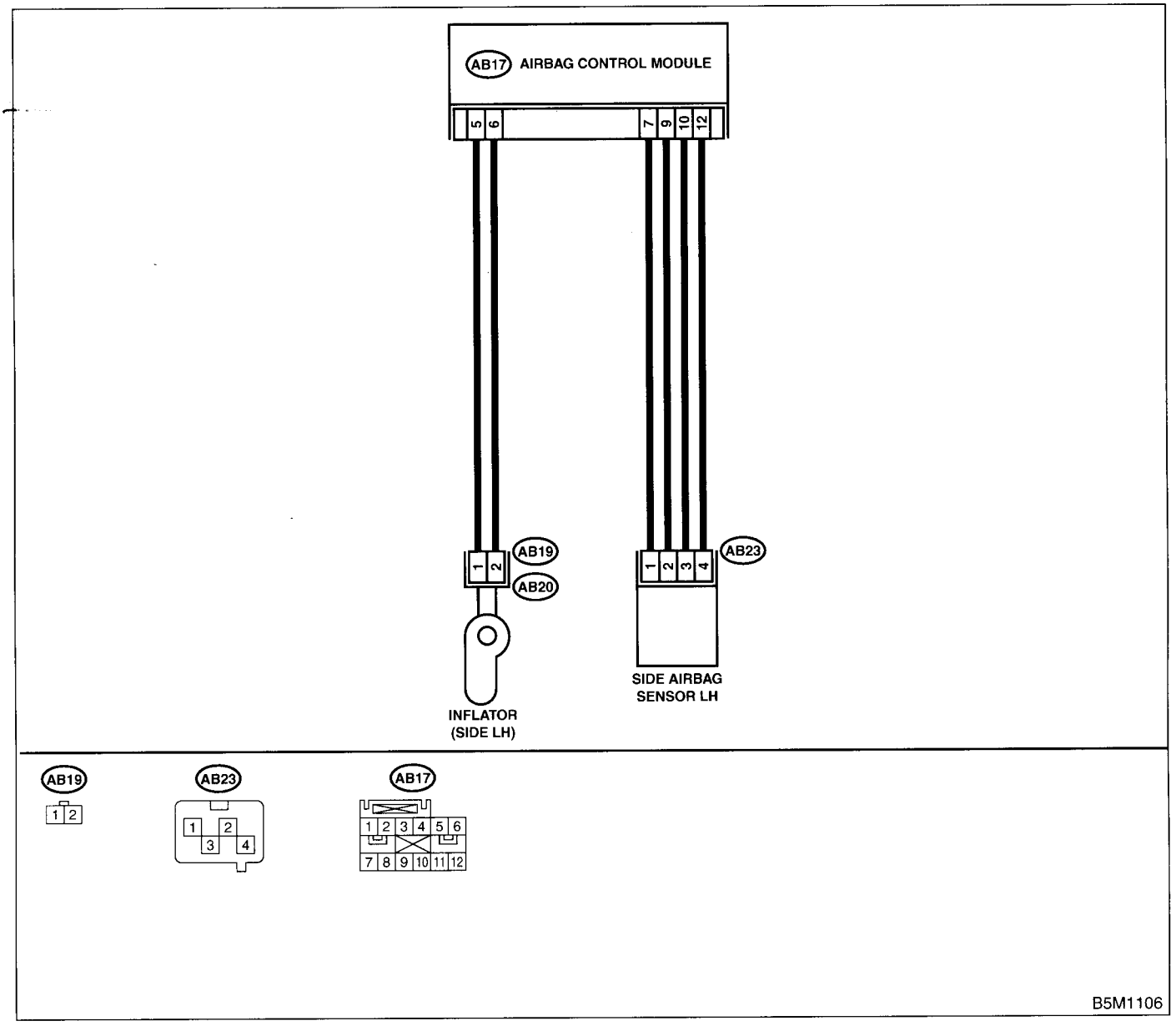
DIAGNOSIS:

- Side airbag sensor (LH) is faulty.
- Side airbag harness (LH) is faulty.
- Airbag control module is faulty.

CAUTION:

- **Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground terminal from the battery, and wait more than 20 seconds before starting to work.**
- **Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.**
- **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	Check	Yes	No
1	**CHECK SIDE AIRBAG HARNESS (LH).** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the connector (AB21) from the seat belt pretensioner (LH). <Ref. to SB-8, Front Seat Belt.> 3)Disconnect the connector (AB20) from (AB19). 4)Disconnect the connector (AB17) from the airbag control module. <Ref. to AB-15, Airbag Control Module.> 5)Connect the connector (1I) in the test harness I or I2 to the connector (AB17). 6)Disconnect the connector (AB23) from the side airbag sensor (LH), and connect the connector (1G) in the test harness G to the connector (AB23). 7)Measure the resistance between connector (3I) in the test harness I or I2 and connector (3G) in the test harness G. ***Connector & terminal*** ***(3I) No. 5 — (3G) No. 4:*** ***(3I) No. 14 — (3G) No. 5:*** ***(3I) No. 15 — (3G) No. 1:*** ***(3I) No. 16 — (3G) No. 2:***	Is the resistance less than 10 Ω?	Go to step **2.**	Replace the body harness with side airbag harness.
2	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance between connector (3I) in the test harness I or I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 5 — Chassis ground:*** ***(3I) No. 14 — Chassis ground:*** ***(3I) No. 15 — Chassis ground:*** ***(3I) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the side airbag sensor (LH). <Ref. to AB-16, Side Airbag Sensor.> When the sensor replacement is not OK, replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Replace the body harness with side airbag harness.

R: TROUBLE CODE 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-16, Side Airbag Sensor.>

S: TROUBLE CODE 54

DIAGNOSIS:

- Side airbag sensor (LH) is faulty.

When Code 54 is displayed, the circuit within the side airbag sensor (LH) is faulty. Replace the side airbag sensor (LH).
<Ref. to AB-16, Side Airbag Sensor.>

T: TROUBLE CODE 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-15, Airbag Control Module.>
- Front seat assembly with side airbag module. (Operating side) <Ref. to SE-6, Front Seat.>
- Side airbag sensor. (Operating side) <Ref. to AB-16, Side Airbag Sensor.>

U: TROUBLE CODE 61

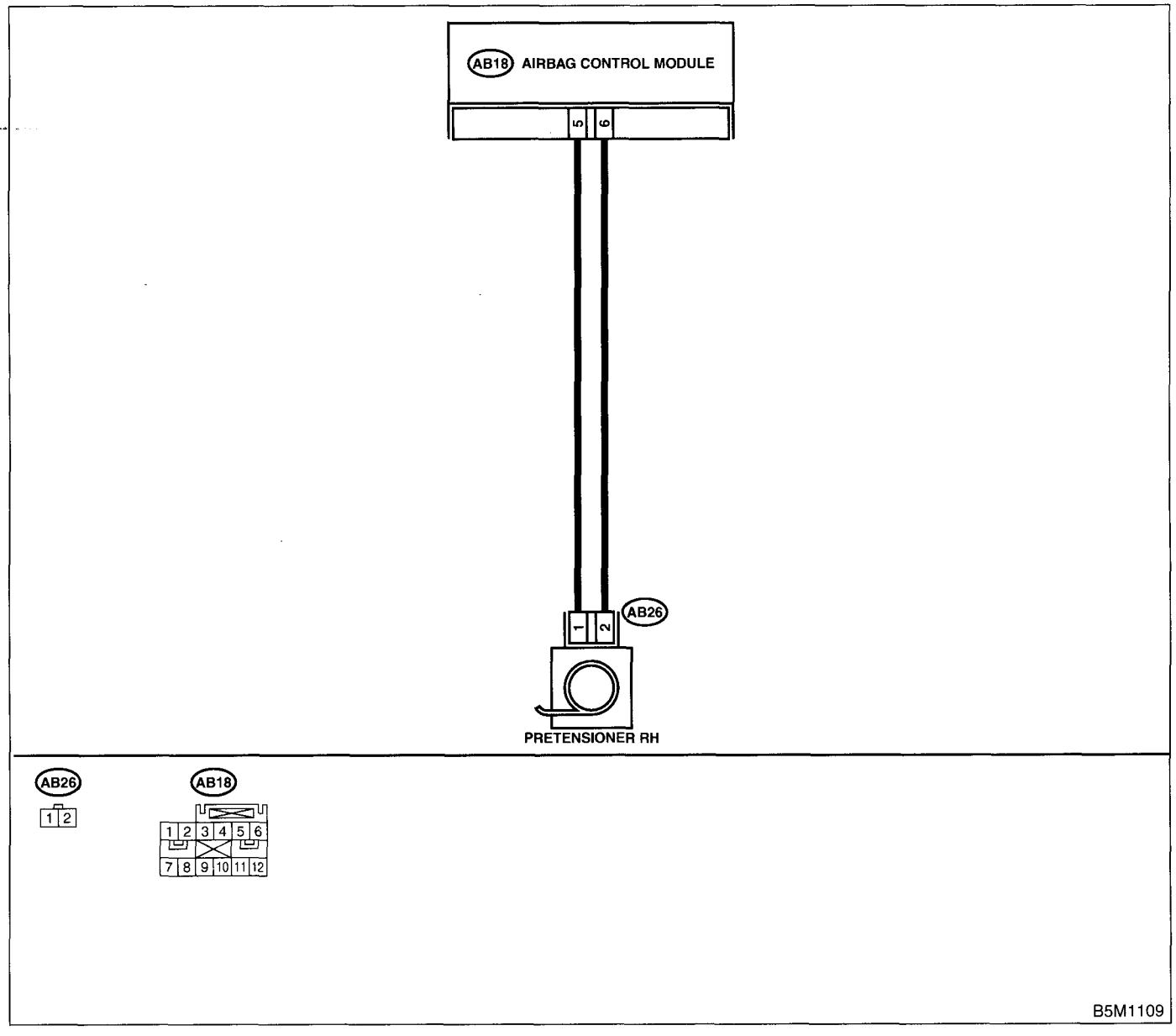
DIAGNOSIS:

- Seat belt pretensioner (RH) circuit is open, shorted or shorted to ground.
- Airbag control module is faulty.
- Pretensioner is faulty.
- Pretensioner harness is faulty.

CAUTION:

- **Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground terminal from the battery, and wait more than 20 seconds before starting to work.**
- **Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.**
- **When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.**

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SEAT BELT PRETENSIONER.** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the connector (AB26) from the seat belt pretensioner (RH). <Ref. to SB-8, Front Seat Belt.> 3)Connect the connector (1L) in the test harness L to (AB26). 4)Connect the airbag resistor to the connector (3L) in the test harness L. 5)Connect the battery ground terminal and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace the seat belt pretensioner (RH). <Ref. to SB-8, Front Seat Belt.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (RH).** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the airbag resistor from the test harness L. 3)Disconnect the connector (AB25) from (AB24). 4)Disconnect the connectors (AB17) and (AB18) from the airbag control module. <Ref. to AB-15, Airbag Control Module.> 5)Connect the connector (1I) in the test harness I or I2 to the connector (AB18). 6)Measure the resistance between connector (3I) in the test harness I or I2 and connector (3L) in the test harness L. ***Connector & terminal*** ***(3I) No. 8 — (3L) No. 6:*** ***(3I) No. 6 — (3L) No. 5:***	Is the resistance less than 10 Ω?	Go to step **3.**	Replace the body harness with side airbag harness.
3	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance of the connector (3I) in the test harness I or I2. ***Connector & terminal*** ***(3I) No. 6 — No. 8:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the body harness with side airbag harness.
4	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance between connector (3I) in the test harness I or I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 6 — Chassis ground:*** ***(3I) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Replace the body harness with side airbag harness.

V: TROUBLE CODE 62

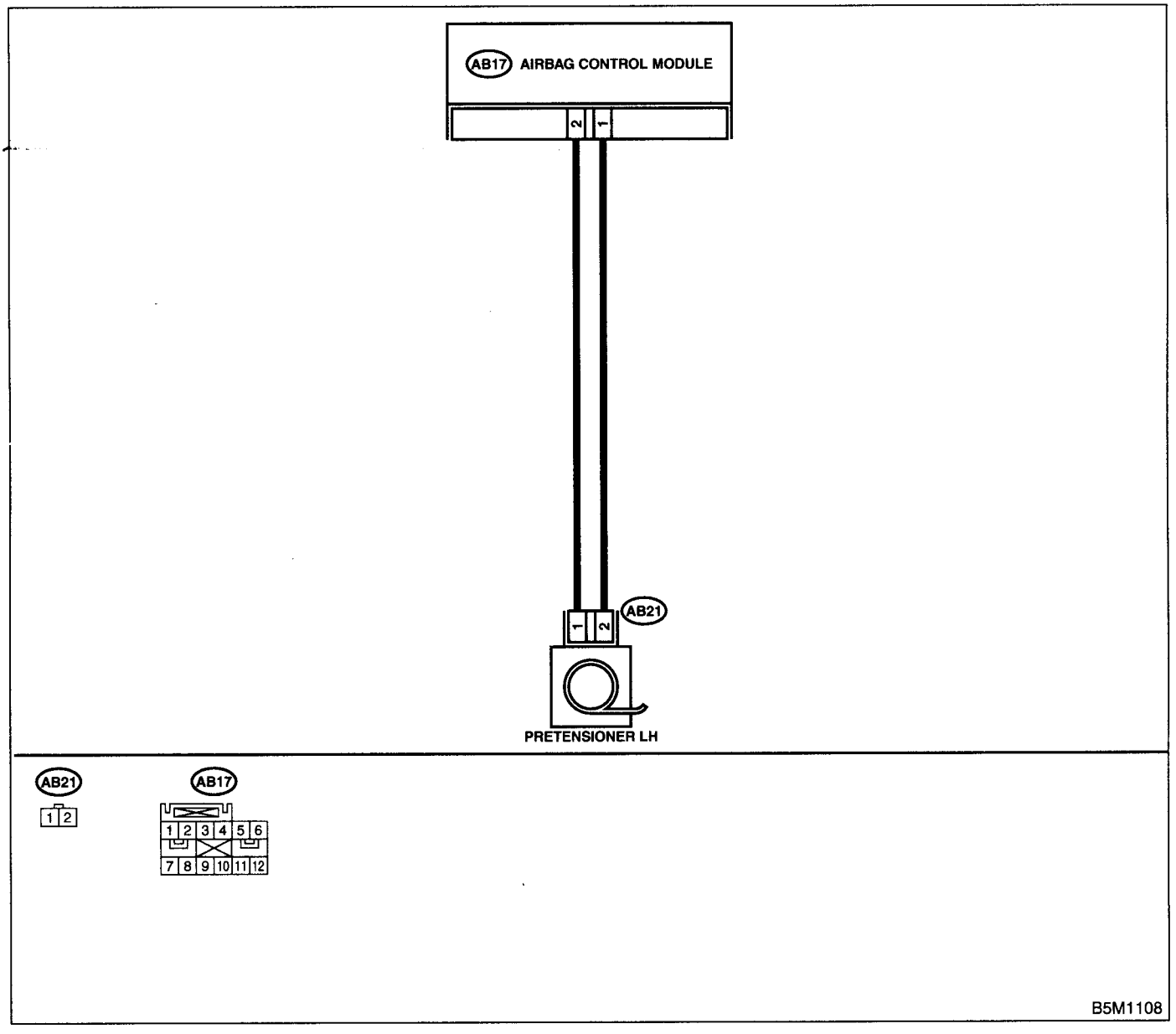
DIAGNOSIS:

- Seat belt pretensioner (LH) circuit is open, shorted or shorted to ground.
- Airbag control module is faulty.
- Pretensioner is faulty.
- Pretensioner harness is faulty.

CAUTION:

- **Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground terminal from the battery, and wait more than 20 seconds before starting to work.**
- **Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.**
- **When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.**

WIRING DIAGRAM:



	Step	Check	Yes	No
	CHECK SEAT BELT PRETENSIONER. 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the connector (AB21) from the seat belt pretensioner (LH). <Ref. to SB-8, Front Seat Belt.> 3)Connect the connector (1L) in the test harness L to (AB21). 4)Connect the airbag resistor to the connector (3L) in the test harness L. 5)Connect the battery ground terminal and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace the seat belt pretensioner LH). <Ref. to SB-8, Front Seat Belt.>	Go to step **2.**
--	**CHECK SIDE AIRBAG HARNESS (LH).** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the airbag resistor from the test harness L. 3)Disconnect the connector (AB20) from (AB19). 4)Disconnect the connectors (AB17) and (AB18) from the airbag control module. <Ref. to AB-15, Airbag Control Module.> 5)Connect the connector (1I) in the test harness I or I2 to the connector (AB17). 6)Measure the resistance between connector (3I) in the test harness I or I2 and the connector (3L) in the test harness L. ***Connector & terminal*** ***(3I) No. 11 — (3L) No. 6:*** ***(3I) No. 13 — (3L) No. 5:***	s the resistance less than 10 Ω?	Go to step **3.**	Replace the body harness with side airbag harness.
1	**CHECK SIDE AIRBAG HARNESS (LH).** Measure the resistance of the connector (3I) in the test harness I or I2. ***Connector & terminal*** ***(3I) No. 11 — No. 13:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the body harness with side airbag harness.
1	**CHECK SIDE AIRBAG HARNESS (LH).** Measure the resistance between the connector (3I) in the test harness I or I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 11 — Chassis ground:*** ***(3I) No. 13 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Replace the body harness with side airbag harness.

W: TROUBLE CODE 65

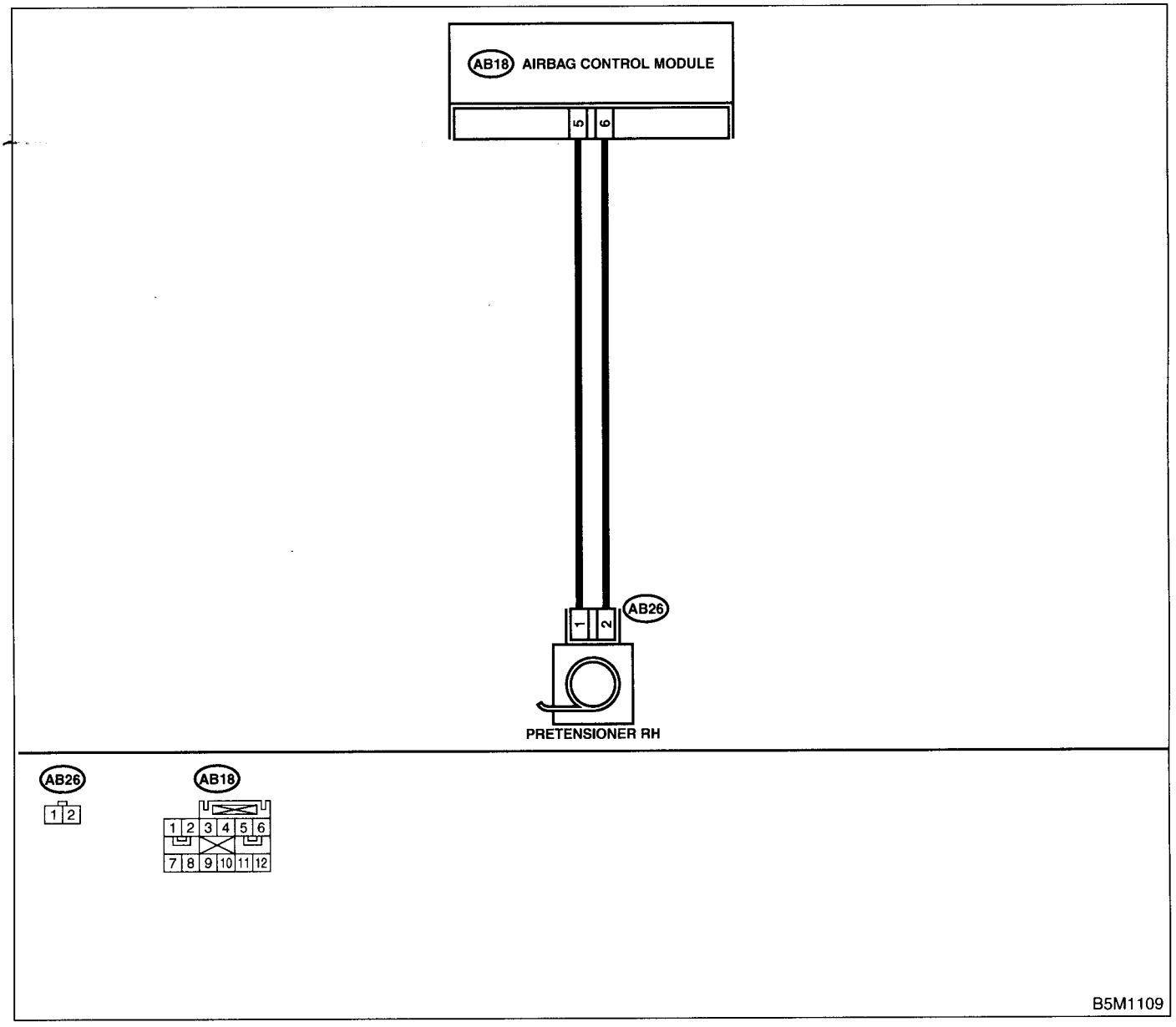
DIAGNOSIS:

- Seat belt pretensioner (RH) circuit is shorted to the power supply.
- Pretensioner is faulty.
- Pretensioner harness is faulty.
- Airbag control module is faulty.

CAUTION:

- **Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground terminal from the battery, and wait more than 20 seconds before starting to work.**
- **Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.**
- **When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.**

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SEAT BELT PRETENSIONER.** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the connector (AB26) from the seat belt pretensioner (RH). <Ref. to SB-8, Front Seat Belt.> 3)Connect the connector (1L) in the test harness L to (AB26). 4)Connect the airbag resistor to the connector (3L) in the test harness L. 5)Connect the battery ground terminal, and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace the seat belt pretensioner (RH). <Ref. to SB-8, Front Seat Belt.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (RH).** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the airbag resistor from the test harness L. 3)Disconnect the connector (AB25) from (AB24). 4)Disconnect the connectors (AB17) and (AB18) from the airbag control module. <Ref. to AB-15, Airbag Control Module.> 5)Connect the connector (1I) in the test harness I or I2 to the connector (AB18). 6)Connect the battery ground cable and turn the ignition switch ON. 7)Measure the voltage between connector (3I) in the test harness I or I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 6 (+) — Chassis ground (–):*** ***(3I) No. 8 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Replace the body harness with side airbag harness.

X: TROUBLE CODE 66

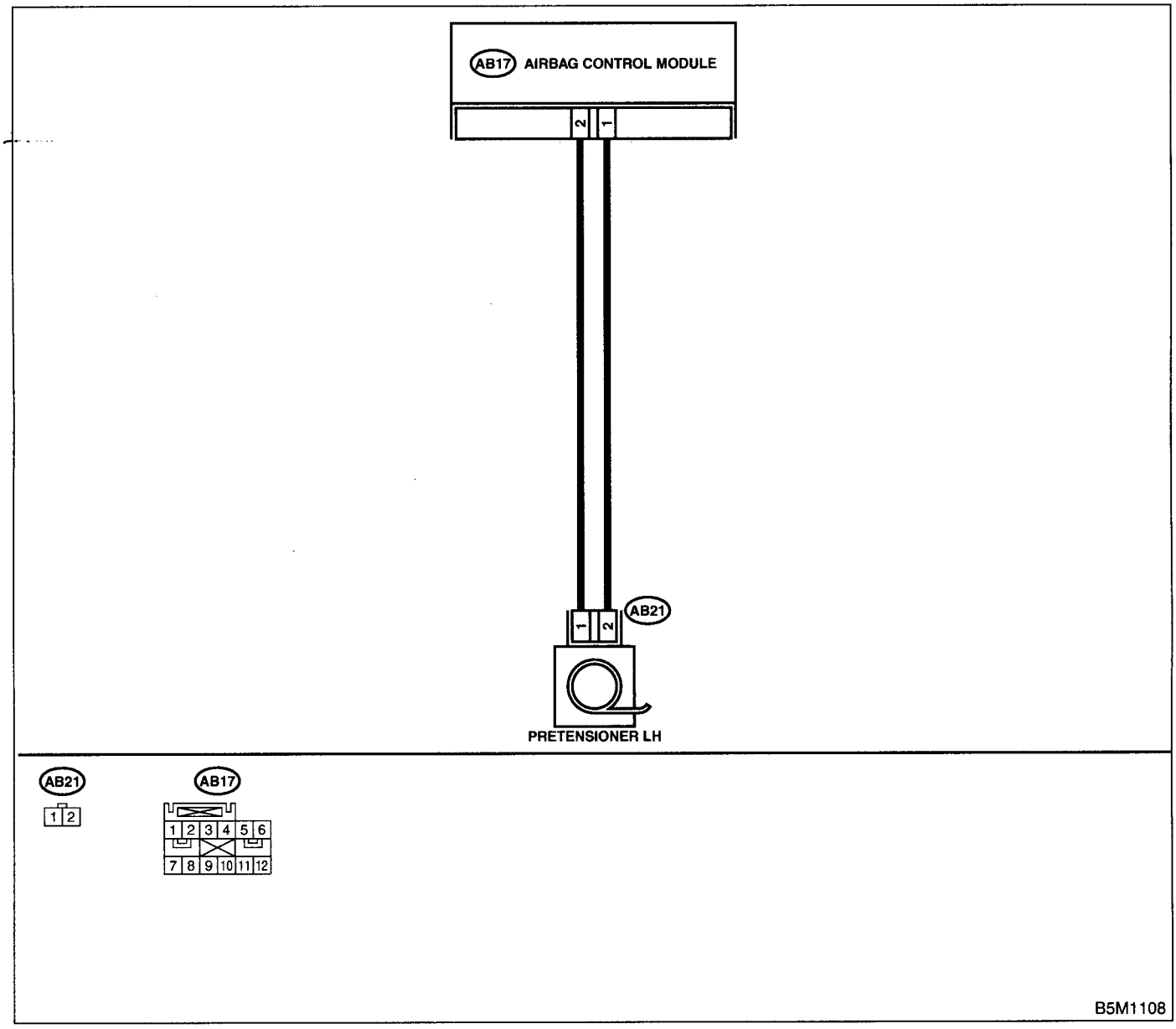
DIAGNOSIS:

- Seat belt pretensioner (LH) circuit is shorted to the power supply.
- Pretensioner is faulty.
- Pretensioner harness is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground terminal from the battery, and wait more than 20 seconds before starting to work.
• Before replacing the airbag module, seat belt pretensioner, roll connector, control module and the sensor, reconnect each part and confirm that the warning light operates properly.
• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SEAT BELT PRETENSIONER.** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the connector (AB21) from the seat belt pretensioner (LH). <Ref. to SB-8, Front Seat Belt.> 3)Connect the connector (1L) in the test harness L to (AB21). 4)Connect the airbag resistor to the connector (3L) in the test harness L. 5)Connect the battery ground terminal and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace the seat belt pre-tensioner (LH). <Ref. to SB-8, Front Seat Belt.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (LH).** 1)Turn the ignition switch OFF, disconnect the battery ground terminal, and wait more than 20 seconds. 2)Disconnect the airbag resistor from the test harness L. 3)Disconnect the connector (AB20) from (AB19). 4)Disconnect the connectors (AB17) and (AB18) from the airbag control module. <Ref. to AB-15, Airbag Control Module.> 5)Connect the connector (1I) in the test harness I or I2 to the connector (AB17). 6)Connect the battery ground terminal and turn the ignition switch ON. 7)Measure the voltage between connector (3I) in the test harness I or I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 11 (+) — Chassis ground (–):*** ***(3I) No. 13 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Replace the body harness with side airbag harness.

SEAT BELT SYSTEM

SB

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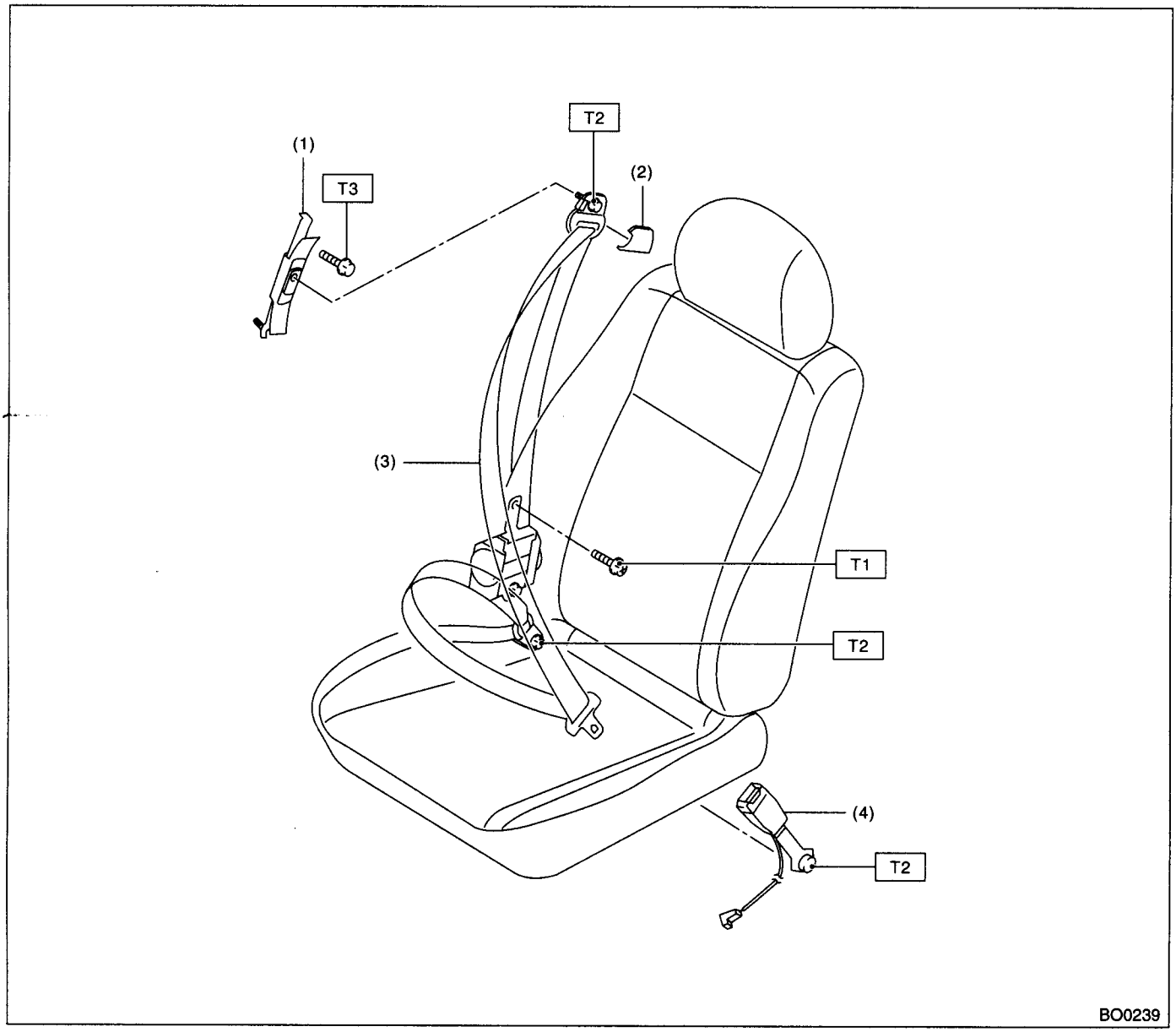
2. Pretensioner Connector 6
3. Inspection Locations After a Collision 7
4. Front Seat Belt 8
5. Rear Seat Belt 10

1. General Description

A: COMPONENT

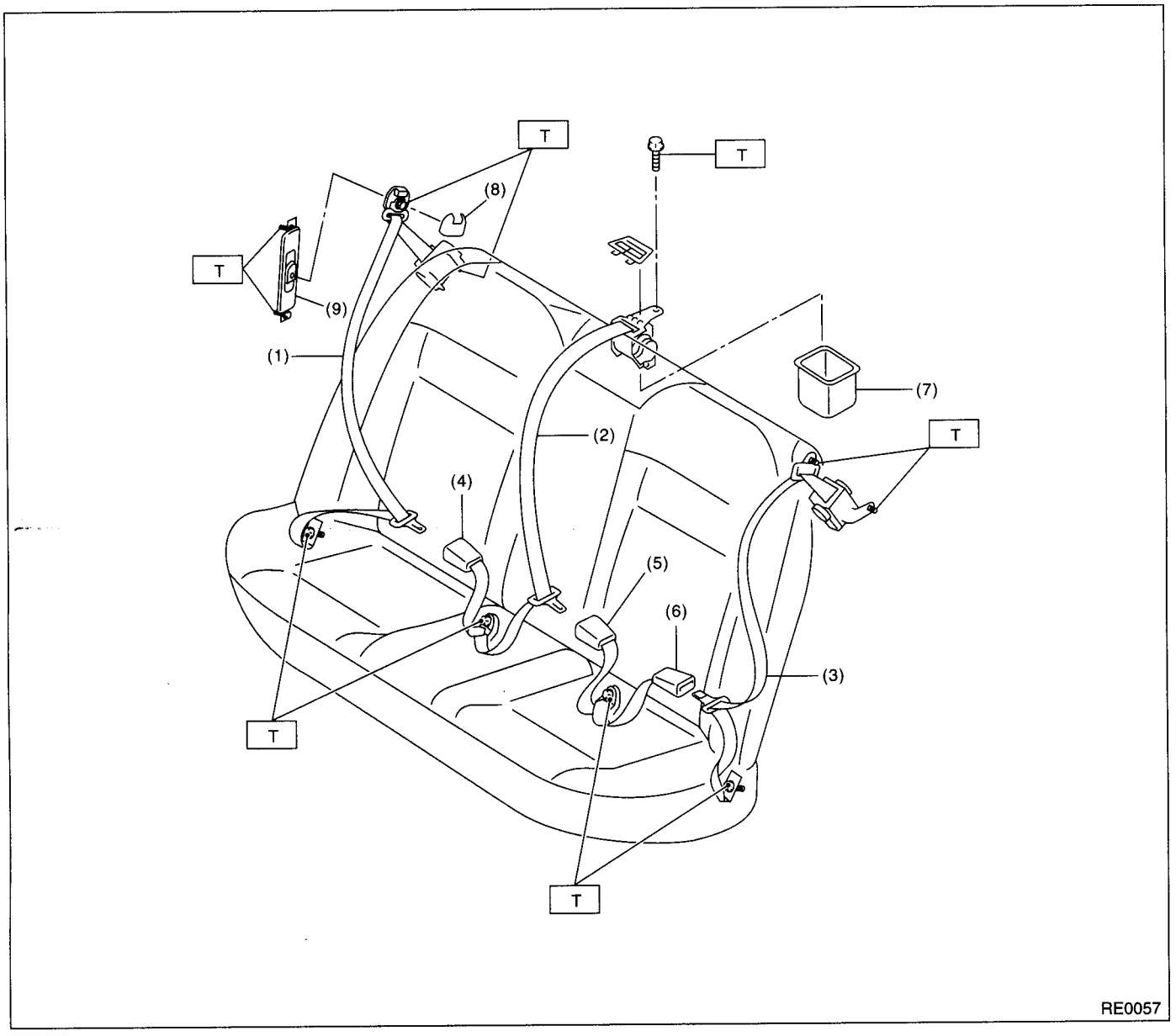
1. FRONT SEAT BELT



(1) Adjuster anchor ASSY
(2) Anchor cover
(3) Outer belt ASSY
(4) 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)

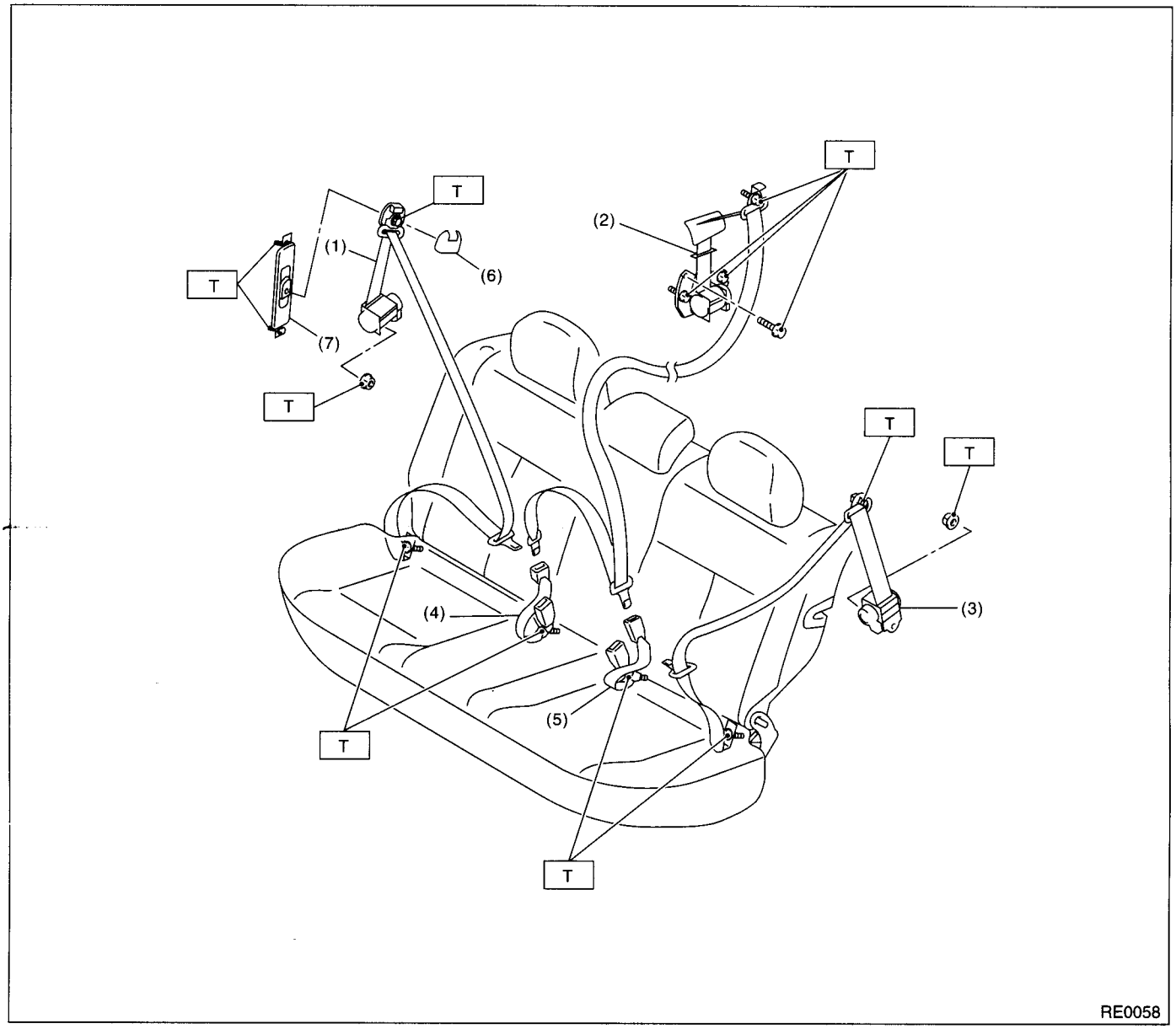
2. REAR SEAT BELT (SEDAN)



(1) Outer seat belt RH
(2) Outer seat belt CENTER
(3) Outer seat belt LH
(4) Inner seat belt RH
(5) Inner seat belt CENTER
(6) Inner seat belt LH
(7) Case center ELR
(8) Anchor cover
(9) Adjustable anchor ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T: 30 (3.1, 22)

3. REAR SEAT BELT (WAGON)



(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) Adjustable anchor ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T: 30 (3.1, 22)

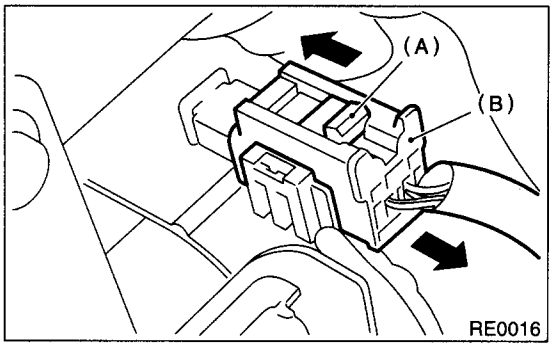
B: CAUTION

- Before starting, turn the ignition switch 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 the 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.
- If the material gets in your eyes or on your skin during deployment, wash it away with clean water, and then consult a doctor.

2. Pretensioner Connector

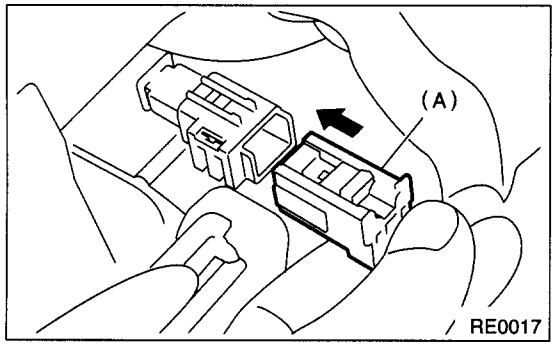
A: OPERATION

1) How to disconnect:
   (1) Move the slide lock (A) in the direction of the arrow.
   (2) Pull the connector (B) 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 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.**

3. Inspection Locations After a Collision

A: INSPECTION

Check for the following, and then replace with new parts if necessary.

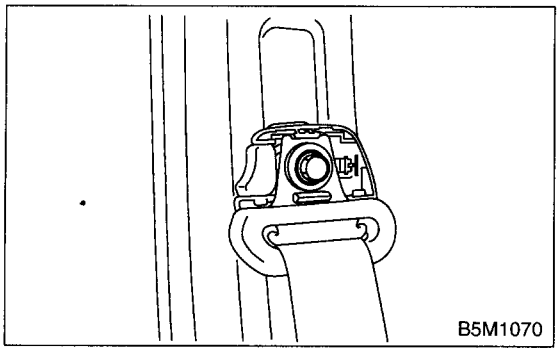
- Center pillar lower garnish is discolored or cracked.
- Wire harness and/or connector is damaged.

4. Front Seat Belt

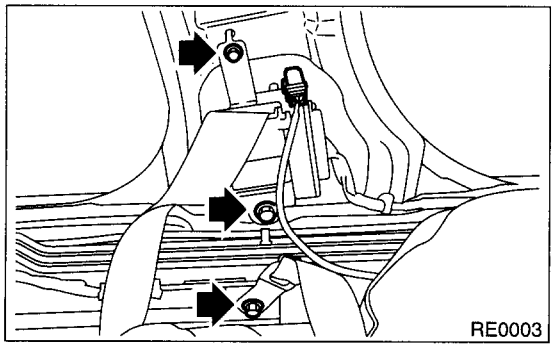
A: REMOVAL

1. OUTER BELT (FRONT)

1) Fold backrest all the way forward, and then move the front seat all the way forward.
2) Turn the ignition switch 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-46, REMOVAL, Lower Inner Trim.>
4) Remove the anchor cover. Loosen the shoulder anchor bolt, and then detach the shoulder anchor from center pillar.



5) Turn over the floor mat to remove the bolts.

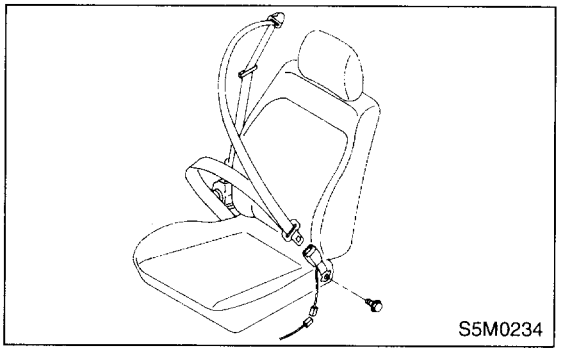


6) Disconnect the yellow connector of pretensioner harness, and remove the outer belt (front).

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. INNER BELT (FRONT)

1) Disconnect the connector.
2) Remove the anchor bolt, and then detach the inner belt.



B: INSTALLATION

1. OUTER BELT (FRONT)

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.**

2. INNER BELT (FRONT)

Install in the reverse order of removal.

C: INSPECTION

1. OUTER BELT (FRONT)

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. INNER BELT (FRONT)

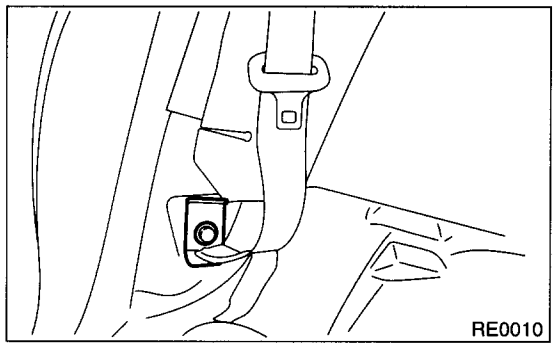
Check for the following, and replace with new parts if necessary.
- Inner belt is deformed or damaged.
- Seat belt buckle is engaged improperly.

5. Rear Seat Belt

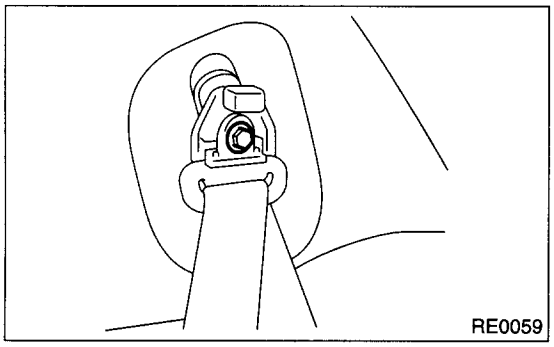
A: REMOVAL

1. OUTER BELT SIDE (SEDAN)

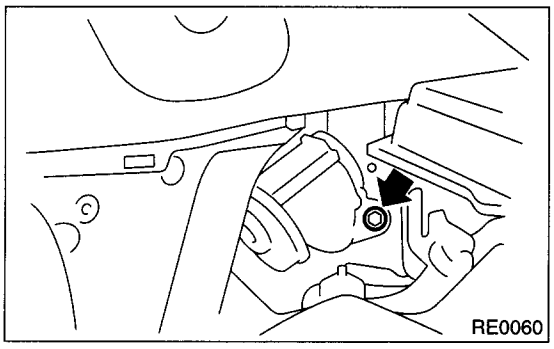
1) Remove the rear seat. <Ref. to SE-11, REMOVAL, Rear Seat.>
2) Remove the side sill rear lower cover. <Ref. to EI-46, REMOVAL, Lower Inner Trim.>
3) Remove the seat belt lower anchor bolt.



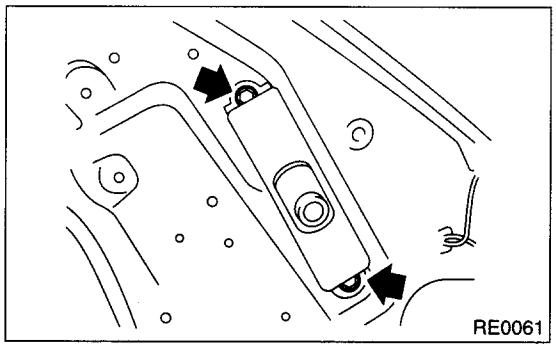
4) Remove the anchor cover. Remove the bolt and shoulder anchor from pillar.



5) Remove the quarter pillar trim. <Ref. to EI-47, REMOVAL, Rear Quarter Trim.>
6) Remove the bolts, and then detach the seat belt.

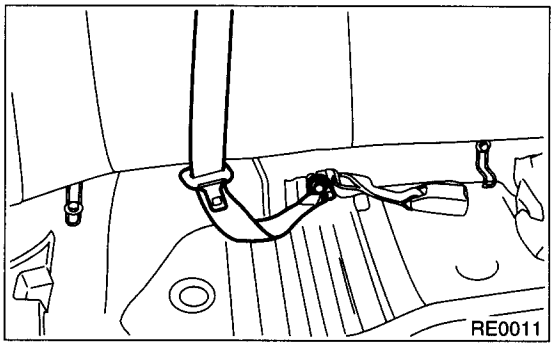


7) Remove the two bolts and adjustable anchor ASSY.

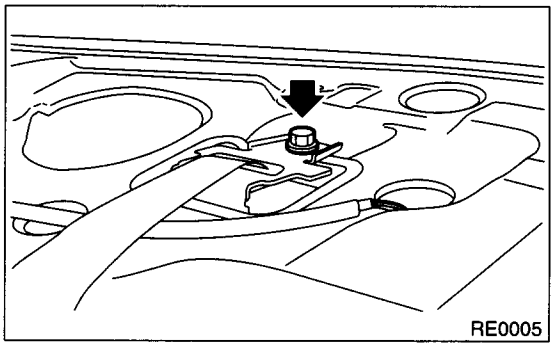


2. OUTER BELT CENTER (SEDAN)

1) Remove the rear seat. <Ref. to SE-11, REMOVAL, Rear Seat.>
2) Remove the seat belt lower anchor bolt.

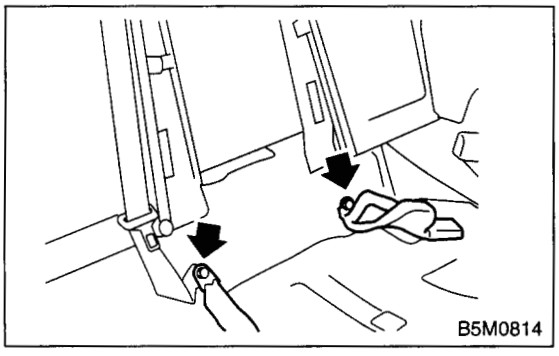


3) Remove the quarter pillar trim. <Ref. to EI-47, Removal, Rear Quarter Trim.>
4) Remove the rear shelf trim. <Ref. to EI-53, REMOVAL, Rear Shelf Trim.>
5) Remove the bolts, and then detach the seat belt.



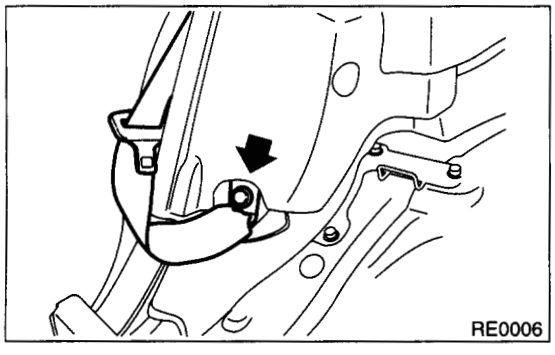
3. INNER BELT (SEDAN)

1) Remove the rear cushion. <Ref. to SE-11, REMOVAL, Rear Seat.>
2) Remove the bolts, and then detach the inner belt.

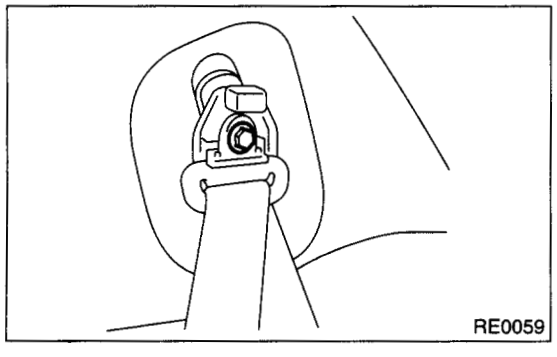


4. OUTER BELT SIDE (WAGON)

1) Remove the luggage floor mat. <Ref. to EI-56, REMOVAL, Luggage Floor Mat.>
2) Remove the rear seat. <Ref. to SE-11, REMOVAL, Rear Seat.>
3) Remove the side sill rear lower cover. <Ref. to EI-46, REMOVAL, Lower Inner Trim.>
4) Remove the seat belt lower anchor bolt.

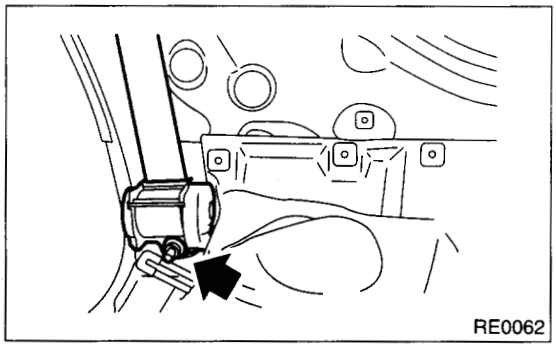


5) Remove the anchor cover. Remove the bolt and shoulder anchor from pillar.

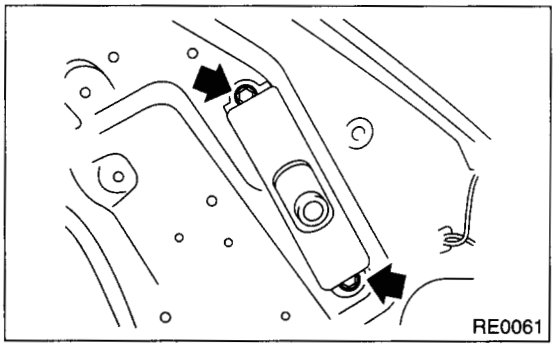


6) Remove the rear quarter trim. <Ref. to EI-47, REMOVAL, Rear Quarter Trim.>

7) Remove the bolts, and then detach the outer belt side.

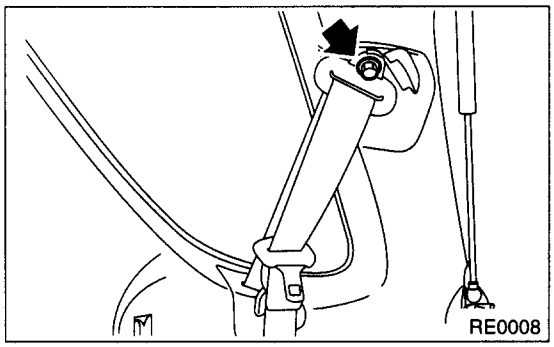


8) Remove the two bolts and adjustable anchor ASSY.

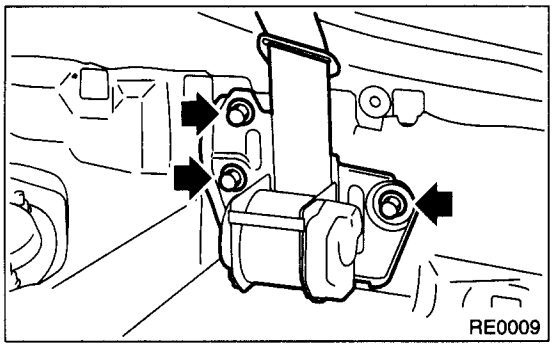


5. OUTER BELT CENTER (WAGON)

1) Loosen the shoulder anchor bolt, and then detach the shoulder anchor from quarter pillar.

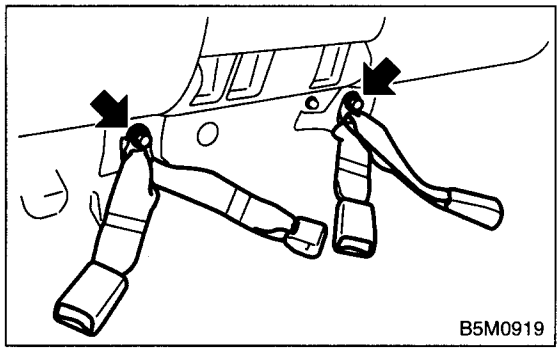


2) Remove the quarter trim. <Ref. to EI-47, REMOVAL, Rear Quarter Trim.>
3) Remove the three bolts, and then detach the outer belt center.



6. INNER BELT (WAGON)

1) Remove the rear cushion.
2) Remove the bolt, and then detach the inner belt.



B: INSTALLATION

1. OUTER BELT SIDE (SEDAN)

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.

2. OUTER BELT CENTER (SEDAN)

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.

3. INNER BELT (SEDAN)

Install in the reverse order of removal.

CAUTION:
During installation, make sure that the seat belts are not twisted.

4. OUTER BELT SIDE (WAGON)

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.

5. OUTER BELT CENTER (WAGON)

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.

6. INNER BELT (WAGON)

Install in the reverse order of removal.

CAUTION:
During installation, make sure that the seat belts are not twisted.

C: INSPECTION

1. OUTER BELT SIDE (SEDAN)

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 (SEDAN)

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 (SEDAN)

Check for the following, and replace with new parts if necessary.
• Inner belt is deformed or damaged.
• Seat belt buckle is engaged improperly.

4. OUTER BELT SIDE (WAGON)

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.

5. OUTER BELT CENTER (WAGON)

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.

6. INNER BELT (WAGON)

Check for the following, and replace with new parts if necessary.
• Inner belt is deformed or damaged.
• Seat belt buckle is engaged improperly.

LIGHTING SYSTEM

LI

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22.	High-mounted Stop Light	24
23.	Spot Light	25
24.	Room Light	26
25.	Luggage Room Light	27
26.	Trunk Room Light	28
27.	Glove Box Light	29

1. General Description

A: SPECIFICATIONS

Headlight			12 V — 55 W/65 W (Halogen)
Front turn signal light			12 V — 21 W
Side marker light			12 V — 5 W
Parking light			12 V — 5 W
Front fog light			12 V — 55 W (Halogen)
Rear combination light	Sedan	Tail/Stop light	12 V — 21 W/5 W
		Tail light	12 V — 21 W/5 W
		Stop light	12 V — 21 W
		Turn signal light	12 V — 21 W
		Back-up light	12 V — 21 W
	Wagon	Tail/Stop light	12 V — 21 W/5 W
		Turn signal light	12 V — 21 W
		Back-up light	12 V — 21 W
		Side marker light	12 V — 5 W
License plate light			12 V — 5 W
High-mounted stop light	Sedan		12 V — 21 W
	Wagon		12 V — 13 W
Room light			12 V — 8 W
Spot light			12 V — 8 W
Luggage room light			12 V — 13 W
Trunk 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 the radio, control module, and other parts provided with memory functions, record the 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:

- **The air bag system wiring harness is routed near electrical parts and switches. All air bag system wiring harnesses and connectors are yellow. Do not use an electric test equipment on these circuits.**
- **Be careful not to damage the air bag 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-98, SCHEMATIC, Headlight System.>

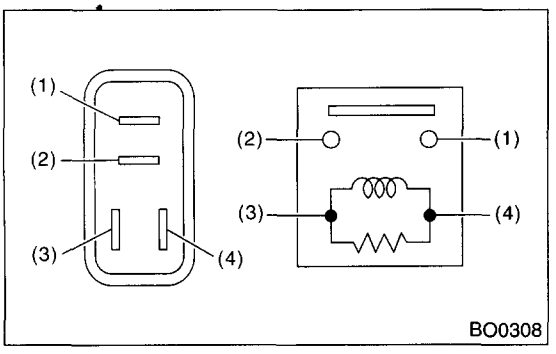
2. CLEARANCE LIGHT AND ILLUMINATION LIGHT

<Ref. to WI-94, SCHEMATIC, Clearance Light and Illumination Light System.>

B: INSPECTION

1. HEADLIGHT RELAY

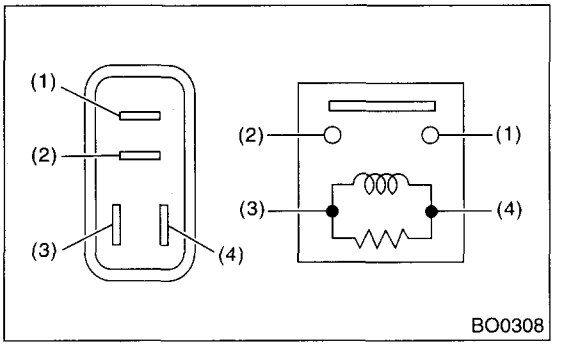
Measure the headlight relay resistance between terminals when connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground terminal.



Current	Terminal No.	Standard
Flow	1 and 2	Less than 1Ω
No flow		More than 1MΩ

2. 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

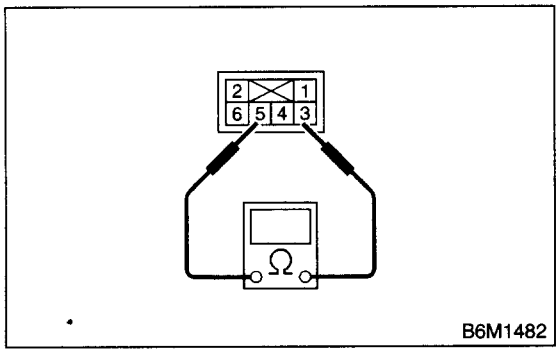
1. FRONT FOG LIGHT

<Ref. to WI-97, SCHEMATIC, Front Fog Light System.>

B: INSPECTION

1. FRONT FOG LIGHT SWITCH

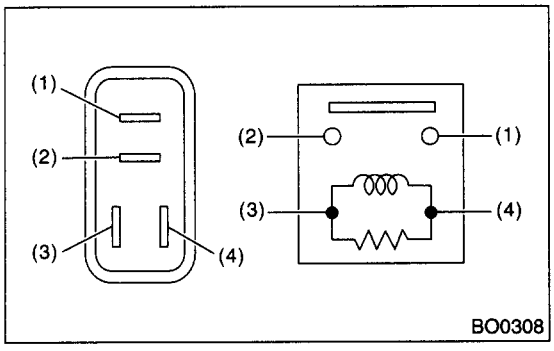
Measure the front fog light switch resistance.



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. Turn Signal and Hazard Light System

A: SCHEMATIC

1. TURN SIGNAL LIGHT AND HAZARD LIGHT

<Ref. to WI-104, SCHEMATIC, Turn Signal Light and Hazard Light System.>

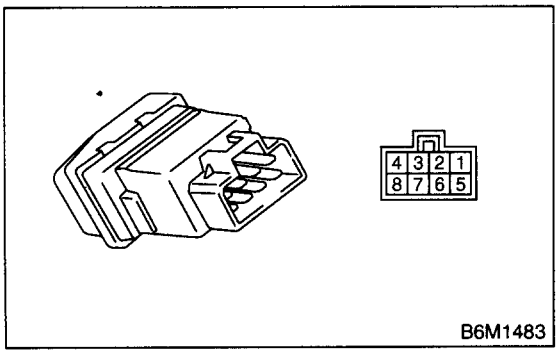
B: INSPECTION

1. TURN SIGNAL SWITCH

<Ref. to LI-9, INSPECTION, Combination Switch (Light).>

2. HAZARD SWITCH

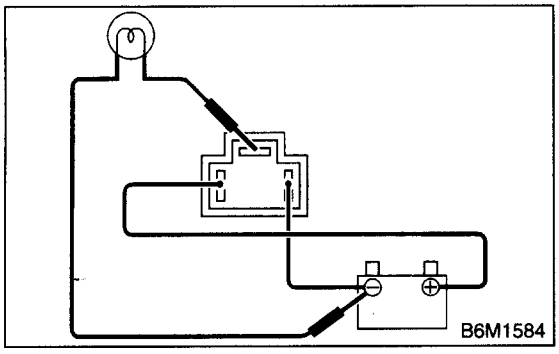
Measure the hazard switch resistance.



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 & 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.



5. Back-up Light System

A: SCHEMATIC

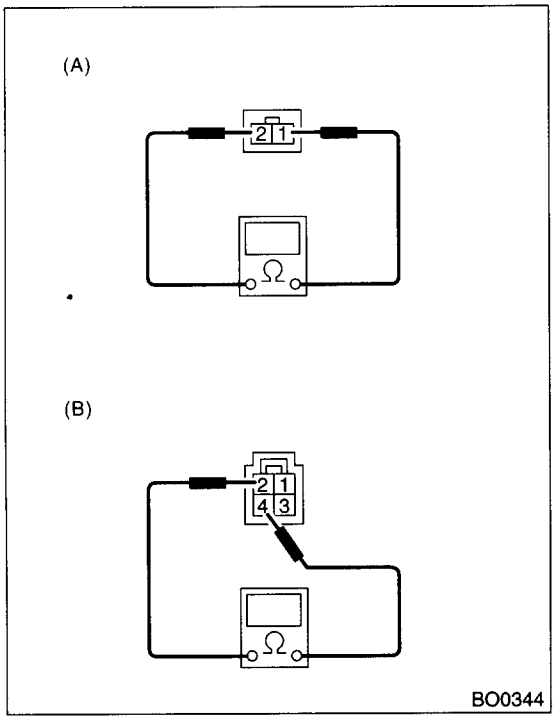
1. BACK-UP LIGHT

<Ref. to WI-93, SCHEMATIC, Back-up Light System.>

B: INSPECTION

1. BACK-UP LIGHT SWITCH (M/T)

Measure the back-up light switch resistance.

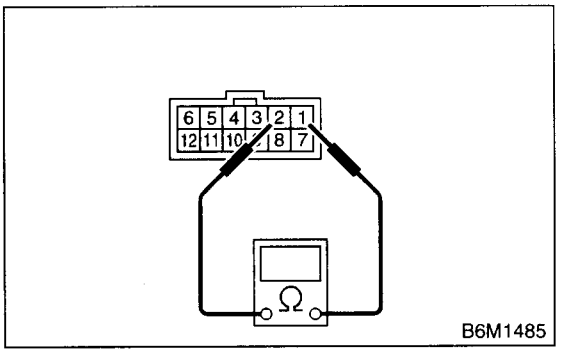


(A) Non-turbo model
(B) Turbo model

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

6. Stop Light System

A: SCHEMATIC

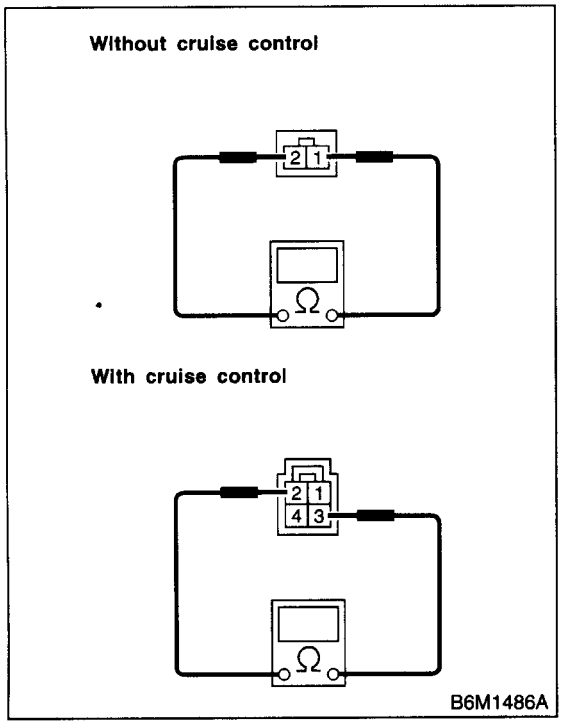
1. STOP LIGHT

<Ref. to WI-103, SCHEMATIC, Stop Light System.>

B: INSPECTION

1. STOP LIGHT SWITCH

Measure the stop light switch resistance.



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

7. Interior Light System

A: SCHEMATIC

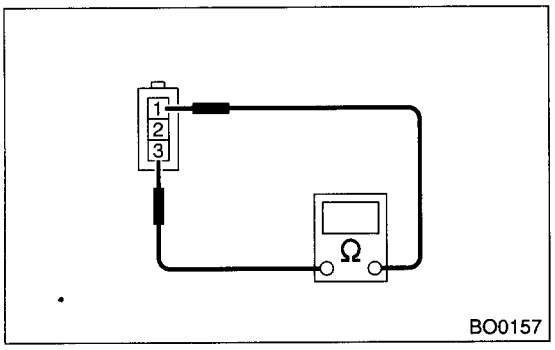
1. INTERIOR LIGHT

<Ref. to WI-101, 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

3. TRUNK ROOM LIGHT SWITCH

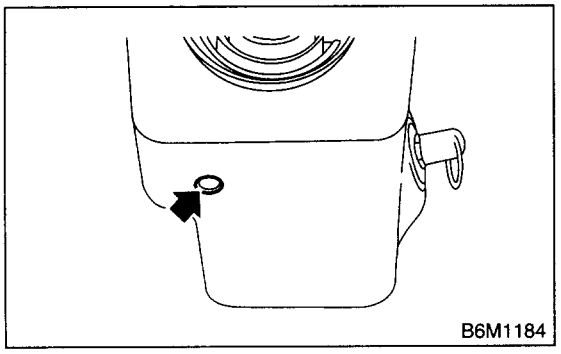
Measure the trunk room light switch resistance.

Switch position	Terminal No.	Standard
When trunk lid is opened	1 and 2	Less than 1Ω
When trunk lid is closed		More than 1MΩ

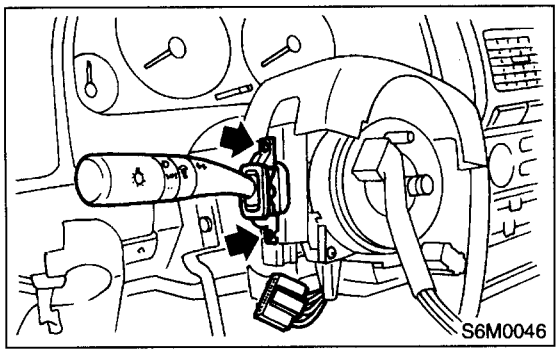
8. Combination Switch (Light)

A: REMOVAL

1) Remove the instrument panel lower cover. <Ref. to EI-42, REMOVAL, Instrument Panel Assembly.>
2) Remove the screws which secure upper column cover to lower column cover.



3) Disconnect the connector from combination switch.
4) Remove the screws which secure switch and remove the switch.

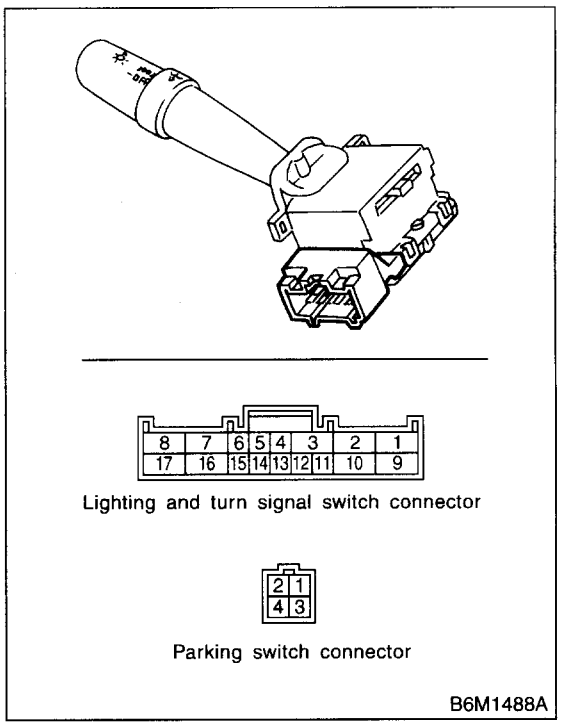


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the combination switch resistance.



1. LIGHTING SWITCH

Switch position	Terminal No.	Standard
OFF	—	More than 1MΩ
Tail	14 and 16	Less than 1Ω
Head	13, 14 and 16	Less than 1Ω

2. DIMMER AND PASSING SWITCH

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

3. TURN SIGNAL SWITCH

Switch position	Terminal No.	Standard
Left	1 and 2	Less than 1Ω
Neutral	—	More than 1MΩ
Right	2 and 3	Less than 1Ω

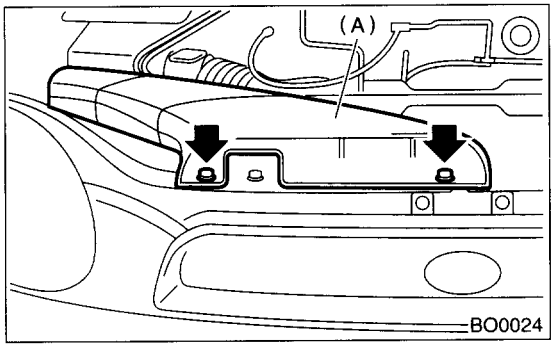
4. PARKING SWITCH

Switch position	Terminal No.	Standard
OFF	2 and 4	Less than 1Ω
ON	1 and 4	Less than 1Ω

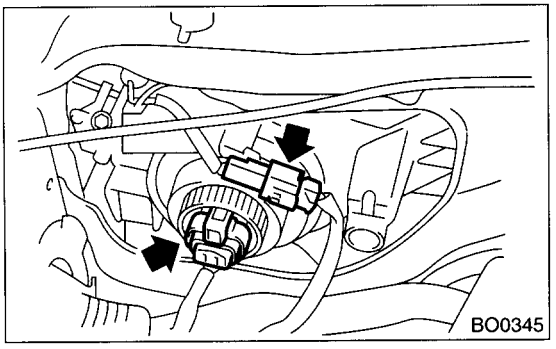
9. Headlight Assembly

A: REMOVAL

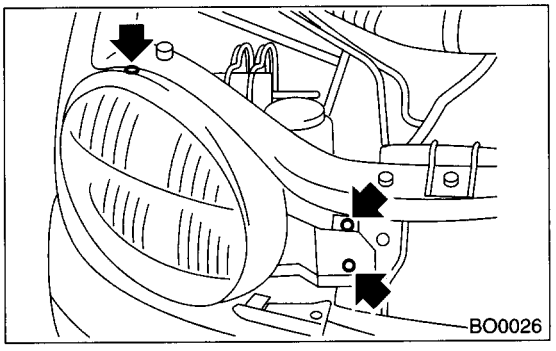
1) Disconnect the ground terminal from battery.
2) Remove the duct (A) (when right side headlight is removed).



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.



5) Remove three bolts and disconnect the connectors, and then detach the headlight assembly.



B: INSTALLATION

Install in the reverse order of removal.

C: ADJUSTMENT

1. HEADLIGHT AIMING

NOTE:
As this headlignt is the "VISUAL AIMING TYPE", it is possible to adjust aiming only in the vertical direction. It cannot be adjusted in the horizontal direction.

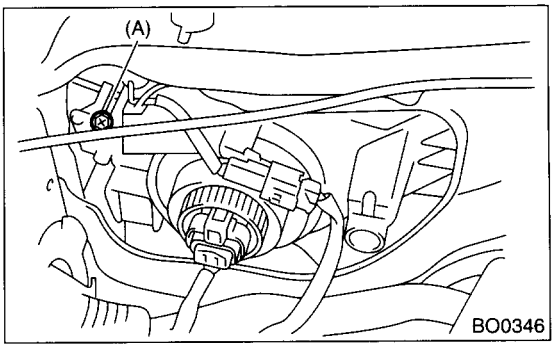
CAUTION:
Turn off the light before adjusting headlight aiming. If the light is necessary to check aiming, do not turn on for more than two minutes.

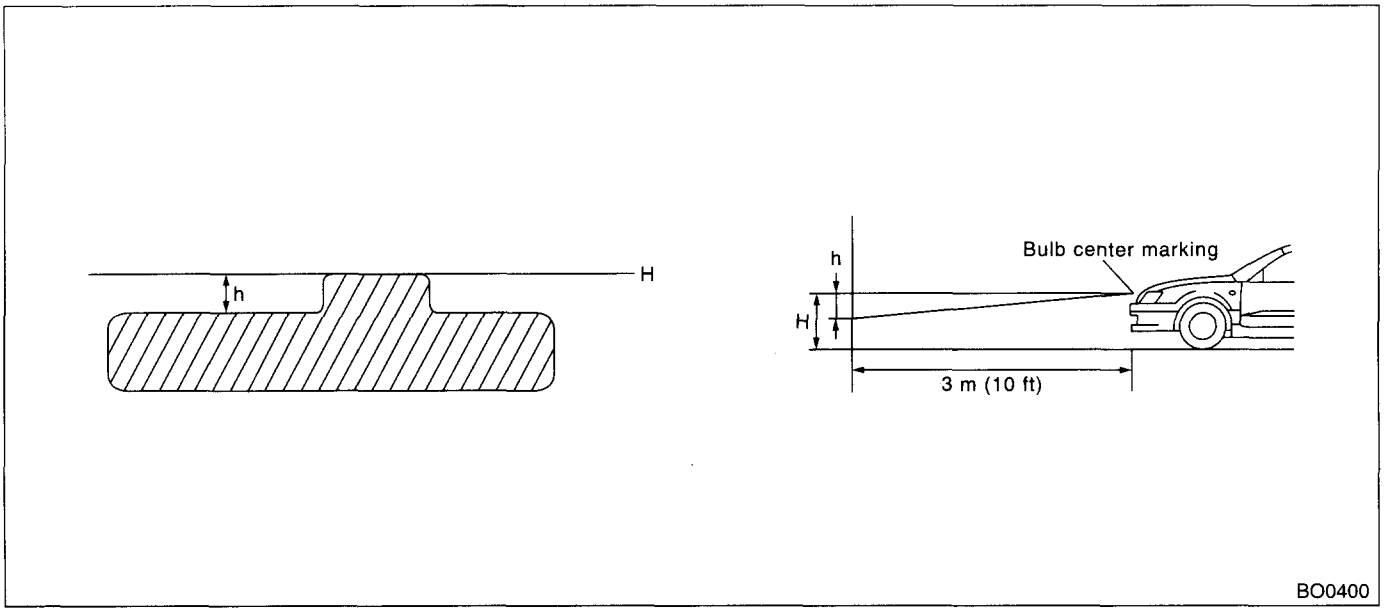
NOTE:
Before checking the headlight aiming, be sure of the following:

- 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 fuel tank is fully filled.
- Bounce the vehicle several times to normalize the suspension.
- Make certain that someone is seated in the driver's seat.

Turn the headlight on and then adjust the low beam pattern to the following positions on the screen.

NOTE:
Adjust the headlight aiming by turning the adjusting screw (A).





H mm (in)			h mm (in) at 3 m (10 ft)
Sedan	Wagon		
RS, WRX	TS, WRX	Outback	
620 (24.41)	620 (24.41)	630 (24.80)	21 (0.83)

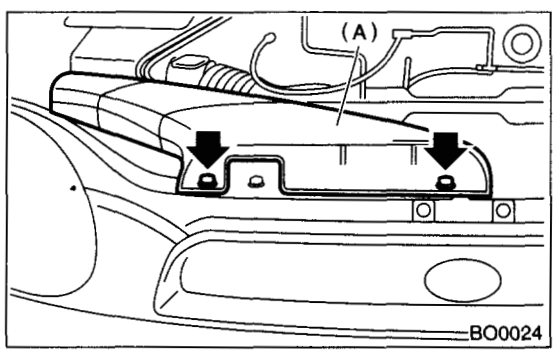
10.Headlight Bulb

A: REMOVAL

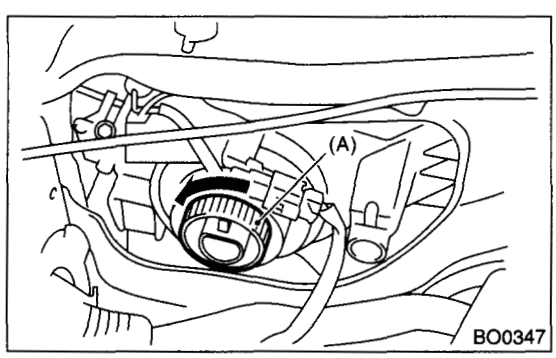
CAUTION:

- **Because the tungsten 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 the performance.**

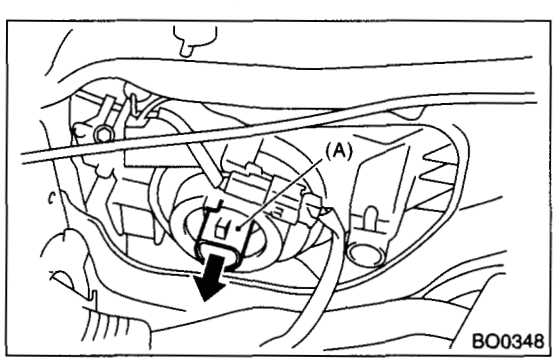
1) Disconnect the ground terminal from battery.
2) Remove the duct (A) (when right side headlight is removed).



3) Disconnect the harness connector.
4) Remove the cap (A).



5) Remove the headlight bulb (A).



B: INSTALLATION

Install in the reverse order of removal.

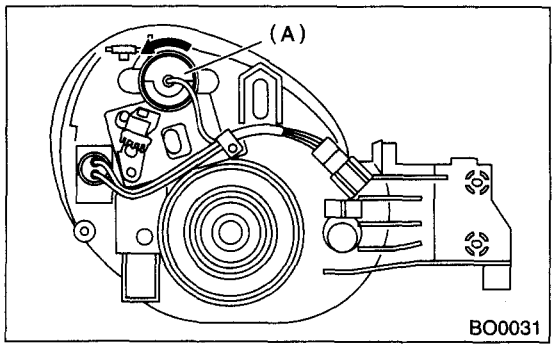
C: INSPECTION

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.

11.Front Turn Signal Light Bulb

A: REMOVAL

1) Remove the headlight assembly. <Ref. to LI-10, REMOVAL, Headlight Assembly.>
2) Turn the socket (A) and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

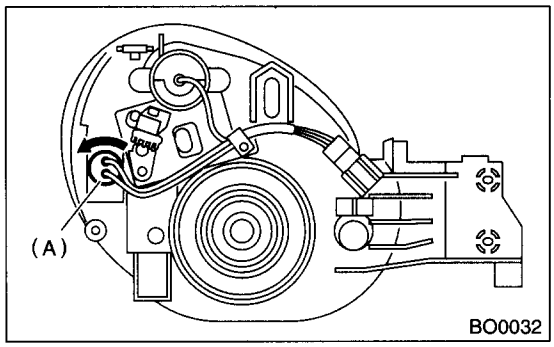
C: INSPECTION

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.

12.Clearance/Parking Light Bulb

A: REMOVAL

1) Remove the headlight assembly. <Ref. to LI-10, REMOVAL, Headlight Assembly.>
2) Turn the socket (A) and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

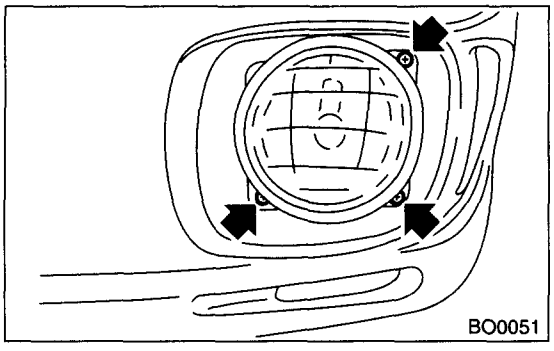
C: INSPECTION

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.

13.Front Fog Light Assembly

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the mounting bolts, and then detach the fog light assembly.



3) Disconnect the harness connector.

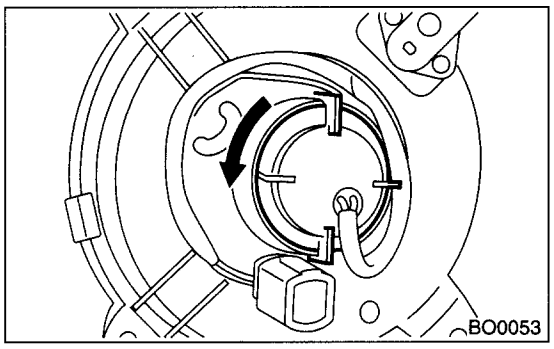
B: INSTALLATION

Install in the reverse order of removal.

14.Front Fog Light Bulb

A: REMOVAL

1) Remove the front fog light assembly. <Ref. to LI-15, REMOVAL, Front Fog Light Assembly.>
2) Remove the back cover.



3) Remove the spring retainer then detach the fog light bulb.

B: INSTALLATION

Install in the reverse order of removal.

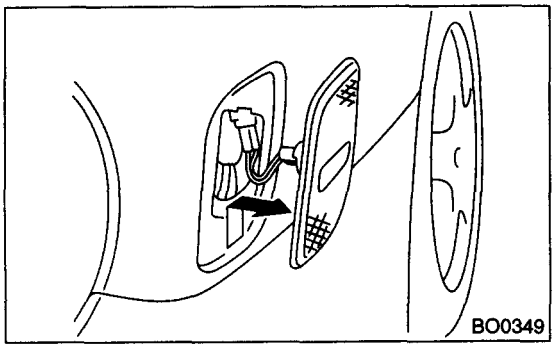
C: INSPECTION

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.

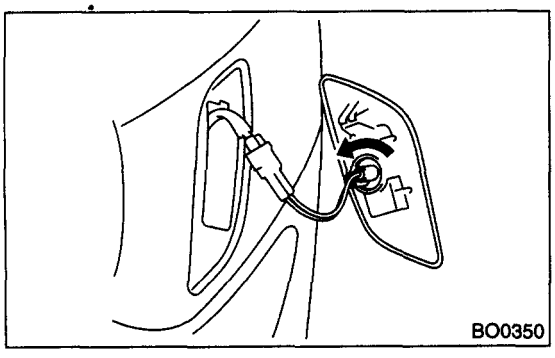
15.Front Side Marker Light Assembly

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Pull out the light from body while pushing it up.



3) Disconnect the harness connector and remove the light.
4) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

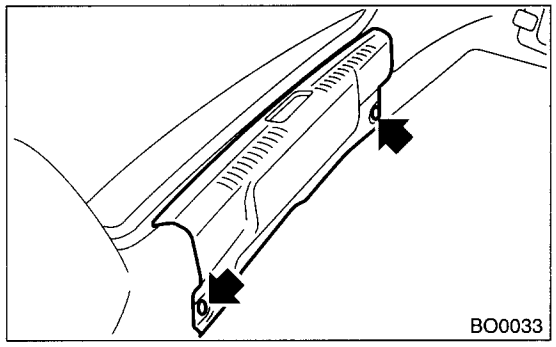
1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

16.Rear Combination Light Assembly

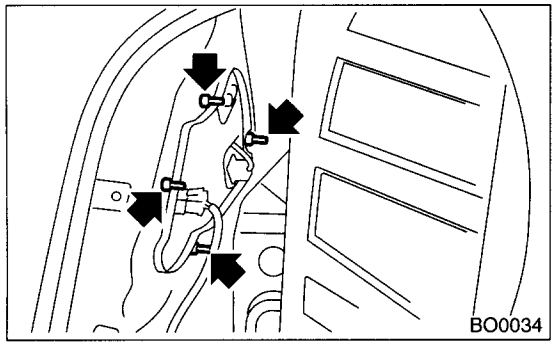
A: REMOVAL

1. SEDAN

1) Disconnect the ground terminal from battery.
2) Remove the clips and then detach the trunk rear trim.

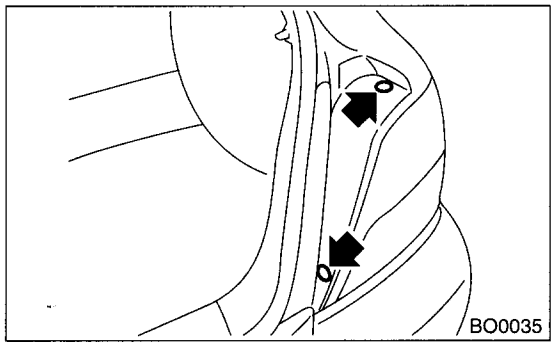


3) Remove the trunk side trim of rear portion.
4) Remove four nuts and then detach the rear combination light while disconnecting the connector.

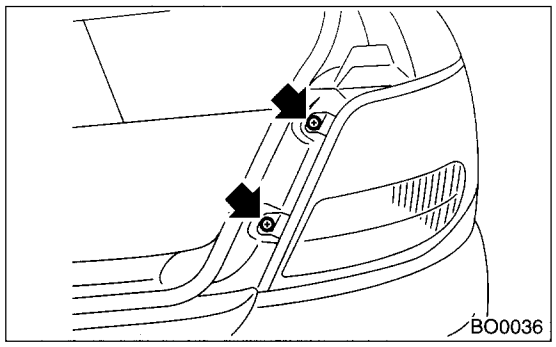


2. WAGON

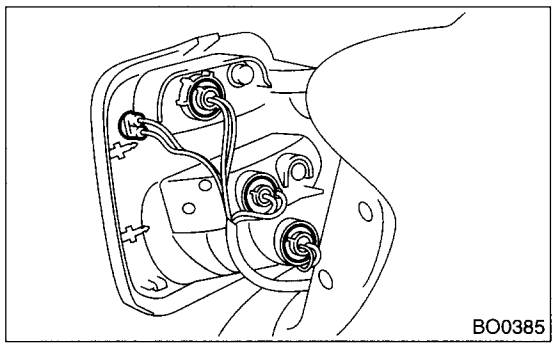
1) Disconnect the ground terminal from battery.
2) Remove the clips and then detach the rear combination light covers.



3) Remove two bolts.



4) Remove the rear quarter trim.
<Ref. to EI-47, WAGON, REMOVAL, Rear Quarter Trim.>
5) Disconnect the connector and then detach the rear combination light assembly.



B: INSTALLATION

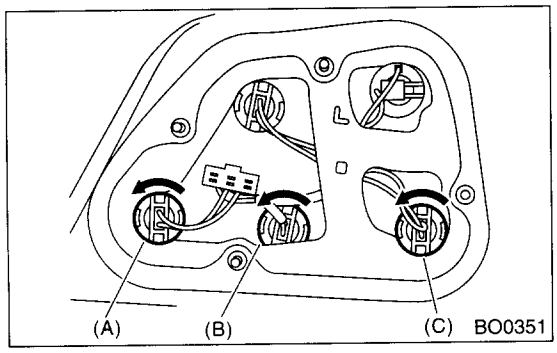
Install in the reverse order of removal.

17.Stop/Tail Light Bulb

A: REMOVAL

1. SEDAN

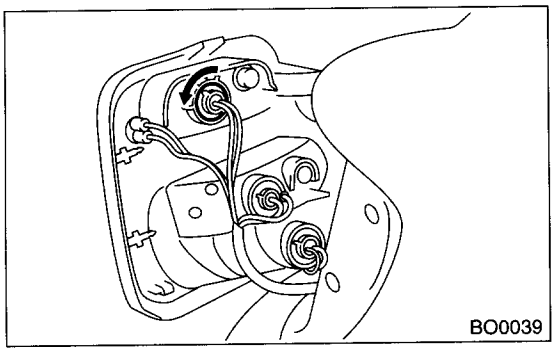
1) Remove the trunk side trim of rear portion.
2) Turn the socket and remove the bulb.



(A) Stop light
(B) Tail light
(C) *Tail/stop lignt

2. WAGON

1) Remove the rear combination light assembly. <Ref. to LI-18, WAGON, REMOVAL, Rear Combination Light Assembly.>
2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

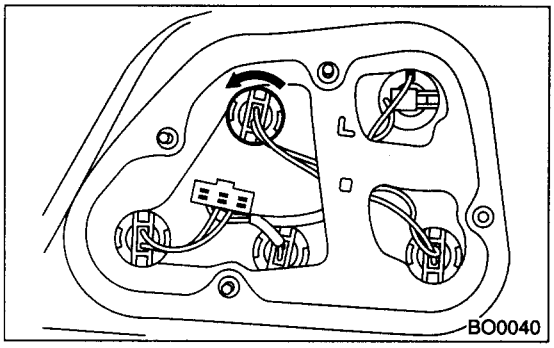
1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

18.Back-up Light Bulb

A: REMOVAL

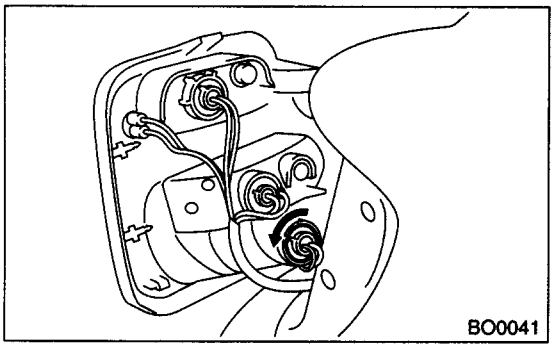
1. SEDAN

1) Remove the trunk side trim of rear portion.
2) Turn the socket and remove the bulb.



2. WAGON

1) Remove the rear combination light assembly. <Ref. to LI-18, WAGON, REMOVAL, Rear Combination Light Assembly.>
2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

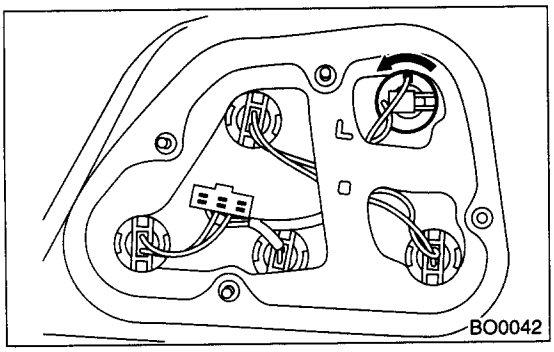
1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

19.Rear Turn Signal Light Bulb

A: REMOVAL

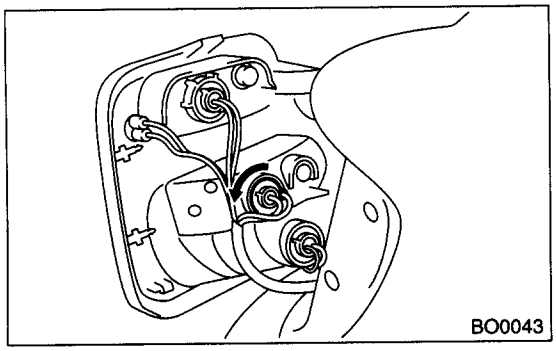
1. SEDAN

1) Remove the trunk side trim of rear portion.
2) Turn the socket and remove the bulb.



2. WAGON

1) Remove the rear combination light assembly. <Ref. to LI-18, WAGON, REMOVAL, Rear Combination Light Assembly.>
2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

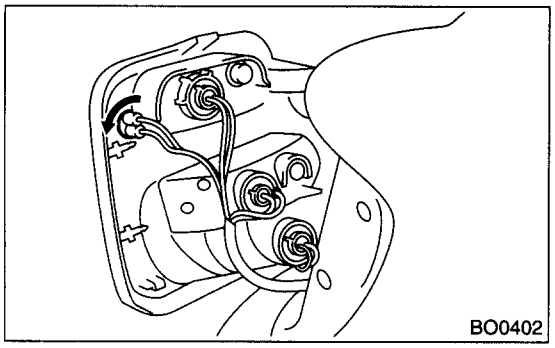
C: INSPECTION

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 Side Marker Light Bulb

A: REMOVAL

1) Remove the rear combination light assembly. <Ref. to LI-18, WAGON, REMOVAL, Rear Combination Light Assembly.>
2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

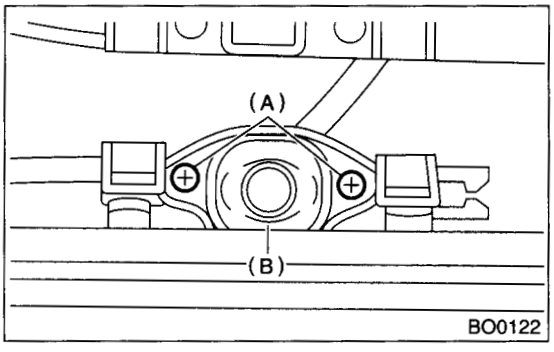
C: INSPECTION

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.License Plate Light

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the license plate light mounting screw (A) and then remove the lens (B)



3) Remove the bulb.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

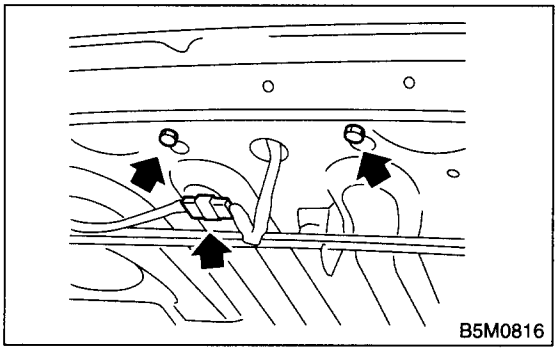
1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

22.High-mounted Stop Light

A: REMOVAL

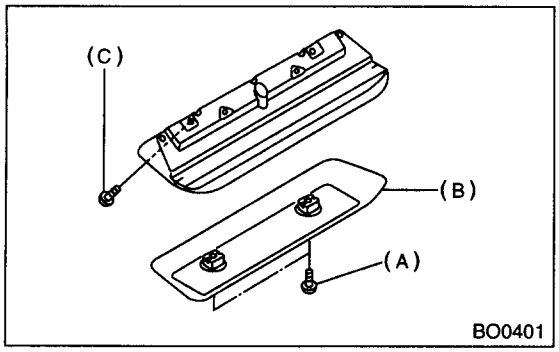
1. SEDAN

1) Disconnect the ground terminal from battery.
2) Disconnect the connector of high-mounted stop light from body harness.
3) Remove the bolts, then detach the high-mounted stop light assembly.



2. WAGON

1) Disconnect the ground terminal from battery.
2) Remove the screws (A) and then detach the cover (B).
3) Remove the screws (C) and then detach the high-mounted stop light while disconnecting the connector.



B: INSTALLATION

Install in the reverse order of removal.

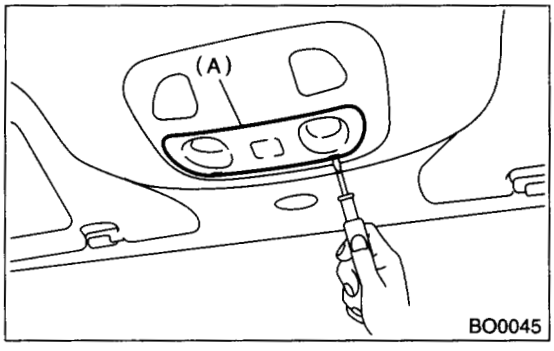
C: INSPECTION

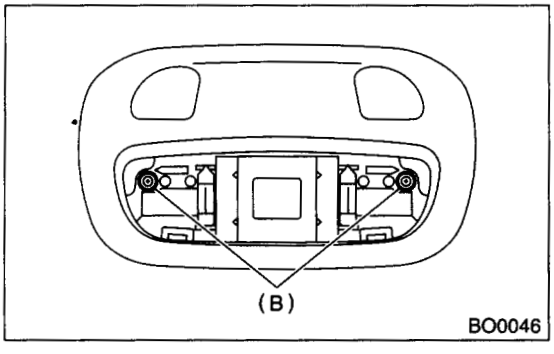
1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

23.Spot Light

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the lens (A) and spot light mounting screw (B).





3) 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

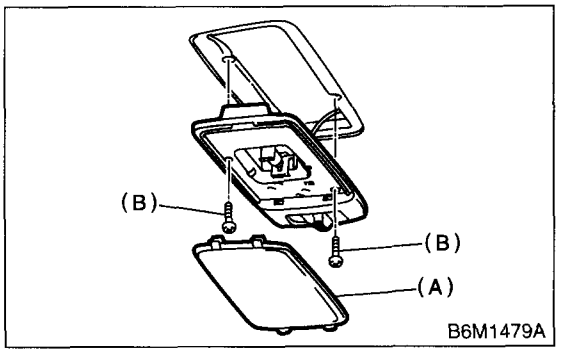
Measure the spot light resistance.

Switch position	Terminal No.	Standard
OFF	—	More than 1MΩ
ON	1 and 2	1.5 ± 0.5Ω

24.Room Light

A: REMOVAL

1) Disconnect the ground terminal 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.

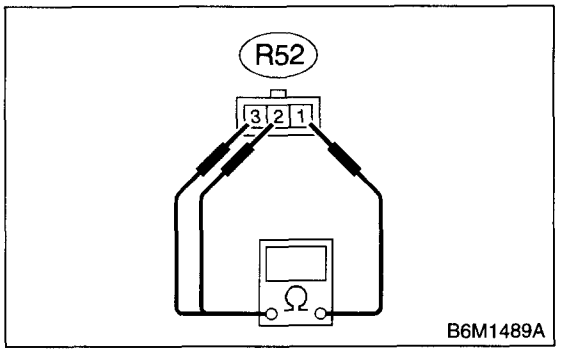
C: INSPECTION

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 resistance.

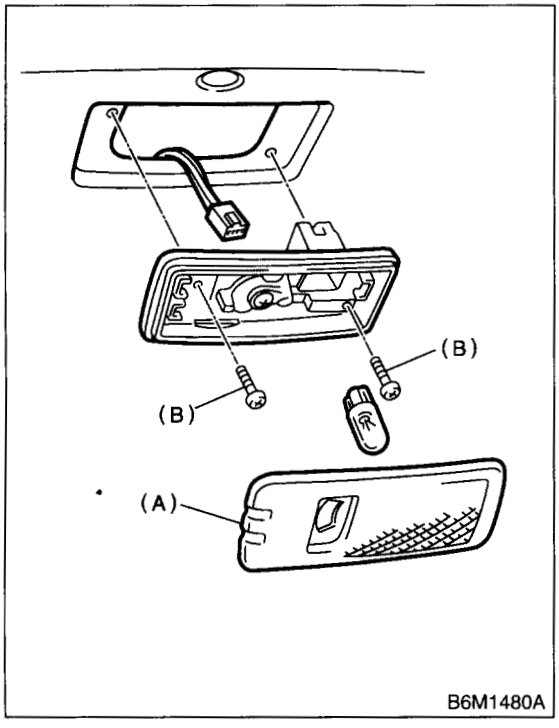


Switch position	Terminal No.	Standard
OFF	—	More than 1MΩ
ON	1 and 3	1.5 ± 0.5Ω
DOOR	1 and 2	1.5 ± 0.5Ω

25.Luggage Room Light

A: REMOVAL

1) Disconnect the ground terminal 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.

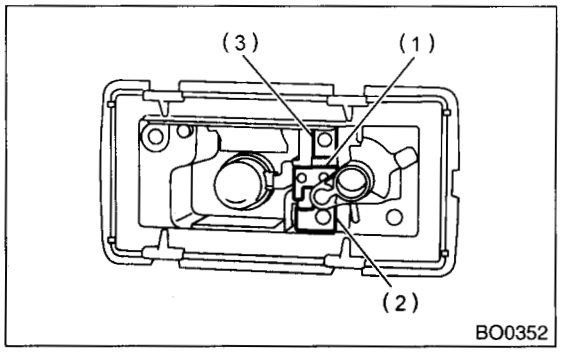
C: INSPECTION

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 resistance.

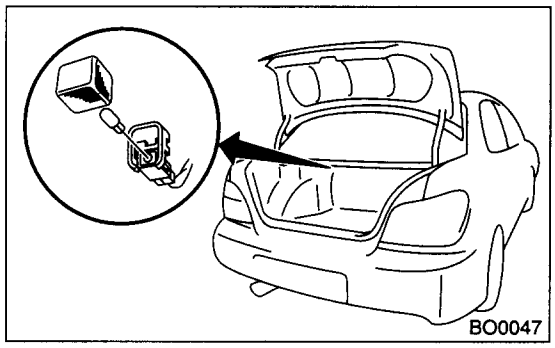


Switch position	Terminal No.	Standard
OFF	—	More than 1MΩ
ON	1 and 3	1.5 ± 0.5Ω
DOOR	1 and 2	1.5 ± 0.5Ω

26. Trunk Room Light

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Disconnect the harness connectors and remove the trunk room light.



B: INSTALLATION

Install in the reverse order of removal.

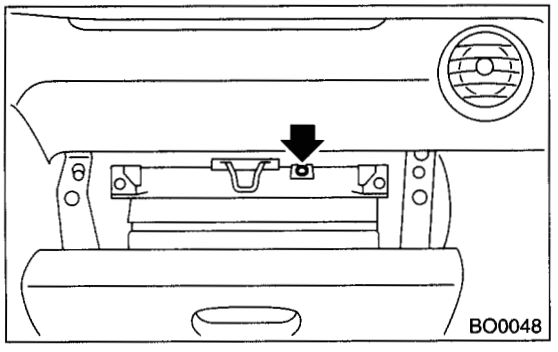
C: INSPECTION

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.

27.Glove Box Light

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the glove box. <Ref. to EI-39, 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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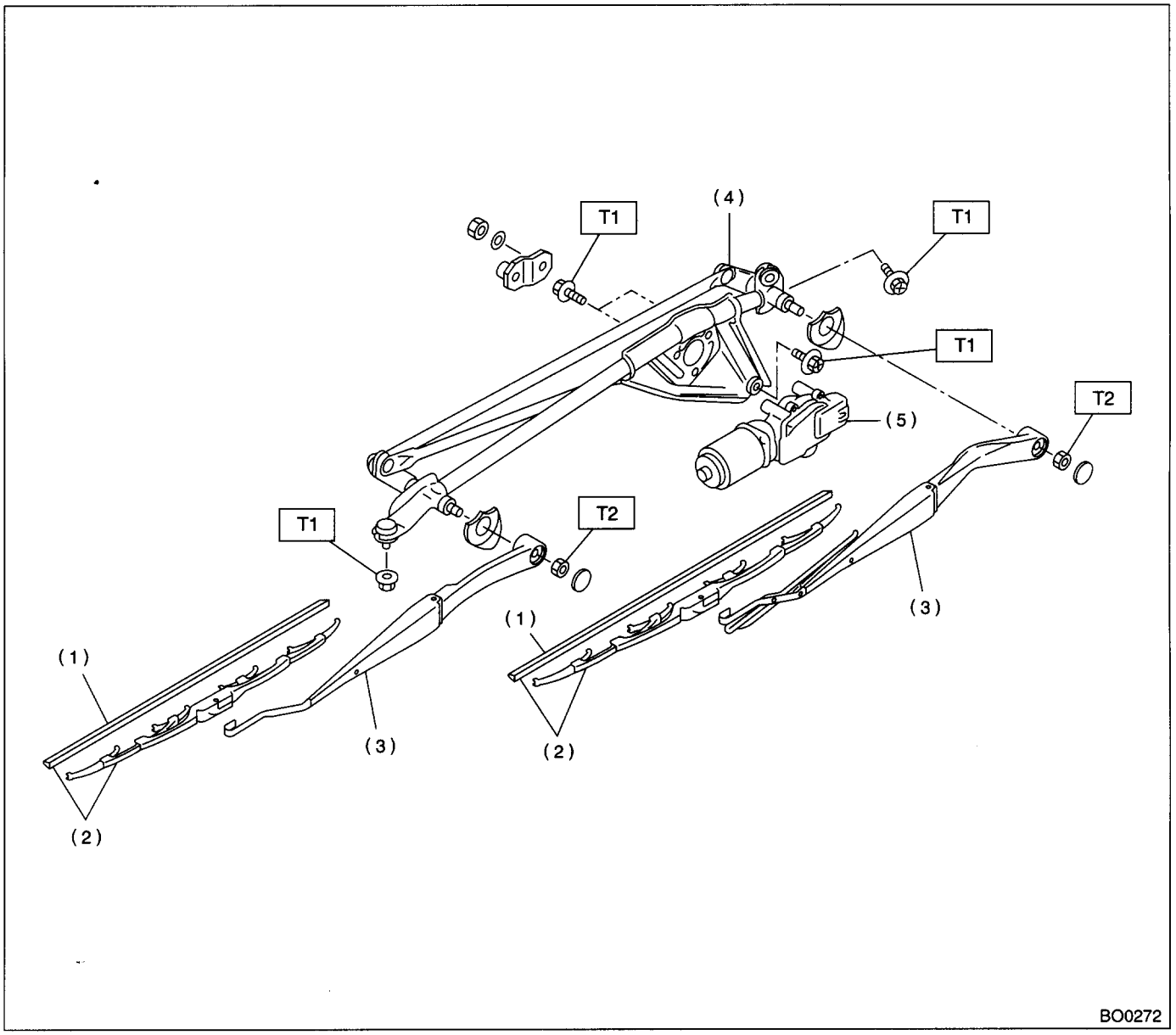
1. General Description

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

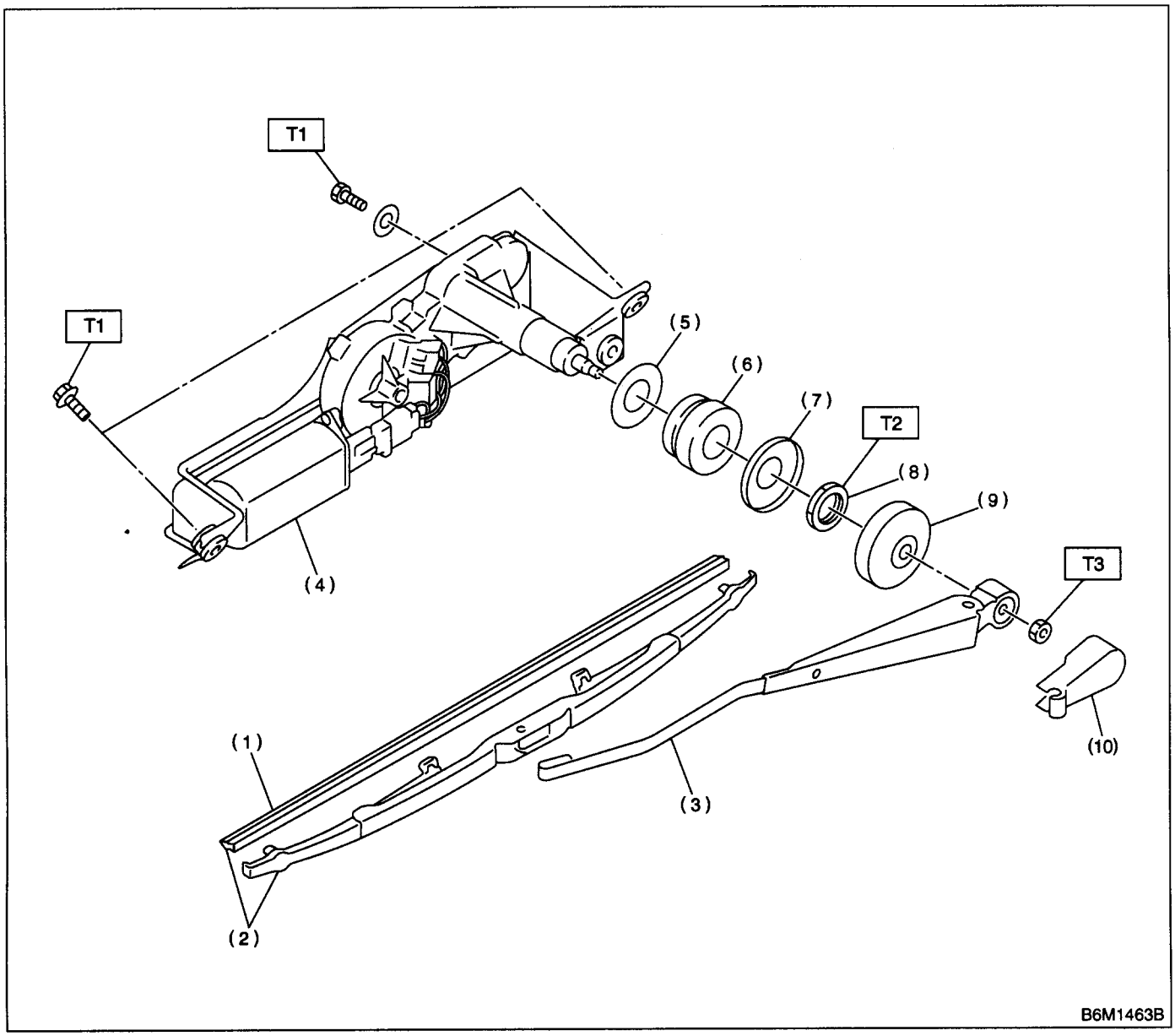
1. FRONT WIPER



(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)

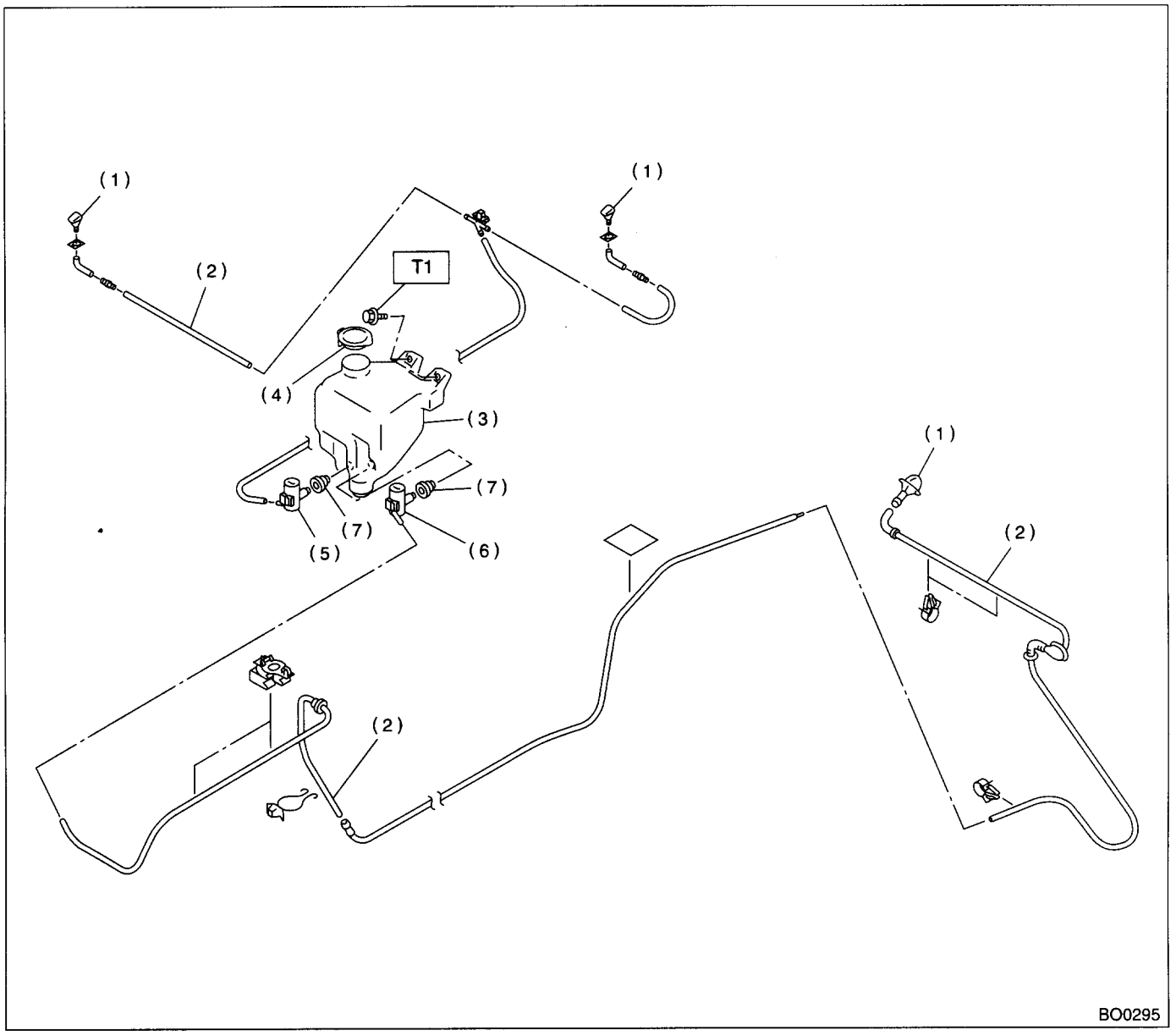
2. REAR WIPER



(1) Wiper rubber
(2) Wiper blade ASSY
(3) Wiper arm
(4) Wiper motor
(5) Spacer A
(6) Cushion
(7) Spacer B
(8) Nut
(9) Cap
(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

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 the wire harnesses of airbag system pass near electrical parts and switches.
- 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-127, SCHEMATIC, Wiper and Washer System (Front).>

2. WIPER AND WASHER (REAR)

<Ref. to WI-128, SCHEMATIC, Wiper and Washer System (Rear).>

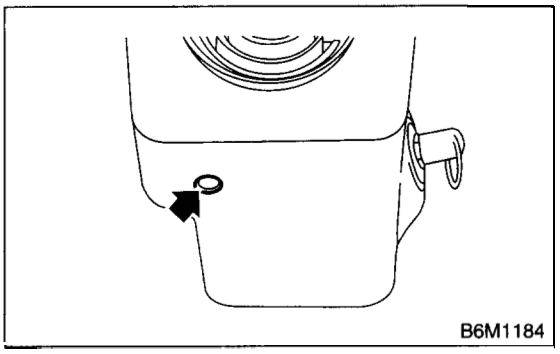
B: INSPECTION

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 hose and nozzle

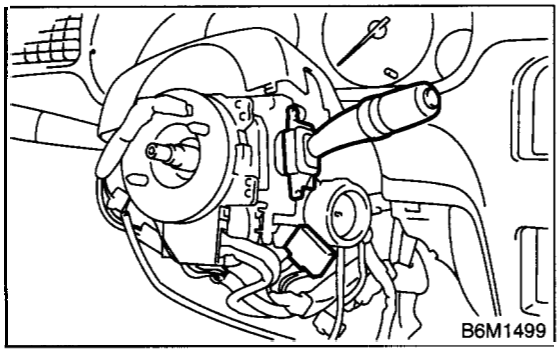
3. Combination Switch (Wiper)

A: REMOVAL

1) Loosen the screw to remove a steering column cover.



2) Disconnect the connectors from combination switches.
3) Loosen the screw to remove combination switch.

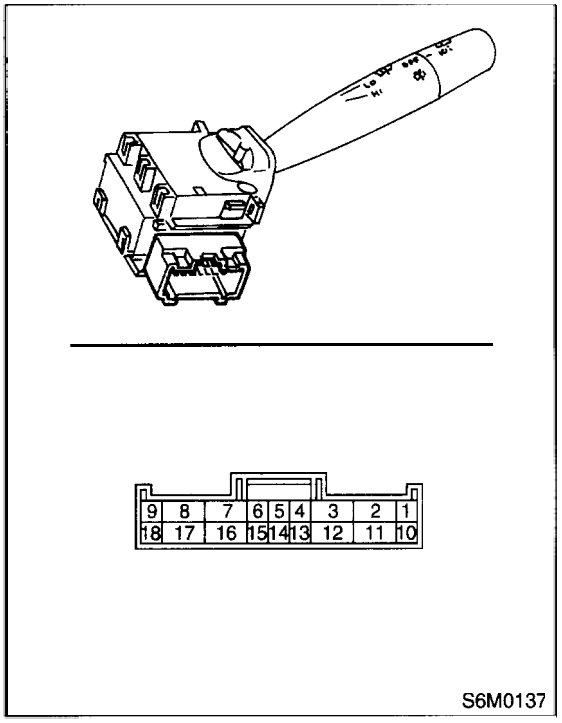


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

- Measure the combination switch.

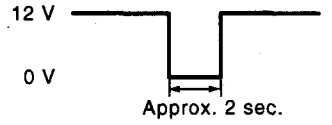
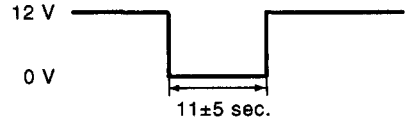
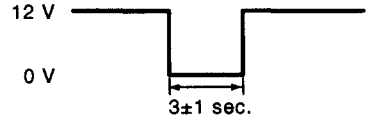


	Switch position	Terminal No.	Standard
FRONT	OFF	7 and 16	less than 1Ω
	INT	7 and 16	less than 1Ω
	LO	7 and 17	less than 1Ω
	HI	8 and 17	less than 1Ω
	Washer ON	2 and 11	less than 1Ω
REAR	Washer ON	2 and 10 2 and 12 10 and 12	less than 1Ω
	OFF	—	more than 1MΩ
	ON	2 and 10	less than 1Ω
	Washer ON	2 and 10 2 and 12 10 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.)

Switch position	Voltage
MIN.	
MAX.	
Non variable type	

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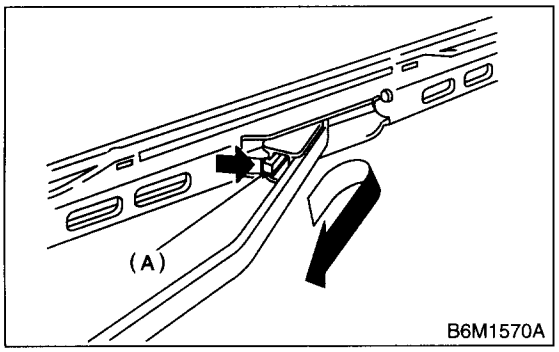
If operation is not as specified, replace the switch.

4. Wiper Blade

A: REMOVAL

While pushing the locking clip (A) up, pull out the blade from arm to arrow direction.



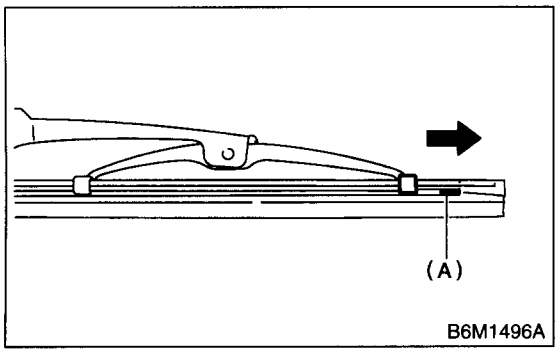
B: INSTALLATION

1) Install in the reverse order of removal.
2) Confirm that the clip is locked securely.

C: DISASSEMBLY

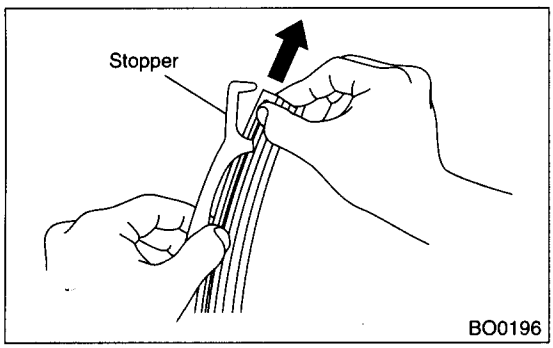
1. METAL TYPE

Pull on side (A) of the wiper rubber stopper and remove the rubber from the blade assembly.



2. RESIN TYPE

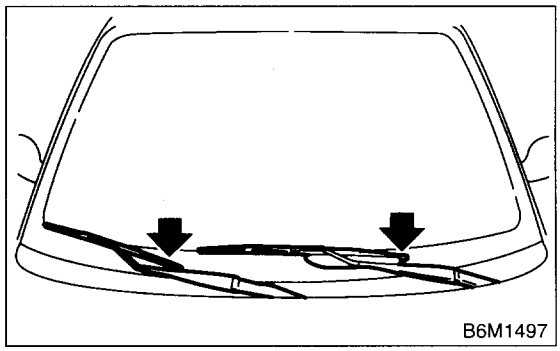
Pull the wiper rubber top slightly from the stopper and pull out fully.



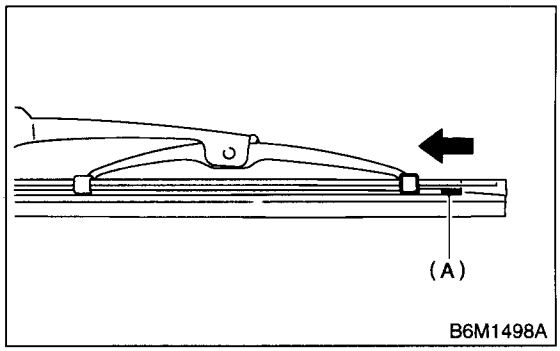
D: ASSEMBLY

1. METAL TYPE

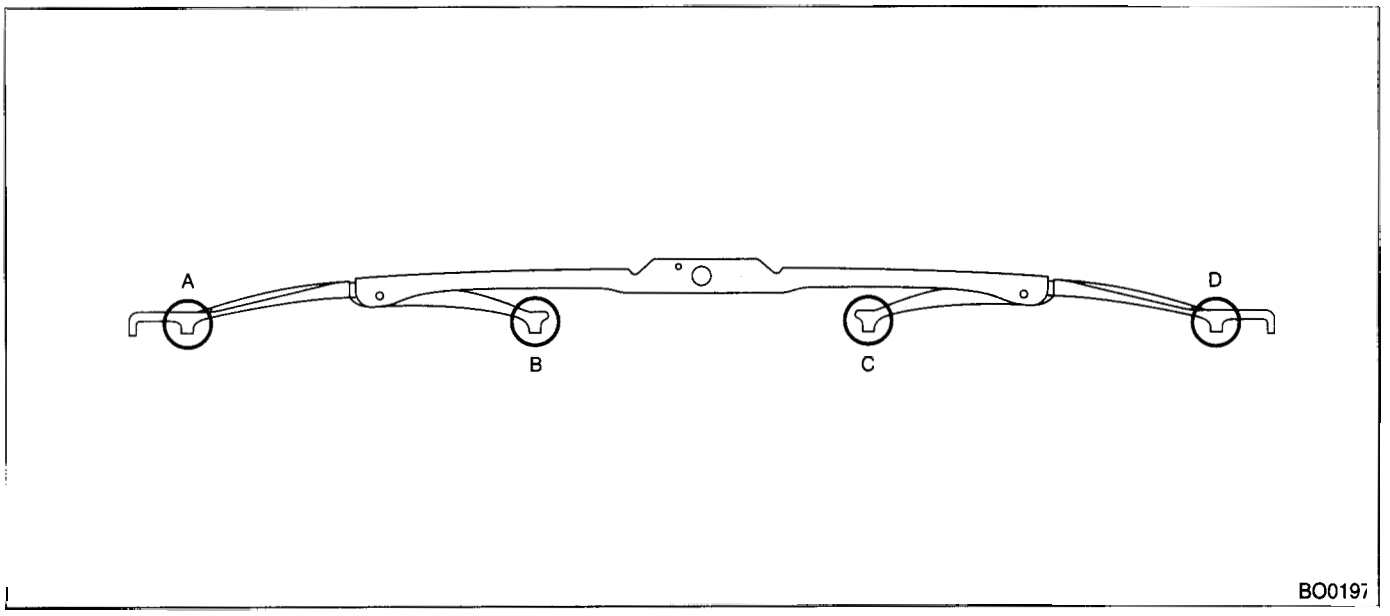
1) Insert the wiper rubber onto the blade so that the stopper is in the position shown.



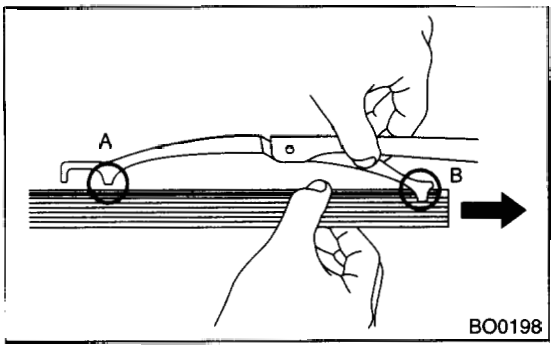
2) Make sure the wiper rubber is securely fastened to the pull stopper (A).



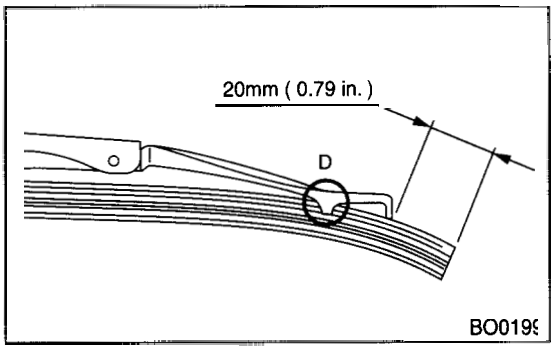
2. RESIN TYPE



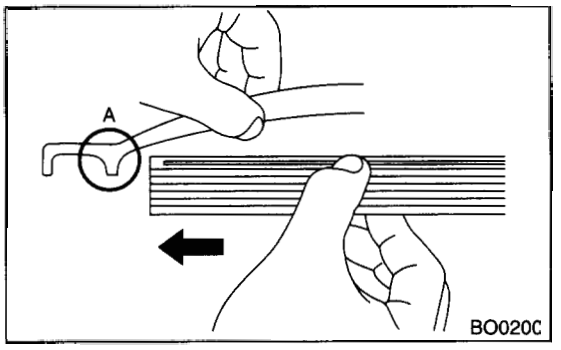
1) Insert the wiper rubber through the claw (B).



2) Insert the wiper rubber top until it protrudes about 20mm (0.79 in) from the stopper (D).



3) Insert the wiper rubber into the claw (A).



E: INSPECTION

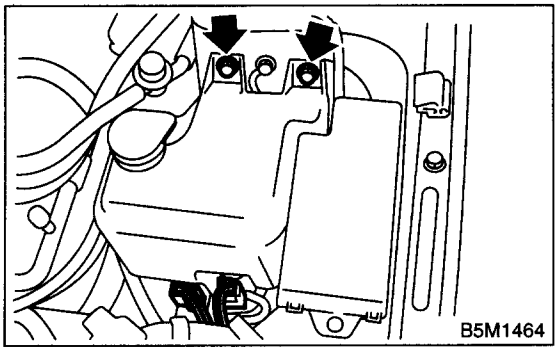
1) When the wiper does not perform well, inspect the following:
- Make sure the movable part of the blade assembly moves smoothly.
- Make sure the wiper rubber is not deformed or damaged.

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 terminal from battery.
3) Remove the two bolts, hose and connector and then remove the tank.

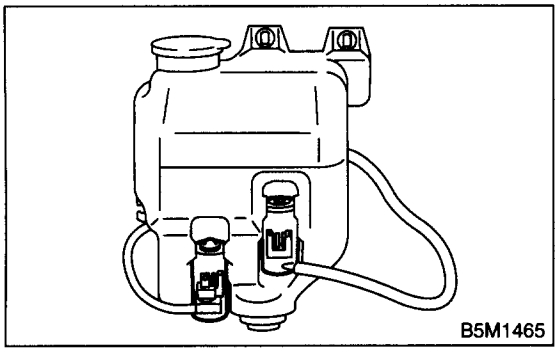


B: INSTALLATION

Install in the reverse order of removal.

C: DISASSEMBLY

Pull out the washer motor from tank.

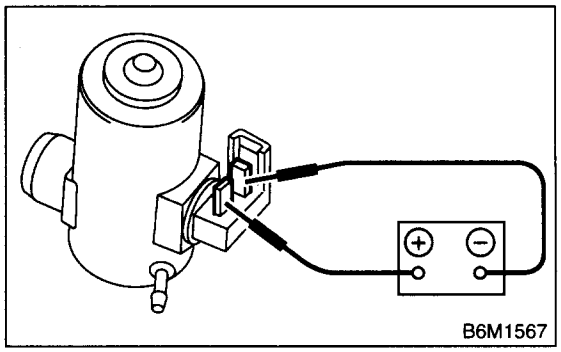


D: ASSEMBLY

1) Assemble in the reverse order of disassembly.
2) Confirm that water does not leak from installation area of motor.

E: INSPECTION

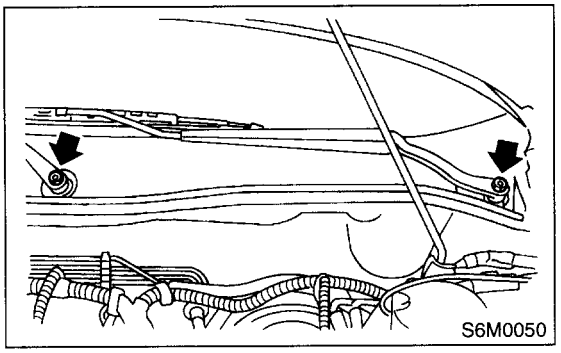
Apply battery voltage to the connector terminal of the washer motor and make sure the motor operates.



6. Front Wiper Arm

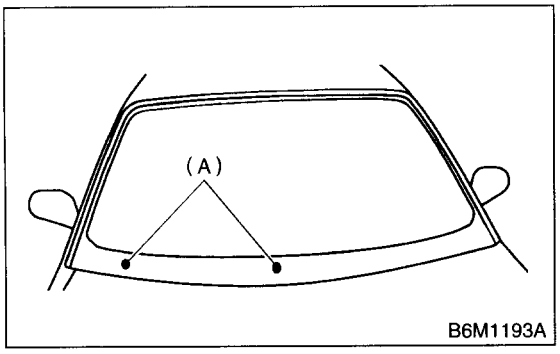
A: REMOVAL

1) Open the hood.
2) Remove the cap.
3) Loosen the nut to remove arm.



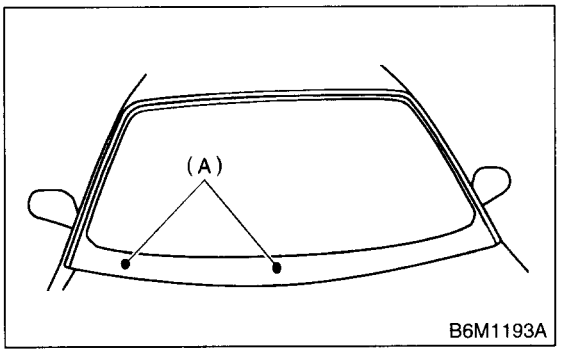
B: INSTALLATION

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.



C: ADJUSTMENT

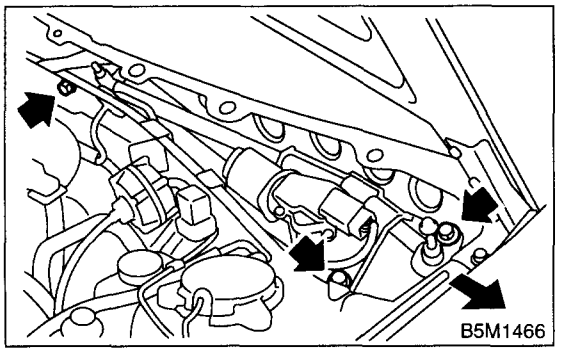
Operate the wiper once. Align the wiper blade to ceramic print point mark (A) of front window pane.



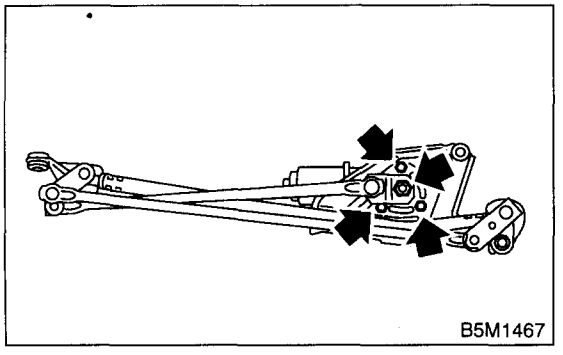
7. Front Wiper Motor and Link

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the cowl panel. <Ref. to EI-33, REMOVAL, Cowl Panel.>
3) Disconnect the connector of motor.
4) Loosen the bolts and nuts to remove wiper link.

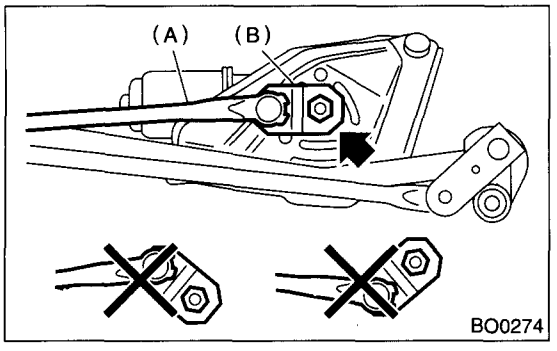


5) Loosen the bolts and nuts to remove motor.



B: INSTALLATION

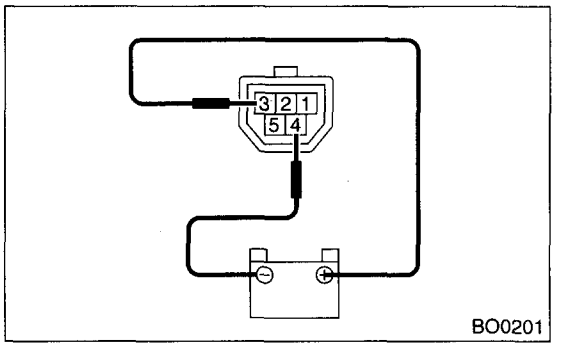
1) Connect the battery ground terminal to battery.
2) To confirm that the motor is at auto stop position, connect the harness to motor and turn the wiper switch ON/OFF once.
3) Disconnect the ground terminal from battery.
4) Tighten the nut where rod (A) and link plate (B) is aligned in a straight line.



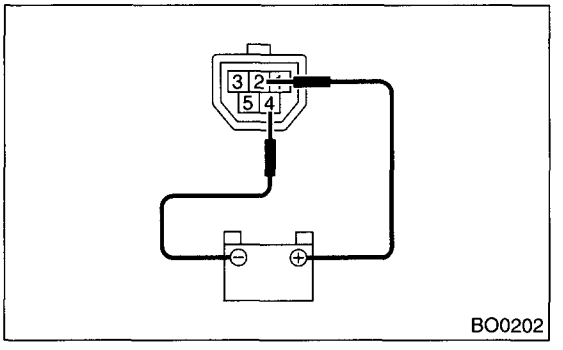
5) Install in the reverse order of removal.

C: INSPECTION

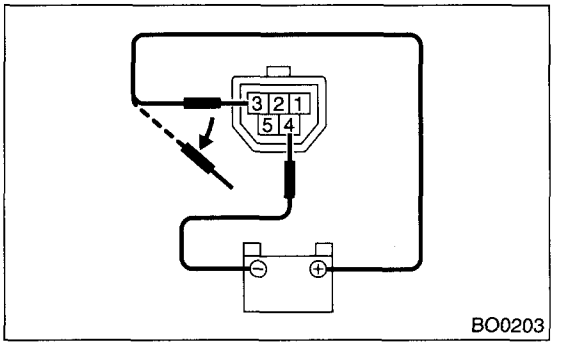
1) When the battery is connected to the terminal of connectors, confirm that motor operates at low speed.



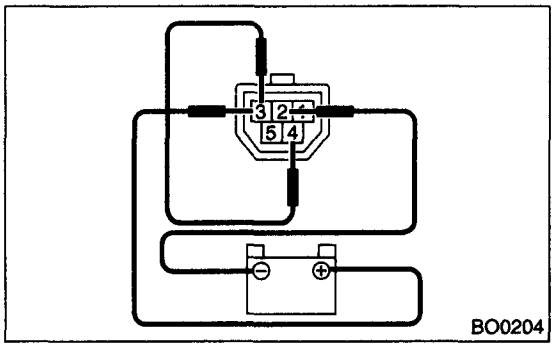
2) When the battery is connected to the terminal of connectors, confirm that motor operates at high speed.



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.



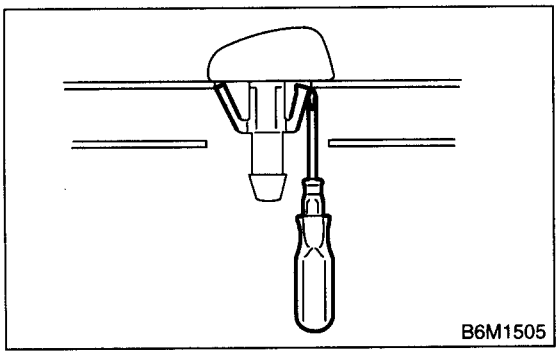
4) Connect the battery and confirm that the motor stops at automatic stop position after the motor operates at low speed again.



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.>

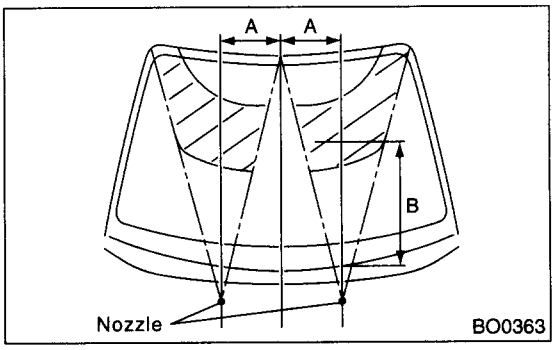
C: INSPECTION

- 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.

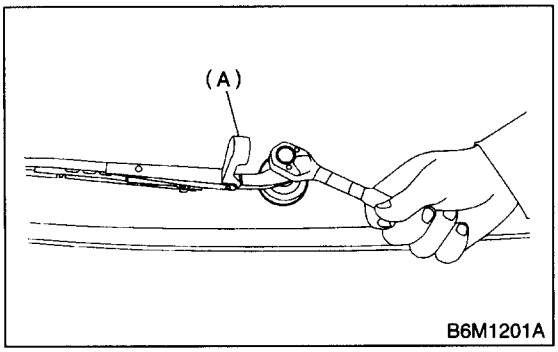
Injection position:
A: 257 mm (10.12 in)
B: 512 mm (20.16 in)



9. Rear Wiper Arm

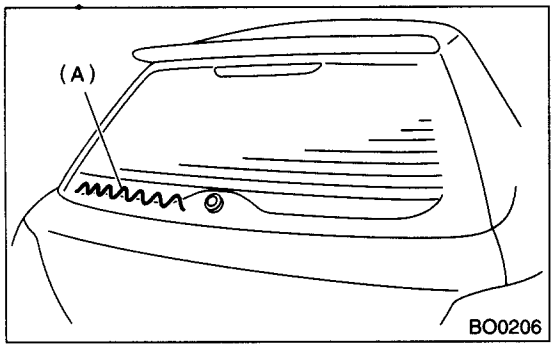
A: REMOVAL

1) Raise the wiper arm cover (A).
2) Loosen the nut to remove wiper arm.



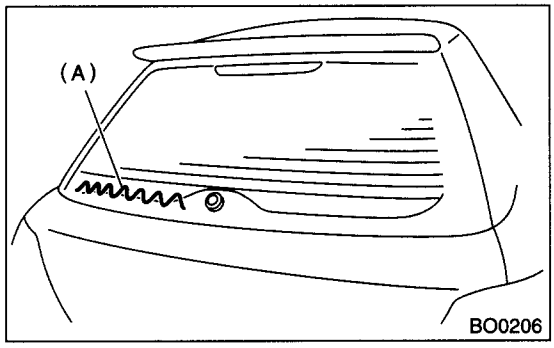
B: INSTALLATION

1) Install in the reverse order of removal.
2) Operate the rear wiper once.
3) Align the blade to rear defogger heat wire (A).



C: ADJUSTMENT

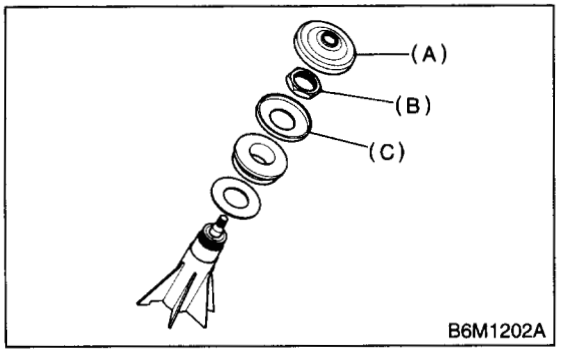
1) Operate the rear wiper once.
2) Align the blade to rear defogger heat wire (A).



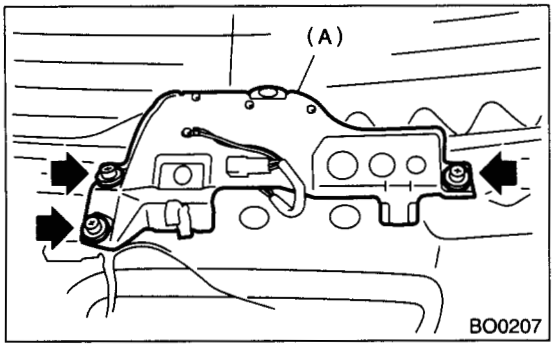
10.Rear Wiper Motor

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the rear wiper arm.
3) Remove the cap (A), nut (B), and spacer (C) from rear wiper shaft.

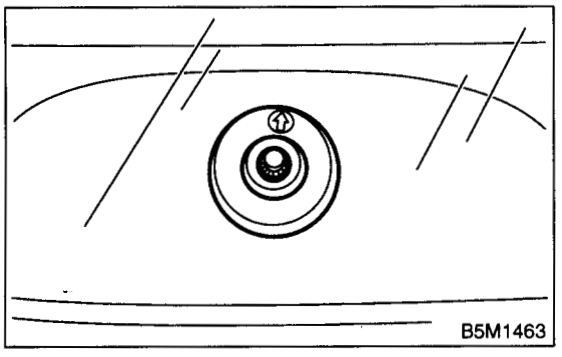


4) Remove the rear gate lower trim. <Ref. to EI-52, REMOVAL, Rear Gate Trim.>
5) Unclip the clip of harness and disconnect connector of wiper motor.
6) Loosen the bolts to remove wiper motor assembly (A).



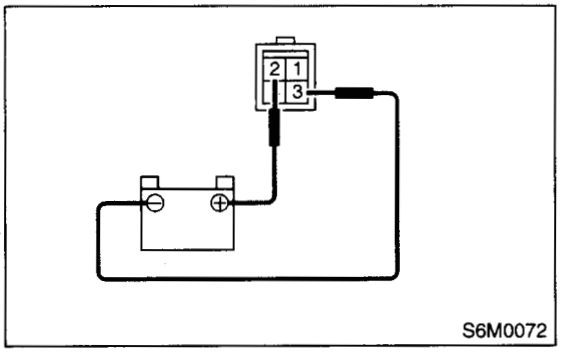
B: INSTALLATION

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.

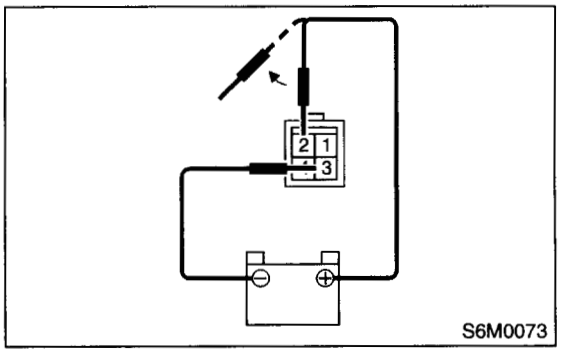


C: INSPECTION

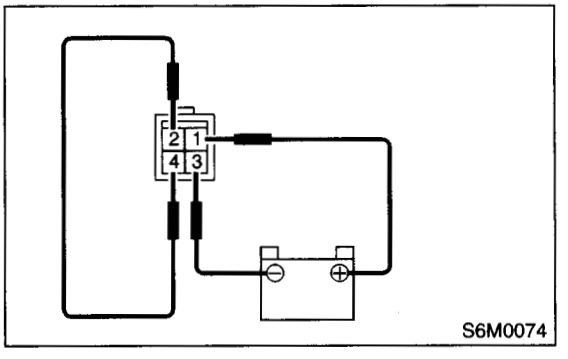
1) Connect the battery to wiper motor connector and confirm that wiper motor operates.



2) Connect the battery to terminal of connector and remove the terminal connections with motor rotated, and stop the wiper motor through operation.



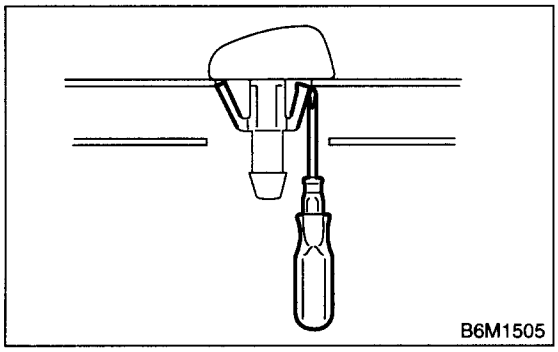
3) Connect the battery and confirm that the motor stops at automatic stop position after the motor operates at low speed again.



11.Rear Washer Nozzle

A: REMOVAL

1) Remove the high-mount stop light. <Ref. to LI-24, REMOVAL, High-mounted Stop Light.>
2) Remove the washer hose from the washer nozzle.
3) 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 Nozzle.>

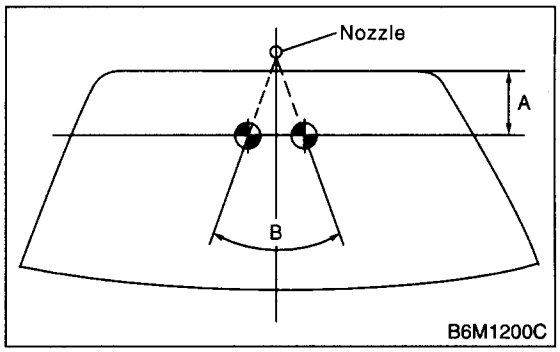
C: INSPECTION

- 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.

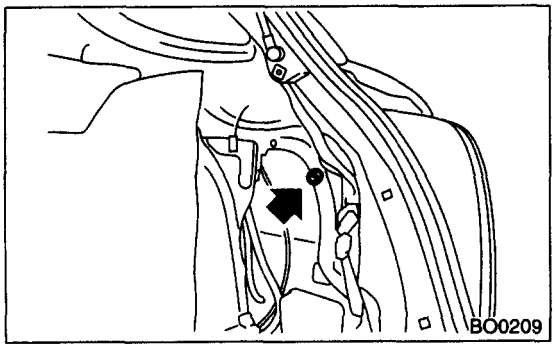
Injection position:
A: 39 mm (1.54 in)
B: 72°



12.Wiper Control Relay

A: REMOVAL

1) Disconnect the ground terminal from battery.
Remove the right quarter lower trim. <Ref. to EI-47, REMOVAL, Rear Quarter Trim.>
2) Loosen the nut to remove control unit.

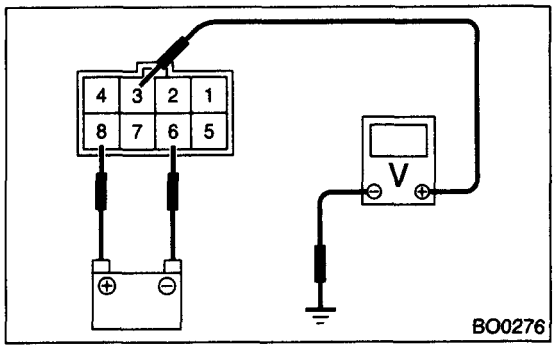


B: INSTALLATION

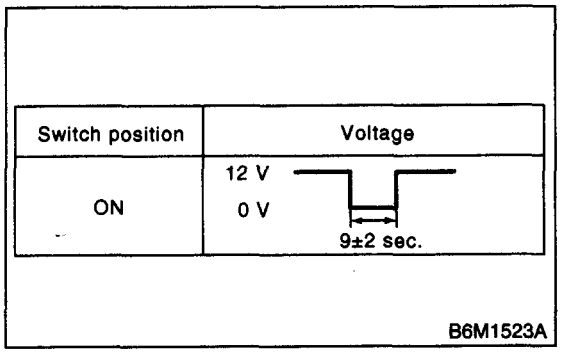
Install in the reverse order of removal.

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 negative lead to ground.



3) Measure the voltage when the wiper relay is operated.



If operation is not as specified, replace the switch.

WIPER CONTROL RELAY

ENTERTAINMENT

ET

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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 the 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. Radio System

A: SCHEMATIC

1. RADIO

<Ref. to WI-52, SCHEMATIC, Audio System.>

B: INSPECTION

Symptom	Repair order
No power coming in (No display and no sound from speakers)	(1) Check fuse and power supply for radio. (2) Check radio ground. (3) Remove radio for repair.
A specific speaker does not operate.	(1) Check speaker. (2) Check output circuit between radio and speaker.
Radio generates noise with engine running	(1) Check radio ground. (2) Check generator. (3) Check ignition coil. (4) Remove radio for repair.
AM and FM modes are weak or noisy	(1) Check antenna. (2) Check radio ground. (3) Remove radio for repair.

3. Cigarette Lighter System

A: SCHEMATIC

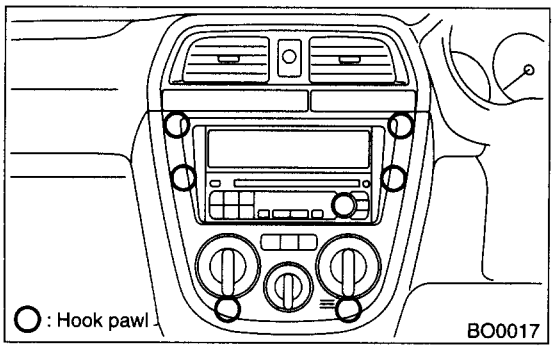
1. CIGARETTE LIGHTER

<Ref. to WI-88, SCHEMATIC, Front Accessory Power Supply System.>

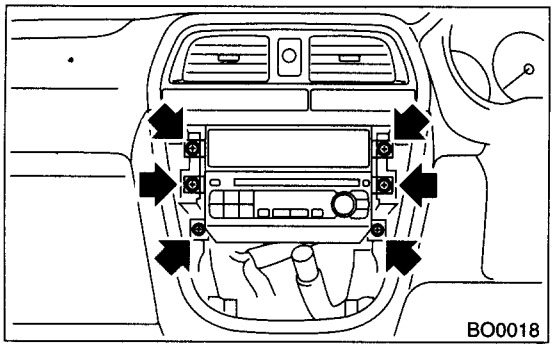
4. Radio Body

A: REMOVAL

1) Disconnect the battery ground cable.
2) Remove the center panel while disconnecting connector.



3) Remove the fitting screws, and slightly pull radio out from the center console.



4) Disconnect the electric connectors and antenna feeder cord.

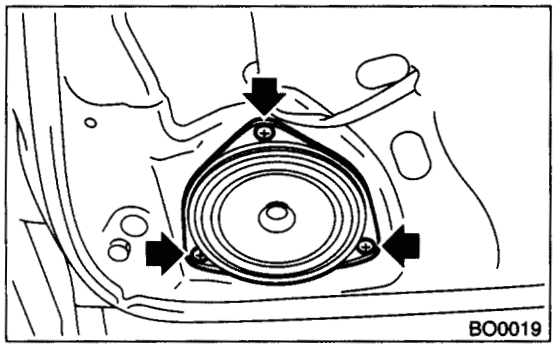
B: INSTALLATION

Install in the reverse order of removal.

5. Front Speaker

A: REMOVAL

1) Disconnect the battery ground cable.
2) Remove the front door trim. <Ref. to EI-37, REMOVAL, Front Door Trim.>
3) Remove the front speaker mounting screws.



4) Disconnect the harness connector and remove the front speaker.

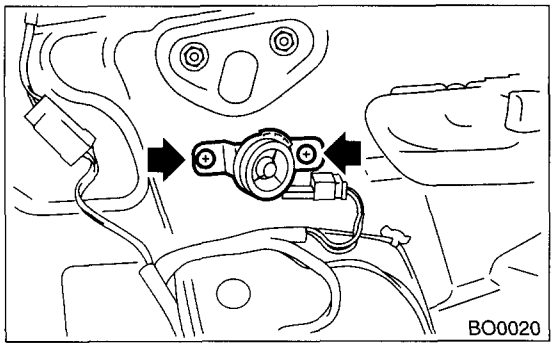
B: INSTALLATION

Install in the reverse order of removal.

6. Tweeter

A: REMOVAL

1) Disconnect the battery ground cable.
2) Remove the front door trim. <Ref. to EI-37, REMOVAL, Front Door Trim.>
3) Remove the tweeter mounting screws.



4) Disconnect the harness connector and remove the tweeter.

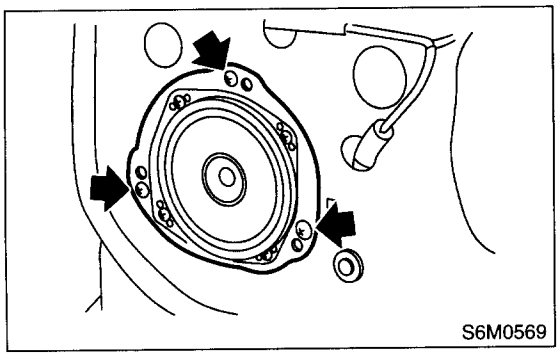
B: INSTALLATION

Install in the reverse order of removal.

7. Rear Speaker

A: REMOVAL

1) Disconnect the battery ground cable.
2) Remove the rear door trim. <Ref. to EI-38, REMOVAL, Rear Door Trim.>
3) Remove the rear speaker mounting screws.



4) Disconnect the harness connector and remove the rear speaker.

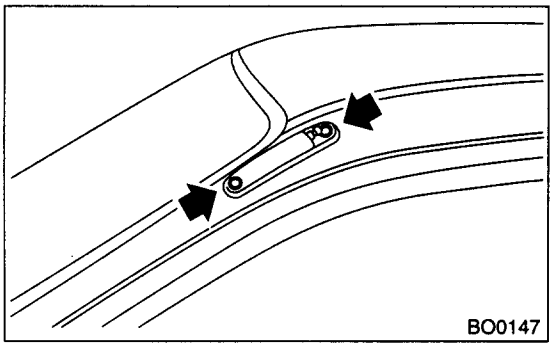
B: INSTALLATION

Install in the reverse order of removal.

8. Antenna

A: REMOVAL

1) Remove the mounting screws and detach antenna.
2) Disconnect the harness connector.



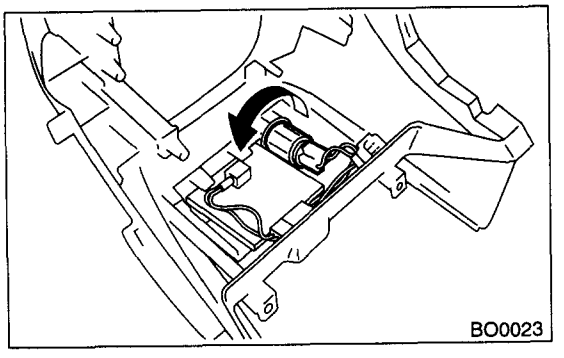
B: INSTALLATION

Install in the reverse order of removal.

9. Cigarette Lighter

A: REMOVAL

1) Disconnect the battery ground cable.
2) Remove the center panel. <Ref. to ET-6, REMOVAL, Radio Body.>
3) Disconnect the harness connectors and remove the cigarette lighter.



B: INSTALLATION

Install in the reverse order of removal.

CIGARETTE LIGHTER

COMMUNICATION SYSTEM

COM

Page

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2. Horn System 3
3. Horn 4
4. Horn Switch 5

1. General Description

A: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

2. Horn System

A: SCHEMATIC

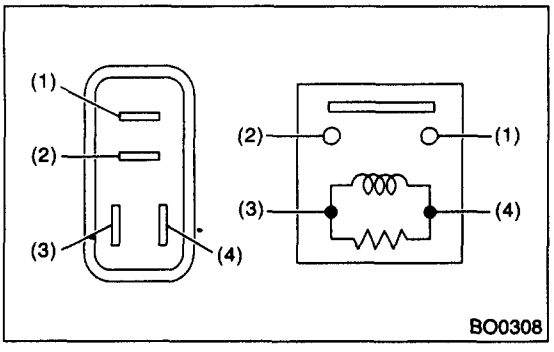
1. HORN

<Ref. to WI-89, 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 ground terminal.

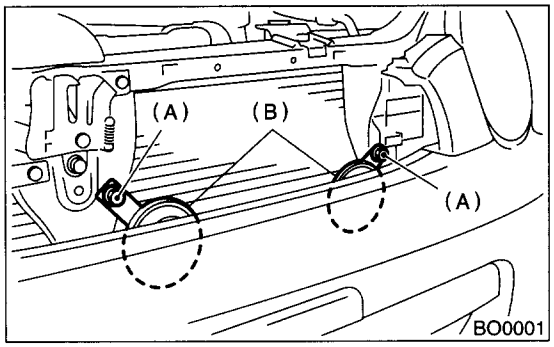


Current	Terminal No.	Standard
Flow	1 and 2	Less than 1Ω
No Flow		More than 1MΩ

3. Horn

A: REMOVAL

1) Disconnect the battery ground cable.
2) Remove the horn bracket mounting bolt (A).
3) Disconnect the harness connector and remove the horn assembly (B).

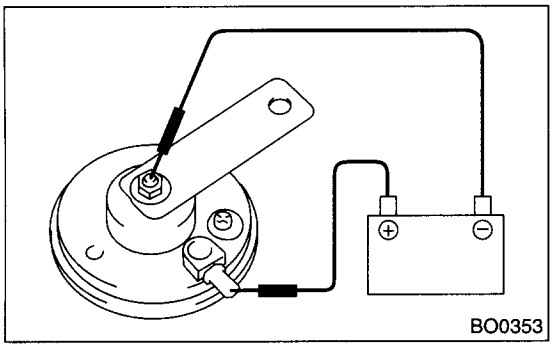


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

With 12 V direct current supply between horn terminal and case ground, check that the horn sounds properly.

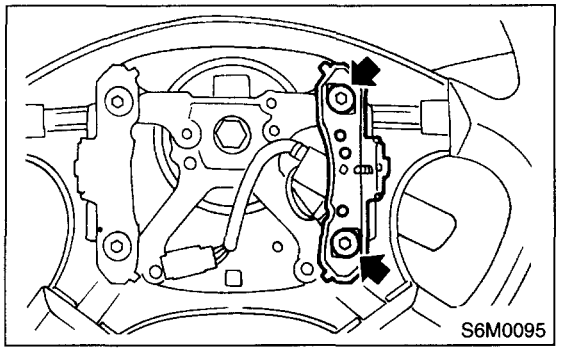


4. Horn Switch

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 battery ground cable.
2) Remove the driver's airbag module. <Ref. to AB-12, Driver's Airbag Module.>
3) Remove the horn switch from the steering wheel as shown.

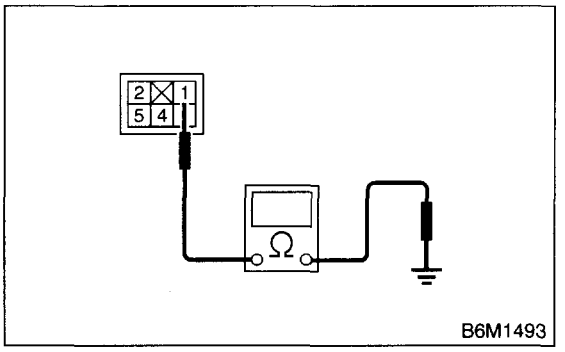


B: INSTALLATION

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

HORN SWITCH

GLASS/WINDOWS/MIRRORS

GW

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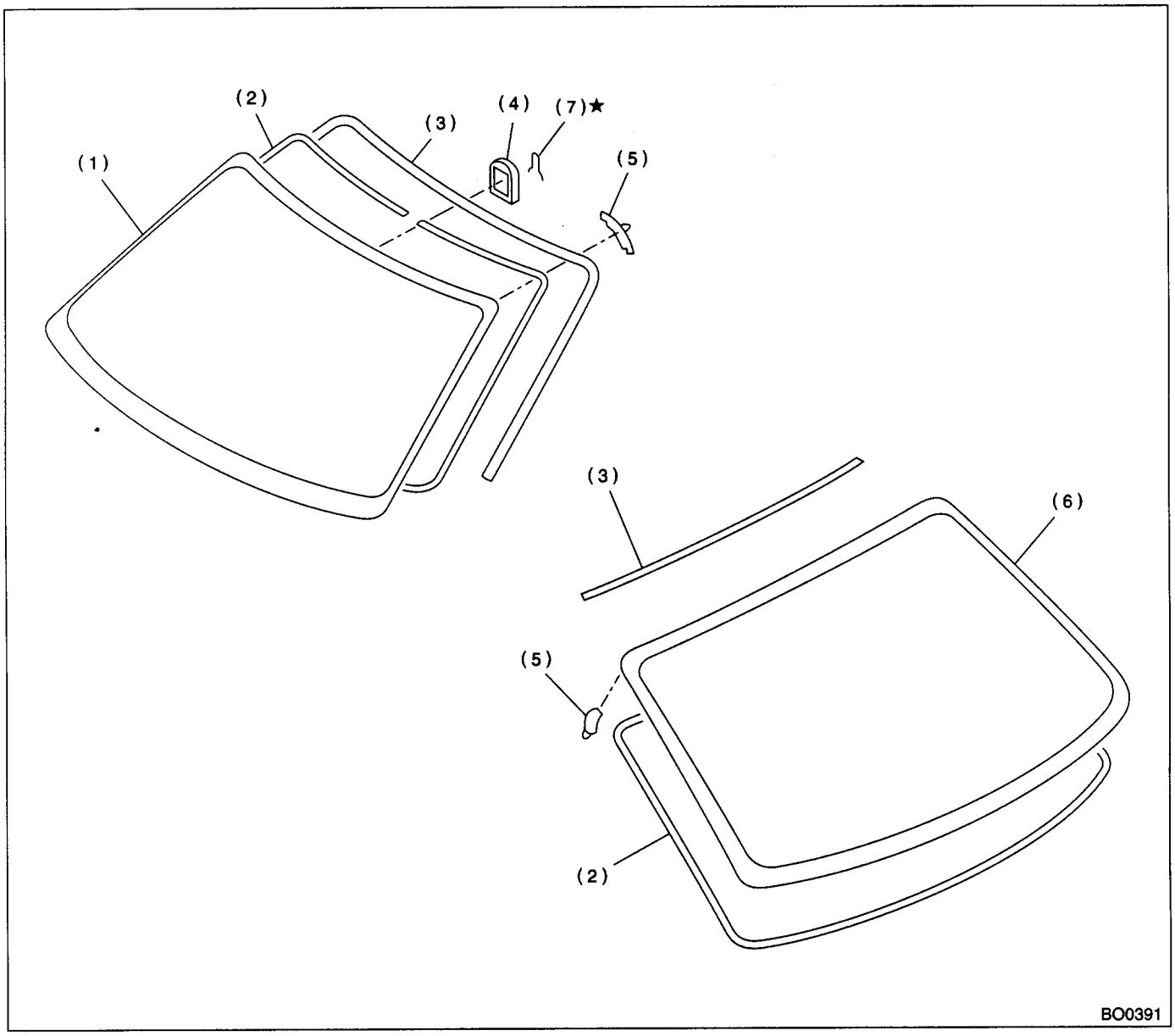
1. General Description

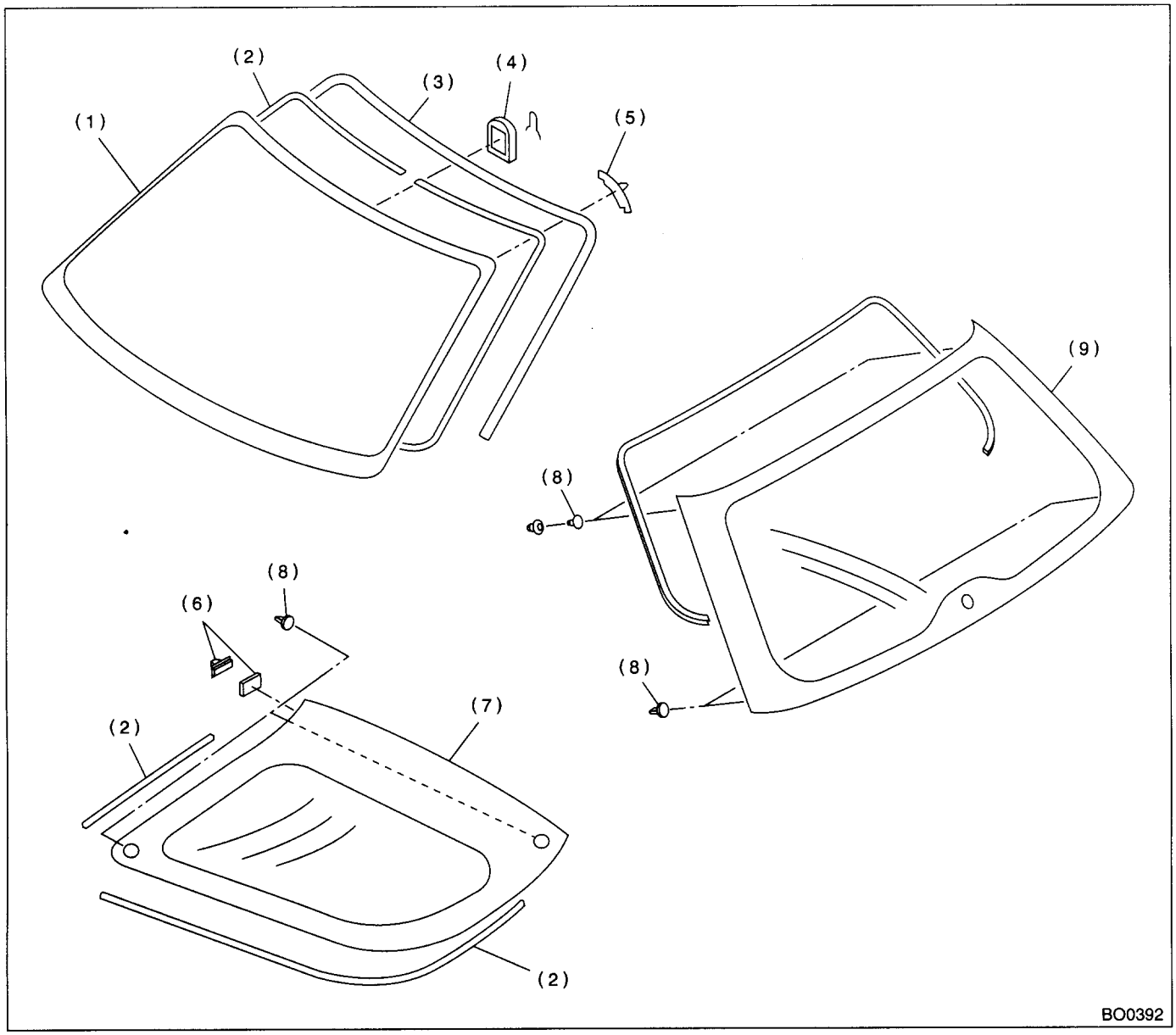
A: COMPONENT

1. FIXED GLASS (SEDAN)



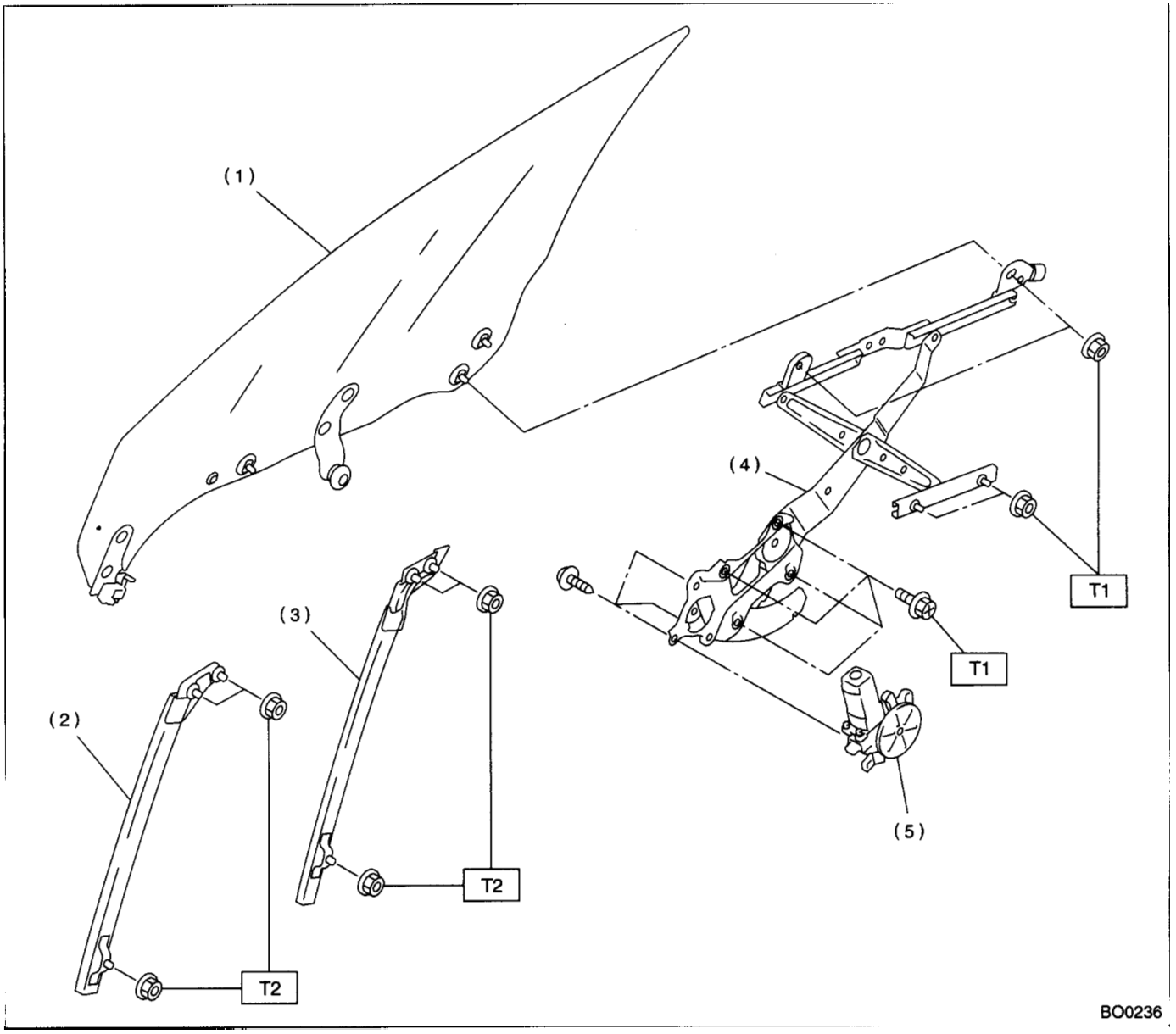
(1) Windshield glass
(2) Dam rubber
(3) Molding
(4) Rearview mirror mount
(5) Locate pin
(6) Rear window glass
(7) Spring

2. FIXED GLASS (WAGON)



(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) Glass

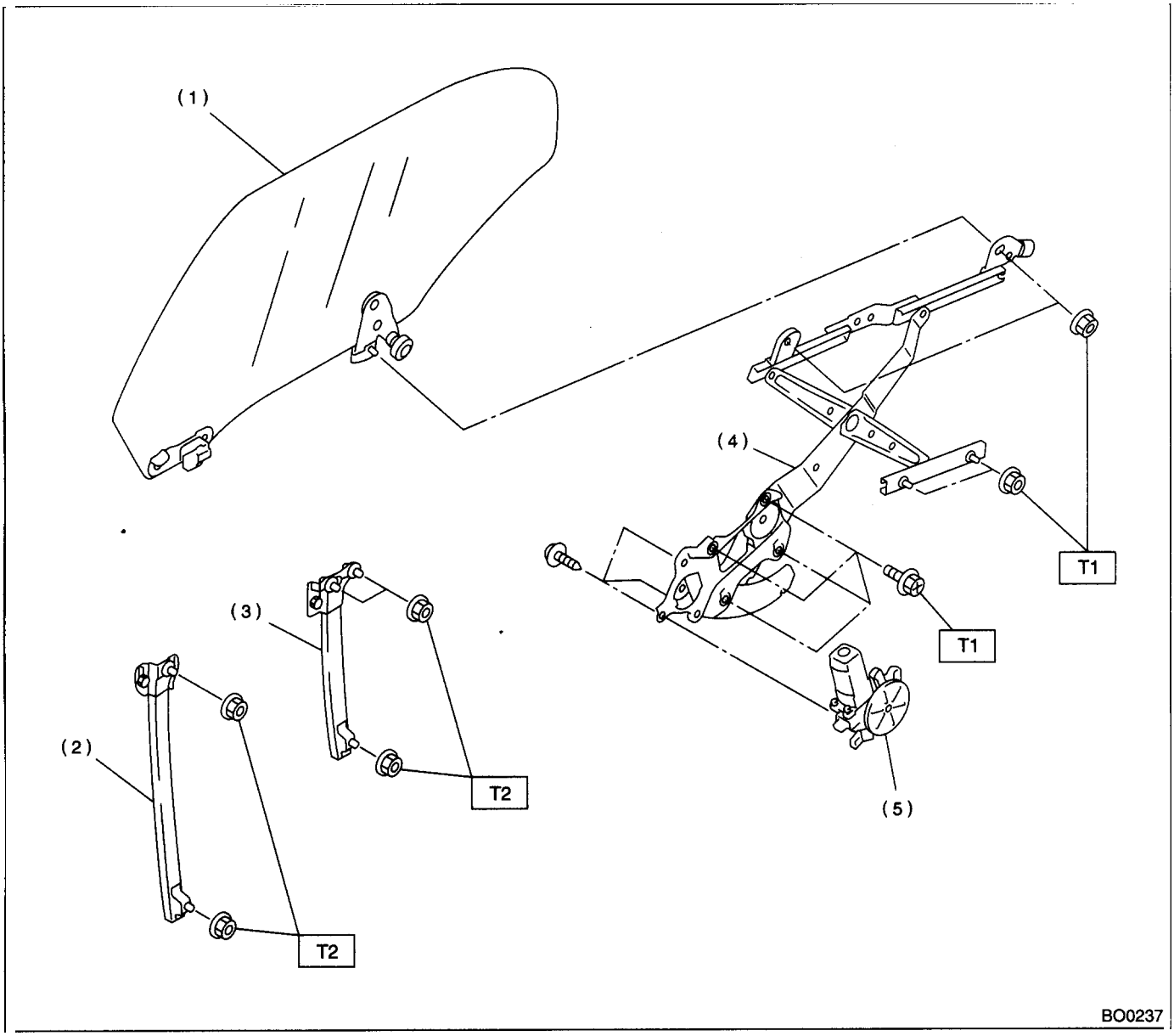
3. FRONT DOOR GLASS



(1) Glass
(2) Door sash (Front)
(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)

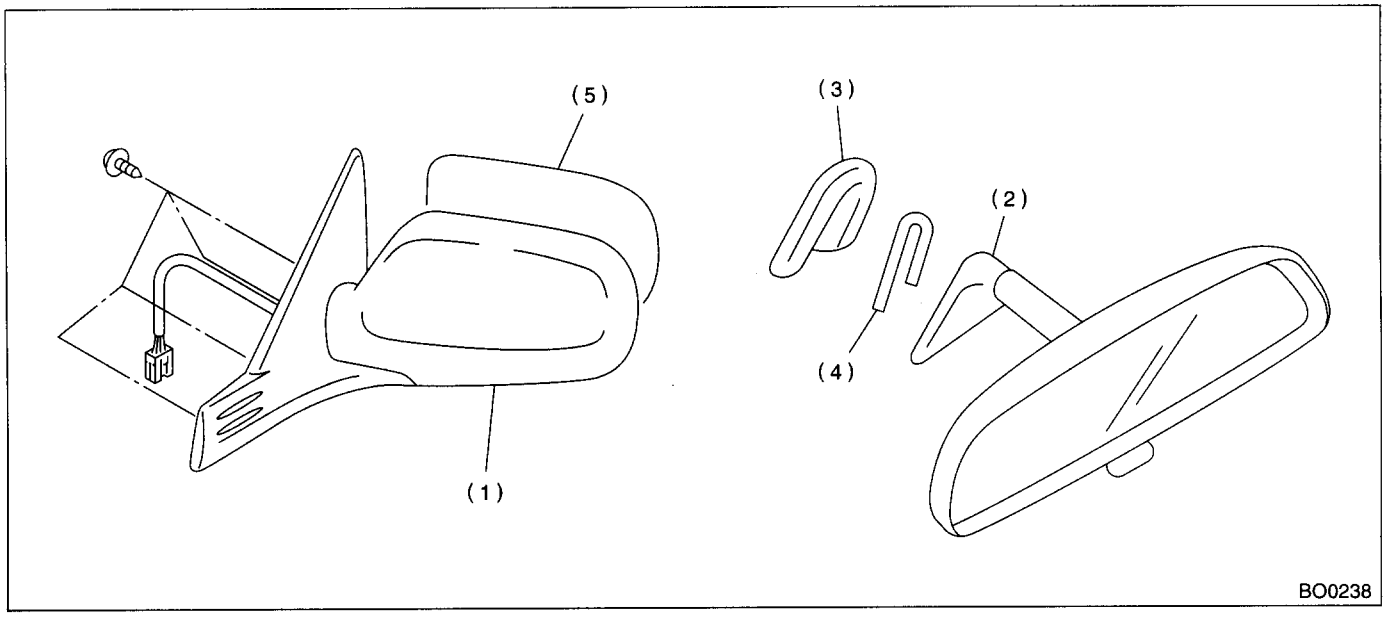
4. REAR DOOR GLASS



(1) Glass
(2) Door sash (Front)
(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)

5. MIRRORS



(1) Outer mirror
(2) Inner rearview mirror
(3) Mount
(4) Spring
(5) Mirror

B: CAUTION

- When electrical connectors are disconnected, always conduct an operational check after connecting them again.
- Avoid impact and damage to the glass.

C: 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

<Ref. to WI-109, 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. Rear Window Defogger System

A: SCHEMATIC

<Ref. to WI-117, Rear Window Defogger System.>

B: INSPECTION

Symptom	Repair order
Rear window defogger does not operate.	(1) Fuse (M/B No. 1) (F/B No. 11) (2) Rear defogger relay (3) Rear defogger timer (4) Defogger switch (5) Rear defogger condenser (6) Deffogger wire (7) Wire harness

4. Remote Control Mirror System

A: SCHEMATIC

<Ref. to WI-118, Remote Controlled Rearview Mirror System.>

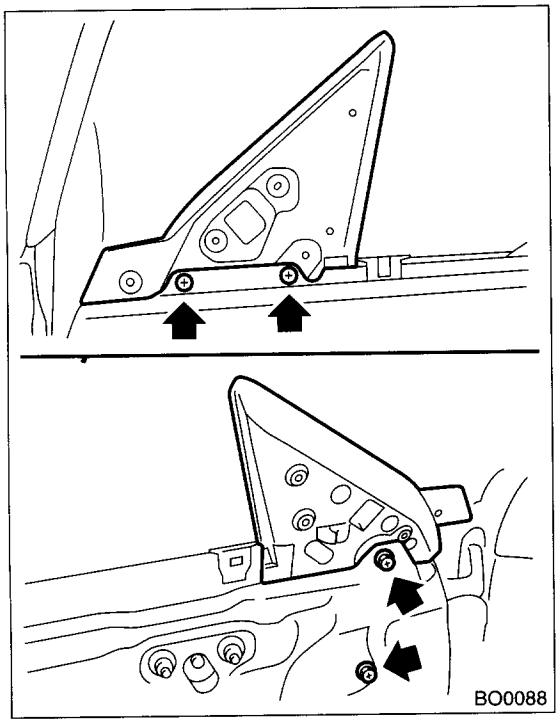
B: INSPECTION

Symptom	Repair order
All function does not operate.	(1) Fuse (F/B No. 1) (F/B No. 4) (F/B No. 19) (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

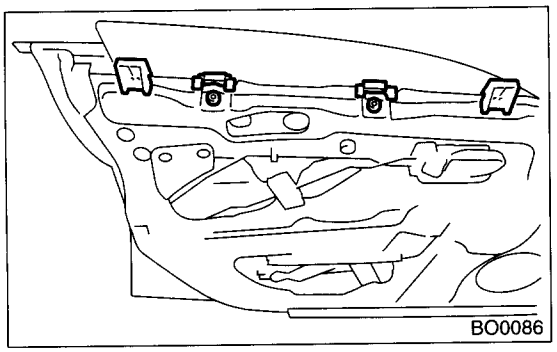
5. Front Door Glass

A: REMOVAL

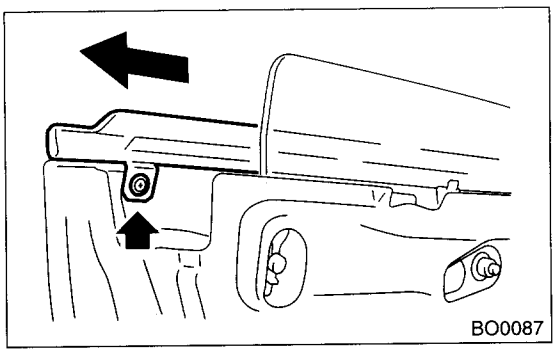
1) Remove the front door trim. <Ref. to EI-37, REMOVAL, Front Door Trim.>
2) Remove the sealing cover. <Ref. to EB-14, REMOVAL, Front Sealing Cover.>
3) Remove the outer mirror assembly. <Ref. to GW-33, REMOVAL, Outer Mirror Assembly.>
4) Remove the gusset.



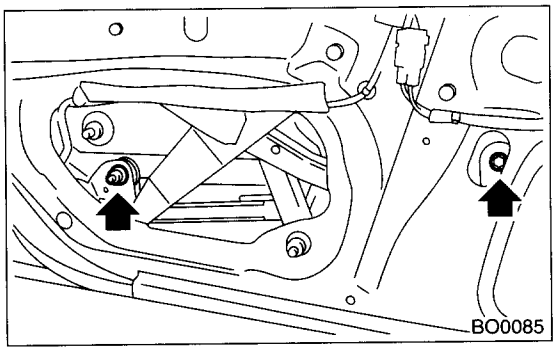
5) Remove the stabilizers and trim hooks.



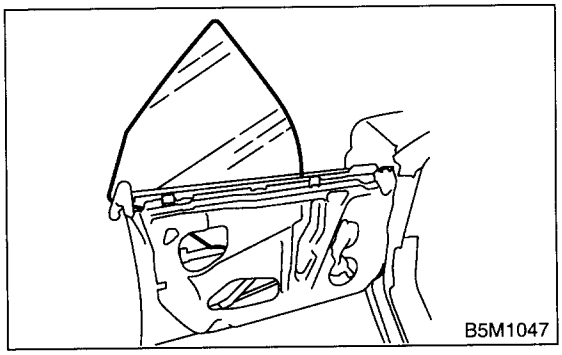
6) Remove the rear end of door weather strip and weather strip outer.



7) Operate the power window switch to move glass to position shown in the figure, and then remove the two nuts from the service holes.



8) Remove the door glass.



CAUTION:
- **Do not turn regulator in the closing direction after removal of the glass. Otherwise gear may be disengaged.**
- **Avoid impact and damage to the glass.**

B: INSTALLATION

1) Install in the reverse order of removal.

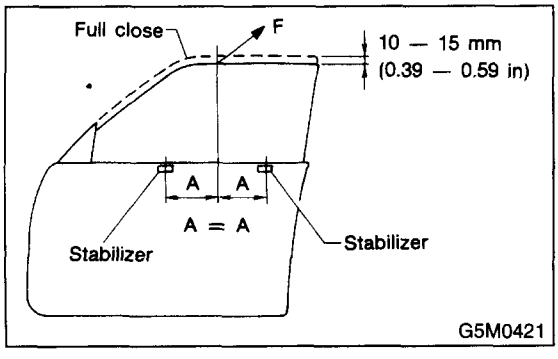
CAUTION:
Make sure that glass stay is placed securely in sash.

2) Adjust the front door glass. <Ref. to GW-17, ADJUSTMENT, Front Door Glass.>

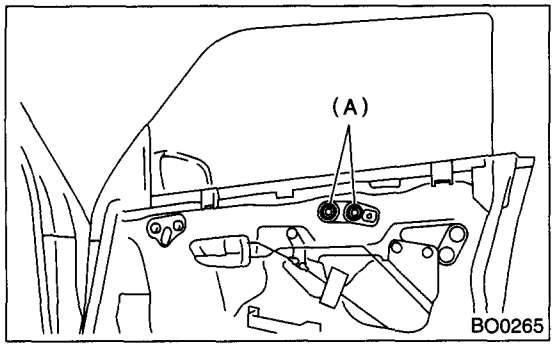
C: ADJUSTMENT

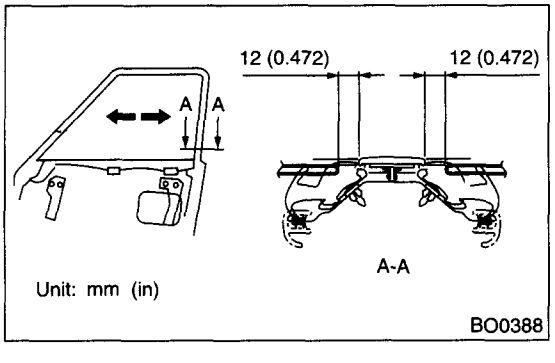
NOTE:
Before adjustment, ensure that all adjusting bolts of stabilizer, upper stopper, and sash are loose and door glass is raised so that it is in contact with weatherstrip.

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±4.9 N (4.6±0.5 kg, 11.0±1.1 lb) (F) to upper edge of glass above midpoint of two outer stabilizers, press the inner stabilizer at pressure of 10±5 N (1.0±0.5 kg, 0.2±0.1 lb) to the glass, then secure it.

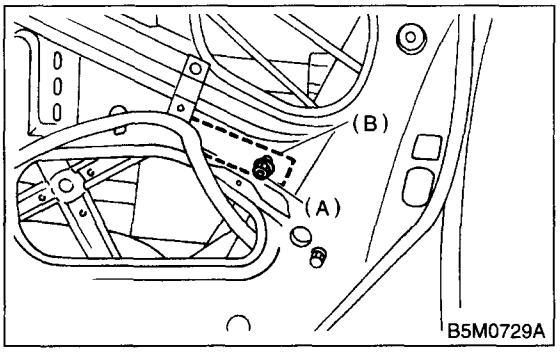


4) For adjustment of clearance between front glass and center pillar cover, loosen the nuts (A), and move the glass sash back and forward until clearance becomes the value shown.

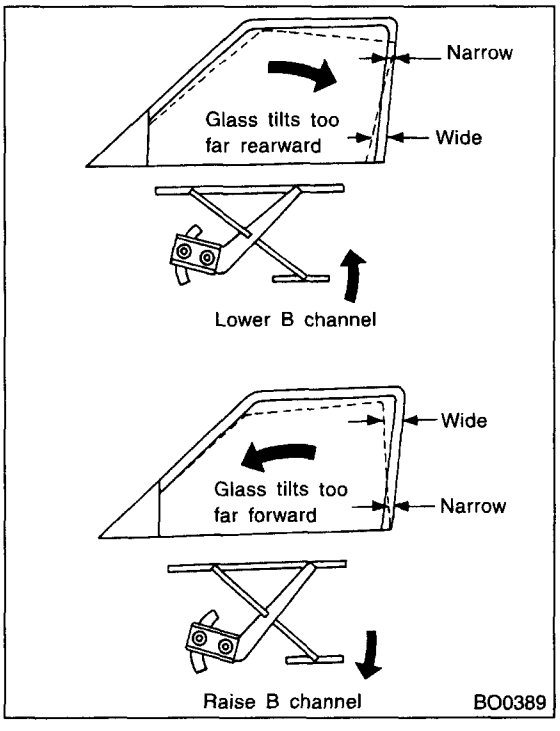




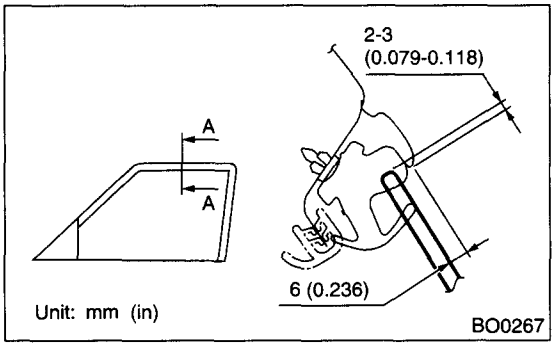
5) For adjustment of upper and lower ends of center pillar, loosen the adjusting nut (A) of B-channel (B).



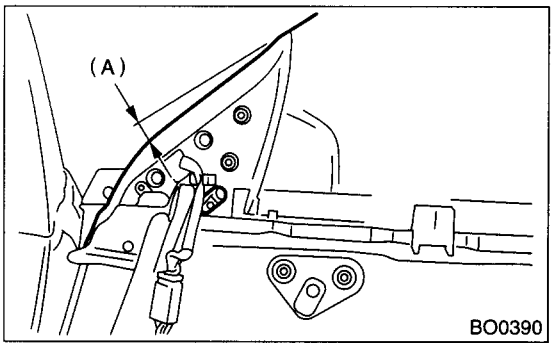
6) Adjust so that the upper and lower ends of center pillar are the same size.



7) For glass stroke adjustment, close 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.



For preventing wind noise, adjust the glass at the position where tip of gusset is raised up a little.

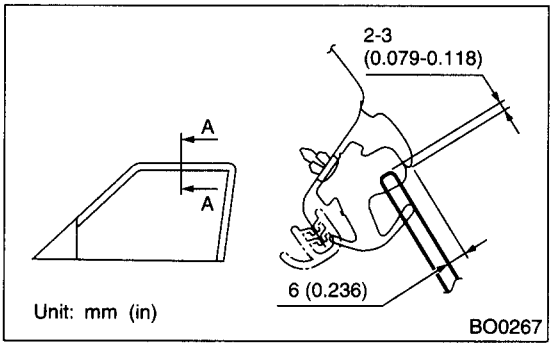


(A) 0-1.5 mm (0-0.059 in)

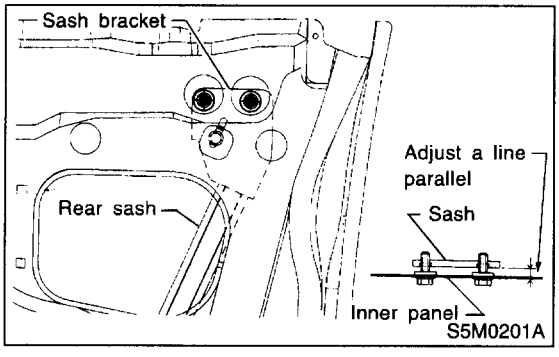
8) After stabilizer adjustment, carry out glass crimp adjustment. First, visually ensure positional relationship between retainer & molding and glass of the roof side, and then begin with rear sash adjustment. Adjust two adjusting bolts alternately step by step to obtain dimensions shown below (cross-section A). •

NOTE:
If two nuts are loosened at the same time, the 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.



CAUTION:
Do not tilt sash bracket to inner panel during adjustment. Otherwise smooth regulator operation cannot be achieved.



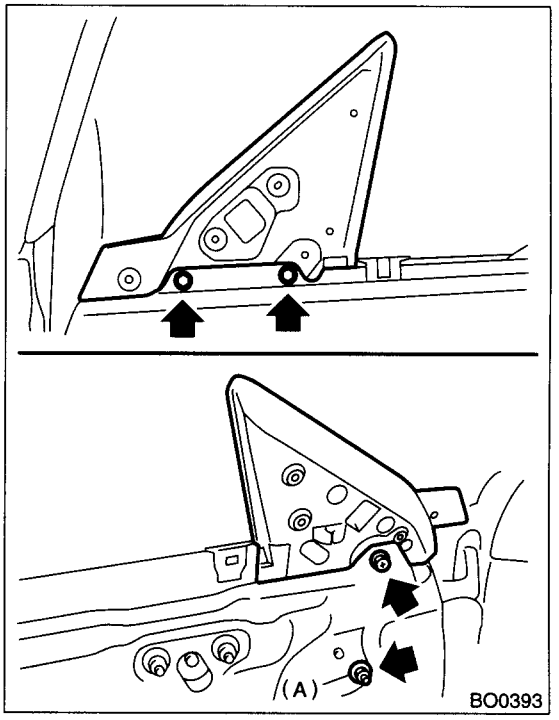
10) Make adjustment of front sash in the same manner as that of rear sash.

CAUTION:
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 of glass, if there is a gap between outer lip of gusset and glass surface, adjust the gap with adjusting bolt (A) in lower fitting part of gusset to prevent generation of wind noise.

13) During adjustments, loosen other three clamping bolts.

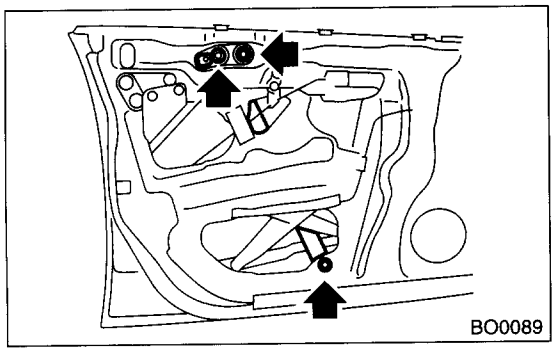


14) After adjustment, tighten the bolts and nuts.

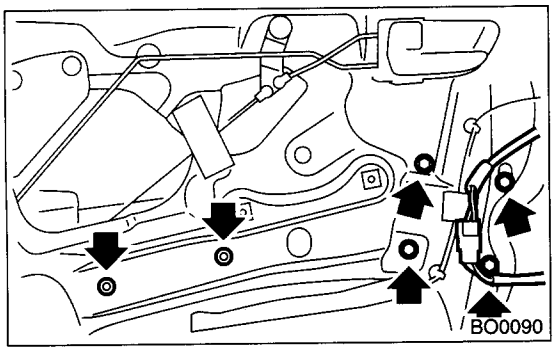
6. Front Regulator and Motor Assembly

A: REMOVAL

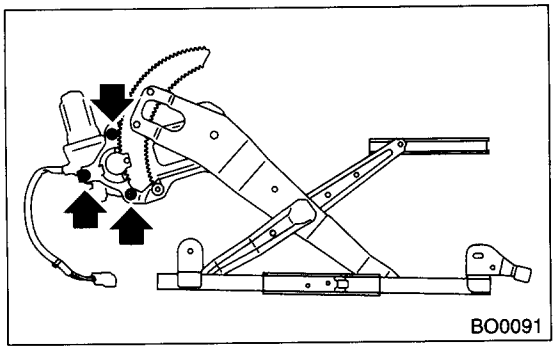
1) Remove the door glass. <Ref. to GW-15, REMOVAL, Front Door Glass.>
2) Loosen the nuts to remove the rear sash.



3) Disconnect the motor connector.
4) Loosen four bolts and two nuts to remove the 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.>

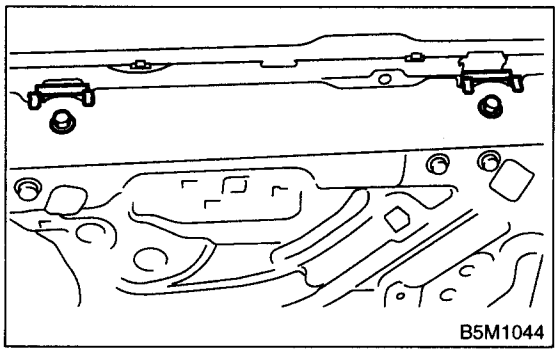
C: INSPECTION

1) Make sure that the power window motor rotates properly when the battery voltage is applied to the terminals of motor connector.
2) Change the polarity of battery connections to terminals to ensure that the motor rotates in reverse direction.

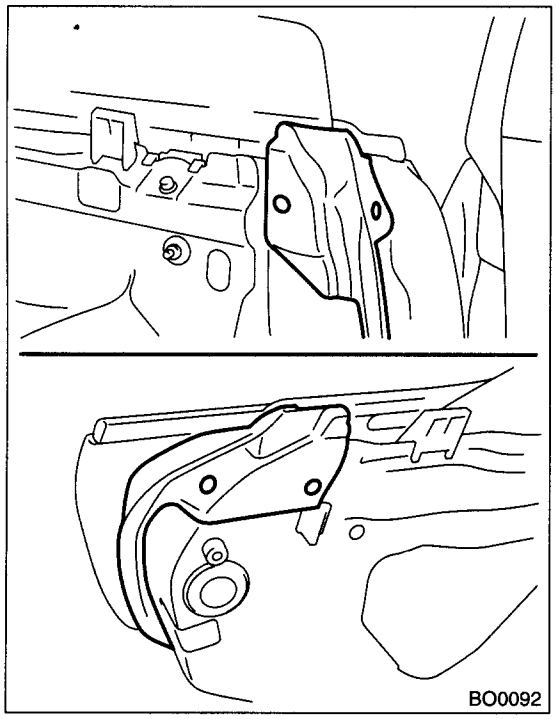
7. Rear Door Glass

A: REMOVAL

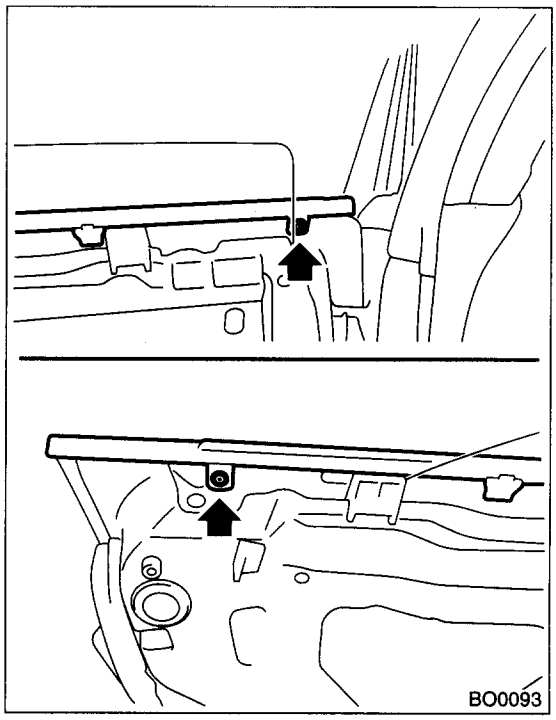
1) Remove the rear door trim. <Ref. to EI-38, REMOVAL, Rear Door Trim.>
2) Remove the sealing cover. <Ref. to EB-17, REMOVAL, Rear Sealing Cover.>
3) Remove the stabilizer.



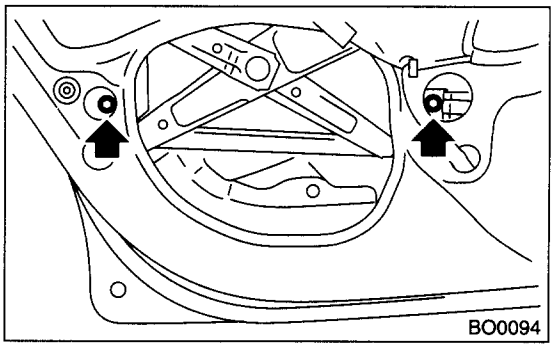
4) Remove the door weather strip.



5) Loosen two screw to remove weather strip outer.



6) Operate the power window switch to remove glass as shown in the figure, and remove two nuts.



7) Loosen two rear sash installation nuts, and move the rear sash backward.
8) Remove the glass.

CAUTION:
Avoid impact and damage to the glass.

B: INSTALLATION

1) Install in the reverse order of removal.

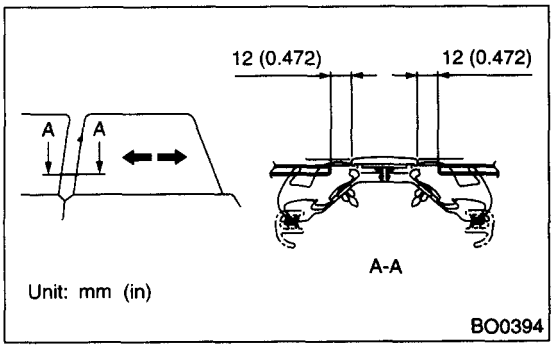
CAUTION:
Make sure that glass stay is placed securely in sash.

2) Adjust rear door glass. <Ref. to GW-21, ADJUSTMENT, Rear Door Glass.>

C: ADJUSTMENT

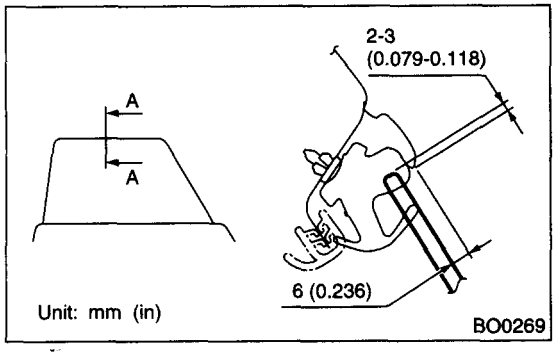
NOTE:
The rear door glass, as a rule, should be adjusted in the same manner as front glass, although they are different in dimension. Special notes for rear glass are given below.

1) Adjust the glass position using the following dimensions as a guide line.



CAUTION:
• If dimensions are smaller than the given dimensions, glass may get caught in weatherstrip during lifting/lowering operation. In the worst case, it may cause glass not to be opened fully.
• After adjustment, move glass up and down to check whether it is caught.

2) Adjust the crimp of glass using the following dimensions as a guide line.

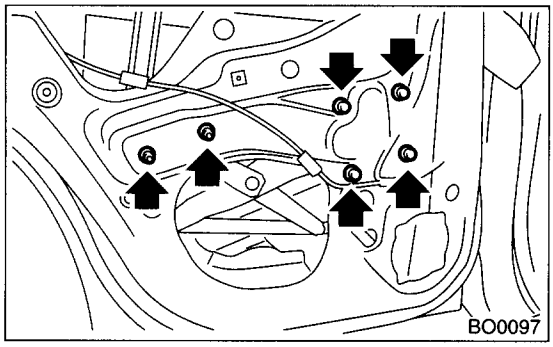


CAUTION:
• If crimp of rear glass is higher than necessary, glass may get caught in weatherstrip of center pillar corner, resulting in early wear of weatherstrip. Be careful when adjusting.
• After adjustment, move glass up and down to check whether it is caught.

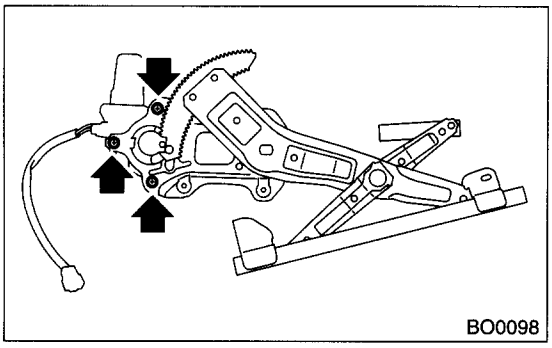
8. Rear Regulator and Motor Assembly

A: REMOVAL

1) Remove the door glass. <Ref. to GW-20, REMOVAL, Rear Door Glass.>
2) Remove the front sash.
3) Disconnect the motor connector.
4) Loosen four bolts and two nuts to remove regulator assembly.



5) Loosen screws to remove motor assembly.



B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust the rear door glass. <Ref. to GW-21, ADJUSTMENT, Rear Door Glass.>

C: INSPECTION

1) Make sure that the power window motor rotates properly when the battery voltage is applied to the terminals of motor connector.
2) Change the polarity of battery connections to the terminals to ensure that the motor rotates in reverse direction.

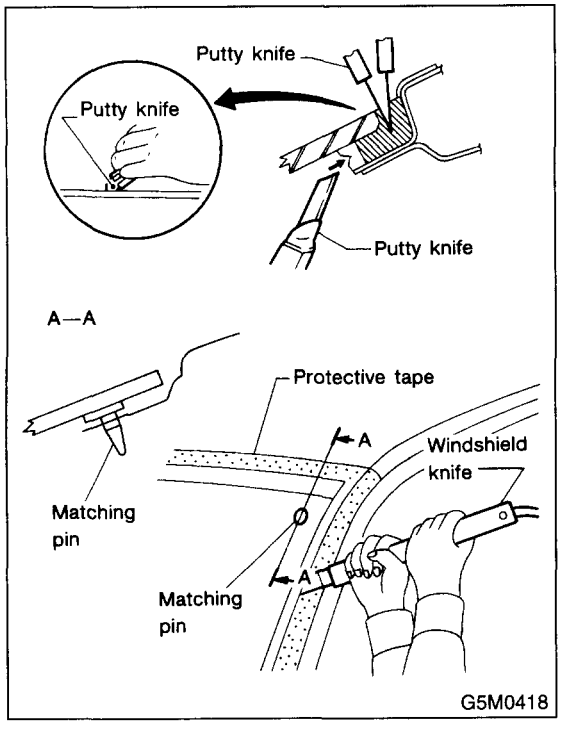
9. Windshield Glass

A: REMOVAL

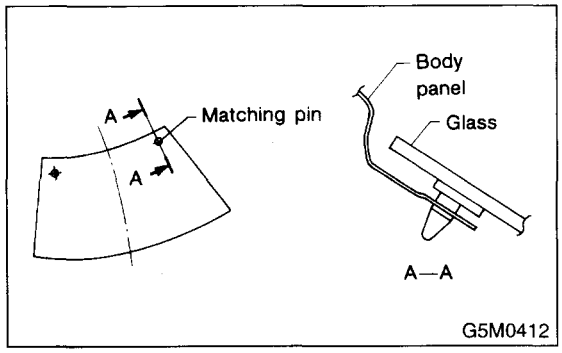
1. USING WINDSHIELD KNIFE

1) Remove the cowl panel. <Ref. to EI-33, REMOVAL, Cowl Panel.>
2) Remove the glass molding.
3) Tape the body side of the circumference of windshield glass for protection.
4) Apply the 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.

CAUTION:
- **Do not twist windshield knife.**
- **Cutting of adhesive layer shall be started with wider gap between windshield glass and body.**

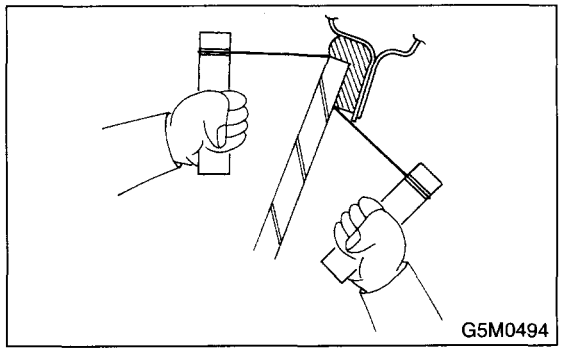


NOTE:
Because the matching pins are bonded to the corners of glass, use piano wire to cut the pin.



2. USING PIANO WIRE

1) Remove the cowl panel. <Ref. to EI-33, 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 drill or knife.
5) Pass the piano wire through the hole, and attach securely both the wire ends to pieces of wood.



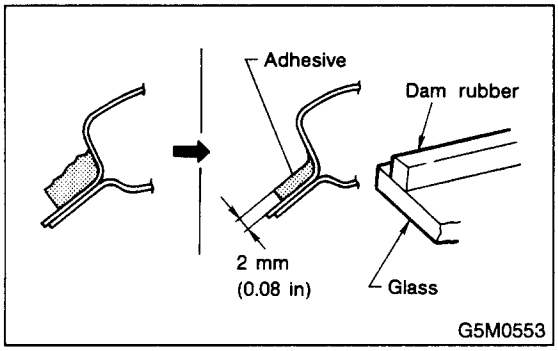
6) Pull the wire ends alternately to cut off the adhesive layer.

CAUTION:
- **Do not tightly pull the piano wire against the windshield glass edge.**
- **Be careful not to damage interior and exterior parts.**
- **When removal is made with area close to instrument panel, place a protection plate over it. Pay particular attention to the removal.**
- **Do not cross piano wires. Otherwise they may be cut.**

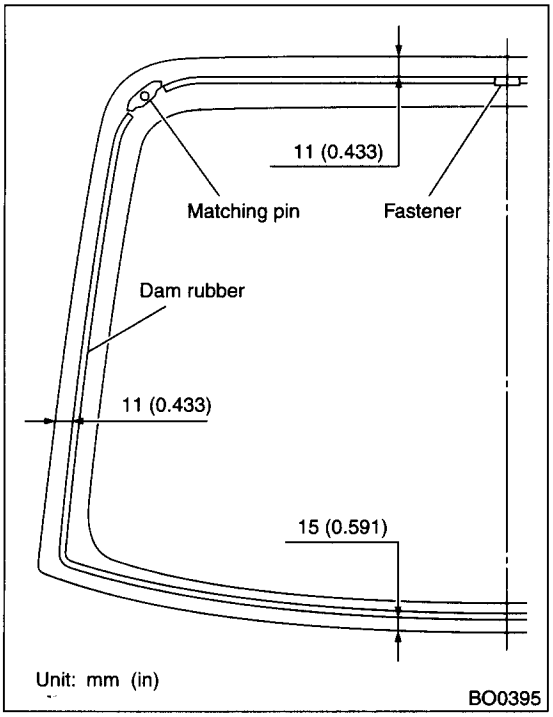
B: INSTALLATION

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.

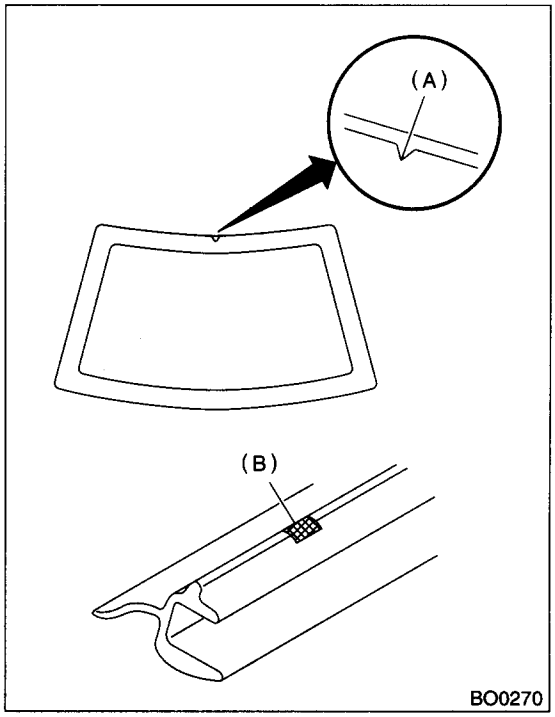
CAUTION:
Be careful not to damage the body and paint surface.



3) Clean the body with alcohol or white gasoline to remove thoroughly chips, dusts, and dirts from the body face.
4) Place the glass on body.
5) Adjust the glass position to make uniform clearance between body and glass in four corners.
6) Bond the matching pins and dam rubber.

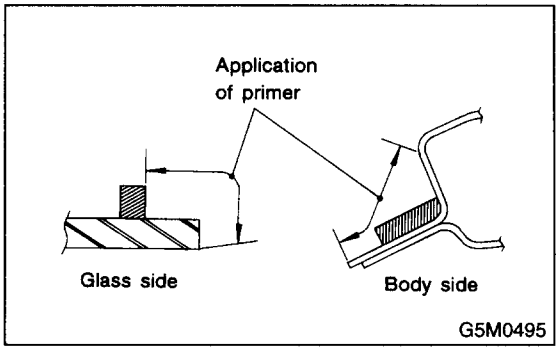


7) Remove the glass from body.
8) Fit the molding mark (B) to notch (A).

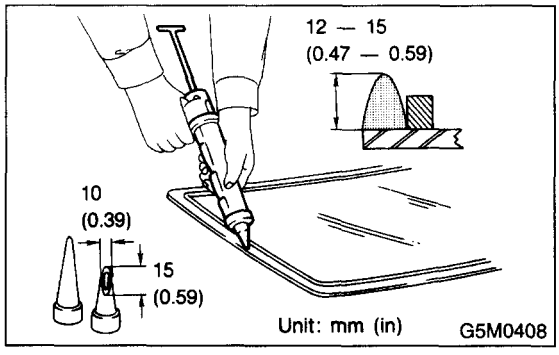


9) Apply the primer to the adhesive layer of glass using sponge.
10) Apply the primer to the adhesive layer of body.

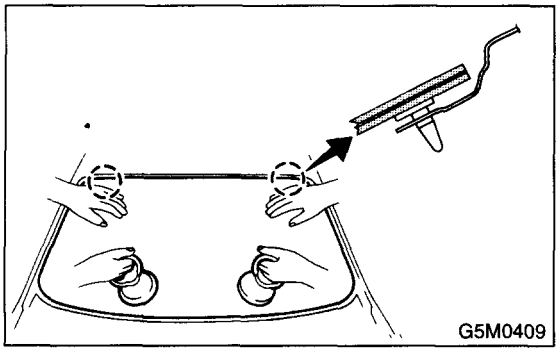
CAUTION:
- **Primer once attached to the painted surface of the body and internal trim is hard to wipe off. Mask the circumference of such areas.**
- **Let primer dry for about ten minutes before installing the glass.**
- **Do not touch surface coated with primer.**



11) Cut off the cartridge nozzle tip and set it in sealant gun as shown.



12) Apply the adhesive to the glass end surface as shown.
13) Fit the matching pins using suction rubber cup to install windshield glass.



14) Lightly press the windshield glass for tight fit.
15) Make the adhesive surface flush using spatula.

CAUTION:
• When door is opened/closed after glass is bonded, always lower door glass and then open/close it carefully.
• Move vehicle slowly.

16) After completion of all work, allow 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.

17) After curing of adhesive, pour water on external surface of vehicle to check that there are no water leaks.

CAUTION:
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) Install the cowl panel. <Ref. to EI-33, INSTALLATION, Cowl Panel.>

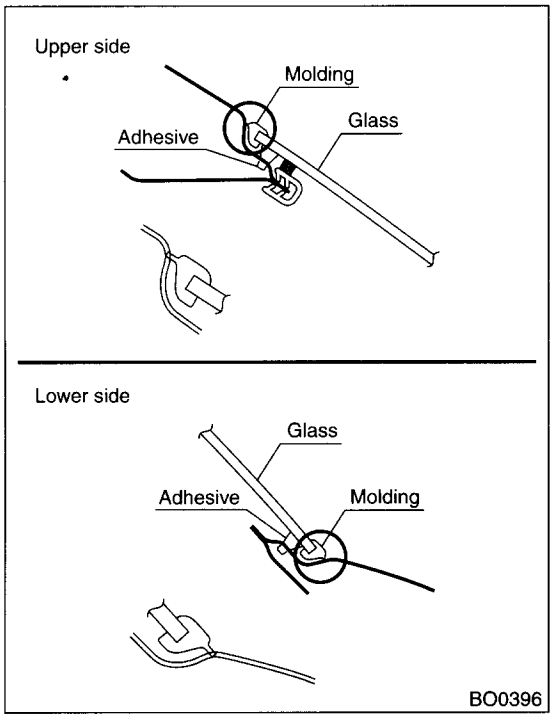
10.Rear Gate Glass

A: REMOVAL

1) Remove the rear wiper motor. <Ref. to WW-17, REMOVAL, Rear Wiper Motor.>
2) Remove the electrical connector from the rear defogger terminal.
3) Remove the glass in the same procedure as for windshield glass. <Ref. to GW-23, REMOVAL, Windshield Glass.>

B: INSTALLATION

1) Apply the adhesive evenly to the glass attachment area.
2) Insert the glass clip pin into the rear gate hole, and after pushing on the area around the clip pin to secure it, push lightly all around the area to seal it.
3) About one hour after installation, conduct a leak test.



CAUTION:
• When door is opened/closed after glass is bonded, always lower door glass and then open/close it carefully.
• Move vehicle slowly.

4) After completion of all work, allow 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.

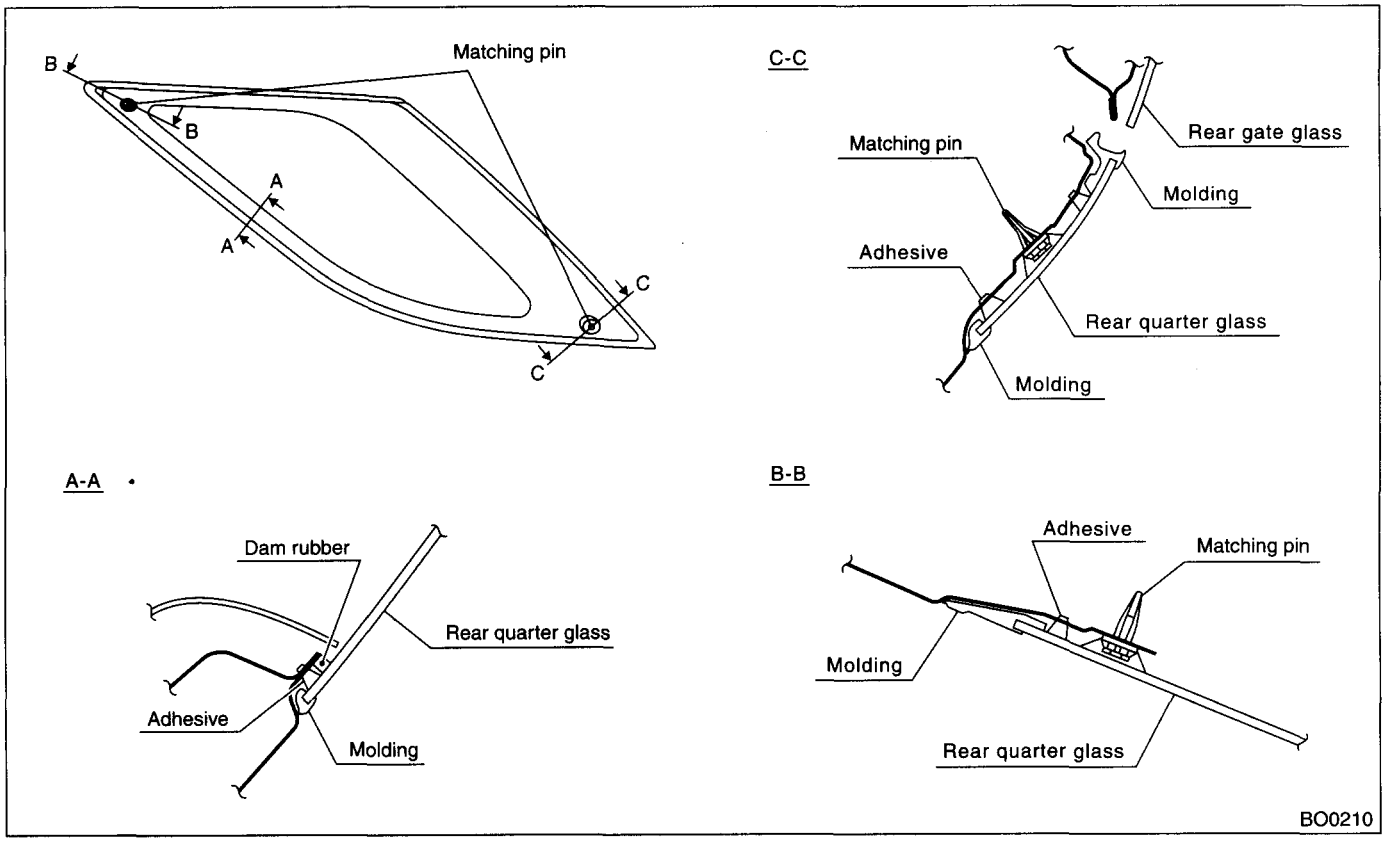
CAUTION:
When a vehicle is returned to the user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.

5) Connect the rear defogger terminals.
6) Install the rear wiper. <Ref. to WW-17, INSTALLATION, Rear Wiper Motor.>

11.Rear Quarter Glass

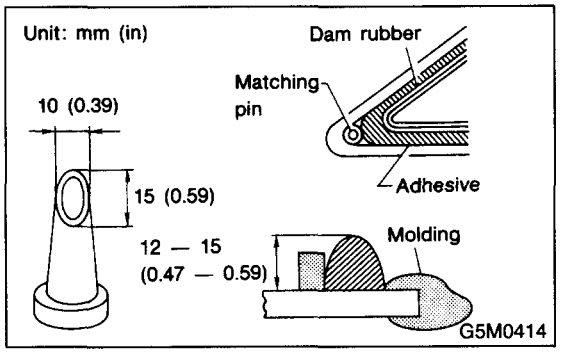
A: REMOVAL

Remove the glass in the same procedure as for windshield glass. <Ref. to GW-23, REMOVAL, Windshield Glass.>



B: INSTALLATION

1) Cut off the nozzle tip as shown in the figure.



2) Install the glass in the same procedure as for windshield the glass. <Ref. to GW-24, INSTALLATION, Windshield Glass.>

CAUTION:

- **When door is opened/closed after glass is bonded, always lower door glass and then open/close it carefully.**
- **Move vehicle slowly.**

3) After completion of all work, allow 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 the water on external surface of vehicle to check that there are no water leaks.

CAUTION:
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.

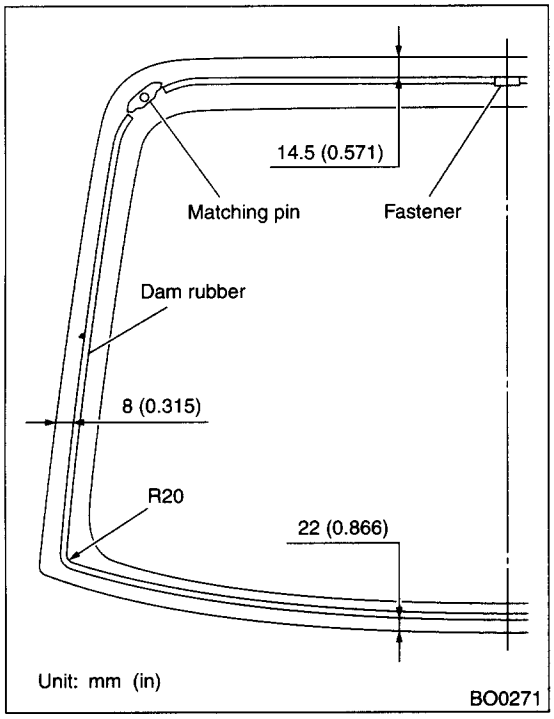
12.Rear Window Glass

A: REMOVAL

1) Disconnect the electrical connectors from the rear defogger terminals.
2) Remove the glass in the same procedure as for windshield glass. <Ref. to GW-23, REMOVAL, Windshield Glass.>

B: INSTALLATION

1) Bond the dam rubber and matching pin.



2) Install the glass in the same procedure as for windshield glass. <Ref. to GW-24, INSTALLATION, Windshield Glass.>
3) Connect the rear defogger terminals.

CAUTION:
• When door is opened/closed after glass is bonded, always lower door glass and then open/close door carefully.
• Move vehicle slowly.

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.

5) After curing of adhesive, pour the water on external surface of vehicle to check that there are no water leaks.

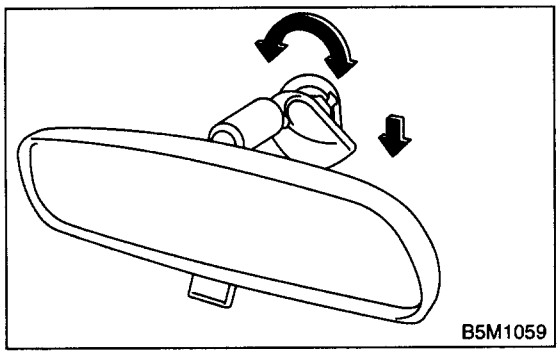
CAUTION:
When a vehicle is returned to the user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.

13.Inner Rearview Mirror

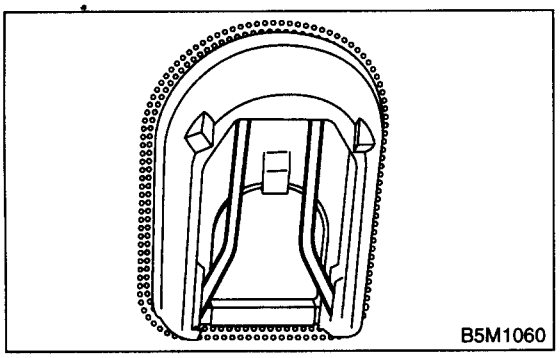
A: REMOVAL

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 the mirror base.



CAUTION:
Be careful not to damage the mirror surface.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

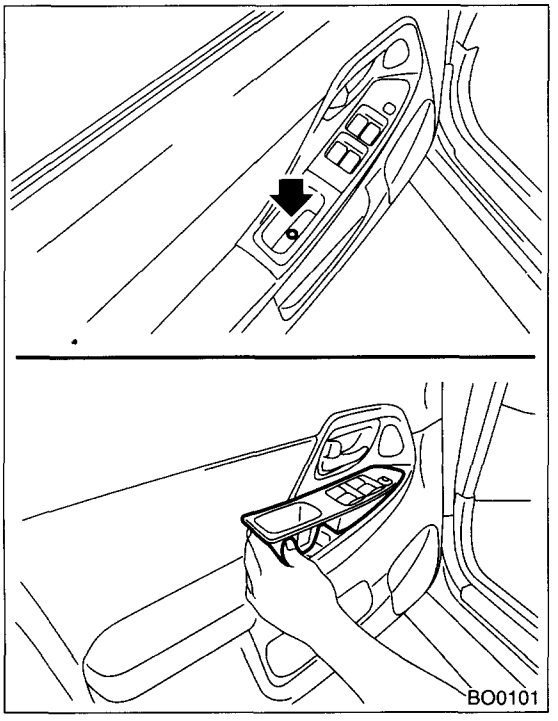
Do not let mirror be damaged.
Do not let spring deteriorate.

14.Power Window Control Switch

A: REMOVAL

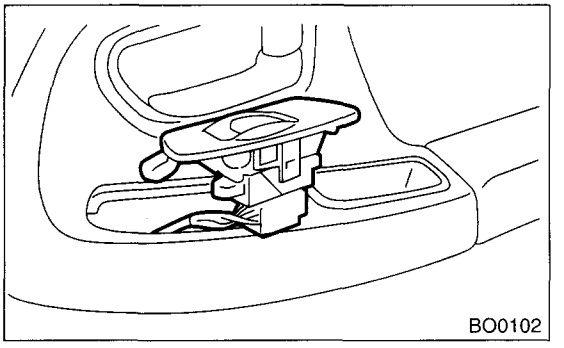
1. MAIN SWITCH

1) Disconnect the ground terminal from battery.
2) Loosen the screw to remove power window main switch.
3) Disconnect the connector.



2. SUB-SWITCH

1) Disconnect the ground terminal from battery.
2) Remove the switch panel.
3) 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 switch resistance.

Driver's switch:

Switch position	Terminal No.	Standard
UP	13 and 2, 1 and 5	less than 1Ω
OFF	1 and 2 1 and 5 2 and 5	less than 1Ω
DOWN	13 and 1, 2 and 5	less than 1Ω
AUTO DOWN	13 and 1, 2 and 5	less than 1Ω

Front passenger's switch:

Switch position	Terminal No.	Standard
UP	13 and 6, 7 and 5	less than 1Ω
OFF	6 and 7 and 5	less than 1Ω
DOWN	13 and 7, 6 and 5	less than 1Ω

Rear left switch:

Switch position	Terminal No.	Standard
UP	10 and 13, 9 and 5	less than 1Ω
OFF	10 and 9 10 and 5 9 and 5	less than 1Ω
DOWN	13 and 9, 10 and 5	less than 1Ω

Rear right switch:

Switch position	Terminal No.	Standard
UP	13 and 16, 15 and 5	less than 1Ω
OFF	16 and 15 16 and 5 5 and 15	less than 1Ω
DOWN	13 and 15, 16 and 5	less than 1Ω

If NG, replace the main switch.

2. SUB-SWITCH

Measure switch resistance.

Front passenger's door switch and rear door switch:

Switch position	Terminal No.	Standard
UP	8 and 5, 6 and 7	less than 1Ω
OFF	4 and 5, 6 and 7	less than 1Ω
DOWN	8 and 7, 4 and 5	less than 1Ω

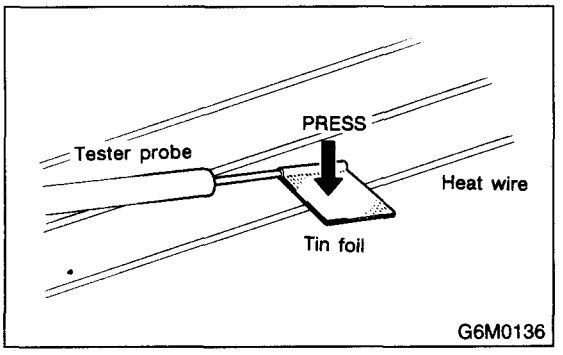
If NG, replace the sub-switch.

15.Rear Window Defogger

A: INSPECTION

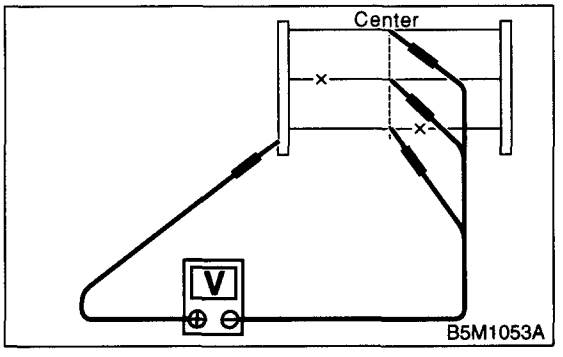
CAUTION:
When wiping stain on glass off with cloth, use a dry and soft cloth and move it in the direction of the heat wire extension to avoid damage to the heat wire.

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.



4) Measure the voltage at wire center with DC voltmeter.

Standard voltage:
Approx. 6 volts



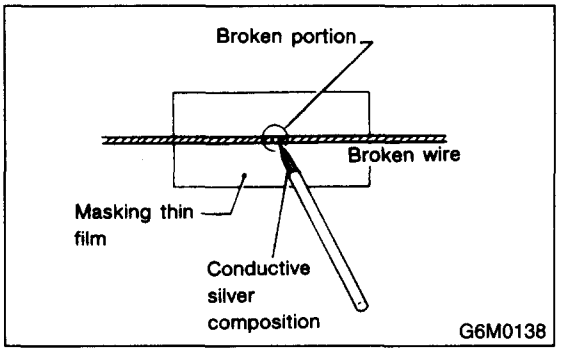
Voltage	Criteria
Approx. 6 V	OK
Approx. 12 V or 0 V	Broken

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 voltmeter, and then move negative lead along the wire up to the 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 the conductive silver composition (DU-PONT No. 4817) to the broken portion.

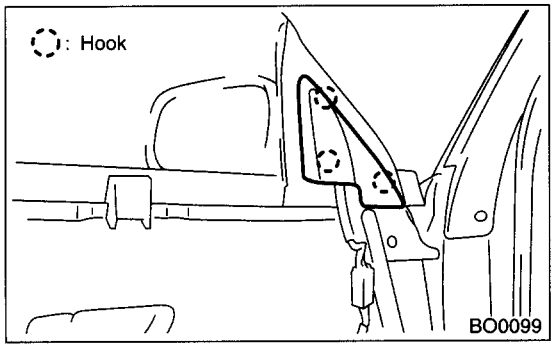


4) After repair, check wire.

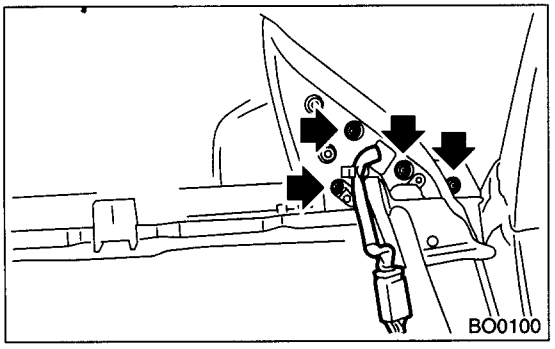
16.Outer Mirror Assembly

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the door trim. <Ref. to EI-37, REMOVAL, Front Door Trim.>
3) Remove the mirror gusset cover.



4) Disconnect the mirror connector.
5) Loosen the screws to remove mirror assembly.

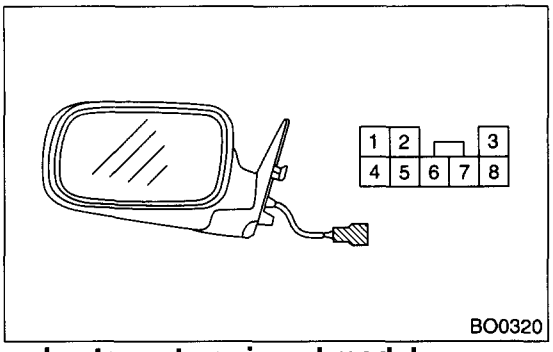


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Check to ensure that the rearview mirror moves properly when the battery voltage is applied to terminals.



Mirror heater not-equipped model:

Switch position	Terminal No.
OFF	—
UP	4 (+) and 6 (–)
DOWN	6 (+) and 4 (–)
LEFT	5 (+) and 6 (–)
RIGHT	6 (+) and 5 (–)

If NG, replace the mirror.

Mirror heater equipped model:

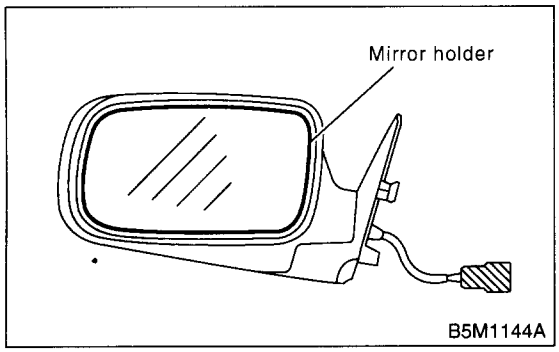
Switch position	Terminal No.
OFF	—
UP	6 (+) and 8 (–)
DOWN	8 (+) and 6 (–)
LEFT	7 (+) and 8 (–)
RIGHT	8 (+) and 7 (–)

If NG, replace the mirror.

17.Outer Mirror

A: REPLACEMENT

1) Remove the door mirror assembly. <Ref. to GW-33, 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-bladed screwdriver without sharp edges to lift the mirror out of the mirror holder. (Also remove the connector from the back of mirrors with heaters.)



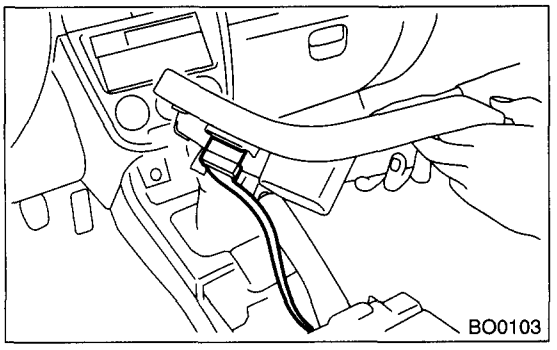
4) Warm the area around the mirror holder with a hair drier until the edges of the mirror holder become soft (about 2 or 3 minutes with a 1,000 W drier.)
5) Remove the backing of the new two-sided tape, and push the mirror in to install it.

CAUTION:
Unless the mirror holder is warmed sufficiently, the mirror holder edges may be damaged or the mirror cracked.

18. Remote Control Mirror Switch

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the console cover.
3) Disconnect the connector.

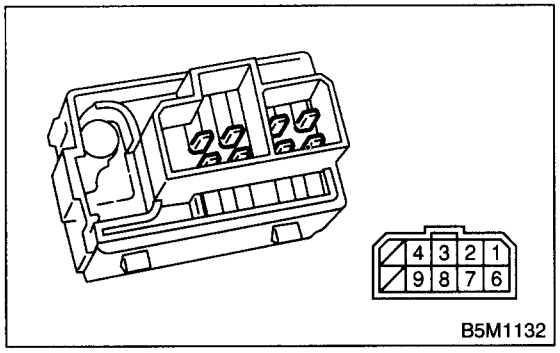


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Move the rearview mirror switch to each position and measure switch resistance.



Change over switch left position:

Switch position	Terminal No.	Standard
OFF	All terminal	more than 1MΩ
UP	4 and 6, 2 and 1	less than 1Ω
DOWN	6 and 2, 4 and 1	less than 1Ω
LEFT	4 and 8, 2 and 1	less than 1Ω
RIGHT	8 and 2, 4 and 1	less than 1Ω

Change over switch right position:

Switch position	Terminal No.	Standard
OFF	All terminal	more than 1MΩ
UP	4 and 7, 2 and 1	less than 1Ω
DOWN	7 and 2, 4 and 1	less than 1Ω
LEFT	4 and 9, 2 and 1	less than 1Ω
RIGHT	9 and 2, 4 and 1	less than 1Ω

If NG, replace the switch.

BODY STRUCTURE

BS

Page

Refer to G1831BE SUPPLEMENT for this section.

BODY STRUCTURE

BS

Page

1. General Description 2
2. Datum Points 3
3. Datum Dimensions 11

1. General Description

A: PREPARATION TOOL

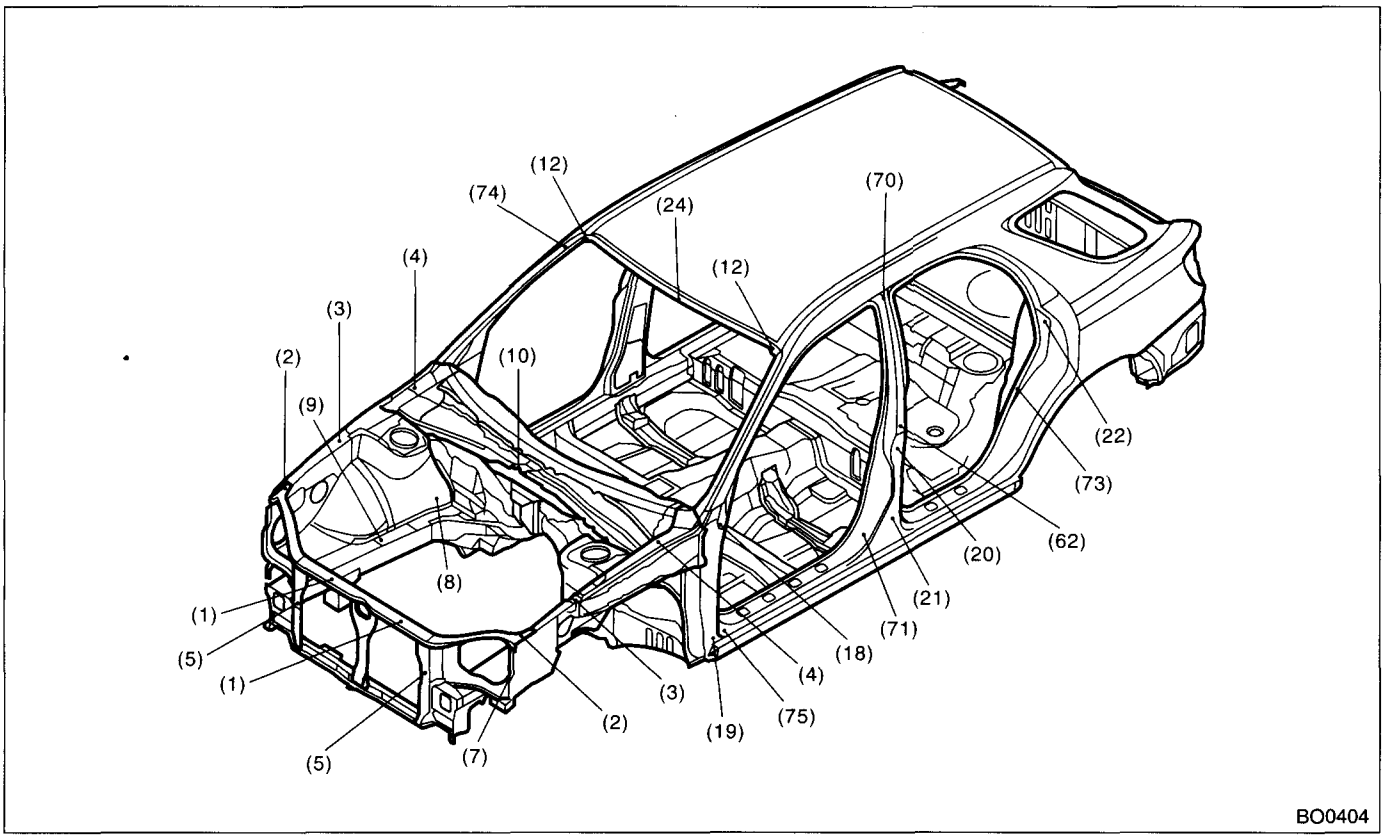
TOOL NAME	REMARKS
Tram tracking gauge	Used for measuring dimension.
Tape measure	Used for measuring dimension.

2. Datum Points

A: LOCATION

NOTE:
- Datum points are specified for body repair.
- Guide holes, locators, and indents are provided to facilitate panel replacement and to increase alignment accuracy.
- Both right and left reference points are symmetrical.

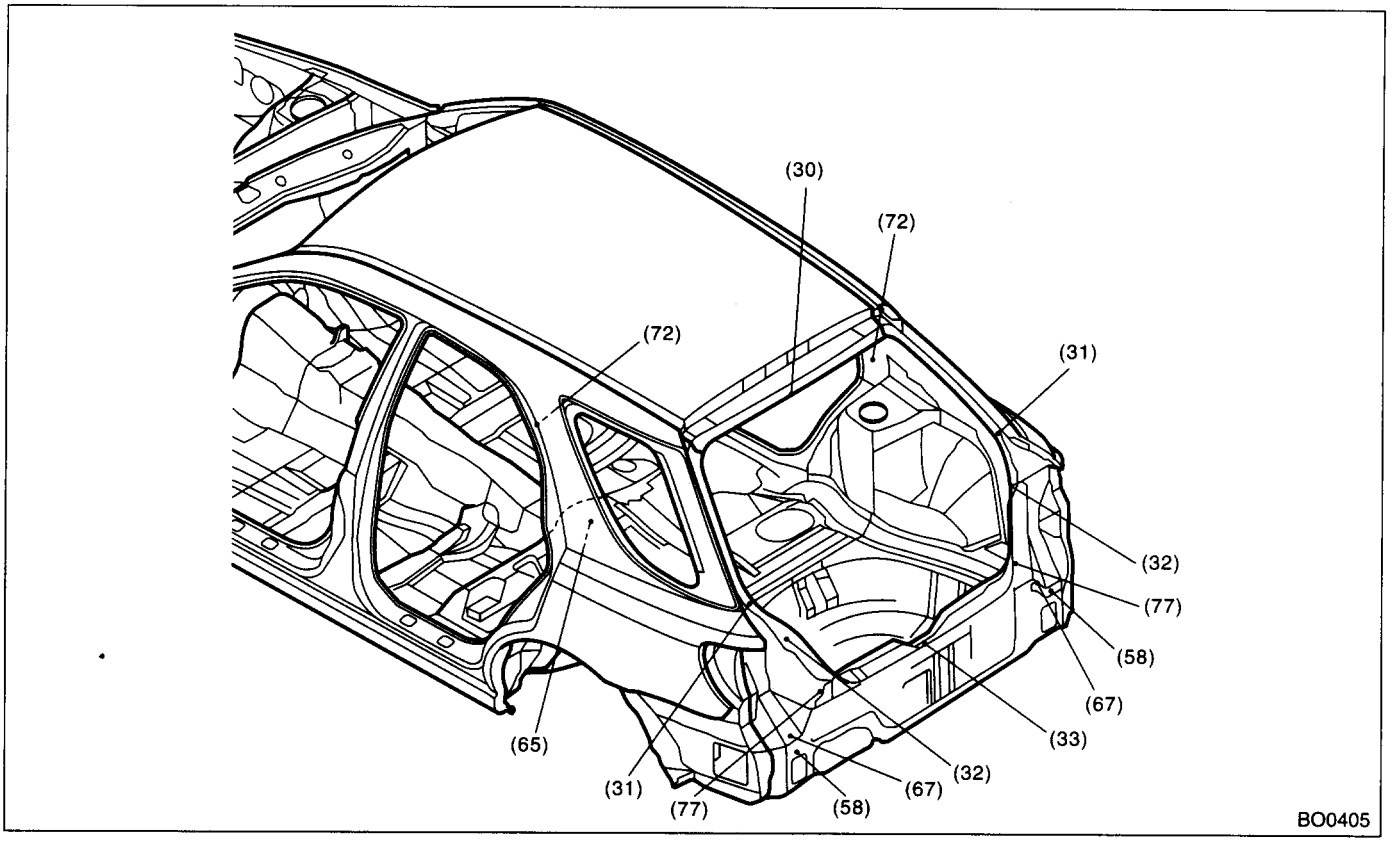
1. WAGON/SEDAN



(1) Radiator attaching hole 12 mm (0.47 in) dia. (Symmetrical)
(2) Fender attaching hole 7 mm (0.28 in) dia. (Symmetrical)
(3) Fender attaching hole 10 mm (0.39 in) dia. (Symmetrical)
(4) Hood hinge attaching hole 12 mm (0.47 in) dia. (Symmetrical)
(5) Radiator panel side gauge hole 20 mm (0.79 in) dia. (Symmetrical)
(7) Fender attaching hole 9 mm (0.35 in) dia. (Symmetrical)
(8) Gauge hole 12 mm (0.47 in) dia. (Symmetrical)
(9) Front suspension cross member attaching hole 12.4 mm (0.488 in) dia. (Symmetrical)
(10) Cowl panel attaching hole 6 mm (0.24 in) dia. (Vehicle center)
(12) Front glass attaching hole Right 6.5 mm (0.256 in) dia. Left 6.5 × 10 mm (0.256 × 0.39 in) dia.
(18) Fender attaching hole 12 mm (0.47 in) dia. (Symmetrical)
(19) Fender attaching hole 12 mm (0.47 in) dia. (Symmetrical)
(20) Outer panel center pillar gauge hole 12 mm (0.47 in) dia. (Symmetrical)
(21) Outer panel center pillar gauge hole 12 mm (0.47 in) dia. (Symmetrical)
(22) Weather strip patch attaching hole 5.2 mm (0.205 in) dia. (Symmetrical)
(24) Roof panel repair locator hollow
(62) Belt anchor attaching hole 11 mm (0.43 in) dia. (Symmetrical)
(70) Trim clip attaching hole 8.5 mm (0.335 in) dia. (Symmetrical)
(71) Harness clip attaching hole 7 mm (0.28 in) dia. (Symmetrical)
(73) Harness clip attaching hole 7 mm (0.28 in) dia. (Symmetrical)
(74) Trim clip attaching hole 10 mm (0.39 in) dia. (Symmetrical)
(75) Insulator attaching hole 8 mm (0.31 in) dia. (Symmetrical)

DATUM POINTS

2. WAGON (REAR SECTION)



(30) Child anchor attaching hole 11 mm (0.43 in) dia.

(31) Washer hose attaching hole Left 7 mm (0.28 in) dia.

(32) Rear combination light mounting hole 7 mm (0.28 in) dia. (Symmetrical)

(33) Two striker attaching hole 15 mm (0.59 in) dia.

(58) Rear bumper plate nut attaching hole 11 mm (0.43 in) dia. (Symmetrical)

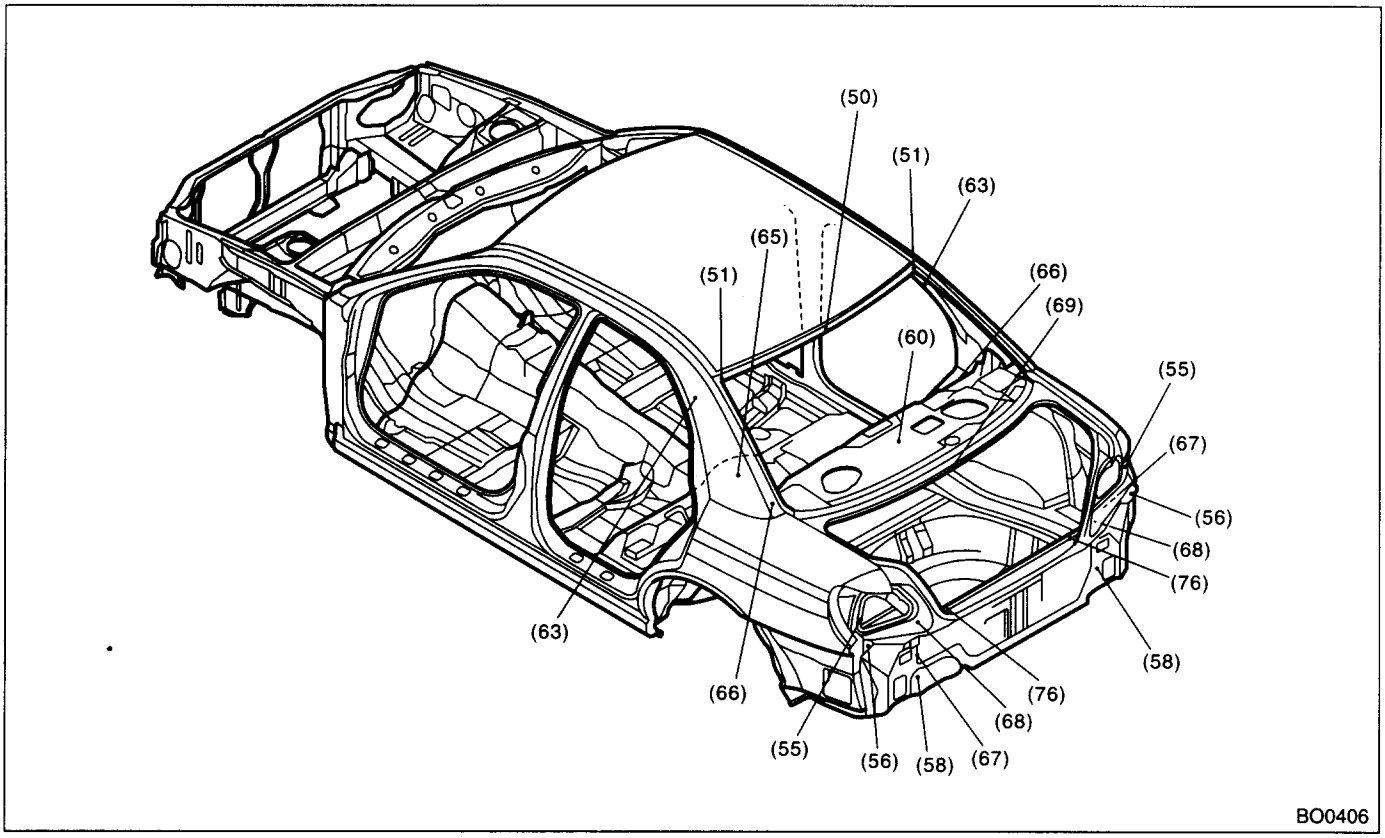
(65) Floor mat clip attaching hole 8 mm (0.31 in) dia.

(67) Gusset floor rear side gauge hole 11.5 mm (0.453 in) dia. (Symmetrical)

(72) Trim upper clip attaching hole 8.5 mm (0.335 in) dia. (Symmetrical)

(77) Harness clip attaching hole 7 mm (0.28 in) dia. (Symmetrical)

3. SEDAN (REAR SECTION)



(50) Repair locator hollow (Vehicle center)

(51) Glass attaching hole Right 6.5 mm (0.256 in) dia. Left 6.5 × 10 mm (0.256 × 0.39 in) dia.

(55) Rear combination light mounting hole 8 mm (0.31 in) dia. (Symmetrical)

(56) Bumper attaching hole 7 mm (0.28 in) dia. (Symmetrical)

(58) Rear bumper attaching hole 11 mm (0.43 in) dia. (Symmetrical)

(60) Choke coil harness attaching hole 5.4 mm (0.213 in) dia.

(63) Feeder line fixing hole 7 mm (0.28 in). (Symmetrical)

(65) Floor mat clip attaching hole 8 mm (0.31 in) dia.

(66) Bulkhead rear gauge hole 10 mm (0.39 in) dia. (Symmetrical)

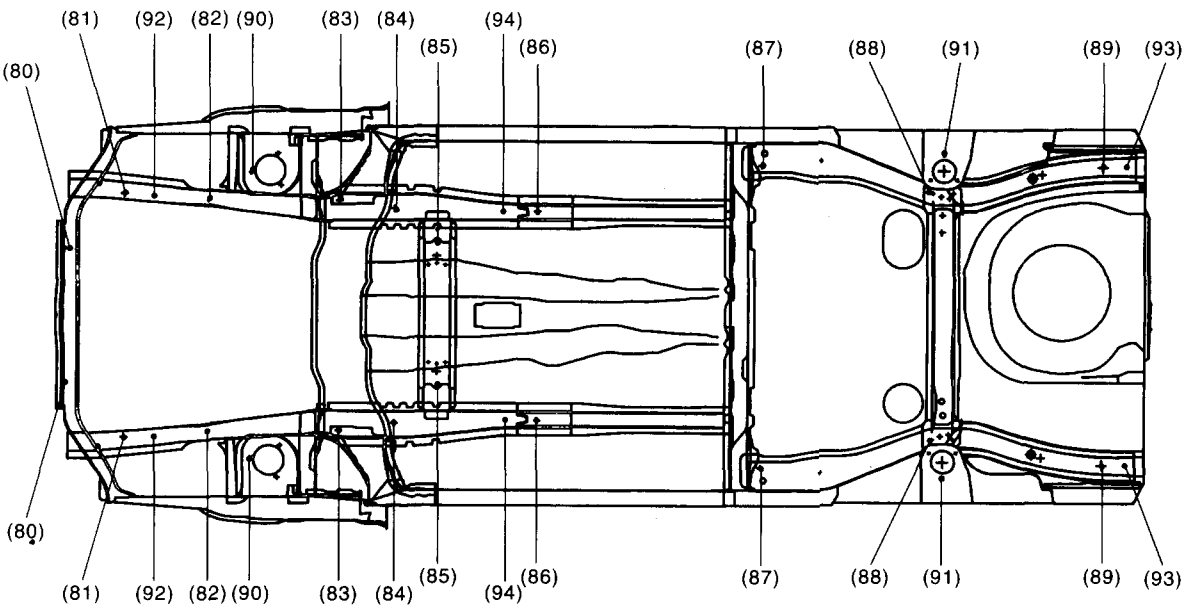
(67) Gusset floor rear side gauge hole 11.5 mm (0.453 in) dia. (Symmetrical)

(68) Rear skirt inner side gauge hole 10 mm (0.39 in) dia. (Symmetrical)

(69) Rear panel (reinforcement) repair locator hollow (Vehicle center)

(76) Press location hole 15 mm (0.59 in) dia. (Symmetrical)

4. UNDERBODY SECTION



(80) Radiator lower frame gauge hole 12 mm (0.47 in) dia. (Symmetrical)

(81) Side frame gauge hole 20 mm (0.79 in) dia. (Symmetrical)

(82) Front crossmember (Ft) attaching hole 12.4 mm (0.488 in) dia. (Symmetrical)

(83) Suspension attaching hole 17 mm (0.67 in) dia. (Symmetrical)

(84) Side frame gauge hole 20 mm (0.79 in) dia. (Symmetrical)

(85) Transmission mount attaching hole 14 mm (0.55 in) dia.

(86) Side frame gauge hole 18 mm (0.71 in) dia. (Symmetrical)

(87) Rear differential attaching hole 16 mm (0.63 in) dia. (Symmetrical)

(88) Rear suspension attaching hole 16 mm (0.63 in) dia. (Symmetrical)

(89) Rear side frame gauge hole 15 mm (0.59 in) dia. (Symmetrical)

(90) Strut mount attaching hole 9.5 mm (0.374 in) dia. (Symmetrical)

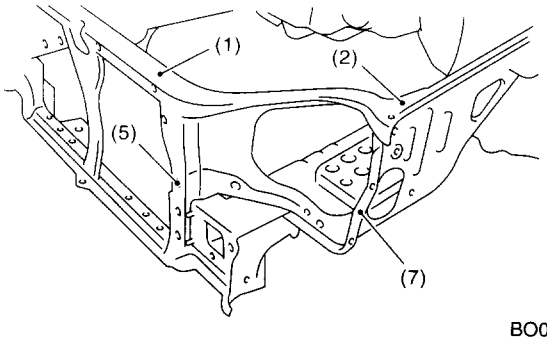
(91) Strut mount attaching hole 10 mm (0.39 in) dia. (Symmetrical)

(92) Sub frame attaching hole 16 mm (0.63 in) dia. (Symmetrical)

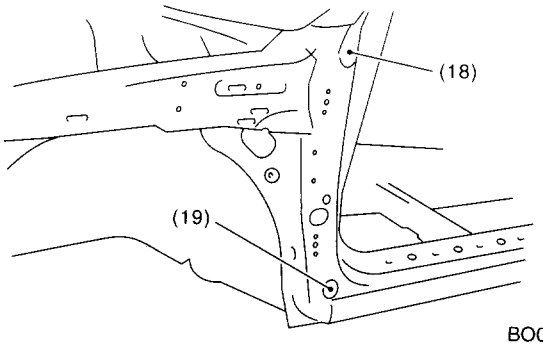
(93) Bumper beam attaching hole Right 15 mm (0.59 in) dia. Left 19 x 15 mm (0.75 x 0.59 in) dia.

(94) Side frame gauge hole 15 mm (0.59 in) dia. (Symmetrical)

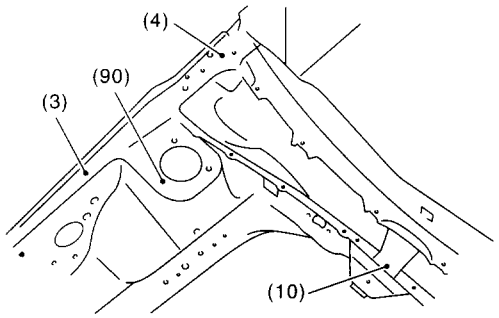
DATUM POINTS



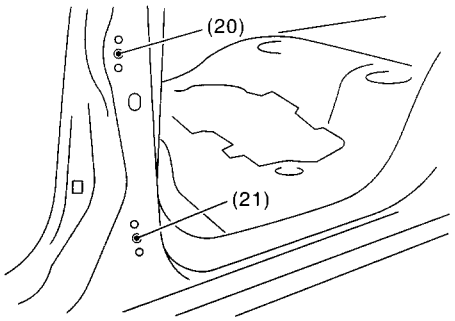
BO0408



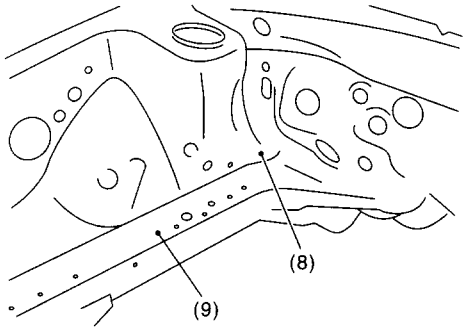
BO0413



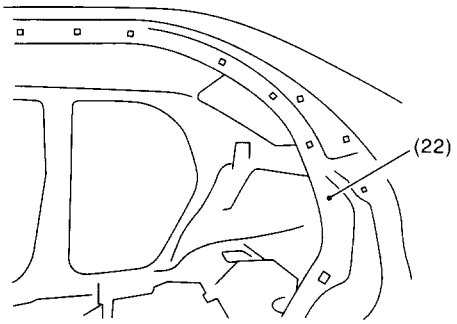
BO0409



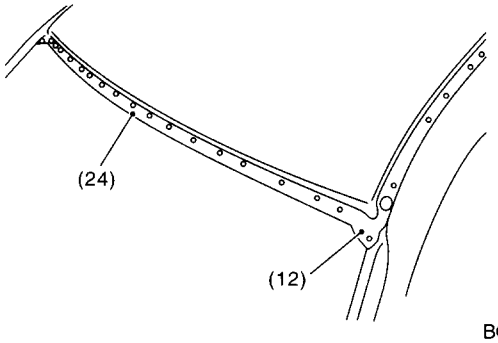
BO0414



BO0410

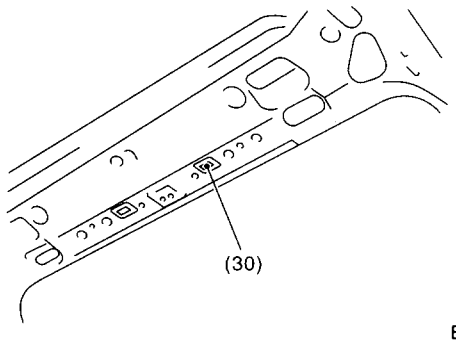


BO0415



BO0411

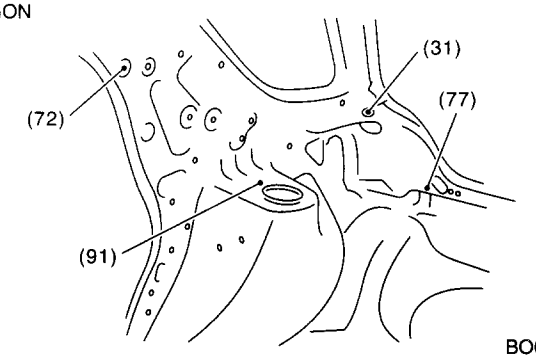
WAGON



BO0417

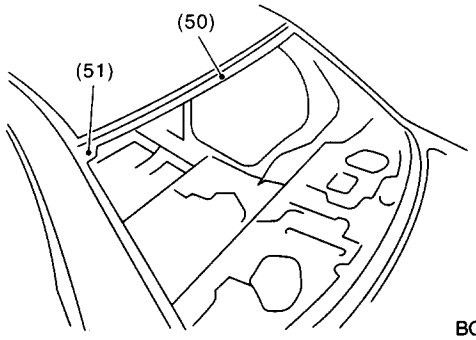
DATUM POINTS

WAGON



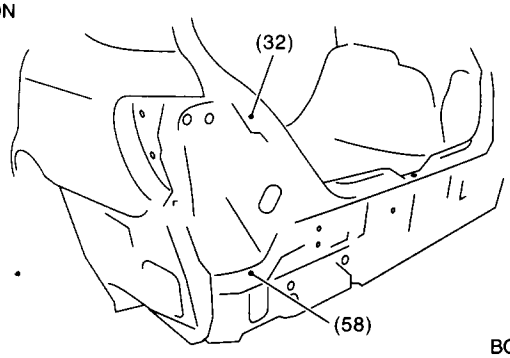
BO0418

SEDAN



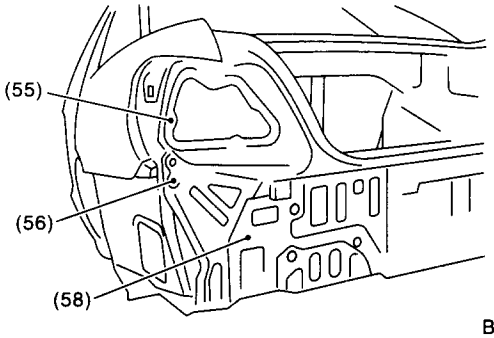
BO0422

WAGON



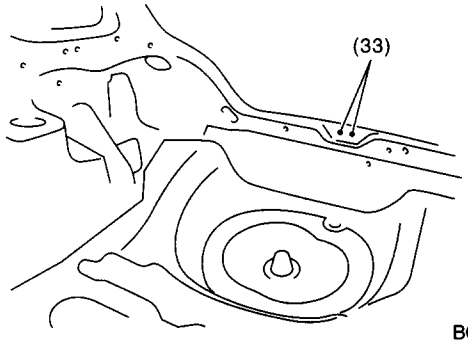
BO0419

SEDAN



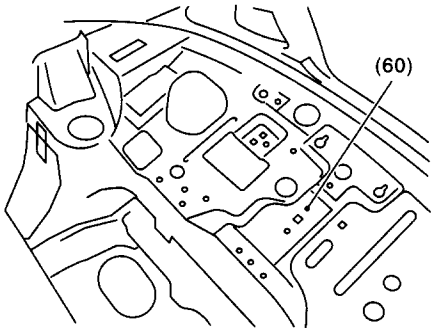
BO0424

WAGON



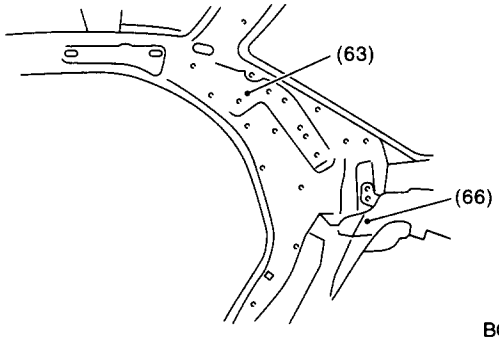
BO0420

SEDAN

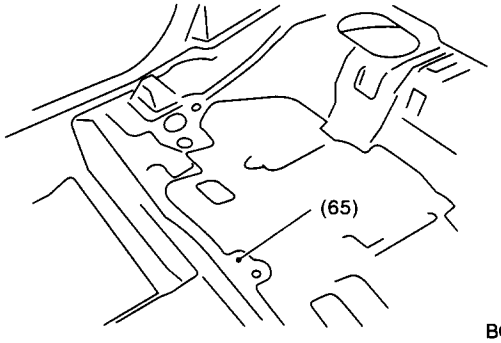


BO0425

SEDAN

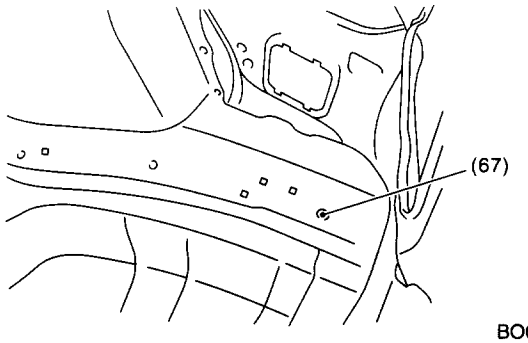


BO0421

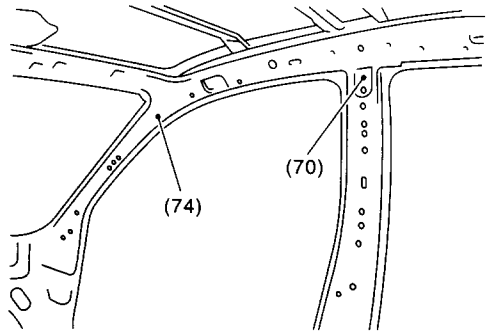


BO0426

DATUM POINTS

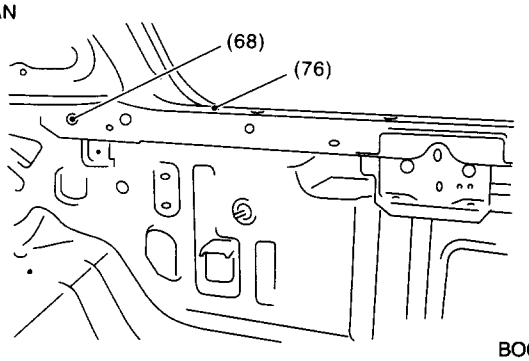


BO0427

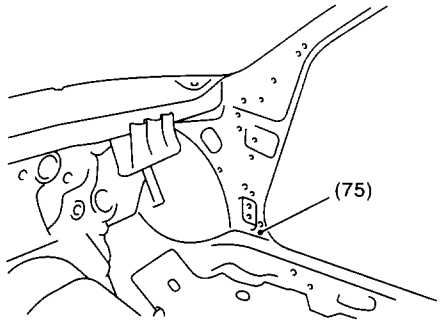


BO0431

SEDAN

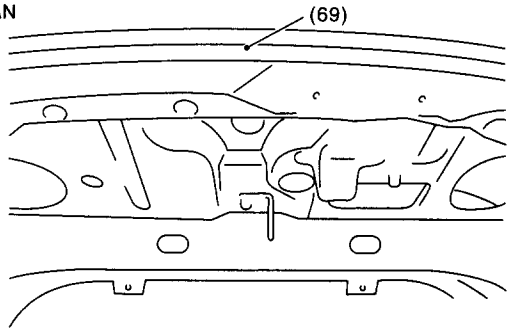


BO0428

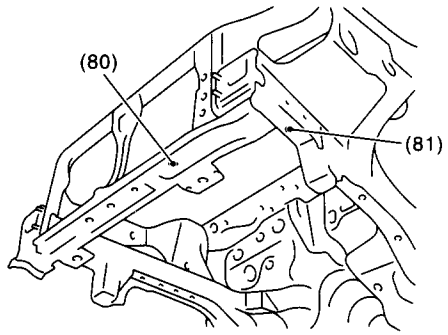


BO0432

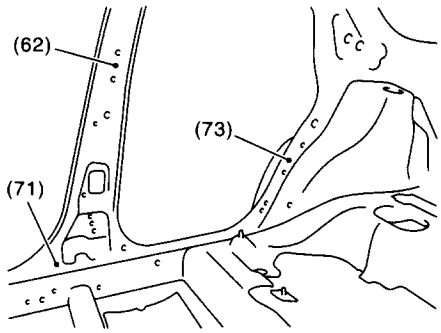
SEDAN



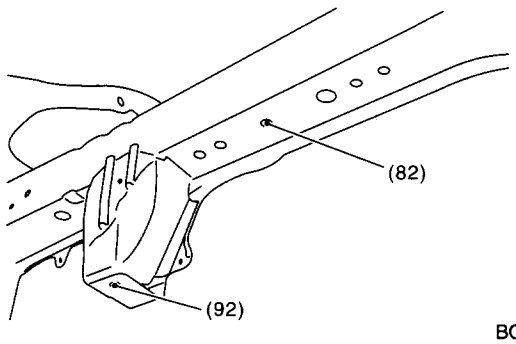
BO0429



BO0433

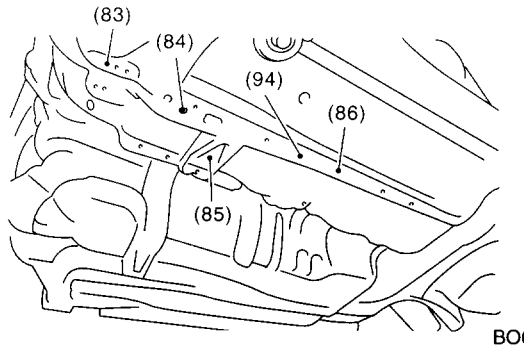


BO0430

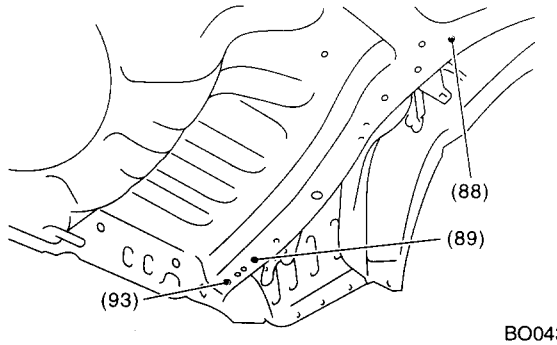


BO0434

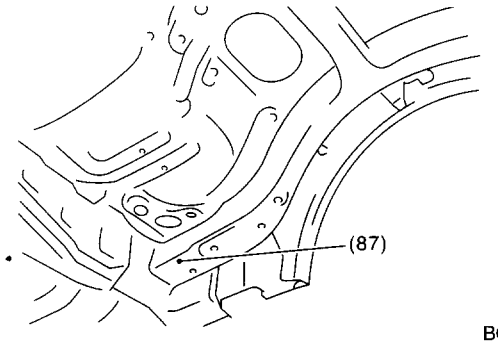
DATUM POINTS



BO0435



BO0437



BO0436

SUBARU

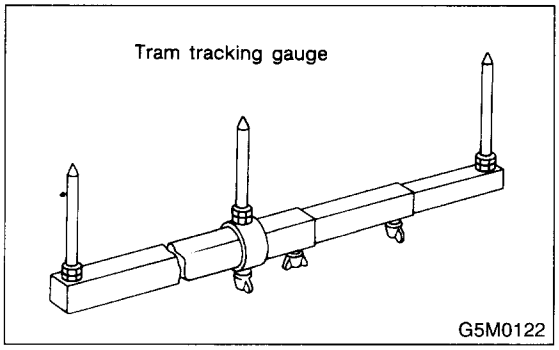
3. Datum Dimensions

A: MEASUREMENT

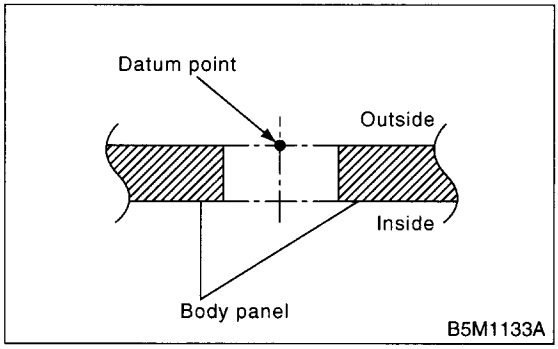
Refer to LOCATION for details on measurement points. <Ref. to BS-3, LOCATION, Datum Points.>

NOTE:

- Using a tram tracking gauge, measure all the dimensions.
- When using a tape measure, carefully measure dimensions without letting the tape measure sag or twist.
- Measure the linear dimensions between cores of holes.
- Suffixes "RH" and "LH" indicate right-hand and left-hand.

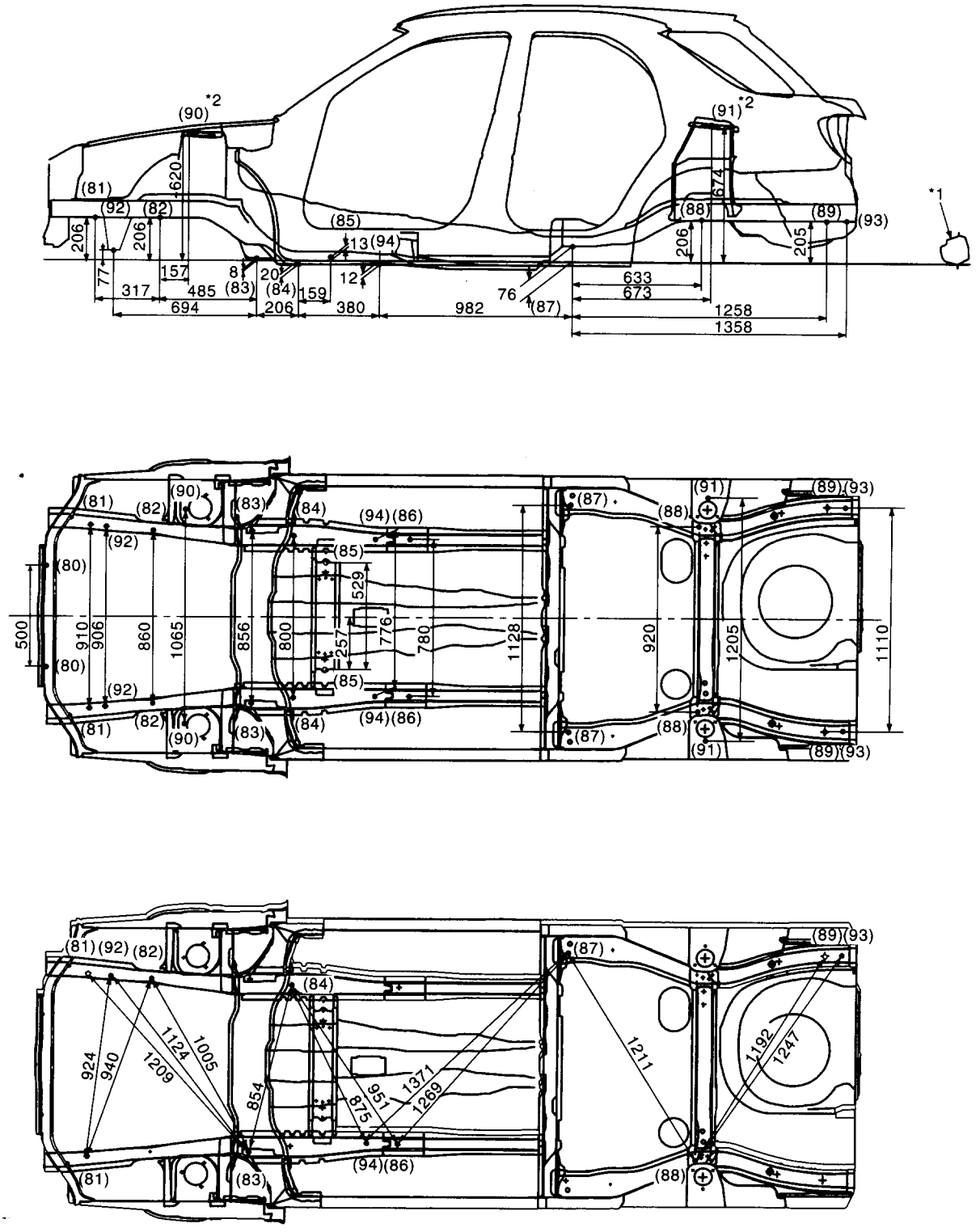


- Measure at the center of the circle around the outside of the body panel.



DATUM DIMENSIONS

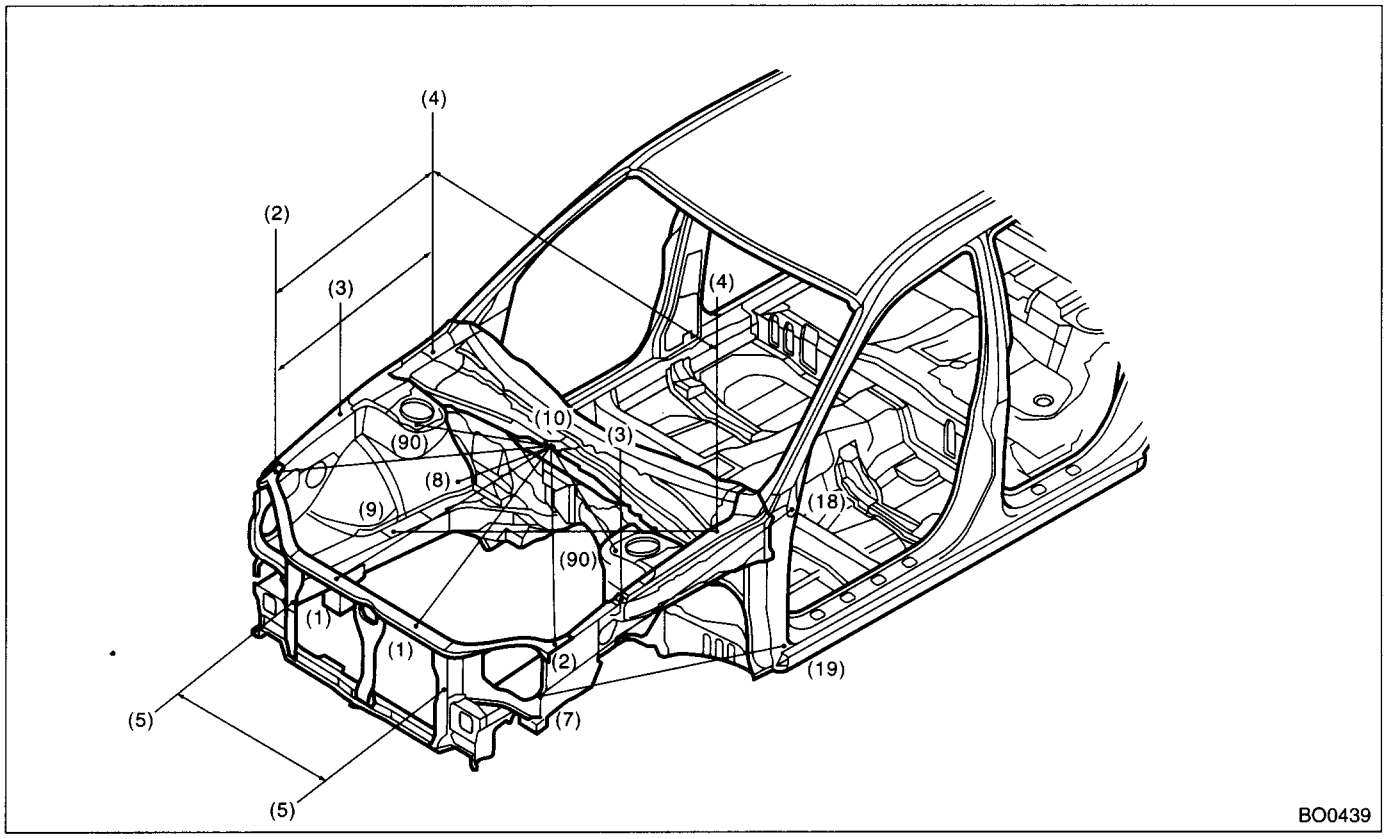
1. CENTER STRUCTURE



*1: Side sill
*2: Upper surface

BO0438

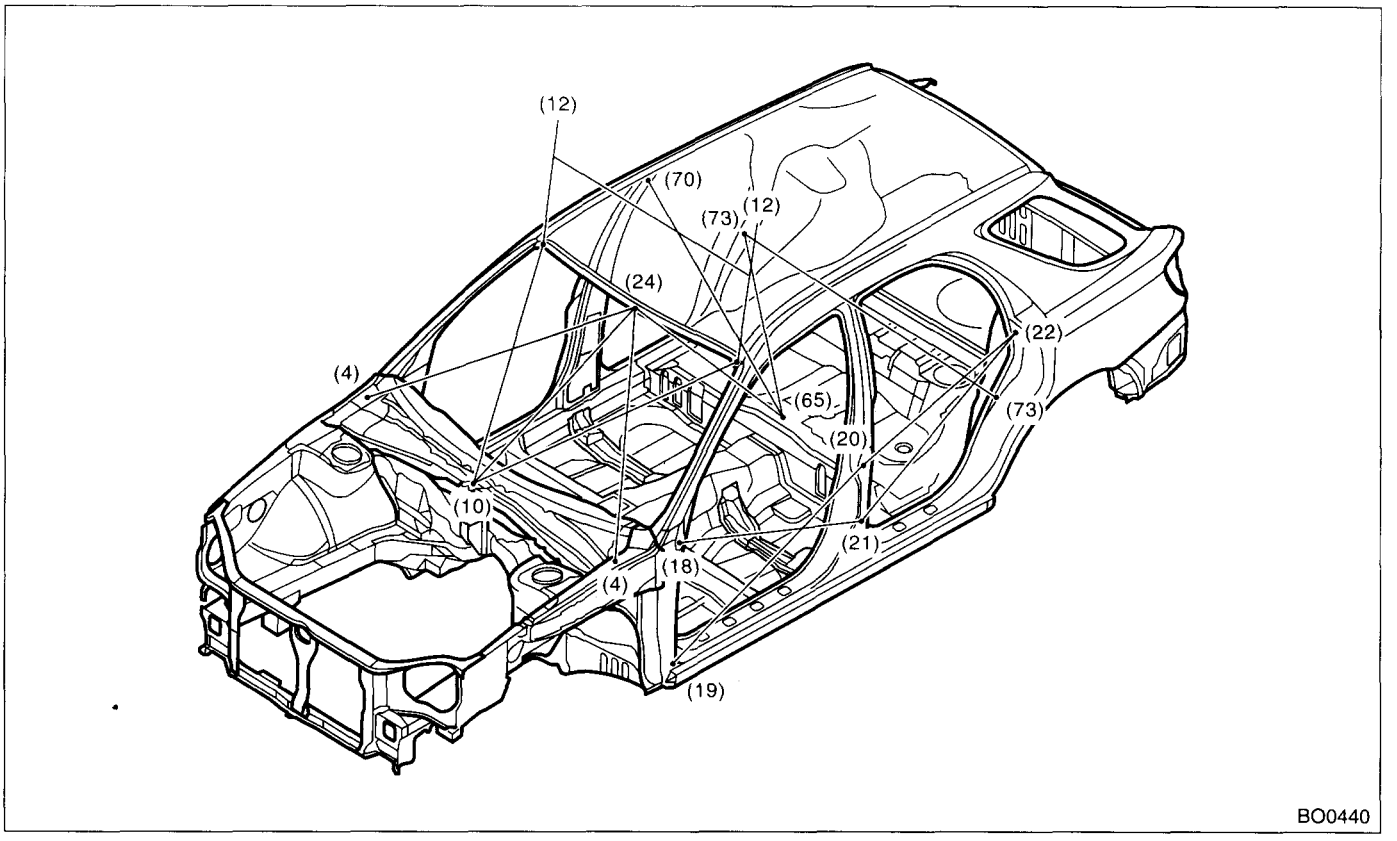
2. WAGON/SEDAN (FRONT STRUCTURE)



Unit: mm (in)

Point to point	Dimension	Point to point	Dimension
(10) to (1) RH	912 (35.91)	(2) RH to (2) LH	1,341 (52.80)
(10) to (1) LH	912 (35.91)	(5) RH to (5) LH	720 (28.35)
(10) to (90) RH	566 (22.28)	(7) RH to (18) RH	1,138 (44.80)
(10) to (90) LH	566 (22.28)	(7) LH to (18) LH	1,138 (44.80)
(10) to (8) RH	581 (22.87)	(7) RH to (19) RH	1,116 (43.94)
(10) to (8) LH	581 (22.87)	(7) LH to (19) LH	1,116 (43.94)
(10) to (2) RH	947 (37.28)	(4) RH to (2) LH	1,583 (62.32)
(10) to (2) LH	947 (37.28)	(4) LH to (2) RH	1,583 (62.32)
(4) RH to (2) RH	778 (30.63)	(3) RH to (3) LH	1,396 (54.96)
(4) LH to (2) LH	778 (30.63)	(3) RH to (4) LH	1,470 (57.87)
(4) RH to (3) RH	430 (16.93)	(3) LH to (4) RH	1,470 (57.87)
(4) LH to (3) LH	430 (16.93)	(2) RH to (3) LH	1,412 (55.59)
(90) RH to (90) LH	1,065 (41.93)	(2) LH to (3) RH	1,412 (55.59)
(8) RH to (8) LH	894 (35.20)	(9) RH to (9) LH	860 (33.86)
(8) RH to (4) LH	1,210 (47.64)	(9) RH to (8) LH	931 (36.65)
(8) LH to (4) RH	1,210 (47.64)	(9) LH to (8) RH	931 (36.65)
(3) RH to (2) RH	349 (13.74)	(9) RH to (4) LH	1,280 (50.39)
(3) LH to (2) LH	349 (13.74)	(9) LH to (4) RH	1,280 (50.39)
(4) RH to (4) LH	1,417 (55.79)	—	—

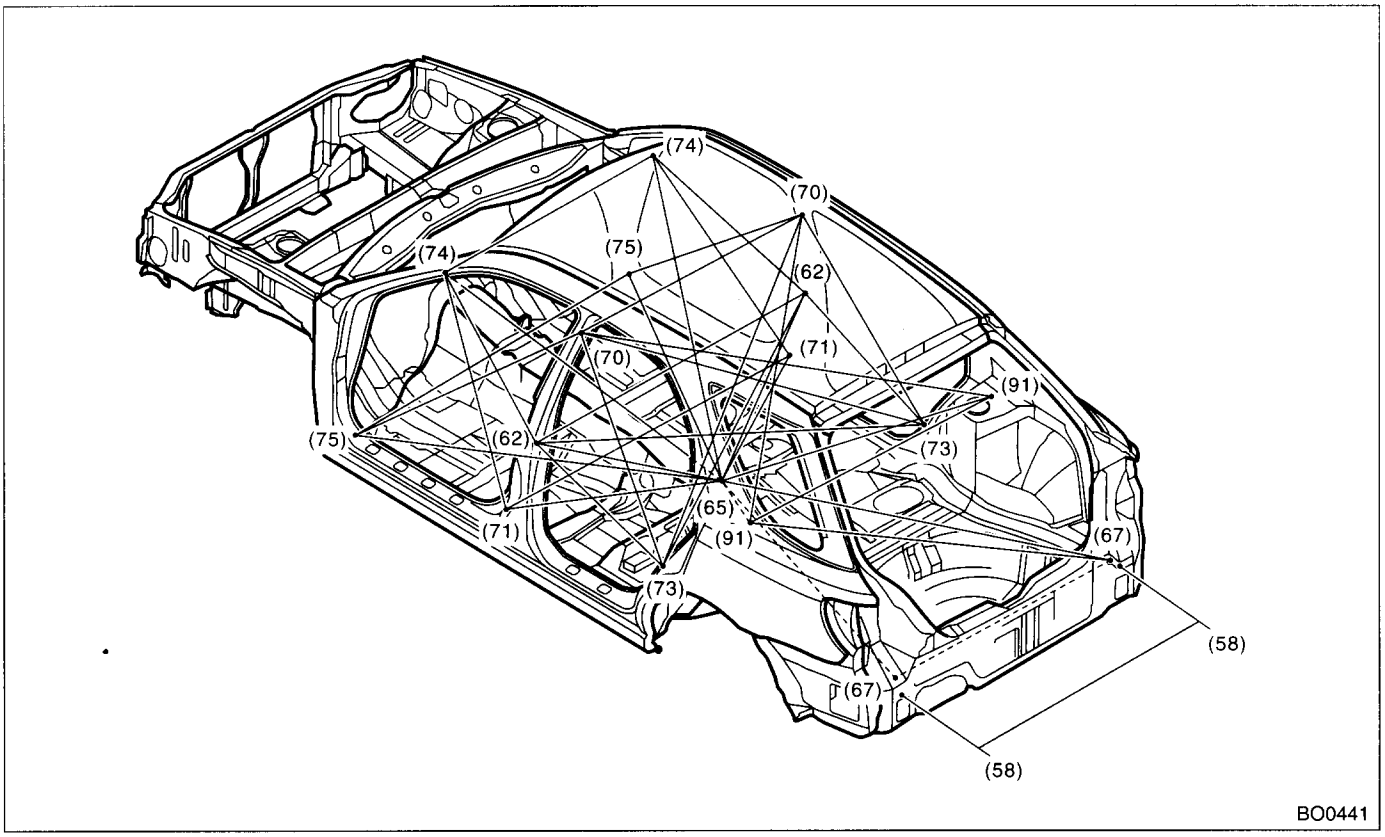
DATUM DIMENSIONS



Unit: mm (in)

Point to point	Dimension	Point to point	Dimension
(4) RH to (24)	1,127 (44.37) Wagon	(19) LH to (20) LH	1,089 (42.87)
(4) LH to (24)	1,110 (43.70) Sedan	(20) RH to (22) RH	869 (34.21)
(10) to (24)	957 (37.68) Wagon	(20) LH to (22) LH	869 (34.21)
(10) to (24)	935 (36.81) Sedan	(21) RH to (22) RH	985 (38.78)
(10) to (12) RH	1,122 (44.17) Wagon	(21) LH to (22) LH	985 (38.78)
(10) to (12) RH	1,106 (43.54) Sedan	(24) to (65)	1,232 (48.50) Wagon
(10) to (12) LH	1,122 (44.17) Wagon	(24) to (65)	1,237 (48.70) Sedan
(10) to (12) LH	1,106 (43.17) Sedan	(65) to (70) RH	1,067 (42.01)
(12) RH to (12) LH	1,029 (40.51) Wagon	(65) to (70) LH	1,067 (42.01)
(12) RH to (12) LH	1,042 (41.02) Sedan	(65) to (73) RH	830 (32.68)
(18) RH to (21) RH	1,049 (41.30)	(65) to (73) LH	830 (32.68)
(18) LH to (21) LH	1,049 (41.30)	(73) RH to (73) LH	1,394 (54.88)
(19) RH to (20) RH	1,089 (42.87)	—	—

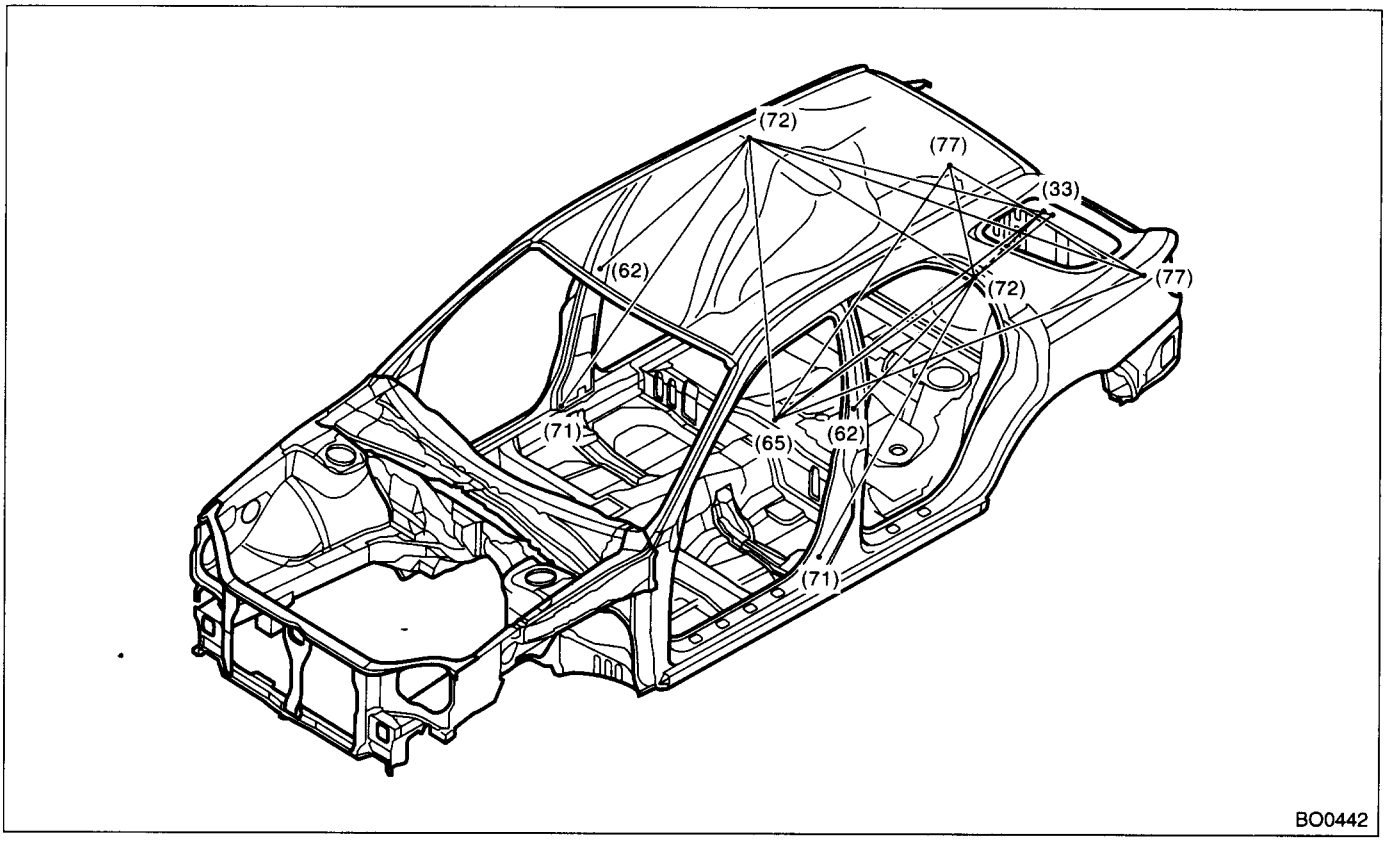
3. WAGON/SEDAN (REAR STRUCTURE)



Unit: mm (in)

Point to point	Dimension	Point to point	Dimension
(58) RH to (58) LH	1,128 (44.41)	(67) RH to (67) LH	1,110 (43.70)
(62) RH to (62) LH	1,332 (52.44)	(67) RH to (91) LH	1,381 (54.37)
(62) RH to (65)	915 (36.02)	(67) LH to (91) RH	1,381 (54.37)
(62) LH to (65)	915 (36.02)	(70) RH to (70) LH	1,060 (41.73)
(62) RH to (73) RH	762 (30.00)	(70) RH to (73) RH	948 (37.32)
(62) LH to (73) LH	762 (30.00)	(70) LH to (73) LH	948 (37.32)
(62) RH to (73) LH	1,561 (61.46)	(70) RH to (73) LH	1,542 (60.71)
(62) LH to (73) RH	1,561 (61.46)	(70) LH to (73) RH	1,542 (60.71)
(62) RH to (74) RH	592 (23.31) Wagon	(70) RH to (75) RH	1,443 (56.81)
(62) LH to (74) LH	603 (23.74) Sedan	(70) LH to (75) LH	1,443 (56.81)
(65) to (67) RH	1,501 (59.09)	(70) RH to (91) LH	1,532 (60.32)
(65) to (67) LH	1,501 (59.09)	(70) LH to (91) RH	1,532 (60.32)
(65) to (71) RH	823 (32.40)	(71) RH to (71) LH	1,361 (53.58)
(65) to (71) LH	823 (32.40)	(71) RH to (74) RH	954 (37.56) Wagon
(65) to (74) RH	1,275 (50.20) Wagon	(71) LH to (74) LH	949 (37.36) Sedan
(65) to (74) LH	1,282 (50.47) Sedan	(74) RH to (74) LH	1,135 (44.69) Wagon
(65) to (75) RH	1,450 (57.09)	(74) RH to (74) LH	1,147 (45.16) Sedan
(65) to (75) LH	1,450 (57.09)	(75) RH to (75) LH	1,399 (55.08)
(65) to (91) RH	1,064 (41.89)	(91) RH to (91) LH	1,205 (47.44)
(65) to (91) LH	1,064 (41.89)	—	—

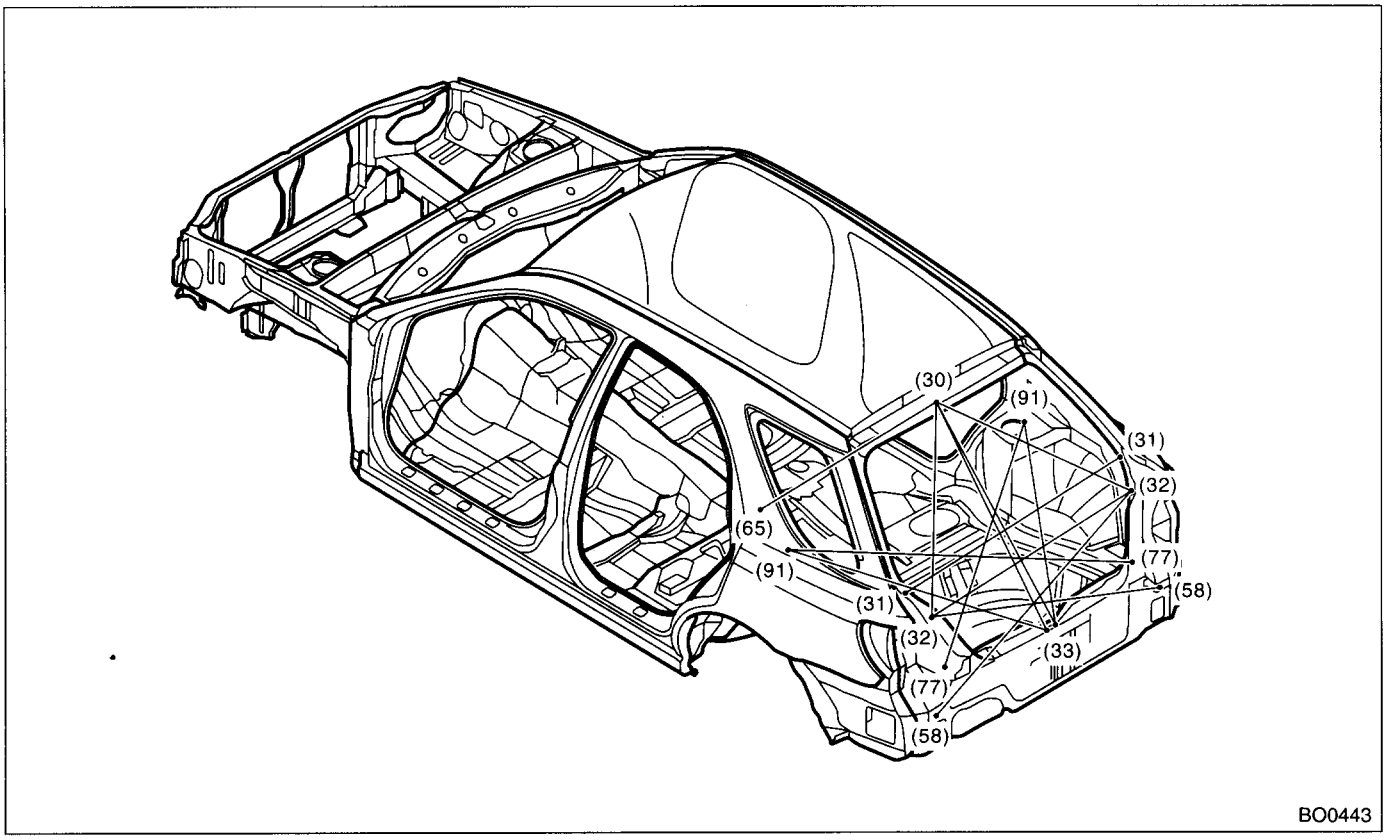
4. WAGON (FRONT STRUCTURE)



Unit: mm (in)

Point to point	Dimension	Point to point	Dimension
(33) RH to (65)	1,534 (60.39)	(65) to (77) RH	1,538 (60.55)
(33) LH to (65)	1,534 (60.39)	(65) to (77) LH	1,538 (60.55)
(33) RH to (72) LH	1,344 (52.91)	(71) RH to (72) RH	1,223 (48.15)
(33) LH to (72) RH	1,344 (52.91)	(71) LH to (72) LH	1,223 (48.15)
(62) RH to (72) RH	732 (28.82)	(72) RH to (72) LH	1,226 (48.27)
(62) LH to (72) LH	732 (28.82)	(72) RH to (77) LH	1,544 (60.79)
(65) to (72) RH	1,076 (42.36)	(72) LH to (77) RH	1,544 (60.79)
(65) to (72) LH	1,076 (42.36)	(77) RH to (77) LH	898 (35.35)

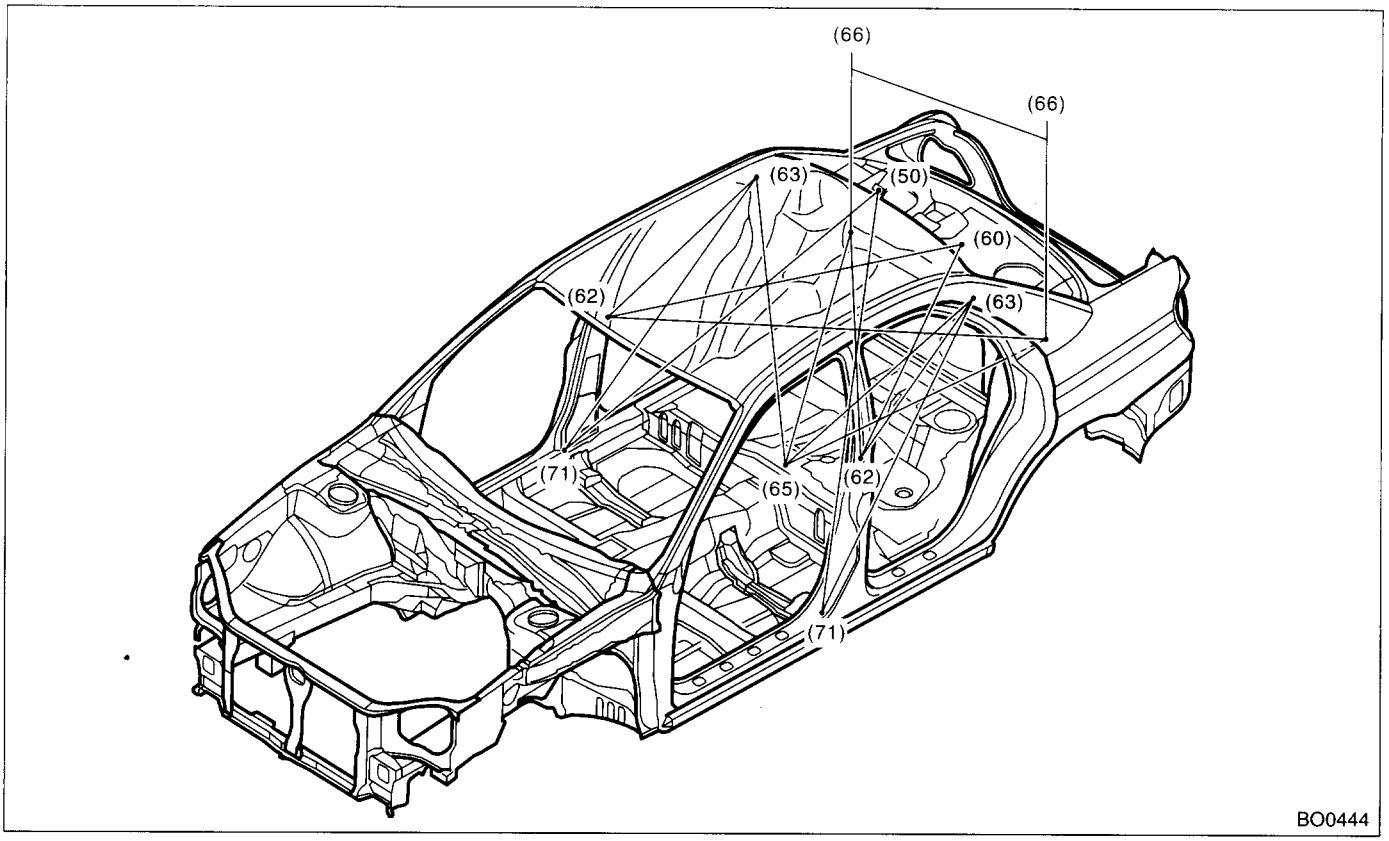
5. WAGON (REAR STRUCTURE)



Unit: mm (in)

Point to point	Dimension	Point to point	Dimension
(30) to (32) RH	850 (33.46)	(32) RH to (58) LH	1,139 (44.84)
(30) to (32) LH	850 (33.46)	(32) LH to (58) RH	1,139 (44.84)
(30) to (33) RH	904 (35.59)	(33) RH to (91) LH	993 (39.09)
(30) to (33) LH	904 (35.59)	(33) LH to (91) LH	993 (39.09)
(30) to (65)	1,292 (50.87)	(77) RH to (91) LH	1,289 (50.75)
(31) RH to (31) LH	1,212 (47.72)	(77) LH to (91) RH	1,289 (50.75)
(32) RH to (32) LH	1,038 (40.87)	—	—

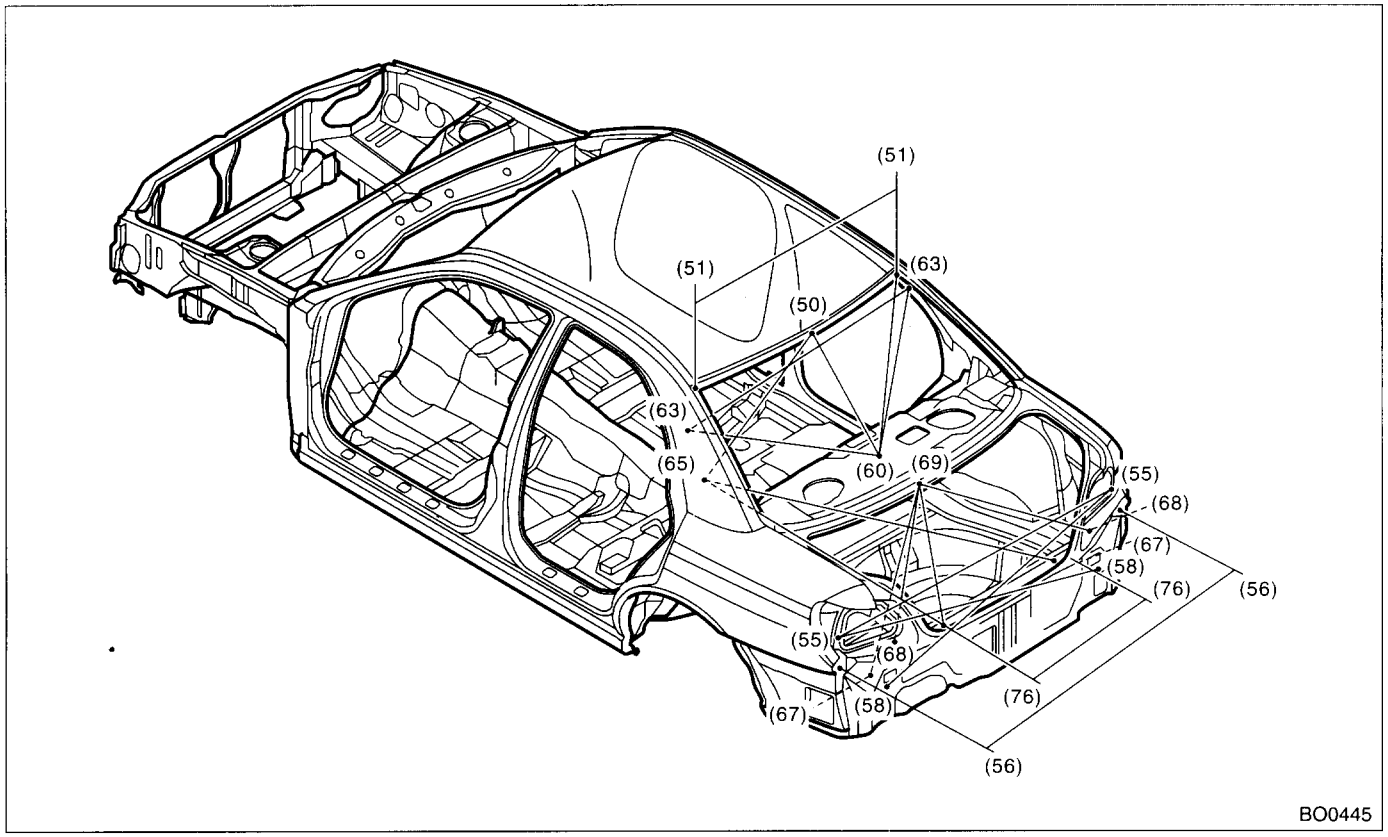
6. SEDAN (FRONT STRUCTURE)



Unit: mm (in)

Point to point	Dimension	Point to point	Dimension
(50) to (71) RH	1,562 (61.50)	(63) RH to (65)	1,118 (44.02)
(50) to (71) LH	1,562 (61.50)	(63) LH to (65)	1,118 (44.02)
(60) to (62) RH	1,338 (52.68)	(63) RH to (71) RH	1,283 (50.51)
(60) to (62) LH	1,338 (52.68)	(63) LH to (71) LH	1,283 (50.51)
(62) RH to (63) RH	773 (30.43)	(65) to (66) RH	956 (37.64)
(62) LH to (63) LH	773 (30.43)	(65) to (66) LH	956 (37.64)
(62) RH to (66) LH	1,449 (57.05)	(66) RH to (66) LH	840 (33.07)
(62) LH to (66) RH	1,449 (57.05)	—	—

7. SEDAN (REAR STRUCTURE)



Unit: mm (in)

Point to point	Dimension	Point to point	Dimension
(50) to (60)	501 (19.72)	(65) to (76) LH	1,544 (60.79)
(50) to (65)	1,082 (42.60)	(65) to (68) RH	1,581 (62.24)
(51) RH to (51) LH	1,025 (40.35)	(65) to (68) LH	1,581 (62.24)
(51) RH to (60)	734 (28.90)	(67) RH to (69)	784 (30.87)
(55) RH to (55) LH	1,406 (55.35)	(67) LH to (69)	784 (30.87)
(55) RH to (58) LH	1,297 (51.06)	(68) RH to (68) LH	1,020 (40.16)
(55) LH to (58) RH	1,297 (51.06)	(68) RH to (69)	681 (26.81)
(56) RH to (56) LH	1,426 (56.14)	(68) LH to (69)	681 (26.81)
(60) to (63) RH	764 (30.08)	(69) to (76) RH	537 (21.14)
(60) to (63) LH	764 (30.08)	(69) to (76) LH	537 (21.14)
(63) RH to (63) LH	1,183 (46.57)	(76) RH to (76) LH	600 (23.62)
(65) to (76) RH	1,544 (60.79)	—	—

INSTRUMENTATION/DRIVER INFO

IDI

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1. General Description

A: SPECIFICATIONS

Combination meter	Speedometer	Electric pulse type
	Temperature gauge	Thermistor cross coil type
	Fuel gauge	Resistance cross coil type
	Tachometer	Electric impulse type
	Turn signal indicator light	14 V — 1.4 W
	Charge indicator light	LED
	Oil pressure indicator light	LED
	ABS warning light	LED
	CHECK ENGINE warning light (Malfunction indicator light)	LED
	HI-beam indicator light	14 V — 1.4 W
	Door open warning light	LED
	Seat belt warning light	LED
	Brake fluid and parking brake warning light	LED
	FWD indicator light	LED
	AIRBAG warning light	LED
	Meter illumination light	14 V — 3 W, 14 V — 2 W
	AT OIL TEMP. warning light	LED
	Security indicator light	LED
	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 the meters and instrument panel.
- Be careful not to damage the meter glasses.
- Make sure the 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 circuit plate.
- 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-56, SCHEMATIC, Combination Meter.>

2. OUTSIDE TEMPERATURE INDICATOR

<Ref. to WI-107, SCHEMATIC, Outside Temperature Display System.>

B: INSPECTION

CAUTION:
When measuring the voltage and resistance of the ECM, TCM, or each sensor, use a tapered pin with a diameter of less the an 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: <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-7, 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-8, 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-9, 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-10, CHECK OUTSIDE TEMPERATURE INDICATOR, INSPECTION, Combination Meter System.>

2. CHECK POWER SUPPLY AND GROUND CIRCUIT

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY FOR COMBINATION METER.** 1)Remove the combination meter. <Ref. to IDI-11, REMOVAL, Combination Meter Assembly.> 2)Disconnect the combination meter harness connector. 3)Turn the ignition switch to ON. 4)Measure the voltage between the combination meter connector (i10) and chassis ground. ***Connector & terminal*** ***(i10) No. 7 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open or short between the ignition switch and combination meter.
2	**CHECK POWER SUPPLY FOR COMBINATION METER.** Measure the voltage between the combination meter connector (i10) and chassis ground. ***Connector & terminal*** ***(i10) No. 10 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Check the harness for open or short between the 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 the combination meter connector (i10) and chassis ground. ***Connector & terminal*** ***(i10) No. 6 — Chassis ground:***	Is the resistance less than 10 Ω?	Replace the combination meter printed circuit.	Repair the wiring harness.

3. CHECK VEHICLE SPEED SENSOR

	Step	Check	Yes	No
1	**CHECK VEHICLE SPEED SENSOR.** 1)Set the vehicle on a free roller, or 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 the combination meter connector (i10) and chassis ground. ***Connector & terminal*** ***(i10) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 1V ←→ more than 4 V?	Check the speedometer. <Ref. to IDI-13, 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 the vehicle speed sensor connector (B17) and engine ground. ***Connector & terminal*** ***(B17) No. 3 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Check the harness for open or short between the 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 the vehicle speed sensor connector (B17) and engine ground. ***Connector & terminal*** ***(B17) No. 2 — Engine ground:***	Is the resistance less than 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 the combination meter. 2)Measure the resistance between the vehicle speed sensor harness connector and combination meter harness connector. ***Connector & terminal*** ***(B17) No. 1 — (i10) No. 2:***	Is the resistance less than 10 Ω?	Replace the vehicle speed sensor.	Repair the wiring harness.

4. CHECK TRANSMISSION CONTROL MODULE

	Step	Check	Yes	No
1	**CHECK TRANSMISSION CONTROL MODULE SIGNAL.** 1)Set the vehicle on a free roller, or 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 the transmission control module connector (B56: turbo model) or (B55: non-turbo model) and chassis ground. ***Connector & terminal*** ***Turbo model:*** ***(B56) No. 17 (+) — Chassis ground (–):*** ***Non-turbo model:*** ***(B55) No. 13 (+) — Chassis ground (–):***	Is the voltage less than 1 V ←→ more than 4 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 the transmission control module and combination meter. 3)Measure the resistance between the transmission control module harness connector (B56: turbo model) or (B55: non-turbo model) and combination meter harness connector (i10). ***Connector & terminal*** ***Turbo model:*** ***(B56) No. 17 — (i10) No. 2:*** ***Non-turbo model:*** ***(B55) No. 13 — (i10) No. 2:***	Is the resistance less than 10 Ω?	Check the speedometer. <Ref. to IDI-13, REMOVAL, Speedometer.>	Repair the wiring harness.

5. CHECK ENGINE CONTROL MODULE

	Step	Check	Yes	No
1	**CHECK ENGINE CONTROL MODULE SIGNAL.** 1)Start the engine. 2)Measure the voltage between the engine control module connector (B136: turbo model) or (B134: non-turbo model) and engine ground. ***Connector & terminal*** ***Turbo model:*** ***(B136) No. 9 (+) — Engine ground (–):*** ***Non-turbo model:*** ***(B134) No. 30 (+) — Engine ground (–):***	Is the voltage 0 ←→ 13 V or more?	Go to step **2.**	Check the engine control module. <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(DOHC TURBO)-2, Basic Diagnostic Procedure.>

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN COMBINATION METER AND ENGINE CONTROL MOD-**	Is the resistance less than 10 Ω?	Check the tachometer. <Ref. to IDI-14, REMOVAL, Tachometer.>	Repair the wiring harness.

	Step	Check	Yes	No
	CHECK FUEL LEVEL SENSOR. 1)Remove the fuel level sensor. <Ref. to FU(SOHC)-62, REMOVAL, Fuel Level Sensor.> or <Ref. to FU(DOHC TURBO)-62, REMOVAL, Fuel Level Sensor.> 2)Measure the resistance between the fuel level sensor terminals when setting the float to FULL and EMPTY position. ***Terminals*** ***No. 2 — No. 3:***	Is the resistance 0.5 to 2.5 Ω (FULL) and 50 to 52 Ω (EMPTY)?	Go to step **2.**	Replace the fuel level sensor.
1	**CHECK FUEL SUB LEVEL SENSOR.** 1)Remove the fuel sub level sensor. <Ref. to FU(SOHC)-63, REMOVAL, Fuel Sub Level Sensor.> or <Ref. to FU(DOHC TURBO)-63, REMOVAL, Fuel Sub Level Sensor.> 2)Measure the resistance between the fuel sub level sensor terminals when setting the float to FULL and EMPTY position. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 0.5 to 2.5 Ω (FULL) and 42 to 44 Ω (EMPTY)?	Go to step **3.**	Replace the fuel sub level sensor.
1	**CHECK HARNESS BETWEEN FUEL SUB LEVEL SENSOR AND COMBINATION METER.** 1)Disconnect the connector from the combination meter. 2)Measure the resistance between the fuel sub level sensor harness connector terminal and combination meter harness connector terminal. ***Connector & terminal*** ***(R59) No. 1 — (i12) No. 2:***	Is the resistance less than 10 Ω?	Go to step **4.**	Repair the wiring harness.
1	**CHECK HARNESS BETWEEN FUEL LEVEL SENSOR AND FUEL SUB LEVEL SENSOR.** Measure the resistance between the fuel level sensor harness connector terminal and fuel sub level sensor harness connector terminal. ***Connector & terminal*** ***(R58) No. 3 — (R59) No.2:***	Is the resistance less than 10 Ω?	Go to step **5.**	Repair the wiring harness.

	Step	Check	Yes	No
5	**CHECK FUEL LEVEL SENSOR GROUND CIRCUIT.** Measure the resistance between the fuel level sensor harness connector terminal and chassis ground. ***Connector & terminal*** ***(R58) No. 2 — Chassis ground:***	Is the resistance less than 10 Ω?	Check the fuel gauge. <Ref. to IDI-15, REMOVAL, Fuel Gauge.>	Repair the wiring harness.

7. CHECK ENGINE COOLANT TEMPERATURE SENSOR

	Step	Check	Yes	No
1	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** Check the engine coolant temperature sensor. <Ref. to EN(SOHC)-120, DTC P0117 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or <Ref. to EN(DOHC TURBO)-126, DTC P0117 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is the engine coolant temperature sensor 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 the engine coolant temperature sensor and combination meter. 3)Measure the resistance between the engine coolant temperature sensor harness connector (E8) and combination meter harness connector (i12). ***Connector & terminal*** ***(E8) No. 3 — (i12) No. 9:***	Is the resistance less than 10 Ω?	Check the water temperature gauge. <Ref. to IDI-16, REMOVAL, Water Temperature Gauge.>	Repair the wiring harness.

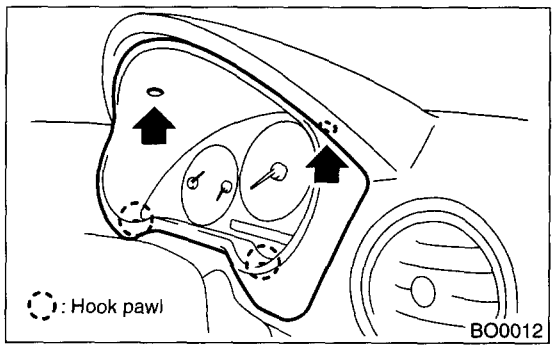
8. CHECK OUTSIDE TEMPERATURE INDICATOR

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY FOR AMBIENT SENSOR.** 1)Turn the ignition switch OFF. 2)Disconnect the connector from the combination meter. 3)Turn the ignition switch ON. 4)Measure the voltage between the combination meter terminal and chassis ground. ***Connector & terminal*** ***(i11) No. 11 (+) — Chassis ground (–):***	Is the voltage more than 4V?	Go to step **2.**	Replace the combination meter printed circuit.
2	**CHECK HARNESS BETWEEN AMBIENT SENSOR AND COMBINATION METER.** 1)Turn the ignition switch OFF. 2)Disconnect the connector from the ambient sensor. 3)Measure the resistance between the ambient sensor harness connector terminal and combination meter harness connector terminal. ***Connector & terminal*** ***(F78) No. 1 — (i11) No. 11:*** ***(F78) No. 2 — (i11) No. 8:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the wiring harness.
3	**CHECK AMBIENT SENSOR.** 1)Remove the ambient sensor. 2)Check the ambient sensor. <Ref. to IDI-17, INSPECTION, Ambient Sensor.>	Is the ambient sensor 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 (2.2 kΩ) between the terminals of ambient sensor harness connector. 3)Turn the ignition switch ON and check the outside temperature indicator display.	Is the outside temperature indicator indicating 25°C (77°F)?	Repair the poor contact of ambient sensor harness connector.	Replace the combination meter printed circuit.

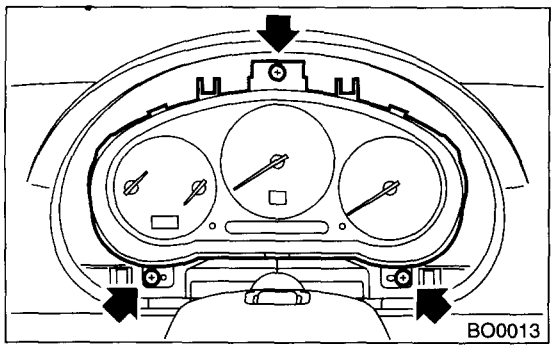
3. Combination Meter Assembly

A: REMOVAL

1) Disconnect the battery ground cable.
2) Set the tilt steering at the lowest position.
3) Remove the screws and detach the 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 the meter.

CAUTION:
• Be careful not to damage the meter or instrument panel.
• Pay particular attention to avoid damaging the meter glass.

B: INSTALLATION

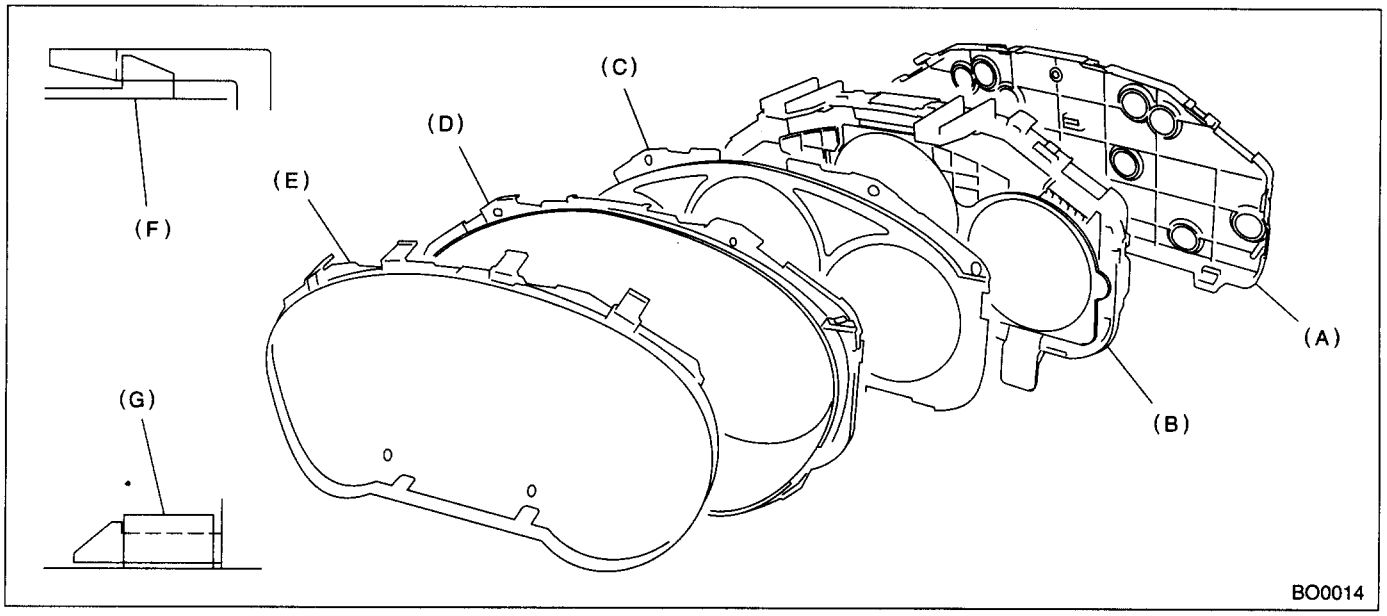
Install in the reverse order of removal.

CAUTION:
• Make sure the electrical connector is connected securely.
• Make sure that each meter operates normally.

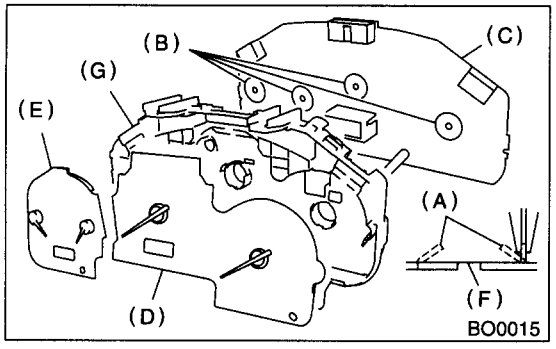
C: DISASSEMBLY

CAUTION:
Use gloves to avoid damage and getting fingerprints on the glass surface and meter surfaces.

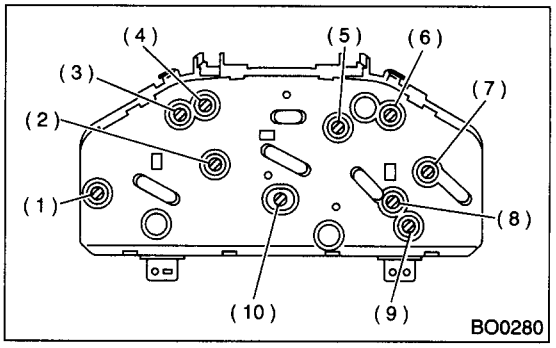
1) Disengage claw (F) to remove case (B) from back cover (A).
2) Disengage claw (G) to remove meter glass (E), reflector (D) and window plate (C) from inner case.



3) Pull up claw (A) in portion (B) of combination meter printed circuit (C) with combination pliers. Push out speedometer and tachometer assembly (D) and fuel gauge and water temperature gauge assembly (E) using hole (F).
4) Pull up the claw in the center of combination meter printed circuit (C), and remove the combination meter printed circuit from case (G).



1. BULB REPLACEMENT



(1) Tachometer
(2) Speedometer and tachometer
(3) Turn RH
(4) HI-beam
(5) Speedometer
(6) Turn LH
(7) Fuel gauge
(8) Temperature gauge
(9) LCD (Outside temperature indicator)
(10) LCD (Odometer and tripmeter)

D: ASSEMBLY

Assemble in the reverse order of disassembly.

4. Speedometer

A: REMOVAL

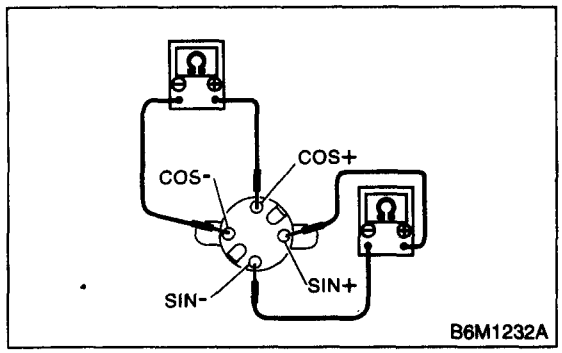
Disassemble the combination meter, and then remove the speedometer and tachometer assembly. <Ref. to IDI-12, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the speedometer resistance.



Terminal	Resistance
SIN+ and SIN–	200±8 Ω
COS+ and COS–	200±8 Ω

If NG, replace the speedometer and tachometer assembly.
If OK, replace the combination meter printed circuit.

5. Tachometer

A: REMOVAL

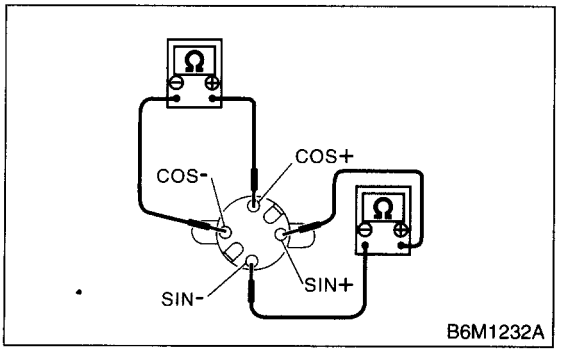
Disassemble the combination meter, and then remove the speedometer and tachometer assembly. <Ref. to IDI-12, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the tachometer resistance.



Terminal	Resistance
SIN+ and SIN–	200±8 Ω
COS+ and COS–	200±8 Ω

If NG, replace the speedometer and tachometer assembly.
If OK, replace the combination meter printed circuit.

6. Fuel Gauge

A: REMOVAL

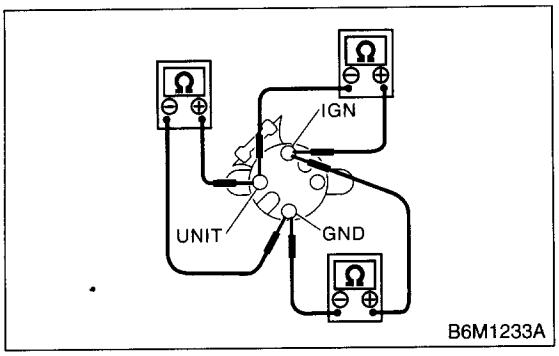
Disassemble the combination meter, and then remove the water temperature gauge and fuel gauge assembly. <Ref. to IDI-12, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the fuel gauge resistance.



Terminal	Resistance
IGN and GND	170±10 Ω
IGN and UNIT	35±10 Ω
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

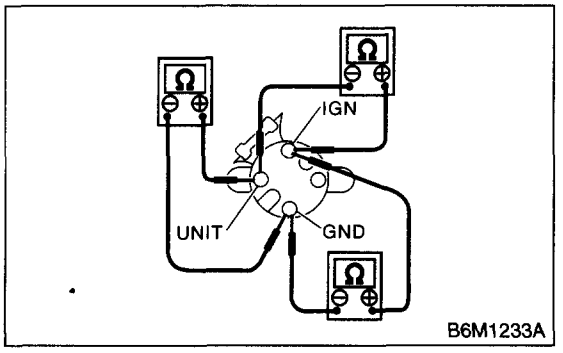
Disassemble the combination meter, and then remove the water temperature gauge and fuel gauge assembly. <Ref. to IDI-12, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the water temperature gauge resistance.



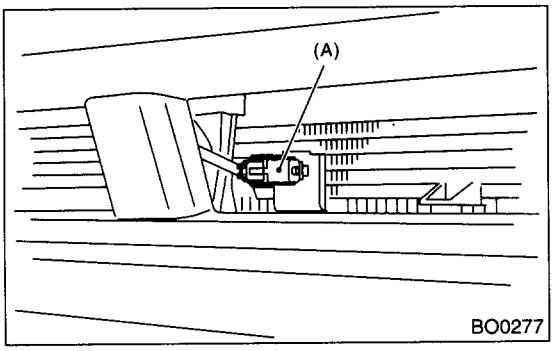
Terminal	Resistance
IGN and GND	208±10 Ω
IGN and UNIT	56±10 Ω
UNIT and GND	264±10 Ω

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 battery ground cable.
2) Disconnect the ambient sensor connector.
3) Remove ambient sensor (A) from the radiator lower panel.

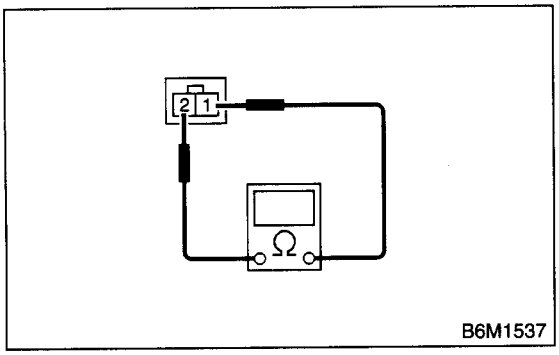


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the ambient sensor resistance.



Terminal	Resistance
1 and 2	2.2 kΩ/25°C (77°F)

If NG, replace the ambient sensor.

SEATS

SE

Page

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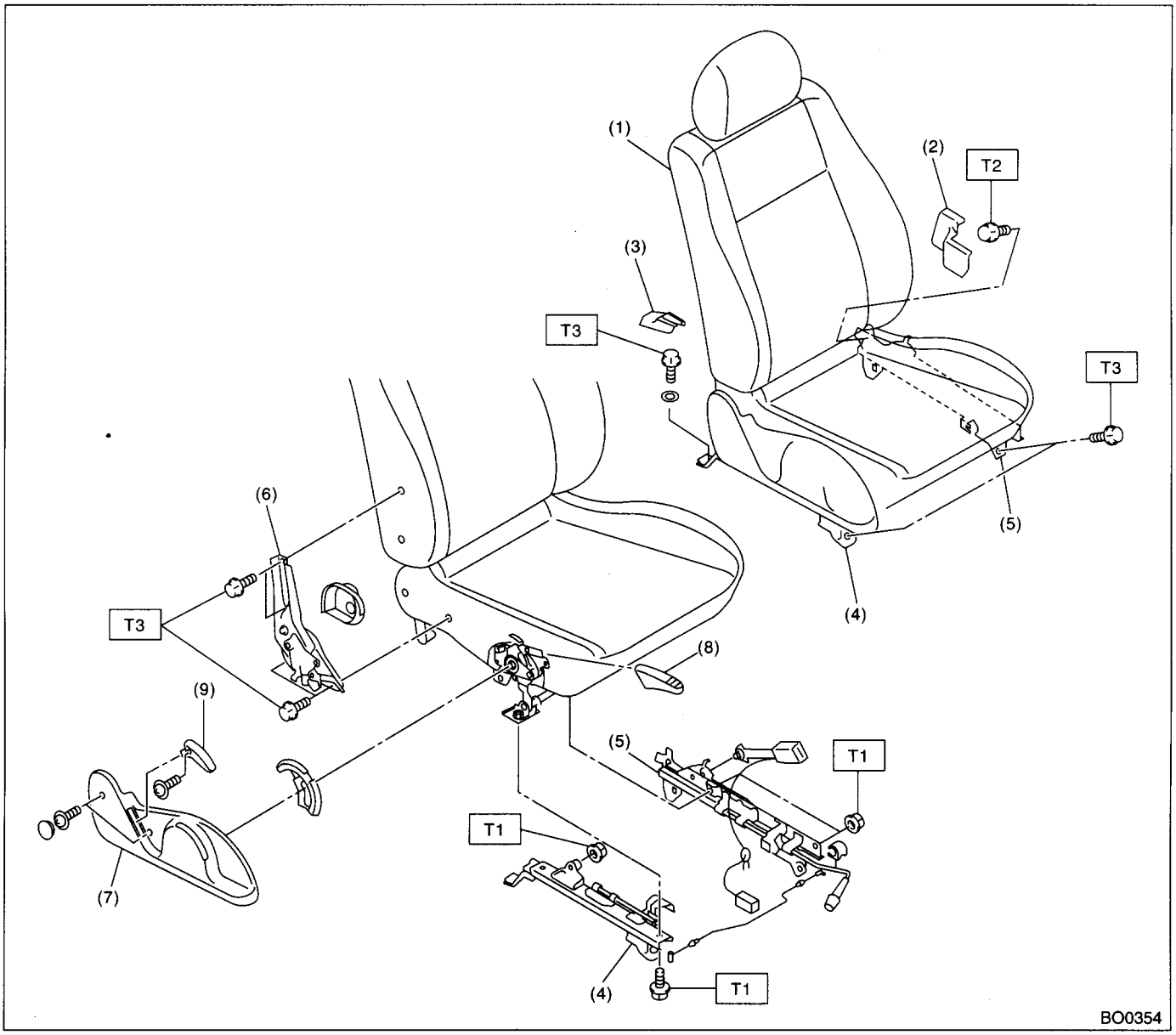
2. Front Seat 6
3. Rear Seat 11

1. General Description

A: COMPONENT

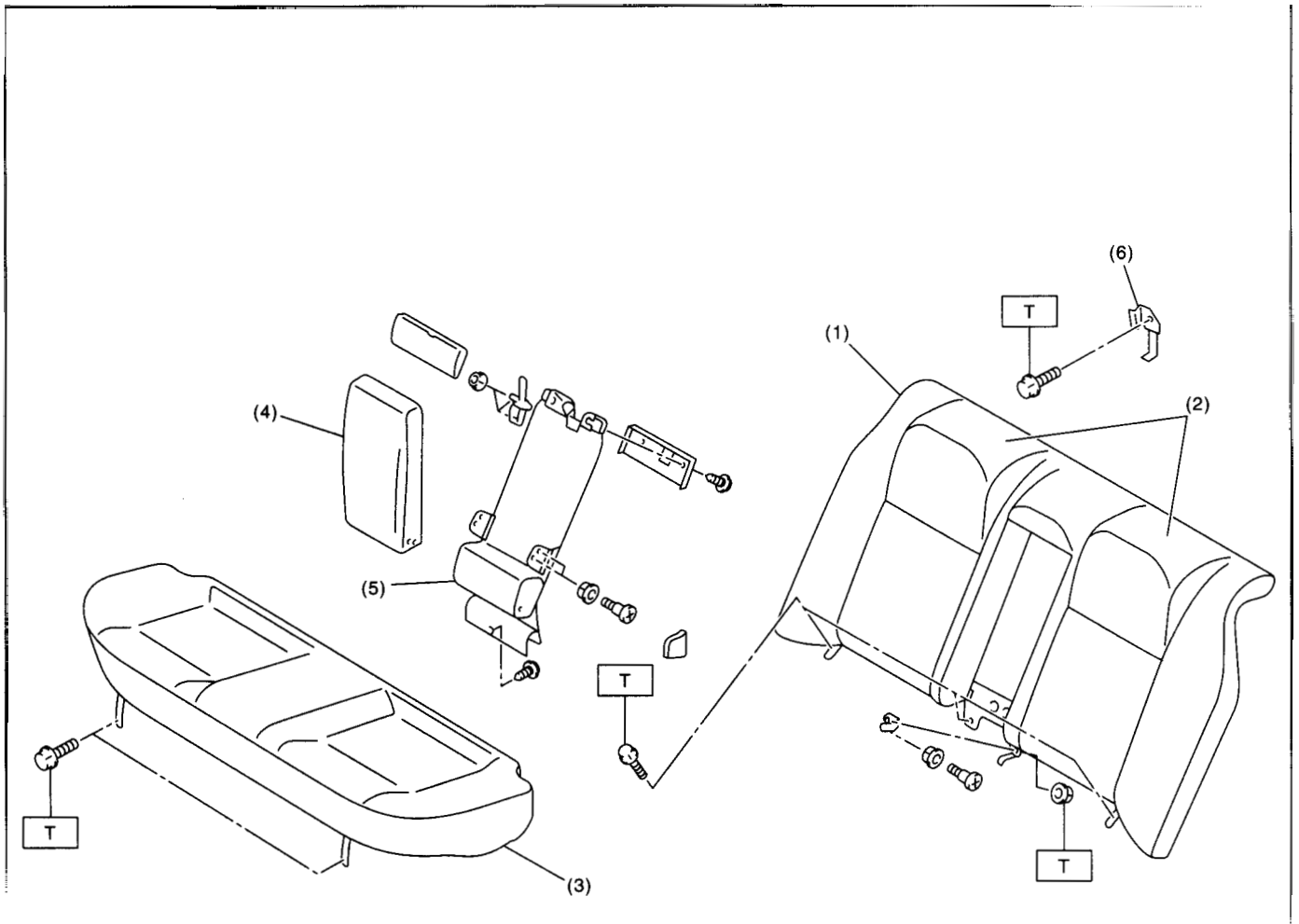
1. FRONT SEAT



(1) Front seat ASSY
(2) Rail cover IN
(3) Rail cover OUT
(4) Slide rail OUT
(5) Slide rail IN
(6) Seat hinge
(7) Seat hinge cover
(8) Seat lifter lever
(9) Reclining lever

Tightening torque: N·m (kgf-m, ft-lb)
T1: 24.5 (2.5, 18)
T2: 30 (3.1, 22)
T3: 53 (5.4, 39)

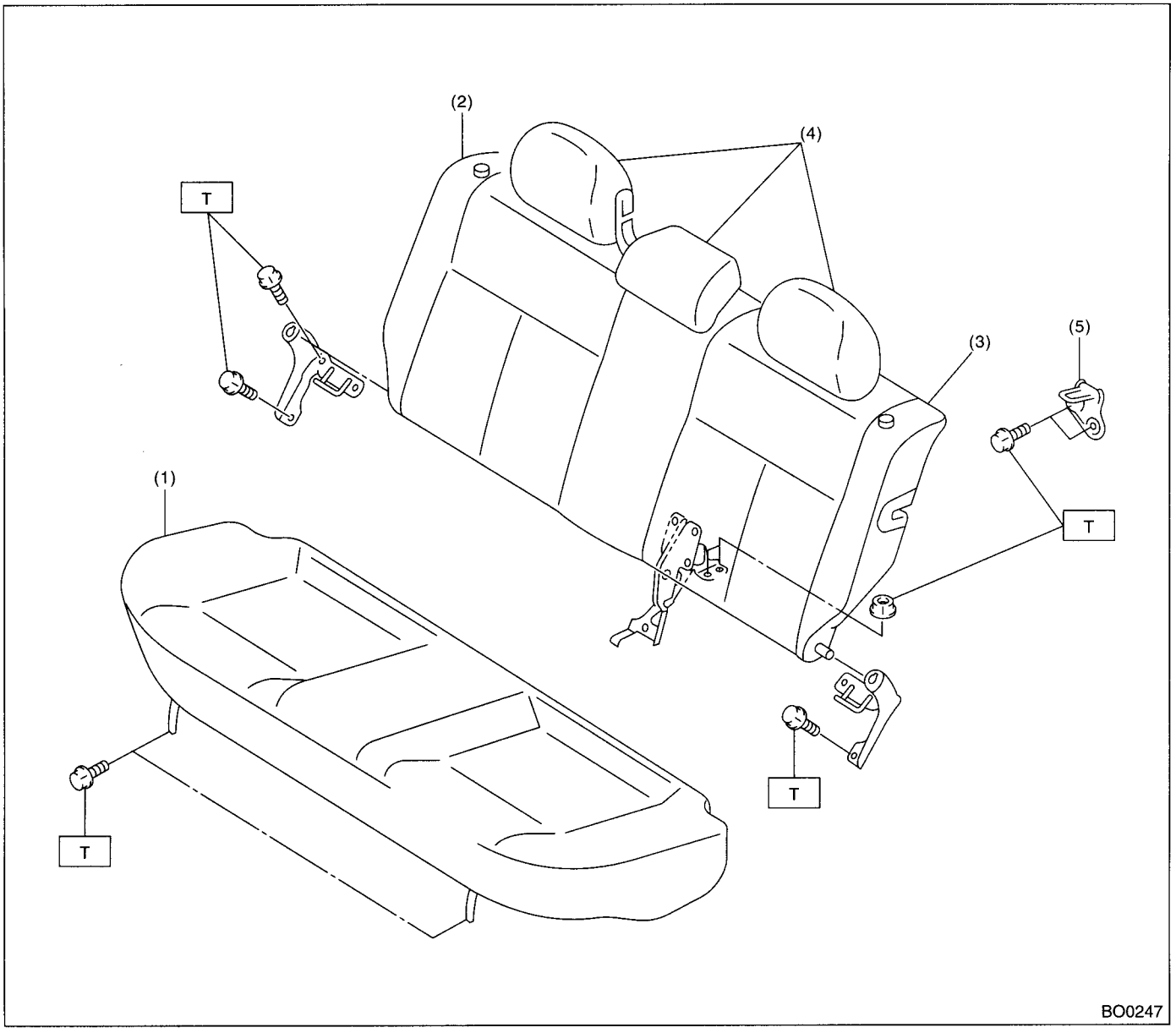
2. REAR SEAT (SEDAN)



BO0355

(1)	Backrest	(4)	Arm rest	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	Head restraint	(5)	Center through frame	***T: 24.5 (2.5, 18.1)***
(3)	Cushion	(6)	Hook	

3. REAR SEAT (WAGON)



(1) Cushion
(2) Backrest RH
(3) Backrest LH
(4) Head restraint
(5) Striker

Tightening torque: N·m (kgf-m, ft-lb)
T: 24.5 (2.5, 18.1)

B: CAUTION

- Take care not to contaminate or damage seat surface.
- While loading to or unloading to the vehicle, take care not to contact body.
- When removing the front seat from a side airbag loaded vehicle, follow cautions given in the airbag section.

C: PREPARATION TOOL

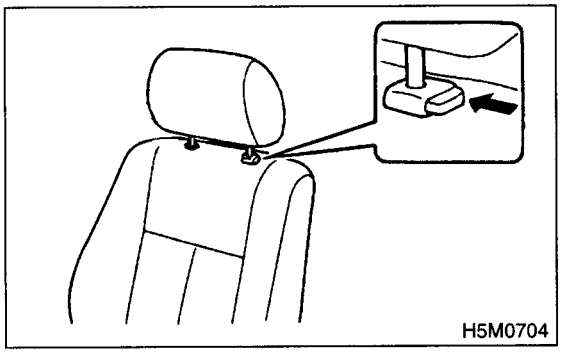
1. GENERAL TOOL

TOOL NAME	REMARKS
Long Nose Pliers	Used for removing and installing the hog ring

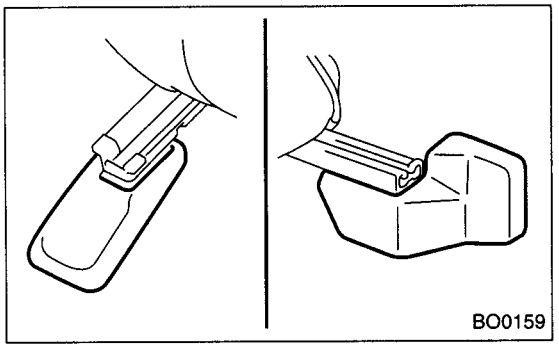
2. Front Seat

A: REMOVAL

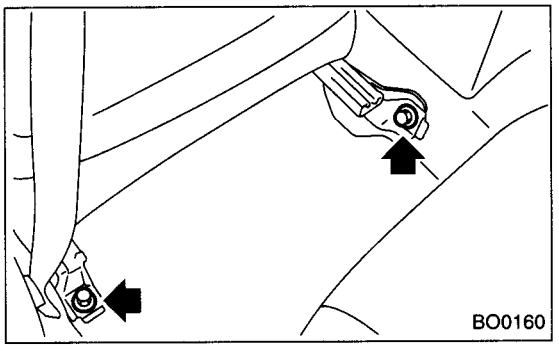
1) Disconnect the ground terminal from battery.
2) While pressing the headrest lock button, remove the headrest.



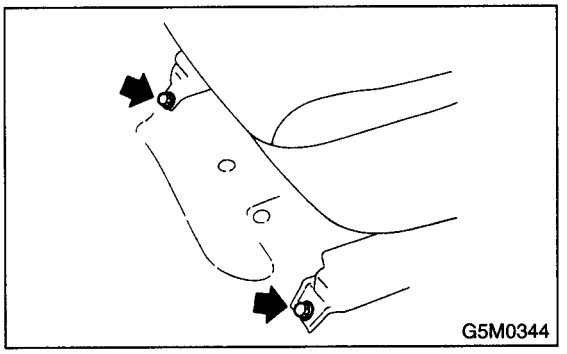
3) Tilt forward the backrest.
4) Move the seat to full front end.
5) Remove the bolt cover at rear end of slide rail.



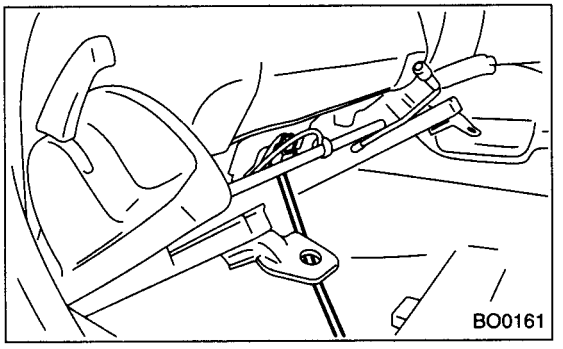
6) Remove the two bolts at rear side of seat rail.



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 the seat. (Side airbag equipped vehicle)
10) Disconnect the connector of seat belt warning.



11) Remove the front seat from vehicle.

CAUTION:
When removing the seat from vehicle, take care not to damage body, seat or trim.

B: INSTALLATION

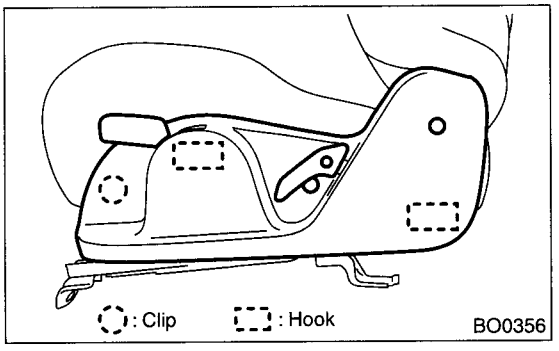
Install in the reverse order of removal.

CAUTION:
Confirm that the seat can move smoothly and be locked securely at any position.

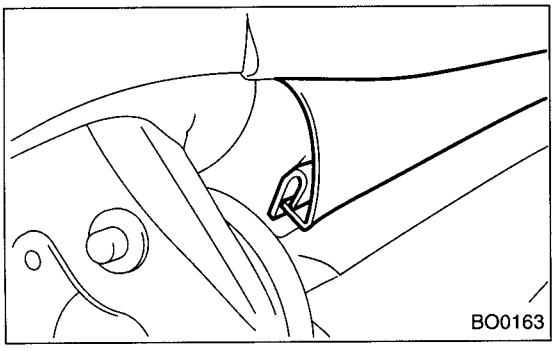
C: DISASSEMBLY

1. DRIVER'S SEAT

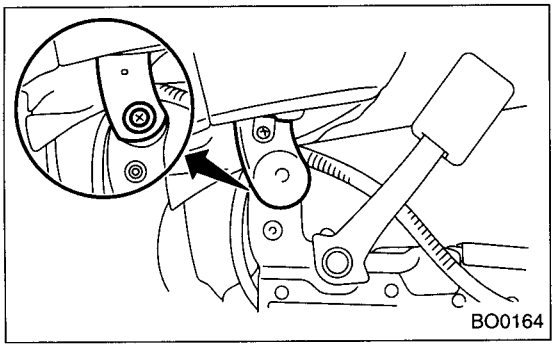
1) Remove the seat from the vehicle. <Ref. to SE-6, REMOVAL, Front Seat.>
2) Remove the reclining hinge cover.



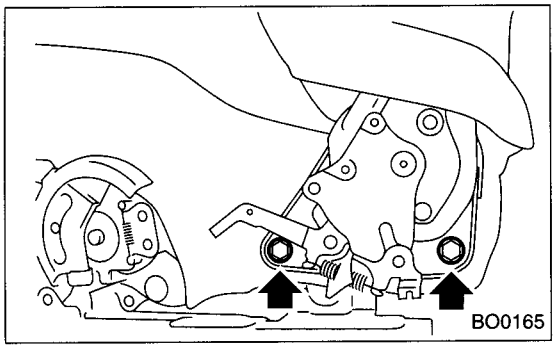
3) Remove the hook at bottom of seat backrest.



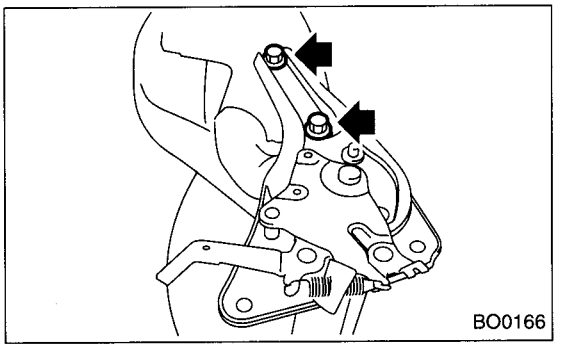
4) Remove the hinge cover and screw.



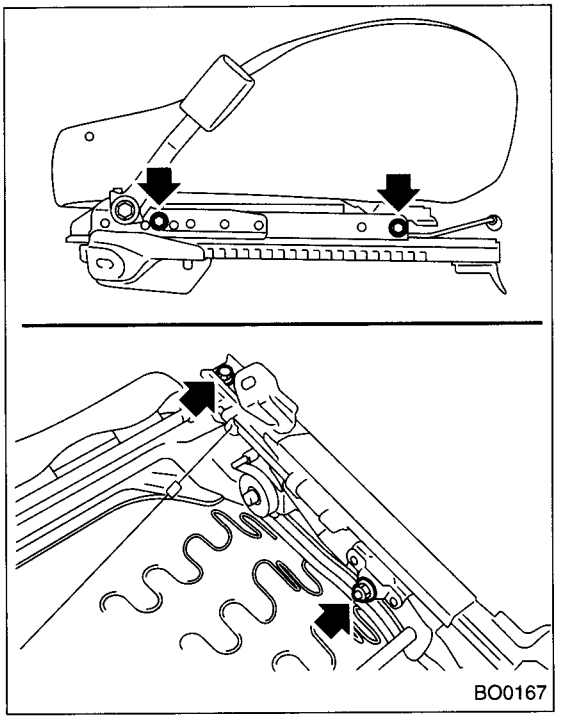
5) Remove the two bolts.



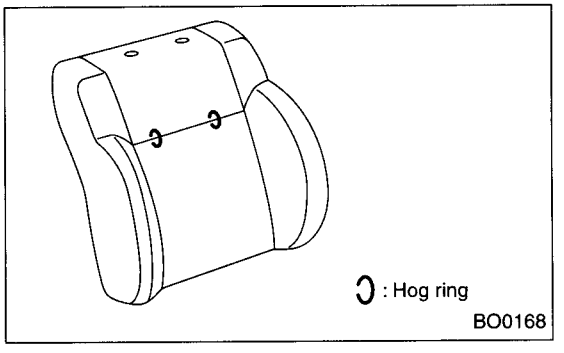
6) Turn the cover, and remove the two bolts from hinge.



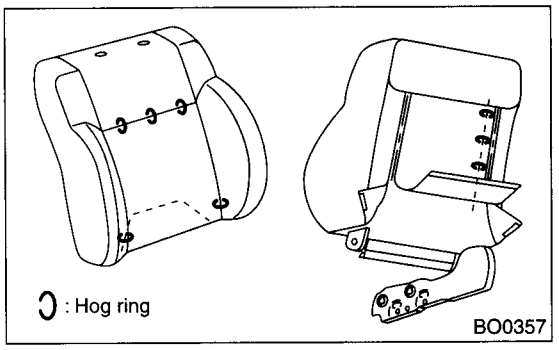
7) Loosen the bolt and nuts to remove slide rail.



8) Remove the hog rings, and then remove seat back rest cover.
Without side airbag model:

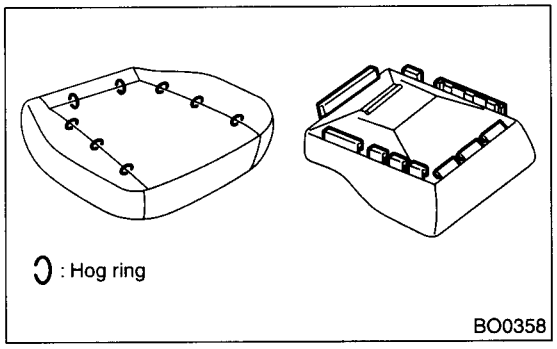


With side airbag model:

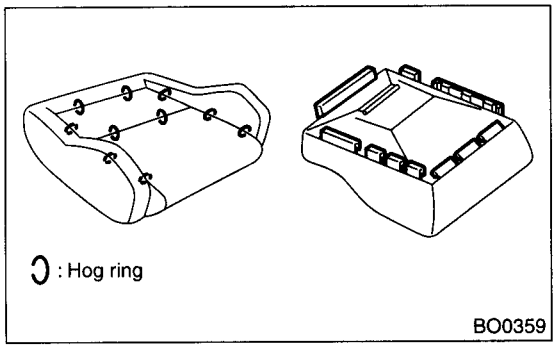


9) Remove the hog rings, and then remove the seat cushion cover.

Standard type model:

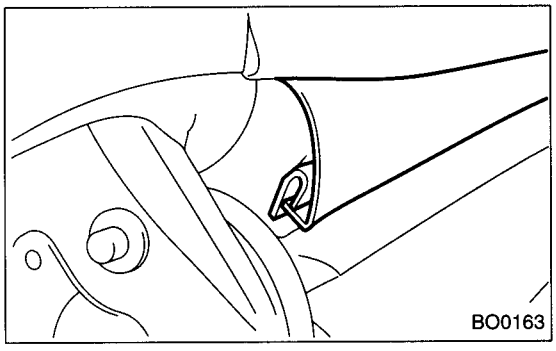


Sporty type model:

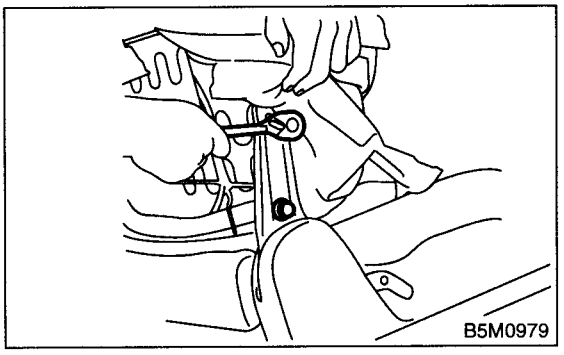


2. PASSENGER'S SEAT

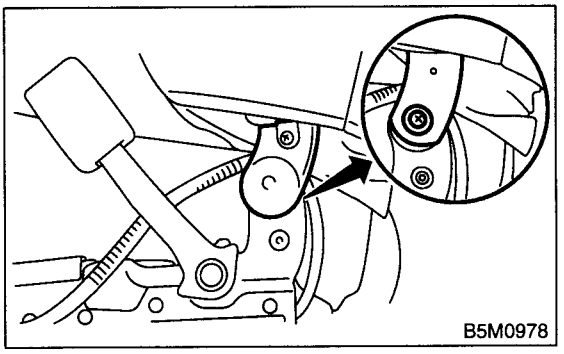
1) Remove the seat from the vehicle. <Ref. to SE-6, REMOVAL, Front Seat.>
2) Remove the hook at bottom of seat back rest.



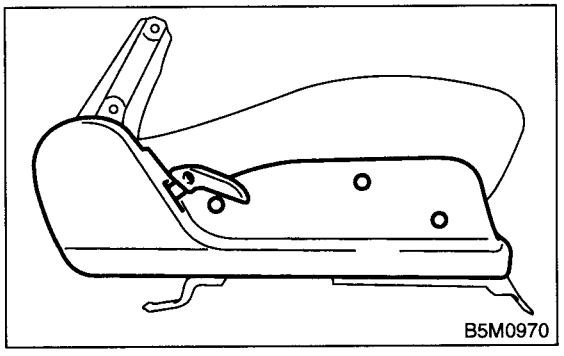
3) Turn the cover, and remove the two bolts from hinge.



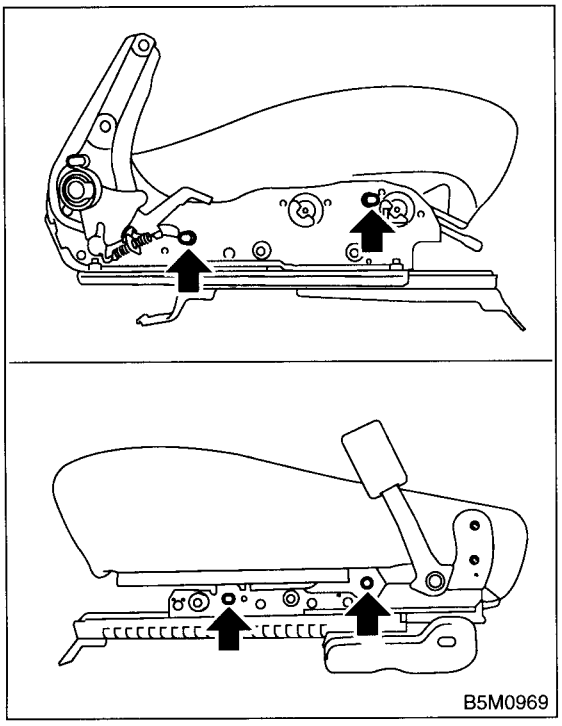
4) Remove the hinge screw cover and screw, and remove seat back rest from hinge.



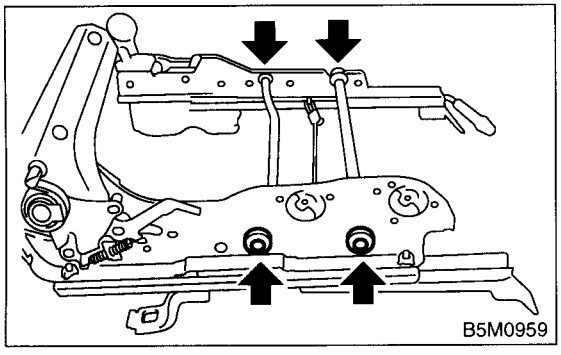
5) Remove the reclining lever cover and hinge cover.



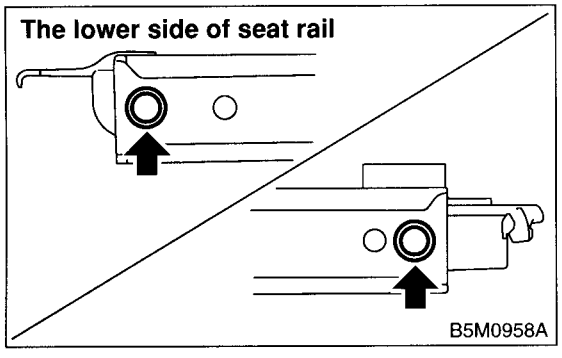
6) Loosen four bolts to remove the seat cushion.



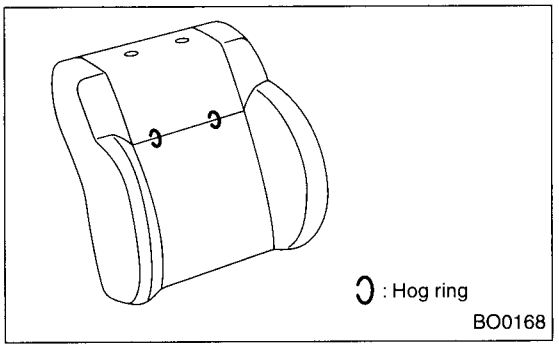
7) Loosen four screws to remove the hinge.



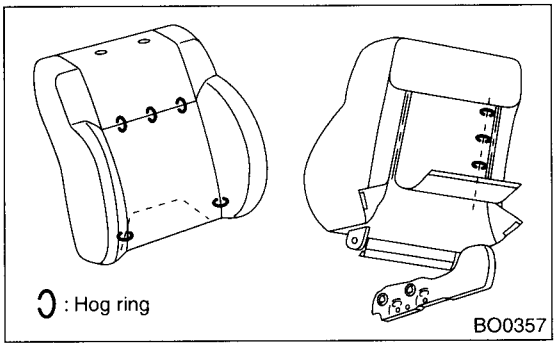
8) Loosen two bolts to remove the slide rail.



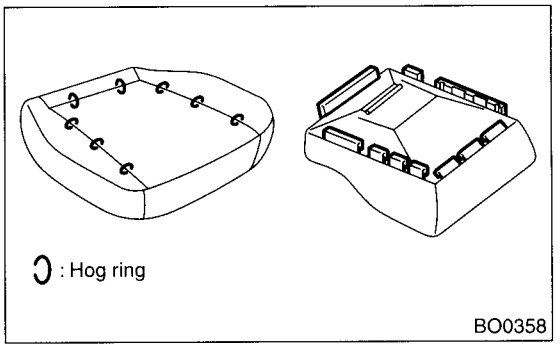
9) Remove the hog rings, and then remove the seat back rest cover.
Without side airbag model:



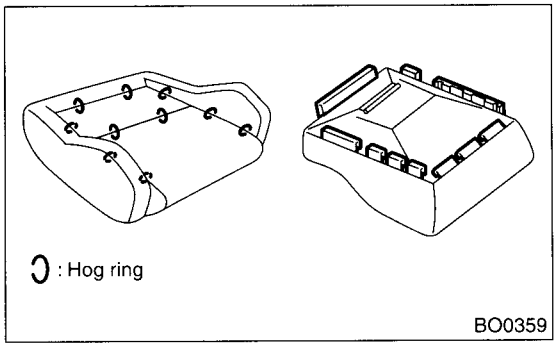
With side airbag model:



10) Remove the hog rings, and then remove the seat cushion cover.
Standard type model:



Sporty type model:



D: ASSEMBLY

1. DRIVER'S SEAT

Assemble in the reverse order of disassembly.

NOTE:
- Do not contaminate or damage the cover.
- While installing the hog rings, prevent the seat from getting wrinkled.

2. PASSENGER'S SEAT

Assemble in the reverse order of disassembly.

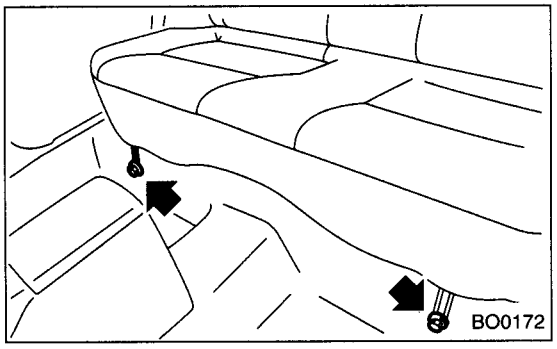
NOTE:
- Do not contaminate or damage the cover.
- While installing the hog rings, prevent the seat from getting wrinkled.

3. Rear Seat

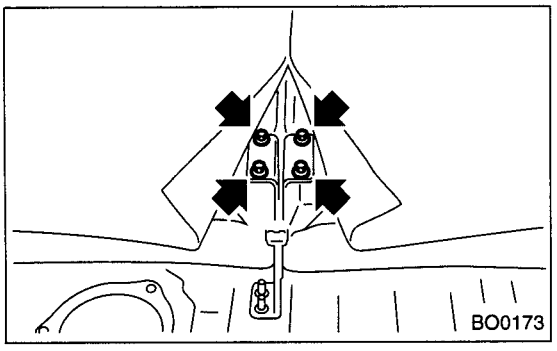
A: REMOVAL

1. WAGON

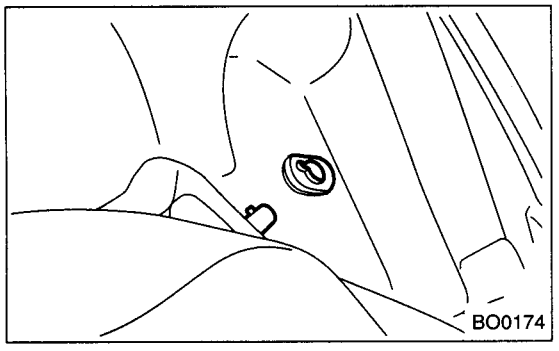
1) Remove the bolts, and then detach rear seat cushion.



2) Remove the headrest.
3) Remove the luggage floor mat. <Ref. to EI-56, REMOVAL, Luggage Floor Mat.>
4) Turn over the mat to remove bolts.

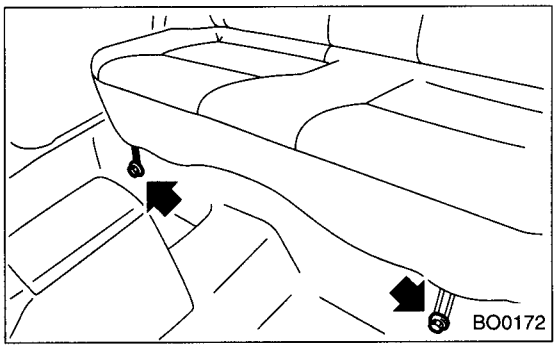


5) Remove the rear seat backrest.

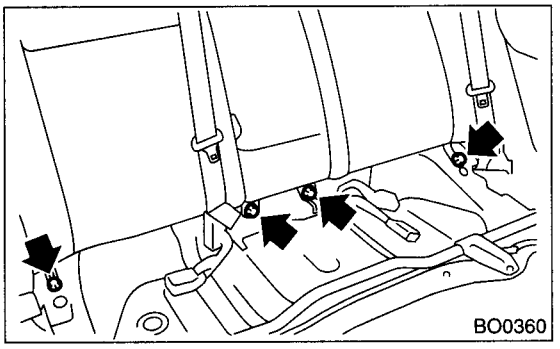


2. SEDAN

1) Remove the bolts, and then detach rear seat cushion.



2) Remove the bolts securing lower portion of backrest and then open the center trunk through lid.



3) Lift the rear seat backrest and then remove it.

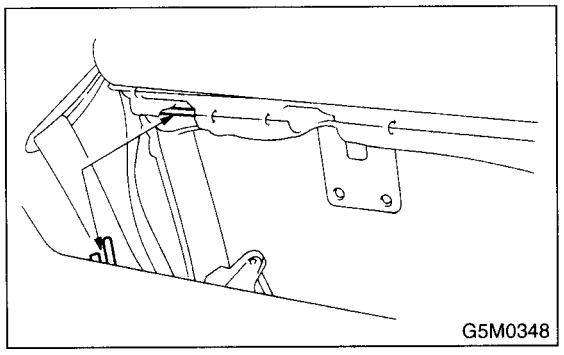
B: INSTALLATION

1. WAGON

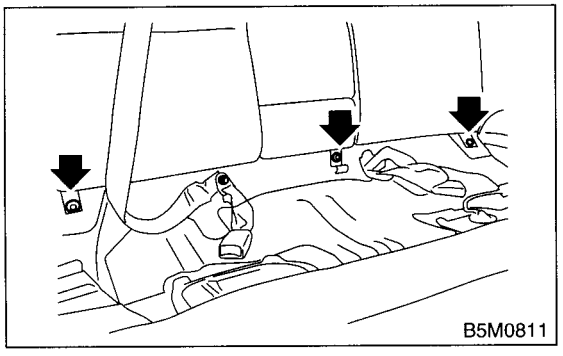
Install in the reverse order of removal.

2. SEDAN

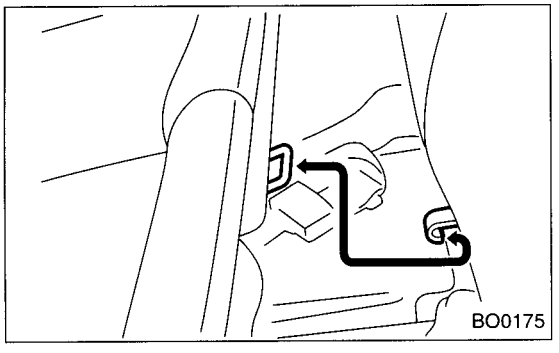
1) Hook and fasten the upper-back side of the rear seat backrest to the body hook.



2) Tighten the bolts.



3) Hook and fasten the seat cushion to the hook on the lower part of the rear seat backrest.

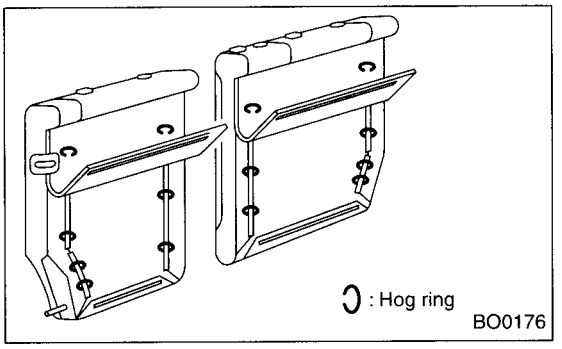


C: DISASSEMBLY

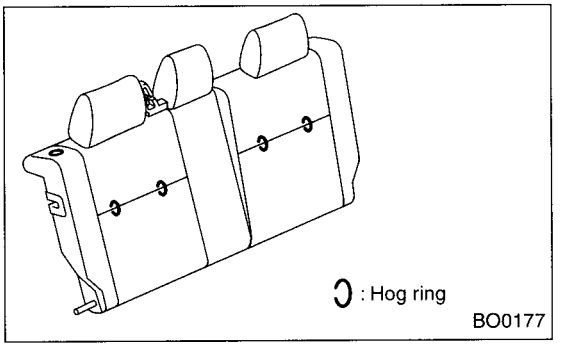
1. WAGON

1) Remove the rear seat. <Ref. to SE-11, WAGON, REMOVAL, Rear Seat.>

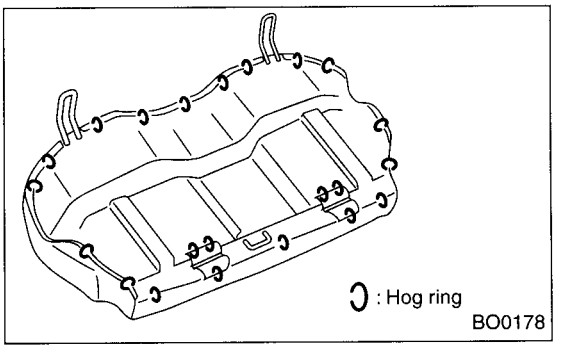
2) Remove the hog rings from around the seat backrest.



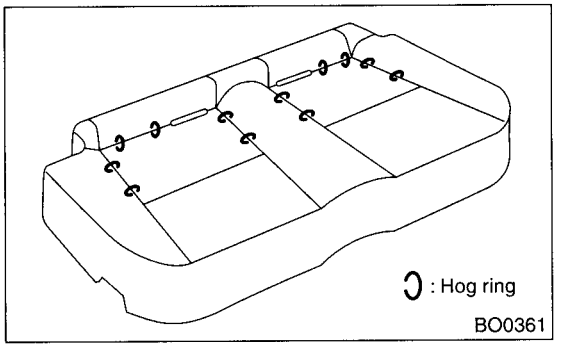
3) Remove the hog rings on front side of cushion pad, and then remove the cover.



4) Remove the hog rings from around the seat cushion.

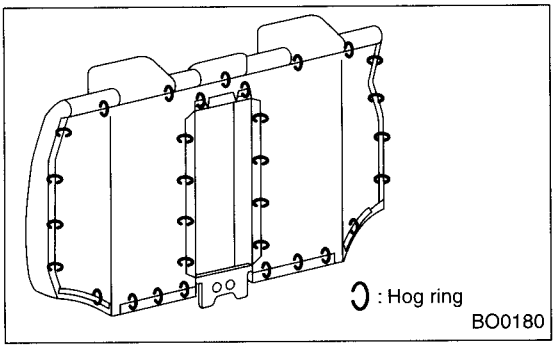


5) Remove the hog rings, and then remove the cover.

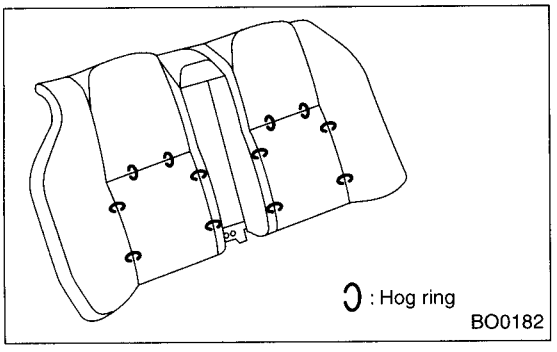


2. SEDAN

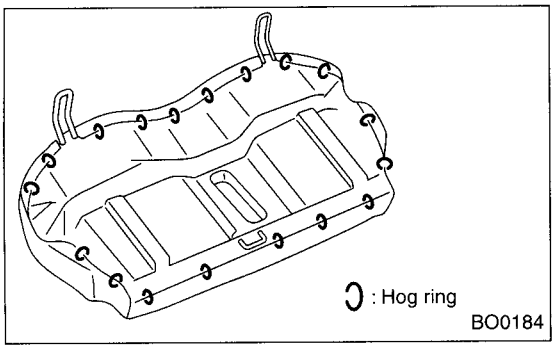
1) Remove the rear seat. <Ref. to SE-11, SEDAN, REMOVAL, Rear Seat.>
2) Remove the hog rings from around the seat backrest.



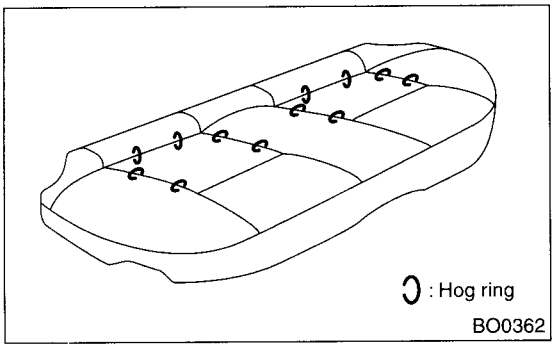
3) Remove the hog rings, and then remove the seat cover.



4) Remove the hog rings around the seat cushion.



5) Remove the hog rings, and then remove the seat cover.



D: ASSEMBLY

1. WAGON

Assemble in the reverse order of disassembly.

NOTE:
- Do not contaminate or damage the cover.
- While installing the hog rings, prevent the seat from getting wrinkled.

2. SEDAN

Assemble in the reverse order of disassembly.

NOTE:
- Do not contaminate or damage the cover.
- While installing the hog rings, prevent the seat from getting wrinkled.

REAR SEAT

SECURITY AND LOCKS

SL

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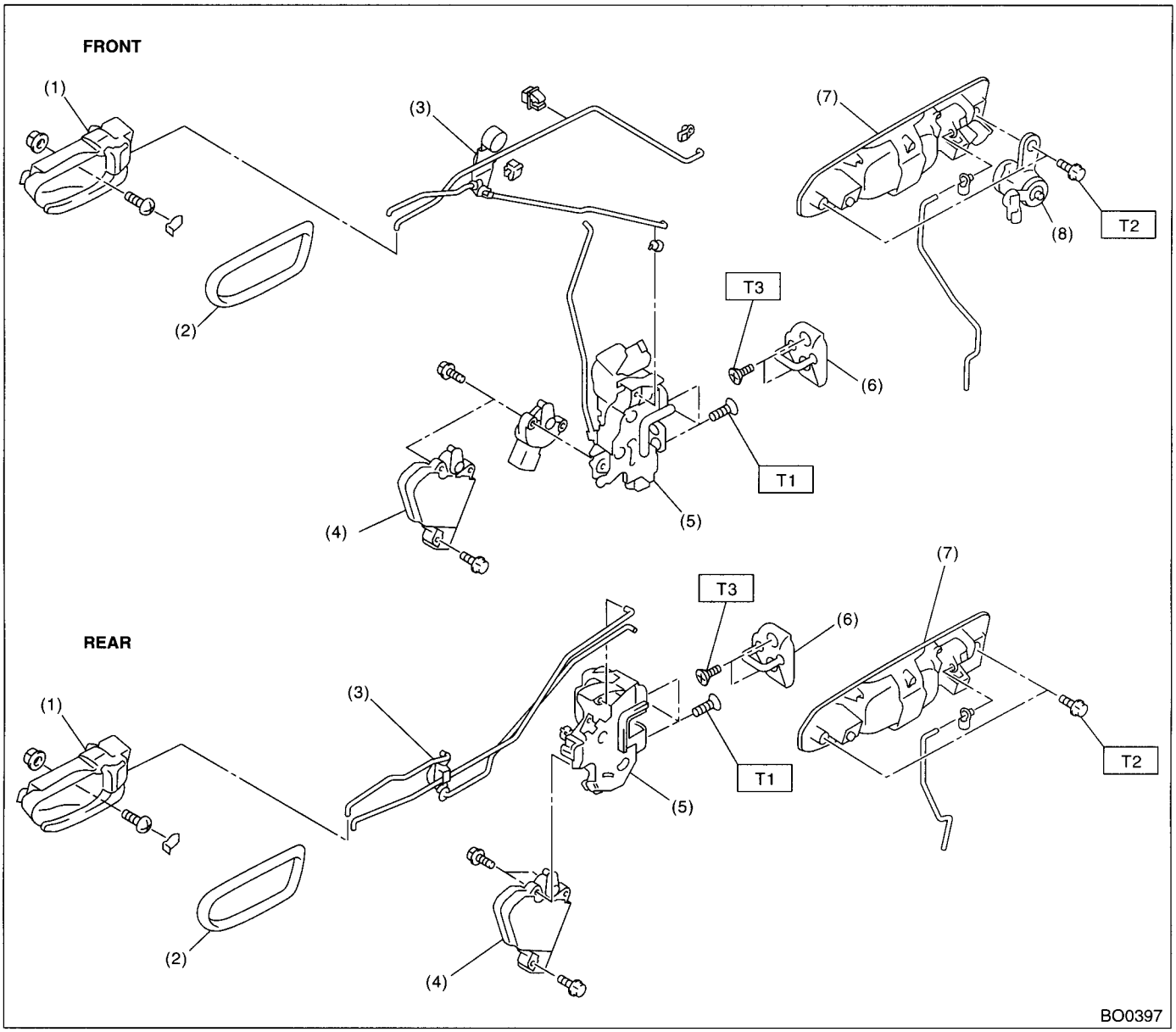
1. General Description

A: COMPONENT

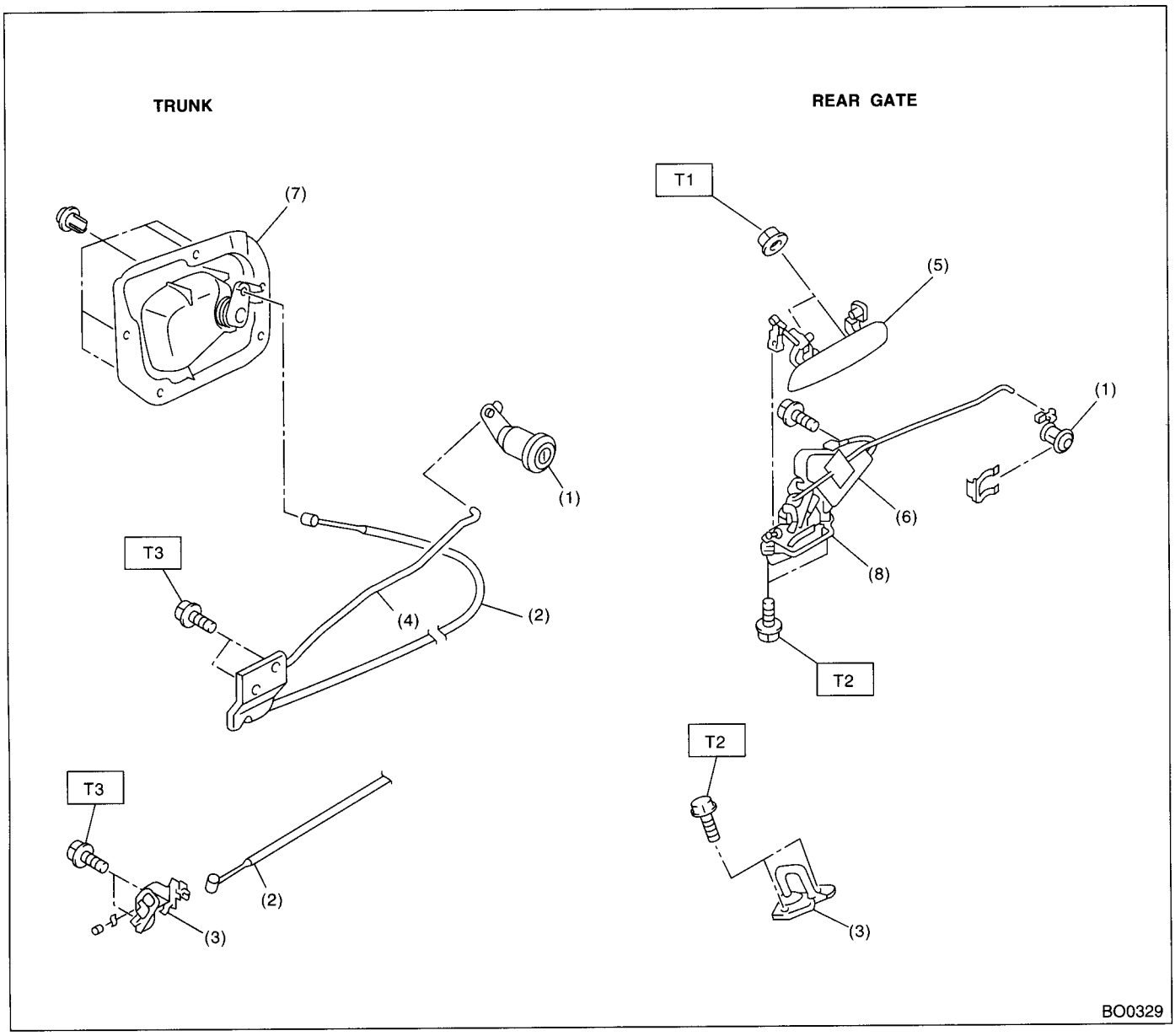
1. DOOR LOCK ASSEMBLY



(1) Inner remote ASSY
(2) Inner remote cover
(3) Bell crank
(4) Auto-door lock actuator
(5) Door latch
(6) Striker
(7) Door outer handle
(8) Key cylinder

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 7.4 (0.75, 5.4)
T3: 14 (1.4, 10.1)

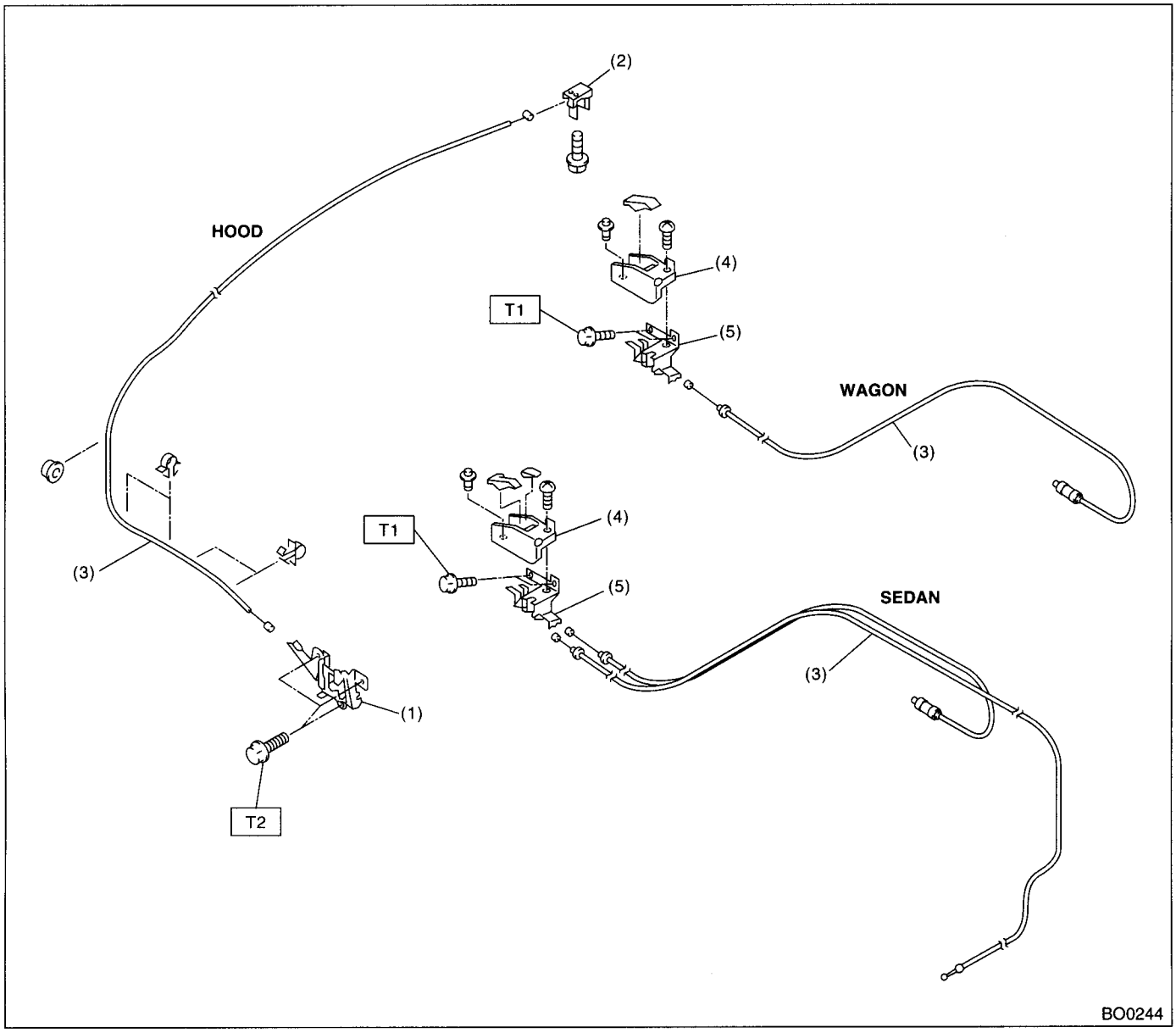
2. TRUNK LID AND REAR GATE LOCK



(1)	Key cylinder	(5)	Rear gate outer handle
(2)	Cable	(6)	Rear gate actuator
(3)	Striker	(7)	Trunk lid release handle
(4)	Trunk lid lock ASSY	(8)	Rear gate latch

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.5 (0.46, 3.3)
T2: 18 (1.84, 13.3)
T3: 25 (2.5, 18.1)

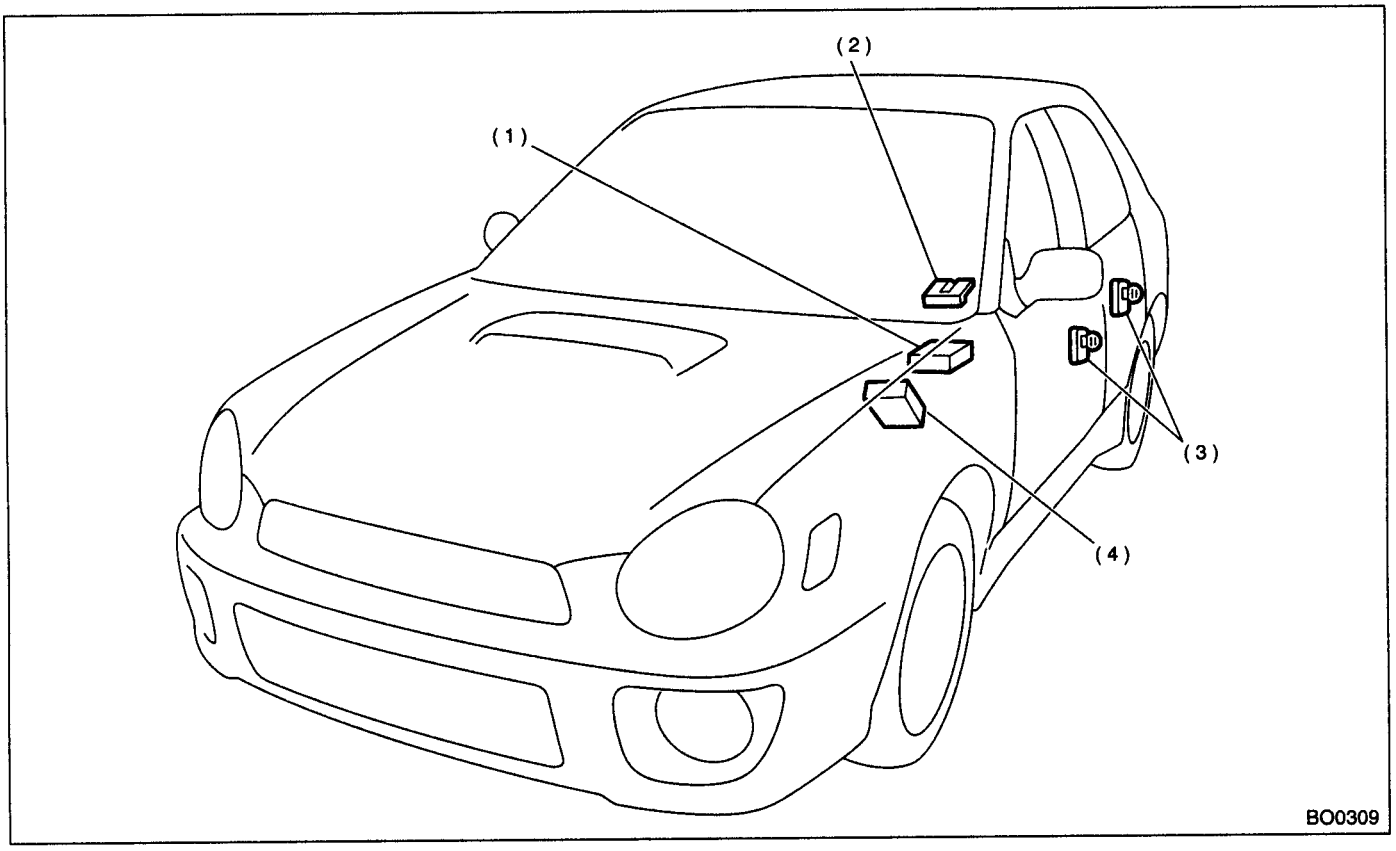
3. HOOD LOCK AND REMOTE OPENERS



(1) Hood lock ASSY
(2) Lever ASSY
(3) Cable
(4) Cover
(5) Pull handle ASSY

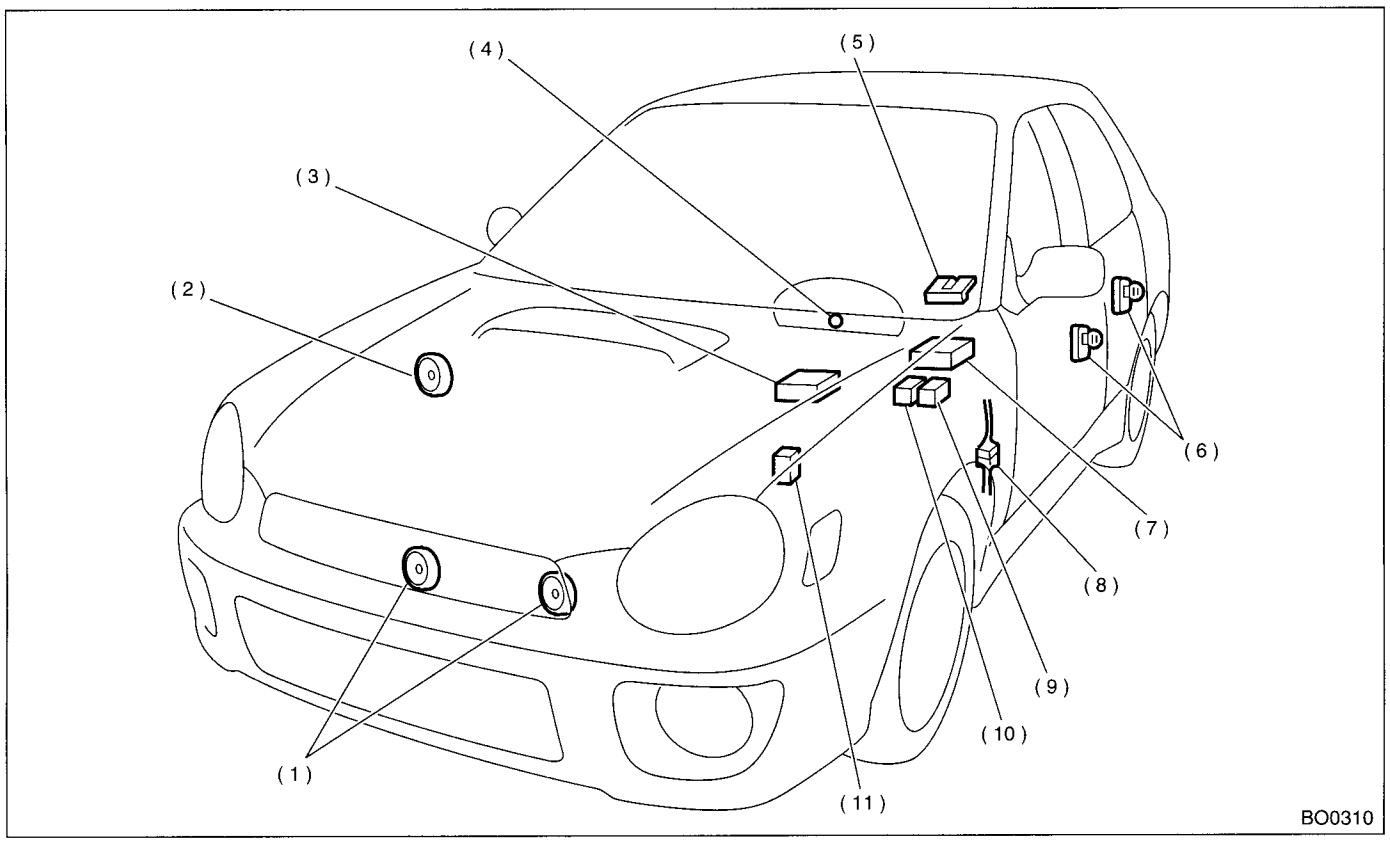
Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 32 (3.3, 23.9)

4. KEYLESS ENTRY SYSTEM



(1) Keyless entry control module
(2) Rear gate latch switch (Wagon)
(3) Door switch
(4) Integrated module

5. SECURITY SYSTEM



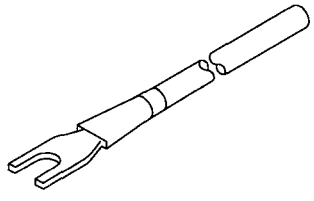
(1) Horn
(2) Security horn
(3) Security control module
(4) Security indicator light (in combination meter)
(5) Trunk room light switch (Sedan), rear gate latch switch (Wagon)
(6) Door switch
(7) Keyless entry control module
(8) Passive arm connector
(9) Security horn relay
(10) Interrupt relay
(11) Horn relay (in main fuse box)

B: CAUTION

• Before disassembling or reassembling the parts, always disconnect the battery ground cable. When repairing the radio, control module, etc. which are provided with memory functions, record the memory contents before disconnecting battery ground cable. Otherwise, these contents are cancelled upon disconnection.
• Reassemble the parts in the reverse order of disassembly procedure unless otherwise indicated.
• Adjust the parts to the specifications contained in this manual if so designated.
• Connect the connectors and hoses securely during reassembly.
• After reassembly, ensure the functional parts operate smoothly.
• The 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 the 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
 B5M1120	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-64, 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 the integrated module.	<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-11, CHECK DOOR LOCK ACTUATOR AND CIRCUIT, INSPECTION, Door Lock Control System.>
The driver side or passenger side 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-11, CHECK DOOR LOCK ACTUATOR AND CIRCUIT, INSPECTION, Door Lock Control System.>

2. CHECK FUSE

Step		Check	Yes	No
1	**CHECK FUSE.** Remove and visually check the fuse No. 2 (in the main fuse box) and No. 3 (in the fuse and relay box).	Is the fuse blown (15A)?	Replace the fuse with a new one.	Check the power supply and ground circuit. <Ref. to SL-10, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Door Lock Control System.>

3. CHECK POWER SUPPLY AND GROUND CIRCUIT

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY.** 1)Disconnect the integrated module harness connector. 2)Measure the voltage between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B281) No. 1 (+) — Chassis ground (–):*** ***(B281) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open circuits or shorts between the integrated module and the fuse.
2	**CHECK GROUND CIRCUIT.** Measure the resistance between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B281) No. 4, 13 — Chassis ground:***	Is the resistance less than 10 Ω?	The power supply and ground circuit is OK.	Repair the harness.

4. CHECK DOOR LOCK SWITCH AND CIRCUIT

	Step	Check	Yes	No
1	**CHECK DOOR LOCK SWITCH CIRCUIT.** 1)Disconnect the integrated 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*** ***Driver side:*** ***(B280) No. 12 — Chassis ground:*** ***Passenger side:*** ***(B280) No. 12 — Chassis ground:***	Is the resistance less than 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*** ***Driver side:*** ***(B280) No. 11 — Chassis ground:*** ***Passenger side:*** ***(B280) No. 11 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **3.**	The door lock switch is OK.
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. ***Terminal*** ***Driver side: No. 5 — No. 9:*** ***Passenger side: No. 5 — No. 4:***	Is the resistance less than 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. ***Terminal*** ***Driver side: No. 5 — No. 8:*** ***Passenger side: No. 5 — No. 2:***	Is the resistance less than 1 Ω?	Check the harness for open circuits or shorts between the integrated module and the door lock switch.	Replace the door lock switch.

5. CHECK DOOR LOCK ACTUATOR AND CIRCUIT

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL.** Measure the voltage between the harness connector terminal and chassis ground when moving the door lock switch to LOCK. ***Connector & terminal*** ***(B281) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Replace the integrated module.
2	**CHECK OUTPUT SIGNAL.** Measure the voltage between the harness connector terminal and chassis ground when moving the door lock switch to UNLOCK. ***Connector & terminal*** ***(B291) No. 7, 8 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Replace the integrated module.
3	**CHECK DOOR LOCK ACTUATOR.** Check the door lock actuator. Front door lock actuator: <Ref. to SL-31, Front Door Lock Actuator.> Rear door lock actuator: <Ref. to SL-35, Rear Door Lock Actuator.> Rear gate latch lock actuator: <Ref. to SL-38, Rear Gate Latch Lock Actuator.>	Is the door lock actuator OK?	Check the harness for open circuits or shorts between the integrated module and the door lock actuator.	Replace the door lock actuator.

3. Keyless Entry System

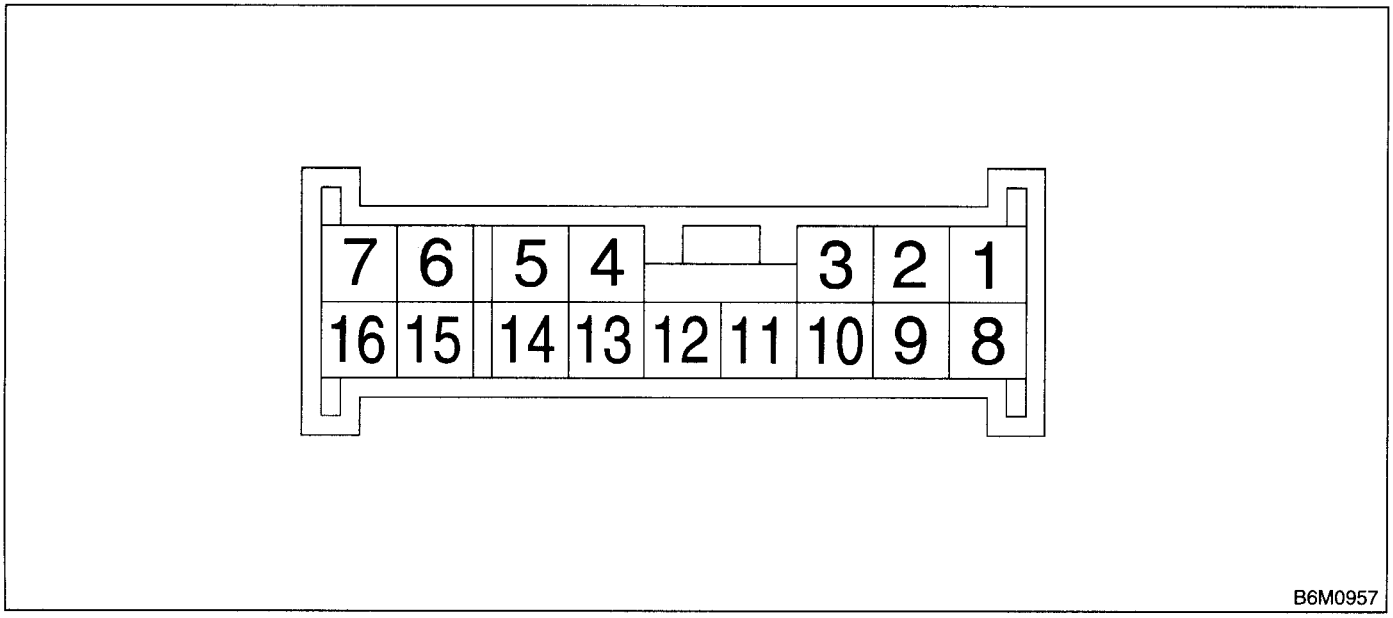
A: SCHEMATIC

1. KEYLESS ENTRY

<Ref. to WI-90, SCHEMATIC, Keyless Entry System.>

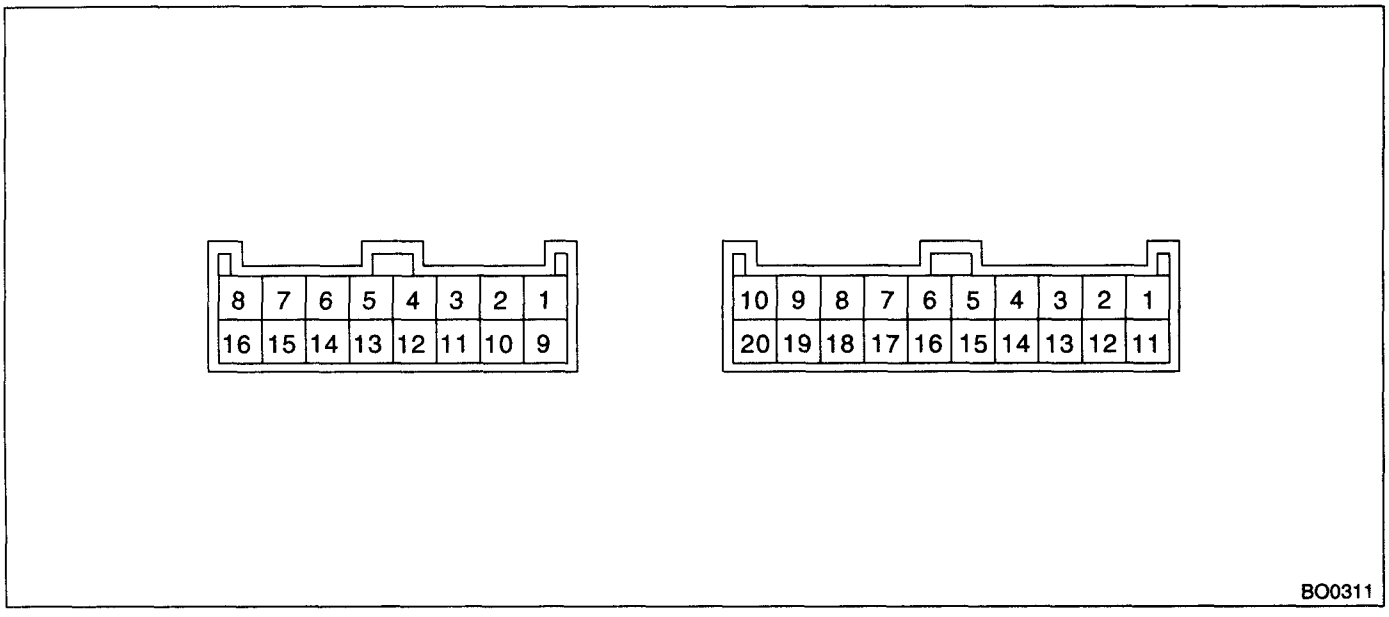
B: ELECTRICAL SPECIFICATION

1. KEYLESS ENTRY CONTROL MODULE



Content	Terminal No.	Measuring condition
Integrated module	2 (OUTPUT)	Battery voltage is present when pressing the transmitter LOCK/ARM button one time.
Power supply (Back-up)	3	Battery voltage is constantly present.
Door lock switch	5 (INPUT)	0 V is present when operating the door lock switch.
Trunk room light switch (Sedan), rear gate latch switch (Wagon)	6 (INPUT)	0 V is present when opening the trunk lid or rear gate.
Ground	8	0 V is constantly present.
Integrated module	9 (OUTPUT)	Battery voltage is present when pressing the transmitter UNLOCK/DISARM button one time.
Security control module	10	—
Security control module	11	—
Horn relay	12 (OUTPUT)	0 V is present when pressing the transmitter UNLOCK/DISARM or LOCK/ARM button.
Security control module	13	—
Ignition switch (ON)	14 (INPUT)	Battery voltage is present when ignition switch is turned ON.
Door unlock switch	15 (INPUT)	0 V is present when operating the door lock switch.
Key warning switch	16 (INPUT)	Battery voltage is present when inserting the key into the ignition switch.

2. INTEGRATED MODULE



Content	Terminal No.	Measuring condition
Door switch (Except driver's door)	A7 (INPUT)	0 V is present when any door is open (Except driver's door).
Door switch (Driver's door)	A8 (INPUT)	0 V is present when driver's door is open.
Door unlock switch	A11 (INPUT)	0 V is present when operating the door lock switch.
Door lock switch	A12 (INPUT)	0 V is present when operating the door lock switch.
Keyless entry control module	A13	—
Keyless entry control module	A14	—
Ignition switch (ON)	A19 (INPUT)	Battery voltage is present when iginition switch is turned ON.
Key warning switch	A20 (INPUT)	Battery voltage is present when inserting the key into ignition switch.
Power supply	B1	Battery voltage is constantly present.
Power supply	B2	Battery voltage is constantly present.
Ground	B4	0 V is constantly present.
Room light	B5 (OUTPUT)	0 V is present when pressing the transmitter UNLOCK/DISARM button one time.
Door and rear gate lock actuator	B6 (OUTPUT)	Battery voltage is present when pressing the transmitter LOCK/ARM button one time.
Door and rear gate lock actuator (Except driver side)	B7 (OUTPUT)	Battery voltage is present when pressing the transmitter UNLOCK/DISARM button two times.
Door lock actuator (Driver side)	B8 (OUTPUT)	Battery voltage is present when pressing the transmitter UNLOCK/DISARM button one time.
Ground	B13	0 V is constantly present.

C: INSPECTION

1. SYMPTOM CHART

Symptom	Repair order	Reference
None of the functions of the keyless entry system operate.	1. Check the transmitter battery and function.	<Ref. to SL-16, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
	2. Check the fuse.	<Ref. to SL-17, CHECK FUSE, INSPECTION, Keyless Entry System.>
	3. Check the keyless entry control module power supply and ground circuit.	<Ref. to SL-17, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Keyless Entry System.>
	4. Replace the keyless entry control module.	<Ref. to SL-49, Keyless Entry Control Module.>
The transmitter cannot be programmed.	1. Check the transmitter battery and function.	<Ref. to SL-16, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
	2. Check the ignition switch circuit.	<Ref. to SL-17, CHECK IGNITION SWITCH CIRCUIT, INSPECTION, Keyless Entry System.>
	3. Check the door switch.	<Ref. to SL-18, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	4. Replace the keyless entry control module.	<Ref. to SL-49, 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, Door Lock Control System.>	1. Check the transmitter battery and function.	<Ref. to SL-16, CHECK TRANSMITTER BATTERY AND FUNCTION, 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 the output signal to integrated module.	<Ref. to SL-20, CHECK OUTPUT SIGNAL TO INTEGRATED MODULE, INSPECTION, Keyless Entry System.>
	5. Replace the keyless entry control module.	<Ref. to SL-49, Keyless Entry Control Module.>
The panic alarm does not operate.	1. Check the transmitter battery and function.	<Ref. to SL-16, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
	2. Check the horn operation.	<Ref. to SL-19, CHECK HORN OPERATION, INSPECTION, Keyless Entry System.>
	3. Replace the keyless entry control module.	<Ref. to SL-49, Keyless Entry Control Module.>

Symptom	Repair order	Reference
The horn chirp does not operate.	1. Check the horn chirp function.	<Ref. to SL-16, CHECK HORN CHIRP SETTING, INSPECTION, Keyless Entry System.>
	2. Check the transmitter battery and function.	<Ref. to SL-16, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
	3. Check the key warning switch.	<Ref. to SL-19, CHECK KEY WARNING SWITCH, INSPECTION, Keyless Entry System.>
	4. Check the door switch.	<Ref. to SL-18, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	5. Check the horn operation.	<Ref. to SL-19, CHECK HORN OPERATION, INSPECTION, Keyless Entry System.>
	6. Replace the keyless entry control module.	<Ref. to SL-49, Keyless Entry Control Module.>
The room light operation does not activate.	1. Check the transmitter battery and function.	<Ref. to SL-16, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
	2. Check the room light operation.	<Ref. to SL-20, CHECK ROOM LIGHT OPERATION, INSPECTION, Keyless Entry System.>
	3. Check the key warning switch.	<Ref. to SL-19, CHECK KEY WARNING SWITCH, INSPECTION, Keyless Entry System.>
	4. Check the door switch.	<Ref. to SL-18, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	5. Check the output signal to integrated module.	<Ref. to SL-20, CHECK OUTPUT SIGNAL TO INTEGRATED MODULE, INSPECTION, Keyless Entry System.>
	6. Replace the keyless entry control module.	<Ref. to SL-49, Keyless Entry Control Module.>
The door warning does not operate.	1. Check the transmitter battery and function.	<Ref. to SL-16, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
	2. Check the door switch.	<Ref. to SL-18, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	3. Check the horn operation.	<Ref. to SL-19, CHECK HORN OPERATION, INSPECTION, Keyless Entry System.>
	4. Replace the keyless entry control module.	<Ref. to SL-49, Keyless Entry Control Module.>

2. CHECK TRANSMITTER BATTERY AND FUNCTION

	Step	Check	Yes	No
1	**CHECK TRANSMITTER BATTERY.** 1)Remove the battery from the transmitter. <Ref. to SL-51, REMOVAL, Keyless Transmitter.> 2)Check the battery voltage. <Ref. to SL-51, INSPECTION, Keyless Transmitter.>	Is the voltage more than 2 V?	Go to step **2.**	Replace the transmitter battery.
2	**CHECK LED OF TRANSMITTER.** 1)Press the LOCK/ARM or UNLOCK/DISARM button six times to synchronize with the keyless entry control module. 2)Press the LOCK/ARM button.	Does the LED blink one time?	Go to step **3.**	Replace the transmitter. <Ref. to SL-51, REPLACEMENT, Keyless Transmitter.>
3	**CHECK LED OF TRANSMITTER.** Keep the LOCK/ARM button pressed.	Does the LED blink one time and then turn on?	Go to step **4.**	Replace the transmitter. <Ref. to SL-51, REPLACEMENT, Keyless Transmitter.>
4	**CHECK LED OF TRANSMITTER.** Press the UNLOCK/DISARM button.	Does the LED blink one time?	Go to step **5.**	Replace the transmitter. <Ref. to SL-51, REPLACEMENT, Keyless Transmitter.>
5	**CHECK LED OF TRANSMITTER.** Keep the UNLOCK/DISARM button pressed.	Does the LED blink two times?	The transmitter is OK.	Replace the transmitter. <Ref. to SL-51, REPLACEMENT, Keyless Transmitter.>

3. CHECK HORN CHIRP SETTING

	Step	Check	Yes	No
1	**CHECK HORN CHIRP SETTING.** Check the current setting of the horn chirp. 1)Remove the key from the ignition switch. 2)Close all doors and the rear gate or trunk lid. 3)Press the LOCK/ARM or UNLOCK/DISARM button.	Does the horn signal chirp?	The horn chirp function is OK.	Go to step **2.**
2	**CHECK HORN CHIRP SETTING.** 1)Press the UNLOCK/DISARM button once. 2)Press both the LOCK/ARM and UNLOCK/DISARM button for more than 2 seconds. 3)Press the LOCK/ARM or UNLOCK/DISARM button.	Does the horn signal chirp?	The horn chirp function is OK.	Check the transmitter function. <Ref. to SL-16, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>

4. CHECK FUSE

	Step	Check	Yes	No
1	**CHECK FUSE.** Remove and visually check the fuse No. 2 (in the main fuse box)	Is the fuse blown? (15 A)	Replace the fuse with a new one.	Check the power supply and ground circuit. <Ref. to SL-17, CHECK POWER SUPPLY AND GROUND CIRCUIT, Keyless Entry System.>

5. CHECK POWER SUPPLY AND GROUND CIRCUIT

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY.** 1)Disconnect the keyless entry control module harness connector. 2)Measure the voltage between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B176) No. 3 (+) — chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open circuits and shorts between the keyless entry control module and fuse.
2	**CHECK GROUND CIRCUIT.** Measure the resistance between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B176) No. 8 — chassis ground:***	Is the resistance less than 10 Ω?	The power supply and ground circuit are OK.	Repair the harness.

6. CHECK IGNITION SWITCH CIRCUIT

	Step	Check	Yes	No
1	**CHECK IGNITION SWITCH SIGNAL.** 1)Disconnect the keyless entry control module harness connector. 2)Turn the ignition switch ON. 3)Measure the voltage between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B176) No. 14 (+) — chassis ground (–):***	Is the voltage more than 10 V?	The ignition switch circuit is OK.	Check the harness for open circuits and shorts between the keyless entry control module and ignition relay.

7. CHECK DOOR SWITCH

	Step	Check	Yes	No
1	**CHECK DOOR SWITCH CIRCUIT.** Measure the voltage between the keyless entry control module harness connector terminal and chassis ground. ***Connector & terminal*** ***Front and rear door:*** ***(B176) No. 7 (+) — chassis ground (–):*** ***Rear gate or trunk lid:*** ***(B176) No. 6 (+) — chassis ground (–):***	Is the voltage 0 V when each door, rear gate and trunk lid is opened?	Go to step **2.**	Go to step **3.**
2	**CHECK DOOR SWITCH CIRCUIT.** Measure the voltage between the keyless entry control module harness connector terminal and chassis ground. ***Connector & terminal*** ***Front and rear door:*** ***(B176) No. 7 (+) — chassis ground (–):*** ***Rear gate or trunk lid:*** ***(B176) No. 6 (+) — chassis ground (–):***	Is the voltage approx. 10 V when each door, rear gate and trunk lid is closed?	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 the door switch terminals. ***Terminal*** ***Front LH No. 1 — No. 3:*** ***Front RH No. 1 — No. 3:*** ***Rear LH No. 1 — No. 3:*** ***Rear RH No. 1 — No. 3:*** ***Rear gate No. 1 — No. 2:*** ***Trunk lid No. 1 — No. 2:***	Is the resistance more than 1 MΩ when the door switch is pushed?	Go to step **4.**	Replace the door switch.
4	**CHECK DOOR SWITCH.** Measure the resistance between the door switch terminals. ***Terminal*** ***Front LH No. 1 — No. 3:*** ***Front RH No. 1 — No. 3:*** ***Rear LH No. 1 — No. 3:*** ***Rear RH No. 1 — No. 3:*** ***Rear gate No. 1 — No. 2:*** ***Trunk lid No. 1 — No. 2:***	Is the resistance less than 1 Ω when the door switch is released?	Check the harness for open circuits and shorts between the keyless entry control module and door switch.	Replace the door switch.

8. CHECK KEY WARNING SWITCH

	Step	Check	Yes	No
1	**CHECK FUSE.** Remove and visually check the fuse No. 6 (in the main fuse box).	Is the fuse blown? (15A)	Replace the fuse with a new one.	Go to step **2.**
2	**CHECK KEY WARNING SWITCH CIRCUIT.** 1)Disconnect the keyless entry control module harness connector. 2)Insert the key into the ignition switch. (LOCK position) 3)Measure the voltage between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B176) No. 16 (+) — chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Go to step **4.**
3	**CHECK KEY WARNING SWITCH CIRCUIT.** 1)Remove the key from the ignition switch. 2)Measure the voltage between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B176) No. 16 (+) — chassis ground (–):***	Is the voltage 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 the ignition switch. (LOCK position) 3)Measure the resistance between the key warning switch terminals. ***Terminal*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Go to step **5.**	Replace the key warning switch.
5	**CHECK KEY WARNING SWITCH.** 1)Remove the key from the ignition switch. 2)Measure the resistance between the key warning switch terminals. ***Terminal*** ***No. 1 — No. 2:***	Is the resistance more than 1 MΩ?	**Check the following:** • Harness for open circuits and 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.

9. CHECK HORN OPERATION

	Step	Check	Yes	No
1	**CHECK HORN OPERATION.** Make sure the horn sounds when the horn switch is pushed.	Does the horn sound?	Go to step **2.**	Check the horn circuit.
2	**CHECK HORN OPERATION.** 1)Disconnect the keyless entry control module harness connector. 2)Ground the harness connector terminal with a suitable wire. ***Connector & terminal*** ***(B176) No. 12 — chassis ground:***	Does the horn sound?	Replace the keyless entry control module.	Check the harness for open circuits and/or shorts between the keyless entry control module and horn relay.

10.CHECK ROOM LIGHT OPERATION

	Step	Check	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?	Go to step **2.**	Check the room light circuit.
2	**CHECK HARNESS BETWEEN ROOM LIGHT AND INTEGRATED MODULE.** 1)Disconnect the integrated module harness connector and room light harness connector. 2)Measure the resistance between the integrated module harness connector terminal and the room light harness connector terminal. ***Connector & terminal*** ***(B281) No. 5 — (R52) No. 2:***	Is resistance less than 10 Ω?	The room light operation circuit is OK.	Check the harness for open circuits and/or shorts between the integrated module and room light.

11.CHECK OUTPUT SIGNAL TO INTEGRATED MODULE

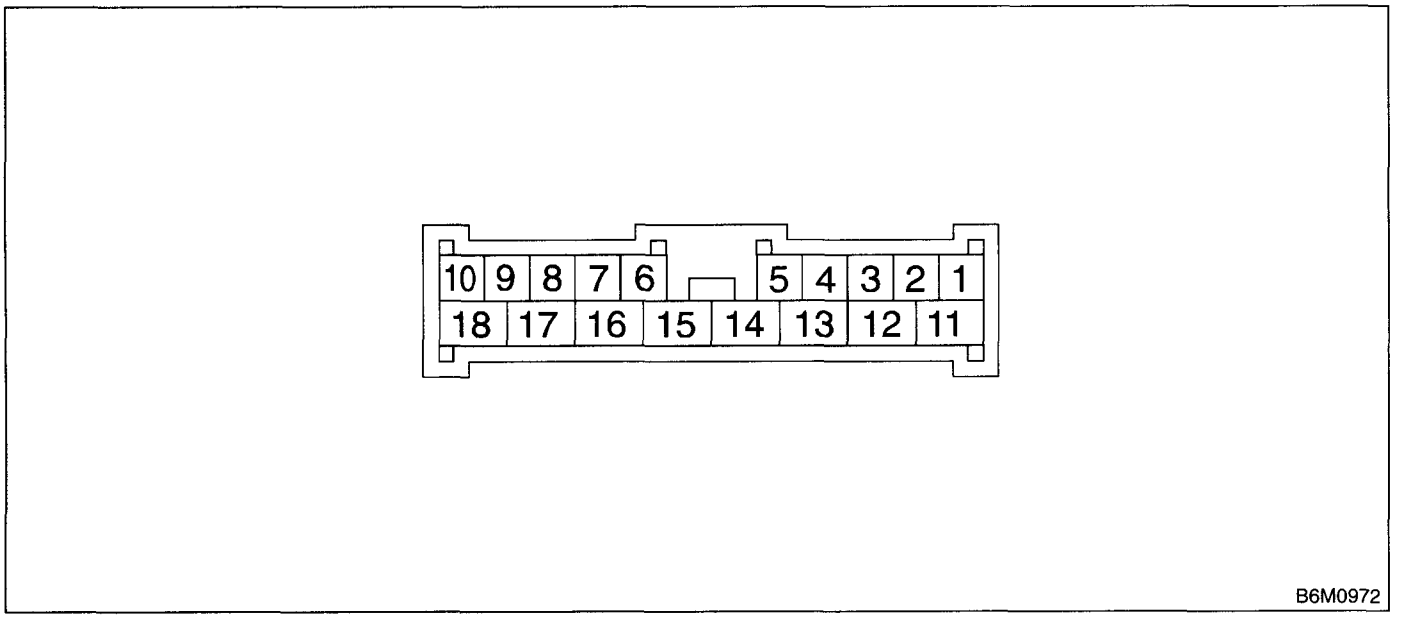
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL.** Measure the voltage between the keyless entry control module harness connector terminal and chassis ground when UNLOCK/DISARM button of transmitter is pressed. ***Connector & terminal*** ***(B176) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 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/ARM button of transmitter is pressed. ***Connector & terminal*** ***(B176) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Replace the keyless entry control module.
3	**CHECK HARNESS BETWEEN KEYLESS ENTRY CONTROL MODULE AND INTEGRATED MODULE.** 1)Disconnect the keyless entry control module harness connector and integrated module harness connector. 2)Measure the resistance between the keyless entry control module harness connector terminal and integrated module harness conector terminal. ***Connector & terminal*** ***(B176) No. 9 — (B280) No. 14:*** ***(B176) No. 2 — (B280) No. 13:***	Is the resistance less than 10 Ω?	Replace the integrated module.	Check the harness for open circuit or shorts between the keyless entry control module and integrated module.

4. Security System

A: SCHEMATIC

<Ref. to WI-121, SCHEMATIC, Security System.>

B: ELECTRICAL SPECIFICATION



Content	Terminal No.	Measuring condition
Empty	1	—
Ignition switch (ON)	2 (INPUT)	Battery voltage is present when ignition switch is turned ON.
Passive arm	3	—
Trunk room light switch (Sedan), rear gate latch switch (Wagon)	4 (INPUT)	0 V is present when trunk room light switch or rear gate latch switch is turned ON.
Door switch	5 (INPUT)	0 V is present when any door is open.
Empty	6	—
Keyless entry control module	7	—
Keyless entry control module	8	—
Security indicator light	9 (OUTPUT)	0 V is present when activating the alarm operation.
Keyless entry control module	10	—
Power supply for clearance light (Back-up)	11	Battery voltage is constantly present.
Clearance light	12 (OUTPUT)	Battery voltage is present when activating the alarm operation.
Power supply (Back-up)	13	Battery voltage is constantly present.
Ground	14	0 V is constantly present.
Interrupt relay	15 (OUTPUT)	Battery voltage is present when activating the alarm operation.
Security horn relay	16 (INPUT)	Battery voltage is present when activating the alarm operation.
Security horn	17 (OUTPUT)	Battery voltage is present when activating the alarm operation.
Security horn relay	18 (INPUT)	Battery voltage is present when activating the alarm operation.

C: INSPECTION

1. BASIC DIAGNOSTIC PROCEDURE

	Step	Check	Yes	No
1	**CHECK SECURITY SYSTEM SET OPERATION.** 1)Before starting this diagnosis, open all windows. 2)Remove the key from ignition key cylinder, and then close all doors and rear gate or trunk lid. 3)Press the LOCK/ARM button of transmitter.	Can the security system be set?	Go to step **2.**	Go to symptom 1. <Ref. to SL-23, SYMPTOM CHART, INSPECTION, Security System.>
2	**CHECK SECURITY INDICATOR LIGHT AND CLEARANCE LIGHT BLINKING.** Check the security indicator light and clearance light blinking.	Do the security indicator light and clearance light blink?	Go to step **3.**	Go to symptom 2. <Ref. to SL-23, SYMPTOM CHART, INSPECTION, Security System.>
3	**CHECK SECURITY ALARM OPERATION.** 1)Unlock all doors using the door lock switch on front door. 2)Open any door, rear gate or trunk lid.	Does the security system not alarm when one of the doors is opened?	Go to symptom 3. <Ref. to SL-23, SYMPTOM CHART, INSPECTION, Security System.>	Go to step **4.**
4	**CHECK SECURITY ALARM OPERATION.** Check the security alarm operation.	Does the security alarm (horn, clearance light and security indicator light) operate? And is the starter motor deactivated?	Go to step **5.**	Go to symptom 4. <Ref. to SL-23, SYMPTOM CHART, INSPECTION, Security System.>
5	**CHECK SECURITY ALARM CANCEL OPERATION.** Press the UNLOCK/DISARM button of transmitter.	Does the security alarm (horn and clearance light) stop? And is the starter motor activated?	Go to step **6.**	Go to symptom 5. <Ref. to SL-23, SYMPTOM CHART, INSPECTION, Security System.>
6	**CHECK BATTERY DISCONNECT PROTECTION.** Check the battery disconnect protection. <Ref. to SL-22, CHECK BATTERY DISCONNECT PROTECTION, INSPECTION, Security System.>	Is the battery disconnect protection OK?	Go to step **7.**	Replace the security control module.
7	**PERFORM IMPACT SENSITIVITY TEST.** Perform the impact sensitivity test. <Ref. to SL-45, IMPACT SENSITIVITY TEST, INSPECTION, Security Control Module.>	Is the impact sensitivity OK?	Press the UNLOCK/DISARM button of transmitter, and finish the diagnosis.	Replace the security control module.

2. CHECK BATTERY DISCONNECT PROTECTION

1) Remove the key from the ignition switch.
2) Close all the doors and rear gate or trunk lid.
3) Open the front hood.
4) Press the LOCK/ARM button of the transmitter.
5) Disconnect the ground cable from the battery.
6) Reconnect the cable to the battery.
7) Check that the security indicator light blinks after reconnecting the battery cable.

If NG, replace the security control module.

3. SYMPTOM CHART

	Symptom		Repair order	Reference
1	The security system cannot be set.		1. Check the transmitter function.	<Ref. to SL-16, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
			2. Check the fuse.	<Ref. to SL-24, CHECK FUSE, INSPECTION, Security System.>
			3. Check the security control module power supply and ground circuit.	<Ref. to SL-24, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Security System.>
			4. Check the door switch.	<Ref. to SL-24, CHECK DOOR SWITCH, INSPECTION, Security System.>
			5. Replace the security control module.	<Ref. to SL-45, Security Control Module.>
2	The security system can be set, but the security indicator light or clearance light does not blink.	Security indicator light	Check the security indicator light circuit.	<Ref. to SL-25, CHECK SECURITY INDICATOR LIGHT CIRCUIT, INSPECTION, Security System.>
		Clearance light	Check the clearance light operation.	<Ref. to SL-27, CHECK CLEARANCE LIGHT OPERATION, INSPECTION, Security System.>
3	The security system does not alarm when one of the door is opened.		Check the door switch.	<Ref. to SL-24, CHECK DOOR SWITCH, INSPECTION, Security System.>
4	The security alarm does not activate.	All functions	Check the door switch.	<Ref. to SL-24, CHECK DOOR SWITCH, INSPECTION, Security System.>
		Security indicator light	Check the security indicator light circuit.	<Ref. to SL-25, CHECK SECURITY INDICATOR LIGHT CIRCUIT, INSPECTION, Security System.>
		Security horn	Check the security horn.	<Ref. to SL-26, CHECK SECURITY HORN, INSPECTION, Security System.>
		Clearance light	Check the clearance light operation.	<Ref. to SL-27, CHECK CLEARANCE LIGHT OPERATION, INSPECTION, Security System.>
		Starter motor deactivation	Check the interrupt relay circuit.	<Ref. to SL-27, CHECK INTERRUPT RELAY CIRCUIT, INSPECTION, Security System.>
5	The security system cannot be canceled.	Transmitter	Check the transmitter function.	<Ref. to SL-16, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
		Ignition switch	Check the ignition switch circuit.	<Ref. to SL-27, CHECK IGNITION SWITCH CIRCUIT, INSPECTION, Security System.>

4. CHECK FUSE

	Step	Check	Yes	No
1	**CHECK FUSE.** Remove and visually check the fuse No. 2 and 7 (in main fuse box).	Is the fuse blown? (15 A and 20 A)	Replace the fuse with a new one.	Check the power supply and ground circuit. <Ref. to SL-24, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Security System.>

5. CHECK POWER SUPPLY AND GROUND CIRCUIT

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY.** 1)Disconnect the security control module harness connector. 2)Measure the voltage between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B93) No. 11 (+) — chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open circuits and shorts between the security control module and fuse.
2	**CHECK POWER SUPPLY.** 1)Disconnect the security control module harness connector. 2)Measure the voltage between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B93) No. 13 (+) — chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Check the harness for open circuits and shorts between the security control module and fuse.
3	**CHECK GROUND CIRCUIT.** Measure the resistance between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B93) No. 14 — chassis ground:***	Is the resistance less than 10 Ω?	The power supply and ground circuit are OK.	Repair the harness.

6. CHECK DOOR SWITCH

	Step	Check	Yes	No
1	**CHECK DOOR SWITCH CIRCUIT.** Measure the voltage between the security control module harness connector terminal and chassis ground. ***Connector & terminal*** ***Front and rear door:*** ***(B93) No. 5 (+) — chassis ground (–):*** ***Rear gate or trunk lid:*** ***(B93) No. 4 (+) — chassis ground (–):***	Is the voltage 0 V when each door, rear gate or trunk lid is opened?	Go to step **2.**	Go to step **3.**
2	**CHECK DOOR SWITCH CIRCUIT.** Measure the voltage between the security control module harness connector terminal and chassis ground. ***Connector & terminal*** ***Front and rear door:*** ***(B93) No. 5 (+) — chassis ground (–):*** ***Rear gate or trunk lid:*** ***(B93) No. 4 (+) — chassis ground (–):***	Is the voltage approx. 10 V when each door, rear gate or trunk lid is closed?	The door switch is OK.	Go to step **3.**

	Step	Check	Yes	No
3	**CHECK DOOR SWITCH.** 1)Disconnect the door switch harness connector. 2)Measure the resistance between the door switch terminals. ***Terminal*** ***Front LH No. 1 — No. 3:*** ***Front RH No. 1 — No. 3:*** ***Rear LH No. 1 — No. 3:*** ***Rear RH No. 1 — No. 3:*** ***Rear gate No. 1 — No. 2:*** ***Trunk lid No. 1 — No. 2:***	Is the resistance more than 1 MΩ when the door switch is pushed?	Go to step **4.**	Replace the door switch.
4	**CHECK DOOR SWITCH.** Measure the resistance between the door switch terminals. ***Terminal*** ***Front LH No. 1 — No. 3:*** ***Front RH No. 1 — No. 3:*** ***Rear LH No. 1 — No. 3:*** ***Rear RH No. 1 — No. 3:*** ***Rear gate No. 1 — No. 2:*** ***Trunk lid No. 1 — No. 2:***	Is the resistance less than 1Ω when the door switch is released?	Check the harness for open circuits and shorts between the security control module and door switch.	Replace the door switch.

7. CHECK SECURITY INDICATOR LIGHT CIRCUIT

	Step	Check	Yes	No
1	**CHECK SECURITY INDICATOR LIGHT.** 1)Disconnect the security control module harness connector. 2)Ground the harness connector terminal with a suitable wire. ***Connector & terminal*** ***(B93) No. 9 — chassis ground:***	Does the security indicator light illuminate?	Replace the security control module.	Go to step **2.**
2	**CHECK POWER SUPPLY FOR SECURITY INDICATOR LIGHT.** 1)Disconnect the connector from the combination meter. 2)Measure the voltage between the combination meter harness connector terminal and chassis ground. ***Connector & terminal*** ***(i10) No. 10 (+) — chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Check the harness for open circuits and shorts between the combination meter and the fuse.
3	**CHECK SECURITY INDICATOR LIGHT CIRCUIT.** Measure the resistance between the combination meter harness connector terminal and security control module harness connector terminal. ***Connector & terminal*** ***(i11) No. 6 — (B93) No. 9:***	Is the resistance less than 10 Ω?	Replace the combination meter printed circuit.	Check the harness for open circuits and shorts between the combination meter and security control module.

8. CHECK SECURITY HORN

	Step	Check	Yes	No
1	**CHECK SECURITY HORN RELAY.** Remove and check the security horn relay. <Ref. to SL-47, Security Horn Relay.>	Is the security horn relay OK?	Go to step **2.**	Replace the security horn relay.
2	**CHECK POWER SUPPLY FOR SECURITY HORN RELAY.** Measure the voltage between the security horn relay harness connector terminal and chassis ground. ***Connector & terminal*** ***(B243) No. 1 (+) — chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Check the harness for open circuits and shorts between the security horn relay and horn relay.
3	**CHECK POWER SUPPLY FOR SECURITY HORN RELAY.** Measure the voltage between the security horn relay harness connector terminal and chassis ground. ***Connector & terminal*** ***(B243) No. 2 (+) — chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Check the harness for open circuits and shorts between the security horn relay and the fuse.
4	**CHECK HARNESS BETWEEN SECURITY HORN RELAY AND SECURITY CONTROL MODULE.** 1)Disconnect the security control module harness connector. 2)Measure the resistance between the security horn relay harness connector terminal and security control module harness connector terminal. ***Connector & terminal*** ***(B243) No. 3 — (B93) No. 18:***	Is the resistance less than 10 Ω?	Go to step **5.**	Check the harness for open circuits and shorts between the security horn relay and security control module.
5	**CHECK HARNESS BETWEEN SECURITY HORN RELAY AND SECURITY CONTROL MODULE.** Measure the resistance between the security horn relay harness connector terminal and security control module harness connector terminal. ***Connector & terminal*** ***(B243) No. 4 — (B93) No. 16:***	Is the resistance less than 10 Ω?	Go to step **6.**	Check the harness for open circuits and shorts between the security horn relay and security control module.
6	**CHECK HARNESS BETWEEN SECURITY CONTROL MODULE AND SECURITY HORN.** 1)Disconnect the security horn harness connector. 2)Measure the resistance between the security control module harness connector terminal and security horn harness connector terminal. ***Connector & terminal*** ***(B93) No. 17 — (B204) No. 1:***	Is the resistance less than 10 Ω?	Go to step **7.**	Check the harness for open circuits and shorts between the security control module and security horn.
7	**CHECK SECURITY HORN.** Remove and check the security horn. <Ref. to SL-46, Security Horn.>	Is the security horn OK?	Replace the security control module.	Replace the security horn.

9. CHECK CLEARANCE LIGHT OPERATION

	Step	Check	Yes	No
1	**CHECK CLEARANCE LIGHT OPERATION.** Turn the parking switch ON and check if the clearance light illuminates.	Does the clearance light illuminate?	Go to step **2.**	Check the clearance light circuit.
2	**CHECK POWER SUPPLY FOR SECURITY CONTROL MODULE.** 1)Turn the parking switch OFF. 2)Disconnect the security control module harness connector. 3)Measure the voltage between the security control module harness connector terminal and chassis ground. ***Connector & terminal*** ***(B93) No. 11 (+) — chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Check the harness for open circuits and shorts between the security control module and the fuse.
3	**CHECK HARNESS BETWEEN SECURITY CONTROL MODULE AND FUSE BOX.** 1)Disconnect the fuse box harness connector (B152). 2)Measure the resistance between the security control module harness connector terminal and fuse box harness connector terminal. ***Connector & terminal*** ***(B93) No. 12 — (B152) No. 11:***	Is the resistance less than 10 Ω?	Replace the security control module.	Check the harness for open circuits and shorts between the security control module and the fuse.

10.CHECK INTERRUPT RELAY CIRCUIT

	Step	Check	Yes	No
1	**CHECK INTERRUPT RELAY.** Remove and check the interrupt relay. <Ref. to SL-48, Interrupt Relay.>	Is the interrupt relay OK?	Go to step **2.**	Replace the interrupt relay.
2	**CHECK POWER SUPPLY FOR INTERRUPT RELAY.** Measure the voltage between the interrupt relay harness connector terminal and chassis ground. ***Connector & terminal*** ***(B59) No. 1 (+) — chassis ground (–):***	Is the voltage more than 10 V when the ignition switch is turned to START?	Go to step **3.**	Check the harness for open circuits and shorts between the interrupt relay and ignition switch.
3	**CHECK HARNESS BETWEEN INTERRUPT RELAY AND SECURITY CONTROL MODULE.** Measure the resistance between the interrupt relay harness connector terminal and security control module harness connector terminal. ***Connector & terminal*** ***(B59) No. 4 — (B93) No. 15:***	Is the resistance less than 10 Ω?	Replace the security control module.	Check the harness for open circuits and shorts between the interrupt relay and security control module.

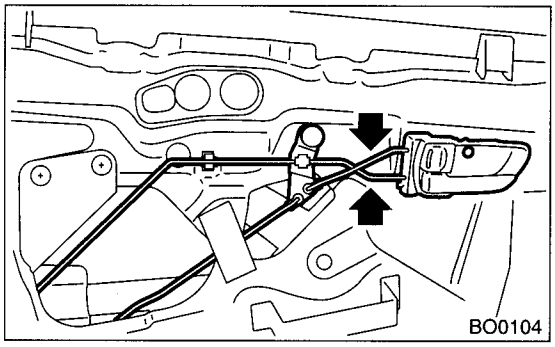
11.CHECK IGNITION SWITCH CIRCUIT

	Step	Check	Yes	No
1	**CHECK IGNITION SWITCH SIGNAL.** 1)Disconnect the security control module harness connector. 2)Turn the ignition switch ON. 3)Measure the voltage between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B93) No. 2 (+) — chassis ground (–):***	Is the voltage more than 10 V?	The ignition switch circuit is OK.	Check the harness for open circuits and shorts between the security control module and ignition switch.

5. Front Inner Remote

A: REMOVAL

1) Remove the door trim. <Ref. to EI-37, REMOVAL, Front Door Trim.>
2) Remove the sealing cover. <Ref. to EB-14, REMOVAL, Front Sealing Cover.>
3) Remove the screw and the two rod joints.
4) Remove the front inner remote.



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Make sure the lock works properly after installation.

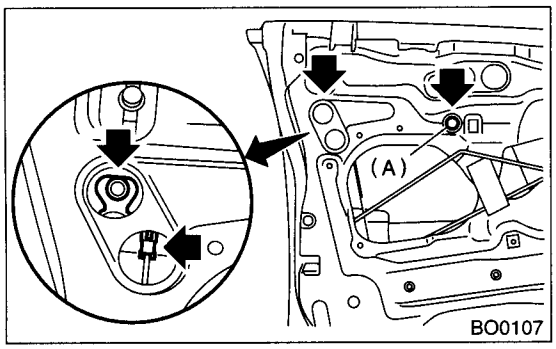
C: INSPECTION

1) Make sure the rod is not deformed.
2) Make sure the lever and rod work smoothly.

6. Front Outer Handle

A: REMOVAL

1) Remove the door trim. <Ref. to EI-37, REMOVAL, Front Door Trim.>
2) Remove the sealing cover. <Ref. to EB-14, REMOVAL, Front Sealing Cover.>
3) Remove bolt (A).
4) Move the front door glass downward. Remove the bolt and rod clamp.
5) Remove the front outer handle.



CAUTION:
Do not use excessive force to remove the door panel. This will deform it.

B: INSTALLATION

Install in the reverse order of removal.

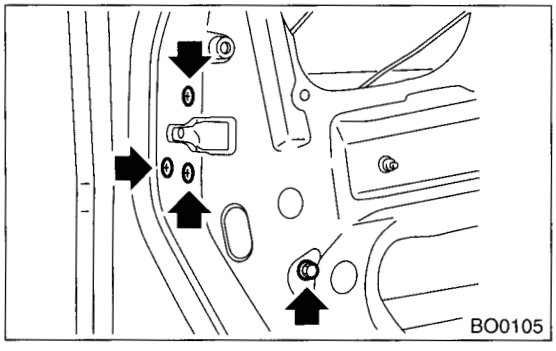
C: INSPECTION

1) Make sure the rod is not deformed.
2) Make sure the lever and rod work smoothly.

7. Front Door Latch Assembly

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the front door trim. <Ref. to EI-37, REMOVAL, Front Door Trim.>
3) Remove the sealing cover. <Ref. to EB-14, REMOVAL, Front Sealing Cover.>
4) Remove the front inner remote. <Ref. to SL-28, REMOVAL, Front Inner Remote.>
5) Remove the three screws and bolt.



6) Disconnect the connector. Remove the front door latch assembly.

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Make sure the lock works properly after installation.

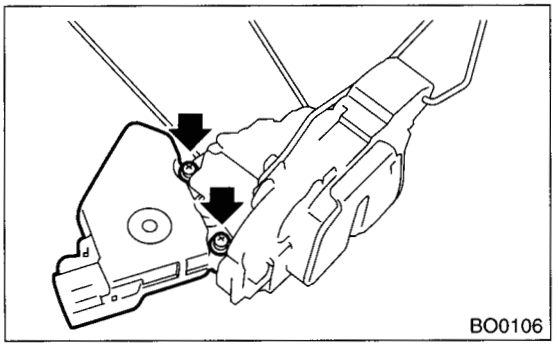
C: INSPECTION

1) Make sure the rod is not deformed.
2) Make sure the lever and rod work smoothly.

8. Front Door Lock Actuator

A: REMOVAL

1) Remove the front door latch assembly. <Ref. to SL-28, REMOVAL, Front Inner Remote.>
2) Loosen two screws to remove the front door lock acutuator.

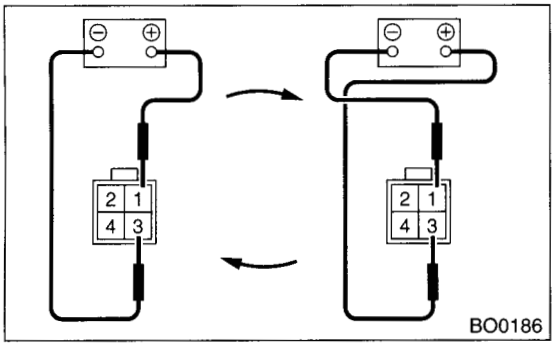


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1) Disconnect the door lock actuator harness connector.
2) Connect the battery to the door lock actuator terminals.



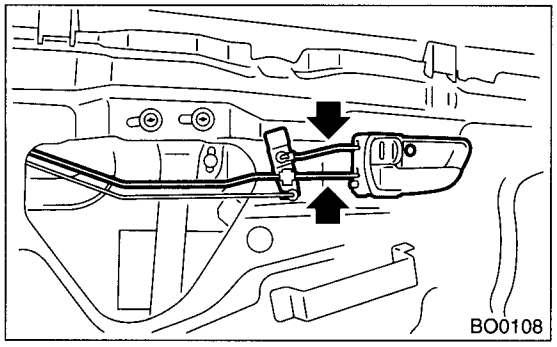
Terminal No.	Actuator operation
No. 3 (+) and No. 1 (–)	Unlocked → Locked
No. 1 (+) and No. 3 (–)	Locked → Unlocked

If NG, replace the door lock actuator.

9. Rear Inner Remote

A: REMOVAL

1) Remove the rear door trim. <Ref. to EI-38, REMOVAL, Rear Door Trim.>
2) Remove the sealing cover. <Ref. to EB-17, REMOVAL, Rear Sealing Cover.>
3) Remove the screw and the two rod joints.
4) Remove the inner remote.



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Make sure the lock works properly after installation.

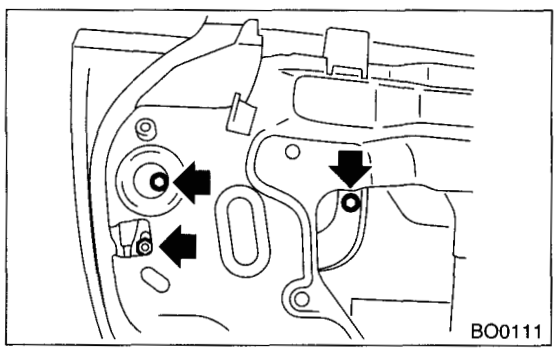
C: INSPECTION

1) Make sure the rod is not deformed.
2) Make sure the lever and rod work smoothly.
3) Make sure the child safety lock on rear doors work properly, when applicable.

10.Rear Outer Handle

A: REMOVAL

1) Remove the rear door trim. <Ref. to EI-38, REMOVAL, Rear Door Trim.>
2) Remove the sealing cover. <Ref. to EB-17, REMOVAL, Rear Sealing Cover.>
3) Remove the rear inner remote. <Ref. to SL-32, REMOVAL, Rear Inner Remote.>
4) Remove the rear door latch assembly. <Ref. to SL-34, REMOVAL, Rear Door Latch Assembly.>
5) Loosen two bolts and nut to remove the rear outer handle.



CAUTION:
Do not use excessive force to remove the door panel. This will deform it.

B: INSTALLATION

Install in the reverse order of removal.

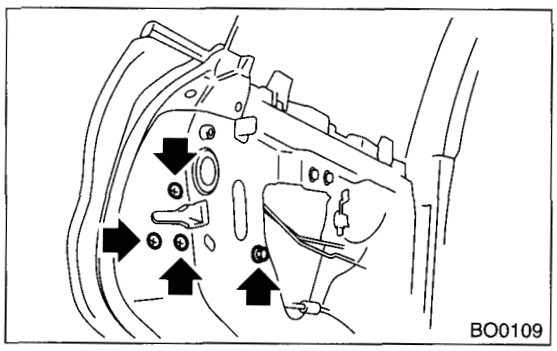
C: INSPECTION

1) Make sure the rod is not deformed.
2) Make sure the lever and rod work smoothly.

11.Rear Door Latch Assembly

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the rear door trim. <Ref. to EI-38, REMOVAL, Rear Door Trim.>
3) Remove the sealing cover. <Ref. to EB-17, REMOVAL, Rear Sealing Cover.>
4) Remove the rear inner remote. <Ref. to SL-32, REMOVAL, Rear Inner Remote.>
5) Remove the three screws and bolt.



6) Disconnect the connector, and then remove the rear door latch assembly.

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Make sure the lock works properly after installation.

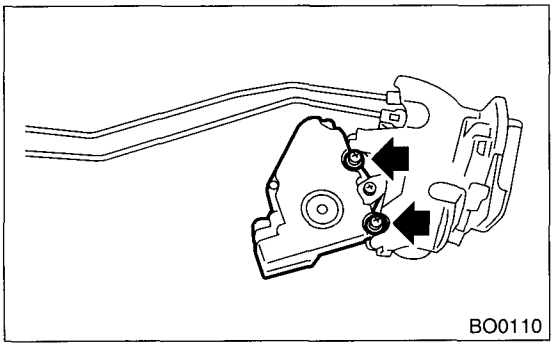
C: INSPECTION

1) Make sure the rod is not deformed.
2) Make sure the lever and rod work smoothly.

12.Rear Door Lock Actuator

A: REMOVAL

1) Remove the rear door latch assembly. <Ref. to SL-34, REMOVAL, Rear Door Latch Assembly.>
2) Loosen two screws to remove the rear door lock acutuator.



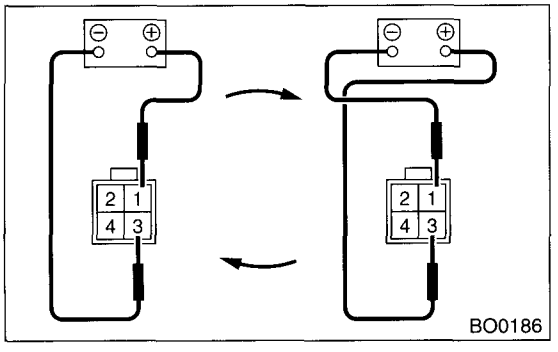
B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Make sure the lock works properly after installation.

C: INSPECTION

1) Disconnect the door lock actuator harness connector.
2) Connect the battery to the door lock actuator terminals.



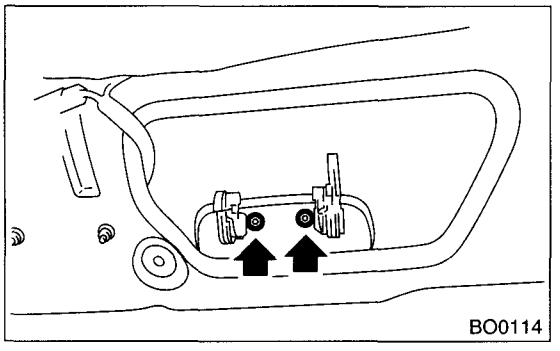
Terminal No.	Actuator operation
No. 3 (+) and No. 1 (–)	Unlocked → Locked
No. 1 (+) and No. 3 (–)	Locked → Unlocked

If NG, replace the door lock actuator.

13.Rear Gate Outer Handle

A: REMOVAL

1) Remove the rear gate trim. <Ref. to EI-52, REMOVAL, Rear Gate Trim.>
2) Remove the rear gate latch assembly. <Ref. to SL-37, REMOVAL, Rear Gate Latch Assembly.>
3) Loosen two nuts to remove the rear gate outer handle.



B: INSTALLATION

Install in the reverse order of removal.

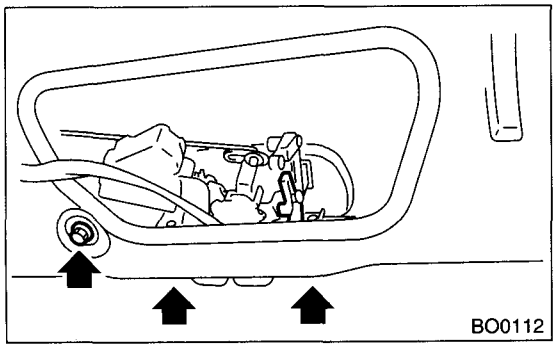
C: INSPECTION

1) Inspect the rod for deformation.
2) Make sure the lever and rod move smoothly.

14.Rear Gate Latch Assembly

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the rear gate trim. <Ref. to EI-52, REMOVAL, Rear Gate Trim.>
3) Remove the rear gate key cylinder rod clamp.
4) Remove the three bolts.



5) Disconnect the connectors, and then remove the rear gate latch assembly.

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Make sure the lock works properly after installation.

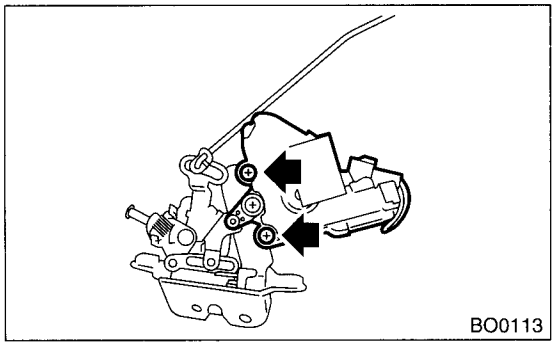
C: INSPECTION

1) Make sure the rod is not deformed.
2) Make sure the lever and rod work smoothly.

15.Rear Gate Latch Lock Actuator

A: REMOVAL

1) Remove the rear gate latch assembly. <Ref. to SL-37, REMOVAL, Rear Gate Latch Assembly.>
2) Loosen two screws to remove the rear gate lock actuator.

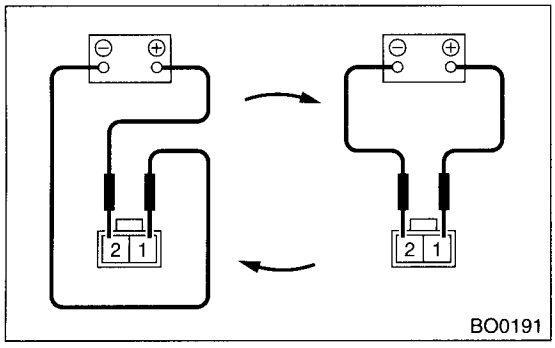


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1) Disconnect the door lock actuator harness connector.
2) Connect the battery to the door lock actuator terminals.



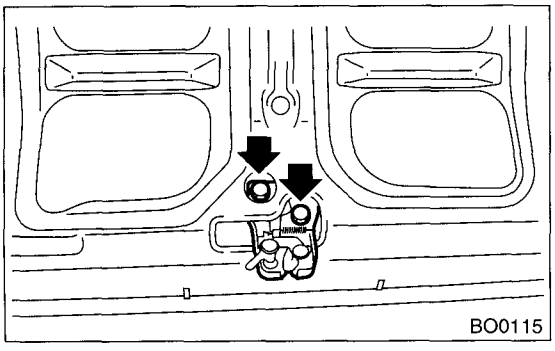
Terminal No.	Actuator operation
No. 1 (+) and No. 2 (–)	Unlocked → Locked
No. 2 (+) and No. 1 (–)	Locked → Unlocked

If NG, replace the rear gate latch lock actuator.

16.Trunk Lid Lock Assembly

A: REMOVAL

1) Remove the trunk lid key cylinder rod clamp.
2) Loosen two bolts to remove the trunk lid lock assembly.



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
- **Apply grease to the parts that rub.**
- **Make sure the lock works properly after installation.**

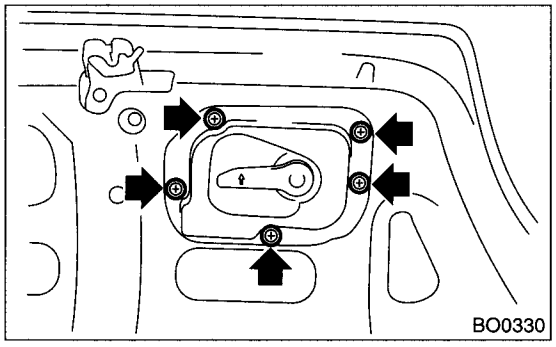
C: INSPECTION

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.

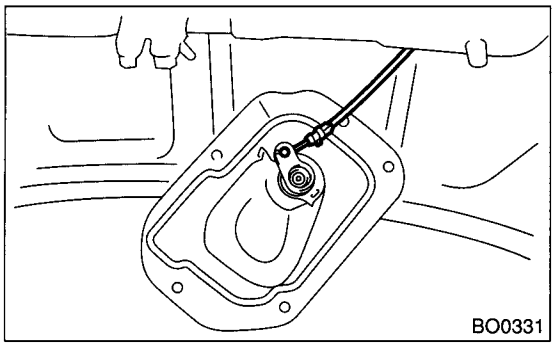
17.Trunk Lid Release Handle

A: REMOVAL

1) Remove the five clips.



2) Remove the cable from trunk lid release handle.



B: INSTALLATION

Install in the reverse order of removal.

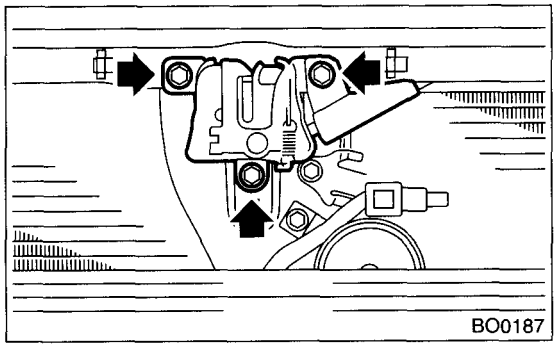
C: INSPECTION

1) Make sure the cable is not deformed.
2) Make sure the lever works smoothly.

18.Front Hood Lock Assembly

A: REMOVAL

1) Open the hood.
2) Remove the bolt. Remove the hood lock assembly.
3) Remove the release cable from the lock assembly.



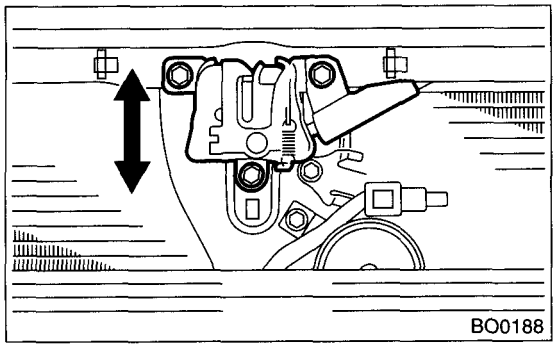
B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
- **Apply grease to the 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

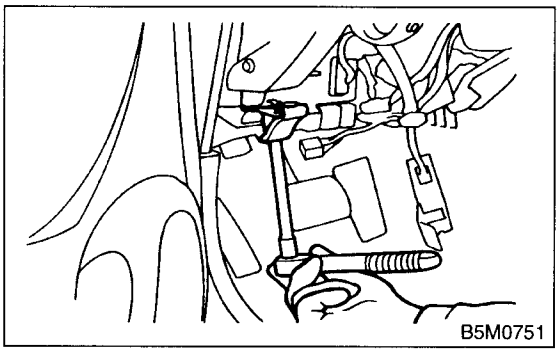
1) Check the striker for bending or abnormal wear.
2) Check the safety lever for improper movement.
3) Check other levers and the spring for rust formation and unsmooth movement.

19.Remote Openers

A: REMOVAL

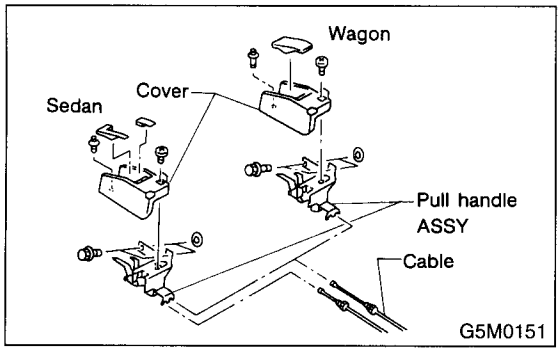
1. HOOD OPENER

1) Remove the release cable from the hood lock.
2) Remove the bolt. Remove the opener lever.

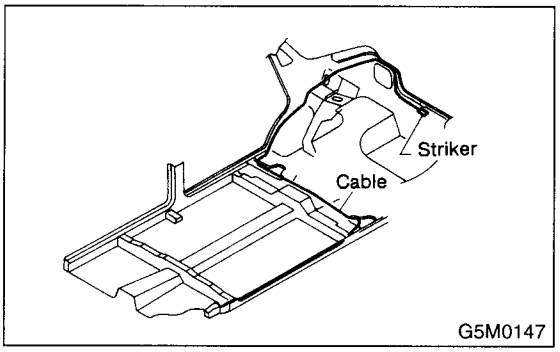


2. TRUNK LID OPENER

1) Remove the rear seat. <Ref. to SE-11, REMOVAL, Rear Seat.>
2) Remove the center pillar lower trim and side sill cover on the passenger side. Remove the rear pillar lower trim. Pull back the floor mat. Remove the clip holding the cable.
3) Remove the bolt. Remove the opener pull handle.

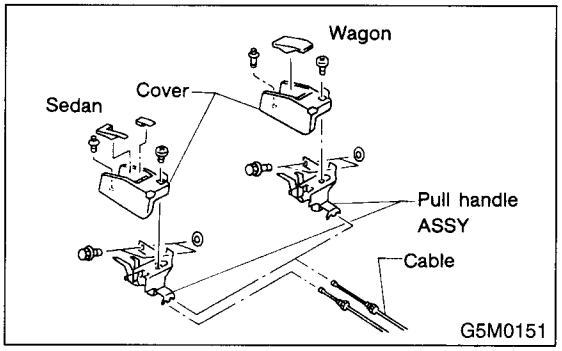


4) Remove the cable from the opener pull handle.
5) Remove the striker from the trunk lid.
6) Remove the cable from the striker.

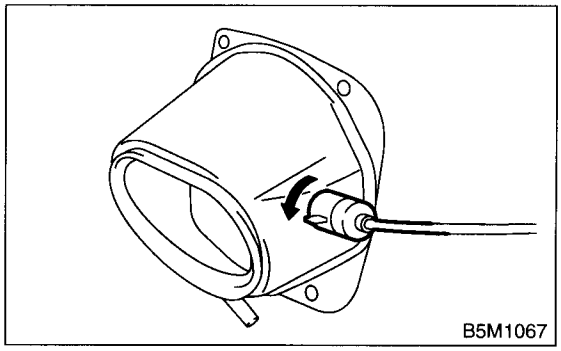


3. FUEL FLAP OPENER

1) Remove the rear seat. <Ref. to SE-11, REMOVAL, Rear Seat.>
2) Remove the center pillar lower trim and side sill cover on the passenger side. Remove the rear pillar lower trim. Pull back the floor mat. Remove the clip holding the cable.
3) Remove the bolt. Remove the opener pull handle.



4) Remove the cable from the opener pull handle.
5) Remove the right rear quarter trim. <Ref. to EI-47, REMOVAL, Rear Quarter Trim.>
6) Rotate the fuel lock inside the quarter panel to the left and remove.



B: INSTALLATION

1. HOOD OPENER

Install in the reverse order of removal.

2. TRUNK LID OPENER

Install in the reverse order of removal.

3. FUEL FLAP OPENER

Install in the reverse order of removal.

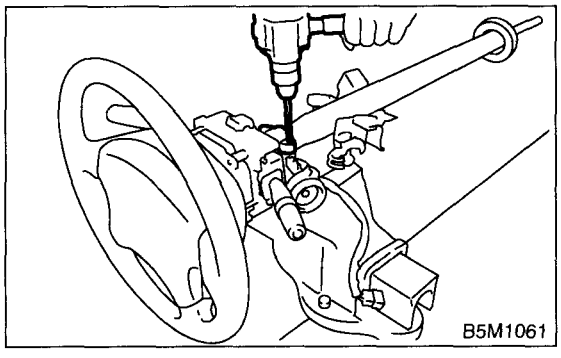
C: INSPECTION

Make sure the fuel flap opens and closes smoothly.

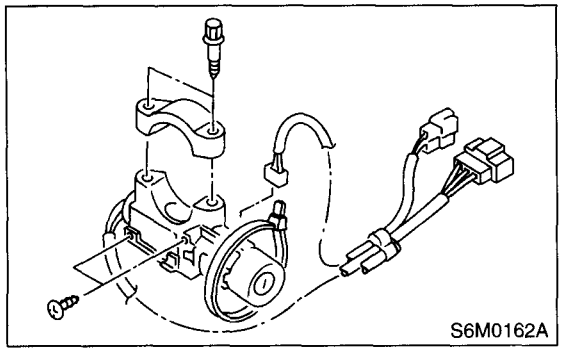
20.Ignition Key Lock

A: REPLACEMENT

1) Disconnect the ground terminal from battery.
2) Remove the steering column. <Ref. to PS-23, 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 the end of the thread.



B: INSPECTION

1) Remove the instrument panel lower cover.
2) Remove the lower column cover.
3) Unfasten the holddown clip which secures the harness and disconnect the connector of the ignition switch from the body harness.
4) Turn the ignition key plate to each position and measure the ignition switch resistance.

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

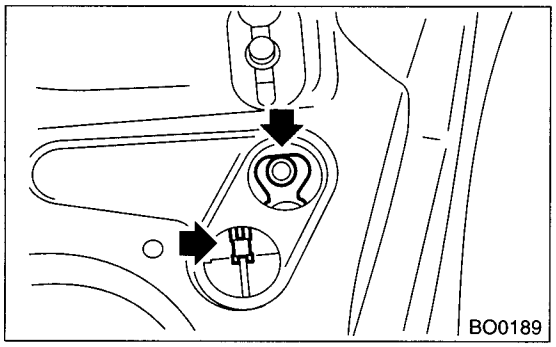
If NG, replace the ignition switch.

21.Key Lock Cylinders

A: REPLACEMENT

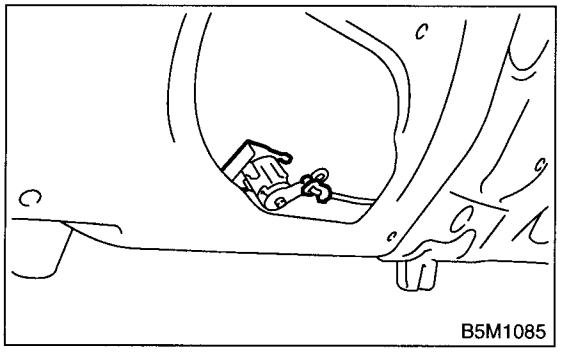
1. FRONT DOOR

1) Remove the door trim. <Ref. to EI-37, REMOVAL, Front Door Trim.>
2) Pull back the sealing cover.
3) Move the front door glass downward.
4) Remove the rod clamp. Remove the bolt. Replace the key cylinder.



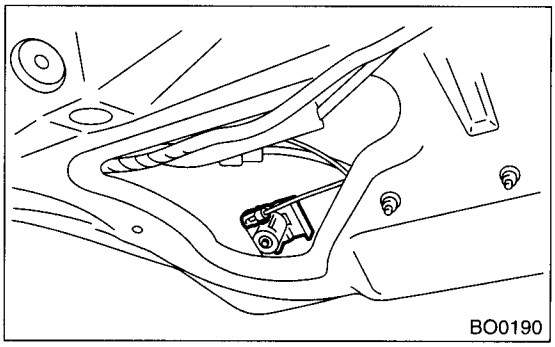
2. TRUNK LID

1) Remove the trunk lid release handle. <Ref. to SL-40, Trunk Lid Release Handle.>
2) Remove the rod clamp. Remove the lock plate. Replace the key cylinder.



3. REAR GATE

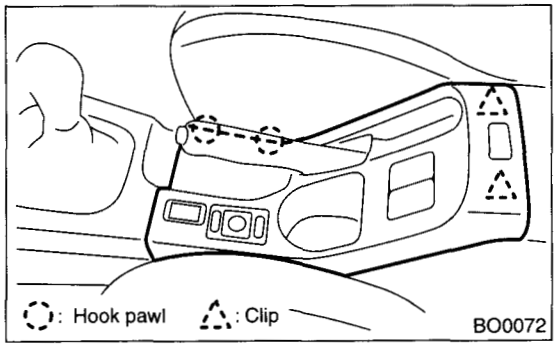
1) Remove the rear gate trim. <Ref. to EI-52, REMOVAL, Rear Gate Trim.>
2) Remove the rod clamp. Remove the lock plate. Replace the key cylinder.



22.Security Control Module

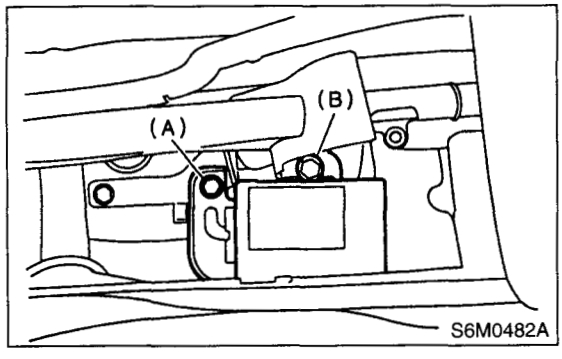
A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the console cover.



3) Disconnect the connector from the security control module.
4) Remove bolt (A) and loosen bolt (B).

NOTE:
Loosen bolt (B) without completely removing it.



5) Remove the security control module.

B: INSTALLATION

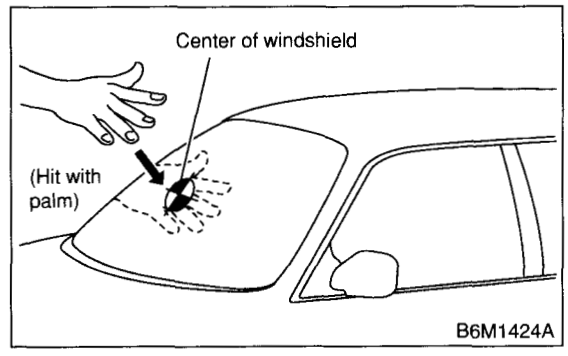
Install in the reverse order of removal.

NOTE:
To install the security control module, tighten the bolts securely so that the bolts do not come loose.

C: INSPECTION

1. IMPACT SENSITIVITY TEST

1) Remove the key from the ignition switch.
2) Close all windows.
3) Close all doors and the rear gate or trunk lid.
4) Cover the hood with a blanket.
5) Press the LOCK/ARM button of the transmitter.
6) Confirm that the security indicator light blinks every 2 seconds.
7) Hit the center of the windshield with your palm and make sure the alarm operates.



If NG, adjust the impact sensitivity. <Ref. to SL-45, ADJUSTMENT, Security Control Module.>

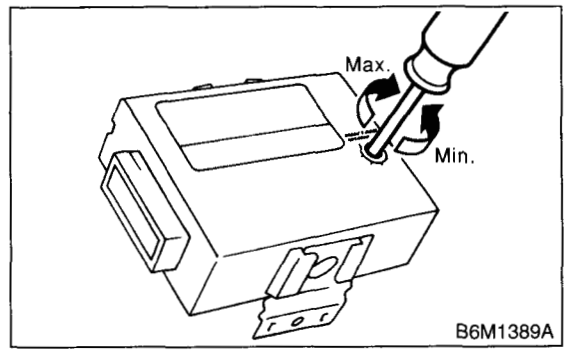
D: ADJUSTMENT

1. IMPACT SENSITIVITY

NOTE:
Before adjustment, make sure the security control module has been securely installed on the bracket.

1) Remove the security control module. <Ref. to SL-45, REMOVAL, Security Control Module.>
2) Adjust the sensitivity adjust screw in the security control module.

NOTE:
After adjusting, be sure to plug the adjust screw hole.

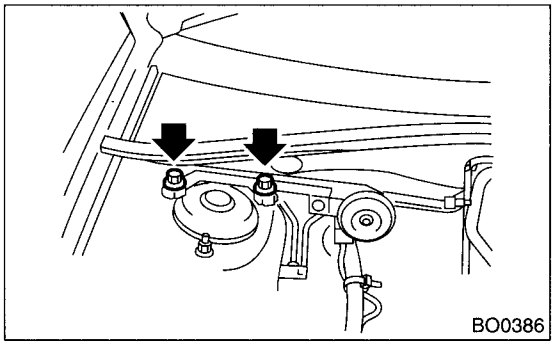


3) Install the security control module.
4) Perform the impact sensitivity test.

23.Security Horn

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the nuts and then detach the security horn while disconnecting the connector.

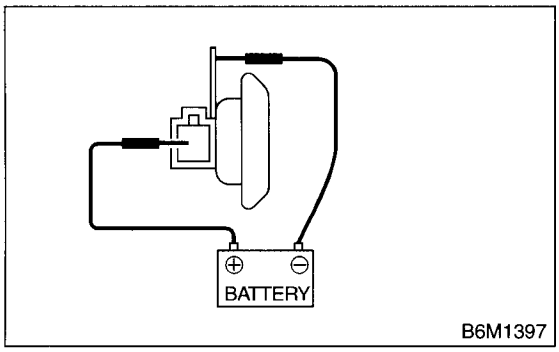


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Connect the battery to the security horn terminal and case ground and make sure the horn sounds properly.

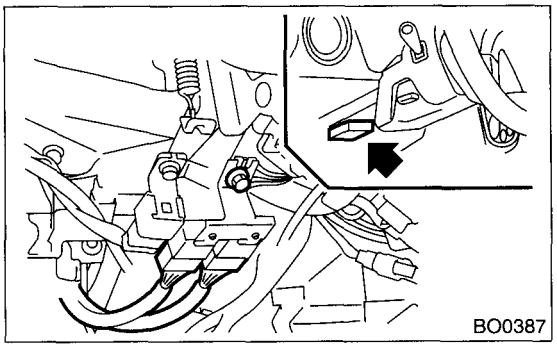


If NG, replace the security horn.

24.Security Horn Relay

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the mounting bolt and detach the security horn relay (near the fuse box).



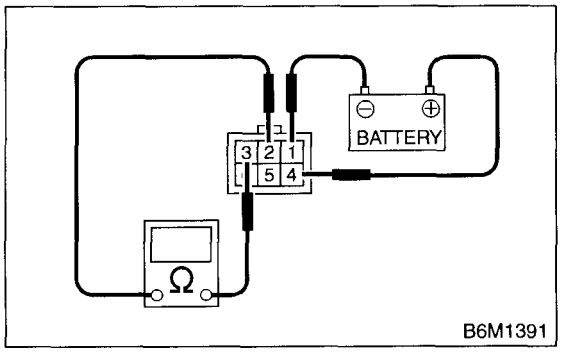
B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the security horn relay resistance between terminals (indicated in the table below) when connecting terminal No. 4 to battery positive terminal and terminal No. 1 to battery ground terminal.

Current	Terminal No.	Standard
Flow	2 and 3	Less than 1 Ω
No flow		More than 1 MΩ

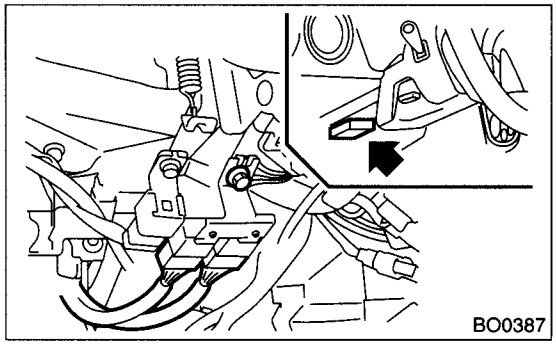


If NG, replace the security horn relay.

25.Interrupt Relay

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the mounting nuts and detach the interrupt relay (near the fuse box).



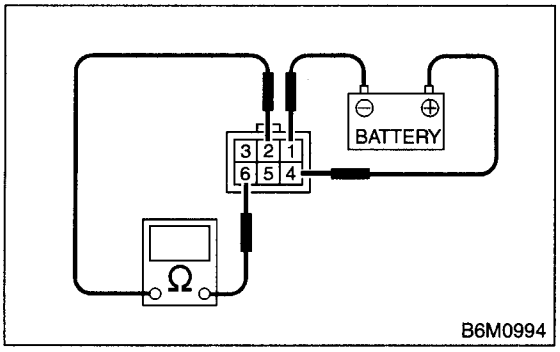
B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the interrupt relay resistance between terminals (indicated in the table below) when connecting terminal No.4 to battery positive terminal and terminal No.1 to battery ground terminal.

Current	Terminal No.	Standard
Flow	2 and 6	Less than 1 Ω
No flow		More than 1 MΩ

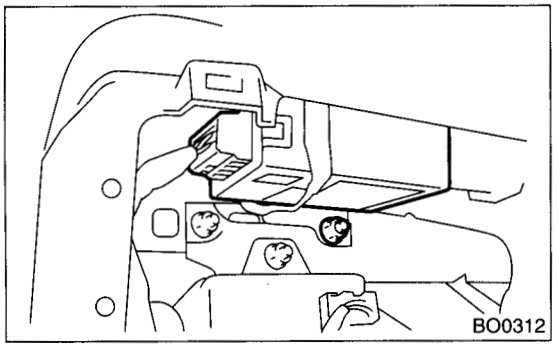


If NG, replace the interrupt relay.

26. Keyless Entry Control Module

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the instrument panel lower cover. <Ref. to EI-42, REMOVAL, Instrument Panel Assembly.>
3) Remove the nut, then remove the keyless entry control module while disconnecting the connector.



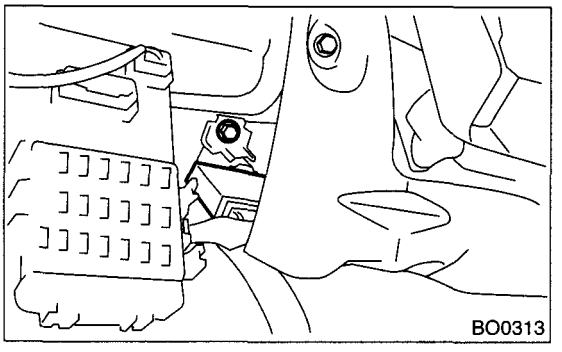
B: INSTALLATION

Install in the reverse order of removal.

27.Integrated Module

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the instrument panel lower cover. <Ref. to EI-42, REMOVAL, Instrument Panel Assembly.>
3) Remove the nut, then remove the integrated module while disconnecting the connector.



B: INSTALLATION

Install in the reverse order of removal.

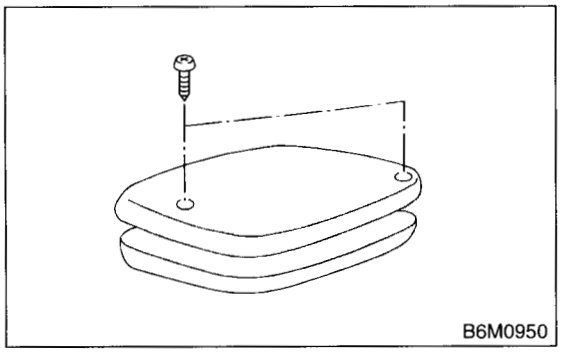
28.Keyless Transmitter

A: REMOVAL

1. TRANSMITTER BATTERY

Remove the battery from the transmitter.

NOTE:
To prevent static electricity damage to the transmitter printed circuit board, touch the steel area of building with hand to discharge static electricity carried on body or clothes before disassembling the transmitter.



B: INSTALLATION

1. TRANSMITTER BATTERY

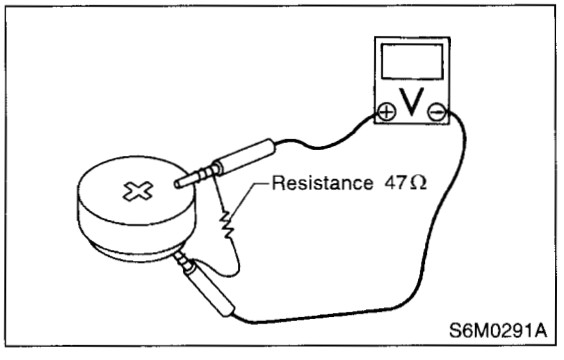
Install in the reverse order of removal.

C: INSPECTION

1. TRANSMITTER BATTERY

Measure the voltage between the battery (+) terminal and (–) terminal.

NOTE:
• Battery discharge occurs during the measurement. Complete the measurement within 5 seconds.
• During the battery voltage measurement, the voltage falls more than 1.8 volts in 3 seconds period.



Tester connection		Standard
(+)	(–)	
Battery (+) terminal	Battery (–) terminal	More than 2 V

If NG, replace the battery. (Use CR2032 or equivalent.)

D: REPLACEMENT

1. TRANSMITTER PROGRAMMING

NOTE:
Perform the programming when the transmitter is replaced and when an additional transmitter is required.

NOTE:
Finish the operation from step 1) through 4) within 45 seconds.

1) Sit on the driver's seat and close all doors, rear gate and trunk lid.
2) Open the driver's door.
3) Close the driver's door.
4) Turn the ignition switch from ON to LOCK ten times within 15 seconds.

NOTE:
Do not start the engine at this time.

5) The horn chirps one time to indicate that the system has entered in the programming mode.
6) Open the driver's door.
7) Close the driver's door.
8) Press any button on the transmitter that you wish to program into the system.
9) Horn will chirp two times to indicate that the transmitter has been programmed.

NOTE:
Any additional transmitter can also be programmed at this time. Repeat steps 6) through 9) for an additional transmitter.

10) Remove the ignition key from the ignition switch.
11) The horn will chirp three times to indicate that the system has exited the programming mode.
12) Check the keyless entry system properly operates by operating each transmitter.

EXTERIOR/INTERIOR TRIM

EI

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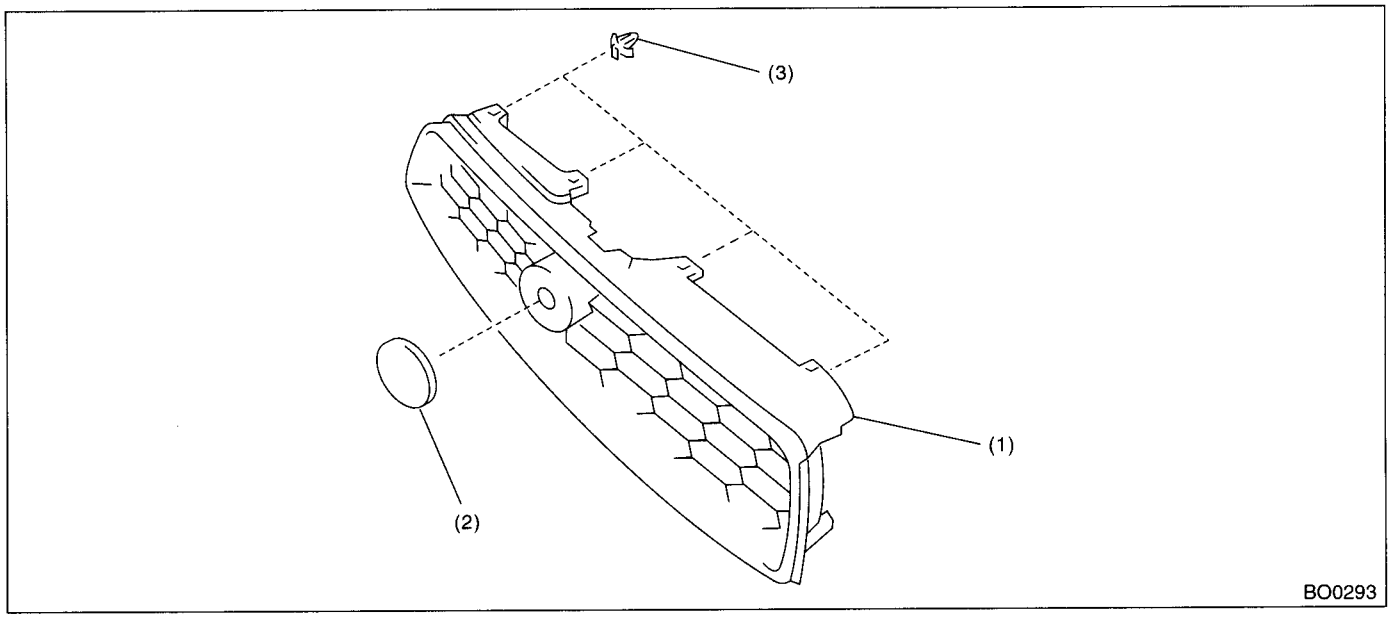
1. General Description

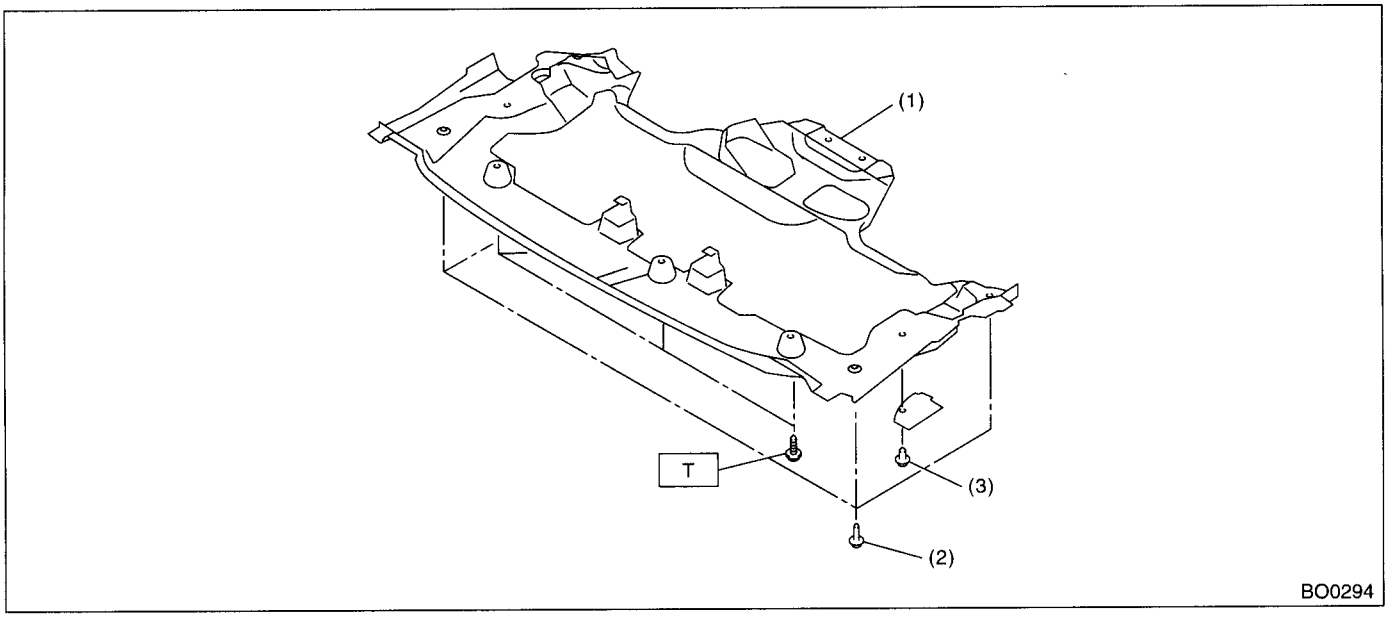
A: COMPONENT

1. FRONT GRILLE



(1) Front grille
(2) Front grille emblem
(3) Clip

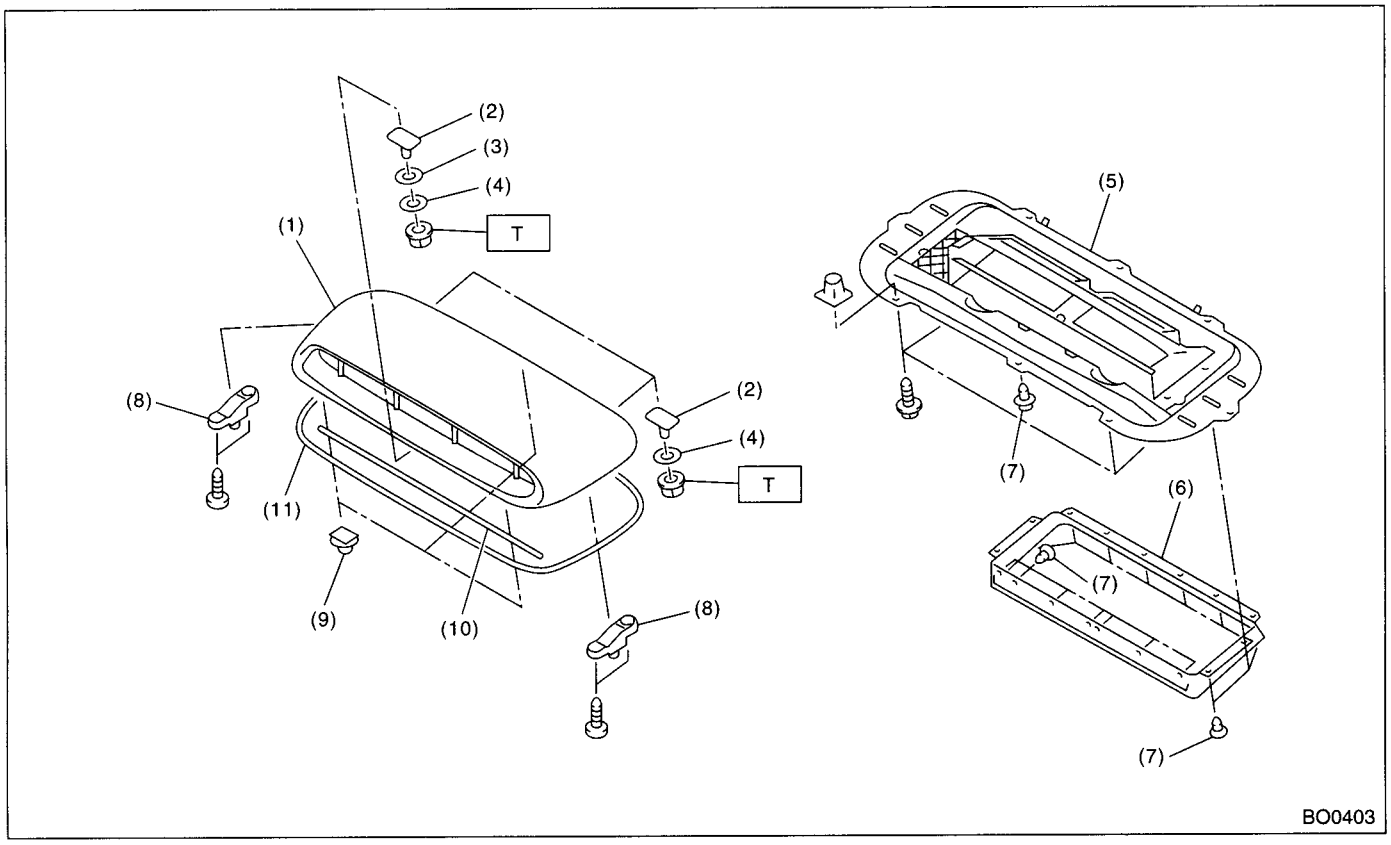
2. UNDER COVER



(1) Under cover
(2) Clip (side)
(3) Clip

Tightening torque: N·m (kgf-m, ft-lb)
T: 14 (1.42, 10.3)

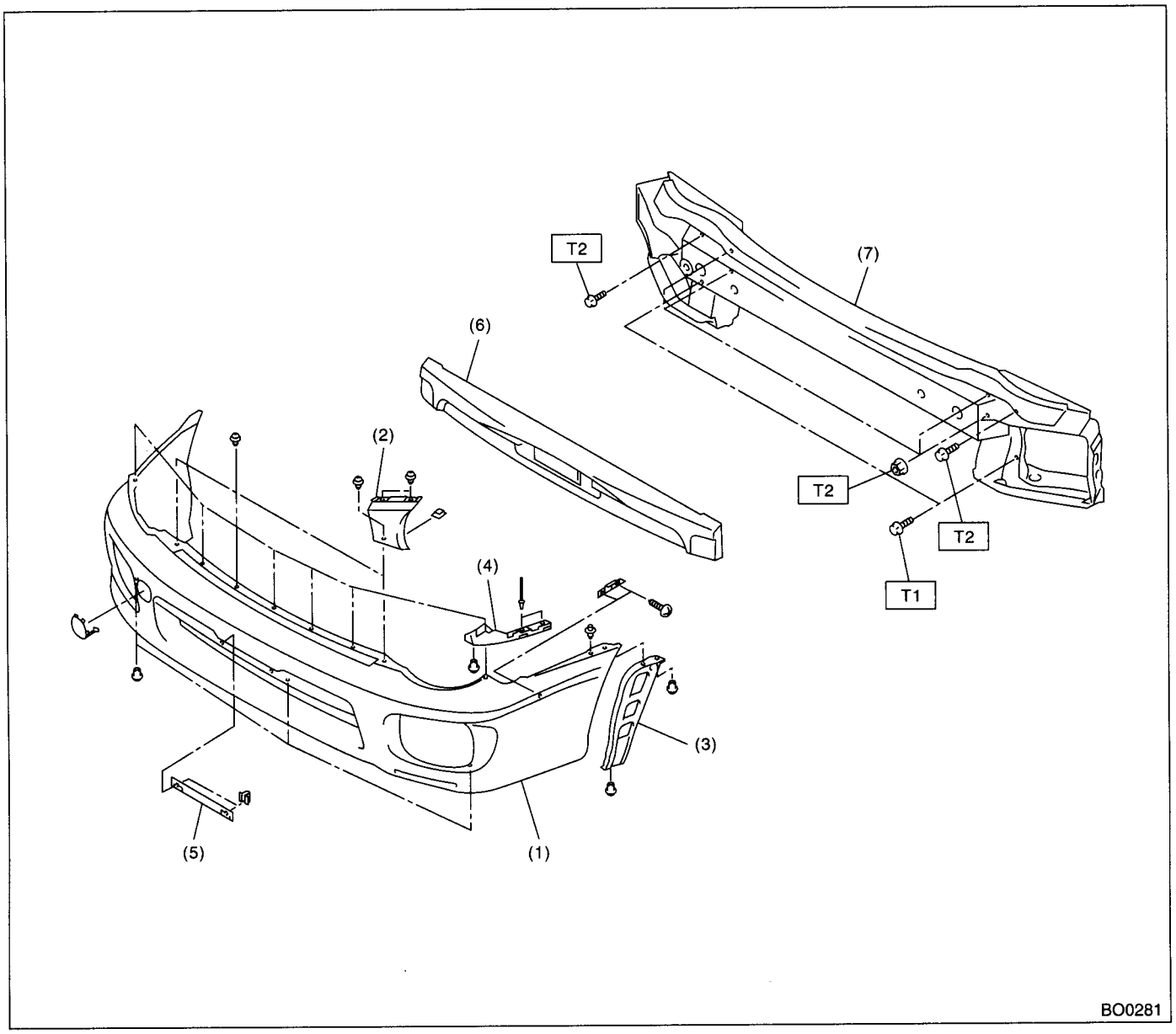
3. HOOD GRILLE



(1) Hood grille
(2) Bolt
(3) Metal washer
(4) Foam rubber washer
(5) Grille duct
(6) Grille lower duct
(7) Clip
(8) Black clip
(9) White clip
(10) Packing
(11) Packing

Tightening torque: N·m (kgf-m, ft-lb)
T: 4.4 (0.45, 3.25)

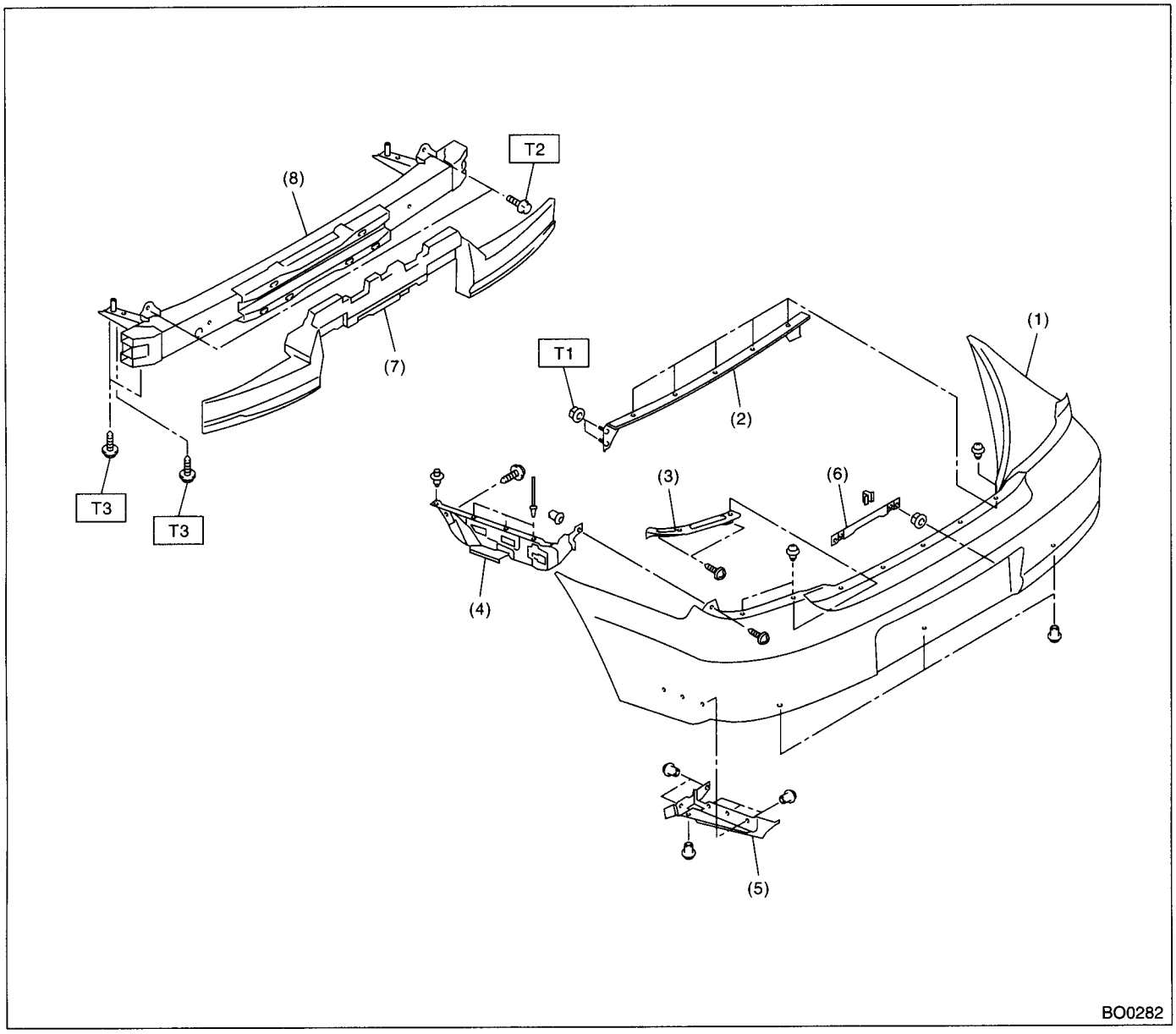
4. FRONT BUMPER



(1) Bumper face
(2) Head light side cover
(3) Bumper side bracket
(4) Bumper corner bracket
(5) License plate bracket
(6) Bumper energy absorber
(7) Bumper back beam

Tightening torque: N·m (kgf-m, ft-lb)
T1: 32 (3.3, 24)
T2: 69 (7.0, 51)

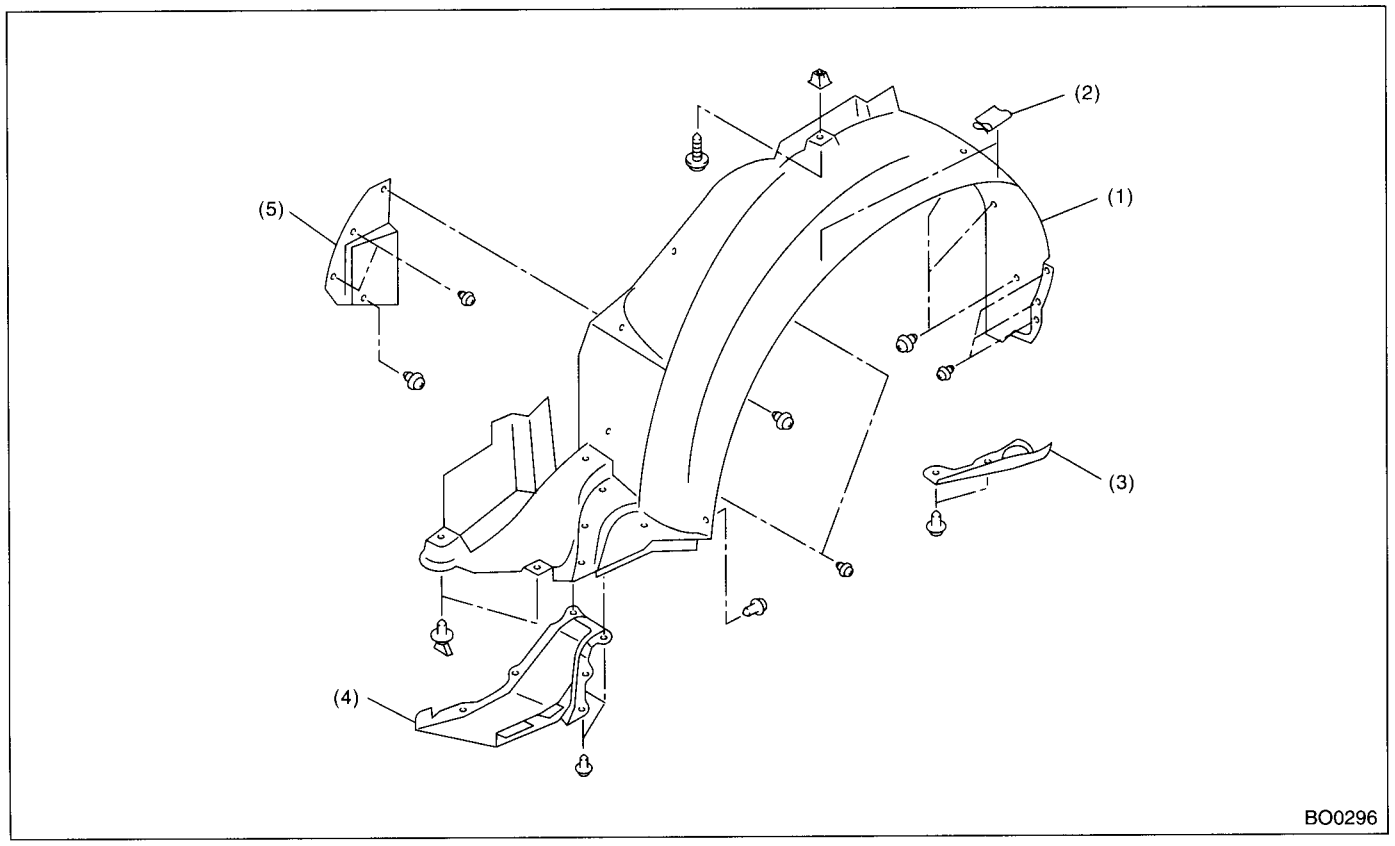
5. REAR BUMPER



(1)	Bumper face	(5)	Bumper side cover
(2)	Bumper upper beam	(6)	License plate base
(3)	Bumper corner bracket	(7)	Bumper energy absorber
(4)	Bumper side bracket	(8)	Bumper back beam

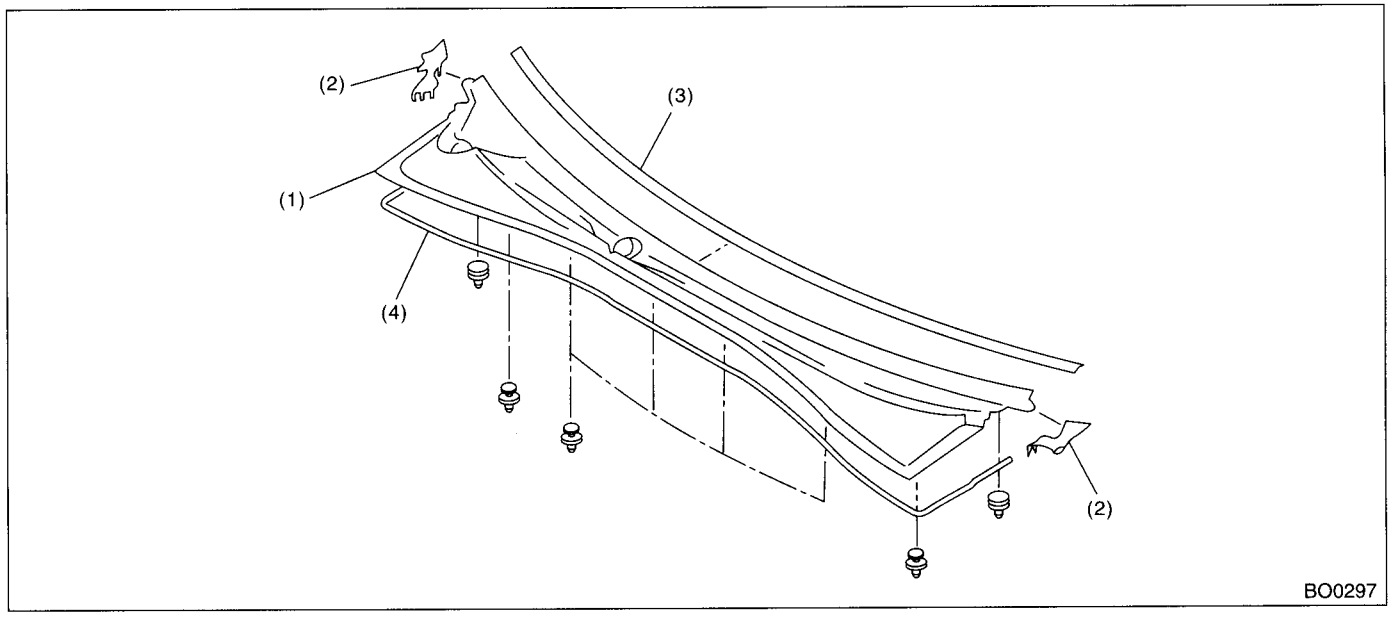
Tightening torque: N·m (kgf-m, ft-lb)
T1: 33 (3.4, 24)
T2: 34 (3.5, 25)
T3: 95 (9.7, 70)

6. MUD GUARD



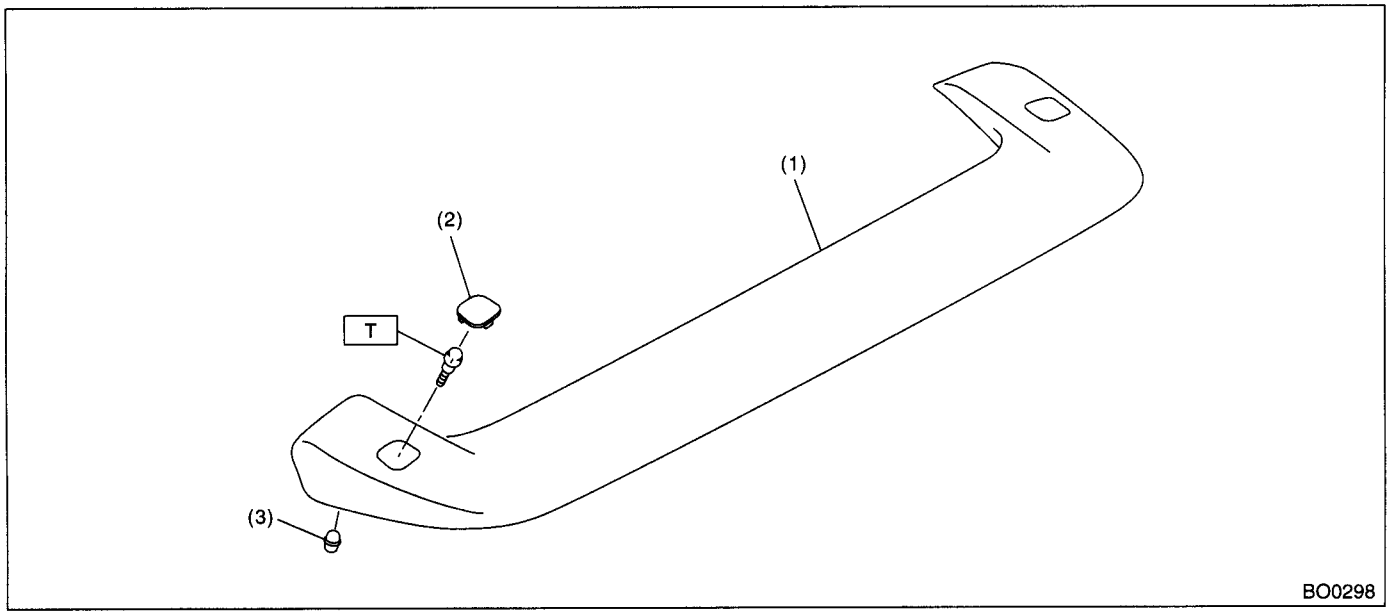
(1) Mud guard
(2) Clip
(3) Sub frame cover
(4) Brake duct plate
(5) Mud guard plate

7. COWL PANEL



(1) Cowl panel
(2) Cowl side panel
(3) Protector
(4) Seal

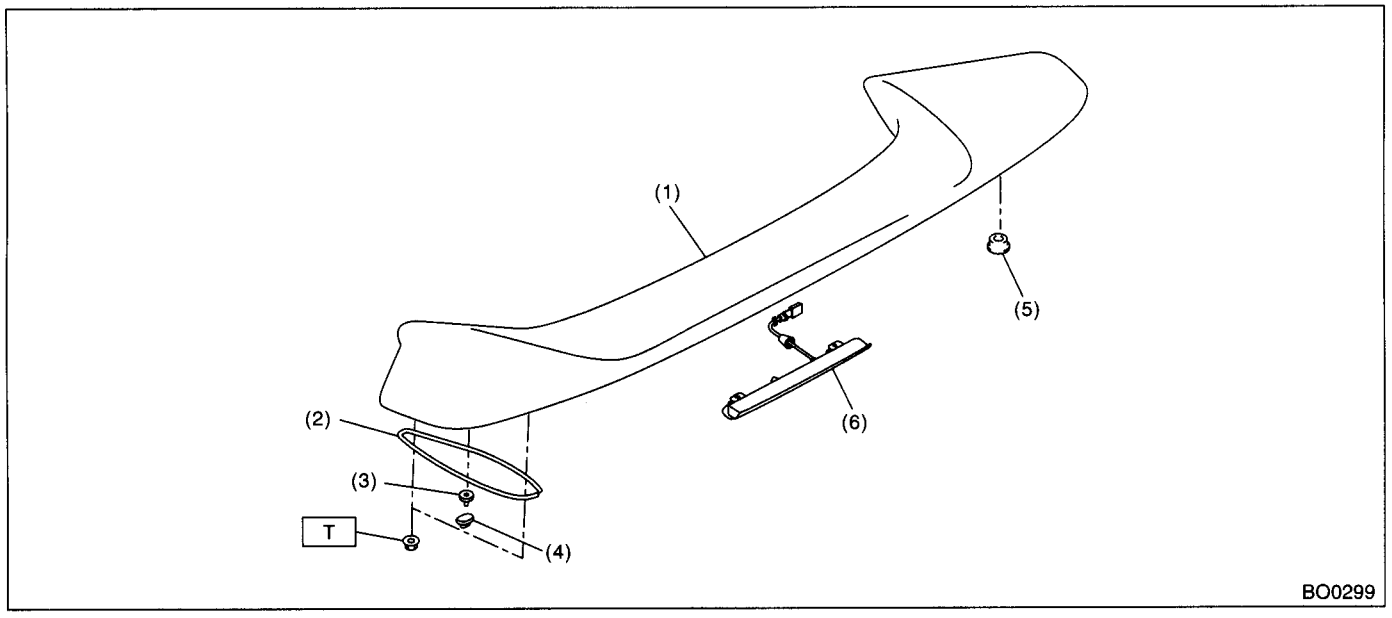
8. ROOF SPOILER



(1) Roof spoiler
(2) Cap
(3) Clip

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.35 (0.749, 5.42)

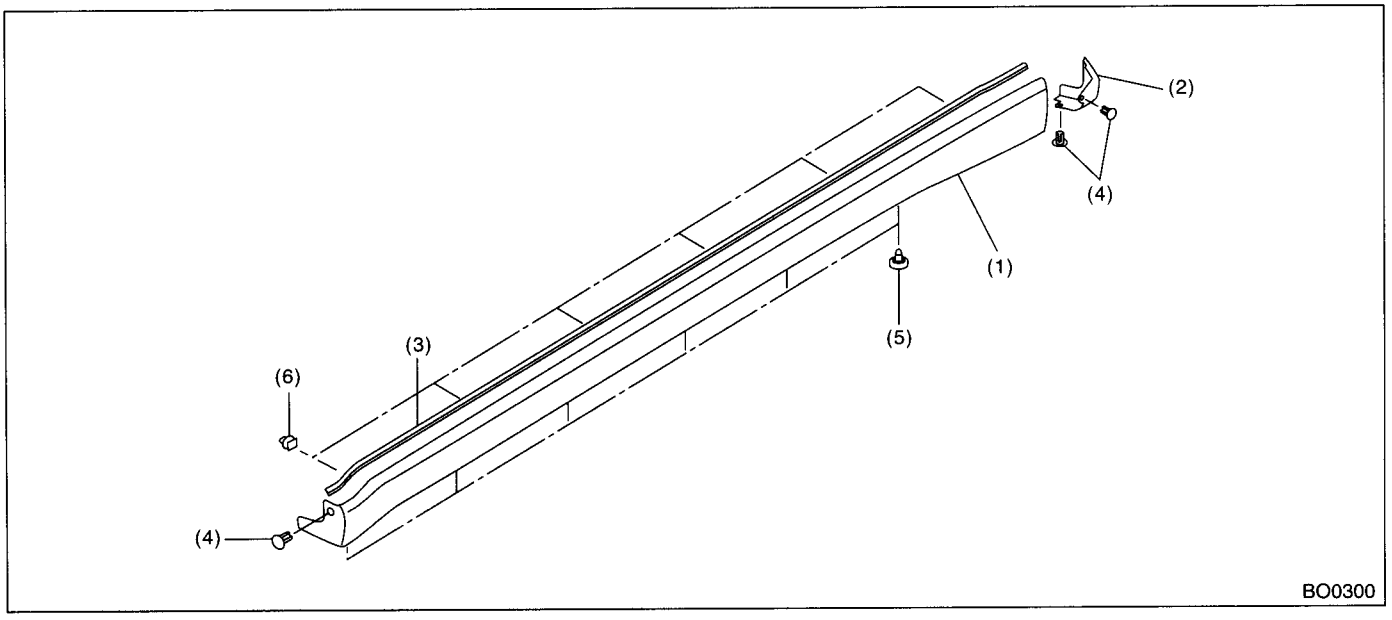
9. REAR SPOILER



(1) Rear spoiler
(2) Protector
(3) Clip
(4) Grommet
(5) Seal (only RH side)
(6) High mount stop lamp

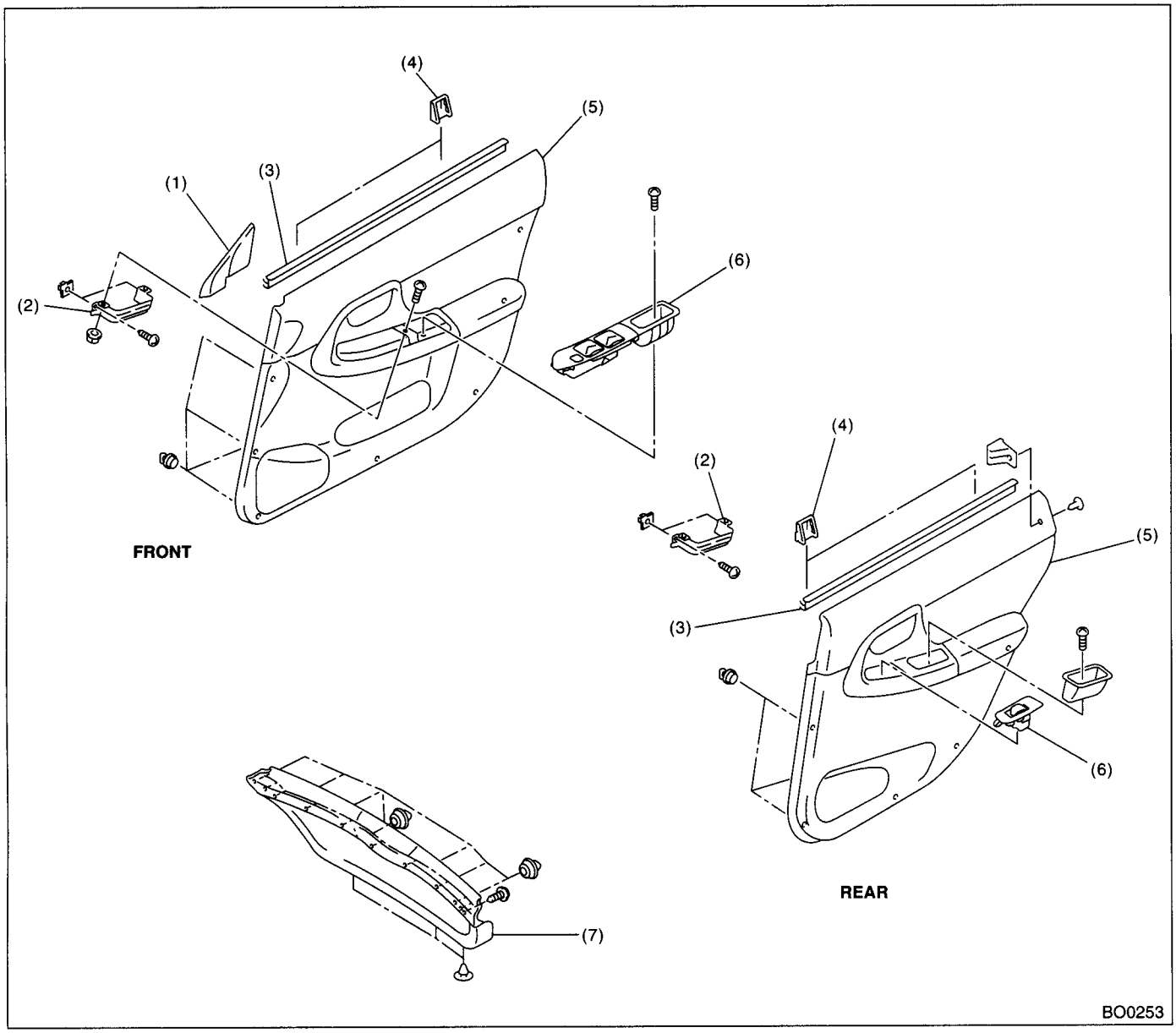
Tightening torque: N·m (kgf-m, ft-lb)
T: 7.4 (0.75, 5.46)

10.SIDE SILL SPOILER



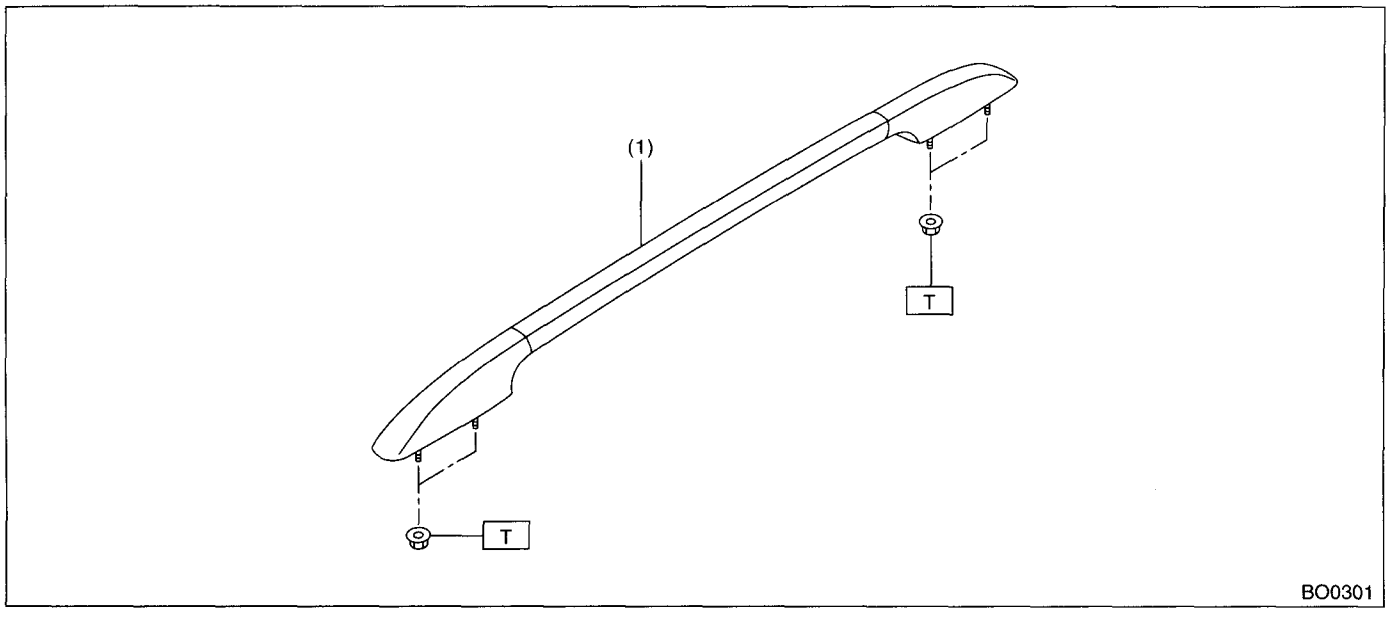
(1) Side sill spoiler
(2) End cover
(3) Protector
(4) Rivet clip
(5) Clip
(6) Spoiler clip

11.DOOR TRIM



(1) Gusset cover
(2) Bracket
(3) Weatherstrip upper
(4) Clip
(5) Trim panel
(6) Power window switch cover
(7) Lower trim

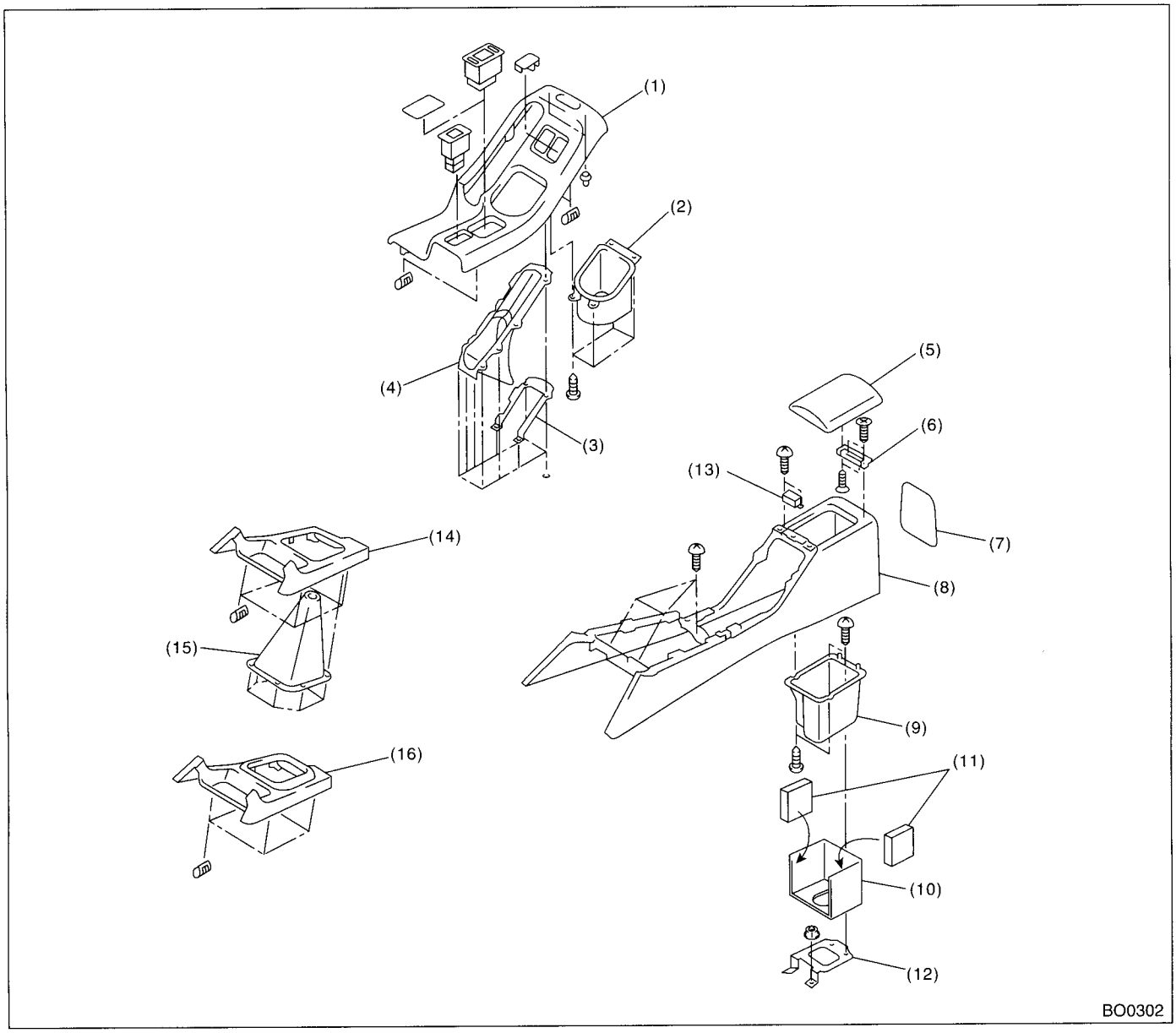
12.ROOF RAIL



(1) Roof rail

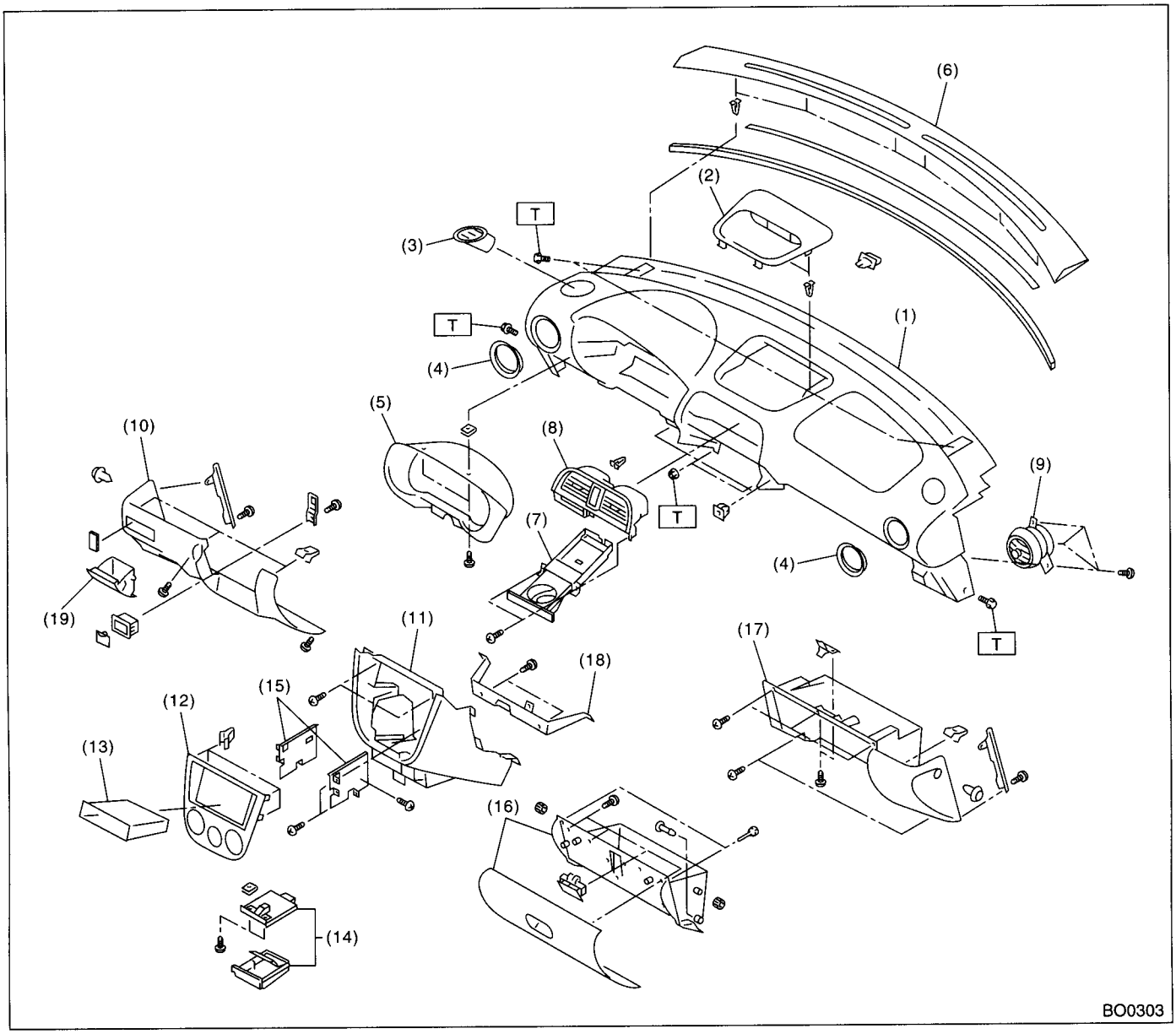
Tightening torque: N·m (kgf-m, ft-lb)
T: 7.4 (0.75, 5.46)

13.CONSOLE BOX



(1) Console cover
(2) Cup holder
(3) Bracket
(4) Strip
(5) Upper lid
(6) Lid hinge
(7) Rear lid
(8) Console box
(9) Console pocket
(10) Upper bracket
(11) Pad
(12) Lower bracket
(13) Lock
(14) Front cover (MT)
(15) Boot
(16) Front cover (AT)

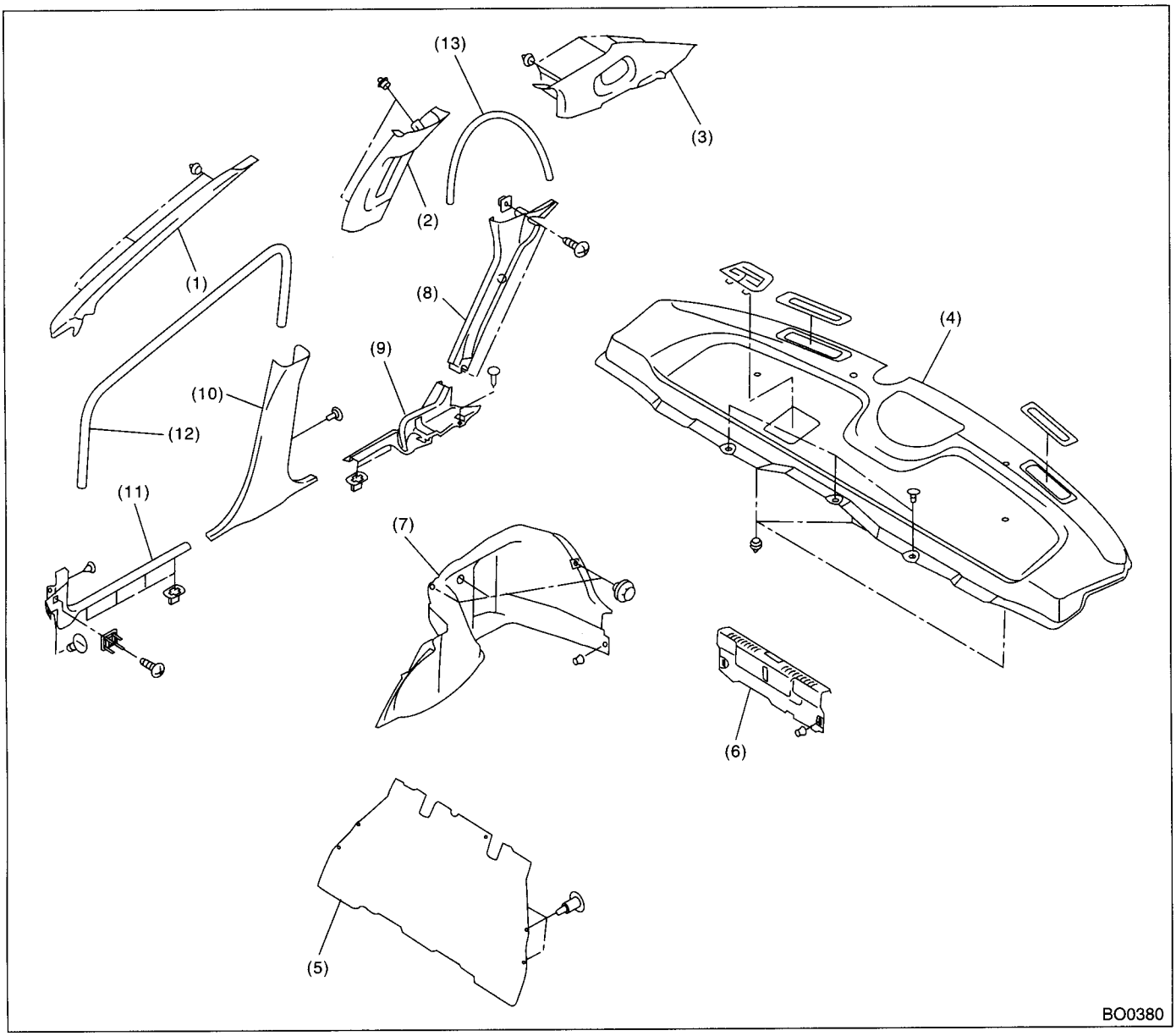
14.INSTRUMENT PANEL



(1) Pad & frame
(2) Center upper panel
(3) Air vent grille (Defroster)
(4) Grille cover
(5) Meter visor
(6) Defroster grille
(7) Cup holder
(8) Air vent grille (Center)
(9) Air vent grille (Side)
(10) Lower cover
(11) Console cover
(12) Center panel
(13) Center pocket
(14) Ash tray
(15) Audio bracket
(16) Glove box lid
(17) Glove box panel
(18) Console rein forcement
(19) Coin box

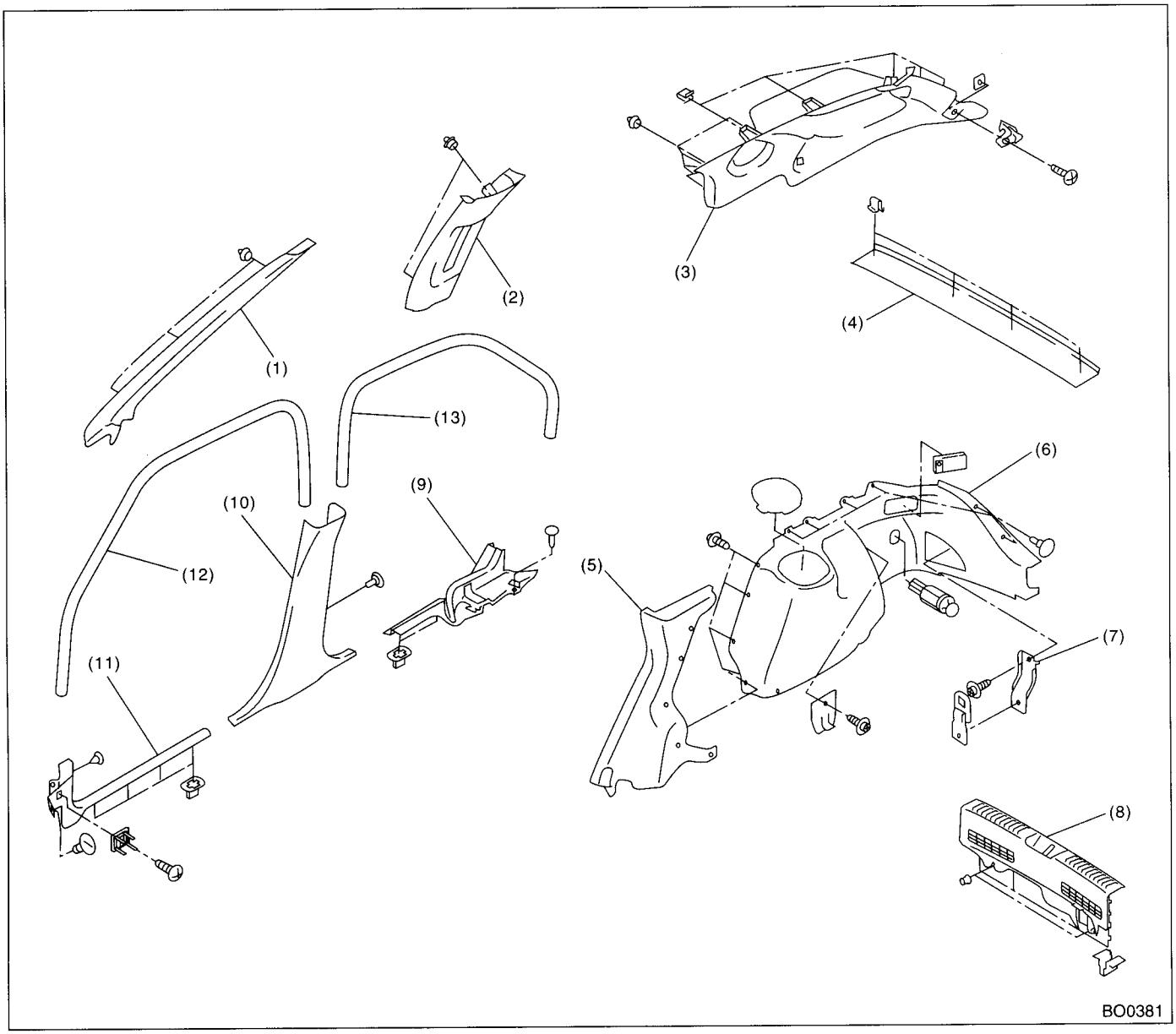
Tightening torque: N·m (kgf-m, ft-lb)
T: 7 (0.71, 5.2)

15.INNER TRIM (SEDAN)



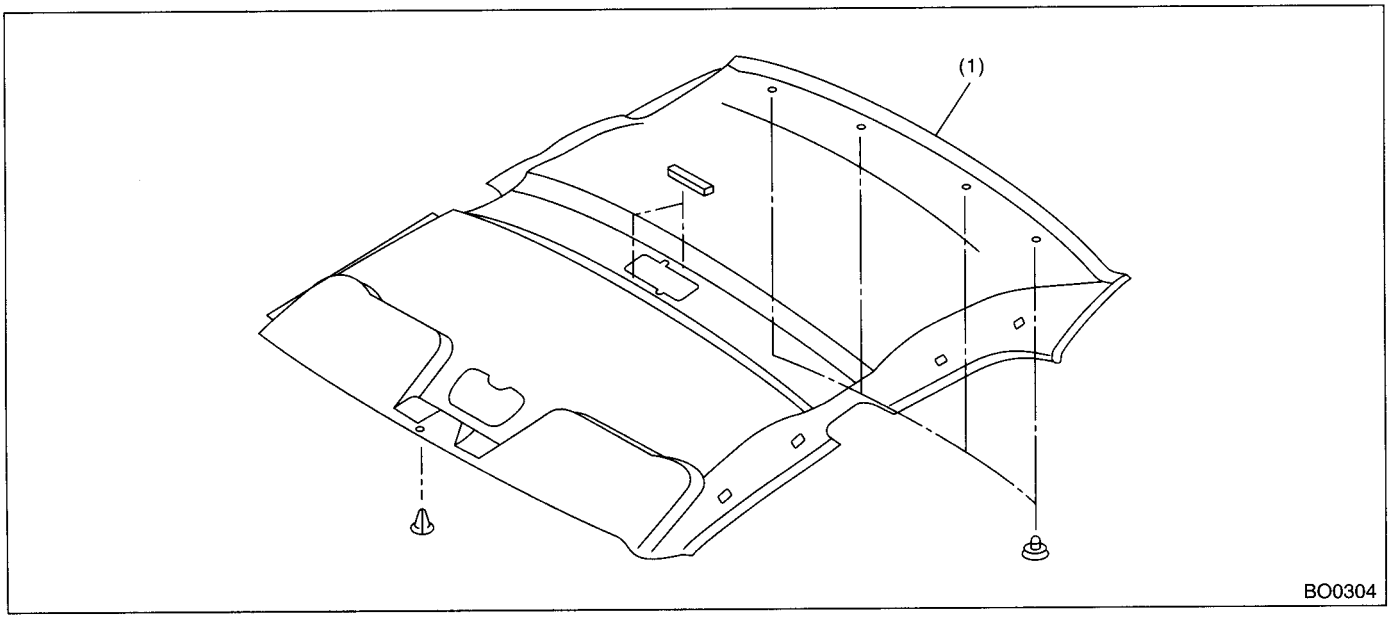
(1) Front pillar upper trim
(2) Center pillar upper trim
(3) Rear pillar upper trim
(4) Rear shelf trim
(5) Rear bulk trim
(6) Trunk rear trim
(7) Trunk side trim
(8) Rear pillar lower trim
(9) Side sill rear cover
(10) Center pillar lower trim
(11) Side sill front cover
(12) Front garnish
(13) Rear garnish

16.INNER TRIM (WAGON)



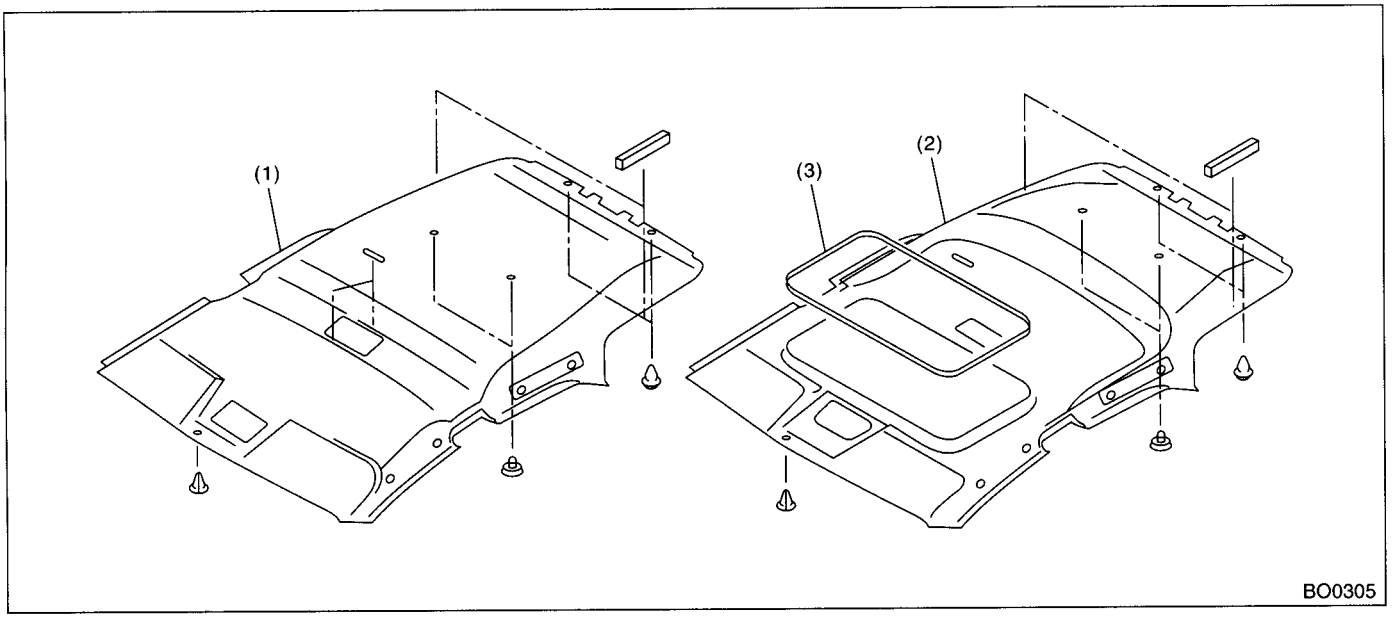
(1) Front pillar upper trim
(2) Center pillar upper trim
(3) Rear pillar upper trim
(4) Rear rail trim
(5) Rear pillar lower trim
(6) Rear quarter lower trim
(7) Hook
(8) Rear skirt trim
(9) Side sill rear cover
(10) Center pillar lower trim
(11) Side sill front cover
(10) Front garnish
(11) Rear garnish
(12) Front garnish
(13) Rear garnish

17.ROOF TRIM (SEDAN)



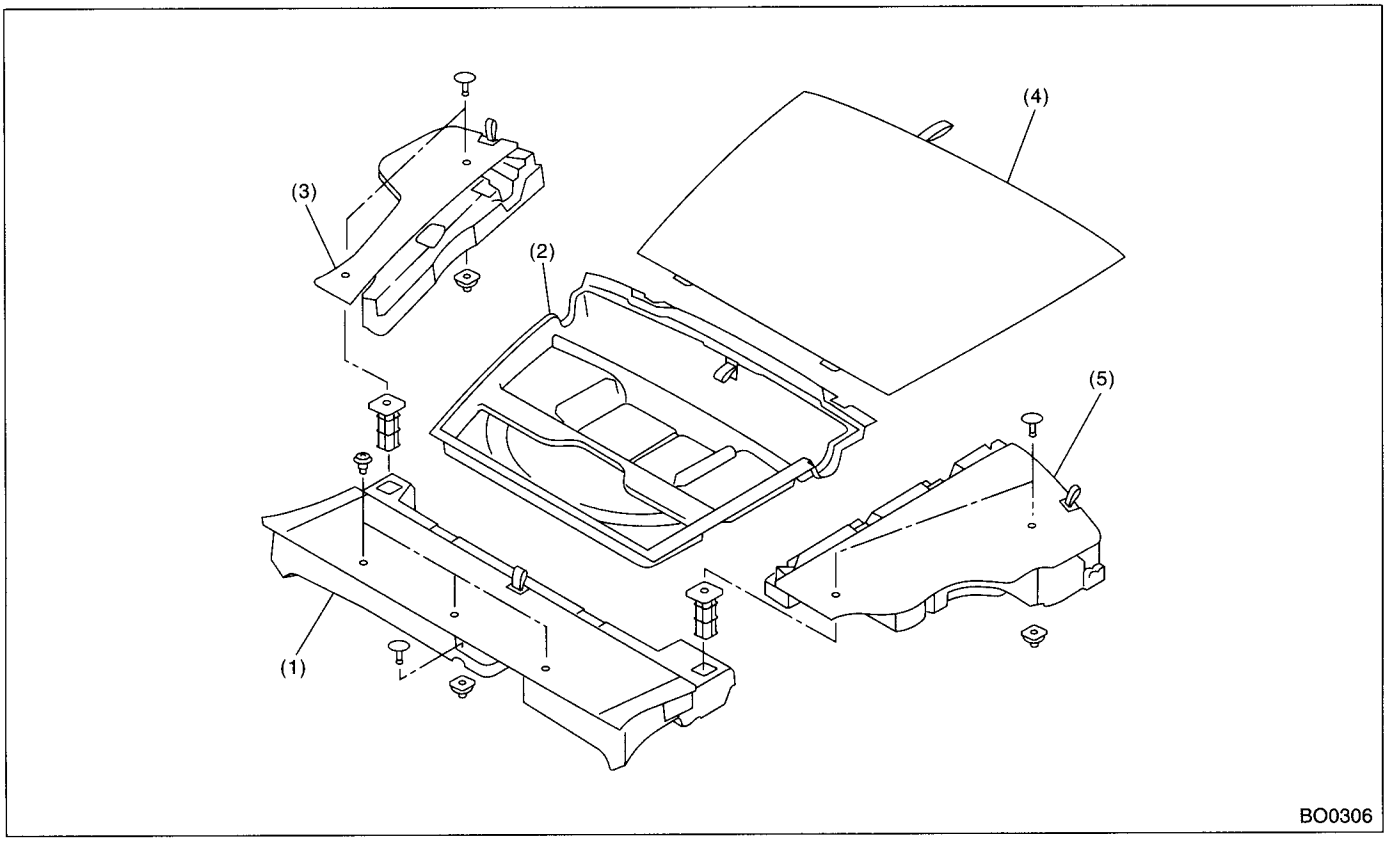
(1) Roof trim

18.ROOF TRIM (WAGON)



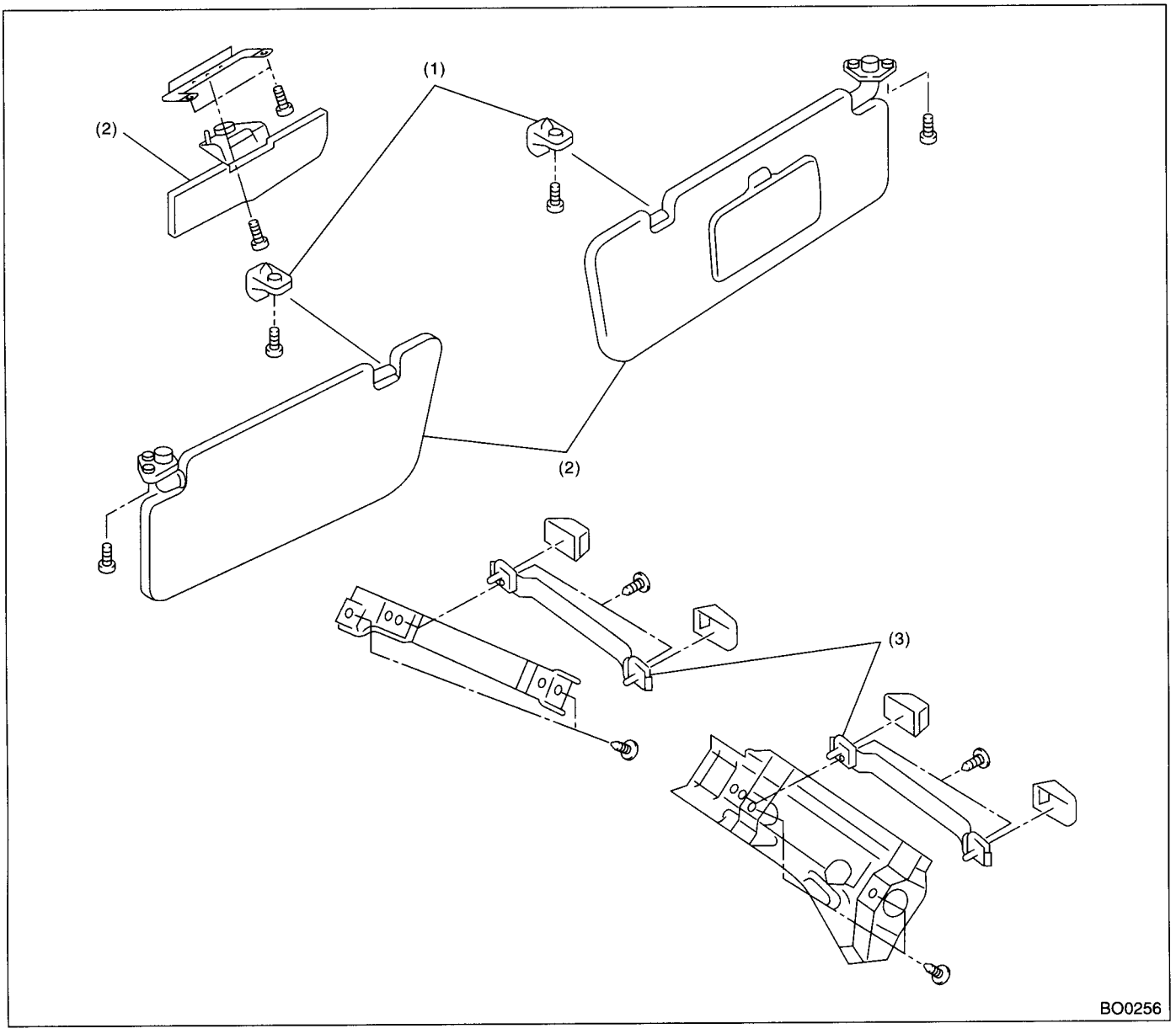
(1) Roof trim
(2) Roof trim (sun roof model)
(3) Sun roof garnish

19.LUGGAGE FLOOR MAT



(1) Front floor mat
(2) Floor box
(3) Side floor mat (RH)
(4) Center floor mat
(5) Side floor mat (LH)

20.INNER ACCESSORIES



(1) Hook (2) Sun visor (3) Assist grip

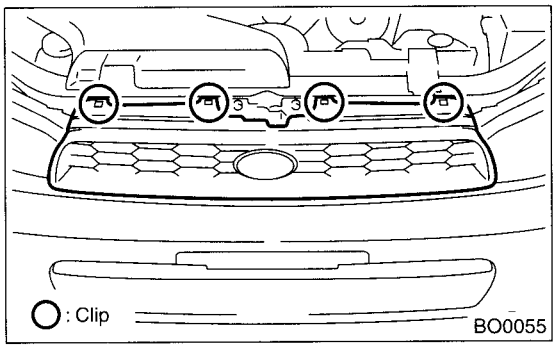
B: PREPARATION TOOL

TOOL NAME	REMARKS
Clip remover	Used for removal of trim.

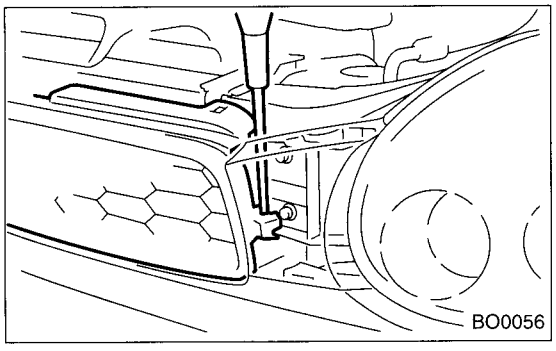
2. Front Grille

A: REMOVAL

1) Open the hood.
2) Remove the four clips.



3) Remove the two hooks.



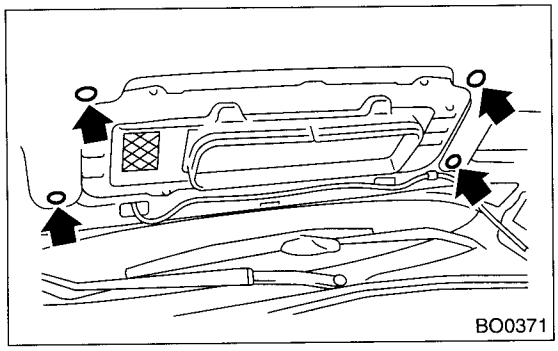
B: INSTALLATION

Install in the reverse order of removal.

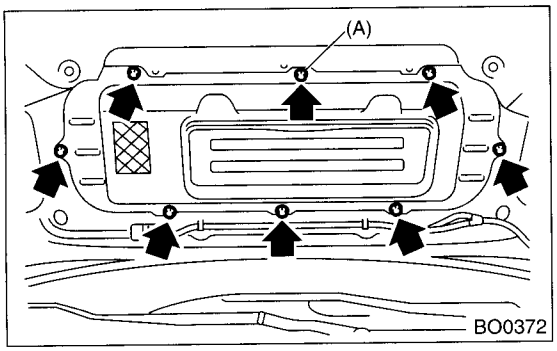
3. Hood Grille

A: REMOVAL

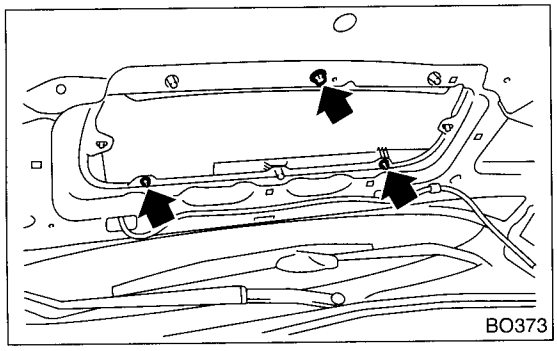
1) Remove the four clips of hood insulator.



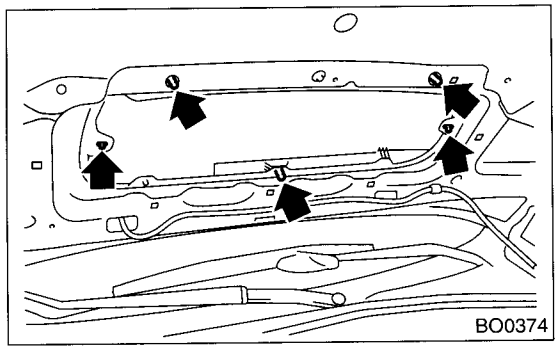
2) Remove seven bolts and clip (A) to remove the hood duct.



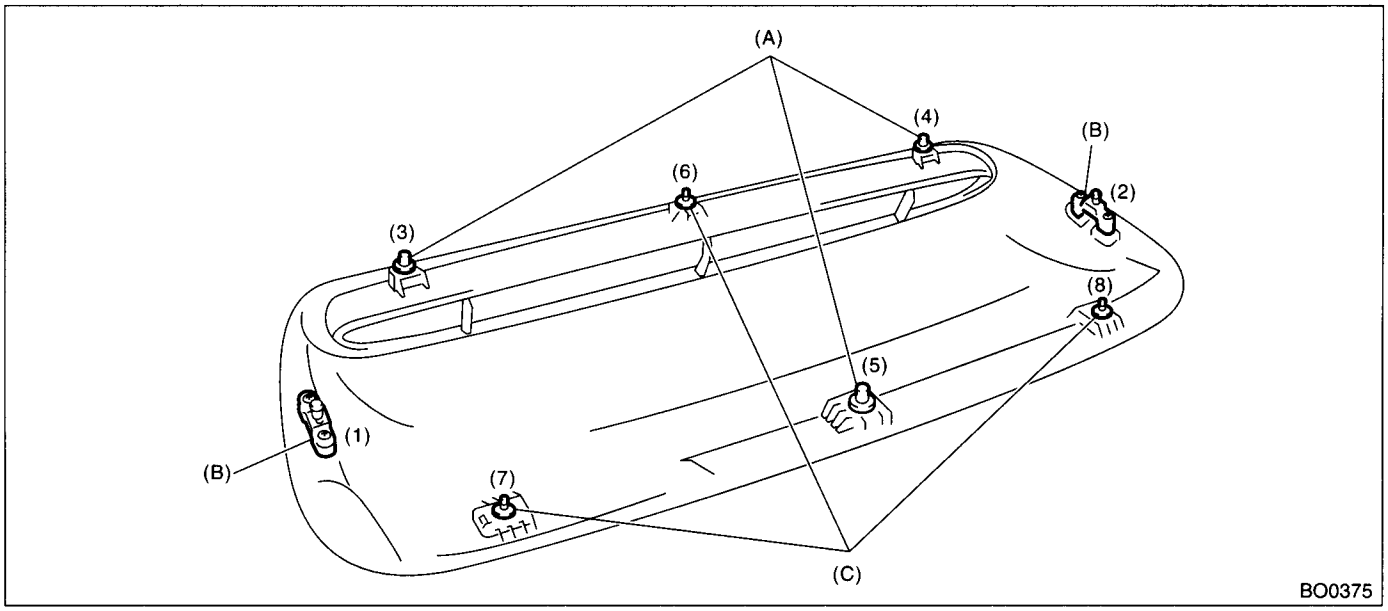
3) Remove three nuts.



4) Remove three white clips and two black clips to remove the hood grille.

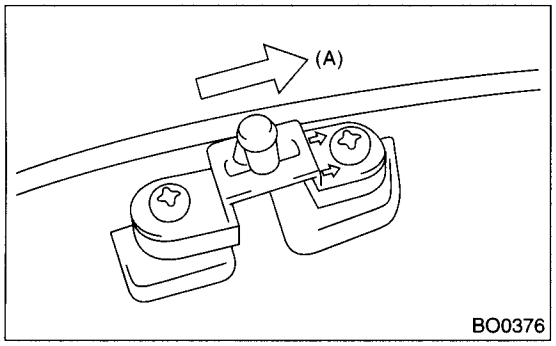


B: INSTALLATION



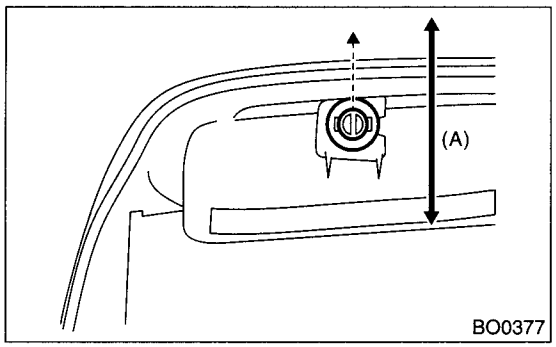
(A) White clip (B) Black clip (C) Bolt

1) Replace the black clip (1), (2) with a new one. Install the clip with arrow mark facing the front side of grille (A).

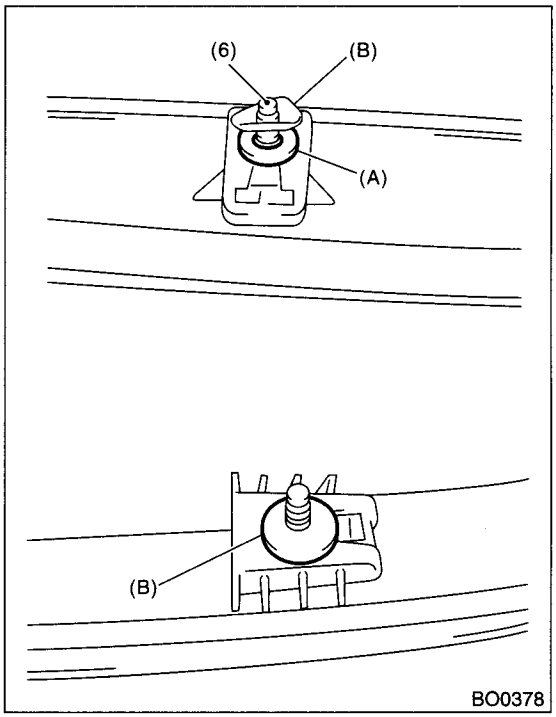


2) Replace the white clip (3), (4), (5) with a new one. Install the white clip (3), (4) by aligning the rib of clip parallel with the grille front/rear direction (A).

CAUTION:
Do not use foam rubber washer with new white clips.

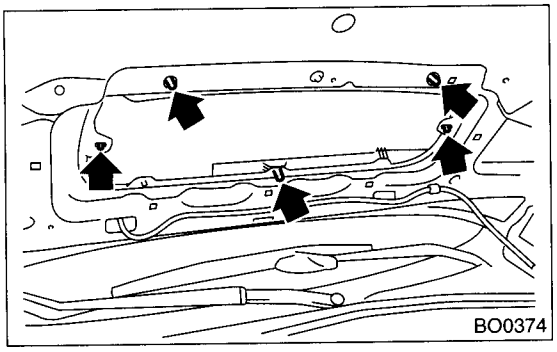


3) Attach the metal washer (A) only to bolt (6). Attach the foam rubber washer (B) to bolt (6), (7), (8).



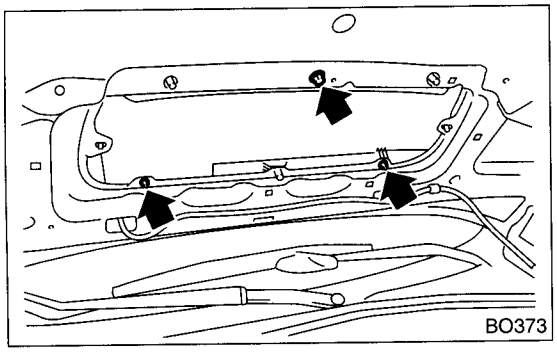
4) Insert the hood grille clip and engage the five clips.

CAUTION:
Make sure that the anchor portion of each clip is firmly engaged.

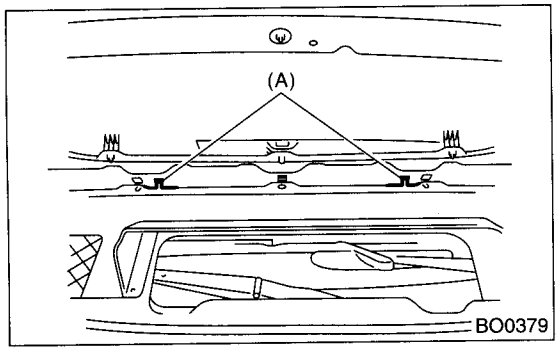


5) Install the three nuts.

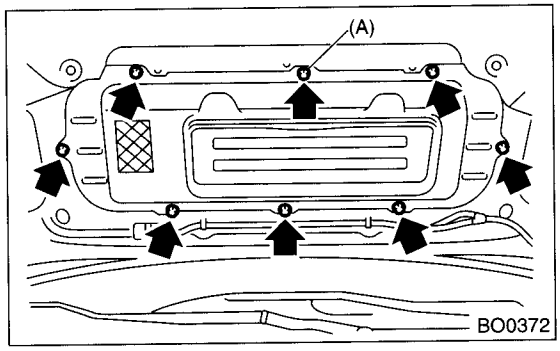
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.25 ft-lb)



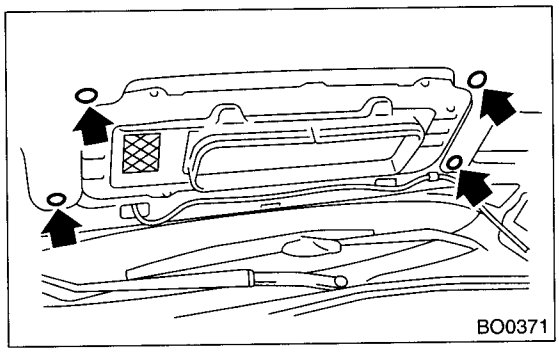
6) Catch the two hooks of hood duct to the hood holes.



7) Install the hood duct with clip (A) and seven bolts.



8) Install the hood insulator with four new clips.



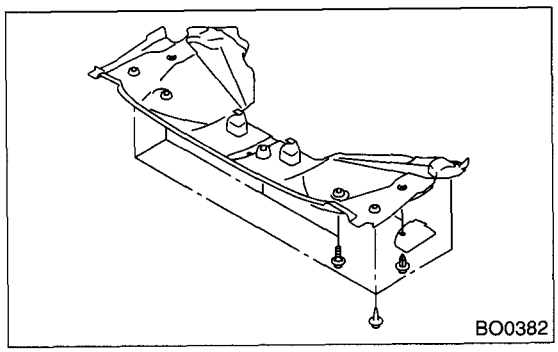
C: INSPECTION

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 clips to remove the under cover.



B: INSTALLATION

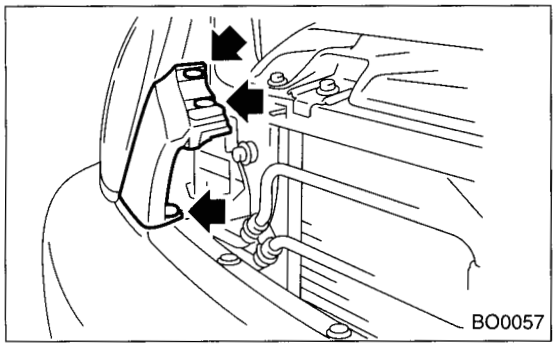
Install in the reverse order of removal.

5. Front Bumper

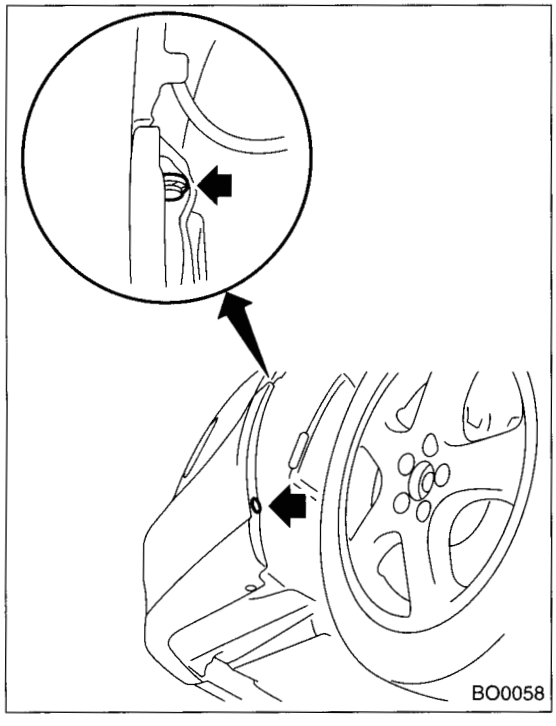
A: REMOVAL

CAUTION:
• Handle the bumper carefully to avoid damage to the bumper face.
• Do not damage the body during removal or installation of bumper.
• To avoid damage to the bumper, lay the removed bumper on sheet spread on the floor. Do not lay it directly on the floor.

1) Disconnect the ground terminal from battery.
2) Remove the front grille. <Ref. to EI-18, REMOVAL, Front Grille.>
3) Loosen the three clips to remove the head light side cover.

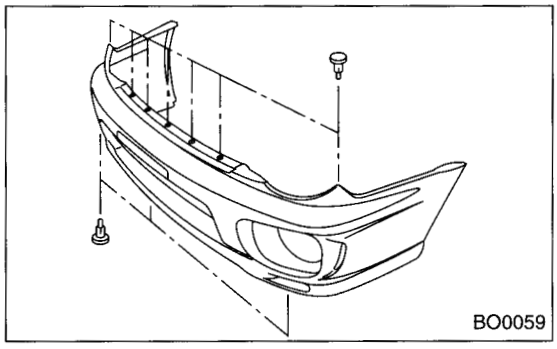

BO0057

4) Pull off the front side of front mud guard to remove the clip.


BO0058

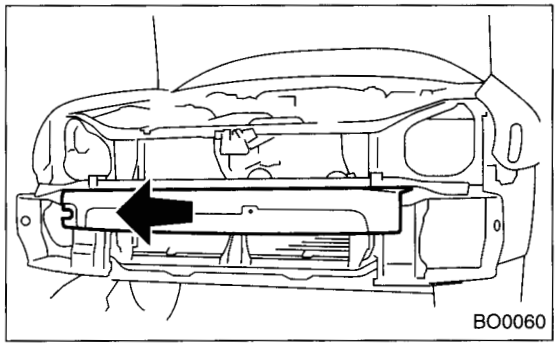
5) Remove clips, and pull out bumper slightly.

6) Disconnect the fog light connector to remove the bumper.

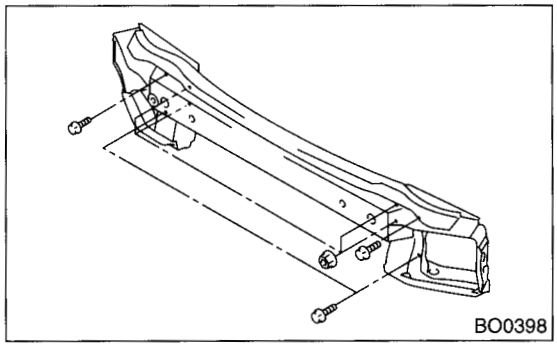

BO0059

7) Remove the E/A FORM from bumper beam.

CAUTION:
• E/A FORM may easily break. Do not apply excessive force to it during removal.


BO0060

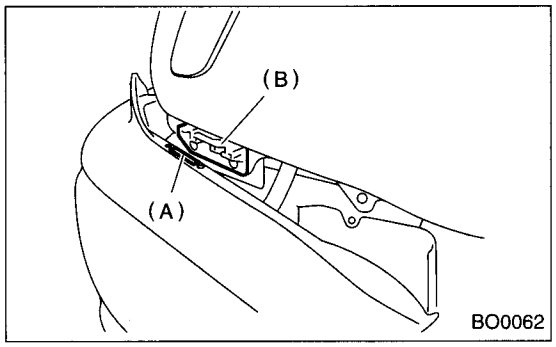
8) Remove the bumper beam.


BO0398

B: INSTALLATION

CAUTION:
• Handle the bumper carefully to avoid damage to the bumper face.
• Do not damage the body during removal or installation of bumper.

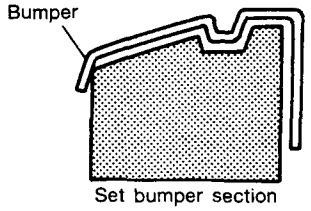
1) Install in the reverse order of removal.
2) Fit the slider (A) to guide plate (B) securely.



Tightening torque:
Refer to COMPONENT of General Description for tightening torque. <Ref. to EI-4, 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.	 G5M0164
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 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>

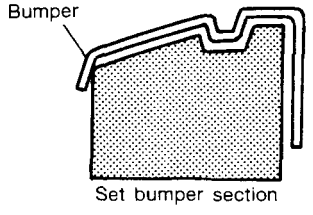
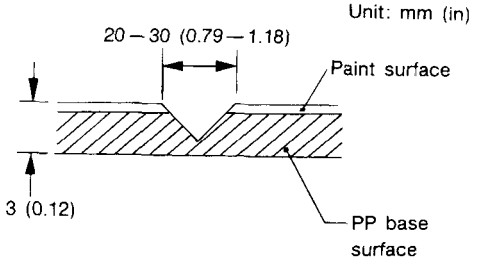
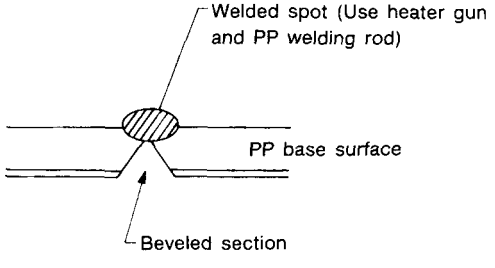
• Deep damage caused by scratching fences, etc.

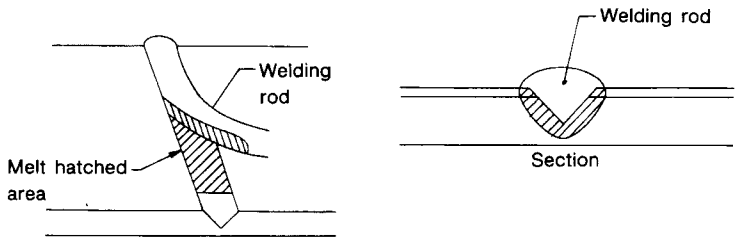
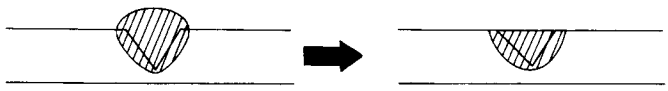
A dent cannot be repaired but a whitened or swelled part can be removed.

<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 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.  G5M0164
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.  G5M0165
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.  G5M0166 NOTE: • Do not melt 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.
		 G5M0167
		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.
		 G5M0168
		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 parts on the bumper in reverse order of removal.	
26	Bumper installation	Install the bumper.	

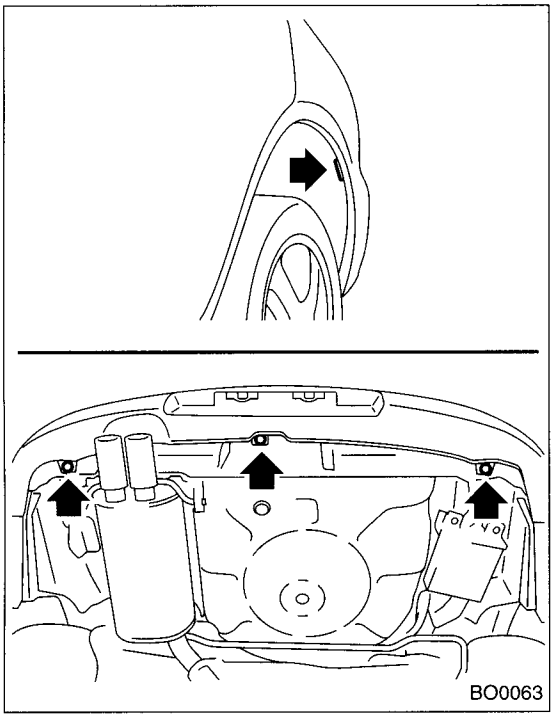
6. Rear Bumper

A: REMOVAL

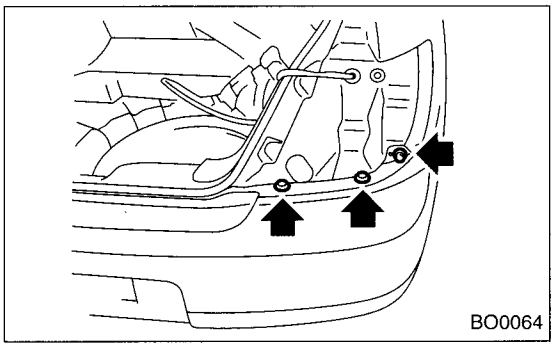
1. WAGON

CAUTION:
• Handle the bumper carefully to avoid damage to the bumper face.
• Do not damage the body during removal or installation of bumper.
• To avoid damage to the bumper, lay the removed bumper on sheet spread on the floor. Do not lay it directly on the floor.

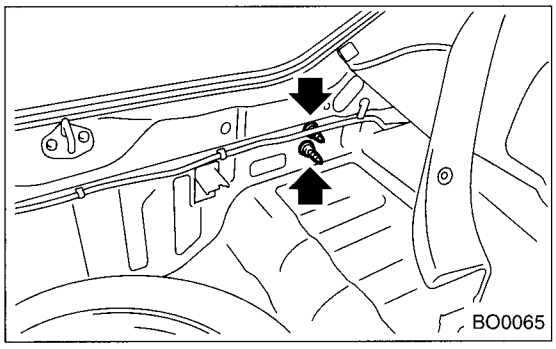
1) Disconnect the ground terminal from battery.
2) Remove the bolts and clips.



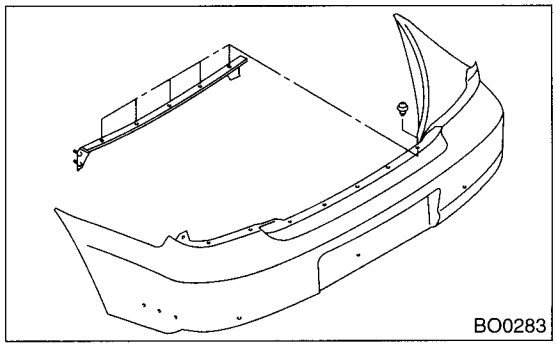
3) Remove the rear combination light assembly. <Ref. to LI-18, REMOVAL, Rear Combination Light Assembly.>
4) Remove the screw and two clips from each side.



5) Remove the floor box.
6) Remove the rear skirt trim.
7) Pull off the rear end of rear quarter lower trim, and then loosen the two nuts from each side to remove the rear bumper.

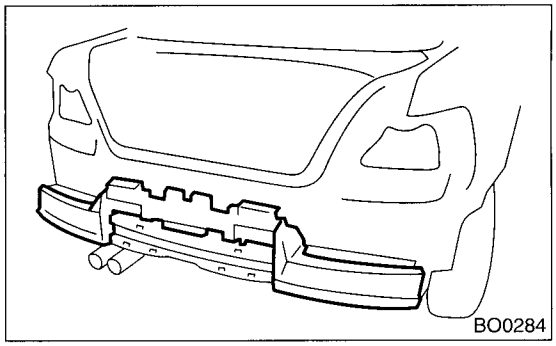


8) Loosen the clips to remove the bumper beam.

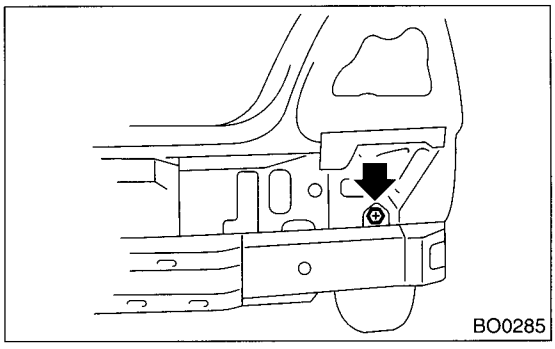


9) Remove the E/A FORM from bumper beam.

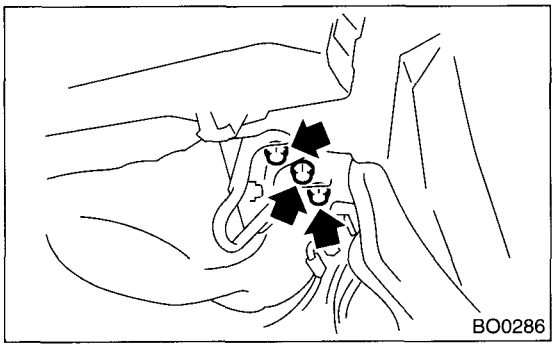
CAUTION:
E/A FORM may easily break. Do not apply excessive force to it during removal.



10) Remove the bolt.



11) Remove the canister. <Ref. to EC(SOHC)-5, REMOVAL, Canister.>
12) Remove the three bolts, then remove the bumper beam.



2. SEDAN

Refer to rear bumper removal WAGON. <Ref. to EI-30, WAGON, REMOVAL, Rear Bumper.>

B: INSTALLATION

1. WAGON

CAUTION:
• Handle the bumper carefully to avoid damage to the bumper face.
• Do not damage the body during removal or installation of bumper.

1) Install in the reverse order of removal.

Tightening torque:
Refer to COMPONENT of General Description for tightening torque. <Ref. to EI-5, REAR BUMPER, COMPONENT, General Description.>

2. SEDAN

CAUTION:
• Handle the bumper carefully to avoid damage to the bumper face.
• Do not damage the body during removal or installation of bumper.

1) Install in the reverse order of removal.

Tightening torque:
Refer to COMPONENT of General Description for tightening torque. <Ref. to EI-5, REAR BUMPER, COMPONENT, General Description.>

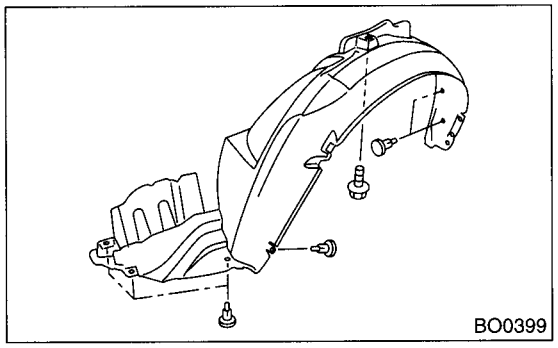
C: REPAIR

Refer to front bumper repair. <Ref. to EI-23, REMOVAL, Front Bumper.>

7. Mud Guard

A: REMOVAL

1) Jack-up the vehicle.
2) Loosen the screws and clips to remove the mud guard.



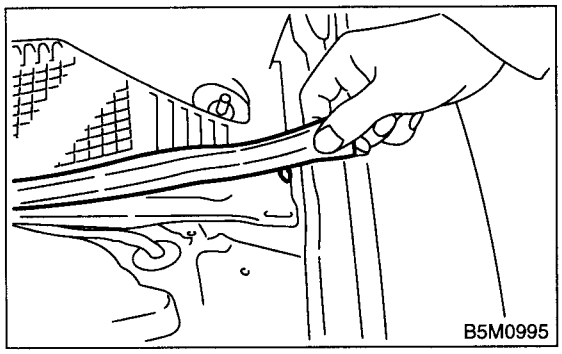
B: INSTALLATION

Insert the hook into body, and tighten it with screw and clip.

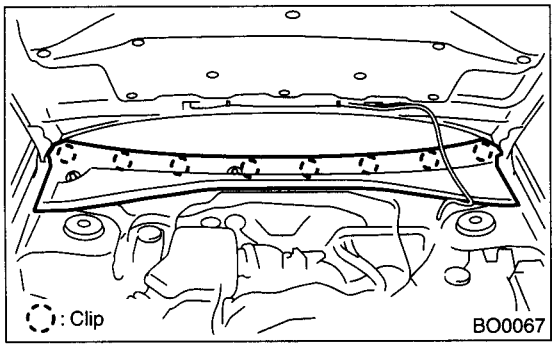
8. Cowl Panel

A: REMOVAL

1) Open the hood.
2) Remove the wiper arm. <Ref. to WW-12, REMOVAL, Front Wiper Arm.>
3) Remove the front panel seal.



4) Loosen the clips to remove the cowl panel.



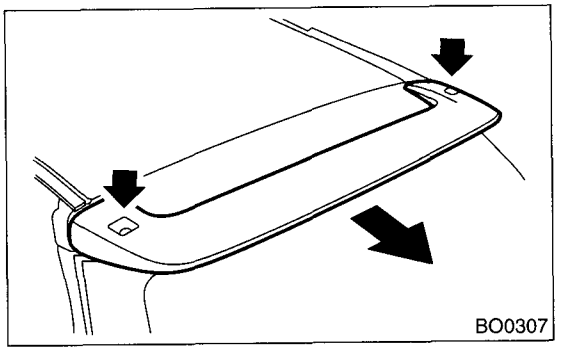
B: INSTALLATION

Install in the reverse order of removal.

9. Roof Spoiler

A: REMOVAL

1) Remove the bolt cap, then remove the two bolts.
2) Detach the roof spoiler.



B: INSTALLATION

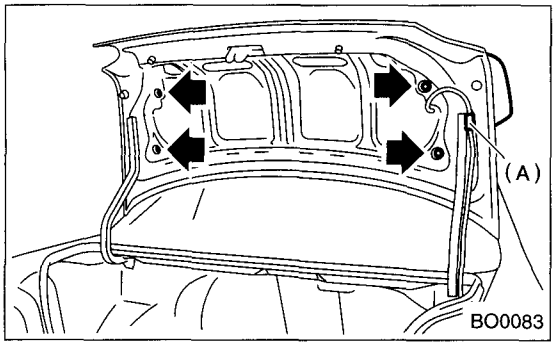
Install in the reverse order of removal.

10.Rear Spoiler

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Open the trunk lid.
3) Remove the electrical connector (A) of high-mounted stop light.
4) Loosen the mounting nut of rear spoiler to remove the rear spoiler.

CAUTION:
• When removing the nut, do not drop it into trunk lid.
• Pay attention to avoid damage during removal or installation.



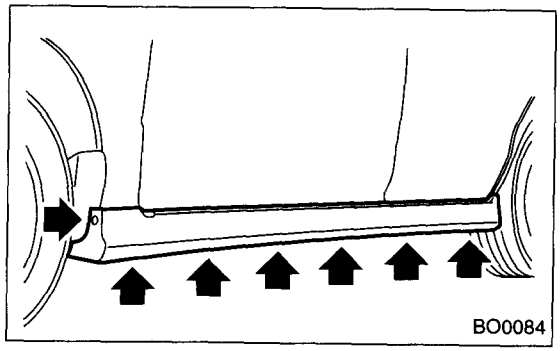
B: INSTALLATION

1) Install in the reverse order of removal.
2) Clean the mounting surfaces of trunk lid and spoiler before installation.

11.Side Sill Spoiler

A: REMOVAL

Remove the clips (1 on front, 6 on lower), then remove the side sill spoiler.



B: INSTALLATION

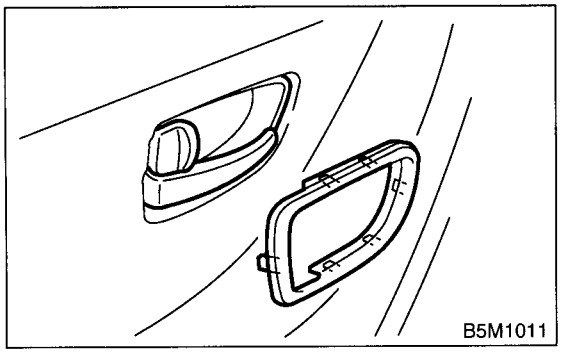
Install in the reverse order of removal.

12.Front Door Trim

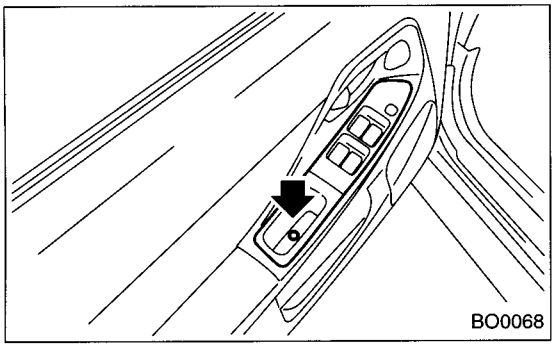
A: REMOVAL

CAUTION:
Do not apply excessive force to the clip. Otherwise the clip may be broken.

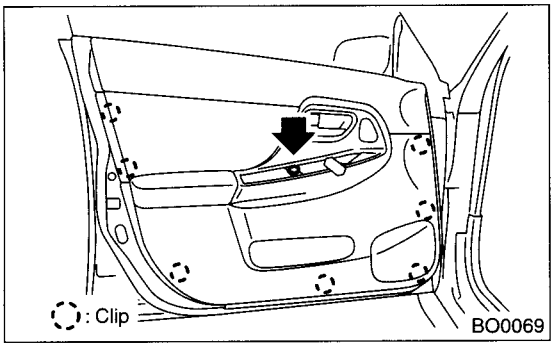
1) Disconnect the ground terminal from battery.
2) Pull up the inner remote cover toward you to remove the upper hook. Pull down it to remove the lower hook. Remove the inner remote cover.



3) Remove the screw.
4) Remove the power window switch assembly and disconnect the harness connector.



5) Remove the screw.
6) Remove the clips of trim panel using clip remover to remove the trim panel.



B: INSTALLATION

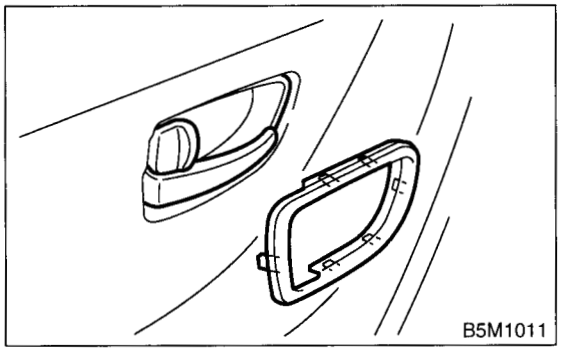
Install in the reverse order of removal.

13.Rear Door Trim

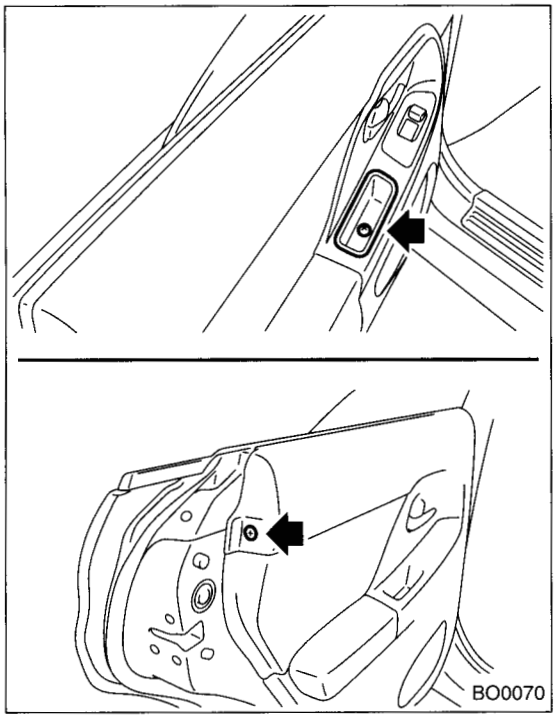
A: REMOVAL

CAUTION:
Do not apply excessive force to the clip. Otherwise the clip may be broken.

1) Disconnect the ground terminal from battery.
2) Pull up the inner remote cover toward you to remove the upper hook. Pull down it to remove the lower hook. Remove the inner remote cover.

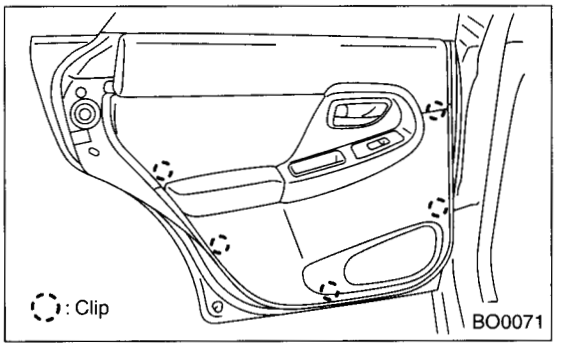


3) Remove the screw and clip.



4) Remove the clips of trim panel using clip remover to remove the trim panel.

5) Disconnect the power window harness connector.



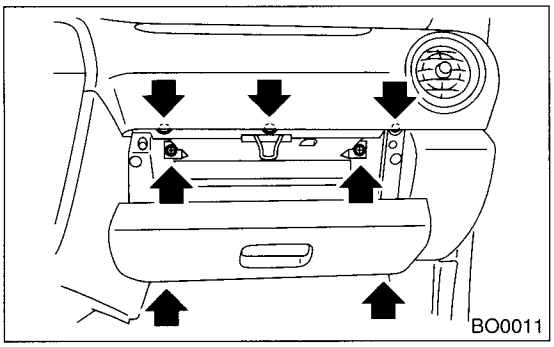
B: INSTALLATION

Install in the reverse order of removal.

14.Glove Box

A: REMOVAL

1) Open the glove box.
2) Loosen the screws to remove glove box.



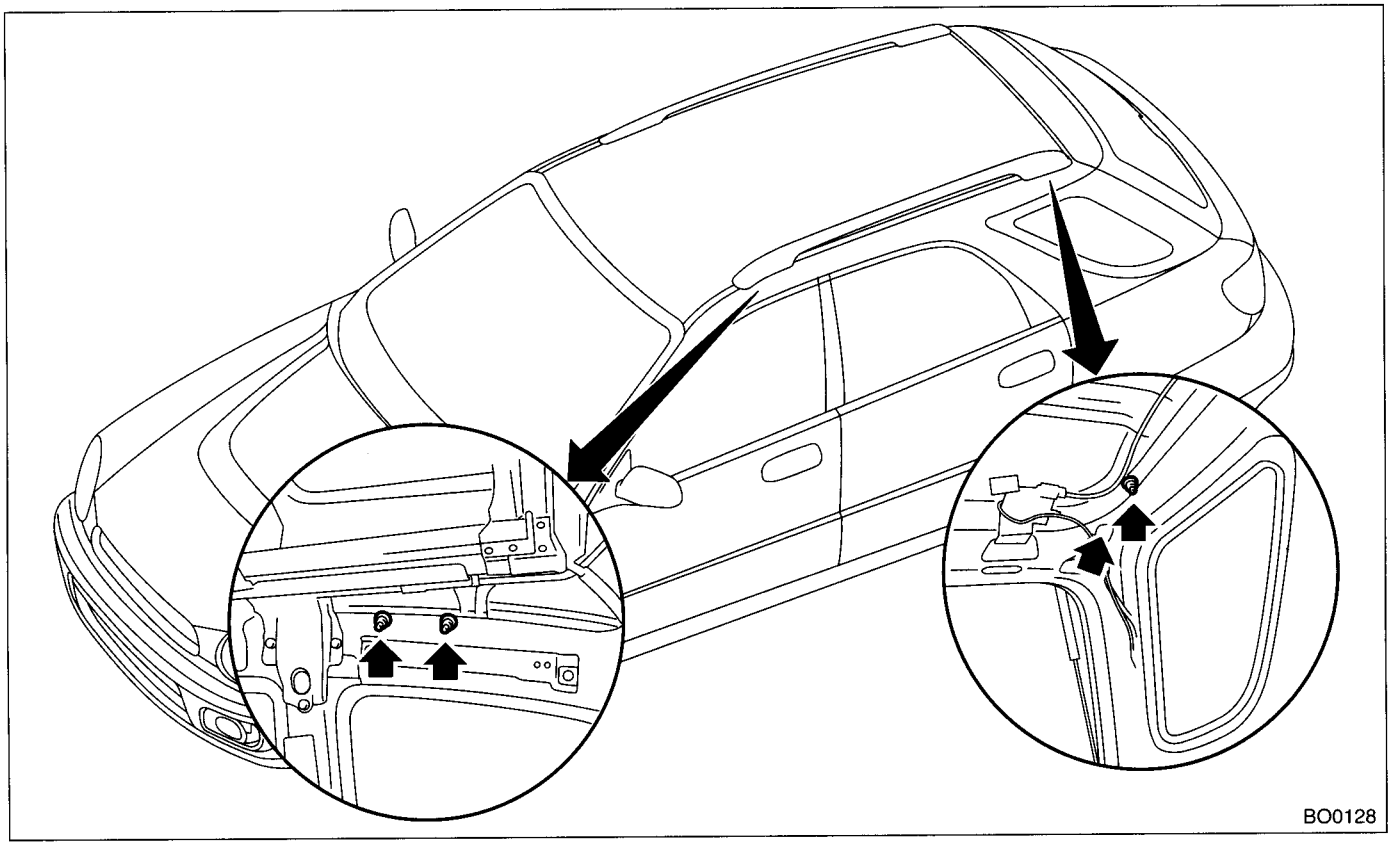
B: INSTALLATION

Install in the reverse order of removal.

15.Roof Rail

A: REMOVAL

1) Remove the roof trim. <Ref. to EI-50, REMOVAL, Roof Trim.>
2) Remove the four mounting nuts and then detach the roof rail carefully.



B: INSTALLATION

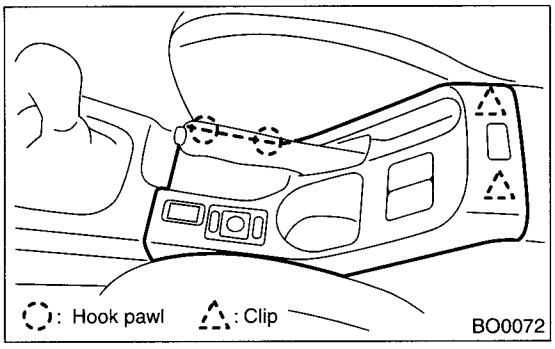
Install in the reverse order of removal.

CAUTION:
Be careful not to scratch the body panels with roof rail stud bolts when removing and installing them.

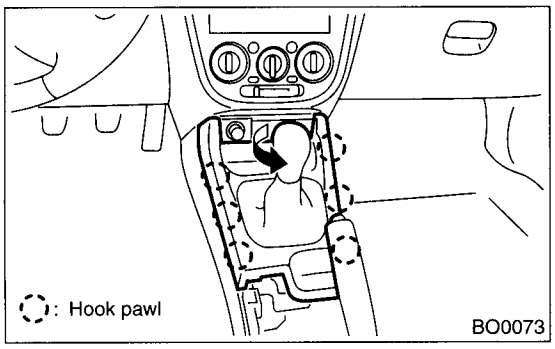
16.Console Box

A: REMOVAL

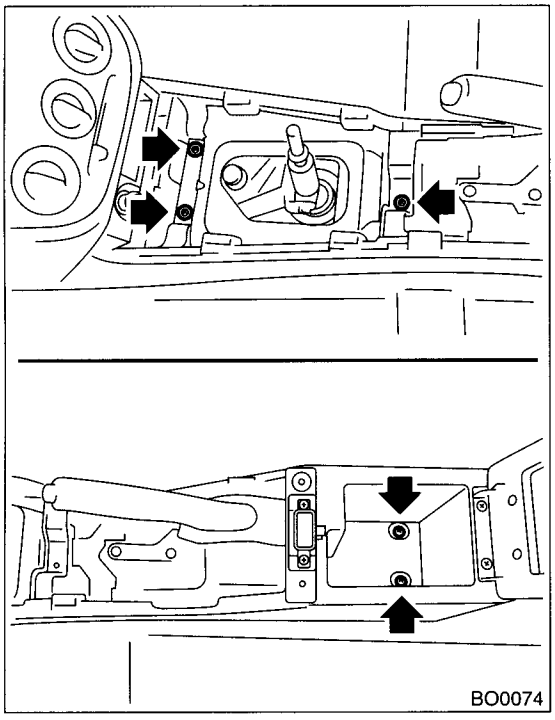
1) Disconnect the ground terminal from battery.
2) Remove the console cover.



3) Remove the shift knob (MT model) and front cover.



4) Loosen the screws to remove the console box.



B: INSTALLATION

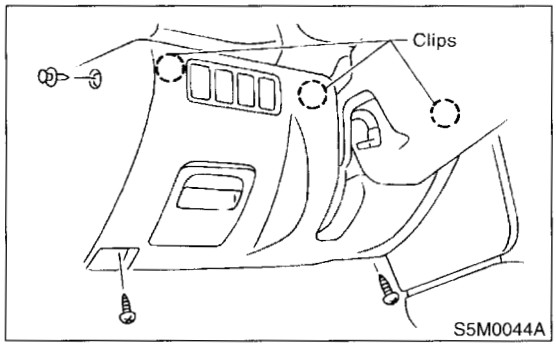
Install in the reverse order of removal.

17.Instrument Panel Assembly

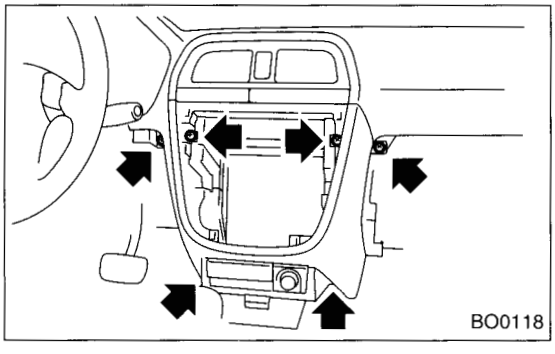
A: REMOVAL

WARNING:
• 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.

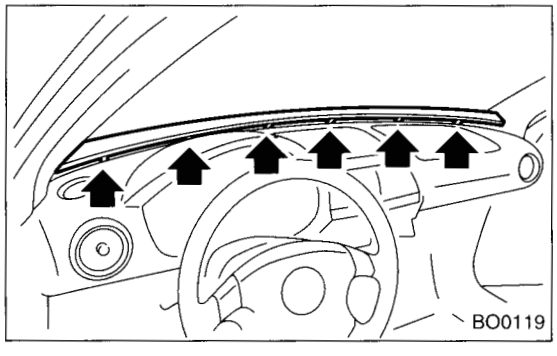
1) Disconnect the ground terminal from battery.
2) Loosen the screws and clips to remove the lower cover.



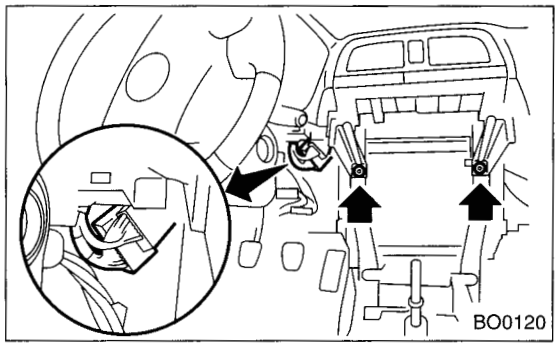
3) Remove the glove box. <Ref. to EI-39, REMOVAL, Glove Box.>
4) Remove the center console panel. <Ref. to AC-25, REMOVAL, Control Unit.>
5) Remove the passenger airbag module. <Ref. to AB-13, Passenger's Airbag Module.>
6) Loosen the four screws and two nuts to remove the lower console panel.



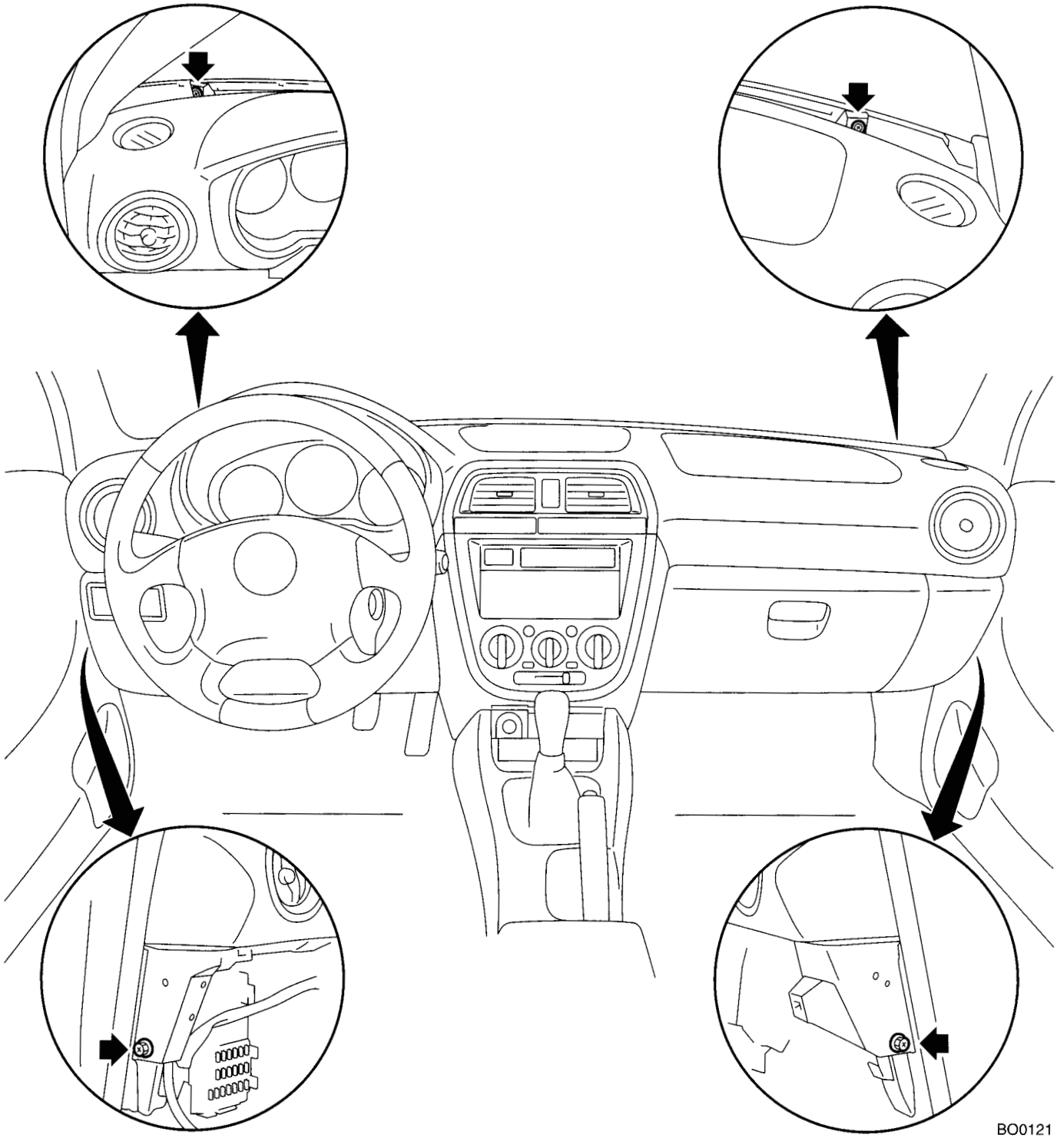
7) Loosen the hooks to remove the defroster panel.



8) Remove the two nuts and disconnect the two connectors.



9) Remove the instrument panel mounting bolts.



BO0121

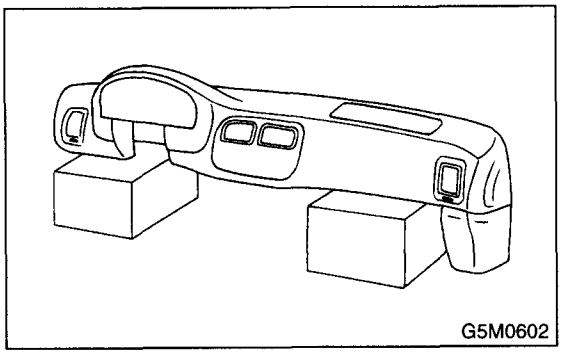
10) Remove the instrument panel.

CAUTION:
Do not pull the harness when disconnecting the connector.

NOTE:
If necessary, make matching marks for easy reassembly.

CAUTION:
• Take care not to scratch the instrument panel and related parts.

- **When storing the removed instrument panel, place it standing up on the floor.**

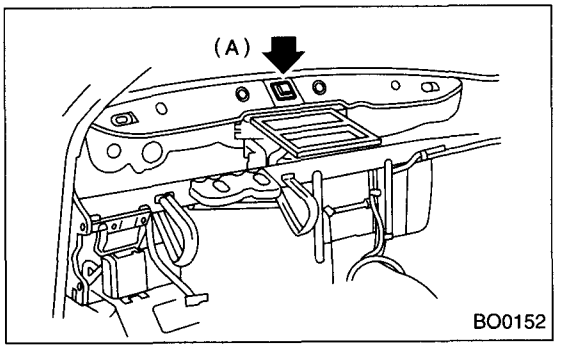


B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
- **Be careful not to snag the harness.**
- **Make sure to connect the harness connector.**
- **Take care not to scratch the instrument panel and related parts.**

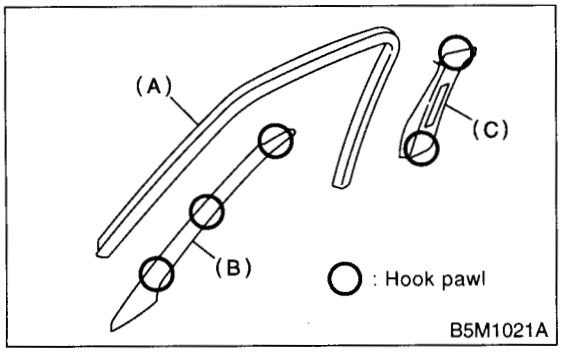
NOTE:
When setting the instrument panel into position, push the hook into grommet (A) on the body panel.



18.Upper Inner Trim

A: REMOVAL

1) Remove the lower inner trim. <Ref. to EI-46, 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).

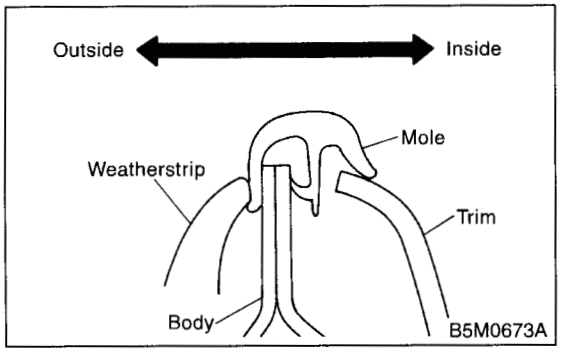


B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Be sure to securely hook pawls of inner trim panel to body flange.

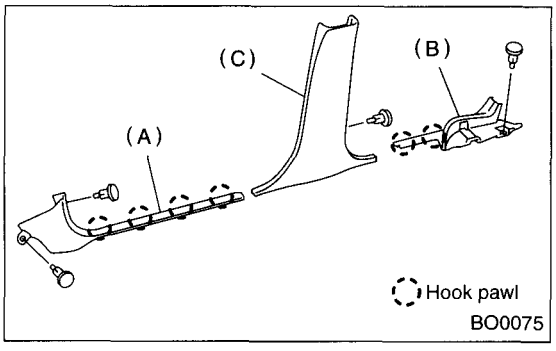
NOTE:
When installing the center pillar upper trim and front pillar upper trim, be sure to set the front mole as shown in figure.



19.Lower Inner Trim

A: REMOVAL

1) Remove the side sill front cover (A).
2) Remove the rear seat cushion <Ref. to SE-11, REMOVAL, Rear Seat.>, then remove side sill rear cover (B).
3) Remove the center pillar lower trim (C).



B: INSTALLATION

Install in the reverse order of removal.

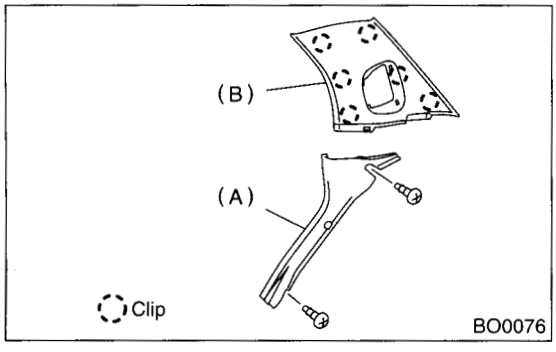
CAUTION:
Be sure to securely hook pawls of inner trim panel to body flange.

20.Rear Quarter Trim

A: REMOVAL

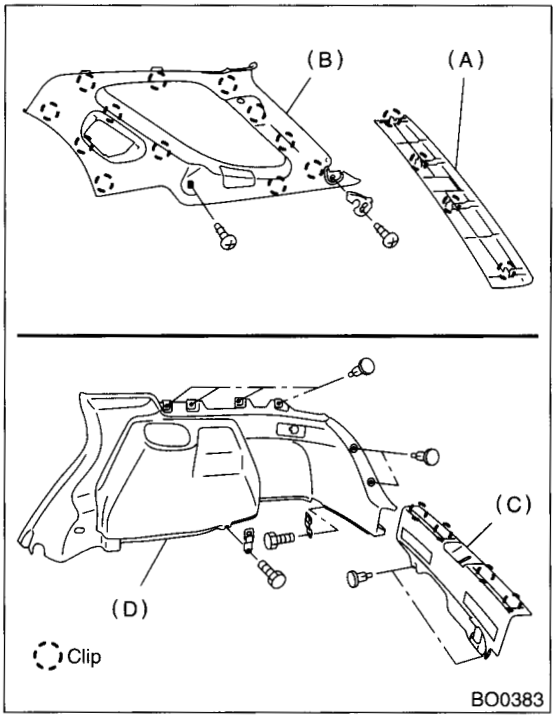
1. SEDAN

1) Remove the rear seat. <Ref. to SE-11, REMOVAL, Rear Seat.>
2) Remove the side sill rear cover. <Ref. to EI-46, REMOVAL, Lower Inner Trim.>
3) Remove the rear pillar lower cover (A).
4) Remove the seatbelt lower anchor bolt, and then remove the rear pillar upper trim (B).



2. WAGON

1) Remove the rear seat. <Ref. to SE-11, REMOVAL, Rear Seat.>
2) Remove the side sill rear cover.
3) Remove the rear rail trim (A).
4) Loosen the screws and clips to remove the rear quarter upper trim (B).
5) Remove the rear skirt trim (C).
6) Loosen the bolts and clips to remove the rear quarter lower trim (D).

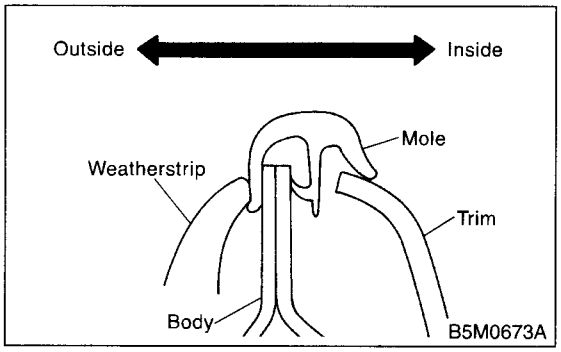


B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Be sure to securely hook pawls of inner trim panel to body flange.

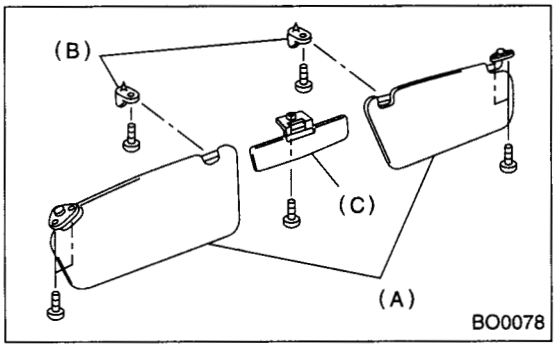
NOTE:
When installing the rear quarter upper trim, be sure to set the rear mole as shown in the figure.



21.Sun Visor

A: REMOVAL

Remove the mounting screws then detach the sun visor (A), hook (B) and center visor (C).



B: INSTALLATION

Install in the reverse order of removal.

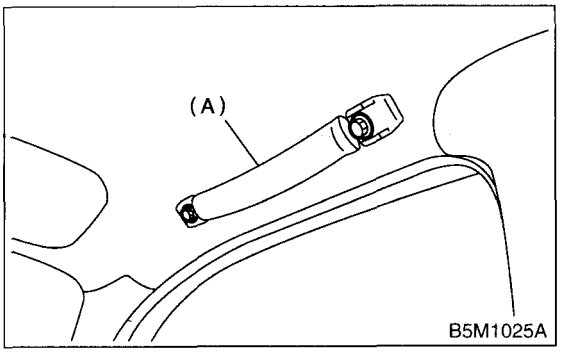
22.Roof Trim

A: REMOVAL

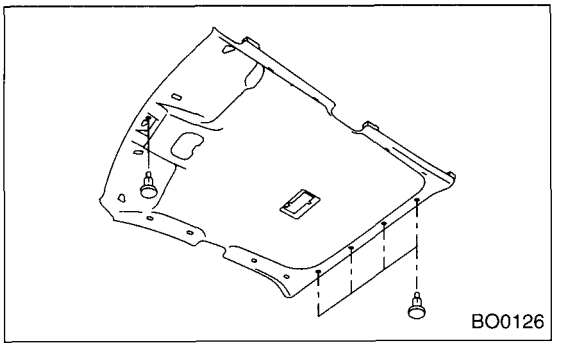
CAUTION:
When removing the clip, use great care not to damage the roof trim.

1. SEDAN

1) Disconnect the ground terminal from battery.
2) Remove the spots light. <Ref. to LI-25, REMOVAL, Spot Light.>
3) Remove the room light. <Ref. to LI-26, REMOVAL, Room Light.>
4) Remove the sun visor and hook on both sides. <Ref. to EI-49, REMOVAL, Sun Visor.>
5) Remove the assist-grips (A).

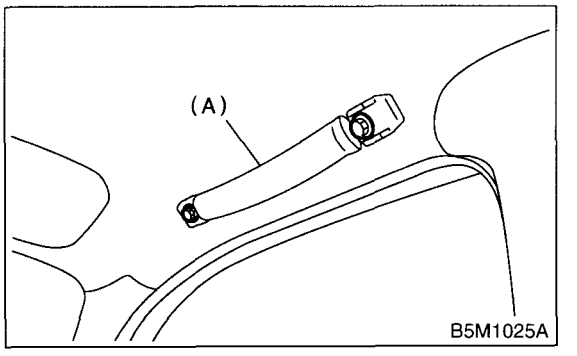


6) Remove the upper inner trim. <Ref. to EI-45, REMOVAL, Upper Inner Trim.>
7) Remove the quarter upper trim. <Ref. to EI-47, SEDAN, REMOVAL, Rear Quarter Trim.>
8) Remove the clips, and then remove the roof trim.

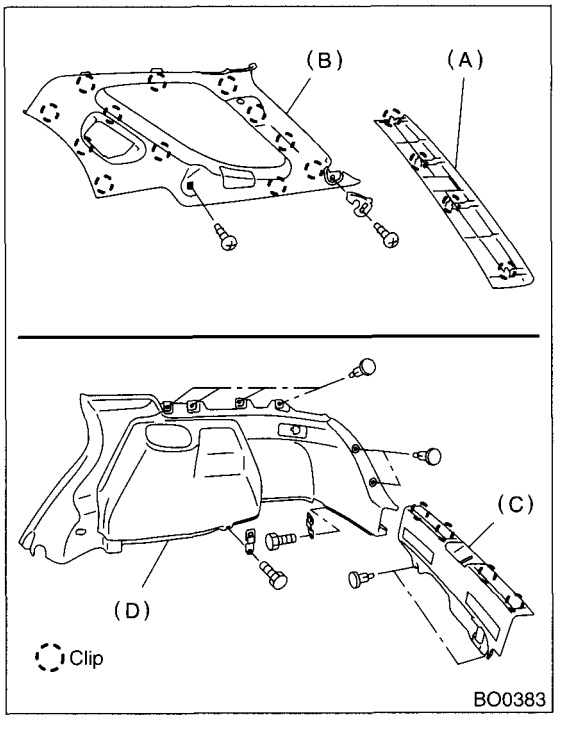


2. WAGON

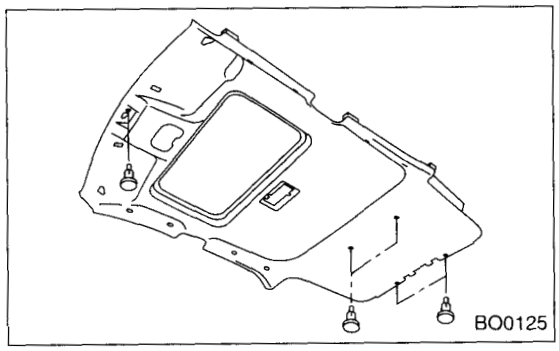
1) Disconnect the ground terminal from battery.
2) Remove the room light. <Ref. to LI-26, REMOVAL, Room Light.>
3) Remove the sun visor and hook on both sides. <Ref. to EI-49, REMOVAL, Sun Visor.>
4) Remove the assist-grips (A).



5) Remove the upper inner trim. <Ref. to EI-45, REMOVAL, Upper Inner Trim.>
6) Remove the rear quarter upper trim shown in the figure.
7) Remove the rear rail trim (A).
8) Remove the rear quarter upper trim (B) of both sides.



9) Remove the clips, and then remove the roof trim.



B: INSTALLATION

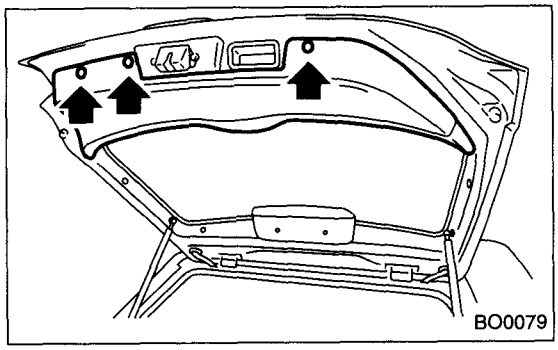
Install in the reverse order of removal.

23.Rear Gate Trim

A: REMOVAL

CAUTION:
Be careful not to damage the clips or their holes.

1) Remove the clips and detach the rear gate trim.



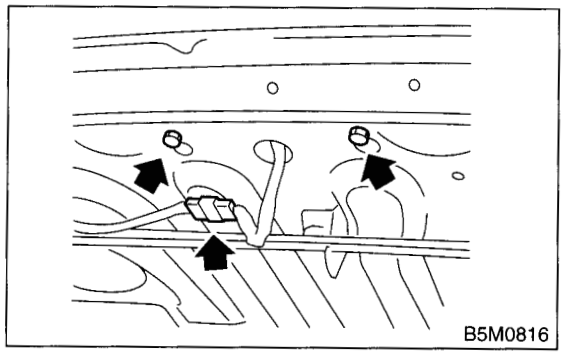
B: INSTALLATION

Install in the reverse order of removal.

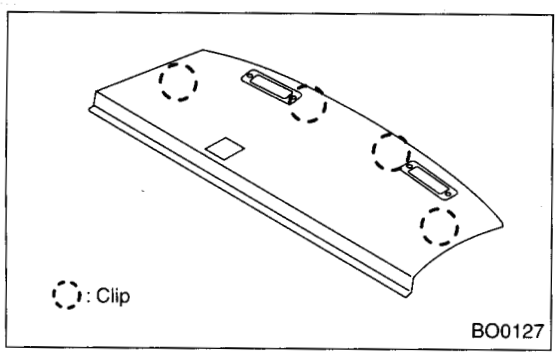
24.Rear Shelf Trim

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the high-mounted stop light.



3) Remove the rear quarter upper trim. <Ref. to EI-47, REMOVAL, Rear Quarter Trim.>
4) Remove the seat belt center lower anchor bolt.
5) Remove the rear shelf trim.



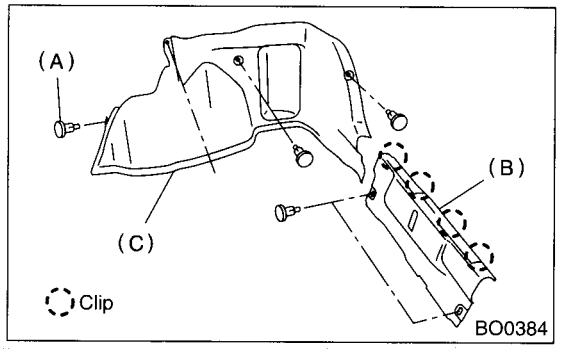
B: INSTALLATION

Install in the reverse order of removal.

25.Trunk Trim

A: REMOVAL

1) Remove the rear seat backrest. <Ref. to SE-11, SEDAN, REMOVAL, Rear Seat.>
2) Remove the clip (A).
3) Loosen the clips, and then detach the trunk rear trim (B).
4) Loosen the clips to remove the trunk side trim (C).



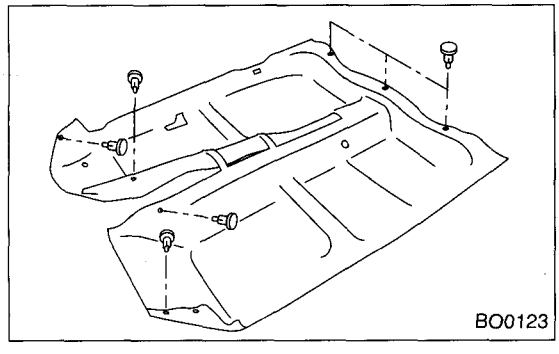
B: INSTALLATION

Install in the reverse order of removal.

26.Floor Mat

A: REMOVAL

1) Remove the front seats. <Ref. to SE-6, REMOVAL, Front Seat.>
2) Remove the rear seat cushion. <Ref. to SE-11, REMOVAL, Rear Seat.>
3) Remove the console box. <Ref. to EI-41, Console Box.>
4) Remove the side sill front cover, side sill rear cover and center pillar lower trim. <Ref. to EI-46, REMOVAL, Lower Inner Trim.>
5) Remove the clips from floor mat.
6) Remove the mat hook.
7) Remove the mat from toe board area.
8) Remove the mat from rear heater duct.
9) Roll the mat, and then take it out of opened rear door.



B: INSTALLATION

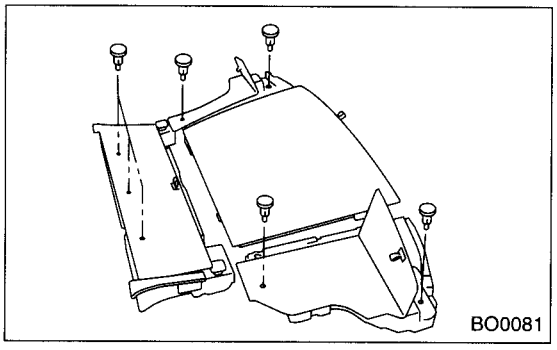
Install in the reverse order of removal.

NOTE:
- Secure the mat firmly with hook and Velcro tape.
- Insert the mat edge firmly into the groove of side sill cover.

27. Luggage Floor Mat

A: REMOVAL

Remove the clips, then detach the rear floor mats and boxes.



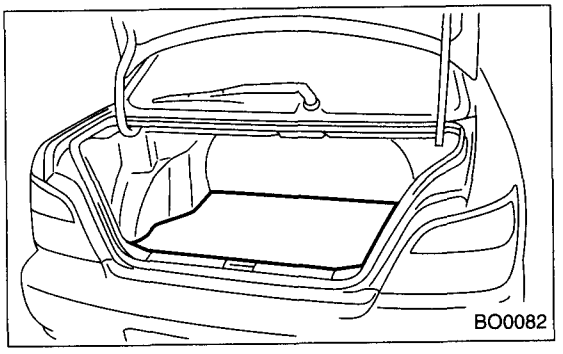
B: INSTALLATION

Install in the reverse order of removal.

28.Trunk Room Mat

A: REMOVAL

Draw out the trunk room mat.



B: INSTALLATION

Install in the reverse order of removal.

TRUNK ROOM MAT

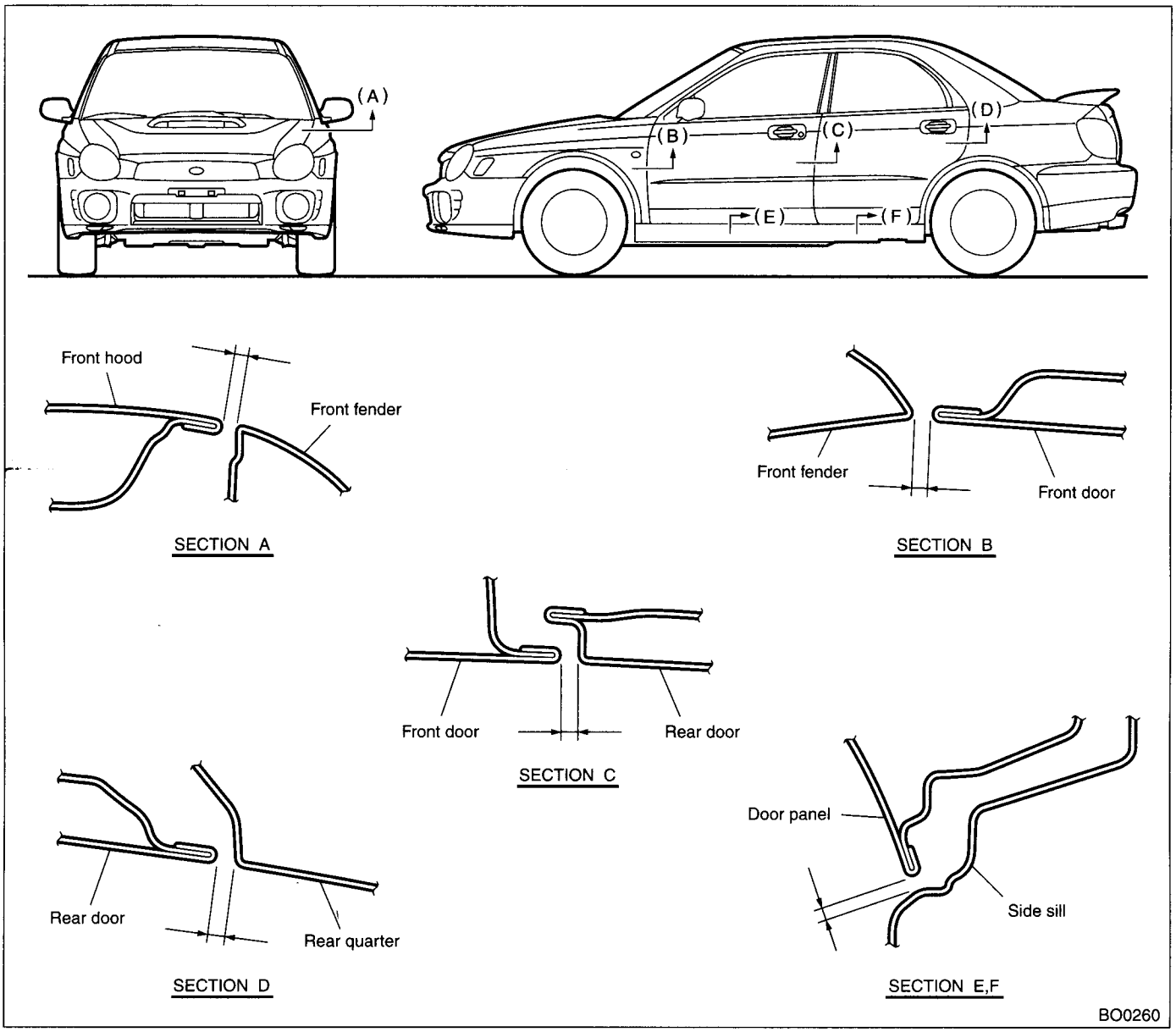
EXTERIOR BODY PANELS

EB

		Page
1.	General Description	2
2.	Front Hood	10
3.	Fender Panel	11
4.	Front Door Panel	12
5.	Front Sealing Cover	14
6.	Rear Door Panel	15
7.	Rear Sealing Cover	17
8.	Trunk Lid Panel	18
9.	Rear Gate Panel	19

1. General Description

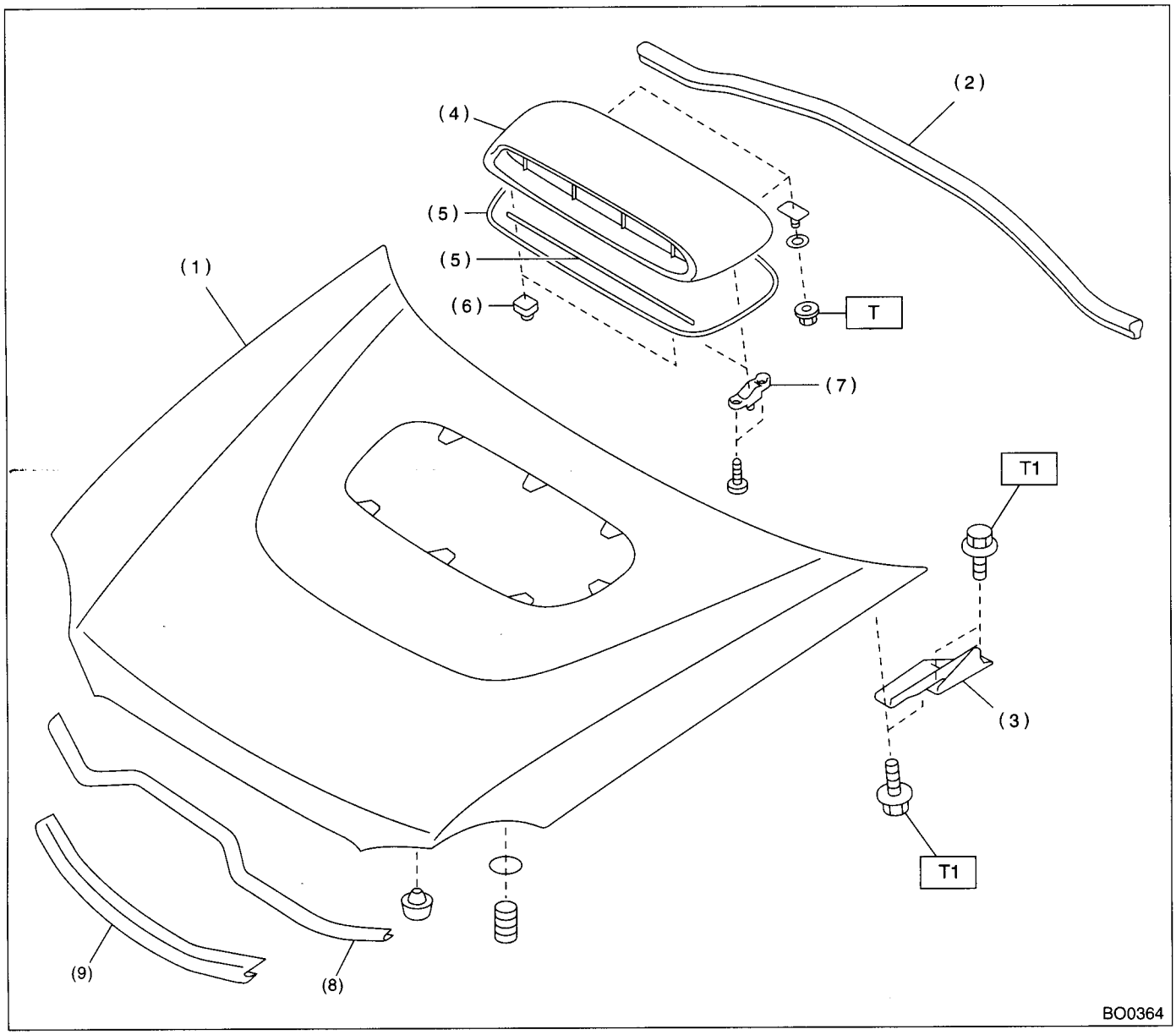
A: SPECIFICATIONS



Section	Part	Specification
A	Front hood to Front fender	NA: 4.0 mm ± 1.0 (0.16 ± 0.04 in) TURBO: 3.7 mm ± 1.0 (0.15 ± 0.04 in)
B	Front fender to Front door	4.6 mm ± 1.0 (0.18 ± 0.04 in)
C	Front door to Rear door	5.0 mm (0.20 in)
D	Rear door to Rear quarter	4.6 mm (0.18 in)
E, F	Door panel to Side sill	5.9 mm (0.23 in)

B: COMPONENT

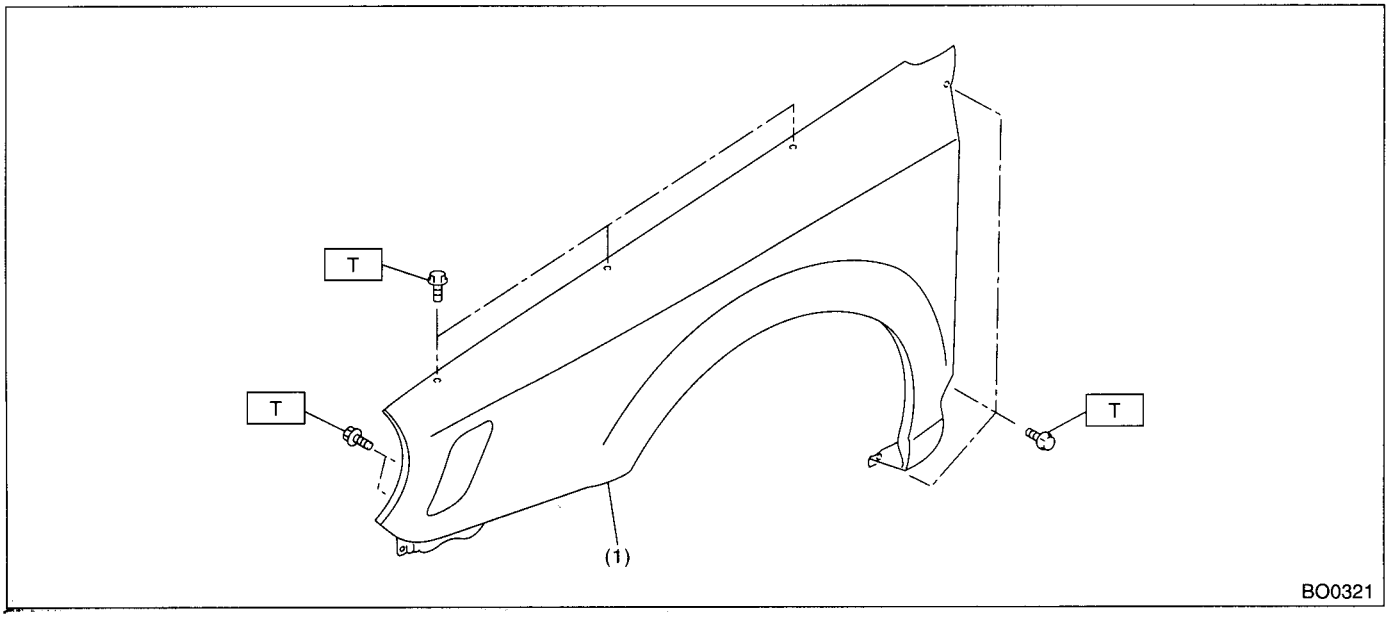
1. FRONT HOOD



(1) Front hood
(2) Seal (Front panel)
(3) Hinge
(4) Hood grille
(5) Packing
(6) Clip
(7) Locking piece
(8) Seal (Intake duct) (Only turbo model)
(9) Seal (Hood)

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.35 (0.75, 5.4)
T1: 24.5 (2.5, 18.1)

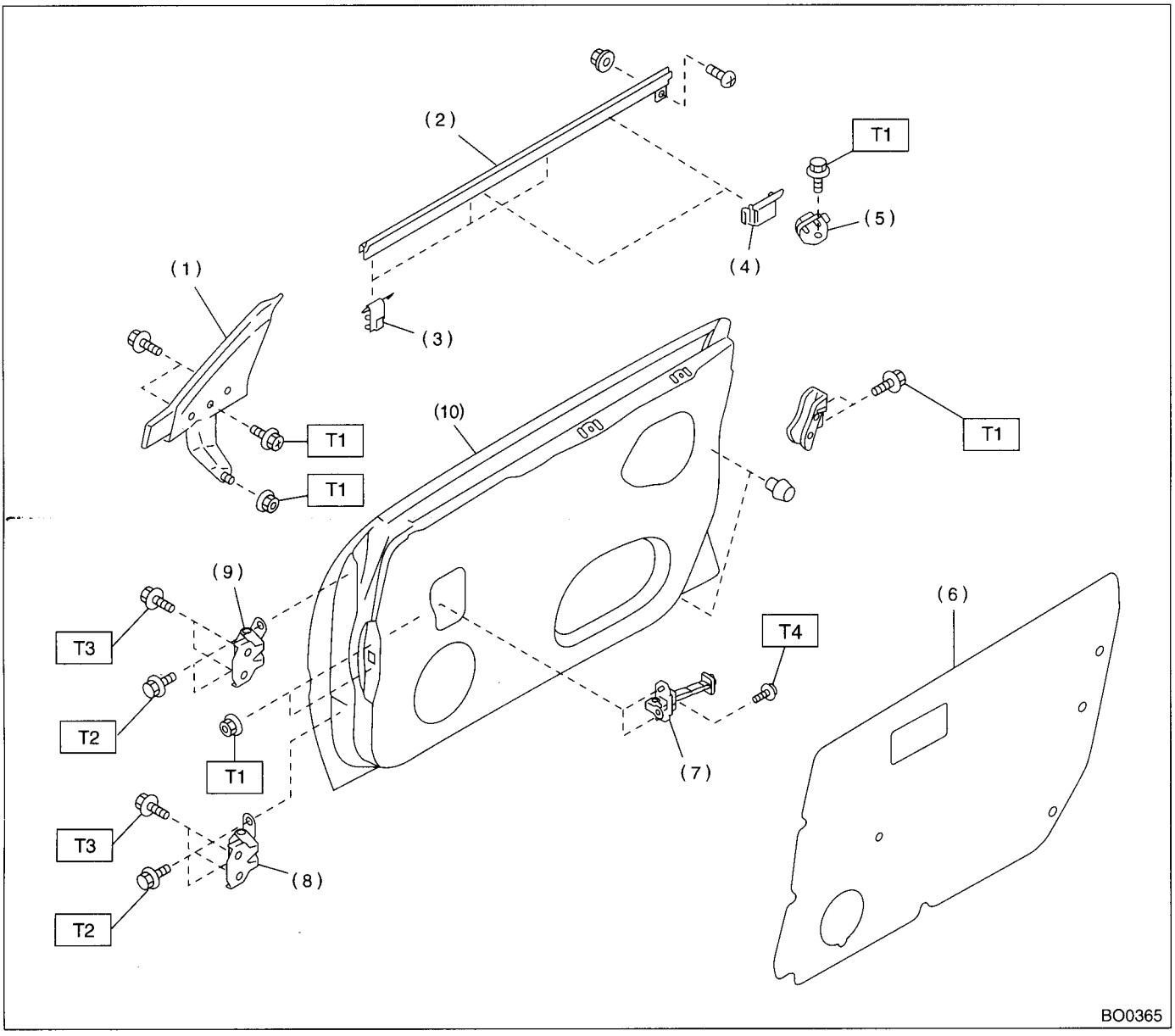
2. FRONT FENDER PANEL



(1) Front fender panel

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.35 (0.75, 5.4)

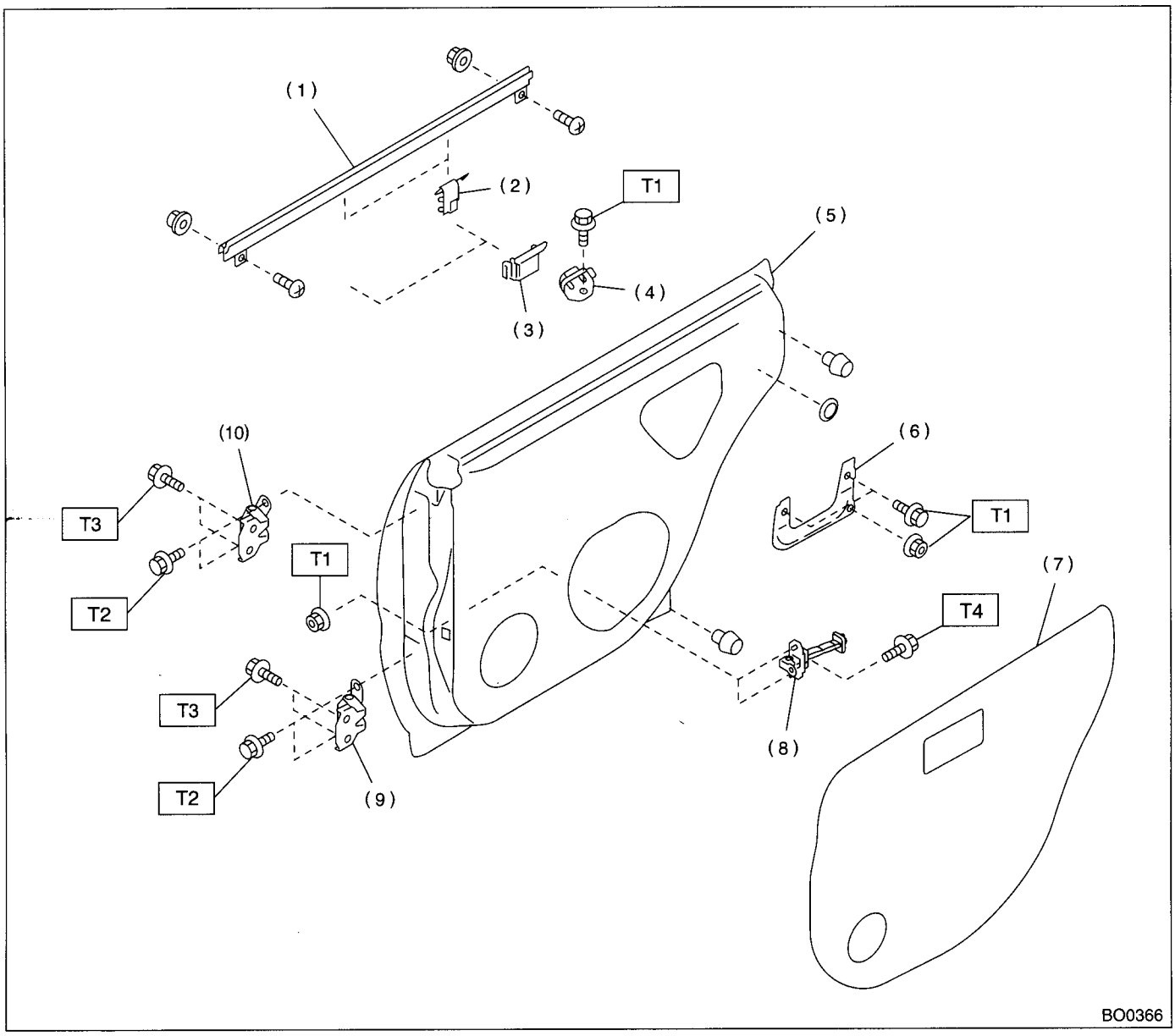
3. FRONT DOOR PANEL



(1)	Gusset	(6)	Sealing cover
(2)	Weatherstrip (Outer)	(7)	Checker
(3)	Clip (Weatherstrip, outer)	(8)	Lower hinge
(4)	Stabilizer (Outer)	(9)	Upper hinge
(5)	Stabilizer (Inner)	(10)	Door panel

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.4 (0.75, 5.5)
T2: 24.5 (2.49, 18)
T3: 29.4 (3.0, 21.7)
T4: 32.3 (3.29, 23.8)

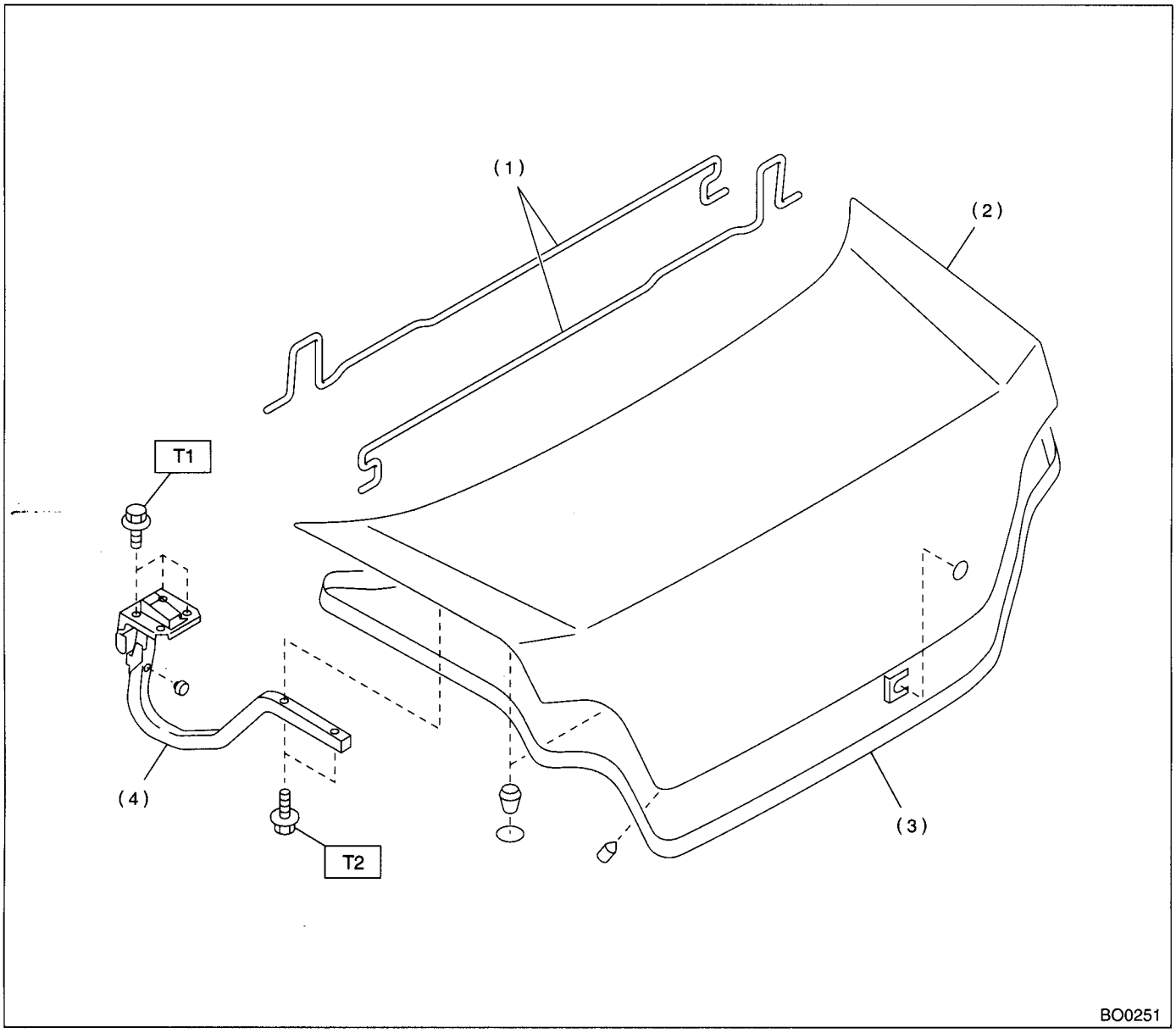
4. REAR DOOR PANEL



(1) Weatherstrip (Outer)
(2) Clip (Weatherstrip, outer)
(3) Stabilizer (Outer)
(4) Stabilizer (Inner)
(5) Door panel
(6) Bracket
(7) Sealing cover
(8) Checker
(9) Lower hinge
(10) Upper hinge

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.4 (0.75, 5.5)
T2: 24.5 (2.49, 18)
T3: 29.4 (3.0, 21.7)
T4: 32.3 (3.29, 23.8)

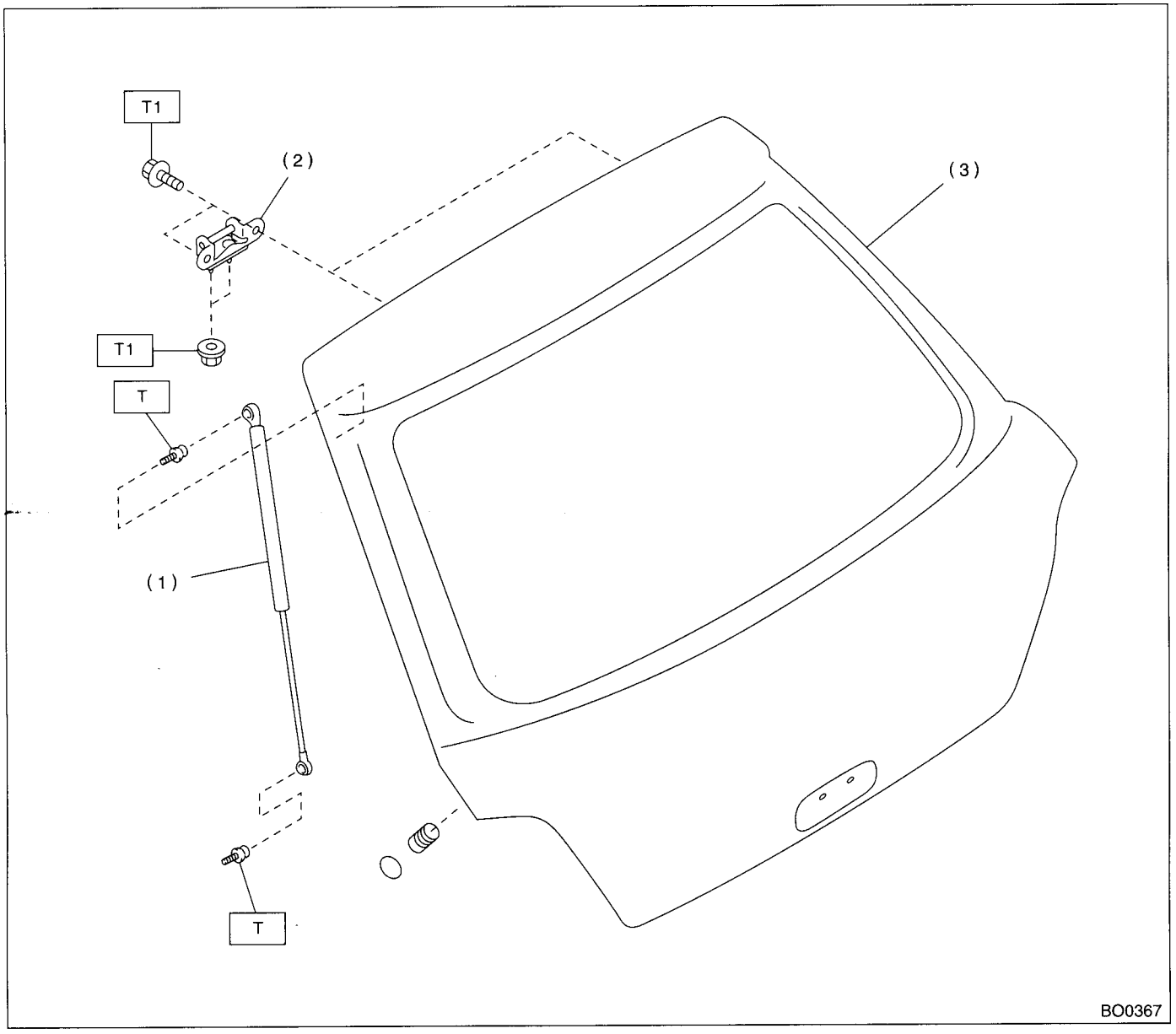
5. TRUNK LID PANEL



(1) Torsion bar
(2) Trunk lid
(3) Weatherstrip
(4) Hinge ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 14 (1.8, 13)

6. REAR GATE PANEL



(1) Gas stay
(2) Hinge
(3) Rear gate

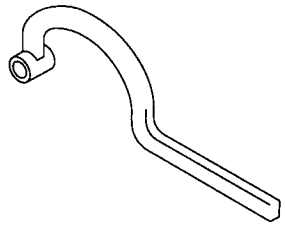
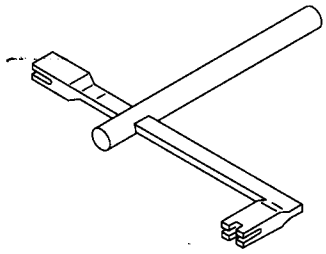
Tightening torque: N·m (kgf-m, ft-lb)
T: 14 (1.43, 10.3)
T1: 25 (2.5, 18.1)

C: CAUTION

- Exterior body panels are heavy. Do not drop and damage the panels. During removal and installation, do not damage the panel painting surface.
- While removing mounting bolts, using assistance devices such as a support jack will help support the panel.
- Be careful not to lose small parts.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B5M1117	925610000	WRENCH	Used for removing and installing door hinge.
 B5M1118	927780000	REMOVER	Used for removing and installing trunk torsion bar.

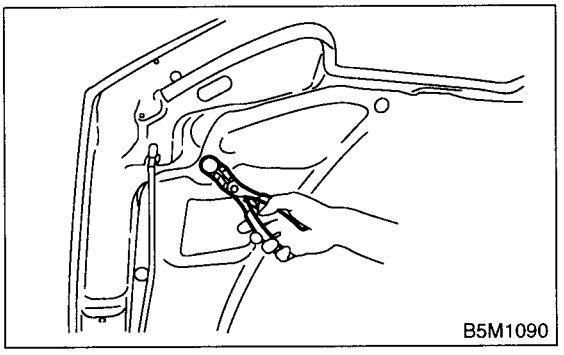
2. GENERAL TOOL

TOOL NAME	REMARKS
Support Jack	Used for supporting door panel.

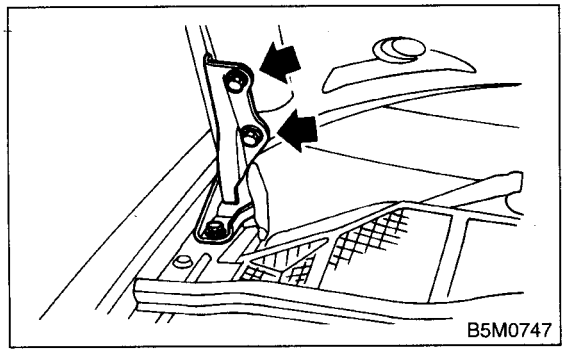
2. Front Hood

A: REMOVAL

1) Open the front hood to remove the washer nozzles.
2) Release the clips to remove the hood insulator.



3) Remove the bolts to disconnect the hood from hinges.



4) Remove the hood grille. (Turbo model) <Ref. to EI-19, REMOVAL, Hood Grille.>

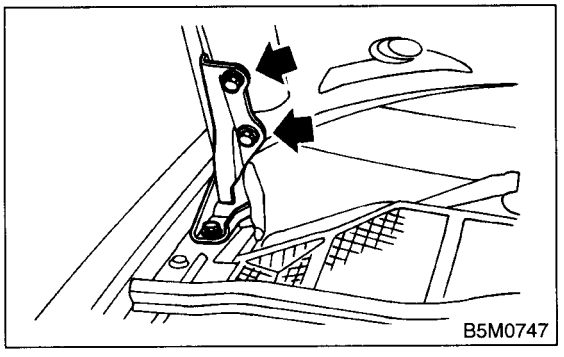
B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust the clearance between hood and fender. Clearance must be equal at both sides.

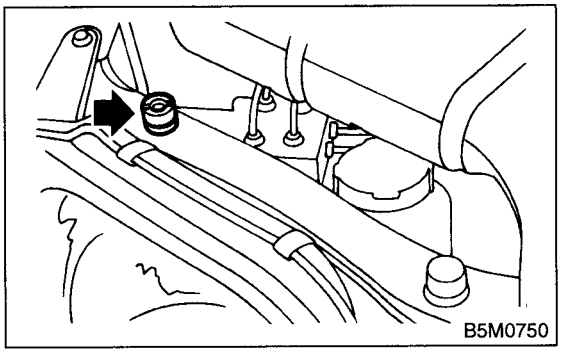
Tightening torque:
24.5 N·m (2.49 kgf-m, 18 ft-lb)

C: ADJUSTMENT

1) Use the hinge mounting holes to align the front hood longitudinally and laterally.



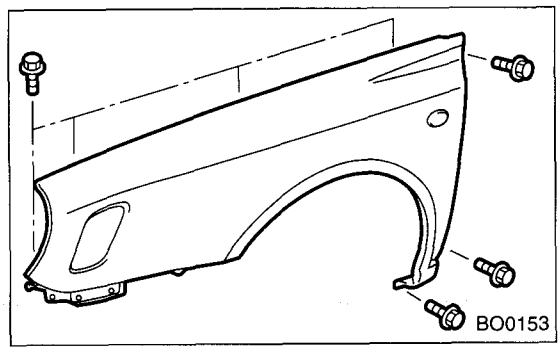
2) Adjust the height at front end of hood. <Ref. to SL-41, ADJUSTMENT, Front Hood Lock Assembly.>
3) Rotate the hood buffer to adjust lateral height.



3. Fender Panel

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the side sill spoilers. <Ref. to EI-36, Side Sill Spoiler.> (If fitted)
3) Remove the front bumper face. <Ref. to EI-23, REMOVAL, Front Bumper.>
4) Remove the mud guard. <Ref. to EI-32, REMOVAL, Mud Guard.>
5) Loosen the bolts to remove front fender.



B: INSTALLATION

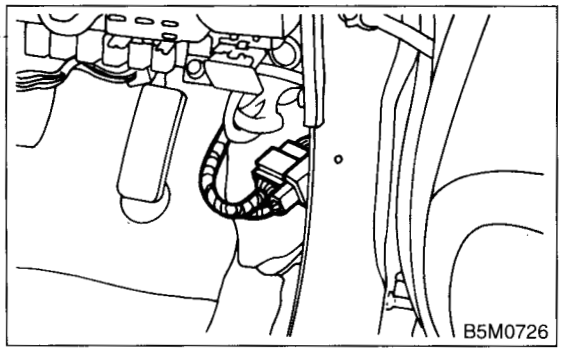
1) Install in the reverse order of removal.
2) When the fender panel is installed, the clearance between fender panel and hood or front fender must be equal.

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

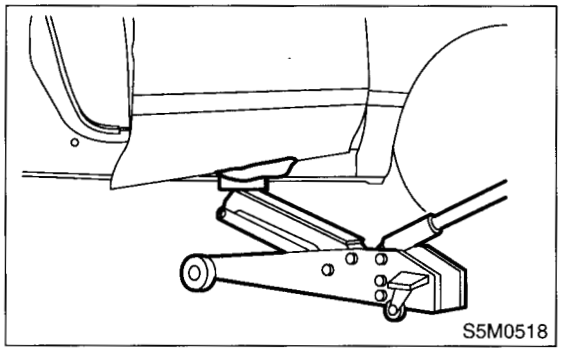
4. Front Door Panel

A: REMOVAL

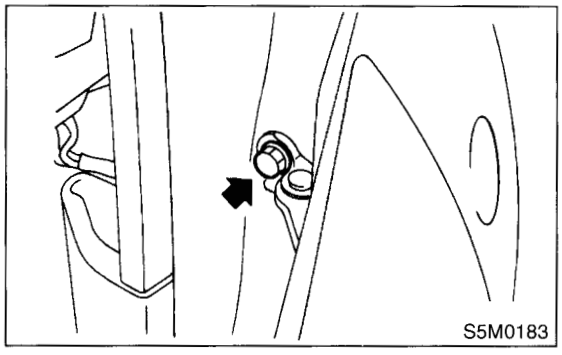
1) Disconnect the ground terminal from battery.
2) Remove the front door trim. <Ref. to EI-37, REMOVAL, Front Door Trim.>
3) Remove the outer mirror assembly. <Ref. to GW-33, REMOVAL, Outer Mirror Assembly.>
4) Remove the front door glass. <Ref. to GW-15, REMOVAL, Front Door Glass.>
5) Remove the front door regulator and motor. <Ref. to GW-19, REMOVAL, Front Regulator and Motor Assembly.>
6) Remove the front door latch assembly. <Ref. to SL-30, REMOVAL, Front Door Latch Assembly.>
7) Remove the front outer handle. <Ref. to SL-29, REMOVAL, Front Outer Handle.>
8) Remove the front pillar lower trim to disconnect connector from the body harness.


B5M0726

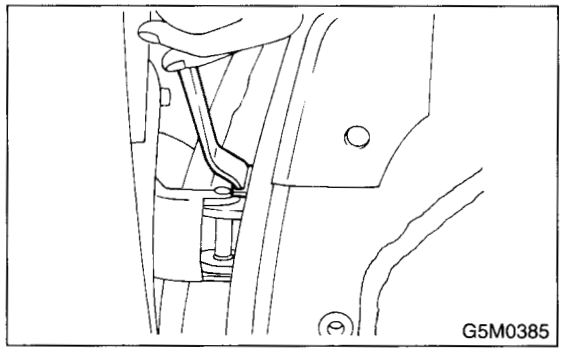
9) Put a wooden block on jack and place jack under the door. Support the door with a support jack to protect it from damage.


S5M0518

10) Remove the checker bolts.


S5M0183

11) Remove the door-side bolts for upper and lower hinges to remove the door.


G5M0385

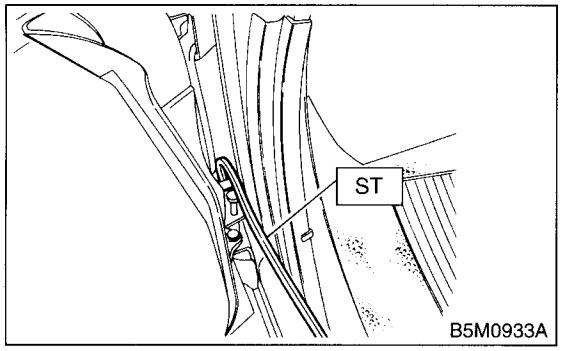
CAUTION:
• During removal and installation of doors, do not damage body.
• Doors are heavy. Be careful not to drop and damage them.

B: INSTALLATION

1) Install in the reverse order of removal.
2) Apply grease to sliding area of the door hinges. Refer to COMPONENT of General Description for tightening torque. <Ref. to EB-5, FRONT DOOR PANEL, General Description.>

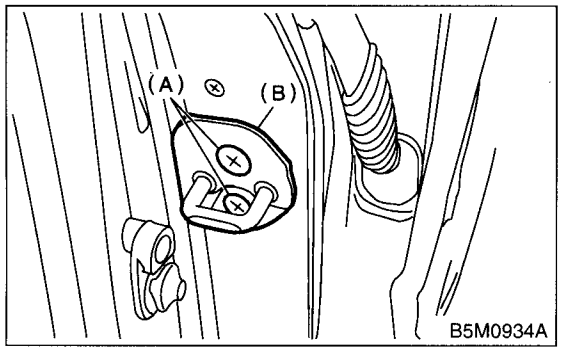
C: ADJUSTMENT

1) Using special tool, 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 screw (A) and 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 impact wrench. Welding area on striker nut plate is easily broken.

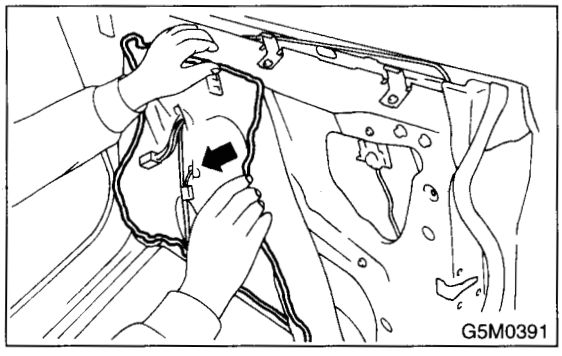


5. Front Sealing Cover

A: REMOVAL

1) Disconnect the battery ground cable.
2) Remove the front door trim. <Ref. to EI-37, REMOVAL, Front Door Trim.>
3) Remove the front speaker. <Ref. to ET-7, REMOVAL, Front Speaker.>
4) Using a spatula, remove the sealer.

CAUTION:
• Carefully remove sealer. Excessive force will easily break the cover.
• If cover gets broken, replace it with a new one.



B: INSTALLATION

1) Install in the reverse order of removal.
2) When replacing sealing cover, use the CEMEDINE 5430L sealer.
3) Press the sealer-applied area firmly to prevent any floating on surface.

Sealer:
CEMEDINE 5430L or equivalent

CAUTION:
• Apply a uniform bead of sealer.
• Attach sealing cover, keeping it from becoming wrinkled.
• Breaks in the bead will allow water leakage and contamination.

C: INSPECTION

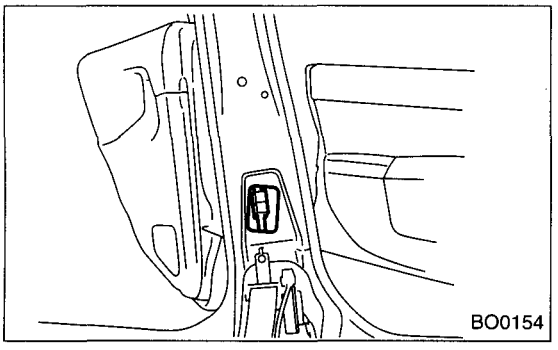
If the sealing cover is damaged, replace it with a new one.

6. Rear Door Panel

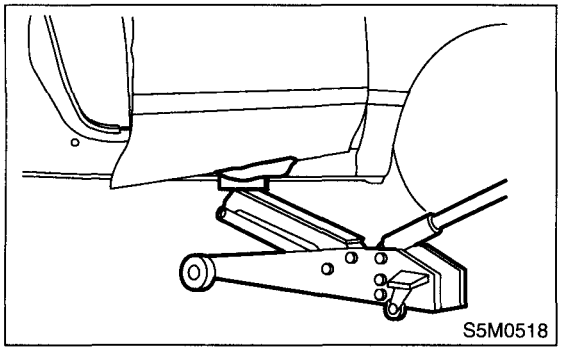
A: REMOVAL

CAUTION:
• During removal and installation of doors, do not damage body.
• Doors are heavy. Be careful not to drop and damage them.

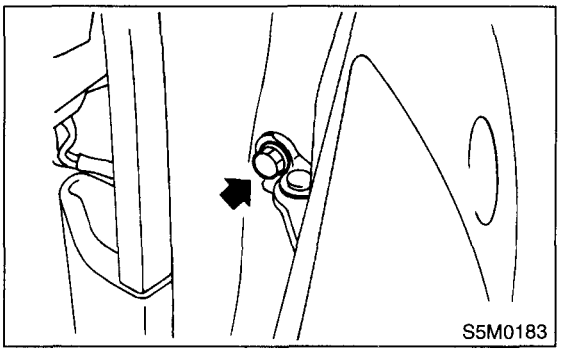
1) Disconnect the ground terminal from battery.
2) Remove the rear door trim. <Ref. to EI-38, REMOVAL, Rear Door Trim.>
3) Remove the rear door glass. <Ref. to GW-20, REMOVAL, Rear Door Glass.>
4) Remove the rear door regulator and motor assembly. <Ref. to GW-22, REMOVAL, Rear Regulator and Motor Assembly.>
5) Remove the rear door latch. <Ref. to SL-34, REMOVAL, Rear Door Latch Assembly.>
6) Remove the rear outer handle. <Ref. to SL-33, REMOVAL, Rear Outer Handle.>
7) Remove the center pillar lower trim. <Ref. to EI-46, REMOVAL, Lower Inner Trim.>
8) Disconnect the connector of door harness.


BO0154

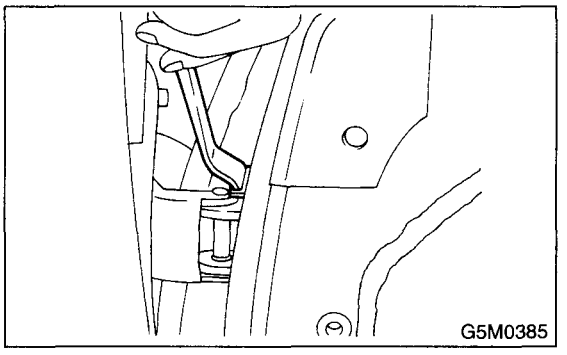
9) Put a wooden block on the jack and place the jack under the door. Support the door with the jack to protect it.


S5M0518

10) Remove the checker bolts.


S5M0183

11) Remove the door-side bolts for upper and lower hinges to remove door.

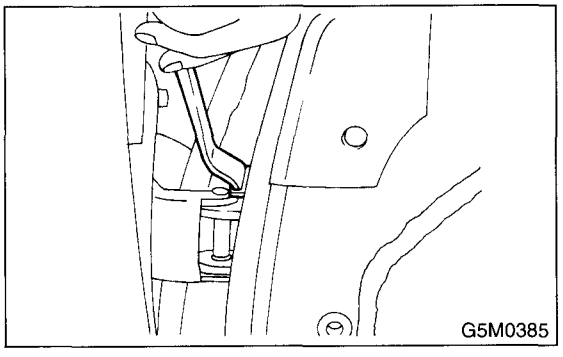

G5M0385

B: INSTALLATION

1) Install in the reverse order of removal.
2) Apply grease to sliding area of the door hinges. Refer to COMPONENT of General Description for tightening torque. <Ref. to EB-6, REAR DOOR PANEL, General Description.>

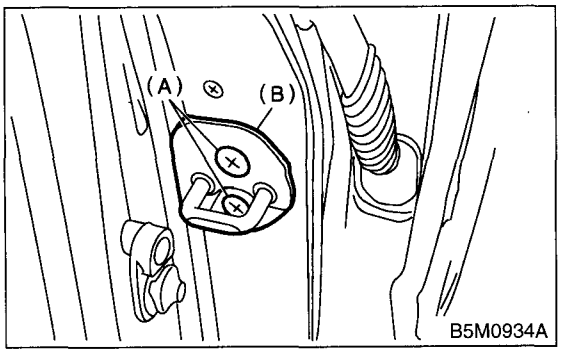
C: ADJUSTMENT

1) Open the front door, loosen the door-side bolts of upper and lower hinges to align the position of rear door panel longitudinally and vertically.



2) Loosen the screw (A) and 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.

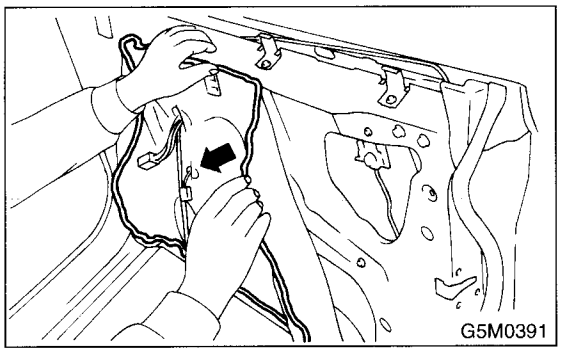


7. Rear Sealing Cover

A: REMOVAL

1) Disconnect the battery ground cable.
2) Remove the rear door trim. <Ref. to EI-38, REMOVAL, Rear Door Trim.>
3) Remove the rear speaker. <Ref. to ET-9, REMOVAL, Rear Speaker.>
4) Using a spatula, remove the sealer.

CAUTION:
• Carefully remove sealer. Excessive force will easily break the cover.
• If cover gets broken, replace it with a new one.



B: INSTALLATION

1) Install in the reverse order of removal.
2) When replacing sealing cover, use the CEMEDINE 5430L sealer.
3) Press the sealer-applied area firmly to prevent any floating on surface.

Sealer:
CEMEDINE 5430L or equivalent

CAUTION:
• Apply an uniform bead of sealer.
• Attach sealing cover, keeping it from becoming wrinkled.
• Breaks in the bead will allow water leakage and contamination.

C: INSPECTION

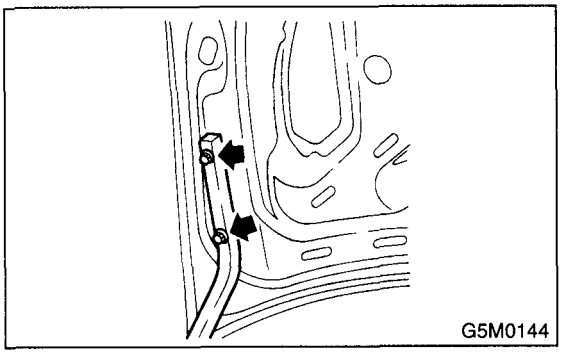
If the sealing cover gets damaged, replace it with a new one.

8. Trunk Lid Panel

A: REMOVAL

1. TRUNK LID

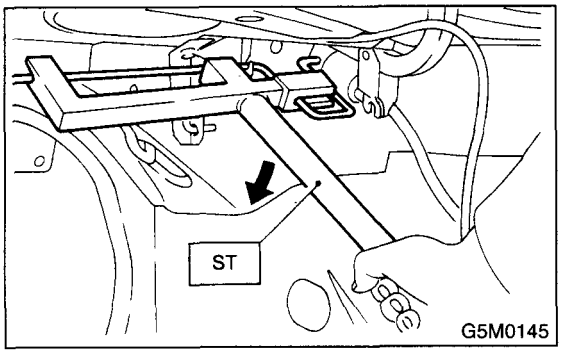
1) Open the trunk lid.
2) Remove the trunk lid release handle. <Ref.to>
3) Loosen the trunk lid mounting bolts to remove trunk lid from the hinges.



2. TORSION BAR

1) Open the trunk lid.
2) Using special tool, remove the torsion bar from the hinge link.
ST 927780000 REMOVER

CAUTION:
During removal and installation, carefully handle torsion bar. It will generate reactive force.



3) Remove the right/left torsion bars.

CAUTION:
After the torsion bar is removed, the trunk lid will slam shut. Be careful not to get hit by the trunk lid.

B: INSTALLATION

1. TRUNK LID

1) Install in the reverse order of removal.
2) Install the trunk lid with uniform clearance.

Tightening torque:
14 N·m (1.8 kgf-m, 13 ft-lb)

2. TORSION BAR

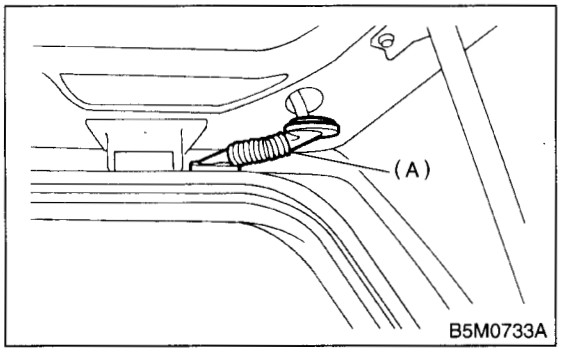
1) Install in the reverse order of removal.
2) Apply the grease to rotating area of hinges and mating surface of torsion bar.

9. Rear Gate Panel

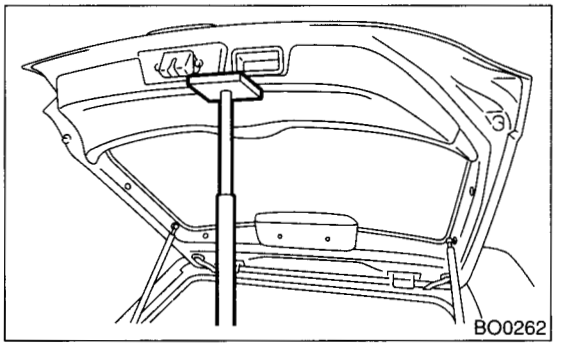
A: REMOVAL

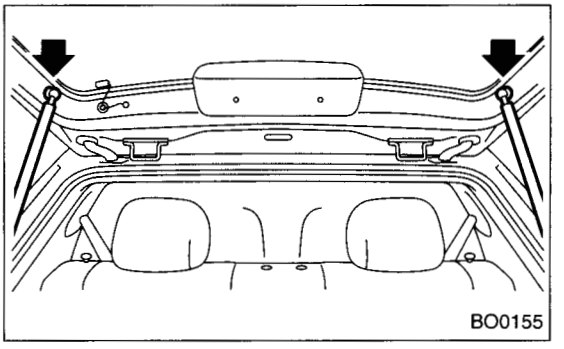
1. REAR GATE PANEL

1) Disconnect the battery ground cable.
2) Open the rear gate.
3) Remove the rear gate outer handle. <Ref. to SL-36, REMOVAL, Rear Gate Outer Handle.>
4) Remove the rear gate latch assembly. <Ref. to SL-37, REMOVAL, Rear Gate Latch Assembly.>
5) Remove the rear gate key lock cylinders. <Ref. to SL-44, REAR GATE, REPLACEMENT, Key Lock Cylinders.>
6) Remove the rear wiper. <Ref. to WW-17, REMOVAL, Rear Wiper Motor.>
7) Disconnect the connectors of rear wiper, rear defogger, and other lighting devices.
8) Disconnect the washer hose.
9) Remove the rubber duct (A) connection, and pull out the harness and washer hose from the rear gate.



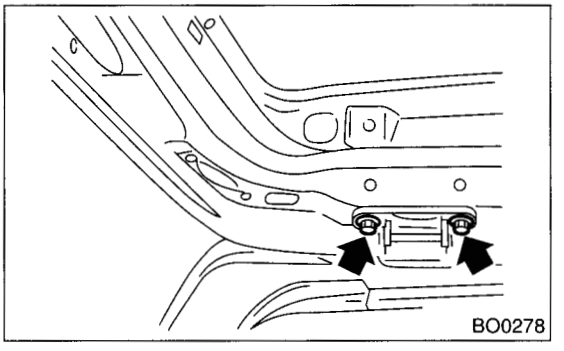
10) Using a support, support the rear gate while removing gas stay mounting bolts.





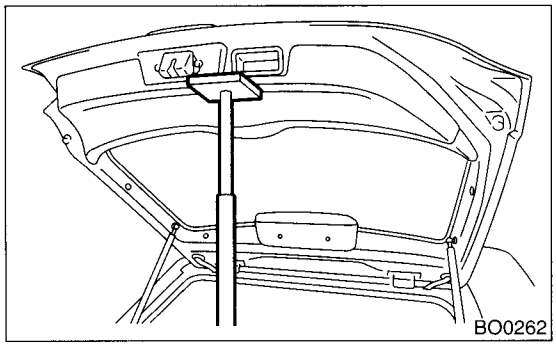
CAUTION:
When the rear gate is released, it may hit and damage the body. To prevent this, place a shop cloth between body and gate.

11) Loosen the rear gate bolts to remove the rear gate.



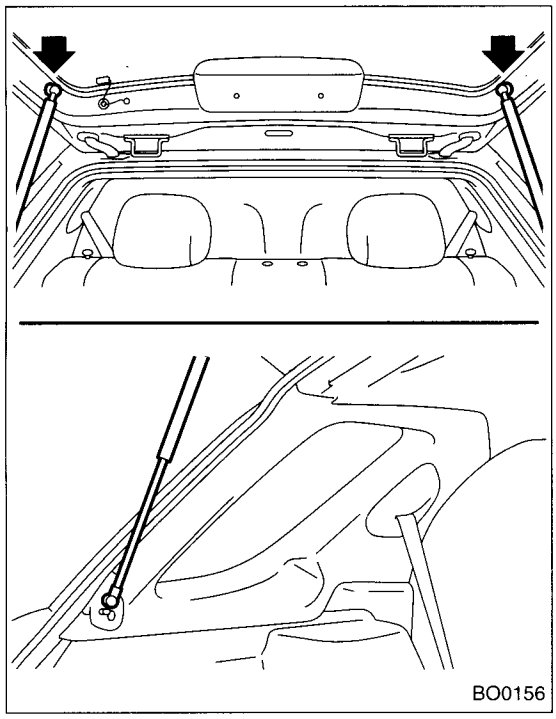
2. GAS STAY

1) Open the rear gate. Using a support jack to support the rear gate.



CAUTION:
- **After gas stay is removed, rear gate cannot stay open. Supporting the rear gate with a jack, remove the bolts.**
- **Do not damage piston rods and oil seals.**
- **Never disassemble cylinders: They contain gas.**

2) Loosen the bolts to remove 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-8, REAR GATE PANEL, General Description.>

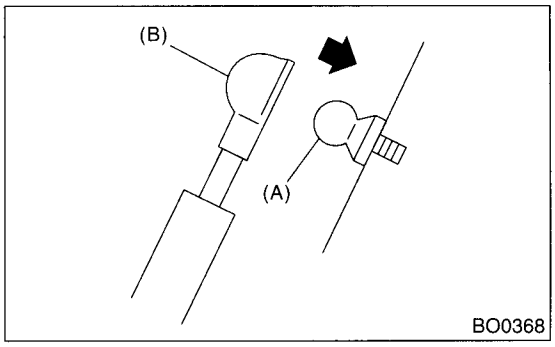
CAUTION:
Do not damage painted surfaces of body and rear gate.

2. GAS STAY

1) Install mounting bolt (A) to the rear gate panel and body.

Tightening torque:
14 N·m (1.8 kgf-m, 13 ft-lb)

2) Firmly install the gas stay (B) to mounting bolt (A).



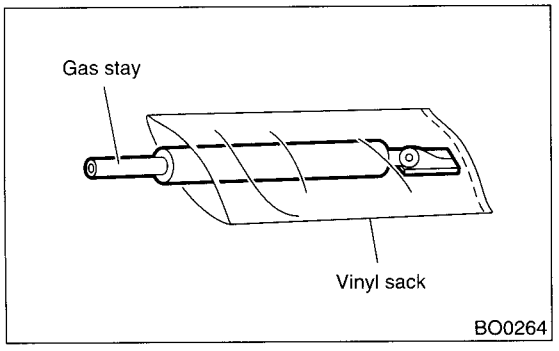
CAUTION:
After supporting rear gate with a jack, start operation.

C: DISPOSAL

1. GAS STAY

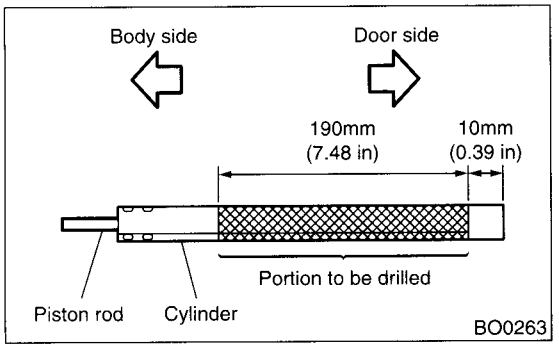
CAUTION:
Gas is colorless, odorless, and harmless. However, gas pressure may spray cutting powder or oil. Be sure to wear dust-resistant goggles.

1) Cover with a vinyl sack as shown in the figure.



CAUTION:
Prevent the vinyl sack 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 door side, and bleed gas stay completely.



CRUISE CONTROL SYSTEM

CC

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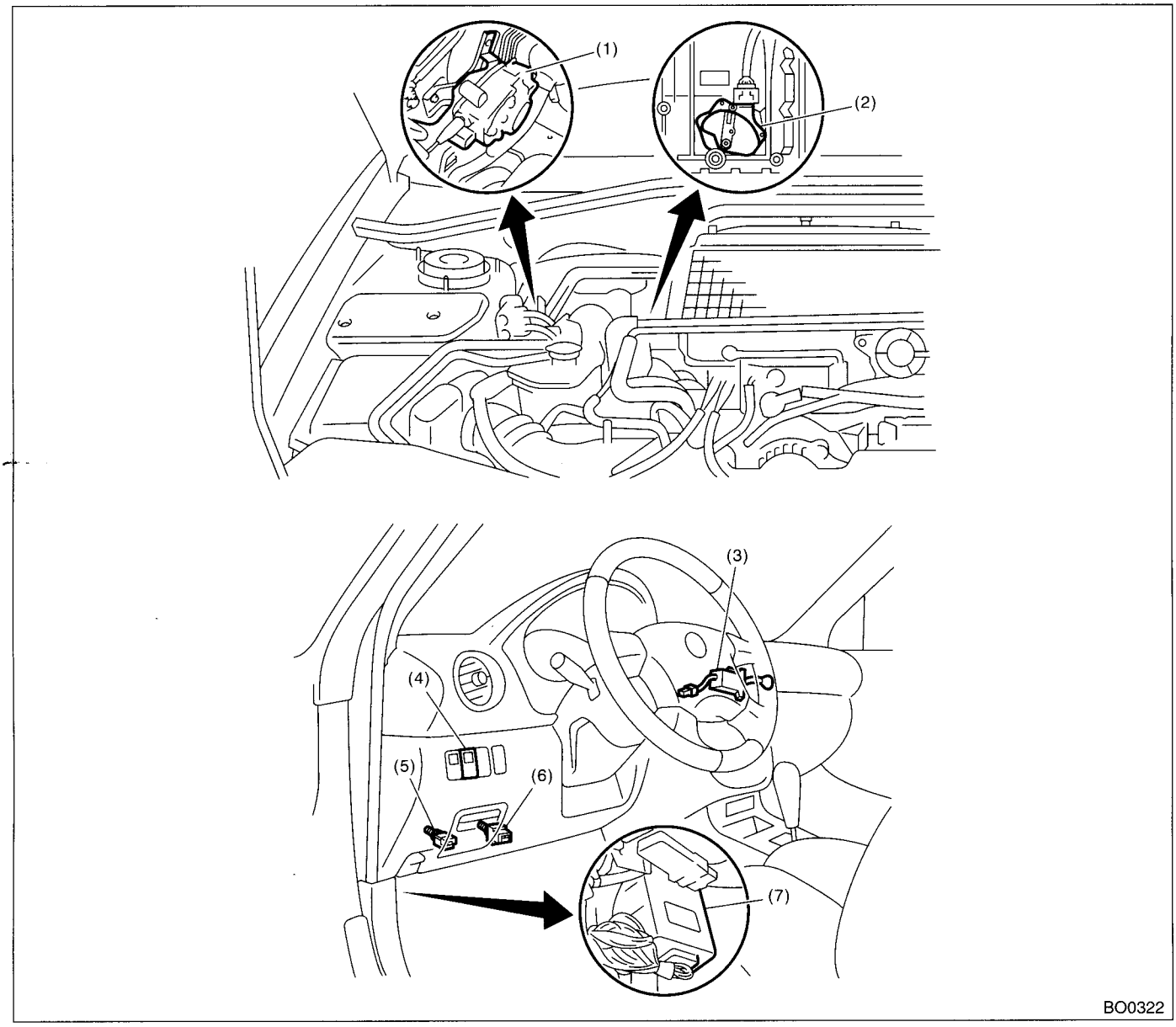
1.	General Description	2
2.	Actuator	4
3.	Cruise Control Module	5
4.	Cruise Control Main Switch	6
5.	Cruise Control Command Switch	7
6.	Stop and Brake Switch	8
7.	Clutch Switch	9
8.	Inhibitor Switch	10

1. General Description

A: COMPONENT



(1) Actuator
(2) Inhibitor switch (AT)
(3) Cruise control command switch
(4) Cruise control main switch
(5) Clutch switch (MT)
(6) Stop and brake switch
(7) Cruise control module

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 the parts in the reverse order of disassembly unless otherwise indicated.
- Adjust the 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

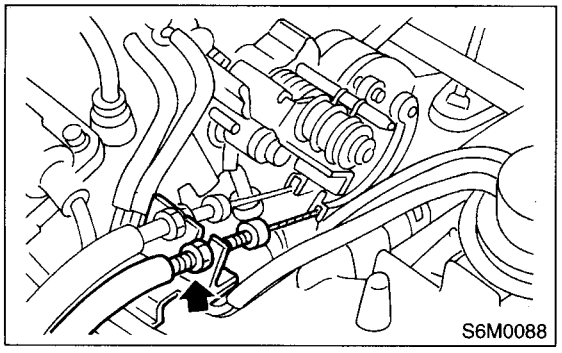
TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

2. Actuator

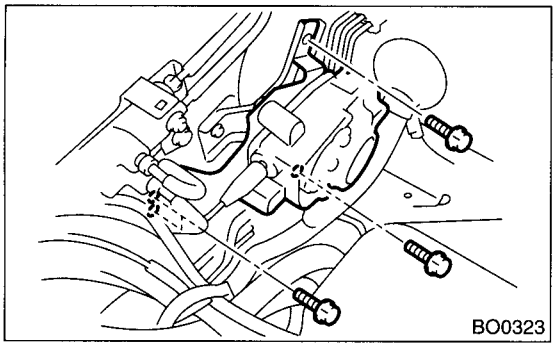
A: REMOVAL

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 cable sharply with a radius less than 100 mm (3.94 in); otherwise, cable may bend permanently, resulting in poor performance.
• When installing cable, be careful not to sharply bend or pinch the inner cable; otherwise, the cable may break.

1) Disconnect the ground terminal 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.


S6M0088

4) Remove the actuator attaching bolts.
5) Remove the actuator while disconnecting connector.

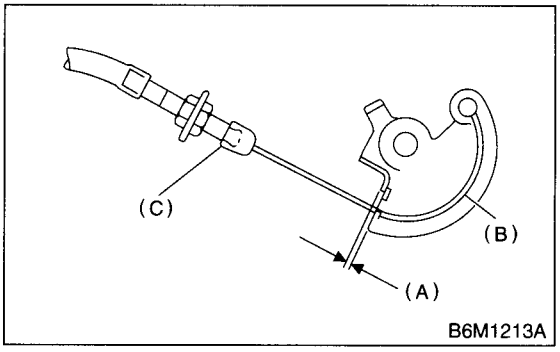

BO0323

B: INSTALLATION

Install in the reverse order of removal.

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

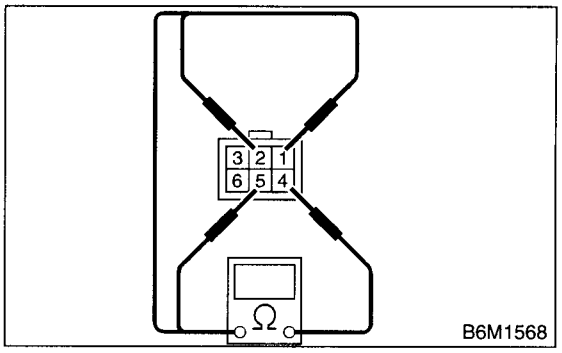
NOTE:
(A): Must be adjusted when cable end outer is fixed in place, so that the gap between throttle cam and lever is 0 — 1 mm (0 — 0.04 in).
(Must be attached while throttle cam is being pulled by wire cable.)
(B): Must be coated evenly on cam end inner connection.
(C): Cover must be inserted securely, until tip of cable touches cover stopper.



B6M1213A

C: INSPECTION

Measure the cruise control actuator resistance.



B6M1568

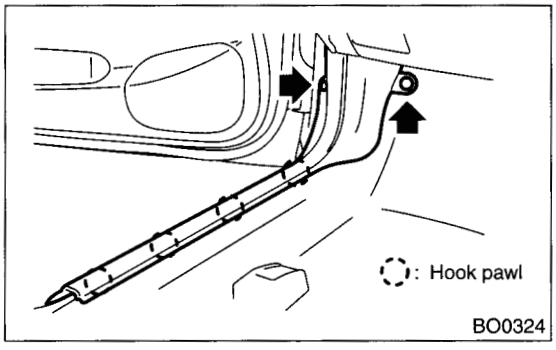
Terminal No.	Standard
4 and 1	Approx. 5Ω
4 and 2	Approx. 5Ω
4 and 5	Approx. 5Ω
3 and 6	Approx. 39Ω

If NG, replace cruise control actuator.

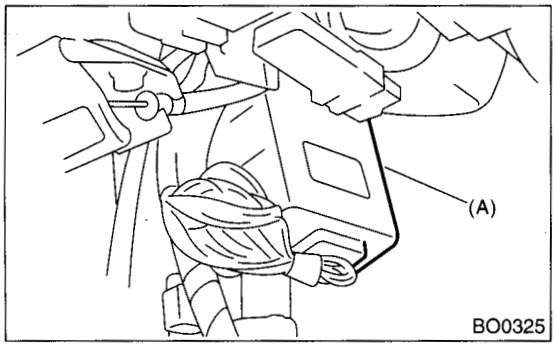
3. Cruise Control Module

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the side sill front cover.



3) Disconnect the connector from the cruise control module.
4) Remove the cruise control module (A).



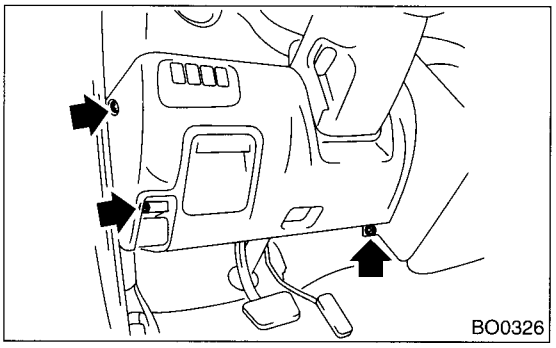
B: INSTALLATION

Install is in the reverse order of removal.

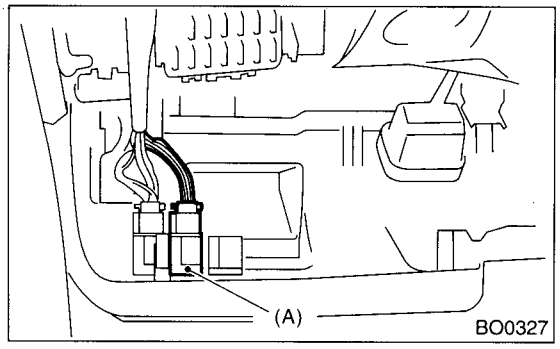
4. Cruise Control Main Switch

A: REMOVAL

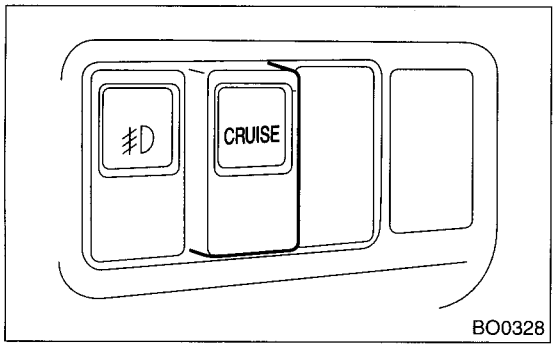
1) Disconnect the ground terminal from battery.
2) Remove the screws and clip from the instrument panel lower cover.
3) Remove the instrument panel lower cover.



4) Disconnect the connector from the cruise control main switch(A).



5) Remove the main switch by pushing it outward.

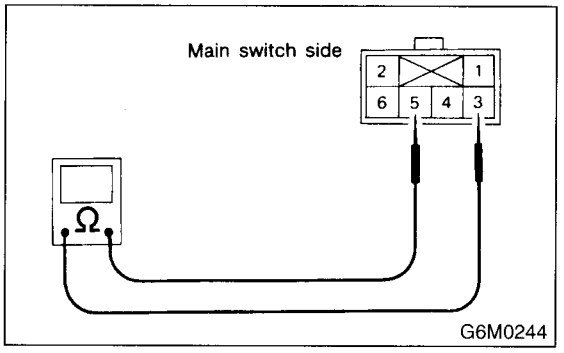


B: INSTALLATION

Install is in the reverse order of removal.

C: INSPECTION

Measure the cruise control main switch resistance.



Switch position	Terminal No.	Standard
OFF	3 and 5	More than 1MΩ
ON	3 and 5	Less than 1Ω

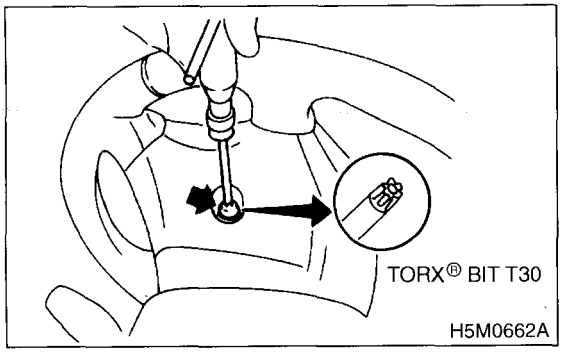
If NG, replace the cruise control main switch.

5. Cruise Control Command Switch

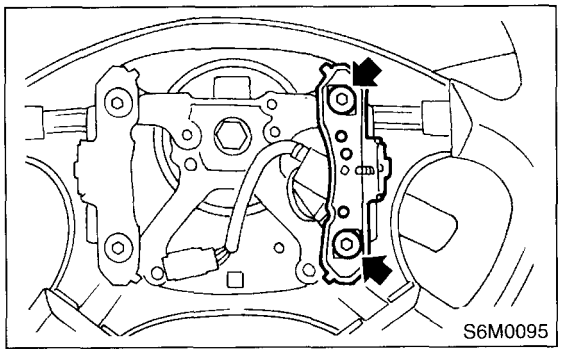
A: REMOVAL

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.>

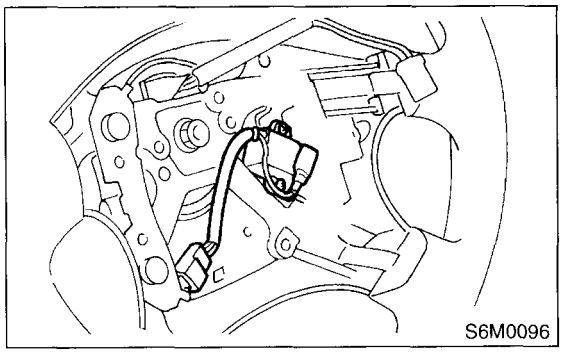
1) Set the front wheels in straight ahead position.
2) Turn ignition switch OFF.
3) Disconnect the ground terminal from battery and wait for at least 20 seconds before starting work.
4) Using TORX® BIT T30 (Tamper resistant type), loosen two TORX® bolts which secure driver's airbag module.



5) Disconnect the airbag module connector on back of the airbag module.
6) Remove the horn switch from the steering wheel as shown.



7) Disconnect the horn and cruise control command switch connector, then remove the cruise control command switch.

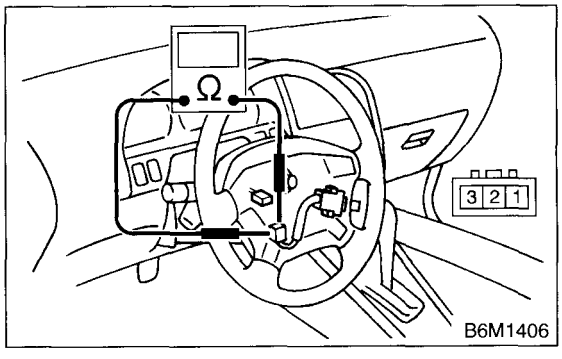


B: INSTALLATION

Install is 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 1Ω
	ON	1 (+) and 3 (–)	Less than 1Ω
SET/COAST	OFF	1 and 3	More than 1MΩ
	ON	1 and 3	Less than 1Ω
RESUME/ ACCEL	OFF	1 and 2	More than 1MΩ
	ON	1 and 2	Less than 1Ω

If NG, replace the cruise control command switch.

6. Stop and Brake Switch

A: REMOVAL

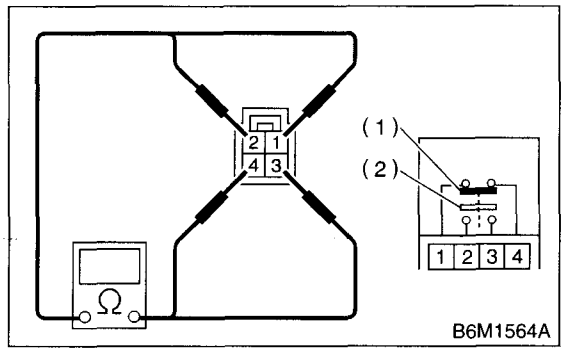
1) Disconnect the ground terminal from battery.
2) Disconnect the connector from the switch, and then remove the switch. <Ref. to BR-55, REMOVAL, Stop Light Switch.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the brake switch (1) and stop light switch (2) resistance.



Switch	Pedal	Terminal No.	Standard
Brake	Released	1 and 4	Less than 1Ω
	Depressed	1 and 4	More than 1MΩ
Stop light	Released	2 and 3	More than 1MΩ
	Depressed	2 and 3	Less than 1Ω

If NG, replace the stop and brake switch.

7. Clutch Switch

A: REMOVAL

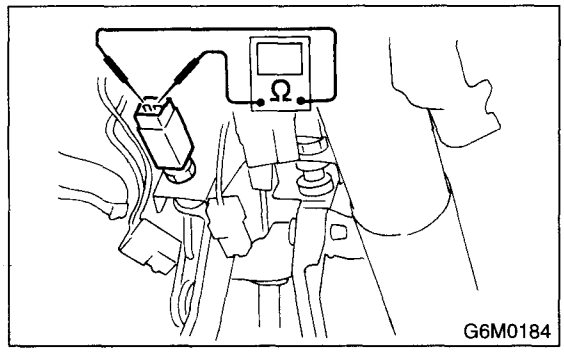
1) Disconnect the ground terminal from battery.
2) Disconnect the connector from the clutch switch, and then remove the switch. <Ref. to CL-26, DISASSEMBLY, Clutch Pedal.>

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 1Ω
	Depressed	1 and 2	More than 1MΩ

If NG, replace the clutch switch.

8. Inhibitor Switch

A: REMOVAL

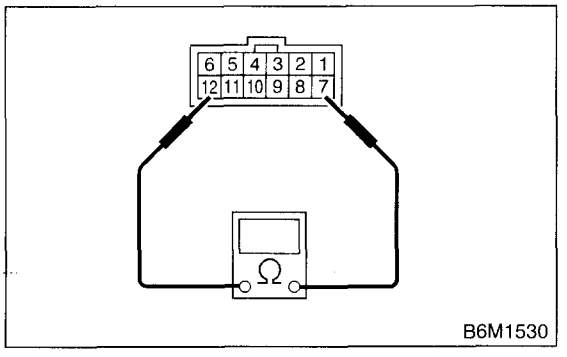
1) Disconnect the ground terminal from the battery.
2) Disconnect the connector from the switch, and then remove the switch. <Ref. to AT-29, REMOVAL, Inhibitor Switch.>

B: INSTALLATION

Installation is 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 1Ω
N		Less than 1Ω
Except P and N		More than 1MΩ

If NG, replace the inhibitor switch.

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

CC

		Page
1.	Basic Diagnostic Procedure	2
2.	General Description	3
3.	Electrical Components Location	5
4.	Cruise Control Module I/O Signal	6
5.	Subaru Select Monitor	9
6.	Diagnostics Chart with Symptom	11
7.	List of Diagnostic Trouble Code (DTC)	26
8.	Diagnostics Chart with Diagnostic Trouble Code	28

1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	**START DIAGNOSIS.** 1)Perform pre-inspection. <Ref. to CC-4, INSPECTION, General Description.> 2)Check cruise control main switch operation.	Is cruise control main switch turned 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?	Go to step **3.**	Go to step **4.**
3	**PERFORM CRUISE CANCEL CONDITIONS DIAGNOSIS.** Perform cruise cancel conditions diagnosis. <Ref. to CC-9, Subaru Select Monitor.>	Is trouble code indicated?	Go to "Diagnostics Chart with Trouble Code".	Go to step **4.**
4	**CHECK CRUISE CONTROL SET OPERATION.** Check cruise control set operation.	Can cruise control be set while driving at 40 km/h (25 MPH)?	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 vehicle speed is held within set speed.	Is vehicle speed held within set speed ±3 km/h (±2 MPH) ?	Go to step **6.**	Go to symptom 3. <Ref. to CC-11, SYMPTOM CHART, Diagnostics Chart with Symptom.>
6	**CHECK RESUME/ACCEL OPERATION.** Check RESUME/ACCEL operation.	Does vehicle speed increase or return to set speed after RESUME/ACCEL switch has been pressed?	Go to step **7.**	Go to symptom 4. <Ref. to CC-11, SYMPTOM CHART, Diagnostics Chart with Symptom.>
7	**CHECK SET/COAST OPERATION.** Check SET/COAST operation.	Does vehicle speed decrease after SET/COAST switch has been pressed?	Go to step **8.**	Go to symptom 5. <Ref. to CC-11, SYMPTOM CHART, Diagnostics Chart with Symptom.>
8	**CHECK CANCEL OPERATION.** Check CANCEL operation.	Is cruise control released after CANCEL switch has been pressed?	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 cruise control release operation.	Is cruise control released after brake pedal has been depressed?	Go to step **10.**	Go to symptom 7. <Ref. to CC-11, SYMPTOM CHART, Diagnostics Chart with Symptom.>
10	**CHECK CRUISE CONTROL RELEASE OPERATION.** Check cruise control release operation.	Is cruise control released after clutch pedal has been depressed? (MT)	Finish the diagnostics.	Go to symptom 8. <Ref. to CC-11, SYMPTOM CHART, Diagnostics Chart with Symptom.>

2. General Description

A: CAUTION

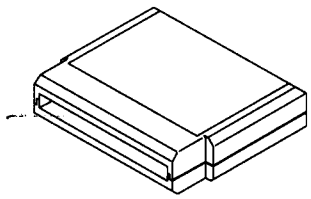
1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

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 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
 B2M3876	24082AA150 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
B2M3877	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 TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.

C: INSPECTION

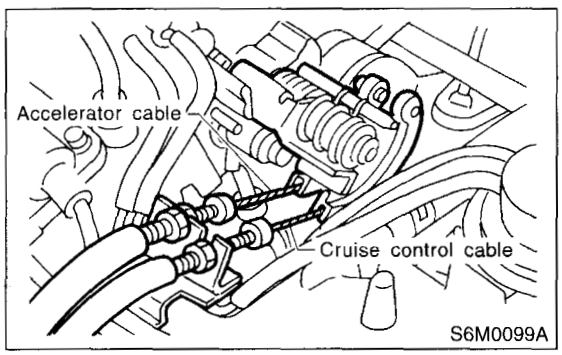
1. BATTERY

Measure the battery voltage and specific gravity of electrolyte.

Standard voltage:
12 V, or more

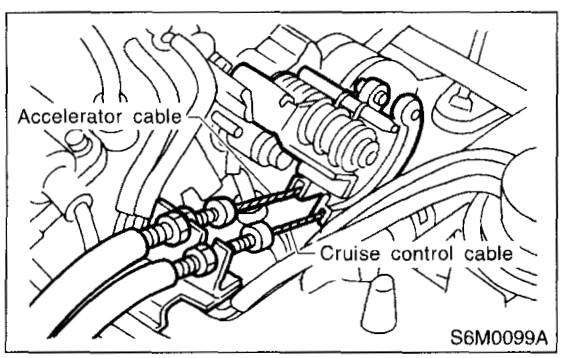
Specific gravity:
Above 1.260

2. CRUISE CONTROL CABLE



Check the cruise control cable installation.
If NG, install the cable securely.

3. ACCELERATOR CABLE

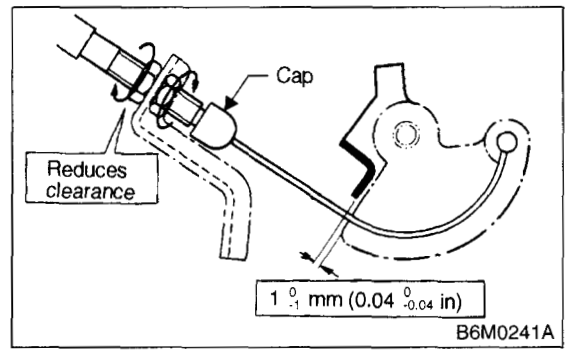


Check movement of the accelerator cable when the cruise control throttle is moved by hand.
If NG, check the throttle cam.

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 is within specifications.

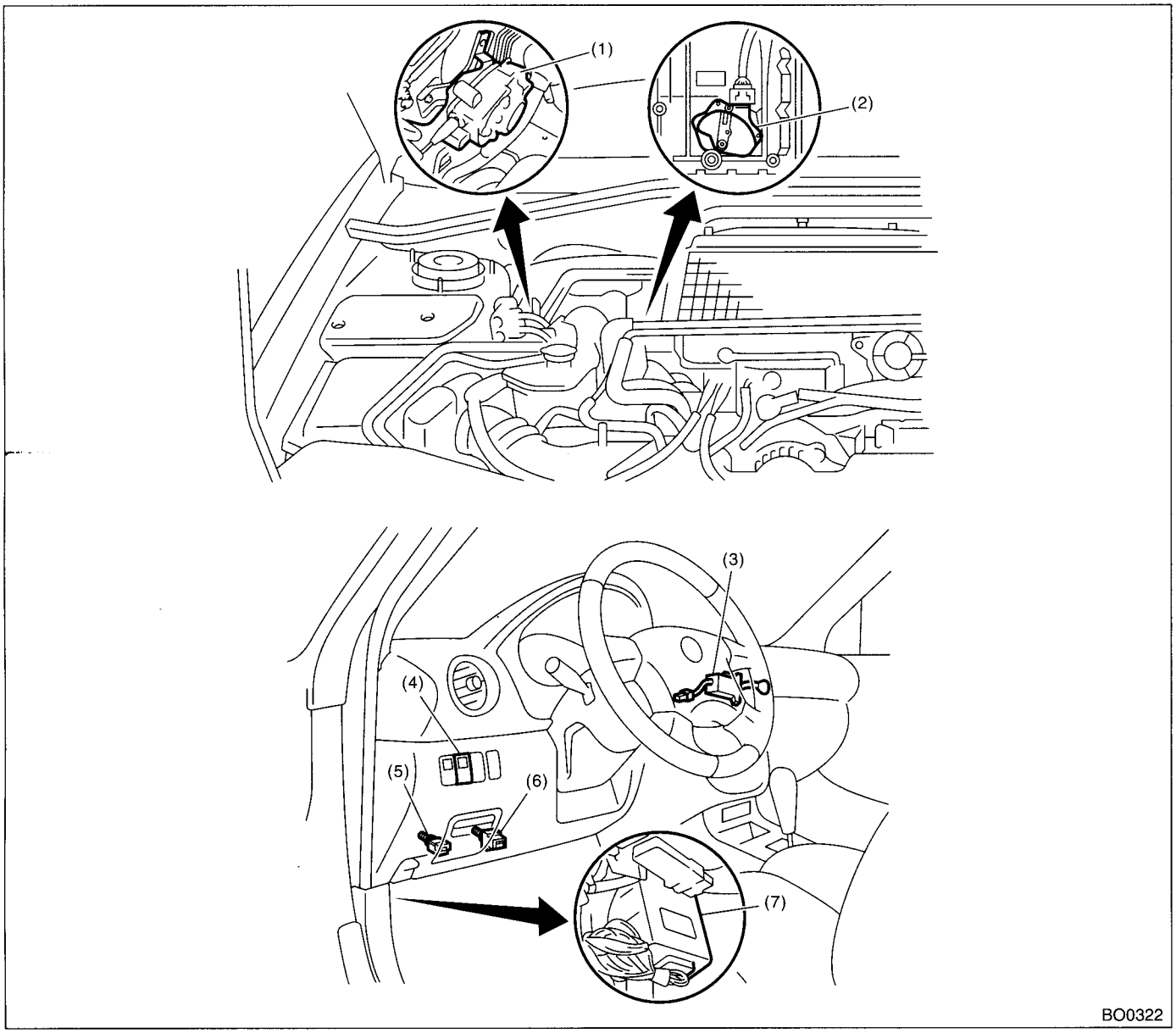
Throttle cam-to-lever clearance:
0 — 1 mm (0 — 0.04 in)

If NG, adjust the clearance with the adjust nut.

NOTE:
Check that the cap is positioned in the groove.

3. Electrical Components Location

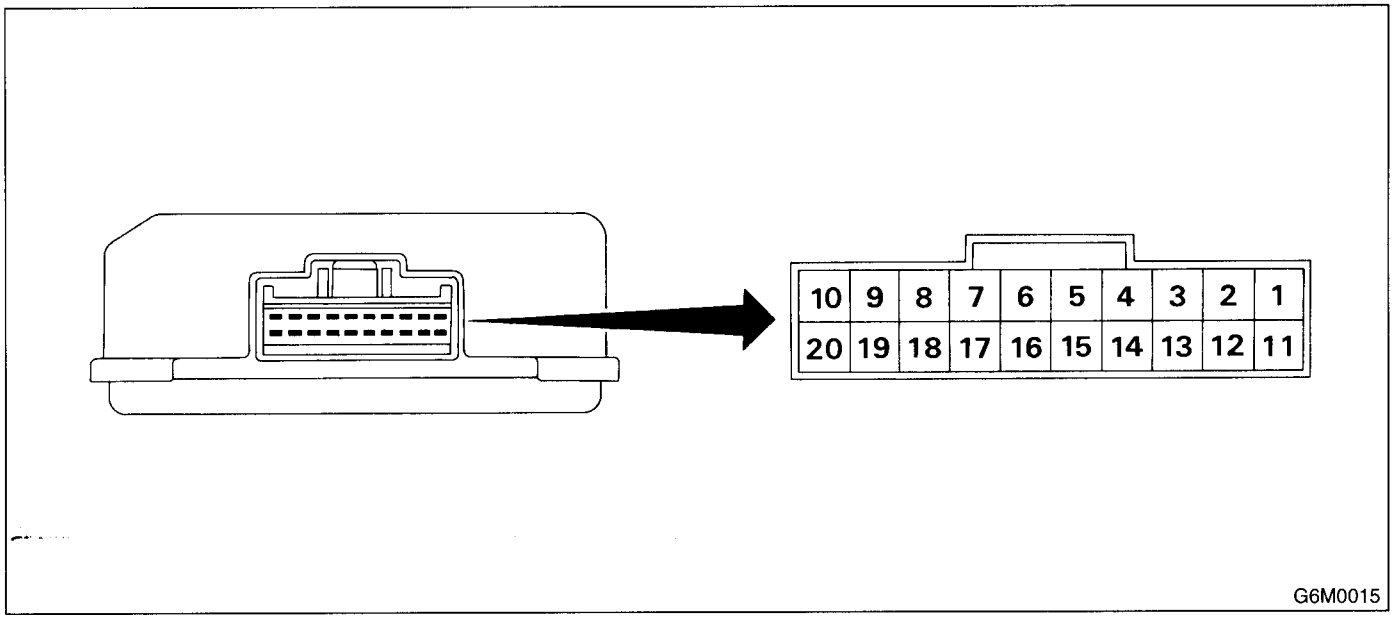
A: LOCATION



(1) Actuator
(2) Inhibitor switch (AT)
(3) Cruise control command switch
(4) Cruise control main switch
(5) Clutch switch (MT)
(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)
Main light	1	• Battery voltage is present when main switch is turned OFF. • "0" volt is present when main switch is turned ON.
Inhibitor switch (AT)	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 during pressing the cruise control main switch, and then battery voltage is present while main switch is turned ON. • "0" volt is present when main switch is turned OFF.

Content	Terminal No.	Measuring conditions and I/O signals (ignition switch ON and engine idling)
Brake switch	16	Leave clutch pedal released (MT), 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) TCM (AT)	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

1. CRUISE CONTROL

<Ref. to WI-61, SCHEMATIC, Cruise Control System.>

5. Subaru Select Monitor

A: OPERATION

1. GENERAL

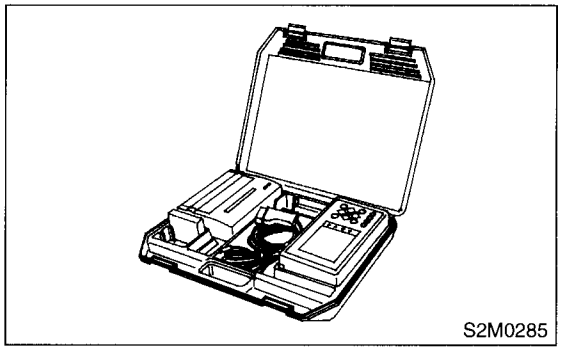
The on-board diagnosis function of the cruise control system uses an external Subaru Select Monitor.
The on-board diagnosis function operates in two categories, which are used depending on the type of problems;
1) Cruise cancel conditions diagnosis
(1) This category of diagnosis requires actual vehicle 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.

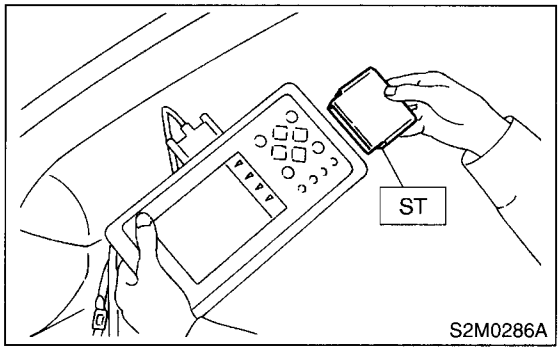
2) Real-time diagnosis
The real-time diagnosis function is used to determine whether or not the input signal system is in good order, according to signal emitted from switches, sensors, etc.
(1) Vehicle cannot be driven at cruise speed because problem occurs in the cruise control system or its associated circuits.
(2) Monitor the signal conditions from switches and sensors.

2. CRUISE CANCEL CONDITIONS DIAGNOSIS

1) Prepare Subaru Select Monitor kit.

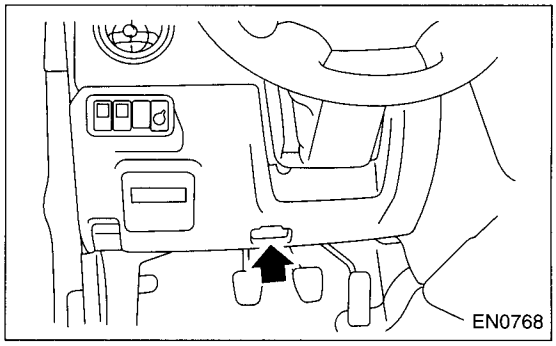

S2M0285

2) Connect the diagnosis cable to the Subaru Select Monitor.
3) Insert the cartridge into the Subaru Select Monitor.
<Ref. to CC-3, SPECIAL TOOLS, PREPARATION TOOL, General Description.>



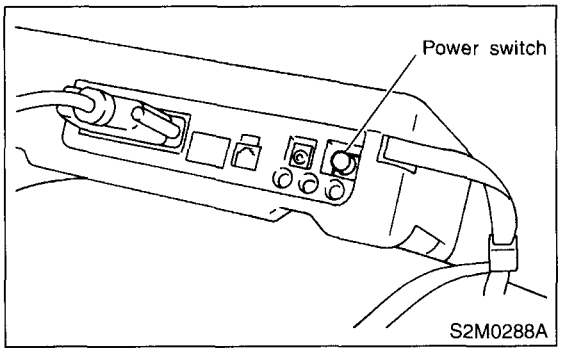
S2M0286A

4) Connect the Subaru Select Monitor to the data link connector.
(1) Data link connector located in the lower portion of the instrument panel (on the driver's side).


EN0768

(2) Connect the diagnosis cable to the 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.



7) On the Main Menu display screen, select the {All System Diagnosis} and press the [YES] key.

NOTE:
The diagnostic trouble code 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 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 will appear on select monitor display.

CAUTION:
• A diagnostic trouble code will also appear when cruise cancel is effected by driver. Do not confuse.
• Have a co-worker ride in vehicle to assist in diagnosis during driving.

NOTE:
Diagnostic trouble code will be cleared by turning 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 the [YES] key.
5) On the System Selection Menu display screen, select the {Cruise Control} and press the [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 the [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.)
• Turn ON the "SET/COAST" switch.
• Turn ON 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, refer to the LIST OF DIAGNOSTIC TROUBLE CODE.
<Ref. to CC-26, LIST OF DIAGNOSTIC TROUBLE CODE (DTC), .>

6. Diagnostics Chart with Symptom

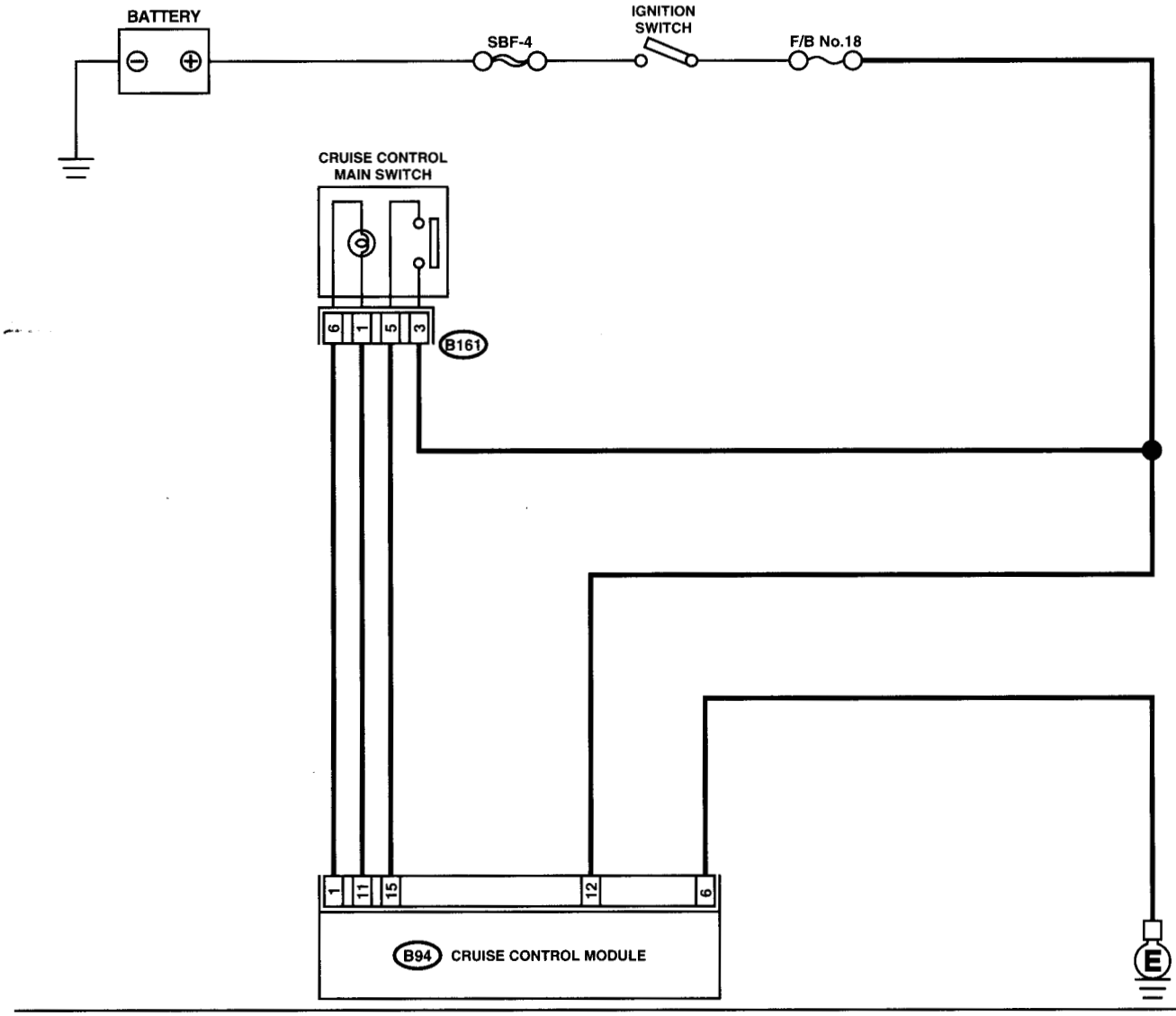
A: SYMPTOM CHART

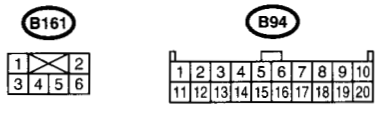
Symptom		Repair area	Reference
1	Cruise control main switch is not turned ON.	(1) Check power supply.	<Ref. to CC-14, CHECK POWER SUPPLY, Diagnostics Chart with Symptom.>
		(2) Check cruise control main switch.	<Ref. to CC-16, CHECK CRUISE CONTROL MAIN SWITCH, Diagnostics Chart with Symptom.>
2	Cruise control cannot be set.	(1) Check SET/COAST switch.	<Ref. to CC-18, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostics Chart with Symptom.>
		(2) Check stop light switch and brake switch.	<Ref. to CC-20, CHECK STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostics Chart with Symptom.>
		(3) Check clutch switch (MT).	<Ref. to CC-22, CHECK CLUTCH SWITCH (MT), Diagnostics Chart with Symptom.>
		(4) Check inhibitor switch (AT).	<Ref. to CC-24, CHECK INHIBITOR SWITCH (AT), Diagnostics Chart with Symptom.>
		(5) Check vehicle speed sensor.	<Ref. to CC-30, DTC 22 VEHICLE SPEED SENSOR, Diagnostics Chart with Diagnostic Trouble Code.>
		(6) Check motor drive system.	<Ref. to CC-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Diagnostic Trouble Code.>
		(7) Check motor clutch drive system.	<Ref. to CC-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Diagnostic Trouble Code.>
3	Vehicle speed is not held within set speed ±3 km/h (±2 MPH).	(1) Check vehicle speed sensor.	<Ref. to CC-30, DTC 22 VEHICLE SPEED SENSOR, Diagnostics Chart with Diagnostic Trouble Code.>
		(2) Check motor drive system.	<Ref. to CC-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Diagnostic Trouble Code.>
		(3) Check motor clutch drive system.	<Ref. to CC-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Diagnostic Trouble Code.>
4	Vehicle speed does not increase or does not return to set speed after RESUME/ ACCEL switch has been pressed.	(1) Check RESUME/ACCEL switch.	<Ref. to CC-18, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostics Chart with Symptom.>
		(2) Check motor drive system.	<Ref. to CC-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Diagnostic Trouble Code.>
		(3) Check motor clutch drive system.	<Ref. to CC-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Diagnostic Trouble Code.>
5	Vehicle speed does not decrease after SET/COAST switch has been pressed.	(1) Check SET/COAST switch.	<Ref. to CC-18, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostics Chart with Symptom.>
		(2) Check motor drive system.	<Ref. to CC-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Diagnostic Trouble Code.>
		(3) Check motor clutch drive system.	<Ref. to CC-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Diagnostic Trouble Code.>
6	Cruise control is not released after CANCEL switch has been pressed.	(1) Check CANCEL switch.	<Ref. to CC-18, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostics Chart with Symptom.>
		(2) Check motor drive system.	<Ref. to CC-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Diagnostic Trouble Code.>
		(3) Check motor clutch drive system.	<Ref. to CC-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Diagnostic Trouble Code.>
7	Cruise control is not released after brake pedal has been depressed.	(1) Check stop light switch and brake switch.	<Ref. to CC-20, CHECK STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostics Chart with Symptom.>
		(2) Check motor drive system.	<Ref. to CC-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Diagnostic Trouble Code.>
		(3) Check motor clutch drive system.	<Ref. to CC-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Diagnostic Trouble Code.>

Symptom		Repair area	Reference
8	Cruise control is not released after clutch pedal has been depressed (MT).	(1) Check clutch switch.	<Ref. to CC-22, CHECK CLUTCH SWITCH (MT), Diagnostics Chart with Symptom.>
		(2) Check motor drive system.	<Ref. to CC-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Diagnostic Trouble Code.>
		(3) Check motor clutch drive system.	<Ref. to CC-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Diagnostic 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:





BO0287

DIAGNOSTICS CHART WITH SYMPTOM

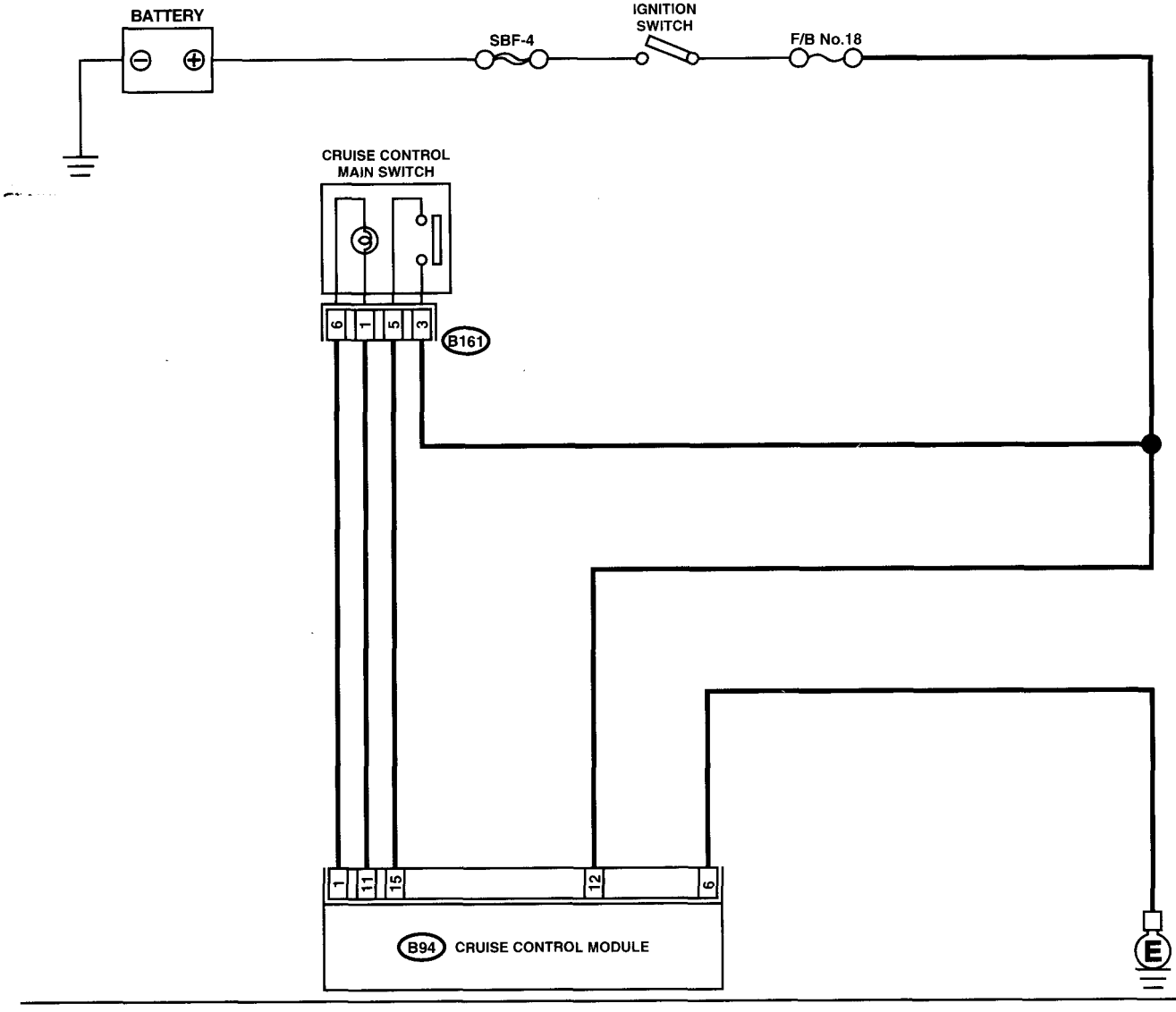
	Step	Check	Yes	No
1	**CHECK POWER SUPPLY.** 1)Disconnect cruise control module harness connector. 2)Turn ignition switch ON. 3)Measure voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B94) No. 12 — Chassis ground:***	Is the voltage more than 10 V?	Go to step **2.**	• Check fuse No. 18 (in fuse & relay box). • Check harness for open or short between cruise control module and fuse & relay box.
2	**CHECK GROUND CIRCUIT.** Measure resistance between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B94) No. 6 — Chassis ground:***	Is the resistance less than 10 Ω?	Power supply and ground circuit are OK.	Repair harness.

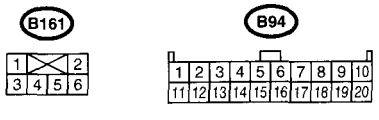
C: CHECK CRUISE CONTROL MAIN SWITCH

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 sounds.
This operation sounds will be heard when ignition switch and cruise control main switch is turned to ON.

WIRING DIAGRAM:



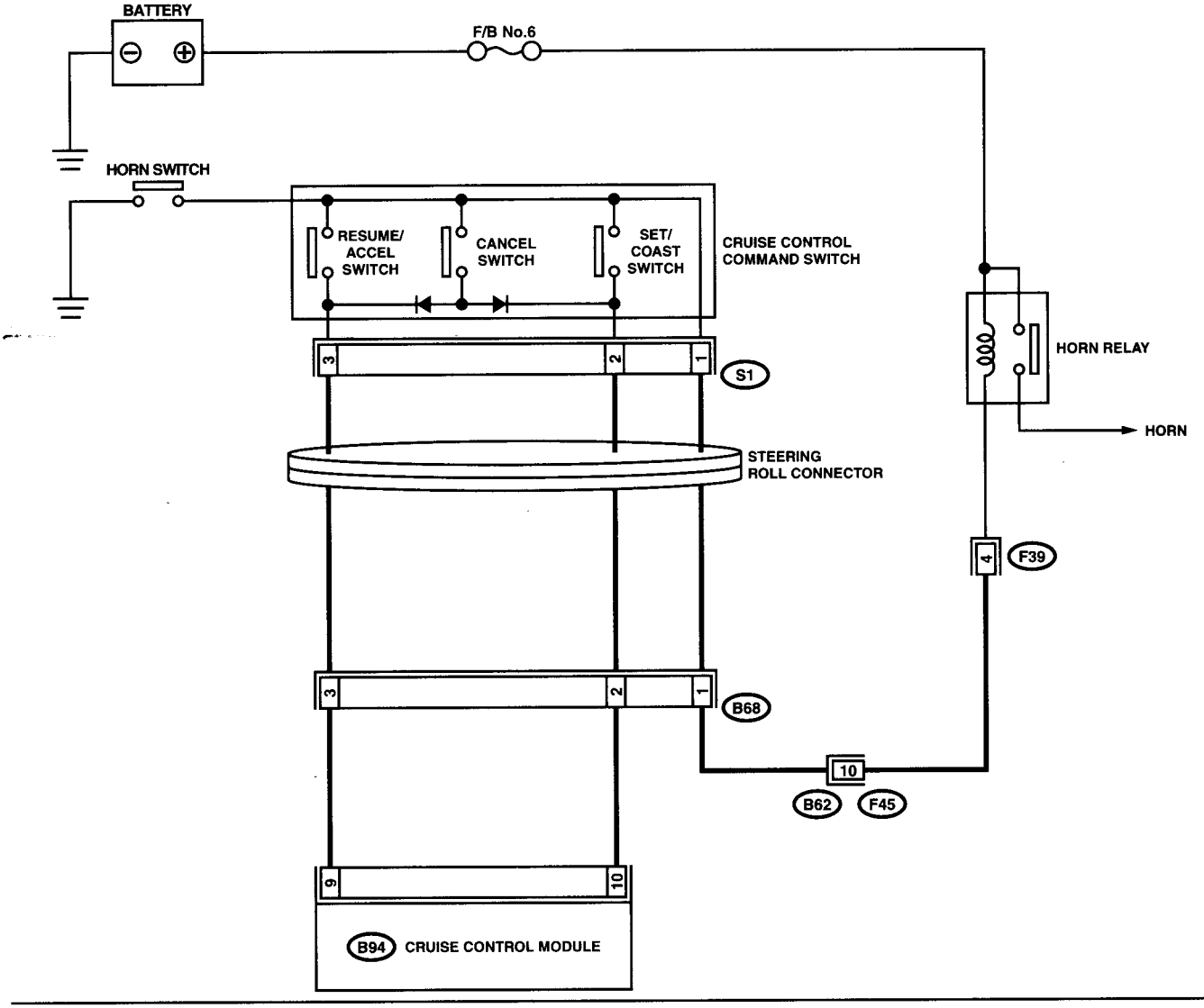


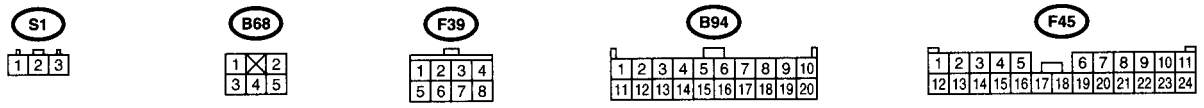
BO0287

	Step	Check	Yes	No
1	**CHECK CRUISE CONTROL MAIN SWITCH CIRCUIT.** 1)Disconnect cruise control main switch harness connector. 2)Turn ignition switch ON. 3)Measure voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B161) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	• Check fuse No. 18 (in fuse & relay box). • Check harness for open or short between cruise control main switch and fuse & relay box.
2	**CHECK CRUISE CONTROL MAIN SWITCH CIRCUIT.** 1)Turn ignition switch OFF. 2)Disconnect cruise control module harness connector. 3)Measure resistance between cruise control module harness connector terminal and cruise control main switch harness connector terminal. ***Connector & terminal*** ***(B94) No. 15 — (B161) No. 5:*** ***(B94) No. 1 — (B161) No. 6:*** ***(B94) No. 11 — (B161) No. 1:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair harness.
3	**CHECK CRUISE CONTROL MAIN SWITCH.** Remove and check cruise control main switch. <Ref. to CC-6, Cruise Control Main Switch.>	Is cruise control main switch OK?	Replace cruise control module.	Replace cruise control main switch.

D: CHECK CRUISE CONTROL COMMAND SWITCH

TROUBLE SYMPTOM:
Cruise control cannot be set. (Cancelled immediately.)
WIRING DIAGRAM:



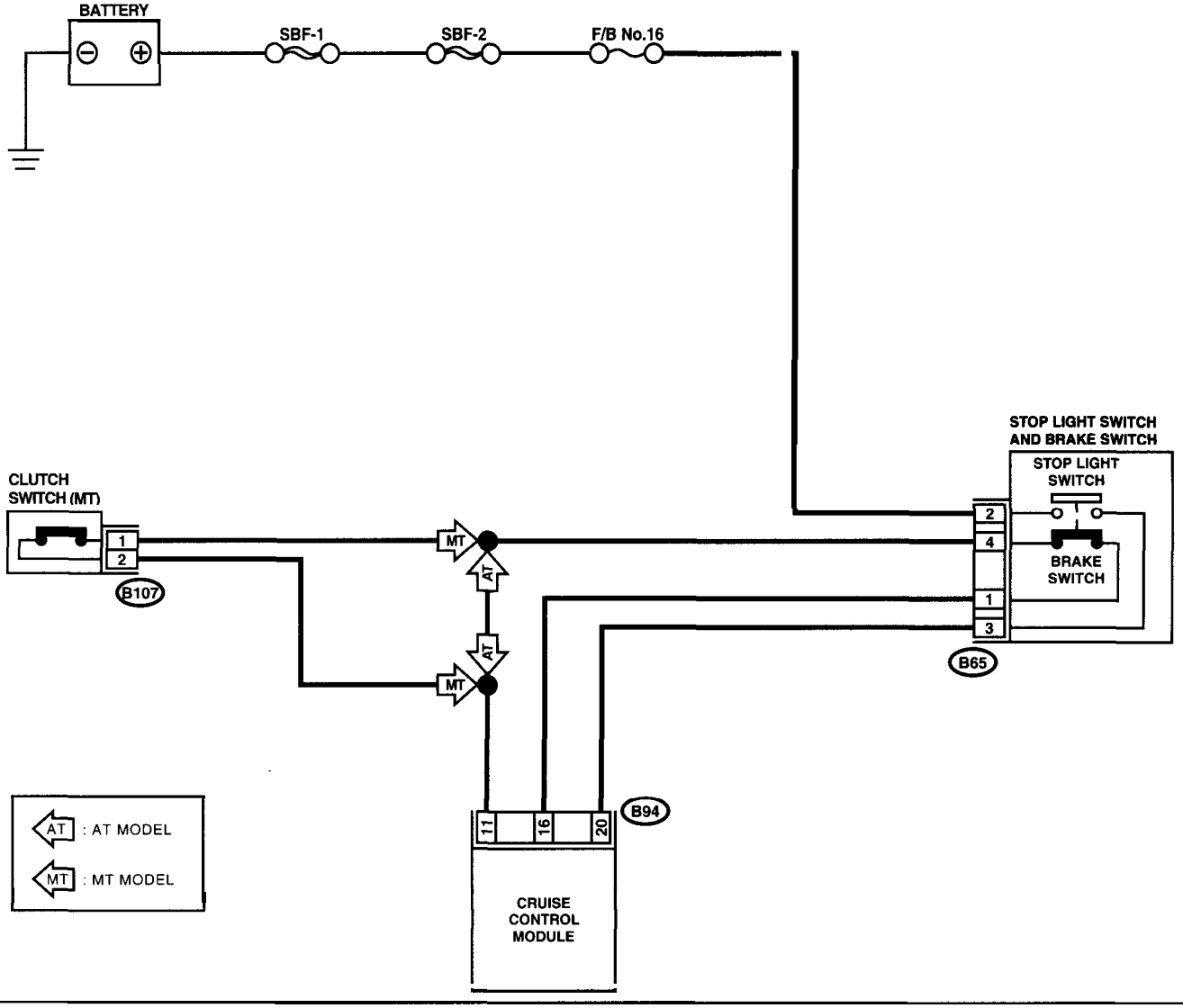


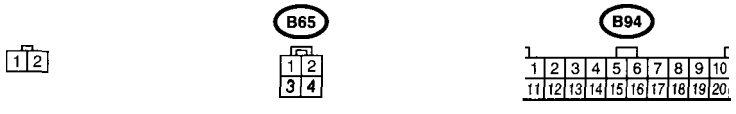
BO0288

	Step	Check	Yes	No
1	**CHECK SET/COAST SWITCH CIRCUIT.** 1)Disconnect cruise control module harness connector. 2)Turn ignition switch ON. 3)Measure 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 voltage 0 V when SET/COAST switch is not pressed? Is the voltage more than 10 V when SET/COAST switch is pressed?	Go to step **2.**	Go to step **4.**
2	**CHECK RESUME/ACCEL SWITCH CIRCUIT.** Measure 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 voltage 0 V when RESUME/ACCEL switch is not pressed? Is the voltage more than 10 V when RESUME/ACCEL switch is pressed?	Go to step **3.**	Go to step **4.**
3	**CHECK CANCEL SWITCH CIRCUIT.** Measure 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 voltage 0 V when CANCEL switch is not pressed? Is the voltage more than 10 V when CANCEL switch is pressed?	Cruise control command switch circuit is OK.	Go to step **4.**
4	**CHECK POWER SUPPLY FOR COMMAND SWITCH.** Check horn operation.	Does horn sound?	Go to step **5.**	• Check fuse No. 6 (in fuse & relay box). • Check horn relay. <Ref. to COM-3, HORN RELAY, INSPECTION, Horn System.> • Check harness for open or short between cruise control command switch and fuse & relay box.
5	**CHECK CRUISE CONTROL COMMAND SWITCH.** Remove and check cruise control command switch. <Ref. to CC-7, Cruise Control Command Switch.>	Is cruise control command switch OK?	Check harness between cruise control command switch and cruise control module.	Replace cruise control command switch.

E: CHECK STOP LIGHT SWITCH AND BRAKE SWITCH

TROUBLE SYMPTOM:
Cruise control cannot be set.
WIRING DIAGRAM:



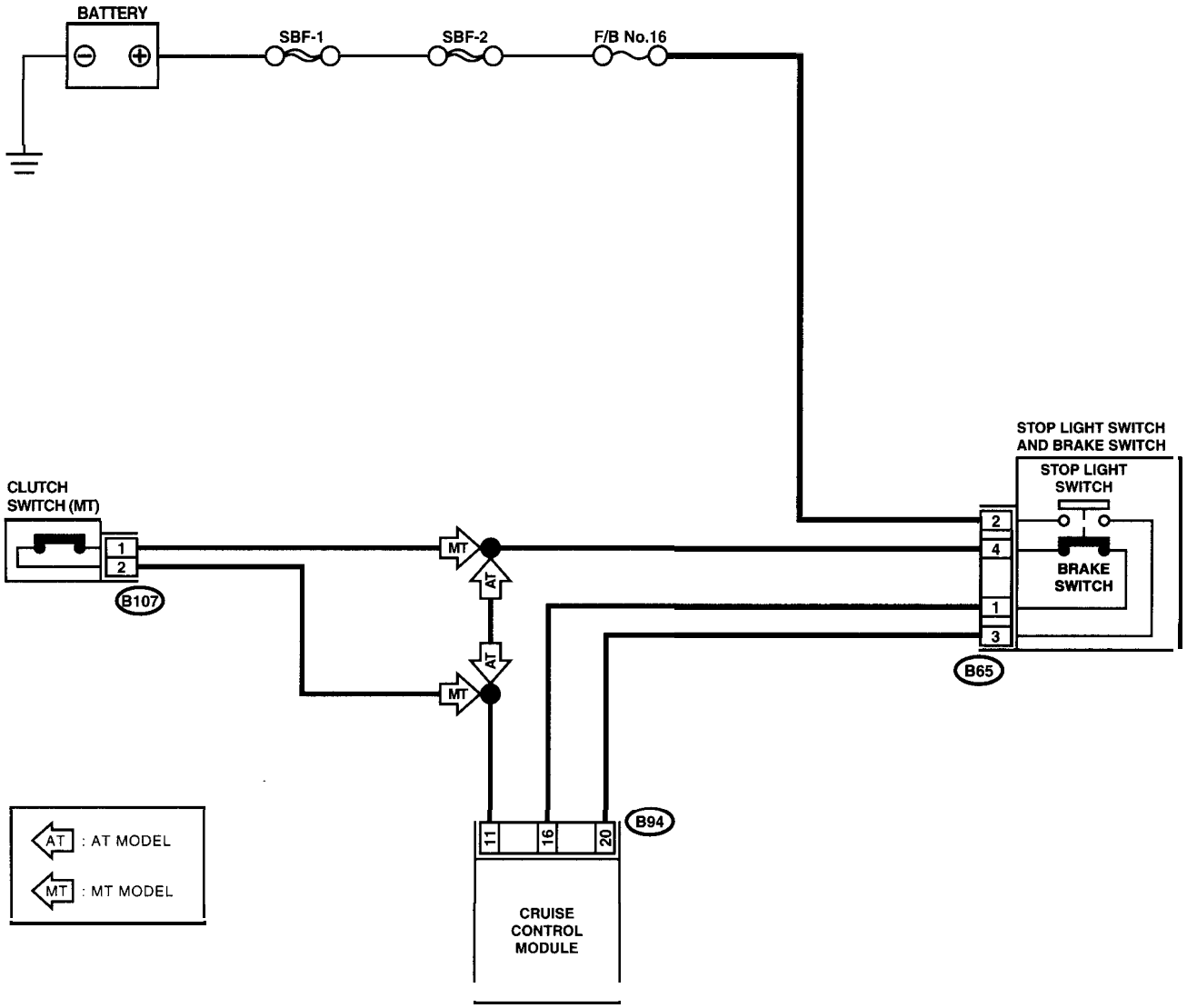


BO0289

	Step	Check	Yes	No
1	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT.** 1)Disconnect stop light switch and brake switch harness connector. 2)Turn ignition switch ON. 3)Turn cruise control main switch ON. 4)Measure voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B65) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	• Check fuse No. 16 (in fuse & relay box). • Check harness for open or short between stop light/brake switch and fuse & relay box.
2	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT.** Measure voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B65) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	• Check harness for open or short between stop light/brake switch and cruise control module (AT). • Check clutch switch and the circuit (MT).
3	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT.** 1)Turn cruise control main switch and ignition switch OFF. 2)Disconnect cruise control module harness connector. 3)Measure 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 resistance less than 10 Ω?	Go to step **4.**	Repair harness.
4	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH.** Remove and check stop light switch and brake switch. <Ref. to CC-8, Stop and Brake Switch.>	Are stop light switch and brake switch OK?	Stop light switch and brake switch circuit are OK.	Replace stop light switch and brake switch.

F: CHECK CLUTCH SWITCH (MT)

TROUBLE SYMPTOM:
Cruise control cannot be set.
WIRING DIAGRAM:

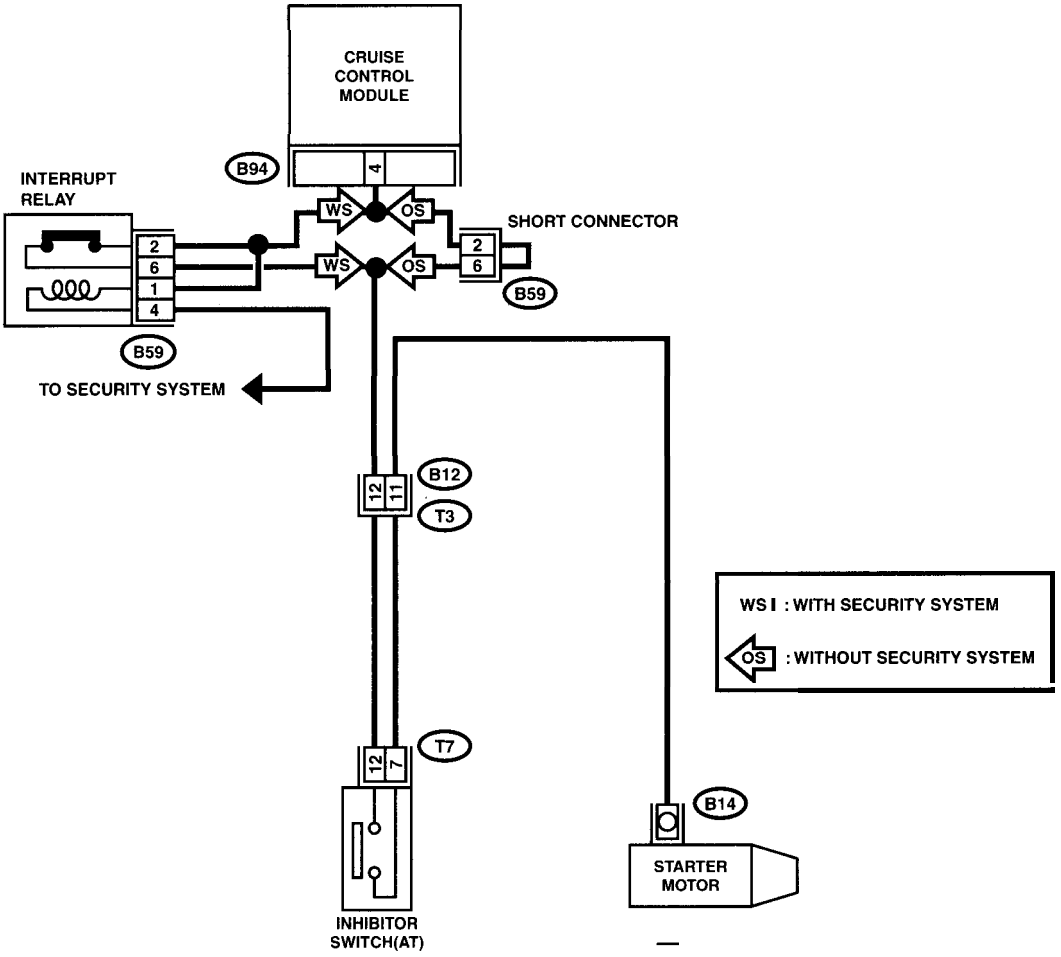


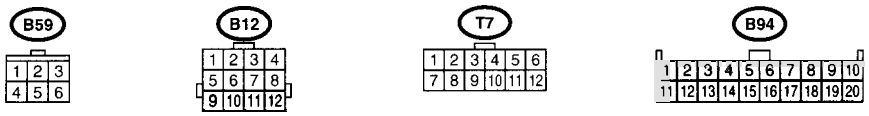
BO0289

	Step	Check	Yes	No
1	**CHECK CLUTCH SWITCH CIRCUIT.** 1)Disconnect clutch switch harness connector. 2)Turn ignition switch ON. 3)Turn cruise control main switch ON. 4)Measure voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B107) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Check harness for open or short between clutch switch and cruise control module.
2	**CHECK CLUTCH SWITCH CIRCUIT.** 1)Turn cruise control main switch and ignition switch OFF. 2)Disconnect stop light switch and brake switch harness connector. 3)Measure 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 resistance less than 10 Ω?	Go to step **3.**	Repair harness.
3	**CHECK CLUTCH SWITCH.** Remove and check clutch switch. <Ref. to CC-9, Clutch Switch.>	Is clutch switch OK?	Clutch switch circuit is OK.	Replace clutch switch.

G: CHECK INHIBITOR SWITCH (AT)

TROUBLE SYMPTOM:
Cruise control cannot be set.
WIRING DIAGRAM:





BO0290

	Step	Check	Yes	No
1	**CHECK INHIBITOR SWITCH CIRCUIT.** 1)Disconnect inhibitor switch harness connector. 2)Turn ignition switch ON. 3)Turn cruise control main switch ON. 4)Measure voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(T7) No. 12 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Check the following. • Interrupt relay (with security system) <Ref. to SL-48, Interrupt Relay.> • Harness for open or short between inhibitor switch and cruise control module.
2	**CHECK INHIBITOR SWITCH CIRCUIT.** 1)Turn cruise control main switch and ignition switch OFF. 2)Disconnect starter motor harness connector. 3)Measure resistance between inhibitor switch harness connector terminal and chassis ground. ***Connector & terminal*** ***(T7) No. 7 — (B14) No. 1:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair harness.
3	**CHECK INHIBITOR SWITCH.** Remove and check inhibitor switch. <Ref. to CC-10, Inhibitor Switch.>	Is inhibitor switch OK?	Inhibitor switch circuit is OK.	Replace 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-28, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostics Chart with Diagnostic Trouble Code.>
22	Vehicle speed sensor	Vehicle speed signal changes more than 10 km/h (6 MPH) within 350 ms.	<Ref. to CC-30, DTC 22 VEHICLE SPEED SENSOR, Diagnostics Chart with Diagnostic 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-28, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostics Chart with Diagnostic Trouble Code.>
25	Cruise control module is abnormal.	Two output values stored in cruise control module memory are not the same.	<Ref. to CC-28, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostics Chart with Diagnostic Trouble Code.>
28	Wiring harness opened.	Open wiring harness circuit is detected via control module relay when main switch is ON.	<Ref. to CC-33, DTC 28 WIRING HARNESS OPENED., Diagnostics Chart with Diagnostic 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-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Diagnostic Trouble Code.>
36	Trouble of motor	Motor turning speed is low.	<Ref. to CC-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Diagnostic 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-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Diagnostic Trouble Code.>
38	Motor drive shaft does not engage properly.	Motor drive gear engagement is not properly adjusted.	<Ref. to CC-38, DTC 38 MOTOR DRIVE SHAFT DOES NOT ENGAGE PROPERLY., Diagnostics Chart with Diagnostic Trouble Code.>

DTC	Item	Contents of diagnosis	Reference
39	Motor is overloaded.	Current flows through motor more frequently than under normal conditions.	<Ref. to CC-39, DTC 39 MOTOR IS OVER-LOADED., Diagnostics Chart with Diagnostic Trouble Code.>
2A	Cruise control module is abnormal.	Cruise control module self-diagnosis function senses abnormality.	<Ref. to CC-28, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostics Chart with Diagnostic Trouble Code.>

8. Diagnostics Chart with Diagnostic 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.

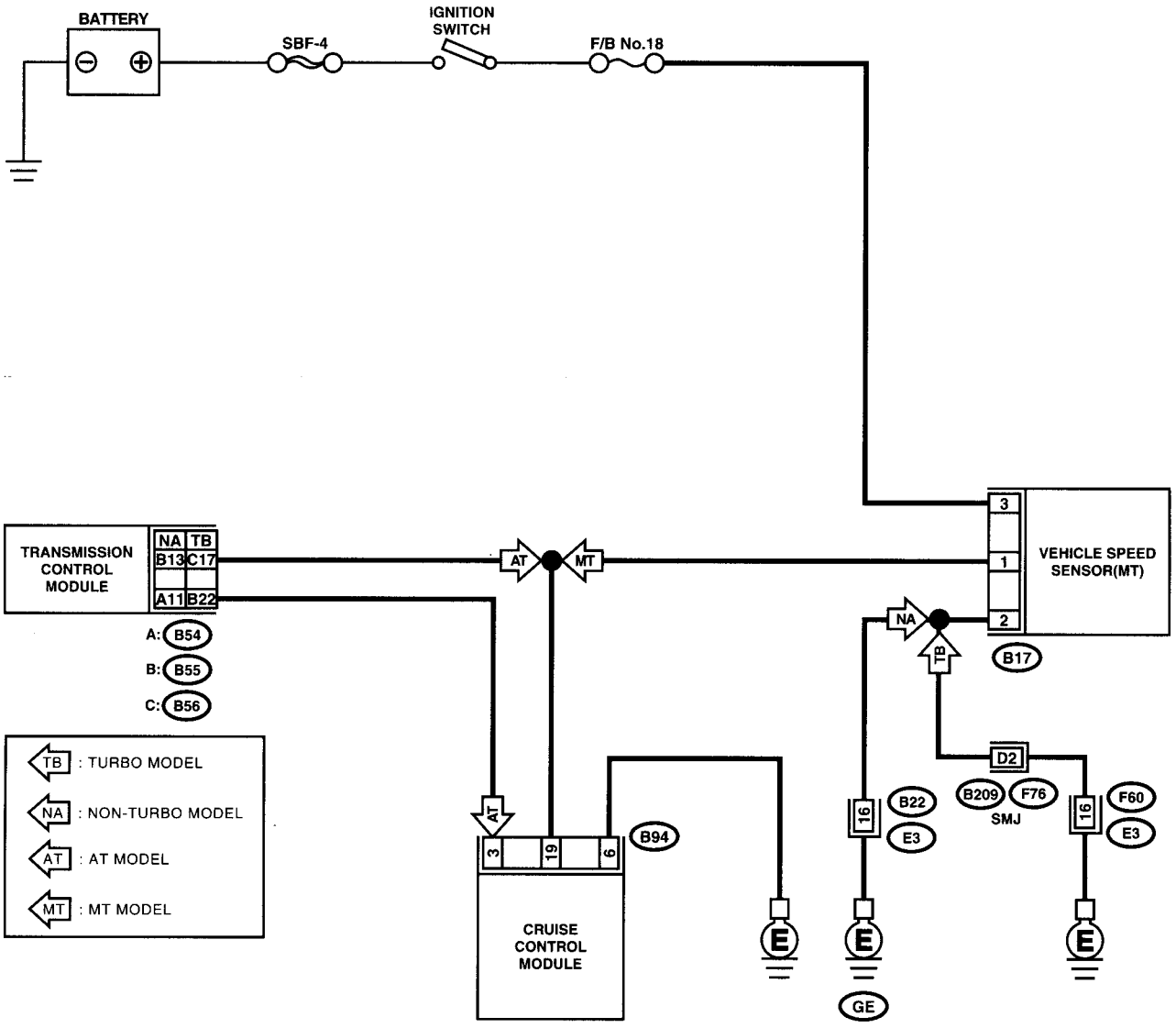
TROUBLE SYMPTOM:

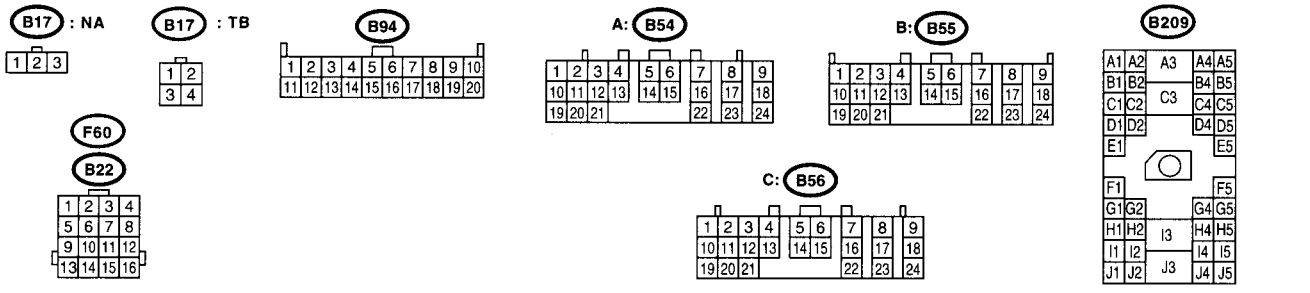
- Cruise control is canceled and memorized cruise speed is also canceled.
- Once the cruise control is canceled, the cruise control cannot be set until the ignition switch and cruise control main switch turns OFF, and then turns ON again.

NOTE:
Check the input/output signal and vehicle speed signal with select monitor. When the signals are in good condition, failure is in cruise control module. (Check 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:





BO0291

	Step	Check	Yes	No
1	**CHECK TRANSMISSION TYPE.**	Is the transmission type MT?	Go to step **2.**	Go to step **6.**
2	**CHECK HARNESS BETWEEN BATTERY AND VEHICLE SPEED SENSOR.** 1)Disconnect harness connector from vehicle speed sensor. 2)Turn ignition switch to ON. 3)Measure voltage between vehicle speed sensor harness connector terminal and chassis ground. ***Connector & terminal*** ***(B17) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Check harness for open or short between ignition switch and vehicle speed sensor.
3	**CHECK HARNESS BETWEEN CRUISE CONTROL MODULE AND VEHICLE SPEED SENSOR.** 1)Turn ignition switch to OFF. 2)Disconnect harness connector from cruise control module. 3)Measure 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 resistance less than 10 Ω?	Go to step **4.**	Repair harness.
4	**CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ENGINE GROUND.** Measure resistance between vehicle speed sensor harness connector terminal and engine ground. ***Connector & terminal*** ***(B17) No. 2 — Engine ground:***	Is the resistance less than 10 Ω?	Go to step **5.**	Repair harness.
5	**CHECK VEHICLE SPEED SENSOR.** 1)Connect harness connector to vehicle speed sensor. 2)Set the vehicle on free roller, or lift-up the vehicle and support with safety stands. **Warning:** **Be careful not to be caught up by the running wheels.** 3)Drive the vehicle at speed greater than 20 km/h (12 MPH). 4)Measure voltage between cruise control module harness connector terminal and chassis ground. ***Connector & terminal*** ***(B94) No. 19 (+) — Chassis ground (–):***	Is the voltage less than 1V ←→ more than 4 V?	Replace cruise control module. <Ref. to CC-5, Cruise Control Module.>	Replace vehicle speed sensor.

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN CRUISE CONTROL MODULE AND TRANSMISSION CONTROL MODULE.** 1)Disconnect harness connector from transmission control module and cruise control module. 2)Measure resistance between cruise control module harness connector terminal and transmission control module harness connector terminal. **CAUTION:** **To measure the voltage and/or resistance, 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).** ***Connector & terminal*** ***Turbo model:*** ***(B94) No. 19 — (B56) No. 17:*** ***Non-turbo model:*** ***(B94) No. 19 — (B55) No. 13:***	Is the resistance less than 10 Ω?	Go to step **7.**	Repair harness connector between cruise control module and transmission control module.
7	**CHECK TRANSMISSION CONTROL MODULE.** 1)Connect harness connector to transmission control module. 2)Set the vehicle on free roller, or lift-up the vehicle and support with safety stands. **Warning:** **Be careful not to be caught by the running wheels.** 3)Drive the vehicle faster than 10 km/h (6 MPH). 4)Measure voltage between transmission control module harness connector terminal and chassis ground. **CAUTION:** **To measure the voltage and/or resistance, 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).** ***Connector & terminal*** ***Turbo model:*** ***(B56) No. 17 (+) — Chassis ground (–):*** ***Non-turbo model:*** ***(B55) No. 13 (+) — Chassis ground (–):***	Is the voltage less than 1 V ⟷ more than 4 V?	Replace cruise control module. <Ref. to CC-5, Cruise Control Module.>	Replace transmission control module. <Ref. to AT-45, Transmission Control Module (TCM).>

C: DTC 28 WIRING HARNESS OPENED.

	Step	Check	Yes	No
1	**CHECK BATTERY.** Measure battery specific gravity of electrolyte.	Is battery specific gravity more than 1.250?	Go to step **2.**	Charge or replace battery. Go to step **2.**
2	**CHECK FUSES, CONNECTORS AND HARNESSES.** Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.	Is there anything unusual about the appearance of main fuse, fuse, harness, connector and grounding?	Repair or replace faulty parts.	End of inspection.

D: DTC 35 AND 36 ACTUATOR MOTOR

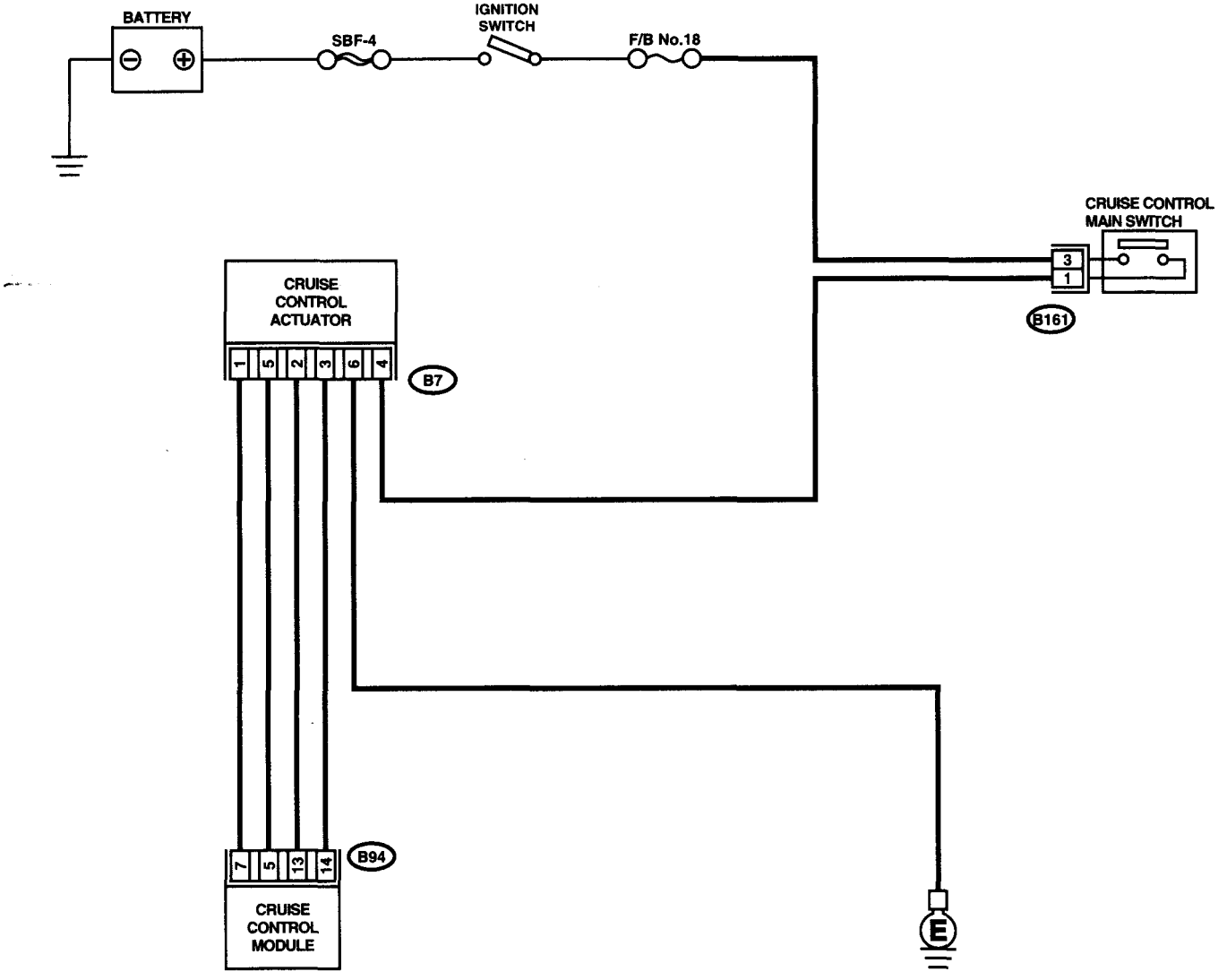
DIAGNOSIS:

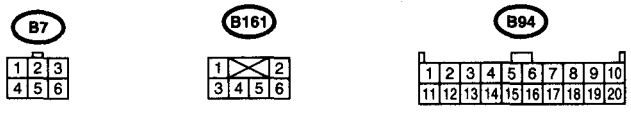
Open or poor contact of cruise control actuator motor.

TROUBLE SYMPTOM:

Cruise control cannot be set. (Cancelled immediately.)

WIRING DIAGRAM:



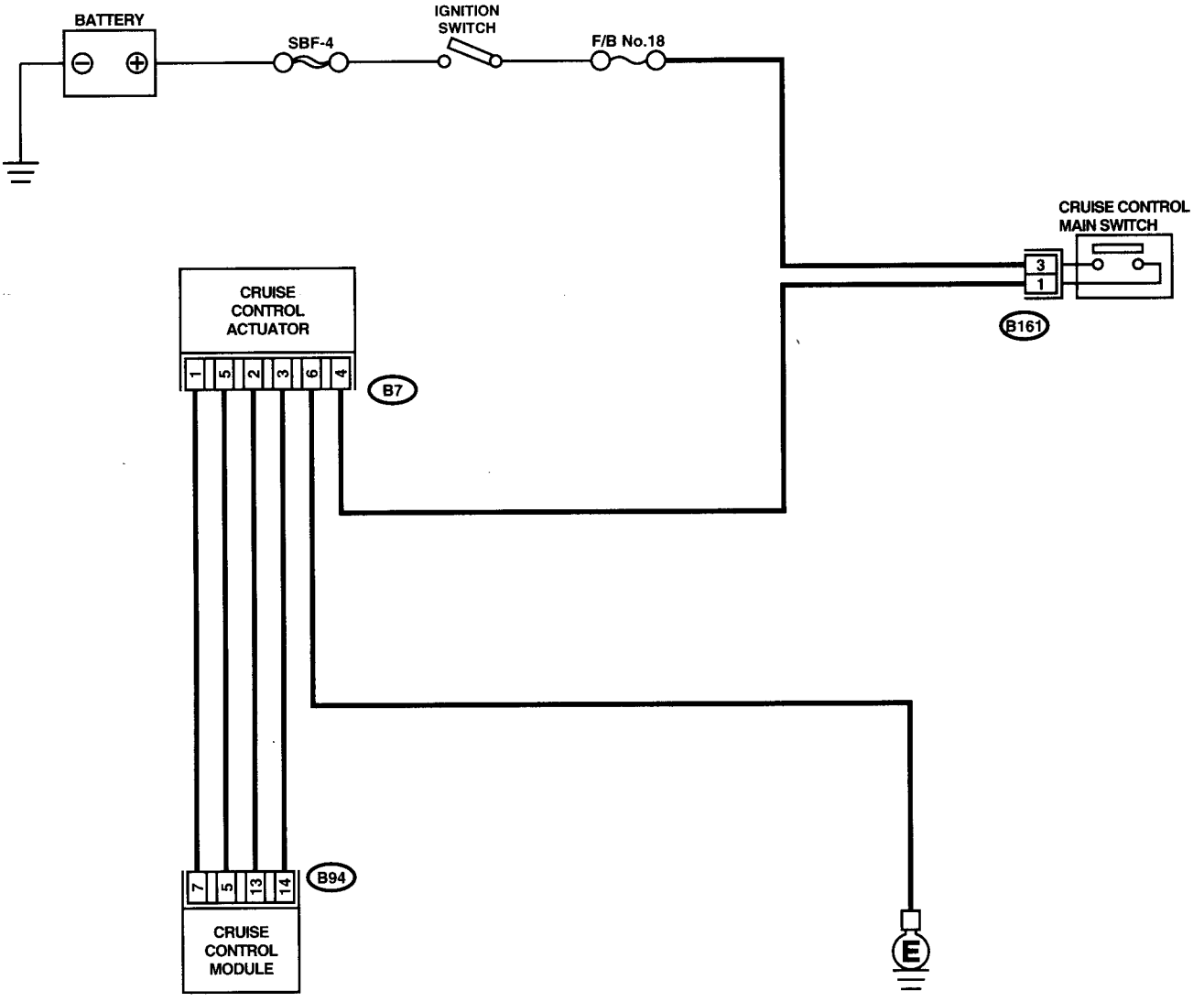


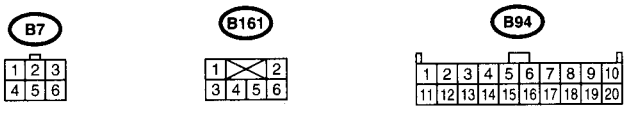
BO0292

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY.** 1)Turn ignition switch OFF. 2)Disconnect harness connector from cruise control actuator. 3)Turn ignition switch ON. 4)Turn cruise control main switch ON. 5)Measure voltage between cruise control actuator harness connector terminal and chassis ground. ***Terminals*** ***(B7) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Check harness for open or short between cruise control main switch and cruise control actuator.
2	**CHECK GROUND CIRCUIT OF ACTUATOR.** Measure resistance between cruise control actuator harness connector terminal and chassis ground. ***Terminals*** ***(B7) No. 6 — Chassis ground:***	Is resistance less than 10 Ω?	Go to step **3.**	Repair harness.
3	**MEASURE RESISTANCE OF ACTUATOR.** Measure resistance of cruise control actuator motor. ***Terminals*** ***No. 4 — No. 1:*** ***No. 4 — No. 2:*** ***No. 4 — No. 5:***	Is resistance approximately 5 Ω?	Go to step **4.**	Replace cruise control actuator. <Ref. to CC-4, Actuator.>
4	**CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE.** 1)Disconnect harness connector from cruise control module. 2)Measure resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal. ***Connector & terminal*** ***(B7) No. 1 — (B94) No. 7:***	Is resistance less than 10 Ω?	Go to step **5.**	Repair harness.
5	**CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE.** Measure resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal . ***Connector & terminal*** ***(B7) No. 5 — (B94) No. 5:***	Is resistance less than 10 Ω?	Replace cruise control module. <Ref. to CC-5, Cruise Control Module.>	Repair 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:





BO0292

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY.** 1)Turn ignition switch OFF. 2)Disconnect harness connector from cruise control actuator. 3)Turn ignition switch ON. 4)Turn cruise control main switch ON. 5)Measure voltage between cruise control actuator harness connector terminal and chassis ground. ***Terminals*** ***(B7) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Check harness for open or short between cruise control main switch and cruise control actuator.
2	**CHECK GROUND CIRCUIT OF ACTUATOR.** Measure resistance between cruise control actuator harness connector terminal and chassis ground. ***Terminals*** ***(B7) No. 6 — Chassis ground:***	Is resistance less than 10 Ω?	Go to step **3.**	Repair harness.
3	**MEASURE RESISTANCE OF ACTUATOR CLUTCH.** Measure resistance of cruise control actuator clutch. ***Terminals*** ***No. 3 — No. 6:***	Is resistance approximately 39 Ω?	Go to step **4.**	Replace cruise control actuator. <Ref. to CC-4, Actuator.>
4	**CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE.** 1)Disconnect harness connector from cruise control module. 2)Measure resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal. ***Connector & terminal*** ***(B7) No. 2 — (B94) No. 13:***	Is resistance less than 10 Ω?	Go to step **5.**	Repair harness.
5	**CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE.** Measure resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal. ***Connector & terminal*** ***(B7) No. 3 — (B94) No. 14:***	Is resistance less than 10 Ω?	Replace cruise control module. <Ref. to CC-5, Cruise Control Module.>	Repair harness.

F: DTC 38 MOTOR DRIVE SHAFT DOES NOT ENGAGE PROPERLY.

	Step	Check	Yes	No
1	**CHECK ACTUATOR MOTOR.** 1)Disconnect harness connector from cruise control actuator. 2)Remove cruise control actuator from mounting bracket. 3)Pull cable by hand to check for looseness or status of inner gear engagement.	Are foreign particles caught in inner gear or does inner gear engage and disengage improperly?	Replace cruise control actuator. <Ref. to CC-4, Actuator.>	Check the cruise control cable adjustment.<Ref. to CC-4, CABLE FREE PLAY, General Description.>

G: DTC 39 MOTOR IS OVERLOADED.

	Step	Check	Yes	No
1	**CHECK THE OPERATING CURRENT TO ACTUATOR MOTOR.** 1)Connect Subaru Select Monitor to data link connector. 2)Try to drive the vehicle while operating the cruise control system. 3)Check the operation current to the cruise control actuator motor.	Is current more than 10A?	Replace cruise control module. <Ref. to CC-5, Cruise Control Module.>	Check the power supply circuit. <Ref. to CC-14, CHECK POWER SUPPLY, Diagnostics Chart with Symptom.>

OPTION PARTS

OP

Page

Refer to G1831BE SUPPLEMENT for this section.

OPTION PARTS

OP

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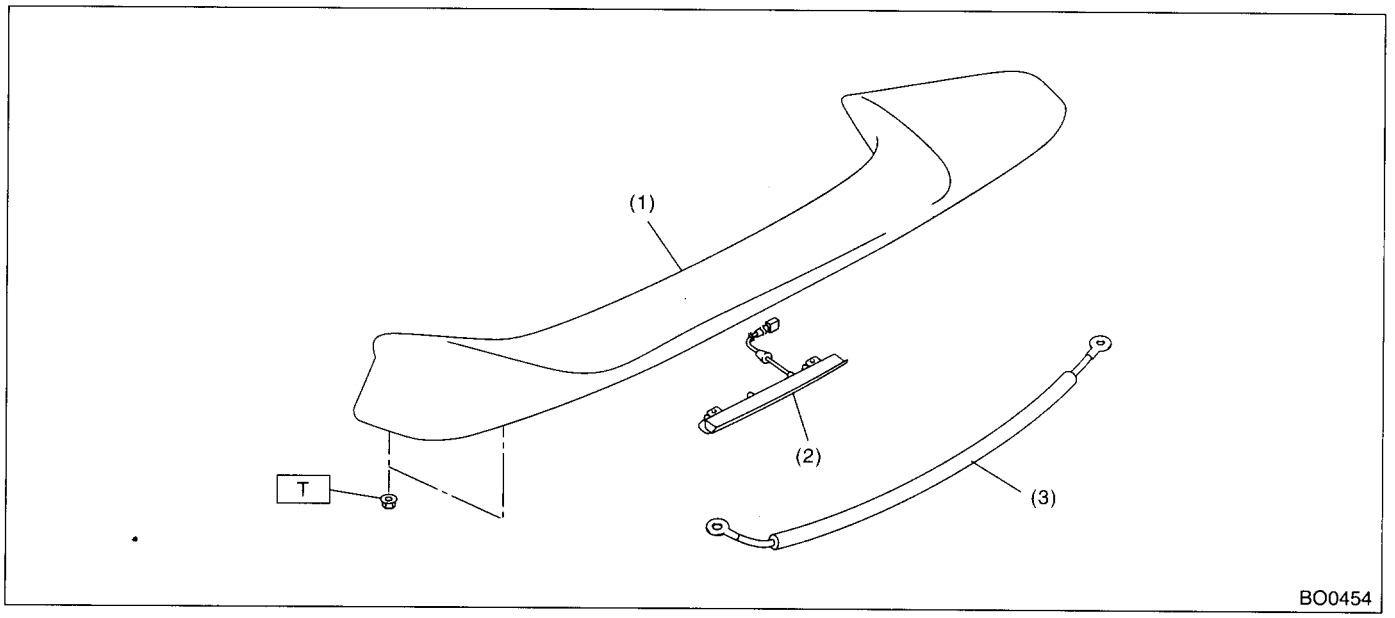
1. General Description 2
2. Rear Spoiler 5
3. Crossbar 6
4. Trailer Hitch 7
5. Rear Differential Protector 8

1. General Description

A: COMPONENT

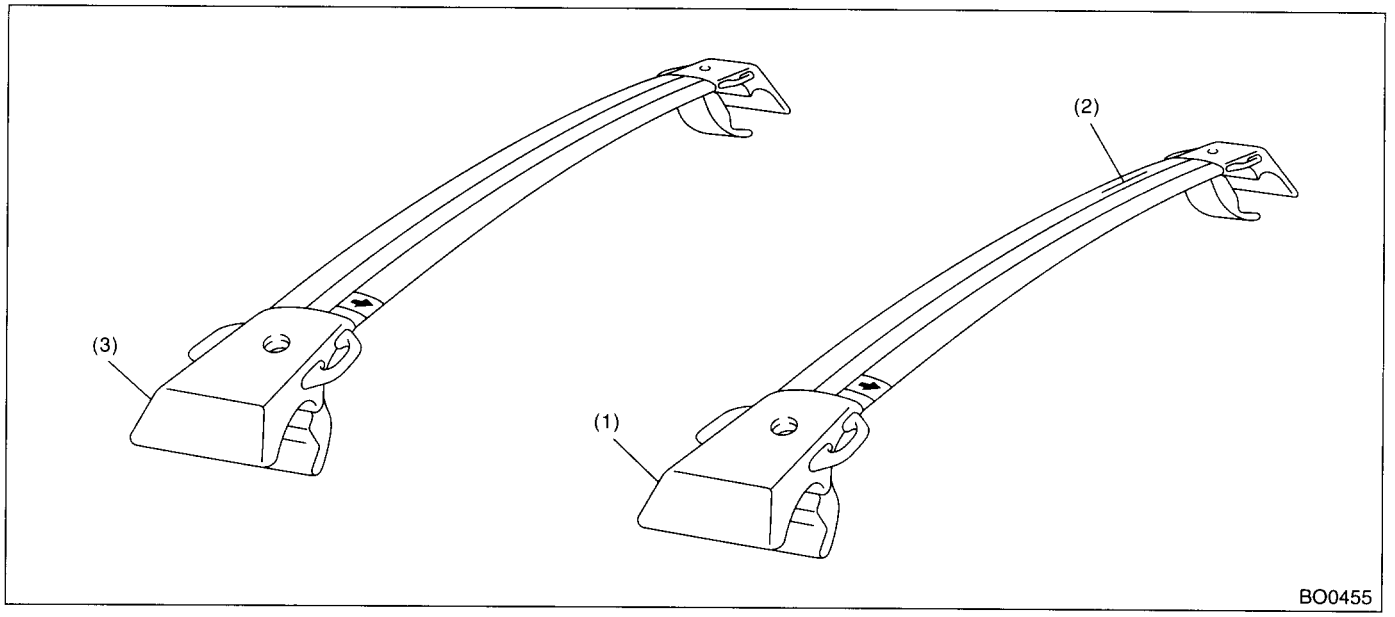
1. REAR SPOILER



(1) Rear spoiler
(2) High mount stop lamp
(3) Retention cable

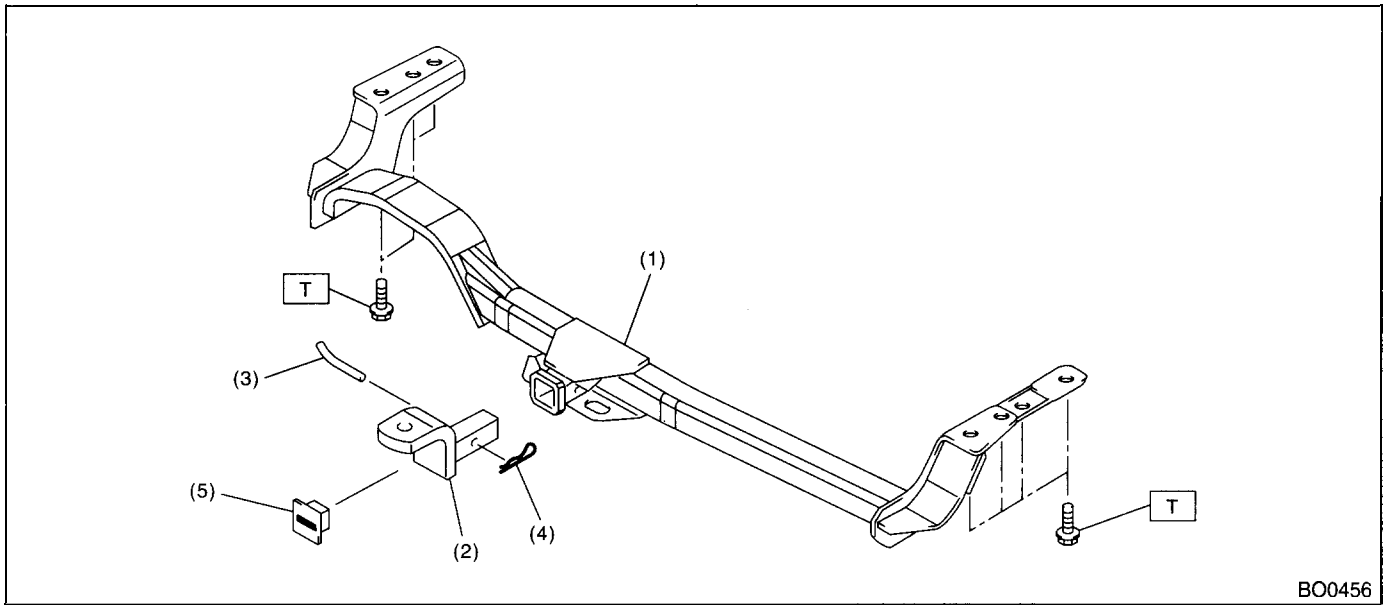
Tightening torque: N·m (kgf-m, ft-lb)
T: 7.4 (0.75, 5.46)

2. CROSSBAR



(1) Front crossbar
(2) Caution label (Front crossbar)
(3) Rear crossbar

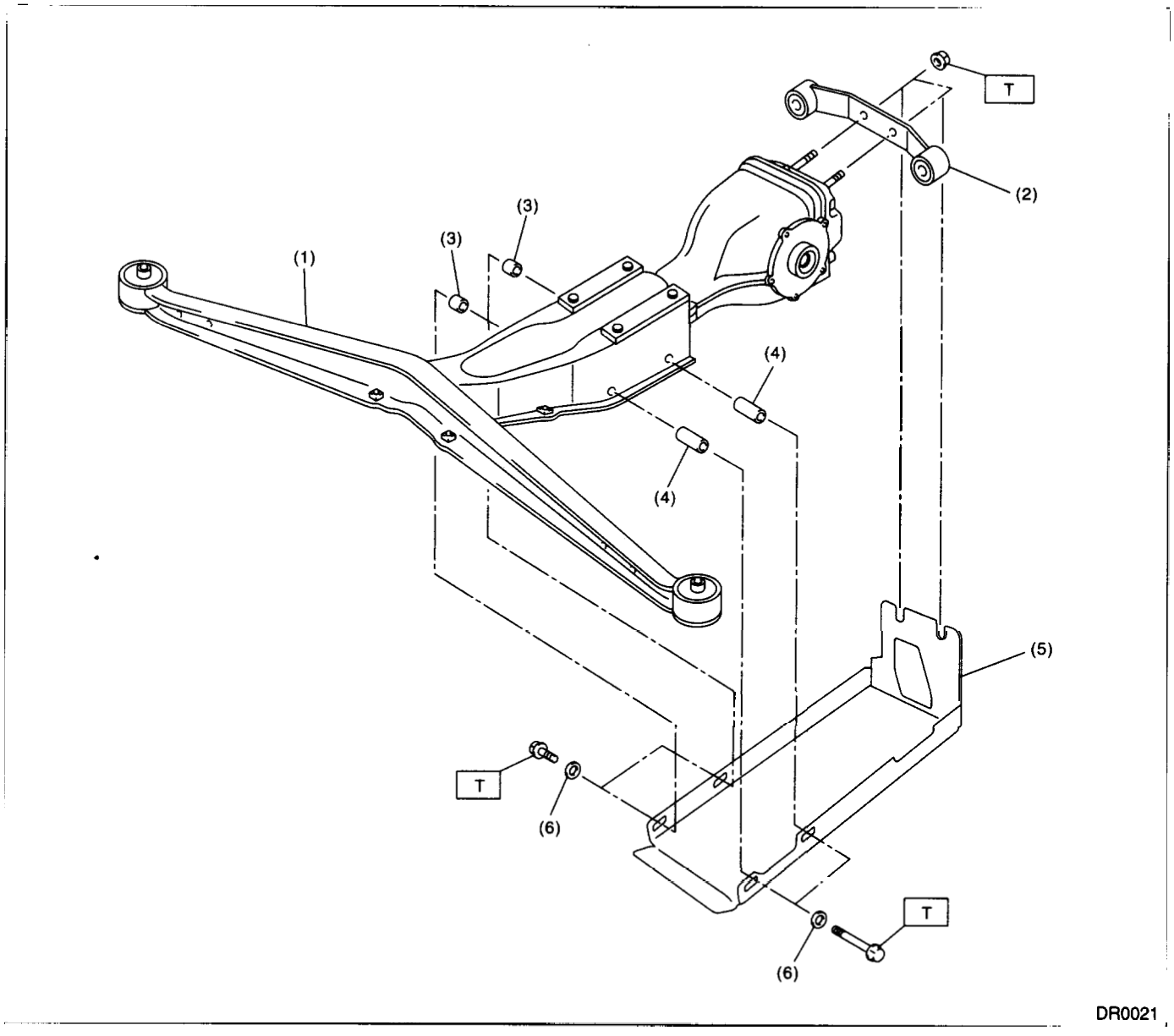
3. TRAILER HITCH



(1) Receiver hitch
(2) Ball mount
(3) Ball mount pin
(4) Ball mount clip
(5) Receiver cover

Tightening torque: N·m (kgf-m, ft-lb)
T: 95 (9.7, 70)

4. REAR DIFFERENTIAL PROTECTOR



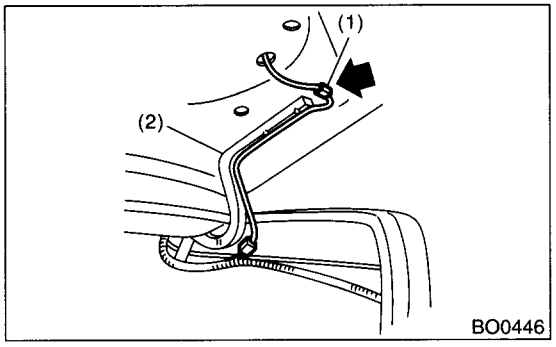
(1) Differential front member
(2) Differential rear member
(3) Spacer (Short)
(4) Spacer (Long)
(5) Rear differential protector
(6) Washer

Tightening torque: N·m (kgf-m, ft-lb)
T: 70 (7.1, 51.6)

2. Rear Spoiler

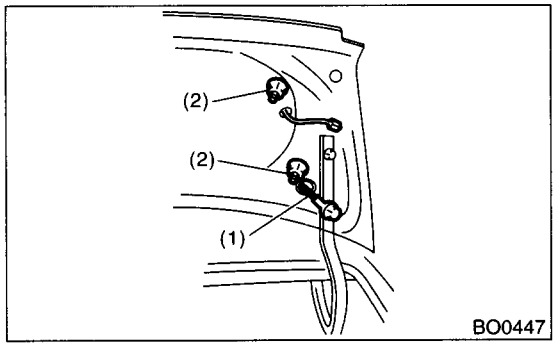
A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Open the trunk lid.
3) Disconnect the connector of high mounted stop-light.



(1) Connector
(2) Trunk hinge

4) Remove the retention cable with the trunk hinge lower side bolt.
5) Remove the mounting nuts of rear spoiler.



(1) Retention cable
(2) Mounting nut

6) Remove the rear spoiler with retention cable.

CAUTION:
Pay attention to avoid damage during removal or installation.

B: INSTALLATION

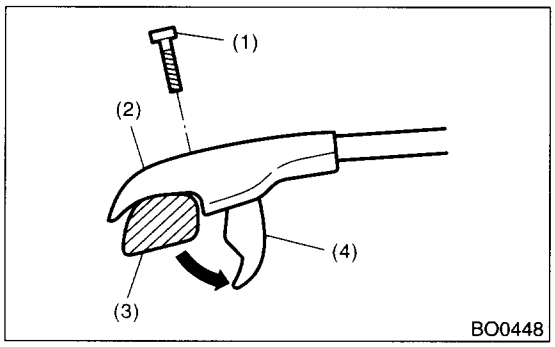
Install in the reverse order of removal.

Tightening torque:
Rear spoiler to trunk lid
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)
Retention cable to trunk hinge
13.7 N·m (1.4 kgf-m, 10.1 ft-lb)

3. Crossbar

A: REMOVAL

1) Remove the TORX® bolt T30 from each end support.
2) Rotate the lower clamp of each end support about 90 degress downward to remove the crossbar.



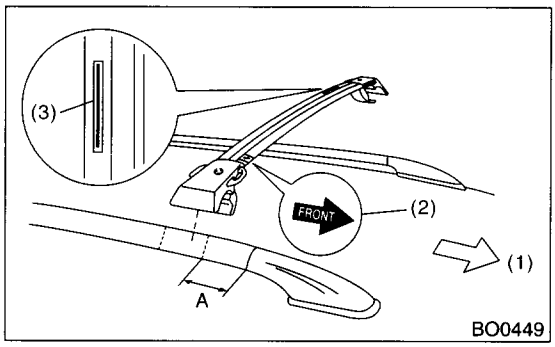
(1) TORX® bolt T30
(2) End support
(3) Roof rail
(4) Lower clamp

CAUTION:
Pay attention to avoid damage to the roof panel during removal or installation.

B: INSTALLATION

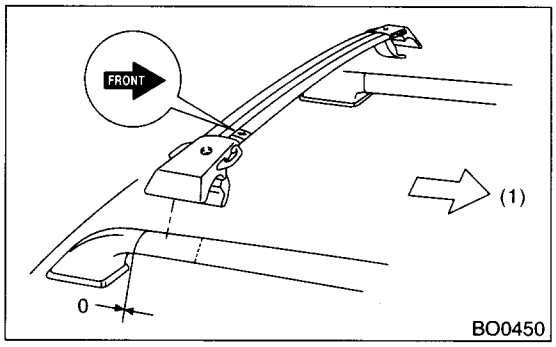
1) Rotate the lower clamp of each end support about 90 degrees downward.
2) Set the front crossbar so that front direction mark on the right side top face of crossbar point in the direction of vehicle front.
3) Place the crossbar end support at position 76.2 mm (3 in) behind the joint of front roof rail support and roof rail.

Length A:
76.2 mm (3 in)



(1) Front of vehicle
(2) Front direction mark
(3) Caution label (Front crossbar)

4) Set the rear crossbar so that front direction mark on the right side top face of crossbar point in the direction of vehicle front.
5) Place the crossbar end support on a joint of rear roof rail support and roof rail.



(1) Front of vehicle
(2) Front direction mark

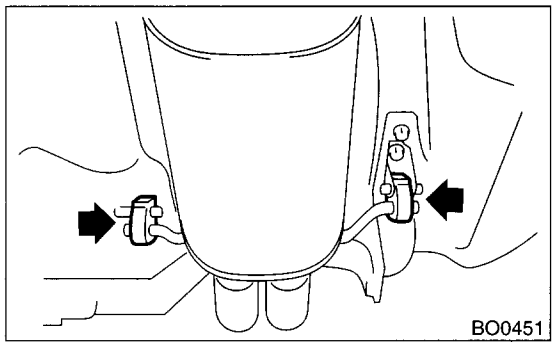
6) Tighten the end support and clamp using TORX® bolt T30.

4. Trailer Hitch

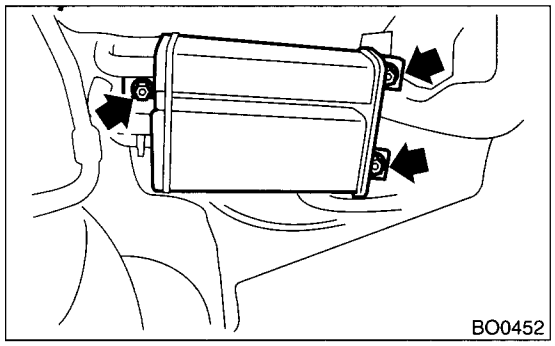
A: REMOVAL

CAUTION:
Because the trailer hitch is heavy, two people are required to remove it.

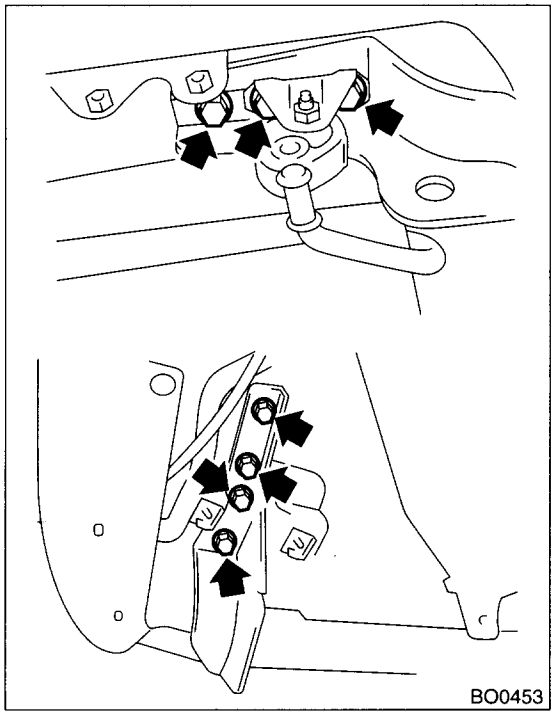
1) Lift-up the vehicle.
2) Remove the rubber cushion from tail pipe.



3) Remove the three nuts and canister.



4) Remove the trailer hitch installation bolts.



5) Remove the trailer hitch while lowering tail pipe.

B: INSTALLATION

CAUTION:
Because the trailer hitch is heavy, two people are required to install it.

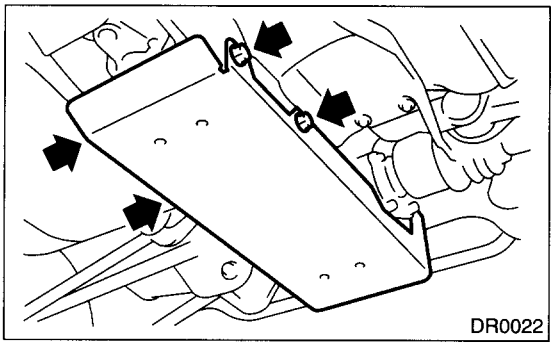
Install in the reverse order of removal.

Tightening torque:
Trailer hitch to body:
95 N·m (9.7 kgf-m, 70 ft-lb)
Canister:
23 N·m (2.3 kgf-m, 17 ft-lb)

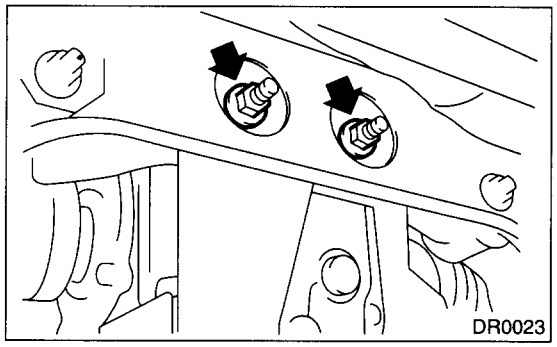
5. Rear Differential Protector

A: REMOVAL

1) Remove the rear exhaust pipe and muffer.
2) Remove the differential front member installation bolts.



3) Loosen the nuts until the rear differential protector can be removed.

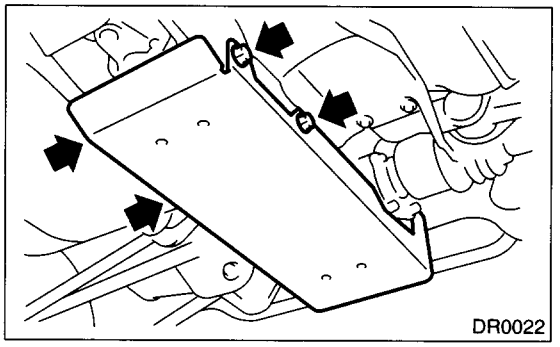


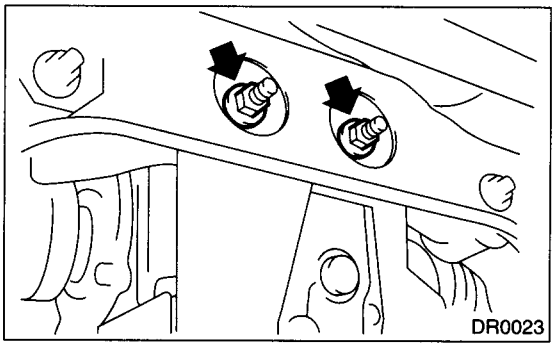
4) Remove the rear differential protector.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
70 N·m (7.1 kgf-m, 51.6 ft-lb)



NOTE:
Install the protector between the nuts and differential rear member.

Tightening torque:
70 N·m (7.1 kgf-m, 51.6 ft-lb)