REPAIR SECTION

FOREWORD

This portion of the 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 both the fully qualified and the less-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.

Important safety notice

- Providing appropriate service and repair is a matter of great importance in the serviceman's safety maintenance and safe operation, function and performance which the SUBARU vehicle possesses.
- In case the replacement of parts or replenishment of consumables is required, genuine SUBARU parts whose parts numbers are designated or their equivalents must be utilized.
- It must be made well known that the safety of the serviceman and the safe operation of the vehicle would be jeopardized if the used any service parts, consumables, special tools and work procedure manuals which are not approved or designated by SUBARU.

How to use this manual

- This Service Manual is divided into four volumes by section so that it can be used with ease at work. Refer to the Table of Contents, select and use the necessary section.

  - GENERAL INFORMATION SECTION
  - REPAIR SECTION
  - DIAGNOSTICS SECTION
  - WIRING DIAGRAM SECTION

- Each chapter in the manual is basically made of the following four types of areas.

  S SPECIFICATIONS AND SERVICE DATA
  C COMPONENT PARTS
  W SERVICE PROCEDURE
  (X SERVICE PROCEDURE)
  (Y SERVICE PROCEDURE)
  T DIAGNOSTICS

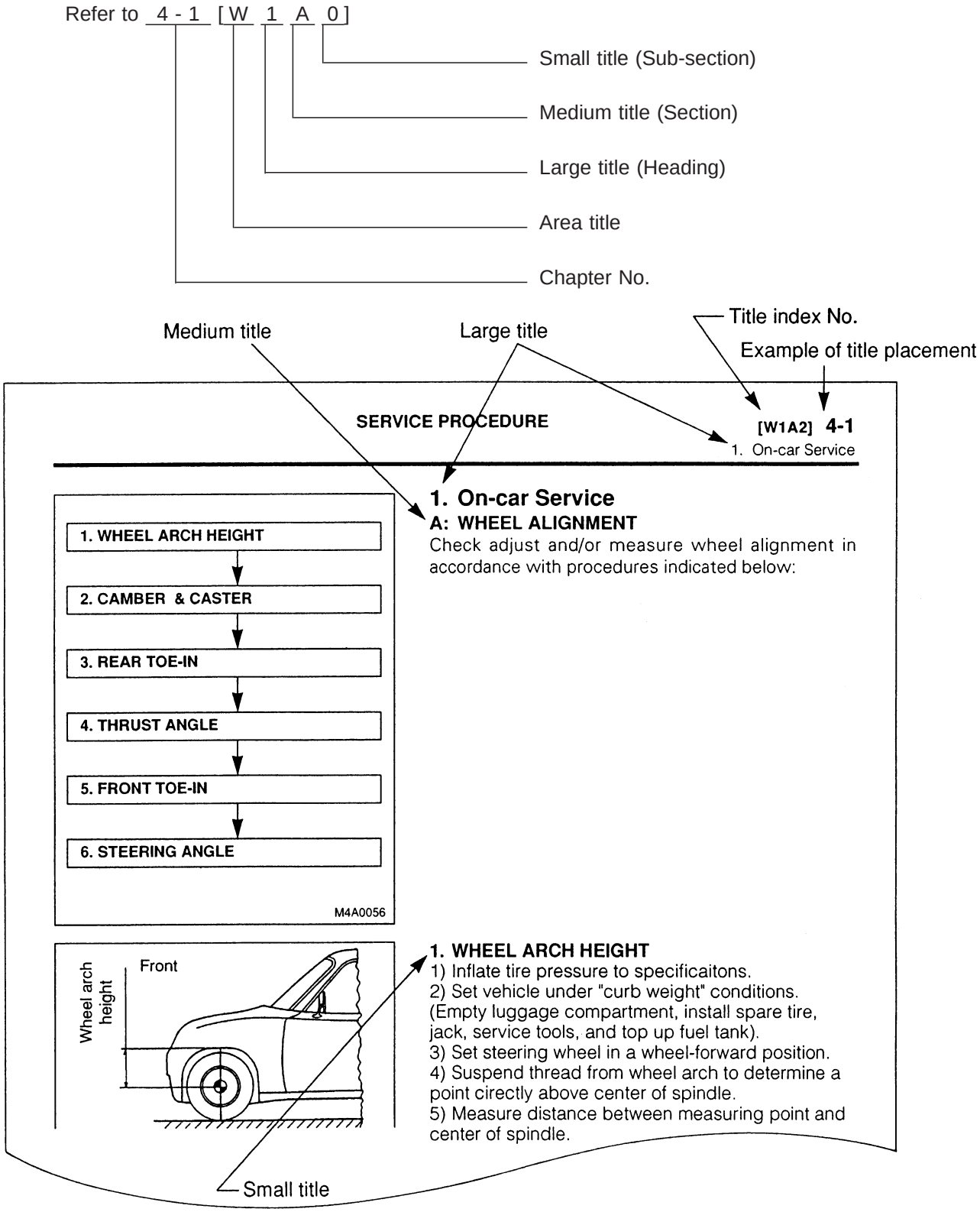
- The description of each area is provided with four types of titles different in size as shown below. The Title No. or Symbol prefixes each title in order that the construction of the article and the flow of explanation can be easily understood.

  [Example of each title]

  - Area title: W SERVICE PROCEDURE (one of the four types of areas)
  - Large title (Heading): 1. Oil Pump (to denote the main item of explanation)
  - Medium title (Section): A: REMOVAL (to denote the type of work in principle)
  - Small title (Sub-section): 1. INNER ROTATOR (to denote a derivative item of explanation)

- The Title Index No. is indicated on the top left (or right) side of the page as the book is opened. This is useful for retrieving the necessary portion.

(Example of usage)



- In this manual, the following symbols are used.

  ✻ : Selective part

  ★ : Replacement part

  : Should be lubricated with oil.

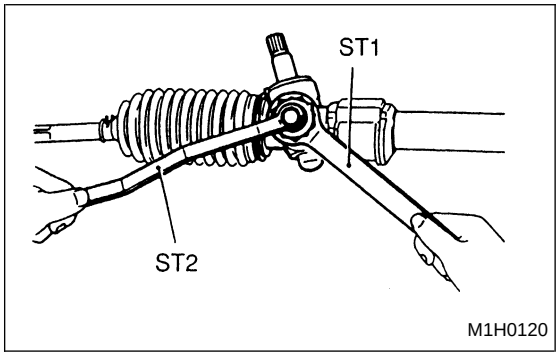
  : Should be lubricated with grease.

  : Sealing point

  T : Tightening torque

- WARNING, CAUTION, NOTE
  - WARNING: Indicates the item which must be observed precisely during performance of maintenance services in order to avoid injury to the mechanics and other persons.
  - CAUTION: Indicates the item which must be followed precisely during performance of maintenance services so as to avoid damage and breakage to the vehicle and its parts and components.
  - NOTE: Indicates the hints, knacks, etc. which make the maintenance job easier.

- SPECIAL TOOLS
  When any special tool is required to perform the job, it is identified by “ST” in the applicable illustration and its part number is shown in the manual.



1. Procedures for adjusting backlash

1) Set steering wheel to the straight-ahead position.
2) Remove the exhaust pipe
3) Loosen the lock nut with ST.

ST1	921650000	STEERING GEARBOX WRENCH
ST2	921550000	STEERING GEARBOX WRENCH

Description (of job method)

Shows the part name

Shows the part number

Tells that two kinds of special tools are required.
When two or more kinds of special tools are required to do a job, they are identified by ST1, ST2,.....respectively.

TABLE OF CONTENTS

ON-CAR SERVICES 2-2

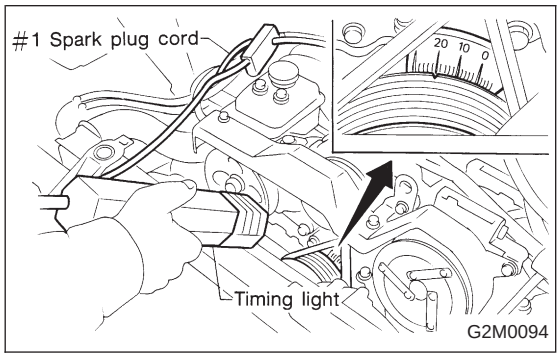
1. Foreword

This chapter describes major inspection and service procedures for the engine mounted on the body. For procedures not found in this chapter, refer to the service procedure section in the applicable chapter.

2. Ignition Timing

A: MEASUREMENT

1) Warm-up the engine.



2) To check the ignition timing, connect a timing light to #1 cylinder spark plug cord, and illuminate the timing mark with the timing light.
3) Start the engine at idle speed and check the ignition timing.
If the timing is not correct, check the ignition control system. <Ref. to 2-7 Fuel Injection System [T7C0] (1800 cc)/ 2-7b On-Board Diagnostics II System [T8D0] (2200 cc).>

Ignition timing [BTDC/rpm]:
20°±8°/700

NOTE:
To improve stability, ignition timing while engine is idling is also controlled. For this reason specified ignition timing range is increased somewhat, to ±8°.

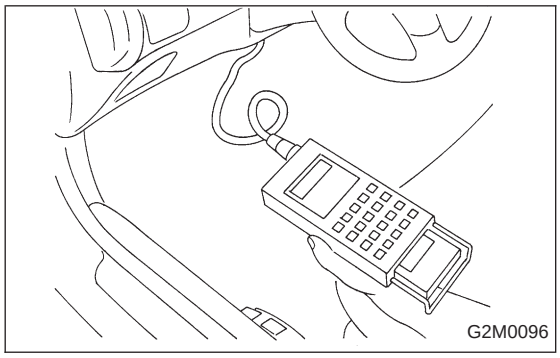
3. Engine Idle Speed

A: MEASUREMENT

1) Before checking idle speed, check the following:

(1) Ensure that 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 that malfunction indicator lamp (CHECK ENGINE light) does not illuminate.

2) Warm-up the engine.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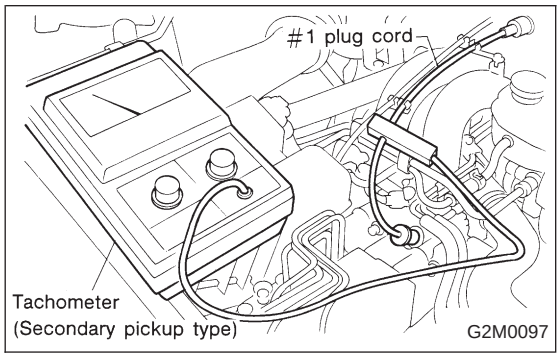
3) Connect Subaru Select Monitor or the OBD-II general scan tool (2200 cc) to data link connector.

CAUTION:
When connecting Subaru Select Monitor, turn ignition switch to OFF.

4) Start the engine and measure engine speed.

NOTE:
Engine speed is indicated on Subaru Select Monitor by selecting “MODE F04”.



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NOTE:
- When using the OBD-II general scan tool, carefully read its operation manual. (2200 cc)
- When Subaru Select Monitor is not used, attach the pickup sensor on tachometer (Secondary pickup type) to #1 plug cord.
- This ignition system provides simultaneous ignition for #1 and #2 plugs. It must be noted that some tachometers may register twice that of actual engine speed.

5) Check idle speed when unloaded (with headlights, heater fan, rear defroster, radiator fan, air conditioning, etc. OFF).

Idle speed [No load and gears in neutral (MT) or N or P (AT) position]:
700±100 rpm

6) Check idle speed when loaded. (Turn air conditioning switch to “ON” and operate compressor for at least one minute before measurement.)

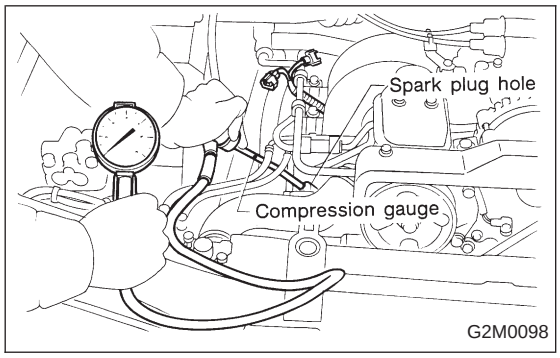
Idle speed [A/C switch “ON”, no load and gears in neutral (MT) or N or P (AT) position]:
800±50 rpm (1800 cc)
850±50 rpm (2200 cc)

CAUTION:
Never rotate idle adjusting screw, if idle speed is outside specifications, refer to General On-board Diagnosis Table under “2-7 Fuel Injection System (1800 cc) or On-Board Diagnostics II System (2200 cc)”.

4. Engine Compression

A: MEASUREMENT

1) After warming-up the engine, turn ignition switch to OFF.
2) Make sure that the battery is fully charged.
3) Remove all the spark plugs.
4) Disconnect connectors from fuel injectors.
5) Fully open 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.

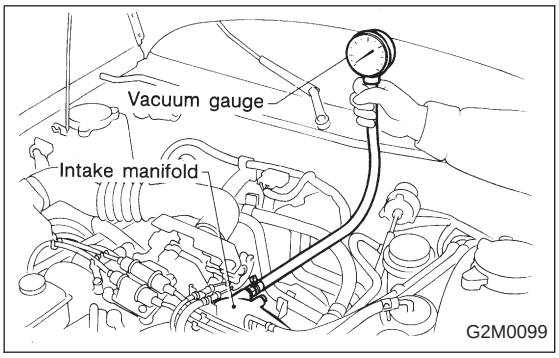
9) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (200 — 300 rpm and fully open throttle):
Standard
1,079 — 1,275 kPa
(11.0 — 13.0 kg/cm^2, 156 — 185 psi)
Limit
883 kPa (9.0 kg/cm^2, 128 psi)
Difference between cylinders
196 kPa (2.0 kg/cm^2, 28 psi)

5. Intake Manifold Vacuum

A: MEASUREMENT

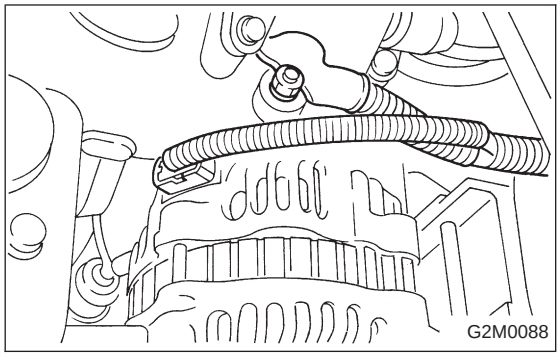
1) Warm-up the engine.
2) Disconnect the vacuum hose and install the vacuum gauge to the hose fitting on the manifold.



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"):
1800 cc:
Less than − 66.7 kPa
(− 500 mmHg, − 19.69 inHg)
2200 cc:
Less than − 60.0 kPa
(− 450 mmHg, − 17.72 inHg)

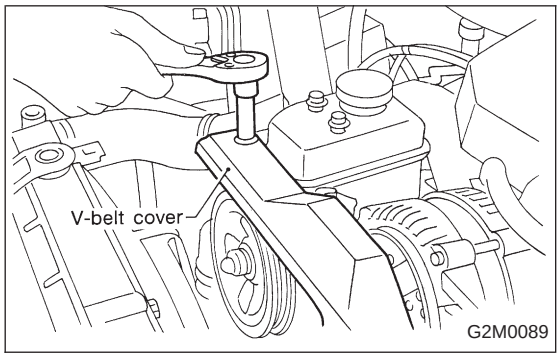
Diagnosis of engine condition by measurement of manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Leakage around intake manifold gasket or throttle chamber gasket.
2. When 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 muffler 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



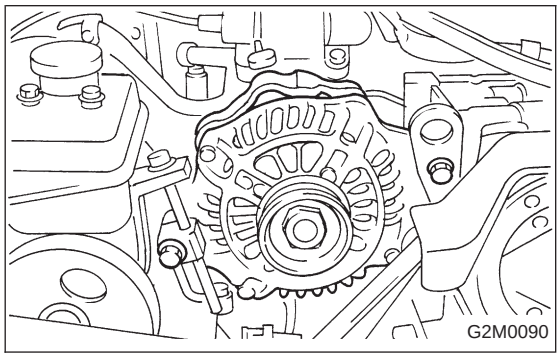
6. Engine Oil Pressure

A: MEASUREMENT

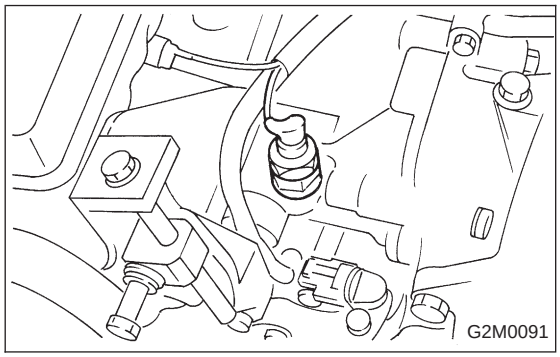
1) Remove generator from bracket.
   (1) Disconnect connector and terminal from generator.



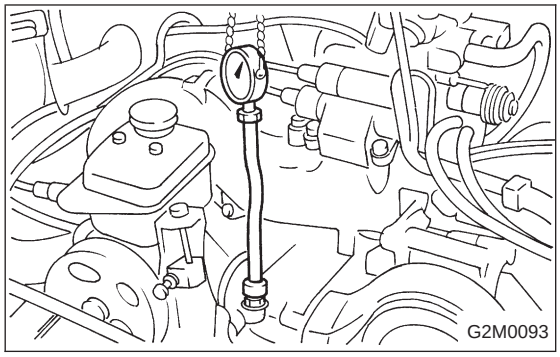
   (2) Remove V-belt cover.
   (3) Loosen lock bolt and slider bolt, and remove front side V-belt.



   (4) Remove lock bolt.
   (5) Remove bolts which install generator on bracket.



2) Disconnect connector from oil pressure switch.
3) Remove oil pressure switch from engine block.



4) Connect oil pressure gauge hose.
5) Start the engine, and measure oil pressure.

Oil pressure:
98 kPa (1.0 kg/cm^2,14 psi) or more at 600 rpm
294 kPa (3.0 kg/cm^2, 43 psi) or more at 5,000 rpm

CAUTION:
● If oil pressure is out of specification, check oil pump, oil filter and lubrication line.
<Ref. to 2-4 [T100].>
● If oil pressure warning light is turned ON and oil pressure is in specification, replace oil pressure switch.
<Ref. to 2-4 [W3A0].>

NOTE:
The specified data is based on an engine oil temperature of 80°C (176°F).

6) After measuring oil pressure, install oil pressure switch.

Tightening torque:
25±3 N·m (2.5±0.3 kg-m, 18.1±2.2 ft-lb)

7) Install generator and V-belt in the reverse order of removal, and adjust the V-belt deflection.

ENGINE 2-3

1. Specifications

Model			1800 cc	2200 cc
ENGINE	Type		Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine	
	Valve arrangement		Belt driven, single over-head camshaft, 4-valve/cylinder	
	Bore x Stroke	mm (in)	87.9 x 75.0 (3.461 x 2.953)	96.9 x 75.0 (3.815 x 2.953)
	Piston displacement	cm^3 (cu in)	1,820 (111.06)	2,212 (135.0)
	Compression ratio		9.5	
	Compression pressure (at 200 — 300 rpm)	kPa (kg/cm^2, psi)	1,079 — 1,275 (11.0 — 13.0, 156 — 185)	
	Number of piston rings		Pressure ring: 2, Oil ring: 1	
	Intake valve timing	Opening	1° BTDC	1° BTDC
		Closing	59° ABDC	55° ABDC
	Exhaust valve timing	Opening	50° BBDC	48° BBDC
		Closing	6° ATDC	12° ATDC
	Idling speed [At neutral position on MT, or "P" or "N" position on AT]	rpm	700±100 (No load) 800±50 (A/C switch ON)	700±100 (No load) 850±50 (A/C switch ON)
	Firing order		1 → 3 → 2 → 4	
	Ignition timing	BTDC/rpm	AT: 20°±8°/700 MT: 20°±2°/700	

2. Service Data

Belt tension adjuster	Protrusion of adjuster rod					15.4 — 16.4 mm	(0.606 — 0.646 in)
Belt tensioner	Spacer O.D.					16 mm	(0.63 in)
	Tensioner bush I.D.					16.16 mm	(0.6362 in)
	Clearance between spacer and bush				STD	0.117 — 0.180 mm	(0.0046 — 0.0071 in)
					Limit	0.230 mm	(0.0091 in)
	Side clearance of spacer				STD	0.37 — 0.54 mm	(0.0146 — 0.0213 in)
					Limit	0.8 mm	(0.031 in)
Valve rocker arm	Clearance between shaft and arm				STD	0.020 — 0.054 mm	(0.0008 — 0.0021 in)
					Limit	0.10 mm	(0.0039 in)
Camshaft	Bend limit					0.025 mm	(0.0010 in)
	Thrust clearance				STD	0.030 — 0.260 mm	(0.0012 — 0.0102 in)
					Limit	0.35 mm	(0.0138 in)
	Cam lobe height		1800 cc	Intake	STD	32.364 — 32.464 mm	(1.2742 — 1.2781 in)
					Limit	32.214 mm	(1.2683 in)
				Exhaust	STD	32.364 — 32.464 mm	(1.2742 — 1.2781 in)
					Limit	32.214 mm	(1.2683 in)
			2200 cc	Intake	STD	31.994 — 32.094 mm	(1.2596 — 1.2635 in)
					Limit	31.844 mm	(1.2537 in)
				Exhaust	STD	32.624 — 32.724 mm	(1.2844 — 1.2883 in)
					Limit	32.474 mm	(1.2785 in)
	Camshaft journal O.D.	RH	Front	LH	Rear	31.935 — 31.950 mm	(1.2573 — 1.2579 in)
			Center		Center	37.435 — 37.450 mm	(1.4738 — 1.4744 in)
			Rear		Front	37.935 — 37.950 mm	(1.4935 — 1.4941 in)
	Camshaft journal hole I.D.	RH	Front	LH	Rear	32.005 — 32.025 mm	(1.2600 — 1.2608 in)
			Center		Center	37.505 — 37.525 mm	(1.4766 — 1.4774 in)
			Rear		Front	38.005 — 38.025 mm	(1.4963 — 1.4970 in)
	Oil clearance				STD	0.055 — 0.090 mm	(0.0022 — 0.0035 in)
					Limit	0.10 mm	(0.0039 in)
Cylinder head	Surface warpage limit					0.05 mm	(0.0020 in)
	Surface grinding limit					0.1 mm	(0.004 in)
	Standard height					98.3 mm	(3.870 in)
Valve set	Refacing angle					90°	
	Contacting width			Intake	STD	0.7 mm	(0.028 in)
					Limit	1.4 mm	(0.055 in)
				Exhaust	STD	1.4 mm	(0.055 in)
					Limit	1.8 mm	(0.071 in)
Valve guide	Inner diameter					6.000 — 6.012 mm	(0.2362 — 0.2367 in)
	Protrusion above head					17.5 — 18.0 mm	(0.689 — 0.709 in)
Valve	Head edge thickness			Intake	STD	1.0 mm	(0.039 in)
					Limit	0.8 mm	(0.031 in)
				Exhaust	STD	1.2 mm	(0.047 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	101.0 mm	(3.976 in)
					Exhaust	101.2 mm	(3.984 in)

STD: Standard I.D.: Inner Diameter O.D.: Outer Diameter

Valve spring	Free length		1800 cc		46.16 mm	(1.8173 in)
			2200 cc		44.05 mm	(1.7342 in)
	Squareness		1800 cc		2.5°, 2.0 mm	(0.079 in)
			2200 cc		2.5°, 1.9 mm	(0.075 in)
	Tension/spring height		1800 cc		190.3 — 219.7 N (19.4 — 22.4 kg, 42.8 — 49.4 lb)/37.0 mm (1.457 in) 401.1 — 461.9 N (40.9 — 47.1 kg, 90.2 — 103.9 lb)/29.2 mm (1.150 in)	
			2200 cc		174.6 — 200.1 N (17.8 — 20.4 kg, 39.2 — 45.0 lb)/36.0 mm (1.417 in) 405.0 — 458.0 N (41.3 — 46.7 kg, 91.1— 103.0 lb)/28.2 mm (1.110 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	1800 cc	STD	A	87.905 — 87.915 mm	(3.4608 — 3.4612 in)
				B	87.895 — 87.905 mm	(3.4604 — 3.4608 in)
		2200 cc	STD	A	96.905 — 96.915 mm	(3.8151 — 3.8155 in)
				B	96.895 — 96.905 mm	(3.8148 — 3.8151 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	1800 cc	STD	A	87.885 — 87.895 mm	(3.4600 — 3.4604 in)
				B	87.875 — 87.885 mm	(3.4596 — 3.4600 in)
			0.25 mm (0.0098 in) OS		88.125 — 88.135 mm	(3.4695 — 3.4699 in)
			0.50 mm (0.0197 in) OS		88.375 — 88.385 mm	(3.4793 — 3.4797 in)
		2200 cc	STD	A	96.885 — 96.895 mm	(3.8144 — 3.8148 in)
				B	96.875 — 96.885 mm	(3.8140 — 3.8144 in)
			0.25 mm (0.0098 in) OS		97.115 — 97.145 mm	(3.8234 — 3.8246 in)
			0.50 mm (0.0197 in) OS		97.365 — 97.395 mm	(3.8333 — 3.8344 in)
Piston pin	Standard clearance between piston pin and hole in piston			STD	0.004 — 0.010 mm	(0.0002 — 0.0004 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	0.5 mm	(0.020 in)
		Second ring		STD	0.20 — 0.35 mm	(0.0079 — 0.0138 in)
				Limit	0.5 mm	(0.020 in)
		Oil ring		STD	0.20 — 0.70 mm	(0.0079 — 0.0276 in)
				Limit	1.0 mm	(0.039 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)

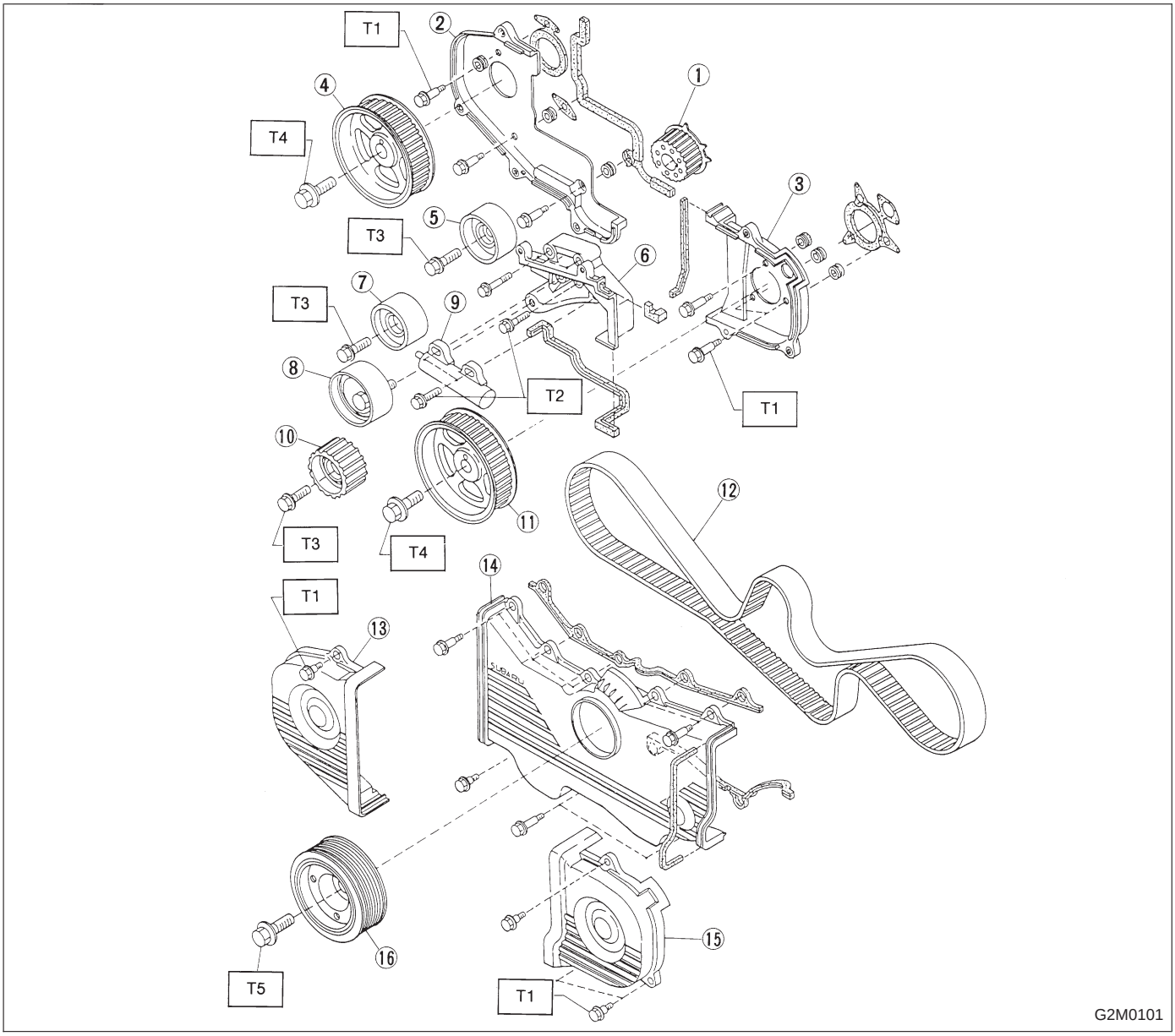
Connecting rod	Bend twist per 100 mm (3.94 in) in length	Limit	0.10 mm	(0.0039 in)
	Side clearance	STD	0.070 — 0.330 mm	(0.0028 — 0.0130 in)
		Limit	0.4 mm	(0.016 in)
Connecting rod bearing	Oil clearance	STD	0.015 — 0.045 mm	(0.0006 — 0.0018 in)
		Limit	0.05 mm	(0.0020 in)
	Thickness at center portion	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)

STD: Standard OS: Oversize US: Undersize

Crankshaft	Bend limit			0.035 mm	(0.0014 in)
	Crankpin and crank journal	Out-of-roundness		0.030 mm (0.0012 in) or less	
		Grinding limit		0.250 mm	(0.0098 in)
	Crankpin outer diameter		STD	51.984 — 52.000 mm	(2.0466 — 2.0472 in)
			0.03 mm (0.0012 in) US	51.954 — 51.970 mm	(2.0454 — 2.0461 in)
			0.05 mm (0.0020 in) US	51.934 — 51.950 mm	(2.0446 — 2.0453 in)
			0.25 mm (0.0098 in) US	51.734 — 51.750 mm	(2.0368 — 2.0374 in)
	Crank journal outer diameter	#1, #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	59.934 — 59.950 mm	(2.3596 — 2.3602 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm	(2.3520 — 2.3527 in)
		#2, #3, #4	STD	59.992 — 60.008 mm	(2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.954 — 59.970 mm	(2.3604 — 2.3610 in)
			0.05 mm (0.0020 in) US	59.934 — 59.950 mm	(2.3596 — 2.3602 in)
			0.25 mm (0.0098 in) US	59.734 — 59.750 mm	(2.3517 — 2.3524 in)
	Thrust clearance		STD	0.030 — 0.115 mm	(0.0012 — 0.0045 in)
			Limit	0.25 mm	(0.0098 in)
	Oil clearance	#1, #5	STD	0.010 — 0.030 mm	(0.0004 — 0.0012 in)
			Limit	0.040 mm	(0.0016 in)
		#2, #3, #4	STD	0.010 — 0.030 mm	(0.0004 — 0.0012 in)
			Limit	0.035 mm	(0.0014 in)
Crankshaft bearing	Crankshaft bearing thickness	#1, #5	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, #3, #4	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)

STD: Standard US: Undersize

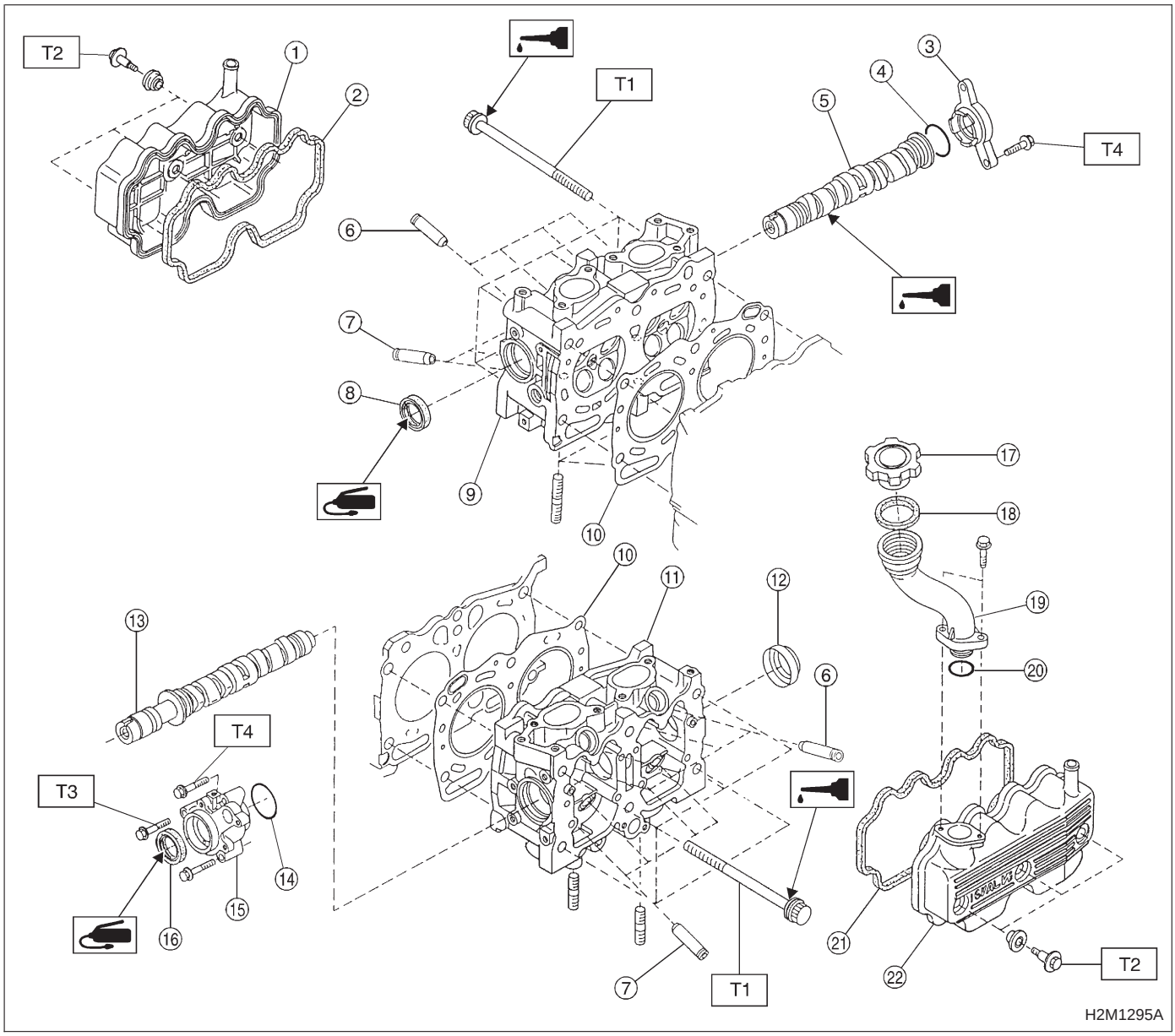
1. Timing Belt



① Crankshaft sprocket
② Right-hand belt cover No. 2
③ Left-hand belt cover No. 2
④ Right-hand camshaft sprocket
⑤ Belt idler
⑥ Tensioner bracket
⑦ Belt idler
⑧ Belt tensioner
⑨ Tensioner adjuster
⑩ Belt idler No. 2
⑪ Left-hand camshaft sprocket
⑫ Timing belt
⑬ Right-hand belt cover
⑭ Front belt cover
⑮ Left-hand belt cover
⑯ Crankshaft pulley

Tightening torque: N·m (kg-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 23 — 26 (2.3 — 2.7, 17 — 20)
T3: 35 — 43 (3.6 — 4.4, 26 — 32)
T4: 74 — 83 (7.5 — 8.5, 54 — 61)
T5: 93 — 103 (9.5 — 10.5, 69 — 76)

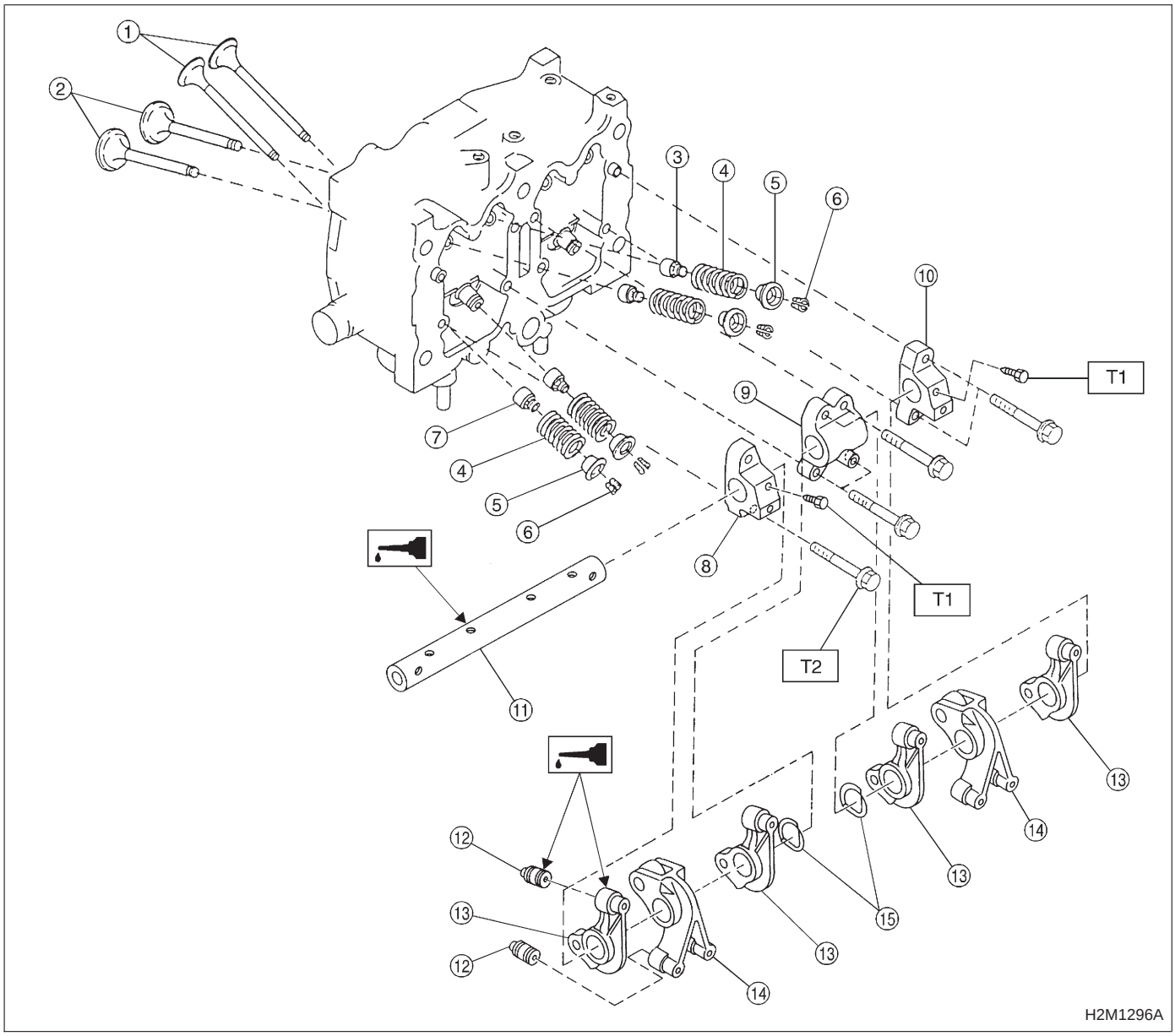
2. Cylinder Head and Camshaft



① Rocker cover (RH)
② Rocker cover gasket
③ Camshaft support (RH)
④ O-ring
⑤ Camshaft (RH)
⑥ Intake valve guide
⑦ Exhaust valve guide
⑧ Oil seal
⑨ Cylinder head (RH)
⑩ Cylinder head gasket
⑪ Cylinder head (LH)
⑫ Plug
⑬ Camshaft (LH)
⑭ O-ring
⑮ Camshaft support (LH)
⑯ Oil seal
⑰ Oil filler cap
⑱ Gasket
⑲ Oil filler pipe
⑳ O-ring
㉑ Rocker gasket
㉒ Rocker cover (LH)

Tightening torque: N·m (kg-m, ft-lb)
T1: Refer to 2-3 [W6E1].
T2: 5±1 (0.5±0.1, 3.6±0.7)
T3: 10 (1.0, 7)
T4: 16 (1.6, 12)

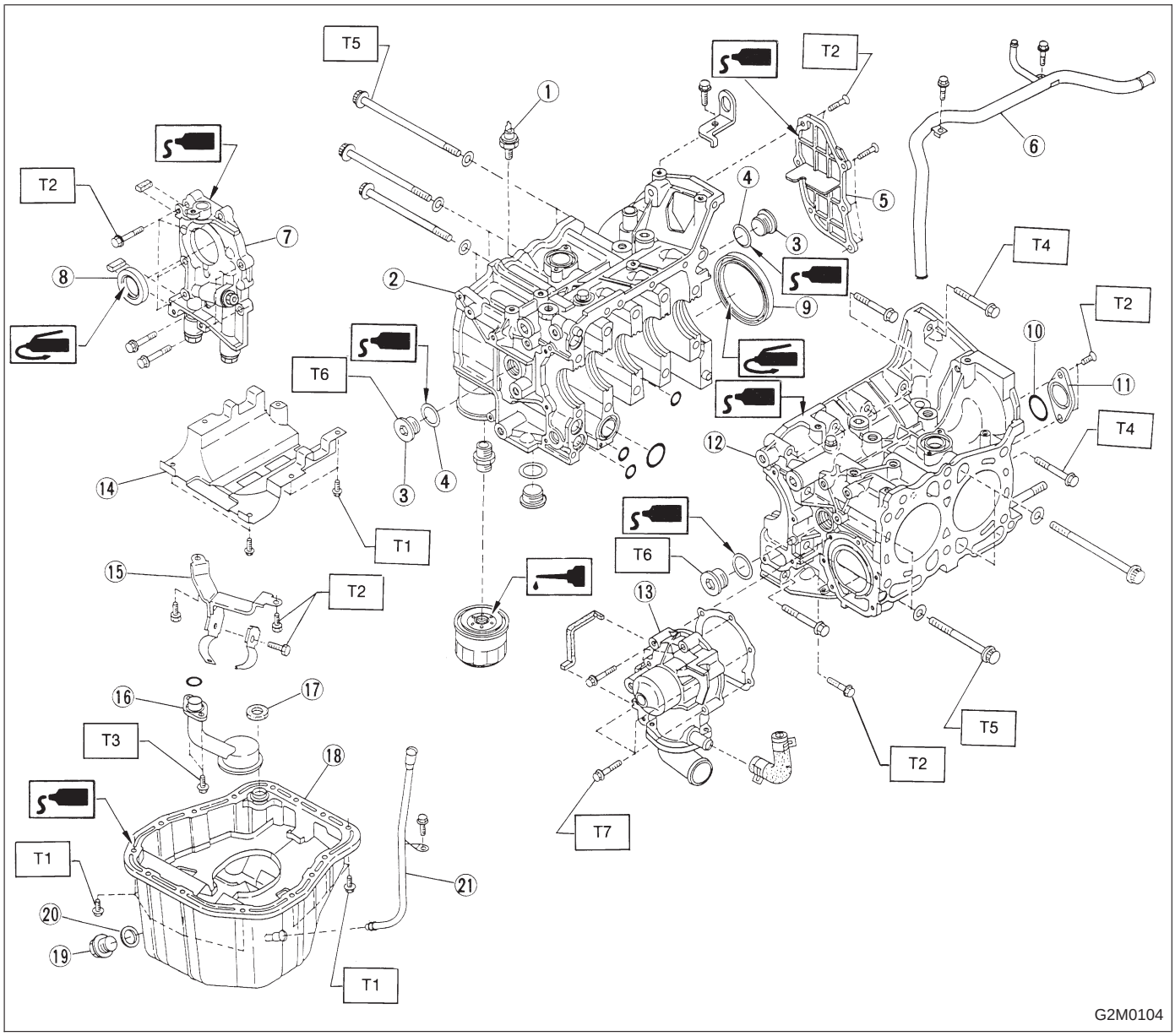
3. Cylinder Head and Valve Assembly



① Exhaust valve
② Intake valve
③ Intake valve oil seal
④ Valve spring
⑤ Retainer
⑥ Retainer key
⑦ Exhaust valve oil seal
⑧ Rocker shaft support
⑨ Rocker shaft support
⑩ Rocker shaft support
⑪ Rocker shaft
⑫ Hydraulic lash adjuster
⑬ Intake valve rocker arm
⑭ Exhaust valve rocker arm
⑮ Spring

Tightening torque: N·m (kg-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 12±1 (1.2±0.1, 8.7±0.7)

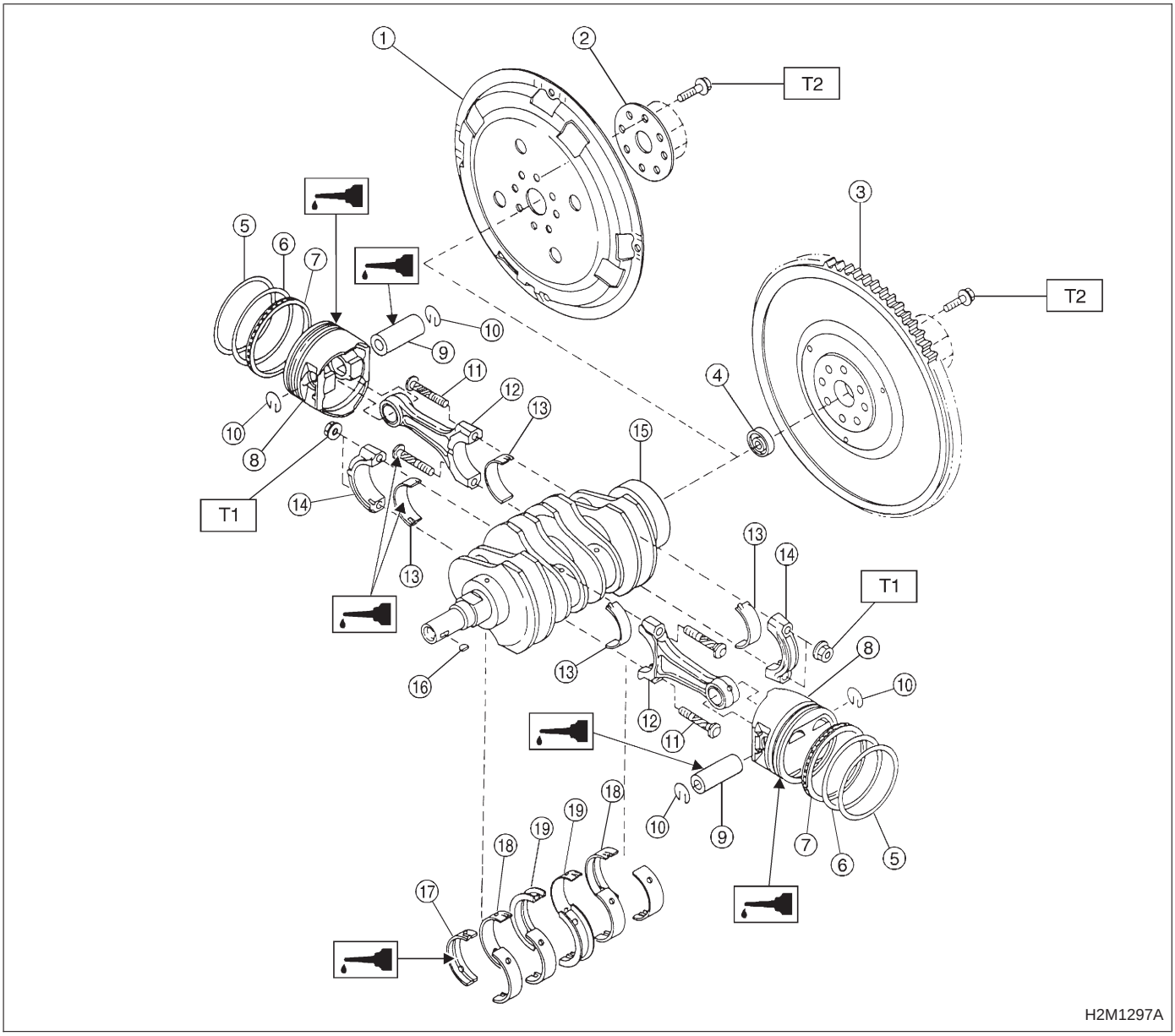
4. Cylinder Block



① Oil pressure switch
② Cylinder block (RH)
③ Service hole plug
④ Gasket
⑤ Oil separator cover
⑥ Water 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 strainer stay
⑯ Oil strainer
⑰ Gasket
⑱ Oil pan
⑲ Oil drain plug
⑳ Gasket
㉑ Oil filler pipe

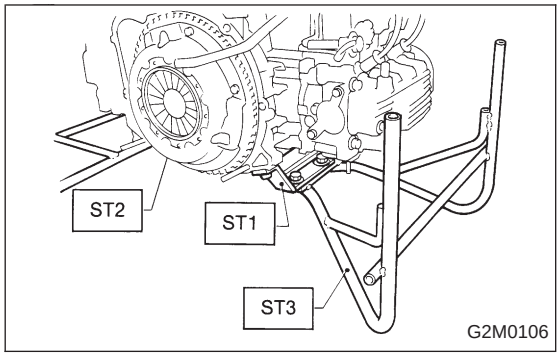
Tightening torque: N·m (kg-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7)
T4: 23 — 26 (2.3 — 2.7, 17 — 20)
T5: 44 — 50 (4.5 — 5.1, 33 — 37)
T6: 62 — 76 (6.3 — 7.7, 46 — 56)
T7: First 10 — 14 (1.0 — 1.4, 7 — 10)
Second 10 — 14 (1.0 — 1.4, 7 — 10)

5. Crankshaft and Piston



① Drive plate
② Reinforcement
③ Flywheel
④ Bell bearing
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, #5
⑱ Crankshaft bearing #2, #4
⑲ Crankshaft bearing #3

Tightening torque: N·m (kg-m, ft-lb)
T1: 43 — 46 (4.4 — 4.7, 32 — 34)
T2: 69 — 75 (7.0 — 7.6, 51 — 55)



1. General Precautions

1) Before disassembling engine, place it on ST3.

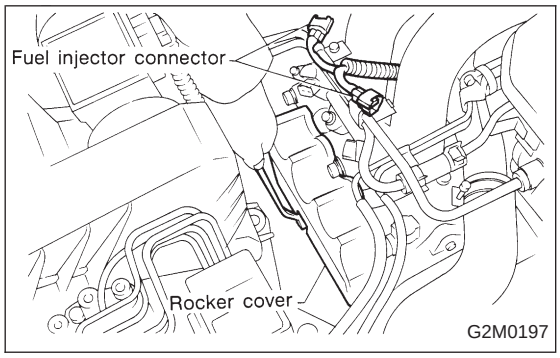
ST1	498457000	ENGINE STAND ADAPTER RH
ST2	498457100	ENGINE STAND ADAPTER LH
ST3	499817000	ENGINE STAND

2) All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.
3) Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
4) Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
5) All removed parts, if to be reused, should be reinstalled in the original positions and directions.
6) Gaskets and lock washers must be replaced with new ones. Liquid gasket should be used where specified to prevent leakage.
7) Bolts, nuts and washers should be replaced with new ones as required.
8) Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.

2. Hydraulic Lash Adjuster

A: INSPECTION

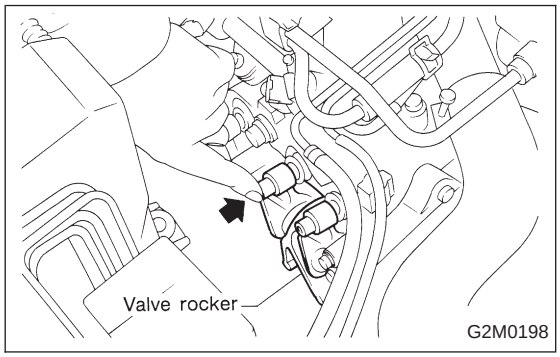
1) Disconnect blow-by hose from rocker cover.
2) Remove spark plug cap.



3) Disconnect connectors from fuel injectors. (1800 cc)

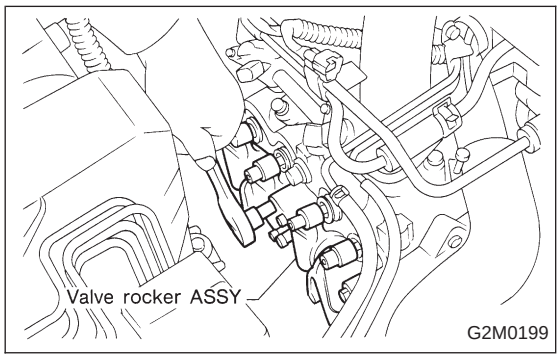
4) Remove left and right rocker covers.

CAUTION:
Before removing left rocker cover, disconnect engine harness connector (1800 cc), battery cables and generator cable.

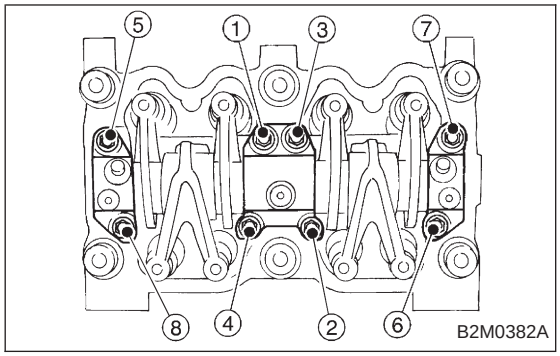


5) Manually push valve rocker (at lash adjuster location) to check that there is no air in it.

NOTE:
When air is in lash adjuster, valve rocker moves when pushed with fingers.



6) If air is in lash adjuster, remove valve rocker assembly from engine and bleed air completely.



B: AIR BLEEDING

1) Remove valve rocker assembly.

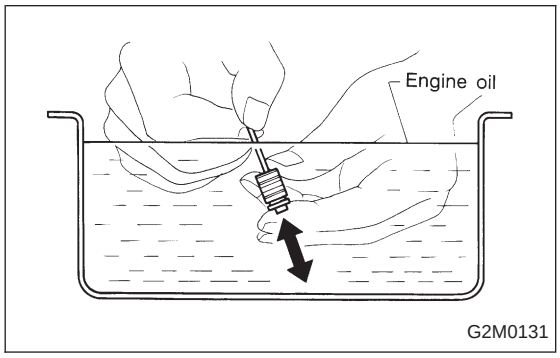
(1) Remove bolts ① through ④ in numerical sequence.

CAUTION:
Leave two or three threads of bolt ① engaged to retain valve rocker assembly.

(2) Equally loosen bolts ⑤ through ⑧ all the way, being careful that knock pin is not gouged.

2) Manually remove lash adjusters where air is trapped.

CAUTION:
If lash adjuster is difficult to remove manually, use pliers. Be careful not to scratch lash adjuster.



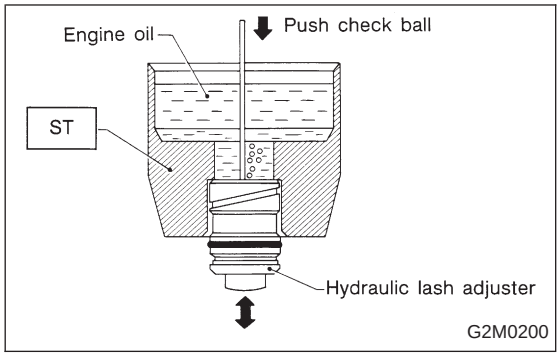
3) Bleed air from hydraulic lash adjuster as described below:

(1) While dipping hydraulic lash adjuster in engine oil, as shown in Figure, push check ball in using a 2 mm (0.08 in) diameter round bar.

(2) With check ball pushed in, manually move plunger up and down at one second intervals until air bubbles disappear.

(3) After air bubbles disappear, remove round bar and quickly push plunger in to ensure it is locked. If plunger does not lock properly, replace hydraulic lash adjuster.

CAUTION:
Leave hydraulic lash adjuster (after air is bled) in engine oil until it is ready for installation.



4) Using ST;

(1) Insert lash adjuster into ST, and fill ST with engine oil. Using a 2 mm (0.08 in) diameter rod, push check ball in.

ST 499597000 OIL SEAL GUIDE

(2) With check ball pushed in, push plunger at an interval of one second.

(3) Move plunger up and down until air bubbles are no longer emitted from lash adjuster.

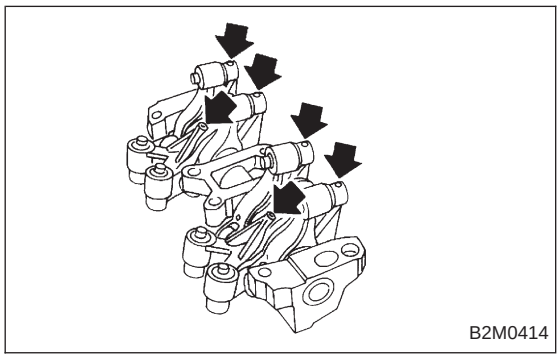
NOTE:
Hold hydraulic lash adjusters vertically during air bleeding.

5) Remove the rod. Push plunger to ensure that air is completely bled out.

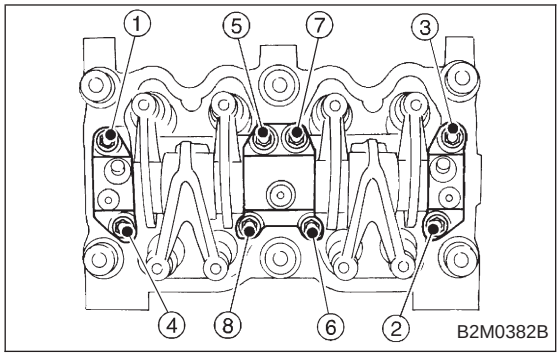
CAUTION:
If plunger does not properly lock (when pushed), replace lash adjuster with a new one.

6) Fill rocker arm's oil reservoir with engine oil and install lash adjuster.

CAUTION:
- **Do not rotate lash adjuster during installation.**
- **Be careful not to scratch the oil seal.**



CAUTION:
When removing valve rocker assembly, keep the assembly soaked in engine oil, or position it with air bleeding orifice on rocker arm facing upward as shown. This prevents oil leakage from and air entering into the hydraulic lash adjuster. Failure to do so may cause air to enter the hydraulic lash adjuster, causing loss in performance.



7) Temporarily and equally tighten bolts ① through ④. Do not allow knock pin to catch valve rocker assembly.
8) Tighten bolts ⑤ through ⑧ to specified torque.
9) Tighten bolts ① through ④ to specified torque.

Tightening torque:
12±1 N·m (1.2±0.1 kg-m, 8.7±0.7 ft-lb)

10) Install rocker covers.

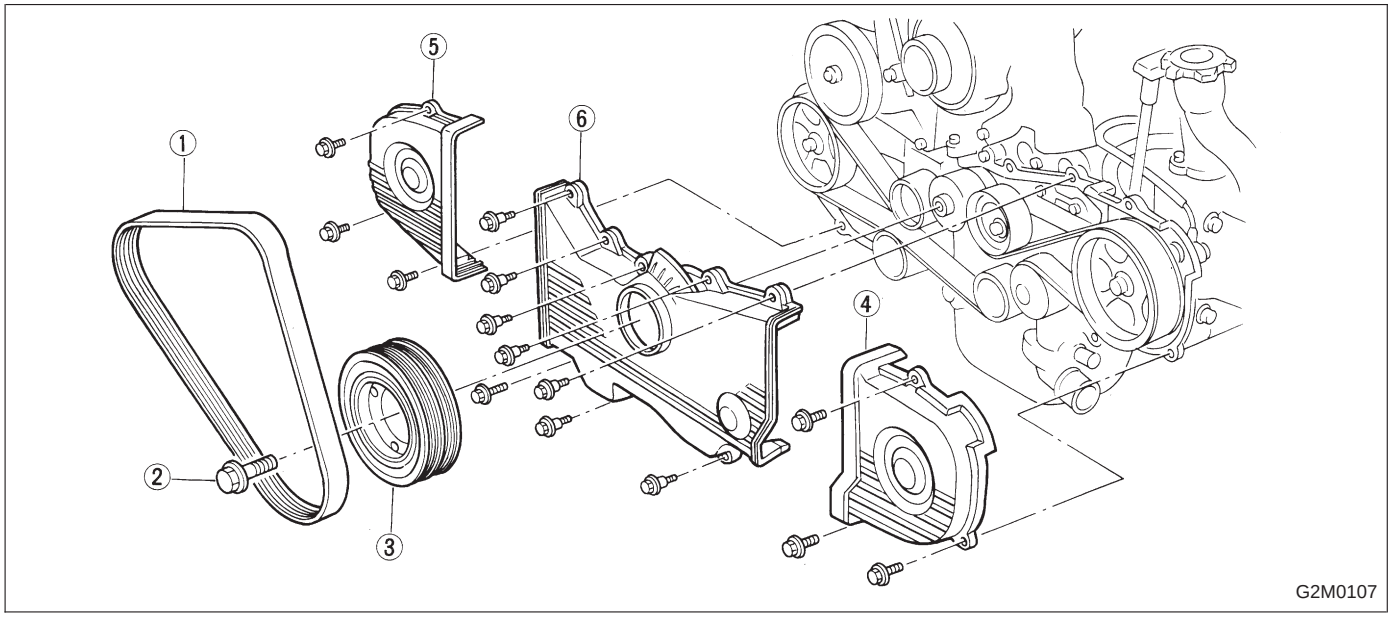
Tightening torque:
5±1 N·m (0.5±0.1 kg-m, 3.6±0.7 ft-lb)

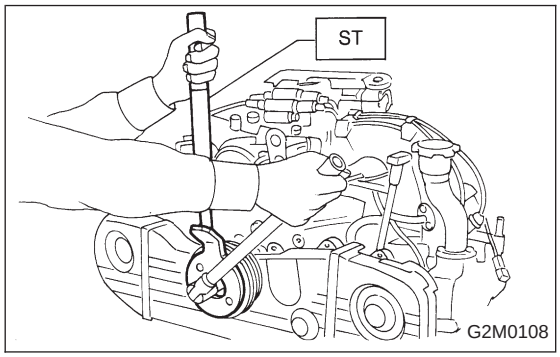
11) Connect harness connectors, hoses, etc. to their positions.

3. Timing Belt

A: REMOVAL

1. CRANKSHAFT PULLEY AND BELT COVER



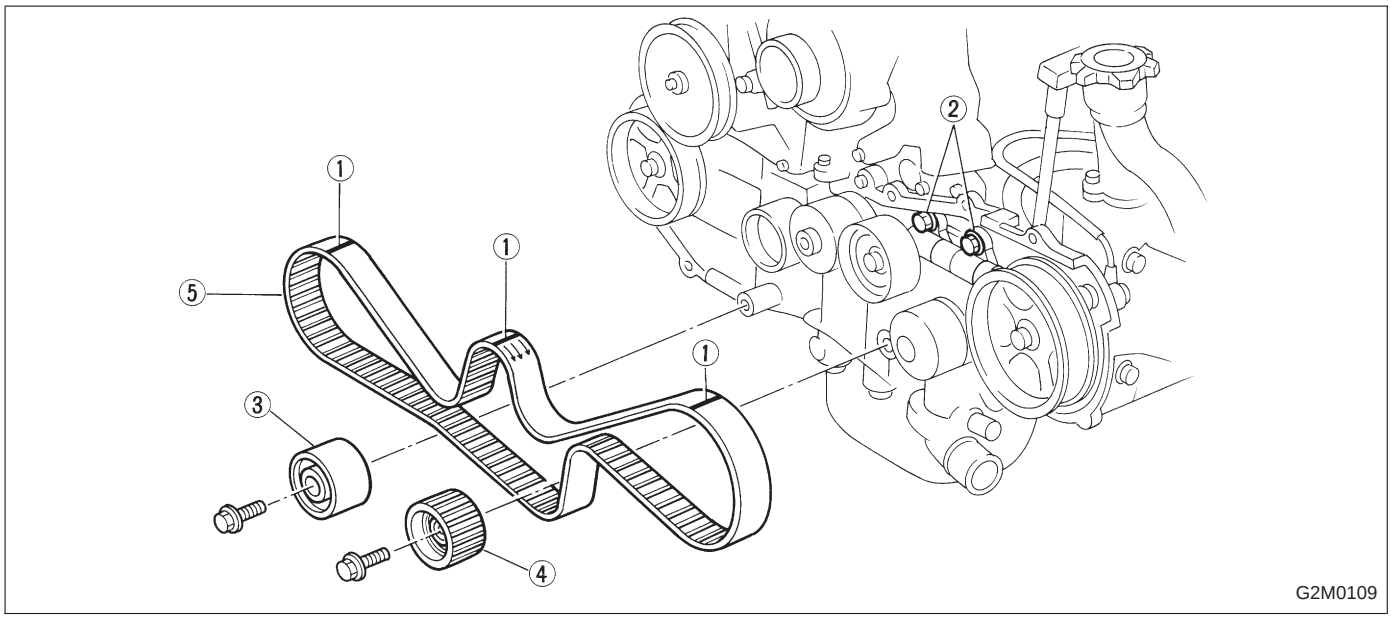


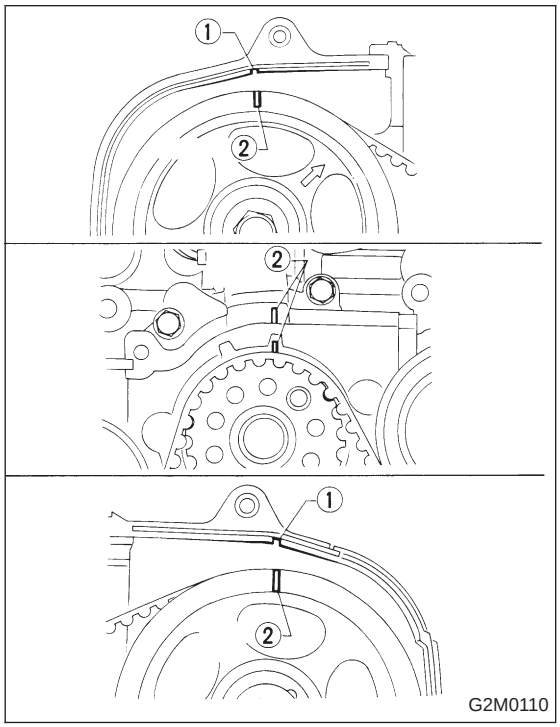
1) Remove V-belt and A/C belt tensioner.
2) Remove pulley bolt. To lock crankshaft use ST.

ST 499977000 CRANKSHAFT PULLEY WRENCH

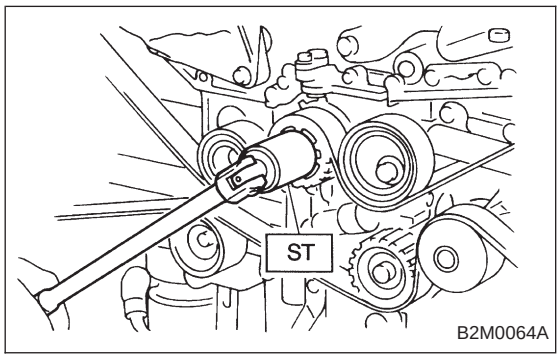
3) Remove crankshaft pulley.
4) Remove left-hand belt cover.
5) Remove right-hand belt cover.
6) Remove front belt cover.

2. TIMING BELT



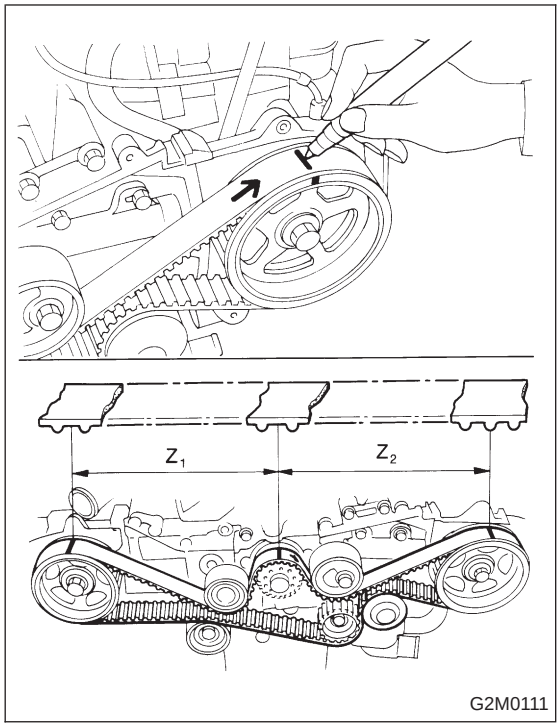


1) If alignment mark ② and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing timing belt as follows:



(1) Turn crankshaft, and align alignment marks ② on crankshaft sprocket, and left and right camshaft sprockets with notches ① of belt cover and cylinder block.

ST 499987500 CRANKSHAFT SOCKET



(2) Using white paint, put alignment and/or arrow marks on timing belts in relation to the sprockets.

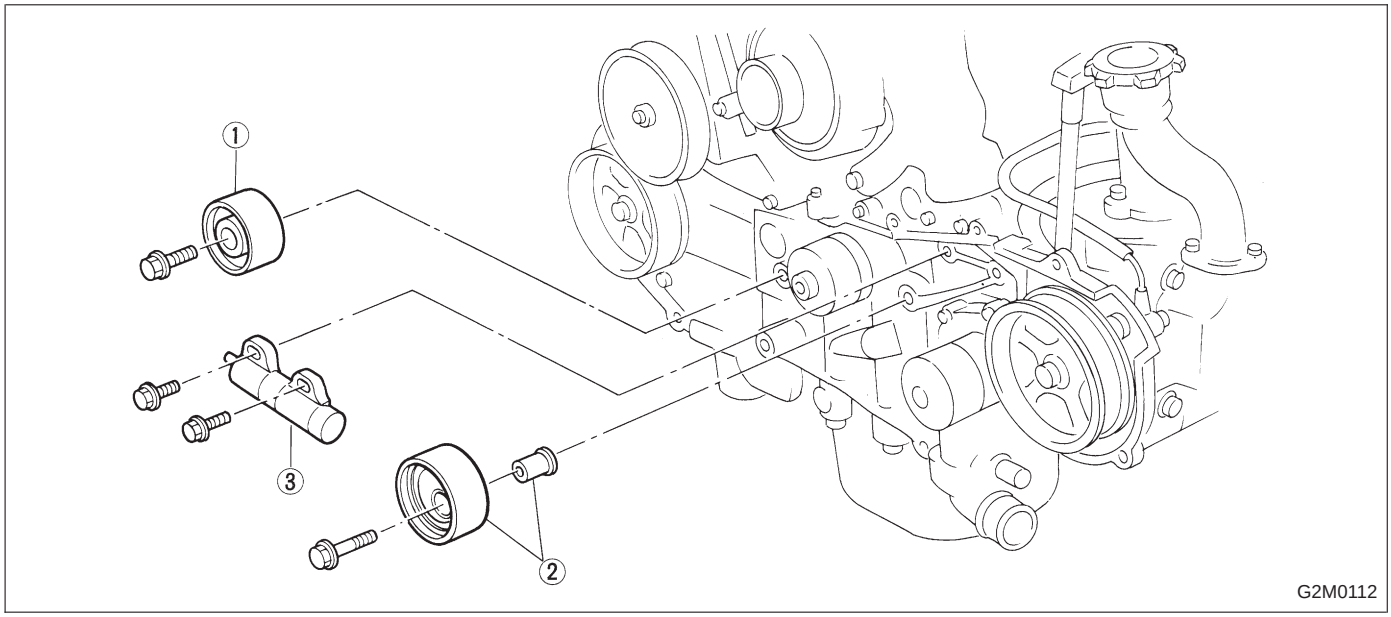
Z_1: 44 tooth length
Z_2: 40.5 tooth length

2) Loosen tensioner adjuster mounting bolts.

3) Remove belt idler.

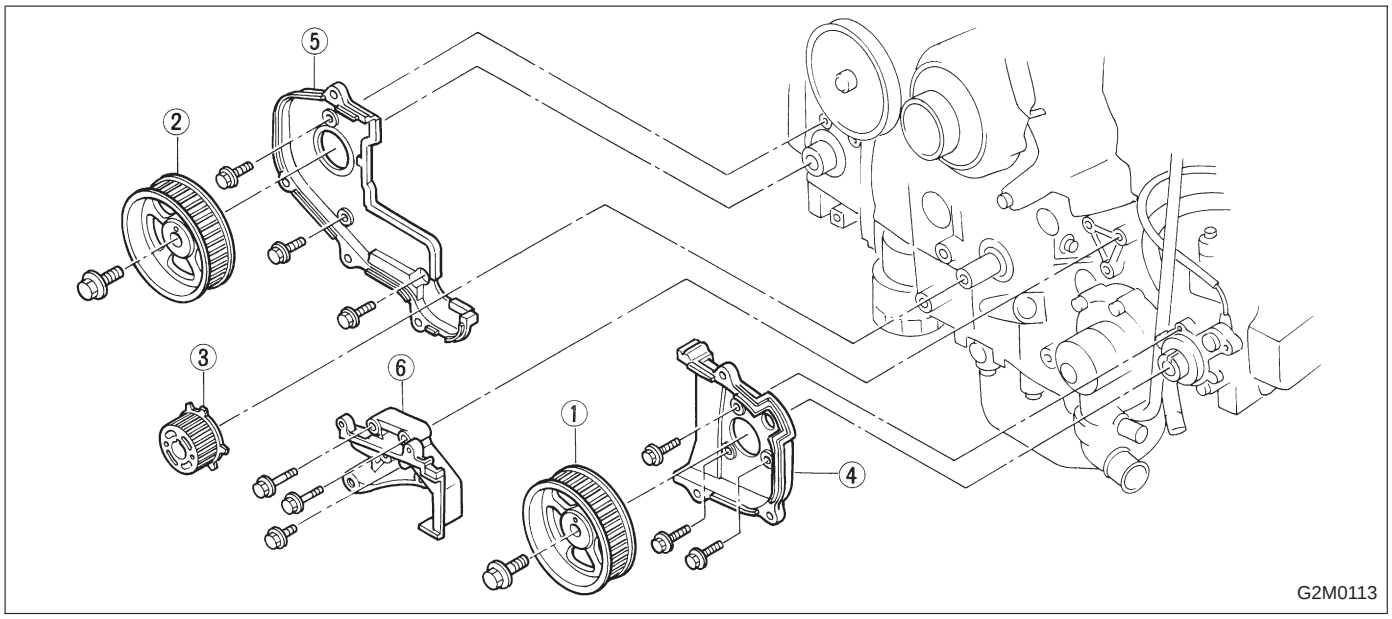
4) Remove belt idler No. 2.
5) Remove timing belt.

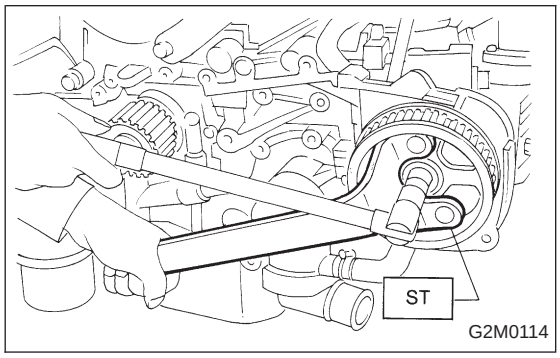
3. BELT TENSIONER AND IDLER



1) Remove belt idler.
2) Remove belt tensioner and spacer.
3) Remove belt tension adjuster.

4. SPROCKET





1) Remove left-hand camshaft sprocket.

2) Remove right-hand camshaft sprocket. To lock camshaft use ST.

ST 499207100 CAMSHAFT SPROCKET WRENCH

3) Remove crankshaft sprocket.
4) Remove left-hand belt cover No. 2.
5) Remove right-hand belt cover No. 2.

CAUTION:
Do not damage or lose the seal rubber when removing belt covers.

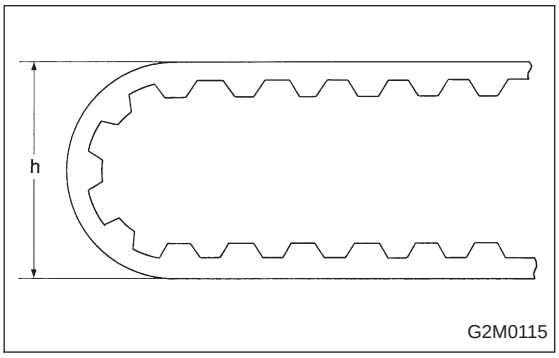
6) Remove tensioner bracket.

B: INSPECTION

1. TIMING BELT

1) Check timing belt teeth for breaks, cracks, and wear. If any fault is found, replace belt.
2) Check the condition of back side of belt; if any crack is found, replace 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

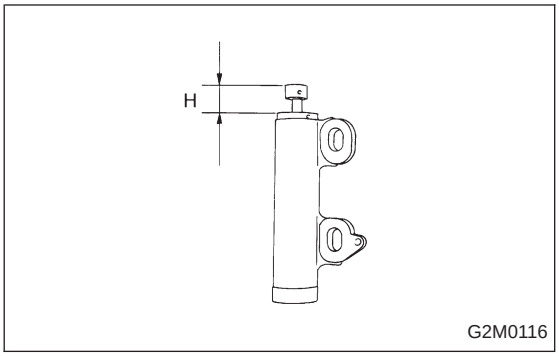
2. BELT TENSION ADJUSTER

1) Visually check oil seals for leaks, and rod ends for abnormal wear or scratches. If necessary, replace belt tension adjuster.

CAUTION:
Slight traces of oil at rod' oil seal does not indicate a problem.

2) While holding tensioner with both hands, push the rod section against floor or wall ensuring the rod section will react as follows:

(1) When applying a force of 147 N (15 kg, 33 lb), the rod section should not sink.
(2) When applying a force of 147 to 490 N (15 to 50 kg, 33 to 110 lb), the rod section should maintain a projectionally acting force and should not sink within 8.5 seconds.



3) Measure the extension of rod beyond the body. If it is not within specifications, replace with a new one.

Rod extension: H
15.4 — 16.4 mm (0.606 — 0.646 in)

3. BELT TENSIONER

1) Check mating surfaces of timing belt and contact point of tension adjuster rod for abnormal wear or scratches. Replace belt tensioner if faulty.
2) Check spacer and tensioner bushing for wear.
3) Check tensioner for smooth rotation. Replace if noise or excessive play is noted.
4) Check tensioner for grease leakage.

4. BELT IDLER

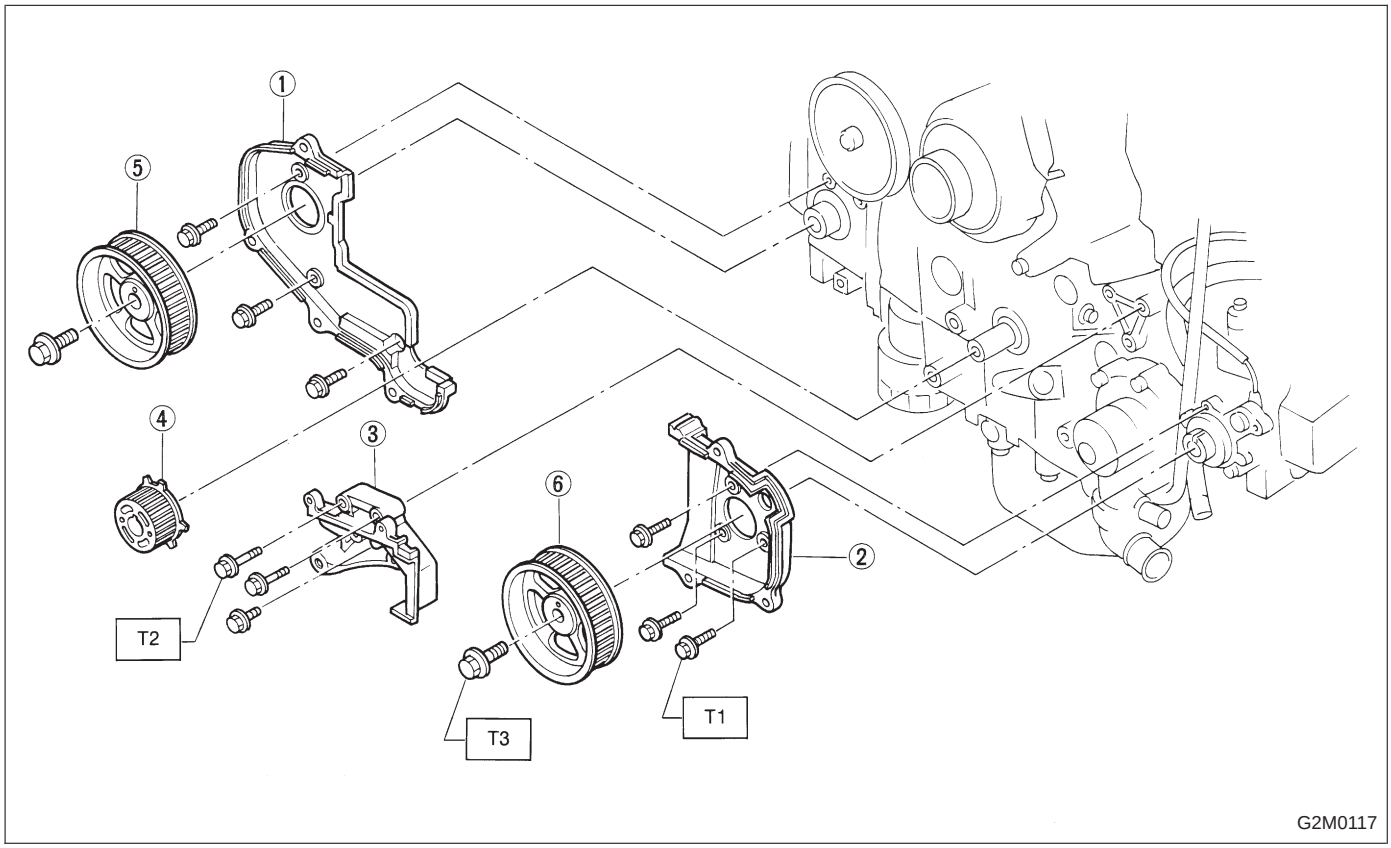
1) Check idler for smooth rotation. Replace if noise or excessive play is noted.
2) Check outer contacting surfaces of idler pulley for abnormal wear and scratches.
3) Check idler for grease leakage.

5. SPROCKET

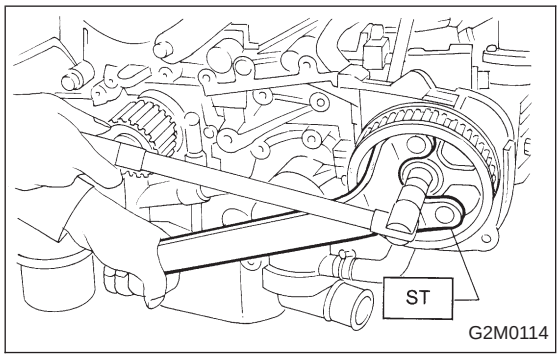
1) Check sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.
3) Check crankshaft sprocket notch for sensor for damage and contamination of foreign matter.

C: INSTALLATION

1. SPROCKET



Tightening torque: N·m (kg-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 23 — 26 (2.3 — 2.7, 17 — 20)
T3: 64 — 74 (6.5 — 7.5, 47 — 54)

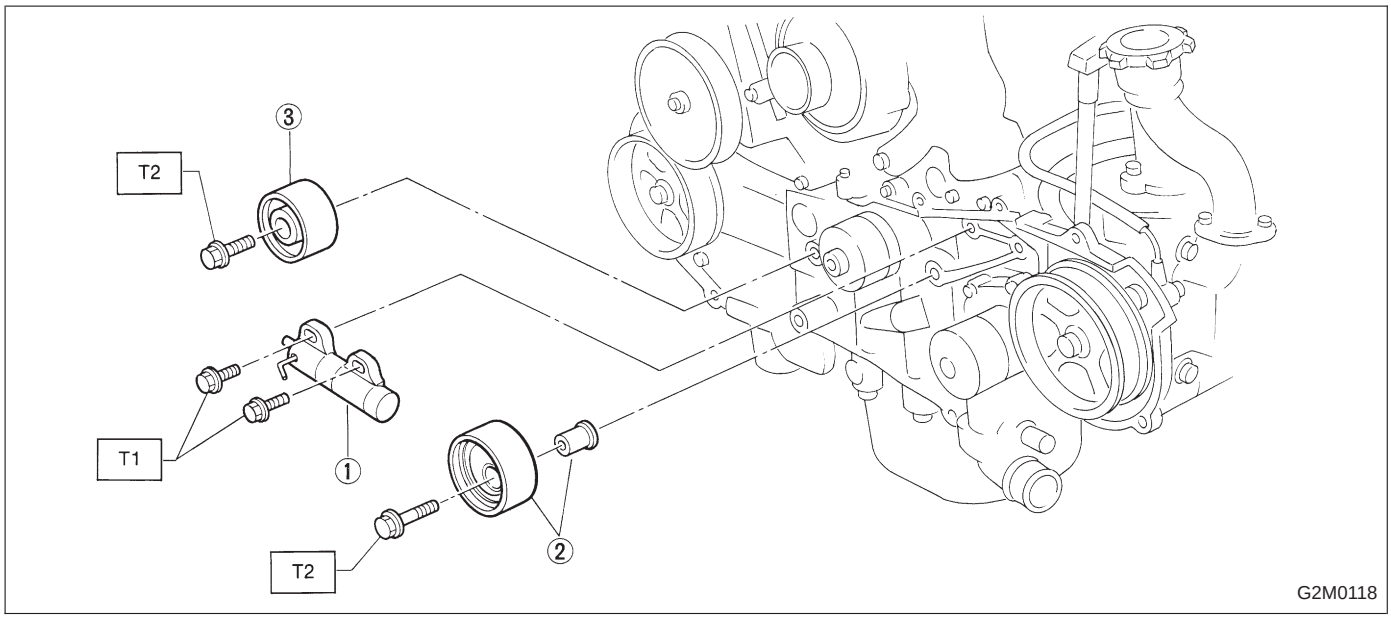


1) Install right-hand belt cover No. 2.
2) Install tensioner bracket.
3) Install left-hand belt cover No. 2.
4) Install crankshaft sprocket.
5) Install right-hand camshaft sprocket and left-hand camshaft sprocket. To lock camshaft use ST.

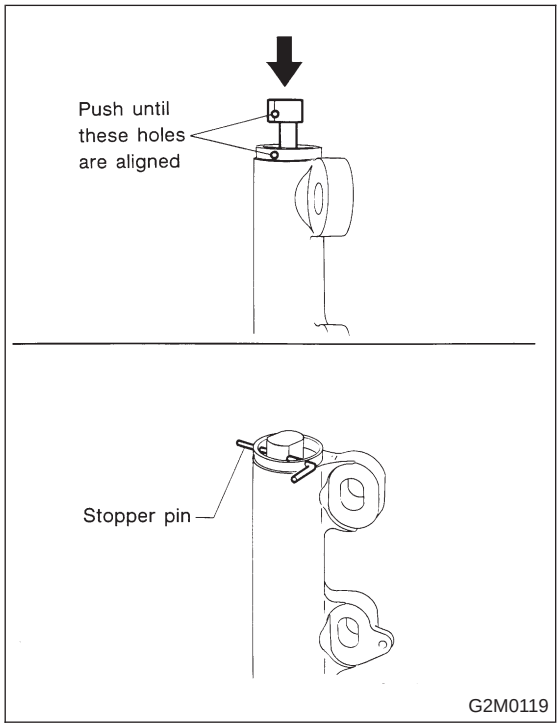
ST 499207100 CAMSHAFT SPROCKET WRENCH

CAUTION:
Do not confuse left- and right-hand camshaft sprockets during installation. The left-hand camshaft sprocket is identified by a projection used to monitor cam angle sensor.

2. BELT TENSIONER AND IDLER



Tightening torque: N·m (kg-m, ft-lb)
T1: 23 — 26 (2.3 — 2.7, 17 — 20)
T2: 35 — 43 (3.6 — 4.4, 26 — 32)

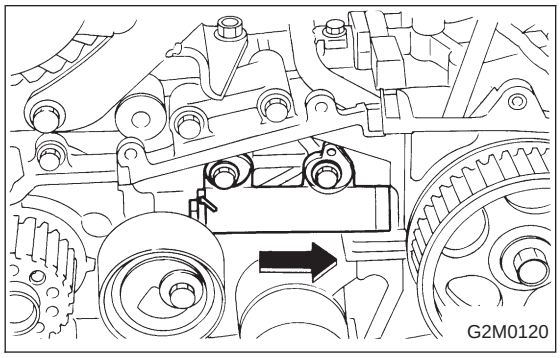


1) Installation of belt tension adjuster
Insert stopper pin 1.5 mm (0.059 in) diameter into place while pushing tension adjuster rod into body using a press.

CAUTION:
- **Do not allow press pressure to exceed 9,807 N (1,000 kg, 2,205 lb).**
- **Do not release press pressure until stopper pin is completely inserted.**
- **Push tension adjuster rod vertically.**
- **Press-in the push rod gradually taking three minutes or more.**

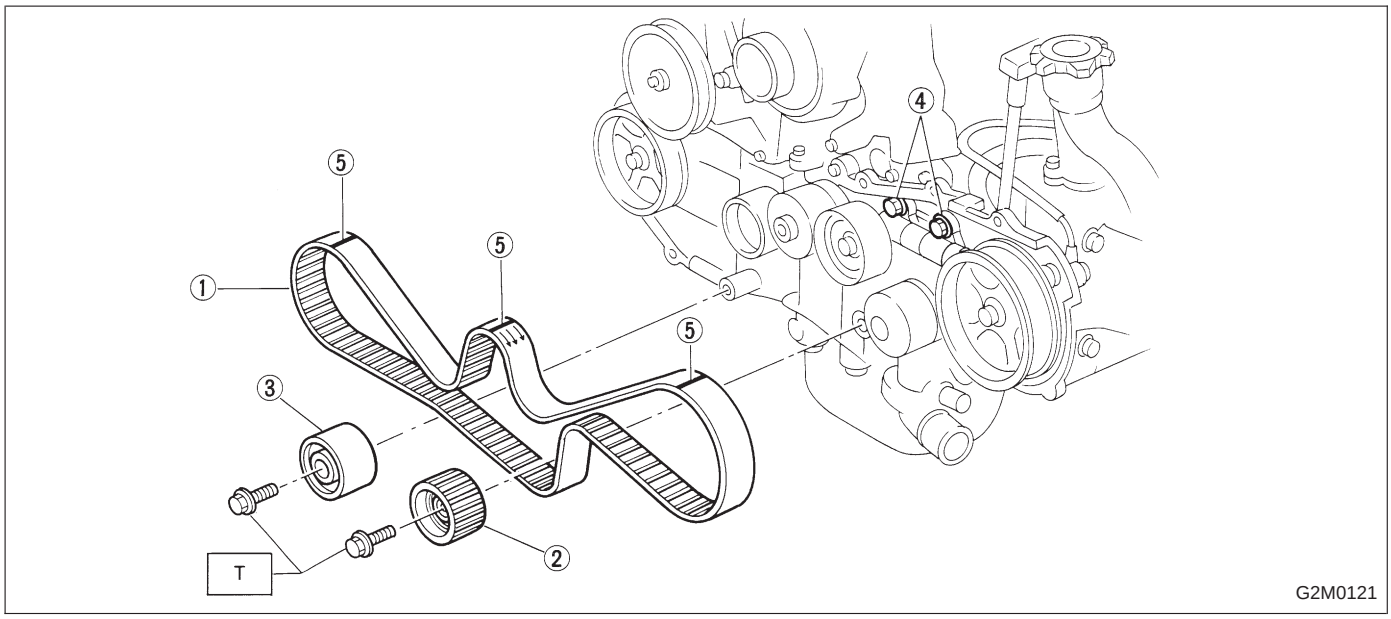
2) Install belt tensioner and spacer.

3) Install belt idler.

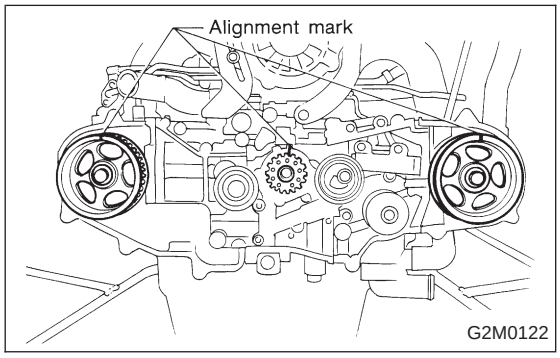


(1) Temporarily tighten bolts while belt tension adjuster is pushed all the way to the right.

3. TIMING BELT



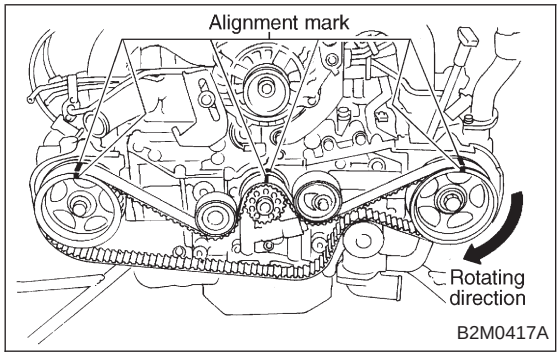
Tightening torque: N·m (kg-m, ft-lb)
T: 35 — 43 (3.6 — 4.4, 26 — 32)



1) Installation of timing belt.

(1) Using ST, turn left and right camshaft sprockets so that their alignment marks come to top positions.

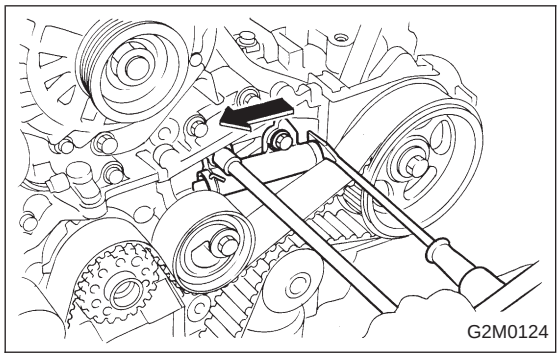
ST 499207100 CAMSHAFT SPROCKET WRENCH



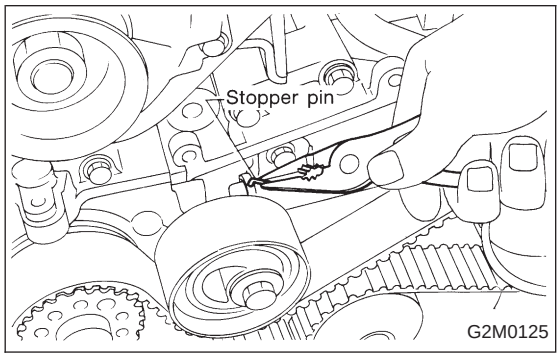
(2) While aligning alignment mark on timing belt with marks on sprockets, position timing belt properly.

CAUTION:
Ensure belt's rotating direction is correct.

2) Install belt idler No. 2.
3) Install belt idler.



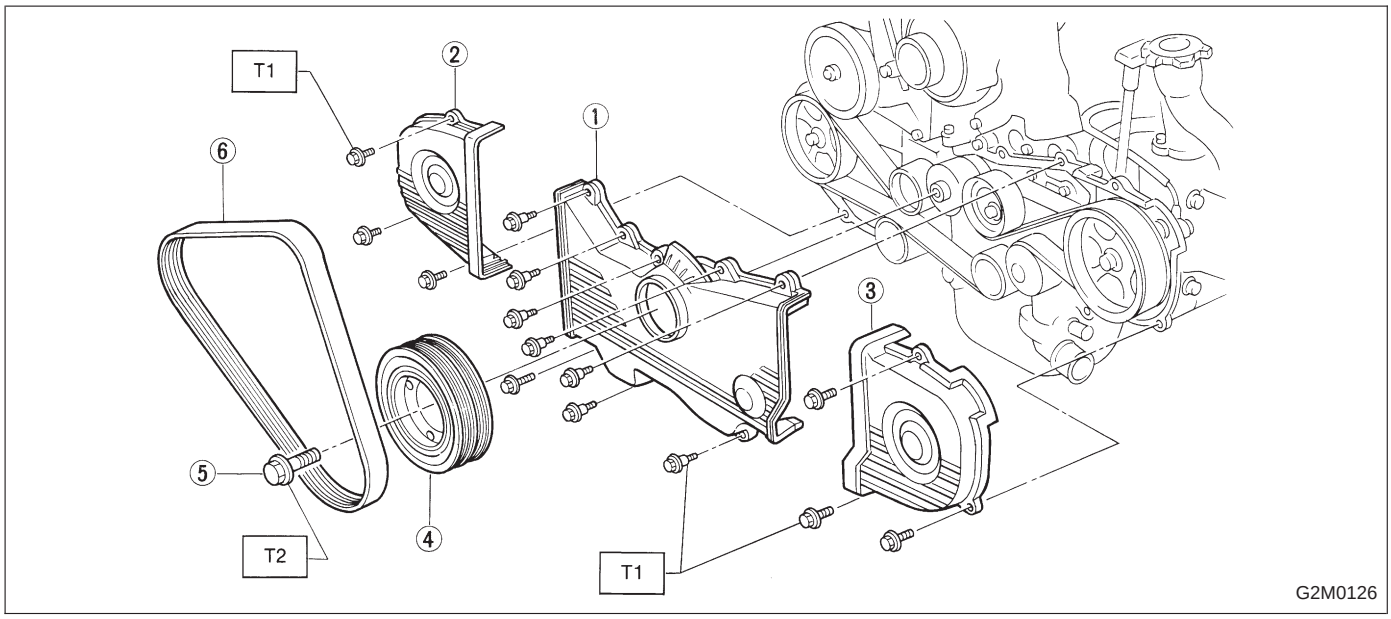
4) Loosen belt tension adjuster attaching bolts and move adjuster all the way to the left. Tighten the bolts.



5) After ensuring that the marks on timing belt and camshaft sprockets are aligned, remove stopper pin from belt tension adjuster.

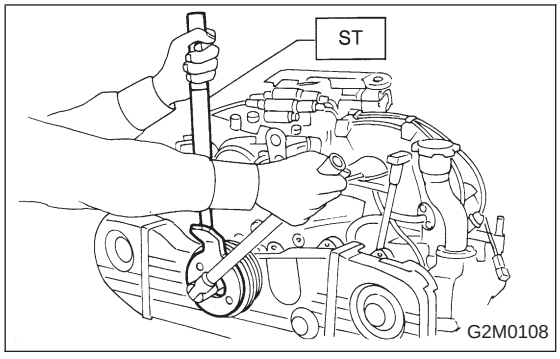
CAUTION:
After properly installing timing belt, remove rocker cover and ensure that the valve lash adjuster contains no air.

4. CRANKSHAFT PULLEY AND BELT COVER



Tightening torque: N·m (kg-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 93 — 103 (9.5 — 10.5, 69 — 76)

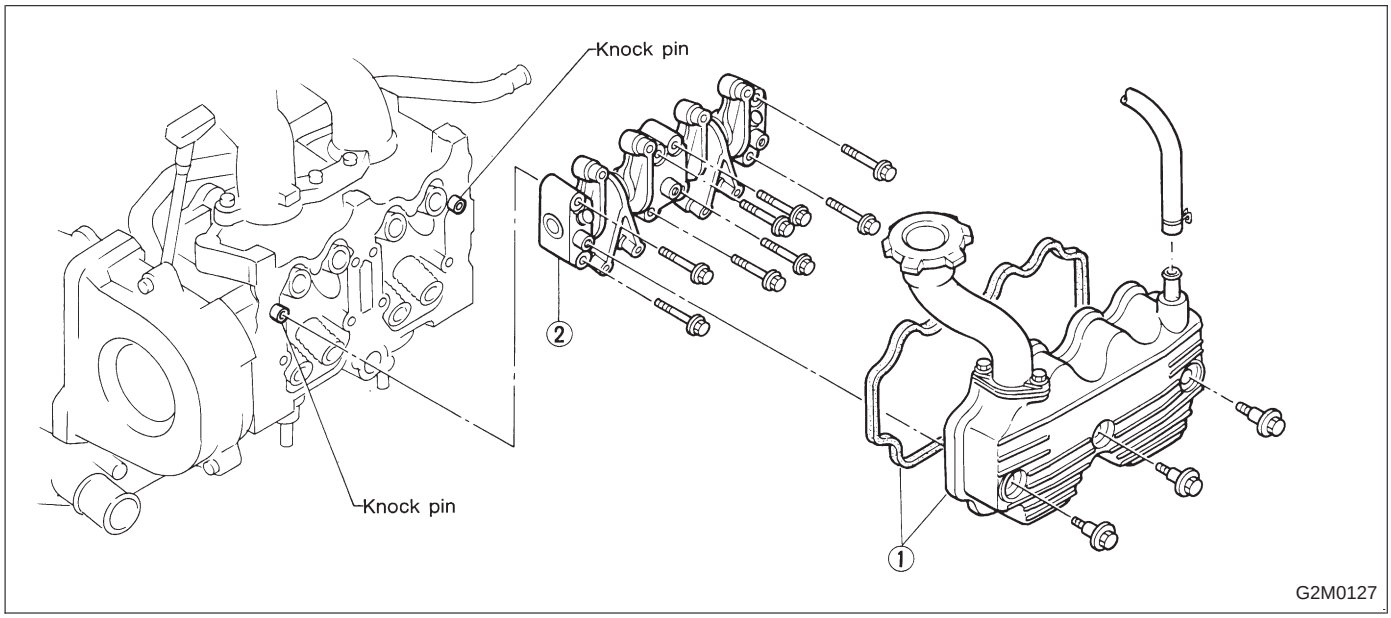
1) Install front belt cover.
2) Install right-hand belt cover.
3) Install left-hand belt cover.
4) Install crankshaft pulley.

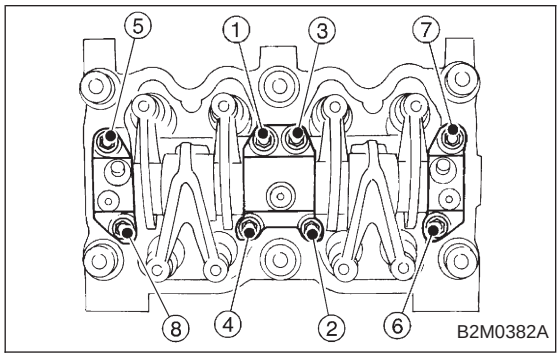


5) Install pulley bolt.
To lock crankshaft, use ST.
ST 499977000 CRANKSHAFT PULLEY WRENCH
6) Install V-belt.

4. Valve Rocker Assembly

A: REMOVAL

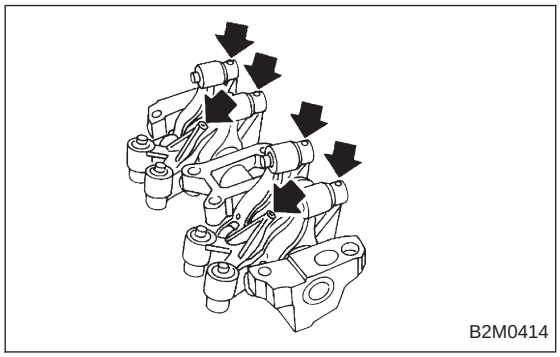




1) Disconnect PCV hose and remove rocker cover.
2) Removal of valve rocker assembly
   (1) Remove bolts ① through ④ in numerical sequence.

CAUTION:
Leave two or three threads of bolt ① engaged to retain valve rocker assembly.

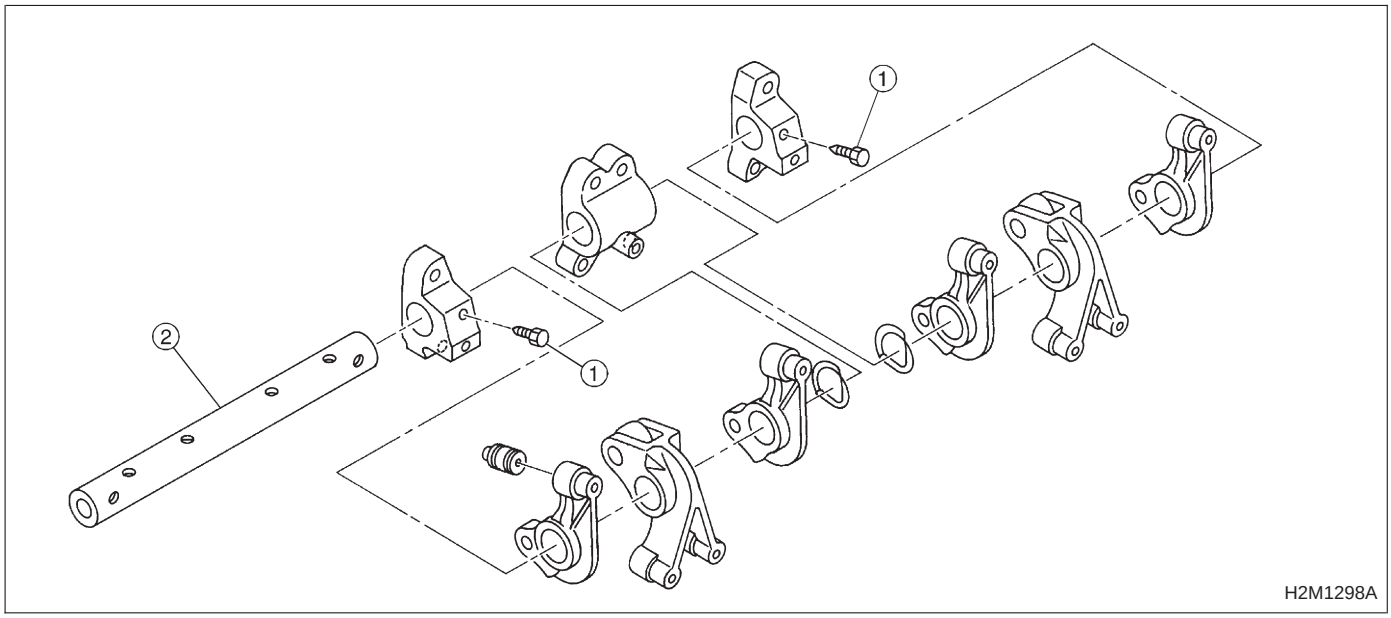
   (2) Equally loosen bolts ⑤ through ⑧ all the way, being careful that knock pin is not gouged.



   (3) Remove valve rocker assembly.

CAUTION:
Locate valve rocker assembly with air vent (on rocker arm) facing upward or dip it in engine oil after removal.

B: DISASSEMBLY



1) Remove bolts which secure rocker shaft.
2) Extract rocker shaft. Remove valve rocker arms, springs and shaft supports from rocker shaft.

CAUTION:
- **Arrange all removed parts in order so that they can be installed in their original positions.**
- **Locate rocker arms with air vents facing upward.**

3) Remove valve lash adjuster from valve rocker.

CAUTION:
- **Do not remove valve lash adjuster unless it requires air bleeding or replacement.**
- **If valve lash adjuster is hard to remove by hand, use pliers. Be careful not to scratch valve lash adjuster.**
- **Dip lash adjuster in engine oil after removal.**

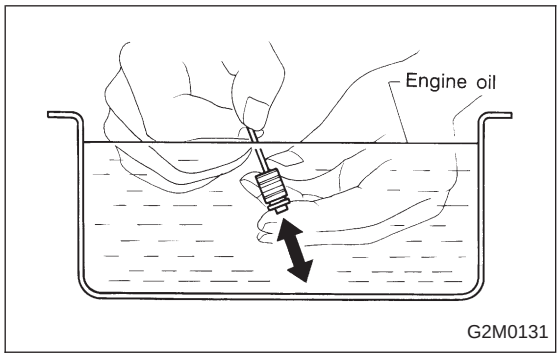
C: INSPECTION

1. HYDRAULIC LASH ADJUSTER

1) Bleed air from hydraulic lash adjuster as described below:

(1) While dipping hydraulic lash adjuster in engine oil, as shown in Figure, push check ball in using a 2 mm (0.08 in) dia. round bar.

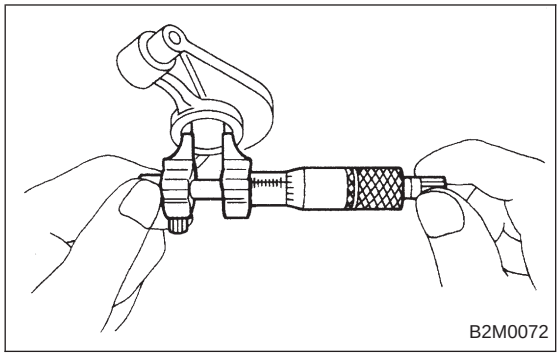
(2) With check ball pushed in, manually move plunger up and down at one second intervals until air bubbles disappear.

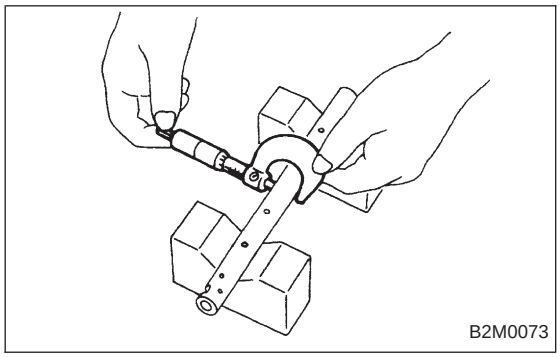


(3) After air bubbles disappear, remove round bar and quickly push plunger in to ensure it is locked. If plunger does not lock properly, replace hydraulic lash adjuster.

CAUTION:
Leave hydraulic lash adjuster (after air is bled) in engine oil until it is ready for installation.

2) Replace hydraulic lash adjuster with a new one if valve contact surface is scratched.


B2M0072


B2M0073

2. VALVE ROCKER ARM

1) Measure inside diameter of valve rocker arm and outside diameter of valve rocker shaft, and determine the difference between the two (= oil clearance).

Clearance between arm and shaft:
Standard
0.020 — 0.054 mm (0.0008 — 0.0021 in)
Limit
0.10 mm (0.0039 in)

If oil clearance exceeds specifications, replace valve rocker arm or shaft.

NOTE:
Replace valve rocker arm or shaft, whichever shows greater amount of wear.

Rocker arm inside diameter:
22.020 — 22.041 mm (0.8669 — 0.8678 in)

Rocker shaft diameter:
21.987 — 22.000 mm (0.8656 — 0.8661 in)

2) Measure inside diameter of rocker shaft support and outside diameter of valve rocker shaft, and determine the difference between the two (= oil clearance).

Clearance between support and shaft:
Standard
0.005 — 0.039 mm (0.0002 — 0.0015 in)
Limit
0.05 mm (0.0020 in)

If oil clearance exceeds specifications, replace rocker shaft support or shaft.

NOTE:
Replace rocker shaft support or shaft, whichever shows greater amount of wear.

Rocker shaft support inside diameter:
22.005 — 22.026 mm (0.8663 — 0.8672 in)

Rocker shaft diameter:
21.987 — 22.000 mm (0.8656 — 0.8661 in)

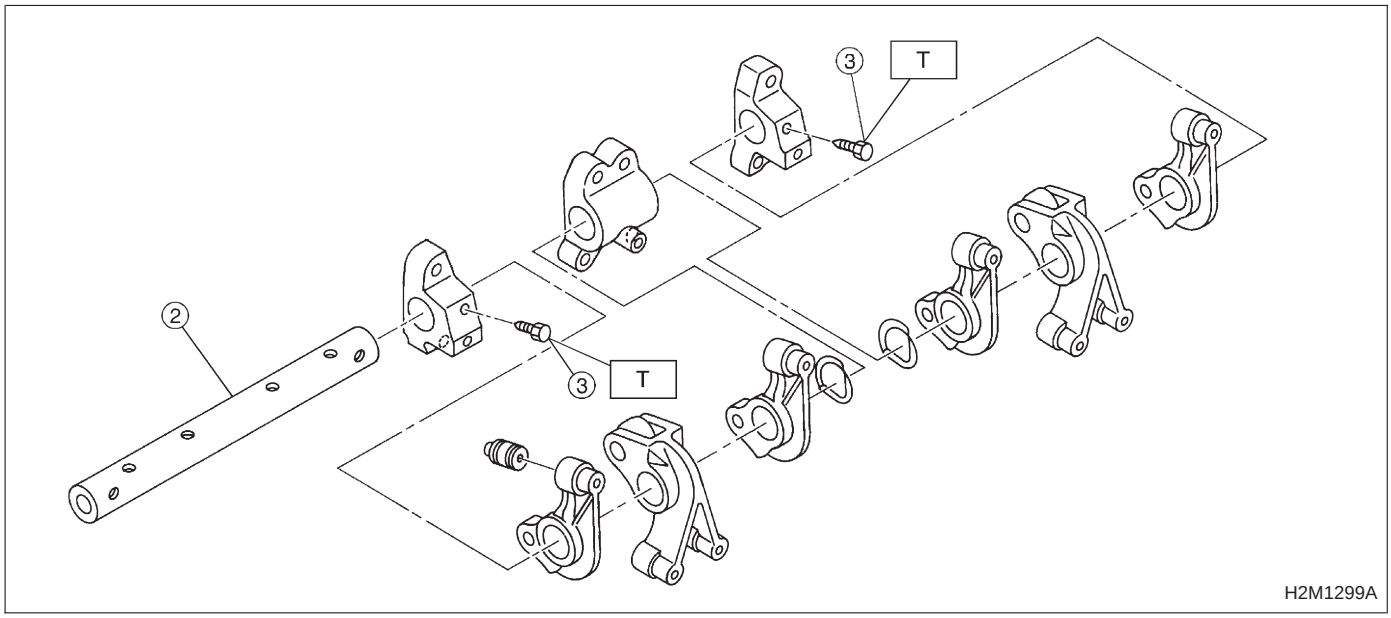
3) If cam or valve contact surface of valve rocker arm is worn or dented excessively, replace valve rocker arm.
4) Check that valve rocker arm roller rotates smoothly. If not, replace valve rocker arm.

3. VALVE ROCKER SHAFT

Visually check oil relief valve of shaft end for any of the following abnormalities.
- Breaks in check ball body
- Foreign particles caught in valve spring
- Oil leaks at check ball

CAUTION:
Repair or replace valve rocker shaft as necessary.

D: ASSEMBLY



Tightening torque: N·m (kg-m, ft-lb)
T: 5 (0.5, 3.6)

1) After bleeding air from hydraulic lash adjuster, position hydraulic lash adjuster in valve rocker arm while dipping in engine oil. <Ref. to 2-3 [W4C1].>

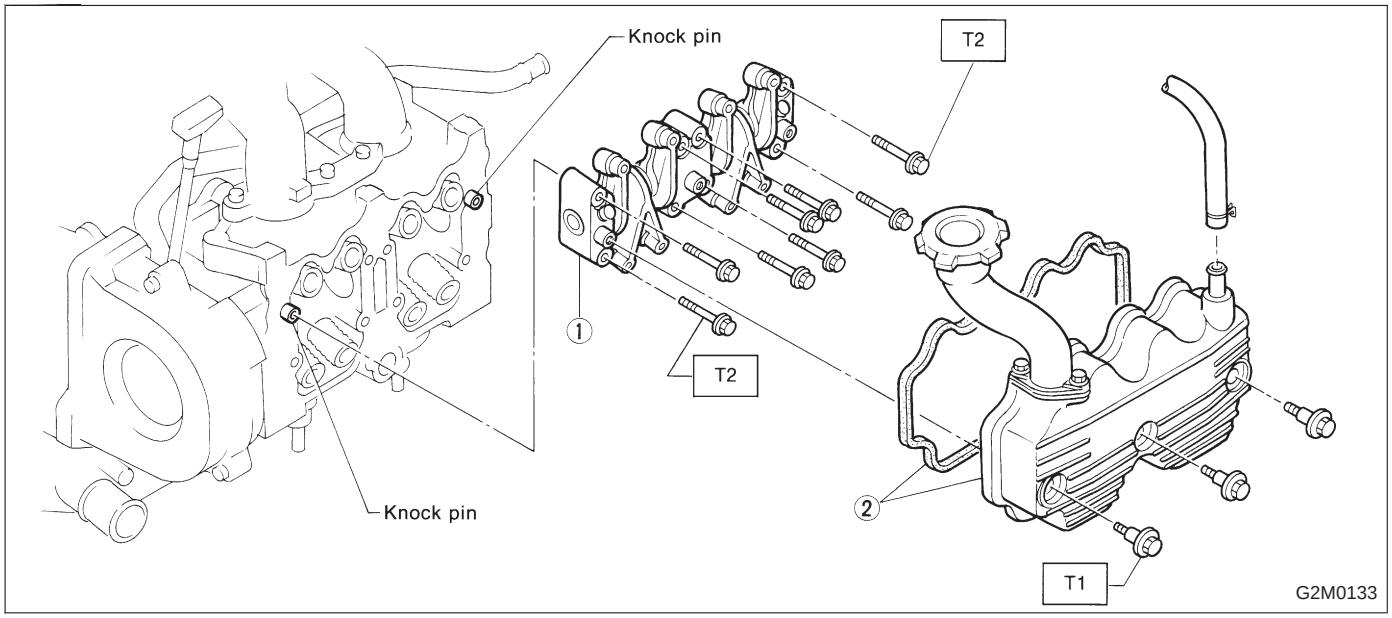
CAUTION:
- **Fill rocker arm oil reservoir chamber with engine oil.**
- **Install a new hydraulic lash adjuster O-ring, being careful not to scratch it.**
- **Do not attempt to rotate hydraulic lash adjuster during installation.**

2) Arrange valve rocker arms, springs and shaft supports in assembly order and insert valve rocker shaft. Ensure that cutout portion of rocker shaft faces oil holes in shaft supports.

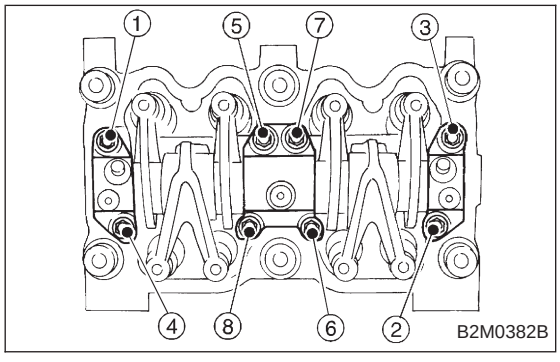
CAUTION:
Valve rocker arms, rocker shaft and shaft supports have identification marks. Ensure parts with same markings are properly assembled.

3) Install valve rocker shaft securing bolts while aligning shaft “lock” holes with bolts.

E: INSTALLATION



Tightening torque: N·m (kg-m, ft-lb)
T1: 5±1 (0.5±0.1, 3.6±0.7)
T2: 12±1 (1.2±0.1, 8.7±0.7)



1) Installation of valve rocker assembly

(1) Temporarily tighten bolts ① through ④ equally as shown in Figure.

CAUTION:
Do not allow valve rocker assembly to gouge knock pins.

(2) Tighten bolts ⑤ through ⑧ to specified torque.
(3) Tighten bolts ① through ④ to specified torque.

2) Install rocker cover and connect PCV hose.

5. Camshaft

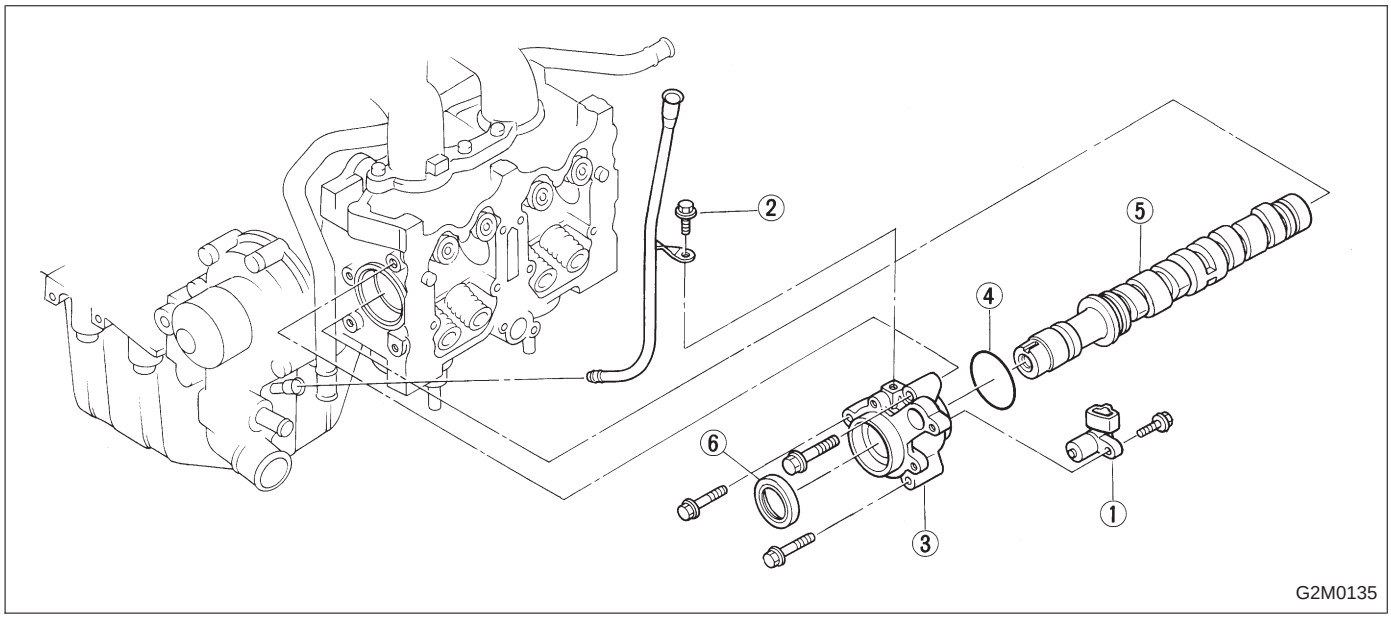
A: REMOVAL

1. RELATED PARTS

1) Remove timing belt, camshaft sprockets and related parts.
<Ref. to 2-3 [W3A0].>

2) Remove valve rocker Assembly.
<Ref. to 2-3 [W4A0].>

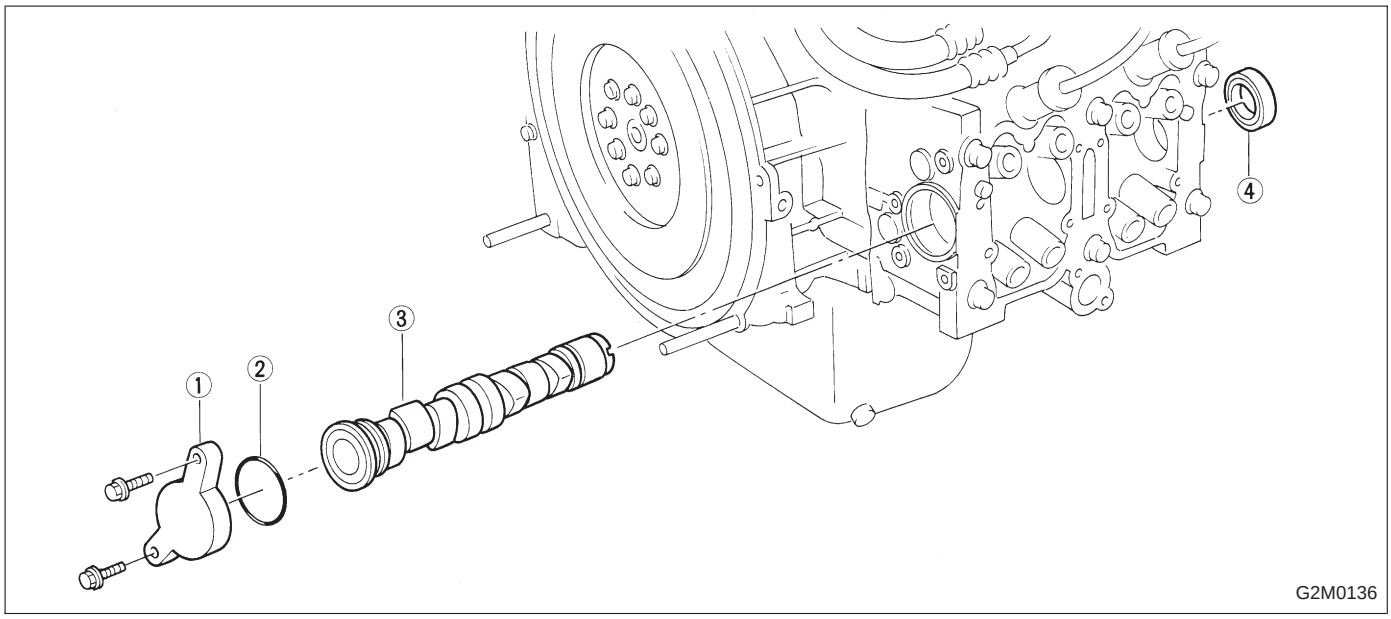
2. CAMSHAFT LH



1) Remove camshaft position sensor.
2) Remove oil level gauge guide attaching bolt.
3) Remove camshaft support LH.
4) Remove O-ring.
5) Remove camshaft LH.
6) Remove oil seal.

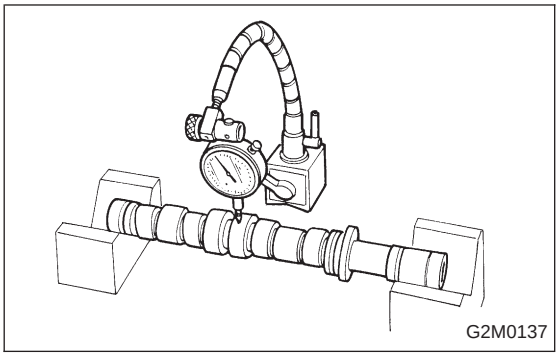
CAUTION:
- **Do not remove oil seal unless necessary.**
- **Do not scratch journal surface when removing oil seal.**

3. CAMSHAFT RH



1) Remove camshaft support RH.
2) Remove O-ring.
3) Remove camshaft.
4) Remove oil seal.

CAUTION:
- **Do not remove oil seal unless necessary.**
- **Do not scratch journal surface when removing oil seal.**


G2M0137

B: INSPECTION

1. CAMSHAFT

1) Measure the bend, and repair or replace if necessary.

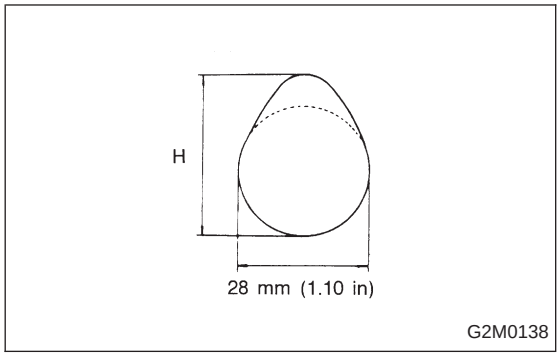
Limit:
0.025 mm (0.0010 in)

2) Check journal for damage and wear. Replace if faulty.

3) Measure outside diameter of camshaft journal and inside diameter of cylinder head journal, and determine the difference between the two (= oil clearance). If oil clearance exceeds specifications, replace camshaft or cylinder head as necessary.

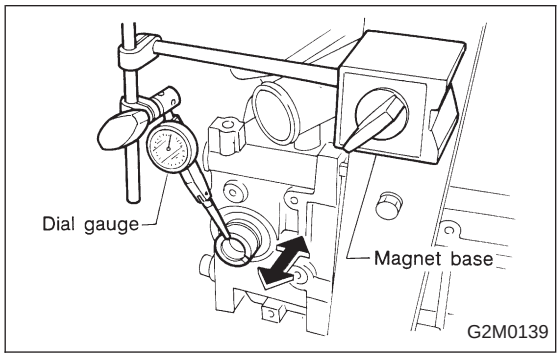
Unit: mm (in)

Item				
	Right-hand camshaft	Front	Center	Rear
	Left-hand camshaft	Rear	Center	Front
Clearance at journal	Standard	0.055 — 0.090 (0.0022 — 0.0035)		
	Limit	0.10 (0.0039)		
Camshaft journal O.D.		31.935 — 31.950 (1.2573 — 1.2579)	37.435 — 37.450 (1.4738 — 1.4744)	37.935 — 37.950 (1.4935 — 1.4941)
Journal hole I.D.		32.005 — 32.025 (1.2600 — 1.2608)	37.505 — 37.525 (1.4766 — 1.4774)	38.005 — 38.025 (1.4963 — 1.4970)



4) Check cam face condition; remove minor faults by grinding with oil stone. Measure the cam height H; replace if the limit has been exceeded.

Cam height: H
1800 cc:
Standard
32.364 — 32.464 mm (1.2742 — 1.2781 in)
Limit
32.214 mm (1.2683 in)
2200 cc:
Standard
IN: 31.994 — 32.094 mm (1.2596 — 1.2635 in)
EX: 32.624 — 32.724 mm (1.2844 — 1.2883 in)
Limit
IN: 31.844 mm (1.2537 in)
EX: 32.474 mm (1.2785 in)



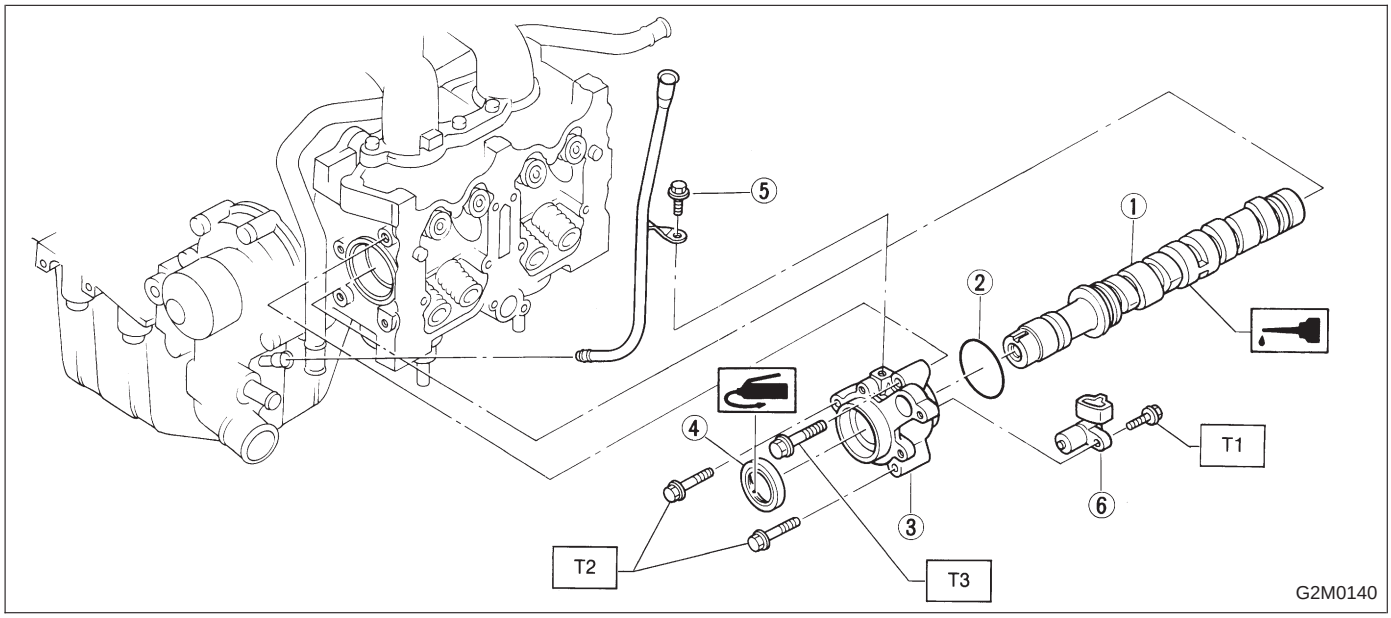
2. CAMSHAFT SUPPORT

Measure the thrust clearance of camshaft with dial gauge. If the clearance exceeds the limit, replace camshaft support.

Standard:
0.030 — 0.260 mm (0.0012 — 0.0102 in)
Limit:
0.35 mm (0.0138 in)

C: INSTALLATION

1. CAMSHAFT LH

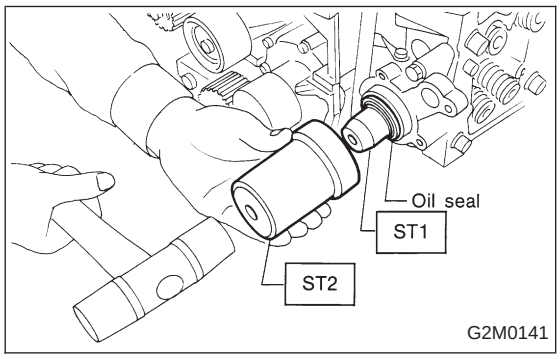


Tightening torque: N·m (kg-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 10 (1.0, 7)
T3: 16 (1.6, 12)

1) Apply a coat of engine oil to camshaft journals and install camshaft LH.
2) Apply a coat of engine oil or grease to O-ring.
3) Install O-ring to camshaft support.

CAUTION:
Use a new O-ring.

4) Install camshaft support.



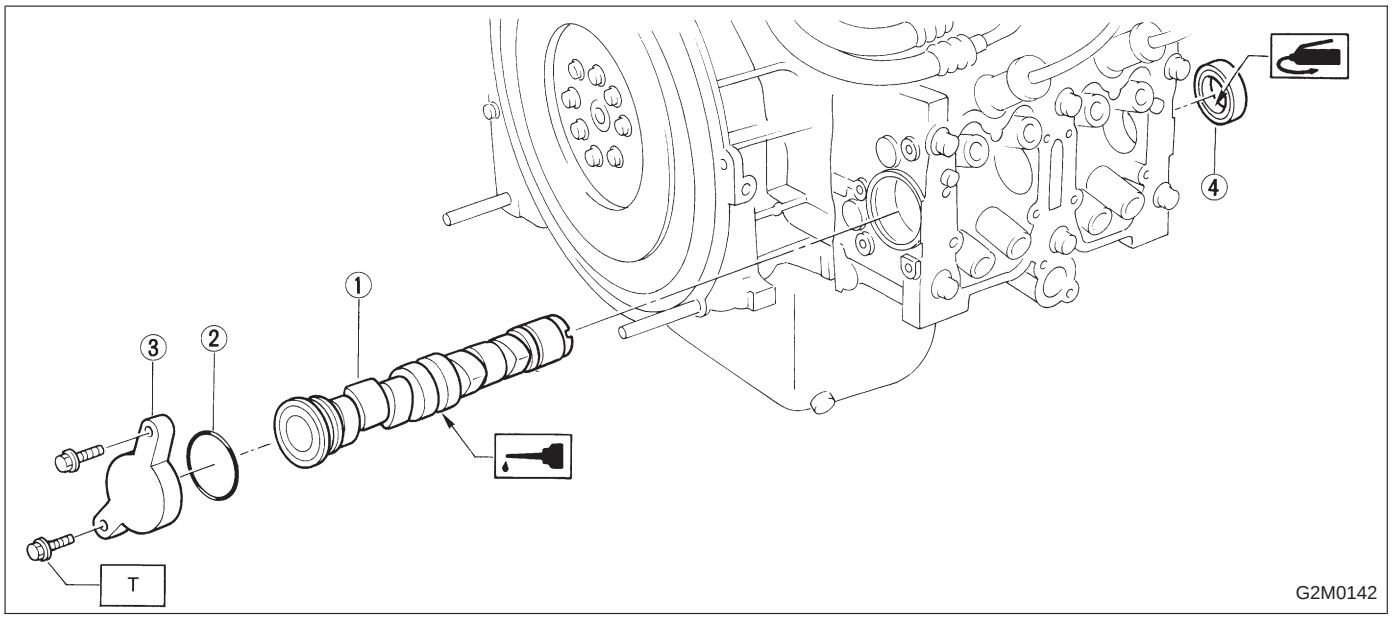
5) Apply a coat of grease to oil seal lips and install oil seal on camshaft support by using ST1 and ST2.

CAUTION:
Use a new oil seal.

ST1 499597000 OIL SEAL GUIDE
ST2 499587100 OIL SEAL INSTALLER

6) Install oil level gauge guide bolt.
7) Install camshaft position sensor.

2. CAMSHAFT RH

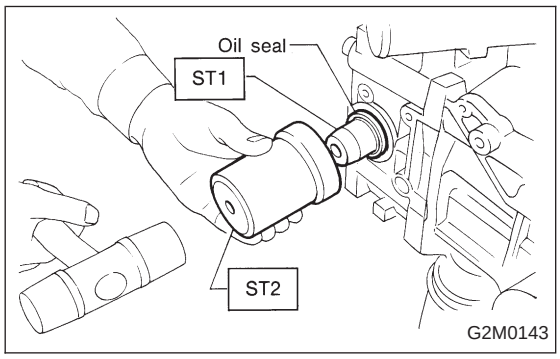


Tightening torque: N·m (kg-m, ft-lb)
T: 16 (1.6, 1.2)

1) Apply a coat of engine oil to camshaft journals and install camshaft RH.
2) Apply a coat of engine oil or grease to O-ring.
3) Install O-ring to camshaft support.

CAUTION:
Use a new O-ring.

4) Install camshaft support.



5) Install oil seal by using ST1 and ST2.

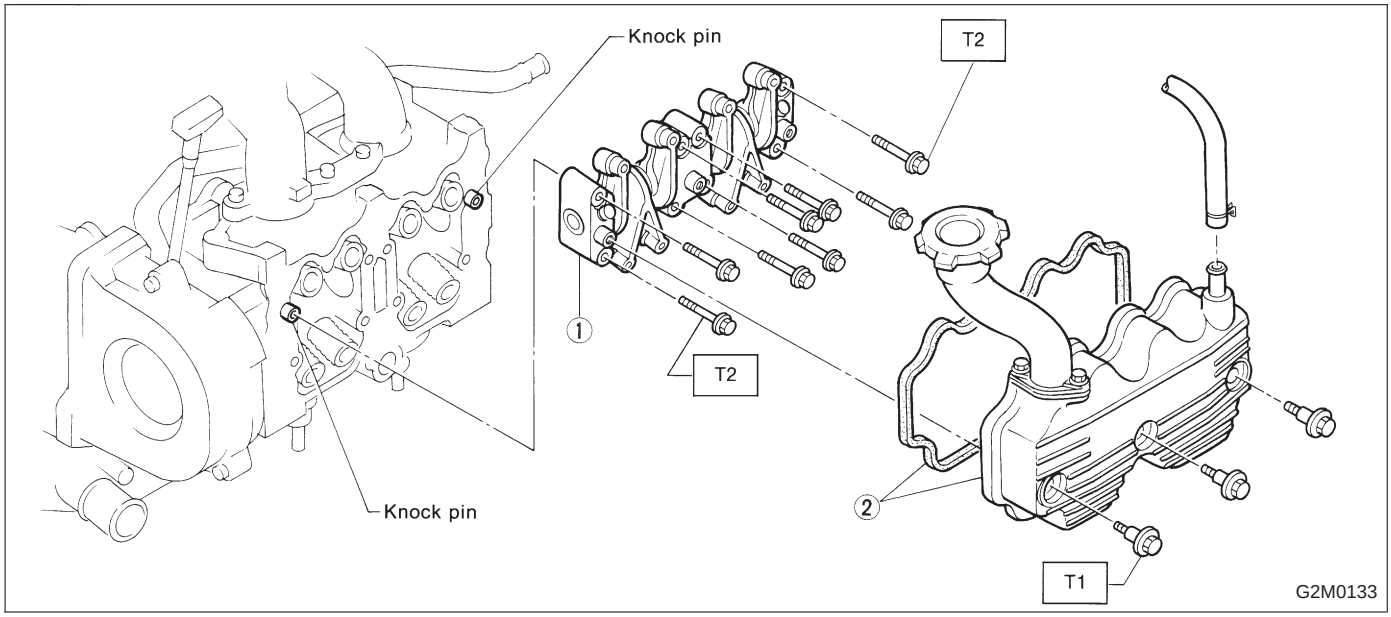
CAUTION:

Use a new oil seal.

ST1 499597000 OIL SEAL GUIDE
ST2 499587100 OIL SEAL INSTALLER

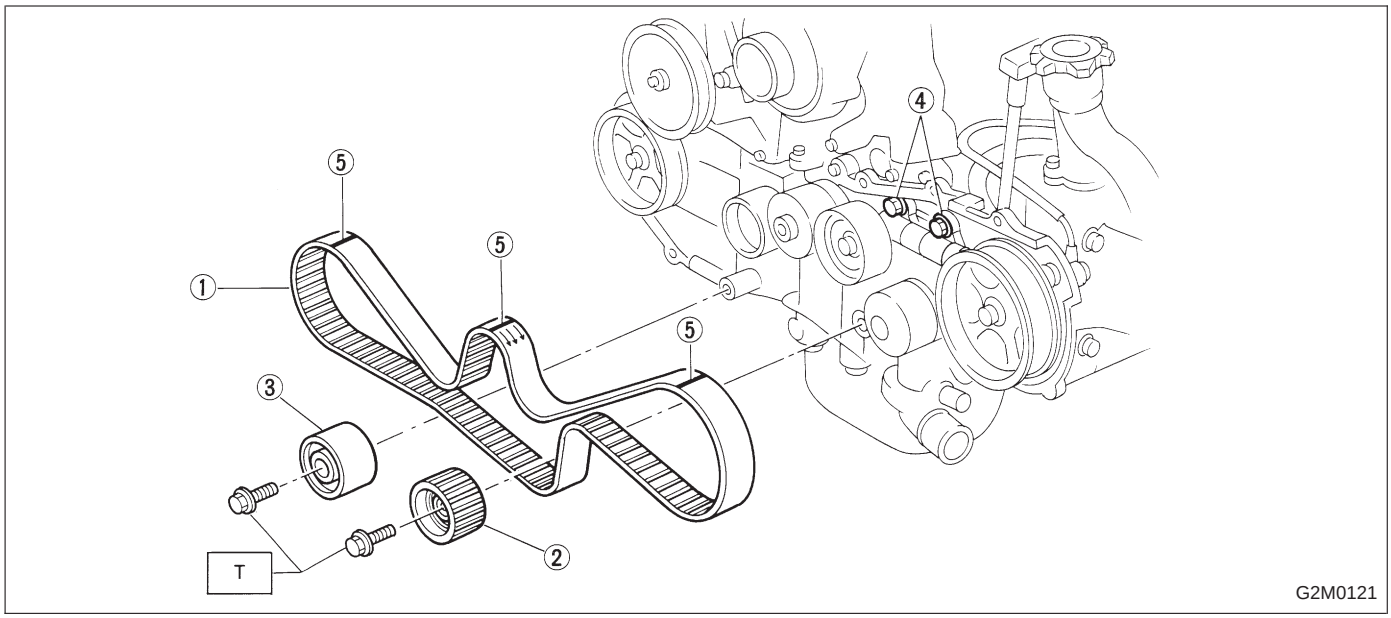
3. RELATED PARTS

1) Install valve rocker assembly.
<Ref. to 2-3 [W4E0].>



Tightening torque: N·m (kg-m, ft-lb)
T1: 5±1 (0.5±0.1, 3.6±0.7)
T2: 12±1 (1.2±0.1, 8.7±0.7)

2) Install timing belt, camshaft sprockets and related parts.
<Ref. to 2-3 [W3C0].>



Tightening torque: N·m (kg-m, ft-lb)
T: 35 — 43 (3.6 — 4.4, 26 — 32)

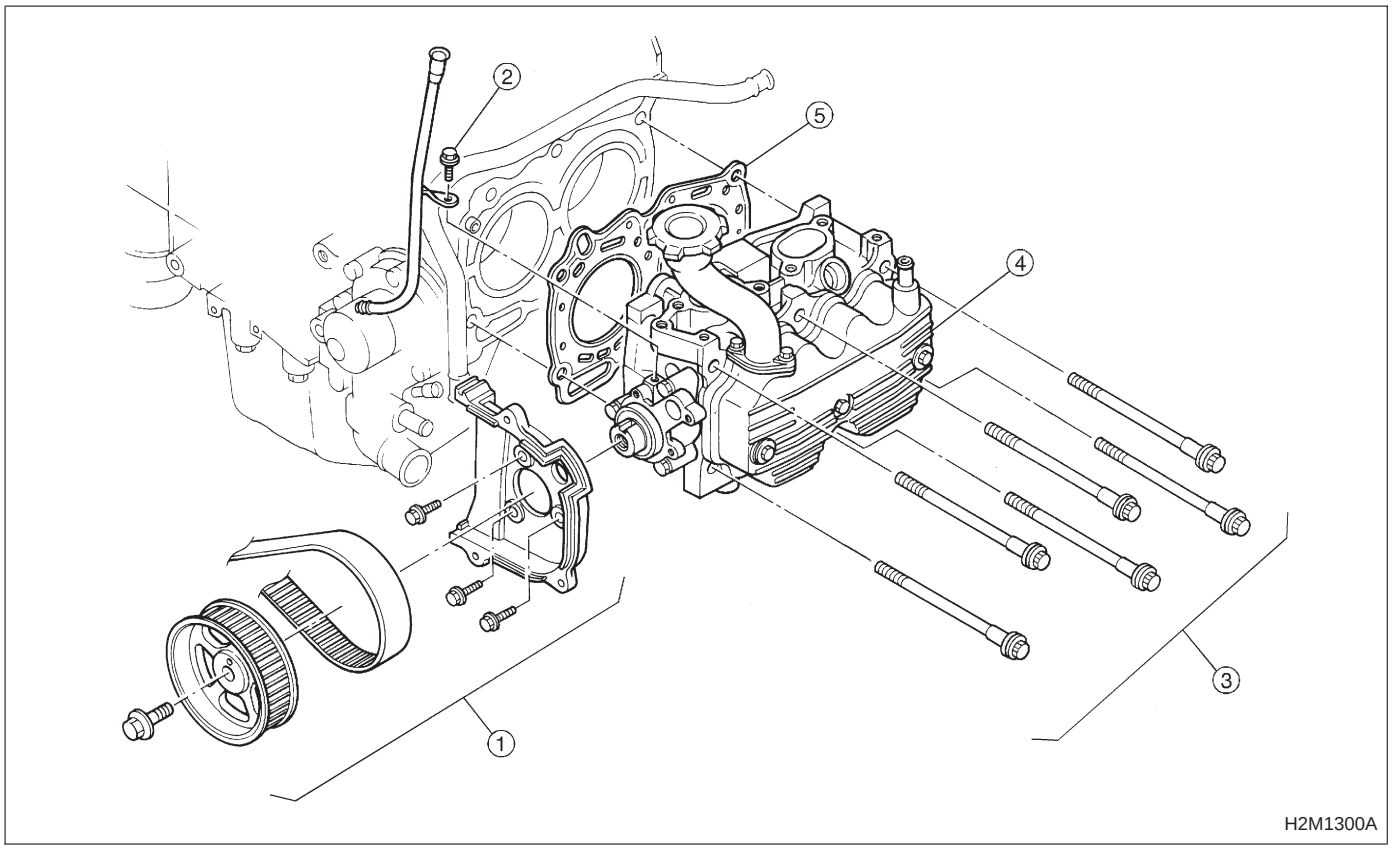
6. Cylinder Head

A: REMOVAL

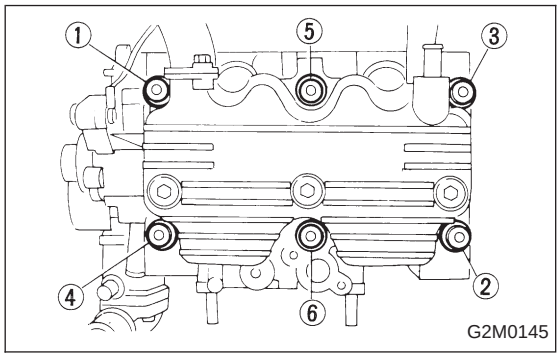
1. INTAKE MANIFOLD

1) Release fuel pressure.
2) Drain engine coolant.
3) Remove V-belt.
4) Remove alternator and bracket.
5) Disconnect spark plug caps.
6) Remove Connector bracket attaching bolt.
7) Remove crankshaft position sensor and camshaft position sensor.
8) Disconnect oil pressure switch connector.
9) Disconnect blow-by hose.
10) Remove EGR pipe.
11) Remove air suction valve and pipe. (California model)
12) Remove intake manifold and gasket.
13) Remove water pipe.

2. CYLINDER HEAD



1) Remove timing belt, camshaft sprocket and related parts.
<Ref. to 2-3 [W3A0].>
2) Remove oil level gauge guide attaching bolt (left hand only) and oil level gauge guide.



3) Remove cylinder head bolts in numerical sequence shown in Figure.

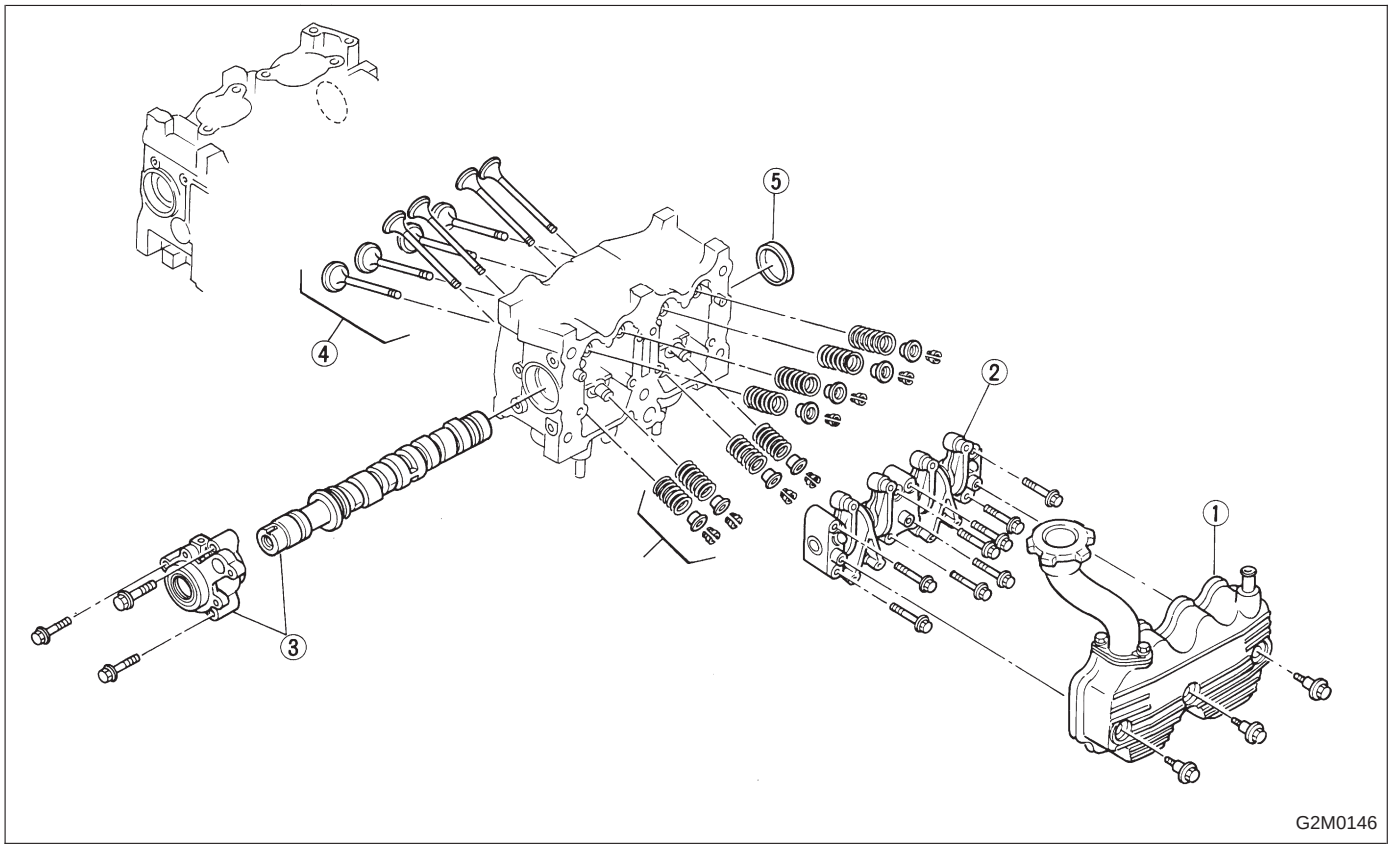
CAUTION:
Leave bolts ① and ③ engaged by three or four threads to prevent cylinder head from falling.

4) While tapping cylinder head with a plastic hammer, separate it from cylinder block.
Remove bolts ① and ③ to remove cylinder head.
5) Remove cylinder head gasket.

CAUTION:
Do not scratch the mating surface of cylinder head and cylinder block.

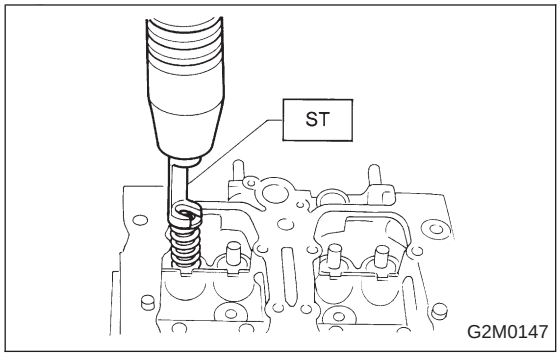
6) Similarly, remove right-hand cylinder head.

B: DISASSEMBLY



1) Remove rocker cover.
2) Remove valve rocker assembly.
<Ref. to 2-3 [W4A0].>
3) Remove camshaft and support.
<Ref. to 2-3 [W5A0].>
4) Place cylinder head on ST.

ST 498267200 CYLINDER HEAD TABLE



5) Set ST on valve spring. Compress valve spring and remove the valve spring retainer key. Remove each valve and valve spring.

ST 499718000 VALVE SPRING REMOVER

CAUTION:
- **Mark each valve to prevent confusion.**
- **Use extreme care not to damage the lips of the intake valve oil seals and exhaust valve oil seals.**

6) Removal of plug (cylinder head LH).

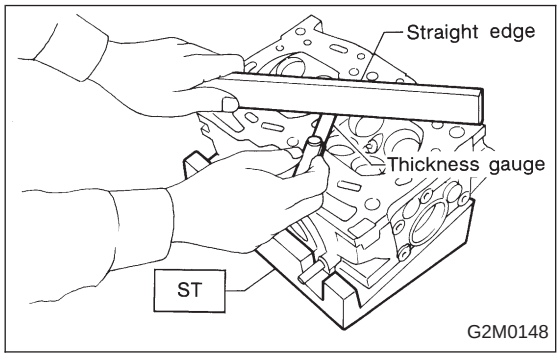
CAUTION:
Do not remove plug unless necessary.

C: INSPECTION

1. CYLINDER HEAD

1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect important areas by means of red check.
Also, make sure that gasket installing surface shows no traces of gas and water leaks.
2) Place cylinder head on ST.

ST 498267200 CYLINDER HEAD TABLE



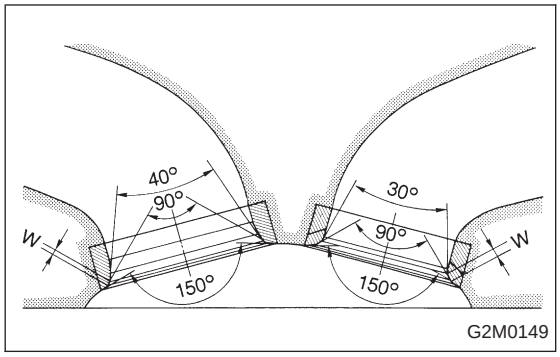
3) Measure the warping of the cylinder head surface that mates with crankcase by using a straight edge and thickness gauge.
If the warping exceeds 0.05 mm (0.0020 in), regrind the surface with a surface grinder.

Warping limit:
0.05 mm (0.0020 in)

Grinding limit:
0.1 mm (0.004 in)

Standard height of cylinder head:
98.3 mm (3.870 in)

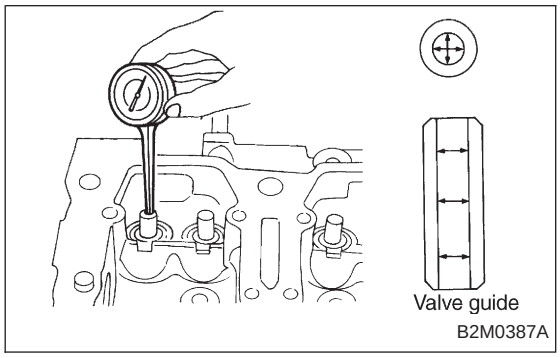
CAUTION:
Uneven torque for the cylinder head nuts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.

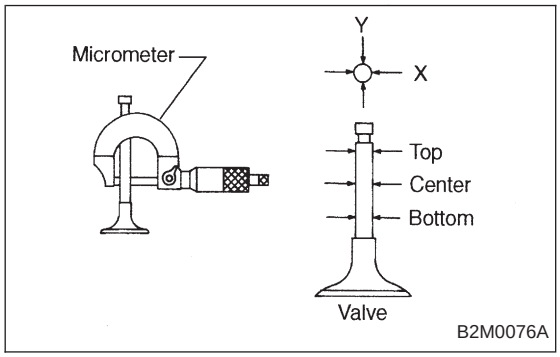


2. VALVE SEAT

Inspect 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
0.7 mm (0.028 in)
Limit
1.4 mm (0.055 in)
Exhaust
Standard
1.0 mm (0.039 in)
Limit
1.8 mm (0.071 in)





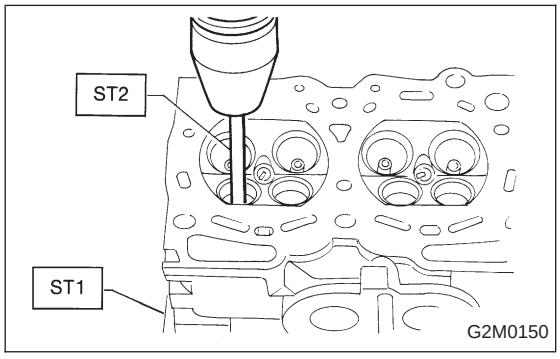
3. VALVE GUIDE

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)

Valve guide inner diameters:
6.000 — 6.012 mm (0.2362 — 0.2367 in)

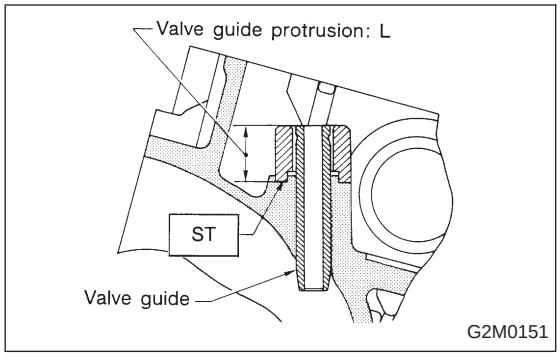
Valve stem outer diameter:
Intake
5.950 — 5.965 mm (0.2343 — 0.2348 in)
Exhaust
5.945 — 5.960 mm (0.2341 — 0.2346 in)



2) If the clearance between valve guide and stem exceeds the specification, replace guide as follows:

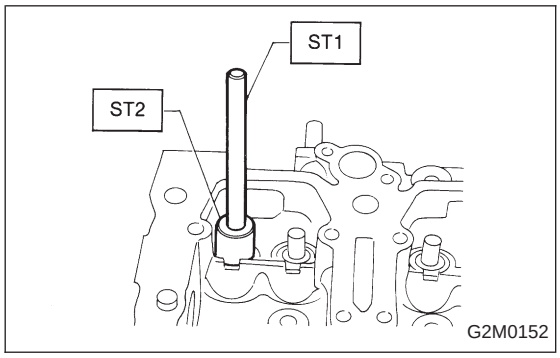
(1) Place cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.
(2) Insert ST2 into valve guide and press it down to remove valve guide.

ST1 498267200 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



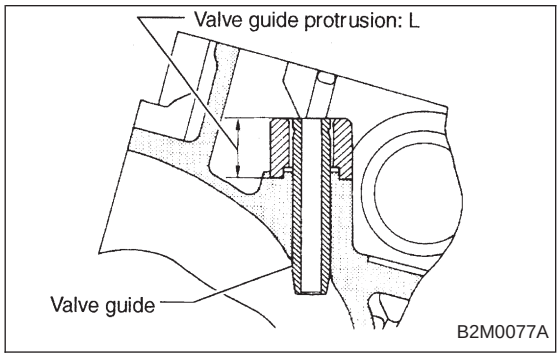
(3) Turn cylinder head upside down and place ST as shown in the Figure.

ST 499767000 VALVE GUIDE ADJUSTER



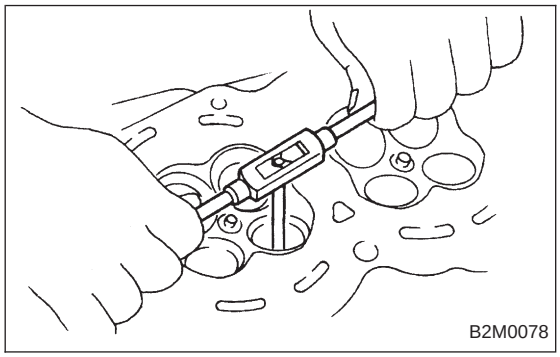
(4) Before installing new oversize valve guide, make sure that neither scratches nor damages exist on the inside surface of the valve guide holes in cylinder head.
(5) Put new valve guide, coated with sufficient oil, in cylinder, and insert ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499767200 VALVE GUIDE REMOVER
ST2 499767000 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion: L
17.5 — 18.0 mm (0.689 — 0.709 in)

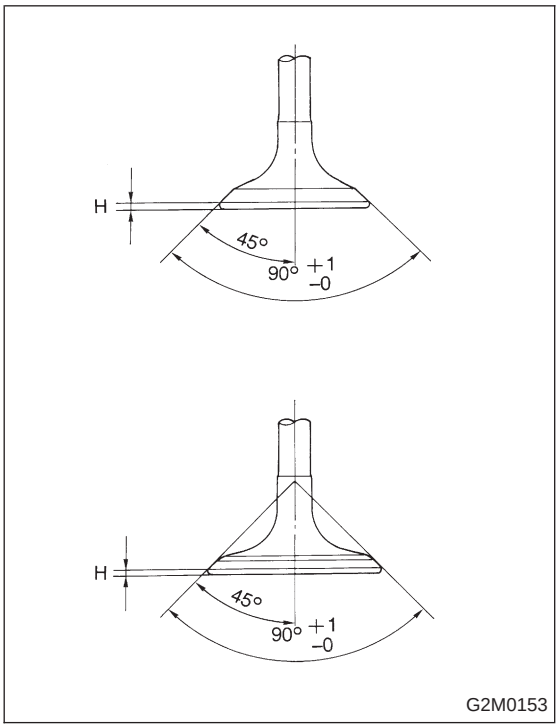


(7) Ream the inside of valve guide with ST. Gently rotate the reamer clockwise while pressing it lightly into valve guide, and return it also rotating clockwise. After reaming, clean valve guide to remove chips.

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 valve guide.



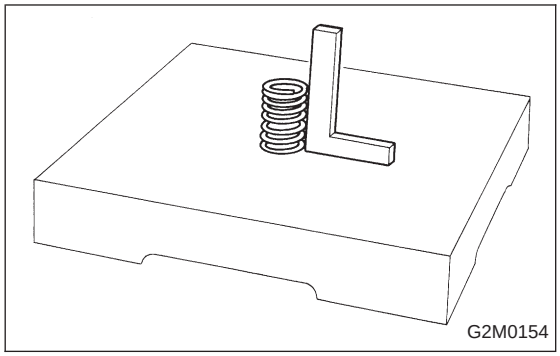
4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if “H” is less than the specified limit.

H:
Intake
Standard
1.0 mm (0.039 in)
Limit
0.8 mm (0.031 in)
Exhaust
Standard
1.2 mm (0.047 in)
Limit
0.8 mm (0.031 in)

Valve overall length:
Intake
101.0 mm (3.976 in)
Exhaust
101.2 mm (3.984 in)

2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. Also refer to 2. VALVE SEAT 2-3 [W6C2] at this time. Install a new intake valve oil seal after lapping.



5. VALVE SPRINGS

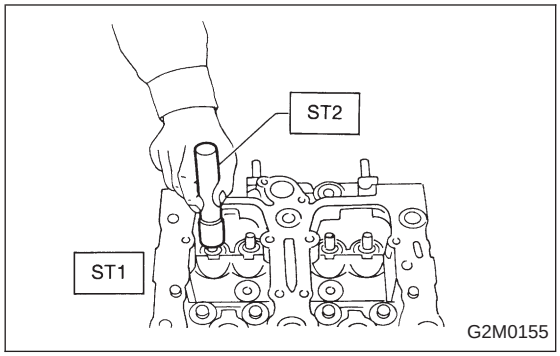
1) Check valve springs for damage, free length, and tension. Replace valve spring if it is not to the specifications presented below.
2) To measure the squareness of the valve spring, stand the spring on a surface plate and measure its deflection at the top using a try square.

1800 cc:

Free length	46.16 mm (1.8173 in)
Squareness	2.5°, 2.0 mm (0.079 in)
Tension/spring height	190.3 — 219.7 N (19.4 — 22.4 kg, 42.8 — 49.4 lb)/ 37.0 mm (1.457 in)
	401.1 — 461.9 N (40.9 — 47.1 kg, 90.2 — 103.9 lb)/ 29.2 mm (1.150 in)

2200 cc:

Free length	44.05 mm (1.7342 in)
Squareness	2.5°, 1.9 mm (0.075 in)
Tension/spring height	174.6 — 200.1 N (17.8 — 20.4 kg, 39.2 — 45.0 lb)/ 36.0 mm (1.417 in)
	405.0 — 458.0 N (41.3 — 46.7 kg, 91.1 — 103.0 lb)/ 28.2 mm (1.110 in)



6. INTAKE AND EXHAUST VALVE OIL SEAL

Replace oil seal with new one, if lip is damaged or spring out of place, or when the surfaces of intake valve and valve seat are reconditioned or intake valve guide is replaced.

1) Place cylinder head on ST1.
2) Press in oil seal to the specified dimension indicated in the Figure by using ST2.

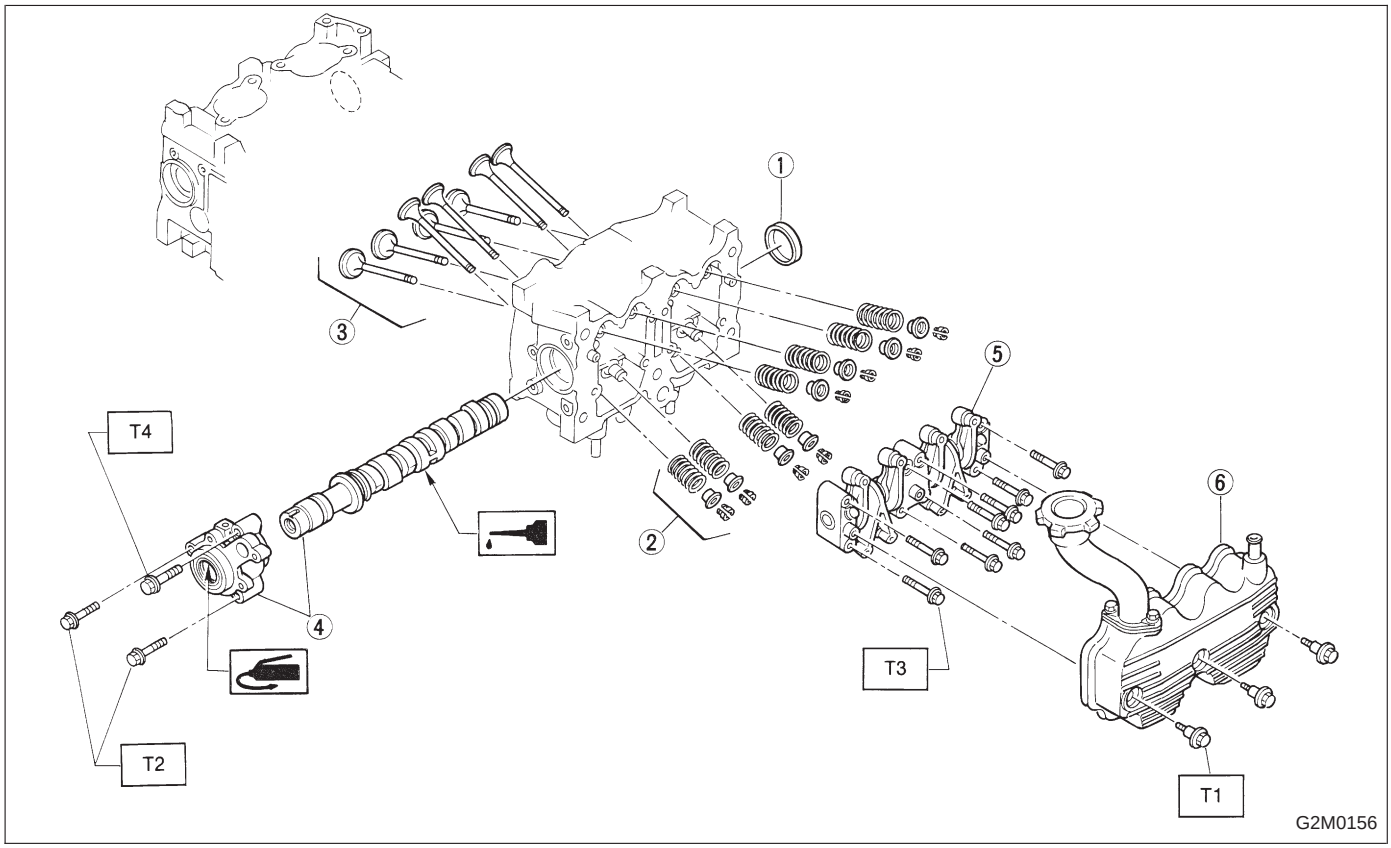
ST1 498267200 CYLINDER HEAD TABLE
ST2 498857100 VALVE OIL SEAL GUIDE

CAUTION:
- **Apply engine oil to oil seal before force-fitting.**
- **When press-fitting oil seal, do not use a hammer or strike into position.**
- **Differentiate between 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 [White]
Exhaust [White]

D: ASSEMBLY



Tightening torque: N·m (kg-m, ft-lb)
T1: 5±1 (0.5±0.1, 3.6±0.7)
T2: 10 (1.0, 7)
T3: 12±1 (1.2±0.1, 8.7±0.7)
T4: 16 (1.6, 12)

1) Install plug (cylinder head LH) by using ST.

ST 499587100 OIL SEAL INSTALLER

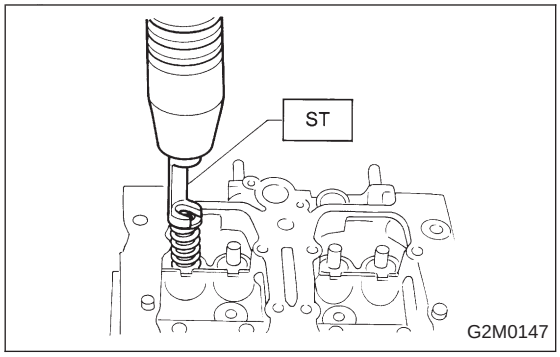
2) Installation of valve spring and valve.

(1) Place cylinder head on ST.

ST 498267200 CYLINDER HEAD TABLE

(2) Coat stem of each valve with engine oil and insert valve into valve guide.

CAUTION:
When inserting valve into valve guide, use special care not to damage the oil seal lip.



(3) Install valve spring and retainer.

CAUTION:
Be sure to install the valve springs with their close-coiled end facing the seat on the cylinder head.

(4) Set ST on valve spring.

ST 499718000 VALVE SPRING REMOVER

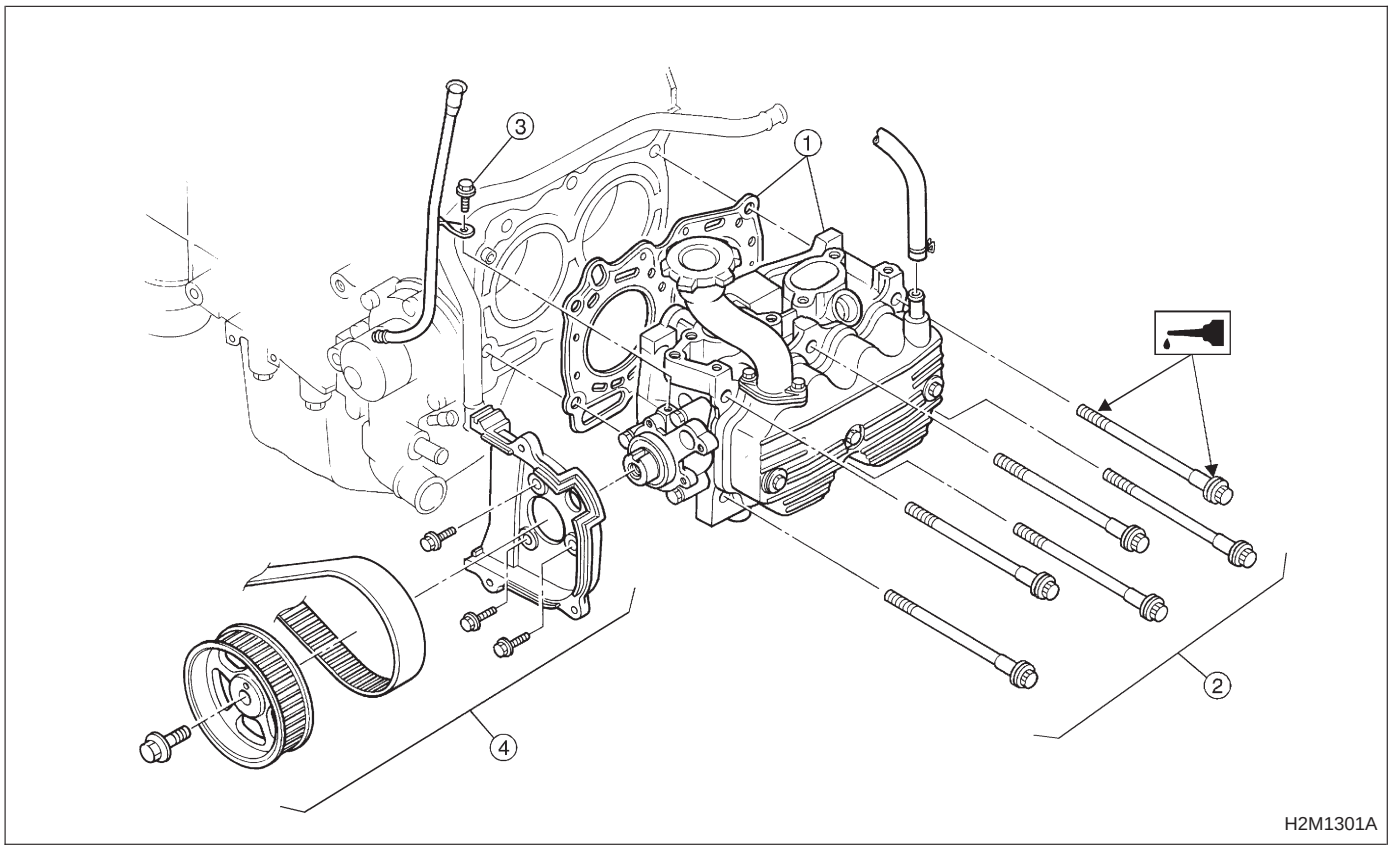
(5) Compress valve spring and fit valve spring retainer key.

(6) After installing, tap valve spring retainers lightly with wooden hammer for better seating.

3) Install camshaft and support.
<Ref. to 2-3 [W5C0].>
4) Install valve rocker assembly.
<Ref. to 2-3 [W4E0].>
5) Install rocker cover.

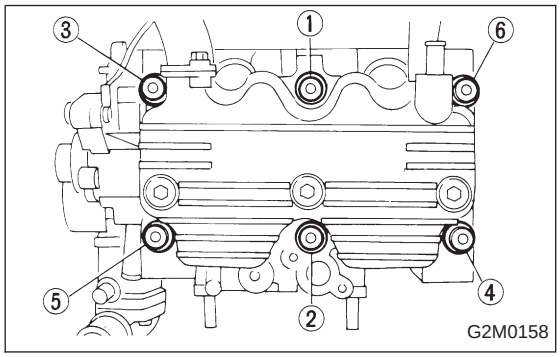
E: INSTALLATION

1. CYLINDER HEAD



1) Install cylinder head and gaskets on cylinder block.

CAUTION:
Use new cylinder head gaskets.



2) Tighten 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 kg-m, 22 ft-lb) in numerical order shown in Figure.
   Then tighten all bolts to 69 N·m (7.0 kg-m, 51 ft-lb) in numerical order.
   (3) Back off all bolts by 180° first; back them off by 180° again.
   (4) Tighten bolts ① and ② to 34 N·m (3.5 kg-m, 25 ft-lb).
   (5) Tighten bolts ③, ④, ⑤ and ⑥ to 15 N·m (1.5 kg-m, 11 ft-lb).
   (6) Tighten all bolts by 80 to 90° in numerical sequence.

CAUTION:
Do not tighten bolts more than 90°.

(7) Further tighten all bolts by 80 to 90° in numerical sequence.

CAUTION:
Ensure that the total "re-tightening angle" [steps (6) and (7) above] do not exceed 180°.

3) Install oil level gauge guide attaching bolt (left hand only).
4) Install timing belt, camshaft sprocket and related parts. <Ref. to 2-3 [W3C0].>

2. INTAKE MANIFOLD

CAUTION:
Use dry compressed air to remove foreign particles before installing each solenoid valve and sensor.

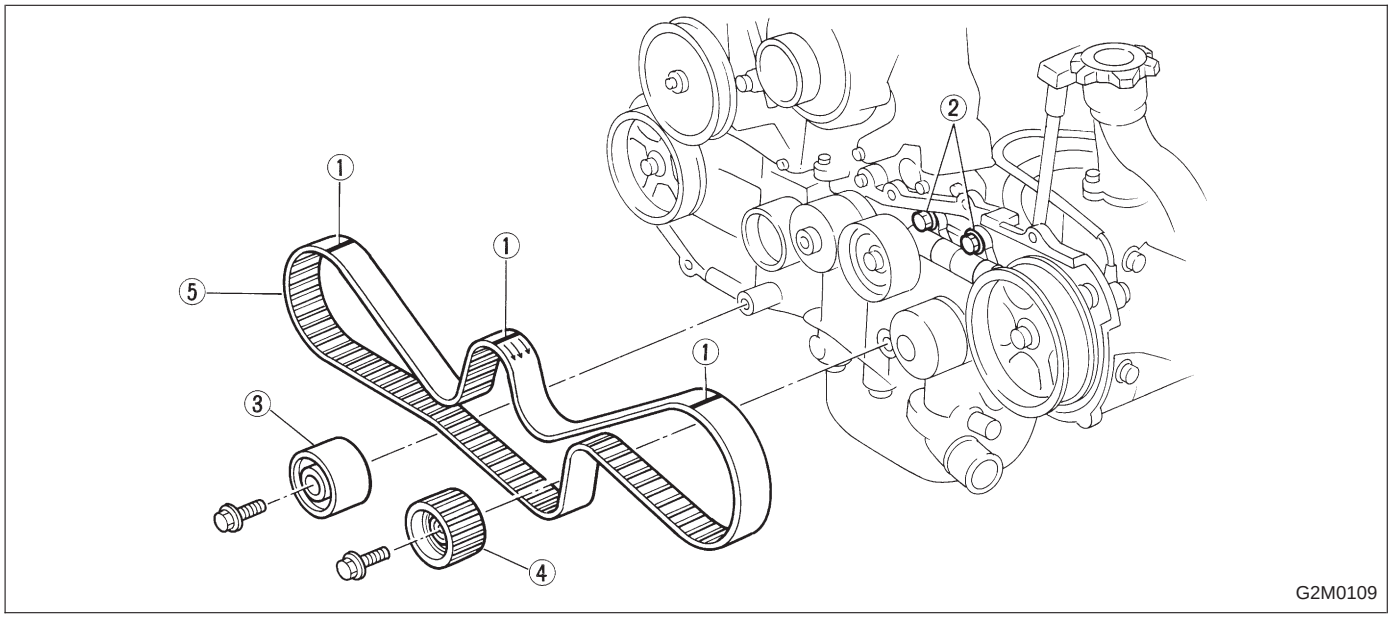
1) Install water pipe.
2) Install intake manifold.
3) Connect blow-by hose.
4) Install EGR pipe.
5) Install air suction valve and pipe. (California model)
6) Connect oil pressure switch connector.
7) Install crankshaft position sensor and camshaft position sensor.
8) Install connector bracket attaching bolt.
9) Connect spark plug caps.
10) Install alternator and bracket.
11) Install V-belt.
12) Remove ENGINE STAND.

7. Cylinder Block

A: REMOVAL

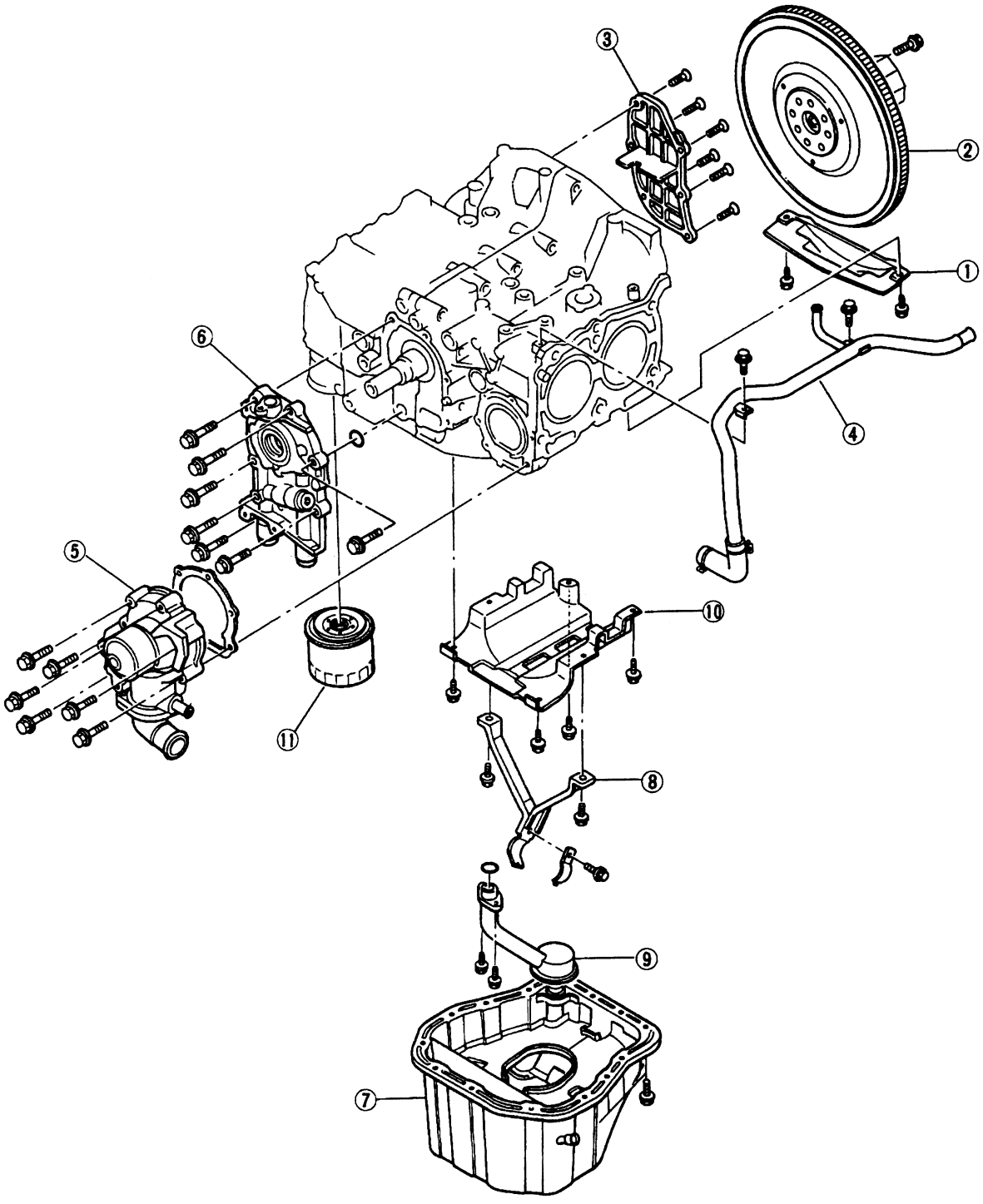
1. RELATED PARTS

1) Remove timing belt, camshaft sprocket and related parts.
<Ref. to 2-3 [W3A0].>



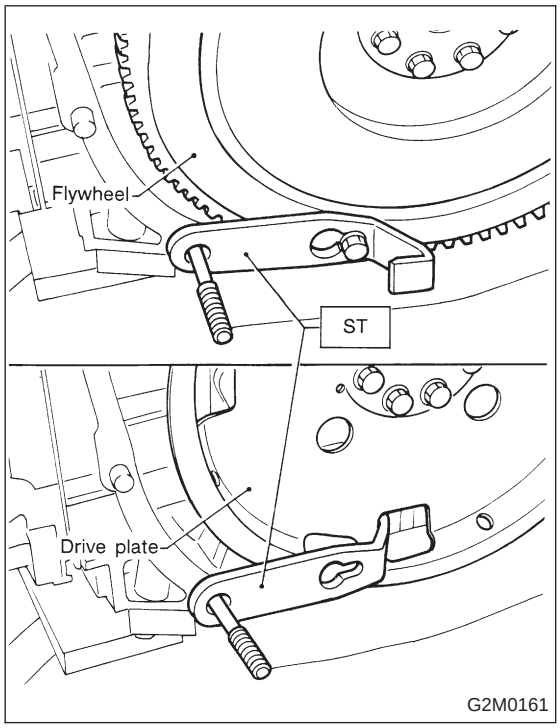
2) Remove intake manifold and cylinder head.
<Ref. to 2-3 [W6A0].>

2. OIL PUMP AND WATER PUMP



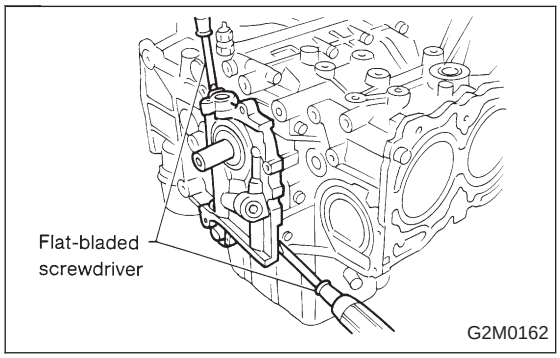
G2M0160

1) Remove housing cover.



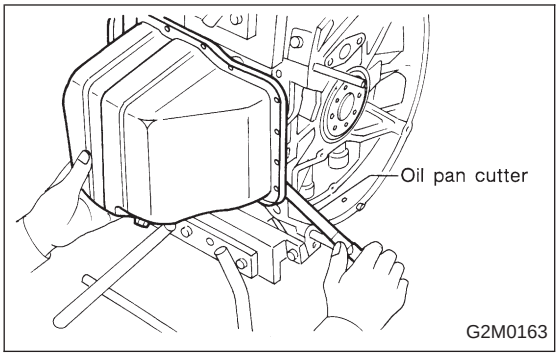
2) Remove flywheel or drive plate.
To lock crankshaft use ST.
ST 498497100 CRANKSHAFT STOPPER

3) Remove oil separator cover.
4) Remove water pipes.
5) Remove water pump.



6) Remove oil pump from cylinder block.
Use a flat-bladed screwdriver as shown in Figure when removing oil pump.

CAUTION:
Be careful not to scratch the mating surface of cylinder block and oil pump.



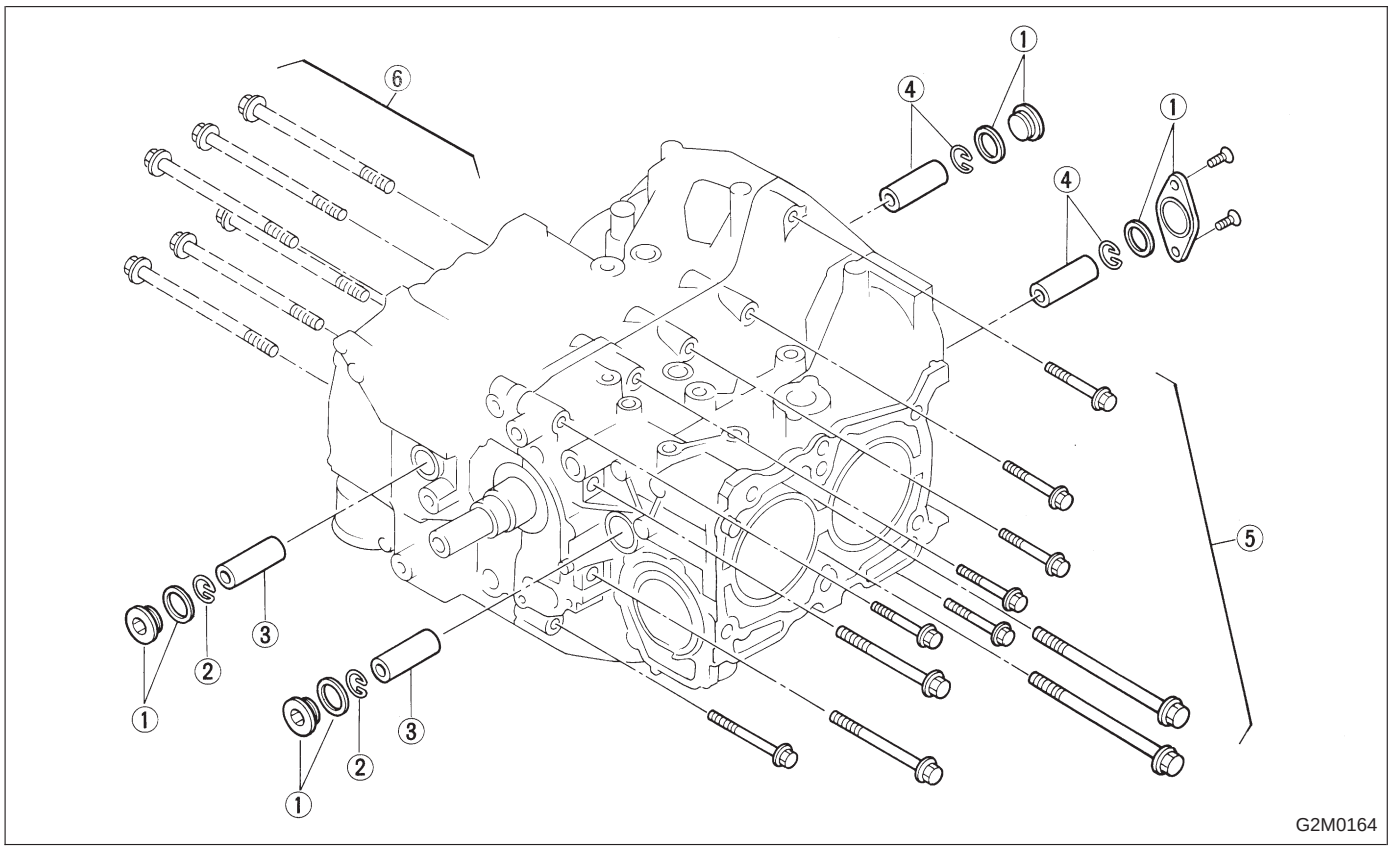
7) Removal of oil pan.
(1) Turn cylinder block with #2 and #4 piston sides facing upward.
(2) Remove bolts which secure oil pan to cylinder block.
(3) Insert a oil pan cutter blade between cylinder block-to-oil pan clearance and remove oil pan.

CAUTION:
Do not use a screwdriver or similar tool in place of oil pan cutter blade.

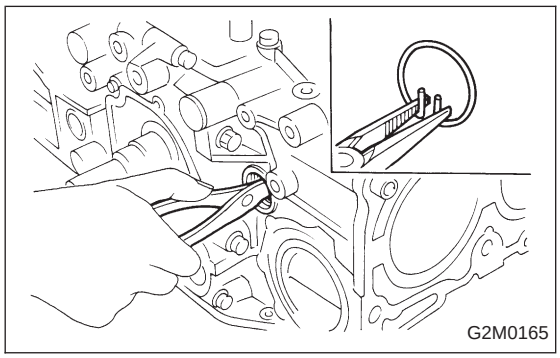
8) Remove oil strainer stay.
9) Remove oil strainer.
10) Remove baffle plate.
11) Remove oil filter.

B: DISASSEMBLY

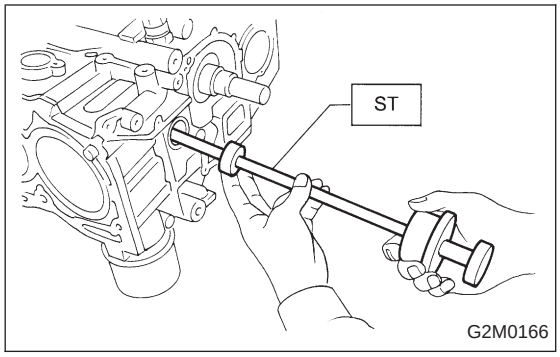
1. PISTON PIN AND CYLINDER BLOCK CONNECTING BOLT



1) Remove service hole cover and service hole plugs using hexagon wrench (14 mm).



2) Rotate crankshaft to bring #1 and #2 pistons to BDC position, then remove piston circlip through service hole of #1 and #2 cylinders.



3) Draw out piston pin from #1 and #2 pistons by using ST.

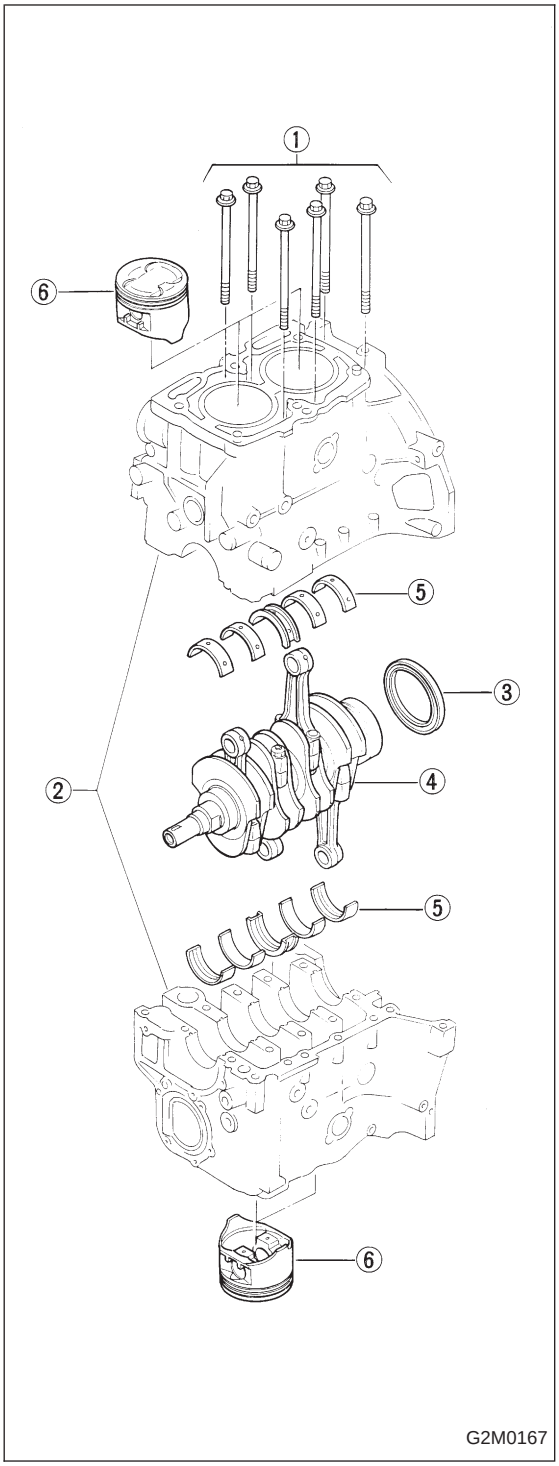
ST 499097500 PISTON PIN REMOVER

CAUTION:
Be careful not to confuse original combination of piston, piston pin and cylinder.

4) Similarly remove piston pins from #3 and #4 pistons by using ST.

5) Remove bolts which connect cylinder block on the side of #2 and #4 cylinders.

6) Back off bolts which connect cylinder block on the side of #1 and #3 cylinders two or three turns.



2. CYLINDER BLOCK

1) Set up cylinder block so that #1 and #3 cylinders are on the upper side, then remove cylinder block connecting bolts.
2) Separate left-hand and right-hand cylinder blocks.

CAUTION:
When separating cylinder block, do not allow the connecting rod to fall and damage the cylinder block.

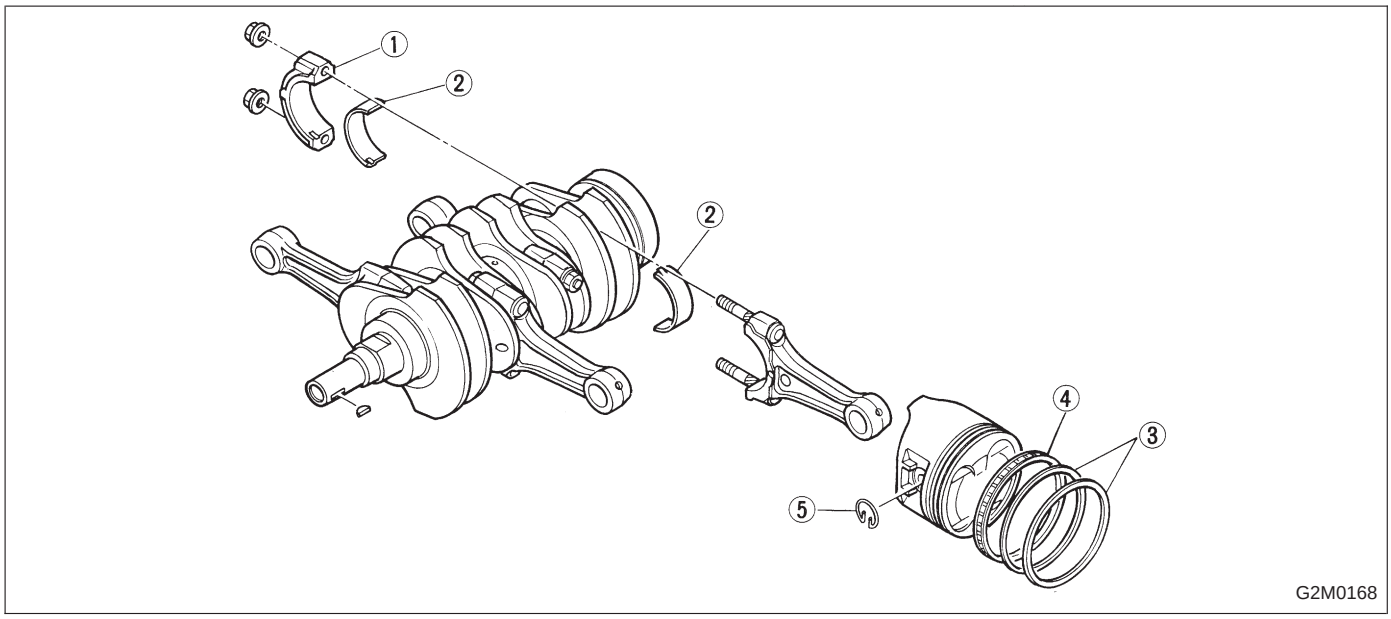
3) Remove rear oil seal.
4) Remove crankshaft together with connecting rod.
5) Remove crankshaft bearings from cylinder block using hammer handle.

CAUTION:
Do not confuse combination of crankshaft bearings. Press bearing at the end opposite to locking lip.

6) Draw out each piston from cylinder block using wooden bar or hammer handle.

CAUTION:
Do not confuse combination of piston and cylinder.

3. CRANKSHAFT AND PISTON



1) Remove connecting rod cap.
2) Remove connecting rod bearing.

CAUTION:
Arrange removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

3) Remove piston rings using the piston ring expander.
4) Remove the oil ring by hand.

CAUTION:
Arrange the removed piston rings in good order to prevent confusion.

5) Remove circlip.

C: INSPECTION

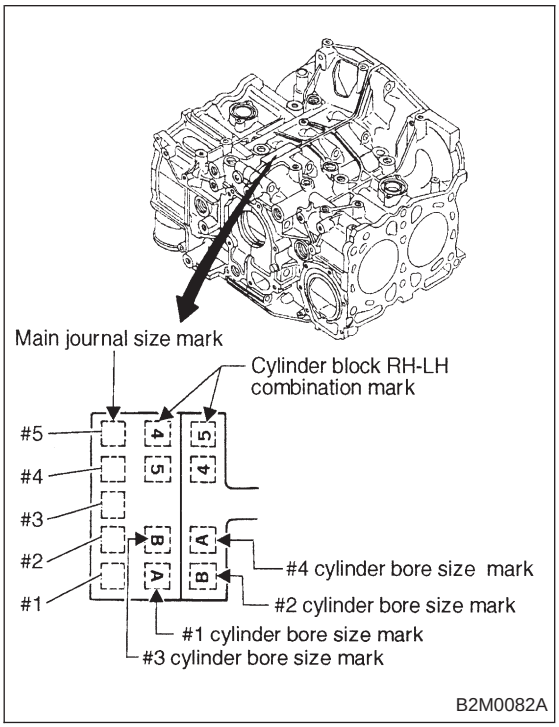
1. CYLINDER BLOCK

1) Check for cracks and damage visually. Especially, inspect important parts by means of red lead check.
2) Check the oil passages for clogging.
3) Inspect 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)

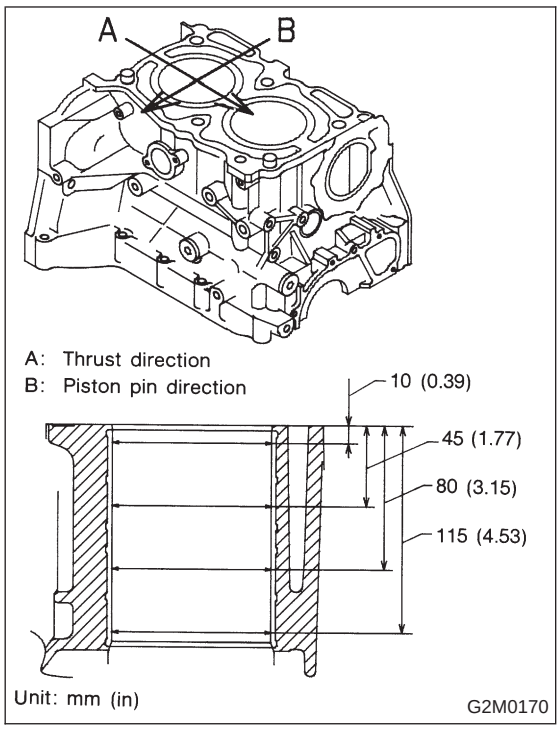


2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on the cylinder block's front upper surface.

NOTE:
Standard sized pistons are classified into two grades, "A" and "B". These grades should be used as a guideline in selecting a standard piston.

Standard diameter:
1800 cc:
A: 87.905 — 87.915 mm (3.4608 — 3.4612 in)
B: 87.895 — 87.905 mm (3.4604 — 3.4608 in)
2200 cc:
A: 96.905 — 96.915 mm (3.8151 — 3.8155 in)
B: 96.895 — 96.905 mm (3.8148 — 3.8151 in)



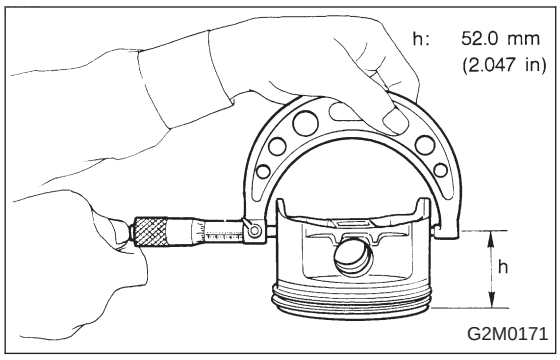
2) How to measure the inner diameter of each cylinder
Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights shown in the Figure, using a cylinder bore gauge.

CAUTION:
Measurement should be performed at a temperature 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)

3) When 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 outer diameter:
1800 cc:
Standard
A: 87.885 — 87.895 mm (3.4600 — 3.4604 in)
B: 87.875 — 87.885 mm (3.4596 — 3.4600 in)
0.25 mm (0.0098 in) oversize
88.125 — 88.135 mm (3.4695 — 3.4699 in)
0.50 mm (0.0197 in) oversize
88.375 — 88.385 mm (3.4793 — 3.4797 in)
2200 cc:
Standard
A: 96.885 — 96.895 mm (3.8144 — 3.8148 in)
B: 96.875 — 96.885 mm (3.8140 — 3.8144 in)
0.25 mm (0.0098 in) oversize
97.115 — 97.145 mm (3.8234 — 3.8246 in)
0.50 mm (0.0197 in) oversize
97.365 — 97.395 mm (3.8333 — 3.8344 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 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 as instructed in 2. CYLINDER AND PISTON 2-3 [W7C2]. If any of the clearances is not to specification, replace the piston or bore the cylinder to use an oversize piston.

3) Make sure that piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if defective.

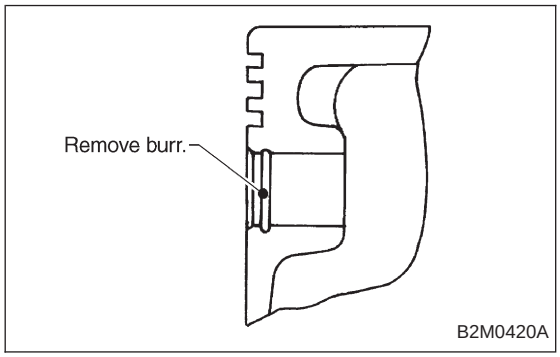
Standard clearance between piston pin and hole in piston:

Standard

0.004 — 0.010 mm (0.0002 — 0.0004 in)

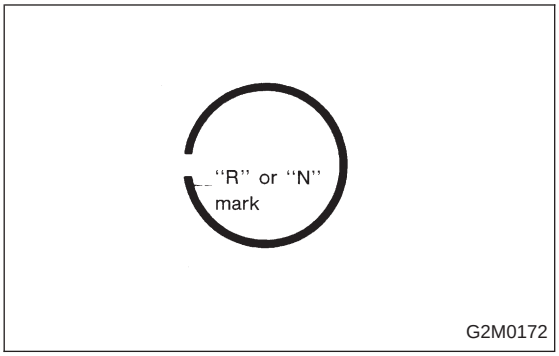
Limit

0.020 mm (0.0008 in)



4) Check circlip installation groove on the piston for burr. If necessary, remove burr from the groove so that piston pin can lightly move.

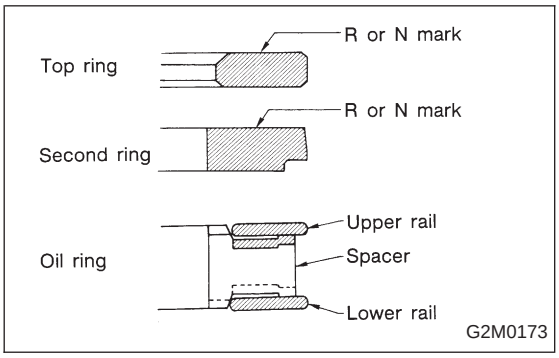
5) Check piston pin circlip for distortion, cracks and wear.



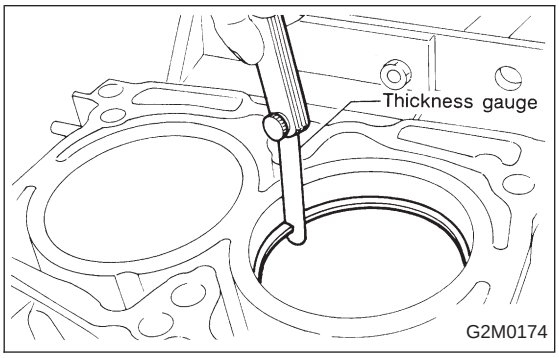
4. PISTON RING

1) If piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace piston ring with a new one of the same size as the piston.

CAUTION:
● "R" or "N" is marked on the end of the top and second rings. When installing the rings to the piston, face this mark upward.



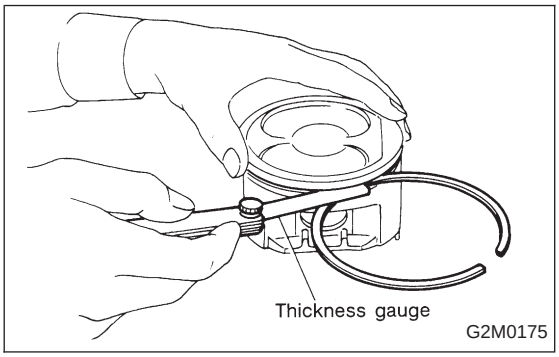
● The oil ring is a combined ring consisting of two rails and a spacer in between. When installing, be careful to assemble correctly.



2) Squarely place 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)	0.5 (0.020)
	Second ring	0.20 — 0.35 (0.0079 — 0.0138)	0.5 (0.020)
	Oil ring rail	0.20 — 0.70 (0.0076 — 0.0276)	1.0 (0.039)



3) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

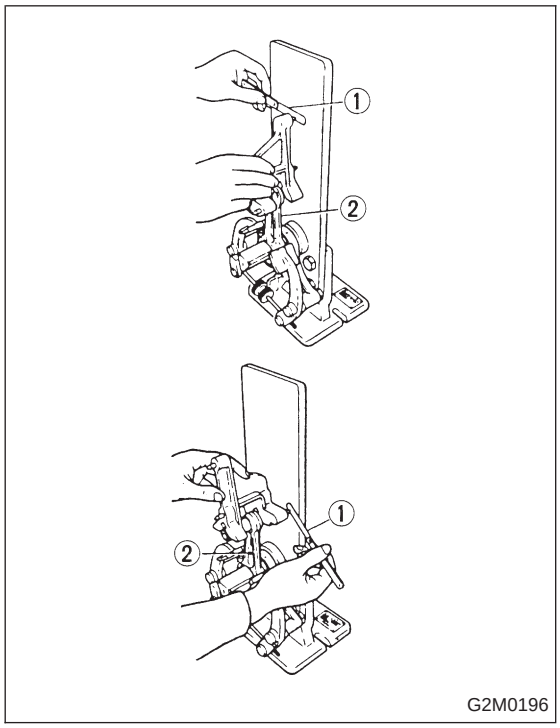
CAUTION:
Before measuring the clearance, clean the piston ring groove and piston ring.

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

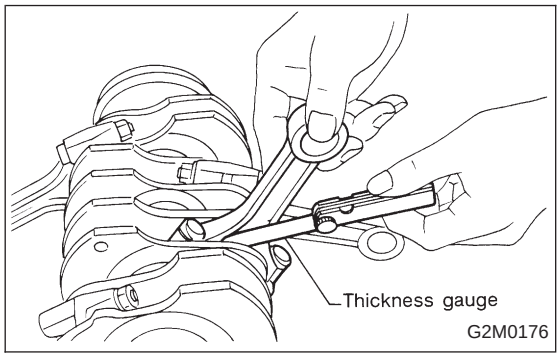
1) Replace connecting rod, if the large or small end thrust surface is damaged.



2) Check for bend or twist using a connecting rod aligner. Replace 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)

① Thickness gauge
② Connecting rod



3) Install connecting rod fitted with bearing to crankshaft and measure the side clearance (thrust clearance). Replace 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 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

0.015 — 0.045 mm (0.0006 — 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)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.510 — 1.513 (0.0594 — 0.0596)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.520 — 1.523 (0.0598 — 0.0600)	51.934 — 51.950 (2.0446 — 2.0453)
0.25 (0.0098) undersize	1.620 — 1.623 (0.0638 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

6) Inspect bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at the connecting rod small end.

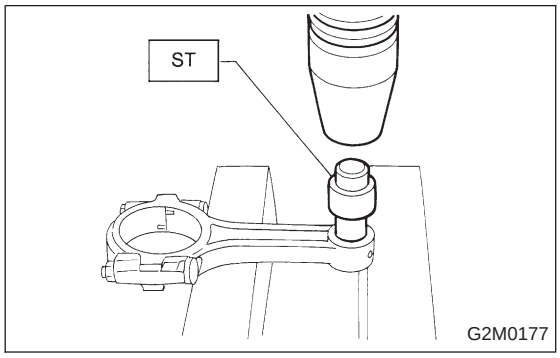
Clearance between piston pin and bushing:

Standard

0 — 0.022 mm (0 — 0.0009 in)

Limit

0.030 mm (0.0012 in)



7) Replacement procedure is as follows.

(1) Remove bushing from connecting rod with ST and press.

(2) Press bushing with ST after applying oil on the periphery of bushing.

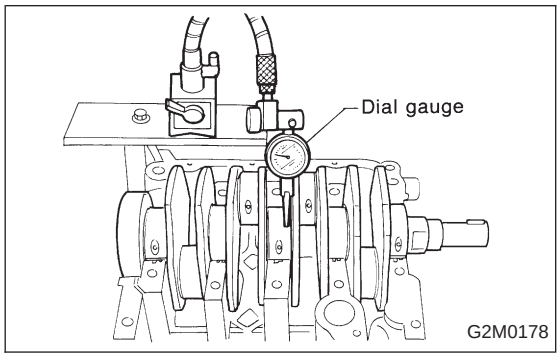
ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER

(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.

(4) After completion of reaming, clean bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

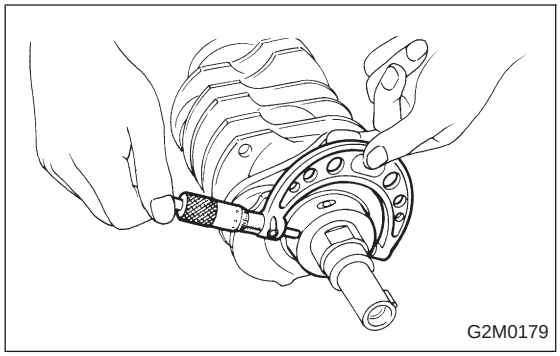
1) Clean crankshaft completely and check for cracks by means of red check etc., and replace if defective.



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 crankshaft bend using a dial gauge.

Crankshaft bend limit:
0.035 mm (0.0014 in)



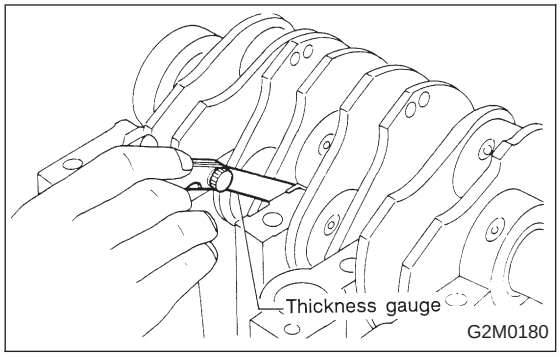
3) Inspect the crank journal and crankpin for wear. If not to specifications, replace bearing with an undersize one, and replace or recondition crankshaft as necessary. When grinding crank journal or crankpin, finish them to the specified dimensions according to the undersize bearing to be used.

Crankpin and crank journal:
Out-of-roundness
0.030 mm (0.0012 in) or less
Taper limit
0.07 mm (0.0028 in)
Grinding limit
0.250 mm (0.0098 in)

Unit: mm (in)

		Crank journal			Crank pin O.D.
		#1, #5	#2, #4	#3	
Standard	Journal O.D.	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.998 — 2.011 (0.0787 — 0.0792)	2.000 — 2.013 (0.0787 — 0.0793)	2.000 — 2.013 (0.0787 — 0.0793)	1.492 — 1.501 (0.0587 — 0.0591)
0.03 (0.0012) undersize	Journal O.D.	59.962 — 59.978 (2.3607 — 2.3613)	59.954 — 59.970 (2.3604 — 2.3610)	←	51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.022 (0.0795 — 0.0796)	2.019 — 2.022 (0.0795 — 0.0796)	1.510 — 1.513 (0.0594 — 0.0596)
0.05 (0.0020) undersize	Journal O.D.	59.934 — 59.950 (2.3596 — 2.3602)	←	←	51.934 — 51.950 (2.0446 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	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)	59.734 — 59.750 (2.3517 — 2.3524)	←	51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	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 bearing.

Crankshaft thrust clearance:

Standard

0.030 — 0.115 mm (0.0012 — 0.0045 in)

Limit

0.25 mm (0.0098 in)

5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting, and wear.

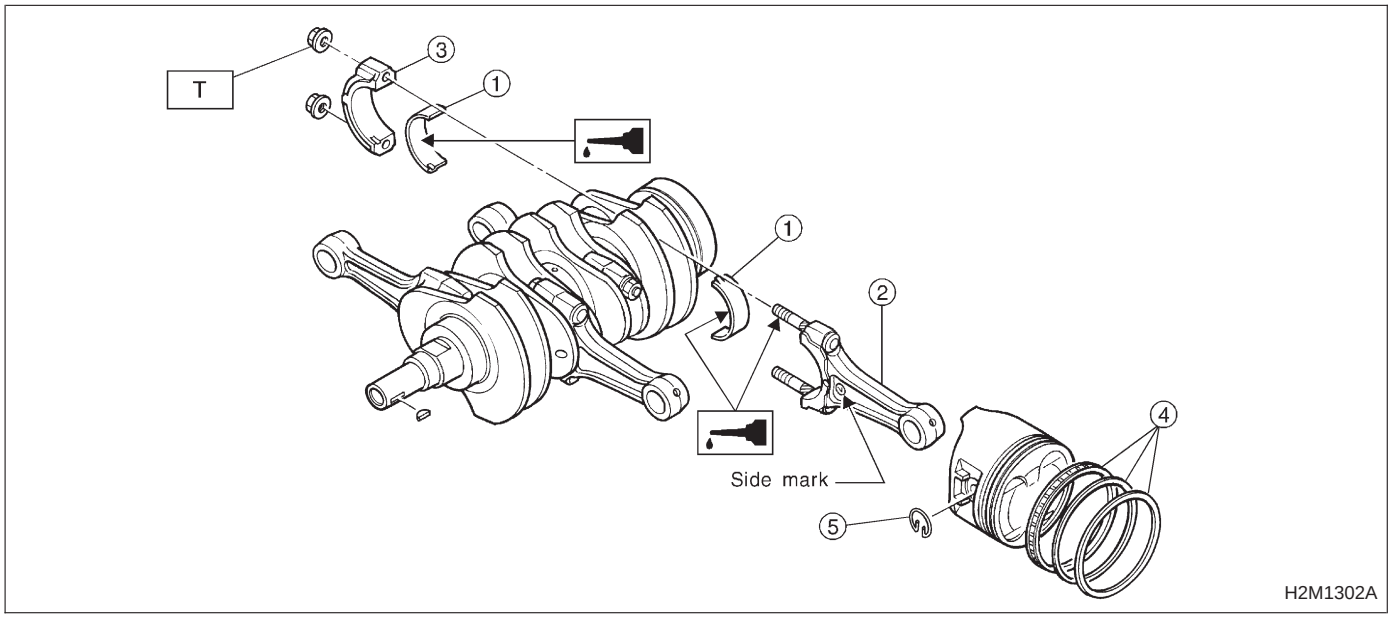
6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specification, replace defective bearing with an undersize one, and replace or recondition crankshaft as necessary.

Unit: mm (in)

Crankshaft oil clearance		
Standard	#1, #5	0.010 — 0.030 (0.0004 — 0.0012)
	#2, #3, #4	0.010 — 0.030 (0.0004 — 0.0012)
Limit	#1, #5	0.040 (0.0016)
	#2, #3, #4	0.035 (0.0014)

D: ASSEMBLY

1. CRANKSHAFT AND PISTON



Tightening torque: N·m (kg-m, ft-lb)
T: 43 — 46 (4.4 — 4.7, 32 — 34)

1) Install connecting rod bearings on connecting rods and connecting rod caps.

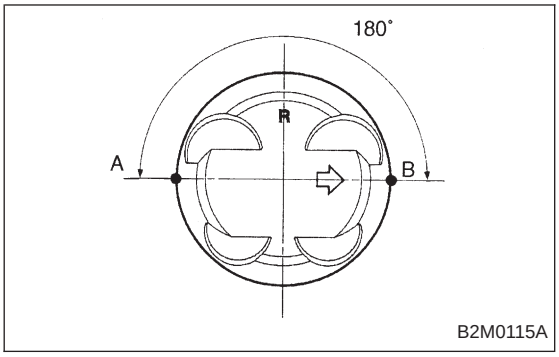
CAUTION:
Apply oil to the surfaces of the connecting rod bearings.

2) Install connecting rod on crankshaft.

CAUTION:
Position each connecting rod with the side marked facing forward.

3) Install connecting rod cap with connecting rod nut.
Ensure the arrow on connecting rod cap faces the front during installation.

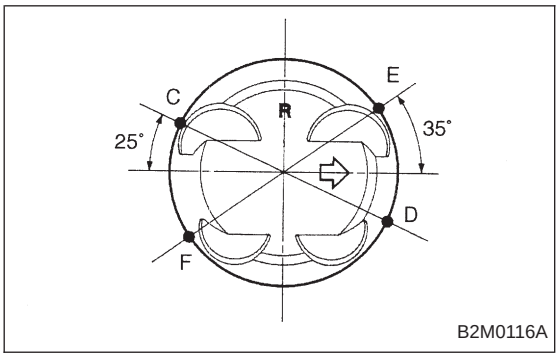
CAUTION:
● Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
● When tightening the connecting rod nuts, apply oil on the threads.



B2M0115A

4) Installation of piston rings and oil ring

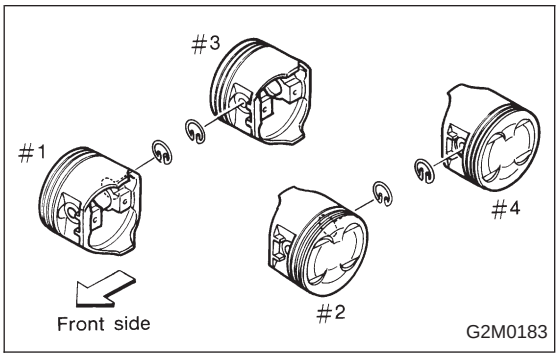
(1) Install oil ring spacer, upper rail and lower rail in this order by hand. Then install second ring and top ring with a piston ring expander.
(2) Position the top ring gap at A or B in the Figure.
(3) Position the second ring gap at 180° on the reverse side for the top ring gap.



B2M0116A

(4) Position the upper rail gap at C or D in the Figure.
(5) Position the expander gap the at 180° of the reverse side for the upper rail gap.
(6) 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.**

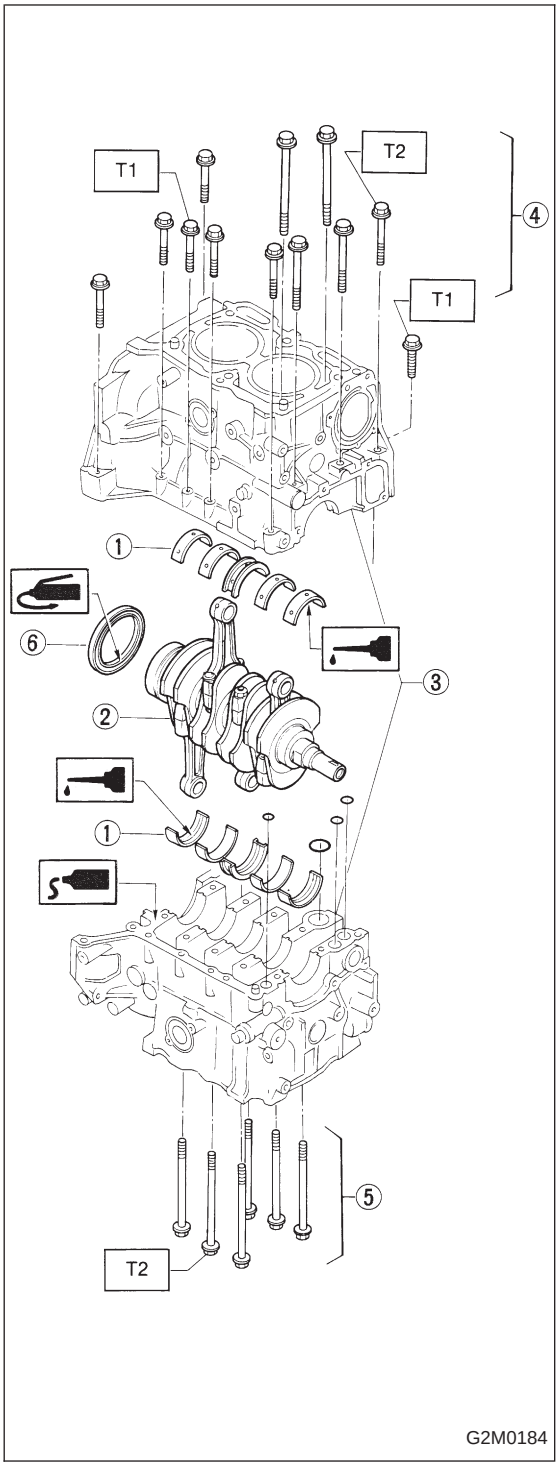


G2M0183

5) Install circlip.

Install circlips in piston holes located opposite service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

CAUTION:
Use new circlips.



2. CYLINDER BLOCK

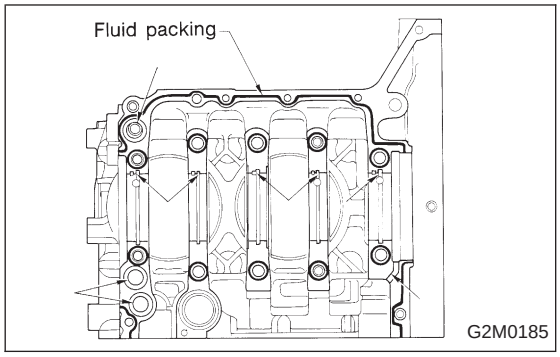
1) Install ST to cylinder block, then install crankshaft bearings.

ST 499817000 ENGINE STAND

CAUTION:
Remove oil the mating surface of bearing and cylinder block before installation. Also apply a coat of engine oil to crankshaft pins.

2) Position crankshaft on the #2 and #4 cylinder block.

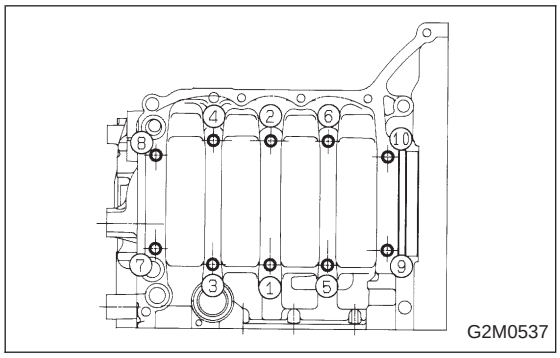
Tightening torque:
T1: 23 — 26 N·m (2.3 — 2.7 kg-m, 17 — 20 ft-lb)
T2: 44 — 50 N·m (4.5 — 5.1 kg-m, 33 — 37 ft-lb)



3) Apply fluid packing to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

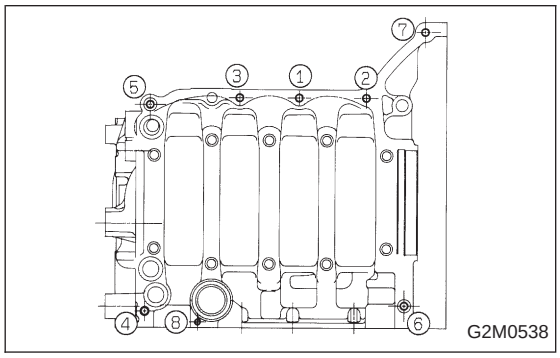
Fluid packing:
THREE BOND 1215 or equivalent

CAUTION:
Do not allow fluid packing to jut into O-ring grooves, oil passages, bearing grooves, etc.



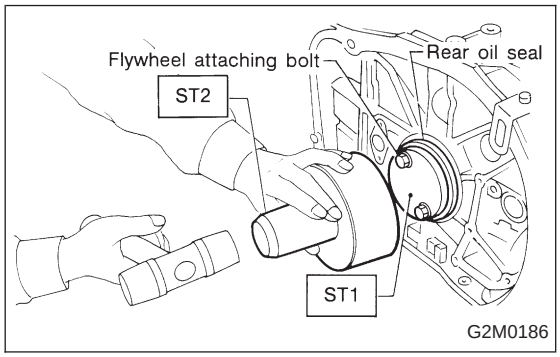
4) Temporarily tighten 10 mm cylinder block connecting bolts in numerical order shown in Figure.
5) Tighten 10 mm cylinder block connecting bolts in numerical order.

Tightening torque:
44 — 50 N·m (4.5 — 5.1 kg-m, 33 — 37 ft-lb)



6) Tighten 8 mm and 6 mm cylinder block connecting bolts in numerical order shown in Figure.

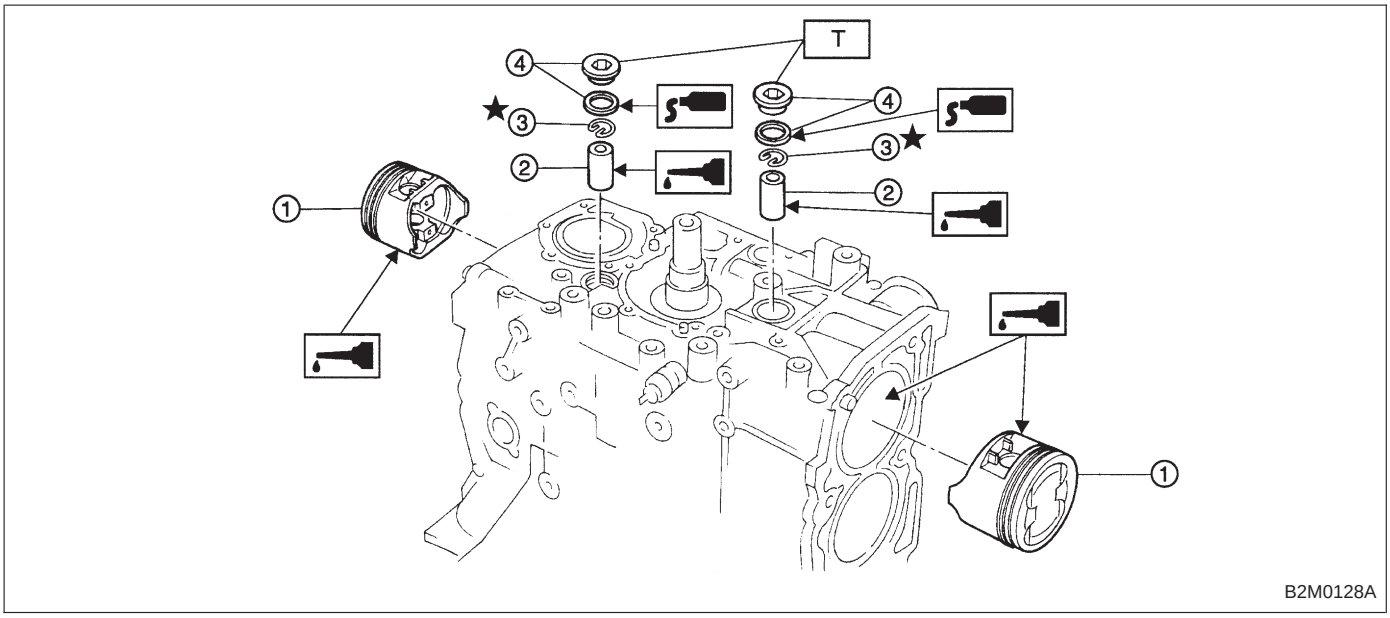
Tightening torque:
①— ⑦: 23 — 26 N·m
(2.3 — 2.7 kg-m, 17 — 20 ft-lb)
⑧: 6.4 N·m (0.65 kg-m, 4.7 ft-lb)



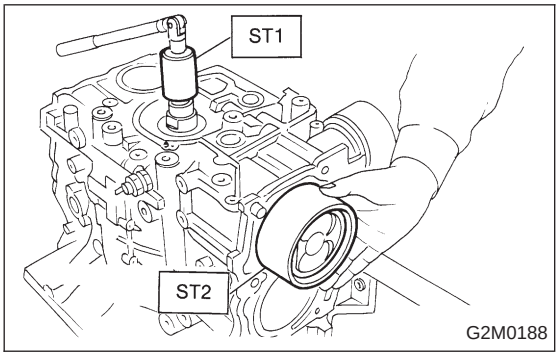
7) Install rear oil seal by using ST1 and ST2.

ST1	499597100	OIL SEAL GUIDE
ST2	499587200	OIL SEAL INSTALLER

3. PISTON AND PISTON PIN (#1 AND #2)



Tightening torque: N·m (kg-m, ft-lb)
T: 69±7 (7.0±0.7, 50.6±5.1)



1) Installing piston

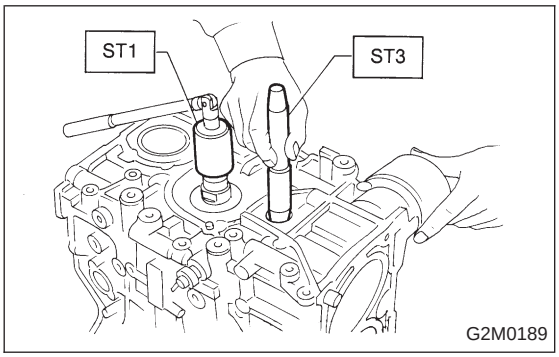
(1) Turn cylinder block so that #1 and #2 cylinders face upward.

(2) Using ST1, turn crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

ST1 499987500 CRANKSHAFT SOCKET

(3) Apply a coat of engine oil to pistons and cylinders and insert pistons in their cylinders by using ST2.

ST2 498747000 PISTON GUIDE (1800 cc)
498747100 PISTON GUIDE (2200 cc)



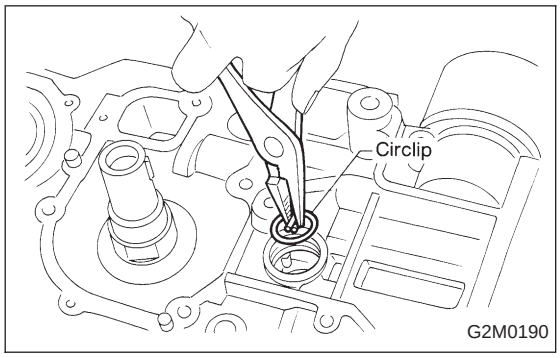
2) Installing piston pin

(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 piston pin and insert piston pin into piston and connecting rod through service hole.



(3) Install circlip.

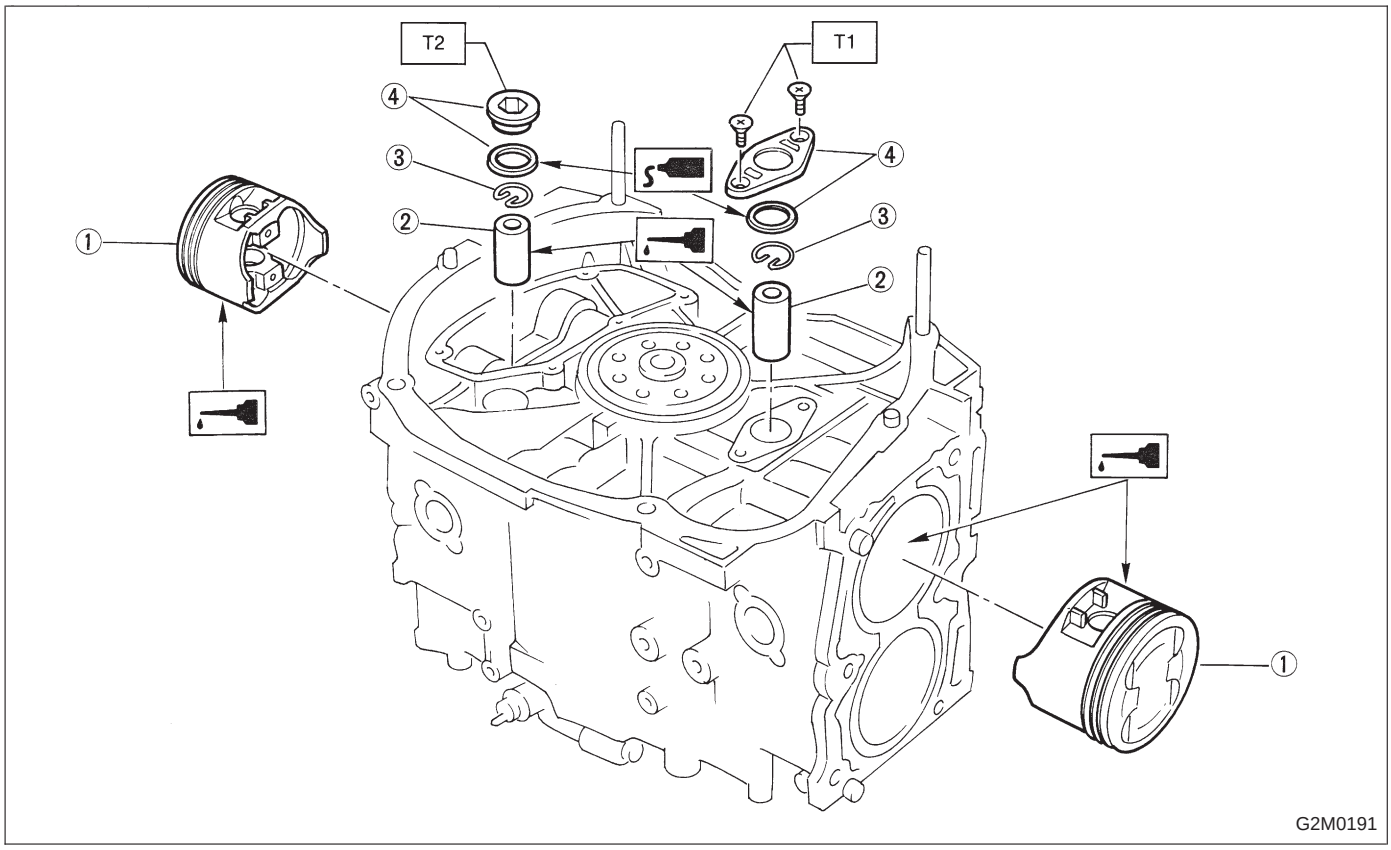
CAUTION:
Use new circlips.

(4) Install service hole plug and gasket.

CAUTION:
Use a new gasket and apply a coat of fluid packing to it before installation.

Fluid packing:
THREE BOND 1215 or equivalent

4. PISTON AND PISTON PIN (#3 AND #4)

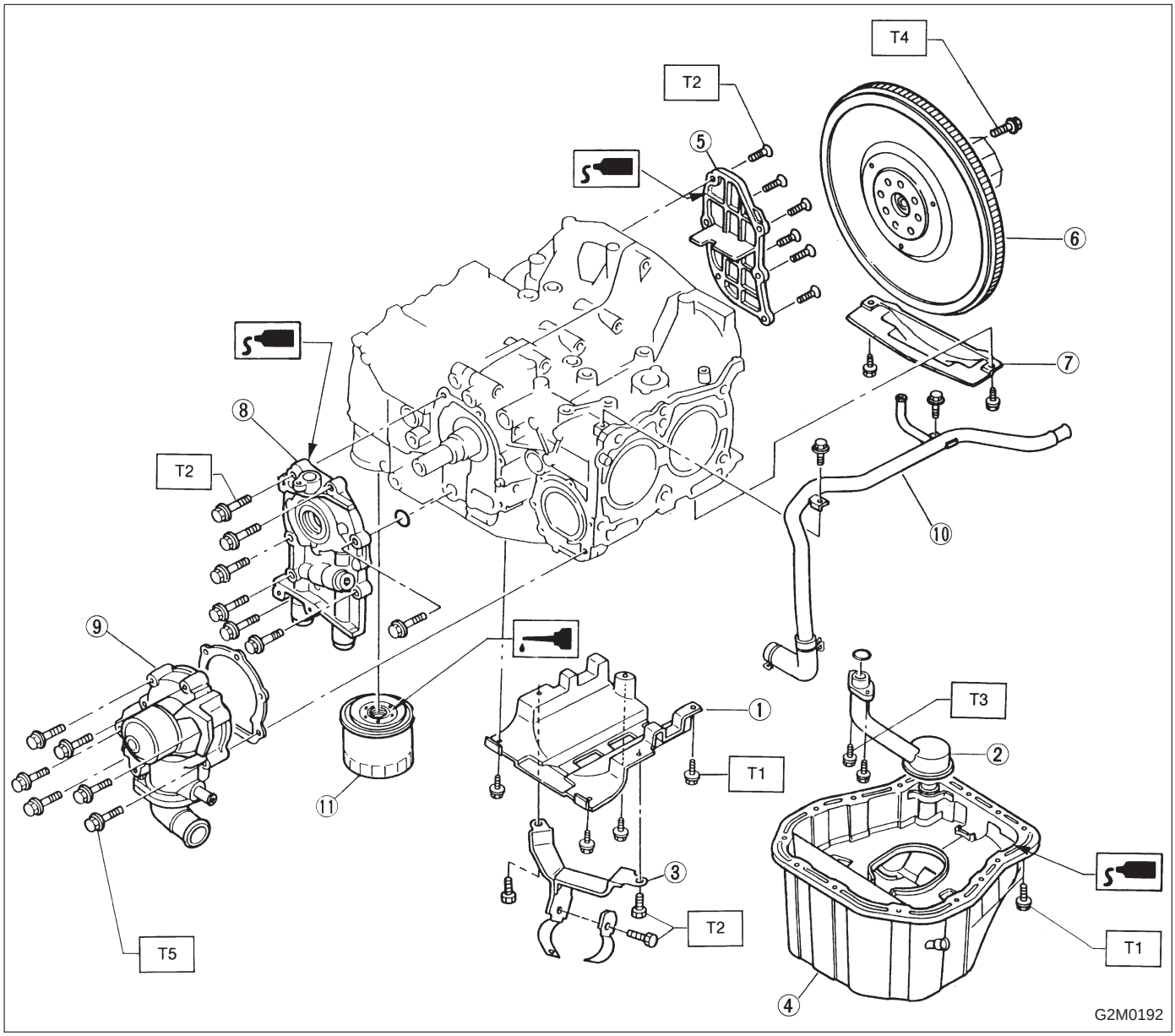


Tightening torque: N·m (kg-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 62 — 76 (6.3 — 7.7, 46 — 56)

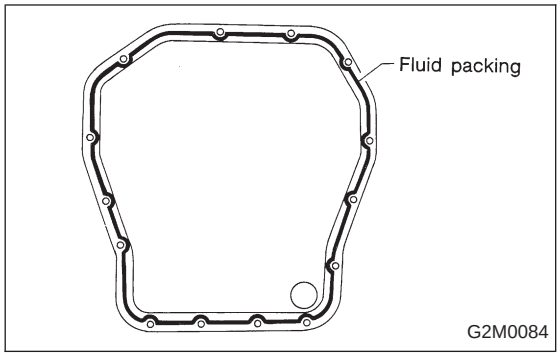
Turn cylinder block so that #3 and #4 cylinders face upward. Using the same procedures as used for #1 and #2 cylinders, install pistons and piston pins.

E: INSTALLATION

1. OIL PUMP AND WATER PUMP

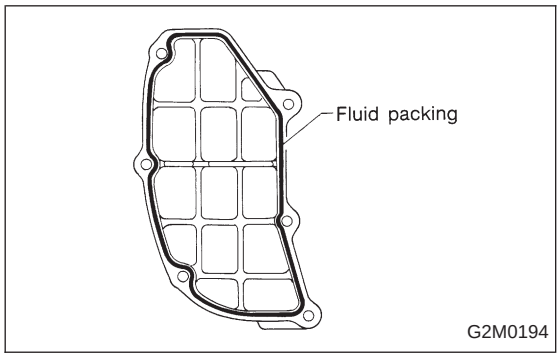


Tightening torque: N·m (kg-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7)
T4: 69 — 75 (7.0 — 7.6, 51 — 55)
T5: First 10 — 14 (1.0 — 1.4, 7 — 10)
Second 10 — 14 (1.0 — 1.4, 7 — 10)



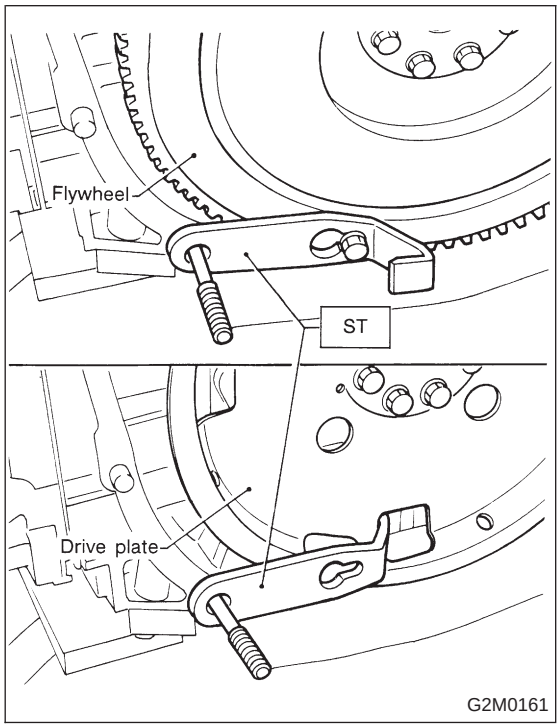
1) Install baffle plate.
2) Install oil strainer and O-ring
3) Install oil strainer stay.
4) Apply fluid packing to matching surfaces and install oil pan.

Fluid packing:
THREE BOND 1207C or equivalent

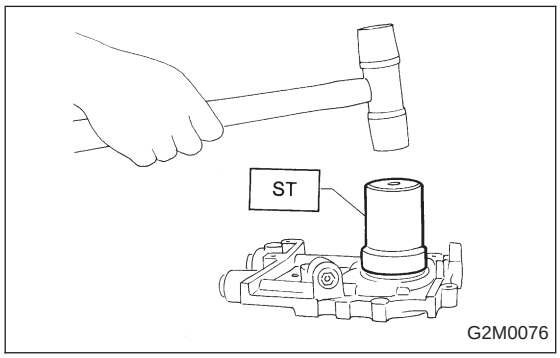


5) Apply fluid packing to matching surfaces and install oil separator cover.

Fluid packing:
THREE BOND 1207C or equivalent

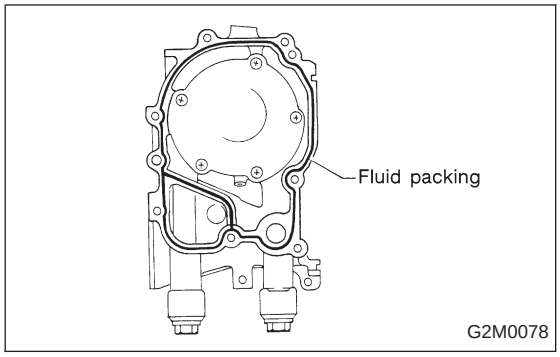


6) Install flywheel or drive plate.
To lock crankshaft, use ST.
ST 498497100 CRANKSHAFT STOPPER
7) Install housing cover.



8) Installation of oil pump.
(1) Discard front oil seal after removal. Replace with a new one by using ST.

ST 499587100 OIL SEAL INSTALLER



(2) Apply fluid packing to matching surface of oil pump.

Fluid packing:

THREE BOND 1215 or equivalent

(3) Install oil pump on cylinder block. Be careful not to damage oil seal during installation.

CAUTION:

● Do not forget to install O-ring and seal when installing oil pump.

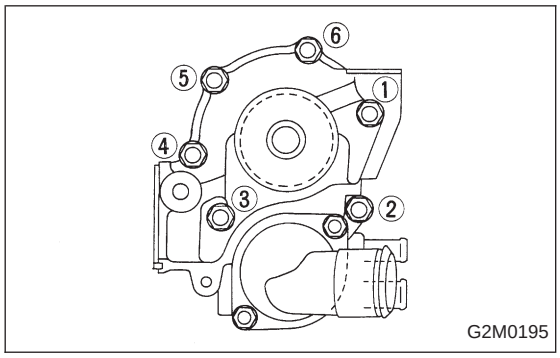
● Align flat surface of oil pump's inner rotor with crankshaft before installation.

9) Install water pump and gasket.

CAUTION:

● Be sure to use a new gasket.

● When installing water pump, tighten bolts in two stages in numerical sequence as shown in Figure.



10) Install water pipes.

11) Install oil filter.

2. RELATED PARTS

1) Install cylinder head and intake manifold.
<Ref. to 2-3 [W6E0].>

2) Install timing belt, camshaft sprocket and related parts.
<Ref. to 2-3 [W3C0].>

1. Engine Trouble in General

Numbers shown in the chart refer to the possibility of reason for the trouble in order (“Very often” to “Rarely”)
1 — Very often
2 — Sometimes
3 — Rarely

TROUBLE													
Engine will not start.				Rough idle and engine stall.	Low output, hesitation and poor acceleration.	Surging.	Engine does not return to idle.	Dieseling (Run-on).	After burning in exhaust system.	Knocking.	Excessive engine oil consumption.	Excessive fuel consumption.	
Starter does not turn.	Initial combustion does not occur.	Initial combustion occurs.	Engine stalls after initial combustion.										**POSSIBLE CAUSE**
													STARTER
2													● Defective battery-to-starter harness.
3													● Defective starter switch.
3													● Defective inhibitor switch.
2	3												● Defective starter.
													BATTERY
1													● Poor terminal connection.
1													● Run-down battery.
2													● Defective charging system.
	1	1	1	1	1	1	1	1	1	1		1	Fuel injection system <Ref. to 2-7 Fuel Injection System (1800 cc model)/2-7b On-Board Diagnostics II System (2200 cc model).>

TROUBLE													
Engine will not start.													
Starter does not turn.	Initial combustion does not occur.	Initial combustion occurs.	Engine stalls after initial combustion.	Rough idle and engine stall.	Low output, hesitation and poor acceleration.	Surging.	Engine does not return to idle.	Dieseling (Run-on).	After burning in exhaust system.	Knocking.	Excessive engine oil consumption.	Excessive fuel consumption.	
													INTAKE SYSTEM
			2	1	1	1			3	1			● Loosened or cracked intake air pipe.
			3	1	1	1			3	1	1		● Loosened or cracked blow-by hose.
			3	1	2	1	1		2	1			● Loosened or cracked vacuum hose.
		2	2	2	2	2				1			● Defective intake manifold gasket.
		2	2	2	2	2				1			● Defective throttle body gasket.
				3	2	2			2	2	2		● Defective PCV valve.
				2	2	2			3	2	3		● Loosened oil filler cap.
			3	3	1	2				2		1	● Dirty air cleaner element.
													FUEL LINE
	1	3		3	2	2							● Defective fuel pump and relay.
		3	3	3	2	2							● Clogged fuel line.
	2	2	2	2	3	3							● Lack of or insufficient fuel.
													BELT
	2	2	2										● Defective.
	2	2	2	3	2	2			2	2		2	● Defective timing.
													FRICTION
3													● Seizure of crankshaft and connecting rod bearing.
3													● Seized camshaft.
3													● Seized or stuck piston and cylinder.
													COMPRESSION
	3	3	3	2	2	2			2	3		2	● Defective hydraulic lash adjuster
	3	3	3	2	2	3			3			3	● Loosened spark plugs or defective gasket.
	3	3	3	2	2	3			3			3	● Loosened cylinder head bolts or defective gasket.
	3	3	3	2	2	3			2			2	● Improper valve seating.
	3	3	3	3	3	3			3		1	3	● Defective valve stem.
	2	2	2	2	2	3			3			3	● Worn or broken valve spring.
	3	3	3	2	3	3			3		1	2	● Worn or stuck piston rings, cylinder and piston.
	2	2	2	1	1	1			1	2		2	● Incorrect valve timing.
	2	2	2	2	2	2							● Improper engine oil (low viscosity).

TROUBLE													
Engine will not start.													
Starter does not turn.	Initial combustion does not occur.	Initial combustion occurs.	Engine stalls after initial combustion.	Rough idle and engine stall.	Low output, hesitation and poor acceleration.	Surging.	Engine does not return to idle.	Dieseling (Run-on).	After burning in exhaust system.	Knocking.	Excessive engine oil consumption.	Excessive fuel consumption.	
													LUBRICATION SYSTEM
				2	2				3			3	● Incorrect oil pressure.
											2		● Loosened oil pump attaching bolts and defective gasket.
											2		● Defective oil filter seal.
											2		● Defective crankshaft oil seal.
				3							2		● Defective rocker cover gasket.
											2		● Loosened oil drain plug or defective gasket.
											2		● Loosened oil pan fitting bolts or defective oil pan.
													COOLING SYSTEM
				3	3	2		2		1			● Overheating.
					3				3			3	● Over cooling.
													OTHERS
				1	1	3			3				● Malfunction of Evaporative Emission Control System.
				2			1						● Stuck or damaged throttle valve.
				3			2	2				2	● Accelerator cable out of adjustment.

2. Engine Noise

Valve lash adjusters may make clicking noise once engine starts. It is normal if clicking noise ceases after a few minutes.
If clicking noise continues after a few minutes, check engine oil level and add oil if necessary.
Then, do as follows to cease clicking noise.
1) Warm-up engine for five minutes.
2) Turn ignition switch OFF.
3) Connect test mode connector.
4) Start the engine and run it at approximately 2,000 rpm for twenty minutes.
5) Turn ignition switch OFF.
6) Disconnect test mode connector.
7) Start the engine and check that clicking noise is ceased.
If noise still exists, conduct troubleshooting procedures in accordance with the following table.

CAUTION:
Do not disconnect spark plug cord while engine is running.

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	Valve mechanism is defective. ● Broken lash adjuster ● Worn valve rocker ● Worn camshaft ● Broken valve spring ● Worn valve lifter hole
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 engine coolant pump shaft

Type of sound	Condition	Possible cause
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

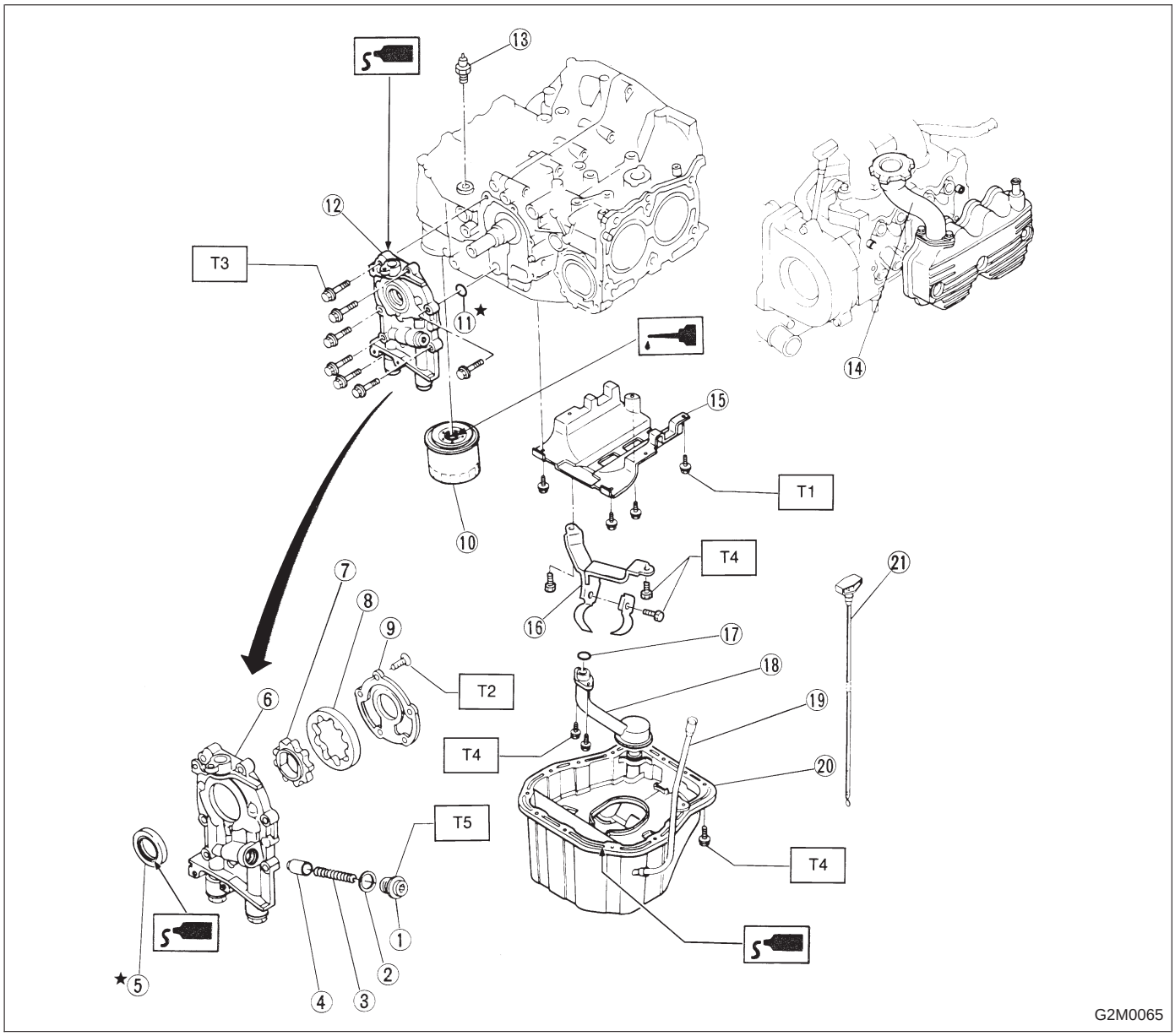
NOTE*:
● When disconnecting fuel injector connector, CHECK ENGINE Malfunction Indicator Lamp (MIL) illuminates and trouble code is stored in ECM memory.
● Therefore, carry out the CLEAR MEMORY MODE after connecting fuel injector connector. (Ref. to 2-7 Fuel Injection System (1800 cc model only).)
● Therefore, carry out the CLEAR MEMORY MODE and INSPECTION MODE after connecting fuel injector connector. (Ref. to 2-7b On-Board Diagnostics II System (2200 cc model only).)

ENGINE LUBRICATION SYSTEM 2-4

1. Specifications

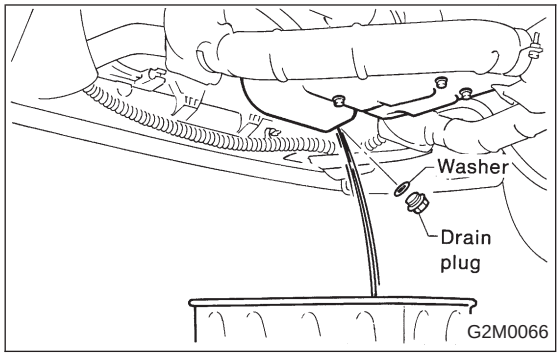
Lubrication method					Forced lubrication
Oil pump	Pump type				Trochoid type
	Number of teeth		Inner rotor		9
			Outer rotor		10
	Outer rotor diameter x thickness				78 x 9 mm (3.07 x 0.35 in)
	Tip clearance between inner and outer rotor			STANDARD	0.04 — 0.14 mm (0.0016 — 0.0055 in)
				LIMIT	0.18 mm (0.0071 in)
	Side clearance between inner rotor and pump case			STANDARD	0.02 — 0.07 mm (0.0008 — 0.0028 in)
				LIMIT	0.15 mm (0.0059 in)
	Case clearance between outer rotor and pump case			STANDARD	0.10 — 0.175 mm (0.0039 — 0.0069 in)
				LIMIT	0.20 mm (0.0079 in)
	Capacity at 80°C (176°F)	600 rpm	Discharge	- pressure	98 kPa (1.0 kg/cm^2, 14 psi) or more
				- quantity	4.2 ℓ (4.4 US qt, 3.7 Imp qt)/min.
		5,000 rpm	Discharge	- pressure	294 kPa (3.0 kg/cm^2, 43 psi) or more
				- quantity	42.0 ℓ (11.10 US gal, 9.24 Imp gal)/min.
	Relief valve operation pressure				490 kPa (5.0 kg/cm^2, 71 psi)
Oil filter	Type				Full-flow filter type
	Filtration area				1,000 cm^2 (155 sq in)
	By-pass valve opening pressure				156 kPa (1.6 kg/cm^2, 23 psi)
	Outer diameter x width				80 x 70 mm (3.15 x 2.76 in)
	Oil filter to engine thread size				M 20 x 1.5
Relief valve (on rocker shaft) operation pressure					69 kPa (0.7kg/cm^2, 10 psi)
Oil pressure switch	Type				Immersed contact point type
	Working voltage — wattage				12 V — 3.4 W or less
	Warning light activation pressure				14.7 kPa (0.15 kg/cm^2, 2.1 psi)
	Proof pressure				More than 981 kPa (10 kg/cm^2, 142 psi)
Oil capacity (at replacement)					4.0 ℓ (4.2 US qt, 3.5 Imp qt)

1. Lubrication System



① Plug
② Washer
③ Relief valve spring
④ Relief valve
⑤ Oil seal
⑥ Oil pump case
⑦ Inner rotor
⑧ Outer rotor
⑨ Oil pump cover
⑩ Oil filter
⑪ O-ring
⑫ Oil pump ASSY
⑬ Oil pressure switch
⑭ Oil filler duct
⑮ Baffle plate
⑯ Oil strainer stay
⑰ O-ring
⑱ Oil strainer
⑲ Oil level gauge guide
⑳ Oil pan
㉑ Oil level gauge

Tightening torque: N·m (kg-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 5 — 6 (0.5 — 0.6, 3.6 — 4.3)
T3: 6.4 (0.65, 4.7)
T4: 9.8 (1.0, 7.0)
T5: 40.7 — 47.6 (4.15 — 4.85, 30.0 — 35.1)

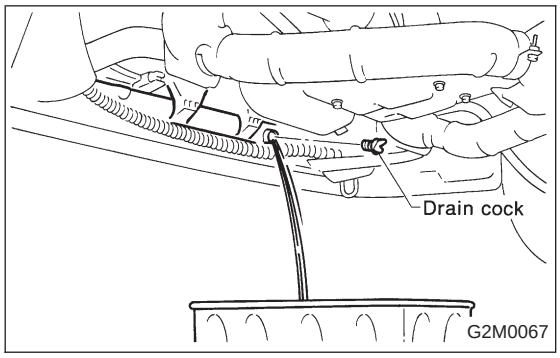


1. Oil Pump

A: REMOVAL

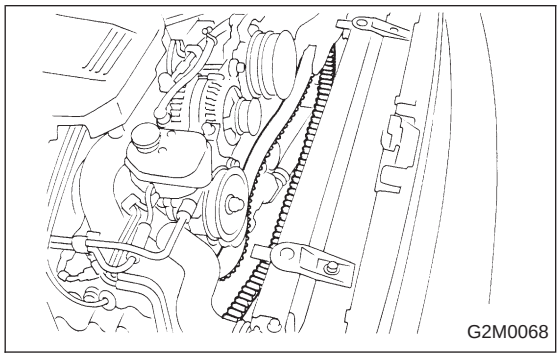
1) Drain engine oil.

Set container under the vehicle, and remove drain plug from oil pan.

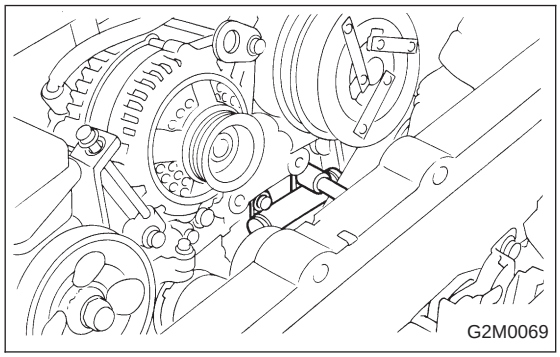


2) Drain coolant.

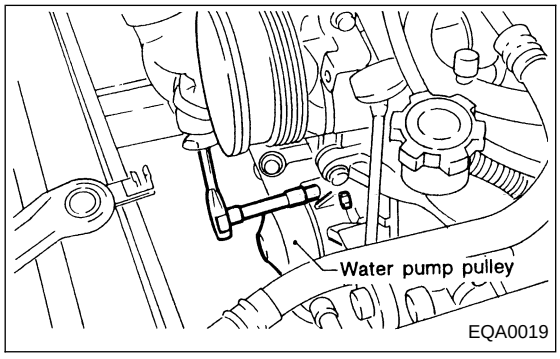
Set container under the vehicle, and remove drain cock from radiator.



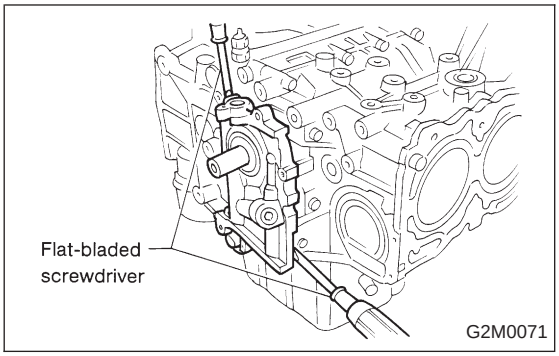
3) Remove belt covers, timing belt and related parts. <Ref. to 1-5 [W2A0].>



4) Remove belt tensioner bracket.

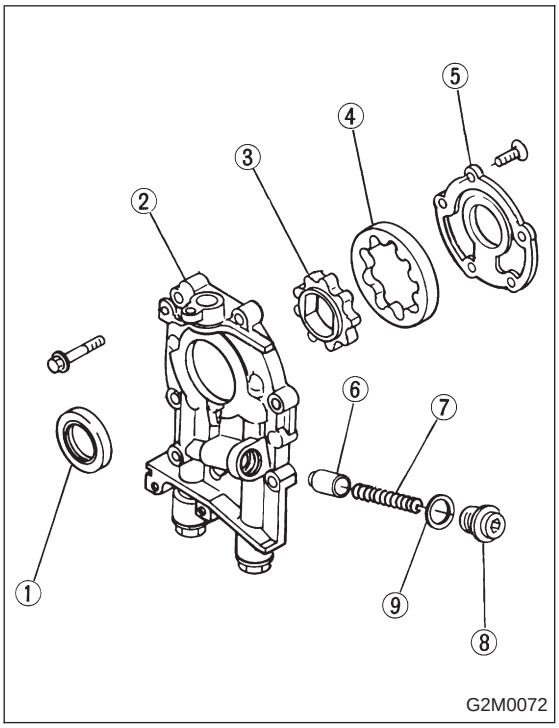


5) Remove left cam sprocket and left belt cover No. 2.
6) Remove water pump.



7) Remove oil pump by using flat-bladed screwdriver.

CAUTION:
Be careful not to scratch mating surfaces of cylinder block and oil pump.

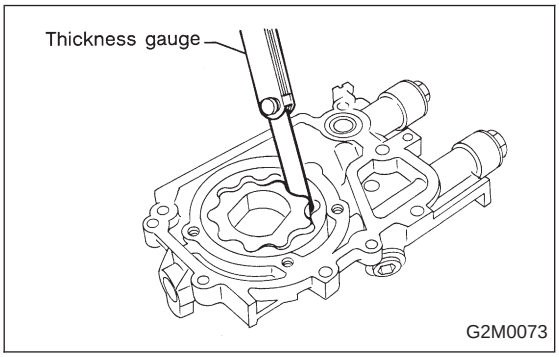


B: DISASSEMBLY

Remove screws which secure oil pump cover and disassemble oil pump.
Inscribe alignment marks on inner and outer rotors so that they can be replaced in their original positions during reassembly.

CAUTION:
Before removing relief valve, loosen plug when removing oil pump from cylinder block.

① Oil seal
② Pump case
③ Inner rotor
④ Outer rotor
⑤ Pump cover
⑥ Relief valve
⑦ Relief spring
⑧ Plug
⑨ Washer

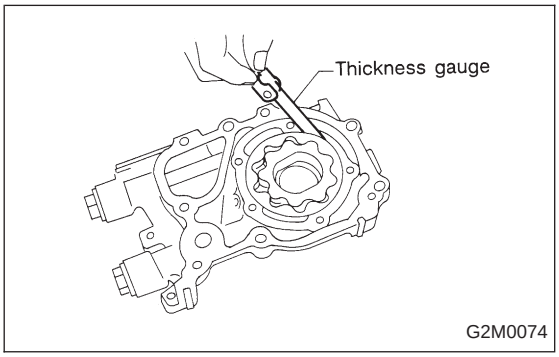


C: INSPECTION

1. TIP CLEARANCE

Measure the tip clearance of rotors. If the clearance exceeds the limit, replace rotors as a matched set.

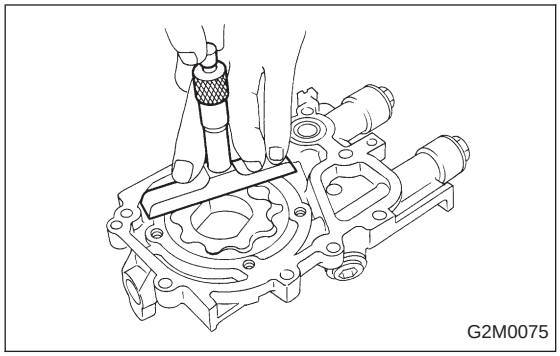
Tip clearance:
Standard
0.04 — 0.14 mm (0.0016 — 0.0055 in)
Limit
0.18 mm (0.0071 in)



2. CASE CLEARANCE

Measure the clearance between the outer rotor and the cylinder block rotor housing. If the clearance exceeds the limit, replace the rotor.

Case clearance:
Standard
0.10 — 0.175 mm (0.0039 — 0.0069 in)
Limit
0.20 mm (0.0079 in)


G2M0075

3. SIDE CLEARANCE

Measure clearance between oil pump inner rotor and pump cover. If the clearance exceeds the limit, replace rotor or pump body.

Side clearance:
Standard
0.02 — 0.07 mm (0.0008 — 0.0028 in)
Limit
0.15 mm (0.0059 in)

4. OIL RELIEF VALVE

Check the valve for fitting condition and damage, and the relief valve spring for damage and deterioration. Replace the parts if defective.

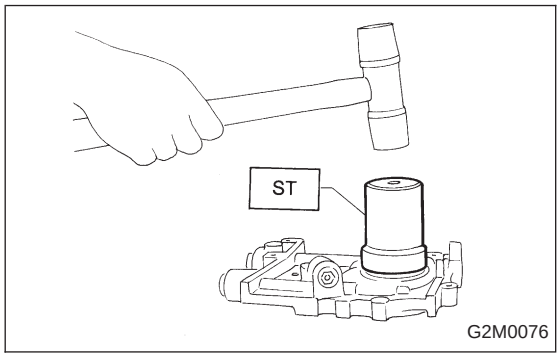
Relief valve spring:
Free length; 71.8 mm (2.827 in)
Installed length; 54.7 mm (2.154 in)
Load when installed; 77.08 N (7.86 kg, 17.33 lb)

5. OIL PUMP CASE

Check the oil pump case for worn shaft hole, clogged oil passage, worn rotor chamber, cracks, and other faults.

6. OIL SEAL

Check the oil seal lips for deformation, hardening, wear, etc. and replace if defective.



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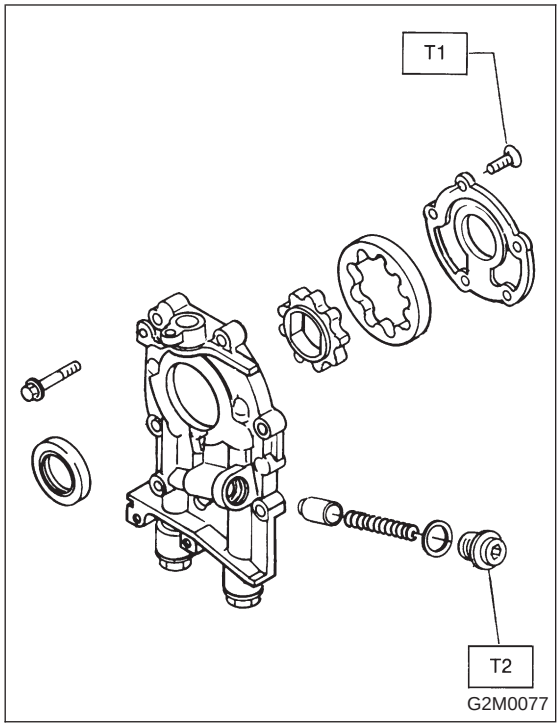
D: ASSEMBLY

1) Install front oil seal by using ST.

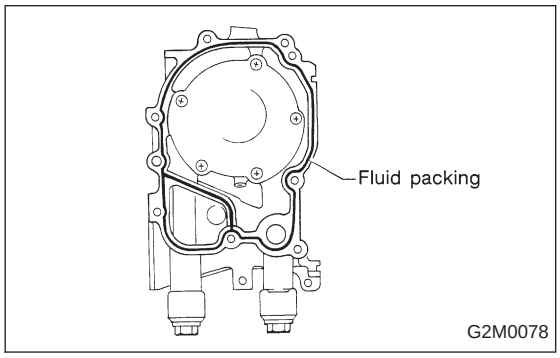
ST 499587100 OIL SEAL INSTALLER

CAUTION:
Use a new oil seal.



2) Install inner and outer rotors in their original positions.
3) Install oil relief valve and relief spring.
4) Install oil pump cover.

Tightening torque:
T1: 5 — 6 N·m (0.5 — 0.6 kg-m, 3.6 — 4.3 ft-lb)
T2: 40.7 — 47.6 N·m
(4.15 — 4.85 kg-m, 30.0 — 35.1 ft-lb)



E: INSTALLATION

Installation is in the reverse order of removal.

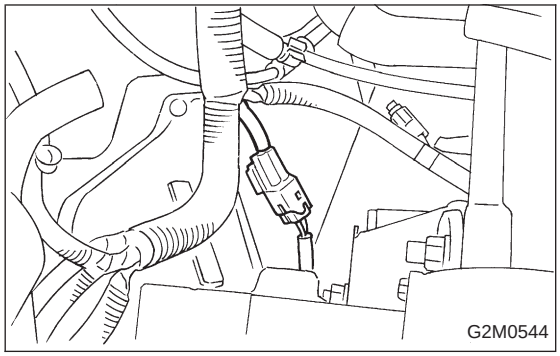
Observe the following:
1) Apply fluid packing to matching surfaces of oil pump.

Fluid packing:
THREE BOND 1215 or equivalent

2) Replace O-ring with a new one.
3) Be careful not to scratch oil seal when installing oil pump on cylinder block.

CAUTION:
Apply fluid packing to oil pressure switch threads before installation.

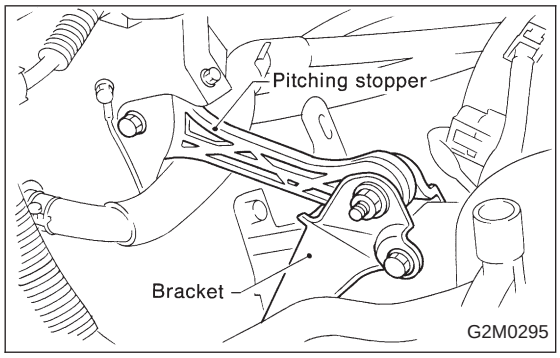
Fluid packing:
THREE BOND 1215 or equivalent



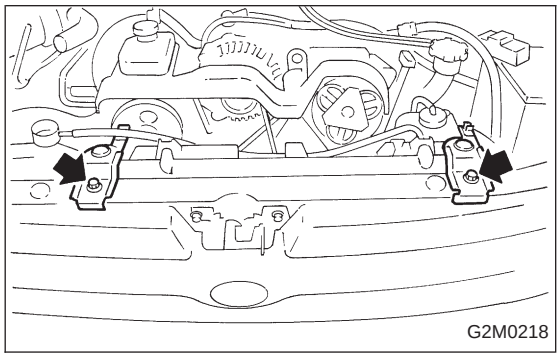
2. Oil Pan and Oil Strainer

A: REMOVAL

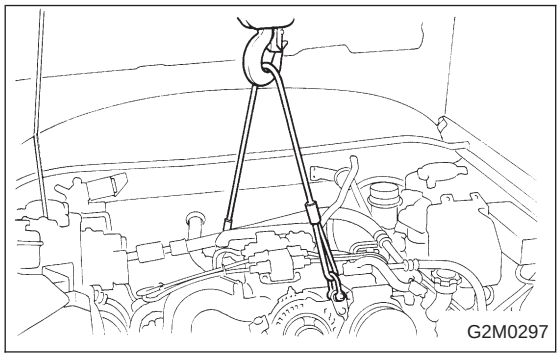
1) Remove front wheels.
2) Remove air intake duct.
3) Disconnect connector from front oxygen sensor.



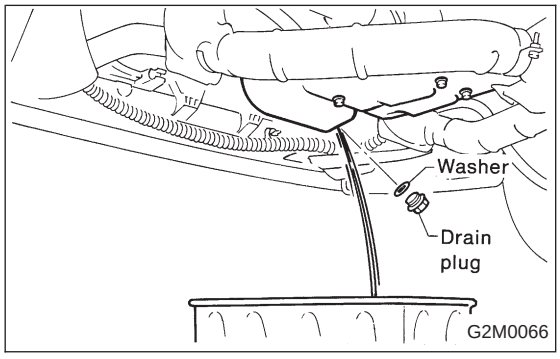
4) Remove pitching stopper.



5) Remove radiator upper brackets.



6) Support engine with a lifting device and wire ropes.

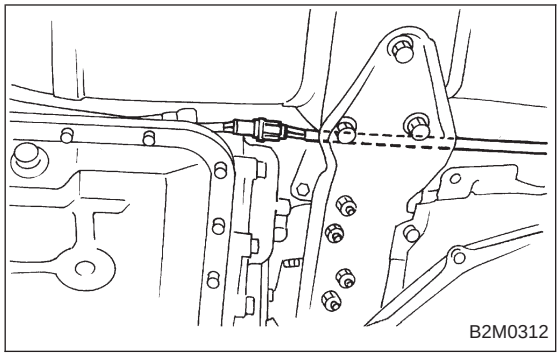


7) Lift-up the vehicle.

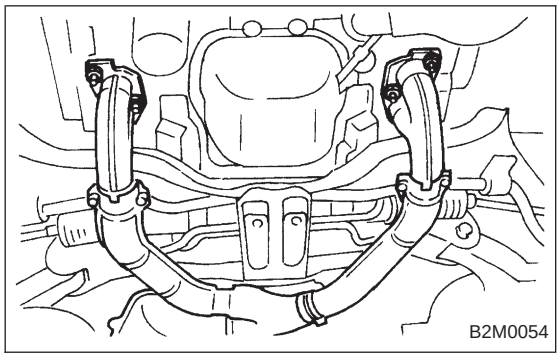
CAUTION:
At this time, raise up wire ropes.

8) Drain engine oil.

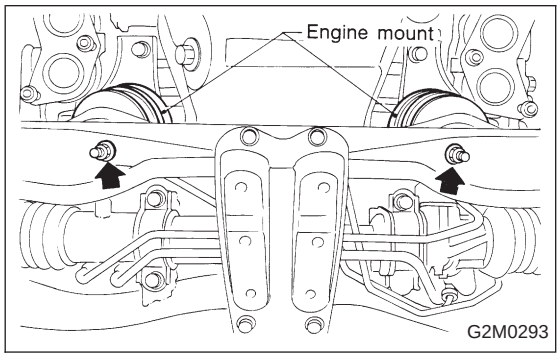
Set container under the vehicle, and remove drain plug from oil pan.


B2M0312

9) Disconnect connector from rear oxygen sensor. (2200 cc)

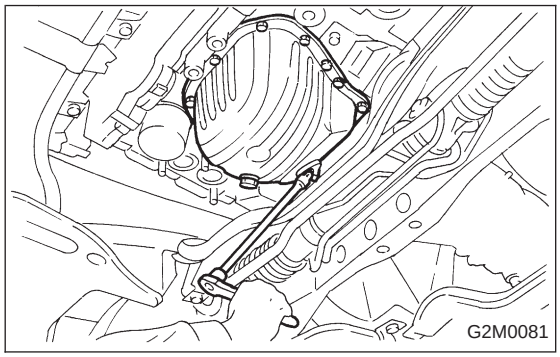

B2M0054

10) Remove front exhaust pipe.
(1) Separate front catalytic converter from center exhaust pipe.
(2) Remove front exhaust pipe from engine.
(3) Remove bolt which installs front exhaust pipe on bracket.



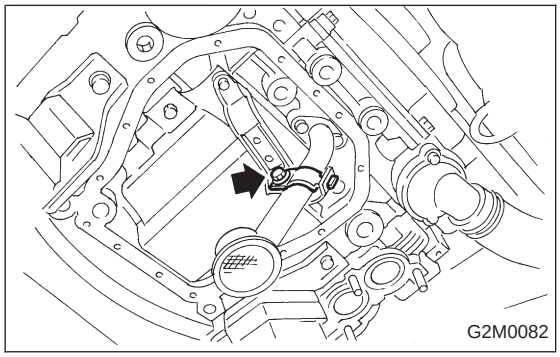
G2M0293

11) Remove nuts which install front cushion rubber onto front crossmember.

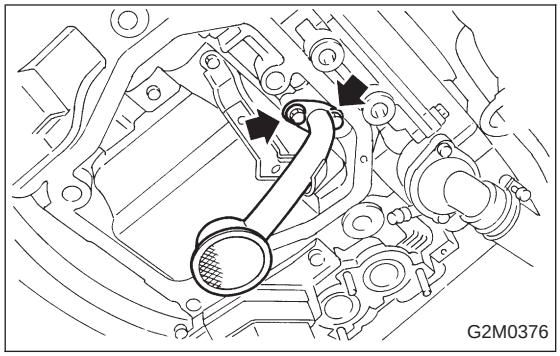

G2M0081

12) Remove bolts which install oil pan on cylinder block while raising up engine.
13) Insert oil pan cutter blade between cylinder block-to-oil pan clearance.

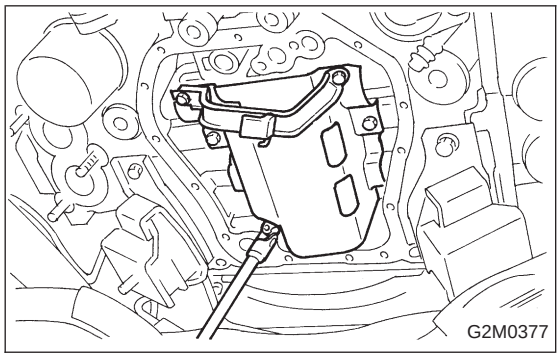
CAUTION:
Do not use a screwdriver or similar tool in place of oil pan cutter.


G2M0082

14) Separate oil strainer from oil strainer stay.



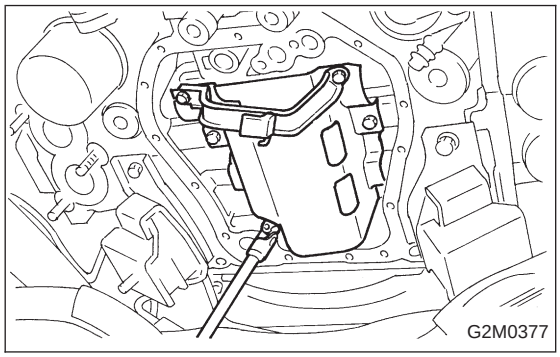
15) Remove oil strainer.



16) Remove baffle plate and oil strainer stay.

B: INSPECTION

By visual check make sure oil pan, oil strainer, oil strainer stay and baffle plate are not damaged.

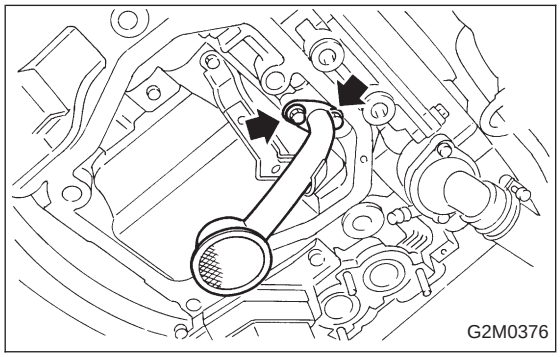


C: INSTALLATION

CAUTION:
Before installing oil pan, clean sealant from oil and engine block.

1) Install baffle plate and oil strainer stay.

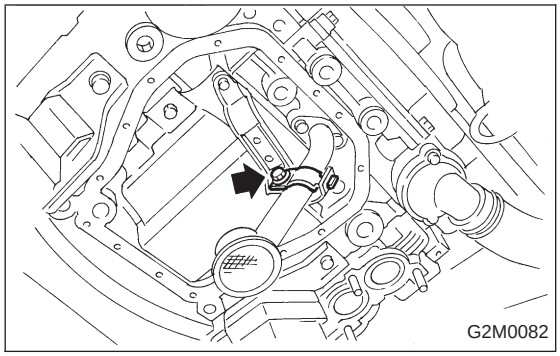
Tightening torque:
5 N·m (0.5 kg-m, 3.6 ft-lb)



2) Install oil strainer onto baffle plate.

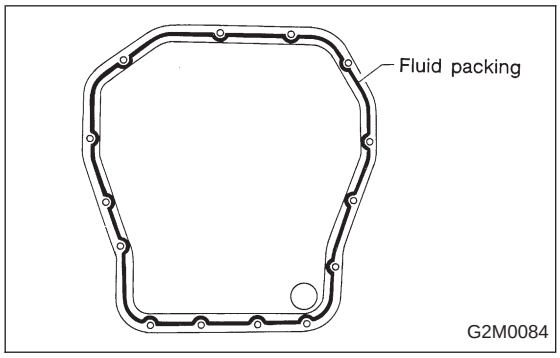
CAUTION:
Replace O-ring with a new one.

Tightening torque:
9.8 N·m (1.0 kg-m, 7 ft-lb)



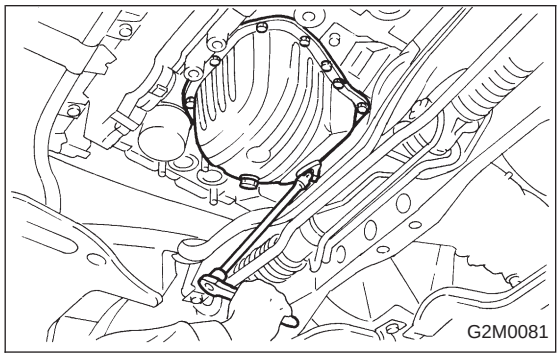
3) Hold oil strainer to oil strainer stay.

Tightening torque:
9.8 N·m (1.0 kg-m, 7 ft-lb)



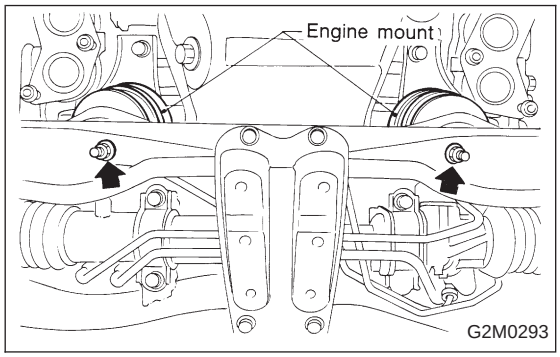
4) Apply fluid packing to mating surfaces and install oil pan.

Fluid packing:
THREE BOND 1215 or equivalent



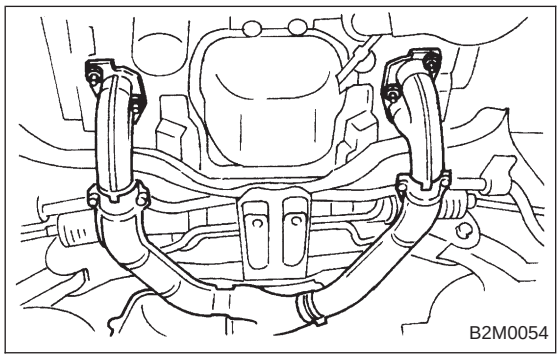
5) Tighten bolts which install oil pan onto engine block.

Tightening torque:
9.8 N·m (1.0 kg-m, 7 ft-lb)



6) Lower engine onto front crossmember.
7) Tighten nuts which install front cushion rubber onto front crossmember.

Tightening torque:
54 — 83 N·m (5.5 — 8.5 kg-m, 40 — 61 ft-lb)

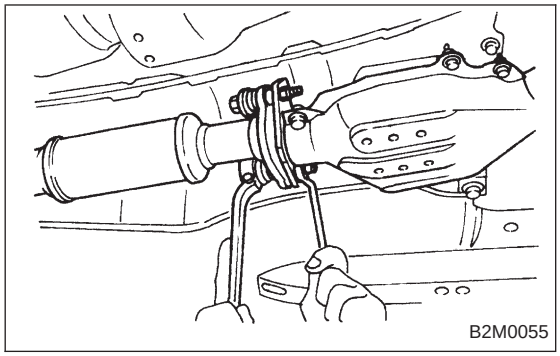


8) Install front exhaust pipe.

CAUTION:
Always use the new gaskets.

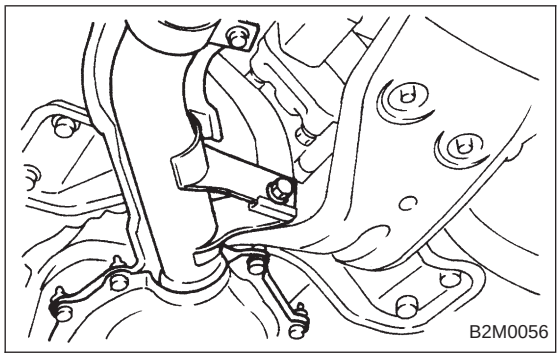
(1) Place front exhaust pipe on bracket.
(2) Tighten nuts which install front exhaust pipe on engine.

Tightening torque:
25 — 35 N·m (2.6 — 3.6 kg-m, 18 — 26 ft-lb)


B2M0055

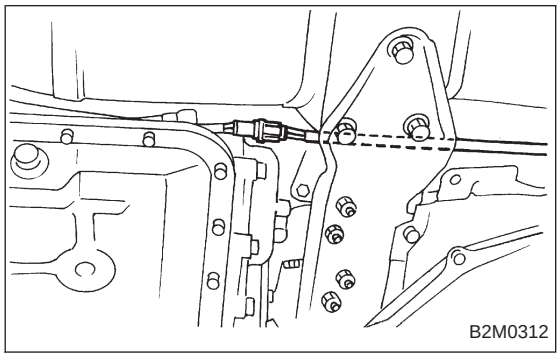
(3) Tighten nuts which install front catalytic converter to center exhaust pipe.

Tightening torque:
30 — 40 N·m (3.1 — 4.1 kg-m, 22 — 30 ft-lb)

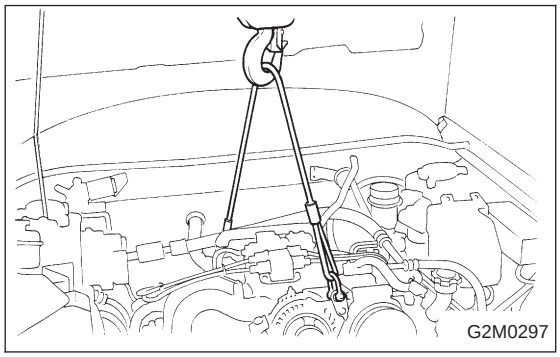

B2M0056

(4) Tighten bolt which installs front exhaust pipe on bracket.

Tightening torque:
21 — 26 N·m (2.1 — 2.7 kg-m, 15 — 20 ft-lb)


B2M0312

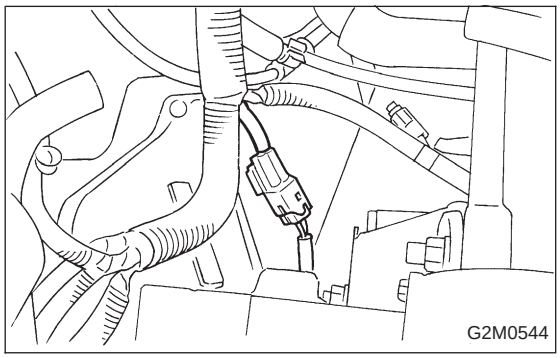
9) Connect connector to rear oxygen sensor. (2200 cc)


G2M0297

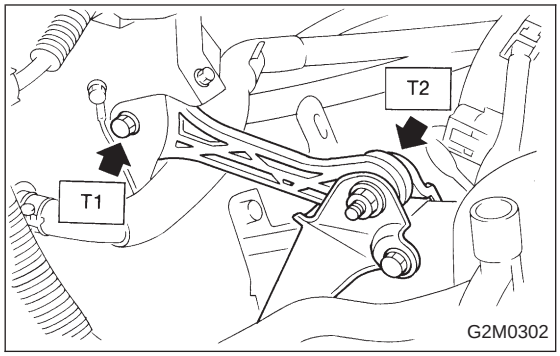
10) Lower the vehicle.

CAUTION:
At this time, lower lifting device and release steel cables.

11) Remove lifting device and steel cables.

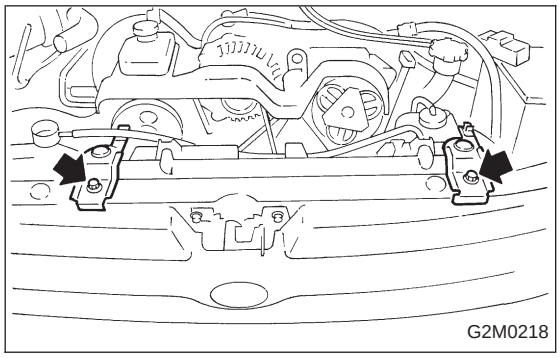

G2M0544

12) Connect connector to front oxygen sensor.

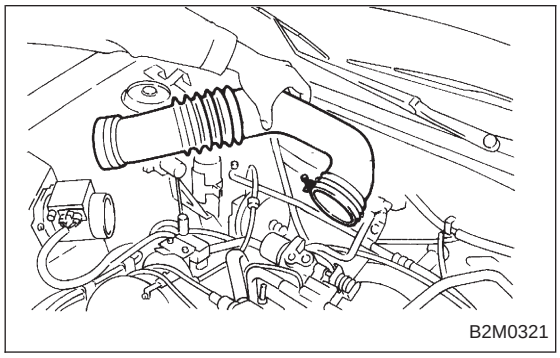


13) Install pitching stopper.

Tightening torque:
T1: 44 — 54 N·m (4.5 — 5.5 kg-m, 33 — 40 ft-lb)
T2: 47 — 67 N·m (4.8 — 6.8 kg-m, 35 — 49 ft-lb)



14) Install radiator upper brackets.

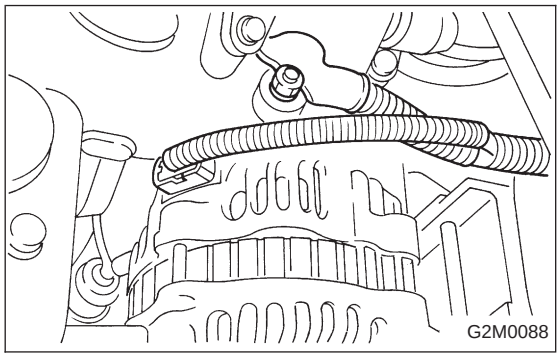


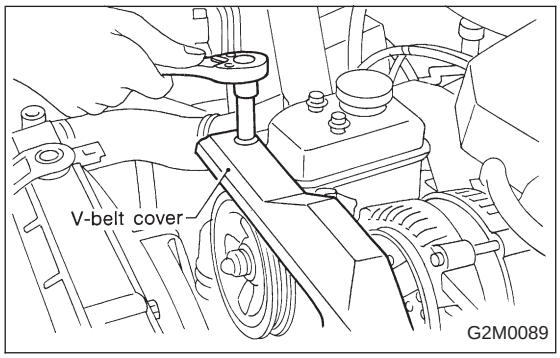
15) Install air intake duct.

3. Oil Pressure Switch

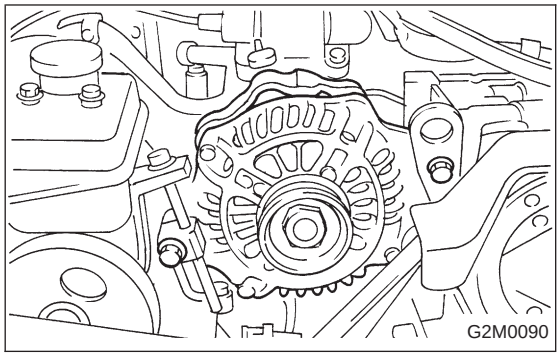
A: REMOVAL

1) Remove alternator from bracket.
(1) Disconnect connector and terminal from generator.

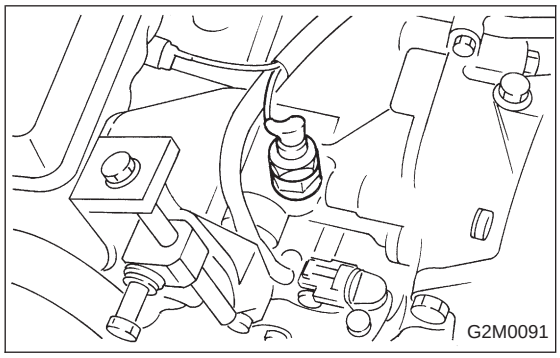




(2) Remove V-belt cover.
(3) Loosen lock bolt and slider bolt, and remove front side V-belt.

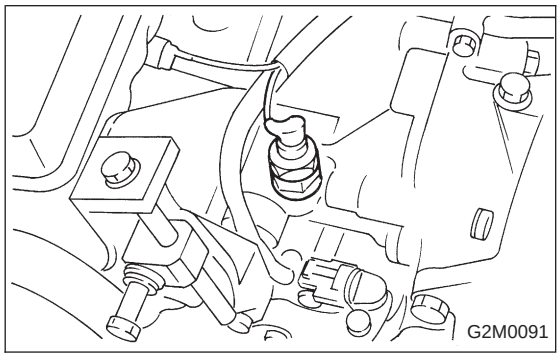


(4) Remove bolts which install generator on bracket.



2) Disconnect terminal from oil pressure switch.
3) Remove oil pressure switch.

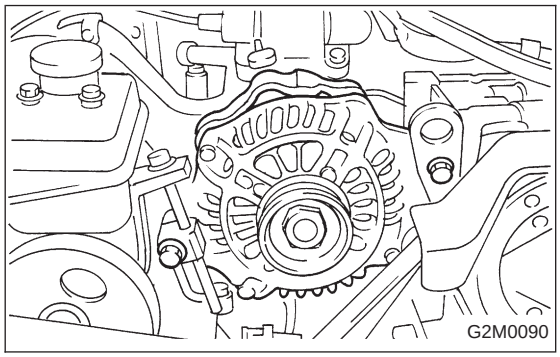
B: INSTALLATION



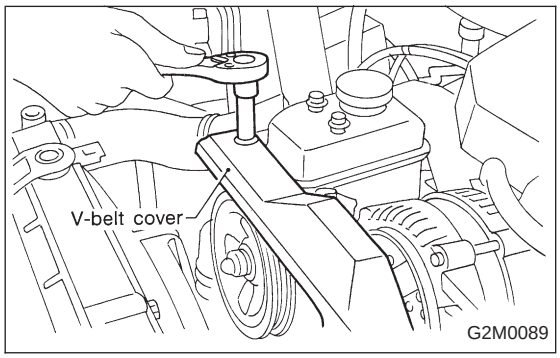
1) Install oil pressure switch onto engine block.

Tightening torque:
25±3 N·m (2.5±0.3 kg-m, 18.1±2.2 ft-lb)

2) Connect terminal of oil pressure switch.

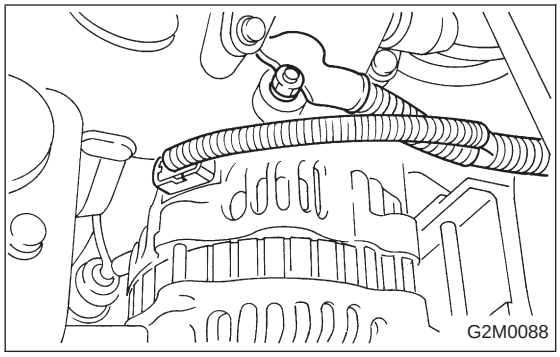


3) Install generator on bracket and temporary tighten installing bolts.



4) Install front side V-belt and adjust it.
<Ref. to 1-5 [01A0].>

5) Install V-belt cover.



6) Connect connector and terminal to generator.

1. Engine Lubrication System

Before troubleshooting, make sure that the engine oil level is correct and no oil leakage exists.

Trouble	Possible cause		Corrective action
1. Warning light remains on.	1) Oil pressure switch failure	Cracked diaphragm or oil leakage within switch	Replace.
		Broken spring or seized contacts	Replace.
	2) Low oil pressure	Clogged oil filter	Replace.
		Malfunction of oil by-pass valve of oil filter	Clean or replace.
		Malfunction of oil relief valve of oil pump	Clean or replace.
		Clogged oil passage	Clean.
		Excessive tip clearance and side clearance of oil pump rotor and gear	Replace.
		Clogged oil strainer or broken pipe	Clean or replace.
	3) No oil pressure	Insufficient engine oil	Replenish.
		Broken pipe of oil strainer	Replace.
		Stuck oil pump rotor	Replace.
2. Warning light does not go on.	1) Burn-out bulb		Replace.
	2) Poor contact of switch contact points		Replace.
	3) Disconnection of wiring		Repair.
3. Warning light flickers momentarily.	1) Poor contact at terminals		Repair.
	2) Defective wiring harness		Repair.
	3) Low oil pressure		Check for the same possible causes as listed in 1.—2)

ENGINE COOLING SYSTEM 2-5

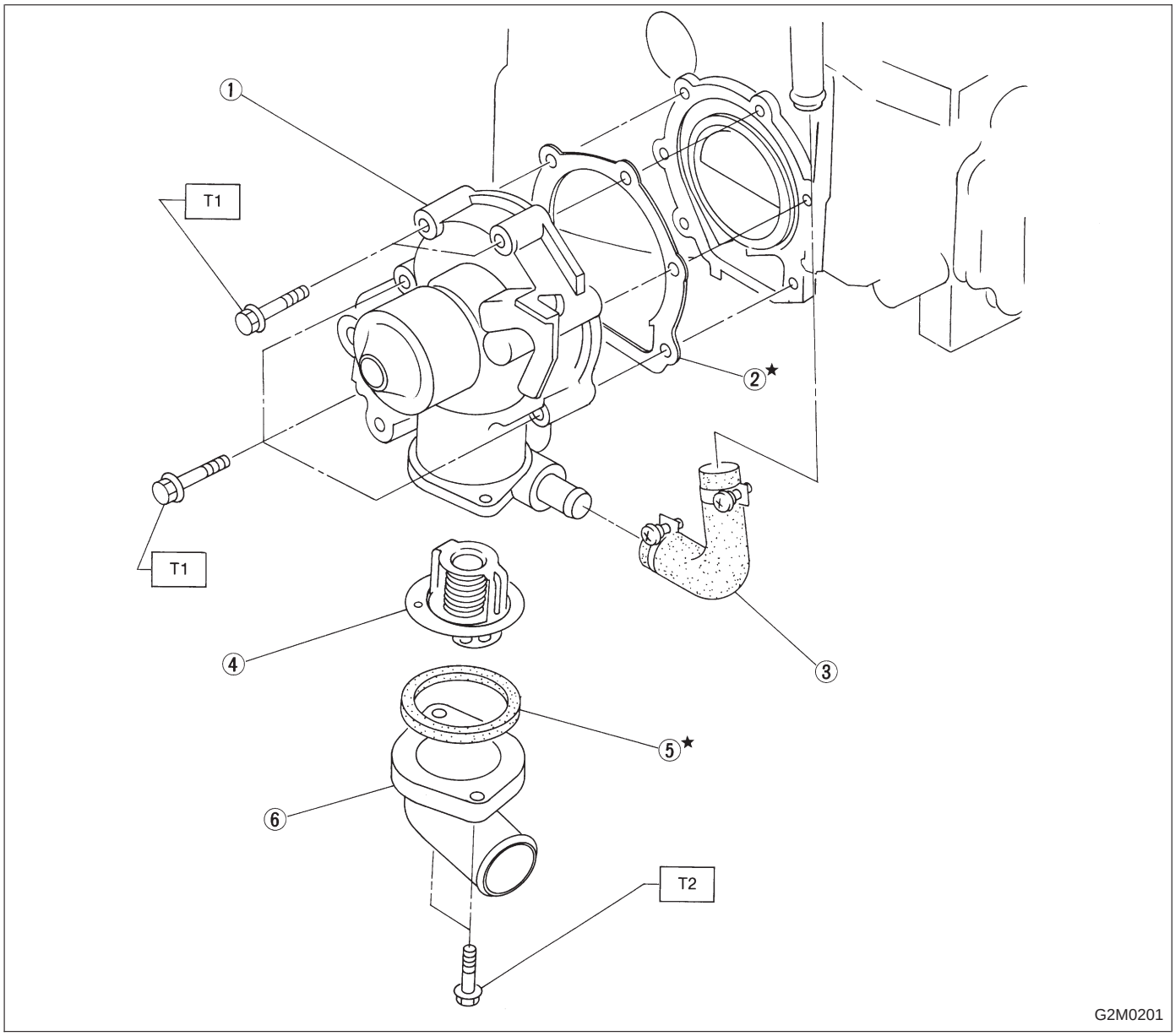
1. Specifications

Cooling system			Electric fan + Forced engine coolant circulation system
Total engine coolant capacity ℓ (US qt, Imp qt)		MT model	6.4 (6.8, 5.6)
		AT model	6.35 (6.7, 5.6)
Engine coolant pump	Type		Centrifugal impeller type
	Discharge performance I	Discharge	20 ℓ (5.3 US gal, 4.4 Imp gal)/min.
		Pump speed—total engine coolant head	760 rpm — 0.3 mAq (1.0 ftAq)
		Engine coolant temperature	85°C (185°F)
	Discharge performance II	Discharge	100 ℓ (26.4 US gal, 22.0 Imp gal)/min.
		Pump speed—total engine coolant head	3,000 rpm — 5.0 mAq (16.4 ftAq)
		Engine coolant temperature	85°C (185°F)
	Discharge performance III	Discharge	200 ℓ (52.8 US gal, 44.0 Imp gal)/min.
		Pump speed—total engine coolant head	6,000 rpm — 23.0 mAq (75.5 ftAq)
		Engine coolant temperature	85°C (185°F)
	Impeller diameter		76 mm (2.99 in)
	Number of impeller vanes		8
	Pump pulley diameter		60 mm (2.36 in)
Thermostat	Type		Wax pellet type
	Starts to open		76 — 80°C (169 — 176°F)
	Fully opened		91°C (196°F)
	Valve lift		9.0 mm (0.354 in) or more
	Valve bore		35 mm (1.38 in)
Radiator fan	Motor		120 W
	Fan diameter x Blade		320 mm (12.60 in) x 4
Radiator	Type		Down flow, pressure type
	Core dimensions		670 x 361 x 16 mm (26.38 x 14.21 x 0.63 in)
	Pressure range in which cap valve is open		Above: 88±10 kPa (0.9±0.1 kg/cm^2, 12.8±1.4 psi) Below: − 4.9 to − 9.8 kPa (−0.05 to −0.1 kg/cm^2, −0.7 to −1.4 psi)
	Fins		Corrugated fin type
Reservoir tank	Capacity		0.55 ℓ (0.6 US qt, 0.5 Imp qt)

2. Service Data

Engine coolant pump	Clearance between impeller and case	Standard Limit	0.5 — 0.7 mm (0.020 — 0.028 in) 1.0 mm (0.039 in)
	“Thrust” runout of impeller end		0.5 mm (0.020 in)

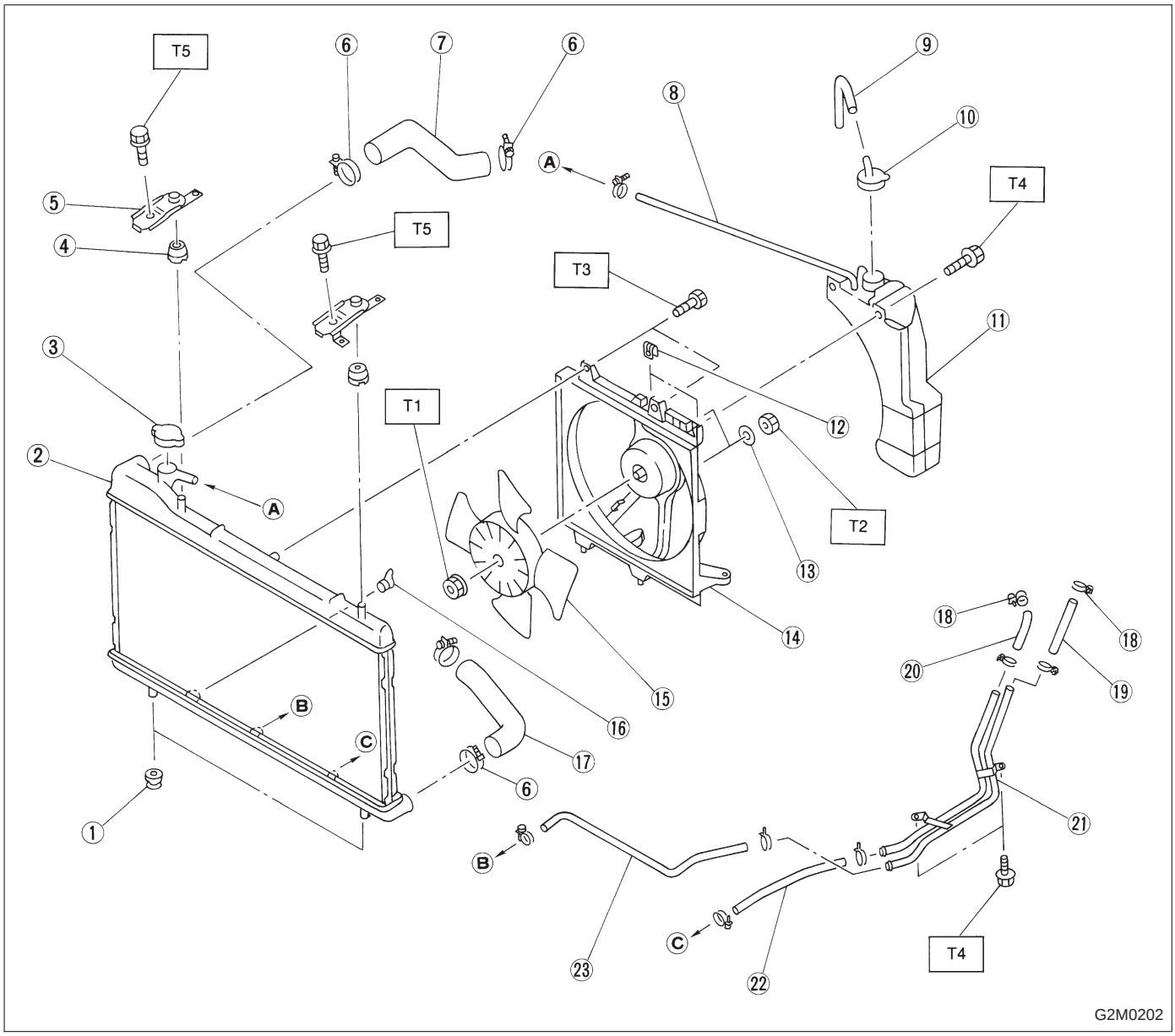
1. Engine Coolant Pump



① Engine coolant pump ASSY
② Gasket
③ Heater hose
④ Thermostat
⑤ Gasket
⑥ Thermostat case

Tightening torque: N·m (kg-m, ft-lb)
T1: First 10 — 14 (1.0 — 1.4, 7 — 10)
Second 10 — 14 (1.0 — 1.4, 7 — 10)
T2: 6 — 7 (0.6 — 0.7, 4.3 — 5.1)

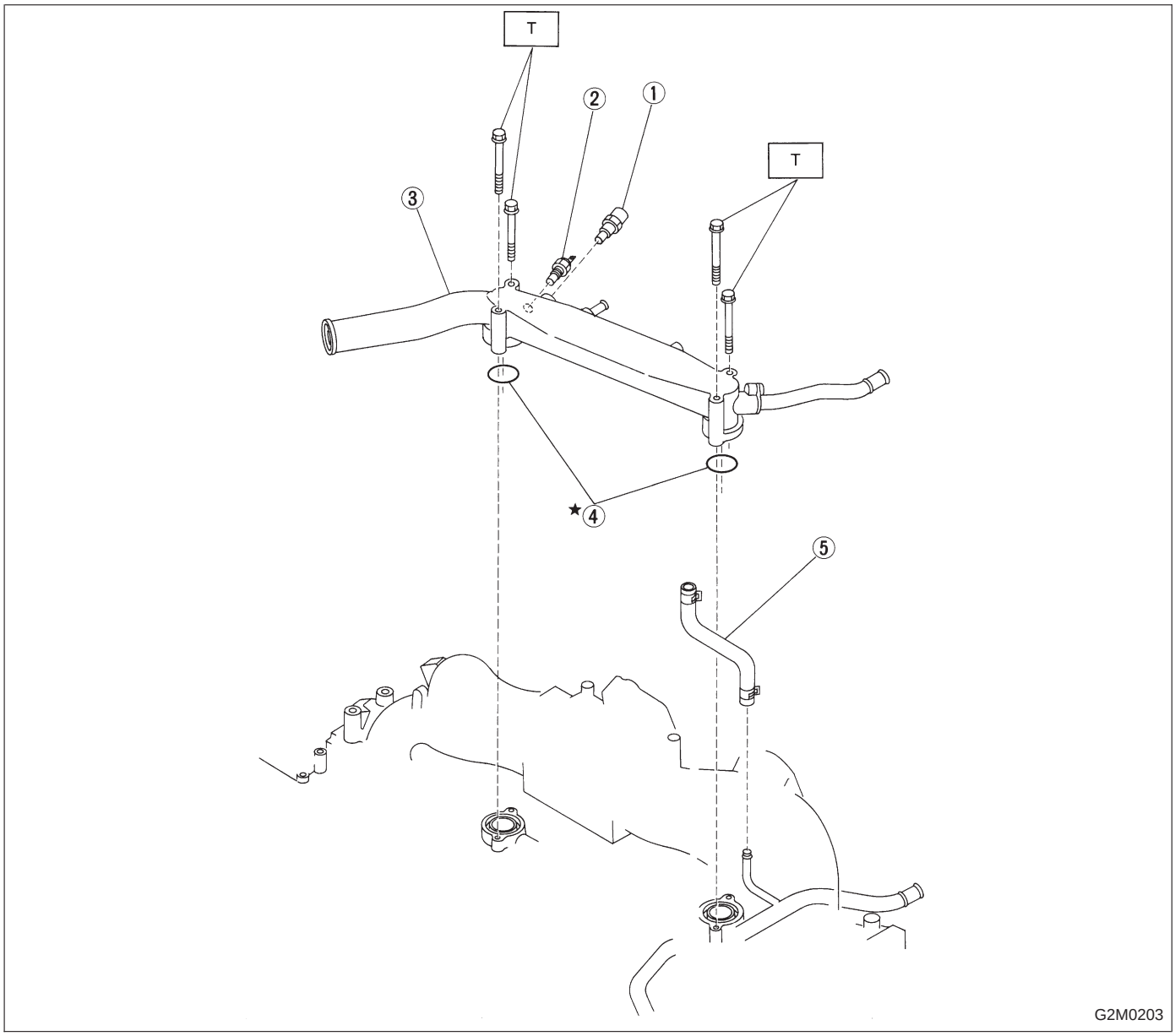
2. Radiator and Radiator Fan



① Radiator lower cushion
② Radiator
③ Radiator cap
④ Radiator upper cushion
⑤ Radiator upper bracket
⑥ Clamp
⑦ Radiator inlet hose
⑧ Over flow hose
⑨ Air vent hose
⑩ Engine coolant reservoir tank cap
⑪ Engine coolant reservoir tank
⑫ Clip
⑬ Washer
⑭ Radiator main fan motor ASSY
⑮ Radiator main fan
⑯ Radiator drain plug
⑰ Radiator outlet hose
⑱ ATF hose clamp
⑲ ATF inlet hose A
⑳ ATF outlet hose A
㉑ ATF pipe
㉒ ATF outlet hose B
㉓ ATF inlet hose B

Tightening torque: N·m (kg-m, ft-lb)
T1: 1.5 — 2.5 (0.15 — 0.25, 1.1 — 1.8)
T2: 3 — 4 (0.3 — 0.4, 2.2 — 2.9)
T3: 3 — 5 (0.3 — 0.5, 2.2 — 3.6)
T4: 5.4 — 9.3 (0.55 — 0.95, 4.0 — 6.9)
T5: 13 — 23 (1.3 — 2.3, 9 — 17)

3. Engine Coolant Pipe



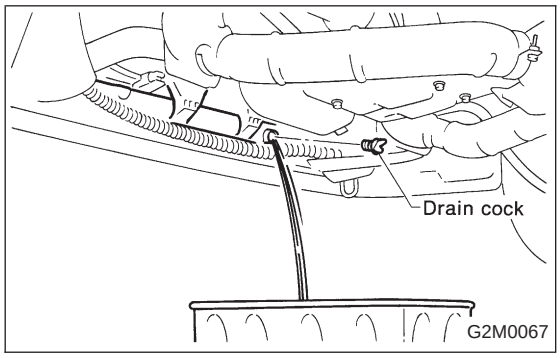
① Engine coolant temperature sensor
② Engine coolant temperature gauge
③ Engine coolant pipe
④ O-ring
⑤ By-pass hose

Tightening torque: N·m (kg-m, ft-lb)
T: 6 — 7 (0.6 — 0.7, 4.3 — 5.1)

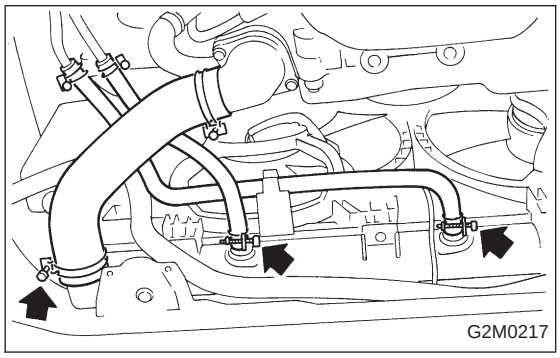
1. Engine Coolant Pump

A: REMOVAL

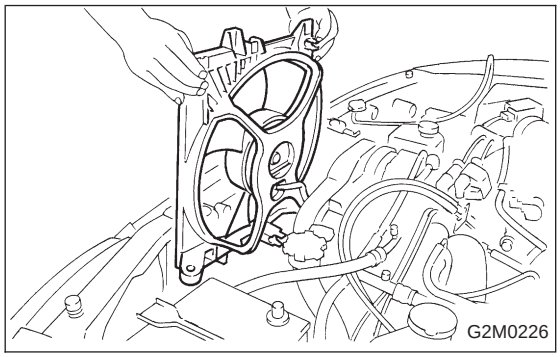
1) Open front hood.
2) Disconnect ground cable from the battery.



3) Drain engine coolant completely.
Set container under the vehicle, and remove drain cock from radiator.

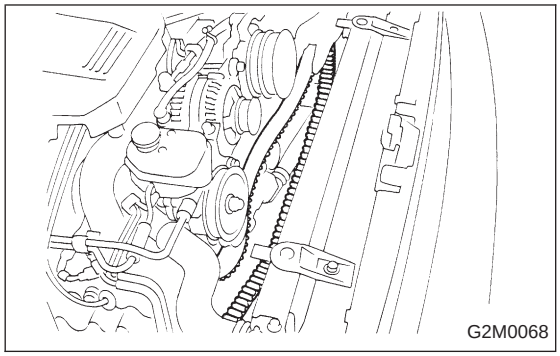


4) Disconnect radiator outlet hose from engine coolant pump.

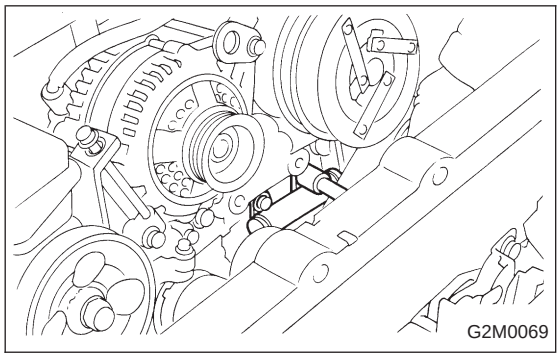


5) Remove radiator fan motor assembly.
<Ref. to 2-5 [W5A0].>

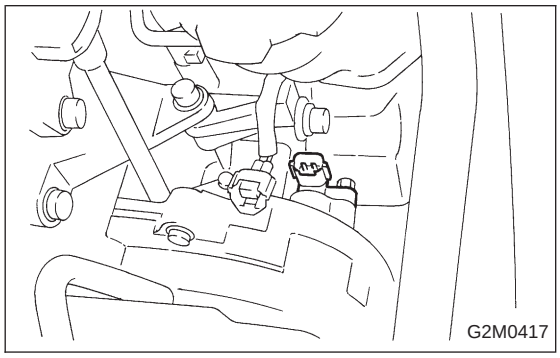
6) Remove V-belt(s).
<Ref. to 1-5 [01A0].>



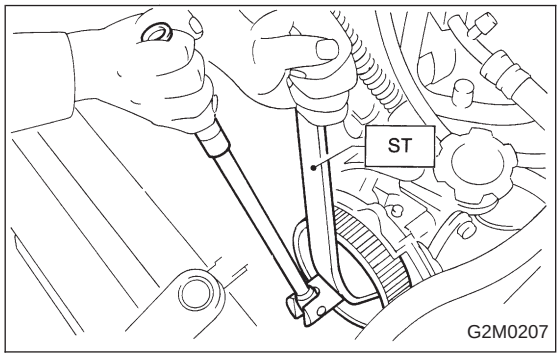
7) Remove timing belt.
<Ref. to 1-5 [02A0].>



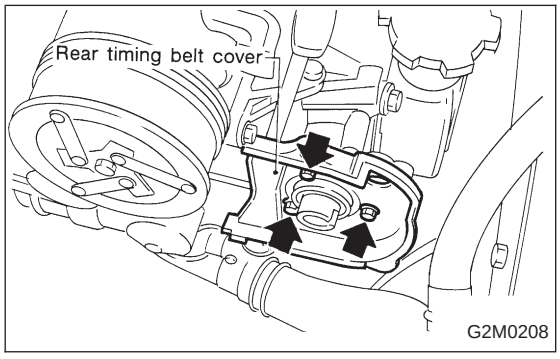
8) Remove belt tension adjuster.



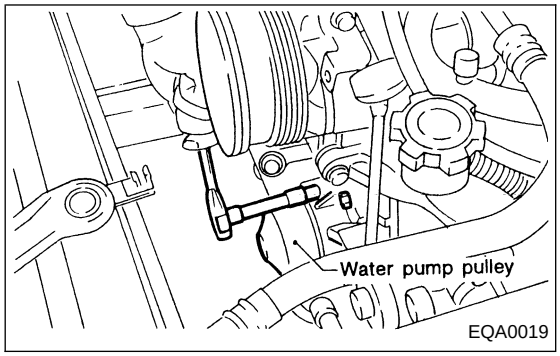
9) Remove camshaft position sensor.



10) Remove left side camshaft pulley by using ST.
ST 499207100 CAMSHAFT SPROCKET WRENCH



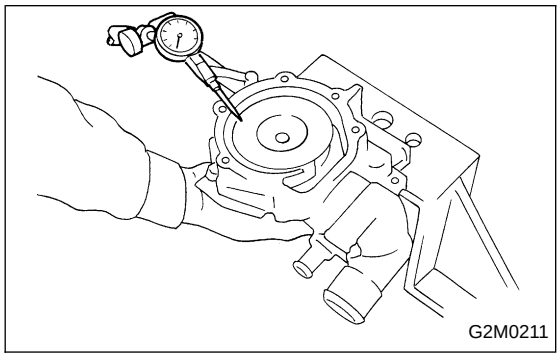
11) Remove left side rear timing belt cover.



12) Remove tensioner bracket.
13) Disconnect heater hose from engine coolant pump.
14) Remove engine coolant pump.

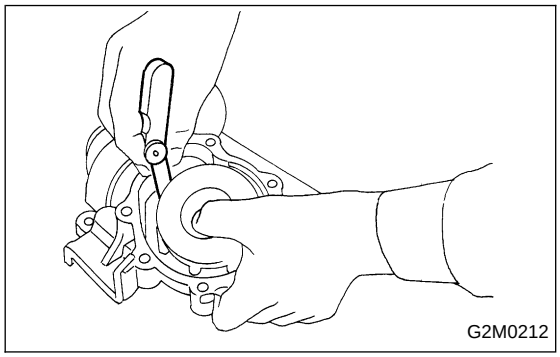
B: INSPECTION

1) Check engine coolant pump bearing for smooth rotation.
2) Check engine coolant pump pulley for abnormalities.



3) Using a dial gauge, measure impeller runout in thrust direction while rotating the pulley.

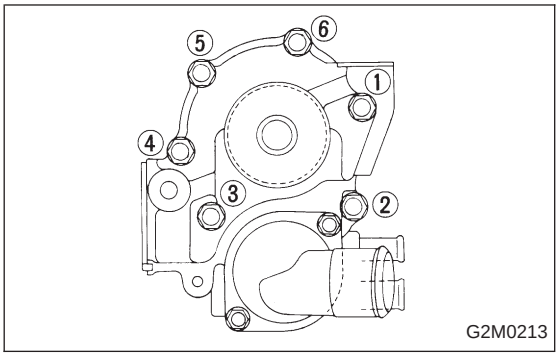
"Thrust" runout limit:
0.5 mm (0.020 in)



4) Check clearance between impeller and pump case.

Clearance between impeller and pump case:
Standard
0.5 — 0.7 mm (0.020 — 0.028 in)
Limit
1.0 mm (0.039 in)

5) After engine coolant pump installation, check pulley shaft for engine coolant leaks. If leaks are noted, replace engine coolant pump assembly.



C: INSTALLATION

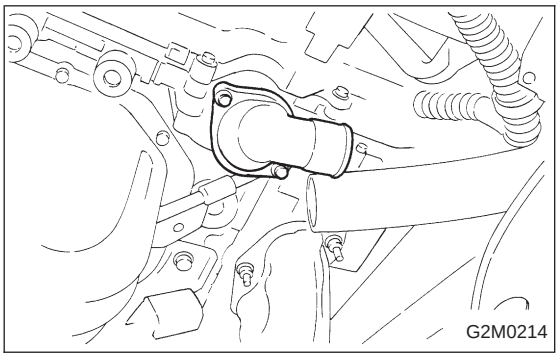
Installation is in the reverse order of removal.

CAUTION:
- **Replace gasket with a new one.**
- **When installing engine coolant pump, tighten bolts in two stages in numerical sequence as shown in figure.**

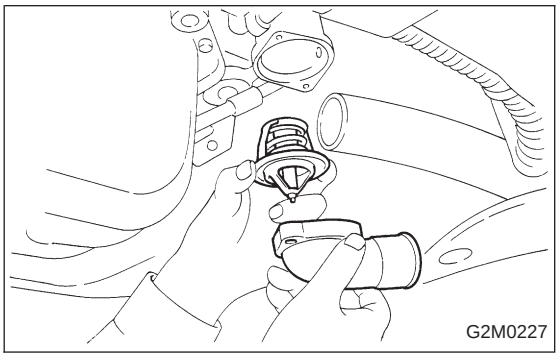
Tightening torque:
10 — 14 N·m (1.0 — 1.4 kg-m, 7 — 10 ft-lb)

2. Thermostat

A: REMOVAL AND INSTALLATION



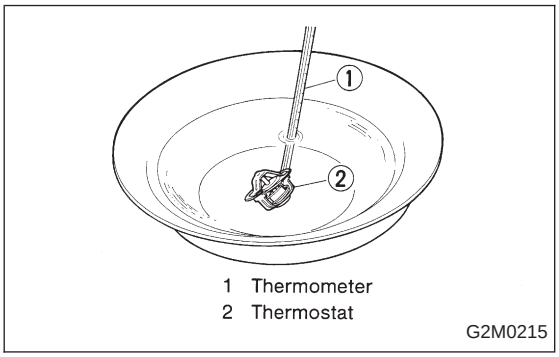
1) Drain engine coolant.
Set container under the vehicle, and remove drain cock from radiator.
2) Disconnect radiator outlet hose from thermostat cover.
3) Remove thermostat cover and gasket, and pull out the thermostat.



4) Install the thermostat in the intake manifold, and install the thermostat cover together with a gasket.

CAUTION:
- **When reinstalling the thermostat, use a new gasket.**
- **The thermostat must be installed with the jiggle pin upward.**
- **In this time, set the jiggle pin of thermostat for front side.**

B: INSPECTION



Replace the thermostat if the valve does not close completely at an ambient temperature or if the following test shows unsatisfactory results.
Immerse the thermostat and a thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. The measurement should be to the specification.

Starts to open:
76.0 — 80.0°C (169 — 176°F)

Fully opens:
91°C (196°F)

3. Radiator

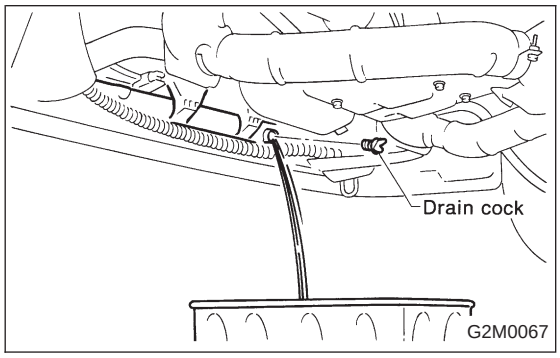
A: ON-CAR SERVICE

1) Remove radiator cap, top off radiator, and attach tester to radiator in place of cap.
2) Apply a pressure of 157 kPa (1.6 kg/cm^2, 23 psi) to radiator to check if:

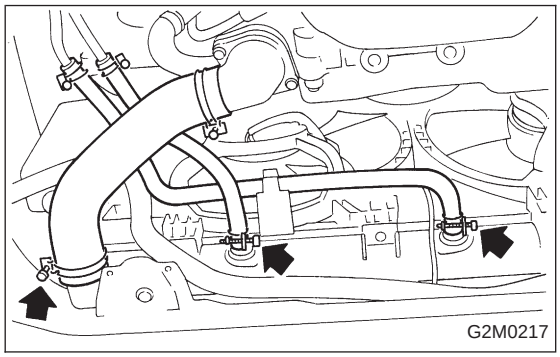
(1) Engine coolant leaks at/around radiator.
(2) Engine coolant leaks at/around hoses or connections.

CAUTION:
- **Engine should be off.**
- **Wipe engine coolant from check points in advance.**
- **Be careful to prevent engine coolant from spurting out when removing tester.**
- **Be careful also not to deform filler neck of radiator when installing or removing tester.**

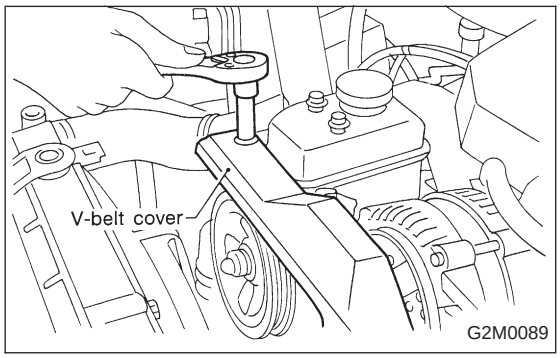
B: REMOVAL



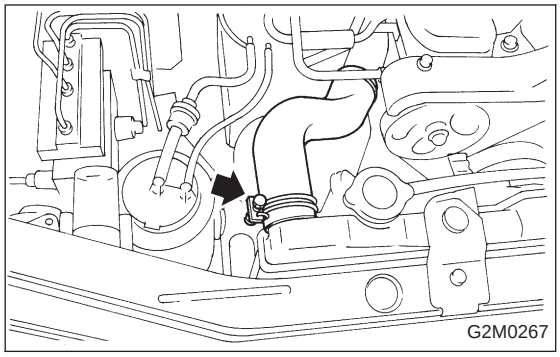
1) Disconnect battery cables and remove battery from body.
2) Drain engine coolant.
Set container under the vehicle, and remove drain cock from radiator.



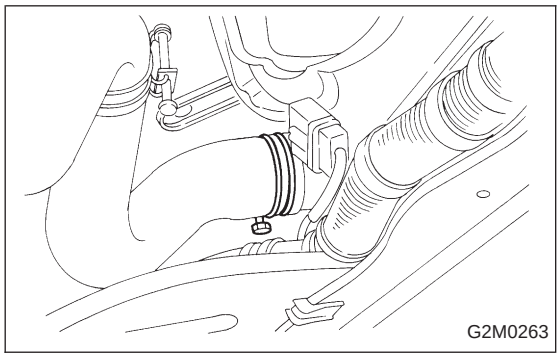
3) Disconnect radiator outlet hose from thermostat cover.
4) Disconnect ATF cooler hoses from radiator. (AT model)



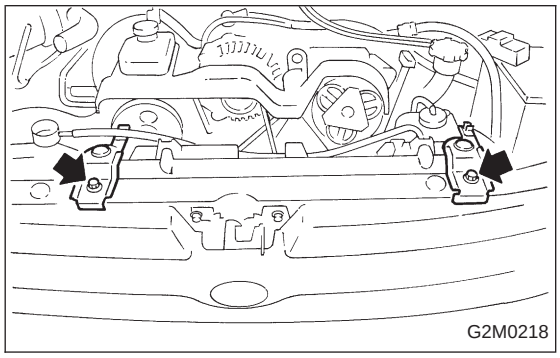
5) Remove V-belt cover.



6) Disconnect inlet hose from radiator.



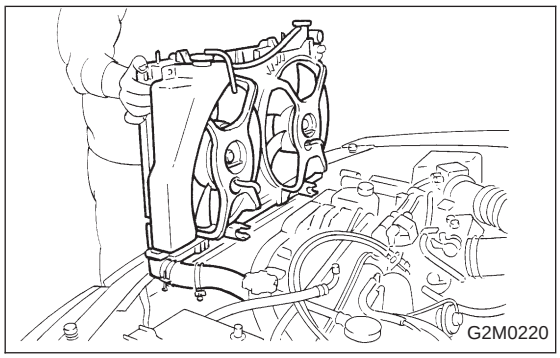
7) Disconnect connectors of radiator main fan and sub fan motor.



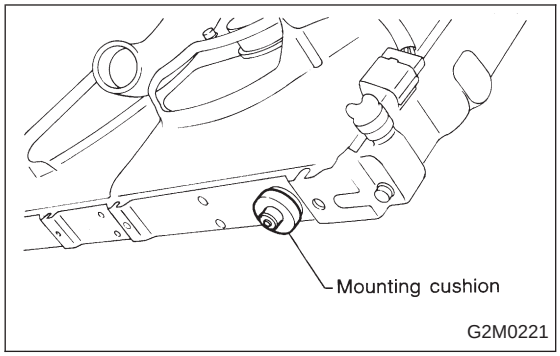
8) Remove radiator upper brackets.

NOTE:
Place left upper radiator bracket between grille and body.

9) While slightly lifting radiator, slide it to left.

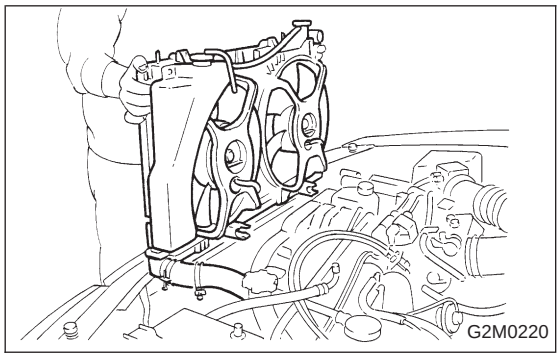


10) Lift radiator up and away from vehicle.

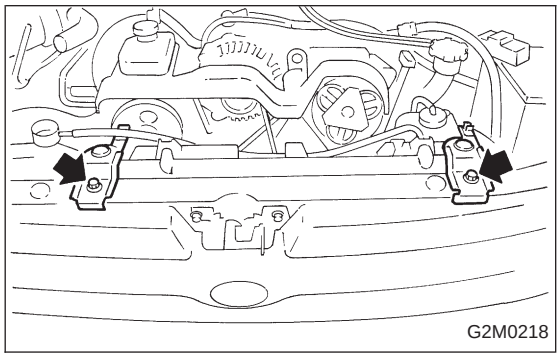


C: INSTALLATION

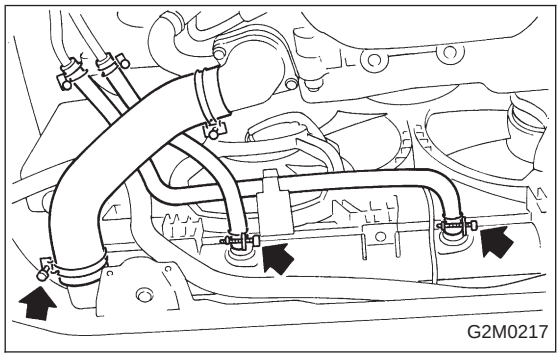
1) Attach radiator mounting cushions to pins on the lower side of radiator.



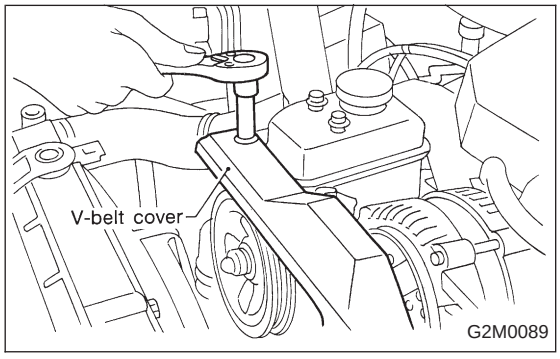
2) Fit cushions on lower side of radiator, into holes on body side and install radiator.



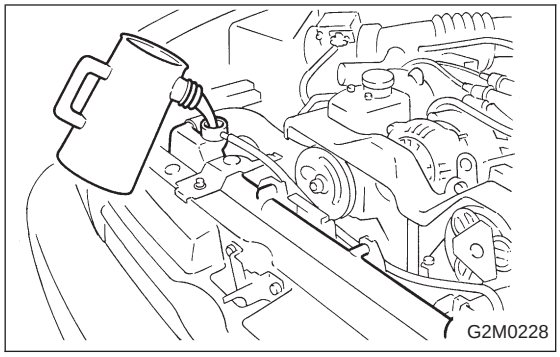
3) Install radiator brackets and tighten bolts.
4) Connect radiator main fan motor and sub fan motor connectors.



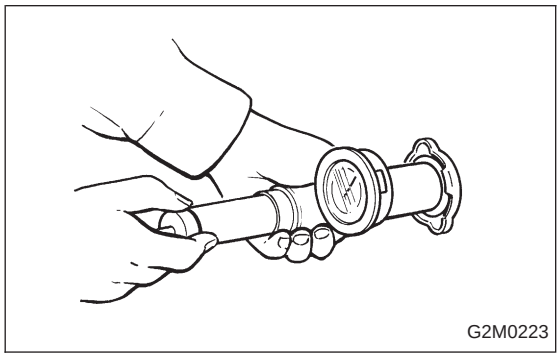
5) Connect radiator inlet and outlet hoses.
6) Connect ATF cooler hoses. (AT model)



7) Install V-belt cover.


G2M0228

8) Pour engine coolant.
(1) Pour engine coolant into radiator up to filler neck position.
(2) Pour engine coolant into reservoir tank up to upper level.
(3) Attach radiator cap and reservoir tank cap properly.
(4) Warm-up engine completely for more than five minutes at 2,000 to 3,000 rpm.
(5) Stop engine and wait until temperature drops to a safe level.
(6) If engine coolant level drops in radiator, add engine coolant to filler neck position.
(7) If engine coolant level drops from upper level of reservoir tank, add engine coolant to upper level.
(8) Attach radiator cap, air vent plug and reservoir tank cap properly.
9) Connect ground cable to battery terminal.


G2M0223

4. Radiator Cap

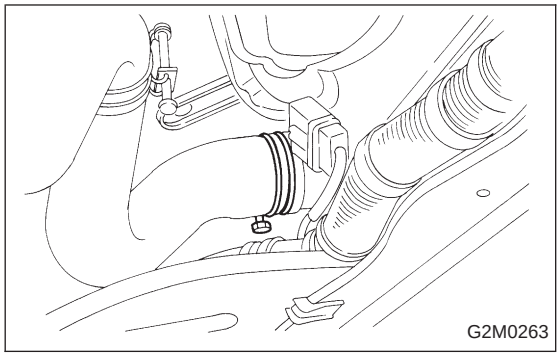
A: INSPECTION

1) Attach radiator cap to tester.
2) Increase pressure until tester gauge pointer stops. Radiator cap is functioning properly if it holds the service limit pressure for five to six seconds.

Standard pressure:
78 — 98 kPa (0.8 — 1.0 kg/cm^2, 11 — 14 psi)

Service limit pressure:
69 kPa (0.7 kg/cm^2, 10 psi)

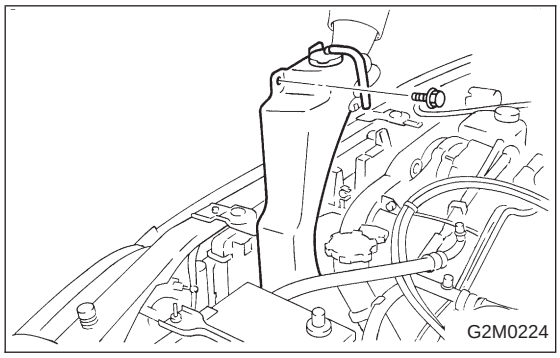
CAUTION:
Be sure to remove foreign matter and rust from the cap in advance; otherwise, results of pressure test will be incorrect.


G2M0263

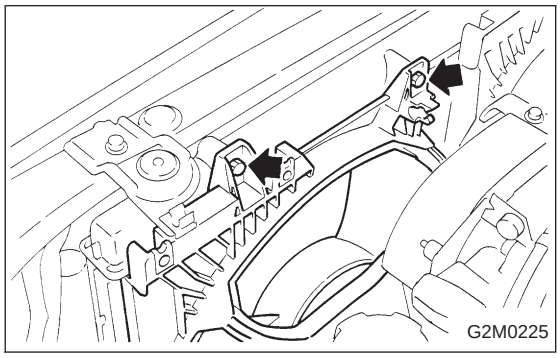
5. Radiator Fan and Fan Motor

A: REMOVAL

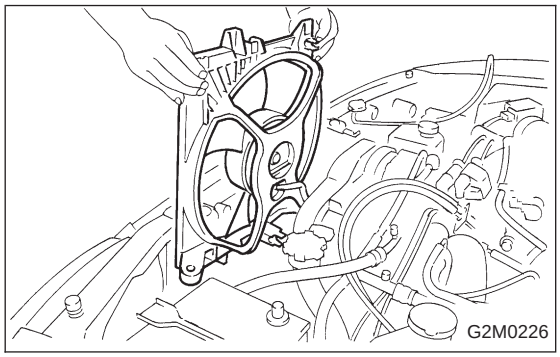
1) Disconnect ground cable from battery terminal.
2) Disconnect connector from fan motor.


G2M0224

3) Remove reservoir tank.


G2M0225

4) Remove two bolts holding shroud to radiator upper side.


G2M0226

5) Remove radiator fan motor assembly.
6) Remove fan motor from shroud.

B: INSTALLATION

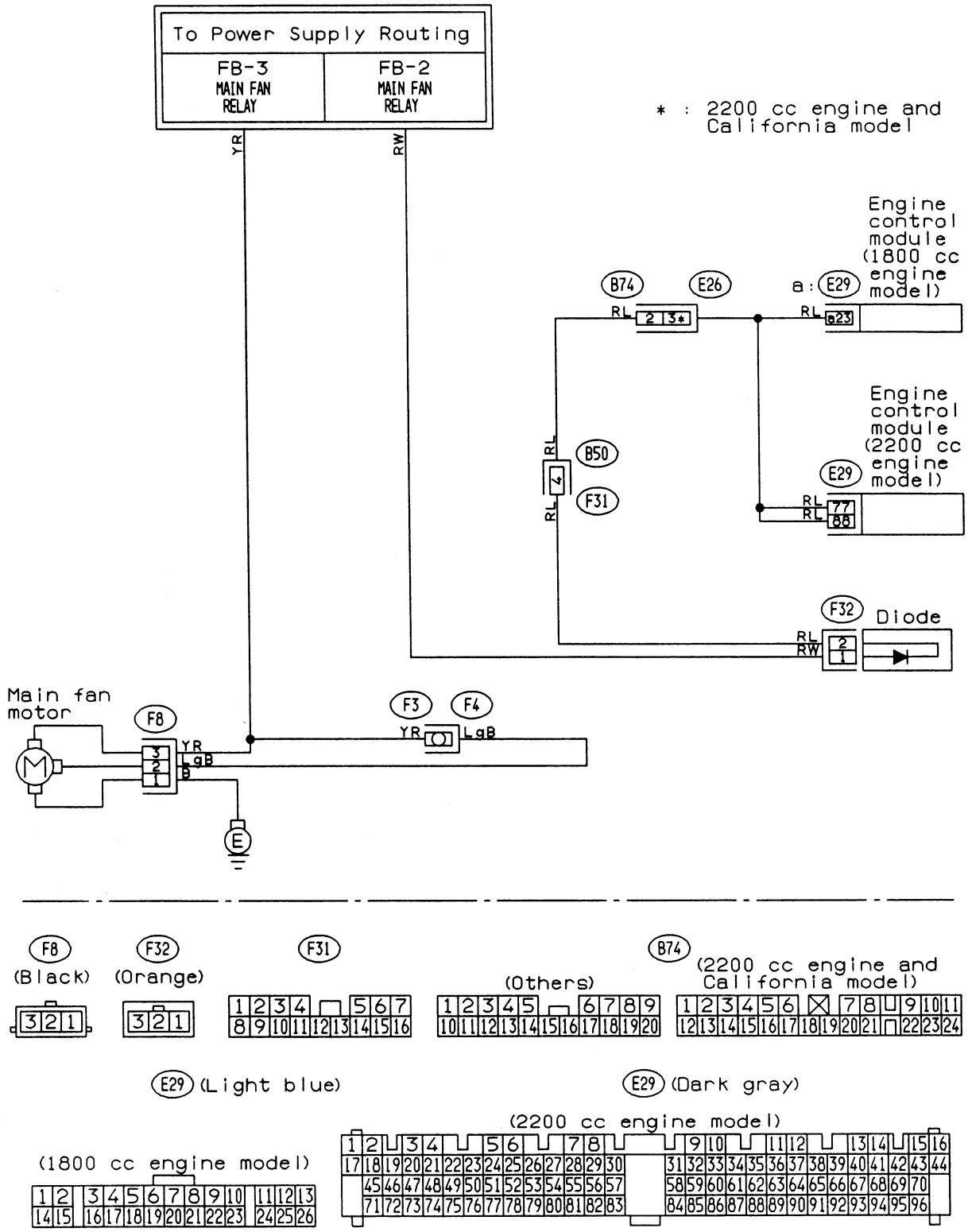
Installation is in the reverse order of removal procedures. Observe the following:
1) Before installing radiator fan motor, apply a coat of sealant to threads and tighten nuts.
2) Make sure radiator fan does not come into contact with shroud when installed.
3) After installation, make sure there is no unusual noise or vibration when fan is rotated.

1. Engine Cooling System

Trouble	Possible cause	Corrective action
Over-heating	a. Insufficient engine coolant.	Replenish engine coolant, inspect for leakage, and repair.
	b. Loose timing belt.	Repair or replace timing belt tensioner.
	c. Oil on drive belt.	Replace.
	d. Malfunction of thermostat.	Replace.
	e. Malfunction of engine coolant pump.	Replace.
	f. Clogged engine coolant passage.	Clean.
	g. Improper ignition timing.	Inspect and repair ignition control system. <On 1800 cc model, ref. to 2-7 [T7C0].> <On 2200 cc model, ref. to 2-7b [T8D0].>
	h. Clogged or leaking radiator.	Clean or repair, or replace.
	i. Improper engine oil in engine coolant.	Replace engine coolant.
	j. Air/fuel mixture ratio too lean.	Inspect and repair fuel injection system. <On 1800 cc model, ref. to 2-7 [T8O0].> <On 2200 cc model, ref. to 2-7b [T10P0].>
	k. Excessive back pressure in exhaust system.	Clean or replace.
	l. Insufficient clearance between piston and cylinder.	Adjust or replace.
	m. Slipping clutch.	Repair or replace.
	n. Dragging brake.	Adjust.
	o. Improper transmission oil.	Replace.
	p. Defective thermostat.	Replace.
	q. Malfunction of electric fan.	Inspect radiator fan relay, engine coolant temperature sensor or radiator motor and replace there.
Over-cooling	a. Atmospheric temperature extremely low.	Partly cover radiator front area.
	b. Defective thermostat.	Replace.
Engine coolant leaks	a. Loosened or damaged connecting units on hoses.	Repair or replace.
	b. Leakage from engine coolant pump.	Replace.
	c. Leakage from engine coolant pipe.	Repair or replace.
	d. Leakage around cylinder head gasket.	Retighten cylinder head nuts or replace gasket.
	e. Damaged or cracked cylinder head and crankcase.	Repair or replace.
	f. Damaged or cracked thermostat case.	Repair or replace.
	g. Leakage from radiator.	Repair or replace.
Noise	a. Defective drive belt.	Replace.
	b. Defective radiator fan.	Replace.
	c. Defective engine coolant pump bearing.	Replace engine coolant pump.
	d. Defective engine coolant pump mechanical seal.	Replace engine coolant pump.

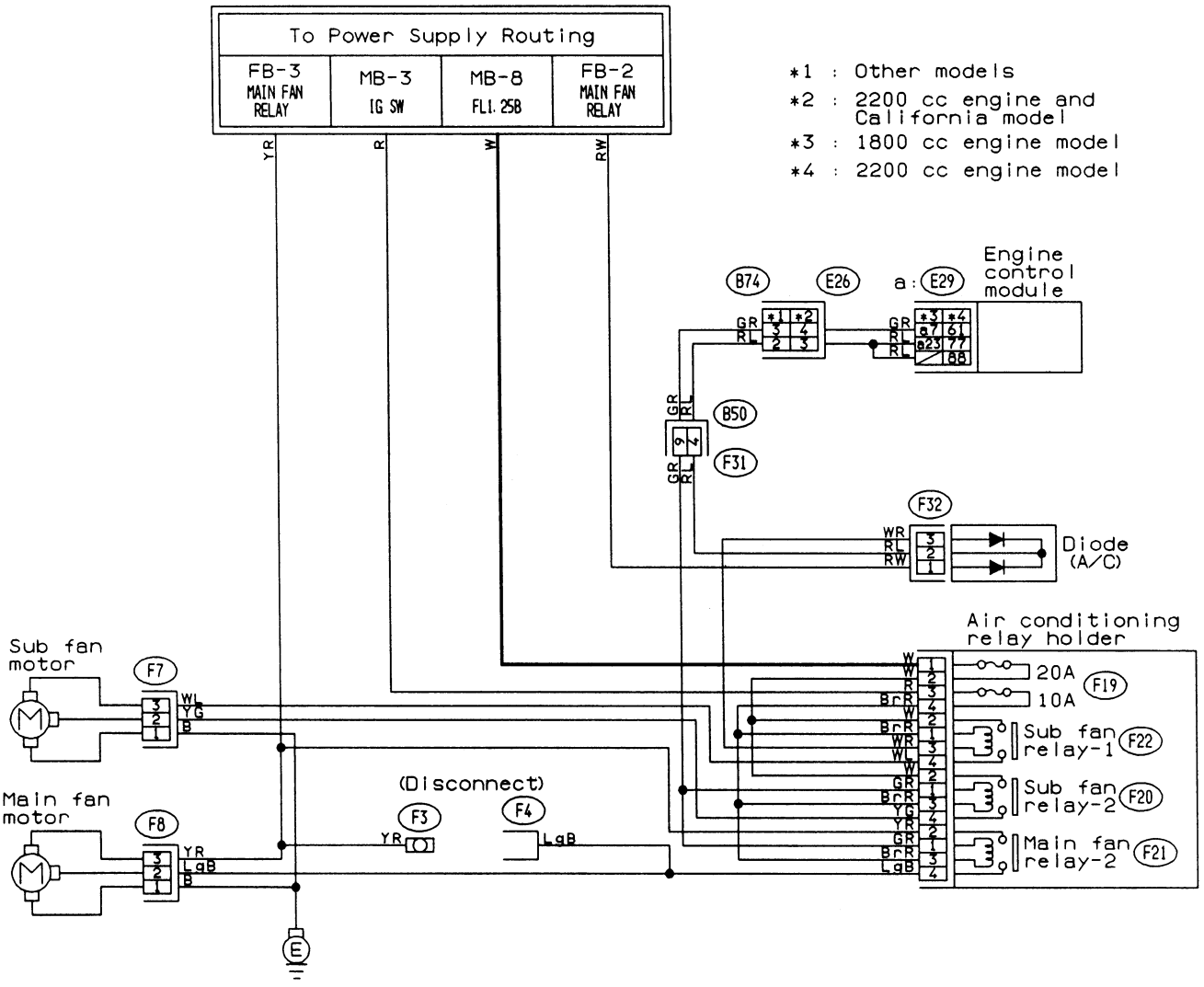
2. Radiator Main Fan (2200 cc Model)

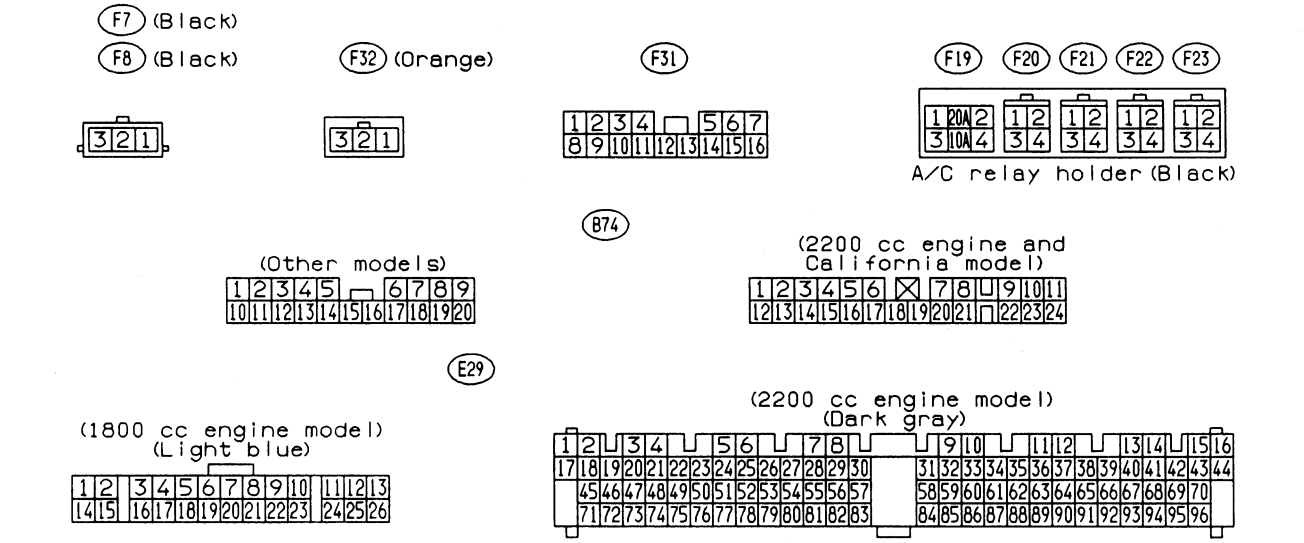
1. WITHOUT A/C MODEL



GU14-04

2. WITH A/C MODEL





GU14-03

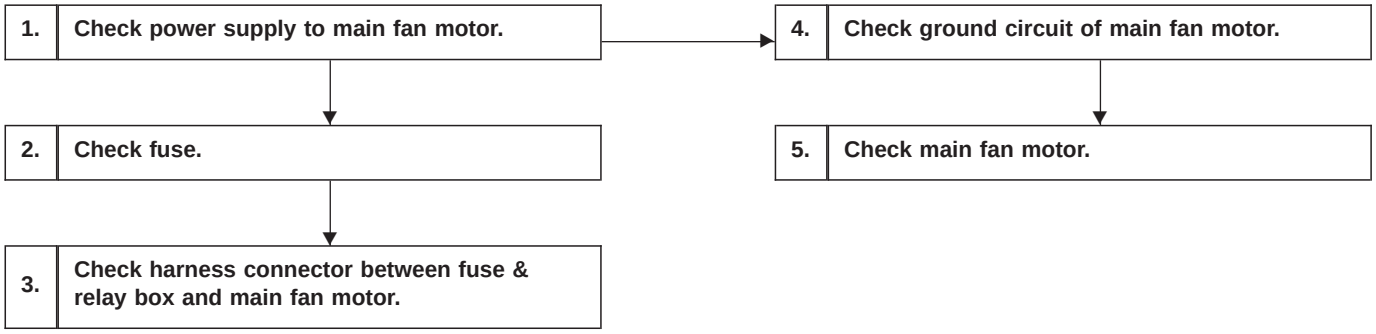
A: OPERATION (WITHOUT A/C MODEL)

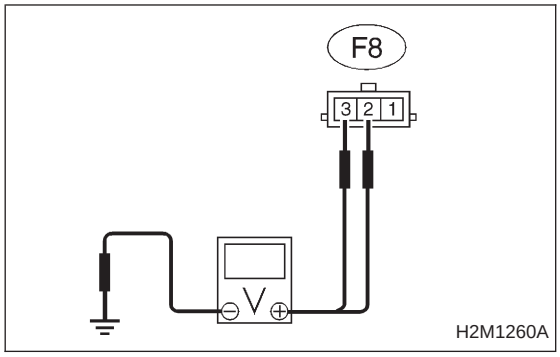
CONDITION:

- Engine coolant temperature is above 95°C (203°F).

TROUBLE SYMPTOM:

- Radiator main fan does not operate under the above condition.





1	CHECK POWER SUPPLY TO MAIN FAN MOTOR.

CAUTION:
Be careful not to overheat engine during repair.

1) Turn ignition switch to OFF.
2) Disconnect connector from main fan motor.
3) Warm-up the engine until engine coolant temperature increases over 95°C (203°F).
4) Stop the engine and turn ignition switch to ON.
5) Measure voltage between main fan motor connector and body.

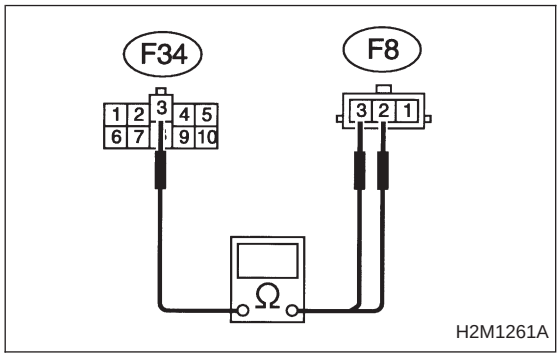
CHECK ***: Connector & terminal***
(F8) No. 3 — Body/10 V, or more
(F8) No. 2 — Body/10 V, or more

YES : Go to step 4.
NO : Go to step 2.

2	CHECK FUSE.

1) Turn ignition switch to OFF.
2) Remove fuse No. 13 from fuse & relay box.
3) Check condition of fuse.

CHECK ***: Does the fuse blown-out?***
YES : Replace fuse.
NO : Go to step 3.

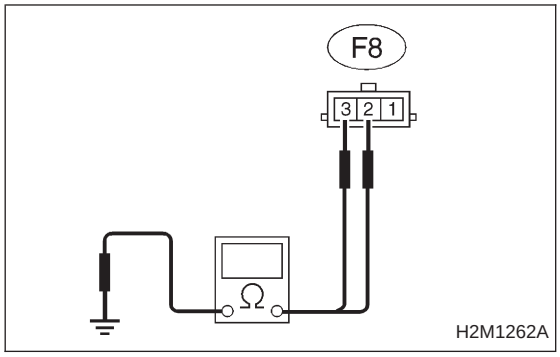


3	CHECK HARNESS CONNECTOR BETWEEN FUSE & RELAY BOX AND MAIN FAN MOTOR.

1) Disconnect connector from fuse & relay box.
2) Measure resistance of harness connector between fuse & relay box and main fan motor.

CHECK ***: Connector & terminal***
(F34) No. 3 — (F8) No. 2/1 Ω, or less
(F34) No. 3 — (F8) No. 3/1 Ω, or less

YES : Go to next step.
NO : In this case, repair the following items:
- Open circuit of harness between fuse & relay box and main fan motor connector
- Open circuit of harness between fuse & relay box connector and coupling connector (F3)
- Open circuit of harness between coupling connector (F4) and main fan motor connector
- Poor contact in coupling connector (F3)



3) Measure resistance between main fan motor connector and body.

CHECK ***: Connector & terminal***
(F8) No. 2 — Body/1 MΩ, or more
(F8) No. 3 — Body/1 MΩ, or more

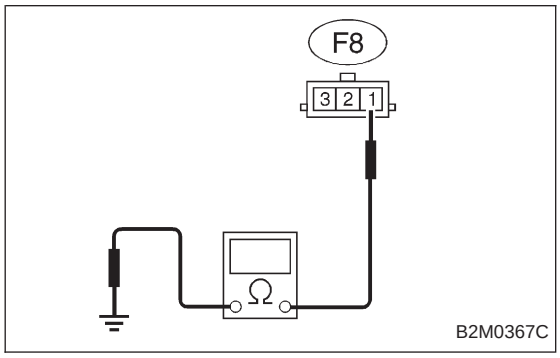
YES : Go to next CHECK .

NO : Repair short circuit between fuse & relay box and main fan motor connector.

CHECK ***: Is there poor contact in fuse & relay box or main fan motor connector?***

YES : Repair poor contact in fuse & relay box or main fan motor connector.

NO : Refer to 2-7b “On-Board Diagnostics II System” diagnostics procedure.



4	**CHECK GROUND CIRCUIT OF MAIN FAN MOTOR.**

1) Turn ignition switch to OFF.
2) Measure resistance between main fan motor connector and body.

CHECK ***: Connector & terminal***
(F8) No. 1 — Body/5 Ω, or less

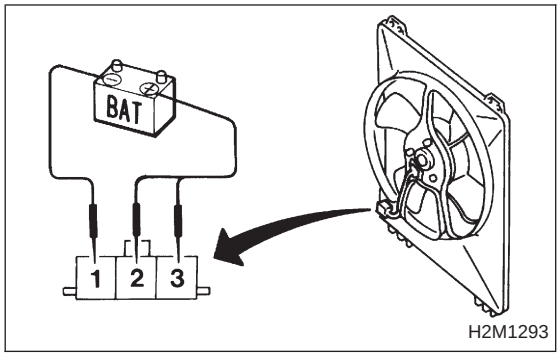
YES : Go to next CHECK .

NO : Repair open circuit of harness between main fan motor connector and body.

CHECK ***: Is there poor contact in main fan motor connector?***

YES : Repair poor contact in main fan motor connector.

NO : Go to step 5.



5	CHECK MAIN FAN MOTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from main fan motor.

CHECK ***: Does the main fan rotate while connecting battery positive (+) terminal to terminals Nos. 2 and 3, and connecting battery negative (−) terminal to terminal No. 1 of main fan motor connector?***

YES : Repair poor contact in main fan motor connector.

NO : Replace main fan motor with a new one.

B: LO MODE OPERATION (WITH A/C MODEL)

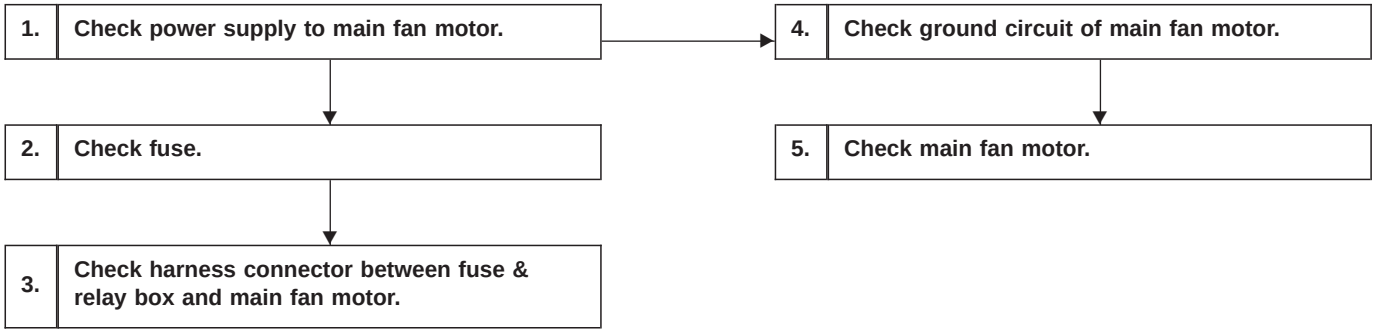
CONDITION:

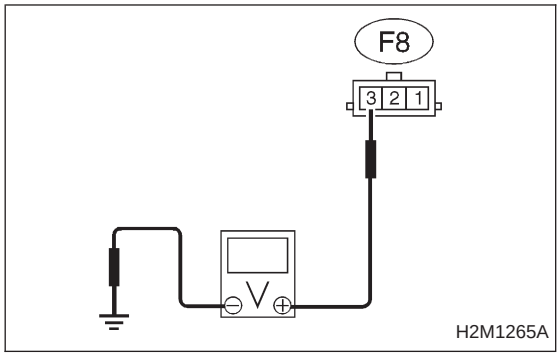
Condition (1) :
- Engine coolant temperature is below 89°C (192°F).
- A/C switch is turned ON.
- Vehicle speed is below 10 km/h (6 MPH).

Condition (2) :
- Engine coolant temperature is above 95°C (203°F).
- A/C switch is turned OFF.
- Vehicle speed is below 10 km/h (6 MPH).

TROUBLE SYMPTOM:

- Radiator main fan does not rotate at LO speed under conditions (1) and (2) above.





1	CHECK POWER SUPPLY TO MAIN FAN MOTOR.

CAUTION:
Be careful not to overheat engine during repair.

1) Turn ignition switch to OFF.
2) Disconnect connector from main fan motor.
3) Warm-up the engine until engine coolant temperature increases over 95°C (203°F).
4) Stop the engine and turn ignition switch to ON.
5) Turn A/C switch to OFF.
6) Measure voltage between main fan motor connector and body.

CHECK ***: Connector & terminal (F8) No. 3 — Body/10 V, or more***

YES : Go to step 4.

NO : Go to step 2.

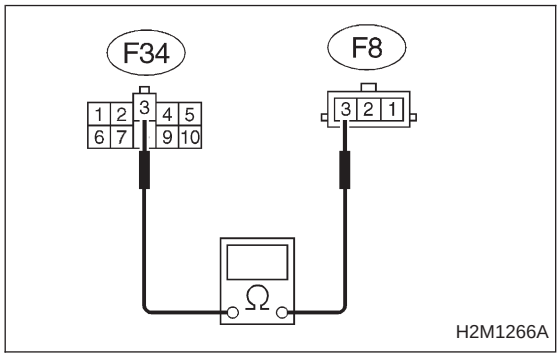
2	CHECK FUSE.

1) Turn ignition switch to OFF.
2) Remove fuse No. 13 from fuse & relay box.
3) Check condition of fuse.

CHECK ***: Is the fuse blown-out?***

YES : Replace fuse.

NO : Go to step 3.



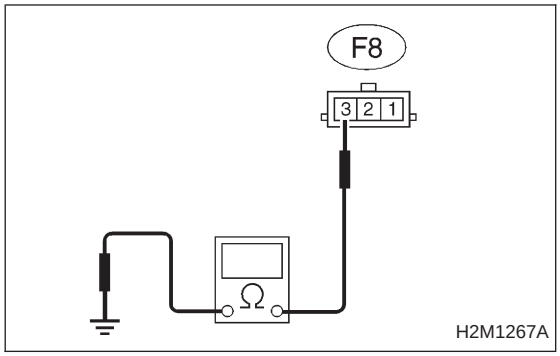
3	CHECK HARNESS CONNECTOR BETWEEN FUSE & RELAY BOX AND MAIN FAN MOTOR.

1) Disconnect connector from fuse & relay box.
2) Measure resistance of harness connector between fuse & relay box and main fan motor.

CHECK ***: Connector & terminal (F34) No. 3 — (F8) No. 3/1 Ω, or less***

YES : Go to next step.

NO : In this case, repair open circuit of harness between fuse & relay box and main fan motor connector.



3) Measure resistance between main fan motor connector and body.

CHECK ***: Connector & terminal (F8) No. 3 — Body/1 MΩ, or more***

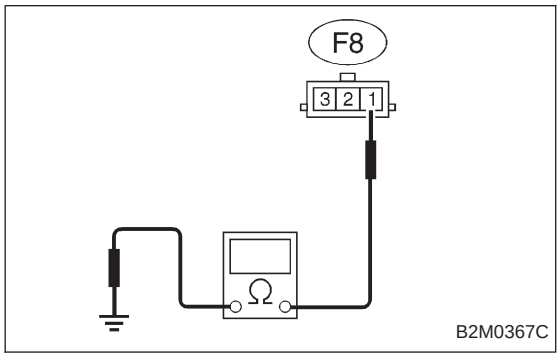
YES : Go to next CHECK .

NO : Repair short circuit between fuse & relay box and main fan motor connector.

CHECK ***: Is there poor contact in fuse & relay box or main fan motor connector?***

YES : Repair poor contact in fuse & relay box or main fan motor connector.

NO : Refer to 2-7b “On-Board Diagnostics II System” diagnostics procedure.



4	**CHECK GROUND CIRCUIT OF MAIN FAN MOTOR.**

1) Turn ignition switch to OFF.
2) Measure resistance between main fan motor connector and body.

CHECK ***: Connector & terminal (F8) No. 1 — Body/5 Ω, or less***

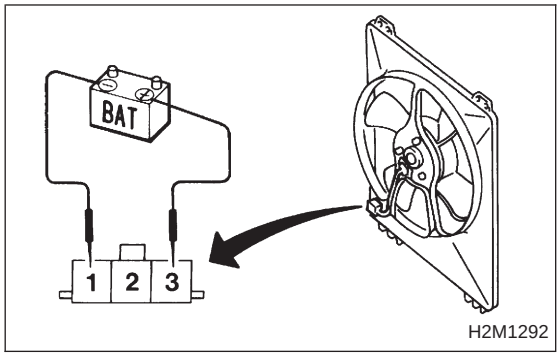
YES : Go to next CHECK .

NO : Repair open circuit of harness between main fan motor connector and body.

CHECK ***: Is there poor contact in main fan motor connector?***

YES : Repair poor contact in main fan motor connector.

NO : Go to step 5.



5	CHECK MAIN FAN MOTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from main fan motor.

CHECK ***: Does the main fan rotate at LO speed while connecting battery positive (+) terminal to terminal No. 3, and connecting battery negative (−) terminal to terminal No. 1 of main fan motor connector?***

YES : Repair poor contact in main fan motor connector.

NO : Replace main fan motor with a new one.

C: HI MODE OPERATION (WITH A/C MODEL)

CONDITION:

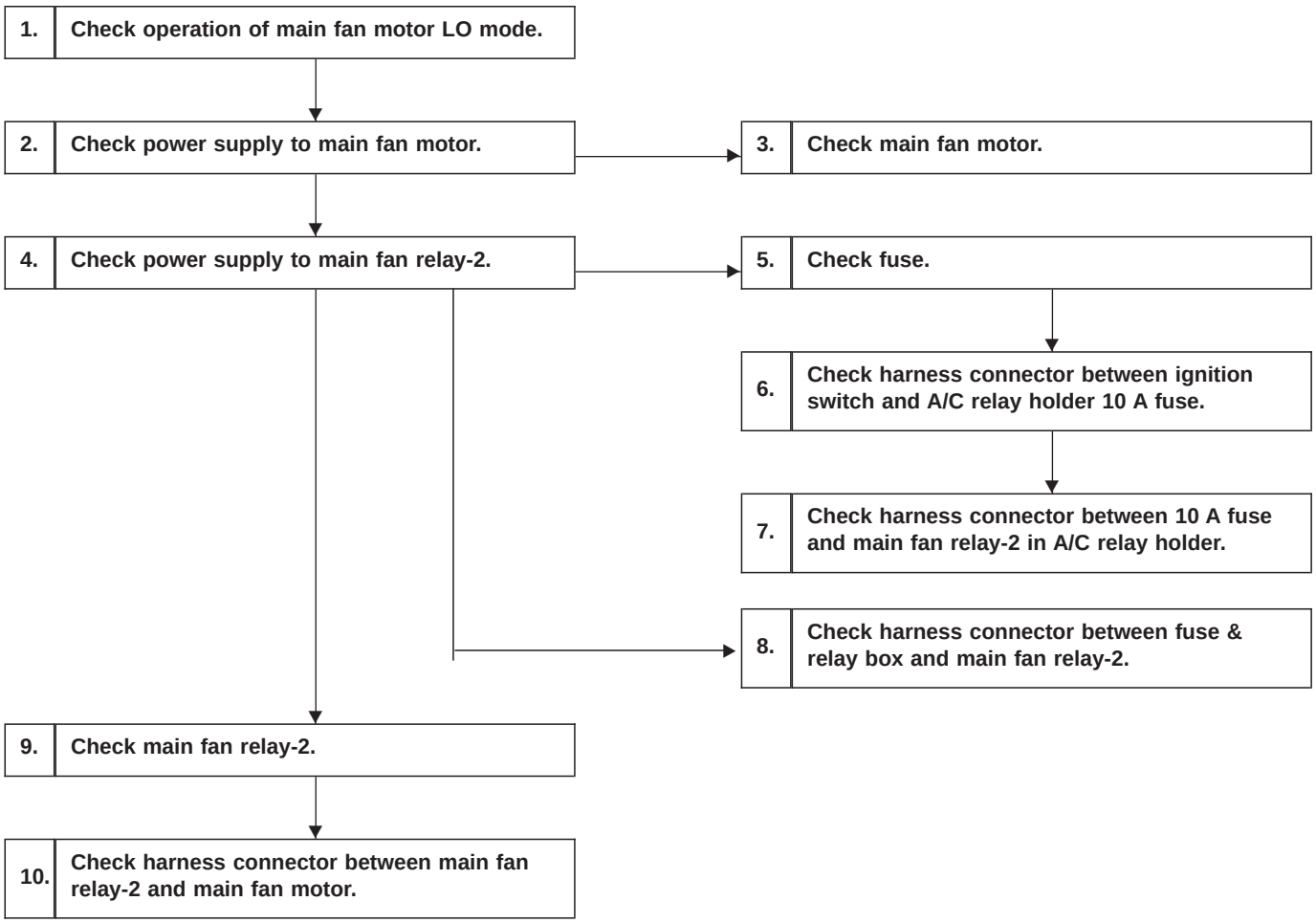
Condition (1) :
- Engine coolant temperature is below 89°C (192°F).
- A/C switch is turned ON.
- Vehicle speed is over 20 km/h (12 MPH).

Condition (2) :
- Engine coolant temperature is above 95°C (203°F).
- A/C switch is turned OFF.
- Vehicle speed is over 20 km/h (12 MPH).

Condition (3) :
- Engine coolant temperature is above 95°C (203°F).
- A/C switch is turned ON.

TROUBLE SYMPTOM:

- Radiator main fan does not rotate at HI speed under conditions (1), (2) and (3) above.



1	CHECK OPERATION OF MAIN FAN MOTOR LO MODE.

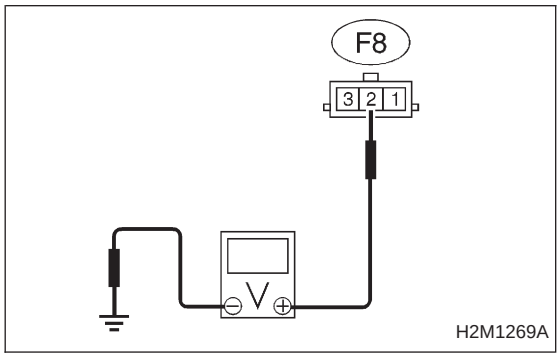
CAUTION:
Be careful not to overheat engine during repair.

1) Warm-up the engine until engine coolant temperature increases over 95°C (203°F).
2) Stop the engine and turn ignition switch to ON.
3) Turn A/C switch to OFF.

CHECK ***: Does the main fan operate at LO MODE?***

YES : Go to step 2.

NO : Go to LO MODE OPERATION diagnostics chart. <Ref. to 2-5 [T2B0].>



2	CHECK POWER SUPPLY TO MAIN FAN MOTOR.

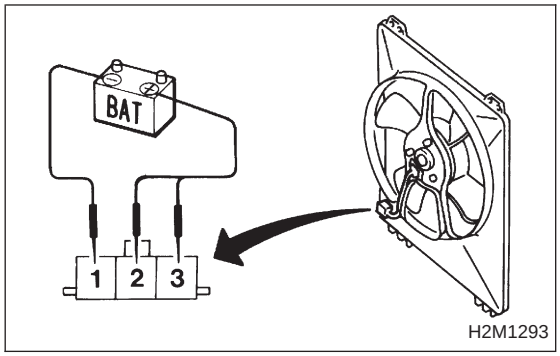
CAUTION:
Be careful not to overheat engine during repair.

1) Turn ignition switch to OFF.
2) Disconnect connector from main fan motor.
3) Warm-up the engine until engine coolant temperature increases over 95°C (203°F).
4) Stop the engine and turn ignition switch to ON.
5) Turn A/C switch to ON.
6) Measure voltage between main fan motor connector and body.

CHECK ***: Connector & terminal***
(F8) No. 2 — Body/10 V, or more

YES : Go to step 3.

NO : Go to step 4.



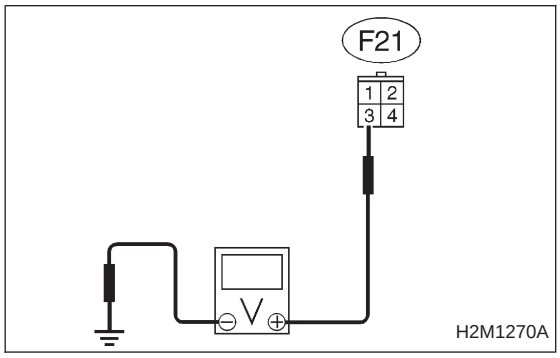
3	CHECK MAIN FAN MOTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from main fan motor.

CHECK : ***Does the main fan rotate at HI speed while connecting battery positive (+) terminal to terminals Nos. 2 and 3, and connecting battery negative (−) terminal to terminal No. 1 of main fan motor connector?***

YES : Repair poor contact in main fan motor connector.

NO : Replace main fan motor with a new one.



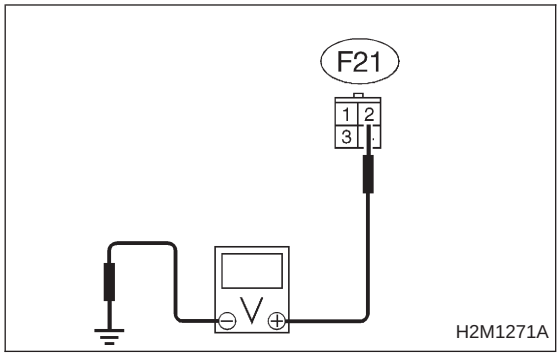
4	CHECK POWER SUPPLY TO MAIN FAN RELAY-2.

1) Turn ignition switch to OFF.
2) Remove main fan relay-2 from A/C relay holder.
3) Turn ignition switch to ON.
4) Measure voltage between main fan relay-2 connector and body.

CHECK : ***Connector & terminal (F21) No. 3 — Body/10 V, or more***

YES : Go to next step.

NO : Go to step 5.



CAUTION:
Be careful not to overheat engine during repair.

5) Start and warm-up the engine until engine coolant temperature increases over 95°C (203°F).
6) Stop the engine and turn ignition switch to ON.
7) Turn A/C switch to ON.
8) Measure voltage between main fan relay-2 connector and body.

CHECK ***: Connector & terminal (F21) No. 2 — Body/10 V, or more***

YES : Go to step 9.

NO : Go to step 8.

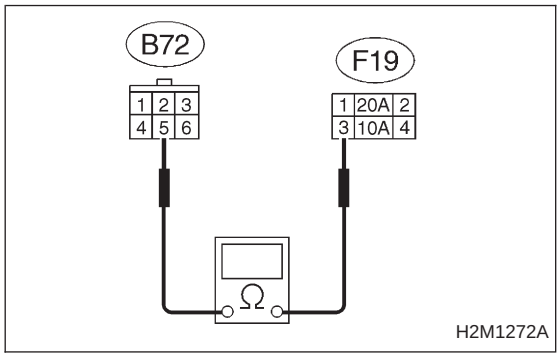
5	CHECK FUSE.

1) Turn ignition switch to OFF.
2) Remove 10 A fuse from A/C relay holder.
3) Check condition of fuse.

CHECK ***: Is the fuse blown-out?***

YES : Replace fuse.

NO : Go to step 6.



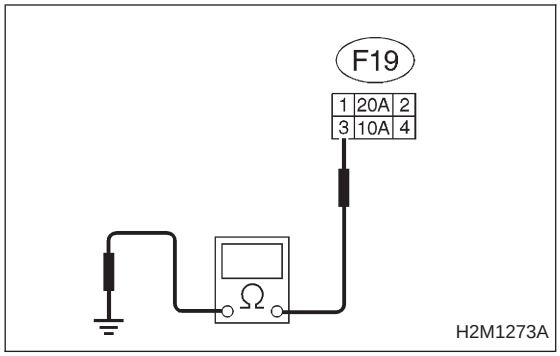
6	CHECK HARNESS CONNECTOR BETWEEN IGNITION SWITCH AND A/C RELAY HOLDER 10 A FUSE.

1) Turn ignition switch to OFF.
2) Disconnect connector from ignition switch.
3) Disconnect connectors (F36) and (B35) from fuse & relay box.
4) Measure resistance of harness connector between ignition switch and A/C relay holder 10 A fuse.

CHECK ***: Connector & terminal (B72) No. 5 — (F19) No. 3/1 Ω, or less***

YES : Go to next step.

NO : In this case, repair the following items:
- Open circuit of harness between ignition switch connector and coupling connector (B49)
- Open circuit of harness between coupling connector (F30) and A/C relay holder 10 A fuse connector
- Poor contact in coupling connector (B49)



5) Measure resistance between A/C relay holder 10 A fuse connector and body.

CHECK ***: Connector & terminal (F19) No. 3 — Body/1 MΩ, or more***

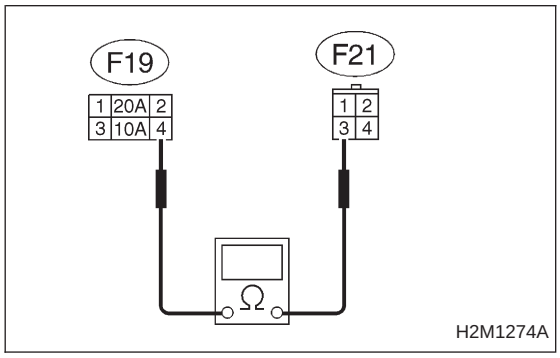
YES : Go to next CHECK .

NO : Repair short circuit between ignition switch and A/C relay holder 10 A fuse connector.

CHECK ***: Is there poor contact in ignition switch or A/C relay holder 10 A fuse connector?***

YES : Repair poor contact in ignition switch or 10 A fuse connector.

NO : Go to step 7.



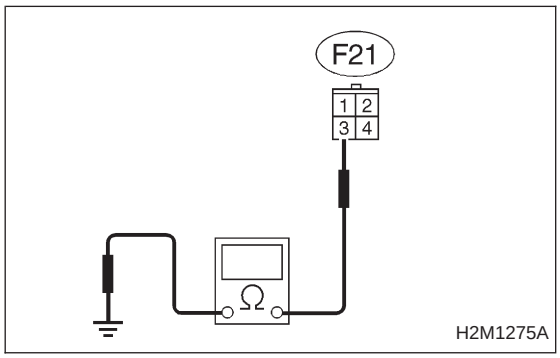
7	**CHECK HARNESS CONNECTOR BETWEEN 10 A FUSE AND MAIN FAN RELAY-2 IN A/C RELAY HOLDER.**

1) Turn ignition switch to OFF.
2) Measure resistance of harness connector between 10 A fuse and main fan relay-2.

CHECK ***: Connector & terminal (F19) No. 4 — (F21) No. 3/1 Ω, or less***

YES : Go to next step.

NO : In this case, repair open circuit of harness between 10 A fuse and main fan relay-2 connector.

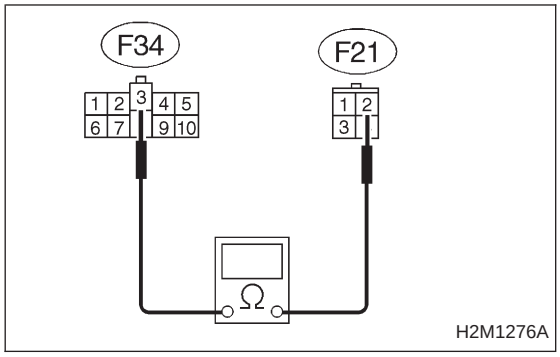


3) Measure resistance between main fan relay-2 connector and body.

CHECK ***: Connector & terminal (F21) No. 3 — Body/1 MΩ, or more***

YES : Repair poor contact in 10 A fuse or main fan relay-2 connector.

NO : Repair short circuit between 10 A fuse and main fan relay-2 connector.



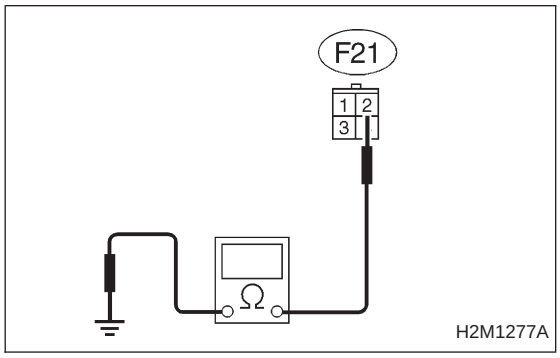
8	CHECK HARNESS CONNECTOR BETWEEN FUSE & RELAY BOX AND MAIN FAN RELAY-2.

1) Turn ignition switch to OFF.
2) Disconnect connector from fuse & relay box.
3) Measure resistance of harness connector between fuse & relay box and main fan relay-2.

CHECK : ***Connector & terminal (F34) No. 3 — (F21) No. 2/1 Ω, or less***

YES : Go to next step.

NO : In this case, repair open circuit of harness between fuse & relay box and main fan relay-2.

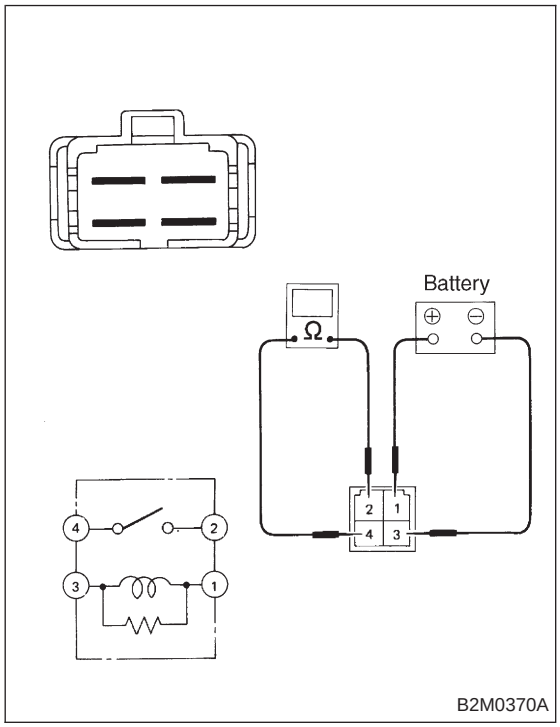


4) Measure resistance between main fan relay-2 connector and body.

CHECK : ***Connector & terminal (F21) No. 2 — Body/1 MΩ, or more***

YES : Repair poor contact in main fan relay-2 connector.

NO : Repair short circuit between fuse & relay box and main fan relay-2 connector.



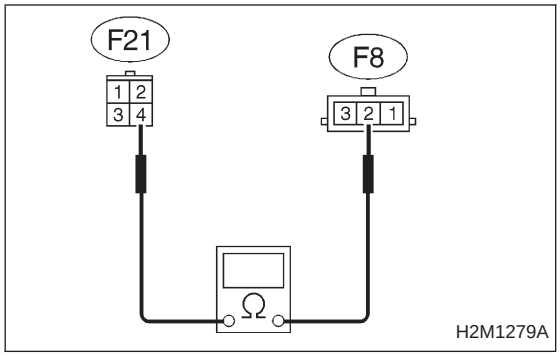
9	CHECK MAIN FAN RELAY-2.

1) Turn ignition switch to OFF.
2) Remove main fan relay-2 from A/C relay holder.
3) Check continuity between main fan relay-2 terminals.

CHECK : ① ***Does continuity exist between terminals (2) and (4) while connecting battery to terminals (1) and (3)?***
② ***Does no continuity exist between terminals (2) and (4) when battery is disconnected?***

YES : Go to step 10.

NO : Replace main fan relay-2.



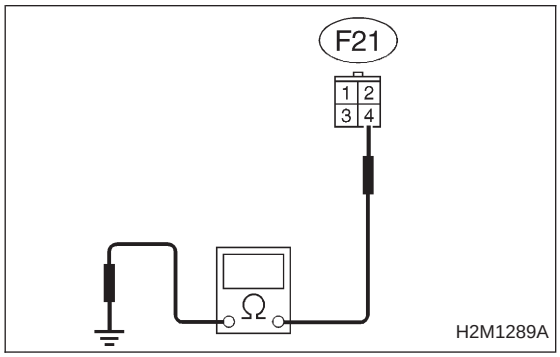
10	CHECK HARNESS CONNECTOR BETWEEN MAIN FAN RELAY-2 AND MAIN FAN MOTOR.

1) Turn ignition switch to OFF.
2) Measure resistance of harness connector between main fan relay-2 and main fan motor.

CHECK ***: Connector & terminal (F21) No. 4 — (F8) No. 2/1 Ω, or less***

YES : Go to next step.

NO : In this case, repair open circuit of harness between main fan relay-2 and main fan motor connector.



3) Measure resistance between main fan relay-2 connector and body.

CHECK ***: Connector & terminal (F21) No. 4 — Body/1 MΩ, or more***

YES : Go to next CHECK .

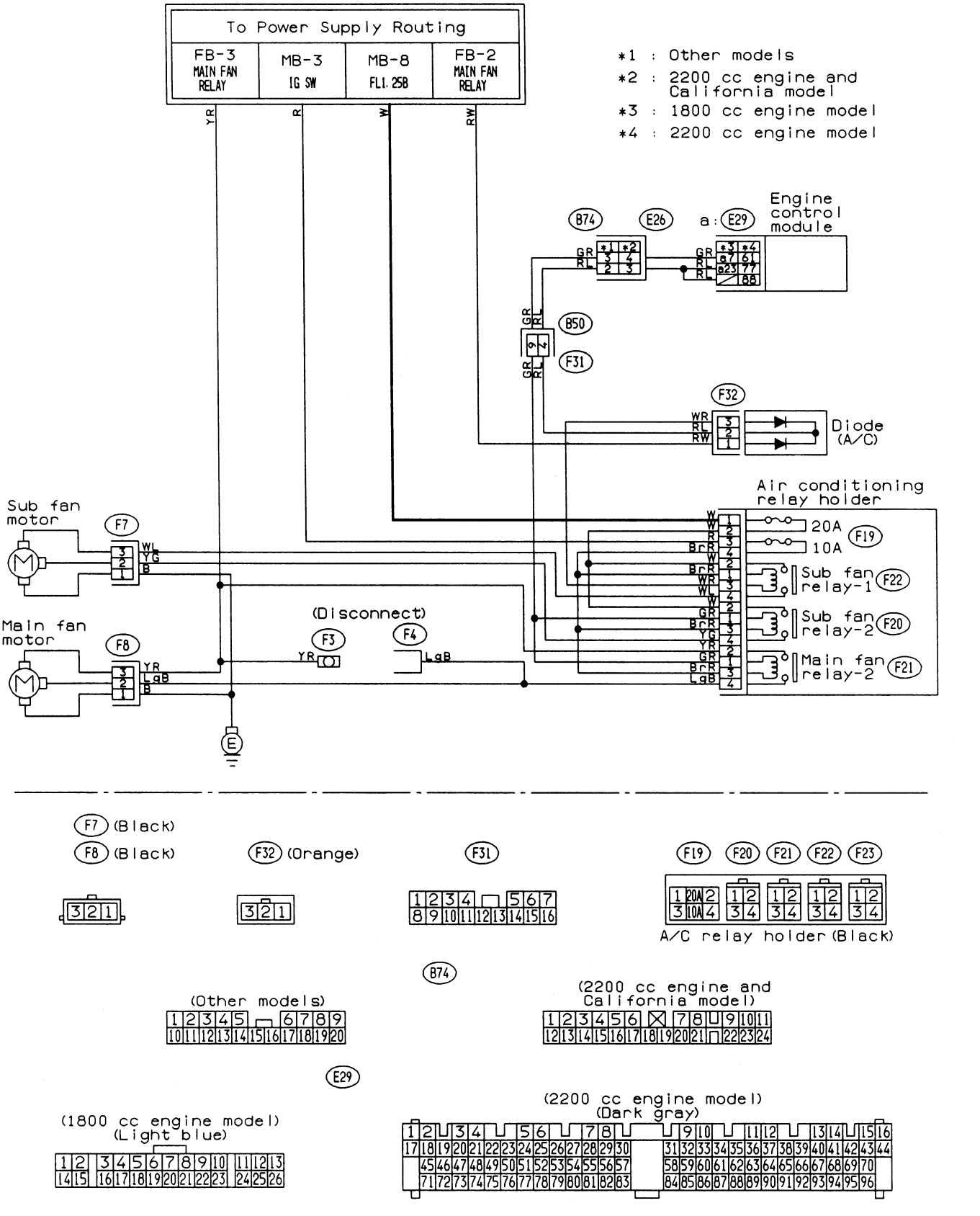
NO : Repair short circuit between main fan relay-2 and main fan motor connector.

CHECK ***: Is there poor contact in main fan relay-2 or main fan motor connector?***

YES : Repair poor contact in main fan relay-2 or main fan motor connector.

NO : Refer to 2-7b “On-Board Diagnostics II System” diagnostics procedure.

3. Radiator Sub Fan (With A/C model only) (2200 cc Model)



GU14-03

A: LO MODE OPERATION

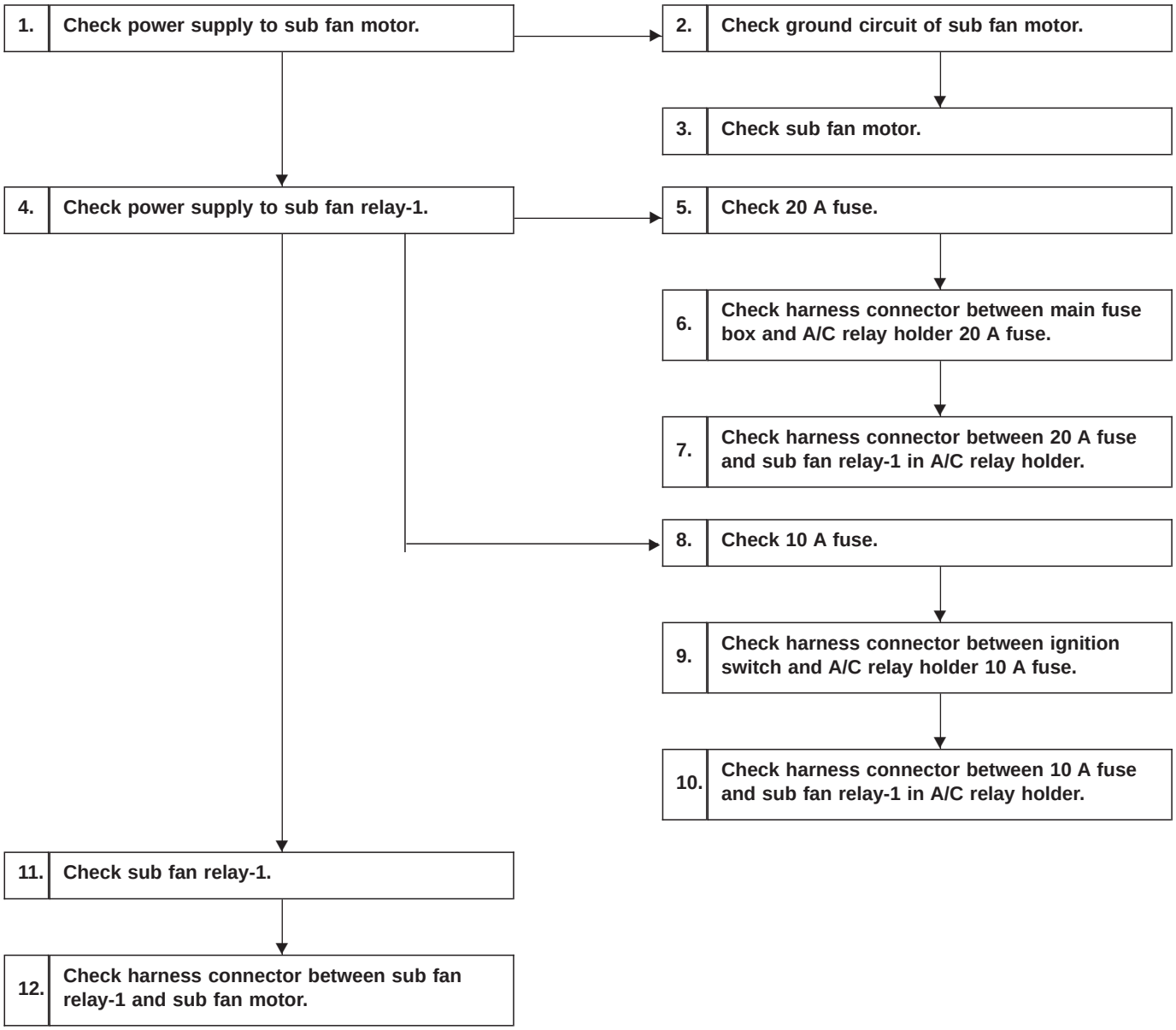
CONDITION:

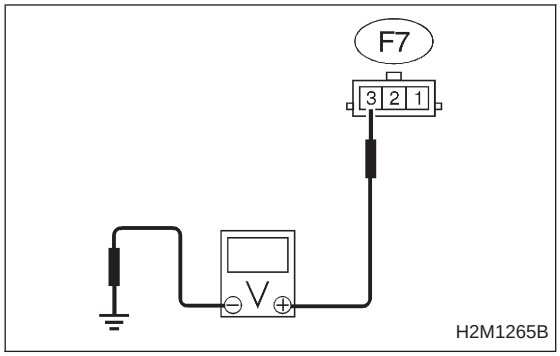
Condition (1) :
- Engine coolant temperature is below 89°C (192°F).
- A/C switch is turned ON.
- Vehicle speed is below 10 km/h (6 MPH).

Condition (2) :
- Engine coolant temperature is above 95°C (203°F).
- A/C switch is turned OFF.
- Vehicle speed is below 10 km/h (6 MPH).

TROUBLE SYMPTOM:

- Radiator sub fan does not rotate at LO speed under conditions (1) and (2) above.





1	CHECK POWER SUPPLY TO SUB FAN MOTOR.

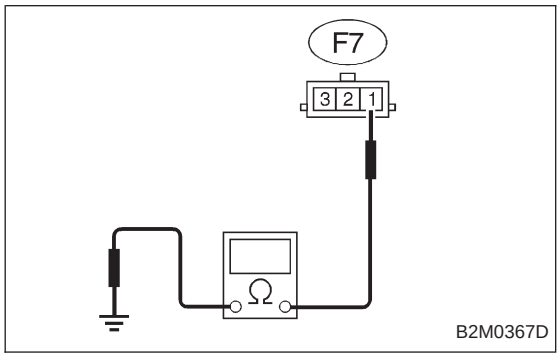
CAUTION:
Be careful not to overheat engine during repair.

1) Turn ignition switch to OFF.
2) Disconnect connector from sub fan motor.
3) Warm-up the engine until engine coolant temperature increases over 95°C (203°F).
4) Stop the engine and turn ignition switch to ON.
5) Turn A/C switch to OFF.
6) Measure voltage between sub fan motor connector and body.

CHECK ***: Connector & terminal (F7) No. 3 — Body/10 V, or more***

YES : Go to step 2.

NO : Go to step 4.



2	CHECK GROUND CIRCUIT OF SUB FAN MOTOR.

1) Turn ignition switch to OFF.
2) Measure resistance between sub fan motor connector and body.

CHECK ***: Connector & terminal (F7) No. 1 — Body/5 Ω, or less***

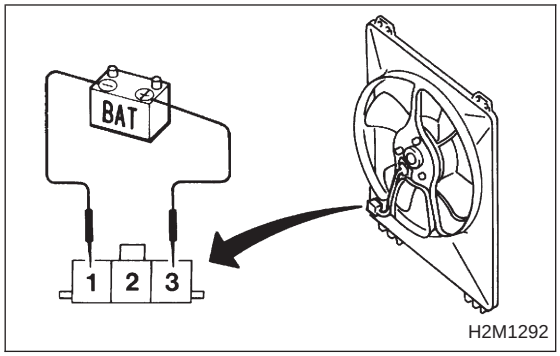
YES : Go to next CHECK .

NO : Repair open circuit of harness between sub fan motor connector and body.

CHECK ***: Is there poor contact in sub fan motor connector?***

YES : Repair poor contact in sub fan motor connector.

NO : Go to step 3.



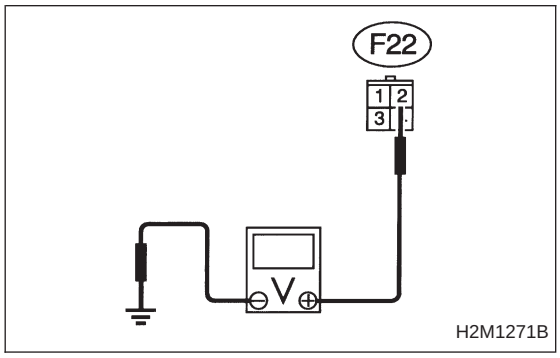
3	CHECK SUB FAN MOTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from sub fan motor.

CHECK : ***Does the sub fan rotate at LO speed while connecting battery positive (+) terminal to terminal No. 3, and connecting battery negative (−) terminal to terminal No. 1 of sub fan motor connector?***

YES : Repair poor contact in sub fan motor connector.

NO : Replace sub fan motor with a new one.



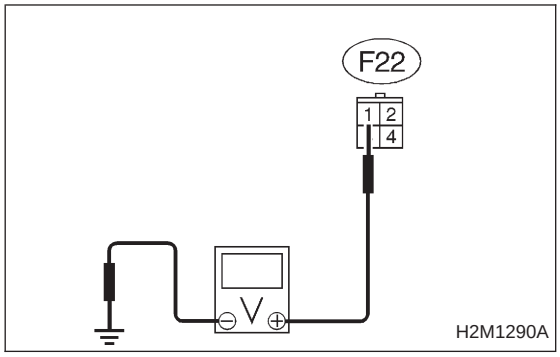
4	CHECK POWER SUPPLY TO SUB FAN RELAY-1.

1) Turn ignition switch to OFF.
2) Remove sub fan relay-1 from A/C relay holder.
3) Measure voltage between sub fan relay-1 connector and body.

CHECK : ***Connector & terminal (F22) No. 2 — Body/10 V, or more***

YES : Go to next step.

NO : Go to step 5.



CAUTION:
Be careful not to overheat engine during repair.

4) Start and warm-up the engine until engine coolant temperature increases over 95°C (203°F).
5) Stop the engine and turn ignition switch to ON.
6) Turn A/C switch to OFF.
7) Measure voltage between sub fan relay-1 connector and body.

CHECK ***: Connector & terminal (F22) No. 1 — Body/10 V, or more***

YES : Go to step 11.

NO : Go to step 8.

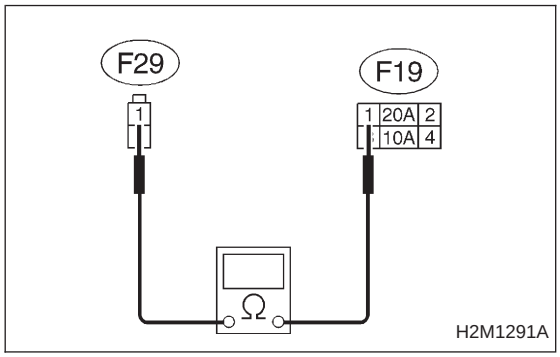
5	CHECK 20 A FUSE.

1) Turn ignition switch to OFF.
2) Remove 20 A fuse from A/C relay holder.
3) Check condition of fuse.

CHECK ***: Is the fuse blown-out?***

YES : Replace fuse.

NO : Go to step 6.



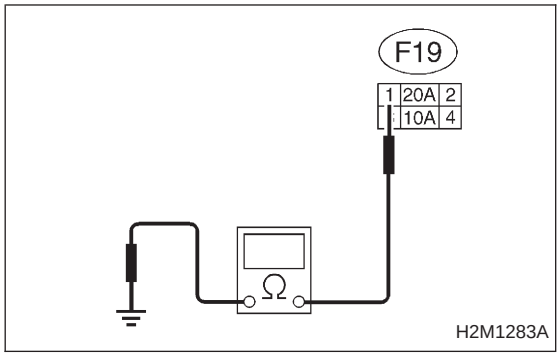
6	CHECK HARNESS CONNECTOR BETWEEN MAIN FUSE BOX AND A/C RELAY HOLDER 20 A FUSE.

1) Turn ignition switch to OFF.
2) Disconnect connector from main fuse box.
3) Measure resistance of harness connector between main fuse box and A/C relay holder 20 A fuse connector.

CHECK ***: Connector & terminal (F29) No. 1 — (F19) No. 1/1 Ω, or less***

YES : Go to next step.

NO : In this case, repair open circuit of harness between main fuse box and 20 A fuse connector.



4) Disconnect connector (F18) from SBF holder, and disconnect connectors (F16) and (F17) from generator.
5) Measure resistance between 20 A fuse connector and body.

CHECK ***: Connector & terminal (F19) No. 1 — Body/1 MΩ, or more***

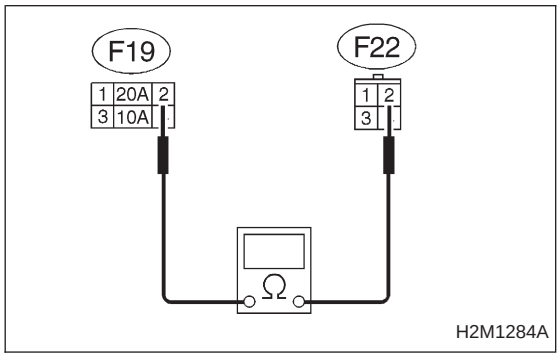
YES : Go to next CHECK .

NO : Repair short circuit between main fuse box and 20 A fuse connector.

CHECK ***: Is there poor contact in main fuse box or 20 A fuse connector?***

YES : Repair poor contact in main fuse box or 20 A fuse connector.

NO : Go to step 7.



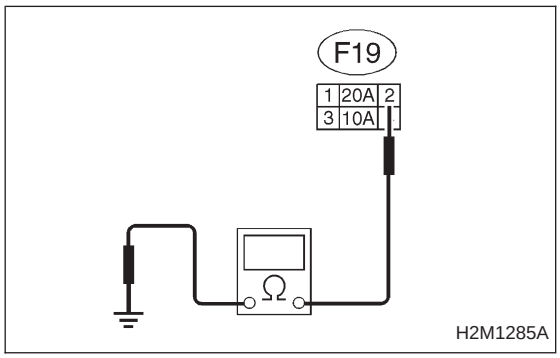
7	**CHECK HARNESS CONNECTOR BETWEEN 20 A FUSE AND SUB FAN RELAY-1 IN A/C RELAY HOLDER.**

1) Measure resistance of harness connector between 20 A fuse and sub fan relay-1.

CHECK ***: Connector & terminal (F19) No. 2 — (F22) No. 2/1 Ω, or less***

YES : Go to next step.

NO : In this case, repair open circuit of harness between 20 A fuse and sub fan relay-1 connector.



2) Measure resistance between 20 A fuse connector and body.

CHECK ***: Connector & terminal (F19) No. 2 — Body/1 MΩ, or more***

YES : Repair poor contact in 20 A fuse or sub fan relay-1 connector.

NO : Repair short circuit between 20 A fuse and sub fan relay-1 connector.

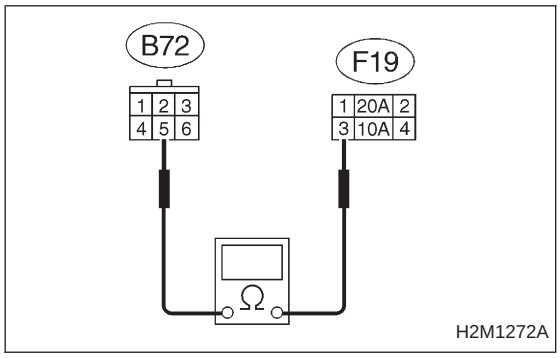
8	CHECK 10 A FUSE.

1) Turn ignition switch to OFF.
2) Remove 10 A fuse from A/C relay holder.
3) Check condition of fuse.

CHECK ***: Is the fuse blown-out?***

YES : Replace fuse.

NO : Go to step 9.



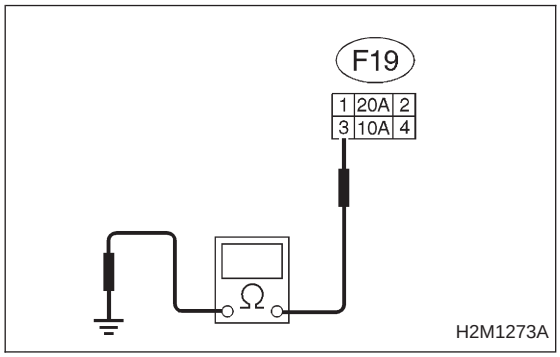
9	CHECK HARNESS CONNECTOR BETWEEN IGNITION SWITCH AND A/C RELAY HOLDER 10 A FUSE.

1) Turn ignition switch to OFF.
2) Disconnect connector from ignition switch.
3) Disconnect connectors (F36) and (B35) from fuse & relay box.
4) Measure resistance of harness connector between ignition switch and A/C relay holder 10 A fuse connector.

CHECK ***: Connector & terminal***
(B72) No. 5 — (F19) No. 3/1 Ω, or less

YES : Go to next step.

NO : In this case, repair the following items:
- Open circuit of harness between ignition switch connector and coupling connector (B49)
- Open circuit of harness between coupling connector (F30) and A/C relay holder 10 A fuse connector
- Poor contact in coupling connector (B49)



5) Measure resistance between A/C relay holder 10 A fuse connector and body.

CHECK ***: Connector & terminal***
(F19) No. 3 — Body/1 MΩ, or more

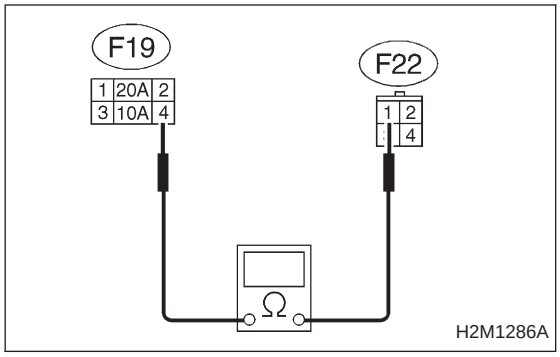
YES : Go to next CHECK .

NO : Repair short circuit between ignition switch and 10 A fuse connector.

CHECK ***: Is there poor contact in ignition switch or 10 A fuse connector?***

YES : Repair poor contact in ignition switch or 10 A fuse connector.

NO : Go to step 10.



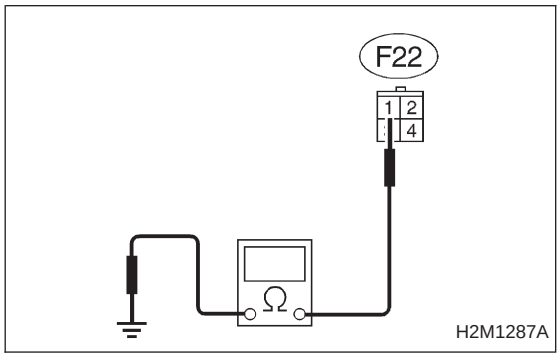
10	CHECK HARNESS CONNECTOR BETWEEN 10 A FUSE AND SUB FAN RELAY-1 IN A/C RELAY HOLDER.

1) Measure resistance of harness connector between 10 A fuse and sub fan relay-1.

CHECK : ***Connector & terminal***
(F19) No. 4 — (F22) No. 1/1 Ω, or less

YES : Go to next step.

NO : In this case, repair open circuit of harness between 10 A fuse and sub fan relay-1 connector in A/C relay holder.

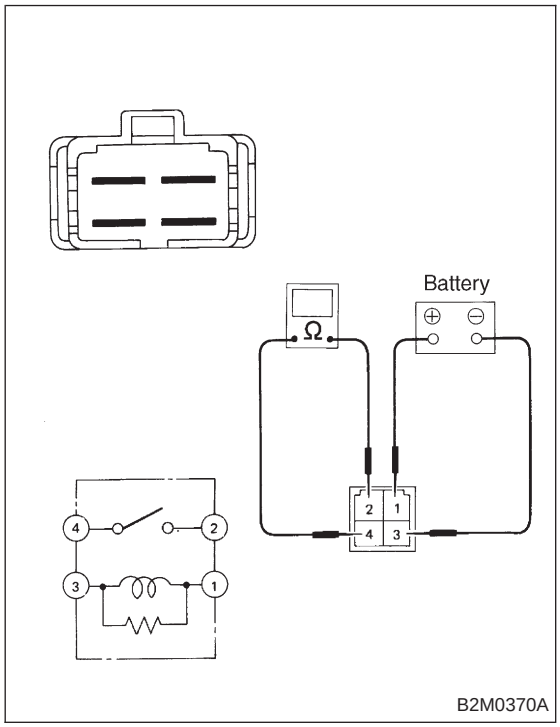


2) Measure resistance between sub fan relay-1 connector and body.

CHECK : ***Connector & terminal***
(F22) No. 1 — Body/1 MΩ, or more

YES : Repair poor contact in 10 A fuse or sub fan relay-1 connector.

NO : Repair short circuit between 10 A fuse and sub fan relay-1 connector.



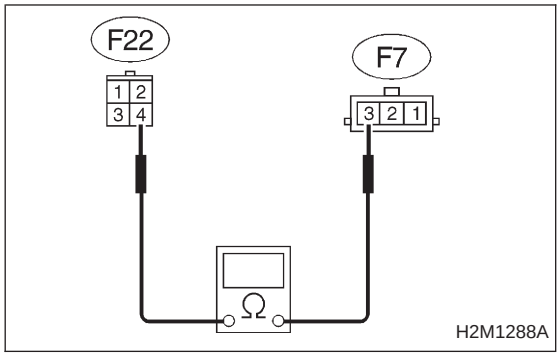
11	CHECK SUB FAN RELAY-1.

Check continuity between sub fan relay-1 terminals.

CHECK : ① ***Does continuity exist between terminals (2) and (4) while connecting battery to terminals (1) and (3)?***
② ***Does no continuity exist between terminals (2) and (4) when battery is disconnected?***

YES : Go to step 12.

NO : Replace sub fan relay-1.



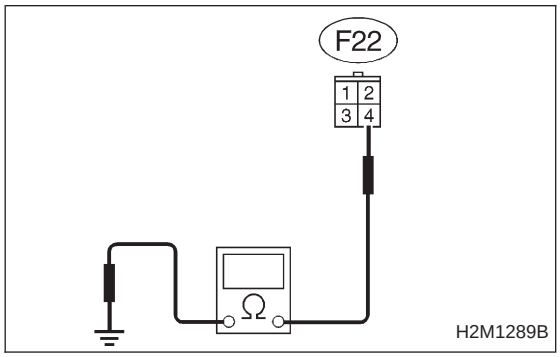
12	CHECK HARNESS CONNECTOR BETWEEN SUB FAN RELAY-1 AND SUB FAN MOTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from sub fan motor.
3) Measure resistance of harness connector between sub fan relay-1 and sub fan motor.

CHECK ***: Connector & terminal (F22) No. 4 — (F7) No. 3/1 Ω, or less***

YES : Go to next step.

NO : In this case, repair open circuit of harness between sub fan relay-1 and sub fan motor connector.



4) Measure resistance between sub fan relay-1 connector and body.

CHECK ***: Connector & terminal (F22) No. 4 — Body/1 MΩ, or more***

YES : Go to next CHECK .

NO : Repair short circuit between sub fan relay-1 and sub fan motor connector.

CHECK ***: Is there poor contact in sub fan relay-1 or sub fan motor connector?***

YES : Repair poor contact in sub fan relay-1 or sub fan motor connector.

NO : Refer to 2-7b “On-Board Diagnostics II System” diagnostics procedure.

B: HI MODE OPERATION

CONDITION:

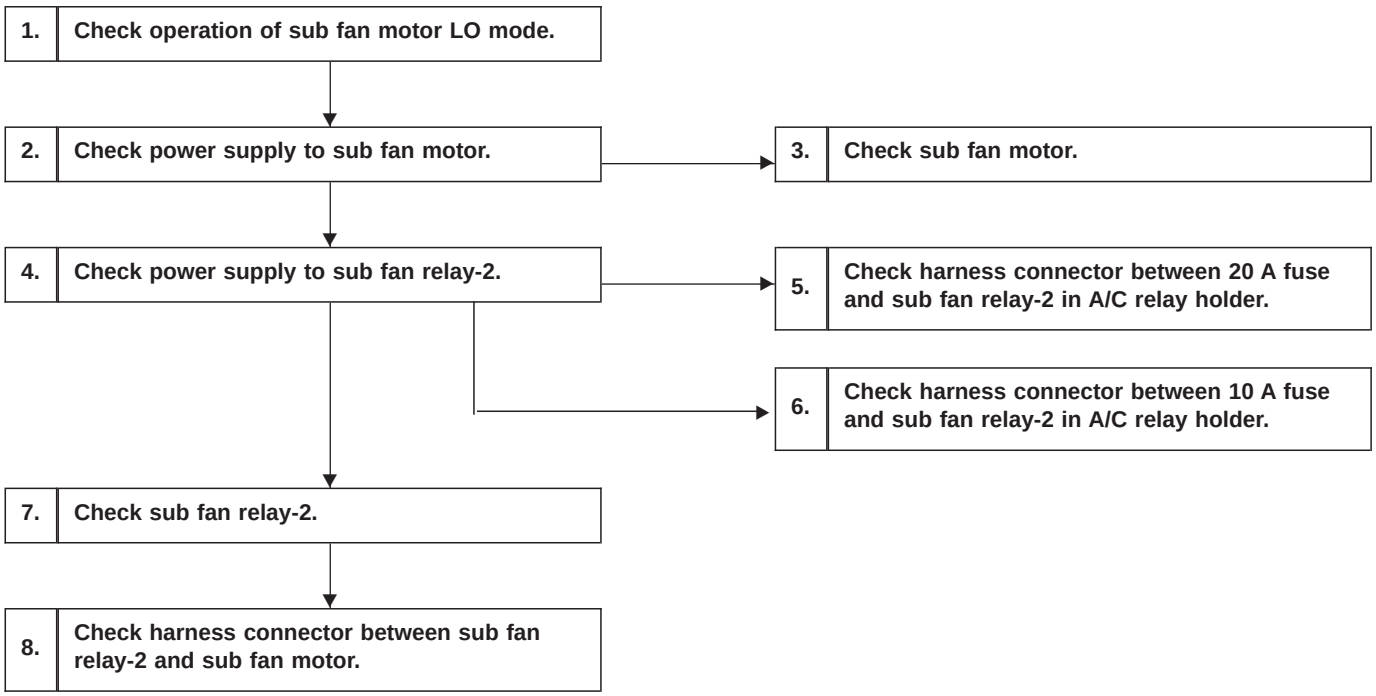
Condition (1) :
- Engine coolant temperature is below 89°C (192°F).
- A/C switch is turned ON.
- Vehicle speed is over 20 km/h (12 MPH).

Condition (2) :
- Engine coolant temperature is above 95°C (203°F).
- A/C switch is turned OFF.
- Vehicle speed is over 20 km/h (12 MPH).

Condition (3) :
- Engine coolant temperature is above 95°C (203°F).
- A/C switch is turned ON.

TROUBLE SYMPTOM:

- Radiator sub fan does not rotate at HI speed under conditions (1), (2) and (3) above.



1	CHECK OPERATION OF SUB FAN MOTOR LO MODE.

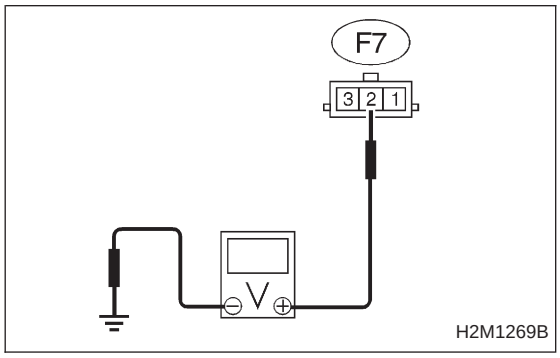
CAUTION:
Be careful not to overheat engine during repair.

1) Warm-up the engine until engine coolant temperature increases over 95°C (203°F).
2) Stop the engine and turn ignition switch to ON.
3) Turn A/C switch to OFF.

CHECK ***: Does the sub fan operate at LO MODE?***

YES : Go to step 2.

NO : Go to LO MODE OPERATION diagnostics chart. <Ref. to 2-5 [T3A0].>



2	CHECK POWER SUPPLY TO SUB FAN MOTOR.

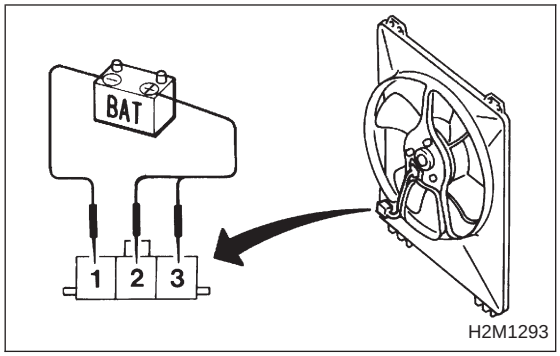
CAUTION:
Be careful not to overheat engine during repair.

1) Turn ignition switch to OFF.
2) Disconnect connector from sub fan motor.
3) Warm-up the engine until engine coolant temperature increases over 95°C (203°F).
4) Stop the engine and turn ignition switch to ON.
5) Turn A/C switch to ON.
6) Measure voltage between sub fan motor connector and body.

CHECK ***: Connector & terminal***
(F7) No. 2 — Body/10 V, or more

YES : Go to step 3.

NO : Go to step 4.



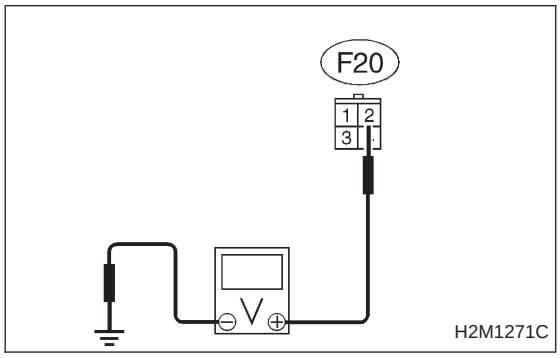
3	CHECK SUB FAN MOTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from sub fan motor.

CHECK : ***Does the sub fan rotate at HI speed while connecting battery positive (+) terminal to terminals Nos. 2 and 3, and connecting battery negative (−) terminal to terminal No. 1 of sub fan motor connector?***

YES : Repair poor contact in sub fan motor connector.

NO : Replace sub fan motor with a new one.



4	CHECK POWER SUPPLY TO SUB FAN RELAY-2.

1) Turn ignition switch to OFF.
2) Remove sub fan relay-2 from A/C relay holder.
3) Measure voltage between sub fan relay-2 connector and body.

CHECK : ***Connector & terminal (F20) No. 2 — Body/10 V, or more***

YES : Go to next step.

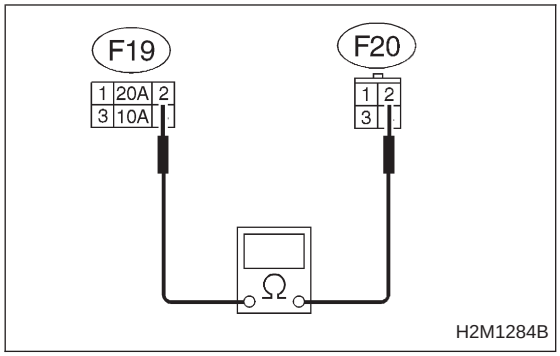
NO : Go to step 5.

4) Turn ignition switch to ON.
5) Measure voltage between sub fan relay-2 connector and body.

CHECK : ***Connector & terminal (F20) No. 3 — Body/10 V, or more***

YES : Go to step 7.

NO : Go to step 6.



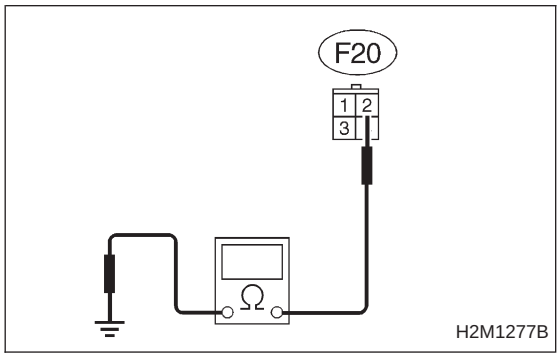
5	CHECK HARNESS CONNECTOR BETWEEN 20 A FUSE AND SUB FAN RELAY-2 IN A/C RELAY HOLDER.

1) Turn ignition switch to OFF.
2) Remove 20 A fuse from A/C relay holder.
3) Measure resistance of harness connector between 20 A fuse and sub fan relay-2.

CHECK : ***Connector & terminal***
(F19) No. 2 — (F20) No. 2/1 Ω, or less

YES : Go to next step.

NO : In this case, repair open circuit of harness between 20 A fuse and sub fan relay-2 connector.

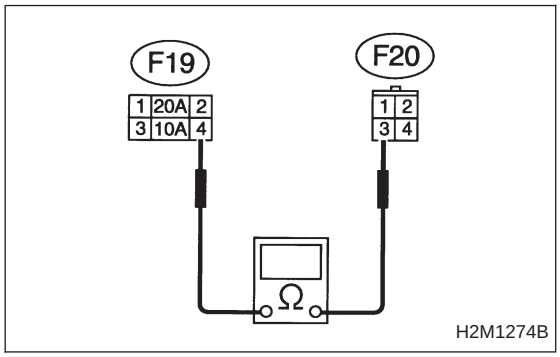


4) Measure resistance between sub fan relay-2 connector and body.

CHECK : ***Connector & terminal***
(F20) No. 2 — Body/1 MΩ, or more

YES : Repair poor contact in 20 A fuse or sub fan relay-2 connector.

NO : Repair short circuit between 20 A fuse and sub fan relay-2 connector.



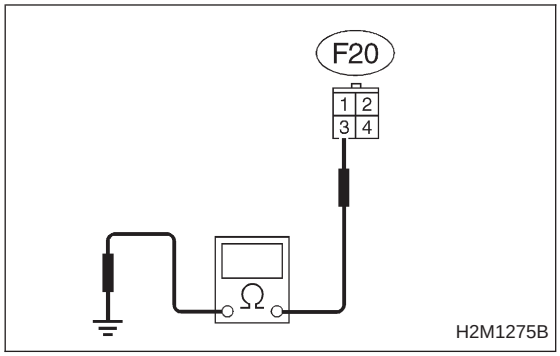
6	CHECK HARNESS CONNECTOR BETWEEN 10 A FUSE AND SUB FAN RELAY-2 IN A/C RELAY HOLDER.

1) Turn ignition switch to OFF.
2) Remove 10 A fuse from A/C relay holder.
3) Measure resistance of harness connector between 10 A fuse and sub fan relay-2.

CHECK : ***Connector & terminal***
(F19) No. 4 — (F20) No. 3/1 Ω, or less

YES : Go to next step.

NO : In this case, repair open circuit of harness between 10 A fuse and sub fan relay-2 connector.

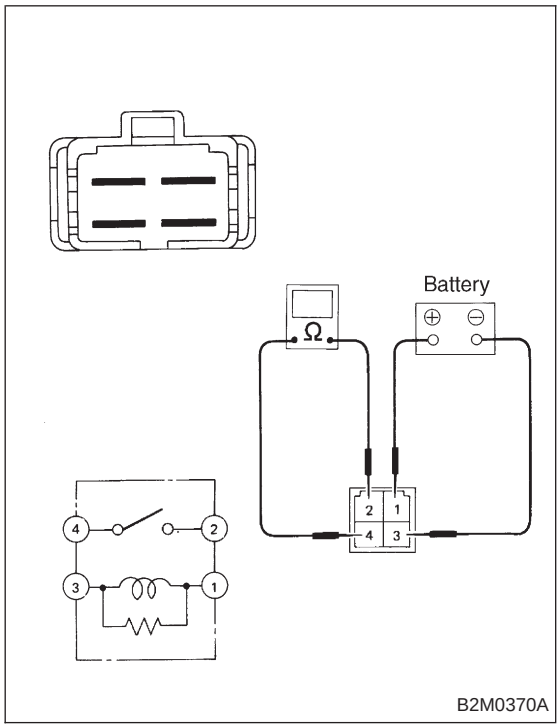


4) Measure resistance between sub fan relay-2 connector and body.

CHECK ***: Connector & terminal***
(F20) No. 3 — Body/1 MΩ, or more

YES : Repair poor contact in 10 A fuse or sub fan relay-2 connector.

NO : Repair short circuit between 10 A fuse and sub fan relay-2 connector.



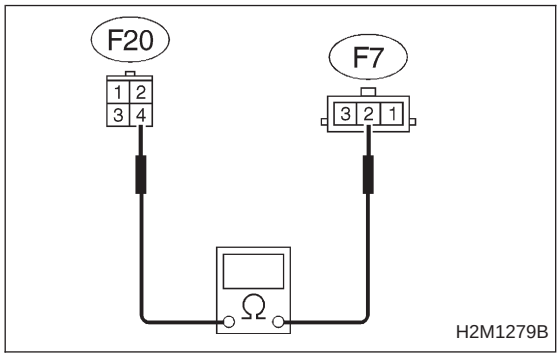
7	CHECK SUB FAN RELAY-2.

Check continuity between sub fan relay-2 terminals.

CHECK ***: ① Does continuity exist between terminals (2) and (4) while connecting battery to terminals (1) and (3)?***
② Does no continuity exist between terminals (2) and (4) when battery is disconnected?

YES : Go to step 8.

NO : Replace sub fan relay-2.



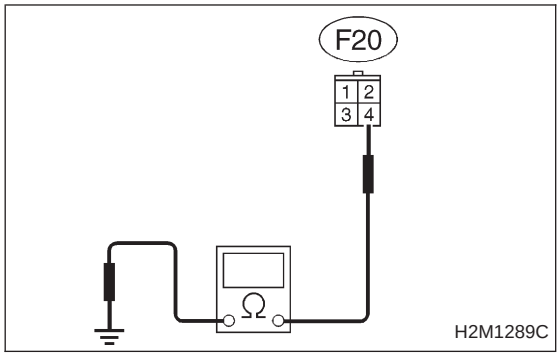
8	CHECK HARNESS CONNECTOR BETWEEN SUB FAN RELAY-2 AND SUB FAN MOTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from sub fan motor.
3) Measure resistance of harness connector between sub fan relay-2 and sub fan motor.

CHECK ***: Connector & terminal***
(F20) No. 4 — (F7) No. 2/1 Ω, or less

YES : Go to next step.

NO : In this case, repair open circuit of harness between sub fan relay-2 and sub fan motor connector.



4) Measure resistance between sub fan relay-2 connector and body.

CHECK ***: Connector & terminal (F20) No. 4 — Body/1 MΩ, or more***

YES : Go to next CHECK .

NO : Repair short circuit between sub fan relay-2 and sub fan motor connector.

CHECK ***: Is there poor contact in sub fan relay-2 or sub fan motor connector?***

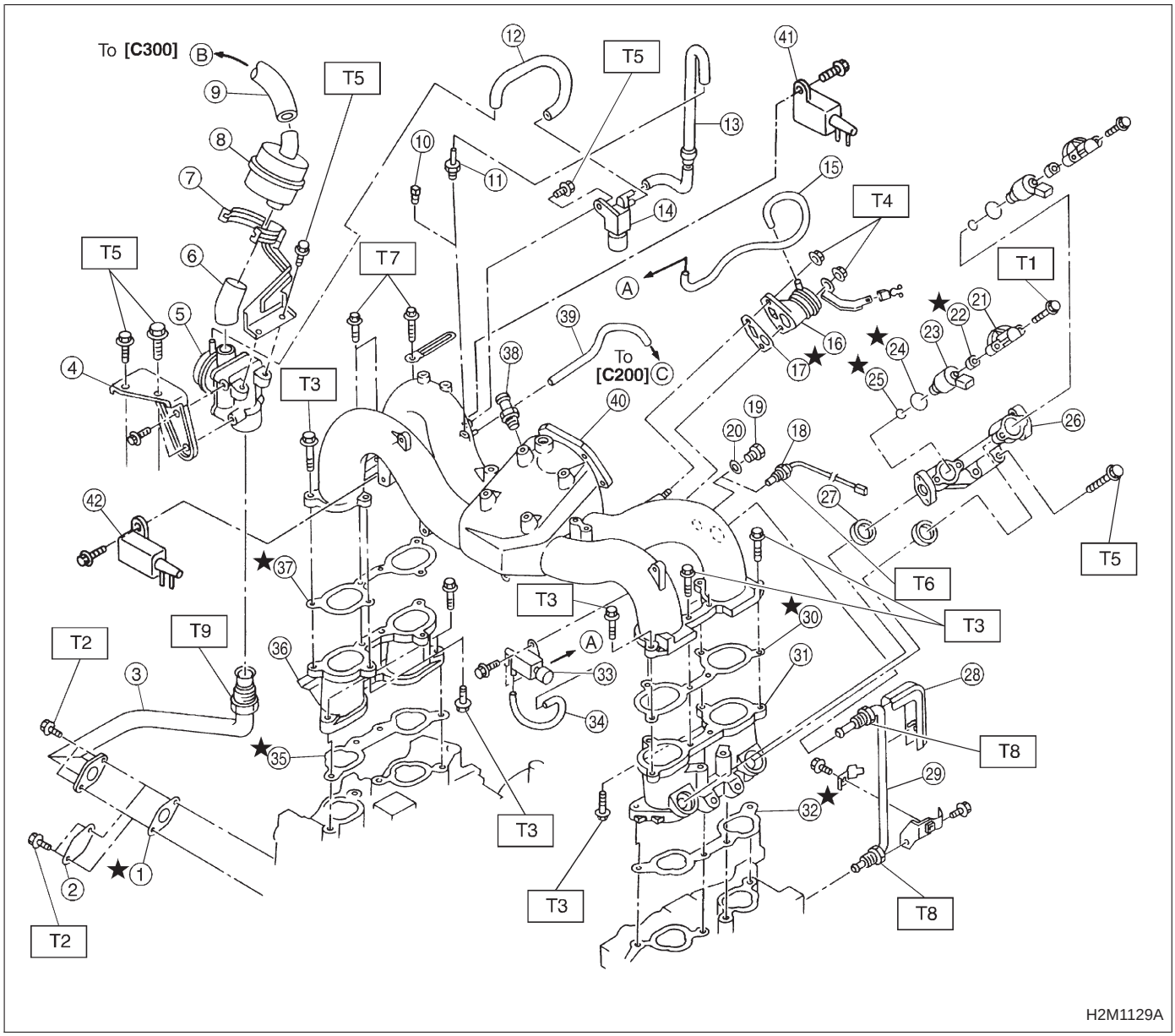
YES : Repair poor contact in sub fan relay-2 or sub fan motor connector.

NO : Refer to 2-7b “On-Board Diagnostics II System” diagnostics procedure.

FUEL INJECTION SYSTEM 2-7

1. Collector Chamber and Intake Manifold

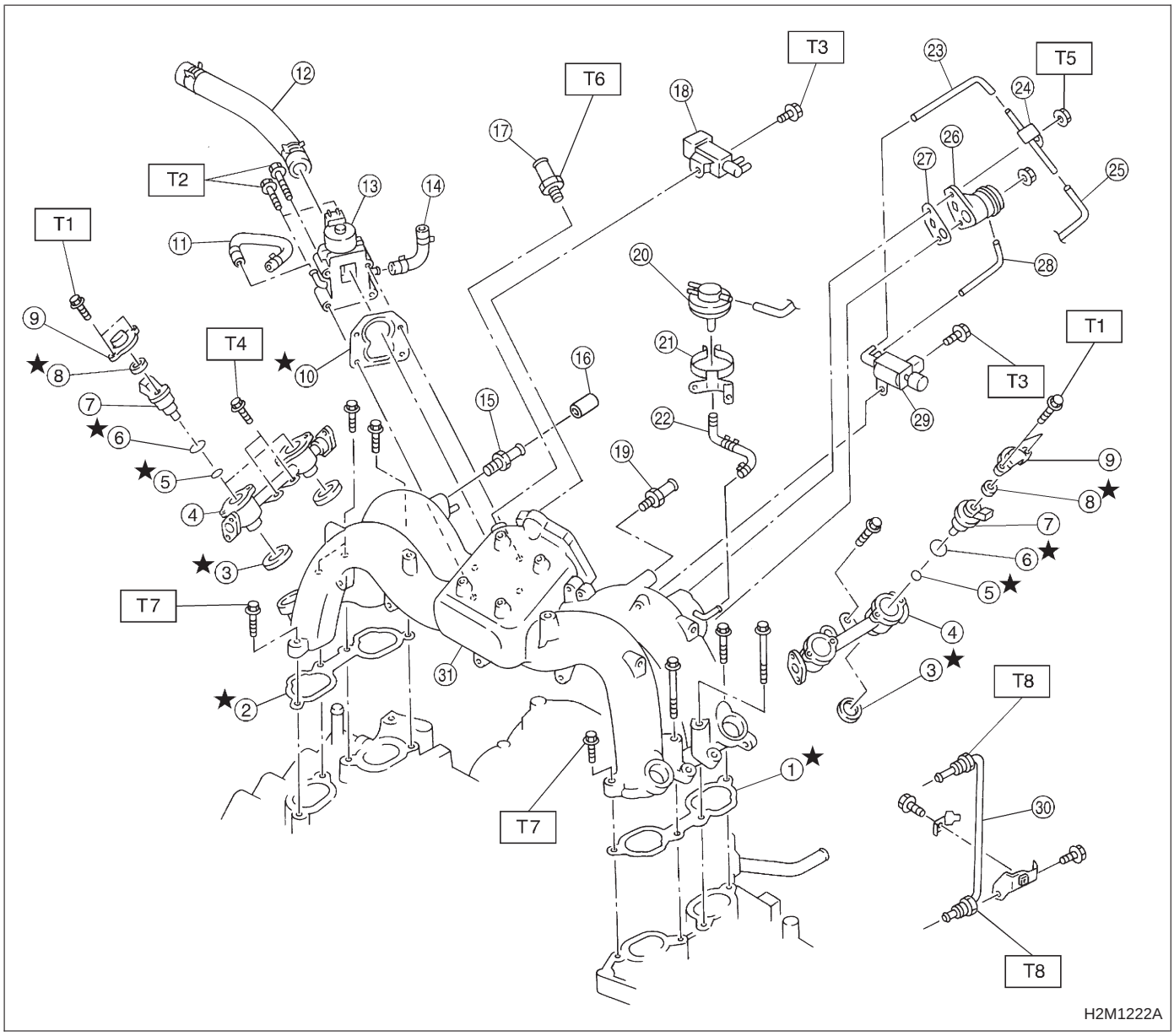
1. 1800 cc MODEL



① Gasket
② Hole lid
③ Air suction pipe
④ Air suction valve bracket
⑤ Air suction valve
⑥ Air suction hose A
⑦ Air suction valve holder
⑧ Silencer
⑨ Air suction hose B
⑩ Plug
⑪ Nipple
⑫ Air suction solenoid valve hose A
⑬ Air suction solenoid valve hose B
⑭ Air suction solenoid valve
⑮ EGR valve hose
⑯ EGR valve
⑰ Gasket
⑱ Recirculation gas temperature sensor
⑲ Plug
⑳ Washer
㉑ Fuel injector cap
㉒ Insulator
㉓ Fuel injector
㉔ O-ring A
㉕ O-ring B
㉖ Fuel pipe
㉗ Washer
㉘ EGR pipe cover
㉙ EGR pipe
㉚ Collector chamber gasket RH
㉛ Intake manifold RH
㉜ Intake manifold gasket RH
㉝ EGR solenoid valve
㉞ EGR solenoid valve hose
㉟ Intake manifold gasket LH
㊱ Intake manifold LH
㊲ Collector chamber gasket LH
㊳ PCV valve
㊴ Air by-pass hose
㊵ Collector chamber
㊶ Purge control solenoid valve (except California)
㊷ Purge control solenoid valve (California)

Tightening torque: N·m (kg-m, ft-lb)
T1: 3.4±0.5 (0.35±0.05, 2.5±0.4)
T2: 8±2 (0.8±0.2, 5.8±1.4)
T3: 12±3 (1.2±0.3, 8.7±2.2)
T4: 19±1.5 (1.9±0.15, 13.7±1.1)
T5: 19±4.9 (1.9±0.5, 13.7±3.6)
T6: 20±1 (2.0±0.1, 14.5±0.7)
T7: 27.0±7.4 (2.75±0.75, 19.9±5.4)
T8: 34±2 (3.5±0.2, 25.3±1.4)
T9: 39±5 (4.0±0.5, 28.9±3.6)

2. 2200 cc MODEL

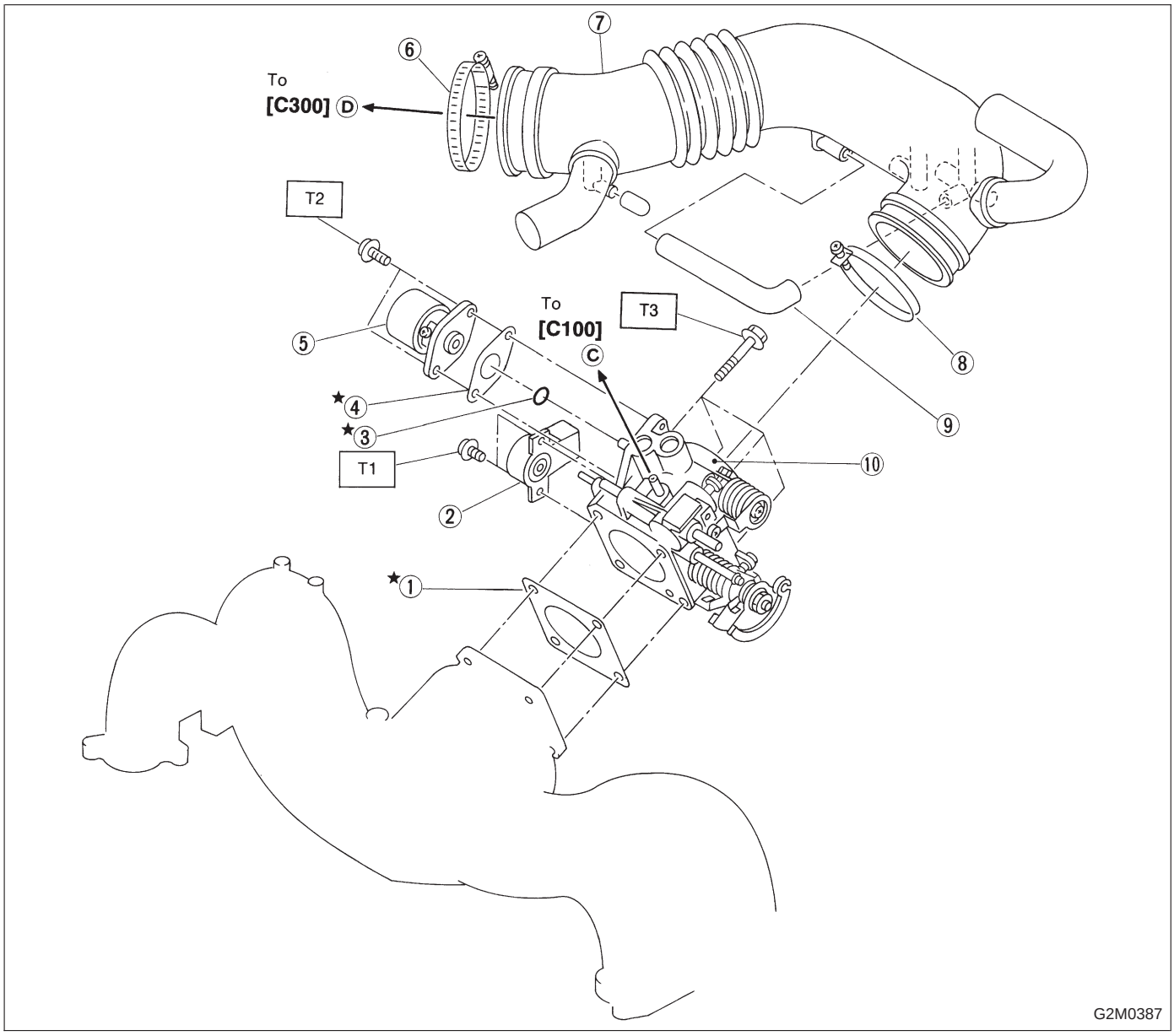


① Intake manifold gasket RH
② Intake manifold gasket LH
③ Fuel injector pipe insulator
④ Fuel injector pipe
⑤ O-ring A
⑥ O-ring B
⑦ Fuel injector
⑧ Insulator
⑨ Fuel injector cap
⑩ Gasket
⑪ Engine coolant hose B
⑫ Air by-pass hose
⑬ Idle air control solenoid valve
⑭ Engine coolant hose A
⑮ Nipple
⑯ Rubber cap
⑰ PCV valve
⑱ Purge control solenoid valve
⑲ Nipple
⑳ BPT
㉑ BPT holder bracket
㉒ Back pressure hose
㉓ EGR vacuum hose A
㉔ EGR vacuum pipe
㉕ EGR vacuum hose C
㉖ EGR valve
㉗ Gasket
㉘ EGR vacuum hose B
㉙ EGR solenoid valve
㉚ EGR pipe
㉛ Intake manifold

Tightening torque: N·m (kg-m, ft-lb)
T1: 3.4±0.5 (0.35±0.05, 2.5±0.4)
T2: 6.4±0.5 (0.65±0.05, 4.7±0.4)
T3: 16±1.5 (1.6±0.15, 11.6±1.1)
T4: 19±1 (1.9±0.1, 13.7±0.7)
T5: 19±1.5 (1.9±0.15, 13.7±1.1)
T6: 23±3 (2.3±0.3, 16.6±2.2)
T7: 25±2 (2.5±0.2, 18.1±1.4)
T8: 34±2 (3.5±0.2, 25.3±1.4)

2. Air Intake System

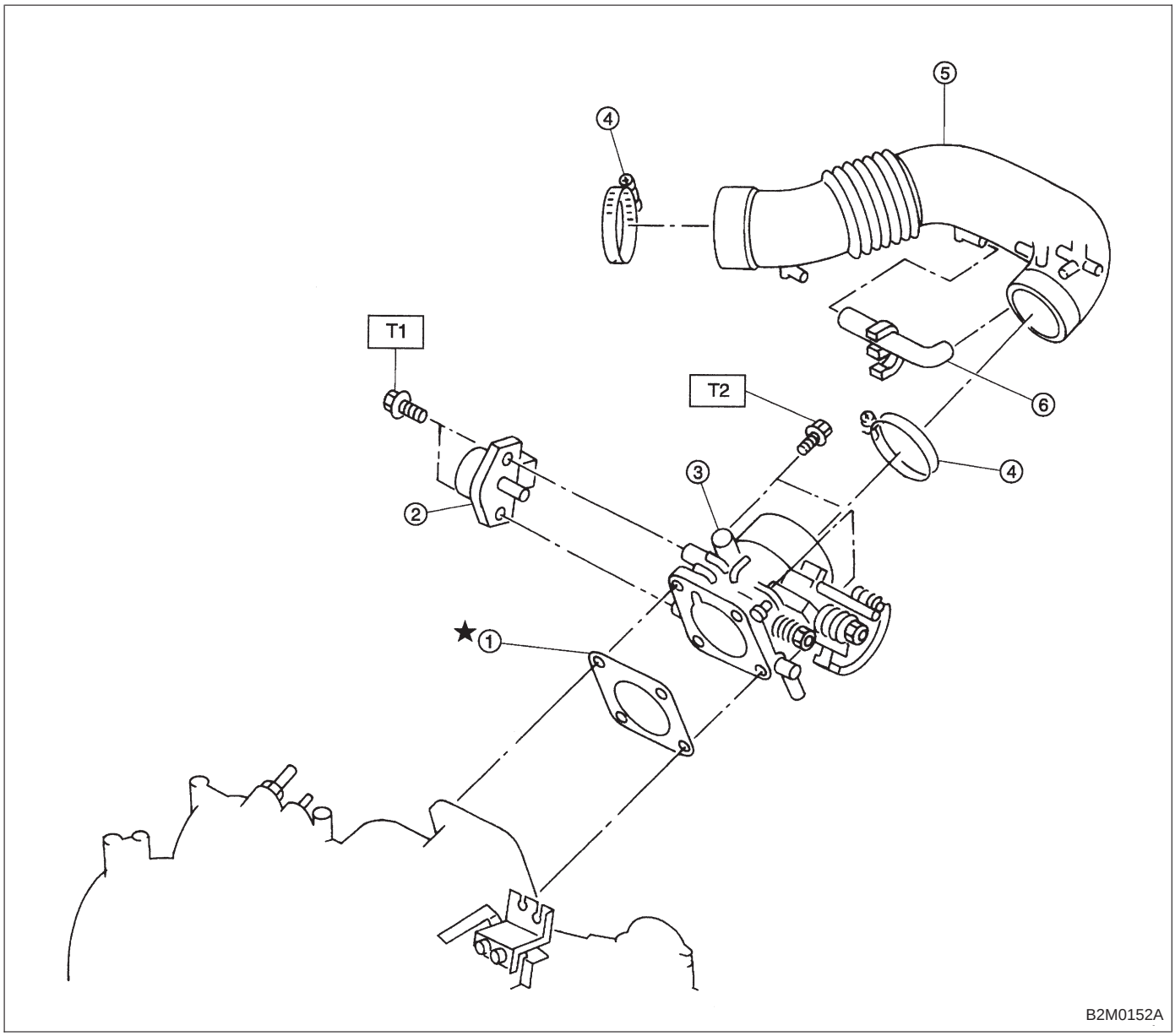
1. 1800 cc MODEL



① Gasket
② Throttle position sensor
③ O-ring
④ Gasket
⑤ Idle air control solenoid valve
⑥ Clamp
⑦ Air intake duct
⑧ Clamp
⑨ By-pass hose
⑩ Throttle body

Tightening torque: N·m (kg-m, ft-lb)
T1: 2.2±0.2 (0.22±0.02, 1.6±0.1)
T2: 6.0±0.8 (0.61±0.08, 4.4±0.6)
T3: 19±4.9 (1.9±0.5, 13.7±3.6)

2. 2200 cc MODEL

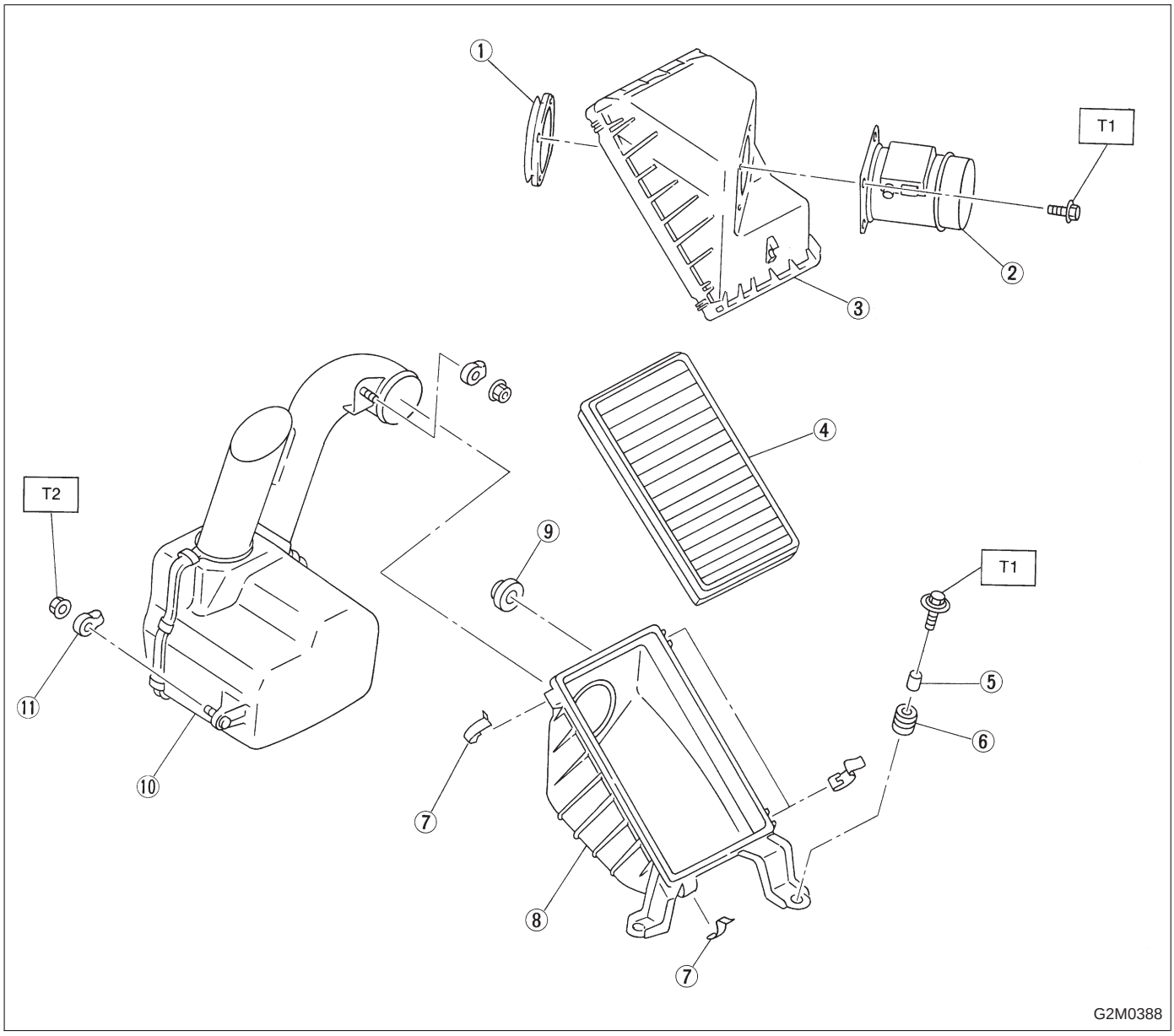


① Gasket
② Throttle position sensor
③ Throttle body
④ Clamp
⑤ Air intake duct
⑥ By-pass hose

Tightening torque: N·m (kg-m, ft-lb)
T1: 2.2±0.2 (0.22±0.02, 1.6±0.1)
T2: 22±2 (2.2±0.2, 15.9±1.4)

3. Air Cleaner

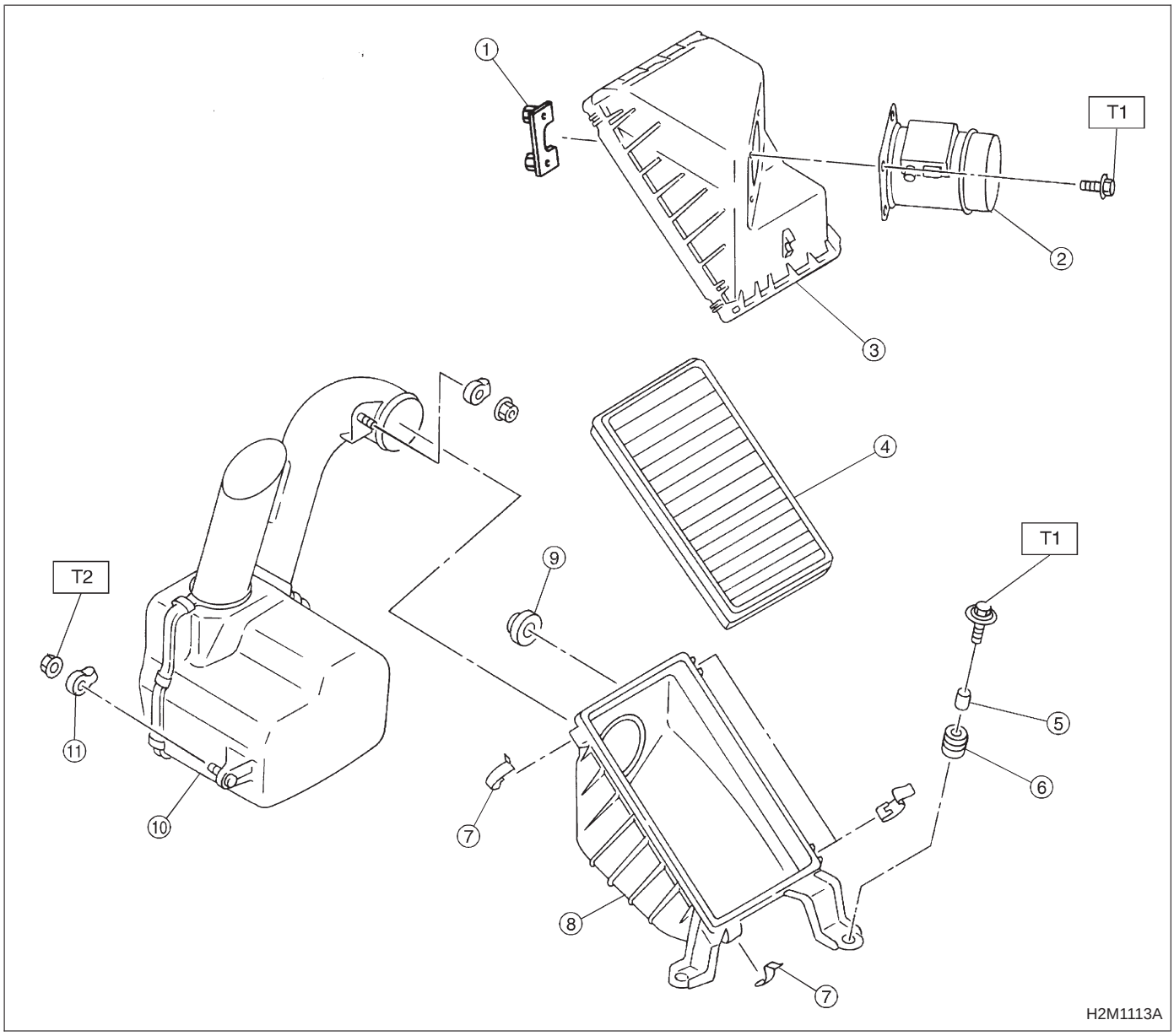
1. 1800 cc MODEL



① Mass air flow sensor bracket
② Mass air flow sensor ASSY
③ Air cleaner upper cover
④ Air cleaner element
⑤ Spacer
⑥ Bush
⑦ Clip
⑧ Air cleaner case
⑨ Cushion rubber
⑩ Resonator chamber ASSY
⑪ Clip

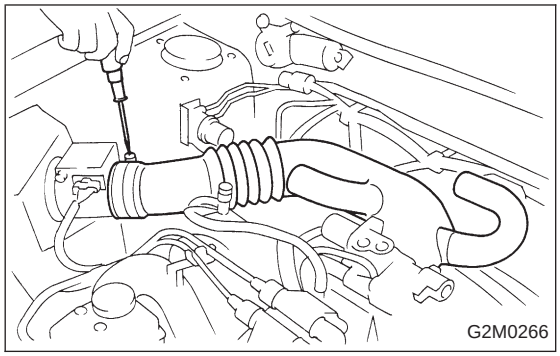
Tightening torque: N·m (kg-m, ft-lb)
T1: 7.4±2.0 (0.75±0.2, 5.4±1.4)
T2: 33±10 (3.4±1.0, 25±7)

2. 2200 cc MODEL



① Mass air flow sensor bracket
② Mass air flow sensor ASSY
③ Air cleaner upper cover
④ Air cleaner element
⑤ Spacer
⑥ Bush
⑦ Clip
⑧ Air cleaner case
⑨ Cushion rubber
⑩ Resonator chamber ASSY
⑪ Clip

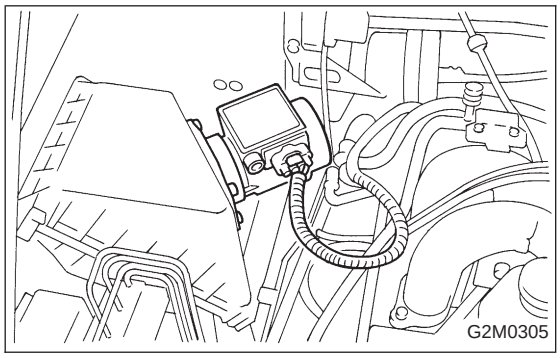
Tightening torque: N·m (kg-m, ft-lb)
T1: 7.4±2.0 (0.75±0.2, 5.4±1.4)
T2: 33±10 (3.4±1.0, 25±7)


G2M0266

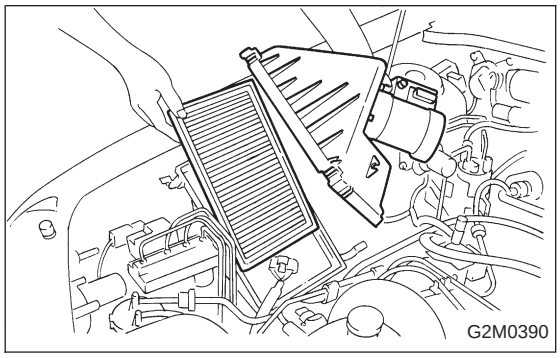
1. Air Cleaner and Air Intake Duct

A: REMOVAL AND INSTALLATION

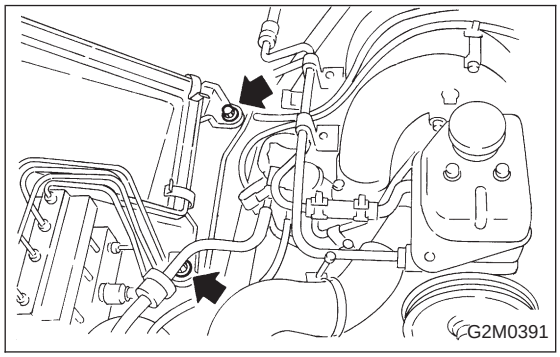
1) Loosen clamp which connect air intake duct to throttle body and mass air flow sensor.
2) Remove air intake duct.


G2M0305

3) Disconnect connector from mass air flow sensor.

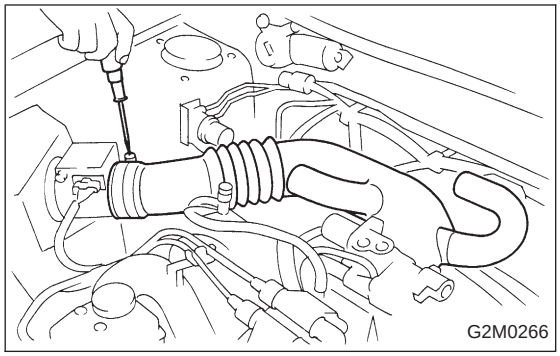

G2M0390

4) Remove clip of air cleaner upper cover.
5) Remove air cleaner element.


G2M0391

6) Remove air cleaner lower case.

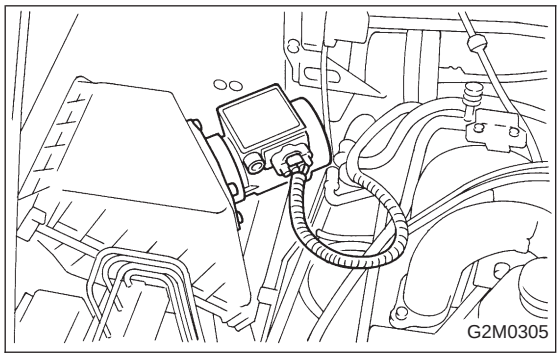
7) Installation is in the reverse order of removal.



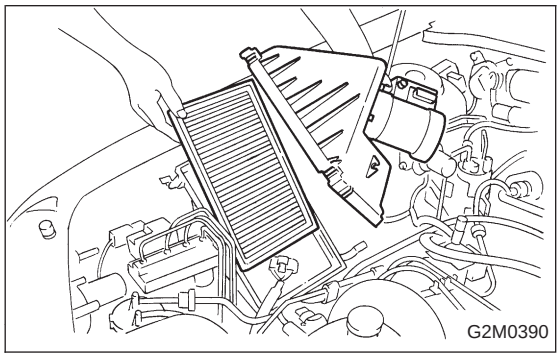
2. Mass Air Flow Sensor

A: REMOVAL AND INSTALLATION

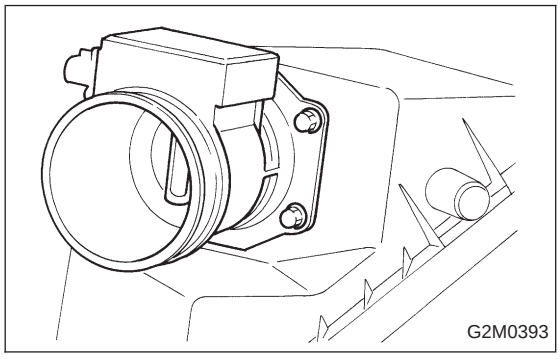
1) Remove air intake duct.



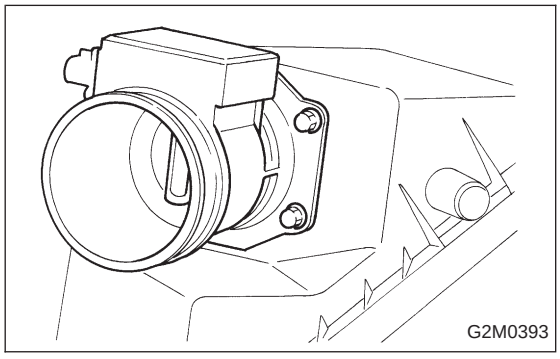
2) Disconnect connector from mass air flow sensor.



3) Remove air cleaner upper cover.

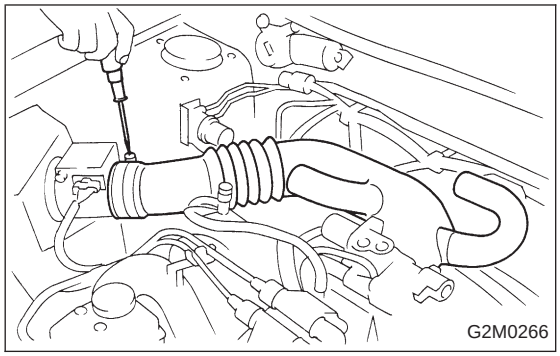


4) Remove mass air flow sensor from air cleaner upper cover.



5) Installation is in the reverse order of removal.

Tightening torque:
7.4±2.0 N·m (0.75±0.2 kg-m, 5.4±1.4 ft-lb)

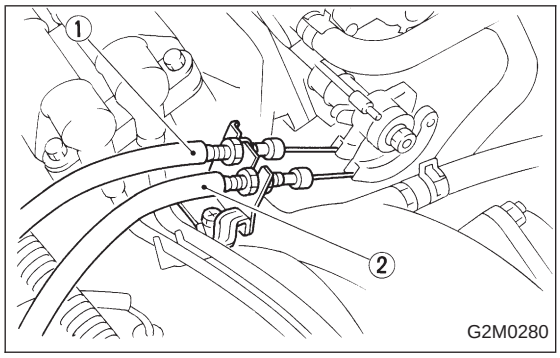


3. Throttle Body

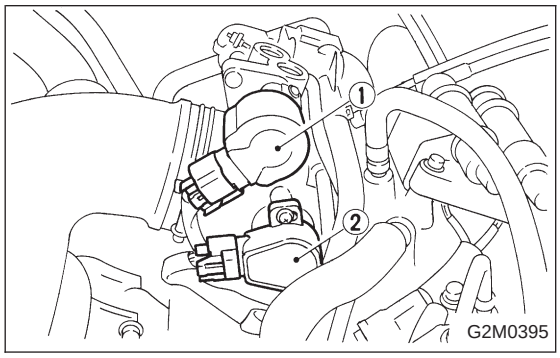
A: REMOVAL AND INSTALLATION

1. 1800 cc MODEL

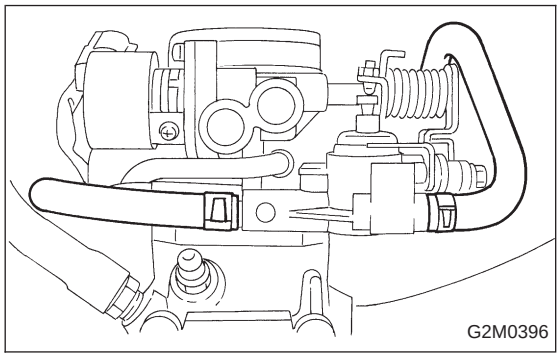
1) Remove air intake duct.



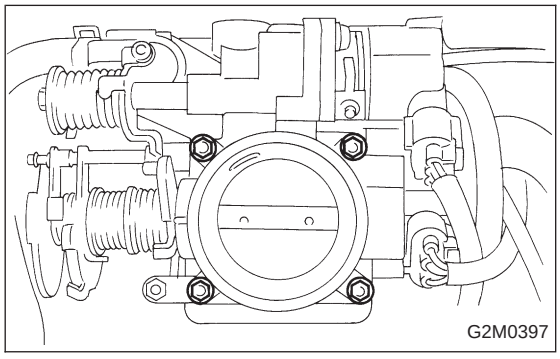
2) Disconnect accelerator cable ②.
3) Disconnect cruise control cable ①. (With cruise control)



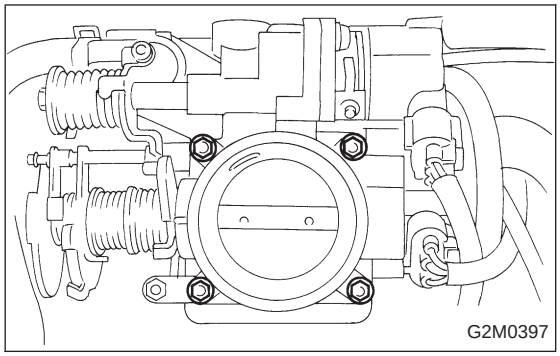
4) Disconnect connectors from idle air control solenoid valve and throttle position sensor.
① Idle air control solenoid valve
② Throttle position sensor



5) Disconnect water hoses from throttle body.



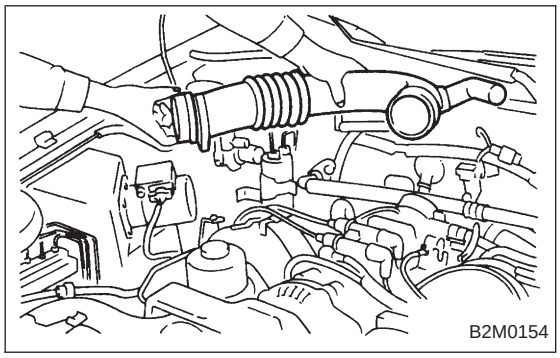
6) Remove bolts which install throttle body to collector chamber.


G2M0397

7) Installation is in the reverse order of removal.

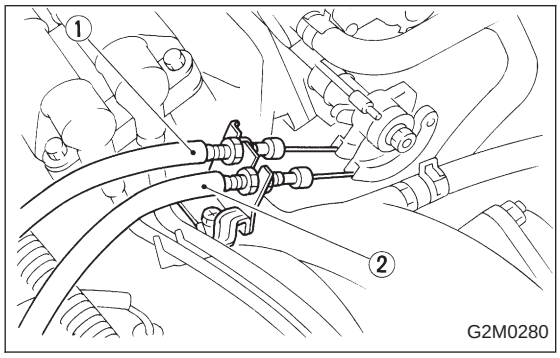
CAUTION:
Always use a new gasket.

Tightening torque:
19±4.9 N·m (1.9±0.5 kg-m, 13.7±3.6 ft-lb)


B2M0154

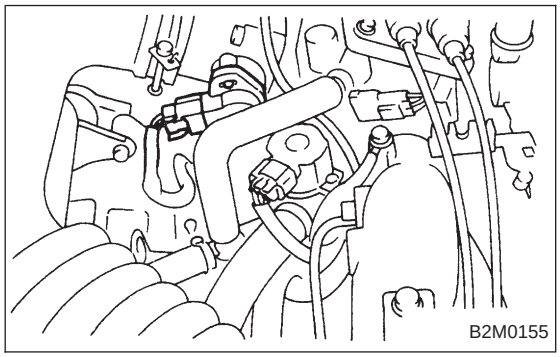
2. 2200 cc MODEL

1) Remove air intake duct.

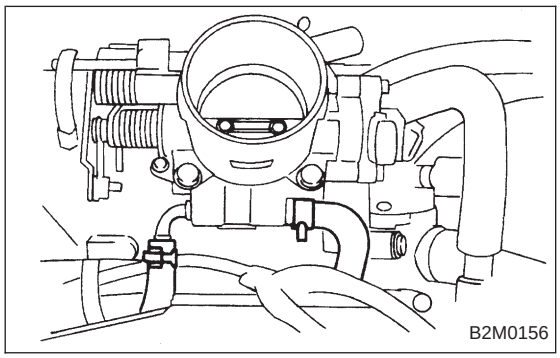


G2M0280

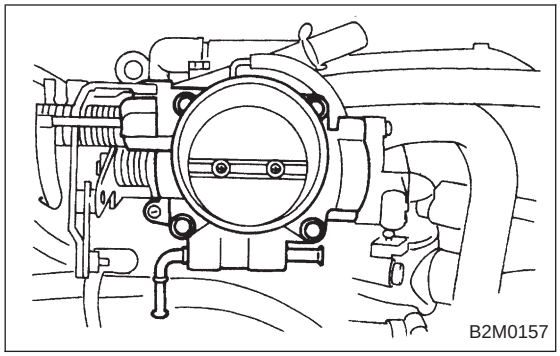
2) Disconnect accelerator cable ①.
3) Disconnect cruise control cable ②. (With cruise control model)


B2M0155

4) Disconnect connector from throttle position sensor.


B2M0156

5) Disconnect engine coolant hoses from throttle body.

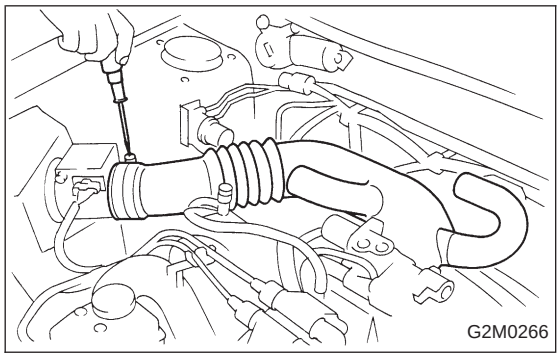

B2M0157

6) Remove bolts which install throttle body to collector chamber.

7) Installation is in the reverse order of removal.

CAUTION:
Always use a new gasket.

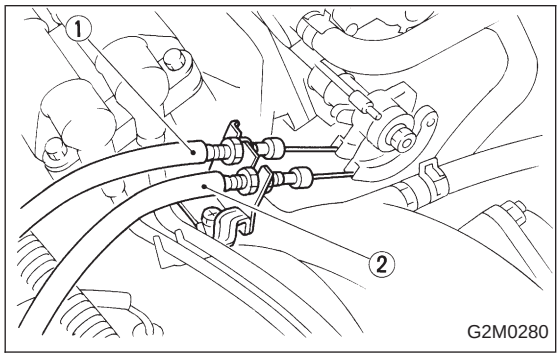
Tightening torque:
22±2 N·m (2.2±0.2 kg-m, 15.9±1.4 ft-lb)


G2M0266

4. Collector Chamber and Intake Manifold

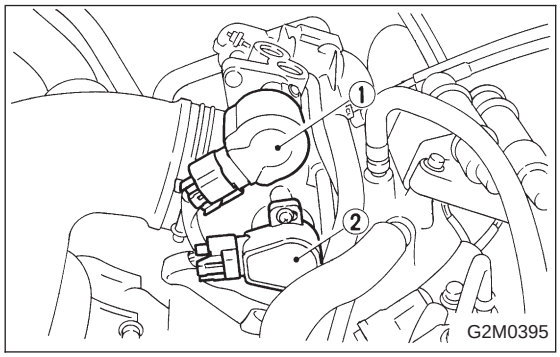
A: REMOVAL

1) Release fuel pressure. <Ref. to 2-8 [W1A0].>
2) Remove air intake duct.



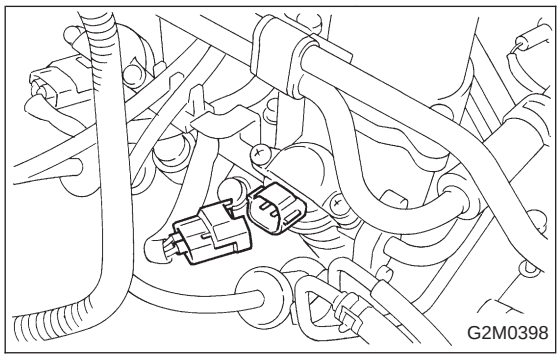
G2M0280

3) Disconnect accelerator cable ②.
4) Disconnect cruise control cable ①. (With cruise control)

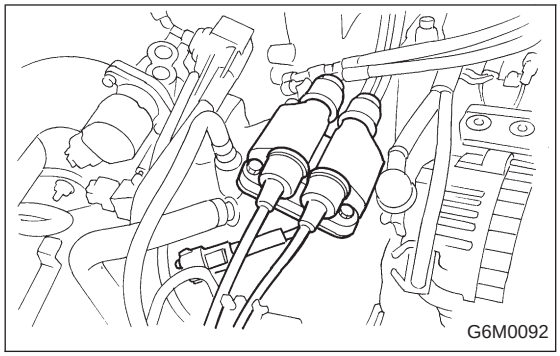


G2M0395

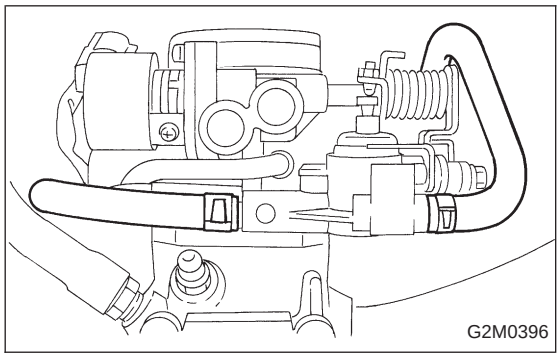
5) Disconnect connectors from idle air control solenoid valve and throttle position sensor.
① Idle air control solenoid valve
② Throttle position sensor


G2M0398

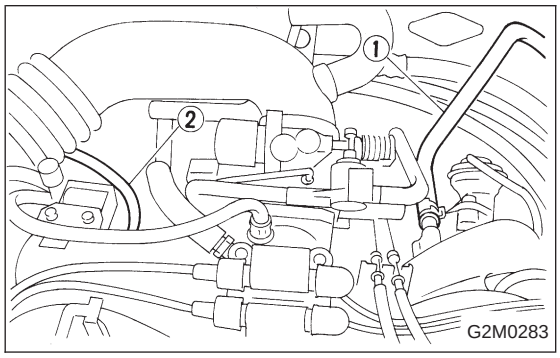
6) Disconnect connectors from fuel injectors.



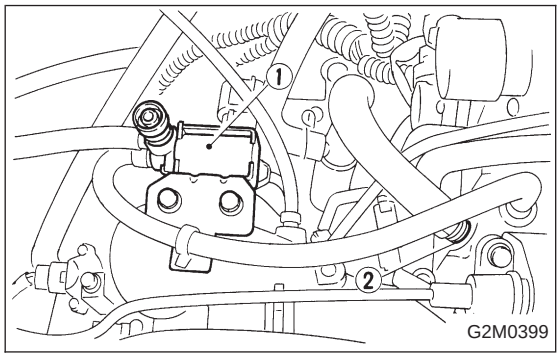
7) Disconnect spark plug cords from ignition coil.
8) Disconnect connector from ignition coil.



9) Disconnect water hose from throttle body.

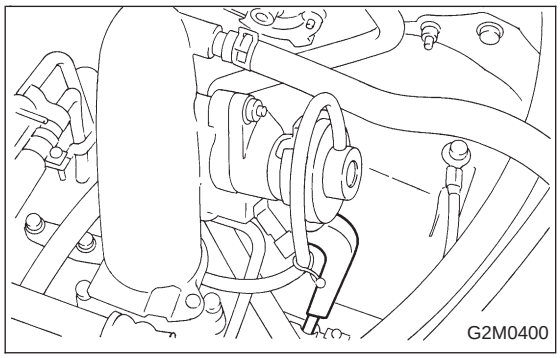


10) Disconnect brake booster hose ①.
11) Disconnect cruise control vacuum hose ②. (With cruise control)

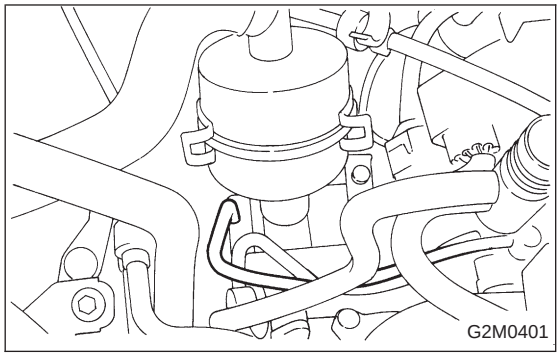


12) Disconnect air by-pass hose from FICD solenoid valve. (With A/C)
13) Disconnect emission hose from PCV valve.

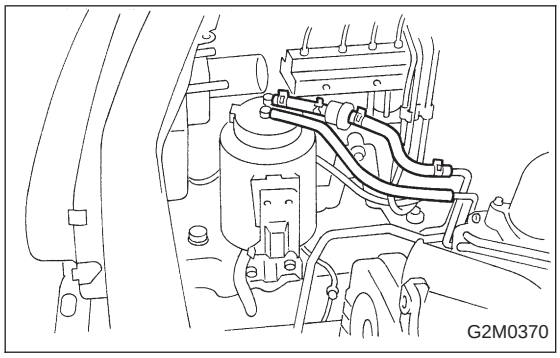
① FICD solenoid valve
② PCV valve



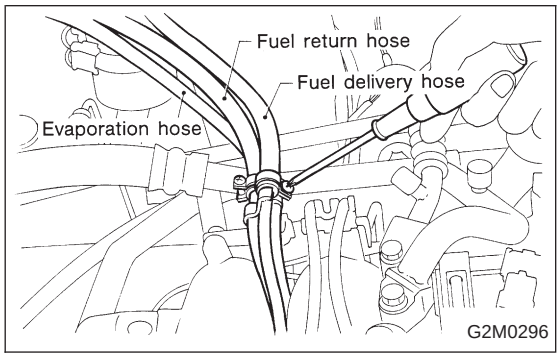
14) Remove cover, and disconnect pipe from EGR valve.



15) Disconnect hose from air suction valve.

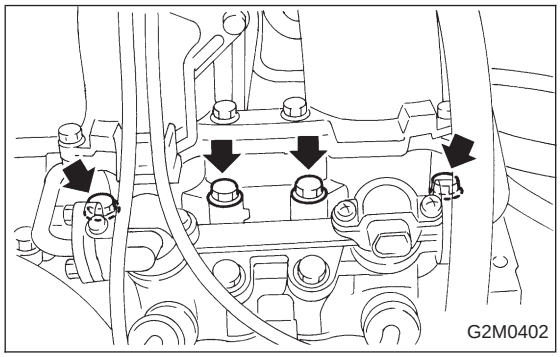


16) Disconnect canister hose from pipe.

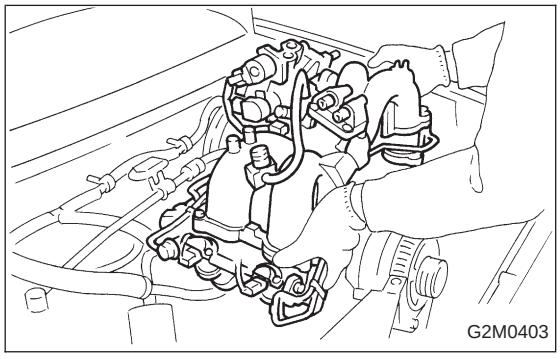


17) Disconnect fuel hoses from pipes.

WARNING:
Catch fuel from hoses in a container.



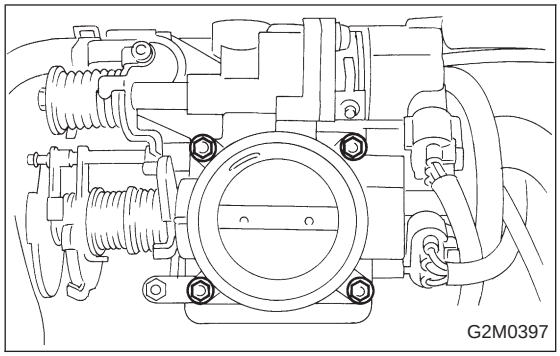
18) Remove bolts which hold power steering pipe bracket onto intake manifold.
19) Remove bolts which hold intake manifold onto cylinder heads.



20) Disconnect the following connectors on inner side of collector chamber.

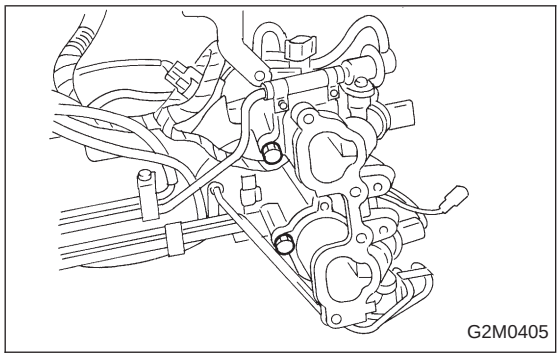
① Purge control solenoid valve
② EGR solenoid valve
③ Air suction solenoid valve

21) Remove collector chamber and intake manifold.

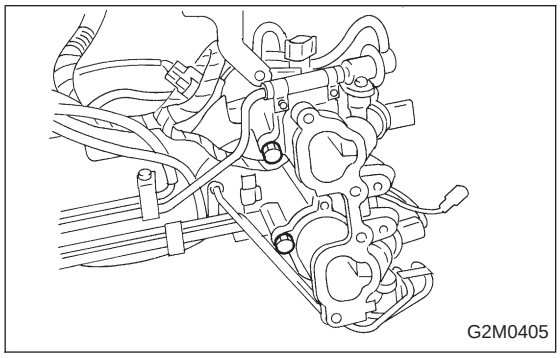


B: DISASSEMBLY

1) Remove throttle body from collector chamber.



2) Remove intake manifold from collector chamber.

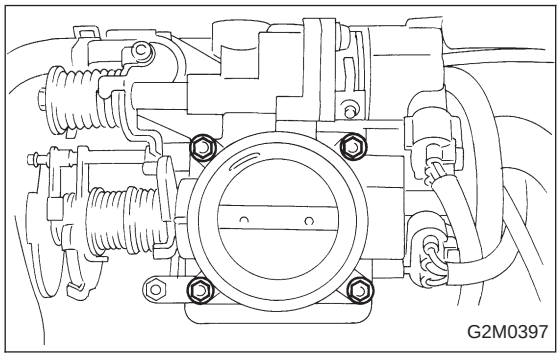


C: ASSEMBLY

1) Assemble intake manifold from collector chamber.

CAUTION:
Replace gaskets with new ones.

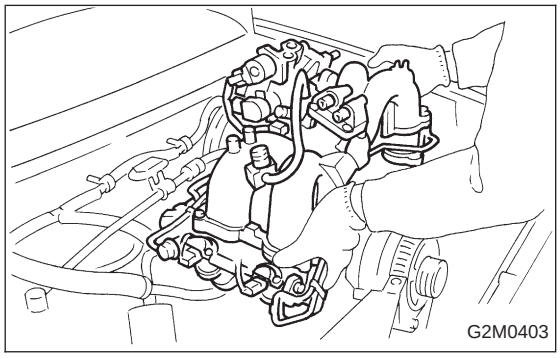
Tightening torque:
1800 cc model:
12±3 N·m (1.2±0.3 kg-m, 8.7±2.2 ft-lb)



2) Assemble throttle body from collector chamber.

CAUTION:
Replace gasket with a new one.

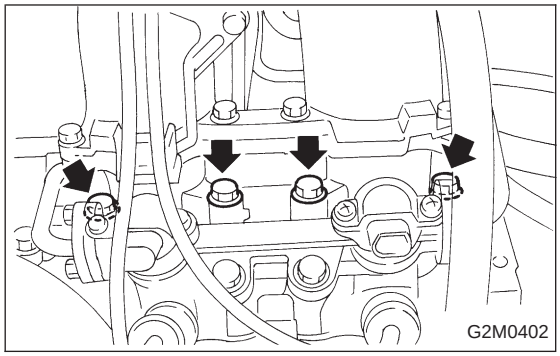
Tightening torque:
1800 cc model:
19±4.9 N·m (1.9±0.5 kg-m, 13.7±3.6 ft-lb)
2200 cc model:
22±2 N·m (2.2±0.2 kg-m, 15.9±1.4 ft-lb)



D: INSTALLATION

1) Connect following connectors on inner side of collector chamber.

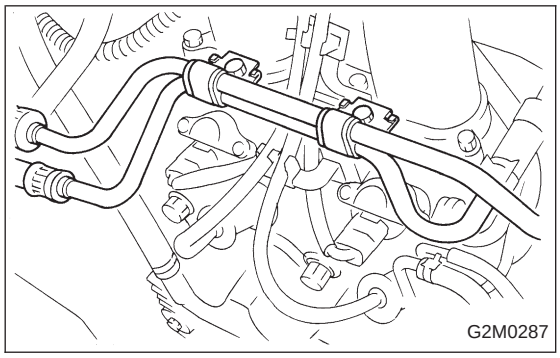
- Purge control solenoid valve
- EGR solenoid valve
- Air suction solenoid valve



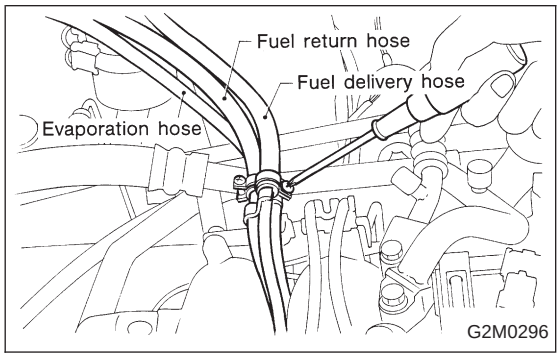
2) Install intake manifold and collector chamber onto cylinder heads.

CAUTION:
Always use new gaskets.

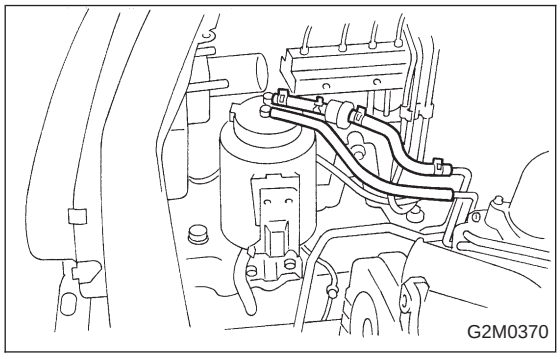
Tightening torque:
1800 cc model:
27.0±7.4 N·m (2.75±0.75 kg-m, 19.9±5.4 ft-lb)
2200 cc model:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)



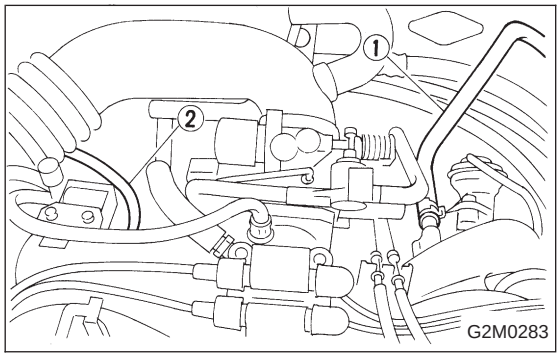
3) Install power steering pipe bracket onto intake manifold.



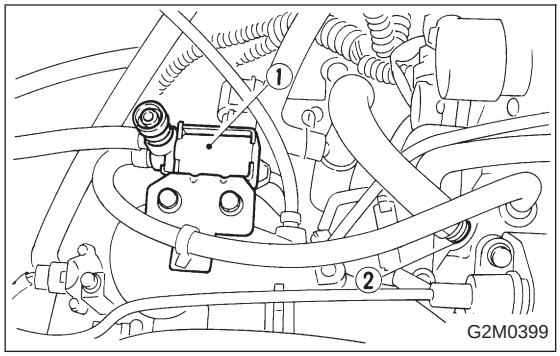
4) Connect fuel hoses.



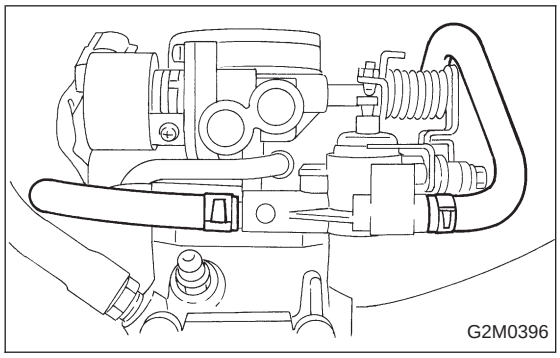
5) Connect canister hoses.



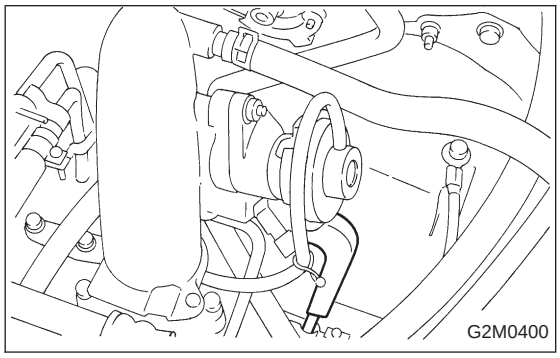
6) Connect cruise control vacuum hose ②. (With cruise control)
7) Connect brake booster vacuum hose ①.



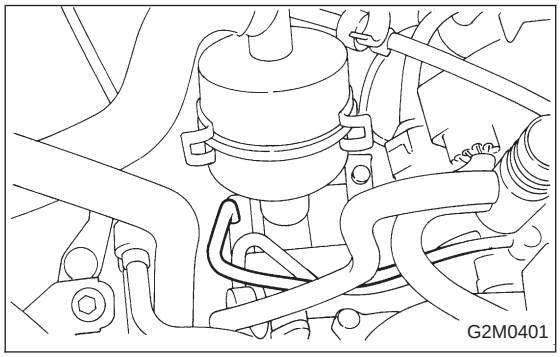
8) Connect air by-pass hose to FICD solenoid valve. (With A/C)
9) Connect emission hose to PCV valve.
① FICD solenoid valve
② PCV valve



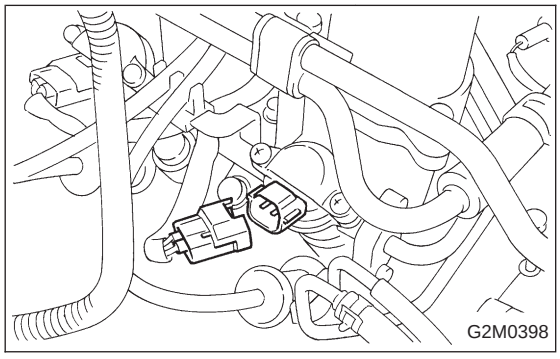
10) Connect engine coolant hoses to throttle body.



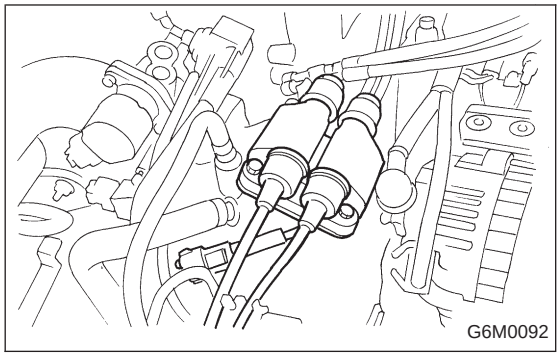
11) Connect pipe to EGR valve, and install cover.



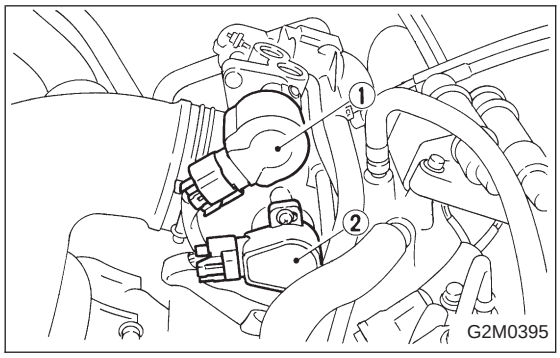
12) Connect hose to air suction valve.



13) Connect connectors to fuel injectors.

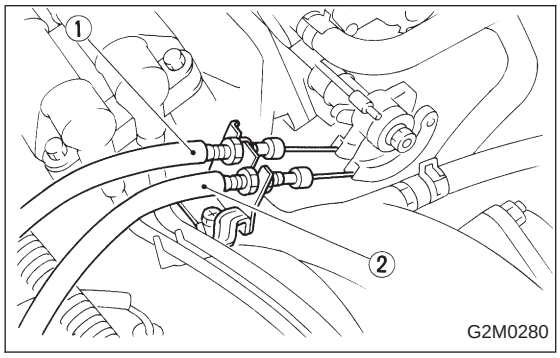

G6M0092

14) Connect spark plug cords to ignition coil.
15) Connect connector to ignition coil.



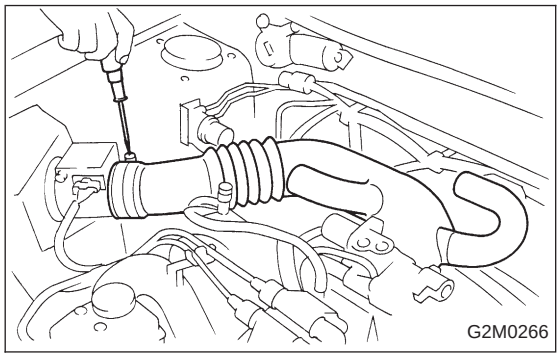
G2M0395

16) Connect connectors to throttle position sensor and idle air control solenoid valve.
① Idle air control solenoid valve
② Throttle position sensor

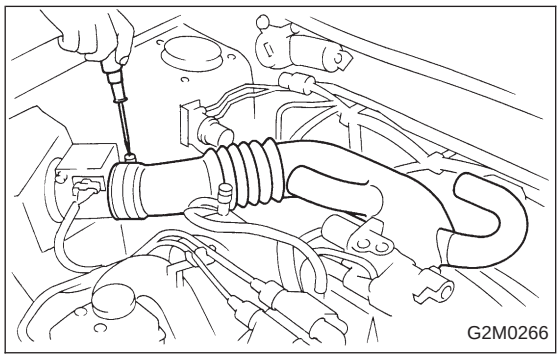


G2M0280

17) Connect accelerator cable ②.
18) Connect cruise control cable ①. (With cruise control)


G2M0266

19) Install air intake duct.

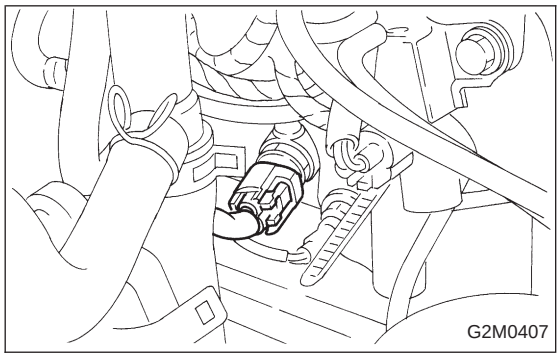

G2M0266

5. Engine Coolant Temperature Sensor

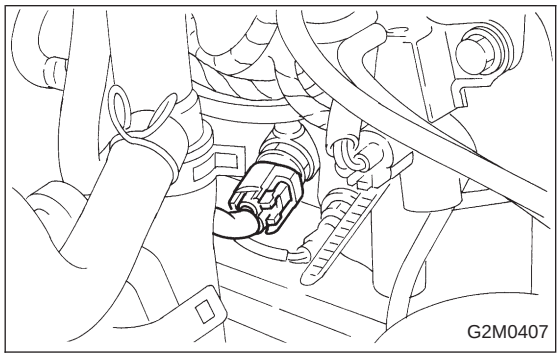
A: REMOVAL AND INSTALLATION

1) Remove air intake duct.

2) Disconnect connector from engine coolant temperature sensor.


G2M0407

3) Remove engine coolant temperature sensor.

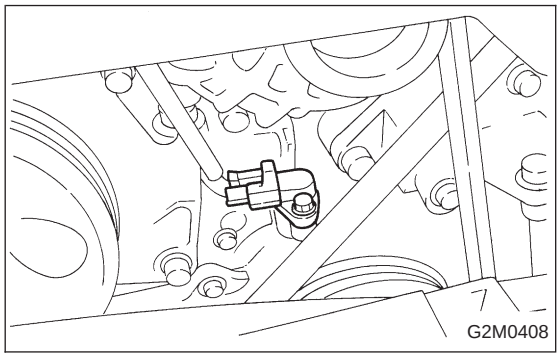

G2M0407

4) Installation is in the reverse order of removal.

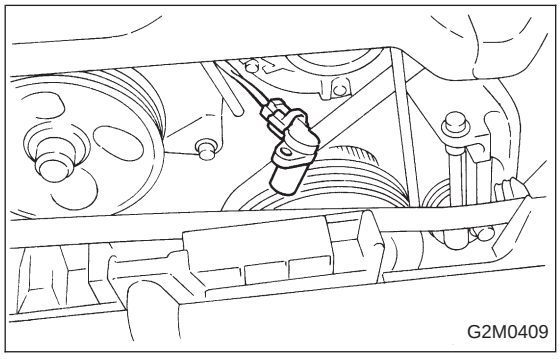
Tightening torque:
25±3 N·m (2.5±0.3 kg-m, 18.1±2.2 ft-lb)

6. Crankshaft Position Sensor

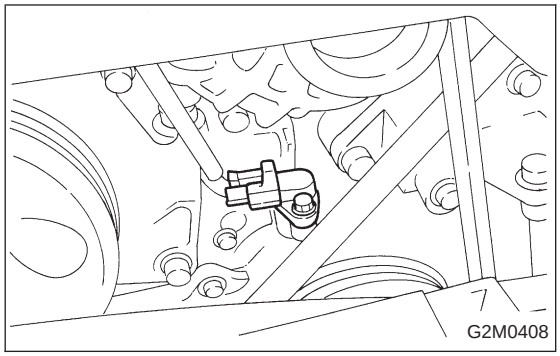
A: REMOVAL AND INSTALLATION


G2M0408

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


G2M0409

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



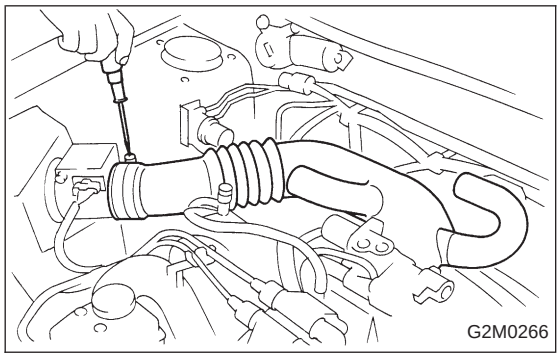
3) Installation is in the reverse order of removal.

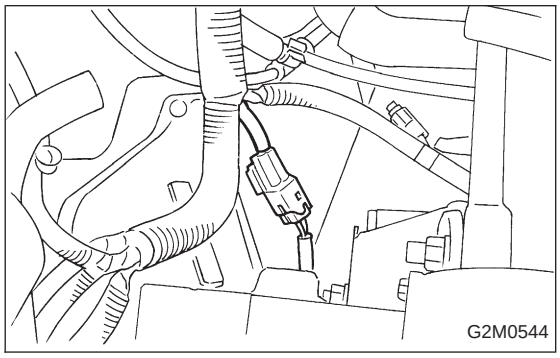
Tightening torque:
49 N·m (5.0 kg-m, 36 ft-lb)

7. Front Oxygen Sensor

A: REMOVAL

1) Remove air intake duct.

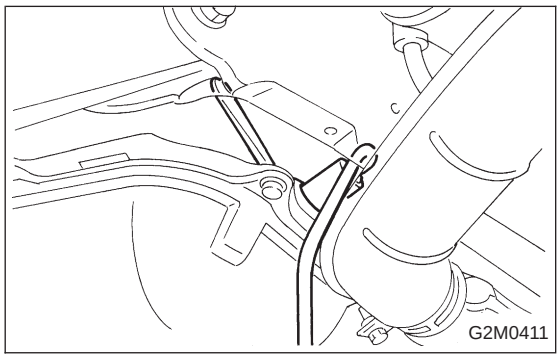




2) Disconnect connector from front oxygen sensor.

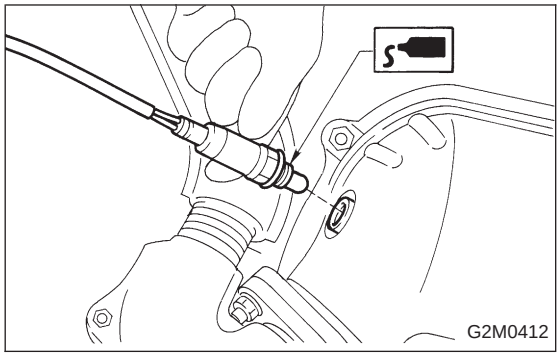
3) Lift up the vehicle.
4) Apply SUBARU CRC or its equivalent to threaded portion of oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)



5) Remove front oxygen sensor.

CAUTION:
When removing front oxygen sensor, do not force oxygen sensor especially when exhaust pipe is cold, otherwise it will damage exhaust pipe.

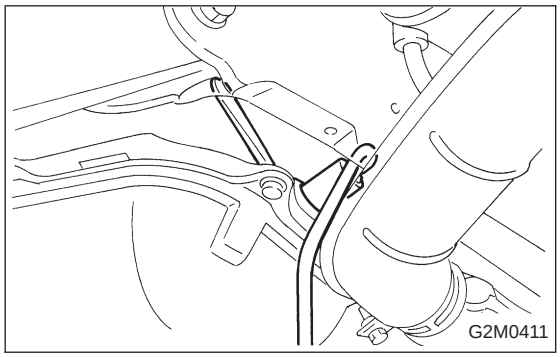


B: INSTALLATION

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

Anti-seize compound:
SS-30 by JET LUBE

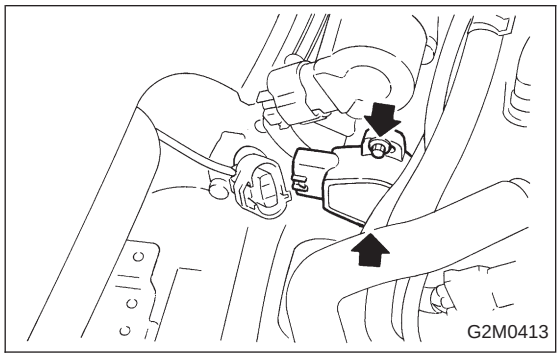
CAUTION:
Never apply anti-seize compound to protector of oxygen sensor.



2) Install front oxygen sensor.

Tightening torque:
21±3 N·m (2.1±0.3 kg-m, 15.2±2.2 ft-lb)

3) Connect connector of front oxygen sensor.
4) Install air intake duct.



8. Throttle Position Sensor

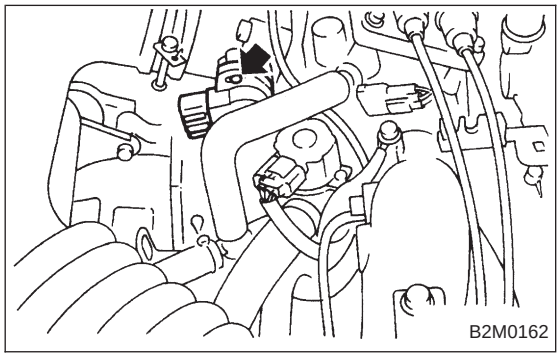
A: REMOVAL AND INSTALLATION

1. 1800 cc MODEL

1) Disconnect connector from throttle position sensor.
2) Remove throttle position sensor holding screws, and remove it.
3) Installation is in the reverse order of removal.

Tightening torque:
2.2±0.2 N·m (0.22±0.02 kg-m, 1.6±0.1 ft-lb)

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

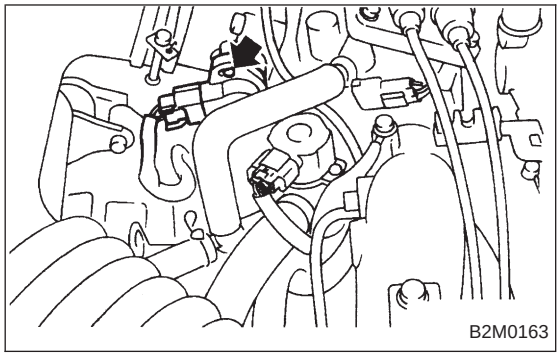


2. 2200 cc MODEL

1) Disconnect connector from throttle position sensor.
2) Remove throttle position sensor holding screws, and remove it.
3) Installation is in the reverse order of removal.

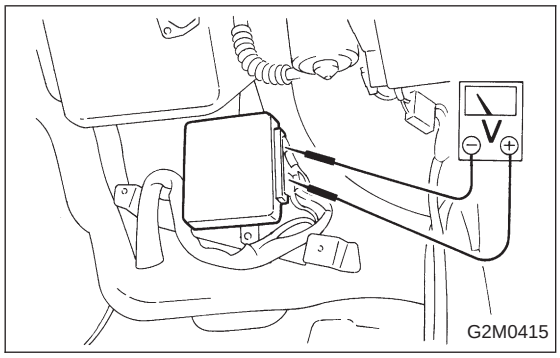
Tightening torque:
2.2±0.2 N·m (0.22±0.02 kg-m, 1.6±0.1 ft-lb)

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



B: ADJUSTMENT

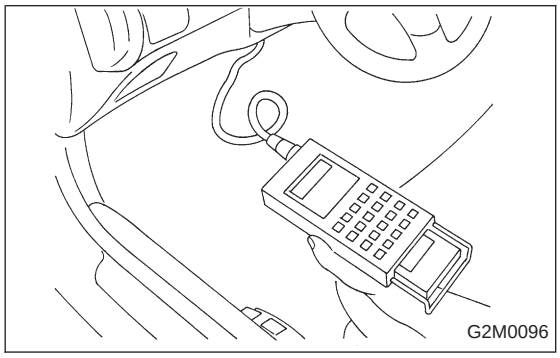
1) Turn ignition switch to OFF.
2) Loosen throttle position sensor holding screws.



3) When using voltage meter;
   (1) Take out ECM.
   (2) Turn ignition switch to ON.
   (3) Adjust throttle position sensor so that signal voltage to ECM may be in specification.

Connector & Terminal / Specified voltage
(E29) No. 24 — (E29) No. 22 / 0.45 — 0.55 V
[Fully closed.]

   (4) Tighten throttle position sensor holding screws.



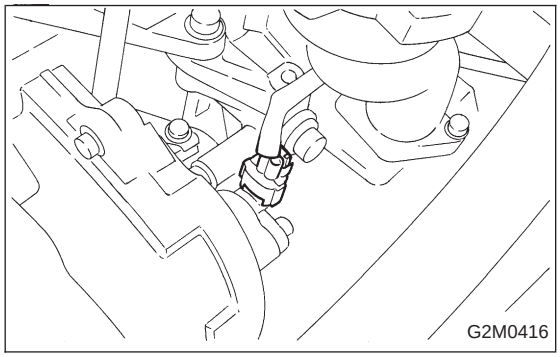
4) When using Subaru Select Monitor;
   (1) Connect Subaru Select Monitor to the data link connector.
   (2) Turn ignition switch to ON and SSM switch to ON.
   (3) Select mode “F10”.
   (4) Adjust throttle position sensor to specified data.

Condition / Specified data.
Throttle fully closed / 0.50 V

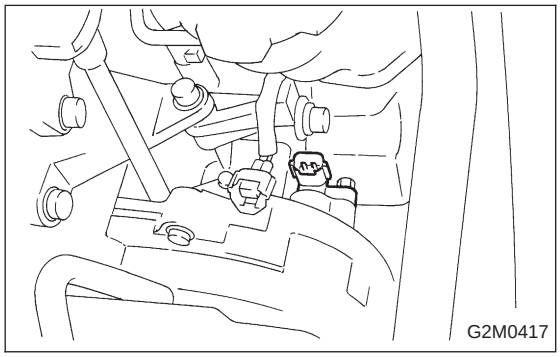
   (5) Tighten throttle position sensor holding screws.

9. Camshaft Position Sensor

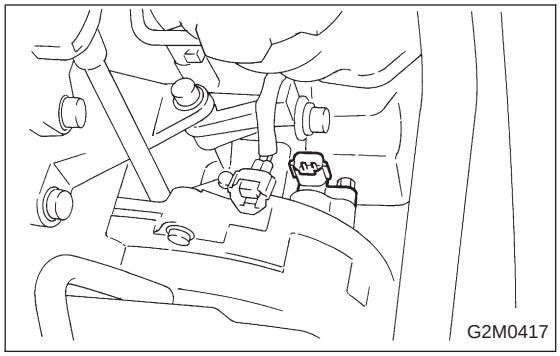
A: REMOVAL AND INSTALLATION



1) Disconnect connector from camshaft position sensor.



2) Remove camshaft position sensor from camshaft support LH.


G2M0417

3) Installation is in the reverse order of removal.

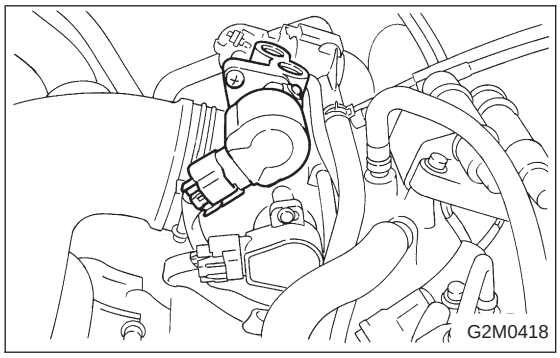
Tightening torque:
49 N·m (5.0 kg-m, 36 ft-lb)

10. Idle Air Control Solenoid Valve

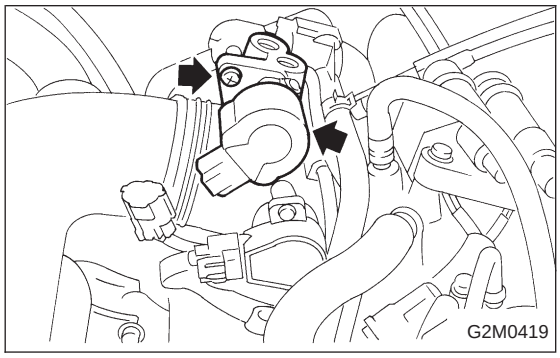
A: REMOVAL AND INSTALLATION

1. 1800 cc MODEL

1) Disconnect connector from idle air control solenoid valve.


G2M0418

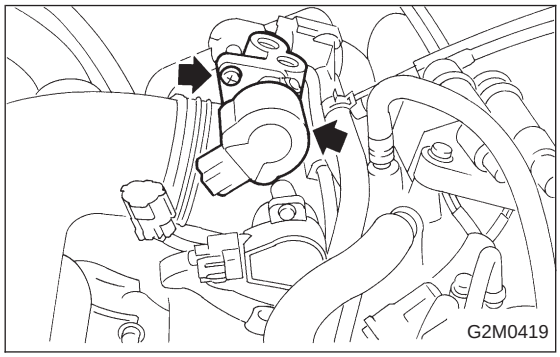
2) Remove idle air control solenoid valve from throttle body.


G2M0419

3) Installation is in the reverse order of removal.

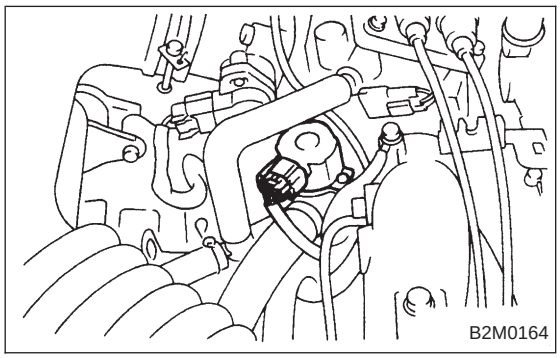
CAUTION:
Replace gasket with a new one.

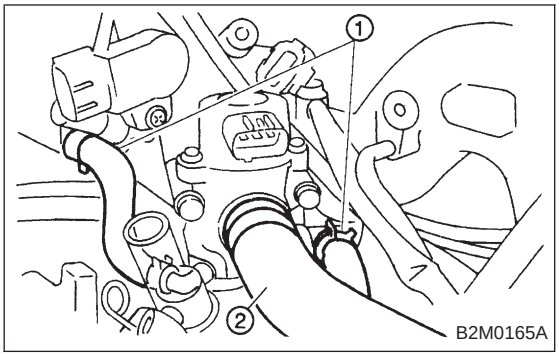
Tightening torque:
6.0±0.8 N·m (0.61±0.08 kg-m, 4.4±0.6 ft-lb)


G2M0419

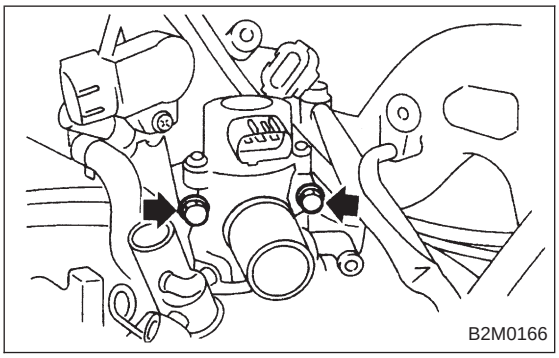
2. 2200 cc MODEL

1) Disconnect connector from idle air control solenoid valve.


B2M0164



2) Disconnect engine coolant hoses ① from idle air control solenoid valve.
3) Disconnect air by-pass hose ② from idle air control solenoid valve.

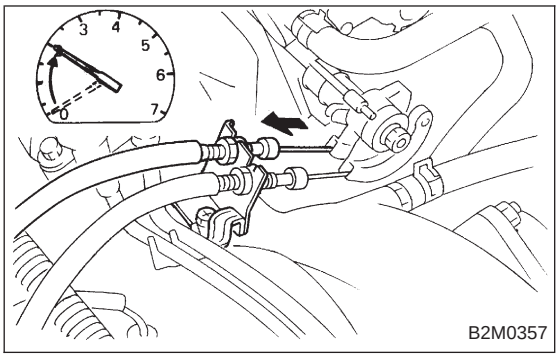


4) Remove idle air control solenoid valve from throttle body.
5) Installation is in the reverse order of removal.

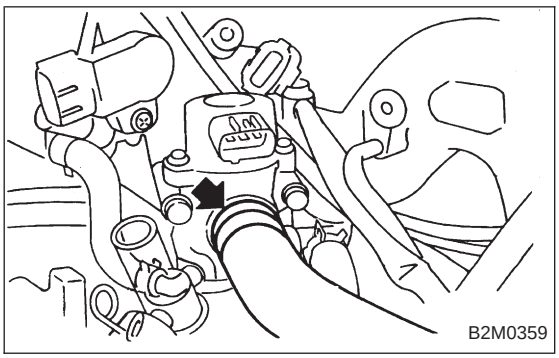
CAUTION:
Replace gasket with a new one.

Tightening torque:
6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)

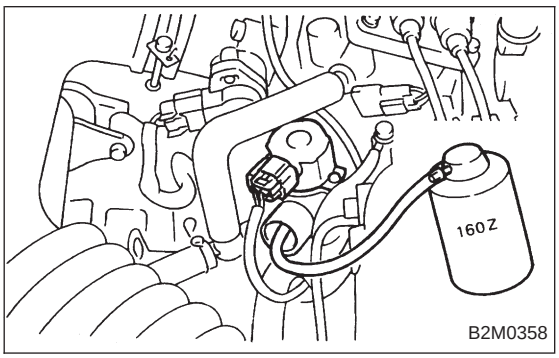
B: CLEANING (2200 cc MODEL)



1) Start and warm-up the engine until radiator fan operates.
2) Hold throttle valve so that engine speed is at 2,000 rpm.



3) Disconnect by-pass hose from idle air control solenoid valve.



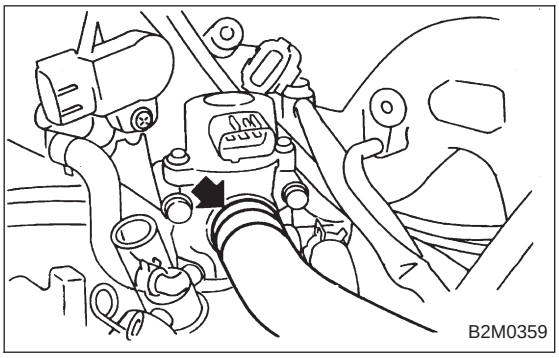
4) Slowly pour one can (16 oz) of cleaner into by-pass air hole.

Cleaner:
- ***Part No. 1050002 GM Top Engine Cleaner***
- ***Part No. X66-A AC Delco Carburetor Tune-up Conditioner***

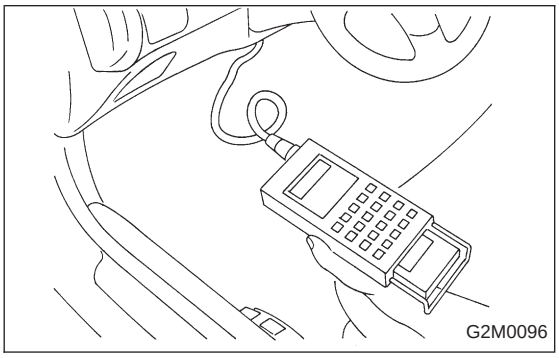
5) Leave the engine running for five minutes.

NOTE:
White smoke comes out of the muffler until the cleaner is used up.

6) Stop the engine.



7) Release the throttle valve.
8) Connect by-pass hose to idle air control solenoid valve.

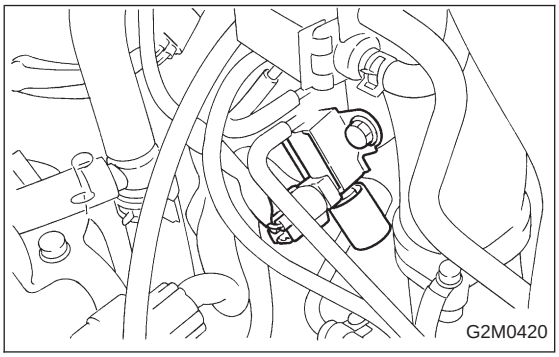


9) Check duty ratio of idle air control solenoid valve with Subaru Select Monitor.
(1) Connect Subaru Select Monitor to the data link connector.
(2) Start the engine and turn Subaru Select Monitor switch to ON.
(3) Select mode “F12”.
(4) Make sure duty ratio on radiator fan and electric load is OFF.

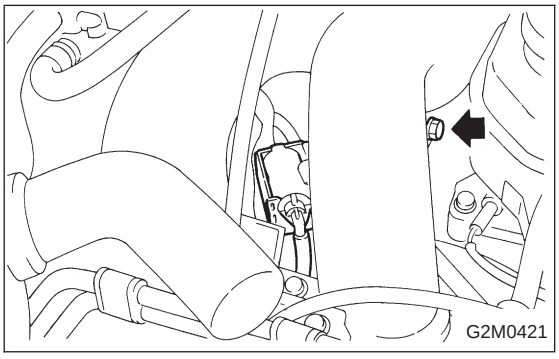
Specified data: 25 — 40%

11. Purge Control Solenoid Valve

A: REMOVAL



1) Remove air suction solenoid valve.

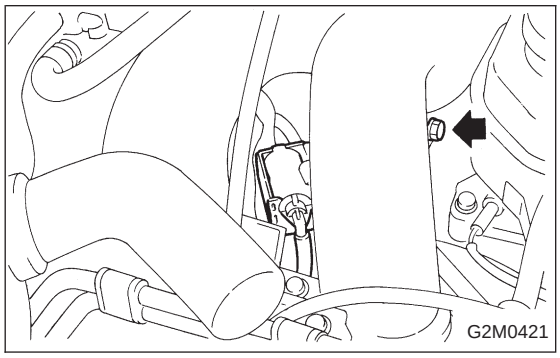


2) Remove bolt which installs bracket of purge control solenoid valve onto collector chamber.

3) Take out purge control solenoid valve with bracket through the bottom of the collector chamber.
4) Disconnect connector and hoses from purge control solenoid valve.

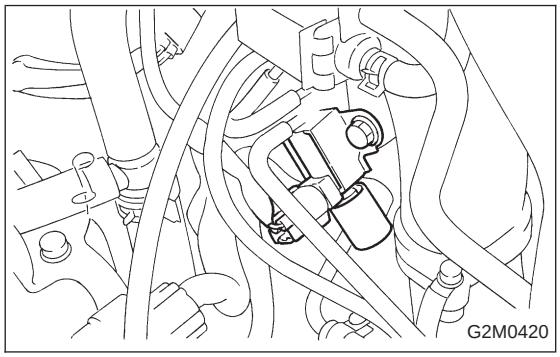
B: INSTALLATION

1) Connect hoses and connector to purge control solenoid valve.
2) Install purge control solenoid valve with bracket through collector chamber.


G2M0421

3) Tighten bolt which installs bracket of purge control solenoid valve onto collector chamber.

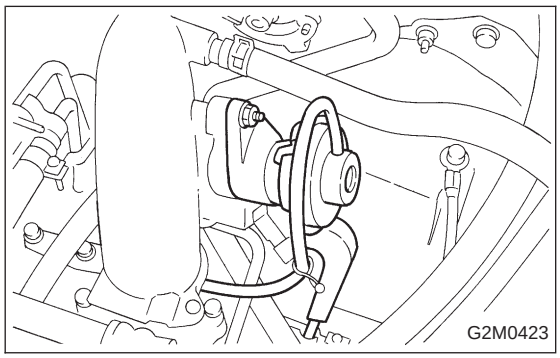
Tightening torque:
1800 cc model:
19±4.9 N·m (1.9±0.5 kg-m, 13.7±3.6 ft-lb)
2200 cc model:
16±1.5 N·m (1.6±0.15 kg-m, 11.6±1.1 ft-lb)


G2M0420

4) Install air suction solenoid valve.

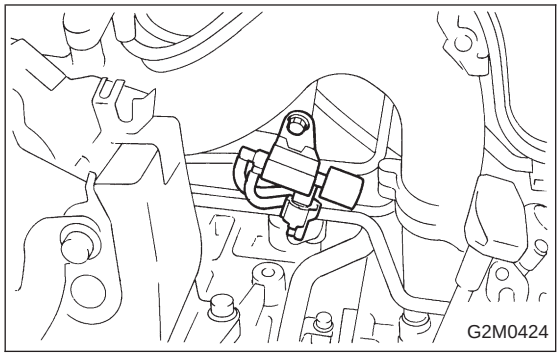
12. EGR Valve

A: REMOVAL AND INSTALLATION


G2M0423

1) Disconnect vacuum hose form EGR valve.
2) Remove bolts which install EGR valve onto collector chamber.
3) Installation is in the reverse order of removal.

Tightening torque:
19±1.5 N·m (1.9±0.15 kg-m, 13.7±1.1 ft-lb)



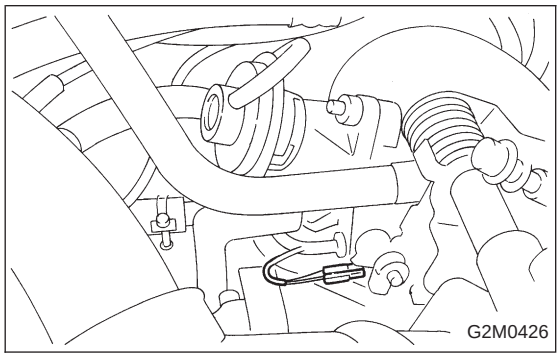
13. EGR Solenoid Valve

A: REMOVAL AND INSTALLATION

1) Remove bolt which installs EGR solenoid valve onto collector chamber.
2) Disconnect hoses and connector from EGR solenoid valve.

3) Installation is in the reverse order of removal.

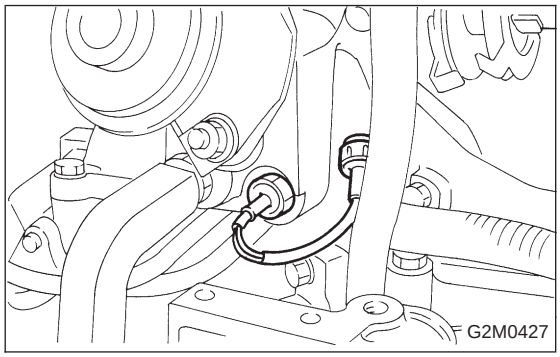
Tightening torque:
1800 cc model:
19±4.9 N·m (1.9±0.5 kg-m, 13.7±3.6 ft-lb)
2200 cc model:
16±1.5 N·m (1.6±0.15 kg-m, 11.6±1.1 ft-lb)



14. Recirculation Gas Temperature Sensor

A: REMOVAL AND INSTALLATION

1) Disconnect connectors from recirculation gas temperature sensor.



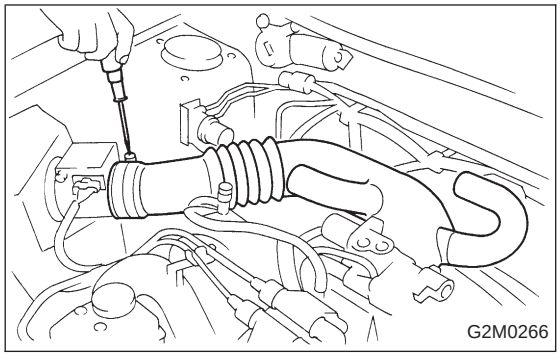
2) Apply SUBARU CRC or its equivalent to threaded portion of recirculation gas temperature sensor and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

3) Remove recirculation gas temperature sensor from collector chamber.

CAUTION:
When removing recirculation gas temperature sensor, do not force it excessively.

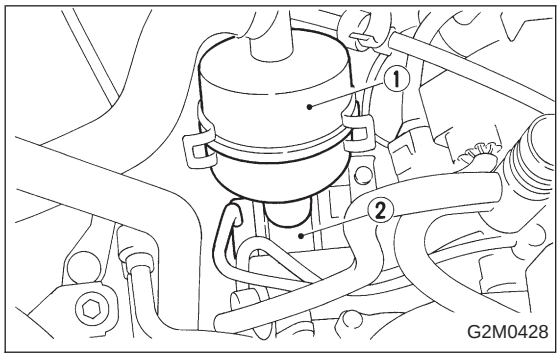
4) Installation is in the reverse order of removal.



15. Air Suction Valve

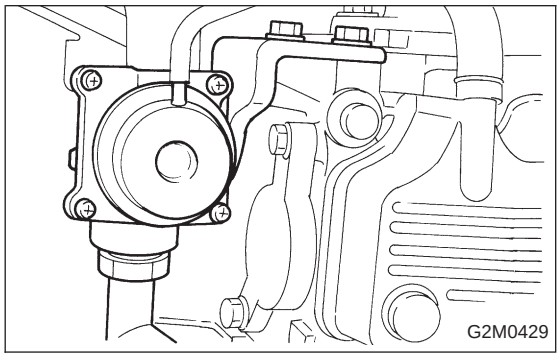
A: REMOVAL

1) Remove air intake duct.



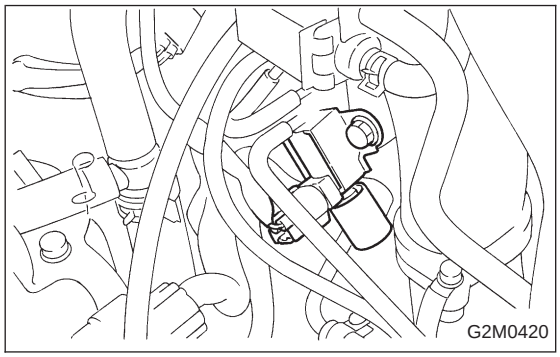
2) Remove hose from air suction valve.
3) Remove air suction valve.

① Silencer
② Air suction valve



4) Installation is in the reverse order of removal.

Tightening torque:
19±4.9 N·m (1.9±0.5 kg-m, 13.7±3.6 ft-lb)

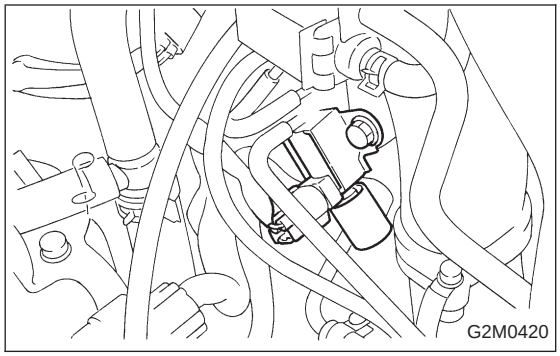


16. Air Suction Solenoid Valve

A: REMOVAL AND INSTALLATION

1) Disconnect connector and hoses from air suction solenoid valve.

2) Remove air suction solenoid valve.

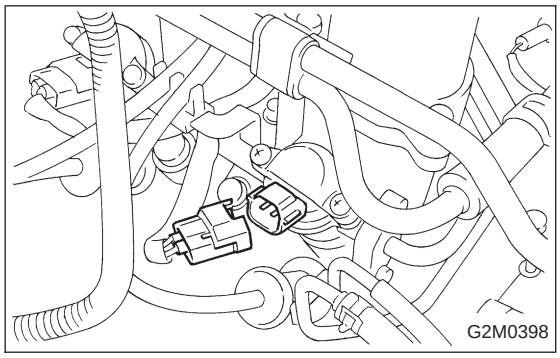


3) Installation is in the reverse order of removal.

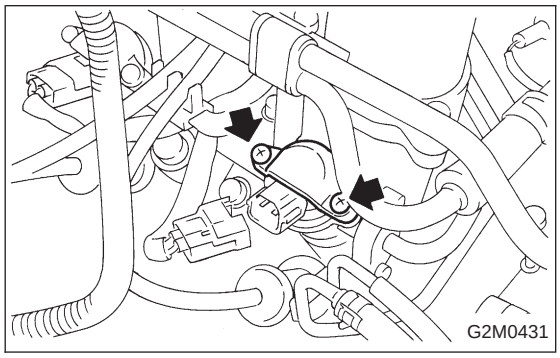
Tightening torque:
19±4.9 N·m (1.9±0.5 kg-m, 13.7±3.6 ft-lb)

17. Fuel Injector

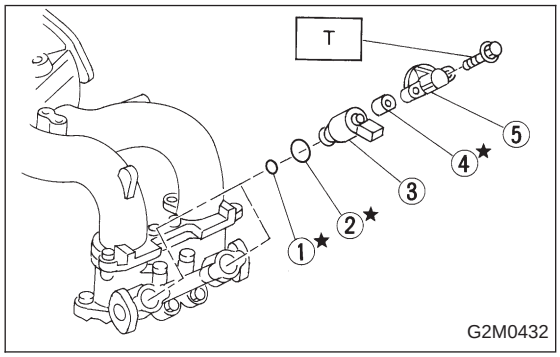
A: REMOVAL AND INSTALLATION



1) Release fuel pressure.
2) Disconnect connector from fuel injector.



3) Remove fuel injector from fuel pipe assembly.



4) Installation is in the reverse order of removal.

CAUTION:
Replace O-rings and insulator.

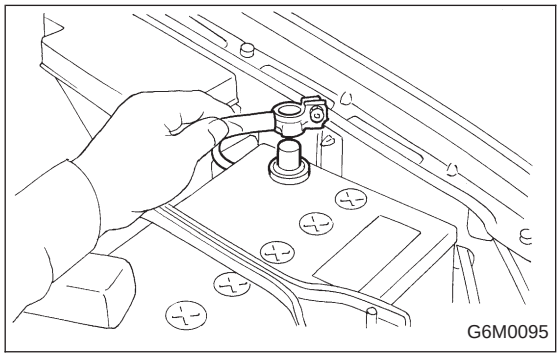
Tightening torque:
3.4±0.5 N·m (0.35±0.05 kg-m, 2.5±0.4 ft-lb)

① O-ring B
② O-ring A
③ Fuel injector
④ Insulator
⑤ Fuel injector cup

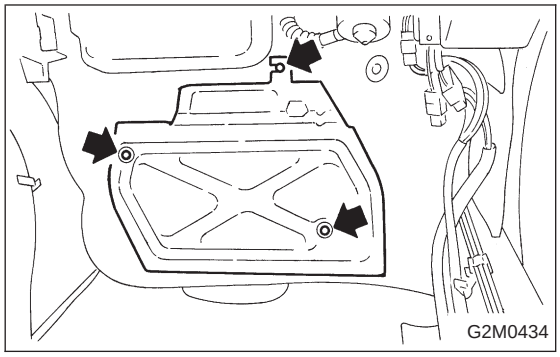
18. Engine Control Module

A: REMOVAL AND INSTALLATION

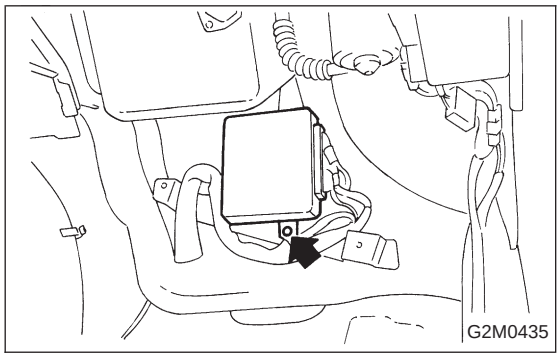
1. 1800 cc MODEL



1) Disconnect battery ground cable.

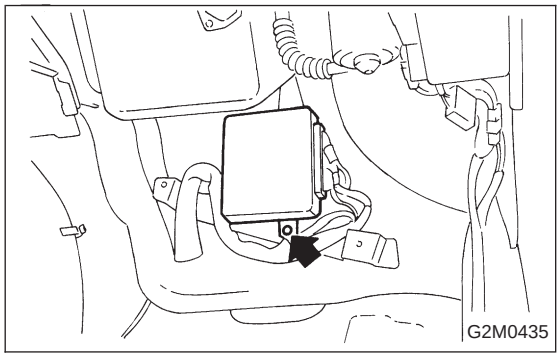


2) Detach floor mat of front passenger seat.
3) Remove protect cover.



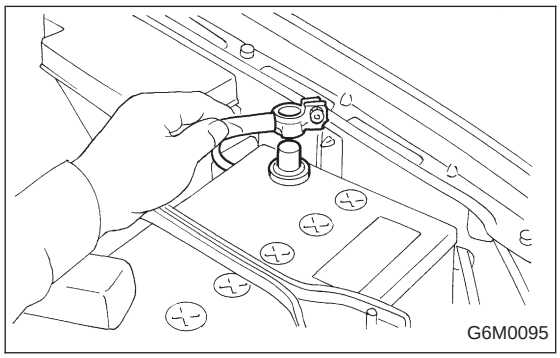
4) Remove nuts which install ECM onto body.

5) Take out ECM and disconnect connector from it.

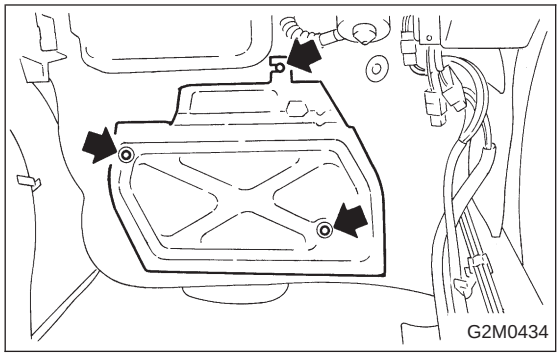


6) Installation is in the reverse order of removal.

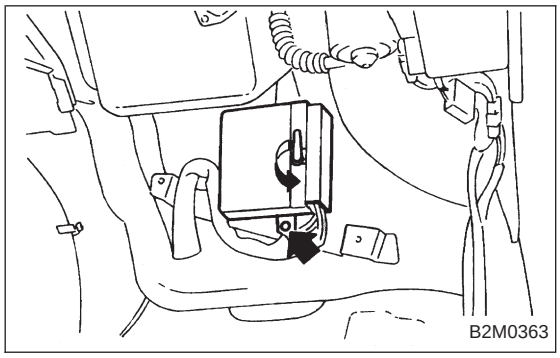
2. 2200 cc MODEL



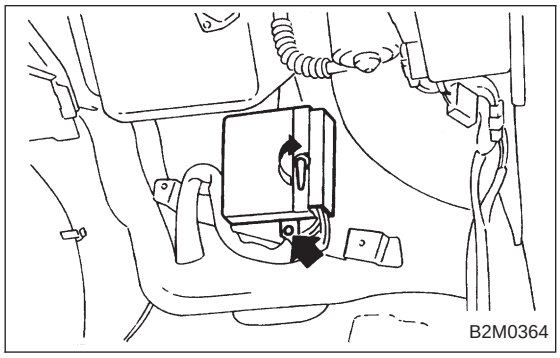
1) Disconnect battery ground cable.



2) Detach floor mat of front passenger seat.
3) Remove protect cover.



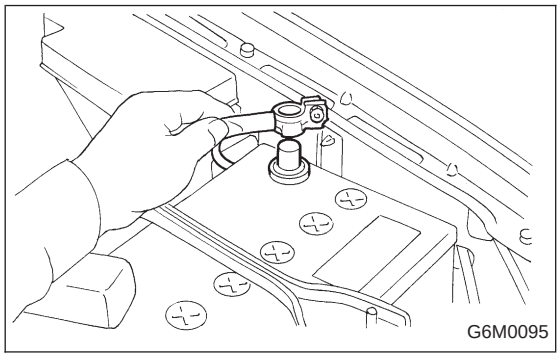
4) Release the lock of ECM connector and disconnect it.
5) Remove nuts which install ECM onto body.
6) Take out ECM.



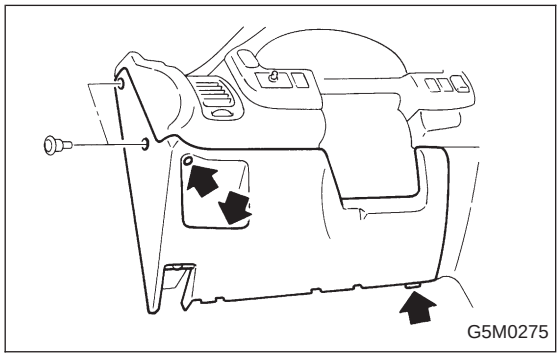
7) Connect ECM connector and lock it.
8) Installation is in the reverse order of removal.

19. Main Relay and Fuel Pump Relay

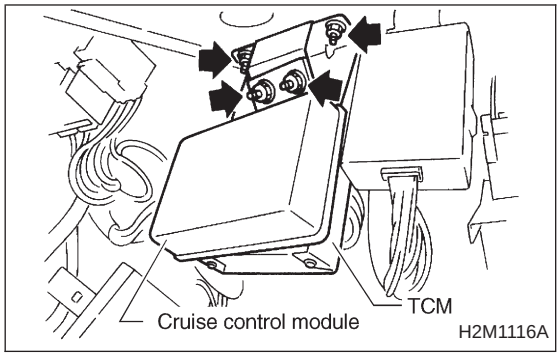
A: REMOVAL AND INSTALLATION



1) Disconnect battery ground cable.

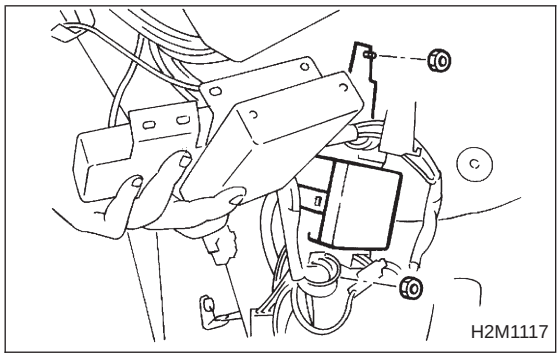


2) Remove steering lower cover.
3) Remove front pillar lower trim.

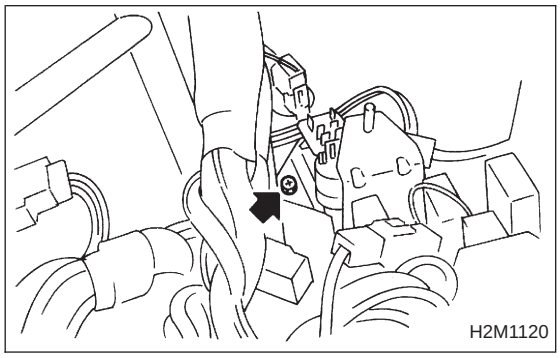


4) Remove bolts which install TCM and cruise control module on bracket.

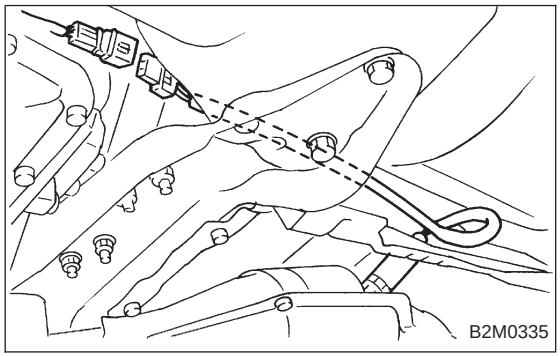
NOTE:
It is not necessary to disconnect connectors from TCM and cruise control module.



5) Remove fuse and relay box from bracket.



6) Disconnect connector from horn relay.
7) Remove all relays with bracket from body.
8) Remove main relay and fuel pump relay from bracket.
9) Installation is in the reverse order of removal.



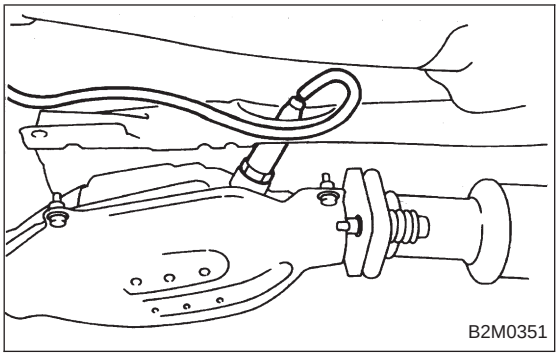
20. Rear Oxygen Sensor (2200 cc Model)

A: REMOVAL

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

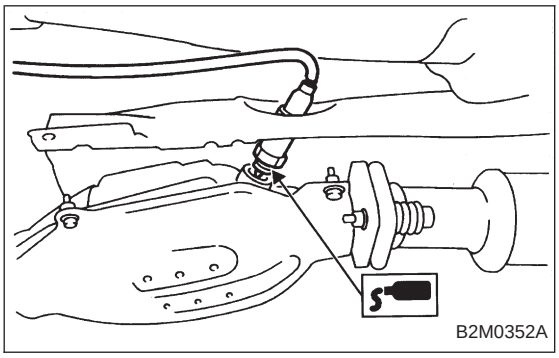
3) Apply SUBARU CRC or its equivalent to threaded portion of rear oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)


B2M0351

4) Remove rear oxygen sensor.

CAUTION:
When removing rear oxygen sensor, do not force rear oxygen sensor especially when exhaust pipe is cold, otherwise it will damage exhaust pipe.

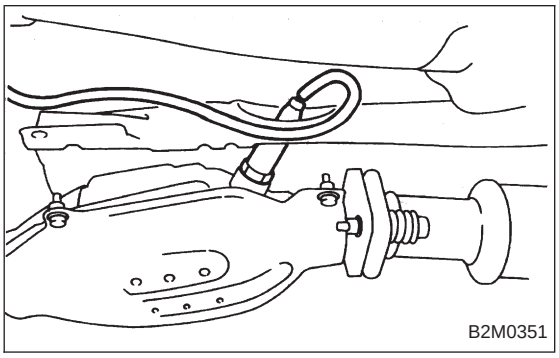

B2M0352A

B: INSTALLATION

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

Anti-seize compound:
SS-30 by JET LUBE

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


B2M0351

2) Install rear oxygen sensor.

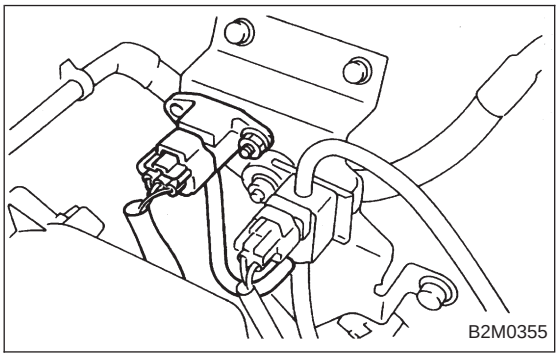
Tightening torque:
21±3 N·m (2.1±0.3 kg-m, 15.2±2.2 ft-lb)

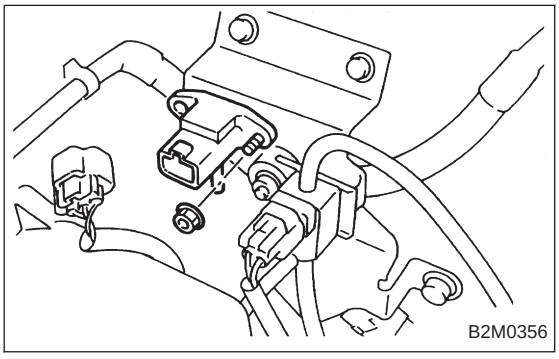
3) Connect connector of rear oxygen sensor.
4) Lower the vehicle.

21. Pressure Sensor (2200 cc Model)

A: REMOVAL AND INSTALLATION

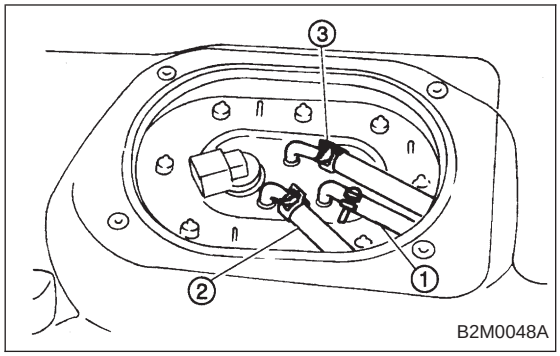
1) Disconnect connector from pressure sensor.
2) Disconnect hose from pressure sensor.


B2M0355


B2M0356

3) Remove pressure sensor from bracket.
4) Installation is in the reverse order of removal.

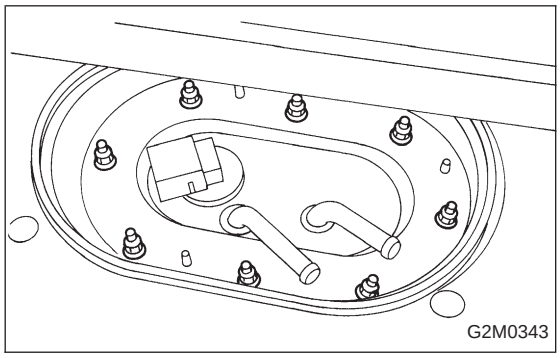
Tightening torque:
6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)



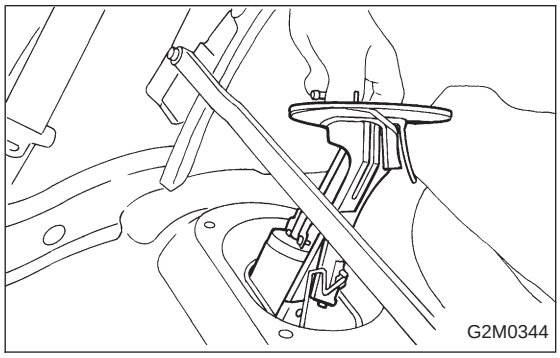
22. Fuel Temperature Sensor (California FWD Model)

A: REMOVAL

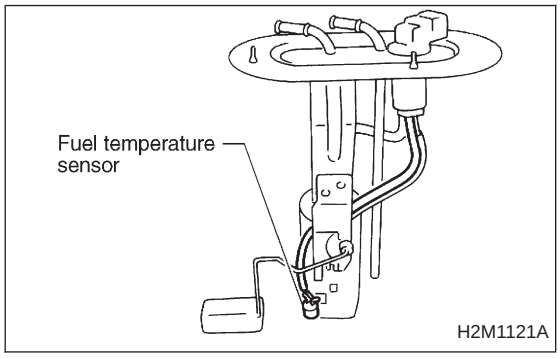
1) Release fuel pressure. <Ref. to 2-8 [W1A0].>
2) Disconnect fuel delivery hose ① and return hose ②.



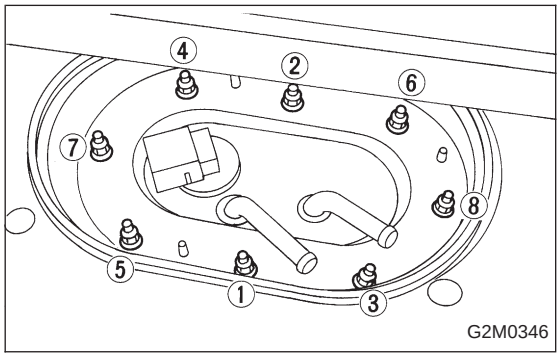
3) Remove nuts which install fuel pump assembly onto fuel tank.



4) Take off fuel pump from fuel tank.



5) Remove fuel temperature sensor from fuel pump assembly.

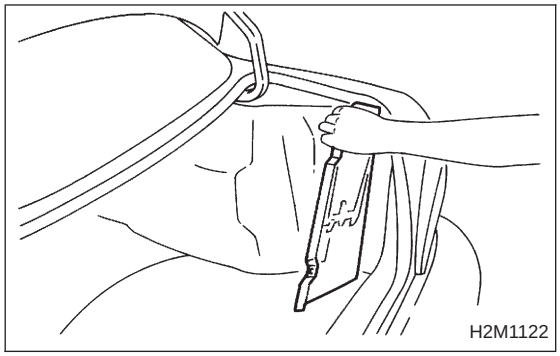


B: INSTALLATION

Installation is in the reverse order of removal. Do the following:

(1) Always use new gaskets.
(2) Ensure sealing portion is free from fuel or foreign particles before installation.
(3) Tighten nuts in numerical sequence shown in Figure to specified torque.

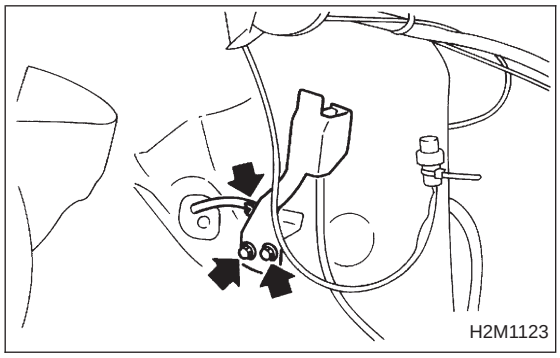
Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)


H2M1122

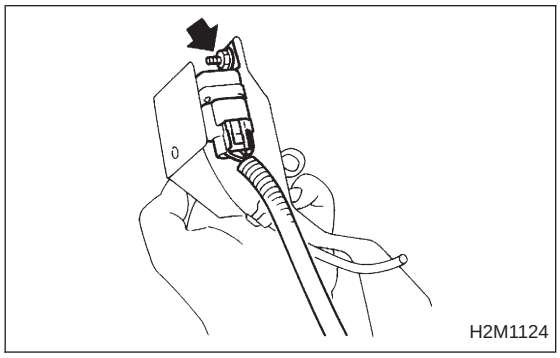
23. Fuel Tank Pressure Sensor (California FWD Model)

A: REMOVAL AND INSTALLATION

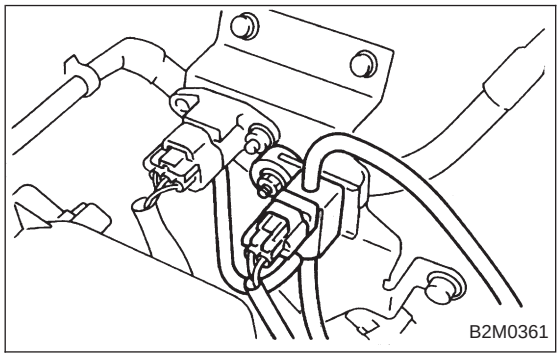
1) Remove right side rear quarter trim.


H2M1123

2) Disconnect hose from connection pipe.
3) Remove bolts which install fuel tank pressure sensor bracket on body.


H2M1124

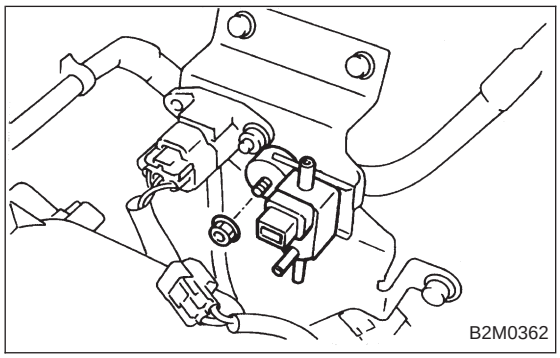
4) Disconnect connector from fuel tank pressure sensor.
5) Remove fuel tank pressure sensor from bracket.
6) Disconnect hose from fuel tank pressure sensor.
7) Installation is in the reverse order of removal.


B2M0361

24. Pressure Sources Switching Solenoid Valve (2200 cc Model)

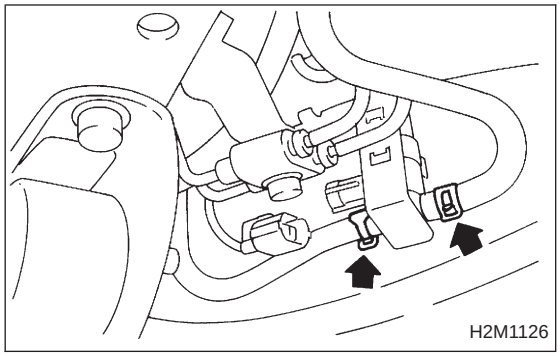
A: REMOVAL AND INSTALLATION

1) Disconnect connector from pressure sources switching solenoid valve.
2) Disconnect hoses from pressure sources switching solenoid valve.


B2M0362

3) Remove pressure sources switching solenoid valve from bracket.
4) Installation is in the reverse order of removal.

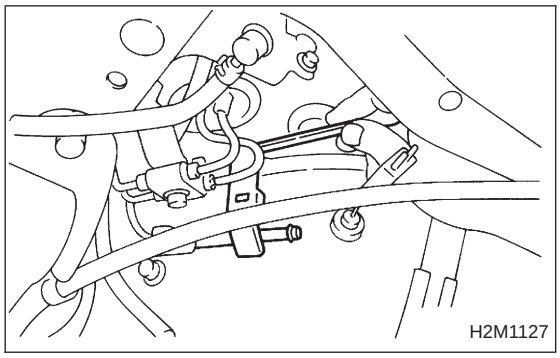
Tightening torque:
6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)



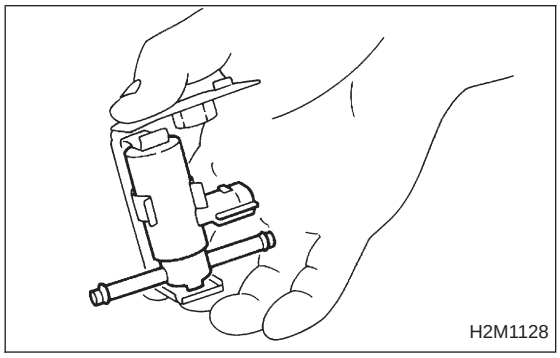
25. Pressure Control Valve (California FWD Model)

A: REMOVAL AND INSTALLATION

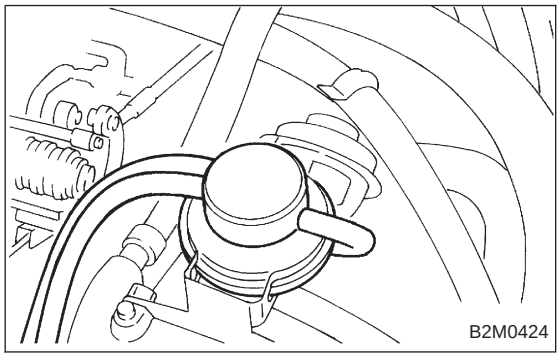
1) Disconnect evaporation hoses from pressure control valve.
2) Disconnect connector from pressure control valve.



3) Remove pressure control valve with bracket.



4) Remove pressure control valve from bracket.
5) Installation is in the reverse order of removal.



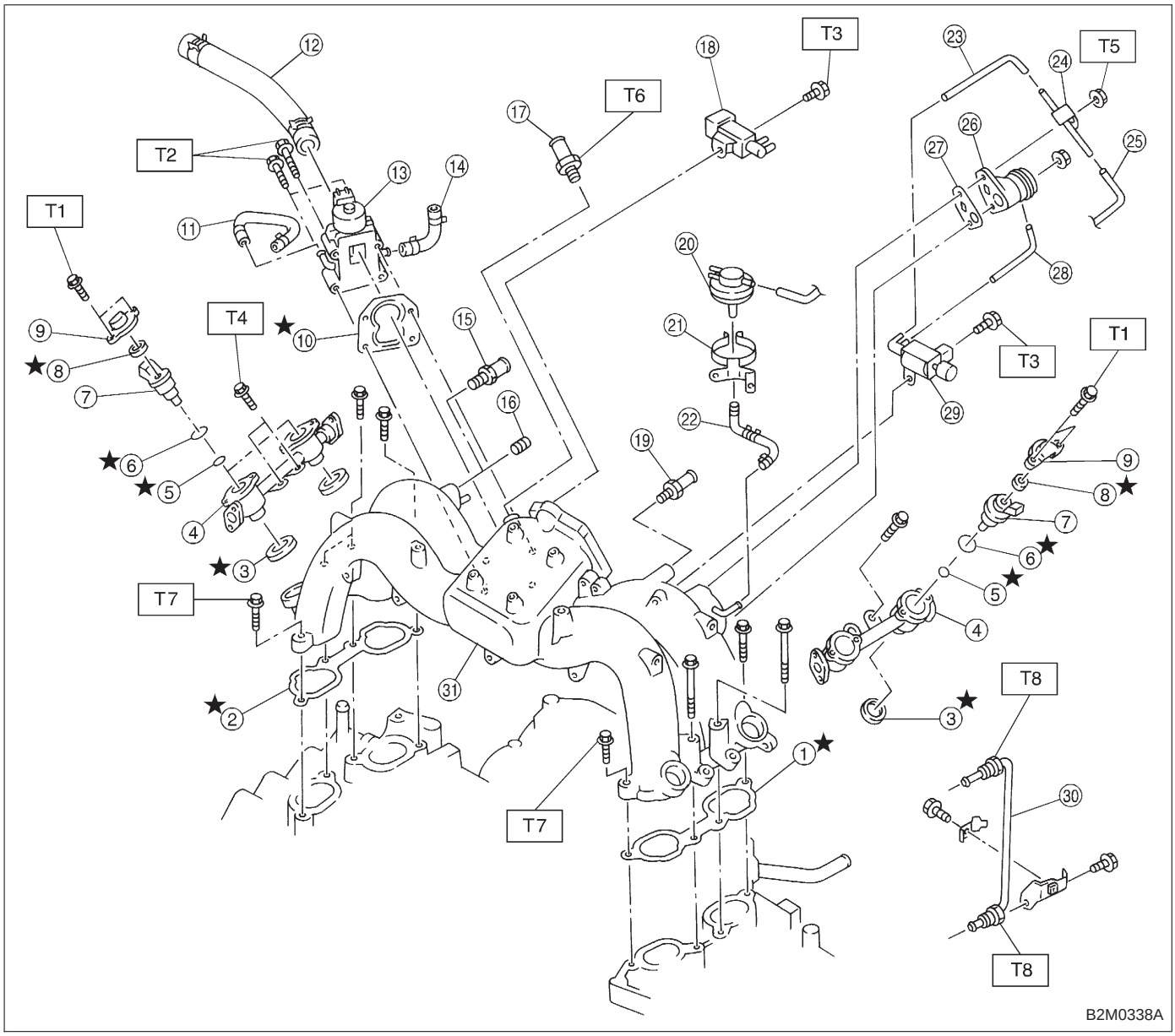
26. Back-Pressure Transducer [BPT] (2200 cc Model)

A: REMOVAL AND INSTALLATION

1) Disconnect vacuum hoses from BPT.
2) Remove BPT from bracket.
3) Installation is in the reverse order of removal.

FUEL INJECTION SYSTEM (2200 cc model) 2-7b

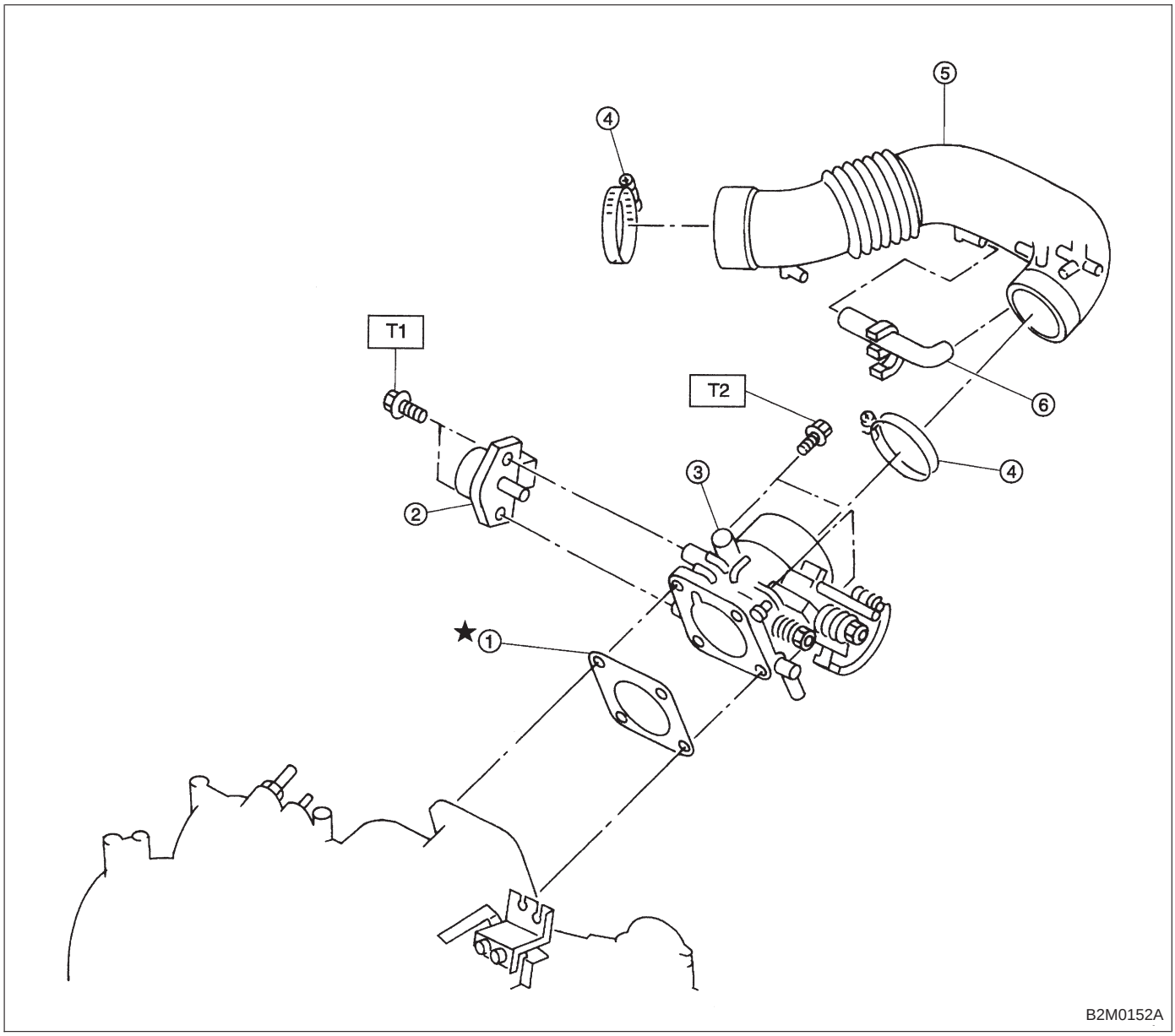
1. Intake Manifold



① Intake manifold gasket RH
② Intake manifold gasket LH
③ Fuel injector pipe insulator
④ Fuel injector pipe
⑤ O-ring A
⑥ O-ring B
⑦ Fuel injector
⑧ Insulator
⑨ Fuel injector cap
⑩ Gasket
⑪ Engine coolant hose B
⑫ Air by-pass hose
⑬ Idle air control solenoid valve
⑭ Engine coolant hose A
⑮ Nipple
⑯ Plug
⑰ PCV valve
⑱ Purge control solenoid valve
⑲ Nipple
⑳ BPT
㉑ BPT holder bracket
㉒ Back pressure hose
㉓ EGR vacuum hose A
㉔ EGR vacuum pipe
㉕ EGR vacuum hose C
㉖ EGR valve
㉗ Gasket
㉘ EGR vacuum hose B
㉙ EGR solenoid valve
㉚ EGR pipe
㉛ Intake manifold

Tightening torque: N·m (kg-m, ft-lb)
T1: 3.4±0.5 (0.35±0.05, 2.5±0.4)
T2: 6.4±0.5 (0.65±0.05, 4.7±0.4)
T3: 16±1.5 (1.6±0.15, 11.6±1.1)
T4: 19±1 (1.9±0.1, 13.7±0.7)
T5: 19±1.5 (1.9±0.15, 13.7±1.1)
T6: 23±3 (2.3±0.3, 16.6±2.2)
T7: 25±2 (2.5±0.2, 18.1±1.4)
T8: 34±2 (3.5±0.2, 25.3±1.4)

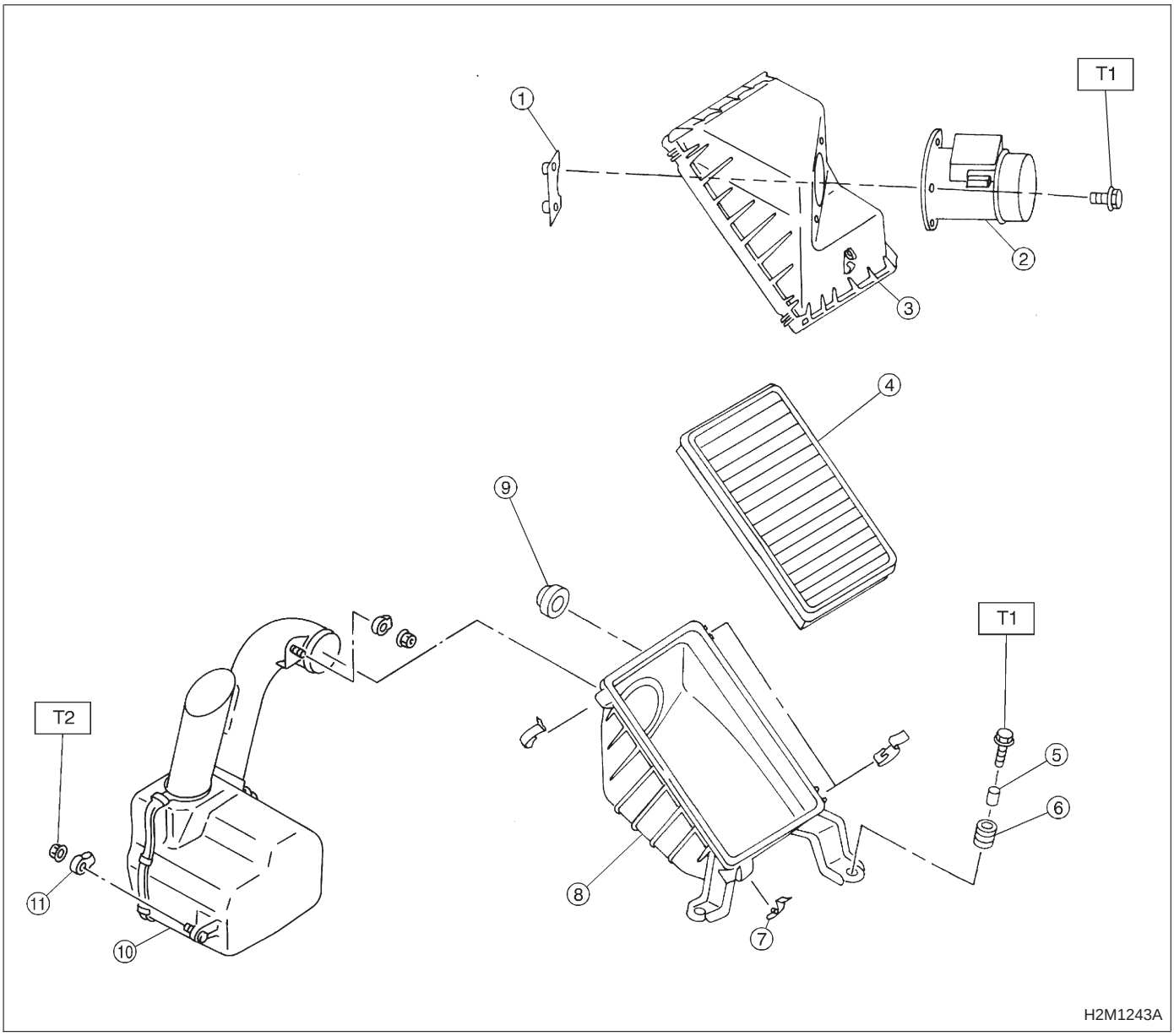
2. Air Intake System



① Gasket
② Throttle position sensor
③ Throttle body
④ Clamp
⑤ Air intake duct
⑥ By-pass hose

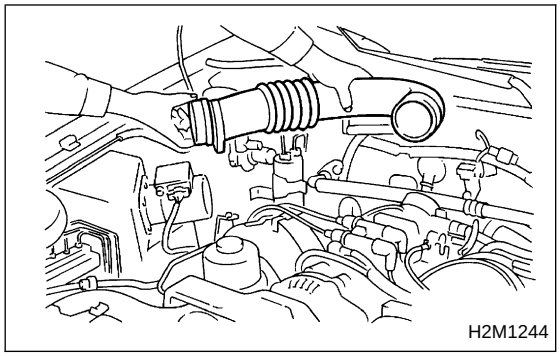
Tightening torque: N·m (kg-m, ft-lb)
T1: 2.2±0.2 (0.22±0.02, 1.6±0.1)
T2: 22±2 (2.2±0.2, 15.9±1.4)

3. Air Cleaner



① Mass air flow sensor bracket
② Mass air flow sensor ASSY
③ Air cleaner upper cover
④ Air cleaner element
⑤ Spacer
⑥ Bush
⑦ Clip
⑧ Air cleaner case
⑨ Cushion rubber
⑩ Resonator chamber ASSY
⑪ Clip

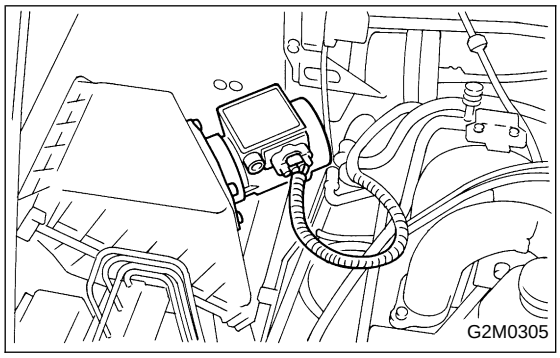
Tightening torque: N·m (kg-m, ft-lb)
T1: 7.4±2.0 (0.75±0.2, 5.4±1.4)
T2: 33±10 (3.4±1.0, 25±7)


H2M1244

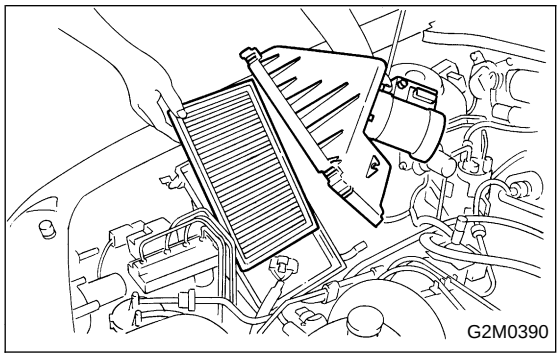
1. Air Cleaner and Air Intake Duct

A: REMOVAL AND INSTALLATION

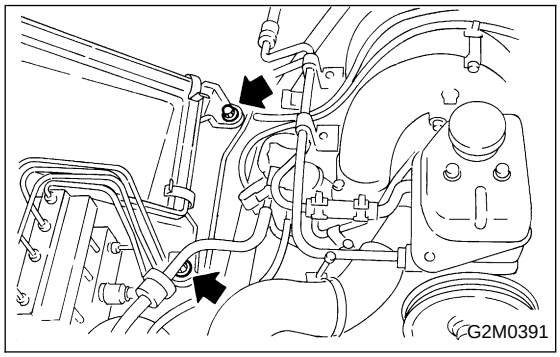
1) Loosen clamp which connect air intake duct to throttle body and mass air flow sensor.
2) Disconnect blow-by hose from air intake duct.
3) Remove air intake duct.


G2M0305

4) Disconnect connector from mass air flow sensor.

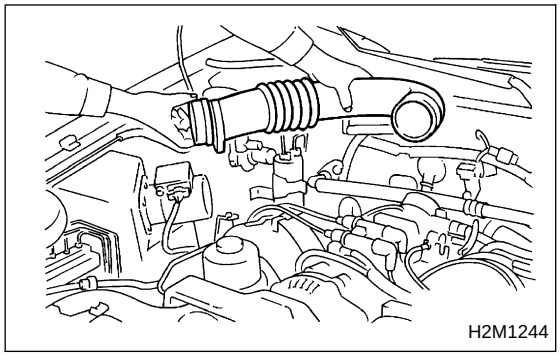

G2M0390

5) Remove clips of air cleaner upper cover.
6) Remove air cleaner element.


G2M0391

7) Remove air cleaner lower case.

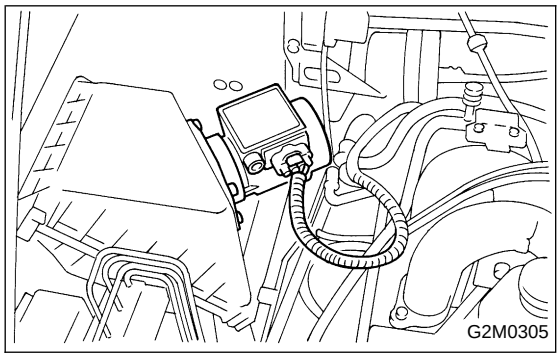
8) Installation is in the reverse order of removal.


H2M1244

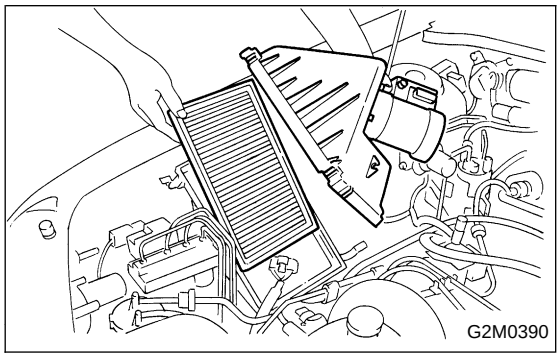
2. Mass Air Flow Sensor

A: REMOVAL AND INSTALLATION

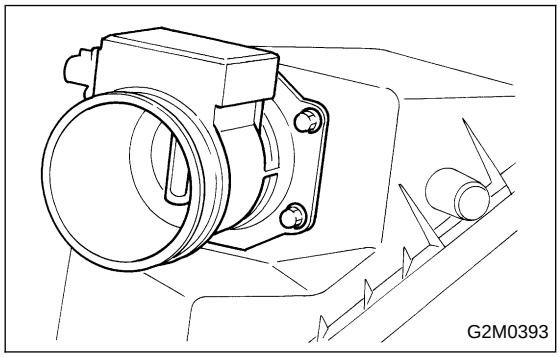
1) Remove air intake duct.


G2M0305

2) Disconnect connector from mass air flow sensor.


G2M0390

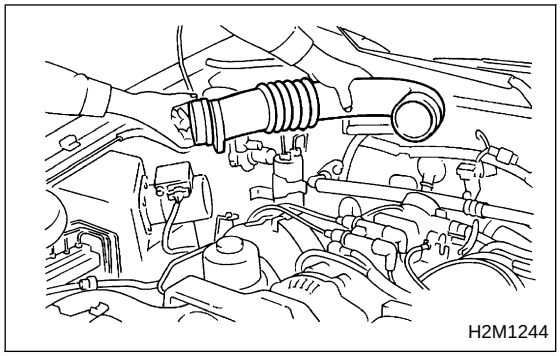
3) Remove air cleaner upper cover.


G2M0393

4) Remove mass air flow sensor from air cleaner upper cover.

5) Installation is in the reverse order of removal.

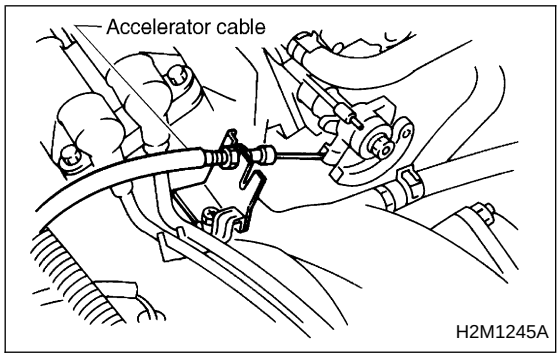
Tightening torque:
7.4±2.0 N·m (0.75±0.2 kg-m, 5.4±1.4 ft-lb)


H2M1244

3. Throttle Body

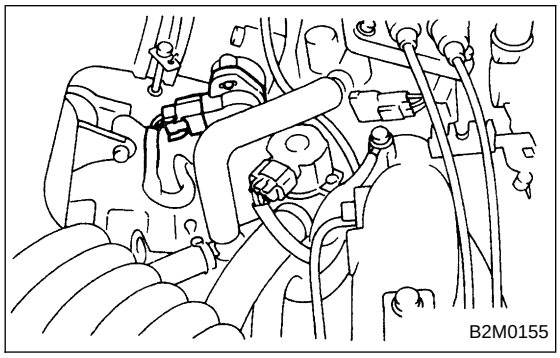
A: REMOVAL AND INSTALLATION

1) Remove air intake duct.

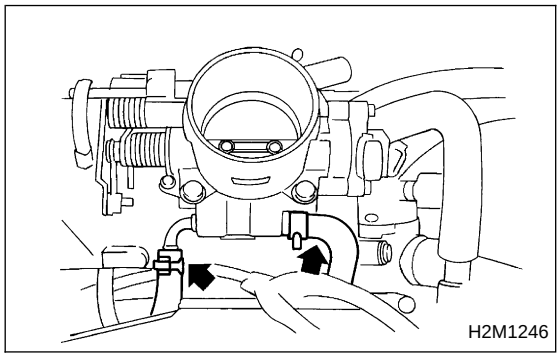


H2M1245A

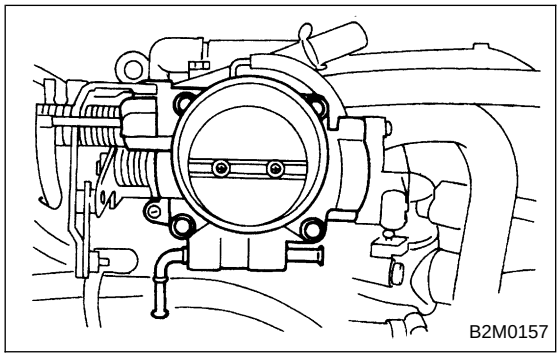
2) Disconnect accelerator cable.


B2M0155

3) Disconnect connector from throttle position sensor.


H2M1246

4) Disconnect engine coolant hoses from throttle body.

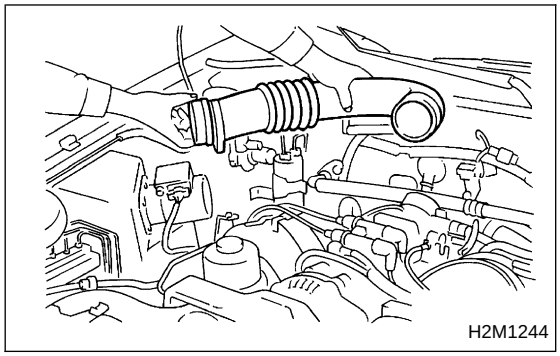

B2M0157

5) Remove bolts which install throttle body to intake manifold.

6) Installation is in the reverse order of removal.

CAUTION:
Always use a new gasket.

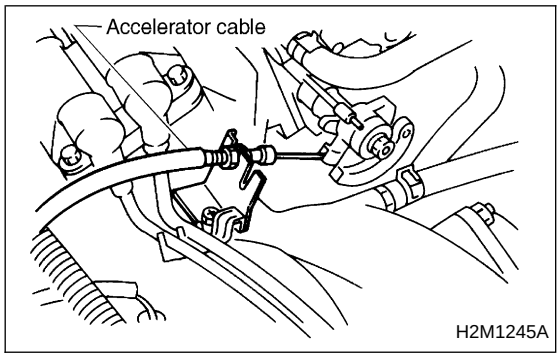
Tightening torque:
22±2 N·m (2.2±0.2 kg-m, 15.9±1.4 ft-lb)


H2M1244

4. Intake Manifold

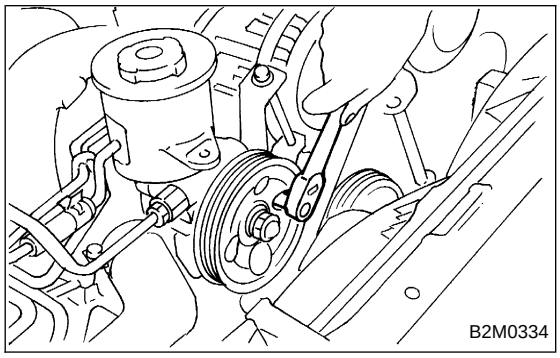
A: REMOVAL

1) Release fuel pressure. <Ref. to 2-8 [W1A0].>
2) Disconnect connector from mass air flow sensor.
3) Remove air intake duct, air cleaner upper cover and air cleaner element.

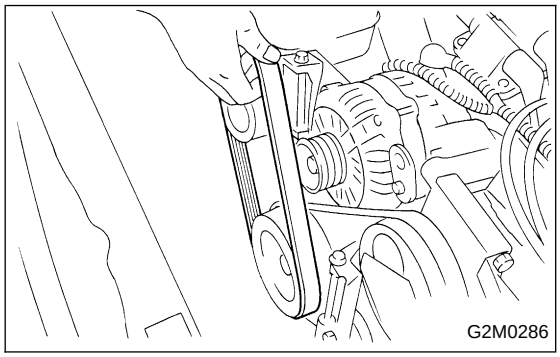


H2M1245A

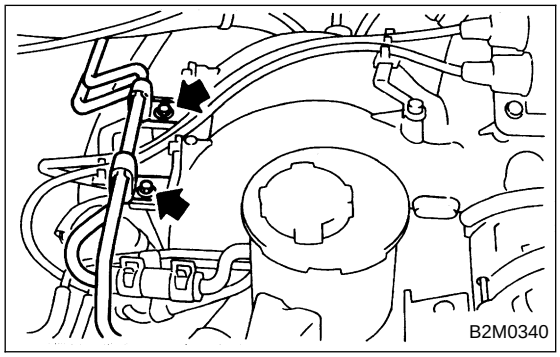
4) Disconnect accelerator cable.


B2M0334

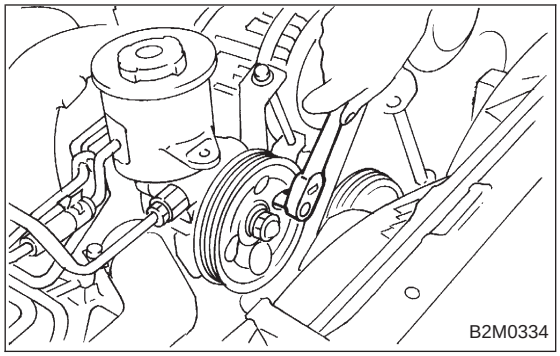
5) Disconnect hoses from pressure sources switching solenoid valve.


G2M0286

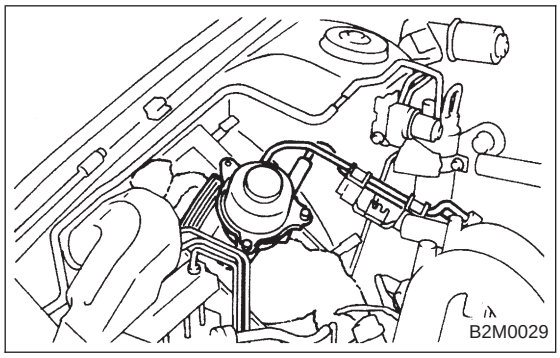
6) Remove power steering pump from bracket.
(1) Loosen lock bolt and slider bolt, and remove front side V-belt.


B2M0340

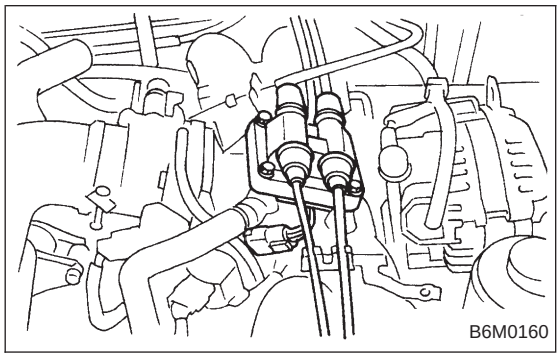
(2) Remove pipe with bracket from intake manifold.


B2M0334

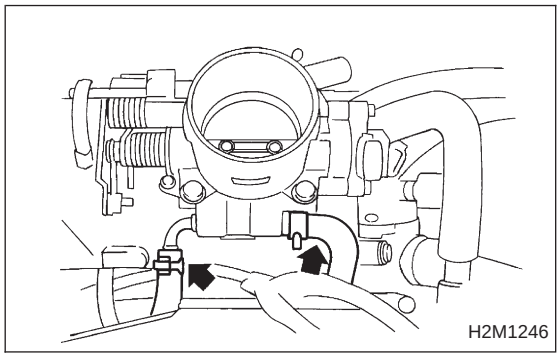
(3) Remove bolts which install power steering pump from bracket.


B2M0029

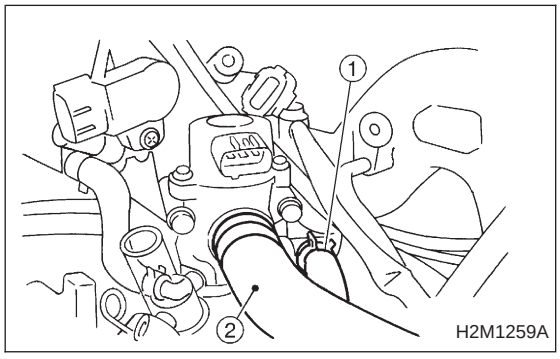
(4) Place power steering pump on the right side wheel apron.


B6M0160

7) Disconnect spark plug cords from ignition coil.

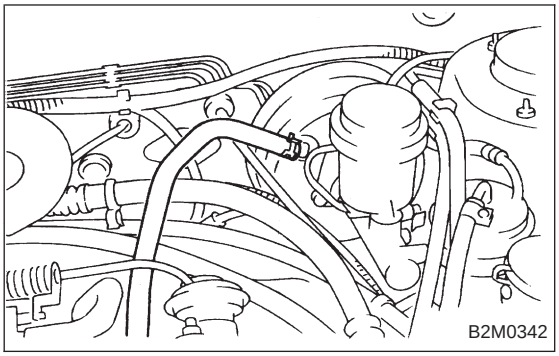

H2M1246

8) Disconnect engine coolant hose from throttle body.

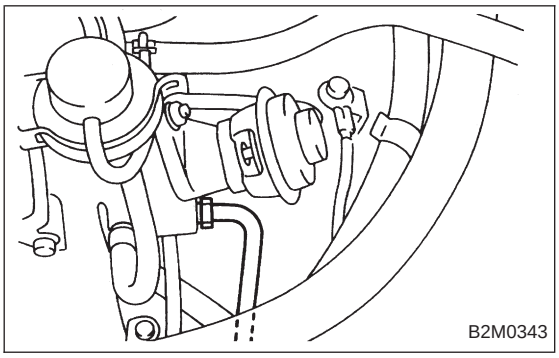


H2M1259A

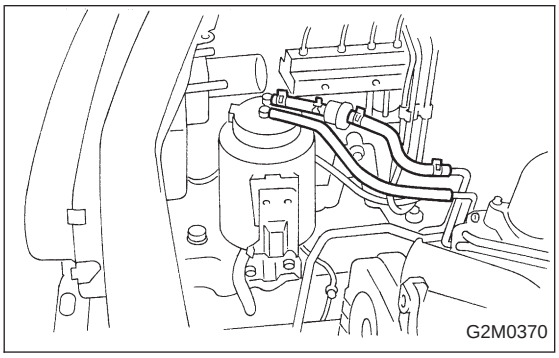
9) Disconnect engine coolant hose ① from idle air control solenoid valve.
10) Disconnect air by-pass hose ② from idle air control solenoid valve.


B2M0342

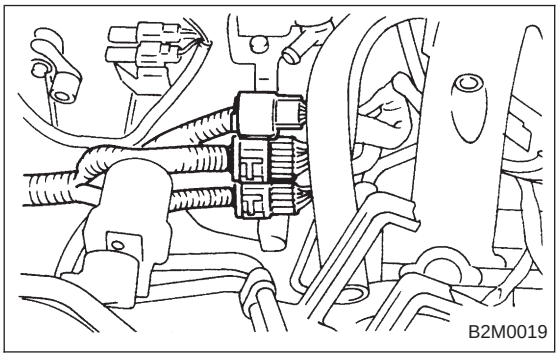
11) Disconnect brake booster hose from intake manifold.


B2M0343

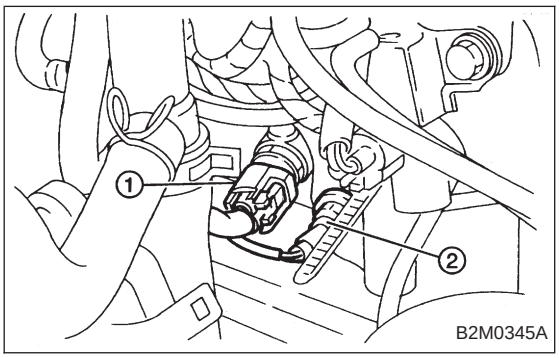
12) Remove EGR pipe.


G2M0370

13) Disconnect canister hose from pipe.

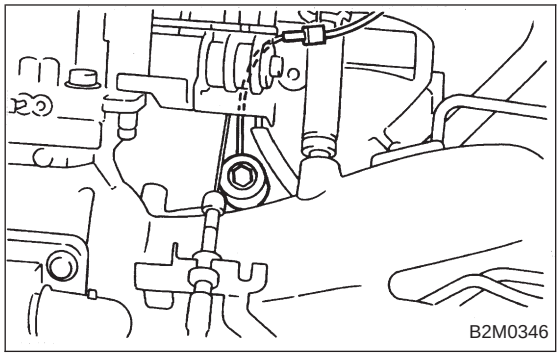

B2M0019

14) Disconnect engine harness connectors from bulkhead harness connectors.

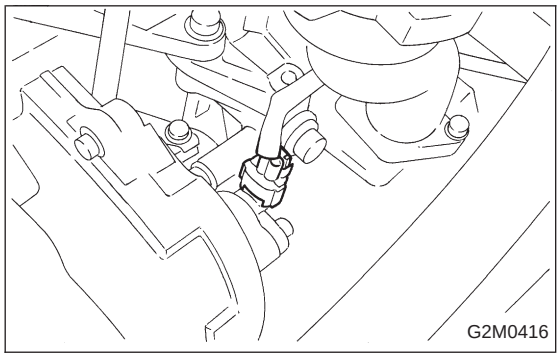


B2M0345A

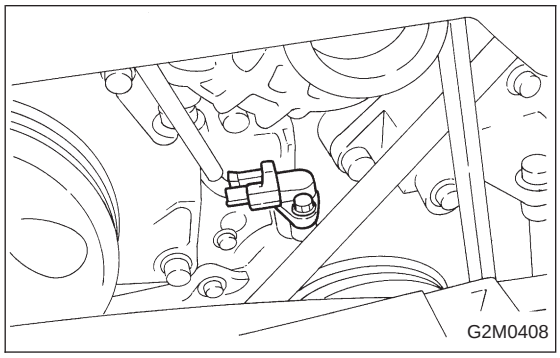
15) Disconnect connectors from engine coolant temperature sensor ① and thermometer ②.



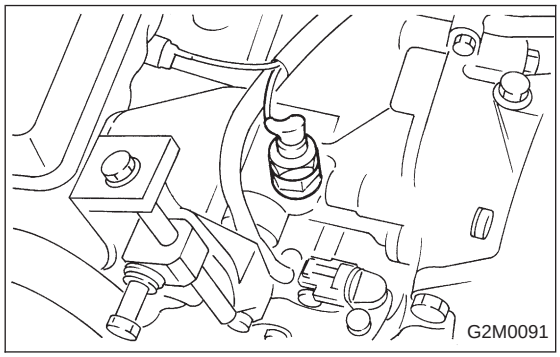
16) Disconnect connector from knock sensor.



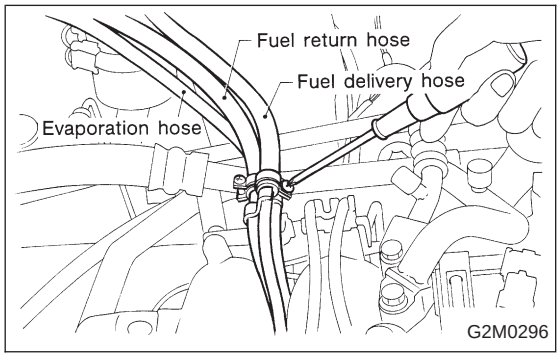
17) Disconnect connector from camshaft position sensor.



18) Disconnect connector from crankshaft position sensor.

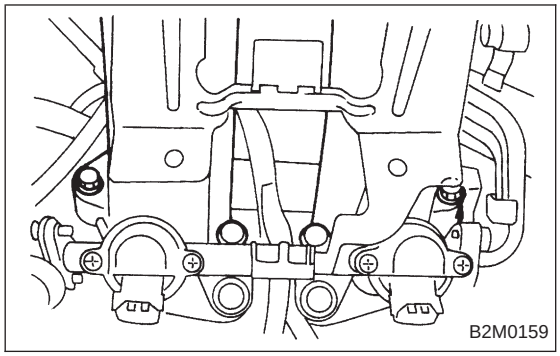


19) Disconnect connector from oil pressure switch.

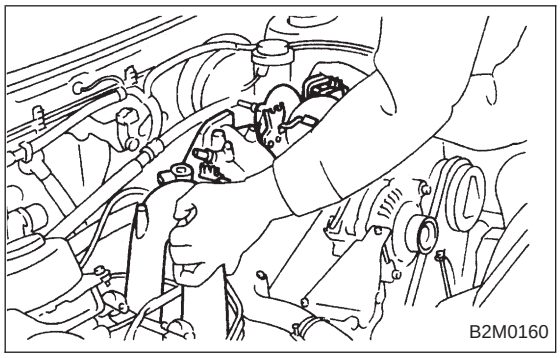


20) Disconnect fuel hoses from pipes.

WARNING:
Catch fuel from hoses in a container.


B2M0159

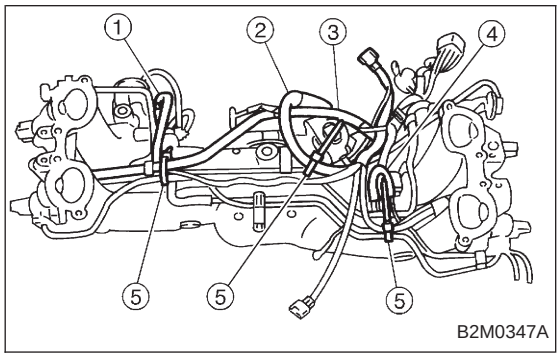
21) Remove bolts which hold intake manifold onto cylinder heads.


B2M0160

22) Remove intake manifold.

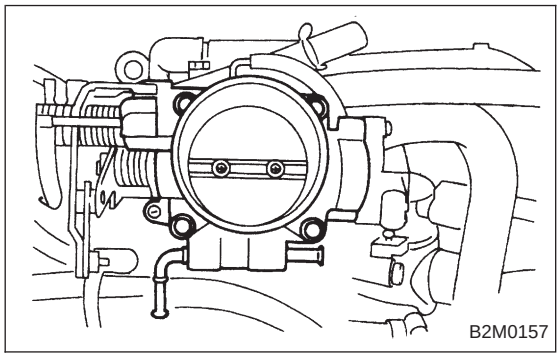
B: DISASSEMBLY

1) Disconnect connectors from throttle position sensor, ignition coil, fuel injectors, idle air control solenoid valve, purge control solenoid valve and EGR solenoid valve.
2) Remove engine harness from intake manifold.

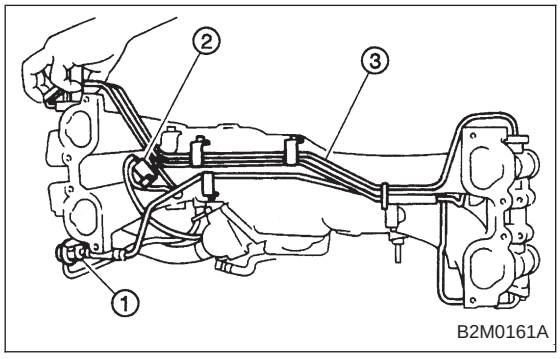


B2M0347A

① EGR solenoid valve
② Throttle position sensor
③ Idle air control solenoid valve
④ Purge control solenoid valve
⑤ Harness band


B2M0157

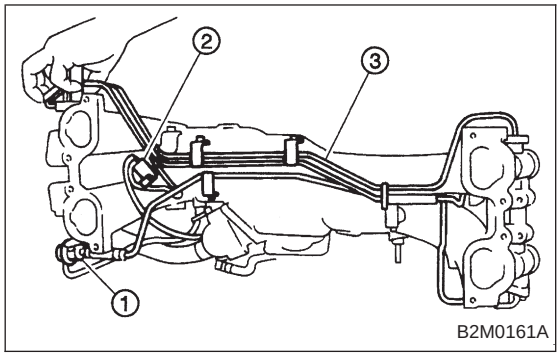
3) Remove throttle body from intake manifold.



B2M0161A

4) Remove fuel pipes, etc. from intake manifold.

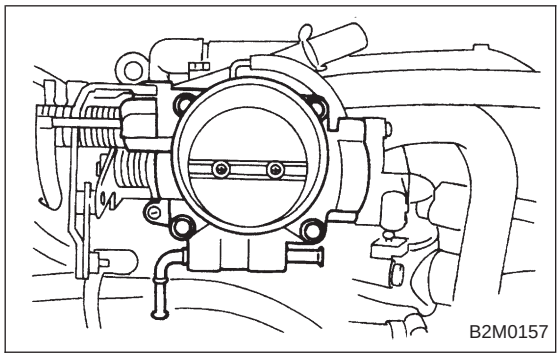
① Pressure regulator
② Purge control solenoid valve
③ Fuel pipe ASSY



C: ASSEMBLY

1) Assemble fuel pipes, etc. to intake manifold.

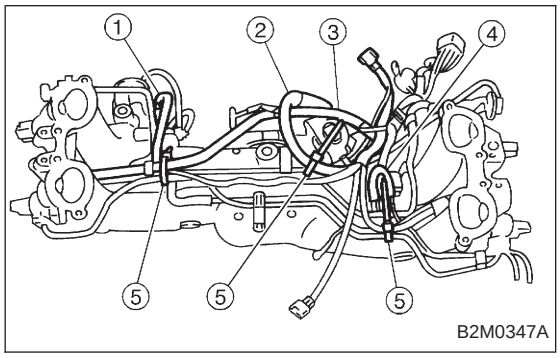
① Pressure regulator
② Purge control solenoid valve
③ Fuel pipe ASSY



2) Assemble throttle body to intake manifold.

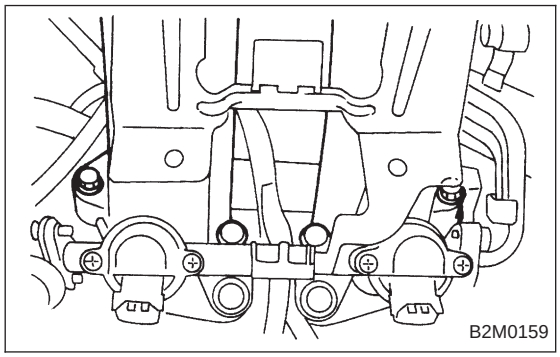
CAUTION:
Replace gasket with a new one.

Tightening torque:
22±2 N·m (2.2±0.2 kg-m, 15.9±1.4 ft-lb)



3) Install engine harness onto intake manifold.
4) Connect connectors to throttle position sensor, ignition coil, fuel injectors, idle air control solenoid valve, purge control solenoid valve and EGR solenoid valve.

① EGR solenoid valve
② Throttle position sensor
③ Idle air control solenoid valve
④ Purge control solenoid valve
⑤ Harness band

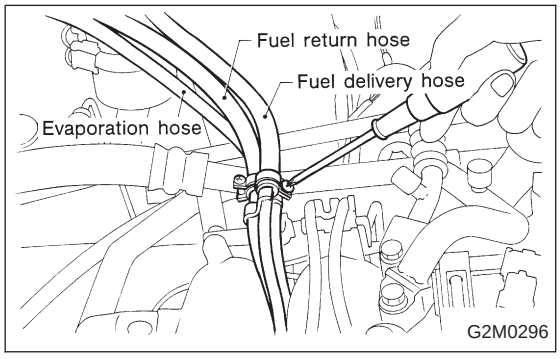


D: INSTALLATION

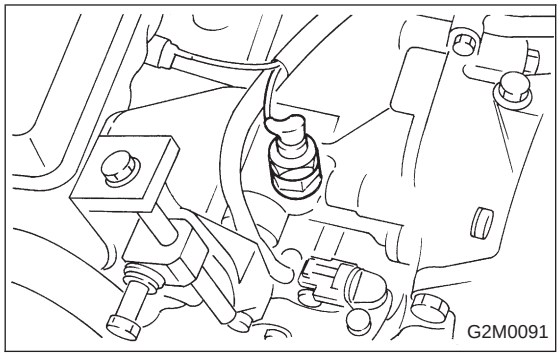
1) Install intake manifold onto cylinder heads.

CAUTION:
Always use new gaskets.

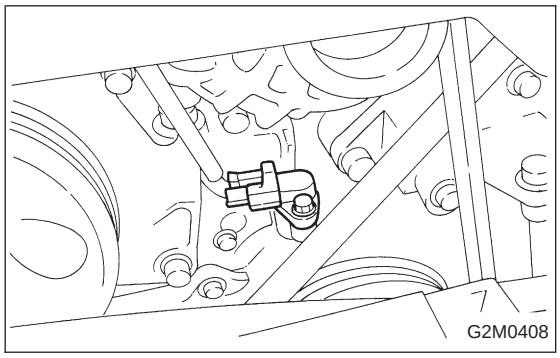
Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)



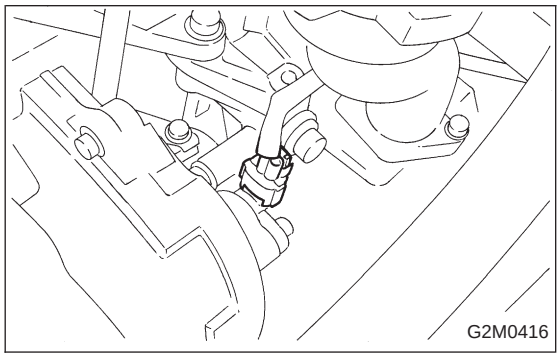
2) Connect fuel hoses.



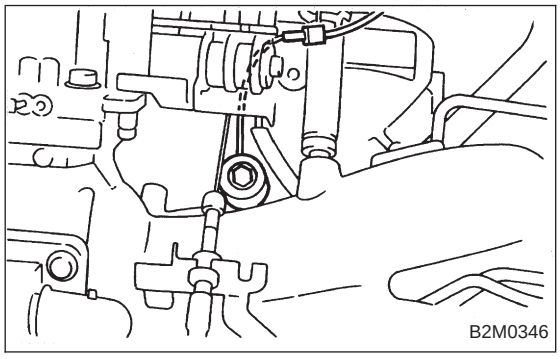
3) Connect connector to oil pressure switch.



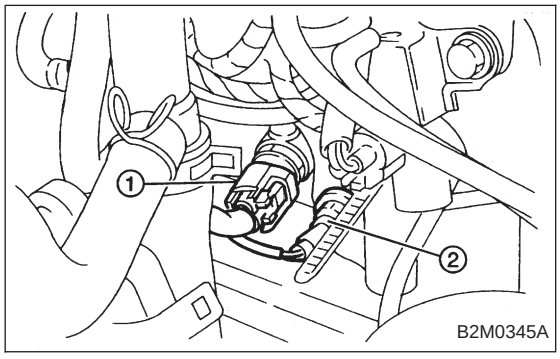
4) Connect connector to crankshaft position sensor.



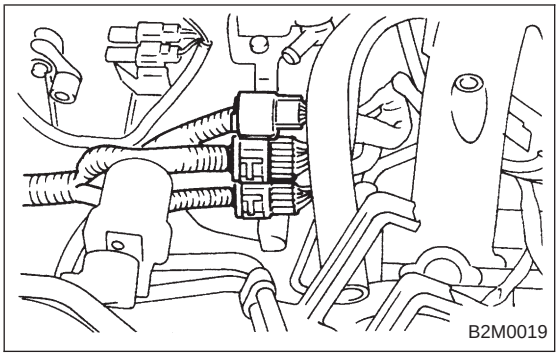
5) Connect connector to camshaft position sensor.



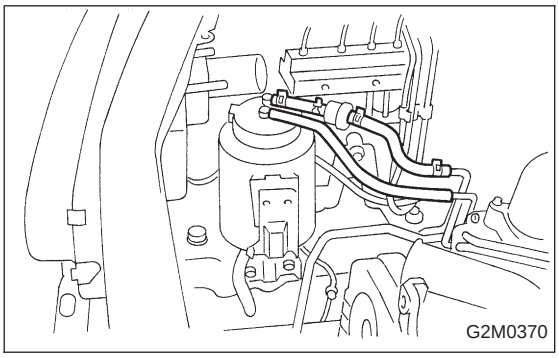
6) Connect connector to knock sensor.



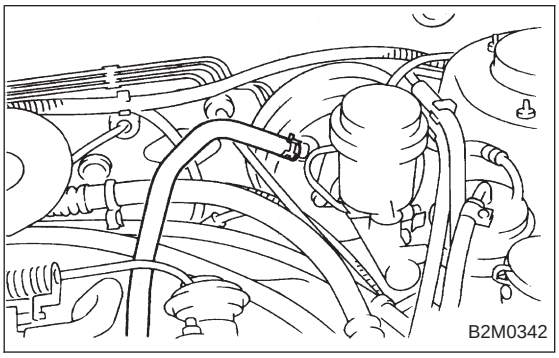
7) Connect connectors to engine coolant temperature sensor ① and thermometer ②.



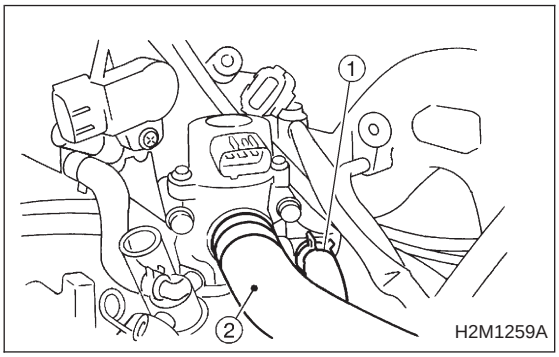
8) Connect engine harness connector to bulkhead harness connectors.



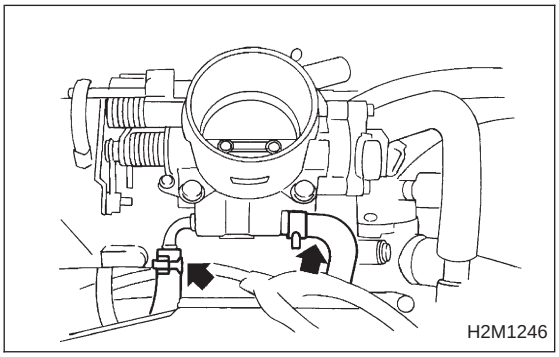
9) Connect canister hoses.



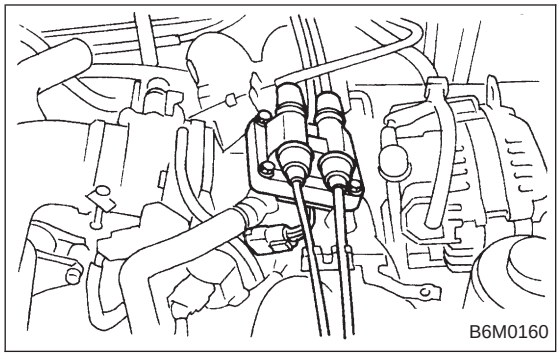
10) Connect brake booster vacuum hose to intake manifold.



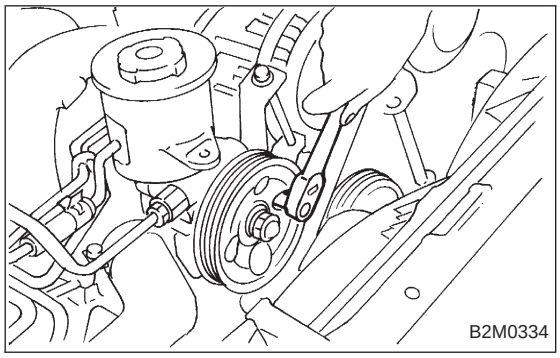
11) Connect engine coolant hose ① from idle air control solenoid valve.
12) Connect air by-pass hose ② from idle air control solenoid valve.



13) Connect engine coolant hoses to throttle body.


B6M0160

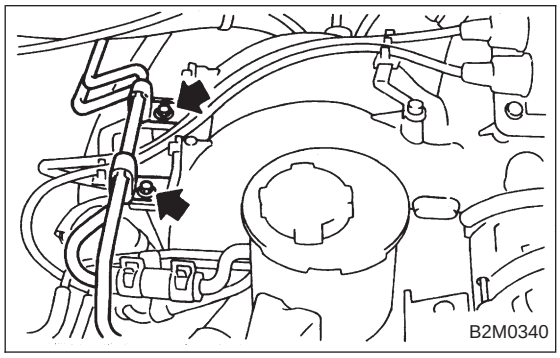
14) Connect spark plug cords to ignition coil.


B2M0334

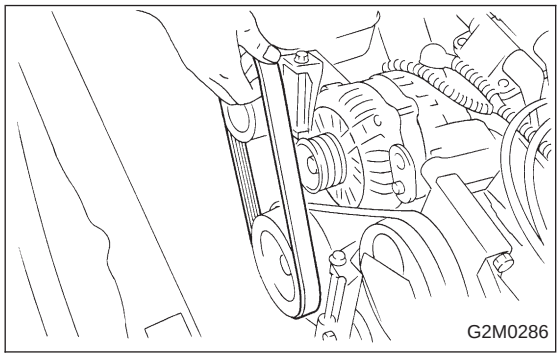
15) Install power steering pump on bracket.

(1) Install power steering pump on bracket, and tighten bolts.

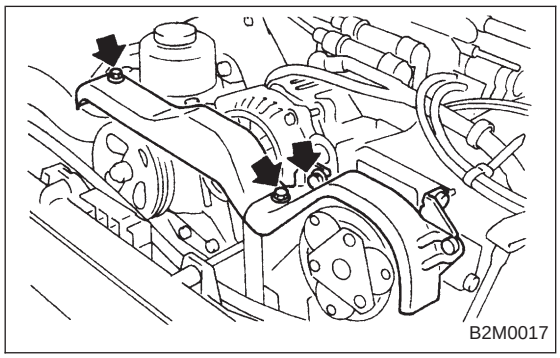
Tightening torque:
39±10 N·m (4.0±1.0 kg-m, 29±7 ft-lb)


B2M0340

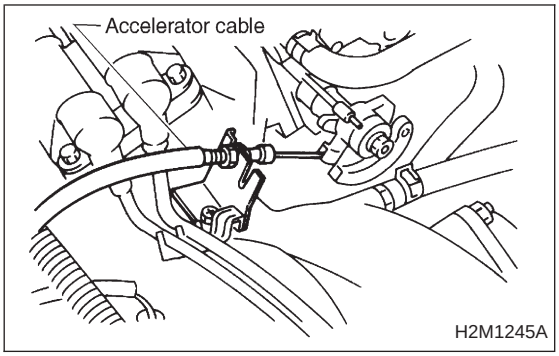
(2) Install power steering pipe bracket on right side intake manifold.


G2M0286

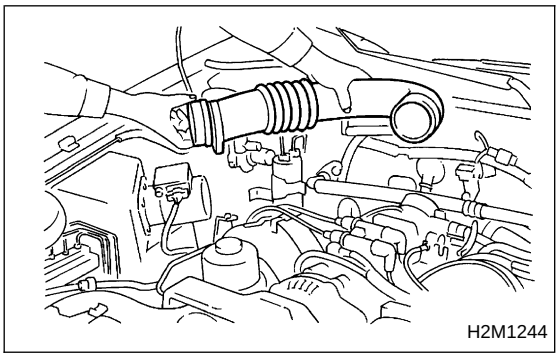
(3) Install front side V-belt, and adjust it.
<Ref. to 1-5 [01A0].>


B2M0017

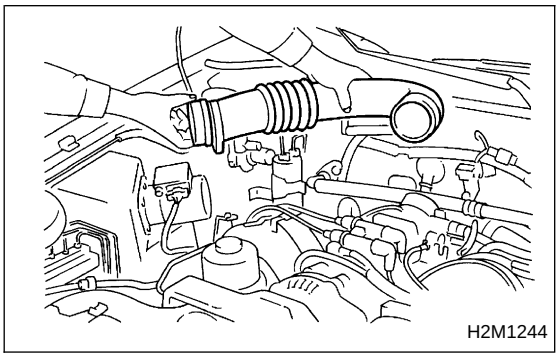
(4) Install V-belt cover.



16) Connect accelerator cable.



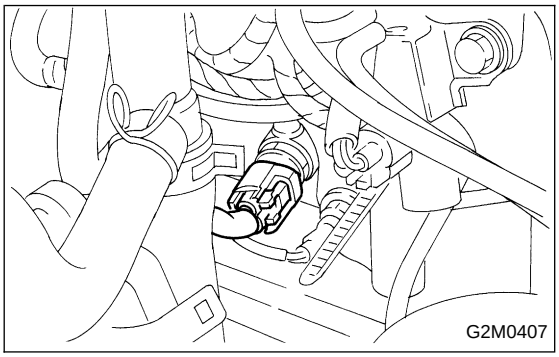
17) Install air cleaner element, air cleaner upper cover and air intake duct.
18) Connect connector to mass air flow sensor.



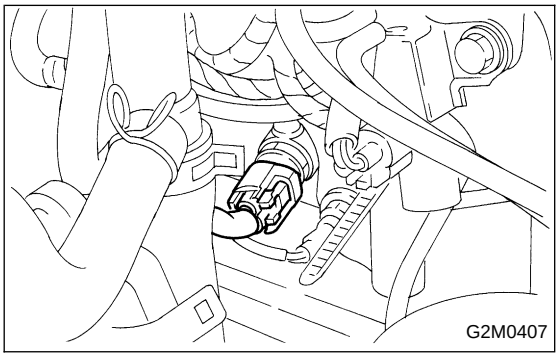
5. Engine Coolant Temperature Sensor

A: REMOVAL AND INSTALLATION

1) Remove air intake duct.

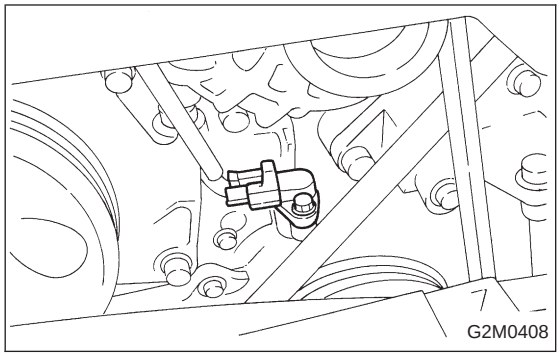


2) Disconnect connector from engine coolant temperature sensor.
3) Remove engine coolant temperature sensor.



4) Installation is in the reverse order of removal.

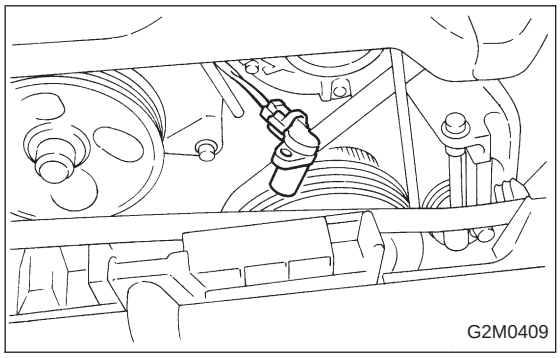
Tightening torque:
25±3 N·m (2.5±0.3 kg-m, 18.1±2.2 ft-lb)



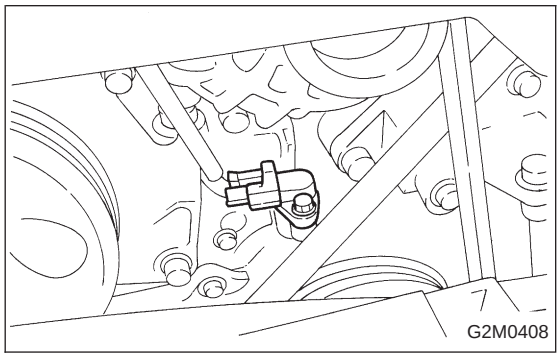
6. Crankshaft Position Sensor

A: REMOVAL AND INSTALLATION

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

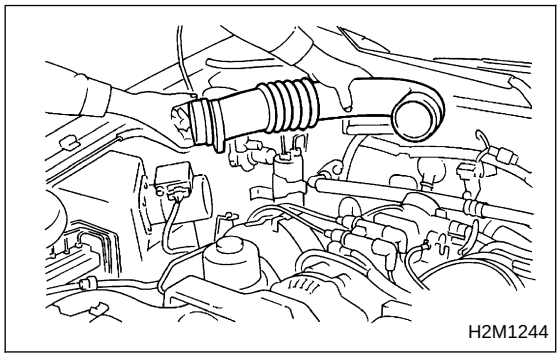


2) Remove crankshaft position sensor, and disconnect connector from it.



3) Installation is in the reverse order of removal.

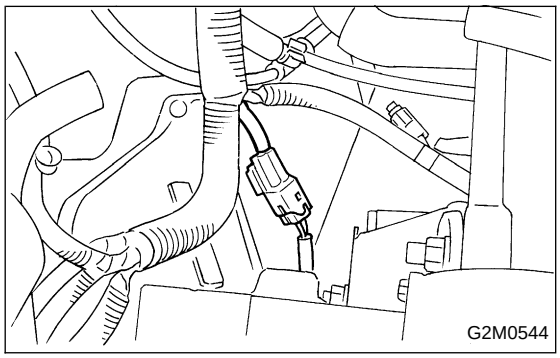
Tightening torque:
6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)



7. Front Oxygen Sensor

A: REMOVAL

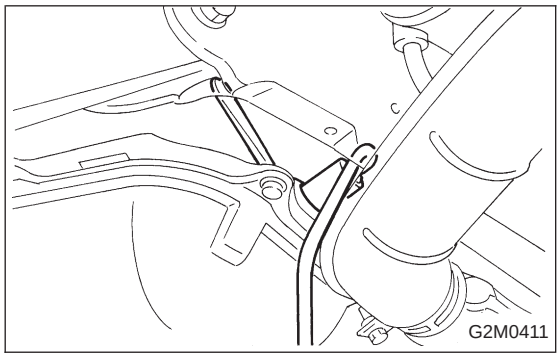
1) Remove air intake duct.



2) Disconnect connector from front oxygen sensor.

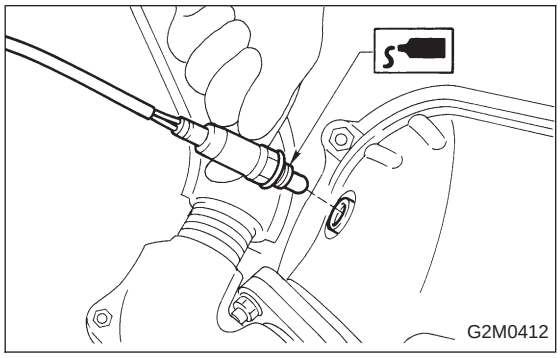
3) Lift-up the vehicle.
4) Apply SUBARU CRC or its equivalent to threaded portion of front oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)



5) Remove front oxygen sensor.

CAUTION:
When removing oxygen sensor, do not force oxygen sensor especially when exhaust pipe is cold, otherwise it will damage exhaust pipe.

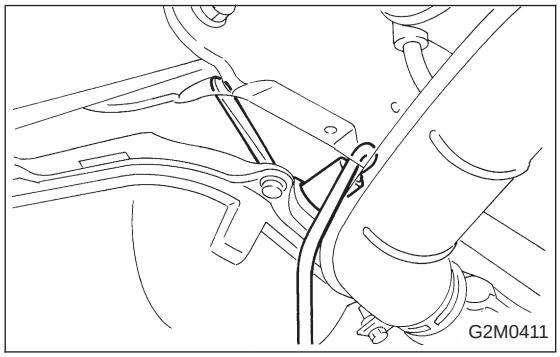


B: INSTALLATION

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

Anti-seize compound:
SS-30 by JET LUBE

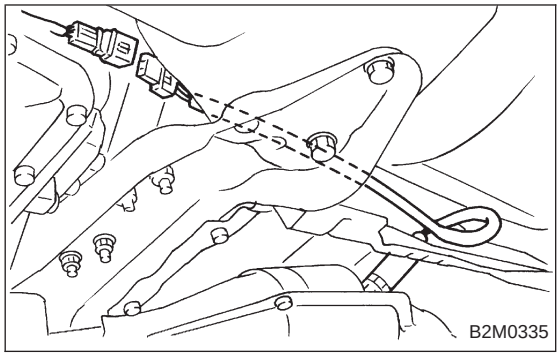
CAUTION:
Never apply anti-seize compound to protector of front oxygen sensor.



2) Install front oxygen sensor.

Tightening torque:
21±3 N·m (2.1±0.3 kg-m, 15.2±2.2 ft-lb)

3) Lower the vehicle.
4) Connect connector of front oxygen sensor.
5) Install air intake duct.



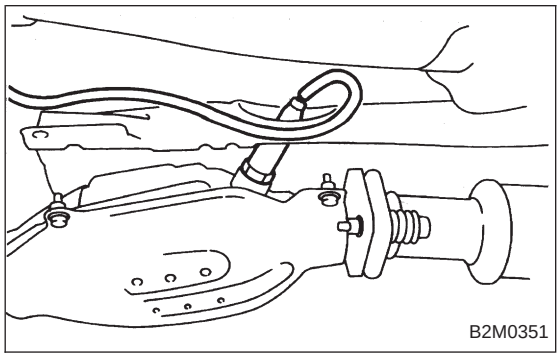
8. Rear Oxygen Sensor

A: REMOVAL

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

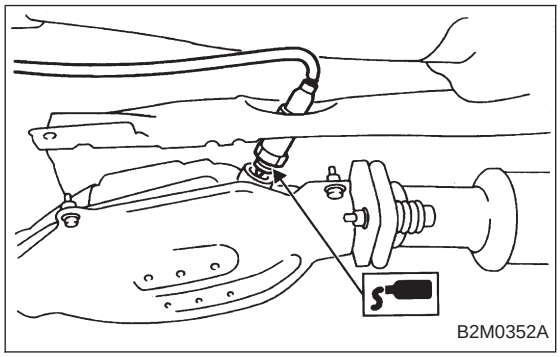
3) Apply SUBARU CRC or its equivalent to threaded portion of rear oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)



4) Remove rear oxygen sensor.

CAUTION:
When removing rear oxygen sensor, do not force rear oxygen sensor especially when exhaust pipe is cold, otherwise it will damage exhaust pipe.

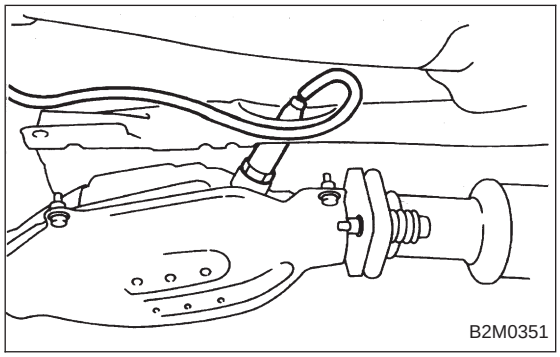


B: INSTALLATION

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

Anti-seize compound:
SS-30 by JET LUBE

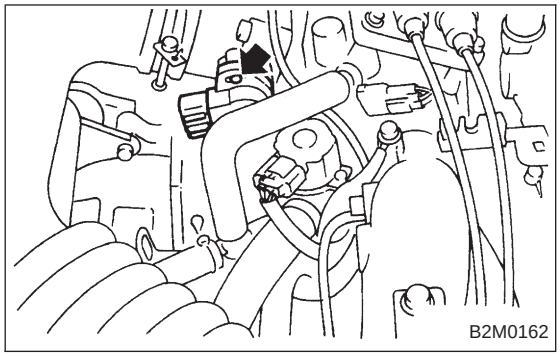
CAUTION:
Never apply anti-seize compound to protector of rear oxygen sensor.



2) Install rear oxygen sensor.

Tightening torque:
21±3 N·m (2.1±0.3 kg-m, 15.2±2.2 ft-lb)

3) Connect connector of rear oxygen sensor.
4) Lower the vehicle.


B2M0162

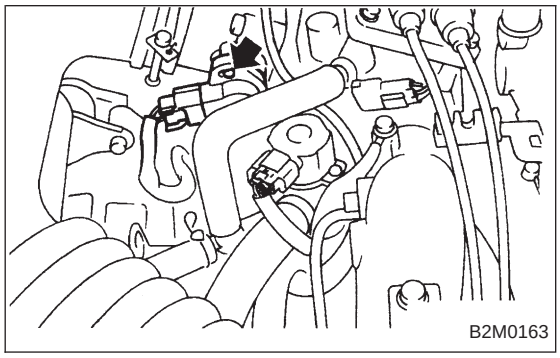
9. Throttle Position Sensor

A: REMOVAL AND INSTALLATION

1) Disconnect connector from throttle position sensor.
2) Remove throttle position sensor holding screws, and remove it.
3) Installation is in the reverse order of removal.

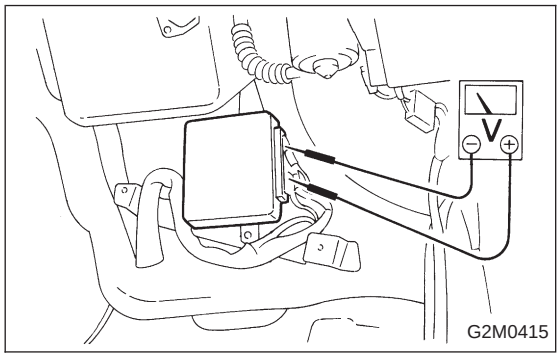
Tightening torque:
2.2±0.2 N·m (0.22±0.02 kg-m, 1.6±0.1 ft-lb)

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


B2M0163

B: ADJUSTMENT

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

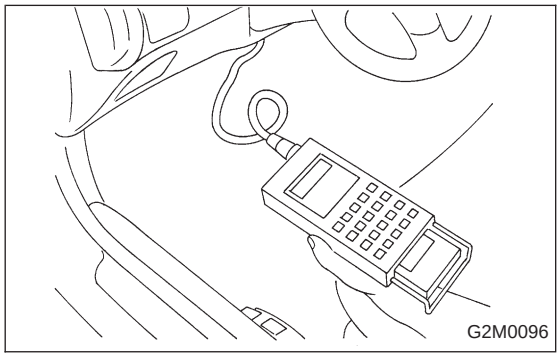


G2M0415

3) When using voltage meter;
   (1) Take out ECM.
   (2) Turn ignition switch to ON.
   (3) Adjust throttle position sensor so that signal voltage to ECM may be in specification.

Connector & Terminal / Specified voltage
(B84) No. 24 — (B84) No. 25 / 0.45 — 0.55 V
[Fully closed.]

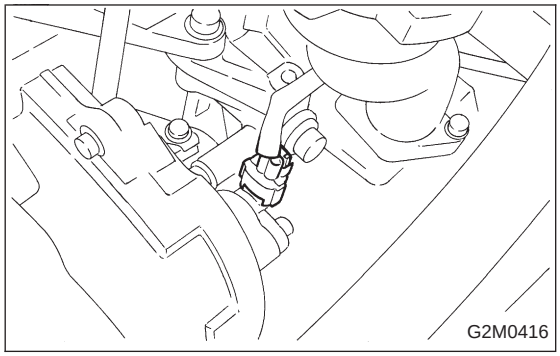
   (4) Tighten throttle position sensor holding screws.


G2M0096

4) When using Subaru Select Monitor;
   (1) Connect Subaru Select Monitor to the data link connector.
   (2) Turn ignition switch to ON and SSM switch to ON.
   (3) Select mode “F10”.
   (4) Adjust throttle position sensor to specified data.

Condition / Specified data.
Throttle fully closed / 0.50 V

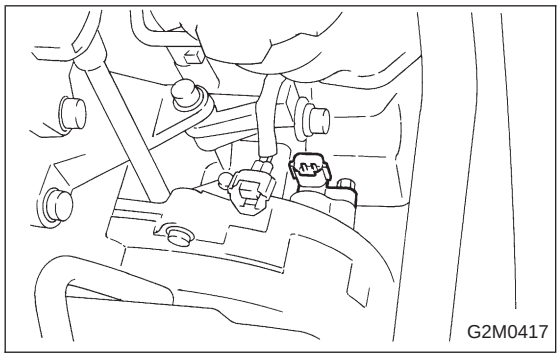
   (5) Tighten throttle position sensor holding screws.



10. Camshaft Position Sensor

A: REMOVAL AND INSTALLATION

1) Disconnect connector from camshaft position sensor.



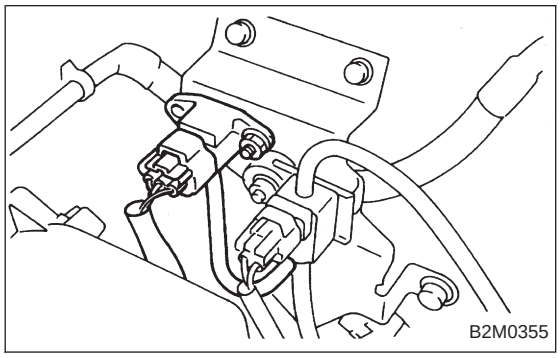
2) Remove camshaft position sensor from camshaft support LH.
3) Installation is in the reverse order of removal.

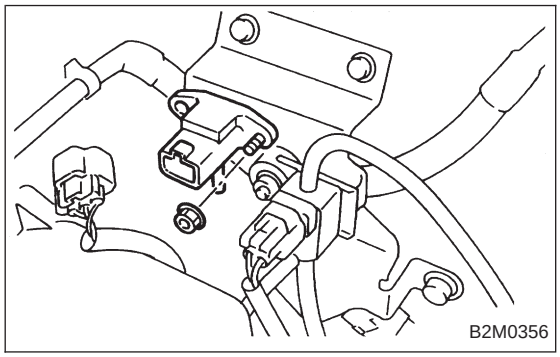
Tightening torque:
6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)

11. Pressure Sensor

A: REMOVAL AND INSTALLATION

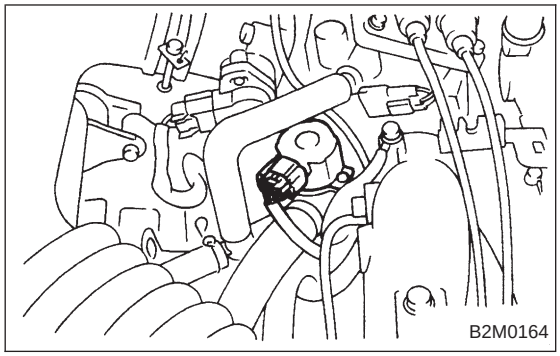
1) Disconnect connector from pressure sensor.
2) Disconnect hose from pressure sensor.





3) Remove pressure sensor from bracket.
4) Installation is in the reverse order of removal.

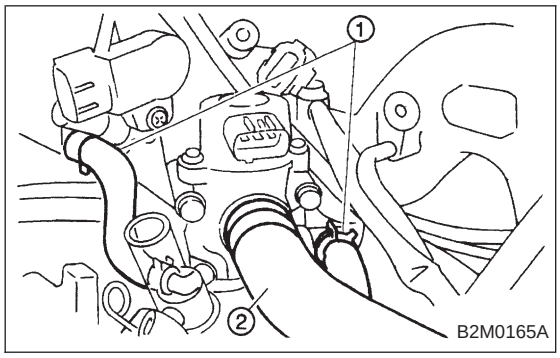
Tightening torque:
6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)


B2M0164

12. Idle Air Control Solenoid Valve

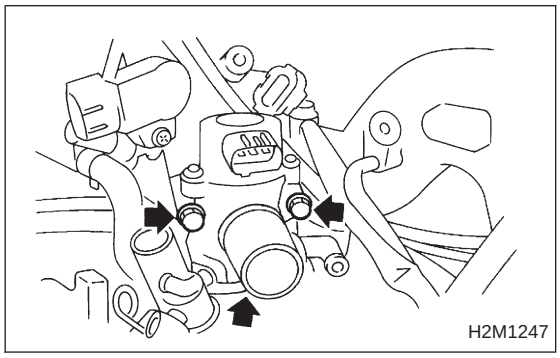
A: REMOVAL AND INSTALLATION

1) Disconnect connector from idle air control solenoid valve.



B2M0165A

2) Disconnect engine coolant hoses ① from idle air control solenoid valve.
3) Disconnect air by-pass hose ② from idle air control solenoid valve.

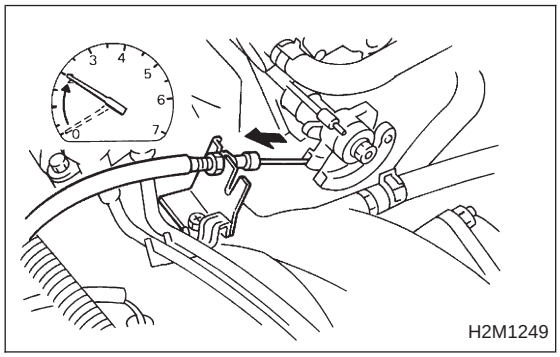

H2M1247

4) Remove idle air control solenoid valve from throttle body.
5) Installation is in the reverse order of removal.

CAUTION:
Replace gasket with a new one.

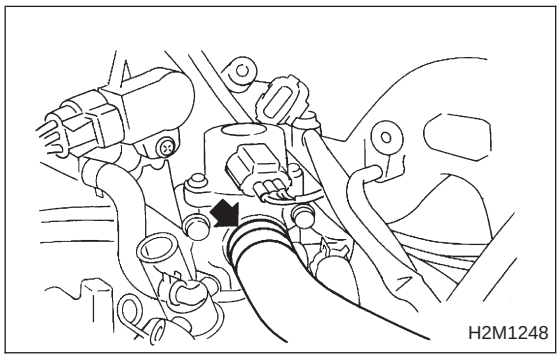
Tightening torque:
6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)

B: CLEANING

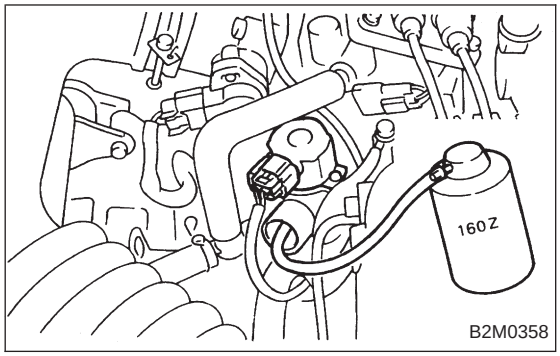


H2M1249

1) Start and warm-up the engine until radiator fan operates.
2) Hold throttle valve so that engine speed is at 2,000 rpm.


H2M1248

3) Disconnect by-pass hose from idle air control solenoid valve.



4) Slowly pour one can (16 oz) of cleaner into by-pass air hole.

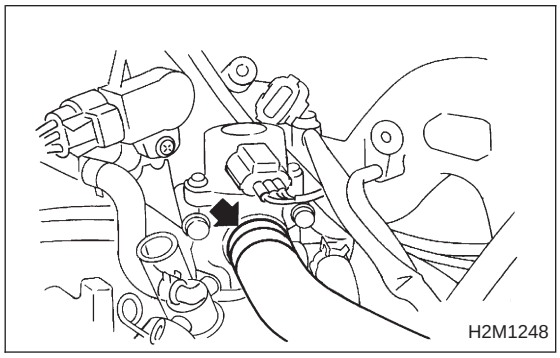
Cleaner:

- ***Part No. 1050002 GM Top Engine Cleaner***
- ***Part No. X66-A AC Delco Carburetor Tune-up Conditioner***

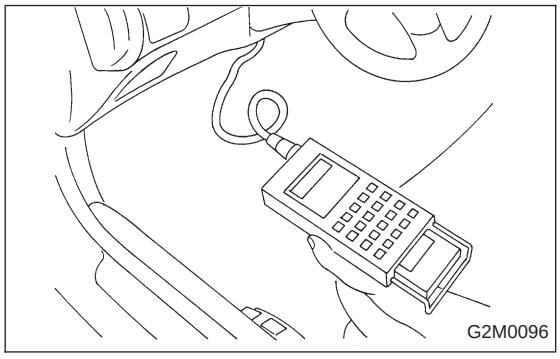
5) Leave the engine running for five minutes.

NOTE:
White smoke comes out of the muffler until the cleaner is used up.

6) Stop the engine.



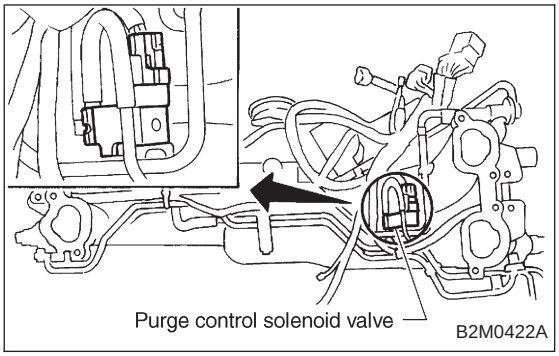
7) Release the throttle valve.
8) Connect by-pass hose to idle air control solenoid valve.



9) Check duty ratio of idle air control solenoid valve with Subaru Select Monitor.

(1) Connect Subaru Select Monitor to the data link connector.
(2) Start the engine and turn Subaru Select Monitor switch to ON.
(3) Select mode “F12”.
(4) Make sure duty ratio on radiator fan and electric load is OFF.

Specified data: 25 — 40%

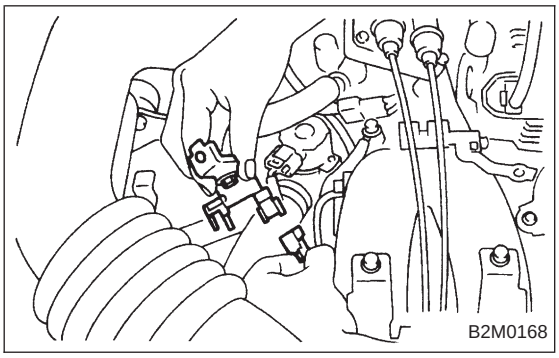


13. Purge Control Solenoid Valve

A: REMOVAL AND INSTALLATION

1) Remove bolt which installs purge control solenoid valve onto intake manifold.

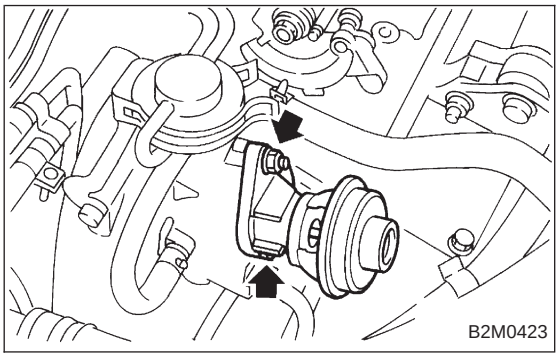
NOTE:
This figure shows the intake manifold detached from the cylinder heads.



2) Take out purge control solenoid valve through the bottom of the intake manifold.
3) Disconnect connector and hoses from purge control solenoid valve.

4) Installation is in the reverse order of removal.

Tightening torque:
16±1.5 N·m (1.6±0.15 kg-m, 11.6±1.1 ft-lb)



14. EGR Valve

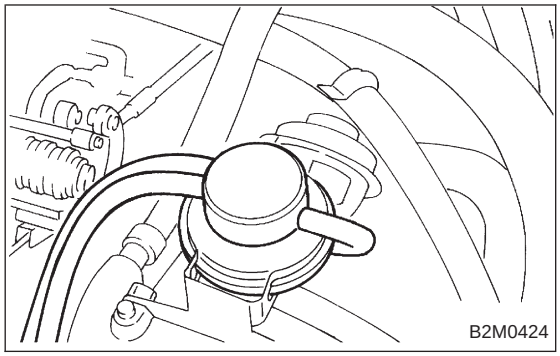
A: REMOVAL AND INSTALLATION

1) Disconnect vacuum hose from EGR valve.
2) Remove bolts which install EGR valve onto intake manifold.

3) Installation is in the reverse order of removal.

CAUTION:
Replace gasket with a new one.

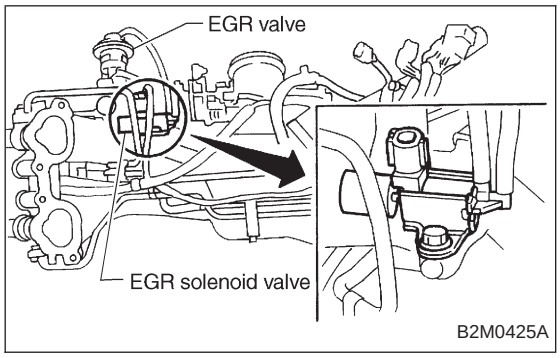
Tightening torque:
19±1.5 N·m (1.9±0.15 kg-m, 13.7±1.1 ft-lb)



15. Back-Pressure Transducer (BPT)

A: REMOVAL AND INSTALLATION

1) Disconnect vacuum hoses from BPT.
2) Remove BPT from bracket.
3) Installation is in the reverse order of removal.



16. EGR Solenoid Valve

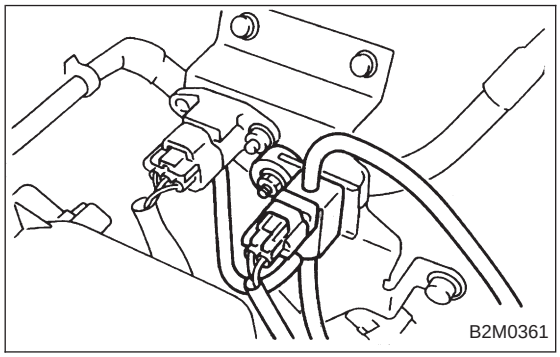
A: REMOVAL AND INSTALLATION

1) Remove bolt which installs EGR solenoid valve onto intake manifold.
2) Disconnect hoses and connector from EGR solenoid valve.

NOTE:
This figure shows the intake manifold detached from cylinder heads.

3) Installation is in the reverse order of removal.

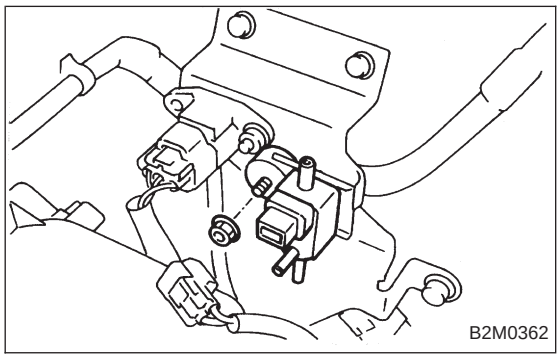
Tightening torque:
16±1.5 N·m (1.6±0.15 kg-m, 11.6±1.1 ft-lb)



17. Pressure Sources Switching Solenoid Valve

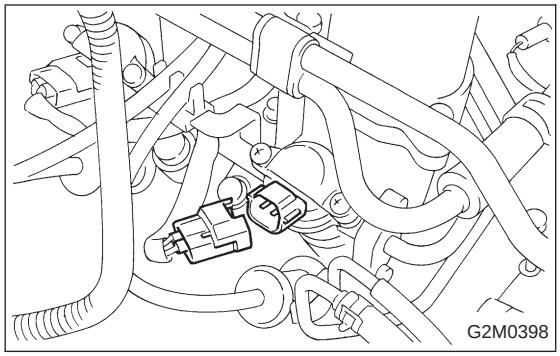
A: REMOVAL AND INSTALLATION

1) Disconnect connector from pressure sources switching solenoid valve.
2) Disconnect hoses from pressure sources switching solenoid valve.



3) Remove pressure sources switching solenoid valve from bracket.
4) Installation is in the reverse order of removal.

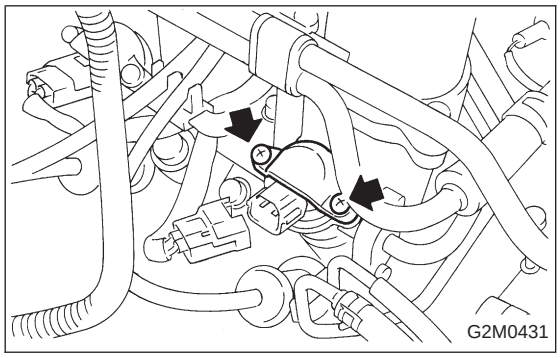
Tightening torque:
6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)



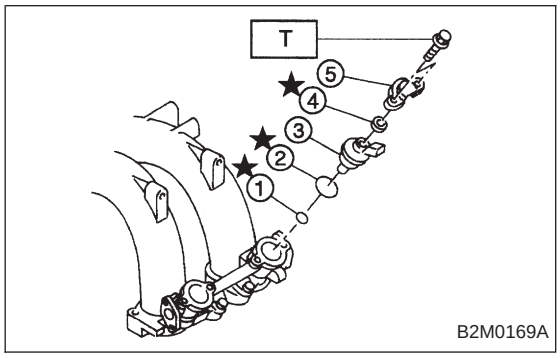
18. Fuel Injector

A: REMOVAL AND INSTALLATION

1) Release fuel pressure.
<Ref. to 2-8 [W1A0].>
2) Disconnect connector from fuel injector.



3) Remove fuel injector from fuel pipe assembly.

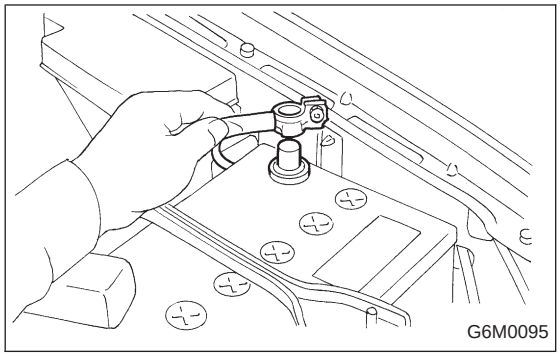


4) Installation is in the reverse order of removal.

CAUTION:
Replace O-rings and insulator.

Tightening torque:
T: 3.4±0.5 N·m (0.35±0.05 kg-m, 2.5±0.4 ft-lb)

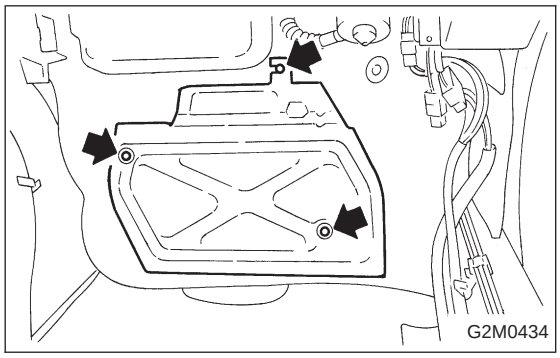
① O-ring B
② O-ring A
③ Fuel injector
④ Insulator
⑤ Fuel injector cup


G6M0095

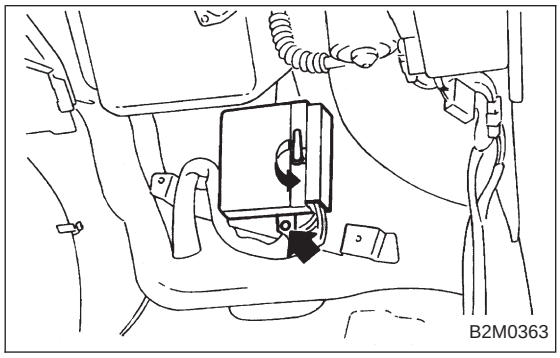
19. Engine Control Module

A: REMOVAL AND INSTALLATION

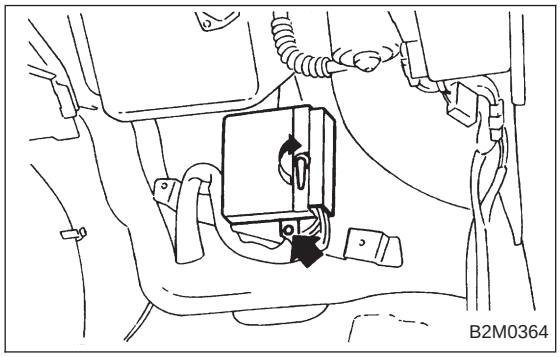
1) Disconnect battery ground cable.


G2M0434

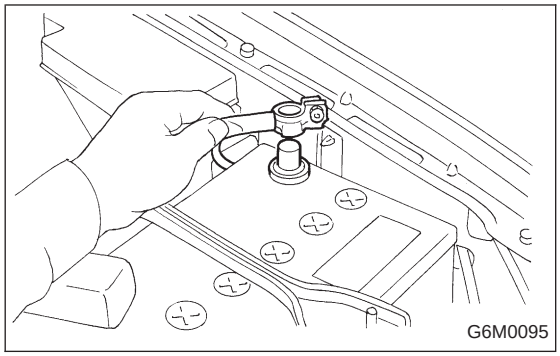
2) Detach floor mat of front passenger seat.
3) Remove protect cover.


B2M0363

4) Release the lock of ECM connector and disconnect it.
5) Remove nuts which install ECM onto body.
6) Take out ECM.


B2M0364

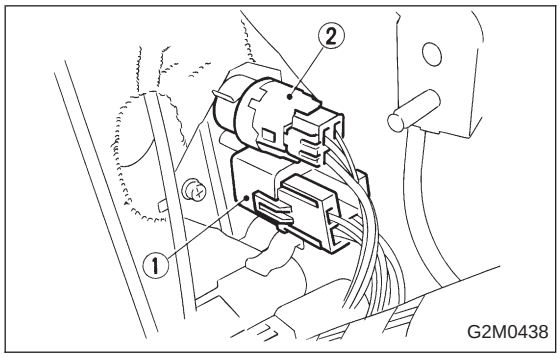
7) Connect ECM connector and lock it.
8) Installation is in the reverse order of removal.


G6M0095

20. Main Relay and Fuel Pump Relay

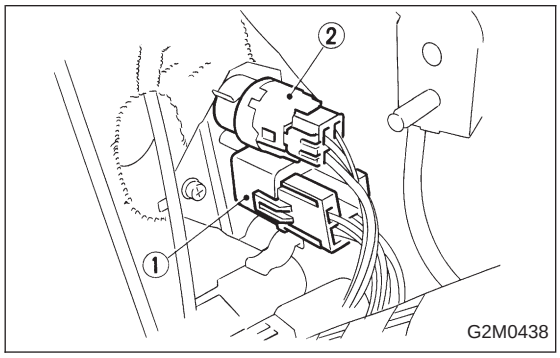
A: REMOVAL AND INSTALLATION

1) Disconnect battery ground cable.



G2M0438

2) Remove screw which installs bracket of main relay ① and fuel pump relay ②.
3) Disconnect connectors from main relay and fuel pump relay.



G2M0438

4) Installation is in the reverse order of removal.

① Main relay
② Fuel pump relay

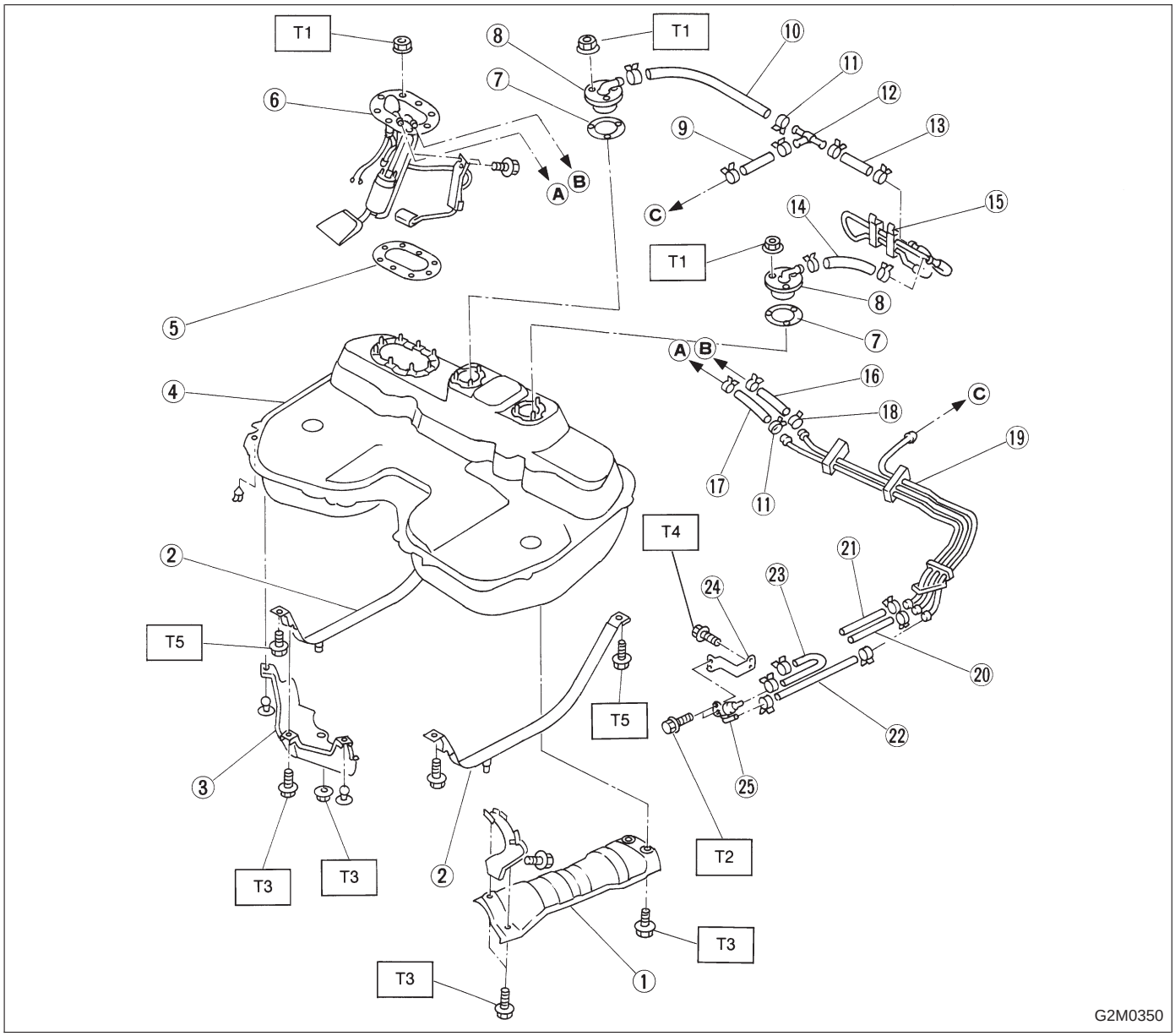
FUEL SYSTEM 2-8

1. Specifications

Fuel tank	Capacity	60 ℓ (15.9 US gal, 13.2 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Discharge pressure	250.1 kPa (2.55 kg/cm^2, 36.3 psi)
	Discharge flow	More than 80 ℓ (21.1 US gal, 17.6 Imp gal)/h [12V at 250.1 kPa (2.55 kg/cm^2, 36.3 psi)]
Fuel filter		Cartridge type

1. Fuel Tank

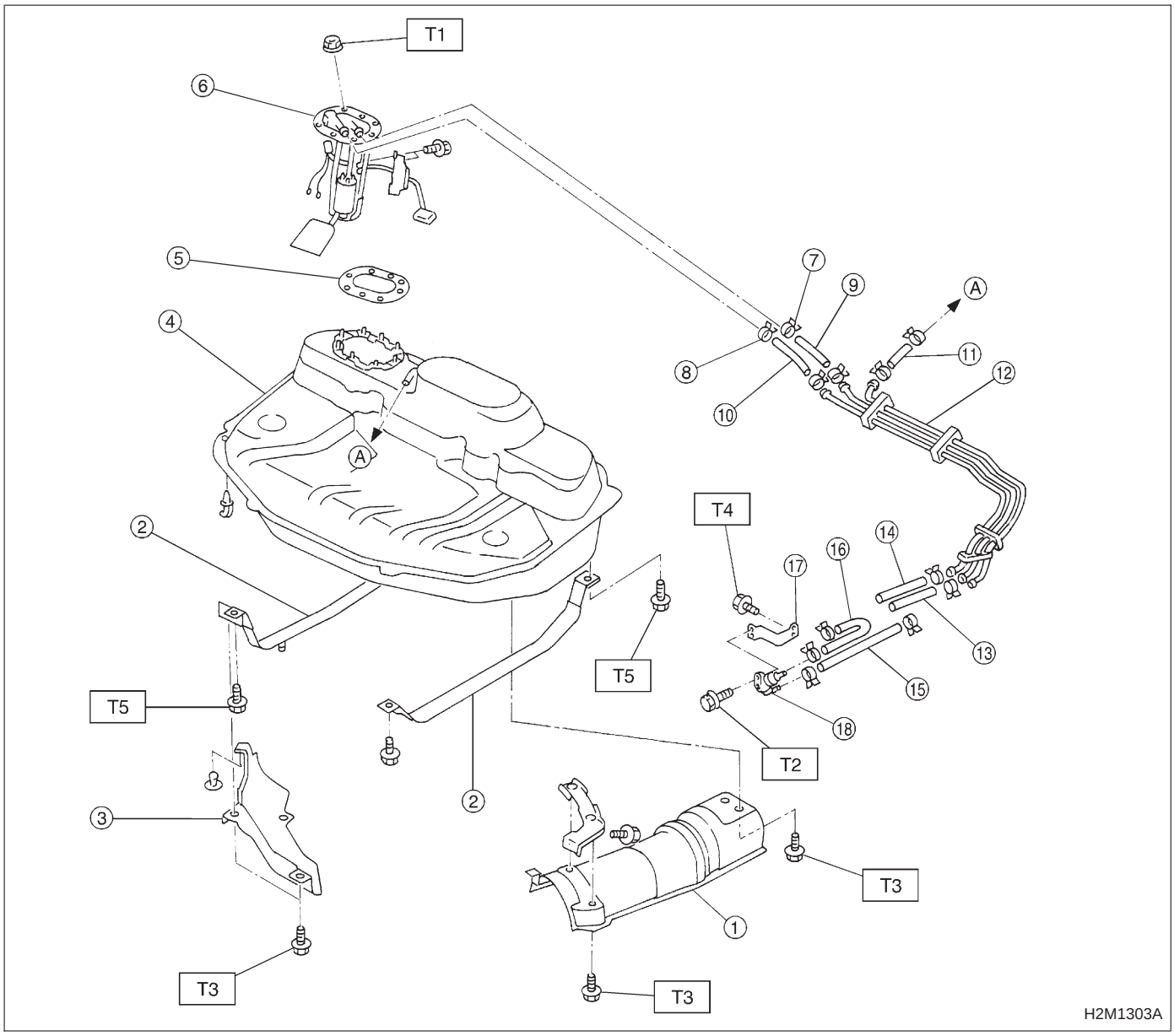
1. AWD MODEL



① Heat sealed cover
② Fuel tank band
③ Protector
④ Fuel tank
⑤ Fuel pump gasket
⑥ Fuel pump ASSY
⑦ Fuel cut valve gasket
⑧ Fuel cut valve
⑨ Evaporation hose C
⑩ Evaporation hose A
⑪ Clip
⑫ Joint pipe
⑬ Evaporation hose B
⑭ Evaporation hose D
⑮ Evaporation pipe ASSY
⑯ Fuel delivery hose A
⑰ Fuel return hose A
⑱ Clamp
⑲ Fuel pipe ASSY
⑳ Fuel delivery hose B
㉑ Fuel return hose B
㉒ Evaporation hose E
㉓ Evaporation hose F
㉔ Roll cover valve bracket
㉕ Roll over valve

Tightening torque: N·m (kg-m, ft-lb)
T1: 4.4±1.5 (0.45±0.15, 3.3±1.1)
T2: 6.5±1.5 (0.65±0.15, 4.8±1.1)
T3: 7.4±2.0 (0.75±0.2, 5.4±1.4)
T4: 18±5 (1.8±0.5, 13.5±3.5)
T5: 33±10 (3.4±1.0, 25±7)

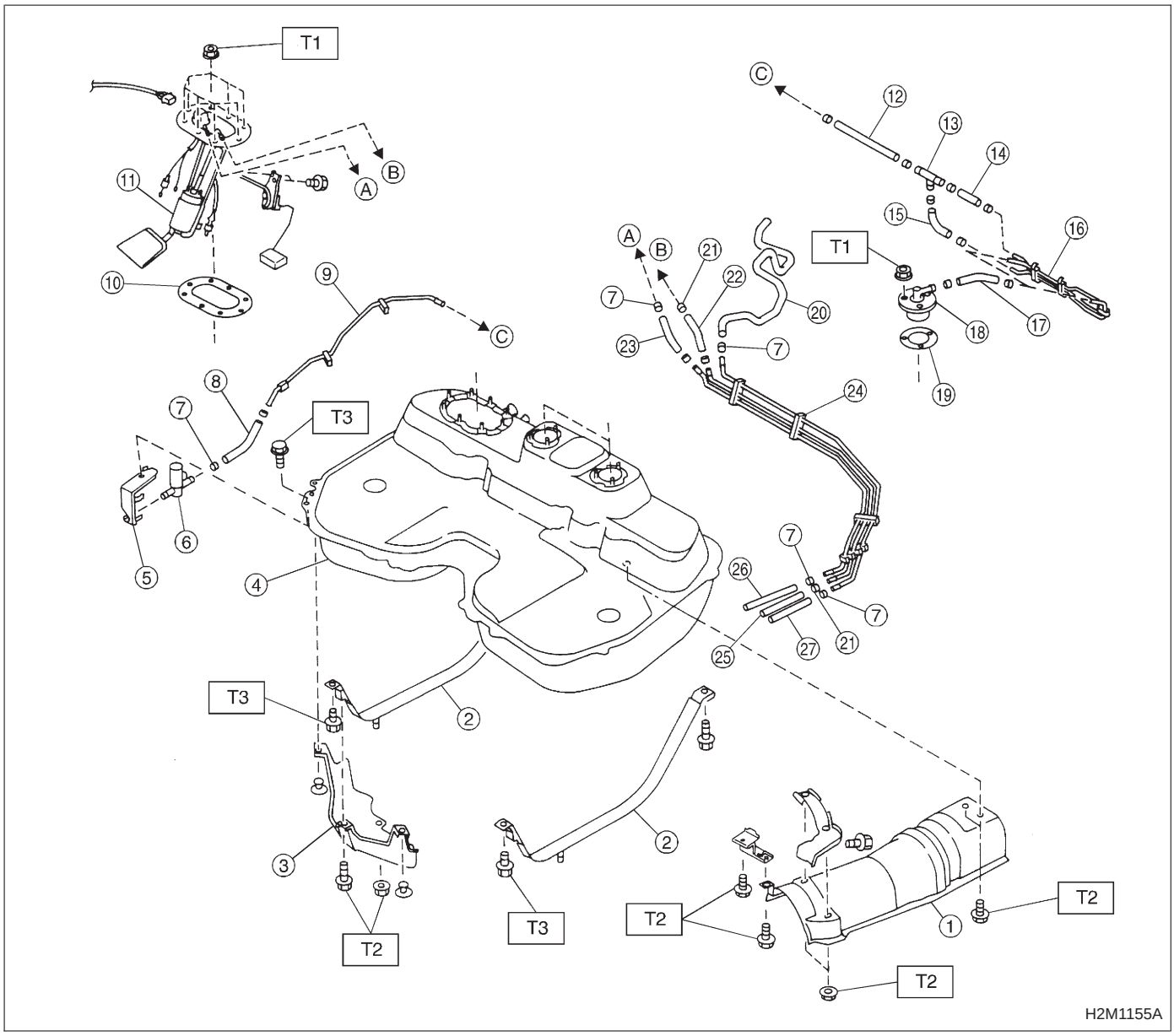
2. FWD MODEL (EXCEPT CALIFORNIA)



① Heat seated cover
② Fuel tank band
③ Protector
④ Fuel tank
⑤ Fuel pump gasket
⑥ Fuel pump ASSY
⑦ Clamp
⑧ Clip
⑨ Fuel delivery hose A
⑩ Fuel return hose A
⑪ Evaporation hose A
⑫ Fuel pipe ASSY
⑬ Fuel delivery hose B
⑭ Fuel return hose B
⑮ Evaporation hose B
⑯ Evaporation hose C
⑰ Roll over valve bracket
⑱ Roll over valve

Tightening torque: N·m (kg-m, ft-lb)
T1: 4.4±1.5 (0.45±0.15, 3.3±1.1)
T2: 6.5±1.5 (0.65±0.15, 4.8±1.1)
T3: 7.4±2.0 (0.75±0.2, 5.4±1.4)
T4: 18±5 (1.8±0.5, 13.5±3.5)
T5: 33±10 (3.4±1.0, 25±7)

3. CALIFORNIA FWD MODEL

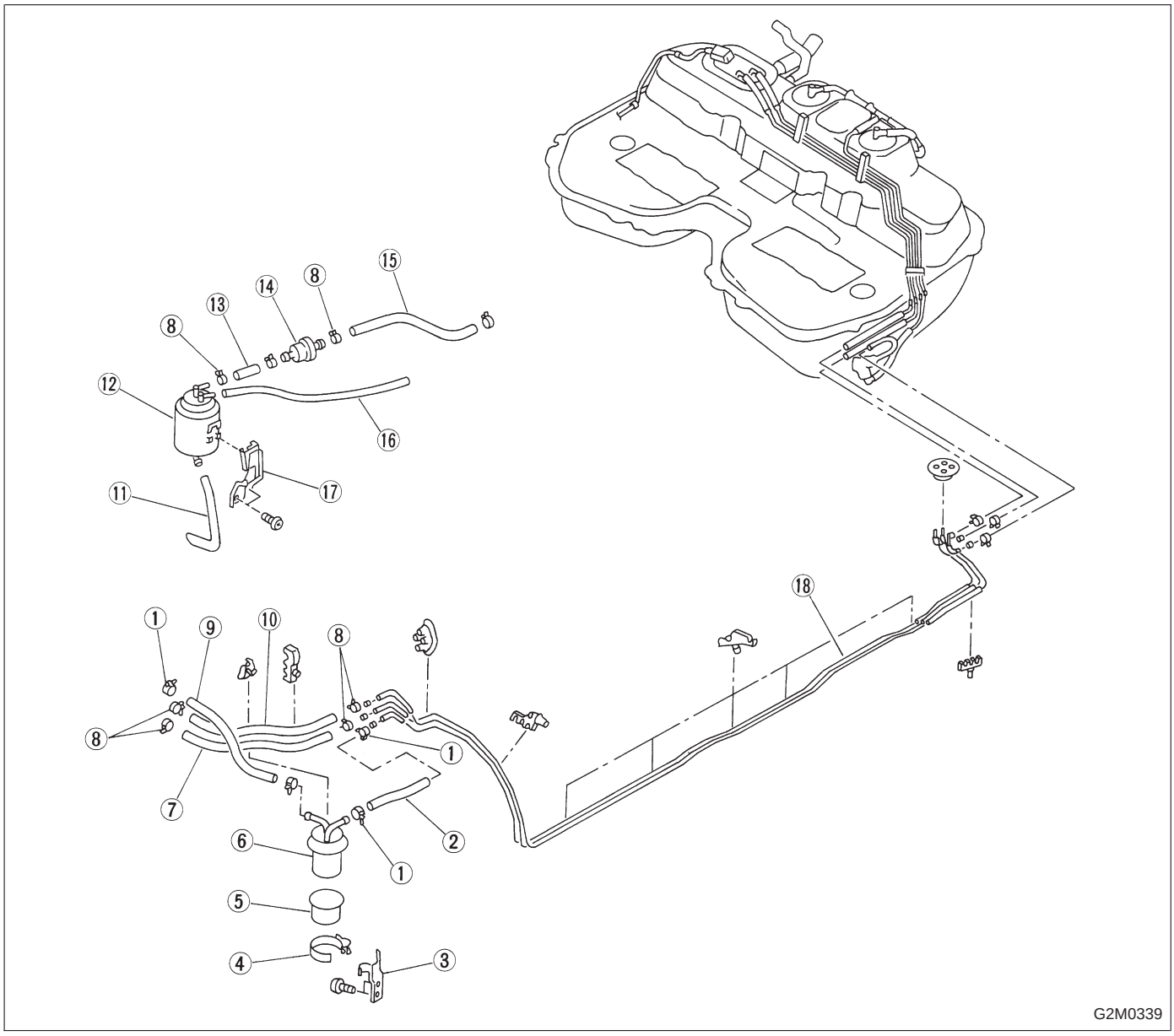


① Heat sealed cover
② Fuel tank band
③ Protector
④ Fuel tank
⑤ Fuel tank pressure control solenoid valve bracket
⑥ Fuel tank pressure control solenoid valve
⑦ Clip
⑧ Evaporation hose G
⑨ Evaporation pipe A
⑩ Fuel pump gasket
⑪ Fuel pump ASSY
⑫ Evaporation hose F
⑬ Joint pipe
⑭ Evaporation hose B
⑮ Evaporation hose A
⑯ Evaporation pipe ASSY
⑰ Evaporation hose D
⑱ Fuel cut valve
⑲ Fuel cut valve gasket
⑳ Evaporation hose C
㉑ Clamp
㉒ Fuel delivery hose A
㉓ Fuel return hose A
㉔ Fuel pipe ASSY
㉕ Fuel delivery hose B
㉖ Fuel return hose B
㉗ Evaporation hose E

Tightening torque: N·m (kg-m, ft-lb)
T1: 4.4±1.5 (0.45±0.15, 3.3±1.1)
T2: 7.4±2.0 (0.75±0.2, 5.4±1.4)
T3: 33±10 (3.4±1.0, 25±7)

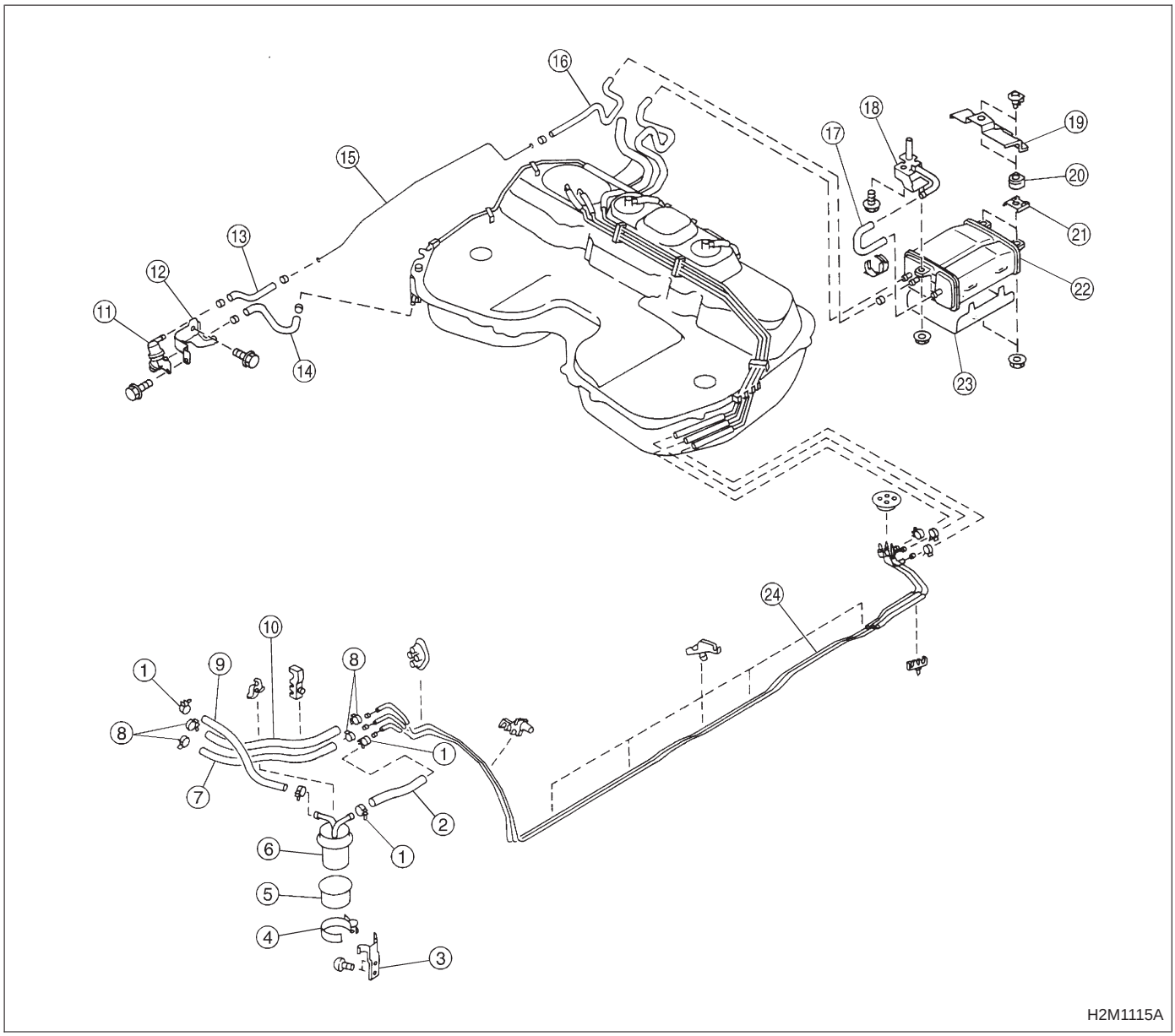
2. Fuel Line

1. FWD (EXCEPT CALIFORNIA) AND AWD MODEL



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
⑪ Air vent hose
⑫ Canister
⑬ Canister hose A
⑭ Two-way valve
⑮ Canister hose B
⑯ Canister hose C
⑰ Canister bracket
⑱ Fuel pipe ASSY

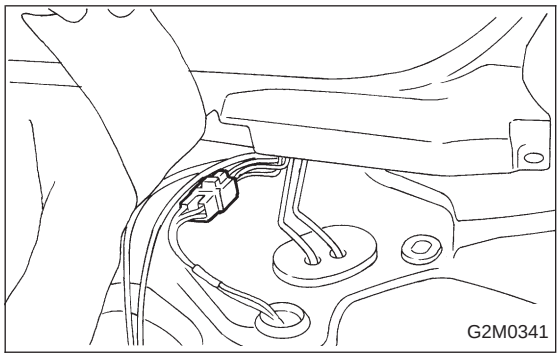
2. CALIFORNIA FWD MODEL



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
⑪ Roll over valve
⑫ Roll over valve bracket
⑬ Evaporation hose H
⑭ Evaporation hose I
⑮ Evaporation pipe B
⑯ Canister hose A
⑰ Canister hose B
⑱ Canister holder
⑲ Canister upper bracket
⑳ Cushion rubber
㉑ Canister lower bracket
㉒ Canister
㉓ Canister cover
㉔ Fuel pipe ASSY

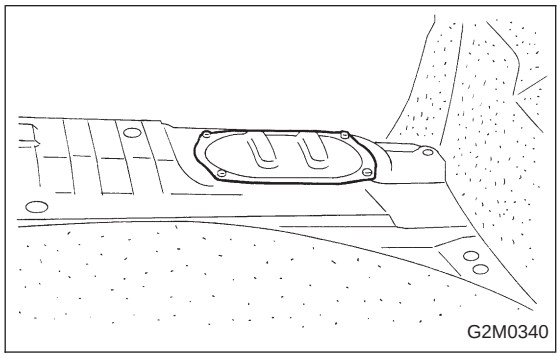
1. Precautions

WARNING:
- **Place “No fire” signs near the working area.**
- **Disconnect ground terminal from battery.**
- **Be careful not to spill fuel on the floor.**



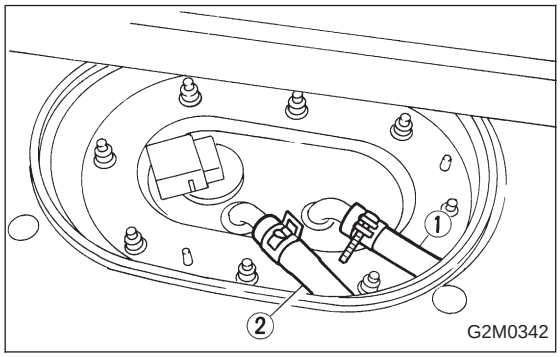
A: RELEASING OF FUEL PRESSURE

1) Remove rear seat, and turn up floor mat.
2) Disconnect connector from fuel tank.
3) Start the engine, and run it until it stalls.
4) After the engine stalls, crank it for five more seconds.
5) Turn ignition switch OFF.

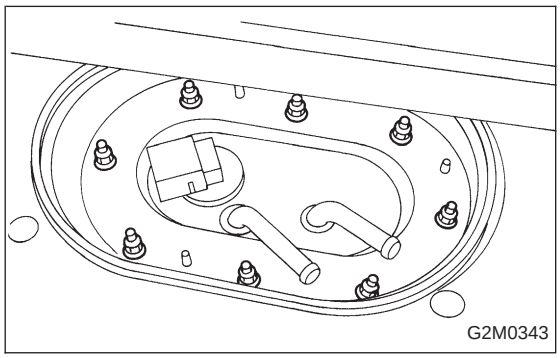


B: DRAINING OF FUEL

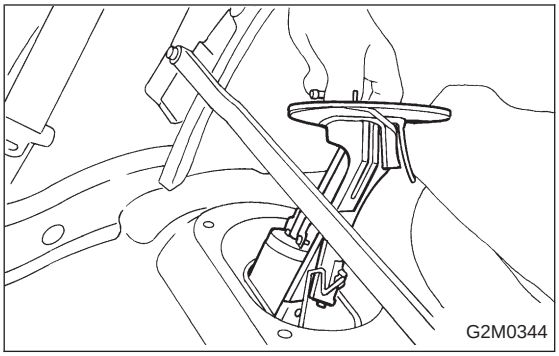
1) Remove rear seat and seat back.
2) Remove access hole lid.
3) Disconnect connector from fuel pump.
4) Release fuel pressure. <Ref. to 2-8 [W1A0].>



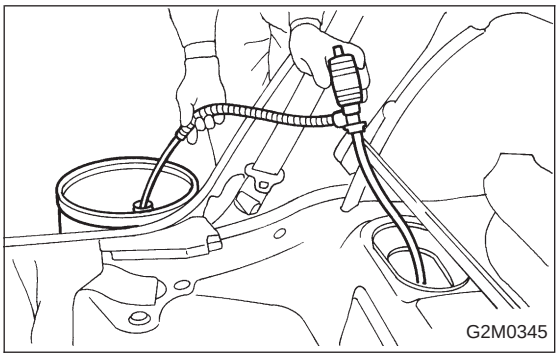
5) Disconnect fuel delivery hose ① and return hose ②.



6) Remove nuts which install fuel pump assembly onto fuel tank.

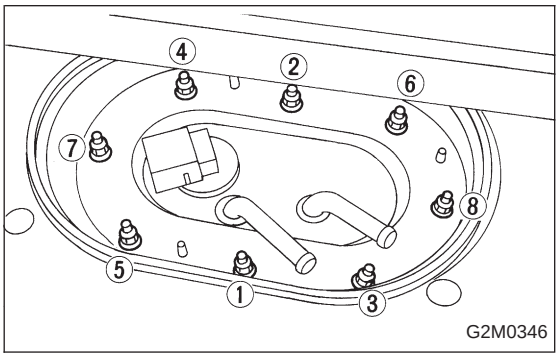


7) Take off fuel pump from fuel tank.



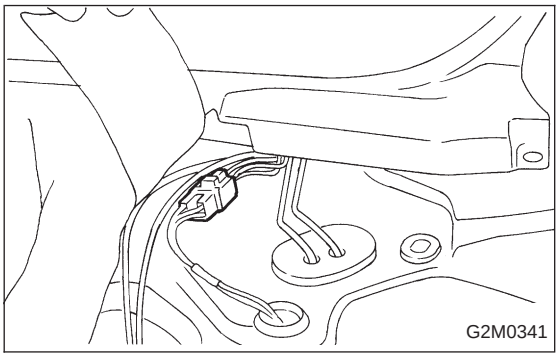
8) Drain fuel from fuel tank by using a hand pump.

WARNING:
Do not use a motor pump when draining fuel.



9) After draining fuel, reinstall fuel pump.
Tighten nuts in numerical sequence shown in Figure to specified torque.

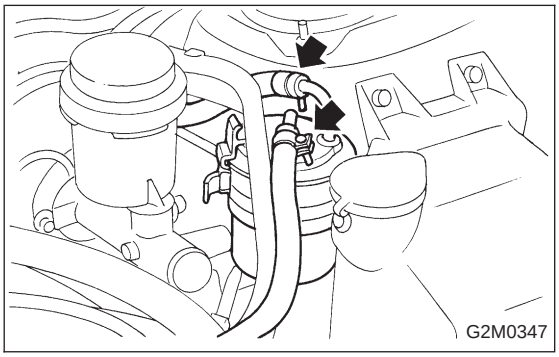
Tightening torque:
3 — 6 N·m (0.3 — 0.6 kg-m, 2.2 — 4.3 ft-lb)



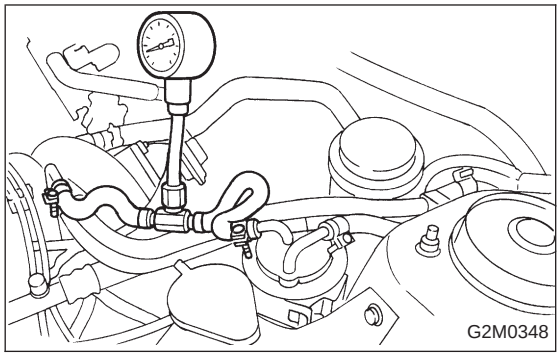
2. On-Car Services

A: MEASUREMENT OF FUEL PRESSURE

1) Release fuel pressure. <Ref. to 2-8 [W1A0].>
2) Connect connector to fuel tank.



3) Disconnect fuel delivery hose from fuel filter, and connect fuel pressure gauge.


G2M0348

4) Start the engine.
5) Measure fuel pressure while disconnecting pressure regulator vacuum hose from collector chamber.

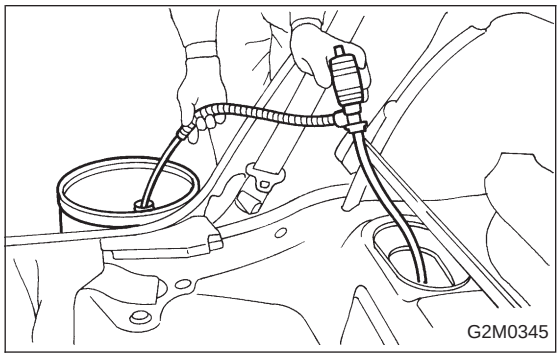
Fuel pressure:
235 — 265 kPa (2.4 — 2.7 kg/cm^2, 34 — 38 psi)

6) After connecting pressure regulator vacuum hose, measure fuel pressure.

Fuel pressure:
177 — 206 kPa (1.8 — 2.1 kg/cm^2, 26 — 30 psi)

WARNING:
Before removing fuel pressure gauge, release fuel pressure.

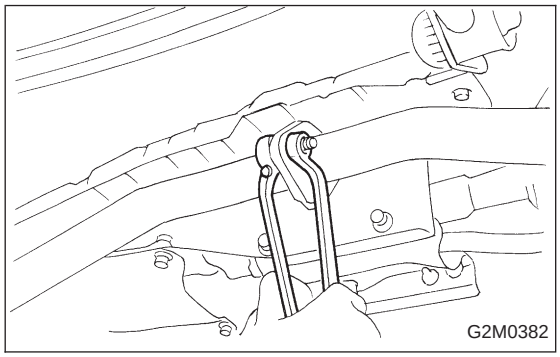
NOTE:
If out of specification as measured at step 6), check or replace pressure regulator and pressure regulator vacuum hose.


G2M0345

3. Fuel Tank

A: REMOVAL

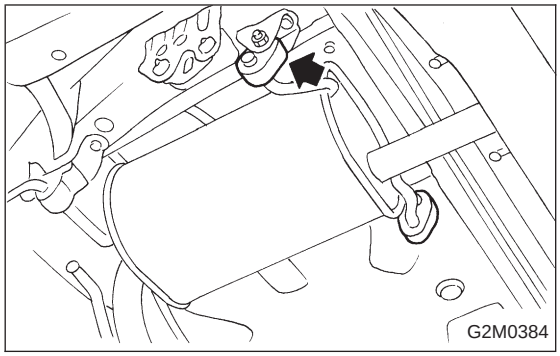
1) Release fuel pressure. <Ref. to 2-8 [W1A0].>
2) Drain fuel from fuel tank. <Ref. to 2-8 [W1B0].>


G2M0382

3) Remove rear exhaust pipe.
   (1) Lift up the vehicle.
   (2) Separate rear exhaust pipe from front catalyst converter.
   (3) Separate rear exhaust pipe from muffler.
   (4) Remove hook from rubber cushion, and remove exhaust pipe.

NOTE:
To facilitate the removal of parts, apply a coat of SUBARU CRC5-56 (004301003)

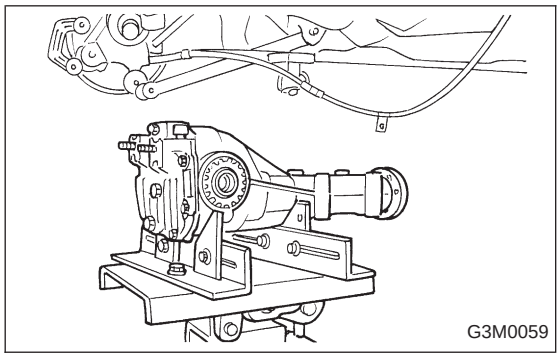
<Ref. to 2-9 [W2A0].>



4) Remove muffler assembly.

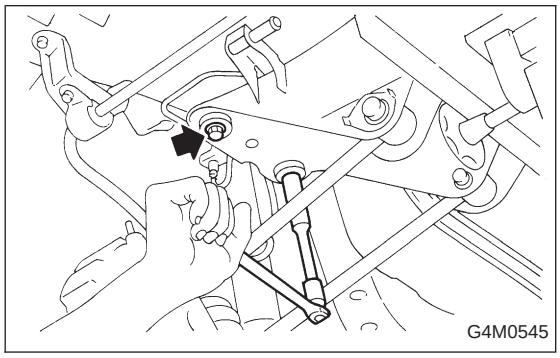
NOTE:
To facilitate the removal of parts, apply a coat of SUBARU CRC5-56 (004301003)

<Ref. to 2-9 [W3A0].>



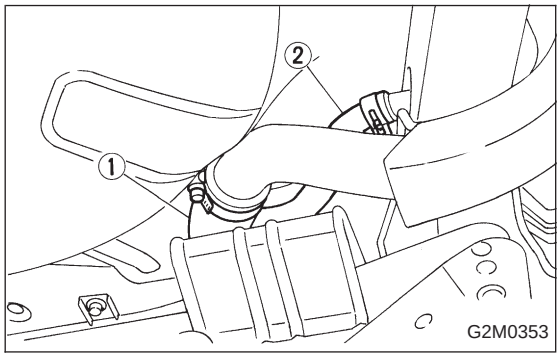
5) Remove rear differential assembly. (AWD model)
(1) Remove rear axle shafts from rear differential assembly.
(2) Remove rear differential front cover.
(3) Remove propeller shaft.
(4) Remove lower differential bracket.
(5) Set transmission jack under rear differential.
(6) Remove bolts which install rear differential onto rear crossmember.

<Ref. to 3-4 [W2C0].>



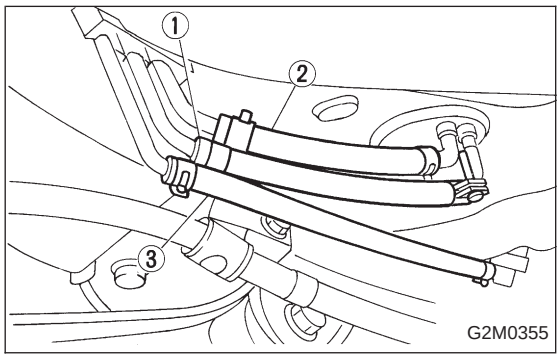
6) Remove rear crossmember. (AWD model)

<Ref. to 4-1 [W11A0].>

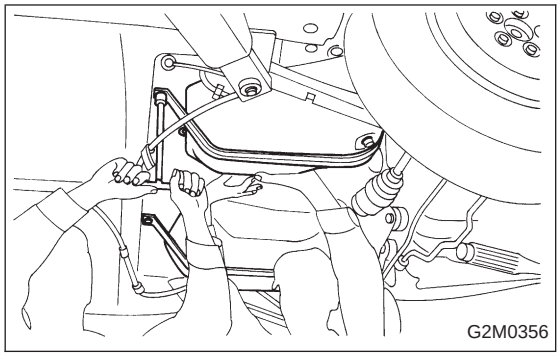


7) Loosen clamp, and disconnect fuel filler hose from pipe.
8) Loosen clamp, and disconnect air vent hose from air vent pipe.

① Fuel filler hose
② Air vent hose



9) Loosen clip and clamps, and disconnect fuel delivery hose ①, return hose ② and evaporation hose ③.

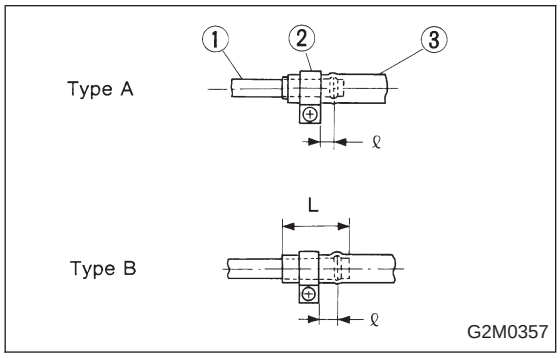


10) While holding fuel tank, remove bolts from bands and dismount fuel tank.

WARNING:
A helper is required to perform step 10).

B: INSTALLATION

Installation is in the reverse order of removal. Observe the following:
1) When installing fuel tank, have a helper hold fuel tank while installing bands.
2) Before tightening band mounting bolts, connect fuel system hoses.



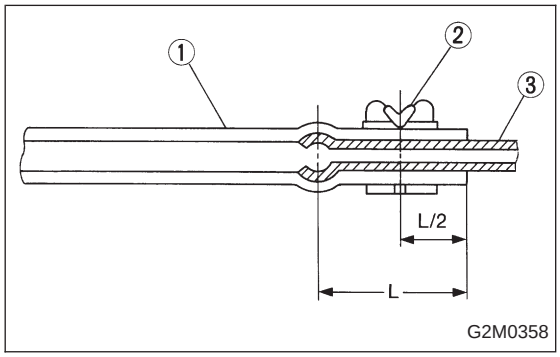
3) Install hose and hold down clips at positions indicated in Figure.

Tightening torque:
1.0 — 1.5 N·m (0.1 — 0.15 kg-m, 0.7 — 1.1 ft-lb)

Type A: When fitting length is specified.
Type B: When fitting length is not specified.

① Fitting
② Clamp
③ Hose

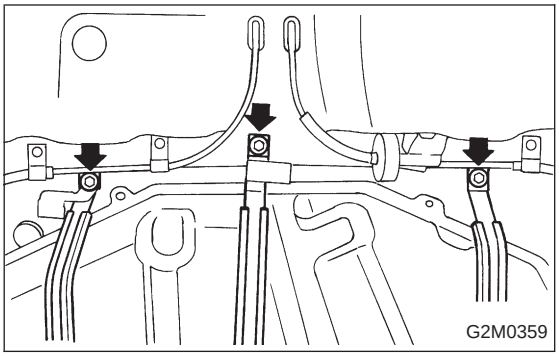
ℓ : 1.0 — 4.0 mm (0.04 — 0.16 in)
L: 20 — 25 mm (0.79 — 0.98 in)



① Hose
② Clip
③ Pipe

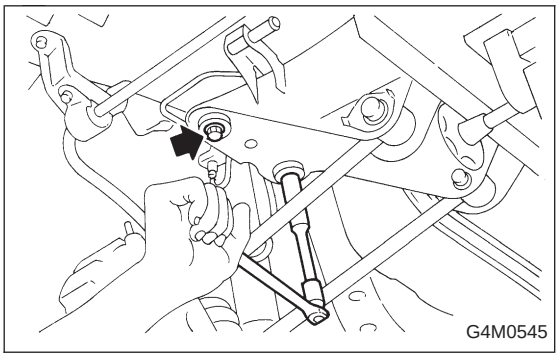
Fuel return hose:
L = 20 — 25 mm (0.79 — 0.98 in)

Evaporation hose:
L = 15 — 20 mm (0.59 — 0.79 in)

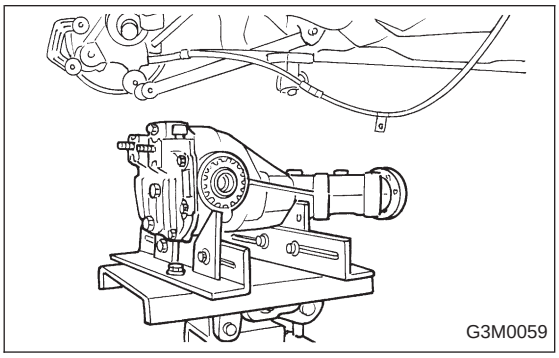


4) Tighten band mounting bolts.

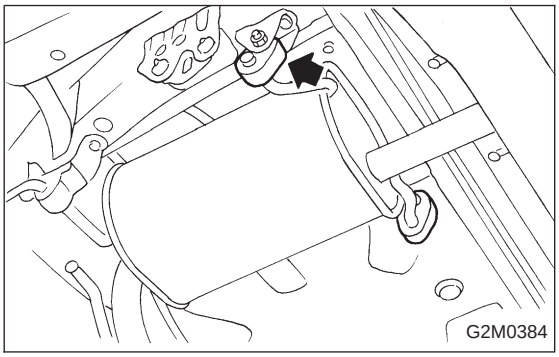
Tightening torque:
33±10 N·m (3.4±1.0 kg-m, 25±7 ft-lb)



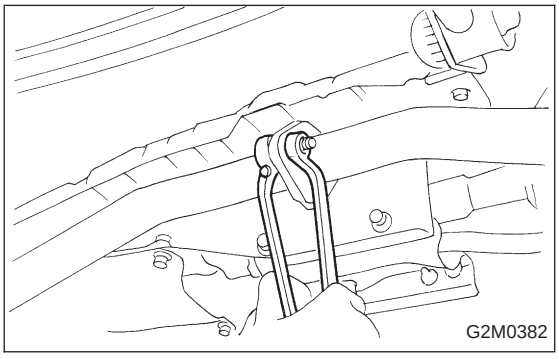
5) Install rear crossmember. <Ref. to 4-1 [W11C0].>



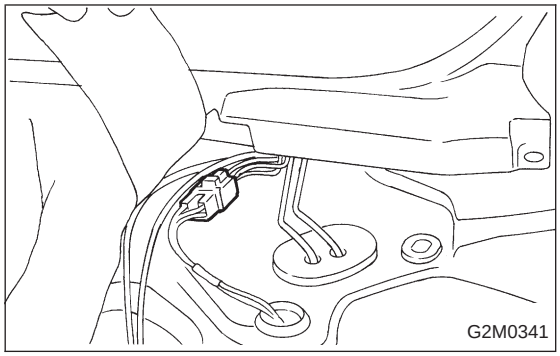
6) Install rear differential assembly. <Ref. to 3-4 [W2G0].>



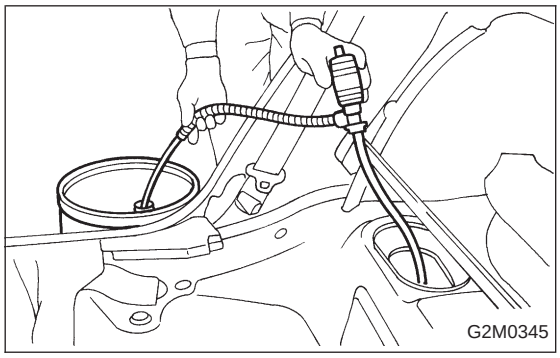
7) Install muffler assembly.



8) Install heat sealed cover.
9) Install rear exhaust pipe.


G2M0341

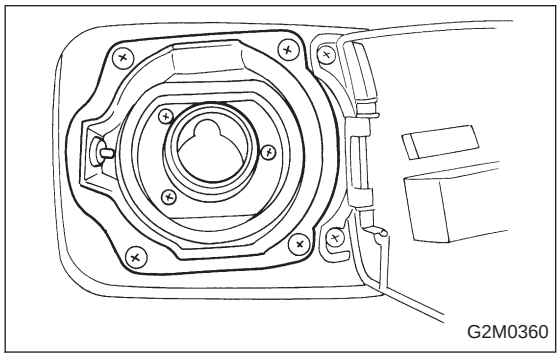
10) Lower the vehicle, and connect connector to fuel pump.
11) Install access hole lid.
12) Install rear seat back and rear seat.


G2M0345

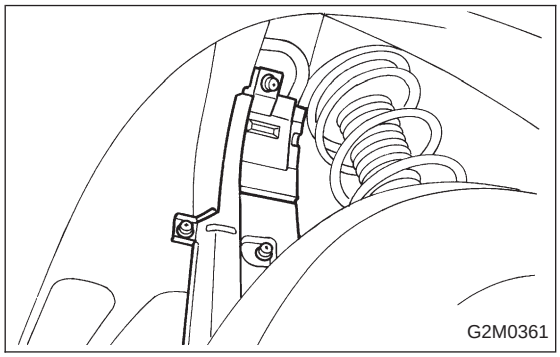
4. Fuel Filler Pipe

A: REMOVAL

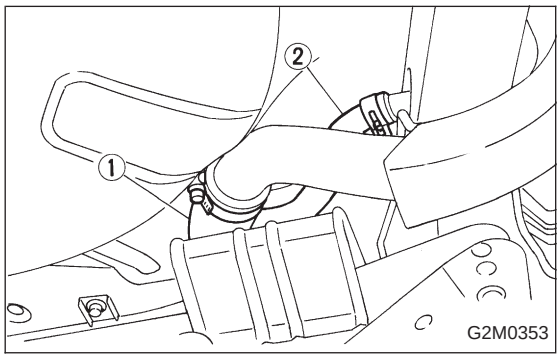
1) Release fuel pressure. <Ref. to 2-8 [W1A0].>
2) Drain fuel from fuel tank. <Ref. to 2-8 [W1B0].>


G2M0360

3) Remove right rear wheel.
4) Open fuel filler flap and remove filler cap.
5) Remove screws holding packing in place.

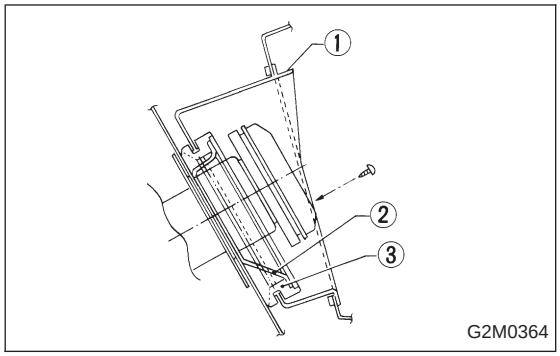

G2M0361

6) Lift up the vehicle.
7) Remove fuel filler pipe protector.



G2M0353

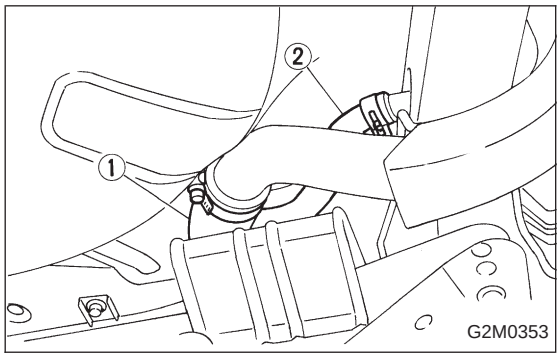
8) Remove clip, and separate air vent hose from pipe.
9) Loosen clamp, and separate fuel filler hose from pipe.
① Fuel filler hose
② Air vent hose
10) Remove fuel filler pipe to under side of the vehicle.



B: INSTALLATION

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

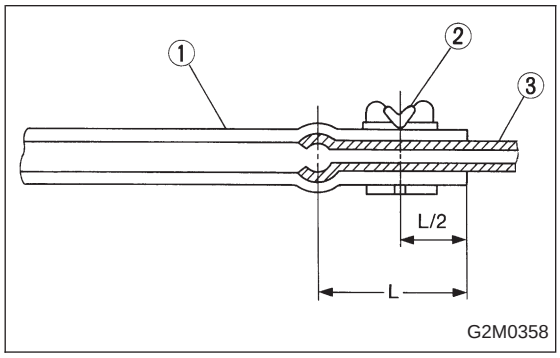
NOTE:
If edges of rubber packing are folded toward the inside, straighten it with a screwdriver.



4) Insert fuel filler hose approximately 25 to 30 mm (0.98 to 1.18 in) over the lower end of fuel filler pipe and tighten clamp.

① Fuel filler hose
② Air vent hose

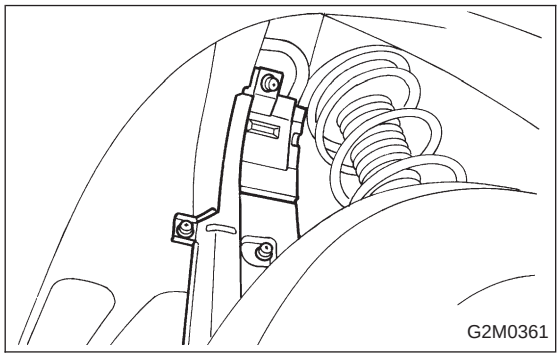
CAUTION:
Do not allow clips to touch air vent hose and rear suspension crossmember.



5) Insert 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.

① Hose
② Clip
③ Pipe

L = 25 — 30 mm (0.98 — 1.18 in)

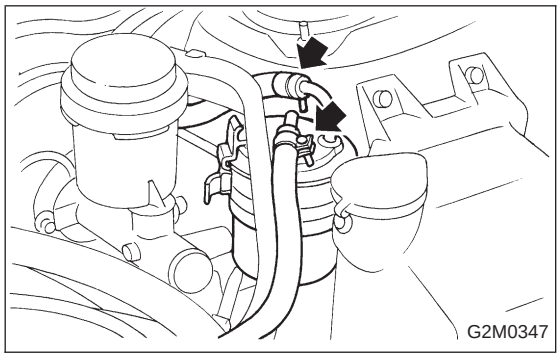


6) Install fuel filler pipe protector.
7) Install right rear wheel.

5. Fuel Filter

A: REMOVAL

1) Release fuel pressure. <Ref. to 2-8 [W1A0].>



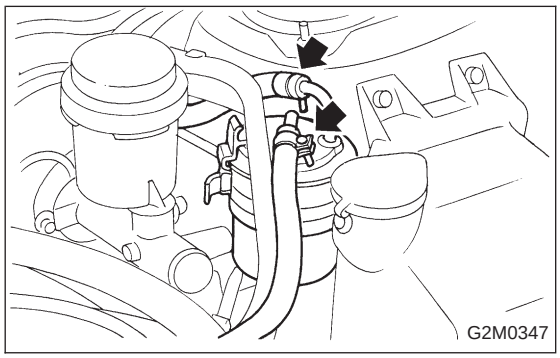
2) Disconnect fuel hoses from fuel filter.
3) Remove filter from holder.

B: INSPECTION

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

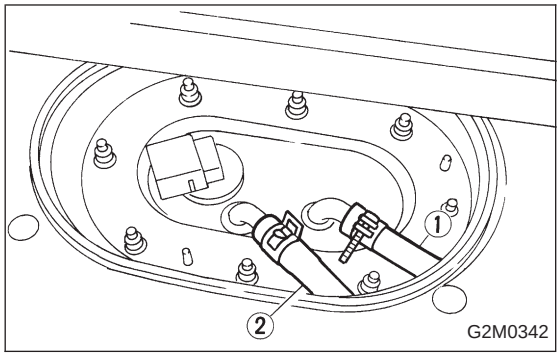
C: INSTALLATION

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) Installation is in the reverse order of removal.
2) Tighten hose clamp screws.

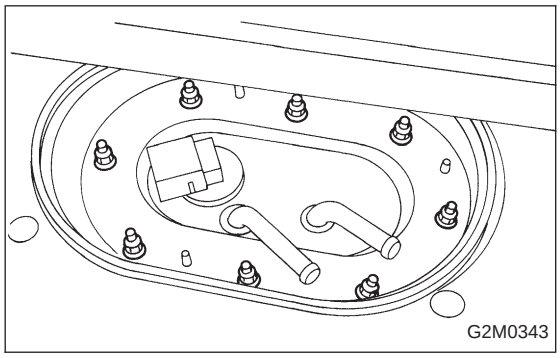
Tightening torque:
1.0 — 1.5 N·m (0.1 — 0.15 kg-m, 0.7 — 1.1 ft-lb)



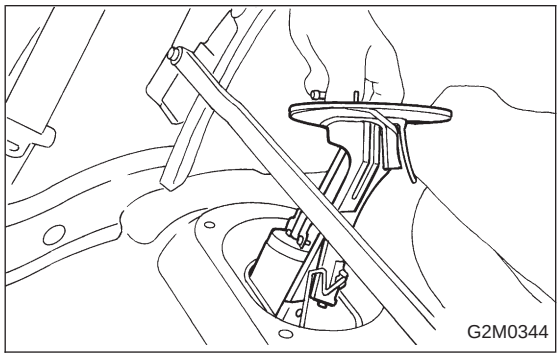
6. Fuel Pump

A: REMOVAL

1) Release fuel pressure. <Ref. to 2-8 [W1A0].>
2) Disconnect fuel delivery hose ① and return hose ②.

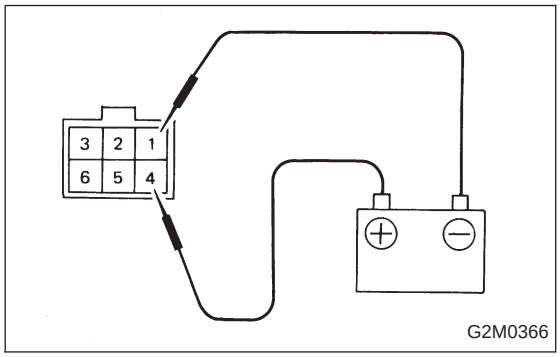


3) Remove nuts which install fuel pump onto fuel tank.



4) Take off fuel pump from fuel tank.

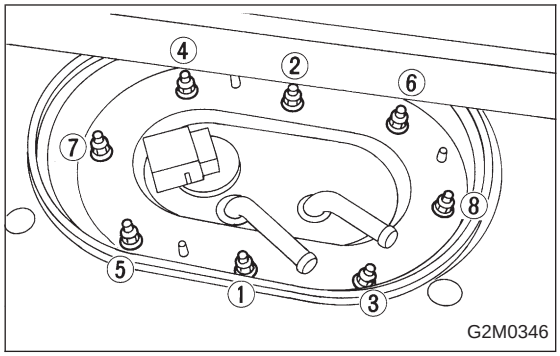
B: INSPECTION



Connect lead harness to connector terminal of fuel pump, and apply a 12 V 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 12 V supply ON and OFF on the battery side.**
- **Do not run fuel pump for a long time under non-load condition.**



C: INSTALLATION

Installation is in the reverse order of removal. Observe the following:

(1) Always use new gaskets.
(2) Ensure sealing portion is free from fuel or foreign particles before installation.
(3) Tighten nuts in numerical sequence shown in Figure to specified torque.

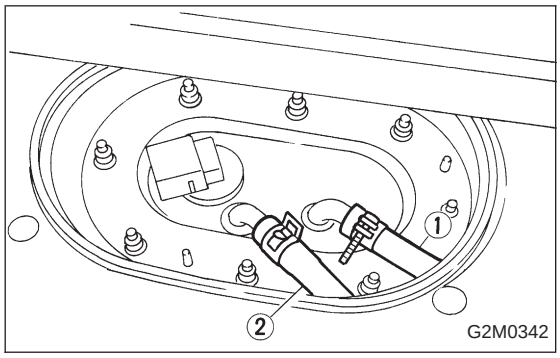
Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)

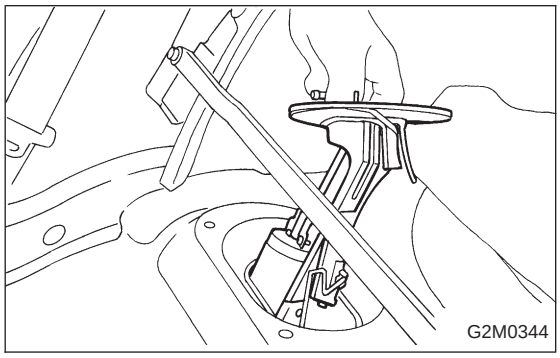
7. Fuel Meter Unit

A: REMOVAL

NOTE:
Fuel meter unit is built in fuel pump assembly.

1) Release fuel pressure. <Ref. to 2-8 [W1A0].>
2) Disconnect fuel delivery hose ① and return hose ②.



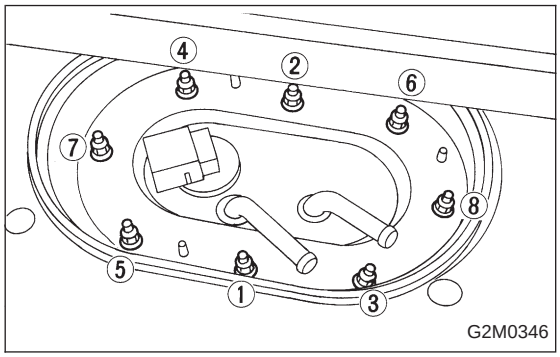


3) Remove nuts which install fuel pump onto fuel tank.
4) Take off fuel pump assembly.

B: INSTALLATION

Installation is in the reverse order of removal. <Ref. to 2-8 [W6C0].>
Tighten nuts in numerical sequence shown in Figure to specified torque.

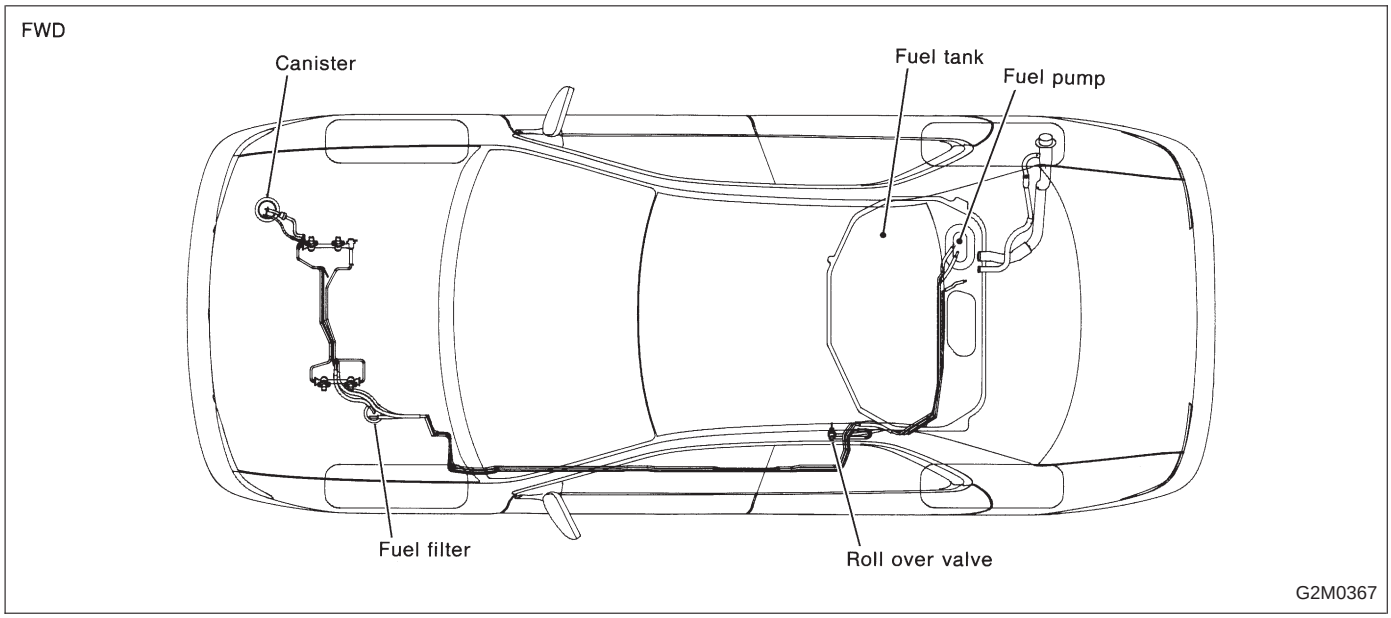
Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)

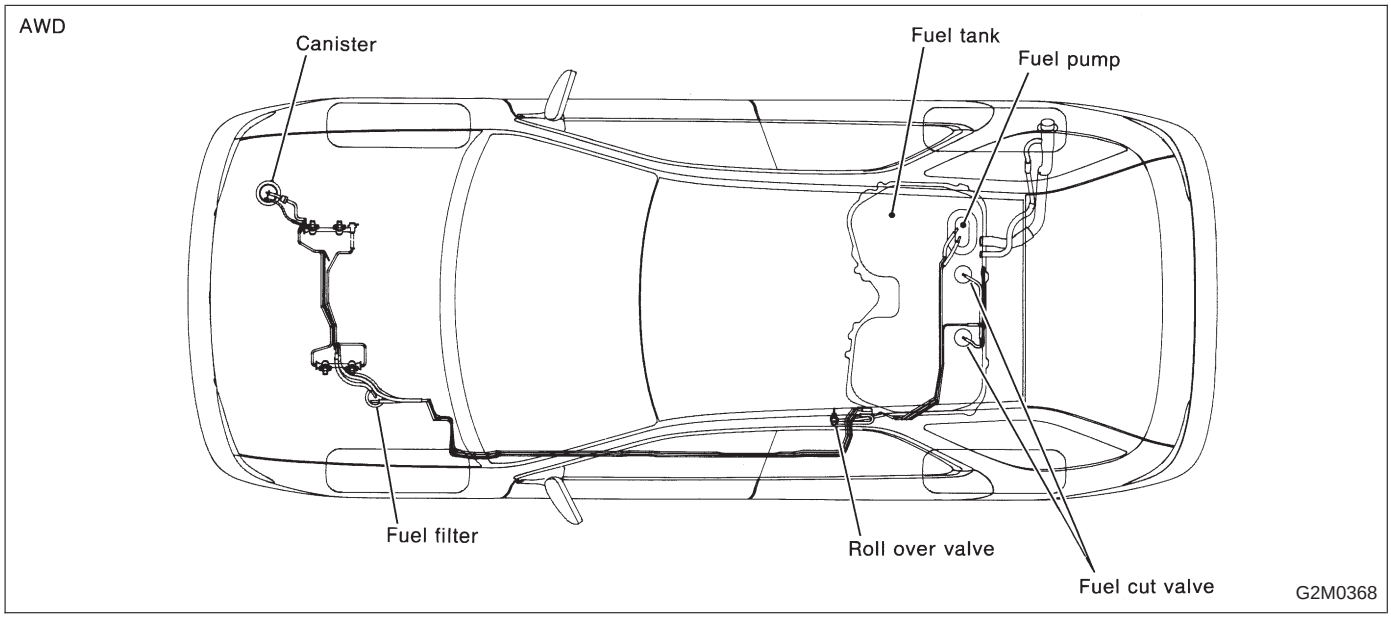


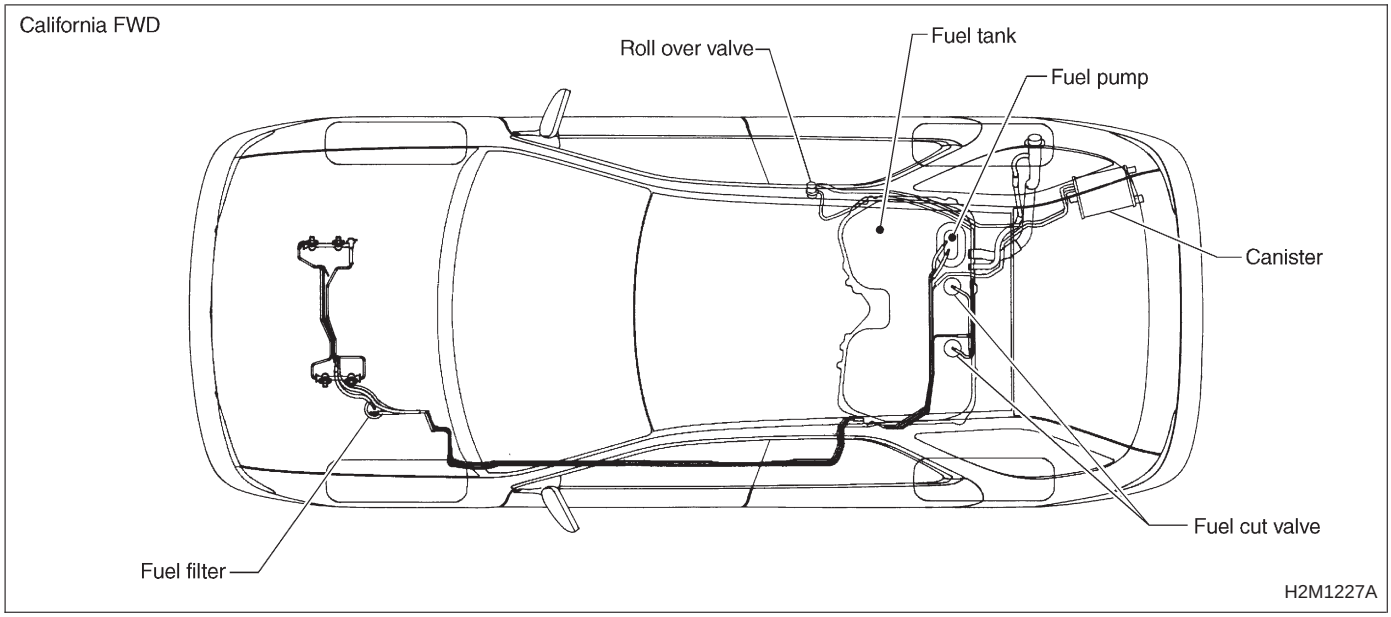
8. Fuel Delivery, Return and Evaporation Lines

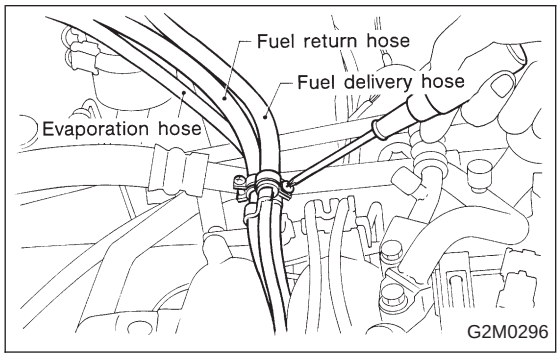
A: REMOVAL

1) Release fuel pressure. <Ref. to 2-8 [W1A0].>
2) Remove inner trim, insulator and rear seat. <Ref. to 5-3 [W2A0], [W3A0].>
3) Remove fuel delivery pipes and hoses, fuel return pipes and hoses, and evaporation pipes and hoses.

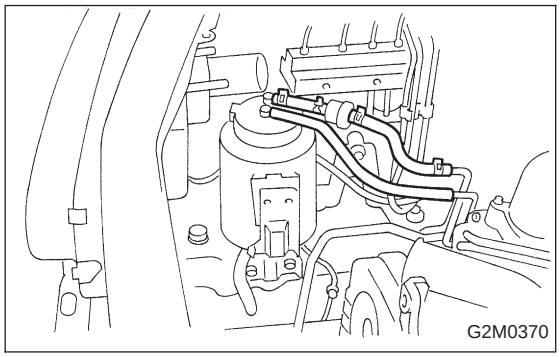




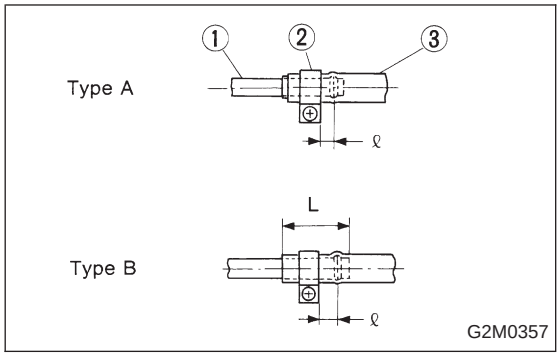




4) In engine compartment, detach fuel delivery hoses, return hoses and evaporation hose.



5) In engine compartment, detach canister hoses from canister. (Except California FWD model)



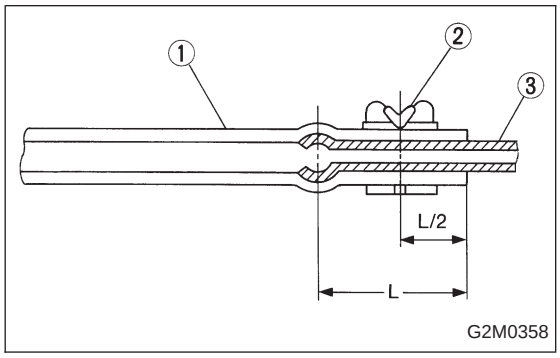
B: INSTALLATION

Installation is in the reverse order of removal.
1) Connect fuel delivery hose to pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).

Type A: When fitting length is specified.
Type B: When fitting length is not specified.

① Fitting
② Clamp
③ Hose

ℓ : 1.0 — 4.0 mm (0.04 — 0.16 in)
L: 20 — 25 mm (0.79 — 0.98 in)

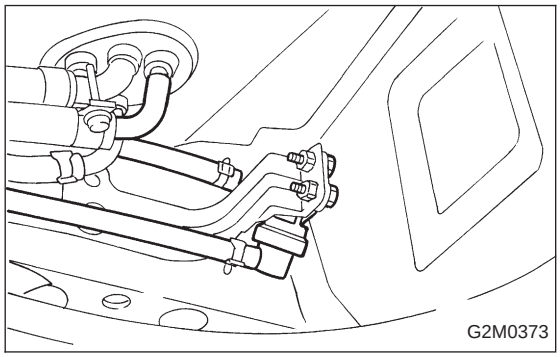


2) Connect evaporation hose to pipe by approx. 15 mm (0.59 in) from hose end.

① Hose
② Clip
③ Pipe

L = 15 — 20 mm (0.59 — 0.79 in)

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

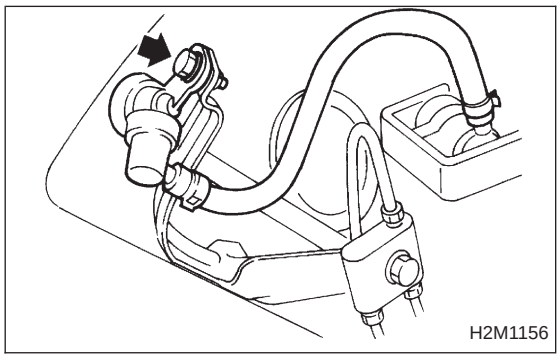


9. Roll Over Valve

A: REMOVAL

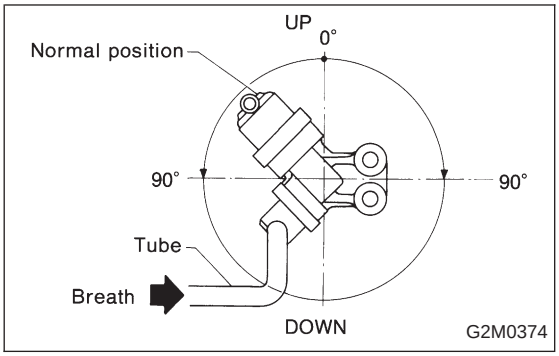
1. EXCEPT CALIFORNIA FWD MODEL

1) Lift up the vehicle.
2) Remove roll over valve with bracket.
3) Disconnect hoses from roll over valve, and remove it from bracket.



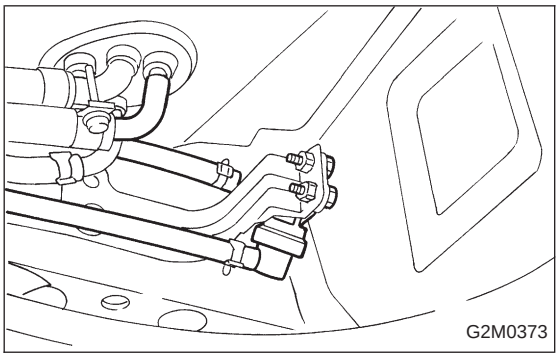
2. CALIFORNIA FWD MODEL

1) Lift up the vehicle.
2) Remove roll over valve from bracket.
3) Disconnect hoses from roll over valve.



B: INSPECTION

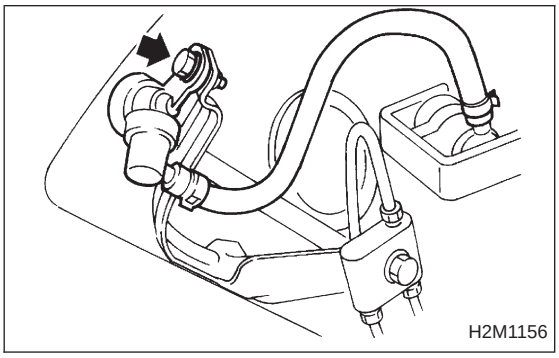
1) Connect hoses to roll over valve as shown in Figure.
2) While blowing through open end of hose, tilt valve at least 90° left and right from normal position.
3) Ensure that there is no air flow when hose is tilted greater than 90°.

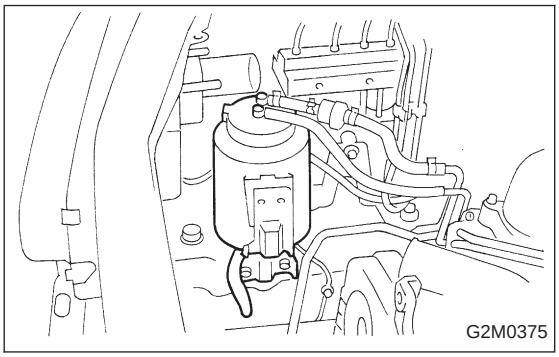


C: INSTALLATION

Installation is in the reverse order of removal.

CAUTION:
- **Do not install top side of valve down.**
- **Before installing bracket on body, securely fit concave part of bracket to hole in body.**





10. Canister

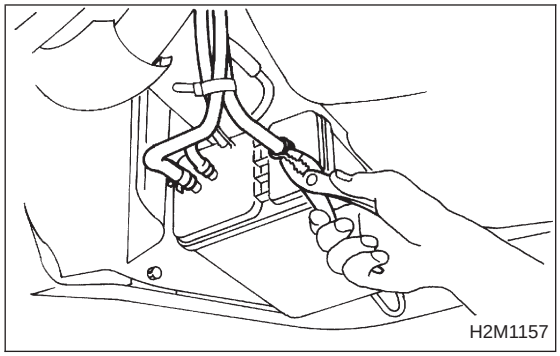
A: REMOVAL AND INSTALLATION

1. EXCEPT CALIFORNIA FWD MODEL

1) Disconnect canister hoses from evaporation pipes.
2) Remove canister with bracket.

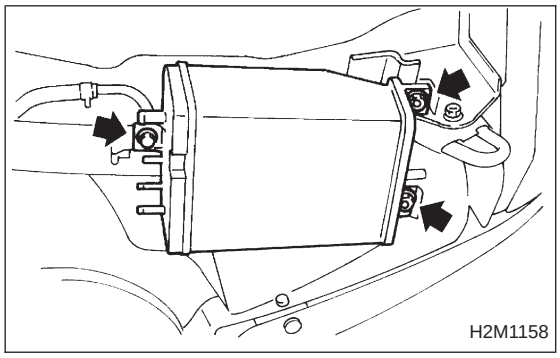
3) Installation is in the reverse order of removal.

CAUTION:
Insert air vent hose of canister into the hole on body.



2. CALIFORNIA FWD MODEL

1) Lift up the vehicle.
2) Disconnect evaporation hoses from canister.

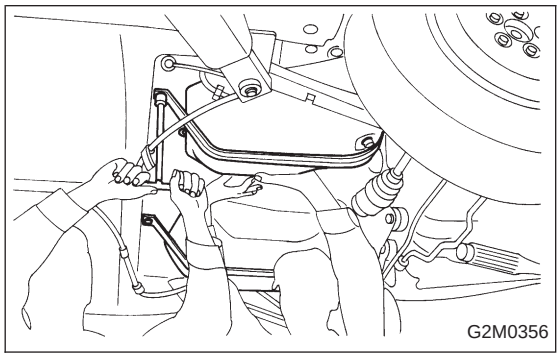


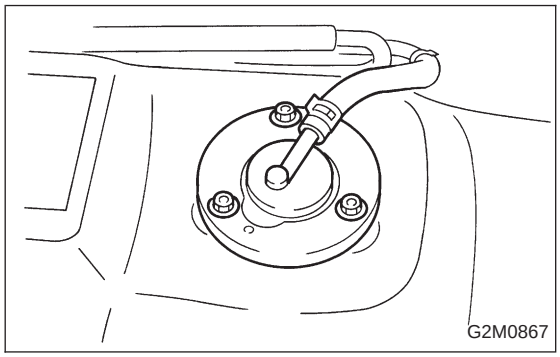
3) Remove canister from body.
4) Installation is in the reverse order of removal.

11. Fuel Cut Valve (AWD and California FWD model)

A: REMOVAL AND INSTALLATION

1) Remove fuel tank. <Ref. to 2-8 [W3A0].>





2) Disconnect evaporation hose from fuel cut valve.
3) Remove fuel cut valve.
4) Installation is in the reverse order of removal procedure.

Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)

1. Fuel System

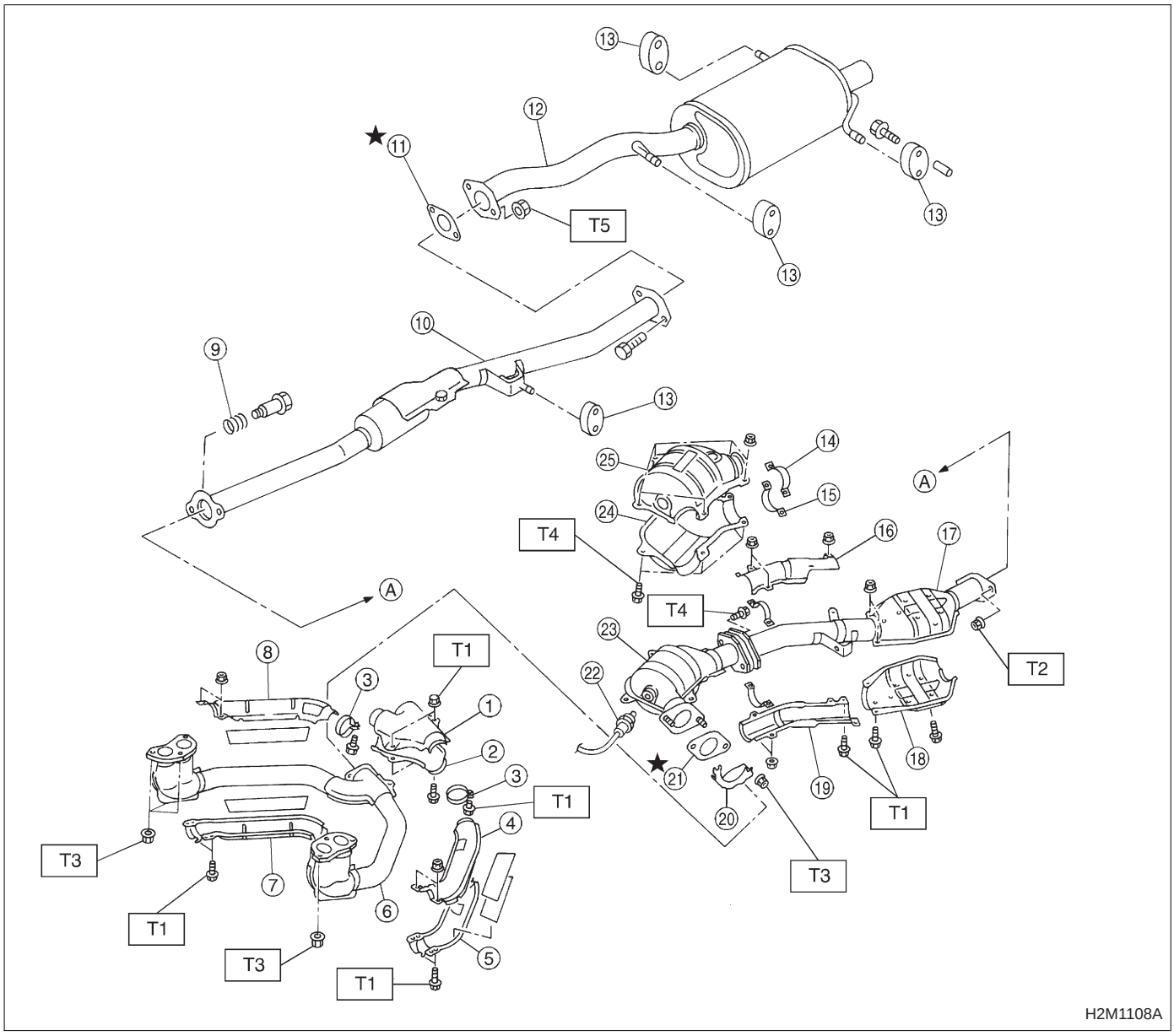
Trouble and possible cause		Corrective action
1. Insufficient fuel supply to the injector		
1)	Fuel pump will not operate.	
	◯ Defective terminal contact.	Inspect connections, especially ground, and tighten securely.
	◯ Trouble in electromagnetic or electronic circuit parts.	Replace fuel pump.
2)	Lowering 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)	Inoperable fuel pump modulator or circuit.	Replace. **Refer to 2-1.**
4. Defective fuel meter indicator		
1)	Defective operation of fuel meter unit.	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 water condensation from the fuel filter.
● Refilling the fuel tank.
1) Refill the fuel tank while there is still some fuel left in the tank.
● Protecting the fuel system against freezing and water condensation.
1) 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 water which may have accumulated in the fuel filter and fuel tank in the manner same as that described under Affected areas below.
2) Affected areas
When water condensation is notched in the fuel filter, drain 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.

EXHAUST SYSTEM 2-9

1. Exhaust System

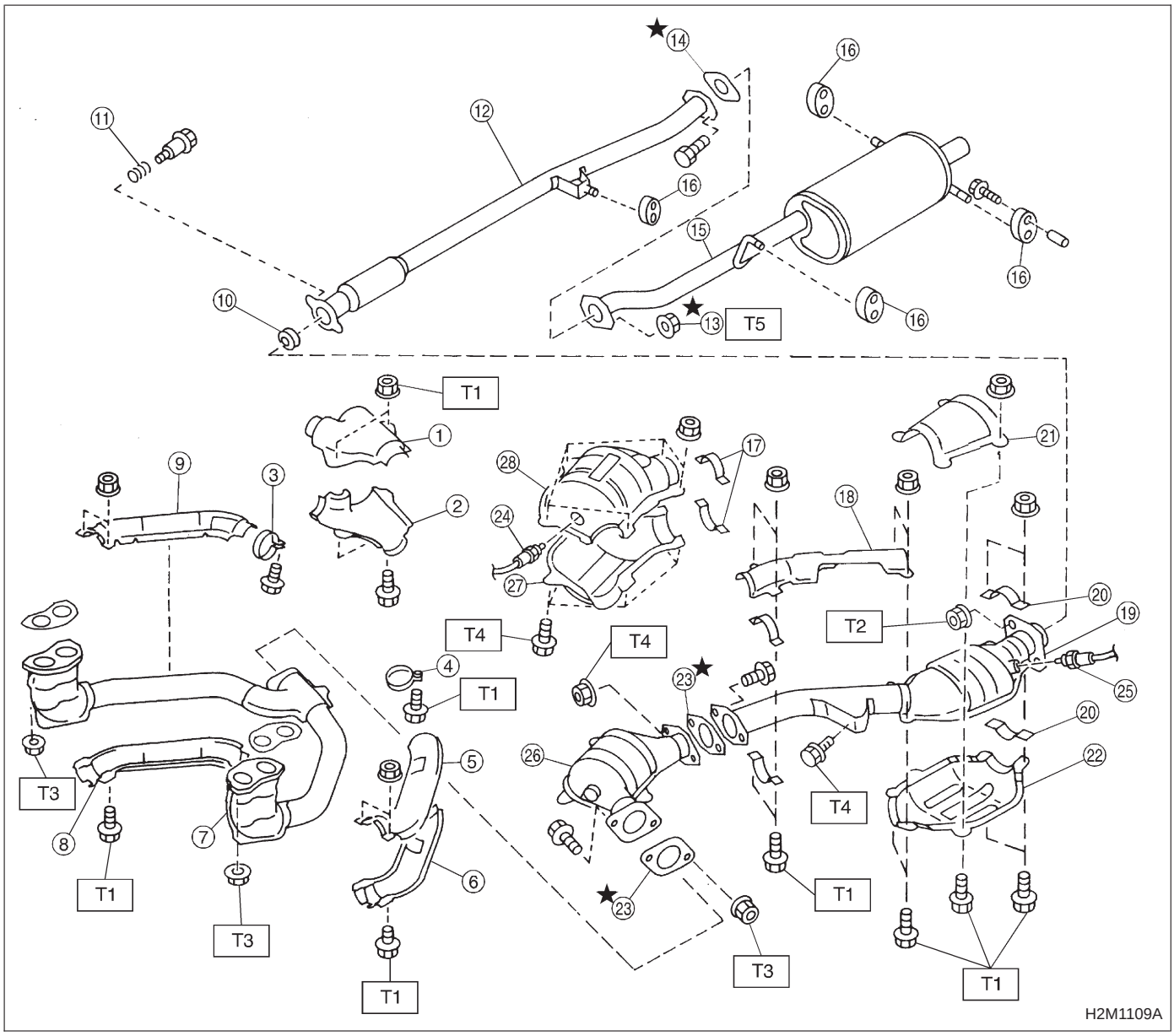
1. 1800 cc MODEL



① Upper front exhaust pipe cover CTR
② Lower front exhaust pipe cover CTR
③ Clamp
④ Upper front exhaust pipe cover LH
⑤ Lower front exhaust pipe cover LH
⑥ Front exhaust pipe
⑦ Lower front exhaust pipe cover RH
⑧ Upper front exhaust pipe cover RH
⑨ Spring
⑩ Rear exhaust pipe
⑪ Gasket
⑫ Muffler
⑬ Cushion rubber
⑭ Upper clamp
⑮ Lower clamp
⑯ Upper center exhaust pipe cover
⑰ Center exhaust pipe
⑱ Lower rear catalytic converter cover
⑲ Lower center exhaust pipe cover
⑳ Protector
㉑ Gasket
㉒ Oxygen sensor
㉓ Front catalytic converter
㉔ Lower front catalytic converter cover
㉕ Upper front catalytic converter cover

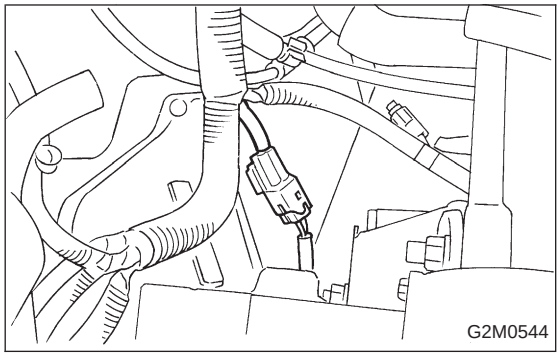
Tightening torque: N·m (kg-m, ft-lb)
T1: 13±3 (1.3±0.3, 9.4±2.2)
T2: 18±5 (1.8±0.5, 13.0±3.6)
T3: 30±5 (3.1±0.5, 22.4±3.6)
T4: 35±5 (3.6±0.5, 26.0±3.6)
T5: 48±5 (4.9±0.5, 35.4±3.6)

2. 2200 cc MODEL



① Upper front exhaust pipe cover CTR
② Lower front exhaust pipe cover CTR
③ Band RH
④ Band LH
⑤ Upper front exhaust pipe cover LH
⑥ Lower front exhaust pipe cover LH
⑦ Front exhaust pipe
⑧ Lower front exhaust pipe cover RH
⑨ Upper front exhaust pipe cover RH
⑩ Gasket
⑪ Spring
⑫ Rear exhaust pipe
⑬ Self-locking nut
⑭ Gasket
⑮ Muffler
⑯ Cushion rubber
⑰ Clamp
⑱ Upper center exhaust pipe cover
⑲ Center exhaust pipe
⑳ Clamp B
㉑ Upper rear catalytic converter cover
㉒ Lower rear catalytic converter cover
㉓ Gasket
㉔ Front oxygen sensor
㉕ Rear oxygen sensor
㉖ Front catalytic converter
㉗ Lower front catalytic converter cover
㉘ Upper front catalytic converter cover

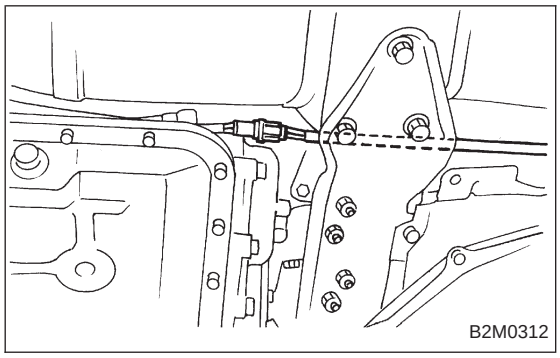
Tightening torque: N·m (kg-m, ft-lb)
T1: 13±3 (1.3±0.3, 9.4±2.2)
T2: 18±5 (1.8±0.5, 13.0±3.6)
T3: 30±5 (3.1±0.5, 22.4±3.6)
T4: 35±5 (3.6±0.5, 26.0±3.6)
T5: 48±5 (4.9±0.5, 35.4±3.6)


G2M0544

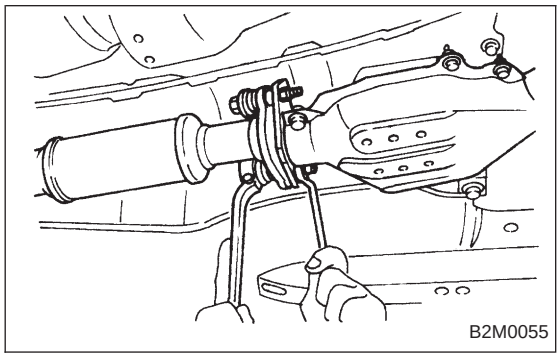
1. Front Exhaust Pipe and Center Exhaust Pipe

A: REMOVAL

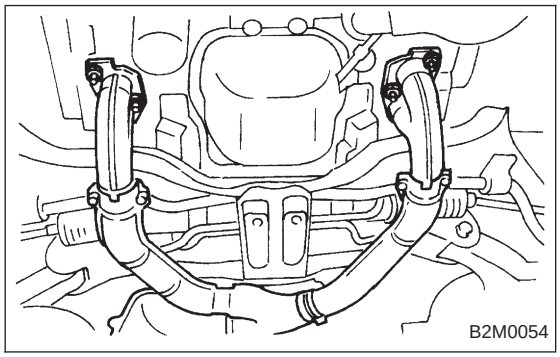
1) Disconnect front oxygen sensor connector.


B2M0312

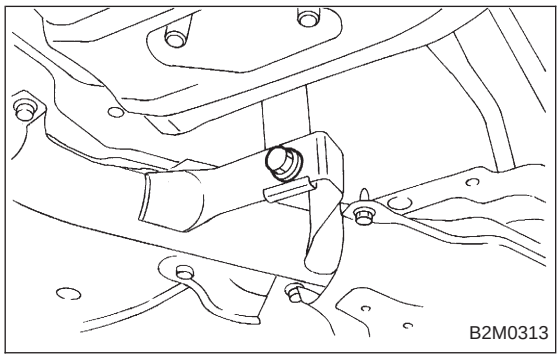
2) Lift-up the vehicle.
3) Disconnect rear oxygen sensor connector. (2200 cc)


B2M0055

4) Separate center exhaust pipe from rear exhaust pipe.

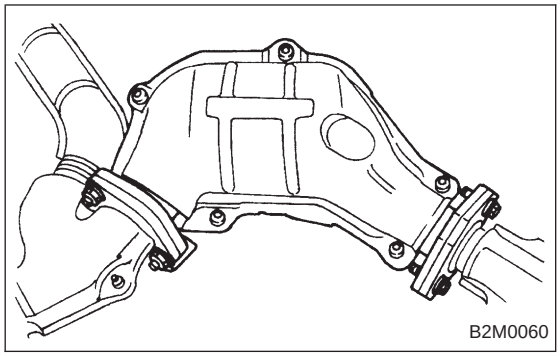

B2M0054

5) Remove bolts which hold front exhaust pipe onto cylinder heads.


B2M0313

6) Remove front exhaust pipe and center exhaust pipe from hanger bracket.

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


B2M0060

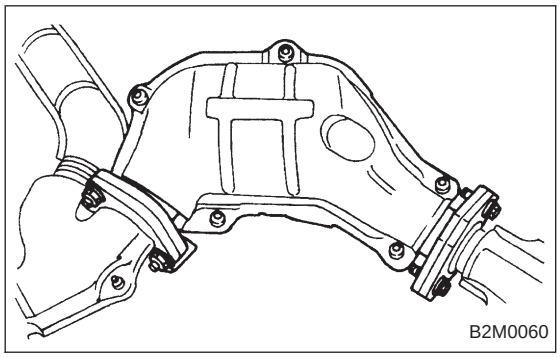
7) Separate front exhaust pipe from front catalytic converter.

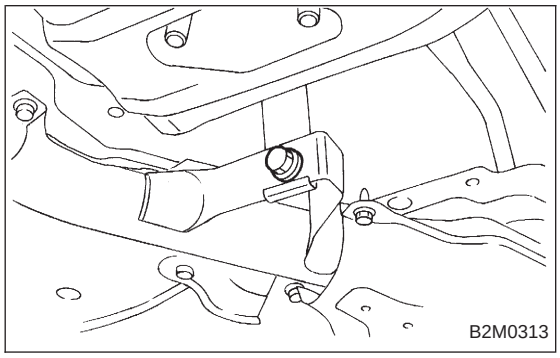
B: INSTALLATION

CAUTION:
Replace gaskets with new ones.

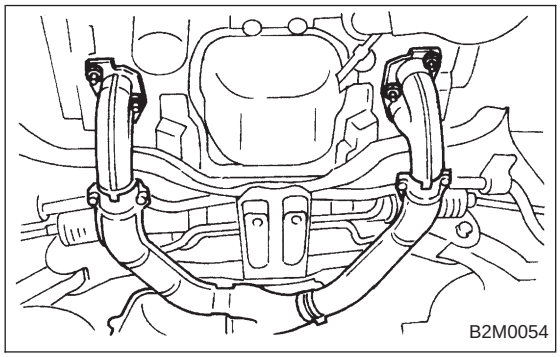
1) Install front catalytic converter to front exhaust pipe.

Tightening torque:
30±5 N·m (3.1±0.5 kg-m, 22.4±3.6 ft-lb)


B2M0060

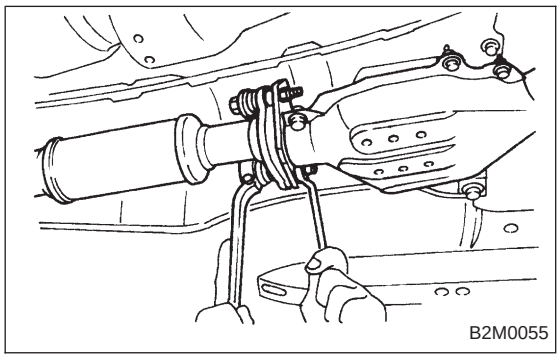

B2M0313

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


B2M0054

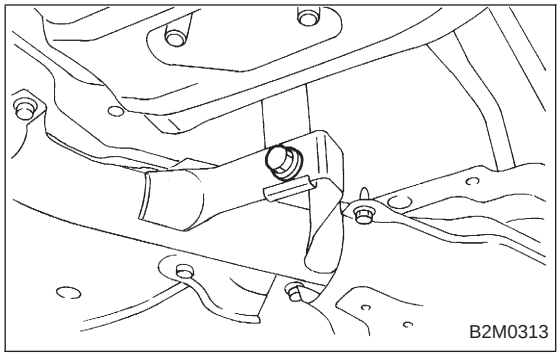
3) Tighten bolts which hold front exhaust pipe onto cylinder heads.

Tightening torque:
30±5 N·m (3.1±0.5 kg-m, 22.4±3.6 ft-lb)


B2M0055

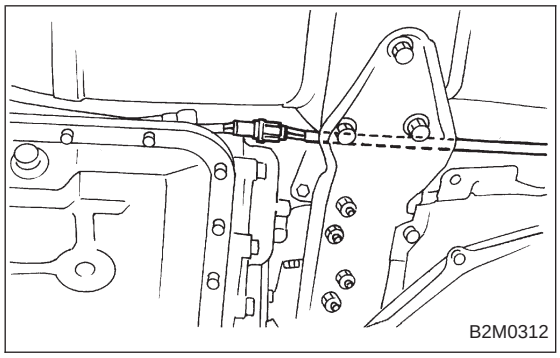
4) Install center exhaust pipe to rear exhaust pipe.

Tightening torque:
18±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)

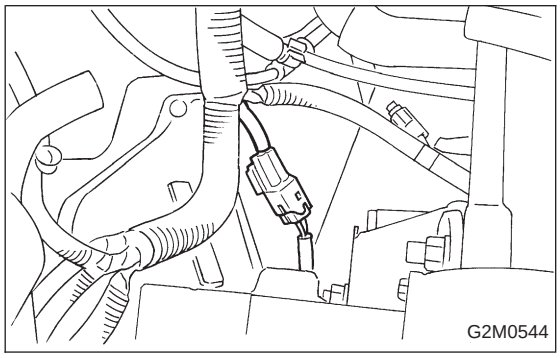


5) Tighten bolt which holds center exhaust pipe to hanger bracket.

Tightening torque:
35±5 N·m (3.6±0.5 kg-m, 26.0±3.6 ft-lb)



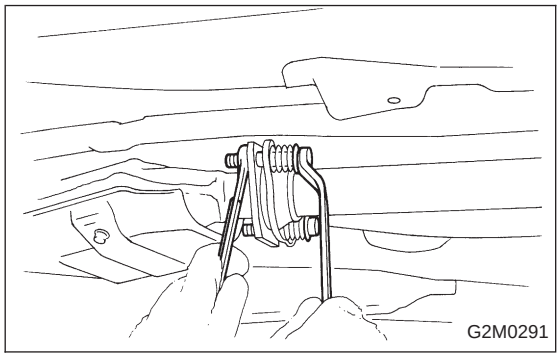
6) Connect rear oxygen sensor connector. (2200 cc)



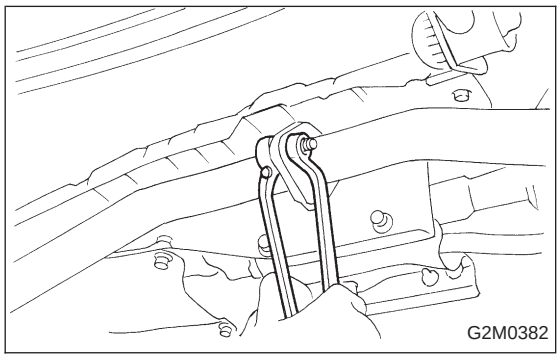
7) Lower the vehicle.
8) Connect front oxygen sensor connector.

2. Rear Exhaust Pipe

A: REMOVAL

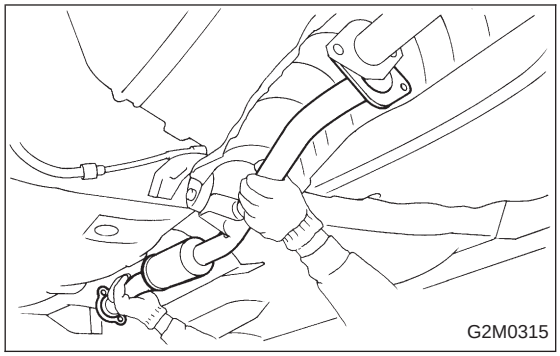


1) Separate rear exhaust pipe from front catalytic converter.



2) Separate rear exhaust pipe from muffler.

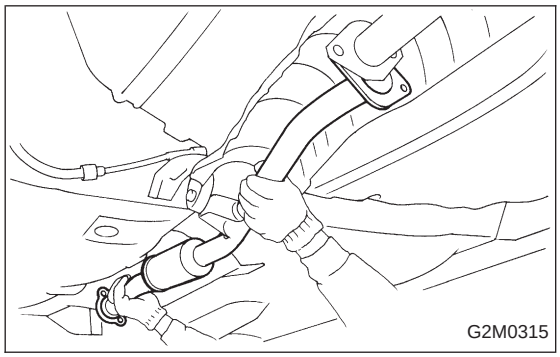
CAUTION:
Be careful not to pull down front exhaust pipe and front catalytic converter.



3) Remove rear exhaust pipe bracket from rubber cushion.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC to pipe bracket in advance.

SUBARU CRC (Part No. 004301003)



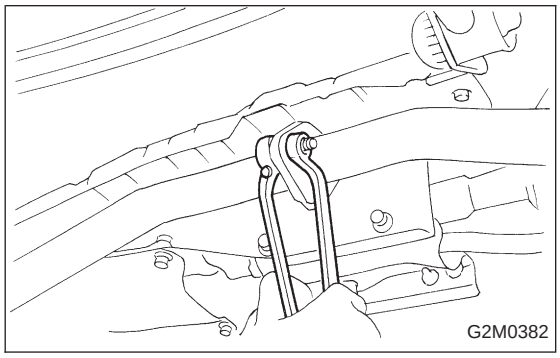
B: INSTALLATION

CAUTION:
Replace gaskets with new ones.

1) Install rear exhaust pipe bracket to rubber cushion.

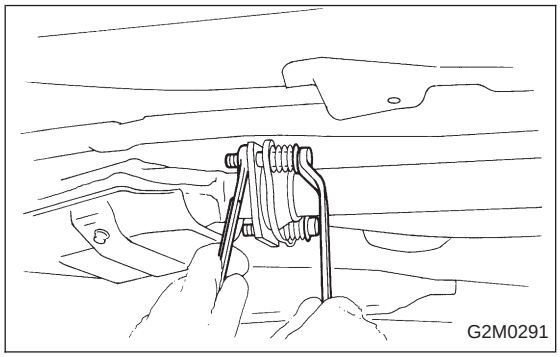
NOTE:
To facilitate installation, apply a coat of SUBARU CRC to mating area of rubber cushion in advance.

SUBARU CRC (Part No. 004301003)



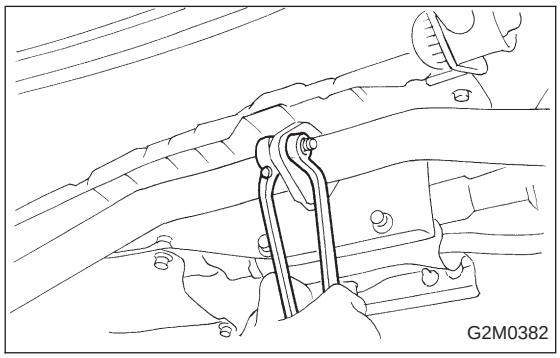
2) Install rear exhaust pipe to muffler.

Tightening torque:
48±5 N·m (4.9±0.5 kg-m, 35.4±3.6 ft-lb)



3) Install rear exhaust pipe to front catalytic converter.

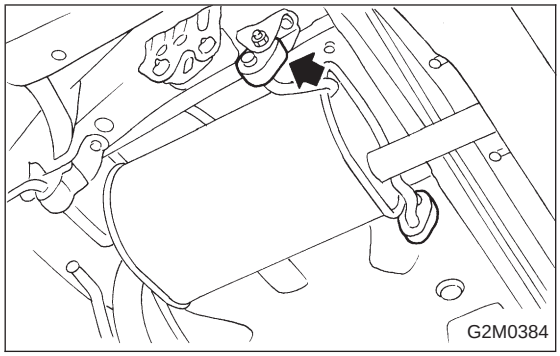
Tightening torque:
18±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)



3. Muffler

A: REMOVAL AND INSTALLATION

1) Separate muffler from rear exhaust pipe.

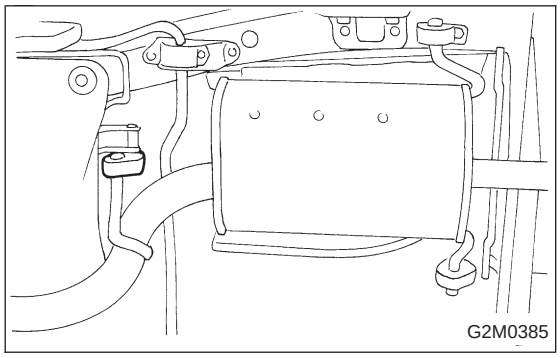


2) Remove left and right rubber cushions.

CAUTION:
Be careful not to pull down front exhaust pipe and front catalytic converter.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC to mating area of rubber cushions in advance.

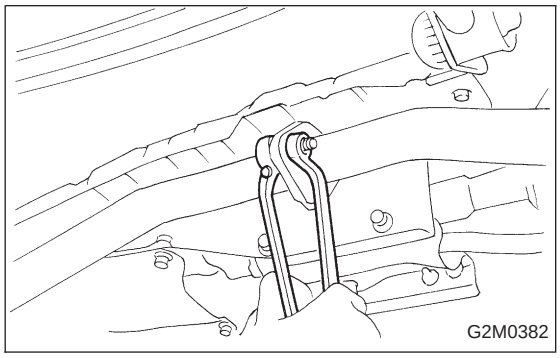
SUBARU CRC (Part No. 004301003)



3) Remove front rubber cushion, and detach muffler assembly.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC to mating area of rubber cushion in advance.

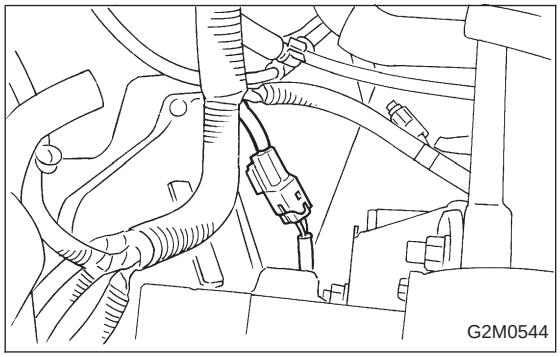
SUBARU CRC (Part No. 004301003)



4) Installation is in the reverse order of removal.

CAUTION:
Replace gasket with a new one.

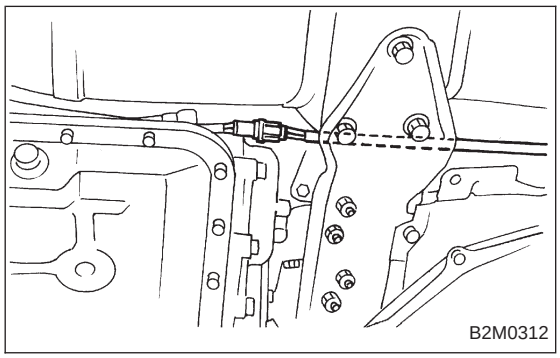
Tightening torque:
48±5 N·m (4.9±0.5 kg-m, 35.4±3.6 ft-lb)



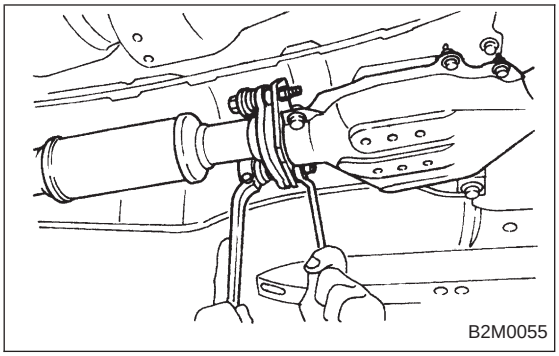
4. Front Catalytic Converter

A: REMOVAL

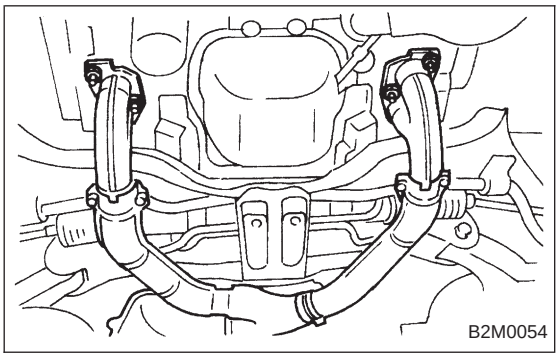
1) Disconnect front oxygen sensor connector.



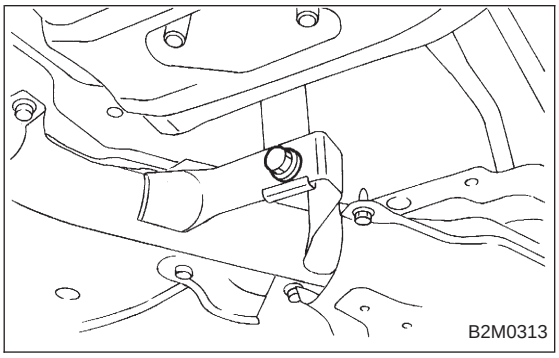
2) Lift-up the vehicle.
3) Disconnect rear oxygen sensor connector. (2200 cc)


B2M0055

4) Separate center exhaust pipe from rear exhaust pipe.

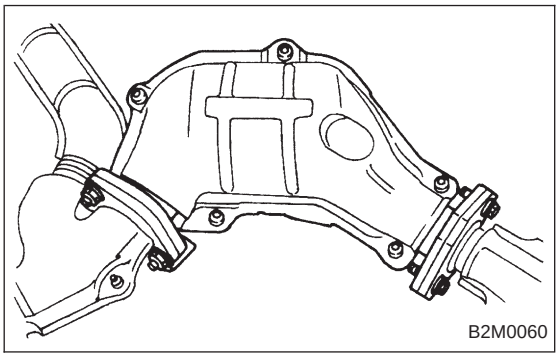

B2M0054

5) Remove bolts which hold front exhaust pipe onto cylinder heads.


B2M0313

6) Remove front exhaust pipe and center exhaust pipe from hanger bracket.

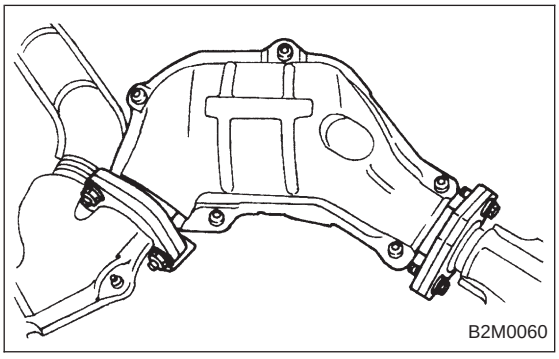
CAUTION:
Be careful not to pull down front exhaust pipe and center exhaust pipe.


B2M0060

7) Separate front catalytic converter from front exhaust pipe and center exhaust pipe.

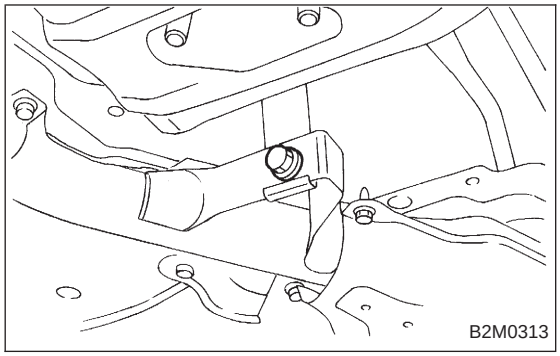
B: INSTALLATION

CAUTION:
Replace gaskets with new ones.

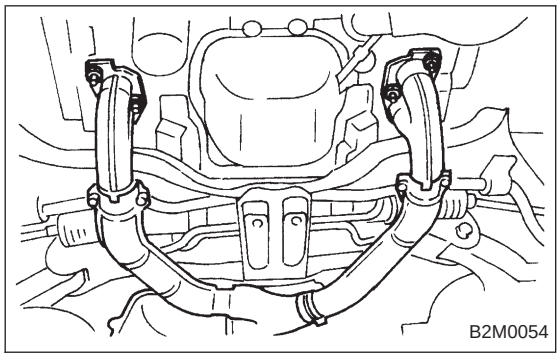

B2M0060

1) Install front catalytic converter to front exhaust pipe and center exhaust pipe.

Tightening torque:
30±5 N·m (3.1±0.5 kg-m, 22.4±3.6 ft-lb)

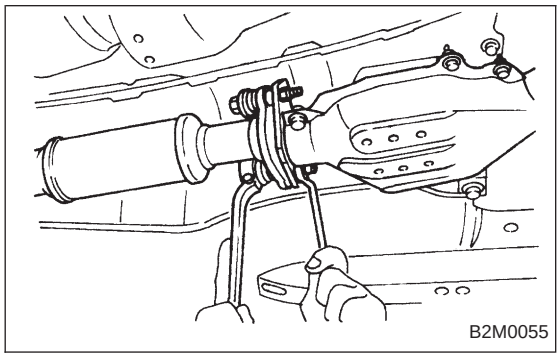


2) Install front exhaust pipe and center exhaust pipe. And temporarily tighten bolt which installs center exhaust pipe to hanger bracket.



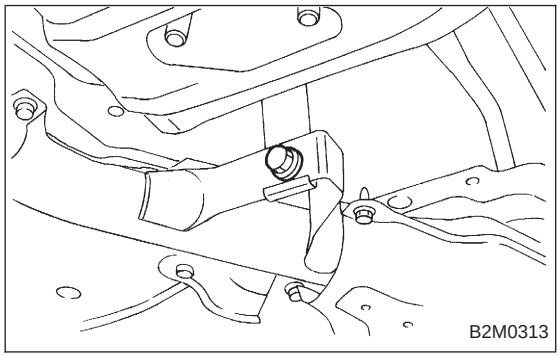
3) Tighten bolts which hold front exhaust pipe onto cylinder heads.

Tightening torque:
30±5 N·m (3.1±0.5 kg-m, 22.4±3.6 ft-lb)



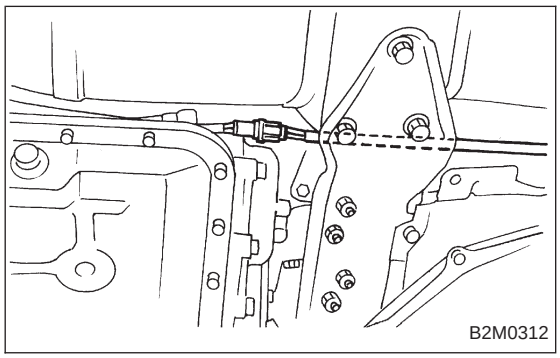
4) Install center exhaust pipe to rear exhaust pipe.

Tightening torque:
18±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)

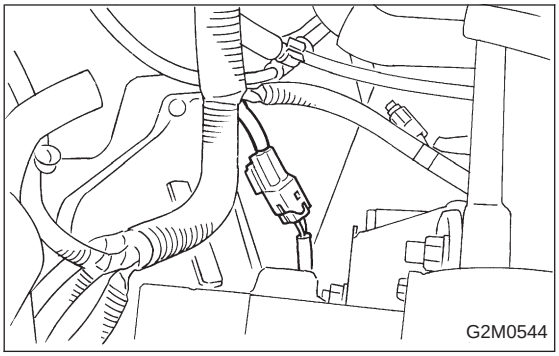


5) Tighten bolt which holds center exhaust pipe to hanger bracket.

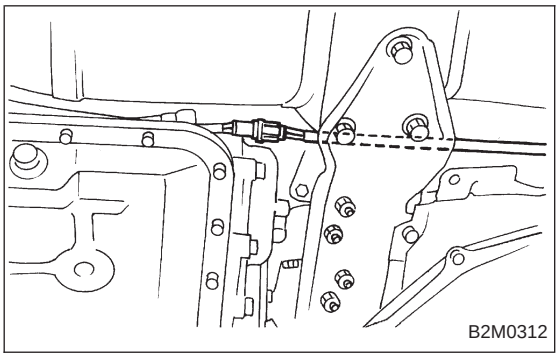
Tightening torque:
35±5 N·m (3.6±0.5 kg-m, 26.0±3.6 ft-lb)



6) Connect rear oxygen sensor connector. (2200 cc)


G2M0544

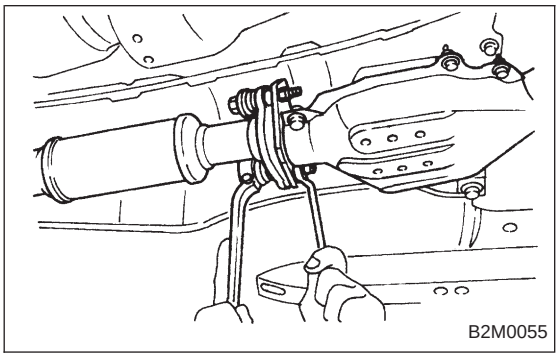
7) Lower the vehicle.
8) Connect front oxygen sensor connector.


B2M0312

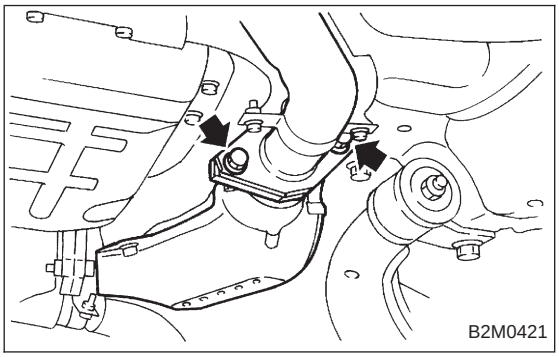
5. Rear Catalytic Converter

A: REMOVAL

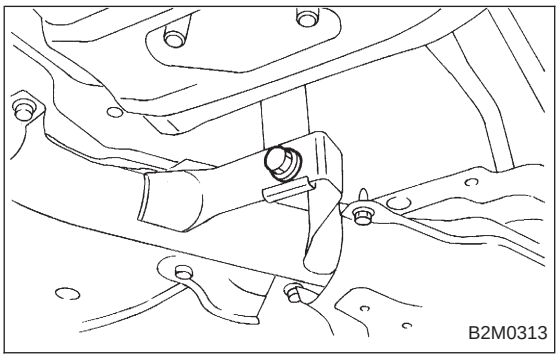
1) Lift-up the vehicle.
2) Disconnect rear oxygen sensor connector. (2200 cc)


B2M0055

3) Separate center exhaust pipe and rear catalytic converter assembly from rear exhaust pipe.

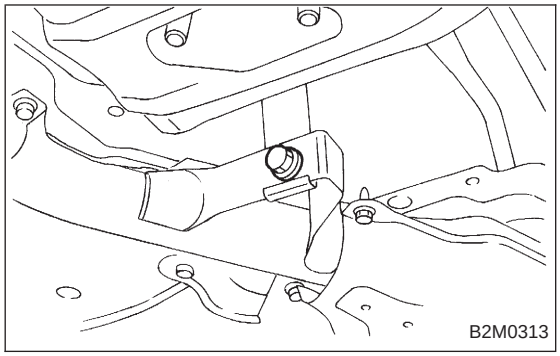

B2M0421

4) Separate center exhaust pipe and rear catalytic converter assembly from front catalytic converter.


B2M0313

5) Remove center exhaust pipe and rear catalytic converter assembly from hanger bracket.

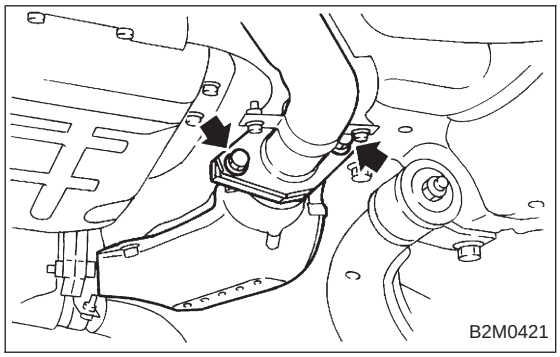
CAUTION:
- **Be careful not to pull down center exhaust pipe.**
- **After removing center exhaust pipe, do not apply excessive pulling force on front catalytic converter and front exhaust pipe.**



B: INSTALLATION

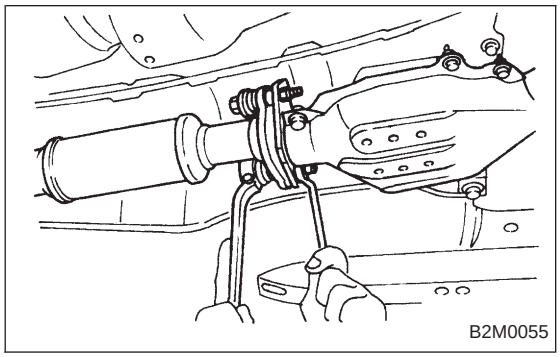
CAUTION:
Replace gaskets with new ones.

1) Install center exhaust pipe and rear catalytic converter assembly.
Temporarily tighten bolt which installs center exhaust pipe to hanger bracket.



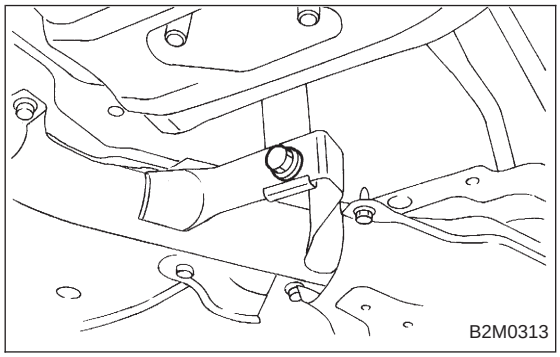
2) Install center exhaust pipe to front catalytic converter.

Tightening torque:
35±5 N·m (3.6±0.5 kg-m, 26.0±3.6 ft-lb)



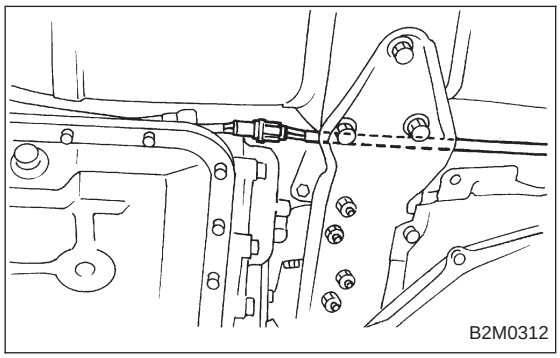
3) Install center exhaust pipe to rear exhaust pipe.

Tightening torque:
18±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)



4) Tighten bolt which holds center exhaust pipe to hanger bracket.

Tightening torque:
35±5 N·m (3.6±0.5 kg-m, 26.0±3.6 ft-lb)



5) Connect rear oxygen sensor connector. (2200 cc)

CLUTCH 2-10

1. Clutch System

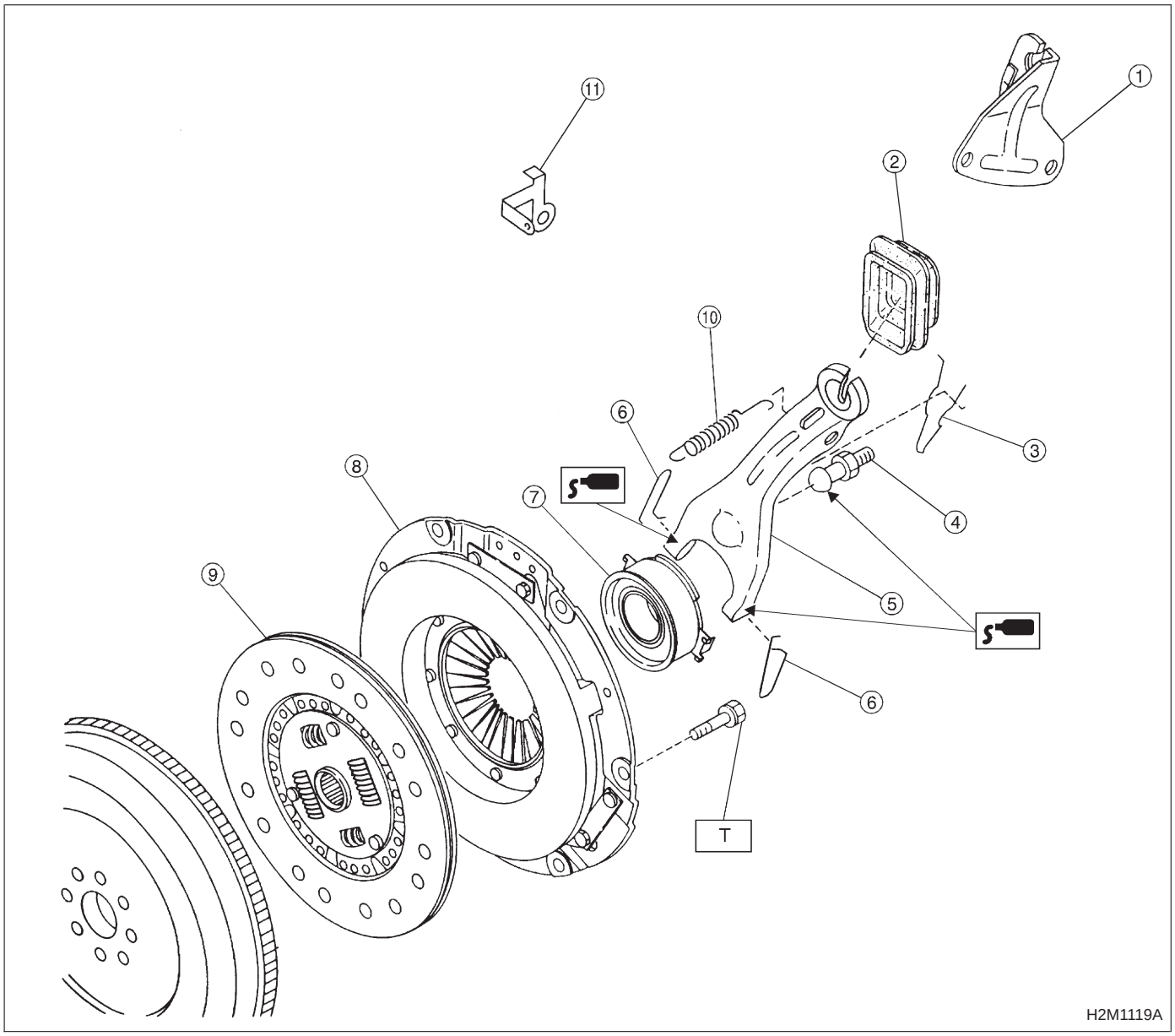
A: SPECIFICATIONS

		FWD	AWD
Clutch cover	Type	Push type	
	Diaphragm set load kg (lb)	440 (970)	450 (992)
Clutch disc	Facing material	Woven (Non asbestos)	
	O.D. x I.D. x thickness mm (in)	215 x 150 x 3.5 (8.46 x 5.91 x 0.138)	225 x 150 x 3.5 (8.86 x 5.91 x 0.138)
	Spline O.D. mm (in)	25.2 (0.992), (No. of teeth: 24)	
Clutch release lever ratio		3.0	
Release bearing		Grease-packed self-aligning	

B: SERVICE DATA

			FWD	AWD
Clutch pedal	Full stroke mm (in)		140 — 150 (5.51 — 5.91)	
Release lever	Stroke mm (in)		24 — 26 (0.94 — 1.02)	
	Play at release lever center mm (in)		3 — 4 (0.12 — 0.16)	
Clutch disc	Depth of rivet head mm (in)	Standard	1.3 — 1.9 (0.051 — 0.075)	
		Limit of sinking	0.3 (0.012)	
	Limit for deflection mm (in)		1.0 (0.039) at R = 102 (4.02)	1.0 (0.039) at R = 107 (4.21)

1. Clutch System



① Clutch cable bracket
② Clutch release lever sealing
③ Retainer spring
④ Pivot
⑤ Clutch release lever
⑥ Clip
⑦ Clutch release bearing
⑧ Clutch cover
⑨ Clutch disc
⑩ Return spring
⑪ Clutch return spring bracket

Tightening torque: N·m (kg-m, ft-lb)
T: 14.2 — 17.2 (1.45 — 1.75, 10.5 — 12.7)

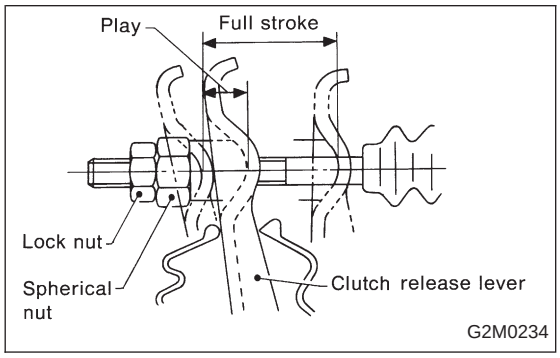
1. General

A: PRECAUTION

When servicing clutch system, pay attention to the following items.

1. MECHANICAL APPLICATION TYPE

1) Check the routing of clutch cable for smoothness.
2) Excessive tightness or looseness of clutch cable have a bad influence upon the cable durability.
3) Apply grease sufficiently to the connecting portion of clutch pedal.
4) Apply grease sufficiently to the release lever portion.
5) Position clutch cable through the center of toeboard hole and route it smoothly. Adjustment is done by moving the outer cable.
6) Make sure not to let the clutch chatter when starting forward or rearward. If clutch chattering occurs, readjust so that the bend of clutch outer cable becomes flatter.



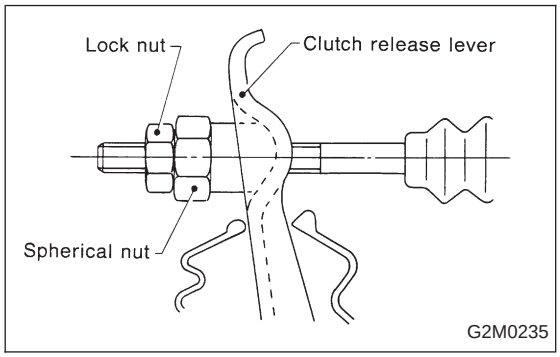
2. On-Car Services

1. MECHANICAL APPLICATION TYPE

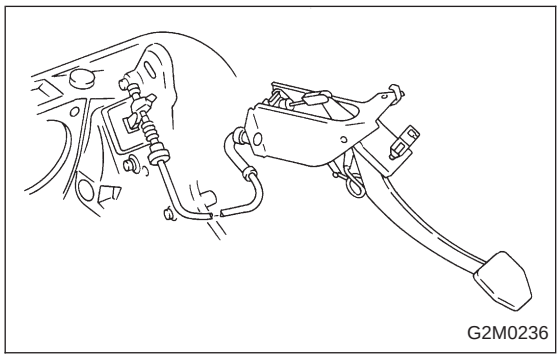
1) Adjust spherical nut so that the play is within the specified value at the lever end (center of spherical nut).

CAUTION:
Take care not to twist the cable during adjustment

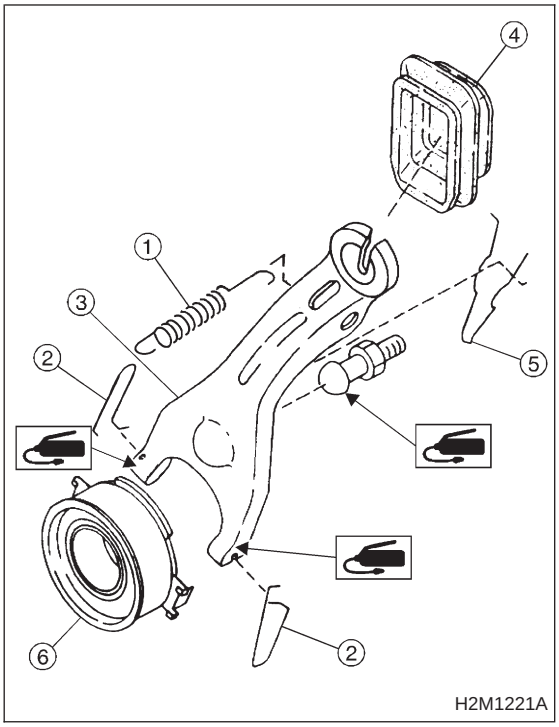
Play: 3 — 4 mm (0.12 — 0.16 in)
Full stroke: 24 — 26 mm (0.94 — 1.02 in)



2) Upon completion of adjustment, securely lock spherical nut with lock nut.



3) Depress clutch pedal to assure there is no abnormality in the clutch system.



H2M1221A

3. Release Bearing and Lever

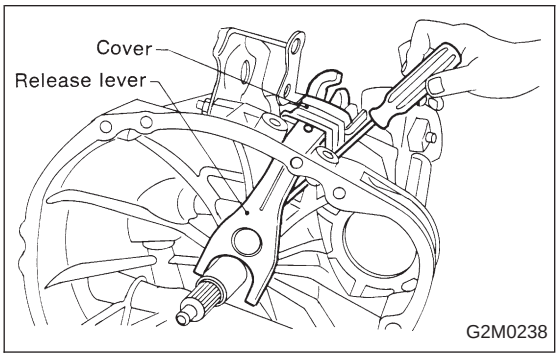
A: REMOVAL

1. MECHANICAL APPLICATION TYPE

1) Remove release lever return spring ①.
2) Remove the two clips ② from clutch release lever ③ and remove release bearing ⑥.

CAUTION:
Be careful not to deform clips.

3) Remove release lever seal ④.



G2M0238

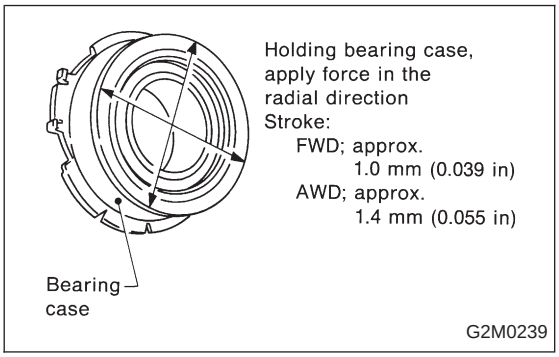
4) Remove release lever retainer spring from release lever pivot with a screwdriver by accessing it through clutch housing release lever hole. Then remove release lever.

B: INSPECTION

1. RELEASE BEARING

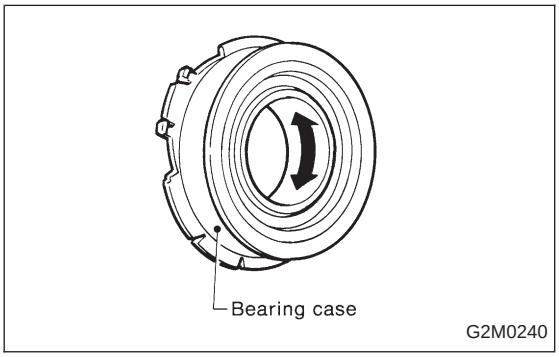
CAUTION:
Since this bearing is grease sealed and is of a nonlubrication type, do not wash with gasoline or any solvent when servicing the clutch.

1) Check the bearing for smooth movement by applying force in the radial direction.

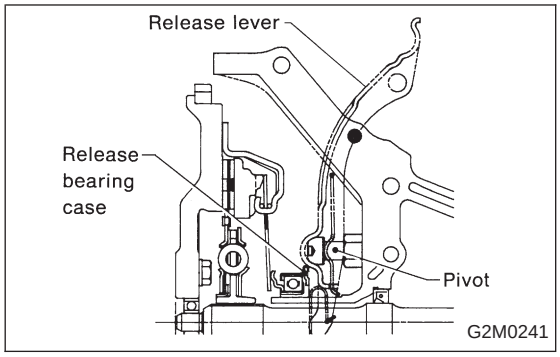


G2M0239

2) Check the bearing for smooth rotation by applying pressure in the thrust direction.
3) Check wear and damage of bearing case surface contacting with lever.



G2M0240

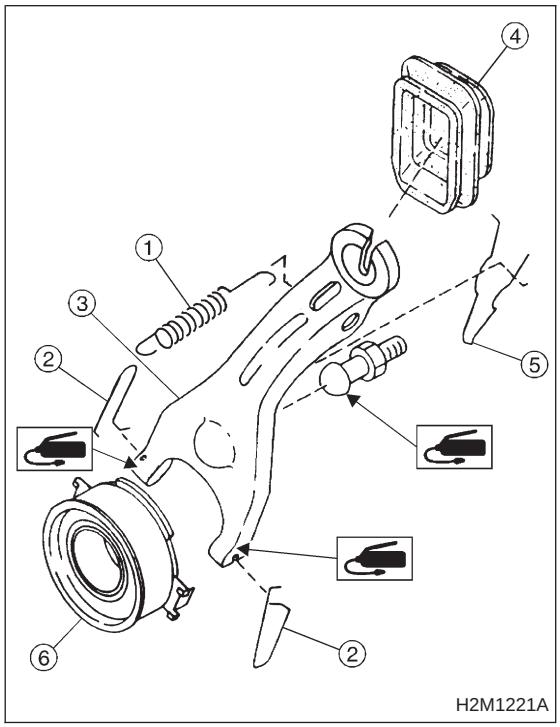


2. RELEASE LEVER

Check lever pivot portion and the point of contact with release bearing case for wear.

C: INSTALLATION

CAUTION:
Before or during assembling, lubricate the following points with a light coat of grease.
- **Inner groove of release bearing**
- **Contact surface of lever and pivot**
- **Contact surface of lever and bearing**
- **Transmission main shaft spline (Use grease containing molybdenum disulphide.)**

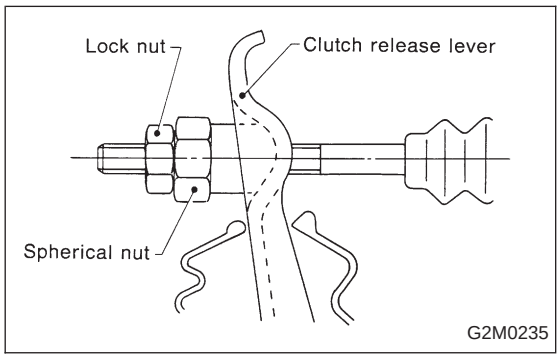


1. MECHANICAL APPLICATION TYPE

1) While pushing release lever ③ to pivot and twisting it to both sides, fit retainer spring ⑤ onto the constricted portion of pivot.

NOTE:
Confirm that retainer spring is securely fitted by observing it through the main case hole.

2) Install release bearing ⑥ and fasten it with two clips ②.
3) Install release lever sealing ④.

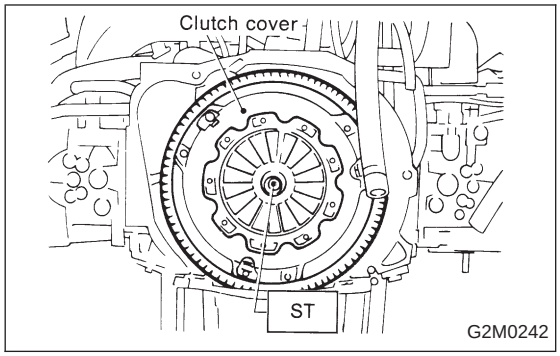


4) After remounting engine and transmission on body, make adjustment of the clutch release lever end play.

CAUTION:
Take care not to twist the cable during adjustment.

5) Install release lever return spring.

NOTE:
Hook up the left hook side of the return spring with the lever.



4. Clutch Disc and Cover

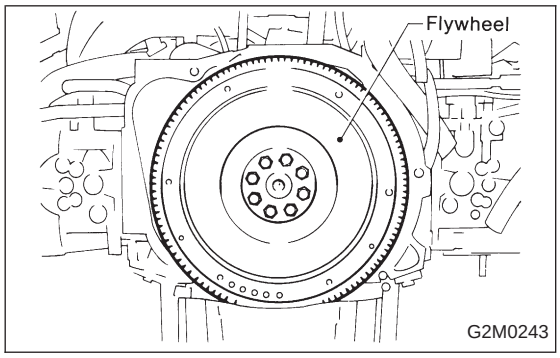
A: REMOVAL

1) Install ST on flywheel.

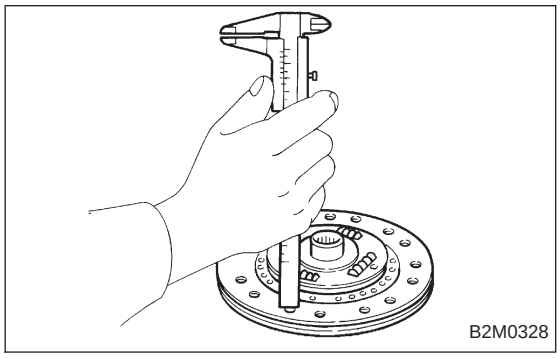
ST 498497100 CRANKSHAFT STOPPER

2) Remove clutch cover and clutch disc.

CAUTION:
● Take care not to allow oil on the clutch disc facing.
● Do not disassemble either clutch cover or clutch disc.



3) Remove flywheel.



B: INSPECTION

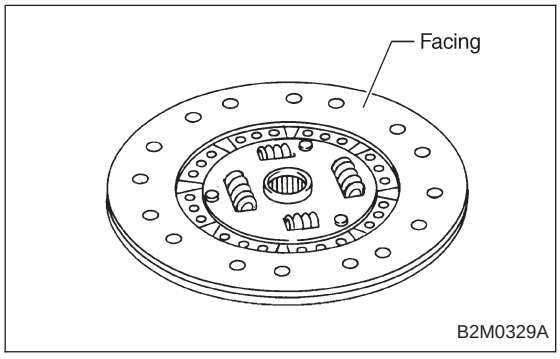
1. CLUTCH DISC

1) Facing wear

Measure the depth of rivet head from the surface of facing. Replace if facings are worn locally or worn down to less than the specified value.

Depth of rivet head
Standard value
1.3 — 1.9 mm (0.051 — 0.075 in)
Limit of sinking
0.3 mm (0.012 in)

CAUTION:
Do not wash clutch disc with any cleaning fluid.

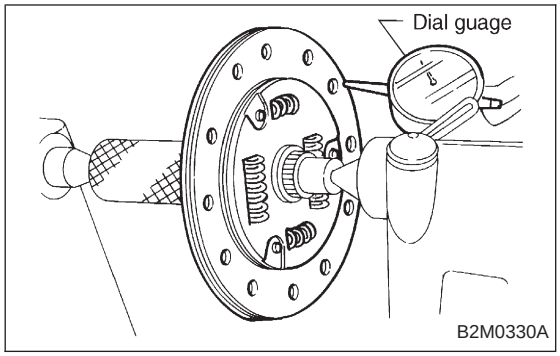


2) Hardened facing

Correct by using emery paper or replace.

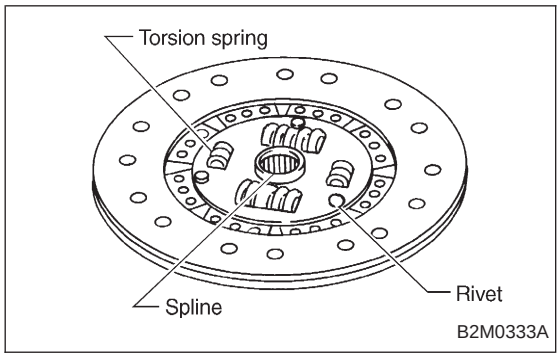
3) Oil soakage on facing

Replace clutch disc and inspect transmission front oil seal, transmission case mating surface, engine rear oil seal and other points for oil leakage.

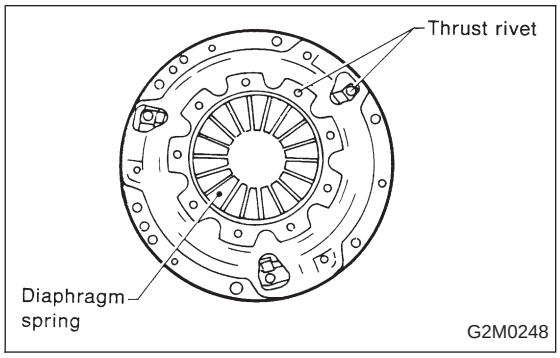


4) Deflection on facing
If deflection exceeds the specified value at the outer circumference of facing, repair or replace.

Limit for deflection:
FWD model: 1.0 mm (0.039 in) at R = 102 mm (4.02 in)
AWD model: 1.0 mm (0.039 in) at R = 107 mm (4.21 in)

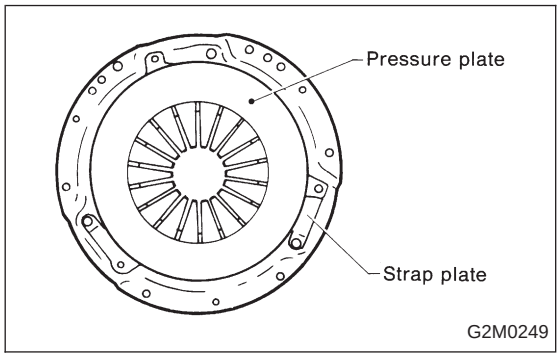


5) Worn spline, loose rivets and torsion spring failure
Replace defective parts.

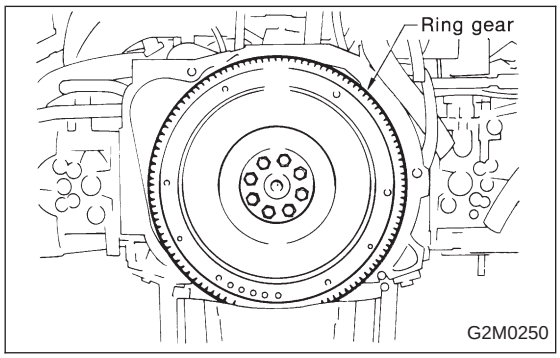


2. CLUTCH COVER

Visually check for the following items without disassembling, and replace or repair if defective.
1) Loose thrust rivet.
2) Damaged or worn bearing contact area at center of diaphragm spring.



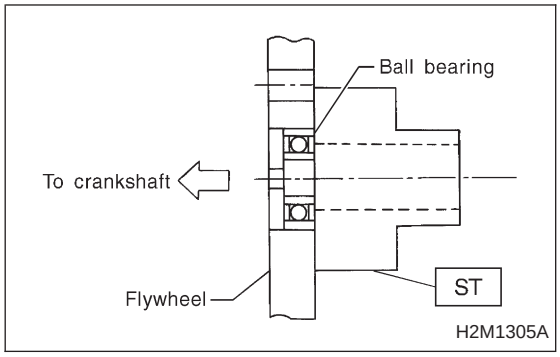
3) Damaged or worn disc contact surface of pressure plate.
4) Loose strap plate setting bolt.
5) Worn diaphragm sliding surface.



3. FLYWHEEL

CAUTION:
Since this bearing is grease sealed and is of a nonlubrication type, do not wash with gasoline or any solvent.

1) Damage of facing and ring gear
If defective, replace flywheel.

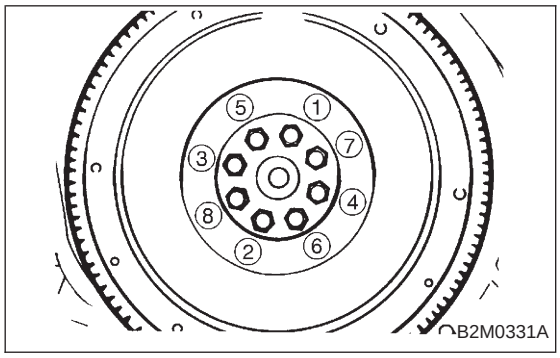


2) Smoothness of rotation
Rotate ball bearing applying pressure in thrust direction.

If noise or excessive play is noted, replace ball bearing as follows:

(1) Drive out ball bearing from flywheel.
(2) Press bearing into flywheel until bearing end surface is flush with clutch disc contact surface of flywheel. Do not press inner race.

ST 899754112 SNAP RING PRESS



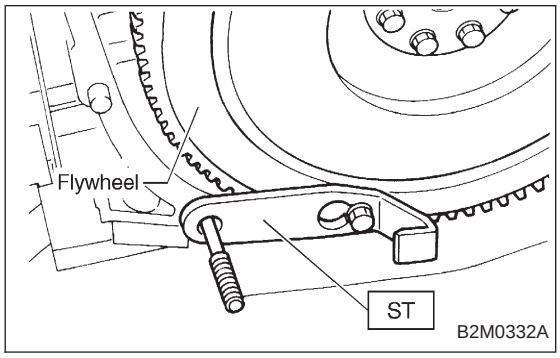
C: INSTALLATION

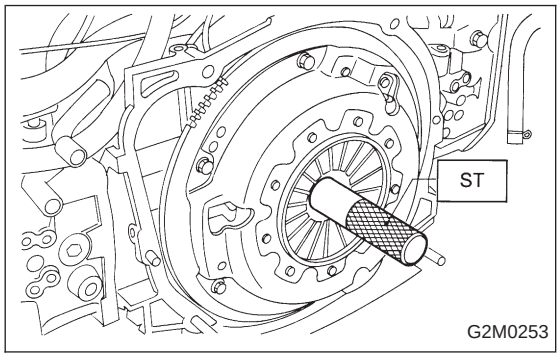
1) Install flywheel.
2) Install ST, and tighten the flywheel attaching bolts to the specified torque.

ST 498497100 CRANKSHAFT STOPPER

Tightening torque:
69 — 75 N·m (7.0 — 7.6 kg-m, 51 — 56 ft-lb)

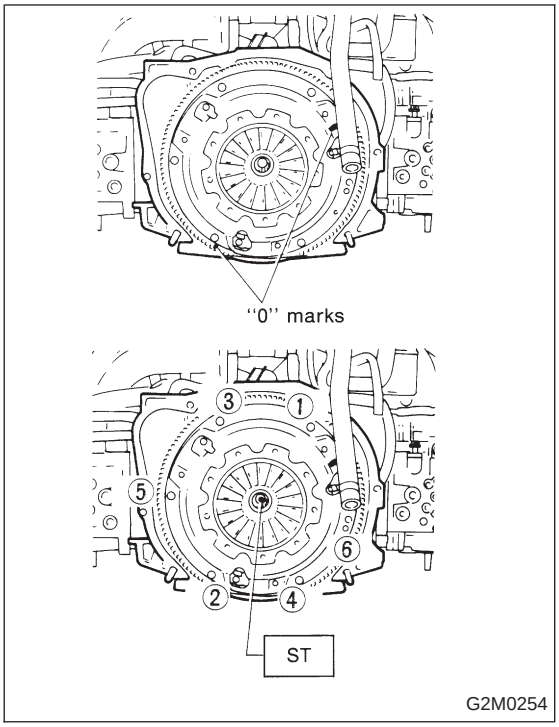
NOTE:
Tighten flywheel installing bolts gradually. Each bolt should be tightened to the specified torque in a crisscross fashion.





3) Insert ST into the clutch disc and install them on the flywheel by inserting the ST end into the pilot bearing.

ST 499747000 CLUTCH DISC GUIDE (FWD model)
ST 499747100 CLUTCH DISC GUIDE (AWD model)



4) Install 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.
- Tighten clutch cover installing bolts gradually. Each bolt should be tightened to the specified torque in a crisscross fashion.

Tightening torque:
14.2 — 17.2 N·m
(1.45 — 1.75 kg-m, 10.5 — 12.7 ft-lb)

5) Remove ST.

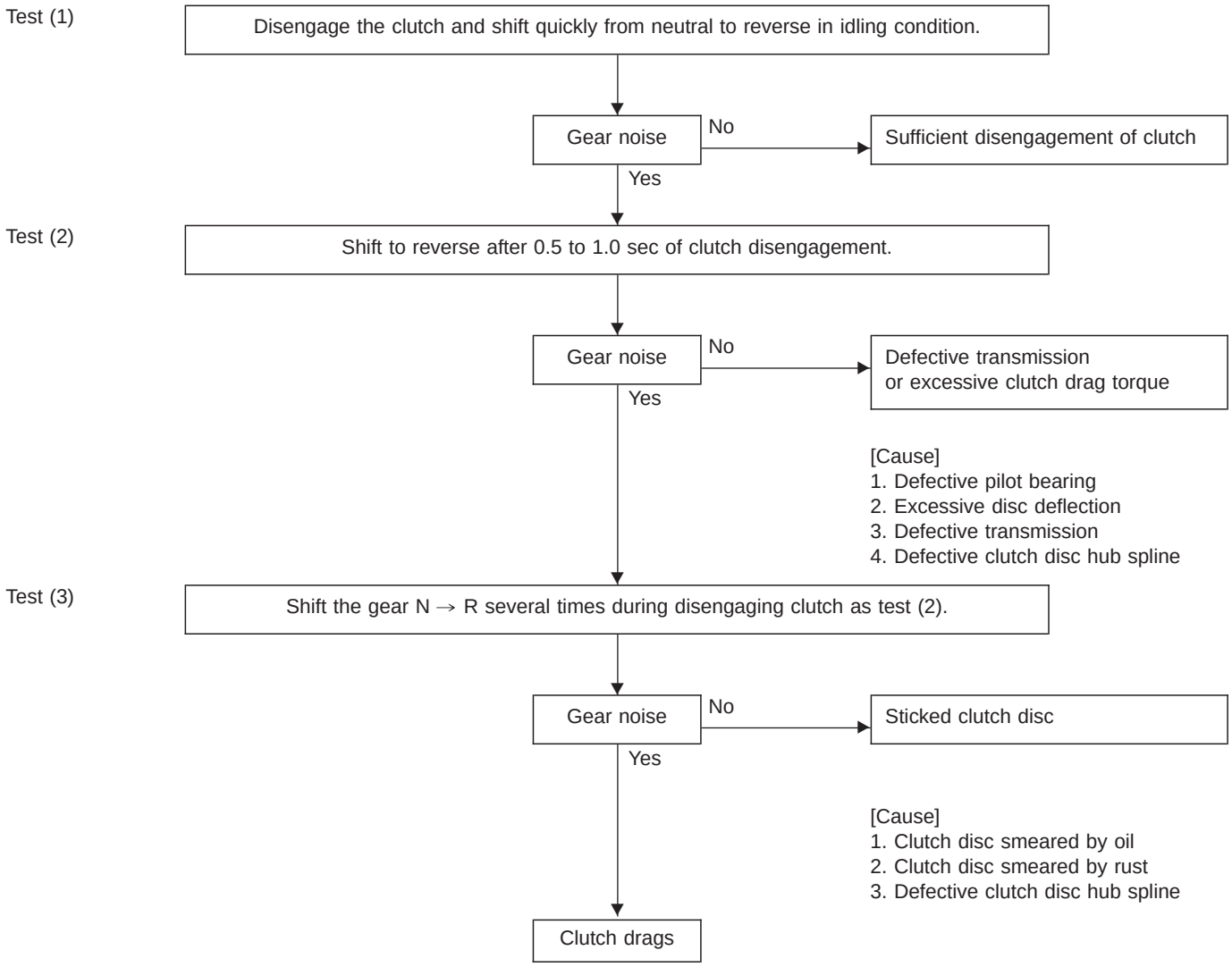
ST 499747000 CLUTCH DISC GUIDE (FWD model)
ST 499747100 CLUTCH DISC GUIDE (AWD model)

1. Clutch System

Condition	Possible cause and testing	Corrective action
1. Clutch slippage	It is hard to perceive clutch slippage in the early stage, but pay attention to the following symptoms.	
	(a) Engine revs up when shifting. (b) High speed driving is impossible; especially rapid acceleration impossible and vehicle speed does not increase in proportion to an increase in engine speed. (c) Power falls, particularly when ascending a slope, and there is a smell of burning of the clutch facing. ● Method of testing: Put the car in stationary condition with parking brake fully applied. Disengage the clutch and shift the transmission gear into the first. Gradually allow the clutch to engage while gradually increasing the engine speed. The clutch function is satisfactory if the engine stalls. However, the clutch is slipping if the car does not start off and the engine does not stall.	
	(a) No clutch pedal play	Readjust.
	(b) No release lever end play	Readjust.
	(c) Clutch facing smeared by oil	Replace.
	(d) Worn clutch facing	Replace.
	(e) Deteriorated diaphragm spring	Replace.
	(f) Distorted pressure plate or flywheel	Correct or replace.
	(g) Defective release bearing holder	Correct or replace.
	(h) Defective pedal and cable system	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 the this sort is due to defective synchronization mechanism, carry out the test as described after. ● Method of testing: Refer to diagnostic diagram on page after.	
	It may be judged as insufficient disengagement of clutch if any noise occurs during this test.	
	(a) Excessive clutch pedal play	Readjust.
	(b) Excessive clutch release lever play	Readjust.
	(c) Worn or rusty clutch disc hub spline	Replace clutch disc.
	(d) Excessive deflection of clutch disc facing	Correct or replace.
	(e) Seized crankshaft pilot needle bearing	Replace.
	(f) Malfunction of pedal and cable system	Correct or replace.
	(g) Cracked clutch disc facing	Replace.
	(h) 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) Improper clutch cable routing	Correct.
	(b) Adhesion of oil on the facing	Replace clutch disc.
	(c) Weak or broken torsion spring	Replace clutch disc.
	(d) Defective facing contact or excessive disc	Replace clutch disc. defection
	(e) Warped pressure plate or flywheel	Correct or replace.
	(f) Loose disc rivets	Replace clutch disc.
	(g) Loose engine mounting	Retighten or replace mounting.
	(h) Improper adjustment of pitching stopper	Adjustment.

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 car 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	Take off rust, apply grease or replace clutch shaft disc or mainshaft.
	(d) Deteriorated or broken torsion spring	Replace clutch disc.
	(e) Loose engine mounting	Retighten or replace mounting.
	(f) Deteriorated diaphragm spring	Replace.

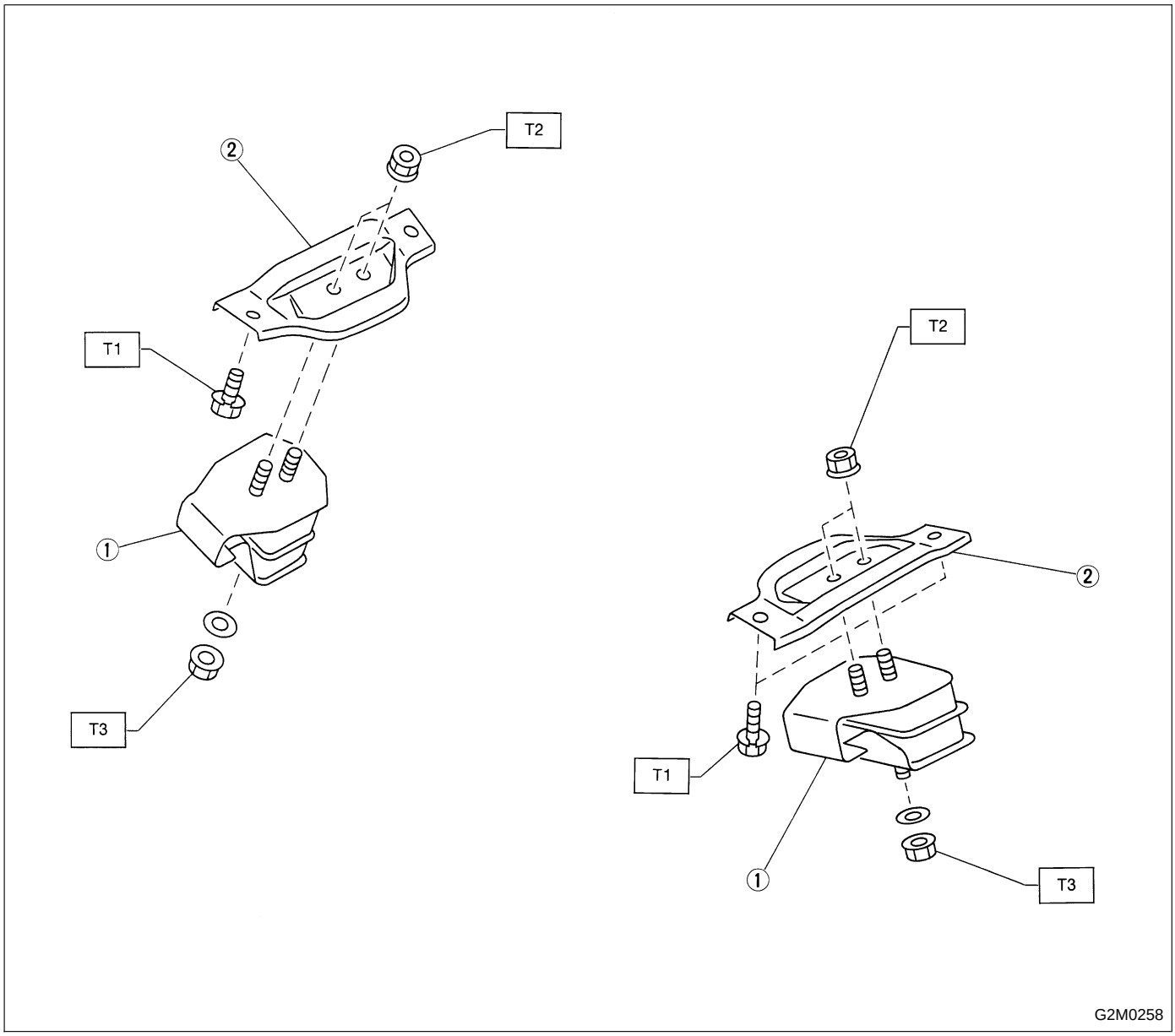
1. DIAGNOSTIC DIAGRAM OF CLUTCH DRAG



[Cause]
1. Cracked clutch disc facing
2. Damaged or worn clutch cover
3. Malfunction of clutch release system
4. Insufficient clutch release amount
5. Excessive clutch pedal play

ENGINE AND TRANSMISSION MOUNTING SYSTEM 2-11

1. Engine Mounting

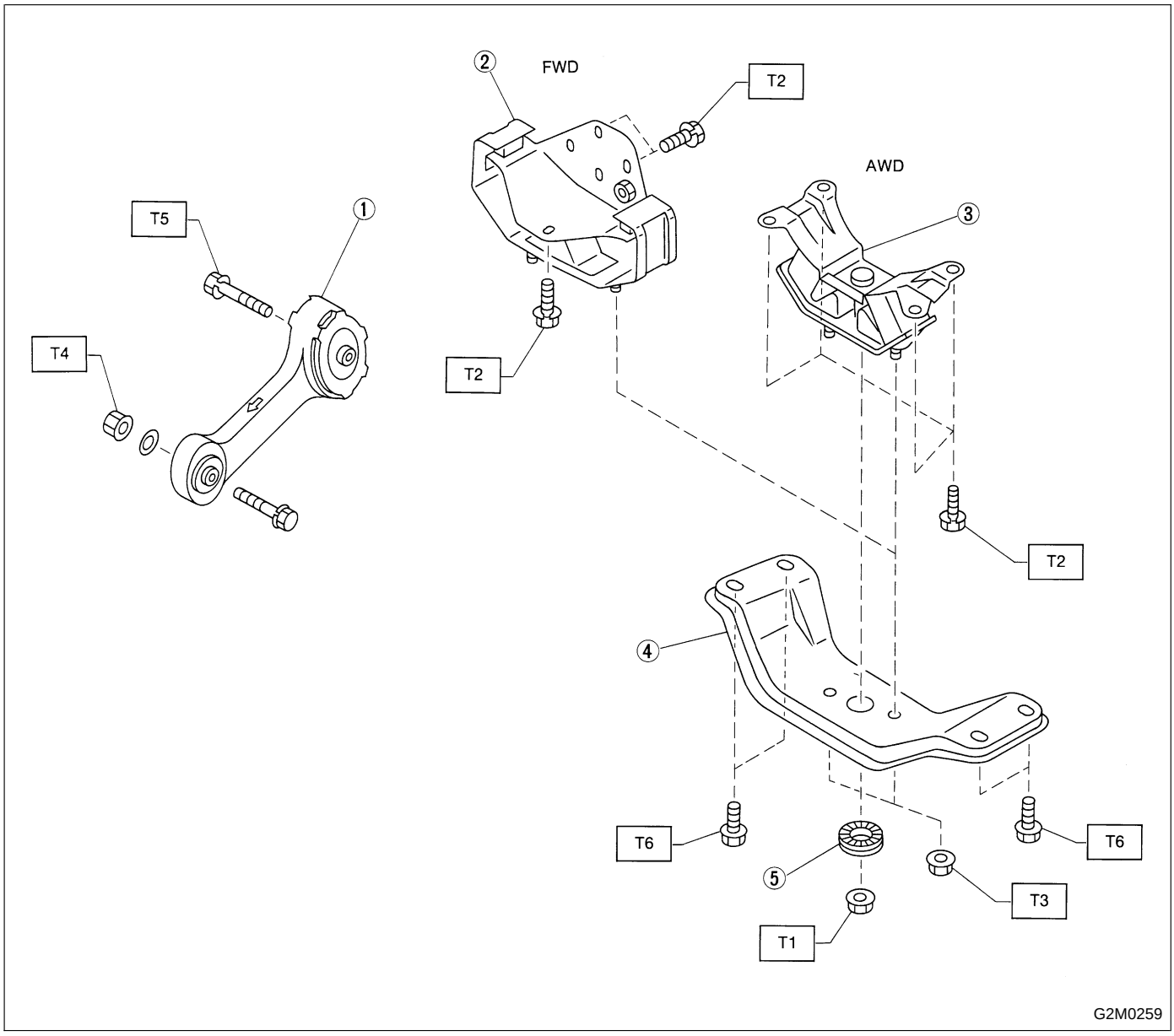


① Front cushion rubber
② Front engine mounting bracket

Tightening torque: N·m (kg-m, ft-lb)
T1: 20 — 33 (2.0 — 3.4, 14 — 25)
T2: 31 — 51 (3.2 — 5.2, 23 — 38)
T3: 54 — 83 (5.5 — 8.5, 40 — 61)

2. Transmission Mounting

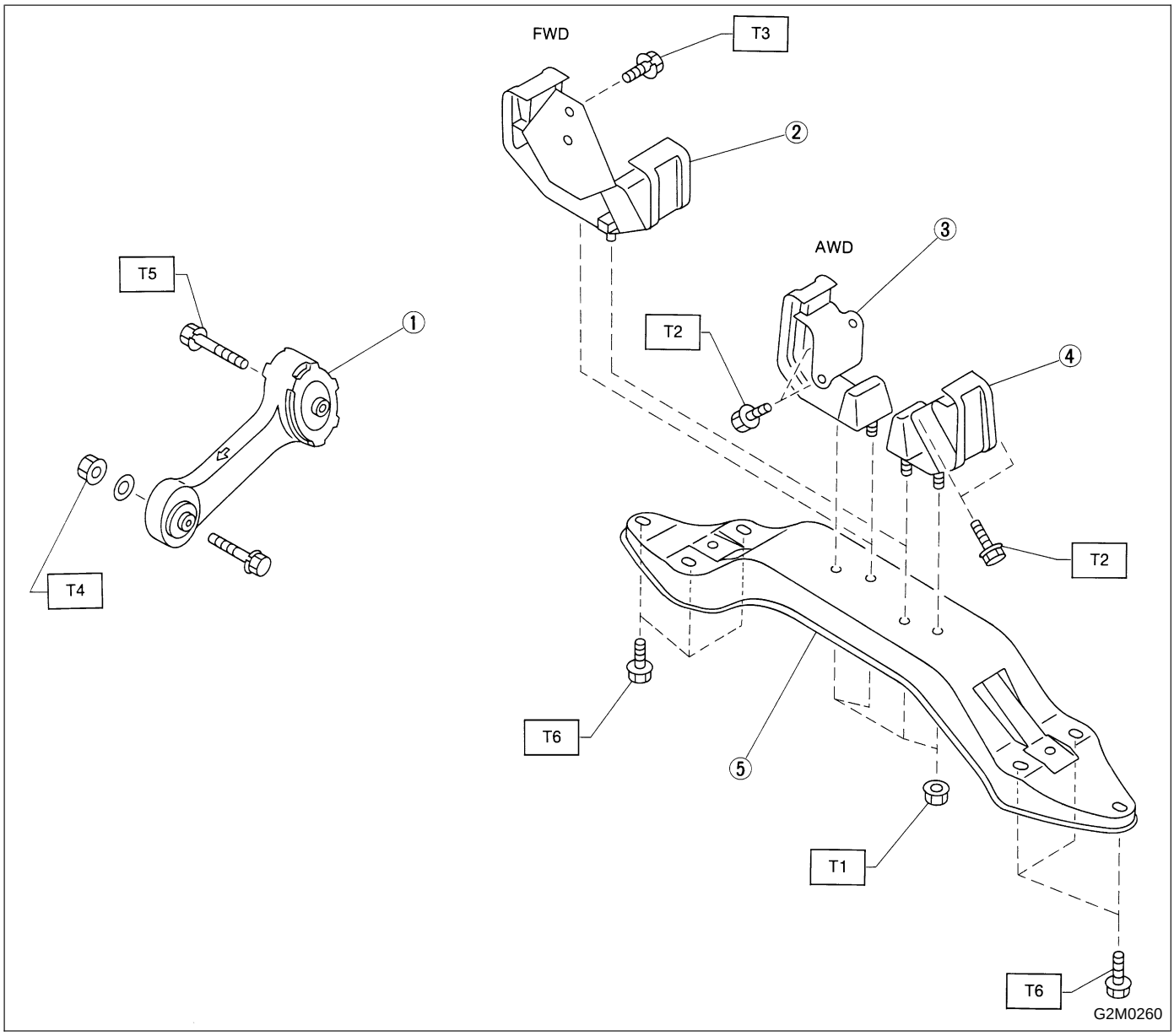
1. MT MODEL



① Pitching stopper
② Rear cushion rubber (FWD)
③ Rear cushion rubber (AWD)
④ Rear crossmember
⑤ Rubber cushion

Tightening torque: N·m (kg-m, ft-lb)
T1: 23 — 36 (2.3 — 3.7, 17 — 27)
T2: 28 — 38 (2.9 — 3.9, 21 — 28)
T3: 27 — 47 (2.8 — 4.8, 20 — 35)
T4: 44 — 54 (4.5 — 5.5, 33 — 40)
T5: 47 — 67 (4.8 — 6.8, 35 — 49)
T6: 54 — 83 (5.5 — 8.5, 40 — 61)

2. AT MODEL



① Pitching stopper
② Rear cushion rubber (FWD)
③ Rear cushion rubber RH (AWD)
④ Rear cushion rubber LH (AWD)
⑤ Crossmember

Tightening torque: N·m (kg-m, ft-lb)
T1: 13 — 23 (1.3 — 2.3, 9 — 17)
T2: 18 — 31 (1.8 — 3.2, 13 — 23)
T3: 28 — 38 (2.9 — 3.9, 21 — 28)
T4: 44 — 54 (4.5 — 5.5, 33 — 40)
T5: 47 — 67 (4.8 — 6.8, 35 — 49)
T6: 54 — 83 (5.5 — 8.5, 40 — 61)

1. General Precaution

1) Remove or install engine and transmission in an area where chain hoists, lifting devices, etc. are available for ready use.
2) 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.
3) Prior to starting work, prepare the following:
Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
4) Lift up or lower the vehicle when necessary. Make sure to support the correct positions. (Refer to Chapter 1-3 “General Information”.)

2. Engine

A: REMOVAL

1. Set the vehicle on lift arms.
2. Open front hood and support with a stay.

↓

3. Release fuel pressure.
4. Disconnect battery cable and remove battery from vehicle.
5. Drain coolant.

↓

6. Remove cooling system.

↓

A/C equipped model

7. Collect refrigerant, and remove pressure hose.

↓

8. Remove air intake system.

↓

9. Remove canister and bracket.

↓

10. Disconnect connectors, cables and hoses.

↓

11. Remove power steering pump from bracket.

↓

12. Remove front exhaust pipe and center exhaust pipe.

↓

13. Remove nuts which hold lower side of transmission to engine.
14. Remove nuts which install front cushion rubber onto front crossmember.

↓

AT model

15. Separate torque converter from drive plate.

↓

16. Remove pitching stopper and bracket.

↓

17. Disconnect fuel delivery hose, return hose and evaporation hose.

↓

18. Support engine with a lifting device and wire ropes.
19. Support transmission with a garage jack.

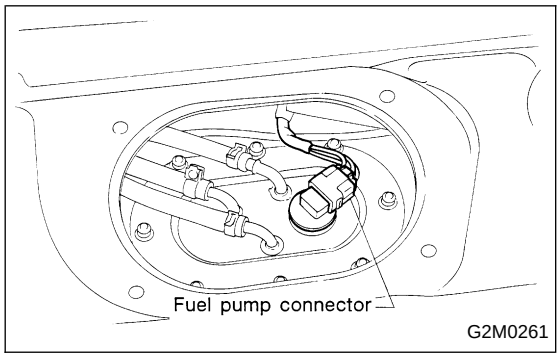
↓

20. Remove bolts which hold upper side of transmission to engine.

↓

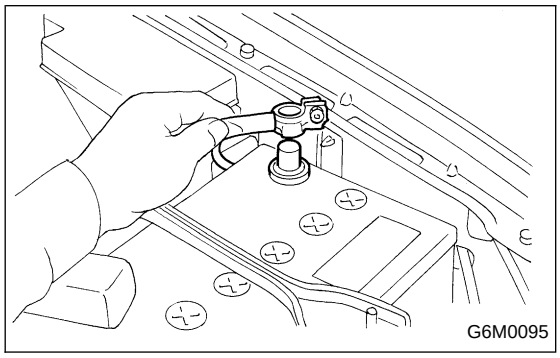
21. Remove engine from vehicle.

1) Set the vehicle on lift arms.
2) Open front hood fully and support with stay.

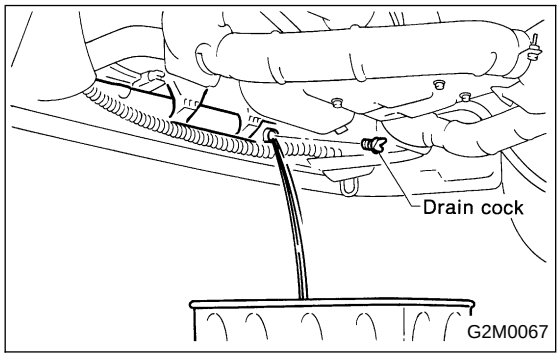


3) Release fuel pressure.
   (1) Disconnect fuel pump connector.
   (2) Start the engine, and run until it stalls.
   (3) After the engine stalls, crank it for five seconds more.
   (4) Turn ignition switch to “OFF”.

<Ref. to 2-8 [W1A0].>

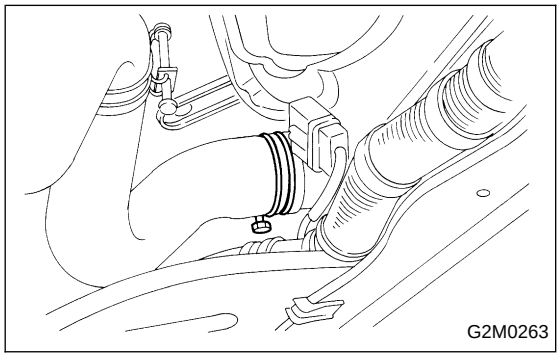


4) Disconnect battery cables and remove battery from vehicle.

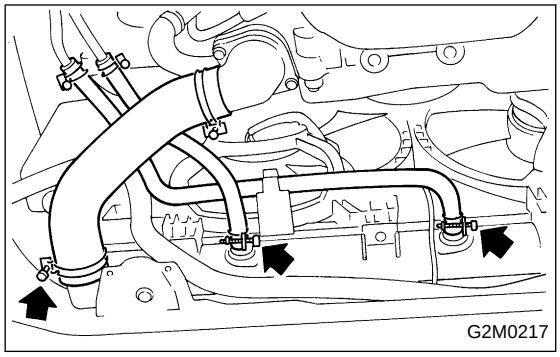


5) Drain coolant.

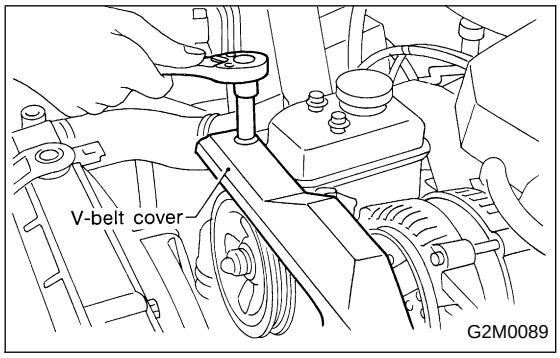
Set container under the vehicle, and remove drain cock from radiator.



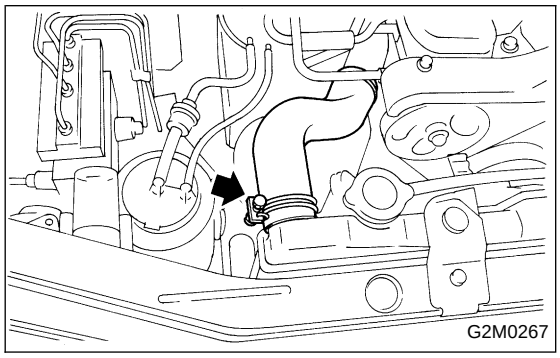
6) Remove cooling system.
   (1) Disconnect radiator fan motor connector.



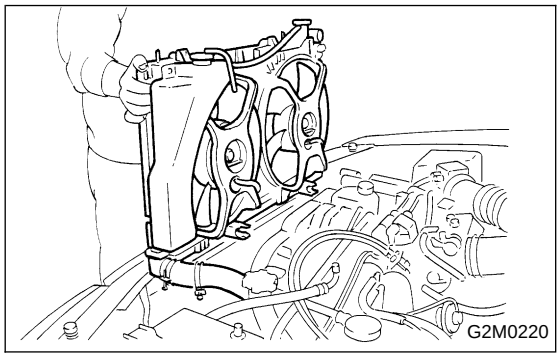
(2) Disconnect radiator outlet hose from thermostat cover.
(3) Disconnect ATF cooler hoses from pipes. (AT model)



(4) Remove V-belt cover.



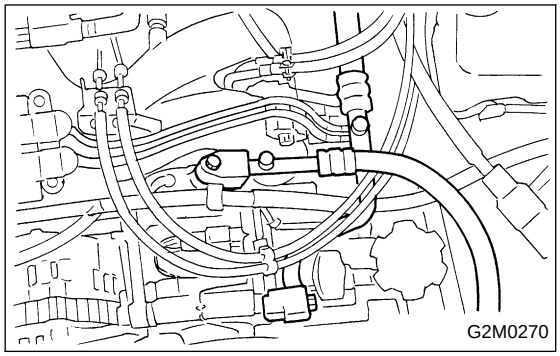
(5) Disconnect radiator inlet hose from radiator.



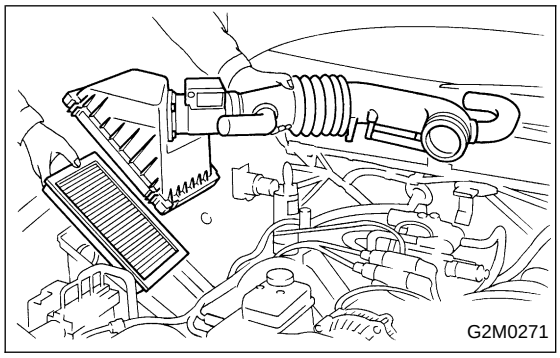
(6) Remove radiator upper bracket, and remove radiator assembly from vehicle.

7) Collect refrigerant, and remove pressure hoses. (With A/C)

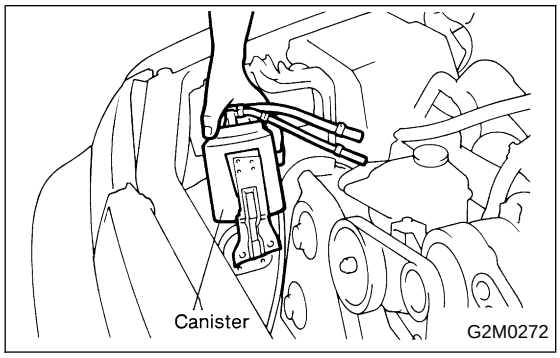
(1) Place and connect the attachment hose to the refrigerant recycle system.
(2) Collect refrigerant from A/C system.



(3) Disconnect A/C pressure hoses from A/C compressor.

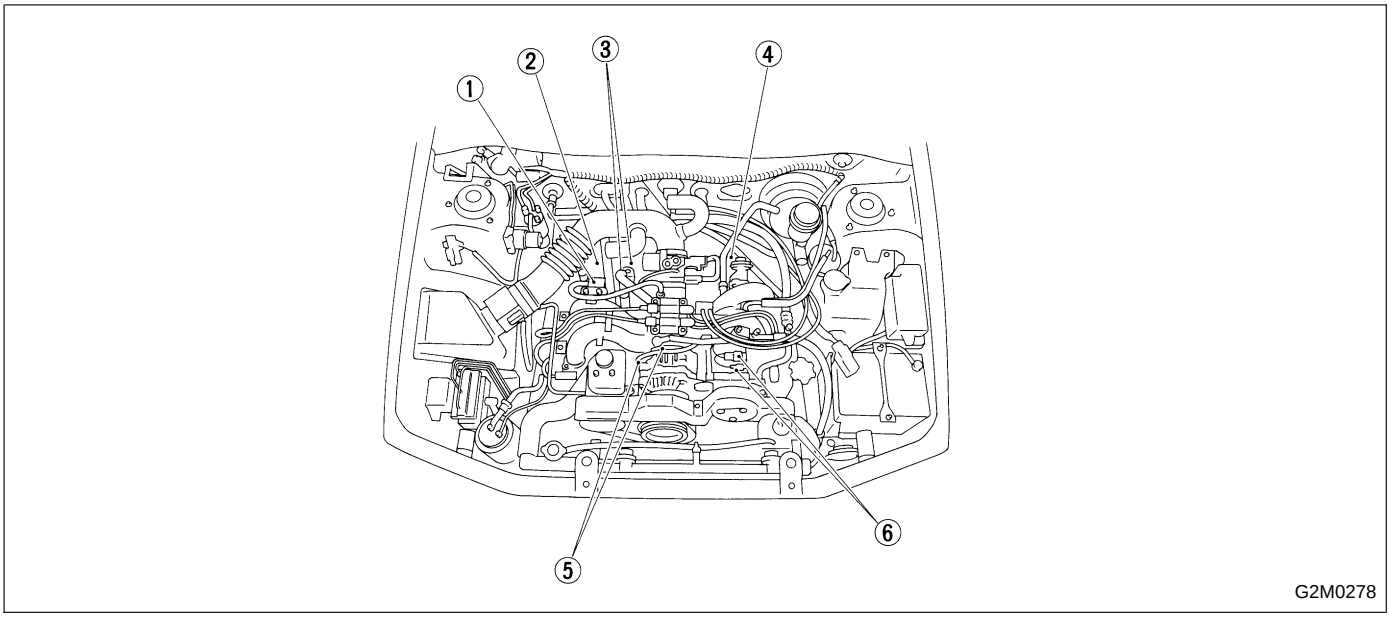


8) Remove air intake system.
(1) Disconnect connector from mass air flow sensor.
(2) Remove air intake duct with air cleaner upper cover, and remove air cleaner element.

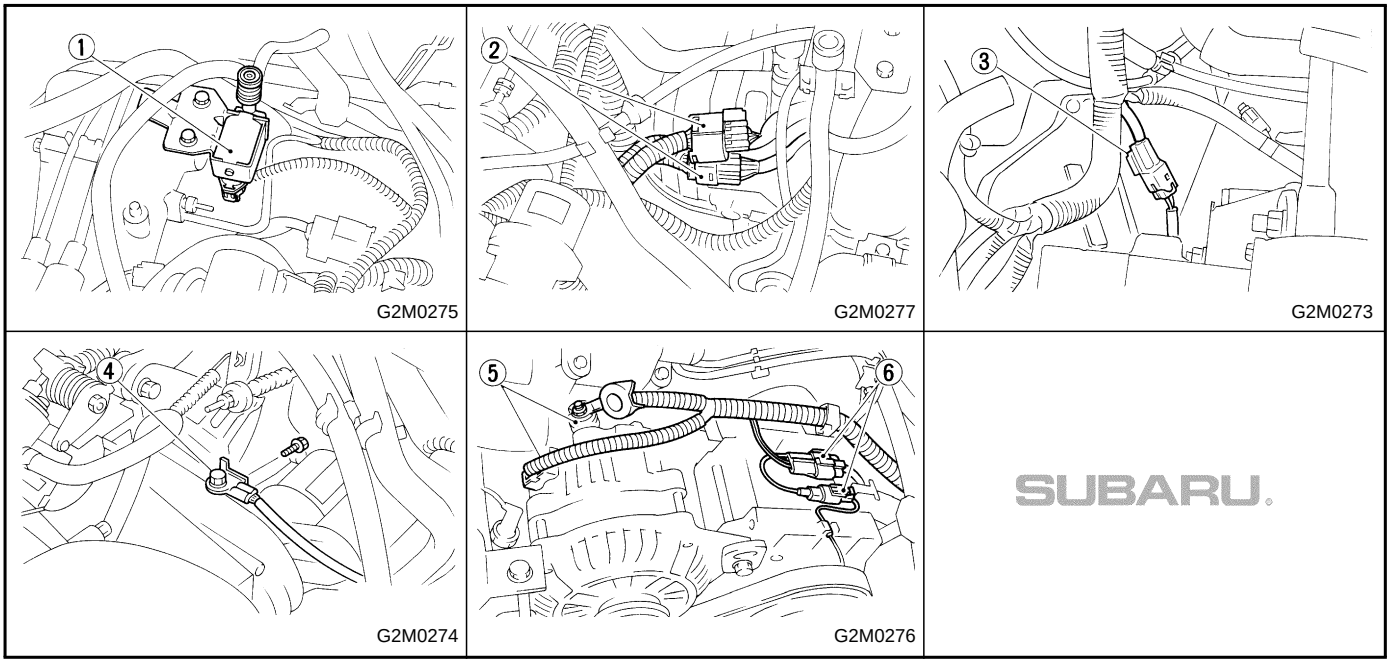


9) Remove canister and bracket.

10) Disconnect connectors, cables and hoses.
(1) Disconnect the following connectors.
① FICD solenoid valve (With A/C)
② Engine harness connectors
③ Oxygen sensor connector
④ Engine ground terminal
⑤ Alternator connector and terminal
⑥ A/C compressor connectors (With A/C)



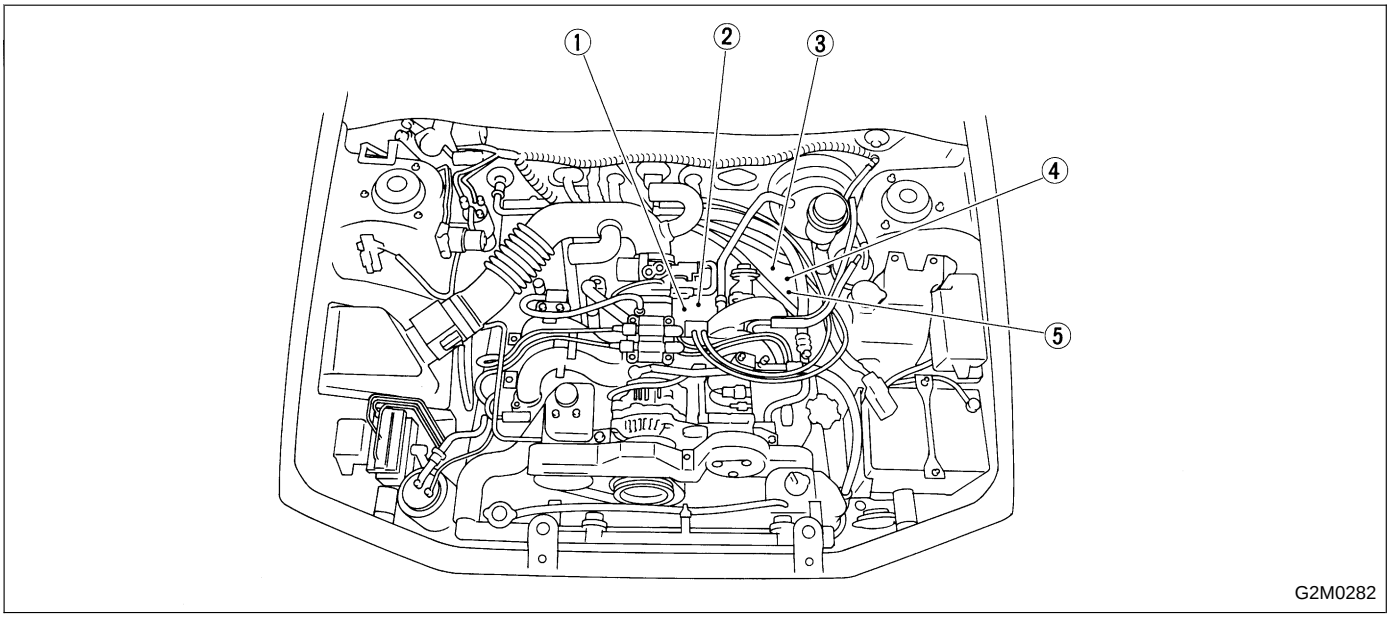
G2M0278



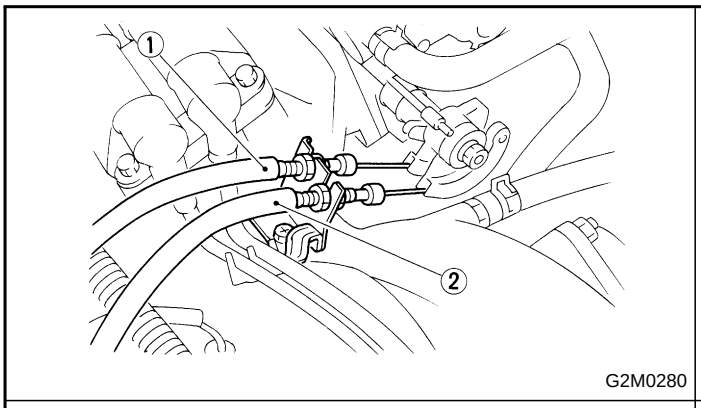
G2M0275 G2M0277 G2M0273
G2M0274 G2M0276

(2) Disconnect the following cables.
① Accelerator cable
② Cruise control cable
③ Clutch release spring (MT model)
④ Clutch cable (MT model)
⑤ Hill holder cable (MT model)

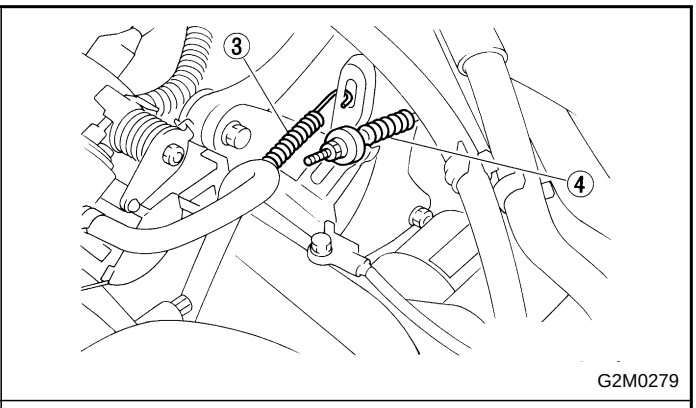
CAUTION:
Disconnect hill-holder cable at connection on clutch release fork side and transfer it to PHV side.



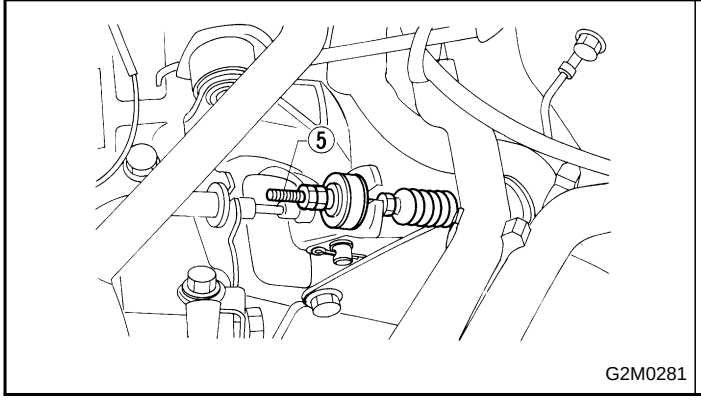
G2M0282



G2M0280

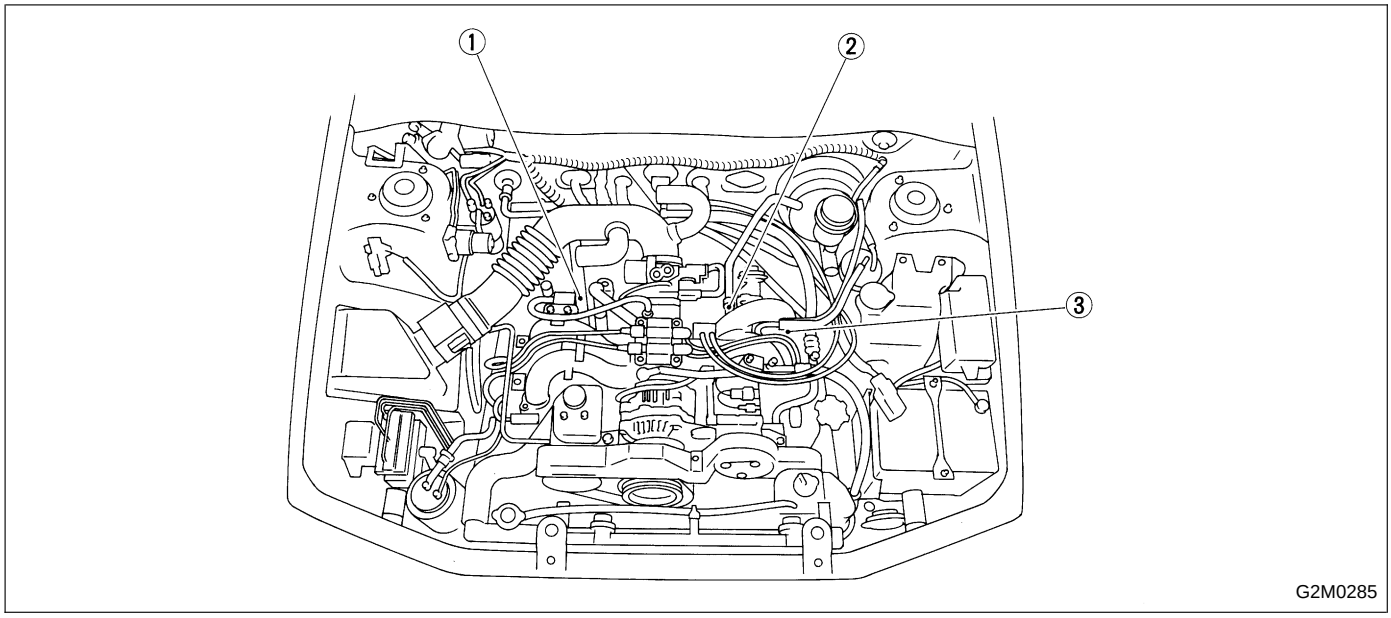


G2M0279



G2M0281

(3) Disconnect the following hoses.
① Cruise control vacuum hose (With cruise control)
② Brake booster vacuum hose
③ Heater inlet and outlet hoses



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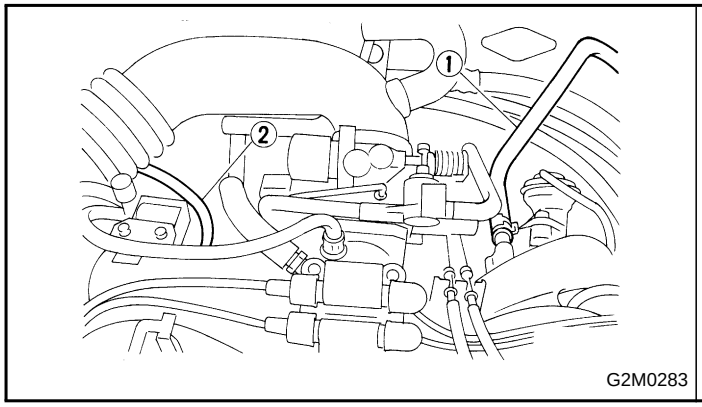

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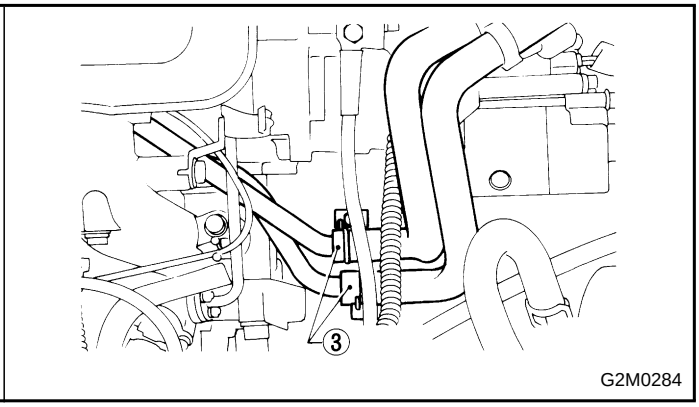
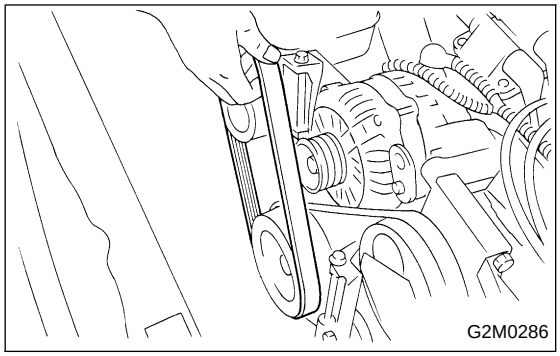
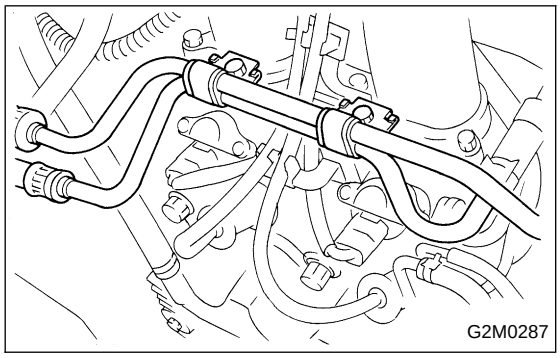


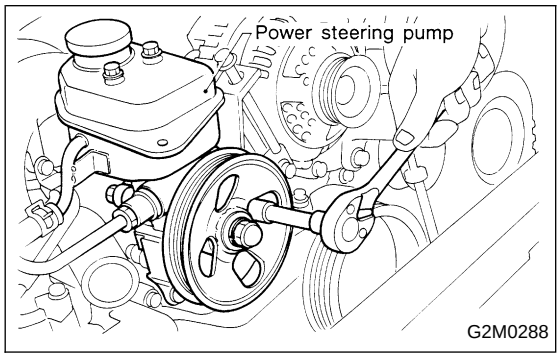
G2M0284



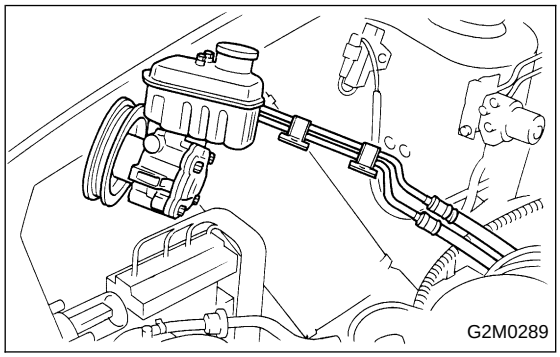
11) Remove power steering pump from bracket.
(1) Loosen lock bolt and slider bolt, and remove front side V-belt.



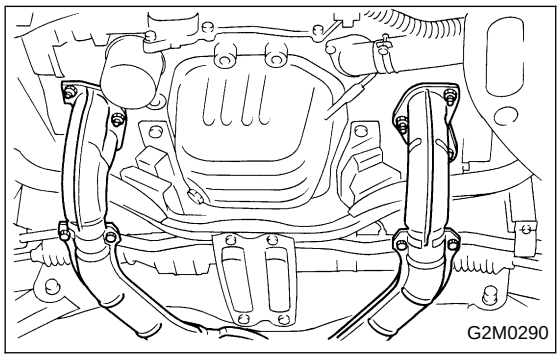
(2) Remove pipe with bracket from intake manifold.



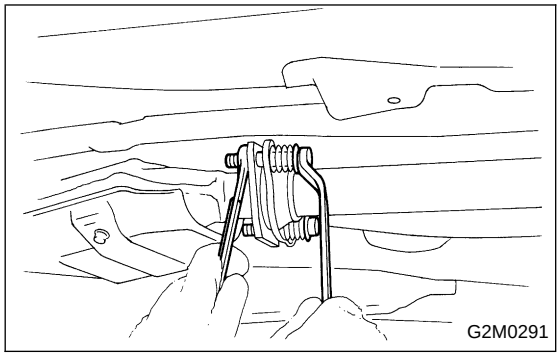
(3) Remove bolts which install power steering pump from bracket.



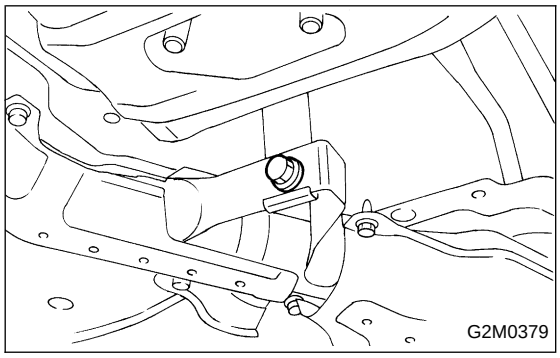
(4) Place power steering pump on the right side wheel apron.



12) Remove front exhaust pipe and center exhaust pipe.
(1) Lift up the vehicle.
(2) Remove nuts which install front exhaust pipe onto engine.

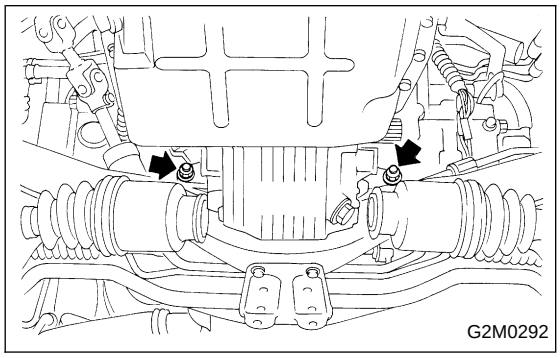


(3) Separate center exhaust pipe from rear exhaust pipe.

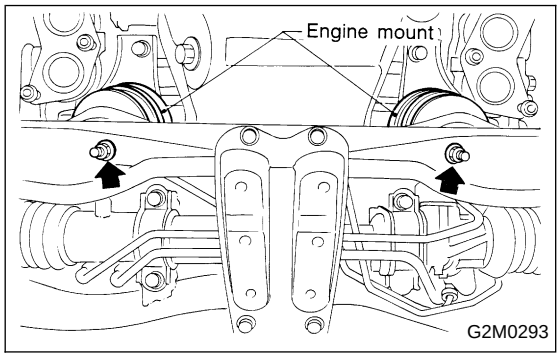


(4) Remove bolt which installs center exhaust pipe on hunger bracket.

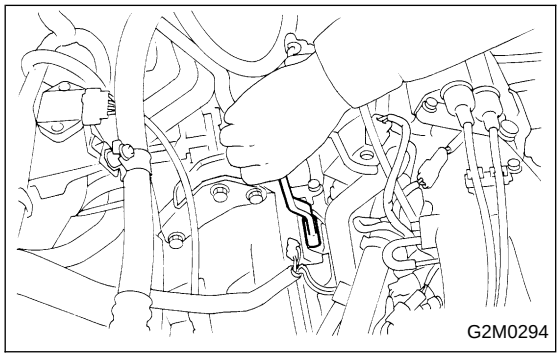
CAUTION:
Exhaust pipe will drop when all bolts are removed. So, hold it when removing the last bolt.



13) Remove nuts which hold lower side of transmission to engine.

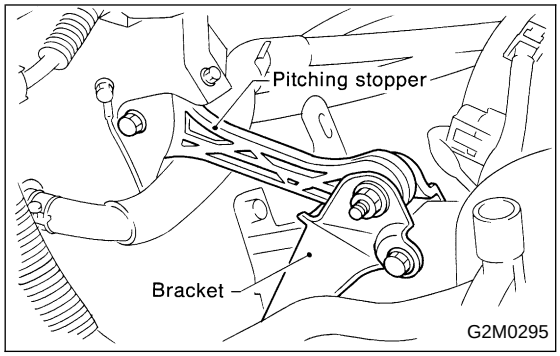


14) Remove nuts which install front cushion rubber onto front crossmember.

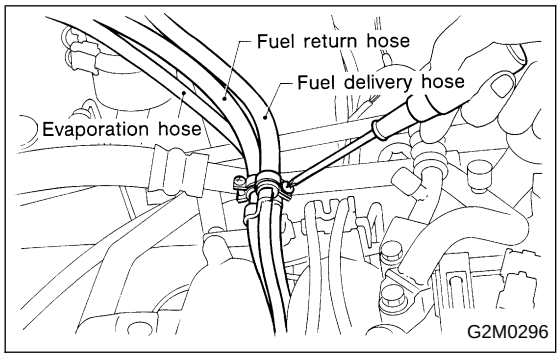


15) Separate torque converter from drive plate. (AT model)
(1) Lower the vehicle.
(2) Remove service hole plug.
(3) Remove bolts which hold torque converter to drive plate.
(4) Remove other bolts while rotating the engine using ST.

ST 499977000 CRANK PULLEY WRENCH

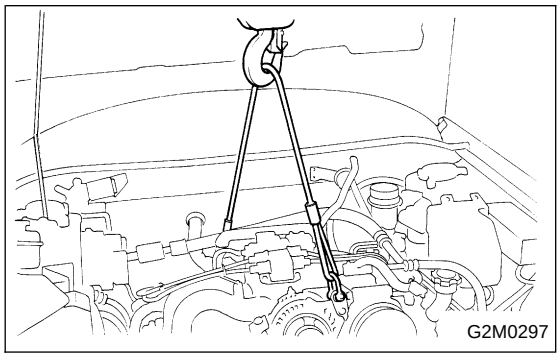


16) Remove pitching stopper.

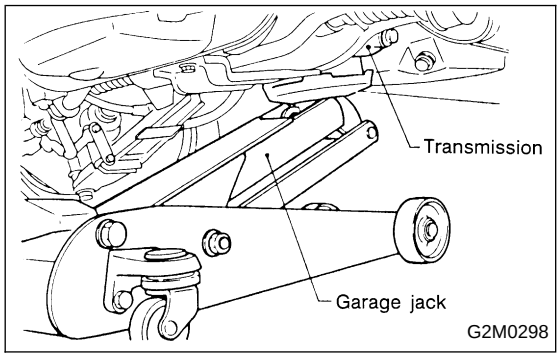


17) Disconnect fuel delivery hose, return hose and evaporation hose.

CAUTION:
Catch fuel from hose into container.

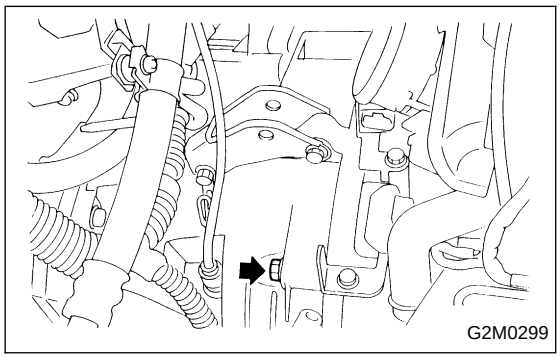


18) Support engine with a lifting device and wire ropes.

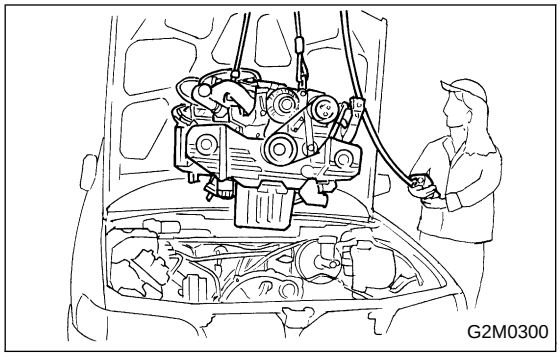


19) Support transmission with a garage jack.

CAUTION:
Before moving 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.



20) Remove bolts which holds upper side of transmission to engine.



21) Remove engine from vehicle.
(1) Slightly raise engine.
(2) Raise transmission with garage jack.
(3) Move engine horizontally until mainshaft is withdrawn from clutch cover.
(4) Slowly move engine away from engine compartment.

CAUTION:
Be careful not to damage adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

B: INSTALLATION

1. Install engine to transmission.

2. Tighten bolts which hold upper side of transmission to engine.

3. Remove lifting device and wire rope.
4. Remove garage jack.

5. Install pitching stopper.

AT model

6. Install torque converter onto drive plate.

7. Install canister and bracket.
8. Install power steering pump on bracket.

9. Tighten nuts which hold lower side of transmission to engine.
10. Tighten nuts which install front cushion rubber onto cross-member.

11. Install front exhaust pipe and center exhaust pipe.

12. Connect hoses, connectors and cables.

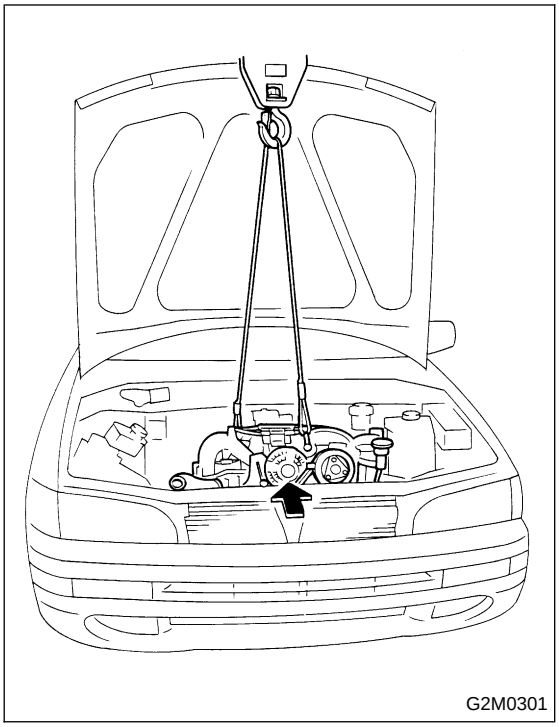
13. Install air intake system.
- Air intake duct
- Air cleaner element and upper cover.

With A/C

14. Install A/C pressure hoses.

15. Install cooling system.

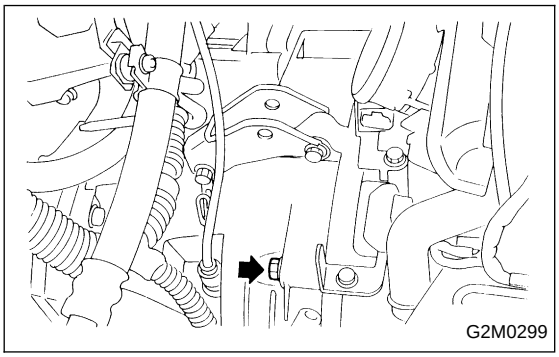
16. Install battery onto the vehicle, and connect cables.
17. Fill coolant.
18. Check ATF level, and connect if necessary. [AT]
19. Correct power steering oil, and bleed air.
20. Remove front hood stay, and close front hood.
21. Remove the vehicle from lift arms.


G2M0301

1) Install engine onto transmission.
   (1) Position engine in engine compartment and align it with transmission.

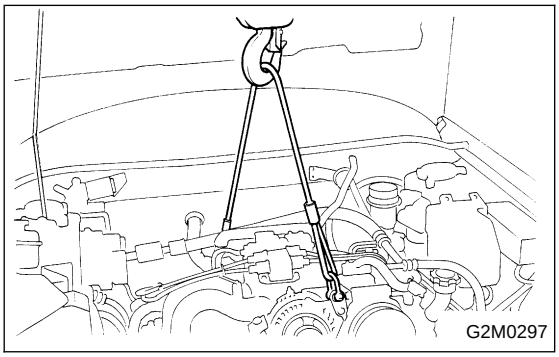
CAUTION:
Be careful not to damage adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

   (2) Apply a small amount of grease to splines of mainshaft.

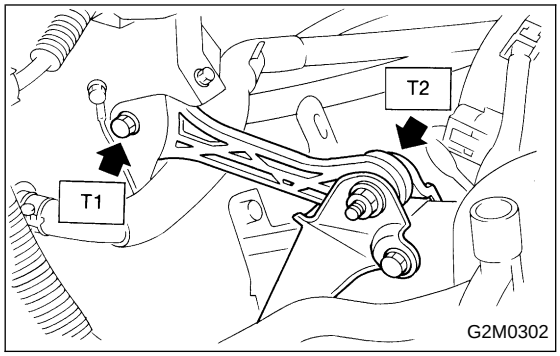

G2M0299

2) Tighten bolts which hold upper side of transmission to engine.

Tightening torque:
46 — 54 N·m (4.7 — 5.5 kg-m, 34 — 40 ft-lb)

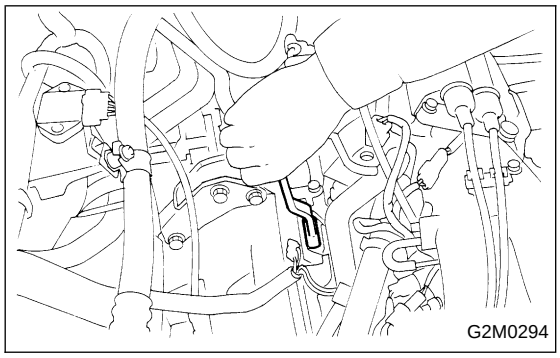

G2M0297

3) Remove lifting device and wire ropes.
4) Remove garage jack.



5) Install pitching stopper.

Tightening torque:
T1: 44 — 54 N·m (4.5 — 5.5 kg-m, 33 — 40 ft-lb)
T2: 47 — 67 N·m (4.8 — 6.8 kg-m, 35 — 49 ft-lb)



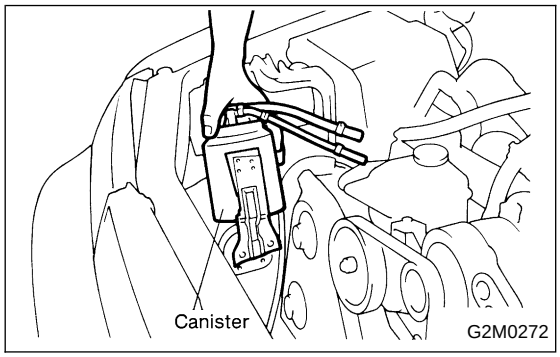
6) Install torque converter onto drive plate. (AT model)
(1) Tighten bolts which hold torque converter to drive plate.
(2) Tighten other bolts while rotating the engine by using ST.

ST 499977000 CRANK PULLEY WRENCH

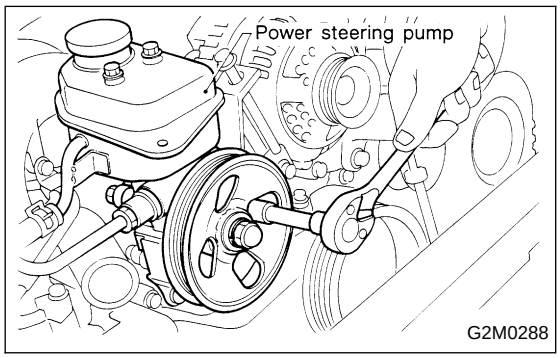
CAUTION:
Be careful not to drop bolts into torque converter housing.

Tightening torque:
23 — 26 N·m (2.3 — 2.7 kg-m, 17 — 20 ft-lb)

(3) Clog plug onto service hole.

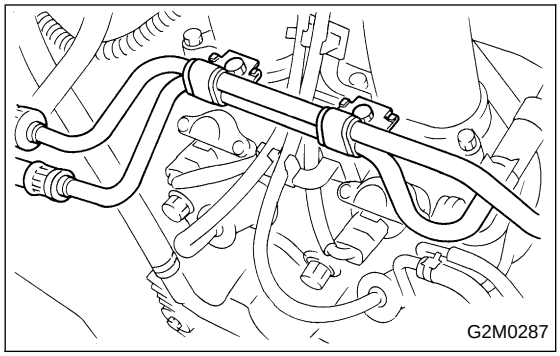


7) Install canister and bracket.

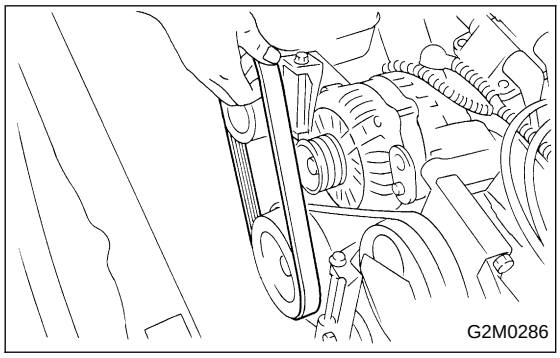


8) Install power steering pump on bracket.
(1) Install power steering pump on bracket, and tighten bolts.

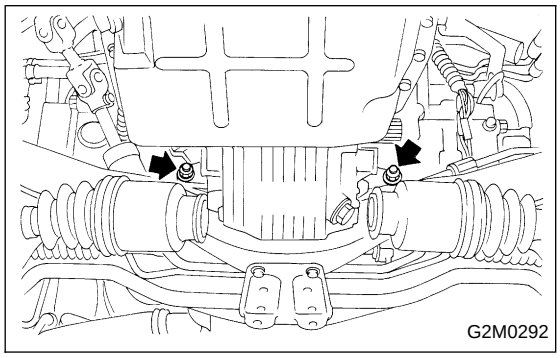
Tightening torque:
29 — 49 N·m (3 — 5 kg-m, 22 — 36 ft-lb)



(2) Install power steering pipe bracket on right side intake manifold, and install spark plug codes.

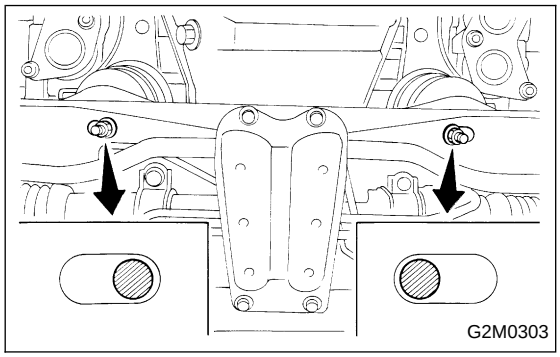


(3) Install front side V-belt, and adjust it.
<Ref. to 1-5 [W1A0].>



9) Tighten nuts which hold lower side of transmission to engine.

Tightening torque:
46 — 54 N·m (4.7 — 5.5 kg-m, 34 — 40 ft-lb)



10) Tighten nuts which install front cushion rubber onto crossmember.

Tightening torque:
54 — 83 N·m (5.5 — 8.5 kg-m, 40 — 61 ft-lb)

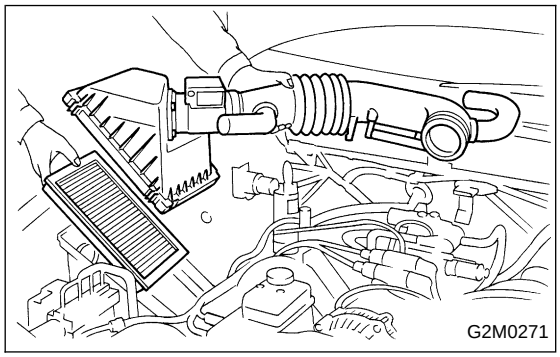
CAUTION:
Be sure to tighten front cushion rubber mounting bolts in the innermost elliptical hole in the front crossmember.

11) Install front exhaust pipe and center exhaust pipe.
12) Connect hoses, connectors and cables.
(1) Connect the following hoses.
- Fuel delivery hose, return hose and evaporation hose
- Heater inlet and outlet hoses
- Brake booster vacuum hose
- Canister hoses

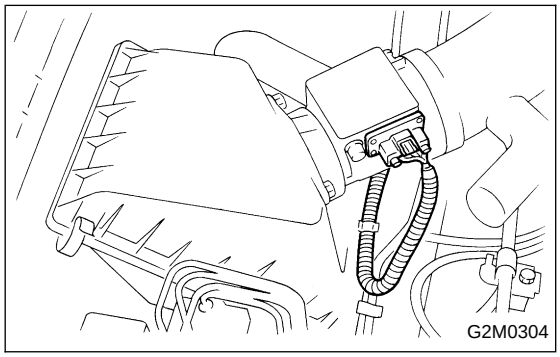
(2) Connect the following connectors.
- Engine ground terminal
- Engine harness connectors
- Oxygen sensor connector
- Cam angle sensor connector
- Crank angle sensor connector
- Alternator connector and terminal
- A/C compressor connectors (With A/C)

(3) Connect the following cables.
- Accelerator cable
- Cruise control cables (With cruise control)
- Hill holder cable
- Clutch cable
- Clutch release spring

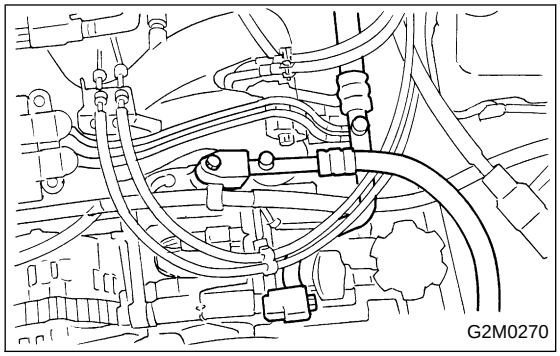
CAUTION:
After connecting each cable, adjust them.


G2M0271

13) Install air intake system.
(1) Install air cleaner element.
(2) Install air intake duct with air cleaner upper cover.


G2M0304

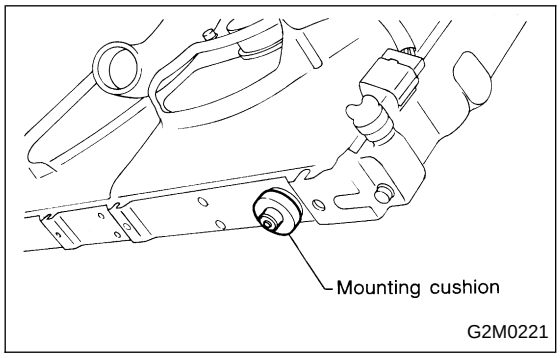
(3) Connect connector to mass air flow sensor.


G2M0270

14) Install A/C flexible hoses. (With A/C)
<Ref. to 4-7 [W16B0].>

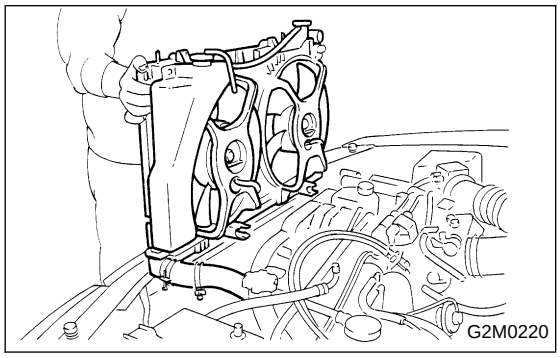
CAUTION:
Use new O-rings.

Tightening torque:
18 — 31 N·m (1.8 — 3.2 kg-m, 13 — 23 ft-lb)

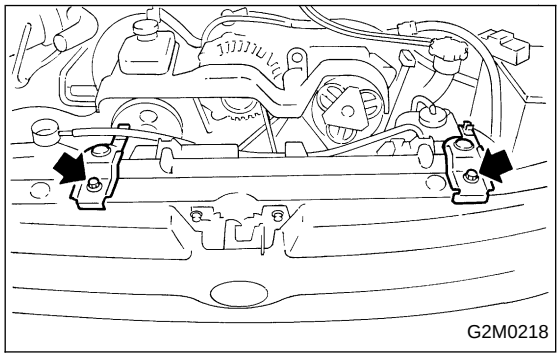


G2M0221

15) Install cooling system.
(1) Attach radiator mounting cushions to pins on lower side of radiator.

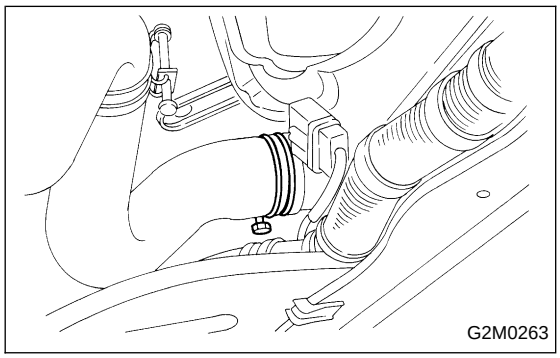

G2M0220

(2) Fit cushions on lower side of radiator, into holes on body side and install radiator.

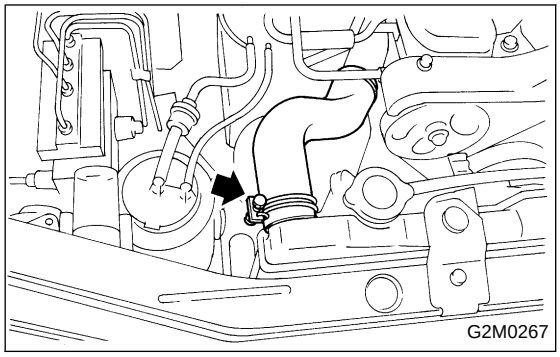

G2M0218

(3) Install radiator brackets and tighten bolts.

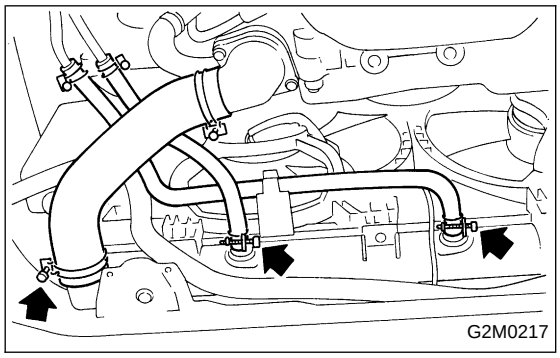
Tightening torque:
12.3 — 15.2 N·m
(1.25 — 1.55 kg-m, 9.0 — 11.2 ft-lb)


G2M0263

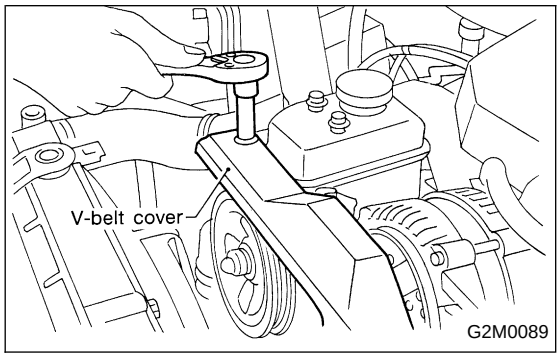
(4) Connect radiator fan motor connector.



(5) Connect radiator inlet hose.



(6) Connect radiator outlet hose.
(7) Connect ATF cooler hoses. (AT model)



(8) Install V-belt cover.

16) Install battery in the vehicle, and connect cables.
17) Fill coolant.
<Ref. to 1-5 [05A0].>
18) Check ATF level and correct if necessary. (AT model)
<Ref. to 3-2 [W2A0].>
19) Charge A/C system with refrigerant.
<Ref. to 4-7 [W700].>
20) Remove front hood stay, and close front hood.
21) Remove the vehicle from lift arms.

3. Transmission

A: REMOVAL

1. Open front hood fully, and support it with stay.
2. Disconnect battery ground terminal.

↓

3. Remove air intake duct.

↓

4. Disconnect connectors and cables.

↓

5. Remove starter.

↓

6. Remove pitching stopper and bracket.

↓

AT model

7. Separate torque converter from drive plate.
8. Remove ATF level gauge.

↓

9. Remove transmission connector bracket.

↓

10. Set special tools.

↓

11. Remove bolt which holds right upper side of transmission to engine.

↓

12. Remove exhaust system.
- Front exhaust pipe
- Center exhaust pipe
- Rear exhaust pipe [AWD]

↓

AT model

13. Drain ATF to remove drain plug.
14. Disconnect ATF cooler hose from pipe on transmission side, and remove ATF supply pipe.

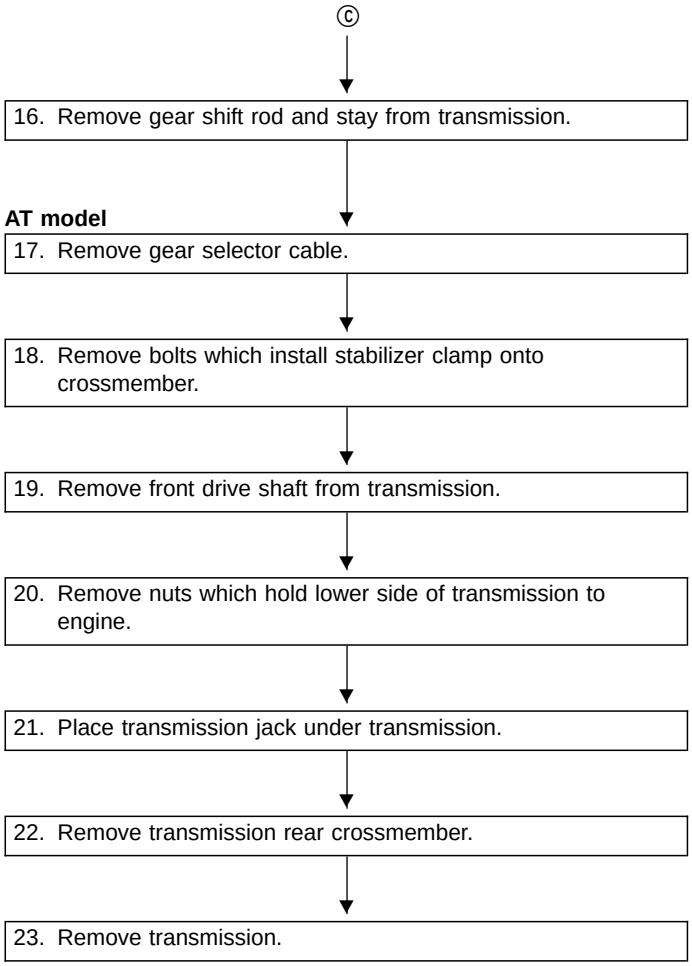
↓

AWD model

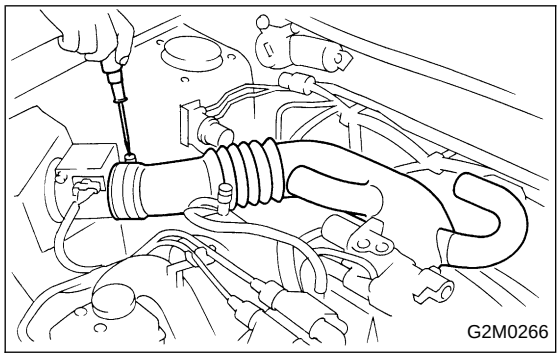
15. Remove propeller shaft.

↓

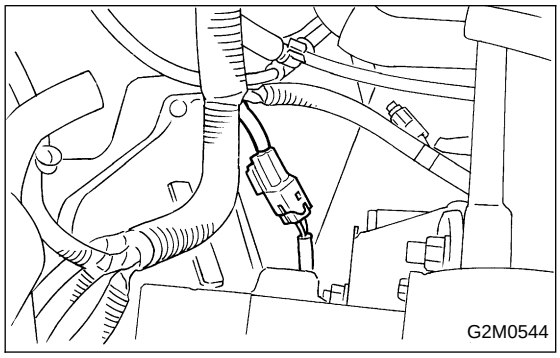
Ⓒ


Ⓒ
16. Remove gear shift rod and stay from transmission.
AT model
17. Remove gear selector cable.
18. Remove bolts which install stabilizer clamp onto crossmember.
19. Remove front drive shaft from transmission.
20. Remove nuts which hold lower side of transmission to engine.
21. Place transmission jack under transmission.
22. Remove transmission rear crossmember.
23. Remove transmission.

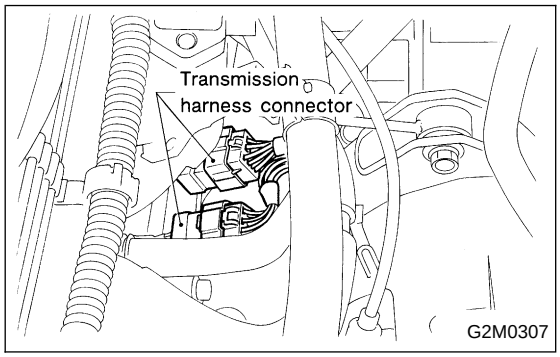
1) Open front hood fully, and support with stay.
2) Disconnect battery ground terminal.


G2M0266

3) Remove air intake duct.

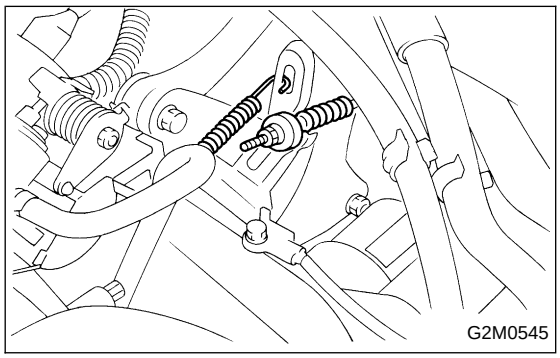

G2M0544

4) Disconnect connectors and cables.
   (1) Disconnect the following connectors.
   - Oxygen sensor

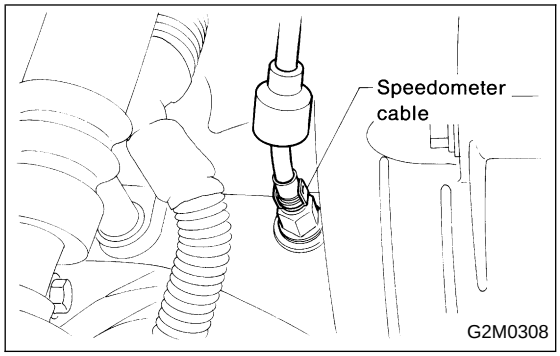


G2M0307

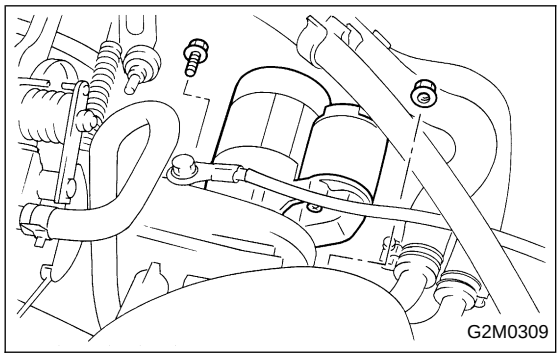
   - Transmission harness connector
   - Transmission ground terminal


G2M0545

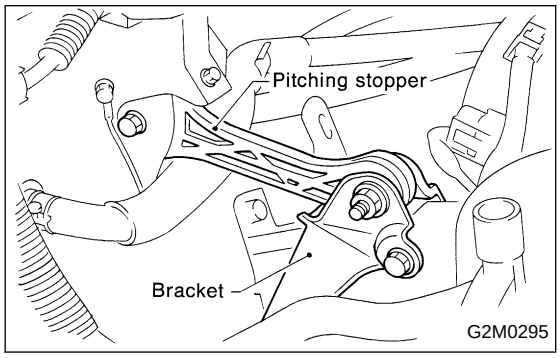
   (2) Disconnect the following cables.
   - Clutch release spring
   - Clutch cable
   - Hill holder cable



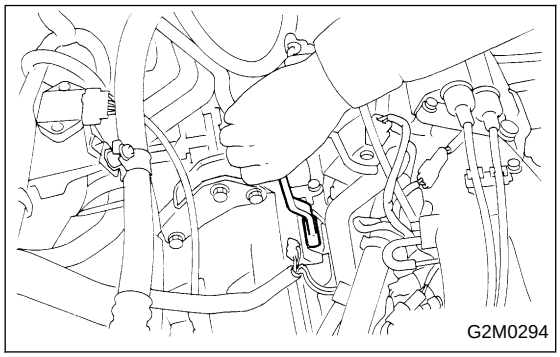
- Speedometer cable



5) Remove starter.
   (1) Disconnect connectors and terminal from starter.
   (2) Remove bolt which installs upper side of starter.
   (3) Remove nut which installs lower side of starter, and remove starter from transmission.



6) Remove pitching stopper.



7) Separate torque converter from drive plate. (AT model)
   (1) Remove service hole plug.
   (2) Remove bolts which hold torque converter to drive plate.
   (3) While rotating the engine, remove other bolts using ST.

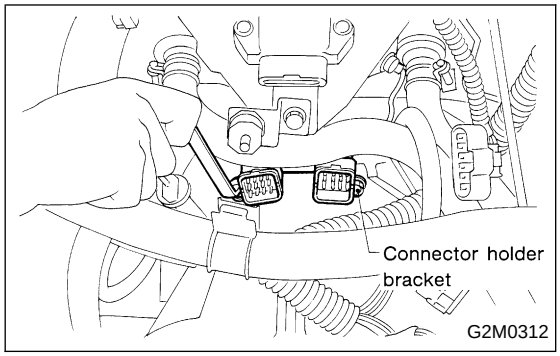
ST 499977000 CRANK PULLEY WRENCH

CAUTION:
Be careful not to drop bolts into torque converter housing.

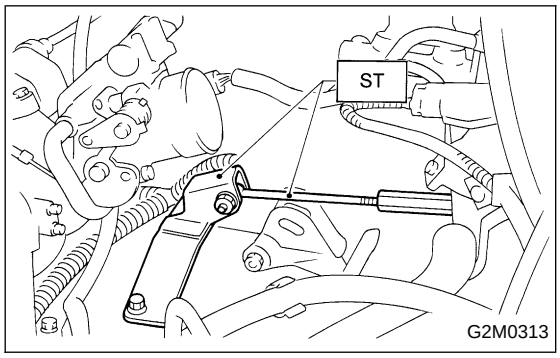
8) Remove ATF level gauge. (AT model)

CAUTION:

Plug opening to prevent entry of foreign particles into transmission fluid.



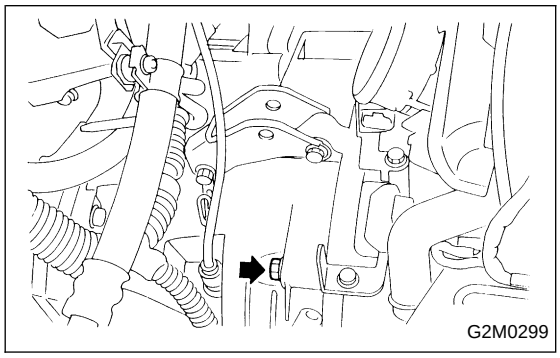
9) Remove transmission connector holder bracket.



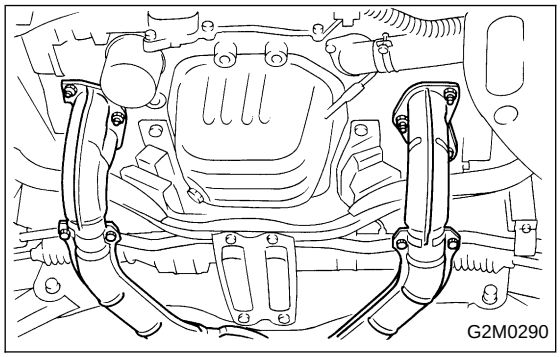
10) Set special tool.

ST 41099AA000 ENGINE SUPPORT ASSY

NOTE:
Also available is Part No. 927670000.



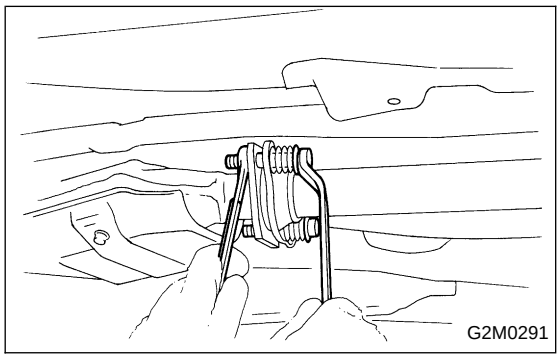
11) Remove bolt which holds right upper side of transmission to engine.



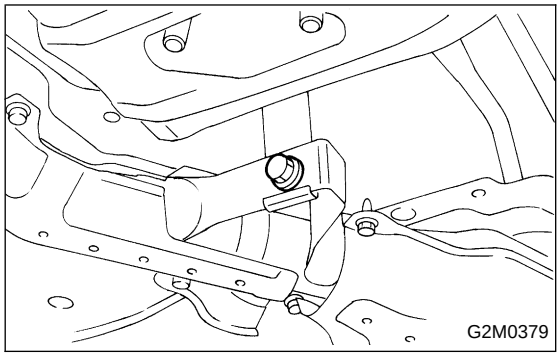
12) Remove exhaust system.

(1) Lift up the vehicle.

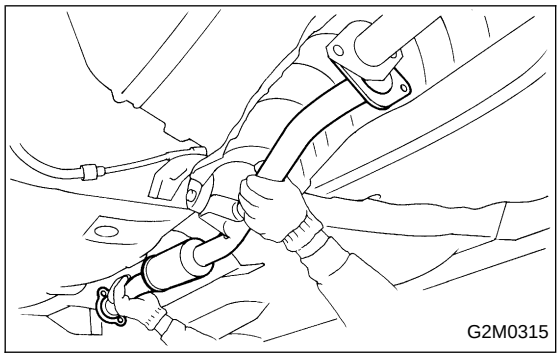
(2) Remove nuts which install front exhaust pipe onto engine.



(3) Separate center exhaust pipe from rear exhaust pipe.

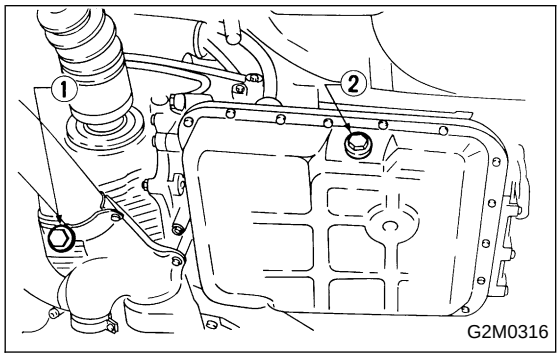


(4) Remove bolt which installs center exhaust pipe to hunger bracket.

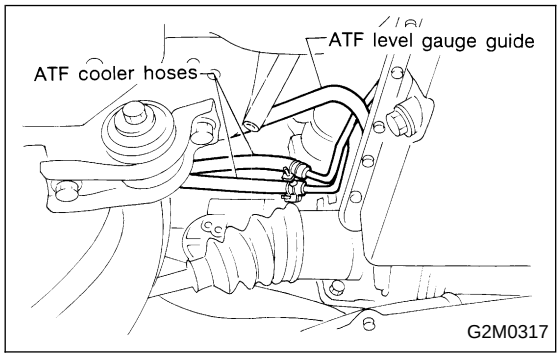


(5) Remove rear exhaust pipe. (AWD model)

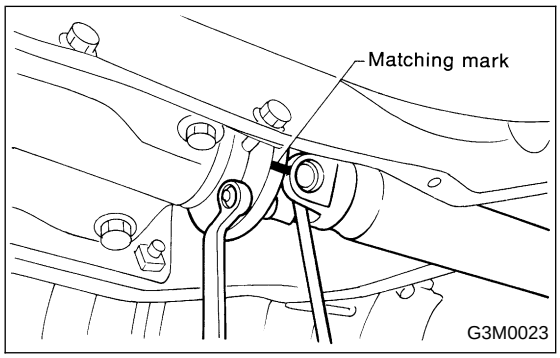
CAUTION:
When removing exhaust pipes, be careful each exhaust pipe does not drop out.



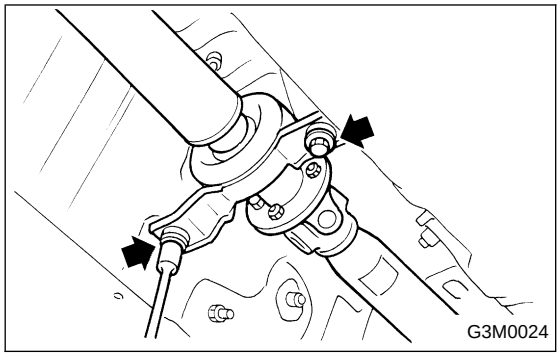
13) Drain ATF to remove drain plug. (AT model)
① Front differential oil drain plug
② ATF drain plug



14) Disconnect ATF cooler hoses from pipes of transmission side and ATF supply pipe. (AT model)



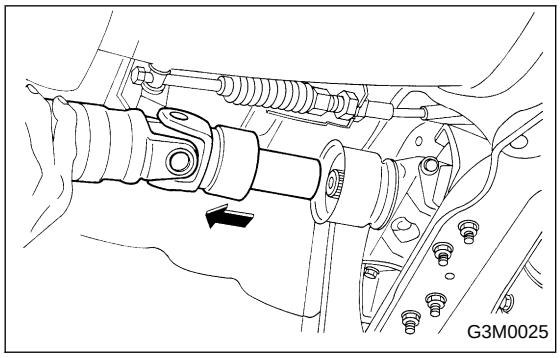
15) Remove propeller shaft. (AWD model)
(1) Remove front cover of rear differential mount.
(2) Separate propeller shaft from rear differential.



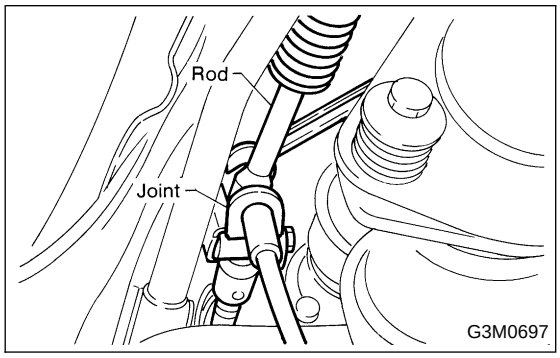
(3) Remove bolts which hold center bearing onto body.

CAUTION:
Be careful not to drop propeller shaft.

(4) Remove propeller shaft from transmission.

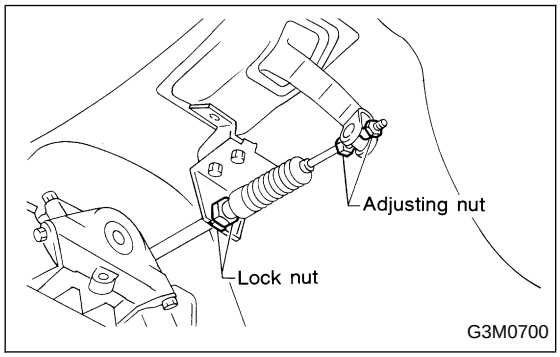


CAUTION:
● Be sure to use an empty container to catch oil flowing out when removing propeller shaft.
● Be sure not to damage oil seals and the frictional surface of sleeve yoke.
● Be sure to plug the opening in transmission after removal of propeller shaft.



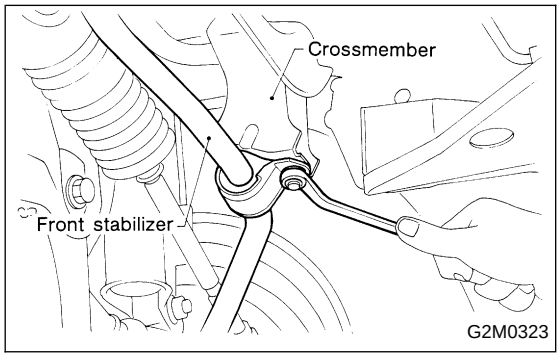
16) Remove gear shift rod and stay from transmission. (MT model)

(1) Remove spring.
(2) Disconnect stay from transmission.
(3) Disconnect rod from transmission.

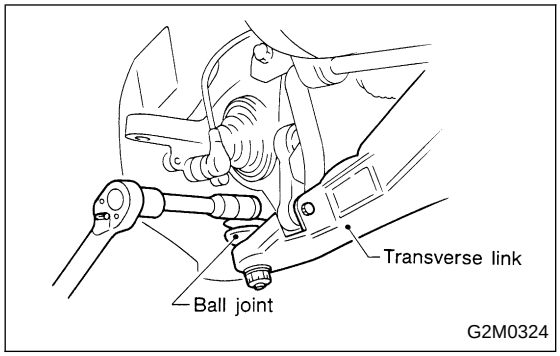


17) Remove shift selector cable. (AT model)

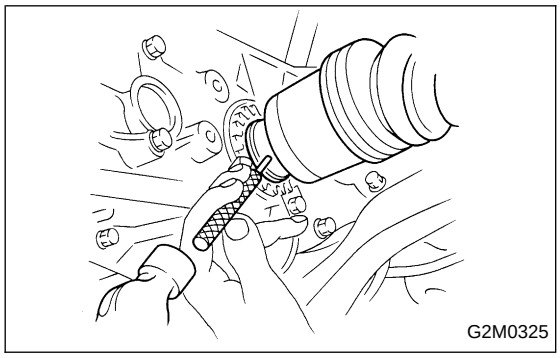
(1) Disconnect shift selector cable from selector lever.
(2) Remove cable bracket from selector lever assembly.



18) Remove bolts which install stabilizer clamp onto crossmember.

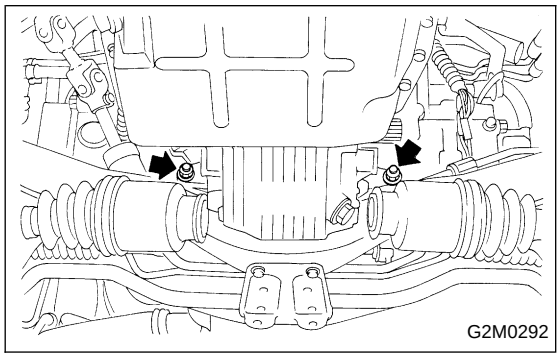


19) Remove front drive shaft from transmission.
(1) Remove transverse link from housing.
(2) Lower transverse link.

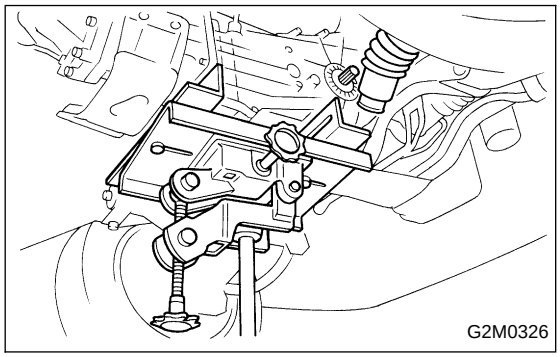


(3) Remove spring pin and separate front drive shaft from each side of the transmission.

CAUTION:
Discard removing spring pin. Replace with a new one.

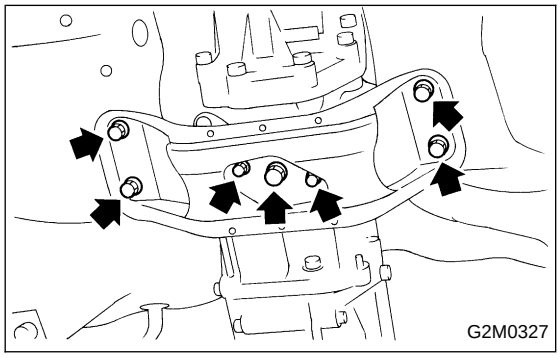


20) Remove nuts which hold lower side of transmission to engine.



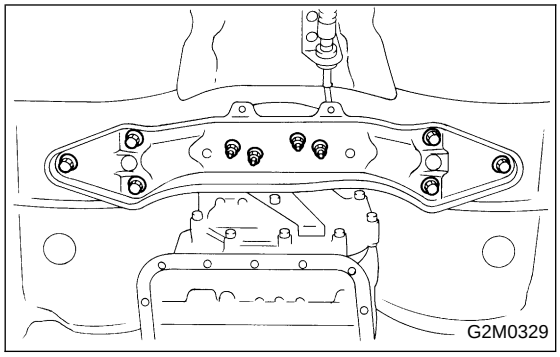
21) Place transmission jack under transmission.

CAUTION:
Always support transmission case with a transmission jack.



22) Remove transmission rear crossmember.

- **MT model**



● **AT model**

23) Remove transmission.

CAUTION:
● Move transmission jack toward rear until mainshaft is withdrawn from clutch cover. (MT model)
● Move transmission and torque converter as a unit away from engine. (AT model)

B: INSTALLATION

1. Install transmission to engine.
2. Install transmission rear crossmember.
3. Take off transmission jack.
4. Tighten nuts which hold lower side of transmission to engine.
5. Tighten bolt which holds right upper side of transmission to engine.

AT model

6. Install torque converter to drive plate.
7. Remove special tools.
8. Install pitching stopper and bracket.
9. Install front drive shaft into transmission.
10. Install stabilizer clamp onto front crossmember.
11. Install gear shift rod and stay.

Ⓓ

Ⓓ

AT model

12. Install gear selector cable to gear selector lever.
13. Install ATF supply pipe, and connect ATF cooler hose to pipe.

AWD model

14. Install propeller shaft.

15. Install exhaust system.
- Rear exhaust pipe [AWD]
- Front exhaust pipe
- Center exhaust pipe

16. Install transmission connector holder bracket.

AT model

17. Install ATF level gauge.

18. Connect connectors and cables.

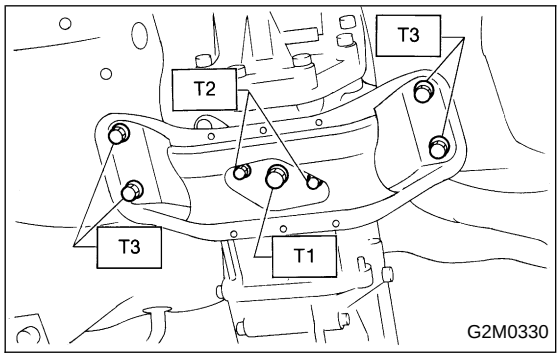
19. Install starter.

20. Install air intake system.

21. Connect battery ground cable.
22. Fill ATF. [AT]
23. Check selector lever operation. [AT]
24. Take off the vehicle from lift arm.
25. Check the vehicle on the road tester. [AT]

1) Install transmission onto engine.
(1) Gradually raise transmission with transmission jack.
(2) Engage them at splines.

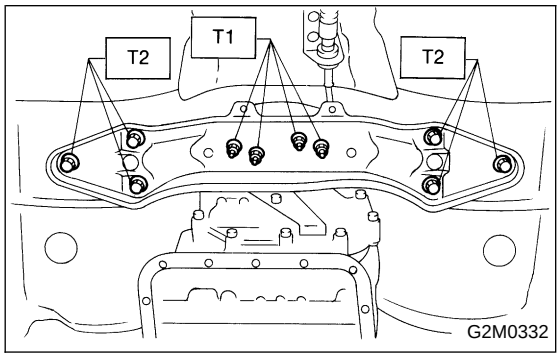
CAUTION:
Be careful not to strike mainshaft against clutch cover. (MT model)



2) Install transmission rear crossmember.

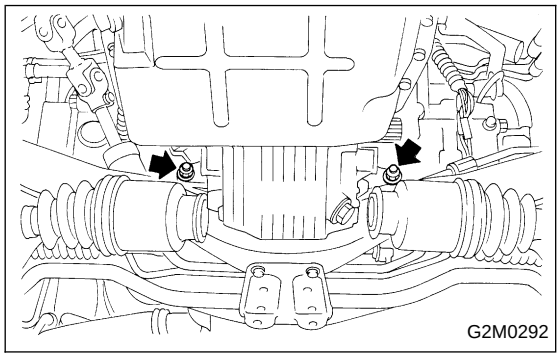
- **MT model**

Tightening torque:
T1: 23 — 26 N·m (2.3 — 2.7 kg-m, 17 — 20 ft-lb)
T2: 27 — 47 N·m (2.8 — 4.8 kg-m, 20 — 35 ft-lb)
T3: 54 — 83 N·m (5.5 — 8.5 kg-m, 40 — 61 ft-lb)



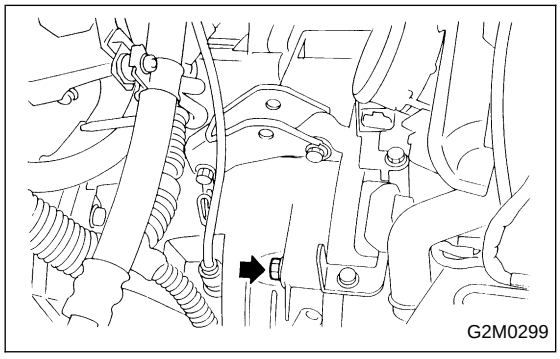
- **AT model**

Tightening torque:
T1: 13 — 23 N·m (1.3 — 2.3 kg-m, 9 — 17 ft-lb)
T2: 54 — 83 N·m (5.5 — 8.5 kg-m, 40 — 61 ft-lb)



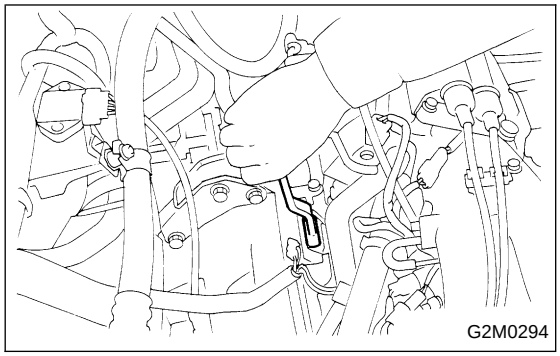
3) Take off transmission jack.
4) Tighten nuts which hold lower side of transmission to engine.

Tightening torque:
46 — 54 N·m (4.7 — 5.5 kg-m, 34 — 40 ft-lb)



5) Tighten bolt which holds right upper side of transmission to engine.

Tightening torque:
46 — 54 N·m (4.7 — 5.5 kg-m, 34 — 40 ft-lb)



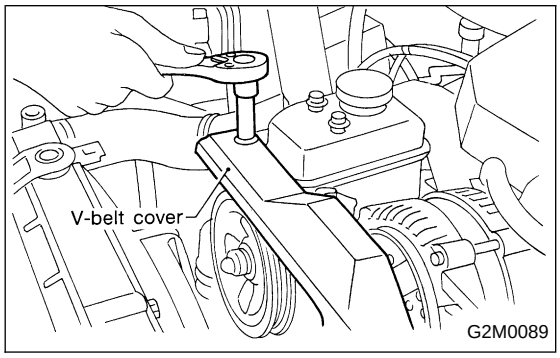
6) Install torque converter to drive plate. (AT model)
(1) Tighten bolts which hold torque converter to drive plate.
(2) Tighten other bolts while rotating the engine by using ST.

ST 499977000 CRANK PULLEY WRENCH

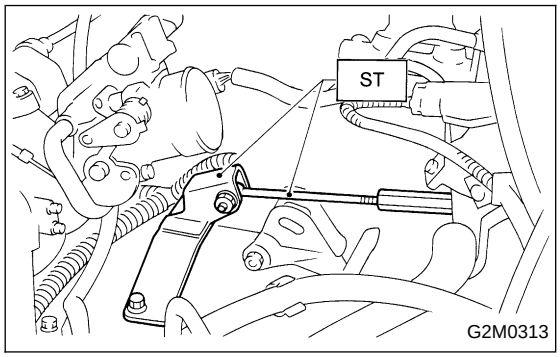
CAUTION:
Be careful not to drop bolts into torque converter housing.

Tightening torque:
23 — 26 N·m (2.3 — 2.7 kg-m, 17 — 20 ft-lb)

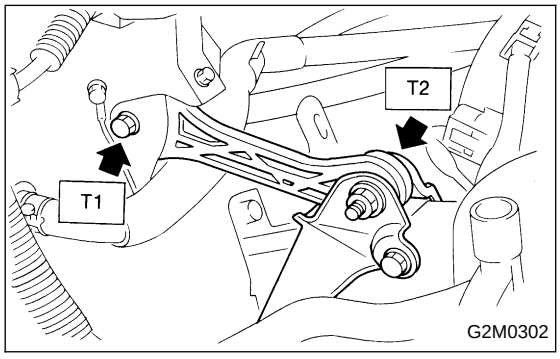
(3) Clog plug onto service hole.



(4) Install V-belt cover.

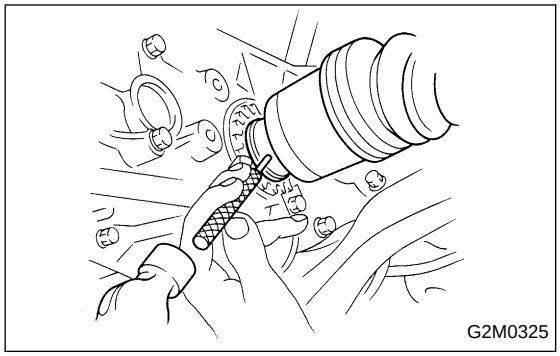


7) Remove special tool.



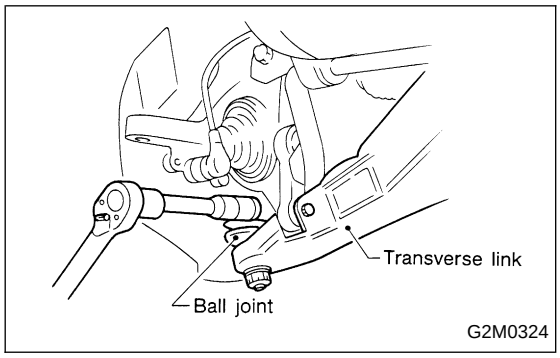
8) Install pitching stopper.

Tightening torque:
T1: 44 — 54 N·m (4.5 — 5.5 kg-m, 33 — 40 ft-lb)
T2: 47 — 67 N·m (4.8 — 6.8 kg-m, 35 — 49 ft-lb)


G2M0325

9) Install front drive shaft into transmission.
(1) Lift up the vehicle.
(2) Install front drive shaft into transmission.
(3) Drive spring pin into chamfered hole of drive shaft.

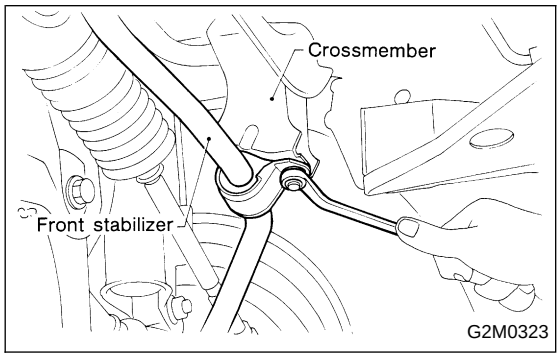
CAUTION:
Always use a new spring pin.



G2M0324

(4) Install ball joint of lower arm into knuckle arm of housing, and tighten installing bolt.

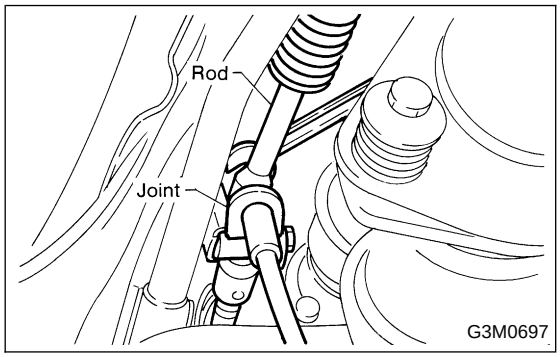
Tightening torque:
25 — 29 N·m (2.5 — 3.0 kg-m, 18 — 22 ft-lb)



G2M0323

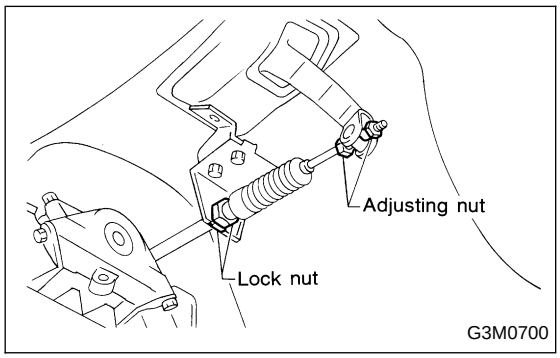
10) Install stabilizer clamp onto front crossmember.

Tightening torque:
21 — 28 N·m (2.1 — 2.9 kg-m, 15 — 21 ft-lb)



G3M0697

11) Install gear shift rod and stay. (MT model)
(1) Install gear shift rod onto transmission.
(2) Install stay onto transmission.
(3) Install spring.

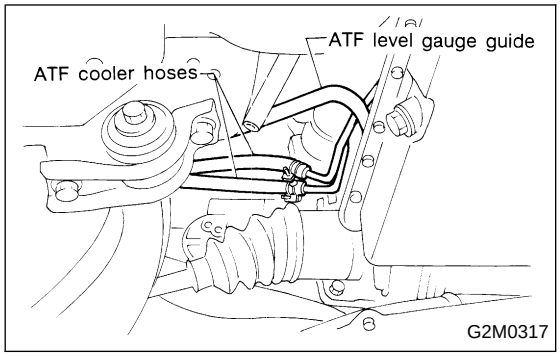


G3M0700

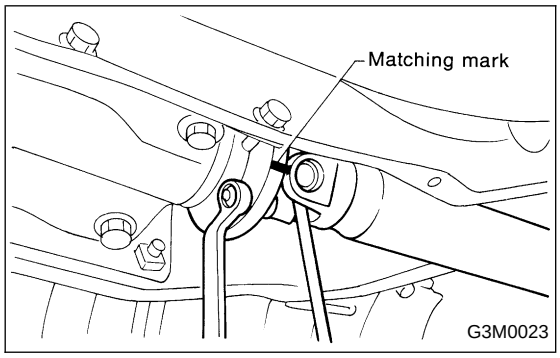
12) Install shift selector cable onto selector cable. (AT model)
(1) Install selector cable into selector lever.
(2) Install cable bracket onto selector lever assembly.

Tightening torque:
13 — 23 N·m (1.3 — 2.3 kg-m, 9 — 17 ft-lb)

NOTE:
Tighten selector cable adjusting and lock nut after checking selector lever operation [step. 23)].

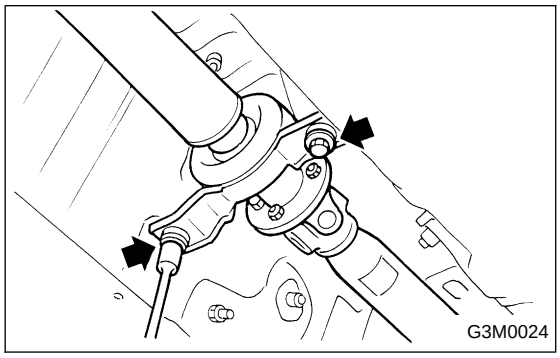


13) Install ATF supply pipe, and ATF cooler hose onto pipe. (AT model)



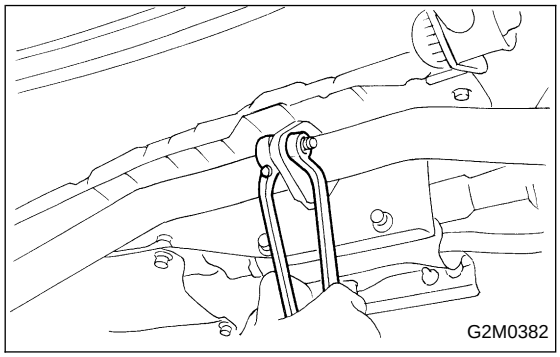
14) Install propeller shaft. (AWD model)
(1) Install propeller shaft into transmission.
(2) Tighten bolts which install propeller shaft onto companion flange of rear differential.

Tightening torque:
24 — 39 N·m (2.4 — 4.0 kg-m, 17 — 29 ft-lb)



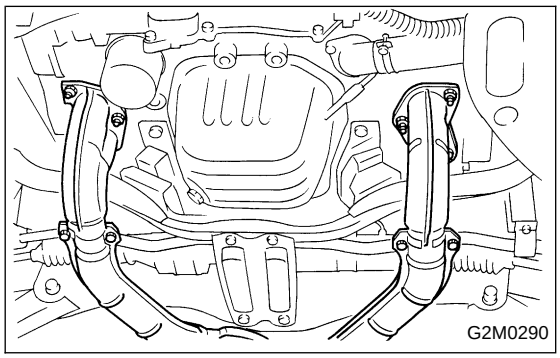
(3) Install center bearing bracket on body.

Tightening torque:
47 — 57 N·m (4.8 — 5.8 kg-m, 35 — 42 ft-lb)



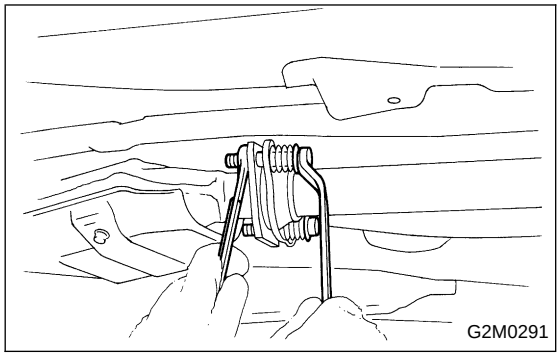
15) Install exhaust system.
(1) Install rear exhaust pipe to muffler. (AWD model)

Tightening torque:
43 — 53 N·m (4.4 — 5.4 kg-m, 32 — 40 ft-lb)



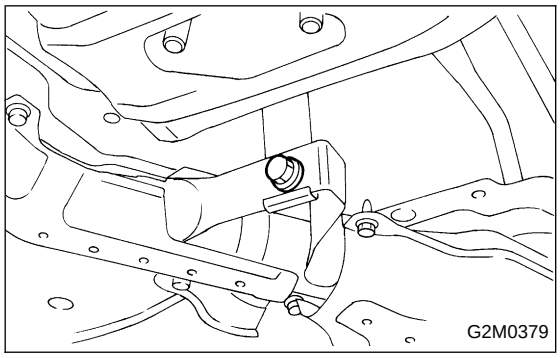
(2) Install front exhaust pipe onto engine.

Tightening torque:
25 — 35 N·m (2.5 — 3.6 kg-m, 18 — 26 ft-lb)



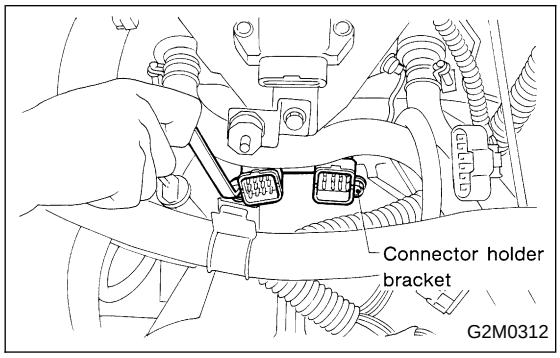
(3) Install center exhaust pipe to rear exhaust pipe.

Tightening torque:
13 — 23 N·m (1.3 — 2.3 kg-m, 9 — 17 ft-lb)



(4) Tighten bolt which installs center exhaust pipe to hunger bracket.

Tightening torque:
25 — 35 N·m (2.5 — 3.6 kg-m, 18 — 26 ft-lb)

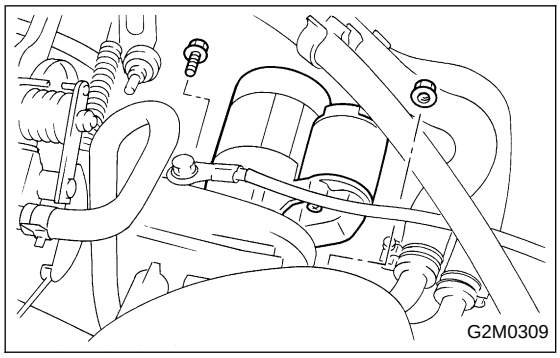


16) Install transmission connector holder bracket.

17) Install ATF level gauge. (AT model)

18) Connect connectors and cables.
(1) Connect the following connectors.
- Transmission harness connectors
- Transmission ground terminal
- Oxygen sensor connector

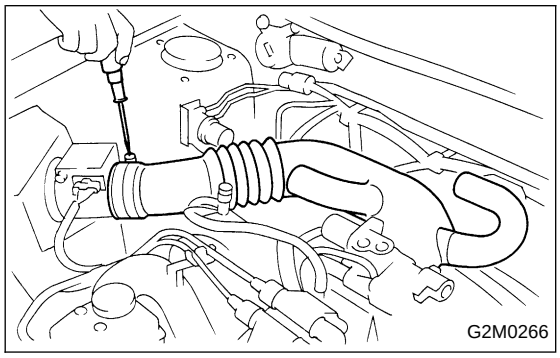
(2) Connect the following cables.
- Speedometer cable
- Cruise control cable
- Clutch cable
- Hill holder cable


G2M0309

19) Install starter.

(1) Install starter onto transmission case, and connect connectors and terminals.
(2) Tighten bolt and nut which install starter onto transmission.

Tightening torque:
46 — 54 N·m (4.7 — 5.5 kg-m, 34 — 40 ft-lb)


G2M0266

20) Install air intake system.

(1) Install air intake duct.
(2) Connect connector to mass air flow sensor.

21) Connect battery ground cable.
22) Fill ATF. (AT model)
<Ref. to 3-2 [W2A0].>
23) Check selector lever operation. (AT model)
<Ref. to 3-3 [W2E0].>
24) Take off vehicle from lift arms.
25) Check the vehicle on road tester. (AT model)
<Ref. to 3-2 [W300].>

MANUAL TRANSMISSION AND DIFFERENTIAL 3-1

1. Manual Transmission and Differential

A: SPECIFICATIONS

Item			Model	
			FWD	AWD
			1800 cc	
Type			5-forward speeds with synchromesh and 1-reverse	
Transmission gear ratio		1st	3.545	
		2nd	2.111	
		3rd	1.448	
		4th	1.088	
		5th	0.825	
		Reverse	3.416	
Front reduction gear	Final	Type of gear	Hypoid	
		Gear ratio	3.700	3.900
Rear reduction gear	Transfer	Type of gear	—	Helical
		Gear ratio	—	1.000
	Final	Type of gear	—	Hypoid
		Gear ratio	—	3.900
Front differential	Type and number of gear		Straight bevel gear (Bevel pinion: 2, Bevel gear: 2)	
Center differential	Type and number of gear		—	Straight bevel gear (Bevel pinion: 2, Bevel gear: 2 and viscous coupling)
Transmission gear oil			GL-5	
Transmission oil capacity			3.3 ℓ (3.5 US qt, 2.9 Imp qt)	4.0 ℓ (4.2 US qt, 3.5 Imp qt)

B: SERVICE DATA

1. EXTENSION (AWD Model)

Snap ring (Inner-72) to ball bearing side clearance:
0 — 0.15 mm (0 — 0.0059 in)

Snap ring (Inner-72)	
Part No.	Thickness mm (in)
805172071	1.78 (0.0701)
805172072	1.90 (0.0748)
805172073	2.02 (0.0795)

Snap ring (Outer-30) to ball bearing side clearance:
0 — 0.15 mm (0 — 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)

2. EXTENSION ASSEMBLY (AWD Model)

Thrust washer (52 x 61 x T) to ball bearing side clearance:
0.05 — 0.30 mm (0.0020 — 0.0118 in)

Thrust washer (52 x 61 x t)	
Part No.	Thickness mm (in)
803052021	0.50 (0.0197)
803052022	0.75 (0.0295)
803052023	1.00 (0.0394)

3. TRANSFER CASE OR REAR CASE

Neutral position adjustment

Adjustment shim	
Part No.	Thickness mm (in)
32190AA000	0.15 (0.0059)
32190AA010	0.30 (0.0118)

Reverse accent shaft (AWD Model)		
Part No.	Mark	Remarks
32188AA020	A	Neutral position is closer to 1st gear.
32188AA002	No mark or B	Standard
32188AA030	C	Neutral position is closer to reverse gear.

Reverse accent shaft (FWD Model)		
Part No.	Mark	Remarks
32188AA020	A	Neutral position is closer to 1st gear.
32188AA002	No mark or B	Standard
32188AA030	C	Neutral position is closer to reverse gear.

Reverse checking plate adjustment

Reverse checking 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.

4. REVERSE IDLER GEAR (AWD Model)

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
32820AA000	0	Further from case wall
32820AA010	No mark	Standard
32820AA020	2	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 x 26 x 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)		

5. REVERSE IDLER GEAR (FWD Model)

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
32820AA000	0	Further from case wall
32820AA010	No mark	Standard
32820AA020	2	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 x 26 x 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)		

6. SHIFTER FORK AND ROD (AWD Model)

Select suitable shifter forks so that both coupling sleeve and reverse driven gear are positioned in the center of their synchro-mesh mechanisms.

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
32810AA060	1	Approach to 4th gear by 0.2 mm (0.008 in)
32810AA070	No mark	Standard
32810AA100	3	Approach to 3rd gear by 0.2 mm (0.008 in)

5th shifter fork		
Part No.	Mark	Remarks
32812AA060	1	Approach to 5th gear by 0.2 mm (0.008 in)
32812AA070	No mark	Standard
32812AA100	3	Become distant from 5th gear by 0.2 mm (0.008 in)

Rod end clearance
A: 1st-2nd — 3rd-4th
0.5 — 1.5 mm (0.020 — 0.059 in)
B: 3rd-4th — 5th
0.6 — 1.4 mm (0.024 — 0.055 in)

7. SHIFTER FORK AND ROD (FWD Model)

Select suitable shifter forks so that both coupling sleeve and reverse driven gear are positioned in the center of their synchro-mesh mechanisms.

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
32810AA060	1	Approach to 4th gear by 0.2 mm (0.008 in)
32810AA070	No mark	Standard
32810AA100	3	Approach to 3rd gear by 0.2 mm (0.008 in)

5th shifter fork		
Part No.	Mark	Remarks
32812AA060	1	Approach to 5th gear by 0.2 mm (0.008 in)
32812AA070	No mark	Standard
32812AA100	3	Become distant from 5th gear by 0.2 mm (0.008 in)

Rod end clearance
A: 1st-2nd — 3rd-4th
0.5 — 1.5 mm (0.020 — 0.059 in)
B: 3rd-4th — 5th
0.6 — 1.4 mm (0.024 — 0.055 in)

8. TRANSMISSION CASE ASSEMBLY (AWD Model)

Drive pinion shim adjustment

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)

Hypoid gear backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)
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)	32294AA040	1
3.87 — 3.99 (0.1524 — 0.1571)	32294AA050	2

9. TRANSMISSION CASE ASSEMBLY (FWD Model)

Drive pinion shim adjustment

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)

Hypoid gear backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)
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)	32294AA040	1
3.87 — 3.99 (0.1524 — 0.1571)	32294AA050	2

10. DRIVE PINION ASSEMBLY (AWD Model)

Preload adjustment of thrust bearing:
Starting torque
0.3 — 0.8 N·m (3 — 8 kg-cm, 2.6 — 6.9 in-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)

Assemble a driven shaft and 1st driven gear that are selected for the proper radial clearance adjustment.

Driven shaft		1st driven gear
Part No.	Diameter A mm (in)	Part No.
32229AA130	49.959 — 49.966 (1.9669 — 1.9672)	32231AA270
32229AA120	49.967 — 49.975 (1.9672 — 1.9675)	32231AA260

11. CENTER DIFFERENTIAL

Snap ring (Inner-110) to center differential case clearance:
0 — 0.15 mm (0 — 0.0059 in)

Snap ring (Inner-110)	
Part No.	Thickness mm (in)
805100061	2.10 (0.0827)
805100062	2.21 (0.0870)
805100063	2.32 (0.0913)

Backlash adjustment axial movement:
0.62 — 0.86 mm (0.0244 — 0.0339 in)

Adjusting washer (45 x 62 x t)	
Part No.	Thickness mm (in)
803045041	1.60 (0.0630)
803045042	1.80 (0.0709)
803045043	2.00 (0.0787)
803045044	2.20 (0.0866)
803045045	2.40 (0.0945)

12. FRONT DIFFERENTIAL (AWD Model)

Bevel gear to pinion backlash
0.13 — 0.18 mm (0.0051 — 0.0071 in)

Washer (38.1 x 50 x 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)

13. FRONT DIFFERENTIAL (FWD Model)

Bevel gear to pinion backlash
0.13 — 0.18 mm (0.0051 — 0.0071 in)

Washer (38.1 x 50 x 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)

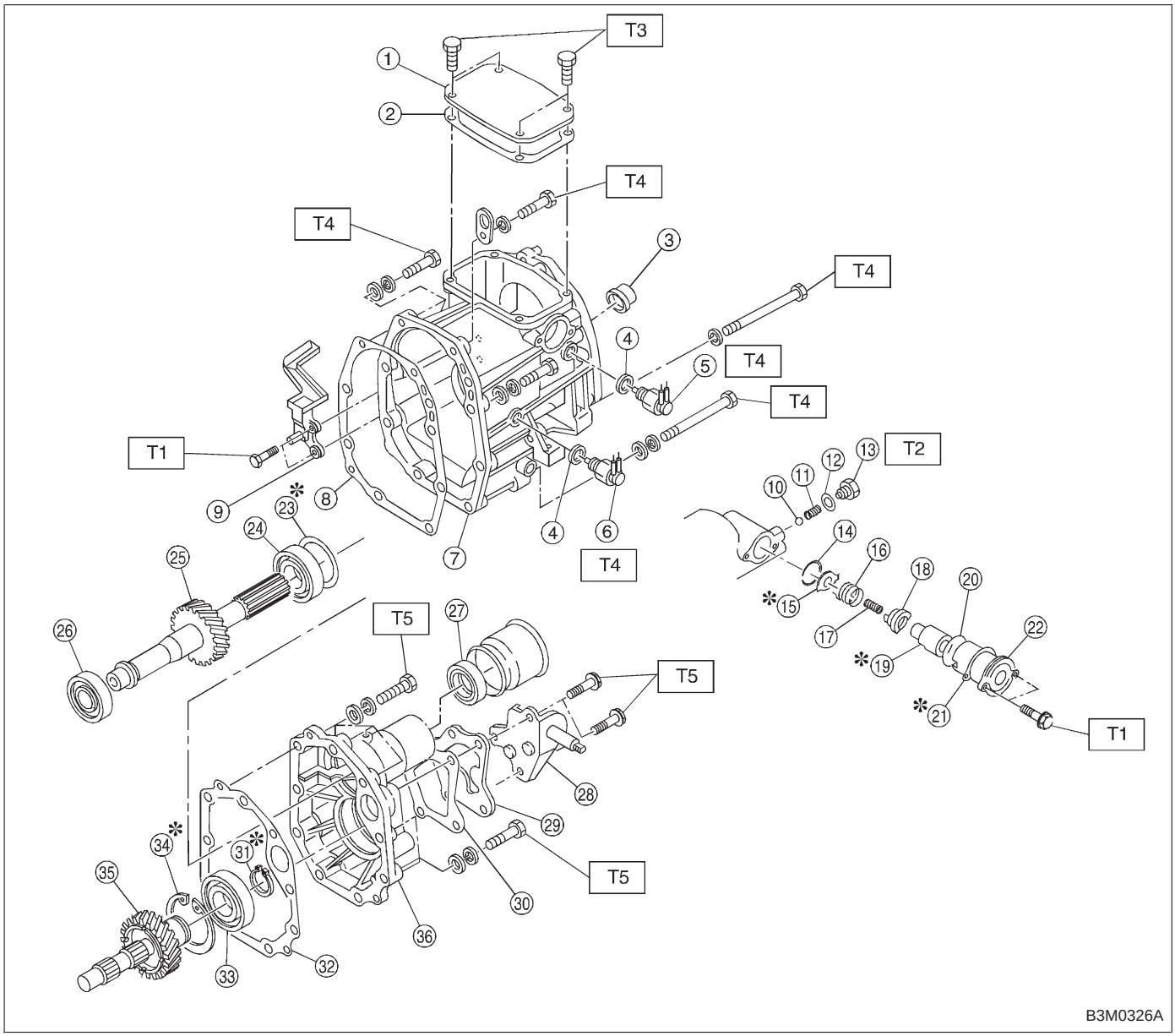
14. DRIVE PINION ASSEMBLY (FWD Model)

Selection of 1st driven gear

1st driven gear	
Outer diameter of bushing mm (in)	Part No.
41.983 — 41.996 (1.6529 — 1.6534)	32231AA320
41.968 — 41.982 (1.6523 — 1.6528)	32231AA330
41.954 — 41.967 (1.6517 — 1.6522)	32231AA340

1. Transfer Case and Extension

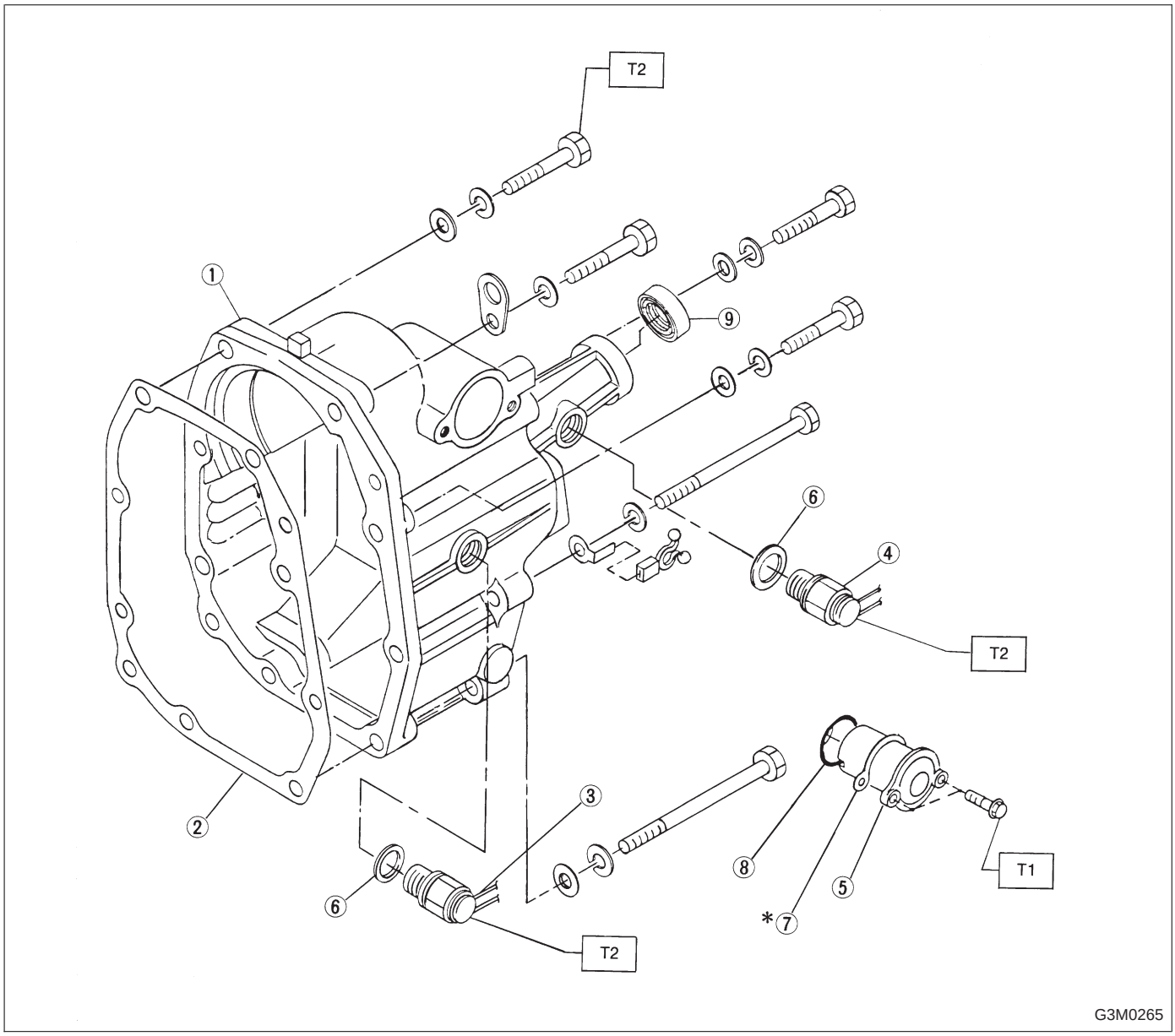
1. AWD MODEL



① Transfer cover
② Cover gasket
③ Oil seal
④ Gasket
⑤ Neutral switch
⑥ Back-up light switch
⑦ Transfer case
⑧ Gasket
⑨ Oil guide
⑩ Ball
⑪ Reverse accent spring
⑫ Gasket
⑬ Plug
⑭ Snap ring (Inner)
⑮ Reverse check plate
⑯ Reverse checking spring
⑰ Reverse return spring
⑱ Reverse checking cam
⑲ Reverse accent shaft
⑳ O-ring
㉑ Adjusting select shim
㉒ Reverse checking sleeve
㉓ Adjusting washer
㉔ Ball bearing
㉕ Transfer driven gear
㉖ Ball bearing
㉗ Oil seal
㉘ Shift bracket
㉙ Extension cover
㉚ Gasket
㉛ Snap ring (Outer-30)
㉜ Gasket
㉝ Ball bearing
㉞ Snap ring (Inner-72)
㉟ Transfer drive gear
㊱ Extension

Tightening torque: N·m (kg-m, ft-lb)
T1: 6 — 7 (0.6 — 0.7, 4.3 — 5.1)
T2: 9 — 11 (0.9 — 1.1, 6.5 — 8.0)
T3: 14.2 — 17.2
(1.45 — 1.75, 10.5 — 12.7)
T4: 23 — 26 (2.3 — 2.7, 17 — 20)
T5: 34 — 40 (3.5 — 4.1, 25 — 30)

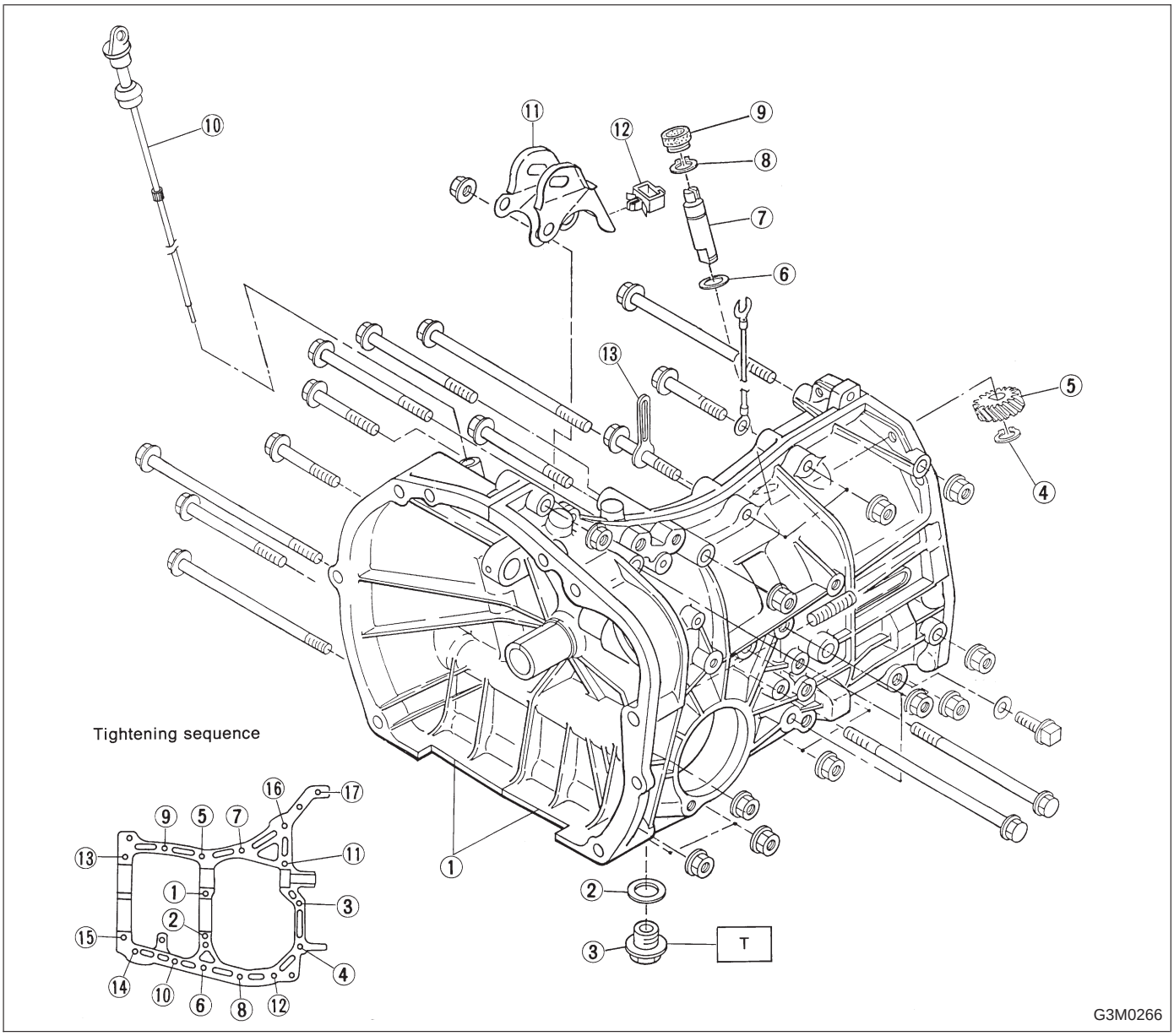
2. Rear Case (FWD Model)



① Rear case
② Case gasket
③ Back-up light switch
④ Neutral switch
⑤ Reverse check sleeve ASSY
⑥ Gasket
⑦ Adjusting shim
⑧ O-ring
⑨ Oil seal

Tightening torque: N·m (kg-m, ft-lb)
T1: 6.4±0.5 (0.65±0.05, 4.7±0.4)
T2: 25±5 (2.5±0.5, 18.1±3.6)

3. Transmission Case



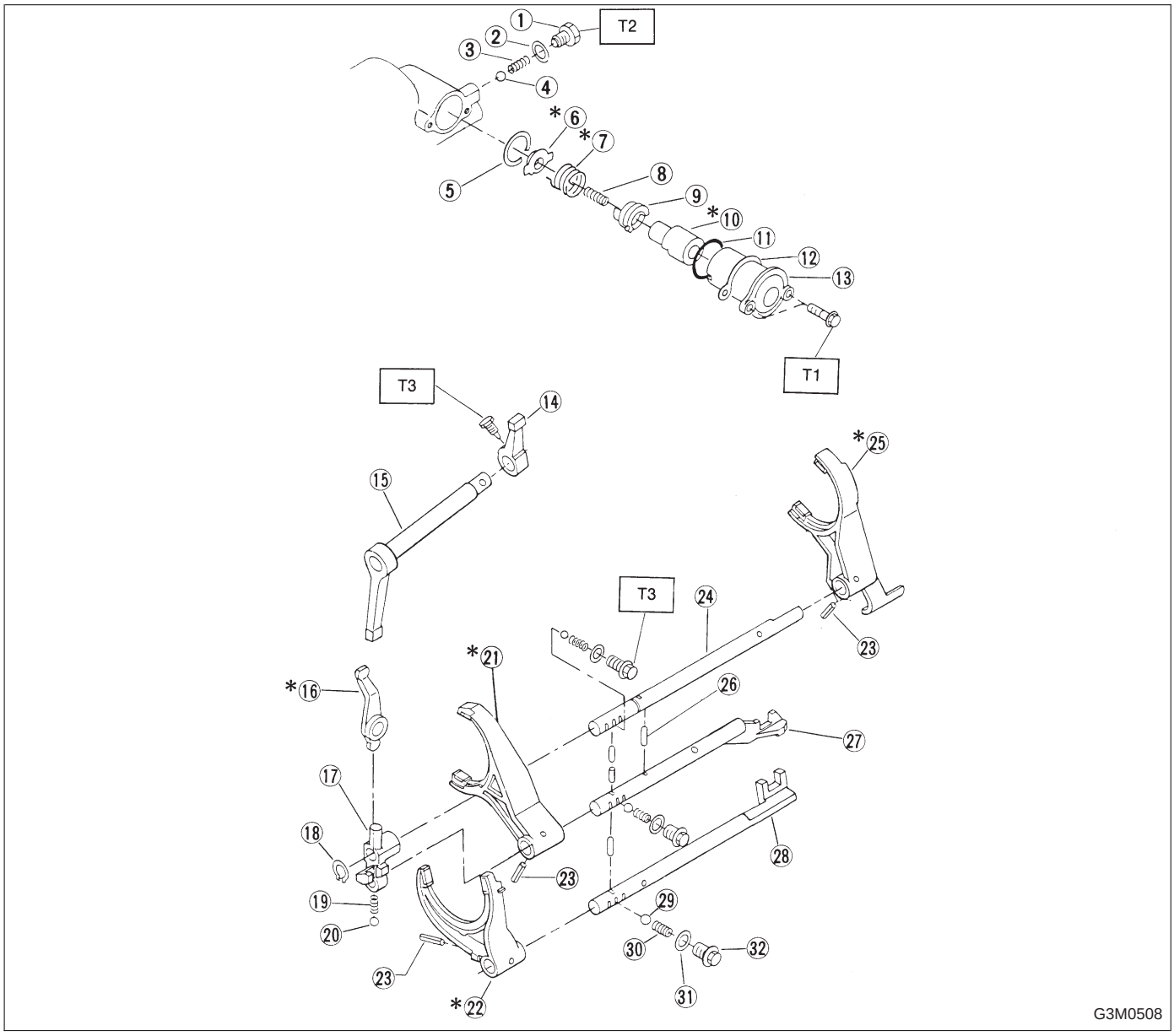
① Transmission case ASSY
② Gasket
③ Drain plug
④ Snap ring (Outer)
⑤ Speedometer driven gear
⑥ Washer
⑦ Speedometer shaft
⑧ Snap ring (Outer)
⑨ Oil seal
⑩ Oil level gauge
⑪ Pitching stopper bracket
⑫ Clamp
⑬ Clip

Tightening torque: N·m (kg-m, ft-lb)
T: 41 — 47 (4.2 — 4.8, 30 — 35)

Size	All models	Torque
8 mm bolt	⑤— ⑮	23 — 26 N·m (2.3 — 2.7 kg-m, 17 — 20 ft-lb)
10 mm bolt	①— ④ ⑯ — ⑰	36 — 42 N·m (3.7 — 4.3 kg-m, 27 — 31 ft-lb)

4. Shifter Fork and Shifter Rod

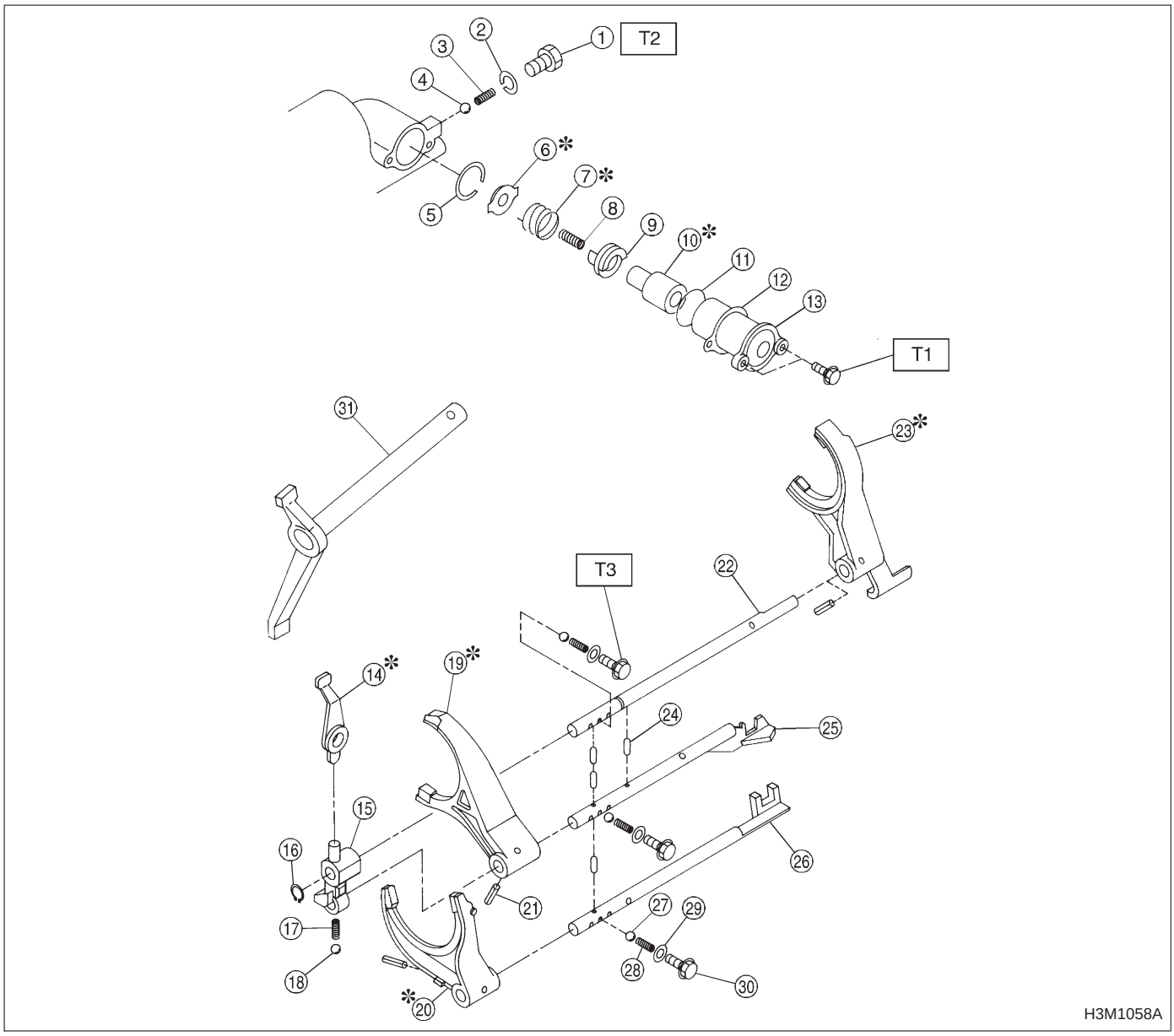
1. AWD MODEL



① Plug
② Gasket
③ Reverse accent spring
④ Ball
⑤ Snap ring (Inner)
⑥ Reverse check plate
⑦ Reverse checking spring
⑧ Reverse return spring
⑨ Reverse checking cam
⑩ Reverse accent shaft
⑪ O-ring
⑫ Adjusting select shim
⑬ Reverse checking sleeve
⑭ Selector arm
⑮ Shifter arm
⑯ Reverse shifter lever
⑰ Reverse fork rod arm
⑱ Snap ring (Outer)
⑲ Spring
⑳ Ball
㉑ 3rd-4th shifter fork
㉒ 1st-2nd shifter fork
㉓ Straight pin
㉔ Reverse fork rod
㉕ 5th shifter fork
㉖ Interlock plunger
㉗ 3rd-4th fork rod
㉘ 1st-2nd fork rod
㉙ Ball
㉚ Checking ball spring
㉛ Gasket
㉜ Checking ball plug

Tightening torque: N·m (kg-m, ft-lb)
T1: 6 — 7 (0.6 — 0.7, 4.3 — 5.1)
T2: 9 — 11 (0.9 — 1.1, 6.5 — 8.0)
T3: 18.1 — 21.1
(1.85 — 2.15, 13.4 — 15.6)

2. FWD MODEL

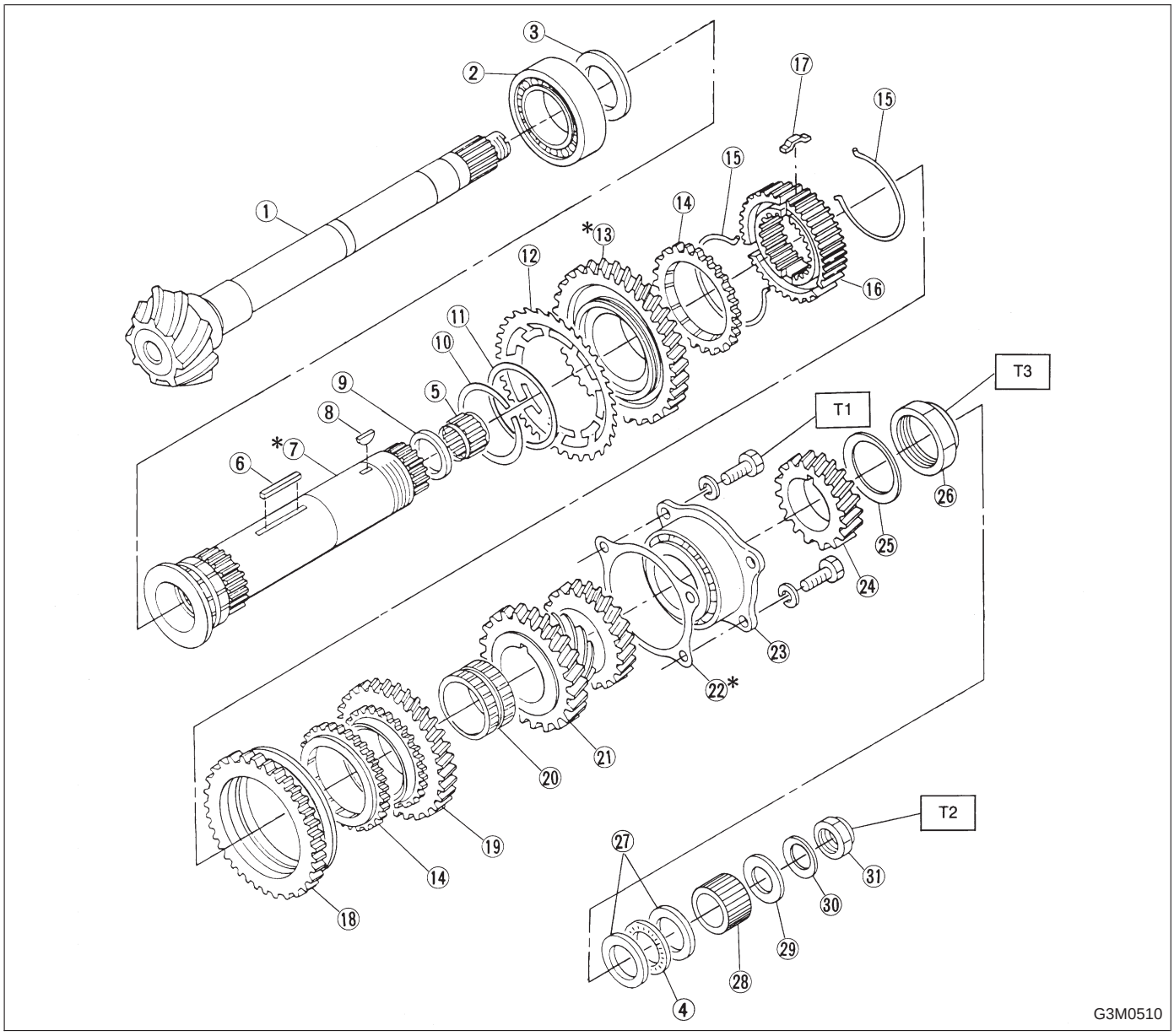


① Plug
② Gasket
③ Reverse accent spring
④ Ball
⑤ Snap ring (Inner)
⑥ Reverse check plate
⑦ Reverse check spring
⑧ Reverse return spring
⑨ Reverse check cam
⑩ Reverse accent shaft
⑪ O-ring
⑫ Adjusting select shim
⑬ Reverse check sleeve
⑭ Reverse shifter lever
⑮ Reverse fork rod arm
⑯ Snap ring (Outer)
⑰ Spring
⑱ Ball
⑲ 3rd-4th shifter fork
⑳ 1st-2nd shifter fork
㉑ Straight pin
㉒ Reverse fork rod
㉓ 5th shifter fork
㉔ Interlock plunger
㉕ 3rd-4th fork rod
㉖ 1st-2nd fork rod
㉗ Ball
㉘ Checking ball spring
㉙ Gasket
㉚ Checking ball plug
㉛ Shifter arm

Tightening torque: N·m (kg-m, ft-lb)
T1: 6.4±0.5 (0.65±0.05, 4.7±0.4)
T2: 10±1 (1.0±0.1, 7.2±0.7)
T3: 19.6±1.5
(2.00±0.15, 14.5±1.1)

5. Drive Pinion Assembly

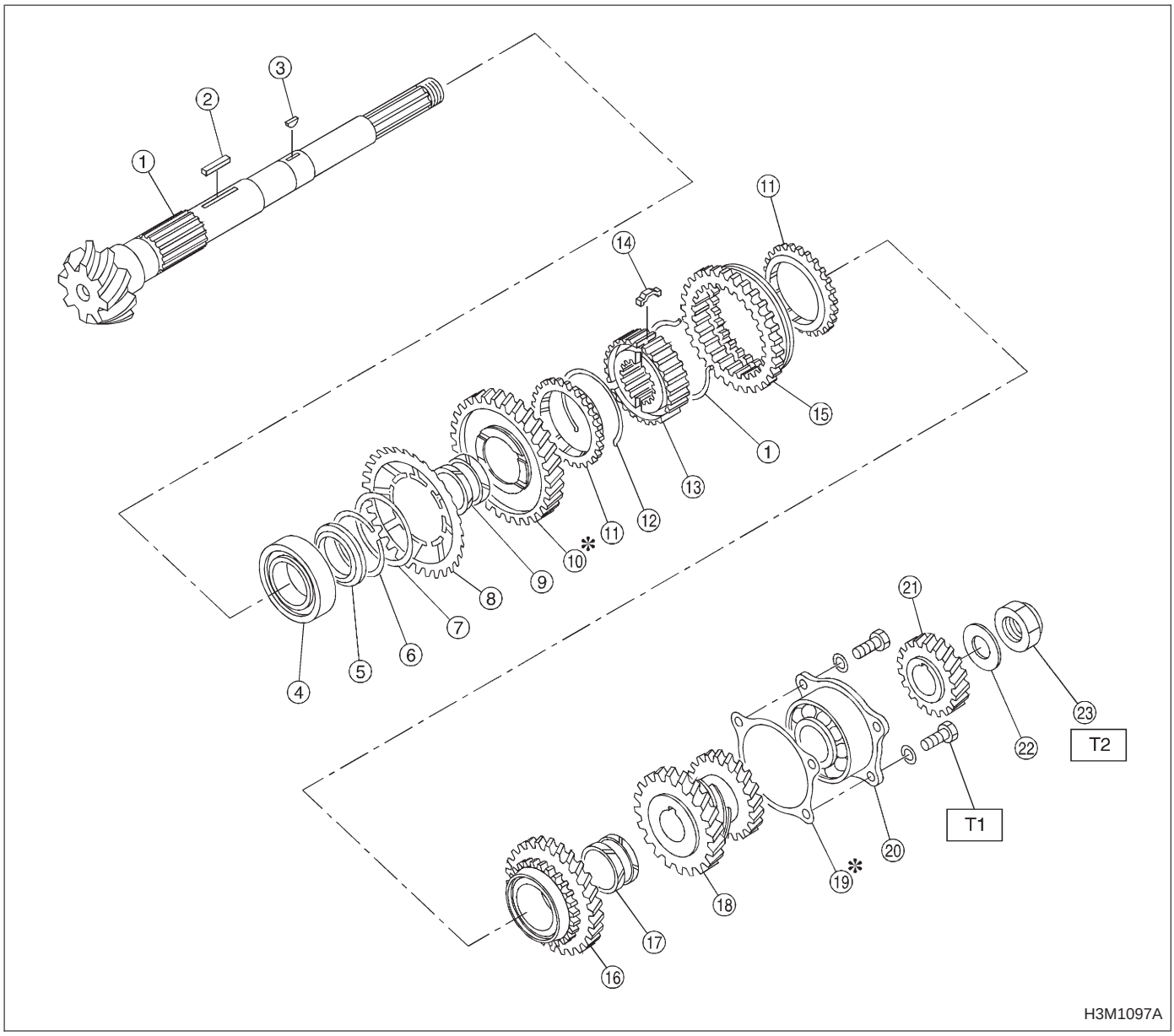
1. AWD MODEL



① Drive pinion shaft
② Roller bearing
③ Washer
④ Thrust bearing
⑤ Needle bearing
⑥ Key
⑦ Driven shaft
⑧ Woodruff key
⑨ Drive pinion collar
⑩ Snap ring (Outer)
⑪ Washer
⑫ Sub gear
⑬ 1st driven gear
⑭ Baulk ring
⑮ Spring
⑯ 1st-2nd synchronizer hub
⑰ Insert
⑱ Reverse driven gear
⑲ 2nd driven gear
⑳ 2nd driven gear bush
㉑ 3rd-4th driven gear
㉒ Drive pinion shim
㉓ Roller bearing
㉔ 5th driven gear
㉕ Lock washer
㉖ Lock nut
㉗ Washer
㉘ Differential bevel gear sleeve
㉙ Washer
㉚ Lock washer
㉛ Lock nut

Tightening torque: N·m (kg-m, ft-lb)
T1: 26 — 32 (2.7 — 3.3, 20 — 24)
T2: 110 — 126
(11.2 — 12.8, 81 — 93)
T3: 235 — 255
(24 — 26, 174 — 188)

2. FWD MODEL

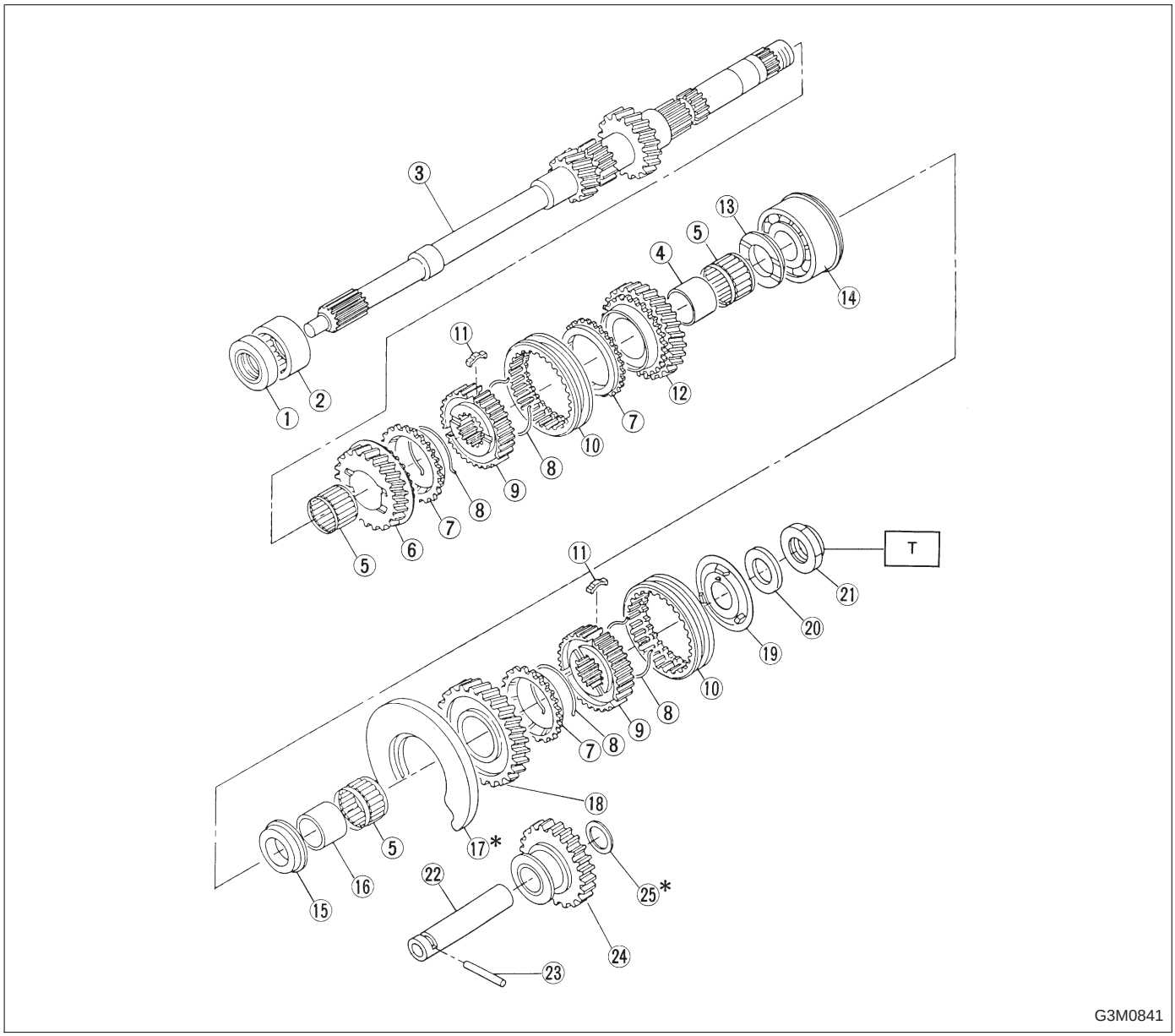


① Drive pinion shaft
② Key
③ Woodruff key
④ Roller bearing
⑤ 1st gear thrust plate
⑥ Snap ring (Outer)
⑦ Washer
⑧ 1st sub gear
⑨ 1st gear bushing
⑩ 1st driven gear
⑪ 1st-2nd baulk ring
⑫ 1st-2nd synchronizer spring
⑬ 1st-2nd synchronizer hub
⑭ 1st-2nd shifting insert
⑮ Reverse driven gear
⑯ 2nd driven gear
⑰ 2nd gear bushing
⑱ 3rd-4th driven gear
⑲ Drive pinion shim
⑳ Ball bearing
㉑ 5th driven gear
㉒ Lock washer
㉓ Lock nut

Tightening torque: N·m (kg-m, ft-lb)
T1: 29±3 (3.0±0.3, 22±2)
T2: 118±6 (12.0±0.6, 86.8±4.3)

6. Main Shaft Assembly

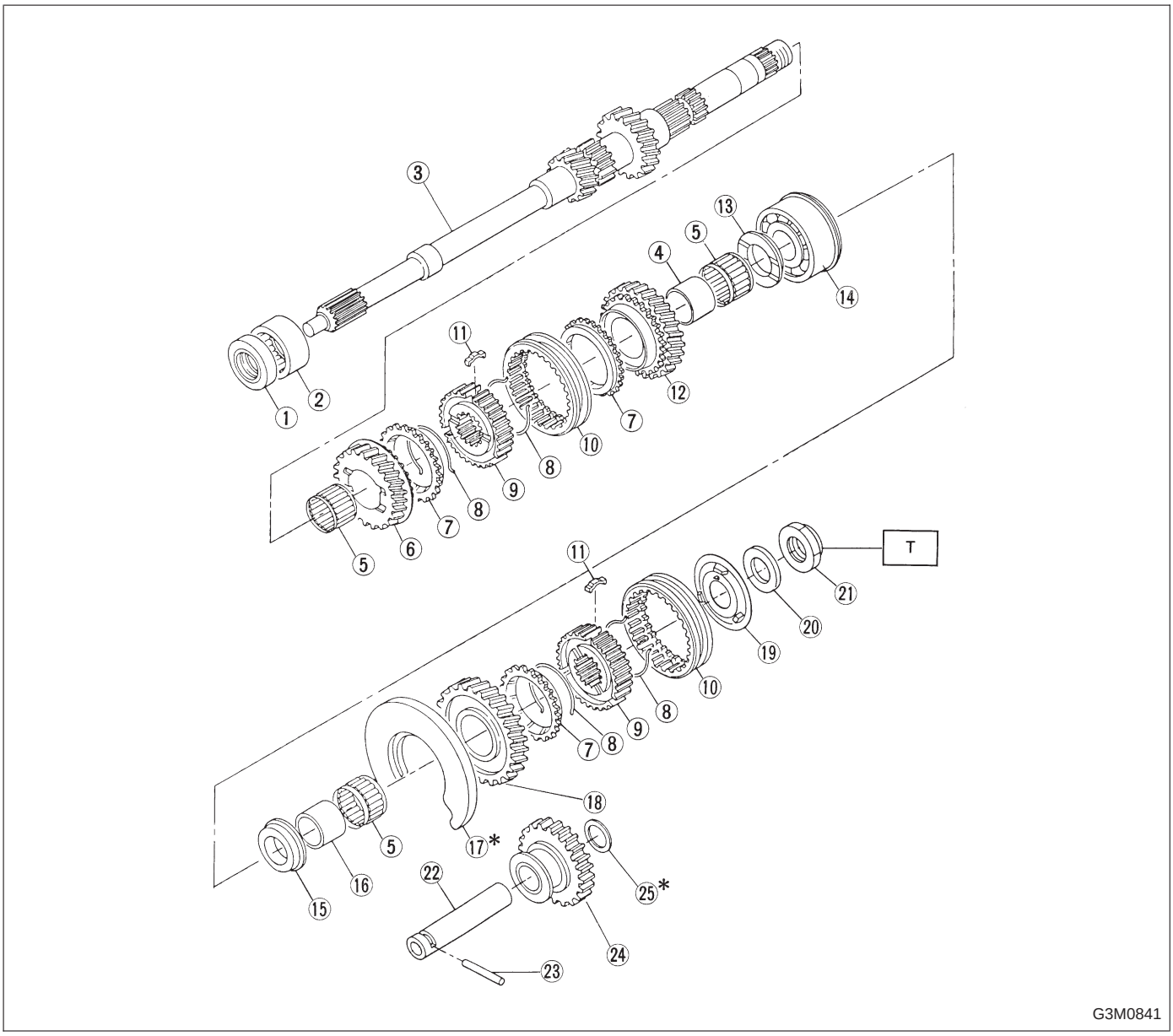
1. AWD MODEL



① Oil seal
② Needle bearing
③ Transmission main shaft
④ 4th needle bearing race
⑤ Needle bearing
⑥ 3rd drive gear
⑦ Baulk ring
⑧ Synchronizer spring
⑨ Synchronizer hub
⑩ Coupling sleeve
⑪ Shifting insert
⑫ 4th drive gear
⑬ 4th gear thrust washer
⑭ Ball bearing
⑮ 5th gear thrust washer
⑯ 5th needle bearing race
⑰ Main shaft rear plate
⑱ 5th drive gear
⑲ Insert stopper plate
⑳ Lock washer
㉑ Lock nut
㉒ Reverse idler gear shaft
㉓ Straight pin
㉔ Reverse idler gear
㉕ Washer

Tightening torque: N·m (kg-m, ft-lb)
T: 118±6
(12.0±0.6, 86.8±4.3)

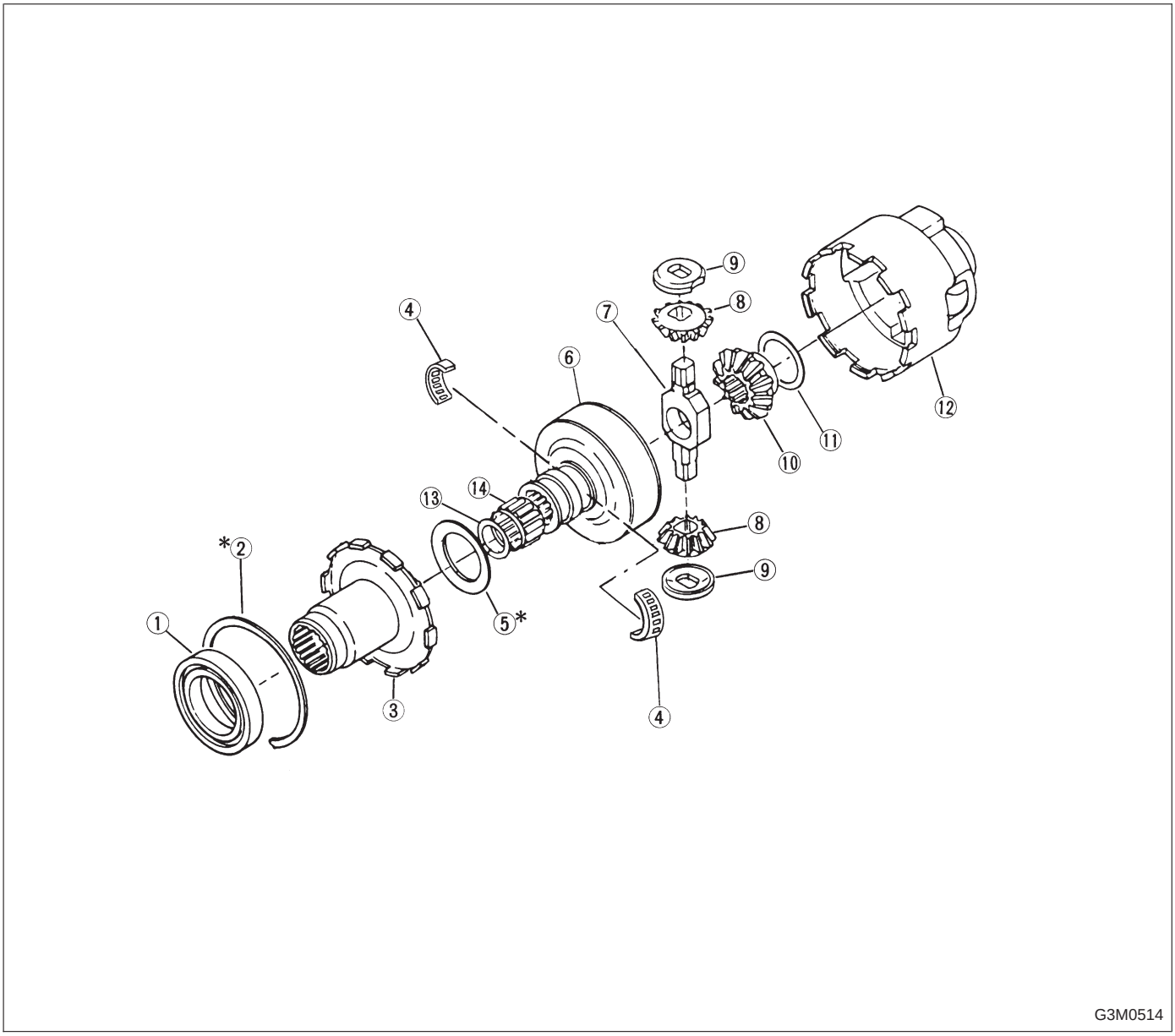
2. FWD MODEL



① Oil seal
② Needle bearing
③ Transmission main shaft
④ 4th needle bearing race
⑤ Needle bearing
⑥ 3rd drive gear
⑦ Baulk ring
⑧ Synchronizer spring
⑨ Synchronizer hub
⑩ Coupling sleeve
⑪ Shifting insert
⑫ 4th drive gear
⑬ 4th gear thrust washer
⑭ Ball bearing
⑮ 5th gear thrust washer
⑯ 5th needle bearing race
⑰ Main shaft rear plate
⑱ 5th drive gear
⑲ Insert stopper plate
⑳ Lock washer
㉑ Lock nut
㉒ Reverse idler gear shaft
㉓ Straight pin
㉔ Reverse idler gear
㉕ Washer

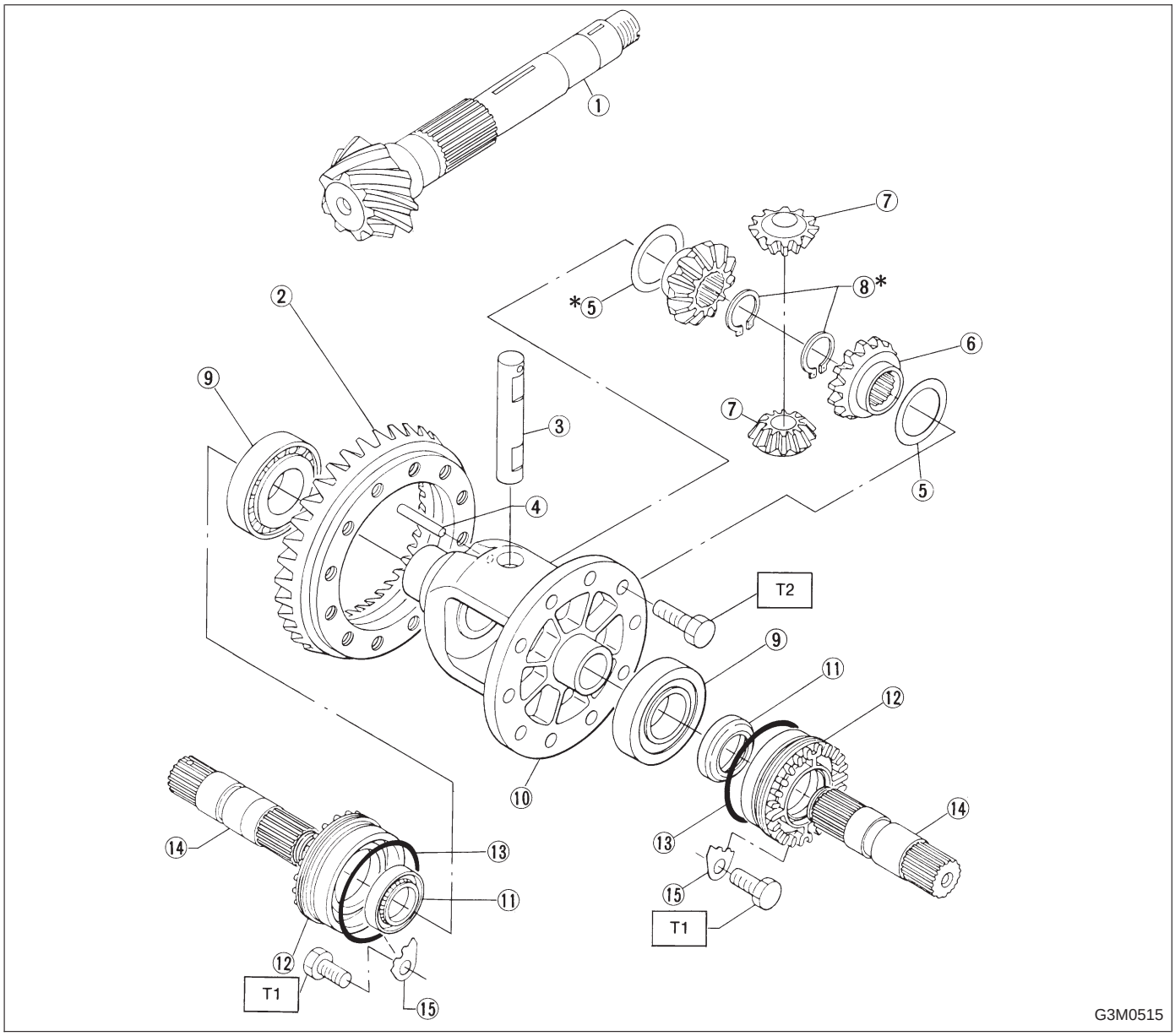
Tightening torque: N·m (kg-m, ft-lb)
T: 118±6 (12.0±0.6, 86.8±4.3)

7. Center Differential



① Ball bearing
② Snap ring (Inner-110)
③ Center differential cover
④ Needle bearing
⑤ Adjusting washer
⑥ Viscous coupling
⑦ Pinion shaft
⑧ Differential bevel pinion
⑨ Retainer
⑩ Differential bevel gear
⑪ Washer
⑫ Center differential case
⑬ Snap ring
⑭ Roller bearing

8. Front Differential



① Drive pinion shaft
② Hypoid driven gear
③ Pinion shaft
④ Straight pin
⑤ Washer
⑥ Differential bevel gear
⑦ Differential bevel pinion
⑧ 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 (kg-m, ft-lb)
T1: 25±3 (2.5±0.3, 18±2)
T2: 62±5 (6.3±0.5, 45.6±3.6)

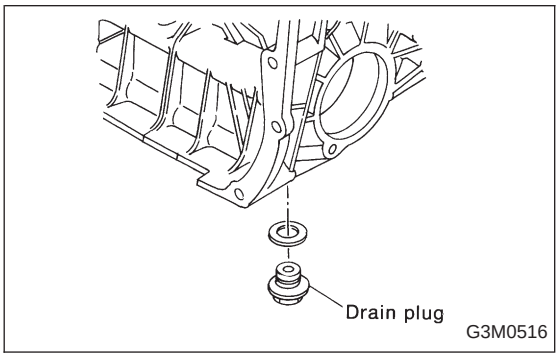
1. General

A: APPLICATION

Large title		Model	
		AWD	FWD
1	General	○	○
2	Transfer Case and Extension (AWD Model)	○	
3	Rear Case (FWD Model)		○
4	Transmission Case (AWD Model)	○	
5	Transmission Case (FWD Model)		○
6	Drive Pinion Assembly (AWD Model)	○	
7	Drive Pinion Assembly (FWD Model)		○
8	Main Shaft Assembly (AWD Model)	○	
9	Main Shaft Assembly (FWD Model)		○
10	Center Differential (AWD Model)	○	
11	Front Differential	○	○

The table above shows the titles of the main sections in Service Procedures and the applicable vehicle models. Carry out service operations by referring to the sections applicable to the vehicle to be serviced.

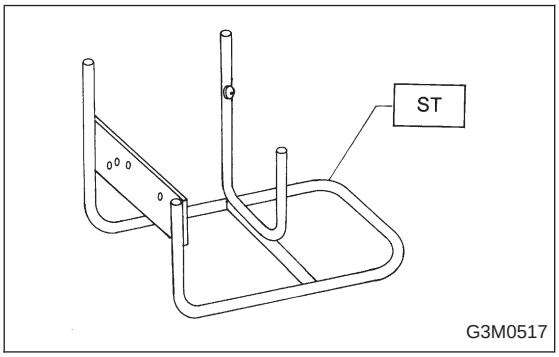
B: PRECAUTIONS



1) The following job should be followed before disassembly:
- Clean oil, grease, dirt and dust from transmission.
- Remove drain plug to drain oil. After draining, retighten it as before.

CAUTION:
Replace gasket with a new one.

Tightening torque:
41 — 47 N·m (4.2 — 4.8 kg-m, 30 — 35 ft-lb)



- Attach transmission to ST.

ST 499937100 TRANSMISSION STAND SET

2) Rotating parts should be coated with oil prior to assembly.
3) All disassembled parts, if to be reused, should be reinstalled in the original positions and directions.
4) Gaskets and lock washers must be replaced with new ones.
5) Liquid gasket should be used where specified to prevent leakage.

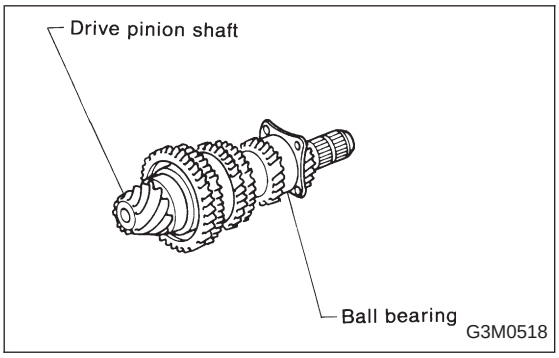
C: INSPECTION

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.

- Bearings having other defects.

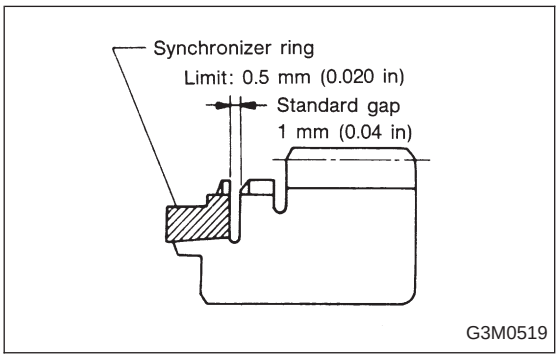
2) Bushing (each gear)

Replace the bushing in the following cases:

(1) When the sliding surface is damaged or abnormally worn.
(2) When the inner wall is abnormally worn.

3) Gears

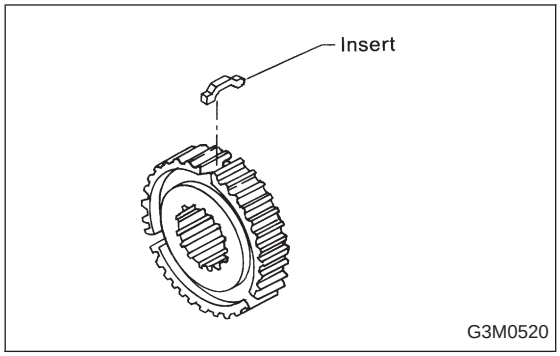
(1) Replace gears with new ones if their tooth surfaces are broken, damaged, or excessively worn.
(2) Correct or replace if the cone that contacts the balk ring is rough or damaged.
(3) Correct or replace if the inner surface or end face is damaged.



4) Balk ring

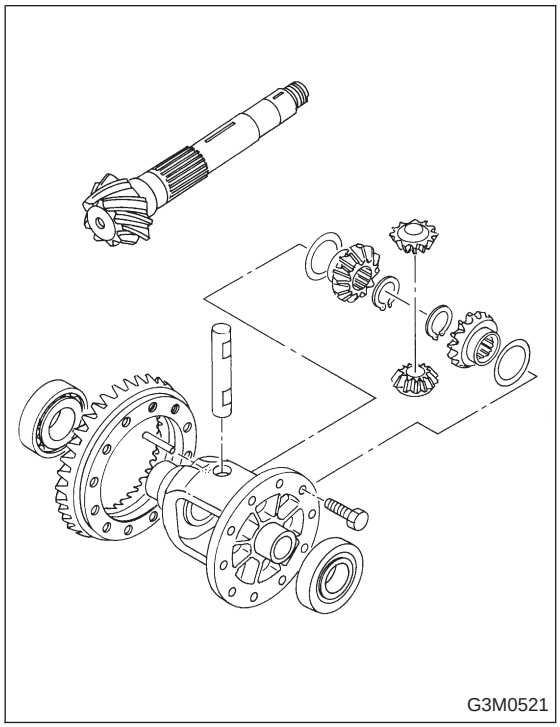
Replace the ring in the following cases:

- 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.
- When the contact surface of the synchronizer insert is scored or abnormally worn down.



5) Insert (shifting)
Replace the insert if deformed, excessively worn, or defective in any way.

6) Oil seal
Replace the oil seal if the lip is deformed, hardened, damaged, worn, or defective in any way.
7) O-ring
Replace the O-ring if the sealing face is deformed, hardened, damaged, worn, or defective in any way.
8) Gearshift mechanism
Repair or replace the gearshift mechanism if excessively worn, bent, or defective in any way.

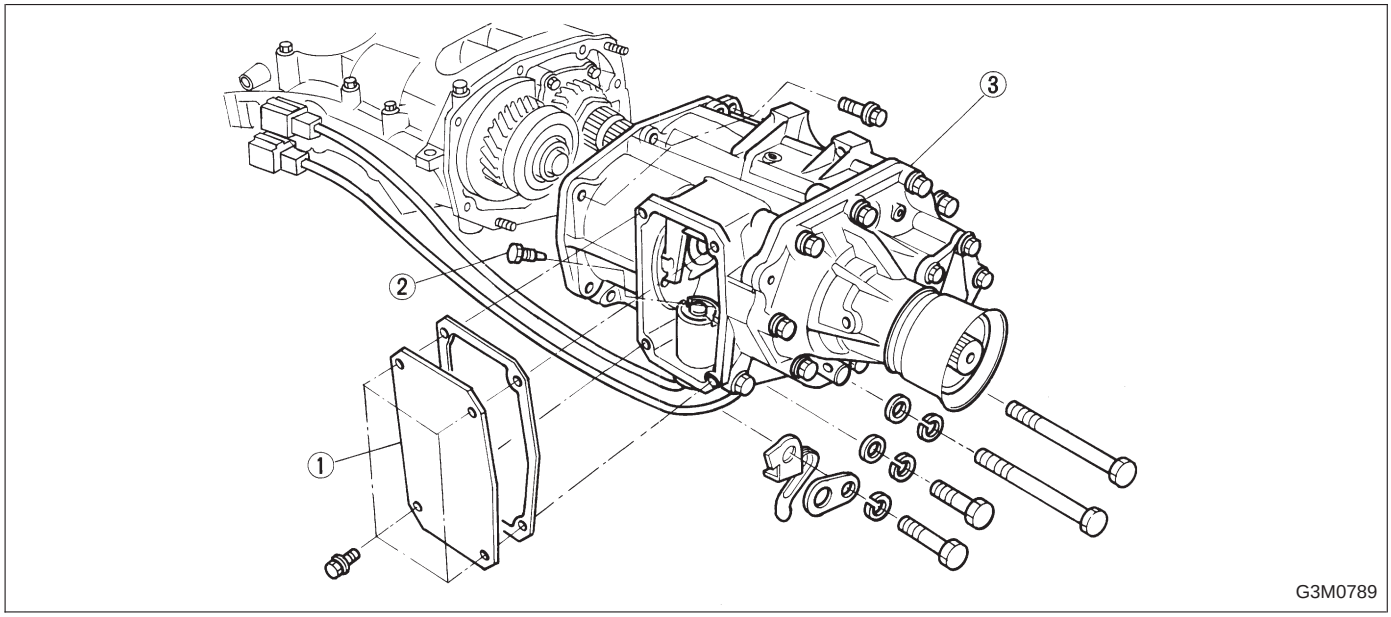


9) Differential gear
Repair or replace the differential gear in the following cases.

(1) The hypoid drive gear and drive pinion shaft tooth surface are damaged, excessively worn, or seized.
(2) The roller bearing on the drive pinion shaft has a worn or damaged roller path.
(3) There is damage, wear, or seizure of the differential bevel pinion, differential bevel gear, washer, pinion shaft, and straight pin.
(4) The differential case has worn or damaged sliding surfaces.

2. Transfer Case and Extension (AWD Model)

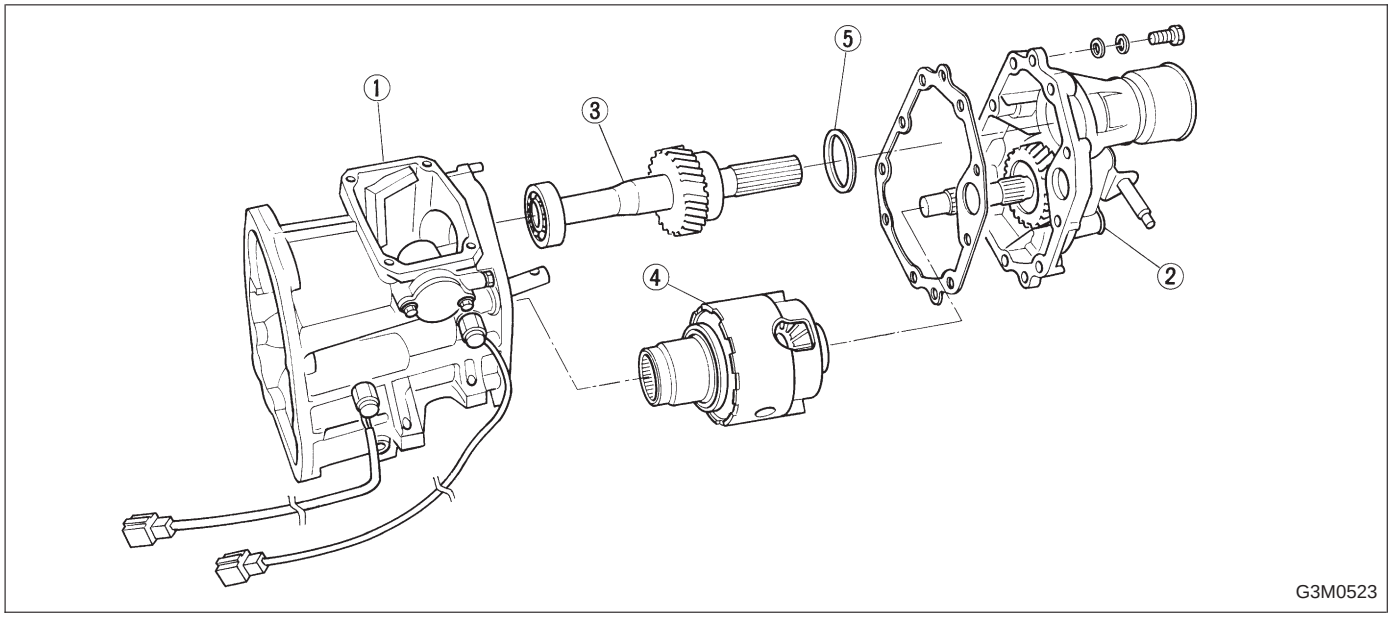
A: REMOVAL



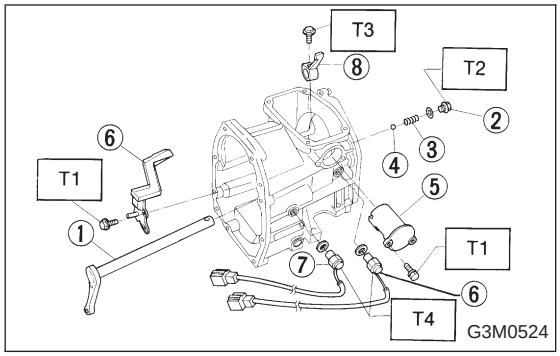
1) Remove transfer cover ①.
2) Remove shifter fork screw ② which secures selector arm to shifter arm.
3) Remove transfer case ③ with extension assembly.

B: DISASSEMBLY

1. SEPARATION OF TRANSFER CASE AND EXTENSION ASSEMBLY



1) Separate transfer case ① and extension assembly ②.
2) Remove transfer driven shaft ③ and center differential ④ as a set.
3) Remove thrust washer ⑤ (52 x 61 x t).



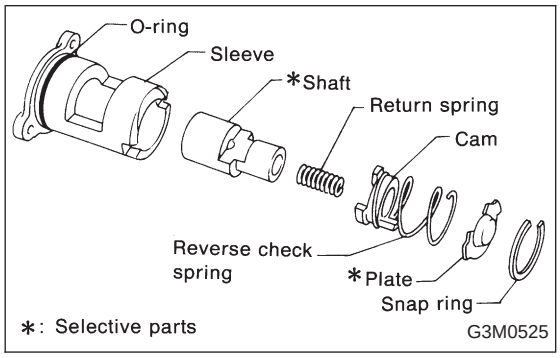
2. TRANSFER CASE

1) Remove neutral switch ⑥.

NOTE:
Before removing shifter arm, disconnect neutral switch.

2) Draw out shifter arm ① and remove selector arm ⑧.
3) Remove plug ②, spring ③ and reverse check ball ④.

Tightening torque:
T1: 6 — 7 N·m (0.6 — 0.7 kg-m, 4.3 — 5.1 ft-lb)
T2: 9 — 11 N·m (0.9 — 1.1 kg-m, 6.5 — 8.0 ft-lb)
T3: 18.1 — 21.1 N·m (1.85 — 2.15 kg-m, 13.4 — 15.6 ft-lb)
T4: 23 —26 N·m (2.3 — 2.7 kg-m, 17 — 20 ft-lb)



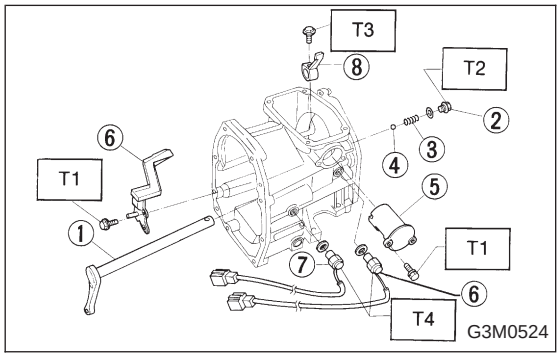
4) Remove reverse checking sleeve.

Disassembly procedure is as follows:

(1) Using a standard screwdriver, remove snap ring (Inner-28).

NOTE:
Replace snap ring with a new one if deformed or weakened.

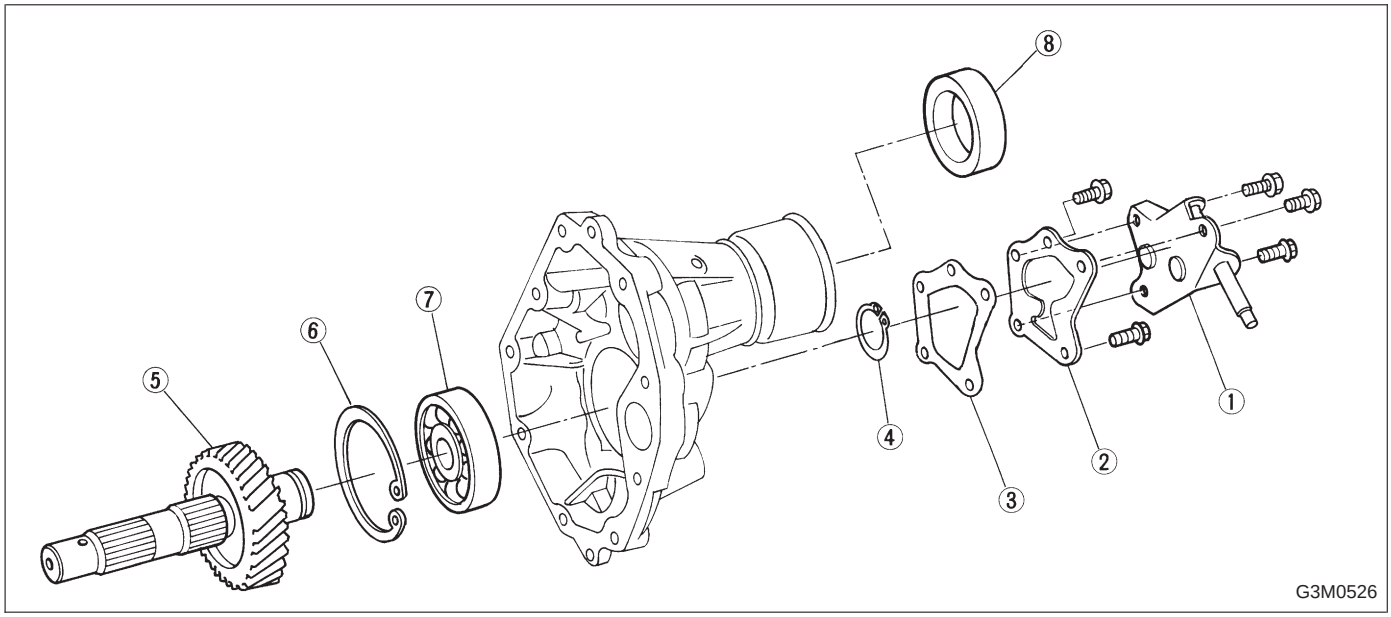
(2) Remove reverse checking plate.
(3) Remove reverse checking spring with cam.
(4) Remove reverse return spring.
(5) Remove reverse accent shaft.
(6) Remove O-ring.



5) Remove back-up light switch ⑦.
6) Remove oil guide.

Tightening torque:
T1: 6 — 7 N·m (0.6 — 0.7 kg-m, 4.3 — 5.1 ft-lb)
T2: 9 — 11 N·m (0.9 — 1.1 kg-m, 6.5 — 8.0 ft-lb)
T3: 18.1 — 21.1 N·m (1.85 — 2.15 kg-m, 13.4 — 15.6 ft-lb)
T4: 23 —26 N·m (2.3 — 2.7 kg-m, 17 — 20 ft-lb)

3. EXTENSION



1) Remove extension cover ② and shift bracket ①.
2) Remove snap ring (Outer-30) ④.
3) Remove transfer drive shaft ⑤.

CAUTION:
Do not remove ball bearing unless replacing.

4) Remove snap ring (Inner-72) ⑥.
5) Removal of ball bearing ⑦.

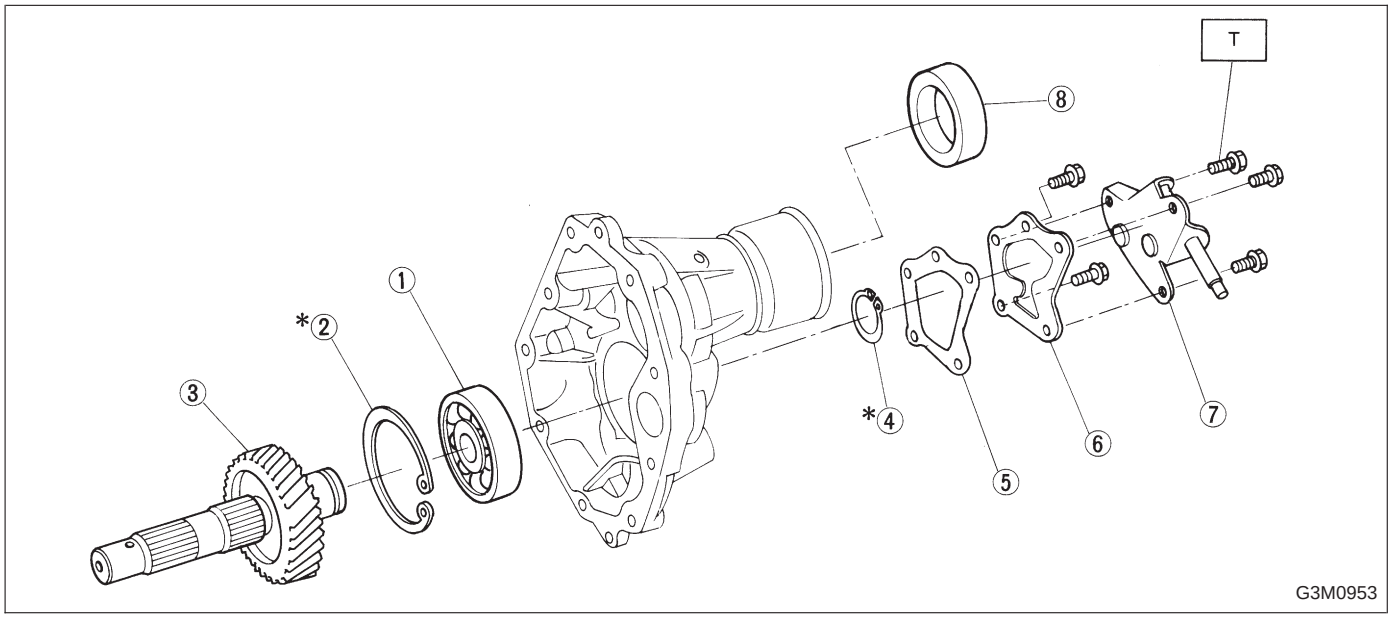
CAUTION:
Do not reuse ball bearing.

6) Removal of oil seal ⑧.

CAUTION:
Do not reuse oil seal.

C: ASSEMBLY

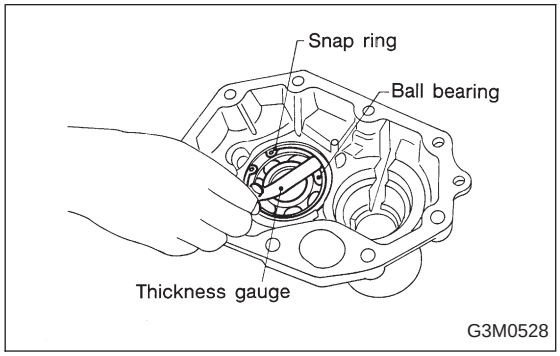
1. EXTENSION



Tightening torque: N·m (kg-m, ft-lb)
T: 23 — 26 (2.3 — 2.7, 17 — 20)

1) Installation of ball bearing ① and selection of snap ring (Inner-72) ②.

(1) Attach ball bearing ① (30 x 72 x 17) to extension and install snap ring.



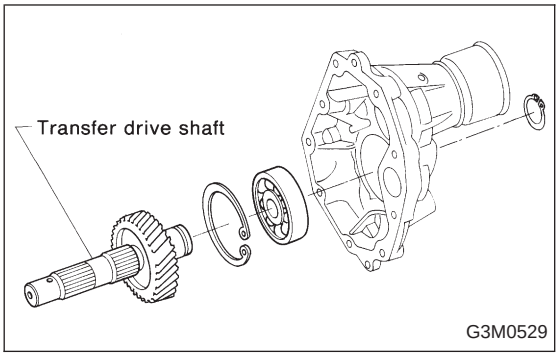
(2) Measure clearance between snap ring and outer race of ball bearing ①.

CAUTION:
Replace ball bearing with a new one.

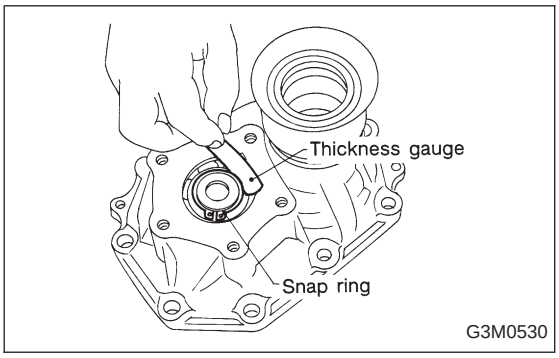
Clearance:
0 — 0.15 mm (0 — 0.0059 in)

(3) If the measurement is not within the specification, select suitable snap ring ②.

● Snap ring (Inner-72)	Part No.	Thickness mm (in)
	805172071	1.78 (0.0701)
	805172072	1.90 (0.0748)
	805172073	2.02 (0.0795)



2) Installation of transfer drive shaft.
Press transfer drive shaft into inner race of ball bearing.

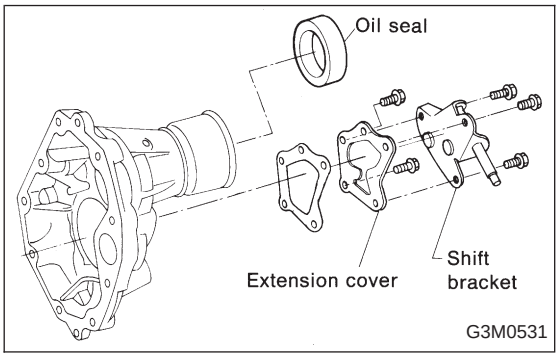


3) Selection of snap ring (Outer-30).
(1) Install snap ring on transfer drive shaft.
(2) Measure clearance between snap ring and inner race of ball bearing.

Clearance:
0 — 0.15 mm (0 — 0.0059 in)

(3) If the measurement is not within the specification, select suitable 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)



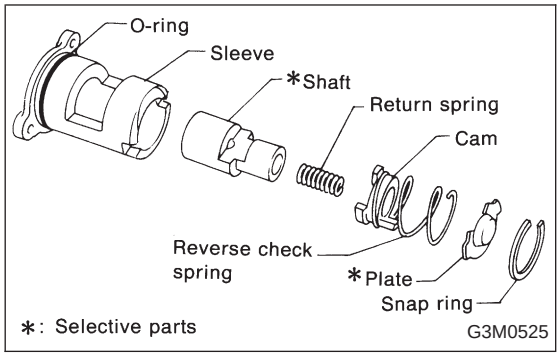
4) Install extension cover and shift bracket.

CAUTION:
Use new gasket.

5) Install oil seal with ST.

ST 498057300 INSTALLER

CAUTION:
Use new oil seal.



2. TRANSFER CASE

Assembly of transfer case is in the reverse order of disassembly. Observe the following:

1) Assembly of reverse checking sleeve.

(1) Install reverse accent shaft, checking cam, return spring and checking spring onto reverse checking sleeve.

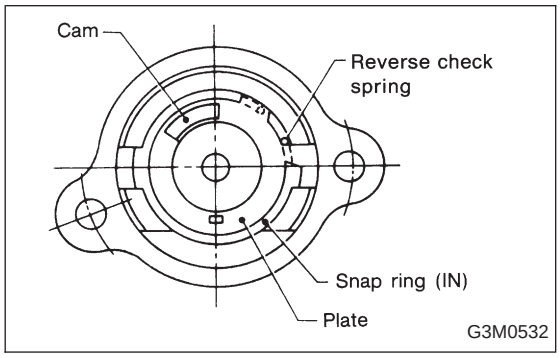
NOTE:
Be sure the bent section of reverse checking spring is positioned in the groove in checking cam.

(2) Hook the bent section of reverse checking spring over reverse check plate.

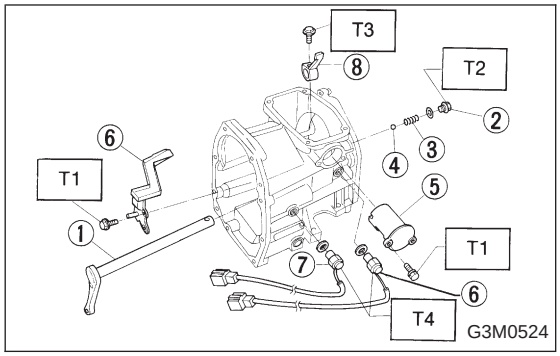
(3) Rotate cam so that the protrusion of reverse checking cam is at the opening in plate.

(4) With cam held in that position, install plate onto reverse checking sleeve and hold with snap ring (Inner-28).

(5) Position O-ring (35.4 x 1.5) in groove in sleeve.



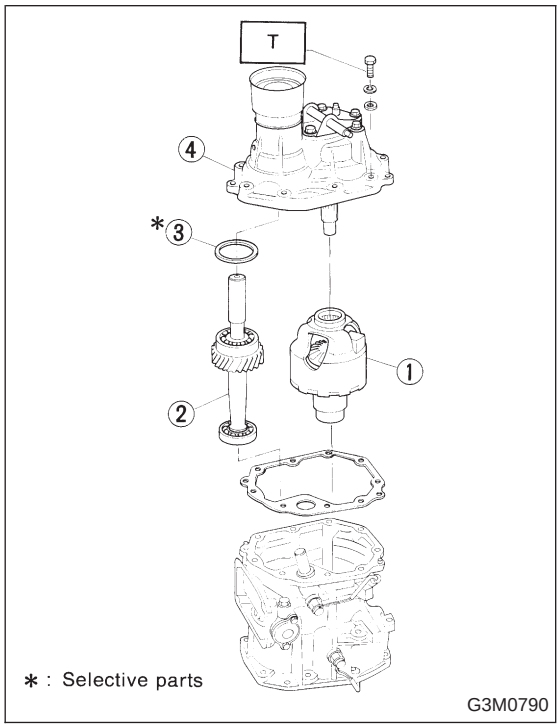
CAUTION:
● Make sure the cutout section of reverse accent shaft is aligned with the opening in reverse checking sleeve.
● Spin cam by hand for smooth rotation.
If it does not return properly, replace reverse checking spring.
● Move cam and shaft all the way toward plate and release.
If cam does not return properly, replace reverse checking spring; if shaft does not, check for scratches on the inner surface of sleeve. If sleeve is in good order, replace spring.
● Select a suitable reverse accent shaft and reverse check plate by referring to "Neutral Position Adjustment."



2) Installation of shifter arm ① and selector arm ⑧.
Install shifter arm into the partition from the front while inserting selector arm into the opening in reverse checking sleeve. Pass shaft through hole in selector arm until its end comes out of the rear of transfer case.

NOTE:
Apply a coat of gear oil to shifter arm. Also make sure oil seal is positioned properly.

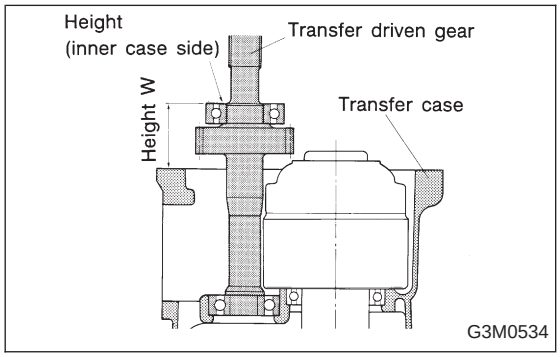
Tightening torque:
T1: 6 — 7 N·m (0.6 — 0.7 kg-m, 4.3 — 5.1 ft-lb)
T2: 9 — 11 N·m (0.9 — 1.1 kg-m, 6.5 — 8.0 ft-lb)
T3: 18.1 — 21.1 N·m (1.85 — 2.15 kg-m, 13.4 — 15.6 ft-lb)
T4: 23 — 26 N·m (2.3 — 2.7 kg-m, 17 — 20 ft-lb)



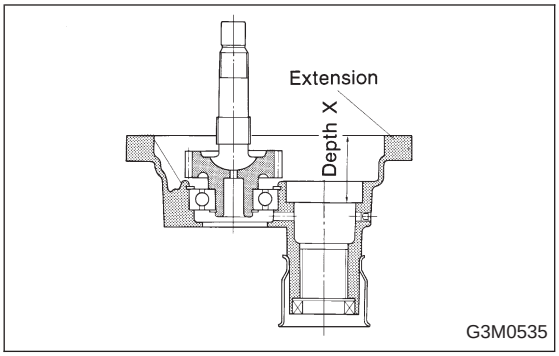
3. COMBINATION OF TRANSFER CASE AND EXTENSION ASSEMBLY

1) Install center differential ① and transfer drive shaft ② into transfer case.

Tightening torque:
T: 34 — 40 N·m (3.5 — 4.1 kg-m, 25 — 30 ft-lb)



2) Selection of thrust washers ③ (52 x 61 x t)
(1) Measure height “W” as shown in figure.

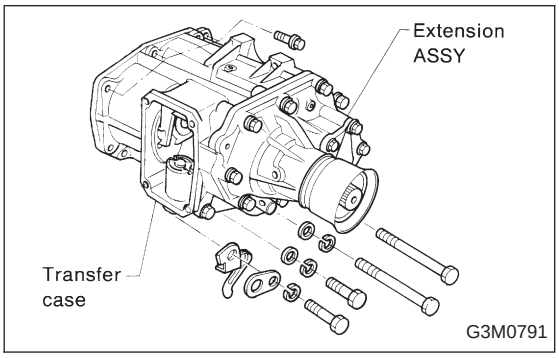


(2) Measure depth “X” as shown in figure.
(3) Calculate space “Y” using the following equation: Y = X − W + 0.24 mm (0.0094 in) [Thickness of gasket]
(4) Select suitable washer in the following table.

● Thrust washer (52 x 61 x t)	Space “Y” mm (in)	Part No.	Thickness mm (in)
	0.55 — 0.79 (0.0217 — 0.0311)	803052021	0.50 (0.0197)
	0.80 — 1.04 (0.0315 — 0.0409)	803052022	0.75 (0.0295)
	1.05 — 1.30 (0.0413 — 0.0512)	803052023	1.00 (0.0394)

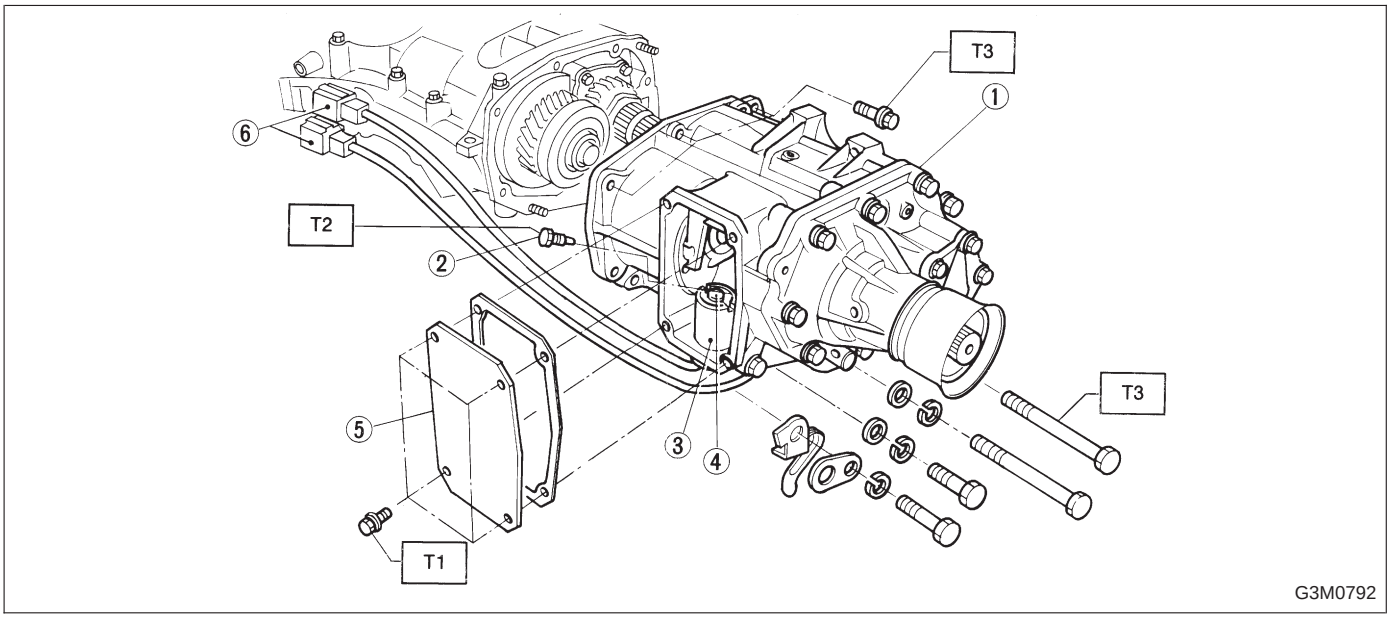
Standard clearance between thrust washer and ball bearing:
0.05 — 0.30 mm (0.0020 — 0.0118 in)

(5) Fit thrust washers on transfer drive shaft.



3) Install extension assembly into transfer case.

D: INSTALLATION



Tightening torque: N·m (kg-m, ft-lb)
T1: 14.2 — 17.2 (1.45 — 1.75, 10.5 — 12.7)
T2: 18.1 — 21.1 (1.85 — 2.15, 13.4 — 15.6)
T3: 23 — 26 (2.3 — 2.7, 17 — 20)

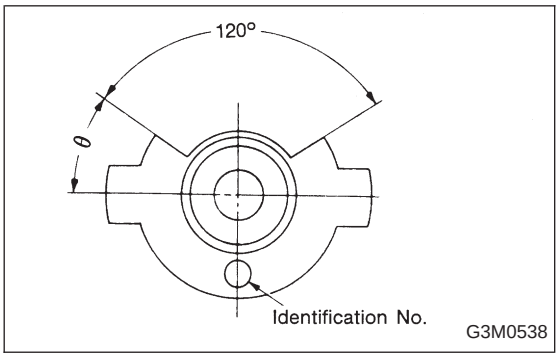
1) Install transfer case with extension assembly ①.
2) Secure selector arm to shifter arm with shifter fork screw ②. Shifter arm should be caught by pawl of rod. Selector arm must be engaged with reverse check sleeve assembly.
3) Adjustment of neutral position.
   (1) Shift gear into 3rd gear position.
   (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 ③ 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).

● Adjustment shim	Part No.	Thickness mm (in)
	32190AA000	0.15 (0.0059)
	32190AA010	0.30 (0.0118)

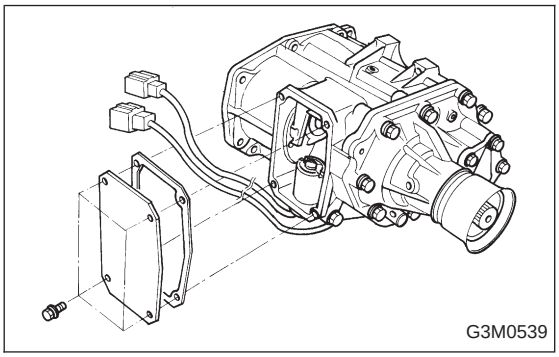
● When shim is removed, the neutral position will move closer to reverse; when shim is added, the neutral position will move closer to 1st gear.
● If shims alone cannot adjust the clearance, replace reverse accent shaft and re-adjust.

● Reverse accent shaft	Part No.	Mark	Remarks
	32188AA020	A	Neutral position is closer to 1st gear.
	32188AA002	No mark or B	Standard
	32188AA030	C	Neutral position is closer to reverse gear.



4) Reverse check plate ④ adjustment.
Shift shifter arm to “5th” and then to reverse to see if reverse check mechanism operates properly. Also check to see if arm returns to Neutral when released from the reverse position. If arm does not return properly, replace reverse check plate.

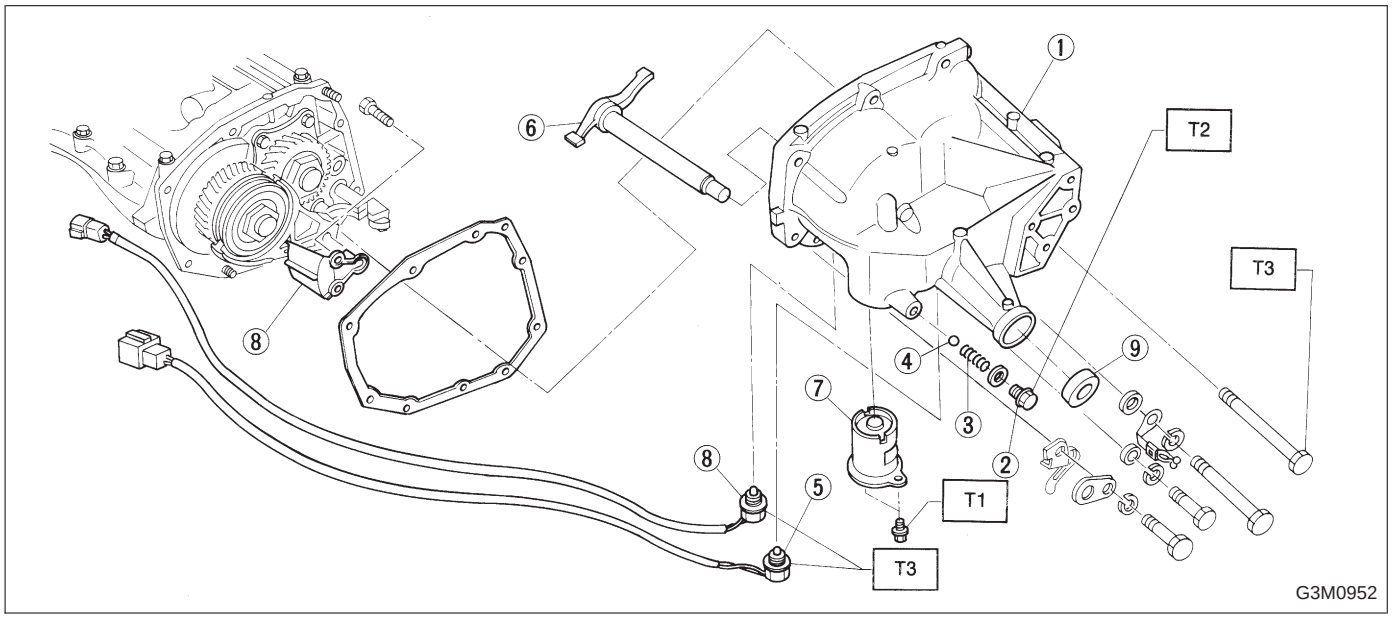
● Reverse check plate	Part No.	No.	Angle θ	Remarks
	32189AA000	0	28°	Arm stops closer to 5th.
	32189AA010	1	31°	Arm stops closer to 5th.
	32189AA020	2	34°	Arm stops in the center.
	32189AA030	3	37°	Arm stops closer to reverse gear.
	32189AA040	4	40°	Arm stops closer to reverse gear.



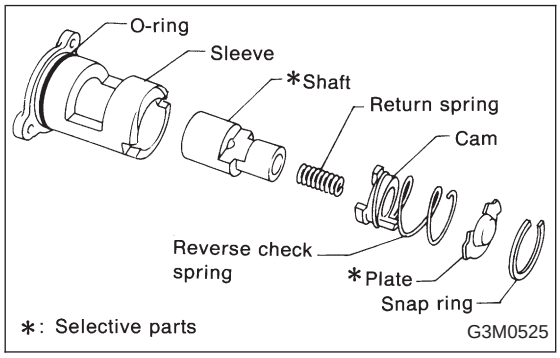
5) Install transfer cover and gasket.
6) Connect each switch.

3. Rear Case (FWD Model)

A: DISASSEMBLY



1) Remove rear case ①.
2) Remove plug ②, spring ③ and reverse check ball ④.
3) Remove neutral switch ⑤.
4) Pull out shifter arm ⑥.



5) Remove reverse checking sleeve ⑦.

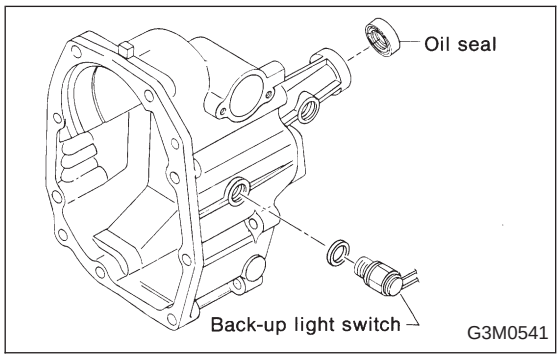
Procedure for disassembly is as follows:

- 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.

(1) Using a standard screwdriver, remove snap ring (Inner-28).

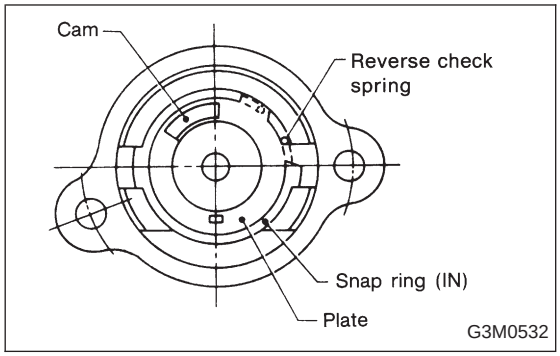
NOTE:
Replace snap ring with a new one if deformed or weakened.

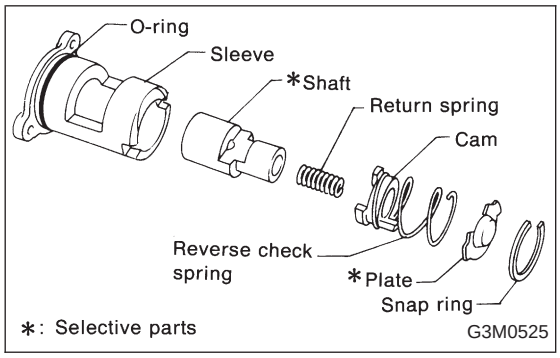
(2) Remove reverse checking plate.
(3) Remove reverse checking spring with cam.
(4) Remove reverse return spring.
(5) Remove reverse accent shaft.
(6) Remove O-ring.



6) Remove back-up light switch.
7) Removal of oil seal.

CAUTION:
Do not reuse oil seal.





B: ASSEMBLY

Assembly of rear case is in the reverse order of disassembly. Observe the following:

1) Assembly of reverse checking sleeve.

(1) Install reverse accent shaft, checking cam, return spring and checking spring onto reverse checking sleeve.

NOTE:
Be sure the bent section of reverse checking spring is positioned in the groove in checking cam.

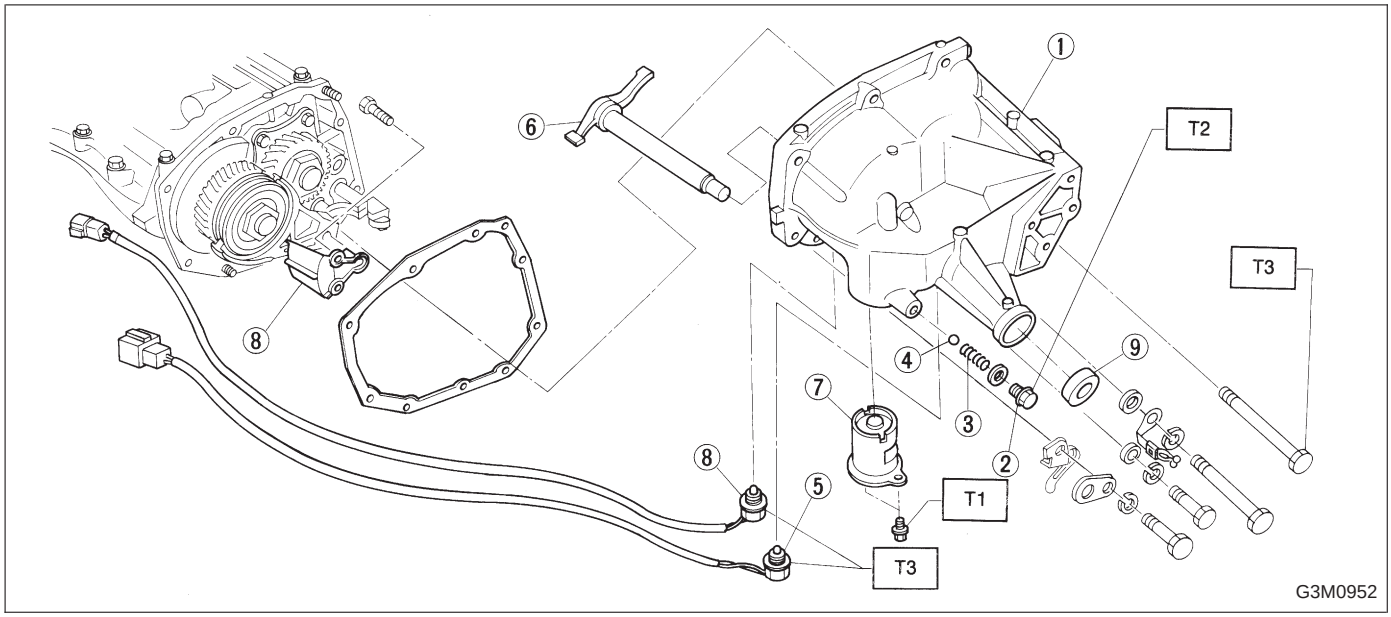
(2) Hook the bent section of reverse checking spring over reverse check plate.

(3) Rotate cam so that the protrusion of reverse checking cam is at the opening in plate.

(4) With cam held in that position, install plate onto reverse checking sleeve and hold with snap ring (Inner-28).

(5) Position O-ring (35.4 x 1.5) in groove in sleeve.

NOTE:
● Make sure the cutout section of reverse accent shaft is aligned with the opening in reverse checking sleeve.
● Spin cam by hand for smooth rotation.
If it does not return properly, replace reverse checking spring.
● Move cam and shaft all the way toward plate and release.
If cam does not return properly, replace reverse checking spring; if shaft does not, check for scratches on the inner surface of sleeve. If sleeve is in good order, replace spring.
● Select a suitable reverse accent shaft and reverse check plate by referring to “Neutral Position Adjustment.”



Tightening torque: N·m (kg-m, ft-lb)
T1: 6.4±0.5 (0.65±0.05, 4.7±0.4)
T2: 10±1 (1.0±0.1, 7.2±0.7)
T3: 25±5 (2.5±0.5, 18.1±3.6)

2) Installation of shifter arm ⑥
Install shifter arm into the partition from the front while inserting selector arm into the opening in reverse check sleeve. Pass shaft through hole in selector arm until its end comes out of the rear of transfer case.

CAUTION:
Apply a coat of gear oil to shifter arm. Also make sure oil seal is positioned properly.

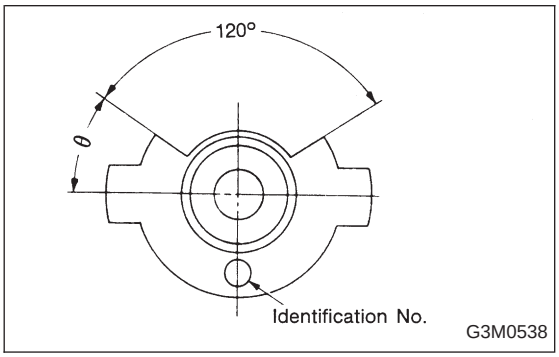
3) Adjustment of neutral position

NOTE:
After assembling and installing rear case, adjust neutral position.

(1) Shift 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.

NOTE:
● When shim is removed, the neutral position will move closer to reverse; when shim is added, the neutral position will move closer to 1st gear.
● If shims alone cannot adjust the clearance, replace reverse accent shaft and re-adjust.

● Reverse accent shaft	Part No.	Mark	Remarks
	32188AA020	A	Neutral position is closer to 1st gear.
	32188AA002	No mark or B	Standard
	32188AA030	C	Neutral position is closer to reverse gear.



4) Reverse checking plate adjustment

NOTE:
After assembling and installing rear case, adjust reverse checking plate.

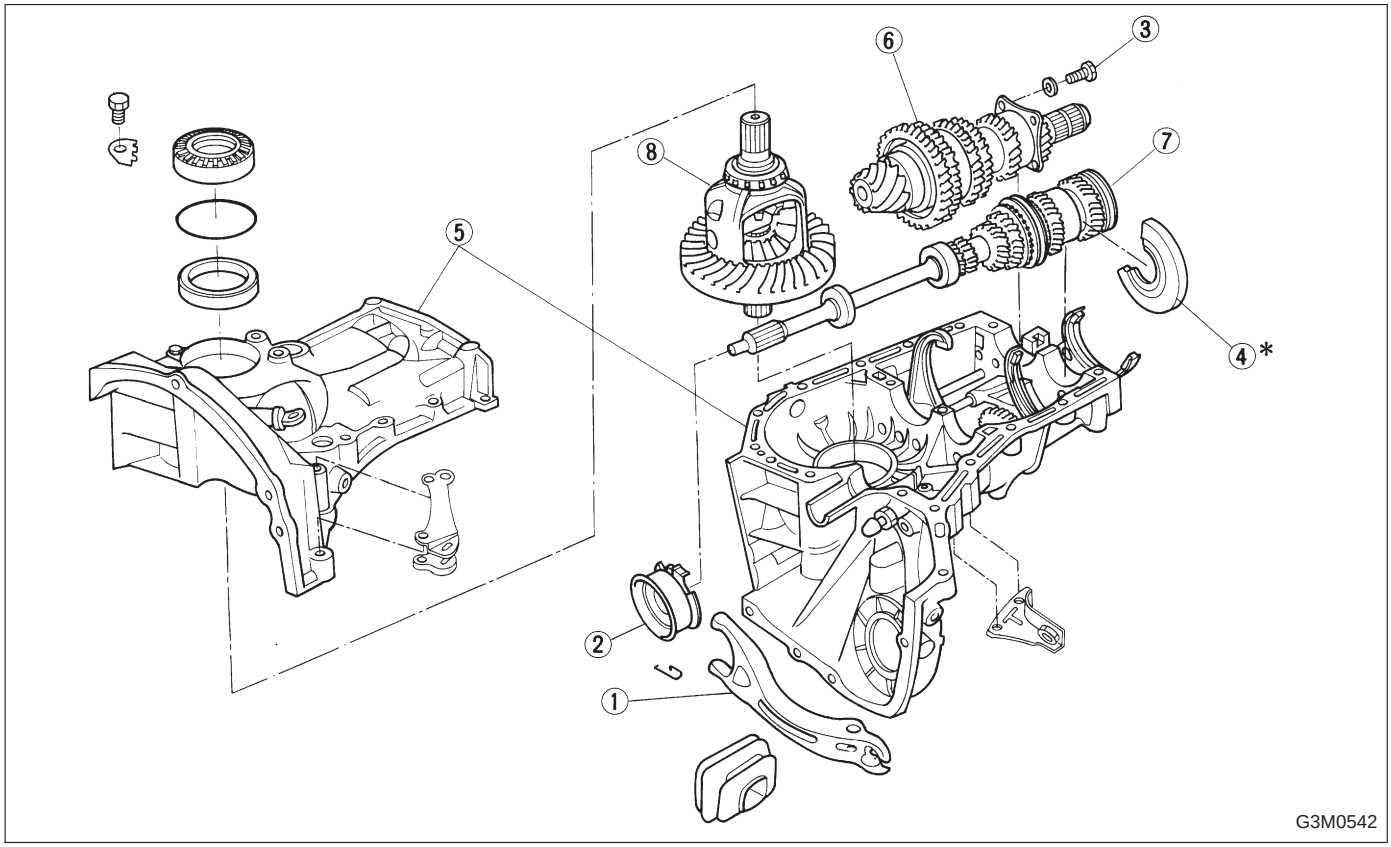
Shift shifter arm to “5th” and then to reverse to see if reverse checking mechanism operates properly. Also check to see if arm returns to Neutral when released from the reverse position. If arm does not return properly, replace reverse checking plate.

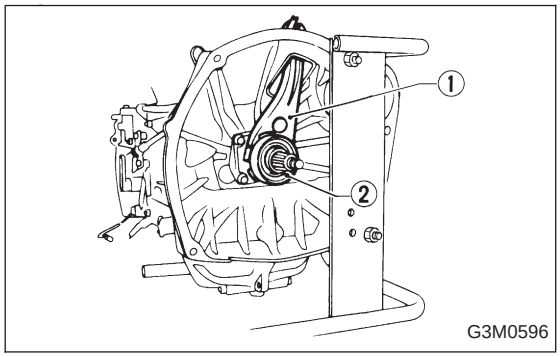
● Reverse checking plate	Part No.	No.	Angle θ	Remarks
	32189AA000	0	28°	Arm stops closer to 5th gear.
	32189AA010	1	31°	Arm stops closer to 5th gear.
	32189AA020	2	34°	Arm stops in the center.
	32189AA030	3	37°	Arm stops closer to reverse gear.
	32189AA040	4	40°	Arm stops closer to reverse gear.

4. Transmission Case (AWD Model)

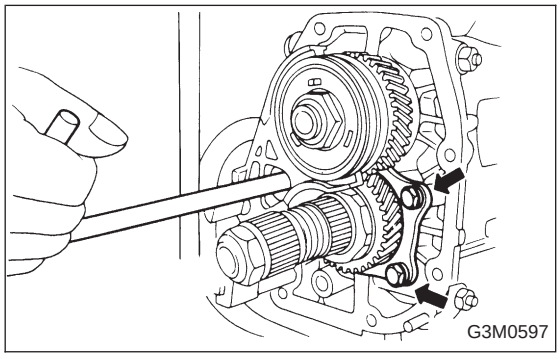
A: DISASSEMBLY

1. SEPARATION OF TRANSMISSION

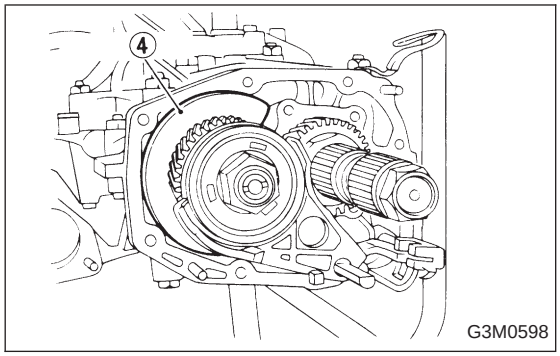




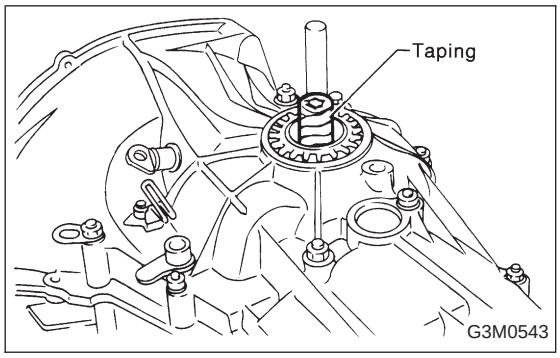
1) Remove clutch release lever ① and bearing ②. <Ref. to 2-10 [W3A0].>



2) Remove bearing mounting bolts.

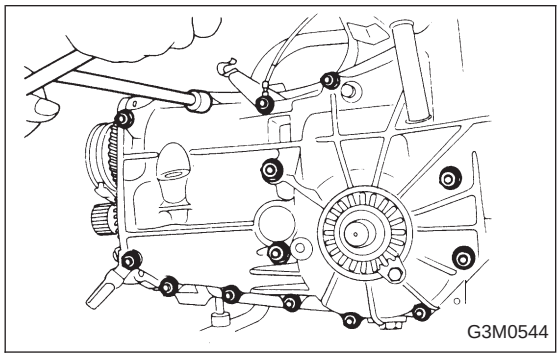


3) Remove main shaft rear plate ④.

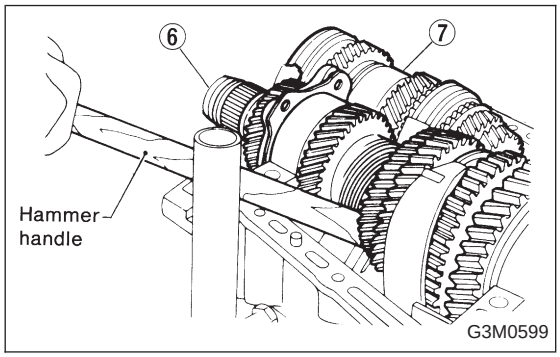


4) Separating transmission case.

(1) Put vinyl tape around splines of right and left axle drive shafts to prevent damage to oil seals.



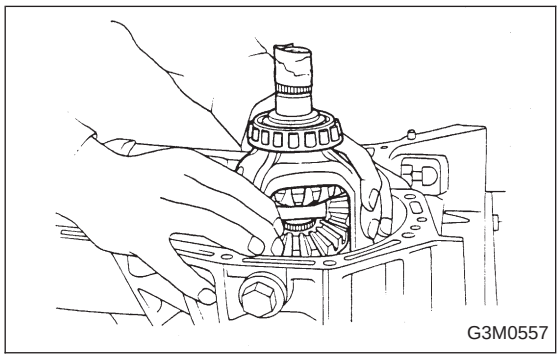
(2) Separate transmission case into right and left cases by loosening seventeen coupling bolts and nuts.



5) Remove drive pinion shaft assembly ⑥ from left side transmission case.

NOTE:
Use a hammer handle, etc. to remove if too tight.

6) Remove main shaft assembly ⑦.

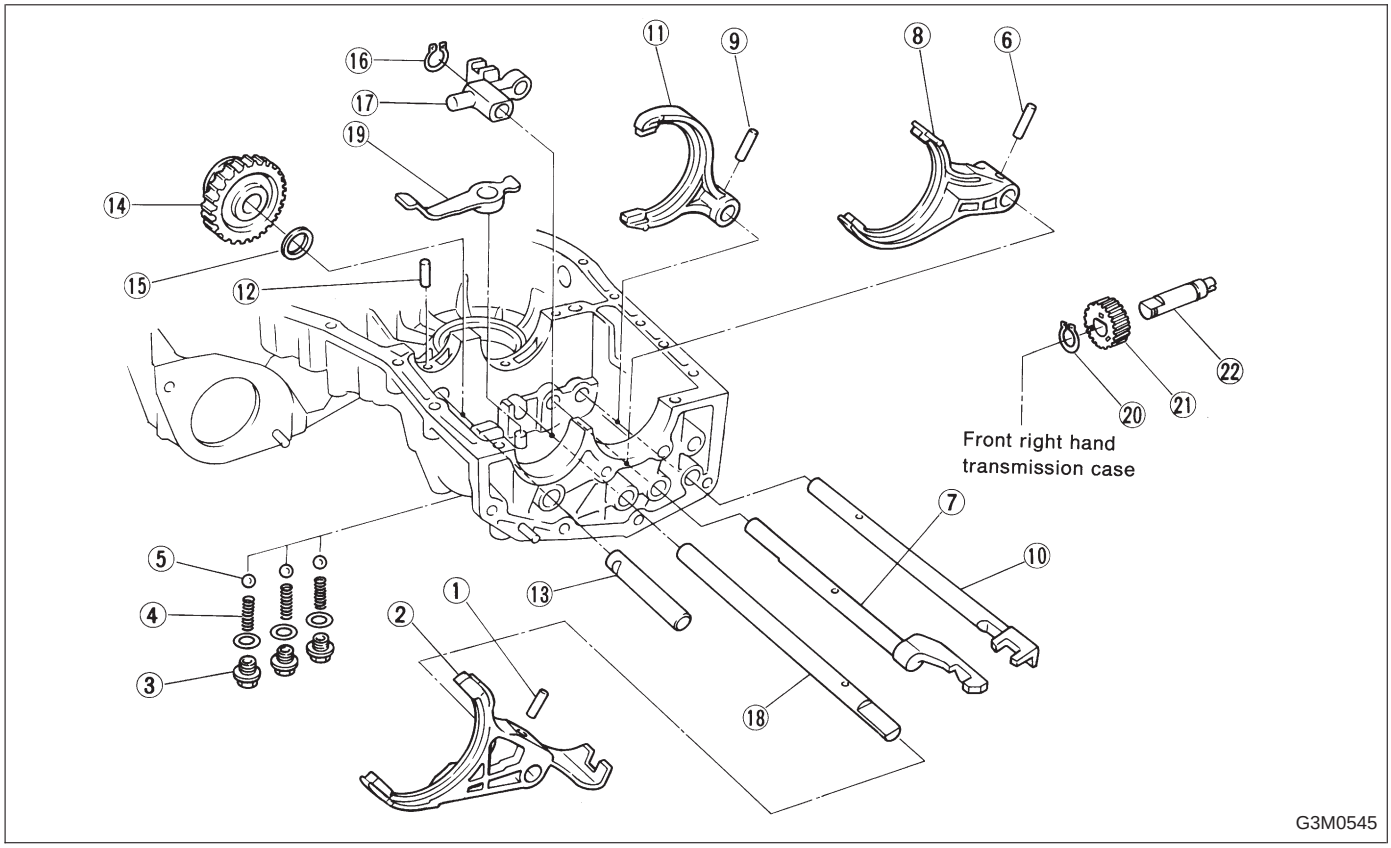


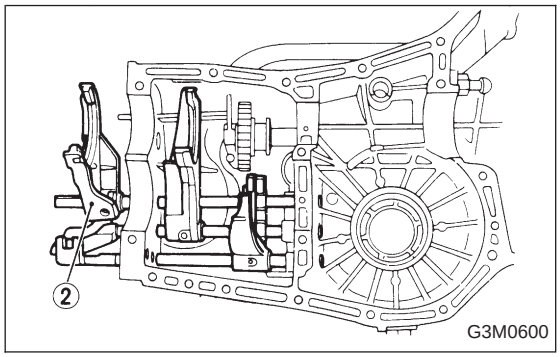
7) Remove differential assembly.

CAUTION:

- **Be careful not to confuse right and left roller bearing outer races.**
- **Be careful not to damage retainer oil seal.**

2. TRANSMISSION CASE

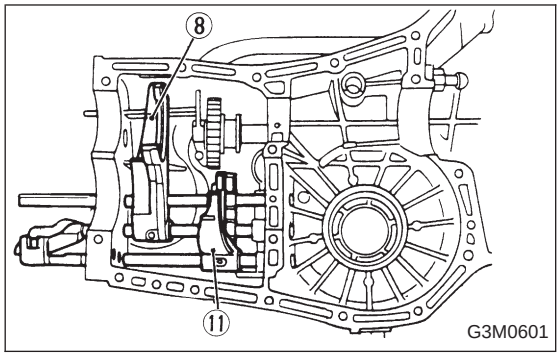




1) Drive out straight pin ① with ST, and remove 5th shifter fork ②.

ST 398791700 STRAIGHT PIN REMOVER

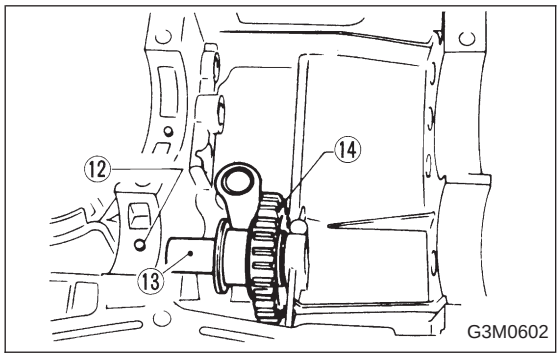
2) Remove plugs ③, springs ④ and checking balls ⑤.



3) Drive out straight pin ⑥, and pull out 3-4 fork rod ⑦ and shifter fork ⑧.

NOTE:
When removing rod, keep other rods in neutral. Also, when pulling out straight pin, remove it toward inside of case so that it may not hit against case.

4) Drive out straight pin ⑨, and pull out 1-2 fork rod ⑩ and shifter fork ⑪.

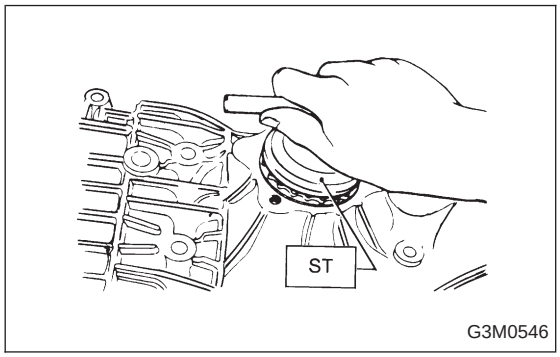


5) Pull out straight pin ⑫, and remove idler gear shaft ⑬, reverse idler gear ⑭ and washer ⑮.

6) Remove outer snap ring ⑯, and pull out reverse shifter rod arm ⑰ from reverse fork rod ⑱. Then take out ball, spring and interlock plunger from rod.
And then remove rod.

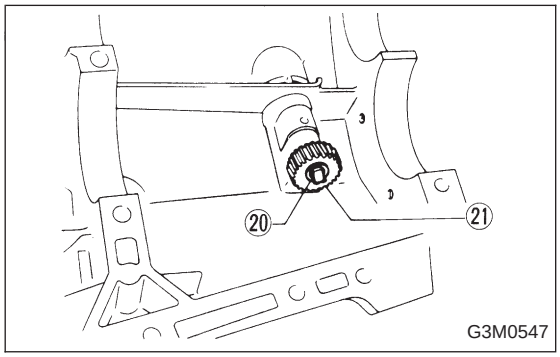
NOTE:
When pulling out reverse shifter rod arm, be careful not to let ball pop out of arm.

7) Remove reverse shifter lever ⑲.



8) Remove differential side retainers using ST.

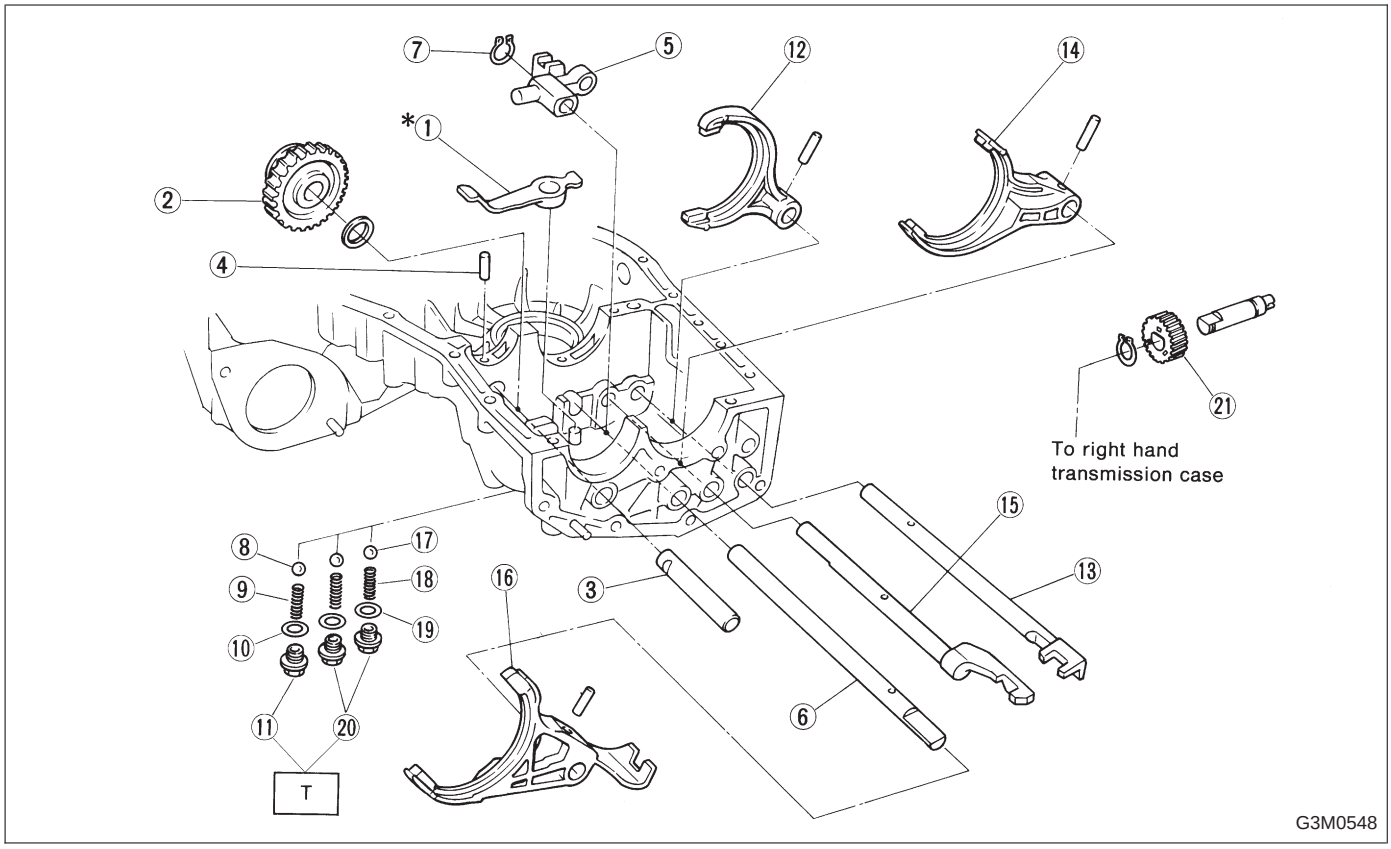
ST 499787000 WRENCH ASSY



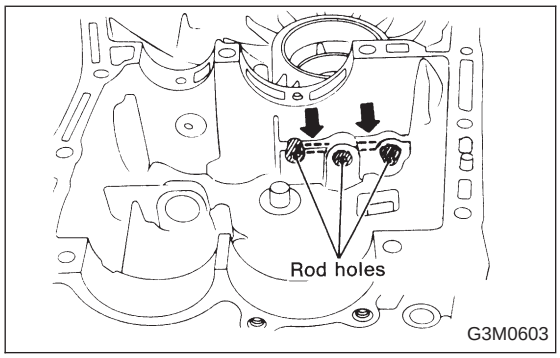
9) Remove outer snap ring ⑳ and pull out speedometer driven gear ㉑. Next, remove speedometer shaft ㉒ and washer.

B: ASSEMBLY

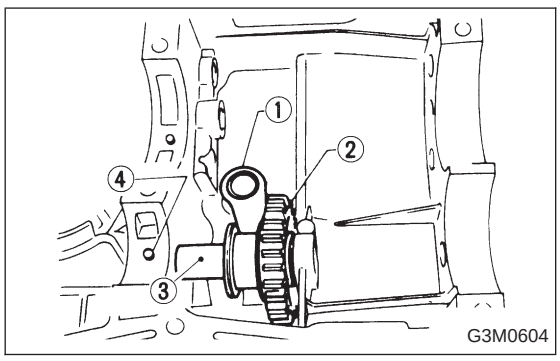
1. TRANSMISSION CASE



Tightening torque: N·m (kg-m, ft-lb)
T: 18.1 — 21.1 (1.85 — 2.15, 13.4 — 15.6)



1) Position interlock plungers (5.56 x 19.6), one plunger in hole between 1-2 and 3-4 fork rod holes, and one plunger in hole between 3-4 and reverse fork rod holes.



2) Install reverse shifter lever ①, reverse idler gear ② and reverse idler gear shaft ③, and secure with straight pin ④.

NOTE:
Be sure to install reverse idler shaft from the rear side.

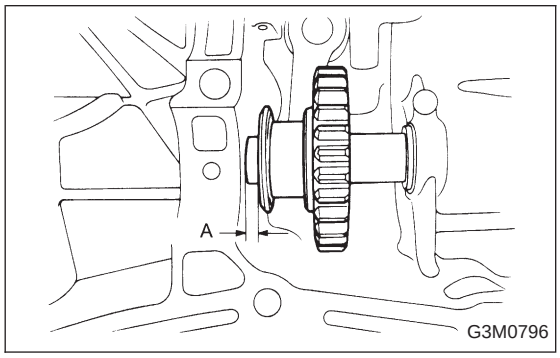
3) Install reverse arm fork spring, ball and interlock plunger (5.56 x 19.6) to reverse fork rod arm ⑤. Insert reverse fork rod ⑥ into hole in reverse fork rod arm ⑤, and hold it with outer snap ring ⑦ using ST.

ST 399411700 ACCENT BALL INSTALLER

CAUTION:
Apply grease to plunger to prevent it from falling.

4) Position ball (7.1438) ⑧, spring ⑨ and gasket ⑩ in reverse shifter rod hole, on left side transmission case, and tighten checking ball plug ⑪.

CAUTION:
Replace gasket with a new one.

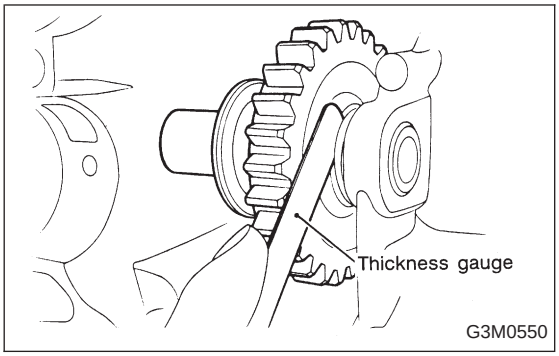


5) Adjustment of reverse idler gear position.

(1) Move reverse shifter rod toward REV side. Adjust clearance between reverse idler gear and transmission case wall, using reverse shifter lever ①.

Clearance A:
6.0 — 7.5 mm (0.236 — 0.295 in)

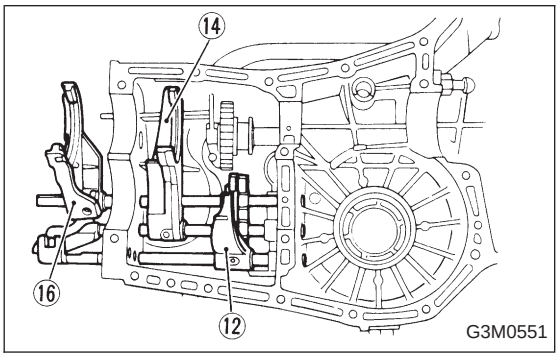
● Reverse shifter lever	Part No.	No.	Remarks
	32820AA000	0	Further from case wall
	32820AA010	No mark	Standard
	32820AA020	2	Closer to case wall



(2) After installing a suitable reverse shifter lever, shift into Neutral. Adjust clearance between reverse idler gear and transmission case wall, using washer(s).

Clearance:
0 — 0.5 mm (0 — 0.020 in)

● Washer (20.5 x 26 x t)	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)



6) Installation of 1-2 shifter fork ⑫ and rod ⑬.

(1) Install 1-2 fork rod into 1-2 shifter fork via the hole on the rear of transmission case.

(2) Align the holes in rod and fork, and drive straight pin (6 x 22) into these holes using ST.

ST 398791600 STRAIGHT PIN REMOVER

NOTE:
● Set other rods to Neutral.
● Make sure interlock plunger (5.56 x 19.6) is on the 3-4 fork rod side.

7) Installation of 3-4 shifter fork ⑭ and rod ⑮.

(1) Install interlock plunger (3 x 11.9) onto 3-4 fork rod.

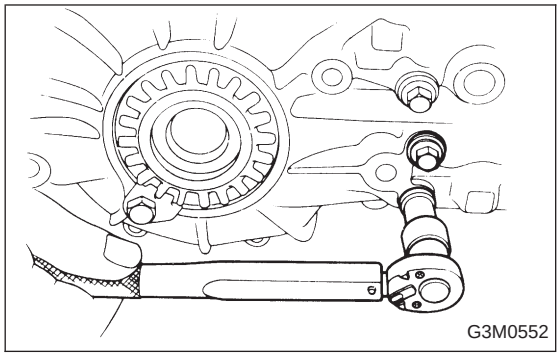
CAUTION:
Apply a coat of grease to plunger to prevent it from falling.

(2) Install 3-4 fork rod into 3-4 shifter fork via the hole on the rear of transmission case.

(3) Align the holes in rod and fork, and drive straight pin (6 x 22) into these holes.

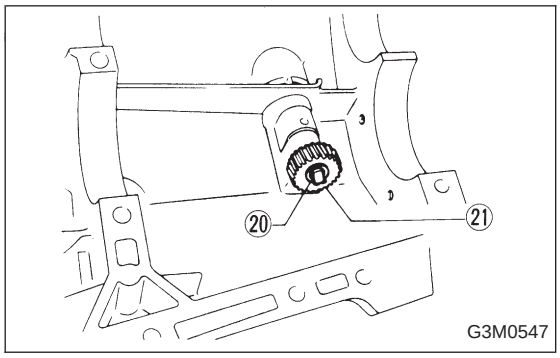
NOTE:
● Set reverse fork rod to Neutral.
● Make sure interlock plunger (installed before) is on the reverse fork rod side.

8) Install 5th shifter fork ⑯ onto the rear of reverse fork rod ⑥. Align holes in the two parts and drive straight pin into place.


G3M0552

9) Position balls (7.1438 mm dia.) ⑰, checking ball springs ⑱ and gaskets ⑲ into 3-4 and 1-2 rod holes, and install plugs ⑳.

CAUTION:
Replace gasket with a new one.



G3M0547

10) Installation of speedometer driven gear ㉑.

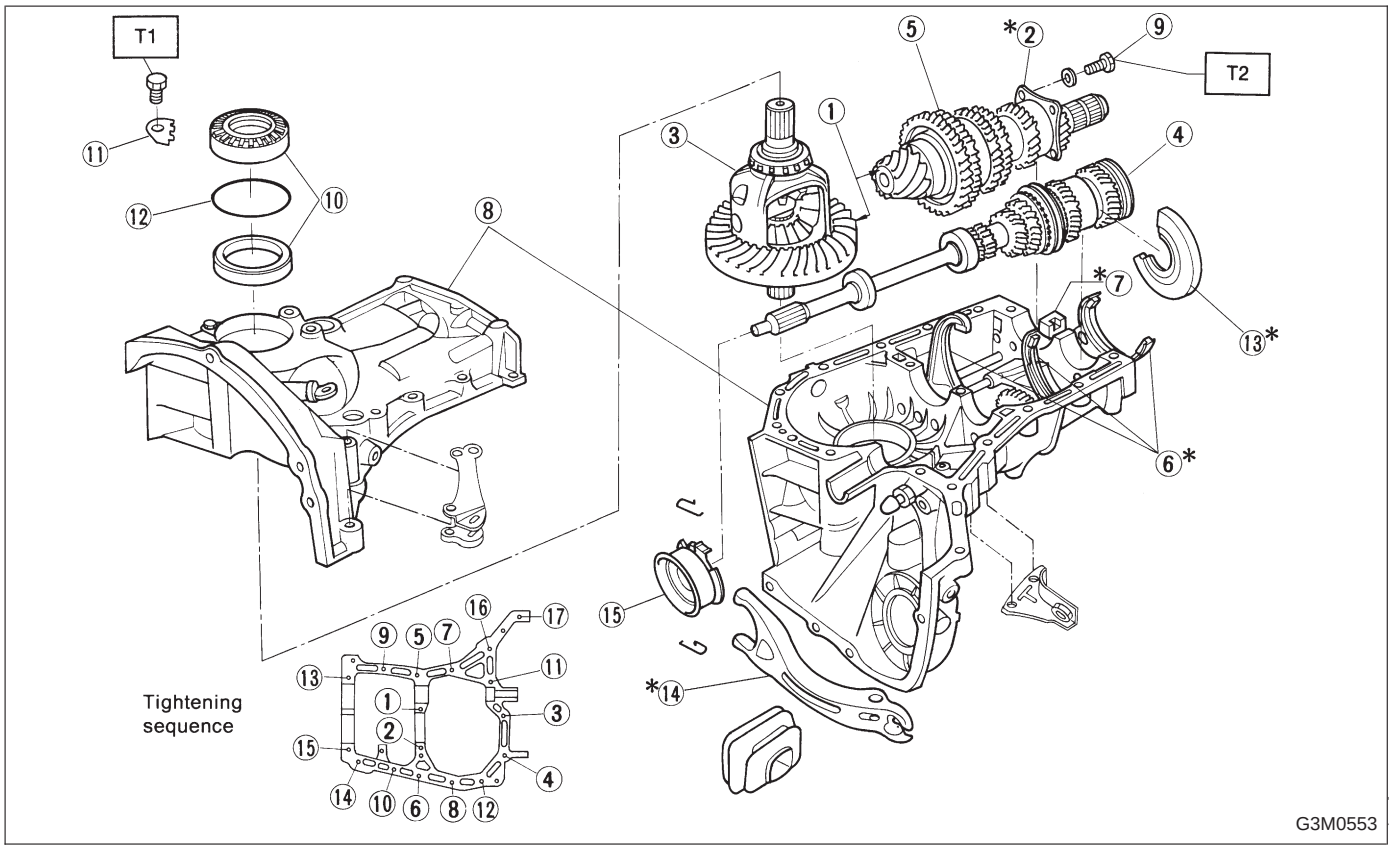
(1) Install washer and speedometer shaft, and press fit oil seal with ST.

ST 899824100 or 499827000 PRESS

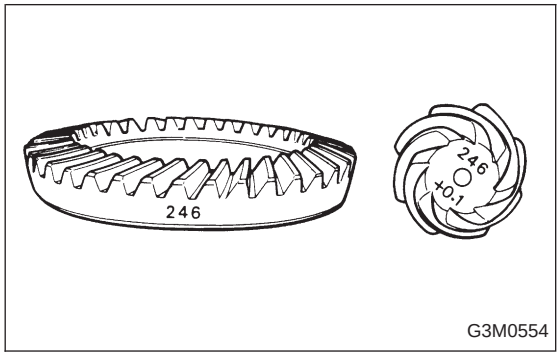
CAUTION:
Use new oil seal, if it has been removed.

(2) Install speedometer driven gear and snap ring.

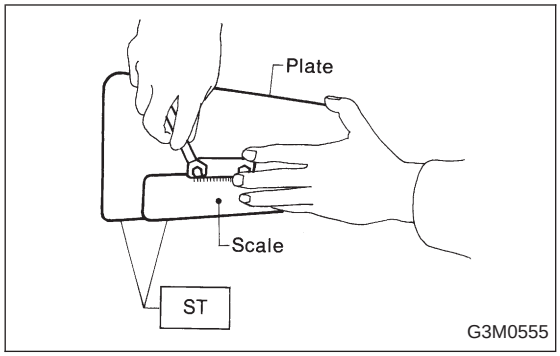
2. COMBINATION OF TRANSMISSION CASE



Tightening torque: N·m (kg-m, ft-lb)
T1: 25 (2.5, 18)
T2: 26 — 32 (2.7 — 3.3, 20 — 24)



1) Alignment marks/figures on hypoid gear set ①
The upper figure on driven pinion is the match number for combining it with hypoid driven gear. The lower figure is for shim adjustment. If no lower figure is shown, the value is zero. The figure on hypoid driven gear indicates a number for combination with drive pinion.



2) Adjustment of drive pinion shim ②

(1) Place drive pinion shaft assembly on right hand transmission main case without shim and tighten bearing mounting bolts.

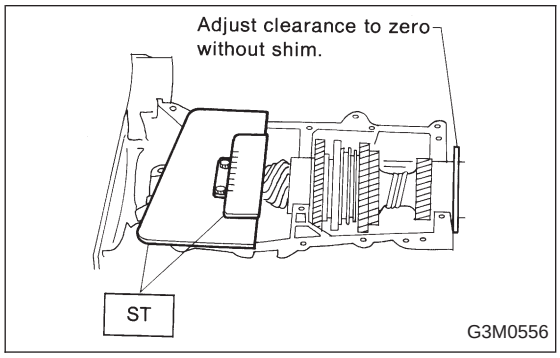
(2) Inspection and adjustment of ST.

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 two bolts.

ST 499917500 DRIVE PINION GAUGE ASSY



(3) Position the ST by inserting the knock pin of ST into the knock hole in the transmission case.

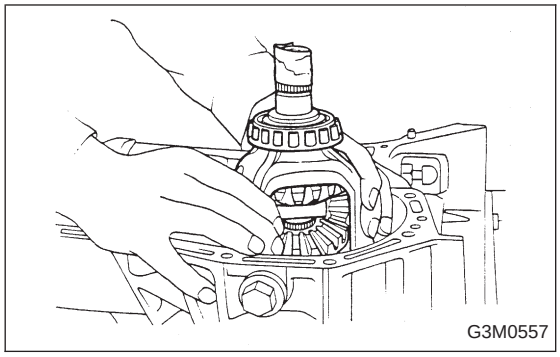
(4) Slide the drive pinion gauge scale with finger tip and read the value at the point where it matches with the end face of drive pinion.

(5) 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 figure on drive pinion is prefixed by + and subtract if the figure is prefixed by − .)

ST 499917500 DRIVE PINION GAUGE ASSY

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.

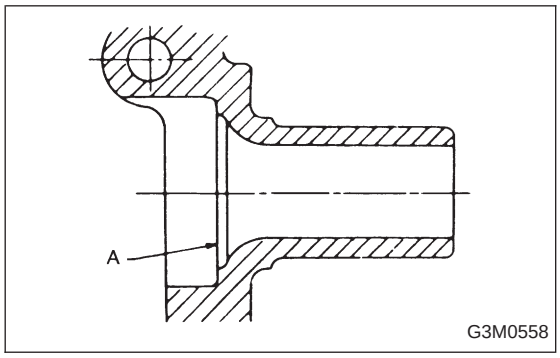
● Drive pinion shim	Part No.	Thickness mm (in)
	32295AA031	0.150 (0.0059)
	32295AA041	0.175 (0.0069)
	32295AA051	0.200 (0.0079)
	32295AA061	0.225 (0.0089)
	32295AA071	0.250 (0.0098)
	32295AA081	0.275 (0.0108)
	32295AA091	0.300 (0.0118)
	32295AA101	0.500 (0.0197)


G3M0557

3) Install differential assembly ③ on left hand transmission case.

CAUTION:
Be careful not to fold the sealing lip of oil seal.

NOTE:
Wrap the left and right splined sections of axle shaft with vinyl tape to prevent scratches.

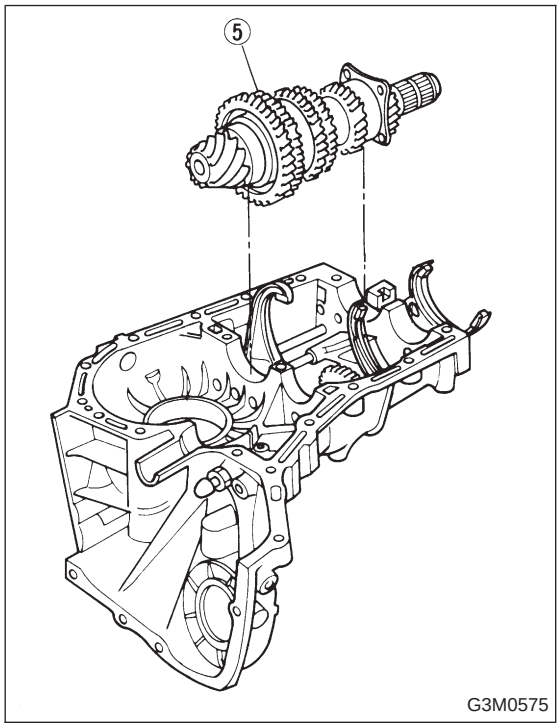


G3M0558

4) Install needle bearing and oil seal onto the front of transmission main shaft assembly, and position in left side transmission case.

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.**

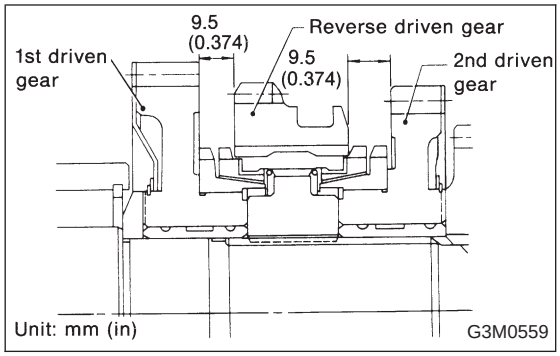
NOTE:
- Align the end face of seal with surface A of left side transmission main case when installing oil seal.
- Be careful not to drop oil seal when installing right side transmission main case.
- Make sure straight pin is positioned in hole in needle bearing's outer race.

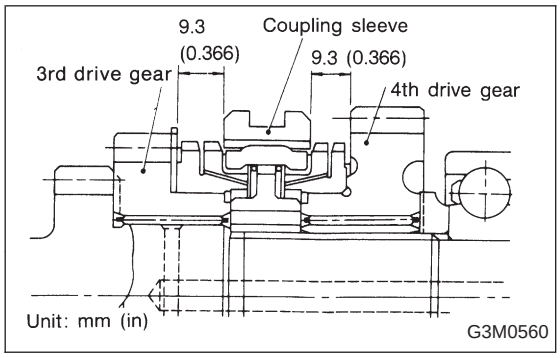


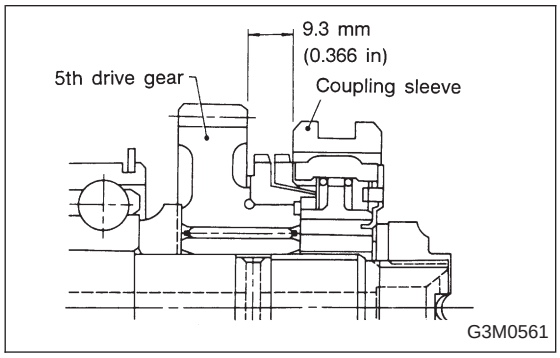
G3M0575

5) Install drive pinion shaft assembly ⑤ with shims selected before into transmission case.

NOTE:
Ensure that the knock pin of the case is fitted into the hole in the bearing outer race.

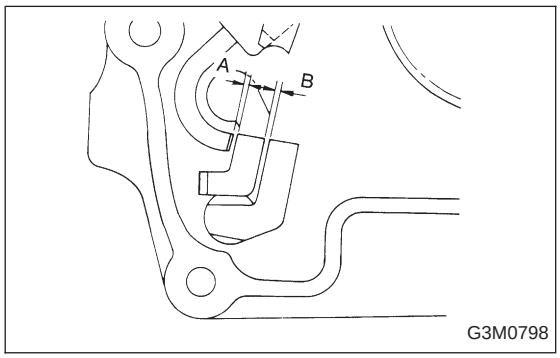






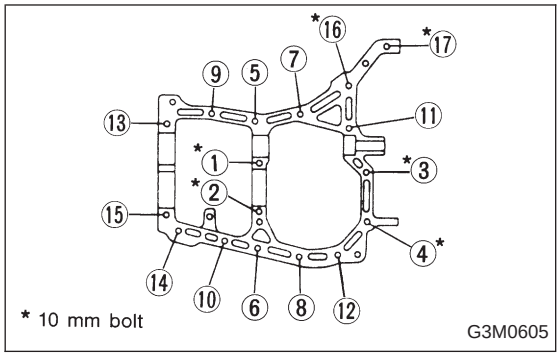
6) Selection of suitable 1st-2nd, 3rd-4th and 5th shifter forks.
Set transmission main shaft assembly and drive pinion shaft assembly in position (so there is no clearance between the two when moved all the way to the front). Select suitable 1st-2nd, 3rd-4th and 5th shifter forks so that coupling sleeve and reverse driven gear are positioned in the center of their synchronizing mechanisms.

1st-2nd shifter fork		
Part No.	No.	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.	No.	Remarks
32810AA060	1	Approach to 4th gear by 0.2 mm (0.008 in)
32810AA070	No mark	Standard
32810AA100	3	Approach to 3rd gear by 0.2 mm (0.008 in)
5th shifter fork		
Part No.	No.	Remarks
32812AA060	1	Approach to 5th gear by 0.2 mm (0.008 in)
32812AA070	No mark	Standard
32812AA100	3	Become distant from 5th gear by 0.2 mm (0.008 in)



7) Inspection of rod end clearance.
Measure rod end clearances A and B. If any clearance is not within specifications, replace rod or fork as required.

A: 1st-2nd to 3rd-4th	0.5 — 1.5 mm (0.020 — 0.059 in)
B: 3rd-4th to 5th	0.6 — 1.4 mm (0.024 — 0.055 in)



8) Combination of transmission case.

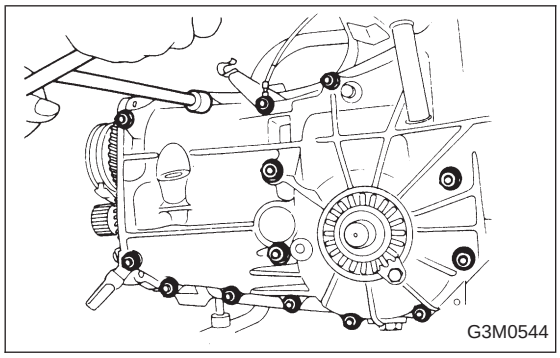
(1) Wipe off grease, oil and dust on the mating surfaces of transmission cases with white gasoline, and apply liquid gasket, and then put case right side and left side together.

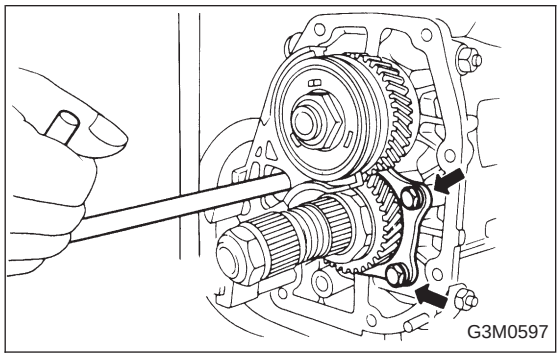
Liquid gasket:
Three-bond 1215 or equivalent

(2) Tighten 17 bolts with bracket, clip, etc. in the following sequence.

Tightening torque:
8 mm bolt
23 — 26 N·m (2.3 — 2.7 kg-m, 17 — 20 ft-lb)
10 mm bolt
36 — 42 N·m (3.7 — 4.3 kg-m, 27 — 31 ft-lb)

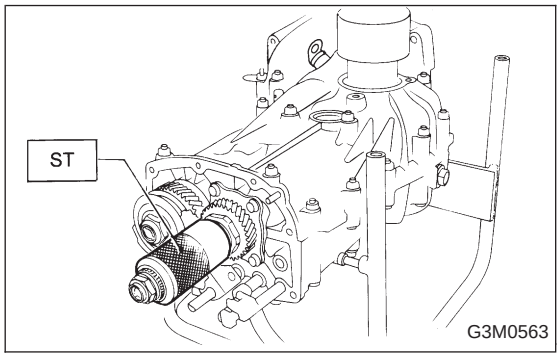
NOTE:
● Insert bolts from the bottom and tighten nuts at the top.
● Put cases together so that drive pinion shim and input shaft holder shim are not caught up in between.
● Confirm that counter gear and speedometer gear are meshed.





9) Tighten ball bearing attachment bolts.

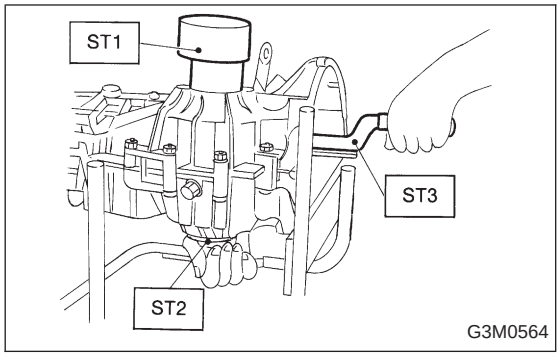
Tightening torque:
26 — 32 N·m (2.7 — 3.3 kg-m, 20 — 24 ft-lb)



10) Backlash adjustment of hypoid gear and preload adjustment of roller bearing.

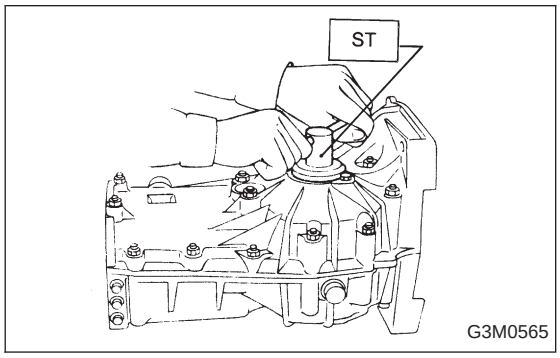
NOTE:
Support drive pinion assembly with ST.

ST 498427100 STOPPER



(1) Place the transmission with case left side facing downward and put ST1 on bearing cup.
(2) Screw 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.

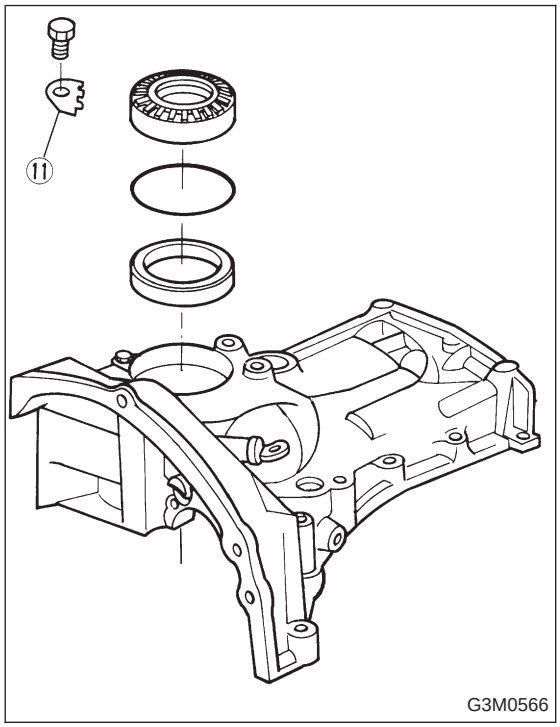
ST1 399780104 WEIGHT
ST2 499787000 WRENCH ASSY
ST3 499927100 HANDLE



(3) 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.

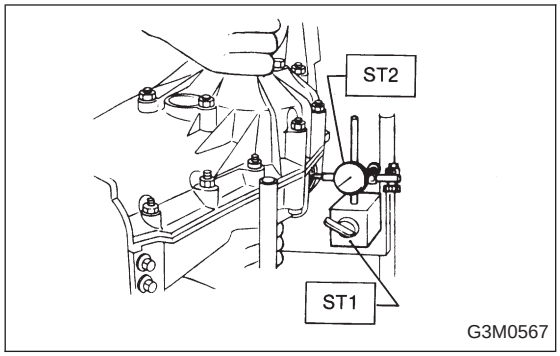
ST 499787000 WRENCH ASSY



(4) Fit lock plate ⑪. 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.

(5) Turn in the retainer on the upper side additionally by 1 notch in order to apply preload on taper roller bearing.
(6) Tighten temporarily both the upper and lower lock plates and mark both holder and lock plate for later readjustment.
(7) Turn transmission main shaft several times while tapping around retainer lightly with plastic hammer.

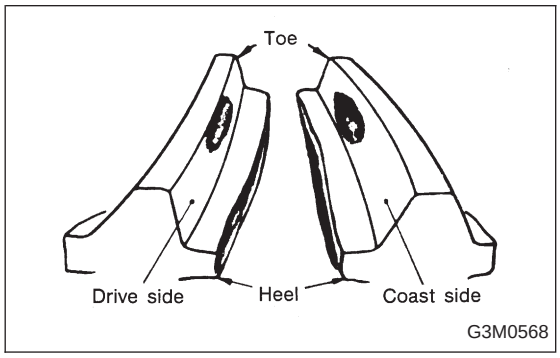


(8) Set ST1 and ST2. Insert the needle through transmission oil drain plug hole so that the needle comes in contact with the tooth surface at a right angle and check the backlash.

ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

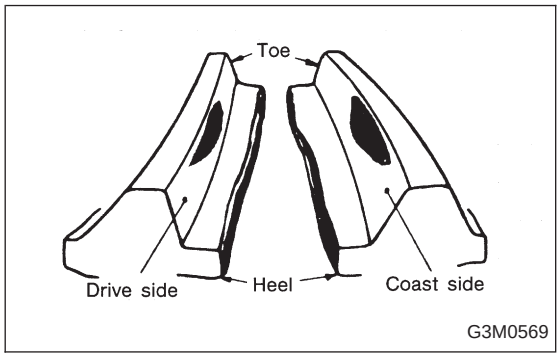
Backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)

NOTE:
● If backlash is outside specified range, adjust it by turning holder in right side case.
● Turning holder pawl 1/2 rotation changes backlash by approximately 0.04 mm (0.0016 in).

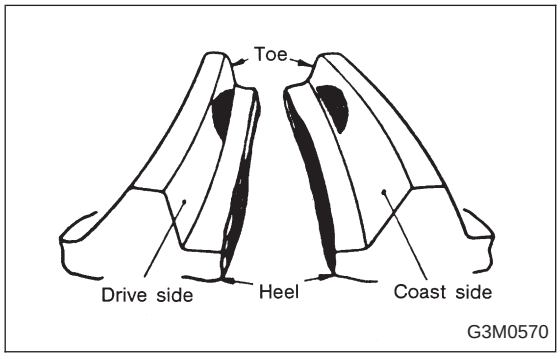


(9) Check tooth contact of hypoid gear as follows: Apply a uniform thin coat of red lead on both tooth surfaces of 3 or 4 teeth of the hypoid gear. Move the hypoid gear back and forth by turning the transmission main shaft until a definite contact pattern is developed on hypoid gear, and judge whether face contact is correct. If it is incorrect, make the following correction.

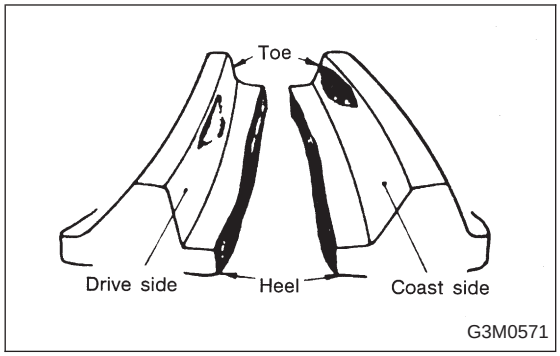
● Tooth contact is correct.



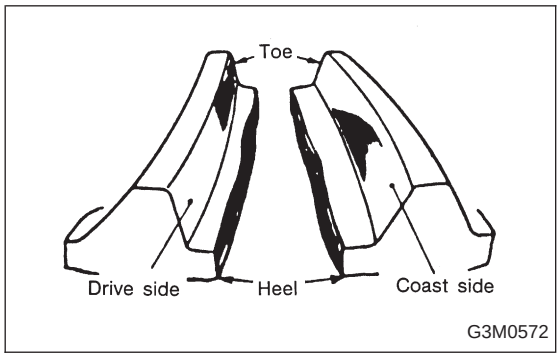
● Backlash is excessive.
To reduce backlash, loosen holder on the upper side (case right side) and turn in the holder on the lower side (case left side) by the same amount.



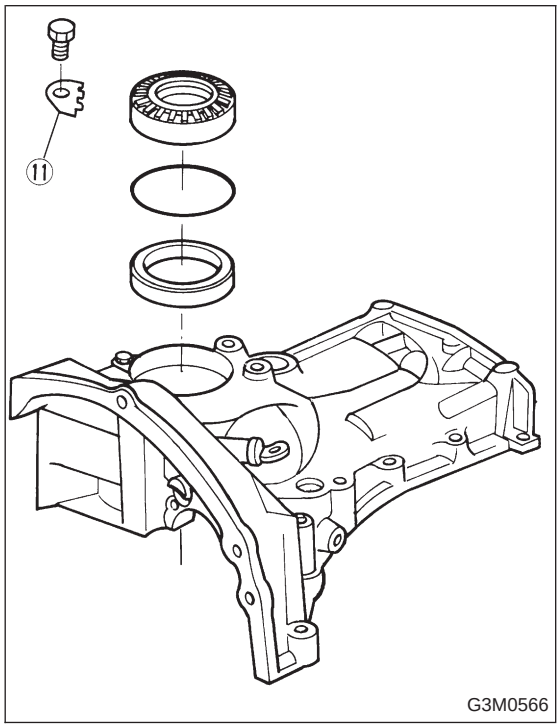
● Backlash is insufficient.
To increase backlash, loosen holder on the lower side (case left side) and turn in the holder on the upper side (case right side) by the same amount.



● The drive pinion shim selected before is too thick. Reduce its thickness.



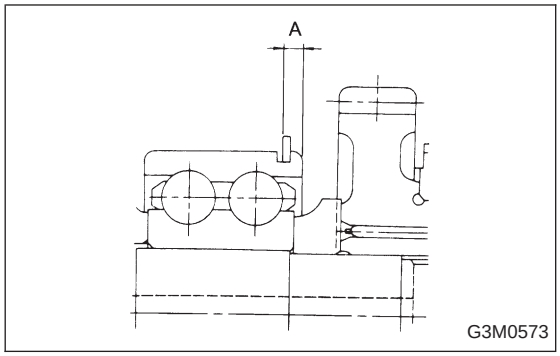
● The drive pinion shim selected before is too thin. Increase its thickness.



11) After checking the tooth contact of hypoid gears, remove the lock plate ⑪. Then loosen retainer until the O-ring groove appears. Fit O-ring into the groove and tighten retainer into the position where retainer has been tightened in.
Tighten lock plate ⑪.

Tightening torque:
22 — 27 N·m (2.2 — 2.8 kg-m, 16 — 20 ft-lb)

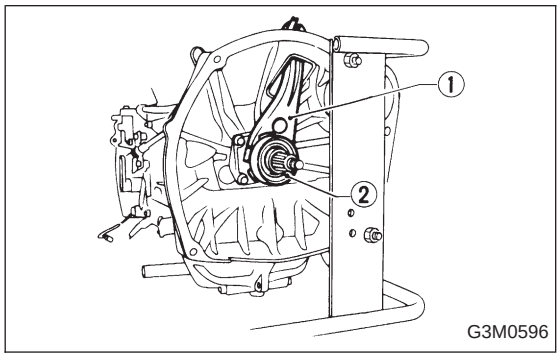
NOTE:
Carry out this job on both upper and lower retainers.



12) Selecting 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.
ST 498147000 DEPTH GAUGE

Dimension A mm (in)	Part No.	Identification
4.0 — 4.13 (0.1575 — 0.1626)	32294AA040	1
3.87 — 3.99 (0.1524 — 0.1571)	32294AA050	2

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.

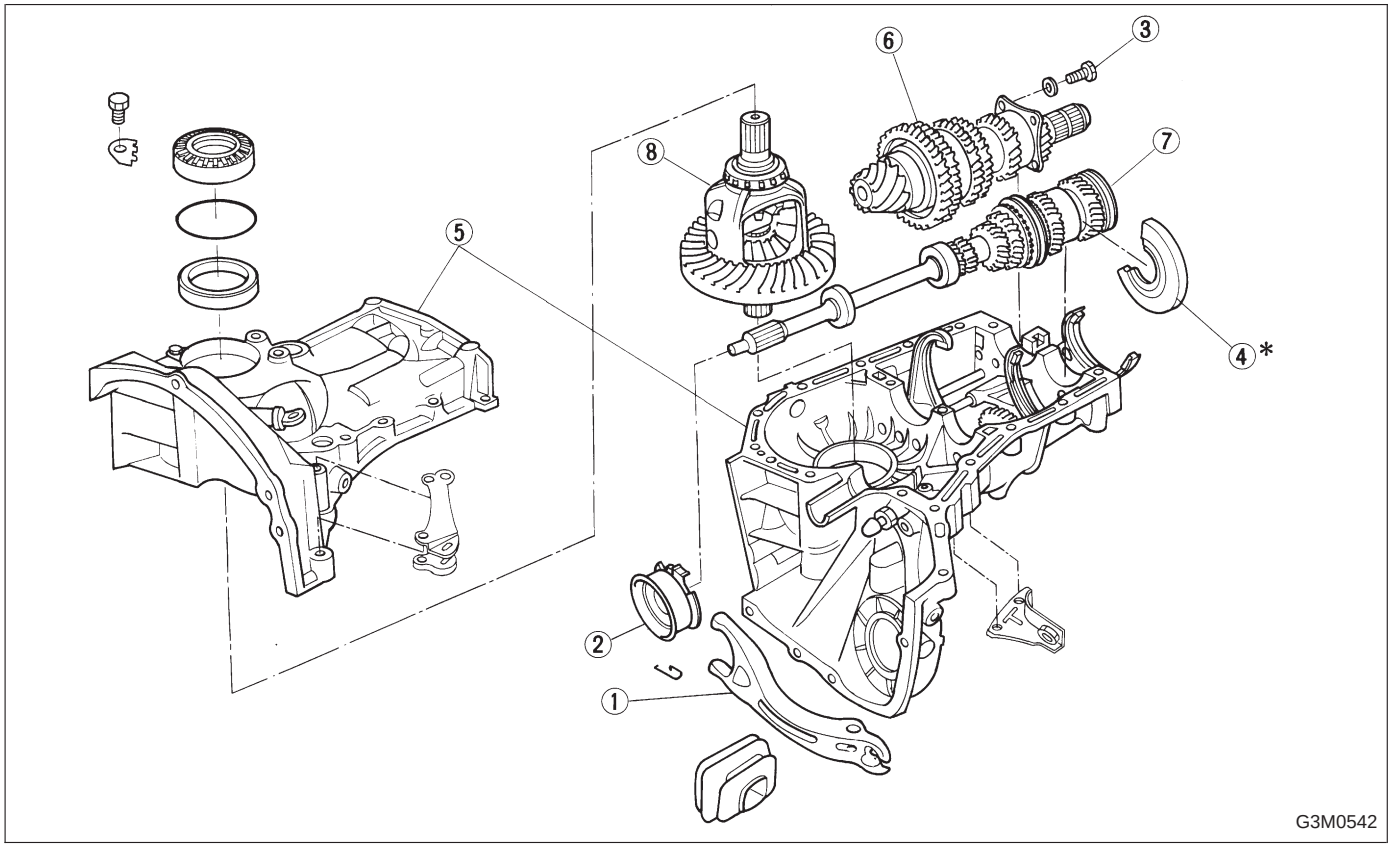


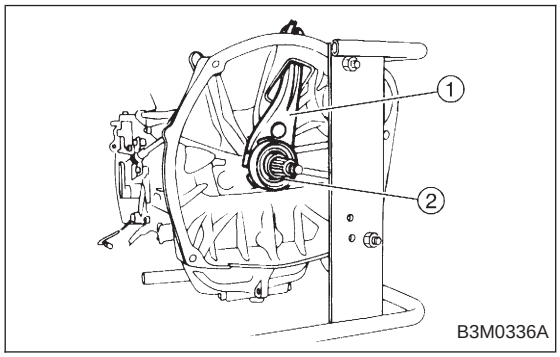
13) Install clutch release lever ① and bearing ②.

5. Transmission Case (FWD Model)

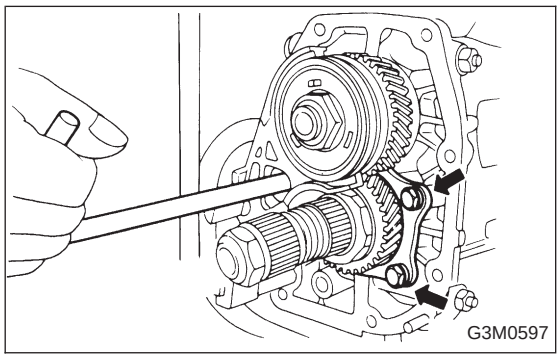
A: DISASSEMBLY

1. SEPARATION OF TRANSMISSION

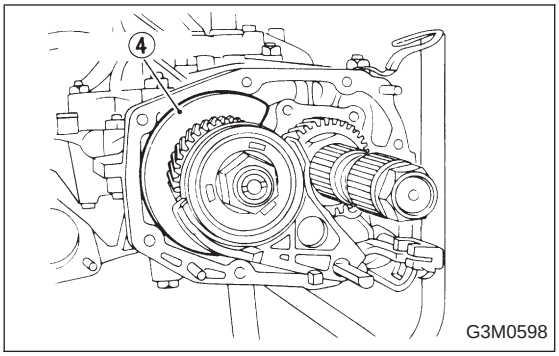




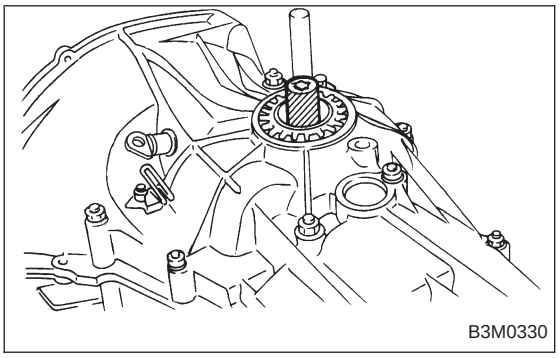
1) Remove clutch release lever ① and bearing ②. <Ref. to 2-10 [W3A0].>



2) Remove bearing mounting bolts.

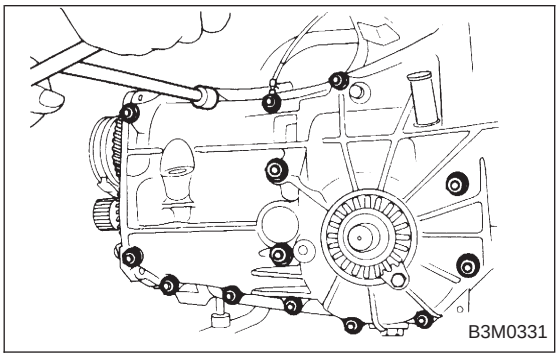


3) Remove main shaft rear plate ④.

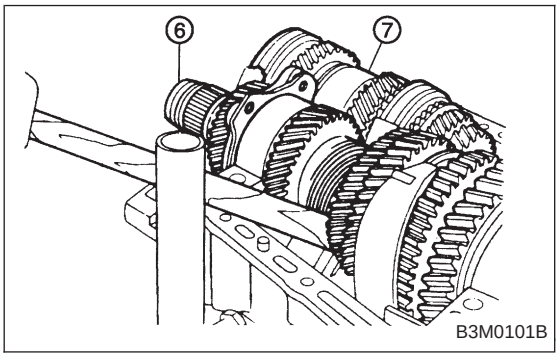


4) Separating transmission case

(1) Put vinyl tape around splines of right and left axle drive shafts to prevent damage to oil seals.



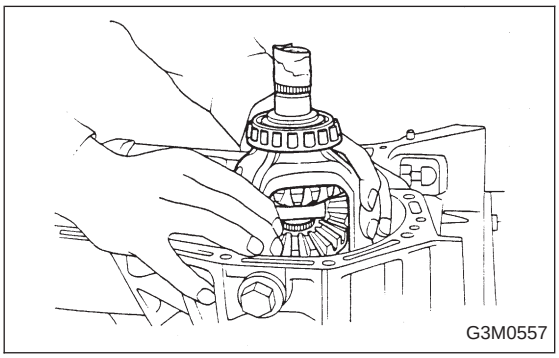
(2) Separate transmission case into right and left cases by loosening seventeen coupling bolts and nuts.



5) Remove drive pinion shaft assembly ⑥ from left side transmission case.

NOTE:
Use a hammer handle, etc. to remove if too tight.

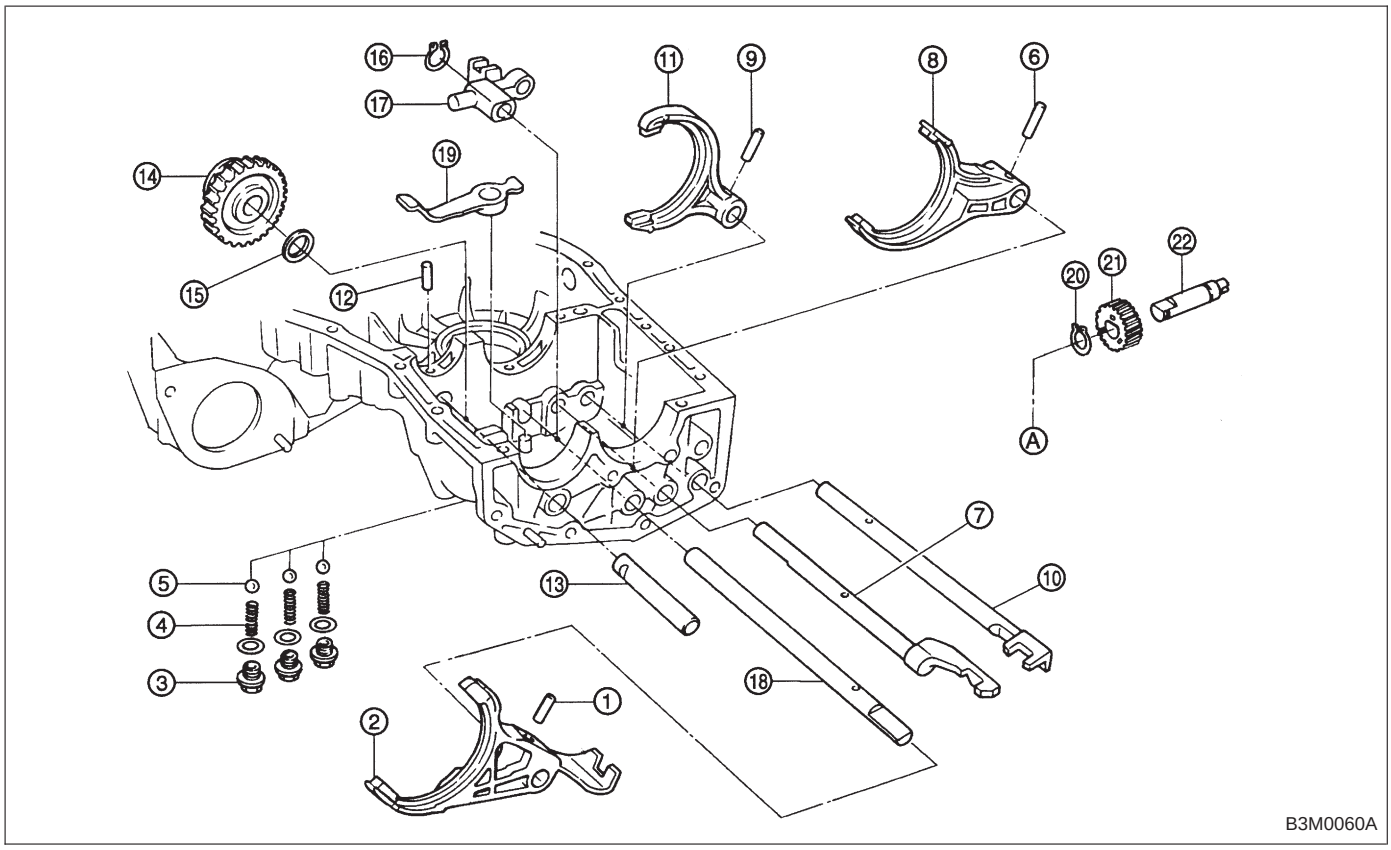
6) Remove main shaft assembly ⑦.



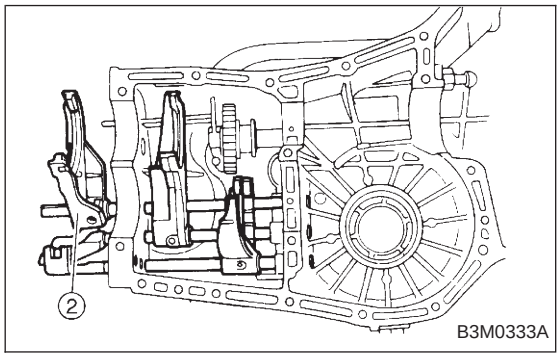
7) Remove differential assembly.

CAUTION:
- **Be careful not to confuse right and left roller bearing outer races.**
- **Be careful not to damage retainer oil seal.**

2. TRANSMISSION CASE



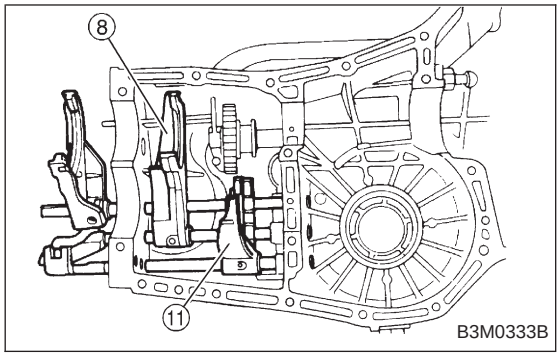
Ⓐ: To right hand transmission case



1) Drive out spring pin ① with ST, and remove 5th shifter fork ②.

ST 398791700 STRAIGHT PIN REMOVER

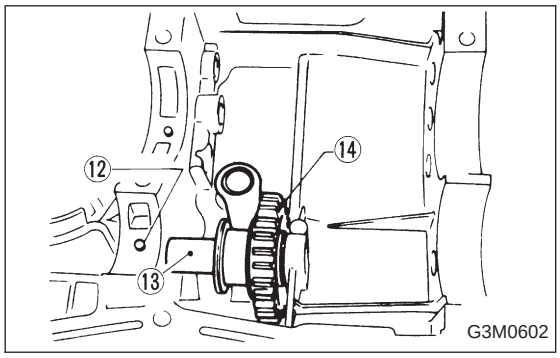
2) Remove plugs ③, springs ④ and checking balls ⑤.



3) Drive out spring pin ⑥, and pull out 3-4 fork rod ⑦ and shifter fork ⑧.

NOTE:
When removing rod, keep other rods in neutral. Also, when pulling out straight pin, remove it toward inside of case so that it may not hit against case.

4) Drive out straight pin ⑨, and pull out 1-2 fork rod ⑩ and shifter fork ⑪.

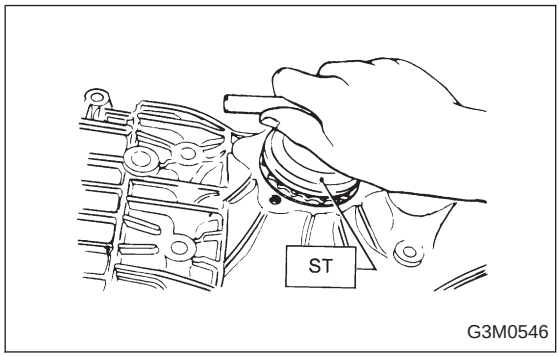


5) Pull out straight pin ⑫, and remove idler gear shaft ⑬, reverse idler gear ⑭ and washer ⑮.

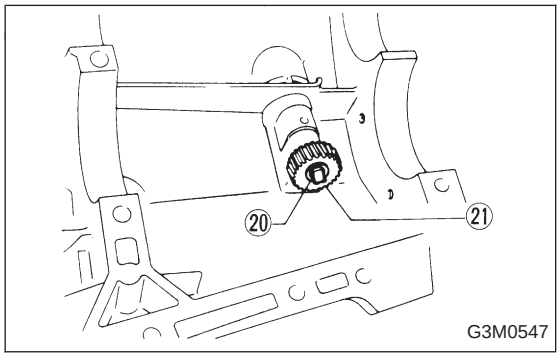
6) Remove outer snap ring ⑯, and pull out reverse shifter rod arm ⑰ from reverse fork rod ⑱. Then take out ball, spring and interlock plunger from rod.
And then remove rod.

NOTE:
When pulling out reverse shifter rod arm, be careful not to let ball pop out of arm.

7) Remove reverse shifter lever ⑲.



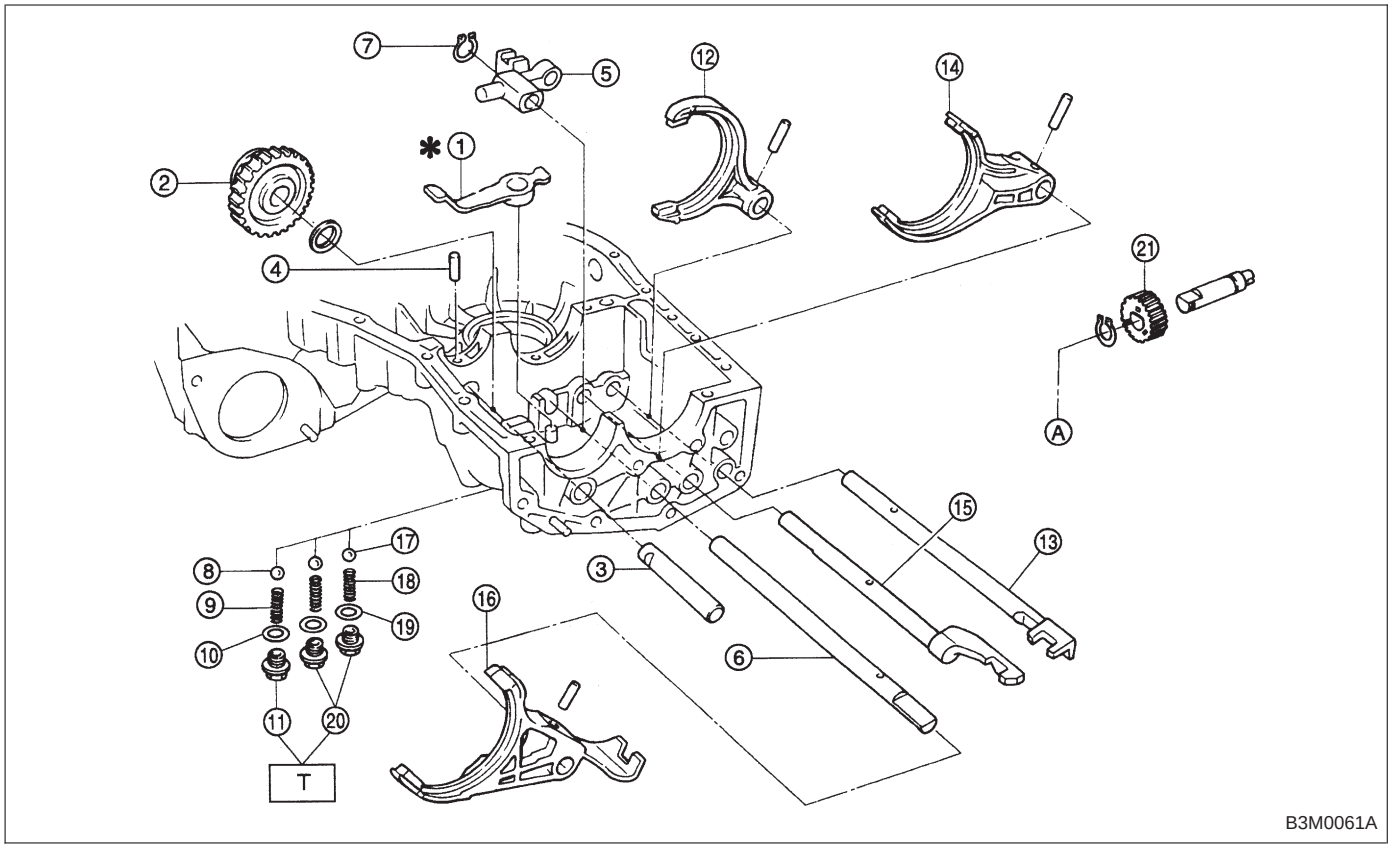
8) Remove differential side retainers using ST.
ST 499787000 WRENCH ASSY



9) Remove outer snap ring ⑳ and pull out speedometer driven gear ㉑. Next, remove oil seal, speedometer shaft ㉒ and washer.

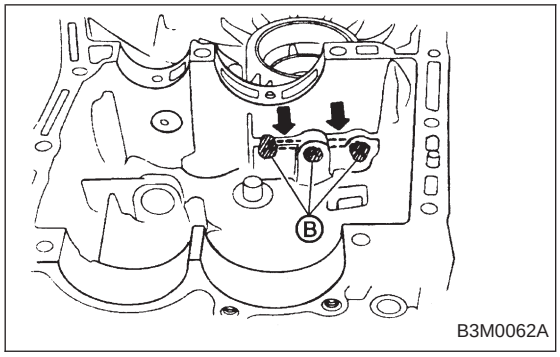
B: ASSEMBLY

1. TRANSMISSION CASE

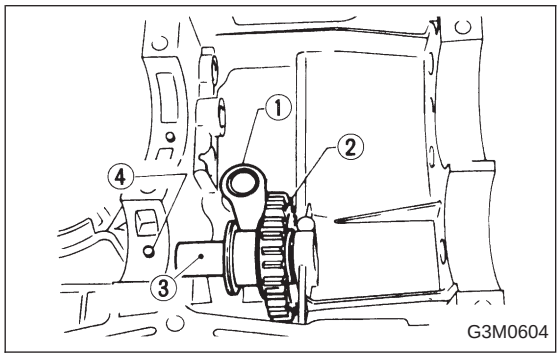


Ⓐ: To right hand transmission case

Tightening torque: N·m (kg-m, ft-lb)
T: 19.6±0.1 (2.00±0.015, 14.5±0.1)



1) Position interlock plungers (5.56 x 19.6), one plunger in hole between 1-2 and 3-4 fork rod holes, and one plunger in hole between 3-4 and reverse fork rod holes.
Ⓑ: Rod holes



2) Install reverse shifter lever ①, reverse idler gear ② and reverse idler gear shaft ③, and secure with straight pin ④.
NOTE:
Be sure to install reverse idler shaft from the rear side.

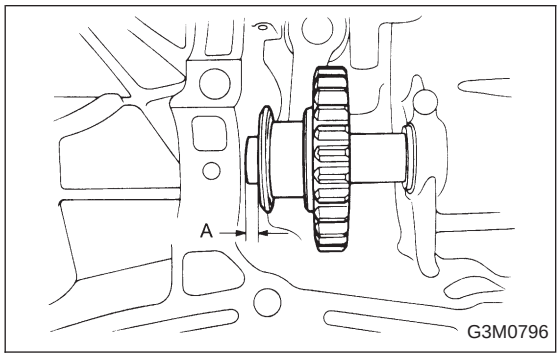
3) Install reverse arm fork spring, ball and interlock plunger (5.56 x 19.6) to reverse fork rod arm ⑤. Insert reverse fork rod ⑥ into hole in reverse fork rod arm ⑤, and hold it with outer snap ring ⑦ using ST.

ST 399411700 ACCENT BALL INSTALLER

CAUTION:
Apply grease to plunger to prevent it from falling.

4) Position ball ⑧ (7.1438), spring ⑨ and gasket ⑩ in reverse shifter rod hole, on left side transmission case, and tighten checking ball plug ⑪.

CAUTION:
Replace gasket with a new one.

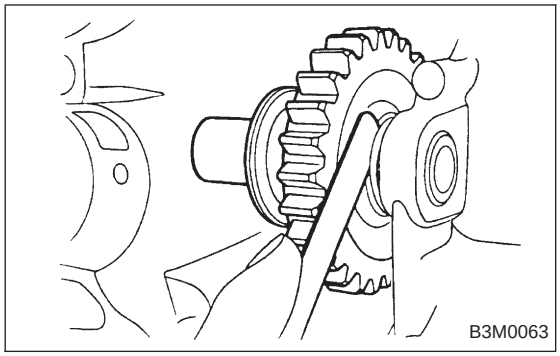


5) Adjustment of reverse idler gear position

(1) Move reverse shifter rod toward REV side. Adjust clearance between reverse idler gear and transmission case wall, using reverse shifter lever ①.

Clearance A:
6.0 — 7.5 mm (0.236 — 0.295 in)

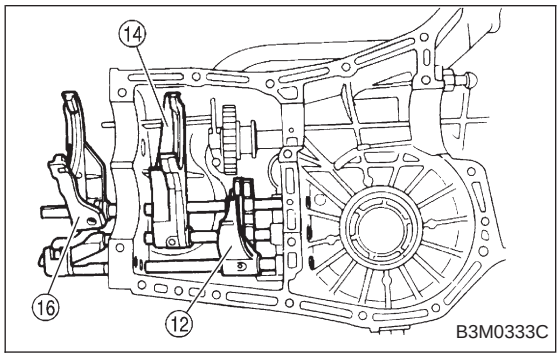
Reverse shifter lever		
Part No.	No.	Remarks
32820AA000	0	Further from case wall
32820AA010	No mark	Standard
32820AA020	2	Closer to case wall



(2) After installing a suitable reverse shifter lever, shift into neutral. Using a thickness gauge, measure clearance between reverse idler gear and transmission case wall and adjust with washer(s).

Clearance:
0 — 0.5 mm (0 — 0.020 in)

Washer (20.5 x 26 x t)	
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)



6) Installation of 1-2 shifter fork ⑫ and rod ⑬

(1) Install 1-2 fork rod into 1-2 shifter fork via the hole on the rear of transmission case.
(2) Align the holes in rod and fork, and drive straight pin (6 x 22) into these holes using ST.

ST 398791700 STRAIGHT PIN REMOVER

NOTE:
- Set other rods to neutral.
- Make sure interlock plunger (5.56 x 19.6) is on the 3-4 fork rod side.

7) Installation of 3-4 shifter fork ⑭ and rod ⑮

(1) Install interlock plunger (3 x 11.9) onto 3-4 fork rod.

CAUTION:
Apply a coat of grease to plunger to prevent it from falling.

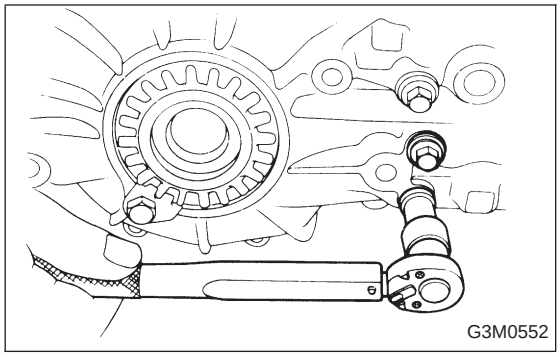
(2) Install 3-4 fork rod into 3-4 shifter fork via the hole on the rear of transmission case.
(3) Align the holes in rod and fork, and drive straight pin (6 x 22) into these holes.

ST 398791700 STRAIGHT PIN REMOVER

NOTE:
- Set reverse fork rod to neutral.
- Make sure interlock plunger (installed before) is on the reverse fork rod side.

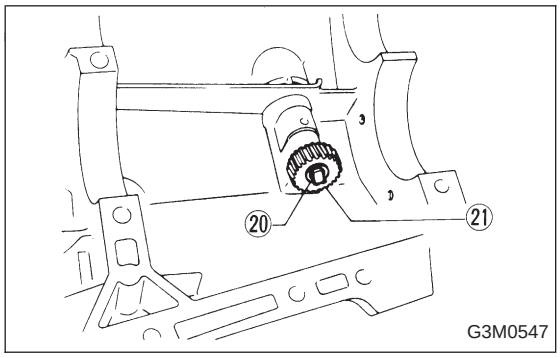
8) Install 5th shifter fork ⑯ onto the rear of reverse fork rod ⑥. Align holes in the two parts and drive straight pin into place.

ST 398791700 STRAIGHT PIN REMOVER


G3M0552

9) Position balls ⑰, checking ball springs ⑱ and gaskets ⑲ into 3-4 and 1-2 rod holes, and install plugs ⑳.

CAUTION:
Replace gasket with a new one.



G3M0547

10) Installation of speedometer driven gear ㉑

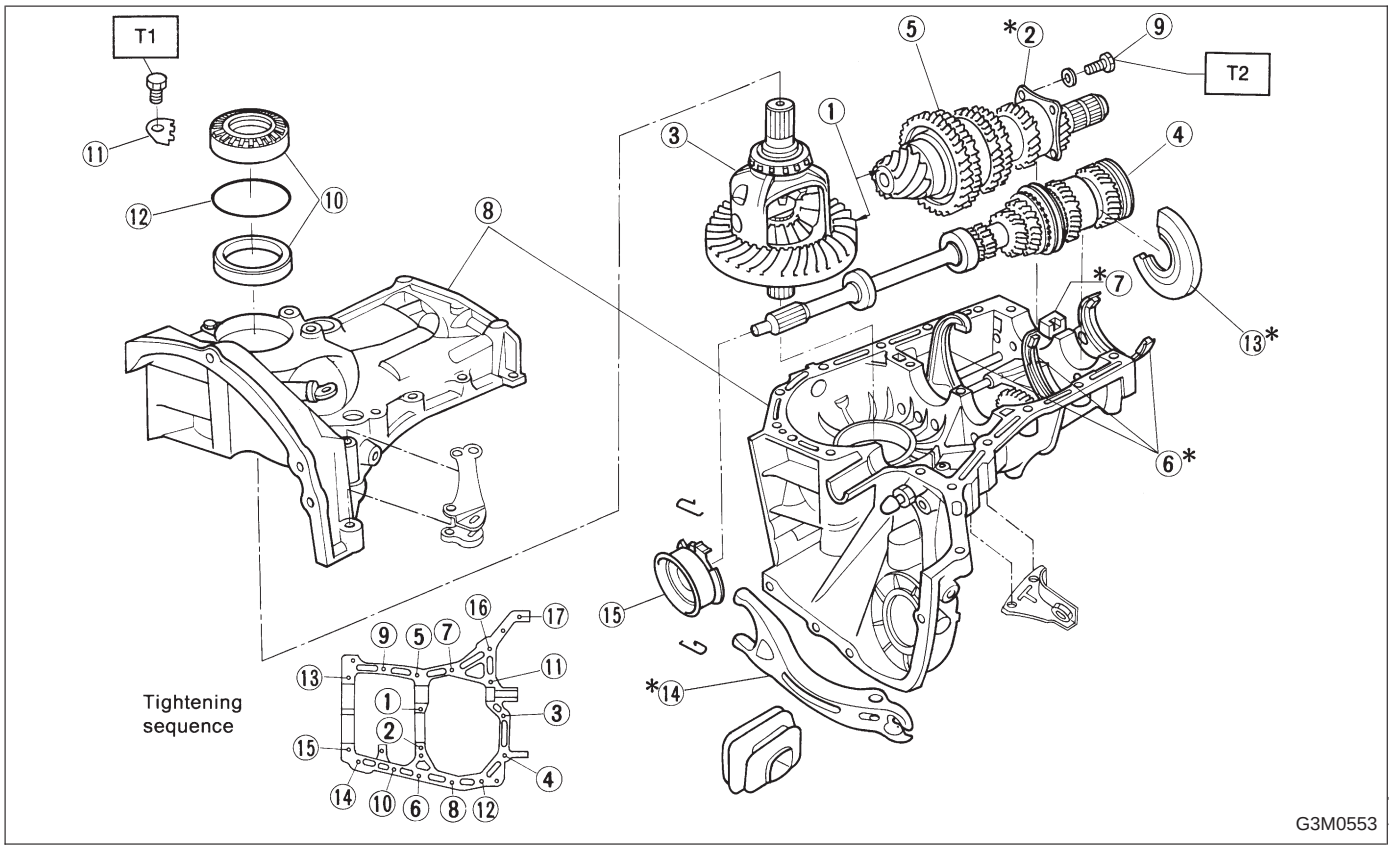
(1) Install washer and speedometer shaft, and press fit oil seal with ST.

ST 899824100 or 499827000 PRESS

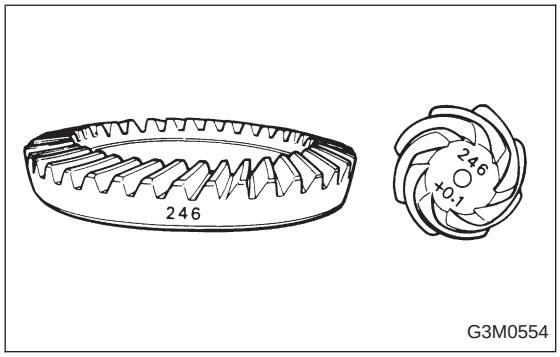
CAUTION:
Use new oil seal, if it has been removed.

(2) Install speedometer driven gear and snap ring.

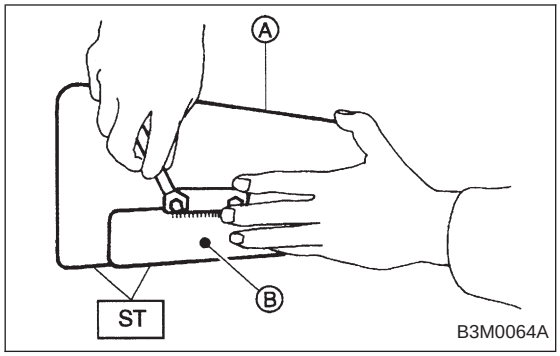
2. COMBINATION OF TRANSMISSION CASE



Tightening torque: N·m (kg-m, ft-lb)
T1: 25 (2.5, 18)
T2: 29±3 (3.0±0.3, 21.7±2.2)



1) Alignment marks/numbers on hypoid gear set ①
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.



2) Adjustment of drive pinion shim ②

(1) Place drive pinion shaft assembly on right hand transmission main case without shim and tighten bearing mounting bolts.

(2) Inspection and adjustment of ST

NOTE:

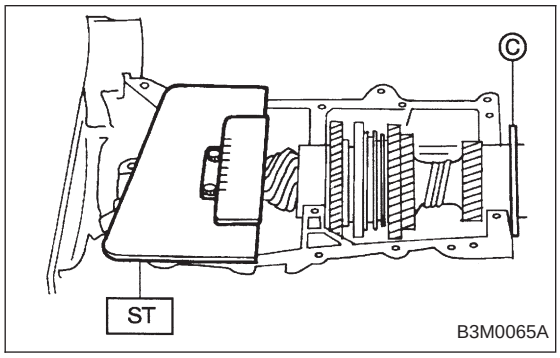
● Loosen the two bolts and adjust so that the scale indicates 0.5 correctly when the plate end and the scale end are on the same level.

● Tighten the two bolts.

ST 499917500 DRIVE PINION GAUGE ASSY

Ⓐ: Plate

Ⓑ: Scale



(3) Position the ST by inserting the knock pin of ST into the knock hole in the transmission case.

(4) 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.

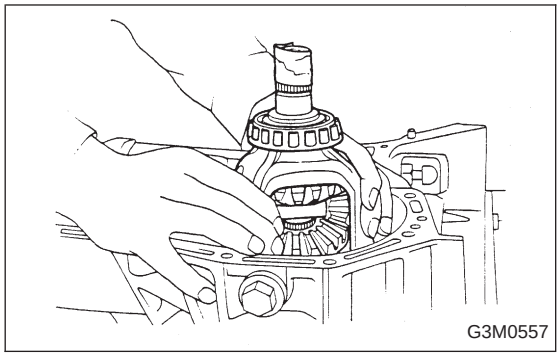
Ⓒ: Adjust clearance to zero without shim.

(5) 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

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.

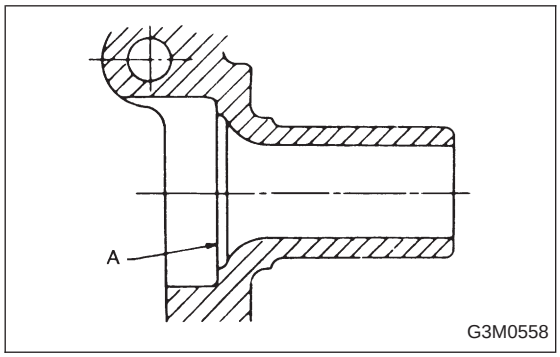
Drive pinion shim	
Part No.	Thickness mm (in)
32295AA031	0.150 (0.0059)
32295AA041	0.175 (0.0069)
32295AA051	0.200 (0.0079)
32295AA061	0.225 (0.0089)
32295AA071	0.250 (0.0098)
32295AA081	0.275 (0.0108)
32295AA091	0.300 (0.0118)
32295AA101	0.500 (0.0197)


G3M0557

3) Install differential assembly ③ on left hand transmission case.

CAUTION:
Be careful not to fold the sealing lip of oil seal.

NOTE:
Wrap the left and right splined sections of axle shaft with vinyl tape to prevent scratches.

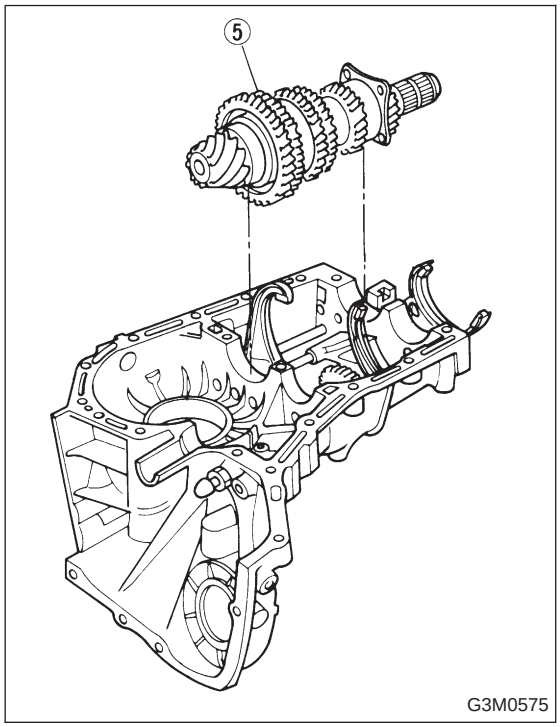


G3M0558

4) Install needle bearing and oil seal onto the front of transmission main shaft assembly ④, and position in left side transmission case.

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.**

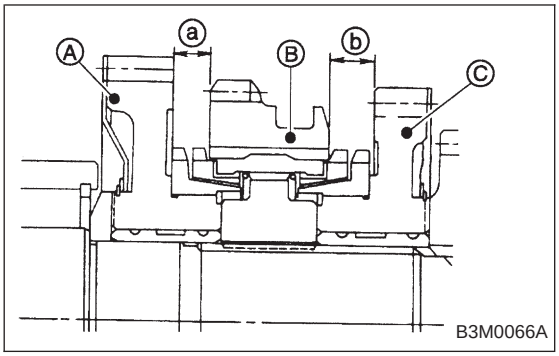
NOTE:
- Align the end face of seal with surface A of left side transmission main case when installing oil seal.
- Be careful not to drop oil seal when installing right side transmission main case.
- Make sure straight pin is positioned in hole in needle bearing's outer race.



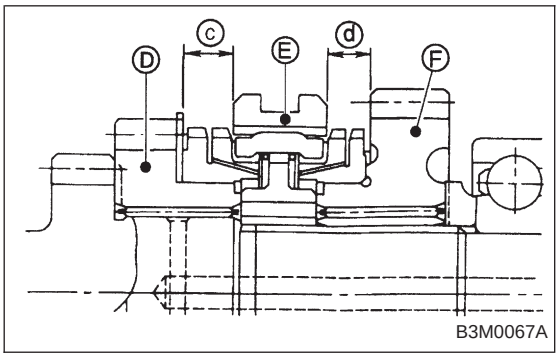
G3M0575

5) Install drive pinion shaft assembly ⑤ with shims selected before into transmission case.

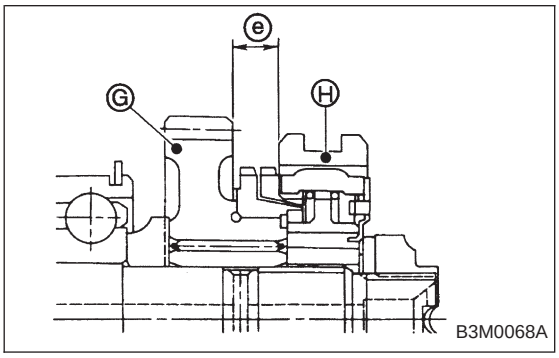
NOTE:
Ensure that the knock pin of the case is fitted into the hole in the bearing outer race.



B3M0066A



B3M0067A



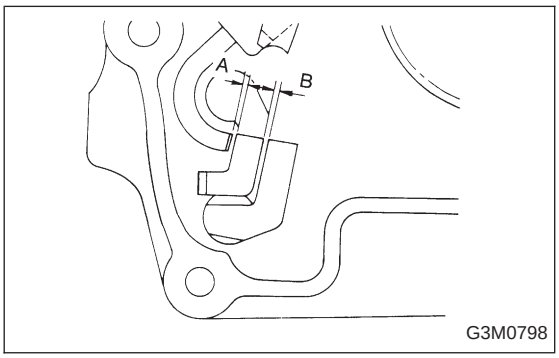
B3M0068A

6) Selection of suitable 1st-2nd, 3rd-4th and 5th shifter fork

Set transmission main shaft assembly and drive pinion shaft assembly in position (so there is no clearance between the two when moved all the way to the front). Select suitable 1st-2nd, 3rd-4th and 5th shifter fork so that coupling sleeve and reverse driven gear are positioned in the center of their synchronizing mechanisms.

	Clearance mm (in)
1st driven gear Ⓐ to reverse driven gear Ⓑ	ⓐ : 9.5 (0.374)
2nd driven gear Ⓒ to reverse driven gear Ⓑ	ⓑ : 9.5 (0.374)
3rd drive gear Ⓓ to coupling sleeve Ⓔ	ⓒ : 9.3 (0.366)
4th drive gear Ⓕ to coupling sleeve Ⓔ	ⓓ : 9.3 (0.366)
5th drive gear Ⓖ to coupling sleeve Ⓗ	ⓔ : 9.3 (0.366)

1st-2nd shifter fork		
Part No.	No.	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.	No.	Remarks
32810AA060	1	Approach to 4th gear by 0.2 mm (0.008 in)
32810AA070	No mark	Standard
32810AA100	3	Approach to 3rd gear by 0.2 mm (0.008 in)
5th shifter fork		
Part No.	No.	Remarks
32812AA060	1	Approach to 5th gear by 0.2 mm (0.008 in)
32812AA070	No mark	Standard
32812AA100	3	Become distant from 5th gear by 0.2 mm (0.008 in)

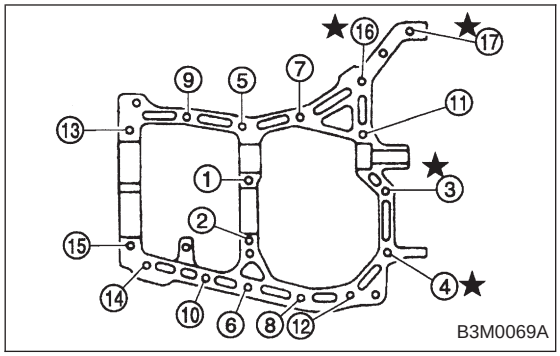


G3M0798

7) Inspection of rod end clearance

Measure rod end clearances A and B. If any clearance is not within specifications, replace rod or fork as required.

A: 1st-2nd to 3rd-4th	0.5 — 1.5 mm (0.020 — 0.059 in)
B: 3rd-4th to 5th	0.6 — 1.4 mm (0.024 — 0.055 in)



8) Combination of transmission case

(1) Wipe off grease, oil and dust on the mating surfaces of transmission cases with white gasoline, and apply liquid gasket, and then put case right side and left side together.

Liquid gasket:

THREE BOND 1215 or equivalent

(2) Tighten 17 bolts with bracket, clip, etc. as shown in the figure.

Tightening torque:

8 mm bolt

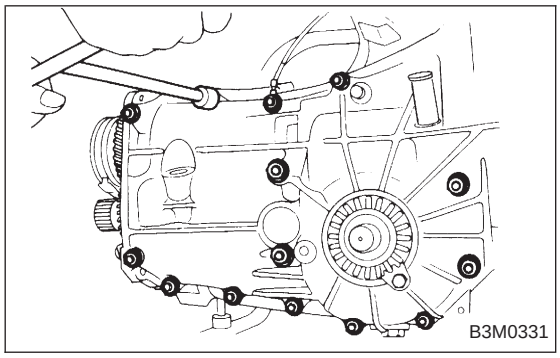
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)

★ 10 mm bolt

39±3 N·m (4.0±0.3 kg-m, 28.9±2.2 ft-lb)

NOTE:

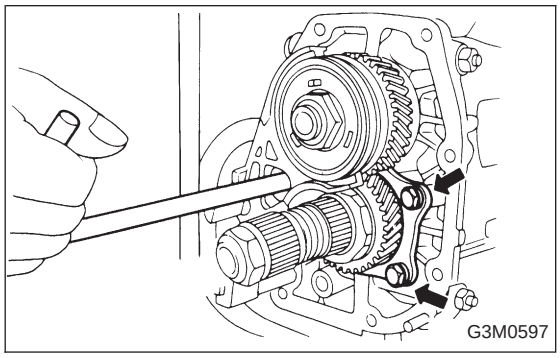
- Insert bolts from the bottom and tighten nuts at the top.
- Put cases together so that drive pinion shim and input shaft holder shim are not caught up in between.
- Confirm that counter gear and speedometer gear are meshed.



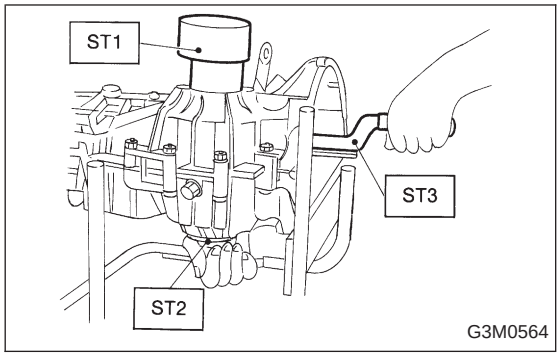
9) Tighten ball bearing attachment bolts.

Tightening torque:

29±3 N·m (3.0±0.3 kg-m, 21.7±2.2 ft-lb)

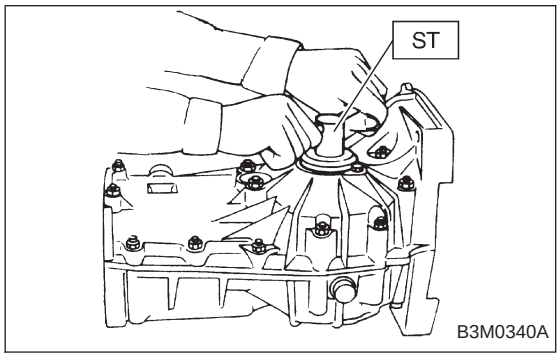


10) Backlash adjustment of hypoid gear and preload adjustment of roller bearing



(1) Place the transmission with case left side facing downward and put ST1 on bearing cup.
(2) Screw 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.

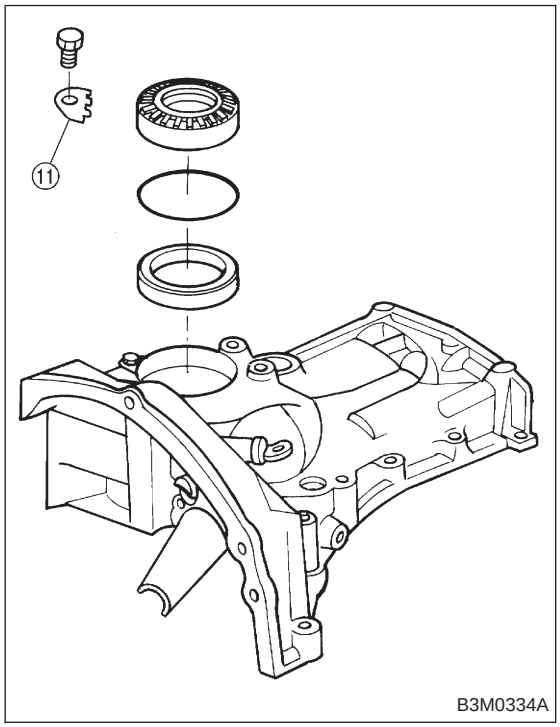
ST1 399780104 WEIGHT
ST2 499787000 WRENCH ASSY
ST3 499927100 HANDLE



(3) 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.

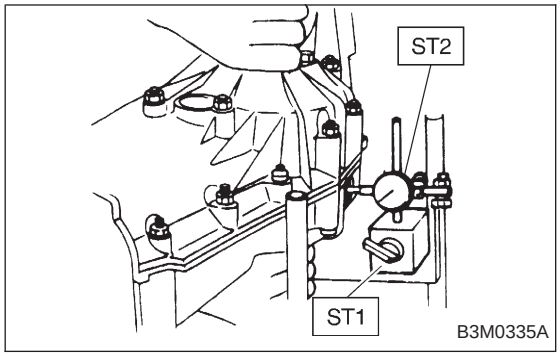
ST 499787000 WRENCH ASSY



(4) Fit lock plate ⑪. 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.

(5) Turn in the retainer on the upper side additionally by 1 notch in order to apply preload on taper roller bearing.
(6) Tighten temporarily both the upper and lower lock plates and mark both holder and lock plate for later readjustment.
(7) Turn transmission main shaft several times while tapping around retainer lightly with plastic hammer.
(8) Set ST1 and ST2. 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.

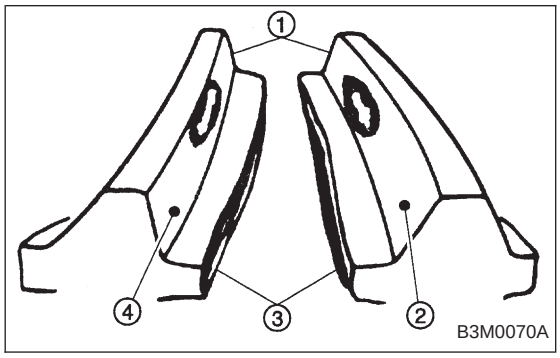


ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

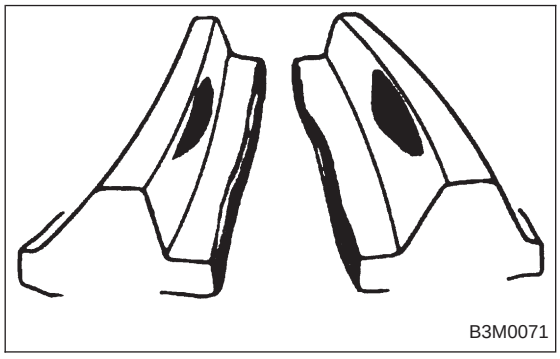
Backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)

NOTE:
● If backlash is outside specified range, adjust it by turning holder in right side case.
● Turning holder pawl 1/2 rotation changes backlash by approximately 0.04 mm (0.0016 in).

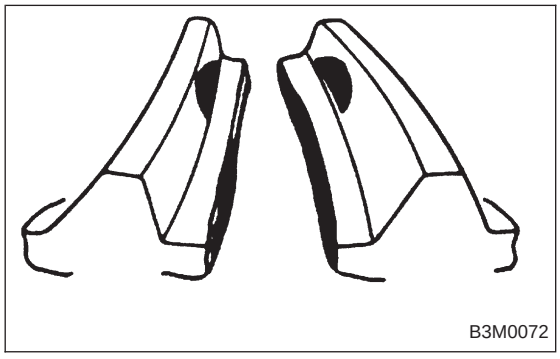
(9) Check tooth contact of hypoid gear as follows: Apply a uniform thin coat of red lead on both tooth surfaces of 3 or 4 teeth of the hypoid gear. Move the hypoid gear back and forth by turning the transmission main shaft until a definite contact pattern is developed on hypoid gear, and judge whether face contact is correct. If it is incorrect, make the following correction.



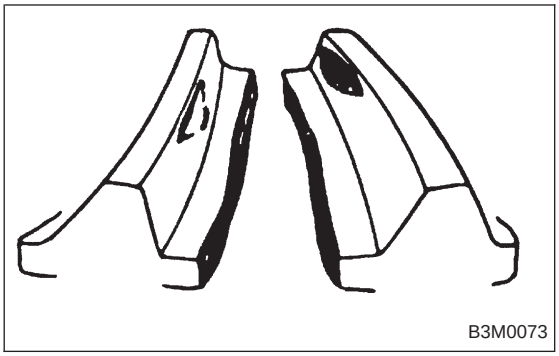
● Tooth contact is correct.
① Toe
② Coast side
③ Heel
④ Drive side



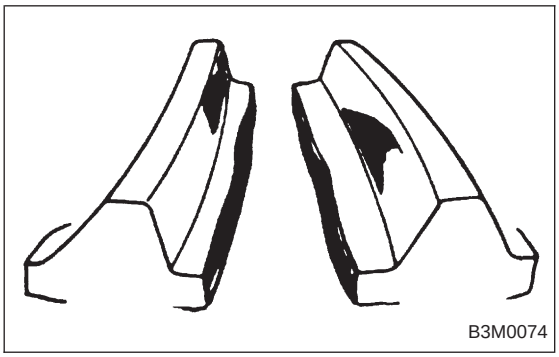
● Backlash is excessive.
To reduce backlash, loosen holder on the upper side (case right side) and turn in the holder on the lower side (case left side) by the same amount.



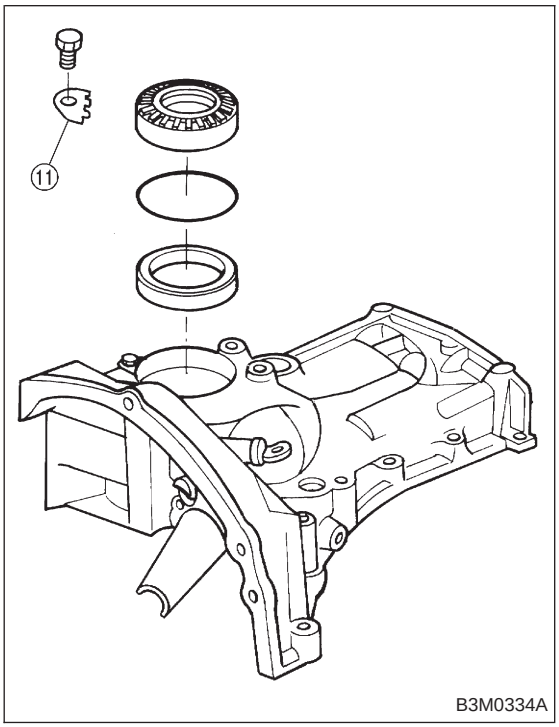
● Backlash is insufficient.
To increase backlash, loosen holder on the lower side (case left side) and turn in the holder on the upper side (case right side) by the same amount.


B3M0073

● The drive pinion shim selected before is too thick. Reduce its thickness.


B3M0074

● The drive pinion shim selected before is too thin. Increase its thickness.

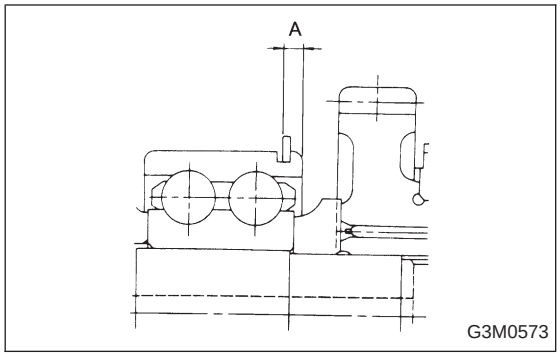


B3M0334A

11) After checking the tooth contact of hypoid gears, remove the lock plate ⑪. Then loosen retainer until the O-ring groove appears. Fit O-ring into the groove and tighten retainer into the position where retainer has been tightened in.
Tighten lock plate ⑪.

Tightening torque:
25±3 N·m (2.5±0.3 kg-m, 18.1±2.2 ft-lb)

NOTE:
Carry out this job on both upper and lower retainers.

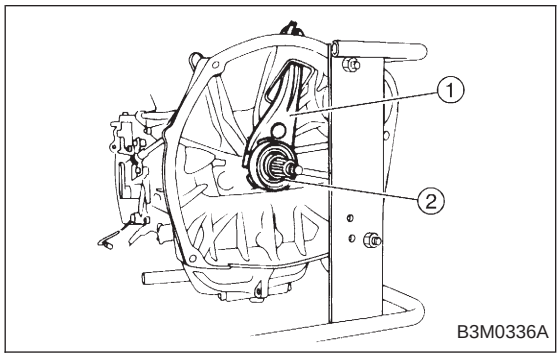


12) Selecting of main shaft rear plate
Using ST, measure the amount A of ball bearing protrusion from transmission main case surface and select the proper plate in the following table:

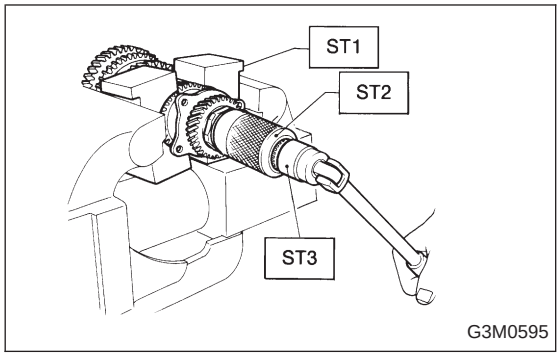
ST 498147000 DEPTH GAUGE

Dimension "A" mm (in)	Part No.	Mark
4.00 — 4.13 (0.1575 — 0.1626)	32294AA040	1
3.87 — 3.99 (0.1524 — 0.1571)	32294AA050	2

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.



13) Install clutch release lever ① and bearing ②.
<Ref. to 2-10 [W3C0].>



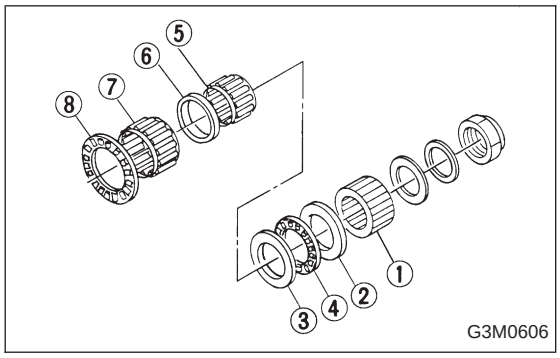
6. Drive Pinion Assembly (AWD Model)

A: DISASSEMBLY

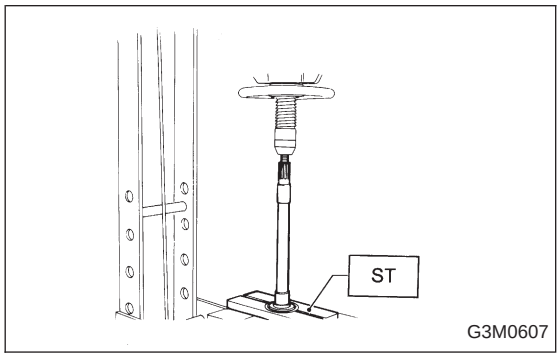
1. DRIVE PINION SHAFT

1) Straighten lock nut at staked portion. Remove the lock nut using ST1, ST2 and ST3.

ST1 899884100 HOLDER
ST2 498427100 STOPPER
ST3 899988608 SOCKET WRENCH



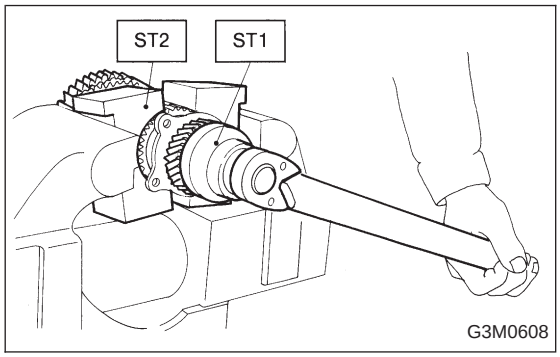
2) Withdraw drive pinion from driven shaft.
Remove differential bevel gear sleeve ①, Adjusting washer No. 1 ② (25 x 37.5 x t), Adjusting washer No. 2 ③ (25 x 37.5 x 4), thrust bearing ④ (25 x 37.5 x 3), needle bearing ⑤ (25 x 30 x 20), drive pinion collar ⑥, needle bearing ⑦ (30 x 37 x 23) and thrust bearing ⑧ (33 x 50 x 3).



3) Remove roller bearing and washer (33 x 50 x 5) using ST and press.

ST 498077000 REMOVER

CAUTION:
Do not reuse roller bearing.

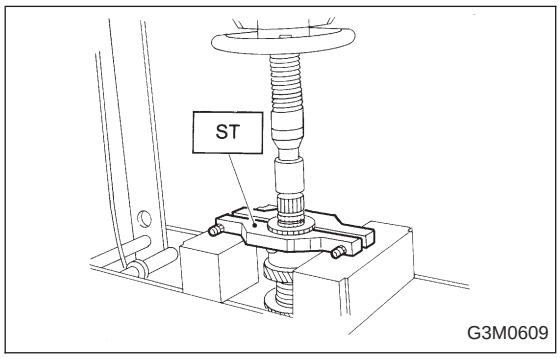


2. DRIVEN GEAR ASSEMBLY

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.

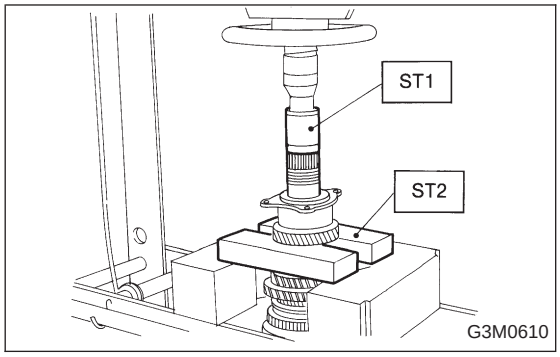
1) Straighten lock nut at staked portion. Remove the lock nut using ST1 and ST2.

ST1 499987300 SOCKET WRENCH (50)
ST2 899884100 HOLDER



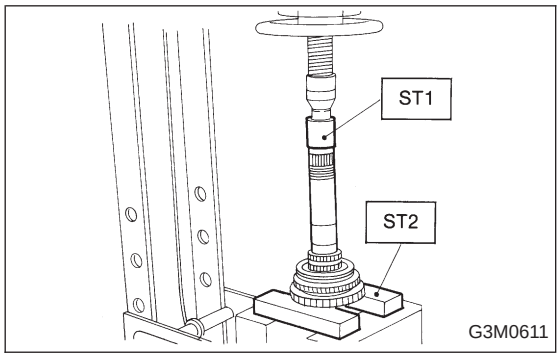
2) Remove 5th driven gear using ST.

ST 499857000 5TH DRIVEN GEAR REMOVER



3) Remove woodruff key.
4) Remove roller bearing (42 x 74 x 40), 3rd and 4th driven gear using ST1 and ST2.

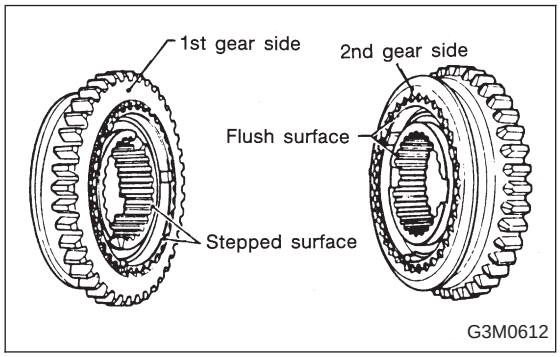
ST1 499757002 SNAP RING PRESS
ST2 899714110 REMOVER



5) Remove the key.
6) Remove 2nd driven gear assembly.
7) Remove 1st driven gear, 2nd gear bushing, gear and hub using ST1 and ST2.
Replace 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 SNAP RING PRESS
ST2 899714110 REMOVER

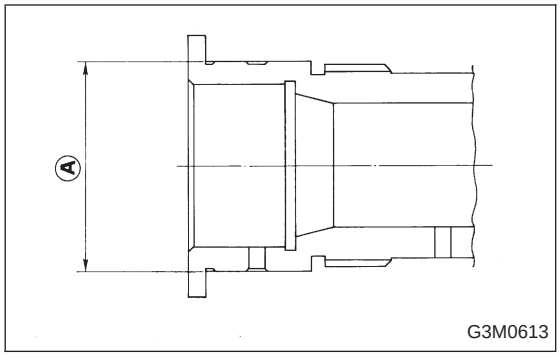
8) Remove sub gears for 1st and 2nd driven gear.



B: ASSEMBLY

1. GEAR AND HUB ASSEMBLY

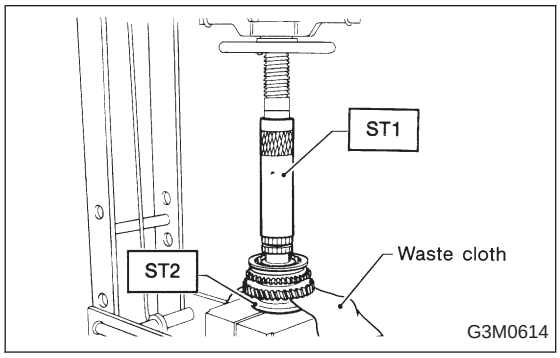
NOTE:
Position open ends of springs 120° apart.



2. DRIVEN GEAR ASSEMBLY

Assemble a driven shaft and 1st driven gear that select for adjustment the proper radial clearance.

Driven shaft		1st driven gear
Part No.	Diameter Ⓐ mm (in)	Part No.
32229AA130	49.959 — 49.966 (1.9669 — 1.9672)	32231AA270
32229AA120	49.967 — 49.975 (1.9672 — 1.9675)	32231AA260



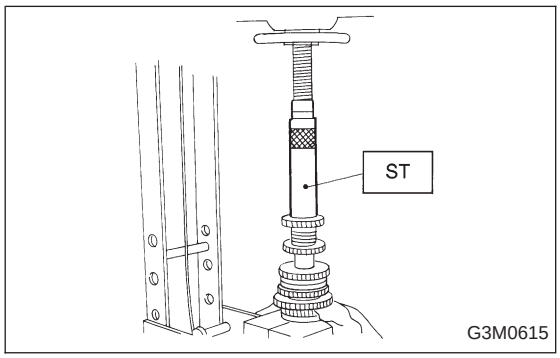
1) Install 1st driven gear, 1st-2nd baulk ring, gear and hub assembly onto driven shaft.

NOTE:
Take care to install gear hub in proper direction.

2) Install 2nd driven gear bushing onto driven shaft using ST1, ST2 and press.

ST1 499277200 INSTALLER
ST2 499587000 INSTALLER

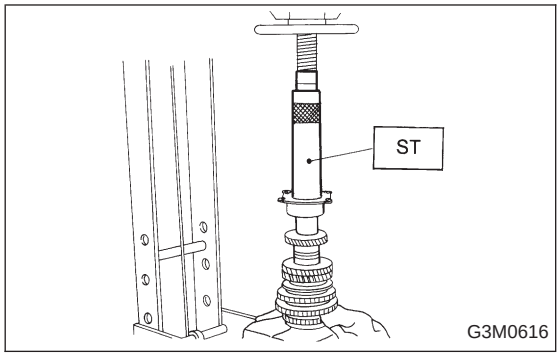
CAUTION:
Attach a cloth to the end of driven shaft to prevent damage.



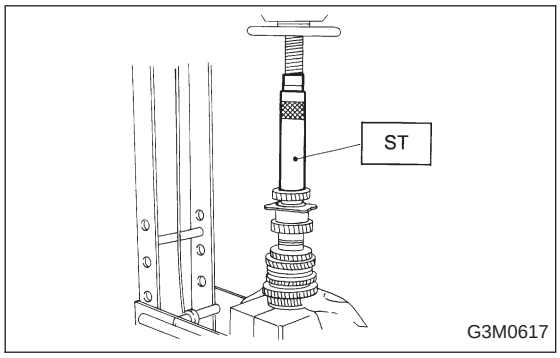
3) Install 2nd driven gear, 1st-2nd baulk ring and insert onto driven shaft. After installing key on driven shaft, install 3rd-4th driven gear using ST and press.

ST 499277200 INSTALLER

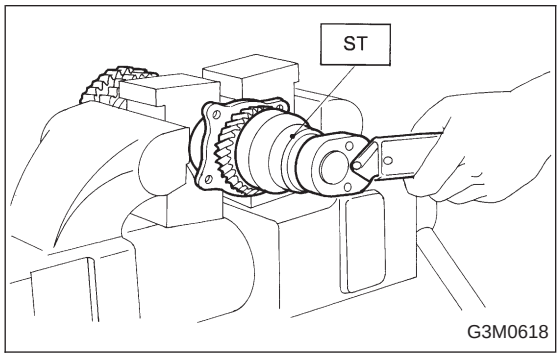
NOTE:
Align groove in baulk ring with insert.



4) Install a set of roller bearings (42 x 74 x 40) onto the driven shaft using ST and press.
ST 499277200 INSTALLER

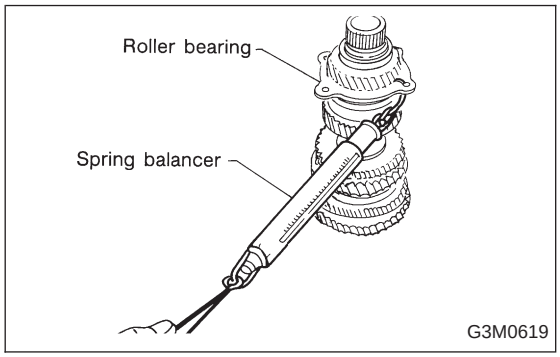


5) Position woodruff key in groove on the rear of driven shaft. Install 5th driven gear onto drive shaft using ST and press.
ST 499277200 INSTALLER

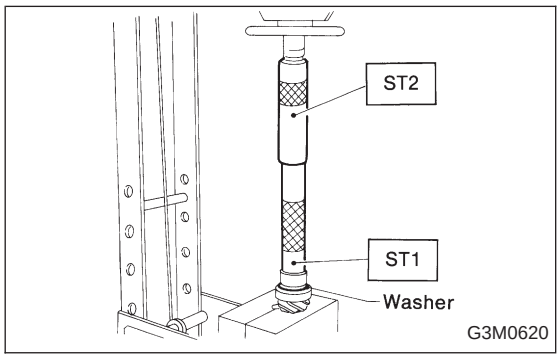


6) Install lock washer (42 x 53 x 2). Install lock nut (42 x 13) and tighten to the specified torque using ST.
ST 499987300 SOCKET WRENCH (50)

Tightening torque:
245±10 N·m (25±1 kg-m, 181±7 ft-lb)

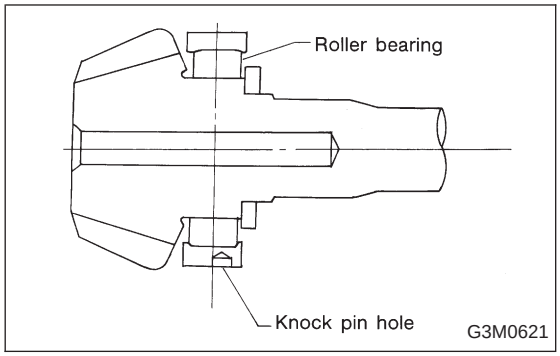


NOTE:
- Stake lock nut at two points.
- Check that starting torque of roller bearing is 0.1 to 1.5 N·m (1 to 15 kg-cm, 0.9 to 13.0 in-lb).

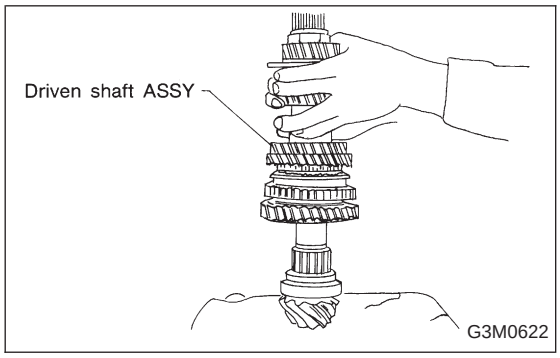


3. DRIVE PINION SHAFT

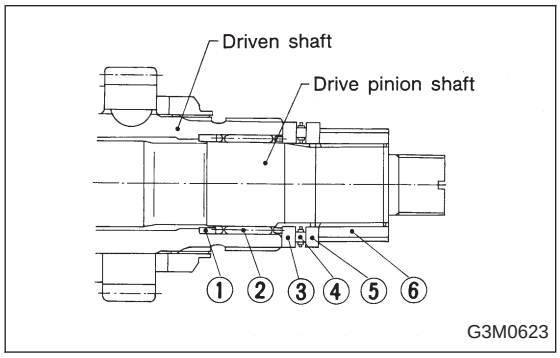
1) Install roller bearing onto drive pinion. Install washer (33 x 50 x 5) using ST1, ST2 and press.
ST1 499277100 BUSH 1-2 INSTALLER
ST2 499277200 INSTALLER



NOTE:
When installing roller bearing, note its directions (front and rear) because knock pin hole in outer race is offset.

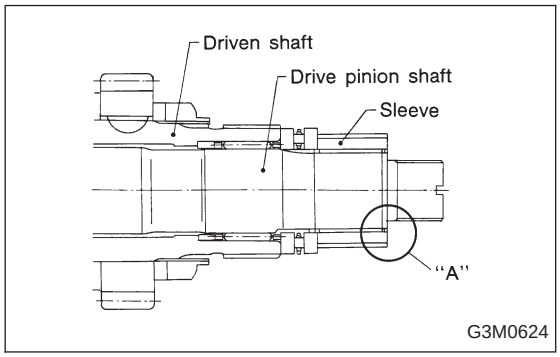


2) Install thrust bearing (33 x 50 x 3) and needle bearing (30 x 37 x 23). Install driven shaft assembly.



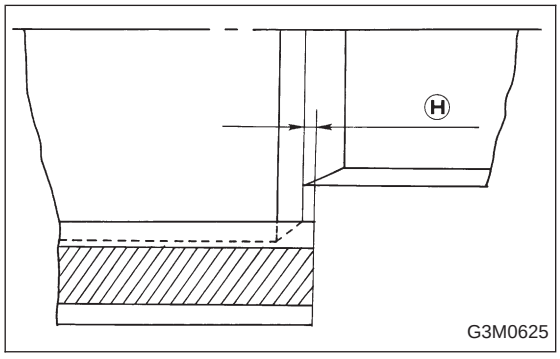
3) Install drive pinion collar ①, needle bearing ② (25 x 30 x 20), Adjusting washer No. 2 ③ (25 x 36 x 4), thrust bearing ④ (25 x 37.5 x 3), Adjusting washer No. 1 ⑤ (25 x 36 x t) and differential bevel gear sleeve ⑥ in that order.

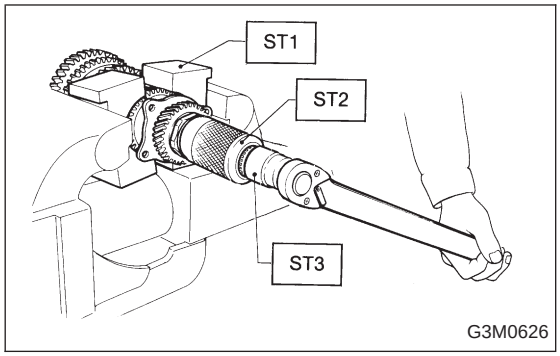
NOTE:
Be careful because spacer must be installed in proper direction.



4. ADJUSTMENT OF THRUST BEARING PRELOAD

1) After completing the preceding steps 1 through 3, select adjusting washer No. 2 so that dimension Ⓗ is zero through visual check. Position washer (18.3 x 30 x 4) and lock washer (18 x 30 x 2) and install lock nut (18 x 13.5).

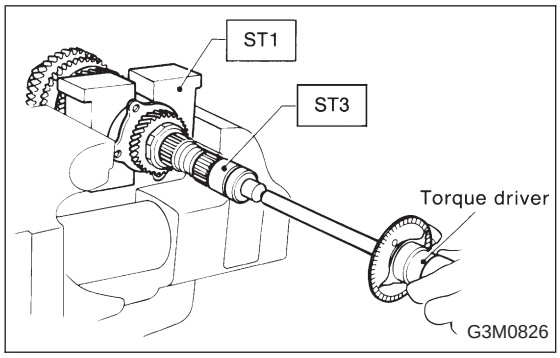




2) Using ST1, ST2 and ST3, tighten lock nut to the specified torque.

ST1 899884100 HOLDER
ST2 498427100 STOPPER
ST3 899988608 SOCKET WRENCH (27)

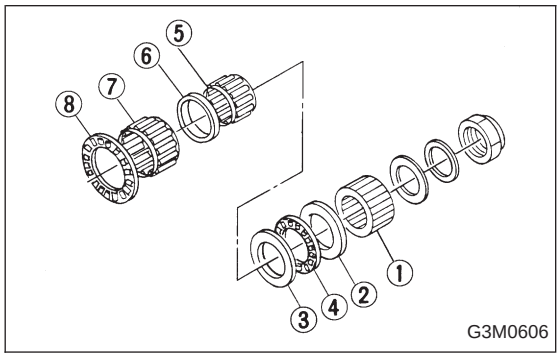
Tightening torque:
118±8 N·m (12±0.8 kg-m, 86.8±5.8 ft-lb)



3) After removing ST1, measure starting torque.

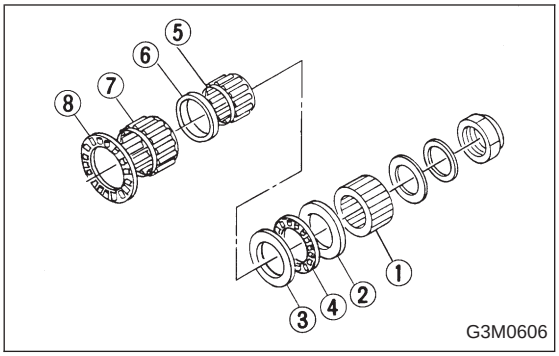
ST1 899884100 HOLDER
ST2 498427100 STOPPER
ST3 899988608 SOCKET WRENCH (27)

Starting torque:
0.3 — 0.8 N·m (3 — 8 kg-cm, 2.6 — 6.9 in-lb)



4) If starting torque is not within specified limit, select new adjusting washer No. 1 ② and recheck starting torque.

● 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)

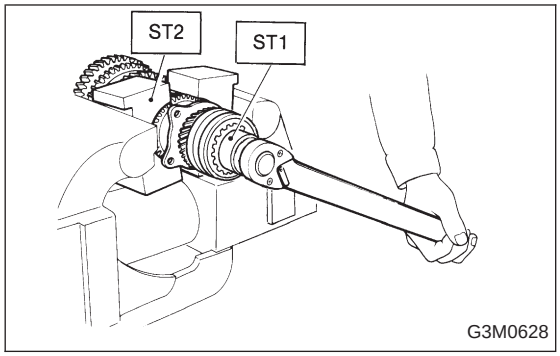


5) If specified starting torque range cannot be obtained when a No. 1 ② adjusting washer is used, then select a suitable No. 2 ③ adjusting washer from those listed in the following table. Repeat steps (1) through (4) to adjust starting torque.

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 starting torque is within specified range, then clinch lock nut at four positions.



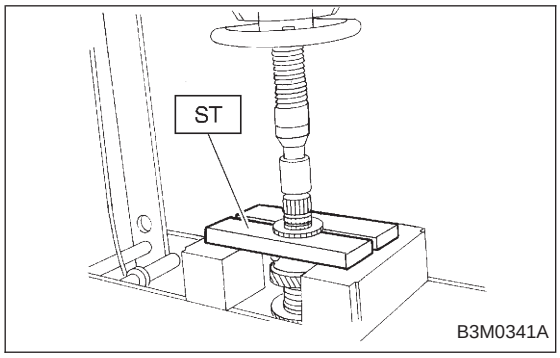
7. Drive Pinion Assembly (FWD Model)

A: DISASSEMBLY

1) Loosen lock nut using ST1 and ST2.

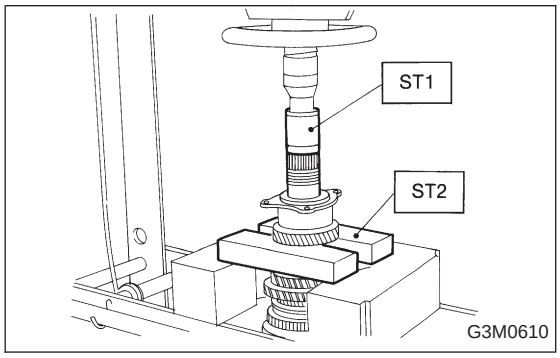
ST1 499987100 or 499987003 or 899984103 SOCKET WRENCH (35)
ST2 899884100 HOLDER

NOTE:
Remove caulking before taking off lock nut.



2) Remove 5th driven gear using a press.

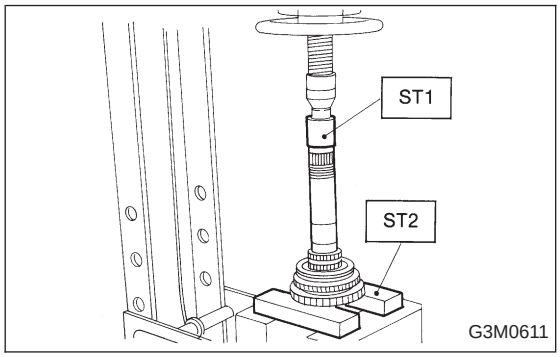
ST 498077000 5TH DRIVEN GEAR REMOVER



3) Remove woodruff key.

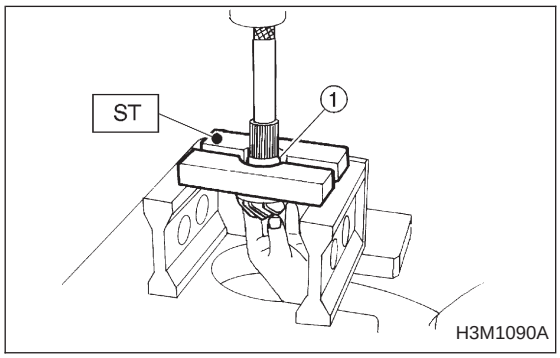
4) Remove roller bearing (29 x 74 x 38) and 3rd-4th driven gear using ST1 and ST2.

ST1 899714110 REMOVER
ST2 499757002 SNAP RING PRESS



5) Remove 2nd driven gear assembly.
6) Remove 3rd-4th driven gear key.
7) Remove 1st driven gear, 2nd gear bushing, and gear & hub assembly using ST1 and ST2.
Replace 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 SNAP RING PRESS
ST2 899714110 REMOVER

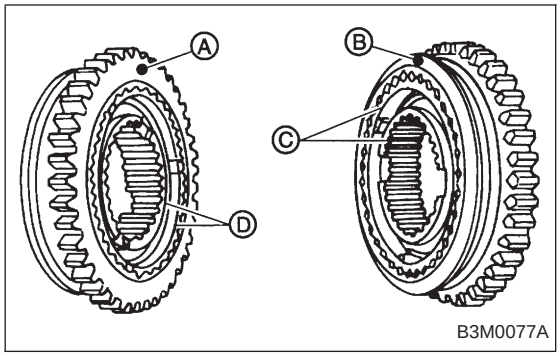


8) Remove 1st gear bushing ①, 1st driven gear thrust plate, and roller bearing (41 x 71 x 23) using ST and press.

ST 498517000 REPLACER

CAUTION:

Replace roller bearing (41 x 71 x 23) with a new one if this disassembly is performed.



B3M0077A

B: ASSEMBLY

1) Assemble gear and hub assembly.

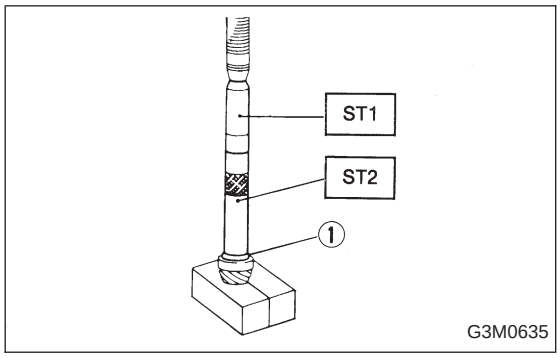
Ⓐ: 1st gear side
Ⓑ: 2nd gear side
Ⓒ: Flush surface
Ⓓ: Stepped surface

NOTE:
● Use new gear and hub assembly, if gear or hub have been replaced.
● Position open ends of springs 120° apart.

2) Drive roller bearing onto drive pinion shaft and 1st driven gear thrust washer ① using ST1 and ST2.

ST1 499877000 INSTALLER
ST2 499277100 INSTALLER

CAUTION:
Use new roller bearing, 1st gear thrust washer.

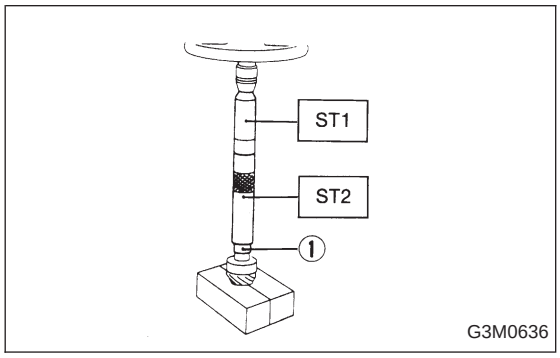


G3M0635

3) Install 1st-2nd driven gear bushing ① onto drive pinion shaft.

NOTE:
Bushing may be installed with either side up.

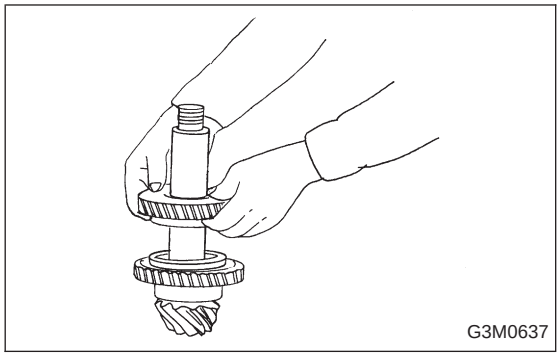
ST1 499877000 INSTALLER
ST2 499277100 INSTALLER



G3M0636

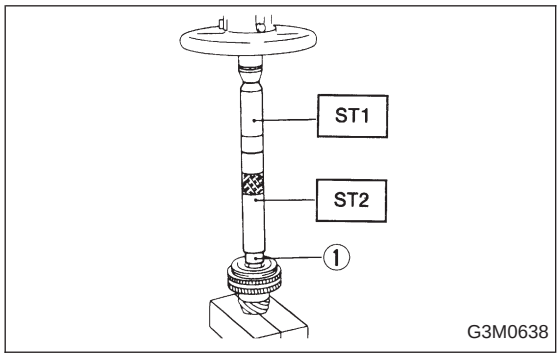
4) Measure outside diameter of 1st driven gear bushing to determine suitable 1st driven gear.

Bushing outside diameter mm (in)	1st driven gear
41.983 — 41.996 (1.6529 — 1.6534)	32231AA320
41.968 — 41.982 (1.6523 — 1.6528)	32231AA330
41.954 — 41.967 (1.6517 — 1.6522)	32231AA340


G3M0637

5) Install 1st driven gear, 1st-2nd balk ring and gear and hub assembly (already assembled in previous step) to drive pinion shaft by hand.

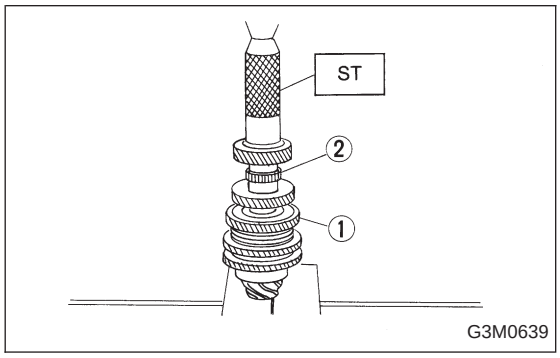
NOTE:
Align ring groove with insert.



G3M0638

6) Install 1st-2nd driven gear bushing ① to drive pinion shaft using ST1 and ST2.

ST1 499877000 INSTALLER
ST2 499277100 INSTALLER



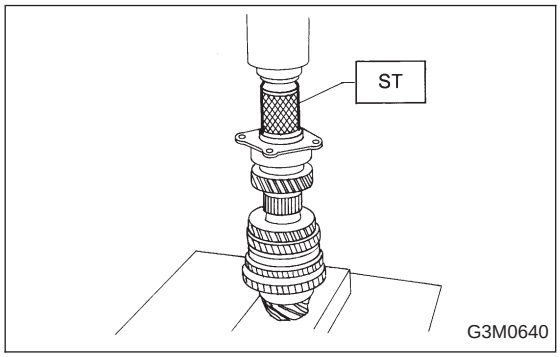
G3M0639

7) Install 2nd driven gear ① and 1st-2nd balk ring to drive pinion shaft by hand.

8) Install key into the groove on drive pinion shaft and install 3rd-4th driven gear.

NOTE:
Ball bearing may be installed without using the tool. There should be no problem.

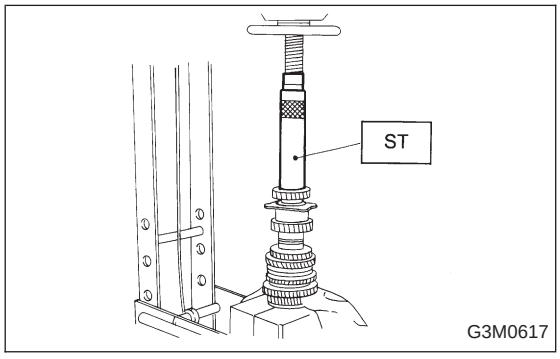
ST 499877000 INSTALLER



G3M0640

9) Install ball bearing (29 x 74 x 38) on drive pinion shaft with ST.

ST 499277100 INSTALLER



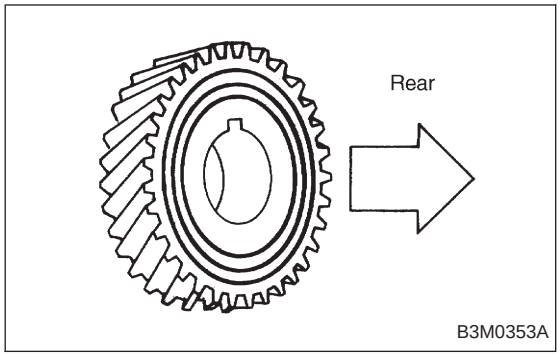
G3M0617

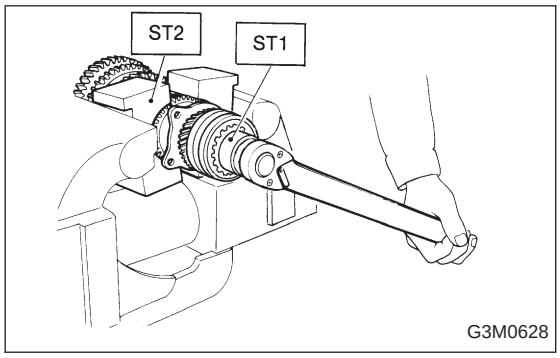
10) Position woodruff key in groove on the rear of drive pinion shaft. Install 5th driven gear onto drive shaft using ST and press.

ST 499277100 INSTALLER

CAUTION:

- **Face 5th driven gear in the correct direction.**
- **Be careful not to dislocate woodruff key while installing 5th gear.**





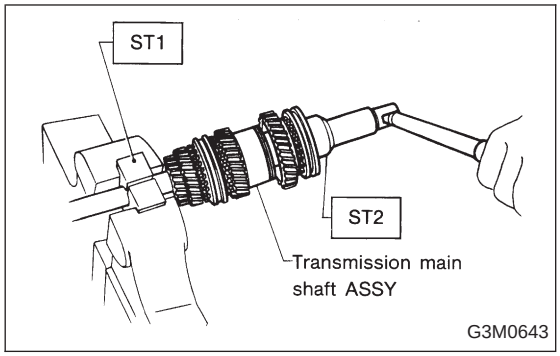
11) Install lock washer and tighten lock nut to the specified torque using ST1 and ST2.

ST1 499987100 or 499987003 or 899984103 SOCKET WRENCH (35)
ST2 899884100 HOLDER

CAUTION:

- **Discard old lock nuts, replace with new ones.**
- **Secure lock nut in four places.**

Tightening torque:
118±6 N·m (12.0±0.6 kg-m, 86.8±4.3 ft-lb)



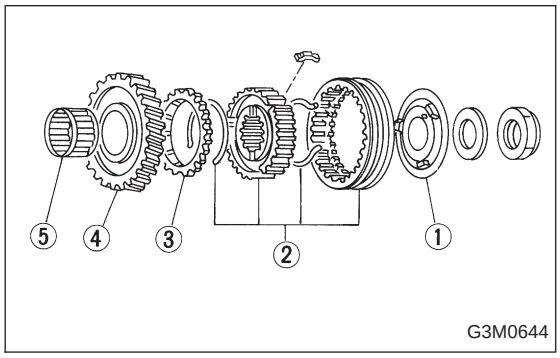
8. Main Shaft Assembly (AWD Model)

A: DISASSEMBLY

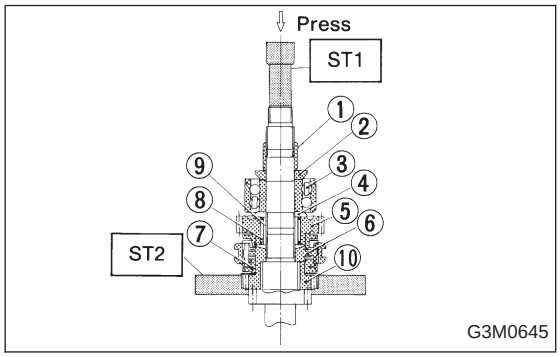
1) Put vinyl tape around main shaft splines to protect oil seal from damage. Then pull out oil seal and needle bearing by hand.
2) Remove lock nut with ST1 and ST2.

ST1 498937000 TRANSMISSION HOLDER
ST2 499987003 SOCKET WRENCH (35)

NOTE:
Remove caulking before taking off lock nut.



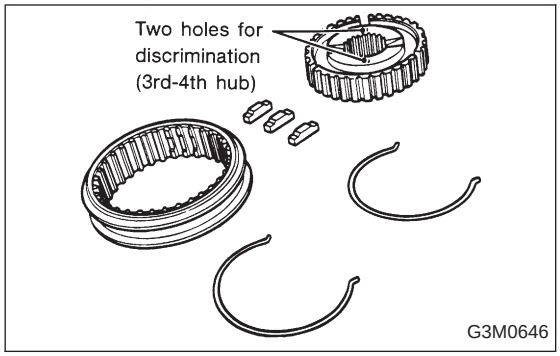
3) Remove insert stopper plate, sleeve and hub assembly No. 2, balk ring, 5th drive gear, and needle bearing (32 x 36 x 25.7).

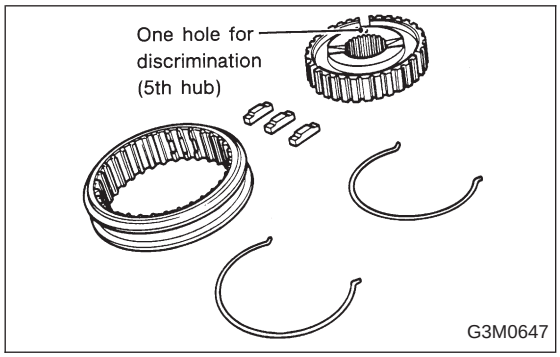


4) Using ST1, ST2 and a press, remove:
- ① 5th needle bearing inner race
- ② 5th gear thrust washer
- ③ Ball bearing (25.5 x 65 x 31)
- ④ 4th gear thrust washer
- ⑤ 4th drive gear
- ⑥ Sleeve and hub assembly
- ⑦ Balk ring
- ⑧ 4th needle bearing
- ⑨ 4th needle bearing inner race
- ⑩ 3rd drive gear

ST1 899864100 REMOVER
ST2 899714110 REMOVER

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 disassemble, mark engagement point on splines beforehand.





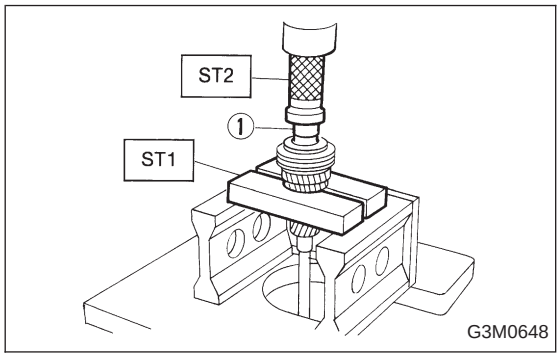
B: ASSEMBLY

1) Assemble sleeve and hub assembly for 3rd-4th, 5th and high-low synchronizing.

NOTE:
Position open ends of spring 120° apart.

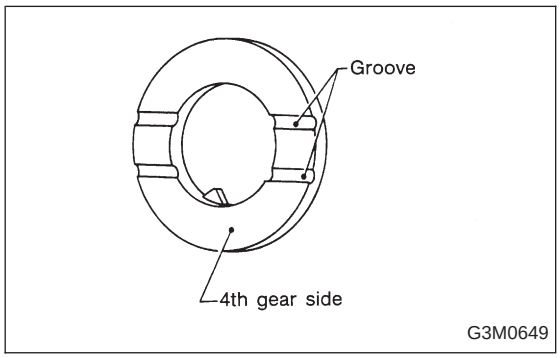
2) Install 3rd drive gear, balk ring, sleeve and hub assembly for 3rd-4th needle bearing (32 x 36 x 25.7) on transmission main shaft.

NOTE:
Align groove in balk ring with shifting insert.



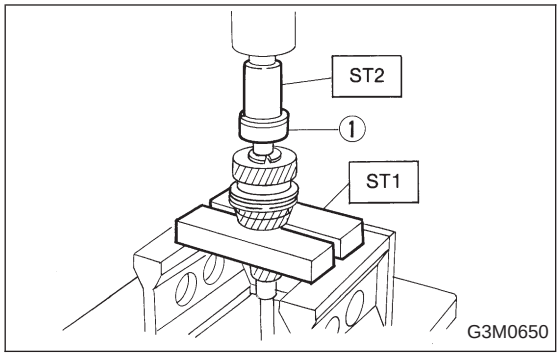
3) Install 4th needle bearing race ① onto transmission main shaft using ST1, ST2 and a press.

ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



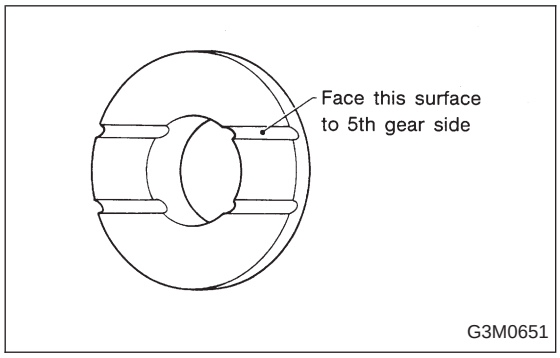
4) Install balk ring, needle bearing (32 x 30 x 25.7), 4th drive gear and 4th gear thrust washer to transmission main shaft.

NOTE:
Face thrust washer in the correct direction.



5) Drive ball bearing ① onto the rear section of transmission main shaft using ST1, ST2 and a press.

ST1 899714110 REMOVER
ST2 499877000 INSTALLER



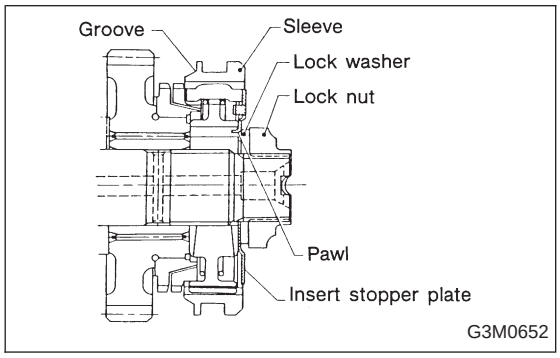
6) Using the same tools as in step 5) above, install the following parts onto the rear section of transmission main shaft.

- 5th gear thrust washer

NOTE:
Face thrust washer in the correct direction.

ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER

- 5th needle bearing race



7) Install the following parts to the rear section of transmission main shaft.

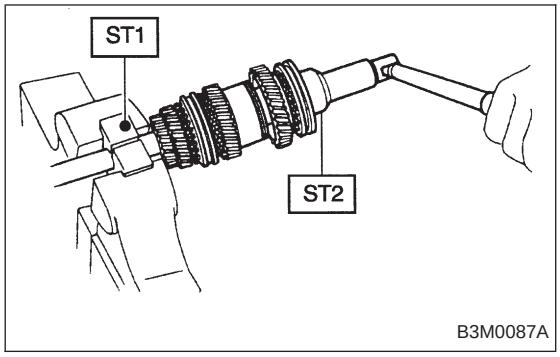
- Needle bearing (32 x 36 x 25.7)
- 5th drive gear
- Balk ring
- Sleeve and hub assembly
- Insert stopper plate
- Lock washer (22 x 38 x 2)
- Tighten lock nuts (22 x 13) to the specified torque using ST1 and ST2.

ST1 499987003 SOCKET WRENCH
ST2 498937000 TRANSMISSION HOLDER

NOTE:

- Align groove in balk ring with shifting insert.
- Be sure to fit pawl of insert stopper plate into 4 mm (0.16 in) dia. hole in the boss section of synchronizer hub.
- Secure lock nuts in two places after tightening.

Tightening torque:
118±6 N·m (12.0±0.6 kg-m, 86.8±4.3 ft-lb)



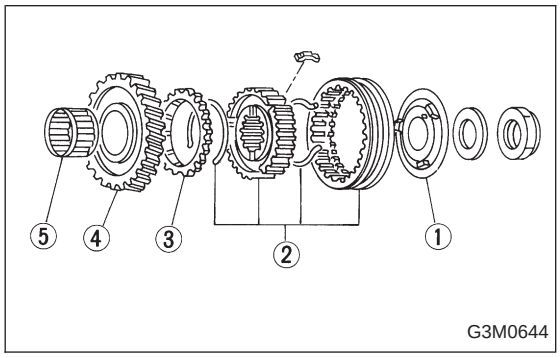
9. Main Shaft Assembly (FWD Model)

A: DISASSEMBLY

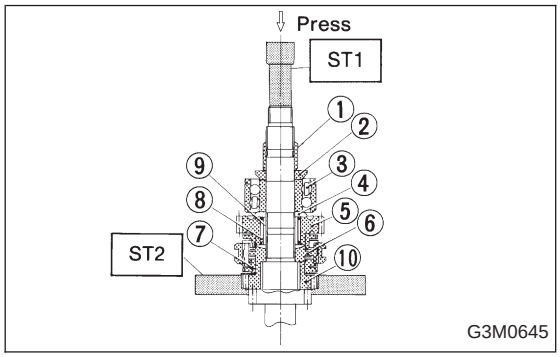
1) Put vinyl tape around main shaft splines to protect oil seal from damage. Then pull out oil seal and needle bearing by hand.
2) Remove lock nut from transmission main shaft assembly.

NOTE:
Remove caulking before taking off lock nut.

ST1 498937000 TRANSMISSION HOLDER
ST2 499987003 SOCKET WRENCH (35)



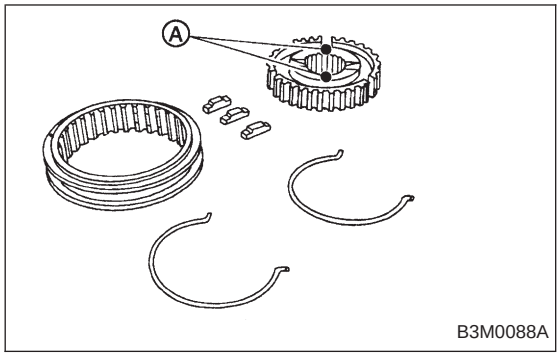
3) Remove insert stopper plate ①, sleeve and hub assembly No. 2, baulk ring ③, 5th drive gear ④, and needle bearing ⑤ (32 x 36 x 25.7).



4) Using ST1, ST2 and a press, remove:
- 5th needle bearing inner race ①
- 5th gear thrust washer ②
- Ball bearing ③ (25.5 x 65 x 31)
- 4th gear thrust washer ④
- 4th drive gear ⑤
- Sleeve and hub assembly ⑥
- Baulk ring ⑦
- 4th needle bearing ⑧
- 4th needle bearing inner race ⑨
- 3rd drive gear ⑩

ST1 899864100 REMOVER
ST2 899714110 REMOVER

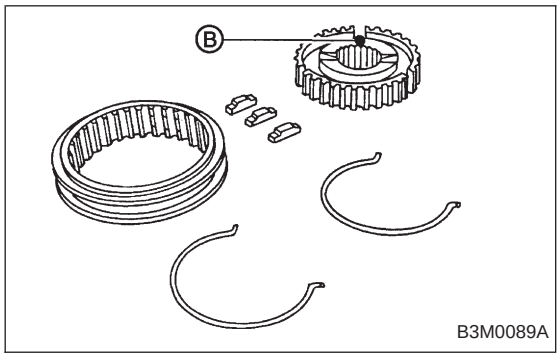
NOTE:
Replace sleeve and hub with new ones. Do not attempt to disassemble because they must engage at a specified point. If they should be disassembled, mark engagement point on splines beforehand.



B: ASSEMBLY

1) Assemble sleeve and hub assembly for 3rd-4th and, 5th and high-low synchronizing.

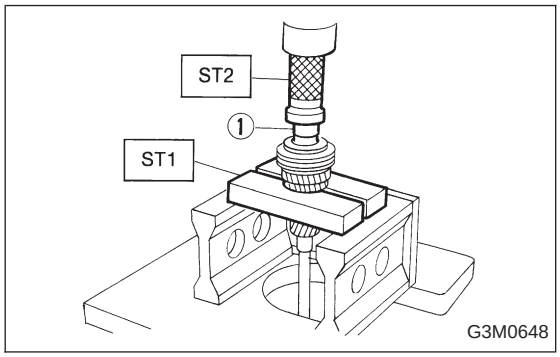
NOTE:
Position open ends of spring 120° apart.
Ⓐ: Two holes for discrimination (3rd-4th hub)



Ⓑ: One hole for discrimination (5th hub)

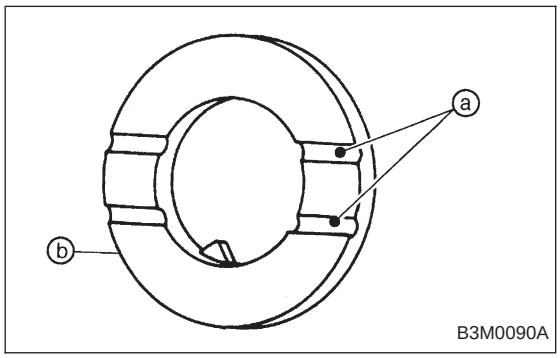
2) Install 3rd drive gear, baulk ring, and sleeve and hub assembly for 3rd-4th needle bearing (32 x 36 x 25.7) on transmission main shaft.

NOTE:
Align groove in baulk ring with shifting insert.



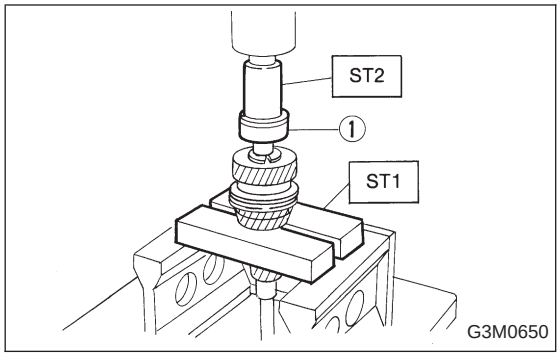
3) Install 4th needle bearing race ① onto transmission main shaft using ST1, ST2 and a press.

ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



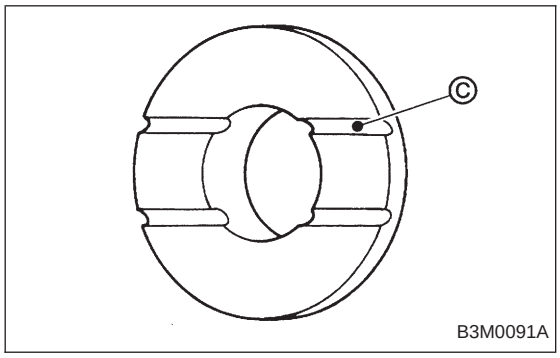
4) Install baulk ring, needle bearing (32 x 30 x 25.7), 4th drive gear and 4th gear thrust washer to transmission main shaft.

NOTE:
Face thrust washer in the correct direction.
ⓐ: Groove
ⓑ: 4th gear side



5) Drive ball bearing ① onto the rear section of transmission main shaft using ST1, ST2 and a press.

ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



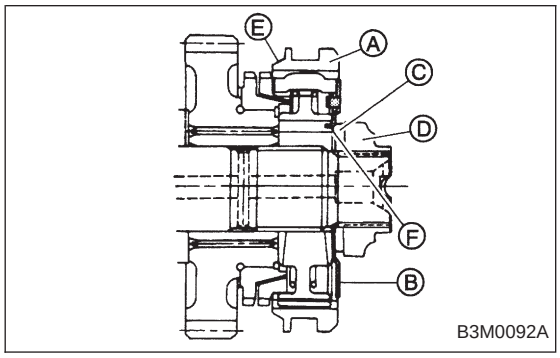
6) Using the same tools as in step 5) above, install the following parts onto the rear section of transmission main shaft.

- 5th gear thrust washer

NOTE:
Face thrust washer in the correct direction.
ⓒ: Face this surface to 5th gear side.

ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER

- 5th needle bearing race



7) Install the following parts to the rear section of transmission main shaft.

- Needle bearing (32 x 36 x 25.7)
- 5th drive gear
- Baulk ring
- Sleeve Ⓐ and hub assembly
- Insert stopper plate Ⓑ
- Lock washer Ⓒ (22 x 38 x 2)
- Tighten lock nuts Ⓓ (22 x 13) to the specified torque using ST1 and ST2.

ST1 499987003 SOCKET WRENCH (35)
ST2 498937000 TRANSMISSION HOLDER

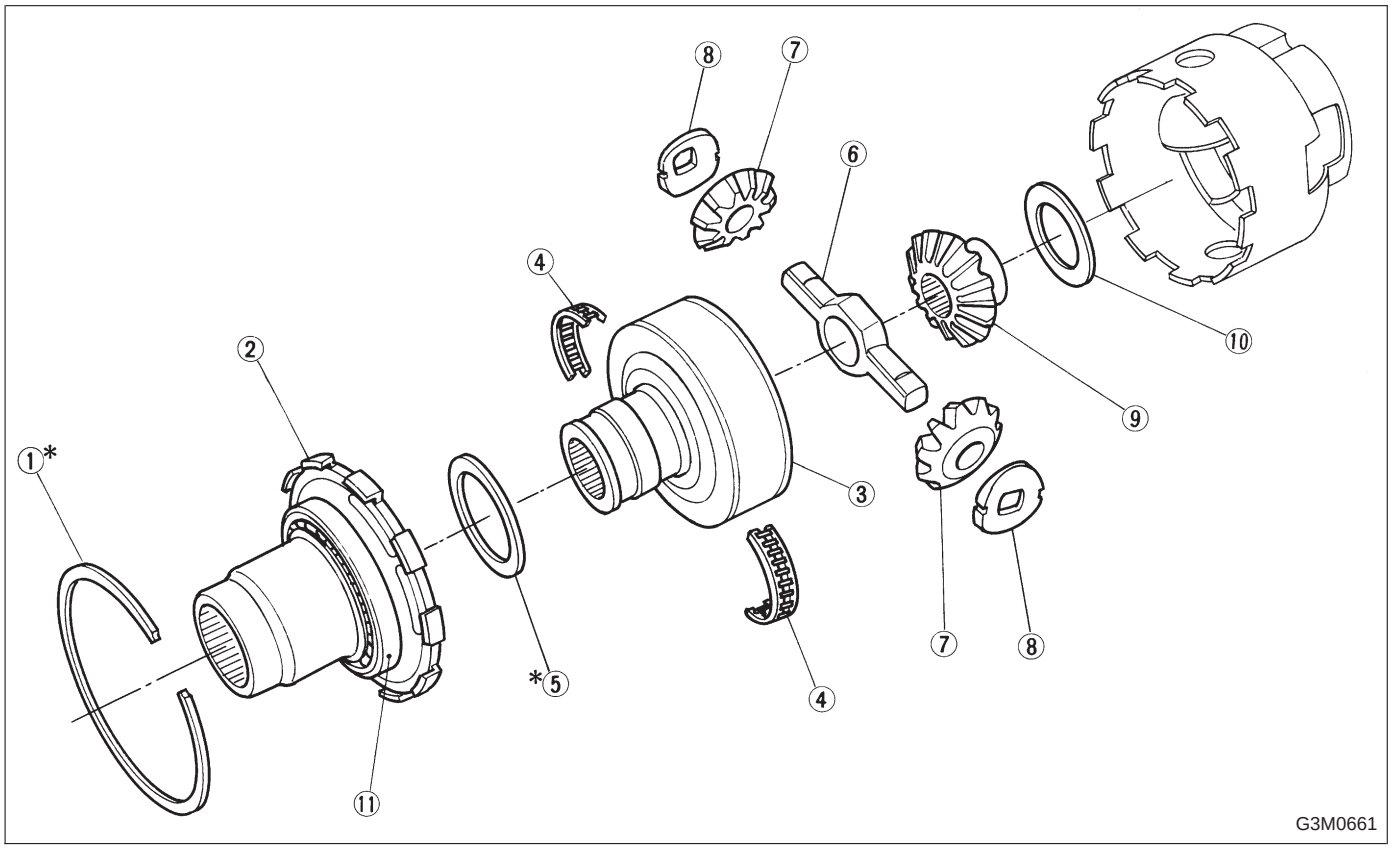
NOTE:

- Align groove Ⓔ in baulk ring with shifting insert.
- Be sure to fit pawl Ⓕ of insert stopper plate into 4 mm (0.16 in) dia. hole in the boss section of synchronizer hub.
- Secure lock nuts in two places after tightening.

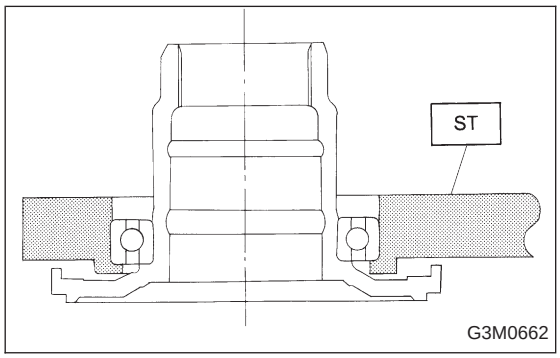
Tightening torque:
118±6 N·m (12.0±0.6 kg-m, 86.8±4.3 ft-lb)

10. Center Differential (AWD Model)

A: DISASSEMBLY



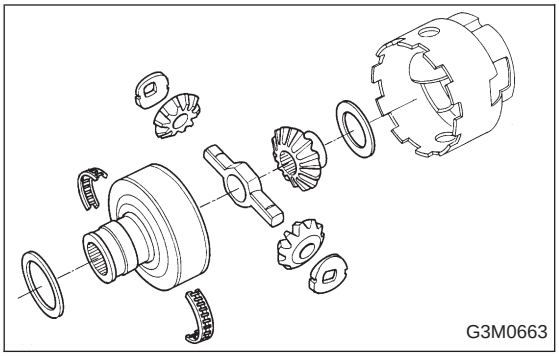
1) Remove snap ring (Inner-110) ① using flat bladed screw driver.
2) Remove center differential cover ②.
3) Remove viscous coupling ③.
4) Remove needle bearings ④.
5) Remove adjusting washer (45 x 62 x t) ⑤.
6) Remove pinion shaft ⑥, bevel pinions ⑦ and retainers ⑧.
7) Remove side gear ⑨.
8) Remove thrust washer ⑩.



9) Remove ball bearing ⑪ using ST.

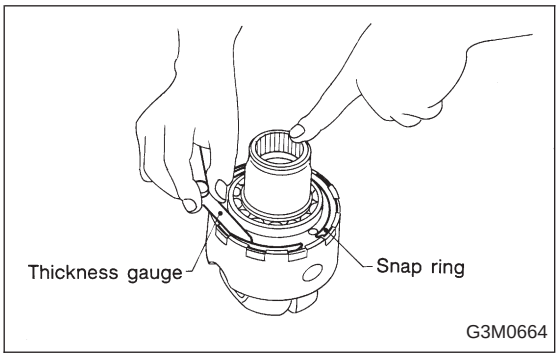
ST 498077300 CENTER DIFFERENTIAL BEARING REMOVER

CAUTION:
Do not reuse ball bearing.



B: ASSEMBLY

Assembly is in the reverse order of disassembly.
Observe the following;
● Install thrust washer with chamfered side of inner perimeter facing the side gear.
● Install adjusting washer with chamfered side of inner perimeter facing the viscous coupling.



1) Selection of snap ring (Inner-110)

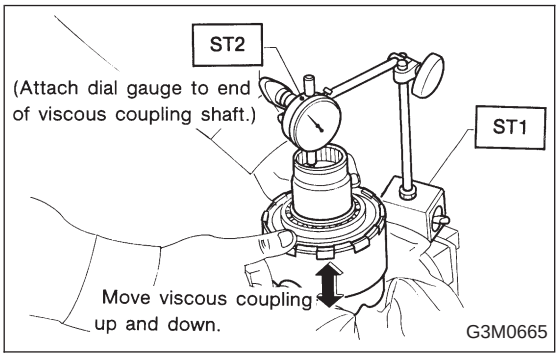
(1) After assembling, measure clearance between snap ring and center differential case.

Clearance:

0 — 0.15 mm (0 — 0.0059 in)

(2) If the measurement is not within the specification, select suitable snap ring.

● Snap ring (Inner-110)	Part No.	Thickness mm (in)
	805100061	2.10 (0.0827)
	805100062	2.21 (0.0870)
	805100063	2.32 (0.0913)



2) Selection of adjusting washer (Backlash adjustment)

(1) After assembling, set up a ST1 and ST2 as shown in figure, and measure backlash in the axial direction.

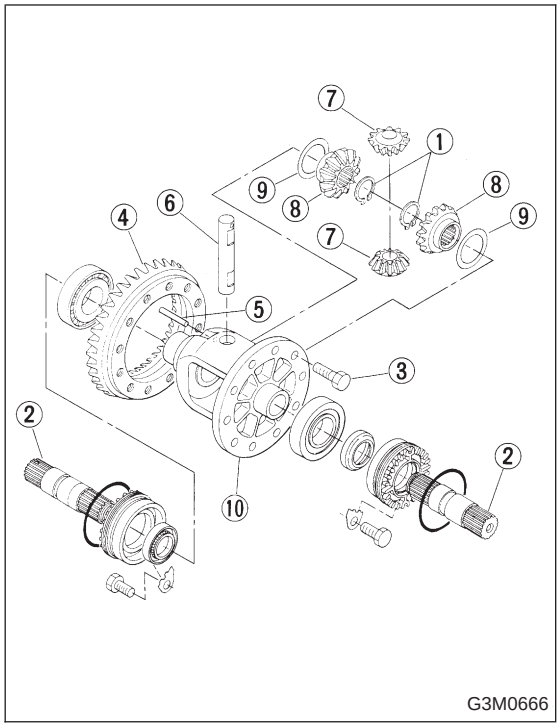
ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

Backlash:

0.62 — 0.86 mm (0.0244 — 0.0339 in)

(2) If the measurement is not within the specification, select suitable washer.

● Adjusting washer (45 x 62 x t)	Part No.	Thickness mm (in)
	803045041	1.60 (0.0630)
	803045042	1.80 (0.0709)
	803045043	2.00 (0.0787)
	803045044	2.20 (0.0866)
	803045045	2.40 (0.0945)



G3M0666

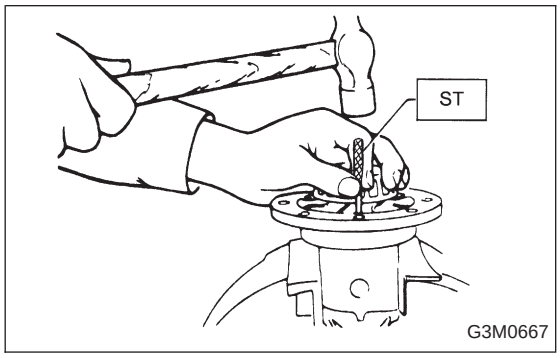
11. Front Differential

A: DISASSEMBLY

1) Remove right and left snap rings ① from differential, and then remove two axle drive shafts ②.

NOTE:
During reassembly, reinstall each axle drive shaft in the same place from which it was removed.

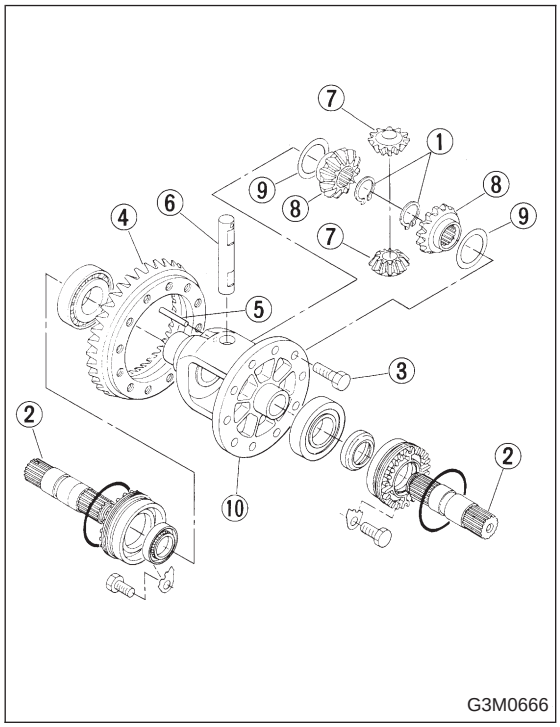
2) Loosen twelve bolts ③ and remove hypoid driven gear ④.



G3M0667

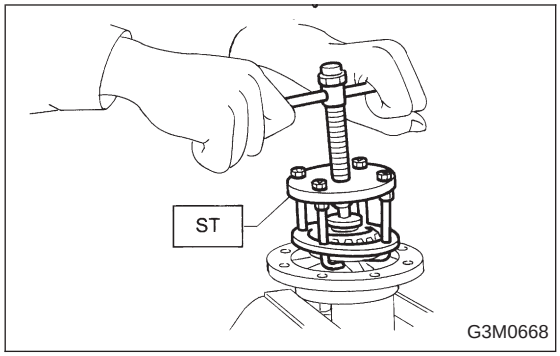
3) Drive out straight pin ⑤ from differential assembly toward hypoid driven gear.

ST 899904100 REMOVER



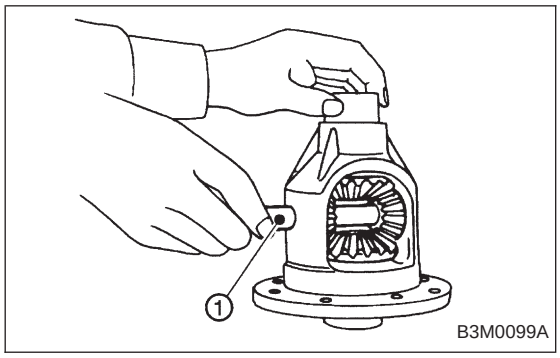
G3M0666

4) Pull out pinion shaft ⑥, and remove differential bevel pinion ⑦ and gear ⑧ and washer ⑨.



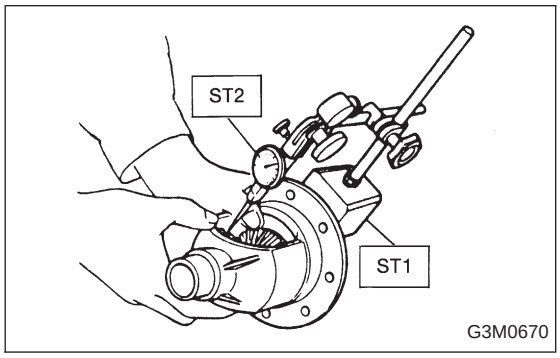
5) Remove roller bearing using ST.
ST 399527700 PULLER SET

B: ASSEMBLY



1) Install bevel gear and bevel pinion together with washers, and insert pinion shaft ①.

NOTE:
Face the chamfered side of washer toward gear.



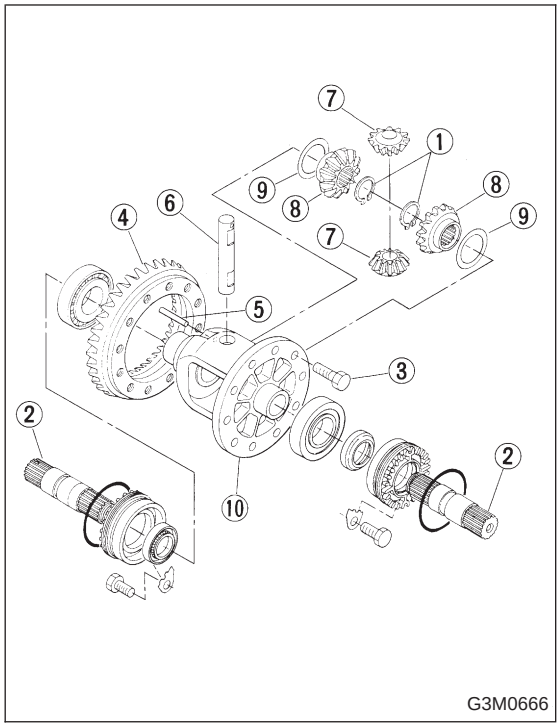
2) Measure backlash between bevel gear and pinion. If it is not within specifications, install a suitable washer to adjust it.

Standard backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)

ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

NOTE:
Be sure the pinion gear tooth contacts adjacent gear teeth during measurement.

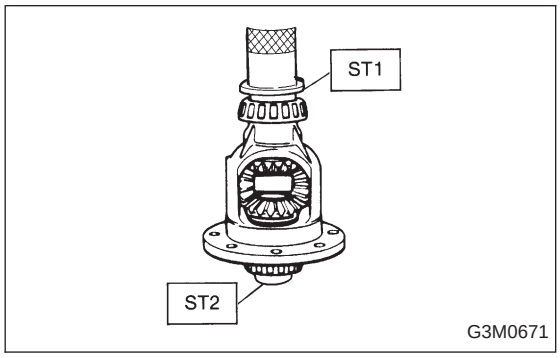
Washer (38.1 x 50 x t)	
Part No.	Thickness mm (in)
803038021	0.925 — 0.950 (0.0364 — 0.0374)
803038022	0.975 — 1.000 (0.0384 — 0.0394)
803038023	1.025 — 1.050 (0.0404 — 0.0413)



3) Align pinion shaft and differential case at their holes, and drive straight pin ⑤ into holes from the hypoid driven gear side, using ST.

ST 899904100 REMOVER

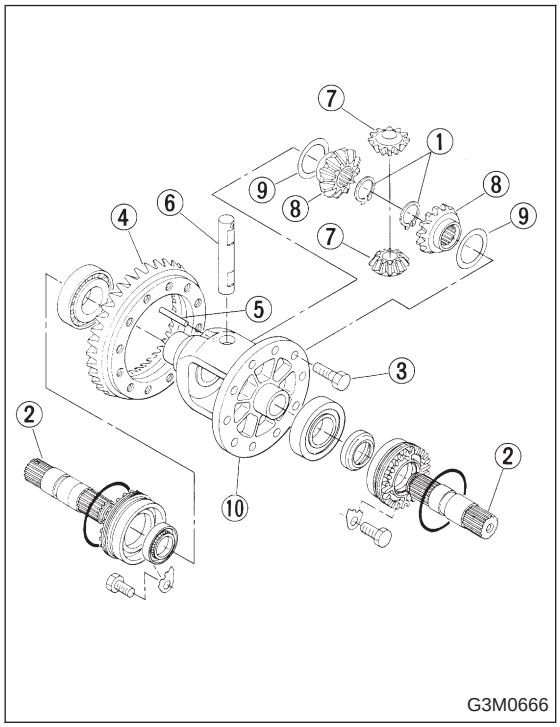
NOTE:
Lock straight pin after installing.



4) Install roller bearing (40 x 80 x 19.75) to differential case.

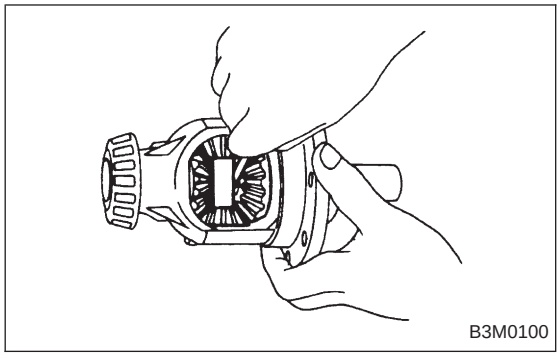
NOTE:
Be careful because roller bearing outer races are used as a set.

ST1 499277100 BUSH 1-2 INSTALLER
ST2 398497701 ADAPTER



5) Install hypoid driven gear ④ to differential case ⑩ using twelve bolts ③.

Tightening torque:
62±5 N·m (6.3±0.5 kg-m, 45.6±3.6 ft-lb)


B3M0100

6) Position drive axle shaft in differential case and hold it with outer snap ring (28). Using a thickness gauge, measure clearance between the shaft and case is within specifications.

Clearance:
0 — 0.2 mm (0 — 0.008 in)

If it is not within specifications, replace snap ring with a suitable one.

Snap ring (Outer-28)	
Part No.	Thickness mm (in)
805028011	1.05 (0.0413)
805028012	1.20 (0.0472)

1. Manual Transmission and Differential

Symptom and possible cause	Remedy
1. Gears are difficult to intermesh. 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.	
(1) Gear slips out when coasting on rough road.	
(2) 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 from transmission. If an unusual noise is heard when the car 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.	Replace.
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.	

Symptom and possible cause	Remedy
4. Broken differential (case, gear, bearing, etc.) 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.	
(d) Improper adjustment of drive pinion and hypoid driven gear.	
(e) Excessive backlash due to worn differential side gear, washer or differential pinion.	Add recommended oil to specified level. Do not use vehicle under severe operating conditions.
(f) Loose hypoid driven gear clamping bolts.	
5. 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 following four kinds of noises. (1) 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. (2) Gear noise when coasting: Damaged gears due to maladjusted bearings and incorrect shim adjustment. (3) Bearing noise when driving or when coasting: Cracked, broken or damaged bearings. (4) 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.

AUTOMATIC TRANSMISSION AND DIFFERENTIAL 3-2

1. Automatic Transmission and Differential

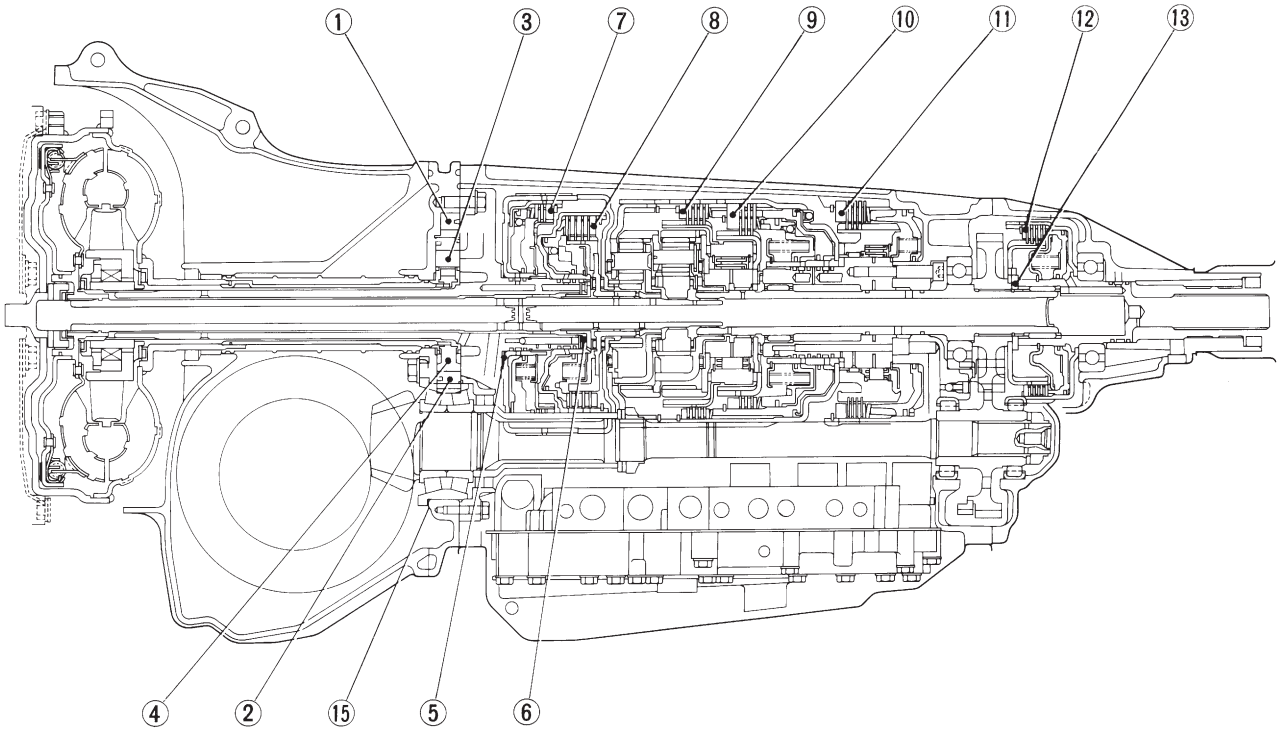
A: SPECIFICATIONS

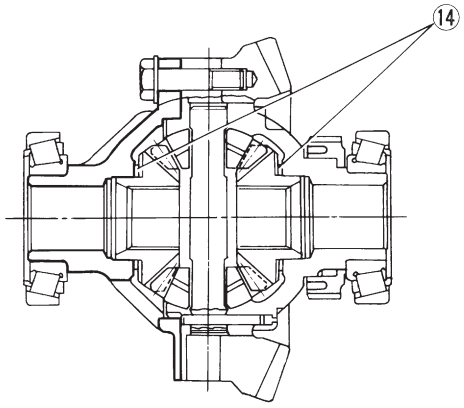
Torque converter clutch	Type		Symmetric, 3 element, single stage, 2 phase torque converter clutch coupling	
	Stall torque ratio	2200 cc	2.1 — 2.3	
		1800 cc	2.2 — 2.4	
	Nominal diameter		236 mm (9.29 in)	
	Stall speed (at sea level)	2200 cc	2,300 — 2,700 rpm	
		1800 cc	2,200 — 2,600 rpm	
	One-way clutch		Sprague type one-way clutch	
Automatic transmission	Transmission	Type	4-forward, 1-reverse, double-row planetary gears	
		Control element	Multi-plate clutch	4 sets
			Multi-plate brake	1 set
			Band brake	1 set
			One-way clutch (sprague type)	2 sets
		Gear ratio	1st	2.785
			2nd	1.545
			3rd	1.000
			4th	0.694
			Reverse	2.272
		Tooth number of planetary gear	Front sun gear	33
			Front pinion	21
			Front internal gear	75
			Rear sun gear	42
			Rear pinion	17
			Rear internal gear	75
		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 4th → 3rd → 2nd)
			1 (1st)	1st gear locked (Deceleration possible 4th → 3rd → 2nd → 1st)
		Control method	Hydraulic remote control	

Automatic transmission	Oil pump	Type		Variable-capacity type vane pump
		Driving method		Driven by engine
		Number of vanes		9 pieces
	Hydraulic control	Type		Electronic/hydraulic control [Four forward speed changes by electrical signals of car speed and accelerator (throttle) opening]
		Fluid		Dexron II or Dexron III type Automatic transmission fluid
		Fluid capacity		7.9 ℓ (8.4 US qt, 7.0 Imp qt)
	Lubrication	Lubrication system		Forced feed lubrication with oil pump
		Oil		Automatic transmission fluid (above mentioned.)
	Cooling	Cooling system		Liquid-cooled cooler incorporated in radiator
	Harness	Inhibitor switch		12 poles
		Transmission harness		FWD ... 11 poles AWD ... 13 poles
	Transfer	Transfer clutch		Hydraulic multi-plate clutch
		Control method		Electronic, hydraulic type
		Lubricant		The same Automatic Transmission Fluid used in automatic transmission.
		1st reduction gear ratio		1.000 (53/53)
Final reduction	Final gear ratio	Front drive	FWD	3.900 (39/10)
			AWD	4.111 (37/9)
	Speedometer gear ratio		2200 cc	0.83 (19/23)
			1800 cc	0.84 (21/25)
	Lubrication oil			API, GL-5
	Oil capacity	Front drive		1.2 ℓ (1.3 US qt, 1.1 Imp qt)
	ATF cooling system	Radiation capacity		1.651 kW (1,420 kcal/h, 5,635 BTU/h)

B: ADJUSTING PARTS

AWD

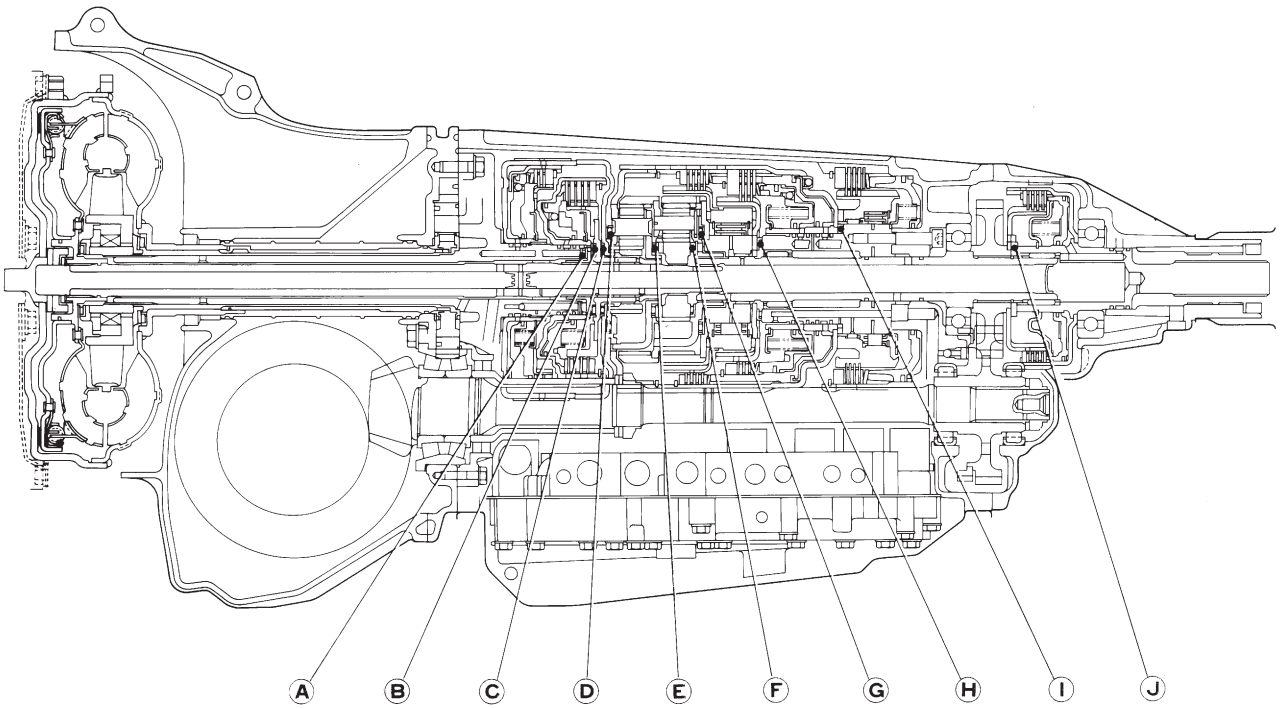


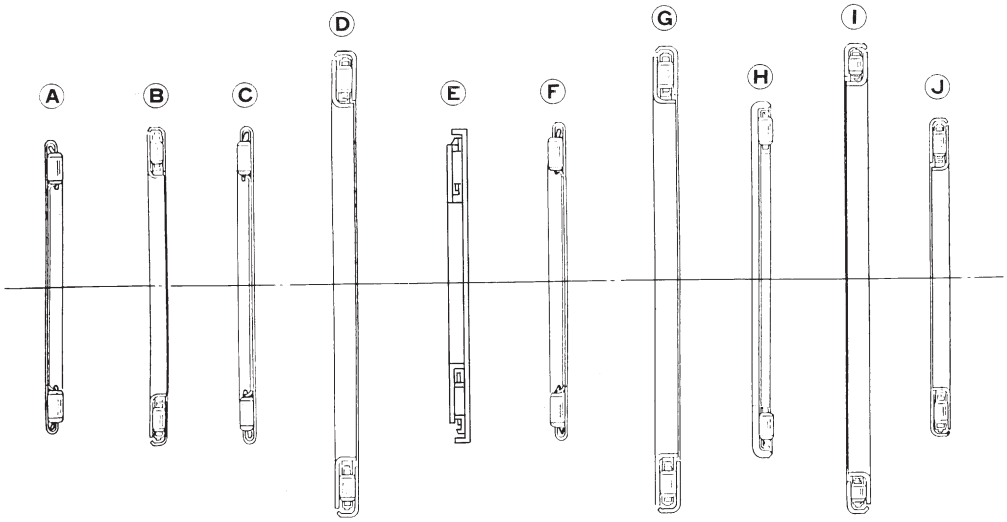


G3M0774

No.	Part Name	Part Number	Dimension mm (in)	Application
1	CONTROL PISTON	31235AA040 — 070	$13.5\ ^{-0.030}_{-0.037}$ ($0.5315\ ^{-0.0012}_{-0.0015}$), $13.5\ ^{-0.023}_{-0.030}$ ($0.5315\ ^{-0.0009}_{-0.0012}$), $13.5\ ^{-0.016}_{-0.023}$ ($0.5315\ ^{-0.0006}_{-0.0009}$), $13.5\ ^{-0.009}_{-0.016}$ ($0.5315\ ^{-0.0004}_{-0.0006}$)	Adjusting side clearance of oil pump
2	CAM RING	31241AA000 — 030	$17\ ^{-0.010}_{-0.017}$ ($0.6693\ ^{-0.0004}_{-0.0007}$), $17\ ^{-0.003}_{-0.010}$ ($0.6693\ ^{-0.0001}_{-0.0004}$), $17\ ^{+0.004}_{-0.003}$ ($0.6693\ ^{+0.0002}_{-0.0001}$), $17\ ^{+0.011}_{+0.004}$ ($0.6693\ ^{+0.0004}_{+0.0002}$)	Adjusting side clearance of oil pump
3	VANE (Oil pump)	31243AA000 — 030	$17\ ^{-0.030}_{-0.037}$ ($0.6693\ ^{-0.0012}_{-0.0015}$), $17\ ^{-0.023}_{-0.030}$ ($0.6693\ ^{-0.0009}_{-0.0012}$), $17\ ^{-0.016}_{-0.023}$ ($0.6693\ ^{-0.0006}_{-0.0009}$), $17\ ^{+0.009}_{+0.016}$ ($0.6693\ ^{+0.0004}_{+0.0006}$)	Adjusting side clearance of oil pump
4	ROTOR (Oil pump)	31240AA000 — 030	$17\ ^{-0.030}_{-0.037}$ ($0.6693\ ^{-0.0012}_{-0.0015}$), $17\ ^{-0.023}_{-0.030}$ ($0.6693\ ^{-0.0009}_{-0.0012}$), $17\ ^{-0.016}_{-0.023}$ ($0.6693\ ^{-0.0006}_{-0.0009}$), $17\ ^{+0.009}_{+0.016}$ ($0.6693\ ^{+0.0004}_{+0.0006}$)	Adjusting side clearance of oil pump
5	THRUST WASHER (Reverse clutch)	31299AA000 — 060	0.7, 0.9, 1.1, 1.3, 1.5, 1.7, 1.9 (0.028, 0.035, 0.043, 0.051, 0.059, 0.067, 0.075)	Adjusting end play of reverse clutch drum
6	BEARING RACE	803031021 — 27	0.8, 1.0, 1.2, 1.4, 1.6, 1.8, 2.0 (0.031, 0.039, 0.047, 0.055, 0.063, 0.071, 0.079)	Adjusting total end play
7	RETAINING PLATE	31567AA350 — 390	4.6, 4.8, 5.0, 5.2, 5.4 (0.181, 0.189, 0.197, 0.205, 0.213)	Adjusting clearance of reverse clutch
8	RETAINING PLATE	31567AA190 — 260	3.6, 3.8, 4.0, 4.2, 4.4, 4.6, 4.8, 5.0 (0.142, 0.150, 0.157, 0.165, 0.173, 0.181, 0.189, 0.197)	Adjusting clearance of high clutch
9	RETAINING PLATE	31567AA010, 060 — 100	8.0, 8.2, 8.4, 8.6, 8.8, 9.0 (0.315, 0.323, 0.331, 0.339, 0.346, 0.354)	Adjusting clearance of forward clutch
10	RETAINING PLATE	31567AA120 — 180	8.0, 8.2, 8.4, 8.6, 8.8, 9.0, 9.2 (0.315, 0.323, 0.331, 0.339, 0.346, 0.354, 0.362)	Adjusting clearance of overrunning clutch
11	RETAINING PLATE No. 2	31667AA180 — 250	6.5, 6.8, 7.1, 7.4, 7.7, 8.0, 8.2, 8.4 (0.256, 0.268, 0.280, 0.291, 0.303, 0.315, 0.323, 0.331)	Adjusting clearance of low and reverse brake
12	PRESSURE PLATE (Front)	31593AA150 — 180	3.3, 3.7, 4.1, 4.5 (0.130, 0.146, 0.161, 0.177)	Adjusting clearance of transfer clutch
13	THRUST BEARING (35 x 53 x T)	806536020, 806535030 — 070, 090	3.8, 4.0, 4.2, 4.4, 4.6, 4.8, 5.0 (0.150, 0.157, 0.165, 0.173, 0.181, 0.189, 0.197)	Adjusting end play of transfer clutch
14	WASHER (38.1 x 50 x T)	803038021 — 023	0.95, 1.00, 1.05 (0.0374, 0.0394, 0.0413)	Adjusting backlash of differential bevel gear
15	DRIVE PINION SHIM	31451AA050 — 100	0.15, 0.175, 0.2, 0.225, 0.250, 0.275 (0.0059, 0.0069, 0.008, 0.0089, 0.0098, 0.0108)	Adjusting drive pinion height

C: LOCATION AND INSTALLING DIRECTION OF THRUST NEEDLE BEARING





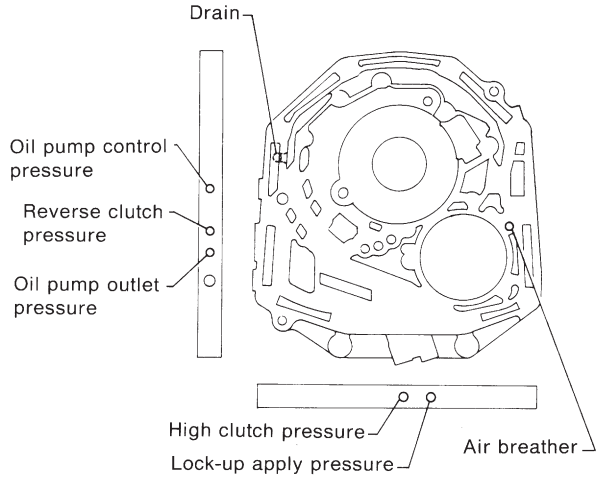
G3M0775

Unit: mm (in)

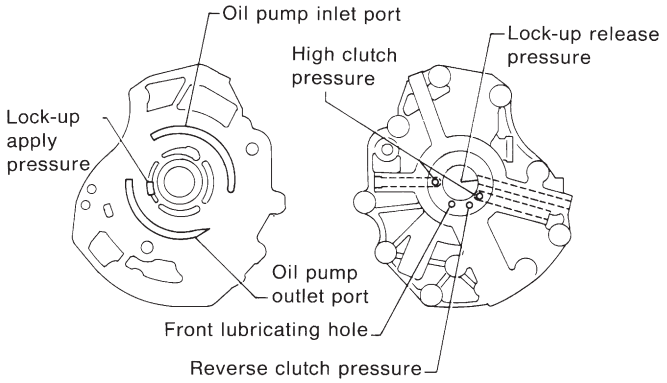
No.	Part Name	Part Number	Inside diameter	Outside diameter	Dimension	Application
A	Thrust needle bearing	806530020	30 (1.18)	47 (1.85)	3.3 (0.130)	A place of high clutch drum
B	Thrust needle bearing	806536020	36 (1.42)	53 (2.09)	3.8 (0.150)	A place of high clutch hub
C	Thrust needle bearing	806535080	35 (1.38)	53 (2.09)	2.8 (0.110)	A place of front sun gear
D	Thrust needle bearing	806558020	58 (2.28)	78 (3.07)	4.0 (0.157)	A place of front planetary carrier
E	Thrust needle bearing	806535120	35 (1.38)	53 (2.09)	4.8 (0.189)	A place of rear sun gear
F	Thrust needle bearing	806534010	34 (1.34)	53 (2.09)	3.37 (0.1327)	A place of rear internal gear
G	Thrust needle bearing	806558020	58 (2.28)	78 (3.07)	4.0 (0.157)	A place of overrunning clutch hub
H	Thrust needle bearing	806542010	42 (1.65)	59 (2.32)	3.6 (0.142)	A place of low & reverse brake
I	Thrust needle bearing	806564010	64 (2.52)	78 (3.07)	4.0 (0.157)	A place of low & reverse brake
J	Thrust needle bearing	806536020 806535030 ~ 806535070 806535090	35 (1.38)	53 (2.09)	3.8, 4.0, 4.2, 4.4, 4.6, 4.8, 5.0 (0.150, 0.157, 0.165, 0.173, 0.181, 0.189, 0.197)	Adjusting end play of transfer clutch

D: FLUID PASSAGES

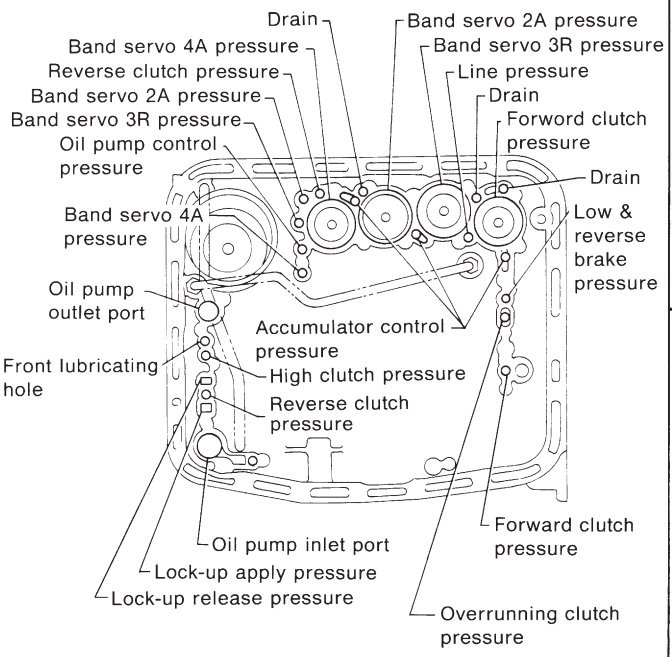
Oil pump housing



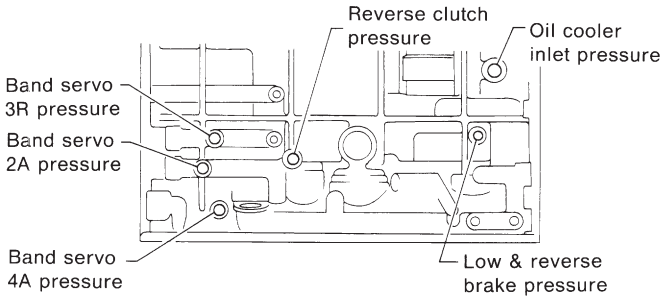
Oil pump cover



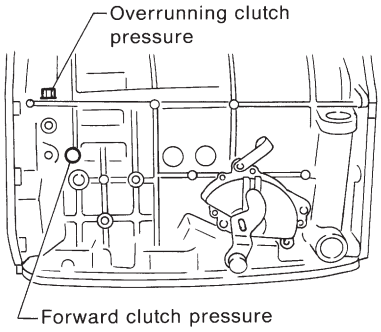
Transmission case



Transmission case LH side

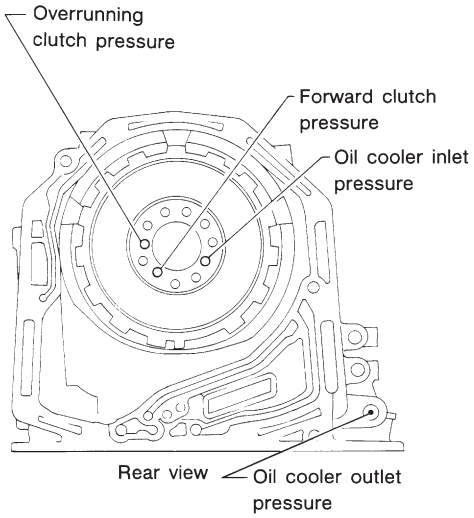


Transmission case RH side

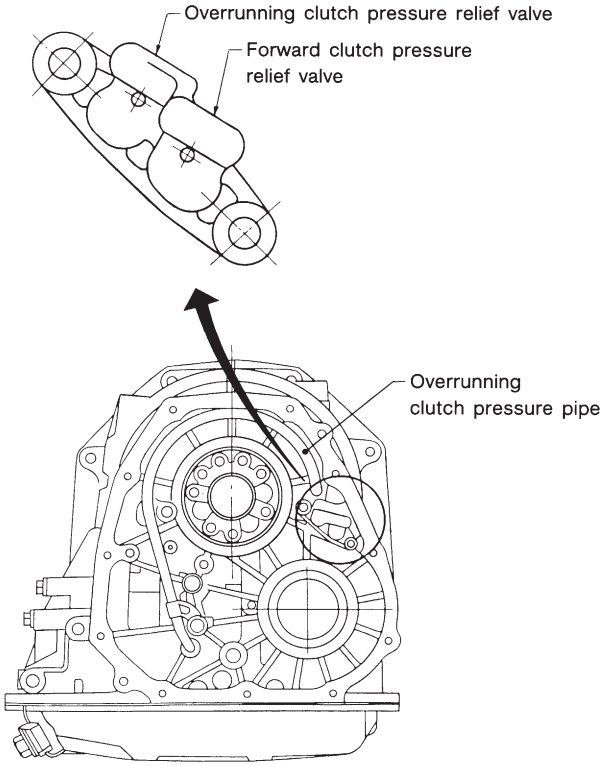


G3M0776

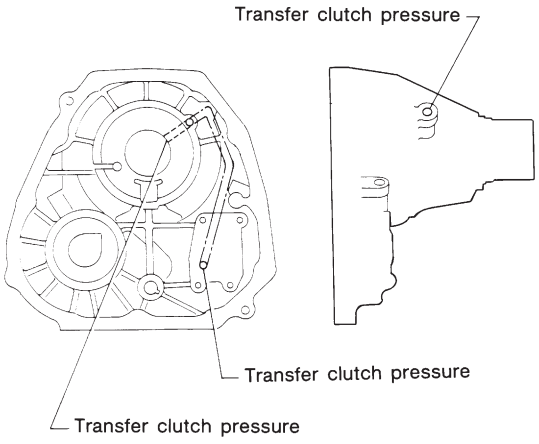
Transmission case



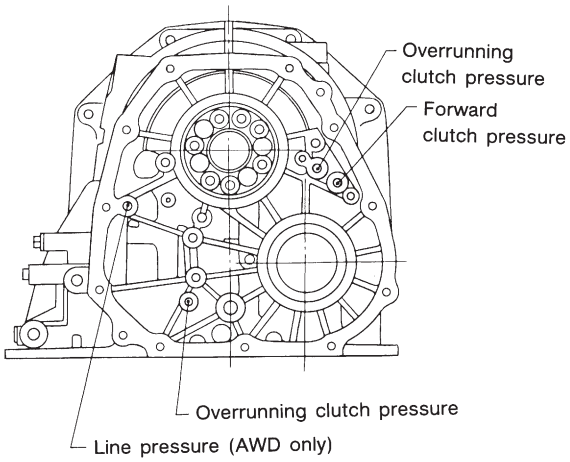
Transmission case



Extension case

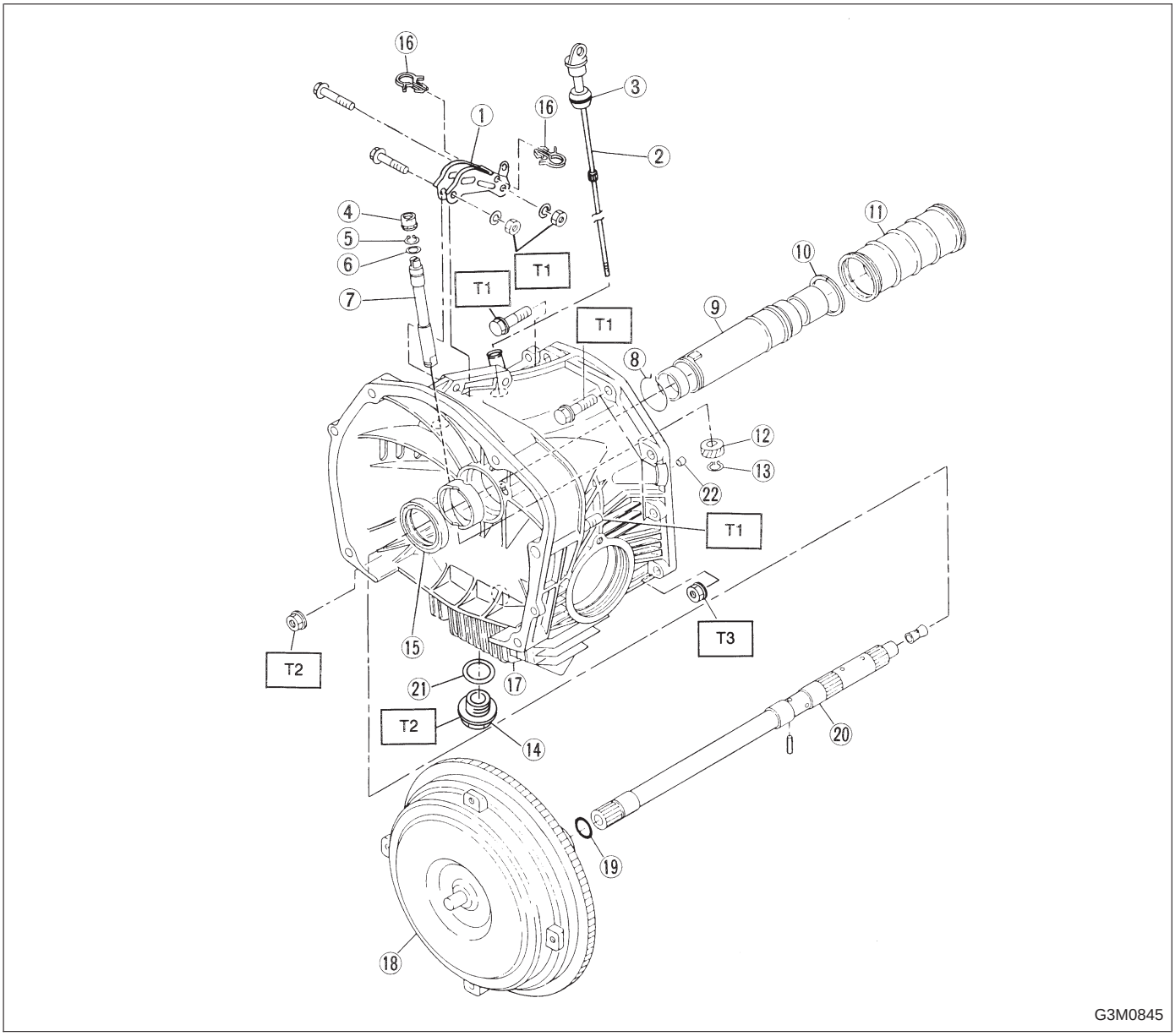


Transmission case



G3M0777

1. Torque Converter Clutch and Case

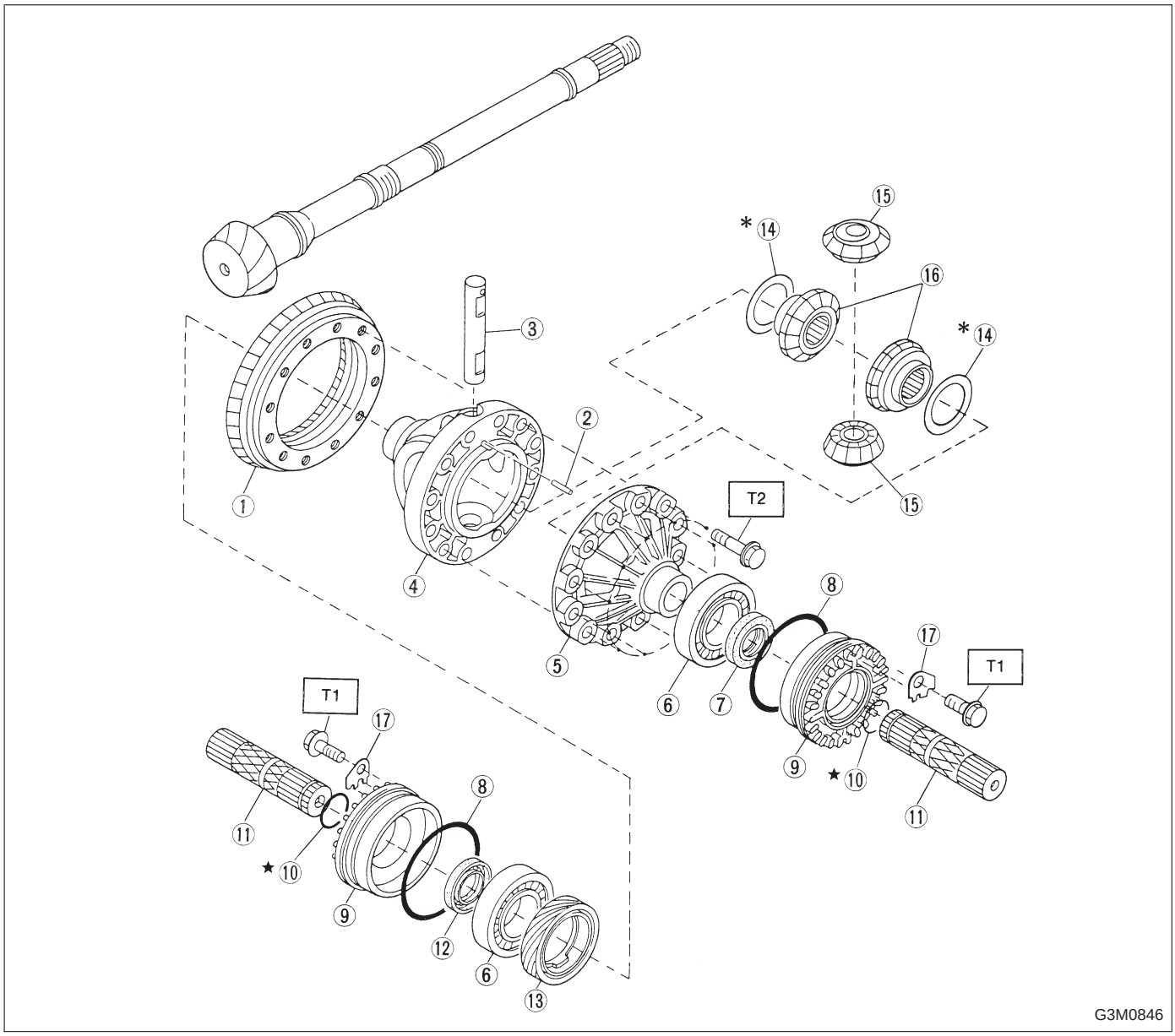


G3M0845

① Pitching stopper bracket
② Oil level gauge
③ O-ring
④ Oil seal
⑤ Snap ring
⑥ Washer
⑦ Speedometer shaft
⑧ Clip
⑨ Oil pump shaft
⑩ Seal ring
⑪ Seal pipe
⑫ Speedometer driven gear
⑬ Snap ring
⑭ Drain plug
⑮ Oil seal
⑯ Air breather hose clip
⑰ Torque converter clutch case
⑱ Torque converter clutch
⑲ O-ring
⑳ Input shaft
㉑ Gasket
㉒ Oil drain pipe

Tightening torque: N·m (kg-m, ft-lb)
T1: 18±5 (1.8±0.5, 13.0±3.6)
T2: 41±3 (4.2±0.3, 30.4±2.2)
T3: 44±3 (4.5±0.3, 32.5±2.2)

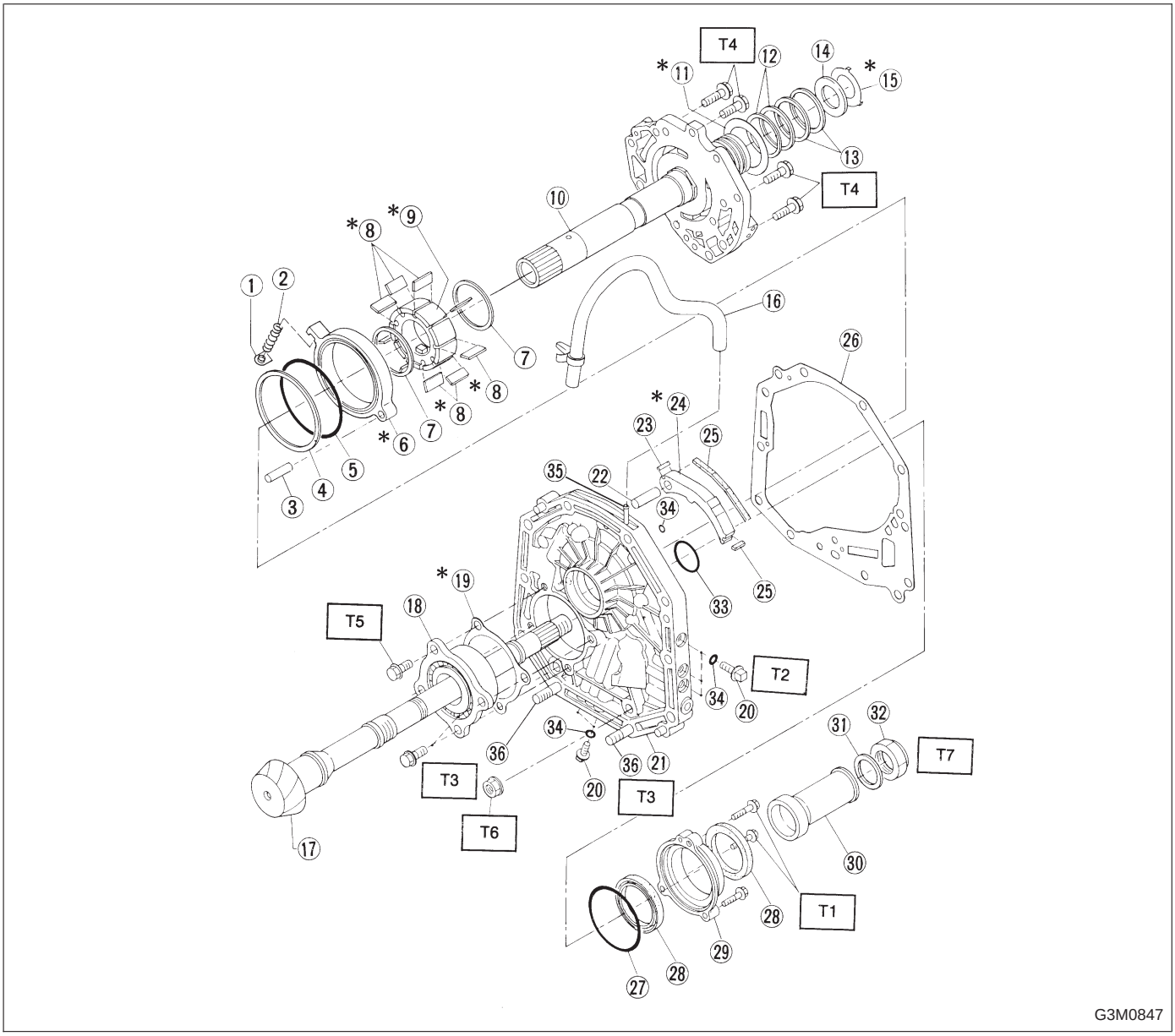
2. Differential Case



① Crown gear
② Straight pin
③ Pinion shaft
④ Differential case (RH)
⑤ Differential case (LH)
⑥ Taper roller bearing
⑦ Oil seal (LH)
⑧ O-ring
⑨ Differential side retainer
⑩ Circlip
⑪ Axle shaft
⑫ Oil seal (RH)
⑬ Speedometer drive gear
⑭ Washer
⑮ Differential bevel pinion
⑯ Differential bevel gear
⑰ Lock plate

Tightening torque: N·m (kg-m, ft-lb)
T1: 25±2 (2.5±0.2, 18.1±1.4)
T2: 62±3 (6.3±0.3, 45.6±2.2)

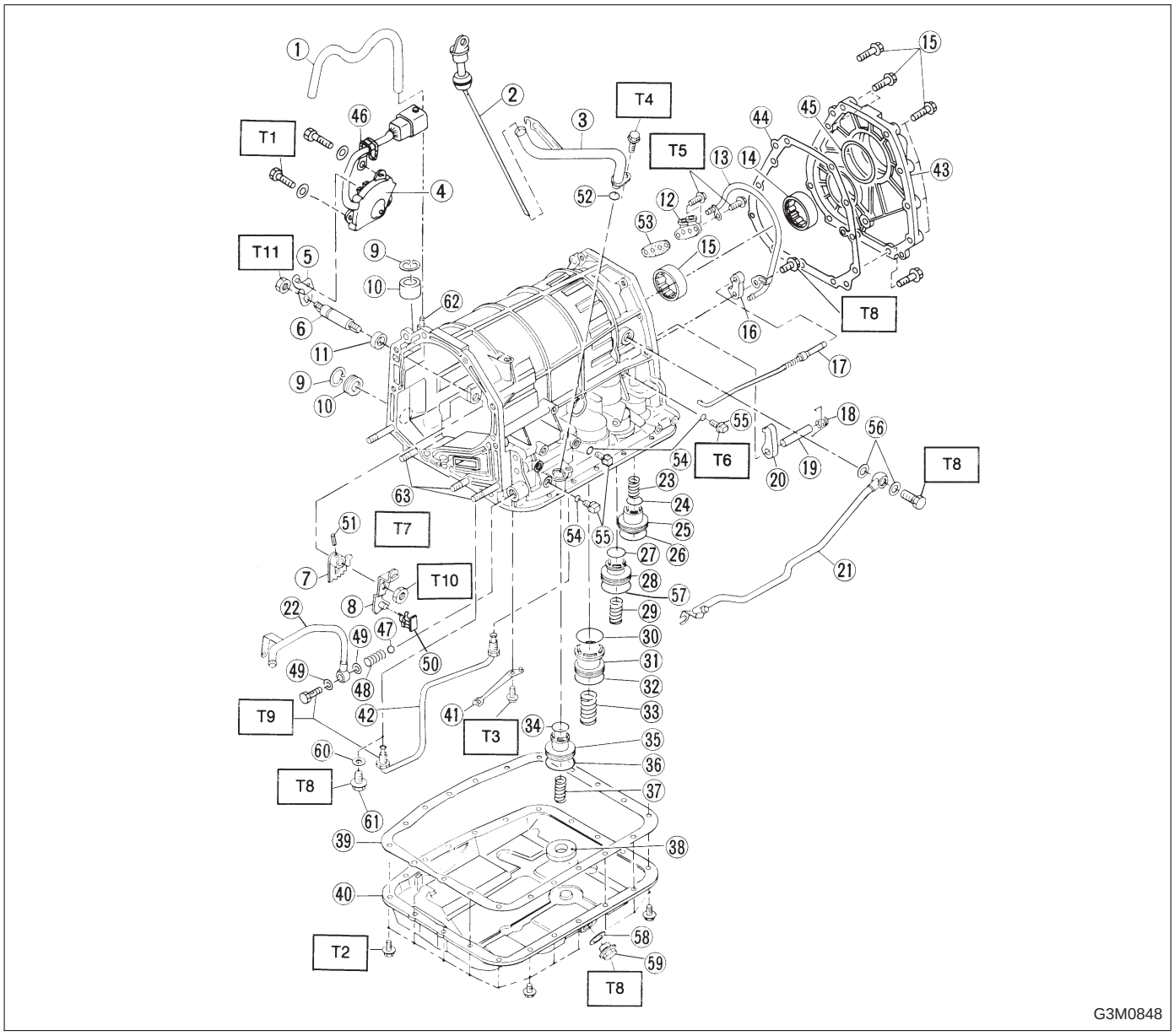
3. Oil Pump



① Retainer
② Return spring
③ Pin
④ Friction ring
⑤ O-ring
⑥ Cam ring
⑦ Vane ring
⑧ Vane
⑨ Rotor
⑩ Oil pump cover
⑪ Thrust washer
⑫ Seal ring (R)
⑬ Seal ring (H)
⑭ Thrust needle bearing
⑮ Thrust washer
⑯ Air breather hose
⑰ Drive pinion shaft
⑱ Roller bearing
⑲ Shim
⑳ Test plug
㉑ Oil pump housing
㉒ Pin
㉓ Side seal
㉔ Control piston
㉕ Plane seal
㉖ Gasket
㉗ O-ring
㉘ Oil seal
㉙ Oil seal retainer
㉚ Drive pinion collar
㉛ Lock washer
㉜ Lock nut
㉝ O-ring
㉞ O-ring
㉟ Nipple
㊱ Stud bolt

Tightening torque: N·m (kg-m, ft-lb)
T1: 7±1 (0.7±0.1, 5.1±0.7)
T2: 13±1 (1.3±0.1, 9.4±0.7)
T3: 18±5 (1.8±0.5, 13.0±3.6)
T4: 25±2 (2.5±0.2, 18.1±1.4)
T5: 39±3 (4.0±0.3, 28.9±2.2)
T6: 41±3 (4.2±0.3, 30.4±2.2)
T7: 113±5 (11.5±0.5, 83.2±3.6)

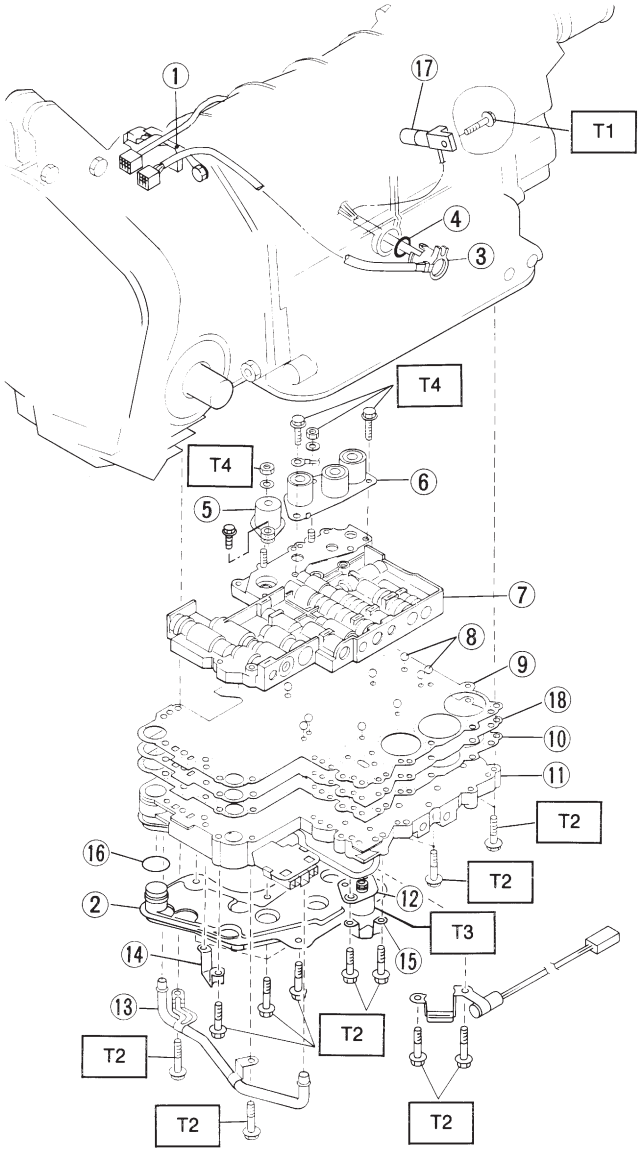
4. Transmission Case, Transmission Cover and Control Device



① Air breather hose
② Oil level gauge
③ Oil charger pipe
④ Inhibitor switch
⑤ Range select lever
⑥ Manual shaft
⑦ Manual plate
⑧ Manual lever
⑨ Snap ring
⑩ Plug
⑪ Oil seal
⑫ Relief valve
⑬ Pipe
⑭ Roller bearing
⑮ Flange bolt
⑯ Parking support
⑰ Parking rod
⑱ Return spring
⑲ Shaft
⑳ Parking pawl
㉑ Inlet pipe
㉒ Outlet pipe
㉓ Spring
㉔ O-ring
㉕ Accumulator piston (N-D)
㉖ O-ring
㉗ O-ring
㉘ Accumulator piston (2-3)
㉙ Spring
㉚ O-ring
㉛ Accumulator piston (1-2)
㉜ O-ring
㉝ Spring
㉞ O-ring
㉟ Accumulator piston (3-4)
㊱ O-ring
㊲ Spring
㊳ Magnet
㊴ Gasket
㊵ Oil pan
㊶ Detention spring
㊷ Pipe (AWD model)
㊸ Transmission cover (FWD model)
㊹ Gasket
㊺ Shim
㊻ Clip
㊼ Ball
㊽ Spring
㊾ Gasket
㊿ Stopper
(51) Spring pin
(52) Gasket
(53) Gasket
(54) O-ring
(55) Test plug
(56) Gasket
(57) O-ring
(58) Gasket
(59) Drain plug
(60) Gasket (FWD model)
(61) Plug (FWD model)
(62) Nipple
(63) Stud bolt

Tightening torque: N·m (kg-m, ft-lb)
T1: 3.4±0.5 (0.35±0.05, 2.5±0.4)
T2: 4.9±0.5 (0.50±0.05, 3.6±0.4)
T3: 6±1 (0.6±0.1, 4.3±0.7)
T4: 6.4±0.5 (0.65±0.05, 4.7±0.4)
T5: 8±1 (0.8±0.1, 5.8±0.7)
T6: 13±1 (1.3±0.1, 9.4±0.7)
T7: 18±3 (1.8±0.3, 13.0±2.2)
T8: 25±2 (2.5±0.2, 18.1±1.4)
T9: 30.9±3.4 (3.15±0.35, 22.8±2.5)
T10: 47±2 (4.8±0.2, 34.7±1.4)
T11: 34±3 (3.5±0.3, 25.3±2.2)

5. Control Valve and Harness Routing

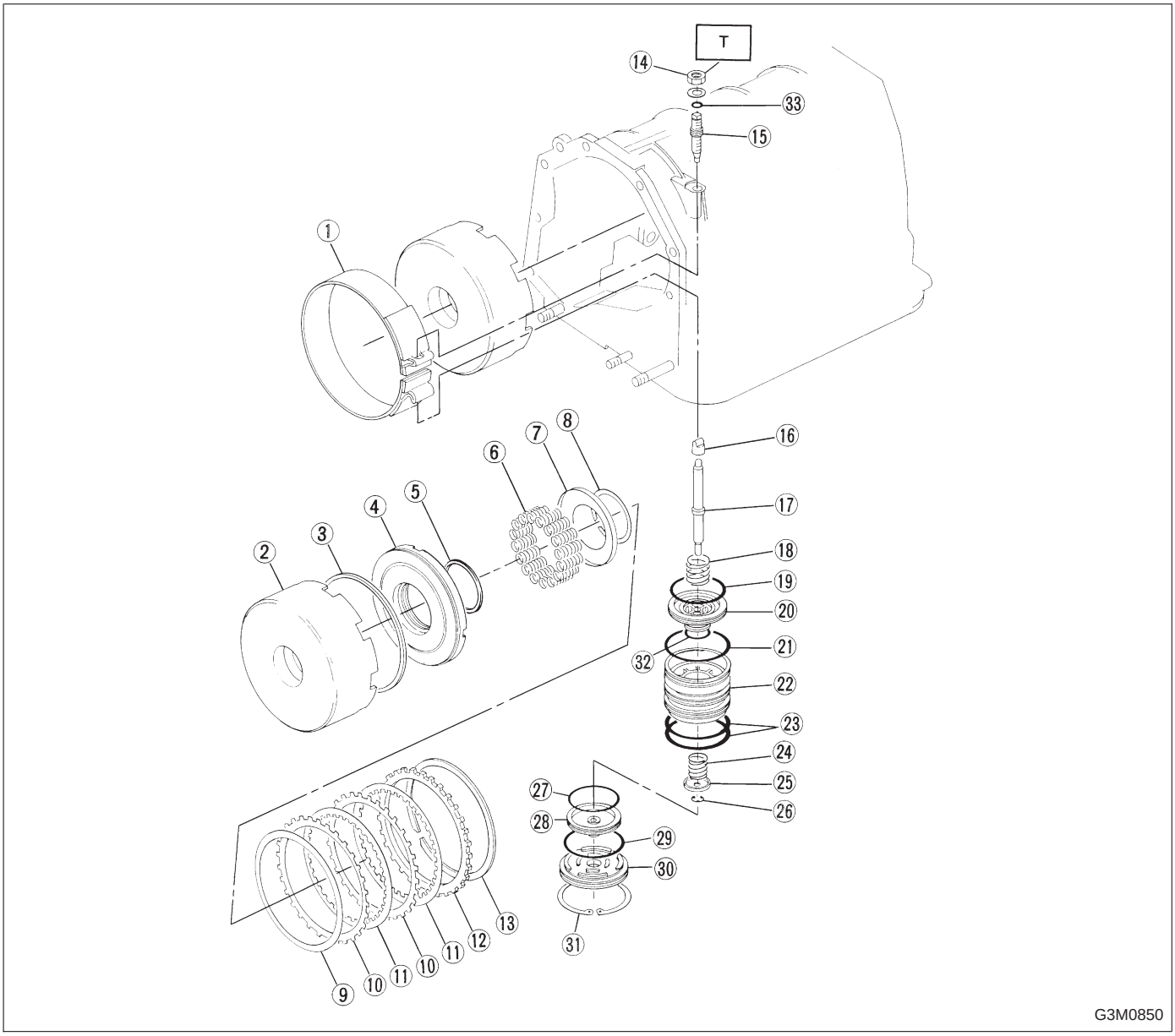


G3M0849

① Stay
② Oil strainer
③ Transmission harness
④ O-ring
⑤ Duty sol. A (Line pressure)
⑥ Sol. ASSY
⑦ Upper valve body
⑧ Ball
⑨ Upper separator gasket
⑩ Lower separator gasket
⑪ Lower valve body
⑫ Duty sol. B (Lock-up)
⑬ Pipe
⑭ Bracket
⑮ Bracket
⑯ O-ring
⑰ Vehicle speed sensor 1 (FWD only)
⑱ Separator plate

Tightening torque: N·m (kg-m, ft-lb)
T1: 7±1 (0.7±0.1, 5.1±0.7)
T2: 8±1 (0.8±0.1, 5.8±0.7)
T3: 11.3±1.5 (1.15±0.15, 8.3±1.1)
T4: 8.3±1.5 (0.85±0.15, 6.1±1.1)

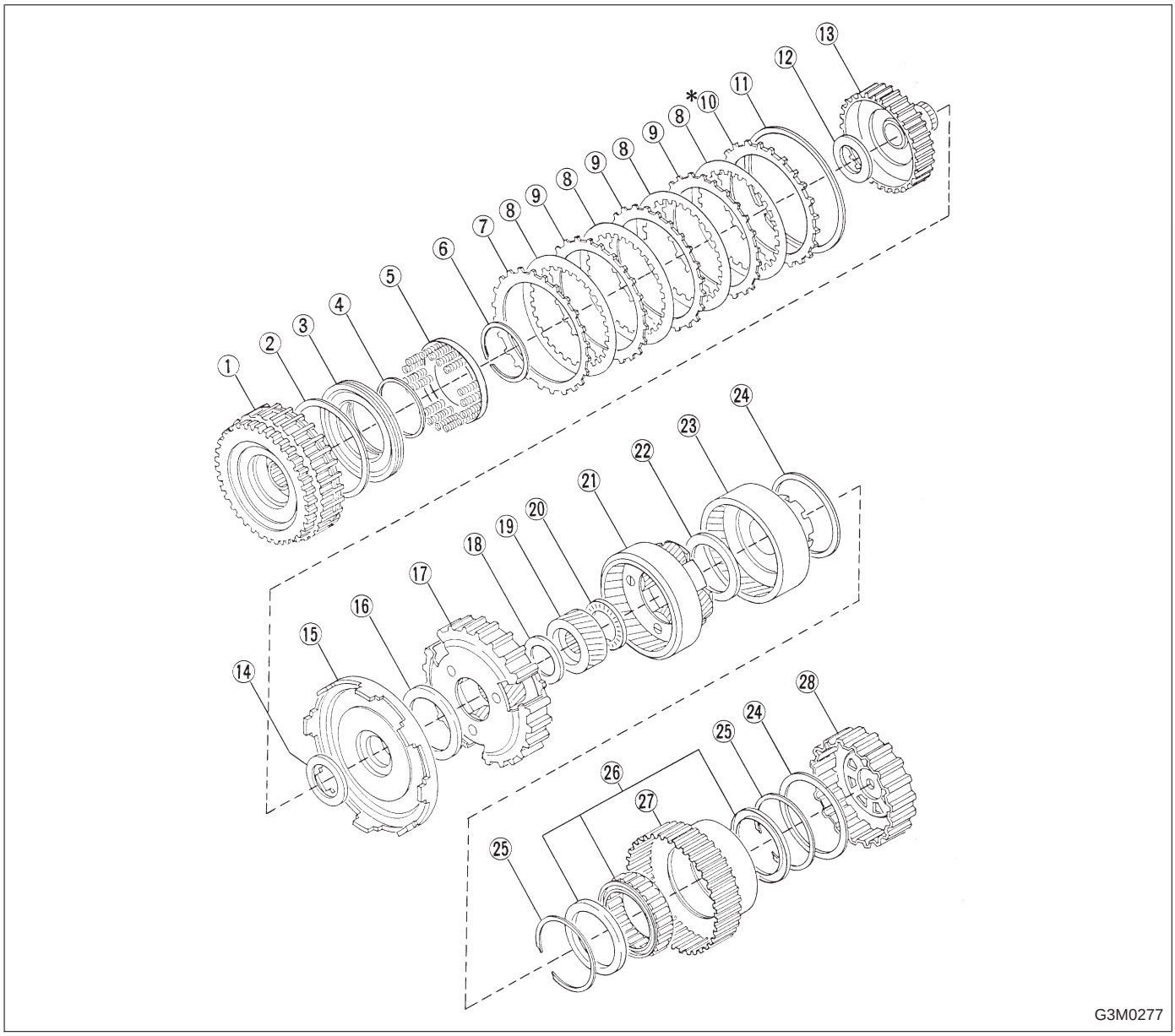
6. Reverse Clutch and Band Brake



① Brake band
② Reverse clutch drum
③ Lip seal
④ Piston
⑤ Lathe cut seal ring
⑥ Spring
⑦ Spring retainer
⑧ Snap ring
⑨ Dish plate
⑩ Driven plate
⑪ Drive plate
⑫ Retaining plate
⑬ Snap ring
⑭ Lock nut
⑮ Brake band adjusting screw
⑯ Strut
⑰ Band servo piston stem
⑱ Spring
⑲ Lathe cut seal ring
⑳ Band servo piston (1-2)
㉑ O-ring
㉒ Retainer
㉓ O-ring
㉔ Spring
㉕ Retainer
㉖ Circlip
㉗ Lathe cut seal ring
㉘ Band servo piston (3-4)
㉙ O-ring
㉚ O.D. servo retainer
㉛ Snap ring
㉜ Lathe cut seal ring
㉝ O-ring

Tightening torque: N·m (kg-m, ft-lb)
T: 26±2 (2.7±0.2, 19.5±1.4)

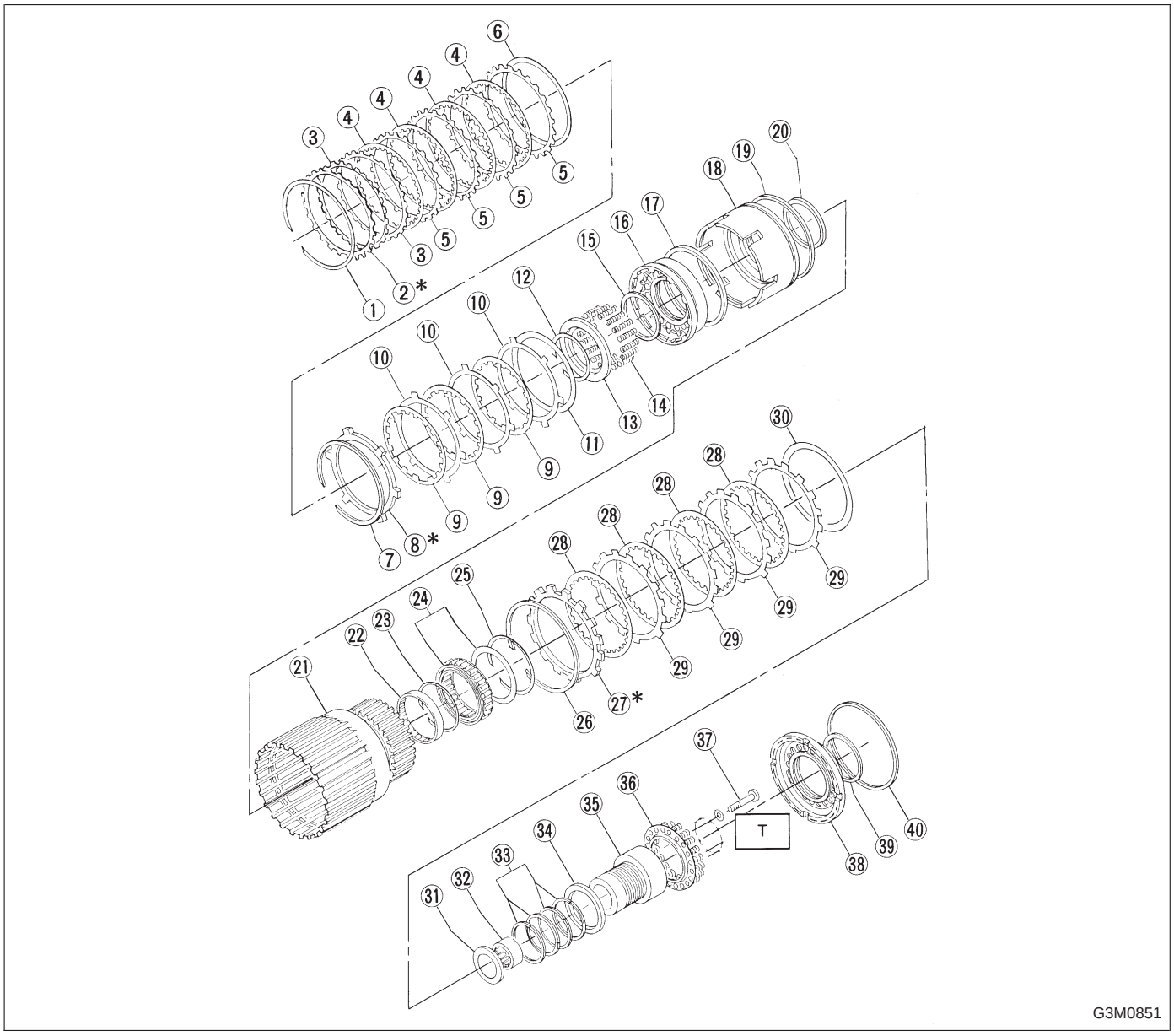
7. High Clutch and Planetary Gear



① High clutch drum
② Lathe cut seal ring
③ Piston
④ Lathe cut seal ring
⑤ Spring retainer
⑥ Snap ring
⑦ Driven plate (Thinner)
⑧ Drive plate
⑨ Driven plate (Thicker)
⑩ Retaining plate
⑪ Snap ring
⑫ Thrust needle bearing
⑬ High clutch hub
⑭ Thrust needle bearing
⑮ Front sun gear
⑯ Thrust needle bearing
⑰ Front planetary carrier
⑱ Thrust needle bearing
⑲ Rear sun gear
⑳ Thrust needle bearing
㉑ Rear planetary carrier
㉒ Thrust needle bearing
㉓ Rear internal gear
㉔ Thrust washer
㉕ Snap ring
㉖ One-way clutch (3-4)
㉗ One-way clutch outer race (3-4)
㉘ Overrunning clutch hub

8. Forward Clutch and Low & Reverse Brake

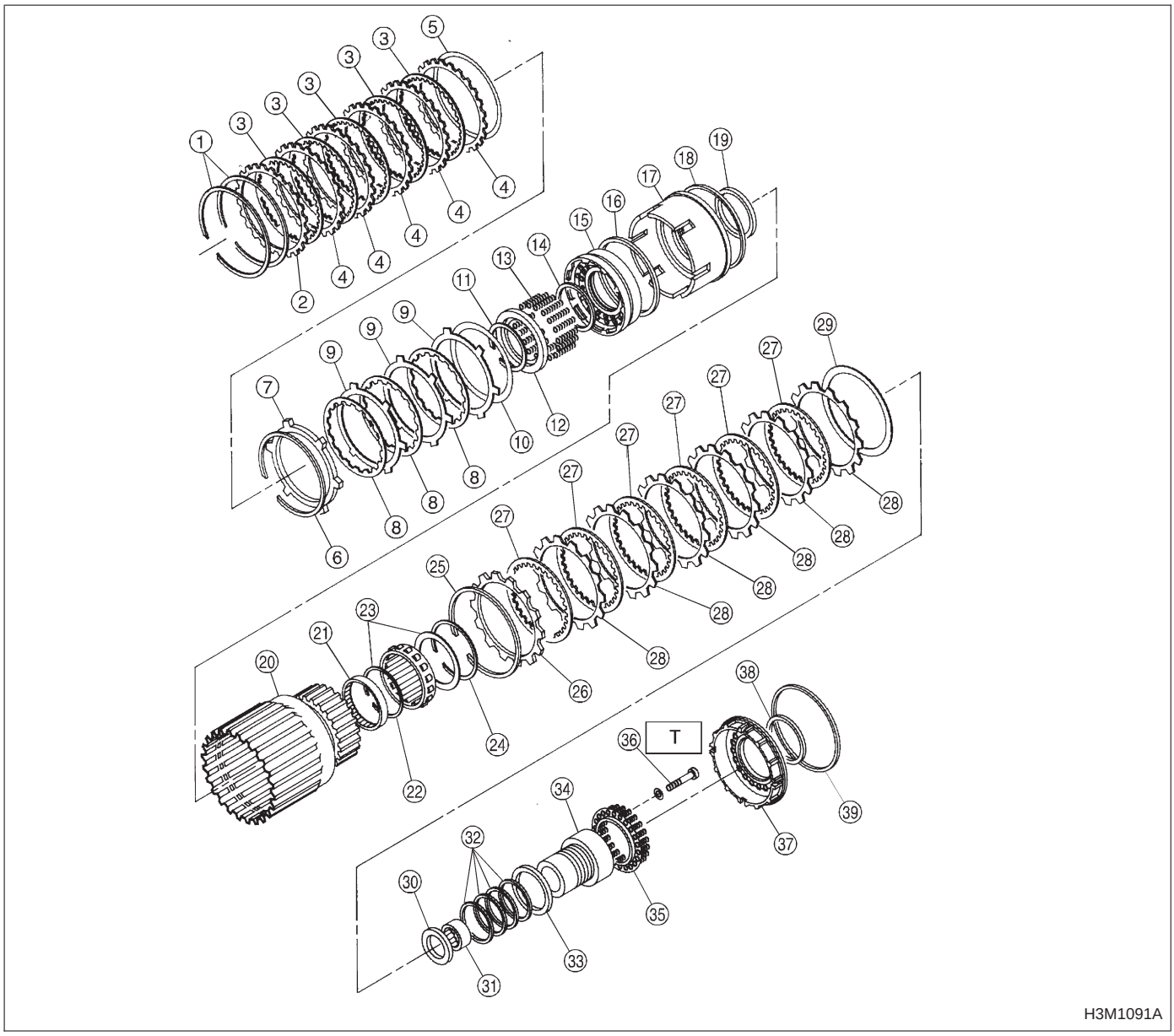
1. 1800 cc MODEL



① Snap ring
② Retaining plate
③ Driven plate (Thinner)
④ Drive plate
⑤ Driven plate (Thicker)
⑥ Dish plate
⑦ Snap ring
⑧ Retaining plate
⑨ Drive plate
⑩ Driven plate
⑪ Dish plate
⑫ Snap ring
⑬ Spring retainer
⑭ Spring
⑮ Lathe cut seal ring
⑯ Overrunning piston
⑰ Lathe cut seal ring
⑱ Forward piston
⑲ Lip seal
⑳ Lathe cut seal ring
㉑ Forward clutch drum
㉒ Needle bearing
㉓ Snap ring
㉔ One-way clutch (1-2)
㉕ Snap ring
㉖ Snap ring
㉗ Retaining plate
㉘ Drive plate
㉙ Driven plate
㉚ Dish plate
㉛ Thrust needle bearing
㉜ Needle bearing
㉝ Seal ring
㉞ Thrust needle bearing
㉟ One-way clutch inner race (1-2)
㊱ Spring retainer
㊲ Socket bolt
㊳ Low & reverse piston
㊴ Lathe cut seal ring
㊵ Lathe cut seal ring

Tightening torque: N·m (kg-m, ft-lb)
T: 25±2 (2.5±0.2, 18.1±1.4)

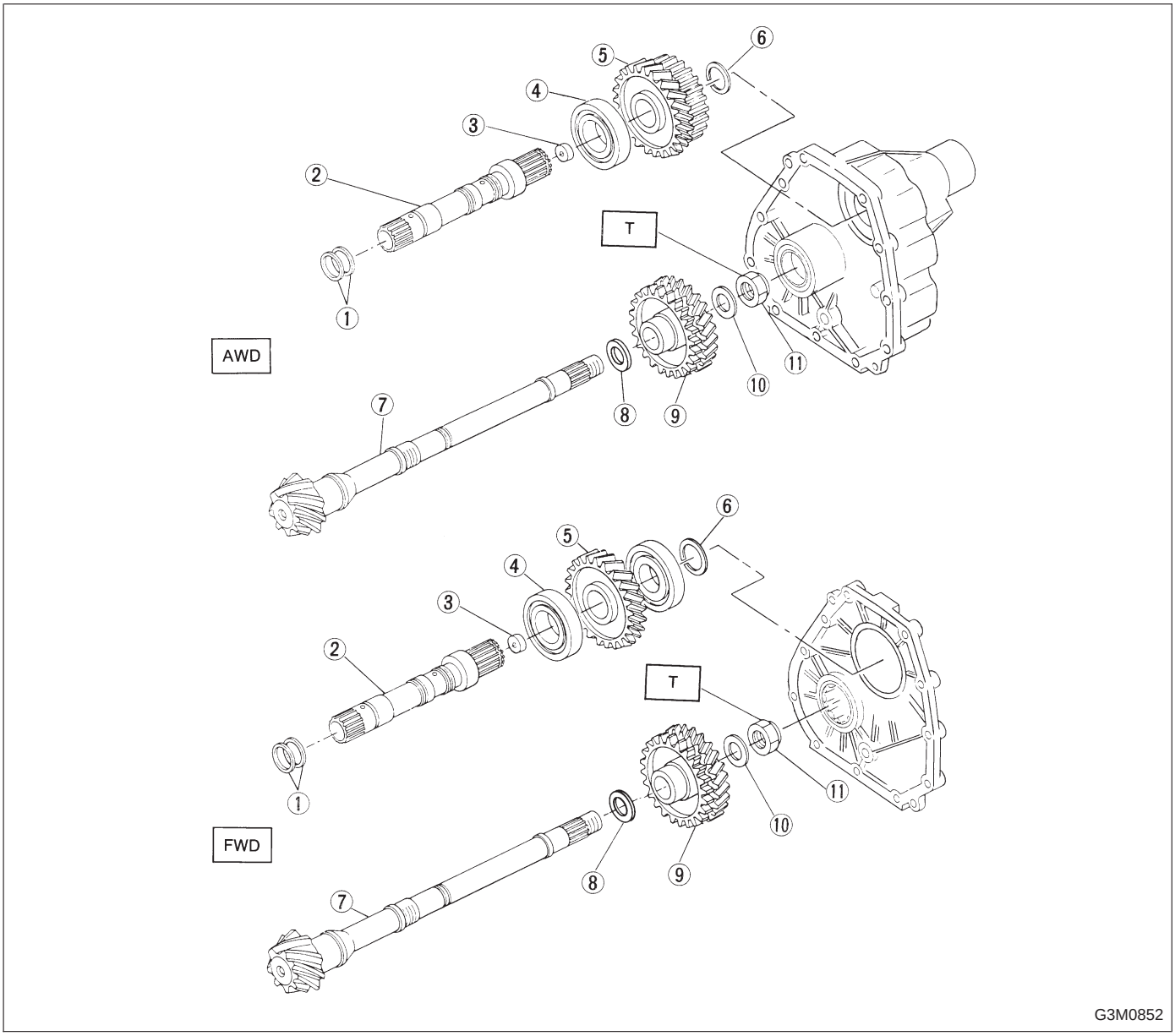
2. 2200 cc MODEL



① Snap ring
② Retaining plate
③ Drive plate (5)
④ Driven plate (5)
⑤ Dish plate
⑥ Snap ring
⑦ Retaining plate
⑧ Drive plate
⑨ Driven plate
⑩ Dish plate
⑪ Snap ring
⑫ Spring retainer
⑬ Spring
⑭ Lathe cut seal ring
⑮ Overrunning piston
⑯ Lathe cut seal ring
⑰ Forward piston
⑱ Lip seal
⑲ Lathe cut seal ring
⑳ Forward clutch drum
㉑ Needle bearing
㉒ Snap ring
㉓ One-way clutch (1-2)
㉔ Snap ring
㉕ Snap ring
㉖ Retaining plate
㉗ Drive plate (6)
㉘ Driven plate (6)
㉙ Dish plate
㉚ Thrust needle bearing
㉛ Needle bearing
㉜ Seal ring
㉝ Thrust washer
㉞ One-way clutch inner race (1-2)
㉟ Spring retainer
㊱ Socket bolt
㊲ Low & reverse piston
㊳ Lathe cut seal ring
㊴ Lathe cut seal ring

Tightening torque: N·m (kg-m, ft-lb)
T: 25±2 (2.5±0.2, 18.1±1.4)

9. Reduction Gear

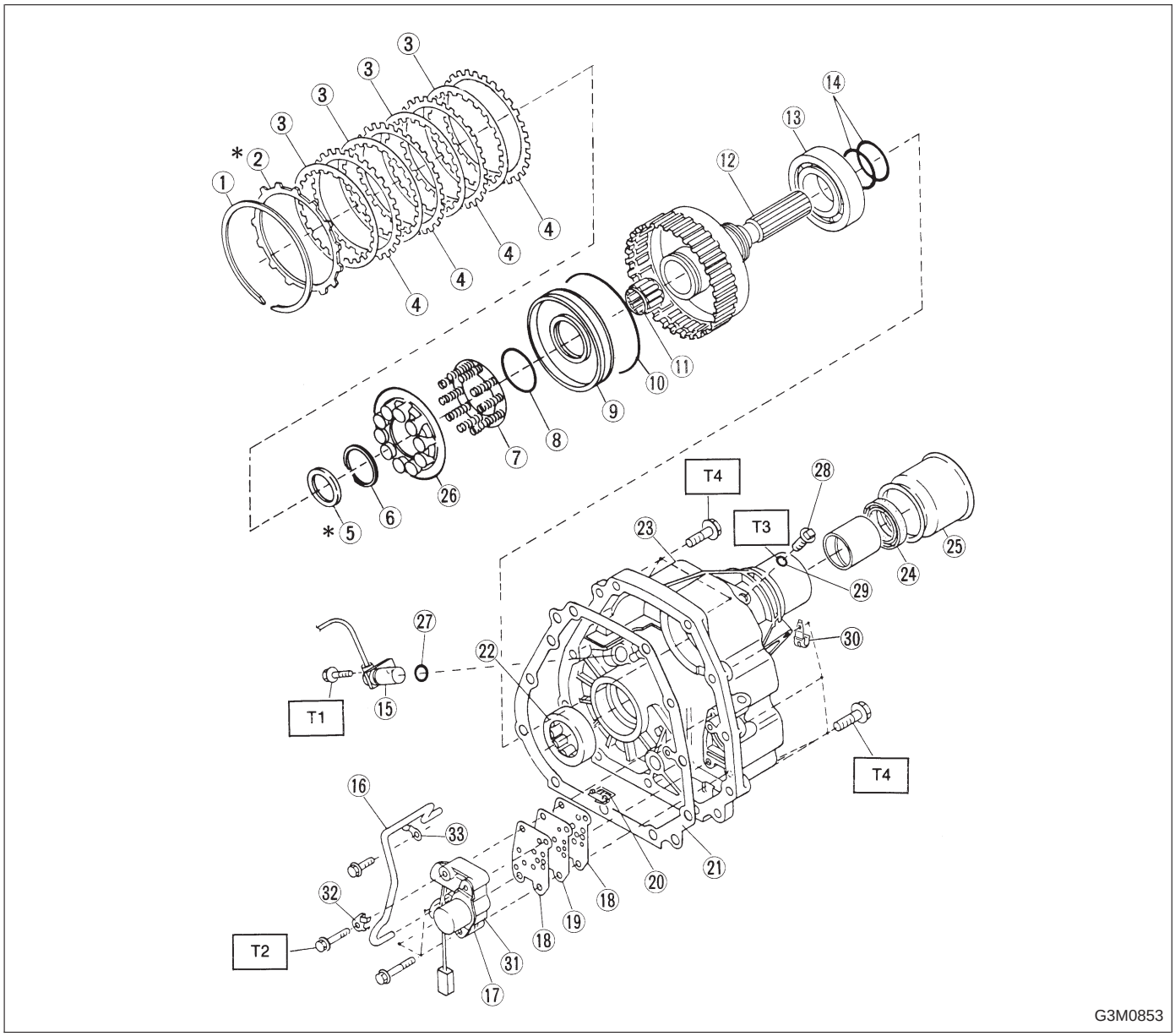


① Seal ring
② Reduction drive shaft
③ Plug
④ Ball bearing
⑤ Reduction drive gear
⑥ Snap ring
⑦ Drive pinion shaft
⑧ Washer
⑨ Reduction driven gear
⑩ Washer
⑪ Lock nut

Tightening torque: N·m (kg-m, ft-lb)
T: 98±5 (10.0±0.5, 72.3±3.6)

10. Transfer and Extension

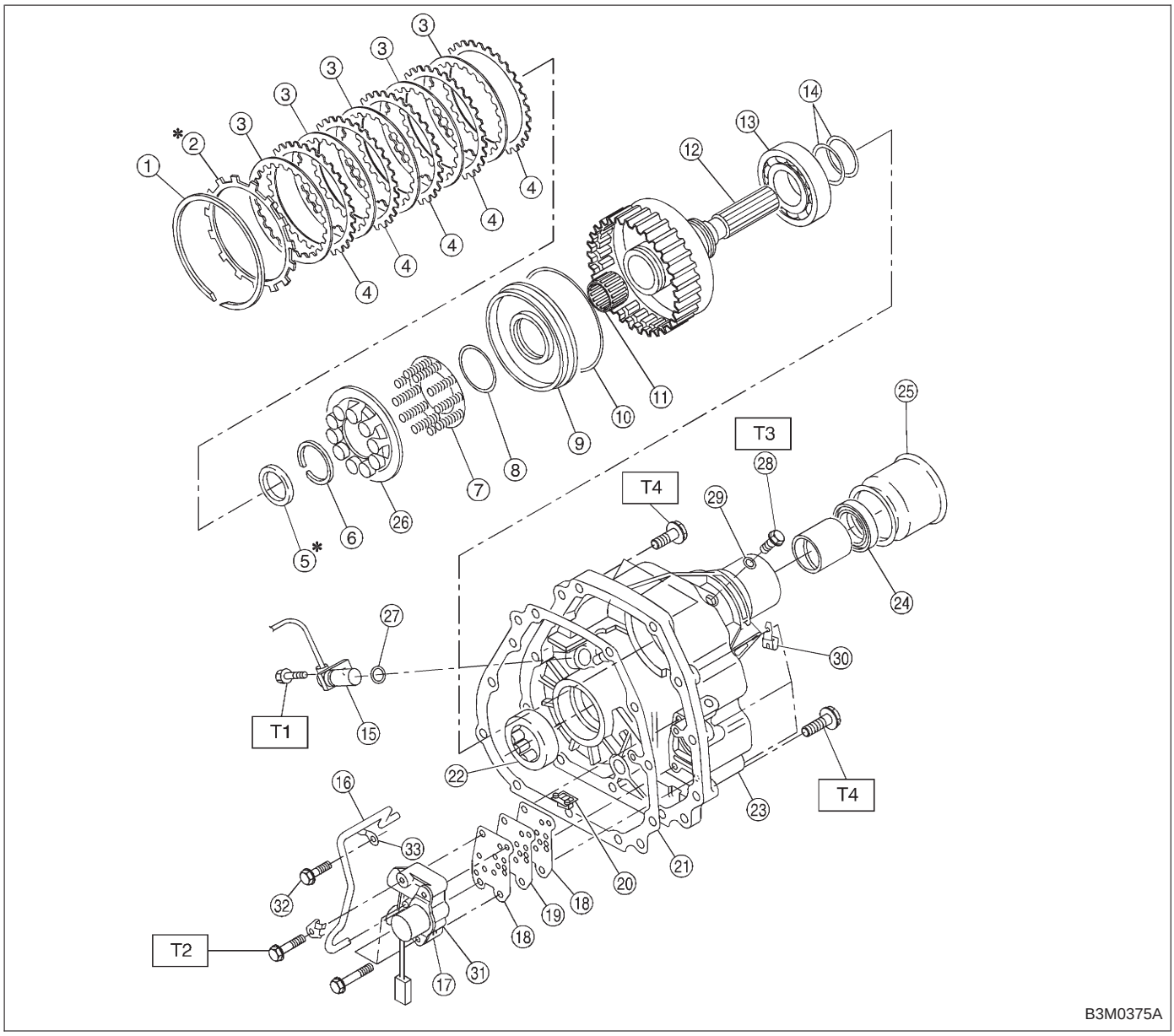
1. 1800 cc MODEL



① Snap ring
② Pressure plate
③ Drive plate
④ Driven plate
⑤ Thrust needle bearing
⑥ Snap ring
⑦ Spring retainer
⑧ Lathe cut seal ring
⑨ Transfer clutch piston
⑩ Lathe cut seal ring
⑪ Needle bearing
⑫ Rear drive shaft
⑬ Ball bearing
⑭ Seal ring
⑮ Vehicle speed sensor 1 (AWD only)
⑯ Pilot valve pipe
⑰ Duty sol. C (transfer clutch)
⑱ Gasket
⑲ Plate
⑳ Filter
㉑ Gasket
㉒ Roller bearing
㉓ Extension case
㉔ Oil seal
㉕ Dust seal
㉖ Seal transfer piston
㉗ O-ring
㉘ Test plug
㉙ O-ring
㉚ Clip
㉛ Transfer valve body
㉜ Clip
㉝ Stay

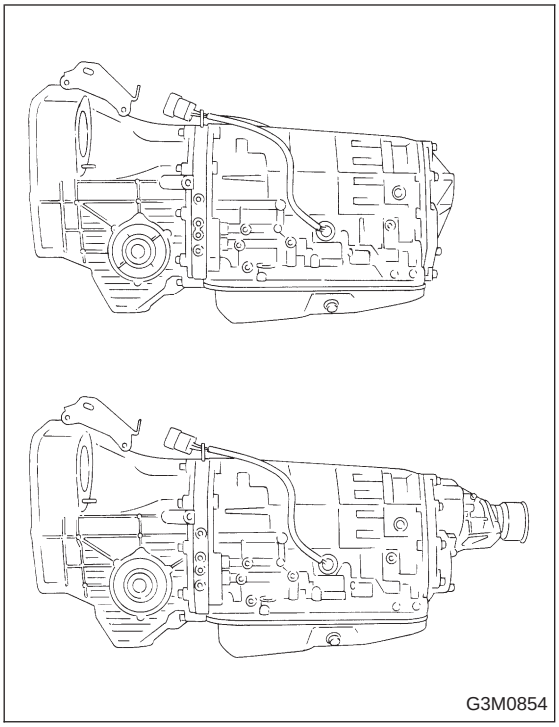
Tightening torque: N·m (kg-m, ft-lb)
T1: 7±1 (0.7±0.1, 5.1±0.7)
T2: 8±1 (0.8±0.1, 5.8±0.7)
T3: 13±1 (1.3±0.1, 9.4±0.7)
T4: 25±1 (2.5±0.1, 18.1±0.7)

2. 2200 cc MODEL



① Snap ring
② Pressure plate
③ Drive plate
④ Driven plate
⑤ Thrust needle bearing
⑥ Snap ring
⑦ Spring retainer
⑧ Lathe cut seal ring
⑨ Transfer clutch piston
⑩ Lathe cut seal ring
⑪ Needle bearing
⑫ Rear drive shaft
⑬ Ball bearing
⑭ Seal ring
⑮ Vehicle speed sensor 1 (AWD only)
⑯ Transfer clutch pipe
⑰ Duty sol. C (Transfer clutch)
⑱ Gasket
⑲ Plate
⑳ Filter
㉑ Gasket
㉒ Roller bearing
㉓ Extension case
㉔ Oil seal
㉕ Dust seal
㉖ Seal transfer piston
㉗ O-ring
㉘ Test plug
㉙ O-ring
㉚ Clip
㉛ Transfer valve body
㉜ Clip
㉝ Stay

Tightening torque: N·m (kg-m, ft-lb)
T1: 7±1 (0.7±0.1, 5.1±0.7)
T2: 8±1 (0.8±0.1, 5.8±0.7)
T3: 13±1 (1.3±0.1, 9.4±0.7)
T4: 25±2 (2.5±0.2, 18.1±1.4)


G3M0854

1. Precaution

When disassembling or assembling the automatic transmission, observe the following instructions.

1) Workshop

Provide a place that is clean and free from dust. Principally the conventional workshop is suitable except for a dusty place. In a workshop where grinding work, etc. which produces fine particles is done, make independent place divided by the vinyl curtain or the equivalent.

2) Worktable

The size of 1 x 1.5 m (40 x 60 in) is large enough to work, and it is more desirable that its surface be covered with flat plate like iron plate which is not rusted too much.

3) Cleaning of exterior

(1) Clean the exterior surface of transmission with steam and/or kerosene prior to disassembly, however it should be noted that vinyl tape be placed on the air-breather or oil level gauge to prevent infiltration of the steam into the transmission and also the cleaning job be done away from the place of disassembly and assembly.

(2) Partial cleaning will do, depending on the extent of disassembly (such as when disassembly is limited to some certain parts).

4) Disassembly, assembly and cleaning

(1) Disassemble and assemble the transmission while inspecting the parts in accordance with the Trouble-shooting.

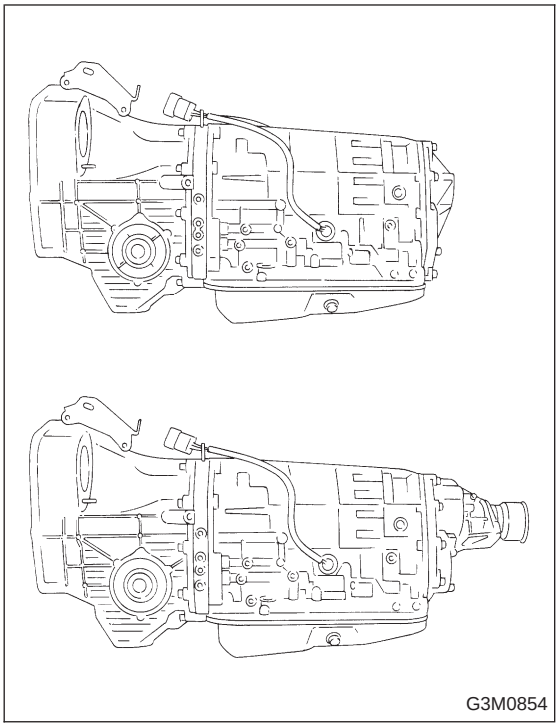
(2) During job, don't use gloves. Don't clean the parts with rags: Use chamois or nylon cloth.

(3) Pay special attention to the air to be used for cleaning. Get the moisture and the dust rid of the air as much as possible. Be careful not to scratch or dent any part while checking for proper operation with an air gun.

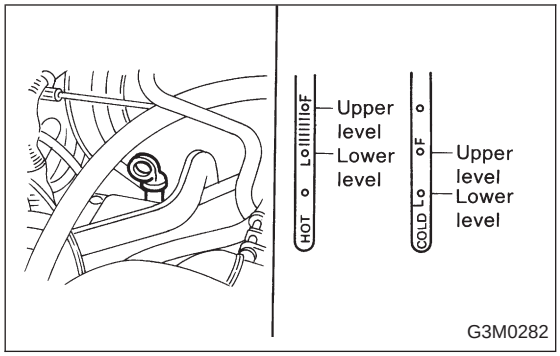
(4) Complete the job from cleaning to completion of assembly as continuously and speedily as possible in order to avoid occurrence of secondary troubles caused by dust. When stopping the job unavoidably cover the parts with clean chamois or nylon cloth to keep them away from any dust.

(5) Use kerosene, white gasoline or the equivalent as washing fluid. Use always new fluid for cleaning the automatic transmission parts and never reuse. The used fluid is usable in disassemble and assemble work of engine and manual transmission.

(6) Although the cleaning should be done by dipping into the washing fluid or blowing of the pressurized washing fluid, the dipping is more desirable. (Do not rub with a brush.) Assemble the parts immediately after the cleaning without exposure to the air for a while. Besides in case of washing rubber parts, perform the job quickly not to dip them into the washing fluid for long time.


G3M0854

(7) Apply the automatic transmission fluid (ATF) onto the parts immediately prior to assembly, and the specified tightening torque should be observed carefully.
(8) Use vaseline if it is necessary to hold parts in the position when assembling.
(9) Drain ATF and differential gear oil into a saucer so that the conditions of fluid and oil can be inspected.
(10) Do not support axle drive shaft, stator shaft, input shaft or various pipes when moving transmission from one place to another.
(11) Always discard old oil seals and O-ring, and install new ones.
(12) Do not reuse old aluminum (overrunning clutch pipe, etc.) pipes, gaskets, spring pins, etc. Install new ones.
(13) Be sure to replace parts which are damaged, worn, scratched, discolored, etc.



2. On-Car Service

A: INSPECTION

1. ATF LEVEL

1) Raise 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.

2) Ensure the vehicle is level. After selecting all positions (P, R, N, D, 3, 2, 1), set the selector leveler in "P" range. Measure fluid level with the engine idling.

NOTE:
After running, idle the engine for one or two minutes before measurement.

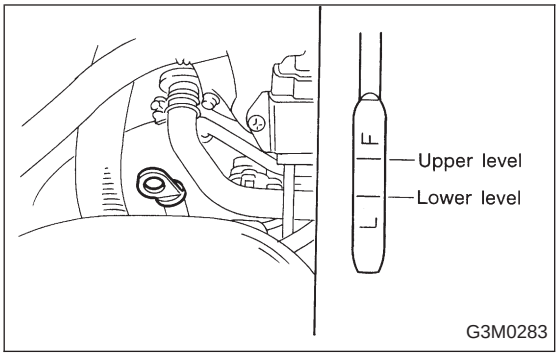
3) If the fluid level is below the center between upper and lower marks, add the recommended ATF until the fluid level is found within the specified range (above the center between upper and lower marks). When the transmission is hot, the level should be above the center of upper and lower marks, and 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 the overfilling of fluid.**

4) Fluid temperature rising speed
- By idling the engine
  Time for rising temperature 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.

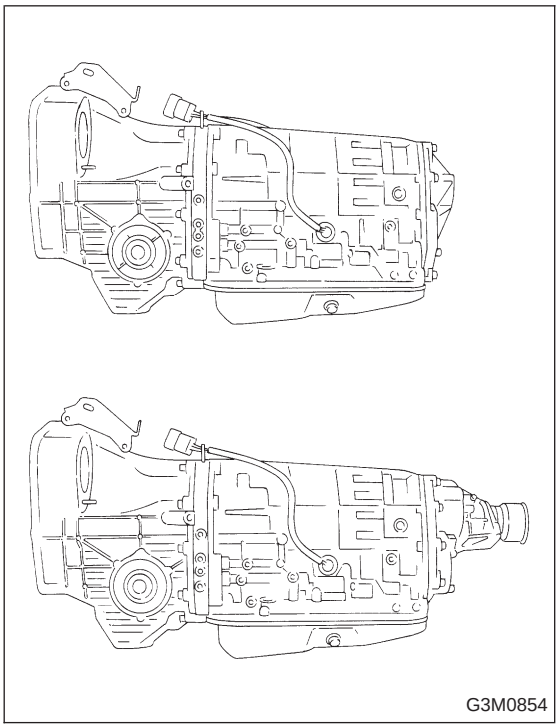


2. DIFFERENTIAL GEAR OIL LEVEL

1) Ensure the vehicle

NOTE:
Do not check the oil level nor add oil to the case with the front end of the vehicle jacked up; this will result in an incorrect reading of the oil level.

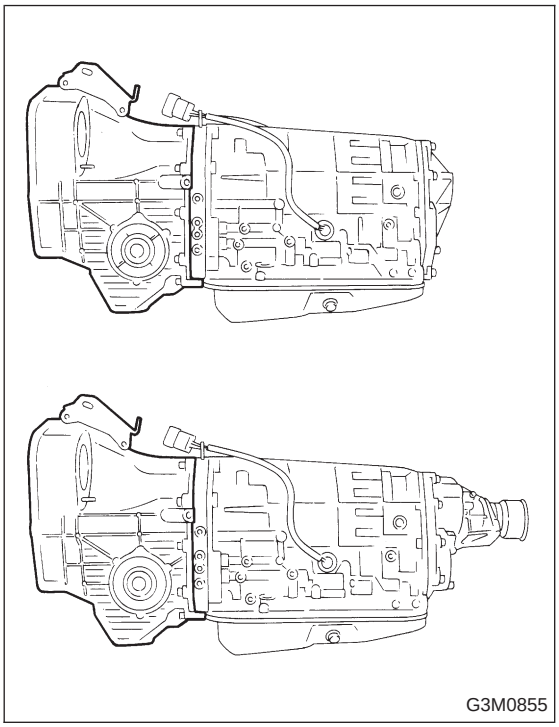
2) Check whether the oil level is between the upper (F) and lower (L) marks. If it is below the lower limit mark, add oil until the level reaches the upper mark.



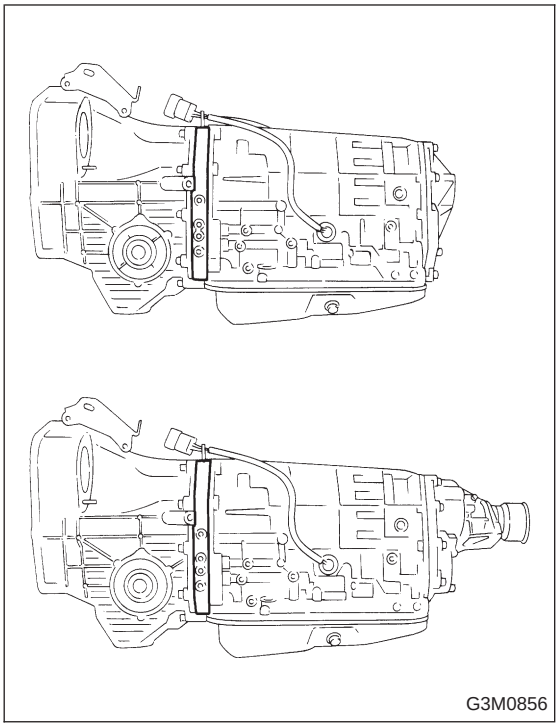
3. OIL LEAKAGE

It is difficult to accurately determine the precise position of a oil leak, since the surrounding area also becomes wet with oil. The places where oil seals and gaskets are used are as follows:

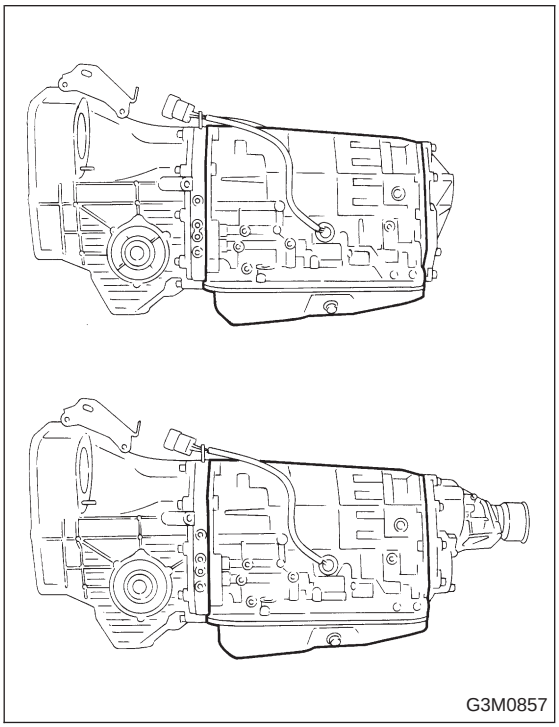
<Jointing portion of the case>
- Transmission case and oil pump housing jointing portion
- Torque converter clutch case and oil pump housing jointing portion
- Transmission case and transmission cover jointing portion (FWD)
- Transmission case and extension case jointing portion (AWD)



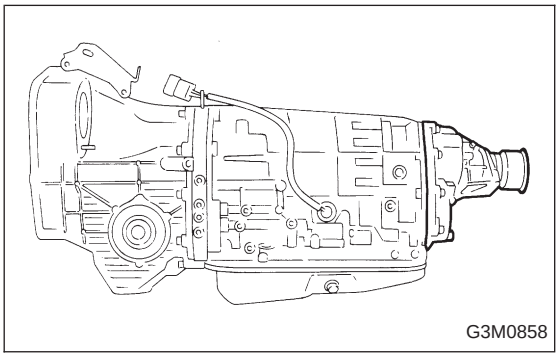
Torque converter clutch case
- Engine crankshaft oil seal
- Torque converter clutch impeller sleeve oil seal
- ATF cooler pipe connector
- Torque converter clutch
- Torque converter clutch case
- Axle shaft oil seal
- O-ring on the outside diameter of axle shaft oil seal holder
- O-ring on the differential oil gauge
- Differential oil drain plug
- Speedometer cable mounting portion
- Location of steel balls



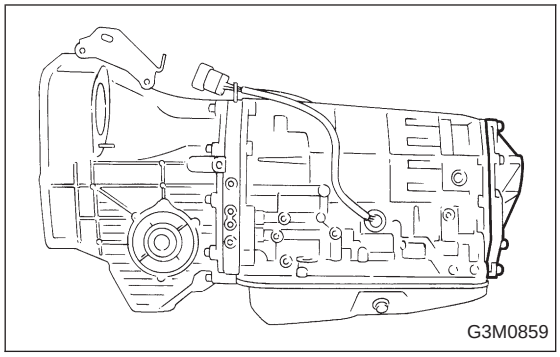
Oil pump housing
- Oil pump housing (Defective casting)
- O-ring on the test plugs
- Checking blind plugs
- Differential gear breather



Automatic transmission case
- Transmission case (Defective casting)
- Mating surface of oil pan
- O-ring on the test plugs
- Checking blind plugs (Steel balls)
- Oil supply pipe connector
- ATF cooler pipe connector and gasket
- Oil pan drain plug
- O-ring on the transmission harness holder
- Oil pump plugs
- ATF breather
- Shift lever oil seal

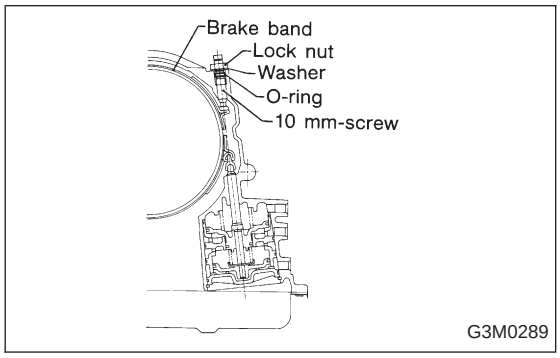


Extension case
- Extension case (Defective casting)
- O-ring on the vehicle speed sensor
- Rear drive shaft oil seal
- Checking blind plugs (Steel ball)
- O-ring on the test plugs


G3M0859

Transmission cover
● Transmission cover (Defective casting)
The point listed above should be checked for fluid leak. Checking method is as follows:

(1) Place the vehicle in the pit, and check whether the leaking oil is ATF or not. The ATF is wine red in color, and can be discriminated easily from engine oil and gear oil.
(2) Wipe clean the leaking oil and dust from a suspectable area, using a noninflammable organic solvent such as carbon tetrachloride.
(3) Run the engine to raise the fluid temperature, and set the selector lever to “D” in order to increase the fluid pressure and quickly detect a leaking point. Also check for fluid leaks while shifting select lever to “R”, “2”, and “1”.



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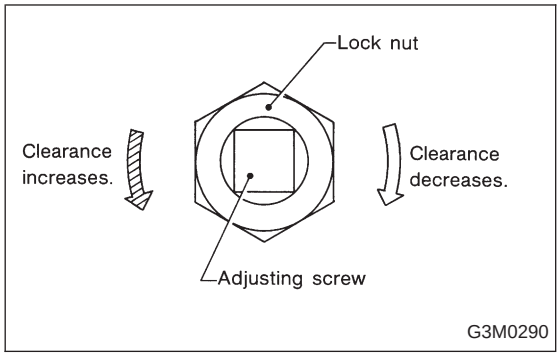
B: ADJUSTMENT

1. BRAKE BAND

If the following abnormal shifting conditions are noted in a road test, the brake band must be adjusted.

Improper brake band clearances and their symptoms	
Clearance	Problem
1. Too wide	Upshift from 1st directly to 3rd gear occurs.
2. Wide	● Engine rpm increases abruptly while upshifting from 1st to 2nd gear or 3rd to 4th gear. ● Time lag of at least one second occurs during kickdown operation from 3rd to 2nd gear.
3. Small	“Braking” symptom occurs while upshifting from 2nd to 3rd gear.
4. Too small	Upshifts from 2nd to 4th gear and downshifts from 4th to 2nd gear occur repeatedly.

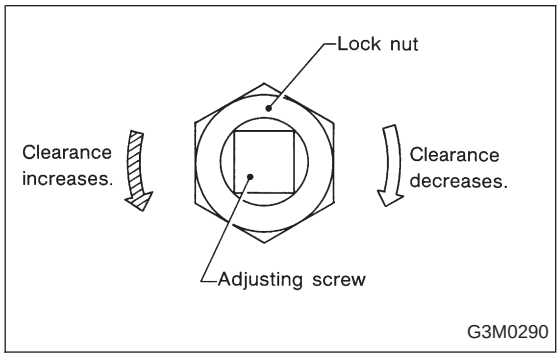


● Adjustment of the adjusting screw

1) Using a ST, immobilize the end of the 10 mm screw projecting on the left side of the transmission case, and loosen the nut with a double-end wrench.
In the case of occurrence of problems 1) and 2) mentioned previously, perform the adjustment by loosening or tightening the nut within a range of 3/4 turn from this state.

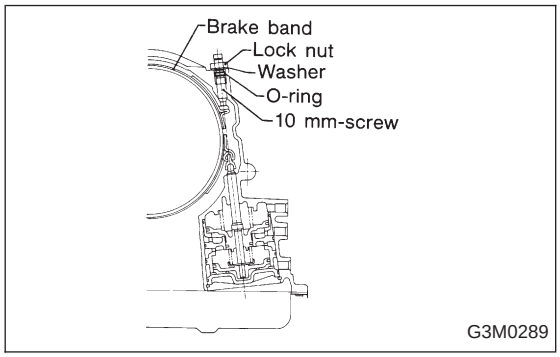
ST 398603610 SOCKET WRENCH

CAUTION:
Do not loosen excessively; otherwise, the band strut on the servo piston will drop off.



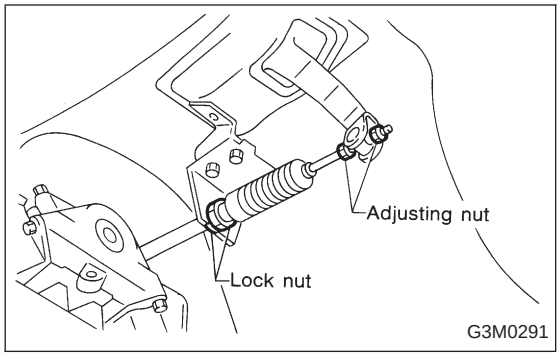
2) In case of the occurrence of problems 1 and 4 mentioned previously, perform the adjustment as follows:
Adjusting procedure: Tighten adjust screw to 9 N·m (0.9 kg-m, 6.5 ft-lb) torque, then back off three turns.

CAUTION:
Do not tighten the adjusting screw with an excessively large torque.



3) With the adjusting screw immobilized, tighten the lock nut.

Tightening torque:
26±2 N·m (2.7±0.2 kg-m, 19.5±1.4 ft-lb)



2. INHIBITOR SWITCH

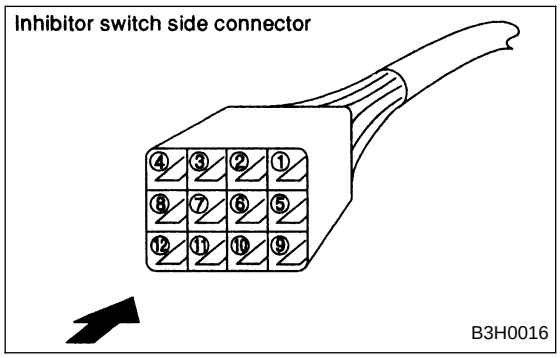
The inhibitor switch allows the back-up lights to turn on when the select lever is in the R range and the starter motor to start when the lever is in the N or P range. It also monitors the input signal electronically controlled for each range and turns on the corresponding range light on the instrument panel.
When light operation, 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.

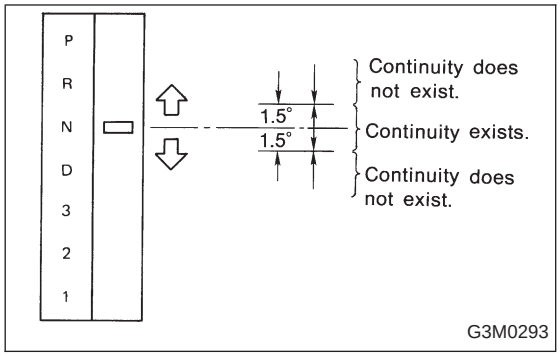
<Inspection>

(1) Disconnect cable end from select lever.
(2) Disconnect inhibitor switch connector.
(3) Check continuity in inhibitor switch circuits with select lever moved to each position.

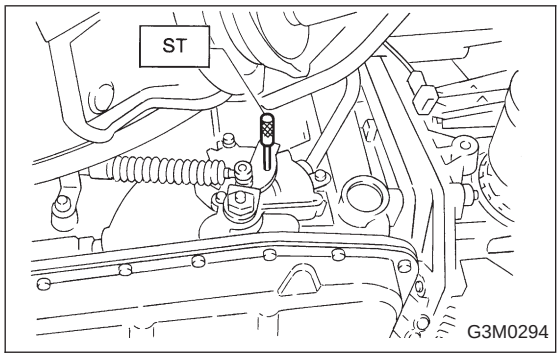
CAUTION:
Also check that continuity in ignition circuit does not exist when selector lever is in R, D, 3, 2 and 1 ranges.

Pin No.	4	3	2	1	8	7	6	5	12	11	10	9
Lead color / Position	B	Y	Br	YG	W	BY	R	GW	BY	BW	BW	RW
P	○	○							○	○		
R	○		○								○	○
N	○			○					○	○		
D	○				○							
3	○					○						
2	○						○					
1	○							○				
	Signal sent to AT control module								Ignition circuit		Back-up light circuit	





(4) 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.



<Adjustment>

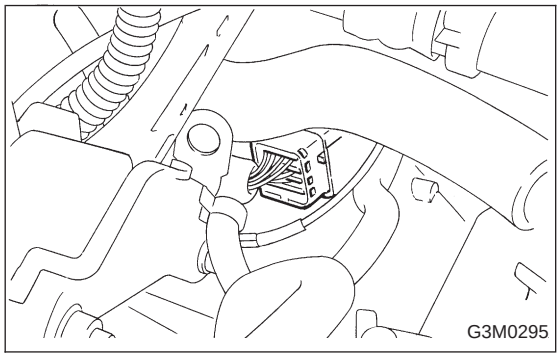
(1) Loosen the three inhibitor switch securing bolts.
(2) Shift the select lever to the N range.
(3) Insert ST as vertical as possible into the holes in the inhibitor switch lever and switch body.

ST 499267300 STOPPER PIN

(4) Tighten the three inhibitor switch bolts.

Tightening torque:
3.4±0.5 N·m (0.35±0.05 kg-m, 2.5±0.4 ft-lb)

(5) Repeat the above checks. If the inhibitor switch is determined to be “faulty”, replace it.



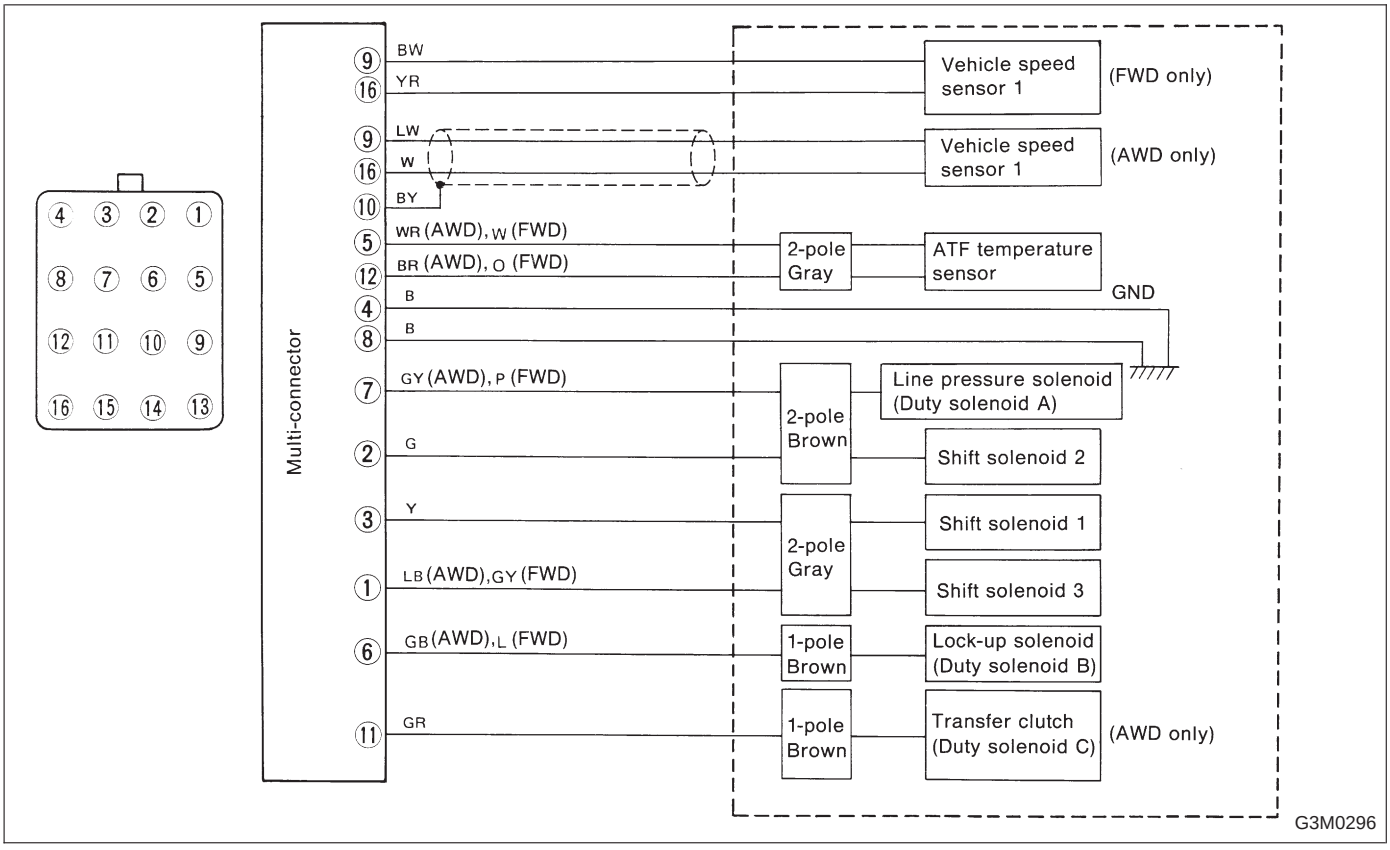
3. SENSOR (IN TRANSMISSION)

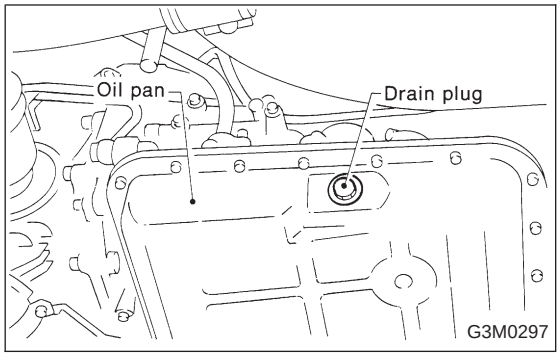
1) Check each sensor, solenoid and ground system for short circuits.

4. STANDARD VALUES

Part name	Terminal	Resistance (Ω)
Vehicle speed sensor 1	9 — 16	450 — 650
ATF temperature sensor	5 — 12	100 — 6,000 [2,000/20°C (68°F)]
Duty solenoid A (Line pressure solenoid)	7 — 4, 8	2.0 — 4.5
Duty solenoid B (Lock-up solenoid)	6 — 4, 8	10 — 17
Shift solenoid 1	3 — 4, 8	20 — 30
Shift solenoid 2	2 — 4, 8	20 — 30
Shift solenoid 3	1 — 4, 8	20 — 30
Duty solenoid C (AWD only) (Transfer clutch solenoid)	11 — 4, 8	10 — 17

NOTE:
If part is faulty, its resistance value will be different from the standard value indicated above.





C: REMOVAL AND INSTALLATION

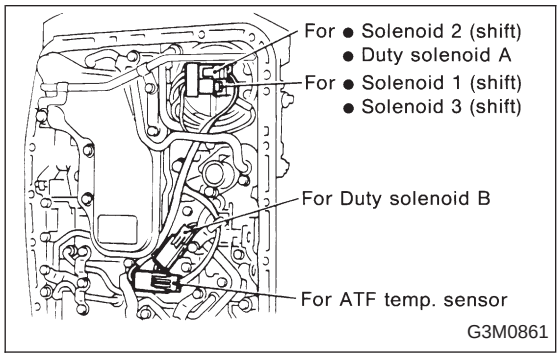
1. SHIFT SOLENOID, DUTY SOLENOID AND VALVE BODY

1) Removal

(1) Clean transmission exterior.
(2) Drain ATF completely.

NOTE:
Tighten ATF drain plug after draining ATF.

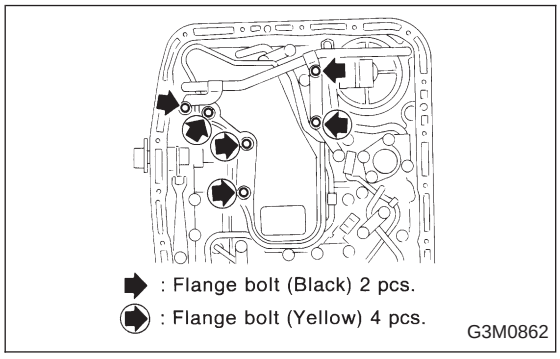
Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)



(3) Remove oil pan and gasket.

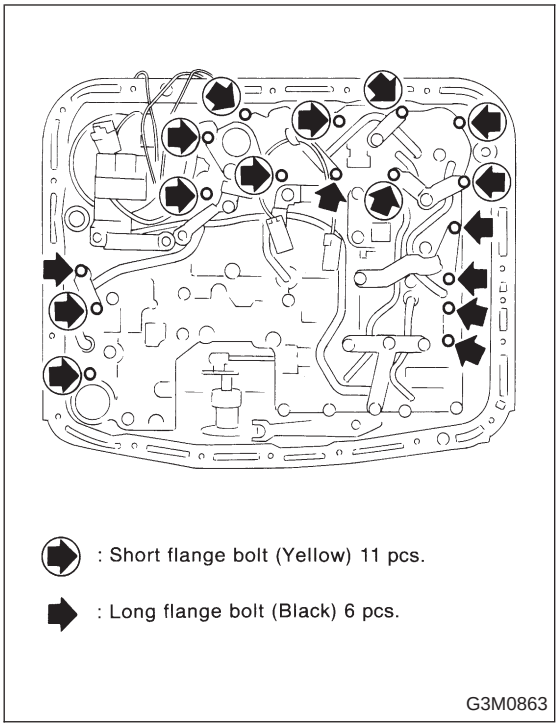
NOTE:
Drain oil into a container.

(4) Disconnect solenoid valve connectors.
Remove connectors from clips and disconnect connectors at 4 places.



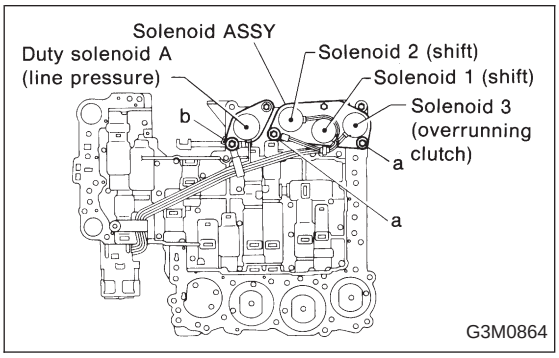
(5) Remove oil strainer.
Disconnect oil pipe by removing the two bolts, and remove four bolts and oil strainer.

NOTE:
Be careful because oil flows from oil strainer.



(6) Remove control valve body and two brackets.
Remove 6 long bolts (Black) and 11 short bolts (Yellow).

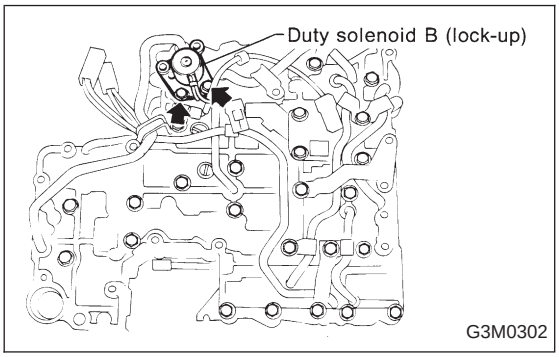
NOTE:
- Be careful because oil flows from valve body.
- Be careful not to damage accumulator spring at rear of control valve.



(7) Remove shift solenoids 1, 2, and 3, and duty solenoid A.

a length: 16 mm (0.63 in)
b length: 27 mm (1.06 in)

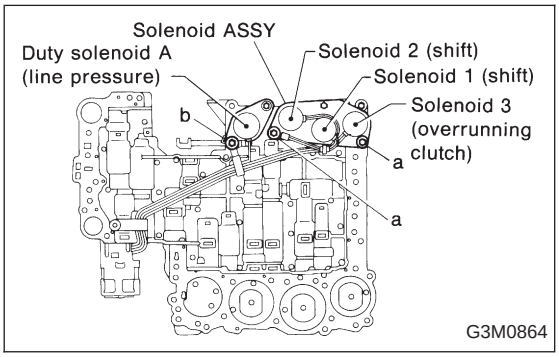
(8) Remove duty solenoid B (lock-up).



2) Installation

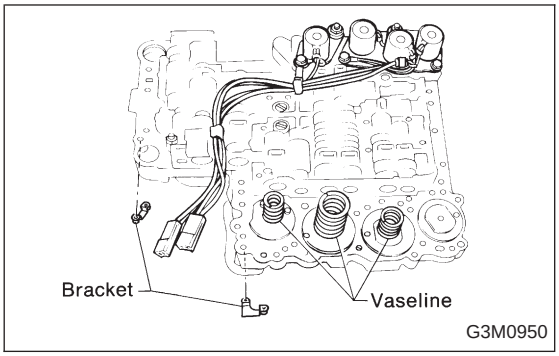
(1) Install duty solenoid B (lock-up).

Tightening torque:
11.3±1.5 N·m (1.15±0.15 kg-m, 8.3±1.1 ft-lb)



(2) Install solenoid valves.
Shift solenoids, 1, 2 and 3, and duty solenoid A (line pressure).

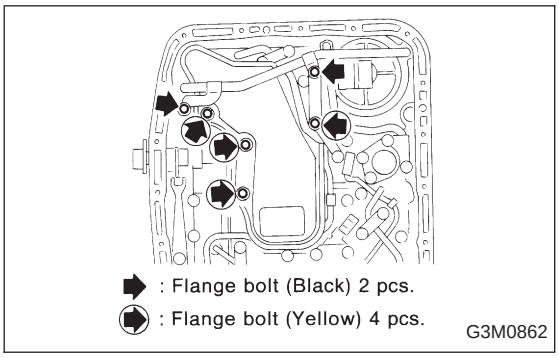
Tightening torque:
8.3±1.5 N·m (0.85±0.15 kg-m, 6.1±1.1 ft-lb)



(3) Install valve body and two brackets.

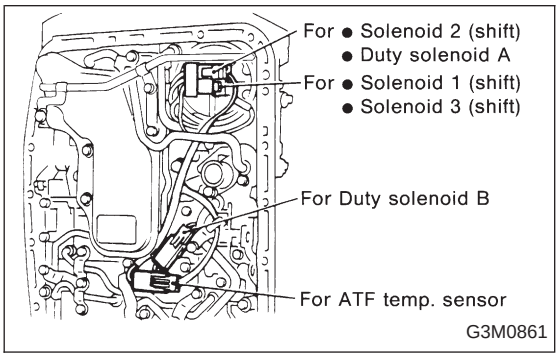
Tightening torque:
8±1 N·m (0.8±0.1 kg-m, 5.8±0.7 ft-lb)

NOTE:
- Secure accumulator springs using vaseline.
- Align manual valve connections.

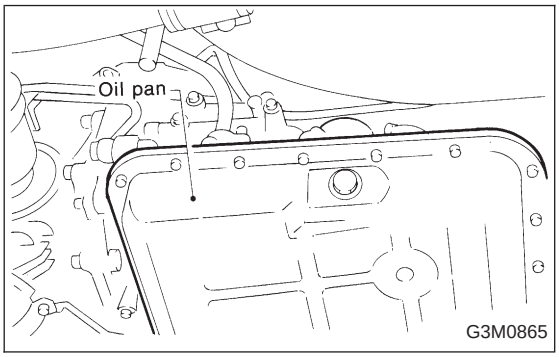


(4) Install oil strainer.
Also install oil pipe and harness connector bracket.

Tightening torque:
8±1 N·m (0.8±0.1 kg-m, 5.8±0.7 ft-lb)

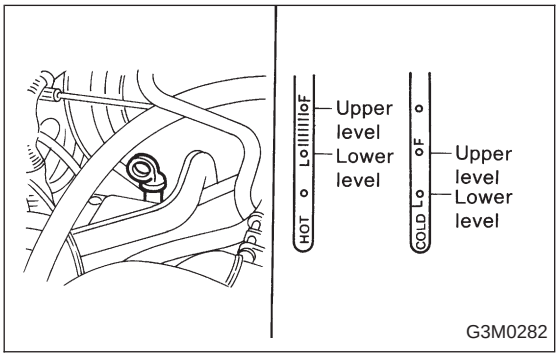


(5) Connect harness connectors at 4 places.
Connect connectors of same color, and secure connectors to valve body using clips.

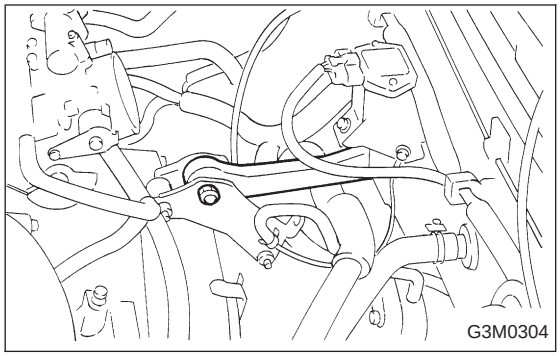


(6) Install oil pan and gasket.

Tightening torque:
4.9±0.5 N·m (0.50±0.05 kg-m, 3.6±0.4 ft-lb)



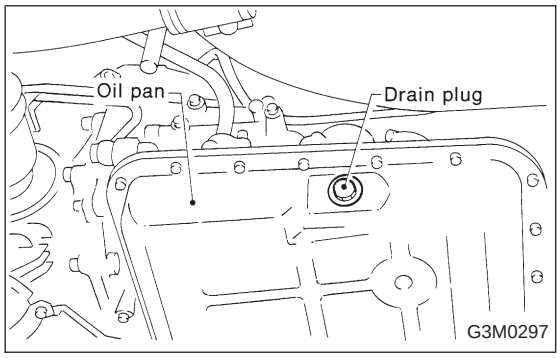
(7) Add and check ATF.


G3M0304

2. DUTY SOLENOID C AND TRANSFER VALVE BODY

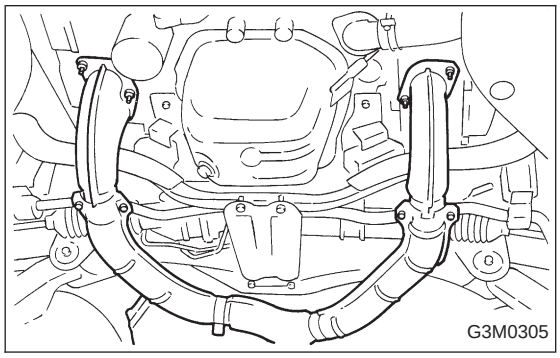
1) Removal

(1) Remove pitching stopper.

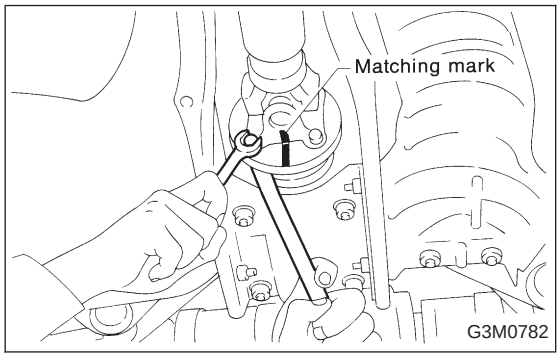


G3M0297

(2) Raise car and drain ATF.


G3M0305

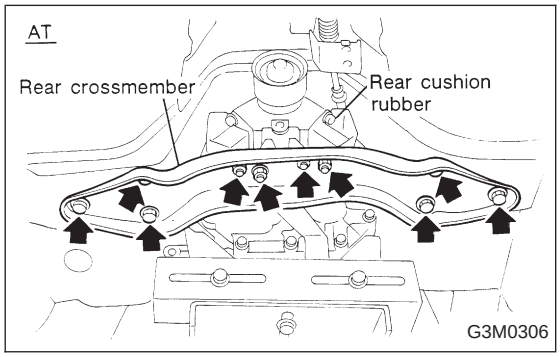
(3) Remove front exhaust pipe.
Disconnect oxygen sensor connector, and remove exhaust pipe.



G3M0782

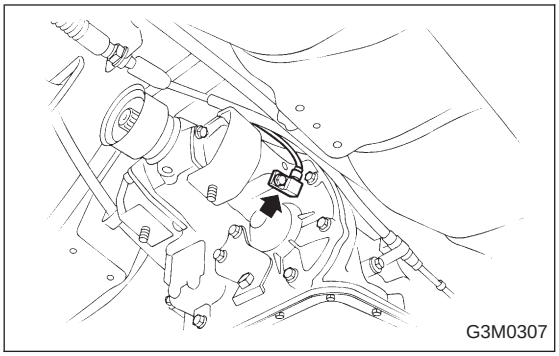
(4) Remove propeller shaft.

NOTE:
Before removing propeller shaft, scribe matching marks on propeller shaft and rear differential coupling.

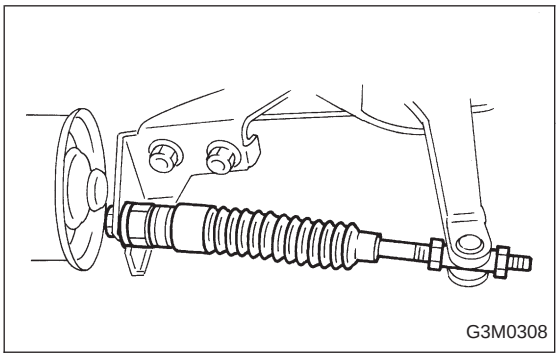


G3M0306

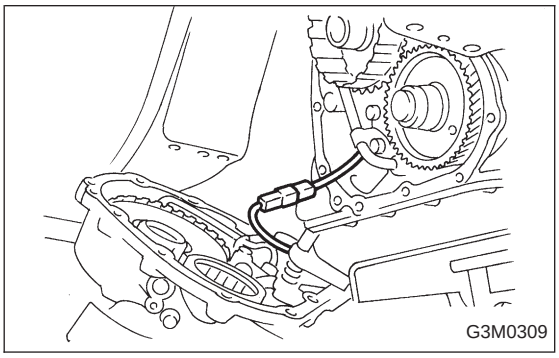
(5) Remove rear crossmember.
- Support transmission using a transmission jack and raise slightly.
- Remove bolts and nuts as shown in Figure.


G3M0307

(6) Remove vehicle speed sensor 1.


G3M0308

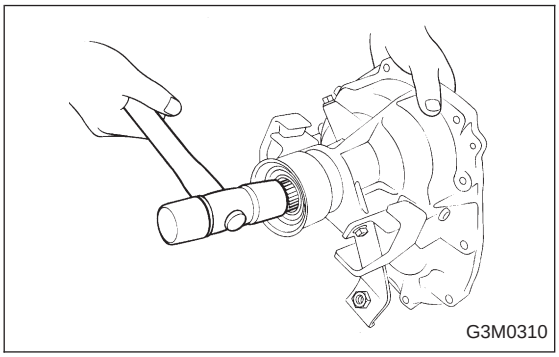
(7) Remove extension and gasket.
- Remove gear select cable nut.
- Move gear select cable so that extension bolts can be removed.


G3M0309

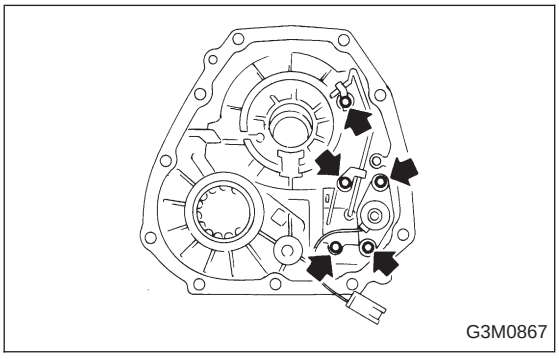
- Remove bolts.
- Remove extension and disconnect duty solenoid C connector.

CAUTION:
Do not force extension back before disconnecting solenoid connector. Otherwise, harness may be damaged.

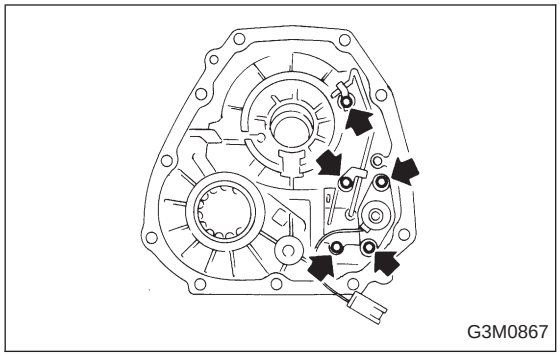
NOTE:
Use a container to catch oil flowing from extension.


G3M0310

(8) Remove duty solenoid C and transfer valve body from extension.
- Remove transfer clutch drum.


G3M0867

- Remove clamp which secures pipe.
- Remove bolts.

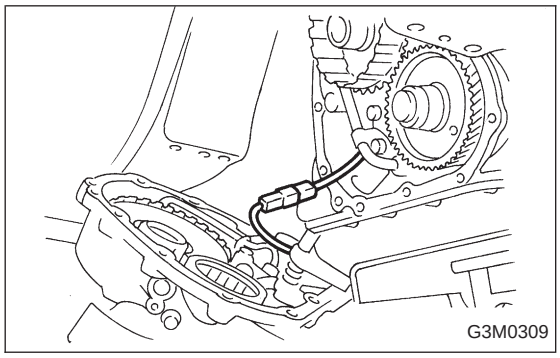

G3M0867

2) Installation

(1) Install duty solenoid C and transfer valve body.
- Install duty solenoid C and transfer valve body.
- Install pipe and clamp.

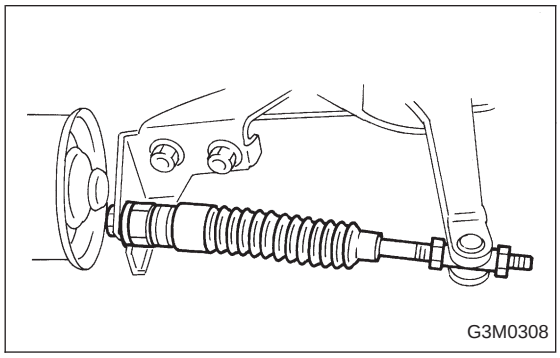
Tightening torque:
8±1 N·m (0.8±0.1 kg-m, 5.8±0.7 ft-lb)

- Install clutch drum.


G3M0309

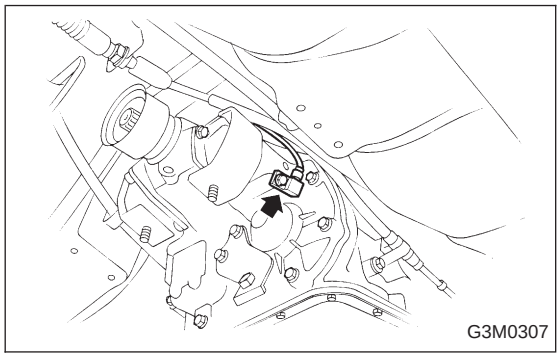
(2) Install extension.
- Connect connector.
- Tighten 11 bolts.

Tightening torque:
25±1 N·m (2.5±0.1 kg-m, 18.1±0.7 ft-lb)


G3M0308

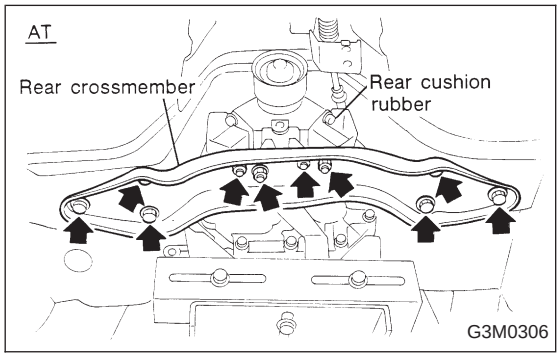
- Install gear select cable.

Tightening torque:
14±4 N·m (1.4±0.4 kg-m, 10.1±2.9 ft-lb)


G3M0307

(3) Install vehicle speed sensor 1.

Tightening torque:
7±1 N·m (0.7±0.1 kg-m, 5.1±0.7 ft-lb)

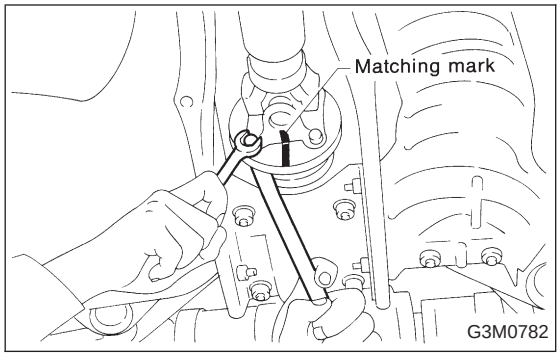


G3M0306

(4) Install rear crossmember.
- Tighten bolts.

Tightening torque:
Crossmember to body
68±15 N·m (7.0±1.5 kg-m, 50.6±10.8 ft-lb)
Crossmember to cushion
18±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)

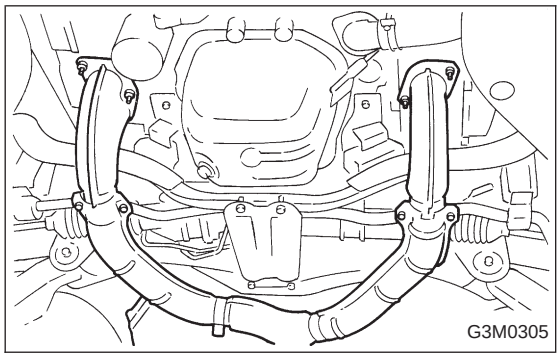
- Lower and remove transmission jack.



(5) Install propeller shaft.

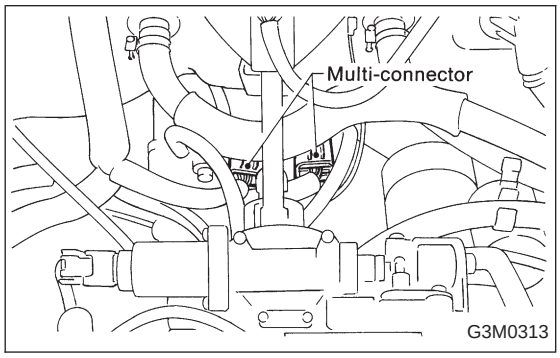
Tightening torque:
At rear differential
23±5 N·m (2.3±0.5 kg-m, 16.6±3.6 ft-lb)
At center bearing
39±5 N·m (4.0±0.5 kg-m, 28.9±3.6 ft-lb)

NOTE:
Align matching marks on propeller shaft and rear differential coupling.

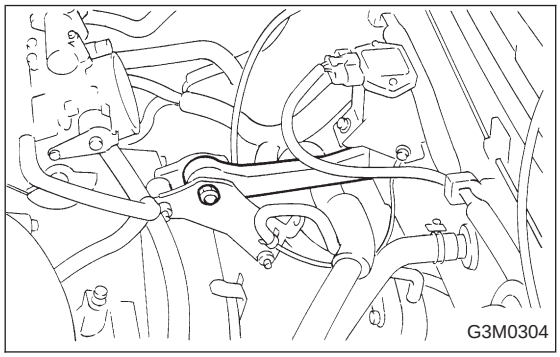


(6) Install front exhaust pipe

Tightening torque:
At engine
29±5 N·m (3.0±0.5 kg-m, 21.7±3.6 ft-lb)
At hanger
29±5 N·m (3.0±0.5 kg-m, 21.7±3.6 ft-lb)
At front and rear connections
18±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)

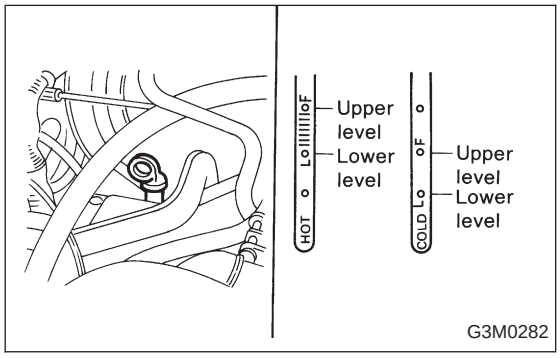


(7) Lower and remove jack.
(8) Connect the following parts:
- Oxygen sensor connector
- Multi-connector



(9) Install pitching stopper.

Tightening torque:
Body side
57±10 N·m (5.8±1.0 kg-m, 42.0±7.2 ft-lb)
Engine side
49±5 N·m (5.0±0.5 kg-m, 36.2±3.6 ft-lb)



(10) Replenish ATF and check oil level. Check for leaks.

3. Performance Test

A: STALL TEST

1. GENERAL

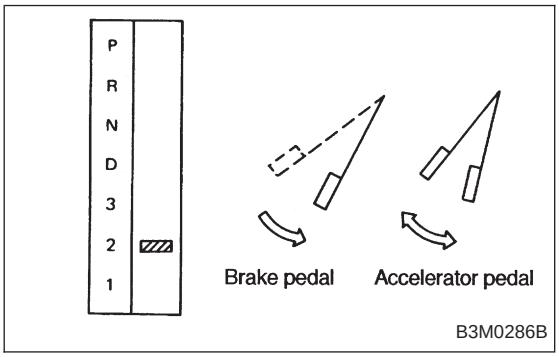
The stall test is of extreme importance in diagnosing the condition of the automatic transmission and the engine. It should be conducted to measure the engine stall speeds in all shift ranges except the P and N ranges.

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

Preparations before test:
① Check that throttle valve opens fully.
② Check that engine oil level is correct.
③ Check that coolant level is correct.
④ Check that ATF level is correct.
⑤ Check that differential gear oil level is correct.
⑥ Increase ATF temperature to 60 to 80°C (140 to 176°F) by idling the engine for approximately 30 minutes (with select lever set to “N” or “P”).

1) Install an engine tachometer at a location visible from the driver’s compartment and mark the stall speed range on the tachometer scale.
2) Place the wheel chocks at the front and rear of all wheels and engage the parking brake.
3) Move the manual linkage to ensure it operates properly, and shift the select lever to the 2 range.



4) While forcibly depressing the foot brake pedal, gradually depress the accelerator pedal until the engine operates at full throttle.

5) When the engine speed is stabilized, read that speed quickly and release the accelerator pedal.
6) Shift the select lever to Neutral, and cool down the engine by idling it for more than one minute.
7) Record the stall speed.
8) If stall speed in 2 range is higher than specifications, forward clutch slipping on brake band slipping may occur. To identify it, conduct the same test as above in D range.
9) Perform the stall tests with the select lever in the R range.

CAUTION:
● 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 band 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.

Specifications

Stall speed (at sea level):
2200 cc 2,300 — 2,700 rpm
1800 cc 2,200 — 2,600 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	● Forward clutch slipping ● One-way clutch (1-2) malfunctioning
	R	● Line pressure too low ● Reverse clutch slipping ● Low & reverse brake slipping
	2	● Line pressure too low ● Forward clutch slipping ● Brake band slipping ● One-way clutch (3-4) malfunctioning

B: TIME LAG TEST

1. GENERAL

If the shift lever is shifted while the engine is idling, there will be a certain time elapse or lag before the shock can be felt. This is used for checking the condition of the forward clutch, reverse clutch, low & reverse brake, forward one-way clutch and low one-way clutch.

CAUTION:
● Perform the test at normal operation fluid temperature (60 to 80°C or 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.
Check idling speed (A/C OFF).
"N" range: 700±100 rpm
3) Shift the shift lever from "N" to "D" range.
Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.
Time lag: Less than 1.2 seconds
4) In same manner, measure the time lag for "N" → "R".
Time lag: Less than 1.5 seconds

3. EVALUATION

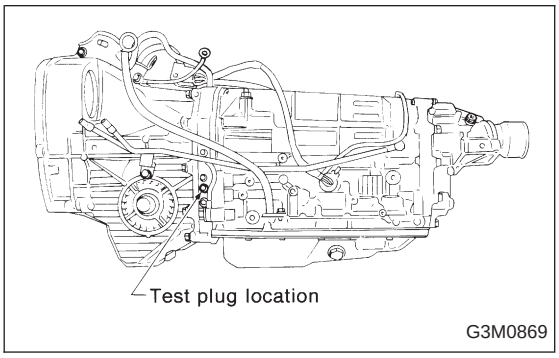
1) If "N" → "D" time lag is longer than specified:
● Line pressure too low
● Forward clutch worn
● Low one-way clutch not operating properly
● Forward one-way clutch not operating properly
2) If "N" → "R" time lag is longer than specified:
● Line pressure too low
● Reverse clutch worn
● Low & reverse brake worn

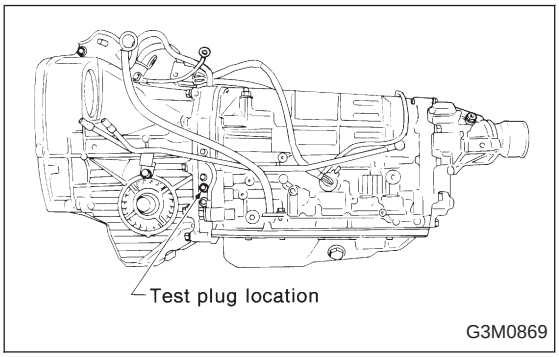
C: LINE PRESSURE TEST

1. GENERAL

If the clutch or the brake band 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 band or control valve.





1) Line pressure measurement (under no load)

CAUTION:

- **Before measuring line pressure, jack-up front wheels (front-wheel-drive model) or all wheels (4-wheel drive model).**
- **Maintain temperature of ATF at approximately 50°C (122°F) during measurement.**

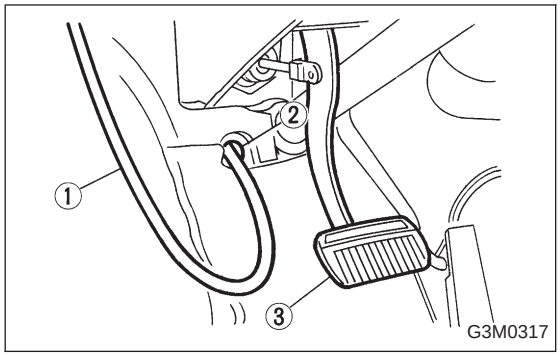
(ATF will reach the above temperature after idling the engine for approximately 30 minutes with select lever in "N" or "P".)

- **A/C switch to OFF**

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 line pressure when select lever is in "R", "2" with engine under stall conditions.**
- **Measure line pressure within 5 seconds after shifting the select lever to each position. (If line pressure needs to be measured again, allow the engine to idle 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".)**
- **A/C switch to OFF**

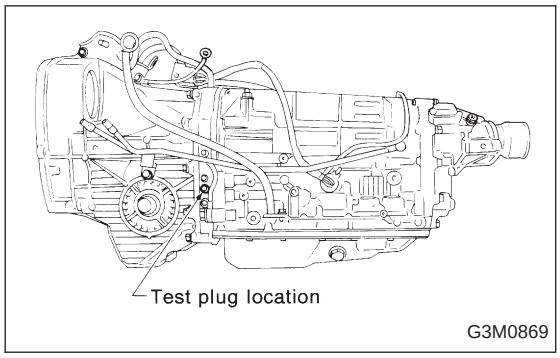


2. TEST METHODS

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.

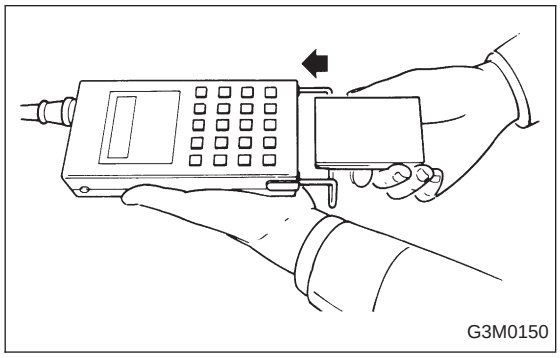
ST 498575400 OIL PRESSURE GAUGE ASSY

① Pressure gauge hose
② Hole in toe board (blank cap hole)
③ Brake pedal



2) Remove the test plug and install ST1 instead.
3) Connect ST1 with ST2.

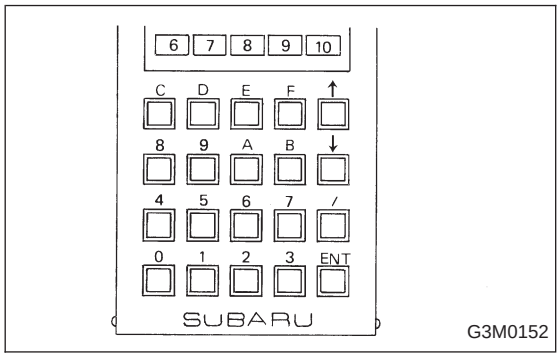
ST1 498897200 OIL PRESSURE GAUGE ADAPTER
ST2 498575400 OIL PRESSURE GAUGE ASSY



4) Connect select monitor to data link connector located under instrument panel (on driver's side).

Application cartridge : No. 498349300

5) Start the engine and warm it up.



6) Select monitor switch ON.
7) Designate mode using function key.
Press [F] [11] [ENT] in that order.

8) Check for duty ratio changes by opening and closing throttle valve.

9) Check line pressure in accordance with the following chart.

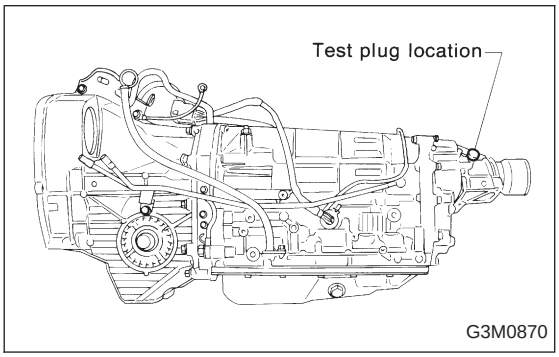
3. EVALUATION

NOTE:
- Under no load: “D”
- Under full load: “R”, “2”

(With engine running at stall speed)

<Standard line pressure> Unit: kPa (kg/cm^2, psi)

Line pressure				
Duty ratio (%)	“2” range	“R” range	“D” range	
			1800 cc	2200 cc
5	1,167 — 1,363 (11.9 — 13.9, 169 — 198)	1,432 — 1,569 (14.6 — 16.0, 208 — 228)	—	
22	—	—	765 — 902 (7.8 — 9.2, 111 — 131)	
100	—	—	235 — 481 (2.4 — 4.9, 34 — 70)	392 — 490 (4.0 — 5.0, 57 — 71)



D: TRANSFER CLUTCH PRESSURE TEST

Check transfer clutch pressure in accordance with the following chart in the same manner as with line pressure. <Ref. to 3-2 [W3C2].>

ST 499897700 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 spare fuse on FWD mode switch.

Unit: kPa (kg/cm^2, psi)

Duty ratio (%)	AWD mode	FWD mode
5	686 — 785 (7.0 — 8.0, 100 — 114)	686 — 785 (7.0 — 8.0, 100 — 114)
40	157 — 206 (1.6 — 2.1, 23 — 30)	—
95	0 (0, 0)	—

If oil pressure is not produced or if it does not change in the AWD mode, the duty solenoid C or transfer valve assembly may be malfunctioning. If oil pressure is produced in the FWD mode, the problem is similar to that in the AWD mode.

E: ROAD TEST

1. GENERAL

Road tests should be conducted to properly diagnose the condition of the automatic transmission.

CAUTION:
When performing test, do not exceed posted speed limit.

2. CHECKING FOR SHIFT PATTERNS

Check “kick-down”.

D range: 1st ⇐ 2nd ⇐ 3rd ⇐ 4th
3 range: 1st ⇐ 2nd ⇐ 3rd ← 4th
2 range: 2nd ← 3rd ← 4th
1 range: 1st ← 2nd ← 3rd ← 4th

3. CHECK FOR ENGINE BRAKE OPERATION

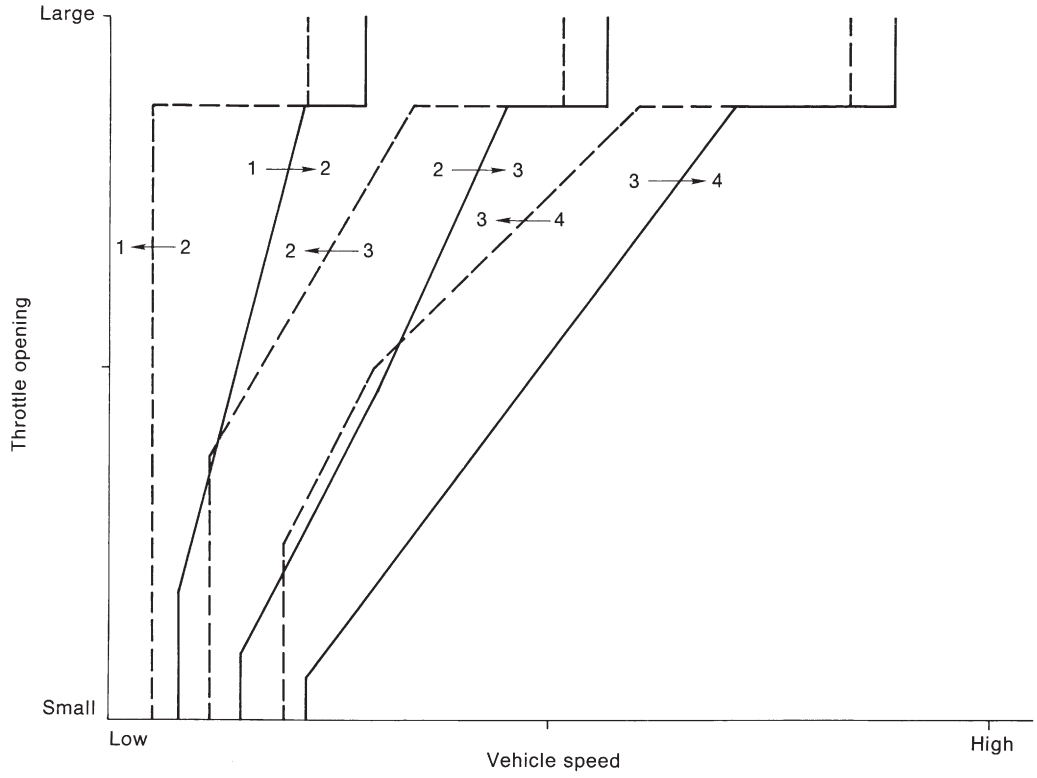
Engine brake operation:
D range → 4th gear
3 range → 3th gear
2 range → 2th gear
1 range → 1th gear

4. CHECK FOR THE AWD FUNCTION

If “tight-corner braking” occurs when the steering wheel is fully turned at low speed:
1) Determine the applicable trouble code and check the corresponding duty solenoid C (transfer) for improper operation.
2) If the solenoid is operating properly, check transfer clutch pressure.
3) If oil pressure is normal but “tight-corner braking” occurs:
Check the transfer control valve for sticking, and the transfer clutch facing for wear.
<Ref. to 3-2 [W15A0].>

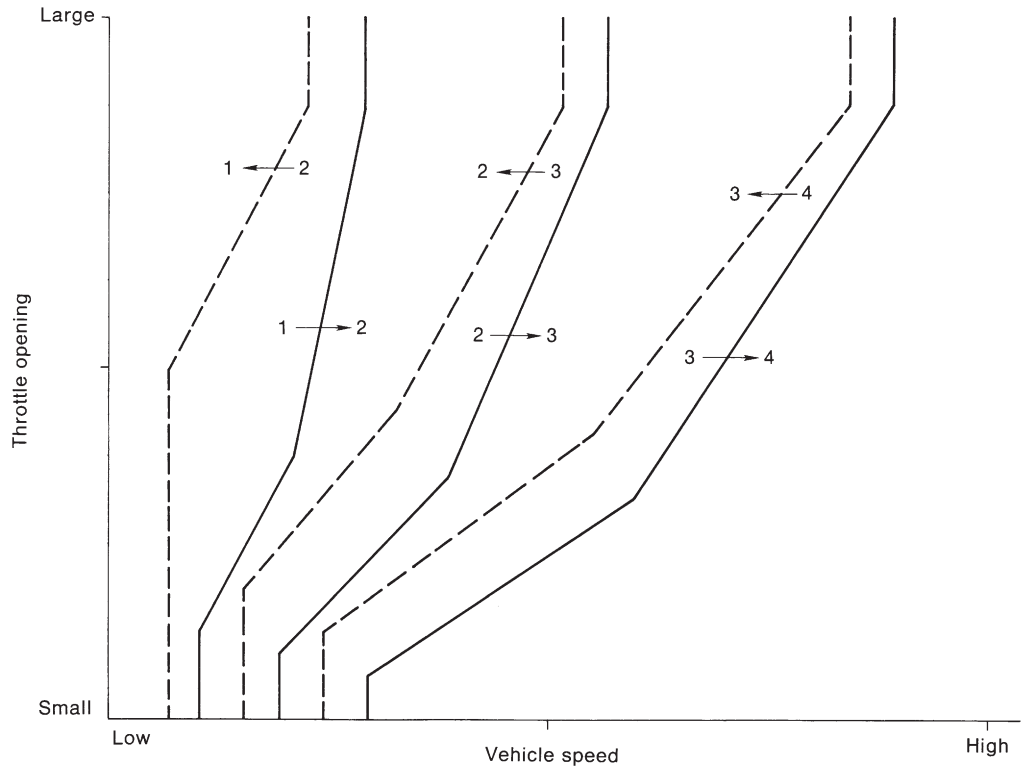
5. AUTOMATIC SHIFT CHARACTERISTICS

FWD model "D" range (Normal pattern)



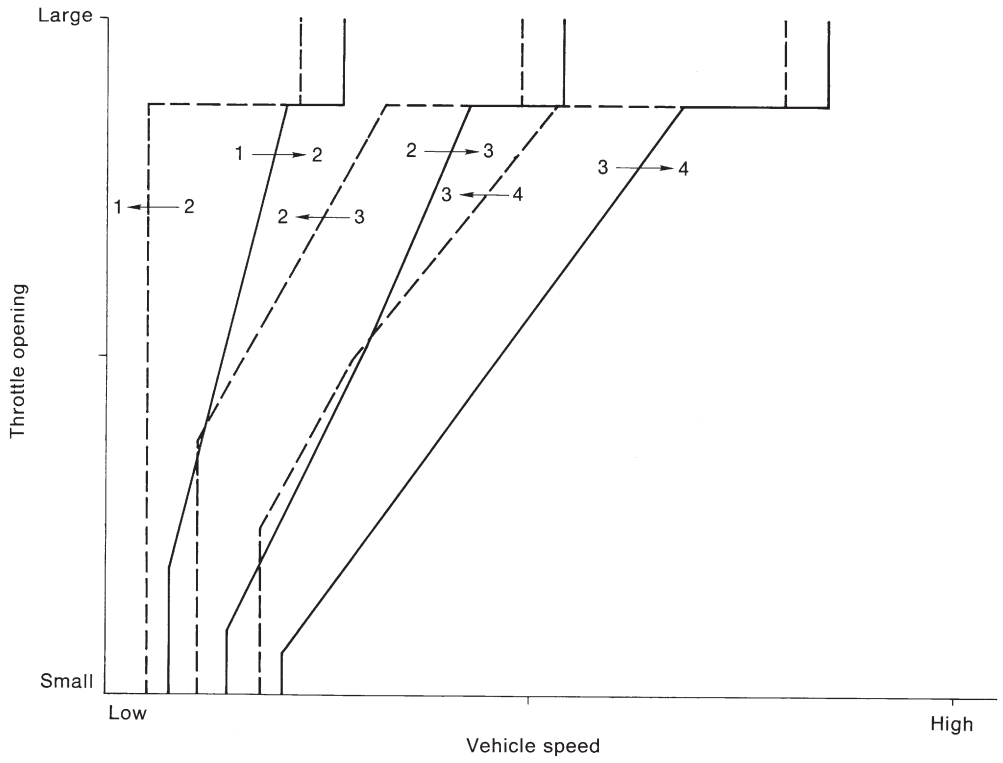
G3M0319

FWD model "D" range (Power pattern)



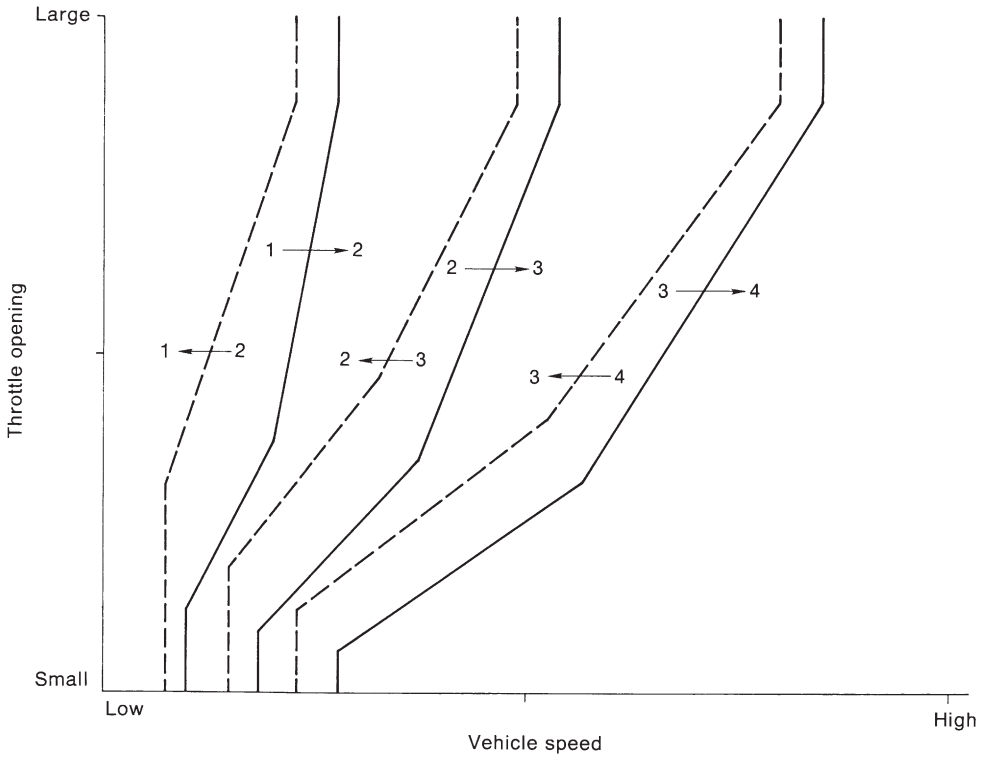
G3M0320

AWD model "D" range (Normal pattern)



G3M0321

AWD model "D" range (Power pattern)

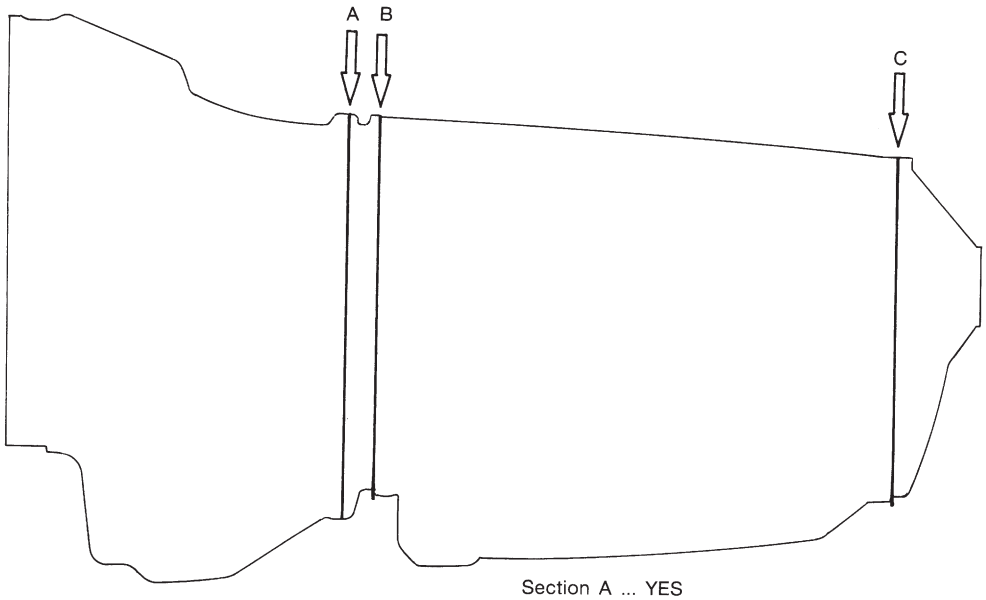


G3M0322

4. Overall Transmission

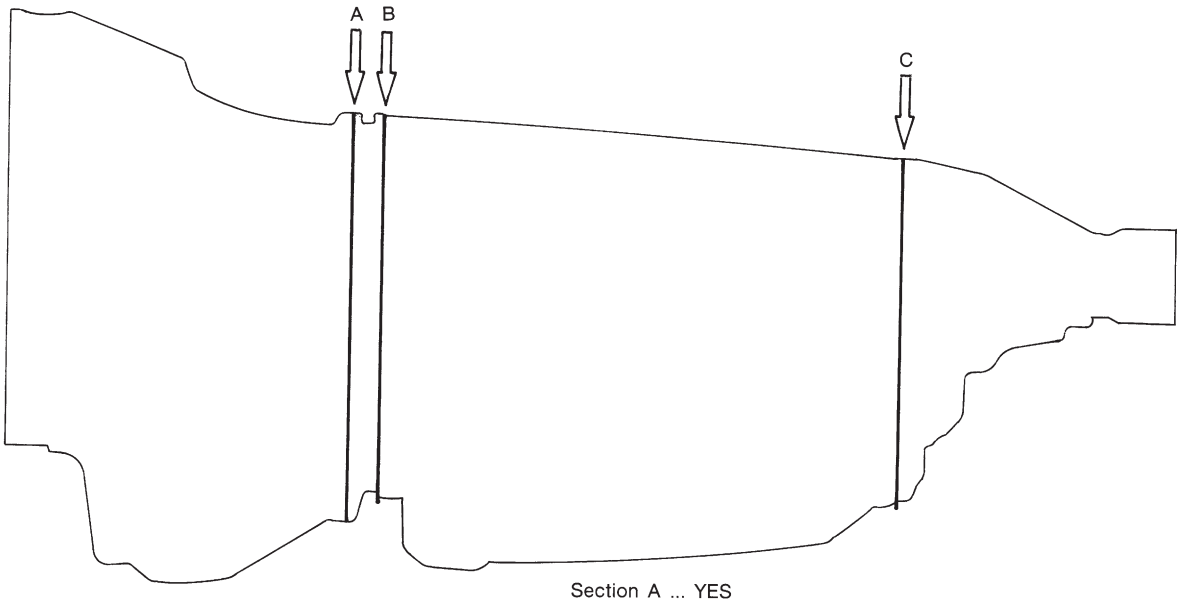
1. SECTIONS THAT CAN BE DETACHED/ASSEMBLED

FWD



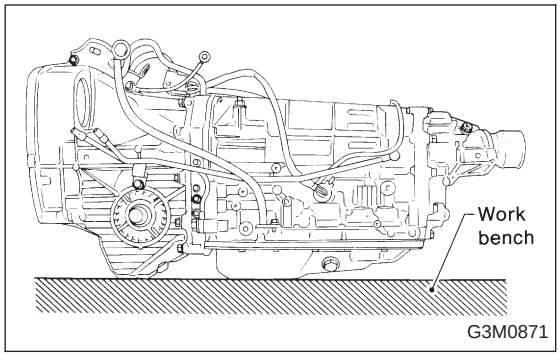
Section A ... YES
Section B ... YES
Section C ... YES

AWD



Section A ... YES
Section B ... YES
Section C ... YES

G3M0323

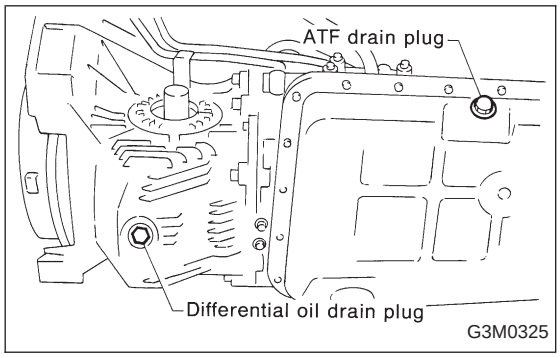


A: DISASSEMBLY

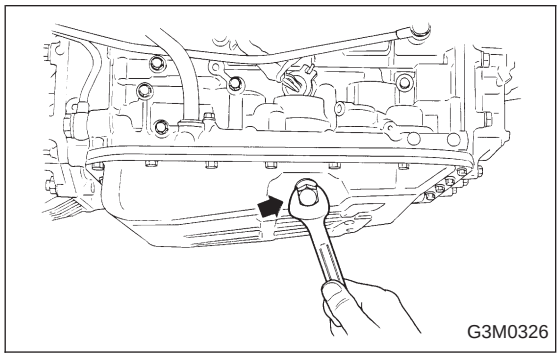
1. EXTERNAL PARTS

1) Place the transmission unit on a work bench, with the oil pan facing down.

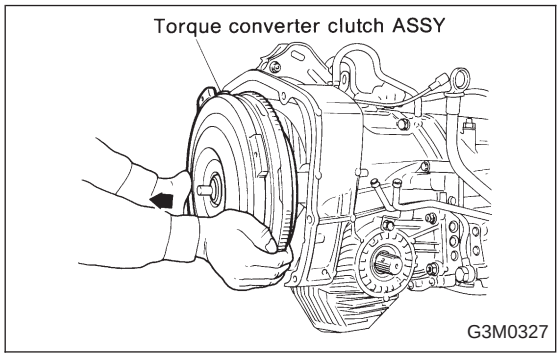
CAUTION:
Be careful not to bend or damage external parts.



2) Remove the drain plug, and drain differential oil. Tighten the plug temporarily after draining.

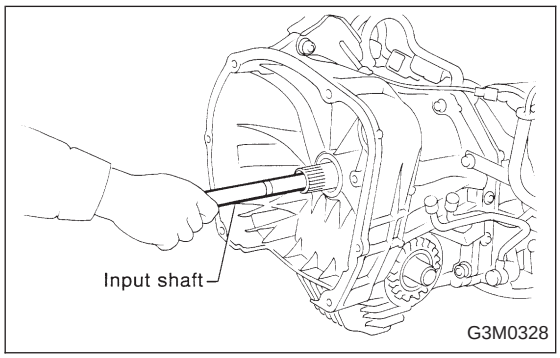


3) Remove the drain plug, and drain automatic transmission fluid (ATF). Tighten the plug temporarily after draining.

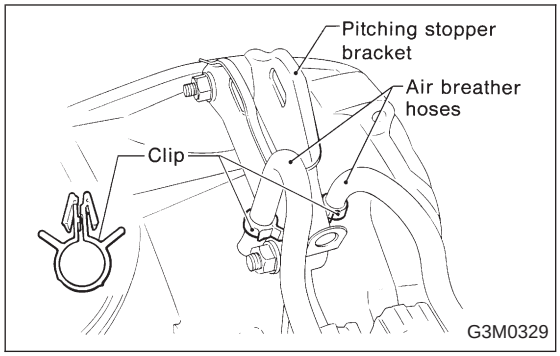


4) Extract the torque converter clutch assembly.

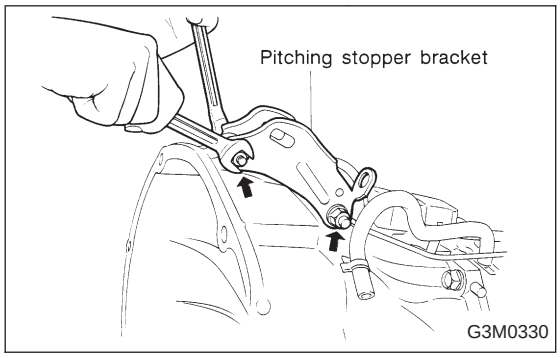
NOTE:
- Extract the torque converter clutch horizontally. Be careful not to scratch the bushing inside the oil pump shaft.
- Note that oil pump shaft also comes out.



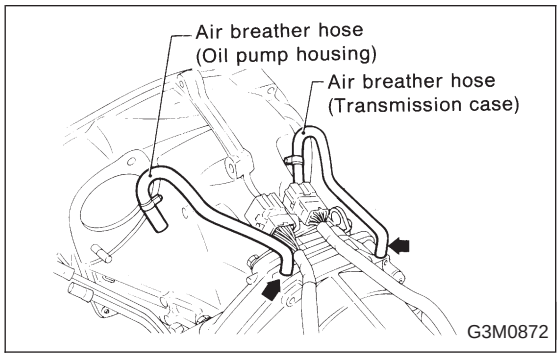
5) Remove the input shaft.



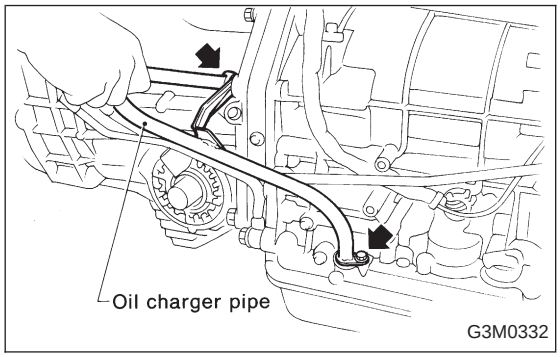
6) Disconnect the air breather hose from the pitching stopper bracket.



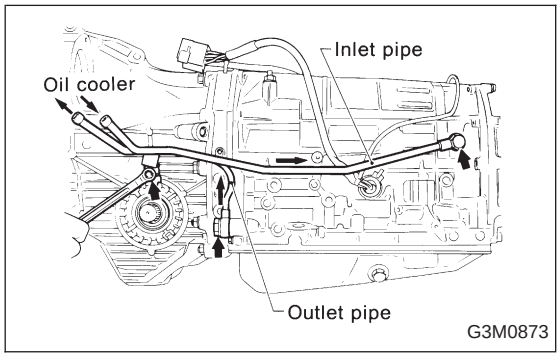
7) Remove the pitching stopper bracket.



8) Disconnect the air breather hose.

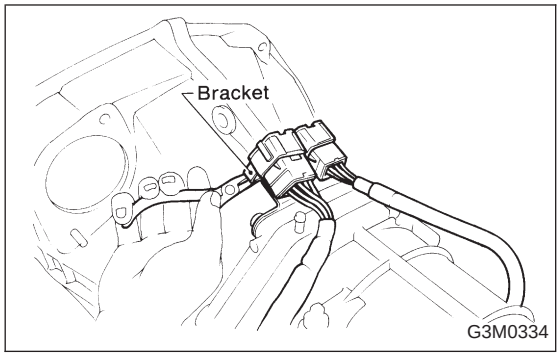


9) Remove the oil charger pipe, and remove the O-ring from the flange face. Attach the O-ring to the pipe.

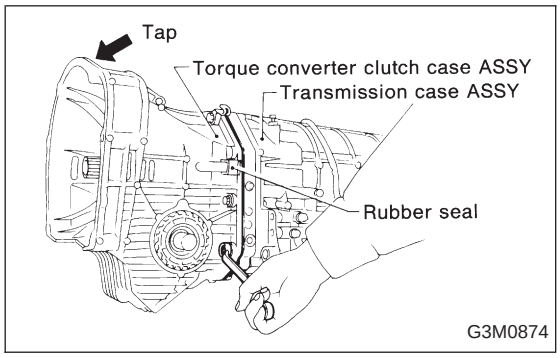


10) Remove the oil cooler inlet and outlet pipes.

CAUTION:
When removing outlet pipes, be careful not to lose balls and springs used with retaining screws.



11) Remove harnesses from bracket.

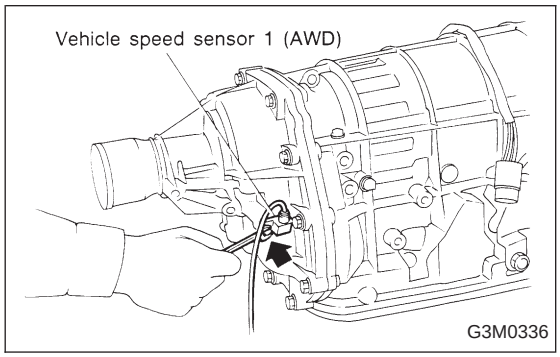


2. SEPARATION OF EACH SECTION

1) Separation of torque converter clutch case and transmission case sections

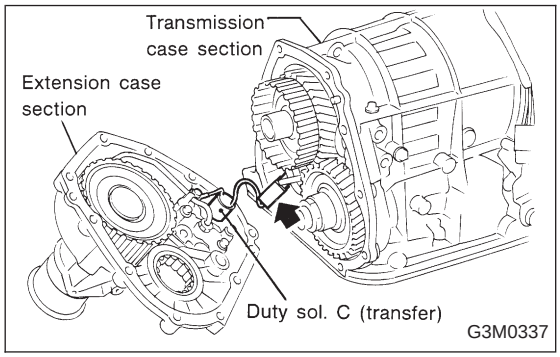
CAUTION:
- **Be careful not to damage the oil seal and bushing inside the torque converter clutch case by the oil pump cover.**
- **Be careful not to lose the rubber seal.**

NOTE:
Separate these cases while tapping lightly on the housing.



2) Separation of transmission case and extension sections (AWD)

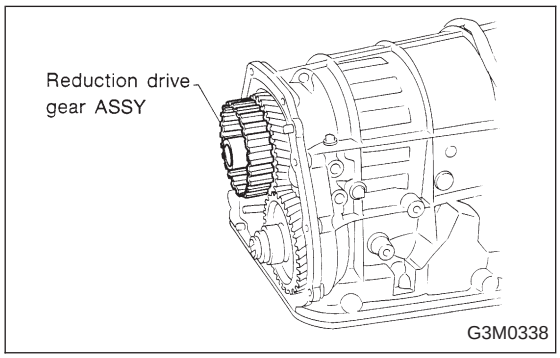
(1) Remove vehicle speed sensor 1.



(2) While pulling the extension slightly, disconnect the connector for the duty solenoid C (transfer).

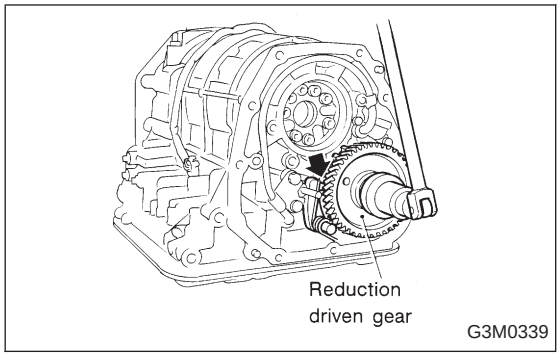
CAUTION:
Be careful not to cut the harness.

3) Separate both sections.

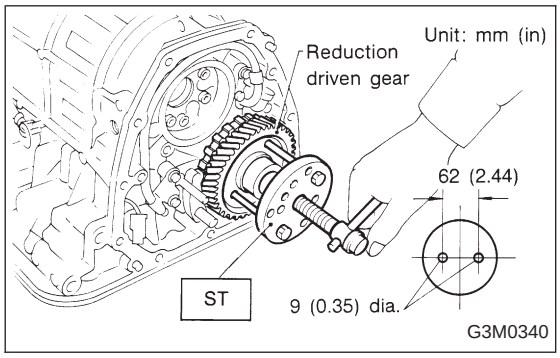


3. TRANSMISSION CASE SECTION

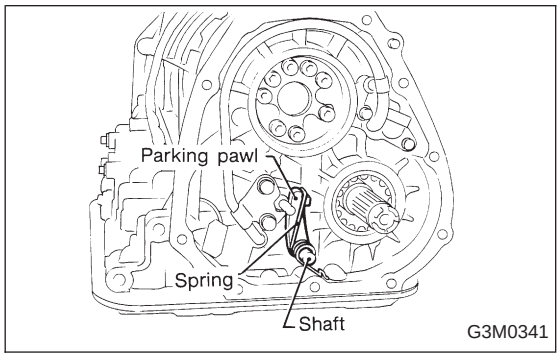
1) Remove the reduction drive gear assembly.



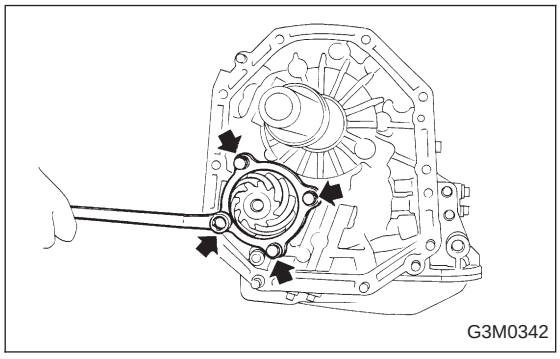
2) Remove the reduction driven gear:
● Straighten the staked portion, and remove the lock nut.
NOTE:
Set the range selector lever to “P”.



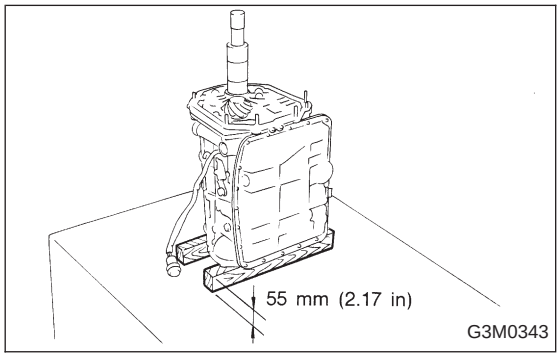
● Using the ST, extract the reduction driven gear.
ST 899524100 PULLER SET
NOTE:
Drill two holes in the puller.



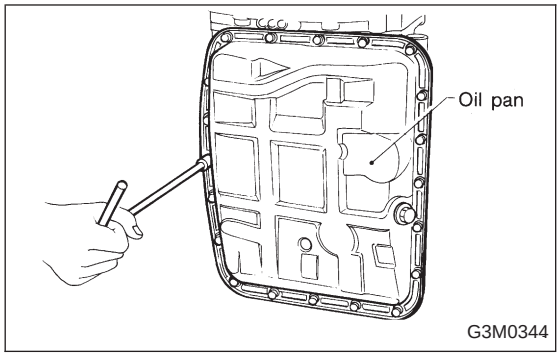
3) Remove the parking pawl, return spring and shaft.



4) Loosen the taper roller bearing mounting bolts.

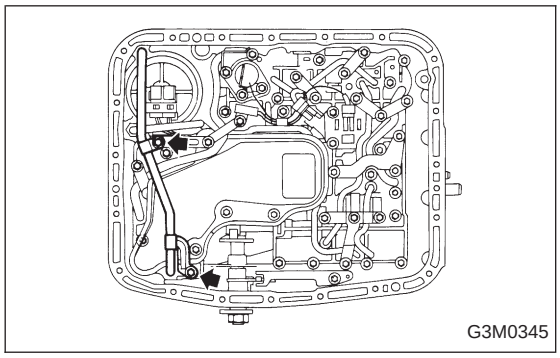


5) Place two wooden blocks on the workbench, and stand the transmission case with its rear end facing down.
CAUTION:
● Be careful not to scratch the rear mating surface of the transmission case.
● Note that the parking rod and drive pinion protrude from the mating surface.



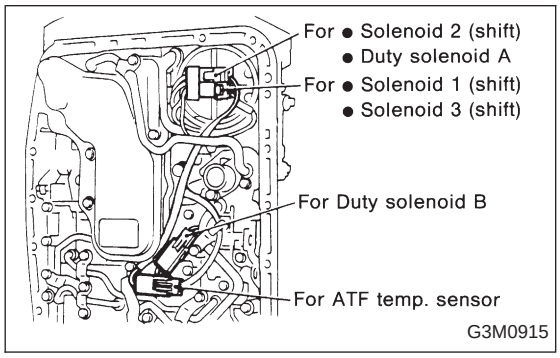
6) Remove the oil pan and gasket.

NOTE:
Tap the corners of the oil pan when removing.

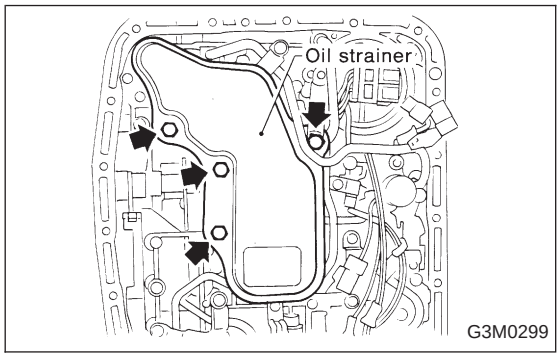


7) Remove the oil cooler outlet pipe.

CAUTION:
Be careful not to twist the pipe.

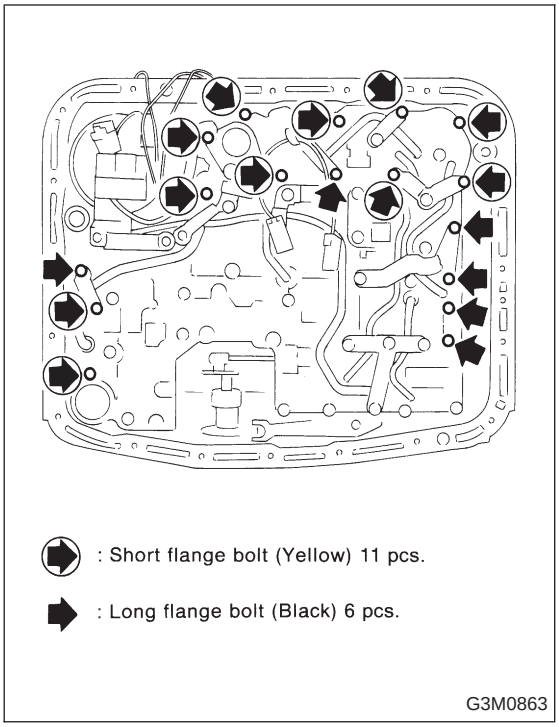


8) Disconnect the harness connectors for the solenoids and duty solenoids and the ground cord.

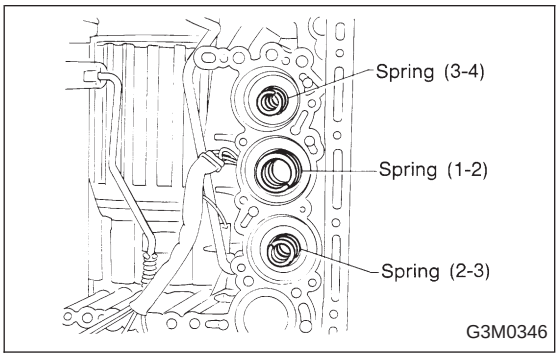


9) Remove the oil strainer.

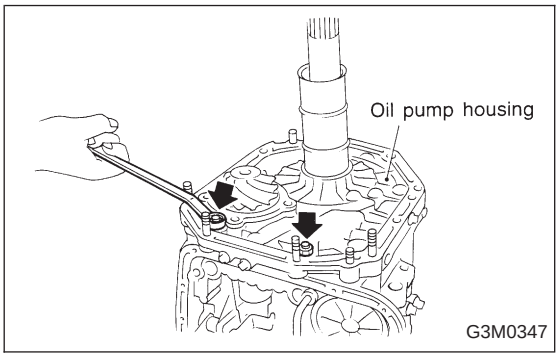
CAUTION:
Be careful not to damage O-ring on oil strainer.



10) Remove the control valve body and the two brackets.

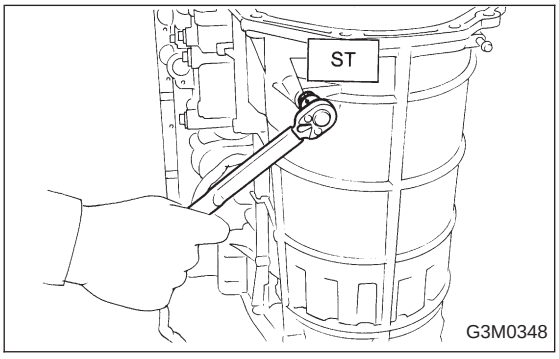


11) Remove three accumulator springs.



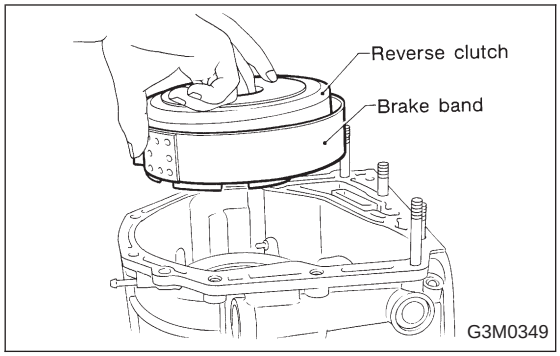
12) Loosen the reverse clutch drum lightly by turning the adjusting screw. Then remove the oil pump housing.

CAUTION:
Be careful not to lose the total end play adjusting thrust washer.



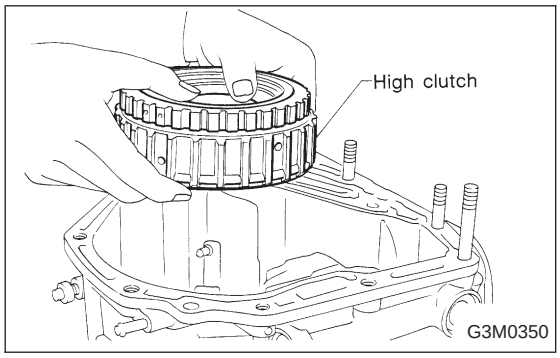
13) Loosen the brake band adjusting screw with ST, and take out the strut.

ST 398603610 SOCKET



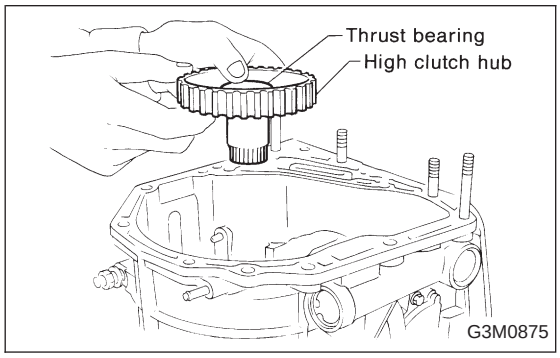
14) Remove the brake band and reverse clutch.

NOTE:
Contract the brake band with a clip.

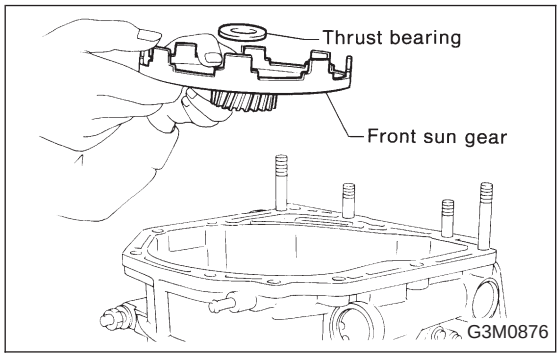


15) Take out the high clutch.

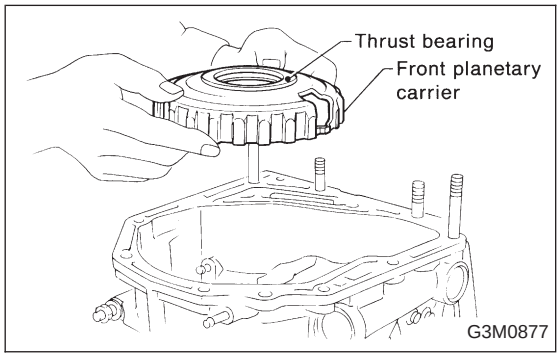
CAUTION:
Thrust needle bearing, bearing race are removed together with high clutch. Be careful not to lose it.



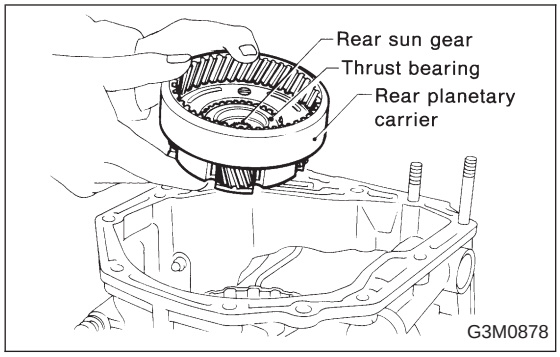
16) Take out the high clutch hub and thrust bearing.



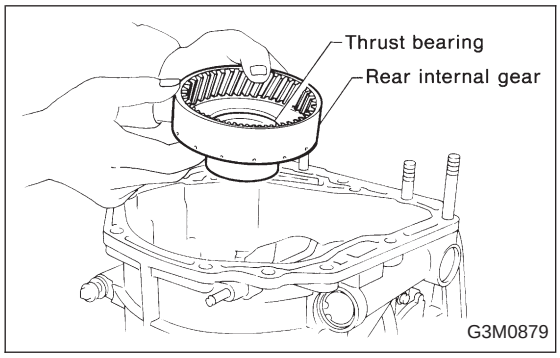
17) Take out the front sun gear and thrust bearing.



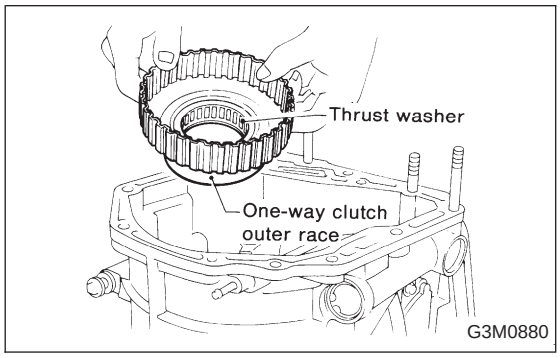
18) Take out the front planetary carrier and thrust bearing.



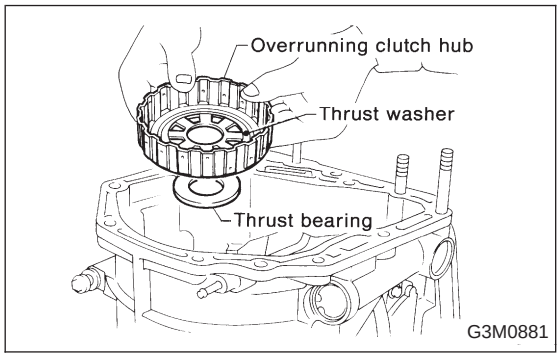
19) Take out the rear planetary carrier with rear sun gear and the thrust bearing.



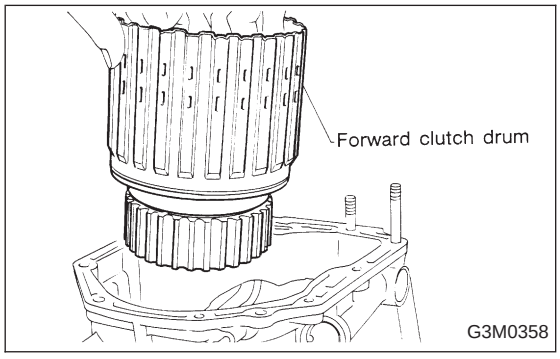
20) Take out the rear internal gear and the thrust bearing.



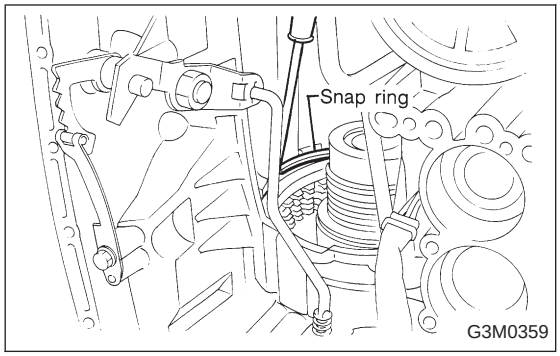
21) Take out the one-way clutch outer race and the thrust washer.



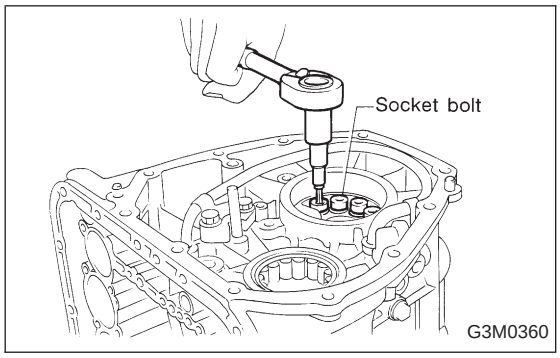
22) Take out the overrunning clutch hub, thrust washer and the thrust bearing.



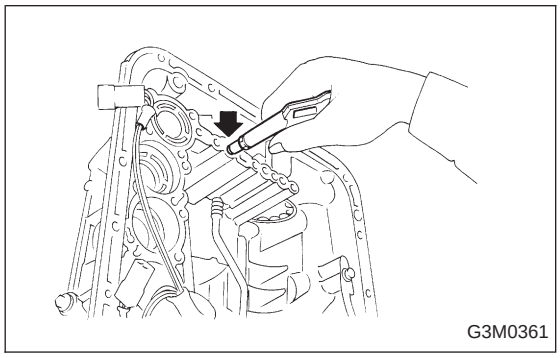
23) Take out the forward clutch drum.



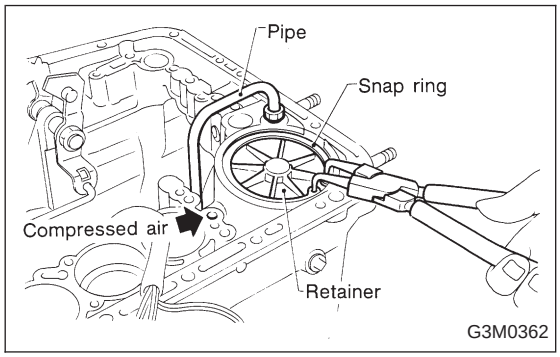
24) Take out the low & reverse brake section.
- Remove the snap ring. Then remove the retaining plate, drive plates, driven plates, and dish plates as a unit.



- Turning the case upside down, take out the one-way clutch inner race and spring retainer.

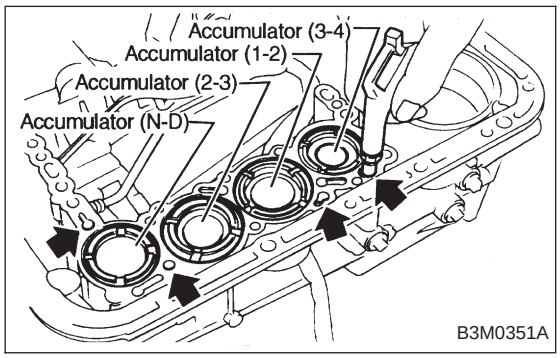


- Take out the low & reverse piston by applying compressed air.

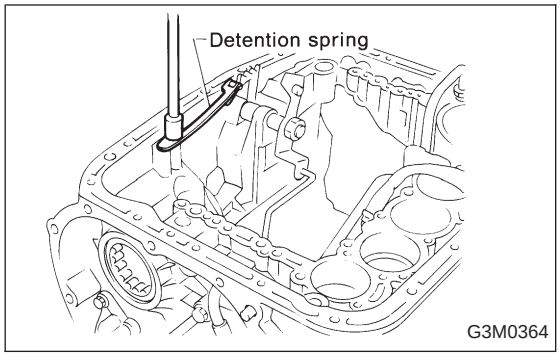


25) After removing the snap ring (inner), take out the servo piston by applying compressed air from the release pressure side.

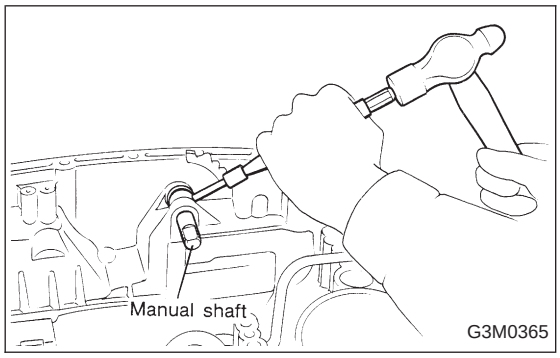
CAUTION:
Hold the servo piston with a rag so that it will not be ejected with the air pressure. In this case, do not allow your finger to be pinched between the pipe and retainer.



26) Apply compressed air from the operating pressure side, and take out accumulator (3-4), accumulator (1-2), accumulator (2-3), accumulator (N-D) and spring.

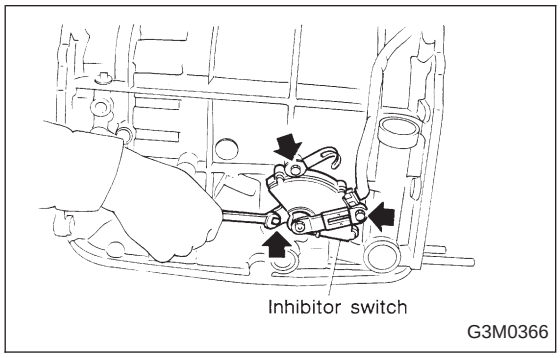


27) Remove the range select lever.
28) Remove the detention spring.

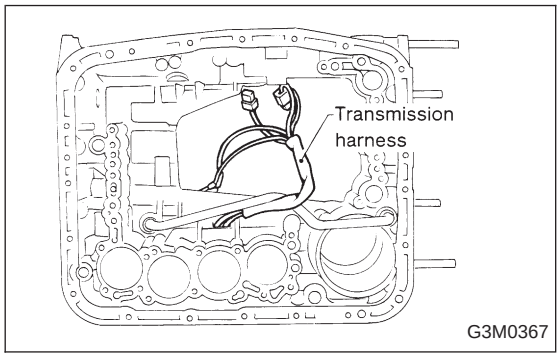


29) Remove the parking rod together with the manual lever. Then remove the manual shaft by pulling off the straight pin.

CAUTION:
Be careful not to damage the lips of the press-fitted oil seal in the case.

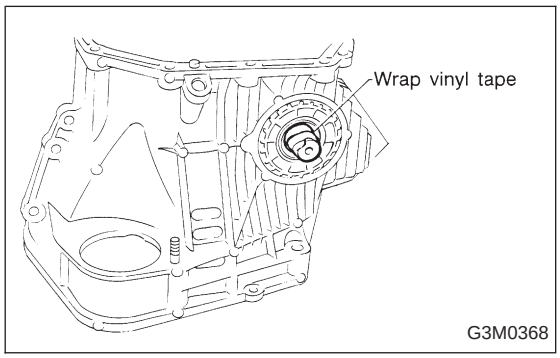


30) Remove the inhibitor switch.



31) Remove the transmission harness.

CAUTION:
Be careful not to damage the cord insulation.

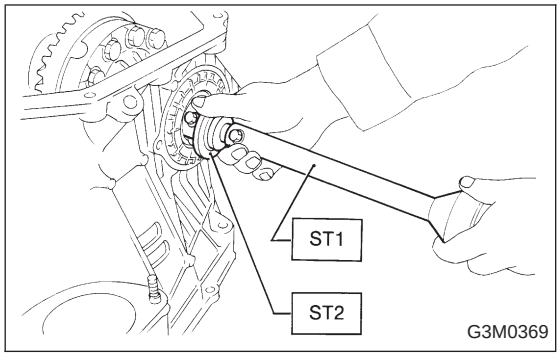


4. TORQUE CONVERTER CLUTCH CASE SECTION

1) Wrap the axle shaft serration with vinyl tape.
2) Remove the differential side retainer with ST.

ST 499787000 WRENCH ASSY

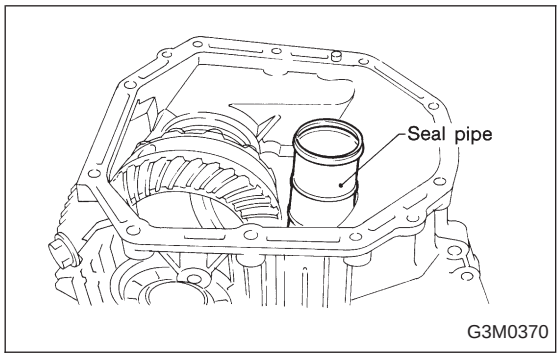
CAUTION:
Hold the differential case assembly by hand to avoid damaging retainer mounting hole of the torque converter clutch case and speedometer gears.



3) Extract the axle shaft with ST1 and ST2.

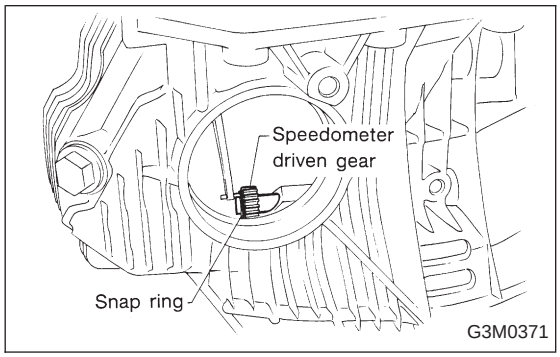
ST1 499095500 REMOVER
ST2 499247300 INSTALLER

CAUTION:
Do not reuse the circlip.

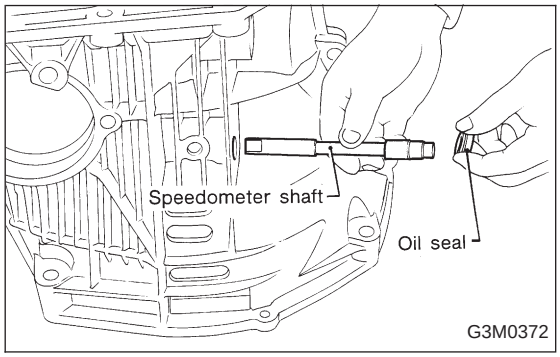


4) Remove the differential case assembly.

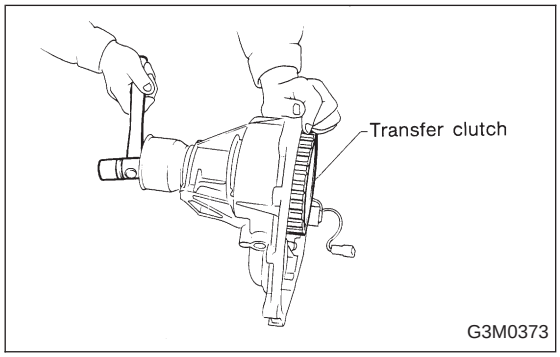
CAUTION:
● Remove the seal pipe if it is attached. (Reusing is not allowed.)
● Be careful not to damage the retainer mounting hole of the torque converter clutch case and the speedometer gears.



5) Remove the snap ring. Then remove the speedometer driven gear.



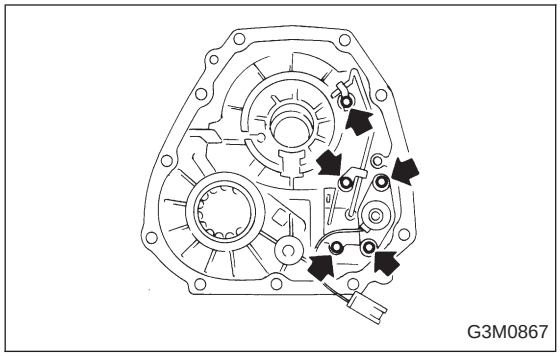
6) Tap out the speedometer shaft to the outside of the case, and remove the oil seal.



5. EXTENSION SECTION

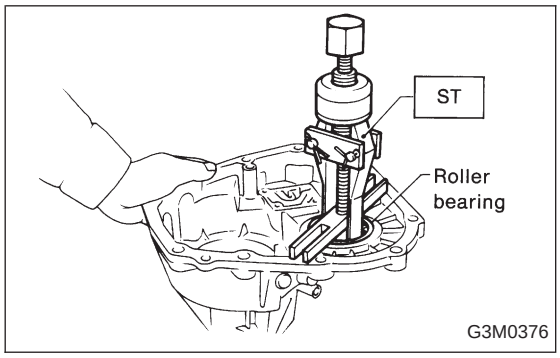
1) Take out the transfer clutch by lightly tapping the end of the rear drive shaft.

CAUTION:
Be careful not to damage the oil seal in the extension.


G3M0867

2) Remove duty solenoid C and the transfer valve body and the transfer pipe.

CAUTION:
- **Take out the inlet filter.**
- **Do not damage the O-ring.**
- **Be careful not to bend the pipe.**



G3M0376

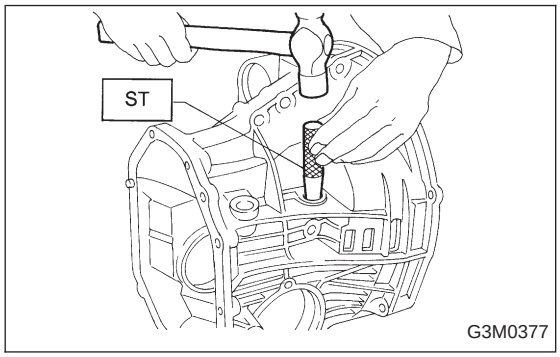
3) Take out the roller bearing with ST.
ST 398527700 PULLER

B: ASSEMBLY OF OVERALL TRANSMISSION

1. TORQUE CONVERTER CLUTCH CASE SECTION

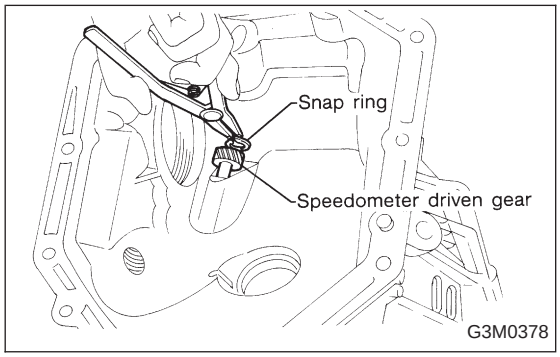
1) Check the appearance of each component and clean.

CAUTION:
Make sure each part is free of harmful cuts, damage and other faults.



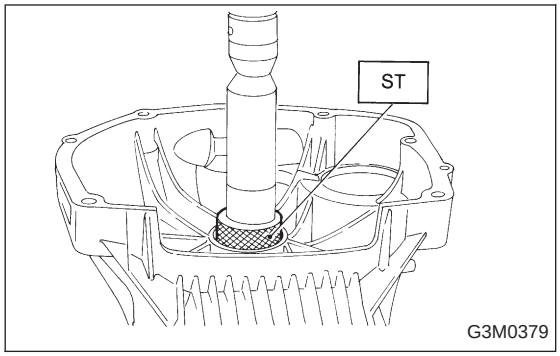
G3M0377

2) Install the washer and snap ring to the speedometer shaft with ST, and set the oil seal. Then force-fit the shaft to the torque converter clutch case.
ST 499827000 PRESS



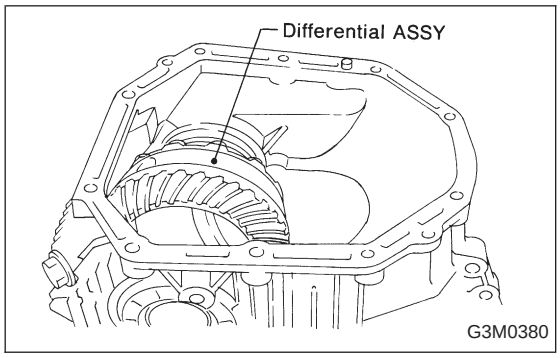
G3M0378

3) Install the speedometer driven gear to the speedometer shaft, and secure with a snap ring.



4) Force-fit the oil seal to the torque converter clutch case with ST.

ST 398437700 DRIFT



5) Install the differential assembly to the case, paying special attention not to damage the speedometer gears (drive and driven) and the inside of the case (particularly, the differential side retainer contact surface).

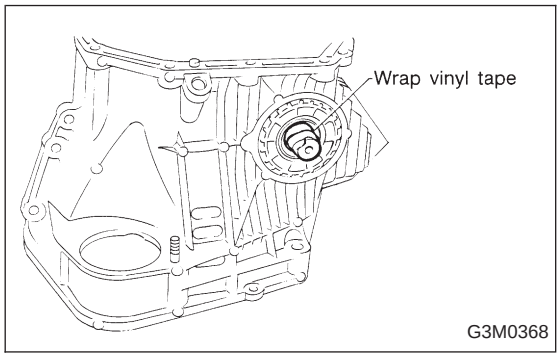
6) Install the circlip to the axle shaft, insert the shaft into the differential assembly, and tap it into position with a plastic hammer.

Thrust play:

Approx. 0.3 — 0.5 mm (0.012 — 0.020 in)

CAUTION:

- **If no play is felt, check whether the shaft is fully inserted. If shaft insertion is correct, replace the axle shaft.**
- **Be sure to use a new circlip.**

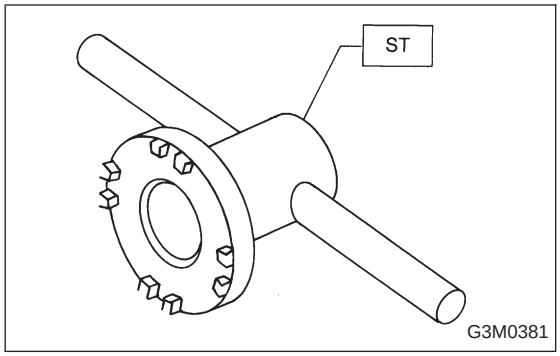


7) Wrap vinyl tape around the splined portion of the axle shaft.

8) Install the oil seal and outer race (taper roller bearing) to the differential side retainer. Then screw in the retainer and the O-ring after coating the threads with oil.

CAUTION:

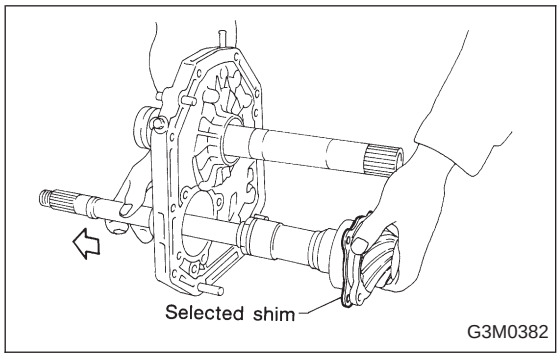
- **Pay attention not to damage the oil seal lips.**
- **Do not confuse the RH and LH oil seals.**
- **Keep the O-ring removed from the retainer.**



9) Using the ST, screw in the retainer until light contact is felt.

ST 499787000 WRENCH ASSY

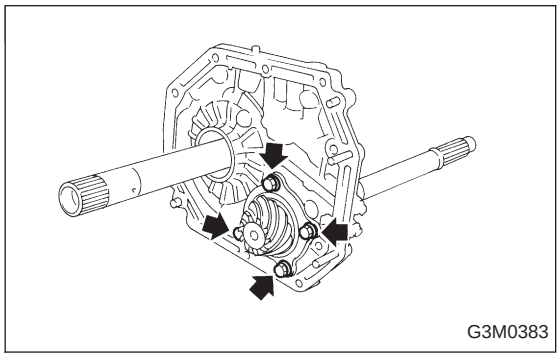
NOTE:
Screw in the RH side slightly deeper than the LH side.



10) Hypoid gear backlash adjustment and tooth contact check

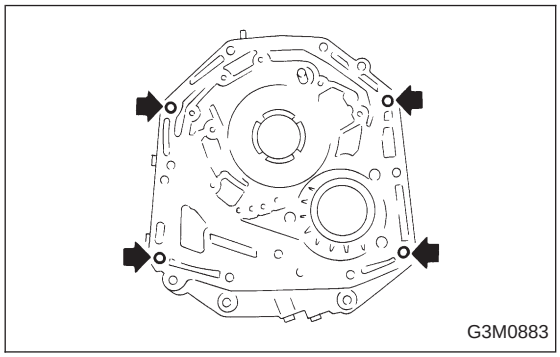
(1) Assemble the drive pinion assembly to the oil pump housing.

CAUTION:
● Be careful not to bend the shims. <Ref. to 3-2 [W8C0].>
● Be careful not to force the pinion against the housing bore.



(2) Tighten four bolts to secure the roller bearing.

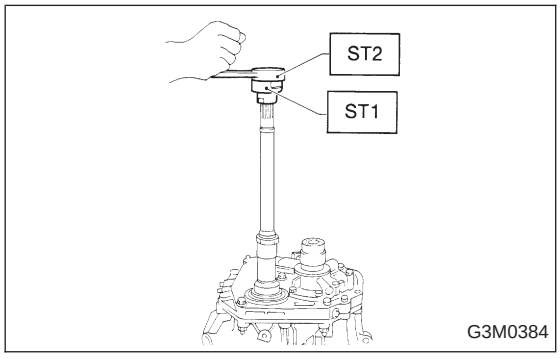
Tightening torque:
39±3 N·m (4.0±0.3 kg-m, 28.9±2.2 ft-lb)



(3) Install the oil pump housing assembly to the torque converter clutch case, and secure evenly by tightening four bolts.

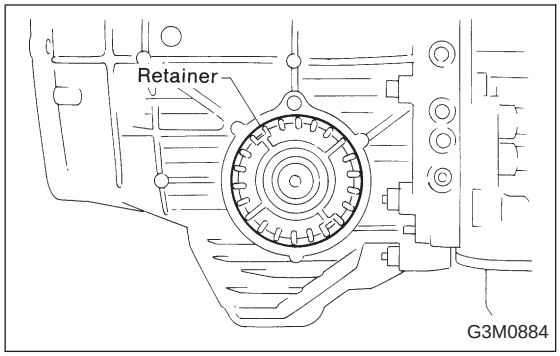
Tightening torque:
33±3 N·m (3.4±0.3 kg-m, 24.6±2.2 ft-lb)

CAUTION:
● Thoroughly remove the liquid gasket from the case mating surface beforehand.
● Use an old gasket or an aluminum washer so as not to damage the mating surface of the housing.

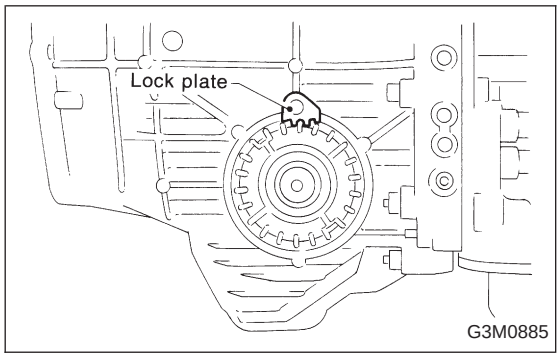


(4) Rotate the drive pinion several times with ST1 and ST2.

ST1 498937100 HOLDER
ST2 499787100 WRENCH

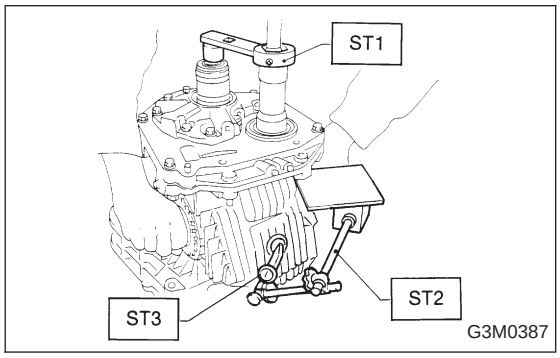


(5) Tighten the LH retainer until contact is felt while rotating the shaft. Then loosen the RH retainer. Keep tightening the LH retainer and loosening the RH retainer until the pinion shaft can no longer be turned. This is the “zero” state.



(6) After the “zero” state is established, back off the LH retainer 3 notches and secure it with the lock plate. Then back off the RH retainer and retighten until it stops. Repeat this procedure several times. Tighten the RH retainer 1-3/4 notches further. This sets the preload. Finally, secure the retainer with its lock plate.

NOTE:
Turning the retainer by one tooth changes the backlash about 0.05 mm (0.0020 in).



(7) Turn the drive pinion several rotations with ST1 and check to see if the backlash is within the standard value with ST2 and ST3.

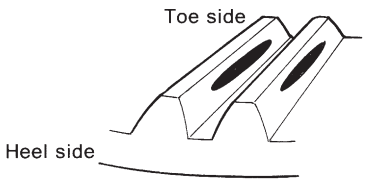
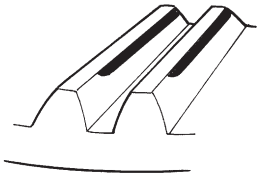
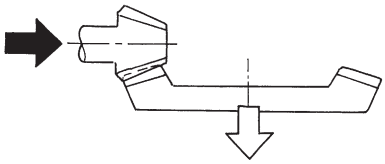
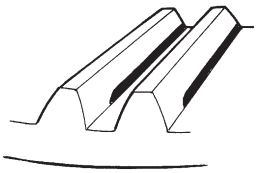
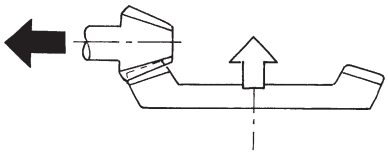
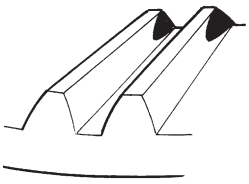
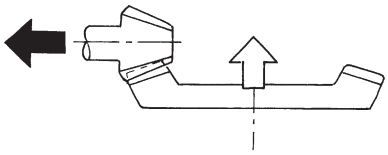
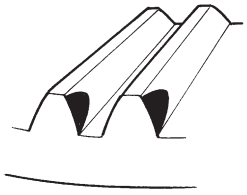
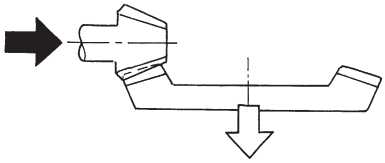
ST1 499787100 WRENCH
ST2 498247001 MAGNET BASE
ST3 498247100 DIAL GAUGE

Backlash:

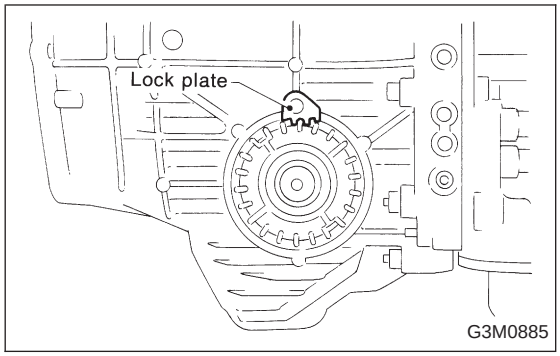
0.13 — 0.18 mm (0.0051 — 0.0071 in)

After confirming that the backlash is correct, check the tooth contact.

(8) Apply red lead evenly to the surfaces of three or four teeth of the crown gear. Rotate the drive pinion in the forward and reverse directions several times. Then remove the oil pump housing, and check the tooth contact pattern.
If tooth contact is improper, readjust the backlash or shim thickness.

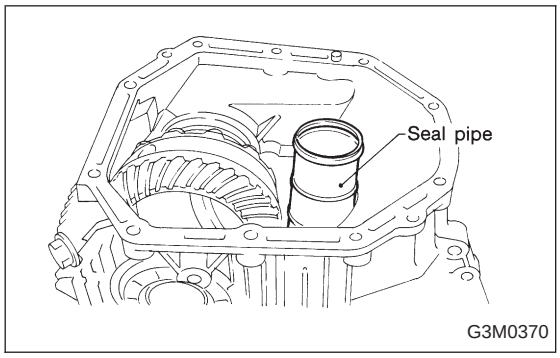
Checking item	Contact pattern	Corrective action
Correct tooth contact Tooth contact pattern slightly shifted toward to under no-load rotation. [When loaded, contact pattern moves toward heel.]	 G3M0098A	—
Face contact Backlash is too large.	This may cause noise and chipping at tooth ends.  G3M0098B	Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.  G3M0098F
Flank contact Backlash is too small.	This may cause noise and stepped wear on surfaces.  G3M0098C	Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.  G3M0098G
Toe contact (Inside end contact)	Contact areas is small. This may cause chipping at toe ends.  G3M0098D	Adjust as for flank contact.  G3M0098G
Heel contact (Outside end 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



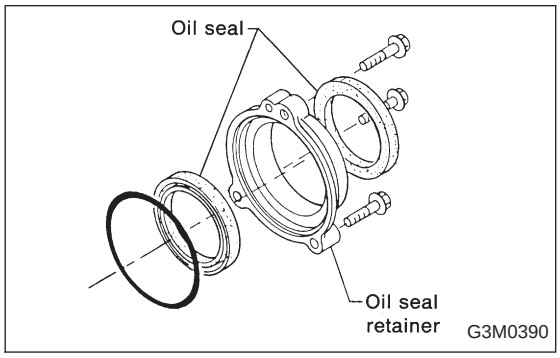
(9) If tooth contact is correct, mark the retainer position and loosen it. After fitting the O-ring, screw in the retainer to the marked position. Then tighten the lock plate to the specified torque.

Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)



11) Install the seal pipe to the torque converter clutch case.

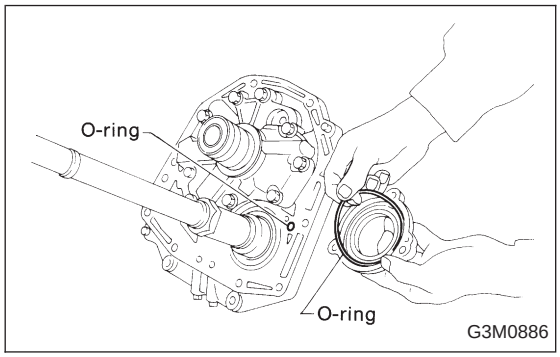
CAUTION:
Be sure to use a new seal pipe.



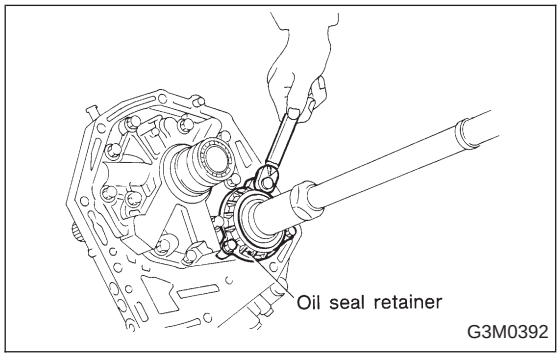
12) Install two oil seals to the oil seal retainer with ST.

ST 499247300 INSTALLER

CAUTION:
- **Pay attention to the orientation of the oil seals.**
- **Be careful not to damage the seal lips. If any damage is found, replace with a new one.**



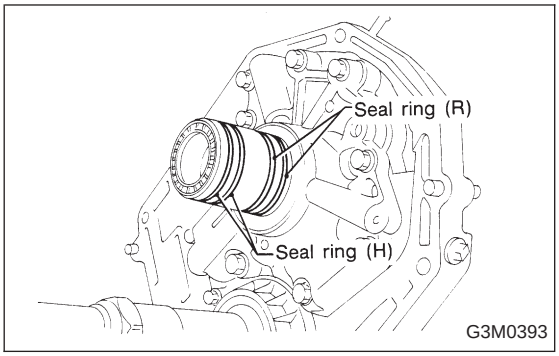
13) Attach the O-ring to the oil seal retainer with vaseline. Install the seal to the oil pump housing bore.



14) Install the oil seal retainer taking care not to damage the oil seal lips. Then secure with three bolts.

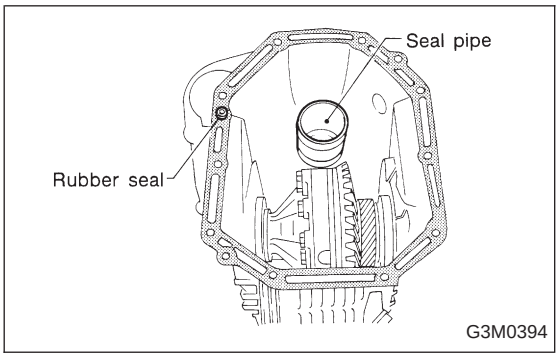
NOTE:
Make sure the O-ring is fitted correctly in position.

Tightening torque:
7±1 N·m (0.7±0.1 kg-m, 5.1±0.7 ft-lb)



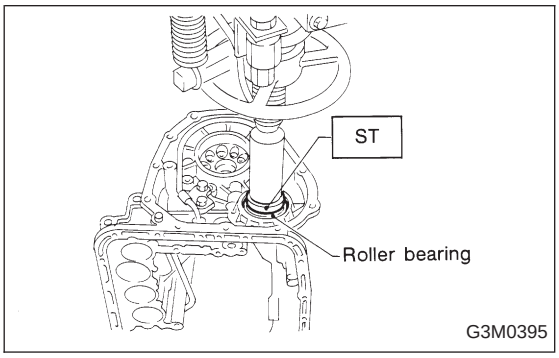
15) Apply vaseline to the groove on the oil pump cover, and install two (R) seal rings and two (H) seal rings.

NOTE:
● Fit the seal ring after compressing, and rub vaseline into the seal ring to avoid expansion.
● The “R” seal ring has a large diameter, while “H” has small diameter.



16) Install the rubber seal to the torque converter clutch case.

CAUTION:
Be careful not to lose the rubber seal.

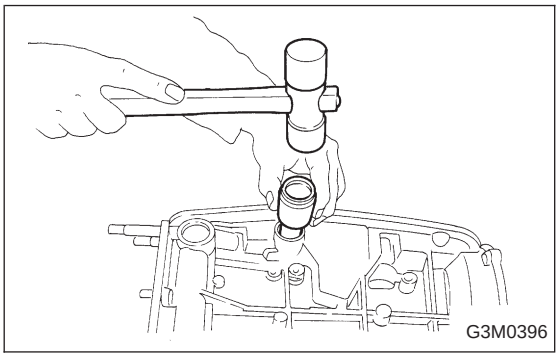


2. TRANSMISSION CASE SECTION

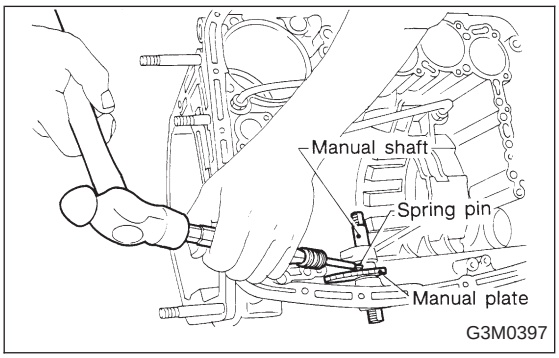
1) Press-fit the roller bearing to the transmission case with ST.

ST 398487700 DRIFT

CAUTION:
Use a new roller bearing.



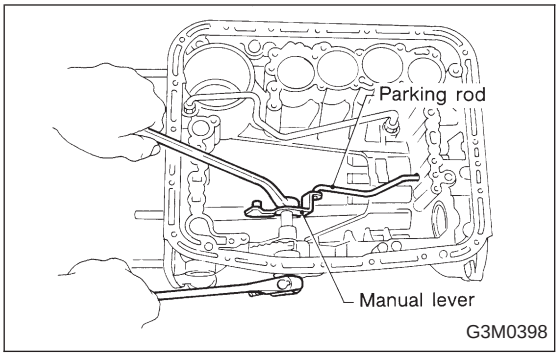
2) Using a plastic hammer, force-fit the oil seal.



3) Install the manual plate and shaft, and secure with a spring pin.

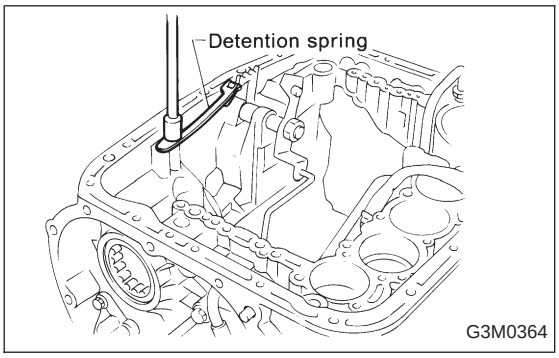
CAUTION:
Be careful not to damage the oil seal lip.

NOTE:
After installation, make sure of smooth movement.



4) Assemble the manual lever and parking rod to the inside shaft, and secure with a nut.

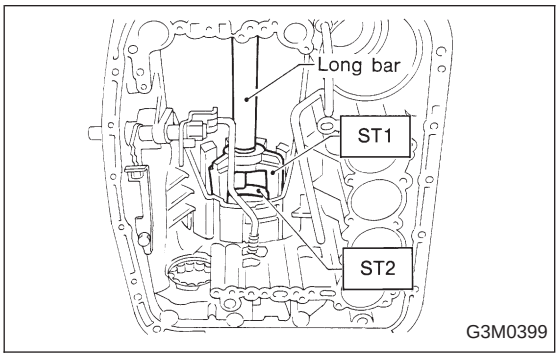
Tightening torque:
47±2 N·m (4.8±0.2 kg-m, 34.7±1.4 ft-lb)



5) Install the detention spring.

NOTE:
Position the spring so that its center is aligned with the center of the manual plate.

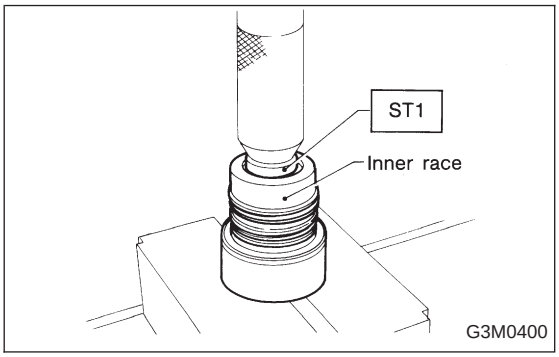
Tightening torque:
6±1 N·m (0.6±0.1 kg-m, 4.3±0.7 ft-lb)



6) Install the lathe cut seal rings to the I.D./O.D. of the low and reverse piston. Then install the piston into the case with a press, ST1 and ST2.

ST1 398673600 COMPRESSOR
ST2 498627000 SEAT

CAUTION:
- **Be careful not to tilt the piston when installing.**
- **Be careful not to damage the lip seal.**



7) Install the one-way clutch inner race.

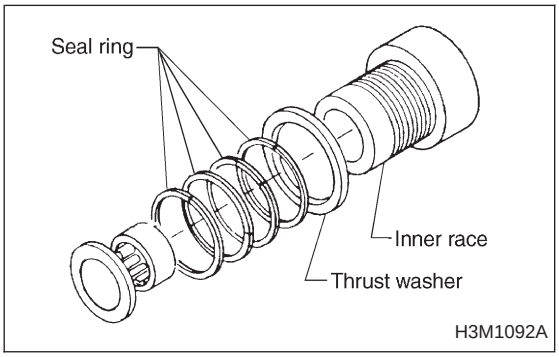
(1) Using a press and ST1, install the needle bearing to the inner race.

ST1 398497701 INSTALLER

CAUTION:
Use a new needle bearing.

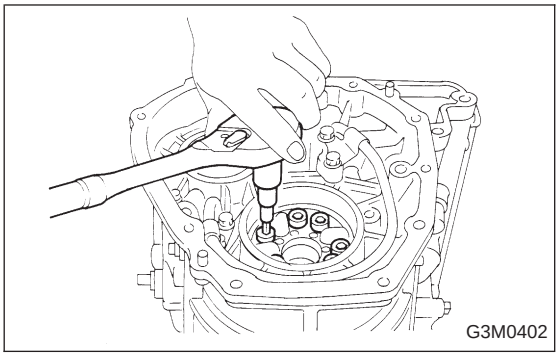
NOTE:
Use the following ST when removing.

ST 398527700 PULLER ASSY



(2) Install the thrust washer.
(3) Install four seal rings.

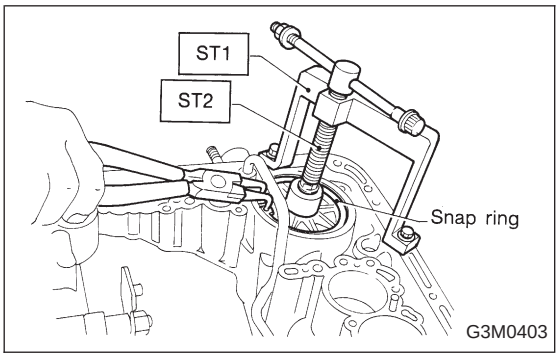
NOTE:
Apply vaseline to the groove of the inner race and to the seal ring after installation, so that the seal ring will not expand.


G3M0402

(4) Place the spring retainer on the inner race. Install the spring to the recessed portion of the piston. Then tighten eight socket head bolts from the rear side of the transmission case.

Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)

CAUTION:
Be sure to tighten evenly.

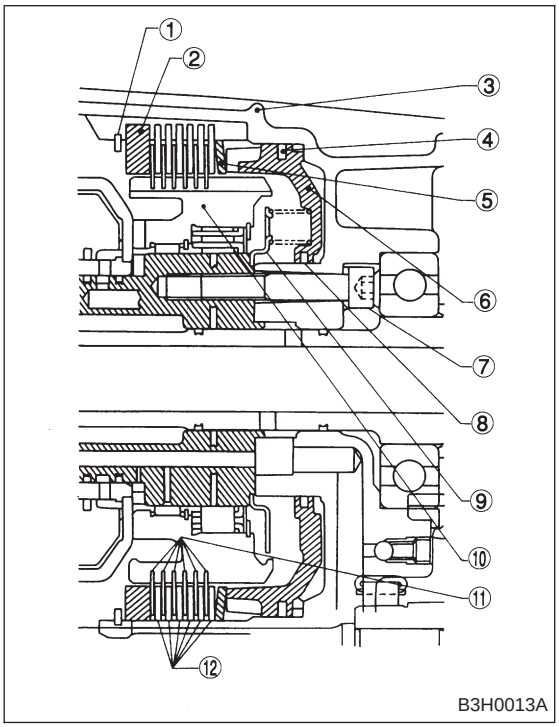


G3M0403

8) Install the band servo sub assembly.
9) Press the O.D. servo retainer into position with ST1 and ST2, and secure with a snap ring.

ST1 498677010 COMPRESSOR
ST2 399703600 PULLER ASSY

CAUTION:
Perform the following operations with the transmission case set vertically on wooden blocks.



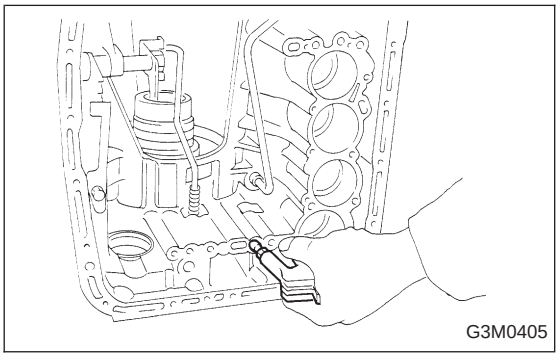
B3H0013A

10) Installation of the low & reverse brake

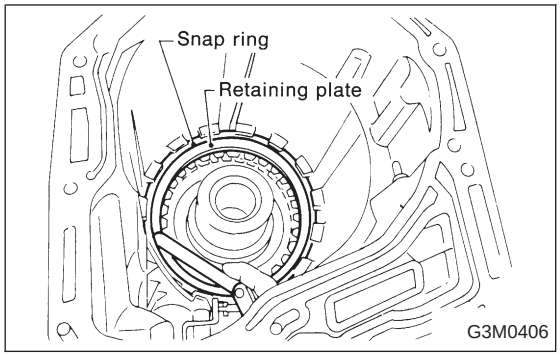
(1) Install dish plate, driven plates, drive plates, and a retaining plate, and secure with a snap ring.

NOTE:
- Pay attention to the orientation of the dish plate.
- Driven plate : 1800 cc / 4 sheets, 2200 cc / 6 sheets
- Drive plate : 1800 cc / 4 sheets, 2200 cc / 6 sheets
- Dish plate : 1

① Snap ring
② Retaining plate
③ Transmission case
④ Lathe cut seal ring
⑤ Dish plate
⑥ Piston
⑦ Bolt
⑧ Lathe cut seal ring
⑨ Clutch spring retainer
⑩ Forward clutch drum
⑪ Drive plate
⑫ Driven plate


G3M0405

(2) Apply compressed air intermittently to check for operation.



(3) Check the clearance. (Selection of retaining plate)

Standard value:

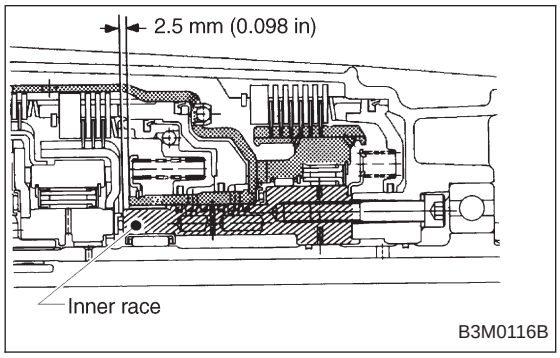
1.1 — 1.7 mm (0.043 — 0.067 in)

Allowable limit:

2.7 mm (0.106 in)

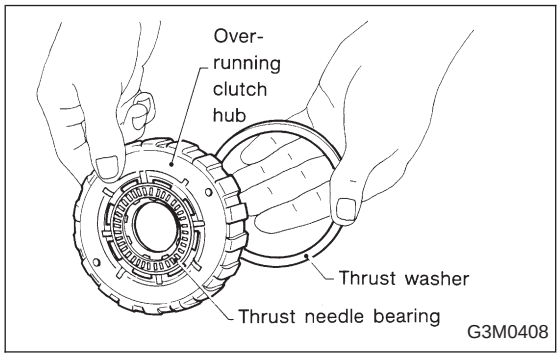
NOTE:
Before measuring clearance, place the same thickness of shim on both sides to prevent retaining plate from tilting.

	Part No.	Thickness mm (in)
● Available retaining plates	31667AA180	6.5 (0.256)
	31667AA190	6.8 (0.268)
	31667AA200	7.1 (0.280)
	31667AA210	7.4 (0.291)
	31667AA220	7.7 (0.303)
	31667AA230	8.0 (0.315)
	31667AA240	8.2 (0.323)
	31667AA250	8.4 (0.331)



11) Install the forward clutch drum.

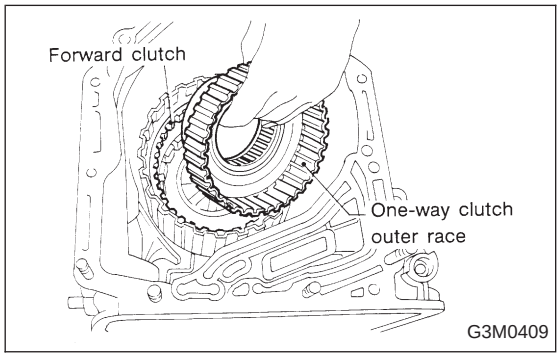
(1) Install carefully while rotating the drum slowly paying special attention not to damage the seal ring.
(2) Installation is complete when the drum recedes 2.5 mm (0.098 in) from the inner race surface.



12) Assemble the overrunning clutch hub.

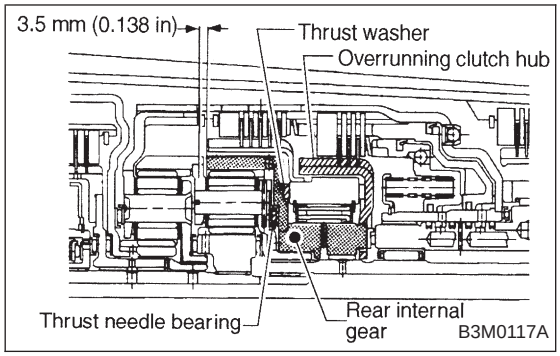
CAUTION:
Install thrust needle bearing in the correct direction. <Ref. to 3-2 [S1C0].>

NOTE:
● Join the thrust needle bearing and thrust washer with vaseline, and then install them together.
● Make sure that the splines are engaged correctly.



13) Install the one-way clutch outer race.

NOTE:
Make sure the forward clutch splines are engaged correctly.



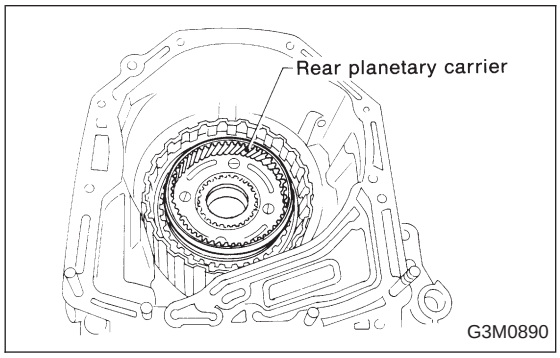
14) Assemble the rear internal gear.

(1) Join the thrust needle bearing and thrust washer to the gear with vaseline, and install the gear while rotating it.

(2) Securely engage the bearing with the dog of the overrunning clutch hub.

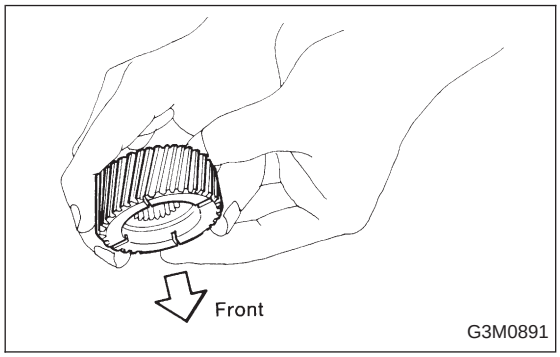
CAUTION:
Install thrust needle bearing in the correct direction. <Ref. to 3-2 [S1C0].>

NOTE:
Installation is complete when the snap ring top surface of the forward clutch drum recedes approximately 3.5 mm (0.138 in).



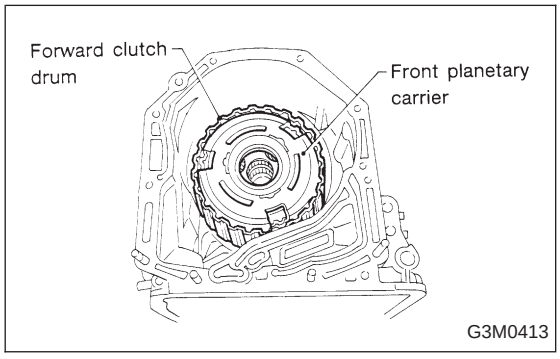
15) Install the rear planetary carrier.
Attach the thrust needle bearing to the inside of the carrier with vaseline. Then install the carrier while rotating slowly.

CAUTION:
Install thrust needle bearing in the correct direction. <Ref. to 3-2 [S1C0].>



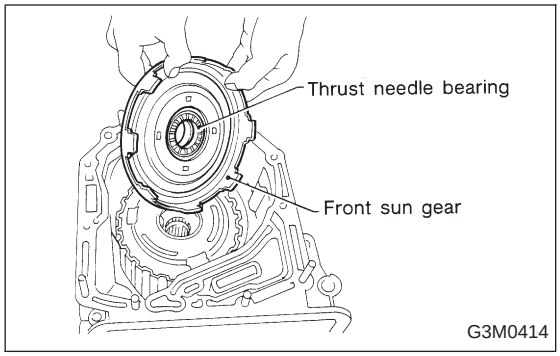
16) Install the rear sun gear.

NOTE:
Install the gear with the oil groove facing up.



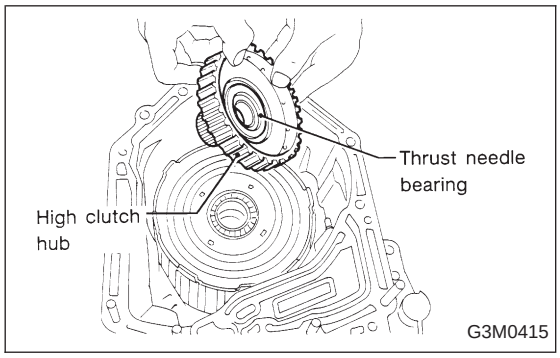
17) Install the front planetary carrier.
Attach the thrust needle bearings to both sides of the carrier with vaseline. Install the carrier carefully, while aligning with the splines of the forward clutch drum, and while rotating the pinion.

CAUTION:
Install thrust needle bearing in the correct direction. <Ref. to 3-2 [S1C0].>



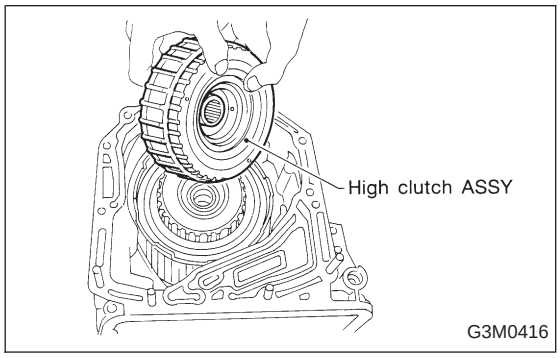
18) Install the front sun gear.
Attach the thrust needle bearing to the gear, and install the gear while turning slowly.

CAUTION:
Install thrust needle bearing in the correct direction. <Ref. to 3-2 [S1C0].>



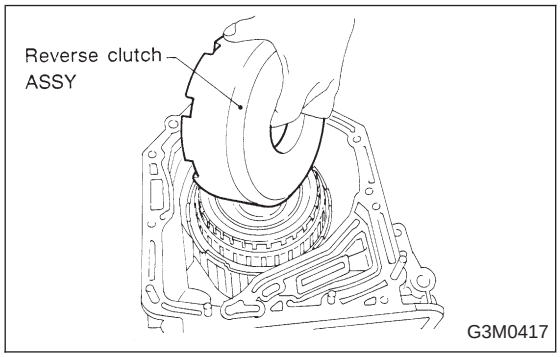
19) Install the high clutch hub.
Attach the thrust needle bearing to the hub with vaseline and install the hub by correctly engaging the splines of the front planetary carrier.

CAUTION:
Install thrust needle bearing in the correct direction. <Ref. to 3-2 [S1C0].>



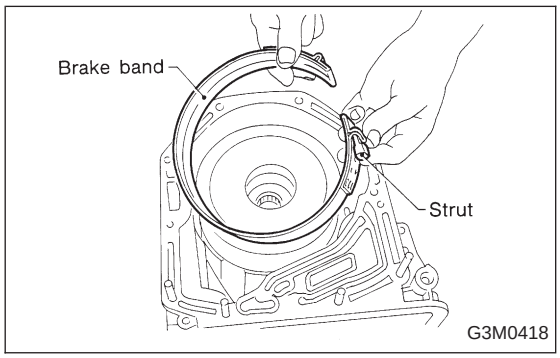
20) Install the high clutch assembly.

NOTE:
Correctly engage the high clutch hub and clutch splines.



21) Install the reverse clutch assembly.

NOTE:
Engage the high clutch outer spline with the reverse clutch spline and the front sun gear with the cut-out portion of the reverse clutch drum correctly when installing.



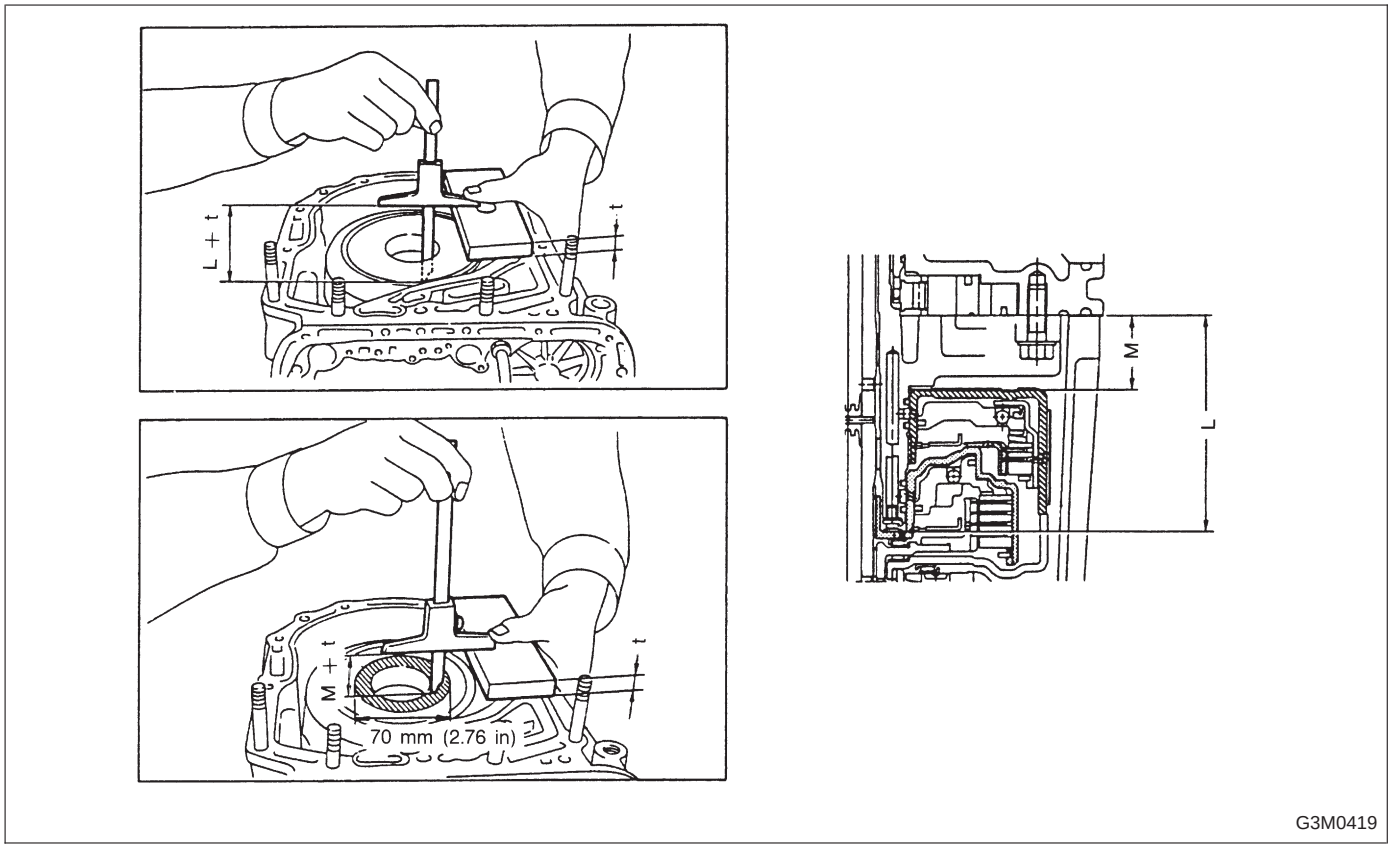
22) Install the brake band.

CAUTION:
Be careful not to damage the brake band when installing.

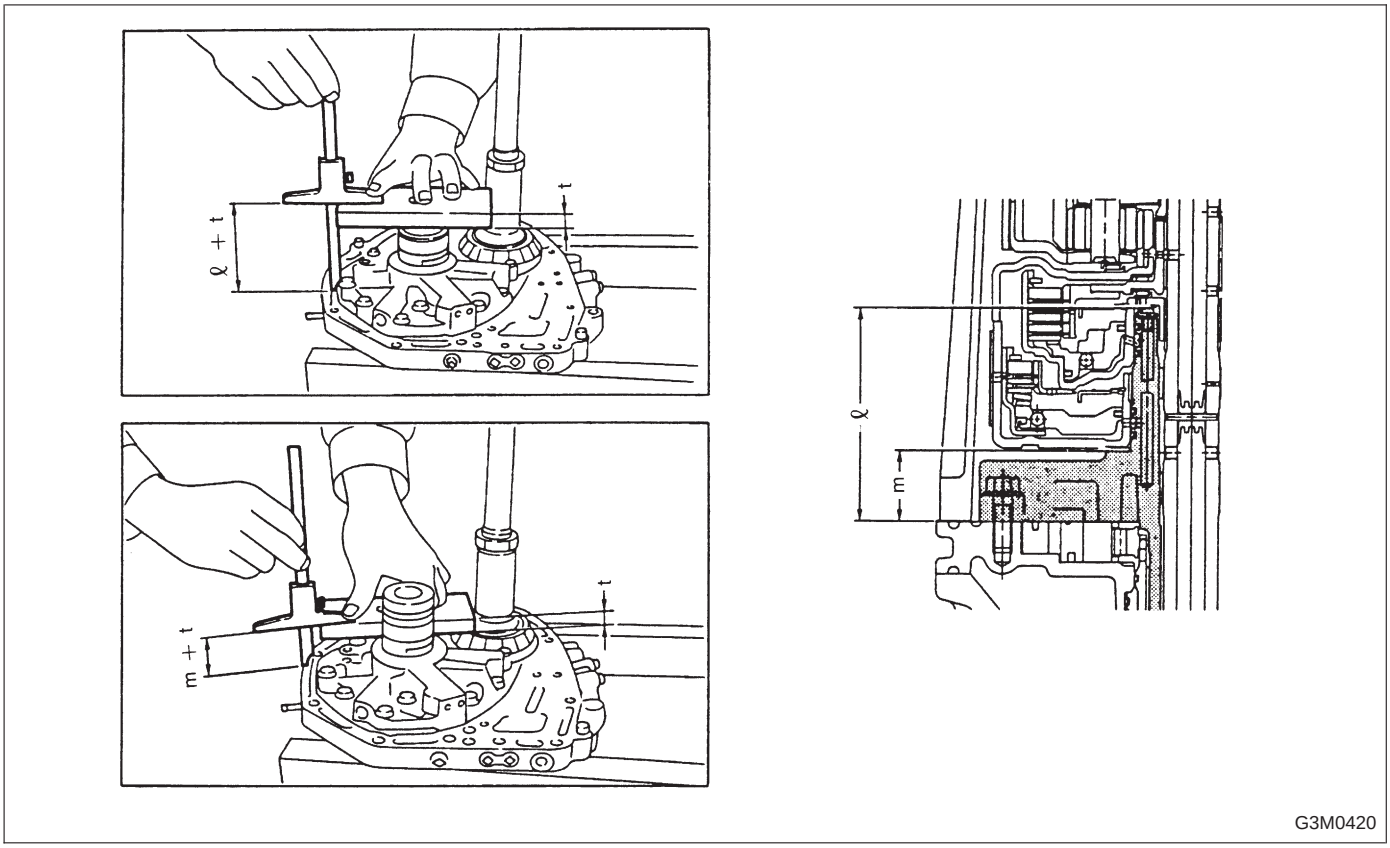
NOTE:
Install the strut to the band servo piston stem. Then tighten it temporarily to avoid tilting the band.

23) Adjustment of total end play and reverse clutch end play

(1) Measure the distance from the transmission case mating surface to the recessed portion of the high clutch drum “L”, and the distance to the top surface of the reverse clutch drum “M”.



(2) Measure the distance from the oil pump housing mating surface to the top surface of the oil pump cover with needle bearing, and to the thrust surface of the reverse clutch.



(3) Equation for calculation

- Total end play

Unit: mm

$C = (L + 0.4) - \ell$

C : Clearance between concave portion of high clutch and end of clutch drum support
L : Length from case mating surface to concave portion of high clutch
0.4 : Gasket thickness
ℓ : Height from housing mating surface to upper surface of clutch drum support

	Part No.	Thickness mm (in)
Select suitable bearing race from among those listed in this table so that clearance C is in the 0.25 — 0.55 mm (0.0098 — 0.0217 in) range.	803031021 803031022 803031023 803031024 803031025 803031026 803031027	0.8 (0.031) 1.0 (0.039) 1.2 (0.047) 1.4 (0.055) 1.6 (0.063) 1.8 (0.071) 2.0 (0.079)

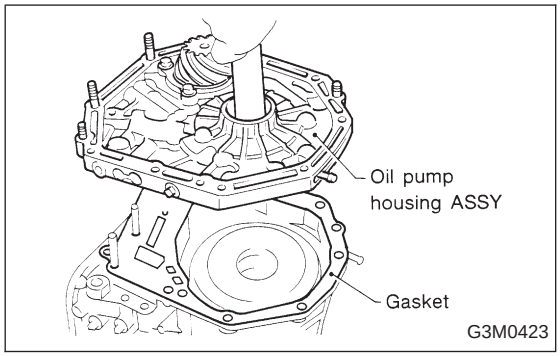
● Reverse clutch end play

Unit: mm

C = (M + 0.4) − m

C : Clearance between oil pump housing hose and end of reverse clutch
M : Distance from case mating surface to upper surface of reverse clutch
0.4 : Gasket thickness
m : Height from housing mating surface to thrust-receiving area of reverse clutch

	Part No.	Thickness mm (in)
Select suitable thrust washer from among those listed in this table so that clearance C is in the 0.55 — 0.90 mm (0.0217 — 0.0354 in) range.	31299AA000	0.7 (0.028)
	31299AA010	0.9 (0.035)
	31299AA020	1.1 (0.043)
	31299AA030	1.3 (0.051)
	31299AA040	1.5 (0.059)
	31299AA050	1.7 (0.067)
	31299AA060	1.9 (0.075)

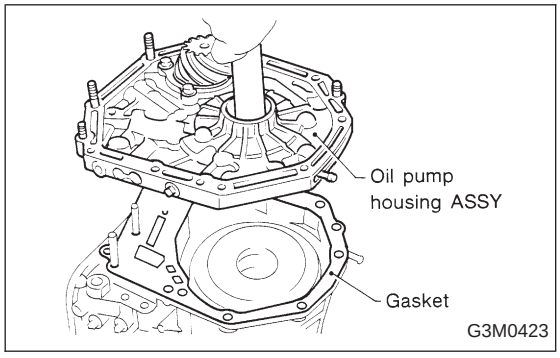


24) Install the oil pump housing assembly.

(1) After completing end play adjustment, insert the bearing race in the recess of the high clutch. Attach the thrust washer and thrust needle bearing to the oil pump cover with vaseline.

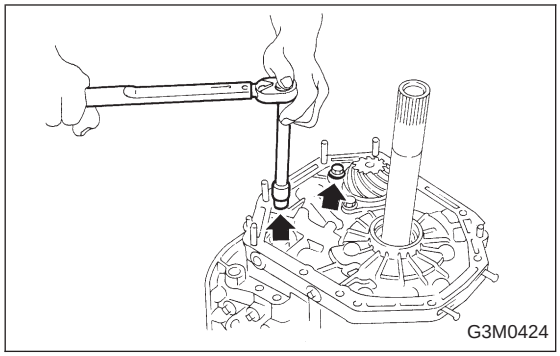
(2) After correctly installing the gasket to the case mating surface, carefully install the oil pump housing assembly. Be careful to avoid hitting the drive pinion against the inside of the case.

CAUTION:
- **Be careful not to damage the seal ring.**
- **Be sure to use a new gasket.**



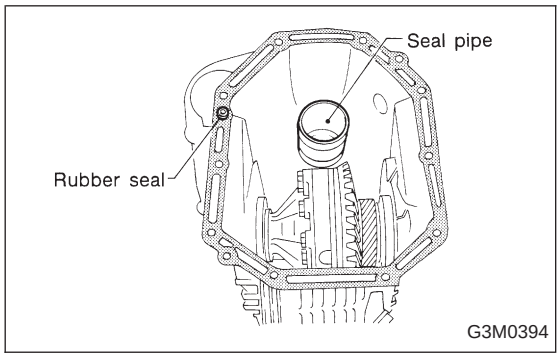
(3) Install both parts with dowel pins aligned. Make sure no clearance exists at the mating surface.

NOTE:
Any clearance suggests a damaged seal ring.


G3M0424

(4) Secure the housing with two nuts.

Tightening torque:
41±3 N·m (4.2±0.3 kg-m, 30.4±2.2 ft-lb)

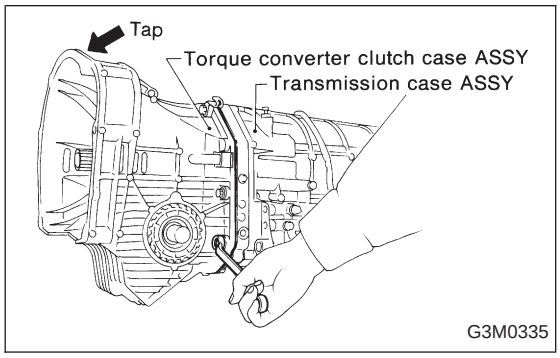


G3M0394

3. TORQUE CONVERTER CLUTCH CASE AND TRANSMISSION CASE

1) Apply proper amount of liquid gasket (THREE-BOND #1215) to the entire torque converter clutch case mating surface.

NOTE:
Make sure that the rubber seal and seal pipe are fitted in position.

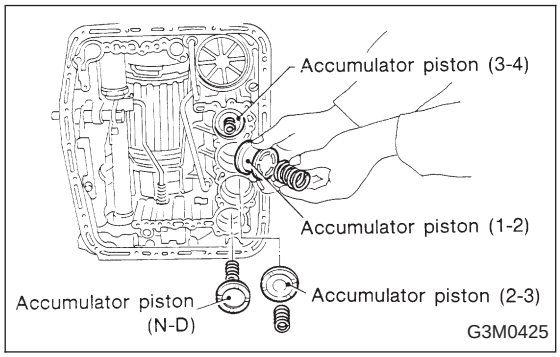


G3M0335

2) Install the torque converter clutch case assembly to the transmission case assembly, and secure with six bolts and four nuts.

Tightening torque:
41±3 N·m (4.2±0.3 kg-m, 30.4±2.2 ft-lb)

CAUTION:
When installing, be careful not to damage the torque converter clutch case bushing and oil seal.



G3M0425

4. CONTROL VALVE AND OIL PAN

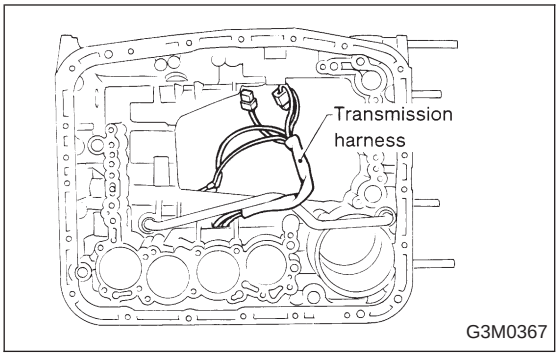
1) Install four accumulators with oil pans facing upward.

CAUTION:
Be careful not to confuse the springs and installation positions.

- Spring spec.

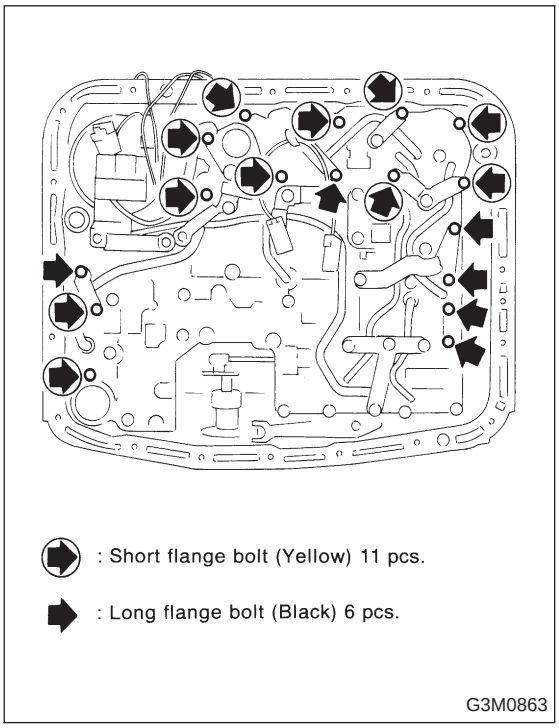
Unit: mm (in)

Accumulator spring	Outer diameter	Free length
1 — 2	28.5 (1.122)	44.5 (1.752)
2 — 3	20.5 (0.807)	31.0 (1.220)
3 — 4	17.3 (0.681)	43.7 (1.720)
N — D	17.8 (0.701)	36.5 (1.437)



2) Install and route the transmission harness.

CAUTION:
Be careful not to damage the harness.

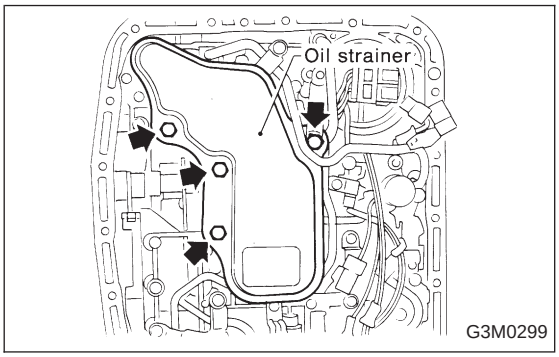


3) Install the control valve assembly.

(1) Set the select lever in range “2”.
(2) Install the two brackets to the control valve by engaging the manual valve and manual lever, then tighten the 17 bolts.

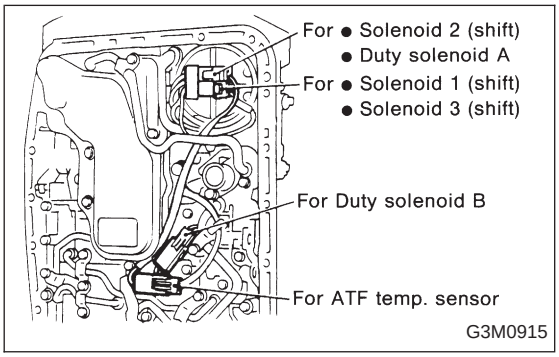
Tightening torque:
8±1 N·m (0.8±0.1 kg-m, 5.8±0.7 ft-lb)

CAUTION:
- **Be careful not to pinch the harness roll the gasket.**
- **Tighten the control valve mounting bolts evenly.**

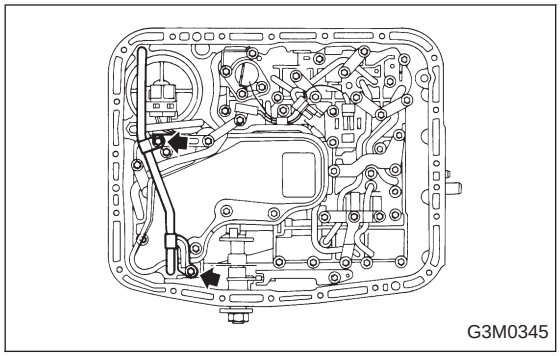


4) Install the oil strainer to the control valve. Be careful not to cut or break the O-ring. Then tighten four bolts.

Tightening torque:
8±1 N·m (0.8±0.1 kg-m, 5.8±0.7 ft-lb)



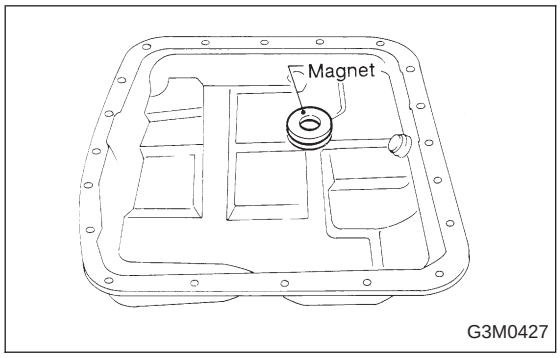
5) Secure four connectors.


G3M0345

6) Install the oil cooler outlet pipe, and secure with two bolts.

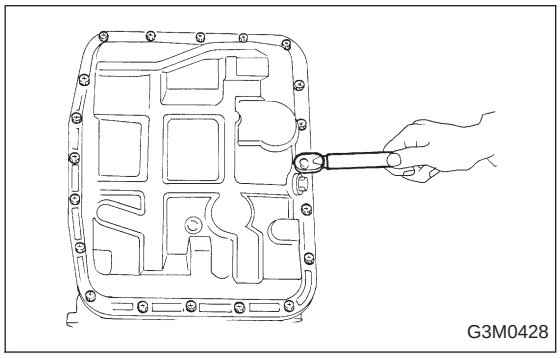
Tightening torque:
8±1 N·m (0.8±0.1 kg-m, 5.8±0.7 ft-lb)

CAUTION:
Fit the pipe into position. Be careful to avoid twisting.



G3M0427

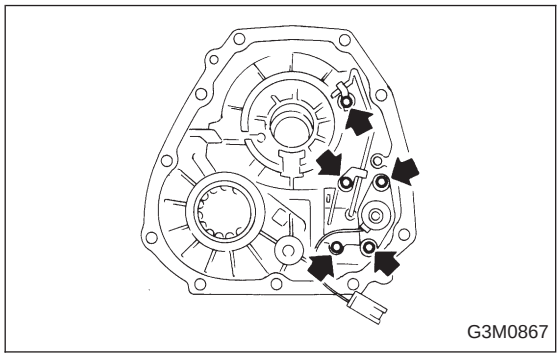
7) Install the oil pan.
(1) Attach the magnet at the specified position.


G3M0428

(2) With gasket inserted, secure the oil pan by tightening 20 bolts.

Tightening torque:
4.9±0.5 N·m (0.50±0.05 kg-m, 3.6±0.4 ft-lb)

NOTE:
Tighten the bolts evenly.


G3M0867

5. EXTENSION SECTION

NOTE:
When installing new oil seal into extension case, press it with ST.

ST 498057300 INSTALLER

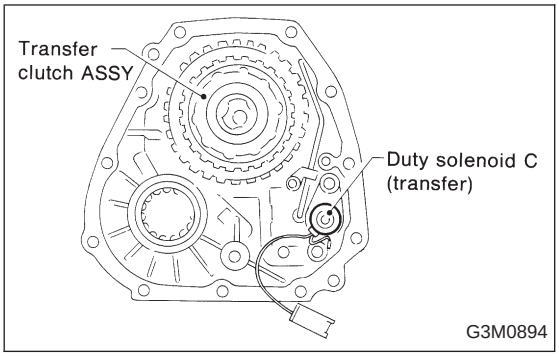
1) Install the filter in the extension case.

NOTE:
Pay attention to the orientation of the filter.

2) Install the transfer clutch valve assembly, transfer pipe, and the stay, then secure with five bolts.

Tightening torque:
8±1 N·m (0.8±0.1 kg-m, 5.8±0.7 ft-lb)

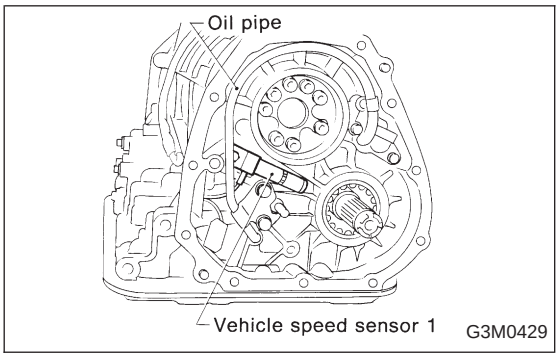
CAUTION:
- **Be sure to tighten the going lead with one of these bolts.**
- **Be sure to use a new gasket.**



3) Install the transfer clutch assembly to the case.

CAUTION:
Be careful not to damage the seal rings.

NOTE:
Insert the clutch assembly fully into position until the bearing shoulder bottoms.

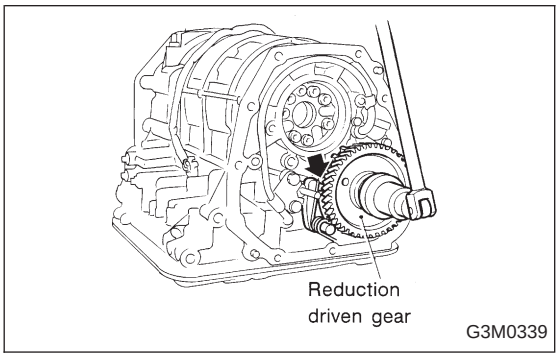


6. CONNECTION OF EACH SECTION

1) Install vehicle speed sensor 1 on transmission case. [FWD only]

Tightening torque:
7±1 N·m (0.7±0.1 kg-m, 5.1±0.7 ft-lb)

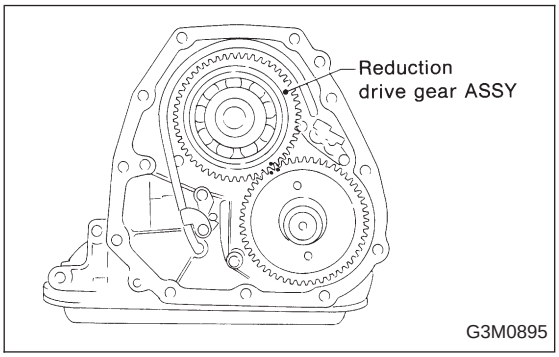
2) Install oil pipe.



3) Install the reduction driven gear.
4) Install the parking pawl and shaft, set the select lever in the “P” range and tighten the drive pinion lock nut.

Tightening torque:
98±5 N·m (10.0±0.5 kg-m, 72.3±3.6 ft-lb)

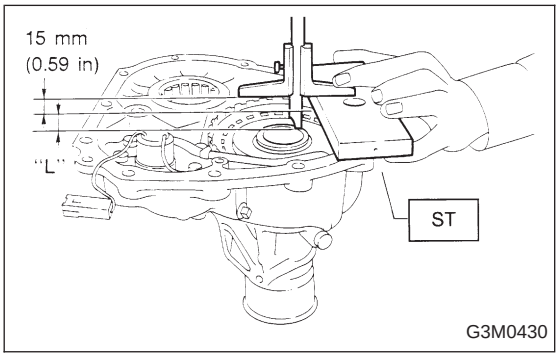
NOTE:
After tightening, stake the lock nut securely.



5) Install the reduction drive gear assembly.

CAUTION:
Align mark on reduction drive gear with mark on driven gear during installation.

NOTE:
Insert it fully into position until the bearing shoulder bottoms.



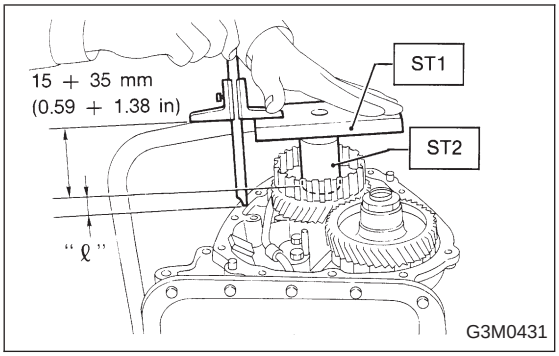
6) Measurement and adjustment of extension end play

(1) Measure distance L from end of extension case and rear drive shaft with ST. (On FWD models, measure distance from end of case to point at bearing location.)

ST 398643600 GAUGE

Unit: mm

L = Measured value − 15



(2) Measure the distance "ℓ" from the transmission case mating surface to the reduction drive gear end surface with ST1 and ST2. (On FWD models, measure distance from end of case to end of bearing.)

Unit: mm

ℓ = Measured value − 50

ST1 398643600 GAUGE
ST2 499577000 GAUGE

(3) Calculation equation:

Unit: mm

T = (L + 0.4) − ℓ

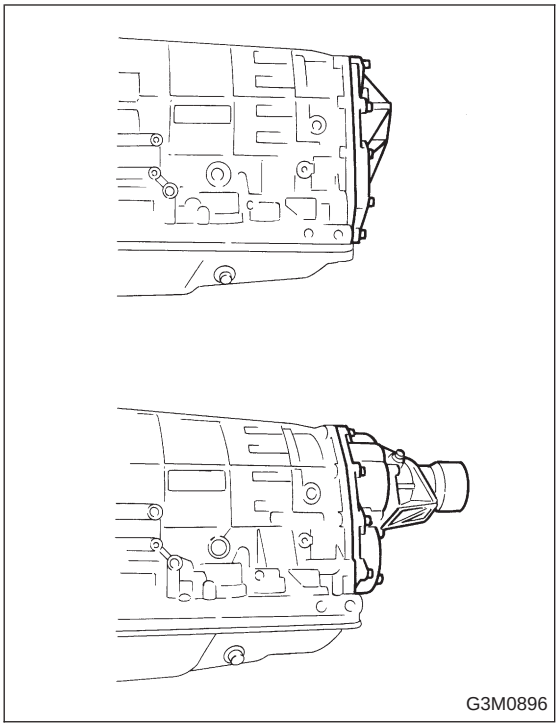
T : Clearance between end of reduction drive gear and end of rear drive shaft. (Clearance between end of reduction drive gear and end of bearing on FWD model)
L : Distance from end of extension case to end of rear drive shaft. (Distance from end of case to point (at bearing location)
0.4 : Gasket thickness
ℓ : Height from end of transmission case to end of reduction drive gear. (Height from end of case to end of bearing on FWD models)

Select suitable thrust needle bearing from among those listed in the following table to adjust clearance in the 0.05 — 0.20 mm (0.0020 — 0.0079 in) range.

	Part No.	Thickness mm (in)
● AWD: Thrust needle bearing	806536020	3.8 (0.150)
	806535030	4.0 (0.157)
	806535040	4.2 (0.165)
	806535050	4.4 (0.173)
	806535060	4.6 (0.181)
	806535070	4.8 (0.189)
	806535090	5.0 (0.197)

	Part No.	Thickness mm (in)
● FWD: Reduction gear shim	31288AA000	0.15 (0.0059)

Select from one to five shims so that clearance is within specifications.


G3M0896

7) Installation of extension case (AWD), transmission cover (FWD) and transmission case.

- AWD model:

  (1) Attach the selected thrust needle bearing to the end surface of reduction drive gear with vaseline.
  (2) Set the parking return spring.
  (3) Remove the transfer clutch from the extension case.
  Set the needle bearing on the reduction drive shaft and then install transfer clutch to the transfer clutch hub.

NOTE:
Be sure to engage the spline teeth correctly.

  (4) With gasket inserted between them, install the extension case to the transmission case.

CAUTION:
- **Be sure to use a new gasket.**
- **After inserting the extension case halfway, connect the connector for duty solenoid C. Be careful not to jam the cord in the case.**
- **Be careful not to damage the rear drive shaft seal ring.**

  (5) Tighten bolts to secure the case.

Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)

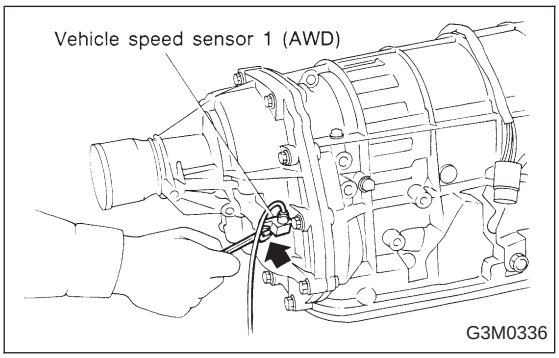
- FWD model:

  (1) Attach selected shim to transmission cover using vaseline.
  (2) Set the parking return spring.
  (3) After positioning gasket, assemble transmission cover and transmission case.

NOTE:
While aligning bearings, parking shaft, reduction driven gear, etc. assemble the two cases.

  (4) Tighten bolts.

Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)

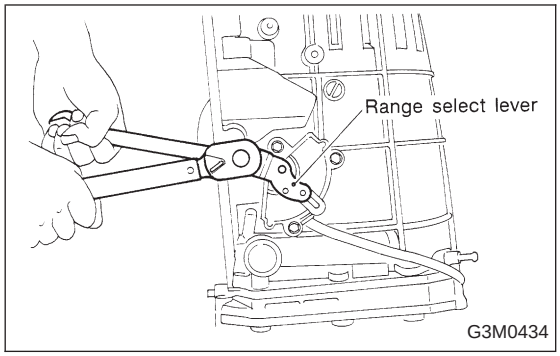


G3M0336

7. EXTERNAL PARTS

1) Install the vehicle speed sensor 1. (AWD only)

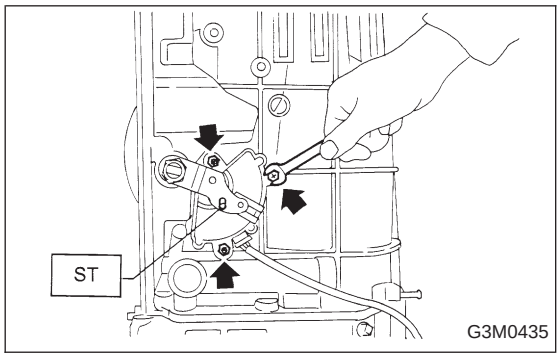
Tightening torque:
7±1 N·m (0.7±0.1 kg-m, 5.1±0.7 ft-lb)



2) Installation and adjustment of inhibitor switch:

(1) Install the inhibitor switch to the transmission case. Fit the projecting portion of the switch in the recessed portion of the case, and tighten three bolts temporarily.
(2) Insert the range select lever into the shaft, and tighten the nut.

Tightening torque:
47±2 N·m (4.8±0.2 kg-m, 34.7±1.4 ft-lb)



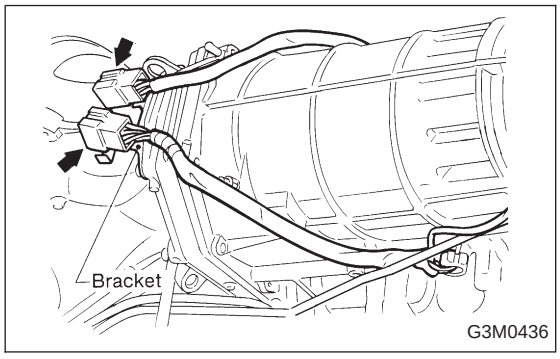
(3) With the selector lever set to “N” adjust the inhibitor switch so that the hole of range select lever is aligned with the inhibitor switch hole with ST.

ST 499267300 STOPPER PIN

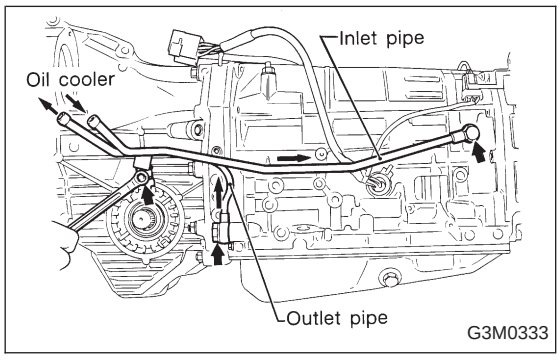
NOTE:
Ensure that gauge moves properly.

(4) With hole aligned, tighten three bolts to secure the inhibitor switch.

Tightening torque:
3.4±0.5 N·m (0.35±0.05 kg-m, 2.5±0.4 ft-lb)



3) Clip the following cords and harness:
(1) Transmission harness
(2) Inhibitor switch cord



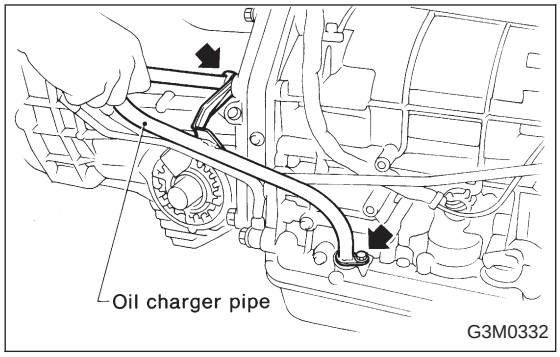
4) Install the oil cooler outlet pipe.

Tightening torque:
34±3 N·m (3.5±0.3 kg-m, 25.3±2.2 ft-lb)

5) Install the oil cooler inlet pipe.

Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)

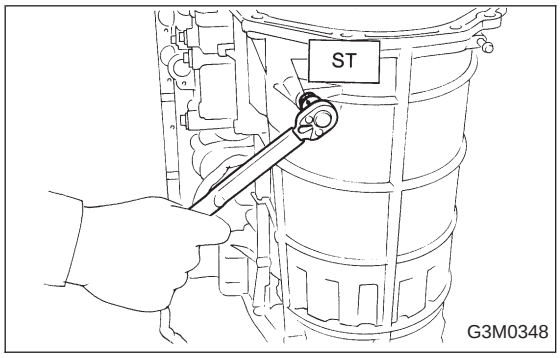
CAUTION:
Be sure to use a new aluminum washer.



6) Install the oil charge pipe.

Tightening torque:
Upper
41±3 N·m (4.2±0.3 kg-m, 30.4±2.2 ft-lb)
Lower
6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)

CAUTION:
Be careful not to damage the O-ring.



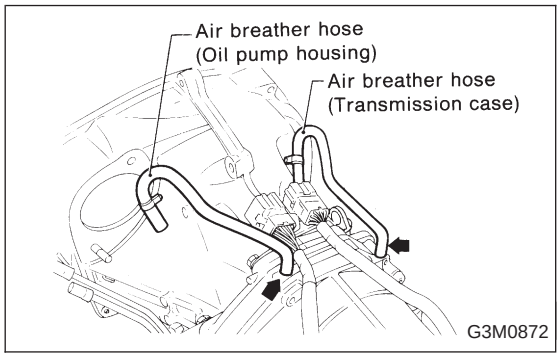
7) Adjustment of brake band:

(1) After tightening the brake band adjusting screw with ST to 9 N·m (0.9 kg-m, 6.5 ft-lb) torque, back it off three turns. Then secure with a lock nut.

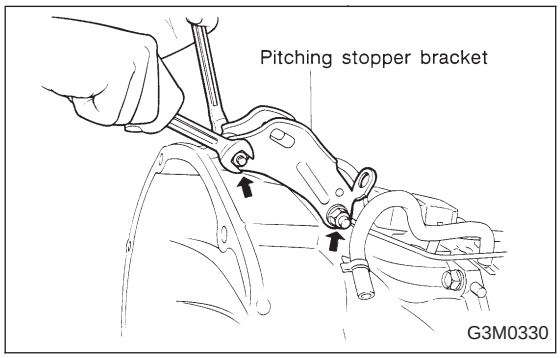
ST 398603610 SOCKET

Tightening torque:
26±2 N·m (2.7±0.2 kg-m, 19.5±1.4 ft-lb)

NOTE:
When tightening the lock nut, be careful not to turn the adjusting screw.

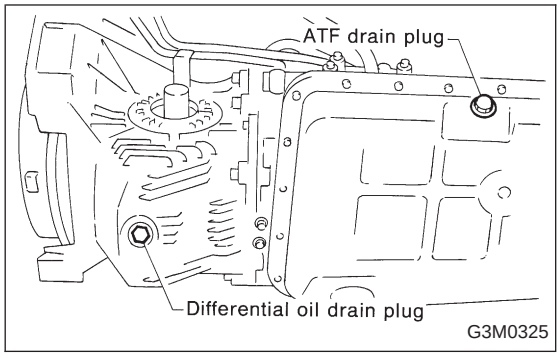


8) Install the air breather hose.



9) Install the pitching stopper bracket.

Tightening torque:
41±3 N·m (4.2±0.3 kg-m, 30.4±2.2 ft-lb)



10) Tighten the drain plugs.

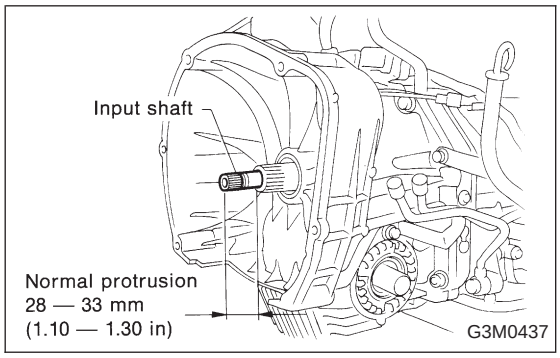
Tightening torque:

Diff.

44±3 N·m (4.5±0.3 kg-m, 32.5±2.2 ft-lb)

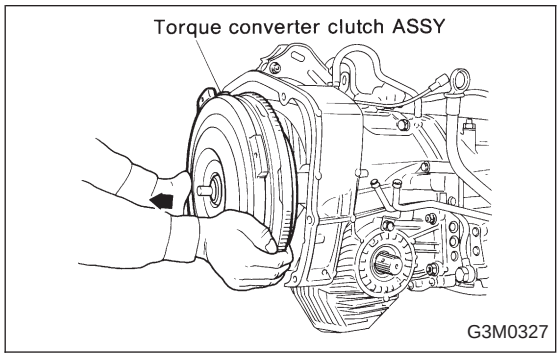
ATF

25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)



11) Insert the input shaft while turning lightly by hand.

CAUTION:
Be careful not to damage the bushing.



12) Install the torque converter clutch assembly.

(1) Install the oil pump shaft to the torque converter clutch.

NOTE:
Make sure the clip fits securely in its groove.

(2) Holding the torque converter clutch assembly by hand, carefully install it to the torque converter clutch case. Be careful not to damage the bushing. Also, to avoid undue contact between the oil pump shaft bushing and stator shaft portion of the oil pump cover.

(3) Rotate the shaft lightly by hand to engage the splines securely.

13) Add oil:

Specified quantity:

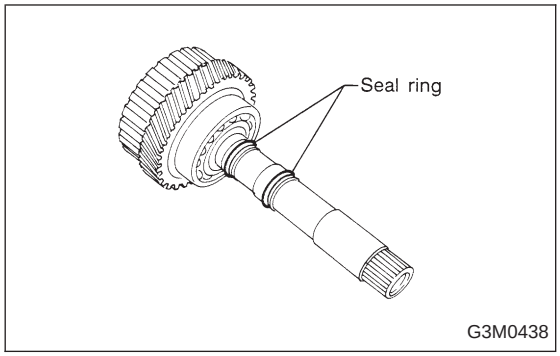
Diff.

1.1 — 1.3 ℓ (1.2 — 1.4 US qt, 1.0 — 1.1 Imp qt)

ATF

7.9 — 8.2 ℓ (8.4 — 8.7 US qt, 7.0 — 7.2 Imp qt)

NOTE:
After adding oil, insert the oil level gauge into the oil inlet.

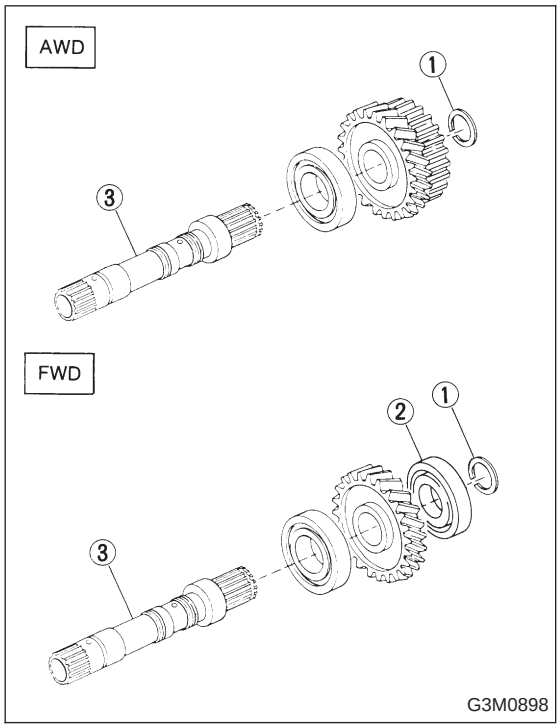


5. Reduction Drive Gear Assembly

A: DISASSEMBLY

1) Take out the seal rings.

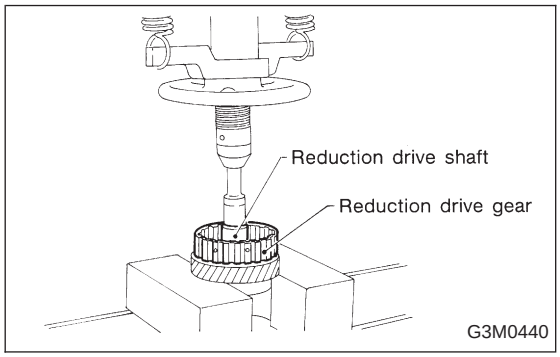
CAUTION:
Be careful not to damage the seal rings.



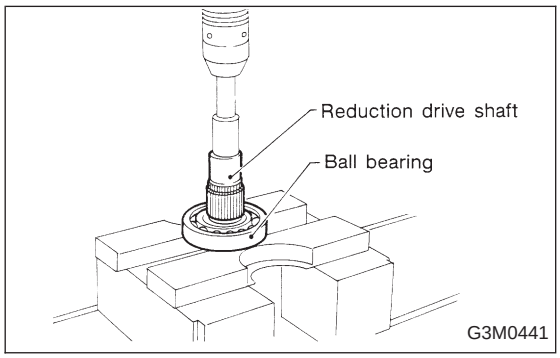
2) Take out the snap ring (outer ①).

CAUTION:
Be careful not to damage the splines.

3) Using a press, remove the ball bearing ② from shaft ③. (FWD only)



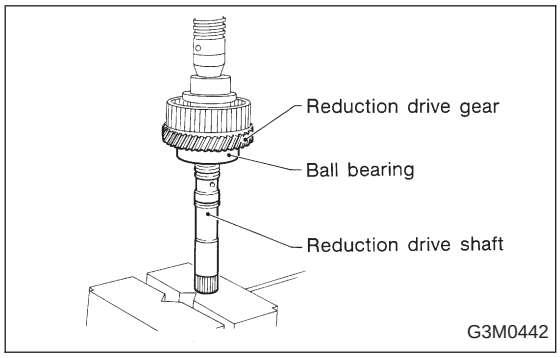
4) Using a press, remove the reduction drive gear.



5) Using a press, remove the ball bearing.

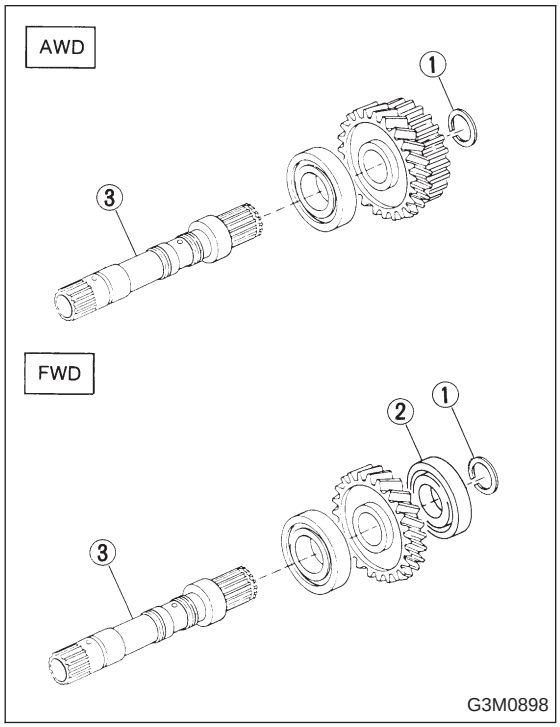
B: INSPECTION

Make sure that each component is free of harmful gouges, cuts, or dust.

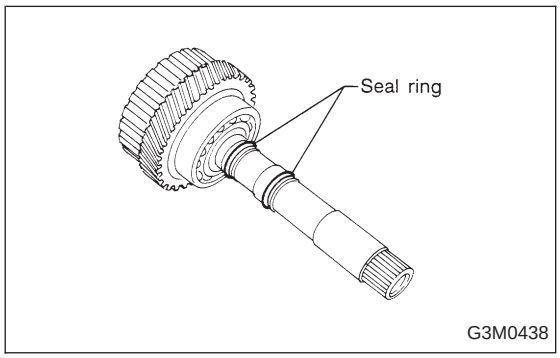


C: ASSEMBLY

1) Press-fit the ball bearing and reduction drive gear to the shaft.



2) AWD: Fit the snap ring ① securely in the snap ring groove on the shaft ③.
FWD: Press ball bearing ② into place and secure snap ring ① to groove in shaft ③.

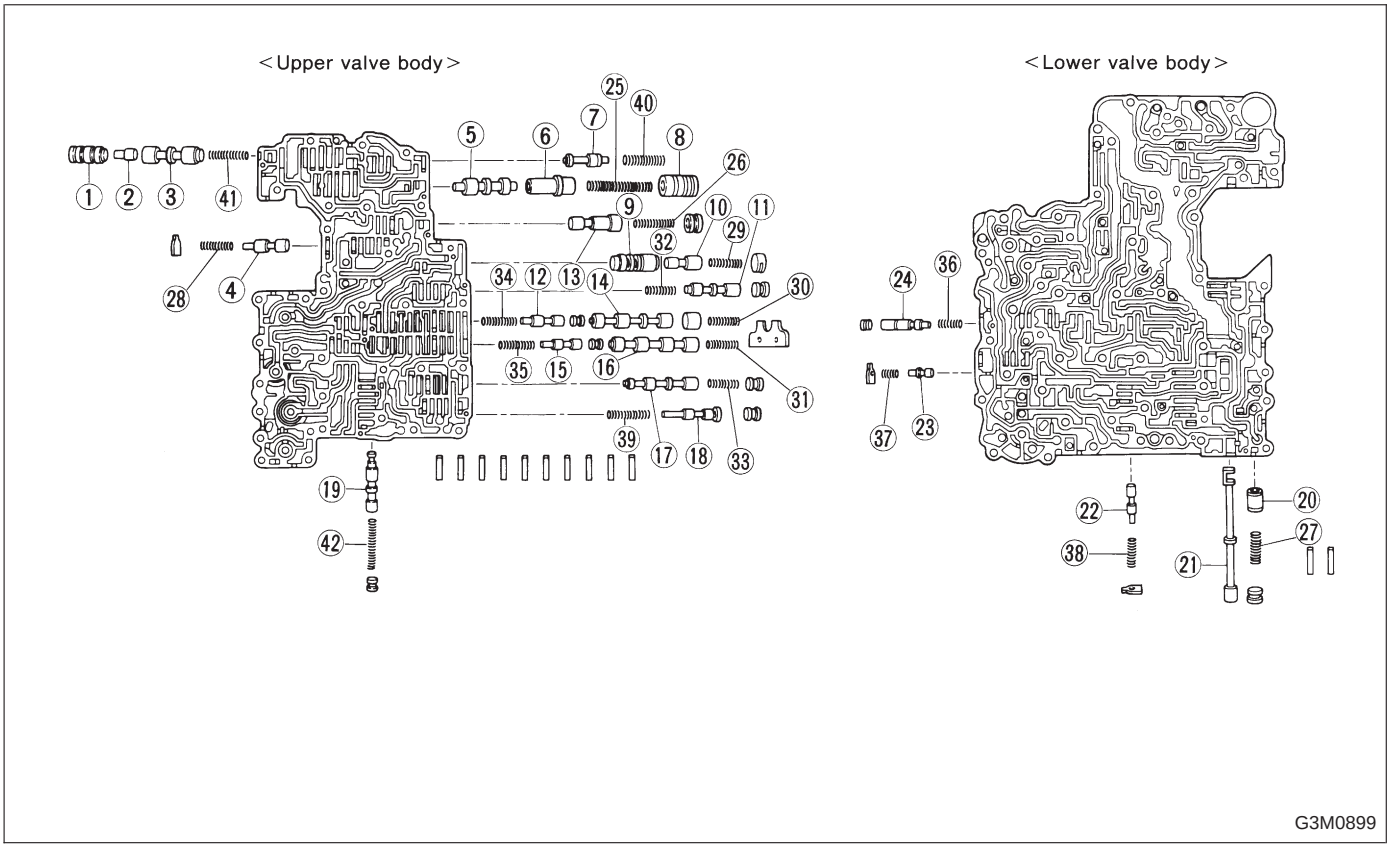


3) Attach two seal rings.

NOTE:
To make subsequent assembly easier, apply vaseline to the grooves of the shaft and to the exterior of the seal ring.

6. Control Valve Body

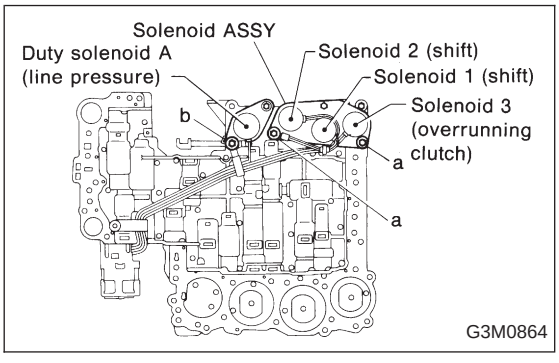
The control valve is composed of parts which are accurately machined to a high degree and should be handled carefully during disassembly and assembly. As these parts are similar in shape, they should be arranged in neat order on a table after disassembly so that they can be easily installed to their original positions. Spring loaded parts should be also handled carefully, as springs may jump out of place when the parts are disassembled or removed. Extreme care should be taken so as not to drop valves on the floor. Before assembling, the parts and valves should be dipped in a container filled with the ATF. Make sure that the valves are clean and free from any foreign material before assembly. Torque specifications should also be observed.



① Lock-up control sleeve
② Lock-up control plug
③ Lock-up control valve
④ Pilot valve
⑤ Pressure regulator valve
⑥ Pressure regulator plug
⑦ Torque converter regulation valve
⑧ Pressure regulator sleeve plug
⑨ Accumulator control sleeve
⑩ Accumulator control plug
⑪ Shuttle duty shift valve
⑫ 4-2 sequence valve
⑬ Pressure modifier valve
⑭ Shift valve B
⑮ 4-2 relay valve
⑯ Shift valve A
⑰ Overrunning clutch control valve
⑱ Overrunning clutch reducing valve
⑲ Shuttle shift valve
⑳ Manual valve
㉑ Forward clutch control valve
㉒ 1st reducing valve
㉓ 3-2 timing valve
㉔ Servo charger valve
㉕ Pressure regulator spring
㉖ Pressure modifier spring
㉗ Modifier accumulator spring
㉘ Pilot spring
㉙ Accumulator control spring
㉚ Shift B spring
㉛ Shift A spring
㉜ Shuttle shift spring
㉝ Overrunning clutch control spring
㉞ 4-2 sequence spring
㉟ 4-2 relay spring
㊱ Servo charger spring
㊲ 3-2 timing spring
㊳ 1st reducing spring
㊴ Overrunning clutch reducing spring
㊵ Torque converter regulator spring
㊶ Lock-up control spring
㊷ Shuttle duty shift spring

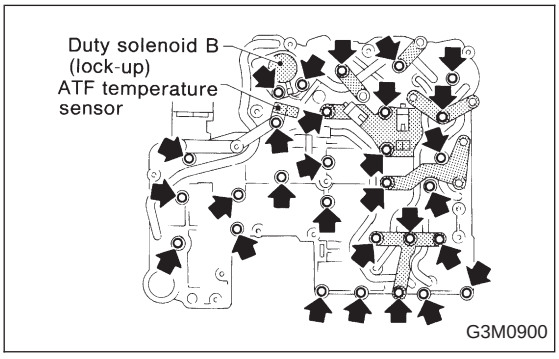
Unit: mm (in)

No.	Part name	Wire dia.	Outer dia.	Effective turn	Free length
25	Pressure regulator spring	1.6 (0.063)	14.0 (0.551)	5.6	31.5 (1.240)
26	Pressure modifier spring	0.8 (0.031)	6.8 (0.268)	10.0	31.95 (1.2579)
27	Modifier accumulator spring	1.3 (0.051)	9.8 (0.386)	8.8	30.5 (1.201)
28	Pilot spring	1.1 (0.043)	9.1 (0.358)	8.3	25.7 (1.012)
29	Accumulator control spring	0.4 (0.016)	6.6 (0.260)	11.0	27.5 (1.083)
30	Shift B spring	0.65 (0.0256)	7.0 (0.276)	9.5	25.0 (0.984)
31	Shift A spring	0.5 (0.020)	7.0 (0.276)	9.5	25.0 (0.984)
32	Shuttle shift spring	0.75 (0.0295)	5.65 (0.2224)	27.6	51.0 (2.008)
33	Overrunning clutch control spring	0.6 (0.024)	7.0 (0.276)	7.9	23.6 (0.929)
34	4-2 sequence spring	0.55 (0.0217)	6.95 (0.2736)	11.0	29.1 (1.146)
35	4-2 relay spring	0.55 (0.0217)	6.95 (0.2736)	11.0	29.1 (1.146)
36	Servo charger spring	0.7 (0.028)	6.7 (0.264)	9.0	23.0 (0.906)
37	3-2 timing spring	0.75 (0.0295)	6.75 (0.2657)	7.5	20.55 (0.8091)
38	1st reducing spring	0.75 (0.0295)	6.75 (0.2657)	12.5	25.4 (1.000)
39	Overrunning clutch reducing spring	1.05 (0.0413)	7.05 (0.2776)	15.21	34.7 (1.366)
40	Torque converter regulator spring	1.3 (0.051)	9.0 (0.354)	11.7	38.0 (1.496)
41	Lock-up control spring	0.75 (0.0295)	13.0 (0.512)	3.5	18.5 (0.728)
42	Shuttle duty shift spring	0.7 (0.028)	6.0 (0.236)	12.0	26.5 (1.043)

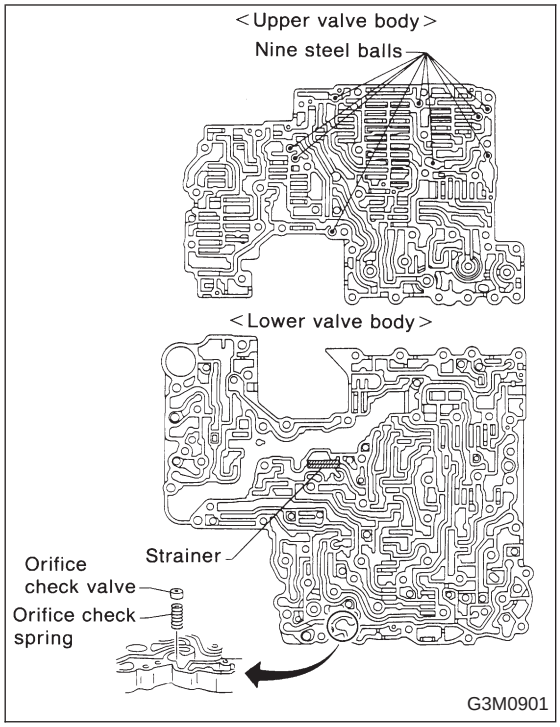


A: DISASSEMBLY

1) Remove the following parts from the upper valve body.
   (1) Solenoid assembly (shift 1-2-3)
   (2) Duty solenoid A (line pressure)



2) Remove the following parts from the lower valve body.
   (1) Duty solenoid B (lock-up)
   (2) ATF temperature sensor
   (3) Bracket
3) Separate the upper valve body and lower valve body.

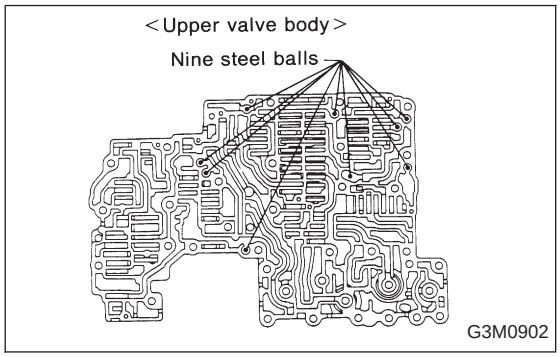


CAUTION:
- **Do not lose the nine (9) steel balls contained in the upper valve body.**
- **Do not lose an orifice and a strainer contained in the lower valve body.**

NOTE:
Remove the upper-lower valve body tightening bolts. Then remove two locating bolts. (⬅)
During ordinary servicing, clean the control valve bodies in this condition, without further disassembly.
In the event of a seized clutch or other problem, disassemble the control valve bodies further, and clean the component parts.

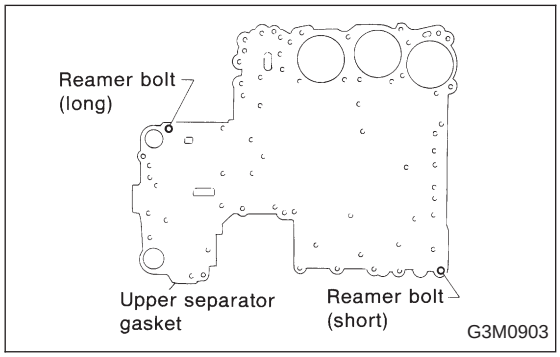
B: INSPECTION

Make sure that each component is free of harmful gouges, cuts, or dust.

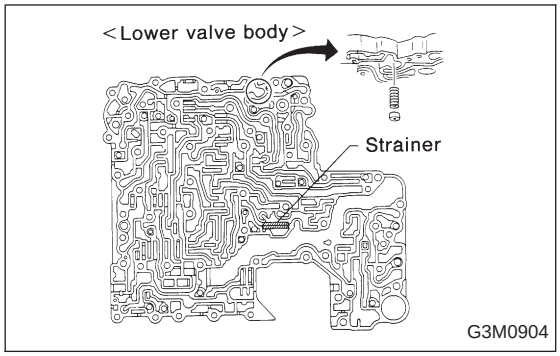


C: ASSEMBLY

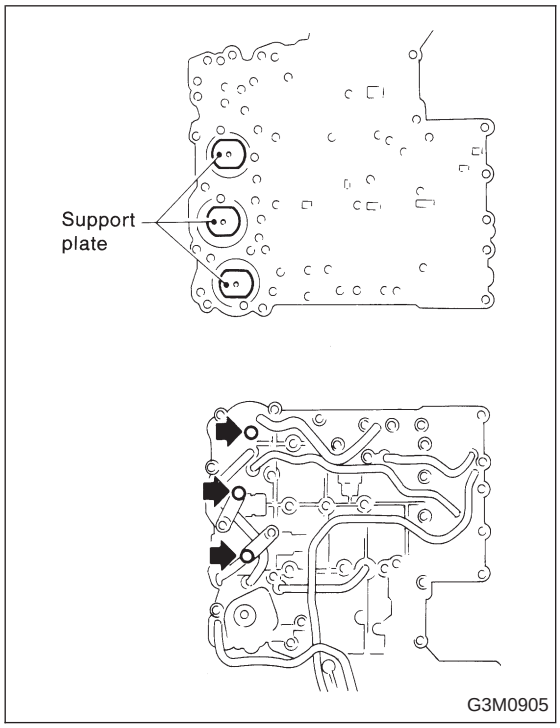
1) Install the nine steel balls to the upper valve body.



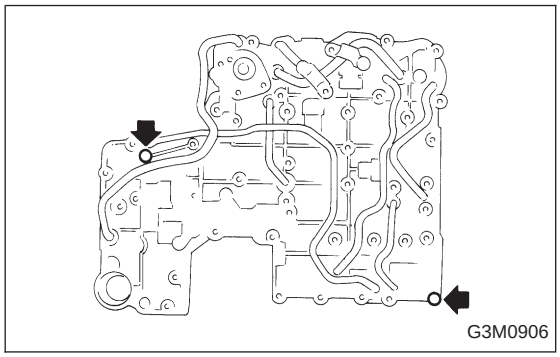
2) From under upper valve body, install two bolts using washers and position upper separator gasket.



3) Install the orifice check valve, orifice check spring and filter to the lower valve body.

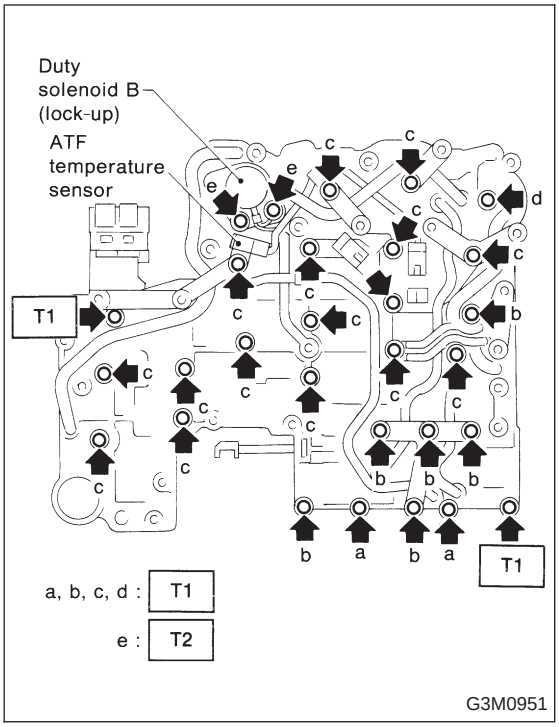


4) Install lower separate gasket and separate plate on lower body in that order, then temporarily tighten three support plates and two brackets.



5) Temporarily assemble lower valve body to upper valve body.

CAUTION:
Be careful not to drop the upper body interior steel ball, or the lower body interior filter, orifice check spring, or orifice check valve.

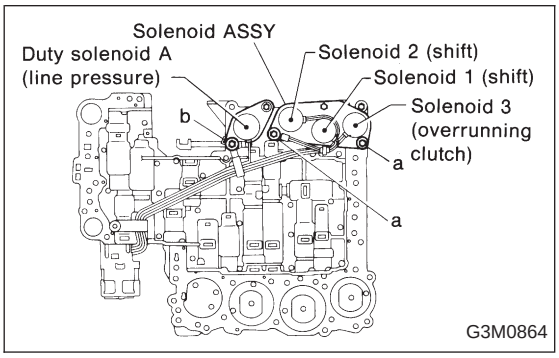


6) Install the duty solenoid B, ATF temperature sensor and four bracket.
7) Tighten twenty seven bolts & washers and two reamer bolts.

Tightening torque:
T1: 8±1 N·m (0.8±0.1 kg-m, 5.8±0.7 ft-lb)
T2: 11.3±1.5 N·m (1.15±0.15 kg-m, 8.3±1.1 ft-lb)

Unit: mm (in)

	a	b	c	d	e
Length	70 (2.76)	50 (1.97)	33 (1.30)	27 (1.06)	28 (1.10)
Numbers	2	6	16	1	2



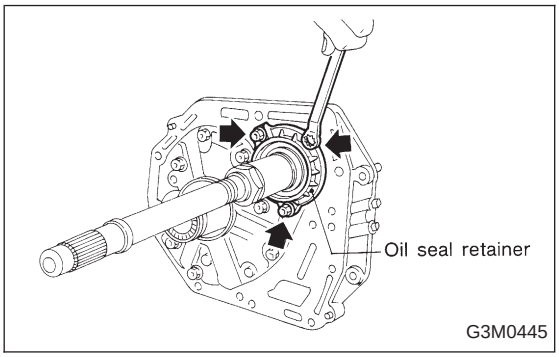
8) Install the shift solenoid and duty solenoid A.

a length : 16 mm (0.63 in)
b length : 27 mm (1.06 in)

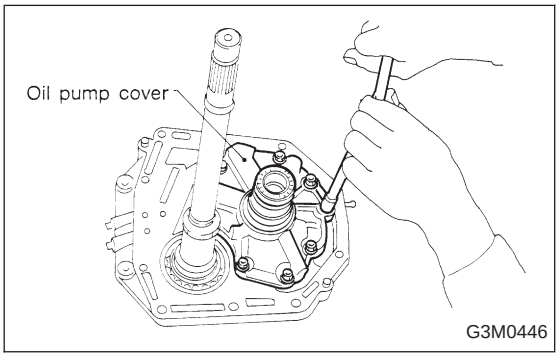
Tightening torque:
8.3±1.5 N·m (0.85±0.15 kg-m, 6.1±1.1 ft-lb)

7. Oil Pump Assembly

A: DISASSEMBLY

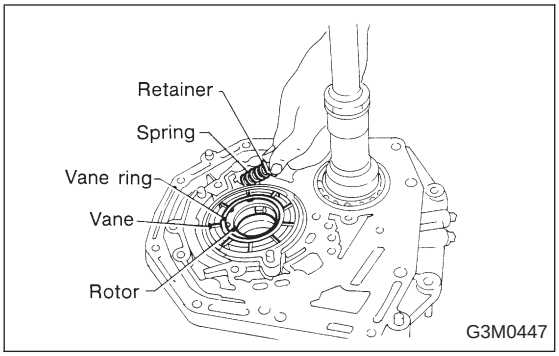


1) Remove the oil seal retainer.
Also remove the O-ring and oil seal (air breather).

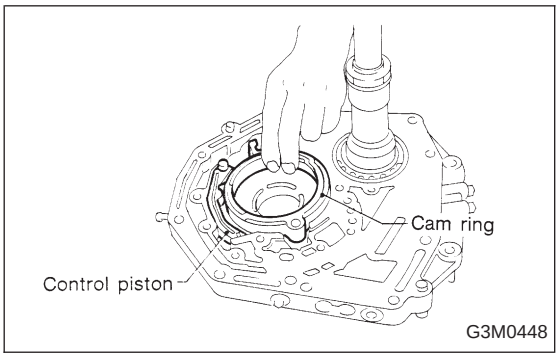


2) Remove the oil pump cover.

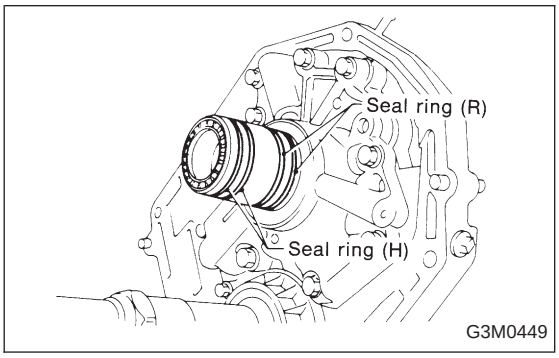
NOTE:
Lightly tap the end of the stator shaft to remove the cover.



3) Remove the retainer and return spring. Then remove the rotor, two vane rings and nine vanes.



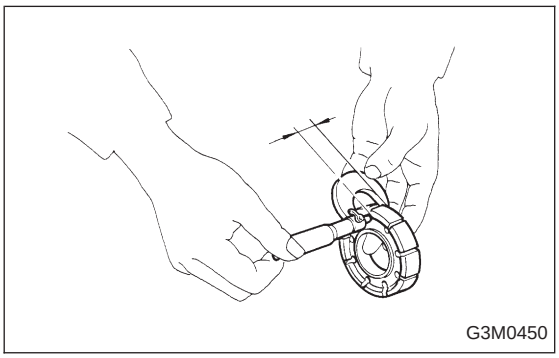
4) Remove the cam ring and control piston.
Also remove the O-ring, friction ring, two side seals, and plain seal.



5) Remove two seal rings (R) and two seal rings (H).

B: INSPECTION

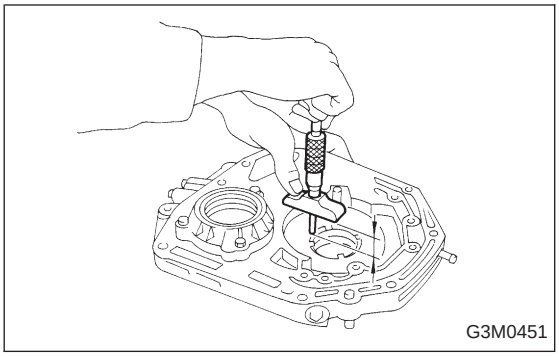
1) Make sure that each component is free of harmful gouges, cuts, and dust.



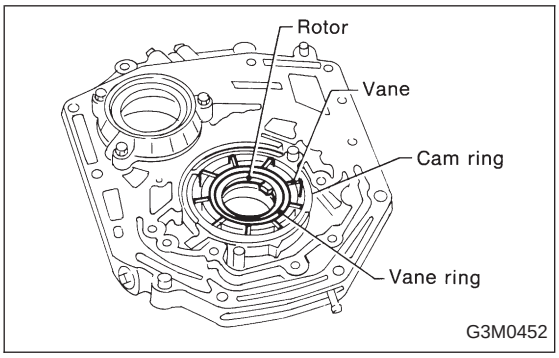
2) Selection of oil pump components (rotor, vanes, control piston and cam ring):

(1) Using a micrometer, measure the height of the rotor, vanes, control piston and cam ring in at least four positions. (Measure the height at one place for each of the nine vanes.)

NOTE:
- Remove the control piston seals when measuring.
- Remove the friction ring from the cam ring when measuring.


G3M0451

(2) Using a depth gauge, measure the depth of the oil pump housing from the contact/sliding surface of the above mentioned component parts in the same manner as above.



G3M0452

(3) Make sure that the clearances are within the specified wear limits. If the wear limit is exceeded, select pump components so that the standard clearance can be obtained.

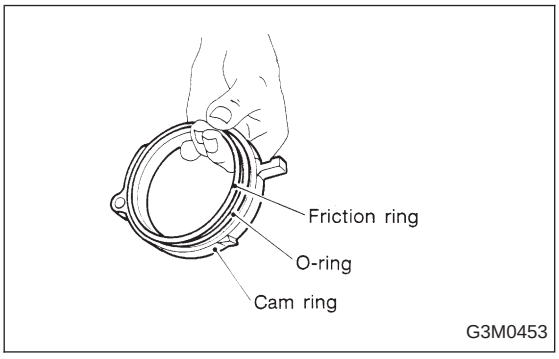
Unit: mm (in)

Part name	Wear limit	Standard value
Rotor, control piston, vanes	0.054 (0.0021)	0.030 — 0.044 (0.0012 — 0.0017)
Cam ring	0.034 (0.0013)	0.010 — 0.024 (0.0004 — 0.0009)

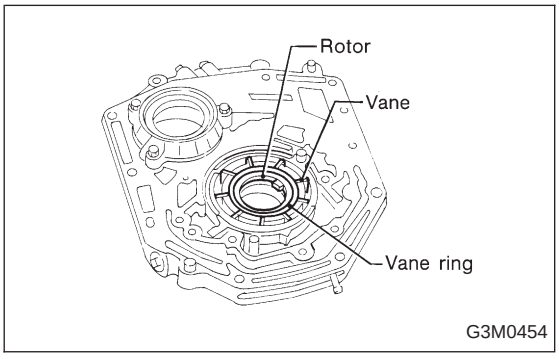
NOTE:
Select vanes which are the same height as the rotor.

C: ASSEMBLY

1) Coat both the O-ring and friction ring with vaseline and attach to the cam ring. Then fit them into the oil pump housing.

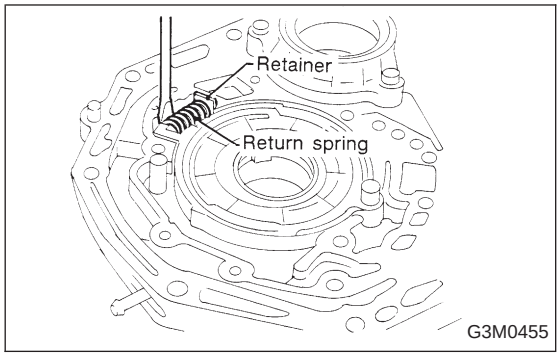


G3M0453

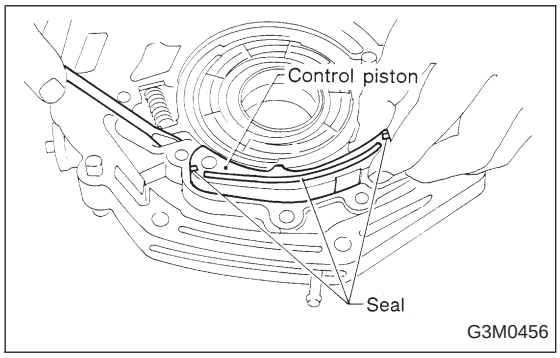


G3M0454

2) Install the vane ring, rotor and vanes into the housing in this sequence.



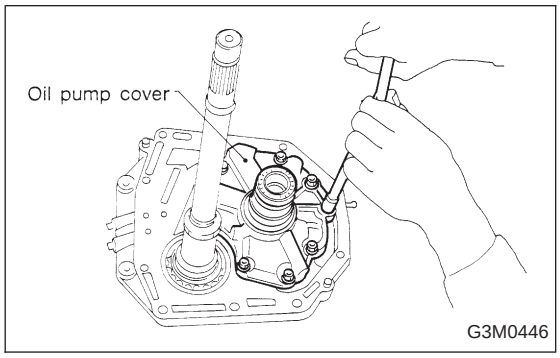
3) Install the return spring and retainer between the housing and cam ring.



4) Install the control piston to the oil pump housing.

NOTE:
Fit the seal in the piston groove, with the red seals facing the top side. (Two side seals and one plain seal are attached.)

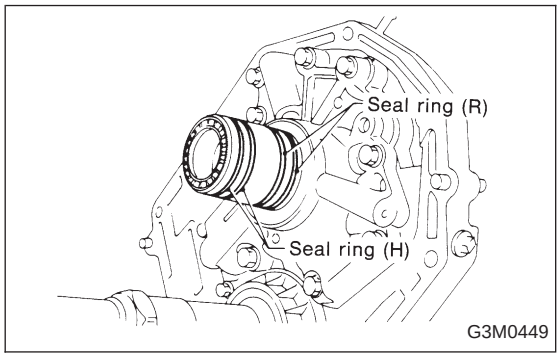
5) Set the rotor at the center of the housing bore. Apply ATF abundantly to each rotary portion.



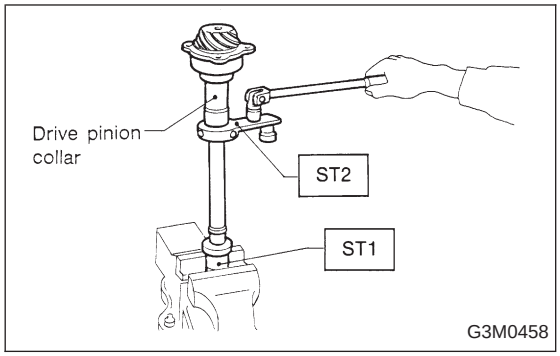
6) Install the oil pump cover.

Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)

NOTE:
- Align both pivots with the pivot holes of the cover, and install the cover being careful not to apply undue force to the pivots.
- After assembling, turn the oil pump shaft to check for smooth rotation of the rotor.



NOTE:
- Install the oil seal retainer and seal rings (R) and (H) after adjusting the drive pinion backlash and tooth contact.



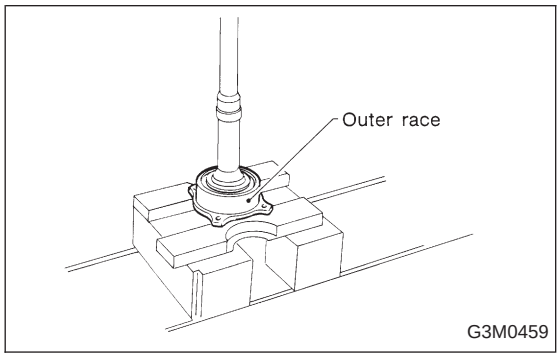
8. Drive Pinion Shaft

A: DISASSEMBLY

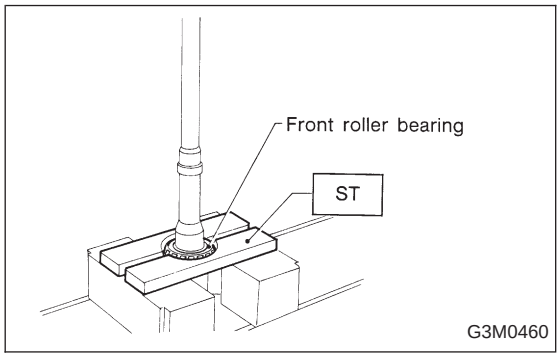
1) Straighten the staked portion of the lock nut, and remove the lock nut while locking the rear spline portion of the shaft with ST1 and ST2. Then pull off the drive pinion collar.

ST1 498937100 HOLDER
ST2 499787100 WRENCH

NOTE:
Remove the O-ring



2) Using a press, separate the rear roller bearing and outer race from the shaft.

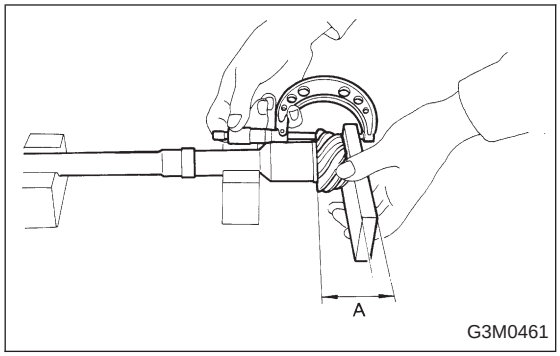


3) Using a press and ST, separate the front roller bearing from the shaft.

ST 498517000 REPLACER

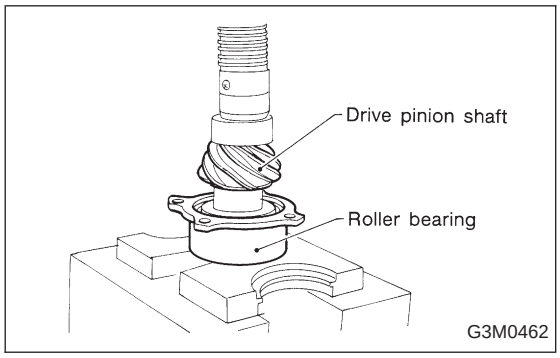
B: INSPECTION

Make sure that all component parts are free of harmful cuts, gouges, and other faults.



C: ASSEMBLY

1) Measure dimension “A” of the drive pinion shaft.

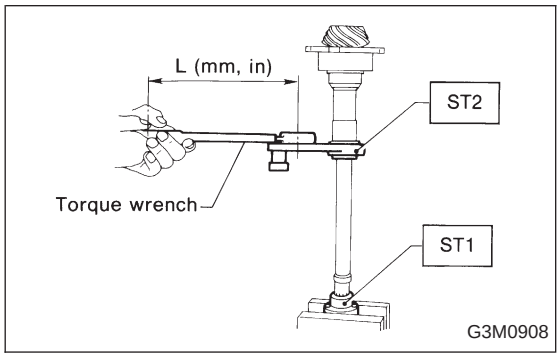


2) Using a press, force-fit the roller bearing in position.

CAUTION:
Do not change the relative positions of the outer race and bearing cone.

3) After fitting the O-ring to the shaft, attach the drive pinion collar to the shaft.

CAUTION:
Be careful not to damage the O-ring.



4) Tighten the lock washer and lock nut with ST1.

ST1 498937100 HOLDER

Actual tightening torque:
113±5 N·m (11.5±0.5 kg-m, 83.2±3.6 ft-lb)

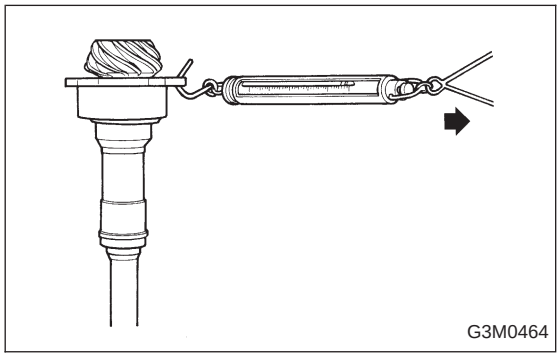
NOTE:
- Pay attention to the orientation of lock washer.
- Tightening torque using wrench is determined by the following equation:

$$T_1 = \frac{72.2}{L + 72.2} \times T$$

T: Actual tightening torque

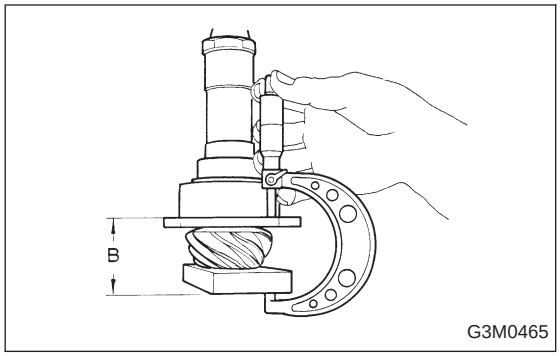
- Install ST2 (WRENCH) to torque wrench as straight as possible.

ST2 499787100 WRENCH



5) Measure the starting torque of the bearing.
Make sure the starting torque is within the specified range.
If out of the allowable range, replace the roller bearing.

Starting torque:
0.3 — 2.0 N·m (3 — 20 kg-cm, 2.6 — 17.4 ft-lb)



6) Stake the lock nut securely at two places.
7) Measure dimension “B” of the drive pinion shaft.

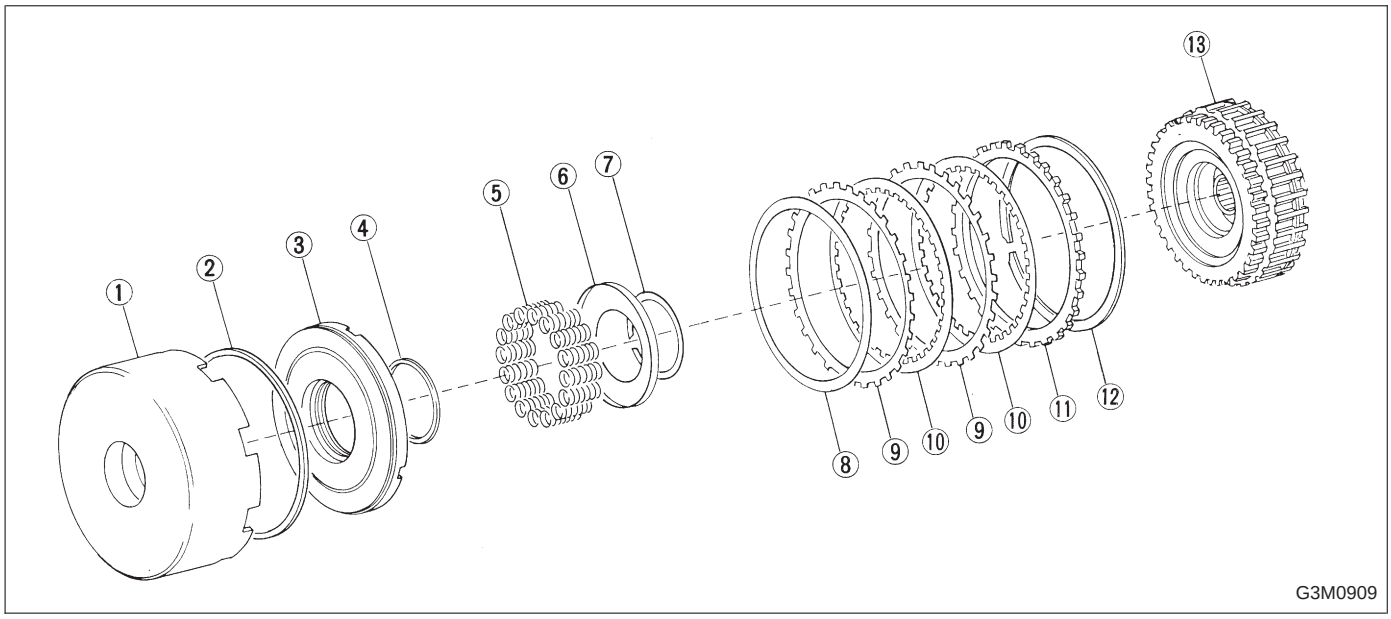
8) Determine the thickness t (mm) of the drive pinion shim.

t = 6.5±0.0625 − (B − A)

NOTE:
The number of shims must be three or less.

	Part No.	Thickness mm (in)
● Available drive pinion shims	31451AA050	0.15 (0.0059)
	31451AA060	0.175 (0.0069)
	31451AA070	0.2 (0.008)
	31451AA080	0.225 (0.0089)
	31451AA090	0.25 (0.0098)
	31451AA100	0.275 (0.0108)

9. Reverse Clutch



① Reverse clutch drum
② Lip seal
③ Reverse clutch piston
④ Lathe cut seal ring
⑤ Spring
⑥ Spring retainer
⑦ Snap ring
⑧ Dish plate
⑨ Driven plate
⑩ Drive plate
⑪ Retaining plate
⑫ Snap ring
⑬ High clutch drum

A: DISASSEMBLY

1) Remove the snap ring ⑫, and take out the retaining plate ⑪, drive plates ⑩, driven plates ⑨, and dish plate ⑧.
2) Using the ST1, ST2 and ST3, remove the snap ring ⑦ and take out the spring retainer ⑥ and spring ⑤.

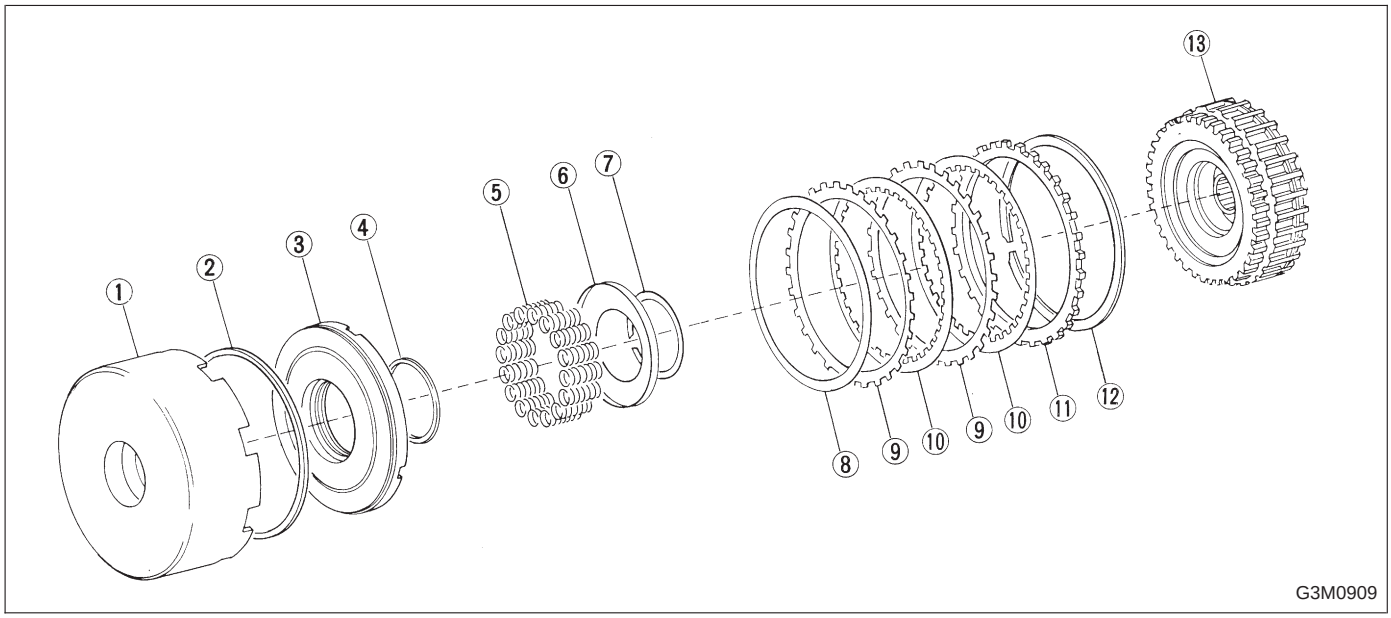
ST1 398673600 COMPRESSOR
ST2 398177700 INSTALLER
ST3 399893600 PLIERS

3) Take out the piston ③ by applying compressed air.

B: INSPECTION

1) Drive plate facing for wear and damage
2) Snap ring for wear, return spring for breakage or setting, and spring retainer for deformation
3) Lip seal and lathe cut seal ring for damage
4) Piston check ball for operation

C: ASSEMBLY



① Reverse clutch drum
② Lip seal
③ Reverse clutch piston
④ Lathe cut seal ring
⑤ Spring
⑥ Spring retainer
⑦ Snap ring
⑧ Dish plate
⑨ Driven plate
⑩ Drive plate
⑪ Retaining plate
⑫ Snap ring
⑬ High clutch drum

1) Using the ST1, ST2 and ST3 as those used in disassembling, assemble piston ③ the return spring ⑤, spring retainer ⑥ and snap ring ⑦.

ST1 398673600 COMPRESSOR
ST2 398177700 INSTALLER
ST3 399893600 PLIERS

2) Assemble the dish plate ⑧, driven plates ⑨, drive plates ⑩ and retaining plate ⑪ in that order and attach the snap ring ⑫.

NOTE:
Pay attention to the orientation of the dish plate.

3) Checking operation:
Apply compressed air intermittently to the oil hole, and check the reverse clutch for smooth operation.

4) Measuring clearance (Retaining plate selection)

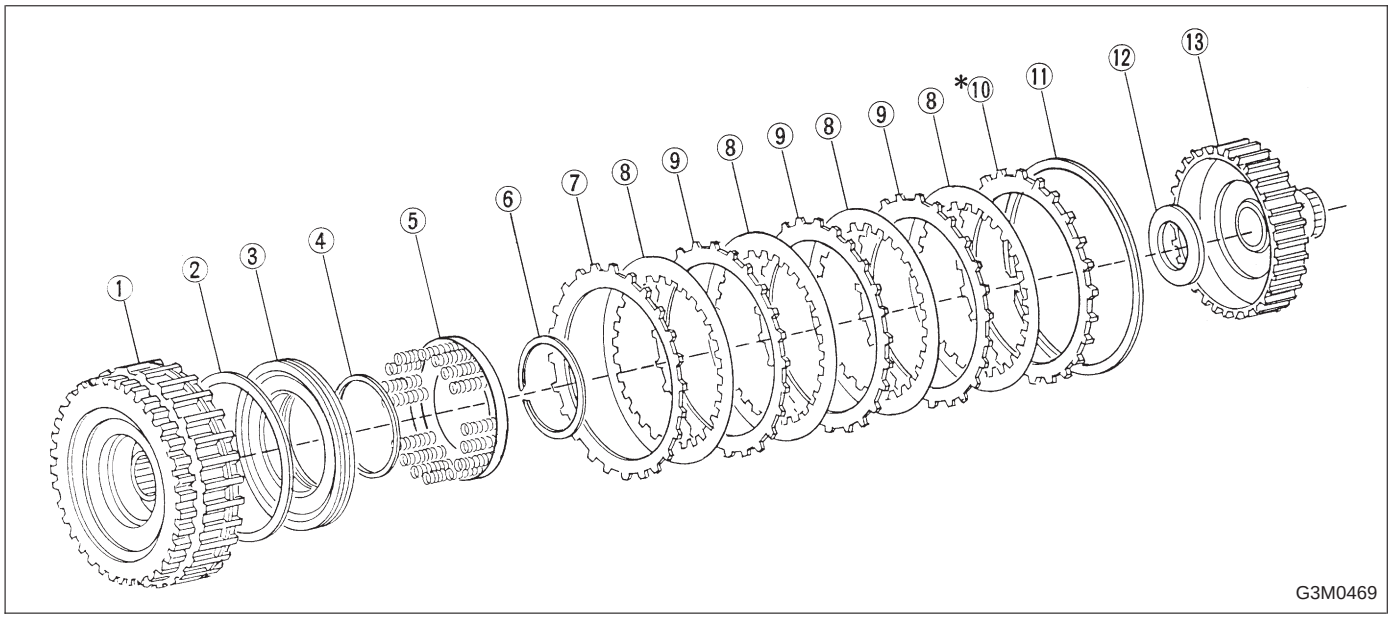
Standard value:
0.5 — 0.8 mm (0.020 — 0.031 in)

Allowable limit:
1.2 mm (0.047 in)

NOTE:
Before measuring clearance, place the same thickness of shim on both sides to prevent retaining plate from tilting.

	Part No.	Thickness mm (in)
• Available retaining plates	31567AA350	4.6 (0.181)
	31567AA360	4.8 (0.189)
	31567AA370	5.0 (0.197)
	31567AA380	5.2 (0.205)
	31567AA390	5.4 (0.213)

10. High Clutch



① High clutch drum
② Lathe cut seal ring
③ High clutch piston
④ Lathe cut seal ring
⑤ Spring retainer
⑥ Snap ring
⑦ Driven plate (Thinner)
⑧ Drive plate
⑨ Driven plate (Thicker)
⑩ Retaining plate
⑪ Snap ring
⑫ Thrust needle bearing
⑬ High clutch hub

A: DISASSEMBLY

1) Remove the snap ring ⑪, and take out the retaining plate ⑩, drive plates ⑧, and driven plates ⑦, ⑨.
2) Using the ST1, ST2 and ST3, remove the snap ring ⑥ and take out the spring retainer ⑤.

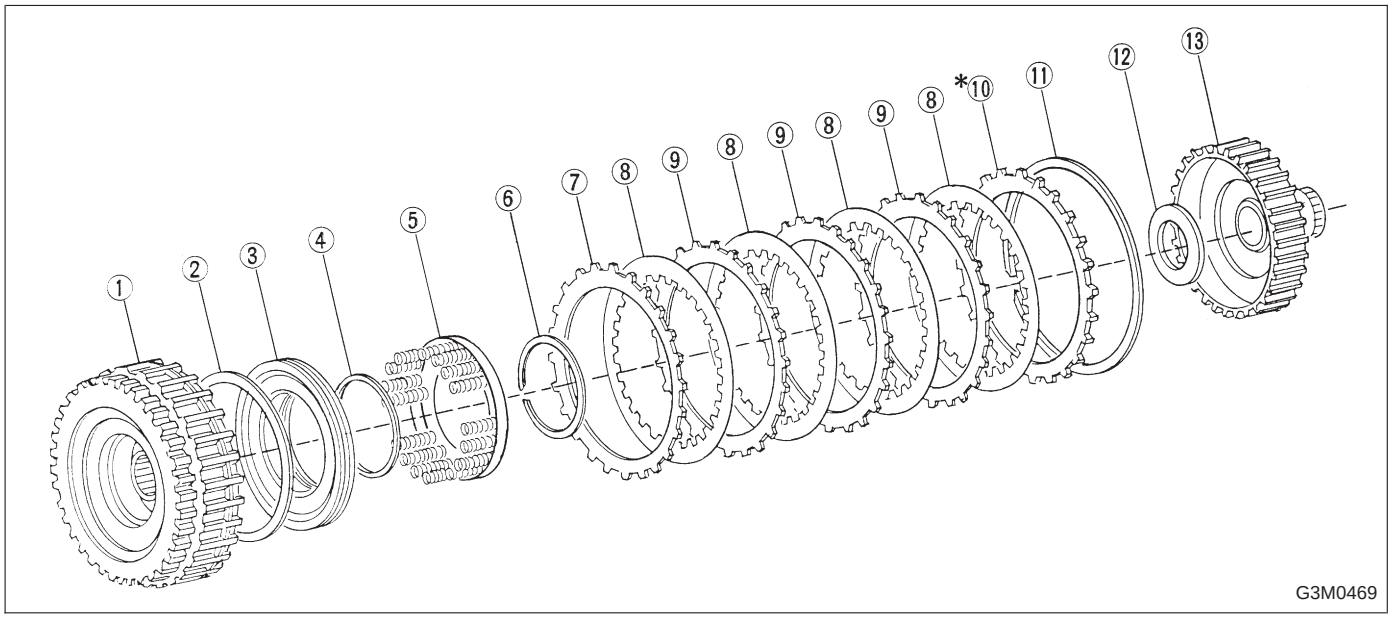
ST1 398673600 COMPRESSOR
ST2 398177700 INSTALLER
ST3 399893600 PLIERS

3) Apply compressed air to the clutch drum ① to remove the piston ③.

B: INSPECTION

1) Drive plate facing for wear and damage
2) Snap ring for wear, return spring for setting and breakage, and spring retainer for deformation
3) Lathe cut rings (large) (small) for damage
4) Piston check ball for smooth operation

C: ASSEMBLY



① High clutch drum
② Lathe cut seal ring
③ High clutch piston
④ Lathe cut seal ring
⑤ Spring retainer
⑥ Snap ring
⑦ Driven plate (Thinner)
⑧ Drive plate
⑨ Driven plate (Thicker)
⑩ Retaining plate
⑪ Snap ring
⑫ Thrust needle bearing
⑬ High clutch hub

1) Using the ST1, ST2 and ST3 as those used in disassembling, assemble the piston ③, spring retainer ⑤, and snap ring ⑥.

ST1 398673600 COMPRESSOR
ST2 398177700 INSTALLER
ST3 399893600 PLIERS

2) Install the driven plate (thinner) ⑦, drive plates ⑧, driven plates (thicker) ⑨, and retaining plate ⑩ in that order. Then attach the snap ring ⑪.

3) Checking operation:
Apply compressed air intermittently to the oil hole, and check the high clutch for smooth operation.

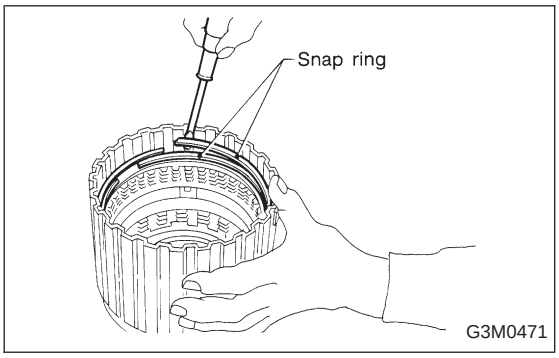
4) Measuring clearance (Retaining plate selection)

Standard value:
1.8 — 2.2 mm (0.071 — 0.087 in)

Allowable limit:
2.6 mm (0.102 in)

NOTE:
Before measuring clearance, place the same thickness of shim on both sides to prevent retaining plate from tilting.

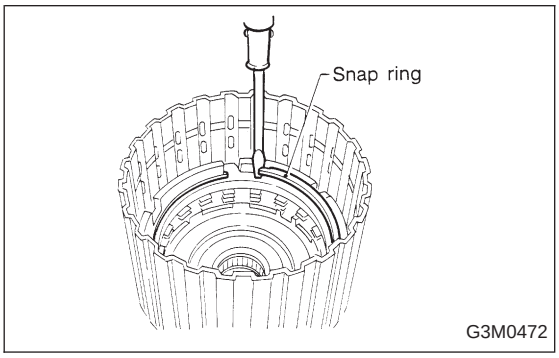
	Part No.	Thickness mm (in)
• Available retaining plates	31567AA190	3.6 (0.142)
	31567AA200	3.8 (0.150)
	31567AA210	4.0 (0.157)
	31567AA220	4.2 (0.165)
	31567AA230	4.4 (0.173)
	31567AA240	4.6 (0.181)
	31567AA250	4.8 (0.189)
	31567AA260	5.0 (0.197)



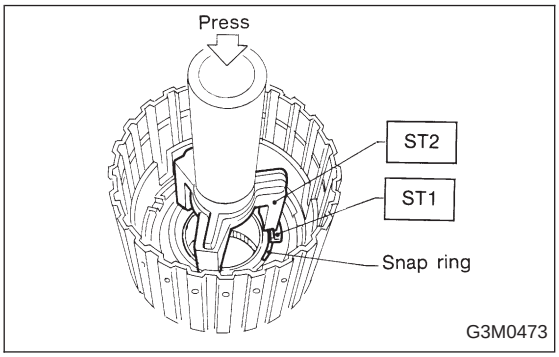
11. Forward Clutch Drum

A: DISASSEMBLY

1) Remove two snap rings from the forward clutch drum.
2) Remove the retaining plate, drive plates, driven plates and dish plate. (Forward clutch)

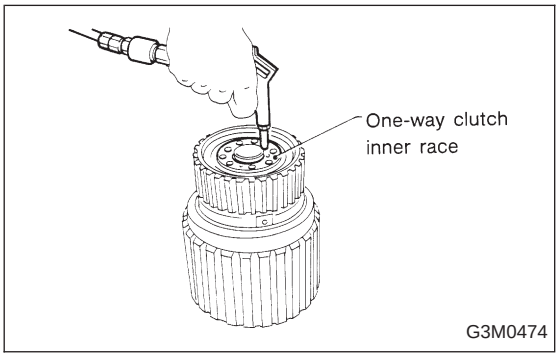


3) Remove the snap ring from the forward clutch drum.
4) Remove the retaining plate, drive plates, driven plates and dish plate. (Overrunning clutch)

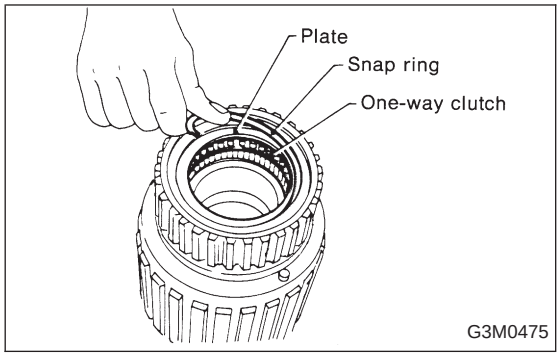


5) Compress the spring retainer, and remove the snap ring from the forward clutch, by using ST1 and ST2.

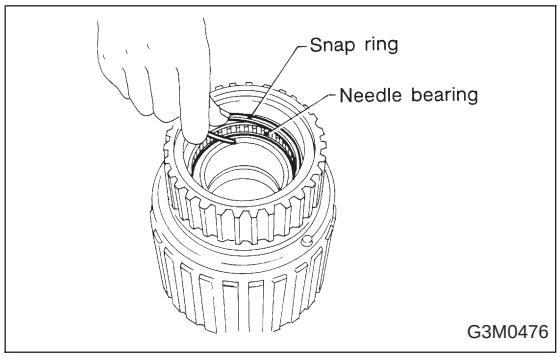
ST1 498627100 SEAT
ST2 398673600 COMPRESSOR



6) Install the one-way clutch inner race to the forward clutch drum, and apply compressed air to remove the over-running piston and forward piston.



7) Remove the one-way clutch after taking out the snap ring.

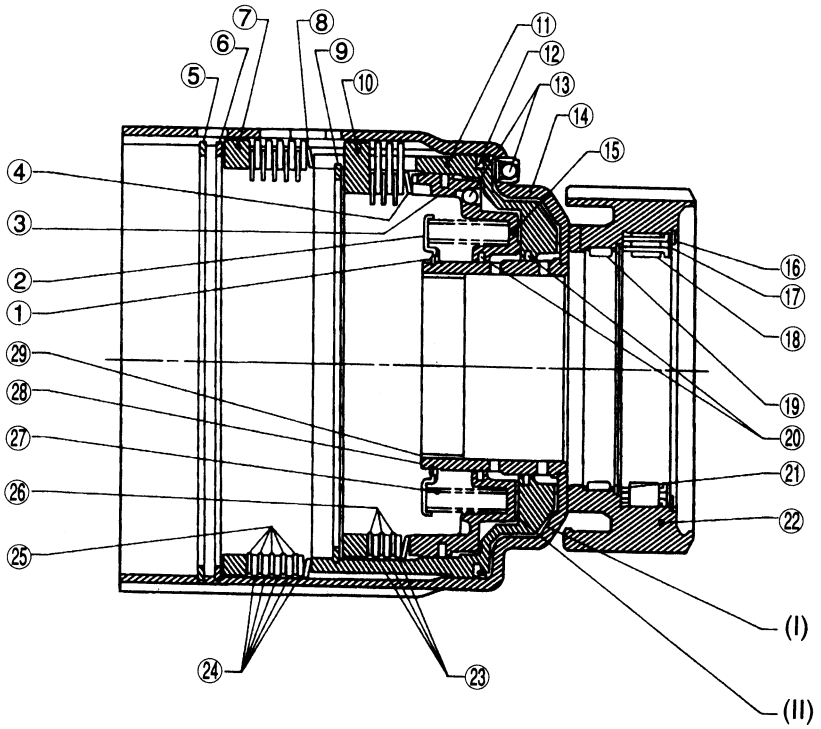


8) Remove the needle bearing after taking out the snap ring.

B: INSPECTION

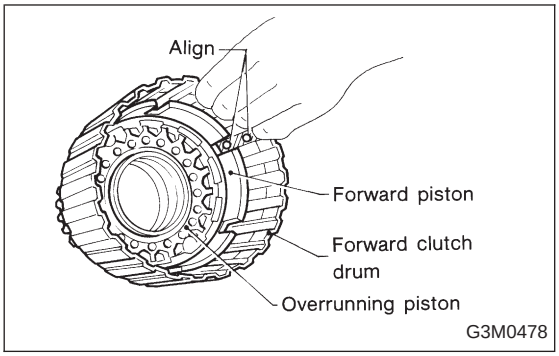
1) Drive plate facing for wear and damage
2) Snap ring for wear, return spring for setting and breakage, and snap ring retainer for deformation
3) Lip seal and lathe cut ring for damage
4) Piston and drum check ball for operation

C: ASSEMBLY



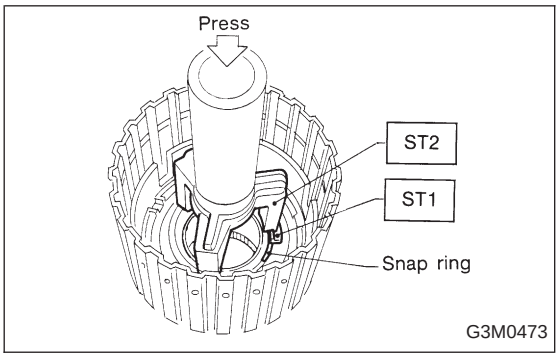
B3H0014A

① Snap ring
② Retainer
③ Lathe cut seal ring
④ Dish plate
⑤ Snap ring
⑥ Snap ring
⑦ Retaining plate
⑧ Dish plate
⑨ Snap ring
⑩ Retaining plate
⑪ Forward clutch piston
⑫ Lathe cut seal ring
⑬ Drift ball
⑭ Forward clutch drum
⑮ Overrunning clutch piston
⑯ Snap ring
⑰ Plate
⑱ O.W.C. (1-2)
⑲ Needle bearing
⑳ Lathe cut seal ring
㉑ Snap ring
㉒ Outer race
㉓ Driven plate
㉔ Driven plate (Thicker)
㉕ Drive plate (Thinner)
㉖ Drive plate
㉗ Return spring
㉘ Sleeve
㉙ Bushing



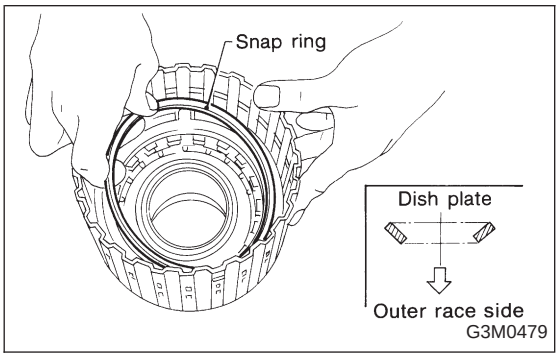
1) Fit the forward piston and overrunning piston to the forward clutch drum.

NOTE:
Align the forward piston cut-out portion with the spline of the drum.



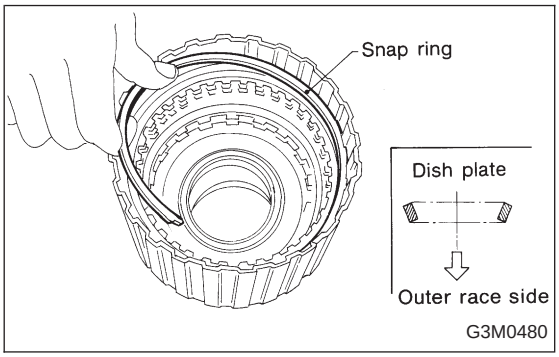
2) Set the retainer on the piston with a press using ST1 and ST2, and attach the snap ring.

ST1 498627000 SEAT
ST2 398673600 COMPRESSOR



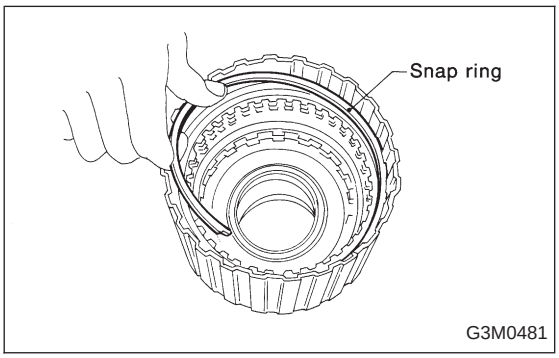
3) Install the dish plate, driven plates, drive plates, and retaining plate, and secure with the snap ring. (Overrunning clutch)

NOTE:
Pay attention to the orientation of the dish plate.

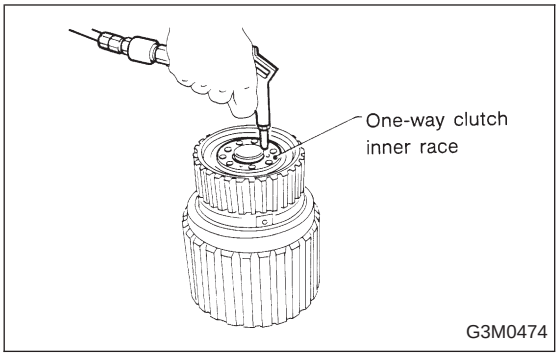


4) Install the dish plates, driven plates (1800 cc / 4 sheets, 2200 cc / 6 sheets), drive plates (1800 cc / 4 sheets, 2200 cc / 6 sheets), and retaining plate, and secure with the snap ring. (Forward clutch)

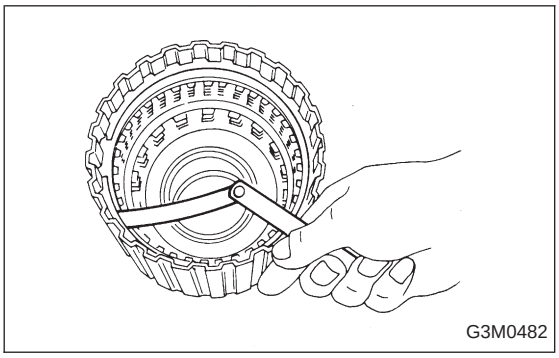
NOTE:
Pay attention to the orientation of the dish plate.



5) Install the snap ring (for front planetary carrier).



6) Check the forward clutch and overrunning clutch for operation.
Set the one-way clutch inner race, and apply compressed air for checking.



7) Checking clearance

- Forward clutch

Standard value:
0.45 — 0.85 mm (0.0177 — 0.0335 in)
Allowable limit:
1.6 mm (0.063 in)

- Overrunning clutch

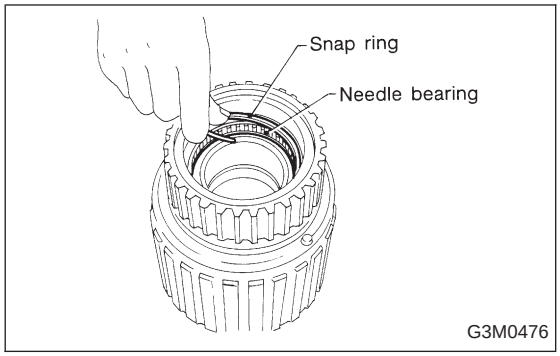
Standard value:
1.0 — 1.4 mm (0.039 — 0.055 in)
Allowable limit:
2.0 mm (0.079 in)

NOTE:
Before measuring clearance, place the same thickness of shim on both sides to prevent retaining plate from tilting.

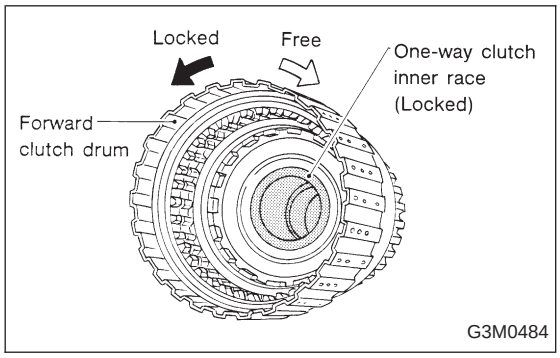
If the clearance is out of the specified range, select a proper retaining plate so that the standard clearance can be obtained.

	Part No.	Thickness mm (in)
• Forward clutch	31567AA270	4.0 (0.157)
	31567AA280	4.2 (0.165)
	31567AA290	4.4 (0.173)
	31567AA300	4.6 (0.181)
	31567AA310	4.8 (0.189)
	31567AA320	5.0 (0.197)
	31567AA330	5.2 (0.205)

	Part No.	Thickness mm (in)
• Overrunning clutch	31567AA120	8.0 (0.315)
	31567AA130	8.2 (0.323)
	31567AA140	8.4 (0.331)
	31567AA150	8.6 (0.339)
	31567AA160	8.8 (0.346)
	31567AA170	9.0 (0.354)
	31567AA180	9.2 (0.362)



8) Install the needle bearing, and secure with the snap ring.



8) Install the one-way clutch (1-2) and plate, and secure with the snap ring.

NOTE:
Set the inner race. Make sure that the forward clutch is free in the clockwise direction and locked in the counter-clockwise direction, as viewed from the front of the vehicle.

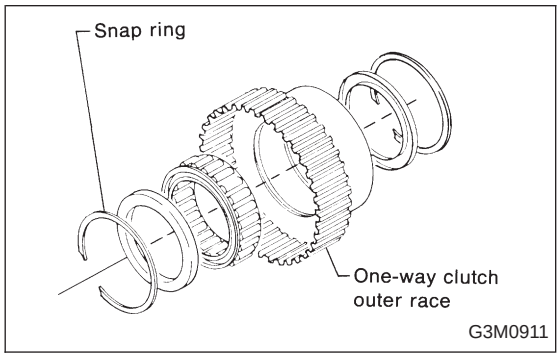
12. One-way Clutch Outer Race

A: DISASSEMBLY

Remove the snap ring. Then remove the one-way clutch (3-4).

B: INSPECTION

Check the sliding surface and one-way clutch (3-4) for any harmful cuts, damage, or other faults.

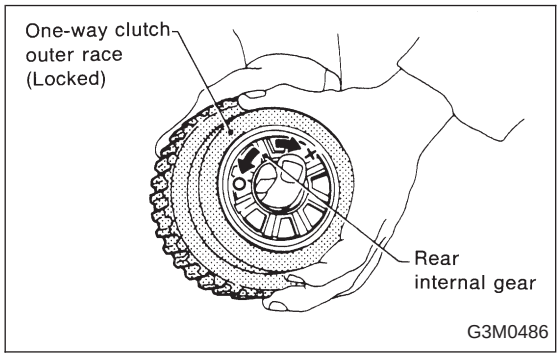


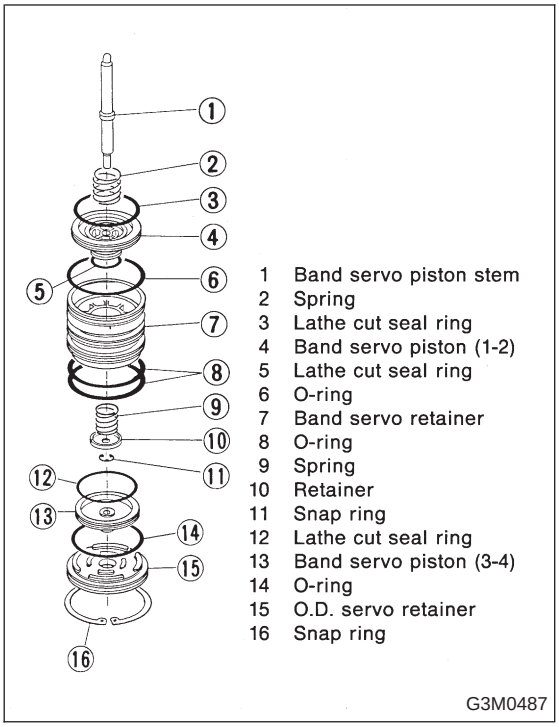
C: ASSEMBLY

1) Assemble the one-way clutch (3-4), and secure with the snap ring.

NOTE:
Pay attention to the orientation of the one-way clutch (3-4).

2) Assemble the rear internal gear, and secure the outer race. Make sure that the internal gear is locked in the clockwise direction, and free to rotate in the counterclockwise direction.





13. Servo Piston

A: DISASSEMBLY

1) Remove the spring ②.
2) Remove the band servo piston (3-4) ⑬.
3) While compressing the retainer ⑩ from above, remove the snap ring ⑪. Then remove the retainer ⑩, spring ⑨ and stem ①.
4) Take out the band servo piston (1-2) ④.

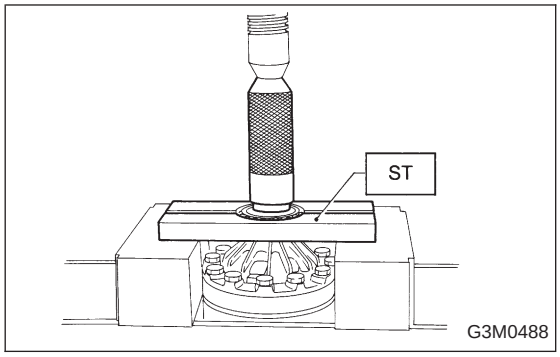
B: INSPECTION

1) Check each component for harmful cuts, damage, or other faults.
2) Check the O-ring and lathe cut ring for damage.

C: ASSEMBLY

1) Install the band servo piston (1-2) ④ to the retainer ⑦, and insert the stem ①.
2) Put the spring ⑨ and retainer ⑩ on the piston ⑬. Fit the snap ring ⑪ securely while compressing the spring ⑨.
3) Install the band servo piston (3-4) ⑬.
4) Install the spring ② securely to the band servo piston (1-2) ④.

CAUTION:
● Many different O-rings and lathe cut rings are used. Be careful not to confuse them when installing.
● Be careful not to damage O-rings and lathe cut rings.



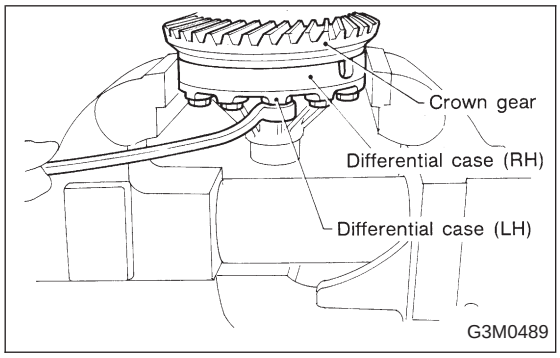
14. Differential Case Assembly

A: DISASSEMBLY

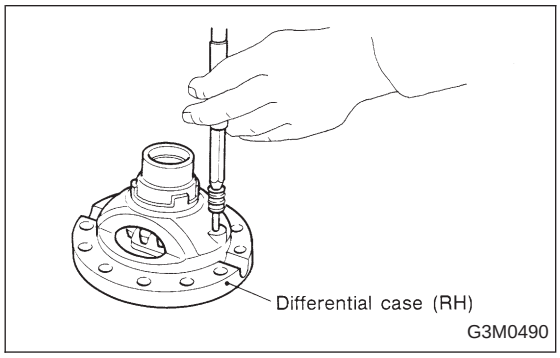
1) Using a press and ST, remove the taper roller bearing.

ST 498077000 REMOVER

CAUTION:
Be careful not to damage the speedometer drive gear.



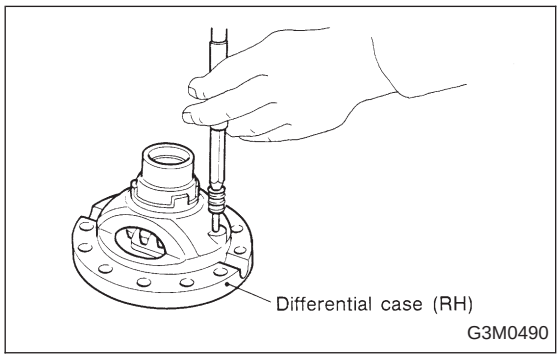
2) Secure the case in a vise and remove the crown gear tightening bolts, then separate the crown gear, case (RH) and case (LH).



3) Pull out the straight pin and shaft, and remove the differential bevel gear, washer, and differential bevel pinion.

B: INSPECTION

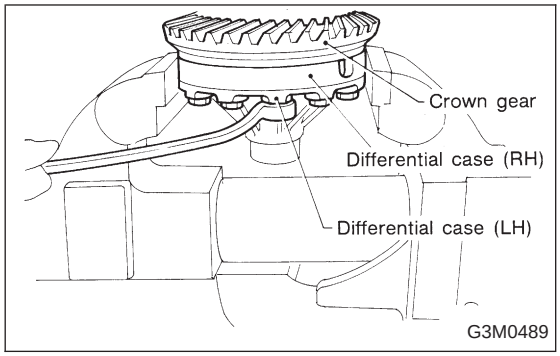
Check each component for harmful cuts, damage and other faults.



C: ASSEMBLY

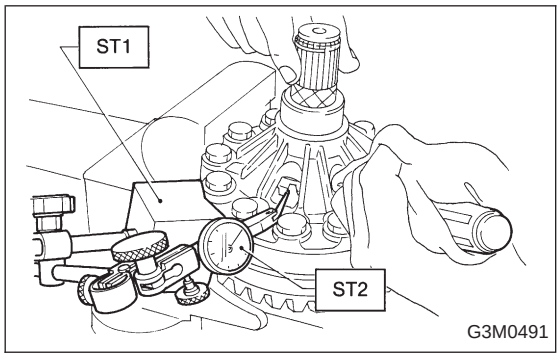
1) Install the washer, differential bevel gear and differential bevel pinion in the differential case (RH). Insert the pinion shaft, and fit the straight pin.

NOTE:
Install straight pin from reverse direction.



2) Install the washer and differential bevel gear to the differential case (LH). Then put the case over the differential case (RH), and connect both cases.
3) Install the crown gear and secure by tightening the bolt.

Standard tightening torque:
62±3 N·m (6.3±0.3 kg-m, 45.6±2.2 ft-lb)

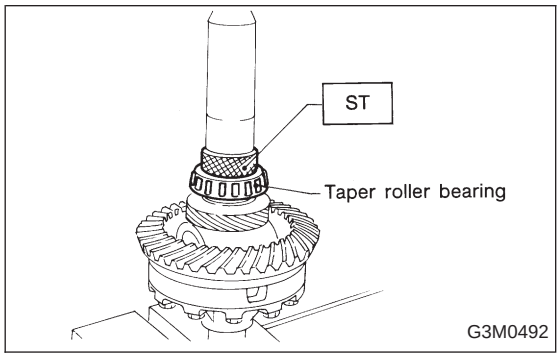


4) Measurement of backlash (Selection of washer).
Measure the gear backlash with ST1 and ST2, and insert ST2 through the access window of the case.

ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

Standard value:
0.13 — 0.18 mm (0.0051 — 0.0071 in)

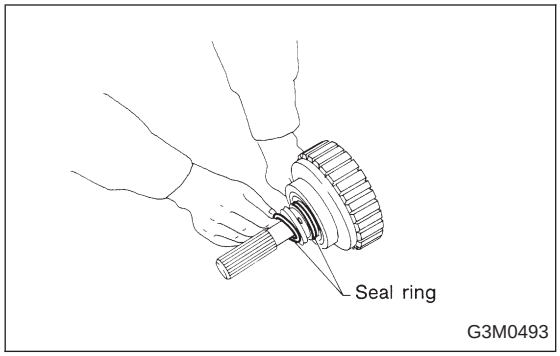
NOTE:
Measure the backlash by applying a pinion tooth between two bevel gear teeth.



5) Install the speedometer drive gear. Then force-fit the taper roller bearing with a press and ST.

ST 398487700 DRIFT

CAUTION:
Be sure to position correctly the locking end of the speedometer drive gear.

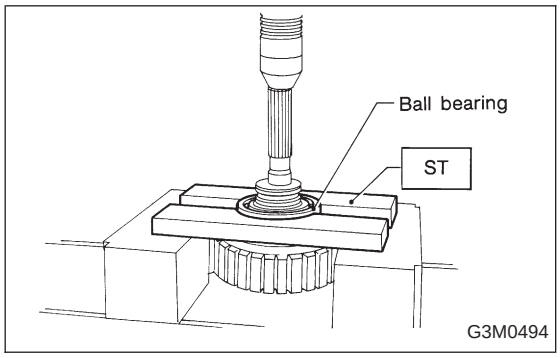


15. Transfer Clutch

A: DISASSEMBLY

1) Remove the seal ring.

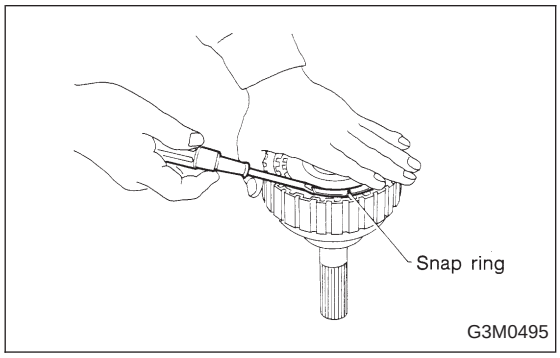
CAUTION:
Be careful not to damage the seal ring.



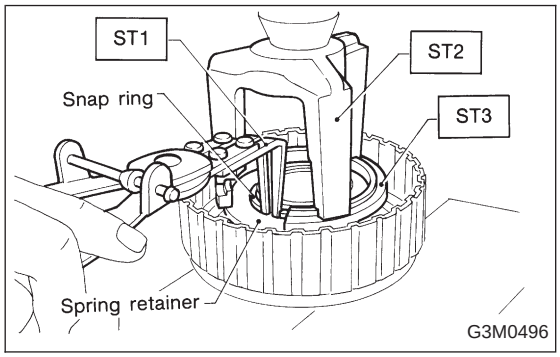
2) Using a press and ST, remove the ball bearing.

ST 498077000 REMOVER

CAUTION:
Do not reuse the bearing.

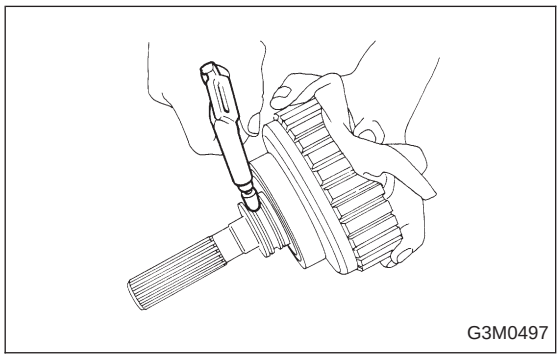


3) Remove the snap ring, and take out the pressure plate, drive plates, and driven plates.



4) Remove the snap ring with ST1, ST2 and ST3, and take out the spring retainer.

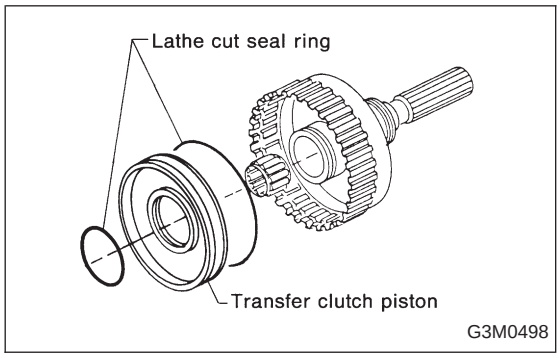
ST1 399893600 PLIERS
ST2 398673600 COMPRESSOR
ST3 498627000 SEAT



5) Apply compressed air to the rear drive shaft to remove the piston.

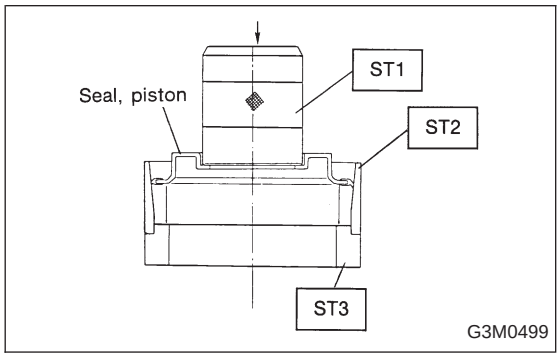
B: INSPECTION

1) Check the drive plate facing for wear and damage.
2) Check the snap ring for wear, return spring for permanent set and breakage, and spring retainer for deformation.
3) Check the lathe cut ring for damage.



C: ASSEMBLY

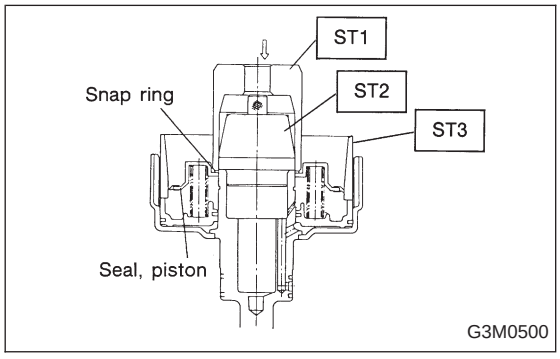
1) Install the lathe cut seal ring to the I.D./O.D. of the transfer clutch piston.



2) Install piston.
   (1) Connect piston to rear drive shaft (until it reaches hole in valve body).
   (2) Install spring retainer to piston.
   (3) Using ST1, ST2 and ST3, attach transfer piston seal to ST2.

ST1 499247400 INSTALLER
ST2 499257400 PISTON GUIDE
ST3 498267400 TABLE

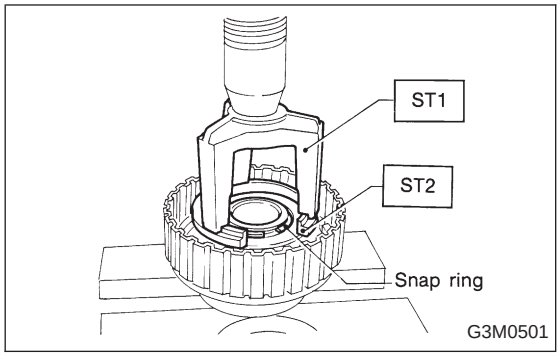
CAUTION:
Be careful not to tilt transfer piston seal.



   (4) Place ST3 onto rear drive shaft so that spring can be inserted into hole in transfer piston seal.
   (5) Attach ST2 to rear drive shaft. Using ST1, press into place.

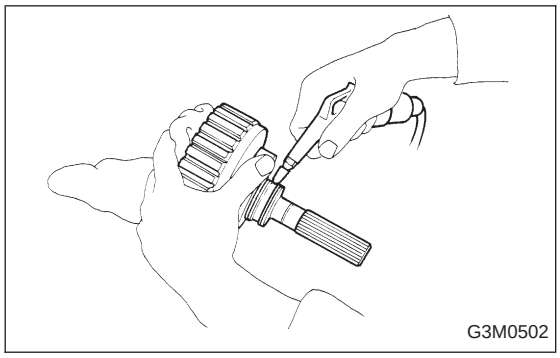
ST1 499247400 INSTALLER
ST2 499257300 SNAP RING OUTER GUIDE
ST3 499257400 PISTON GUIDE

CAUTION:
Do not allow lip of transfer piston seal to fold back.

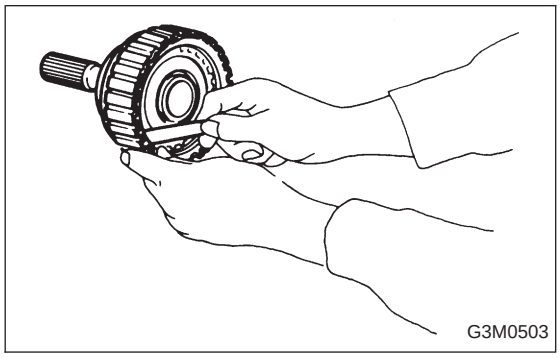


3) Install the driven plates (1800 cc / 4 sheets, 2200 cc / 5 sheets), drive plates (1800 cc / 4 sheets, 2200 cc / 5 sheets), and pressure plate, and secure with a snap ring with ST1, ST2 and a press.

ST1 398673600 COMPRESSOR
ST2 498627000 SEAT



4) Apply compressed air to see if the assembled parts move smoothly.



5) Check the clearance.

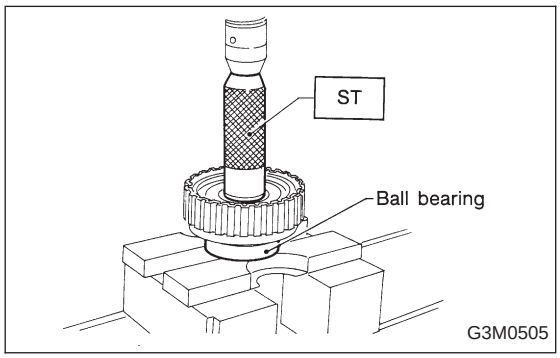
Standard value:
0.2 — 0.6 mm (0.008 — 0.024 in)

Allowable limit:
1.6 mm (0.063 in)

If the clearance is not within the specified range, select a proper pressure plate.

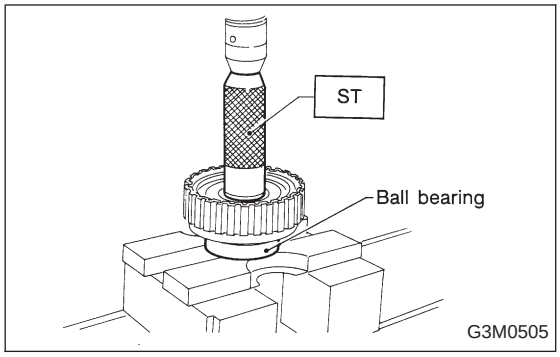
NOTE:
Before measuring clearance, place the same thickness of shim on both sides to prevent pressure plate from tilting.

	Part No.	Thickness mm (in)
● Available pressure plates	31593AA151	3.3 (0.130)
	31593AA161	3.7 (0.146)
	31593AA171	4.1 (0.161)
	31593AA181	4.5 (0.177)



6) Press-fit the ball bearing with ST.

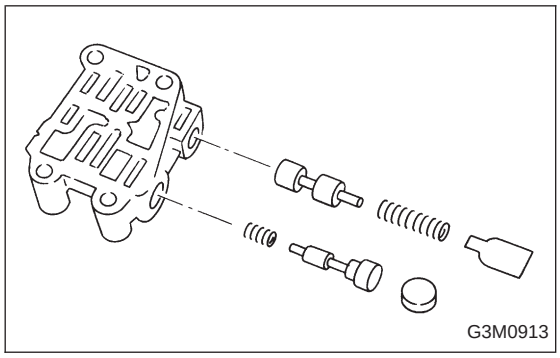
ST 899580100 INSTALLER



7) Coat the seal ring with vaseline, and install it in the seal ring groove of the shaft.

CAUTION:
Do not expand the seal ring excessively when installing.

ST 899580100 INSTALLER



16. Transfer Valve Body

A: DISASSEMBLY

1) Remove the plate. Then remove the spring and pilot valve together.
2) Remove the straight pin and pry out the plug with a screwdriver. Then extract the spring and transfer clutch valve together.

CAUTION:
Be careful not to damage the valve and valve body.

B: INSPECTION

Check each component for harmful cuts, damage, or other faults.

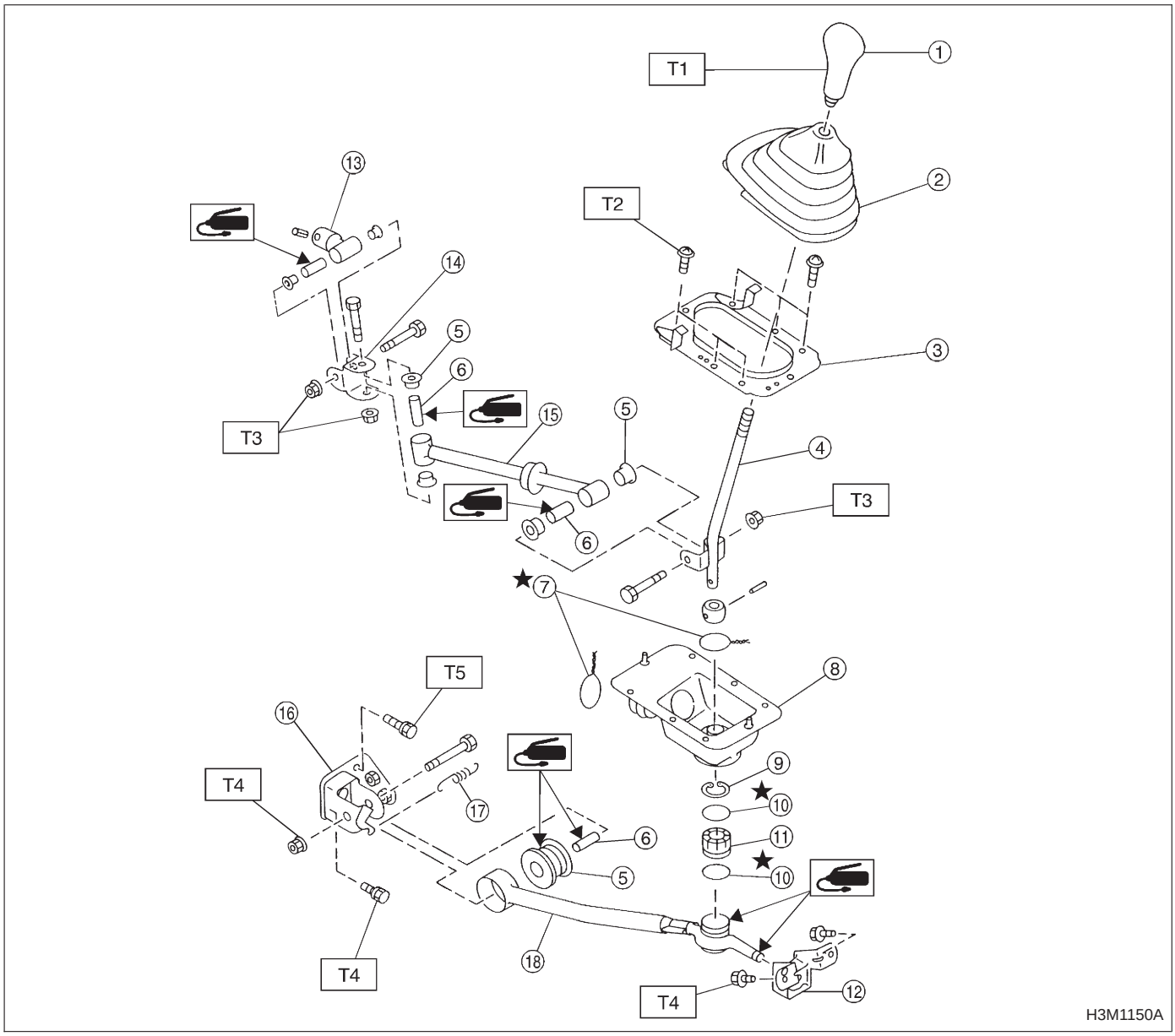
C: ASSEMBLY

To assemble, reverse the removal sequence.

NOTE:
Make sure the valve slides smoothly after assembling.

TRANSMISSION CONTROL SYSTEM 3-3

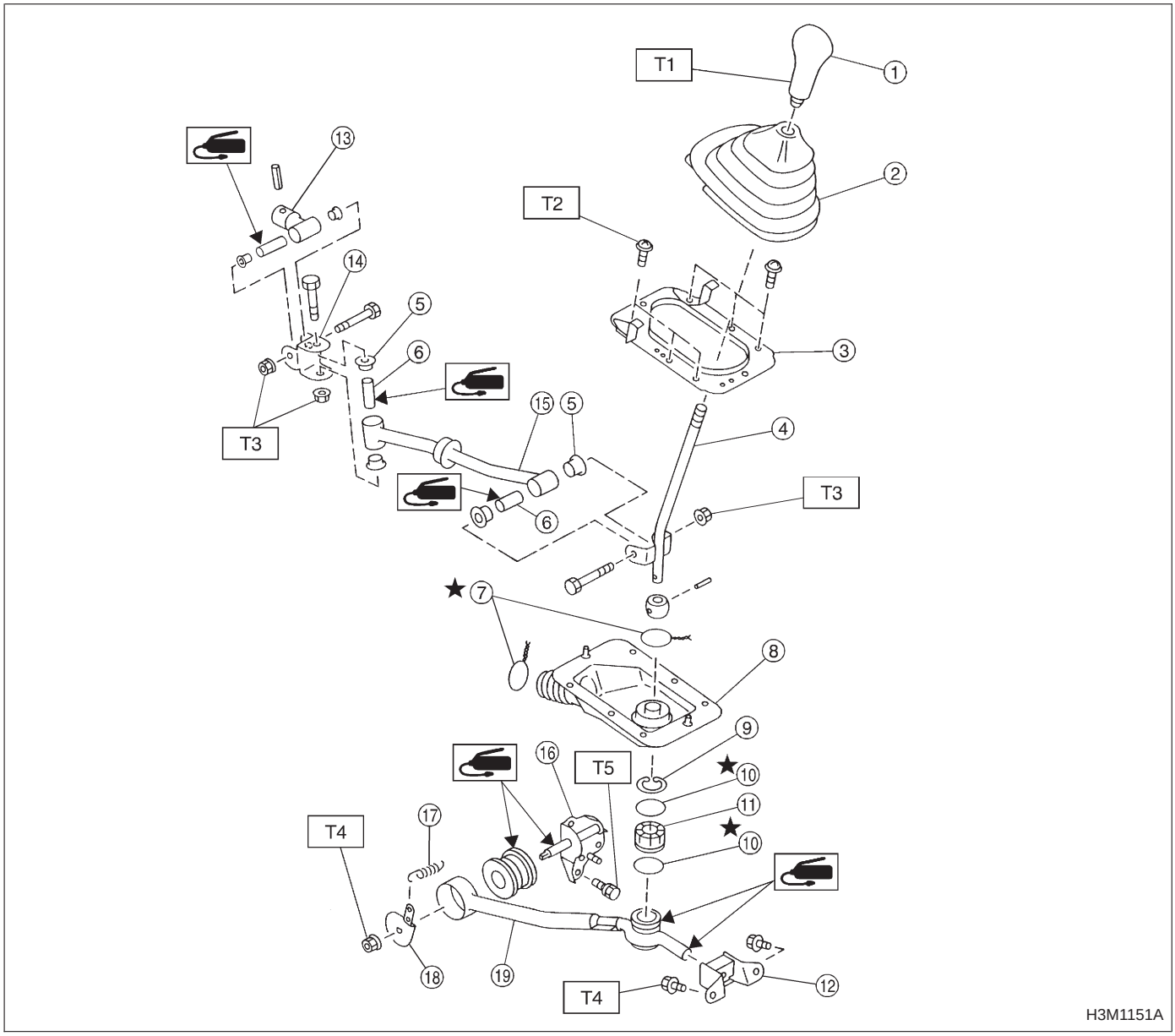
1. Manual Transmission (FWD Model)



① Gear shift knob
② Console boot
③ Boot plate
④ Gear shift lever
⑤ Bush
⑥ Spacer
⑦ Locking wire
⑧ Boot
⑨ Snap ring
⑩ O-ring
⑪ Bush
⑫ Cushion rubber
⑬ Boss
⑭ Joint
⑮ Rod
⑯ Bracket
⑰ Spring
⑱ Stay

Tightening torque: N·m (kg-m, ft-lb)
T1: 4 — 5 (0.4 — 0.5, 2.9 — 3.6)
T2: 3 — 6 (0.3 — 0.6, 2.2 — 4.3)
T3: 9 — 15 (0.9 — 1.5, 6.5 — 10.8)
T4: 13 — 23 (1.3 — 2.3, 9 — 17)
T5: 25 — 34 (2.5 — 3.5, 18 — 25)

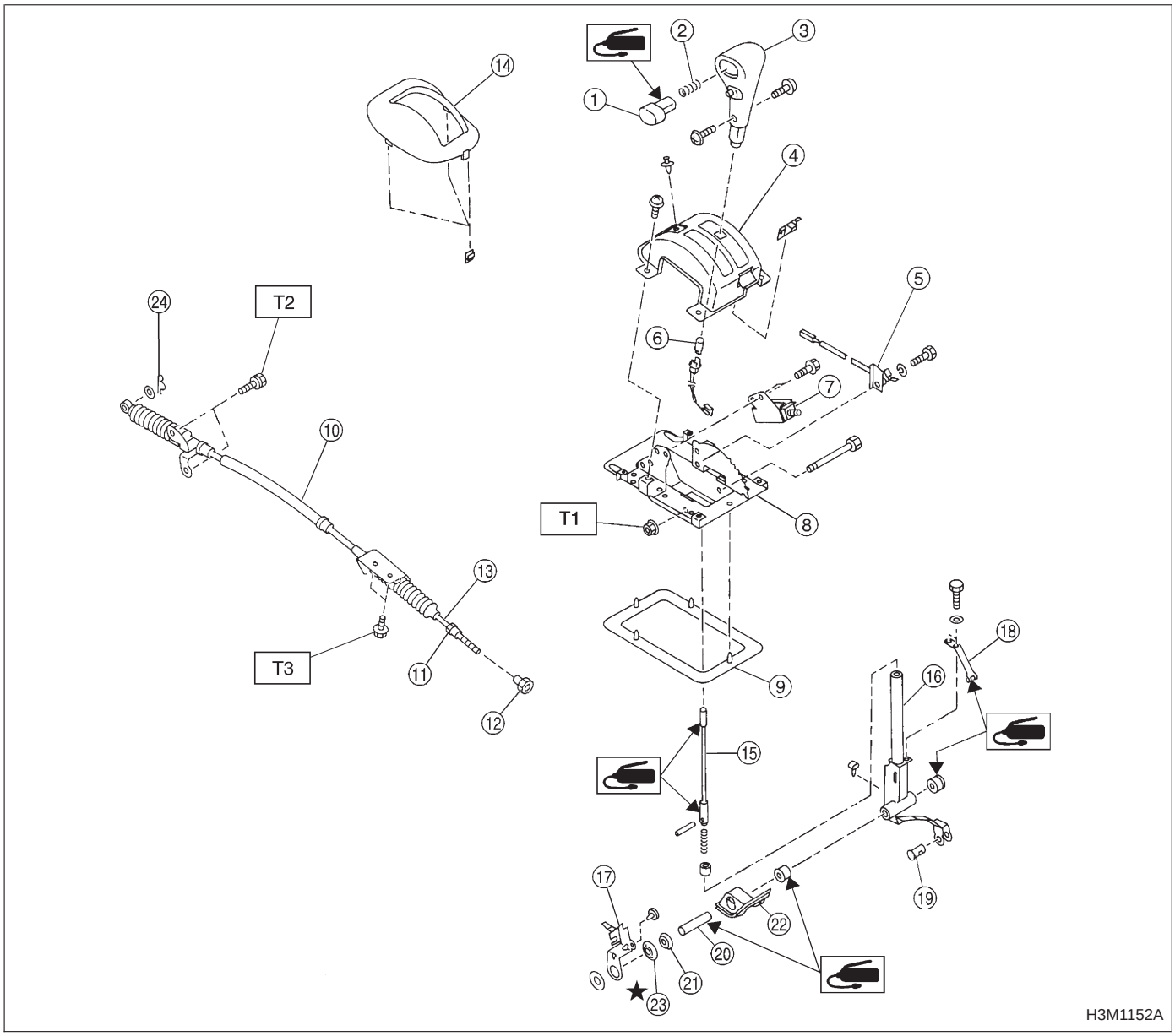
2. Manual Transmission (AWD Model)



① Gear shift knob
② Console boot
③ Boot plate
④ Gear shift lever
⑤ Bush
⑥ Spacer
⑦ Locking wire
⑧ Boot
⑨ Snap ring
⑩ O-ring
⑪ Bush
⑫ Cushion rubber
⑬ Boss
⑭ Joint
⑮ Rod
⑯ Bracket
⑰ Spring
⑱ Washer
⑲ Stay

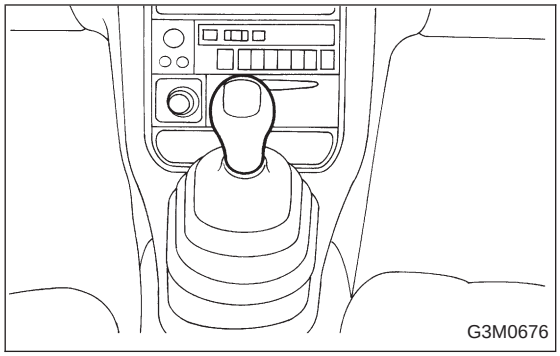
Tightening torque: N·m (kg-m, ft-lb)
T1: 4 — 5 (0.4 — 0.5, 2.9 — 3.6)
T2: 3 — 6 (0.3 — 0.6, 2.2 — 4.3)
T3: 9 — 15 (0.9 — 1.5, 6.5 — 10.8)
T4: 13 — 23 (1.3 — 2.3, 9 — 17)
T5: 25 — 34 (2.5 — 3.5, 18 — 25)

3. Automatic Transmission



① Button
② Spring
③ Grip
④ Indicator cover
⑤ "P" position switch
⑥ Indicator light bulb
⑦ Shift-lock solenoid
⑧ Plate
⑨ Packing
⑩ Outer cable
⑪ Nut
⑫ Nut
⑬ Inner cable
⑭ Panel
⑮ Rod
⑯ Selector lever
⑰ Lock plate
⑱ Detention spring
⑲ Pin
⑳ Spacer
㉑ Washer
㉒ Boot
㉓ Spacer
㉔ Snap pin

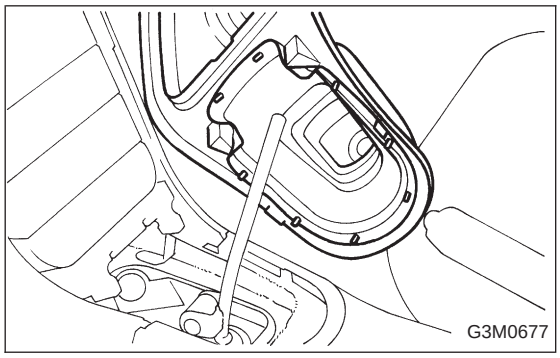
Tightening torque: N·m (kg-m, ft-lb)
T1: 9 — 15 (0.9 — 1.5, 6.5 — 10.8)
T2: 10 — 18 (1.0 — 1.8, 7 — 13)
T3: 13 — 23 (1.3 — 2.3, 9 — 17)


G3M0676

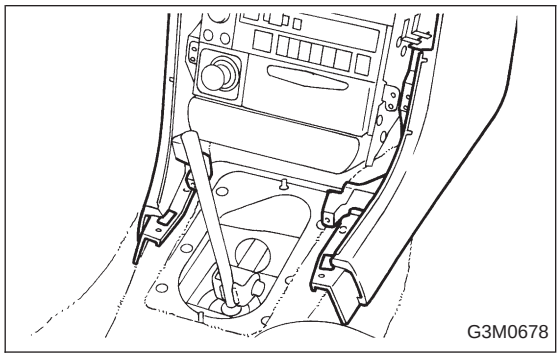
1. Manual Transmission

A: REMOVAL

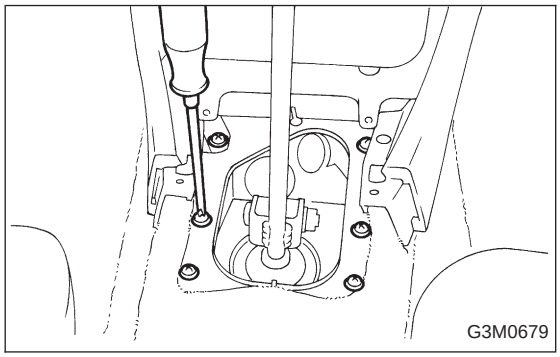
1) Remove knob from gearshift lever.


G3M0677

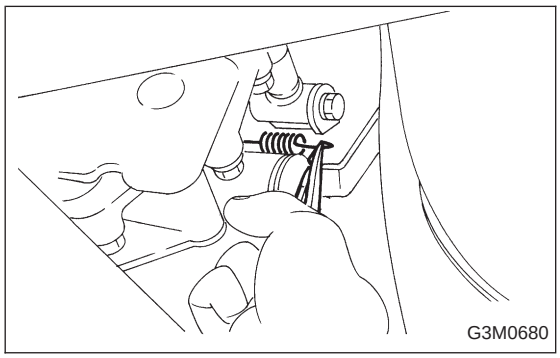
2) Remove console cover and console boot.


G3M0678

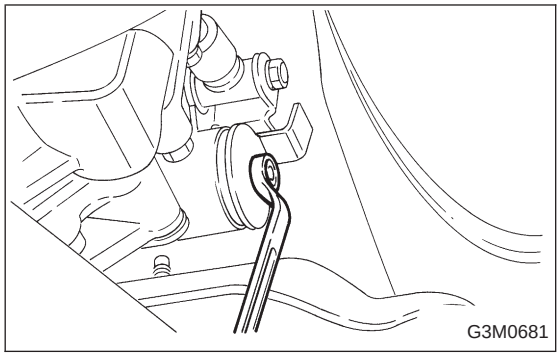
3) Remove rear console box, center console and instrument console.


G3M0679

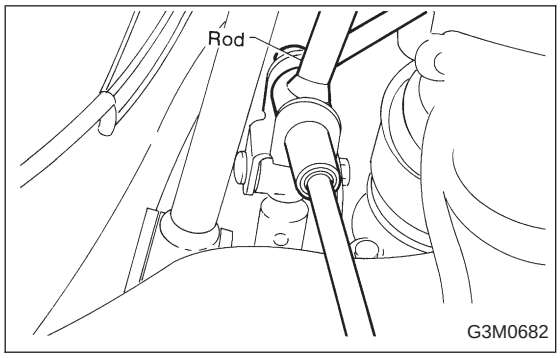
4) Remove boot plate from the body.


G3M0680

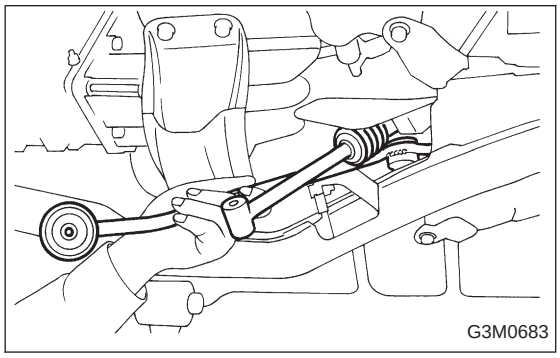
5) Remove the spring between the joint and bracket.



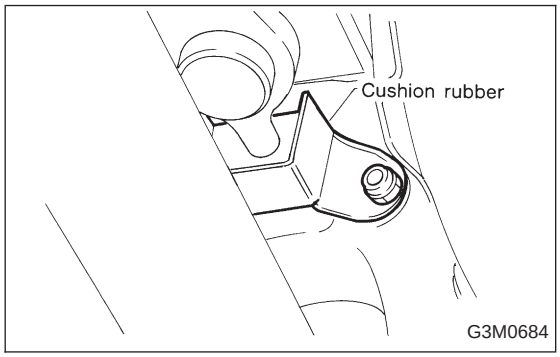
6) Remove stay from bracket.



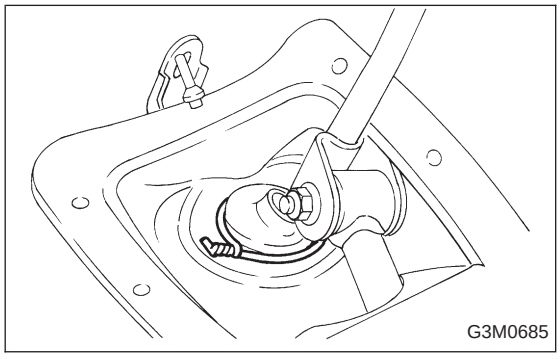
7) Remove rod from joint.



8) Remove gearshift lever.

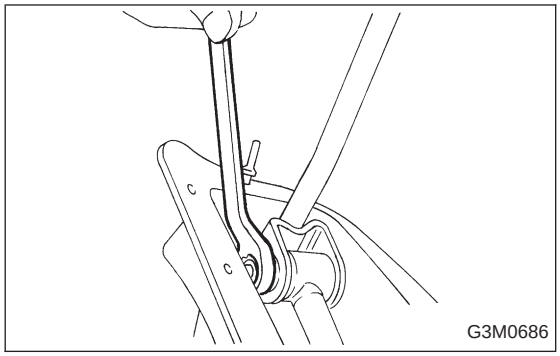


9) Remove the exhaust cover and remove cushion rubber from the body.

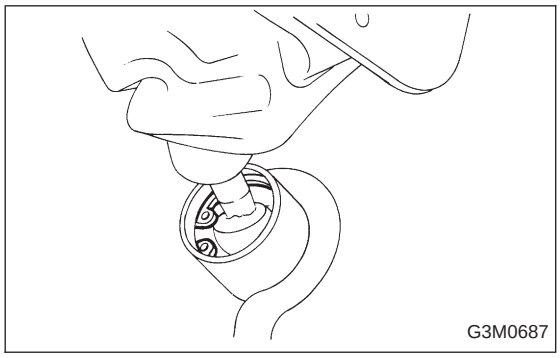


B: DISASSEMBLY

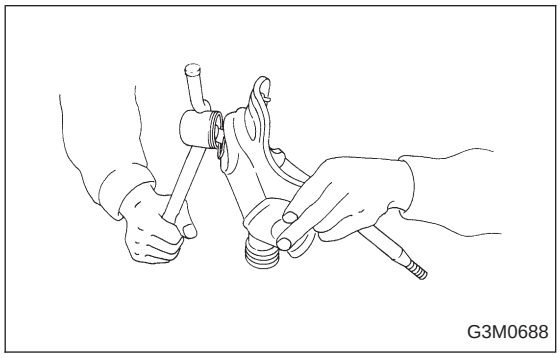
1) Disconnect locking wires.


G3M0686

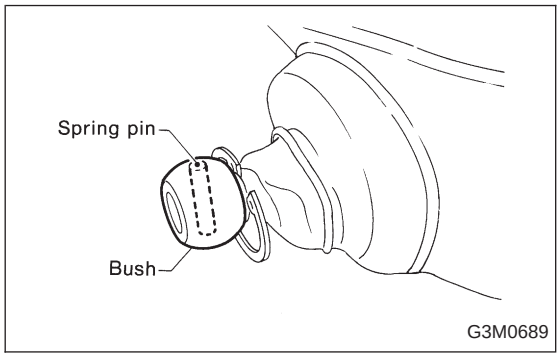
2) Remove rod from gearshift lever.


G3M0687

3) Disconnect snap ring.

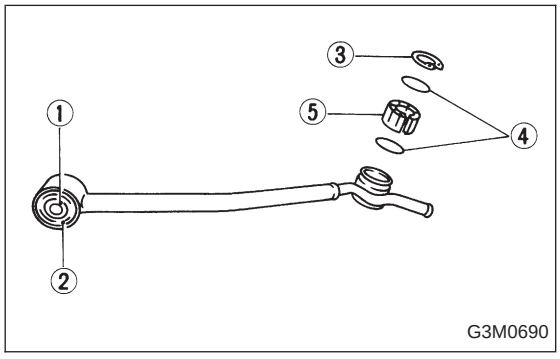

G3M0688

4) Remove gearshift lever from stay.



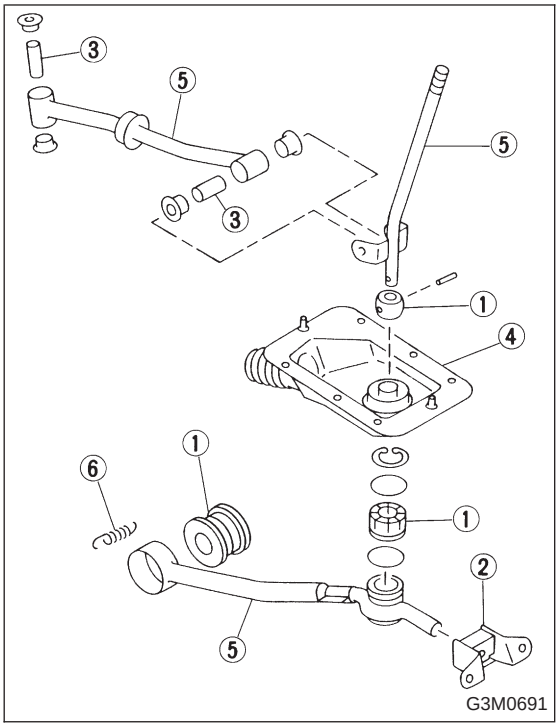
G3M0689

5) Disconnect spring pin and bush from gearshift lever.
6) Remove boot from gearshift lever.



G3M0690

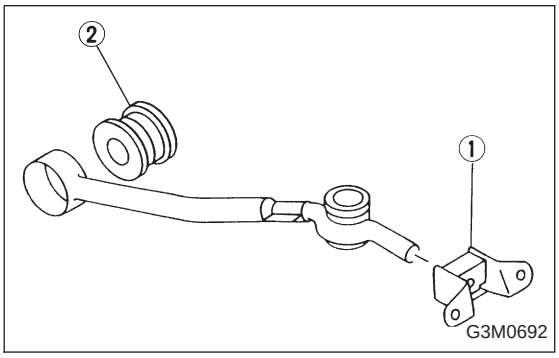
7) Remove the following parts from the stay.
① Spacer
② Bush
③ Snap ring
④ O-ring
⑤ Bush



C: INSPECTION

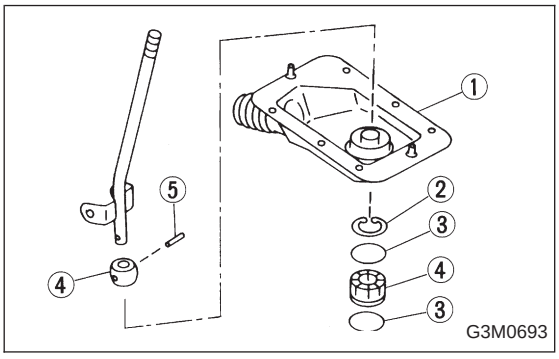
Check the following parts for deformation, damage and wear. Repair or replace any defective parts. Determine defective parts by comparing with new parts.

① Bush
② Cushion
③ Spacer
④ Boot
⑤ Stay, rod and lever
⑥ Spring



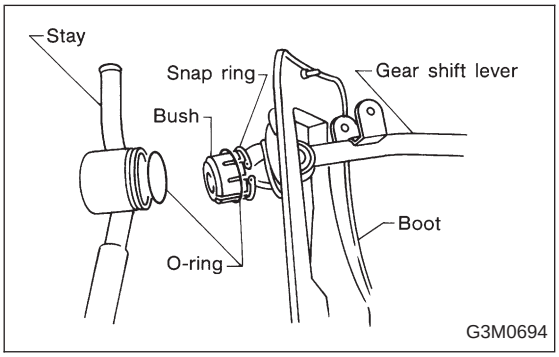
D: ASSEMBLY

1) Clean all parts before assembly.
2) Mount the following parts on the stay.
   ① Cushion rubber
   ② Bush

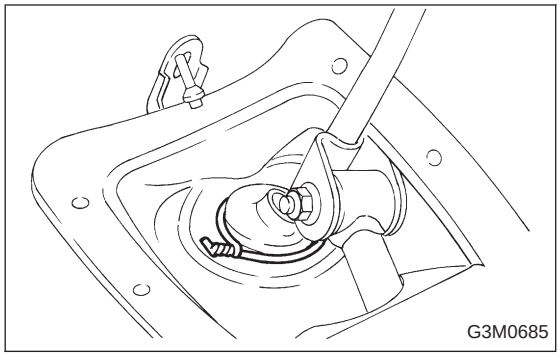


3) Mount the following parts on the gearshift lever.
   ① Boot
   ② Snap ring
   ③ O-ring
   ④ Bush
   ⑤ Spring pin

CAUTION:
- **Always use new O-rings.**
- **Apply grease [SUNLIGHT No. 2 (P/N 003602010) or equivalent] to the inner surface of the bush.**

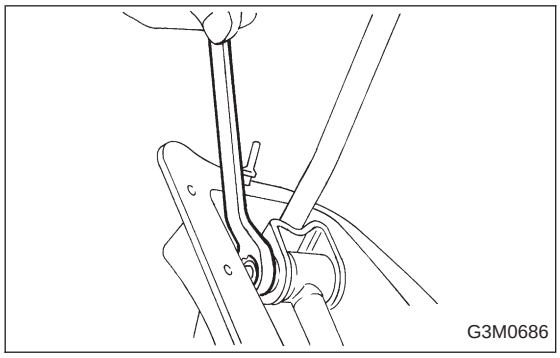


4) Mount gearshift lever on the stay.
5) Install snap ring to the case of the stay.


G3M0685

6) Tighten with locking wire to the extent that the boot will not come off.

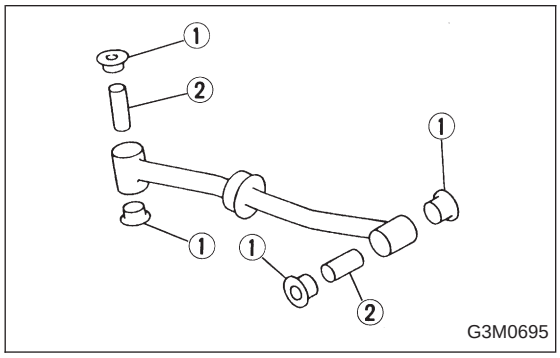
CAUTION:
Always use new locking wire.


G3M0686

7) Insert the rod into the boot hole.
8) Connect rod to gearshift lever.

Tightening torque:
9 — 15 N·m (0.9 — 1.5 kg-m, 6.5 — 10.8 ft-lb)

Rocking torque:
2.7 N·m (0.28 kg-m, 2.0 ft-lb)

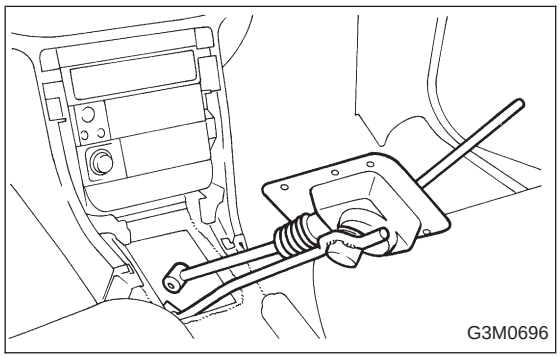


G3M0695

9) Mount the following parts on the rod.
① Bush
② Spacer

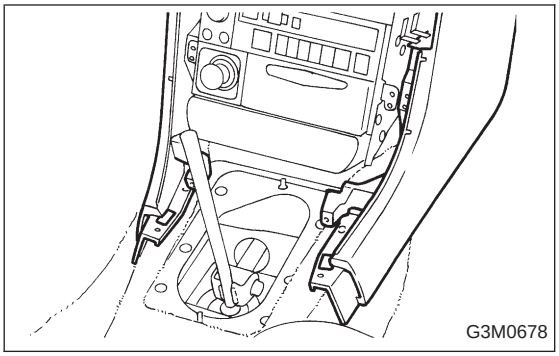
CAUTION:
● Apply grease [SUNLIGHT No. 2 (P/N 003602010) or equivalent] to inner and side surfaces of the bush when installing spacers.
● The rod should be installed in the direction shown in the figure.

10) Check that there is no excessive play and that parts move smoothly.

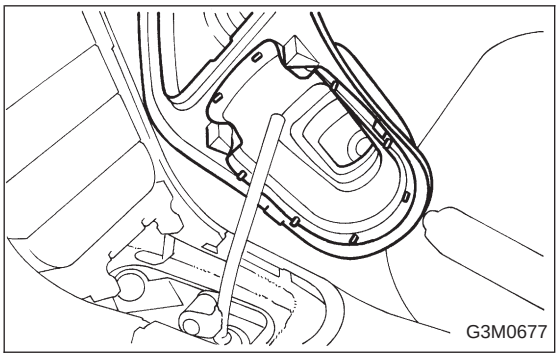

G3M0696

E: INSTALLATION

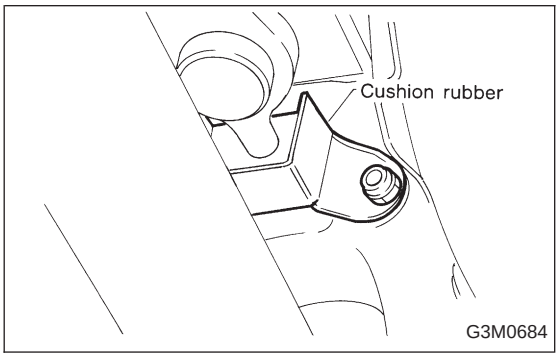
1) Put into gearshift lever from passenger compartment.
2) Mount boot plate on the body.


G3M0678

3) Install rear console box, center console and instrument console.


G3M0677

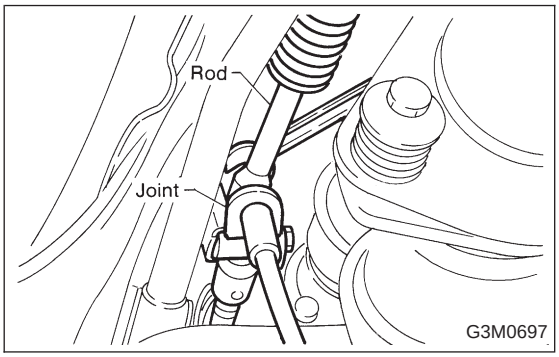
4) Install console cover and boot.
5) Install gearshift knob.



G3M0684

6) Mount cushion rubber on the body.

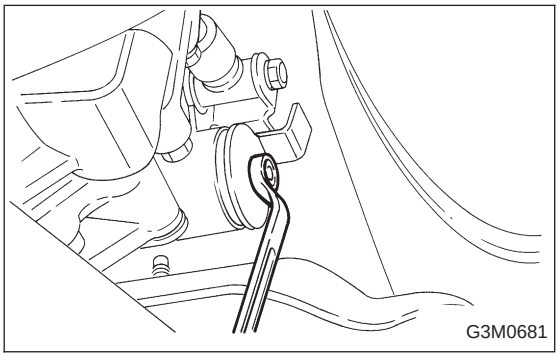
Tightening torque:
13 — 23 N·m (1.3 — 2.3 kg-m, 9 — 17 ft-lb)



G3M0697

7) Connect rod to the joint.

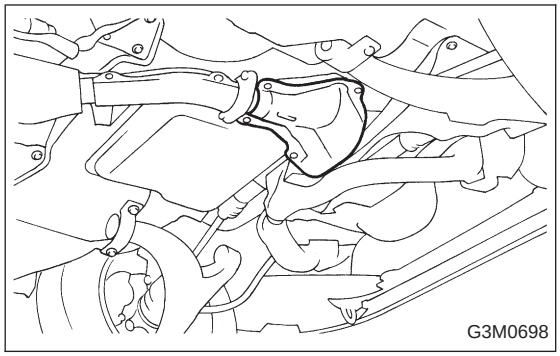
Tightening torque:
9 — 15 N·m (0.9 — 1.5 kg-m, 6.5 — 10.8 ft-lb)


G3M0681

8) Connect stay to the bracket.

Tightening torque:
13 — 23 N·m (1.3 — 2.3 kg-m, 9 — 17 ft-lb)

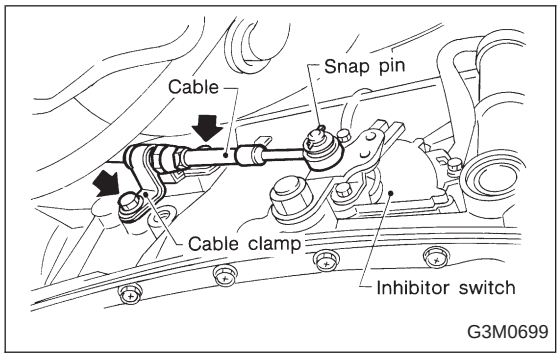
9) Install the exhaust cover.


G3M0698

2. Automatic Transmission

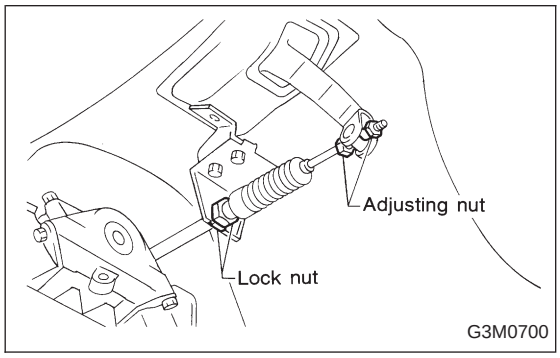
A: REMOVAL

1) Remove the cable.
   (1) Prior to removal, set lever to “N” position.
   (2) Remove front exhaust pipe.



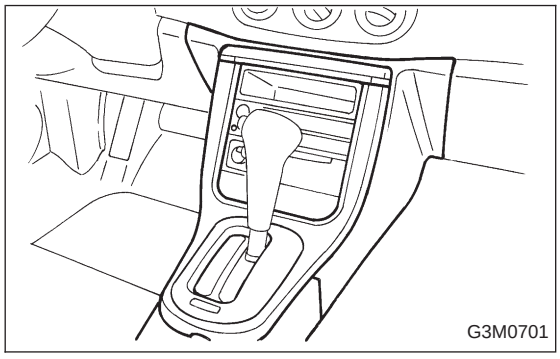
G3M0699

   (3) Separate cable from transmission lever.
   (4) Remove clamp from transmission case.

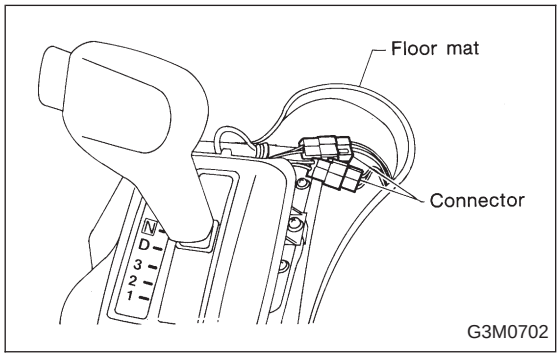


G3M0700

   (5) Disconnect cable from selector lever.

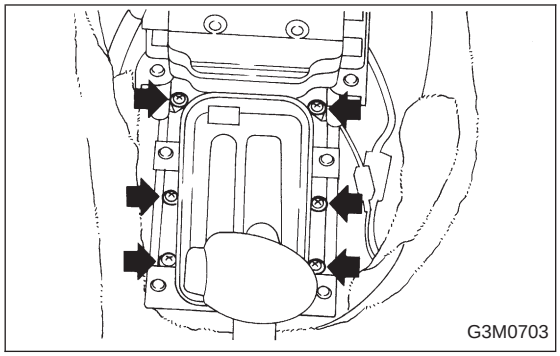

G3M0701

2) Remove all of the screws to take off the following console parts.
- Instrument console
- Center console
- Rear console box

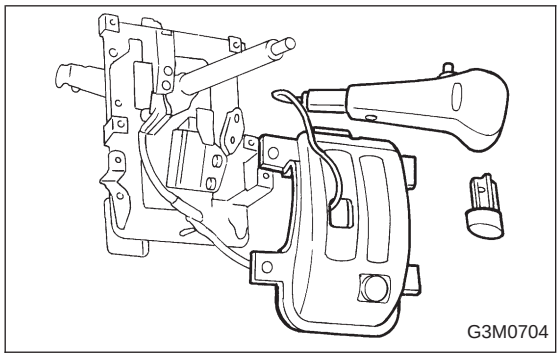


G3M0702

3) Disconnect the connectors.

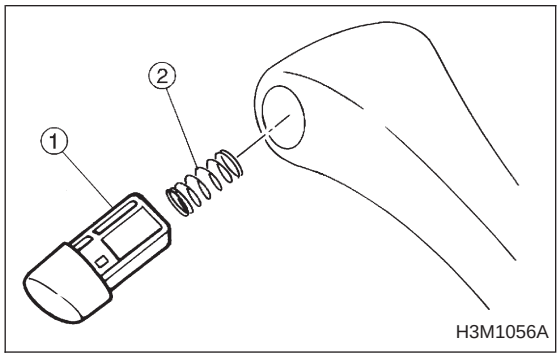

G3M0703

4) Remove the screws to take off the plate from the body.


G3M0704

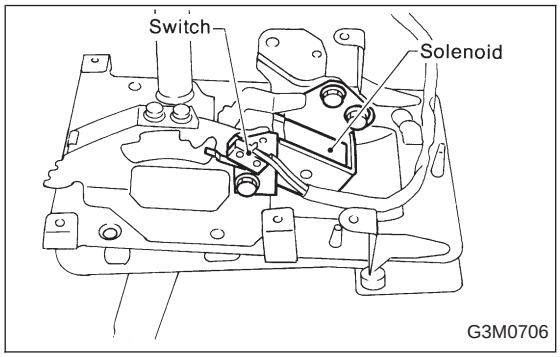
B: DISASSEMBLY

1) Remove grip from selector lever.
2) Remove indicator from plate.



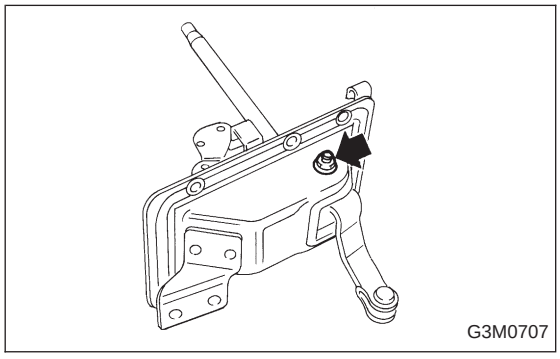
H3M1056A

3) Remove the following parts from the grip.
① Button
② Spring

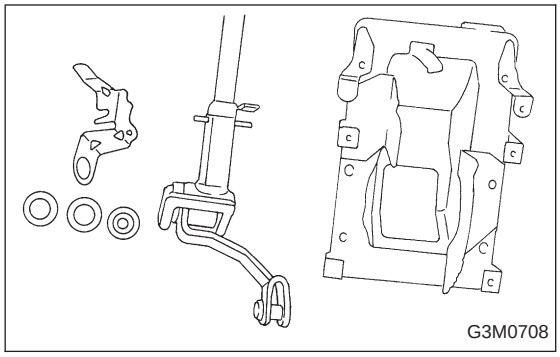


G3M0706

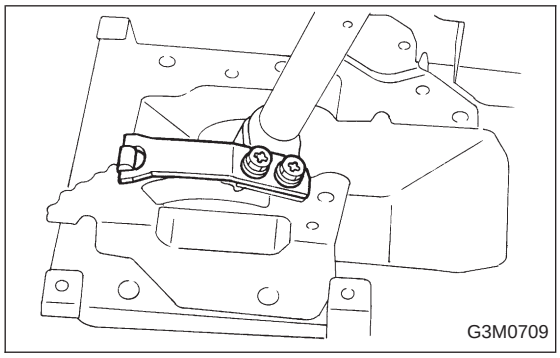
4) Remove shift-lock solenoid and “P” position switch.


G3M0707

5) Remove the bolt to take off the selector lever from the plate.


G3M0708

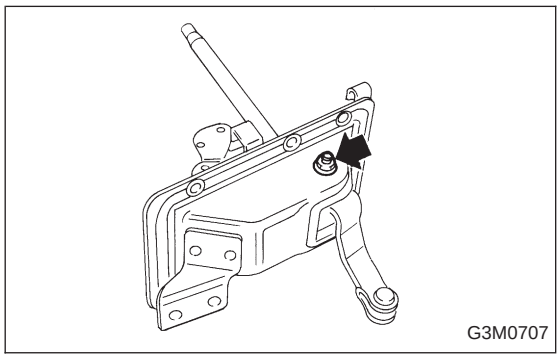
6) Remove lock plate.
7) Remove selector lever from the plate.


G3M0709

8) Remove detention spring.

C: INSPECTION

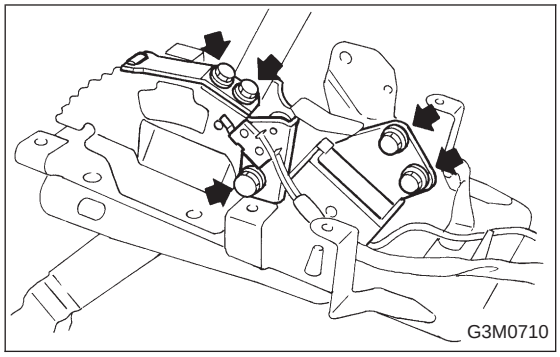
1) Inspect removed parts by comparing with new ones for deformation, damage and wear. Correct or replace if defective.
2) Confirm the following parts for operating condition before assembly.
   (1) Sliding condition of the button in the grip ... it should move smoothly.
   (2) Insertion of the grip on the selector lever ... when pushing the grip on the selector lever by hand, screw holes should be aligned.
   (3) Operation of selector lever and rod ... they should move smoothly.
   (4) Insertion of the spacer into the selector lever ... it should be inserted lightly by finger pressure.


G3M0707

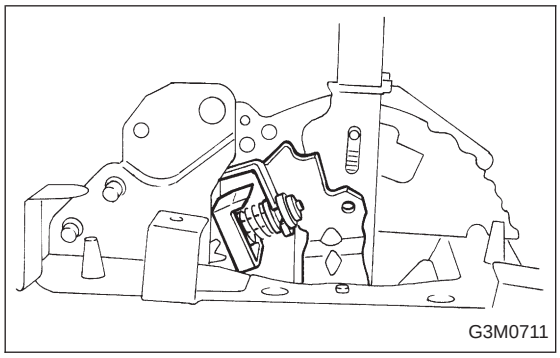
D: ASSEMBLY

1) Clean all parts before assembly.
2) Assemble selector lever and lock plate to the plate.
3) Insert the bolt and tighten the flange nut to the specified torque.

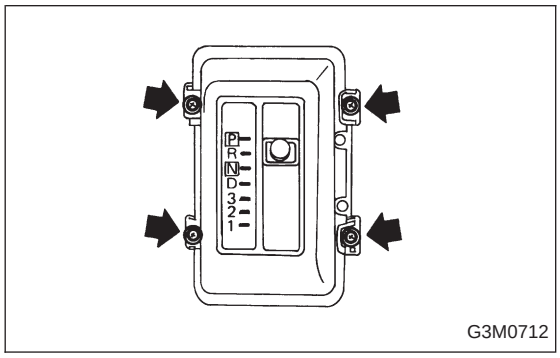
Tightening torque (Flange nut):
11 — 17 N·m (1.1 — 1.7 kg-m, 8 — 12 ft-lb)


G3M0710

4) Assemble detention spring, shift-lock solenoid and “P” position switch.


G3M0711

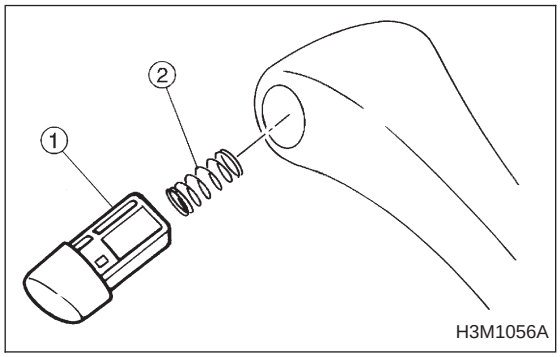
5) Adjust the position of shift-lock plate and solenoid. Then, tighten the bolts.



G3M0712

6) Assemble indicator to the plate.

Tightening torque:
1.3 — 2.6 N·m (0.13 — 0.27 kg-m, 0.9 — 2.0 ft-lb)

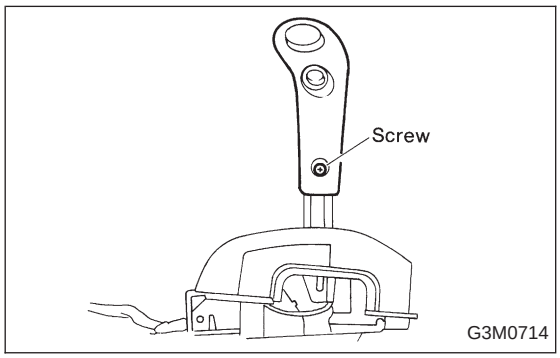


H3M1056A

7) Assemble the following parts to the grip.

CAUTION:
Apply grease on sliding surfaces of the following parts.

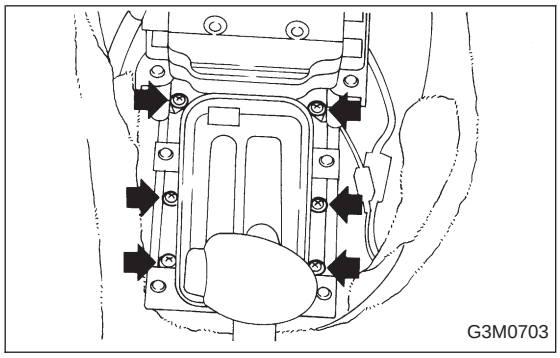
① Button
② Spring



G3M0714

8) Assemble the grip to the selector lever.

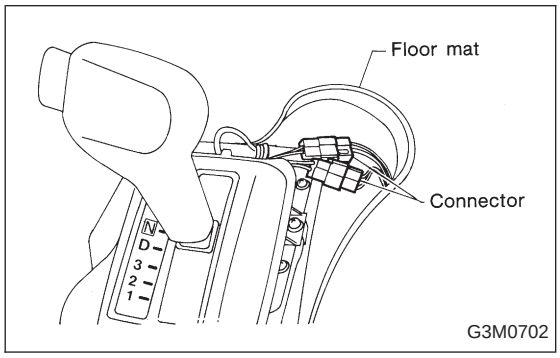
9) After completion of fitting, transfer selector lever to range “P” ~ “1”, pressing the button of the grip; then check whether the indicator and select lever agree, whether the pointer and position mark agree and what the operating force is.


G3M0703

E: INSTALLATION

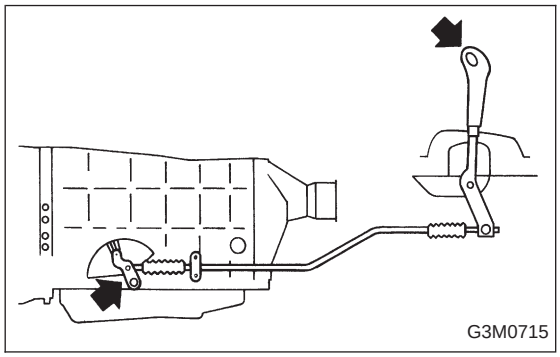
1) Mount the selector lever onto the car body.
2) Tighten the six bolts to install the selector lever to the car body.

Tightening torque:
3 — 6 N·m (0.3 — 0.6 kg-m, 2.2 — 4.3 ft-lb)

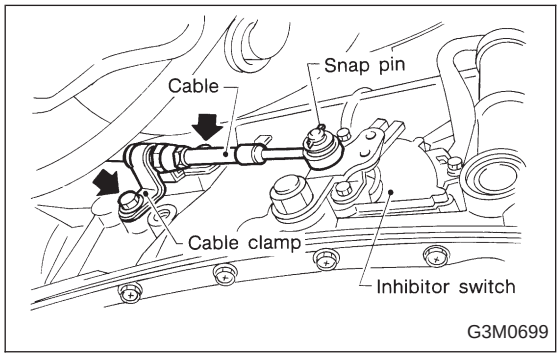


G3M0702

3) Connect connectors and install rear console, center console and instrument console.


G3M0715

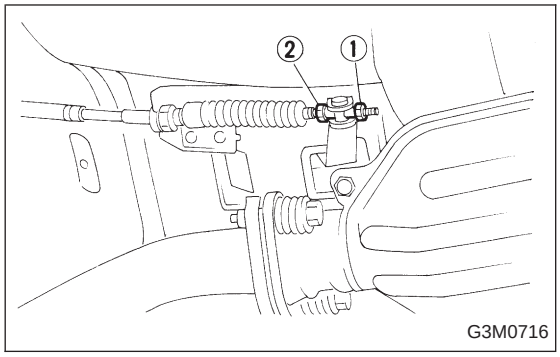
4) Set location of selector lever at “N” position.
5) Set location of selector arm installed on the transmission body at “N” position.



G3M0699

6) Pass inner cable through selector arm pin and then connect it using a washer and snap pin.
7) Attach outer cable to transmission case with the bolts.

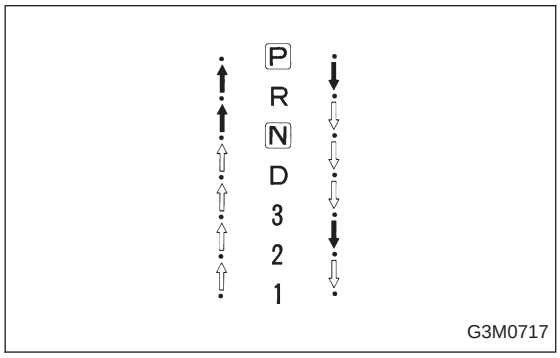
Tightening torque:
10 — 18 N·m (1.0 — 1.8 kg-m, 7 — 13 ft-lb)



8) Insert the thread portion of the other inner cable and into the connector hole of the selector lever, and fix the other outer cable end to the bracket.
9) Adjust the inner cable length.
(1) Put connector into contact with nut ②.
(2) Tighten nut ①.

Tightening torque:
5.4 — 9.3 N·m (0.55 — 0.95 kg-m, 4.0 — 6.9 ft-lb)

10) After completion of fitting, make sure that the selector lever operates smoothly all across the operating range.
11) Connect the harnesses and check the following items.
(1) The engine starts operating when selector lever is in position “P”, but not in other positions.
(2) The back-up light is lit when the selector lever is in position “R”, but not in other positions.



12) Check selector lever operation.

WARNING:
Stop the engine while checking operation of selector lever.

(1) Check that selector lever does not move from “N” to “R” without pushing the button.
(2) Check that selector lever does not move from “R” to “P” without pushing the button.
(3) Check that selector lever does not move from “P” to “R” without pushing the button.
(4) Check that selector lever does not move from “3” to “2” without pushing the button.

13) Check shift lock system.
(1) Ensure ignition switch rotates from “ACC” to “LOCK” when the selector lever is set at “P”. Also check that ignition key can be removed from the “LOCK” position only.
(2) Ensure selector lever moves from “P” to any other position when the brake pedal is depressed with ignition key set at “ON” or “START”.

AWD SYSTEM 3-4

1. AWD System

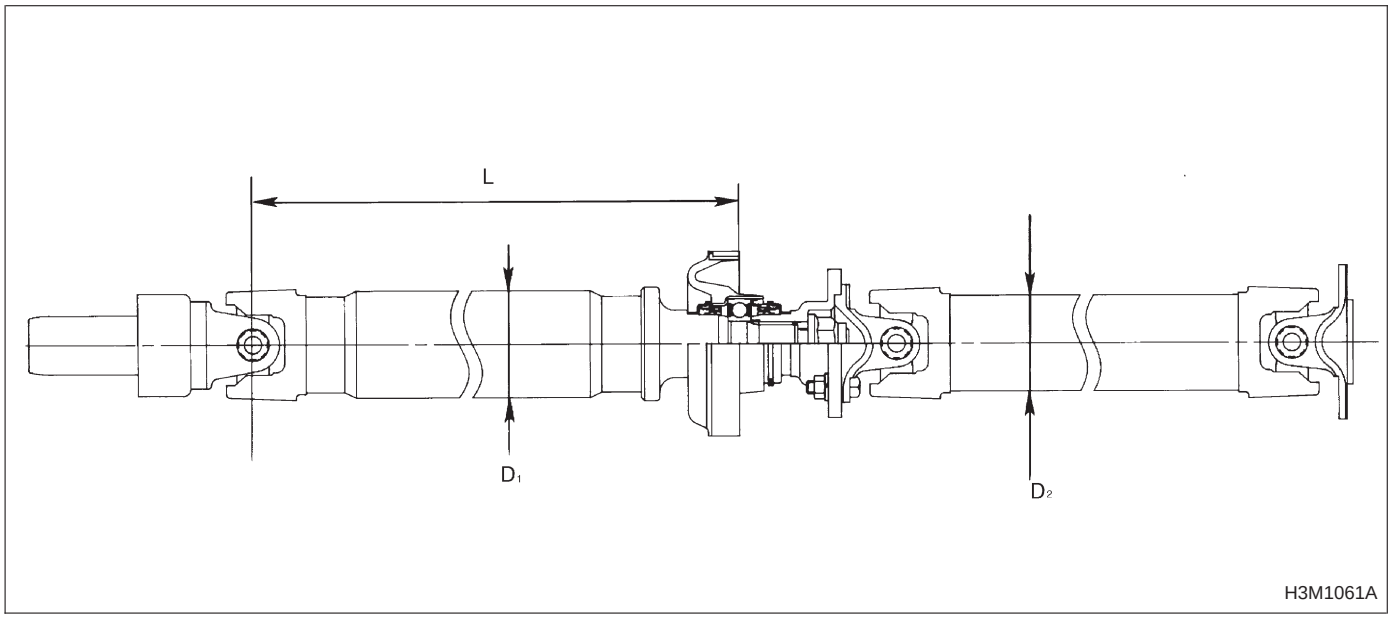
A: SPECIFICATIONS

1. REAR FINAL REDUCTION GEAR RATIO

Type of gear	Hypoid		
	MT	AT	
	1800 cc	1800 cc	2200 cc
Gear ratio (Number of gear teeth)	3.900 (39/10)	4.111 (37/9)	4.111 (37/9)
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)		
Rear differential gear oil	GL-5		

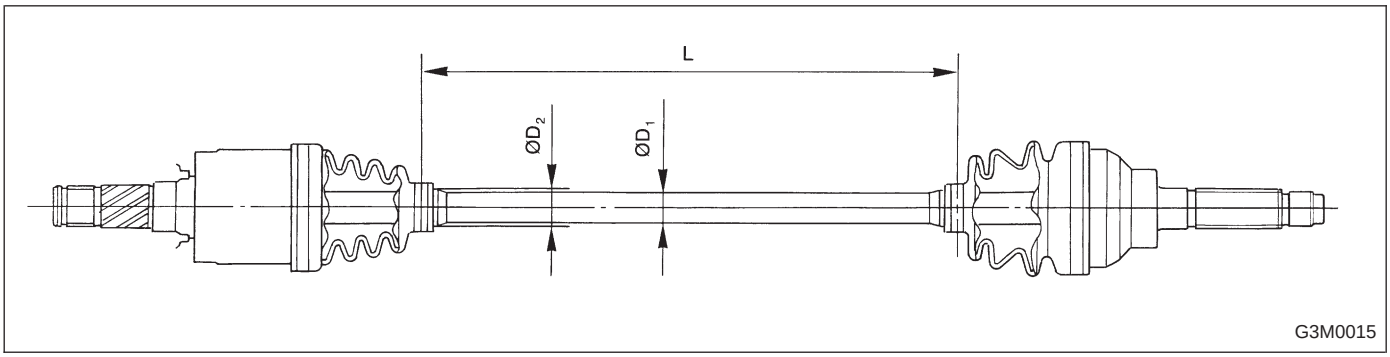
2. PROPELLER SHAFT

Front propeller shaft Joint-to-joint length: L mm (in)	AT	489 (19.25)
	MT	548 (21.57)
Outside dia. of tube mm (in)	D_1	63.5 (2.500)
	D_2	57.0 (2.244)



3. DRIVE SHAFT

Type of drive shaft	Outside dia. of shaft mm (in)		Distance between boots: L mm (in)
	D_1	D_2	
79AC	20.1 (0.791)	23.0 (0.906)	334 (13.15)



B: SERVICE DATA

1. REAR DIFFERENTIAL (1800 cc MODEL)

● Front and rear bearing preload at companion flange bolt hole	New bearing	12.7 — 32.4 N (1.3 — 3.3 kg, 2.9 — 7.3 lb)
● Preload adjusting washer length	Part No.	Length mm (in)
	38336AA000	1.500 (0.0591)
	38336AA120	1.513 (0.0596)
	38336AA010	1.525 (0.0600)
	38336AA130	1.538 (0.0606)
	38336AA020	1.550 (0.0610)
	38336AA140	1.563 (0.0615)
	38336AA030	1.575 (0.0620)
	38336AA150	1.588 (0.0625)
	38336AA040	1.600 (0.0630)
	38336AA160	1.613 (0.0635)
	38336AA050	1.625 (0.0640)
	38336AA170	1.638 (0.0645)
	38336AA060	1.650 (0.0650)
	38336AA180	1.663 (0.0655)
	38336AA070	1.675 (0.0659)
	38336AA190	1.688 (0.0665)
	38336AA080	1.700 (0.0669)
	38336AA200	1.713 (0.0674)
	38336AA090	1.725 (0.0679)
	38336AA210	1.738 (0.0684)
	38336AA100	1.750 (0.0689)
	38336AA220	1.763 (0.0694)
	38336AA110	1.775 (0.0699)
● Preload adjusting spacer length	32288AA040	52.3 (2.059)
	32288AA050	52.5 (2.067)
	31454AA100	52.6 (2.071)
	32288AA060	52.7 (2.075)
	31454AA110	52.8 (2.079)
	32288AA070	52.9 (2.083)
	31454AA120	53.0 (2.087)
	32288AA080	53.1 (2.091)
	32288AA090	53.3 (2.098)
● Pinion height adjusting shim thickness	32295AA200	0.150 (0.0059)
	32295AA210	0.175 (0.0069)
	32295AA220	0.200 (0.0079)
	32295AA230	0.225 (0.0089)
	32295AA240	0.250 (0.0098)
	32295AA250	0.275 (0.0108)

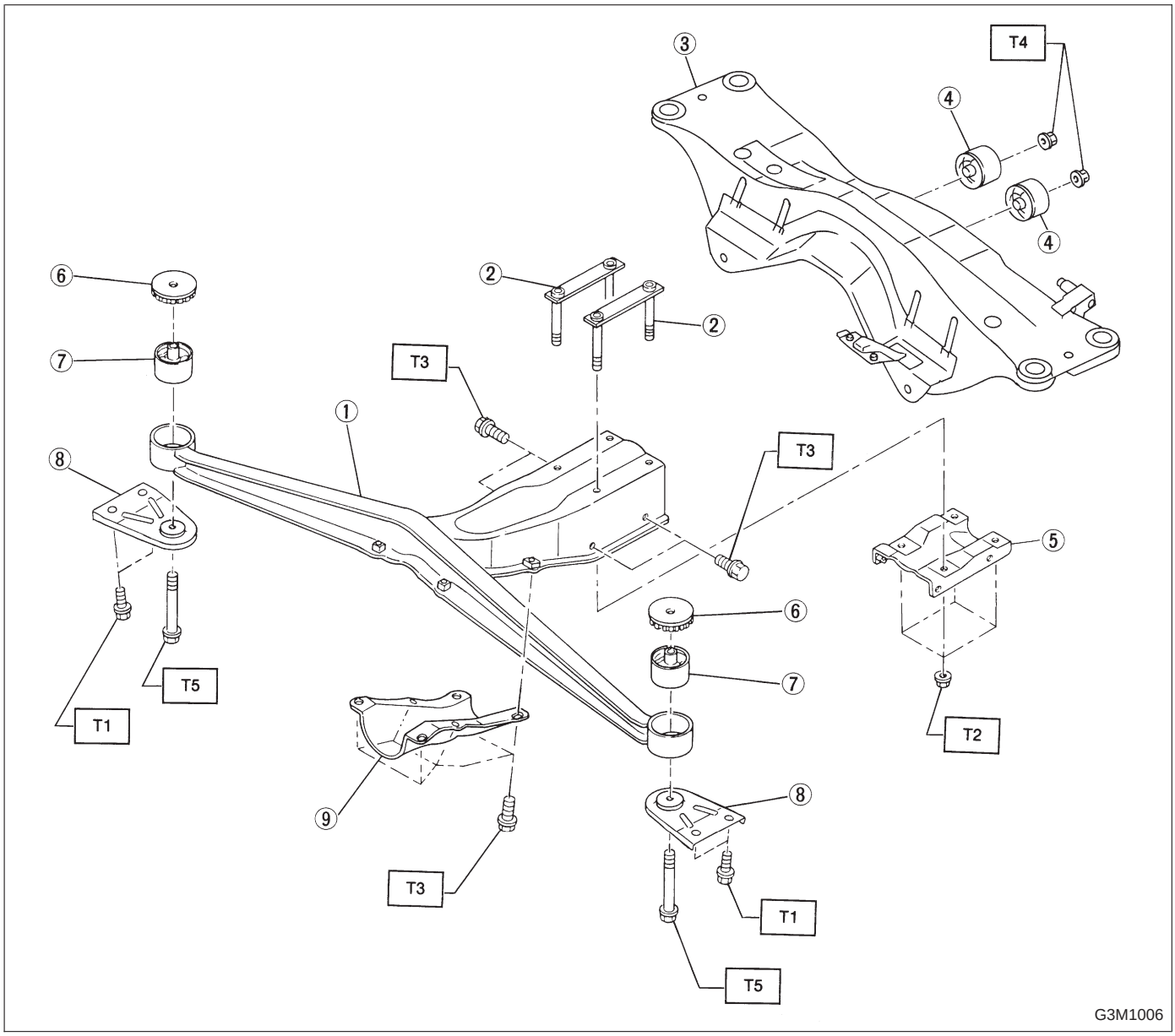
● Side gear backlash	0.05 — 0.15 mm (0.0020 — 0.0059 in)	
● Side gear thrust washer thickness	Part No.	Thickness mm (in)
	803135011	0.925 — 0.950 (0.0364 — 0.0374)
	803135012	0.950 — 0.975 (0.0374 — 0.0384)
	803135013	0.975 — 1.000 (0.0384 — 0.0394)
	803135014	1.000 — 1.025 (0.0394 — 0.0404)
	803135015	1.025 — 1.050 (0.0404 — 0.0413)
● Crown gear to drive pinion backlash	Limit	0.10 — 0.15 (0.0039 — 0.0059)
● Crown gear runout on its back surface		0.05 (0.0020)
● Oil capacity		0.8 ℓ (0.8 US qt, 0.7 Imp qt)

2. REAR DIFFERENTIAL (2200 cc MODEL)

Front and rear bearing preload at companion flange bolt hole	New bearing	19.6 — 28.4 N (2.0 — 2.9 kg, 4.4 — 6.4 lb)
	Used bearing	8.34 — 16.67 N (0.85 — 1.70 kg, 1.87 — 3.75 lb)
Preload adjusting washer length	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)
Preload adjusting spacer length	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)

Pinion height adjusting shim thickness	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 bearing standard width	—	20.00 mm (0.7874 in)
Side bearing retainer shim thickness	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 surface		0.05 mm (0.0020 in)
Oil capacity		0.8 ℓ (0.8 US qt, 0.7 Imp qt)

1. Rear Differential Mounting System

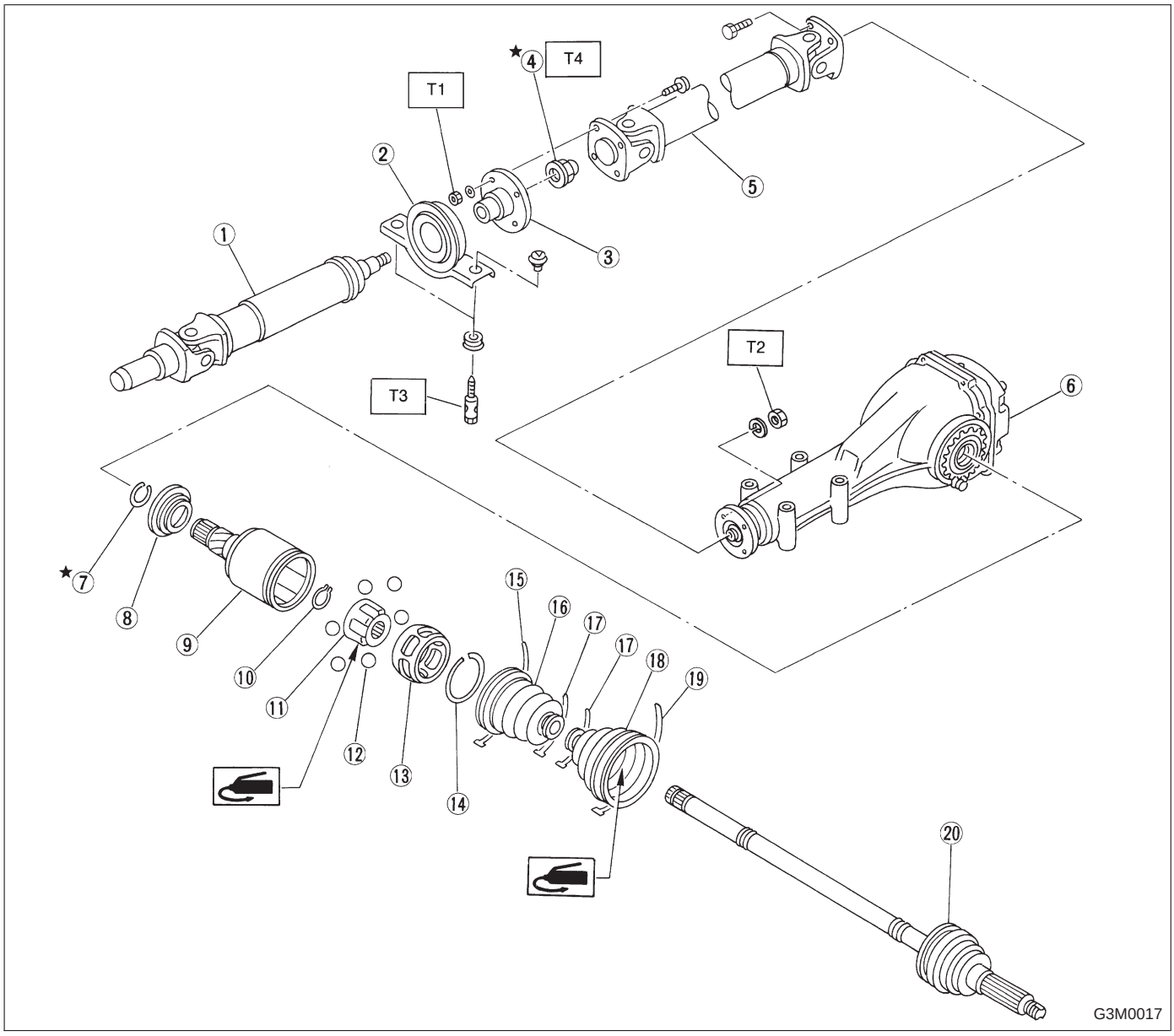


① Differential front member
② Plate
③ Crossmember
④ Rear bushing
⑤ Differential mount lower bracket
⑥ Stopper
⑦ Front bushing
⑧ Differential mount bracket
⑨ Differential mount front cover

Tightening torque: N·m (kg-m, ft-lb)
T1: 32±8 (3.3±0.8, 23.9±5.8)
T2: 64±8 (6.5±0.8, 47.0±5.8)
T3: 69±10 (7.0±1.0, 51±7)
T4: 69±8 (7.0±0.8, 50.6±5.8)
T5: 98±10 (10.0±1.0, 72±7)

2. Propeller Shaft

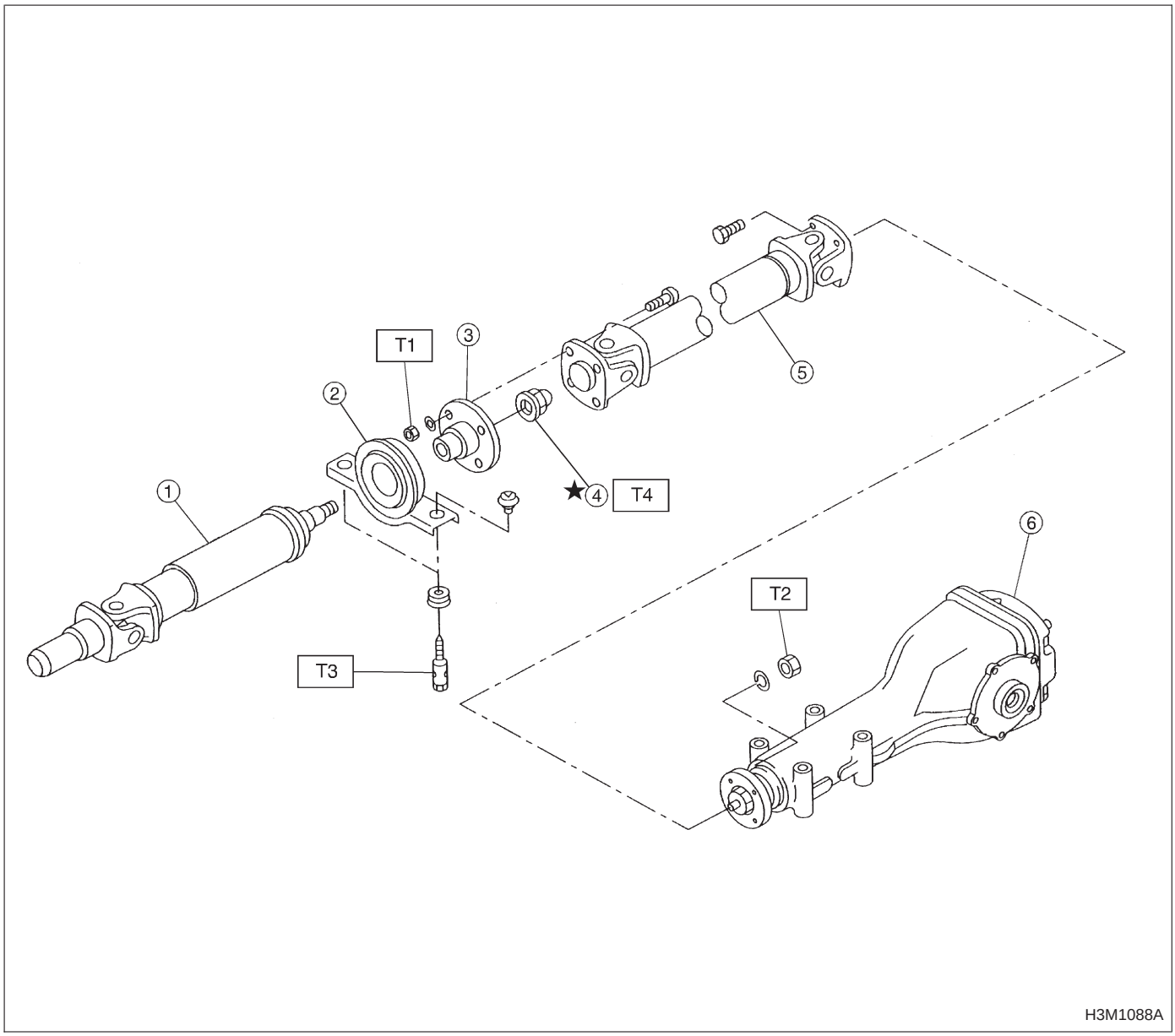
1. 1800 cc MODEL



① Front propeller shaft
② Center bearing
③ Companion flange
④ Stake nut
⑤ Rear propeller shaft
⑥ Rear differential
⑦ Circlip
⑧ Baffle plate (DOJ)
⑨ Outer race (DOJ)
⑩ Snap ring
⑪ Inner race (DOJ)
⑫ Ball
⑬ Cage
⑭ Circlip
⑮ Boot band (DOJ)
⑯ Boot (DOJ)
⑰ Boot band
⑱ Boot (BJ)
⑲ Boot band (BJ)
⑳ BJ ASSY

Tightening torque: N·m (kg-m, ft-lb)
T1: 27.9±4.4 (2.85±0.45, 20.6±3.3)
T2: 31±8 (3.2±0.8, 23.1±5.8)
T3: 52±5 (5.3±0.5, 38.3±3.6)
T4: 270±25 (27.5±2.5, 199±18)

2. 2200 cc MODEL

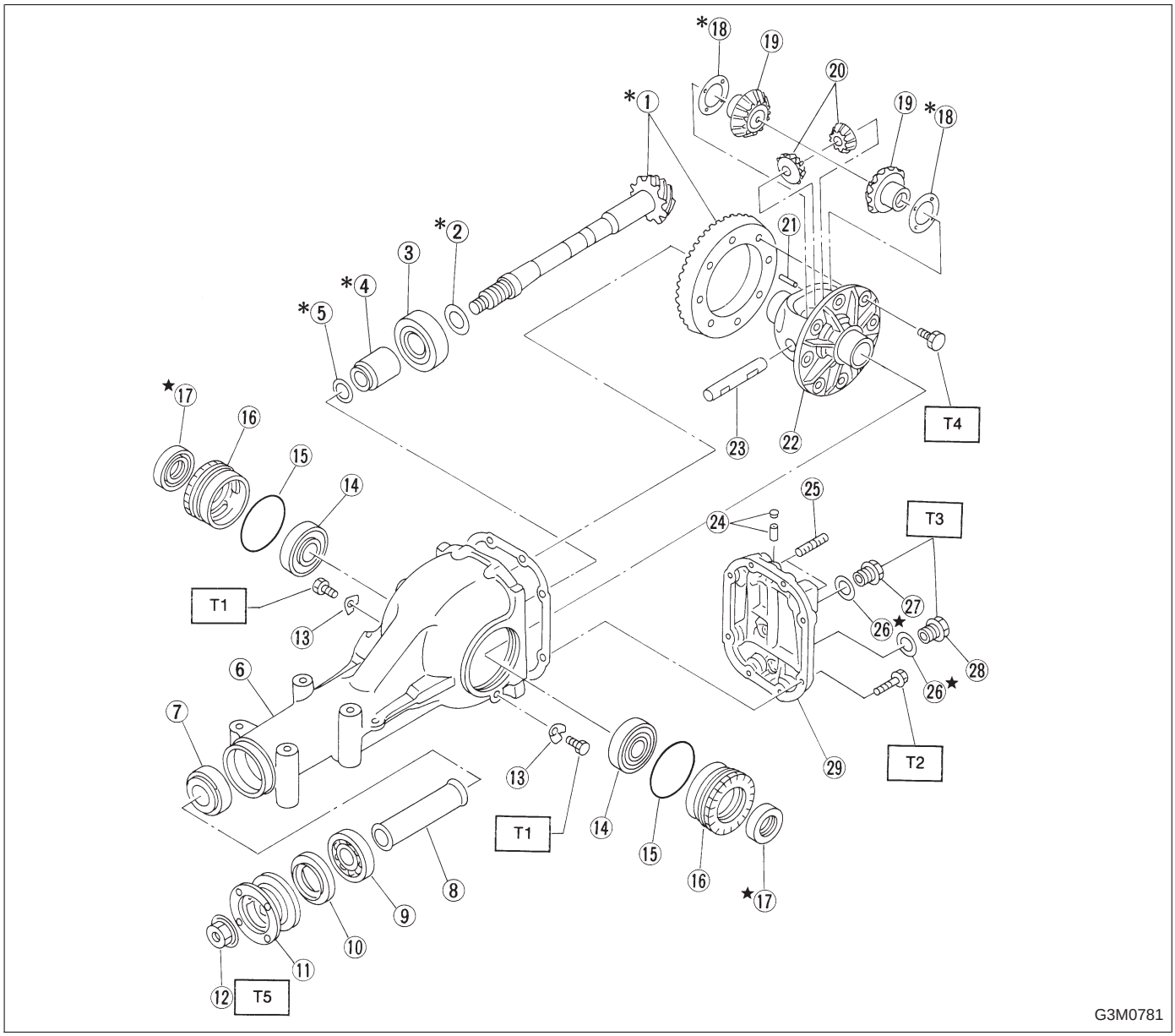


① Front propeller shaft
② Center bearing
③ Companion flange
④ Stake nut
⑤ Rear propeller shaft
⑥ Rear differential

Tightening torque: N·m (kg-m, ft-lb)
T1: 27.9±4.4 (2.85±0.45, 20.6±3.3)
T2: 31±8 (3.2±0.8, 23.1±5.8)
T3: 52±5 (5.3±0.5, 38.3±3.6)
T4: 270±25 (27.5±2.5, 199±18)

3. Rear Differential Assembly

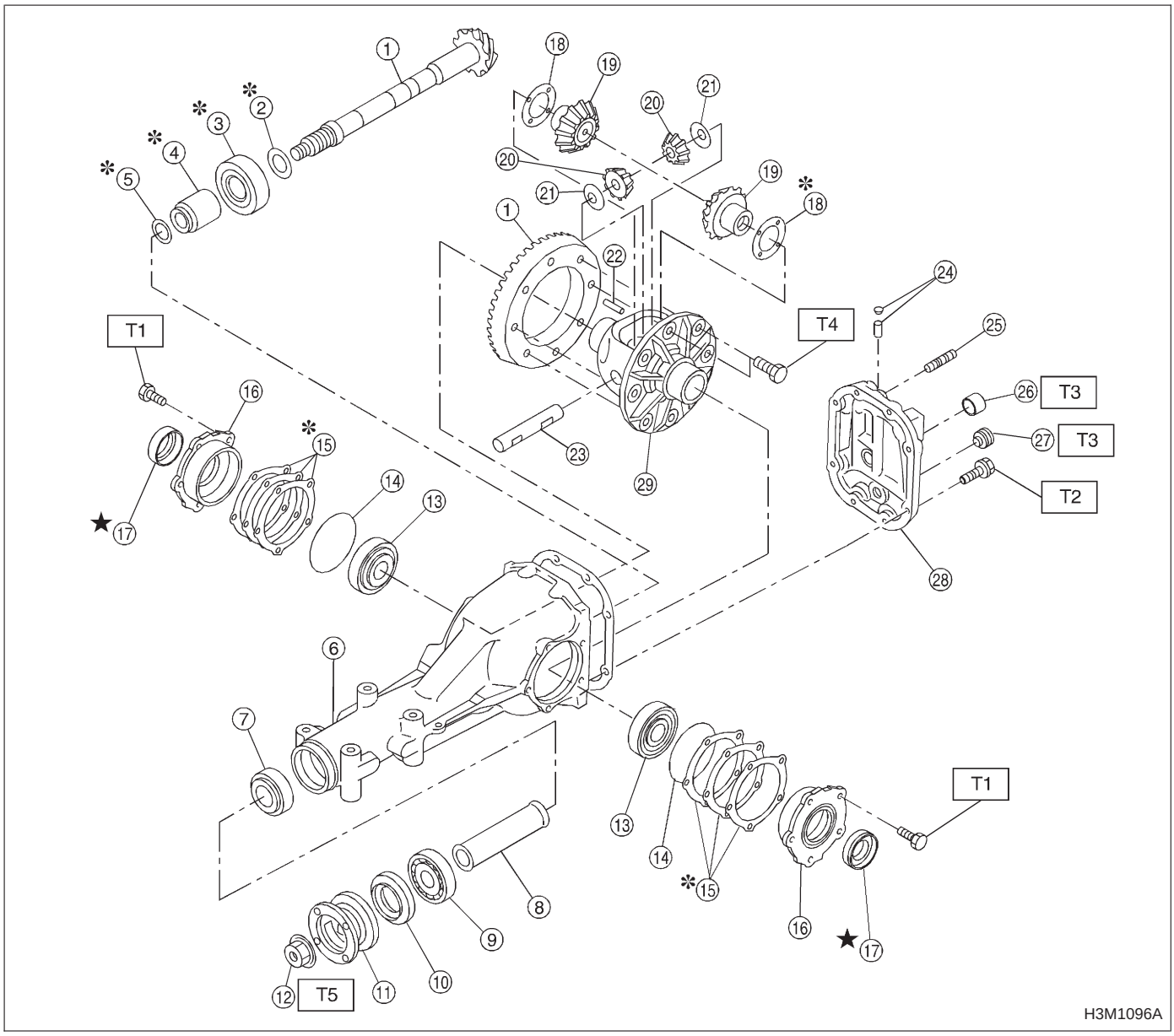
1. 1800 cc MODEL



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 Lock plate
⑭ Side bearing
⑮ O-ring
⑯ Axle shaft holder
⑰ Side oil seal
⑱ Side gear thrust washer
⑲ Side gear
⑳ Pinion mate gear
㉑ Pinion shaft lock pin
㉒ Differential case
㉓ Pinion mate shaft
㉔ Air breather cap
㉕ Stud bolt
㉖ Gasket
㉗ Oil filler plug
㉘ Oil drain plug
㉙ Rear cover

Tightening torque: N·m (kg-m, ft-lb)
T1: 25±3 (2.5±0.3, 18.1±2.2)
T2: 25±2 (2.5±0.2, 18.1±1.4)
T3: 34±4 (3.5±0.4, 25.3±2.9)
T4: 62±5 (6.3±0.5, 45.6±3.6)
T5: 188±26 (19.2±2.7, 139±20)

2. 2200 cc MODEL



① Pinion crown gear set
② Pinion height adjusting washer
③ Rear bearing
④ Bearing preload adjusting spacer
⑤ Bearing preload adjusting washer
⑥ Differential carrier
⑦ Front bearing
⑧ Spacer
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 Side gear thrust washer
⑲ Side gear
⑳ Pinion mate gear
㉑ Pinion mate gear washer
㉒ Pinion shaft lock pin
㉓ Pinion mate shaft
㉔ Air breather cap
㉕ Stud bolt
㉖ Oil filler plug
㉗ Oil drain plug
㉘ Rear cover
㉙ Differential case

Tightening torque: N·m (kg-m, ft-lb)
T1: 10.3±1.5
(1.05±0.15, 7.6±1.1)
T2: 29.4±4.9
(3.00±0.50, 21.7±3.6)
T3: 44.1±3.9
(4.50±0.40, 32.5±2.9)
T4: 103.0±9.8
(10.50±1.00, 75.9±7.2)
T5: 181.4±14.7
(18.50±1.50, 133.8±10.8)

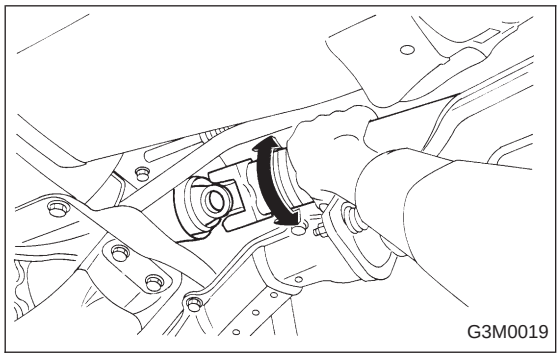
1. Propeller Shaft

A: ON-CAR SERVICE

Check the following points with propeller shaft installed in vehicle.

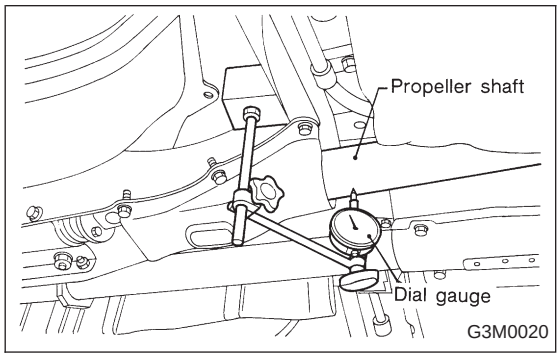
1) Joints and connections

Check for any looseness of yoke flange connecting bolts and center bearing retaining bolts.



2) Splines and bearing locations

Turn propeller shaft by hand to see if abnormal free play exists at splines. Also move yokes to see if abnormal free play exists at spiders and bearings.



3) Runout of propeller shaft

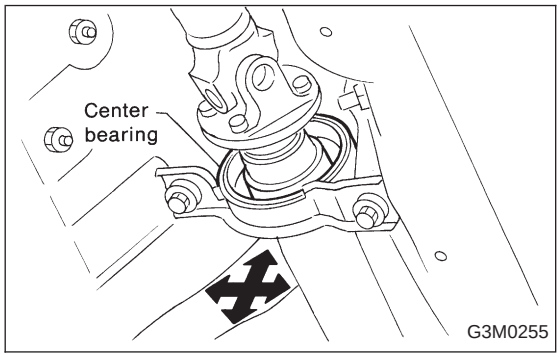
Turn rear wheels by hand to check for “runout” of propeller shaft.

Runout:

Limit 0.6 mm (0.024 in)

NOTE:

Measure runout with a dial gauge at the center of front and rear propeller shaft tubes.



4) Center bearing free play

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.

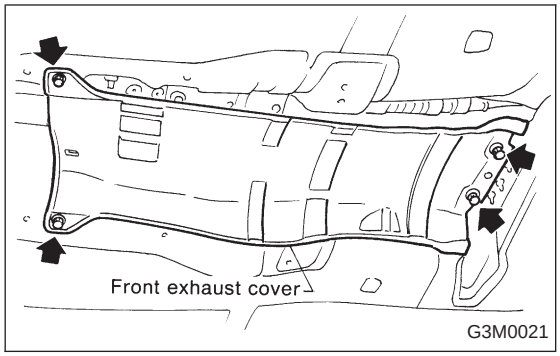
B: REMOVAL

NOTE:

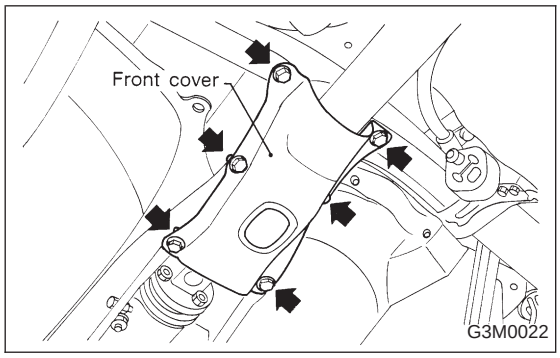
Before removing propeller shaft, wrap metal parts with a cloth or rubber material.

1) Disconnect ground cable from battery.
2) Move selector lever or gear shift lever to “N”.
3) Release the parking brake.
4) Jack up vehicle and support it with sturdy racks.
5) Remove rear exhaust pipe and muffler.

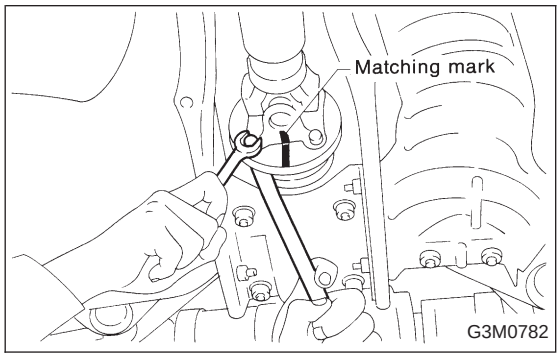
<Ref. to 2-9 [W2A0], [W3A0].>



6) Remove front exhaust cover.

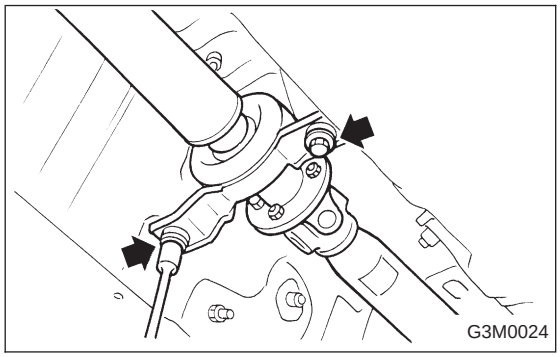


7) Remove differential mount front cover.

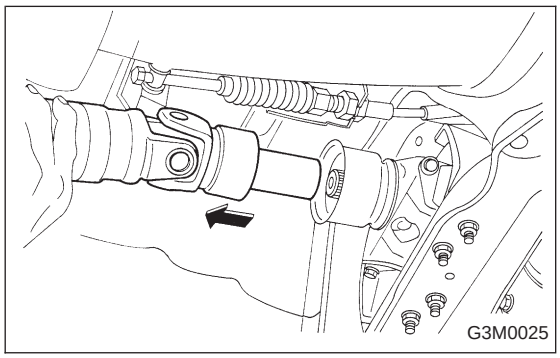


8) Remove the four bolts which hold propeller shaft to rear differential.

NOTE:
- Put matching marks on affected parts before removal.
- Remove all but one bolt.



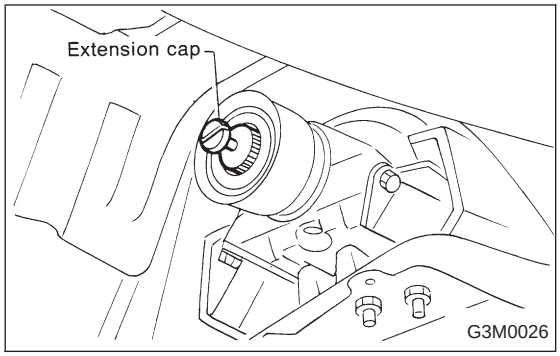
9) Remove the two bolts which hold center bearing to car body.



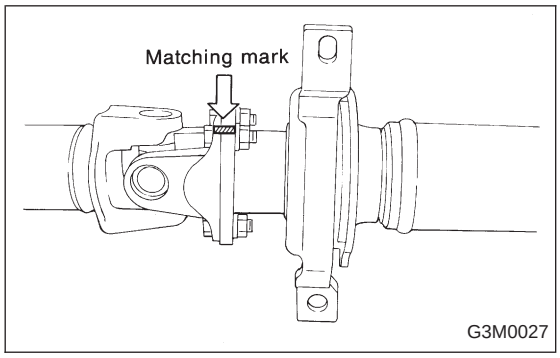
10) Remove propeller shaft from transmission.

CAUTION:
Be sure not to damage oil seals and the frictional surface of sleeve yoke.

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.



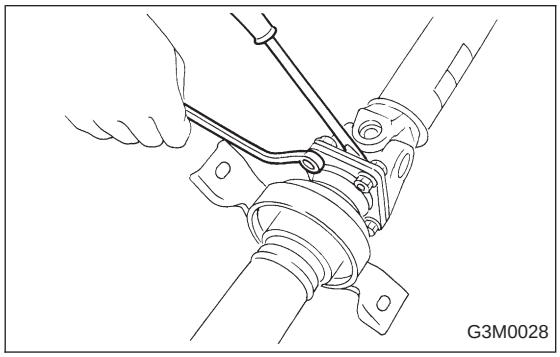
11) Install the extension cap to transmission.



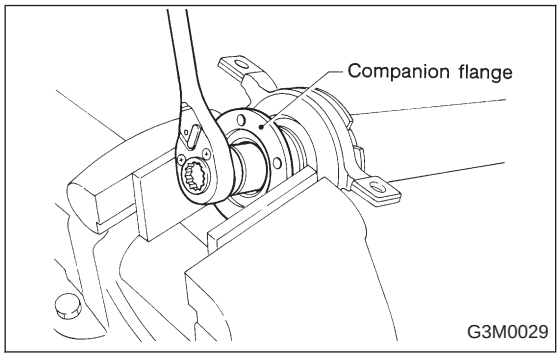
C: DISASSEMBLY

Before removing center bearing, check its condition. If it does not operate smoothly or if there is any free play or leakage, remove as follows:

1) Put matching marks on affected parts.

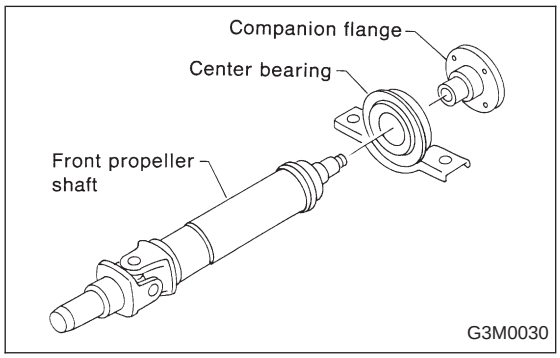


2) Remove bolts which hold front propeller shaft to rear propeller shaft.



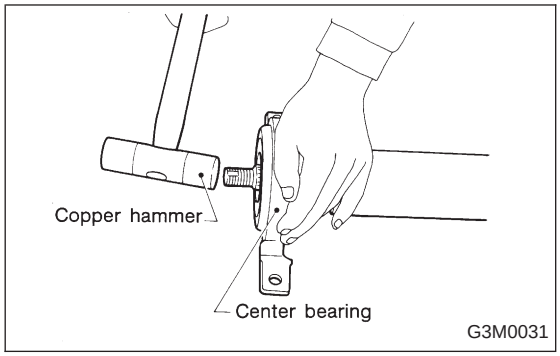
3) Place companion flange in a vise and remove stake nut.

CAUTION:
Be sure not to hold propeller shaft pipe portion in the vise.



4) Drive out companion flange with a puller or press.

NOTE:
Before disassembling, put matching mark on affected parts.



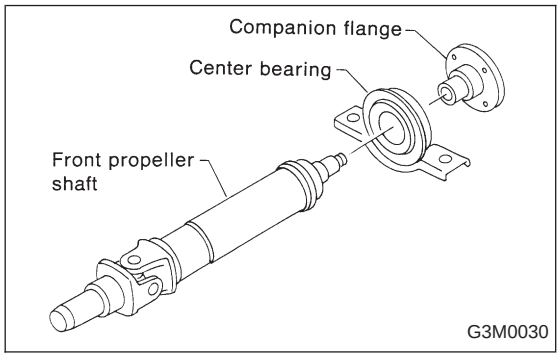
5) Lightly tap the head of front propeller shaft with a copper hammer until center bearing is removed.

CAUTION:
Be careful not to damage the thread portion.

D: INSPECTION

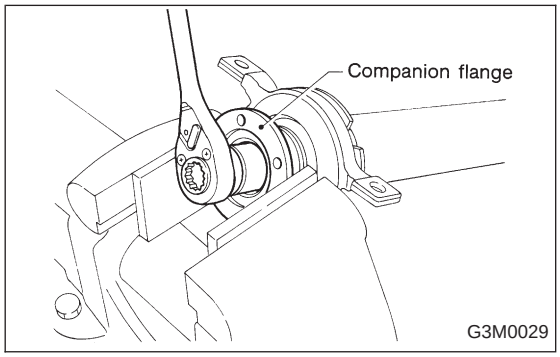
NOTE:
Do not disassemble propeller shaft. Check the following and replace if necessary.

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



E: ASSEMBLY

1) Install center bearing onto front propeller shaft.
2) Align marks and install companion flange.

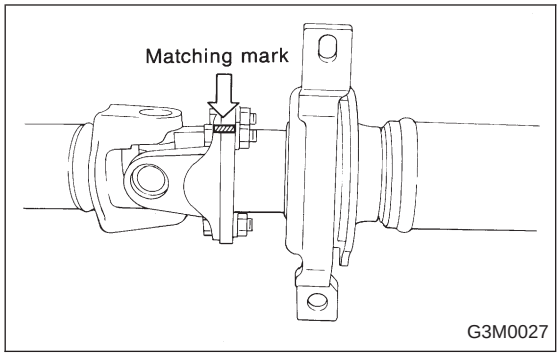


3) Tighten stake nut until center bearing is set in position.

CAUTION:
Be sure to install new stake nut.

Tightening torque:
270±25 N·m (27.5±2.5 kg-m, 199±18 ft-lb)

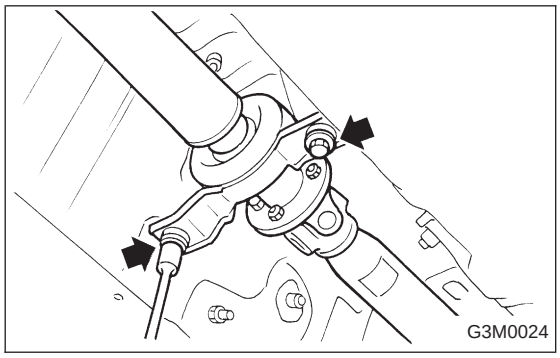
NOTE:
Stake the nut after tightening.



4) Align matching marks and connect front and rear propeller shafts.

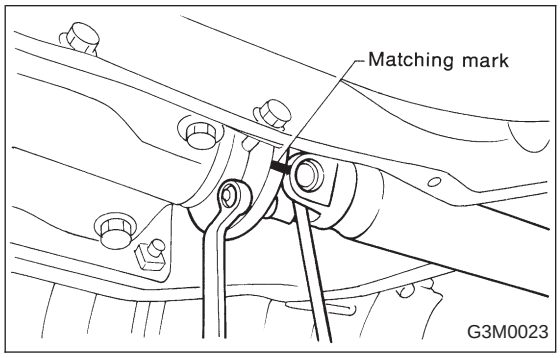
Tightening torque:
27.9±4.4 N·m (2.85±0.45 kg-m, 20.6±3.3 ft-lb)

F: INSTALLATION



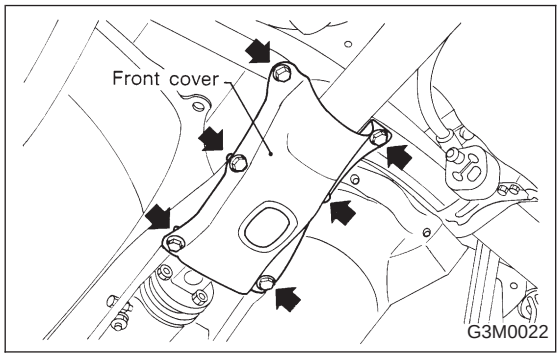
1) Insert sleeve yoke into transmission and attach center bearing to car body.

Tightening torque:
52±5 N·m (5.3±0.5 kg-m, 38.3±3.6 ft-lb)

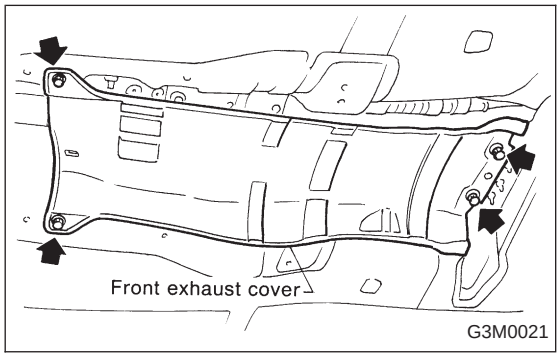


2) Align matching marks and connect flange yoke and rear differential.

Tightening torque:
31±8 N·m (3.2±0.8 kg-m, 23.1±5.8 ft-lb)



3) Install differential mount front cover.



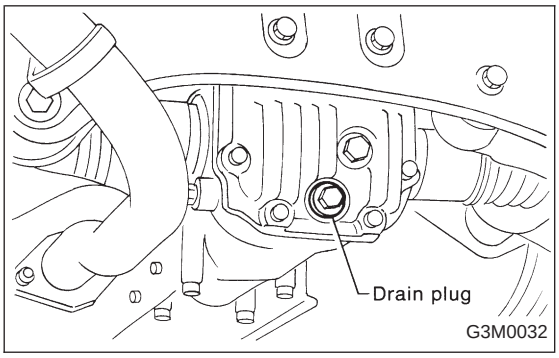
4) Install front exhaust cover.
5) Install rear exhaust pipe and muffler.

2. Rear Differential

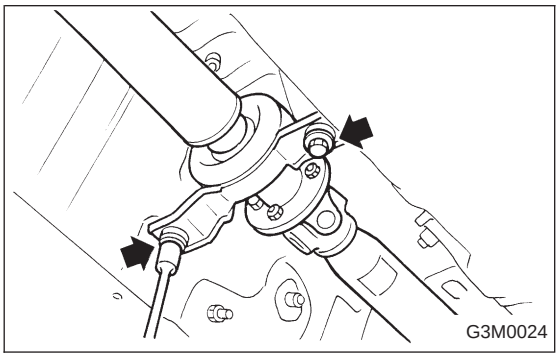
A: ON-CAR SERVICE

1. FRONT OIL SEAL (1800 cc MODEL)

1) Disconnect ground cable from battery.
2) Move selector lever or gear shift lever to “N”.
3) Release the parking brake.

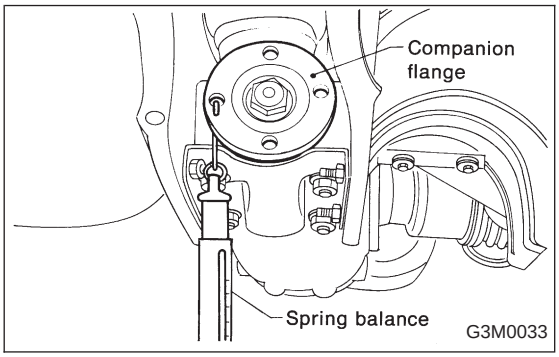


4) Remove oil drain plug, and drain gear oil.



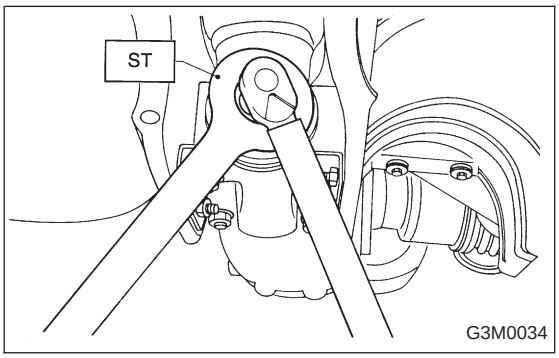
5) Jack-up rear wheels and support the vehicle body with sturdy racks.
6) Remove propeller shaft from body. <Ref. to 3-4 [W1B0].>

CAUTION:
Wrap metal parts with a cloth or rubber material to prevent damage from adjacent metal parts.

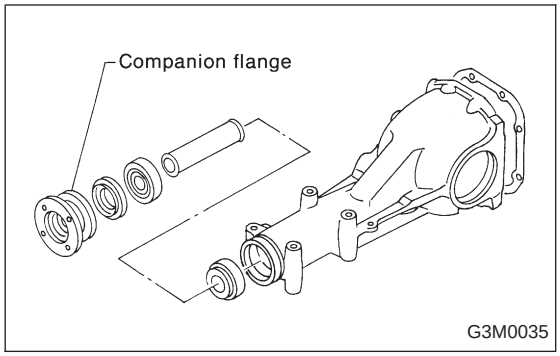


7) Measure turning resistance of companion flange.

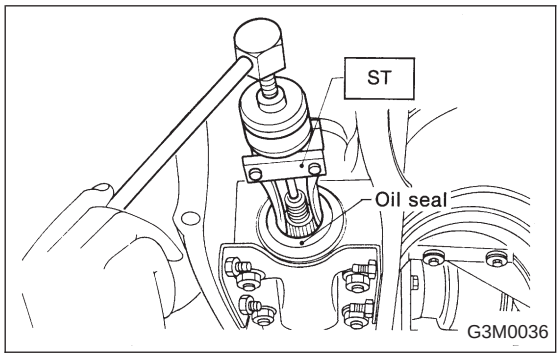
NOTE:
● Before measuring, remove the DOJ.
<Ref. to 3-4 [W2A2].>
● Measure turning resistance after making sure that the companion flange turns smoothly.



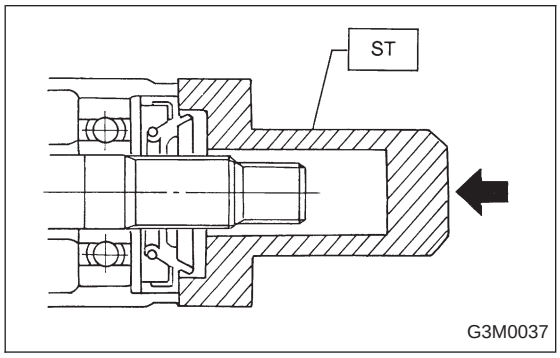
8) Remove self-locking nut while holding companion flange with ST.
ST 498427200 FLANGE WRENCH



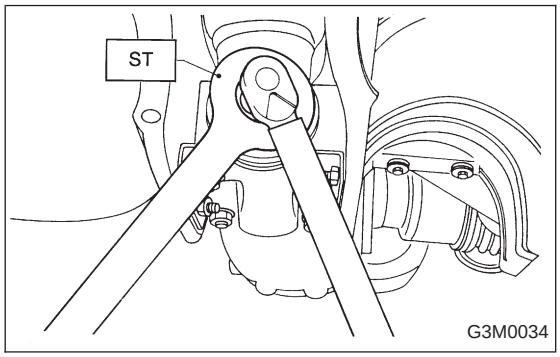
9) Extract companion flange with a puller.



10) Remove oil seal using ST.
ST 398527700 PULLER ASSY



11) Fit a new oil seal using ST.
ST 498447120 OIL SEAL INSTALLER



12) Install companion flange.
13) Tighten 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

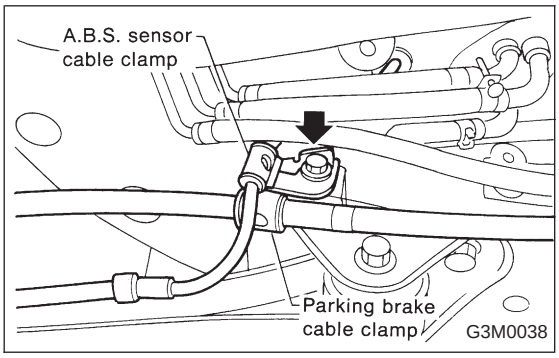
CAUTION:
Use a new self-locking nut.

Tightening torque:
188±26 N·m (19.2±2.7 kg-m, 139±20 ft-lb)

14) Reassembling procedure hereafter is the reverse of the disassembling.

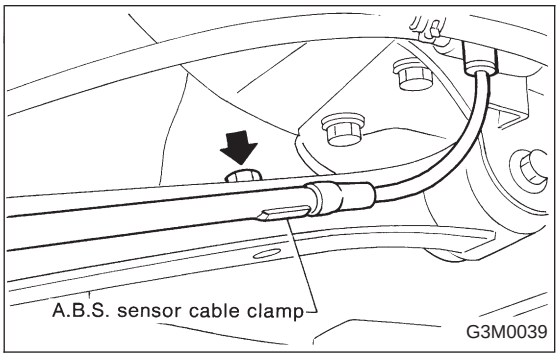
2. SIDE OIL SEAL (1800 cc MODEL)

1) Disconnect ground cable from battery.
2) Move selector 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 wheels.
7) Remove rear exhaust pipe and muffler.
<Ref. to 2-9 [W2A0], [W3A0].>

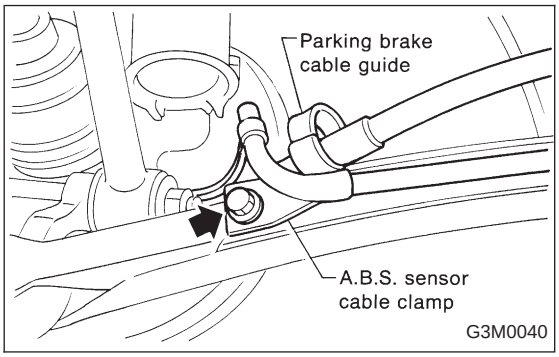


8) Remove the DOJ of rear drive shaft from rear differential.

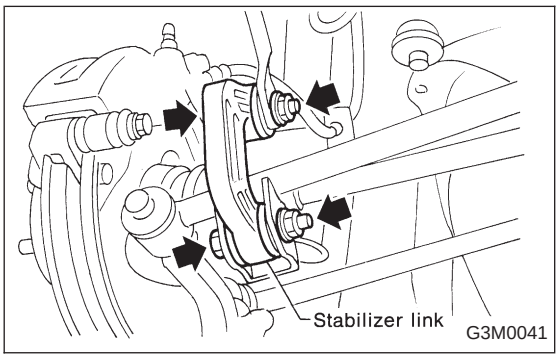
(1) Remove the A.B.S. sensor cable clamp and parking brake cable clamp from bracket.



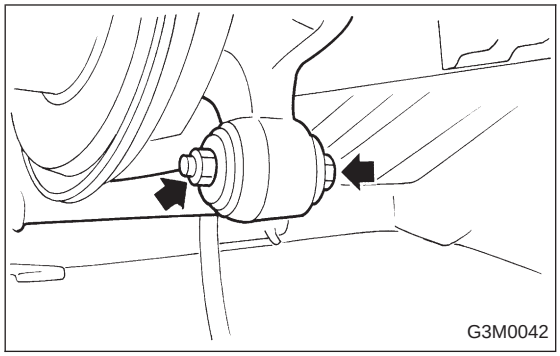
(2) Remove the A.B.S. sensor cable clamp from the trailing link.



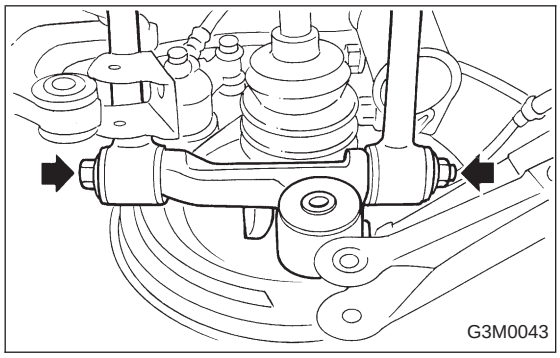
(3) Remove the A.B.S. sensor cable clamp and parking brake cable guide from the trailing link.



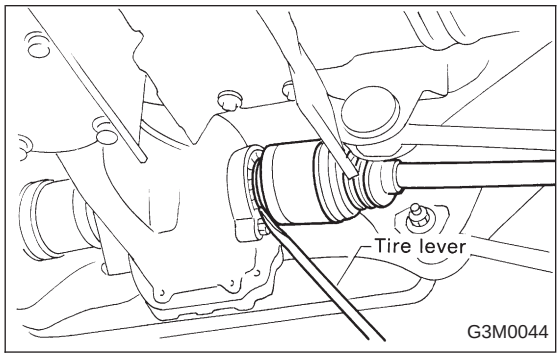
(4) Remove the rear stabilizer link.



(5) Remove the bolts which secure the trailing link to the rear housing.

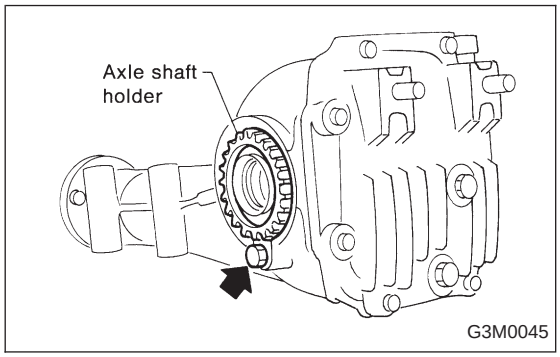


(6) Remove the bolts which secure the front and rear lateral link to the rear housing.

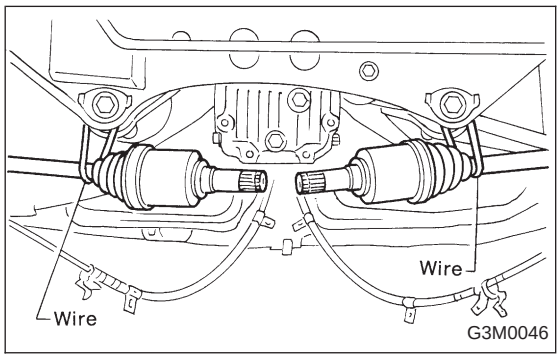


(7) Remove the DOJ from the rear differential with tire lever.

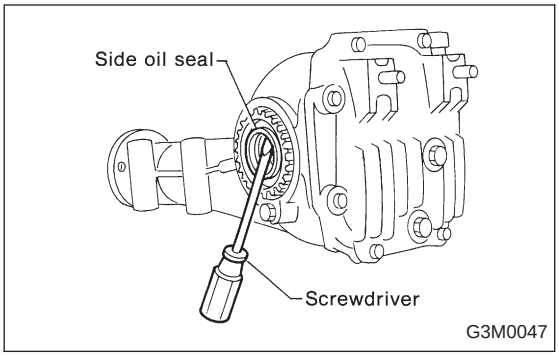
NOTE:
The side spline shaft circlip comes out together with the shaft.



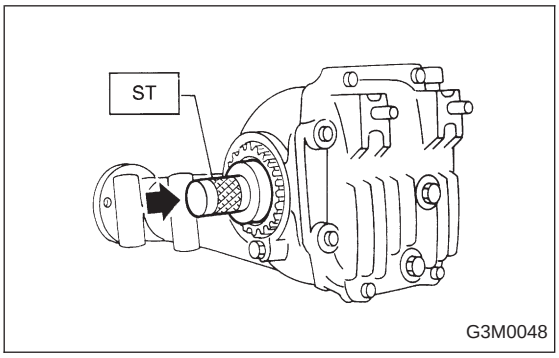
CAUTION:
When removing the DOJ from the rear differential, fit tire lever to the bolt as shown in figure so as not to damage the axle shaft holder.



9) Secure rear drive shaft to rear crossmember using wire.



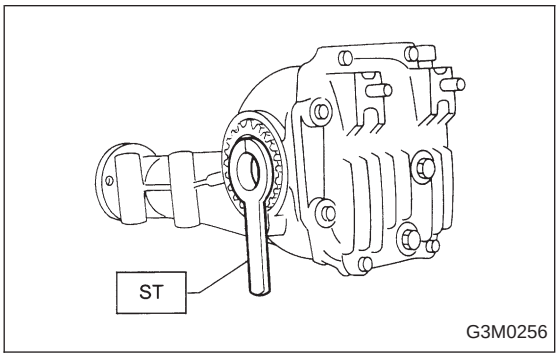
10) Remove oil seal with screwdriver.



11) Drive in a new side oil seal with ST.

CAUTION:
Apply chassis grease between the oil seal lips.

ST 498447100 OIL SEAL INSTALLER

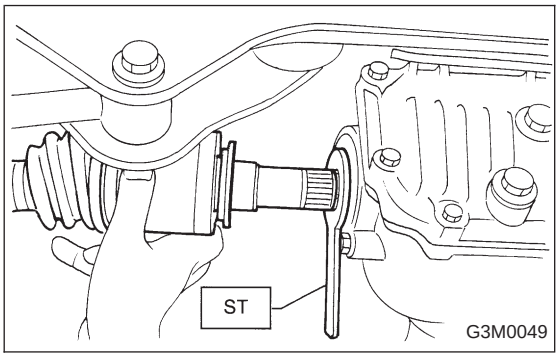


12) Insert the DOJ into rear differential.

CAUTION:
Before inserting, replace the circlip at the end of the spline shaft with a new one.

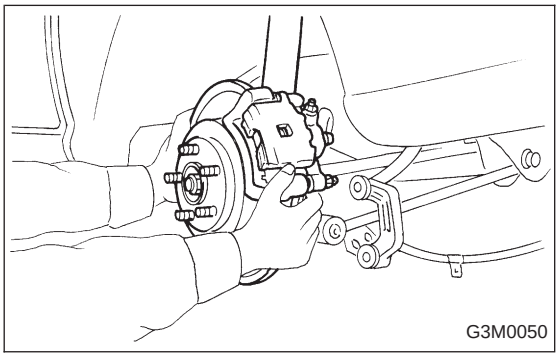
(1) Install ST to rear differential.

ST 28099PA090 SIDE OIL SEAL PROTECTOR



(2) Insert the spline shaft until the spline portion is inside the side oil seal.
(3) Remove ST.

ST 28099PA090 SIDE OIL SEAL PROTECTOR



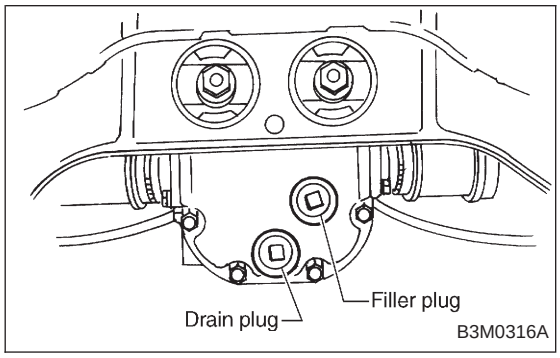
(4) Completely insert DOJ into rear differential by pressing rear housing.

NOTE:
Make sure that oil seal lip is not folded over inward.

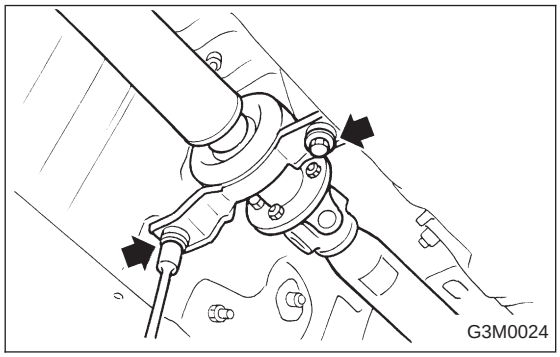
13) Hereafter, re-assemble in reverse order of disassembly.

3. FRONT OIL SEAL (2200 cc MODEL)

1) Disconnect ground cable from battery.
2) Move selector lever or gear shift lever to “N”.
3) Release the parking brake.

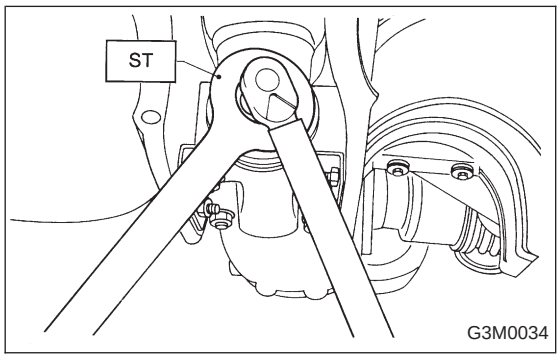


4) Remove oil drain plug, and drain gear oil.

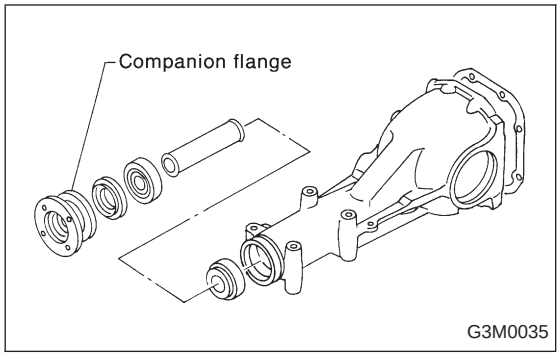


5) Jack-up rear wheels and support the vehicle body with sturdy racks.
6) Remove propeller shaft from body. <Ref. to 3-4 [W1B0].>

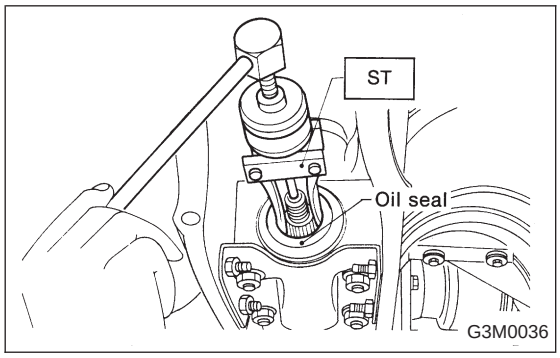
CAUTION:
Wrap metal parts with a cloth or rubber material to prevent damage from adjacent metal parts.



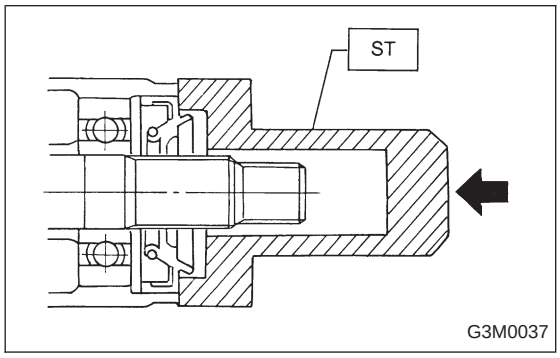
7) Remove self-locking nut while holding companion flange with ST.
ST 498427200 FLANGE WRENCH



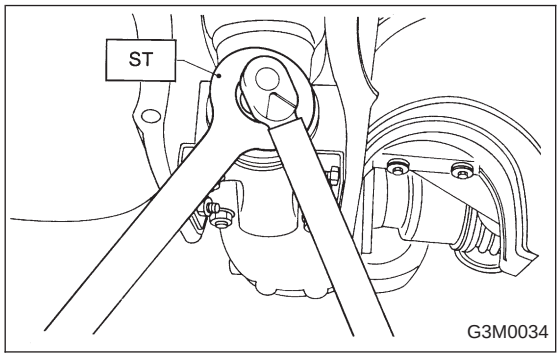
8) Extract companion flange with a puller.



9) Remove oil seal using ST.
ST 499705401 PULLER ASSY



10) Fit a new oil seal using ST.
ST 498447120 OIL SEAL INSTALLER



11) Install companion flange.
12) Tighten 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

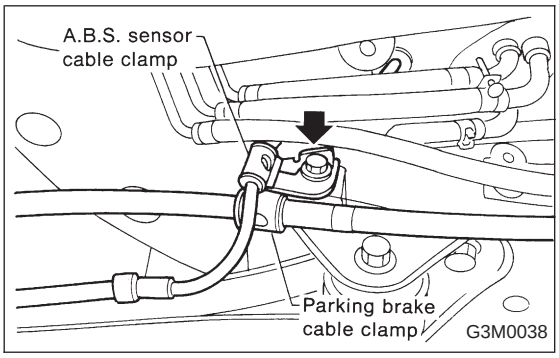
CAUTION:
Use a new self-locking nut.

Tightening torque:
181.4±14.7 N·m (18.50±1.50 kg-m, 133.8±10.8 ft-lb)

13) Reassembling procedure hereafter is the reverse of the disassembling.

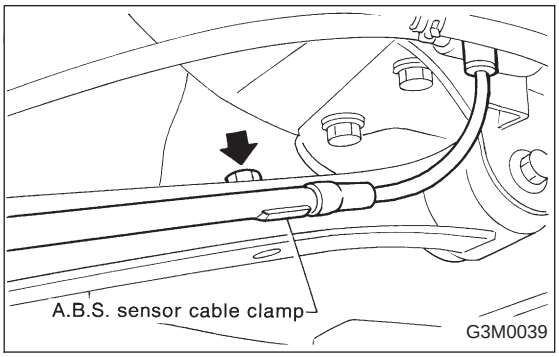
4. SIDE OIL SEAL (2200 cc MODEL)

1) Disconnect ground cable from battery.
2) Move selector 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 wheels.
7) Remove rear exhaust pipe and muffler.
<Ref. to 2-9 [W2A0], [W3A0].>

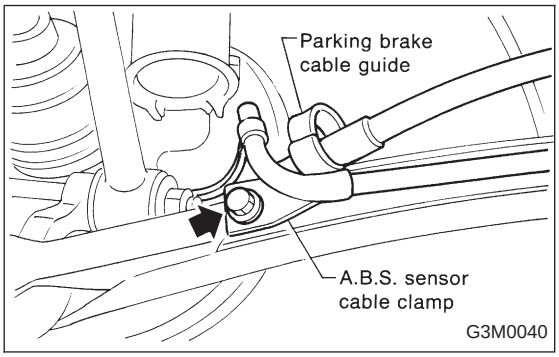


8) Remove the DOJ of rear drive shaft from rear differential.

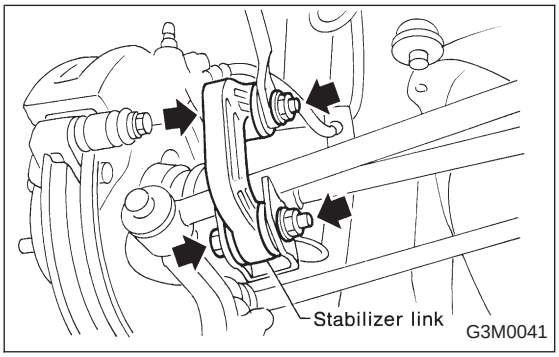
(1) Remove the A.B.S. sensor cable clamp and parking brake cable clamp from bracket.



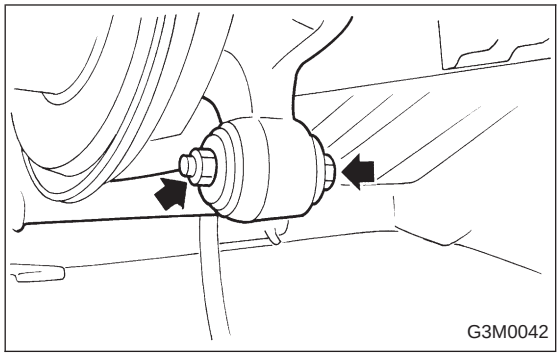
(2) Remove the A.B.S. sensor cable clamp from the trailing link.



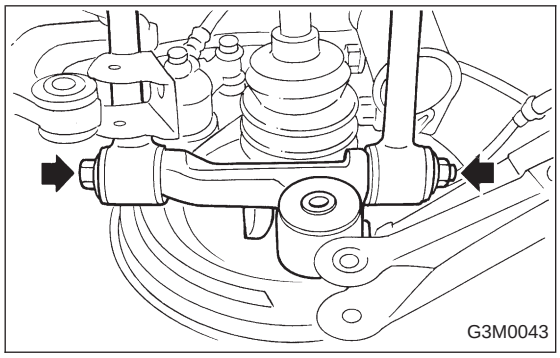
(3) Remove the A.B.S. sensor cable clamp and parking brake cable guide from the trailing link.



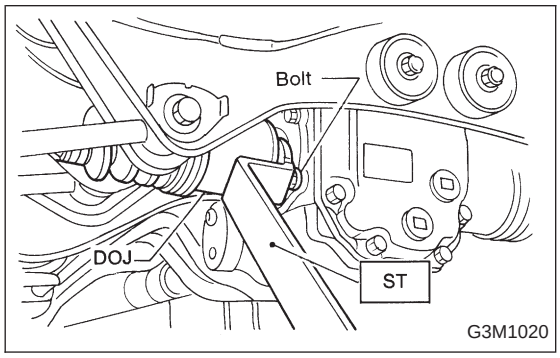
(4) Remove the rear stabilizer link.



(5) Remove the bolts which secure the trailing link to the rear housing.

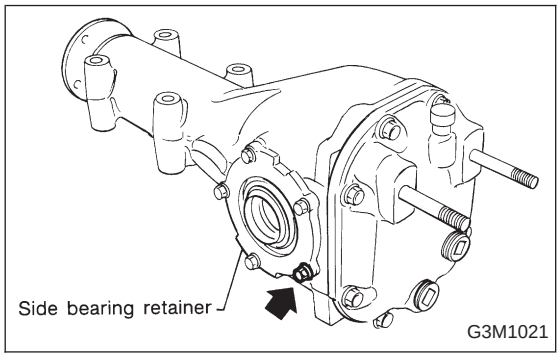


(6) Remove the bolts which secure the front and rear lateral link to the rear housing.

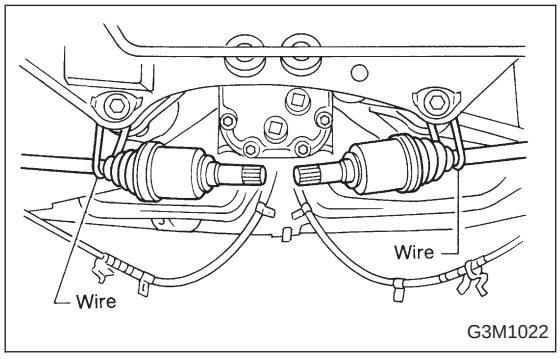


(7) Remove the DOJ from the rear differential by using ST.

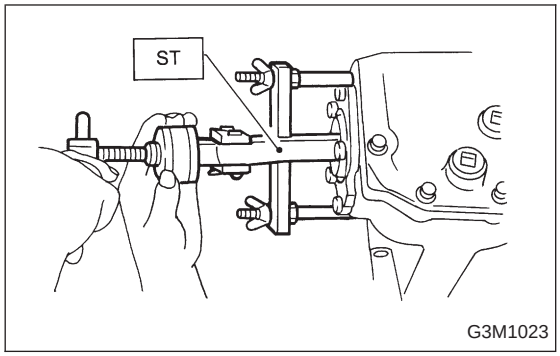
ST 208099PA100 DRIVE SHAFT REMOVER



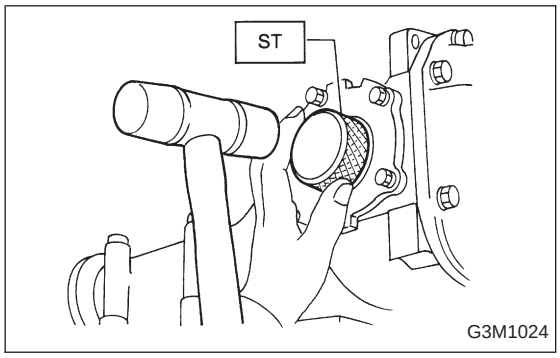
CAUTION:
When removing the DOJ from the rear differential, fit tire lever to the bolt as shown in figure so as not to damage the side bearing retainer.



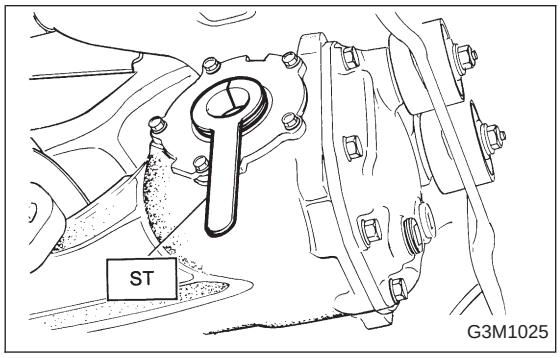
9) Secure rear drive shaft to rear crossmember using wire.



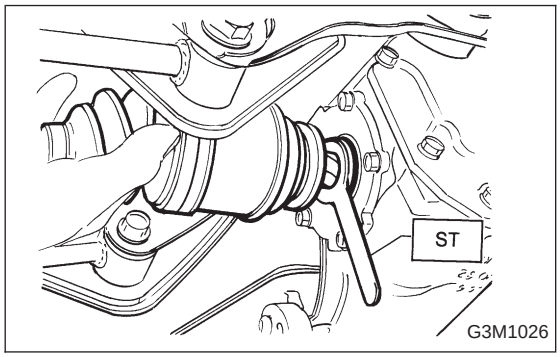
10) Remove side oil seal with ST.
ST 398527700 PULLER ASSY



11) Drive in a new side oil seal with ST.
CAUTION:
Apply chassis grease between the oil seal lips.
ST 398437700 DRIFT

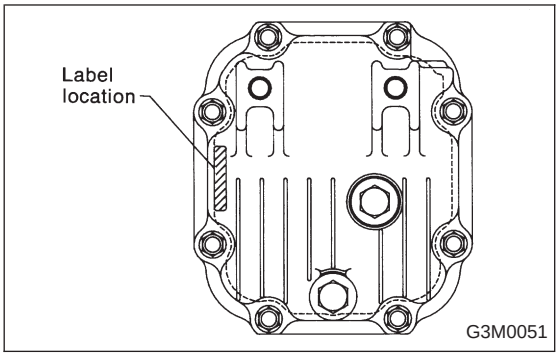


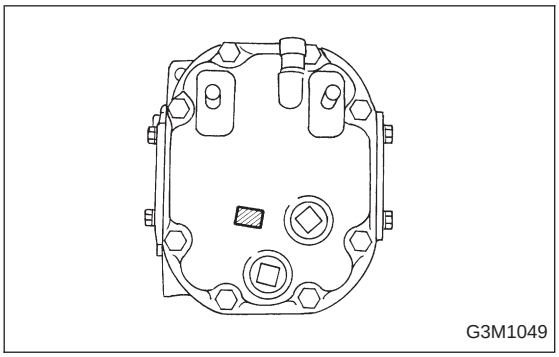
12) Insert the DOJ into rear differential.
(1) Install ST to rear differential.
ST 28099PA090 SIDE OIL SEAL PROTECTOR



(2) Insert the spline shaft until the spline portion is inside the side oil seal.
(3) Remove ST.
ST 28099PA090 SIDE OIL SEAL PROTECTOR

13) Hereafter, re-assemble in reverse order of disassembly.





B: IDENTIFICATION

When replacing a rear differential assembly, select the correct one according to the following table.

CAUTION:
Using the different rear differential assembly causes the drive line and tires to "drag" or emit abnormal noise when AWD is selected.

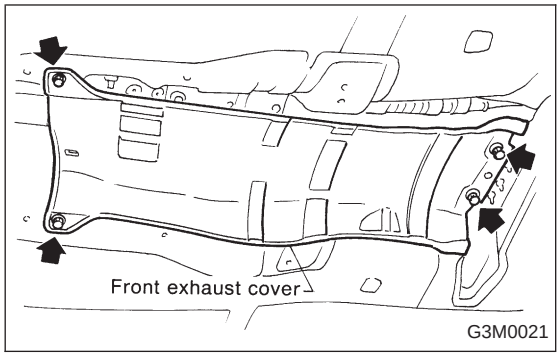
Gear ratio		Part number	Label stuck on rear differential
1800 cc MT	3.900	38300AA060	 H3M1057
1800 cc AT	4.111	38300AA000	 G3M0052
2200 cc AT	4.111	27011AA340	 B3M0127

C: REMOVAL

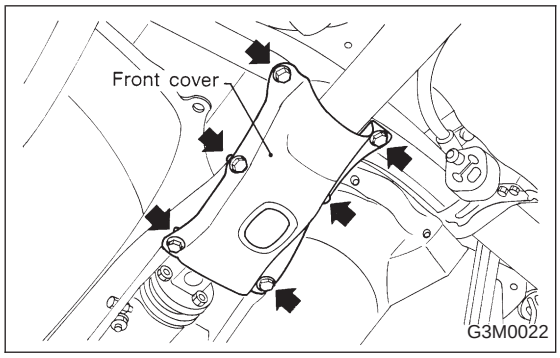
1. 1800 cc MODEL

1) Disconnect ground cable from battery.
2) Move selector lever or gear shift lever to "N".
3) Release the parking brake.
4) Loosen wheel nuts.
5) Jack-up vehicle and support it with sturdy racks.
6) Remove wheels.
7) Remove rear exhaust pipe and muffler.

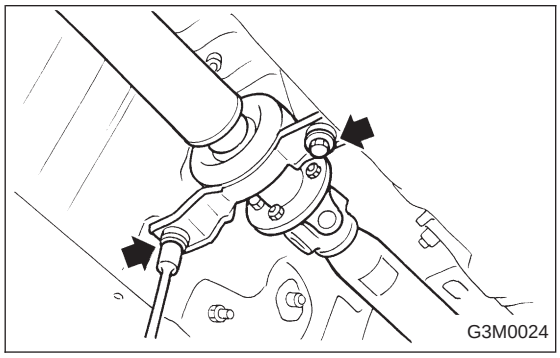
<Ref. to 2-9 [W2A0], [W3A0].>



8) Remove front exhaust cover.



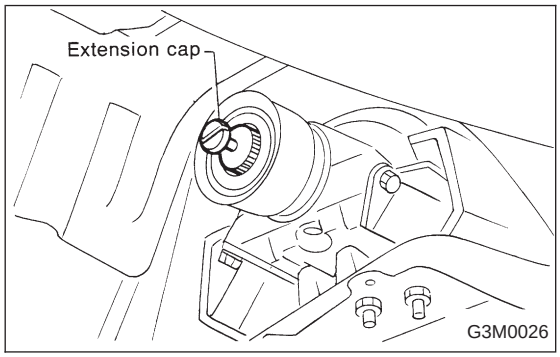
9) Remove front cover of rear differential mount.



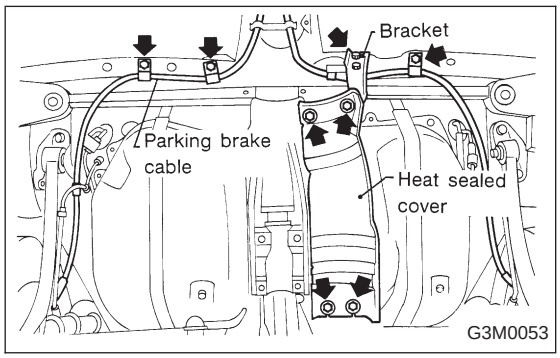
10) Remove propeller shaft.

CAUTION:
When removing propeller shaft, pay attention not to damage the sliding surfaces of rear drive shaft (extension) spline, oil seal and sleeve yoke.

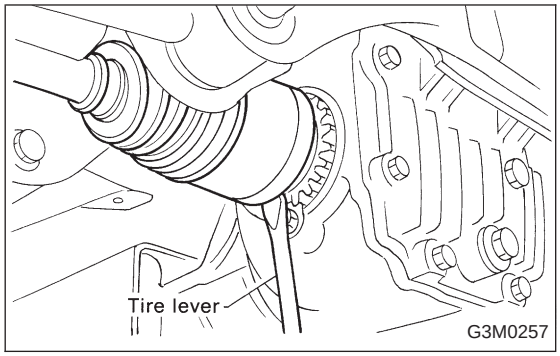
NOTE:
Prepare an oil can and cap since the transmission oil flows out from the extension at removing propeller shaft.



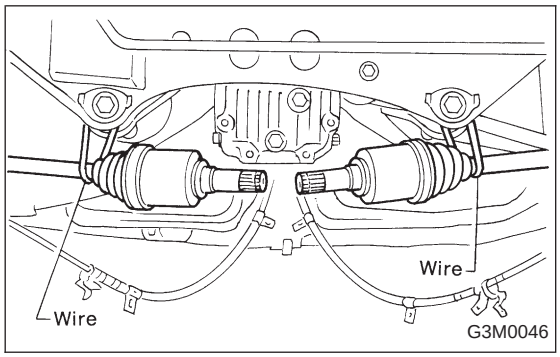
NOTE:
Insert the cap into the extension to prevent transmission oil from flowing out immediately after removing the propeller shaft.



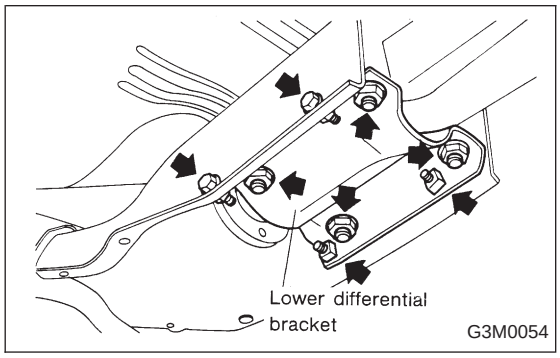
11) Remove heat sealed cover.
12) Remove clamps and bracket of parking brake cable.



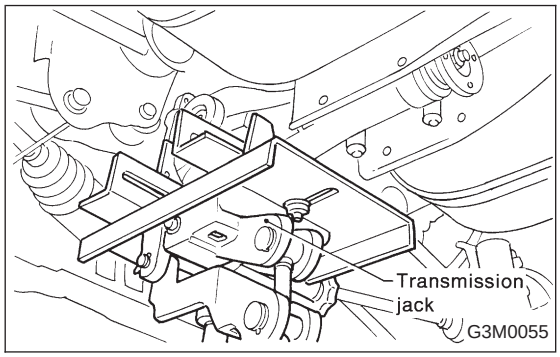
13) Remove DOJ of rear drive shaft from rear differential. <Ref. to 3-4 [W2A2].>



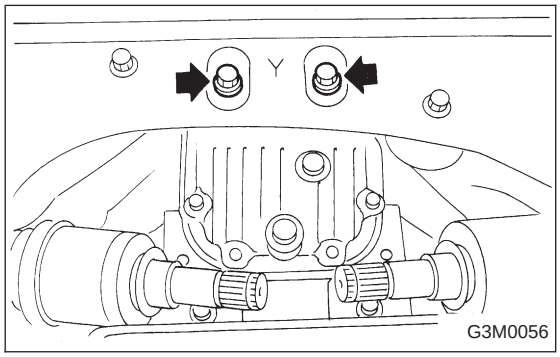
14) Secure rear drive shaft to rear crossmember using wire.



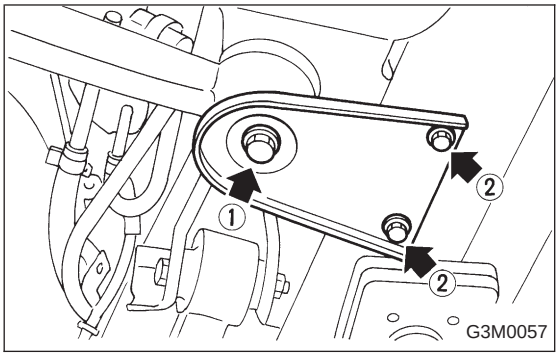
15) Remove lower differential bracket.



16) Support rear differential with transmission jack.

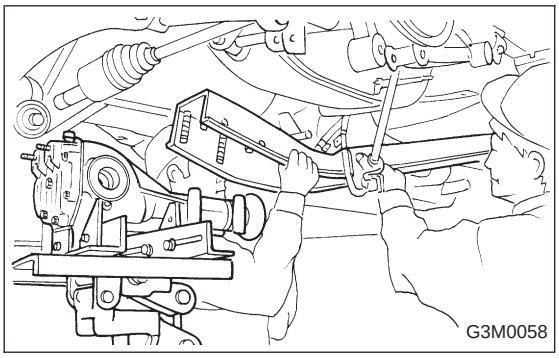


17) Remove self-locking nuts connecting rear differential to rear crossmember.

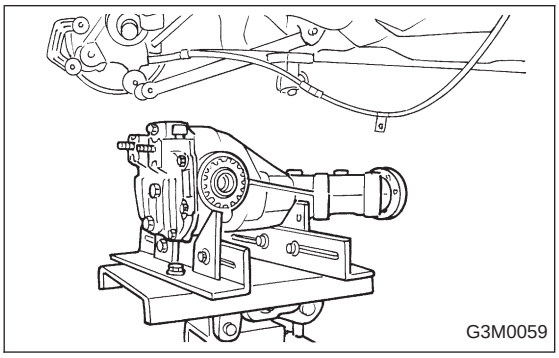


18) Remove bolts which secure rear differential front member to body.
Loosen bolt ① first, then removal bolts ②.

NOTE:
Support front member with the use of a helper to prevent it from dropping.



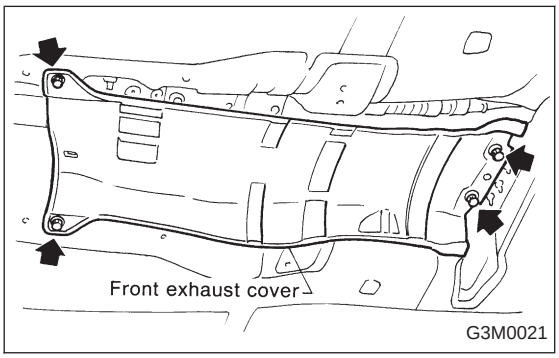
19) While slowly lowering transmission jack, move rear differential forward and remove bolts from rear crossmember.
20) Remove front member from body.



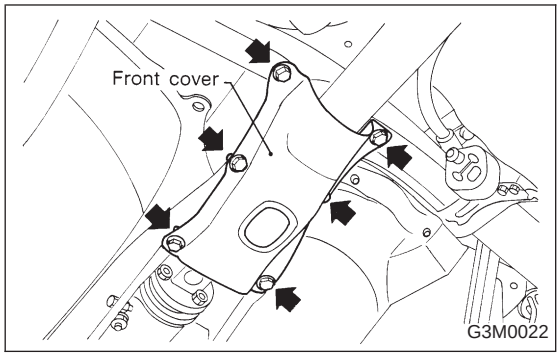
21) Remove rear differential from body.

2. 2200 cc MODEL

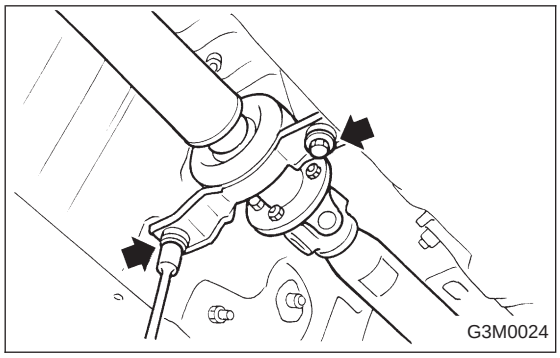
1) Disconnect ground cable from battery.
2) Move selector lever or gear shift lever to “N”.
3) Release the parking brake.
4) Loosen wheel nuts.
5) Jack-up vehicle and support it with sturdy racks.
6) Remove wheels.
7) Remove rear exhaust pipe and muffler.
<Ref. to 2-9 [W2A0], [W3A0].>



8) Remove front exhaust cover.



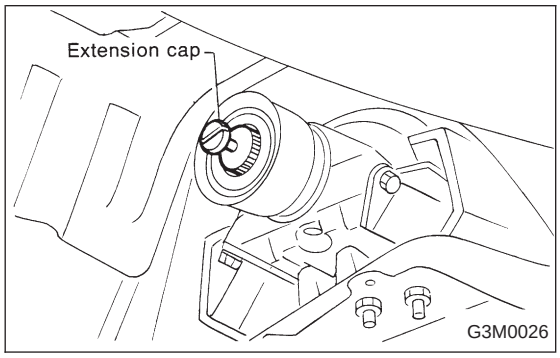
9) Remove front cover of rear differential mount.



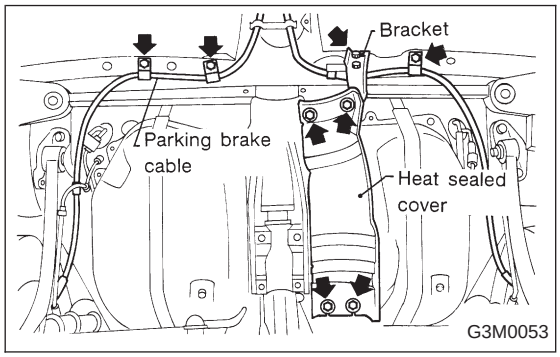
10) Remove propeller shaft.

CAUTION:
When removing propeller shaft, pay attention not to damage the sliding surfaces of rear drive shaft (extension) spline, oil seal and sleeve yoke.

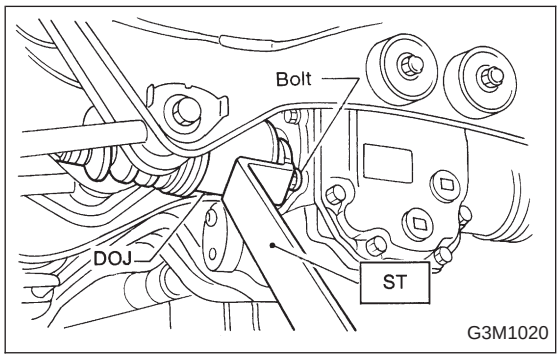
NOTE:
Prepare an oil can and cap since the transmission oil flows out from the extension at removing propeller shaft.



NOTE:
Insert the extension cap into the extension to prevent transmission oil from flowing out immediately after removing the propeller shaft.

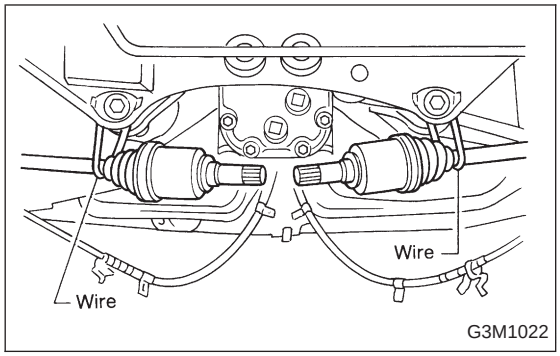


11) Remove heat sealed cover.
12) Remove clamps and bracket of parking brake cable.

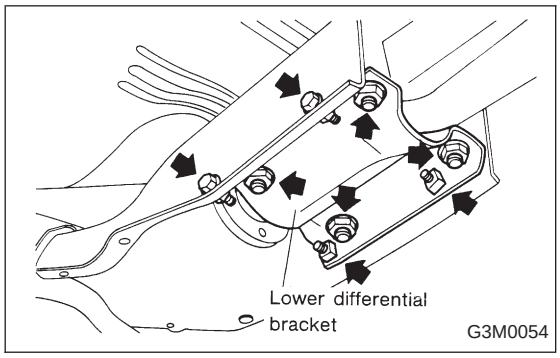


13) Remove DOJ of rear drive shaft from rear differential using ST. <Ref. to 3-4 [W2A4].>

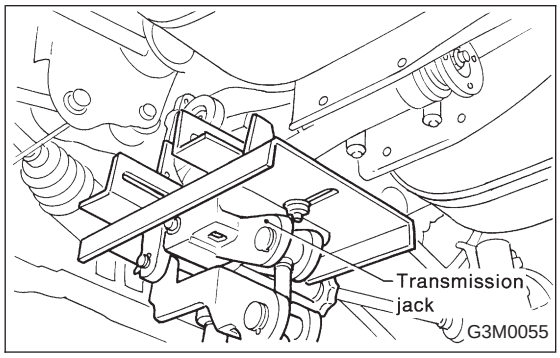
ST 28099PA100 DRIVE SHAFT REMOVER



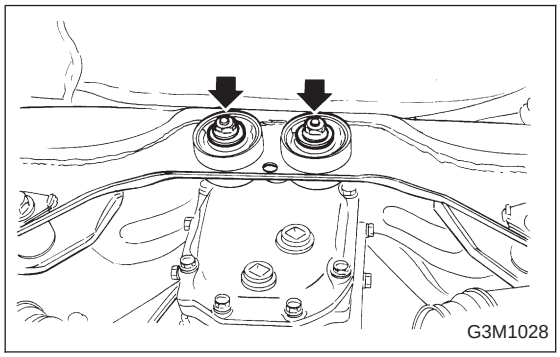
14) Secure rear drive shaft to rear crossmember using wire.



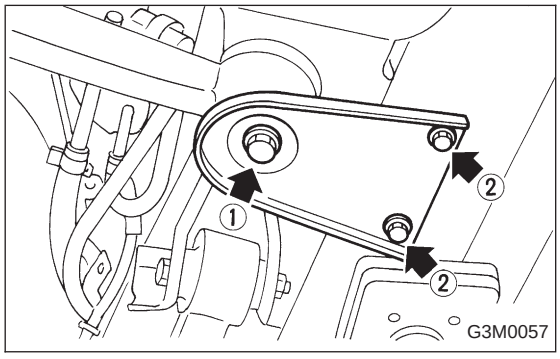
15) Remove lower differential bracket.



16) Support rear differential with transmission jack.



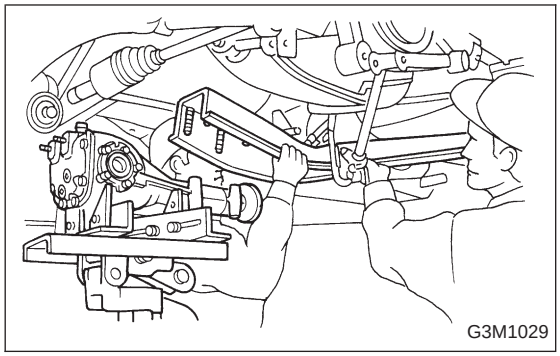
17) Remove self-locking nuts connecting rear differential to rear crossmember.



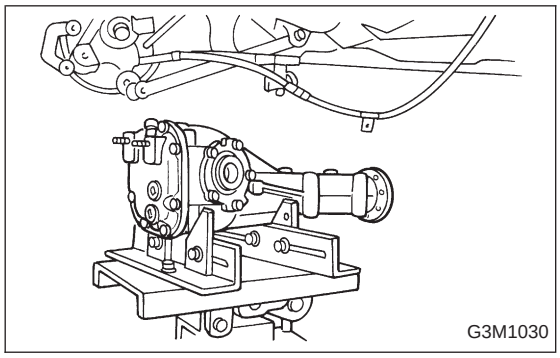
18) Remove bolts which secure rear differential front member to body.
Loosen bolt ① first, then remove bolts ②.

NOTE:
Support front member with the use of a helper to prevent it from dropping.

19) Remove bolt ①.


G3M1029

20) While slowly lowering transmission jack, move rear differential forward and remove front member and rear differential from body.


G3M1030

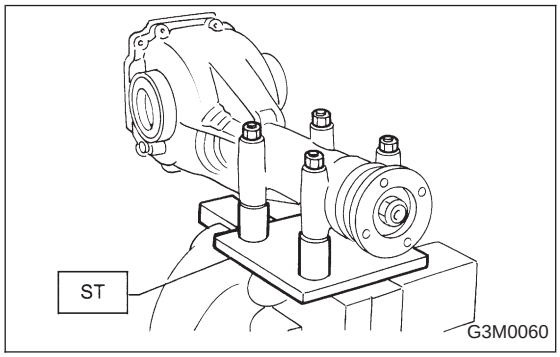
21) Remove rear differential from front member.

D: DISASSEMBLY

1. 1800 cc MODEL

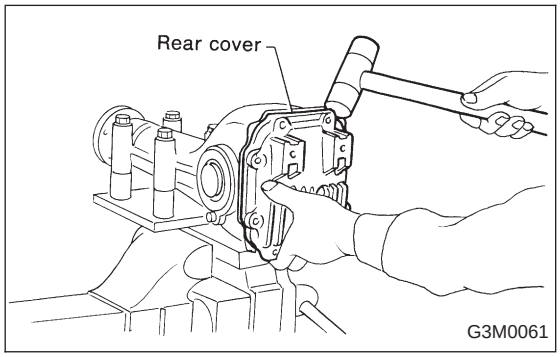
To detect real cause of trouble, inspect the following items before disassembling. <Ref. to 3-4 [W2F1].>

- Tooth contact of crown gear and pinion, and backlash
- Runout of crown gear at its back surface
- Turning resistance of drive pinion



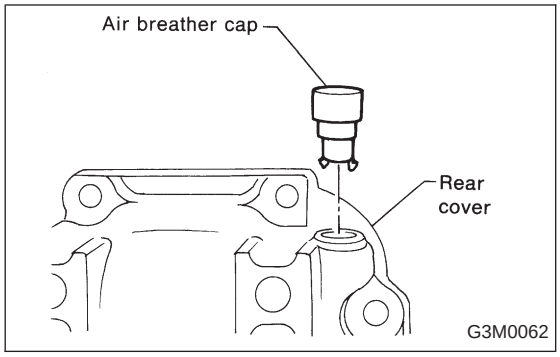
G3M0060

1) Set ST on vise and install the differential assembly to ST.
ST 398217700 ATTACHMENT
2) Drain gear oil by removing plug.

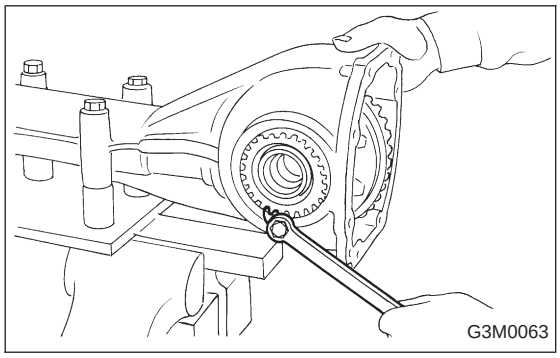


G3M0061

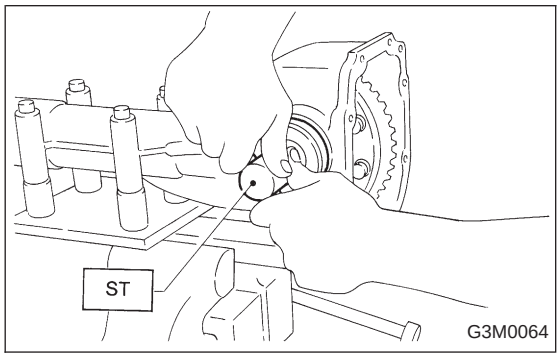
3) Remove rear cover by loosening retaining bolts.



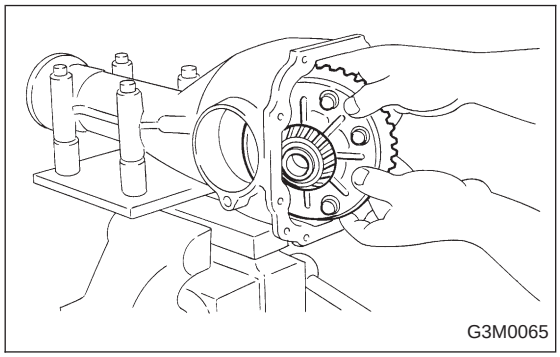
4) Replace air breather cap.
NOTE:
Do not attempt to replace the air breather cap unless necessary.



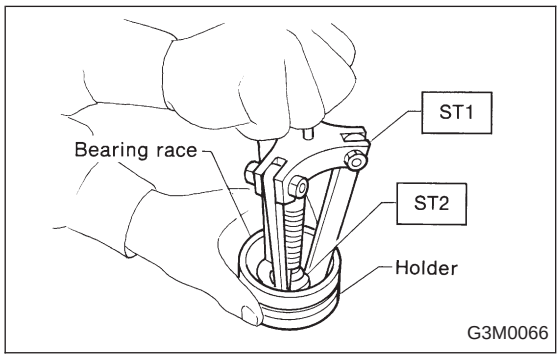
5) Remove right and left lock plates.



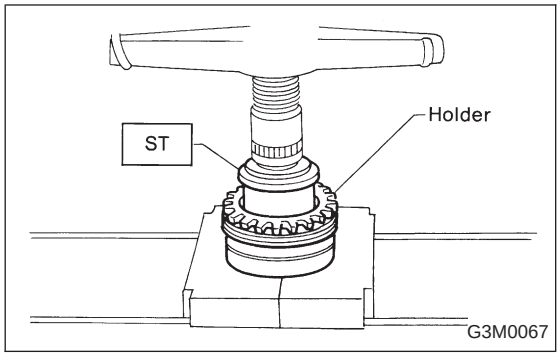
6) Remove right and left holders with ST.
ST 399780111 WRENCH



7) Pull out differential assembly from differential carrier.
CAUTION:
Be careful not to hit the teeth against the case.



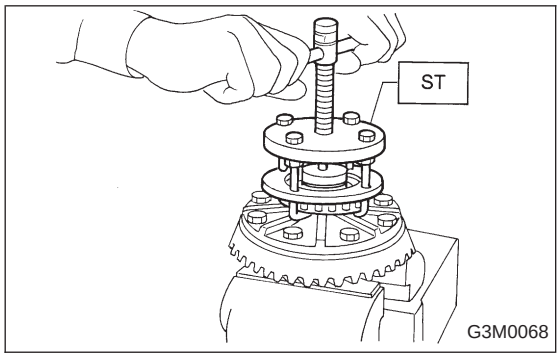
8) Remove bearing race from right and left holders with ST1 and ST2.
ST1 499705401 BEARING OUTER RACE PULLER ASSY
ST2 499705404 OUTER RACE PULLER SEAT



9) Remove oil seal from right and left holders with ST.

CAUTION:
Perform this operation only when changing oil seal.

ST 899580100 INSTALLER

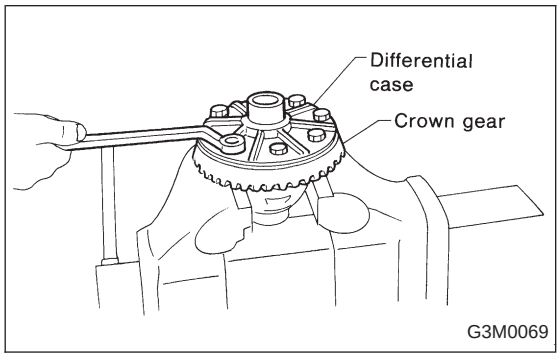


10) Extract bearing cone with ST.

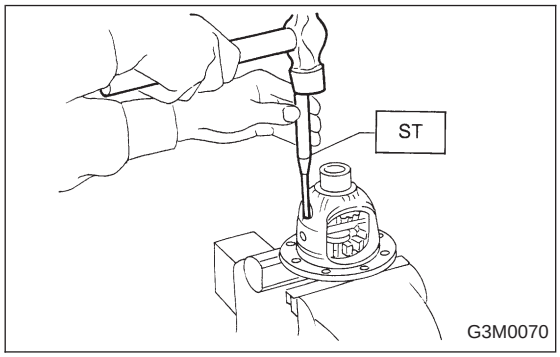
CAUTION:
Do not attempt to disassemble the parts unless necessary.

NOTE:
● Set Puller so that its claws catch the edge of the bearing cone.
● Never mix up the right and left hand bearing cups and cones.

ST 899524100 PULLER SET



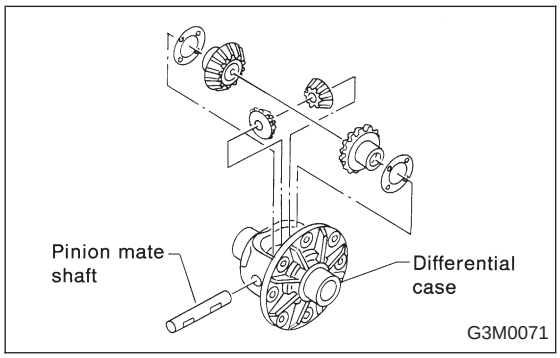
11) Remove crown gear by loosening crown gear bolts.



12) Drive out pinion shaft lock pin from crown gear side.

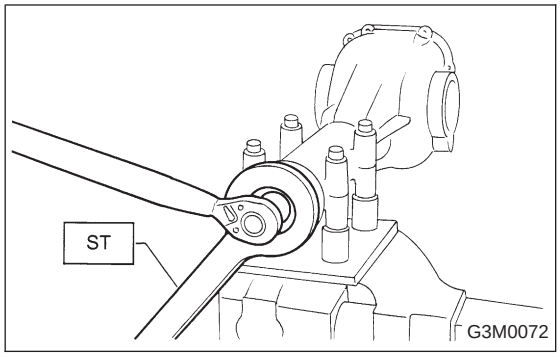
NOTE:
The lock pin is staked at the pin hole end on the differential carrier; do not drive it out forcibly before unstaking it.

ST 899904100 STRAIGHT PIN REMOVER

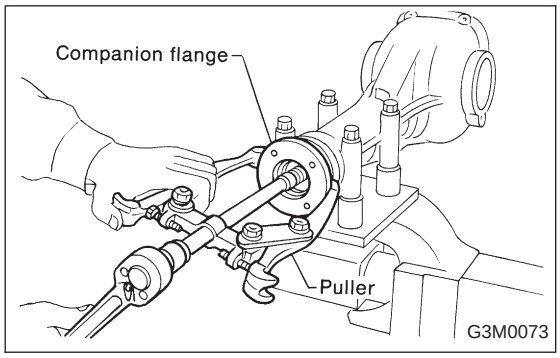


13) Draw out pinion mate shaft and remove pinion mate gears, side gears and thrust washers.

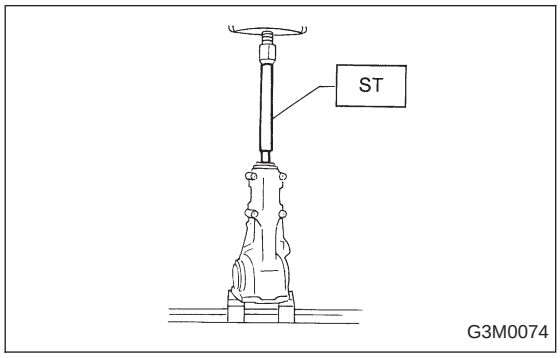
NOTE:
The gears as well as thrust washers should be marked or kept separated left and right, and front and rear.



14) Hold companion flange with ST and remove drive pinion nut.
ST 498427200 FLANGE WRENCH

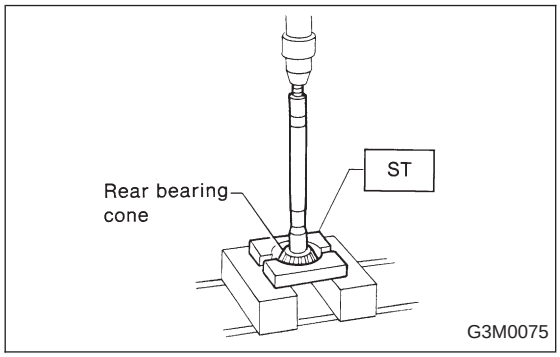


15) Extract the companion flange with a puller.



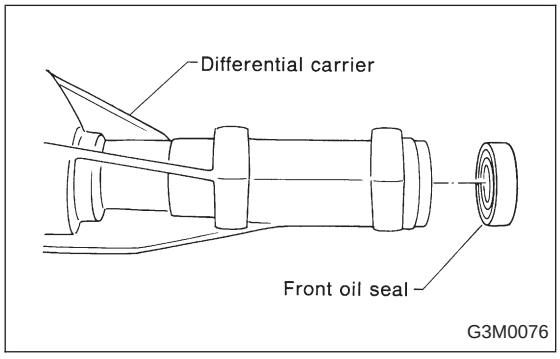
16) Press the end of drive pinion shaft and extract it together with rear bearing cone, preload adjusting spacer and washer.

NOTE:
Hold the drive pinion so as not to drop it.
ST 398467700 DRIFT

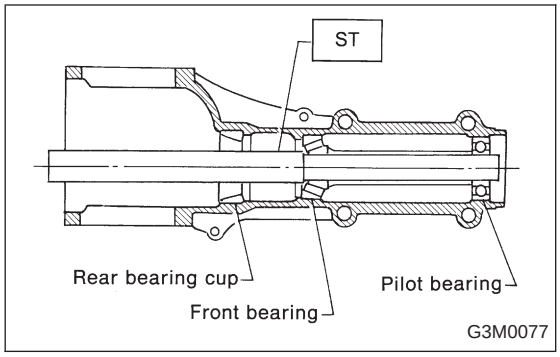


17) Remove rear bearing cone from drive pinion by supporting cone with ST.

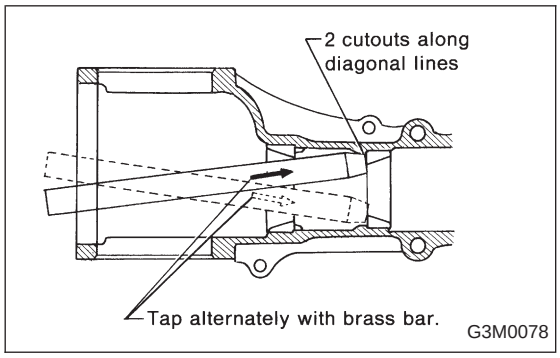
NOTE:
Place the replacer so that its center-recessed side faces the pinion gear.
ST 498515500 REPLACER



18) Remove front oil seal from differential carrier.



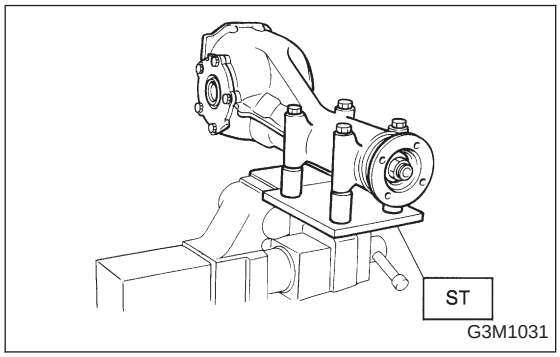
19) Remove pilot bearing together with front bearing cone using ST.
ST 398467700 DRIFT



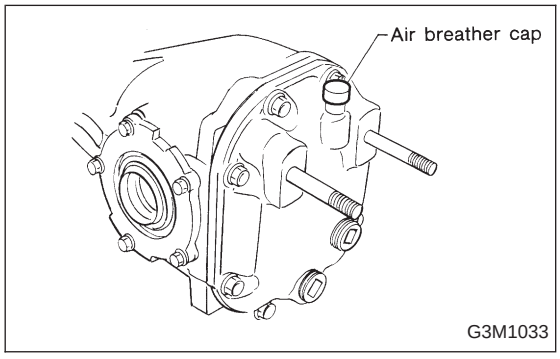
20) When replacing bearings, tap front bearing cup and rear bearing cup in this order out of case by using a brass bar.

2. 2200 cc MODEL

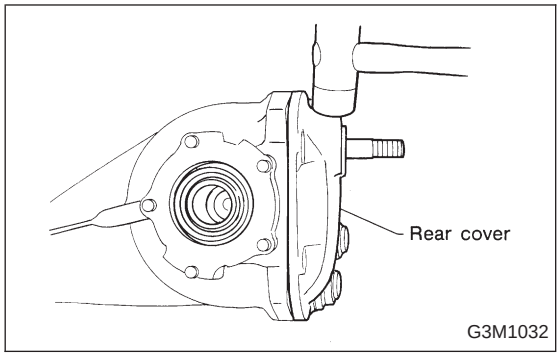
To detect real cause of trouble, inspect the following items before disassembling. <Ref. to 3-4 [W2F2].>
- Tooth contact of crown gear and pinion, and backlash
- Runout of crown gear at its back surface
- Turning resistance of drive pinion



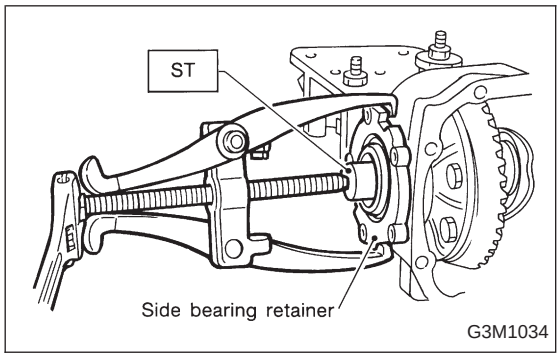
1) Set ST on vise and install the differential assembly to ST.
ST 398217700 ATTACHMENT
2) Drain gear oil by removing plug.



3) Remove the air breather cap.
NOTE:
Do not attempt to replace the air breather cap unless necessary.

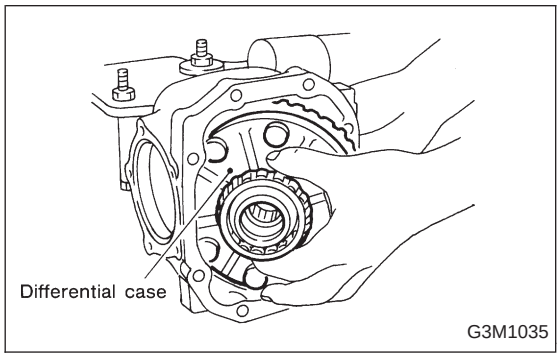


4) Remove rear cover by loosening retaining bolts.



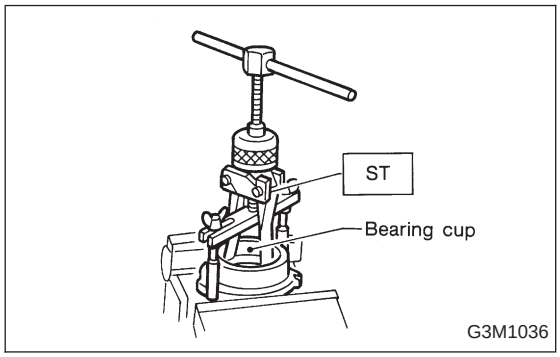
5) Make right and left side bearing retainers in order to identify them at reassembly. Remove side bearing retainer attaching bolts, set ST to differential case, and extract right and left side bearing retainers with a puller.
ST 398457700 ATTACHMENT

CAUTION:
Each shim, which is installed to adjust the side bearing preload, should be kept together with its mating retainer.

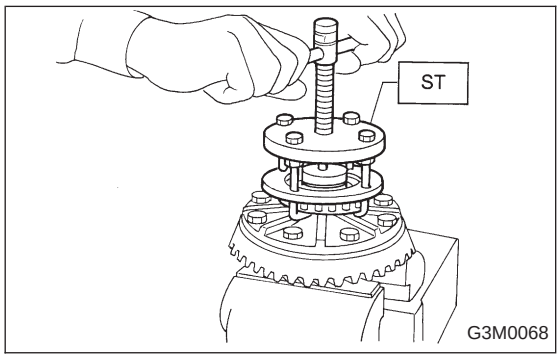


6) Pull out differential case assembly from differential carrier.

CAUTION:
Be careful not to hit the teeth against the case.



7) When replacing side bearing, pull bearing cup from side bearing retainer using ST.
ST 398527700 PULLER ASSY

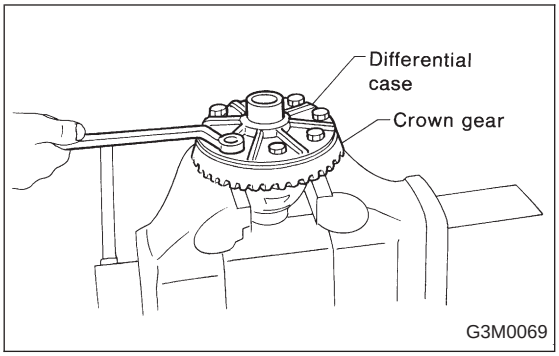


8) Extract bearing cone with ST.

CAUTION:
Do not attempt to disassemble the parts unless necessary.

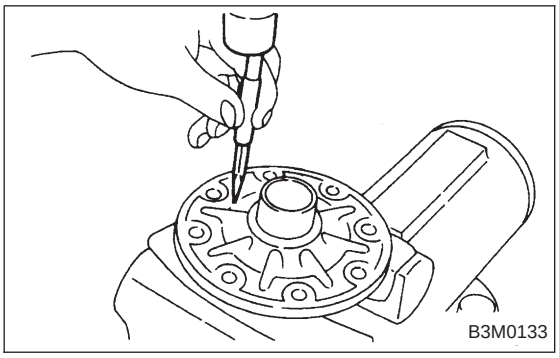
NOTE:
● Set puller so that its claw catch the edge of the bearing cone.
● Never mix up the right and left hand bearing cups and cones.

ST 399527700 PULLER SET



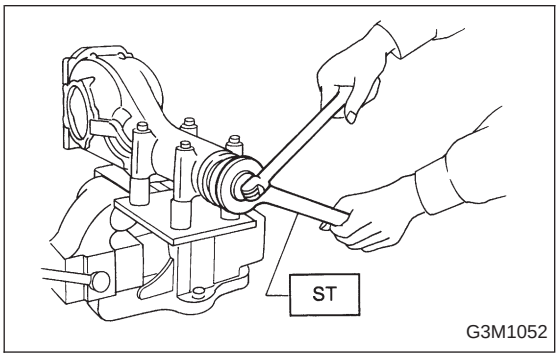
9) Remove crown gear by loosening crown gear bolts.

CAUTION:
Further disassembling is not allowed.

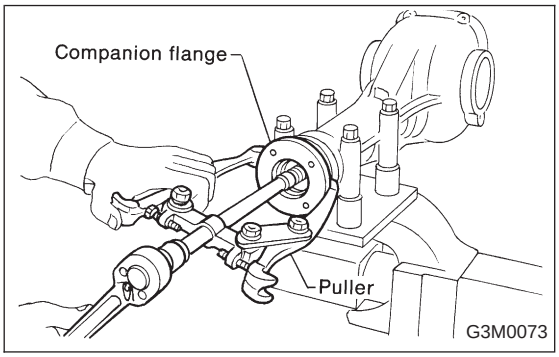


10) Drive out pinion shaft lock pin from crown gear side.

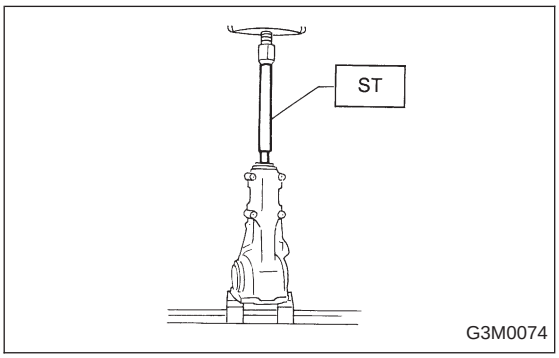
NOTE:
The lock pin is staked at the pin hole end on the differential carrier; do not drive it out forcibly before unstaking it.
ST 899904100 STRAIGHT PIN REMOVER



11) Hold companion flange with ST and remove drive pinion nut.
ST 498427200 FLANGE WRENCH

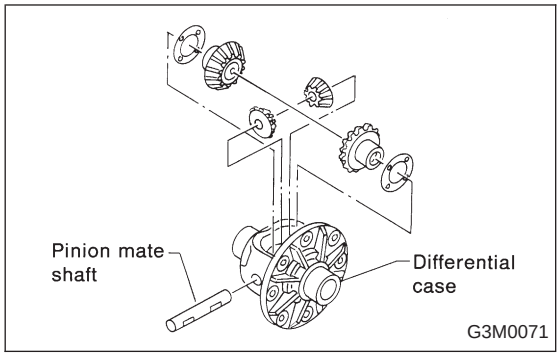


12) Extract the companion flange with a puller.



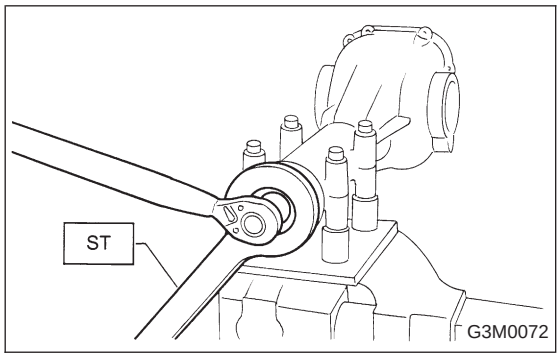
13) Press the end of drive pinion shaft and extract it together with rear bearing cone, preload adjusting spacer and washer.

NOTE:
Hold the drive pinion so as not to drop it.
ST 398467700 DRIFT

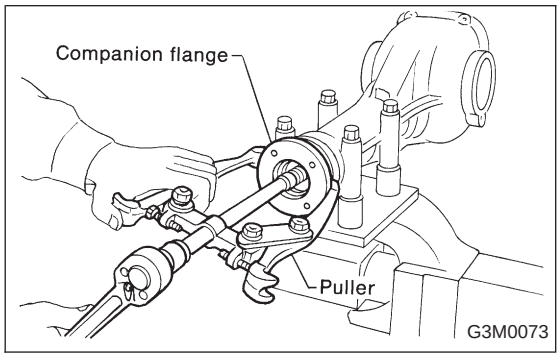


14) Draw out pinion mate shaft and remove pinion mate gears, side gears and thrust washers.

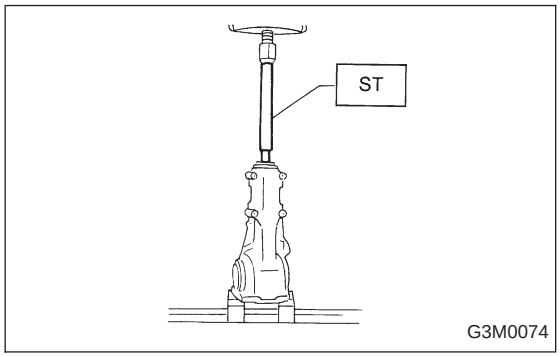
NOTE:
The gears as well as thrust washers should be marked or kept separated left and right, and front and rear.



15) Hold companion flange with ST and remove drive pinion nut.
ST 498427200 FLANGE WRENCH

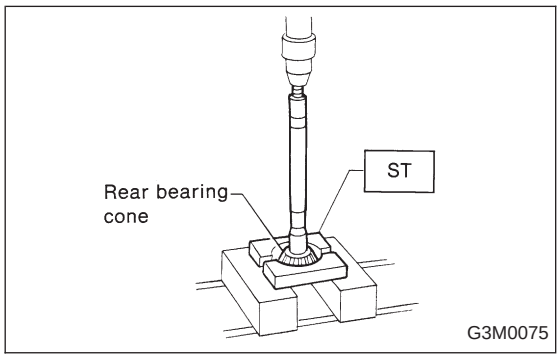


16) Extract the companion flange with a puller.



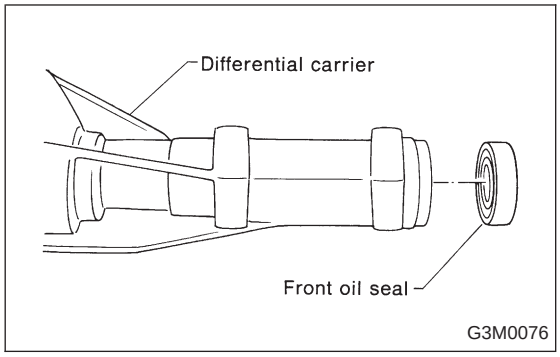
17) Press the end of drive pinion shaft and extract it together with rear bearing cone, preload adjusting spacer and washer.

NOTE:
Hold the drive pinion so as not to drop it.
ST 398467700 DRIFT

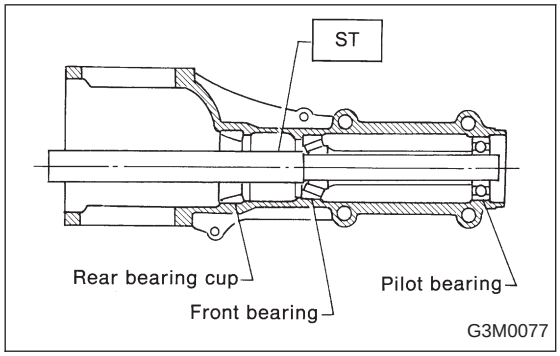


18) Remove rear bearing cone from drive pinion by supporting cone with ST.

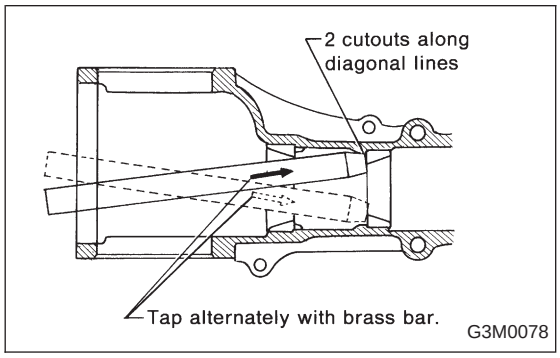
NOTE:
Place the replacer so that its center-recessed side faces the pinion gear.
ST 498515500 REPLACER



19) Remove front oil seal from differential carrier using ST.
ST 398527700 PULLER ASSY



20) Remove pilot bearing cone together with front bearing cone using ST.
ST 398467700 DRIFT



21) When replacing bearings, tap front bearing cup and rear bearing cup in this order out of case by using a brass bar.

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

(1) 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.

(2) 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

(1) Replace if crack, score, or other defects are evident on tooth surface.

(2) 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.

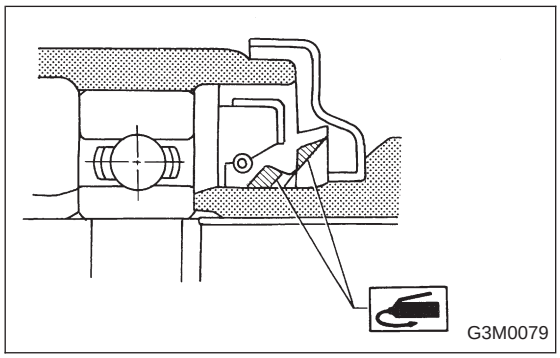
4) Thrust washers of side gear and pinion mate gear
Replace if seizure, flaw, abnormal wear or other defect is evident.
5) Oil seal
Replace if deformed or damaged, and at every disassembling.
6) Differential carrier
Replace if the bearing bores are worn or damaged.
7) Differential case
Replace if its sliding surfaces are worn or cracked.
8) Companion flange
Replace if the oil seal lip contacting surfaces have flaws.

F: ASSEMBLY

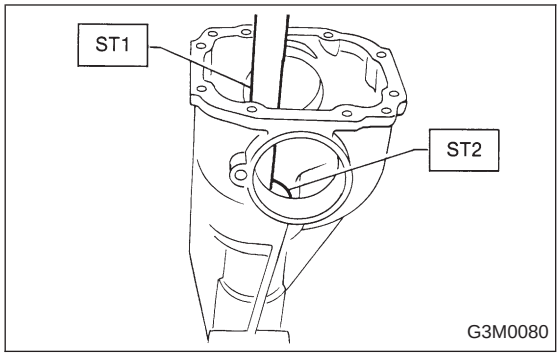
1. 1800 cc MODEL

1) Precautions for assembling

(1) Assemble in the reverse order of disassembling.
(2) Check and adjust each part during assembly.
(3) Keep the shims and washers in order, so that they are not misinstalled.
(4) Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
(5) Apply gear oil when installing the bearings and thrust washers.
(6) Be careful not to mix up the right and left hand cups of the bearings.


G3M0079

(7) Replace the oil seal with new one at every disassembly. Apply chassis grease between the lips when installing the oil seal.



2) Adjust preload for front and rear bearings.
Adjust the bearing preload with spacer and washer between front and rear bearings. Pinion height adjusting washer are not affected by this adjustment. The adjustment must be carried out without oil seal inserted.

(1) Press rear bearing race into differential carrier with ST1 and ST2.

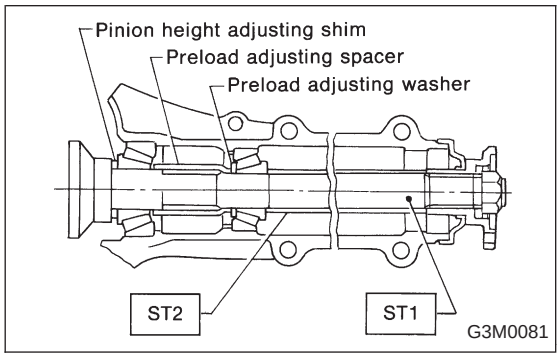
ST1 398477701 HANDLE
ST2 398477702 DRIFT

(2) Press front bearing race into differential carrier with ST1 and ST2.

ST1 398477701 HANDLE
ST2 498447110 DRIFT

(3) Insert front bearing cone.

CAUTION:
Use a new front bearing cone.

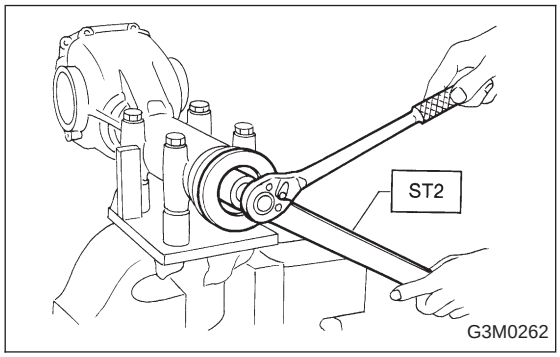


(4) Insert ST1 into case with pinion height adjusting shim and rear bearing cone fitted onto it.

CAUTION:
- **Re-use the used washer if not deformed.**
- **Use a new rear bearing cone.**

(5) Then install preload adjusting spacer and washer, front bearing cone, ST2, companion flange, and washer and drive pinion nut.

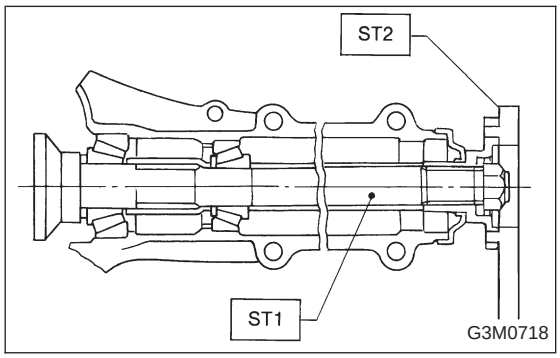
ST1 498447140 DUMMY SHAFT
ST2 32285AA000 DUMMY COLLAR



(6) Turn ST1 with hand to make it seated, and tighten drive pinion nut while measuring the preload with spring balance. Select preload adjusting washer and spacer so that the specified preload is obtained when nut is tightened to the specified torque with ST2.

CAUTION:
Use a new lock nut.

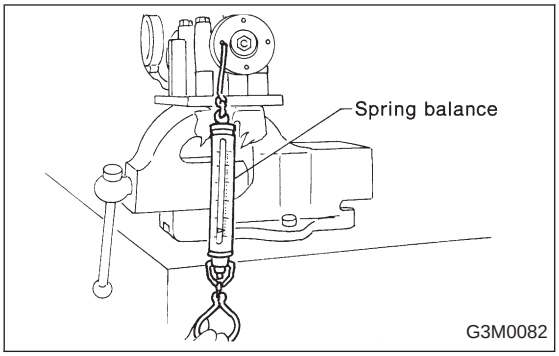
NOTE:
- Be careful not to give excessive preload.



- When tightening the drive pinion nut, lock ST1 with ST2 as illustrated here.

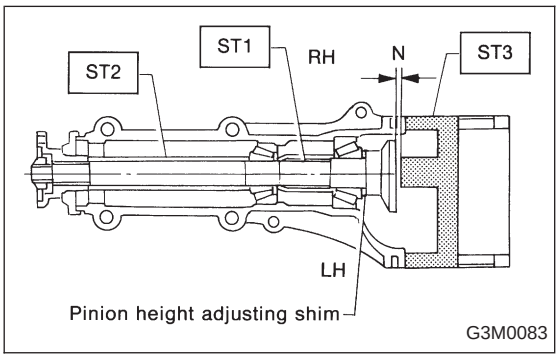
ST1 498447140 DUMMY SHAFT
ST2 398427700 FLANGE WRENCH

Tightening Torque:
181.4±14.7 N·m (18.50±1.50 kg-m, 133.8±10.8 ft-lb)



Front and rear bearing preload
For new bearing: 12.7 — 32.4 N (1.3 — 3.3 kg, 2.9 — 7.3 lb) at companion flange bolt hole

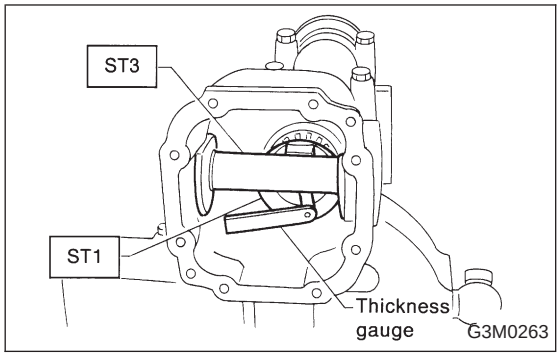
	Part No.	Length mm (in)
● Preload adjusting washer length	38336AA000	1.500 (0.0591)
	38336AA120	1.513 (0.0596)
	38336AA010	1.525 (0.0600)
	38336AA130	1.538 (0.0606)
	38336AA020	1.550 (0.0610)
	38336AA140	1.563 (0.0615)
	38336AA030	1.575 (0.0620)
	38336AA150	1.588 (0.0625)
	38336AA040	1.600 (0.0630)
	38336AA160	1.613 (0.0635)
	38336AA050	1.625 (0.0640)
	38336AA170	1.638 (0.0645)
	38336AA060	1.650 (0.0650)
	38336AA180	1.663 (0.0655)
	38336AA070	1.675 (0.0659)
	38336AA190	1.688 (0.0665)
	38336AA080	1.700 (0.0669)
	38336AA200	1.713 (0.0674)
	38336AA090	1.725 (0.0679)
	38336AA210	1.738 (0.0684)
	38336AA100	1.750 (0.0689)
	38336AA220	1.763 (0.0694)
	38336AA110	1.775 (0.0699)
● Preload adjusting spacer length	32288AA040	52.3 (2.059)
	32288AA050	52.5 (2.067)
	31454AA100	52.6 (2.071)
	32288AA060	52.7 (2.075)
	31454AA110	52.8 (2.079)
	32288AA070	52.9 (2.083)
	31454AA120	53.0 (2.087)
	32288AA080	53.1 (2.091)
	32288AA090	53.3 (2.098)



3) Adjusting drive pinion height
Adjust 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. <Ref. to 2).> 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.



(2) Measure the clearance N between the end of ST3 and the end surface of ST1 by using a thickness gauge.

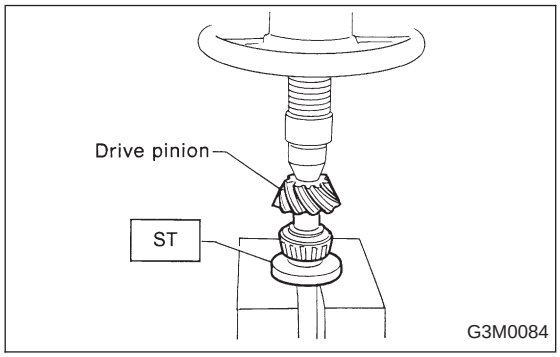
NOTE:
Make sure there is no clearance between the case and ST3.
ST1 498447140 DUMMY SHAFT
ST2 32285AA000 DUMMY COLLAR
ST3 498505501 DIFFERENTIAL CARRIER GAUGE

(3) Obtain the thickness of pinion height adjusting washer to be inserted from the following formula, and replace the temporarily installed shim with this one.

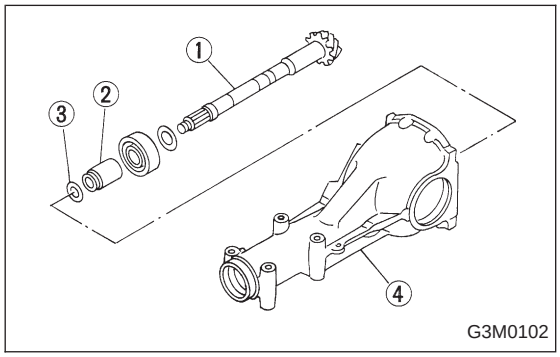
NOTE:
Use 1 to 3 shims as required for adjustment.

T = To + N − 0.35 (mm)
where
T = Thickness of pinion height adjusting shim (mm)
To = Thickness of shim temporarily inserted (mm)
N = Reading of thickness gauge (mm)
(Example of calculation)
To = 0.15 mm
N = 0.4 mm
T = 0.15 + 0.4 − 0.35 = 0.2 mm
Result: Thickness = 0.2 mm
Therefore use the 32295AA220.

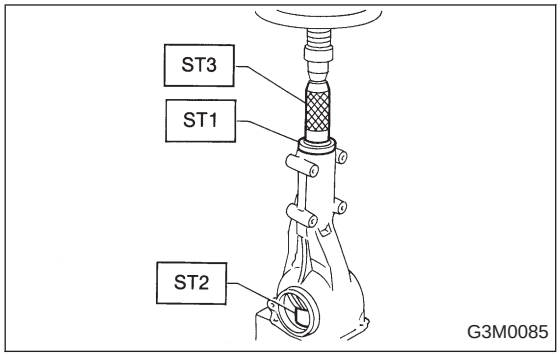
	Part No.	Length mm (in)
● Pinion height adjusting shim thickness	32295AA200	0.150 (0.0059)
	32295AA210	0.175 (0.0069)
	32295AA220	0.200 (0.0079)
	32295AA230	0.225 (0.0089)
	32295AA240	0.250 (0.0098)
	32295AA250	0.275 (0.0108)



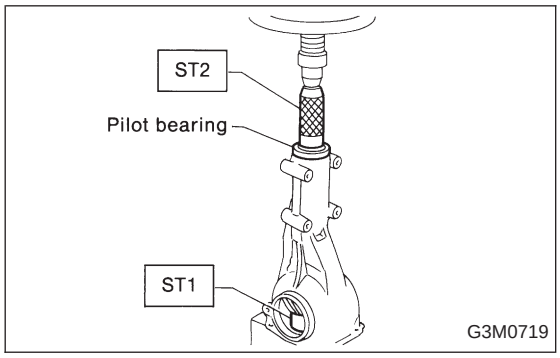
4) Install the selected pinion height adjusting shim on drive pinion, and press the rear bearing cone into position with ST.
ST 498175500 INSTALLER



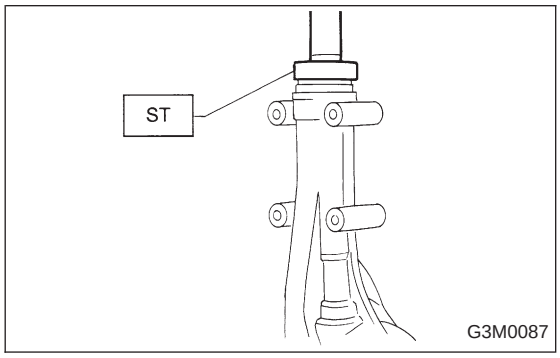
5) Insert drive pinion ① into differential carrier ④, install the previously selected bearing preload adjusting spacer ② and washer ③.



6) Press-fit front bearing cone into case with ST1, ST2 and ST3.
ST1 32285AA000 DUMMY COLLAR
ST2 399780104 WEIGHT
ST3 899580100 INSTALLER

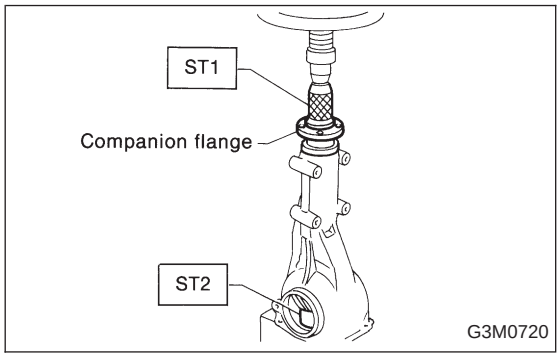


7) Insert spacer, then press-fit pilot bearing with ST1 and ST2.
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER



8) Fit a new oil seal with ST.

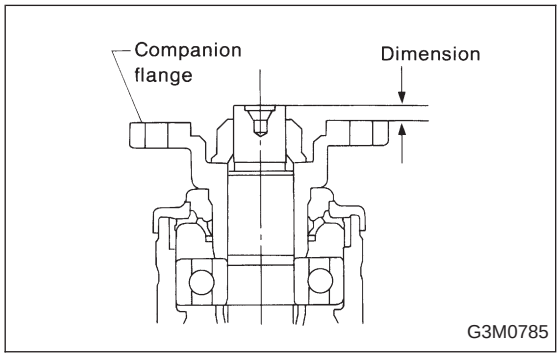
NOTE:
● Press-fit until end of oil seal is 1 mm (0.04 in) inward from end of carrier.
● Apply grease between the oil seal lips. <Ref. to 1).>
ST 498447120 OIL SEAL INSTALLER

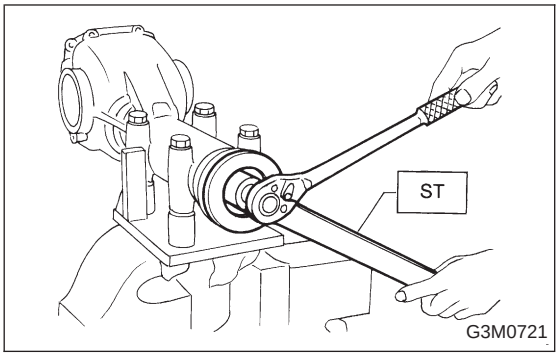


9) Press-fit companion flange with ST1 and ST2 until shaft protrudes 10 to 15 mm (0.39 to 0.59 in) beyond flange.

CAUTION:
Be careful not to damage bearing.

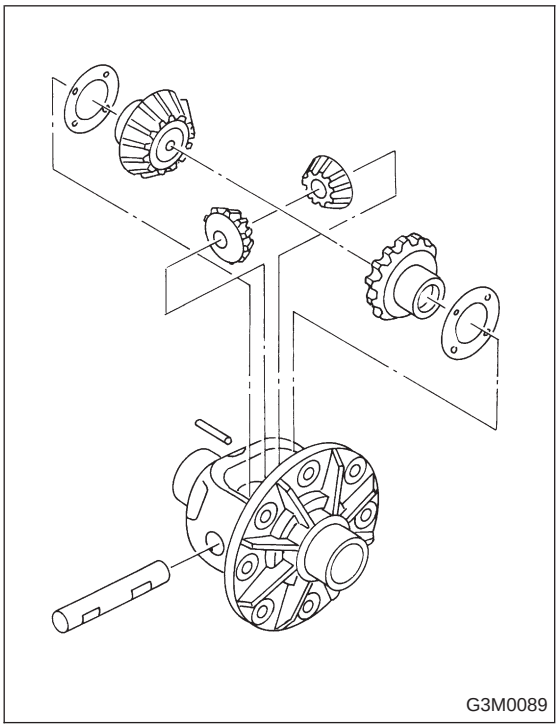
ST1 899874100 INSTALLER
ST2 399780104 WEIGHT





10) Install self-locking nut. Then tighten self-locking nut with ST.
ST 398427700 FLANGE WRENCH

Tightening torque:
181.4±14.7 N·m (18.50±1.50 kg-m, 133.8±10.8 ft-lb)



11) Assembling differential case
Install side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into differential case.

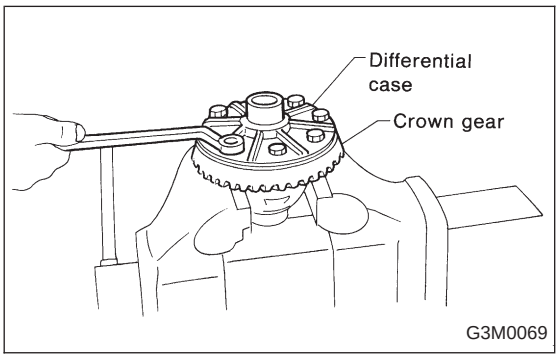
NOTE:
● Apply gear oil on both sides of the washer and on the side gear shaft before installing.
● Insert the pinion mate shaft into the differential case by aligning the lock pin holes.

(1) Measure the clearance between differential case and the back of side gear.
(2) Adjust the clearance as specified by selecting side gear thrust washer.

Side gear backlash:
0.05 — 0.15 mm (0.0020 — 0.0059 in)

	Part No.	Thickness mm (in)
● Side gear thrust washer thickness	803135011	0.925 — 0.950 (0.0364 — 0.0374)
	803135012	0.950 — 0.975 (0.0374 — 0.0384)
	803135013	0.975 — 1.000 (0.0384 — 0.0394)
	803135014	1.000 — 1.025 (0.0394 — 0.0404)
	803135015	1.025 — 1.050 (0.0404 — 0.0413)

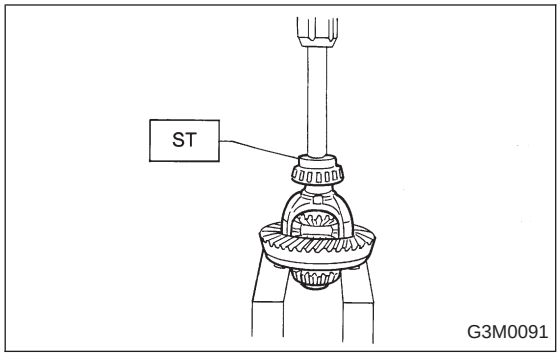
(3) Check the condition of rotation after applying oil to the gear tooth surfaces and thrust surfaces.
(4) After driving in pinion shaft lock pin, stake the both sides of the hole to prevent pin from falling off.



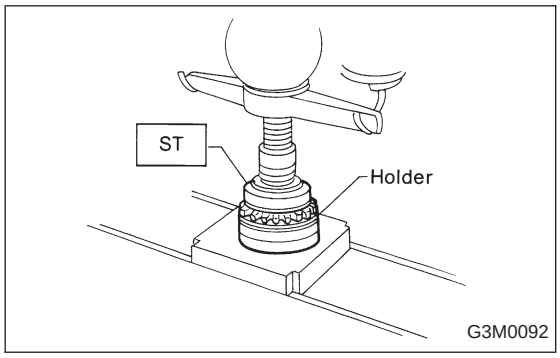
(5) Install crown gear on differential case.

Tightening Torque:
62±5 N·m (6.3±0.5 kg-m, 45.6±3.6 ft-lb)

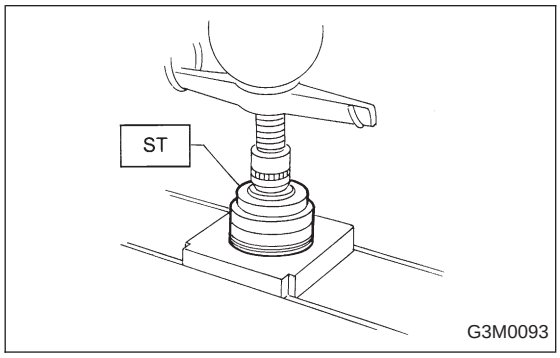
NOTE:
Tighten diagonally while tapping the bolt heads.



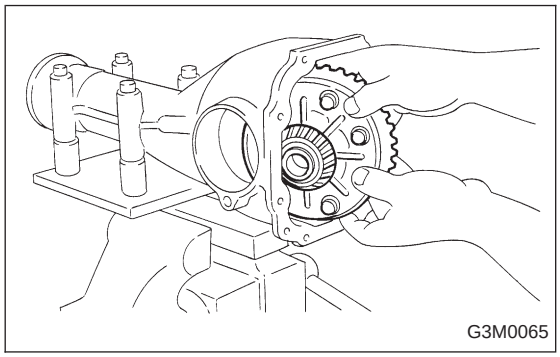
12) Press side bearing cone onto differential case with ST.
ST 498485400 DRIFT



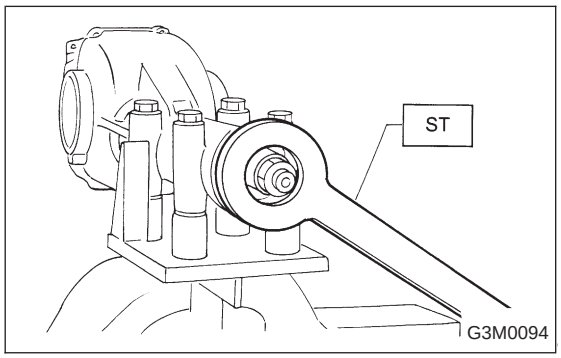
13) Assemble holders.
(1) Install oil seal into right and left holders.
ST 498447100 AXLE SHAFT OIL SEAL INSTALLER



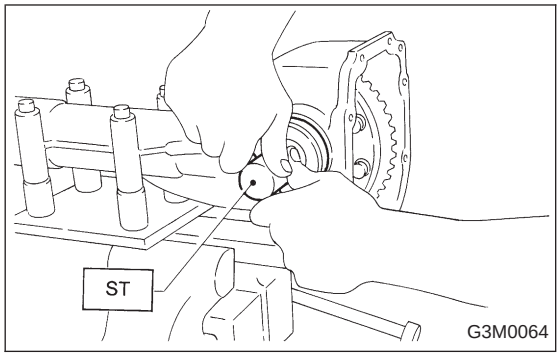
(2) Install bearing race into right and left holders.
ST 398477702 BEARING OUTER RACE DRIFT



(3) Install the differential case assembly into differential carrier in the reverse order of disassembly.



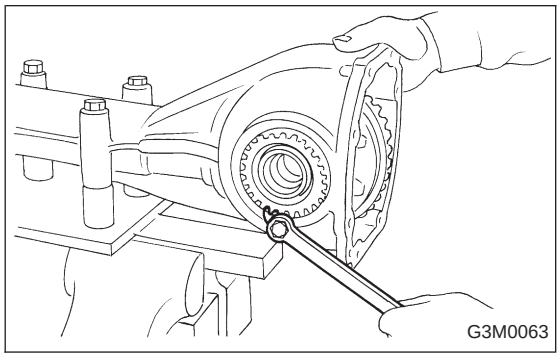
14) Perform adjustment of backlash of pinion crown gear set and adjustment of preload of differential side bearing.
(1) Turn drive pinion with ST for better fitting of differential side bearing.
ST 498427200 FLANGE WRENCH



(2) Screw in side (left-side) holder until light contact is made with ST.
(3) Screw in left-side holder until light contact is made with ST.

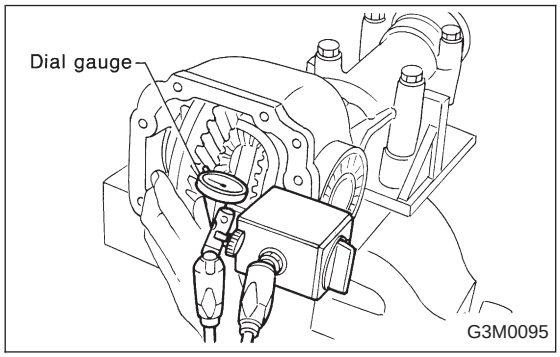
ST 399780111 WRENCH

(4) Back off side (left-side) holder approximately 1 1/2 teeth of holder, and tighten left-side holder by approximately 2 teeth (approximately 1 1/2 + 1/2 teeth).
[Back off amount of side (left-side) holder + 1/2 tooth].
This + 1/2 tooth gives preload.



(5) Temporarily tighten lock plate.

NOTE:
Turn over lock plate to displace holder 1/2 tooth.

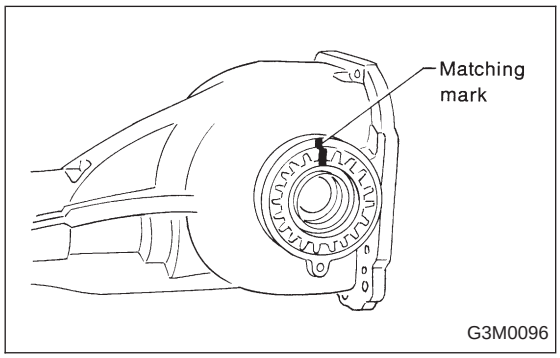


(6) Measure the crown gear-to-drive pinion backlash.

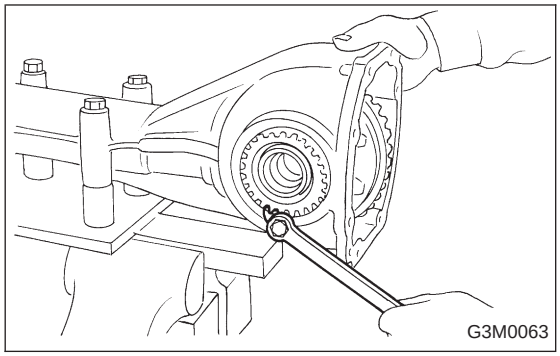
Set magnet base on differential carrier. Align contact point of dial gauge with tooth face of crown gear, and move crown gear while holding drive pinion still. Read value indicated on dial gauge.

Backlash:
0.10 — 0.15 mm (0.0039 — 0.0059 in)

NOTE:
If measured backlash is not within specified range, repeat steps (1) thru (6).



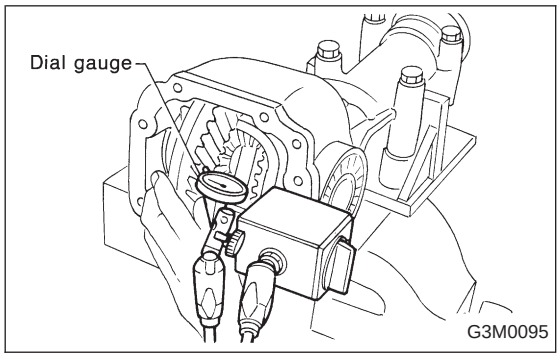
15) Draw a matching mark on both differential carrier and holder. Remove holder one side at a time.
Replace in the original position after inserting an O-ring and applying grease to threaded portion.



16) Tighten bolt of lock plate to specified torque.

Tightening torque:

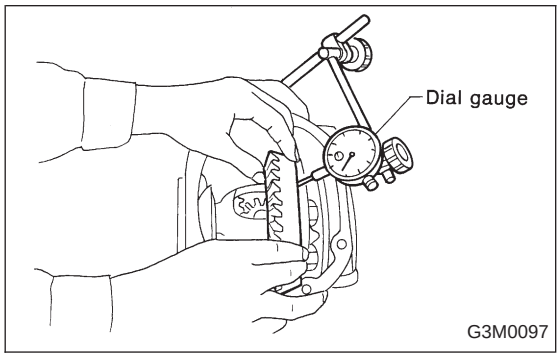
25±3 N·m (2.5±0.3 kg-m, 18.1±2.2 ft-lb)



17) Re-check crown gear-to-pinion backlash.

Backlash:

0.10 — 0.15 mm (0.0039 — 0.0059 in)



18) Check the crown gear runout on its back surface, and make sure pinion and crown gear rotate smoothly.

Limit of runout:

0.05 mm (0.0020 in)

19) Checking and adjusting tooth contact of crown gear.

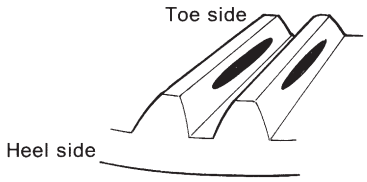
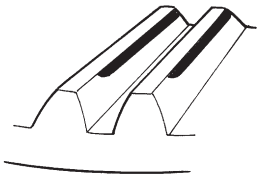
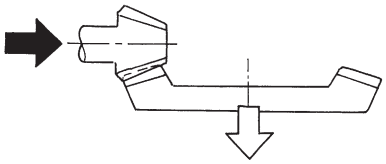
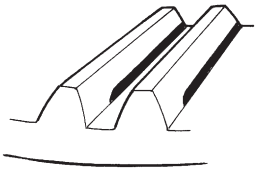
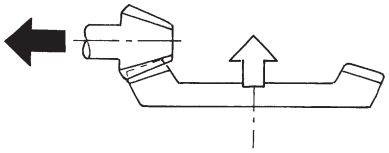
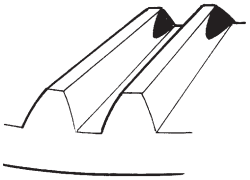
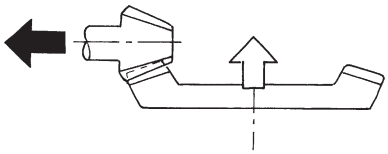
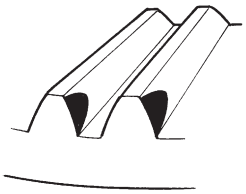
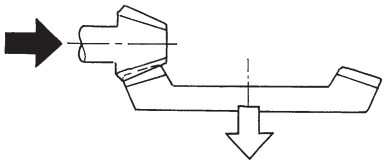
(1) Apply an even coat of red lead on both sides of three or four teeth on the crown gear. Check the contact pattern after rotating crown gear several revolutions back and forth until a definite contact pattern appears on the crown gear.

(2) When the contact pattern is incorrect, readjust according to the instructions given in “Tooth contact pattern”.

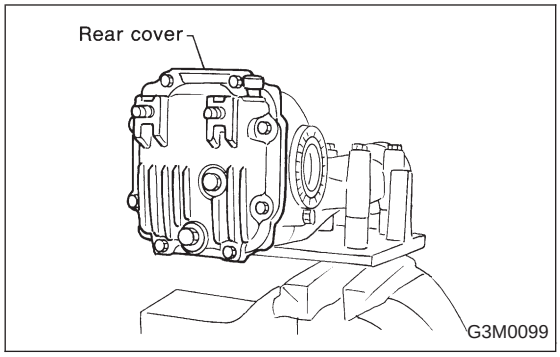
NOTE:
Be sure to wipe off red lead completely after adjustment is completed.

20) If proper tooth contact is not obtained, once again adjust the drive pinion height and the differential side bearing preload (mentioned above) and the hypoid gear backlash.

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.)	 G3M0098A	———
Face contact Backlash is too large.	This may cause noise and chipping at tooth ends.  G3M0098B	Increase thickness of drive pinion height adjusting washer in order to bring drive pinion closer to crown gear center.  G3M0098F
Flank contact Backlash is too small.	This may cause noise and stepped wear on surfaces.  G3M0098C	Reduce thickness of drive pinion height adjusting washer in order to move drive pinion away from crown gear.  G3M0098G
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



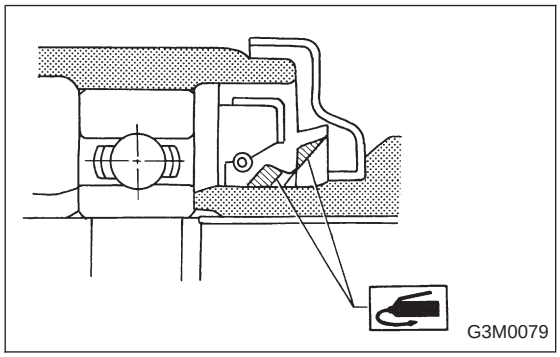
21) Install rear cover and tighten bolts to specified torque.

Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)

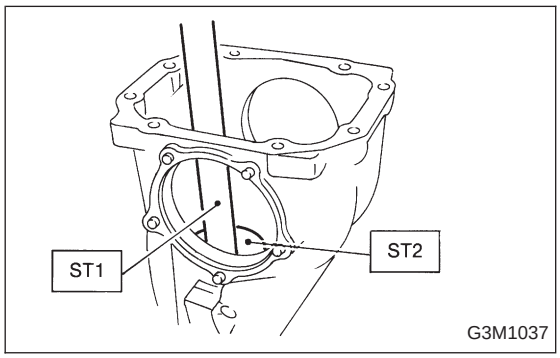
2. 2200 cc MODEL

1) Precautions for assembling

(1) Assemble in the reverse order of disassembling.
(2) Check and adjust each part during assembly.
(3) Keep the shims and washers in order, so that they are not misinstalled.
(4) Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
(5) Apply gear oil when installing the bearings and thrust washers.
(6) Be careful not to mix up the right and left hand cups of the bearings.



(7) Replace the oil seal with new one at every disassembly. Apply chassis grease between the lips when installing the oil seal.

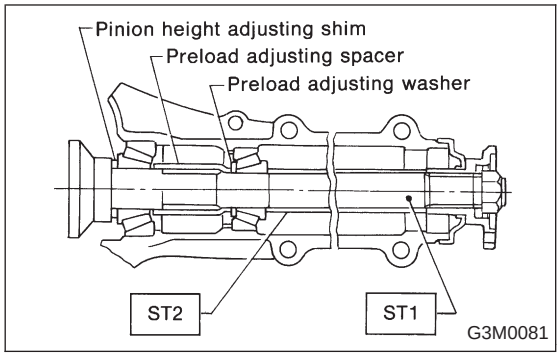


2) Adjusting preload for front and rear bearings

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 rear bearing race into differential carrier with ST1 and ST2.

ST1 398477701 HANDLE
ST2 398477703 DRIFT 2

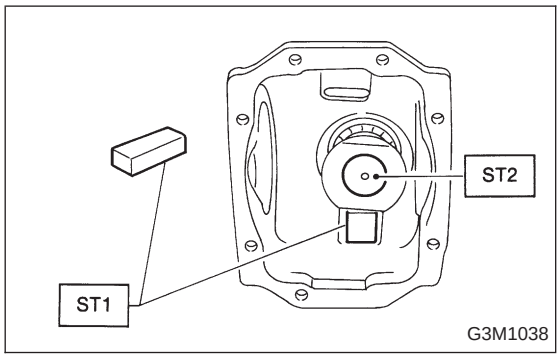


(2) Insert ST1 into case with pinion height adjusting washer and rear bearing cone fitted onto it.

CAUTION:
- **Re-use the used washer if not deformed.**
- **Use a new rear bearing cone.**

(3) Then install preload adjusting spacer and washer, front bearing cone, ST2, companion flange, and washer and drive pinion nut.

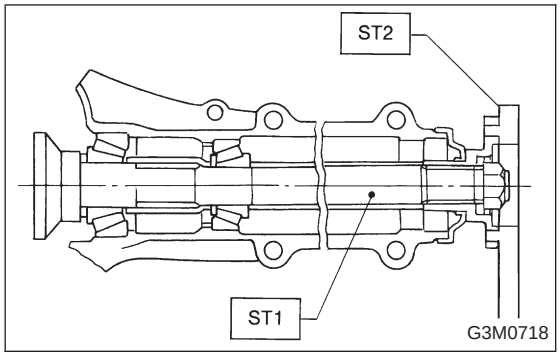
ST1 398507702 DUMMY SHAFT
ST2 398507703 DUMMY COLLAR



(4) Turn ST1 with hand to make it seated, and tighten drive pinion nut while measuring the preload with spring balance. Select preload adjusting washer and spacer so that the specified preload is obtained when nut is tightened to the specified torque with ST2.

CAUTION:
Use a new lock nut.

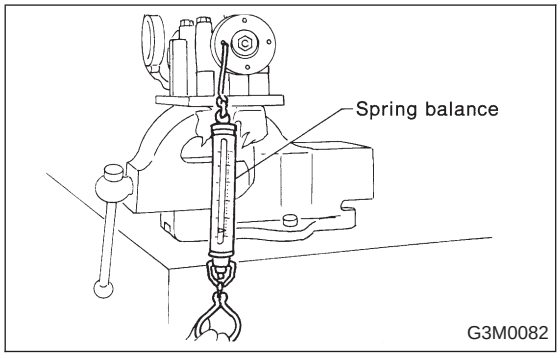
NOTE:
- Be careful not to give excessive preload.



- When tightening the drive pinion nut, lock ST1 with ST2 as shown in the figure.

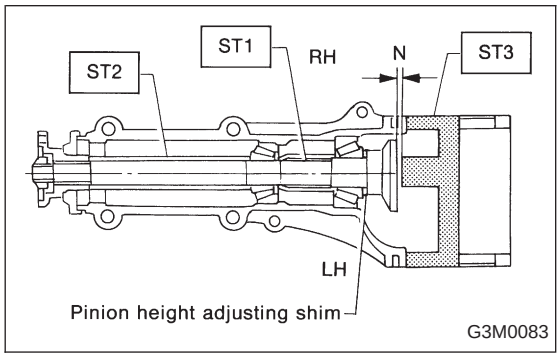
ST1 398507704 BLOCK
ST2 398507702 DUMMY SHAFT
ST3 498427200 FLANGE WRENCH

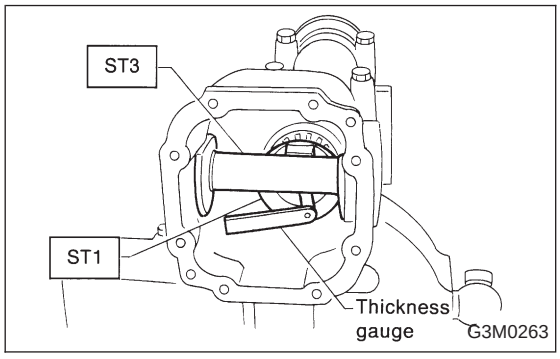
Tightening torque:
181.4±14.7 N·m (18.50±1.50 kg-m, 133.8±10.8 ft-lb)



Front and rear bearing preload
For new bearing: 17.7 — 25.5 N (1.8 — 2.6 kg, 4.0 — 5.7 lb) at companion flange bolt hole

	Part No.	Length mm (in)
● Preload adjusting washer length	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)
● Preload adjusting spacer length	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 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. <Ref. to step 2) 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.

(2) Measure the clearance N between the end of ST3 and the end surface of ST1 by using a thickness gauge.

NOTE:
Make sure there is no clearance between the case and ST3.

ST1 398507702 DUMMY SHAFT
ST2 398507703 DUMMY COLLAR
ST3 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)

Where:

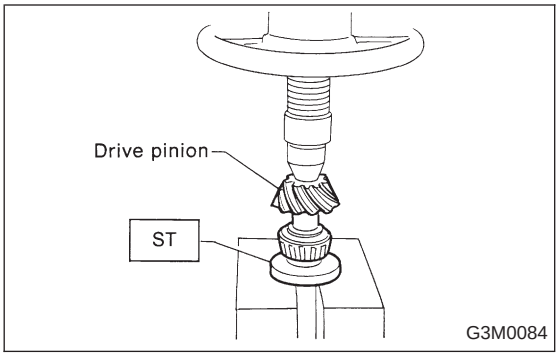
T = Thickness of pinion height adjusting shim (mm)
To = Thickness of shim temporarily inserted (mm)
N = Reading of thickness gauge (mm)
H = Figure marked on drive pinion head

(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

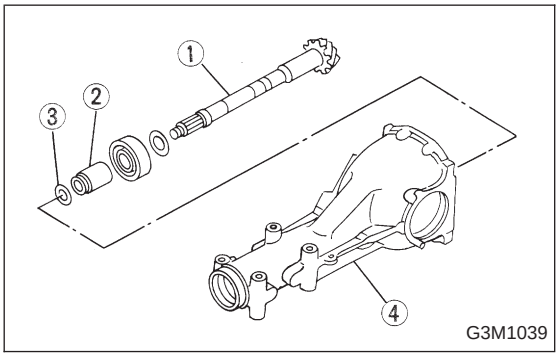
Therefore use the shim 383605200.

	Part No.	Thickness mm (in)
● Pinion height adjusting shim thickness	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)

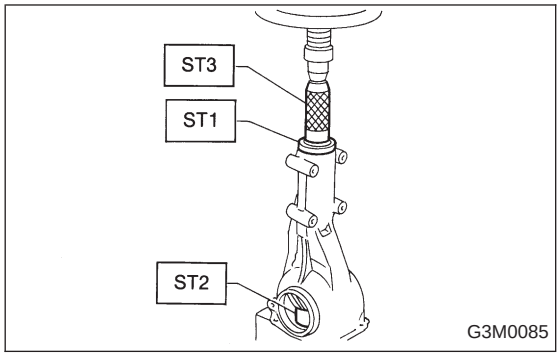


4) Install the selected pinion height adjusting shim on drive pinion, and press the rear bearing cone into position with ST.

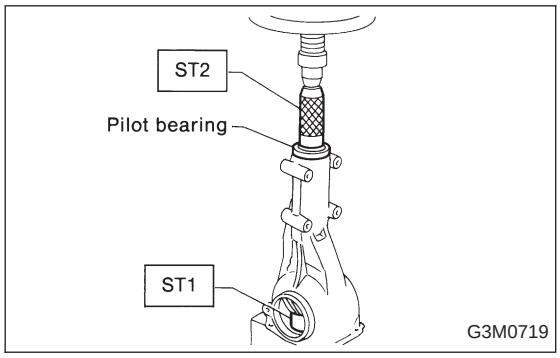
ST 398177700 INSTALLER



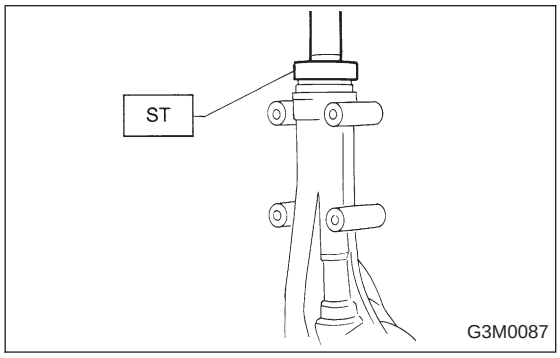
5) Insert drive pinion ① into differential carrier ④, install the previously selected bearing preload adjusting spacer ② and washer ③.



6) Press-fit front bearing cone into case with ST1, ST2 and ST3.
ST1 398507703 DUMMY COLLAR
ST2 399780104 WEIGHT
ST3 899580100 INSTALLER

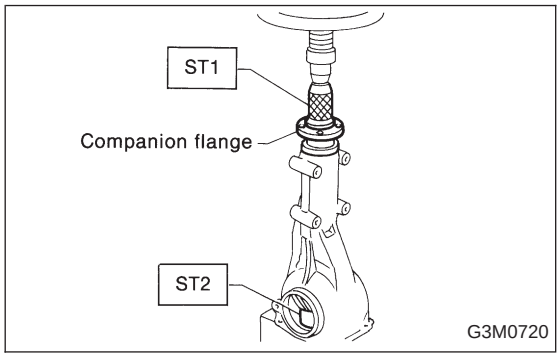


7) Insert spacer, then press-fit pilot bearing with ST1 and ST2.
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER



8) Fit a new oil seal with ST.

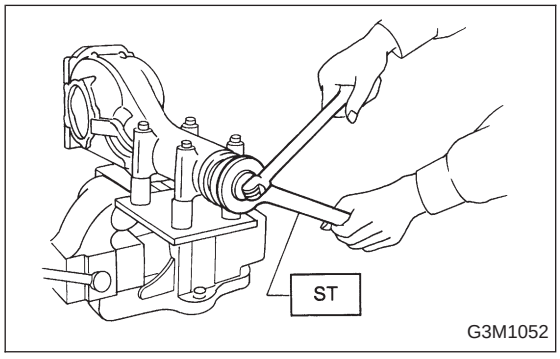
NOTE:
● Press-fit until end of oil seal is 1 mm (0.04 in) inward from end of carrier.
● Apply grease between the oil seal lips. <Ref. to 1).>
ST 498447120 OIL SEAL INSTALLER



9) Press-fit companion flange with ST1 and ST2.

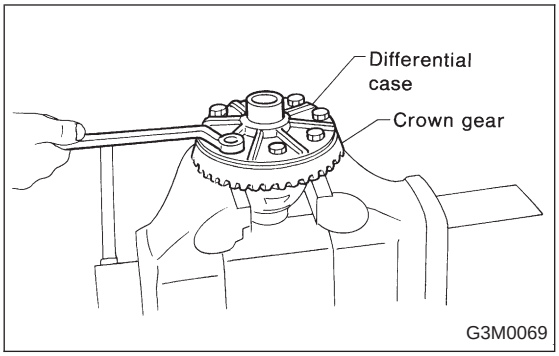
CAUTION:
Be careful not to damage bearing.

ST1 899874100 INSTALLER
ST2 399780104 WEIGHT



10) Install self-locking nut. Then tighten it with ST.
ST 498427200 FLANGE WRENCH

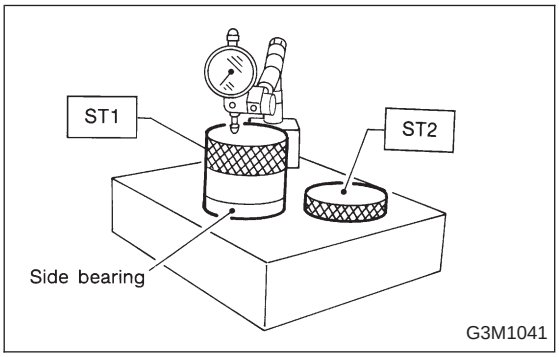
Tightening torque:
181.4±14.7 N·m (18.50±1.50 kg-m, 133.8±10.8 ft-lb)



11) Install crown gear on differential case.

Tightening torque:
103.0±9.8 N·m (10.5±1.0 kg-m, 75.9±7.2 ft-lb)

NOTE:
Tighten diagonally while tapping the bolt heads.

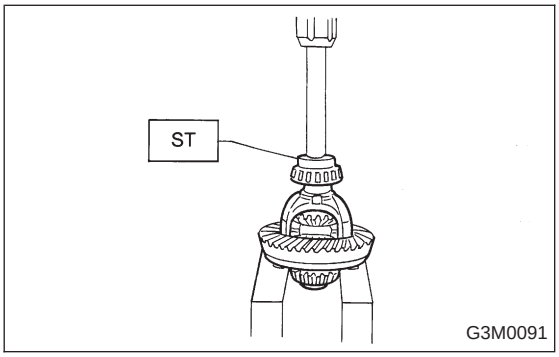


12) Before installing side bearing, measure the bearing width by using a dial gauge, ST1 and ST2.

Standard bearing width:
20.00 mm (0.7874 in)

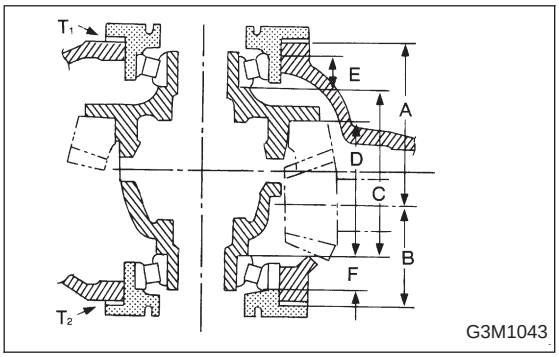
NOTE:
Set the dial gauge needle to zero, using a standard bearing or block of specified height in advance.

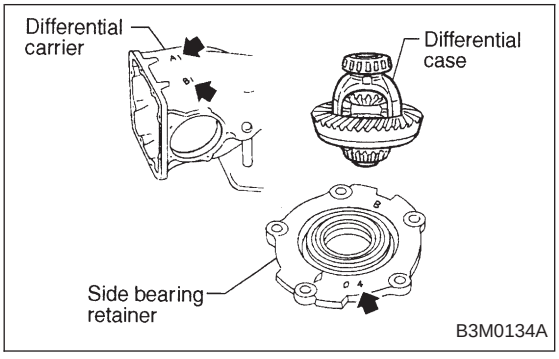
ST1 398227700 WEIGHT
ST2 398237700 GAUGE



13) Press side bearing cone onto differential case with ST1.

ST1 398487700 DRIFT





14) Adjusting side bearing retainer shims

(1) The drive gear backlash and side bearing preload can be determined by the side bearing retainer shim thickness.

(2) When replacing differential case, differential carrier, side bearing and side bearing retainer, obtain the right and left retainer shim thickness from the following formulas.

T_1 (Left) = (A + C + G_1 − D) x 0.01 + 0.76 − E (mm)
T_2 (Right) = (B + D + G_2) x 0.01 + 0.76 − F (mm)
T_1 & T_2 : Thickness of left and right side bearing retainer shim (mm)
A & B : Number marked on differential carrier
C & D : Number marked on differential case
E & F : Difference of width of left and right side bearing from standard width 20.0 mm, expressed in a unit of 0.01 mm. For example, if the bearing measured width is 19.89 mm, value of E or F is as follows. 20.00 −19.89 = 0.11 (E or F)
G_1 & G_2 : Number marked on side bearing retainer

If a number is not marked, regard it as zero.

NOTE:
Use several shims to obtain the calculated thickness.

	Part No.	Thickness mm (in)
● Side bearing retainer shim thickness	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)

Example of calculation

Ex. 1

A = 5, B = 5, C = 3, D = 3, G_1 = 4, G_2 = 1,
E = 0.10 mm, F = 0.15 mm

Left side

T_1= (A + C + G_1 − D) x 0.01 + 0.76 − E
= (5 + 3 + 4 − 3) x 0.01 + 0.76 − 0.10
= 0.09 + 0.76 − 0.10 = 0.75 mm

The correct shims are as follows:

Thickness		Q'ty	
0.25	x	1	= 0.25
0.50	x	1	= 0.50

Total shim thickness = 0.75 mm

Right side

T_2= (B + D + G_2) x 0.01 + 0.76 − F
= (5 + 3 + 1) x 0.01 + 0.76 − 0.15
= 0.09 + 0.76 − 0.15
= 0.70 mm

The correct shims are as follows:

Thickness		Q'ty	
0.20	x	1	= 0.20
0.50	x	1	= 0.50

Total shim thickness = 0.70 mm

Ex. 2

A = 2, B = 3, C = 0, D = 3, G_1 = 2, G_2 = 3,
E = 0.22 mm, F = 0.10 mm

Left side

T_1= (A + C + G_1 − D) x 0.01 + 0.76 − E
= (2 + 0 + 2 − 3) x 0.01 + 0.76 − 0.22
= 0.01 + 0.76 − 0.22
= 0.55 mm

The correct shims are as follows:

Thickness		Q'ty	
0.25	x	1	= 0.25
0.30	x	1	= 0.30

Total shim thickness = 0.55 mm

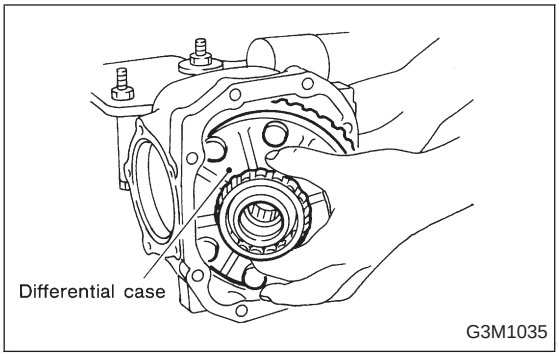
Right side

T_2= (B + D + G_2) x 0.01 + 0.76 − F
= (3 + 3 + 3) x 0.01 + 0.76 − 0.10
= 0.09 + 0.76 − 0.10
= 0.75 mm

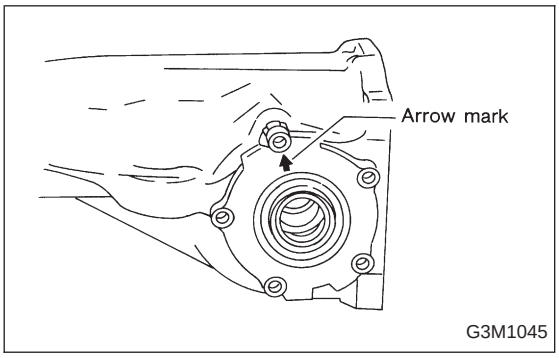
The correct shims are as follows:

Thickness		Q'ty	
0.25	x	1	= 0.25
0.50	x	1	= 0.50

Total shim thickness = 0.75 mm

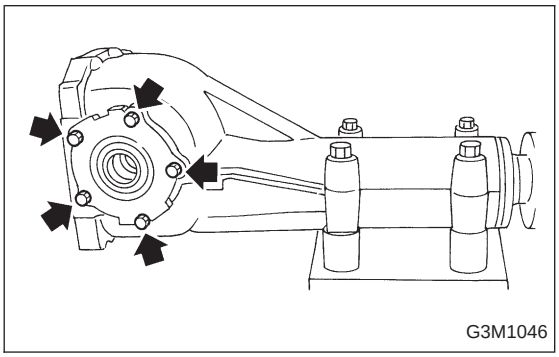


(3) Install the differential case assembly into differential carrier in the reverse order of disassembly.



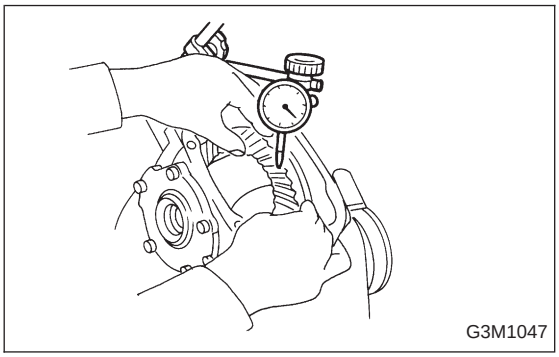
(4) Fit the selected shims and O-ring on side bearing retainer and install them on differential carrier with the arrow mark on the retainer directed as shown in figure.

CAUTION:
Be careful that side bearing cup is not damaged by bearing roller.



(5) Tighten side bearing retainer bolts.

Tightening torque:
10.3±1.5 N·m (1.05±0.15 kg-m, 7.6±1.1 ft-lb)



(6) Measure the crown gear-to-drive pinion backlash.

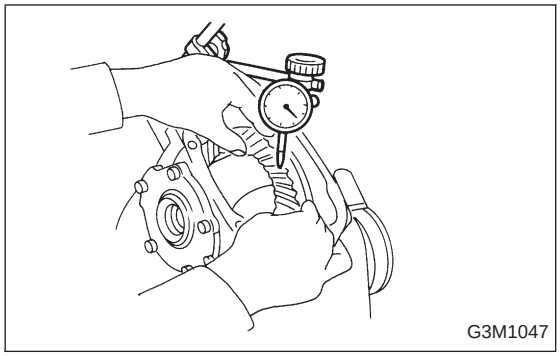
Set magnet base on differential carrier. Align contact point of dial gauge with tooth face of crown gear, and move crown gear while holding drive pinion still. Read value indicated on dial gauge.

Backlash:
0.10 — 0.20 mm (0.0039 — 0.0079 in)

(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:
0.1 — 0.6 N·m (1 — 6 kg-cm, 0.9 — 5.2 in-lb)

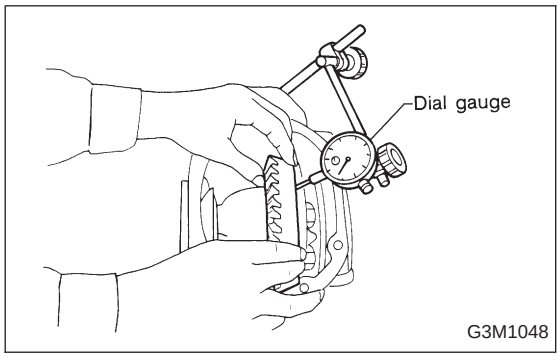
NOTE:
If measured backlash is not within specified range, repeat steps (1) thru (7).


G3M1047

15) Re-check crown gear-to-pinion backlash.

Backlash:

0.10 — 0.20 mm (0.0039 — 0.0079 in)



G3M1048

16) Check the crown gear runout on its back surface, and make sure pinion and crown gear rotate smoothly.

Limit of runout:

0.05 mm (0.0020 in)

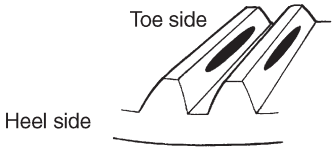
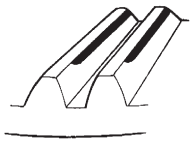
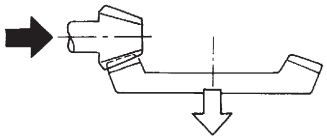
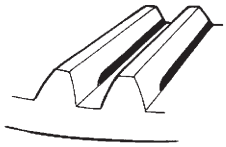
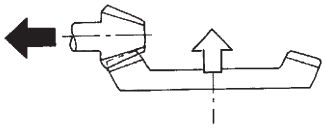
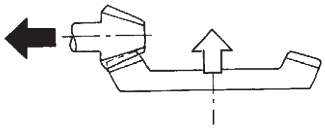
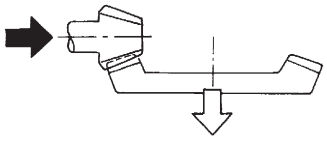
17) Checking and adjusting tooth contact of crown gear

(1) Apply an even coat of red lead on both sides of three or four teeth on the crown gear. Check the contact pattern after rotating crown gear several revolutions back and forth until a definite contact pattern appears on the crown gear.

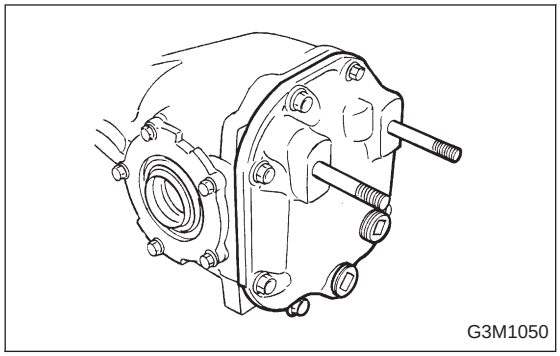
(2) When the contact pattern is incorrect, readjust according to the instructions given in “TOOTH CONTACT PATTERN”.

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 and the differential side bearing preload (mentioned above) and the hypoid gear backlash. <Ref. to step 2).>

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.)	 B3M0317A	———
Face contact Backlash is too large.	This may cause noise and chipping at tooth ends.  B3M0319	Increase thickness of drive pinion height adjusting shim in order to bring drive pinion closer to crown gear center.  B3M0323
Flank contact Backlash is too small.	This may cause noise and stepped wear on surfaces.  B3M0320	Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.  B3M0324
Toe contact Contact area is small.	This may cause chipping at toe ends.  B3M0321	Adjust as for flank contact.  B3M0324
Heel contact Contact area is small.	This may cause chipping at heel ends.  B3M0322	Adjust as for face contact.  B3M0323

➡ : Adjusting direction of drive pinion
⇨ : Adjusting direction of crown gear


G3M1050

19) Install rear cover and tighten bolts to specified torque.

Tightening torque:
29.4±4.9 N·m (3.0±0.5 kg-m, 21.7±3.6 ft-lb)

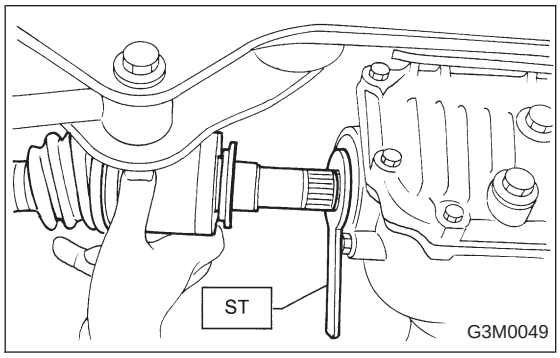
G: INSTALLATION

1. 1800 cc MODEL

To install, reverse the removal sequence.

1) Position front member on body by passing it under parking brake cable and securing to rear differential.

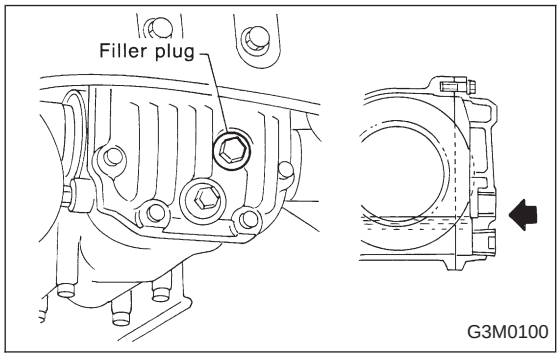
NOTE:
When installing rear differential front member, do not confuse the installation sequence of the upper and lower stoppers.



G3M0049

2) Install DOJ of rear drive shaft into rear differential. <Ref. to 3-4 [W2A2].>

ST 28099PA090 SIDE OIL SEAL PROTECTOR



G3M0100

3) Installing procedure hereafter is in the reverse order of removal.

4) After installation, fill differential carrier with gear oil to the upper plug level.

CAUTION:
Use a new aluminum gasket when installing the plug.

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

2. 2200 cc MODEL

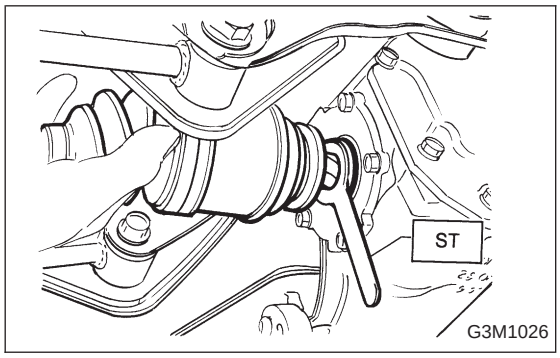
To install, reverse the removal sequence.

1) Install the air breather cap tapping with a plastic hammer.

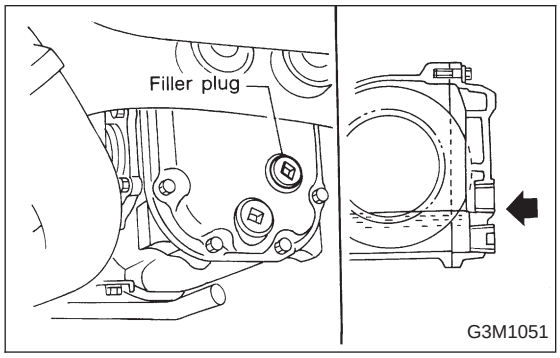
CAUTION:
Be sure to install new air breather cap.

2) Position front member on body by passing it under parking brake cable and securing to rear differential.

NOTE:
When installing rear differential front member, do not confuse the installation sequence of the upper and lower stoppers.



3) Install DOJ of rear drive shaft into rear differential. <Ref. to 3-4 [W2A4].>
ST 28099PA090 SIDE OIL SEAL PROTECTOR



4) Installing procedure hereafter is in the reverse order of removal.
5) After installation, fill differential carrier with gear oil to the upper plug level.

CAUTION:
Apply fluid packing to plug.

Fluid packing:
THREE BOND 1205 or equivalent

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

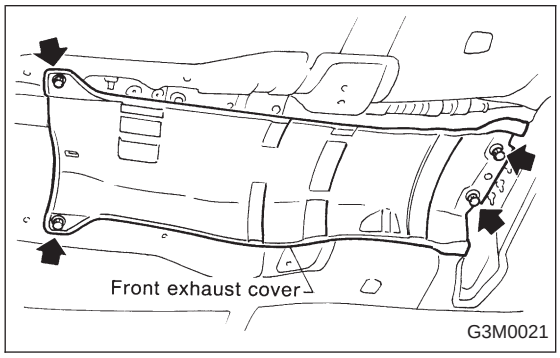
Tightening torque:
44.1±3.9 N·m (4.5±0.4 kg-m, 32.5±2.9 ft-lb)

3. Rear Differential Front Member

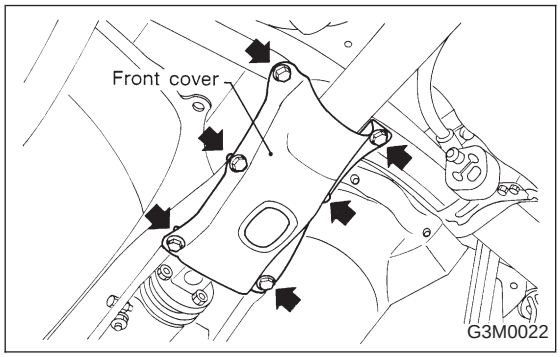
A: REMOVAL

1. 1800 cc MODEL

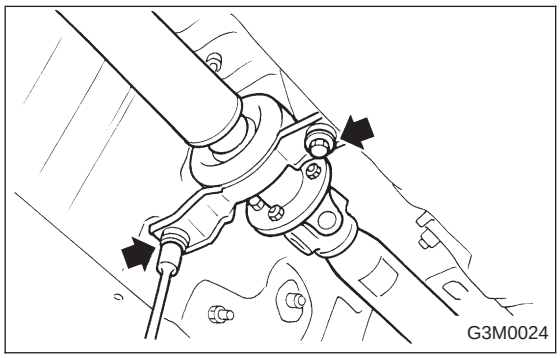
1) Disconnect ground cable from battery.
2) Move selector lever or gear shift lever to “N”.
3) Release the parking brake.
4) Loosen wheel nuts.
5) Jack-up vehicle and support it with sturdy racks.
6) Remove wheels.
7) Remove rear exhaust pipe and muffler.
<Ref. to 2-9 [W2A0], [W3A0].>



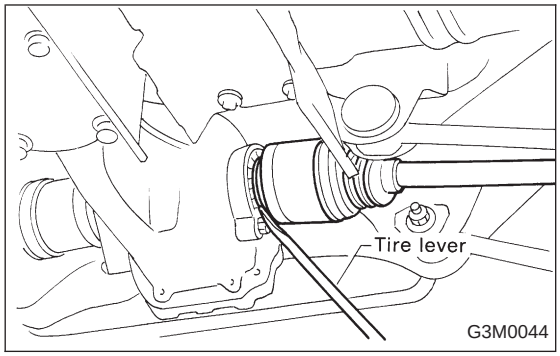
8) Remove front exhaust cover.



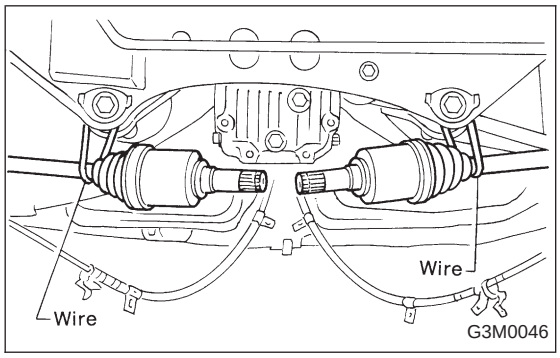
9) Remove front cover of rear differential mount.



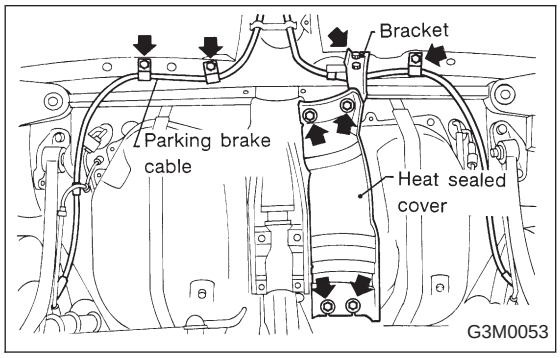
10) Remove propeller shaft. <Ref. to 3-4 [W1B0].>



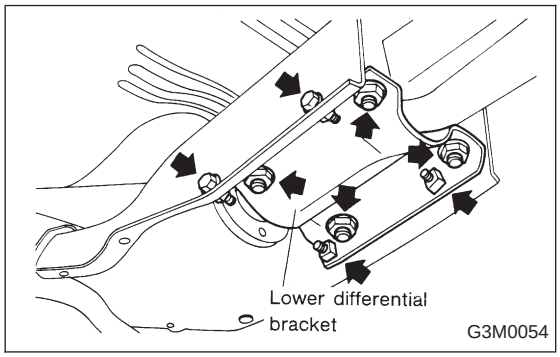
11) Remove rear differential front member.
(1) Remove DOJ of rear drive shaft from rear differential. <Ref. to 3-4 [W2A2].>



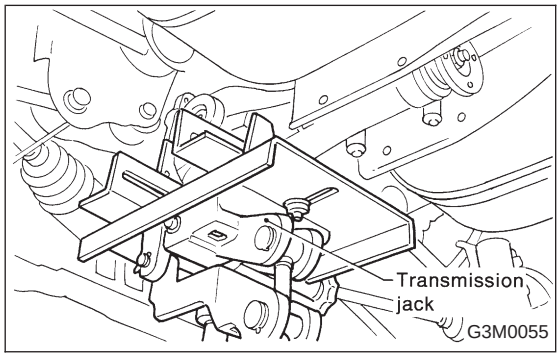
(2) Secure rear drive shaft to rear crossmember using wire.



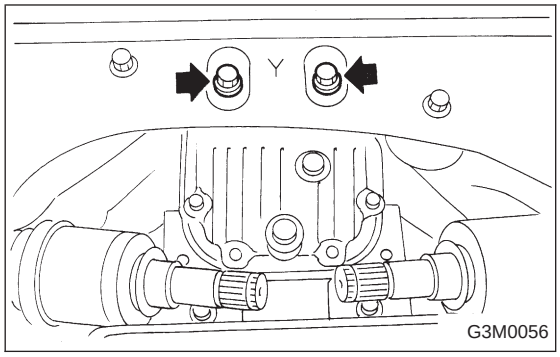
(3) Remove heat sealed cover.
(4) Remove clamps and bracket of parking brake cable.



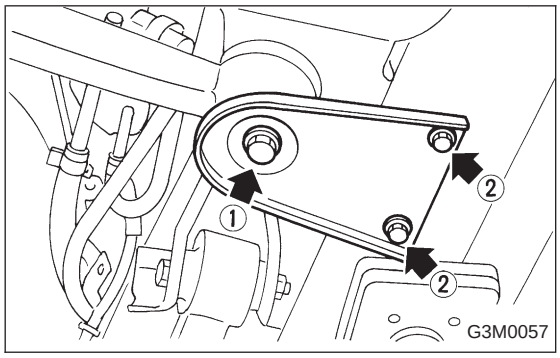
(5) Remove lower differential bracket.



(6) Support rear differential with transmission jack.

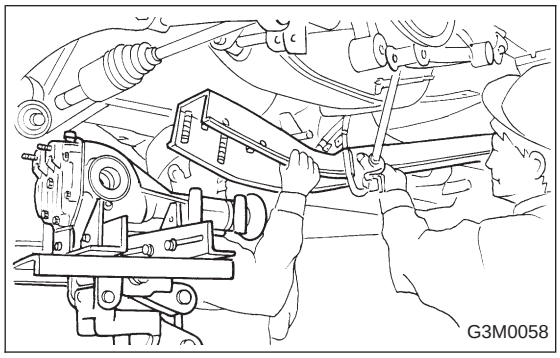


(7) Remove self-locking nuts connecting rear differential to rear crossmember.



(8) Remove bolts which secure rear differential front member to body.
Loosen bolt ① first, then removal bolts ②.

NOTE:
Support front member with the help of another person to prevent it from dropping.

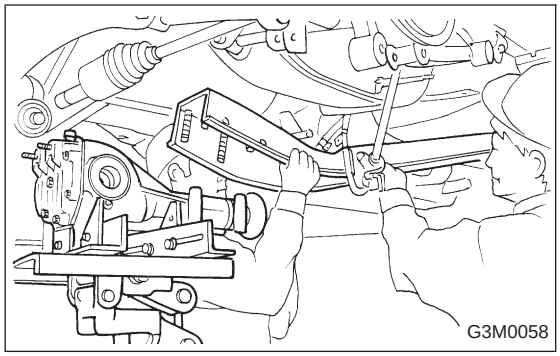


(9) While slowly lowering transmission jack, move rear differential forward and remove stud bolts from rear crossmember.
(10) Remove front member from body.

2. 2200 cc MODEL

1) Disconnect ground cable from battery.
2) Move selector lever or gear shift lever to “N”.
3) Release the parking brake.
4) Loosen wheel nuts.
5) Jack-up vehicle and support it with sturdy racks.
6) Remove wheels.
7) Remove rear exhaust pipe and muffler.
<Ref. to 2-9 [W2A0], [W3A0].>
8) Remove rear differential front member.

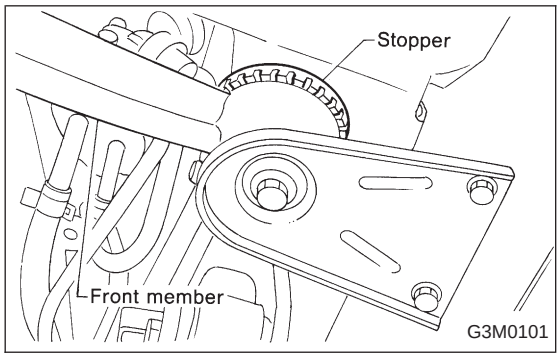
NOTE:
When removing rear differential front member, work the removal procedure as rear differential.
<Ref. to 3-4 [W2C2].>



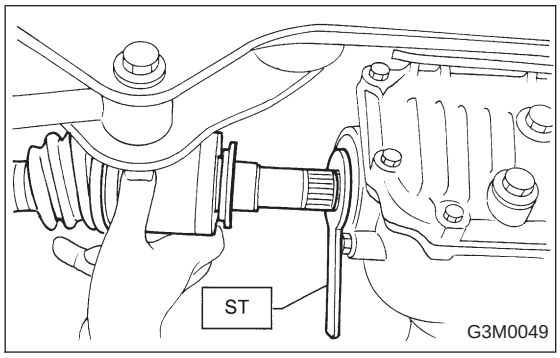
B: INSTALLATION

1. 1800 cc MODEL

To install, reverse the removal sequence.
1) Position front member on body by passing it under parking brake cable and securing to rear differential.



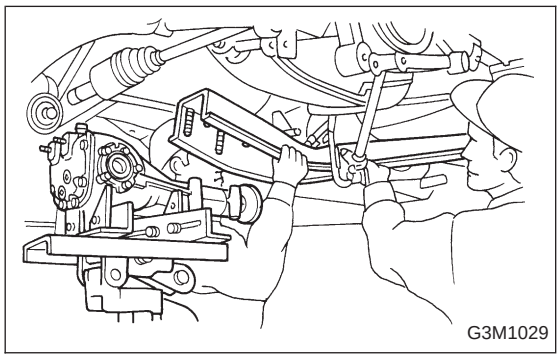
NOTE:
When installing rear differential front member, do not confuse the installation sequence of the stopper.



2) Insert DOJ of rear drive shaft into rear differential.
<Ref. to 3-4 [W2A2].>
ST 28099PA090 SIDE OIL SEAL PROTECTOR

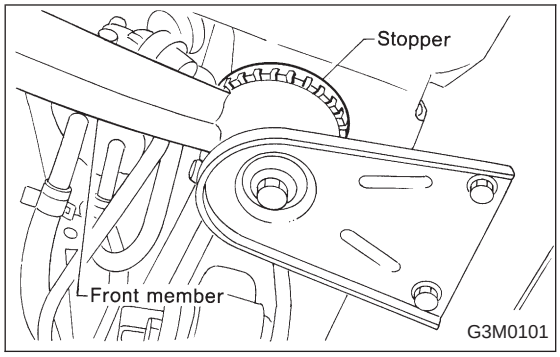
CAUTION:
Before inserting, replace the differential side oil seal and the circlip at the end of the spline shaft with a new one.

3) Installing procedure hereafter is in the reverse order of removal.

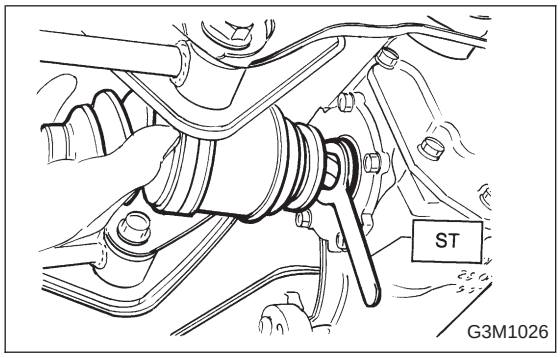


2. 2200 cc MODEL

To install, reverse the removal sequence.
1) Position front member on body by passing it under parking brake cable and securing to rear differential.



NOTE:
When installing rear differential front member, do not confuse the installation sequence of the stopper.



2) Insert DOJ of rear drive shaft into rear differential. <Ref. to 3-4 [W2A4].>

ST 28099PA090 SIDE OIL SEAL PROTECTOR

CAUTION:
Before inserting, replace the differential side oil seal with a new one.

3) Installing procedure hereafter is in the reverse order of removal.

1. Rear Differential

Symptom and 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 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 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 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.

Symptom and possible cause	Remedy
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.
6. Gear noises 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.

2. Propeller Shaft

Symptom and possible cause	Remedy
1. Vibration of propeller shaft 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.

NOTE:
Vibration while cruising may be caused by an unbalanced tire, improper tire inflation pressure, improper wheel alignment, etc.

SUSPENSION 4-1

1. Suspension

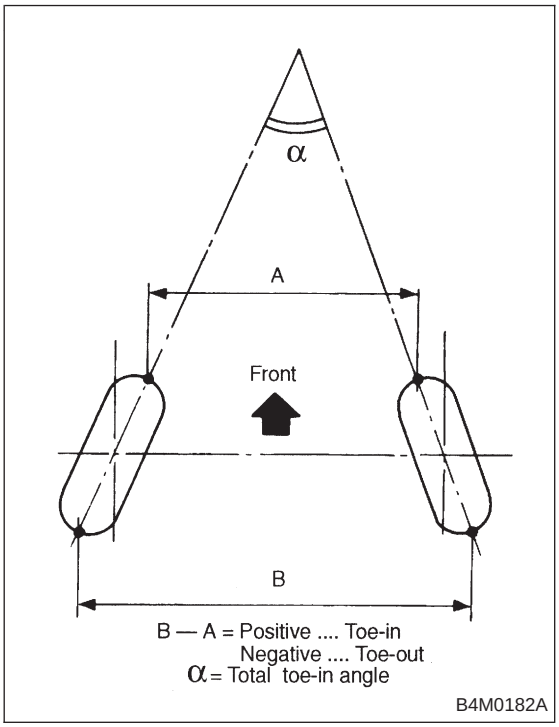
A: SPECIFICATIONS

1. STABILIZER

Model			Bar dia. mm (in)	
			Front	Rear
SEDAN	FWD	BASE, L	18 (0.71)	—
	AWD	BASE, L	18 (0.71)	—
		LX	19 (0.75)	13 (0.51)
WAGON	FWD	BASE, L	19 (0.75)	—
	AWD	L	19 (0.75)	—
		LX	19 (0.75)	13 (0.51)
COUPE	FWD	BASE, L	19 (0.75)	—
	AWD	BASE, L	19 (0.75)	—
		LX	19 (0.75)	13 (0.51)

B: WHEEL ALIGNMENT

		Sedan, Coupe		Wagon	
		FWD	AWD	FWD	AWD
Front	Camber (tolerance: ±0°30′)	0°	0°	0°	0°
	Caster (common difference: ±1°)	3°	3°	3°	3°
	Toe-in mm (in)	0±3 (0±0.12)	Toe-in angle: −0°09′ [when toe-in is −3 (−0.12)] Toe-out angle: 0°09′ [when toe-out is 3 (0.12)]		
	Kingpin angle	14°	14°	14°	14°
	Wheel arch height [tolerance: $^{+12}_{-24}$ mm ($^{+0.47}_{-0.94}$ in)] mm (in)	391 (15.39)	391 (15.39)	391 (15.39)	391 (15.39)
Rear	Camber (tolerance: ±0°45′)	−0°50′	−0°55′	−0°50′	−0°55′
	Toe-in mm (in)	0±3 (0±0.12) Total toe angle: 0°±18′			
	Wheel arch height [tolerance: ±10 mm (±0.39 in)] mm (in)	378 (14.88)	379 (14.92)	378 (14.88)	379 (14.92)
	Thrust angle (tolerance: 0°±20′)	0°	0°	0°	0°



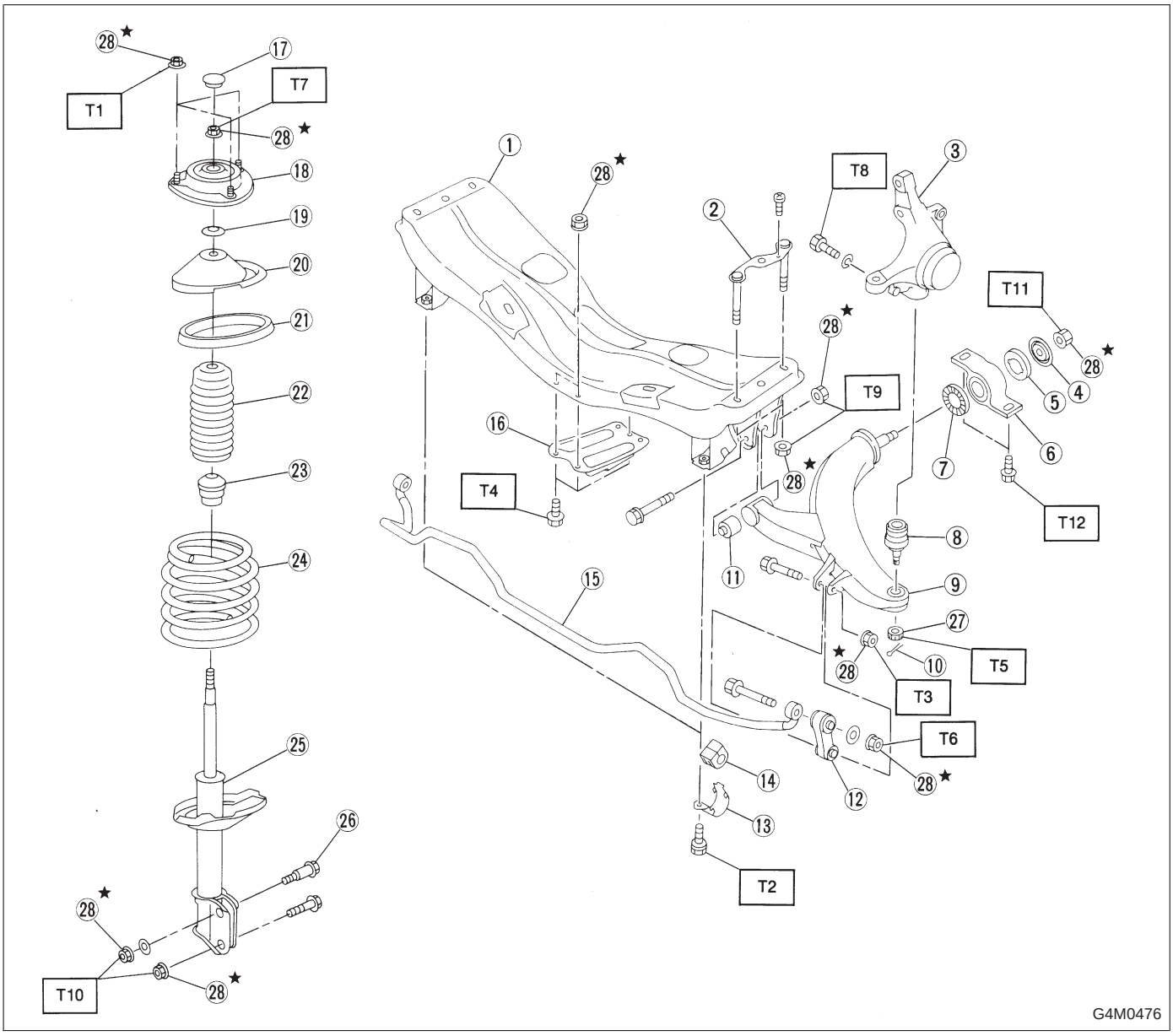
NOTE:
- Front and rear toe-ins and front camber can be adjusted. If toe-in or camber tolerance exceeds specifications, adjust toe-in and camber to the specification.
- The other items indicated in the specification table cannot be adjusted. If the other items exceeds specifications, check suspension parts and connections for deformities; and replace with new ones as required.

C: SERVICE DATA

Strut	Piston rod deflection Limit	0.8 mm (0.031 in)/ 20 N (2 kg, 4 lb)

1. Suspension

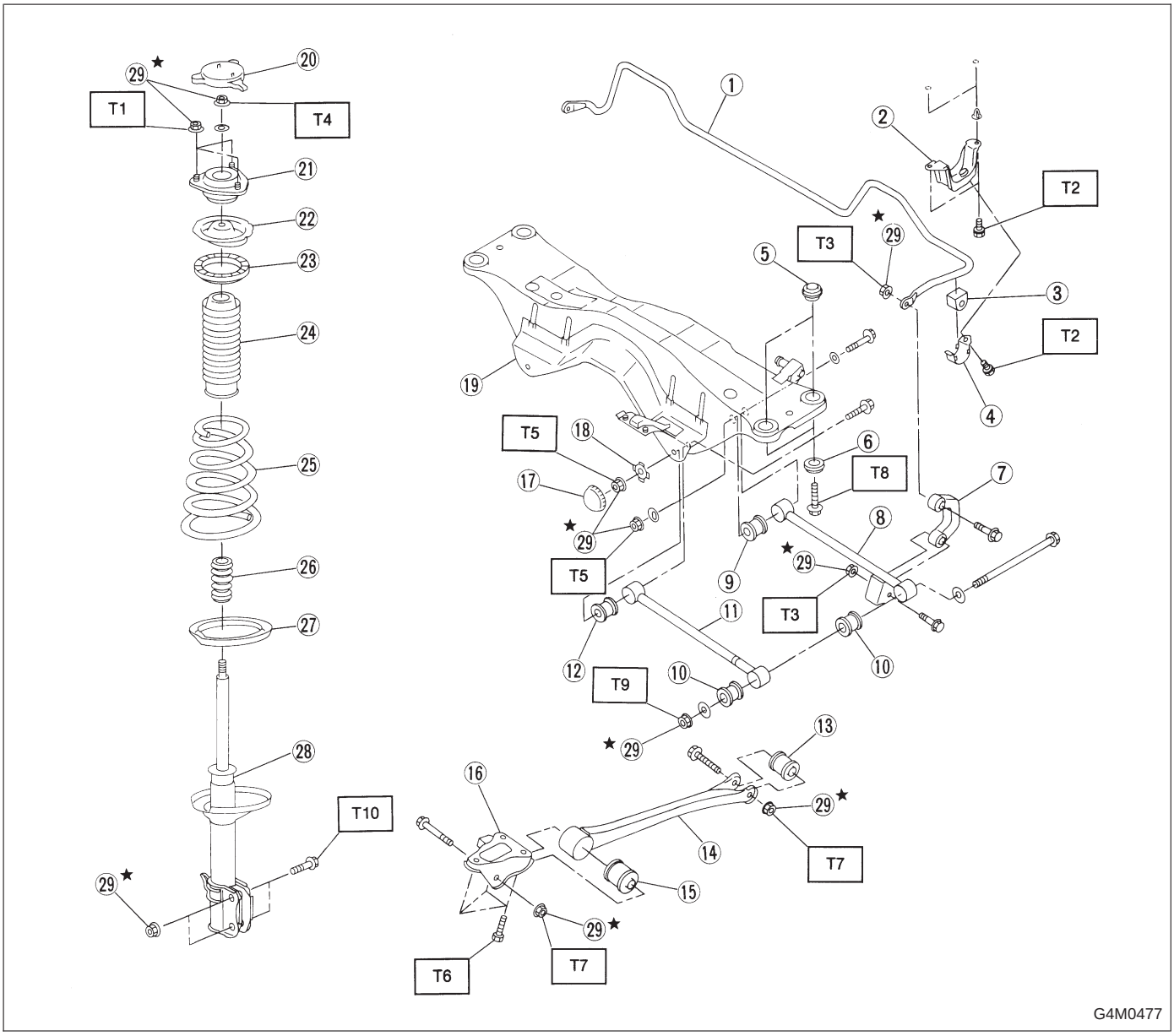
1. FRONT SUSPENSION



① Crossmember
② Bolt ASSY
③ Housing
④ Washer
⑤ Stop rubber (Rear)
⑥ Rear bushing
⑦ Stop rubber (Front)
⑧ Ball joint
⑨ Transverse link
⑩ Cotter pin
⑪ Front bushing
⑫ Stabilizer link
⑬ Clamp
⑭ Bushing
⑮ Stabilizer
⑯ Jack-up plate
⑰ Dust seal
⑱ Strut mount
⑲ Spacer
⑳ Upper spring seat
㉑ Rubber seat
㉒ Dust cover
㉓ Helper
㉔ Coil spring
㉕ Damper strut
㉖ Adjusting bolt
㉗ Castle nut
㉘ Self-locking nut

Tightening torque: N·m (kg-m, ft-lb)
T1: 20±6 (2.0±0.6, 14.5±4.3)
T2: 25±4 (2.5±0.4, 18.1±2.9)
T3: 29±5 (3.0±0.5, 21.7±3.6)
T4: 32±10 (3.3±1.0, 24±7)
T5: 39 (4, 29)
T6: 44±6 (4.5±0.6, 32.5±4.3)
T7: 49^{+10}_{-0} (5.0^{+10}_{-0}, 36^{+7}_{-0})
T8: 49±10 (5.0±1.0, 36±7)
T9: 98±15 (10.0±1.5, 72±11)
T10:152±20 (15.5±2.0, 112±14)
T11:196±25 (20.0±2.5, 145±18)
T12:245±49 (25.0±5.0, 181±36)

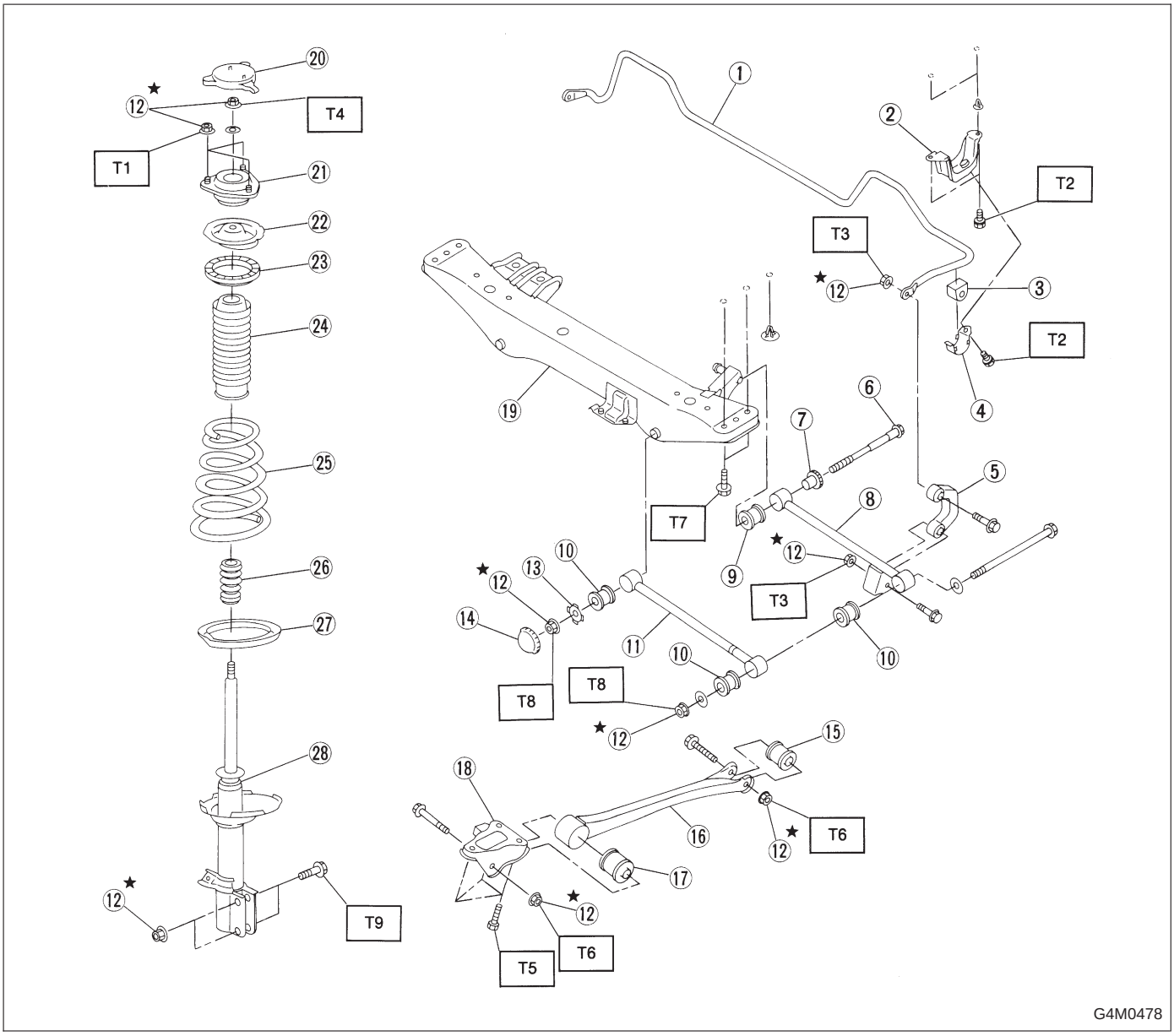
2. REAR SUSPENSION (AWD MODEL)



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
⑱ Washer
⑲ Crossmember
⑳ Cap
㉑ Strut mount
㉒ Spring seat
㉓ Rubber seat upper
㉔ Dust cover
㉕ Coil spring
㉖ Helper
㉗ Rubber seat lower
㉘ Damper strut
㉙ Self-locking nut

Tightening torque: N·m (kg-m, ft-lb)
T1: 20±6 (2.0±0.6, 14.5±4.3)
T2: 25±7 (2.5±0.7, 18.1±5.1)
T3: 44±6 (4.5±0.6, 32.5±4.3)
T4: 59±10 (6.0±1.0, 43±7)
T5: 98±15 (10.0±1.5, 72±11)
T6: 98±20 (10.0±2.0, 72±14)
T7: 113±15 (11.5±1.5, 83±11)
T8: 127±20 (13.0±2.0, 94±14)
T9: 137±20 (14.0±2.0, 101±14)
T10: 196^{+39}_{-10} ($20.0^{+4.0}_{-1.0}$, 145^{+29}_{-7})

3. REAR SUSPENSION (FWD MODEL)



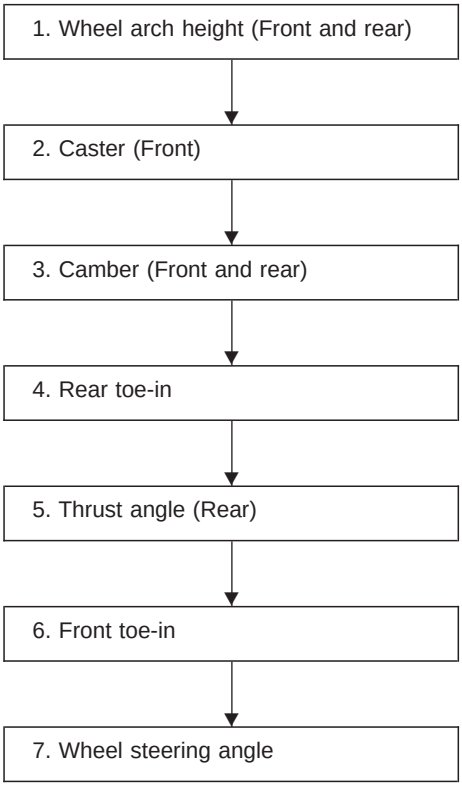
① Stabilizer
② Stabilizer bracket
③ Stabilizer bushing
④ Clamp
⑤ Stabilizer link
⑥ Adjusting bolt
⑦ Adjusting wheel
⑧ Rear lateral link
⑨ Bushing (D)
⑩ Bushing (A)
⑪ Front lateral link
⑫ Self-locking nut
⑬ Washer
⑭ Cap
⑮ Trailing link rear bushing
⑯ Trailing link
⑰ Trailing link front bushing
⑱ Trailing link bracket
⑲ Crossmember
⑳ Cap
㉑ Strut mount
㉒ Spring seat
㉓ Rubber seat upper
㉔ Dust cover
㉕ Coil spring
㉖ Helper
㉗ Rubber seat lower
㉘ Damper strut

Tightening torque: N·m (kg-m, ft-lb)
T1: 20±6 (2.0±0.6, 14.5±4.3)
T2: 25±7 (2.5±0.7, 18.1±5.1)
T3: 44±6 (4.5±0.6, 32.5±4.3)
T4: 59±10 (6.0±1.0, 43±7)
T5: 98±20 (10.0±2.0, 72±14)
T6: 113±15 (11.5±1.5, 83±11)
T7: 127±20 (13.0±2.0, 94±14)
T8: 137±20 (14.0±2.0, 101±14)
T9: 196^{+39}_{-10} ($20.0^{+4.0}_{-1.0}$, 145^{+29}_{-7})

1. On-car Services

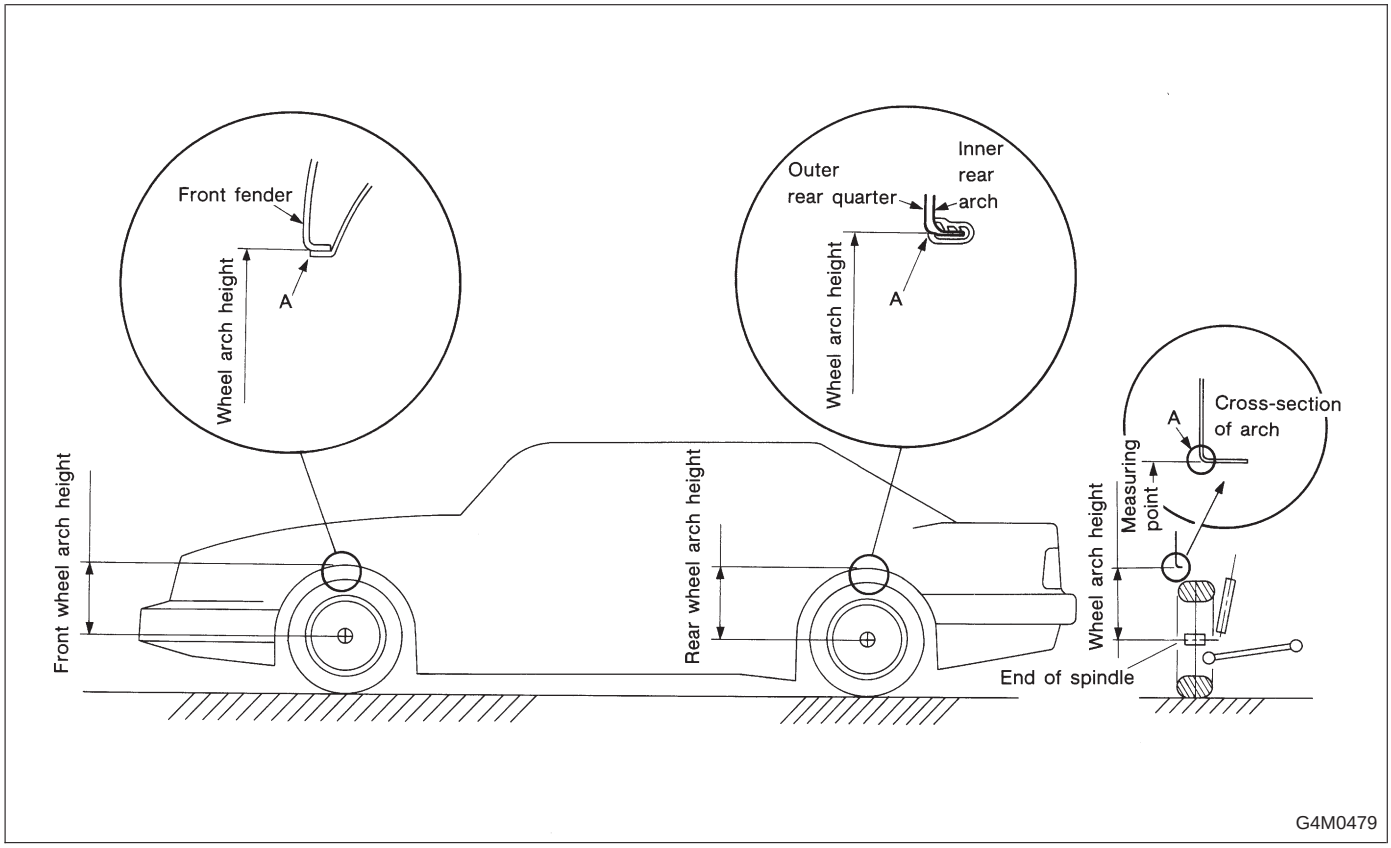
A: WHEEL ALIGNMENT

Check, adjust and/or measure wheel alignment in accordance with procedures indicated below:

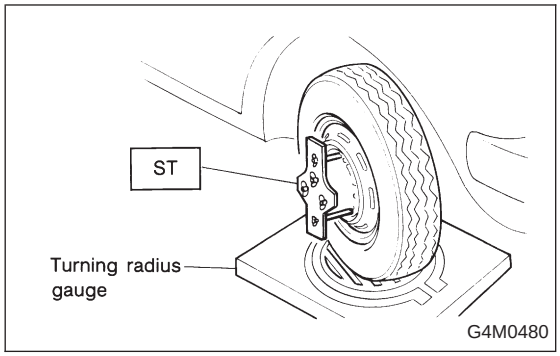


1. WHEEL ARCH HEIGHT

1) Adjust tire pressure to specifications.
2) Set vehicle under “curb weight” conditions. (Empty luggage compartment, install spare tire, jack, service tools, and top up fuel tank.)
3) Set steering wheel in a wheel-forward position.
4) Suspend thread from wheel arch (point “A” in figure below) to determine a point directly above center of spindle.
5) Measure distance between measuring point “A” and center of spindle.



Vehicles		Specified wheel arch height mm (in)	
		Front	Rear
Sedan	FWD	391^{+12}_{-24} ($15.39^{+0.47}_{-0.94}$)	378^{+12}_{-24} ($14.88^{+0.47}_{-0.94}$)
	AWD	391^{+12}_{-24} ($15.39^{+0.47}_{-0.94}$)	379^{+12}_{-24} ($14.92^{+0.47}_{-0.94}$)
Wagon	FWD	391^{+12}_{-24} ($15.39^{+0.47}_{-0.94}$)	378^{+12}_{-24} ($14.88^{+0.47}_{-0.94}$)
	AWD	391^{+12}_{-24} ($15.39^{+0.47}_{-0.94}$)	379^{+12}_{-24} ($14.92^{+0.47}_{-0.94}$)



2. CAMBER AND CASTER

● Inspection

1) Place front wheel to be measured on turning radius gauge. Make sure vehicle is level and ground contacting surfaces of front and rear wheels are set at the same height.

2) Set ST into the center of the wheel, and then install the wheel alignment gauge.

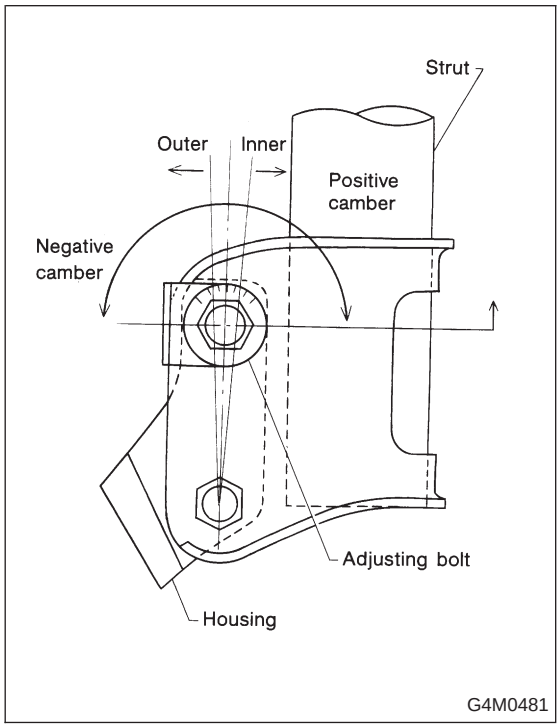
ST 927380000 ADAPTER

NOTE:
Refer to the “SPECIFICATIONS AND SERVICE DATA” for the camber and caster values.

● Front camber adjustment

1) Loosen two self-locking nuts located at lower front portion of strut.

CAUTION:
● When adjusting bolt needs to be adjusted, hold its head with a wrench and turn self-locking nut.
● Discard loosened self-locking nut and replace with a new one.



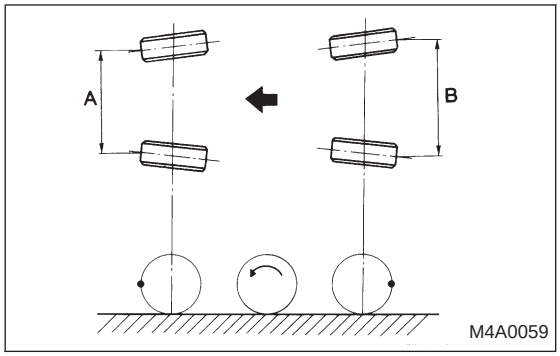
2) Turn camber adjusting bolt so that camber is set at the middle value of specifications.

NOTE:
Moving the adjusting bolt by one scale graduation changes camber by approximately 0°10′.

	Left side	Right side
Rotate clockwise	Camber is increased.	Camber is decreased.
Rotate counterclockwise	Camber is decreased.	Camber is increased.

3) Tighten the two self-locking nuts.

Tightening torque:
152±20 N·m (15.5±2.0 kg-m, 112±14 ft-lb)



3. FRONT WHEEL TOE-IN

● Inspection

1) Using a toe gauge, measure front wheel toe-in.

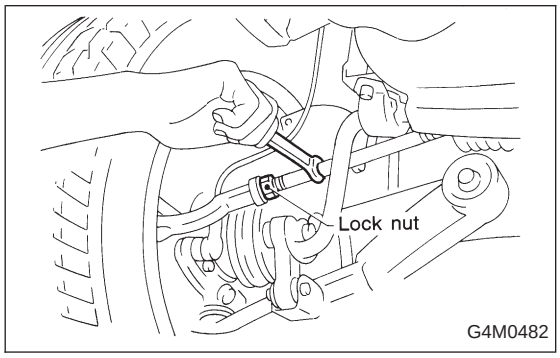
Toe-in: 0±3 mm (0±0.12 in)

2) Mark rear sides of left and right tires at height corresponding to center of spindles and measure distance “B” between marks.

3) Move vehicle forward so that marks line up with front sides at height corresponding to center of spindles.

4) Measure distance “A” between left and right marks. Toe-in can then be obtained by the following equation:

B − A = Toe-in



● Adjustment

1) Loosen the left and right side setting tie-rods lock nuts.

2) Turn the left and right tie rods equal amounts until the toe-in is at the middle value of specifications.

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).

3) Tighten tie-rod lock nut.

Tightening torque:

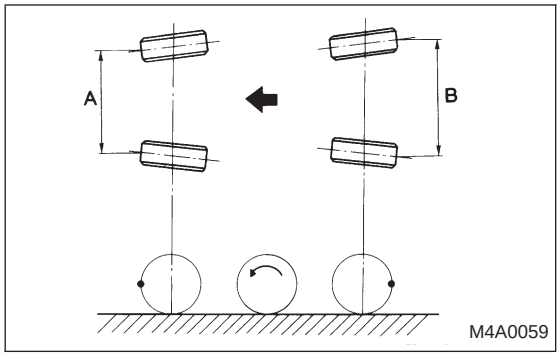
83±5 N·m (8.5±0.5 kg-m, 61.5±3.6 ft-lb)

CAUTION:

Correct tie-rod boot, if it is twisted.

NOTE:

Check the left and right wheel steering angle is within specifications.



4. REAR WHEEL TOE-IN (FWD MODEL)

● Inspection

Using a toe gauge, measure rear wheel toe-in.

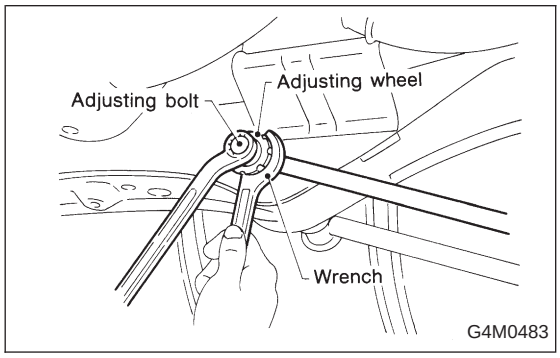
Toe-in: 0±3 mm (0±0.12 in)

2) Mark rear sides of left and right tires at height corresponding to center of spindles and measure distance “B” between marks.

3) Move vehicle forward so that marks line up with front sides at height corresponding to center of spindles.

4) Measure distance “A” between left and right marks. Toe-in can then be obtained by the following equation:

B − A = Toe-in



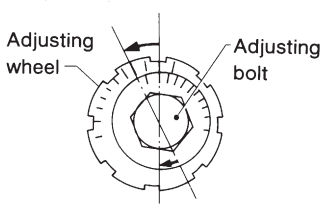
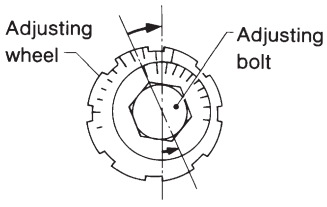
● Adjustment

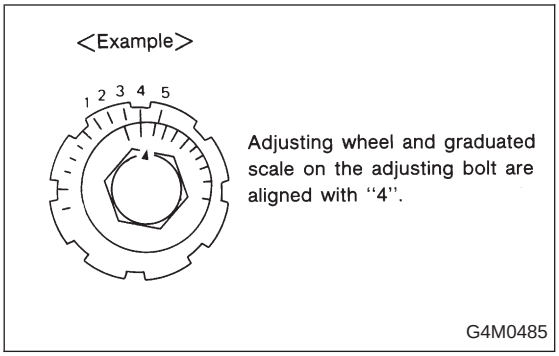
1) Remove cap from lateral link and loosen self-locking nut.

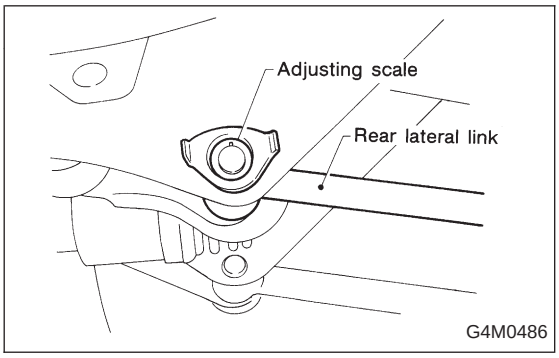
CAUTION:

- **When loosening or tightening adjustment bolt, hold bolt head and loosen self-locking nut.**
- **Replace self-locking nut with a new one.**

2) Using two wrenches, turn adjusting wheel and adjusting bolt equally in opposite directions so that toe-in is at the middle value of specification.

Rotary direction of adjusting wheel and adjusting bolt		Left wheel toe-in	Right wheel toe-in
Turn adjusting wheel counterclockwise and adjusting bolt clockwise.		Toe-in is increased.	Toe-in is decreased.
Turn adjusting wheel clockwise and adjusting bolt counterclockwise.		Toe-in is decreased.	Toe-in is increased.





NOTE:
● When toe-ins for left and right wheels are adjusted at the same time, moving one scale graduation changes toe-in by approximately 4 mm (0.16 in.)
● Turn adjusting wheel and adjusting bolt equally in opposite directions so that same scale graduations are positioned directly above center of the adjusting bolt.

3) Tighten self-locking nut.

Tightening torque:
137±20 N·m (14±2 kg-m, 101±14 ft-lb)

5. REAR WHEEL TOE-IN (AWD MODEL)

● Inspection

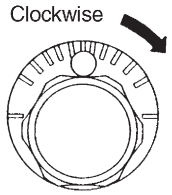
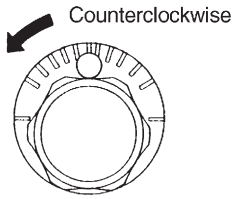
Toe-in:
0±3 mm (0±0.12 in)

● Adjustment

1) Loosen self-locking nut on inner side of rear lateral link.

CAUTION:
● When loosening or tightening adjusting bolt, hold bolt head and turn self-locking nut.
● Discard loosened self-locking nut and replace with a new one.

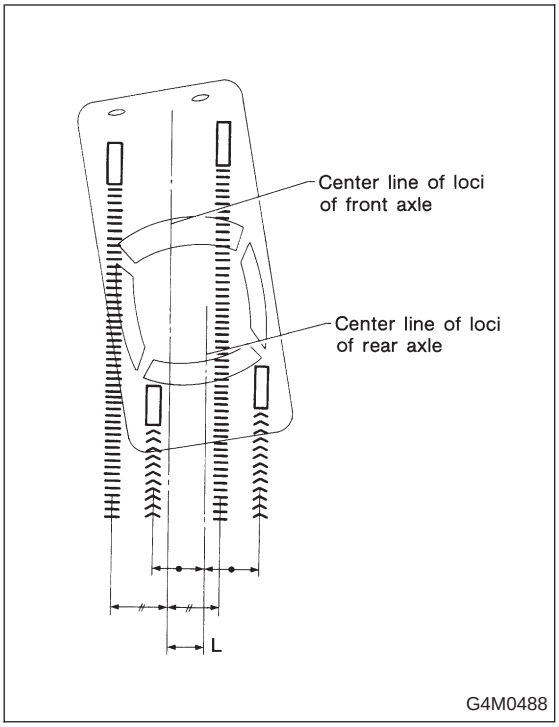
2) Turn adjusting bolt head until toe-in and -out are at the middle value of specifications.

Rotary direction of adjusting bolt	Left wheel toe-in	Right wheel toe-in
 H4M1016A	Toe-in is increased.	Toe-in is decreased.
 H4M1017A	Toe-in is decreased.	Toe-in is increased.

NOTE:
Movement of one scale graduation changes toe-in by approximately 3 mm (0.12 in).

3) Tighten self-locking nut.

Tightening torque:
98±15 N·m (10±1.5 kg-m, 72±11 ft-lb)



6. THRUST ANGLE

● Inspection

1) Position vehicle on a level surface.
2) Move vehicle 3 to 4 meters directly forward.
3) Determine locus of both front and rear axles.
4) Measure distance “L” between center line of loci of the axles.

(For reference)

· Thrust angle is less than 20’ when “L” is equal to or less than 15 mm (0.59 in).

● Adjustment

Make thrust angle adjustments by turning toe-in adjusting bolts of rear suspension equally in the same direction.

NOTE:
On FWD models, turn one rear wheel in the opposite direction of the adjusting bolt by the same amount as for the adjusting wheel.

(For reference)

· When one rear wheel is adjusted in a toe-in direction, adjust the other rear wheel equally in toe-out direction, in order to make thrust angle adjustment.

· When left and right adjusting bolts are turned incrementally by one graduation in the same direction (except for FWD models), the thrust angle of the AWD model will change approximately 10’ [“L” is almost equal to 7.5 mm (0.295 in)] and the thrust angle of the FWD model will change approximately 12’ [“L” is almost equal to 9 mm (0.35 in)].

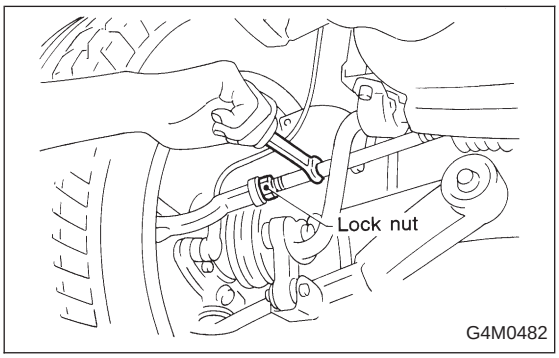
Tolerance of thrust angle:
Less than ±20’

7. STEERING ANGLE

● Inspection

1) Place vehicles on a turning radius gauge.
2) While depressing brake pedal, turn steering wheel fully to the left and right. With steering wheel held at each fully turned position, measure both the inner and outer wheel steering angle.

Tolerance of steering angle:
Inner wheel $39^{\circ}{}^{+1^{\circ}}_{-1.5^{\circ}}$
Outer wheel $33.5^{\circ}{}^{+1^{\circ}}_{-1.5^{\circ}}$



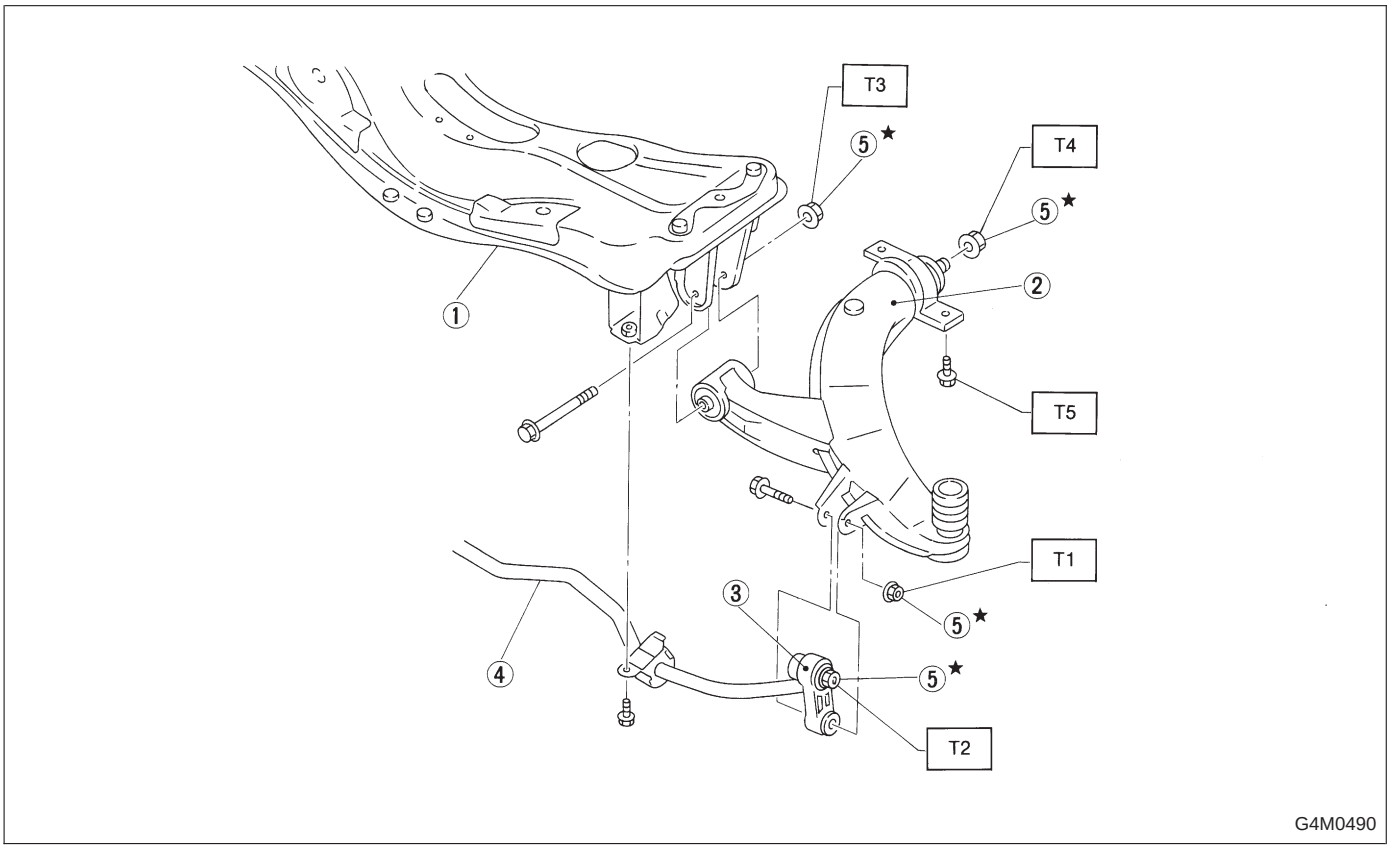
● Adjustment

Turn tie-rod to adjust steering angle of both inner and outer wheels.

CAUTION:
● **Check toe-in.**
● **Correct boot if it is twisted.**

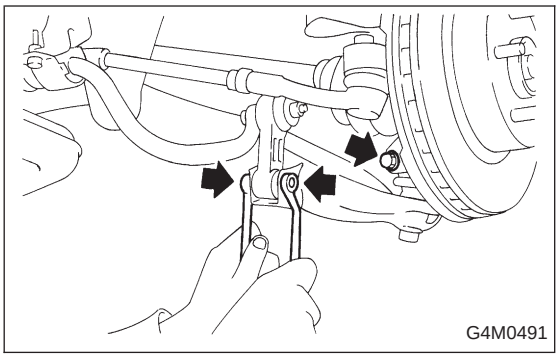
2. Front Transverse Link

A: REMOVAL

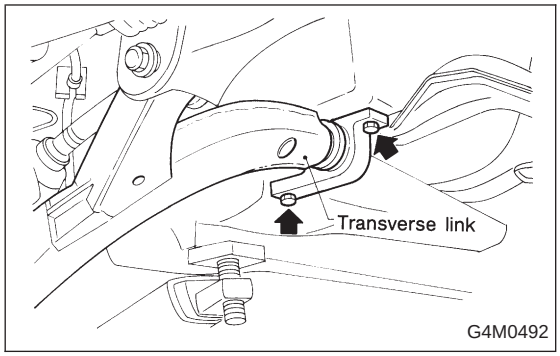


① Front crossmember
② Transverse link
③ Stabilizer link
④ Front stabilizer
⑤ Self-locking nut

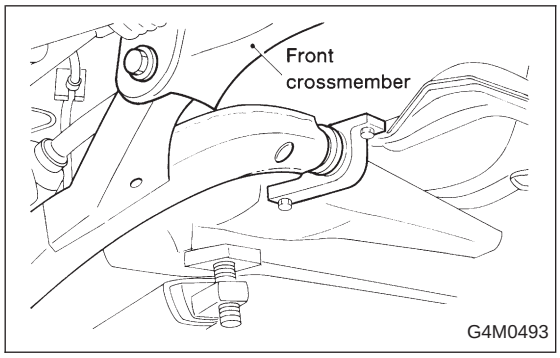
Tightening torque: N·m (kg-m, ft-lb)
T1: 29±5 (3.0±0.5, 21.7±3.6)
T2: 44±6 (4.5±0.6, 32.5±4.3)
T3: 98±15 (10.0±1.5, 72±11)
T4: 196±25 (20.0±2.5, 145±18)
T5: 245±49 (25.0±5.0, 181±36)



1) Disconnect stabilizer link from transverse link.
2) Remove bolt securing ball joint of transverse link to housing.



3) Remove nuts (do not remove bolts.) securing transverse link to crossmember.
4) Remove two bolts securing bushing bracket of transverse link to car body at rear bushing location.



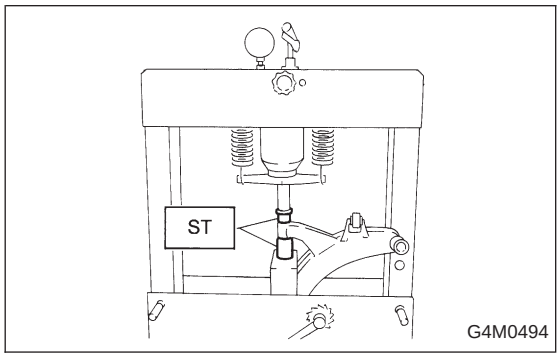
5) Extract ball joint from housing.
6) Remove bolts securing transverse link to crossmember and extract transverse link from crossmember.

B: DISASSEMBLY

1. FRONT BUSHING

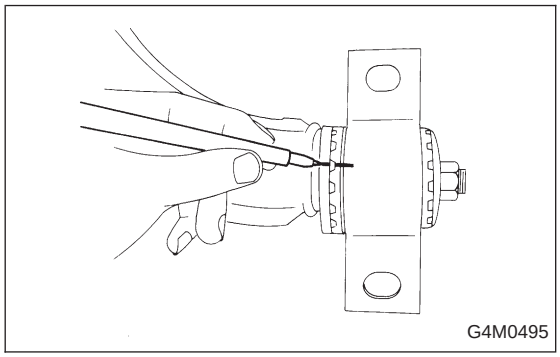
Using ST, press front bushing out of place.

ST 927680000 INSTALLER & REMOVER SET



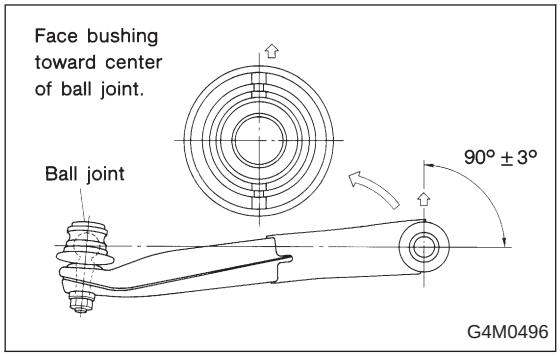
2. REAR BUSHING

1) Scribe an aligning mark on transverse link and rear bushing.
2) Loosen nut and remove rear bushing.



C: INSPECTION

1) Check transverse link for wear, damage and cracks, and correct or replace if defective.
2) Check bushings for cracks, fatigue or damage.
3) Check rear bushing for oil leaks.



D: ASSEMBLY

1. FRONT BUSHING

To reassemble, reverse disassembly procedures.

CAUTION:
Install front bushing in correct direction, as shown in figure.

2. REAR BUSHING

1) Install rear bushing to transverse link and align aligning marks scribed on the two.
2) Tighten self-locking nut.

CAUTION:
- **Discard loosened self-locking nut and replace with a new one.**
- **While holding rear bushing so as not to change position of aligning marks, tighten self-locking nut.**

Tightening torque:
196±25 N·m (20.0±2.5 kg-m, 145±18 ft-lb)

E: INSTALLATION

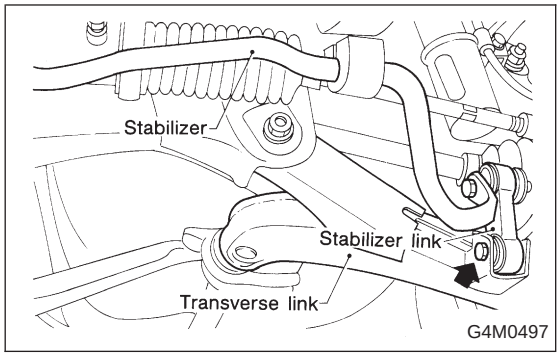
1) Temporarily tighten the two bolts used to secure rear bushing of the transverse link to body.

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 bolts used to connect transverse link to cross-member and temporarily tighten with nuts.

CAUTION:
Discard loosened self-locking nut and replace with a new one.

3) Insert ball joint into housing.



4) Connect stabilizer link to transverse link, and temporarily tighten bolts.

CAUTION:
Discard loosened self-locking nut and replace with a new one.

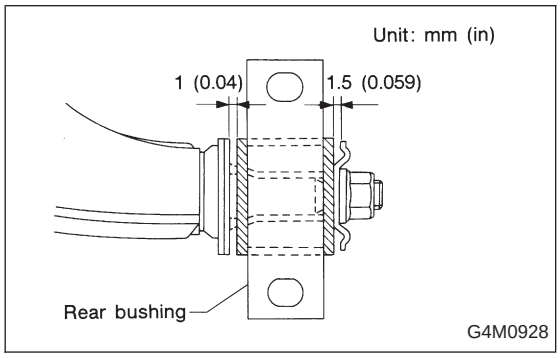
5) Tighten the following points in the order shown below when wheels are in full contact with the ground and vehicle is curb weight.

(1) Transverse link and stabilizer

Tightening torque:
29±5 N·m (3.0±0.5 kg-m, 21.7±3.6 ft-lb)

(2) Transverse link and crossmember

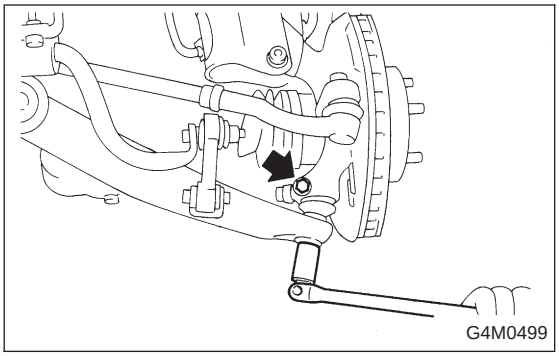
Tightening torque:
98±15 N·m (10.0±1.5 kg-m, 72±11 ft-lb)



(3) Transverse link rear bushing and body

Tightening torque:
245±49 N·m (25±5 kg-m, 181±36 ft-lb)

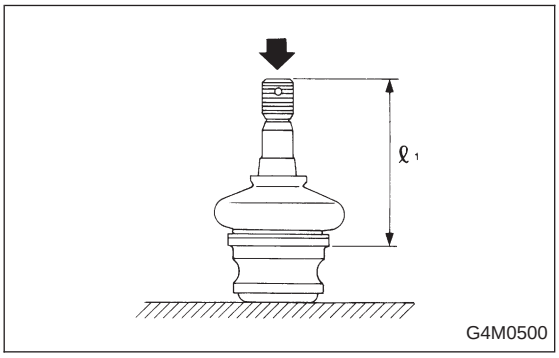
NOTE:
Move rear bushing back and forth until transverse link-to-rear bushing clearance is established (as indicated in figure.) before tightening.


G4M0499

3. Front Ball Joint

A: REMOVAL

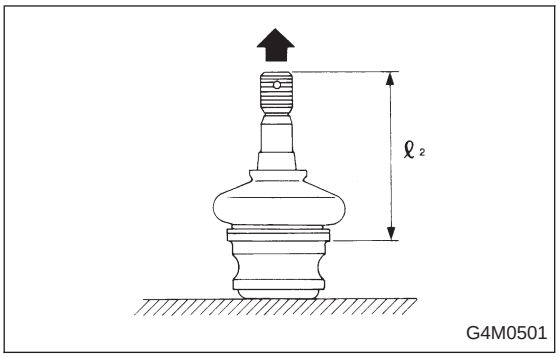
1) Remove the wheels.
2) Pull out the cotter pin from the ball stud, remove the castle nut, and extract the ball stud from the transverse link.
3) Remove the bolt securing the ball joint to the housing.
4) Extract the ball joint from the housing.



G4M0500

B: INSPECTION

1) Measure 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 kg, 154 lb) loaded in the direction shown in the figure, measure dimension ℓ_1.



G4M0501

   (2) With 686 N (70 kg, 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 is 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 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 the new ball joint.

C: INSTALLATION

1) Install ball joint onto housing.

Torque (Bolt):
49 N·m (5.0 kg-m, 36 ft-lb)

CAUTION:
Do not apply grease to tapered portion of ball stud.

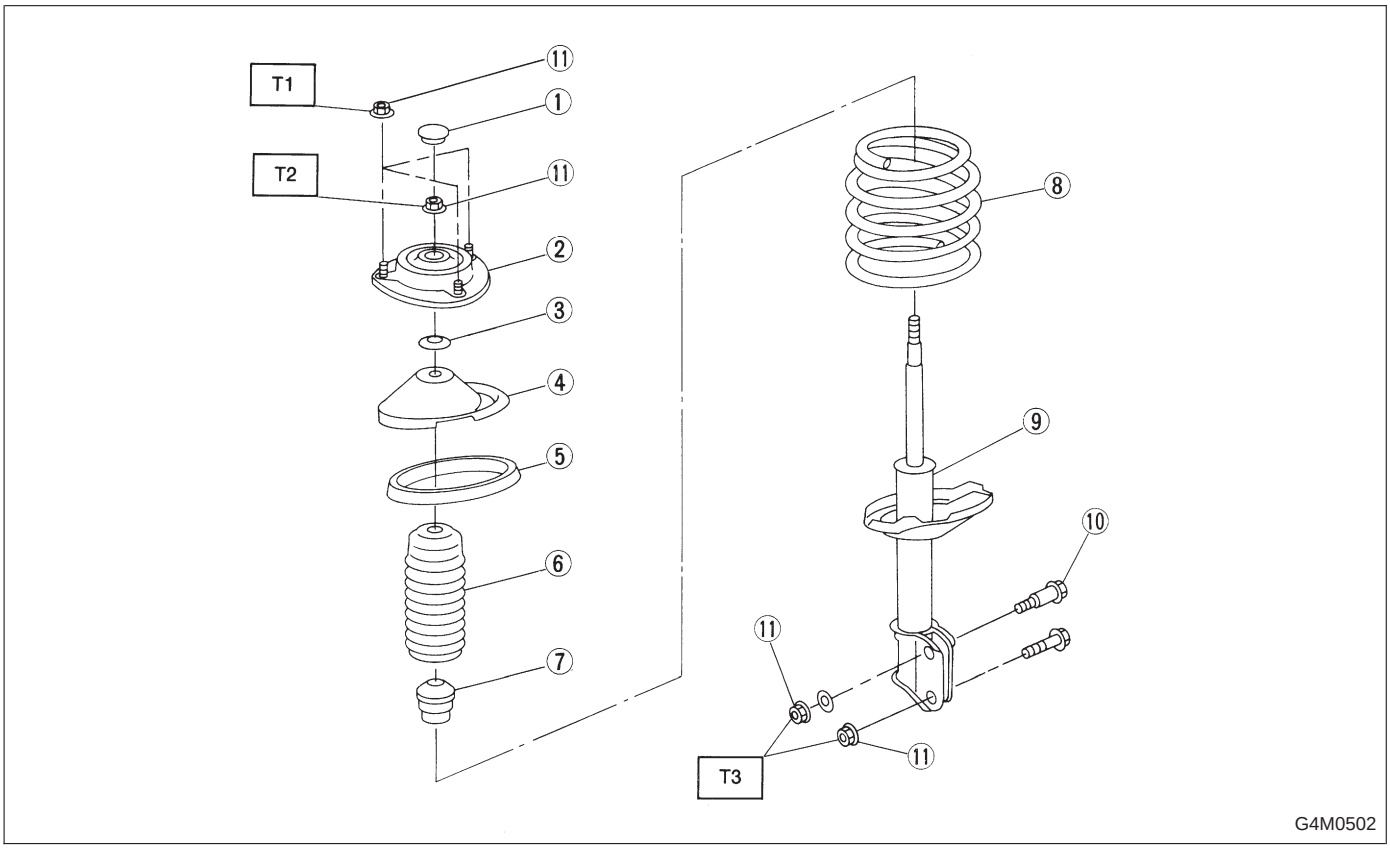
2) Connect ball joint to transverse link.

Torque (Castle nut):
39 N·m (4.0 kg-m, 29 ft-lb)

3) Retighten castle nut further within 60° until a slot in castle nut is aligned with the hole in ball stud end, then insert new cotter pin and bend it around castle nut.
4) Install front wheels.

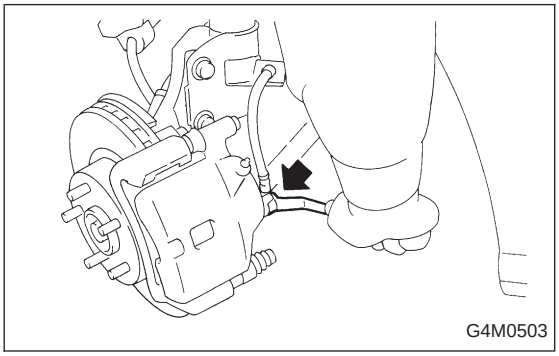
4. Front Strut

A: REMOVAL



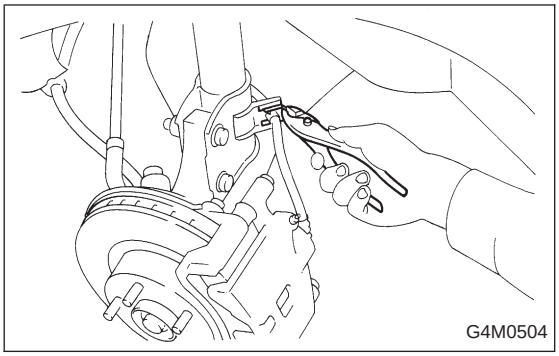
① Dust seal
② Strut mount
③ Spacer
④ Upper spring seat
⑤ Rubber seat
⑥ Dust cover
⑦ Helper
⑧ Coil spring
⑨ Damper strut
⑩ Adjusting bolt
⑪ Self-locking nut

Tightening torque: N·m (kg-m, ft-lb)
T1: 20±6 (2.0±0.6, 14.5±4.3)
T2: 49^{+10}_{-0} (5.0^{+10}_{-0}, 36^{+7}_{-0})
T3: 152±20 (15.5±2.0, 112±14)

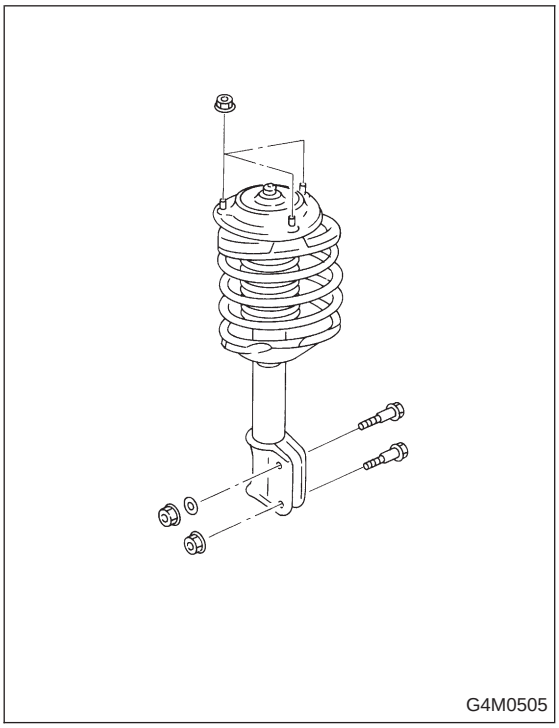


1) Remove wheel.
2) Depress brake pedal and hold it down using a wooden block etc.
3) Remove union bolts from caliper.

CAUTION:
Use brake hose cap to prevent brake fluid from escaping.


G4M0504

4) Remove brake hose clamp and disconnect brake hose from strut. Attach brake hose to body using gum tape.
5) Scribe an alignment mark on the camber adjusting bolt which secures strut to housing.
6) Remove bolt securing the A.B.S. sensor harness on models equipped with A.B.S.

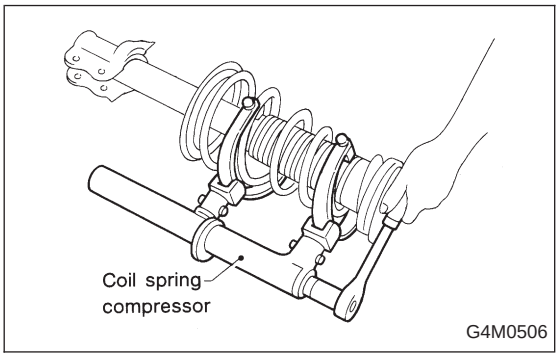

G4M0505

7) Remove two bolts securing housing to strut.

CAUTION:
While holding head of adjusting bolt, loosen self-locking nut.

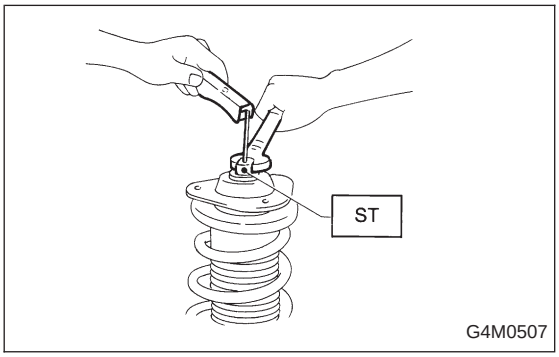
8) Remove the three nuts securing strut mount to body.

B: DISASSEMBLY



G4M0506

1) Using a coil spring compressor, compress coil spring.



G4M0507

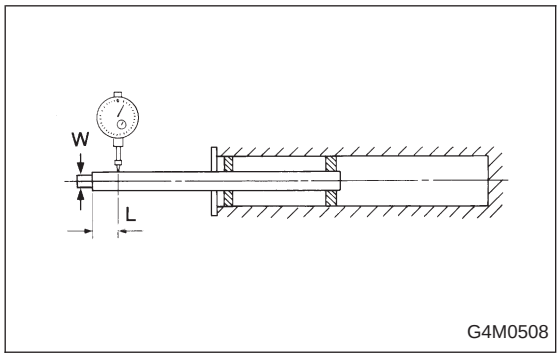
2) Using ST, remove self-locking nut.

ST 927760000 STRUT MOUNT SOCKET

3) Remove strut mount, upper spring seat and rubber seat from strut.
4) Gradually decreasing compression force, and remove coil spring.
5) Remove dust cover and helper spring.

C: 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 its operates smoothly without any binding.
3) Play of piston rod

Measure the play as follows:
Fix outer shell and fully extend the rod. Set a dial gauge at the end of the rod: L [10 mm (0.39 in)], then apply a force of: W [±20 N (±2 kg, ±4 lb)] to threaded portion. With the force of ±20 N (±2 kg, ±4 lb) applied, read both dial gauge readings, P_1 and P_2. The free play is determined by the following equation:

Limit of play:
Less than 0.8 mm (0.031 in)

If the play is greater, replace the strut.

2. STRUT MOUNT

Check rubber part for creep, cracks and deterioration, and replace it with 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 vehicle posture is uneven, although there are no considerable reasons like tire puncture, uneven loading, etc., check coil spring for its free length, cracks, etc., referring to specifications, and replace it with a new one if defective.

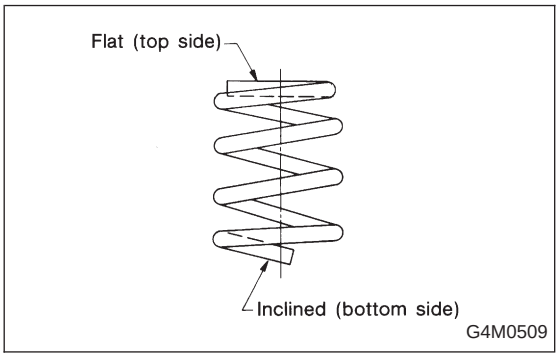
5. HELPER

Replace it with new one if cracked or damaged.

D: ASSEMBLY

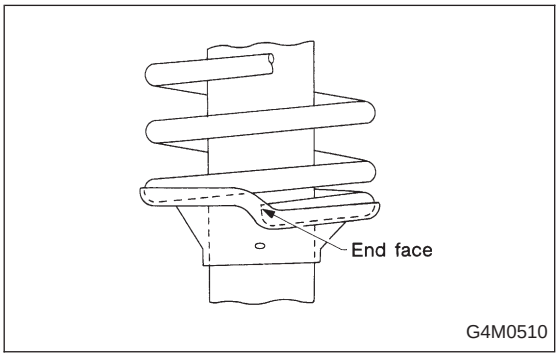
1) Before installing coil spring, strut mount, etc., on the strut, check for the presence of air in the dampening force generating mechanism of the strut since air prevents proper dampening force from being produced.
2) Checking for the presence of air
   (1) Place the strut vertically with the piston rod facing up.
   (2) Move the piston rod to the center of its entire stroke.
   (3) While holding the piston rod end with fingertips, move the rod up and down.
   (4) If the piston rod moves at least 10 mm (0.39 in) in step (3), 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 steps (1) through (4) above 3 or 4 times.

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 item 2) above.

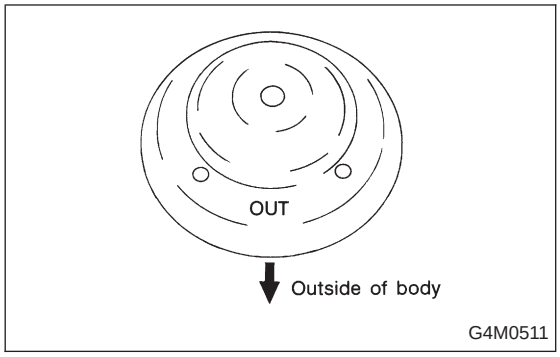


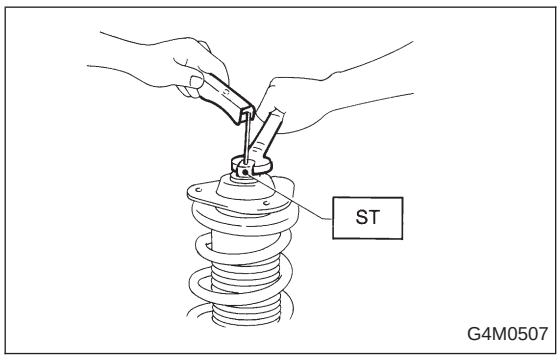
4) Using a coil spring compressor, compress the coil spring.

NOTE:
Make sure that the vertical installing direction of coil spring is as shown in figure.



5) Set the coil spring correctly so that its end face fits well into the spring seat as shown.
6) Install helper and dust cover to the piston rod.





7) Pull the piston rod fully upward, and install rubber seat and spring seat.

NOTE:
Ensure that upper spring seat is positioned with “OUT” mark facing outward.

8) Install strut mount to the piston rod, and tighten the self-locking nut temporarily.

CAUTION:
Be sure to use a new self-locking nut.

9) Loosen the coil spring carefully.

10) Using hexagon wrench to prevent strut rod from turning, tighten self-locking nut with ST.

Tightening torque:
49^{+10}_{-0} N·m ($5.0^{+1.0}_{-0}$ kg-m, 36^{+7}_{-0} ft-lb)

ST 927760000 STRUT MOUNT SOCKET

E: INSTALLATION

1) Install upper strut mount at upper side of strut to body and tighten with nuts.

Tightening torque:
20±6 N·m (2.0±0.6 kg-m, 14.5±4.3 ft-lb)

2) Install A.B.S. sensor harness to strut. (A.B.S. equipped models)

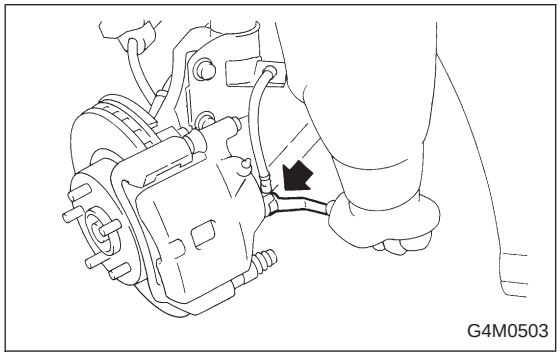
Tightening torque:
152±20 N·m (15.5±2.0 kg-m, 112±14 ft-lb)

3) Position aligning mark on camber adjustment bolt with aligning mark on lower side of strut.

CAUTION:
- **While holding head of adjusting bolt, tighten self-locking nut.**
- **Be sure to use new self-locking nut.**

Tightening torque:
152±20 N·m (15.5±2.0 kg-m, 112±14 ft-lb)

4) Install brake hose at lower side of strut with clamp.



5) Install union bolts which secure brake caliper to brake hose.

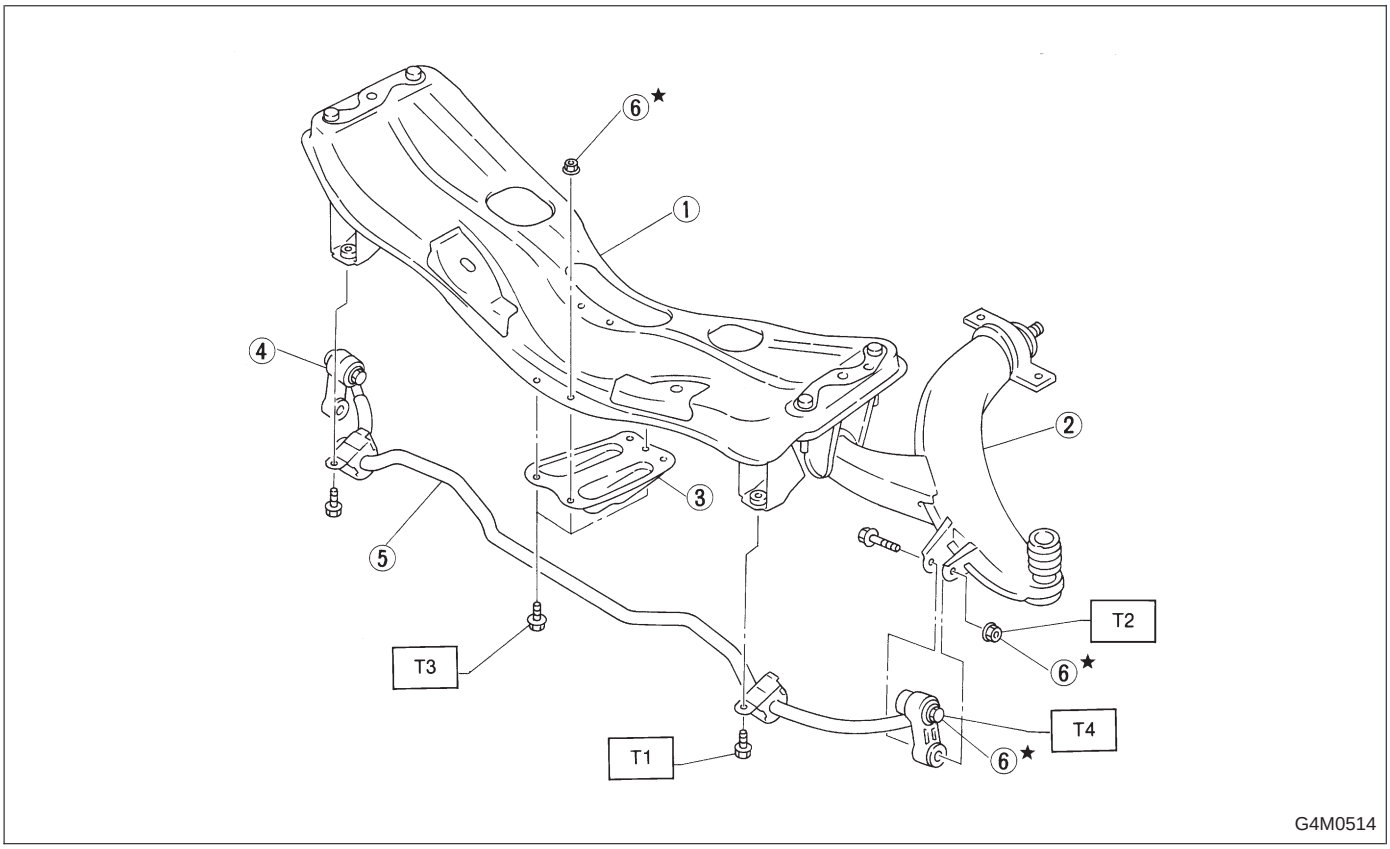
Tightening torque:
18±3 N·m (1.8±0.3 kg-m, 13.0±2.2 ft-lb)

CAUTION:
Be sure to bleed air from brake system.

6) Install wheels.

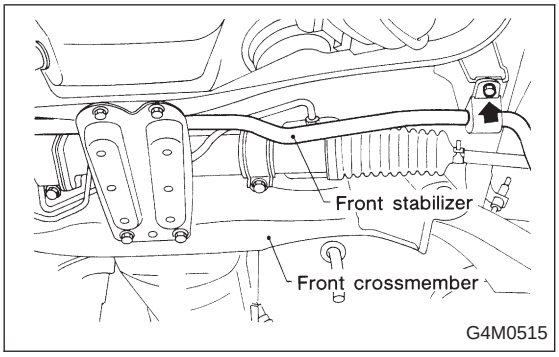
NOTE:
Check wheel alignment and adjust if necessary.

5. Front Stabilizer



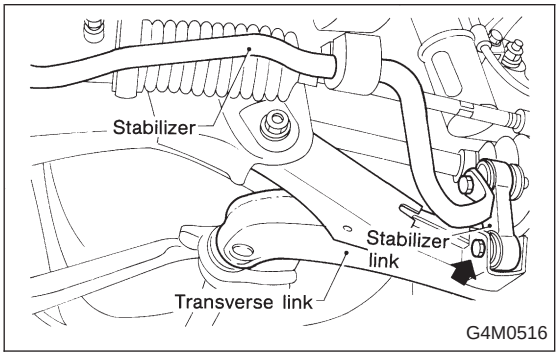
① Front crossmember
② Transverse link
③ Jack-up plate
④ Stabilizer link
⑤ Front stabilizer
⑥ Self-locking nut

Tightening torque: N·m (kg-m, ft-lb)
T1: 25±4 (2.5±0.4, 18.1±2.9)
T2: 29±5 (3.0±0.5, 21.7±3.6)
T3: 32±10 (3.3±1.0, 24±7)
T4: 44±6 (4.5±0.6, 32.5±4.3)



A: REMOVAL

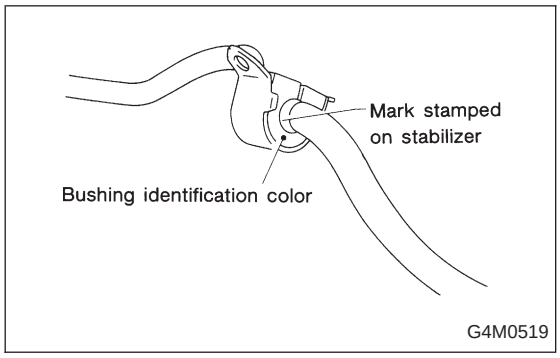
1) Jack-up the front part of the vehicle.
2) Remove bolts which secure stabilizer to crossmember.



3) Remove bolts which secure stabilizer link to front transverse link.
4) Remove jack-up plate from lower part of crossmember.

B: INSPECTION

1) Check bushing for cracks, fatigue or damage.
2) Check stabilizer links for deformities, cracks, or damage, and bushing for protrusions from the hole of stabilizer link.



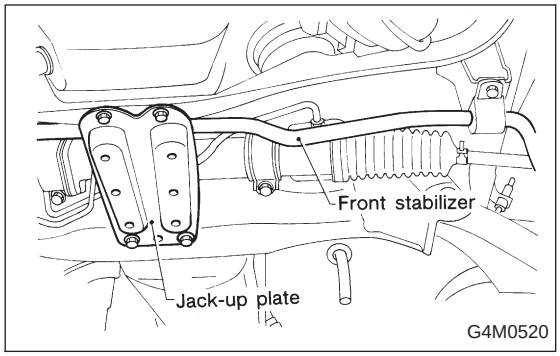
C: INSTALLATION

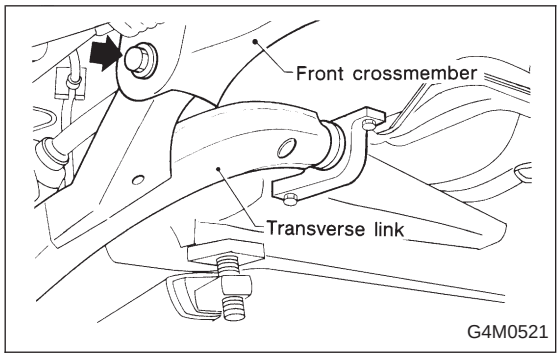
1) To install, reverse the removal procedure.

NOTE:
- Install bushing (on front crossmember side) while aligning it with paint mark on stabilizer.
- Ensure that bushing and stabilizer have the same identification colors when installing.

2) Always tighten rubber bushing location when wheels are in full contact with the ground and vehicle is curb weight.
3) Tightening torque:

Jack-up plate to crossmember:
32±10 N·m (3.3±1.0 kg-m, 24±7 ft-lb)
Stabilizer link to front transverse link:
29±5 N·m (3.0±0.5 kg-m, 21.7±3.6 ft-lb)
Stabilizer to crossmember:
25±4 N·m (2.5±0.4 kg-m, 18.1±2.9 ft-lb)





6. Front Crossmember

A: REMOVAL

1) Disconnect ground cable from battery.
2) Loosen front wheel nuts.
3) Jack-up vehicle, support it with safety stands (rigid racks), and remove front tires and wheels.
4) Remove both stabilizer and jack-up plate.
5) Disconnect tie-rod end from housing.
6) Remove front exhaust pipe.
7) Remove front transverse link from front crossmember.
8) Remove nuts attaching engine mount cushion rubber to crossmember.
9) Remove self-locking nuts connecting steering U/J and pinion shaft.
10) Lift engine by approx. 10 mm (0.39 in) by using chain block.
11) Support crossmember with a jack, remove nuts securing crossmember to body and lower crossmember gradually along with steering gearbox.

CAUTION:
When removing crossmember downward, be careful that tie-rod end does not interfere with DOJ boot.

B: INSTALLATION

1) Installation is in the reverse order of removal procedures.

CAUTION:
Always tighten rubber bushing location when wheels are in full contact with the ground and vehicle is curb weight.

2) Tightening torque

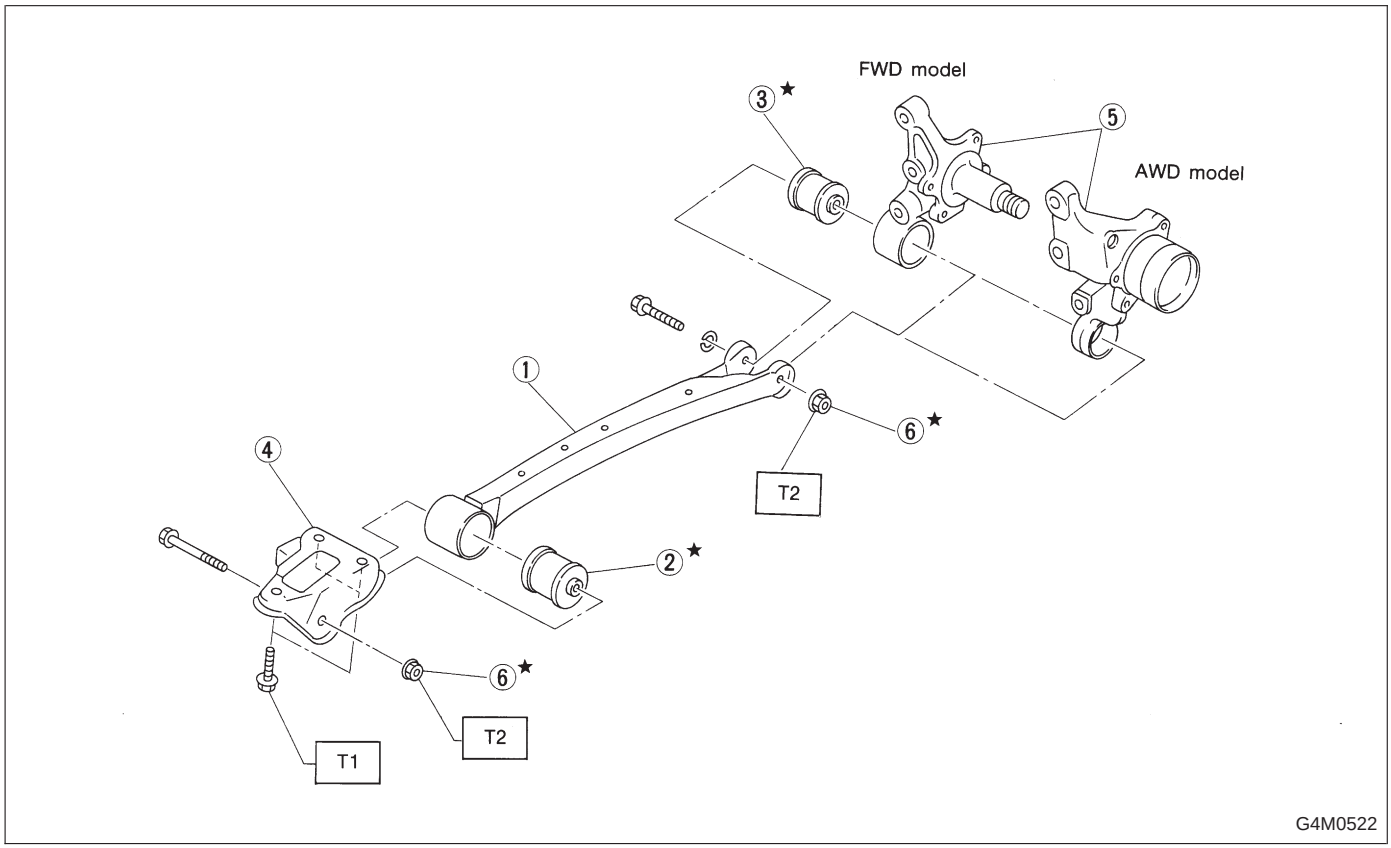
Transverse link bushing to crossmember:
98±15 N·m (10.0±1.5 kg-m, 72±11 ft-lb)
Stabilizer to bush:
25±4 N·m (2.5±0.4 kg-m, 18.1±2.9 ft-lb)
Tie-rod end to housing:
27.0±2.5 N·m (2.75±0.25 kg-m, 19.9±1.8 ft-lb)
Front cushion rubber to crossmember:
69±15 N·m (7.0±1.5 kg-m, 51±11 ft-lb)
Universal joint to pinion shaft:
24±3 N·m (2.4±0.3 kg-m, 17.4±2.2 ft-lb)
Crossmember to body:
98±15 N·m (10.0±1.5 kg-m, 72±11 ft-lb)

3) Purge air from power steering system.

NOTE:
Check wheel alignment and adjust if necessary.

7. Rear Trailing Link

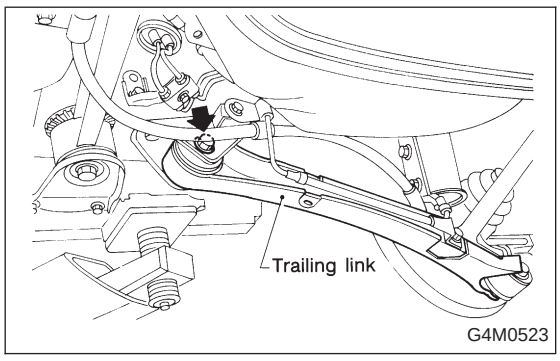
A: REMOVAL



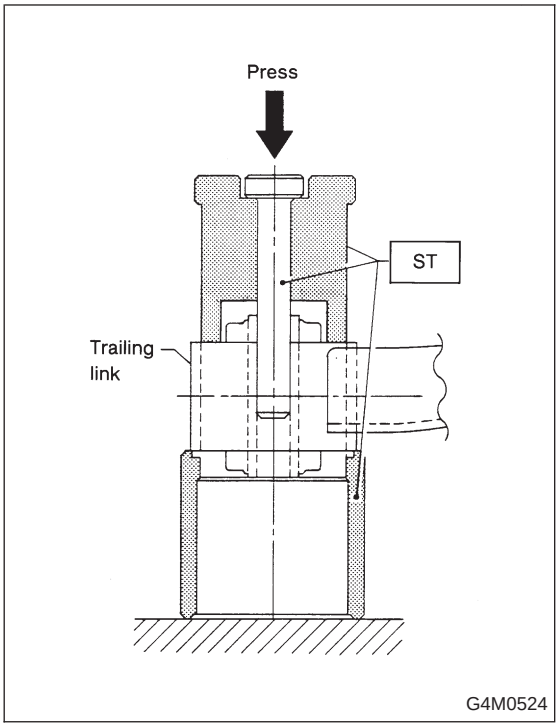
① Trailing link
② Front bushing
③ Rear bushing
④ Bracket
⑤ Housing
⑥ Self-locking nut

Tightening torque: N·m (kg-m, ft-lb)
T1: 98±20 (10.0±2.0, 72±14)
T2: 113±15 (11.5±1.5, 83±11)

1) Loosen rear wheel nuts.
2) Jack-up vehicle, support it with safety stands (rigid racks) and remove rear wheels.
3) Remove both rear parking brake clamp and A.B.S. sensor harness. (only vehicle equipped with A.B.S.)



4) Remove bolt which secure trailing link to trailing link bracket.
5) Remove bolt which secure trailing link to rear housing.

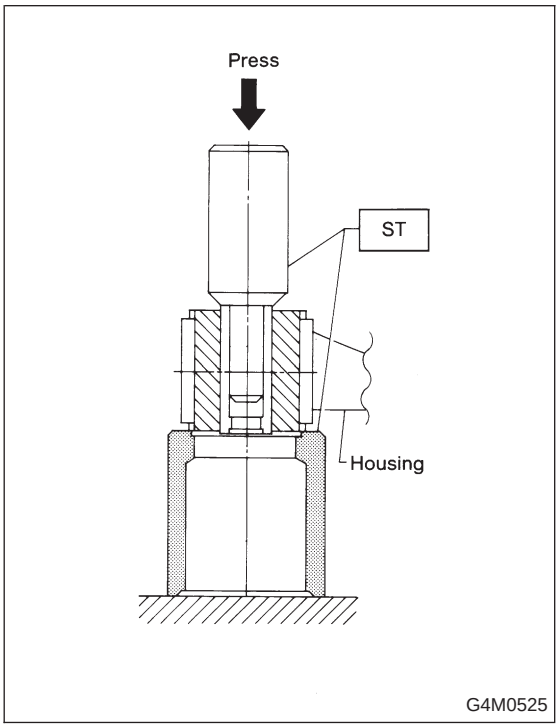


B: DISASSEMBLY

1. FRONT BUSHING

Using ST, press front bushing out of place.

ST 927720000 INSTALLER & REMOVER SET



2. REAR BUSHING

1) Remove housing. Refer to “4-2. WHEELS AND AXLES” for removal procedures.
2) Using ST, press rear bushing out of place.

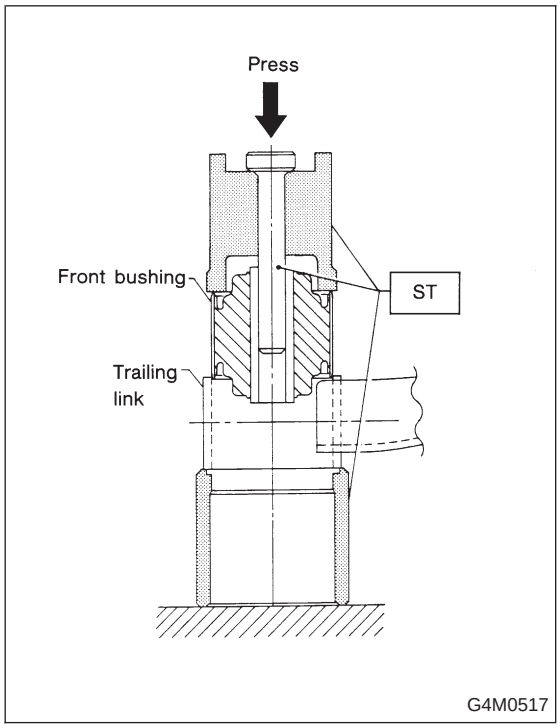
ST 927730000 INSTALLER & REMOVER SET

C: INSPECTION

Check trailing links for bends, corrosion or damage.

D: ASSEMBLY

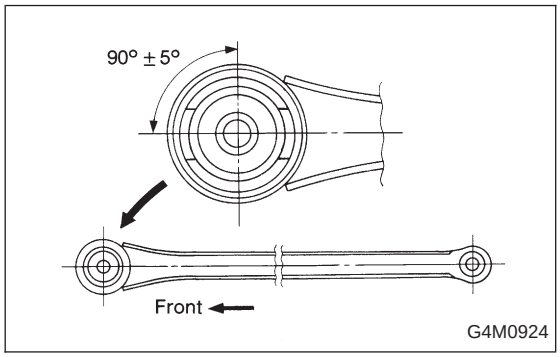
To assemble, reverse above disassembly procedures.



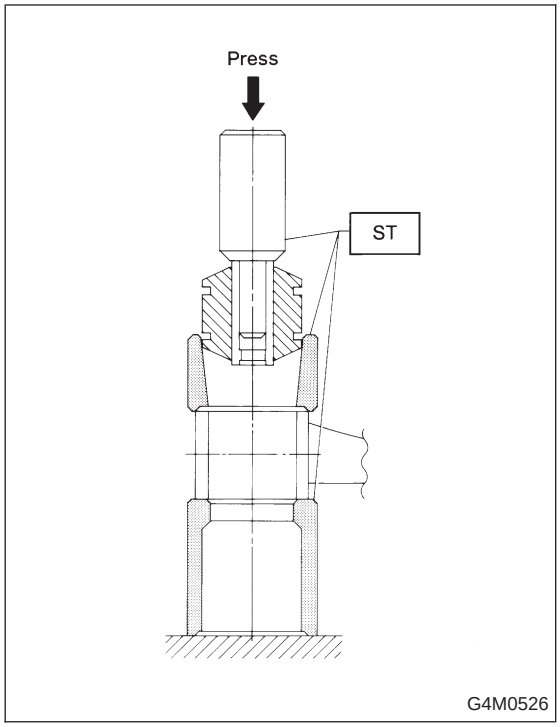
1. FRONT BUSHING

Using ST, press bushing into trailing link.

ST 927720000 INSTALLER & REMOVER SET



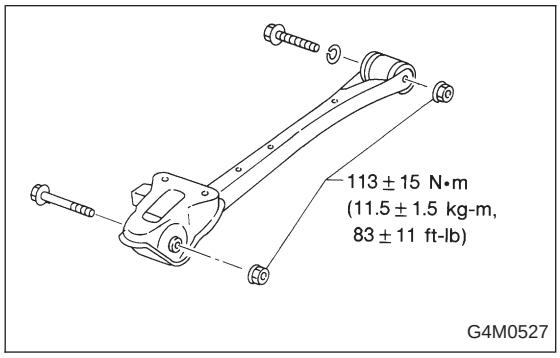
CAUTION:
Install front bushing in the proper direction, as shown in figure.



2. REAR BUSHING

Using ST, press bushing into trailing link.

ST 927730000 INSTALLER & REMOVER SET



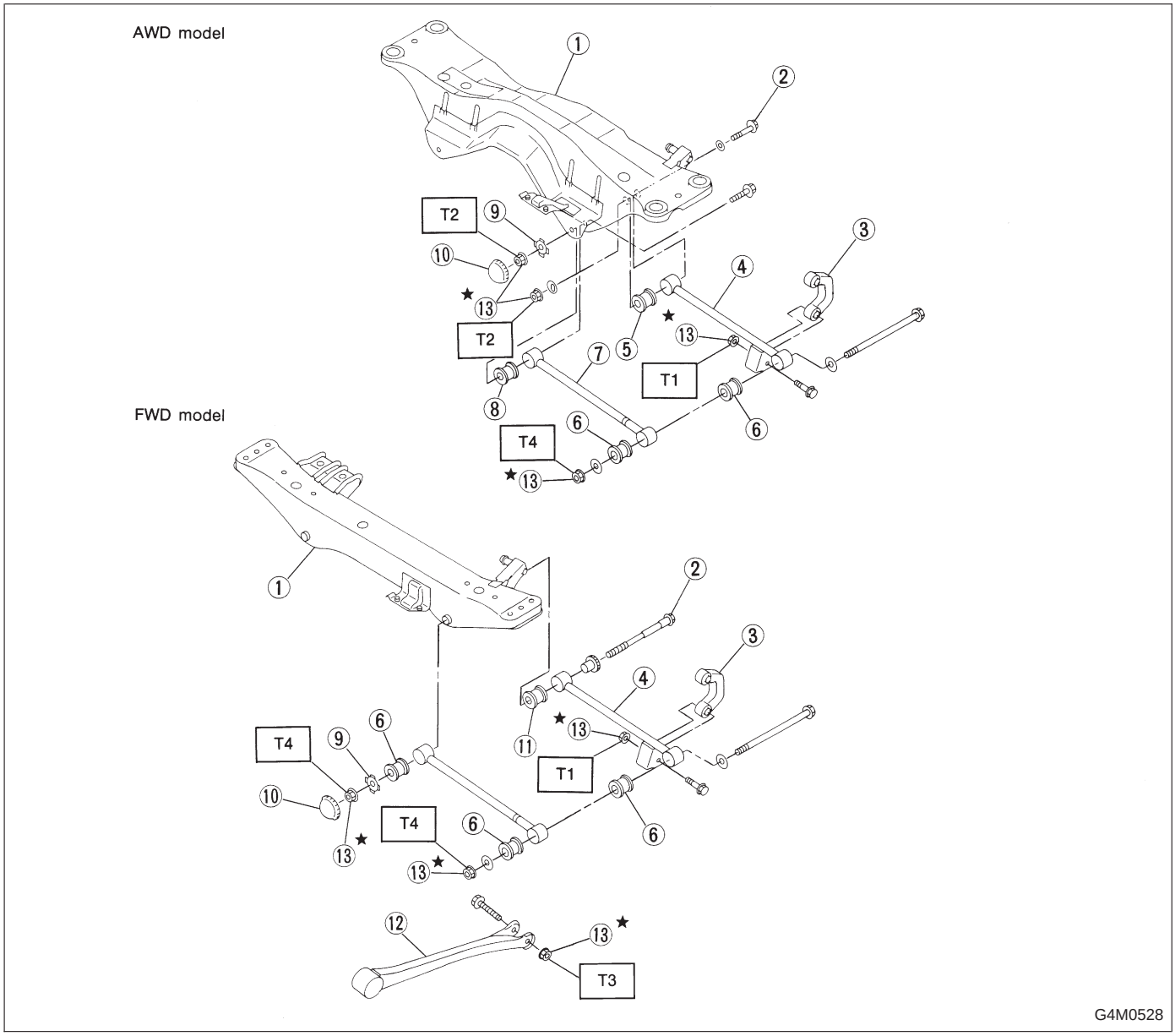
E: INSTALLATION

Installation is in the reverse order of removal.

CAUTION:
Always tighten rubber bushing location when wheels are in full contact with the ground and vehicle is curb weight.

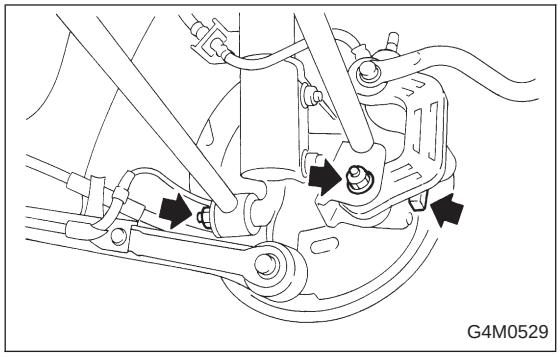
NOTE:
Check wheel alignment and adjust if necessary.

8. Lateral Link



① Crossmember
② Adjusting bolt
③ Stabilizer link
④ Rear lateral link
⑤ Bushing (C)
⑥ Bushing (A)
⑦ Front lateral link
⑧ Bushing (B)
⑨ Washer
⑩ Cap
⑪ Bushing (D)
⑫ Trailing link
⑬ Self-locking nut

Tightening torque: N·m (kg-m, ft-lb)
T1: 44±6 (4.5±0.6, 32.5±4.3)
T2: 98±15 (10.0±1.5, 72±11)
T3: 113±15 (11.5±1.5, 83±11)
T4: 137±20 (14.0±2.0, 101±14)


G4M0529

A: REMOVAL

1. FWD MODEL

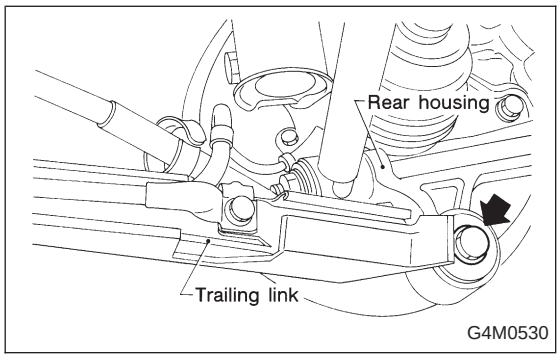
1) Remove rear exhaust pipe and muffler.
2) Remove stabilizer from rear lateral link.
3) Scribe an aligning mark on adjusting bolt, adjusting wheel and crossmember.
4) Remove bolts securing lateral links to housing.
5) Turn cap (lateral link) counterclockwise until it contacts stopper, then remove cap.
6) While holding adjusting bolt head with a wrench, loosen self-locking nut.

CAUTION:
Always loosen self-locking nut before turning adjusting bolt.

7) Lateral link removal
   (1) Left lateral links
   Remove adjusting bolt and front and rear lateral links.
   (2) Right lateral links
   Remove bolts securing crossmember to car body.
   Remove adjusting bolt and front and rear lateral links.

2. AWD MODEL

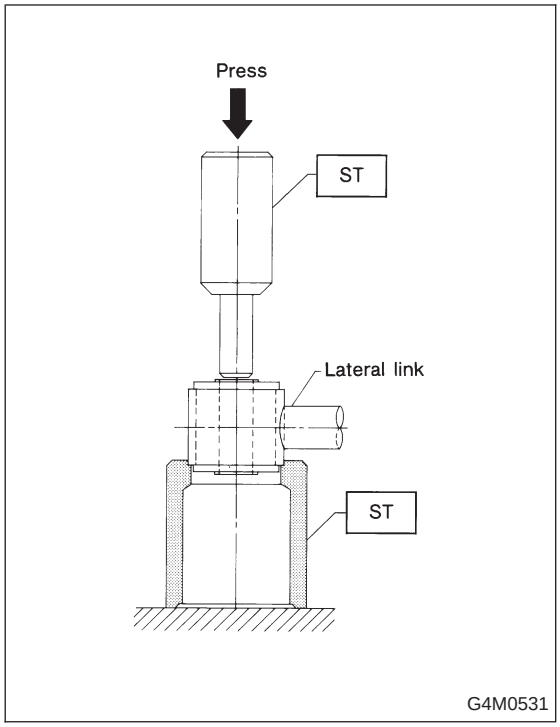
1) Loosen wheel nuts. Jack-up vehicle and remove wheel.
2) Remove stabilizers.
3) (Models equipped with A.B.S.)
Remove A.B.S. sensor harness from trailing link.



G4M0530

4) Remove bolt securing trailing link to housing.
5) Remove DOJ from differential. <Ref. to 4-2 [W4A2].>
6) Scribe an alignment mark on rear lateral link adjusting bolt and crossmember.
7) Remove outer lateral link bolt securing lateral link to housing.
8) Remove bolts securing front and rear lateral links to crossmember, detach lateral links.

CAUTION:
To loosen adjusting bolt, always loosen nut while holding the head of adjusting bolt.



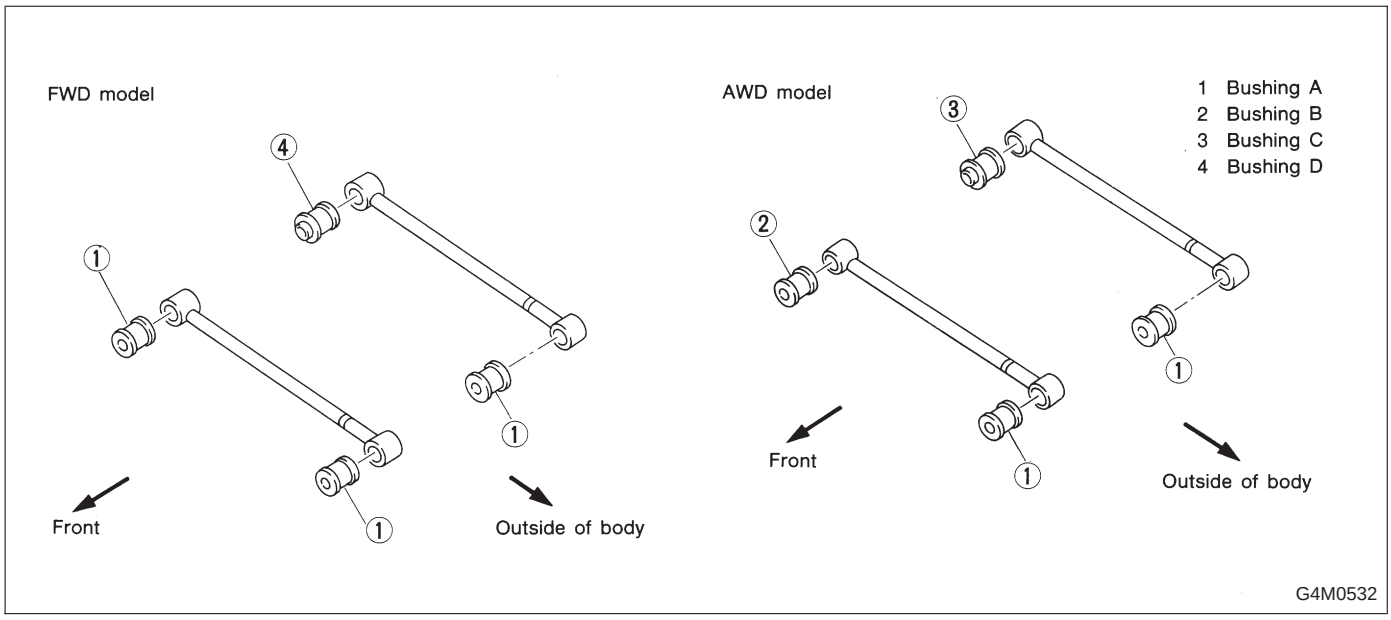
B: DISASSEMBLY

Using ST, press bushing out of place.

NOTE:

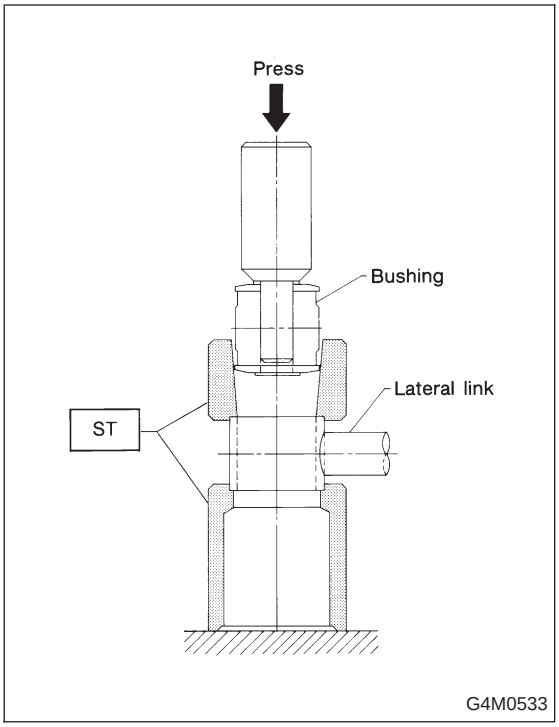
- Using the following figure as a guide, verify the type of bushings.
- Select ST according to the type of bushings used.

Bushing	INSTALLER & REMOVER SET
Bushing A	927700000
Bushing B	927690000
Bushing C	927700000
Bushing D	927710000



C: INSPECTION

Visually check lateral links for damage or bends.

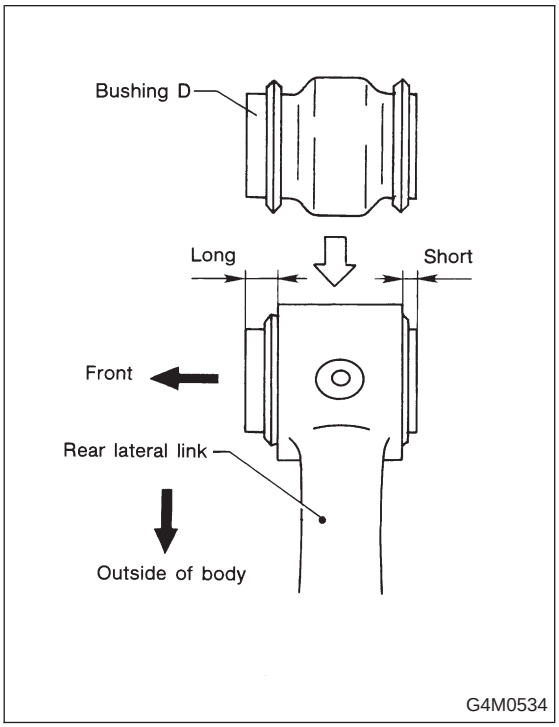


D: ASSEMBLY

Using ST, press bushing into place.

CAUTION:
Select ST according to the type of bushings used.

NOTE:
Use the same ST as that used during disassembly.



NOTE:
Pay attention to the direction of bushing “D” as shown in figure.

E: INSTALLATION

To install, reverse removal procedures, observing the following instructions.

CAUTION:

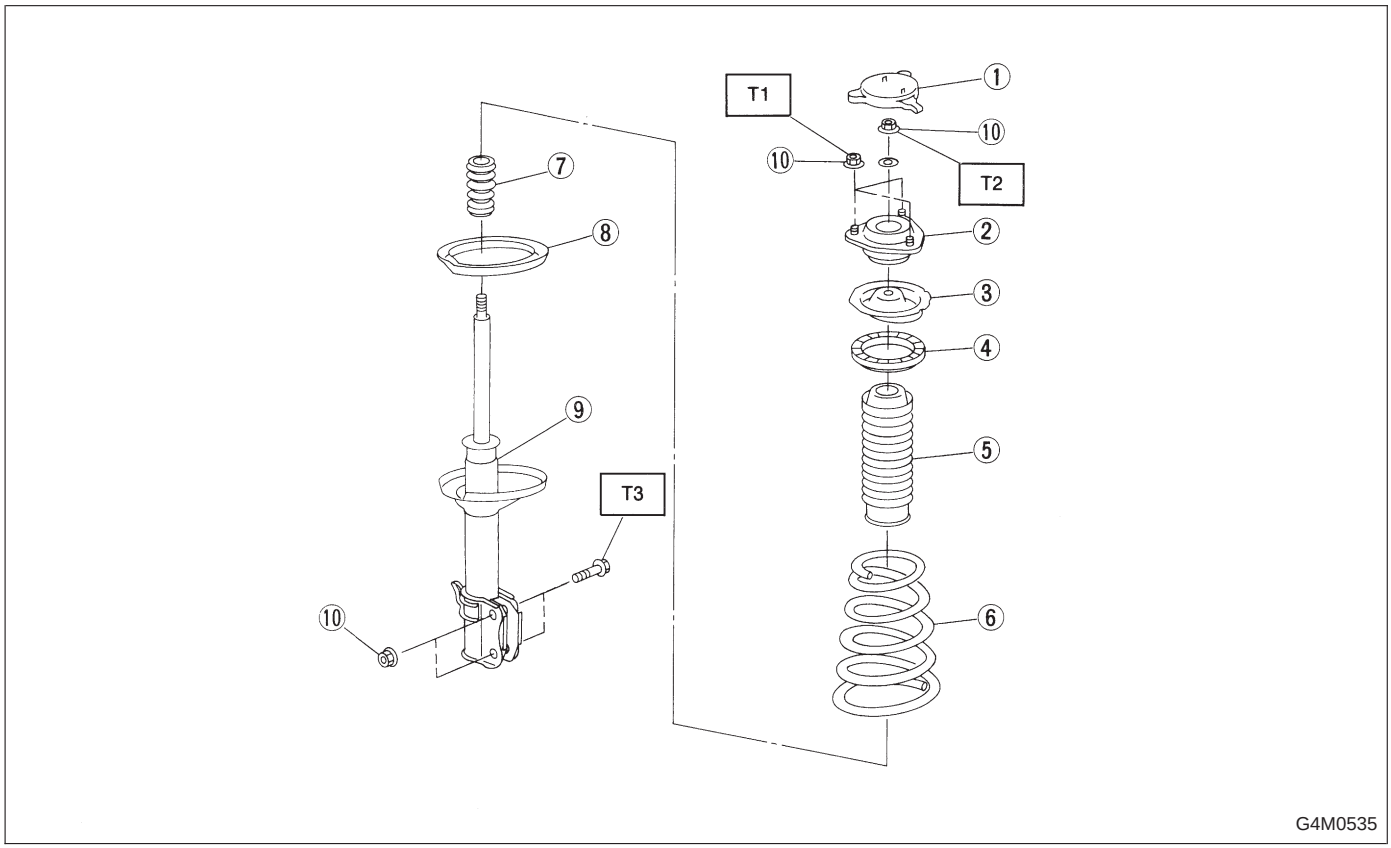
- **Always tighten rubber bushing location when wheels are in full contact with the ground and vehicle is curb weight.**
- **Tighten nut when installing adjusting bolt.**
- **Replace self-locking nut and DOJ circlip with new ones.**

NOTE:

- Lateral link washers for FWD and AWD models can be identified by colors, as follows:
  Olive (FWD model)
  Gold (AWD model)
- Check wheel alignment and adjust if necessary.

9. Rear Strut

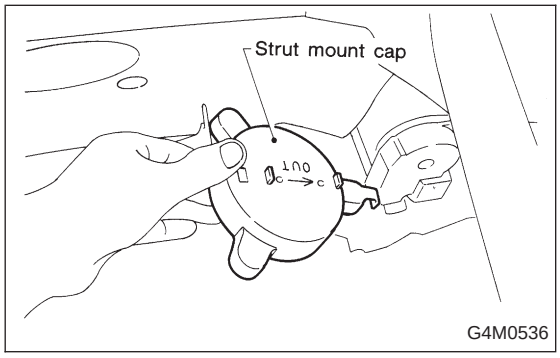
A: REMOVAL



G4M0535

① Cap
② Strut mount
③ Spring seat
④ Rubber seat upper
⑤ Dust cover
⑥ Coil spring
⑦ Helper
⑧ Rubber seat lower
⑨ Damper strut
⑩ Self-locking nut

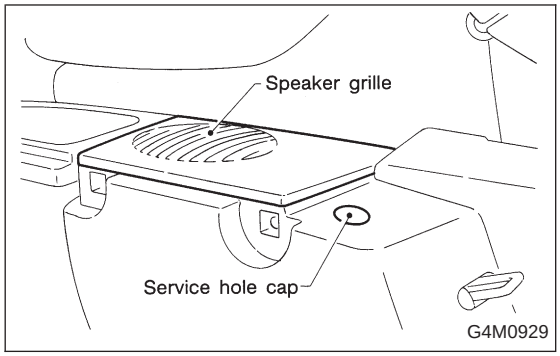
Tightening torque: N·m (kg-m, ft-lb)
T1: 20±6 (2.0±0.6, 14.5±4.3)
T2: 59±10 (6.0±1.0, 43±7)
T3: 196^{+39}_{-10} ($20.0^{+4.0}_{-1.0}$, 145^{+29}_{-7})



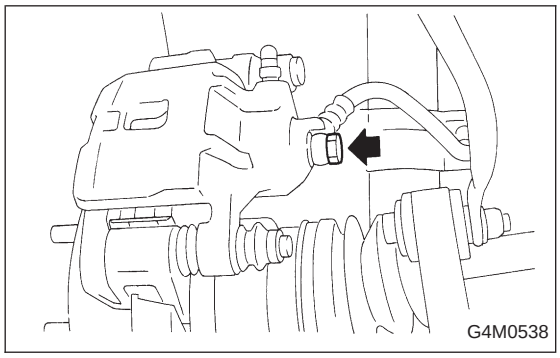
G4M0536

1) Depress brake pedal and secure it in that position using a wooden block, etc.

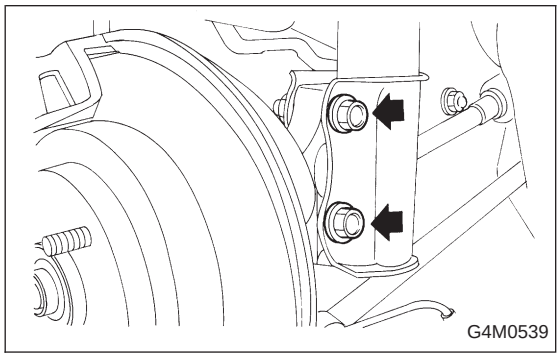
2) Remove rear seat cushion and backrest. (Sedan model)



3) Remove rear speaker grille and service hole cap. (Wagon model)
4) Remove strut mount cap.
5) Loosen rear wheel nuts.
6) Jack-up vehicle, support it with safety stands (rigid racks) and remove rear wheels.
7) Remove brake hose clip.



8) (Model equipped with rear disc brakes)
Remove union bolt from brake caliper.
9) (Model equipped with rear drum brakes)
Disconnect brake hose from brake pipe from strut, and disconnect brake pipe from dram brake.



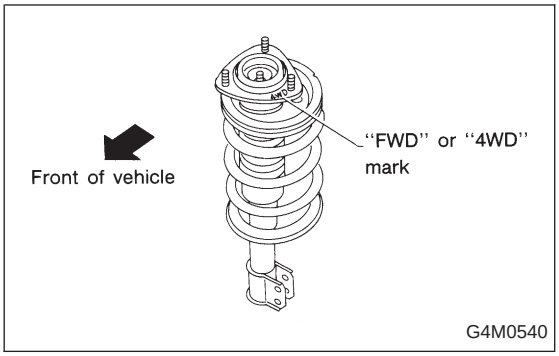
10) Remove bolts which secure rear strut to housing.
11) Remove nuts securing strut mount to body.

B: DISASSEMBLY

For disassembly of rear strut, refer to procedures outlined under front strut as a guide.
<Ref. to 4-1 [W4B0].>

C: INSPECTION

For inspection of rear strut, refer to procedures outlined under front strut as a guide. <Refer to 4-1 [W4C0].>



D: ASSEMBLY

Refer to Front Strut <Ref. to 4-1 [W4D0].> as a guide for assembly procedures.

CAUTION:
Install rear strut with "FWD" or "4WD" mark on strut mount facing outside of car body.

E: INSTALLATION

1) Tighten self-locking nut used to secure strut mount to car body.

CAUTION:
Discard loosened self-locking nut, and replace with a new one.

Tightening torque:
20±6 N·m (2.0±0.6 kg-m, 14.5±4.3 ft-lb)

2) Tighten bolts which secure rear strut to housing.

Tightening torque:
196 $^{+39}_{-10}$ N·m (20.0 $^{+4.0}_{-1.0}$ kg-m, 145 $^{+29}_{-7}$ ft-lb)

Discard loosened self-locking nut, and replace with a new one.

3) (Model with rear disc brake)
Tighten brake hose union bolt on brake caliper.

Tightening torque:
18±3 N·m (1.8±0.3 kg-m, 13.0±2.2 ft-lb)

(Model with rear drum brakes)
Connect brake hose to brake pipe.

Tightening torque:
15 $^{+3}_{-2}$ N·m (1.5 $^{+0.3}_{-0.2}$ kg-m, 10.8 $^{+2.2}_{-1.4}$ ft-lb)

4) Insert brake hose clip between brake hose and lower side of strut.

CAUTION:
- **Check that hose clip is positioned properly.**
- **Check brake hose for twisting, or excessive tension.**
- **(Model equipped with A.B.S.)**

Do not subject A.B.S. sensor harness to excessive tension.

5) Be sure to bleed air from brake system.

6) Lower vehicle and tighten wheel nut.

Tightening torque:
88±10 N·m (9±1 kg-m, 65±7 ft-lb)

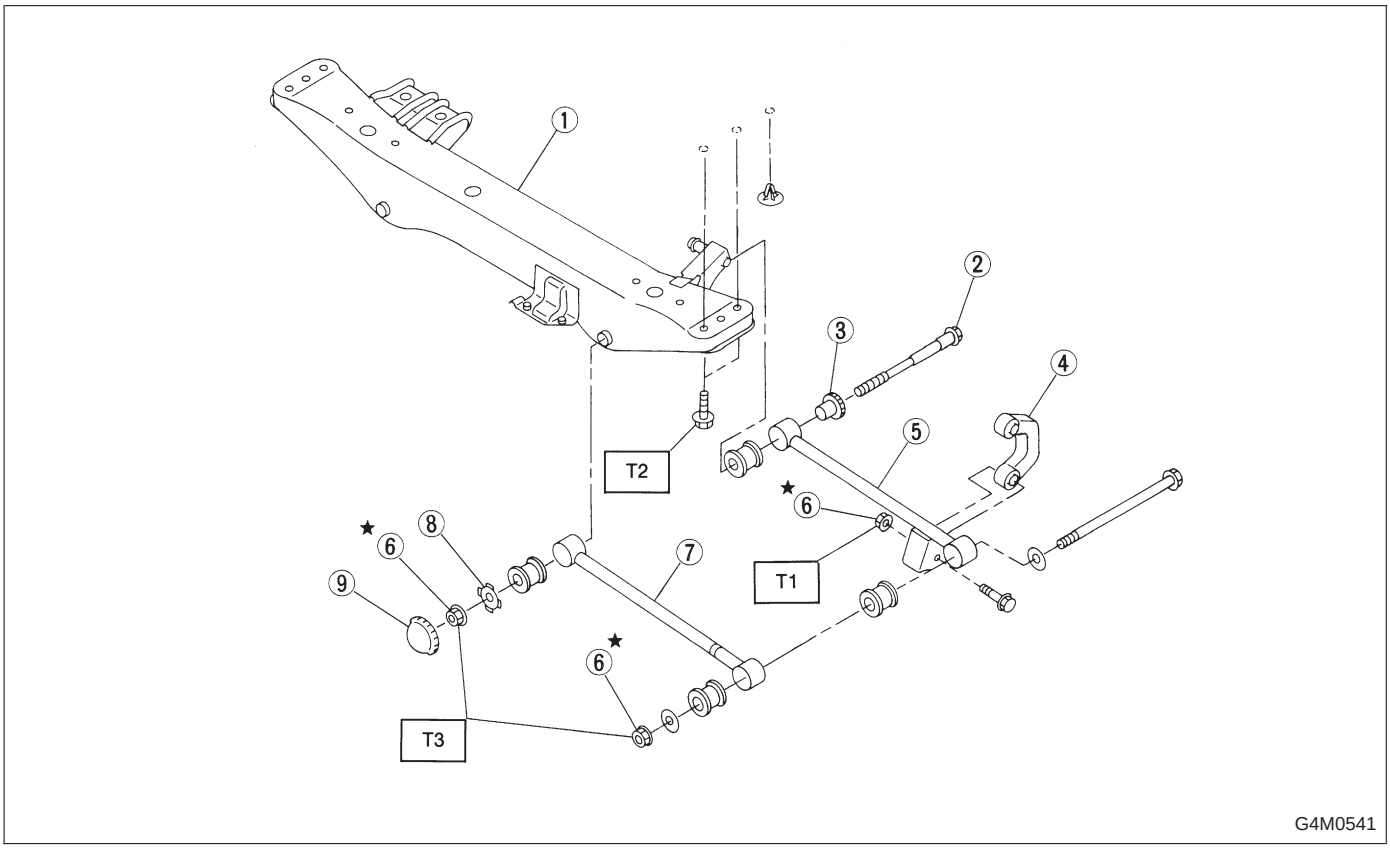
7) Install strut mount cap.

8) (Sedan model)
Install rear seat backrest and rear seat cushion.
(Wagon model)
Install rear speaker grille.

NOTE:
Check wheel alignment and adjust if necessary.

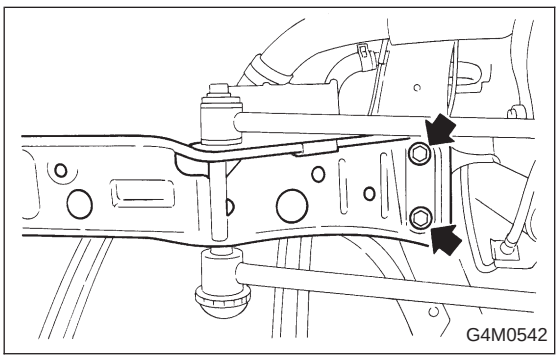
10. Rear Crossmember (FWD Model)

A: REMOVAL



① Crossmember
② Adjusting bolt
③ Adjusting wheel
④ Stabilizer link
⑤ Rear lateral link
⑥ Self-locking nut
⑦ Front lateral link
⑧ Washer
⑨ Cap

Tightening torque: N·m (kg-m, ft-lb)
T1: 44±6 (4.5±0.6, 32.5±4.3)
T2: 127±20 (13.0±2.0, 94±14)
T3: 137±20 (14.0±2.0, 101±14)



1) Disconnect lateral links from housing.
2) Remove rear exhaust pipe and muffler.
3) Remove heat-shield cover.
4) Remove four bolts securing crossmember to body.

B: INSPECTION

Check removed parts for wear, damage and cracks, and correct or replace if defective.

C: INSTALLATION

Installation is in reverse order of removal procedure.

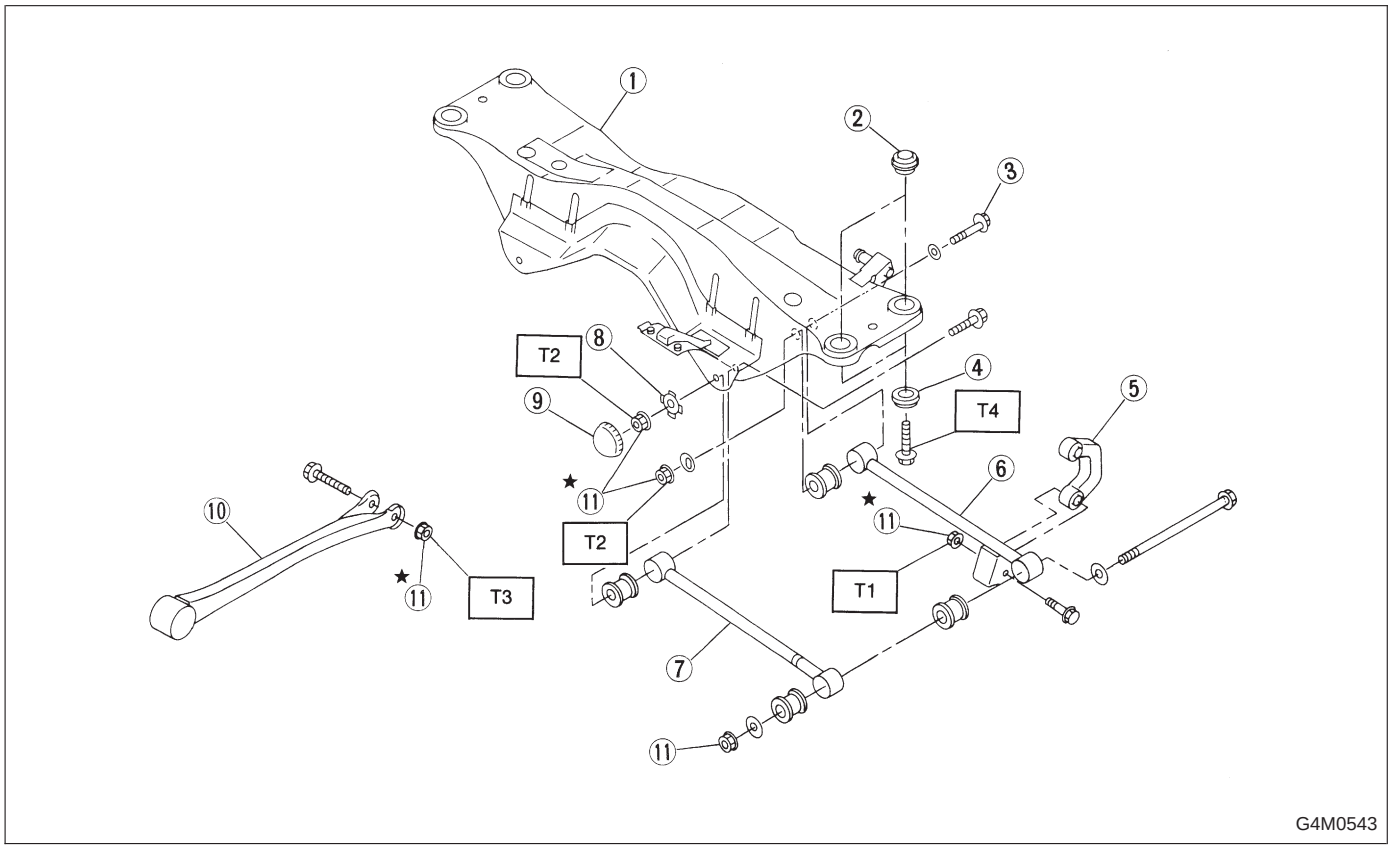
CAUTION:

- **Discard loosened self-locking nut and replace with a new one.**
- **Always tighten nut (not adjusting bolt), when tightening adjusting bolt.**
- **Always tighten rubber bushing location when wheels are in full contact with the ground and vehicle is curb weight.**

NOTE:
Check wheel alignment and adjust if necessary.

11. Rear Crossmember (AWD Model)

A: REMOVAL

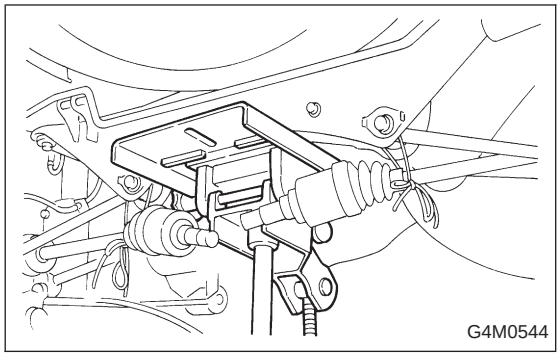


① Crossmember
② Floating bushing
③ Adjusting bolt
④ Stopper
⑤ Stabilizer link
⑥ Rear lateral link
⑦ Front lateral link
⑧ Washer
⑨ Cap
⑩ Trailing link
⑪ Self-locking nut

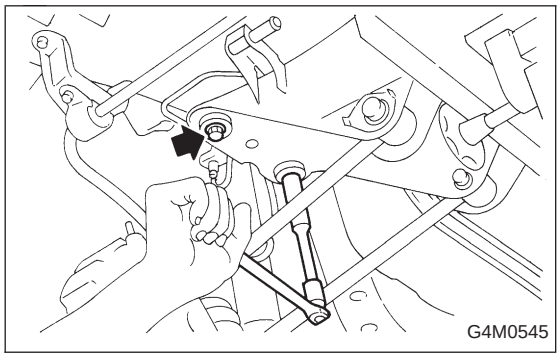
Tightening torque: N·m (kg-m, ft-lb)
T1: 44±6 (4.5±0.6, 32.5±4.3)
T2: 98±15 (10.0±1.5, 72±11)
T3: 113±15 (11.5±1.5, 83±11)
T4: 127±20 (13.0±2.0, 94±14)

CAUTION:
Do not subject A.B.S. sensor harness to excessive tension (if equipped).

1) Separate front exhaust pipe and rear exhaust pipe.
2) Remove rear exhaust pipe and muffler.
3) Remove rear differential. <Ref. to 3-4 [W2C0].>


G4M0544

4) Place transmission jack under rear crossmember.


G4M0545

5) Remove bolts securing crossmember to car body, and remove crossmember.

6) Scribe an alignment mark on rear lateral link cam bolt and crossmember.
7) Remove front and rear lateral links by loosening nuts.

B: INSPECTION

Check removed parts for wear, damage and cracks, and correct or replace if defective.

C: INSTALLATION

1) Install in reverse order of removal.
2) For installation and tightening torque of rear differential, refer to 3-4 [W2G0].
3) Always tighten rubber bushing location when wheels are in full contact with the ground and vehicle is curb weight.

NOTE:
Check wheel alignment and adjust if necessary.

1. Suspension

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	Replace.
(3) Installation of wrong strut	Replace with proper parts.
(4) Installation of wrong coil spring	Replace with proper parts.

2. POOR RIDE COMFORT

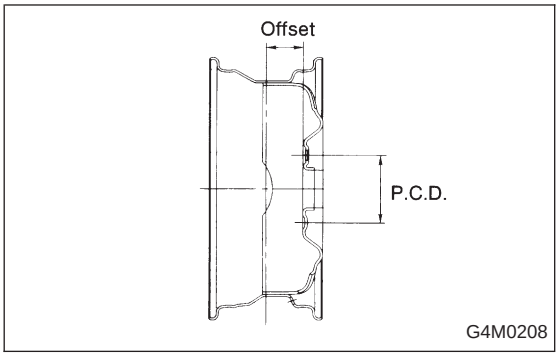
1) Large rebound shock
2) Rocking of vehicle continues too long after running over bump and/or hump.
3) Large shock in bumping

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	Replace.
(5) Damage or deformation of strut mount	Replace.
(6) Unsuitability of maximum and/or minimum length of damper strut	Replace with proper parts.
(7) Deformation or loss of bushing	Replace.
(8) Deformation or damage of helper in strut assembly	Replace.

3. NOISE

Possible causes	Countermeasures
(1) Wear or damage of damper strut 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	Replace with proper parts.
(5) Breakage of coil spring	Replace.
(6) Wear or damage of ball joint	Replace.

WHEELS AND AXLES 4-2



1. Wheels and Axles

A: SPECIFICATIONS

1. TIRE AND WHEEL SIZE

Model		Front and rear				T-type tire		
		Tire size	Rim size	Rim offset mm (in)	P.C.D. mm (in)	Tire size	Rim size	Rim offset mm (in)
FWD	Base	P165/80R13 83S	13 x 5.00B	50 (1.97)	100 (3.94) dia.	T125/70D15	15 x 4T	53 (2.09)
	L	P165/80R13 83S [P175/70R14 84S]	13 × 5.00B [14 x 5 1/2JJ]	50 (1.97) [55 (2.17)]				
	Coupe L	P175/70R14 84S	14 × 5 1/2JJ	55 (2.17)				
AWD	Base	P175/70R14 84S	14 x 5 1/2JJ	55 (2.17)		T125/70D16	16 x 4T	50 (1.97)
	L							
	LX	P195/60R15 87H P185/70R14 87H	15 x 6JJ 14 x 5 1/2JJ			T135/70D16		

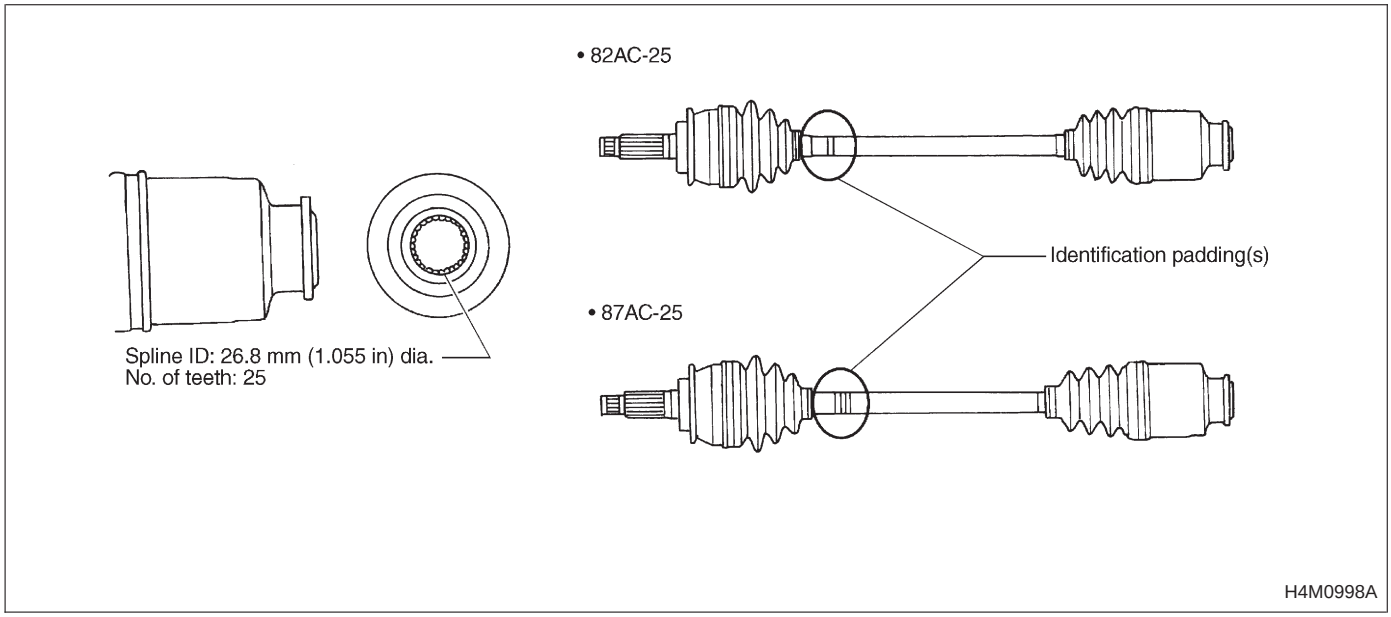
[ ]: A.B.S. equipped vehicle.
NOTE: “T-type” tire for temporary use is supplied as a spare tire.

2. TIRE INFLATION PRESSURE

	Tire size	Tire inflation pressure kPa (kg/cm^2, psi)	
		Light load	Full load
Sedan Wagon Coupe	165/80R13 83S 175/70R14 84S P185/70R14 87H P195/60R15 87H	Ft: 220 (2.2, 32) Rr: 200 (2.0, 29)	
T-type tire	T125/70D15 T125/70D16 T135/70D16	420 (4.2, 60)	

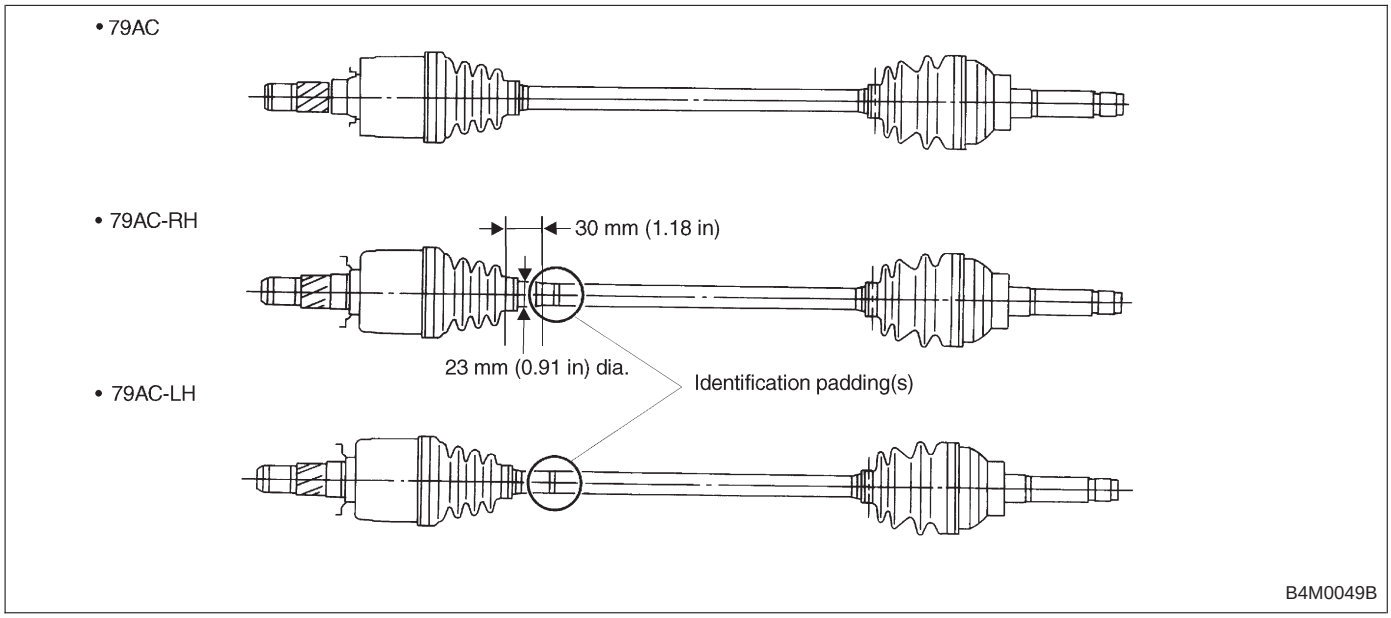
3. FRONT DRIVE SHAFT ASSEMBLY

Type of axle shaft assembly	SHAFT	DOJ
	No. of identification paddings on shaft	No. of spline teeth
82AC-25	1 (One)	25
87AC-25	2 (Two)	25



4. REAR DRIVE SHAFT ASSEMBLY (AWD MODEL)

Type of axle shaft assembly	SHAFT
	No. of identification paddings on shaft
79AC	None
79AC-RH	1 (One)
79AC-LH	1 (One)



5. APPLICATION TABLE

Model	Power unit	Front drive shaft		Rear drive shaft
		5MT	4AT	
FWD	1800 cc	87AC-25	87AC-25	—
AWD	1800 cc	82AC-25	82AC-25	79AC
AWD	2200 cc	—	82AC-25	79AC-RH 79AC-LH

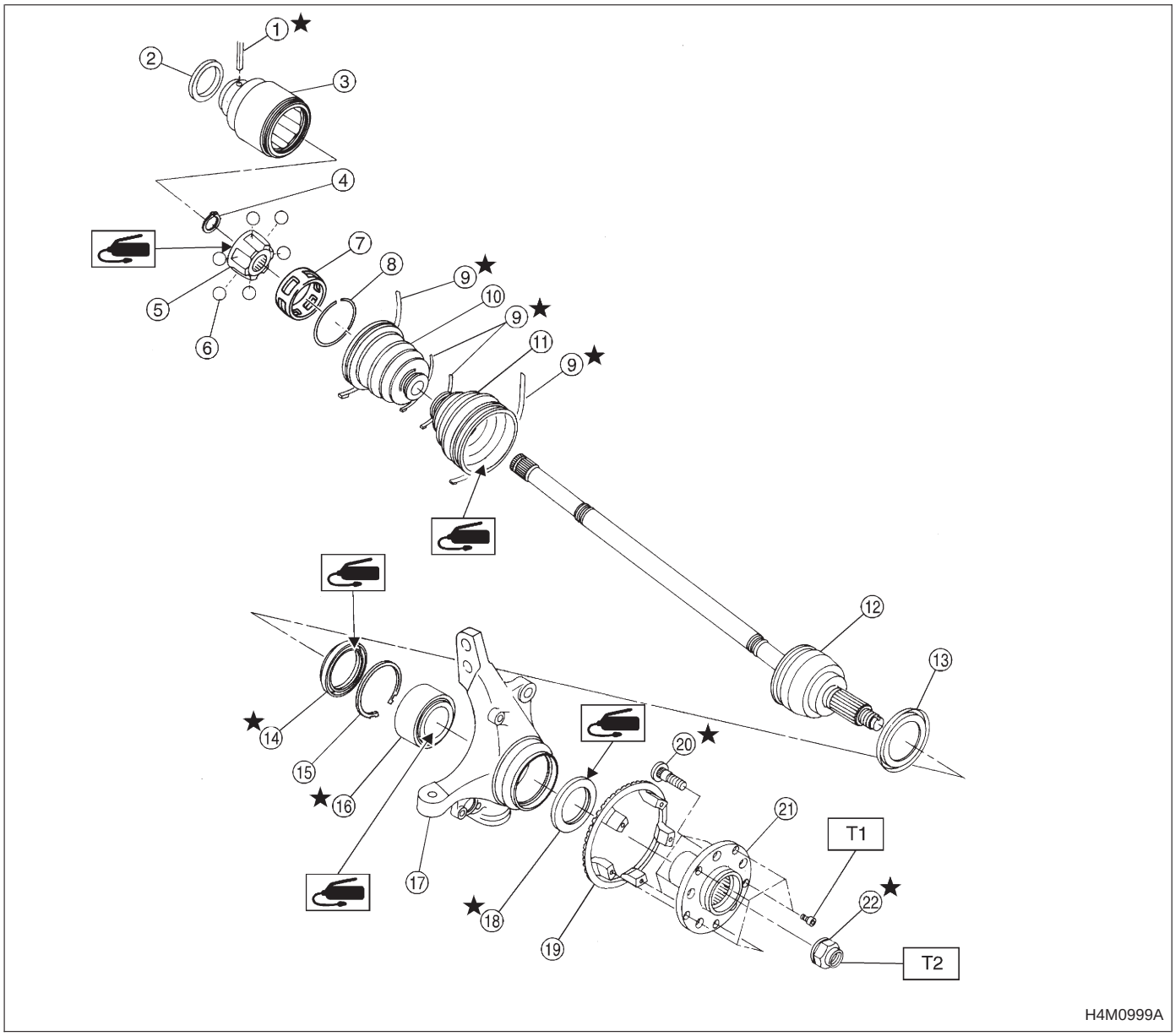
B: SERVICE DATA

Wheel balancing	Standard	Service limit
Dynamic unbalance	Less than 5 g (0.18 oz)	

Balance weight part number (For steel wheel)	Weight g (oz)
28101AA001	5 (0.18)
28101AA011	10 (0.35)
28101AA021	15 (0.53)
28101AA031	20 (0.71)
28101AA041	25 (0.88)
28101AA051	30 (1.06)
28101AA061	35 (1.23)
28101AA071	40 (1.41)
28101AA081	45 (1.59)
28101AA091	50 (1.76)
28101AA101	55 (1.94)
28101AA111	60 (2.12)

Balance weight part number (For aluminum wheel)	Weight g (oz)
23141GA462	5 (0.18)
23141GA472	10 (0.35)
23141GA482	15 (0.53)
23141GA492	20 (0.71)
23141GA502	25 (0.88)
23141GA512	30 (1.06)
23141GA522	35 (1.23)
23141GA532	40 (1.41)
23141GA542	45 (1.59)
23141GA552	50 (1.76)
—	55 (1.94)
23141GA572	60 (2.12)

1. Front Axle

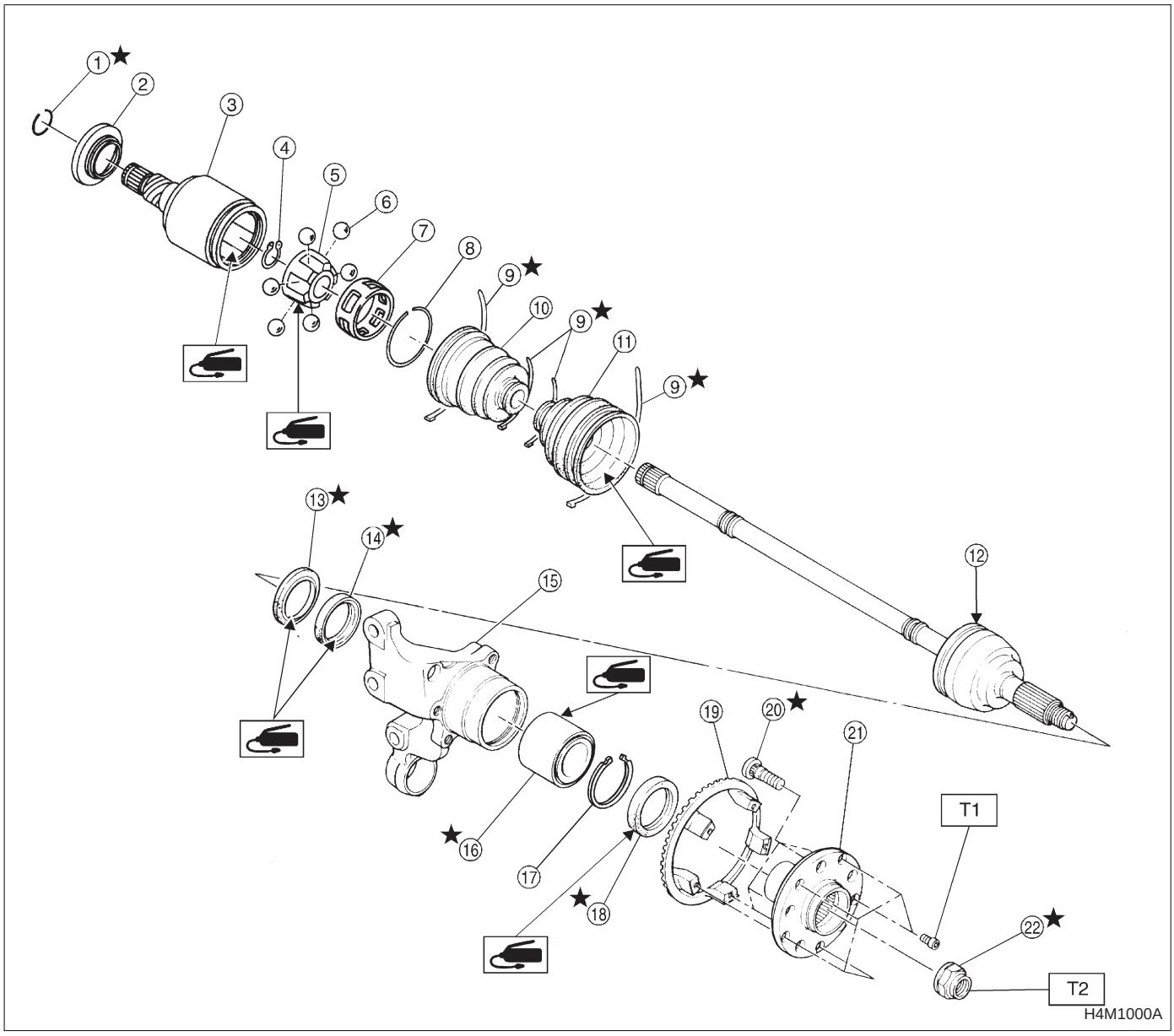


① Spring pin
② Baffle plate (DOJ)
③ Outer race (DOJ)
④ Snap ring
⑤ Inner race (DOJ)
⑥ Ball
⑦ Cage
⑧ Circlip
⑨ Boot band
⑩ Boot (DOJ)
⑪ Boot (UFJ)
⑫ UFJ ASSY
⑬ Baffle plate
⑭ Oil seal (IN)
⑮ Snap ring
⑯ Bearing
⑰ Housing
⑱ Oil seal (OUT)
⑲ Tone wheel
⑳ Hub bolt
㉑ Hub
㉒ Axle nut

Tightening torque: N·m (kg-m, ft-lb)
T1: 13±3 (1.3±0.3, 9.4±2.2)
T2: 186±20 (19±2, 137±14)

2. Rear Axle

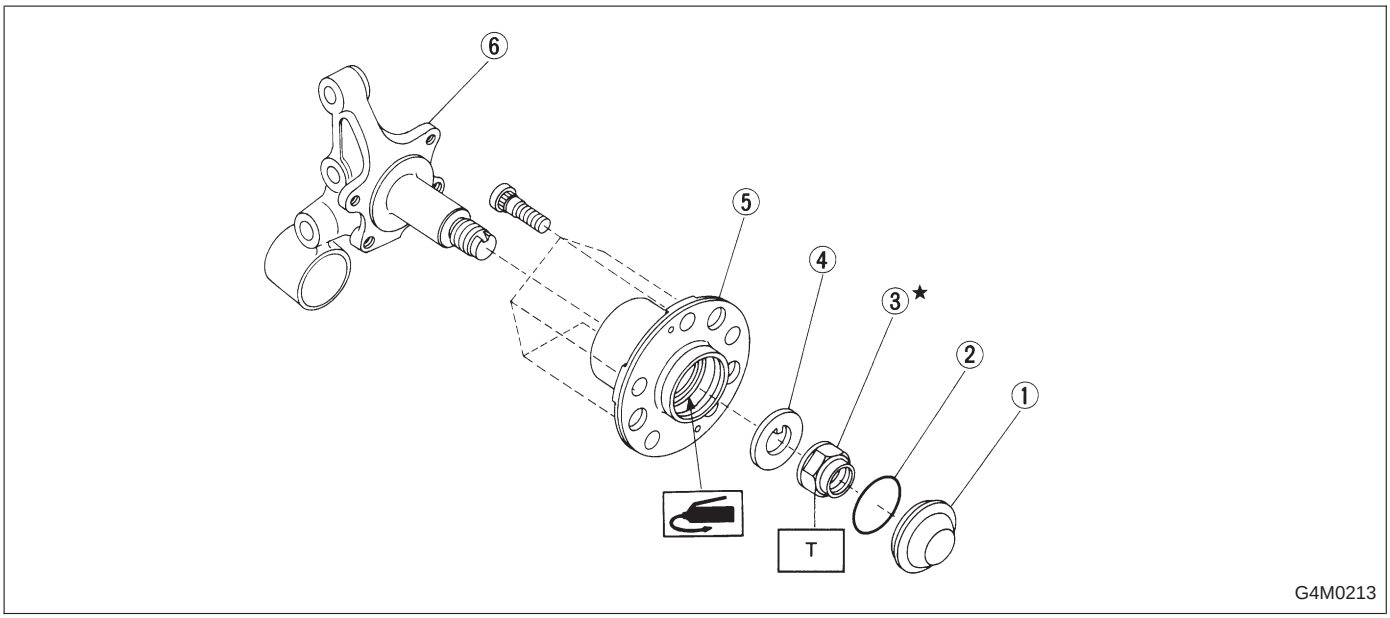
1. AWD MODEL



① Circlip (1800 cc model)
② Baffle plate (DOJ)
③ Outer race (DOJ)
④ Snap ring
⑤ Inner race
⑥ Ball
⑦ Cage
⑧ Circlip
⑨ Boot band
⑩ Boot (DOJ)
⑪ Boot (BJ)
⑫ BJ ASSY
⑬ Oil seal (IN. No. 2)
⑭ Oil seal (IN. No. 3)
⑮ Housing
⑯ Bearing
⑰ Snap ring
⑱ Oil seal (OUT)
⑲ Tone wheel
⑳ Hub bolt
㉑ Hub
㉒ Axle nut

Tightening torque: N·m (kg-m, ft-lb)
T1: 13±3 (1.3±0.3, 9.4±2.2)
T2: 186±20 (19±2, 137±14)

2. FWD MODEL



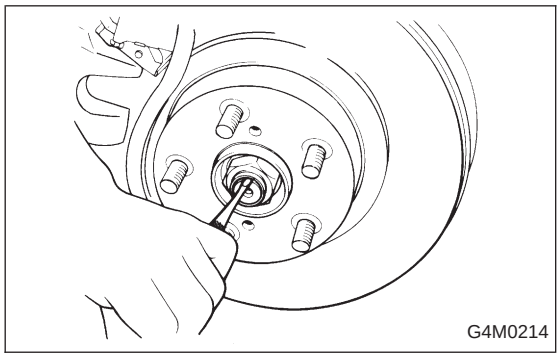
① Hub cap
② O-ring
③ Axle nut
④ Washer
⑤ Hub unit
⑥ Spindle

Tightening torque: N·m (kg-m, ft-lb)
T: 186±20 (19±2, 137±14)

1. Front Axle

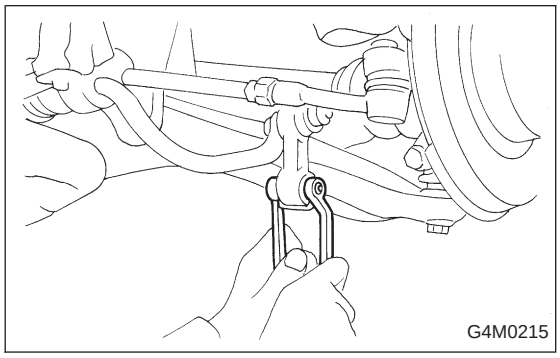
A: REMOVAL

1) Disconnect ground cable from battery.
2) Jack-up vehicle, support it with safety stands, and remove front wheels.

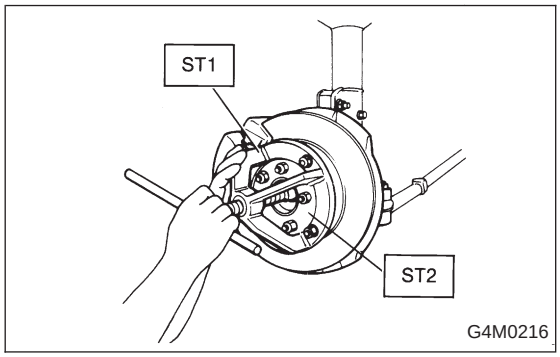

G4M0214

3) Unlock axle nut.
4) Remove 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.


G4M0215

5) Remove stabilizer link.



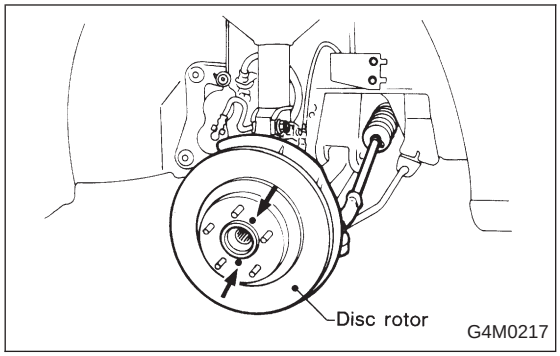
G4M0216

6) Remove DOJ from transmission spindle.
7) Remove front drive shaft assembly from hub. If it is hard to remove, use STs.

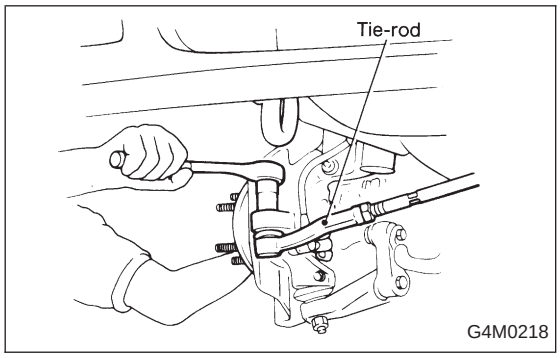
ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 PLATE

CAUTION:
- **Be careful not to damage oil seal lip when removing front drive shaft.**
- **When replacing front drive shaft, also replace inner oil seal.**

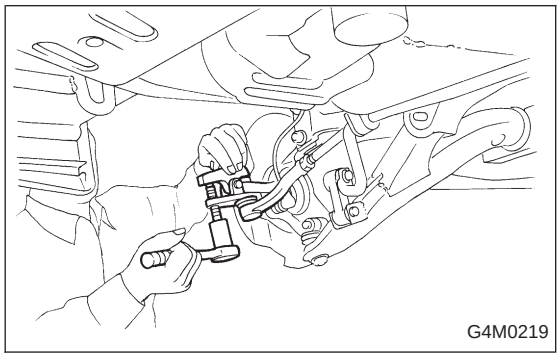
8) Remove disc brake caliper from housing, and suspend it from strut using a wire.



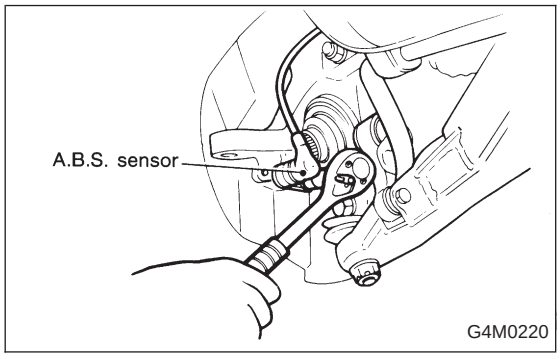
9) Remove disc rotor from hub.
If disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in screw hole on the rotor.



10) Remove cotter pin and castle nut which secure tie-rod end to housing knuckle arm.

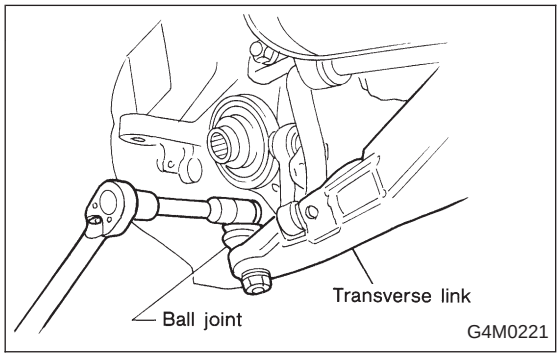


11) Using a puller, remove tie rod ball joint from knuckle arm.

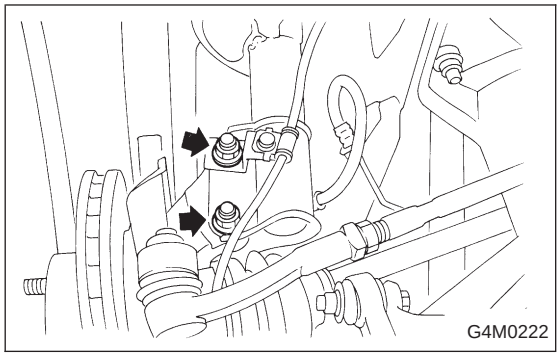


12) On A.B.S. equipped models, remove A.B.S. sensor assembly and harness in advance.

NOTE:
Be sure to use soft jaws (such as aluminum plates) when placing the mating surfaces of housing and strut in a vise.



13) Remove transverse link ball joint from housing.

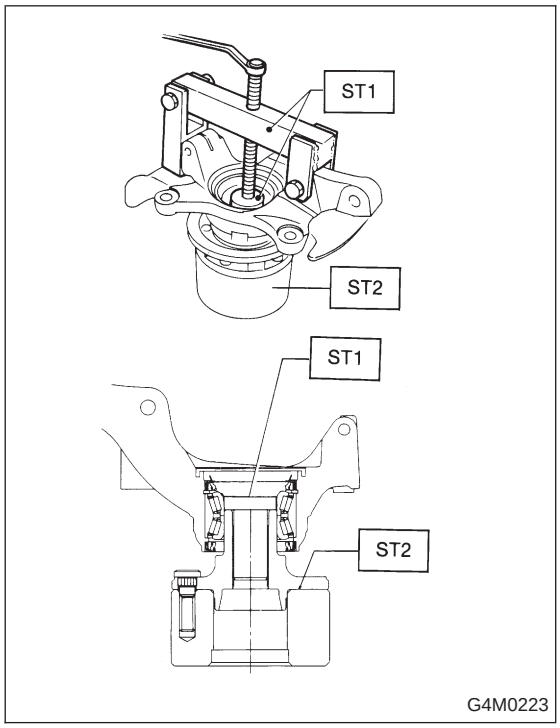

G4M0222

14) After scribing an alignment mark on camber adjusting bolt head, remove bolts which connect housing and strut, and disconnect housing from strut.

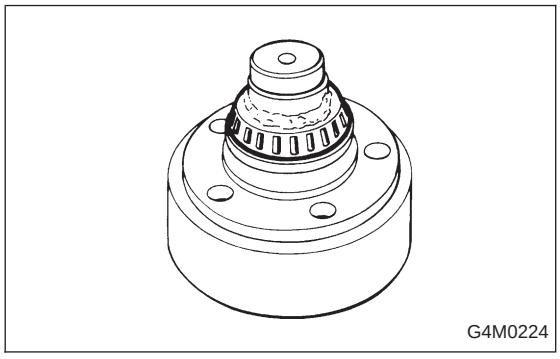
B: DISASSEMBLY

1) Using ST1, support housing and hub securely.
2) Attach ST2 to housing and drive hub out.

ST1 927080000 HUB STAND
ST2 927060000 HUB REMOVER

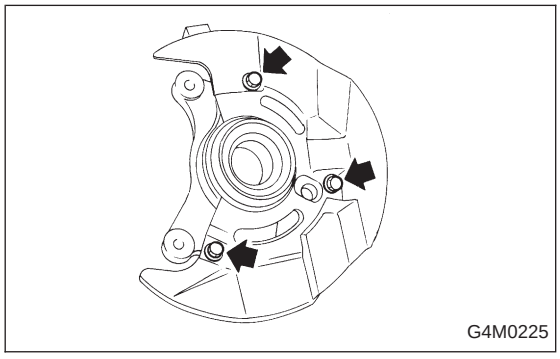


G4M0223


G4M0224

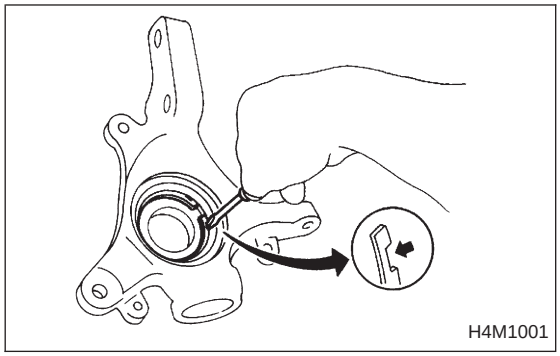
If inner bearing race remains in the hub, remove it with a suitable tool (commercially available).

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.**

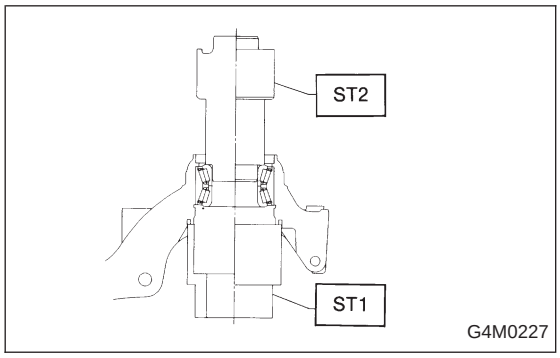

G4M0225

3) Remove disc cover from housing.
4) Using a standard screwdriver, remove outer and inner oil seals.

CAUTION:
Do not use old oil seals.


H4M1001

5) Using flat bladed screwdriver, remove snap ring.



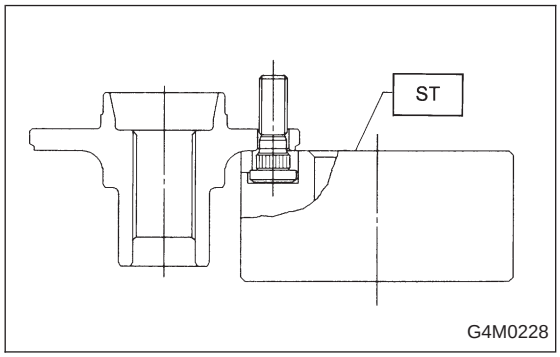
G4M0227

6) Using ST1, support housing securely.
7) Using ST2, press inner race to drive out outer bearing.

ST1 927400000 HOUSING STAND
ST2 927100000 BEARING REMOVER

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) Loosen bolts which secure tone wheel to hub. Remove tone wheel (only vehicle equipped with A.B.S.).

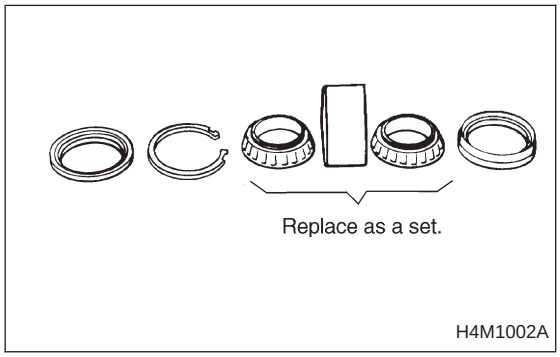


G4M0228

9) Using ST and a hydraulic press, drive hub bolts out.

ST 927080000 HUB STAND

CAUTION:
Be careful not to hammer hub bolts. This may deform hub.

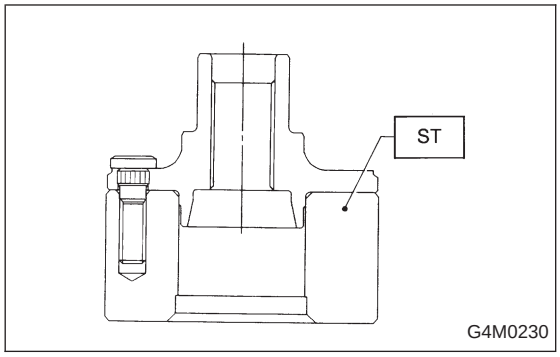


H4M1002A

C: INSPECTION

Check the removed parts for wear and damage. If defective, replace with a new one.

CAUTION:
- **If bearing is faulty, replace it as the bearing set.**
- **Be sure to replace oil seal at every overhaul.**



D: ASSEMBLY

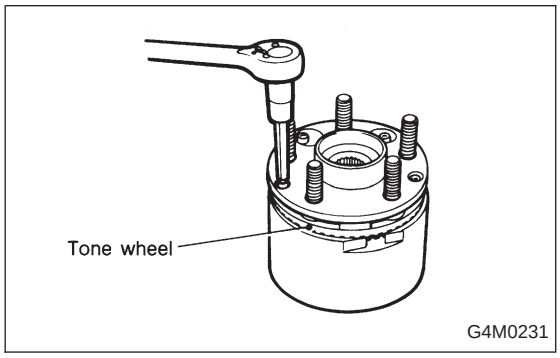
1) Attach hub to ST securely.

ST 927080000 HUB STAND

2) Using a hydraulic press, press 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.

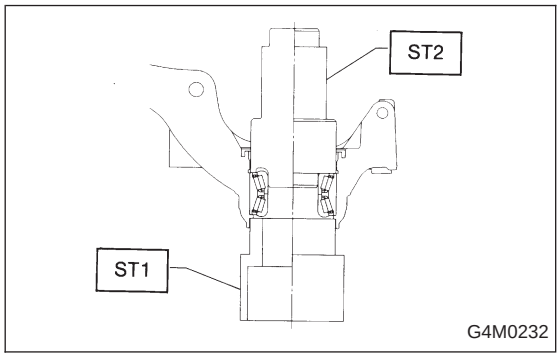


3) Remove foreign particles (dust, rust, etc.) from mating surfaces of hub and tone wheel, and install tone wheel to hub (only vehicle equipped with A.B.S.).

CAUTION:
Be careful not to damage tone wheel teeth.

NOTE:
Ensure tone wheel closely contacts hub.

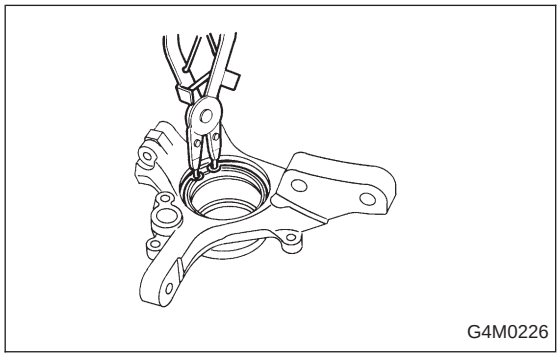
4) Clean dust or foreign particles from inside the housing.



5) Using ST1 and ST2, press a new bearing into place.

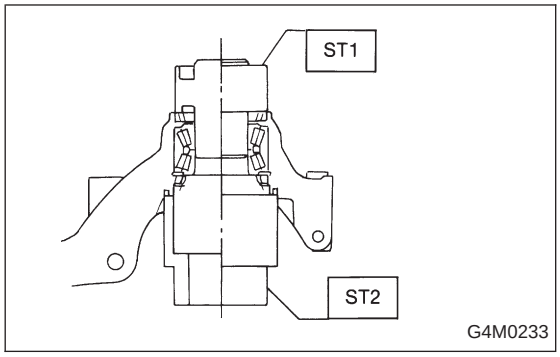
ST1 927400000 HOUSING STAND
ST2 927100000 BEARING REMOVER

CAUTION:
- **Always press outer 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.**



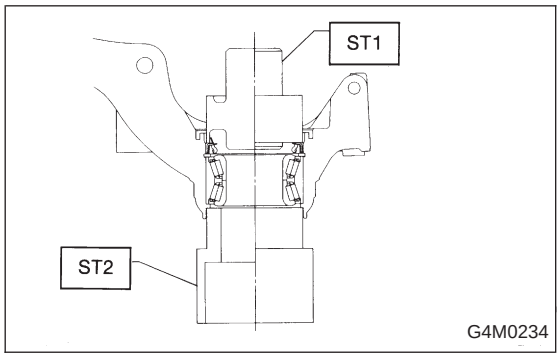
6) Using pliers, install snap ring in its groove.

CAUTION:
Make sure to install it firmly to groove.



7) Using ST1 and ST2, press outer oil seal until it contacts the bottom of housing.

ST1 927410000 OIL SEAL INSTALLER
ST2 927400000 HOUSING STAND



8) Using ST1 and ST2, press inner oil seal until it contacts circlip.

ST1 927410000 OIL SEAL INSTALLER
ST2 927400000 HOUSING STAND

9) Invert ST and housing.

ST 927400000 HOUSING STAND

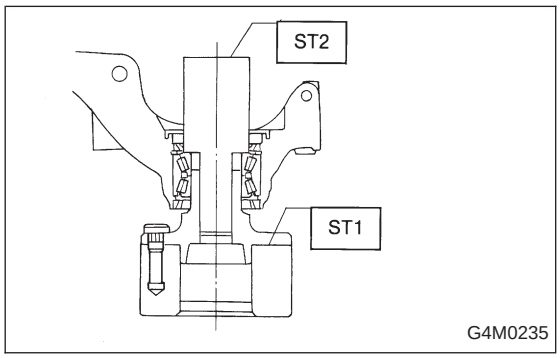
10) Apply sufficient grease to oil seal lip.

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.

11) Install disc cover to housing the three bolts.

Tightening torque:
14±4 N·m (1.4±0.4 kg-m, 10.1±2.9 ft-lb)



12) Attach hub to ST1 securely.
13) Clean dust or foreign particles from the polished surface of hub.
14) Using ST2, press bearing into hub by driving inner race.

ST1 927080000 HUB STAND
ST2 927120000 HUB INSTALLER

E: INSTALLATION

1) Install transverse link ball joint to housing.

Tightening torque:
44±6 N·m (4.5±0.6 kg-m, 32.5±4.3 ft-lb)

2) While aligning alignment mark on camber adjusting bolt head, connect housing and strut.

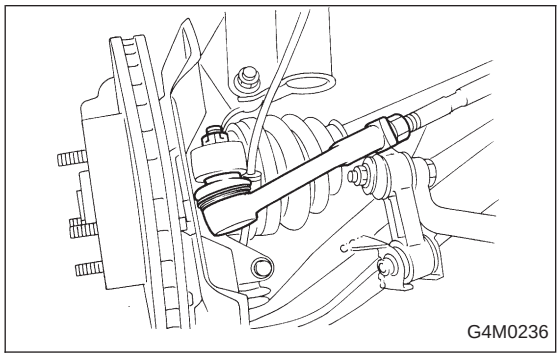
CAUTION:
Use a new self-locking nut.

Tightening torque:
147±15 N·m (15±1.5 kg-m, 108±11 ft-lb)

3) Install speed sensor and harness on housing (only vehicle equipped with A.B.S.).
4) Install disc rotor on hub.
5) Install disc brake caliper on housing.

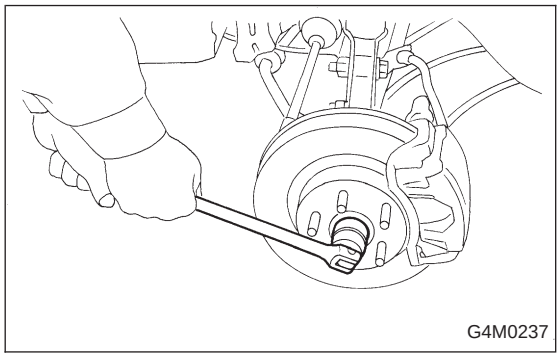
Tightening torque:
59±10 N·m (6±1 kg-m, 43±7 ft-lb)

6) Install front drive shaft. <Ref. to 4-2 [W4E1].>
7) Connect stabilizer link.


G4M0236

8) Install tie-rod end ball joint on housing knuckle arm.

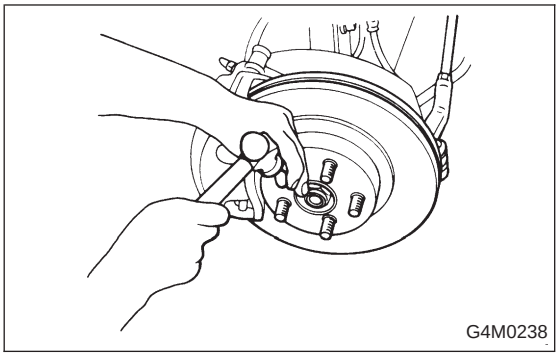
Tightening torque:
27.0±2.5 N·m (2.75±0.25 kg-m, 19.9±1.8 ft-lb)


G4M0237

9) While depressing brake pedal, tighten axle nut and lock it securely.

Tightening torque:
186±20 N·m (19±2 kg-m, 137±14 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.**


G4M0238

10) After tightening axle nut, lock it securely.
11) Install wheel and tighten wheel nuts to specified torque.

Tightening torque:
88±10 N·m (9±1 kg-m, 65±7 ft-lb)

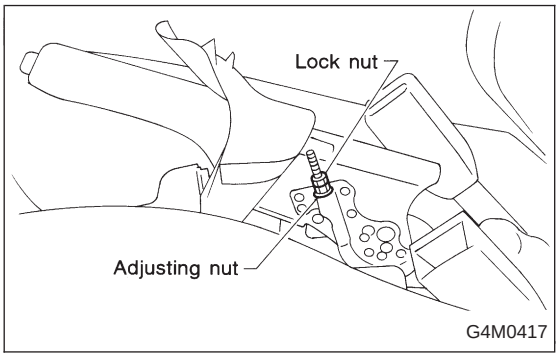
2. Rear Axle (AWD Model)

A: REMOVAL

1) Disconnect ground cable from battery.
2) Jack-up vehicle, and remove rear wheel cap and wheels.

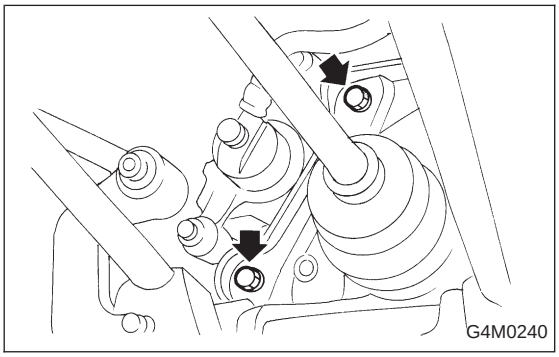
CAUTION:
Be sure to loosen and retighten axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.

3) Unlock axle nut.
4) Remove axle nut using a socket wrench.



G4M0417

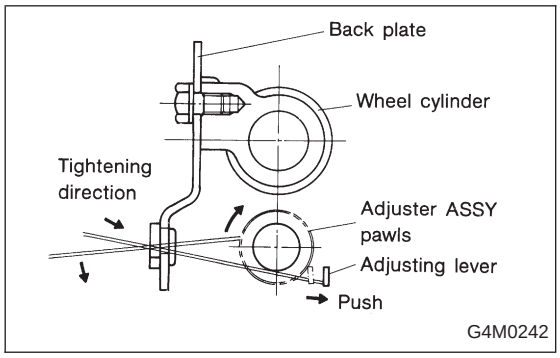
5) Return parking brake lever and loosen adjuster.
   (1) Disc brake: Perform steps 6) and 7).
   (2) Drum brake: Perform steps 8) and 10).


G4M0240

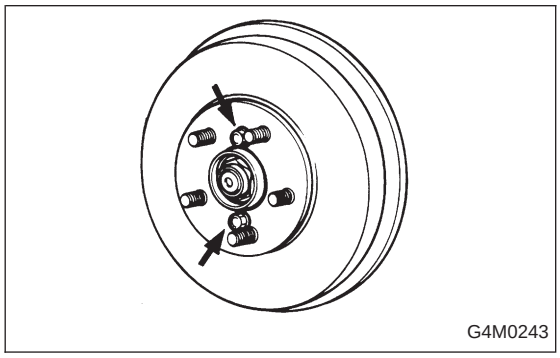
6) Remove disc brake caliper from back plate, and suspend it from strut using a piece of wire.
7) Remove disc rotor from hub.

NOTE:
If disc rotor seizes up within hub, drive it out by installing an 8-mm bolt into bolt hole in disc rotor.

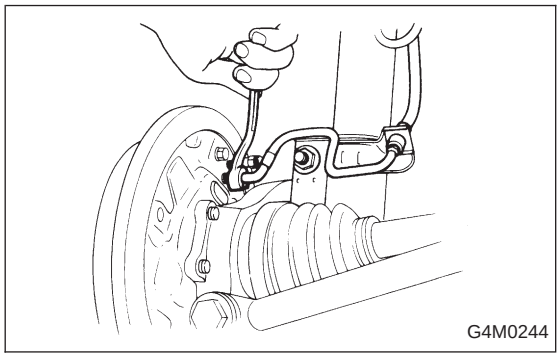
8) Remove brake drum from hub.



9) If it is difficult to remove brake drum, remove adjusting hole cover from back plate, and then turn adjusting screw using a slot-type screwdriver until brake shoe separates from the drum.

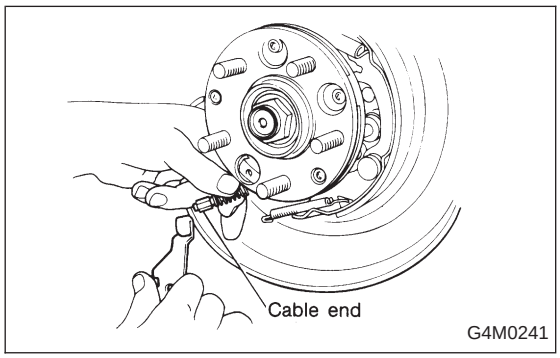


NOTE:
If brake drum is difficult to remove, drive it out by installing an 8-mm bolt into bolt hole in brake drum.

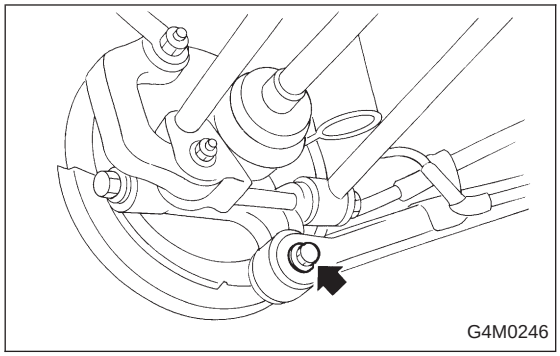


10) Using a flare-nut wrench, disconnect brake pipe from wheel cylinder.

CAUTION:
Cover open end of wheel cylinder to prevent entry of foreign particles.

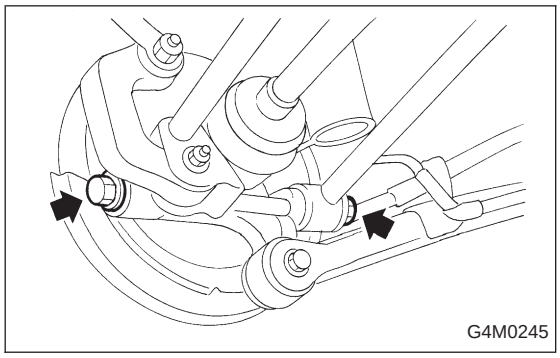


11) Disconnect end of parking brake cable.



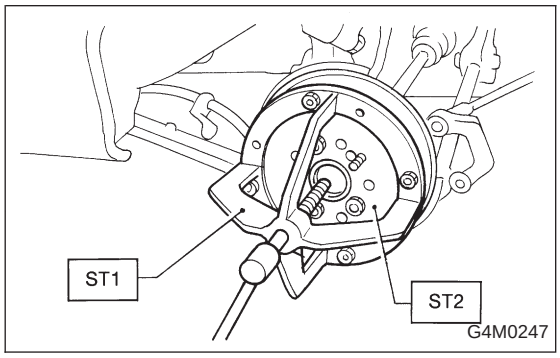
12) Remove bolts which secure trailing link assembly to rear housing.

CAUTION:
Discard old self-locking nut. Replace with a new one.



13) Remove bolts which secure lateral link assembly to rear housing.

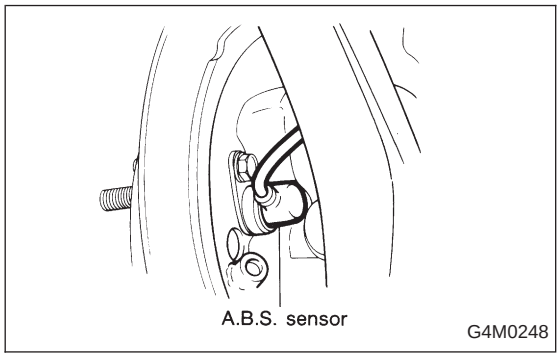
CAUTION:
Discard old self-locking nut. Replace with a new one.



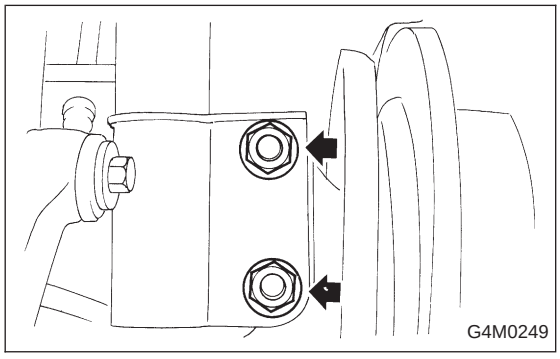
14) Disengage BJ from housing splines, and remove rear drive shaft assembly. If it is hard to remove, use STs.

ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 PLATE

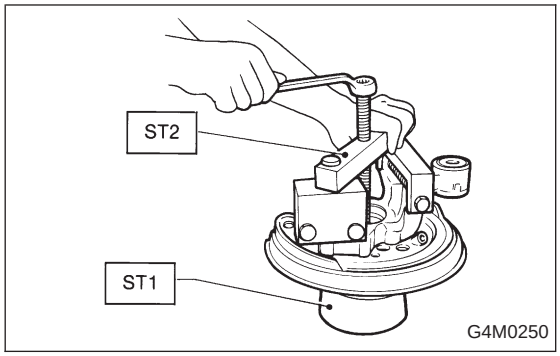
CAUTION:
- **Be careful not to damage oil seal lip when removing rear drive shaft.**
- **When rear drive shaft is to be replaced, also replace inner oil seal with a new one.**



15) Remove rear A.B.S. sensor from back plate (only vehicle equipped with A.B.S.).



16) Remove bolts which secure rear housing to strut, and separate the two.



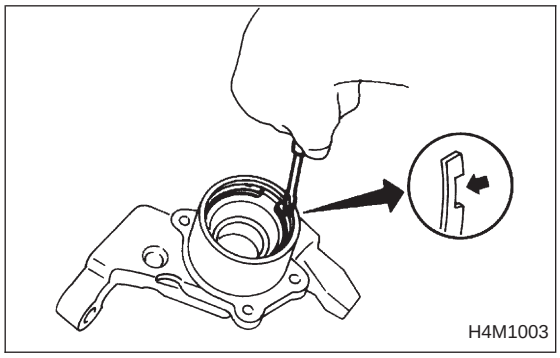
B: DISASSEMBLY

1) Using ST1 and ST2, remove hub from rear housing.

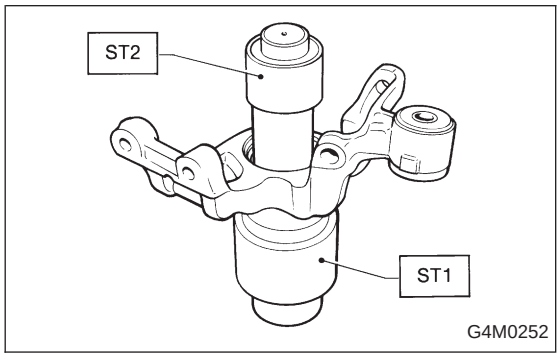
ST1 927080000 HUB STAND
ST2 927420000 HUB REMOVER

2) Remove back plate from rear housing.
3) Using a standard screwdriver, remove outer and inner oil seals.

CAUTION:
Use new oil seals.



4) Using flat bladed screwdriver, remove snap ring.

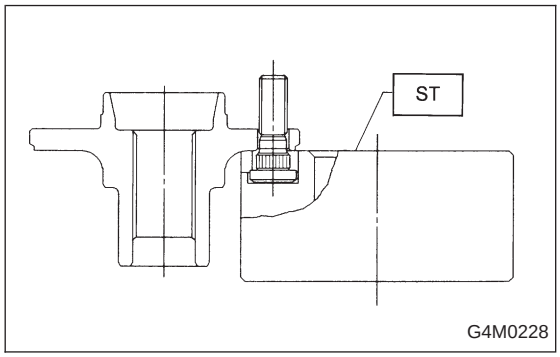


5) Using ST1 and ST2, remove bearing by pressing inner race.

ST1 927430000 HOUSING STAND
ST2 927440000 BEARING REMOVER

CAUTION:
- **Do not remove bearing unless damaged.**
- **Do not re-use bearing after removal.**

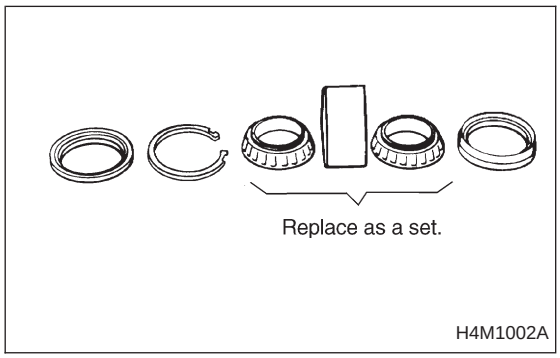
6) Remove tone wheel bolts and remove tone wheel from hub (only vehicle equipped with A.B.S.).



7) Using ST, press hub bolt out.

ST 927080000 HUB STAND

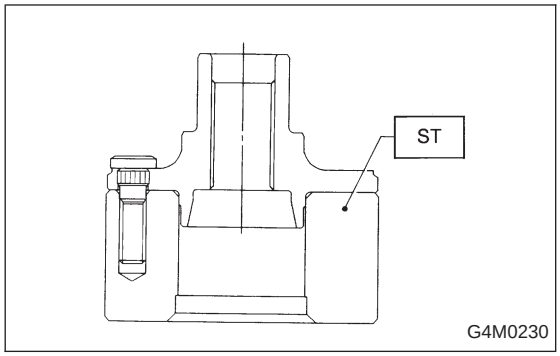
CAUTION:
Be careful not to hammer hub bolts. This may deform hub.



C: INSPECTION

Check 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.**

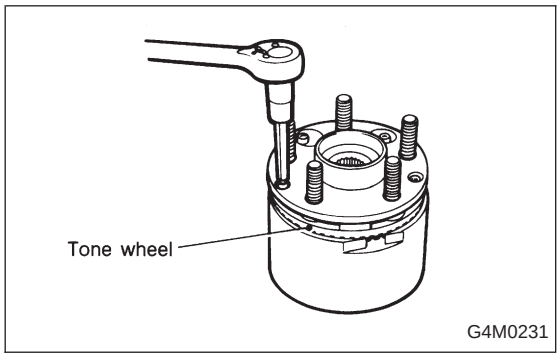


D: ASSEMBLY

1) Using ST, press new hub bolt into place.

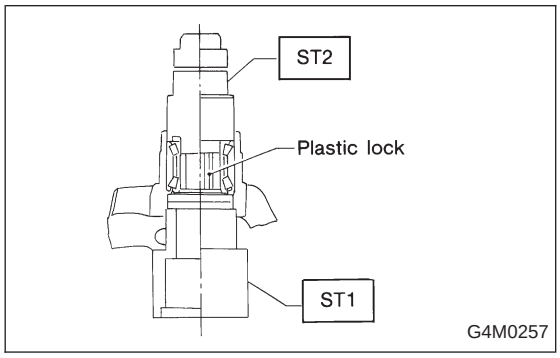
CAUTION:
- **Ensure hub bolt closely contacts hub.**
- **Use a 12 mm (0.47 in) hole in the ST to prevent hub bolt from tilting during installation.**

ST 927080000 HUB STAND



2) Remove foreign particles (dust, rust, etc.) from mating surfaces of hub and tone wheel, and install tone wheel to hub (only vehicle equipped with A.B.S.).

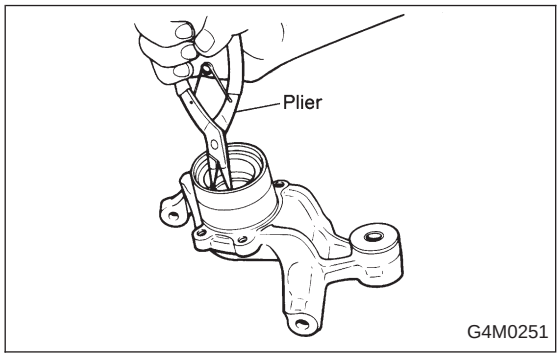
CAUTION:
- **Ensure tone wheel closely contacts hub.**
- **Be careful not to damage tone wheel teeth.**



3) Clean housing interior completely. Using ST1 and ST2, press bearing into housing.

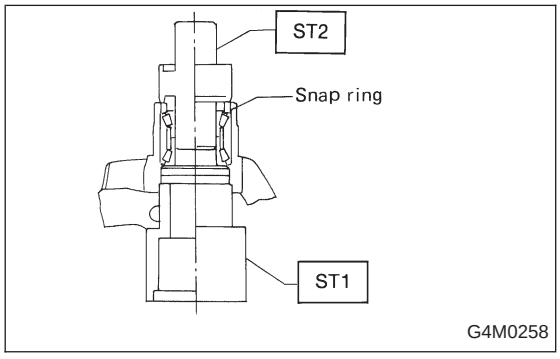
ST1 927430000 HOUSING STAND
ST2 927440000 BEARING REMOVER

CAUTION:
- **Always press outer 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.**



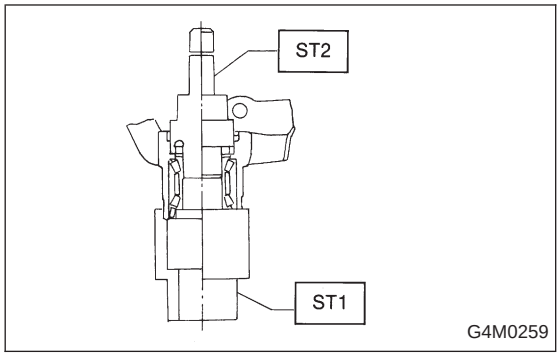
4) Using plier, install snap ring.

CAUTION:
Ensure snap ring fits in groove properly.



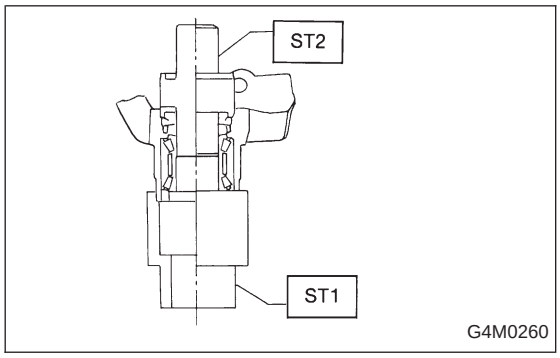
5) Using ST1 and ST2, press outer oil seal until it comes in contact with snap ring.

ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER



6) Invert both ST1 and housing.
7) Using ST2, press inner oil seal into housing until it touches bottom.

ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER



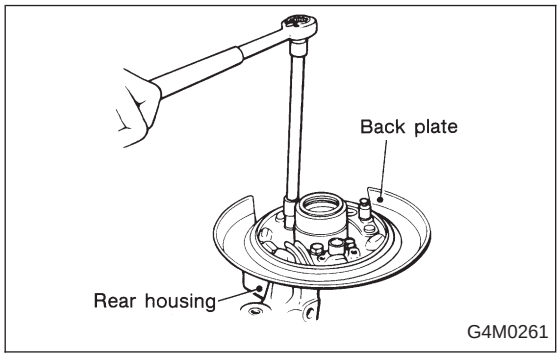
8) Using ST1 and ST2, press sub seal into place.

ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER

9) Apply sufficient grease to oil seal lip.

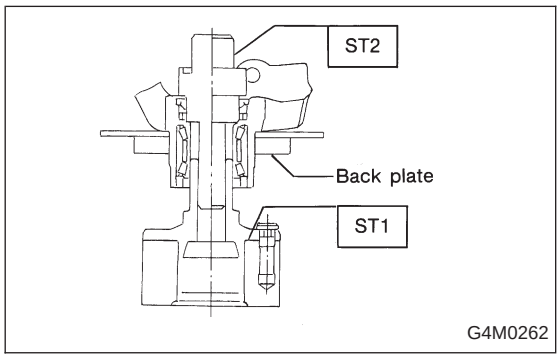
Specified grease:
SHELL 6459N

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 back plate to rear housing.

Tightening torque:
52±6 N·m (5.3±0.6 kg-m, 38.3±4.4 ft-lb)



11) Using ST1 and ST2, press bearing into hub.

ST1 927080000 HUB STAND
ST2 927450000 HUB INSTALLER

E: INSTALLATION

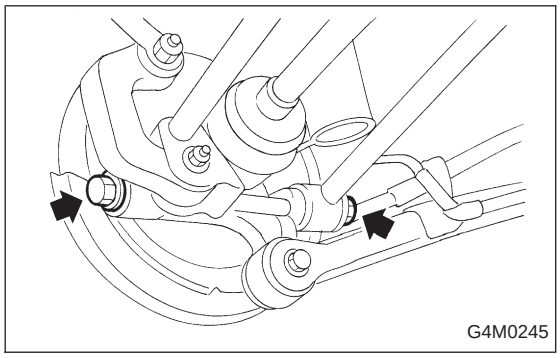
1) Connect rear housing assembly and strut assembly.

CAUTION:
Use a new self-locking nut.

Tightening torque:
147±15 N·m (15±1.5 kg-m, 108±11 ft-lb)

2) Fit BJ (bell joint) to rear housing splines.

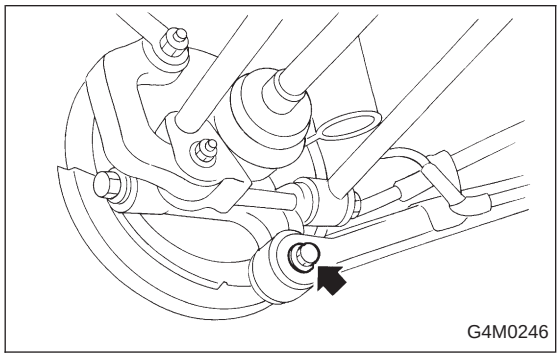
CAUTION:
Be careful not to damage inner oil seal lip.


G4M0245

3) Connect rear housing assembly to lateral link assembly.

CAUTION:
Use a new self-locking nut.

Tightening torque:
137±20 N·m (14±2 kg-m, 101±14 ft-lb)


G4M0246

4) Connect rear housing assembly to trailing link assembly.

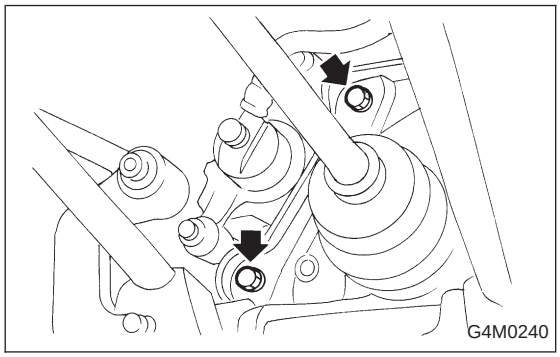
CAUTION:
Use a new self-locking nut.

Tightening torque:
98 — 127 N·m (10 — 13 kg-m, 72 — 94 ft-lb)

Disc brake: Perform steps 5) and 6).

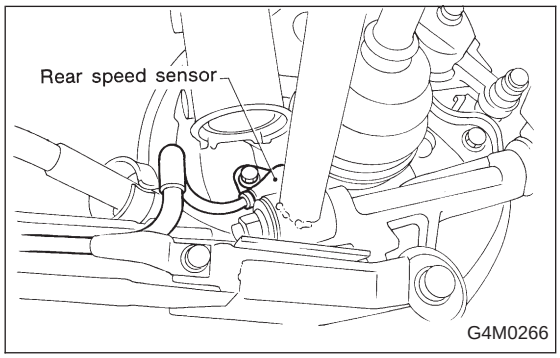
5) Connect parking brake cable to parking brake.

6) Install disc rotor on rear housing assembly.


G4M0240

7) Install disc brake caliper on back plate.

Tightening torque:
52±6 N·m (5.3±0.6 kg-m, 38.3±4.3 ft-lb)



G4M0266

8) Install rear speed sensor to back plate (only vehicle equipped with A.B.S.).

Drum brake: Perform steps 9) through 11).
9) Clean brake pipe connection. Using a flare-nut wrench, connect brake pipe to wheel cylinder.
10) Connect parking brake cable to lever.
11) Install brake drum on rear housing assembly.
12) Bleed air from brake system. <Ref. to 4-4 [W11B0].>
13) Adjust parking brake lever stroke by turning adjuster.
14) Move brake lever back to apply brakes. While depressing brake pedal, tighten axle nut using a socket wrench. Lock axle nut after tightening.

Tightening torque:
186±20 N·m (19±2 kg-m, 137±14 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.

15) Install wheel and tighten wheel nuts to specified torque.

Tightening torque:
88±10 N·m (9±1 kg-m, 65±7 ft-lb)

3. Rear Axle (FWD Model)

A: REMOVAL

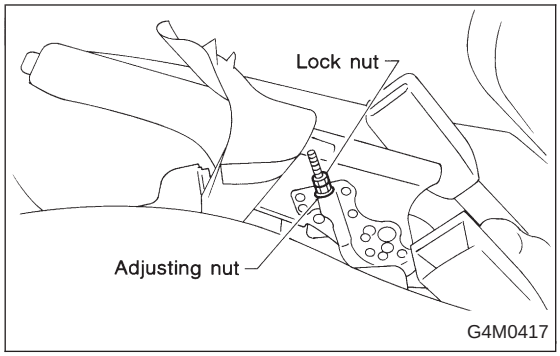
1) Disconnect ground cable from battery.
2) Jack-up vehicle, and remove rear wheel cap and wheels.

CAUTION:
Be sure to loosen and retighten axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.

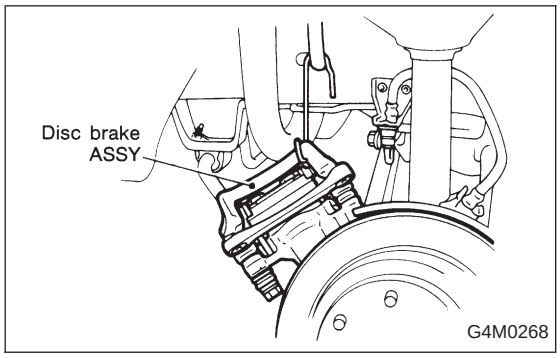
3) Pry hub cap off with a screwdriver placed between it and hub.
4) Unlock axle nut.
5) Remove axle nut using a socket wrench. Remove washer.

CAUTION:
Do not re-use old axle nut. Replace with a new one.

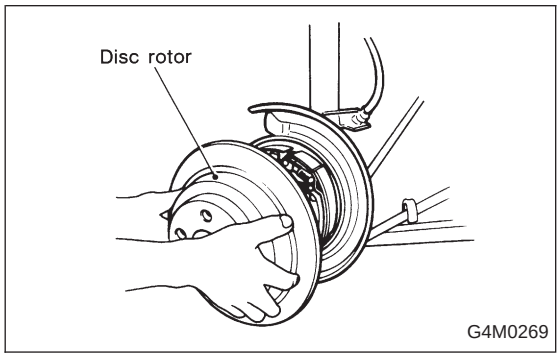
NOTE:
Temporarily tighten axle nut to hold hub in place.



6) Return parking brake lever and loosen adjuster.
   (1) Disc brake: Perform steps 7) through 9).
   (2) Drum brake: Perform steps 10) through 13).



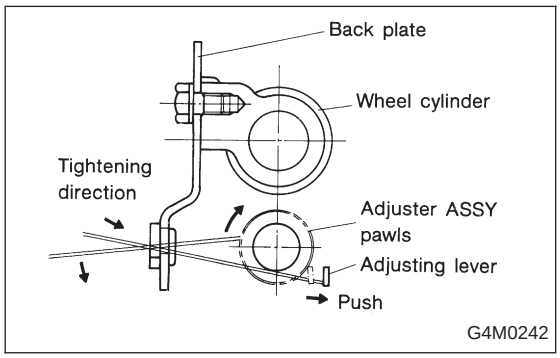
7) Remove disc brake assembly from back plate. Suspend disc brake assembly from strut using a wire.



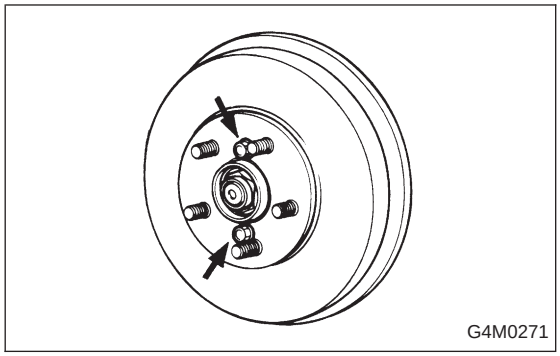
8) Remove disc rotor from hub.
If disc rotor seizes up within hub, drive it out by installing an 8-mm bolt in bolt hole on disc rotor.

9) Disconnect end of parking brake cable.

10) Remove brake drum from hub.



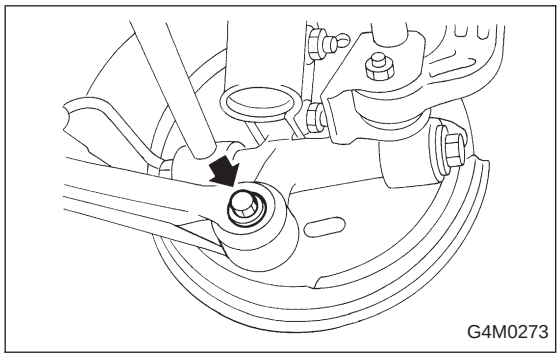
11) If it is difficult to remove brake drum, remove adjusting hole cover from back plate, and then turn adjusting screw using a slot-type screwdriver until brake shoe separates from the drum.


G4M0271

NOTE:
If brake drum seizes up within hub, drive it out by installing an 8-mm bolt in bolt hole on brake drum.

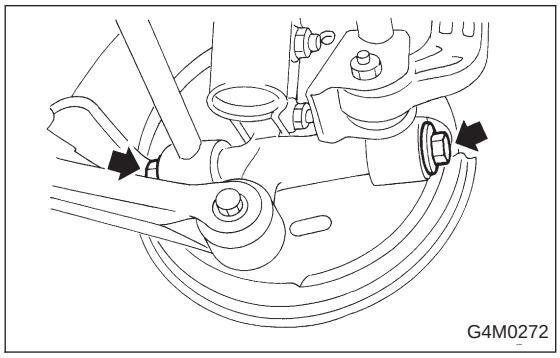
12) Disconnect end of parking brake cable.
13) Using a flare-nut wrench, disconnect brake pipe from wheel cylinder.

CAUTION:
Cover brake pipe connection to prevent entry of foreign particles.


G4M0273

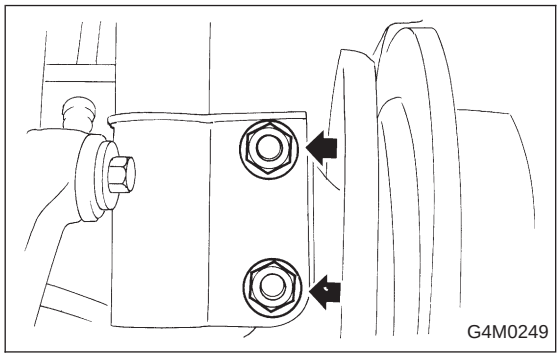
14) Remove bolts which secure trailing link assembly to rear spindle.

CAUTION:
Discard old self-locking nut. Replace with a new one.

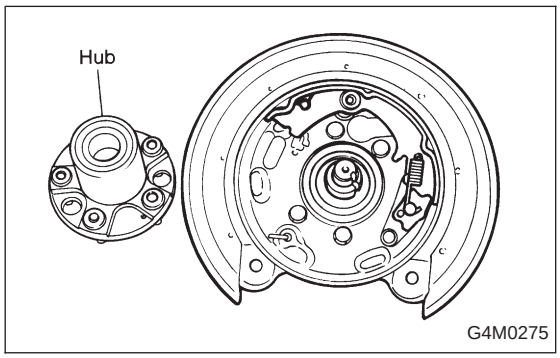

G4M0272

15) Remove bolts which secure lateral link assembly to rear spindle.

CAUTION:
Discard old self-locking nut. Replace with a new one.


G4M0249

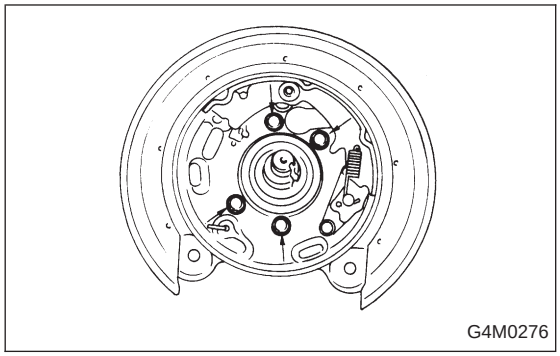
16) Remove bolts which secure strut assembly to rear spindle.
Remove rear spindle, back plate and hub as a unit.



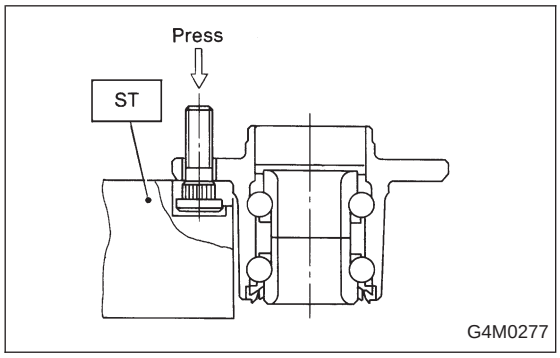
G4M0275

B: DISASSEMBLY

1) Remove hub from rear spindle.


G4M0276

2) Remove back plate from rear spindle.



G4M0277

3) Using ST, press hub bolts out.

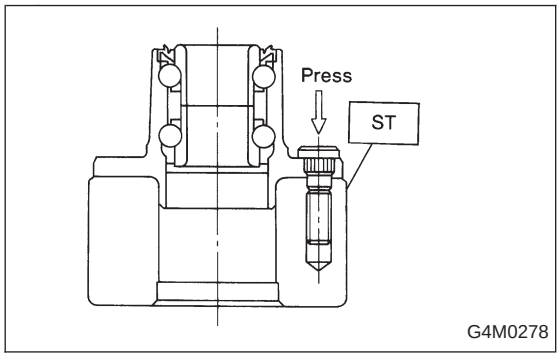
CAUTION:
Do not hammer hub bolt since this may deform hub.

ST 927080000 HUB STAND

C: INSPECTION

Clean the removed parts and check them for wear, damage and corrosion. If faulty, replace.

CAUTION:
Hub unit cannot be disassembled. If faulty, replace it as a unit.



G4M0278

D: ASSEMBLY

1) Using ST, press new hub bolts into place.

NOTE:
- Use a 12 mm (0.47 in) hole in ST to prevent hub bolt from tilting during installation.
- Ensure hub bolt closely contacts hub.

ST 927080000 HUB STAND

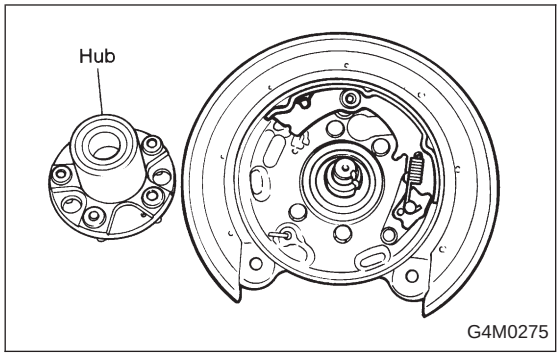
2) Completely clean dust or dirt from the mating/polished surface of rear spindle back plate.

3) Install back plate to rear spindle.

Tightening torque:
52±6 N·m (5.3±0.6 kg-m, 38.3±4.3 ft-lb)

4) Charge oil seal located on the rear of hub with grease.

Specified grease:
SHELL 6459N



5) Install hub on rear spindle. Temporarily tighten axle nut and washer to hold hub in place.

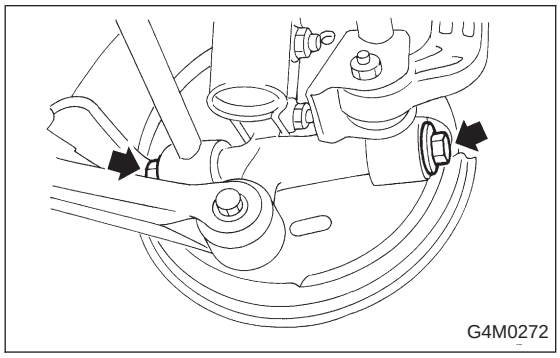
CAUTION:
Discard old axle nut. Replace with a new one.

E: INSTALLATION

1) Connect rear spindle assembly to strut assembly.

Tightening torque:
147±15 N·m (15±1.5 kg-m, 108±11 ft-lb)

CAUTION:
Use a new self-locking nut.



2) Connect rear spindle assembly to lateral link assembly.

Tightening torque:
137±20 N·m (14±2 kg-m, 101±14 ft-lb)

CAUTION:
Use new self-locking nut.

3) Connect rear spindle assembly to trailing link assembly.

Tightening torque:
113±15 N·m (11.5±1.5 kg-m, 83±11 ft-lb)

CAUTION:
Use a new self-locking nut.

Disc brake: Perform steps 4) through 6).

4) Connect end of parking brake cable.
5) Install disc rotor to hub unit.
6) Install disc brake assembly to back plate.

Tightening torque:
52±6 N·m (5.3±0.6 kg-m, 38.3±4.3 ft-lb)

Drum brake: Perform steps 7) through 10).

7) Completely clean brake pipe connection. Using a flare-nut wrench, connect brake pipe to wheel cylinder.
8) Connect parking brake cable to lever.
9) Install brake drum on hub unit.
10) Bleed air from brake system. <Ref. to 4-4 [W11B0].>
11) Tighten axle nut using a socket wrench, and lock securely.

Tightening torque:
186±20 N·m (19±2 kg-m, 137±14 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.

12) Install O-ring to hub cap flange, and install hub cap by lightly tapping it with a plastic-faced hammer.
13) Install wheel and tighten wheel nuts to specified torque.

Tightening torque (Wheel nut):
88±10 N·m (9±1 kg-m, 65±7 ft-lb)

4. Front and Rear Drive Shafts

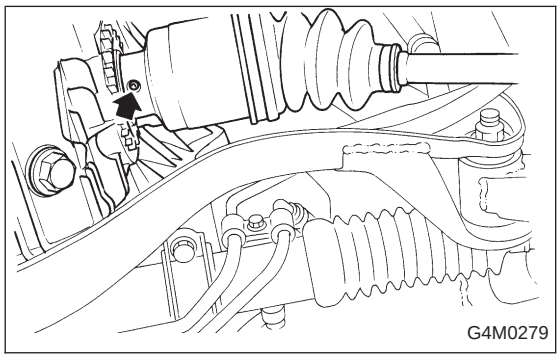
A: REMOVAL

1. FRONT DRIVE SHAFT

1) Disconnect ground cable from battery.
2) Jack-up vehicle, support it with safety stands (rigid rocks), and remove front wheel cap and wheels.
3) Unlock axle nut.
4) Remove axle nut using a socket wrench.

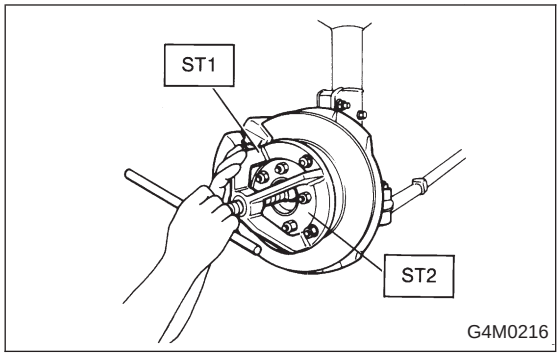
CAUTION:
Be sure to loosen and retighten axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.

5) Disconnect transverse link from housing.


G4M0279

6) Remove spring pin which secures transmission spindle to DOJ.

CAUTION:
Use a new spring pin.



7) Remove front drive shaft assembly. If it is hard to remove, use ST1 and ST2.

ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 PLATE

CAUTION:
● Be careful not to damage oil seal lip when removing front drive shaft.
● When front drive shaft is to be replaced, also replace inner oil seal.

2. REAR DRIVE SHAFT

1) Disconnect ground cable from battery.
2) Lift-up vehicle, and remove 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 axle nut.
4) Loosen axle nut using a socket wrench.

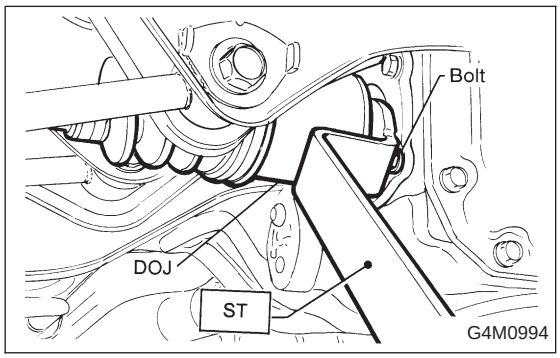
CAUTION:
Do not remove axle nut.

5) Remove A.B.S. sensor clamps and parking brake cable bracket.
6) Remove bolts which secure lateral link assembly to rear housing.

CAUTION:
Discard old self-locking nut. Replace with a new one.

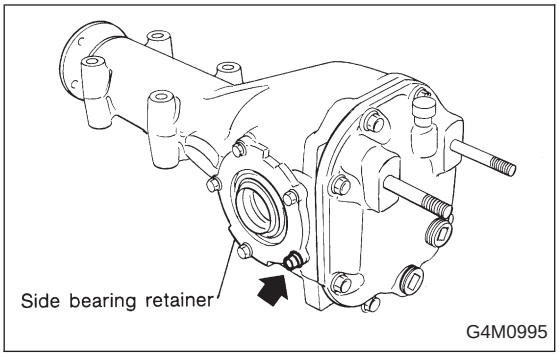
7) Remove bolts which secure trailing link assembly to rear housing.

CAUTION:
Discard old self-locking nut. Replace with a new one.



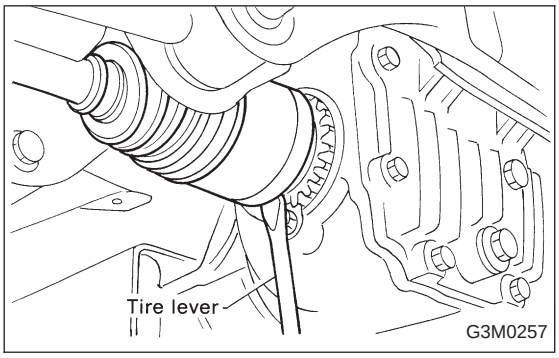
Except 1800 cc model: Perform step 8).
8) Remove DOJ from rear differential using ST.
ST 28099PA100 DRIVE SHAFT REMOVER

CAUTION:
Do not remove circlip attached to inside of differential.



CAUTION:
Be careful not to damage side bearing retainer. Always use bolt as shown in figure, as supporting point for ST during removal.

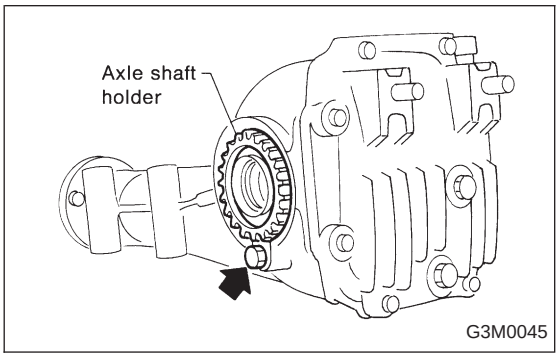
ST 28099PA100 DRIVE SHAFT REMOVER



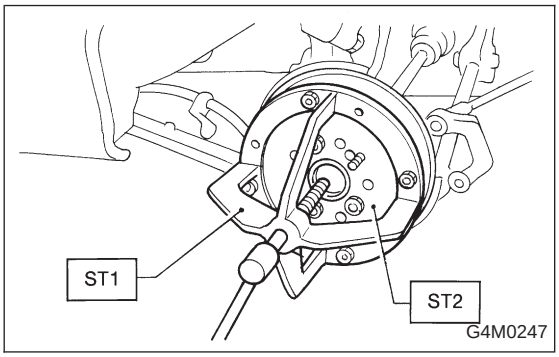
1800 cc model: Perform step 9).

9) Remove DOJ from rear differential using tire lever.

NOTE:
The side spline shaft circlip comes out together with the shaft.



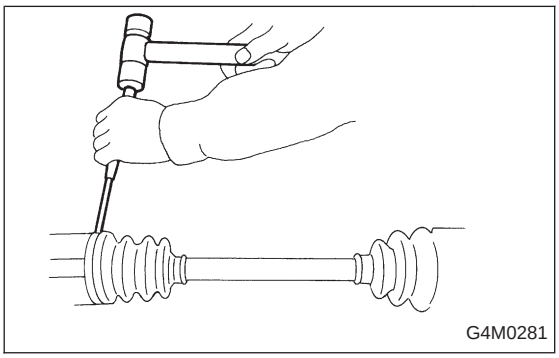
CAUTION:
When removing the DOJ from the rear differential, fit tire lever to the bolt as shown in figure so as not to damage the axle shaft holder.



10) Remove axle nut and drive shaft. If it is hard to remove, use ST1 and ST2.

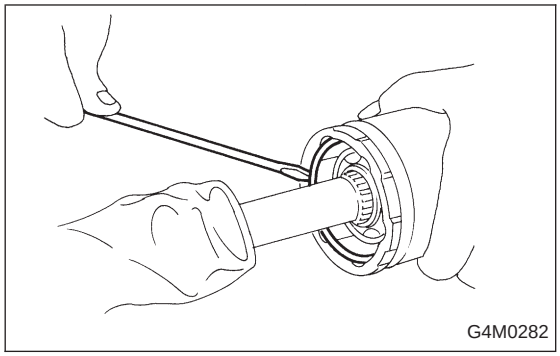
ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 PLATE

CAUTION:
- **Be careful not to damage 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.**

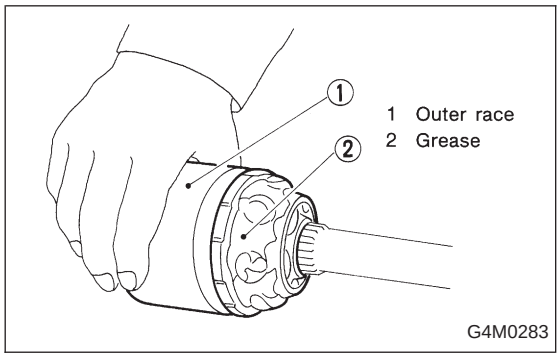


B: DISASSEMBLY

1) Straighten bent claw of larger end of DOJ boot.
2) Loosen band by means of screwdriver or pliers with care of not damaging boot.
3) Remove 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.


G4M0282

5) Pry and remove round circlip located at the neck of DOJ outer race with a screwdriver.



G4M0283

6) Take out DOJ outer race from shaft assembly.
7) Wipe off 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).

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 DOJ inner race.
11) Take off 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 UFJ/BJ boot in the same procedure as steps 1) to 3).
13) Thus, disassembly of axle is completed, but UFJ/BJ is unable to be disassembled.

C: INSPECTION

Check the removed parts for damage, wear, corrosion and 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) UFJ (Under cut Free Joint)
Check seizure, corrosion, damage and excessive play.

4) Boot
Check for wear, warping, breakage or scratches.
5) Grease
Check for discoloration or fluidity.

D: ASSEMBLY

Use specified grease.

UFJ/BJ side:

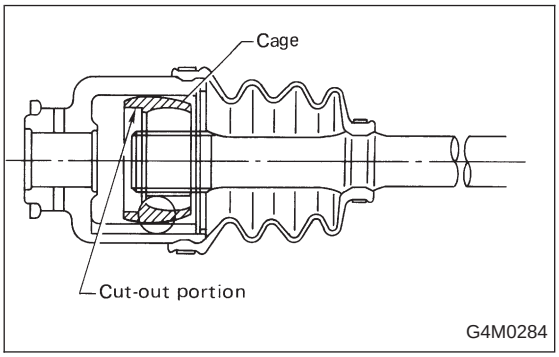
UFJ (Front) — NTG2218 (Part No. 28093AA020)
BJ (Rear) — Molylex No. 2 (Part No. 723223010) or Sunlight TB2-A

DOJ side:

AT model — VU-3A702 (Yellow) (Part No. 23223GA050)
MT model — Molylex No. 2 (Part No. 723223010) or Sunlight TB2-A

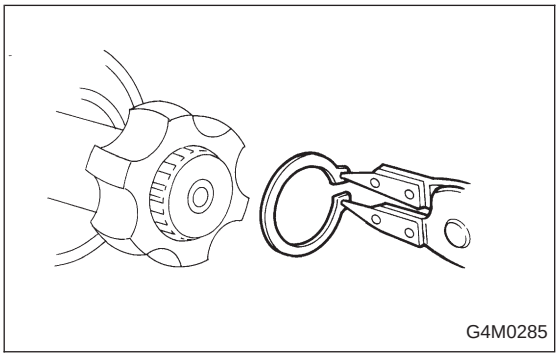
1) Install BJ boot in specified position, and fill it with 60 to 70 g (2.12 to 2.47 oz) of specified grease.
2) Place DOJ boot at the center of shaft.

CAUTION:
Be sure to wrap shaft splines with vinyltape to prevent boot from scratches.



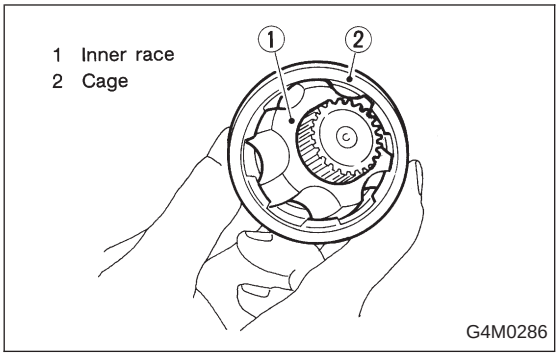
3) Insert DOJ cage onto shaft.

NOTE:
Insert the cage with the cut-out portion facing the shaft end, since the cage has an orientation.



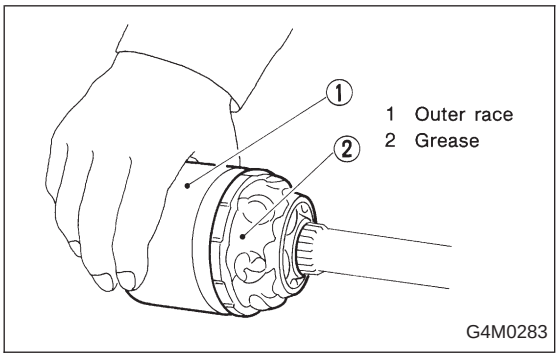
4) Install DOJ inner race on shaft and fit snap ring with pliers.

NOTE:
Confirm that the snap ring is completely fitted in the shaft groove.

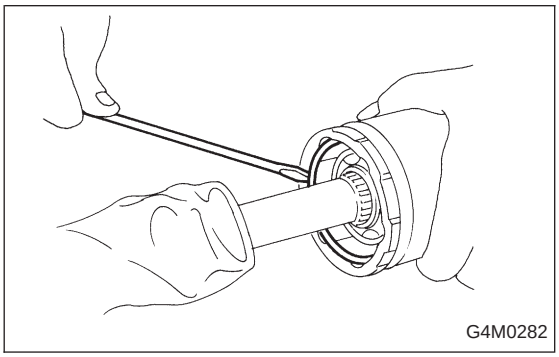


5) Install cage, which was previously fitted, to inner race fixed upon shaft.

NOTE:
Fit the cage with the protruded part aligned with the track on the inner race and then turn by a half pitch.



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.



10) Install circlip in the groove on DOJ outer race.

NOTE:
- Assure that the balls, cage and inner race are completely fitted in the outer race of DOJ.
- Exercise care not to place the matched position of circlip in the ball groove of outer race.
- Pull the shaft lightly and assure that the circlip is completely fitted in the groove.

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 DOJ boot taking care not to twist it.

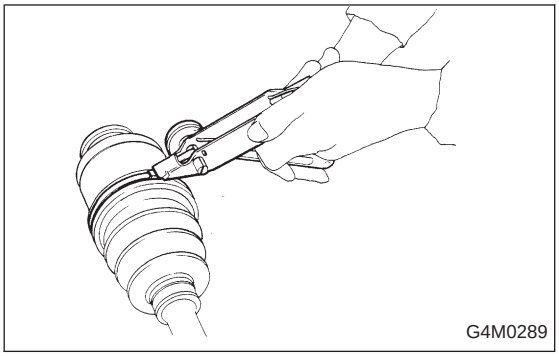
NOTE:
- The inside of the larger end of DOJ boot and the boot groove shall be cleaned so as to be free from grease and other substances.
- When installing DOJ boot, position outer race of DOJ at center of its travel.

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.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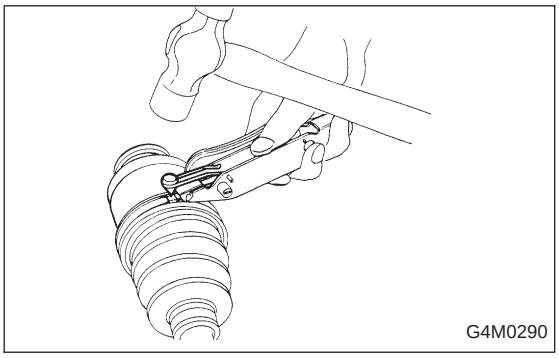
15) Tighten band by using ST.

ST 925091000 BAND TIGHTENING TOOL

NOTE:
Tighten band until it cannot be moved by hand.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16) Tap on the clip with the punch provided at the end of ST.

ST 925091000 BAND TIGHTENING TOOL

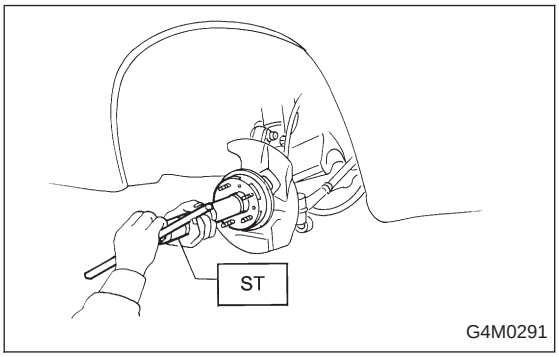
CAUTION:
Tap to an extent that the boot underneath is not damaged.

17) 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.

18) Fix up boot on BJ in the same manner.
19) Install protector onto BJ boot band. (For rear side only)

NOTE:
Extend and retract DOJ to provide equal grease coating.



G4M0291

E: INSTALLATION

1. FRONT DRIVE SHAFT

1) Insert UFJ (Under cut Free Joint) into hub splines.

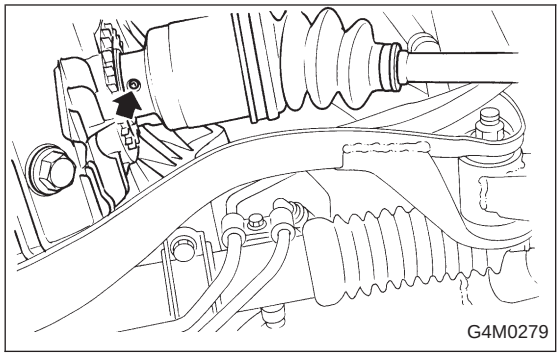
CAUTION:
Be careful not to damage inner oil seal lip.

2) Using ST1 and ST2, pull drive shaft into place.

ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADAPTER

CAUTION:
Do not hammer drive shaft when installing it.

3) Tighten axle nut temporarily.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4) Install DOJ on transmission spindle and drive spring pin into place.

CAUTION:
Always use a new spring pin.

5) Connect transverse link to housing.

Torque (self-locking nut):
49±10 N·m (5.0±1.0 kg-m, 36±7 ft-lb)

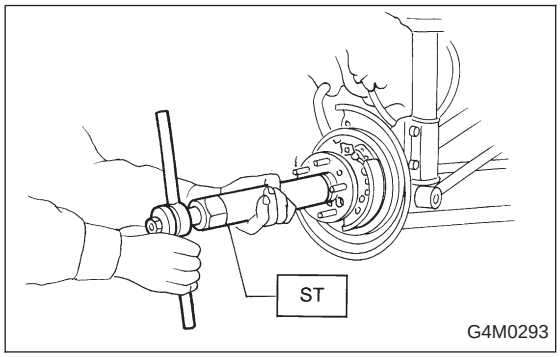
CAUTION:
Use a new self-locking nut.

6) Install stabilizer bracket.
7) While depressing brake pedal, tighten axle nut to the specified torque.

Tightening torque:
186±20 N·m (19±2 kg-m, 137±14 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.



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2. REAR DRIVE SHAFT

1) Insert BJ into rear housing splines.

CAUTION:
Be careful not to damage inner oil seal lip.

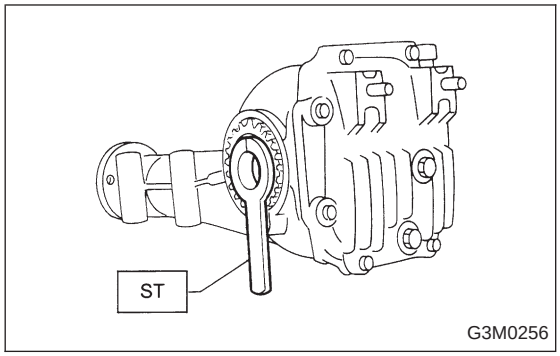
2) Using ST1 and ST2, pull drive shaft into place.

ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADAPTER

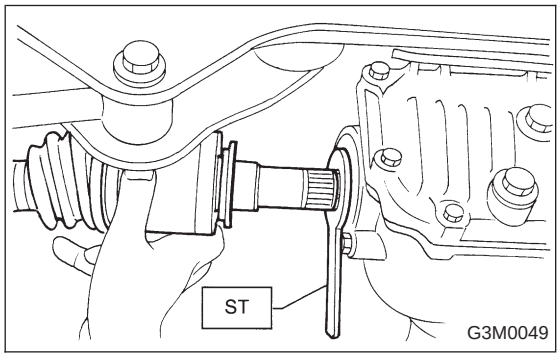
CAUTION:
Do not hammer drive shaft when installing it.

3) Tighten axle nut temporarily.

4) Replace circlips from DOJ spline with new one (only 1800 cc model).



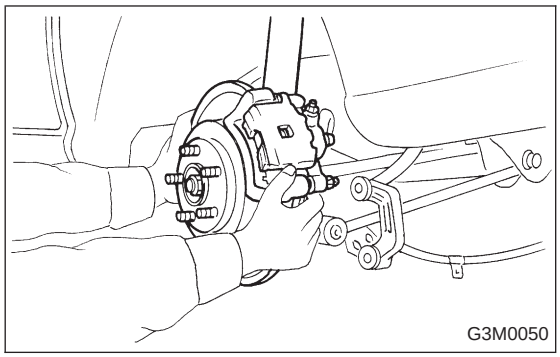
5) Using ST, install DOJ into differential.
ST 28099PA090 SIDE OIL SEAL PROTECTOR



6) Insert DOJ spline end into 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



7) Align DOJ and differential splines.
8) Push housing to insert DOJ into differential.

NOTE:
Make sure DOJ is inserted properly.

9) Connect rear housing assembly to trailing link assembly, and tighten self-locking nut.

Tightening torque:
113±15 N·m (11.5±1.5 kg-m, 83±11 ft-lb)

10) Connect rear housing assembly to lateral link assembly, and tighten self-locking nut.

Tightening torque:
137±20 N·m (14±2 kg-m, 101±14 ft-lb)

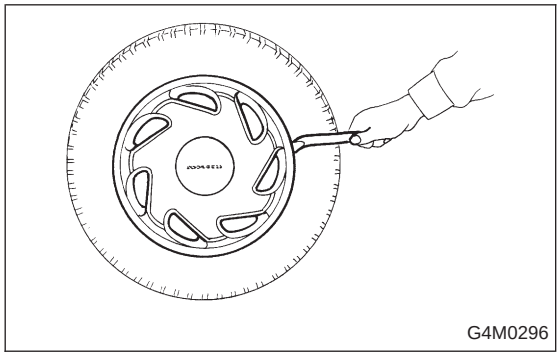
11) Install stabilizer bracket.
12) While depressing brake pedal, tighten axle nut using a socket wrench.

Tightening torque:
186±20 N·m (19±2 kg-m, 137±14 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) After tightening axle nut, lock it securely.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5. Full Wheel Cap

A: REMOVAL

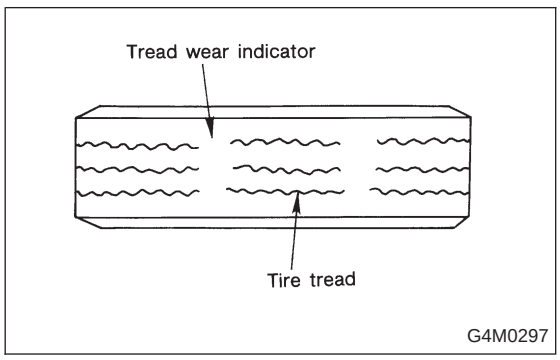
Pry off the full wheel cap with a wheel cap remover inserted between openings in the cap.

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.

6. Steel Wheel and Tire

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) Take stone, glass, nail etc. off the tread groove.



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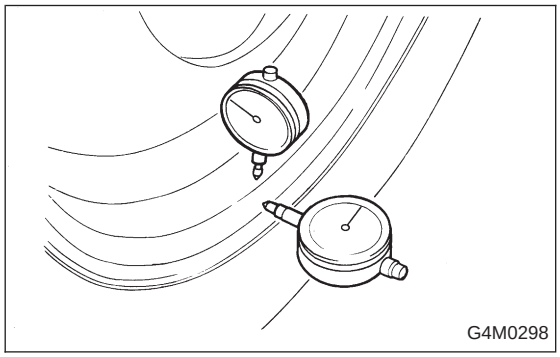
3) Replace tire:
- when large crack on side wall, damage or crack on tread is found.
- when the “tread wear indicator” appears as a solid band across the tread.

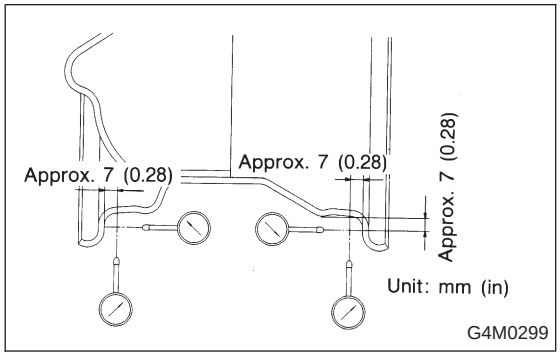
CAUTION:
● **When replacing a tire, make sure to use only the same size, construction and load range as originally installed.**

● **Avoid mixing radial, belted bias or bias tires on the vehicle.**



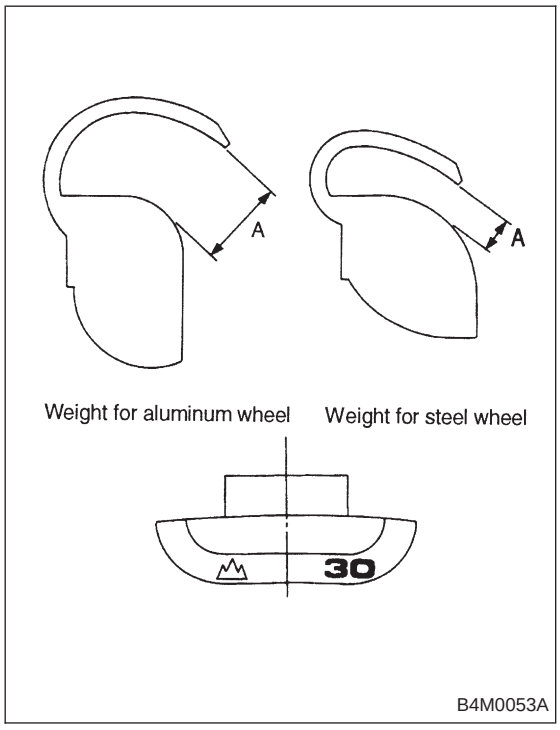
A: INSPECTION OF WHEEL RUNOUT

1) Jack-up vehicle until wheels clear the floor.
2) Slowly rotate wheel to check rim “runout” using a dial gauge.



	Axial runout limit	Radial runout limit
Steel wheel	1.5 mm (0.059 in)	
Aluminum wheel	1.0 mm (0.039 in)	

3) If rim runout exceeds specifications, remove tire from rim and check runout while attaching dial gauge to positions shown in figure.
4) If measured runout still exceeds specifications, replace the wheel.



7. Wheel Balancing

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.

Service limit: A
Weight for steel wheel;
1.6 — 2.0 mm (0.063 — 0.079 in)
Weight for aluminum wheel;
4.3 — 4.7 mm (0.169 — 0.185 in)

CAUTION:
● **55 g (1.94 oz) weight used with aluminum wheel is not available.**
● **Balance weights are available for use with any of 13- to 15-inch wheels.**

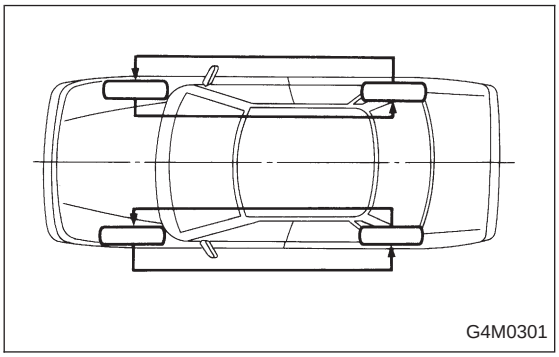
8. Installation of Wheel Assembly to Vehicle

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:
88±10 N·m (9±1 kg-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).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9. 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.

10. “T-type” Tire

“T-type” tire for temporary use is prepared as a spare tire.

CAUTION:

- **Keep the inflation pressure at 412 kPa (4.2 kg/cm^2, 60 psi) at all times.**
- **When the wear indicator appears on the tread surface, replace the tire with a new one.**
- **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.**
- **Replace with a conventional tire as soon as possible since this “T-type” tire is only for temporary use.**

11. Aluminum Wheel

A: INSPECTION

Inspection for aluminum wheels is basically the same as the one for steel wheels. However, check the rim flange for cracks or damage, and replace (not repair) aluminum wheel if air leakage is found.

B: PRECAUTIONS

Aluminum wheels are easily scratched. To maintain their appearance and safety, do the following:

1) Do not damage aluminum wheels during removal, disassembly, installation, wheel balancing, etc. After removing aluminum wheels, place them on a rubber mat, etc.

2) While 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 tire chain, be sure to install it properly not to have a slack; otherwise it may hit wheel while driving.

4) When washing aluminum wheel, use neutral synthetic detergent and water. Avoid using the cleanser including abrasive, hard brushes or an automatic car washer.

STEERING SYSTEM 4-3

PRECAUTION FOR SUPPLEMENTAL RESTRAINT SYSTEM “AIRBAG”

The Supplemental Restraint System “Airbag” helps to reduce the risk or severity of injury to the driver in a frontal collision.

The Supplemental Restraint System consists of an airbag module (located in the center of the steering wheel), sensors, a control module, warning light, wiring harness and roll connector.

Information necessary to service the safety is included in the “5-5. SUPPLEMENTAL RESTRAINT SYSTEM” of this Service Manual.

WARNING:

- **To avoid rendering the Airbag system inoperative, which could lead to personal injury or death in the event of a severe frontal collision, all maintenance must be performed by an authorized SUBARU dealer.**
- **Improper maintenance, including incorrect removal and installation of the Airbag system, can lead to personal injury caused by unintentional activation of the Airbag system.**
- **All Airbag system electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the Supplemental Restraint System “Airbag”.**

1. Steering System

A: SPECIFICATIONS

Whole system	Minimum turning radius m (ft)	5.1 (16.7)
	Steering angle (Inside-Outside)	37.5° — 32.6°
	Steering wheel diameter mm (in)	385 (15.16)
	Overall gear ratio (Turns, lock to lock)	16.5 (3.2)
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 pump
	Output cm^3 (cu in)/rev.	7.2 (0.439)
	Relief pressure kPa (kg/cm^2, psi)	1800 cc model: 6,375 (65, 924) 2200 cc model: 7,355 (75, 1,067)
	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)
	Range of revolution rpm	500 — 7,500
	Revolving direction	Clockwise
Working Fluid (Power steering system)	Name	ATF DEXRON II or IIE
	Capacity Oil tank ℓ (US qt, Imp qt) Total	0.3 (0.3, 0.3) 0.7 (0.7, 0.6)

B: SERVICE DATA

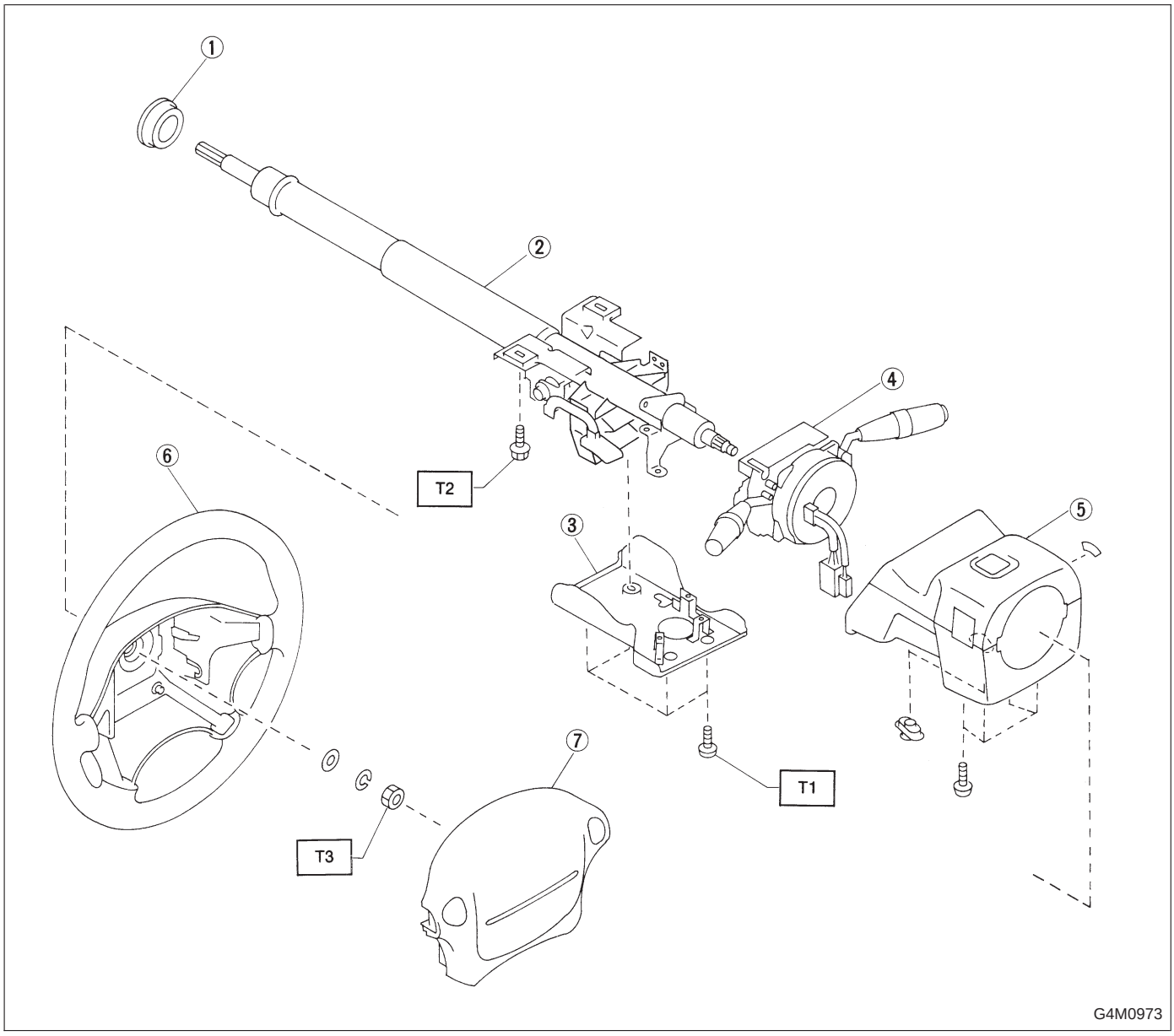
Steering wheel	Free play mm (in)	17 (0.67)
Turning angle	Inner tire & wheel	37.5°
	Outer tire & wheel	32.6°
Steering shaft	Clearance between steering wheel and column cover mm (in)	3.0 (0.118)
Steering gearbox (Power steering system)	Sliding resistance N (kg, lb)	240.3 (24.5, 54.0) or less
	Rack shaft play in radial direction mm (in) Right-turn steering Left-turn steering	 0.15 (0.0059) or less Horizontal movement: 0.3 (0.012) or less Vertical movement: 0.15 (0.0059) or less
	Input shaft play mm (in) In radial direction In axial direction	 0.18 (0.0071) or less 0.1 (0.004) or less
	Turning resistance N (kg, lb)	Within 30 mm (1.18 in) from rack center in straight ahead position: Less than 11.18 (1.14, 2.51) Maximum allowable value: 12.7 (1.3, 2.9)
Oil pump (Power steering system)	Pulley shaft mm (in) Radial play Axial play	 0.4 (0.016) or less 0.9 (0.035) or less
	Pulley Ditch deflection mm (in) Resistance to rotation N (kg, lb)	 1.0 (0.039) or less 9.22 (0.94, 2.07) or less
	Regular pressure kPa (kg/cm^2, psi)	981 (10, 142) or less
	Relief pressure kPa (kg/cm^2, psi)	6,375 (65, 924)
Steering wheel effort (Power steering system)	At standstill with engine idling on a concrete road N (kg, lb)	31.4 (3.2, 7.1) or less
	At standstill with engine stalled on a concrete road N (kg, lb)	147 (15, 33) or less

C: RECOMMENDED POWER STEERING FLUID

Recommended power steering fluid	Manufacturer
ATF DEXRON II or IIE	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

1. Steering Wheel and Column (Tilt)

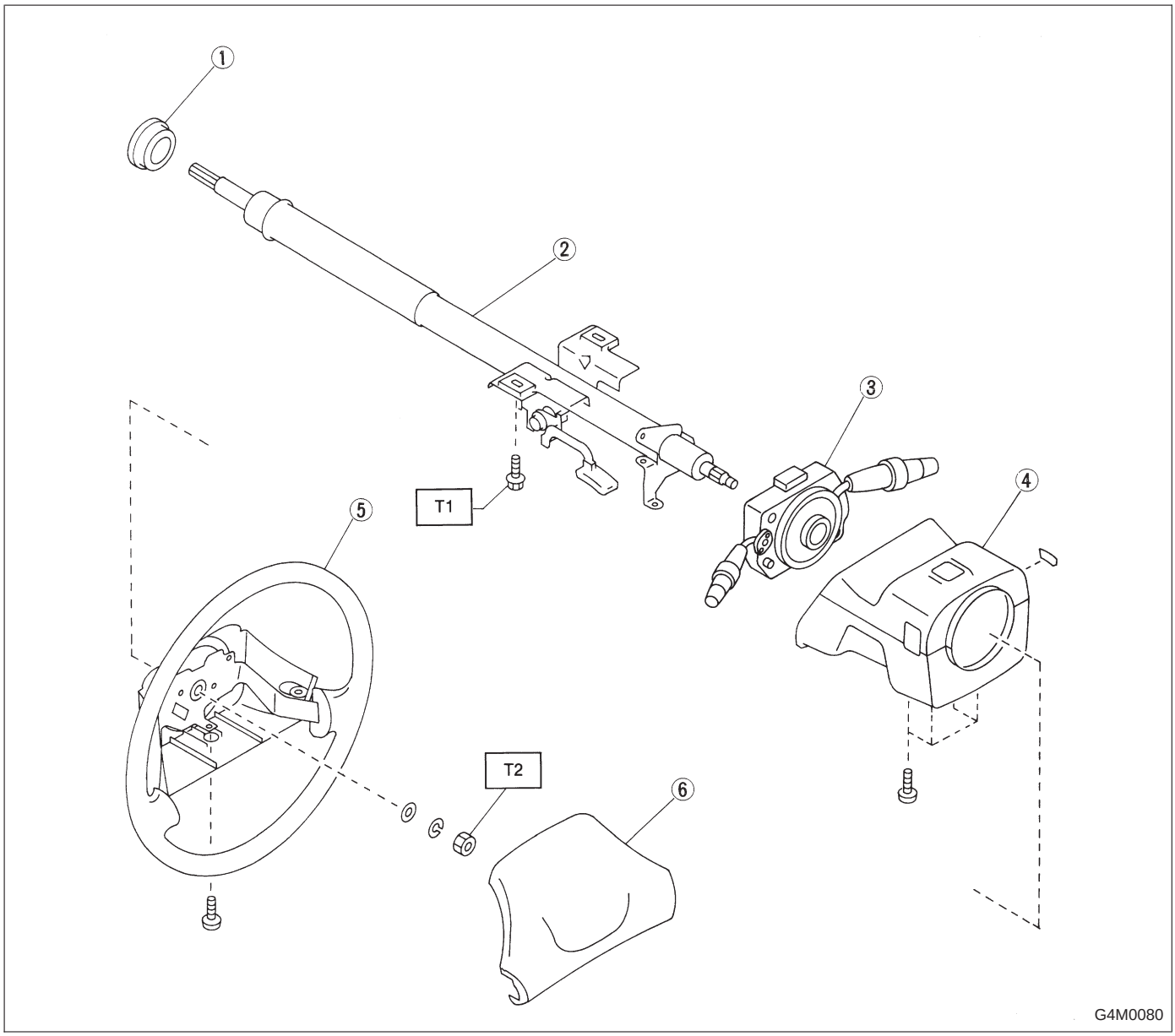
1. WITH AIRBAG MODEL



① Bushing
② Steering shaft
③ Knee protector
④ Steering roll connector
⑤ Column cover
⑥ Steering wheel
⑦ Airbag module

Tightening torque: N·m (kg-m, ft-lb)
T1: 3.4±1.0 (0.35±0.1, 2.5±0.7)
T2: 25±5 (2.5±0.5, 18.1±3.6)
T3: 34±5 (3.5±0.5, 25.3±3.6)

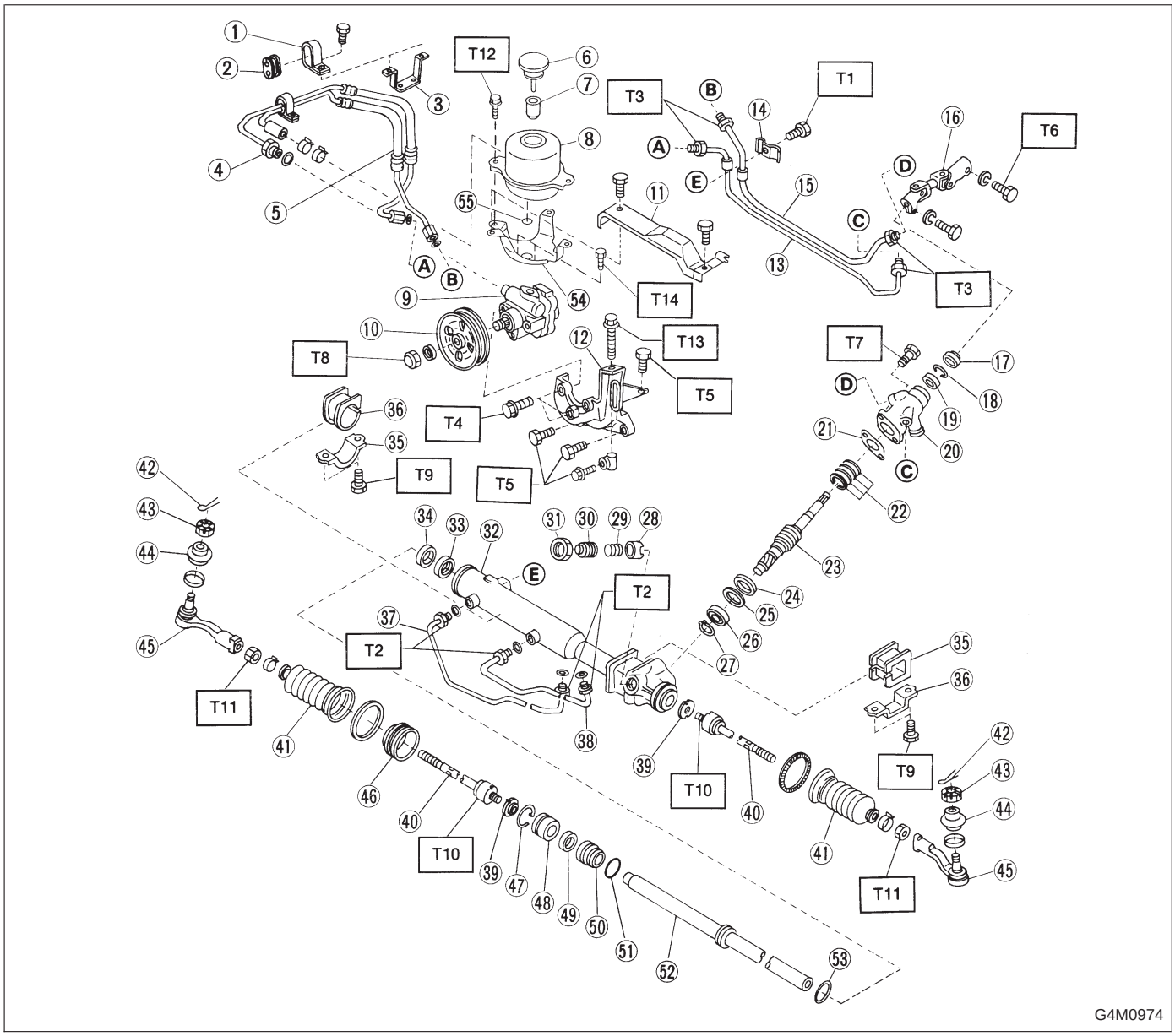
2. WITHOUT AIRBAG MODEL



① Bushing
② Steering shaft
③ Combination switch
④ Column cover
⑤ Steering wheel
⑥ Pad ASSY

Tightening torque: N·m (kg-m, ft-lb)
T1: 25±5 (2.5±0.5, 18.1±3.6)
T2: 34±5 (3.5±0.5, 25.3±3.6)

2. Power Steering System

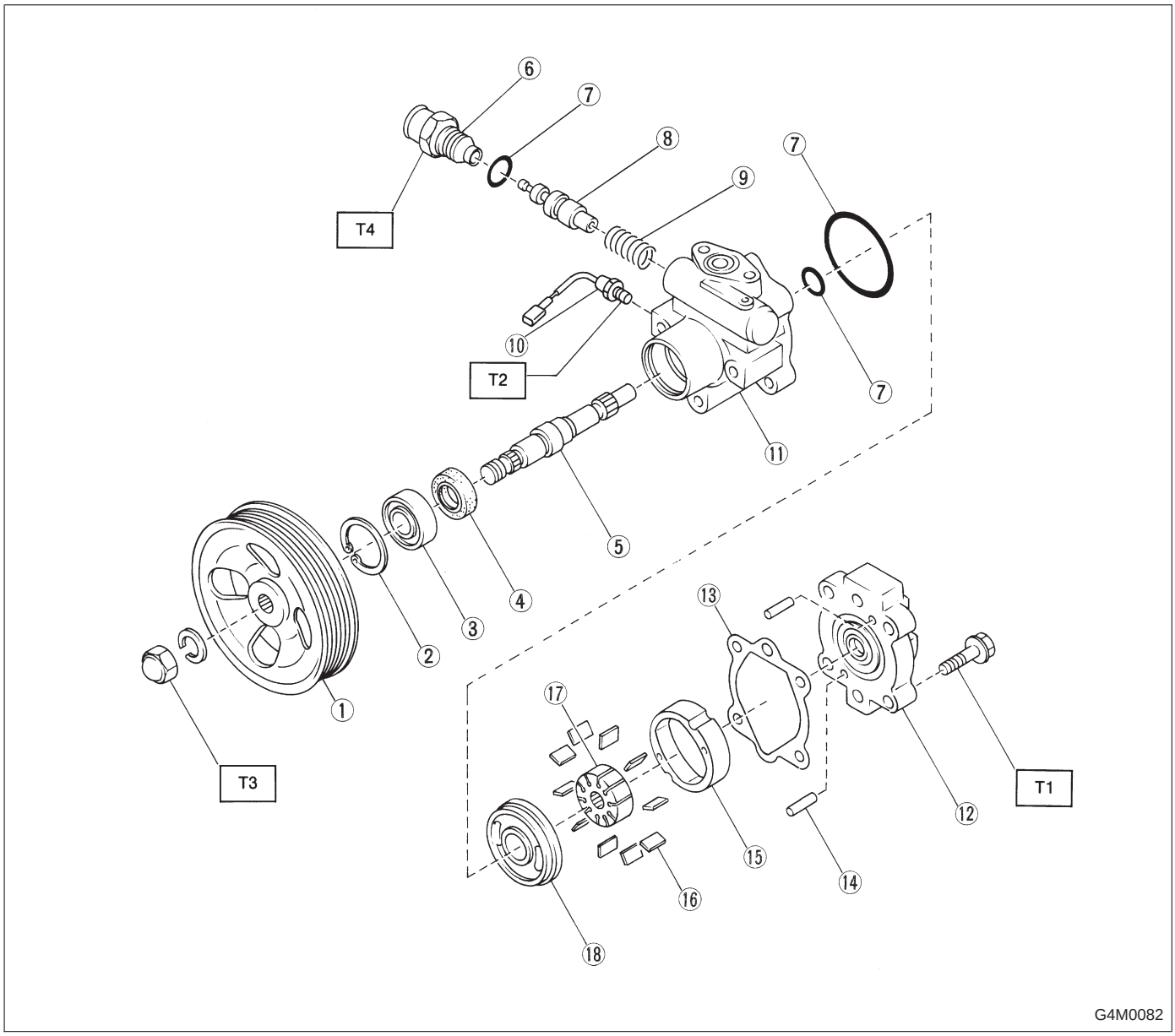


Tightening torque: N·m (kg-m, ft-lb)

- ***T1: 5.4±1.5 (0.55±0.15, 4.0±1.1)***
- ***T2: 13±3 (1.3±0.3, 9.4±2.2)***
- ***T3: 15±5 (1.5±0.5, 10.8±3.6)***
- ***T4: 20.1±2.5 (2.05±0.25, 14.8±1.8)***
- ***T5: 22±2 (2.2±0.2, 15.9±1.4)***
- ***T6: 24±3 (2.4±0.3, 17.4±2.2)***
- ***T7: 25±5 (2.5±0.5, 18.1±3.6)***
- ***T8: 52±10 (5.3±1.0, 38±7)***
- ***T9: 59±12 (6.0±1.2, 43±9)***
- ***T10: 78±10 (8.0±1.0, 58±7)***
- ***T11: 83±5 (8.5±0.5, 61.5±3.6)***
- ***T12: 7.4±2.0 (0.75±0.20, 5.4±1.4)***
- ***T13: 8±2 (0.8±0.2, 5.8±1.4)***
- ***T14: 18^{+5}_{0} ($1.8^{+0.5}_{0}$, $13.0^{+3.6}_{0}$)***

① Clamp
② Adapter
③ Hose bracket
④ Pipe C
⑤ Pipe D
⑥ Cap
⑦ Strainer
⑧ Tank
⑨ Oil pump
⑩ Pulley
⑪ Belt cover
⑫ Bracket
⑬ Pipe E
⑭ Clamp plate
⑮ Pipe F
⑯ Universal joint
⑰ Dust seal
⑱ C-ring
⑲ Oil seal
⑳ Valve housing
㉑ Packing
㉒ Seal ring
㉓ Pinion and valve ASSY
㉔ Oil seal
㉕ Back-up washer
㉖ Ball bearing
㉗ Snap ring
㉘ Sleeve
㉙ Spring
㉚ Adjusting screw
㉛ Lock nut
㉜ Housing ASSY
㉝ Back-up washer
㉞ Oil seal
㉟ Adapter
㊱ Clamp
㊲ Pipe A
㊳ Pipe B
㊴ Lock washer
㊵ Tie-rod
㊶ Boot
㊷ Cotter pin
㊸ Castle nut
㊹ Dust seal
㊺ Tie-rod end
㊻ Spacer
㊼ Circlip
㊽ Rack stopper
㊾ Oil seal
㊿ Rack bushing
(51) O-ring
(52) Rack
(53) Piston ring
(54) Tank bracket
(55) O-ring

3. Power Steering Oil Pump



① Pulley
② Snap ring
③ Bearing
④ Oil seal
⑤ Shaft
⑥ Connector
⑦ O-ring
⑧ Spool valve
⑨ Spring
⑩ Pressure switch
⑪ Front casing
⑫ Rear cover
⑬ Gasket
⑭ Knock pin
⑮ Cam ring
⑯ Vane
⑰ Rotor
⑱ Side plate

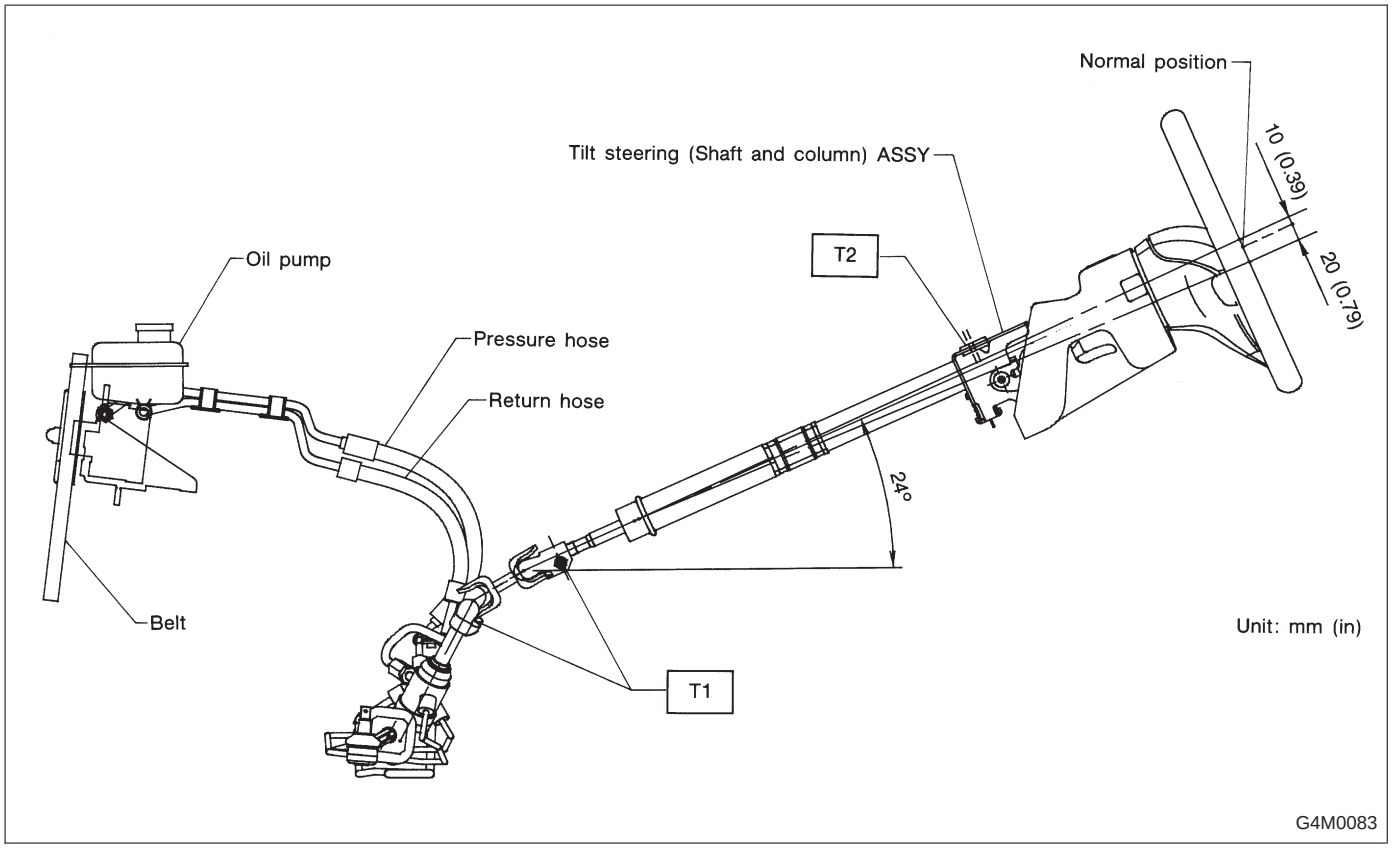
Tightening torque: N·m (kg-m, ft-lb)
T1: 16±2 (1.6±0.2, 11.6±1.4)
T2: 20±3 (2.0±0.3, 14.5±2.2)
T3: 61±6.9 (6.2±0.7, 44.8±5.1)
T4: 74±5 (7.5±0.5, 54.2±3.6)

1. Supplemental Restraint System “Airbag” AIRBAG

Airbag system wiring harness is routed near the steering wheel, steering shaft and column.

WARNING:
● All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
● Be careful not to damage Airbag system wiring harness when servicing the steering wheel, steering shaft and column.

2. Tilt Steering Column

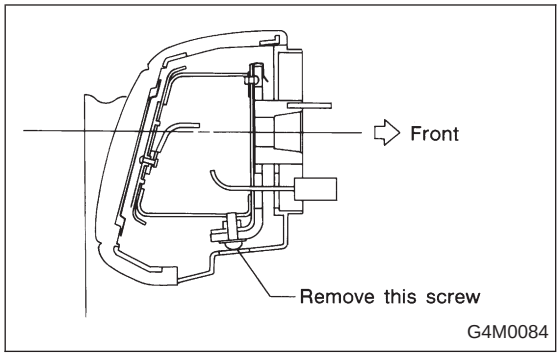


Tightening torque: N·m (kg-m, ft-lb)
T1: 24±3 (2.4±0.3, 17.4±2.2)
T2: 25±5 (2.5±0.5, 18.1±3.6)

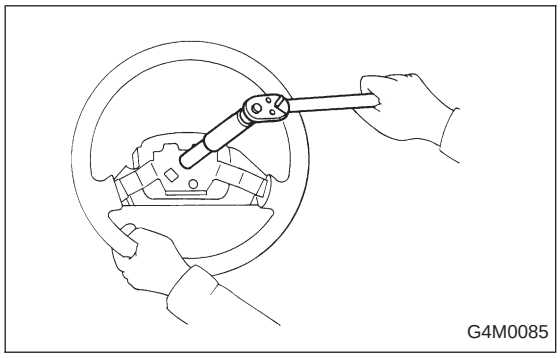
A: REMOVAL

1) Disconnect battery minus terminal.
2) Lift up vehicle.
3) Remove airbag module. (with airbag model) <Ref. to 5-5 [W2A0].>

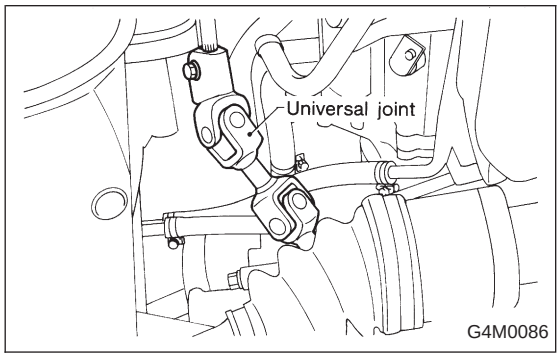
WARNING:
Always refer to “5-5 Supplemental Restraint System” before performing airbag module service (if so equipped).



4) Remove lower screw and slide horn pad assembly forward, then disconnect connector. (without airbag model)
5) Remove horn pad by pulling on it. (without airbag model)



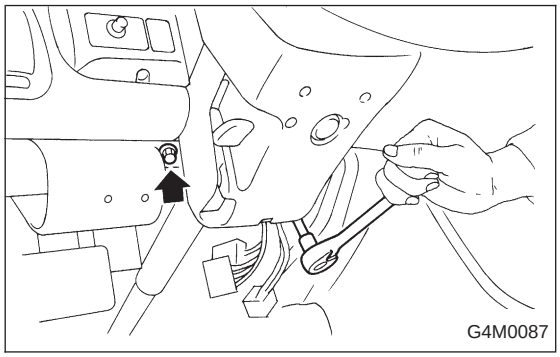
6) Remove steering wheel nut, then draw out steering wheel from shaft using steering puller.



7) Remove universal joint bolts and then remove universal joint.

CAUTION:
Scribe alignment marks on universal joint so that it can be reassembled at the original serration.

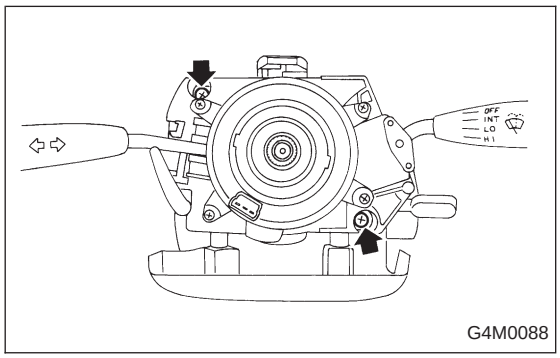
8) Remove trim panel under instrument panel.
9) Disconnect connectors for ignition switch and combination switch wiring harness under instrument panel.



10) Remove the two bolts under instrument panel securing steering shaft.
11) Pull out steering shaft assembly from hole on toe board.

CAUTION:
Be sure to remove universal joint before removing steering shaft assembly installing bolts when removing steering shaft assembly or when lowering it for servicing of other parts.

B: DISASSEMBLY

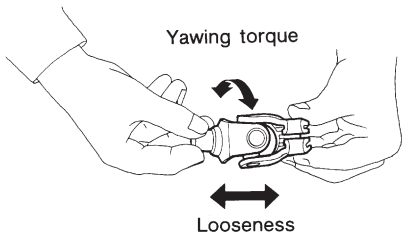
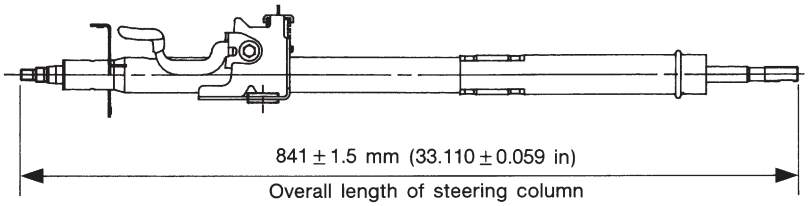


1) Remove the four screws securing upper and lower steering column covers, and the two screws securing combination switch, then remove related parts.

C: INSPECTION

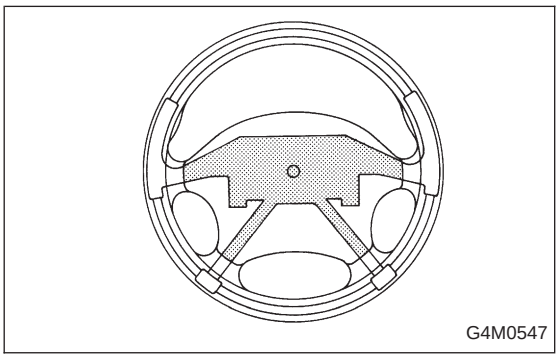
1. BASIC INSPECTION

Clean the disassembled parts with a cloth, and check for wear, damage, or any other faults. If necessary, repair or replace faulty parts.

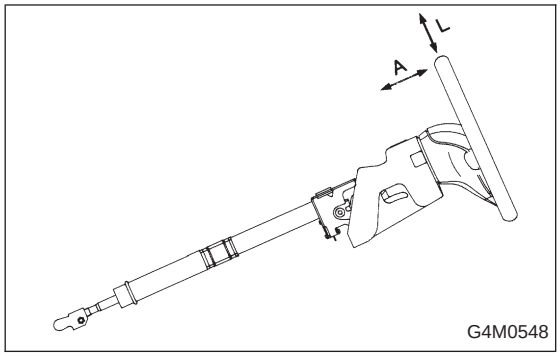
Part name	Inspection	Corrective action
Universal joint	● Free play ● Swinging torque Yawing torque Looseness  G4M0089 **Standard value of universal joint free play: 0 mm (0 in)** **Max. value of universal joint swinging torque: 0.3 N·m (0.03 kg-m, 0.2 ft-lb)**	Replace if faulty.
Steering column	● Overall length of steering column Measure overall length of steering column. Standard overall length of steering column:  G4M0090	Replace steering column assembly.

2. AIRBAG MODEL INSPECTION

WARNING:
For airbag module inspection procedures, refer to 5-5 [S101].


G4M0547

1) Check steering wheel insert for cracks or deformities.



2) Check steering wheel free play in axial and radial directions:

Specifications:

Axial free play A

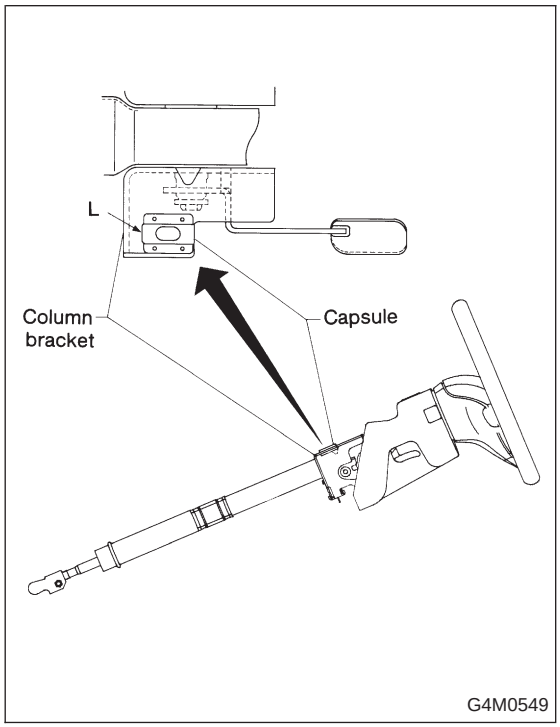
Less than ±6 mm (0.24 in)

Radial free play L

Less than ±7 mm (0.28 in)

3) Check to ensure that new airbag module is properly installed in steering wheel.

4) After installing airbag module, check to ensure that it is free of interference with steering wheel and that clearance between the two is equal at all points.

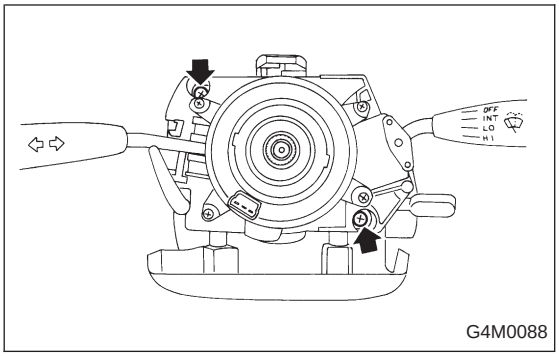


5) Check to ensure that clearance between capsule (at steering column) and cutout portion of column bracket on steering column upper side is within specifications.

Clearance between capsule and cutout portion of column bracket: L

Less than 0.5 mm (0.020 in)

6) If clearance is outside specifications, replace faulty parts with new ones.



G4M0088

D: ASSEMBLY

1) Insert combination switch to upper column shaft, and install lower column cover with tilt lever held in the lowered position. Then route ignition key harness and combination switch harness between column cover mounting bosses.
2) Fit upper column cover to lower column cover, and tighten combination switch and column cover.

Tightening torque:
1.2±0.2 N·m (0.12±0.02 kg-m, 0.9±0.1 ft-lb)

CAUTION:
Don't overtorque screw.

E: INSTALLATION

1) Insert end of steering shaft into toeboard grommet.
2) Tighten steering shaft mounting bolts under instrument panel.

Tightening torque:
25±5 N·m (2.5±0.5 kg-m, 18.1±3.6 ft-lb)

3) Connect ignition and combination switch connectors under instrument panel.
4) Connect airbag system connector at harness spool.

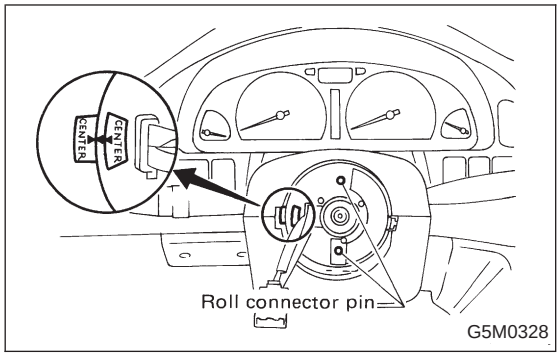
NOTE:
Make sure to apply double lock.

5) Install universal joint.
   (1) Align bolt hole on the long yoke side of universal joint with the cutout at the serrated section of shaft end, and insert universal joint.
   (2) Align bolt hole on the short yoke side of universal joint with the cutout at the serrated section of gearbox assembly. Lower universal joint completely.
   (3) Temporarily tighten bolt on the short yoke side. Raise universal joint to make sure the bolt is properly passing through the cutout at the serrated section.
   (4) Tighten bolt on the long yoke side, then that on the short yoke side.

Tightening torque:
24±3 N·m (2.4±0.3 kg-m, 17.4±2.2 ft-lb)

CAUTION:
● Make sure that universal joint bolts 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 15 mm (0.59 in)



6) Align center of roll connector. (with airbag model) <Ref. to 5-5 [W501].>

CAUTION:
Ensure that front wheels are set in straightforward direction.

7) Set steering wheel to neutral and install it onto steering shaft.

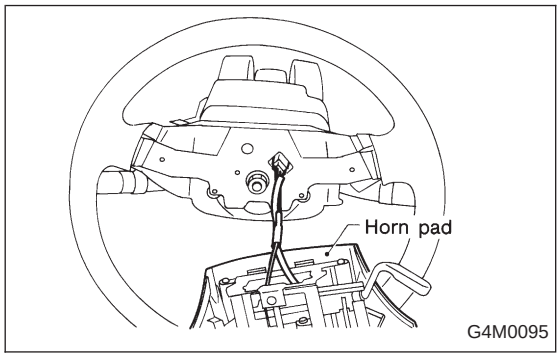
Tightening torque:
34±5 N·m (3.5±0.5 kg-m, 25.3±3.6 ft-lb)

Column cover-to-steering wheel clearance:
2 — 4 mm (0.08 — 0.16 in)

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. (with airbag model)

8) Install airbag module to steering wheel. (with airbag model)

WARNING:
Always refer to 5-5 [W2B0] before performing the service operation.

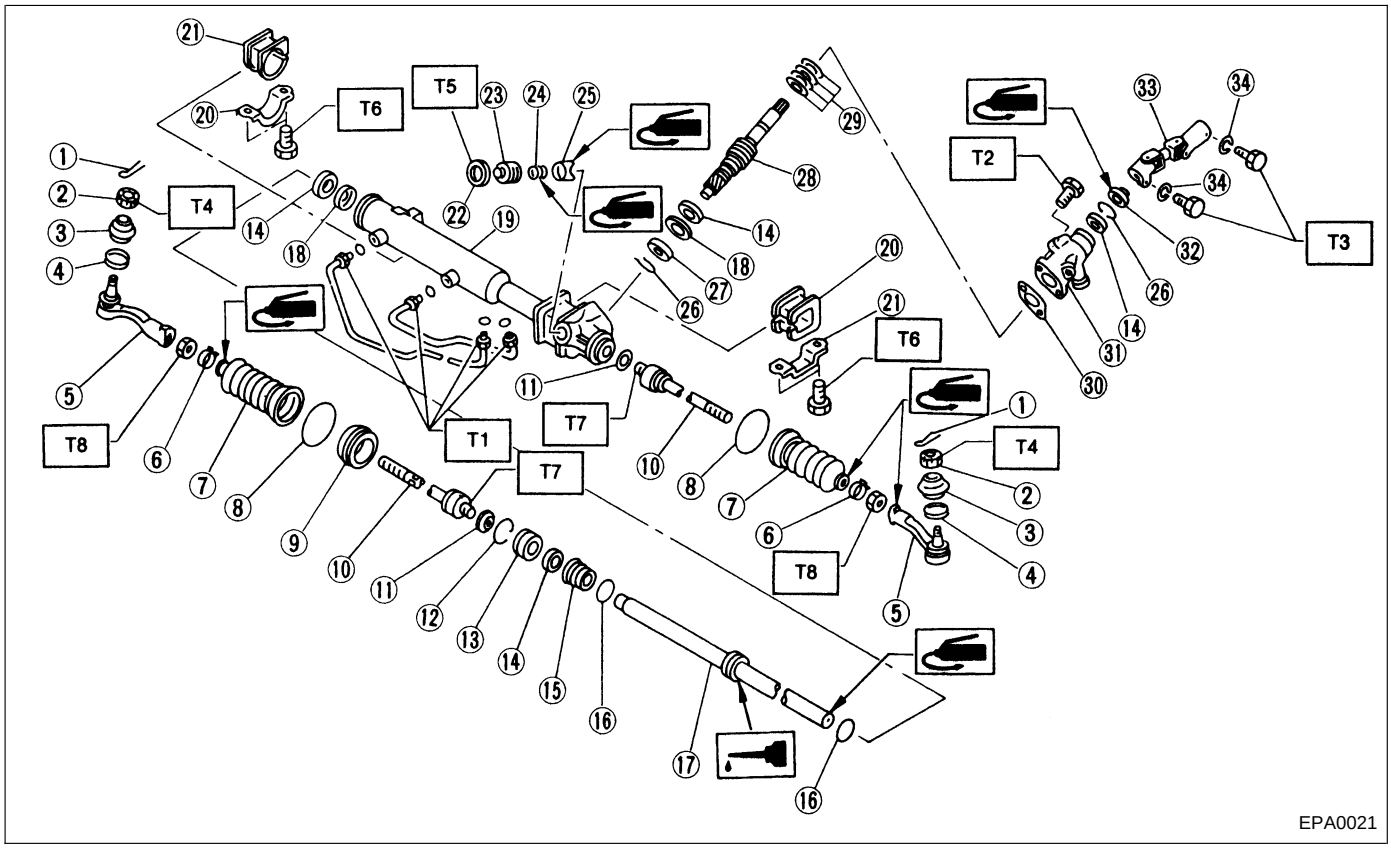


9) Install horn pad to steering wheel. (without airbag model)

(1) Connect harness connector of horn pad to connector of slip ring unit.
(2) Insert horn pad from the top and attach hooks to it.
(3) Secure horn pad to steering wheel with screws.

3. Steering Gearbox (Power Steering System)

NOTE:
For disassembly and assembly of gearbox unit, refer to section Control Valve (Power Steering Gearbox).



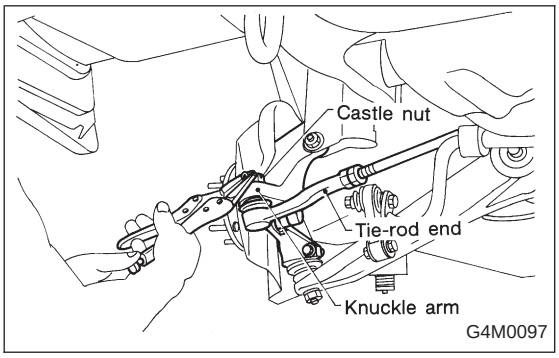
① Cotter pin
② Castle nut
③ Dust cover
④ Clip
⑤ Tie-rod end
⑥ Clip
⑦ Boot
⑧ Clip
⑨ Spacer
⑩ Tie-rod
⑪ Lock washer
⑫ Circlip
⑬ Rack stopper
⑭ Oil seal
⑮ Rack bushing
⑯ O-ring
⑰ Rack
⑱ Back-up washer
⑲ Rack housing
⑳ Adapter
㉑ Clamp
㉒ Lock nut
㉓ Adjusting screw
㉔ Spring
㉕ Sleeve
㉖ C-ring
㉗ Ball bearing
㉘ Valve
㉙ Seal ring
㉚ Packing
㉛ Valve housing
㉜ Dust seal
㉝ Universal joint
㉞ Spring washer

Tightening torque: N·m (kg-m, ft-lb)
T1: 13±3 (1.3±0.3, 9.4±2.2)
T2: 25±5 (2.5±0.5, 18.1±3.6)
T3: 24±3 (2.4±0.3, 17.4±2.2)
T4: 27.0±2.5
(2.75±0.25, 19.9±1.8)
T5: 39±10 (4.0±1.0, 29±7)
T6: 59±12 (6.0±1.2, 43±9)
T7: 78±10 (8.0±1.0, 58±7)
T8: 83±5 (8.5±0.5, 61.5±3.6)

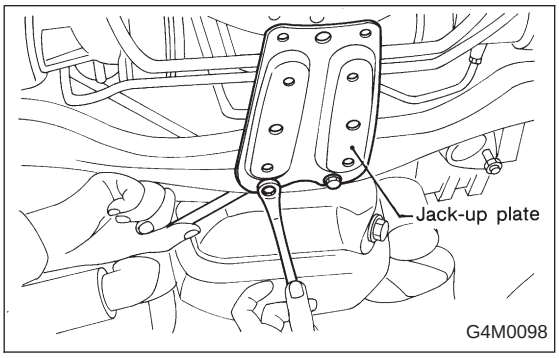
A: REMOVAL

1) Disconnect battery minus terminal.
2) Loosen front wheel nut.
3) Lift vehicle and remove front wheels.
4) Remove front exhaust pipe assembly.

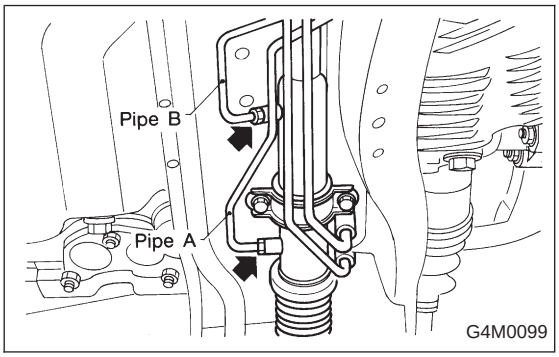
WARNING:
Be careful, exhaust pipe is hot.



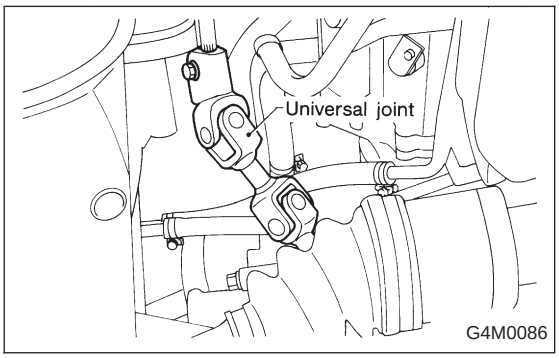
5) Using a puller, remove tie-rod end from knuckle arm after pulling off cotter pin and removing castle nut.



6) Remove jack-up plate and front stabilizer.

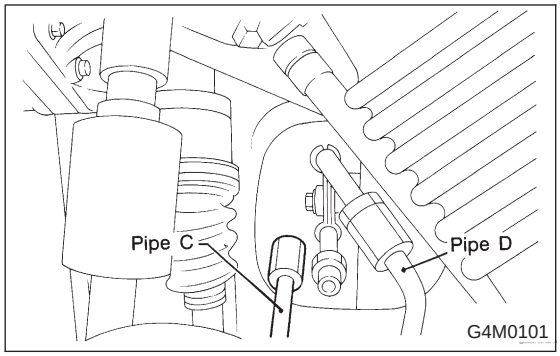


7) Remove one pipe joint at the center of gearbox, and connect vinyl hose to pipe and joint. Discharge fluid by turning steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.



8) Remove lower side bolt of universal joint, then remove upper side bolt and lift the joint upward.

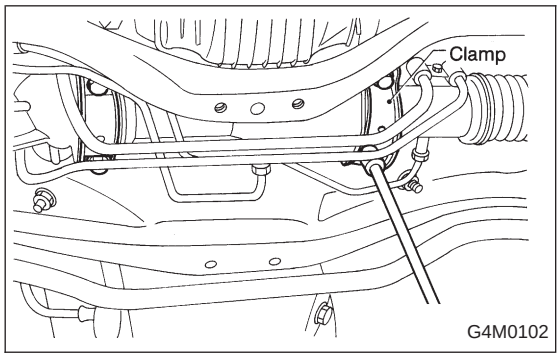
NOTE:
Place a mark on the joint and mating serration so that they can be re-installed at the original position.



9) Disconnect pipes C and D from pipe of gearbox.

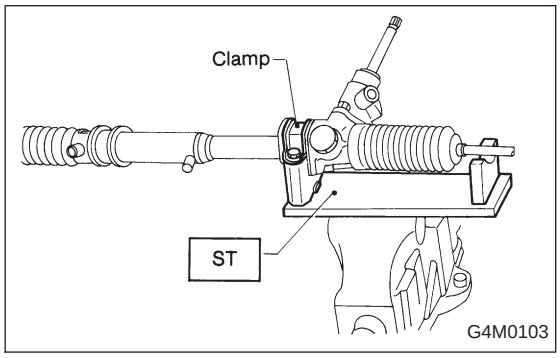
CAUTION:
Be careful not to damage these pipes.

NOTE:
Disconnect upper pipe D first, and lower pipe C second.



10) Remove clamp bolts securing gearbox to crossmember, and remove gearbox.

B: DISASSEMBLY

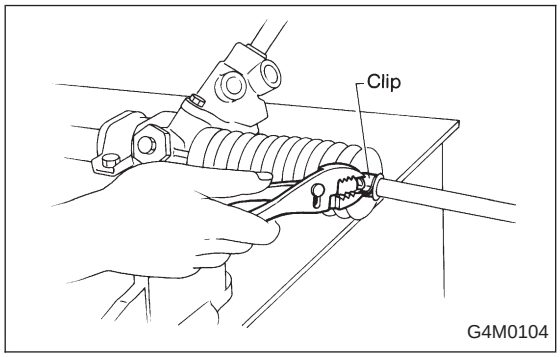


1) Disconnect four pipes from gearbox.
2) Secure gearbox removed from vehicle in vice using ST.

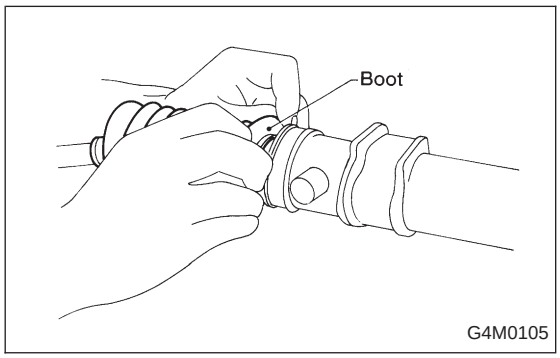
ST 926200000 STAND

CAUTION:
Secure the gearbox in a vice using the ST as shown. Do not attempt to secure it without this ST.

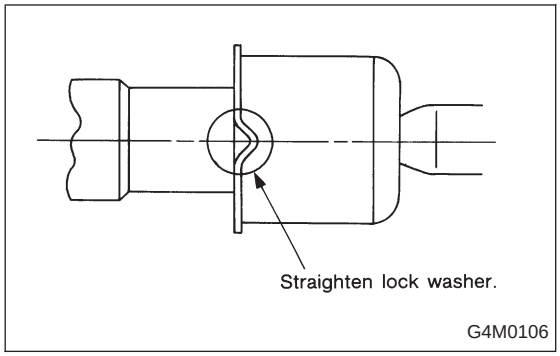
3) Remove tie-rod end and lock nut from gearbox.



4) Remove small clip from boot using pliers, and move boot to tie-rod end side.

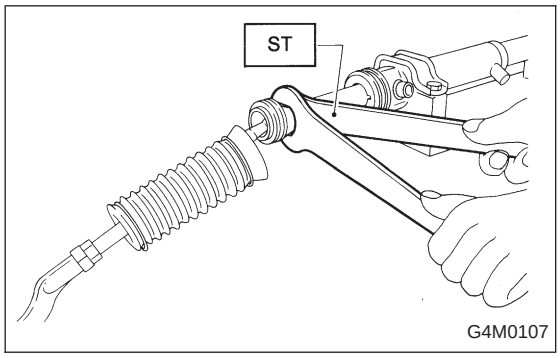


5) Remove boot together with large clips.



6) Straighten lock washer under ball joint.

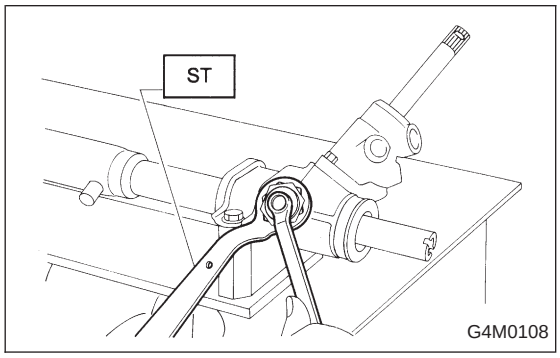
CAUTION:
● Be extremely careful not to hit surface of right hand rack; otherwise, oil leakage may result.
● Tie-rod lock washer must be replaced with a new one whenever it is removed.



7) Loosen ball joint using ST and spanner and remove tie-rod from rack.

NOTE:
When loosening ball joint, securely fix the rack using ST.

ST 925700000 WRENCH



8) Loosen lock nut using ST, and remove adjusting screw.

ST 926230000 SPANNER

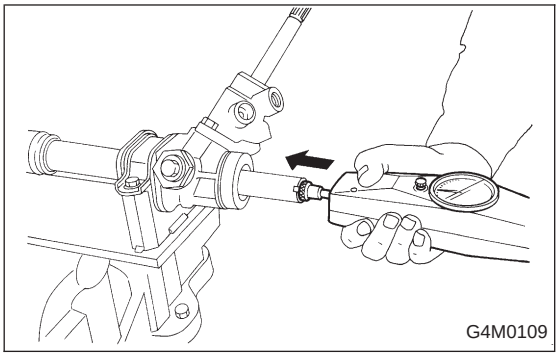
9) Remove spring and sleeve.
10) Remove dust seal.

CAUTION:
Be careful not to damage housing and input shaft, or to allow foreign matters to get inside when removing dust seal.

C: 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 bend or damage is excessive, replace entire gearbox.
2	Dust seal	(1) Crack or damage (2) Wear	If outer wall slips, 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 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 entire gearbox.
4	Gearbox unit	(1) Bend of rack shaft (2) Bend of cylinder portion (3) Crack or damage on cast iron portion	Replace gearbox with new one.
		(4) Wear or damage on rack bush	If free play of rack shaft in radial direction is out of the specified range, replace gearbox with new one. (Refer to “Service limit”.)
		(5) Wear on input shaft bearing	If free plays of input shaft in radial and axial directions are out of the specified ranges, replace 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.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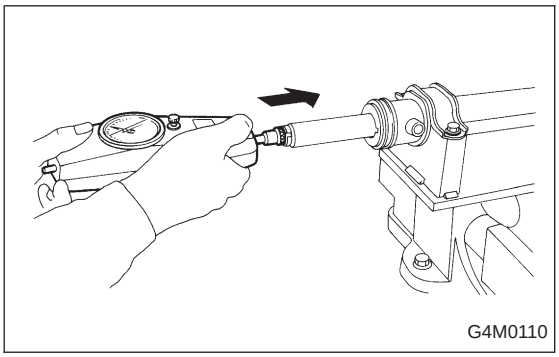

G4M0110

1. SERVICE LIMIT

Make a measurement as follows. If it exceeds the specified service limit, adjust or replace.

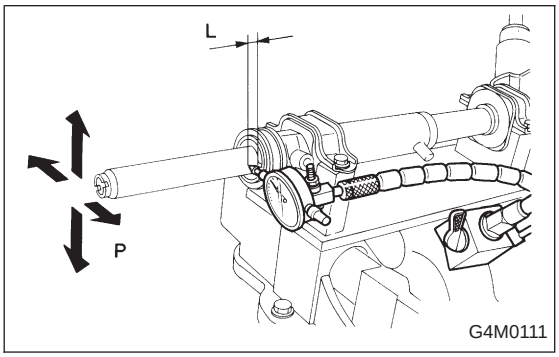
NOTE:
When making a measurement, vise gearbox by using ST. Never vise gearbox by inserting aluminum plates, etc. between vise and gearbox.

ST 926200000 STAND

Sliding resistance of rack shaft:

Service limit

240.3 N (24.5 kg, 54.0 lb) or less



G4M0111

2. RACK SHAFT PLAY IN RADIAL DIRECTION

Right-turn steering:

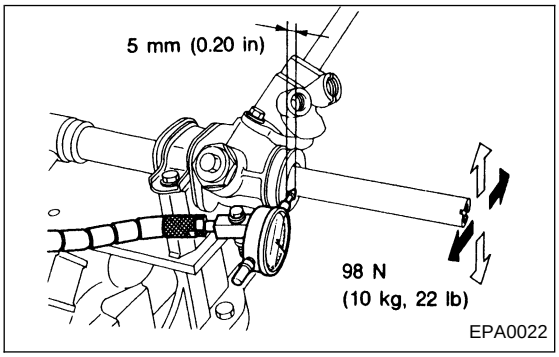
Service limit

0.15 mm (0.0059 in) or less

On condition

L: 5 mm (0.20 in)

P: 98 N (10 kg, 22 lb)



EPA0022

Left-turn steering:

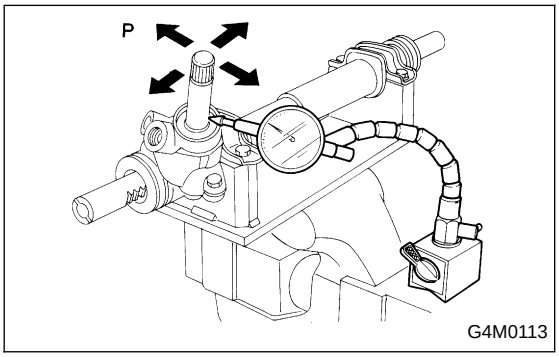
Service limit

Direction ⇳

0.3 mm (0.012 in) or less

Direction ← →

0.15 mm (0.0059 in) or less



G4M0113

3. INPUT SHAFT PLAY

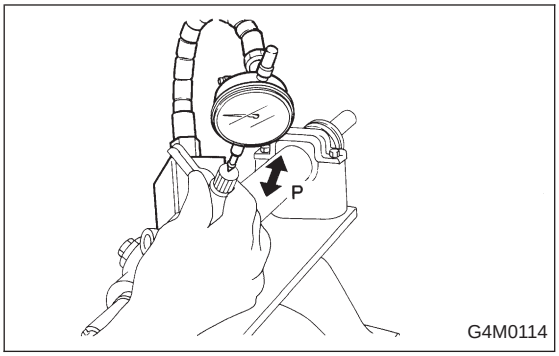
In radial direction:

Service limit

0.18 mm (0.0071 in) or less

On condition

P: 98 N (10 kg, 22 lb)



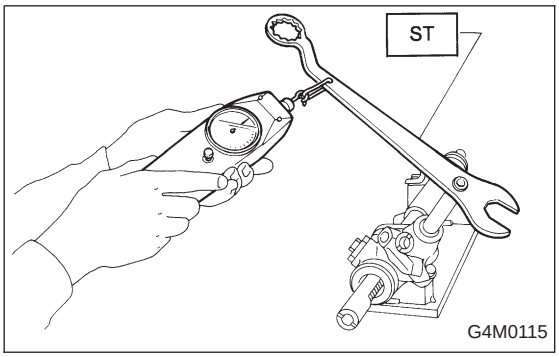
In axial direction:

Service limit

0.1 mm (0.004 in) or less

On condition

P: 20 — 49 N (2 — 5 kg, 4 — 11 lb)



4. TURNING RESISTANCE OF GEARBOX

Using ST, measure gearbox turning resistance.

ST 926230000 SPANNER

Service limit:

Straight-ahead position within 30 mm (1.18 in) from rack center

Less than 11.18 N (1.14 kg, 2.51 lb)

Maximum allowable resistance

12.7 N (1.3 kg, 2.9 lb)

D: ASSEMBLY

CAUTION:
Use only SUBARU genuine grease for gearbox.

Grease:

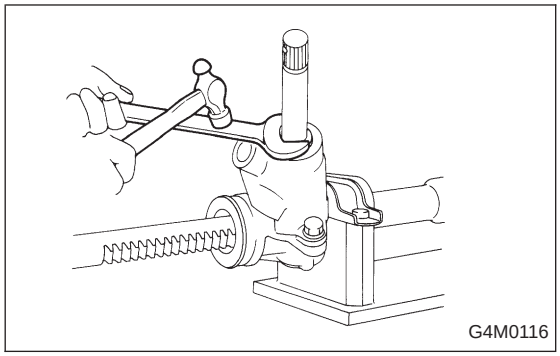
VALIANT GREASE M2
[Part No. 003608001, net 0.5 kg (1.1 lb)]

1) Apply grease to teeth of rack so that grease applied is about as high as teeth, and also apply a thin film of grease to sliding portion of rack shaft.

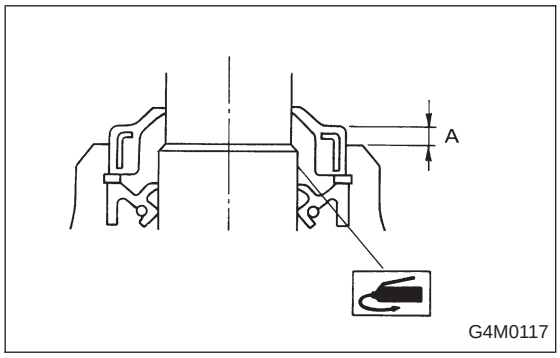
CAUTION:
● When moving rack to stroke end without tie-rod attached, prevent shocks from being applied at the end.
● Do not apply grease to threaded portion at end of rack shaft.
● Move rack shaft to stroke end two (2) or three (3) times to squeeze grease which accumulates on both ends. Remove grease to prevent it from choking air passage hole.

2) Apply grease to sleeve insertion hole.
3) Apply grease to 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.

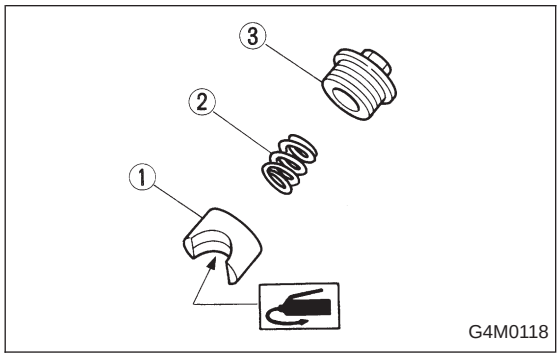

G4M0116

4) Press-fit dust seal into gearbox housing while tapping it via a spanner or the like so that stepping between gearbox and dust seal is normally 2 mm (0.08 in).



G4M0117

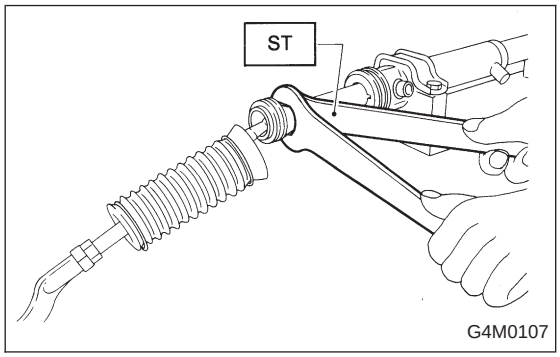
Depth: A
2 mm (0.08 in)



G4M0118

5) Apply grease to sliding surface of sleeve and spring seat, then insert sleeve into pinion housing. Fit spring into sleeve screw, pack grease inside of screw, then install the screw.

① Sleeve
② Spring
③ Adjusting screw



G4M0107

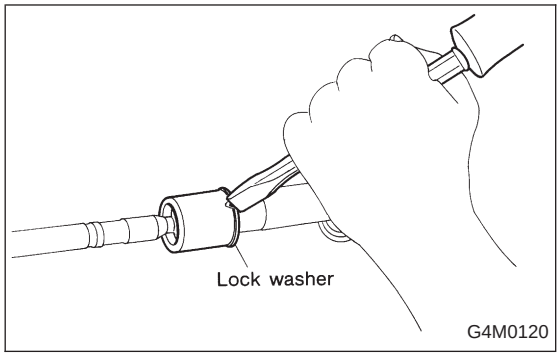
6) Fit new lock washer on screwed portion of rack end. Aligning cut portion of rack and nail of washer, screw in and tighten ball joint by using ST and spanner.

ST 925700000 WRENCH

Tightening torque (Ball joint):
78±10 N·m (8.0±1.0 kg-m, 58±7 ft-lb)

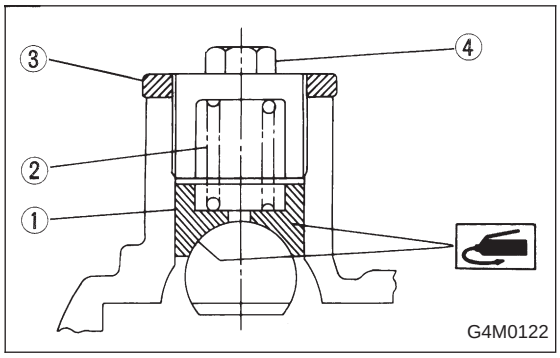
CAUTION:
Pay attention to prevent rack surface on the right side from being damaged by a tool or the like, otherwise oil leakage might be caused.

NOTE:
While tightening ball joint, hold rack with ST to prevent it from revolving.



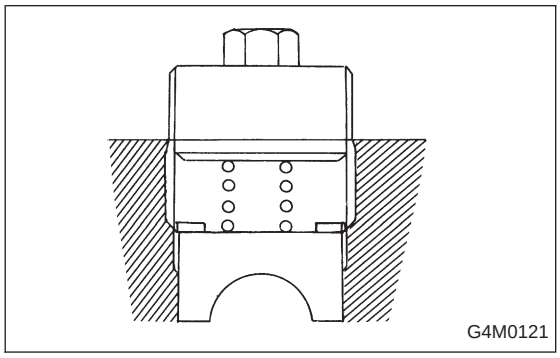
7) Bend lock washer using a chisel.

CAUTION:
Be careful not to scratch rack when bending lock washer.

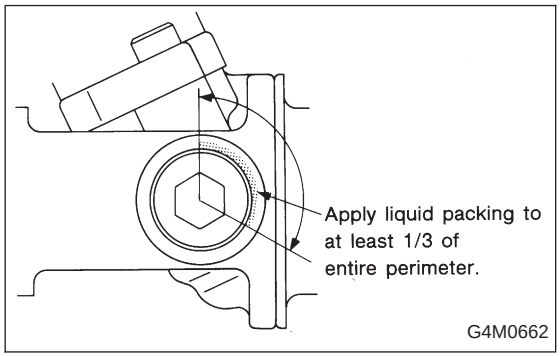


8) Rack and pinion backlash adjustment
(1) Loosen adjusting screw.
(2) Rotate input shaft so that rack is in the straight ahead direction.
(3) Apply grease to sleeve.

① Sleeve
② Spring
③ Lock nut
④ Adjusting screw



(4) Tighten 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

(6) Tighten adjusting screw to 15 N·m (1.5 kg-m, 11 ft-lb) and back off 20°.
(7) Install lock nut. While holding adjusting screw with a wrench, tighten lock nut using ST.

ST 926230000 SPANNER

Tightening torque (Lock nut):
39±10 N·m (4.0±1.0 kg-m, 29±7 ft-lb)

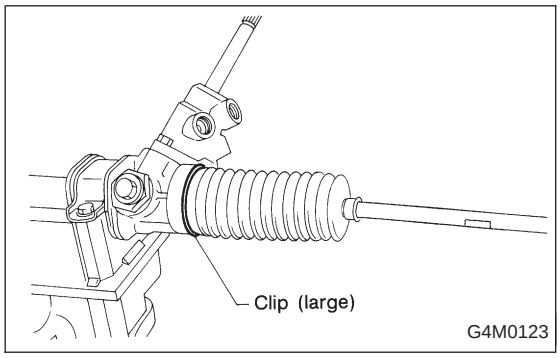
NOTE:
● Hold adjusting screw with a wrench to prevent it from turning while tightening lock nut.

● Make adjustment so that steering wheel can be rotated fully from lock to lock without binding.

9) Check for service limit as per article of “Service limit”. <Ref. to 4-3 [W3C1].> Make replacement and adjustment if necessary.

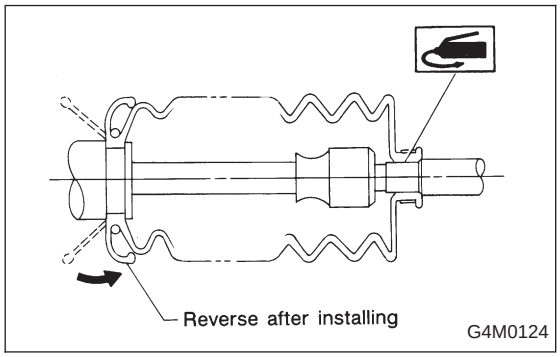
10) Install boot and mounting rubber to housing.

NOTE:
Apply grease through small hole in boot.

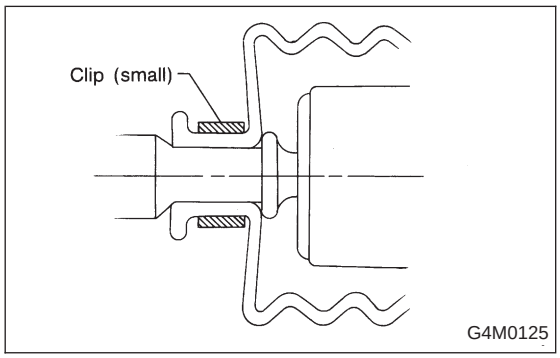


11) Fit clip (large) to boot, and then install boot to gearbox while holding boot flange.
After installing boot, fold back boot flange to the extent that large clip can not be seen.

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.
1. The groove on gearbox
2. The groove on the rod
● Make sure that boot is installed without unusual inflation or deflation.



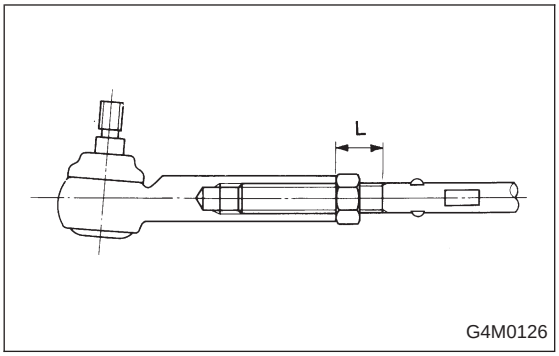
12) Turn boot until it seats well on gearbox and rubber mounting, then bend boot flange back.



13) Fix boot end with clip (small).

CAUTION:
Use screwdriver with blunted tip to prevent boot from damage, when installing.

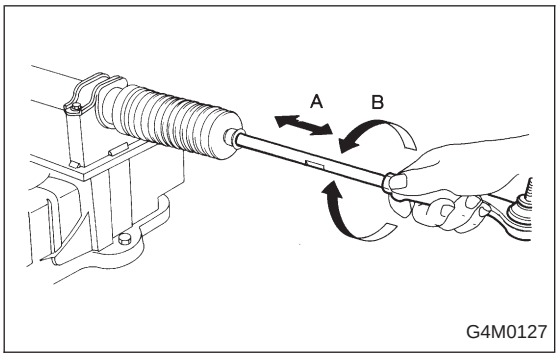
NOTE:
After installing, check boot end is positioned into groove on tie-rod.



14) If tie-rod end was removed, screw in lock nut and tie-rod end to screwed portion of tie-rod, and tighten 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.



15) Inspect gearbox as follows:

A. Holding tie-rod end, repeat lock to lock two (2) or three (3) times as quickly as possible.

B. Holding tie-rod end, turn it slowly at a radius one (1) or two (2) times as large as possible.

After all, make sure that boot is installed in the specified position without deflation.

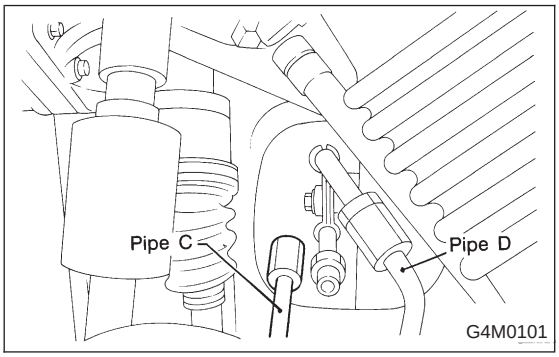
16) Remove gearbox from ST.

ST 926200000 STAND

17) Install four pipes on gearbox.

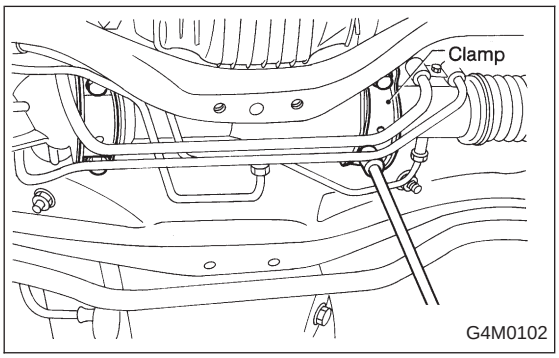
(1) Connect pipes A and B to four pipe joints of gearbox. Connect upper pipe B first, and lower pipe A.

Tightening torque:
13±3 N·m (1.3±0.3 kg-m, 9.4±2.2 ft-lb)



(2) Connect pipes C and D to gearbox.
Connect lower pipe C first, and upper pipe D second.

Tightening torque:
15±5 N·m (1.5±0.5 kg-m, 10.8±3.6 ft-lb)



E: INSTALLATION

1) Insert gearbox into crossmember, being careful not to damage gearbox boot.
2) Tighten gearbox to crossmember bracket via clamp with bolt to the specified torque.

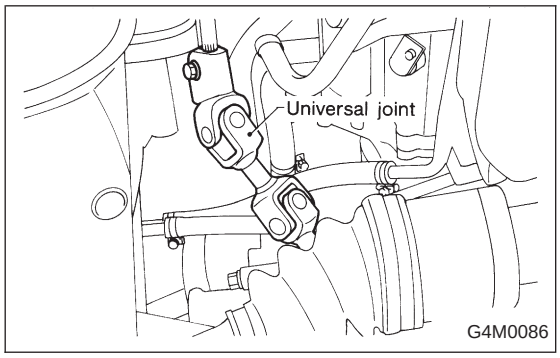
Tightening torque:
59±12 N·m (6.0±1.2 kg-m, 43±9 ft-lb)

3) How to install the joint.

(1) Push the long yoke of the joint, all the way into the serrated portion of the steering shaft, setting the bolt hole in the cutout.

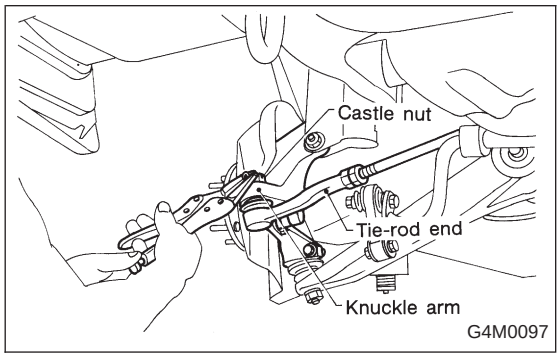
(2) Then pull the short yoke all way out of the serrated portion of the gear box, setting the bolt hole in the cutout.

(3) Insert the bolt through the short yoke, pull the joint and confirm that the bolt is on cutout of the gearbox.



(4) Fasten the short yoke side with a spring washer and bolt, then fasten the long yoke side.

Tightening torque:
24±3 N·m (2.4±0.3 kg-m, 17.4±2.2 ft-lb)



4) Connect tie-rod end and knuckle arm, and tighten with castle nut. Fit cotter pin into the nut and bend the pin to lock.

Castle nut tightening torque:
Tighten to 27.0±2.5 N·m (2.75±0.25 kg-m, 19.9±1.8 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.

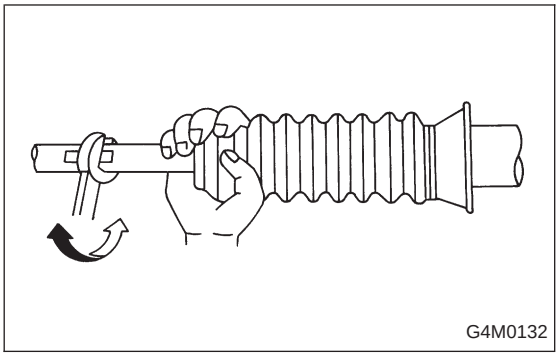
5) Install front stabilizer to vehicle.
6) Install front exhaust pipe assembly.
<Ref. to 2-9 [W1B0].>
7) Install tires.
8) Tighten wheel nuts to the specified torque.

Tightening torque:
88±10 N·m (9.0±1.0 kg-m, 65±7 ft-lb)

9) Connect ground cable to battery.
10) Pour fluid into oil tank, and bleed air. <Ref. to 4-3 [W7A0].>
11) Check for fluid leaks.
12) Install jack-up plate.

WARNING:
Be careful, exhaust manifold is hot.

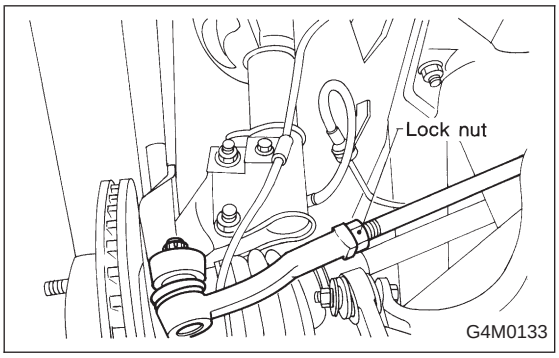
13) Lower vehicle.
14) Check fluid level in oil tank.


G4M0132

15) After adjusting toe-in and steering angle, tighten lock nut on tie-rod end.

Tightening torque:
83±5 N·m (8.5±0.5 kg-m, 61.5±3.6 ft-lb)

CAUTION:
When adjusting toe-in, hold boot as shown to prevent it from being rotated or twisted. If twisted, straighten it.



G4M0133

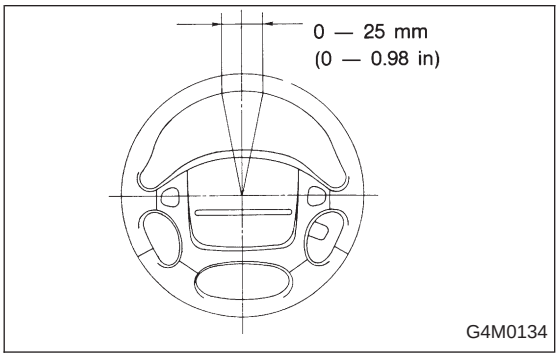
F: ADJUSTMENT

1) Adjust front toe.

Standard of front toe:
IN 3 — OUT 3 mm (IN 0.12 — OUT 0.12 in)

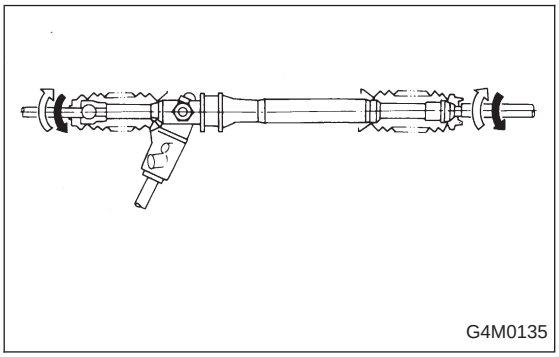
2) Adjust steering angle of wheels.

Inner wheel: 37.5° $^{+1°}_{-1.5°}$
Outer wheel: 32.6° $^{+1°}_{-1.5°}$



G4M0134

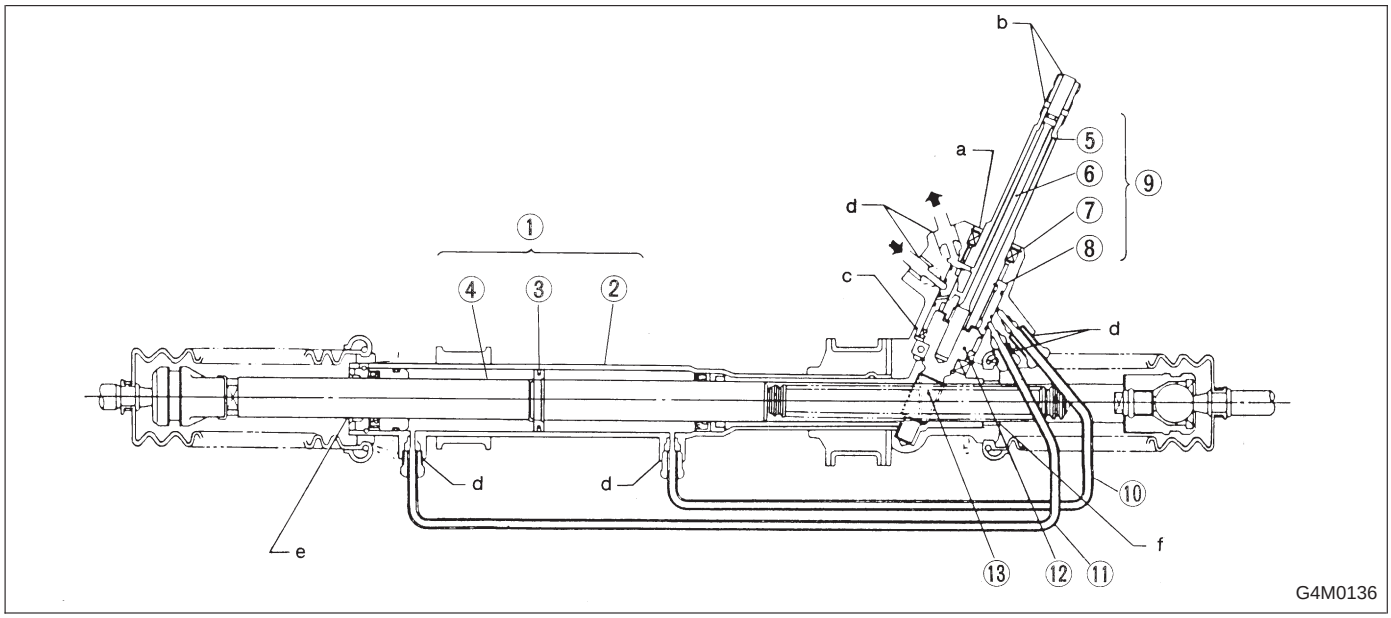
3) If steering wheel spokes are not horizontal when wheels are set in the straight ahead position, and error is more than 5° on the periphery of steering wheel, correctly re-install the steering wheel.


G4M0135

4) If 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.

4. Control Valve (Power Steering Gearbox)

NOTE:
This section focuses on the disassembly and reassembly of control valve. For the inspection and adjustment and the service procedures for associated parts, refer to “Steering Gearbox” <Ref. to 4-3 [W3A0].>



① Power cylinder
② Cylinder
③ Rack piston
④ Rack axle
⑤ Input shaft
⑥ Torsion bar
⑦ Valve housing
⑧ Valve body
⑨ Control valve
⑩ Pipe B
⑪ Pipe A
⑫ Pinion
⑬ Pinion axle

A: CHECKING OIL LEAKING POINTS

1. OIL LEAKING POINTS

1) If leak point is other than a, b, c, or d, perform check step 5 in 4-3 [W4A2] before dismounting gearbox from vehicle. If gearbox is dismounted without confirming where the leak is, it must be mounted again to locate the leak point.
2) 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.
3) Before starting oil leak repair work, be sure to clean the gearbox, hoses, pipes, and surrounding parts. After completing repair work, clean these areas again.

2. OIL LEAK CHECK PROCEDURE AND REPLACEMENT PARTS

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) Leakage from “a”
The oil seal is damaged. Replace valve assembly with a new one.
2) Leakage from “b”
The torsion bar O-ring is damaged. Replace valve assembly with a new one.

3) Leakage from “c”
The oil seal is damaged. Replace valve assembly with a new one.
4) Leakage from “d”
The pipe is damaged. Replace the faulty pipe or O-ring.
5) 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 rack bush with a new one.
(2) Leakage from “f”
There are two possible causes. Take following step first. Remove the pipe assembly B from the valve housing, and close the circuit with ST.

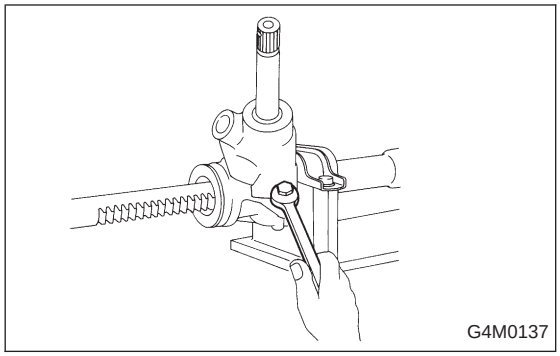
ST 926420000 PLUG

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”:**

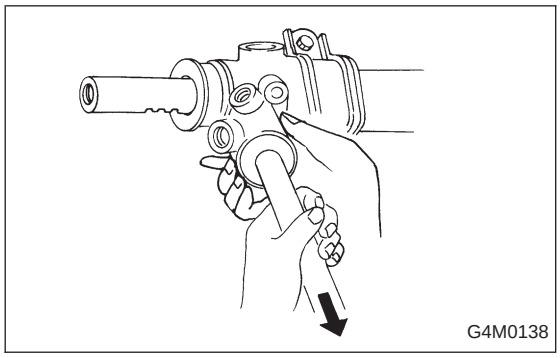
The oil seal of rack housing is damaged.
Replace the oil seal and the parts that are damaged during disassembly with new ones.


G4M0137

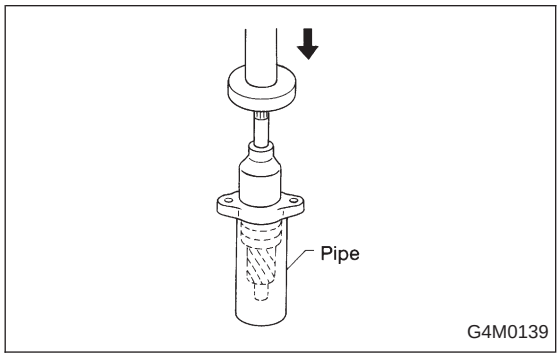
B: DISASSEMBLY

1. VALVE ASSEMBLY

1) Loosen two bolts securing valve assembly.


G4M0138

2) Carefully draw out input shaft and remove valve assembly.

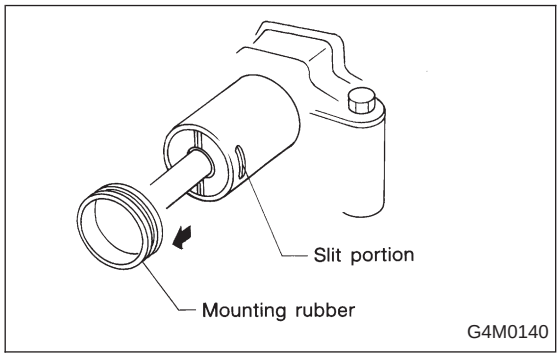


G4M0139

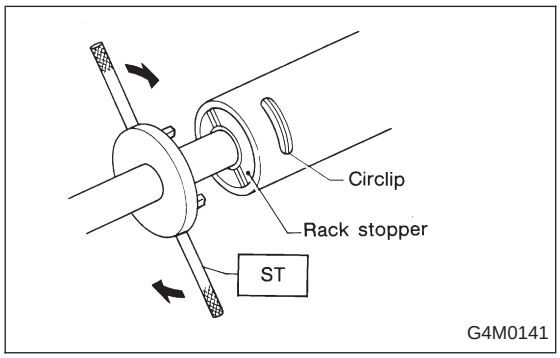
3) Draw out pinion and valve assembly from valve housing, as necessary, using pipe of I.D. 44 to 46 mm (1.73 to 1.81 in) and a press.

2. RACK ASSEMBLY

1) Slide mounting rubber to expose slit.



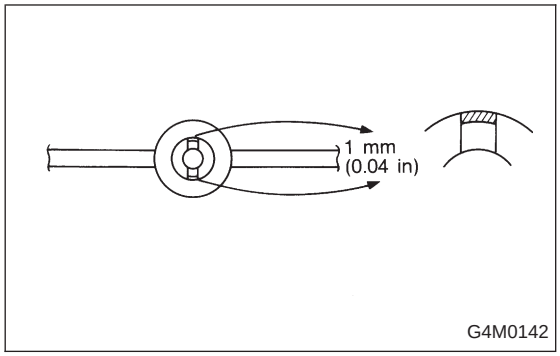
G4M0140



G4M0141

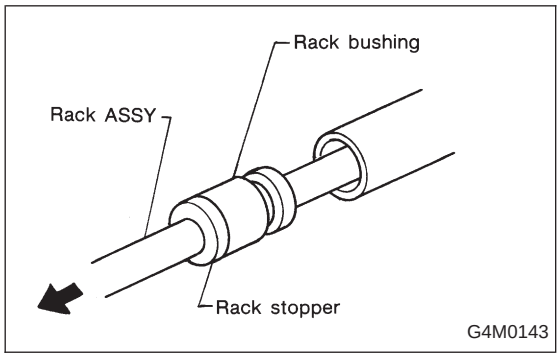
2) Rotate rack stopper in the direction of arrow using ST until the end of circlip comes out of stopper, then rotate it in the opposite direction, and pull out circlip.

ST 926340001 WRENCH



NOTE:
If ST is used, grind area (shown in figure) by 1 mm (0.04 in) in advance.

ST 926340000 WRENCH



3) Pull rack assembly from cylinder side, and draw out rack bushing and rack stopper together with 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.

4) Remove rack bushing and rack stopper from rack assembly.

CAUTION:
Do not reuse removed rack bushing and circlip.

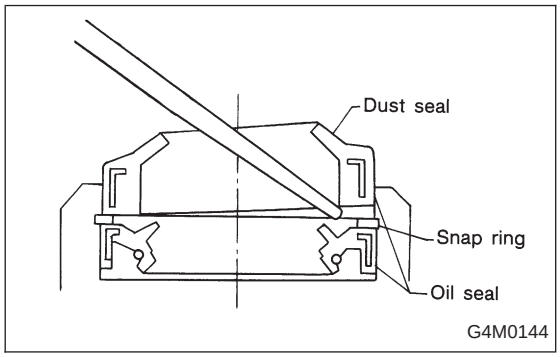
C: REPLACEMENT OF SEAL AND PACKING

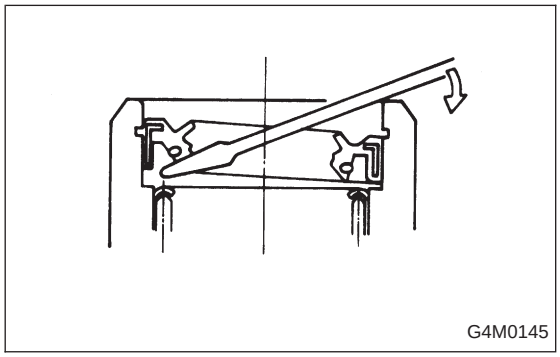
1. VALVE HOUSING OIL SEAL

● Removal

1) Pry off dust seal using screwdriver.

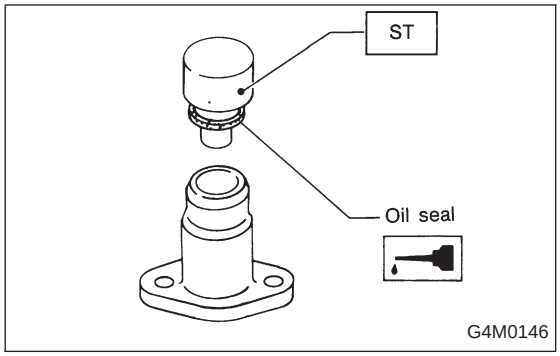
2) Remove snap ring using snap ring pliers.





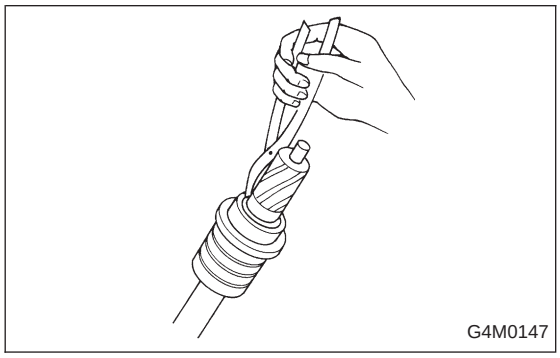
3) Pry off oil seal using screwdriver.

CAUTION:
After removing, check inside surface of valve housing for damage. If oil seal contacting surface is damaged, replace valve housing with a new one.



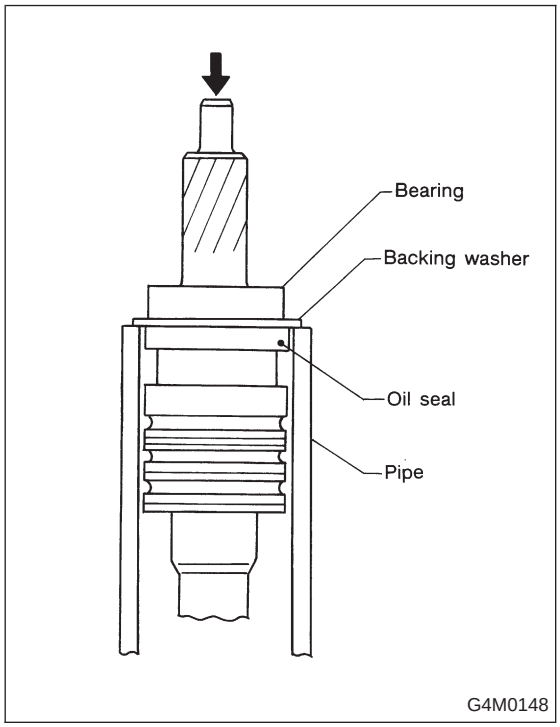
● Installation
1) Press-fit oil seal into valve housing using ST and press.
ST 927610000 INSTALLER
NOTE:
Before fitting, coat oil seal fully with ATF DEXRON II or II-E.

2) Fit snap ring in snap ring groove using snap ring pliers.
CAUTION:
Be careful not to scratch oil seal with snap ring pliers.
NOTE:
Rotate snap ring to check for proper installation.



2. PINION AND VALVE ASSEMBLY

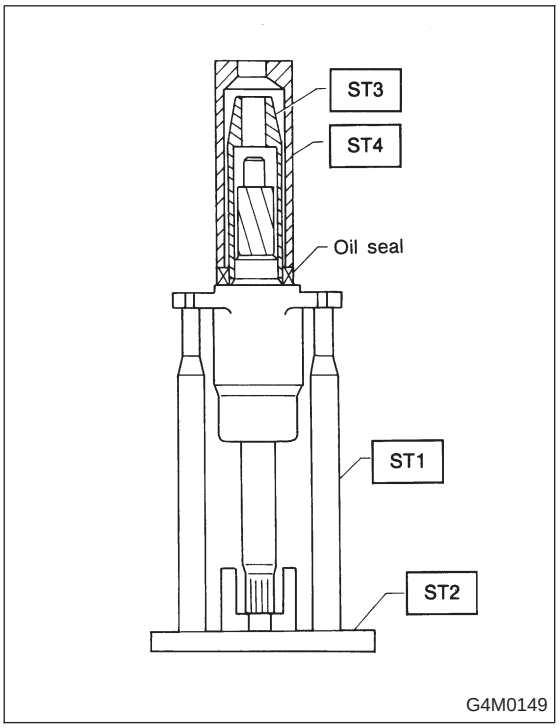
● Removal
1) Remove snap ring using snap ring pliers.
CAUTION:
- **Do not reuse removed snap ring.**
- **Be careful not to scratch pinion and valve assembly.**



2) Press out bearing together with backing 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.
3) Remove oil seal.
CAUTION:
Do not reuse removed oil seal.

● Installation
1) Fit pinion and valve assembly into valve housing.

NOTE:
Apply ATF DEXRON II or II-E to outer diameter surface of input shaft and outer surface of valve body seal ring, and pay special attention not to damage seal when inserting pinion and valve assembly.



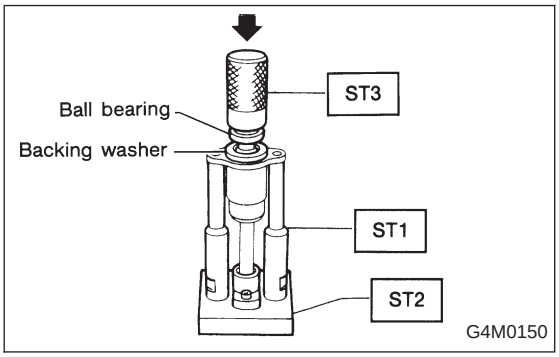
2) Secure valve assembly to ST1 and ST2.

3) Put ST3 over pinion, and insert oil seal, then force-fit oil seal into housing using ST4.

NOTE:
● Apply ATF DEXRON II or II-E to oil seal and ST3, being careful not to damage oil seal lip.
● Push oil seal until ST3 contacts housing end face.

4) Remove ST3, and fit backing washer.

ST1	926370000	INSTALLER A
ST2	927630000	STAND BASE
ST3	926360000	INSTALLER A
ST4	927620000	INSTALLER B



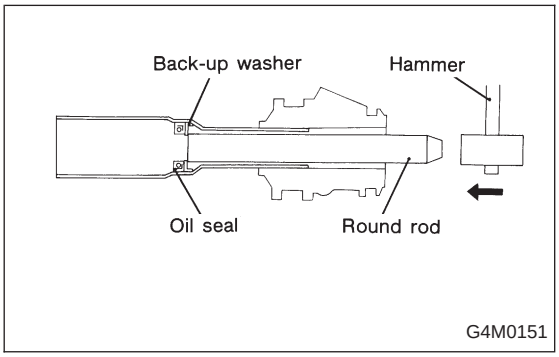
5) Force-fit ball bearing using ST3.

ST1	926370000	INSTALLER A
ST2	927630000	STAND BASE
ST3	927640000	INSTALLER B

NOTE:
Be careful not to tilt ball bearing during installation.

6) Install snap ring using snap ring pliers.

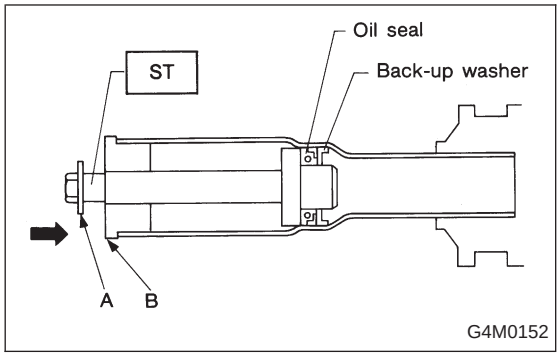
NOTE:
Rotate snap ring to check for proper installation.



3. RACK HOUSING OIL SEAL AND BACK-UP WASHER

● Removal
1) Insert a round rod [26 — 27 mm (1.02 — 1.06 in) dia.] from pinion housing side and remove oil seal and back-up washer by hammering the rod.

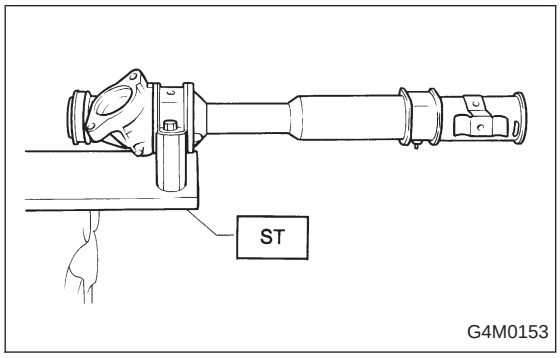
NOTE:
● Discard removed oil seal and back-up washer.
● Apply the unchamfered end of remover to back-up washer.



● Installation
2) Force-fit oil seal and back-up washer using ST.
ST 927650000 INSTALLER

CAUTION:
Be careful not to damage or scratch cylinder inner wall.

NOTE:
● Apply ATF DEXRON II or II-E to oil seal.
● Pay special attention not to install back-up washer and oil seal in wrong direction.
● Push oil seal until the stepped portion of A contacts end face of B.

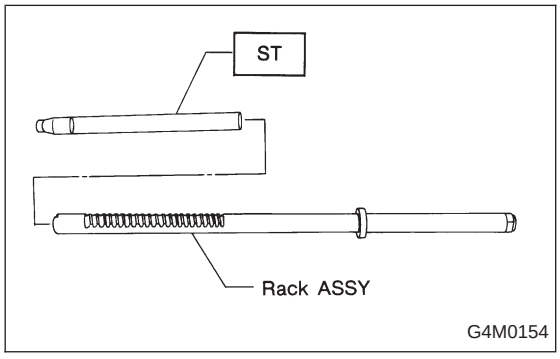


D: ASSEMBLY

1. RACK ASSEMBLY

1) Fixing rack housing
Fix 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.**

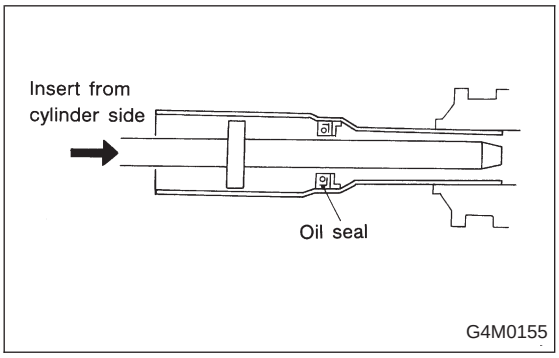


2) Fit ST over toothed portion of rack assembly, and check for binding or unsmooth insertion. If any deformation is noted on flats at the end of rack, shape by using file, and wash with cleaning fluid.

3) Apply genuine grease to teeth of thoroughly washed rack assembly, and fit ST over the toothed portion.
ST 926390001 COVER and REMOVER

NOTE:
● Be careful not to block air passage with grease. Remove excessive grease.

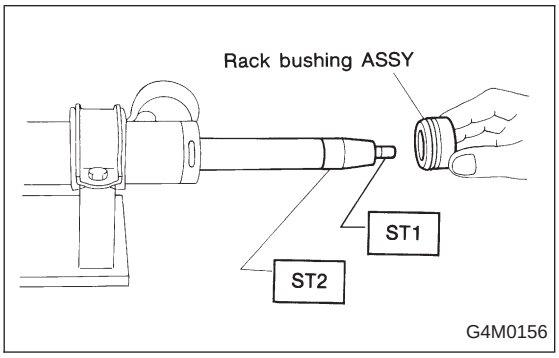
● After fitting cover, check air passage hole for clogging. If clogged, open by removing grease from the hole.
● Check rack shaft for damage.
● Apply ATF DEXRON II or II-E to this ST and surface of piston ring to prevent seal from being damaged.



4) Insert rack assembly into 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 ATF DEXRON II or II-E to surfaces of ST and rack piston.

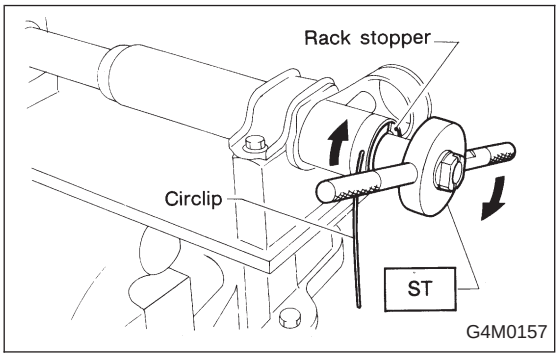
ST 926390001 COVER AND REMOVER



5) 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 ATF DEXRON II or II-E before installing, and pay attention not to damage O-ring and oil seal.



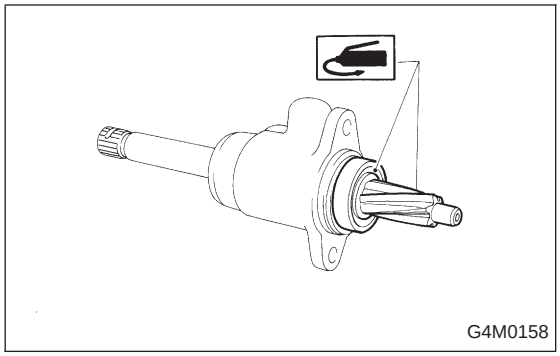
6) Insert rack stopper into cylinder tube until internal groove (on cylinder side) is aligned with external groove (on rack stopper). Turn rack stopper with ST so that rack stopper hole is seen through cylinder slits.
7) Insert rack stopper into rack housing, and wrap circlip using ST to secure rack stopper in position.

ST 926340001 WRENCH

CAUTION:
Be careful not to scratch rack while winding circlip.

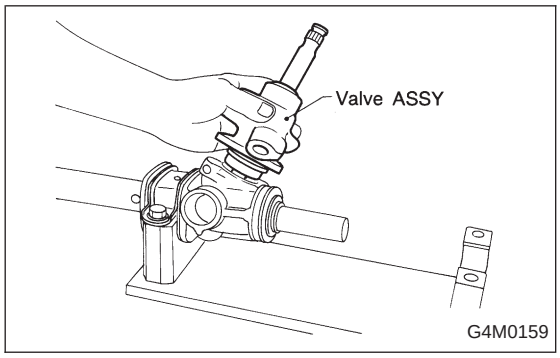
NOTE:
Rotate wrench another 90 to 180° after the end of circlip has been wrapped in.

8) Fit mounting rubber onto rack housing.


G4M0158

2. VALVE ASSEMBLY

1) Apply genuine grease to pinion gear and bearing of valve assembly.



G4M0159

2) Install packing on valve assembly. Insert valve assembly into place while facing rack teeth toward pinion.

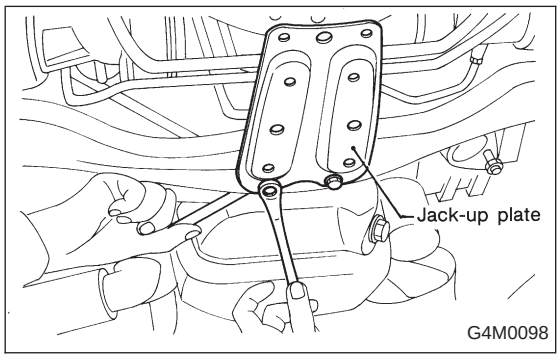
CAUTION:
Be sure to use a new packing.

NOTE:
Do not allow packing to be caught when installing valve assembly.

3) Tighten bolts alternately to secure valve assembly.

Tightening torque:
25±5 N·m (2.5±0.5 kg-m, 18.1±3.6 ft-lb)

CAUTION:
Be sure to alternately tighten bolts.

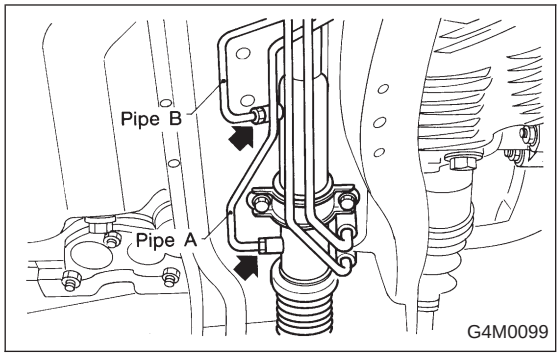


G4M0098

5. Pipe Assembly (Power Steering System)

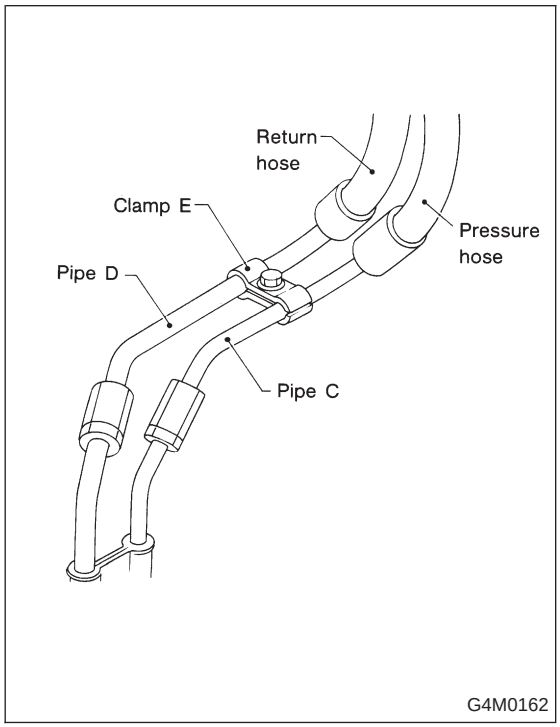
A: REMOVAL

1) Disconnect battery minus terminal.

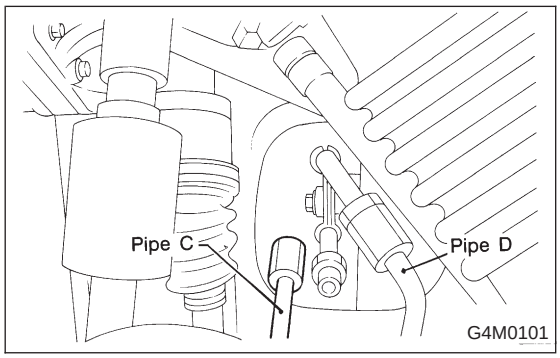


2) Lift vehicle and remove jack-up plate.
3) Remove one pipe joint at the center of gearbox, and connect vinyl hose to pipe and joint. Discharge fluid by turning steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.

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.

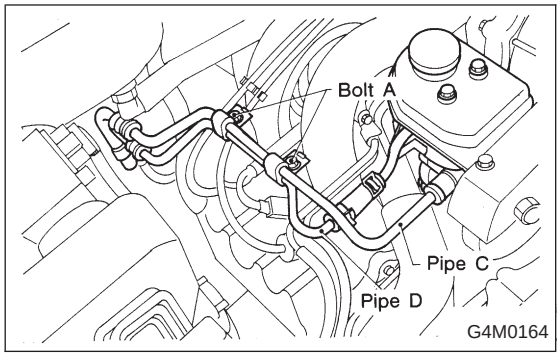


4) Remove clamp E from pipes C and D.



5) Disconnect pipe C from pipe (on the gearbox side).

CAUTION:
● When disconnecting pipe C, use two wrenches to prevent deformities.
● Be careful to keep pipe connections free from foreign matter.



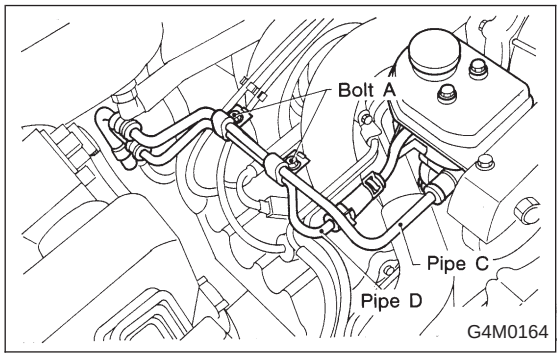
6) Remove bolt A.
Disconnect pipe C from oil pump. Disconnect pipe D from oil tank.

CAUTION:
● Do not allow fluid from the hose end to come into contact with pulley belt.
● To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.

B: CHECK

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.



C: ASSEMBLY

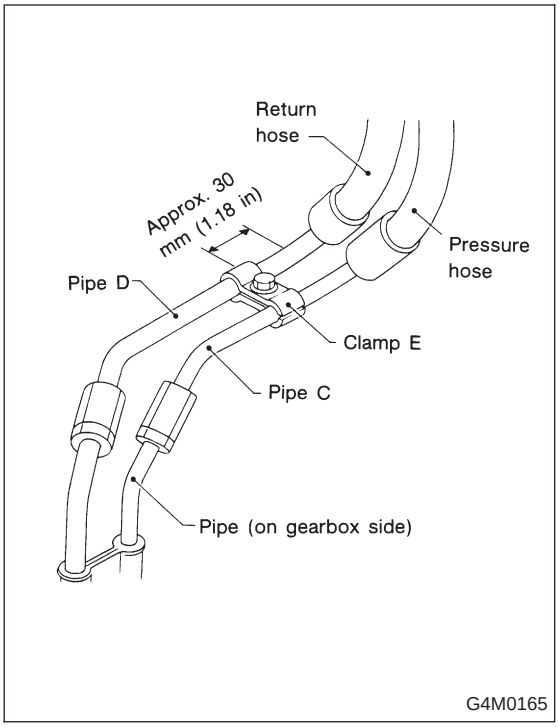
1) Interconnect pipes C and D.

Tightening torque:
Joint nut
15±5 N·m (1.5±0.5 kg-m, 10.8±3.6 ft-lb)

CAUTION:
Visually check that hose between tank and pipe D is free from bending or twisting.

2) Tighten bolt A.

Tightening torque:
13±3 N·m (1.3±0.3 kg-m, 9.4±2.2 ft-lb)



3) Temporarily connect pipes C and D to pipes (on the gearbox side).
4) Temporarily install clamp E on pipes C and D.

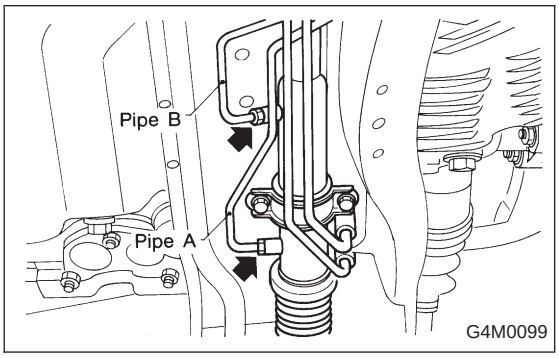
CAUTION:
Ensure that the "8" letter side of clamp E is on the pipe C side.

5) Tighten joint nut.

Tightening torque:
15±5 N·m (1.5±0.5 kg-m, 10.8±3.6 ft-lb)

6) Tighten clamp E firmly.

Tightening torque:
5.4±1.5 N·m (0.55±0.15 kg-m, 4.0±1.1 ft-lb)

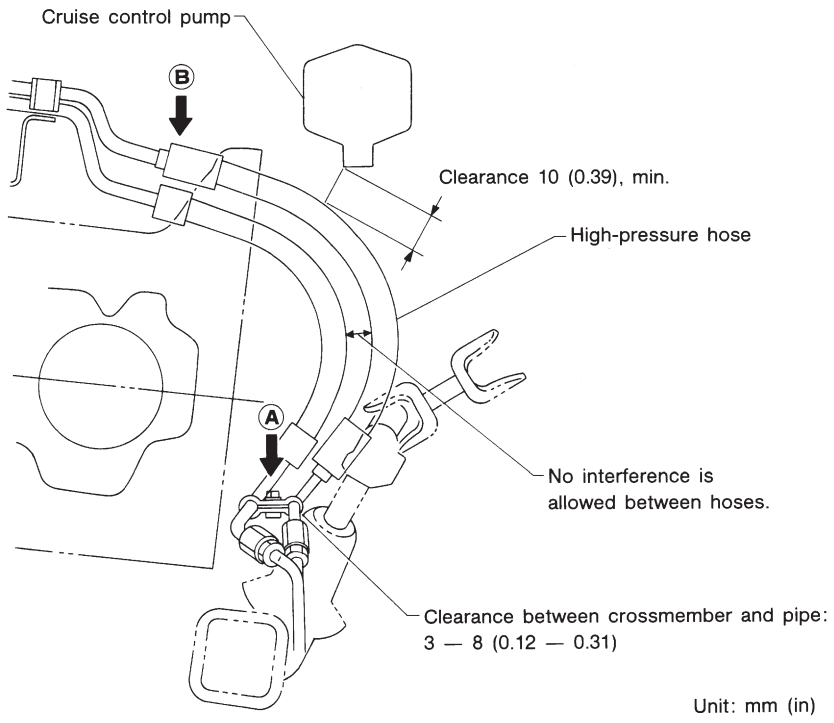


7) Connect pipes A and B to four pipe joints of gearbox. Connect upper pipe B first, and lower pipe A second.

Tightening torque:
13±3 N·m (1.3±0.3 kg-m, 9.4±2.2 ft-lb)

8) Install jack-up plate.
9) Connect battery minus terminal.
10) Feed the specified fluid and discharge air.

NOTE:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

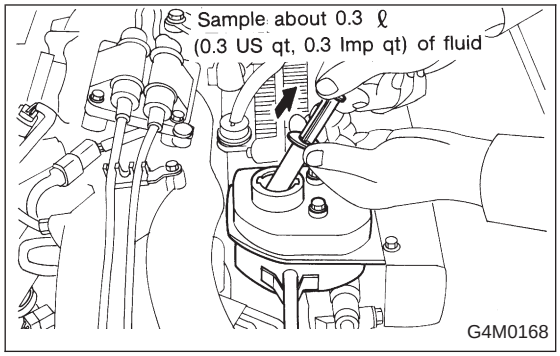


11) Finally check clearance between pipes and/or hoses, as shown above.

If clearance between cruise control pump and power steering hose is less than 10 mm (0.39 in), proceed as follows:

(1) Move clamped section Ⓐ (refer to figure above) down to a point where pipe is close to crossmember (pipe-to-crossmember clearance: 10 mm (0.39 in), min.).

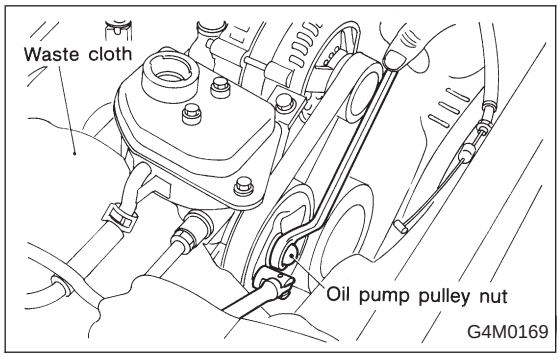
(2) Check that clearance between cruise control pump and power steering hose is at least 10 mm (0.39 in). If it is not, bend section Ⓑ down until a clearance of at least 10 mm (0.39 in) is obtained.



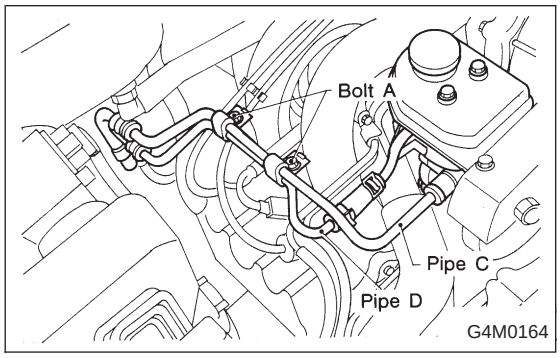
6. Oil Pump (Power Steering System)

A: REMOVAL

1) Remove ground cable from battery.
2) Drain the working fluid about 0.3 ℓ (0.3 US qt, 0.3 Imp qt) from oil tank.
3) Remove pulley belt cover bracket.

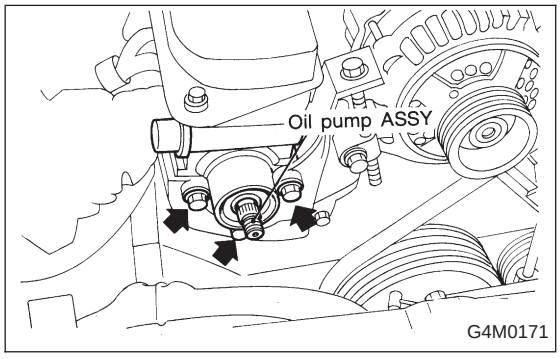


4) Loosen oil pump pulley nut, then remove bolts which secure alternator.
5) Loosen pulley belt(s).
6) Remove the nut and detach oil pump pulley.



7) Disconnect pipe C from oil pump. Disconnect pipe D from oil 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 and pipe, cover the open ends of them with a clean cloth.
● Except when only oil tank needs to be inspected, detach oil tank and oil pump as a unit. Then separate one from the other on a work bench to prevent oil from spilling on any part of the engine.



8) Remove three bolts from the front side of oil pump and detach the pump.
9) Remove three bolts from the lower side of bracket and detach the bracket.

CAUTION:
The bracket does not need to be removed unless it is damaged.

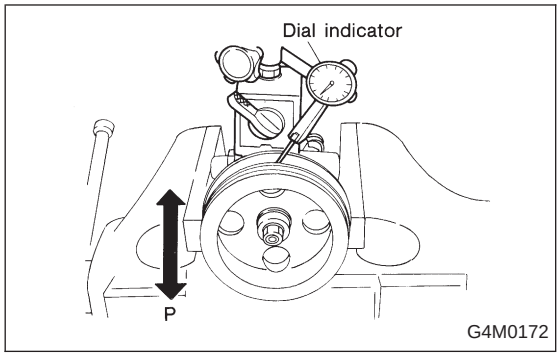
10) Place oil pump in a vise, remove two bolts from the upper side of oil tank and detach oil tank.

CAUTION:
Do not place oil pump directly in the vise; use soft pads and hold oil pump lightly to protect the pump.

B: CHECK

● 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 oil pump with a new one.
		(2) Play of pulley shaft	Measure radial play and axial play. If any of these exceeds the service limit, replace oil pump with a new one. <Ref. to 4-3 [W6B1].>
2	Pulley	(1) Damage	Replace it with a new one.
		(2) Bend	Measure V ditch deflection. If it exceeds the service limit, replace pulley with a new one. <Ref. to 4-3 [W6B1].>
3	Cap	Crack or damage	Replace it with a new one.
4	Strainer	(1) Clogging with dirt	Wash it.
		(2) Breakage	Replace it with a new one.
5	Oil pump (Interior)	(1) Defect or burning of vane pump	Check resistance to rotation of pulley. If it is past the service limit, replace oil pump with a new one. <Ref. to 4-3 [W6B1].>
		(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 oil pump with a new one.
6	O-ring	Crack or deterioration	Replace it with a new one.
7	Oil tank	Crack, damage or oil leakage	Replace it with a new one.
8	Bracket	Crack	Replace it with a new one.



1. SERVICE LIMIT

Make a measurement as follows. If it exceeds the specified service limit, replace the parts with new ones.

CAUTION:

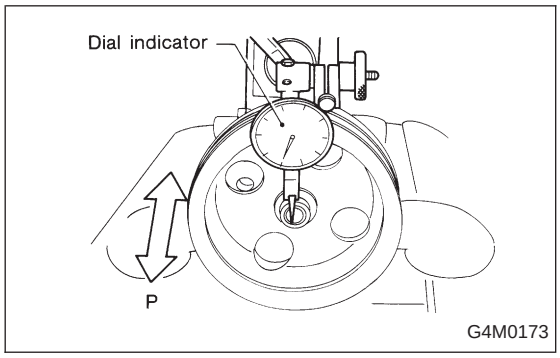
● Fix oil pump on a vise to make a measurement. At this time, hold oil pump with the least possible force between two wood pieces.

● 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.

Play of pulley shaft

Service limit:

Radial play (Direction ⟷)
0.4 mm (0.016 in) or less
Axial play (Direction ⟺)
0.9 mm (0.035 in) or less

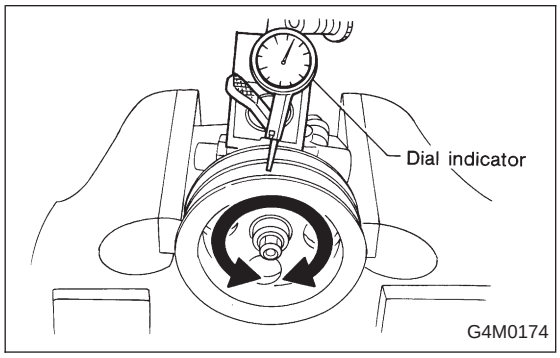


Ditch deflection of pulley

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.

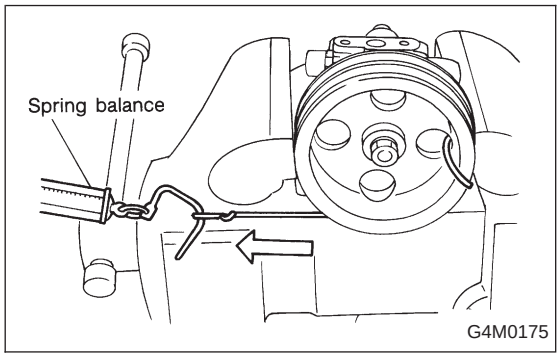


Resistance to rotation of pulley

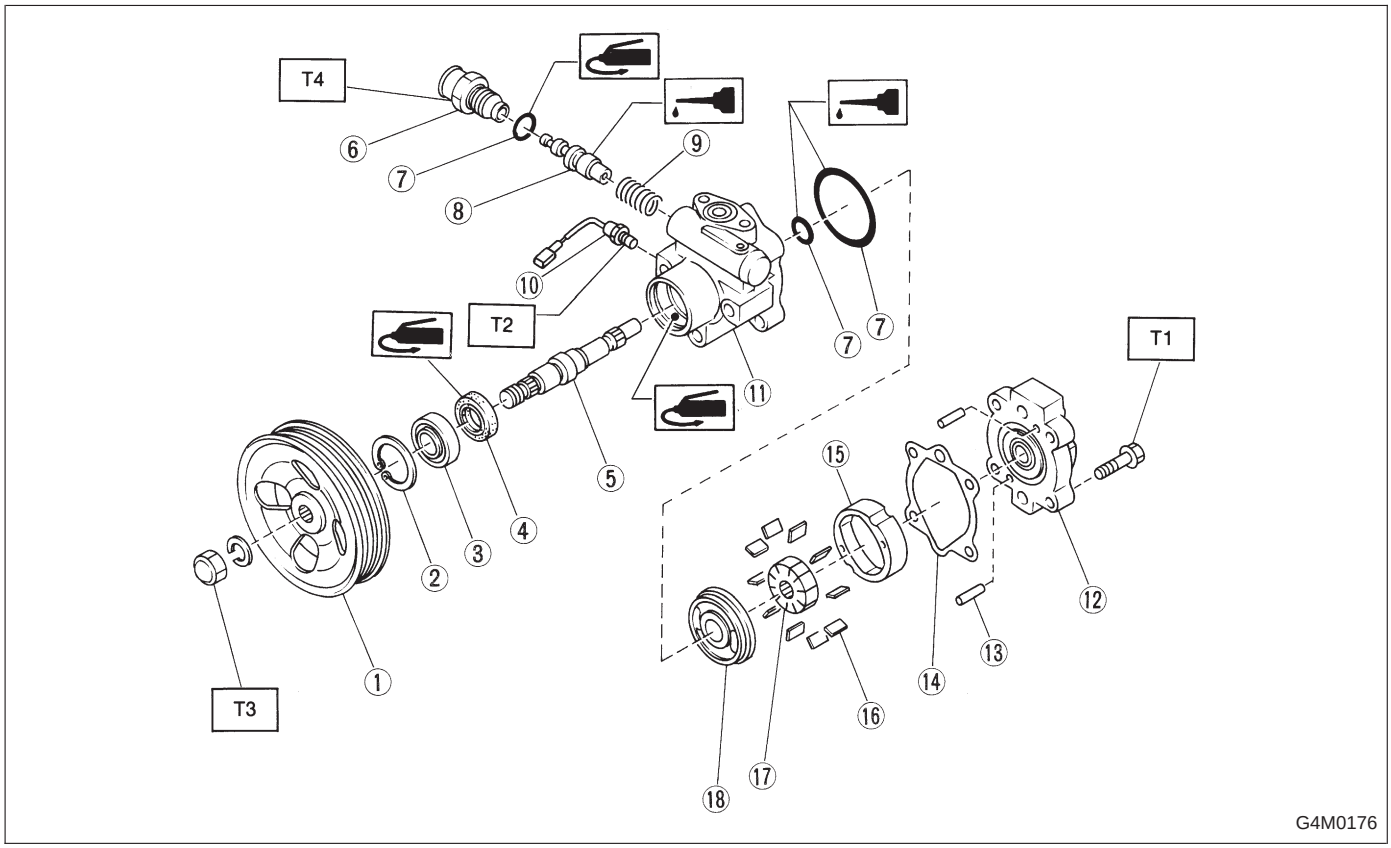
Service limit:

Maximum load; 9.22 N (0.94 kg, 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.

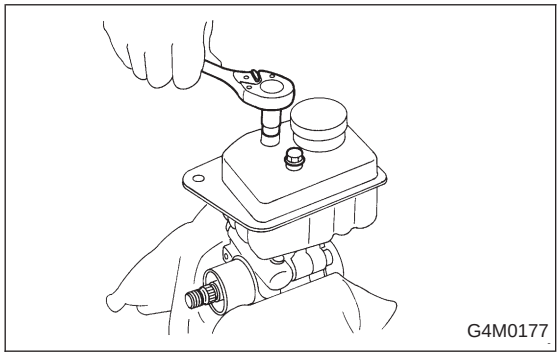


C: DISASSEMBLY



① Pulley
② Snap ring
③ Bearing
④ Oil seal
⑤ Shaft
⑥ Connector
⑦ O-ring
⑧ Spool valve
⑨ Spring
⑩ Pressure switch
⑪ Front casing
⑫ Rear cover
⑬ Knock pin
⑭ Seal washer
⑮ Cam ring
⑯ Vane
⑰ Rotor
⑱ Side plate

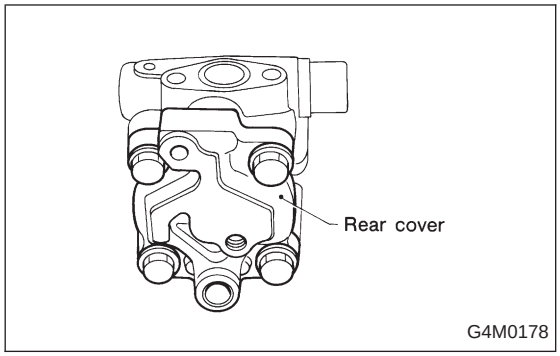
Tightening torque: N·m (kg-m, ft-lb)
T1: 16±2 (1.6±0.2, 11.6±1.4)
T2: 20±3 (2.0±0.3, 14.5±2.2)
T3: 52±10 (5.3±1.0, 38±7)
T4: 74±5 (7.5±0.5, 54.2±3.6)



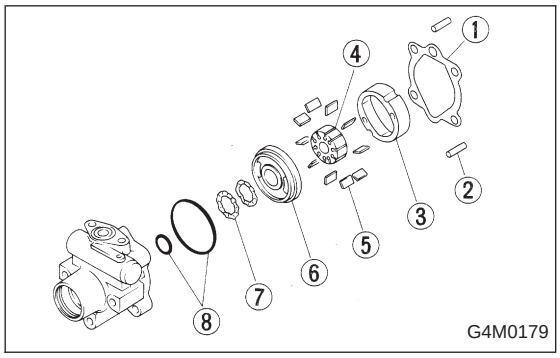
1) Oil pump body

(1) Place oil pump in a vise, and loose bolts which secure tank.

CAUTION:
Do not clamp oil pump too hard; otherwise oil pump may be dented.



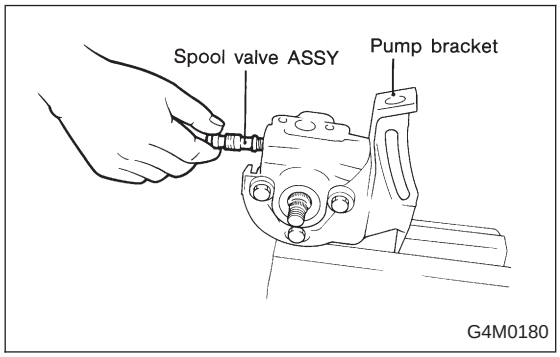
(2) Remove four bolts which secure rear cover.



(3) Remove the following parts from front casing.

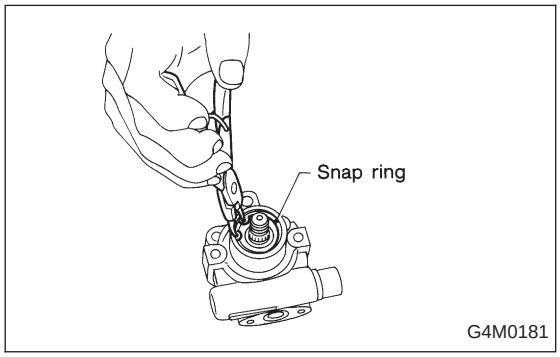
① Seal washer
② Knock pin .....2 ea.
③ Cam ring
④ Rotor
⑤ Vane .....10 ea.
⑥ Side plate
⑦ Wave washer .....2 ea.
⑧ O-ring .....2 ea.

CAUTION:
Discard old seal washer; replace with a new one.

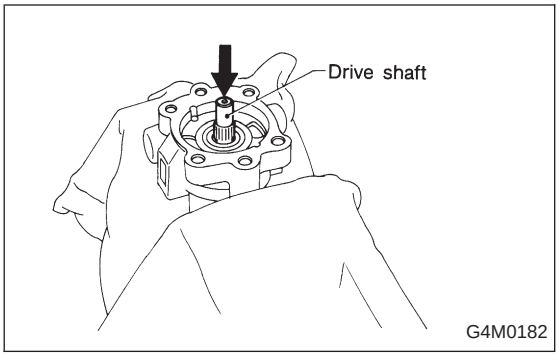


2) Control valve
Slightly loosen outlet connector, and remove connector. Remove the following parts for pump casing.

- Spool valve assembly
- Flow control spring
- Connector
- O-ring

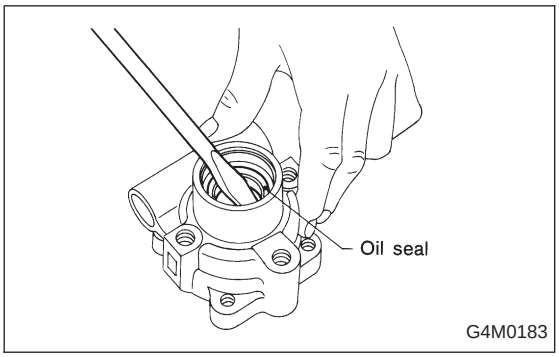


3) Shaft
(1) Remove snap ring from front casing.



(2) Remove shaft using a hand press.

CAUTION:
● Discard old shaft assembly; replace with a new one.
● Be careful not to scratch or dent casing's surface which serves as a seal.



(3) Pry oil seal off using a screwdriver.

CAUTION:
Be careful not to scratch inner surface of casing.

4) Remove pressure switch.

D: 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. Side plate	Wear and damage on sliding surfaces	Replace with a new one.
5. Cam ring	Ridge wear on sliding surfaces	If 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 damage is serious, replace with a new cartridge assembly.
8. Spool valve	Damage or burrs on sliding surface periphery	Replace with a new one together with front casing as selective fit is made.
9. Connector	Damage on threads	Replace with a new one.
10. Spring	Damage	Replace with a new one.
11. Bolts and nuts	Damage on threads	Replace with a new one.

E: ASSEMBLY

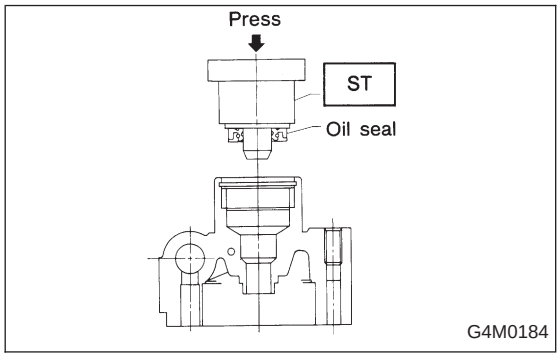
1) Reassembly precautions

(1) Whenever O-rings, oil seals, and snap rings are removed, they must be replaced with new ones.
(2) Thoroughly wash 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 parts are kept away from 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 parts are free from rust. (Use specified hydraulic oil for rust prevention after cleaning and drying.)
(6) Reverse the sequence of disassembly procedures.

2) Shaft

(1) Apply grease to oil seal and inner surface of front casing (at bearing location).

CAUTION:
Make sure that the front body internal surfaces are free from damage.

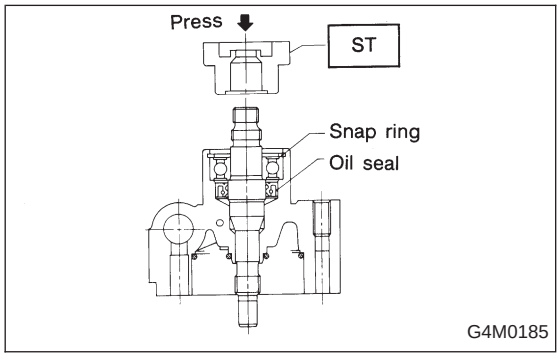


(2) Using ST, press-fit oil seal into front body.

ST 340099AA000 INSTALLER

CAUTION:
When press-fitting, use care to prevent damage to surface mating with rear body.

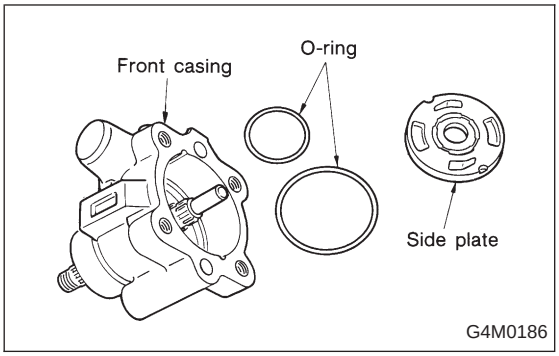
NOTE:
Orient oil seal toward correct direction.



(3) Using ST, press-fit shaft assembly into front body and mount snap ring.

ST 340099AA020 INSTALLER

NOTE:
Turn snap ring to ensure that it fits right into the groove.

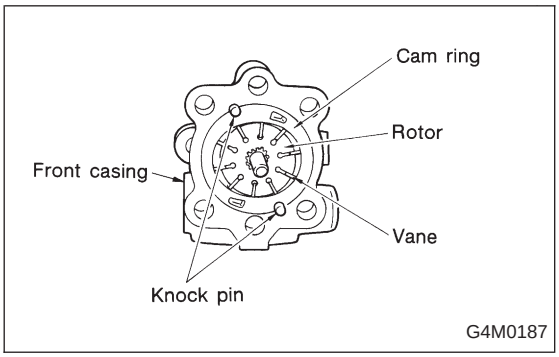


3) Cartridge assembly

(1) Apply specified hydraulic oil to O-rings and fit them into front casing.

(2) Install side plate to front casing.

CAUTION:
Use care not to let side plate gall.

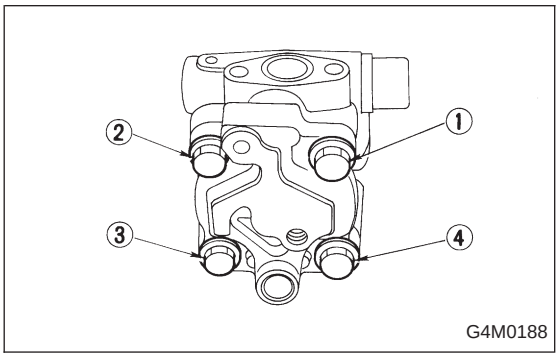


(3) Mount rotor onto shaft.

(4) Install 10 vanes into rotor with their nose radius facing toward cam ring.

(5) Install cam ring to front casing, securing with knock pins.

CAUTION:
Do not use hammer to fit knock pins in position.



4) Rear cover

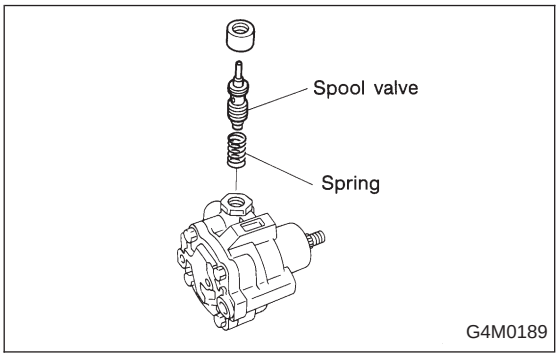
(1) Mount seal washer on front casing.

(2) With knock pin positions aligned, install rear cover.

Tightening torque:
16±2 N·m (1.6±0.2 kg-m, 11.6±1.4 ft-lb)

CAUTION:

Loosely tighten bolts in the sequence (1), (3), (2), and (4) shown in figure. Then, tighten in the same sequence.



5) Spool Valve

(1) Install spring into front casing. Then, with spool valve dipped in specified hydraulic oil, install it into the front casing.

(2) Using a 5-mm dia. round bar, ensure that valve moves smoothly.

(3) Set O-ring, with grease applied to it, onto connector and secure connector to front casing.

Tightening torque:
74±5 N·m (7.5±0.5 kg-m, 54.2±3.6 ft-lb)

CAUTION:
- **Use care to prevent damage to O-ring at installation.**
- **When tightening connector, ensure that O-ring does not protrude or get caught.**

6) Check

(1) When reassembly procedures have been completed, turn 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.

(2) 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

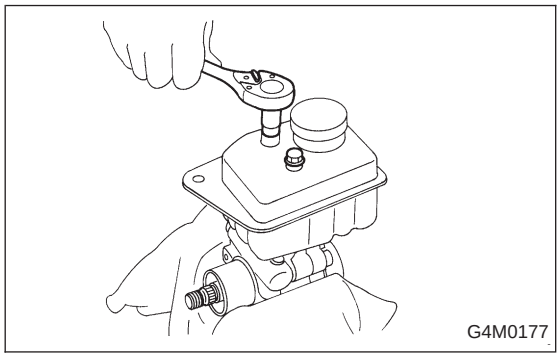
F: INSTALLATION

1) Install bracket on engine.

Tightening torque:
22±2 N·m (2.2±0.2 kg-m, 15.9±1.4 ft-lb)

2) Install oil pump on oil tank as follows outside the vehicle:

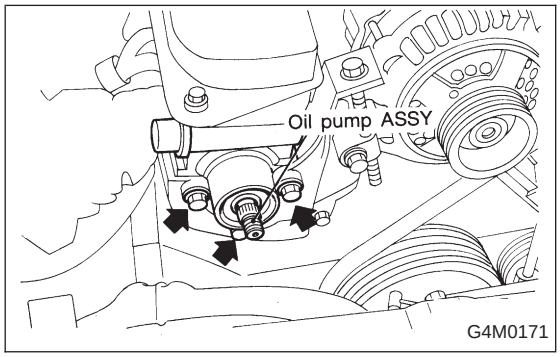
NOTE:
Prior to installation, make sure that all oil is removed from oil pump, oil tank and pipe.


G4M0177

(1) Place oil pump in vise, tighten the two bolts on upper side of oil tank to oil pump.

Tightening torque:
25±7 N·m (2.5±0.7 kg-m, 18.1±5.1 ft-lb)

CAUTION:
Do not place oil pump directly in vise; use soft pads and hold oil pump lightly to protect it.

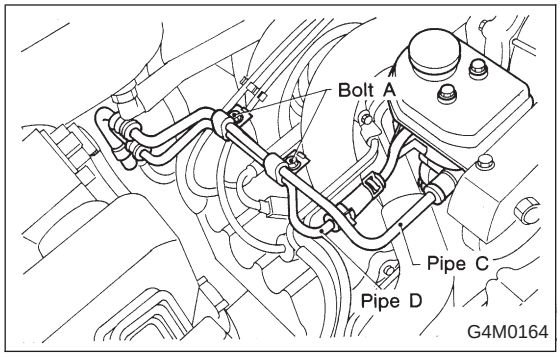


G4M0171

3) Install oil pump, previously assembled to oil tank, on bracket.

Tightening torque:
20.1±2.5 N·m (2.05±0.25 kg-m, 14.8±1.8 ft-lb)

4) Place oil pump pulley and tighten pulley nut temporarily.



5) Interconnect pipes C and D.

Tightening torque:
Joint nut
15±5 N·m (1.5±0.5 kg-m, 10.8±3.6 ft-lb)

CAUTION:
If a hose is twisted at this step, the hose may come into contact with some other parts.

6) Install pulley belt to oil pump.
7) Tighten oil pump pulley nut to the specified torque.

Tightening torque:
52±10 N·m (5.3±1.0 kg-m, 38±7 ft-lb)

8) Check pulley belt tension. <Ref. to 1-5 [01A0].>
9) Tighten bolt belt tension.

Tightening torque:
8±2 N·m (0.8±0.2 kg-m, 5.8±1.4 ft-lb)

10) Install pulley belt cover bracket.
11) Connect minus terminal of battery.
12) Feed the specified fluid and discharge air.

NOTE:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

7. Power Steering Fluid

A: RECOMMENDED AIR BLEEDING AND POWER STEERING FLUID

Recommended power steering fluid	Manufacturer
ATF DEXRON II or IIE	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

1) Feed the specified fluid with its level being about 4 cm (1.6 in) lower than the mouth of tank.
2) Continue to turn steering wheel slowly from lock to lock until 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 steering wheel slowly from lock to lock again until 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 steering wheel from lock to lock until 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.

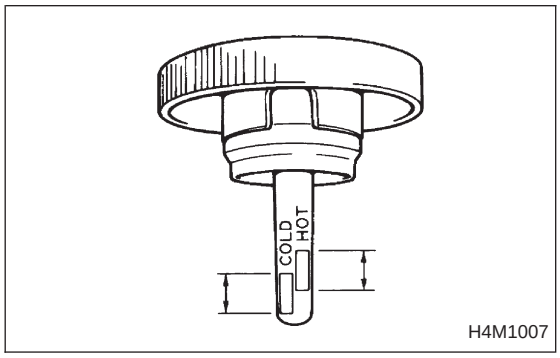
10) Check the fluid leakage at flare nuts after turning steering wheel from lock to lock with engine running.

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.**

11) Inspect fluid level on flat and level surface with engine "OFF" by indicator of filler cap.
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 fluid by using a syringe or the like.

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

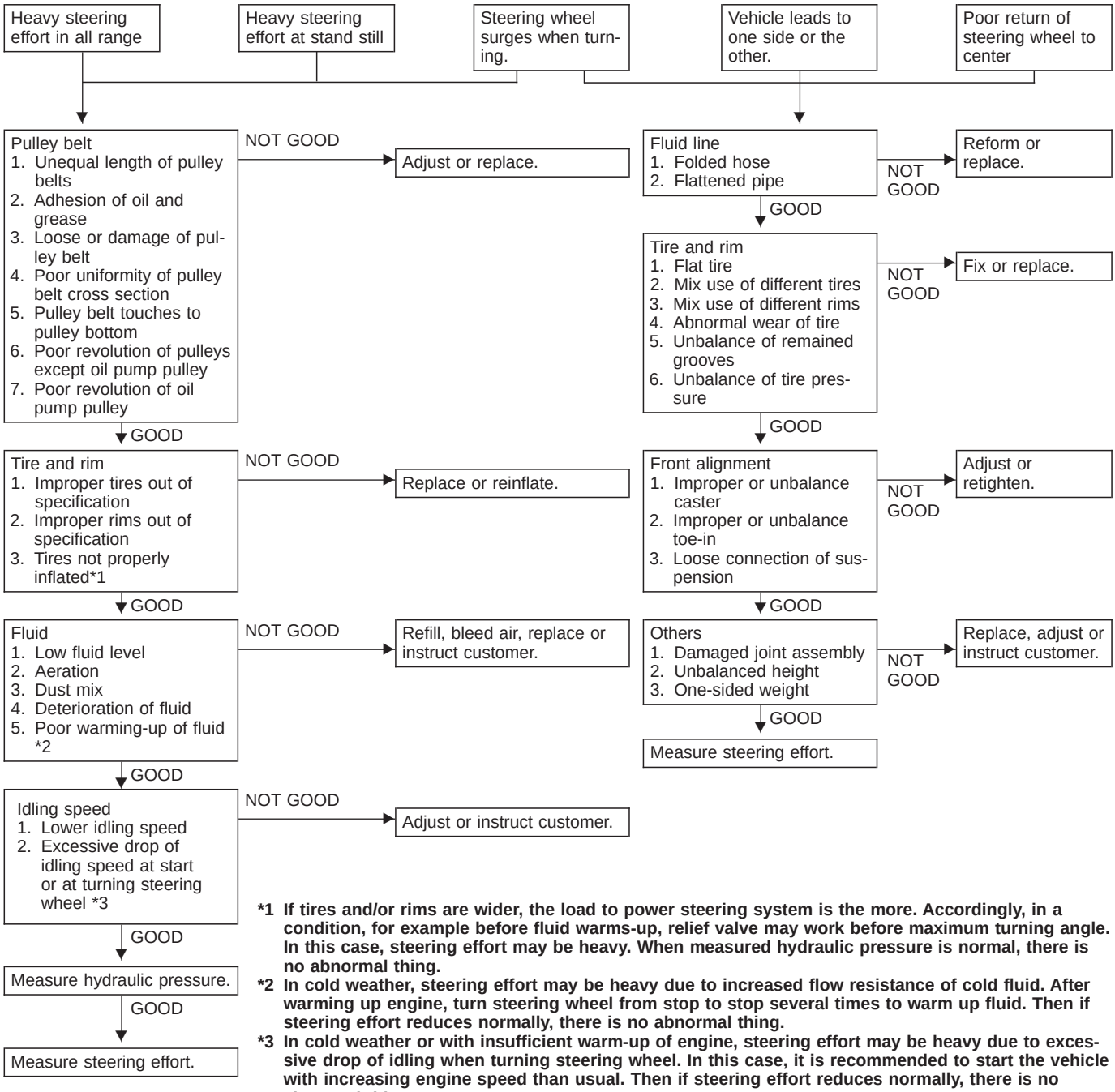


(1) Check at temperature 21°C (70°F) on reservoir surface of oil pump, read the fluid level on the "COLD" side.

(2) Check at temperature 60°C (140°F) on reservoir surface of oil pump, read the fluid level on the "HOT" side.

1. Power Steering

1. STEERING CONDITION



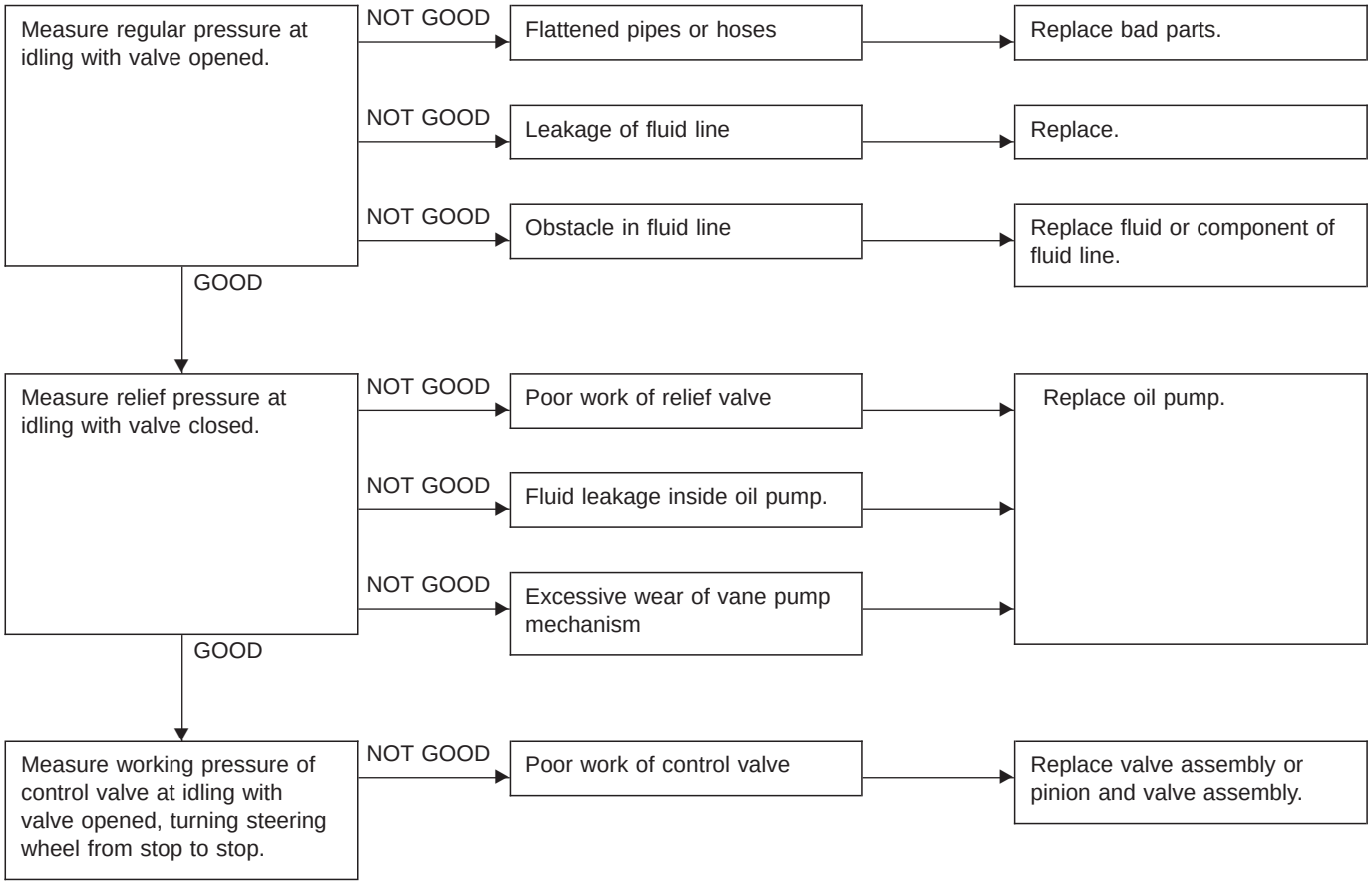
***1 If tires and/or rims are wider, the load to power steering system is the more. Accordingly, in a condition, for example before fluid warms-up, relief valve may work before maximum turning angle. In this case, steering effort may be heavy. When measured hydraulic pressure is normal, there is no abnormal thing.**

***2 In cold weather, steering effort may be heavy due to increased flow resistance of cold fluid. After warming up engine, turn steering wheel from stop to stop several times to warm up fluid. Then if steering effort reduces normally, there is no abnormal thing.**

***3 In cold weather or with insufficient warm-up of engine, steering effort may be heavy due to excessive drop of idling when turning steering wheel. In this case, it is recommended to start the vehicle with increasing engine speed than usual. Then if steering effort reduces normally, there is no abnormal thing.**

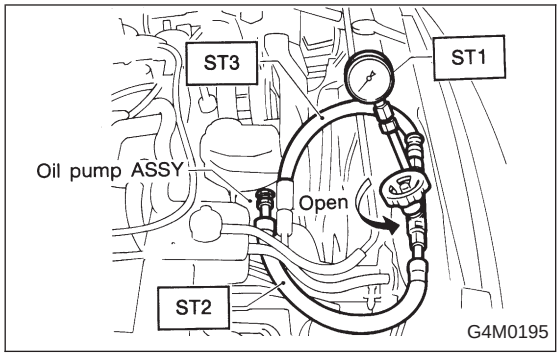
2. MEASUREMENT OF HYDRAULIC PRESSURE

CAUTION:
Be sure to complete all items aforementioned in "STEERING CONDITION" 4-3 [T101], prior to measuring hydraulic pressure. Otherwise, pressure can not be measured correctly.



CAUTION:
- **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 split fluid thoroughly after the measurement.**

NOTE:
Keep engine idling during the measurement.

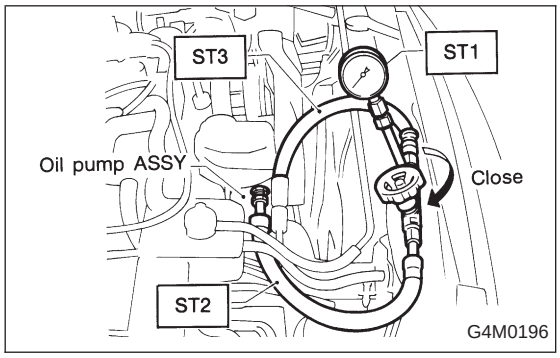


Using STs, measure regulator pressure.

Regular pressure:

981 kPa (10 kg/cm^2, 142 psi) or less

ST1	925711000	PRESSURE GAUGE
ST2	926220000	ADAPTER B
ST3	926210000	ADAPTER A



Using STs, measure relief pressure.

Relief pressure:

1800 cc model

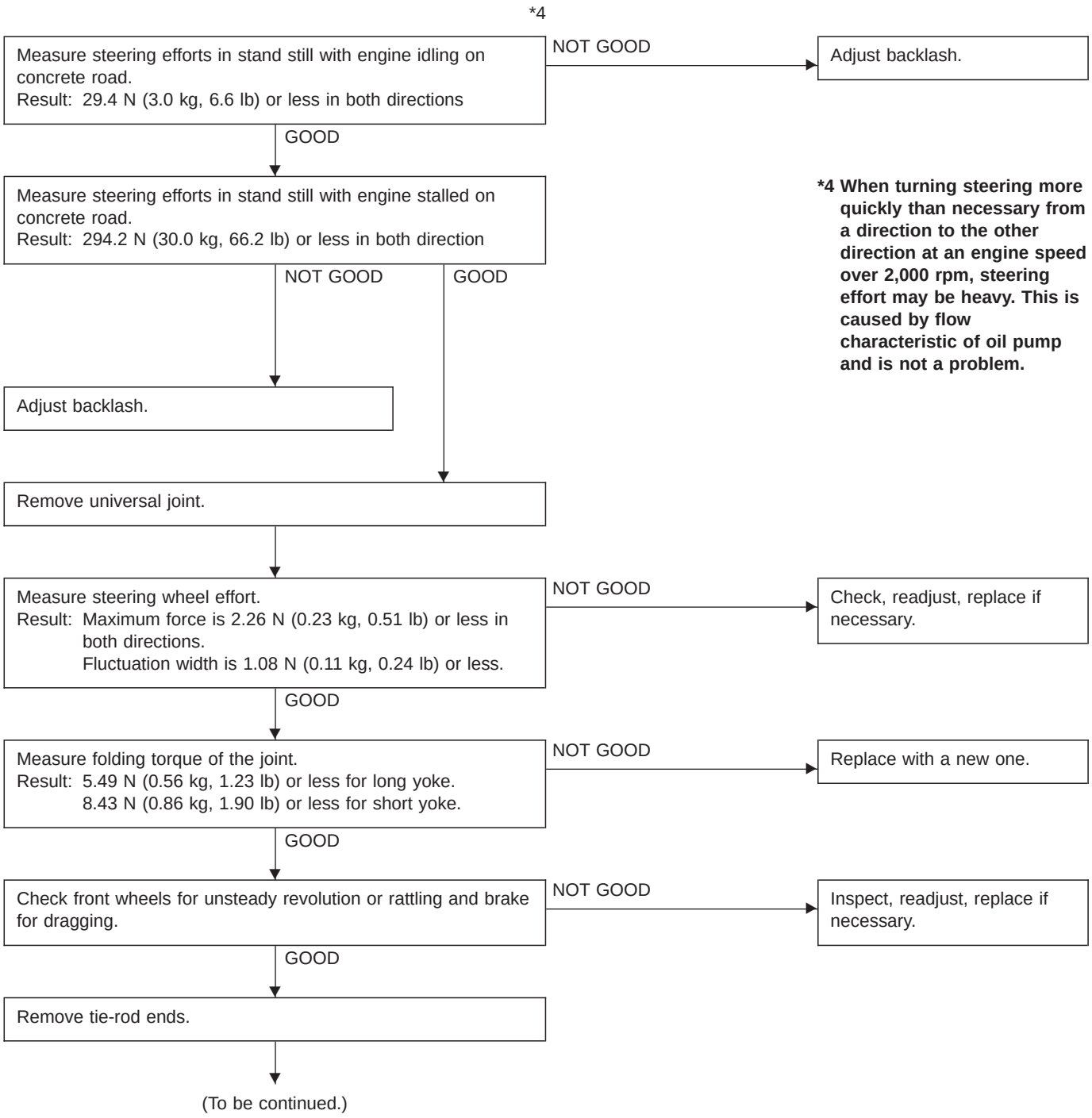
6,178 — 6,767 kPa (63 — 69 kg/cm^2, 896 — 981 psi)

2200 cc model

7,159 — 7,748 kPa (73 — 79 kg/cm^2, 1,038 — 1,123 psi)

ST1	925711000	PRESSURE GAUGE
ST2	926220000	ADAPTER B
ST3	926210000	ADAPTER A

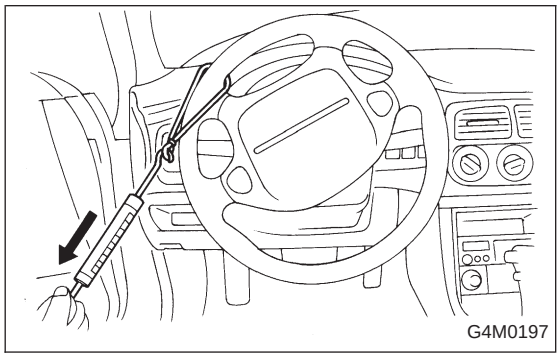
3. MEASUREMENT OF STEERING EFFORT



***4 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.**

Check tie-rod ends, tie-rods and ball joints of suspension for unsteady revolution or rattling.
NOT GOOD → Inspect, replace if necessary.
GOOD

Measure rotating and sliding resistance of gearbox.
Result: Rotating resistance is 11.18 N (1.14 kg, 2.51 lb) or less around center position and 1.79 N (1.61 kg, 3.55 lb) or less in all positions within 20% difference between clockwise and counterclockwise.
Sliding resistance is 304 N (31 kg, 68 lb) or less with 20% difference between left and right directions.
NOT GOOD → Readjust backlash, if ineffective replace bad parts.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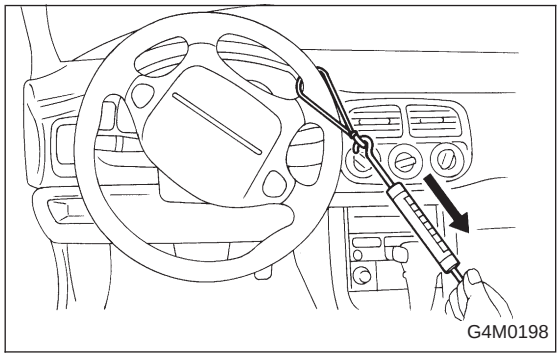
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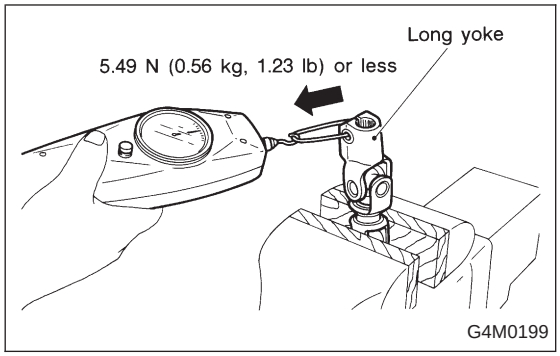
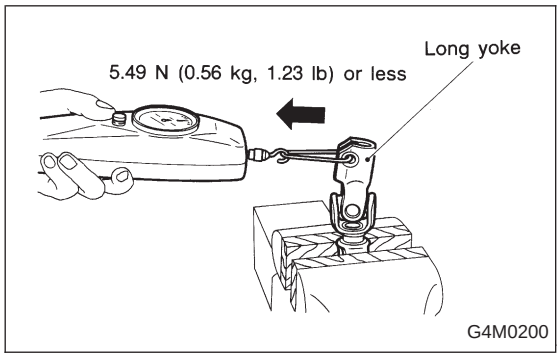
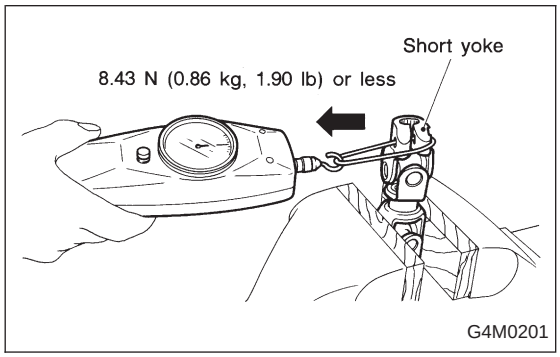
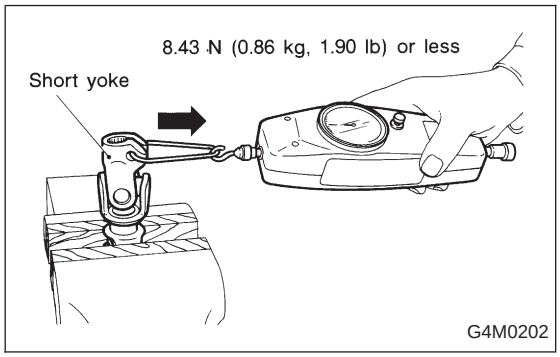
NOTE:
Measurement of steering effort

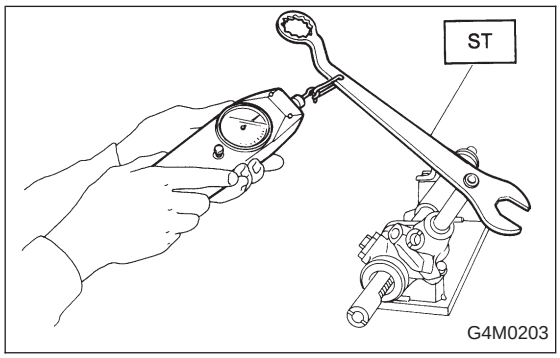


NOTE:
Measurement of folding torque of universal joint









NOTE:
Using ST, measure resistances of gearbox.

ST 926230000 SPANNER

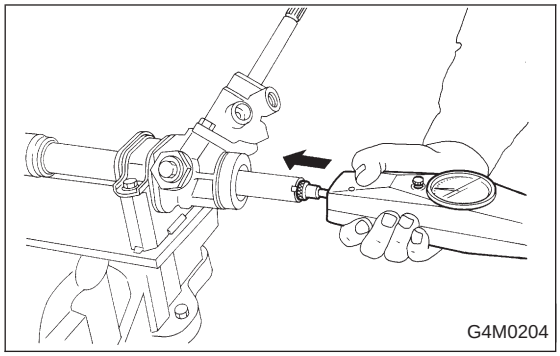
Rotating resistance:

Straight-ahead position within 30 mm (1.18 in) from rack center

Less than 11.18 N (1.14 kg, 2.51 lb)

Maximum allowable torque

15.7 N (1.6 kg, 3.5 lb)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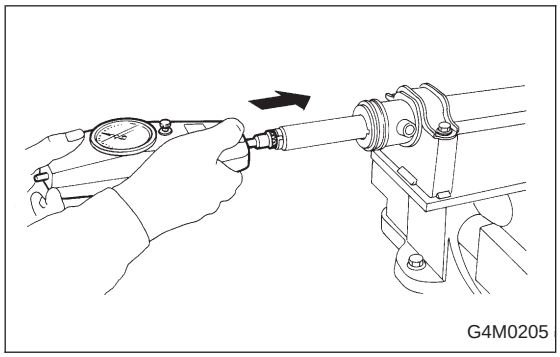
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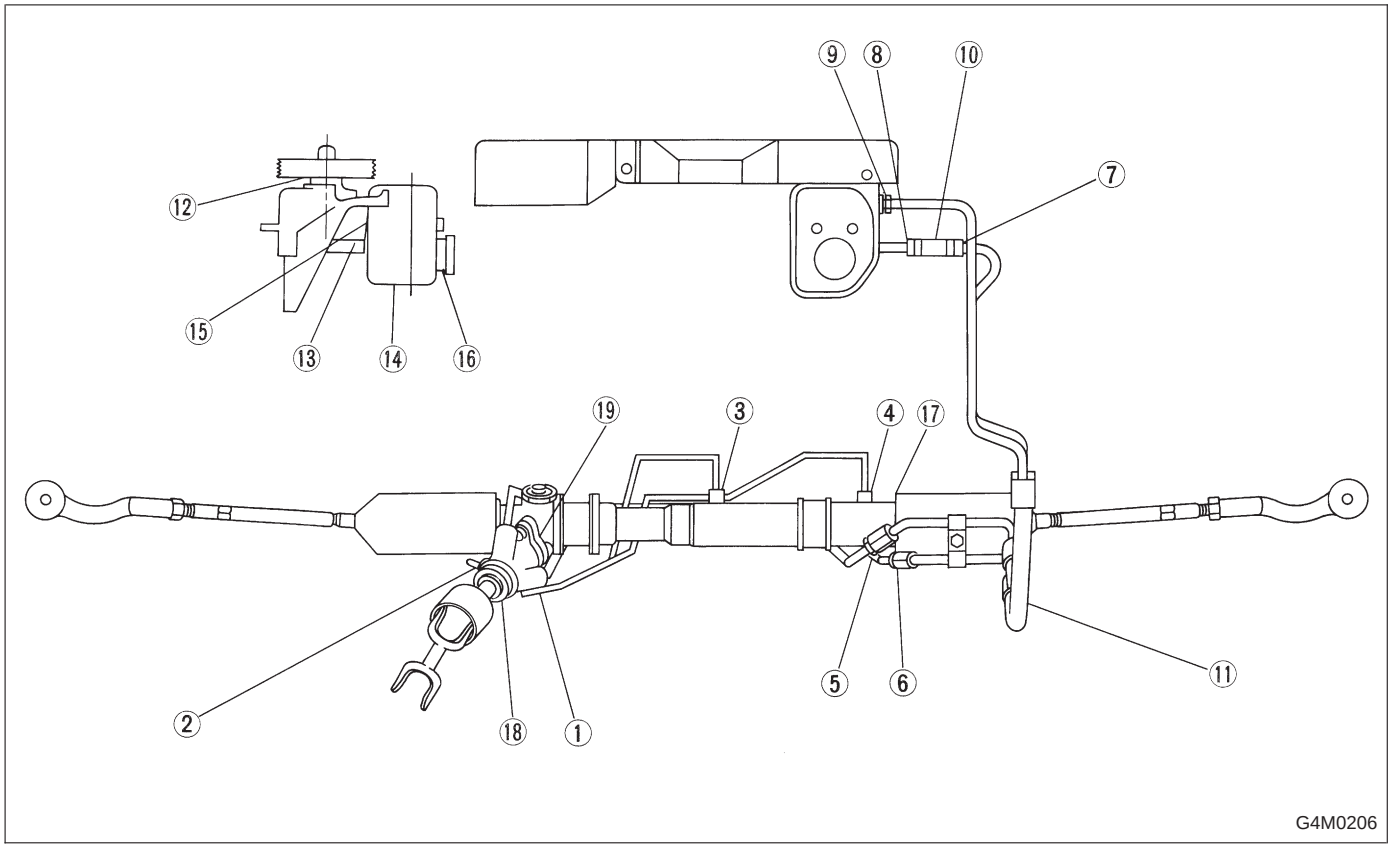
Sliding resistance:
Right-turn steering
304 N (31 kg, 68 lb) or less
Left-turn steering
304 N (31 kg, 68 lb) or less

4. FLUID LEAKAGE

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.

Leakage from connecting portions of pipes and hoses, numbered with ① thru ⑨ in figure	Insufficient tightening of flare nut, catching dirt or the like, damage to flare or flare nut	Loosen and retighten, if ineffective, replace.
	Poor insertion of hose, poor clamping	Retighten or replace clamp.
	Damaged O-ring	Replace O-ring pipe or hose with new one, if ineffective, replace gearbox also.
Leakage from hose ⑩ and ⑪ in figure	Crack or damage in hose	Replace with a new one.
	Crack or damage in hose hardware	
Leakage from surrounding of cast iron portion of oil pump ⑫ and ⑬ in figure	Damaged oil seal, ⑫	Replace oil pump.
	Damaged oil seal, ⑬	
Leakage from oil tank, ⑭ and ⑮ in figure	Crack in oil tank, ⑭	Replace oil tank.
	Damaged O-ring, ⑮	Replace O-ring.
Leakage from filler neck ⑯	Damaged cap packing	Replace cap.
	Crack in root of filler neck	Replace oil tank.
	High fluid level *5	Adjust fluid level.
Leakage from surrounding of power cylinder of gearbox, ⑰ in figure	Damaged oil seal	Replace bad parts.
Leakage from control valve of gearbox, ⑱ and ⑲ in figure	Damaged packing or oil seal	
	Damage in control valve	

***5 Fluid level is specified at optimum position (range) for ordinary use. Accordingly, if the car 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.**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5. NOISE AND VIBRATION

Hiss noise (continuous) While engine is running with maximum turning angle.	Relief valve sound *6	Generates at max. turning angle.	Normal (Don't keep this condition over 5 seconds.)
		Generates without steering operation.	Defective Replace oil pump.
Rattling noise (intermittent) While engine is running.	Interference with adjacent parts		Check clearance. [Refer to next article 6.] Correct if necessary.
	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 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.

***6 Don't keep the relief valve operated over 5 sec. at any time or inner parts of the oil pump may be damaged due to rapid increase of fluid temperature.**

Grinding noise (continuous) While engine is running.	Vane pump aeration *7	Inspect and retighten fluid line connection. Refill fluid and vent air.
	Vane pump seizing	Replace oil pump.
	Pulley bearing seizing of 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 wrong part causing aeration. Replace fluid and vent air.
	Damaged pipe of gearbox	Replace 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 bad parts of gearbox or hose.

***7 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.

Whine or growl (continuous or intermittent) While engine is running with/ without steering turned.	Loosened installation of Oil pump, oil pump bracket	Retighten.
	*8 Abnormal inside of oil pump, hose	Replace oil pump, hose, if the noise can be heard when running as well as stand still.
	Torque converter growl air conditioner compression growl	Remove power steering pulley belt and confirm.
Creaking noise (intermittent) While engine is running with steering turned.	Abnormal inside of gearbox.	Replace bad parts of gearbox
	Abnormal bearing for steering shaft	Apply grease or replace.
	*9 Generates when turning steering wheel with brake (service or parking) applied	If the noise goes off when brake is released, normal.
*10 Vibration While engine is running with/ without steering turned.	Tool low engine speed at start	Adjust and instruct customers.
	Vane pump aeration	Fix wrong part. Vent air.
	Damaged valve in oil pump, Gearbox	Replace oil pump, bad parts of gearbox.
	Looseness of play of steering, suspension parts	Retighten.

***8 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 standstill there is no abnormal function in the system provided that the noise eliminates when the car is running.**

***9 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.**

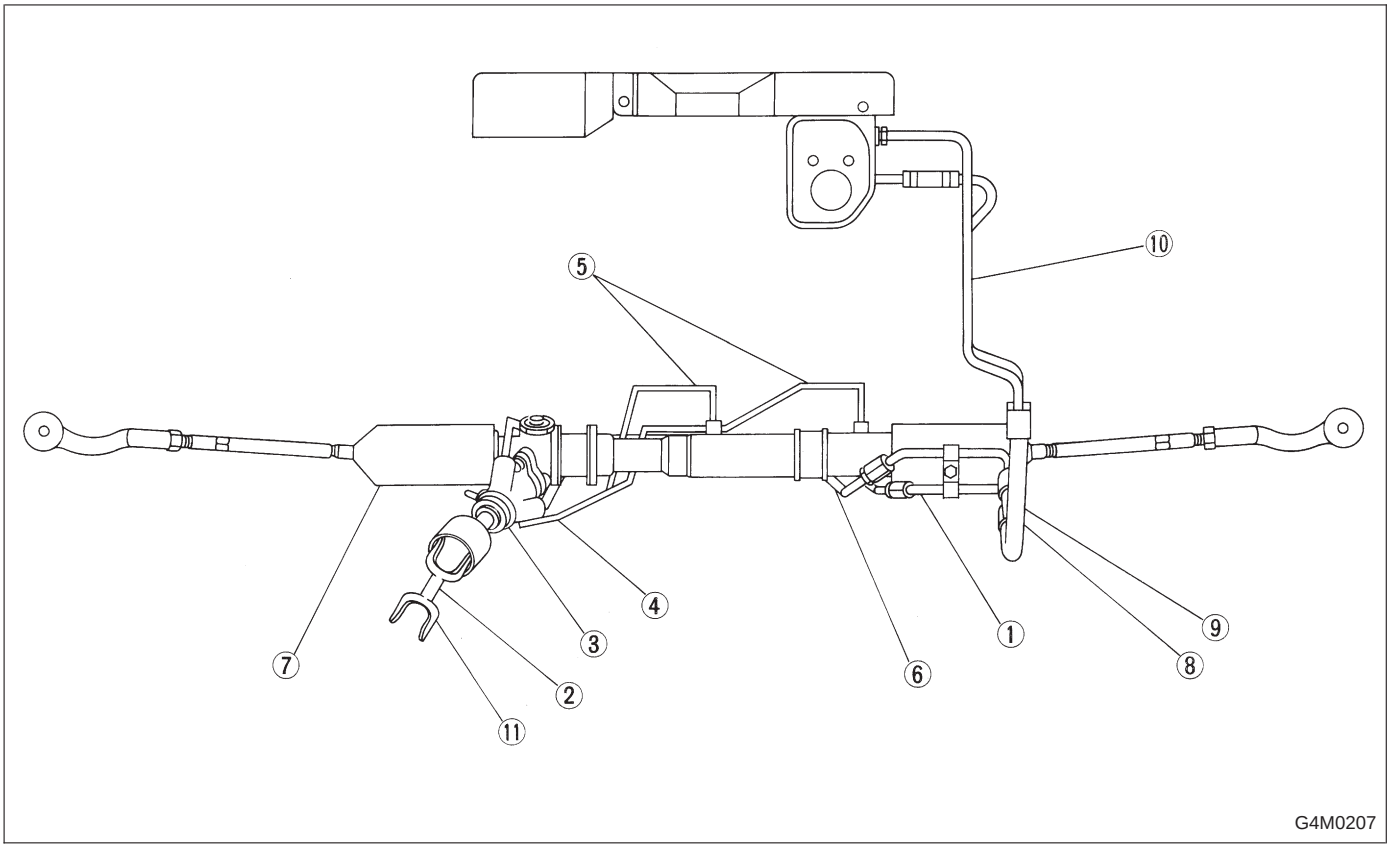
***10 There may be a little vibration around the steering devices when turning steering wheel at standstill, even though the component parts are properly adjusted and have no defects.**
Hydraulic systems are likely to generate this kind of vibration as well as working noise and fluid noise because of 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.

6. CLEARANCE TABLE

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 mm (in)	Location	Minimum allowance mm (in)
① Crossmember — Pipe	5 (0.20)	⑥ Exhaust pipe — Pipe	15 (0.59)
② DOJ — Shaft or joint	14 (0.55)	⑦ Exhaust pipe — Gearbox bolt	15 (0.59)
③ DOJ — Valve housing	11 (0.43)	⑧ Side frame — Hose A and B	15 (0.59)
④ Pipe — Pipe	2 (0.08)	⑨ Cruise control pump — Hose A and B	15 (0.59)
Pipe — Crossmember		⑩ Pipe portion of hose A — Pipe portion of hose B	1.5 (0.059)
⑤ Stabilizer — Pipe	5 (0.20)	⑪ AT cooling hose — Joint	20 (0.79)



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7. BREAKAGE OF HOSES

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.
*11		
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.

***11 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 car 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.

BRAKES 4-4

Page

PRECAUTION FOR SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

The Supplemental Restraint System "Airbag" helps to reduce the risk or severity of injury to the driver in a frontal collision.

The Supplemental Restraint System consists of an airbag module (located in the center of the steering wheel), sensors, a control module, warning light, wiring harness and roll connector.

Information necessary to service the safety is included in the "5-5. SUPPLEMENTAL RESTRAINT SYSTEM" of this Service Manual.

WARNING:

- **To avoid rendering the Airbag system inoperative, which could lead to personal injury or death in the event of a severe frontal collision, all maintenance must be performed by an authorized SUBARU dealer.**
- **Improper maintenance, including incorrect removal and installation of the Airbag system, can lead to personal injury caused by unintentional activation of the Airbag system.**
- **All Airbag system electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the Supplemental Restraint System "Airbag".**

1. Brakes

A: SPECIFICATIONS

1. SEDAN

	Engine (cc)	1800				2200
	Driving system	FWD		AWD		AWD
		Base	L	Base	L	LX
Front brake	Type	Disc (Floating type, ventilated)				
	Effective disc diameter mm (in)	194 (7.64)	194 (7.64) [210 (8.27)]	210 (8.27)		
	Disc thickness x outer diameter mm (in)	18 x 242 (0.71 x 9.53)	18 x 242 (0.71 x 9.53) [24 x 260 (0.94 x 10.24)]	24 x 260 (0.94 x 10.24)		
	Effective cylinder diameter mm (in)	53.97 (2.1248)				
	Pad dimensions (length x width x thickness) mm (in)	112.4 x 44.3 x 11.0 (4.43 x 1.744 x 0.433)				
	Clearance adjustment	Automatic adjustment				
Rear brake	Type	Drum (Leading-trailing type)	Drum (Leading-trailing type) [Disc (Floating type)]	Drum (Leading-trailing type)	Drum (Leading-trailing type) [Disc (Floating type)]	Disc (Floating type)
	Effective drum or disc diameter mm (in)	228.6 (9)	228.6 (9) [230 (9.06)]	228.6 (9)	228.6 (9) [230 (9.06)]	230 (9.06)
	Disc thickness x outer diameter mm (in)	—	— [10 x 266 (0.39 x 10.47)]	—	— [10 x 266 (0.39 x 10.47)]	10 x 266 (0.39 x 10.47)
	Effective cylinder diameter mm (in)	17.46 (0.6874)	17.46 (0.6874) [34.93 (1.3752)]	19.05 (0.7500)	19.05 (0.7500) [34.93 (1.3752)]	34.93 (1.3752)
	Lining or pad dimensions (length x width x thickness) mm (in)	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161)	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161) [92.4 x 33.7 x 10.0 (3.638 x 1.327 x 0.394)]	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161)	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161) [92.4 x 33.7 x 10.0 (3.638 x 1.327 x 0.394)]	92.4 x 33.7 x 10.0 (3.638 x 1.327 x 0.394)
	Clearance adjustment	Automatic adjustment				
Parking brake	Type	Mechanical on rear brake drums				
	Effective drum diameter mm (in)	228.6 (9)	228.6 (9) [170 (6.69)]	228.6 (9)	228.6 (9) [170 (6.69)]	170 (6.69)
	Lining or pad dimensions (length x width x thickness) mm (in)	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161)	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161) [162.6 x 30.0 x 3.2 (6.40 x 1.181 x 0.126)]	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161)	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161) [162.6 x 30.0 x 3.2 (6.40 x 1.181 x 0.126)]	162.6 x 30.0 x 3.2 (6.40 x 1.181 x 0.126)
	Clearance adjustment	Automatic adjustment	Automatic adjustment [Manual adjustment]	Automatic adjustment	Automatic adjustment [Manual adjustment]	Manual adjustment
Master cylinder	Type	Tandem				
	Effective diameter mm (in)	23.81 (0.9374)	23.81 (0.9374) [25.40 (1)]	23.81 (0.9374)	23.81 (0.9374) [25.40 (1)]	25.40 (1)
	Reservoir type	Sealed type				
	Brake fluid reservoir capacity cm^3 (cu in)	190 (11.59)				
Brake booster	Type	Vacuum suspended				
	Effective diameter mm (in)	230 (9.06)	230 (9.06) [180 + 205 (7.09 + 8.07)]	230 (9.06)	230 (9.06) [180 + 205 (7.09 + 8.07)]	180 + 205 (7.09 + 8.07)
Proportioning valve	Split point kPa (kg/cm^2, psi)	2,942 (30.0, 427)	2,942 (30.0, 427) [1,961 (20.0, 284)]	2,942 (30.0, 427)	2,942 (30.0, 427) [1,961 (20.0, 284)]	1,961 (20.0, 284)
	Reducing ratio	0.4				
Brake line		Dual circuit system				
A.B.S.		—	OP	—	OP	STD

[ ]: A.B.S. equipped vehicle.

2. WAGON

	Engine (cc)	1800			2200	
	Driving system	FWD		AWD	AWD	
		Base	L	L	Outback	LX
Front brake	Type	Disc (Floating type, ventilated)				
	Effective disc diameter mm (in)	194 (7.64)	194 (7.64) [210 (8.27)]	210 (8.27)		
	Disc thickness x outer diameter mm (in)	18 x 242 (0.71 x 9.53)	18 x 242 (0.71 x 9.53) [24 x 260 (0.94 x 10.24)]	24 x 260 (0.94 x 10.24)		
	Effective cylinder diameter mm (in)	53.97 (2.1248)				
	Pad dimensions (length x width x thickness) mm (in)	112.4 x 44.3 x 11.0 (4.43 x 1.744 x 0.433)				
	Clearance adjustment	Automatic adjustment				
Rear brake	Type	Drum (Leading-trailing type)	Drum (Leading-trailing type) [Disc (Floating type)]	Drum (Leading-trailing type) [Disc (Floating type)]	Drum (Leading-trailing type)	Disc (Floating type)
	Effective drum or disc diameter mm (in)	228.6 (9)	228.6 (9) [230 (9.06)]	228.6 (9) [230 (9.06)]	228.6 (9)	230 (9.06)
	Disc thickness x outer diameter mm (in)	—	— [10 x 266 (0.39 x 10.47)]	— [10 x 266 (0.39 x 10.47)]	—	10 x 266 (0.39 x 10.47)
	Effective cylinder diameter mm (in)	19.05 (0.7500)	19.05 (0.7500) [34.93 (1.3752)]	19.05 (0.7500) [38.1 (1.500)]	19.05 (0.7500)	38.1 (1.500)
	Lining or pad dimensions (length x width x thickness) mm (in)	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161)	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161) [92.4 x 33.7 x 10.0 (3.638 x 1.327 x 0.394)]	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161) [92.4 x 33.7 x 10.0 (3.638 x 1.327 x 0.394)]	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161)	92.4 x 33.7 x 10.0 (3.638 x 1.327 x 0.394)
	Clearance adjustment	Automatic adjustment				
Parking brake	Type	Mechanical on rear brake drums				
	Effective drum diameter mm (in)	228.6 (9)	228.6 (9) [170 (6.69)]	228.6 (9) [170 (6.69)]	228.6 (9)	170 (6.69)
	Lining or pad dimensions (length x width x thickness) mm (in)	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161)	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161) [162.6 x 30.0 x 3.2 (6.40 x 1.181 x 0.126)]	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161) [162.6 x 30.0 x 3.2 (6.40 x 1.181 x 0.126)]	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161)	162.6 x 30.0 x 3.2 (6.40 x 1.181 x 0.126)
	Clearance adjustment	Automatic adjustment	Automatic adjustment [Manual adjustment]	Automatic adjustment [Manual adjustment]	Automatic adjustment	Manual adjustment
Master cylinder	Type	Tandem				
	Effective diameter mm (in)	23.81 (0.9374)	23.81 (0.9374) [25.40 (1)]	23.81 (0.9374) [25.40 (1)]	23.81 (0.9374)	25.40 (1)
	Reservoir type	Sealed type				
	Brake fluid reservoir capacity cm^3 (cu in)	190 (11.59)				
Brake booster	Type	Vacuum suspended				
	Effective diameter mm (in)	230 (9.06)	230 (9.06) [180 + 205 (7.09 + 8.07)]	230 (9.06) [180 + 205 (7.09 + 8.07)]	230 (9.06)	180 + 205 (7.09 + 8.07)
Proportioning valve	Split point kPa (kg/cm^2, psi)	2,942 (30.0, 427)	2,942 (30.0, 427) [1,961 (20.0, 284)]	2,942 (30.0, 427) [1,961 (20.0, 284)]	2,942 (30.0, 427)	1,961 (20.0, 284)
	Reducing ratio	0.4				
Brake line		Dual circuit system				
A.B.S.		—	OP	OP	—	STD

[ ]: A.B.S. equipped vehicle.

3. COUPE

	Engine (cc)	1800				2200
	Driving system	FWD		AWD		AWD
		Base	L	Base	L	LX
Front brake	Type	Disc (Floating type, ventilated)				
	Effective disc diameter mm (in)	194 (7.64)	210 (8.27)			
	Disc thickness x outer diameter mm (in)	18 x 242 (0.71 x 9.53)	24 x 260 (0.94 x 10.24)			
	Effective cylinder diameter mm (in)	53.97 (2.1248)				
	Pad dimensions (length x width x thickness) mm (in)	112.4 x 44.3 x 11.0 (4.43 x 1.744 x 0.433)				
	Clearance adjustment	Automatic adjustment				
Rear brake	Type	Drum (Leading-trailing type)	Drum (Leading-trailing type) [Disc (Floating type)]	Drum (Leading-trailing type)	Drum (Leading-trailing type) [Disc (Floating type)]	Disc (Floating type)
	Effective drum or disc diameter mm (in)	228.6 (9)	228.6 (9) [230 (9.06)]	228.6 (9)	228.6 (9) [230 (9.06)]	230 (9.06)
	Disc thickness x outer diameter mm (in)	—	— [10 x 266 (0.39 x 10.47)]	—	— [10 x 266 (0.39 x 10.47)]	10 x 266 (0.39 x 10.47)
	Effective cylinder diameter mm (in)	17.46 (0.6874)	17.46 (0.6874) [34.93 (1.3752)]	19.05 (0.7500)	19.05 (0.7500) [34.93 (1.3752)]	34.93 (1.3752)
	Lining or pad dimensions (length x width x thickness) mm (in)	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161)	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161) [92.4 x 33.7 x 10.0 (3.638 x 1.327 x 0.394)]	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161)	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161) [92.4 x 33.7 x 10.0 (3.638 x 1.327 x 0.394)]	92.4 x 33.7 x 10.0 (3.638 x 1.327 x 0.394)
	Clearance adjustment	Automatic adjustment				
Parking brake	Type	Mechanical on rear brake drums				
	Effective drum diameter mm (in)	228.6 (9)	228.6 (9) [170 (6.69)]	228.6 (9)	228.6 (9) [170 (6.69)]	170 (6.69)
	Lining or pad dimensions (length x width x thickness) mm (in)	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161)	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161) [162.6 x 30.0 x 3.2 (6.40 x 1.181 x 0.126)]	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161)	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161) [162.6 x 30.0 x 3.2 (6.40 x 1.181 x 0.126)]	162.6 x 30.0 x 3.2 (6.40 x 1.181 x 0.126)
	Clearance adjustment	Automatic adjustment	Automatic adjustment [Manual adjustment]	Automatic adjustment	Automatic adjustment [Manual adjustment]	Manual adjustment
Master cylinder	Type	Tandem				
	Effective diameter mm (in)	23.81 (0.9374)	23.81 (0.9374) [25.40 (1)]	23.81 (0.9374)	23.81 (0.9374) [25.40 (1)]	25.40 (1)
	Reservoir type	Sealed type				
	Brake fluid reservoir capacity cm^3 (cu in)	190 (11.59)				
Brake booster	Type	Vacuum suspended				
	Effective diameter mm (in)	230 (9.06)	230 (9.06) [180 + 205 (7.09 + 8.07)]	230 (9.06)	230 (9.06) [180 + 205 (7.09 + 8.07)]	180 + 205 (7.09 + 8.07)
Proportioning valve	Split point kPa(kg/cm^2, psi)	2,942 (30.0, 427)	2,942 (30.0, 427) [1,961 (20.0, 284)]	2,942 (30.0, 427)	2,942 (30.0, 427) [1,961 (20.0, 284)]	1,961 (20.0, 284)
	Reducing ratio	0.4				
Brake line		Dual circuit system				
A.B.S.		—	OP	—	OP	STD

[ ]: A.B.S. equipped vehicle.

B: SERVICE DATA

ITEM		STANDARD	SERVICE LIMIT
Front brake	Pad thickness (including back metal)	17 mm (0.67 in)	7.5 mm (0.295 in)
	Disc thickness	13-inch type: 18 mm (0.71 in) 14-inch type: 24 mm (0.94 in)	13-inch type: 16 mm (0.63 in) 14-inch type: 22 mm (0.87 in)
	Disc run-out	—	0.075 mm (0.0030 in)
Rear brake (Disc type)	Pad thickness (including back metal)	15 mm (0.59 in)	6.5 mm (0.256 in)
	Disc thickness	10 mm (0.39 in)	8.5 mm (0.335 in)
	Disc run-out	—	0.10 mm (0.0039 in)
Rear brake (Drum type)	Inside diameter	228.6 mm (9 in)	230.6 mm (9.079 in)
	Lining thickness	4.1 mm (0.161 in)	1.5 mm (0.059 in)
Rear brake (Disc type Parking)	Inside diameter	170 mm (6.69 in)	171 mm (6.73 in)
	Lining thickness	3.2 mm (0.126 in)	1.5 mm (0.059 in)
Parking brake	Lever stroke	7 to 8 notches/196N (20 kg,44 lb)	

			Models without A.B.S.	Models with A.B.S.
Brake booster		Brake pedal force	Fluid pressure	
	Brake fluid pressure without engine running	147 N (15 kg, 33 lb)	785 kPa (8 kg/cm^2, 114 psi)	588 kPa (6 kg/cm^2, 85 psi)
		294 N (30 kg, 66 lb)	2,158 kPa (22 kg/cm^2, 313 psi)	1,863 kPa (19 kg/cm^2, 270 psi)
	Brake fluid pressure with engine running and vacuum at 66.7 kPa (500 mmHg, 19.69 inHg)	147 N (15 kg, 33 lb)	5,492 kPa (56 kg/cm^2, 796 psi)	5,394 kPa (55 kg/cm^2, 782 psi)
		294 N (30 kg, 66 lb)	8,434 kPa (86 kg/cm^2, 1,223 psi)	9,219 kPa (94 kg/cm^2, 1,337 psi)

C: RECOMMENDED BRAKE FLUID

FMVSS No. 116, fresh DOT3 or 4 brake fluid

CAUTION:

- **Avoid mixing brake fluid of different brands to prevent the fluid performance from degrading.**
- **When brake fluid is supplemented, be careful not to allow any dust into the reservoir.**
- **Use fresh DOT3 or 4 brake fluid when replacing or refilling the fluid.**

D: BRAKE FLUID LEVEL INDICATOR

Reserve tank with level indicator:

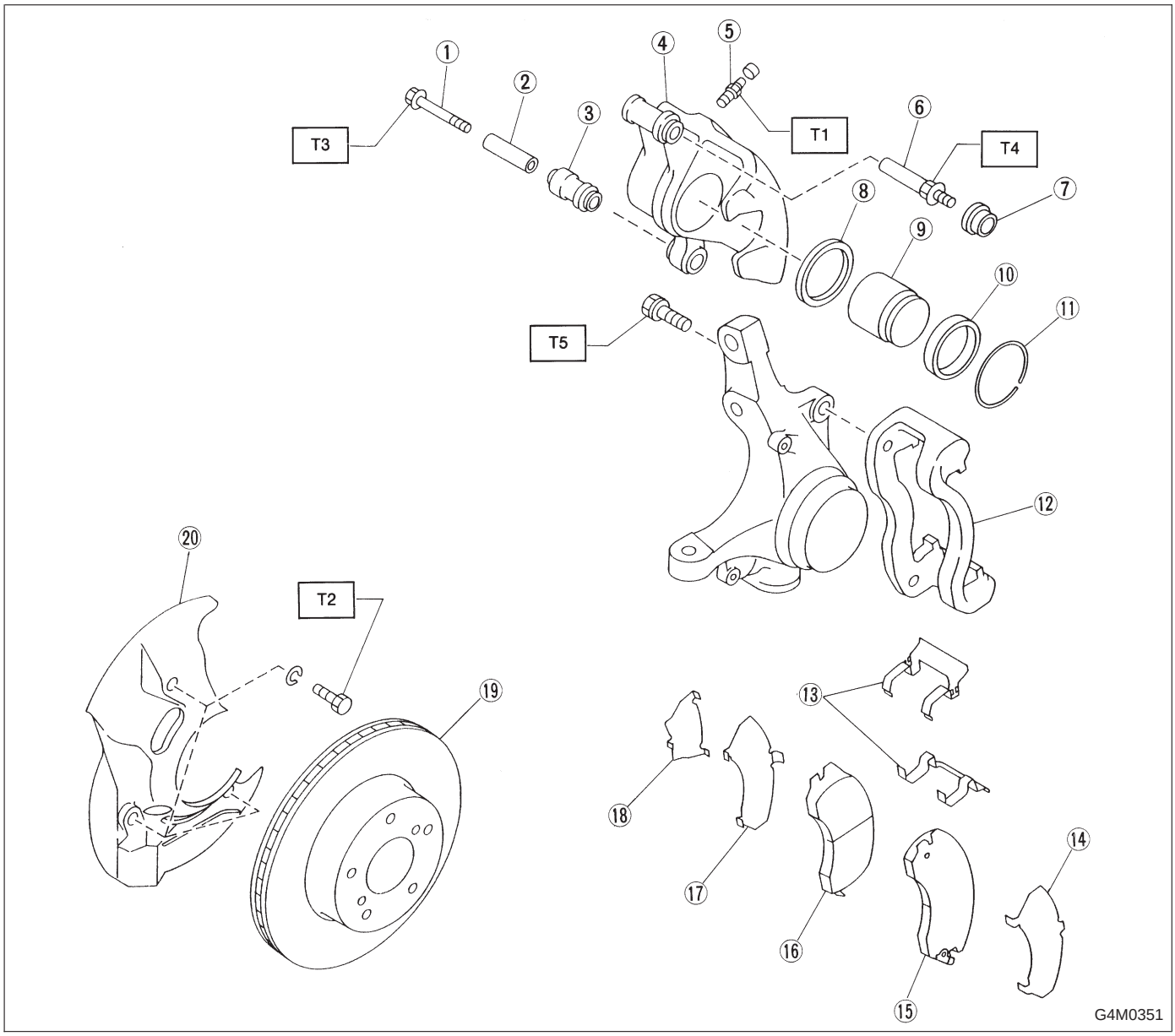
Residual fluid quantity at light ON

Approx. 80 cm^3 (80cc, 4.88 cu in)

Tank capacity

190 cm^3 (190cc, 11.59 cu in)

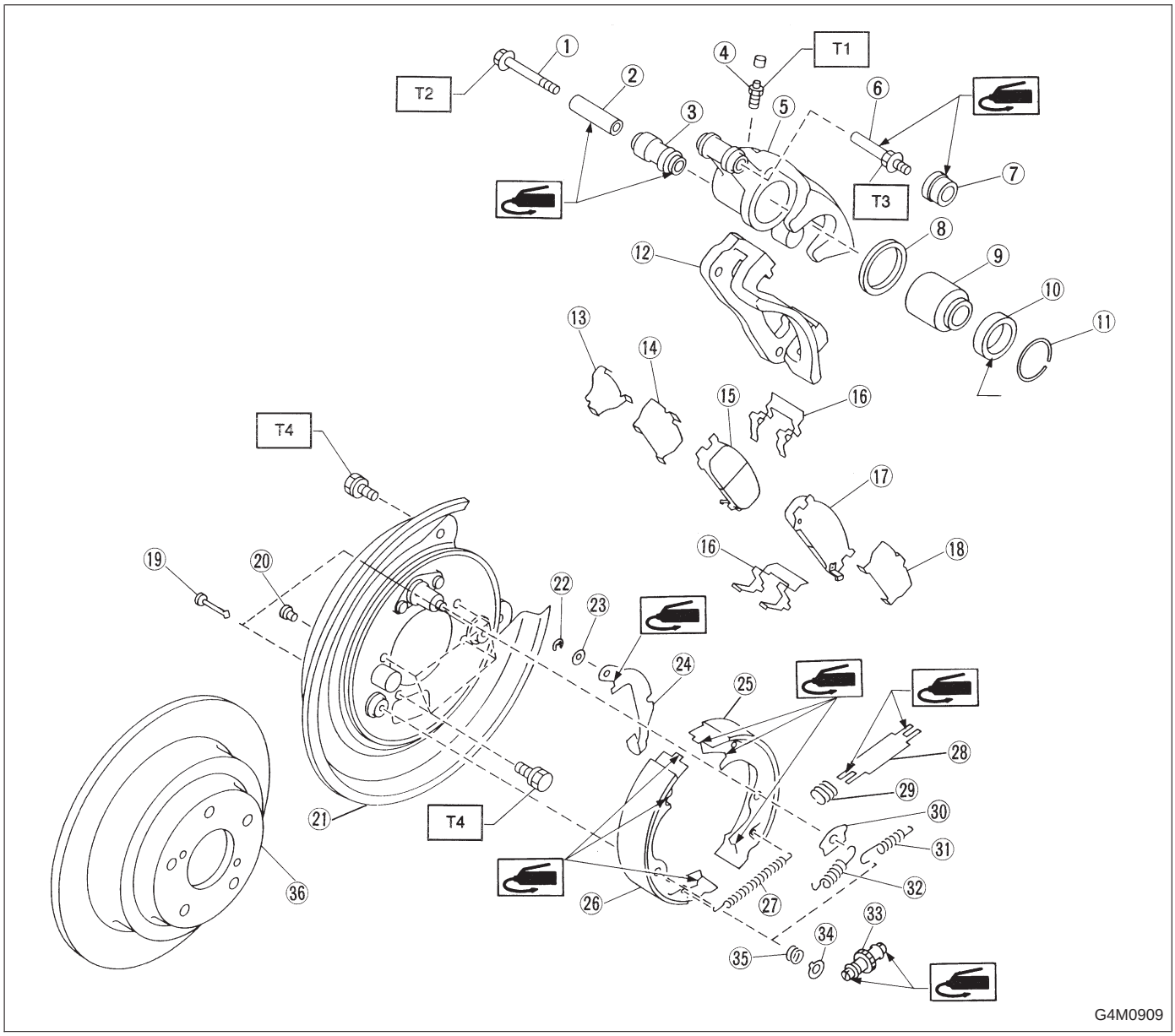
1. Front Disc Brake



① Lock pin
② Lock pin sleeve
③ Lock pin boot
④ Caliper body
⑤ Air bleeder screw
⑥ Guide pin
⑦ Guide pin boot
⑧ Piston seal
⑨ Piston
⑩ Piston boot
⑪ Boot ring
⑫ Support
⑬ Pad clip
⑭ Outer shim
⑮ Pad (Outside)
⑯ Pad (Inside)
⑰ Inner shim
⑱ Shim
⑲ Disc rotor
⑳ Disc cover

Tightening torque: N·m (kg-m, ft-lb)
T1: 8±1 (0.8±0.1, 5.8±0.7)
T2: 14±4 (1.4±0.4, 10.1±2.9)
T3: 36±5 (3.7±0.5, 26.8±3.6)
T4: 49±5 (5.0±0.5, 36.2±3.6)
T5: 78±10 (8.0±1.0, 58±7)

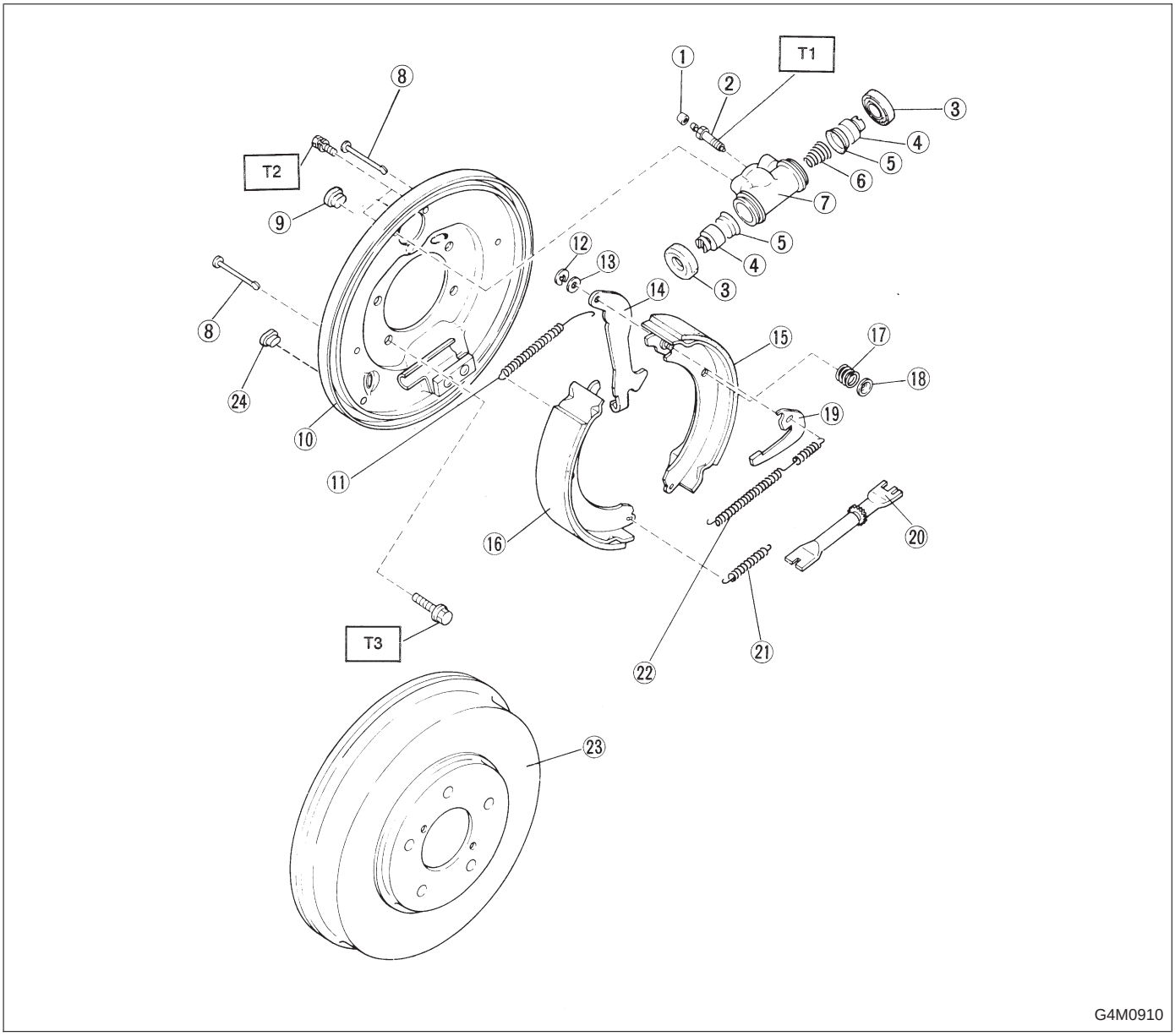
2. Rear Disc Brake



① Lock pin
② Lock pin sleeve
③ Lock pin boot
④ Air bleeder screw
⑤ Caliper body
⑥ Guide pin
⑦ Guide pin boot
⑧ Piston seal
⑨ Piston
⑩ Piston boot
⑪ Boot ring
⑫ Support
⑬ Shim
⑭ Inner shim
⑮ Inner pad
⑯ Pad clip
⑰ Outer pad
⑱ Outer shim
⑲ Shoe hold-down pin
⑳ Cover
㉑ Back plate
㉒ Retainer
㉓ Spring washer
㉔ Parking brake lever
㉕ Parking brake shoe (Secondary)
㉖ Parking brake shoe (Primary)
㉗ Adjusting spring
㉘ Strut
㉙ Strut shoe spring
㉚ Shoe guide plate
㉛ Secondary shoe return spring
㉜ Primary shoe return spring
㉝ Adjuster
㉞ Shoe hold-down cup
㉟ Shoe hold-down spring
㊱ Disc rotor

Tightening torque: N·m (kg-m, ft-lb)
T1: 8±1 (0.8±0.1, 5.8±0.7)
T2: 20±4 (2.0±0.4, 14.5±2.9)
T3: 26±5 (2.7±0.5, 19.5±3.6)
T4: 52±6 (5.3±0.6, 38.3±4.3)

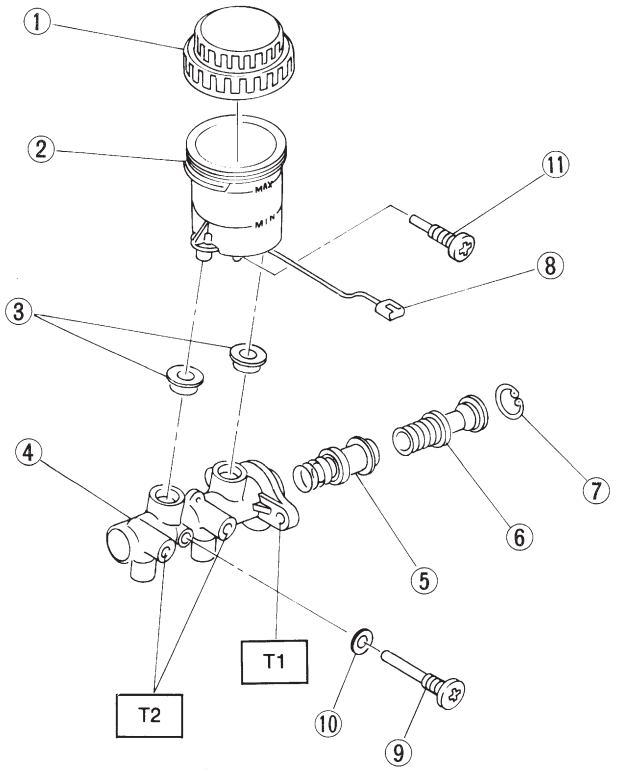
3. Rear Drum Brake



① Air bleeder cap
② Air bleeder screw
③ Boot
④ Piston
⑤ Cup
⑥ Spring
⑦ Wheel cylinder body
⑧ Pin
⑨ Plug
⑩ Back plate
⑪ Upper shoe return spring
⑫ Retainer
⑬ Washer
⑭ Parking brake lever
⑮ Brake shoe (Trailing)
⑯ Brake shoe (Leading)
⑰ Shoe hold-down spring
⑱ Cup
⑲ Adjusting lever
⑳ Adjuster
㉑ Lower shoe return spring
㉒ Adjusting spring
㉓ Drum
㉔ Plug

Tightening torque: N·m (kg-m, ft-lb)
T1: 8±1 (0.8±0.1, 5.8±0.7)
T2: 10±2 (1.0±0.2, 7.2±1.4)
T3: 52±6 (5.3±0.6, 38.3±4.3)

4. Master Cylinder



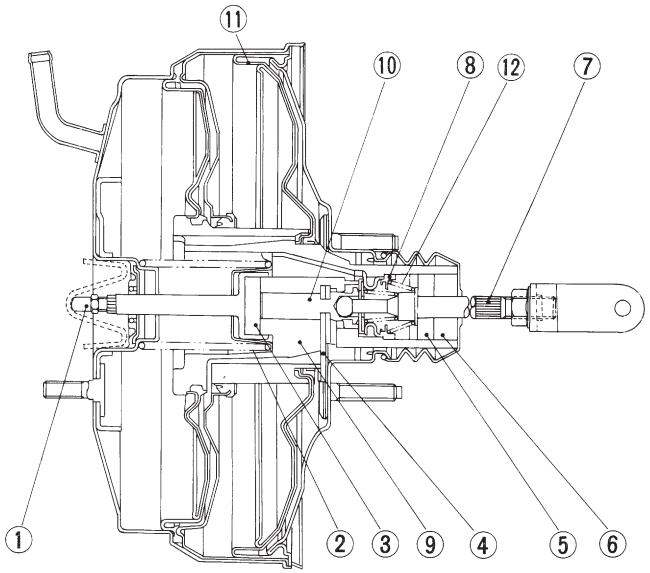
G4M0354

① Cap
② Reserve tank
③ Seal
④ Cylinder body
⑤ Secondary piston
⑥ Primary piston
⑦ C-ring
⑧ Level indicator ASSY
⑨ Supply valve stopper (With A.B.S.)
⑩ Gasket (With A.B.S.)
⑪ Reservoir stopper bolt

Tightening torque: N·m (kg-m, ft-lb)
T1: 14±4 (1.4±0.4, 10.1±2.9)
T2: 14.7^{+3}_{-2}
($1.5^{+0.3}_{-0.2}$, $10.8^{+2.2}_{-1.4}$)

5. Brake Booster

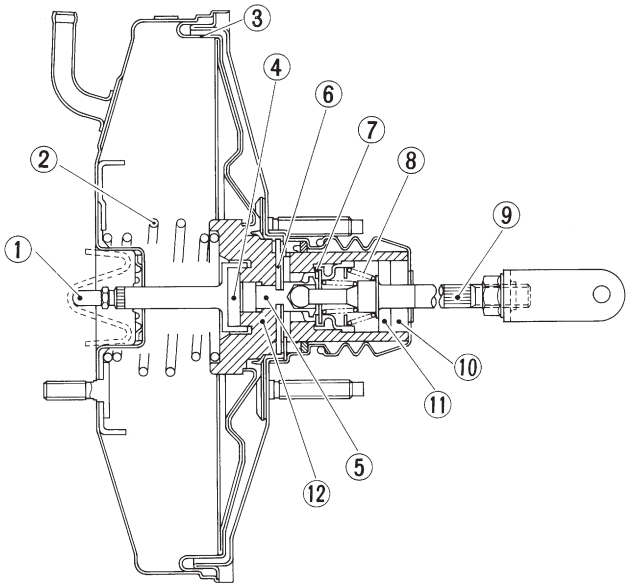
1. MODELS WITH A.B.S.



G4M0355

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

2. MODELS WITHOUT A.B.S.

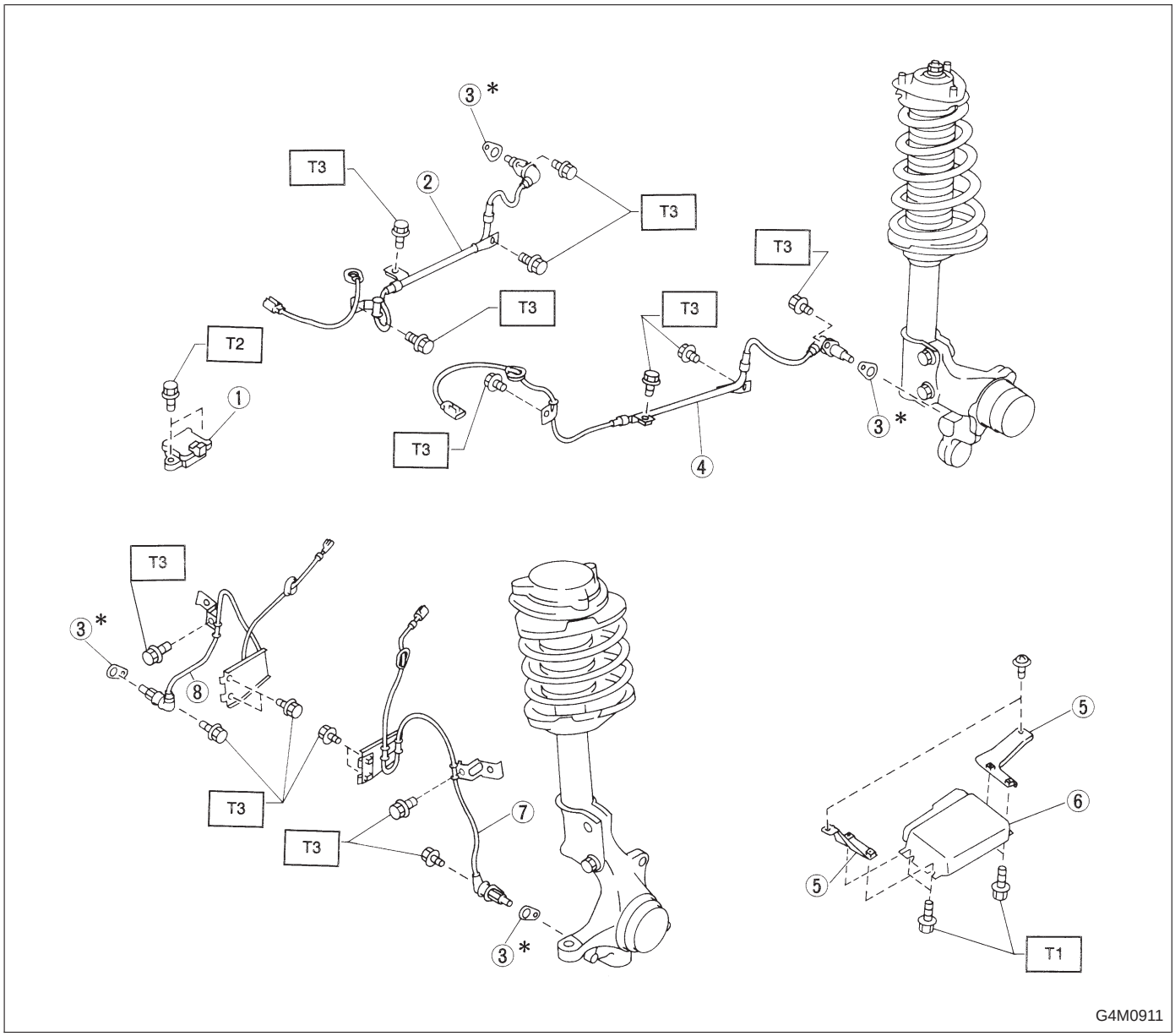


G4M0356

① Push rod
② Return spring
③ Diaphragm plate
④ Reaction disc
⑤ Plunger valve
⑥ Key
⑦ Poppet valve
⑧ Valve return spring
⑨ Operating rod
⑩ Silencer
⑪ Filter
⑫ Valve body

6. A.B.S. System

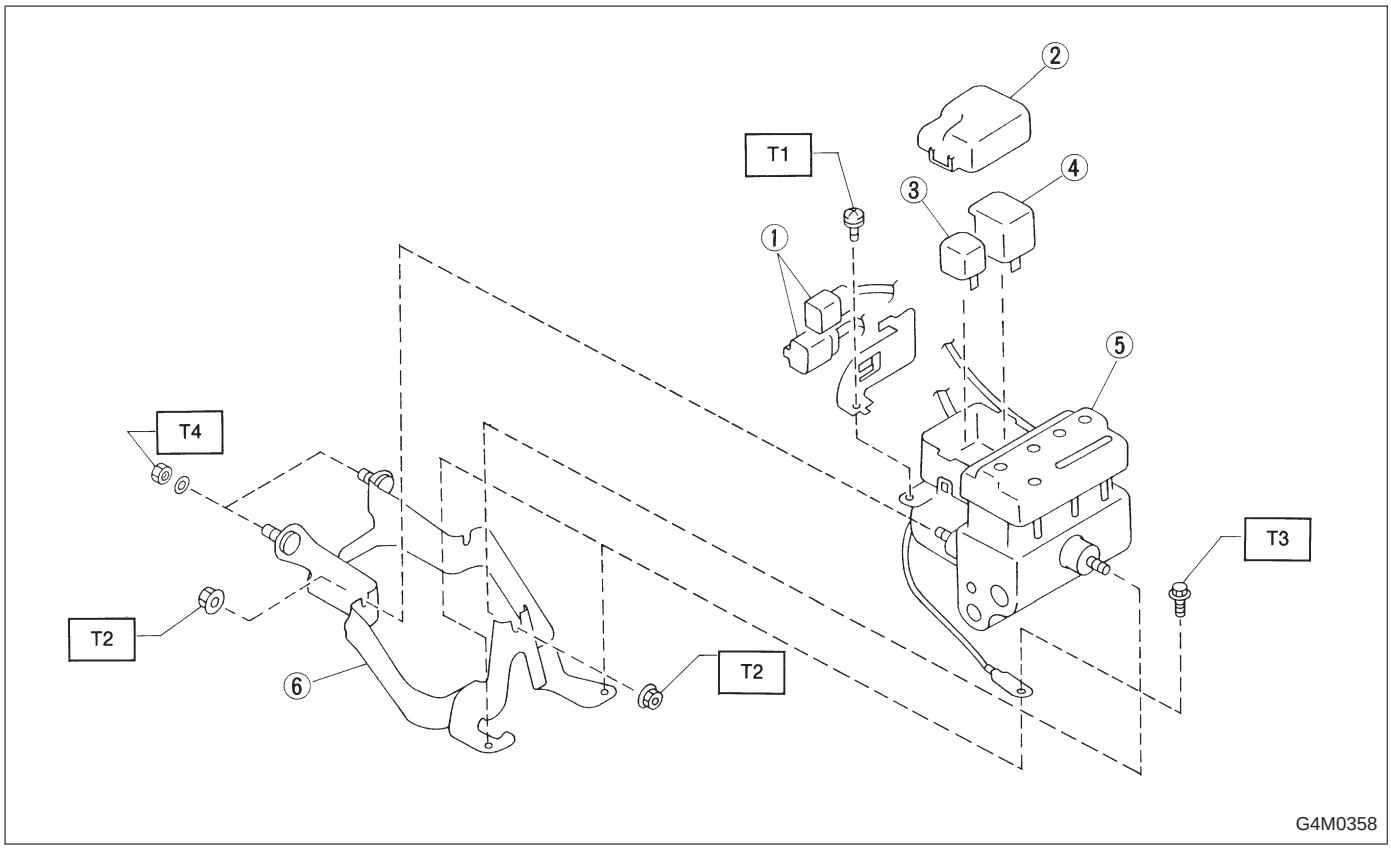
1. SENSOR AND CONTROL MODULE



① G sensor (AWD MT only)
② Rear A.B.S. sensor RH
③ A.B.S. spacer
④ Rear A.B.S. sensor LH
⑤ Bracket
⑥ A.B.S. control module
⑦ Front A.B.S. sensor LH
⑧ Front A.B.S. sensor RH

Tightening torque: N·m (kg-m, ft-lb)
T1: 5.9±1.5 (0.60±0.15, 4.3±1.1)
T2: 7.4±2.0 (0.75±0.2, 5.4±1.4)
T3: 32±10 (3.3±1.0, 24±7)

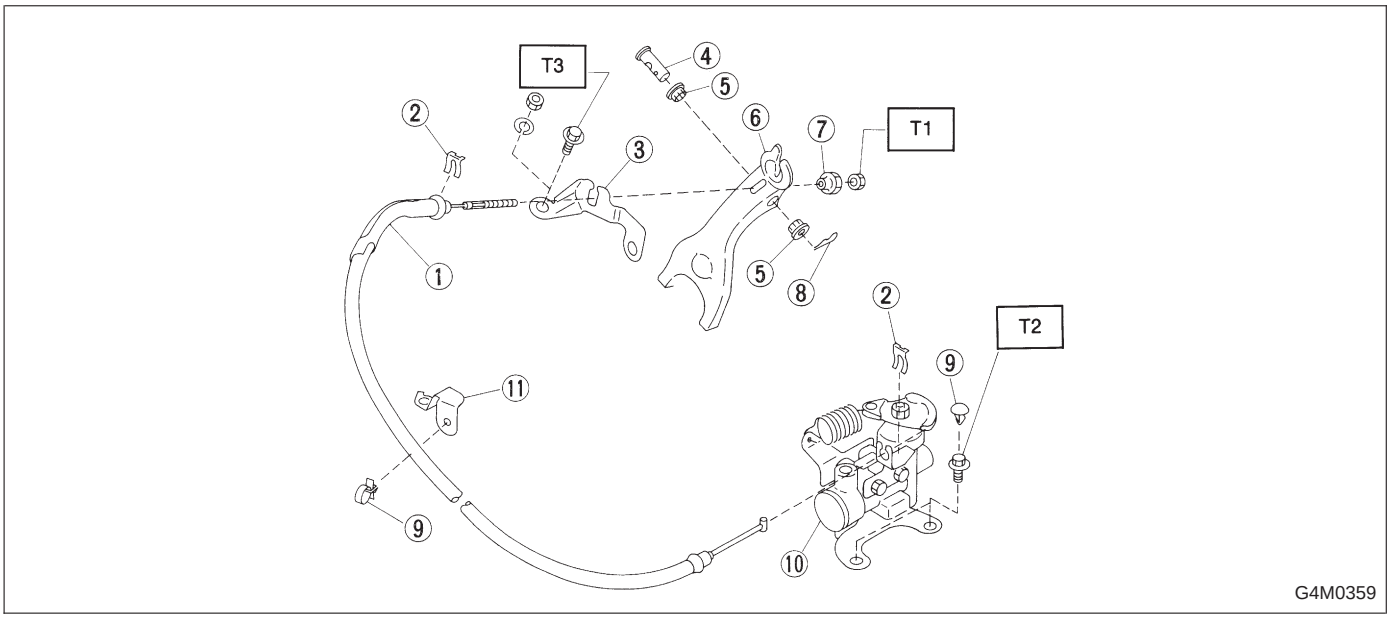
2. HYDRAULIC UNIT



① Connector
② Cap
③ Motor relay
④ Valve relay
⑤ Hydraulic control unit
⑥ Bracket

Tightening torque: N·m (kg-m, ft-lb)
T1: 1.2±0.2 (0.125±0.025, 0.9±0.2)
T2: 18±5 (1.8±0.5, 13.0±3.6)
T3: 32±10 (3.3±1.0, 24±7)
T4: 52±15 (5.3±1.5, 38±11)

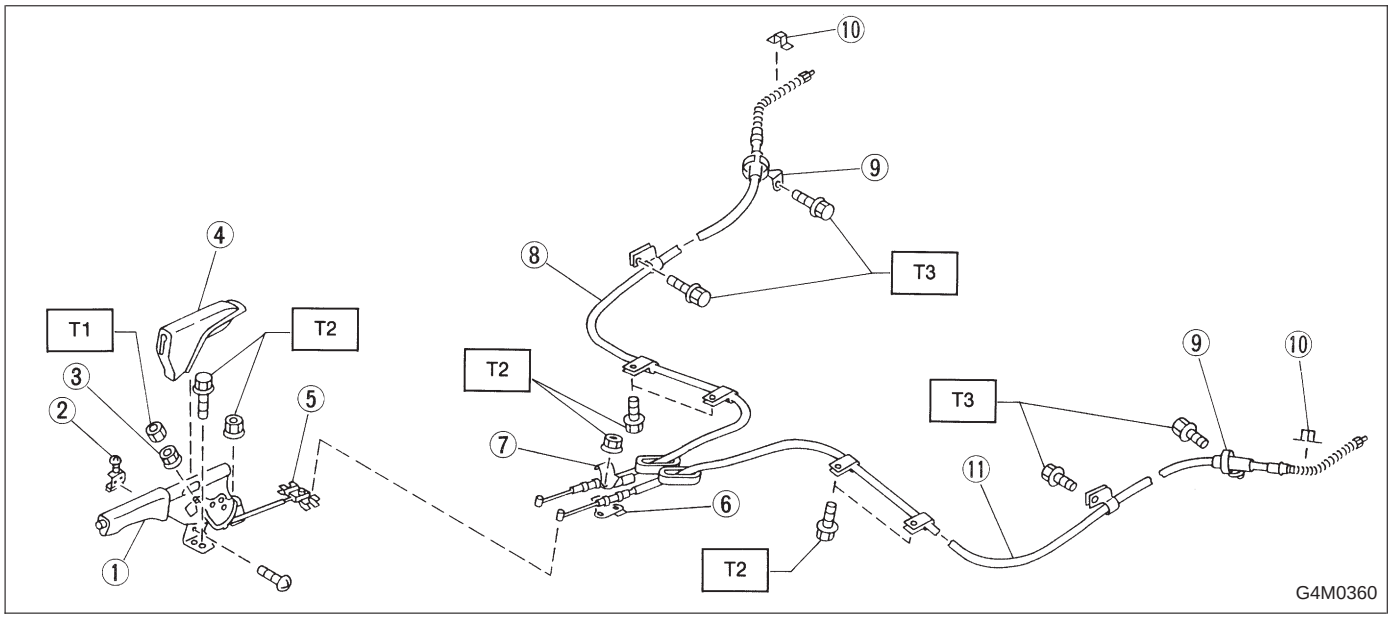
7. Hill Holder



① PHV cable
② Clamp
③ Bracket A
④ Pin
⑤ Bushing
⑥ Release fork
⑦ Adjusting nut
⑧ Snap pin
⑨ Clip
⑩ PHV (Pressure hold valve)
⑪ Bracket

Tightening torque: N·m (kg-m, ft-lb)
T1: 3.4±1.0 (0.35±0.10, 2.5±0.7)
T2: 18±5 (1.8±0.5, 13.0±3.6)
T3: 33±3 (3.4±0.3, 24.6±2.2)

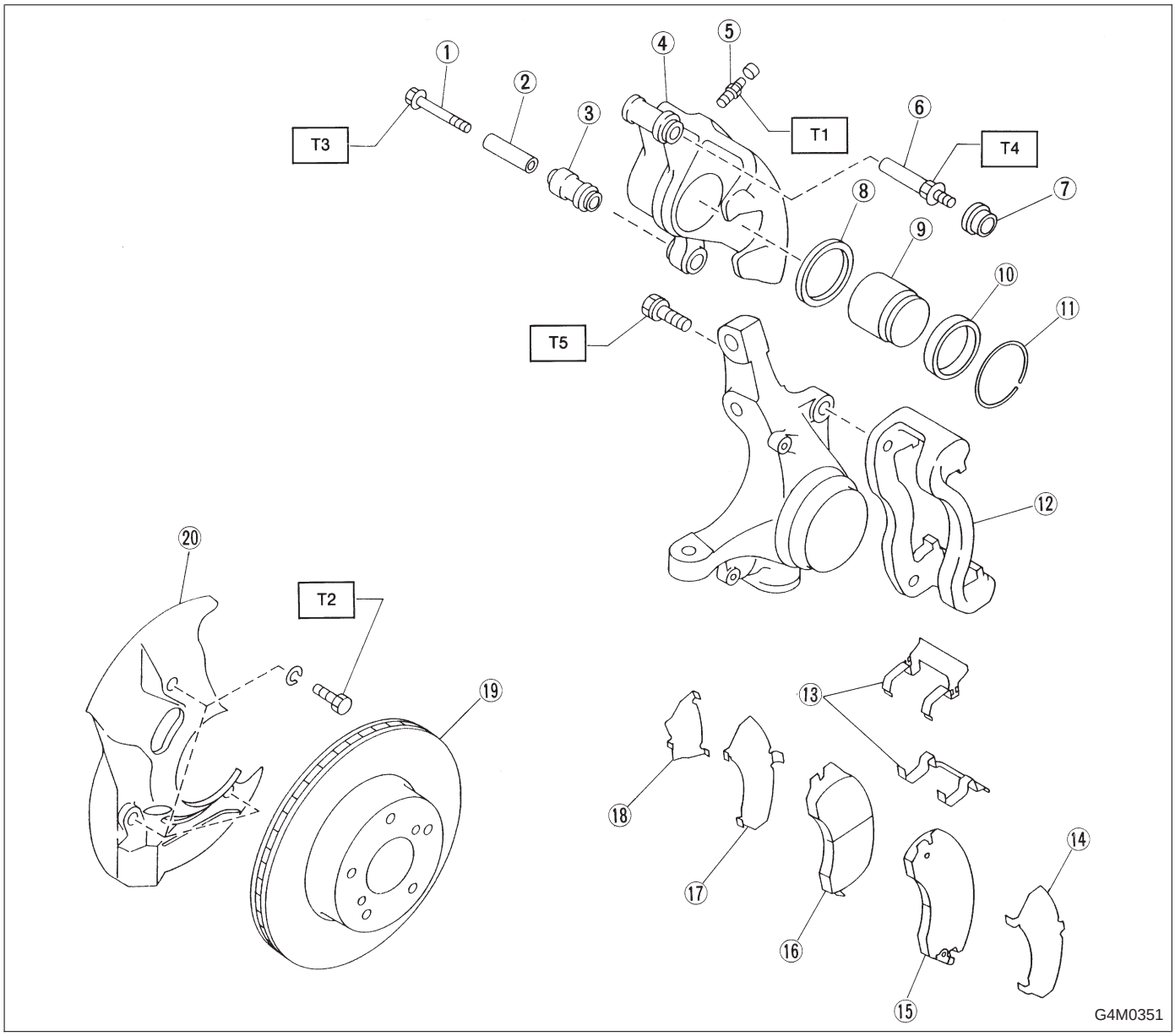
8. Parking (Hand) Brake



① Parking brake lever
② Parking brake switch
③ Adjusting nut
④ Cover
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

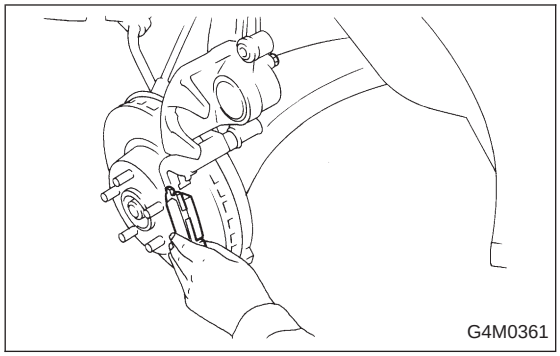
Tightening torque: N·m (kg-m, ft-lb)
T1: 5.9±1.5 (0.60±0.15, 4.3±1.1)
T2: 18±5 (1.8±0.5, 13.0±3.6)
T3: 32±10 (3.3±1.0, 24±7)

1. Front Disc Brake



① Lock pin
② Lock pin sleeve
③ Lock pin boot
④ Caliper body
⑤ Air bleeder screw
⑥ Guide pin
⑦ Guide pin boot
⑧ Piston seal
⑨ Piston
⑩ Piston boot
⑪ Boot ring
⑫ Support
⑬ Pad clip
⑭ Outer shim
⑮ Pad (Outside)
⑯ Pad (Inside)
⑰ Inner shim
⑱ Shim
⑲ Disc rotor
⑳ Disc cover

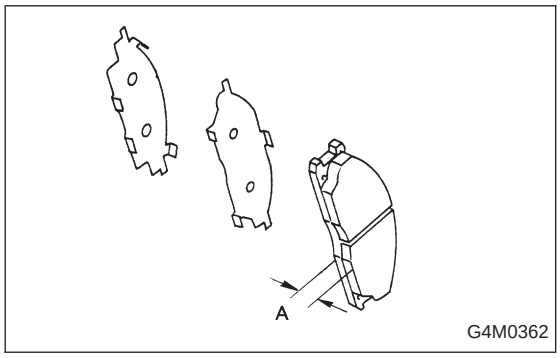
Tightening torque: N·m (kg-m, ft-lb)
T1: 8±1 (0.8±0.1, 5.8±0.7)
T2: 14±4 (1.4±0.4, 10.1±2.9)
T3: 36±5 (3.7±0.5, 26.8±3.6)
T4: 49±5 (5.0±0.5, 36.2±3.6)
T5: 78±10 (8.0±1.0, 58±7)


G4M0361

A: ON-CAR SERVICE

1. PAD

1) Remove lock pin.
2) Raise caliper body.
3) Remove pad.

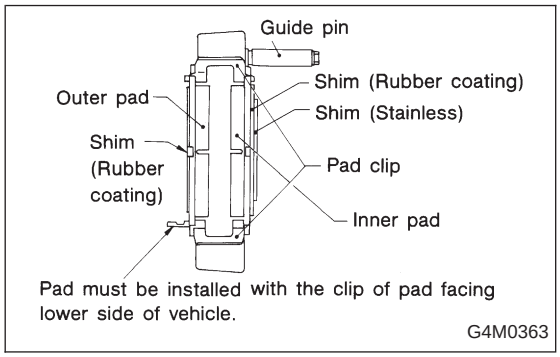


G4M0362

4) Check pad thickness A.

Pad thickness (including back metal) mm (in)	Standard value	17 (0.67)
	Wear limit	7.5 (0.295)

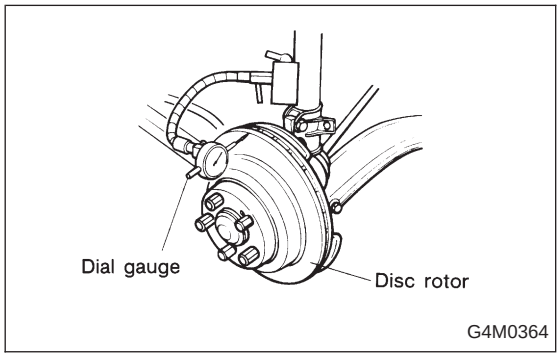
CAUTION:
● Always replace the pads for both the left and right wheels at the same time. Also replace pad clips if they are twisted or worn.
● A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of the wear indicator contacts the disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
● Replace pad if there is oil or grease on it.



G4M0363

5) Apply thin coat of PBC GREASE (Part No. 003607000) to the frictional portion between pad and pad clip.
6) Install pads on support.
7) Install caliper body on support.

NOTE:
If it is difficult to push piston during pad replacement, loosen air bleeder to facilitate work.



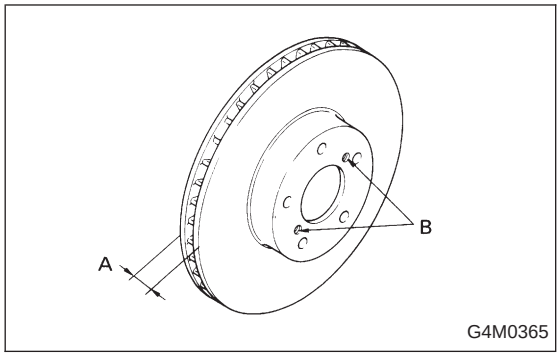
G4M0364

2. DISC ROTOR

1) Install disc rotor by tightening the five wheel nuts.
2) Set a dial gauge on the disc rotor. Turn disc rotor to check runout.

NOTE:
Make sure that dial gauge is set 5 mm (0.20 in) inward of rotor outer perimeter.

Disc rotor runout limit:
0.075 mm (0.003 in)



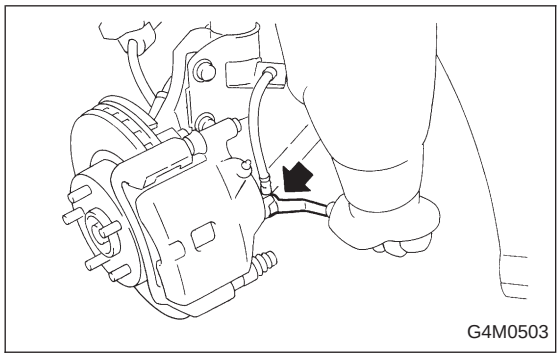
3) Measure disc rotor thickness.

NOTE:
Make sure that micrometer is set 5 mm (0.20 in) inward of rotor outer perimeter.

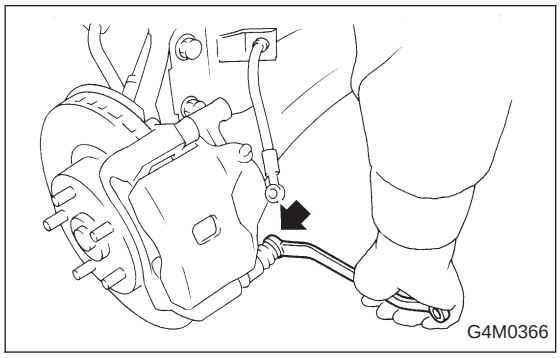
	Tire dia.	Standard value	Service limit	Disc outside dia.
Disc rotor thickness A mm (in)	13″	18.0 (0.709)	16.0 (0.630)	242 (9.53)
	14″	24.0 (0.945)	22.0 (0.866)	260 (10.24)

B: REMOVAL

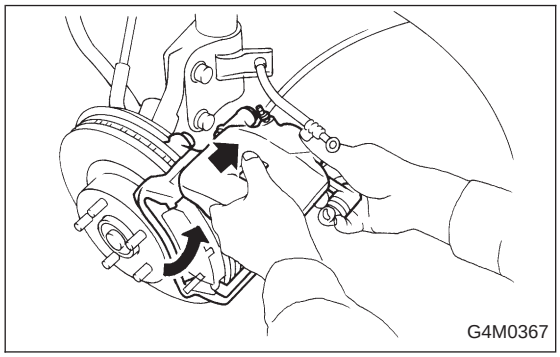
1) Remove union bolt and disconnect brake hose from caliper body assembly.



2) Loosen lock pin.

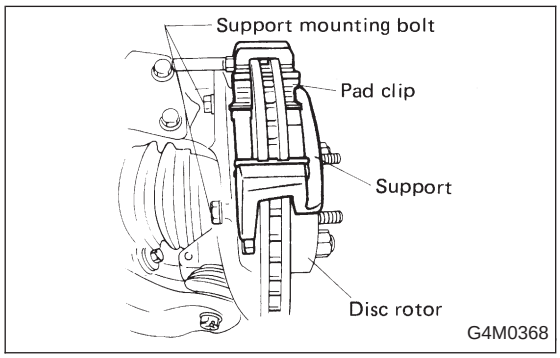


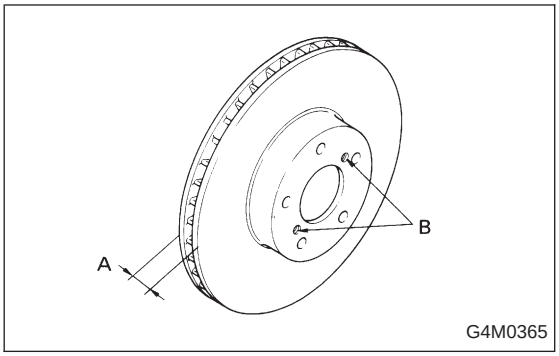
3) Raise caliper body and move it toward vehicle center to separate it from support.



4) Remove support from housing.

NOTE:
Remove support only when replacing it or the rotor. It need not be removed when servicing caliper body assembly.





5) Remove disc rotor from hub.

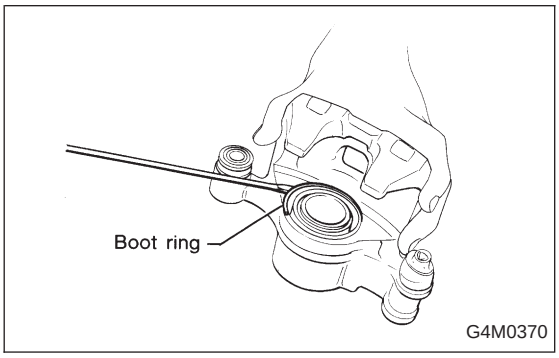
NOTE:
If disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in holes B on the rotor.

6) Clean mud and foreign particles from caliper body assembly and support.

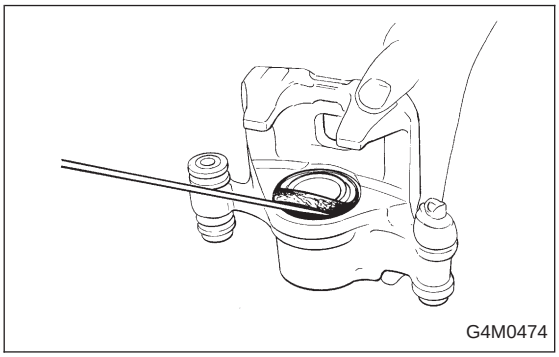
C: DISASSEMBLY

1) Clean mud and foreign particles from caliper body assembly and support.

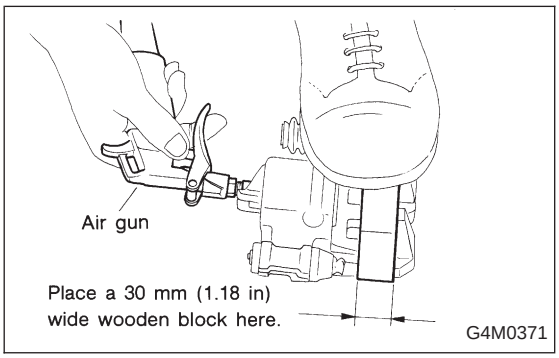
CAUTION:
Be careful not to allow foreign particles to enter inlet (at brake hose connector).



2) Using a standard screwdriver, remove boot ring from piston.



3) Remove boot from piston end.



4) Gradually supply compressed air via caliper body brake hose to force piston out.

CAUTION:
Place a wooden block as shown in Figure to prevent damage to piston.

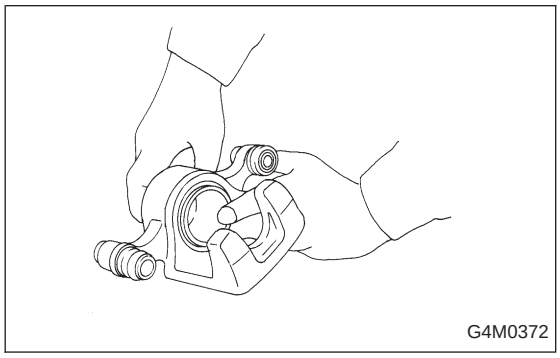
5) Remove piston seal from caliper body cylinder.
6) Remove lock pin sleeve and boot from caliper body.
7) Remove guide pin boot.

D: INSPECTION

1) Repair or replace faulty parts.
2) Check caliper body and piston for uneven wear, damage or rust.
3) Check rubber parts for damage or deterioration.

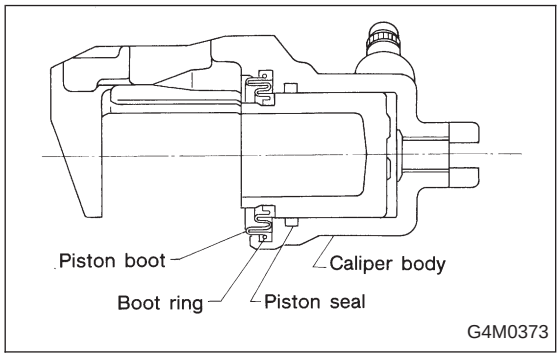
E: ASSEMBLY

1) Clean caliper body interior using brake fluid.
2) Apply a coat of brake fluid to piston seal and fit piston seal in groove on caliper body.
3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.


G4M0372

4) Insert piston into cylinder.

CAUTION:
Do not force piston into cylinder.



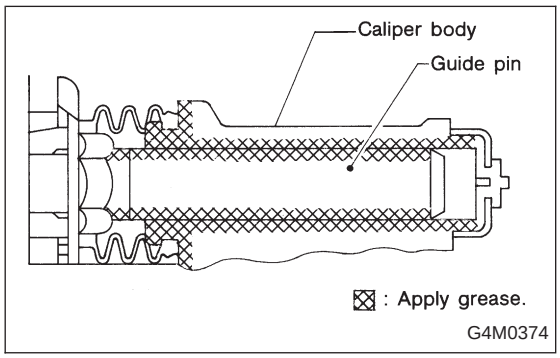
G4M0373

5) Apply a coat of specified grease to boot and fit in groove on ends of cylinder and piston.

Grease:
NIGLUBE RX-2 (Part No. 003606000)

To facilitate installation, fit boot starting with piston end.

6) Install boot ring. Be careful not scratch boot.

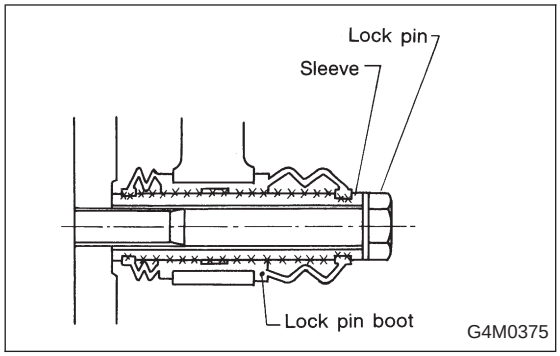


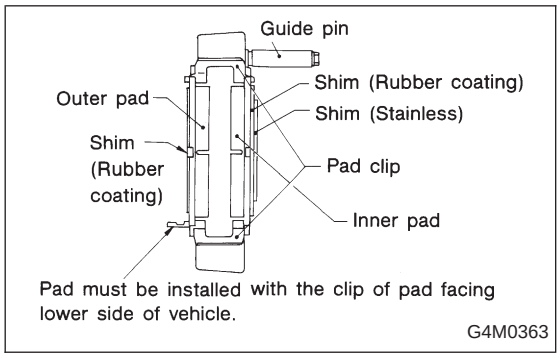
G4M0374

7) Apply a coat of specified grease to guide pin, outer surface, sleeve outer surface, cylinder inner surface, and boot grooves.

Grease:
NIGLUBE RX-2 (Part No. 003606000)

8) Install guide pin boots on caliper body.
9) Install lock pin boots on caliper body and insert lock pin sleeve into place.





F: INSTALLATION

1) Install disc rotor on hub.
2) Install support on housing.

Tightening torque:
78±10 N·m (8±1 kg-m, 58±7 ft-lb)

CAUTION:
● 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.
● A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of the wear indicator contacts the disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
● When replacing the pad, replace pads of the right and left wheels at the same time.

3) Apply thin coat of PBC GREASE (Part No. 003607000) to the frictional portion between pad and pad clip.

4) Install pads, rubber coated shim and stainless shim on support.

5) Install caliper body on support.

Tightening torque:
36±5 N·m (3.7±0.5 kg-m, 27±3.6 ft-lb)

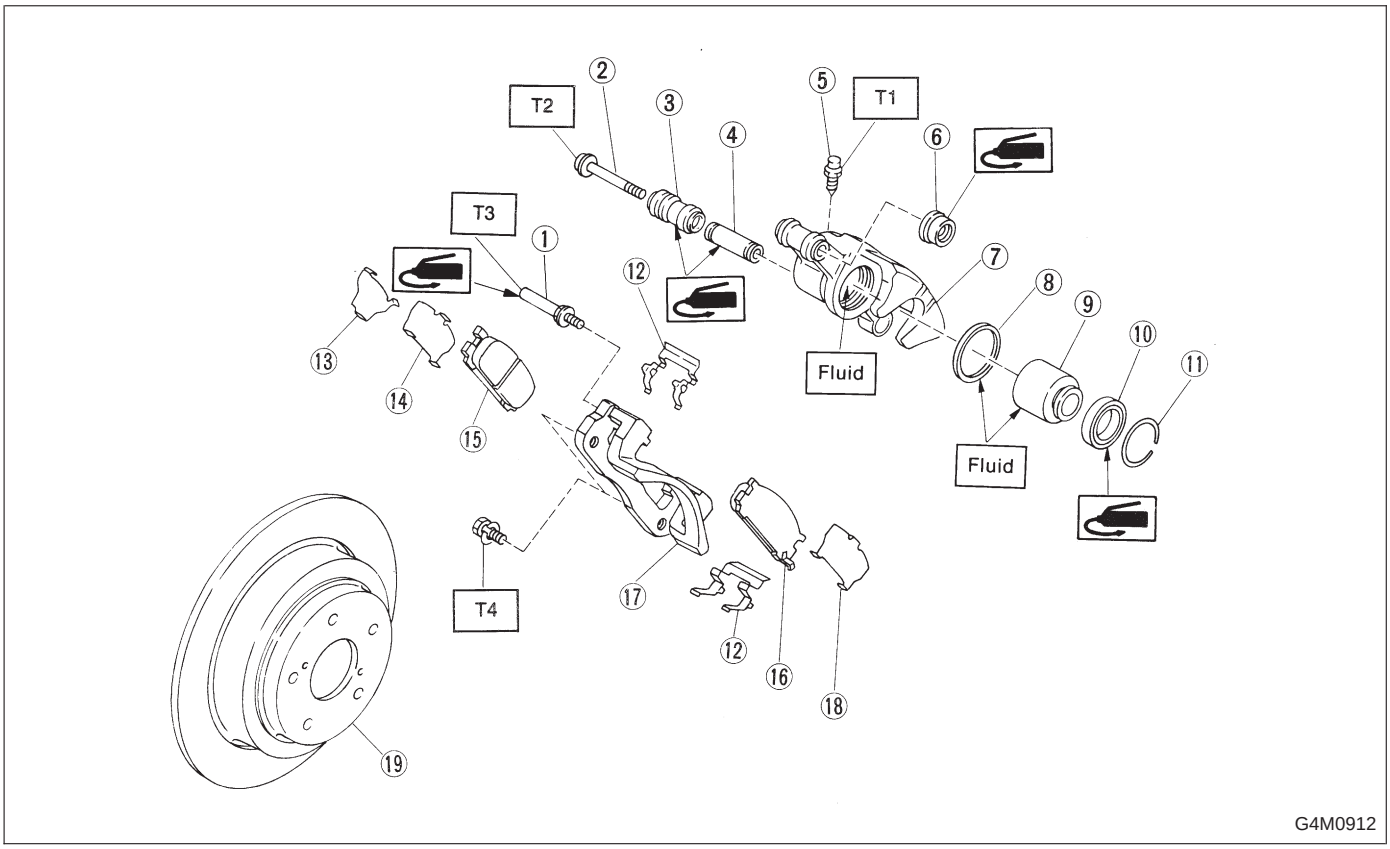
6) Connect brake hose.

Tightening torque:
18±3 N·m (1.8±0.3 kg-m, 13.0±2.2 ft-lb)

CAUTION:
Replace brake hose gaskets with new ones.

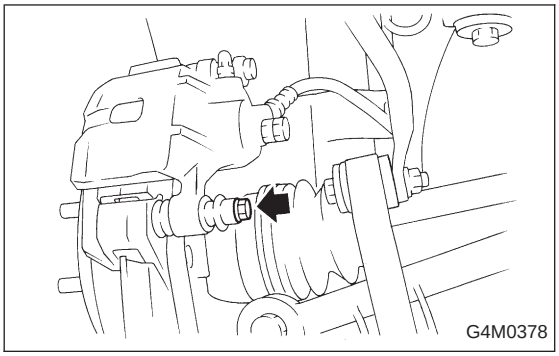
7) Bleed air from brake system.

2. Rear Disc Brake



① Guide pin
② Lock pin
③ Lock pin boot
④ Lock pin sleeve
⑤ Air bleeder screw
⑥ Guide pin boot
⑦ Caliper body
⑧ Piston seal
⑨ Piston
⑩ Piston boot
⑪ Boot ring
⑫ Pad clip
⑬ Shim
⑭ Inner shim
⑮ Inner pad
⑯ Outer pad
⑰ Support
⑱ Outer shim
⑲ Disc rotor

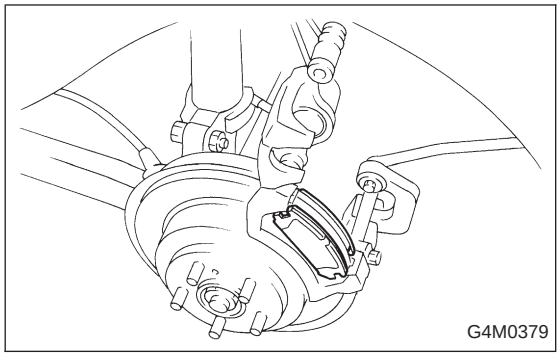
Tightening torque: N·m (kg-m, ft-lb)
T1: 8±1 (0.8±0.1, 5.8±0.7)
T2: 20±4 (2.0±0.4, 14.5±2.9)
T3: 26±5 (2.7±0.5, 19.5±3.6)
T4: 52±6 (5.3±0.6, 38.3±4.3)



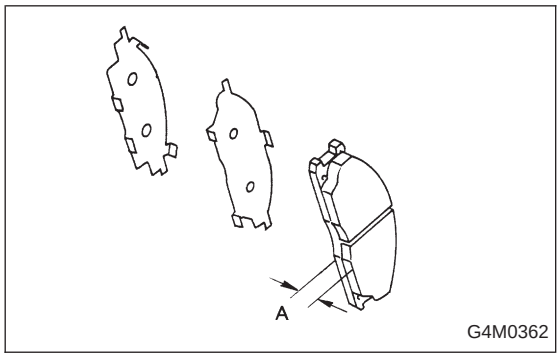
A: ON-CAR SERVICE

1. PAD

1) Remove lock pin.


G4M0379

2) Raise caliper body.
3) Remove pad from support.

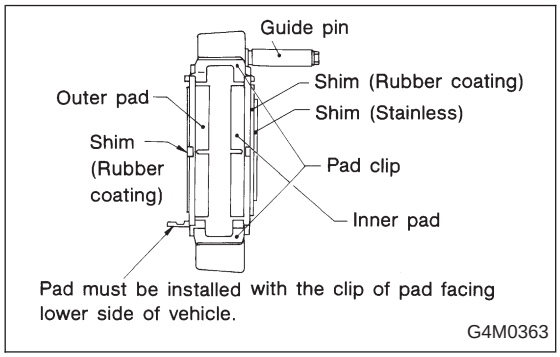


G4M0362

4) Check pad thickness (including back metal).

Pad thickness: A
Standard value 15.0 mm (0.591 in)
Wear limit 6.5 mm (0.256 in)

CAUTION:
● 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.
● A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of the wear indicator contacts the disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
● Replace pad if there is oil or grease on it.



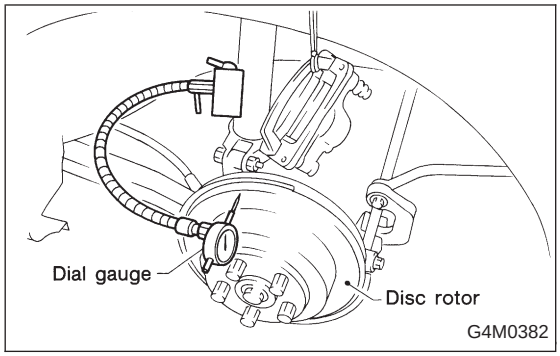
G4M0363

5) Apply thin coat of PBC GREASE (Part No. 03607000) to the frictional portion between pad and pad clip.
6) Install pad on support.

7) Install caliper body on support.

Tightening torque:
20±4 N·m (2.0±0.4 kg-m, 14.5±2.9 ft-lb)

NOTE:
If it is difficult to push piston during pad replacement, loosen air bleeder to facilitate work.

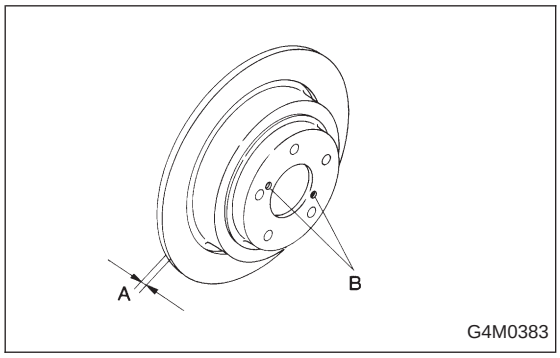


2. DISC ROTOR

1) Install disc rotor by tightening the five wheel nuts.
2) Set a dial gauge on the disc rotor. Turn disc rotor to check runout.

NOTE:
Make sure that dial gauge is set 5 mm (0.20 in) inward of rotor outer perimeter.

Disc rotor runout limit:
0.1 mm (0.004 in)

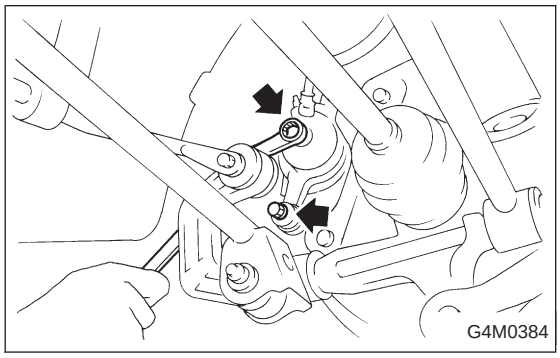


3) Measure disc rotor thickness.

NOTE:
Make sure that micrometer is set 5 mm (0.20 in) inward of rotor outer perimeter.

Disc rotor thickness: A
Standard value 10 mm (0.39 in)
Service limit 8.5 mm (0.335 in)

NOTE:
When removing disc rotor, refer to instructions under Parking Brake 4-4 [W4A0].



B: REMOVAL

1) Lift up vehicle and remove wheels.
2) Disconnect brake hose from caliper body assembly.

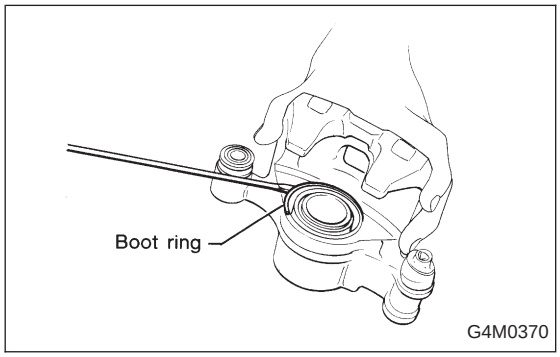
CAUTION:
Do not allow brake fluid to come in contact with vehicle body; wipe off completely if spilled.

3) Remove lock pin.
4) Raise caliper body and move it toward vehicle center to separate it from support.
5) Remove support from back plate.

NOTE:
Remove support only when replacing it or the rotor. It need not be removed when servicing caliper body assembly.

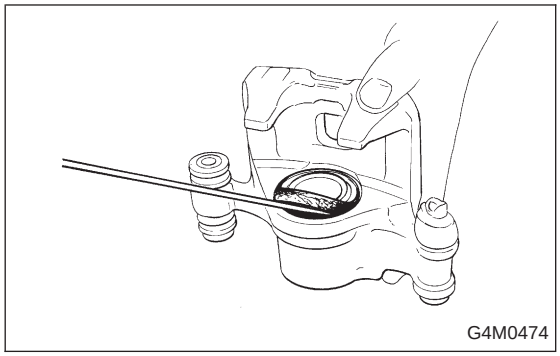
6) Clean mud and foreign particles from caliper body assembly and support.

CAUTION:
Be careful not to allow foreign particles to enter inlet (at brake hose connector).

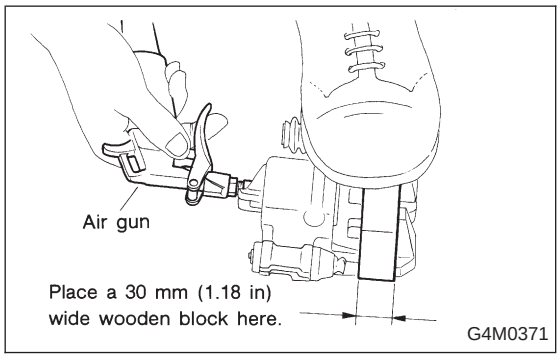


C: DISASSEMBLY

1) Remove the boot ring.


G4M0474

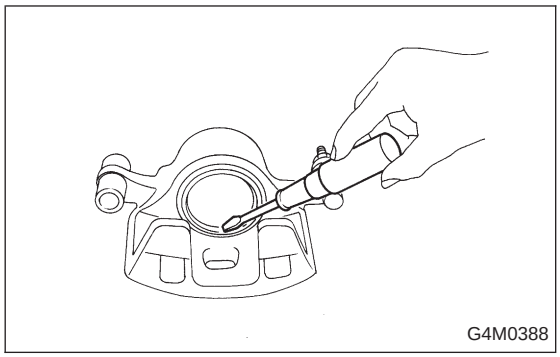
2) Remove the piston boot.



G4M0371

3) Gradually supply compressed air via inlet of caliper body to force piston out.

CAUTION:
- **Place a wooden block as shown in Figure to prevent damage to piston.**
- **Do not apply excessively high pressure.**


G4M0388

4) Remove piston seal from caliper body cylinder.
5) Remove lock pin sleeve and boot from caliper body.
6) Remove guide pin boot.

D: INSPECTION

1) Repair or replace faulty parts.
2) Check caliper body and piston for uneven wear, damage or rust.
3) Check rubber parts for damage or deterioration.

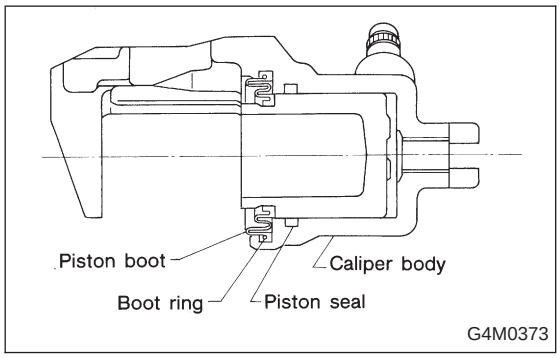
E: ASSEMBLY

1) Clean caliper body interior using brake fluid.
2) Apply a coat of brake fluid to piston seal and fit piston seal in groove on caliper body.
3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
4) Insert piston into cylinder.

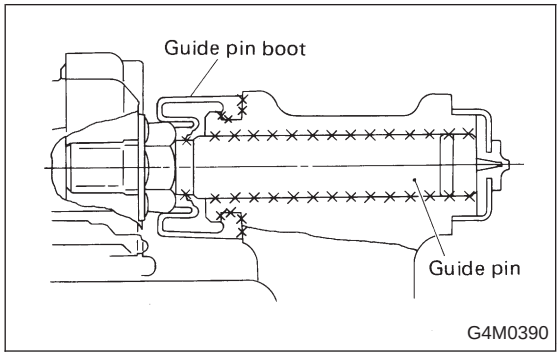
CAUTION:
Do not force piston into cylinder.

5) Apply a coat of specified grease to boot and fit in groove on ends of cylinder and piston.

Grease:
NIGLUBE RX-2 (Part No. 003606000)



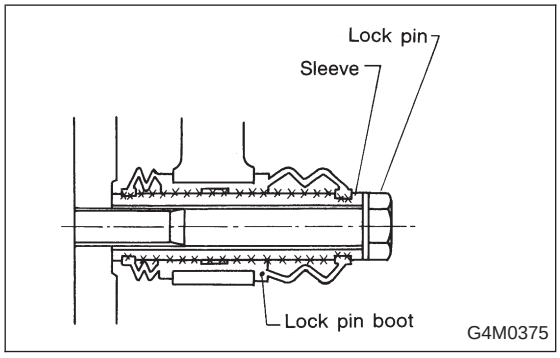
6) Install the piston boot to the caliper body, and attach boot ring.



7) Apply a coat of specified grease to guide pin, outer surface, sleeve outer surface, cylinder inner surface, and boot grooves.

Grease:
NIGLUBE RX-2 (Part No. 003606000)

8) Install guide pin boots on caliper body.
9) Install lock pin boots on caliper body and insert lock pin sleeve into place.



F: INSTALLATION

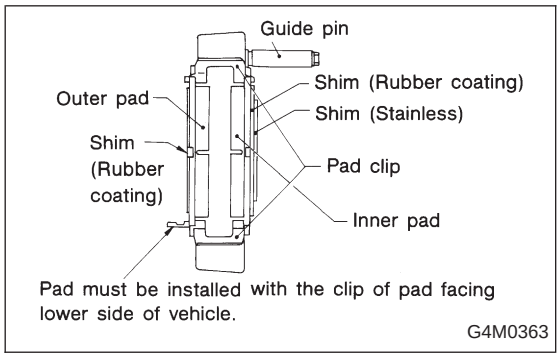
1) Install disc rotor on hub.
2) Install support on back plate.

Tightening torque:
52±6 N·m (5.3±0.6 kg-m, 38.3±4.3 ft-lb)

CAUTION:
● 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.

● A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of the wear indicator contacts the disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
● Replace pads if there is oil or grease on them.

3) Apply thin coat of PBC GREASE (Part No. 003607000) to the frictional portion between pad and pad clip.



4) Install pads on support.

5) Install caliper body on support.

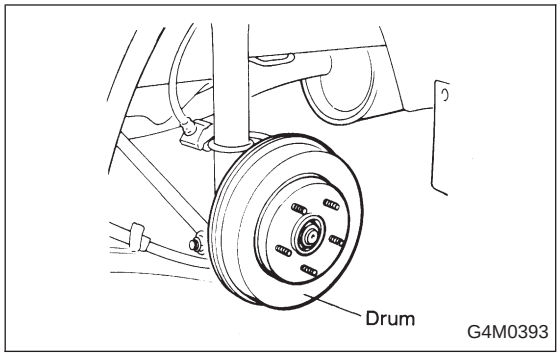
Tightening torque:
20±4 N·m (2.0±0.4 kg-m, 14.5±2.9 ft-lb)

6) Connect brake hose.

Tightening torque:
18±3 N·m (1.8±0.3 kg-m, 13.0±2.2 ft-lb)

CAUTION:
● The brake hose must be connected without any twist.
● Replace brake hose gaskets with new ones.

7) Bleed air from brake system.

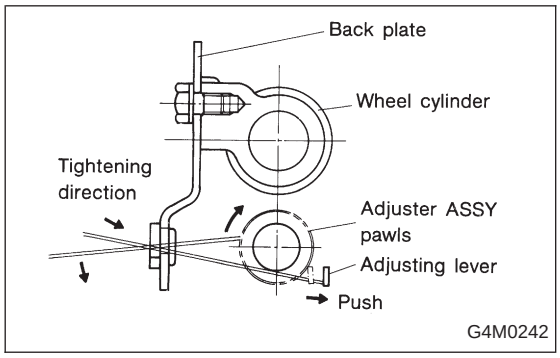


3. Rear Drum Brake

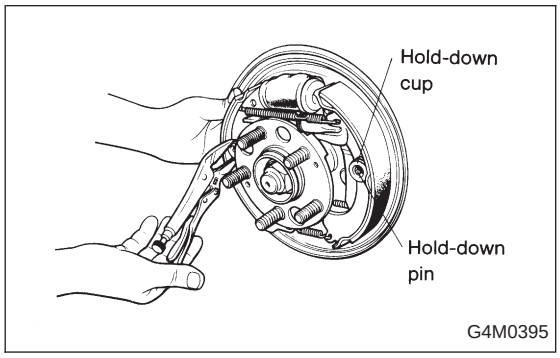
A: REMOVAL

1. BRAKE DRUM AND SHOE

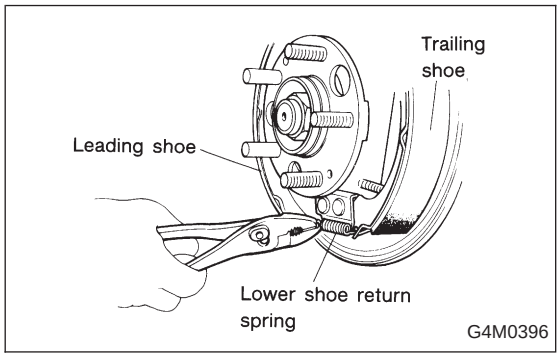
1) Loosen wheel nuts, jack-up vehicle, support it with rigid racks, and remove wheel.
2) Release parking brake.
3) Remove brake drum from brake assembly.



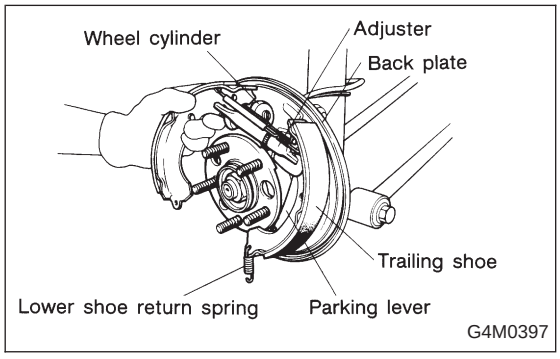
NOTE:
If it is difficult to remove brake drum, remove adjusting hole cover from back plate, and then, turn adjusting screw using a slot-type screwdriver until brake shoe separates from the drum.



4) Hold hold-down pin by securing rear of back plate with your hand.
5) Disconnect hold-down cup from hold-down pin by rotating hold-down cup.



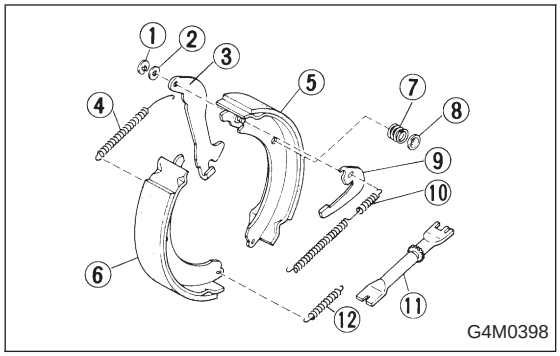
6) Disconnect lower shoe return spring from shoes.



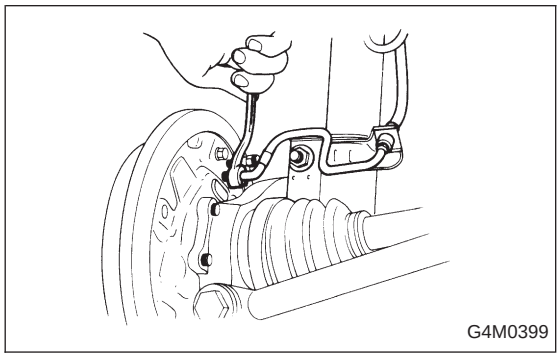
7) Remove shoes one by one from back plate with adjuster.

CAUTION:
Be careful not to bend parking brake cable excessively when removing brake shoes.

8) Disconnect parking brake cable from parking lever.

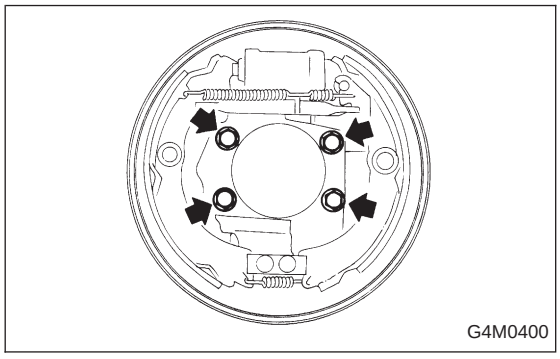


9) Remove the following.
① Retainer
② Washer
③ Parking lever
④ Upper shoe return spring
⑤ Trailing shoe
⑥ Leading shoe
⑦ Shoe hold-down spring
⑧ Shoe hold-down cup
⑨ Adjusting lever
⑩ Adjuster spring
⑪ Adjuster
⑫ Lower shoe return spring

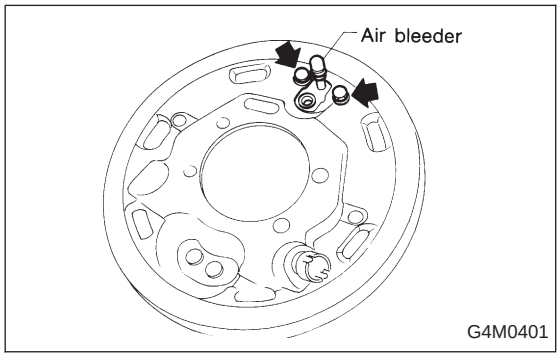


2. BRAKE ASSEMBLY

1) Remove wheel.
2) Remove axle nut.
3) Remove brake drum
4) Unscrew the brake pipe flare nut and disconnect brake pipe.
5) Remove hub. <Ref. to 4-2 [W2A0], [W3A0].>

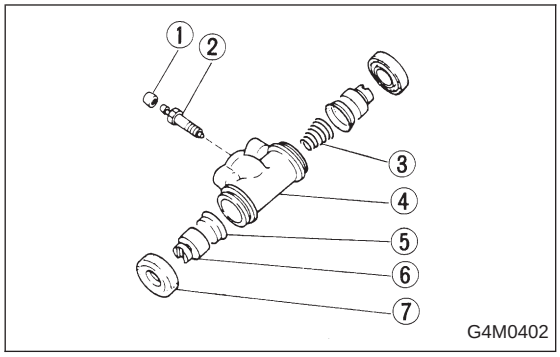


6) Remove the bolts installing back plate, and then, remove brake assembly.



3. WHEEL CYLINDER

1) Remove brake drum and shoes.
2) Unscrew brake pipe flare nut; and disconnect brake pipe.
3) Remove the bolts installing wheel cylinder on back plate, and remove it.

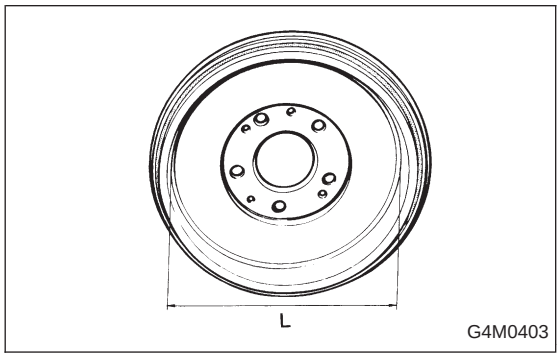


B: DISASSEMBLY

1. WHEEL CYLINDER

1) Remove right and left dust boots from wheel cylinder.
2) Remove piston, cup, spring and air bleeder screw and cap.

① Bleeder cap
② Bleeder screw
③ Spring
④ Cylinder
⑤ Cup
⑥ Piston
⑦ Boot



C: INSPECTION

1) If the inside surface of brake drum is streaked, correct the surface. And, if it is unevenly worn, taperingly streaked, or the outside surface of brake drum is damaged, correct or replace it.
2) Measure the drum inner diameter.

Drum inner diameter: "L"
Standard: 228.6 mm (9 in)
Service limit: 230.6 mm (9.08 in)

3) Measure the lining thickness.

Lining thickness:
Standard: 4.1 mm (0.161 in)
Service limit: 1.5 mm (0.059 in)

4) If the deformation or wear of back plate, shoe, etc. are notable, replace them.
5) When the shoe return spring tension is excessively weakened, replace it, taking care to identify upper and lower springs.

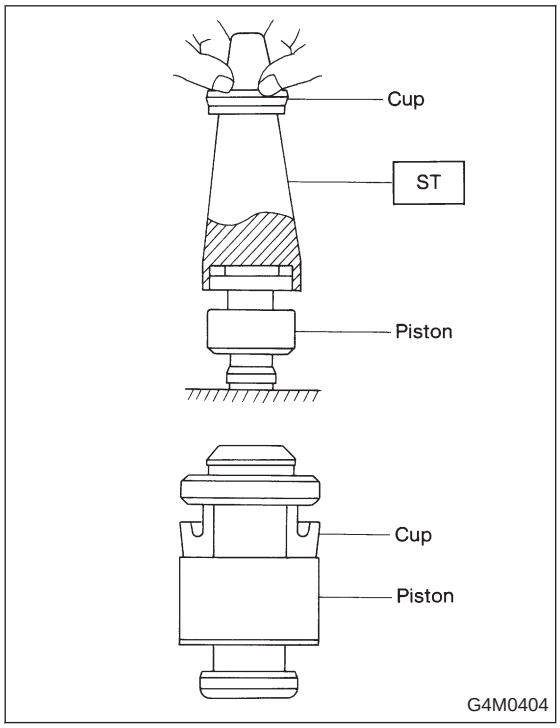
D: ASSEMBLY

1. WHEEL CYLINDER

Clean all parts in brake fluid. Check and replace faulty parts.

- Cup and boot for damage or fatigue
- Cylinder, piston and spring or damage or rust formation

1) Assembly is the reverse order of disassembly.

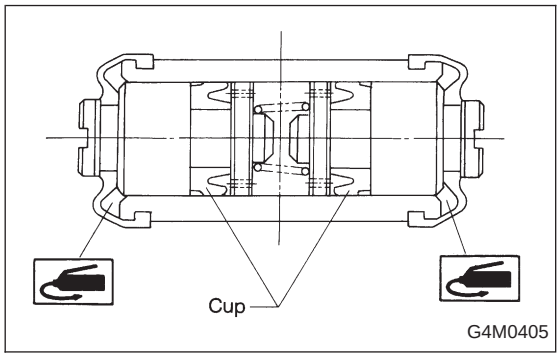


(1) When installing the cup, use ST, apply brake fluid to the frictional surface for smooth installation and pay attention to cup direction.
(2) STs are available in different sizes.

CAUTION:
● When replacing the repair kit, make sure that the sizes of cylinder and cup are the same as those which were replaced.
● Use only the tool of the correct size.

ST: ADAPTER	
Applicable size	Part No.
17.46 mm (11/16 in)	925460000
19.05 mm (3/4 in)	926460000

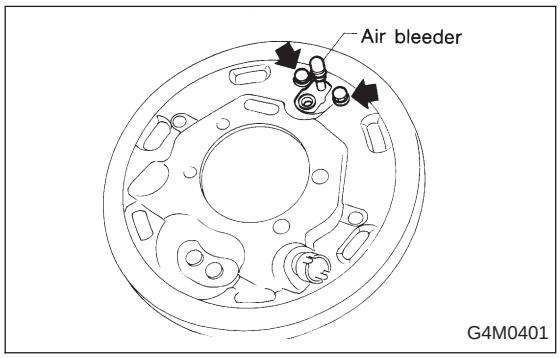
CAUTION:
While assembling, be careful to prevent any metal chip, dust or dirt from entering the wheel cylinder.



2) Apply rubber grease to the boot inside as shown in Figure.

Grease:
NIGLUBE RX-2 (Part No. 003606000)

CAUTION:
Never use brake grease.

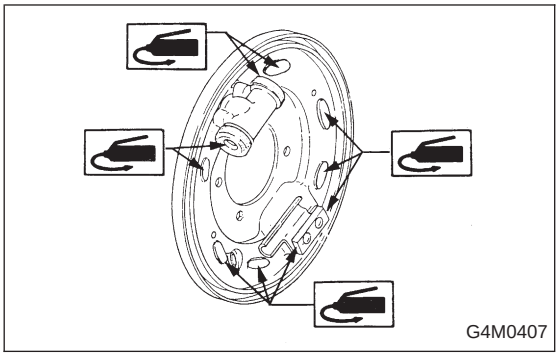


E: INSTALLATION

1. WHEEL CYLINDER

Install wheel cylinder on back plate, and tighten bolts.

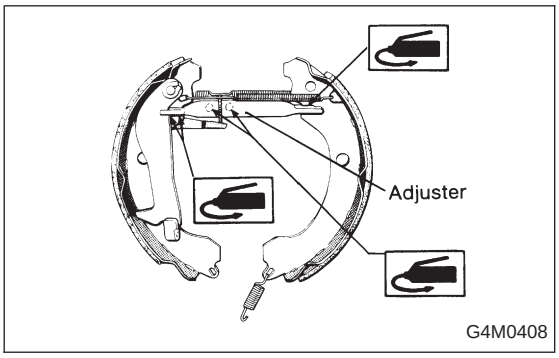
Tightening torque:
10±2 N·m (1.0±0.2 kg-m, 7.2±1.4 ft-lb)


G4M0407

2. BRAKE DRUM AND SHOE

1) Clean back plate and wheel cylinder.
2) Apply grease to portions indicated by arrows in Figure.

Brake grease:
Dow Corning Molykote No. 7439 (Part No. 725191460)

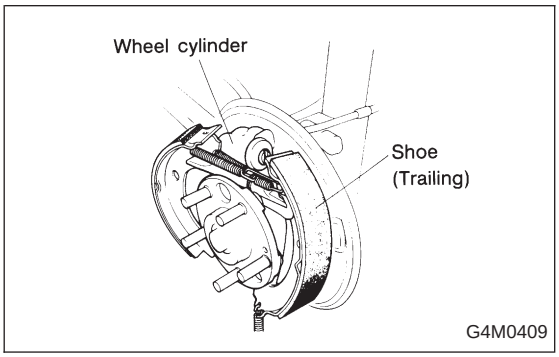


G4M0408

3) Apply grease to adjusting screw and both ends of adjuster.

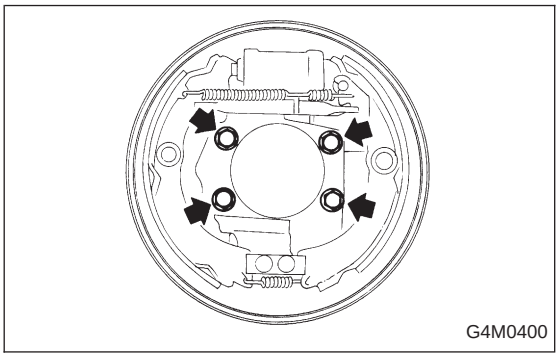
Brake grease:
Dow Corning Molykote No. 7439 (Part No. 725191460)

4) Connect upper shoe return spring to shoes.



G4M0409

5) While positioning shoes (one at a time) in groove on wheel cylinder, secure shoes.
6) Connect lower shoe return spring.
7) Fix shoes by connecting hold-down cup to hold-down pin.


G4M0400

3. BRAKE ASSEMBLY

1) Install brake assembly on housing, and tighten bolts to install back plate.

Tightening torque:
52±6 N·m (5.3±0.6 kg-m, 38.3±4.3 ft-lb)

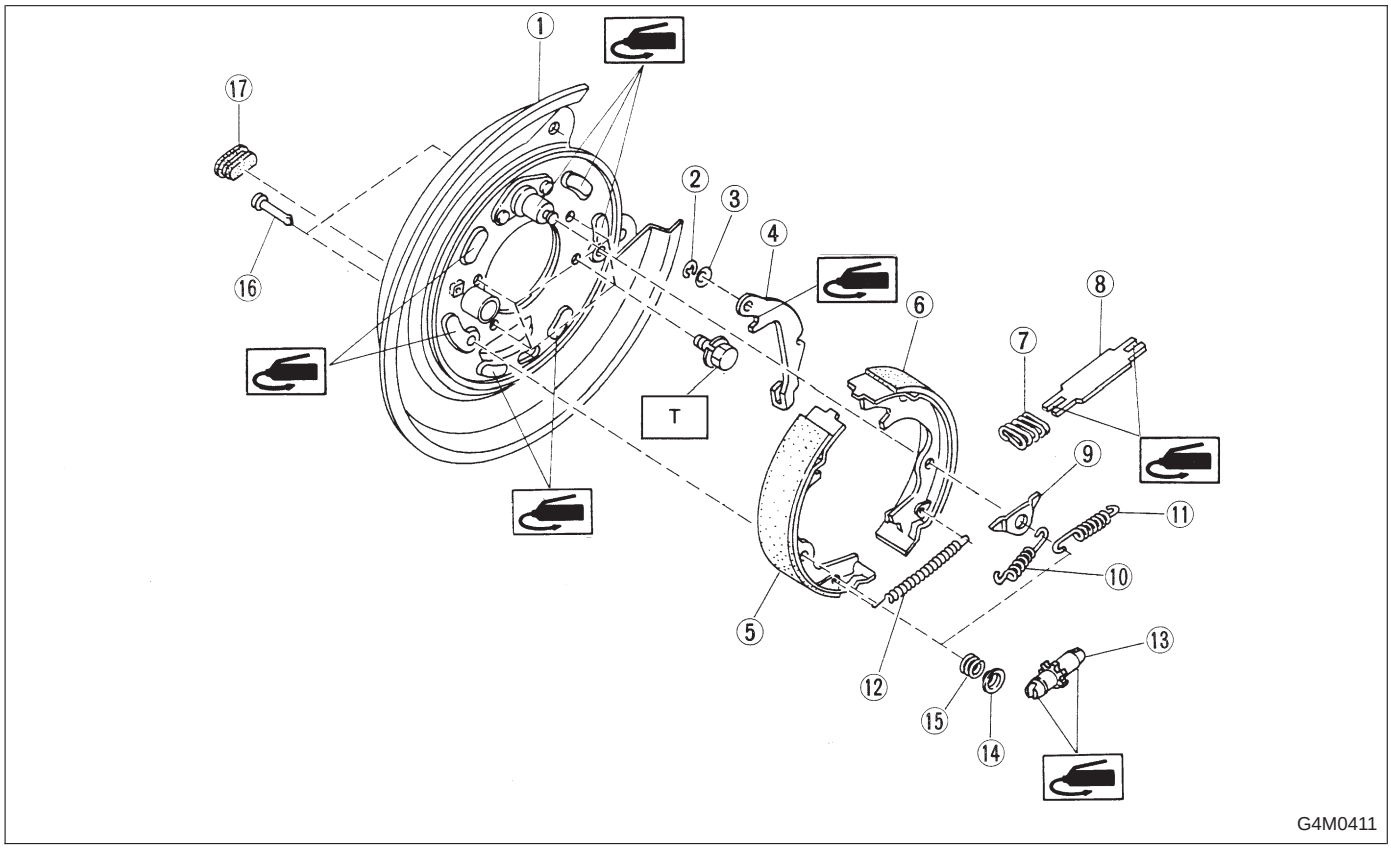
2) Install hub. <Ref. to 4-2 [W2D0], [W3D0].>
3) Connect brake pipe, and tighten brake pipe flange nut.

Tightening torque:
14.7^{+3}_{-2} N·m ($1.5^{+0.3}_{-0.2}$ kg-m, $10.8^{+2.2}_{-1.4}$ ft-lb)

4) Set the outside diameter of brake shoes less than 0.5 — 0.8 mm (0.020 — 0.031 in) in comparison with the inside diameter of brake drum.
5) Install brake drum.
6) After installing brake assembly, bleed air from brake line.

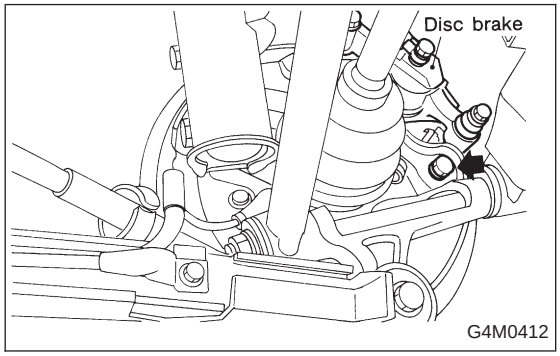
4. Parking Brake (Rear Disc Brake)

A: REMOVAL

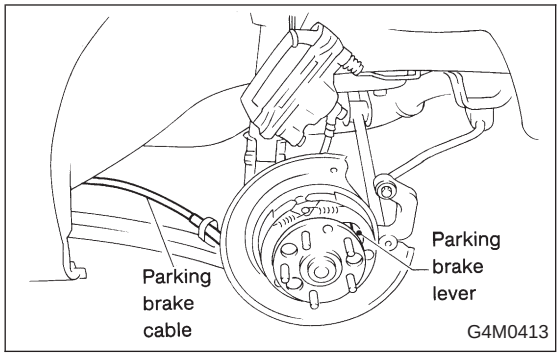


① Back plate
② Retainer
③ Spring washer
④ Lever
⑤ Parking brake shoe (Primary)
⑥ Parking brake show (Secondary)
⑦ Strut spring
⑧ Strut
⑨ Shoe guide plate
⑩ Primary return spring
⑪ Secondary return spring
⑫ Adjusting spring
⑬ Adjuster
⑭ Shoe hold down cup
⑮ Shoe hold down spring
⑯ Shoe hold down pin
⑰ Adjusting hole cover

Tightening torque: N·m (kg-m, ft-lb)
T: 52±6 (5.3±0.6, 38.3±4.3)



1) Remove the two mounting bolts and remove the disc brake assembly.
2) Suspend the disc brake assembly so that the hose is not stretched.
3) Remove the disc rotor.
4) Remove shoe return spring from parking brake assembly.
5) Remove front shoe hold down spring and pin with pliers.
6) Remove strut and strut spring.
7) Remove adjuster assembly from parking brake assembly.
8) Remove brake shoe.
9) Remove rear shoe hold-down spring and pin with pliers.



10) Remove parking cable from parking lever.

11) Using a standard screwdriver, raise retainer. Remove parking lever and washer from brake shoe.

B: INSPECTION

1) Measure 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.

C: INSTALLATION

CAUTION:

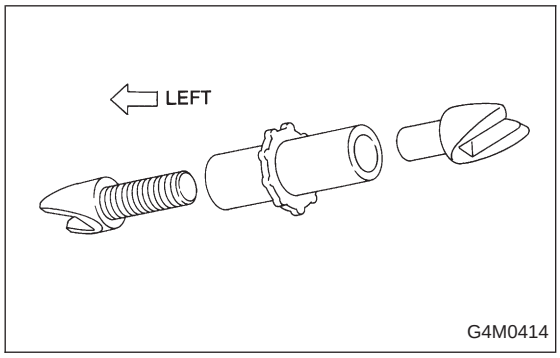
Be sure lining surface is free from oil contamination.

Brake grease:
Dow Corning Molykote No 7439 (Part No. 725191460)

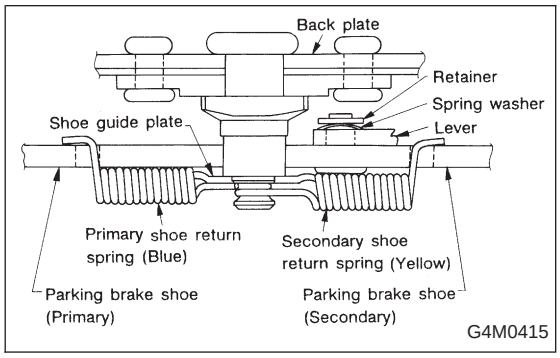
1) Apply brake grease to the following places.
(1) Six contact surfaces of shoe rim and back plate packing.
(2) Contact surface of shoe wave and anchor pin
(3) Contact surface of lever and strut
(4) Contact surface of shoe wave and adjuster assembly
(5) Contact surface of shoe wave and strut
(6) Contact surface of lever and shoe wave

2) Installation is in reverse order of removal.

CAUTION:
- **Use new retainers and clinch them when installing brake shoes to levers.**
- **Ensure that parking lever moves smoothly.**
- **Do not confuse left parking lever with right one.**
- **Do not confuse left strut with right one.**



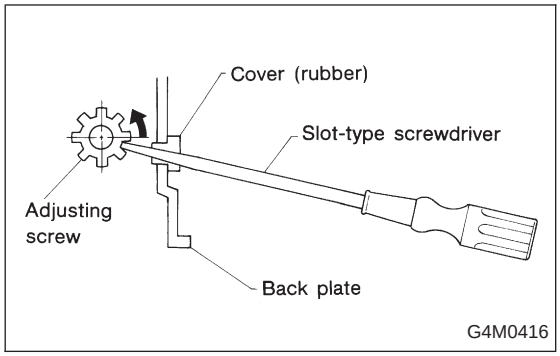
NOTE:
Ensure that adjuster assembly is securely installed with screw in the left side, facing vehicle front.



NOTE:
Ensure that shoe return spring is installed as shown in Figure.

3) Adjust parking brakes. <Ref. to 4-4 [W4D1].>

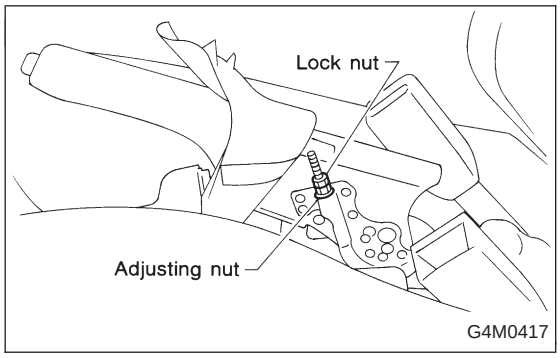
CAUTION:
After replacing parking brake lining, be sure to drive vehicle for "break-in" purposes.
(1) Drive the vehicle about 35 km/h (22 MPH).
(2) With the parking brake release button pushed in, pull the parking brake lever gently.
(3) Drive the vehicle for about 200 meter (0.12 mile) in this condition.
(4) Wait 5 to 10 minutes for the parking brake to cool down. Repeat this procedure once more.
(5) After breaking-in, re-adjust parking brakes.



D: PARKING BRAKE ADJUSTMENT

1. SHOE CLEARANCE ADJUSTMENT

1) Remove adjusting hole cover from back plate.
2) Turn adjusting screw using a slot-type screwdriver until brake shoe is in close contact with disc rotor.
3) Turn back (downward) adjusting screw 3 or 4 notches.
4) Install adjusting hole cover to back plate.



2. LEVER STROKE ADJUSTMENT

1) Remove console box lid.
2) Forcibly pull parking brake lever 3 to 5 times.
3) Adjust parking brake lever by turning adjuster until parking brake lever stroke is set at 6 notches with operating force of 196 N (20 kg, 44 lb).
4) Tighten lock nut.
5) Install console box lid.

Lever stroke:
7 to 8 notches when pulled with a force of 196 N (20 kg, 44 lb)

Torque (Adjuster lock nut):
5.9±1.5 N·m (0.60±0.15 kg-m, 4.3±1.1 ft-lb)

5. Master Cylinder

A: REMOVAL

1) Thoroughly drain brake fluid from reservoir tank.
2) Disconnect fluid level indicator harness connector.
3) Remove brake pipes from master cylinder.
4) Remove master cylinder mounting nuts, and take out master cylinder from brake booster.

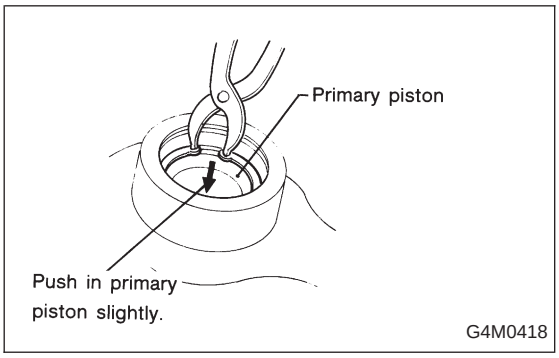
CAUTION:
Be extremely careful not to spill brake fluid. Brake fluid spilt on the vehicle body will harm the painted surface; wipe it off quickly if spilt.

B: DISASSEMBLY

1. PRECAUTIONS FOR DISASSEMBLING

1) Remove mud and dirt from the surface of brake master cylinder.
2) Prepare tools necessary for disassembly operation, and arrange them neatly on work bench.
3) Clean work bench.
4) Tools for disassembly operation:
- 1 Phillips screwdriver
- 1 C-ring pliers

2. DISASSEMBLING PROCEDURE



1) Remove supply valve stopper. (only vehicle equipped with A.B.S.)
2) Remove C-ring with C-ring pliers pushing in primary piston slightly.

NOTE:
Piston may jump out from master cylinder.

3) Extract primary piston assembly and secondary piston assembly.

CAUTION:
- **Do not disassemble the piston assembly; otherwise, the spring set value may be changed.**
- **Use brake fluid or methanol to wash inside wall of cylinder, pistons and piston cups. Be careful not to damage parts when washing. If methanol is used for washing, do not dip rubber parts, such as piston cups, in it for more than 30 seconds; otherwise, they may become swelled.**

C: INSPECTION

If any damage, deformation, wear, swelling, rust, and other faults are found on the primary piston assembly, secondary piston assembly, supply valve stopper, or gasket, replace the faulty part.

CAUTION:
- **The primary and secondary pistons must be replaced as complete assemblies.**
- **The service limit of the clearance between each piston and the master cylinder inner dia. is 0.11 mm (0.0043 in).**
- **When handling parts, be extremely careful not to damage or scratch the parts, or let any foreign matter get on them.**

D: ASSEMBLY

1. PRECAUTIONS FOR ASSEMBLING

1) When assembling, be sure to use recommended brake fluid.
2) Ensure that the inside wall of cylinder, pistons, and piston cups are free from dirt when assembling.
3) Be extremely careful not to damage, scratch, or dent cylinder inside wall, pistons, and piston cups.
4) Do not drop parts. Never attempt to use any part that has been dropped accidentally.

2. ASSEMBLING OPERATION

1) Assembling piston assembly:
Apply recommended brake fluid to inside wall of cylinder, and to outer surface of piston assembly, and install piston assemblies carefully into cylinder.
2) Assembling supply valve stopper:
After installing piston into cylinder, push primary piston in about 10 mm (0.39 in), using a rod, such as push rod then assemble gasket and supply valve stopper.

Tightening torque:
2.2±0.7 N·m (0.225±0.075 kg-m, 1.6±0.5 ft-lb)

CAUTION:
If the gasket and supply valve stopper are assembled without pushing in the primary piston, scratches may be caused on the secondary piston, and no pressure may be built up in the secondary side. To avoid such an error, be sure to push in the primary piston before assembling these parts.

3) Assembling C-ring:
With primary piston pushed in slightly, attach C-ring by using C-ring pliers.

NOTE:
After assembling, ensure that the C-ring is fitted securely in the ring groove.

E: INSTALLATION

To install the master cylinder to the body, reverse the sequence of removal procedure.

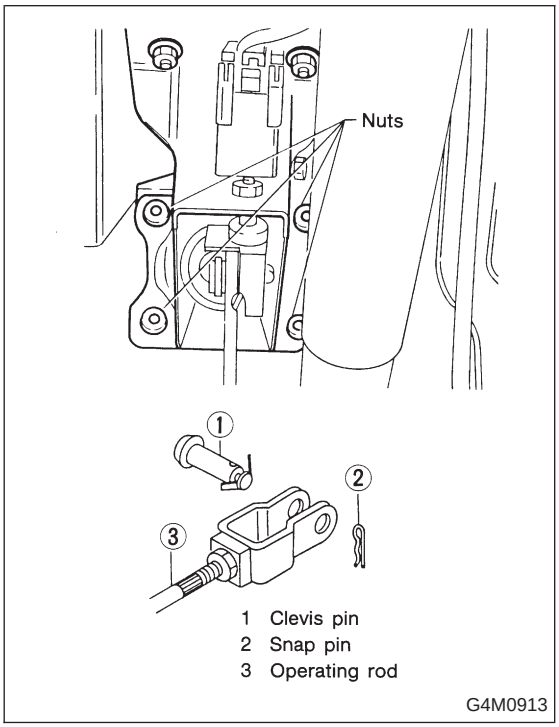
Tightening torque:
Master cylinder mounting nut
14±4 N·m (1.4±0.4 kg-m, 10.1±2.9 ft-lb)
Piping flare nut
14.7^{+3}_{-2} N·m ($1.5^{+0.3}_{-0.2}$ kg-m, $10.8^{+2.2}_{-1.4}$ ft-lb)

CAUTION:
Be sure to use recommended brake fluid.

6. Brake Booster

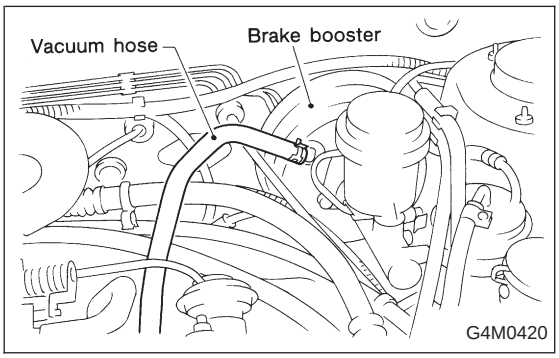
A: REMOVAL

1) Remove the following parts at engine compartment.
   (1) Disconnect connector for brake fluid level indicator.
   (2) Remove brake pipes from master cylinder.
   (3) Remove master cylinder installing nuts.
   (4) Disconnect 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 brake booster while shunning brake pipes.

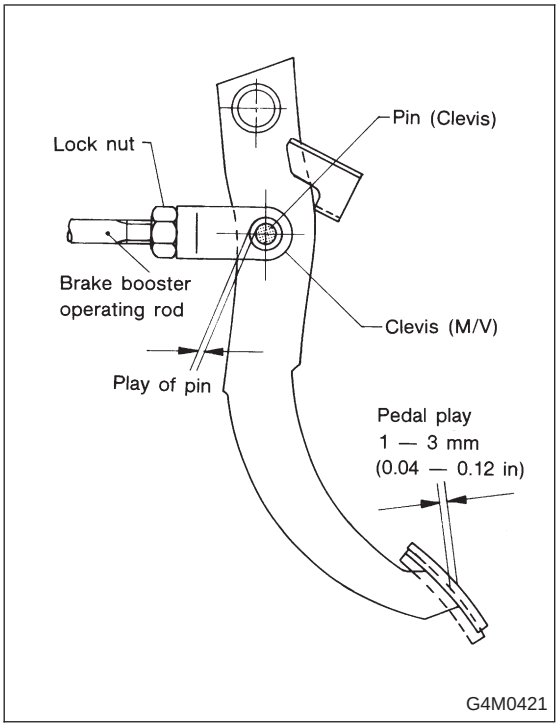


B: INSTALLATION

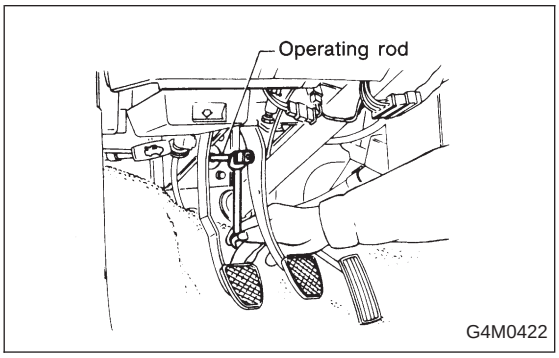
1) Mount brake booster in position.
2) Connect operating rod to brake pedal with clevis pin and snap pin.



3) Connect vacuum hose to brake booster.
4) Mount master cylinder onto brake booster.
5) Connect brake pipes to master cylinder.
6) Connect electric connector for brake fluid level indicator.



7) Adjust operating rod of brake booster as follows:
(1) Be sure 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 kg, 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, loosen lock nut for operating rod and adjust operating rod by turning in the direction that shortens it.

8) Bleed air from brake system.

Torque (Air bleeder screw):
8±1 N·m (0.8±0.1 kg-m, 5.8±0.7 ft-lb)

9) Conduct road tests to ensure brakes do not drag.

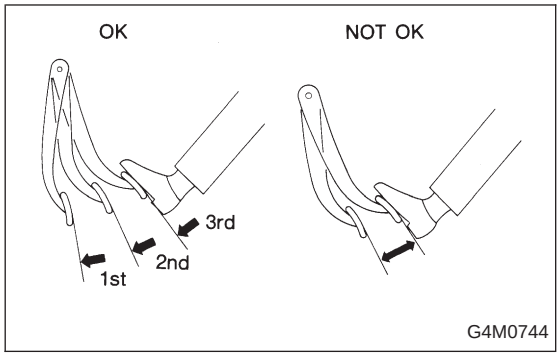
C: OPERATION CHECK

CAUTION:

When checking operation, be sure to securely apply the hand brake.

1. CHECKING WITHOUT USING 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 procedure.

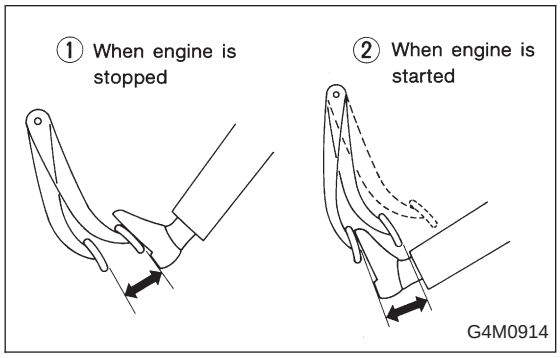


2. AIR TIGHTNESS CHECK

Start engine, and run it for 1 to 2 minutes, then turn it off. Depress 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, brake booster is faulty.

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.



3. OPERATION CHECK

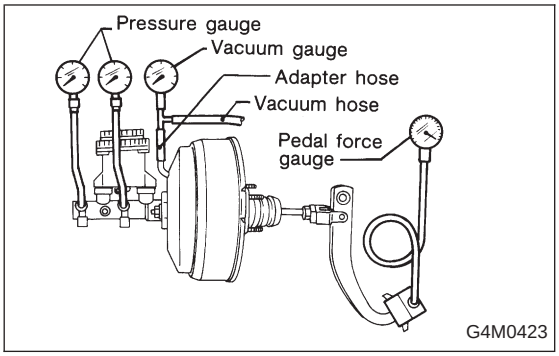
1) With engine off, depress brake pedal several times applying the same pedal force and make sure that the pedal height does not vary with each depression of the pedal.
2) With brake pedal depressed, start engine.
3) As engine starts, brake pedal should move slightly toward the floor. If no change occurs in the pedal height, brake booster is faulty.

NOTE:
If faulty, check precisely with gauges.

4. LOADED AIR TIGHTNESS CHECK

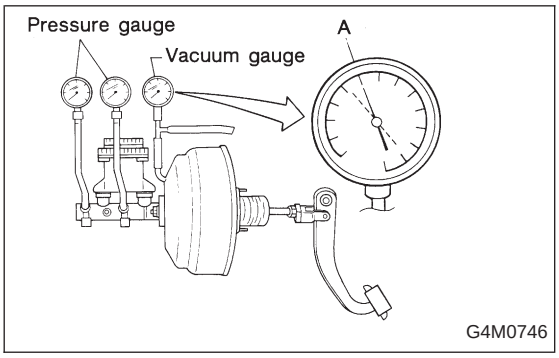
Depress brake pedal while engine is running, and turn off engine while the pedal is still depressed. Keep the pedal depressed for 30 seconds; if no change occurs in the pedal height, brake booster is functioning normally; if the pedal height increases, it is faulty.

NOTE:
If faulty, check precisely with gauges.



5. CHECKING WITH GAUGES

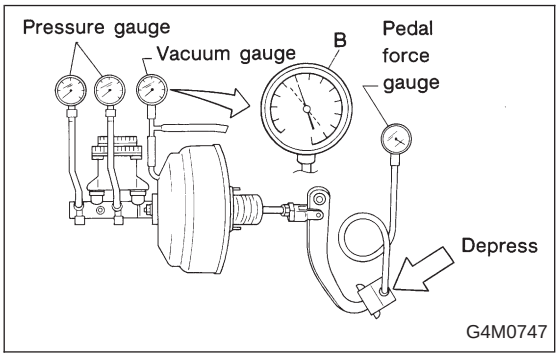
Connect gauges as shown in Figure. After bleeding air from pressure gauges, proceed to each check.



6. AIR TIGHTNESS CHECK

1) Start 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 brake pedal.
2) Stop engine and watch the gauge. If the vacuum drop range is less than 3.3 kPa (25 mmHg, 0.98 inHg) within 15 seconds after stopping engine, brake booster is functioning properly.
If defective, the cause may be one of those listed below.

- Check valve malfunction
- Leak from vacuum hose
- Leak from the shell jointed portion or stud bolt welded portion
- Damaged diaphragm
- Leak from valve body seal and bearing portion
- Leak from plate and seal assembly portion
- Leak from poppet valve assembly portion



7. LOADED AIR TIGHTNESS CHECK

1) Start engine and depress brake pedal with pedal force of 196 N (20 kg, 44 lb). Keep 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.
2) Stop engine and watch vacuum gauge.
If the vacuum drop range is less than 3.3 kPa (25 mmHg, 0.98 inHg) within 15 seconds after stopping engine, brake booster is functioning properly.
If defective, refer to “AIR TIGHTNESS CHECK” described above.

8. LACK OF BOOSTING ACTION CHECK

Turn off engine, and set the vacuum gauge reading at “0”. Then, check the fluid pressure when brake pedal is depressed. The pressure must be greater than the standard value listed below.

Brake pedal force	147 N (15 kg, 33 lb)	294 N (30kg, 66 lb)
Models without A.B.S.	785 kPa (8 kg/cm^2, 114 psi)	2,158 kPa (22 kg/cm^2, 313 psi)
Models with A.B.S.	588 kPa (6 kg/cm^2, 85 psi)	1,863 kPa (19 kg/cm^2, 270 psi)

9. BOOSTING ACTION CHECK

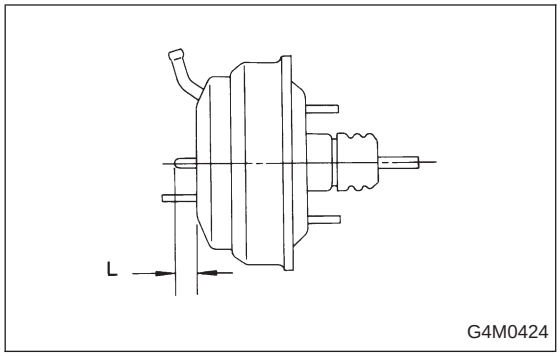
Set the vacuum gauge reading at 66.7 kPa (500 mmHg, 19.69 inHg) by running engine. Then, check the fluid pressure when brake pedal is depressed. The pressure must be greater than the standard value listed below.

Brake pedal force	147 N (15 kg, 33 lb)	294 N (30kg, 66 lb)
Models without A.B.S.	5,492 kPa (56 kg/cm^2, 796 psi)	8,434 kPa (86 kg/cm^2, 1,223 psi)
Models with A.B.S.	5,394 kPa (55 kg/cm^2, 782 psi)	9,219 kPa (94 kg/cm^2, 1,337 psi)

D: HANDLING PRECAUTIONS

1) After protector has been removed from push rod, do not turn the master cylinder side of brake booster downwards.

(1) If the master cylinder side is turned downwards, push rod may come loose by virtue of its own weight, and reaction disc may drop into brake booster.



(2) Whether or not reaction disc has dropped can be determined by measuring the dimension “L”.
The projected amount “L” of pushrod should be as follows:

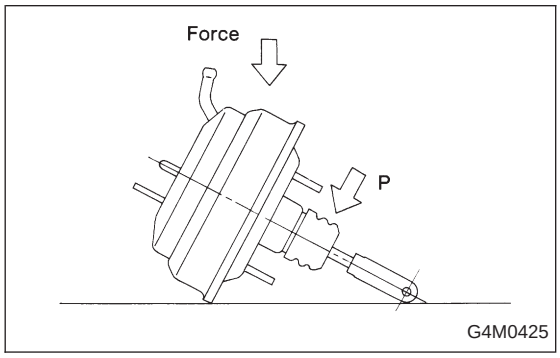
Standard (Correct):
L = 10.4 mm (0.409 in)

Incorrect:
L = 4.4 mm (0.173 in)

(3) If protector is fitted correctly, reaction disc will not fall out.

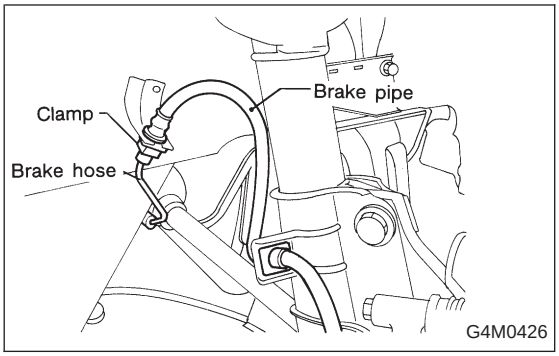
2) Be careful not to drop brake booster. Brake booster should be discarded if it has been dropped.

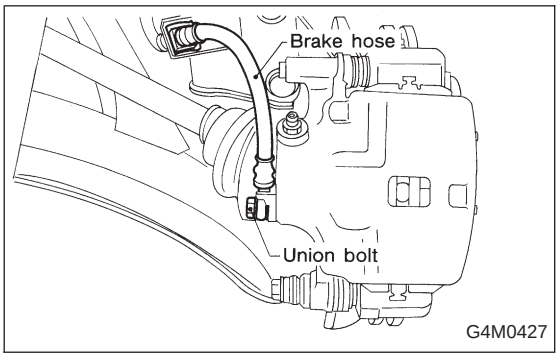
3) Use special care when handling operating rod.
If excessive force is applied to operating rod, sufficient to cause a change in the angle in excess of ±3°, it may result in damage to the power piston cylinder.



4) Use care when placing brake booster on the floor.

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.





7. Brake Hose

A: REMOVAL

1) Separate brake pipe from brake hose.
(Always use flare nut wrench and be careful not to deform flare nut.)
2) Pull out clamp to remove brake hose.
3) Remove clamp at strut and union bolt.

B: INSTALLATION

1. FRONT BRAKE HOSE

1) Route end of brake hose (on caliper side) through hole in brake hose bracket at strut location.
2) Tighten end of brake hose at caliper using a union bolt.

Torque (Union bolt):
18±3 N·m (1.8±0.3 kg-m, 13.0±2.2 ft-lb)

3) Secure middle fitting of brake hose to bracket at strut location using a clamp.
4) Position disc in straight-forward direction and route brake hose through hole in bracket on wheel apron side.

CAUTION:
Be sure brake hose is not twisted.

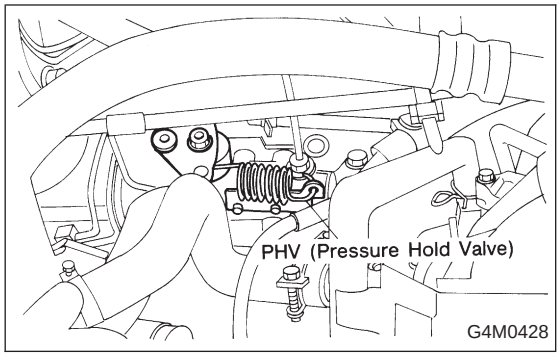
5) Temporarily tighten flare nut to connect brake pipe and hose.
6) Fix brake hose with clamp at wheel apron bracket.
7) While holding hexagonal part of brake hose fitting with a wrench, tighten flare nut to the specified torque.

Torque (Brake pipe flare nut):
14.7^{+3}_{-2} N·m ($1.5^{+0.3}_{-0.2}$ kg-m, $10.8^{+2.2}_{-1.4}$ ft-lb)

8) Bleed air from the brake system.

2. REAR BRAKE HOSE

1) Pass brake hose through the hole of bracket, and lightly tighten flare nut to connect brake pipe.
2) Insert clamp upward to fix brake hose.
3) Perform the same procedures as before mentioned in steps 7) and 8).



8. Hill Holder

A: REMOVAL

1) Drain brake fluid from reservoir of master cylinder.
2) Remove adjusting nut and cable clamp, and disconnect PHV cable from cable bracket on engine.
3) Detach PHV cable from clips.
4) Remove cable clamp, and disconnect PHV cable from PHV stay.

CAUTION:
Carefully protect boots and inner cable from damage when disconnecting PHV cable.

5) Disconnect brake pipes from PHV.

CAUTION:
- **Pay attention not to drop brake fluid onto body painting since it may dissolve paint.**
- **Pay attention not to damage hexagonal head of flare nut by using pipe wrench without fail.**

6) Detach PHV along with support from side frame.

CAUTION:
Exercise utmost care to prevent foreign matter from entering into PHV when removing it.

B: INSPECTION

Check up removed parts as follows, and replace defective ones.
1) Check if boots of PHV cable are damaged or degraded, and if inner cable is damaged or corroded.
2) Check if return spring is worn out, damaged or corroded.
3) Confirm that rolling sound of ball is heard with PHV inclined and lever rotates smoothly.

CAUTION:
Never disassemble PHV. Replace entire PHV assembly if necessary.

C: INSTALLATION

1) Install PHV onto side frame.

Torque:
18±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)

2) Connect brake pipes to PHV.

Torque:
14.7^{+3}_{-2} N·m ($1.5^{+0.3}_{-0.2}$ kg-m, $10.8^{+2.2}_{-1.4}$ ft-lb)

CAUTION:
Confirm that brake pipes are not deformed and/or damaged. Replace them with new ones if necessary.

3) Install PHV cable to PHV stay.

CAUTION:
If cable clamp (and clips) is damaged, replace it with a new one.

4) Connect PHV cable with clips.

NOTE:
Avoid sharp bending of PHV cable as it may cause breakage.

5) Install PHV cable onto cable bracket on engine.
6) Apply grease to the following points.
- Hook portion of return spring
- Cable end portion of lever

Grease:
SUNLIGHT 2 (Part No. 003602010)

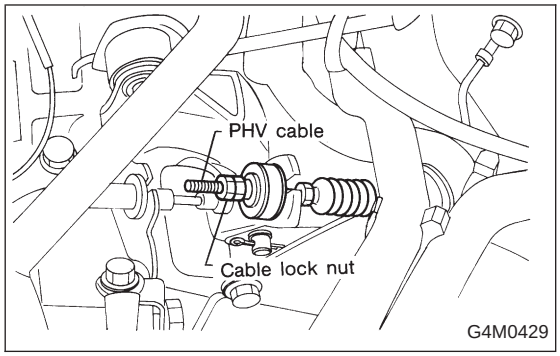
7) Be sure to bleed air from the system.

CAUTION:
After replacing PHV cable or clutch cable with new one, operate clutch pedal about 30 times as a running-in operation prior to adjustment.

D: ADJUSTMENTS

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

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



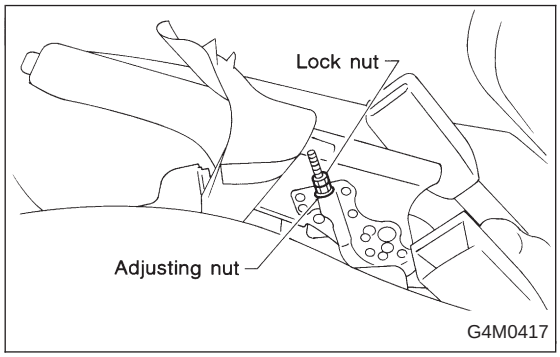
NOTE:
Whenever turning adjust nut, prevent PHV cable from revolving as shown in Figure.

9. Parking Brake Lever

A: REPLACEMENT

1) Remove console box from front floor.
2) Disconnect electric connector for parking brake switch.
3) Loosen parking brake adjuster, and remove inner cable end from equalizer.
4) Remove parking brake lever.
5) Install parking brake lever in the reverse order of removal.

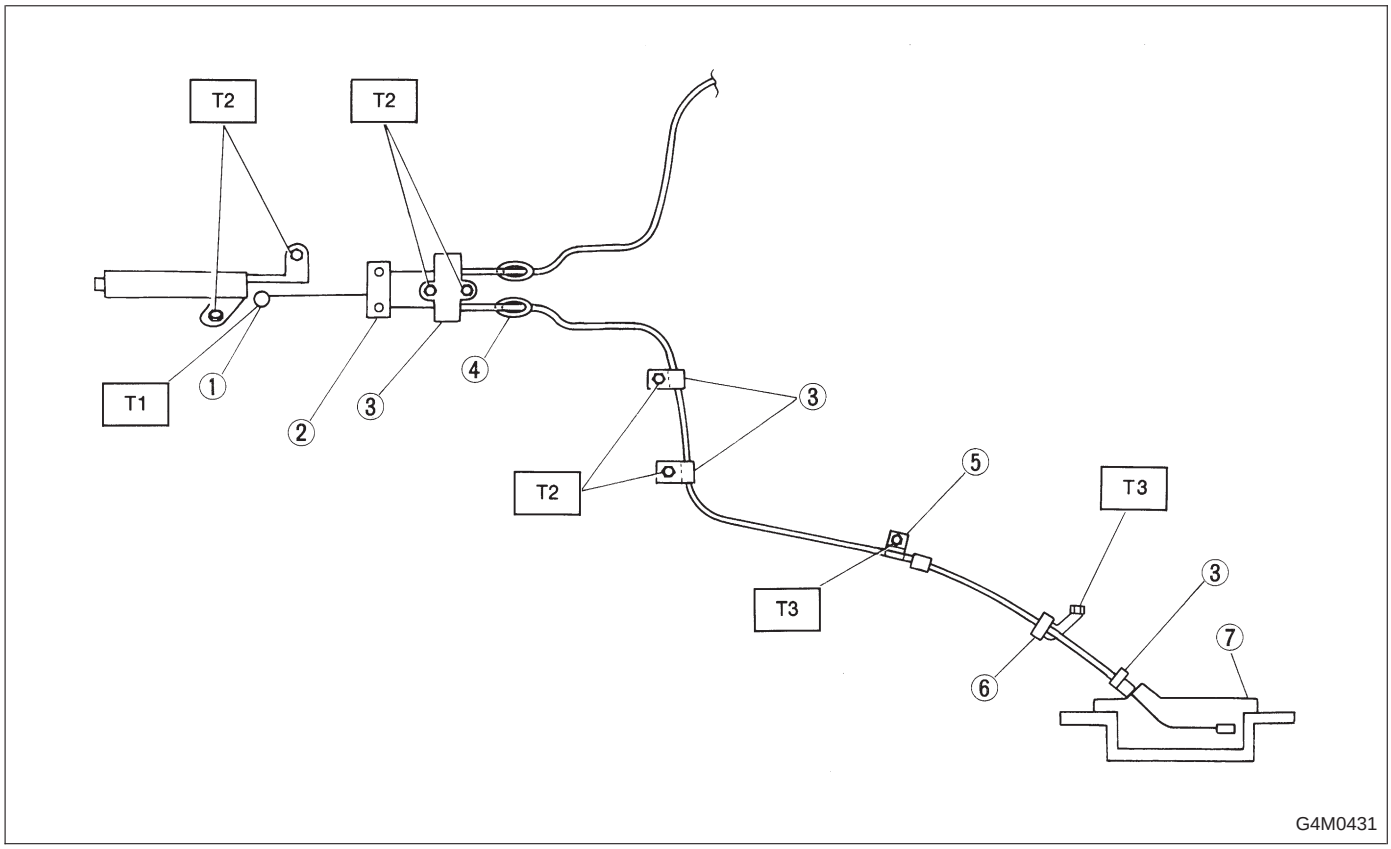
Torque (Lever installing bolt):
18±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)



6) Adjust parking brake lever by turning adjuster until parking brake lever stroke is set at 7 to 8 notches with operating force of 196 N (20 kg, 44 lb).
7) Tighten lock nut.

Torque (Adjuster lock nut):
5.9±1.5 N·m (0.60±0.15 kg-m, 4.3±1.1 ft-lb)

10. Parking Brake Cable

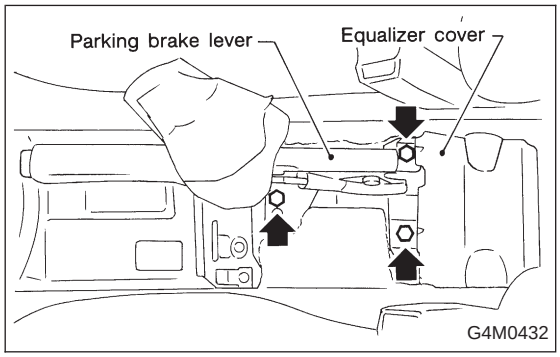


① Adjuster
② Equalizer
③ Clamp
④ Grommet
⑤ Bracket
⑥ Cable guide (Trailing link)
⑦ Parking brake ASSY

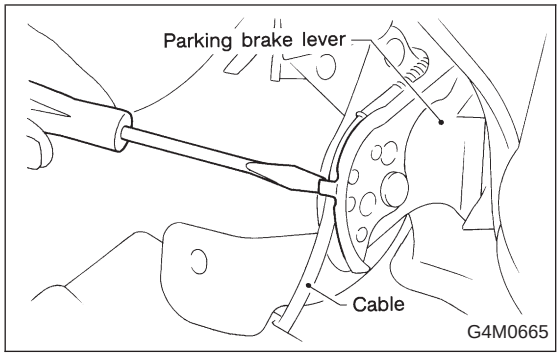
Tightening torque: N·m (kg-m, ft-lb)
T1: 5.9±1.5 (0.60±0.15, 4.3±1.1)
T2: 18±5 (1.8±0.5, 13.0±3.6)
T3: 32±10 (3.3±1.0, 24±7)

A: REPLACEMENT

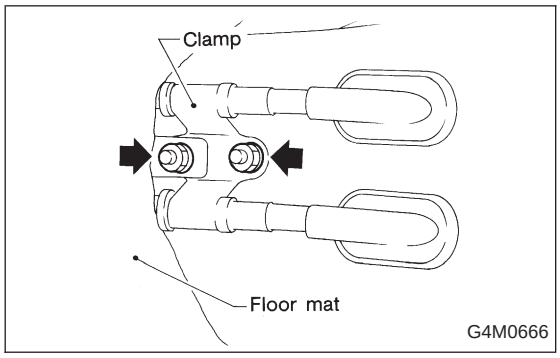
1) Remove rear tires and wheels.
2) Remove rear cushion.
3) Remove console box from front floor.
4) Loosen parking cable adjuster, then remove inner cable end from equalizer, and detach clamps.



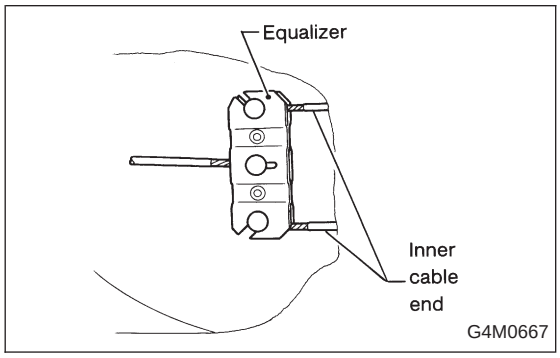
5) Remove parking brake lever.



6) Unbend parking brake lever pawls and remove cable.

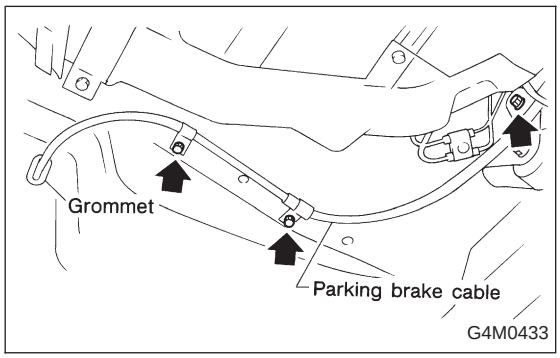


7) Roll up floor mat and remove clamps.
8) Remove equalizer cover.



9) Remove inner cable end from equalizer.

10) Pull out parking brake cable from parking brake assembly. <Ref. to 4-4 [W4A0].>
11) Pull out clamp from parking brake assembly.
12) Remove bolt and bracket from trailing link bracket.



13) Remove bolt and clamp from rear floor.
14) Detach grommet from rear floor.
15) Remove cable assembly from cabin by forcibly pulling it backward.

16) Detach parking brake cable from cable guide at rear trailing link.
17) Install (new) parking brake assembly in the reverse order of removal.

NOTE:
● Be sure to pass cable through cable guide inside the tunnel.
● Be sure to adjust the lever stroke. <Refer to 4-4 [W4D2].>

11. Air Bleeding

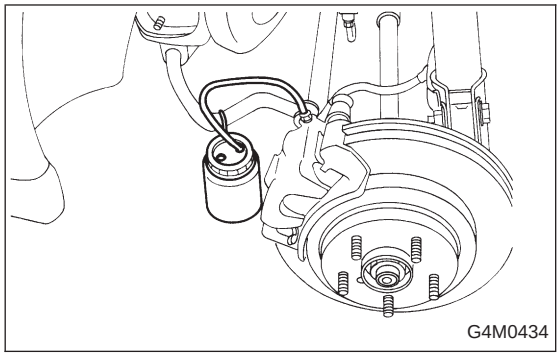
A: GENERAL RULES FOR EFFECTIVE BLEEDING

1) Start with the brakes (wheels) connecting to the secondary chamber of the master cylinder.
2) 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.
3) The air bleeder on each brake shall be released for 1 to 2 seconds.

B: BLEEDING PROCEDURE

CAUTION:
● The FMVSS No. 116, fresh DOT3 or 4 brake fluid must be used.
● Cover 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 reserve tank filled with brake fluid to eliminate entry of air.
● Brake pedal operating must be very slow.
● For convenience and safety, it is advisable to have two man working.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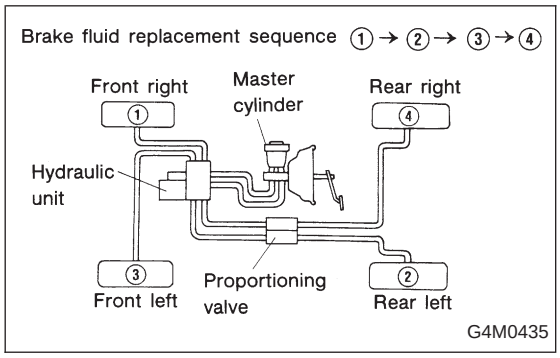

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1) Make sure that there is no leak from joints and connections of the brake system.
2) Fit one end of vinyl tube into the air bleeder and put the other end into a brake fluid container.
3) Slowly depress the brake pedal and keep it depressed. Then, open the air bleeder to discharge air together with the fluid.
Release air bleeder for 1 to 2 seconds.
Next, with the bleeder closed, slowly release the brake pedal.
Repeat these steps until there are no more air bubbles in the vinyl tube.
Allow 3 to 4 seconds between two brake pedal operations.

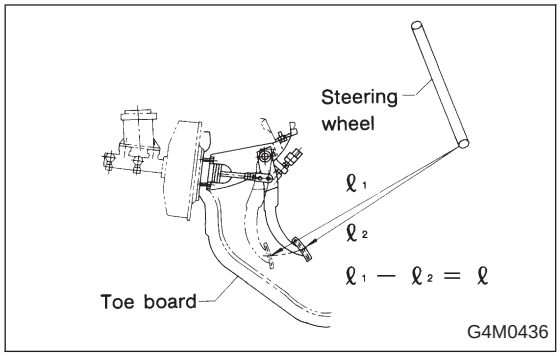
CAUTION:
Cover bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.

NOTE:
Brake pedal operating must be very slow.

4) Tighten air bleeder securely when no air bubbles are visible.

Air bleeder tightening torque:
8±1 N·m (0.8±0.1 kg-m, 5.8±0.7 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 kg, 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.

Specified pedal stroke:
Without A.B.S.
90 mm (3.54 in)
With A.B.S.
95 mm (3.74 in)
When depressing brake pedal with a 490 N (50 kg, 110 lb) load.

(1) Models without A.B.S.
If the distance is more than specifications, there is a possibility that air is in the brake line. Bleed air from the brake line.
(2) Models with A.B.S.
If the distance is more than specifications, there is a possibility air is in the inside of the hydraulic unit. Therefore, air must be bled from the inside of the hydraulic unit to the brake pipes in accordance with the bleeding sequence control. <Ref. to 4-4 [W15C0].>

7) Add brake fluid to the required level (MAX level) of reserve tank.
8) 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.

12. Brake Fluid Replacement

NOTE:
To always maintain the brake fluid characteristics, replace the brake fluid according to maintenance schedule or earlier than that when used in severe condition.

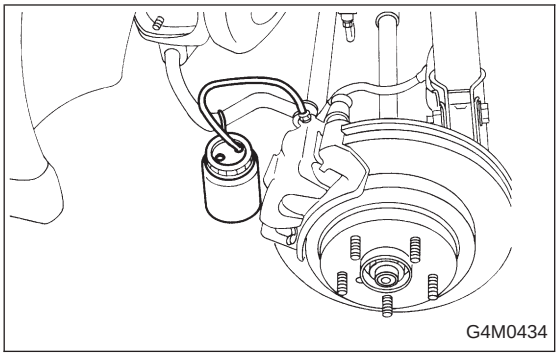
A: REPLACEMENT

CAUTION:
● The FMVSS No. 116, fresh DOT3 or 4 brake fluid must be used.
● Cover 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 reserve tank filled with brake fluid to eliminate entry of air.
● Brake pedal operating must be very slow.
● For convenience and safety, it is advisable to have two man working.
● The amount of brake fluid required is approximately 300 mℓ (10.1 US fl oz, 10.6 Imp fl oz) for total brake system.

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

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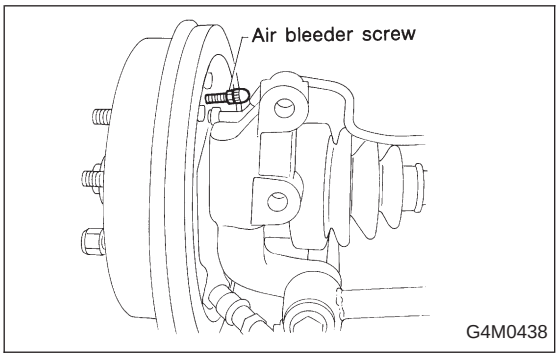

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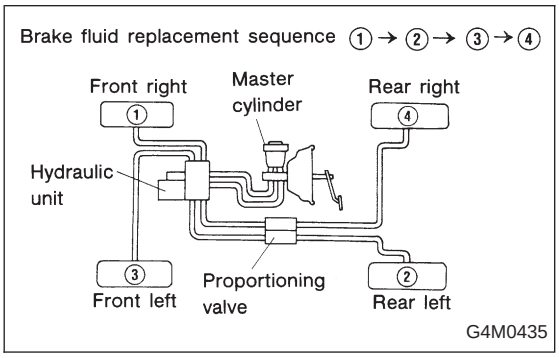


G4M0435

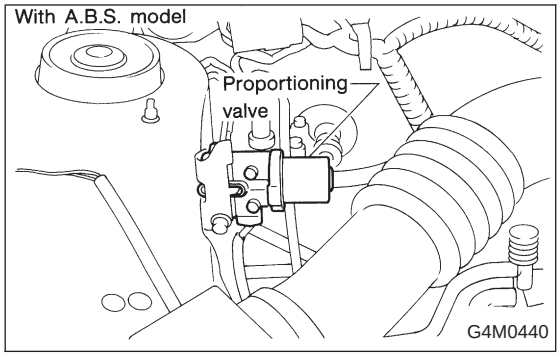
5) Install one end of a vinyl tube onto the air bleeder of and insert the other end of the tube into a container to collect the brake fluid.
6) Instruct your co-worker to depress the brake pedal slowly two or three times and then hold it depressed.
7) Loosen bleeder screw approximately 1/4 turn until 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.

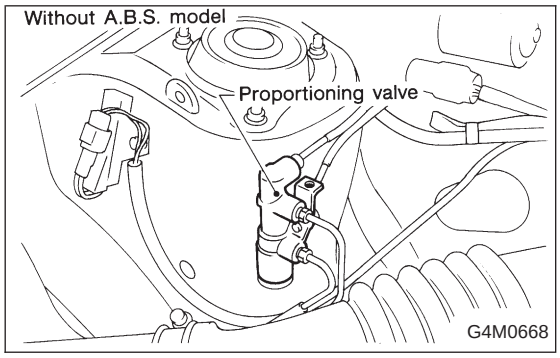
NOTE:
Add brake fluid as necessary while performing the air bleed operation, in order to prevent the tank from running short of brake fluid.

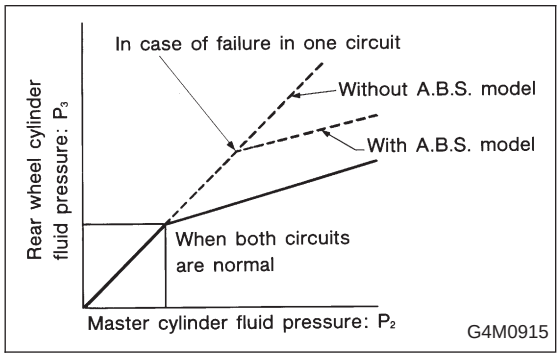
9) After completing the bleeding operation, hold brake pedal depressed and tighten screw and install bleeder cap.

Tightening torque (Bleeder screw):
8±1 N·m (0.8±0.1 kg-m, 5.8±0.7 ft-lb)

10) Bleed air from each wheel cylinder using the same procedures as described in steps 6) through 7) above.
11) Depress brake pedal with a force of approximately 294 N (30 kg, 66 lb) and hold it there for approximately 20 seconds. At this time check pedal to see if it shows any unusual movement.
Visually inspect bleeder screws and brake pipe joints to make sure that there is no fluid leakage.
12) Install wheels, and drive car for a short distance between 2 to 3 km (1 to 2 miles) to make sure that brakes are operating properly.







13. Proportioning Valve

A: INSPECTION

1) Install the oil pressure gauges to measure the master cylinder fluid pressure (front wheel brake fluid pressure) and rear wheel cylinder fluid pressure.
2) Bleed air from the oil pressure gauges.
3) Check the master cylinder fluid pressure and rear wheel cylinder fluid pressure.
The standard values are shown in Figure.
4) For the oil pressure in case of split point, refer to A: SPECIFICATIONS <Ref to 4-4 [S1A0].>

B: REMOVAL

1) Remove brake pipe from proportioning valve at four places.
2) Remove proportioning valve from its bracket.

CAUTION:
Do not disassemble or adjust the proportioning valve. (The proportioning valve must be replaced as an assembly.)

C: INSTALLATION

1) Install proportioning valve to bracket.
2) Connect brake pipes correctly to proportioning valve.
3) Bleed air, then check each joint of brake pipe for oil leaks.

Tightening torque:
Proportioning valve to brake pipe flare nut
14.7^{+3}_{-2} N·m ($1.5^{+0.3}_{-0.2}$ kg-m, $10.8^{+2.2}_{-1.4}$ ft-lb)

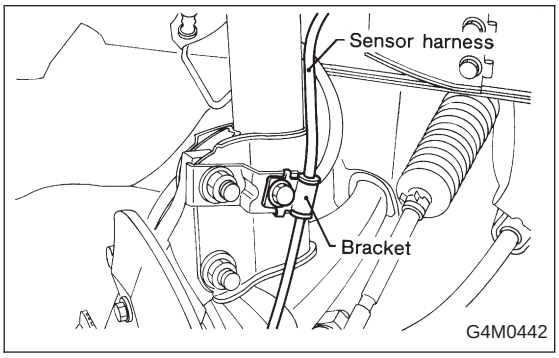
Proportioning valve to bracket
Normal brake vehicle:
22±4.4 N·m (2.25±0.45 kg-m, 16.3±3.3 ft-lb)
A.B.S. equipped vehicle:
18±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)

14. A.B.S. Sensor

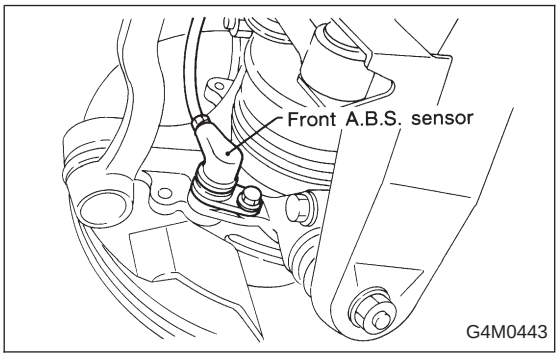
A: REMOVAL

1. FRONT A.B.S. SENSOR

1) Disconnect front A.B.S. sensor located in engine compartment.



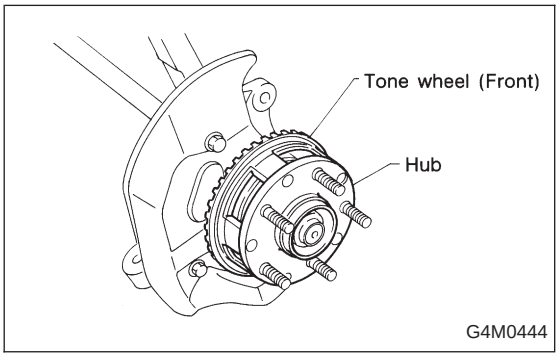
2) Remove bolts which secure sensor harness to bracket.



3) Remove bolts which secure front A.B.S. sensor to housing, and remove front A.B.S. sensor.

CAUTION:
Be careful not to damage pole piece located at tip of the sensor during removal.

4) Remove front disc brake caliper and disc rotor from housing after removing front tire.
5) Remove front drive shaft and housing and hub assembly. <Ref. to 4-2 [W1A0].>

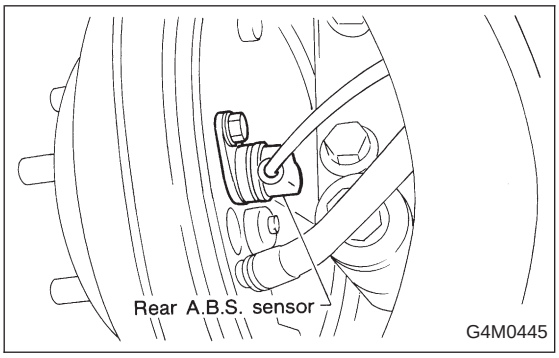


6) Remove tone wheel while removing hub from housing and hub assembly. <Ref. to 4-2 [W1B0].>

CAUTION:
Be careful not to damage teeth faces of tone wheel during removal.

2. REAR A.B.S. SENSOR

1) Remove rear seat and disconnect rear A.B.S. sensor connector.
2) Remove rear sensor harness bracket from rear trailing link.



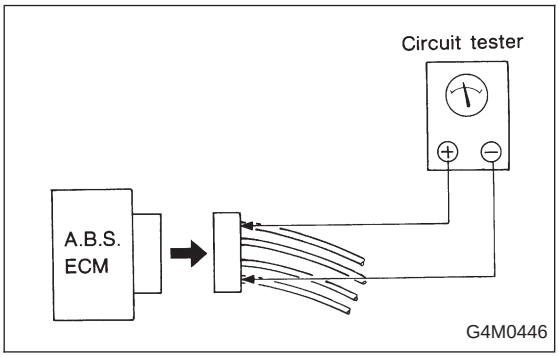
3) Remove rear A.B.S. sensor from rear back plate.
4) Remove rear tone wheel while removing hub from housing and hub assembly. <Ref. to 4-2 [W2A0].>

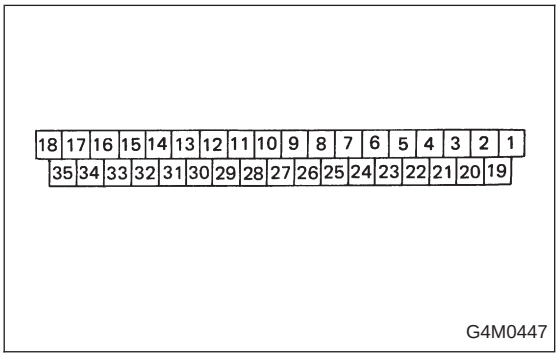
CAUTION:
- **Be careful not to damage pole piece of sensor and teeth faces.**
- **Do not pull sensor harness during removal.**

B: INSPECTION

1. A.B.S. SENSOR

1) Check pole piece of A.B.S. sensor for foreign particles or damage. If necessary, clean pole piece or replace A.B.S. sensor.



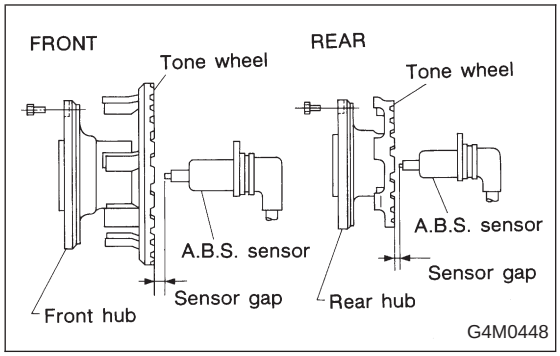


2) Measure resistance between A.B.S. ECM terminals.

A.B.S. sensor	Model	Terminal No.	Standard
Front - LH	AWD	22 and 4	1.0±0.2 kΩ
	FWD	5 and 4	
Front - RH	ALL	23 and 21	
Rear - LH	ALL	8 and 9	
Rear - RH	ALL	24 and 26	
Front - LH	AWD	22 and 10, 20, 34	More than 1×10^3 kΩ (Insulation resistance)
	FWD	5 and 10, 20, 34	
Front - RH	ALL	23 and 10, 20, 34	
Rear - LH	ALL	8 and 10, 20, 34	
Rear - RH	ALL	24 and 10, 20, 34	

CAUTION:
If resistance is outside the standard value, replace wheel A.B.S. sensor with new one or adjust sensor gap between A.B.S. sensor and tone wheel.

NOTE:
Check A.B.S. sensor cable for discontinuity. If necessary, replace with a new one.



2. TONE WHEEL

1) Check tone wheel's teeth (44 pieces) for cracks or dents. If necessary, replace tone wheel with a new one.

2) Clearances (sensor gaps) should be measured one by one to ensure tone wheel and speed sensor are installed correctly.

A.B.S. sensor clearance:

Front

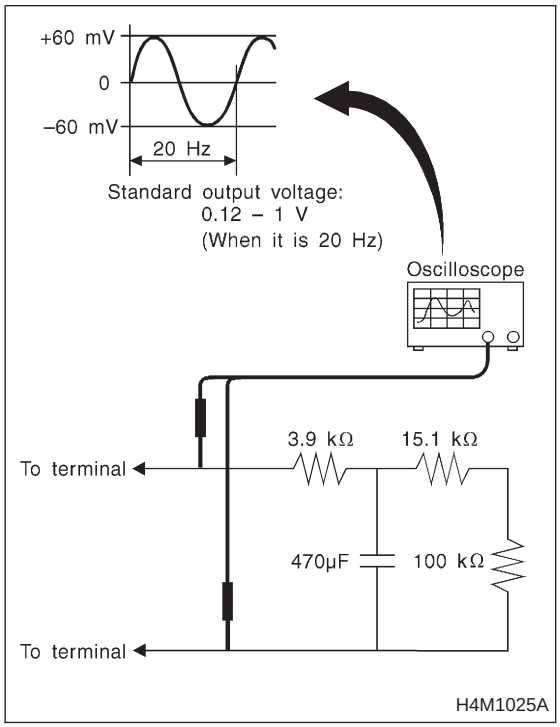
0.9 — 1.4 mm (0.035 — 0.055 in)

Rear

0.7 — 1.2 mm (0.028 — 0.047 in)

NOTE:

- If clearance is narrow, adjust by using spacer (Part No. 26755AA000)
- If clearance is wide, check the outputted voltage then replace A.B.S. sensor or tone wheel if the outputted voltage is outside the specification.



3. OUTPUT VOLTAGE

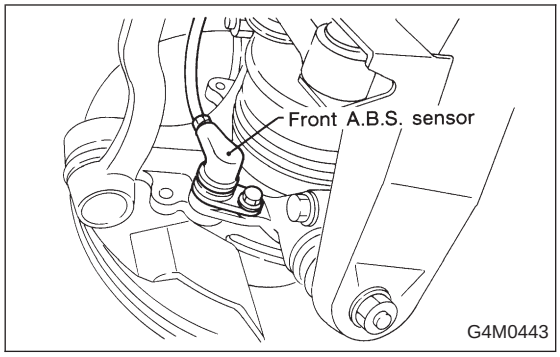
1) Output voltage can be checked by the following method. Install resistor and condenser as follows, then rotate wheel about 2.75 km/h (1.7 MPH) or equivalent.

NOTE:
Regarding terminal No., please refer to item A.B.S. SENSOR.

C: INSTALLATION

1. FRONT A.B.S. SENSOR

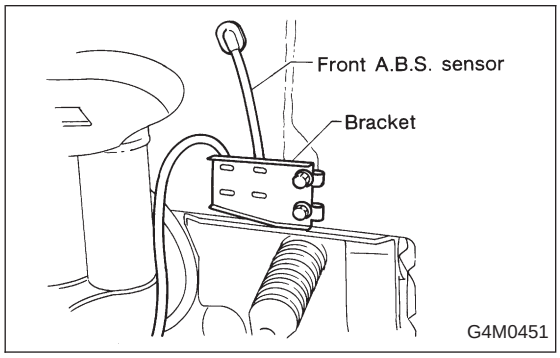
1) Install tone wheel on hub, then install housing on hub assembly. <Ref. to 4-2 [W1D0].>



2) Temporarily install front A.B.S. sensor on housing.

CAUTION:
Be careful not to strike A.B.S. sensor's pole piece and tone wheel's teeth against adjacent metal parts during installation.

3) Install front drive shaft to hub spline. <Ref. to 4-2 [W1E0].>



4) Install front A.B.S. sensor on strut and wheel apron bracket.

Tightening torque:
32±10 N·m (3.3±1.0 kg-m, 24±7 ft-lb)

5) Place a thickness gauge between A.B.S. sensor's pole piece and tone wheel's tooth face. After standard clearance is obtained over the entire perimeter, tighten A.B.S. sensor on housing to specified torque.

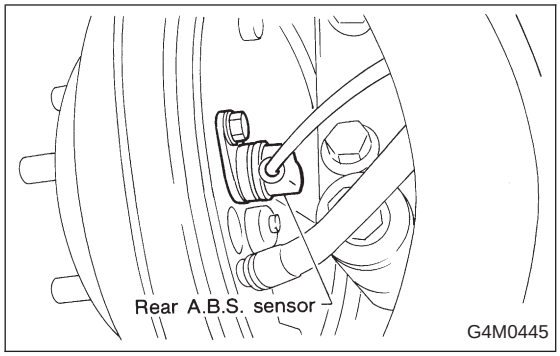
A.B.S. sensor standard clearance:
0.9 — 1.4 mm (0.035 — 0.055 in)

Tightening torque:
32±10 N·m (3.3±1.0 kg-m, 24±7 ft-lb)

NOTE:
If the clearance is outside specifications, readjust.

2. REAR A.B.S. SENSOR

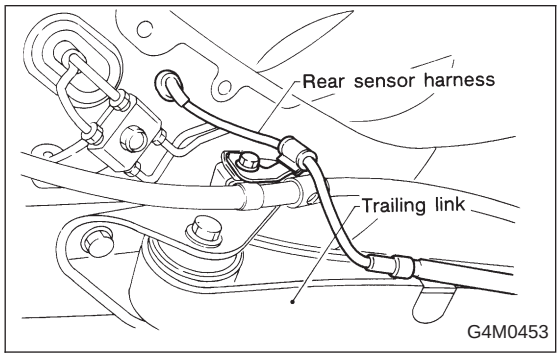
1) Install rear tone wheel on hub, then rear housing on hub. <Ref. to 4-2 [W2D0].>



2) Temporarily install rear A.B.S. sensor on back plate.

CAUTION:
Be careful not to strike A.B.S. sensor's pole piece and tone wheel's teeth against adjacent metal parts.

3) Install rear drive shaft to rear housing and rear differential spindle. <Ref. to 4-2 [W2E0].>



4) Install rear sensor harness on rear trailing link.

Tightening torque:
32±10 N·m (3.3±1.0 kg-m, 24±7 ft-lb)

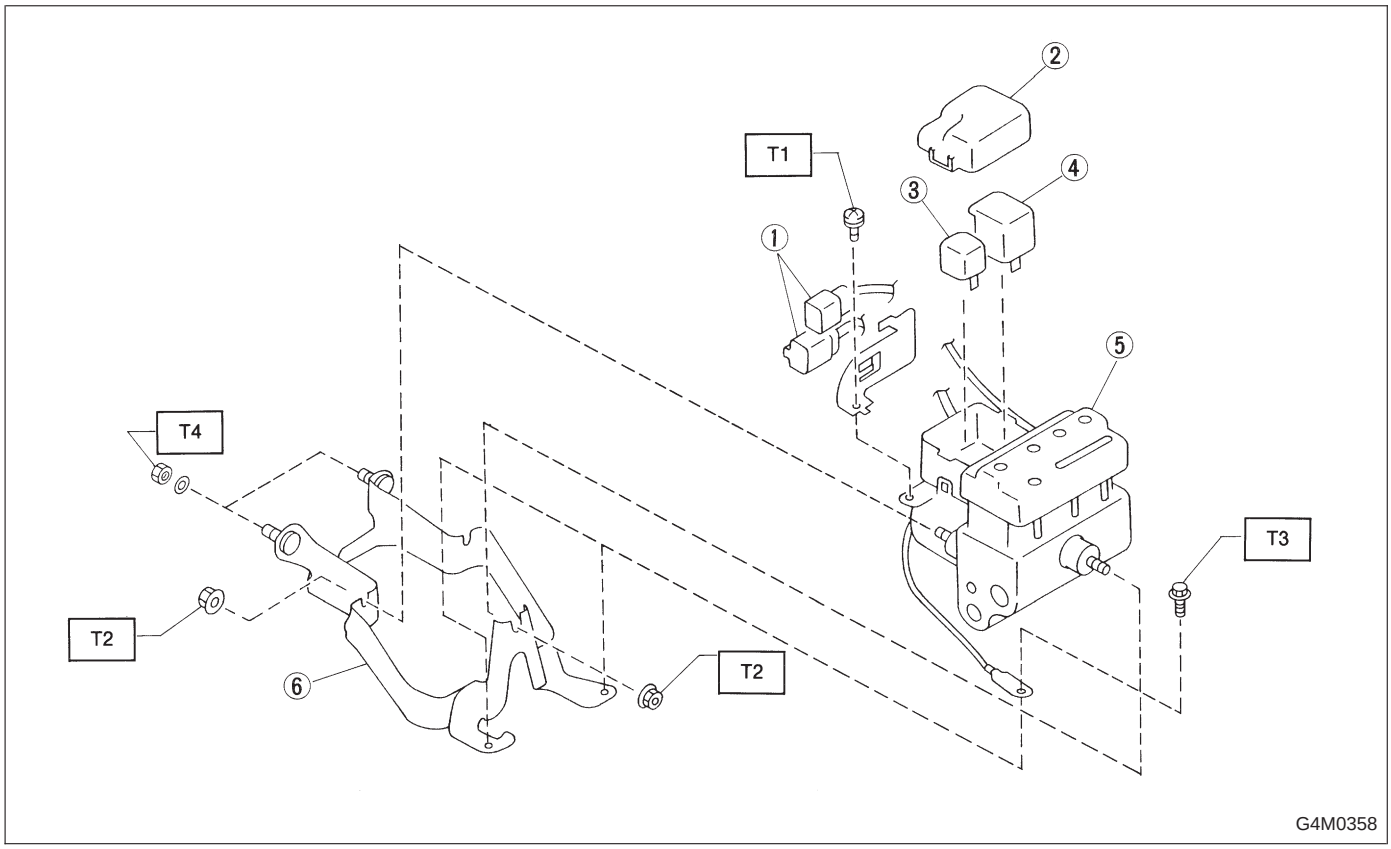
5) Place a thickness gauge between A.B.S. sensor's pole piece and tone wheel's tooth face. After standard clearance is obtained over the entire perimeter, tighten A.B.S. sensor on back plate to specified torque.

A.B.S. sensor standard clearance:
0.7 — 1.2 mm (0.028 — 0.047 in)

Tightening torque:
32±10 N·m (3.3±1.0 kg-m, 24±7 ft-lb)

NOTE:
If the clearance is outside specifications, readjust.

15. Hydraulic Unit for A.B.S. System

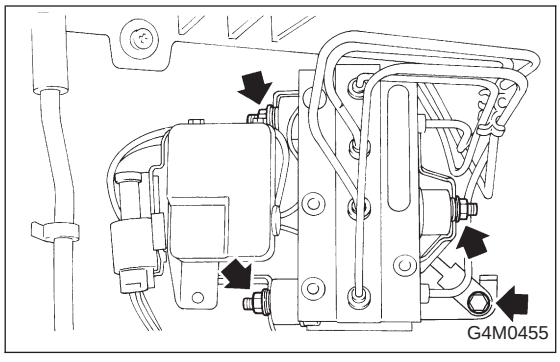


① Connector
② Cap
③ Motor relay
④ Valve relay
⑤ Hydraulic control unit
⑥ Bracket

Tightening torque: N·m (kg-m, ft-lb)
T1: 1.2±0.2 (0.125±0.025, 0.9±0.2)
T2: 18±5 (1.8±0.5, 13.0±3.6)
T3: 32±10 (3.3±1.0, 24±7)
T4: 52±15 (5.3±1.5, 38±11)

A: REMOVAL

1) Remove canister from engine compartment to facilitate removal of hydraulic unit.
2) Disconnect brake pipes from hydraulic unit and plug open joints to prevent entry of foreign particles.



3) Remove nuts and bolt which secure hydraulic unit, and remove hydraulic unit from engine compartment.

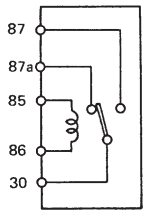
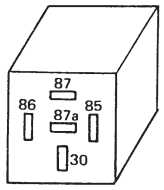
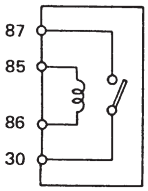
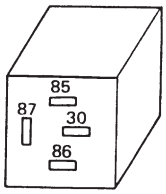
CAUTION:
● Hydraulic unit cannot be disassembled. Do not attempt to loosen bolts and nuts.
● Do not drop or bump hydraulic unit.
● Do not turn the hydraulic unit upside down or place it on its side.
● Be careful to prevent foreign particles from getting into hydraulic unit.

● When a new hydraulic unit is installed, apply a coat of rust-preventive wax (Nippeco LT or GB) to bracket attaching bolts after tightening.
● Do not pull harness disconnecting harness connector.

B: INSPECTION

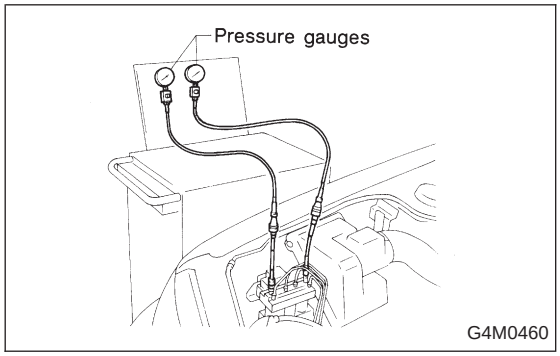
1. CHECKING HYDRAULIC UNIT

1) Check connected and fixed condition of connector.
2) Open hydraulic unit relay box and check for discontinuity or short circuits.

	Condition	Terminal number	Standard	Diagram	Terminal location
Valve relay	Turning off electricity.	85 — 86	93 — 113 Ω	 G4M0456	 G4M0457
		30 — 87a	0 Ω		
		30 — 87	■		
	Turning on electricity between 85 and 86. (DC 12 V)	30 — 87a	■		
		30 — 87	0 Ω		
Motor relay	Turning off electricity.	85 — 86	72 — 88 Ω	 G4M0458	 G4M0459
		30 — 87	■		
	Turning on electricity between 85 and 86. (DC 12 V)	30 — 87	0 Ω		

2. CHECKING THE HYDRAULIC UNIT OPERATION BY PRESSURE GAUGE

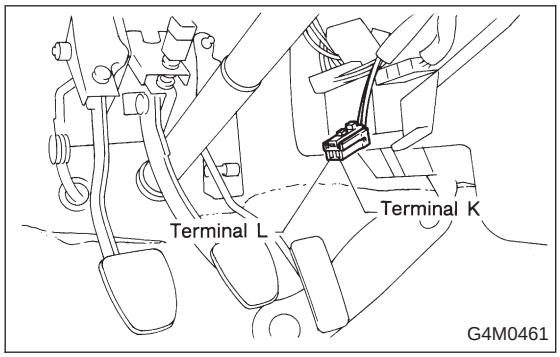
1) Remove the FL and FR pipes from the hydraulic unit.



2) Connect a pressure gauge to the end of the removed FL and FR pipes.

CAUTION:
● Pressure gauges used exclusively for brake fluid must be used.
● Do not employ pressure gauge previously used for transmission since the piston seal is expanded which may lead to malfunction of the brake.

3) Bleed air from the pressure gauges.
4) Perform sequence control. <Ref. to 4-4 [W15C0].>



(1) Ground check connector body K and L terminals which are accessible after removing A.B.S. check connector from lower side of steering column.

(2) Turn ignition switch ON.
(3) The A.B.S. warning light comes on.
(4) Depress the brake pedal within 0.5 seconds after the warning light goes out so that the pressure gauge registers a pressure equal to the initial value.

CAUTION:
Do not depress the clutch pedal.

NOTE:
The engine must not be operating.

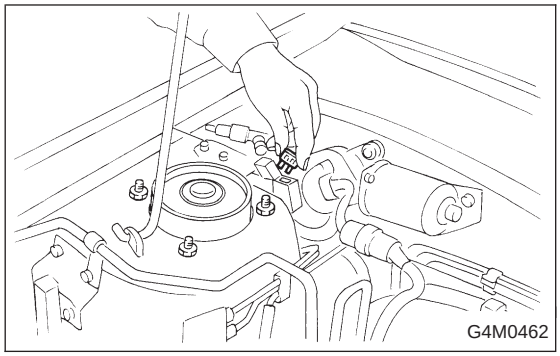
5) When the hydraulic unit begins to work, and first the FL side performs decompression, holding, and compression, and then the FR side performs decompression, holding, and compression.
6) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets the standard values. Also check if any irregular brake pedal tightness is felt.

	Initial value	When decompressed	When compressed
Front wheel	3,432 kPa (35 kg/cm^2, 498 psi)	490 kPa (5 kg/cm^2, 71 psi)	3,432 kPa (35 kg/cm^2, 498 psi)
Rear wheel	3,432 kPa (35 kg/cm^2, 498 psi)	490 kPa (5 kg/cm^2, 71psi)	3,432 kPa (35 kg/cm^2, 498 psi)

- In case of hydraulic unit plunger piston malfunction

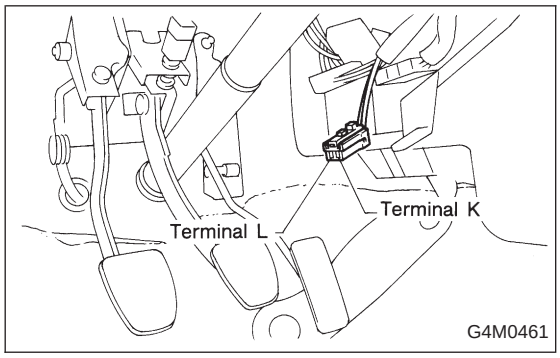
	Initial value	When decompressed	When compressed
Rear right wheel	3,432 kPa (35 kg/cm^2, 498 psi)	490 kPa (5 kg/cm^2, 71 psi)	3,432 kPa (35 kg/cm^2, 498 psi)
Rear left wheel	3,432 kPa (35 kg/cm^2, 498 psi)	3,432 kPa (35 kg/cm^2, 498 psi)	3,432 kPa (35 kg/cm^2, 498 psi)

7) Connect the same pressure gauges to the end of the removed RL and RR pipes of the hydraulic unit.
8) Connect the FL and FR pipes to the hydraulic unit.
9) Bleed air from the pressure gauges and the FL and FR wheel cylinders.
10) Repeat step 4) procedures.
11) The hydraulic unit begins to work, and simultaneously the RL and RR wheel cylinders perform decompression, holding, and compression.
12) Read values indicated on the pressure gauges and check if they meet the standard value.
13) After checking, remove the pressure gauges from the RL and RR pipes and connect the RL and RR pipes to the hydraulic unit, and bleed air.


G4M0462

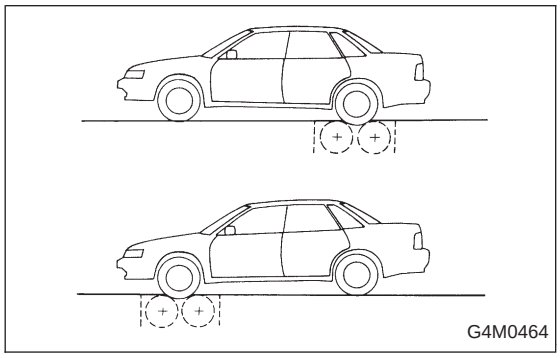
3. CHECKING THE HYDRAULIC UNIT WITH BRAKE TESTER

1) In the case of AWD AT vehicles, install a spare fuse with the FWD connector in the engine compartment to simulate FWD vehicles.



G4M0461

2) Ground check connector body K and L terminals which are accessible after removing A.B.S. check connector from lower side of steering column.


G4M0464

3) Set the front wheels or rear wheels on the brake tester and set the select lever's position at "neutral".

4) Operate the brake tester.
5) Perform sequence control.
   (1) Turn ignition switch ON.
   (2) The A.B.S. warning light comes on.
   (3) Depress the brake pedal within 0.5 seconds after the warning light goes out so that the brake tester registers a pressure equal to the initial value.

CAUTION:
Do not depress the clutch pedal.

NOTE:
The engine must not be operating.

6) Hydraulic unit begins to work; and check the following working sequence.
   (1) The right front wheel performs decompression, holding, and compression in sequence, and subsequently the left front wheel repeats the cycle.
   (2) Simultaneously both right and left rear wheel perform decompression, holding, and compression in sequence.

7) Read values indicated on the brake tester and check if the fluctuation of values, when decompressed and compressed, meet the standard values.

	Initial value	When decompressed	When compressed
Front wheel	1,961 N (200 kg, 441 lb)	245 N (25 kg, 55 lb)	1,961 N (200 kg, 441 lb)
Rear wheel	686 N (70 kg, 154 lb)	245 N (25 kg, 55 lb)	686 N (70 kg, 154 lb)

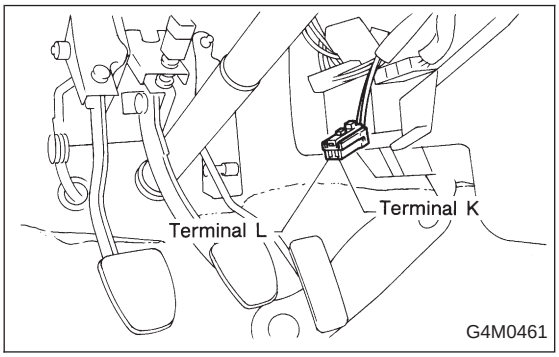
● In case of hydraulic unit plunger piston malfunction

	Initial value	When decompressed	When compressed
Rear right wheel	686 N (70 kg, 154 lb)	245 N (25 kg, 55 lb)	686 N (70 kg, 154 lb)
Rear left wheel	686 N (70 kg, 154 lb)	686 N (70 kg, 154 lb)	686 N (70 kg, 154 lb)

8) After checking, also check if any irregular brake pedal tightness is felt.
9) In case of AWD AT vehicles, remove the spare fuse from the FWD connector in the engine compartment to return to the original AWD state.

C: SEQUENCE CONTROL

Under the 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.



1. OPERATIONAL GUIDELINES OF THE SEQUENCE CONTROL

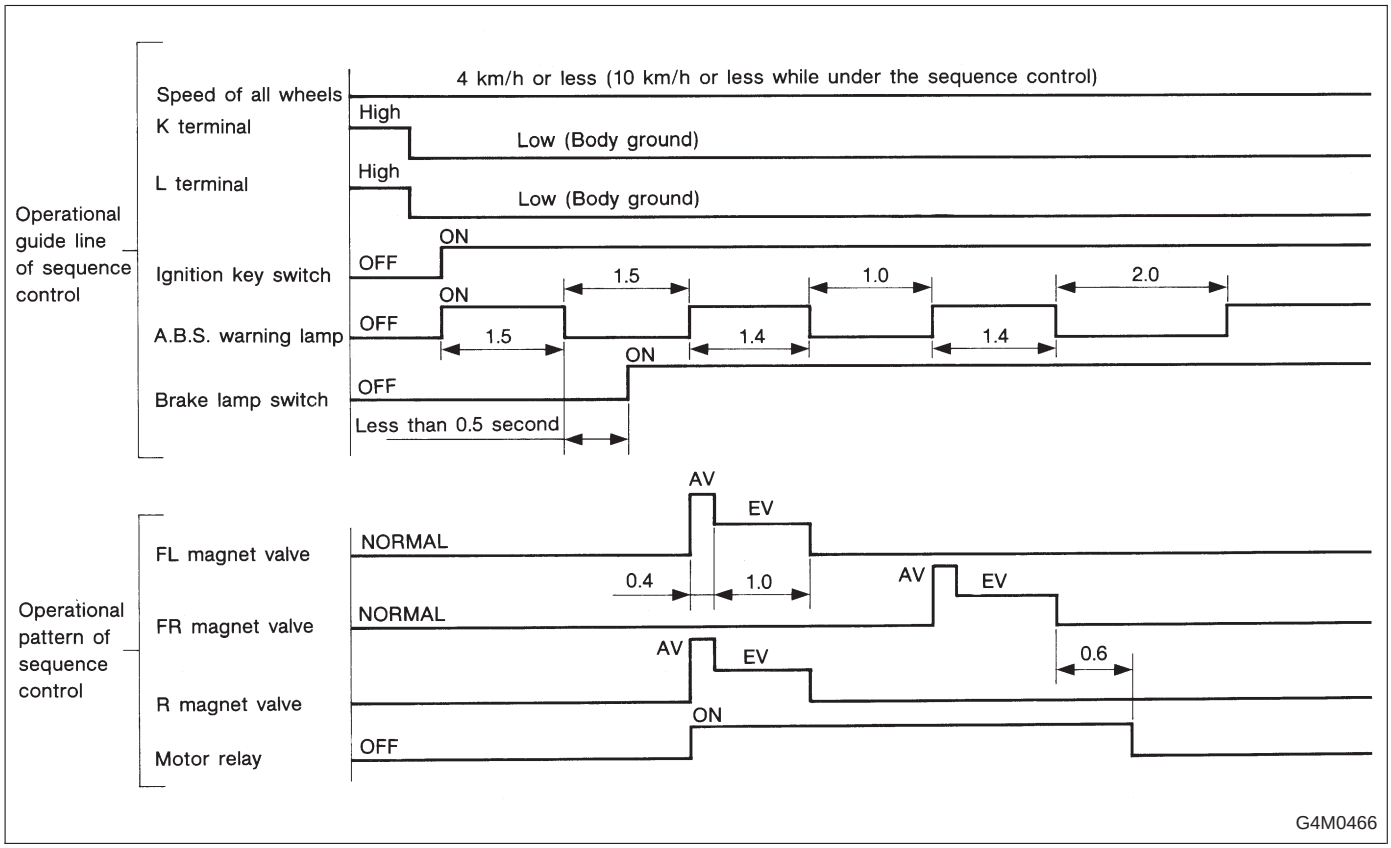
1) Ground the body K and L terminals.
2) Remove A.B.S. check connector from lower side of steering column.
3) Set the speed of all wheels at 4 km/h (2 MPH) or less.
4) Within 0.5 seconds after the A.B.S. warning lamp goes out, immediately after the ignition switch is turned to on, depress the brake pedal and hold.

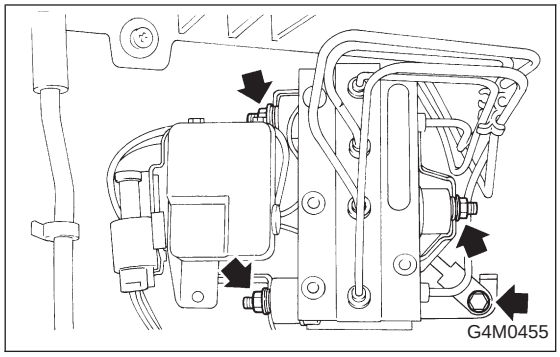
CAUTION:
Do not depress the clutch pedal.

NOTE:
● When the ignition switch is set to on, the brake pedal must not be depressed.
● Engine must not operate.

2. CONDITIONS FOR COMPLETION OF SEQUENCE CONTROL

1) When the speed of at least one wheel reaches 10 km/h (6 MPH), the operation is returned to the normal control mode.
2) When L terminal is separated from ground, the operation is returned to the normal control mode.
3) When K terminal is no longer ground with the body, the operation is returned to the normal control mode.
4) When the brake pedal is released during sequence control and the braking lamp switch is set to off, the operation is returned to the normal control mode.
5) After completion of the sequence control, the operation is returned to the normal control mode.




G4M0455

D: INSTALLATION

1) Install relay box cover on hydraulic unit.
2) Install hydraulic unit to bracket.

Tightening torque:
18±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)

3) Tighten bracket and motor ground lead as a unit.

Tightening torque:
32±10 N·m (3.3±1.0 kg-m, 24±7 ft-lb)

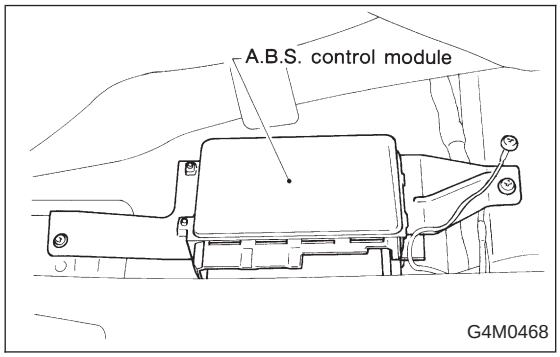
4) Connect brake pipes to their correct hydraulic unit connections.

Tightening torque:
14.7^{+3}_{-2} N·m ($1.5^{+0.3}_{-0.2}$ kg-m, $10.8^{+2.2}_{-1.4}$ ft-lb)

16. A.B.S. Control Module

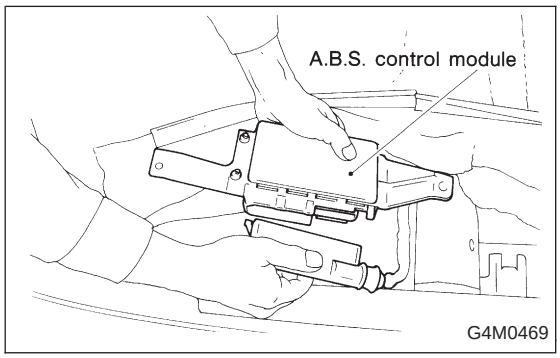
A: REMOVAL

1) Remove floor mat located under lower right side of front seat.



G4M0468

2) Remove screw which secure A.B.S. control module from body.

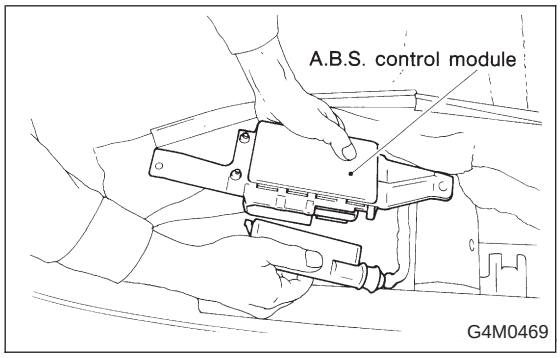


G4M0469

3) Disconnect connector from A.B.S. control module.

B: INSPECTION

Check that connector is connected correctly and that connector terminal sliding resistance is correct.



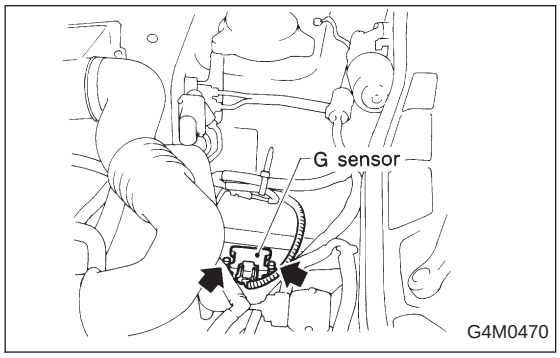
C: INSTALLATION

1) Connect connector to A.B.S. control module.
2) Install A.B.S. control module on body.

17. G Sensor for A.B.S. System

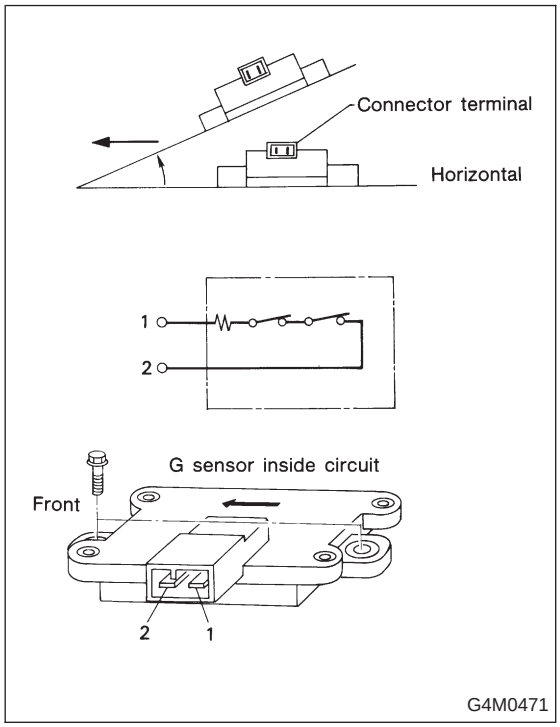
A: REMOVAL AND INSTALLATION

The G sensor is located on the right front wheel apron.



B: INSPECTION

1) Check to ensure that G sensor is securely installed on front wheel apron, and that connector is properly installed.
2) Disconnect connector from G sensor and measure contact resistance between terminals.



Condition of G sensor	Standard
On flat surface	610±60 Ω
* When slanting about 14° — 21.3° (θ)	610±60 Ω → More than 100 kΩ

NOTE:
● Tilt G sensor forward as shown in Figure. If it is tilted backward, it will not operate.
● Hysteresis occurs during ON-OFF operation of sensor. Sensor should turn OFF from ON (610 Ω → More than 100 kΩ) when it is tilted in a range from 14° to 21.3°.

Tightening torque:
7.4±2.0 N·m (0.75±0.2 kg-m, 5.4±1.4 ft-lb)

18. Brake Hose and Pipe AIRBAG

SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

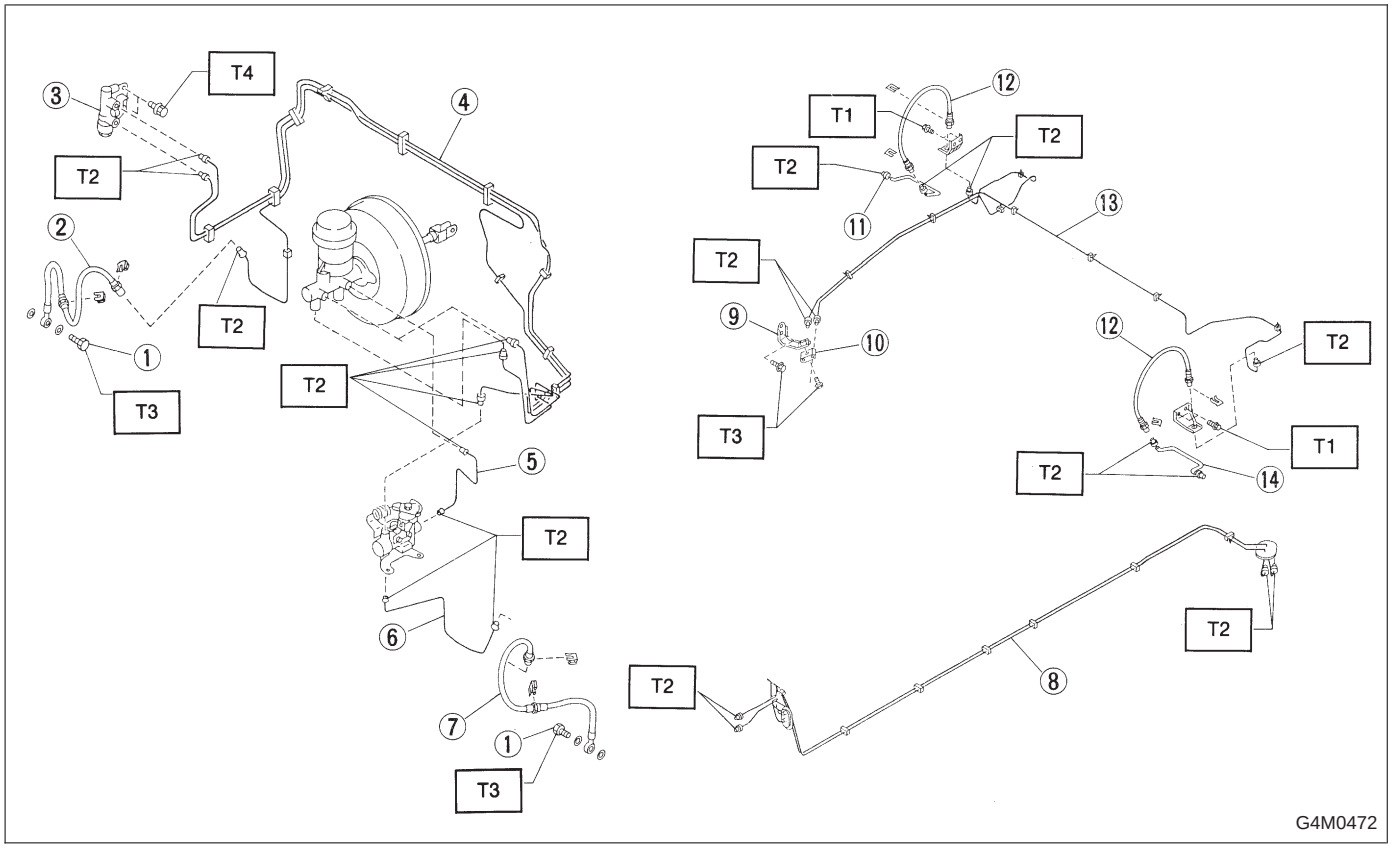
Airbag system wiring harness is routed near the center brake pipe.

CAUTION:
● All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
● Be careful not to damage Airbag system wiring harness when servicing the center brake pipe.

A: REMOVAL AND INSTALLATION

CAUTION:
● When removing and 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.

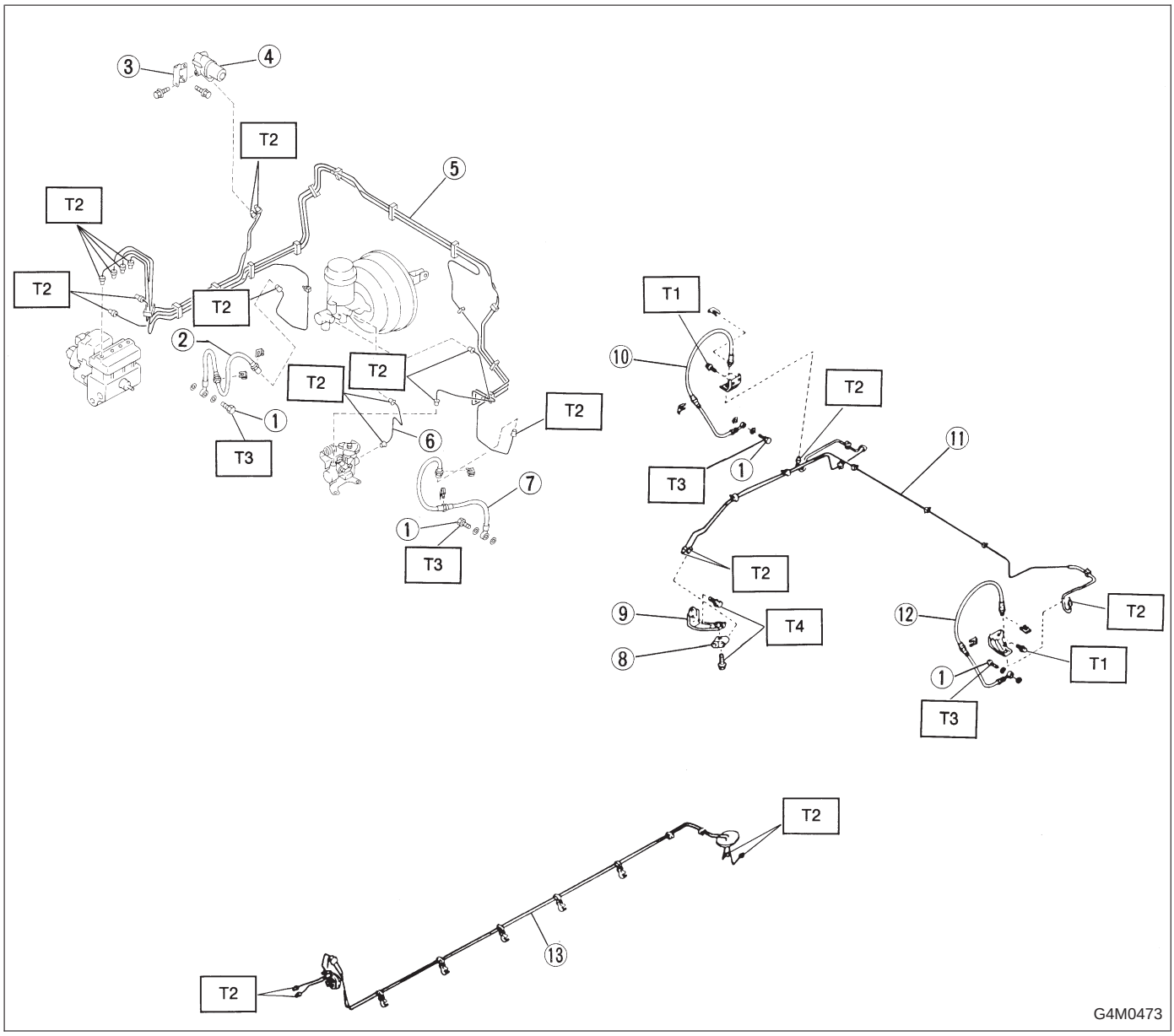
1. MODELS WITHOUT A.B.S.



① Union bolt
② Front brake hose RH
③ Proportioning valve
④ Front brake pipe
⑤ Front adapter pipe (UPPER)
⑥ Front adapter pipe (LOWER)
⑦ Front brake hose LH
⑧ Center brake pipe ASSY
⑨ Connector bracket
⑩ Two-way connector
⑪ Rear brake pipe RH
⑫ Rear brake hose drum
⑬ Rear brake pipe ASSY
⑭ Rear brake pipe LH

Tightening torque: N·m (kg-m, ft-lb)
T1: 13±3 (1.3±0.3, 9.4±2.2)
T2: 14.7^{+3}_{-2} ($1.5^{+0.3}_{-0.2}$, $10.8^{+2.2}_{-1.4}$)
T3: 18±3 (1.8±0.3, 13.0±2.2)
T4: 18±5 (1.8±0.5, 13.0±3.6)

2. MODELS WITH A.B.S.



① Union bolt
② Front brake hose RH
③ Valve bracket
④ Proportioning valve
⑤ Front brake pipe ASSY
⑥ Front adapter pipe
⑦ Front brake hose LH
⑧ Two-way connector
⑨ Connector bolt
⑩ Rear brake hose RH
⑪ Rear brake pipe ASSY
⑫ Rear brake hose LH
⑬ Center brake pipe ASSY

Tightening torque: N·m (kg-m, ft-lb)
T1: 13±3 (1.3±0.3, 9.4±2.2)
T2: 14.7$^{+3}_{-2}$
(1.5$^{+0.3}_{-0.2}$, 10.8$^{+2.2}_{-1.4}$)
T3: 18±3 (1.8±0.3, 13.0±2.2)
T4: 18±5 (1.8±0.5, 13.0±3.6)

1. Entire Brake System

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.

Trouble and possible cause	Corrective action
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.
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.

2. Hill Holder

Trouble and possible cause	Corrective action
1. Counterforce of clutch pedal is too strong.	
(1) PHV cable is damaged or does not operate properly.	Repair or replace.
(2) Lever of PHV is defective.	Replace entire PHV assembly.
(3) Clutch system is anomalous.	Refer to “Clutch and pedal cable system”.
2. Vehicle does not stop on uphill road of 3° or higher inclination.	
(1) Front side of vehicle is lowered.	Refer to “Suspension”.
(2) PHV cable is broken.	Replace.
(3) Play of clutch is excessive.	Adjust.
(4) PHV cable is elongated.	Adjust.
(5) Sealing of PHV is poor.	Replace entire PHV assembly.
3. Shock is felt when starting.	
(1) Poor adjustment of starting performance.	Adjust.
(2) When depressing the brake pedal strongly:	(The stronger brake pedal depressing force, the later hill holder releasing.)
(3) When starting on flat road after stopping reverse movement:	(Because hill holder is activated.)
4. Vehicle slips down when starting.	
(1) PHV cable is elongated.	Adjust.
(2) Clutch facing is worn out.	Adjust or replace.
(3) Bracket (cable) or stay (PHV) is deformed.	Repair or replace.
5. Vehicle cannot start after stoppage.	
(1) Return spring is fatigued or broken.	Replace.
(2) PHV lever won’t return.	Replace entire PHV assembly.
(3) When intentionally depressing brake pedal strongly:	[When the brake pedal is depressed by a force of 1,177 N (120 kg, 265 lb) or more.]
6. Abnormal sound is generated upon releasing brake pedal when stopping.	
(1) Rotor and pad matched with each other due to inadequate depressing force to brake pedal.	(Abnormal sound is not generated when depressing brake pedal a little stronger.)
7. Abnormal sound is generated when operating clutch pedal.	
(1) Grease is inadequate for the hook of return spring and sliding portion of PHV cable end.	Apply grease.
(2) When releasing after maintaining high fluid pressure:	(Flowing sound of fluid when releasing high fluid pressure.)
(3) Clutch system is anomalous.	Refer to “Clutch and pedal cable system”.

CAUTION:
- **Description in parentheses is a characteristic of hill holder and does not indicate abnormality.**

Depressing force required for clutch pedal equipped to hill holder specifications is 20 to 29 N (2 to 3 kg, 4 to 7 lb) larger than the conventional specifications, which does not constitute abnormality.
- **When vehicle cannot travel (brake cannot be released) because return spring is broken, remove adjust nut, disconnect clutch and PHV, and then return PHV lever to release the brake. (Be sure to apply the parking brake before starting this operation.)**
- **The hill holder may not be activated on a slope of an extremely small inclination.**

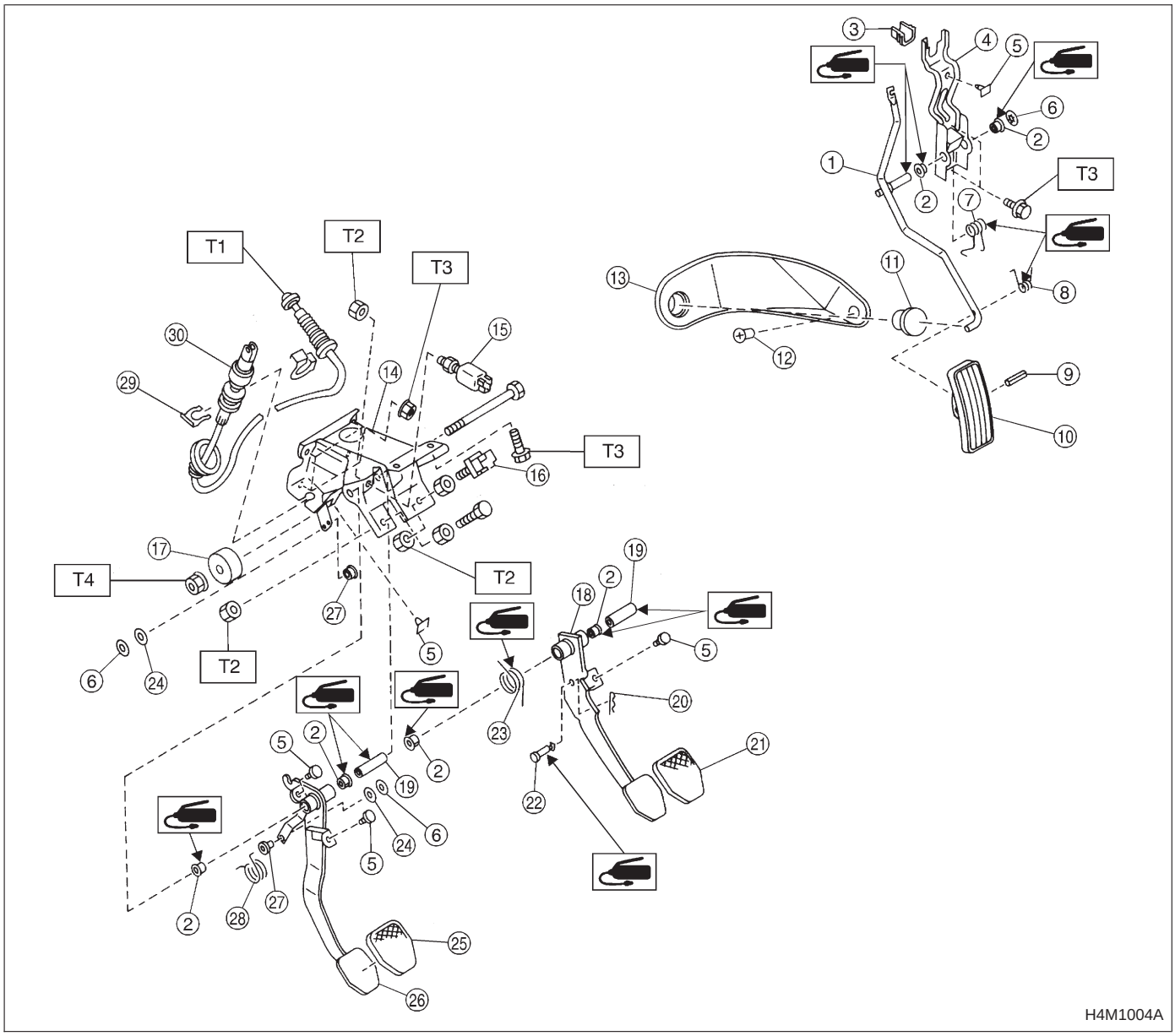
PEDAL SYSTEM AND CONTROL CABLES 4-5

1. Pedal System

A: SERVICE DATA

Brake pedal	Free play		1 — 3 mm (0.04 — 0.12 in) [Depress brake pedal pad with a force of less than 10 N (1 kg, 2 lb).]
Clutch pedal	Free play	At clutch pedal pad	10 — 20 mm (0.39 — 0.79 in)
	Full stroke	At clutch pedal pad	140 — 145 mm (5.51 — 5.71 in)
Accelerator pedal	Free play	At pedal pad	1 — 4 mm (0.04 — 0.16 in)
	Stroke	At pedal pad	46 — 50 mm (1.81 — 1.97 in)

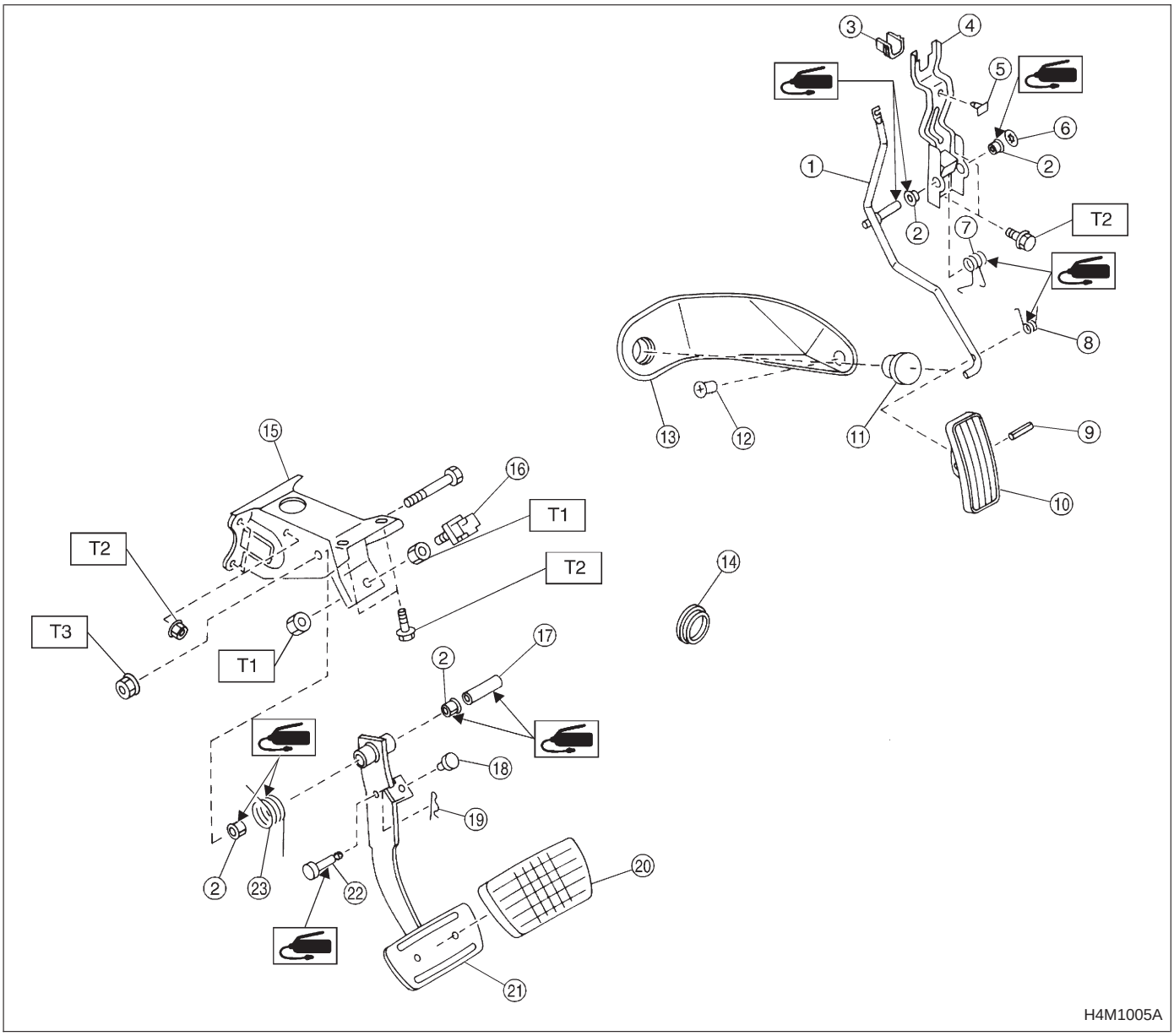
1. Pedal (MT Model)



① Accelerator pedal
② Bushing
③ Holder
④ Accelerator bracket
⑤ Stopper
⑥ Clip
⑦ Accelerator spring
⑧ Accelerator pedal spring
⑨ Spring pin
⑩ Accelerator pedal pad
⑪ Accelerator stopper
⑫ Clip
⑬ Accelerator plate
⑭ Pedal bracket
⑮ Clutch switch (Starter interlock)
⑯ Stop light switch
⑰ Mass damper
⑱ Brake pedal
⑲ Spacer
⑳ Snap pin
㉑ Brake pedal pad
㉒ Clevis pin
㉓ Brake pedal spring
㉔ Washer
㉕ Clutch pedal pad
㉖ Clutch pedal
㉗ Bushing assist
㉘ Spring assist
㉙ Clutch cable clamp
㉚ Clutch cable

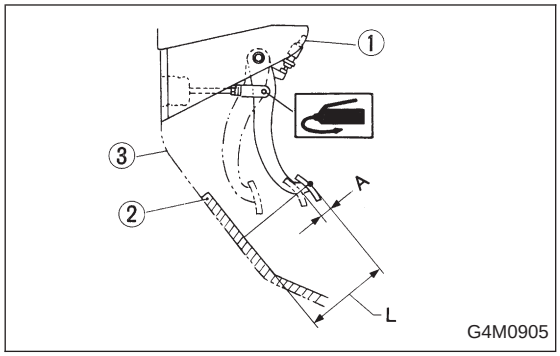
Tightening torque: N·m (kg-m, ft-lb)
T1: 5.9±1.5 (0.60±0.15, 4.3±1.1)
T2: 8±2 (0.8±0.2, 5.8±1.4)
T3: 18±5 (1.8±0.5, 13.0±3.6)
T4: 29±7 (3.0±0.7, 21.7±5.1)

2. Pedal (AT Model)



① Accelerator pedal
② Bushing
③ Holder
④ Accelerator bracket
⑤ Stopper
⑥ Clip
⑦ Accelerator spring
⑧ Accelerator pedal spring
⑨ Spring pin
⑩ Accelerator pedal
⑪ Accelerator stopper
⑫ Clip
⑬ Accelerator plate
⑭ Plug
⑮ Pedal bracket
⑯ Stop light switch
⑰ Spacer
⑱ Stopper
⑲ Snap pin
⑳ Brake pedal pad
㉑ Brake pedal
㉒ Clevis pin
㉓ Brake pedal spring

Tightening torque: N·m (kg-m, ft-lb)
T1: 8±2 (0.8±0.2, 5.8±1.4)
T2: 18±5 (1.8±0.5, 13.0±3.6)
T3: 29±7 (3.0±0.7, 21.7±5.1)



1. Pedal

A: ON-CAR SERVICE

1. BRAKE PEDAL

1) Check position of pedal pad.

① Stop light switch
② Mat
③ Toe board

Pedal height: L
158 mm (6.22 in)

If it is not in specified value, adjust it by adjusting brake booster operating rod length.

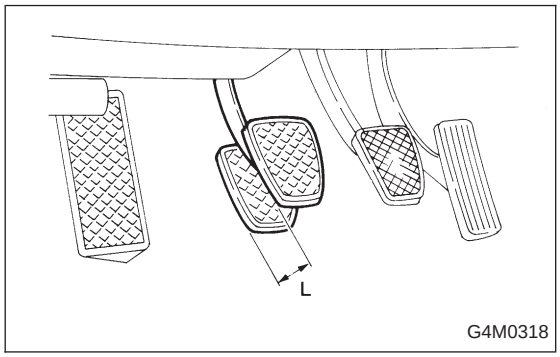
2) Check free play by operating pedal by hand.

If it is not in specified value, adjust it by adjusting position of stop light switch.

CAUTION:
Be careful not to rotate stop light switch.

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 kg, 2 lb).]

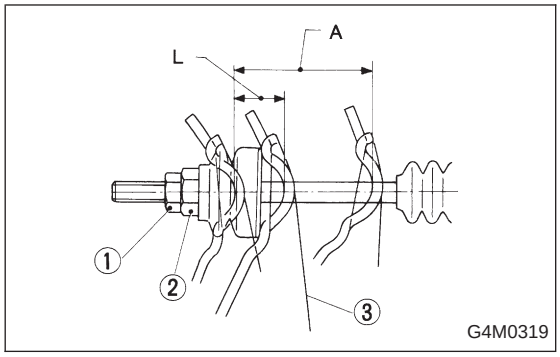
3) Apply grease to operating rod connecting pin to prevent it from wearing.



2. CLUTCH PEDAL

1) Check clutch pedal free play by operating pedal by hand.

Free play: L (At clutch pedal pad)
10 — 20 mm (0.39 — 0.79 in)



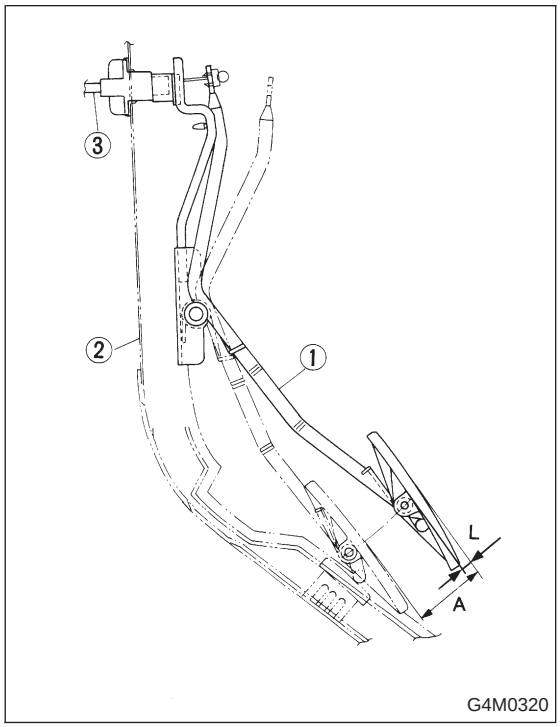
2) If it is not in specified value, adjust it by turning adjusting nut on engine side end of clutch cable.

Free play: L
3 — 4 mm (0.12 — 0.16 in)

Full stroke: A
25.5 — 27 mm (1.004 — 1.063 in)

3) Apply grease to connecting portion of clutch pedal and clutch cable.

① Lock nut
② Adjusting nut
③ Release fork



3. ACCELERATOR PEDAL

Check pedal stroke and free play by operating accelerator pedal by hand.
If it is not within specified value, adjust it by turning nut connecting accelerator cable to throttle body.

Free play at pedal pad: L
1 — 4 mm (0.04 — 0.16 in)

Stroke at pedal pad: A
46 — 50 mm (1.81 — 1.97 in)

① Accelerator pedal
② Toe board
③ Accelerator cable

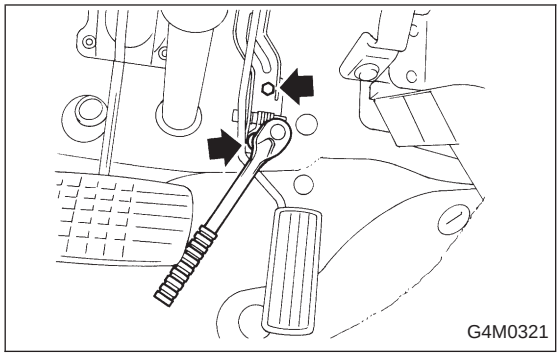
B: REMOVAL

1. ACCELERATOR PEDAL

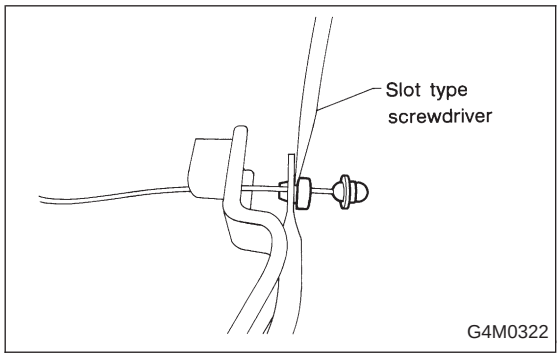
1) Disconnect ground cable from battery.
2) Disconnect accelerator cable from throttle body.

CAUTION:
Be careful not to kink accelerator cable.

3) Remove instrument panel lower cover from instrument panel, and connector.



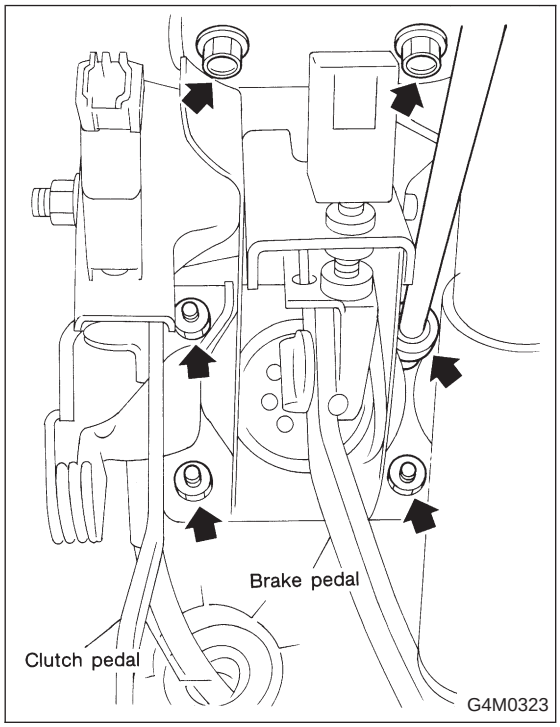
4) Remove accelerator pedal connecting bolt from accelerator pedal bracket.



5) Disconnect accelerator cable from accelerator pedal lever.

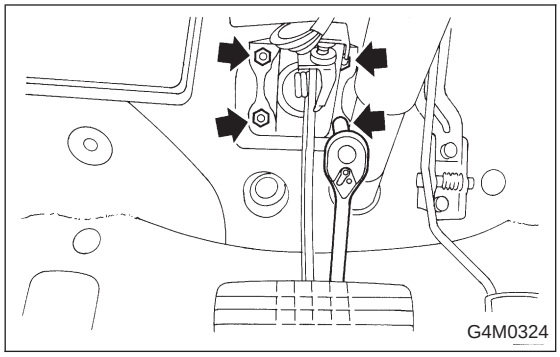
2. BRAKE AND CLUTCH PEDAL (MT model)

1) Disconnect ground cable from battery.
2) Disconnect clutch cable from release lever.
3) Remove instrument panel lower cover from instrument panel.
4) Disconnect the following parts from pedal bracket.
   (1) Operating rod of brake booster
   (2) Electrical connectors (for stop light switch, etc.)
5) Remove clevis pin which secures pedal to push rod.



6) Remove bolts and nuts which secure brake and clutch pedals, and remove pedal bracket and clutch cable as a unit.

CAUTION:
Before removing clutch cable from toe board, remove grommet. Slowly remove clutch cable, being careful not to scratch it.


G4M0324

3. BRAKE PEDAL (AT model)

1) Disconnect ground cable from battery.
2) Remove instrument panel lower cover from instrument panel.
3) Remove clevis pin which secures brake pedal to brake booster operating rod. Also disconnect stop lamp switch connector.
4) Remove two bolts and four nuts which secure brake pedal to pedal.

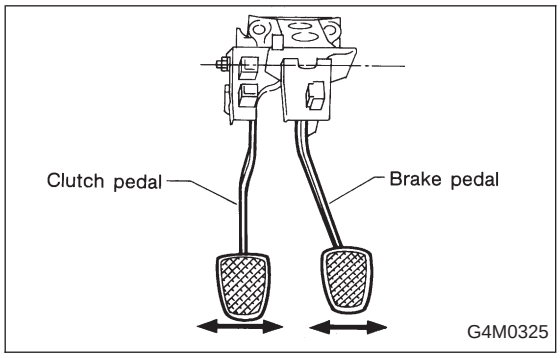
C: INSPECTION

1. BRAKE AND CLUTCH PEDALS

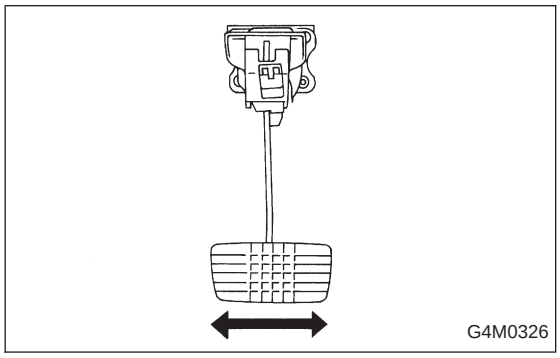
Move brake and clutch pedal pads in the lateral direction with a force of approximately 10 N (1 kg, 2 lb) to ensure pedal deflection is in specified range.

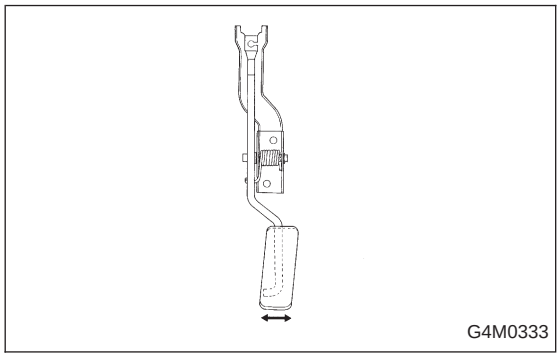
Deflection of brake and clutch pedal:
Service limit
5.0 mm (0.197 in) or less

CAUTION:
If excessive deflection is noted, replace bushings with new ones.



G4M0325


G4M0326

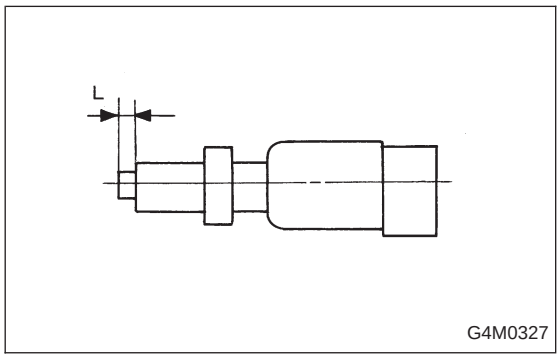

G4M0333

2. ACCELERATOR PEDAL

Lightly move pedal pad in lateral the direction to ensure pedal deflection is in specified range.

Deflection of accelerator pedal:
Service limit
5.0 mm (0.197 in) or less

CAUTION:
If excessive deflection is noted, replace bushing and clip with new ones.

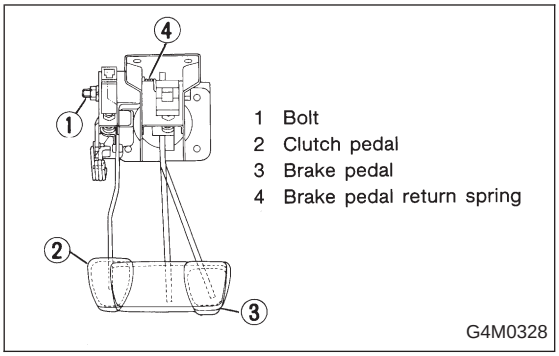


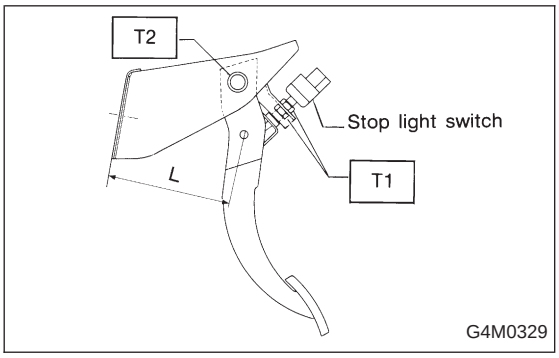
G4M0327

3. STOP LIGHT SWITCH

If 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
$2^{+1.5}_{0}$ mm (0.079 $^{+0.059}_{0}$ in)





D: ASSEMBLY

1. BRAKE AND CLUTCH PEDAL

1) Attach stop light switch, etc. to pedal bracket temporarily.

2) Clean inside of bores of clutch pedal and brake pedal, apply grease, and set bushings into bores.

3) Align bores of pedal bracket, clutch pedal and brake pedal, attach brake pedal return spring and clutch pedal effort reducing spring (vehicle with Hill holder), and then install pedal bolt.

Tightening torque:
T2: 29±7 N·m (3.0±0.7 kg-m, 21.7±5.1 ft-lb)

NOTE:
Clean up inside of bushings and apply grease before installing spacer.

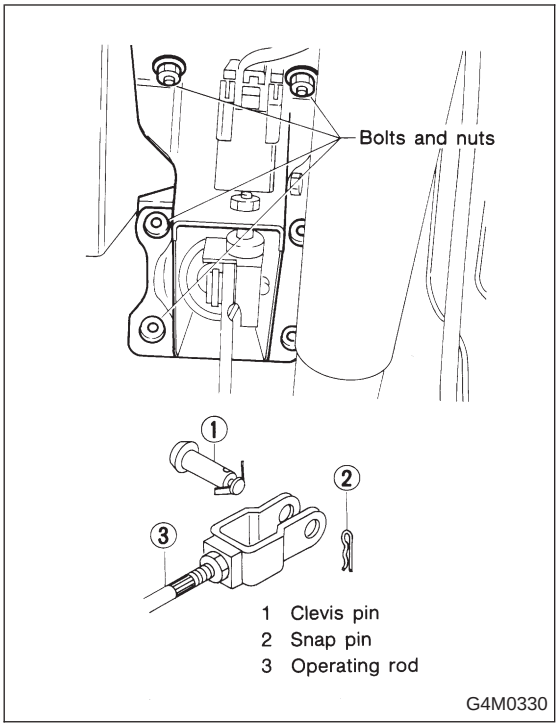
4) Set brake pedal position by adjusting position of stop light switch.

Pedal position: L
125.9 mm (4.96 in)

Tightening torque:
T1: 8±2 N·m (0.8±0.2 kg-m, 5.8±1.4 ft-lb)

2. ACCELERATOR PEDAL

1) Clean and apply grease to spacer and inside bore of accelerator pedal. Install accelerator pedal onto pedal bracket.



E: INSTALLATION

1. BRAKE AND CLUTCH PEDAL

1) Insert clutch cable into hole on toe board, and set pedal bracket above steering column.

CAUTION:
Be careful not to bend clutch cable too much.

2) Insert bolts of brake booster into holes on toe board, support it from engine room, and fit holes of pedal bracket onto the bolts.
At this time, operating rod of brake booster should be engaged with brake pedal.
3) While pushing pedal bracket upward firmly, tighten 4 nuts and 2 bolts at its upper surface.

Tightening torque:
18±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)

4) Connect operating rod of brake booster to brake pedal using clevis pin and snap pin.
5) Connect electrical connectors for stop light switch, etc.
6) Attach clutch cable grommet to toe board, and then connect clutch cable to clutch release fork.
7) Adjustment after pedal installation <Ref. to 4-5 [W1A1].>

CAUTION:
Never fail to cover outer cable end with boot.

2. ACCELERATOR PEDAL

1) Pull out accelerator inner cable to its maximum stroke, and attach it to accelerator pedal.
Pull accelerator cable from throttle body side.

CAUTION:
Be careful not to kink accelerator cable.

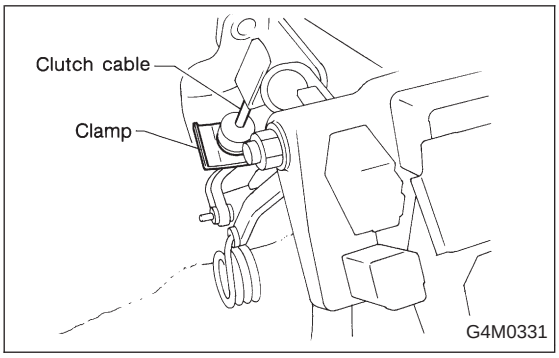
2) Connect accelerator cable to throttle body.
3) Adjustment after pedal installation <Ref. to 4-5 [W1A3].>

NOTE:
Make sure to check operation of accelerator cable by operating accelerator pedal by hand.

2. Clutch Cable

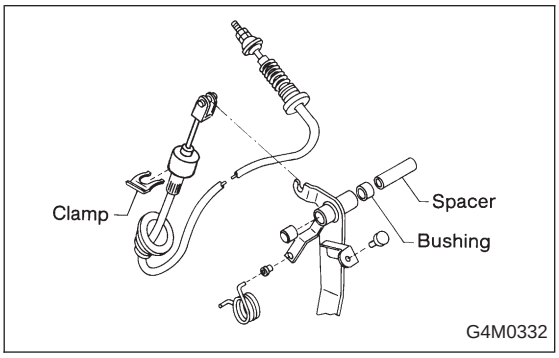
A: REMOVAL

1) Disconnect clutch cable from release lever.



2) Remove clutch cable clamp from pedal bracket.
3) Disconnect clutch cable from pedal bracket and pedal end.
4) Remove clutch cable from body.

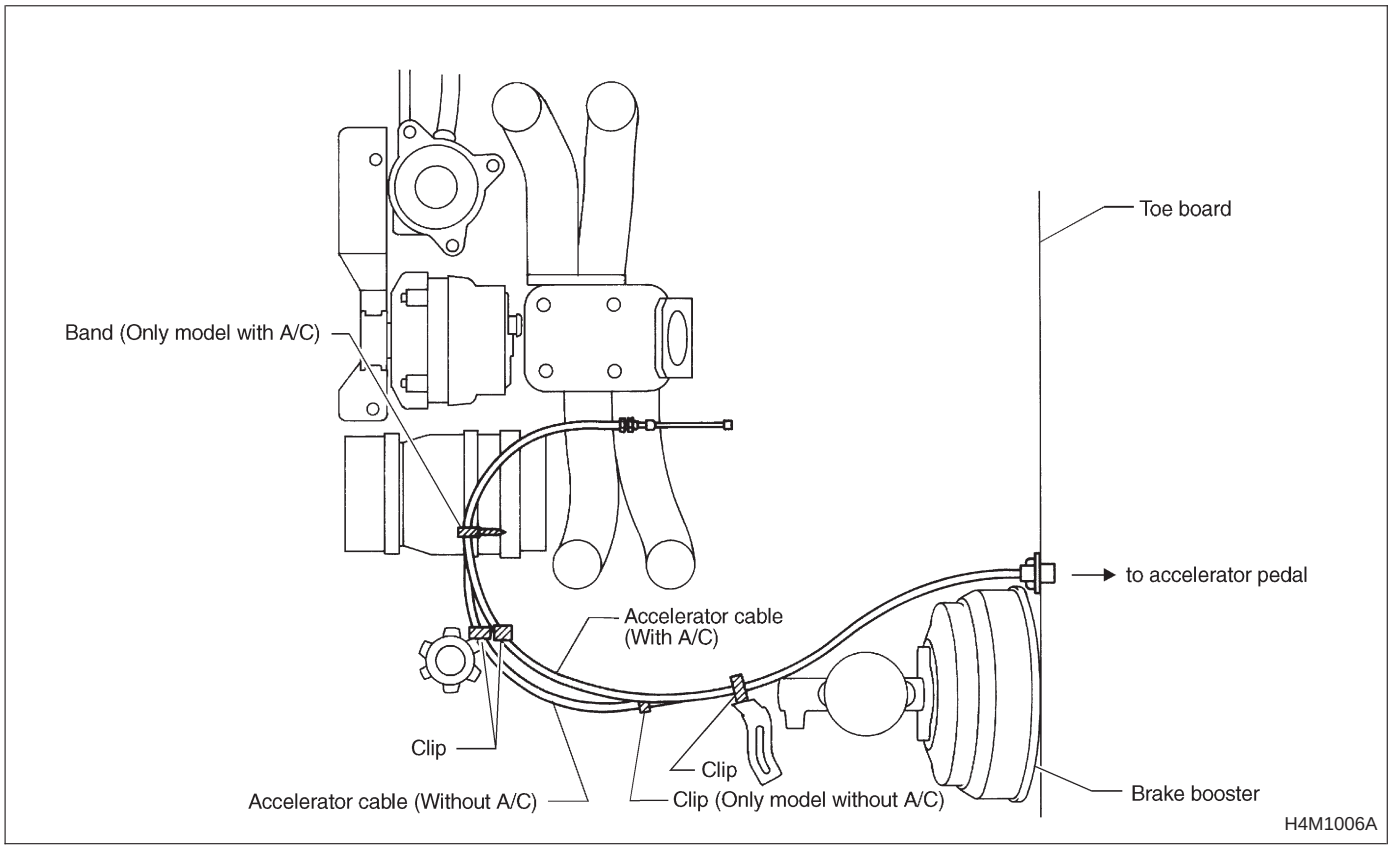
CAUTION:
Before removing clutch cable from toe board, remove grommet. Slowly remove clutch cable, being careful not to scratch it.



B: INSTALLATION

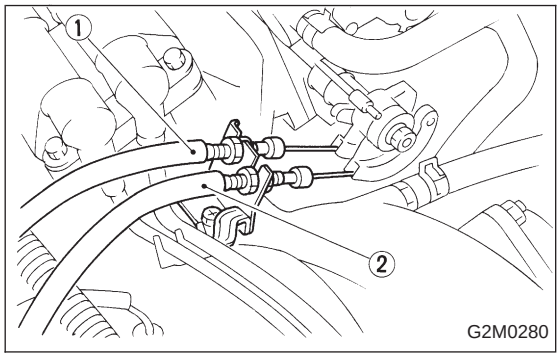
1) Clean clutch pedal fitting hole, and apply grease. Connect clutch cable to clutch pedal.
2) Fit clutch pedal to pedal bolt, and connect clutch cable to bracket with clamp.
3) Connect clutch cable end to pedal end.
4) Connect clutch cable from release lever.
5) Install grommet to toe board.
6) Adjustment after cable installation <Ref. to 4-5 [W1A2].>

3. Accelerator Cable



A: REMOVAL

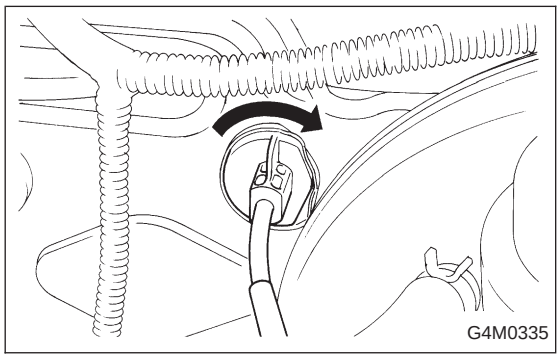
1) Disconnect accelerator cable from connector inside engine compartment first.



2) Remove lock nut from accelerator cable bracket.
3) Separate accelerator cable ① from bracket, then unlock inner cable.
4) Remove cable end from throttle cam using your fingertips.

CAUTION:
Be careful not to bend inner cable.

5) Disconnect cable end from accelerator cable bracket inside driver compartment.
6) Remove clip inside engine compartment.



7) Working inside engine compartment, remove cable connection by turning toe board clockwise.

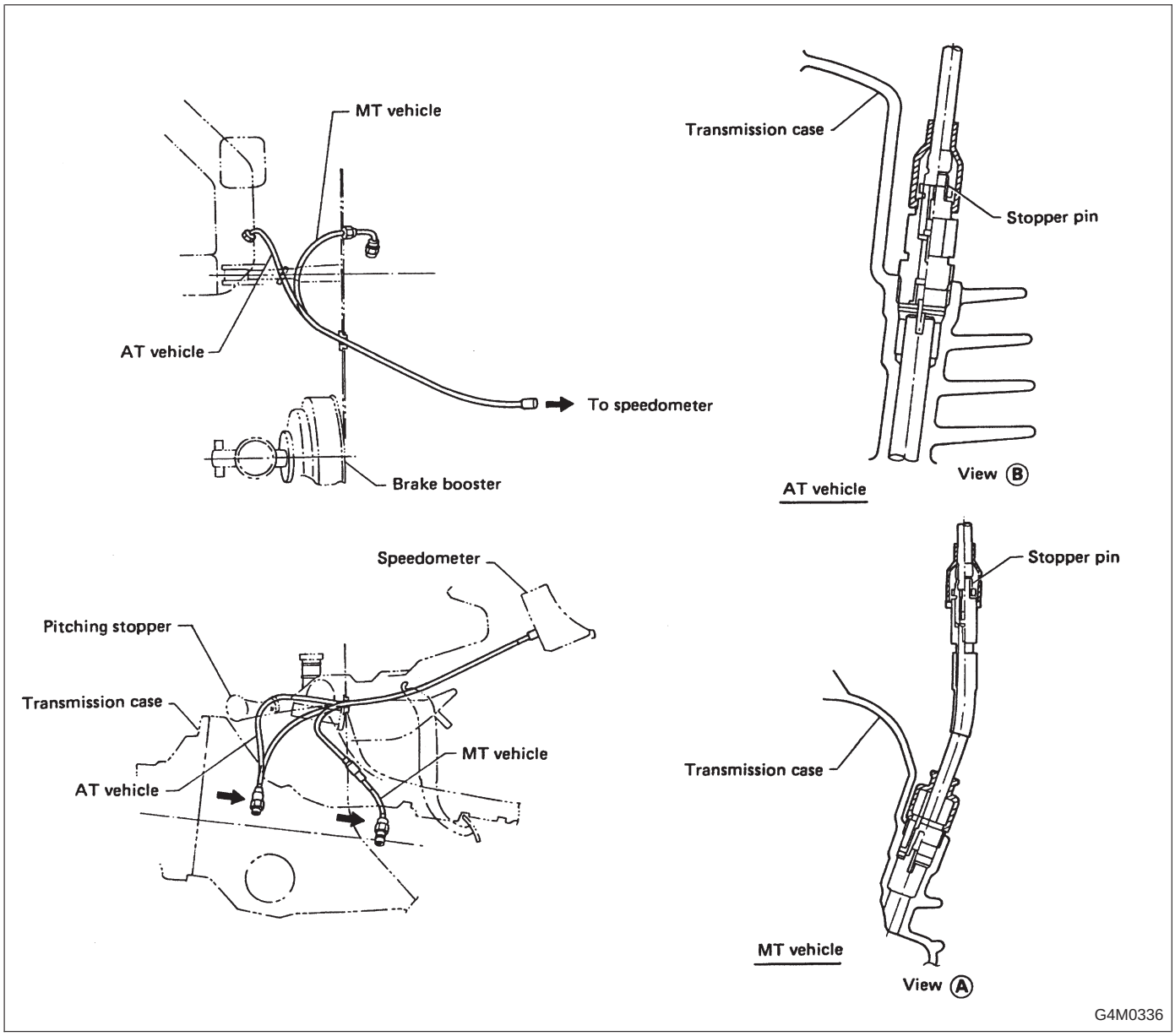
B: INSTALLATION

1) Pass inner cable through toe board hole and route inside driver compartment. Install cable bushing on accelerator pedal end.
2) While turning accelerator cable counterclockwise, transfer it to driver compartment through toe board hole.
3) Connect accelerator cable to upper holder of accelerator pedal.
4) Install clip inside engine compartment.
5) To install cable to throttle cam, reverse the order of the removal procedures.

Tightening torque:
14±4 N·m (1.4±0.4 kg-m, 10.1±2.9 ft-lb)

6) Adjustment after cable installation <Ref. to 4-5 [W1A3].>

4. Speedometer Cable



A: REMOVAL

1) Remove speedometer cable, starting with its midpoint connection inside engine compartment.
2) While holding up boot located at speedometer cable connection, slightly expand clip. Extract speedometer cable by pulling it upward 2 to 3 mm (0.08 to 0.12 in) on speedometer side. Then, release clip and remove speedometer cable.
3) After disconnecting cable from speedometer, pull it out of toe board.
4) Remove screw which secures speedometer cable to transmission side.

B: INSTALLATION

1) After manually screwing speedometer cable on transmission side, tighten it 45 to 90° using a wrench.
2) Securely install boot onto midpoint connection of speedometer cable to prevent entry of water.

1. Pedal System and Control Cables

Trouble	Corrective action
Excessively worn brake pedal pad	Replace.
Failure of clutch and/or accelerator pedals to operate	Connect cables correctly.
Speedometer does not work.	Connect speedometer cable correctly.
Stop light switch does not light up.	Adjust position of stop light switch.
Stop light switch is not smooth and/or stroke is not correct.	Replace.
Insufficient pedal play	Adjust pedal play.
Clutch and/or brake pedal free play insufficient	Adjust pedal free play.
Maladjustment of brake pedal or booster push rod	Inspect and adjust.
Excessively worn and damaged pedal shaft and/or bushing	Replace bushing and/or shaft with new one.

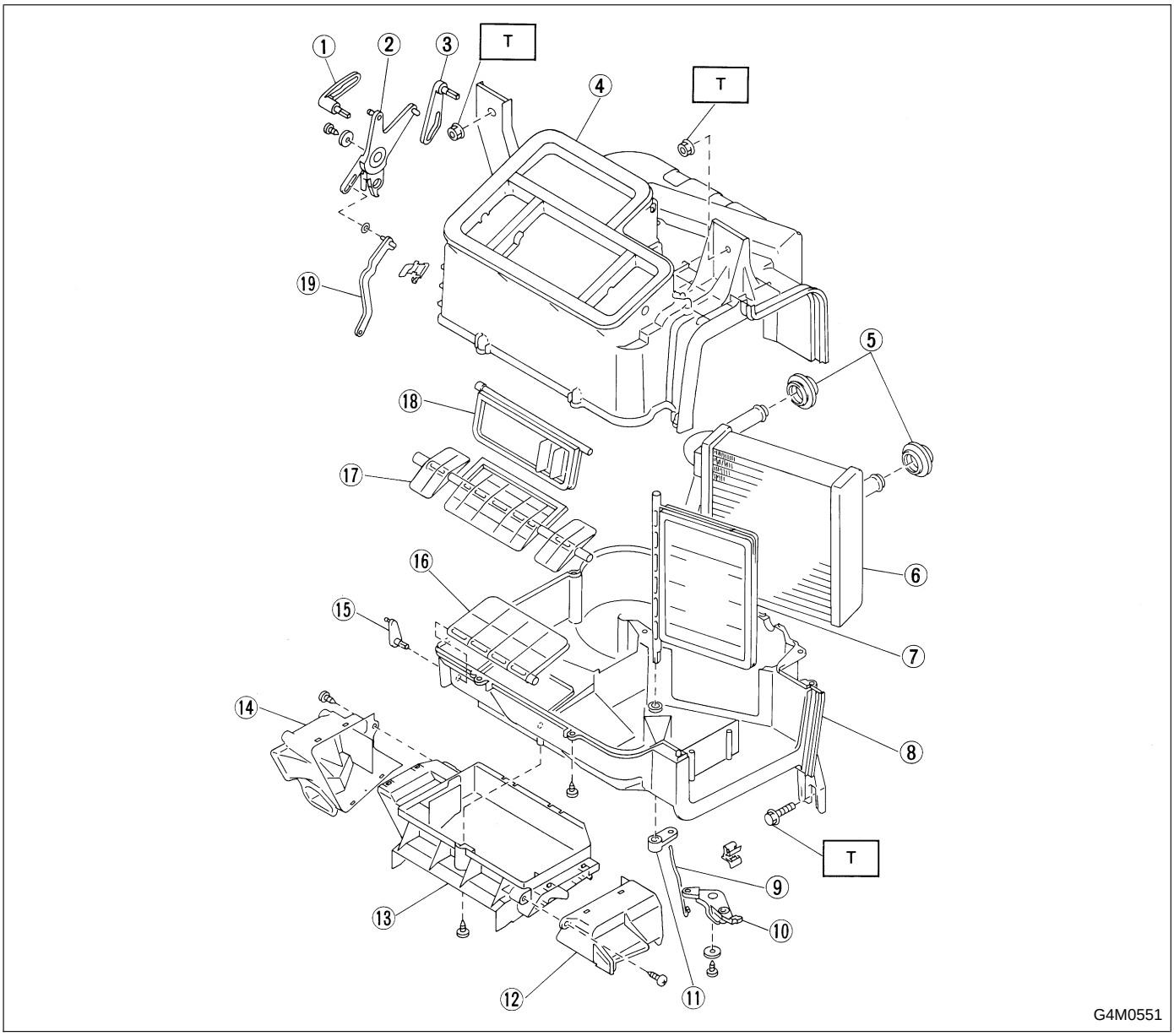
HEATER AND VENTILATOR 4-6

1. Heater and Ventilation

A: SPECIFICATIONS

Item		Specifications	Condition
Heating capacity		4.652 kW (4,000 kcal/h, 15,872 BTU/h) or more	● Mode selector switch : HEAT
			● Temp. 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		270 m^3 (9,534 cu ft)/h	Heat mode (FRESH), FULL HOT at 12.5 V
Max air flow rate		480 m^3 (16,949 cu ft)/h	● Temperature control switch : FULL COLD
			● Blower fan speed : 4th position
			● Mode selector switch : RECIRC (MAX. A/C)
Heater core size (height x length x width x thickness)		192.4 x 152.0 x 25.0 x 1.8 mm (7.57 x 5.98 x 0.984 x 0.071 in)	—
Blower motor	Type	Magnet motor 230 W or less	at 12 V
	Fan type and size (diameter x width)	Sirocco fan type 150 x 75 mm (5.91 x 2.95 in)	—

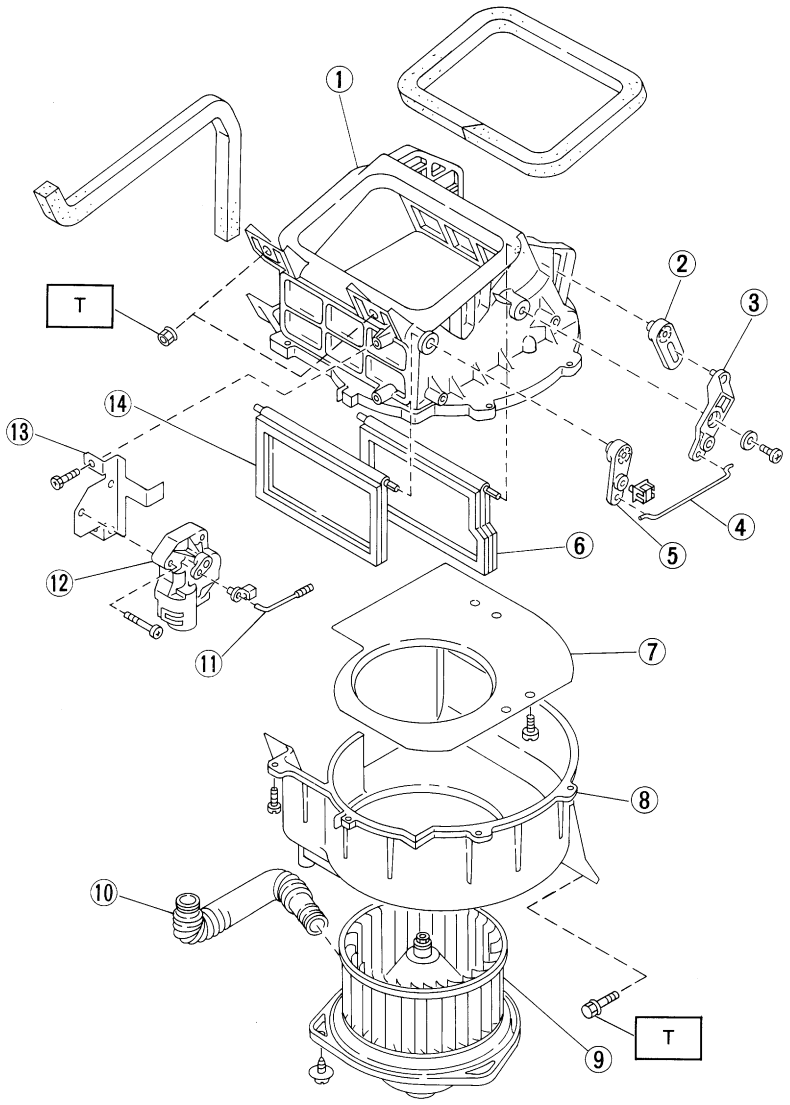
1. Heater Unit



① Vent lever
② Side link
③ DEF. lever
④ Heater case upper
⑤ Heater grommet
⑥ Heater core
⑦ Mix door
⑧ Heater case lower
⑨ Mix rod
⑩ Mix link
⑪ Mix lever
⑫ Foot duct (RH)
⑬ Foot duct (CTR)
⑭ Foot duct (LH)
⑮ Foot lever lower
⑯ Foot door
⑰ Vent door
⑱ DEF. door
⑲ Foot lever upper

Tightening torque: N·m (kg-m, ft-lb)
T: 7.35±1.96
(0.750±0.200, 5.421±1.446)

2. Intake Unit



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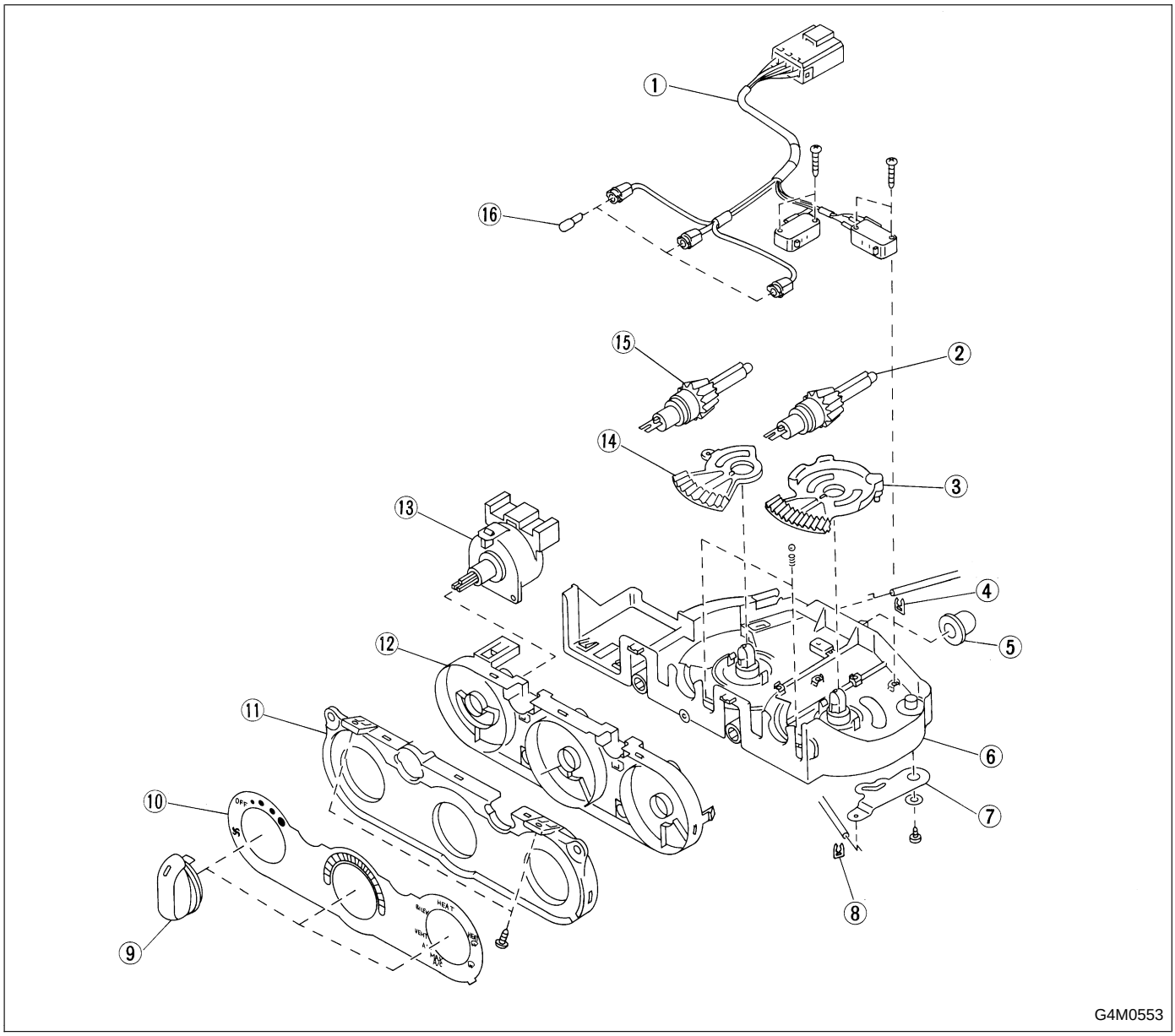
① Intake unit case upper
② Lever (A)
③ Link
④ Rod
⑤ Lever (B)
⑥ Door (A)
⑦ Bell mouth-intake
⑧ Intake unit case lower
⑨ Blower motor ASSY
⑩ Hose
⑪ Actuator rod
⑫ Actuator motor
⑬ Actuator bracket
⑭ Door (B)

Tightening torque: N·m (kg-m, ft-lb)
T: 7.35±1.96
(0.750±0.200, 5.421±1.446)

3. Control Unit



① Harness ASSY
② Shaft
③ Mode lever LH
④ Clip
⑤ Grommet
⑥ Base plate
⑦ Link
⑧ Clip
⑨ Control dial knob
⑩ Plate
⑪ Base plate
⑫ Light box
⑬ Switch ASSY
⑭ TEMP. lever
⑮ Shaft
⑯ Bulb

1. Supplemental Restraint System “Airbag”

Airbag system wiring harness is routed near the instrument panel, heater unit, blower motor and 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 Airbag system wiring harness when servicing the instrument panel, heater unit, blower motor and control unit.

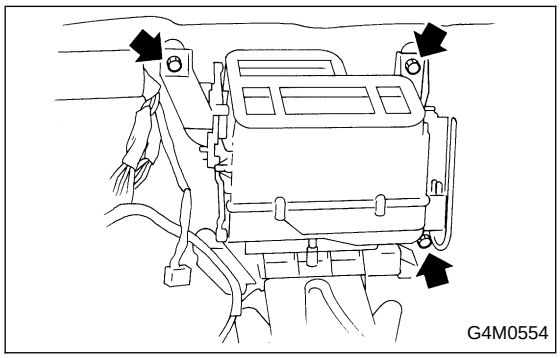
2. Heater Unit

A: REMOVAL

1) Disconnect GND cable from battery.
2) Remove heater hoses (inlet, outlet) in engine compartment.

NOTE:
Drain as much coolant from heater unit as possible, and plug disconnected hose with cloth.

3) Disconnect temperature control cable and mode door control cable from heater unit.
<Ref. to 5-4 [W1A0].>
4) Remove instrument panel.
<Ref. to 5-4 [W1A0].>
5) Remove steering support beam.
<Ref. to 5-1 [C600].>
6) Remove cooling unit.
<Ref. to 4-7 [W14A0].>

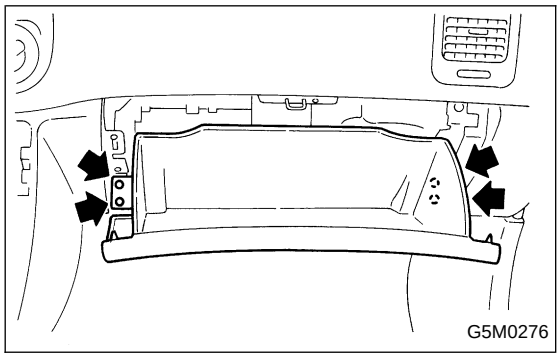


7) Remove heater unit.

B: INSTALLATION

Installation is in the reverse order of removal.

Fitted length of heater hose over pipe:
25 — 30 mm (0.98 — 1.18 in)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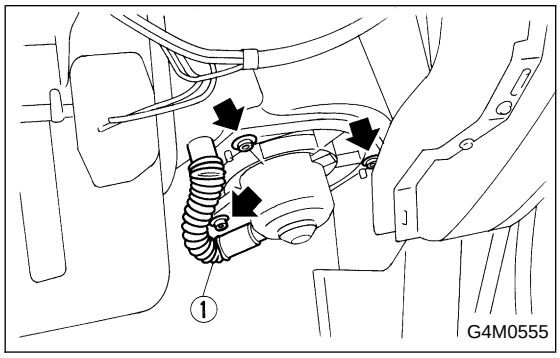
3. Blower Motor Assembly

A: REMOVAL

1) Disconnect GND cable from battery.
2) Remove glove box.
3) Disconnect blower motor harness connector.



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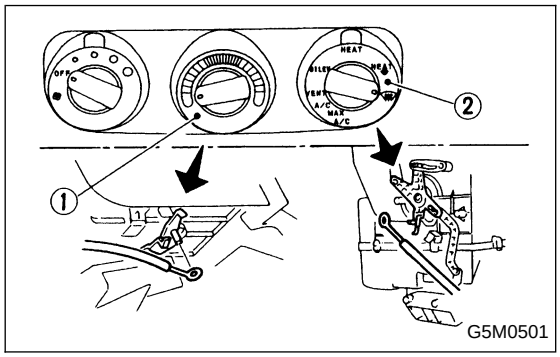
4) Disconnect aspirator pipe ①.
5) Remove blower motor mounting screw.
6) Remove blower motor assembly.



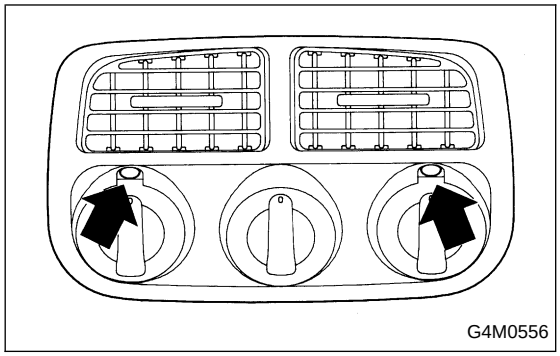
G5M0501

4. Control Unit

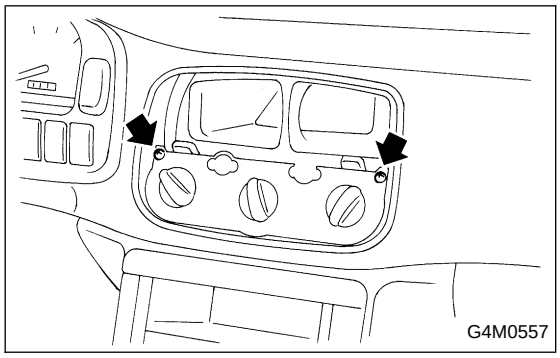
A: REMOVAL

1) Disconnect GND cable from battery.
2) Set temperature control switch ① to “FULL COLD” and mode selector switch ② to “DEF” position.
3) Remove temperature control cable and mode door control cable from heater unit.

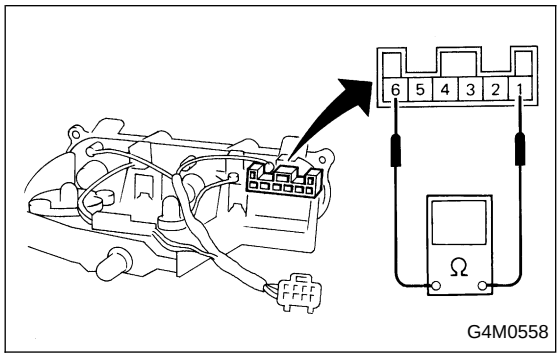
NOTE:
- Do not attempt to move links during installation.
- Before control unit installation, set temperature control switch to “FULL COLD” and mode selector switch to “DEF” position.


G4M0556

4) Remove center panel.


G4M0557

5) Remove control unit assembly and disconnect connector.



G4M0558

B: INSPECTION

1. FAN SWITCH

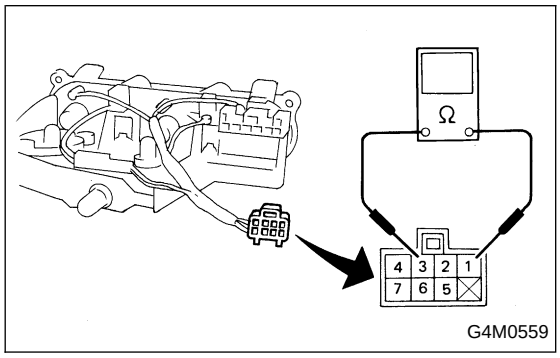
Check continuity between terminals at each switch position.

Switch position	Terminals					
	1	2	3	4	5	6
Low	○	○				○
Med. 1	○		○			○
Med. 2	○			○		○
High	○				○	○

2. CONTROL UNIT

1) Ignition switch is turned OFF.
2) Disconnect connector from control unit.
3) Check circuit continuity between each terminal.

Terminal	Mode selector switch position			Illumi.
	MAX A/C (RECIRC)	Except MAX A/C (FRESH)	● MAX A/C ● A/C (A/C ON)	
1	○	○		
2	○			
3		○		
4			○	
5				○
6				○
7			○	



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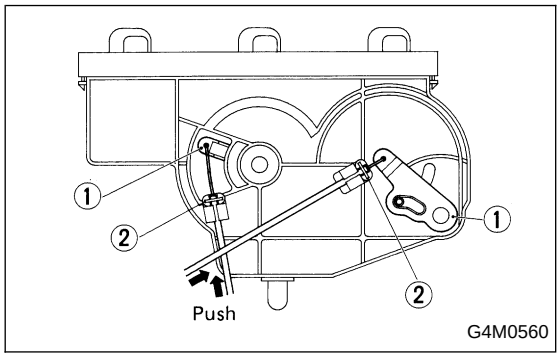


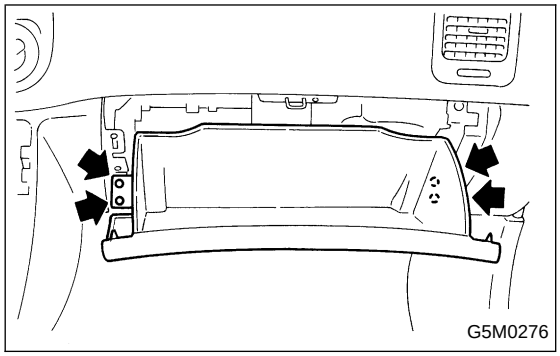
G4M0560

C: ADJUSTMENT

1) Operate temperature control switch to “FULL COLD” and mode selector switch to “MAX A/C” position.
2) Install control cable to lever ①. While pushing outer cable, secure control cable with clip ②.

D: INSTALLATION

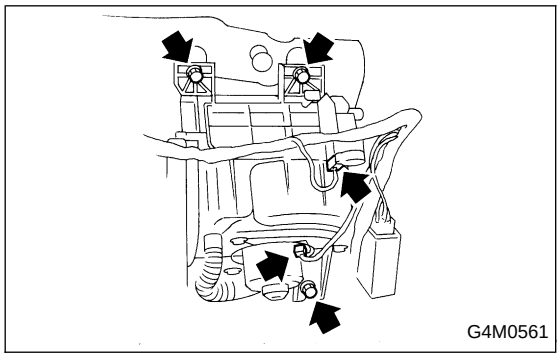
Installation is in the reverse order of removal.



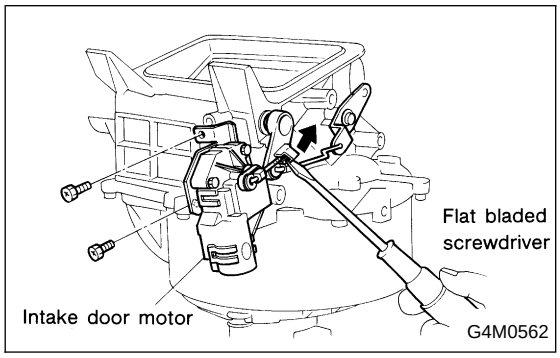
5. Intake Door Motor

A: REMOVAL

1) Disconnect GND cable from battery.
2) Remove glove box.
3) Remove heater duct (or cooling unit with A/C model). <Ref. to 4-7 [W14A0].>

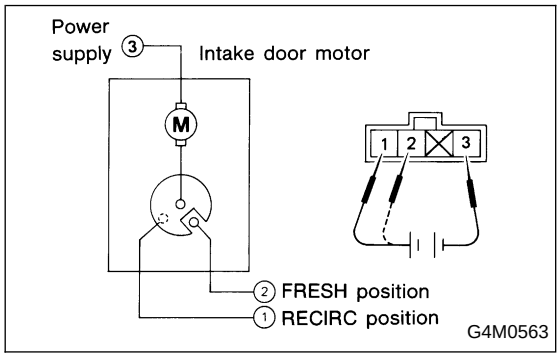


4) Remove intake unit from the vehicle.



5) Remove screws which secure intake door motor to intake unit.

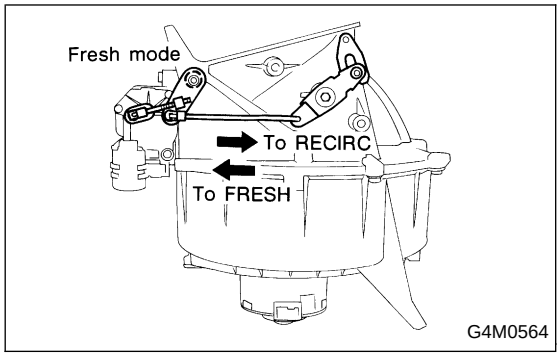
NOTE:
Ensure that RECIRC switch is set to “ON”.



B: INSPECTION

When approx. 12 V is applied to the intake door motor terminals, intake door motor operates as follows.

Intake door motor position	Terminal		Intake door motor operation
	⊕	⊖	
FRESH	3	2	Door motor moved to FRESH position.
RECIRC		1	Door motor moved to RECIRC position.



1) Connect harness to intake door motor.
2) Turn ignition switch to “ACC” and set RECIRC switch to“ON” switch to “RECIRC”.

NOTE:
Ensure that intake door motor is set in the “RECIRC” mode.

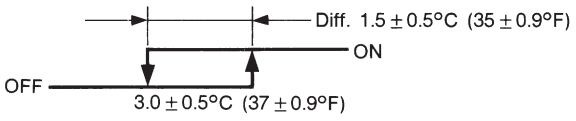
3) Install intake door motor on intake unit.
4) Secure rod holder to link, and install link to intake unit.
5) Manually set rod in the “RECIRC” mode, and secure to rod holder.
6) Operate mode selector switch to ensure that system changes from intake air to “RECIRC” and from “RECIRC” to intake air in full-stroke range.

C: INSTALLATION

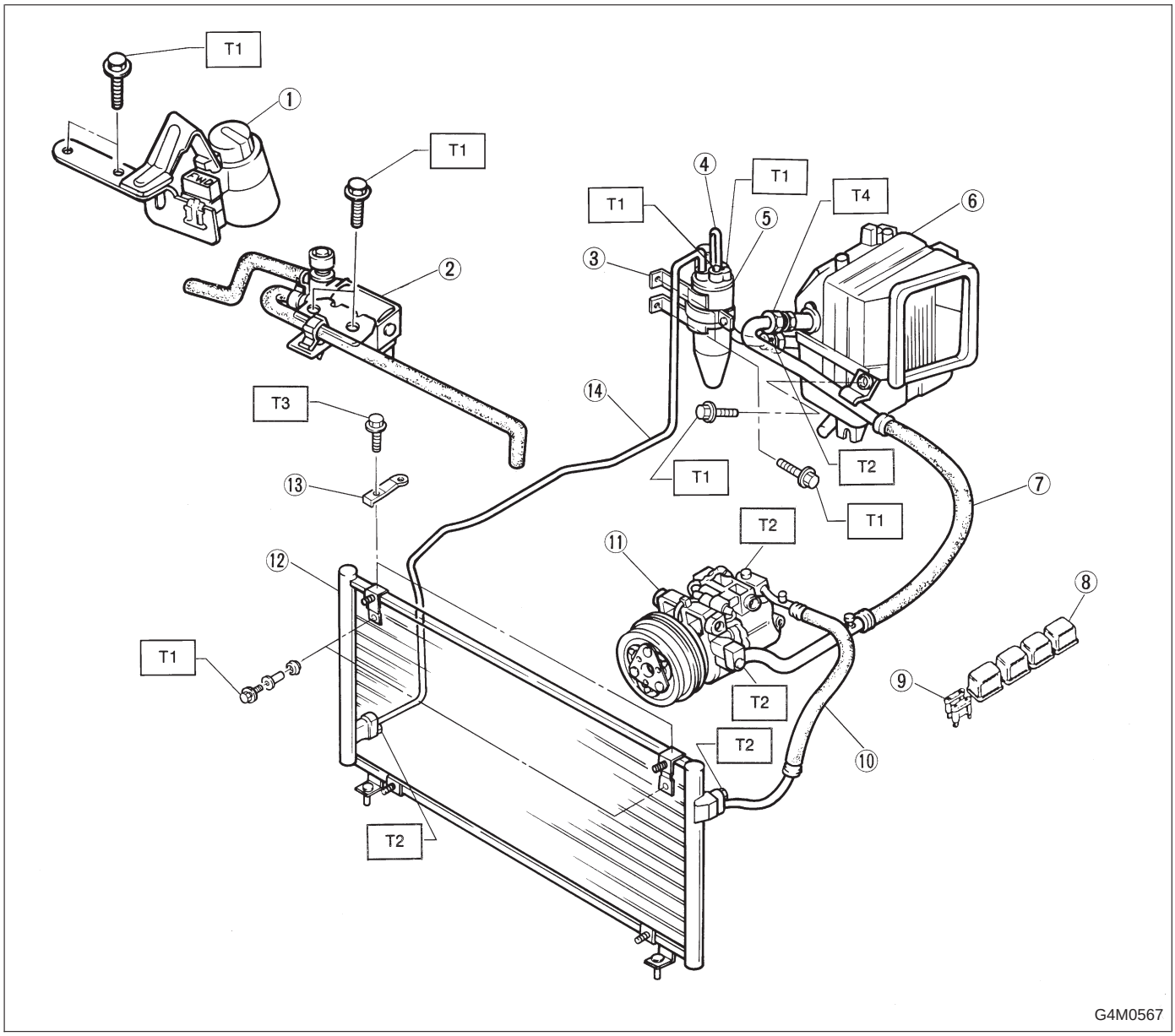
Installation is in the reverse order of removal.

AIR CONDITIONING SYSTEM 4-7

1. Air Conditioning System

Item			Specifications
Type of air conditioner			Reheat air-mix type
Cooling capacity (IMACA)			5.234 kW (4,500 kcal/h, 17,856 BTU/h)
Refrigerant			HFC-134a (CH_2FCF_3) [0.6 — 0.7 kg (1.3 — 1.5 lb)]
Compressor		Type	5-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.)	120 mm (4.72 in)
		Pulley ratio	1.8 model: 1.11, 1.6 model: 0.92
Condenser		Type	Corrugated fin (Multi-flow)
		Core face area	0.196 m^2 (2.1 sq ft)
		Core thickness	19 mm (0.75 in)
		Radiation area	4.7 m^2 (51 sq ft)
Receiver drier		Effective inner capacity	250 cm^3 (15.26 cu in)
Expansion valve		Type	External equalizing
Evaporator		Type	Single tank
		Dimensions (W x H x T)	86 x 222 x 235 mm (3.39 x 8.74 x 9.25 in)
Blower fan		Fan type	Sirocco fan
		Outer diameter x width	150 x 75 mm (5.91 x 2.95 in)
		Power consumption	230 W at 12 V
Condenser fan (Sub fan)		Motor type	Magnet
		Power consumption	120 W at 12 V
		Fan outer diameter	320 mm (12.60 in)
Radiator fan (Main fan)		Motor type	Magnet
		Power consumption	120 W at 12 V
		Fan outer diameter	320 mm (12.60 in)
Idling speed (A/C ON)		MPFI model	850±50 rpm (700±50 rpm “D” range in AT model)
Dual switch (Pressure switch)	Low-pressure switch operating pressure kPa (kg/cm^2, psi)	ON → OFF	176±20 (1.80±0.20, 25.5±2.9)
		OFF → ON	186±29 (1.90±0.30, 27.0±4.2)
	High-pressure switch operating pressure kPa (kg/cm^2, psi)	ON → OFF	2,648±196 (27±2, 384±28)
		DIFF	588±196 (6±2, 85±28)
Compressor relief valve blow-out pressure kPa (kg/cm^2, psi)			3,727±196 (38±2.0, 540±28)
Thermo control amplifier working temperature (Evaporator outlet air)			 G4M0938
Compressor thermocut temperature			140±5°C (284±9°F) Diff. 15±5°C (59±9°F)

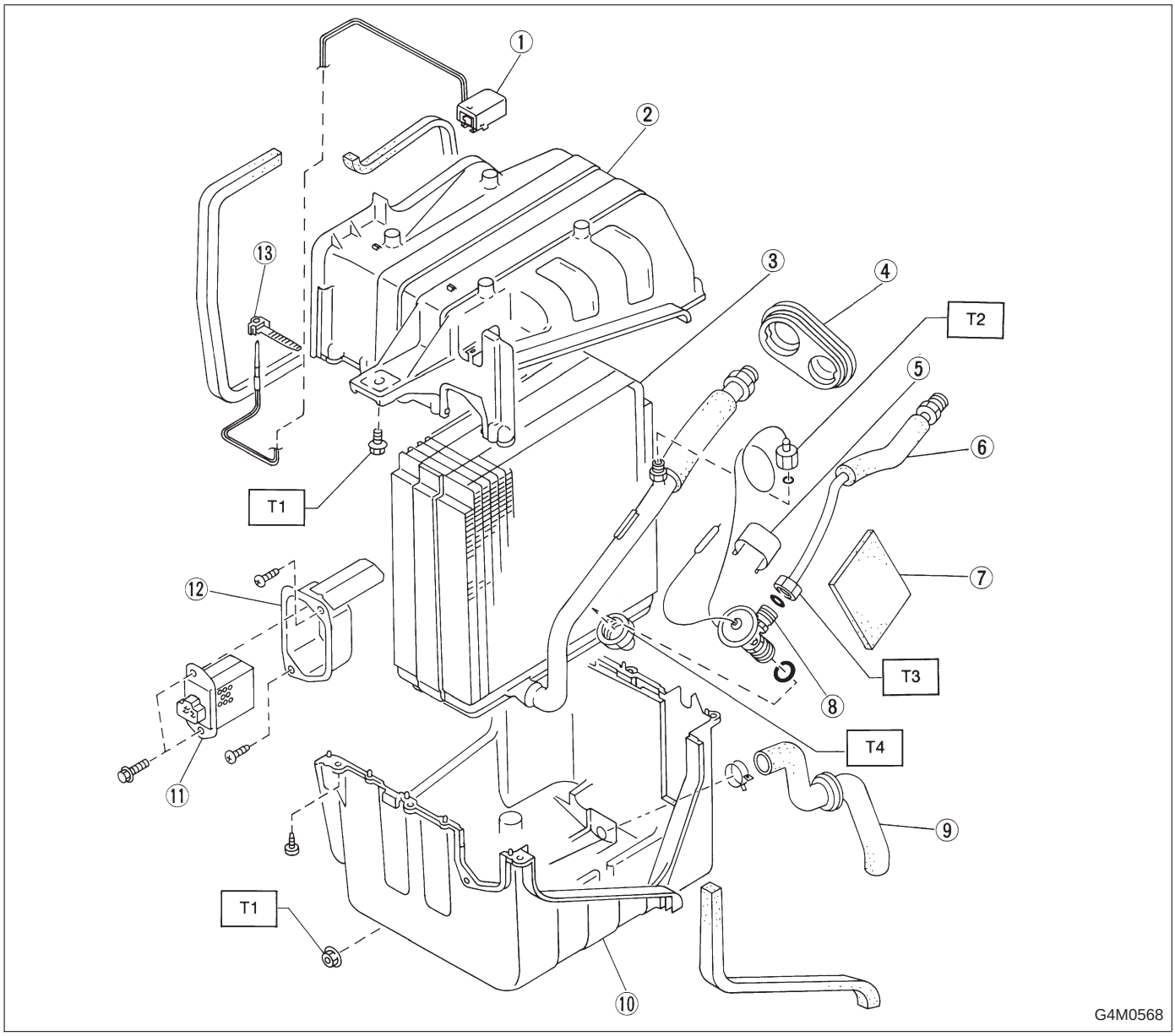
1. Air Conditioning System



① A/C cut relay
② FICD (1800 cc model)
③ Receiver drier bracket
④ Pipe (Receiver drier — C/unit)
⑤ Receiver drier
⑥ Cooling unit
⑦ Hose (Low-pressure)
⑧ A/C relay
⑨ Fuse
⑩ Hose (High-pressure)
⑪ Compressor
⑫ Condenser
⑬ Radiator bracket
⑭ Pipe (Condenser — Receiver drier)

Tightening torque: N·m (kg-m, ft-lb)
T1: 5.39 — 9.31
(0.55 — 0.95, 4.0 — 6.9)
T2: 13 — 23 (1.3 — 2.3, 9 — 17)
T3: 9.8 — 19.6
(1.00 — 2.00, 7.2 — 14.4)
T4: 19.6 — 29.4
(2.00 — 3.00, 14.4 — 21.5)

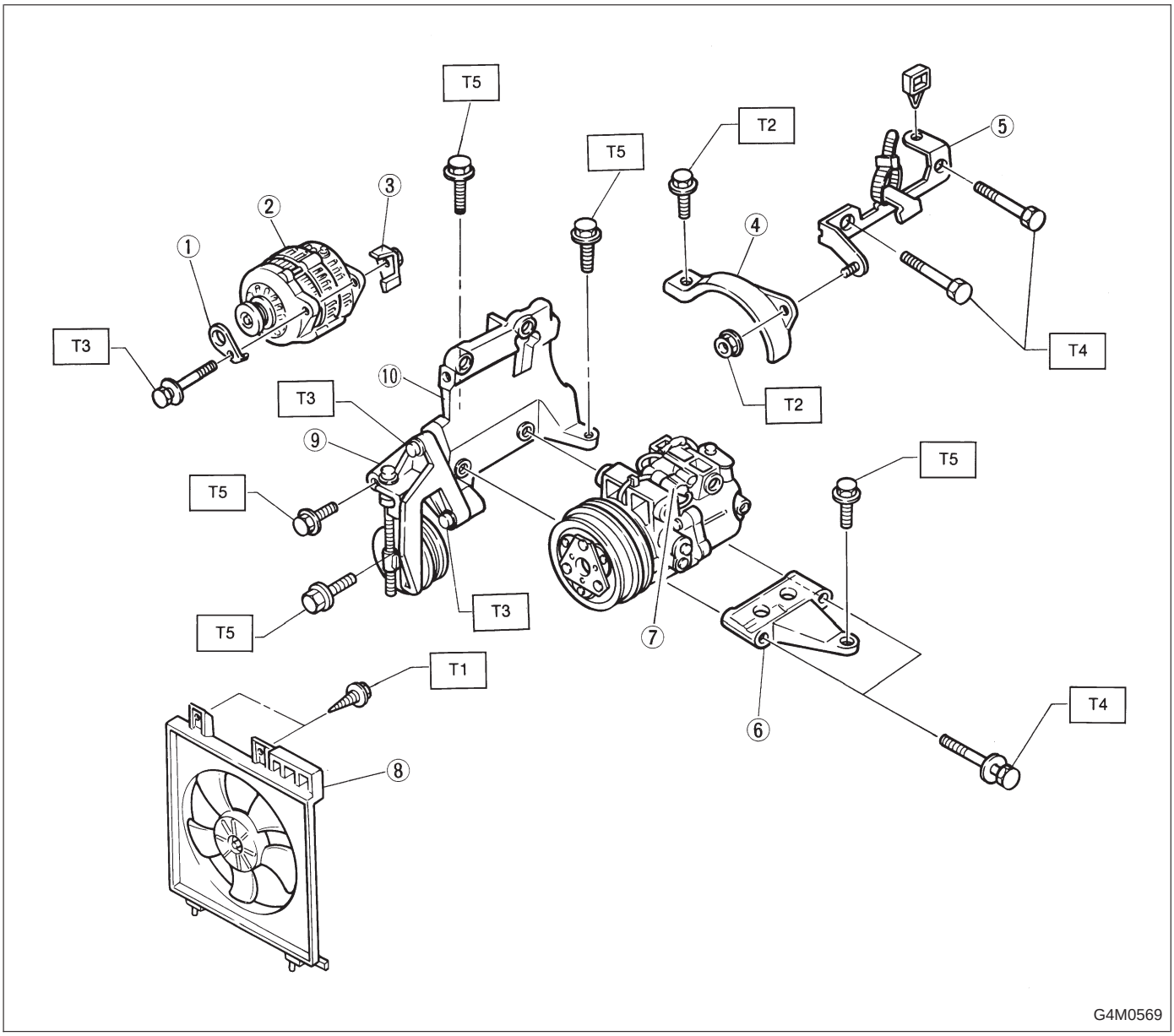
2. Evaporator



① Thermo control amplifier
② Case upper
③ Cooling unit
④ Grommet
⑤ Clip
⑥ Pipe
⑦ Seat
⑧ Expansion valve
⑨ Drain hose
⑩ Case lower
⑪ Resistor
⑫ Resistor bracket
⑬ Thermistor bracket

Tightening torque: N·m (kg-m, ft-lb)
T1: 5.5 — 9.5
(0.56 — 0.97, 4.1 — 7.0)
T2: 13.2 — 16.2
(1.35 — 1.65, 9.7 — 11.9)
T3: 17.6 — 21.6
(1.80 — 2.20, 13.0 — 15.9)
T4: 21.5 — 27.5
(2.20 — 2.80, 15.9 — 20.3)

3. Compressor



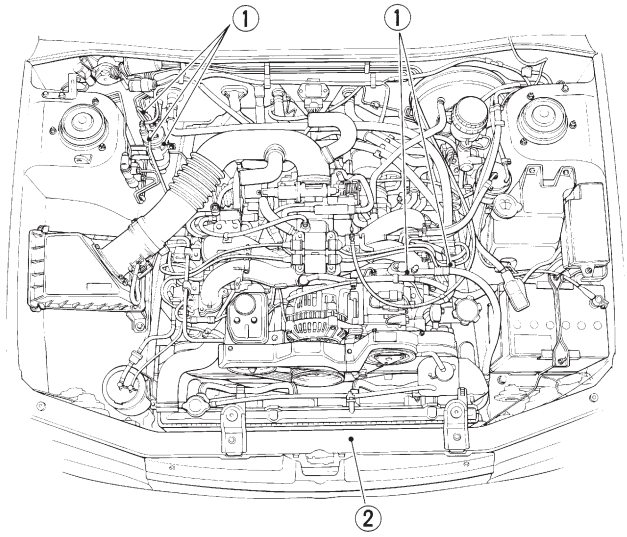
① Alternator bracket
② Alternator
③ Alternator bracket nut
④ Compressor belt cover
⑤ Bracket
⑥ Compressor bracket lower
⑦ Compressor
⑧ Condenser fan motor ASSY
⑨ Idler pulley ASSY
⑩ Compressor bracket upper

Tightening torque: N·m (kg-m, ft-lb)
T1: 3 — 5 (0.3 — 0.5, 2.2 — 3.7)
T2: 5.39 — 9.31
(0.55 — 0.95, 4.0 — 6.9)
T3: 19 — 27 (1.9 — 2.8, 14 — 20)
T4: 24.2 — 33.6
(2.47 — 3.43, 17.8 — 24.8)
T5: 31 — 41 (3.2 — 4.2, 23 — 30)

1. Safety Precautions

1. HFC-134a AIR CONDITIONING SYSTEM

Component parts of the cooling system, refrigerant, compressor oil, and other parts are not the same for the HFC-134a system and the older CFC-12 system. Do not interchange parts or liquid.
Vehicles with HFC-134a air conditioning systems, use only HFC-134a parts that are indicated on a label attached to the vehicle. Before performing any maintenance, verify the type of air conditioning system installed in the vehicle.



① HFC134a 用
USE FOR
HFC134a

② SUBARU TOKYO JAPAN
AIR CONDITIONER (LI-TYPE)
REFRIGERANT CHARGE :
HFC134a, 21-25 OZ (0.6 - 0.7Kg)
COMPRESSOR OIL : DH-PR
COMPRESSOR BELT : 73013AA000 (1.8L)
73013PA000 (1.6L)
REFRIGERANT UNDER HIGH PRESSURE.
CONSULT SERVICE MANUAL.
CAUTION : SYSTEM TO BE SERVICED BY QUALIFIED PERSONNEL.
SAE J639

CAUTION : USE ONLY REFRIGERANT HFC134a AND OIL DH-PR P FOR THIS AIR CONDITIONER. DON'T USE REFRIGERANT CFC12 AND OIL DH-150CX.
ATTENTION : UTILISEZ LE LIQUIDE RÉFRIGÉRANT HFC134a ET L'HUILE DH-PR DANS CE CLIMATISEUR. NE JAMAIS UTILISER LE RÉFRIGÉRANT CFC12 ET L'HUILE DH-150CX.
VORSICHT : NUR KÄL TEMITTEL HFC134a UND ÖL DH-PR FÜR DIESE KLIMAANLAGE VERWENDEN. NIEMALS KÄL TEMITTEL CFC12 UND ÖL DH-150CX.

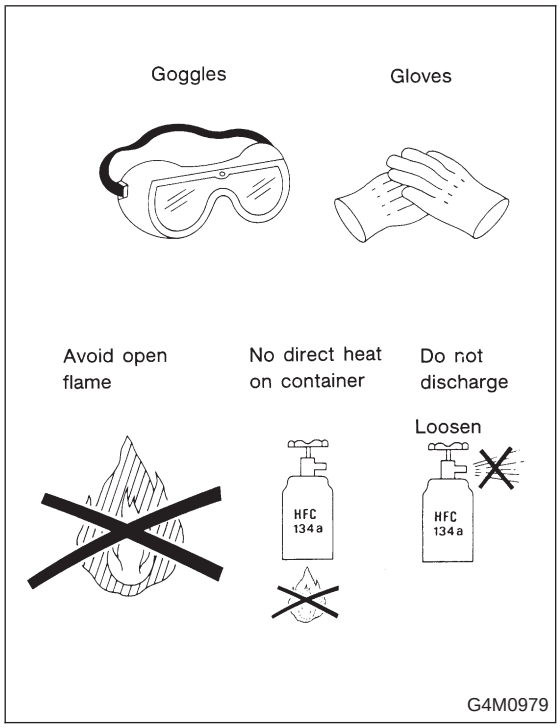
G4M0978

2. COMPRESSOR OIL

Do not use any compressor oil that is not specifically designated for the HFC-134a air conditioning system; only use DH-PR. Also, do not use HFC-134a compressor oil in the CFC-12 air conditioning system. If compression oils are mixed, poor lubrication will result and the compressor itself may be damaged.
Because HFC-134a compressor oil is very hygroscopic (easily absorbs moisture), when parts of the air conditioning system are being removed, quickly install a blind plug to prevent contact with the outside air. Also, always make sure that the service container for compressor oil is tightly closed except when in use. Store compressor oil in a tightly closed steel container.

3. REFRIGERANT

Do not put CFC-12 refrigerant into a HFC-134a air conditioning system. Also, do not put HFC-134a refrigerant into a CFC-12 air conditioning system. If the wrong refrigerant is used, poor lubrication will result and the compressor itself may be destroyed.



4. HANDLING OF REFRIGERANT

Because refrigerant boils at approx. −30°C (−22°F) at sea level, it is cold enough to give you severe frostbite. Always wear goggles to protect your eyes and gloves to protect your hands. Also, even under the pressures normally found in CFC-12 containers, refrigerant will boil with the addition of heat. This could raise the pressure inside the container to a dangerous level.

Never expose a can of HFC-134a to direct sunlight, or to temperatures over 40°C (104°F). One more thing to remember about HFC-134a is that when it is exposed to an open flame or to hot metal, it forms phosgene, a deadly gas. Do not discharge HFC-134a into the atmosphere on purpose. Always read and follow the precautions on the HFC-134a bottle.

2. Basic Information

1) The combination of moisture and refrigerant forms acid, therefore, moisture should not be allowed to enter the refrigerant.
2) Refrigerant oil readily absorbs moisture, therefore, keep refrigerant oil containers tightly capped.
3) The process of evacuating the system is performed to remove small amounts of moisture. This is accomplished by lowering the pressure inside the system, which allows the moisture to boil off, in much the same way that a pot of water will boil away to nothing given enough time. The evacuation process does not suck the moisture out of the system.
4) A minimum level of vacuum must be reached to satisfactorily evacuate the system. This minimum level of vacuum depends on the temperature inside the system. The chart below shows the level of vacuum required to boil water at various temperatures.
Additionally, the vacuum level shown on a gauge will read approx. 4 kPa (25 mmHg, 1 inHg) less for each 304.8 m (1,000 ft) above sea level, due to the decrease in atmospheric pressure at altitude.

Vacuum level required to boil water (at sea level)

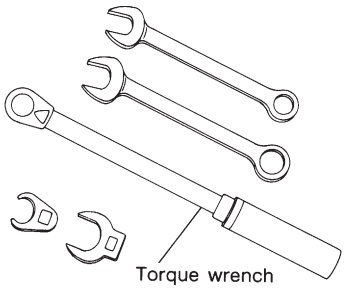
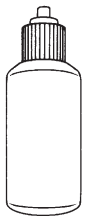
Temperature °C (°F)	Vacuum kPa (mmHg, inHg)
1.7 (35)	100.9 (757, 29.8)
7.2 (45)	100.6 (754, 29.7)
12.8 (55)	99.9 (749, 29.5)
18.3 (65)	99.2 (744, 29.3)
23.9 (75)	98.5 (739, 29.1)
29.4 (85)	97.2 (729, 28.7)
35 (95)	95.8 (719, 28.3)

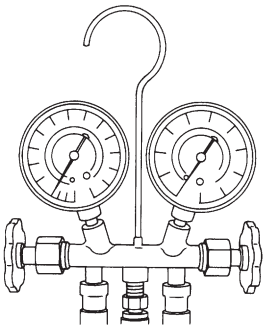
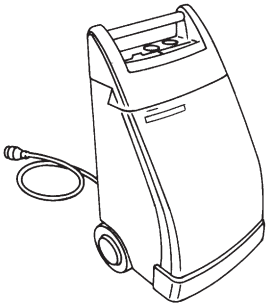
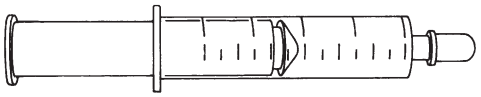
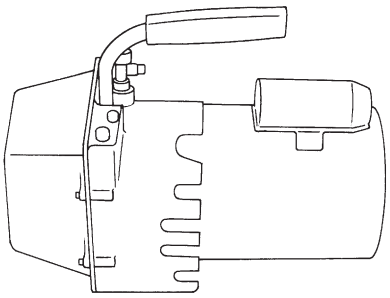
3. Tools and Equipment

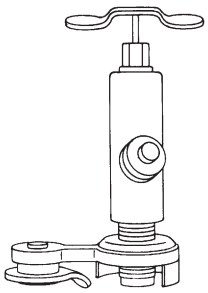
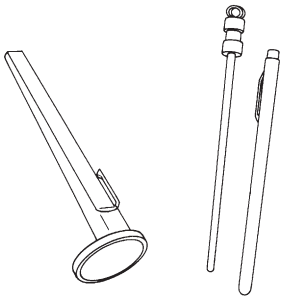
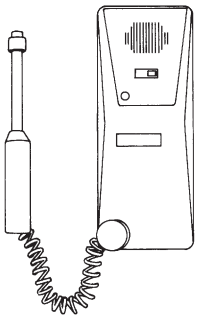
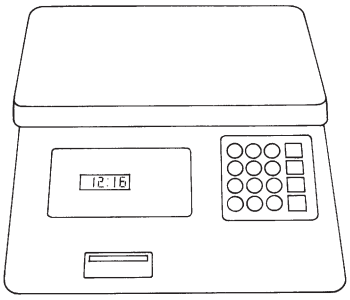
The following section provides information about the tools and equipment that will be necessary to properly service the A/C system.
Since equipment may vary slightly depending on the manufacturer, it is important to always read and follow the manufacturer's instructions.

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

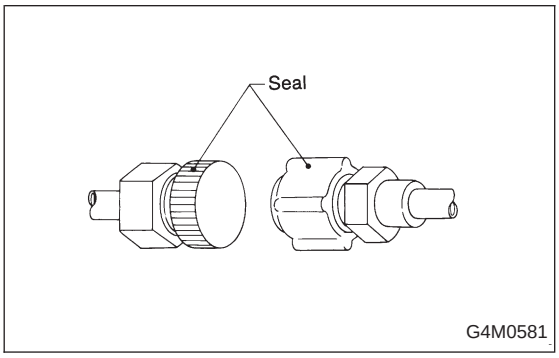
Tools and Equipment	Description
● MANIFOLD GAUGE SET A **MANIFOLD GAUGE SET** (with hoses) can be obtained from either a commercial refrigeration supply house or from an auto shop equipment supplier.	 G4M0573
● REFRIGERANT RECOVERY SYSTEM A **REFRIGERANT RECOVERY SYSTEM** is used for the recovery and 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

Tools and Equipment	Description
● CAN TAP A **CAN TAP** for the 397 g (14 oz) can is available from an auto supply store.	 G4M0577
● 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

4. O-ring Connections

1. GENERAL

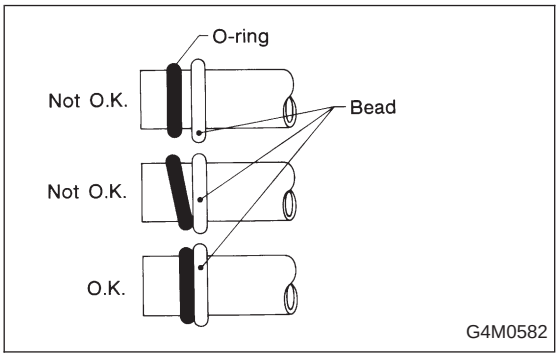
The following points should be kept in mind when assembling O-ring connections:
1) Avoid unnecessary handling and contact of O-rings with your hands, since even clean fingers contain body acids, which can contaminate the O-ring surface.
2) Do not handle O-rings with gloves, shop towels, etc., since lint particles may cling to the O-ring, possibly causing a leak upon assembly.
3) Always lubricate O-rings before assembly to allow the O-ring to seat itself properly.
4) Be certain to use torque wrenches when tightening O-ring fittings, because overtightening can not only damage the O-ring, but it can distort the tube end as well.



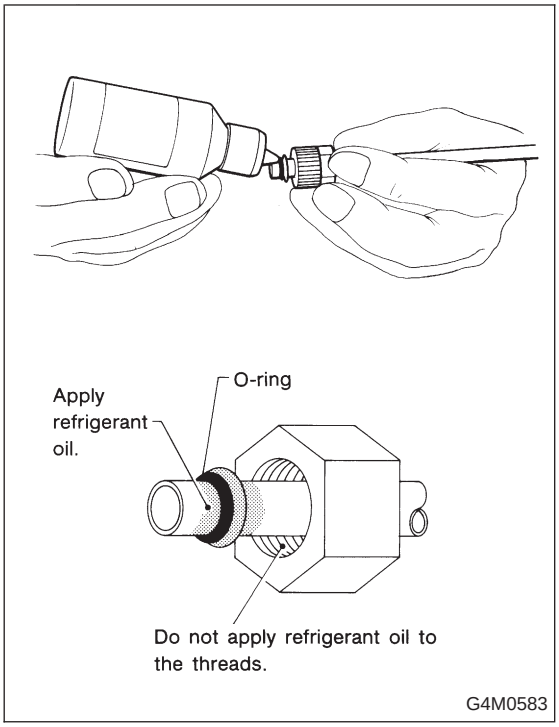
2. REMOVE PROTECTIVE SEALS

Just prior to making the connection, remove the protective seals.

CAUTION:
If for any reason you have to stop before making a connection, recap the tube, component or fitting.

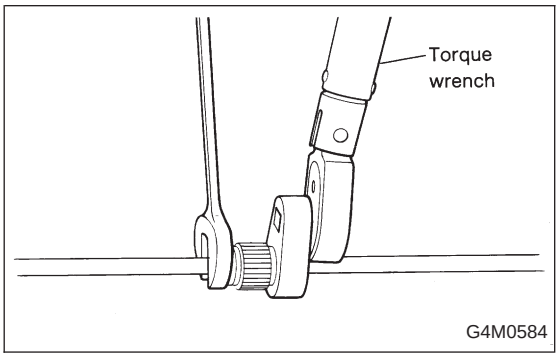


Visually inspect the O-ring surface, the O-ring mating surface, the threads and the connection points. If a defective part is found, replace it.
The O-ring must sit square against the tube bead. If necessary, slide the O-ring into proper position **with clean hands**.



3. LUBRICATE THE COMPONENTS

For lubrication of the components, use only refrigerant oil as described in the appropriate service manual. Apply oil from an oil squirt gun or other closed container. Do not use your finger to spread the oil over the O-ring.
Apply a small amount of refrigerant oil to the top and sides of the O-ring. The area covered by oil should include the O-ring and the tube bead.



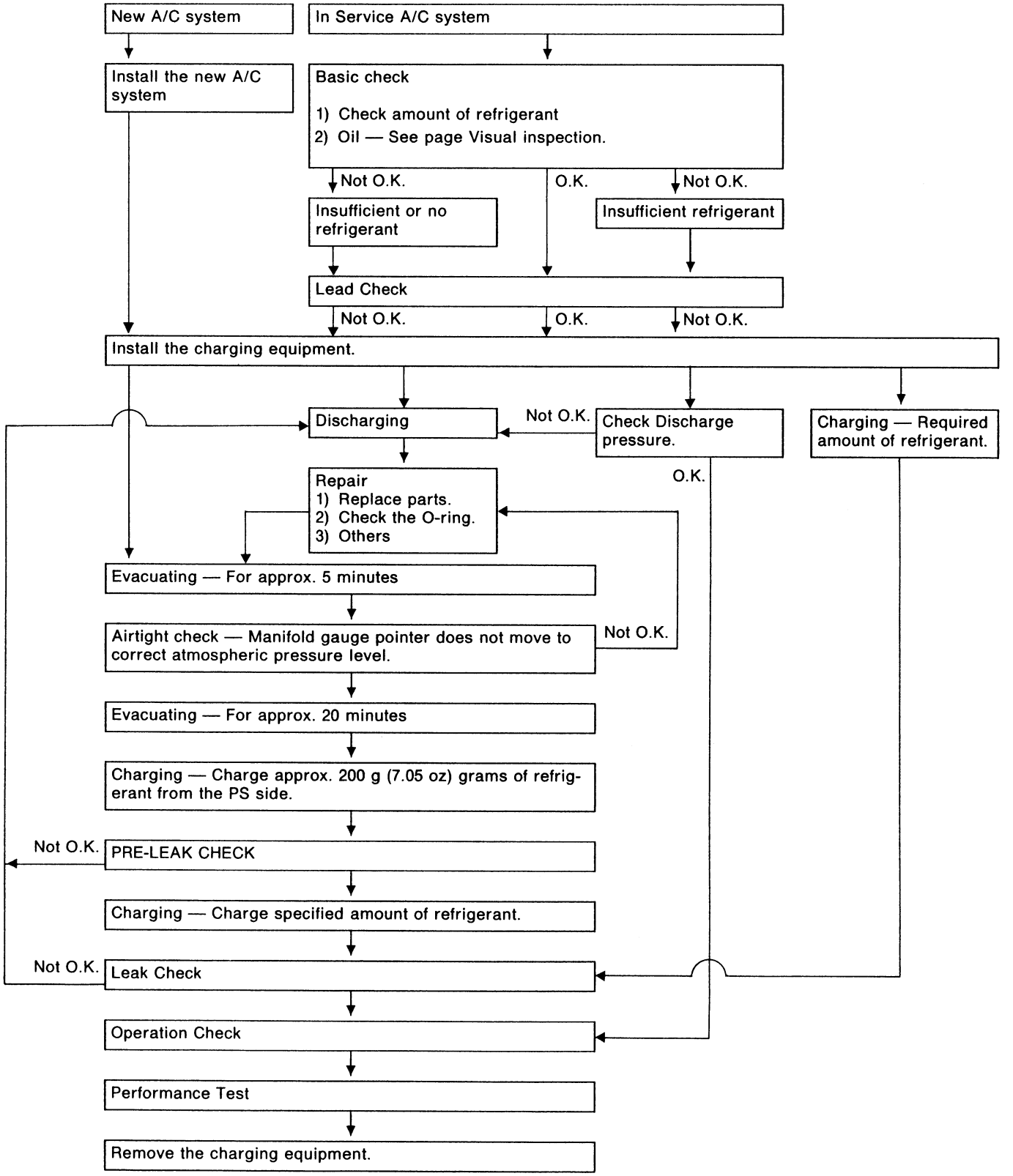
4. TORQUE THE FITTING

Using a back-up wrench in conjunction with a calibrated torque wrench, torque the connection to the midrange of the specification.
After completion of torquing, use a clean shop towel to remove any excess oil from the connection or any oil that may have dripped on the vehicle body or other parts.

CAUTION:
If a leak is suspected after torquing, do not retighten or retorque the connection. Instead, disassemble the connection, remove the O-ring, and inspect the O-ring, threads, joints and seating surfaces.

5. Refrigerant Service Procedure

1. WORK FLOW



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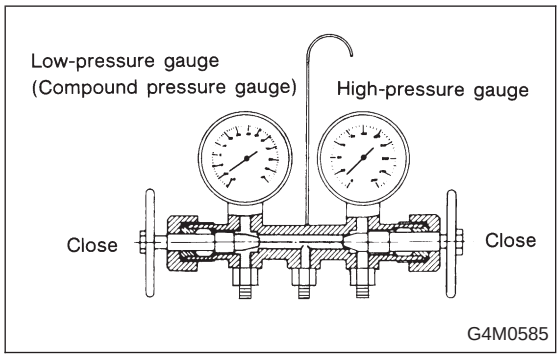
6. Discharge the System

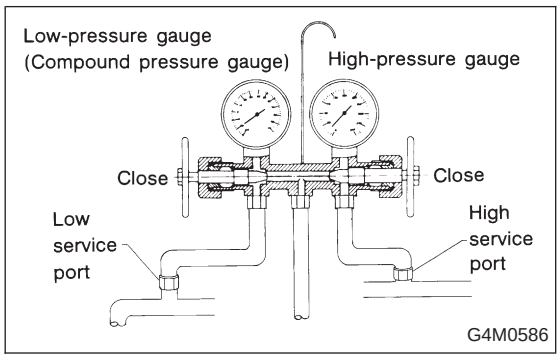
CAUTION:
The following points must be kept in mind when discharging the system.

1) Be certain that goggles and gloves are worn.
2) Connect refrigerant recovery system to manifold gauge set and remove recycle refrigerant from the A/C system.
NOTE:
Refer to that refrigerant recovery system instruction manual for operating procedures.



1. CONNECTING THE MANIFOLD GAUGE SET

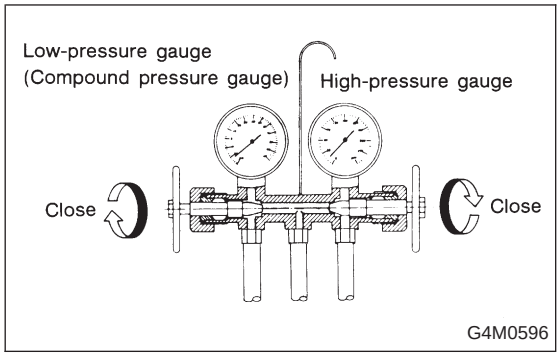
1) Close the high and low side manifold valves



2) Attach the high- and low-pressure manifolds to the high and low services port on the vehicle.

2. PREPARE FOR DISCHARGING

1) Connect center manifold hose to refrigerant recovery system to recycle refrigerant.

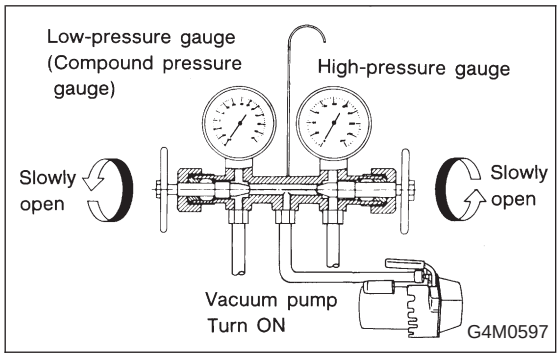


7. Evacuating and Charging

The following points should be kept in mind when evacuating and charging with a manifold gauge set:
1) Be certain that goggles and gloves are worn.
2) If bulk refrigerant [13.6 kg (30 lb) canister] is used, be certain to weigh the charge amount carefully, using the correct equipment, to avoid overcharging the system.

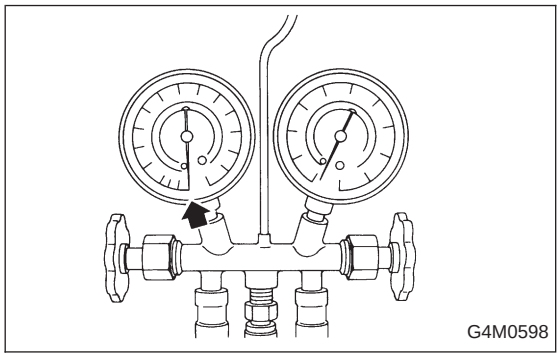
3) The charging procedure described in this section begins by charging **liquid** refrigerant into the high-pressure side of the system **with the engine off.** The procedure is completed by charging refrigerant **vapor** into the low-pressure side of the system with the engine running.

CAUTION:
Never open the high-pressure manifold valve when the engine is running.



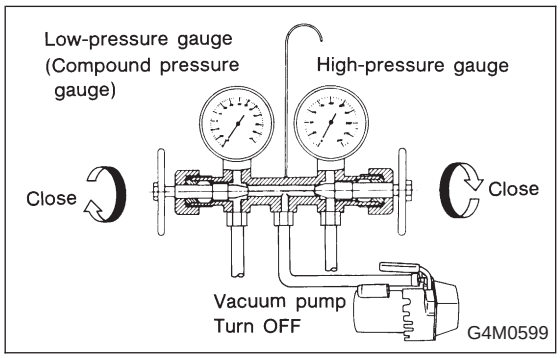
1. CONNECT THE GAUGE SET

1) Close the high- and low-pressure manifold valves
2) Attach the low-pressure manifold hose to the low-pressure service port on the vehicle. Check the low-pressure gauge. If more than 68.6 kPa (0.70 kg/cm^2, 10 psi) is indicated, discharge the system prior to charging.
3) Attach the high-pressure manifold hose to the high-pressure service port on the vehicle.
4) Connect the center hose from the manifold to the vacuum pump.
5) Turn on the vacuum pump.
6) Slowly open the low-pressure manifold valve.
7) When the low-pressure gauge reaches approximately 66.43 kPa (498.3 mmHg, 19.62 inHg), slowly open the high-pressure manifold valve.



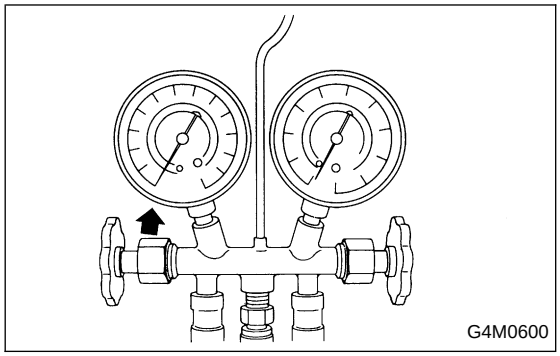
8) Maintain a minimum vacuum level of 100.56 kPa (754.4 mmHg, 29.70 inHg) for a minimum of 15 minutes on a new system or 30 minutes for an in-service system.

NOTE:
The gauge will read 4 kPa (25 mmHg, 1 inHg) less for every 304.8 m (1,000 ft) above sea level.

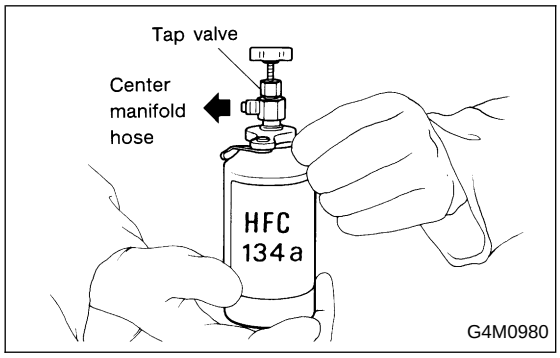


2. PERFORM A VACUUM LEAK TEST

1) After 15 minutes (or more) of evacuation, close the high-pressure manifold valve.
2) Close the low-pressure manifold valve.
3) Turn off the vacuum pump.


G4M0600

4) Note the low side gauge reading.
5) After 5 minutes, re-check the low-pressure gauge reading.
If the vacuum level has changed more than 4 kPa (25 mmHg, 1 inHg), perform an HFC-134a leak test.
If the vacuum reading is about the same as noted in step 2-4), continue on to step 2-6).



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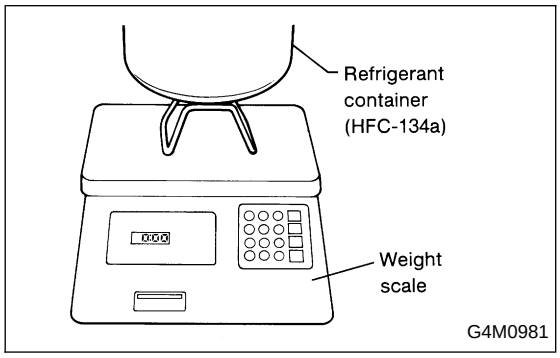
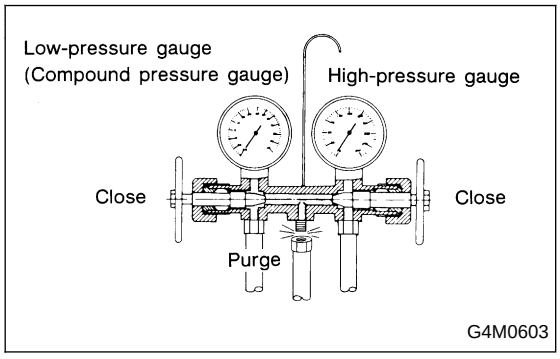
6) Carefully attach the can tap to the refrigerant can by following the can tap manufacturer's instructions.
7) Disconnect the center manifold hose from the vacuum pump and connect the hose to the tap valve.



G4M0981

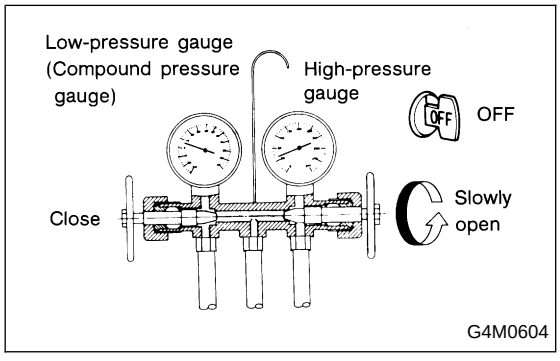
8) If a 13.6 kg (30 lb) container of refrigerant is used a weight scale will be needed. This scale is to determine the amount of refrigerant that is used.
Connect the center hose from the manifold to the valve. Place the 13.6 kg (30 lb) container on the scale, valve end down.



G4M0603

3. PURGE THE CENTER HOSE

1) Verify that all three hose connections are tight at the manifold gauge set.
2) Open the valve on the HFC-134a source.
3) **With safety equipment in place (goggles and gloves), use extreme caution** and loosen the center hose connection at the manifold and allow the HFC-134a to escape for no more than two or three seconds, then quickly retighten the hose fitting at the manifold.

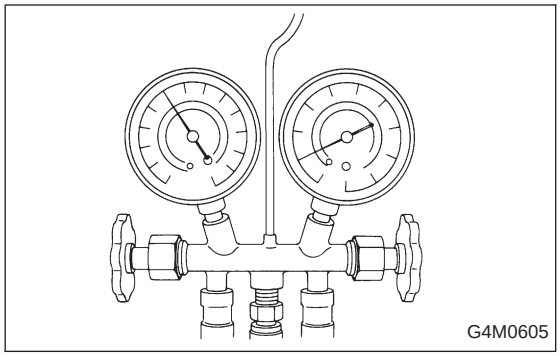


G4M0604

4. INITIAL CHARGING THROUGH THE HIGH SIDE

1) Connect a tachometer to the engine.
2) **With the engine off**, start charging by slowly opening the high-pressure manifold valve.

NOTE:
The initial charge rate can be increased by immersing the can in lukewarm [below 38°C (100°F)] water for a short time.

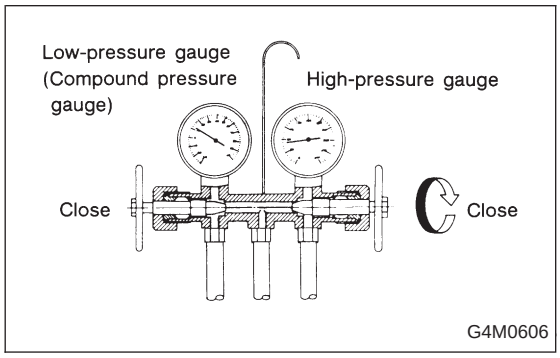

G4M0605

5. CHECK THE GAUGE READINGS

When both the high- and low-pressure gauge readings are about equal, or the HFC-134a source is empty, or the system has been filled to specifications, close the high-pressure manifold valve.

6. ADD ADDITIONAL CANS

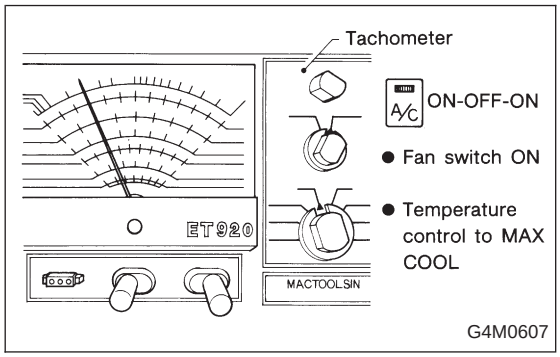
If the HFC-134a source is exhausted, first close the high-pressure manifold valve, second, close the can tap valve, then slowly purge the refrigerant from the service hose by loosening the fitting at the can tap. Repeat steps 15 through 19 as necessary.



G4M0606

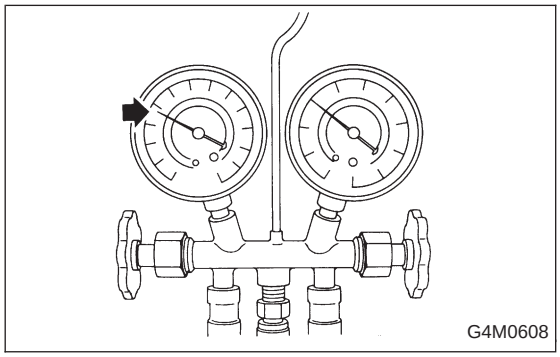
7. COMPLETE CHARGING THROUGH THE LOW SIDE

1) Verify that the high-pressure manifold valve is closed (should have already been closed).
2) Verify that the low-pressure manifold valve is closed (should have already been closed).



G4M0607

3) With the A/C switch off and the windows rolled down, start the engine and run at idle rpm.
4) Set the A/C controls on maximum cool and set the blower speed on the highest setting.
5) Quickly turn the A/C switch on-off-on-off a few times to prevent initial compressor damage due to “load shock”. Finish this operation with the A/C switch in the ON position.
6) Raise engine rpm to approximately 1,500 rpm.


G4M0608

8. CHARGE THE SYSTEM

1) With the refrigerant source connected and the service hose purged, slowly open the low-pressure manifold valve, while checking the low-pressure gauge reading.

CAUTION:
The refrigerant source must be positioned for vapor (valve up).

2) Keep the low side pressure below 276 kPa (2.81 kg/cm^2, 40 psi) by using the low-pressure manifold valve to regulate the flow of refrigerant into the system.

3) When the system is fully charged, close the low-pressure manifold valve.
4) Close the valve at the refrigerant source.

● Refrigerant capacity

Unit: kg (lb)

Refrigerant	Minimum	Maximum
HFC-134a	0.6 (1.3)	0.7 (1.5)

9. COMPLETE ALL SYSTEM CHECKS

1) Evaluate the system performance (refer to performance testing section).
2) Perform leak detection test.

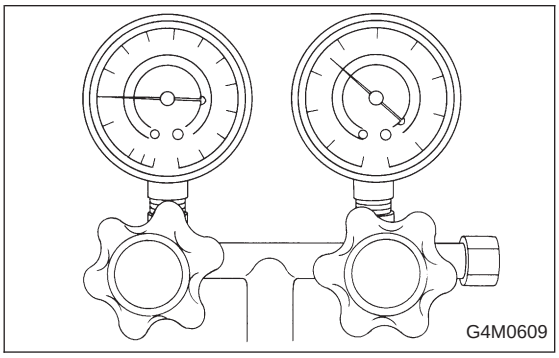
CAUTION:
Always perform leak checking in an environment free of refrigerant pollution.
Do not disconnect the high- or low-pressure hoses from the vehicle before leak checking.

10. DISCONNECT THE MANIFOLD GAUGE SET

1) Remove the high- or low-pressure hoses from the service ports and install the service port caps.

8. Leak Testing

The following points should be kept in mind when conducting a refrigerant leak test.
1) The A/C system to be tested must have an adequate refrigerant charge to begin with.
2) The area where the leak test is conducted must be free of wind and drafts, with still air being the ideal condition.
3) The atmosphere where the leak test is conducted must be free of refrigerant contamination.
4) Operate the A/C system for approx. 10 minutes, then turn the engine off an begin the leak test.
5) Refrigerant gas is heavier than air, therefore always hold the probe below the connection being tested.
6) When checking for a leak along a length of hose or tube, the leak detector probe must be moved slowly, approx. 25 mm (1 in) per second making sure probe does not come in contact with the component being tested.
7) When checking for a leak at a certain point, the leak detector probe must be held at that point for at least 5 seconds.


G4M0609

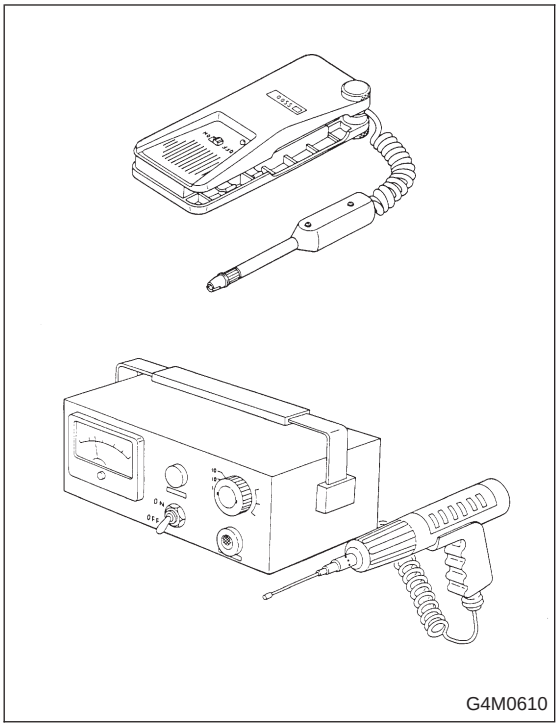
1. CHECK THE SYSTEM PRESSURE

1) With gauges connected to the A/C system, operate the A/C and confirm that the high side pressure is above 690 kPa (7.03 kg/cm^2, 100 psi). If not, evacuate and charge the system before leak checking (refer to evacuation and charging sections).

2. CLEAN CONNECTIONS BEFORE TESTING

Before testing, use a clean shop towel to wipe off refrigerant oil, dirt, or foreign material from all of the connections and components to be tested.

NOTE:
Since refrigerant oil absorbs refrigerant, excess oil on or near a connection may falsely signal a leak.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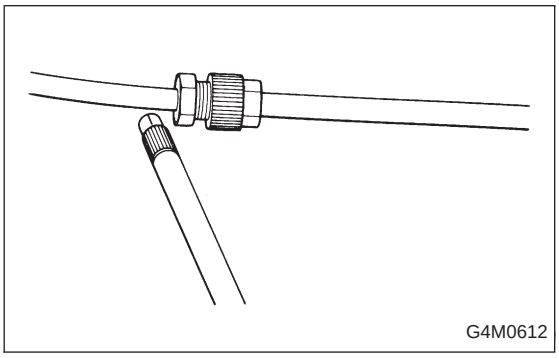
3. CALIBRATE LEAK DETECTOR

Refer to the manufacturer's instructions for the particular type of detector used and calibrate the instrument.

CAUTION:
Always make sure that the probe tip filter is clean and free of contamination.


G4M0612

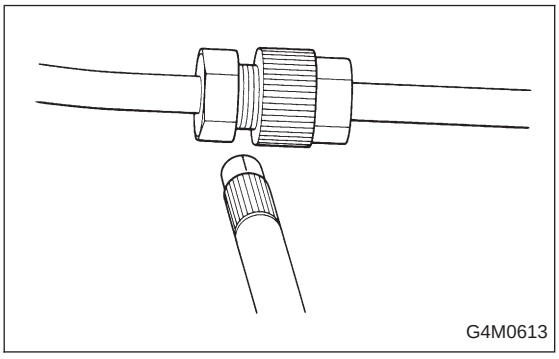
4. LEAK TEST — HIGH-PRESSURE SIDE

Operate the A/C system for approx. 10 minutes, then turn the engine off and begin the leak test.

1) Begin at the connection of the high-pressure tube to the evaporator, and work your way along the high-pressure side of the system to the compressor. There are three places to check each tube connection.

2) Check the area

(1) Check the area where the fitting meets the tube.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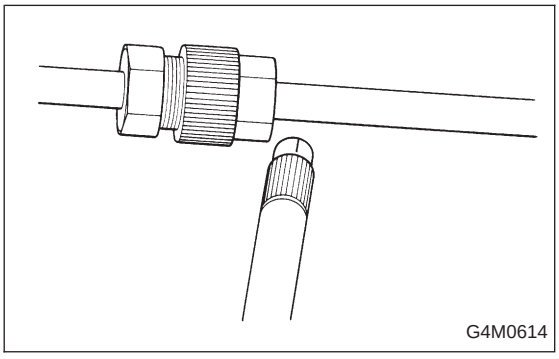
(2) Check the area where the two parts of the fitting join each other.


G4M0614

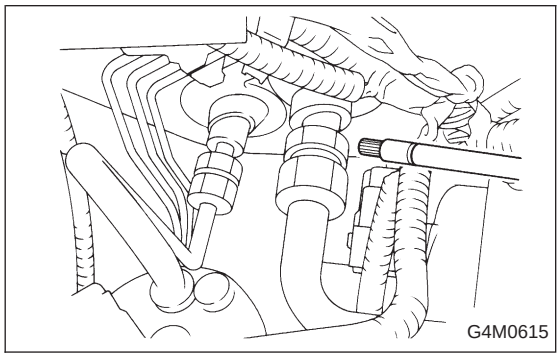
(3) Check the area where the nut meets the tube.

3) Check the area of the pressure switch (dual switch), and also check the seams of the receiver drier.
4) Check the connections of the tubes to the condenser, and also check any welded joints on the condenser.

CAUTION:
An oily area on the fins of the condenser may indicate a leak.

5) Check the area where the hoses attach to the compressor.
6) Check around the machined portions of the compressor (where the compressor sections join each other).
7) If equipped, check the thermal limiter on the compressor housing.
8) Check the compressor shaft seal by probing near the center of the compressor clutch pulley.

NOTE:
Some shaft seals have a very slight amount of normal leakage [approximately 28 g (1.0 oz) per year].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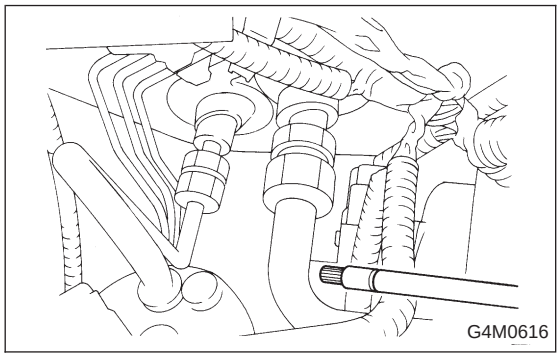
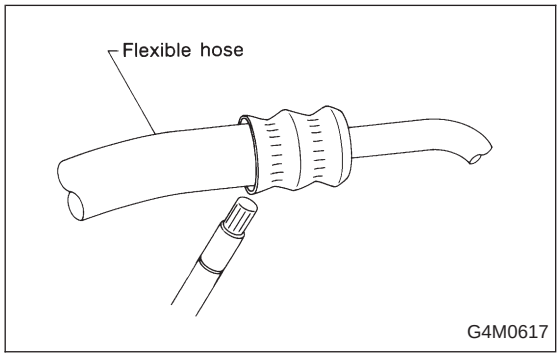

G4M0616

5. LEAK TEST — LOW-PRESSURE SIDE

1) Begin at the connection of the low pressure tube to the evaporator, and work your way along the low-pressure of the system to the compressor. There are three places to check on each tube connection.
2) Check the area.
   (1) Check the area where the fitting joins the tube.
   (2) Check the area where the two parts of the fitting join each other.
   (3) Check the area where the nut joins the tube.

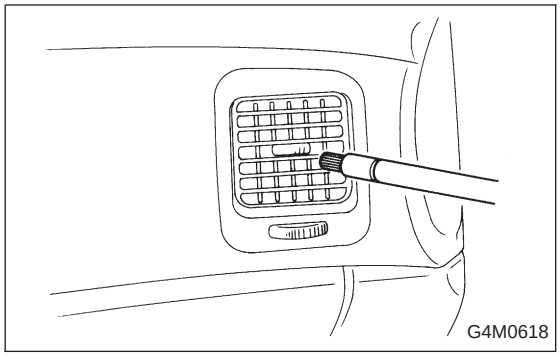


G4M0617

6. CHECK THE FLEXIBLE HOSES

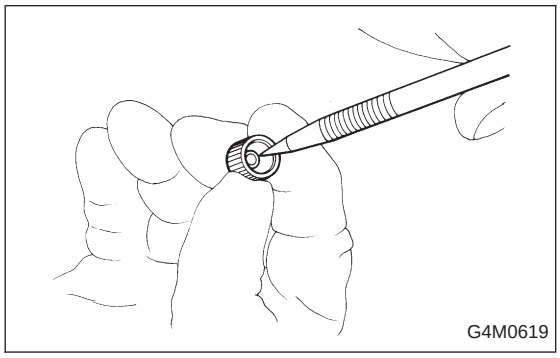
1) Visually inspect the rubber portions of the flexible hoses for cracking. Probe the rubber section, including the ends of any insulators or protectors which may cover sections of the rubber hose, and near the ends where the rubber meets the metal collar.

NOTE:
Be certain to move the probe slowly [approximately 25 mm (1 in) per second] when probing along any length of hose or tube.



7. CHECK THE EVAPORATOR ASSEMBLY

1) Use one or both of the following methods to check the evaporator assembly.
2) Remove the drain hose from the case drain nipple. Hold the probe at the end of the case drain nipple for at least 10 seconds. Be certain to reconnect the drain hose when finished.
3) With the ignition key in the “ACC” position, run the blower on high speed for 1 minute, then turn the blower off. Place the probe in the center instrument panel vent, an turn the blower on low speed for 1 to 2 seconds, then turn the blower off. Leave the probe in the vent for at least 10 seconds.



8. CHECK THE SERVICE PORT CAPS

Visually inspect the inside of the service port caps. Make sure the rubber seal is in place on the inside of the caps. Disconnect the gauges from the vehicle and install the service port caps.

9. Lubrication

1. SYSTEM OIL STABILIZATION

Prior to opening the refrigerant system for repairs (except compressor seizure) the system must be stabilized for correct oil replenishment.
Follow these procedures:
1) Engine speed set to 1,500 rpm.
2) A/C “ON”.
3) Air source to recirculate
4) Blower 4th or high speed position
   - Make sure the air entering the evaporator is above 26.7°C (80°F).
   - The discharge (high) side pressure must be above 588 kPa (6 kg/cm^2, 85 psi).
5) Operate the A/C for 10 minutes.

2. SYSTEM DISCHARGE

Slowly, discharge the system starting with the high-pressure side until the pressure drops below 345 kPa (3.52 kg/cm^2, 50 psi), then open the low-pressure side.

3. OIL REPLACEMENT

After stabilization and discharge, replace the component, adding the appropriate amount of oil (DH-PR) to the new component before installation.

Evaporator	75 mℓ (2.5 US fl oz, 2.6 lmp fl oz)
Receiver drier	10 mℓ (0.34 US fl oz, 0.4 lmp fl oz)
Condenser	35 mℓ (1.2 US fl oz, 1.2 lmp fl oz)
Hose	1 mℓ (0.03 US fl oz, 0.04 lmp fl oz)

If the compressor is replaced (after stabilization):
1) Drain and measure the oil from the original compressor.
2) Drain the oil from the replacement compressor and refill with the same amount that was drained from the original [20 mℓ (0.7 US fl oz, 0.7 imp fl oz) minimum]. Always use DH-PR for the replacement oil.

10. Performance Test

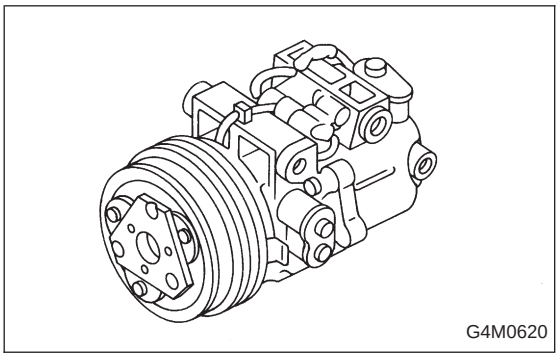
1. VEHICLE SET UP

In order to obtain meaningful test results, the vehicle must be set up to meet the following conditions:
1) Vehicle in shade
2) No wind
3) All vehicle doors closed
4) Front windows open
5) Hood open
6) Engine speed set at 1,500 rpm.
7) A/C ON
8) Temperature control lever — Maximum cold
9) Air source — Recirculation
10) Blower speed — 4th position (High)
11) Operate A/C for 10 minutes (Minimum) before taking measurement.

2. MEASUREMENTS

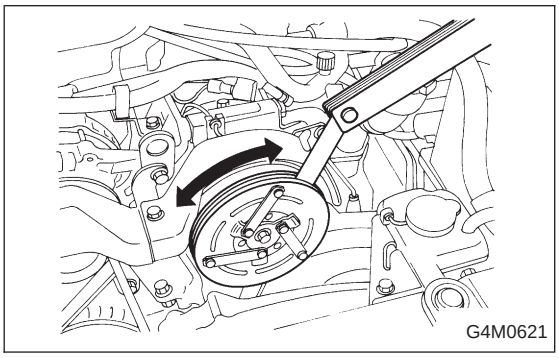
After 10 minutes (Minimum) of A/C operation and using accurate test equipment, take the following measurements (in order):
1) Evaporator intake air temperature at recirculation door.
2) Evaporator discharge air temperature at center grill.
3) Condenser (Ambient) intake air temperature measured 0.9 m (3 ft) in front and in line with the center of the condenser
4) Suction (Low) side pressure
5) Discharge (High) side pressure

NOTE:
If only one thermometer is available; 1) take the ambient measurement first; then 2) the intake air; and 3) discharge air temperature.


G4M0620

11. Compressor

Compressor is a 5-vane rotary type. When trouble occurs, replace compressor as a single unit.

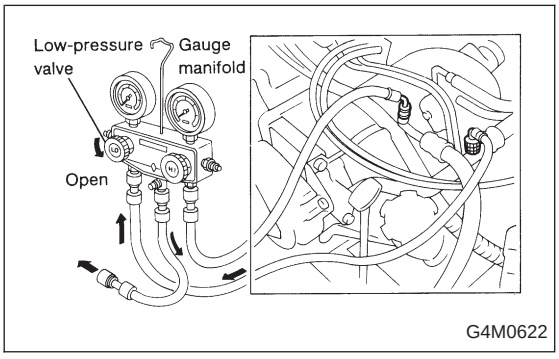

G4M0621

1. COMPRESSOR CLUTCH

Compressor clutch trouble is often caused by clutch slippage and noise. Check and take corrective measures, as required.
1) Check that clearance between drive plate and pulley over the entire perimeter is within specifications.

Clearance:
0.3 — 0.6 mm (0.012 — 0.024 in)

2) Check that voltage applied to magnetic coil is at least 10.5 volts.
3) When noise is noted, check that it originates in either compressor or pulley bearing.

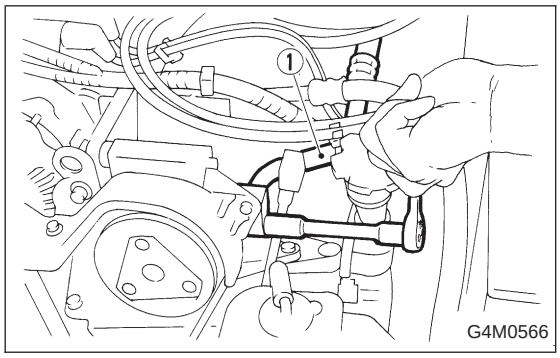


G4M0622

A: REMOVAL

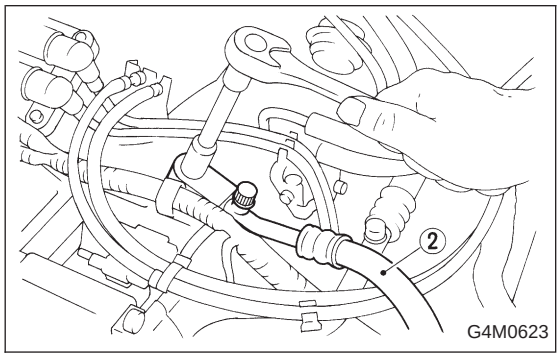
1) Disconnect ground cable from battery.
2) Discharge refrigerant using manifold gauge.
   (1) Fully close low-pressure valve of manifold gauge.
   (2) Connect low-pressure charging hose of manifold gauge to low-pressure service valve.
   (3) Open low-pressure manifold gauge valve slightly, and slowly discharge refrigerant from system.

CAUTION:
Do not allow refrigerant to rush out. Otherwise, compressor oil will be discharged along with refrigerant.



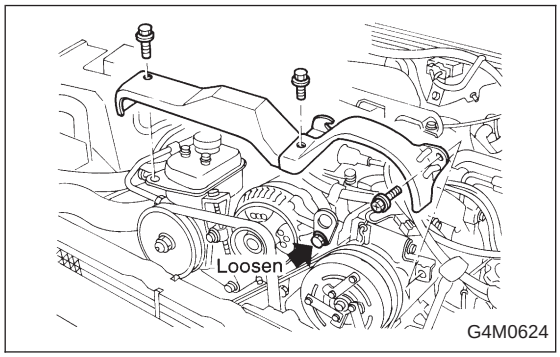
3) Low-pressure hose ① (Flexible hose Ps)

CAUTION:
- **Be careful not to lose O-ring of low-pressure hose.**
- **Plug the opening to prevent foreign matter from entering.**

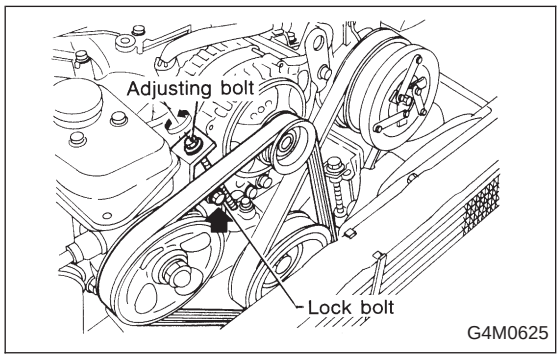


4) High-pressure hose ② (Flexible hose Pd)

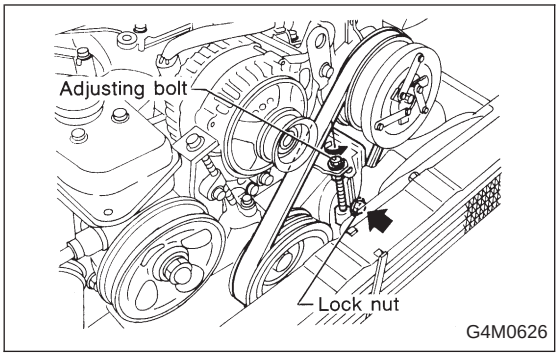
CAUTION:
- **Be careful not to lose O-ring of high-pressure hose.**
- **Plug the opening to prevent foreign matter from entering.**



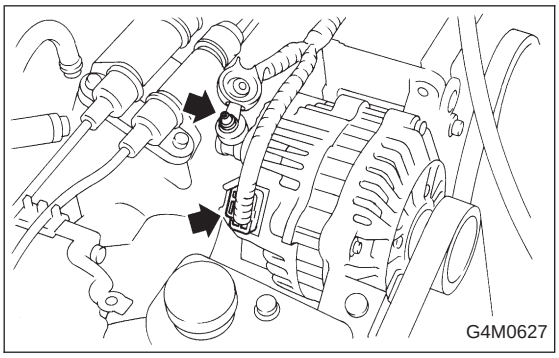
5) Compressor belt cover and generator belt cover
Remove bolts which secure belt covers.



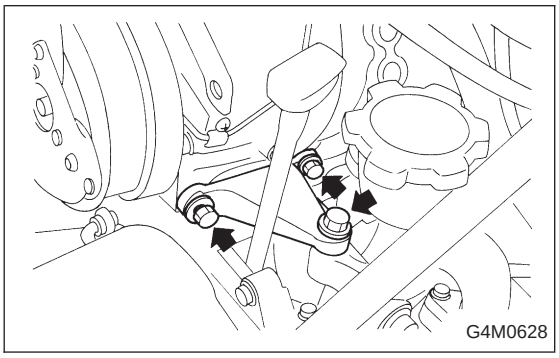
6) Generator V-belt
Loosen lock bolt on generator bracket. Turn adjusting bolt and remove V-belt.



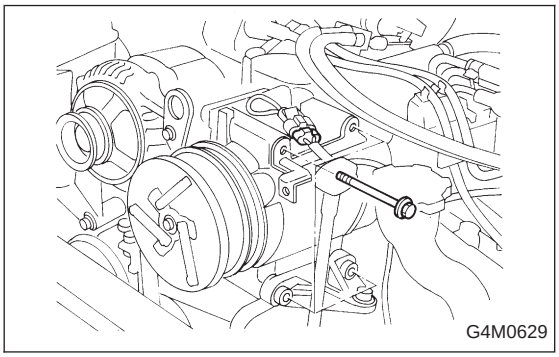
7) Compressor V-belt
Loosen lock bolt on idler pulley. Turn adjusting bolt and remove V-belt.



8) Generator harness

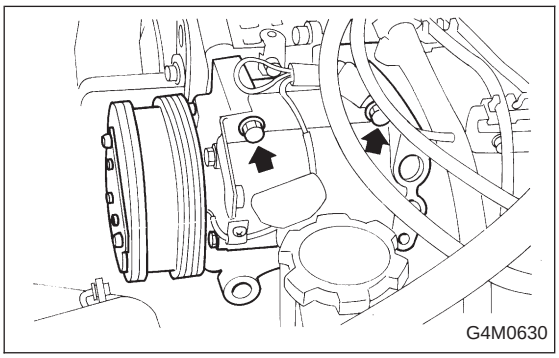


9) Compressor harness
Disconnect compressor harness from body harness.
10) Lower bracket
Remove bolts which secure lower compressor bracket.



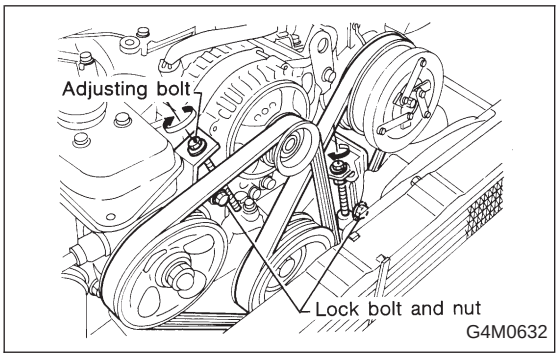
11) Compressor
Remove bolts which secure compressor. Remove compressor from bracket.

B: INSTALLATION



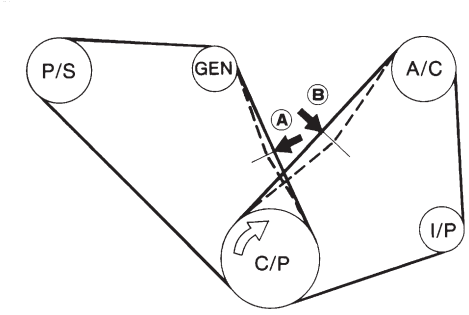
1) Compressor
Install compressor on bracket.

2) Compressor harness
3) Generator harness
4) Compressor V-belt (Rear)
After adjusting belt tension, tighten tension pulley lock bolt securely.



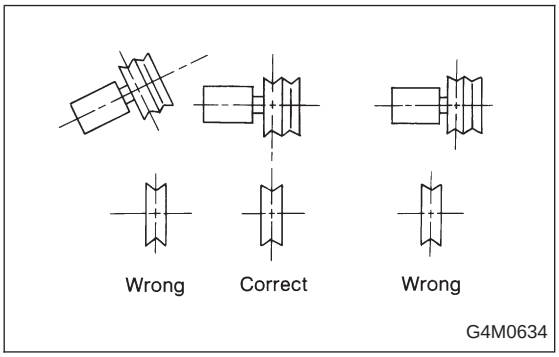
5) Generator V-belt
After adjusting V-belt tension, tighten generator bracket lock bolt securely.

6) Check drive belt tension and adjust it if necessary by changing generator position and/or idler pulley position.

Pulley arrangement	Tension mm (in)/98 N (10 kg, 22 lb)	
	A	B
 G4M0633	*New belt: 7.0 — 9.0 (0.276 — 0.354) Existing belt: 9.0 — 11.0 (0.354 — 0.433)	*New belt: 7.5 — 8.5 (0.295 — 0.335) Existing belt: 9.0 — 10.0 (0.354 — 0.394)

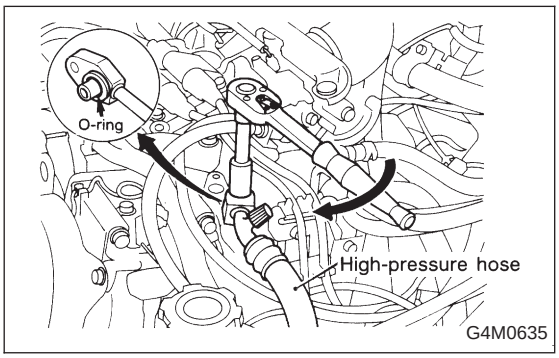
* When replacing belts with new ones, adjust tensions to specification and then readjust to the same specification after running engine for 5 minutes.

Figures in table refer to the number of grooves in pulleys.
C/P : Crankshaft pulley
GEN : Generator pulley
P/S : Power steering oil pump pulley
A/C : Air conditioner compressor pulley
I/P : Idler pulley



G4M0634

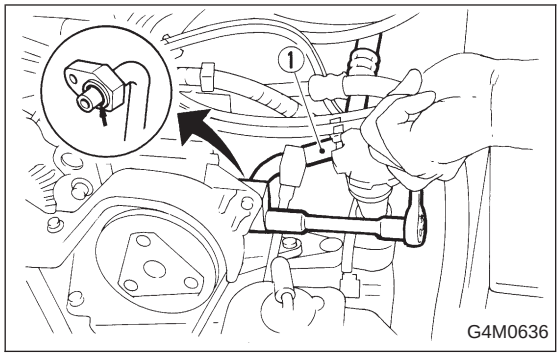
CAUTION:
● Ensure that the V-belt is aligned correctly. If it is not, check for loose bolts.
● The V-belt should not be too tight or too loose.
A belt which is too tight may break bearing or cause gas to leak from the shaft seal. A belt which is too loose slips, thereby causing the belt cut.
● After completing the compressor installation and testing the system operation, check and adjust the tension of both V-belts again.



G4M0635

7) High-pressure hose (Flexible hose Pd)
Connect high-pressure hose with compressor.

CAUTION:
Be sure to apply compressor oil to the periphery of O-ring.



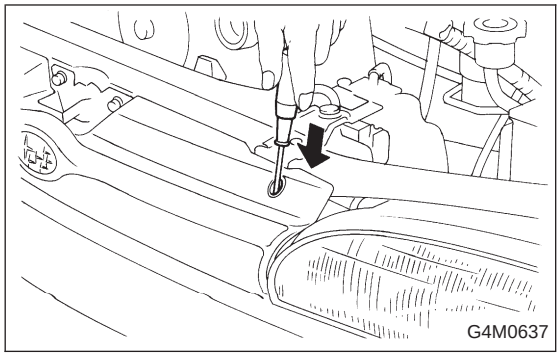
8) Low-pressure hose ① (Flexible hose Ps)
Connect low-pressure hose with compressor.

CAUTION:
Be sure to apply compressor oil to the periphery of O-ring.

9) Install belt cover.

CAUTION:
- **After installing belt cover, make sure it is not misaligned or twisted.**
- **After installing belt cover, check the clearance between pulley and belt cover.**

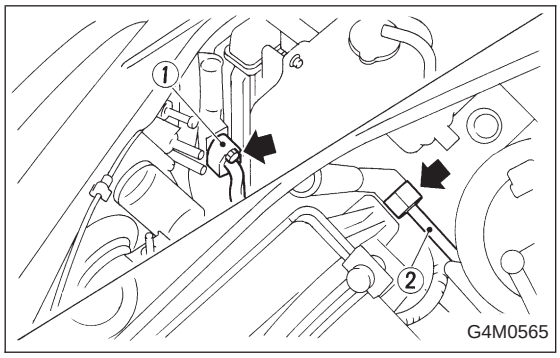
10) Connect ground cable to negative terminal of battery.
11) Charging refrigerant. <Ref. to 4-7 [W700].>


G4M0637

12. Condenser

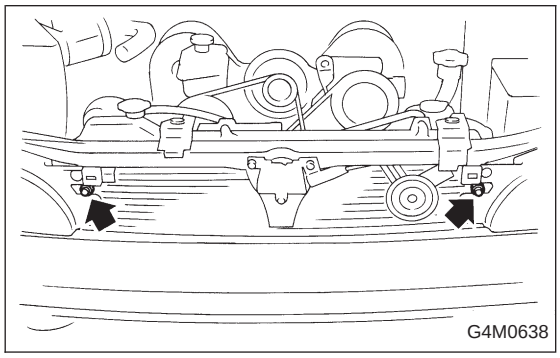
A: REMOVAL AND INSTALLATION

1) Disconnect battery negative terminal.
2) Discharge refrigerant from low-pressure side.
3) Remove front grille.

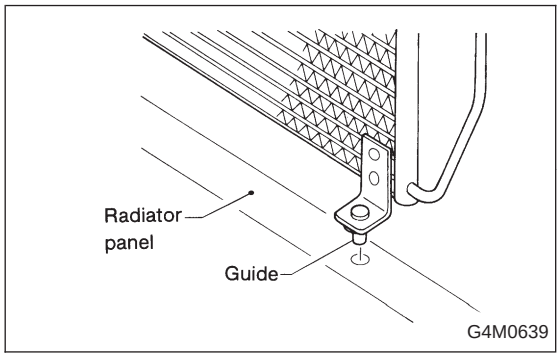


G4M0565

4) Remove the radiator bracket.
5) Disconnect high-pressure hose ① and high-pressure pipe ② from condenser.


G4M0638

6) Remove the two bolts which secure condenser. While lifting condenser, remove it through space between radiator and radiator panel.



G4M0639

7) The condenser should be installed in the reverse order in which it was removed.
When installing the condenser, pay attention to the following:

CAUTION:
Before connecting the pipe, be sure to apply oil to the periphery of O-ring.

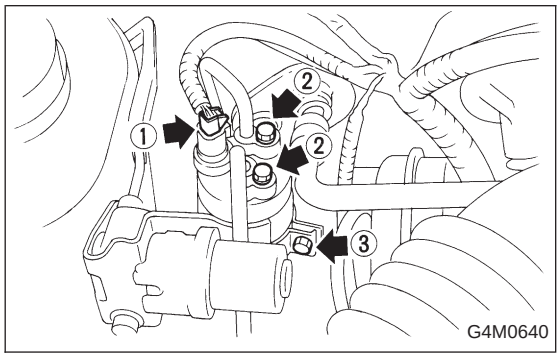
NOTE:
After installing condenser, ensure that guide on lower side of condenser is inserted into hole in radiator panel. Tighten attaching bolts.

B: INSPECTION

1) Make sure the condenser fins are free from dust and insects. If the fins are clogged, clean by blowing air or water through them.

NOTE:
To prevent dust and water from getting into the condenser, this work must be done when the condenser is installed in an actual vehicle.

2) Check the condenser to see if it shows any sign of oil seepage. Should oil ooze or gas leak from the condenser replace it with a new one.



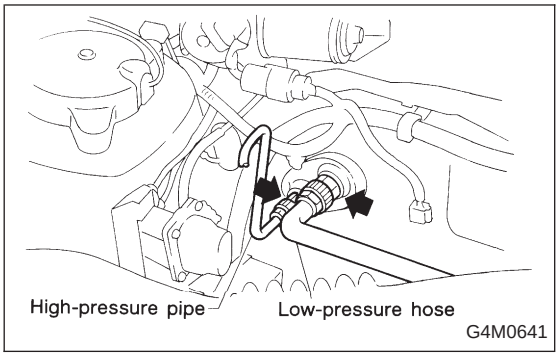
13. Receiver Drier

A: REMOVAL AND INSTALLATION

1) Disconnect battery negative terminal.
2) Discharge refrigerant.
3) Disconnect pressure switch harness ①.
4) Disconnect pipes ②.
5) Remove mounting bolt ③ and remove receiver drier.

CAUTION:
The receiver drier contains a desiccant. Be sure to put a blind plug in the detached receiver drier to protect it from moisture.

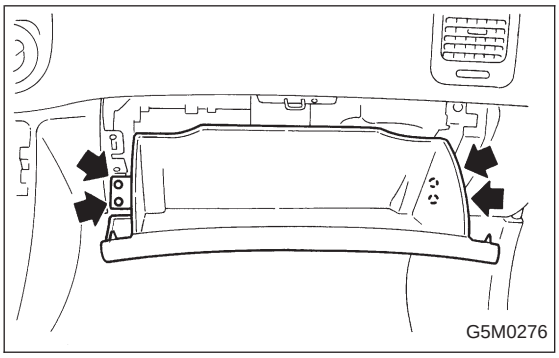
6) Install the receiver drier in the reverse order of removal.



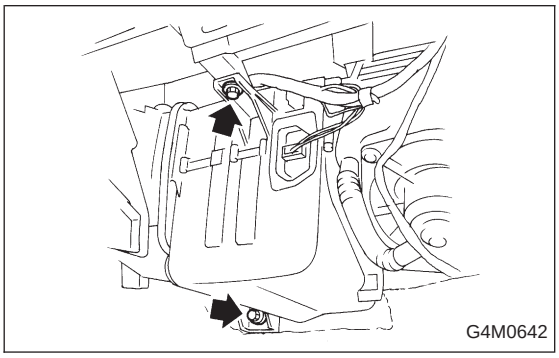
14. Evaporator

A: REMOVAL AND INSTALLATION

1) Disconnect battery negative terminal.
2) Discharge refrigerant.
3) Disconnect discharge pipe, suction pipe and grommets.

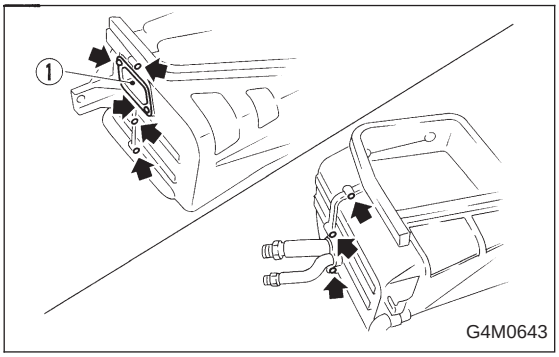


4) Remove glove box.

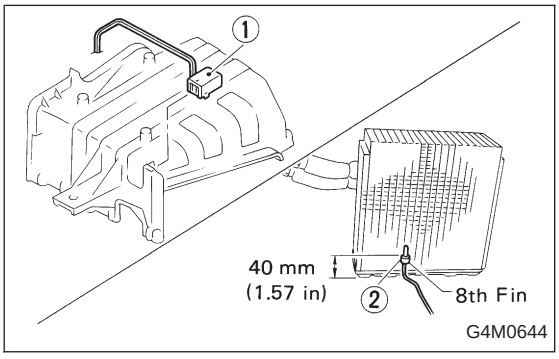


5) Disconnect the harness connector from evaporator.
6) Disconnect drain hose.
7) Remove evaporator mounting bolt and nut.
8) Install the evaporator in the reverse order of removal.

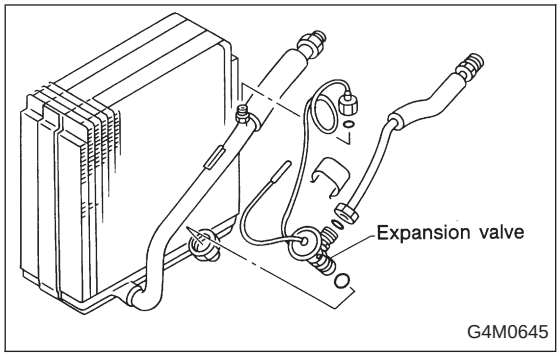
B: DISASSEMBLY AND ASSEMBLY



1) Remove resistor assembly ① and remove six screws from evaporator case.



2) Remove thermostat ① from upper case. (Thermistor ② is inserted into specified evaporator fin position.) When installing thermostat, be sure to insert thermistor into specified fin position.

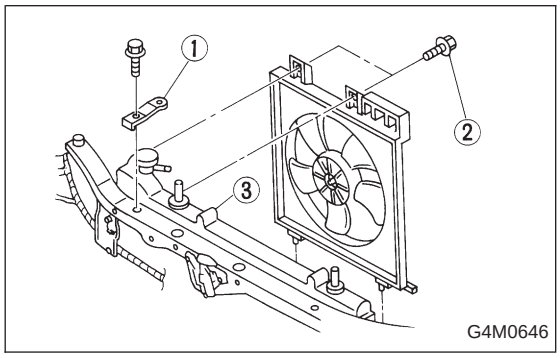


3) Disconnect the connection between the expansion valve and pipe from receiver drier.
4) Remove the expansion valve from pipes.
5) To install expansion valve, reverse removal procedures. Properly wrap capillary tube of expansion valve with seal.
6) Check to see if the evaporator fins are clogged. If they are, clean them with compressed air.

CAUTION:
Water must never be used to clean the evaporator.

7) Check parts that have been removed for cracks or scratches, and repair or replace them with new ones, if necessary.
8) Reassemble the evaporator in the reverse order of disassembly.

NOTE:
Confirm that the O-ring is inserted in the specified position.



15. Condenser Fan Assembly

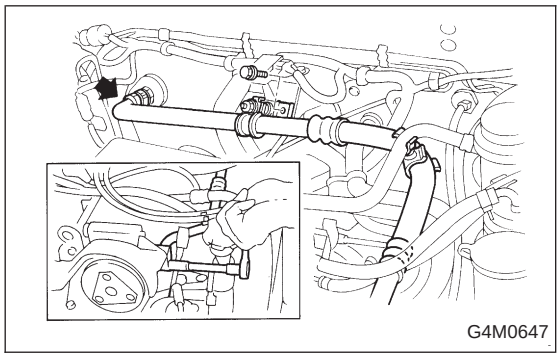
A: REMOVAL AND INSTALLATION

1) Disconnect battery negative terminal.
2) Disconnect harness connector from fan motor.
3) Remove radiator bracket (RH) ① and remove condenser fan bolt ② from radiator ③.
4) Pull condenser fan assembly.
5) Install the condenser fan assembly in the reverse order of removal.

16. Flexible Hose

With the following cautions, replace flexible hoses with new ones if they are damaged or swollen.

(1) The flexible hoses should be free from twists and tension after they have been connected.
(2) The flexible hoses must not be bent or twisted forcibly.

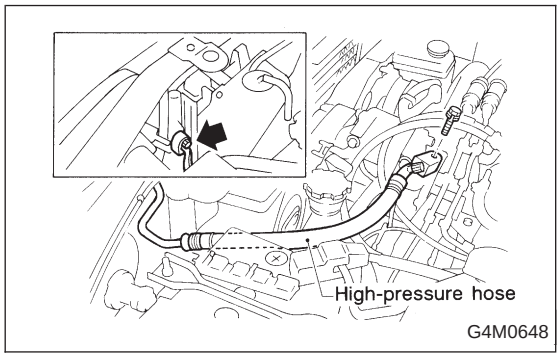

G4M0647

A: REMOVAL

1) Disconnect battery negative terminal.
2) Discharge refrigerant.
3) Remove low-pressure hose.
   (1) Remove hose attaching bolts.
   (2) Remove hose clip.

CAUTION:
Plug the opening to prevent foreign matter from getting in.

   (3) Disconnect the connector at evaporator unit.



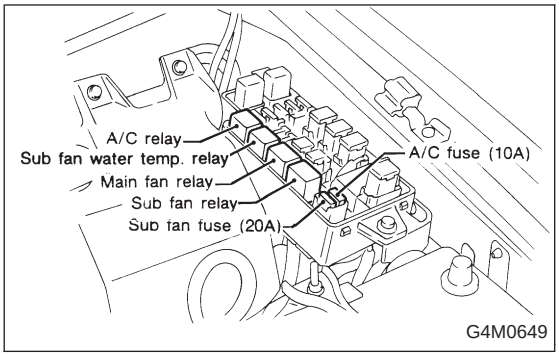
G4M0648

4) Remove high-pressure hose.
   (1) Disconnect hose attaching bolt (compressor side).
   (2) Disconnect hose attaching bolt (condenser side).

CAUTION:
Plug the opening to prevent foreign matter from getting in.

B: INSTALLATION

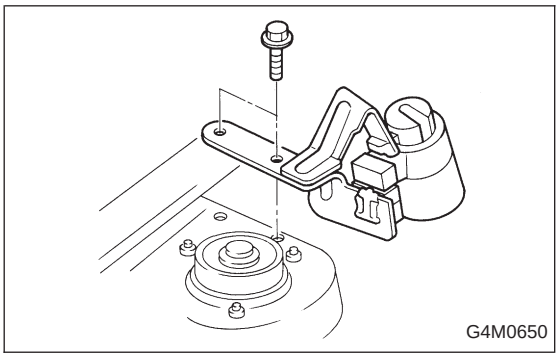
Installation is in the reverse order of removal.



17. Relay and Fuse

A: LOCATION

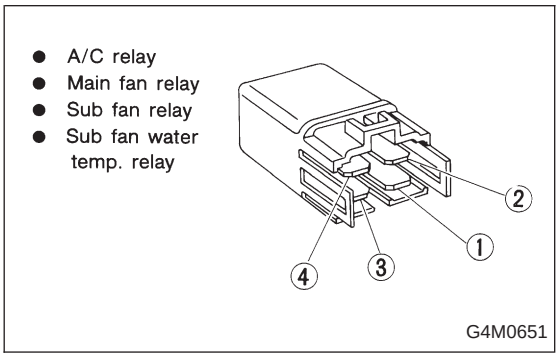
Relays used with A/C system are located as shown in figure.
1) A/C relay
2) Main fan (radiator fan) relay
3) Sub fan (condenser fan) relay
4) Sub fan (condenser fan) water temperature relay
5) Fuses (10 A and 20 A)

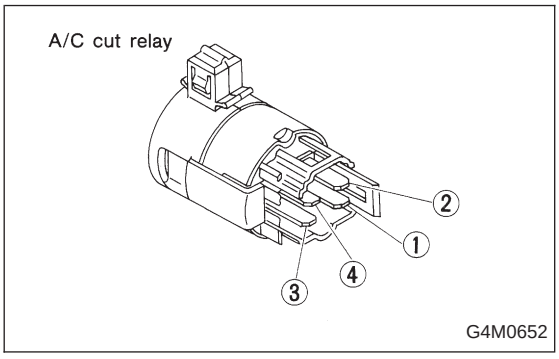


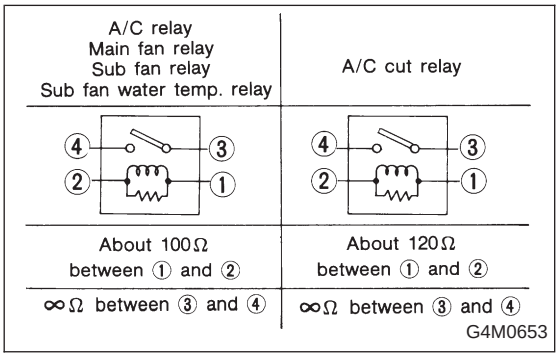
6) A/C cut relay
A/C cut relay is attached by a bolt to top of front suspension bracket (RH) via a bracket.

B: INSPECTION

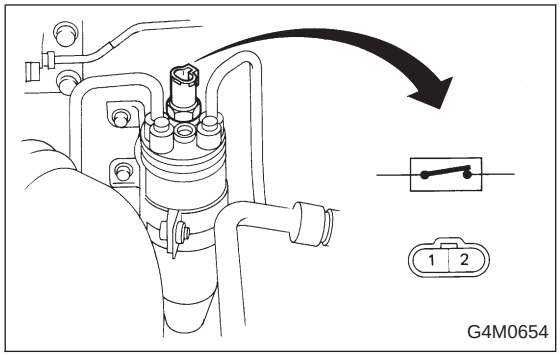
1) Check conduction with a circuit tester (ohm range) according to the following table in figure.







2) Replace relays which do not meet specifications.



18. Pressure Switch (Dual Switch)

Pressure switch is attached to receiver dryer. It has two built-in switches.

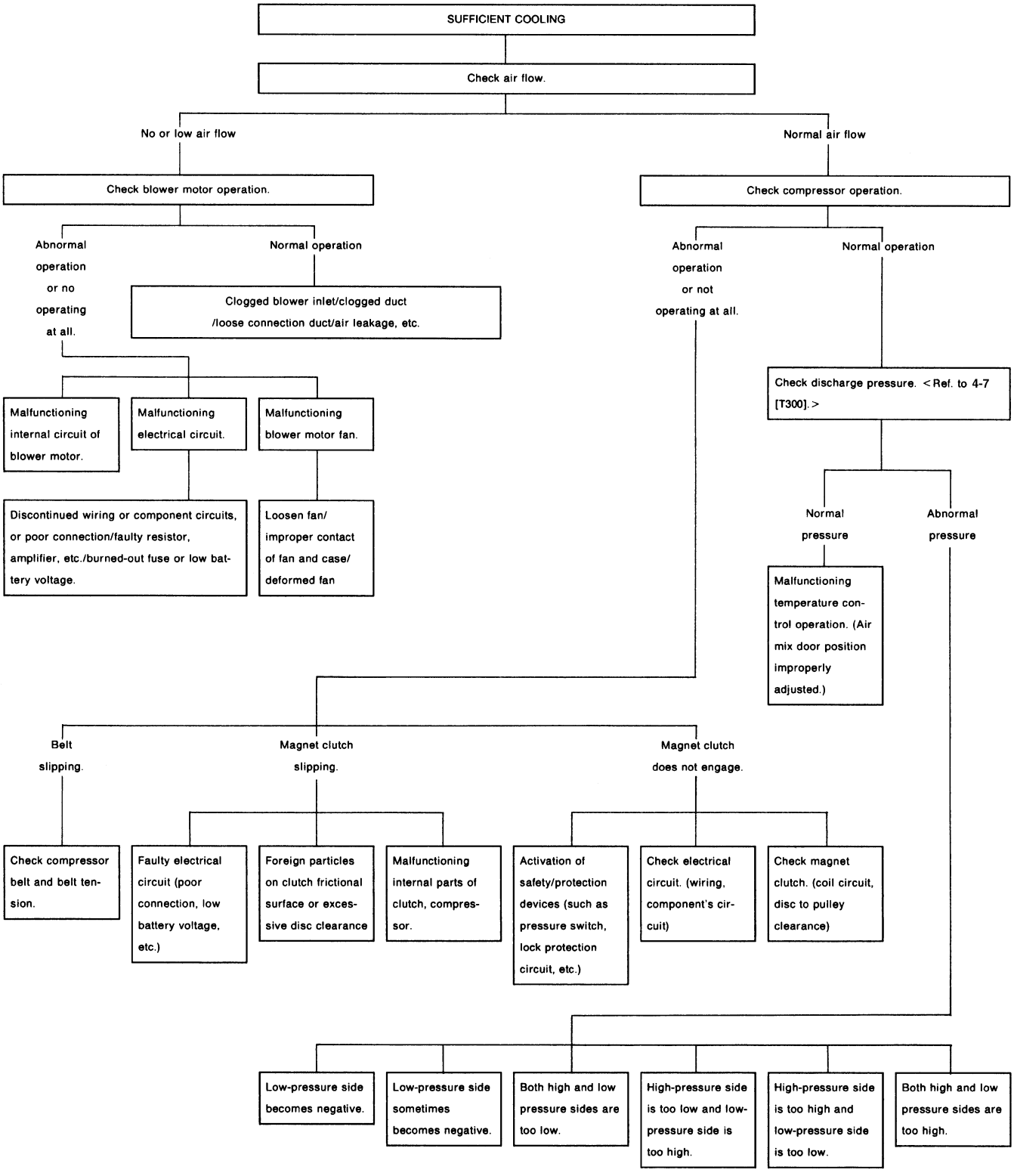
- High and low pressure switch

A: INSPECTION

1) Remove cap from high-pressure line service valve, and connect gauge manifold to service valve.
2) Disconnect pressure switch harness connector, and check pressure switch for proper ON-OFF operation. Use a circuit tester.

	Terminal	Operation	High-pressure side line pressure kPa (kg/cm^2, psi)
High and low pressure switch	① — ②	Turns OFF.	Increasing to 2,648±196 (27±2, 384±28)
			Decreasing to 176±20 (1.8±0.2, 25.5±2.8)
		Turns ON.	Increasing to 186±29 (1.9±0.3, 27.0±4.2)
			Decreasing to 2,059±196 (21±2, 299±28)

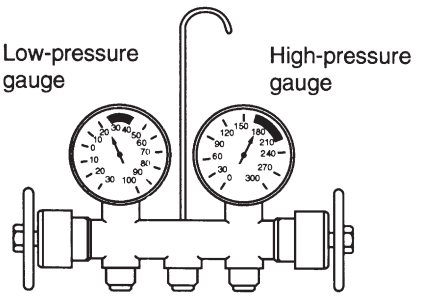
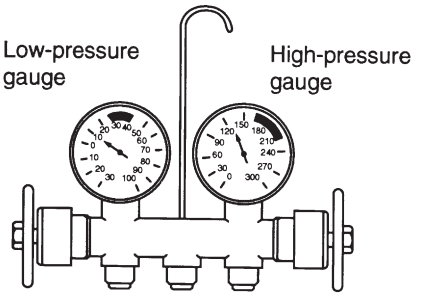
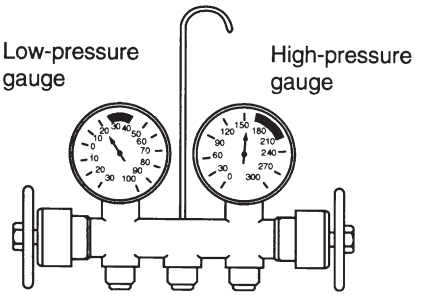
1. Air Conditioning System Diagnosis

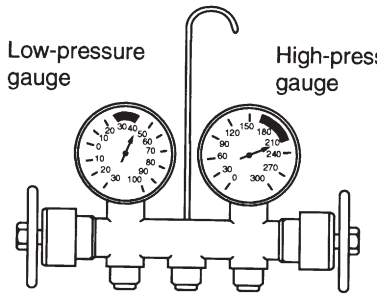
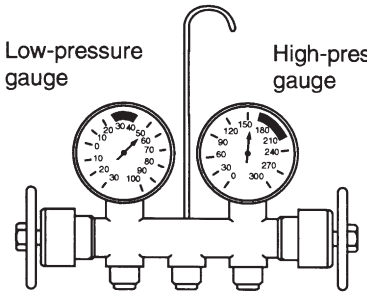
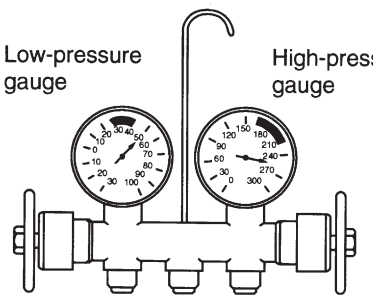
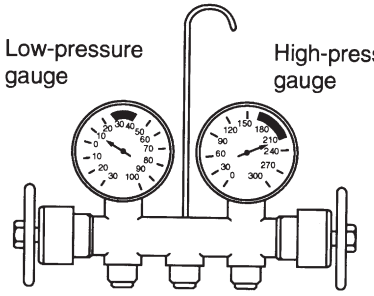


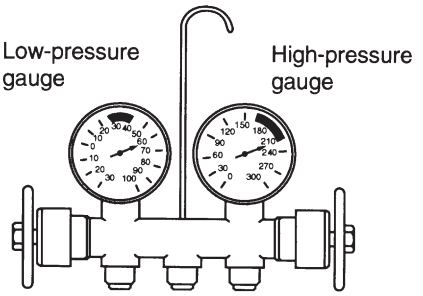
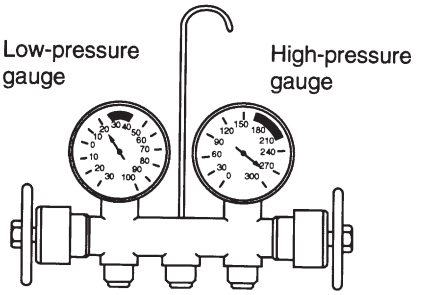
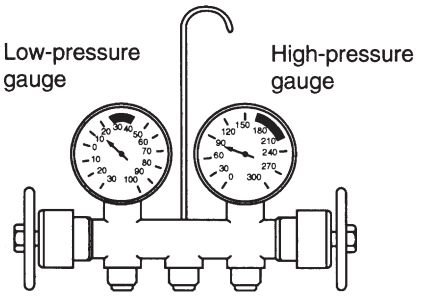
EPA0115

2. Performance Test Diagnosis

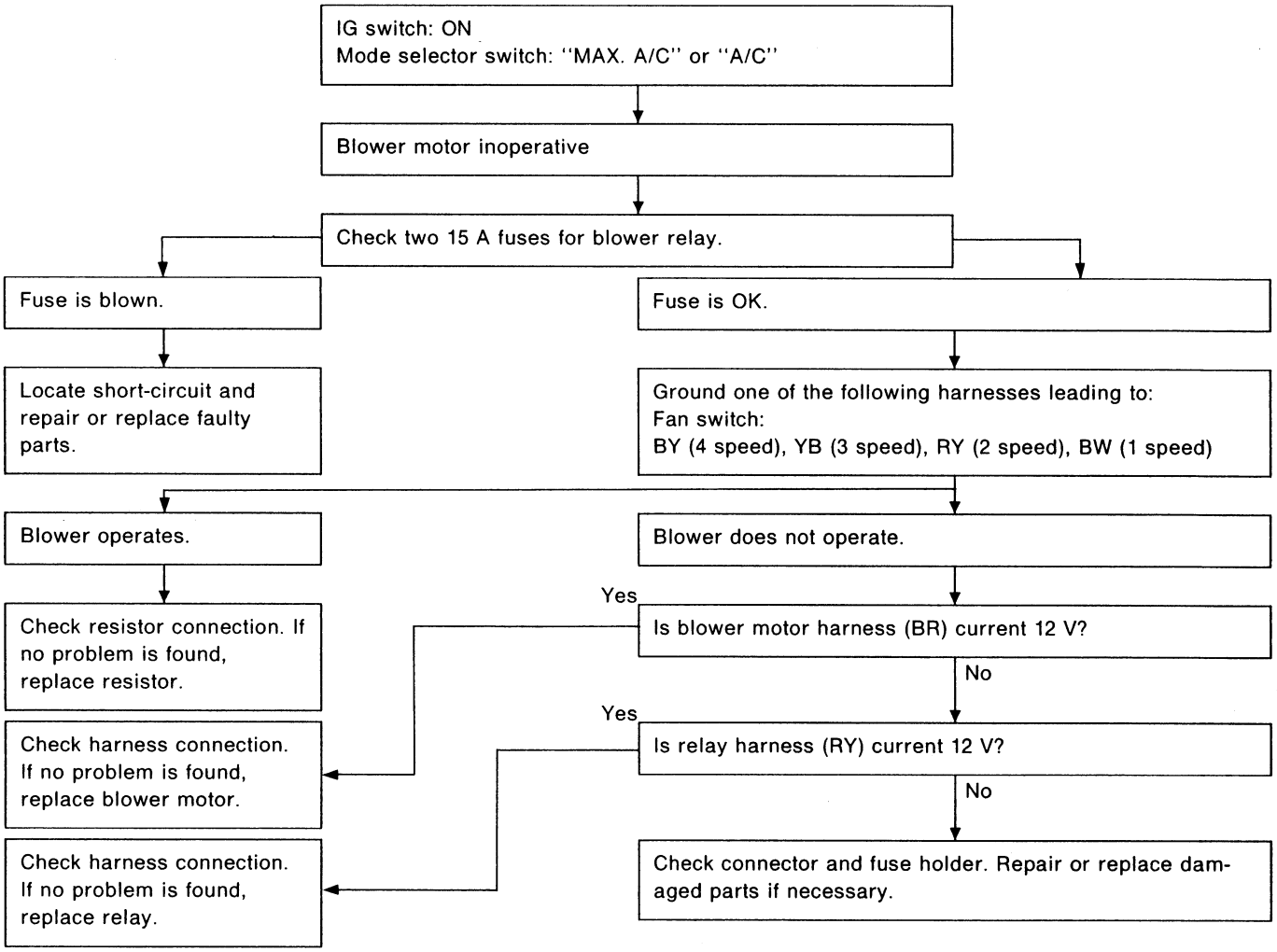
If various conditions caused to other air conditioning system, the characteristics revealed on manifold gauge reading are shown in the following.
As to the method of a performance test, refer to the item of “Performance Test”.
Each shaded area on the following tables indicates a reading of the normal system when the temperature of outside air is 32.5°C (91°F).

Condition		Probable cause	Corrective action
INSUFFICIENT REFRIGERANT CHARGE  G4M0673	Insufficient cooling.	Refrigerant is small, or leaking a little.	1. Leak test. 2. Repair leak. 3. Charge system. **Evacuate, as necessary, and recharge system.**
ALMOST NO REFRIGERANT  G4M0674	No cooling action.	Serious refrigerant leak.	**Stop compressor immediately.** 1. Leak test. 2. Discharge system. 3. Repair leak(s). 4. Replace receiver drier if necessary. 5. Check oil level. 6. Evacuate and recharge system.
FAULTY EXPANSION VALVE  G4M0675	Slight cooling. Sweating or frosted expansion valve inlet.	Expansion valve restricts refrigerant flow. ● Expansion valve is clogged. ● Expansion valve is inoperative. Valve stuck closed. Thermal bulb has lost charge.	If valve inlet reveals sweat or frost: 1. Discharge system. 2. Remove valve and clean it. Replace it if necessary. 3. Evacuate system. 4. Charge system. If valve does not operate: 1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.

Condition		Probable cause	Corrective action
 G4M0676  G4M0677	Insufficient cooling. Sweated suction line. No cooling. Sweating or frosted suction line.	Expansion valve allows too much refrigerant through evaporator. Faulty seal of O-ring in expansion valve.	Check valve for operation. If suction side does not show a pressure decrease, replace valve. 1. Discharge system. 2. Remove expansion valve and replace O-ring. 3. Evacuate and replace system.
AIR IN SYSTEM  G4M0678	Insufficient cooling.	Air mixed with refrigerant in system.	1. Discharge system. 2. Replace receiver drier. 3. Evacuate and charge system.
MOISTURE IN SYSTEM  G4M0679	After operation for a while, pressure on suction side may show vacuum pressure reading. During this condition, discharge air will be warm. As warning of this, reading shows 39 kPa (0.4 kg/cm^2, 6 psi) vibration.	Drier is saturated with moisture. Moisture has frozen at expansion valve. Refrigerant flow is restricted.	1. Discharge system. 2. Replace receiver drier (twice if necessary). 3. Evacuate system completely. (Repeat 30 minute evacuating three times.) 4. Recharge system.

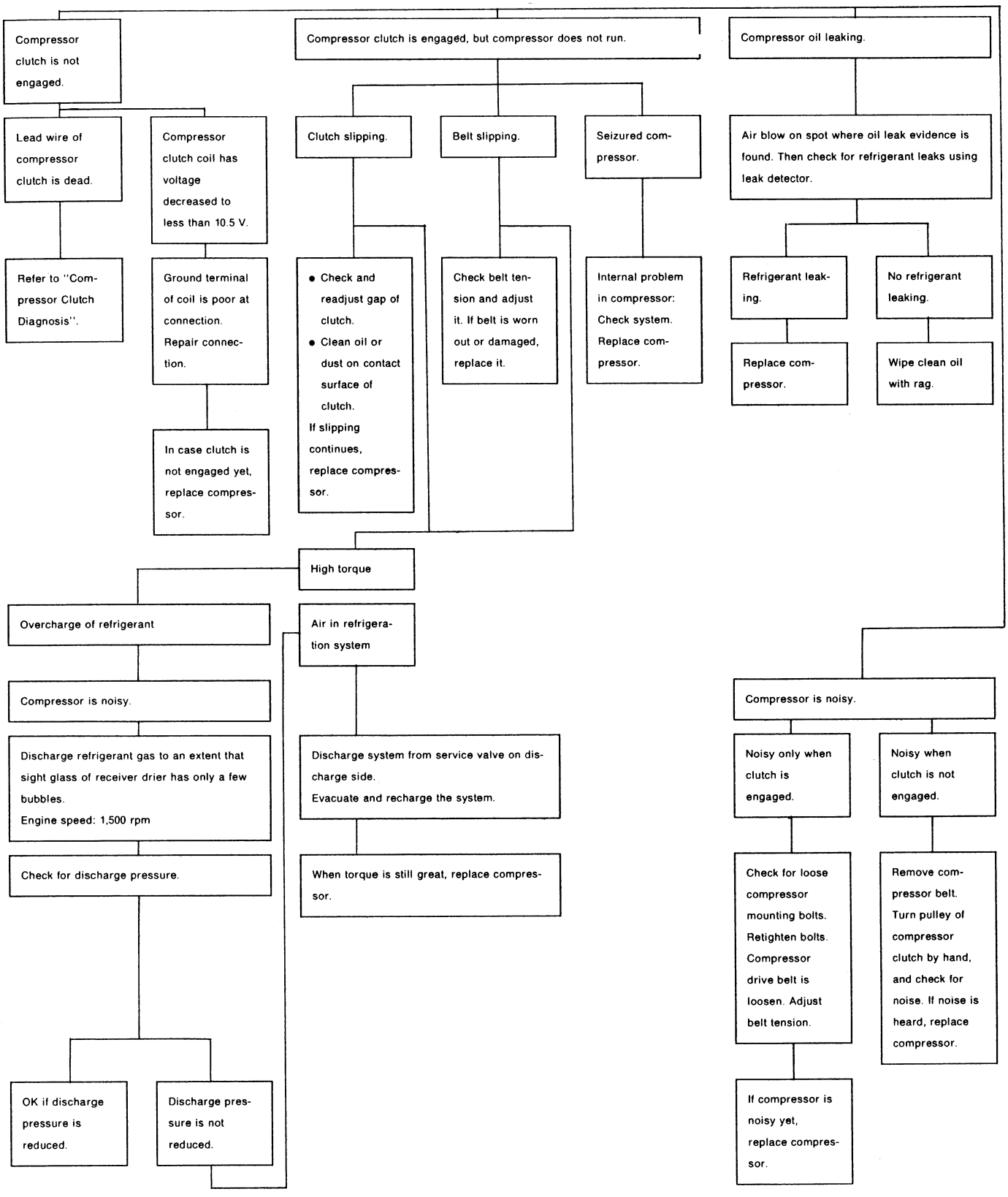
Condition		Probable cause	Corrective action
FAULTY CONDENSER  G4M0680	No cooling action. Engine may overheat. Suction line is very hot.	Condenser is often found not functioning well.	• Check condenser cooling fan. • Check condenser for dirt accumulation. • Check engine cooling system for overheat. • Check for refrigerant overcharge. **If pressure remains high in spite of all above actions taken, remove and inspect the condenser for possible oil clogging.**
HIGH-PRESSURE LINE BLOCKED  G4M0681	Insufficient cooling. Frosted high-pressure liquid line.	Drier clogged, or restriction in high-pressure line.	1. Discharge system. 2. Remove receiver drier or strainer and replace it. 3. Evacuate and charge system.
FAULTY COMPRESSOR  G4M0682	Insufficient cooling.	Internal problem in compressor, or damaged gasket and valve.	1. Discharge system. 2. Remove and check compressor. 3. Repair or replace compressor. 4. Check oil level. 5. Replace receiver drier. 6. Evacuate and charge system.

3. Blower Motor Diagnosis



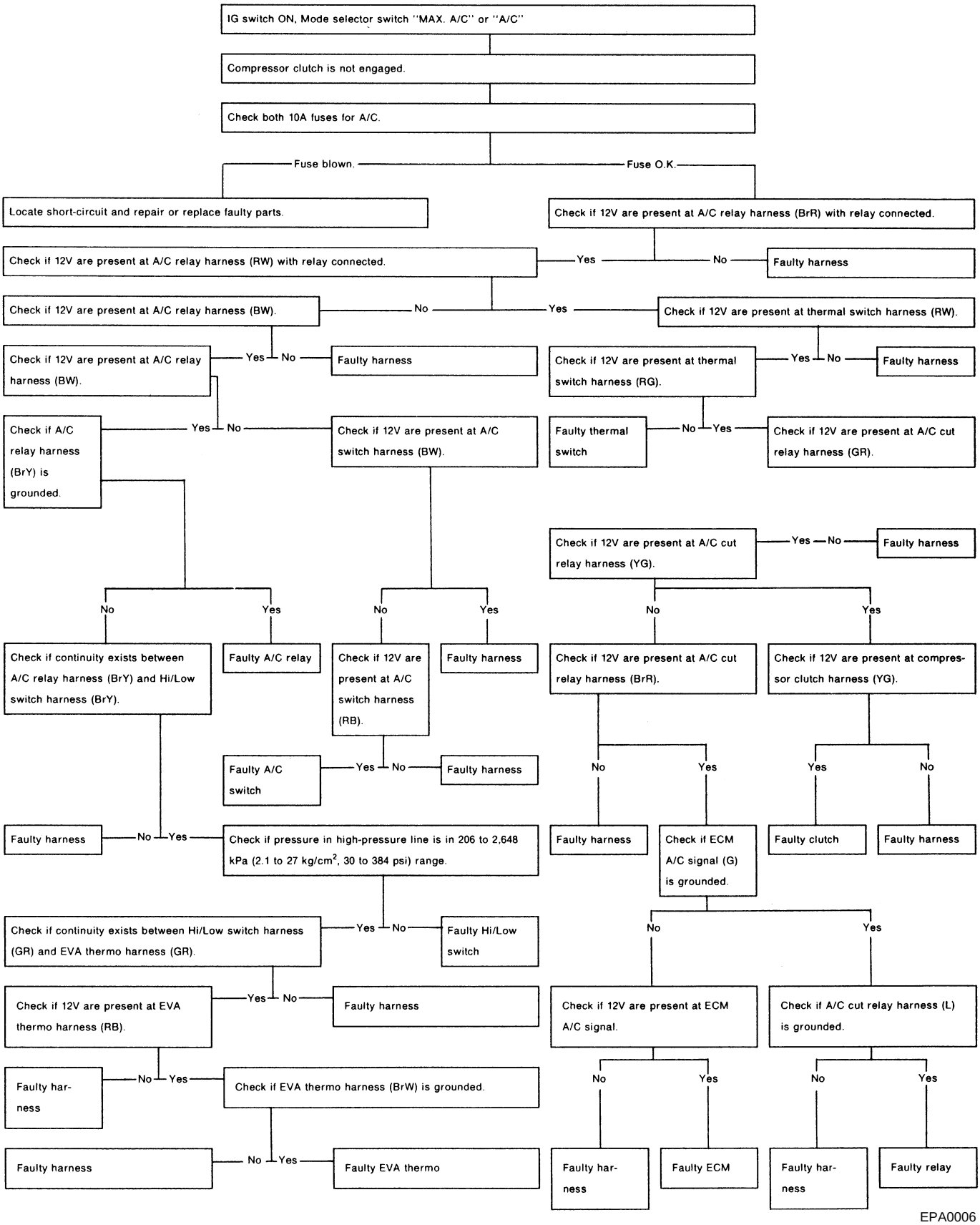
EPA0004

4. Compressor Diagnosis



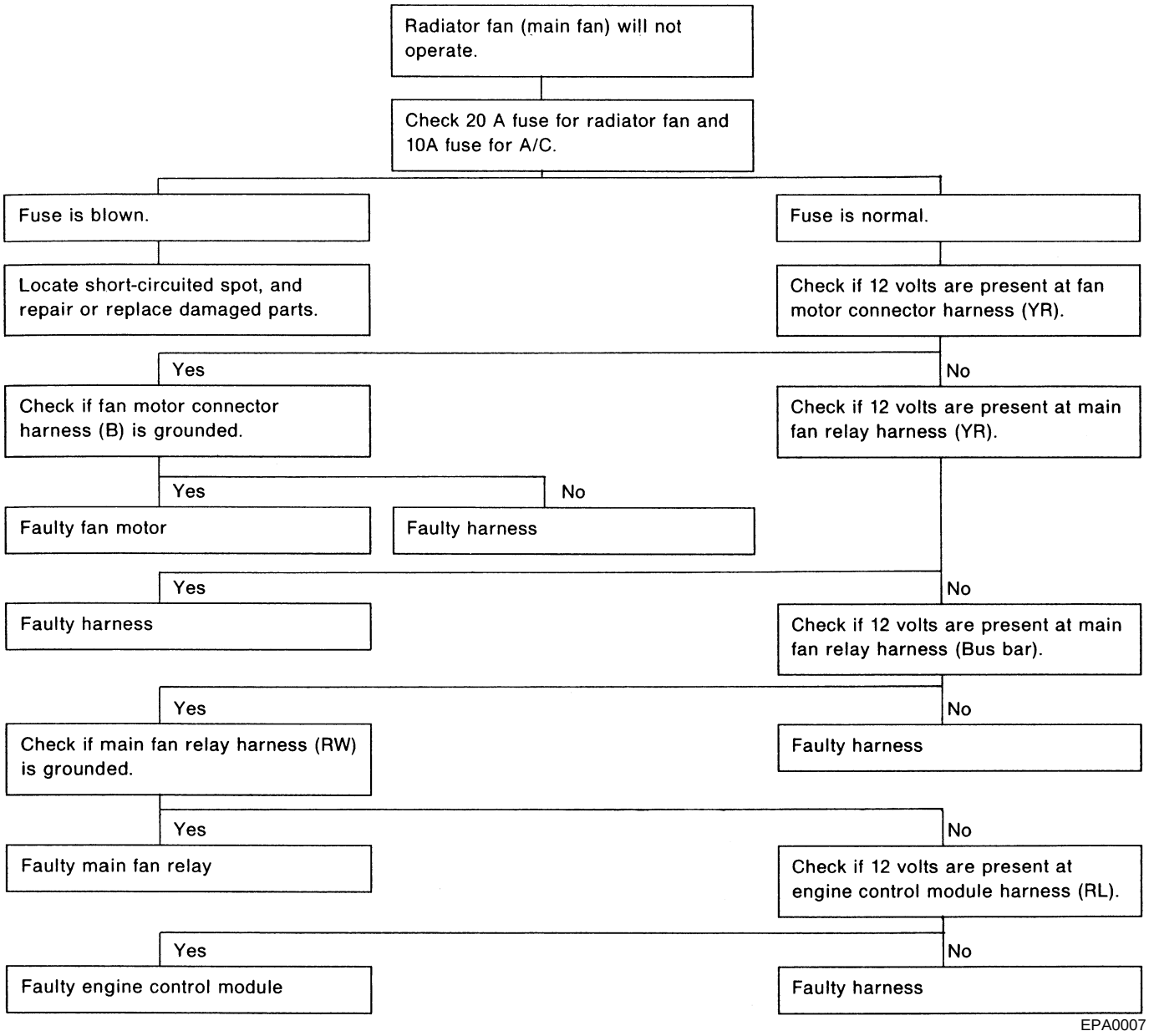
EPA0005

5. Compressor Clutch Diagnosis

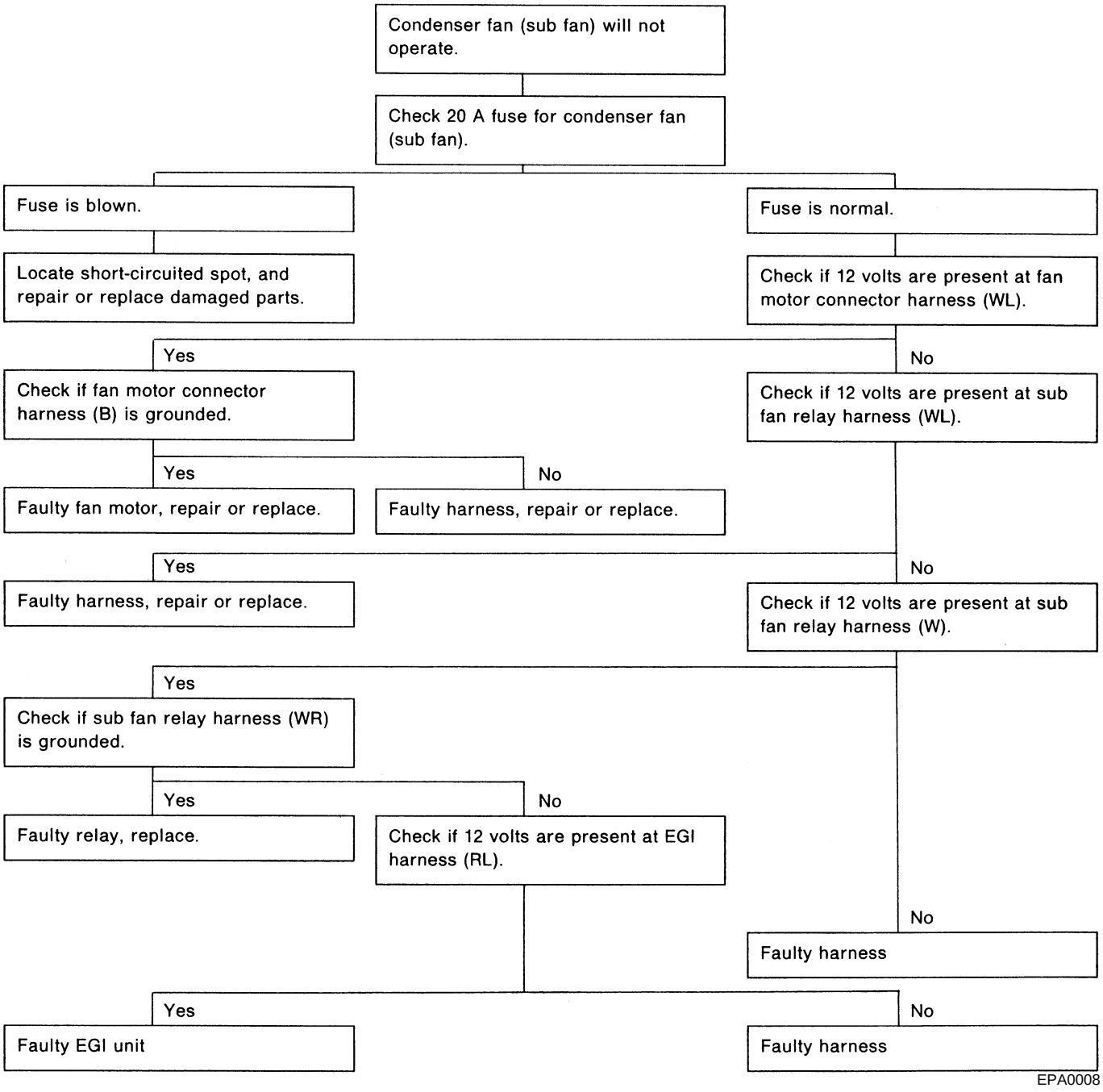


EPA0006

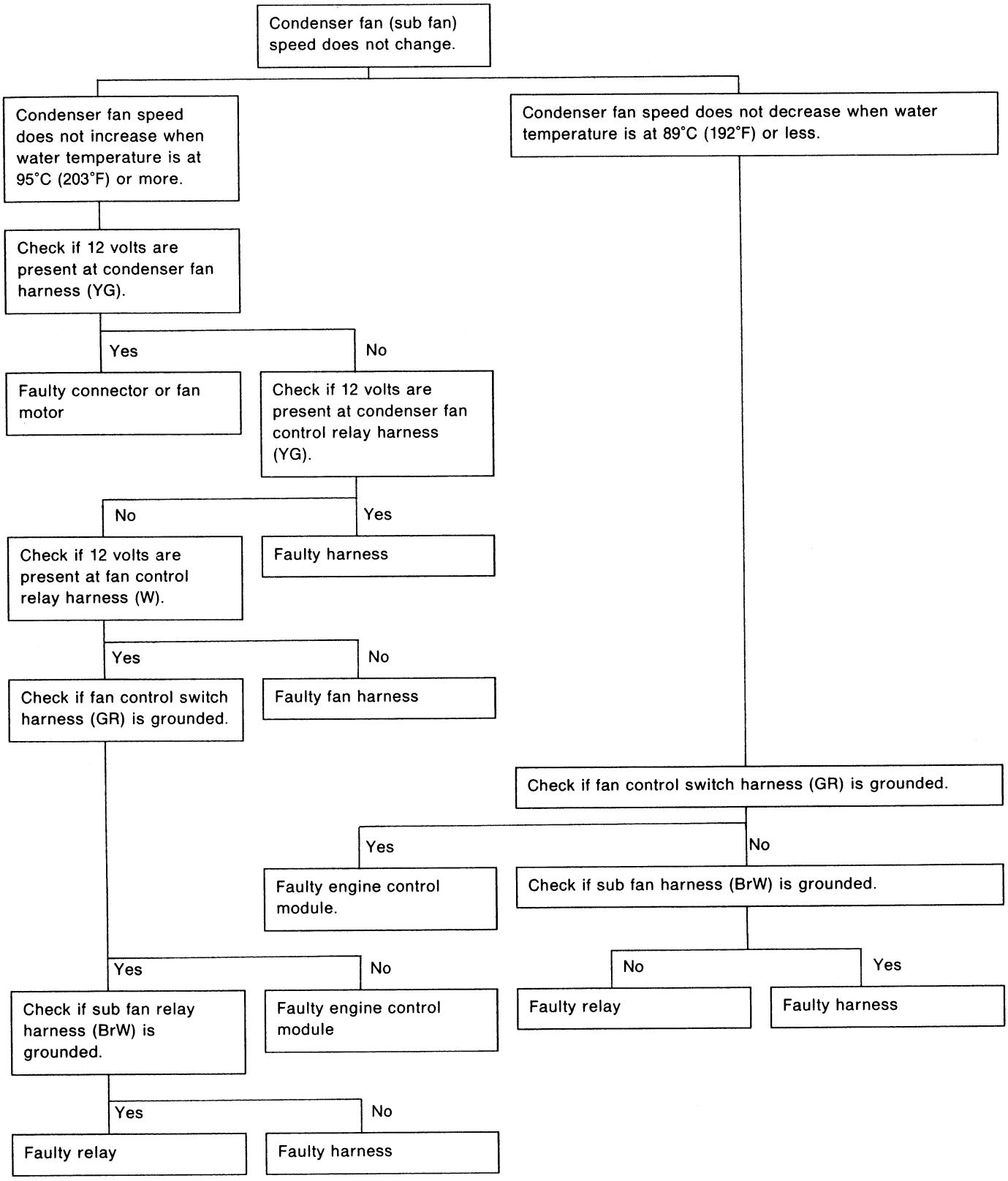
6. Radiator Fan (Main Fan) Diagnosis



7. Condenser Fan (Sub Fan) Diagnosis (I)



8. Condenser Fan (Sub Fan) Diagnosis (II)



EPA0009

BODY AND EXTERIOR 5-1

1. Supplemental Restraint System “Airbag”

Airbag system wiring harness is routed on and along body panels.

CAUTION:

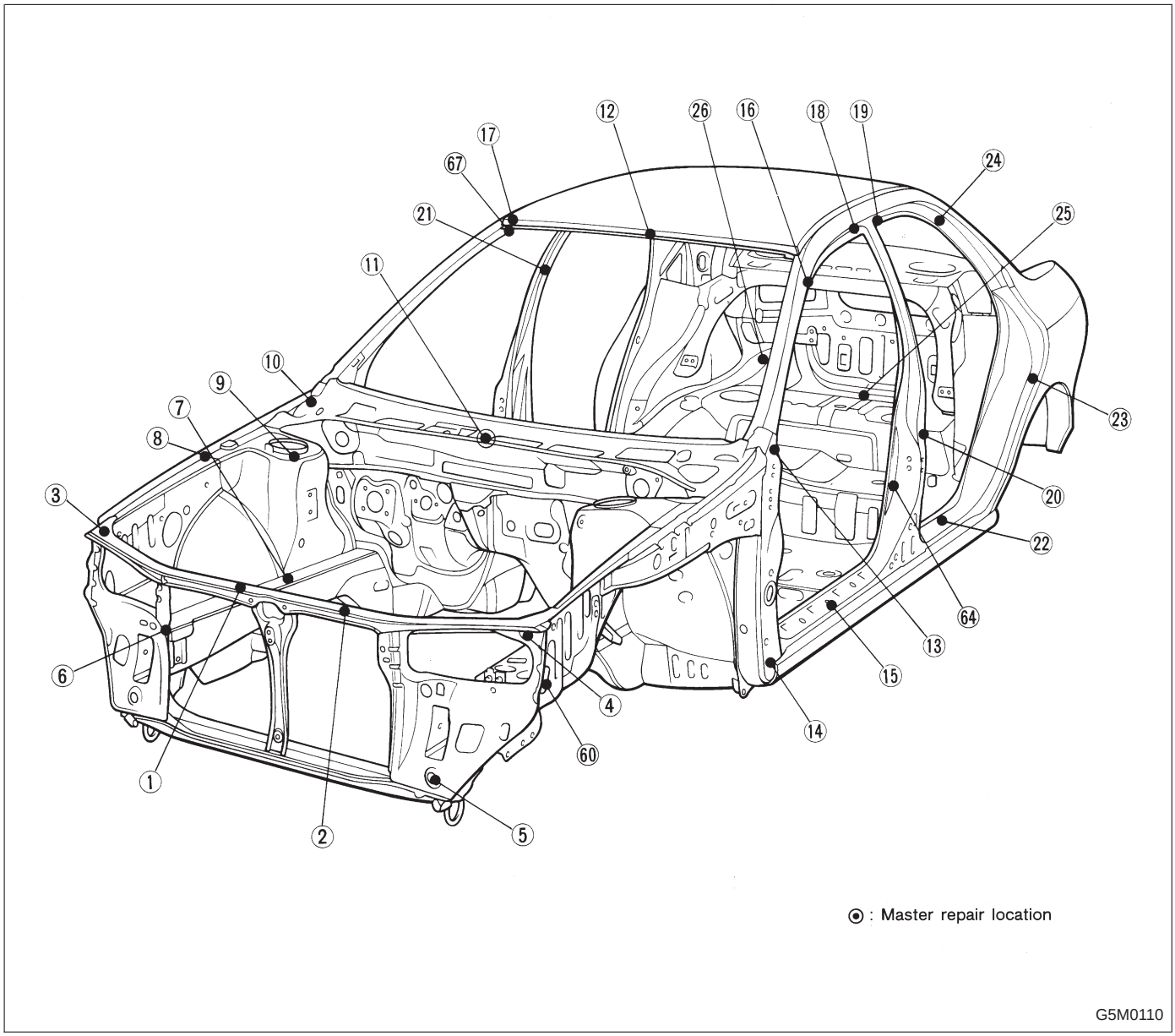
- **All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.**
- **Be careful not to damage Airbag system wiring harness when repairing the body panel.**

2. Body Datum Points

Various master repair locations are established as datum points used during body repairs. In addition, guide holes, locators and indents are provided to facilitate panel replacement and achieve alignment accuracy.

NOTE:
Left and right datum points are all symmetrical to each other.

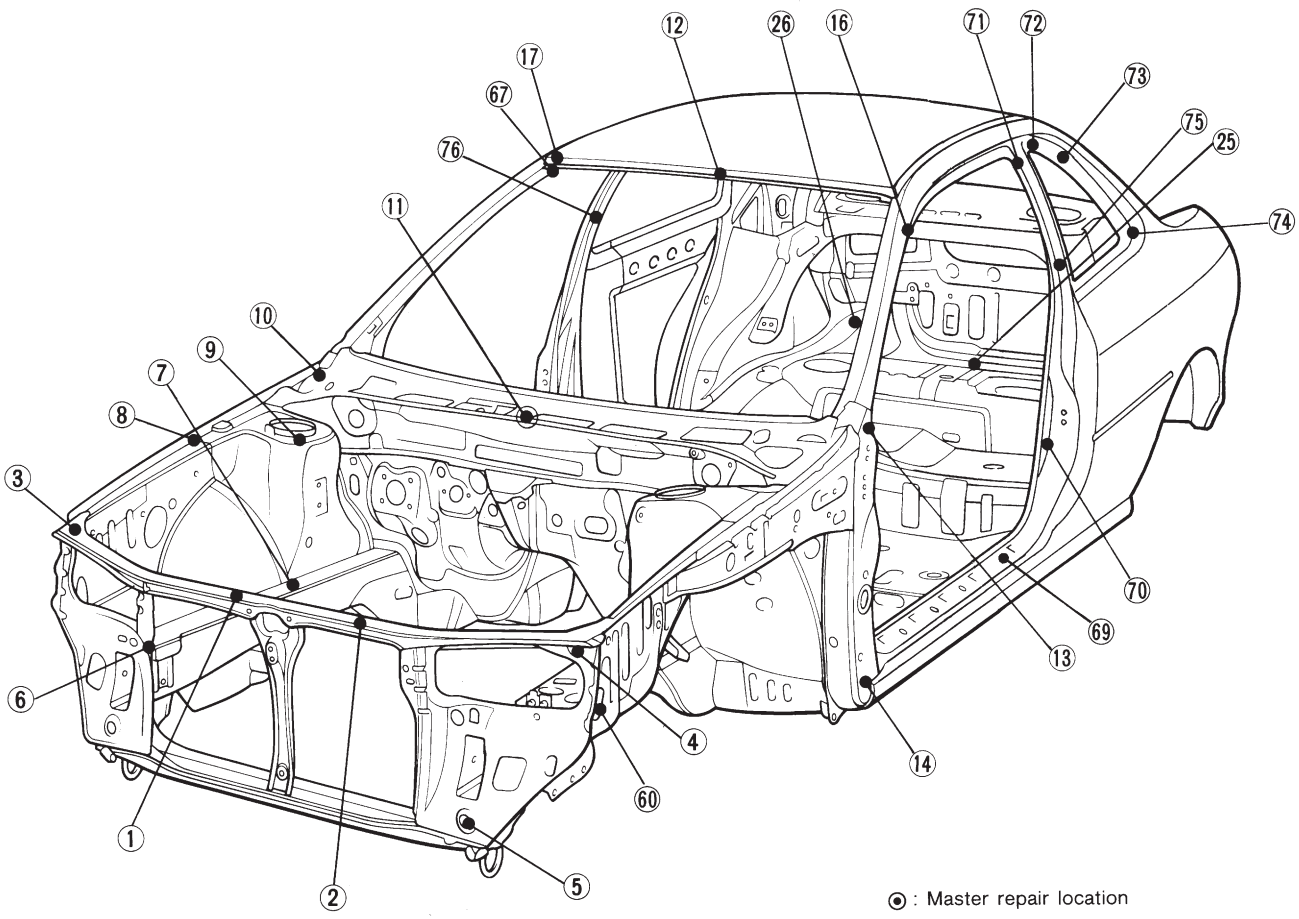
1. ENGINE COMPARTMENT AND ROOM (SEDAN AND WAGON)



① Radiator panel (UPR) repair bolt hole M8 (Right)
② Radiator panel (UPR) repair bolt hole M8 (Left)
③ Fender attaching bolt hole M6 (Symmetrical)
④ Headlight attaching bolt hole M6 (Symmetrical)
⑤ Radiator panel side gauge hole 24 mm (0.94 in) dia. (Symmetrical)
⑥ Front bumper mounting hole 14 x 17 mm (0.55 x 0.67 in) dia. (Symmetrical)
⑦ Front crossmember attaching bolt hole 12.4 mm (0.488 in) dia. (Symmetrical)
⑧ Fender attaching bolt hole M6 (Symmetrical)
⑨ Front strut mounting hole 10 mm (0.39 in) dia. (Symmetrical)
⑩ Hood hinge attaching bolt hole M8 (Symmetrical)
⑪ Cowl panel mounting hole 5 mm (0.20 in) dia.
(Located in center of vehicle.)
⑫ Front rail (Inner) mirror attaching bolt hole 8 mm (0.31 in) dia.
⑬ Fender attaching bolt hole M6 (Symmetrical)
⑭ Front pillar gauge hole 20 mm (0.79 in) dia. (Symmetrical)
⑮ Wax coat hole, 20 mm (0.79 in) dia. (Symmetrical)
⑯ Retainer attaching square hole 7 mm (0.28 in) (Symmetrical)
⑰ Sun visor attaching hole 20 mm (0.79 in) dia. (Symmetrical)
⑱ Retainer attaching square hole 7 mm (0.28 in) (Symmetrical)
⑲ Retainer attaching square hole 7 mm (0.28 in) (Symmetrical)
⑳ Center pillar gauge hole 10 mm (0.39 in) dia. (Symmetrical)
㉑ Belt anchor attaching bolt hole (Symmetrical)
㉒ Wax coat hole, 20 mm (0.79 in) dia. (Symmetrical)
㉓ Rear door switch attaching hole 20 mm (0.79 in) dia. (Symmetrical)
㉔ Retainer attaching square hole 7 mm (0.28 in) (Symmetrical)
㉕ Spare tire attaching bolt hole M8
㉖ Air draw hole 7 mm (0.28 in) dia. (Symmetrical)
㊵ Fender attaching bolt hole M6 (Symmetrical)
㊹ Door switch attaching hole 20 mm (0.79 in) dia. (Symmetrical)
㊼ Front glass attaching hole
Right 6.5 mm (0.256 in) dia.
Left 6.5 x 10 mm (0.256 x 0.39 in) dia.

2. ENGINE COMPARTMENT AND ROOM (COUPE)

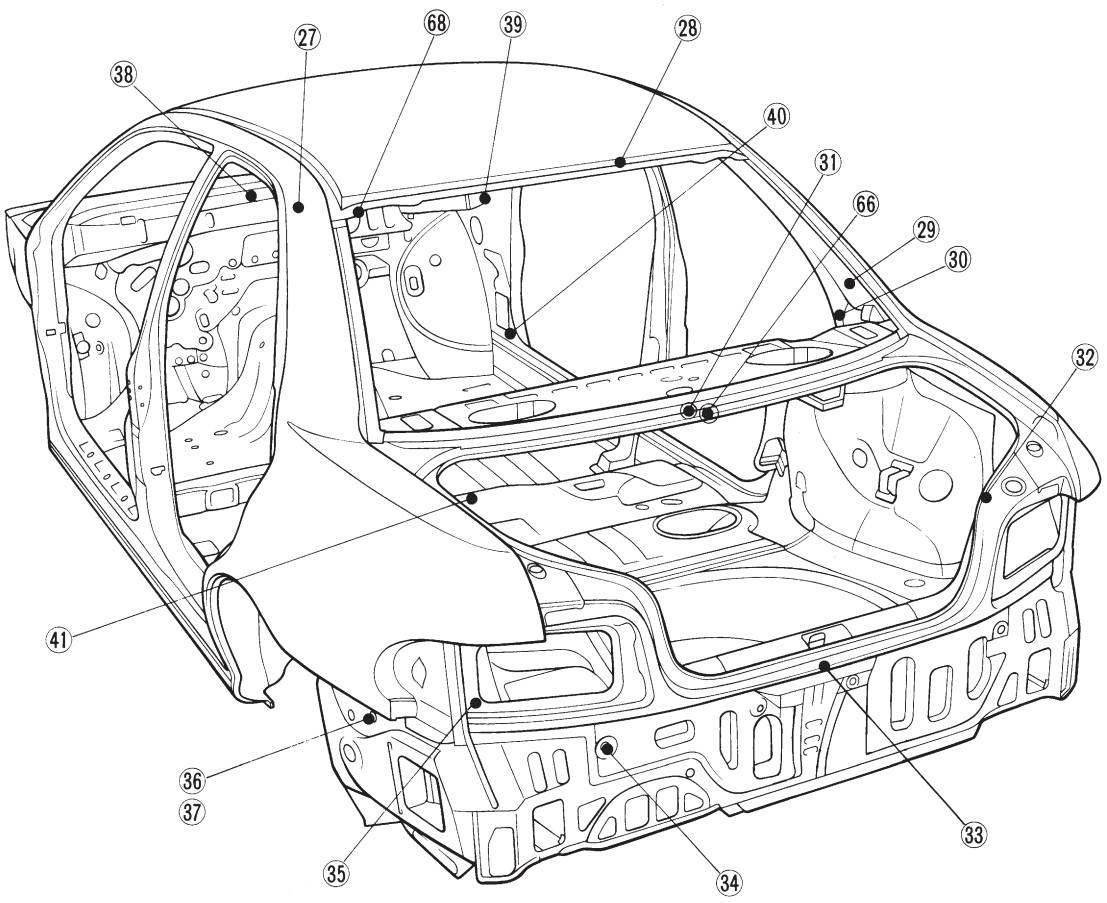
COUPE MODEL



G5M0643

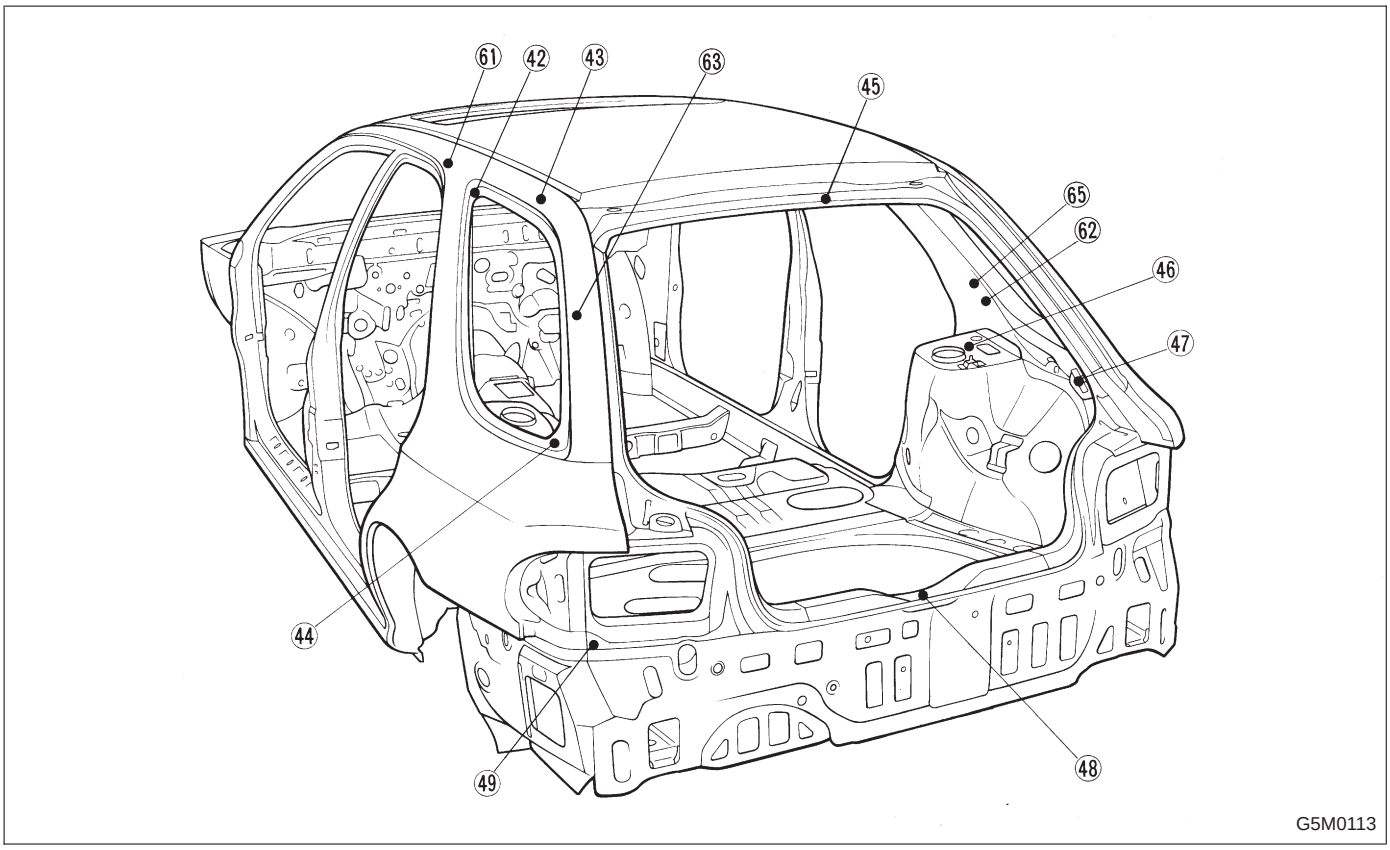
① Radiator panel (UPR) repair bolt hole M8 (Right)
② Radiator panel (UPR) repair bolt hole M8 (Left)
③ Fender attaching bolt hole M6 (Symmetrical)
④ Headlight attaching bolt hole M6 (Symmetrical)
⑤ Radiator panel side gauge hole 24 mm (0.94 in) dia. (Symmetrical)
⑥ Front bumper mounting hole 14 x 17 mm (0.55 x 0.67 in) dia. (Symmetrical)
⑦ Front crossmember attaching bolt hole 12.4 mm (0.488 in) dia. (Symmetrical)
⑧ Fender attaching bolt hole M6 (Symmetrical)
⑨ Front strut mounting hole 10 mm (0.39 in) dia. (Symmetrical)
⑩ Hood hinge attaching bolt hole M8 (Symmetrical)
⑪ Cowl panel mounting hole 5 mm (0.20 in) dia.
(Located in center of vehicle.)
⑫ Front rail (Inner) mirror attaching bolt hole 8 mm (0.31 in) dia.
⑬ Fender attaching bolt hole M6 (Symmetrical)
⑭ Front pillar gauge hole 20 mm (0.79 in) dia. (Symmetrical)
⑯ Retainer attaching square hole 7 mm (0.28 in) (Symmetrical)
⑰ Sun visor attaching hole 20 mm (0.79 in) dia. (Symmetrical)
㉕ Spare tire attaching bolt hole M8
㉖ Air draw hole 7 mm (0.28 in) dia. (Symmetrical)
㊵ Fender attaching bolt hole M6 (Symmetrical)
㊼ Front glass attaching hole
Right 6.5 mm (0.256 in) dia.
Left 6.5 x 10 mm (0.256 x 0.39 in) dia.
㊾ Wax coat hole 20 mm (0.79 in) dia. (Symmetrical)
㊿ Door switch attaching hole 13.5 mm (0.531 in) dia. (Symmetrical)
(71) Retainer attaching square hole 8 mm (0.31 in). (Symmetrical)
(72) Rear quarter glass attaching hole 8 mm (0.31 in) dia. (Symmetrical)
(73) Rear quarter glass attaching hole 7 mm (0.28 in) dia. (Symmetrical)
(74) Rear quarter glass attaching hole 8 x 5.5 mm (0.31 x 0.217 in) dia. (Symmetrical)
(75) Retainer attaching square hole 8 mm (0.31 in). (Symmetrical)
(76) Seat belt anchor attaching bolt hole 16 mm (0.63 in) dia. (Symmetrical)

3. LUGGAGE COMPARTMENT AND ROOM (SEDAN AND COUPE)



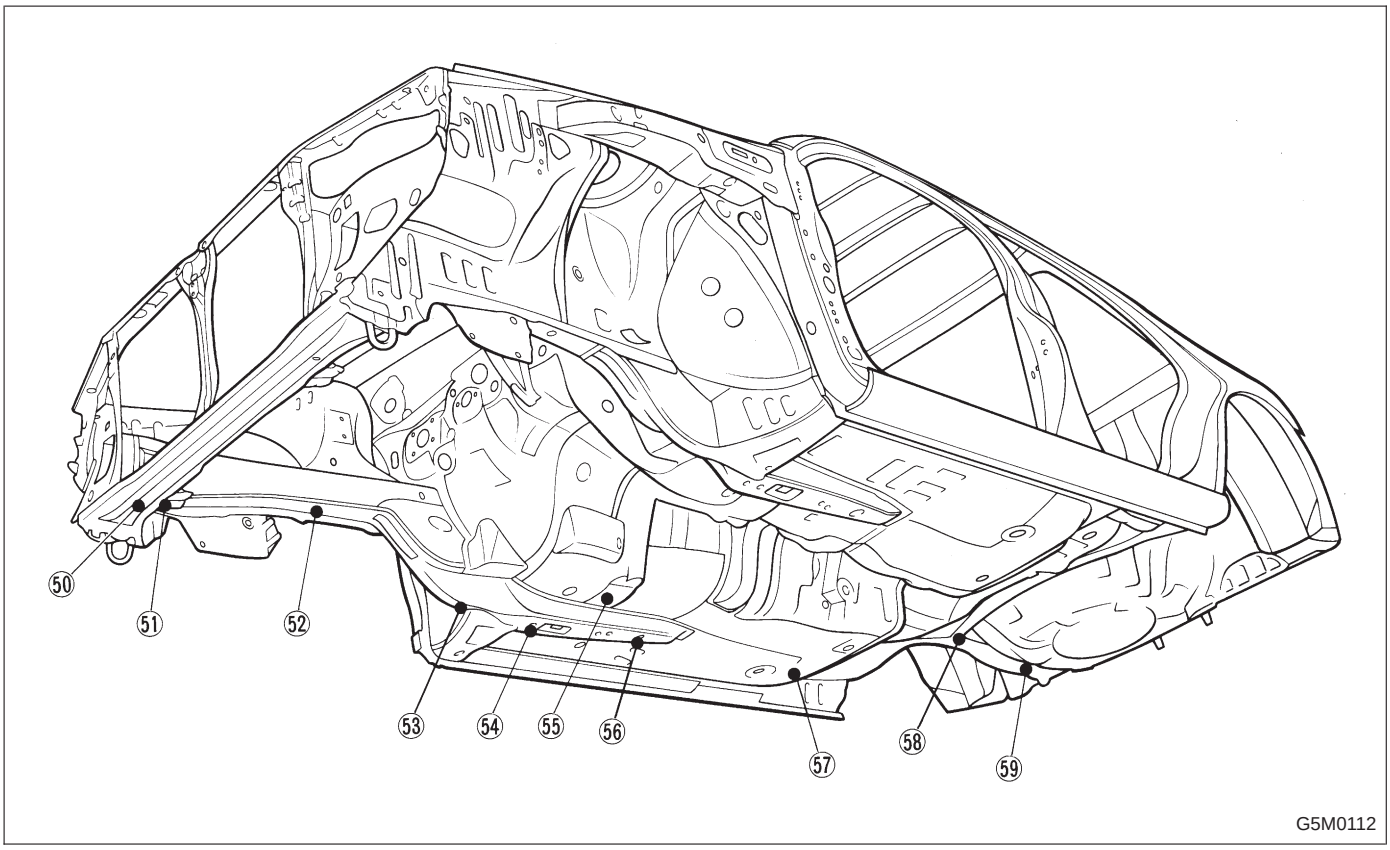
㉗ Rear pillar (Inner) gauge hole 8 mm (0.31 in) dia. (Symmetrical)
㉘ Rear roof trim attaching hole 8 mm (0.31 in) dia. (Symmetrical)
㉙ Rear quarter trim attaching hole 8 mm (0.31 in) dia. (Symmetrical)
㉚ Seat belt anchor attaching bolt hole (Symmetrical)
㉛ Reinforcement (Rear panel rear) repair locator (Located in center of vehicle)
㉜ Rear corner patch at flange (Symmetrical)
㉝ Rear skirt (UPR) cutout (Repair locator)
㉞ Rear skirt gauge hole 20 mm (0.79 in) dia. (Symmetrical)
㉟ Rear combination light mounting hole 9 mm (0.35 in) dia. (Symmetrical)
㊱ Rear quarter bumper side gauge hole 20 mm (0.79 in) dia. (Left)
㊲ Rear quarter bumper side gauge hole 20 mm (0.79 in) dia. (Right)
㊳ Instrument panel attaching square hole 22 x 34.5 mm (0.87 x 1.358 in) (Right)
㊴ Steering support beam attaching bolt hole M8 (Symmetrical)
㊵ Front pillar (Inner) gauge hole 10 mm (0.39 in) dia. (Symmetrical)
㊶ Floor mat attaching clip hole 8 mm (0.31 in) dia. (Symmetrical)
㊻ Rear panel (Center) repair locator (Located in center of vehicle.)
㊽ Rear glass attaching hole
(Right): 6.5 mm (0.256 in) dia.
(Left): 6.5 x 10 mm (0.256 x 0.39 in) dia.

4. LUGGAGE COMPARTMENT AND ROOM (WAGON)

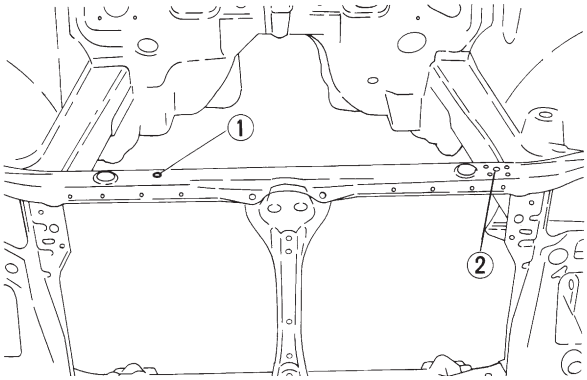


(42) Rear quarter glass attaching hole 8 mm (0.31 in) dia. (Symmetrical)
(43) Roof rail attaching hole 10 mm (0.39 in) dia. (Symmetrical)
(44) Rear quarter glass attaching hole 8 x 15 mm (0.31 x 0.59 in) dia. (Symmetrical)
(45) Rear roof trim attaching hole 8 mm (0.31 in) dia. (Symmetrical)
(46) Rear strut mounting hole 10 mm (0.39 in) dia. (Symmetrical)
(47) Rear gate stay attaching bolt hole M8 (Symmetrical)
(48) Child seat anchor attaching bolt hole
(49) Rear combination light mounting hole 10 mm (0.39 in) dia. (Symmetrical)
(61) Side rail (Inner) gauge hole 8 mm (0.31 in) dia. (Symmetrical)
(62) Rear quarter trim attaching hole 8 mm (0.31 in) dia. (Symmetrical)
(63) Rear quarter harness attaching clip hole 7 mm (0.28 in) dia. (Symmetrical)
(65) Seat belt anchor attaching bolt hole (Symmetrical)

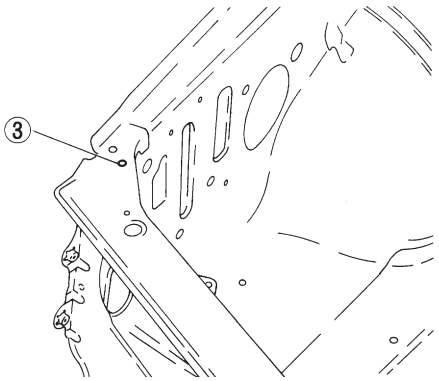
5. UNDER BODY



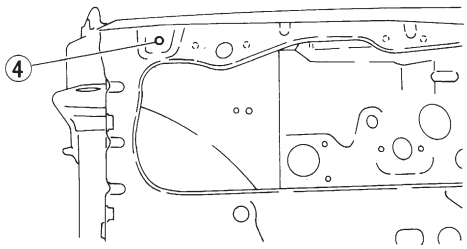
(50) Radiator panel (LWR) frame gauge hole 15 mm (0.59 in) dia. (Symmetrical)
(51) Front side frame gauge hole 20 mm (0.79 in) dia. (Symmetrical)
(52) Front crossmember attaching hole 12.4 mm (0.488 in) dia. (Symmetrical)
(53) Front suspension attaching bolt hole M14
(54) Side frame gauge hole 20 mm (0.79 in) dia. (Symmetrical)
(55) Transmission mount attaching bolt hole M10 (Symmetrical)
(56) Side frame gauge hole 15 mm (0.59 in) dia. (Symmetrical)
(57) Rear differential attaching bolt hole M12 (Symmetrical)
(58) Rear suspension attaching bolt hole M12 (Symmetrical)
(59) Rear side frame gauge hole 15 mm (0.59 in) dia. (Symmetrical)



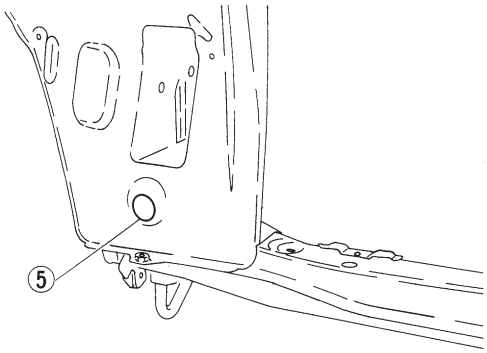
G5M0114



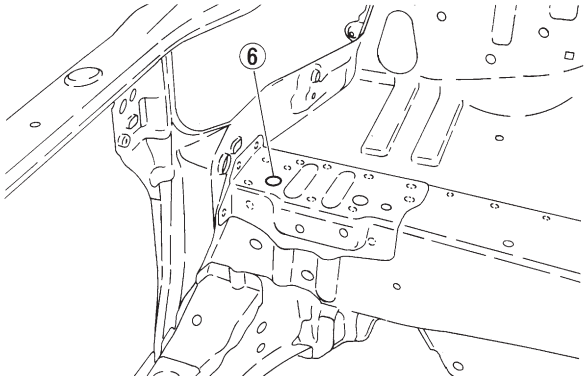
G5M0207



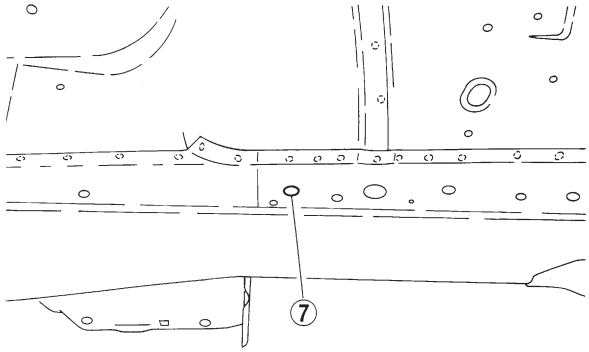
G5M0208



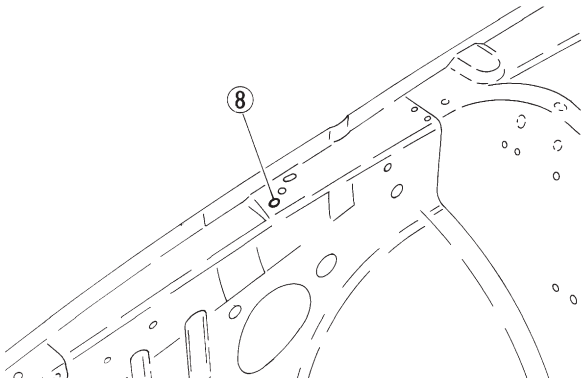
G5M0209



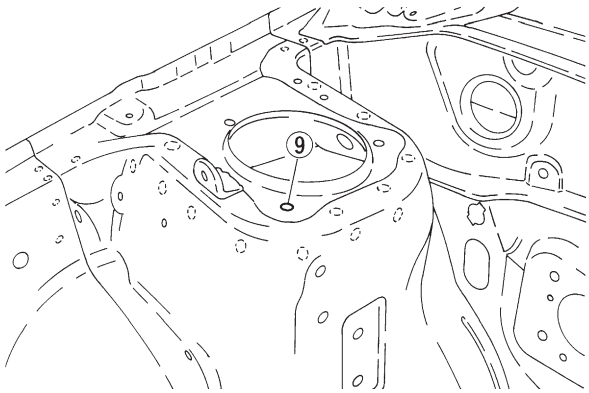
G5M0210



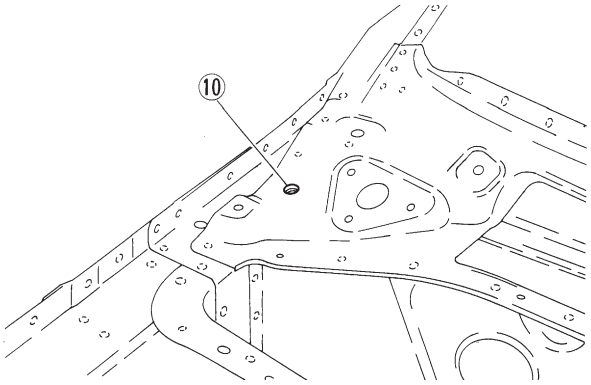
G5M0211



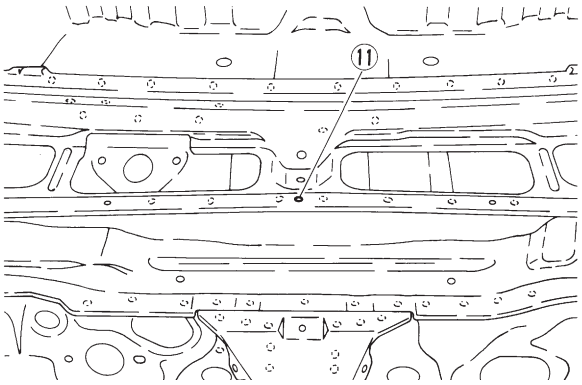
G5M0212



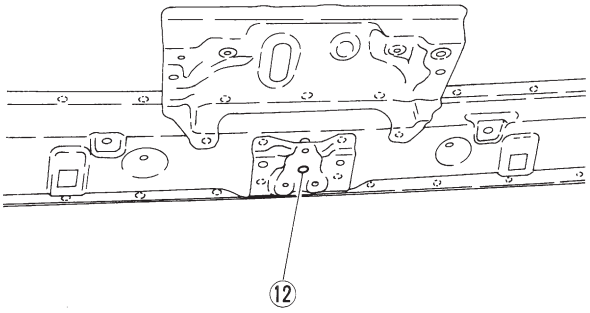
G5M0213



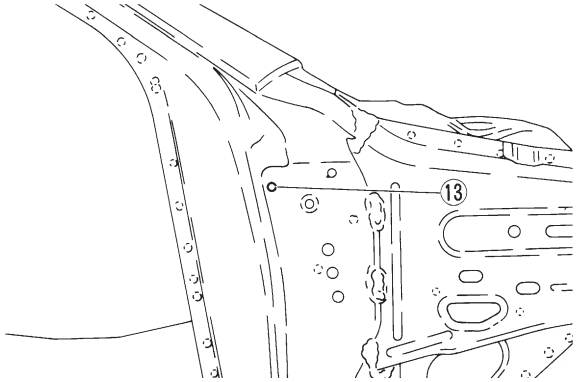
G5M0214



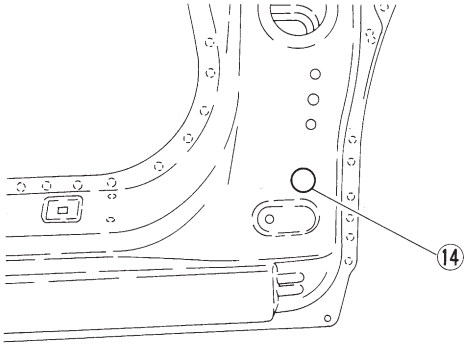
G5M0215



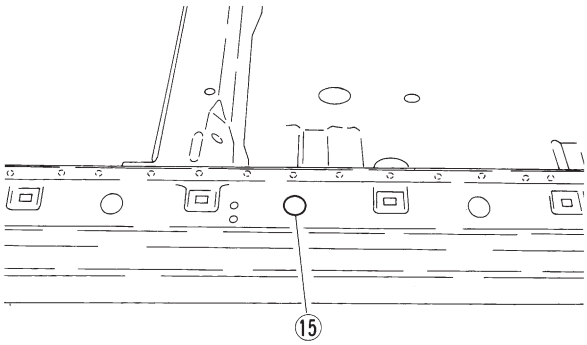
G5M0216



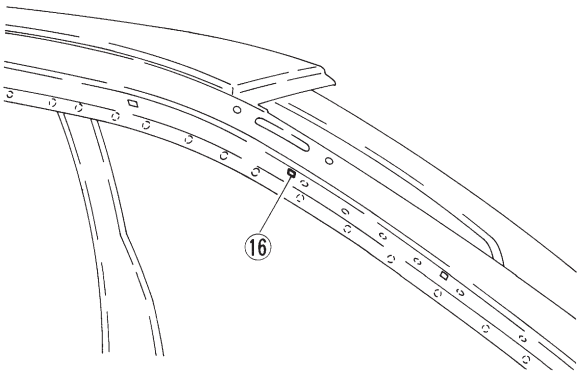
G5M0217



G5M0218



G5M0219



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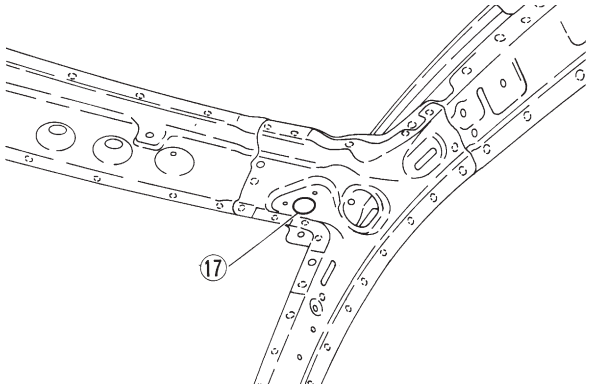

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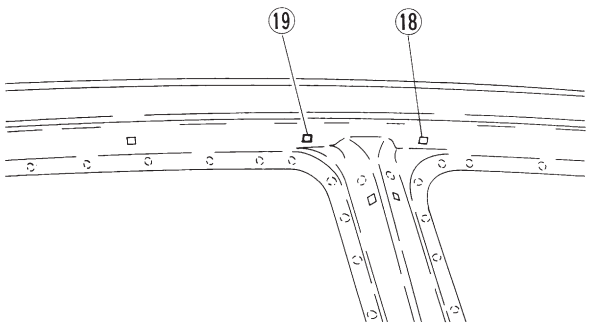

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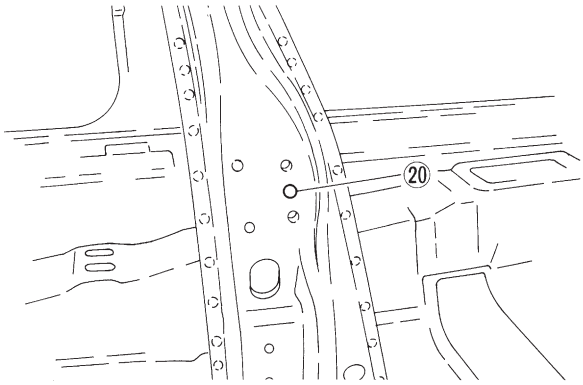

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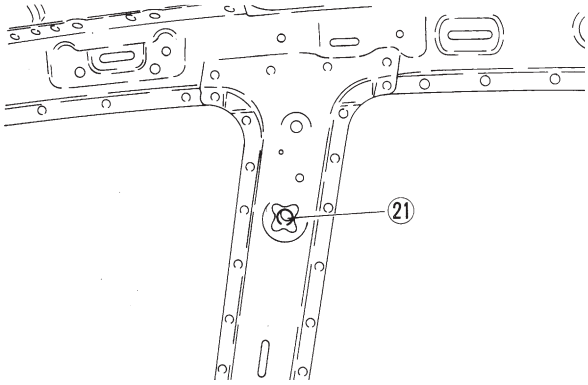

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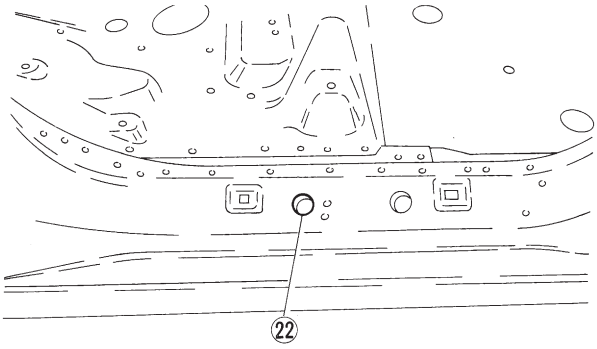

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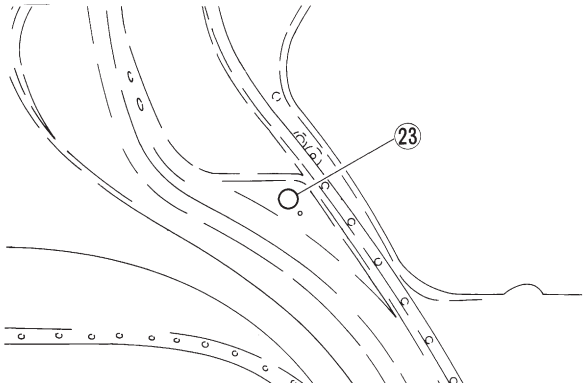

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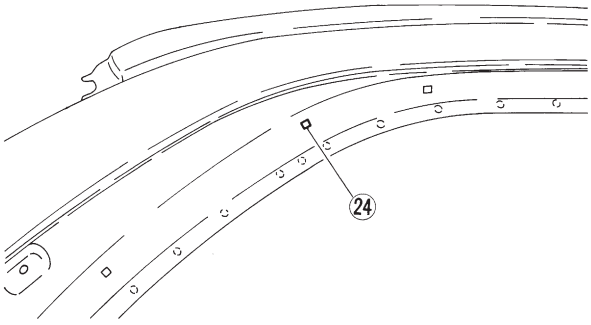

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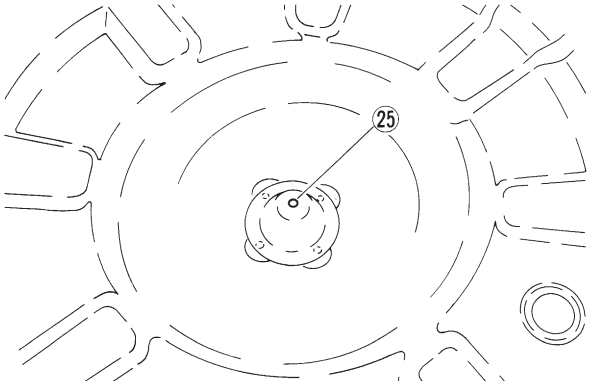

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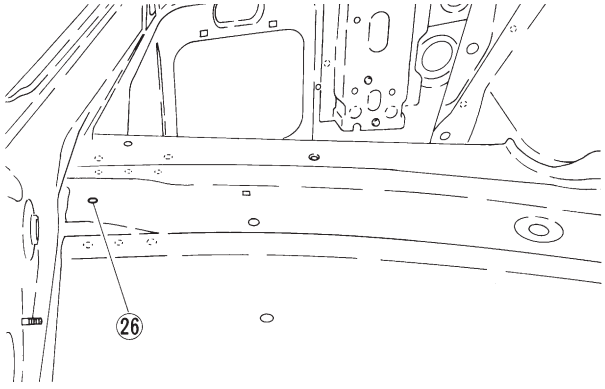

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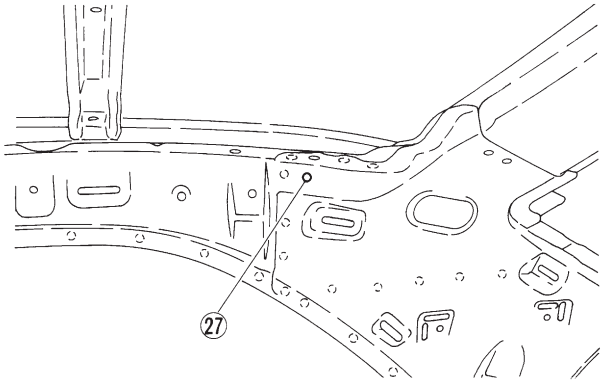

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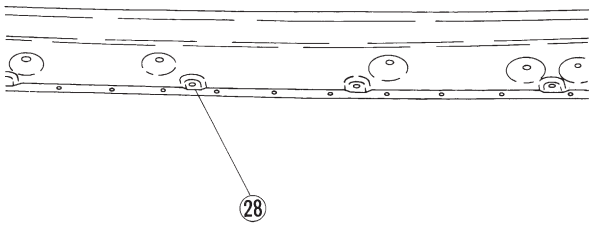

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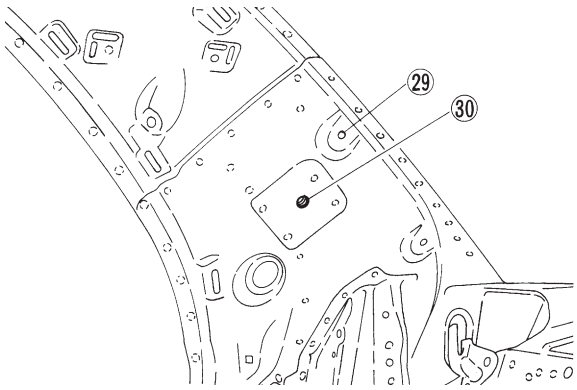

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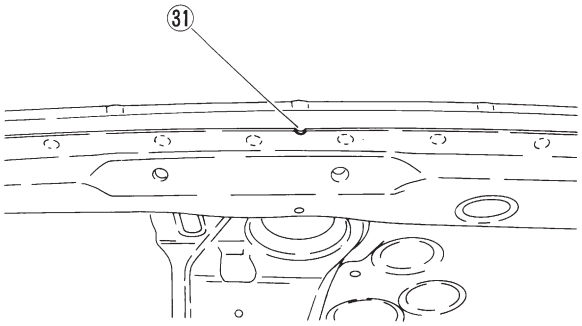

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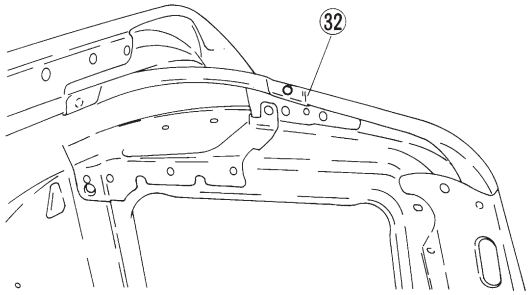

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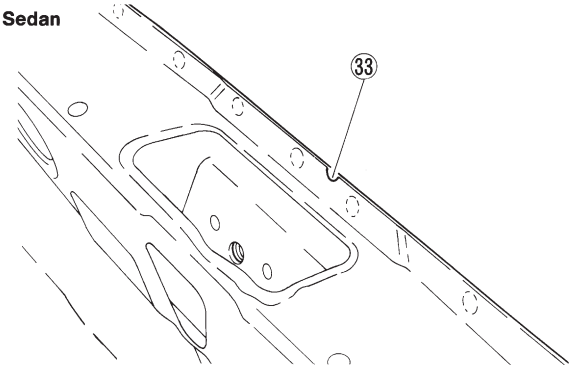

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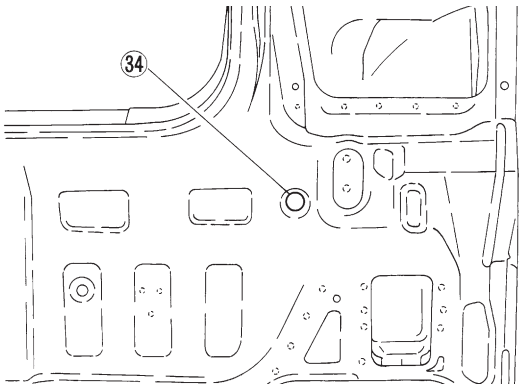

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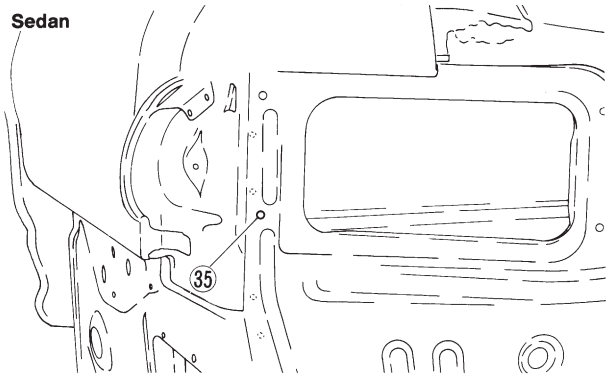

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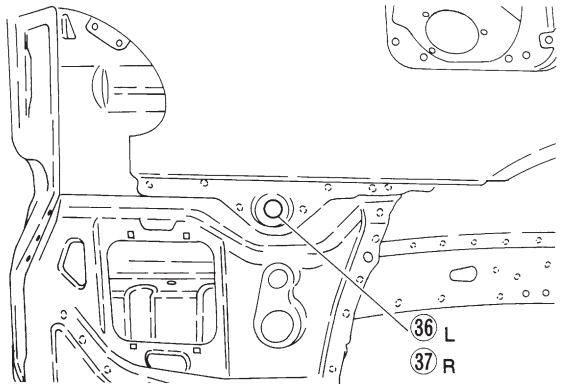

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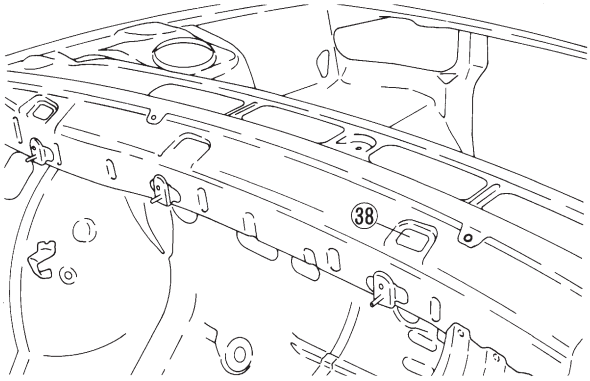

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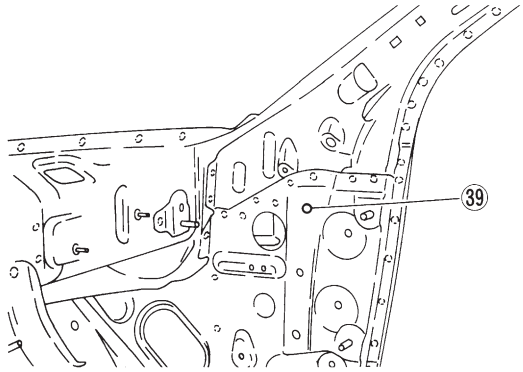

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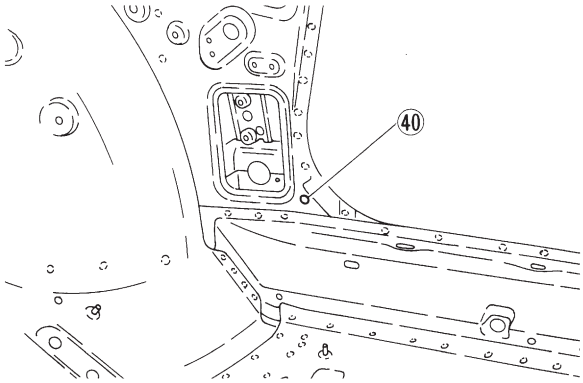

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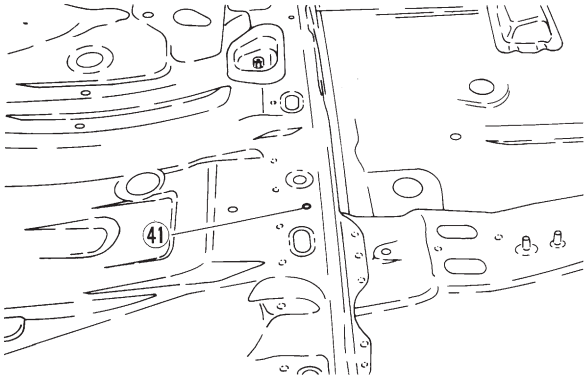

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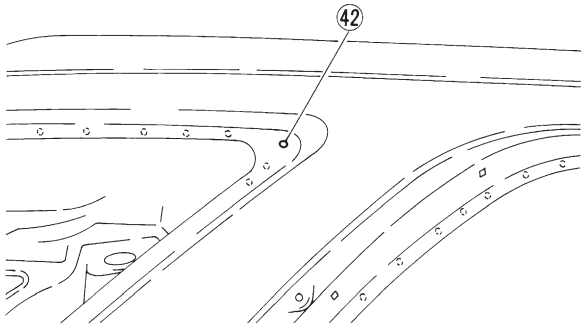

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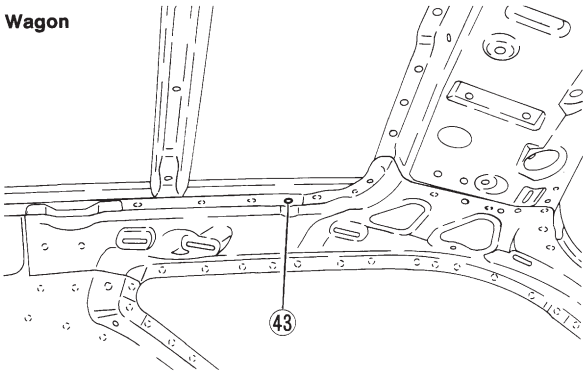

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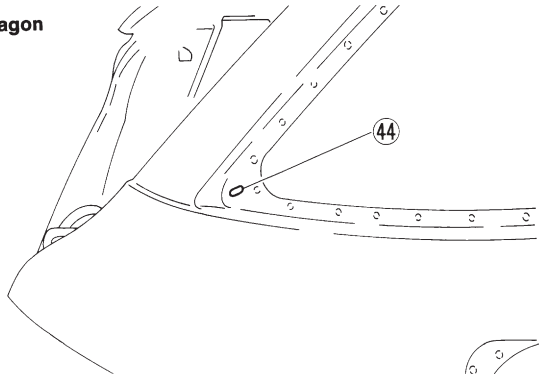

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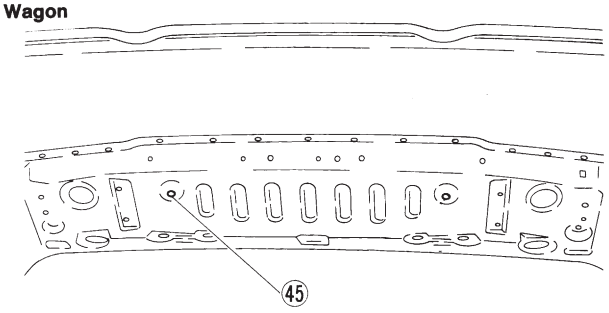

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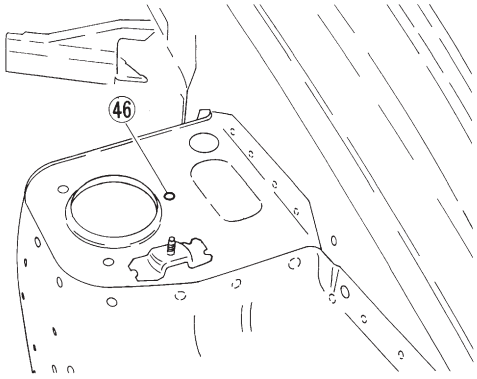

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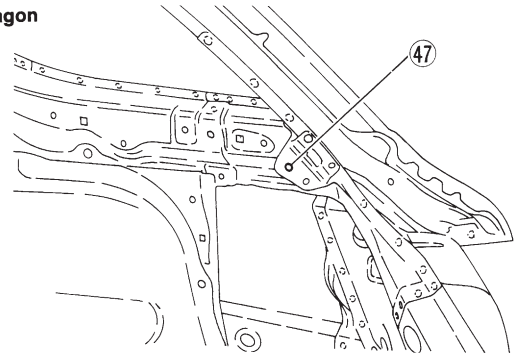

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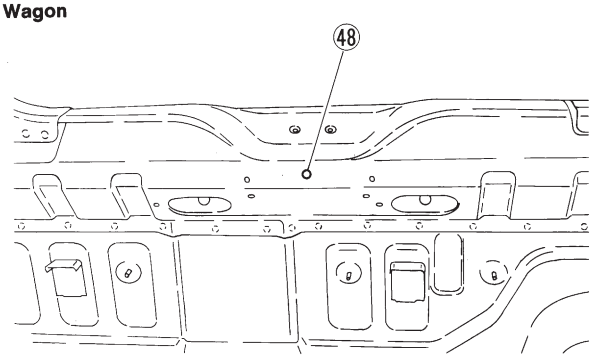

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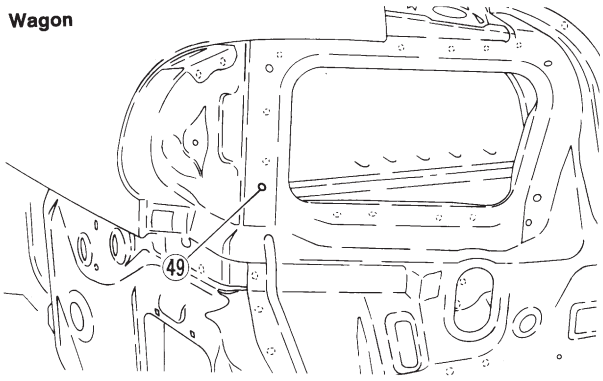

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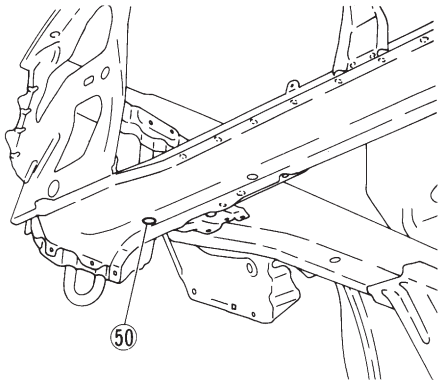

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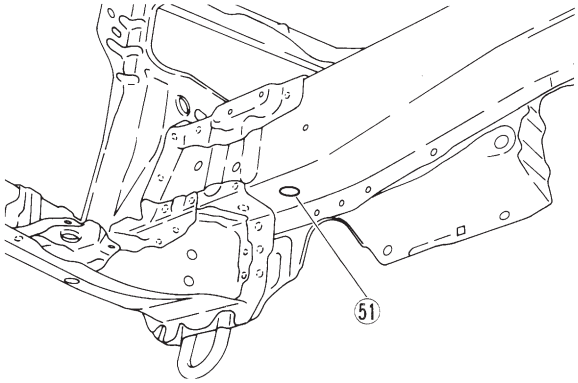

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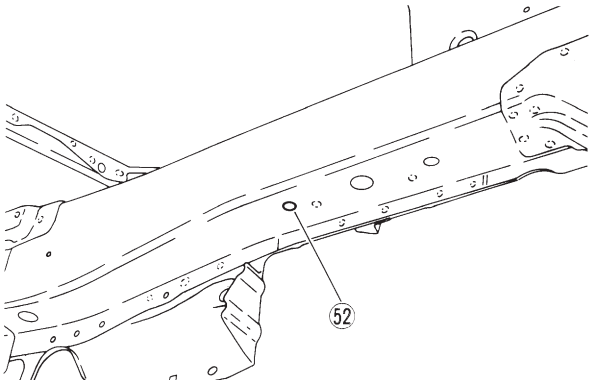

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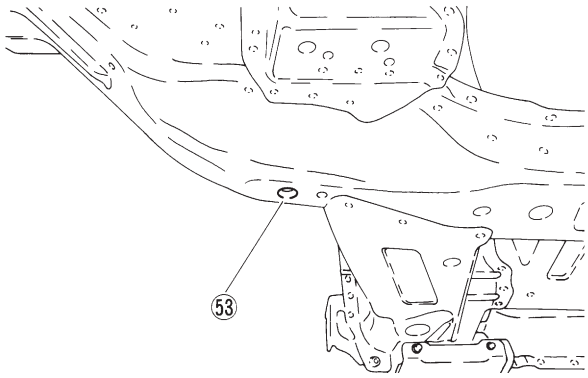

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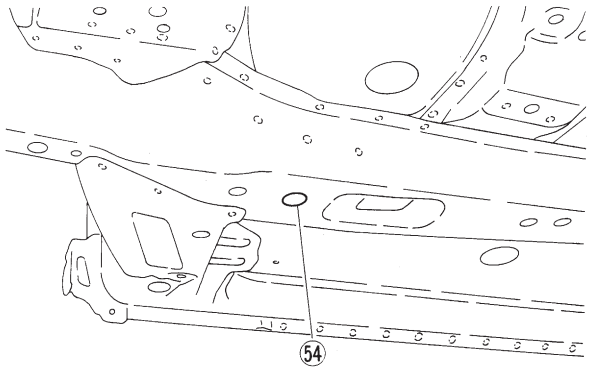

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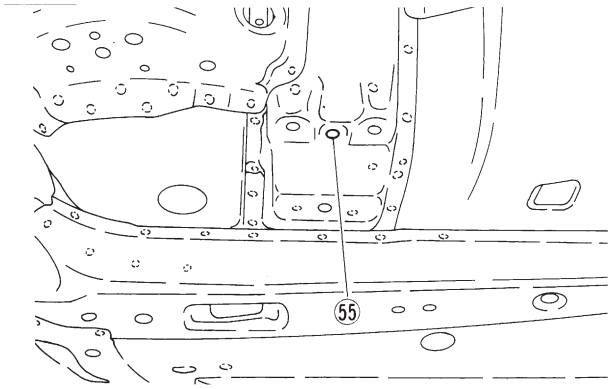

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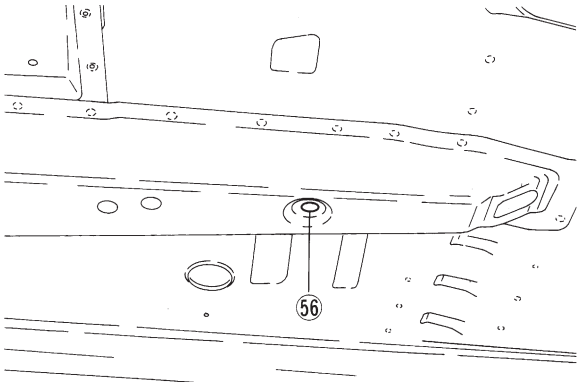

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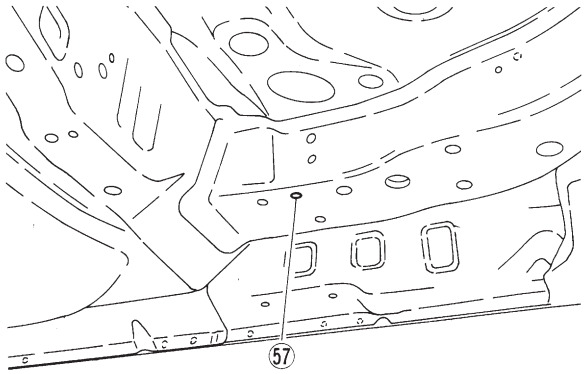

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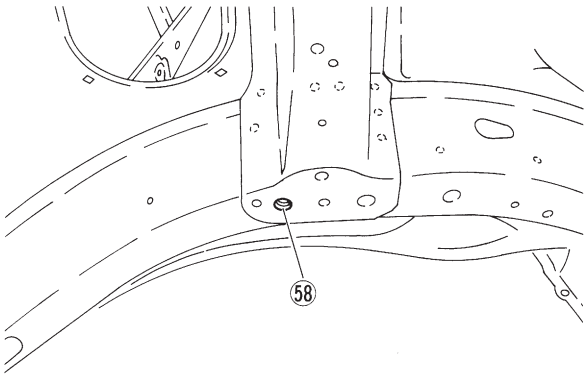

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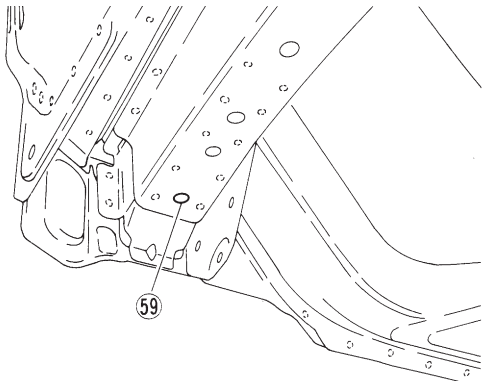

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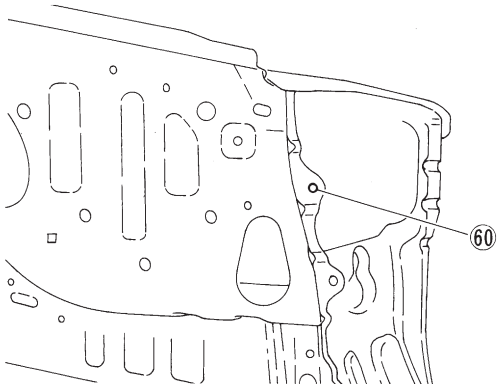

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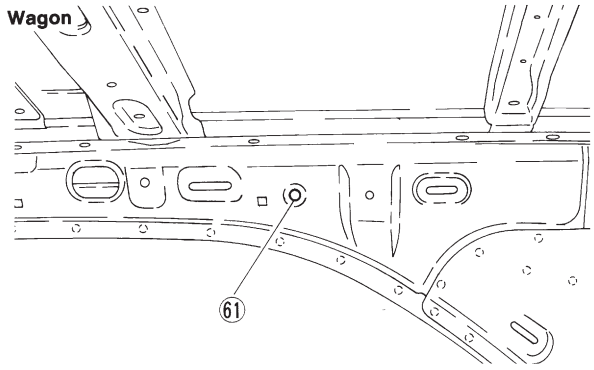

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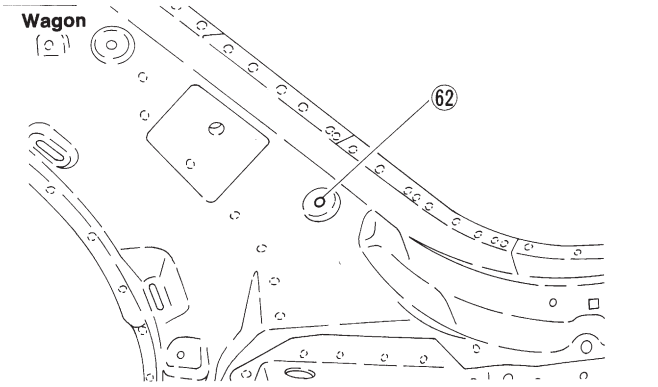

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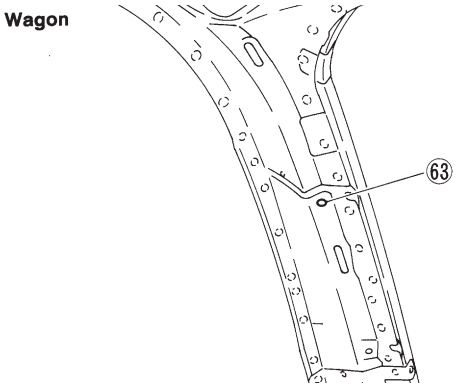

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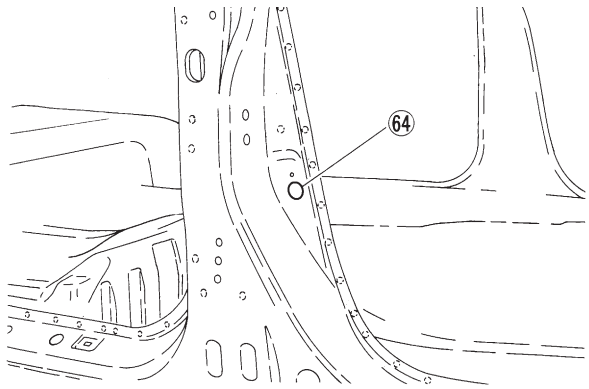

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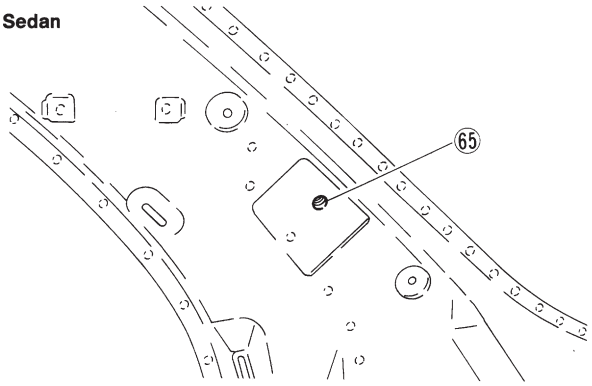

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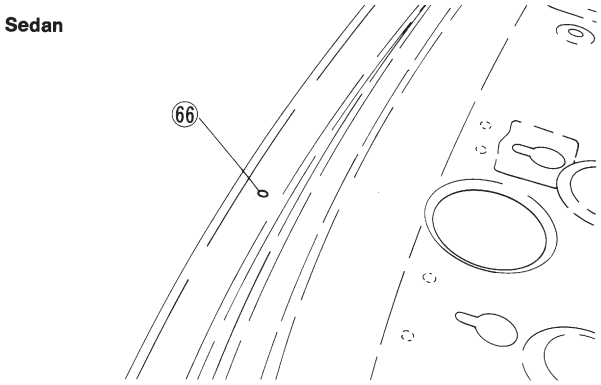

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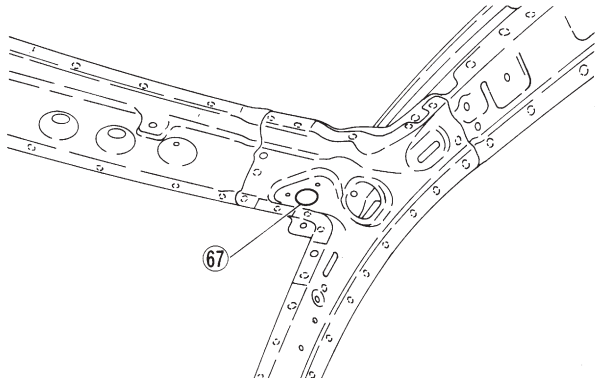

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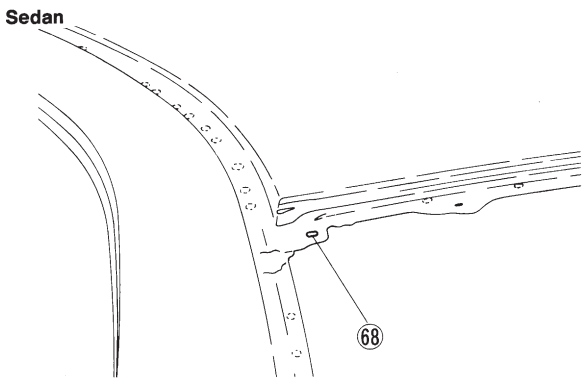

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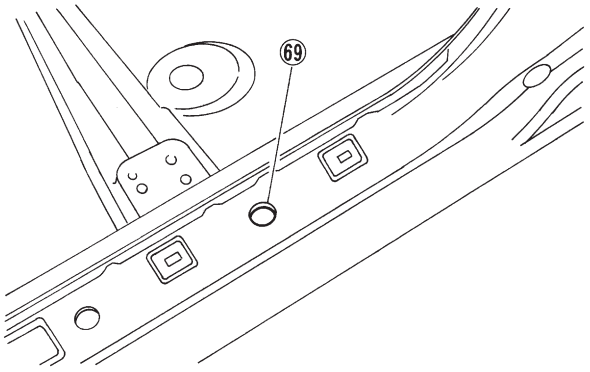

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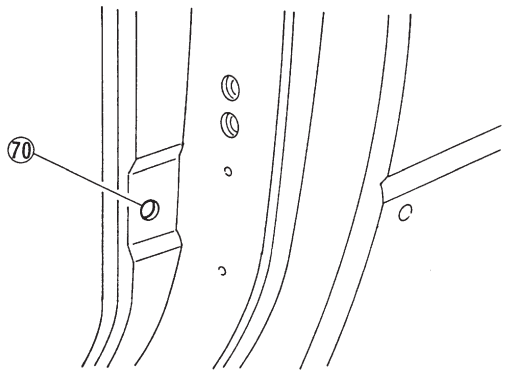

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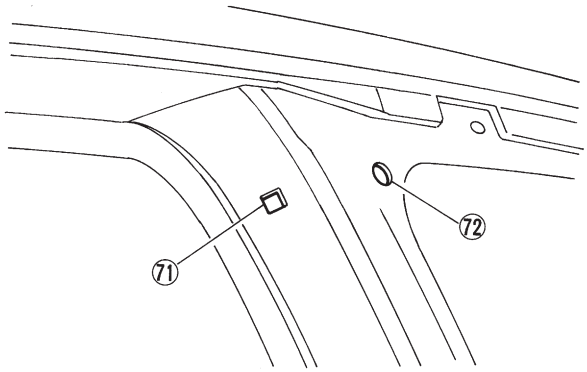

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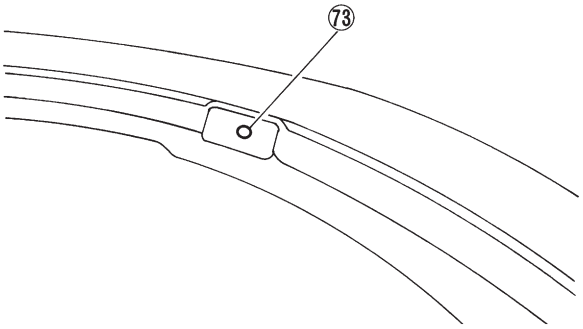

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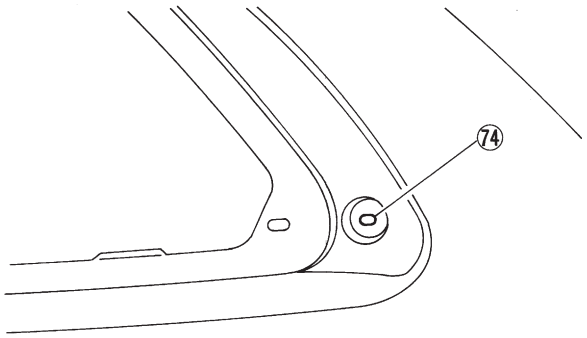

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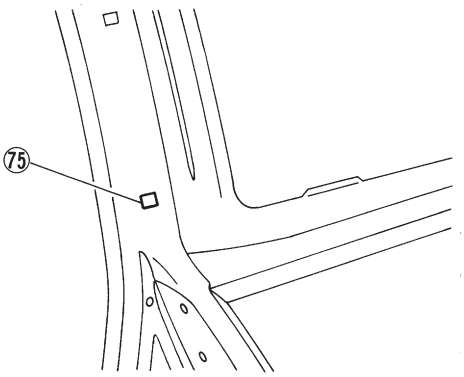

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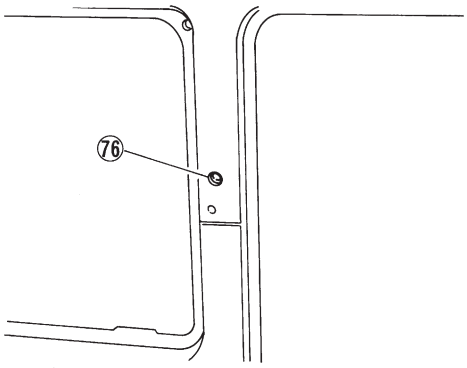
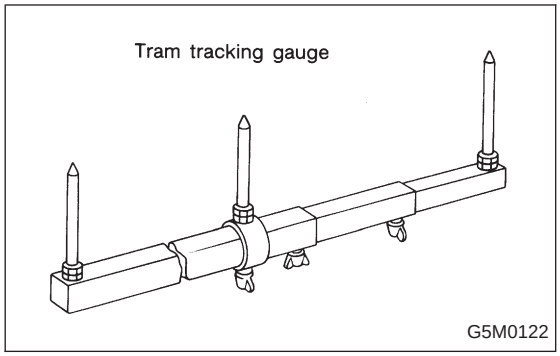


G5M0650



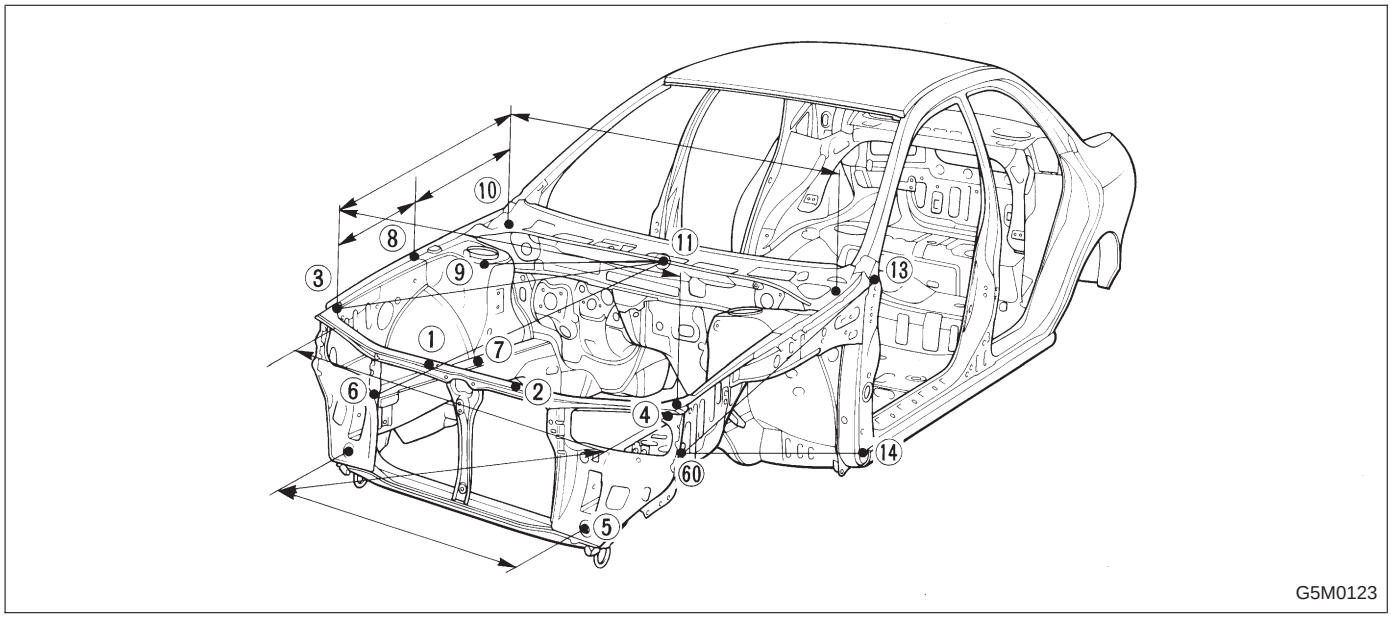
3. Datum Dimensions

Use a tram tracking gauge to measure all dimensions. If a measuring tape is used, be extremely careful because it tends to deflect or twist, which results in a false reading.

NOTE:

- A suffix character “R” or “L” refers to the right or the left.
- All dimensions refer to the distance between the centers of holes measured in a straight line.
- Each dimension indicates a projected dimension between hole centers.

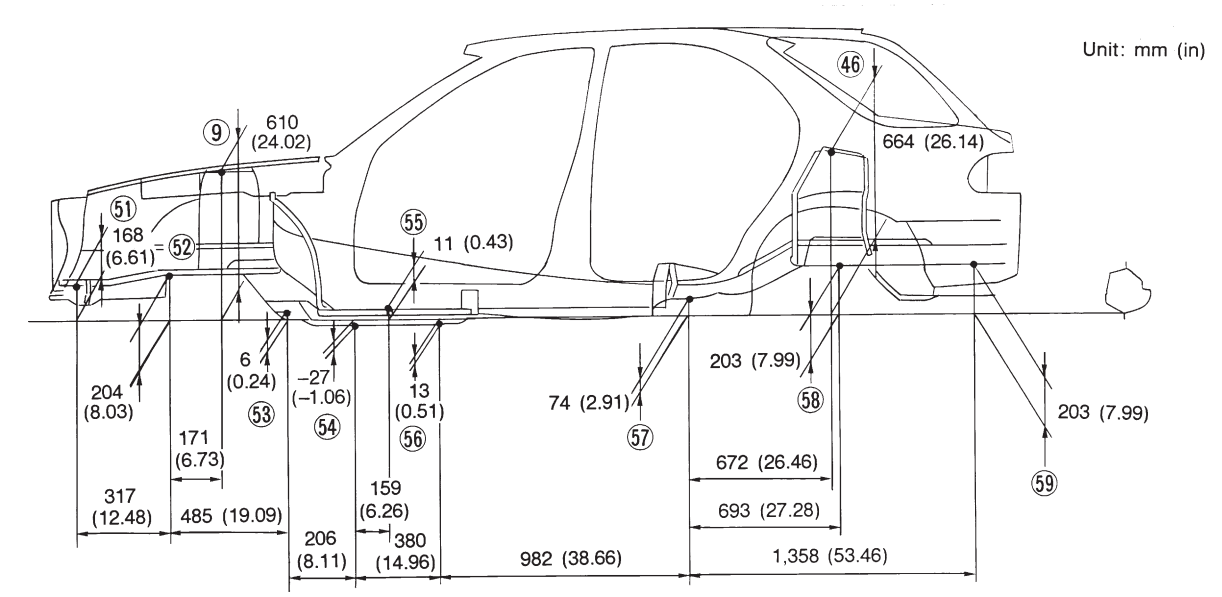
1. FRONT STRUCTURE

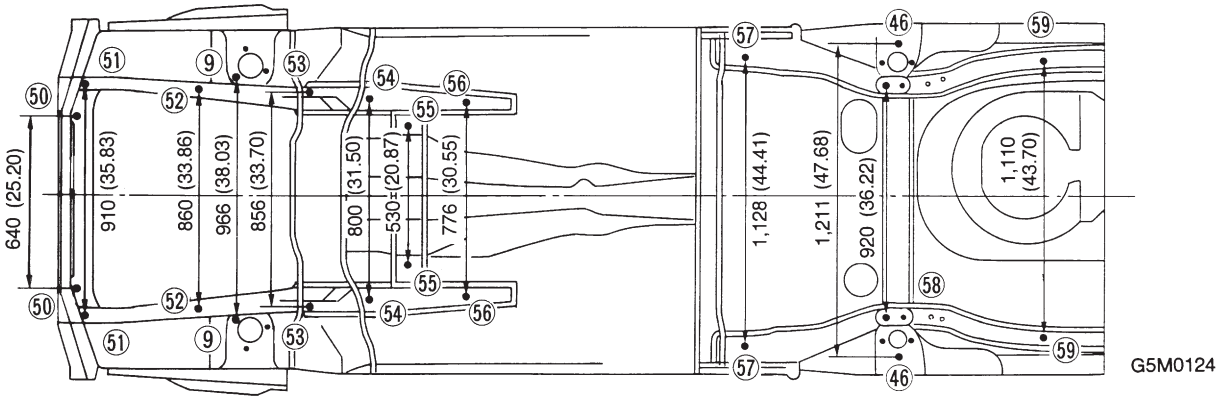


Unit: mm (in)

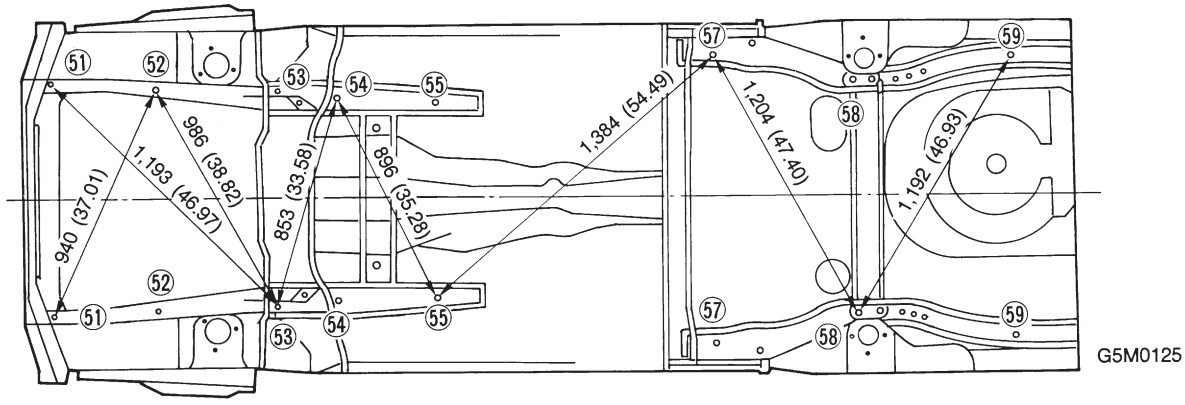
⑪	—	⑨R	:	525 (20.67)
⑪	—	⑨L		
⑪	—	⑥R	:	988 (38.90)
⑪	—	⑥L		
⑪	—	③R	:	990 (38.98)
⑪	—	③L		
⑩R	—	③R	:	829 (32.64)
⑩L	—	③L		
⑩R	—	⑧R	:	567 (22.32)
⑩L	—	⑧L		
⑧R	—	③R	:	264 (10.39)
⑧L	—	③L		
⑩R	—	⑩L	:	1,382 (54.41)
③R	—	③L	:	1,336 (52.60)
⑤R	—	⑤L	:	942 (37.09)
⑤R	—	④R	:	1,174 (46.22)
⑤L	—	④L		
④R	—	④L	:	1,269 (49.96)
⑥⓪R	—	⑬R	:	1,113 (43.82)
⑥⓪L	—	⑬L		
⑥⓪R	—	⑭R	:	1,076 (42.36)
⑥⓪L	—	⑭L		
①	—	⑪	:	882 (34.72)
②	—	⑪	:	913 (35.94)

2. CENTER STRUCTURE





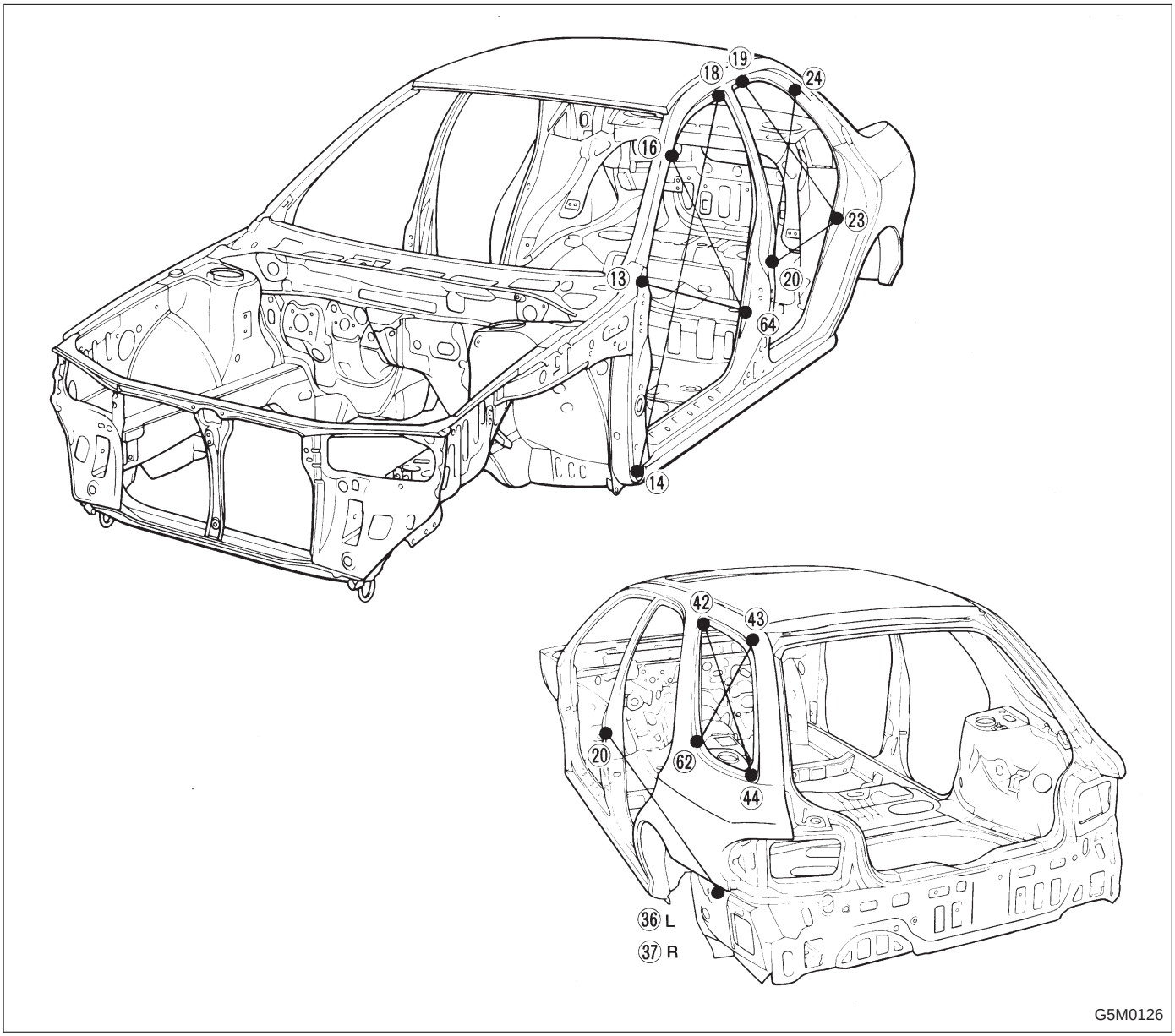
G5M0124



G5M0125

G5M0124

3. DOORS AND REAR QUARTER (SEDAN AND WAGON)

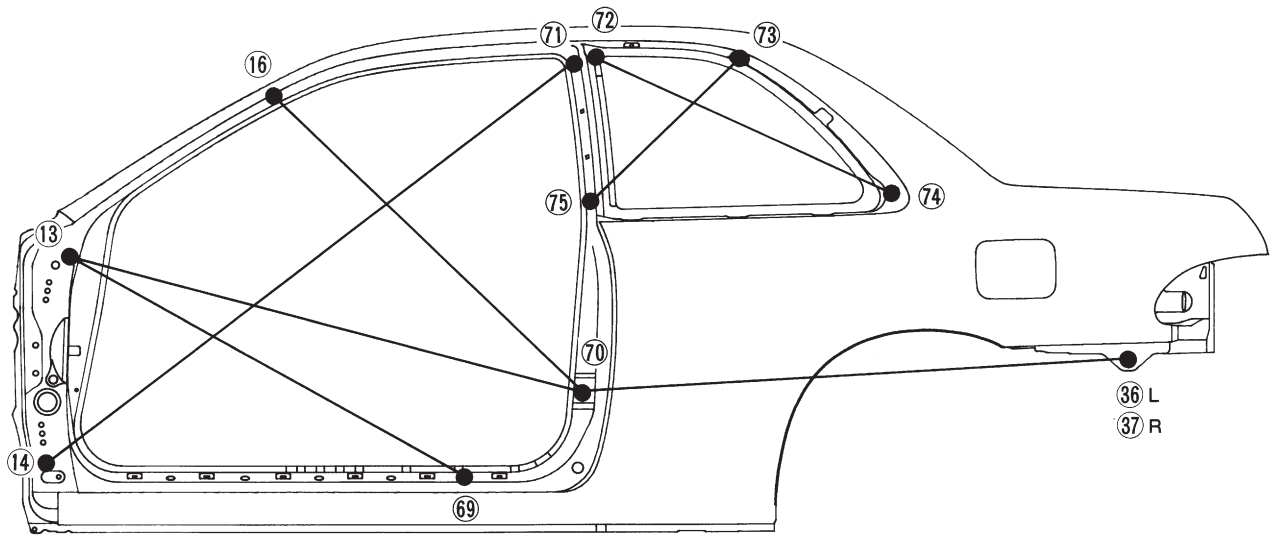


Unit: mm (in)

14	—	18	:	1,495 (58.86)	19	—	23	: 912 (35.91)
13	—	64	:	947 (37.28)	20	—	36 L	: 1,462 (57.56) (Wagon)
16	—	64	:	976 (38.43)	20	—	37 R	: 1,481 (58.31) (Wagon)
20	—	23	:	803 (31.61)	62	—	43	: 377 (14.84) (Wagon)
20	—	24	:	829 (32.64)	42	—	44	: 847 (33.35) (Wagon)

4. DOORS AND REAR QUARTER (COUPE)

COUPE MODEL

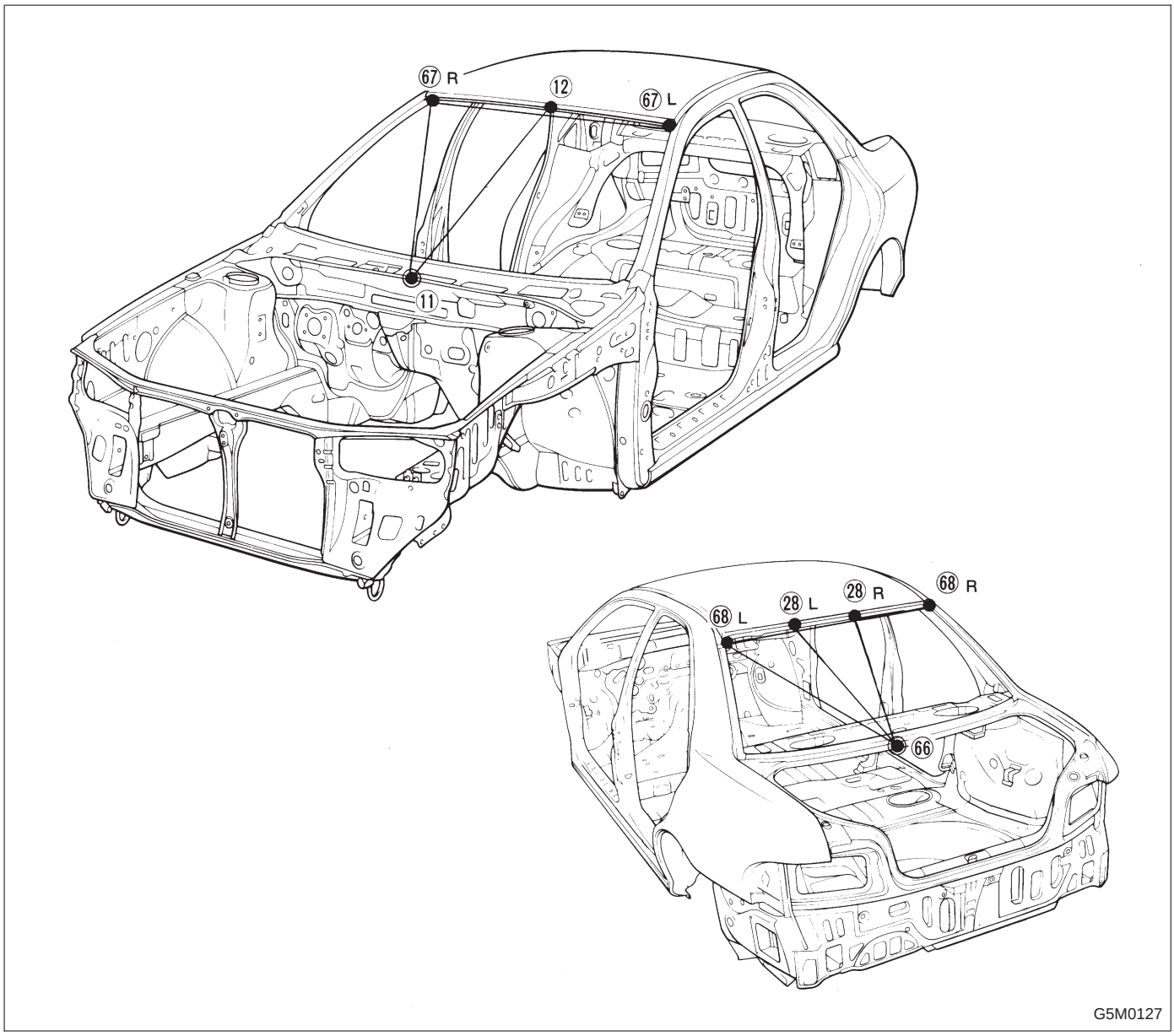


G5M0652

Unit: mm (in)

⑭	—	⑦①	:	1,576 (62.05)	⑦③	—	⑦⑤	: 512 (20.16)
⑬	—	⑦⓪	:	1,251 (49.25)	⑦⓪	—	㊱ L	: 1,295 (50.98)
⑯	—	⑦⓪	:	997 (39.25)	⑦⓪	—	㊲ R	: 1,243 (48.94)
⑬	—	⑥⑨	:	1,063 (41.85)				
⑫	—	⑦④	:	778 (30.63)				

5. FRONT WINDSHIELD AND REAR WINDOW

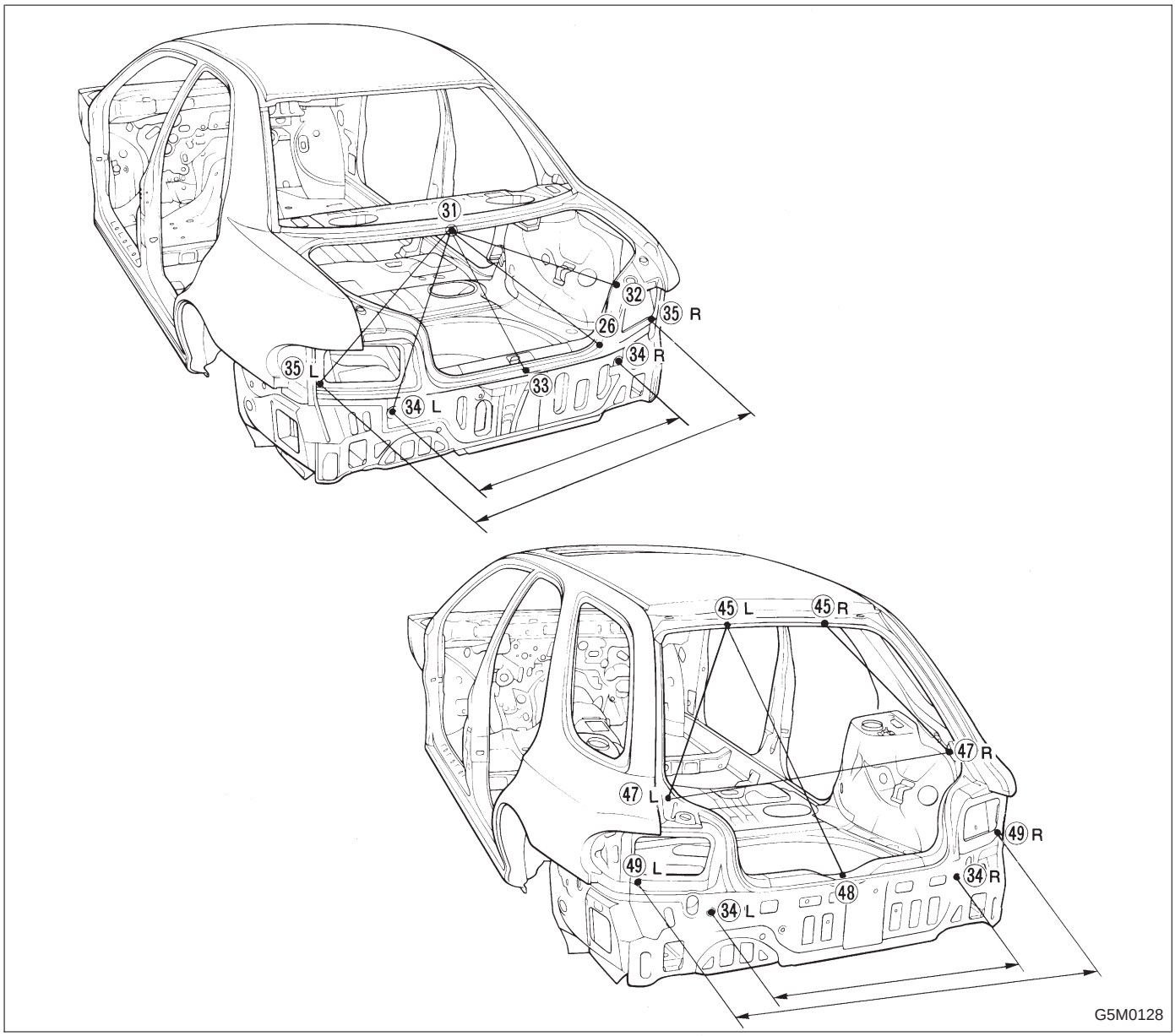


Unit: mm (in)

11	—	12	:	989 (38.94)
67 R	—	67 L	:	1,012 (39.84)
11	—	67 R	:	1,116 (43.94)
11	—	67 L		

66	—	28 R	:	714 (28.11)
66	—	28 L		
66	—	68 R	:	856 (33.70)
66	—	68 L		
68 R	—	68 L	:	1,012 (39.84)

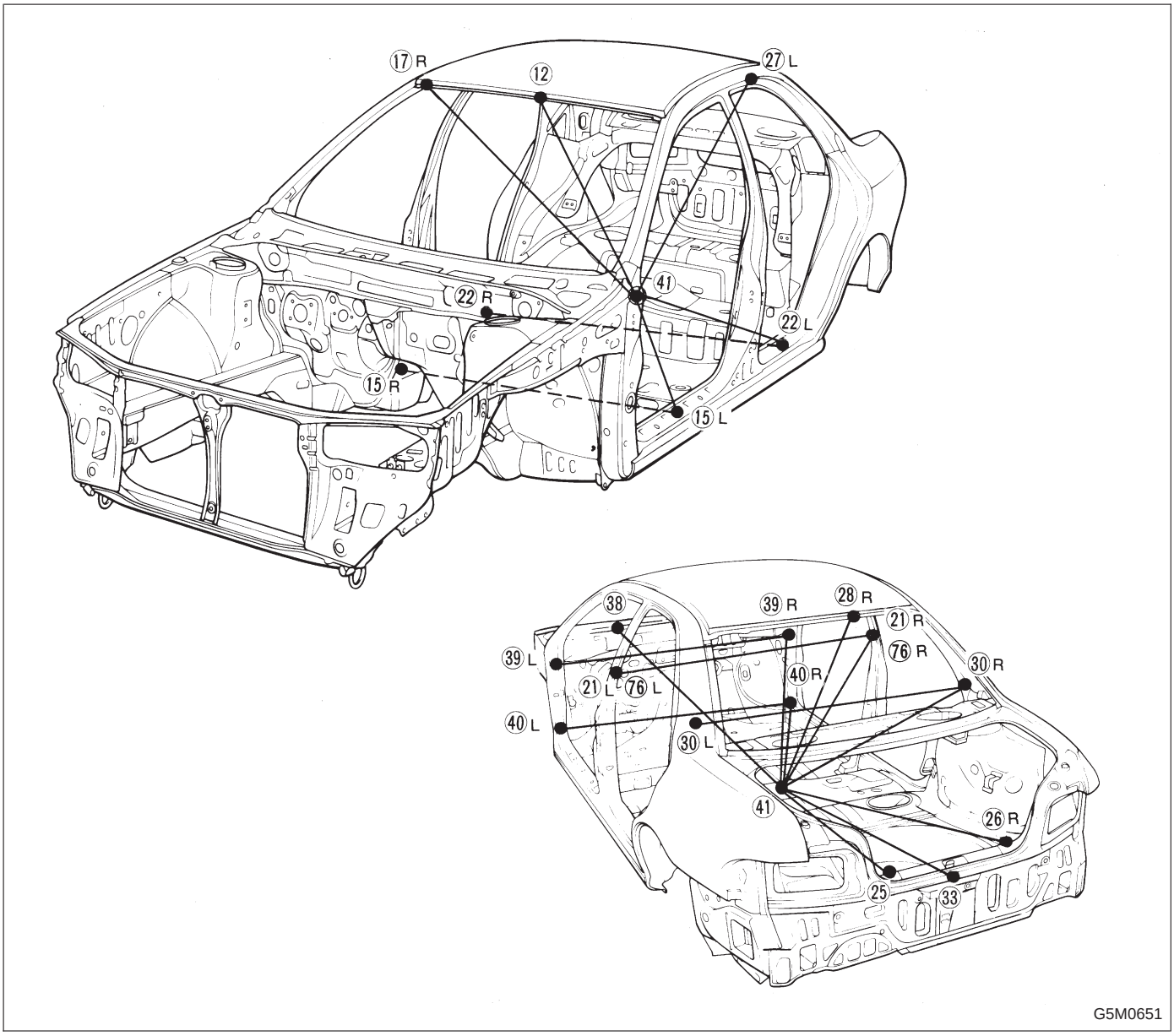
6. TRUNK LID AND REAR GATE



Unit: mm (in)

TRUNK LID				REAR GATE			
㉛	— ㉜R	:	606 (23.86)	㊺R	— ㊽	:	988 (38.90)
㉛	— ㉜L			㊺L	— ㊽		
㉛	— ㉖R	:	831 (32.72)	㊺R	— ㊼R	:	926 (36.46)
㉛	— ㉖L			㊺L	— ㊼L		
㉛	— ㉝	:	564 (22.20)	㊼R	— ㊼L	:	1,043 (41.06)
㉛	— ㉟R	:	831 (32.72)	㊾R	— ㊾L	:	1,335 (52.56)
㉛	— ㉟L			㉞R	— ㉞L	:	890 (35.04)
㉞R	— ㉞L	:	890 (35.04)				
㉟R	— ㉟L	:	1,364 (53.70)				

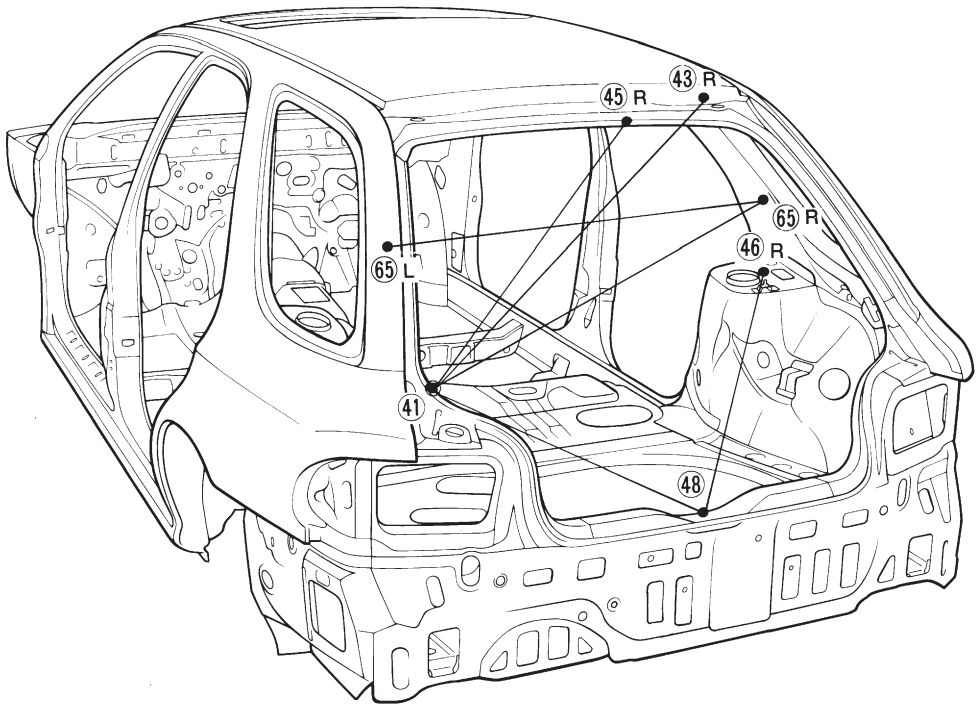
7. COMPARTMENT



Unit: mm (in)

30 R	—	30 L	:	1,197 (47.13)	41	—	15 R, 15 L	:	1,140 (44.88)	41	— 30 R, 30 L : 1,168 (45.98) (Sedan)
21 R	—	21 L	:	1,061 (41.77)							
15 R	—	15 L	:	1,453 (57.20)	41	—	22 R, 22 L	:	733 (28.86)	41	— 28 R, 28 L : 1,050 (41.34) (Sedan)
22 R	—	22 L	:	1,453 (57.20)							
39 R	—	39 L	:	1,388 (54.65)	41	—	12	:	1,156 (45.51)	41	— 21 R, 21 L : 1,038 (40.87)
40 R	—	40 L	:	1,401 (55.16)	41	—	27 R, 27 L	:	1,085 (42.72)		
41	—	38	:	1,527 (60.12)						41	— 17 R, 17 L : 1,208 (47.56)
41	—	39 R, 39 L	:	1,524 (60.00)	41	—	26 R, 26 L	:	1,568 (61.73)		
41	—	40 R, 40 L	:	1,756 (69.13)	41	—	25	:	1,184 (46.61)	41	— 33 : 1,569 (61.77) (Sedan)
										76 R	— 76 L : 1,212 (47.72) (Coupe)

8. LUGGAGE ROOM



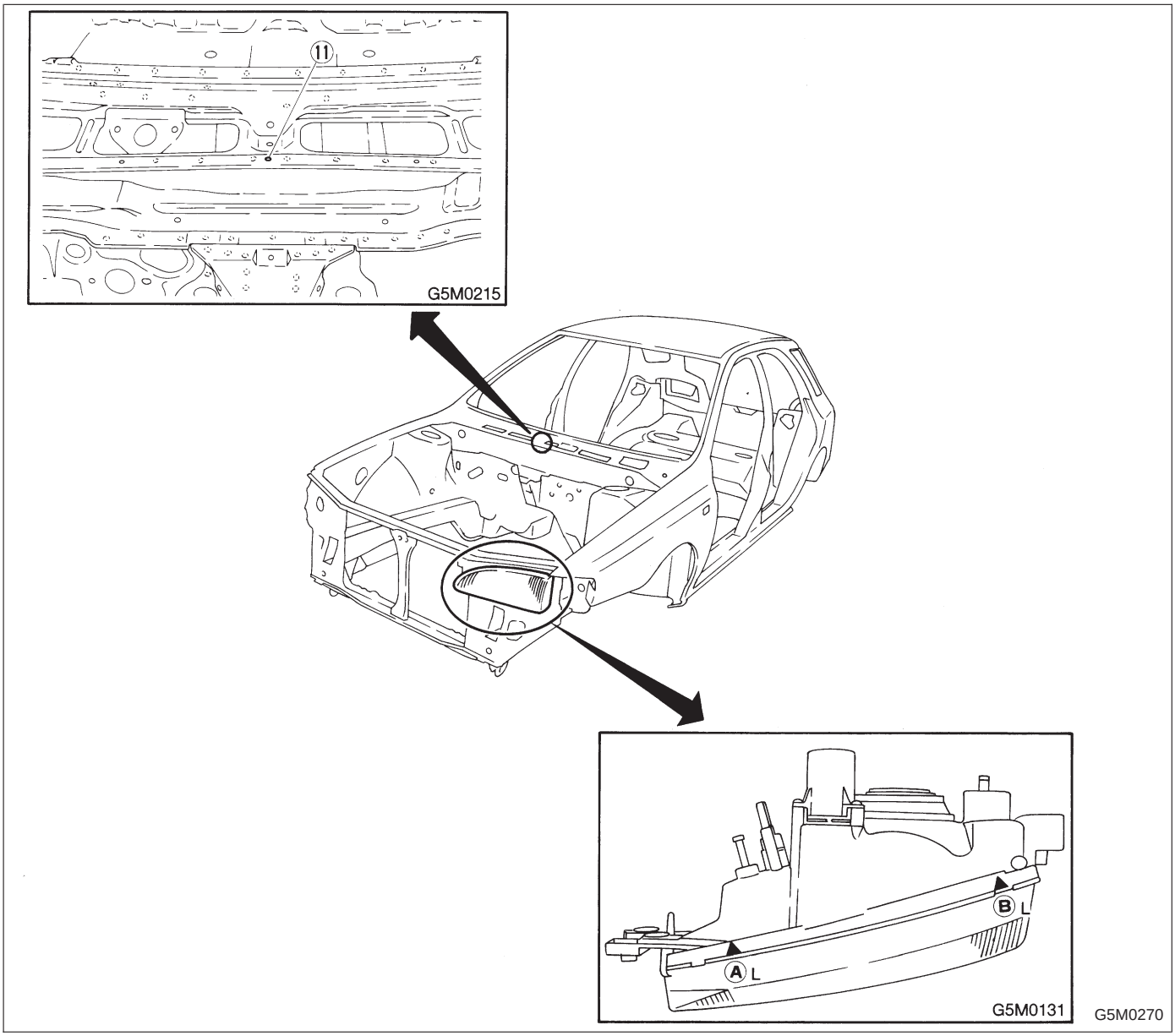
G5M0130

Unit: mm (in)

41	—	65 R	: 1,122 (44.17)	41	—	43 R	: 1,237 (48.70)
41	—	65 L		41	—	43 L	
41	—	45 R	: 1,225 (48.23)	48	—	46 R	: 971 (38.23)
41	—	45 L		48	—	46 L	
41	—	48	: 1,446 (56.93)	65 R	—	65 L	: 1,235 (48.62)

4. Datum Points and Dimensions Concerning On-Board Aiming Adjustment

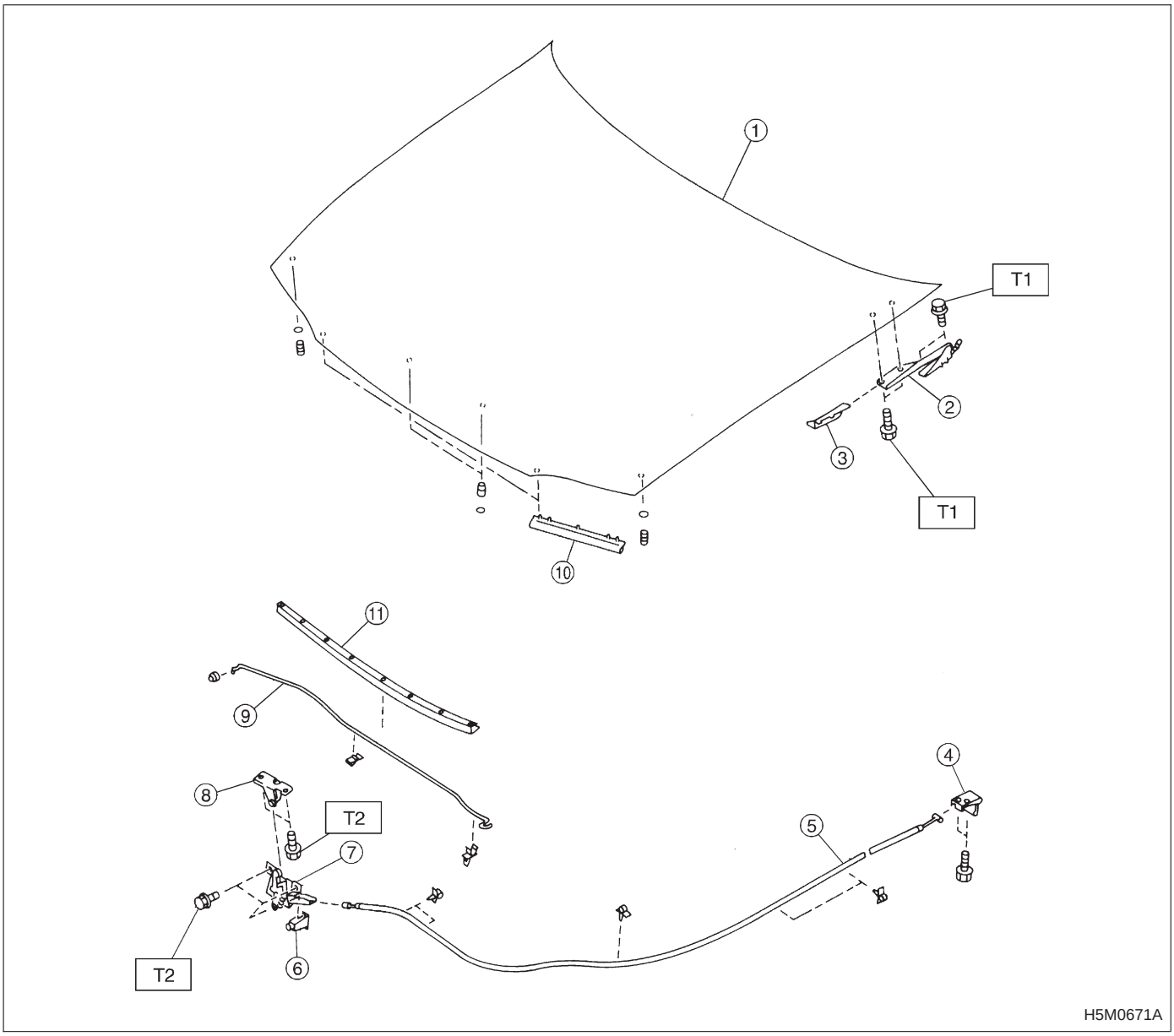
If headlight aiming is misaligned due to damaged body panel, repair headlight mating surface using body and headlight datum points as a guide.



Unit: mm (in)

11 — A L 11 — A R	:	993 (39.09)		11 — B L 11 — B R	:	1,048 (41.26)	

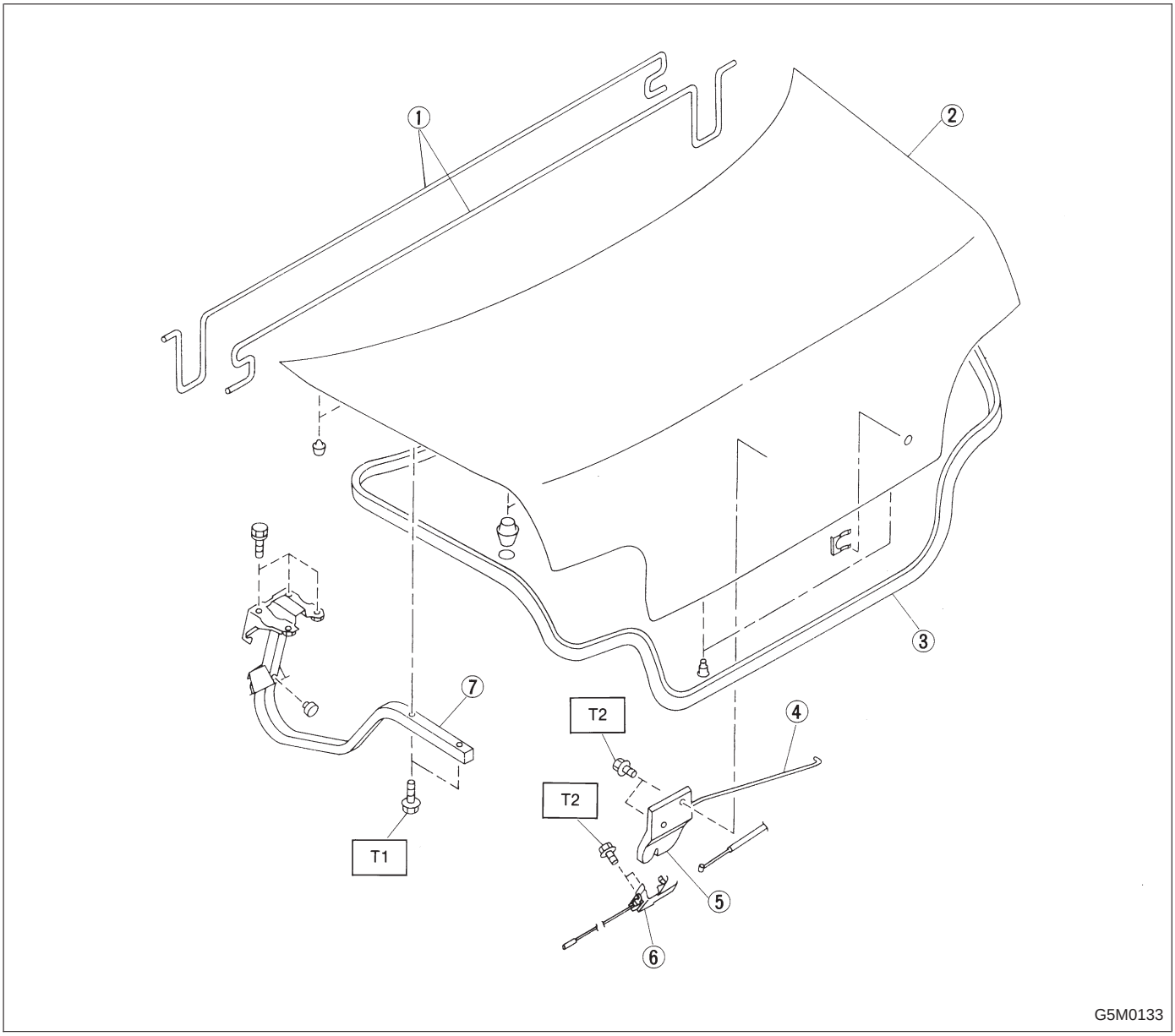
1. Front Hood and Hood Lock



① Front hood
② Hinge (RH, LH)
③ Hood hinge cover (RH, LH)
④ Lever ASSY
⑤ Cable
⑥ Stopper
⑦ Hood lock ASSY
⑧ Striker
⑨ Front hood stay
⑩ Seal (Front hood) SD
⑪ Seal (Front hood) CTR

Tightening torque: N·m (kg-m, ft-lb)
T1: 9 — 19
(0.9 — 1.9, 6.5 — 13.7)
T2: 31 — 33 (3.2 — 3.4, 23 — 25)

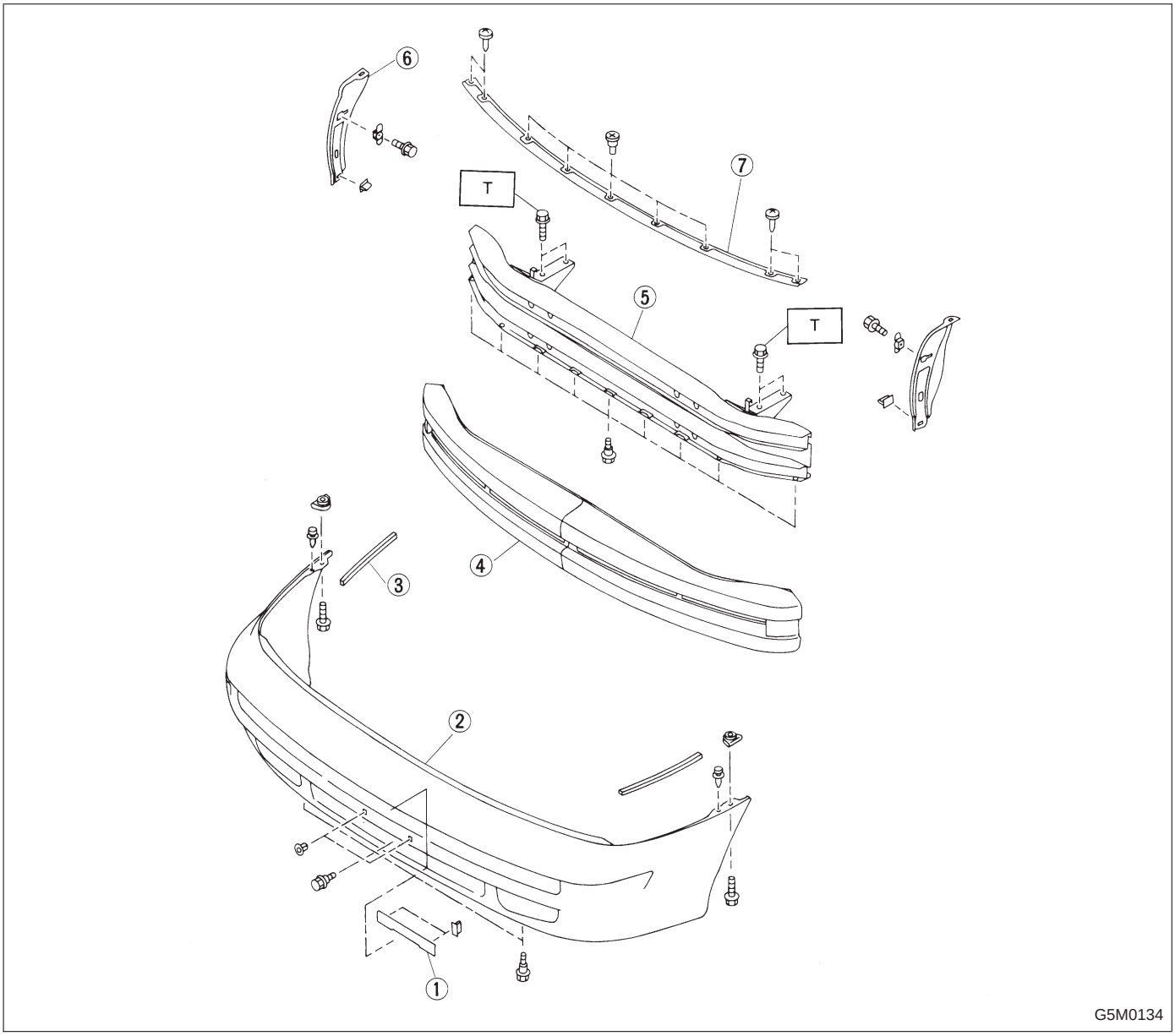
2. Trunk Lid



① Torsion bar
② Trunk lid
③ Weatherstrip
④ Rod
⑤ Trunk lid lock ASSY
⑥ Striker
⑦ Hinge ASSY

Tightening torque: N·m (kg-m, ft-lb)
T1: 10 — 18 (1.0 — 1.8, 7 — 13)
T2: 13 — 23 (1.3 — 2.3, 9 — 17)

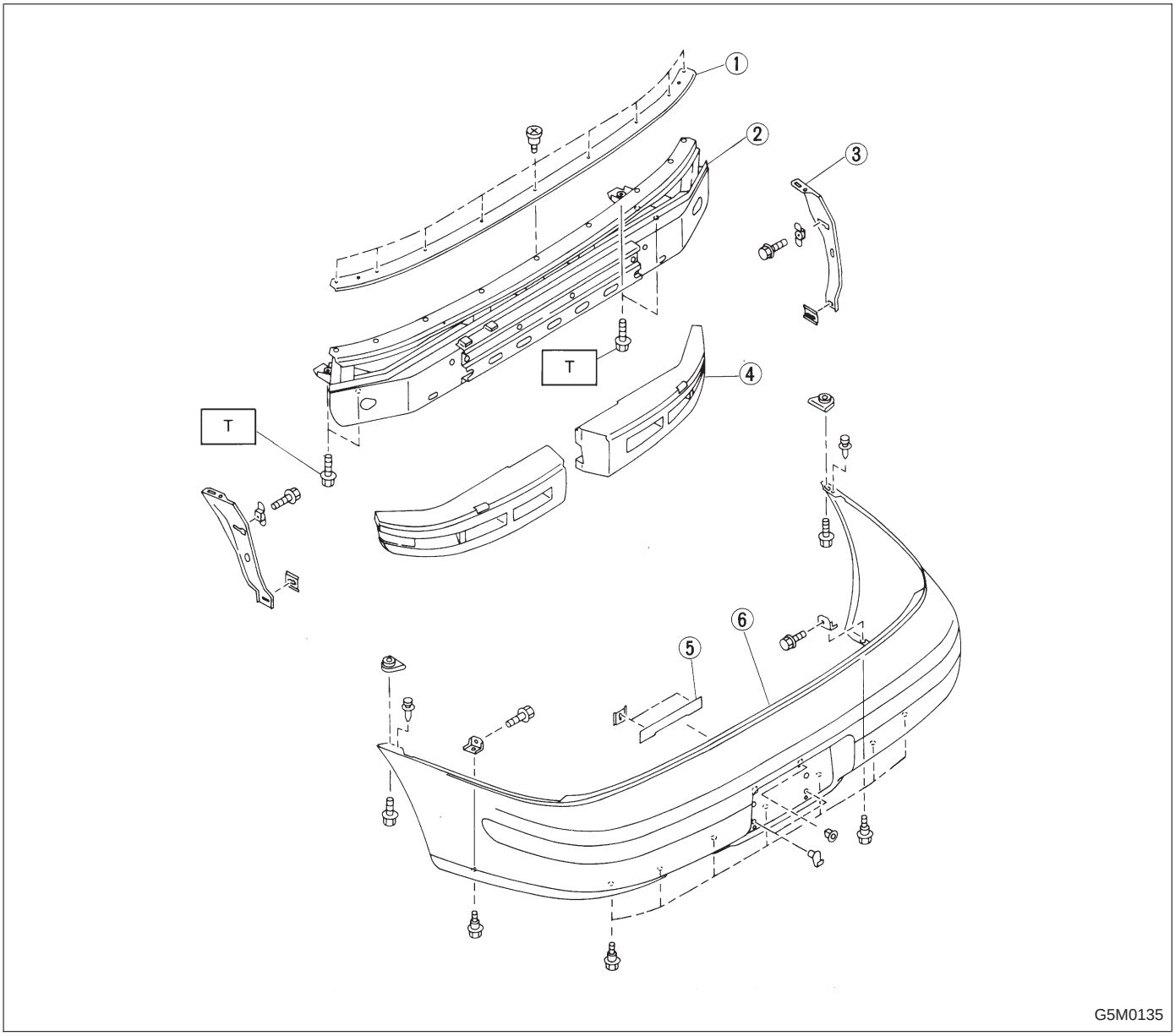
3. Front Bumper



① Plate
② Bumper face
③ Spacer
④ E/A from bumper
⑤ Front beam
⑥ Bracket (Side)
⑦ Holder upper

Tightening torque: N·m (kg-m, ft-lb)
T: 69 — 118 (7 — 12, 51 — 87)

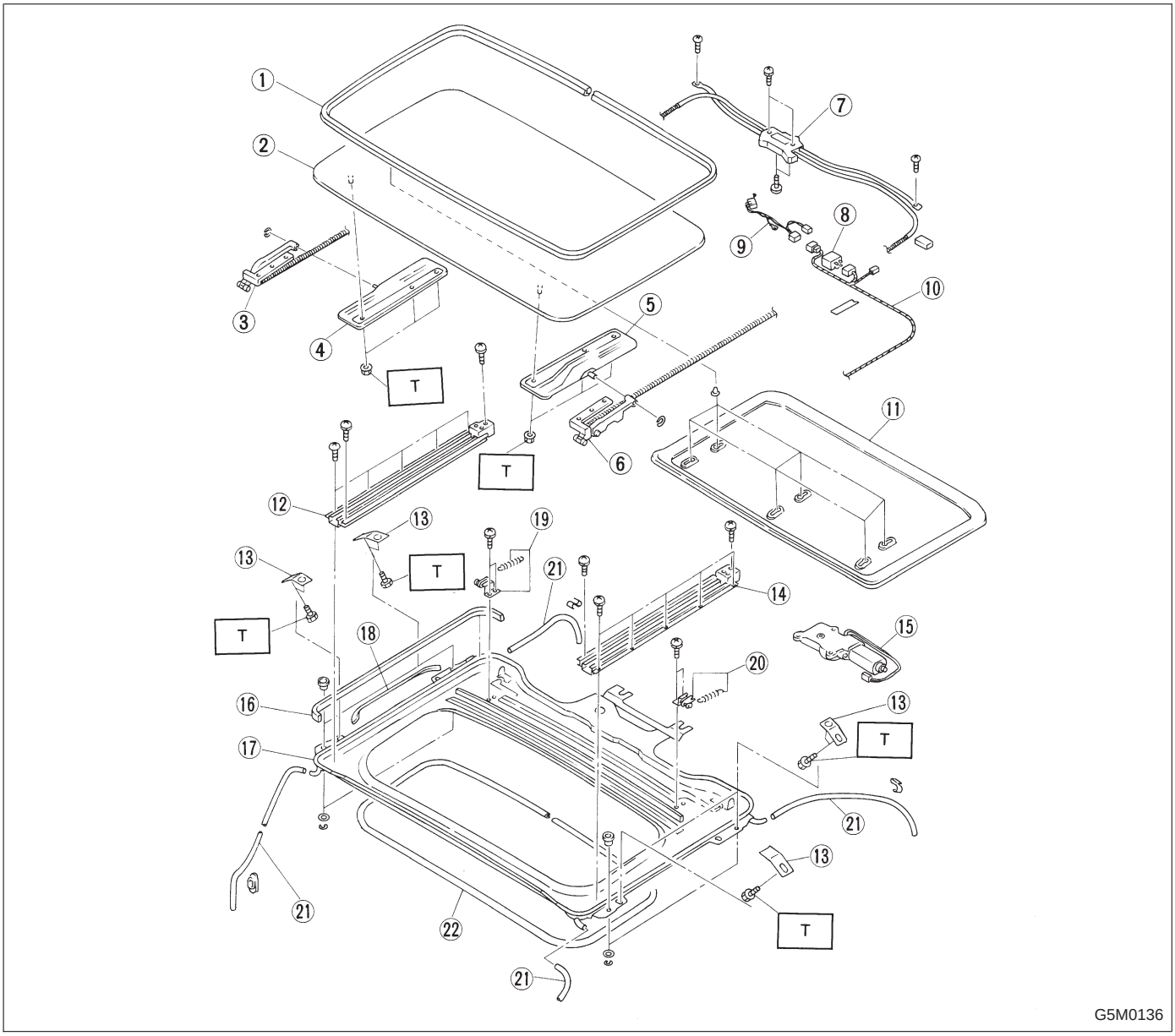
4. Rear Bumper



① Holder upper
② Bumper beam
③ Bracket (Side)
④ E/A from bumper
⑤ Plate
⑥ Bumper surface

Tightening torque: N·m (kg-m, ft-lb)
T: 69 — 127 (7 — 13, 51 — 94)

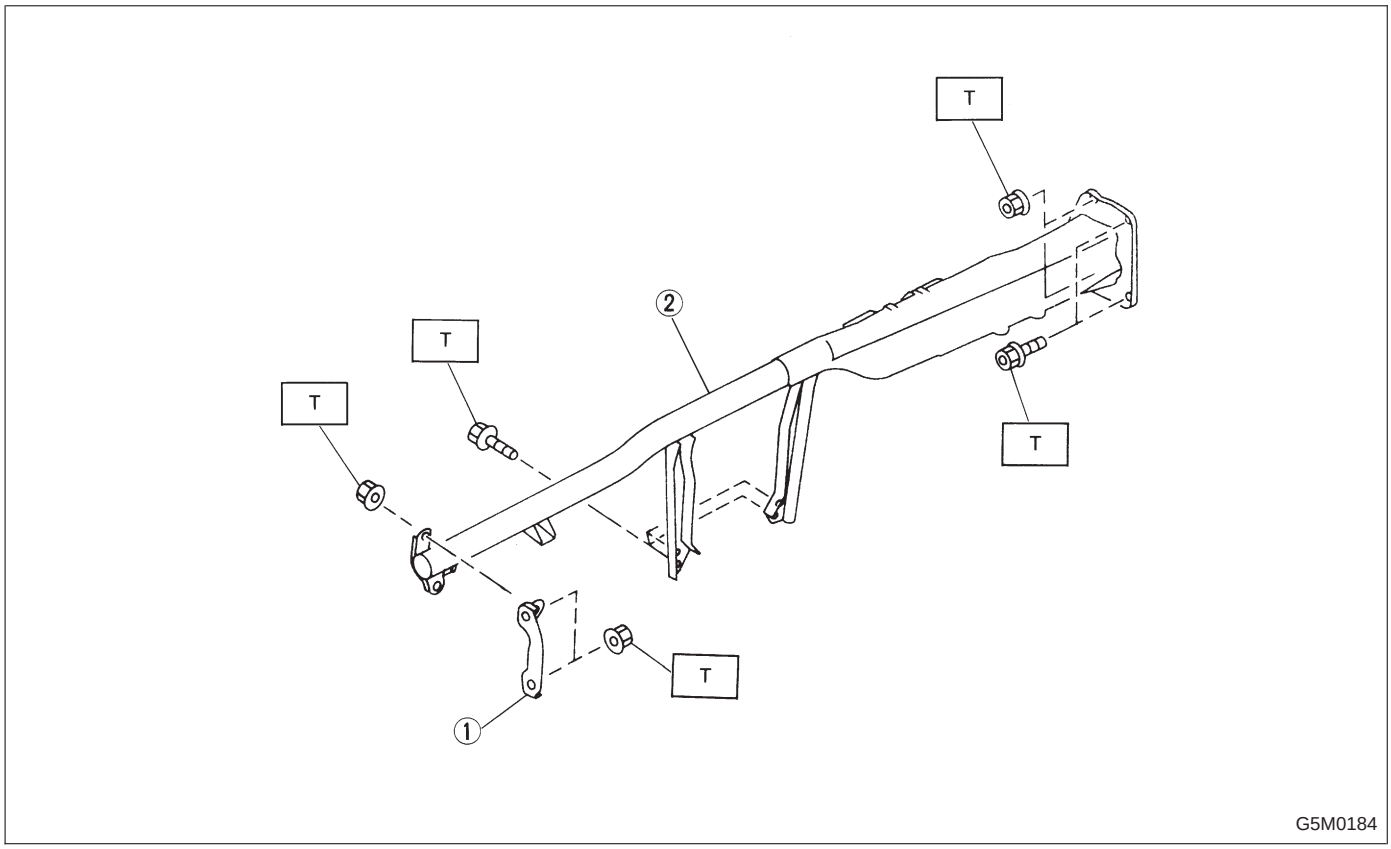
5. Sunroof



① Weatherstrip
② Sunroof panel
③ Rear guide ASSY
④ Lower panel
⑤ Lower panel
⑥ Rear guide ASSY
⑦ Drive unit
⑧ Relay
⑨ Harness
⑩ Harness
⑪ Sunroof trim
⑫ Guide rail
⑬ Set bracket
⑭ Guide rail
⑮ Motor ASSY
⑯ Sealed tape
⑰ Frame ASSY
⑱ Sealed cushion
⑲ Shutting ASSY (RH)
⑳ Shutting ASSY (LH)
㉑ Drain tube
㉒ Garnish

Tightening torque: N·m (kg-m, ft-lb)
T: 5.5 — 9.5
(0.56 — 0.97, 4.1 — 7.0)

6. Steering Support Beam



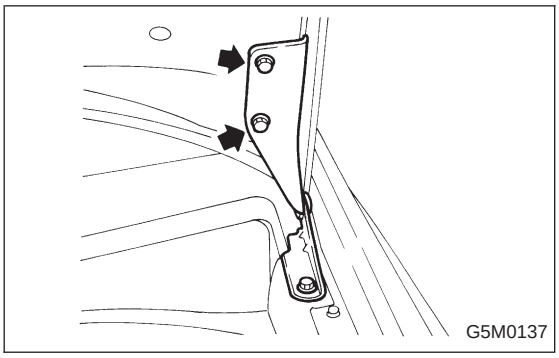
G5M0184

① Bracket
② Steering beam

Tightening torque: N·m (kg-m, ft-lb)
T: 13 — 23 (1.3 — 2.3, 9 — 17)

1. Hood

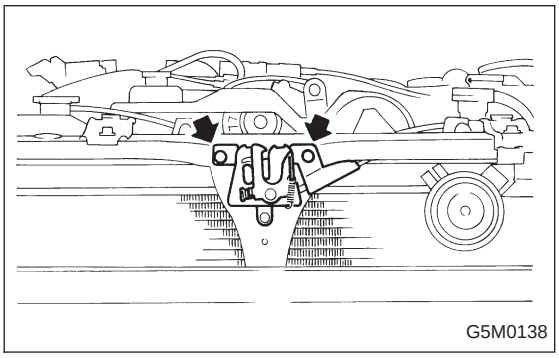
The hood lock has a dual locking design which consists of a main lock and a safety lock mechanism. When the release knob located at the front pillar on the driver's side is pulled back, the main lock is released through the cable attached to the knob.
The safety lock can be released by pushing the lever protruding above the front grill while opening the hood.


G5M0137

A: REMOVAL

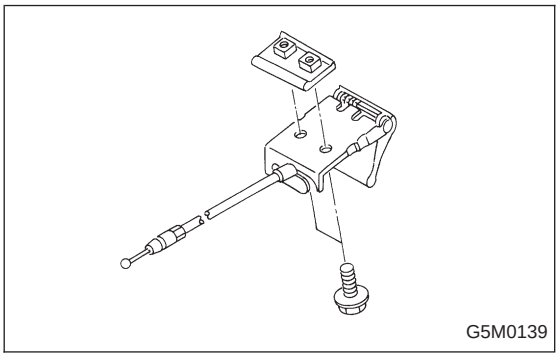
1. HOOD

1) Open front hood, and remove attaching bolt.
2) Detach front hood from hinges.


G5M0138

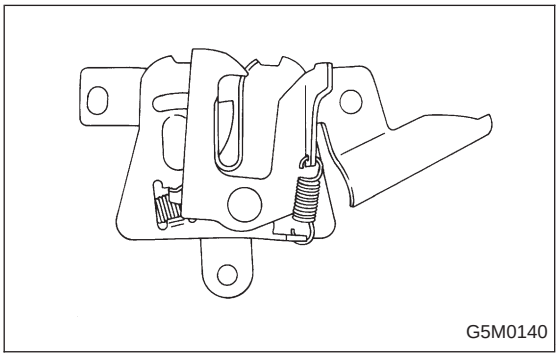
2. HOOD LOCK

1) Open front hood and remove front grille.
2) Remove bolts which secure lock assembly to radiator panel, and remove lock assembly.
3) Disconnect release cable from lock assembly.


G5M0139

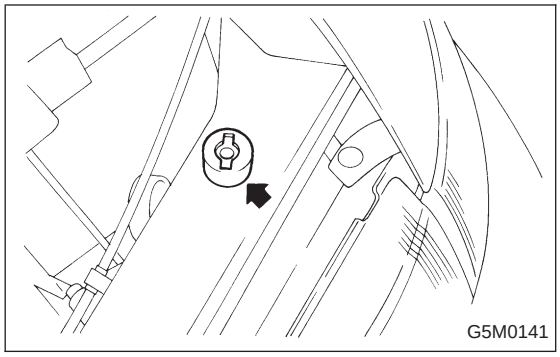
3. RELEASE CABLE

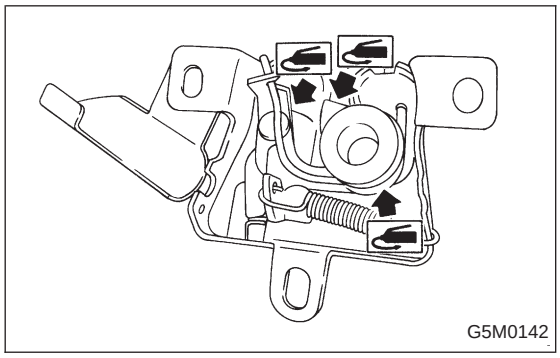
1) Remove front grille.
2) Remove release cable from lock assembly.
3) Remove cable clip from engine compartment.
4) Remove bracket from front pillar.

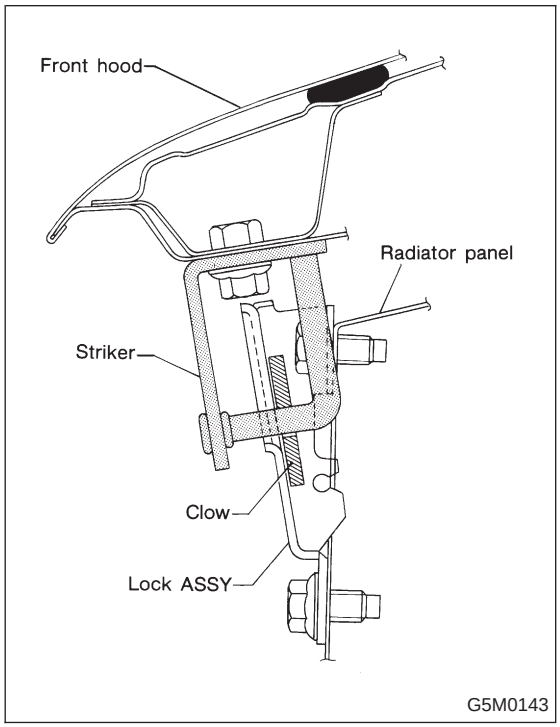

G5M0140

B: POINTS TO CHECK

1) Check striker for bending or abnormal wear.
2) Check safety lever for improper movement.
3) Check other levers and spring for rust formation and unsmooth movement.


G5M0141


G5M0142



G5M0143

C: INSTALLATION

Installation is in the reverse order of removal.

CAUTION:
Adjust buffer assembly on each end so that main lock is applied securely when hood is released from a height of approx. 20 mm (0.79 in).

NOTE:

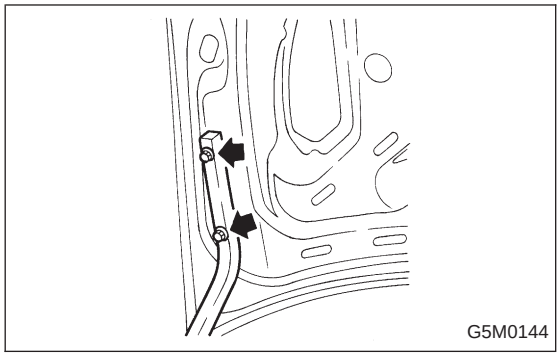
- Align the center of striker with lock during installation. Make sure safety lever is properly caught by striker under the hood's own weight.
- Route hood lock release cable and hold with clips.
- After installing release cable, ensure it operates smoothly.
- Apply grease to sliding surfaces of parts.

D: ADJUSTMENT

1) Fore-aft and left-right adjustments
Loosen striker mounting bolts and adjust fore-and-aft position of striker.

CAUTION:
Do not adjust striker position using the lock. Doing so may result in a misaligned front grille.

2) Up-down adjustment
Make up-and-down adjustment of striker only when hood does not properly contact buffer or hood is not flush with fender, or when release cable does not properly operate. Adjustment can be made by adjusting the stroke length of striker after lock assembly mounting screws are removed.

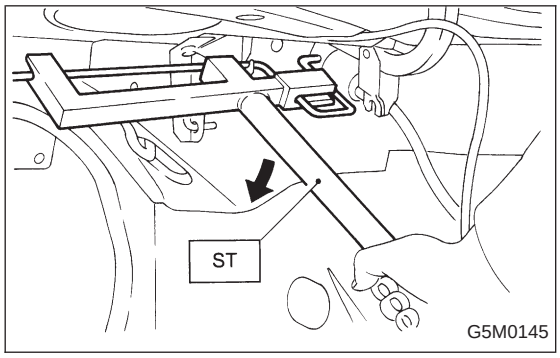

G5M0144

2. Trunk Lid

A: REMOVAL

1. TRUNK LID

1) Open trunk lid.
2) Remove trunk lid mounting bolts and detach trunk lid from hinges.



G5M0145

2. TORSION BAR

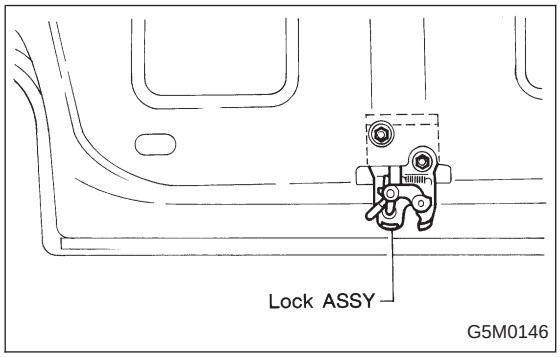
1) Open trunk lid. Remove torsion bars from hinge links using ST.

ST 927780000 REMOVER

CAUTION:
Be careful because torsion bar quickly swings back when released.

2) Remove the left and right torsion bars.

WARNING:
Be careful because trunk lid drops under its own weight when torsion bars are removed.



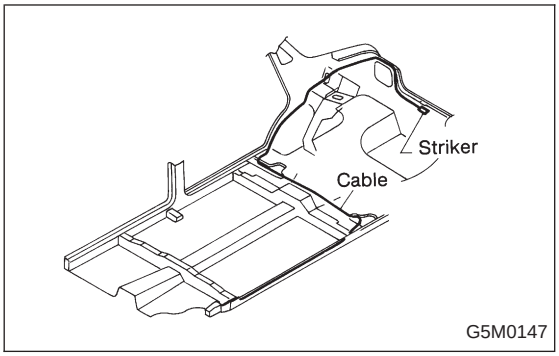
G5M0146

3. TRUNK LID LOCK ASSEMBLY AND KEY CYLINDER

1) Remove rod of lock assembly from rod holder of key lock assembly.
2) Remove bolts which hold lock assembly and remove lock assembly.

NOTE:
- Always remove rear skirt trim panel beforehand, if so equipped.
- Be careful not to bend opener cable.

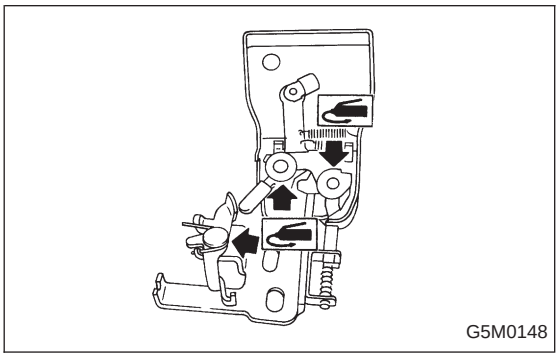
3) Remove clip and detach key cylinder from trunk lid.



4. TRUNK LID OPENER

1) Remove driver's seat, rear seats, center pillar lower cover, floor mat, rear arch cover and side sill cover (on the driver's side).
2) Remove all clips which hold cable.
3) Disconnect cable from pull handle assembly.
4) Remove bolts and detach pull handle assembly.
5) Loosen bolts which hold lock assembly, and remove it.
6) Remove striker from trunk lid.
7) Disconnect cable from striker.

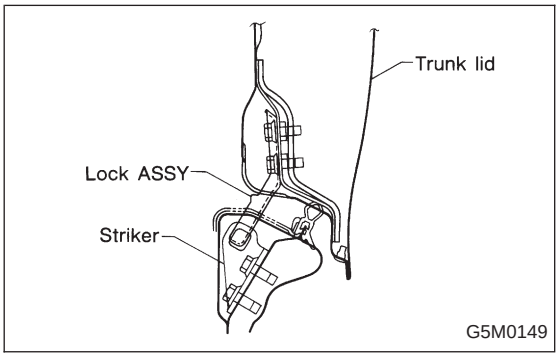
NOTE:
Be careful not to bend or break cable.



B: INSTALLATION

Installation is in the reverse order of removal.

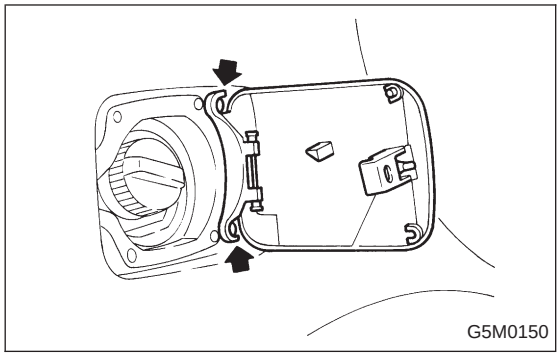
CAUTION:
● When installing cover to pull handle assembly, observe the following:
● Be careful not to catch harness.
● Engage pull handle assembly pawls firmly.
● After installing opener cable, ensure it moves smoothly.
● Apply a coat of grease to the rotary section of hinges and contact surfaces of torsion bars.
● Apply grease to sliding surfaces of lock assembly and striker.



C: ADJUSTMENT

1. TRUNK LID

1) To adjust left-right lid positioning, loosen bolts which hold trunk lid to hinges.
2) To adjust up-down lid alignment, place washer(s) between trunk lid and hinges or move trunk lock assembly up or down.

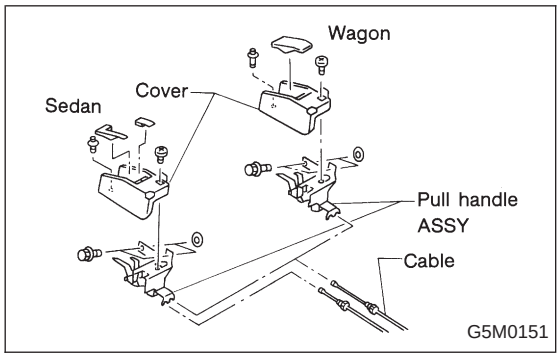

G5M0150

3. Fuel Flap

A: REMOVAL

1. FUEL FLAP

Remove bolts which hold hinge to car body, and detach fuel flap and hinge as a unit.



G5M0151

2. FUEL FLAP OPENER

1) Remove driver's seat, rear seats, center pillar lower cover, floor mat, rear arch cover/rear quarter trim (wagon), and side sill cover (on the driver's side).
2) Remove all clips which hold cable.
3) Disconnect cable from pull handle.
4) Detach pull handle by removing bolts.
5) Detach fuel lock holder by turning it.

B: INSTALLATION

Installation is in the reverse order of removal.

CAUTION:
● When installing cover to pull handle assembly, observe the following:
● Be careful not to catch harness.
● Engage pull handle assembly pawls firmly.
● Make sure the clearance between fuel flap and car body is equal at all points.
● After installing opener cable, ensure it moves smoothly.

4. Repair Instruction for Fuel Flap

1. MOLDED PART SURFACE REPAIR

The molded resin material differs in its properties from PP (polypropylene) used as bumper surface covering material. If its surface is scratched, the affected area can be easily repaired by sanding with grit sandpaper. A dent can also be filled using a method similar to that used for steel panel repair.

2. REFINISHING

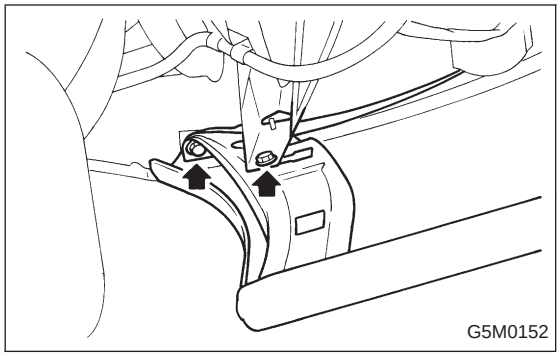
The repaired resin material surface or material requiring only surface coating can be applied with primer and top-coat after foreign matter (dirt, dust, etc.) is removed. Paint used for repairing steel plates can also be applied for refinishing resin material.

3. PROCESS STEPS

Process No.	Process name	Job contents		
1	Sanding ①	If damage penetrates molded material, water sand damaged and molded material surfaces affected using sand paper (#500 to #1000).		
2	Degreasing ① (Cleaning)	Clean off dirt, dust, oil/grease, etc., using white gasoline or alcohol.		
3	Filling	Apply filler (polyester or epoxy) evenly to dented portion (which results from sanding ① above.		
4	Sanding ②	Sand filler smooth, as required, using sand paper (#500 to #1000) and water.		
5	Degreasing ② (Cleaning)	Clean off foreign matter (dust, dirt, oil/grease, etc.) using white gasoline or alcohol.		
6	Undercoating (Primer coating)	Apply primer to the entire filler range (and sanded resin material, if necessary). ● Film thickness: Approx. 5 µm ● Spray pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)		
7	Drying ①	Allow to dry in accordance with paint-baking requirements to be used. Ex.: Urethane-based paint ... 30 minutes at 80°C (176°F)		
8	Sanding ③	Sand filler (Primer surface) smooth using sand paper (#500 to #1000), as required.		
9	Degreasing ③ (Cleaning)	Wipe off foreign matter (dust, dirt, oil/grease, etc.) using white gasoline or alcohol.		
10	Top coating (I)	Solid color	Metallic color	Mica color
		Apply paint using spray gun. ● Film thickness: 30 — 40µ ● Spray pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)	Apply color coat using spray gun. ● Film thickness: 20 — 30µ ● Spray pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)	Apply color coat using spray gun. ● Film thickness: 35 — 45µ ● Spray pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)
11	Air drying ①	Leave coated surface at room temperature [20°C (68°F)] for approx. 10 minutes until it is half-dry.		
12	Drying ②	Solid color	Metallic color	Mica color
		Dry at 80°C (176°F) for 30 minutes.	Unnecessary.	Dry at 80°C (176°F) for 30 minutes.

Process No.	Process name	Job contents		
13	Top coating (II)	Unnecessary.	Apply clear coat to color coat. ● Film thickness: 20 — 30μ ● Spray pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)	Apply mica coat to color coat. ● Film thickness: 20 — 30μ ● Spray pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)
14	Air drying ②	Unnecessary.	Allow to half-dry at 20°C (68°F) for approx. 20 minutes.	
15	Drying ③	Unnecessary.	Dry at 80°C (176°F) for 10 minutes.	Unnecessary.
16	Top coating (III)	Unnecessary.	Unnecessary.	Apply clear coat to mica coat. ● Film thickness: 20 — 30μ ● Spray pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)
17	Air drying ③	Unnecessary.		Allow to half-dry at 20°C (68°F) for 10 minutes.
18	Drying ④	Unnecessary.	Unnecessary.	Allow to dry at 80°C (176°F) for 30 minutes.
19	Final inspection	Check the condition of refinished areas.		

NOTE:
Processes Nos. 1 through 4 refer to work required when damage penetrates the resin material.


G5M0152

5. Front Bumper AIRBAG

A: REMOVAL

SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

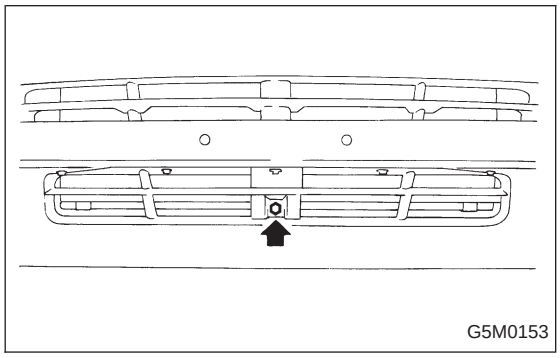
Airbag system wiring harness is routed near the front bumper assembly.

CAUTION:

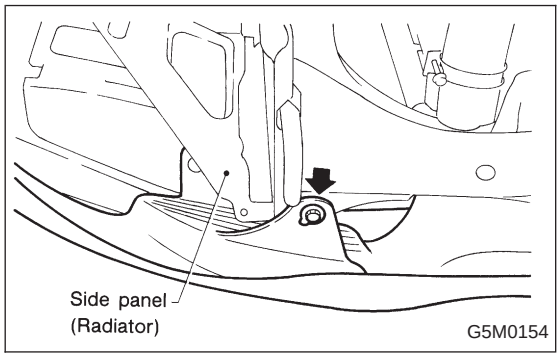
● All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.

● Be careful not to damage Airbag system wiring harness when servicing the front bumper assembly.

1) Disconnect the ground cable from the battery.
2) Remove the canister.
3) Remove the front grille.
4) Remove the parking light and headlight LH.
5) Remove the mud guard.
6) Remove bolts from side of bumper.

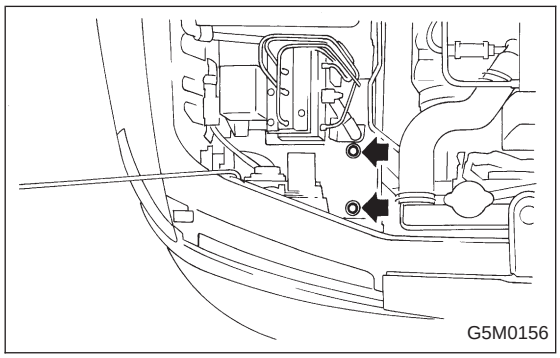

G5M0153

7) Remove bolt from lower center of bumper.

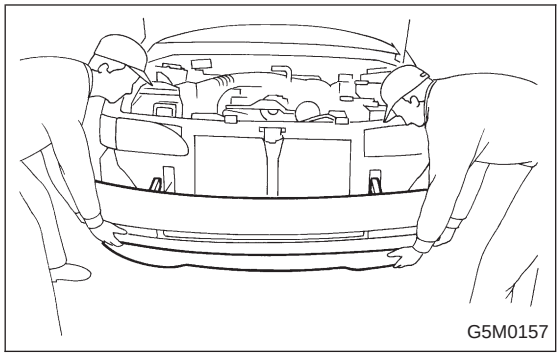


G5M0154

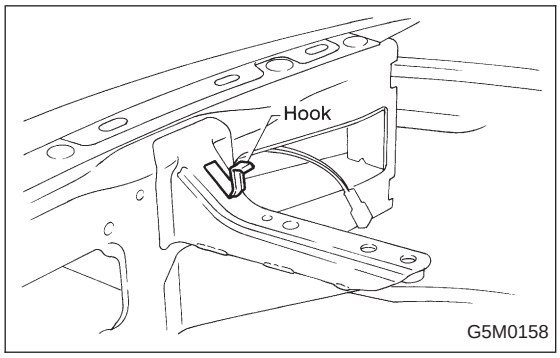
8) Remove bolts from lower side of bumper.


G5M0156

9) Remove bolts (engine compartment side) from bumper stays.
10) Remove turn signal light connector.


G5M0157

11) Remove bumper assembly.

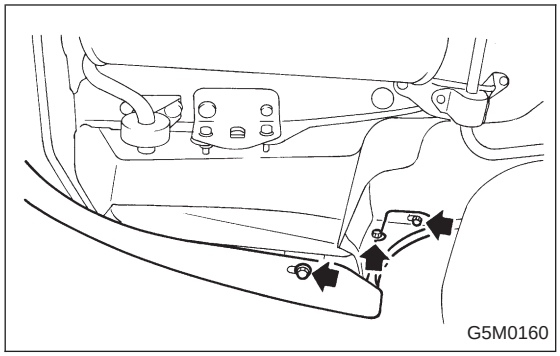


G5M0158

B: INSTALLATION

To install the front bumper, reverse the above removal procedures.

CAUTION:
● Be extremely careful to prevent scratches on bumper face as it is made of resin.
● Be careful not to scratch the body when removing or installing the bumper.
● To facilitate installation of front bumper, attach hook (located at stay) to body panel.

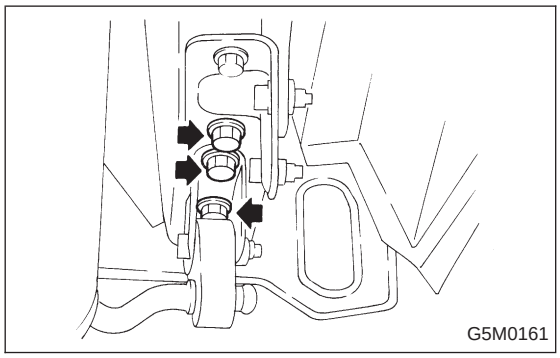

G5M0160

6. Rear Bumper

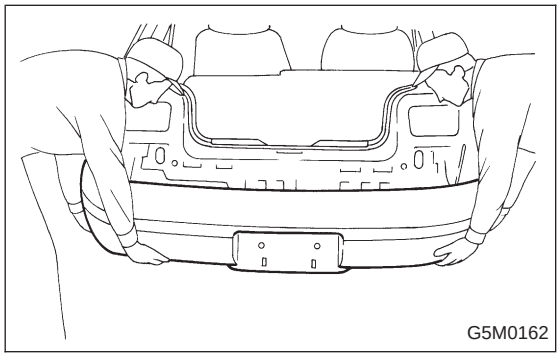
A: REMOVAL

1. SEDAN AND COUPE

1) Open trunk lid. Remove trunk trim panel clips and detach trim.
2) Disconnect license plate light connector.
3) Remove bolts from side of bumper.


G5M0161

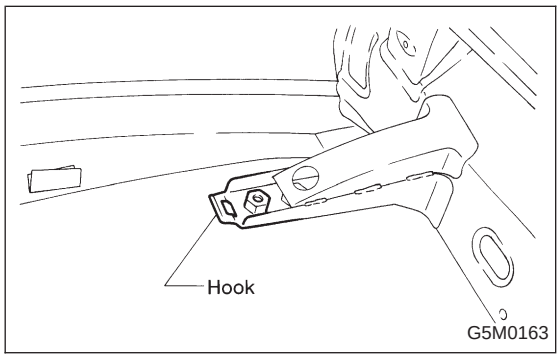
4) Remove bolts from bumper stay.


G5M0162

5) Remove rear bumper.

2. WAGON

1) Open rear gate and rear quarter trim lid.
2) Disconnect license plate light connector.
3) Remove bolts from side of bumper.
4) Remove bolts from bumper stays.
5) Remove bumper assembly.



G5M0163

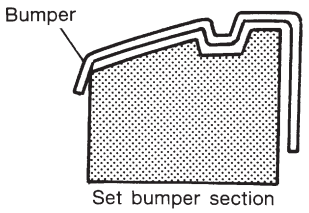
B: INSTALLATION

To install the rear bumper, reverse the above removal procedures.

CAUTION:
● Be extremely careful to prevent scratches on bumper face as it is made of resin.
● Be careful not to scratch the body when removing or installing bumper.
● To facilitate installation of rear bumper, attach hook (located at stay) to body panel.

7. Coating Method for PP Bumper

1. PROCESS STEPS

Process No.	Process name	Job contents	
1	Bumper mounting	Set 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 minute 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.	

8. Repair Instructions for Colored PP Bumper

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.

1. 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 sandpaper 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>

2. DEEP DAMAGE CAUSED BY SCRATCHING FENCES, ETC.

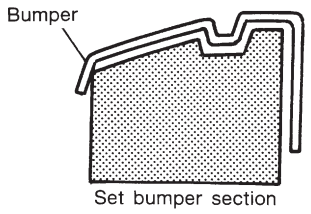
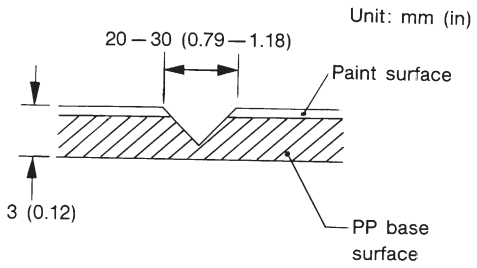
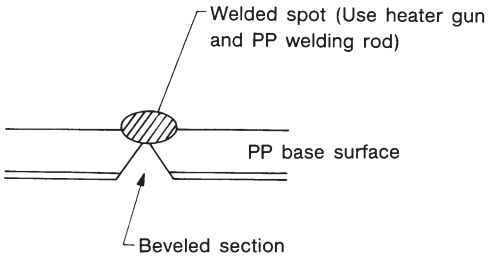
A dent cannot be repaired but a whitened or swelled part can be removed.

<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 sandpaper.</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>

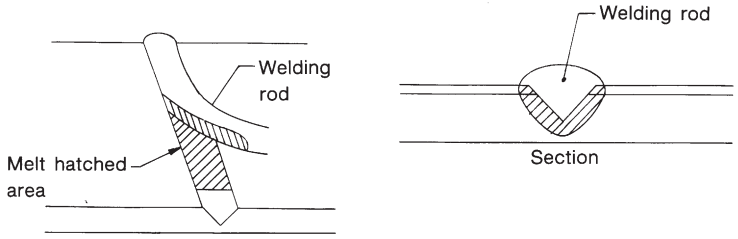
3. DEEP DAMAGE SUCH AS A BREAK OR HOLE THAT REQUIRES FILLING

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.)

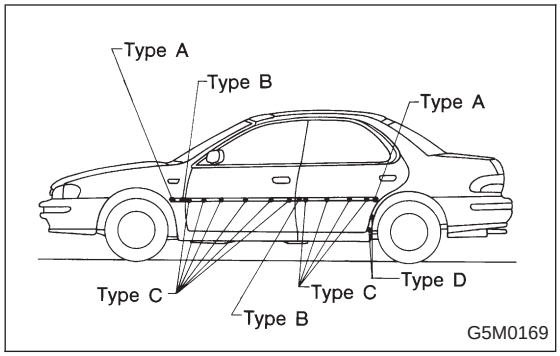
Recommended repair kit: PP Part Repair Kit (NRM)

Process No.	Process name	Job contents	
1	Bumper removal	Remove bumper as required.	
2	Part removal	Remove parts built into bumper as required.	
3	Bumper placement	Place 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 is 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 sandpaper (#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 sandpaper (#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 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 sandpaper and water.

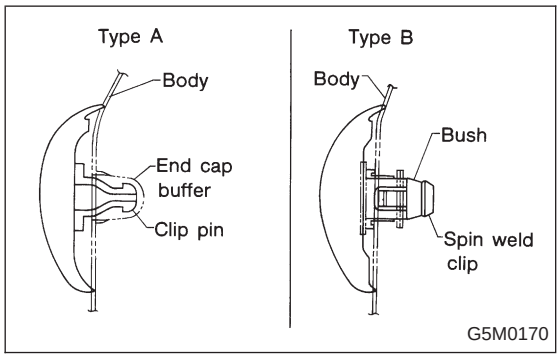
Process No.	Process name	Job contents	
18	Cleaning/degreasing	Same as Process No. 12.	
19	Top coat (I)	Solid color	Metallic color
		Use a “block” coating method. ● Recommended paint: Suncryl (SC) No. 307 Flex Hardener SC Reducer (thinner) ● Mixing ratio: 3 : 1 (Suncryl: No. 307) ● Viscosity: 11 — 13 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: No. 307) ● 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 (SC710: No. 307) ● 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 masking tape applied in Process No. 11 and 13.	
25	Parts installation	Install parts on bumper in reverse order of removal.	
26	Bumper installation	Install bumper.	



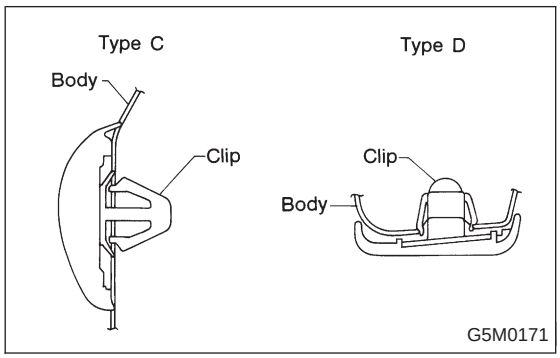
9. Body Protector

A: REMOVAL

NOTE:
Do not re-use protector.



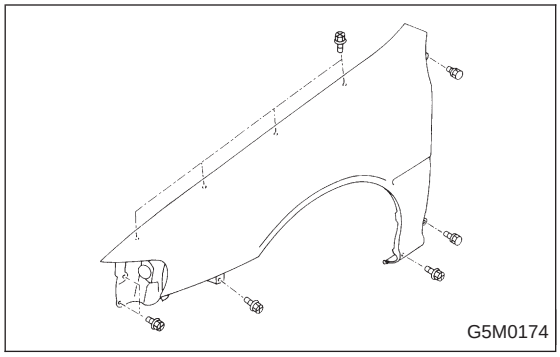
Type A and B: Protector is attached to body with clips.
While holding end of protector by hand, force protector out.



Type C: Protector is attached to body with clips.
Remove door inner trim, and detach protector by pushing clip pawl from inside.
Type D: Protector is attached to body with clips.
While holding end of protector by hand, force protector out.

B: INSTALLATION

Type A: Insert clip pins into holes in body, then fit end cap buffers into place.
Type B: Insert spin weld clips into holes in body, then fit bushings into place.
Type C and D: Align the clips with holes in body and insert them.
NOTE:
Install clips in standard holes first.



10. Front Fender AIRBAG

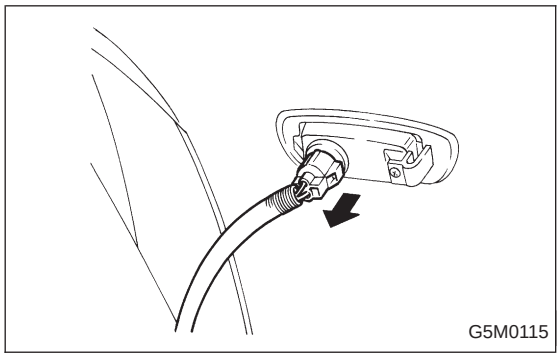
A: REMOVAL

SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the front fender.

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 Airbag system wiring harness when servicing the front fender.**

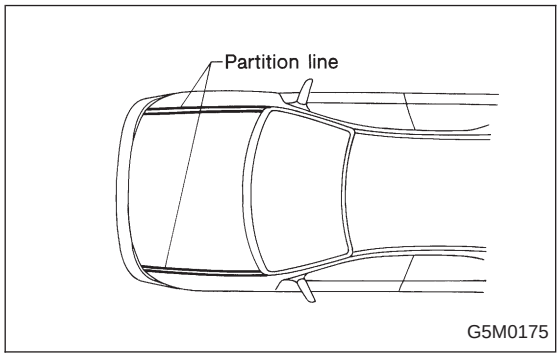

G5M0115

1) Disconnect ground cable from battery.
2) Remove mud guard.
3) Remove parking light and headlight.
4) Remove front bumper.
5) Remove bolts which secure fender to radiator panel and turn signal light connector.
6) Remove body protector. (This step may be skipped if fender is to be reused.)
7) Remove attaching bolt to remove fender.

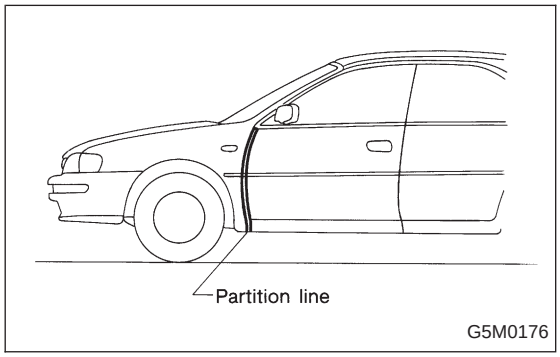
CAUTION:
Be careful not to scratch body panels with fender edges when removing it.

B: INSTALLATION

1) Installation is in the reverse order of removal.
2) Check for alignment of front fender with hood and front door with front fender at all points. Adjust, if necessary.



G5M0175



G5M0176

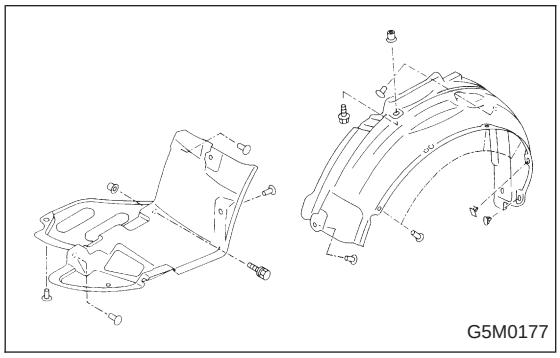
11. Mud Guard and Arch Protector AIRBAG

A: REMOVAL

SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

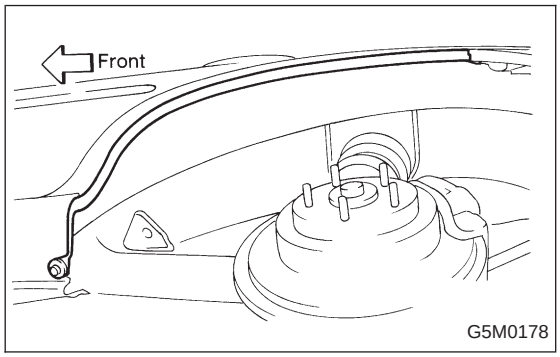
Airbag system wiring harness is routed near the mud guard.

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 Airbag system wiring harness when servicing the mud guard.


G5M0177

1. MUD GUARD

1) Jack-up car to remove tire.
2) Remove screws and clips. Move mud guard toward the center of the body and remove mud guard.



G5M0178

2. REAR ARCH PROTECTOR

1) Remove clip and screws.
2) Remove arch protectors.

B: INSTALLATION

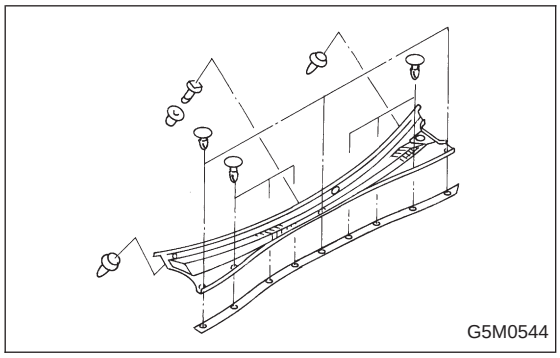
Installation is in the reverse order of removal.

CAUTION:
Only use new nuts and clips.

12. Cowl Panel

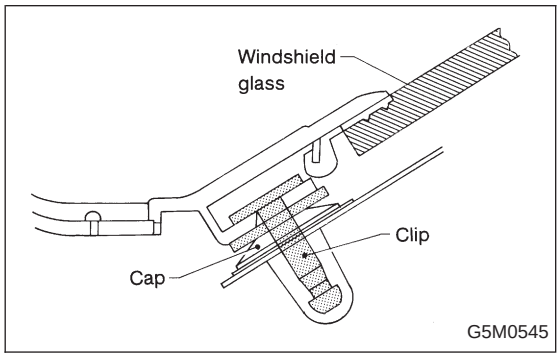
A: REMOVAL

1) Remove wiper arms.
2) Open front hood.
3) Pry clip off front hood seal using a screwdriver.
4) Lift cowl panel and remove clips from windshield.


G5M0544

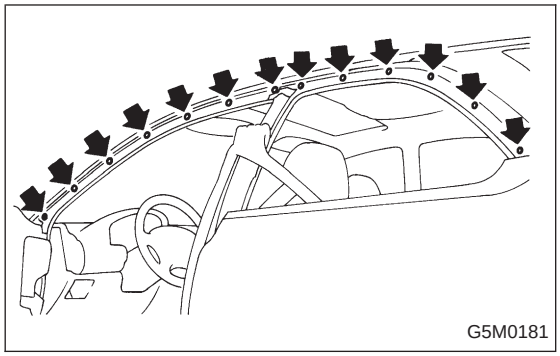
B: INSTALLATION

1) Install clips on cowl panel.
2) Install cap on front panel.
3) Install front hood seal attaching clip on cowl panel.



G5M0545

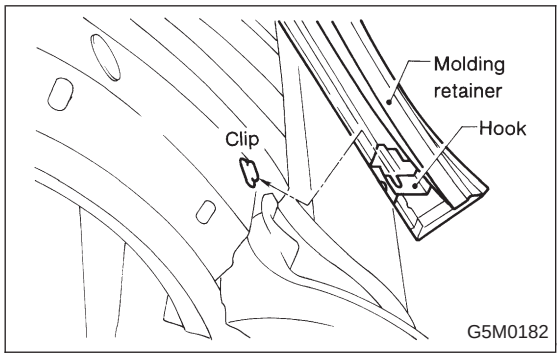
4) Install middle clip and other clips in that order.


G5M0181

13. Molding and Retainer

A: REMOVAL

1) Remove weatherstrip.
2) Remove tapping screws.

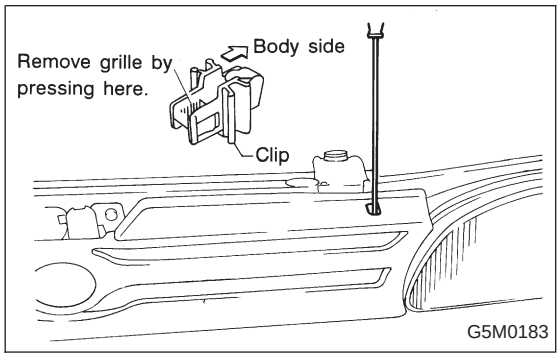


G5M0182

B: INSTALLATION

Installation is in the reverse order of removal.

NOTE:
Insert clips onto hooks, then fasten with screws.



G5M0183

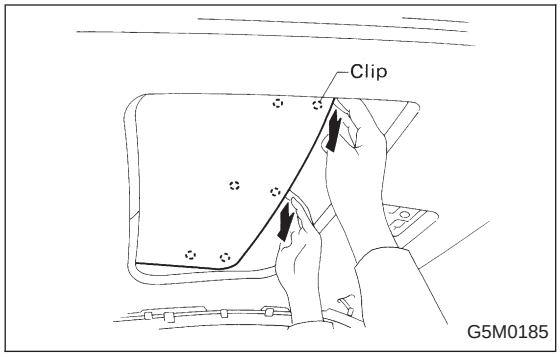
14. Front Grille

A: REMOVAL

Remove two upper clips from body panel. To facilitate removal, press portion shown in figure using screwdriver while lightly pulling front grille.

B: INSTALLATION

Attach clip to grille. Align it with clip hole in body and push it into place.

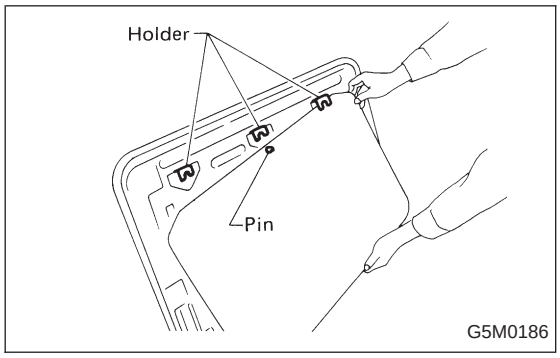


15. Sunroof

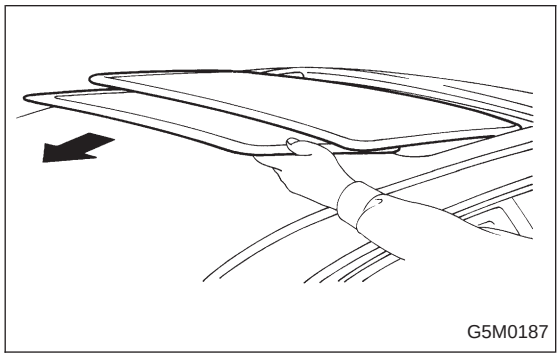
A: REMOVAL

1. SUNROOF PANEL

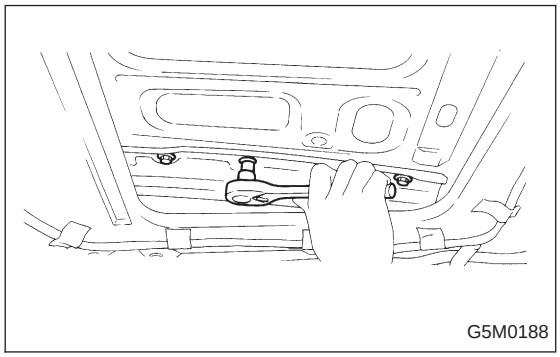
1) Open sunroof approx. 1/3.
2) Remove clips attached to front side of sunroof trim by pulling trim from inside of compartment.



3) Move trim forward, and detach trim end from holder.

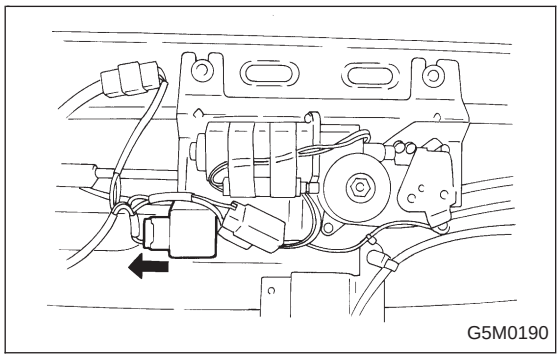


4) Detach trim.



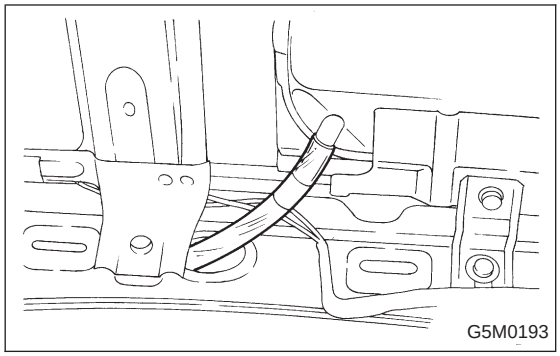
5) Close sunroof and remove nuts.
6) Remove sunroof panel.
7) Installation is in the reverse order of removal.

NOTE:
Sunroof trim reference pin must be fitted in holder notch.



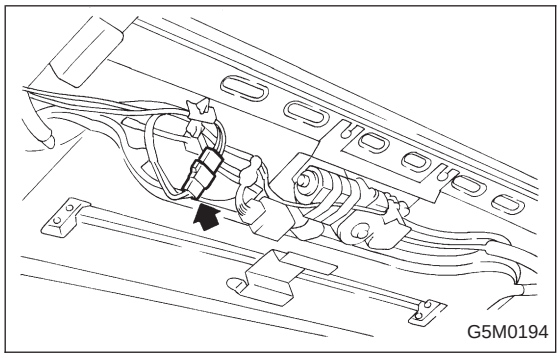
2. SUNROOF MOTOR AND RELAY

1) Remove roof trim, rear quarter trim, pillar trim, etc. <Ref. to 5-3.>
2) Remove screw.
3) Disconnect connector.
4) Remove relay by pulling it out.

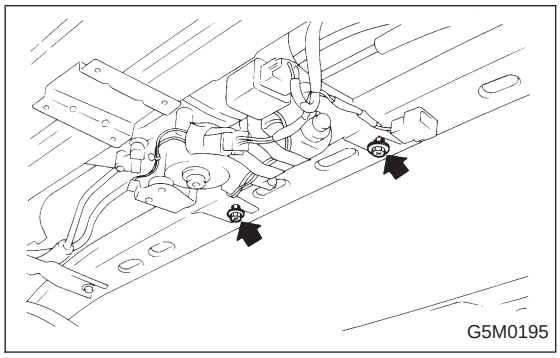


3. SUNROOF FRAME

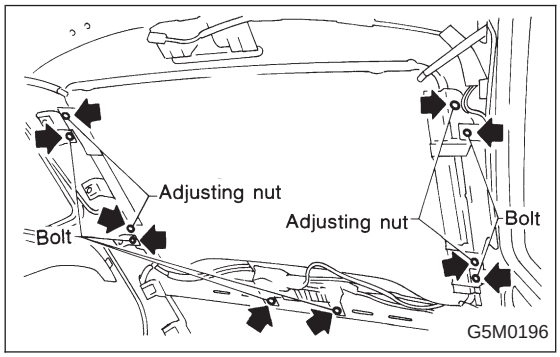
1) Remove roof trim, rear quarter trim, pillar trim, etc. <Ref. to 5-3.>
2) Remove sunroof panel.
3) Disconnect front and rear drain tubes.



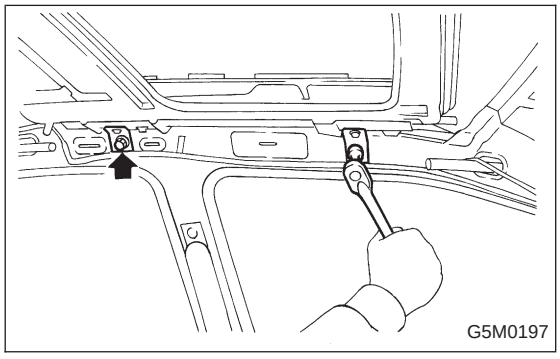
4) Disconnect connector between body harness and sunroof harness.



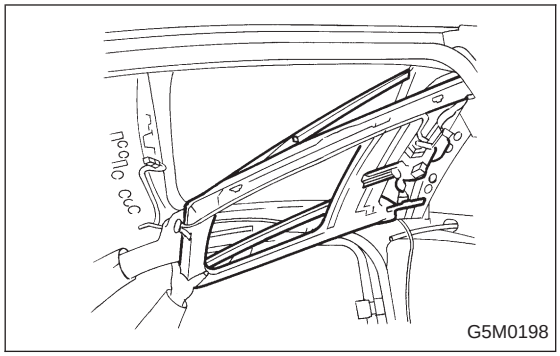
5) Loosen two mounting bolts near motor. (Do not remove bolts.)



6) Remove six bolts, and four adjusting nuts.

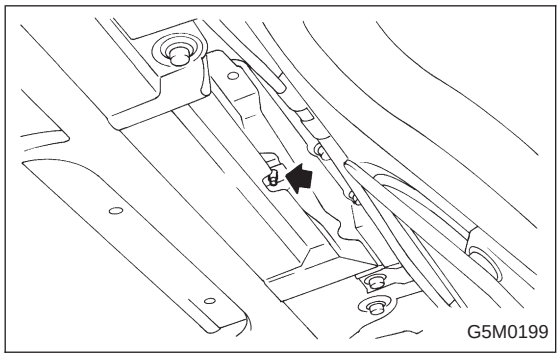


7) Remove sunroof frame.
8) Loosen set bracket mounting bolt.

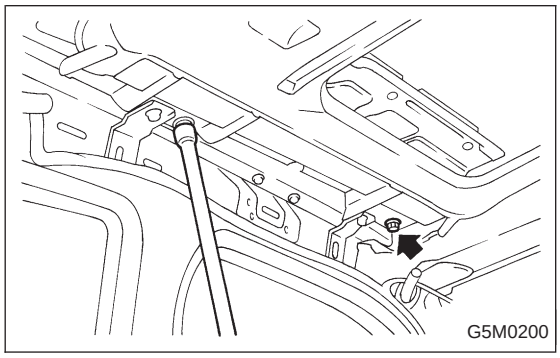

G5M0198

B: INSTALLATION

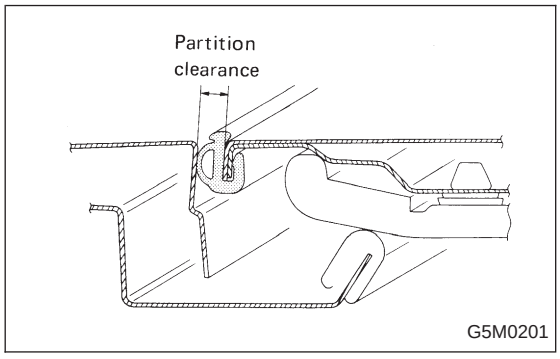
1) Insert frame rear end slit to two bolts fitted temporarily to roof brace.


G5M0199

2) Align frame to reference pin installed on roof.


G5M0200

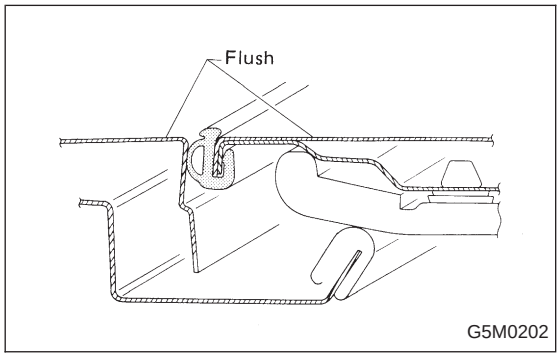
3) Tighten adjusting nut (that is, set frame at highest position).
Temporarily tighten bolts.



G5M0201

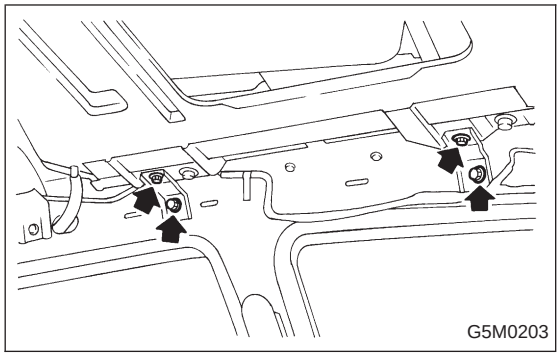
4) Install sunroof panel.
5) Adjust height by turning adjusting nut.
Also adjust front, rear, right, and left side partitions.

Partition clearance:
5.9±0.5 mm (0.232±0.020 in)

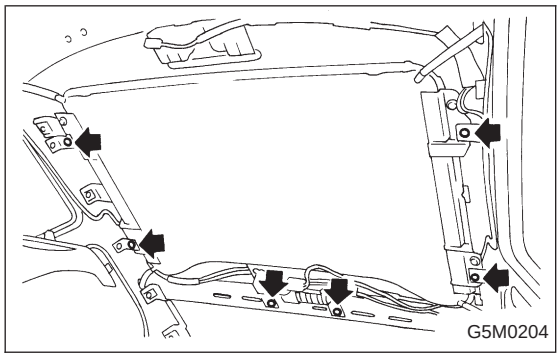


G5M0202

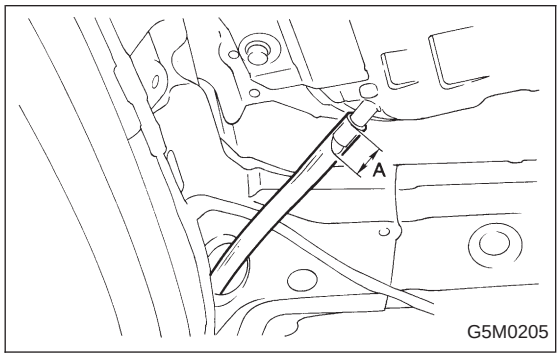
Difference in height between roof panel and sunroof panel:
0±1.0 mm (0±0.039 in)



6) Tighten set bracket mounting bolts.



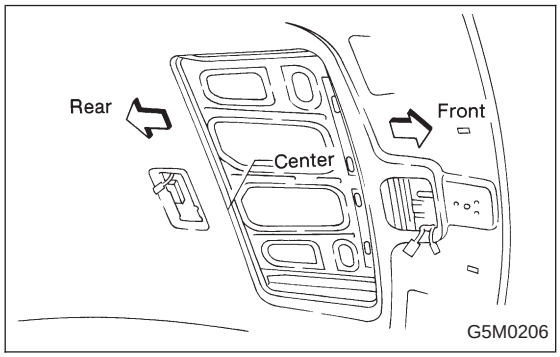
7) Tighten bolts.



8) Install drain tubes.

CAUTION:
Insert drain tube securely into drain pipe.

Length: A
Approx. 20 mm (0.79 in)



9) Install roof trim.
10) Install garnish.
NOTE:
Place garnish joint at rear center of body.
11) Install sunroof trim, pillar trim, rear quarter trim etc.
12) Check the following items after assembling all parts;
- Garnish must be free from waves.
- When sunroof is fully closed, must be no clearance between garnish and sunroof trim.
- Sunroof must be free from slack and noise when it is fully opened and closed.

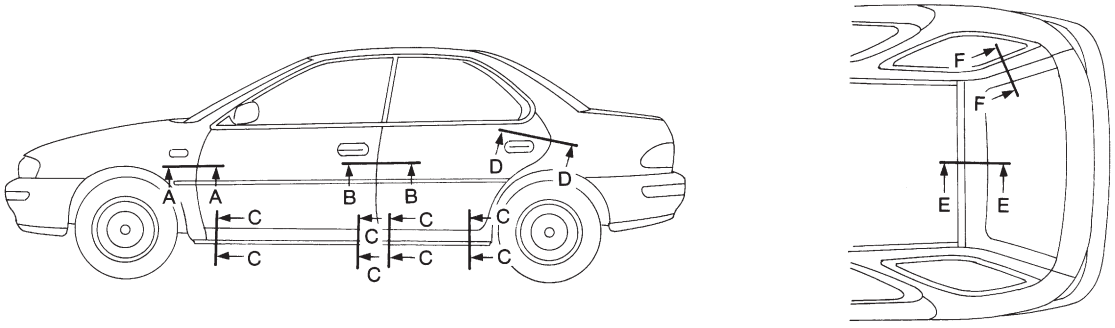
1. Sunroof

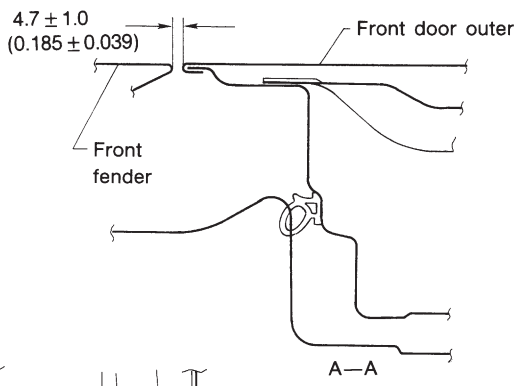
Entry of water into compartment	① Check roof panel and sunroof panel for improper or poor sealing. ② Check drain tube for clogging. ③ Check sunroof frame seal and body for improper fit.
Booming noise	① Check roof panel and roof panel for improper clearance. ② Check sunroof trim and roof trim for improper clearance.
Abnormal motor noise	① Check motor for looseness. ② Check gears and bearings for wear. ③ Check cable for wear. ④ Check cable pipe for deformities.
Failure of sunroof to operate (Motor operates properly.)	① Check guide rail for foreign particles. ② Check guide rail for improper installation. ③ Check parts for mutual interference. ④ Check cable slider for improper clinching. ⑤ Check cable for improper installation. ⑥ Check clutch adjustment nut for improper tightness.
Motor does not rotate or rotates improperly. (Use sunroof wrench to check operation.)	① Check fuse for blowout. ② Check switch for improper function. ③ Check motor for incorrect terminal voltage. ④ Check relay for improper operation. ⑤ Check poor grounding system. ⑥ Check cords for discontinuity and terminals for poor connections. ⑦ Check limit switch for improper operation.

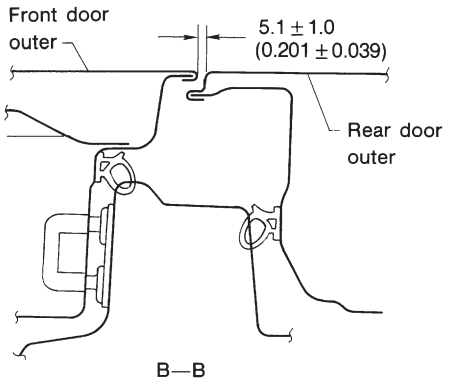
DOORS AND WINDOWS 5-2

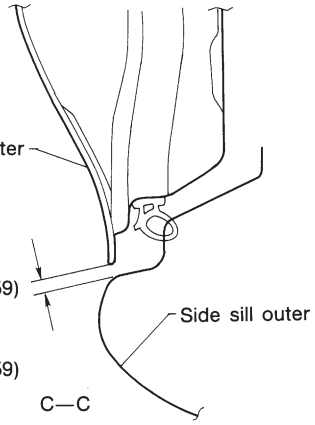
1. Door Alignment

1. SEDAN AND WAGON MODEL

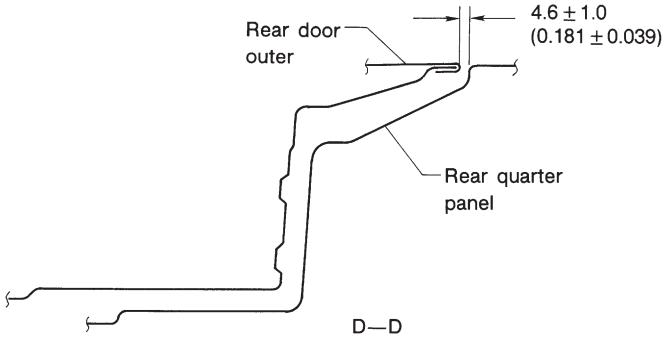


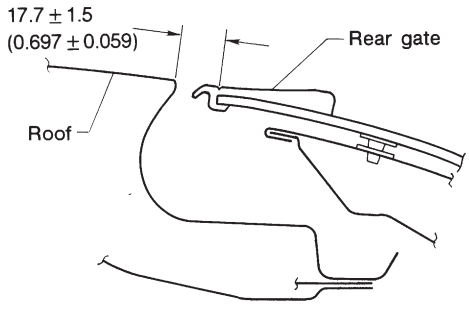


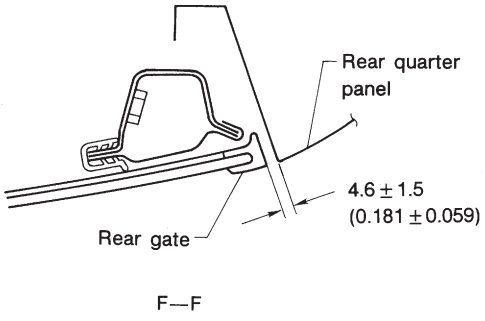




- Front door
  Front part:
  5.2 ± 1.5
  (0.205 ± 0.059)
  Back part:
  5.4 ± 1.5
  (0.213 ± 0.059)
- Rear door
  Front part:
  5.4 ± 1.5
  (0.213 ± 0.059)
  Back part:
  6.1 ± 1.5
  (0.240 ± 0.059)



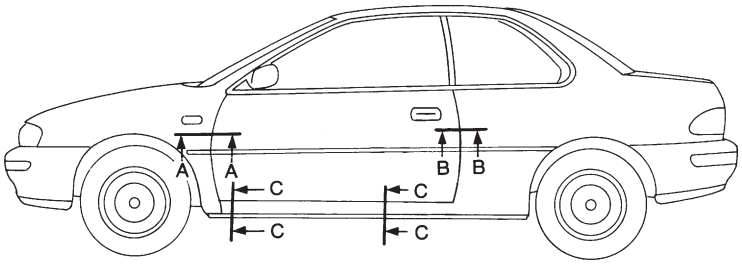


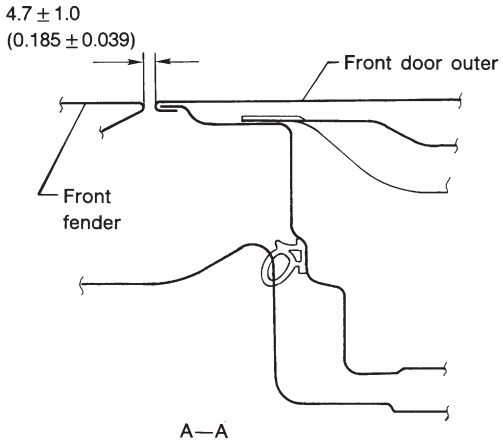


Unit: mm (in)

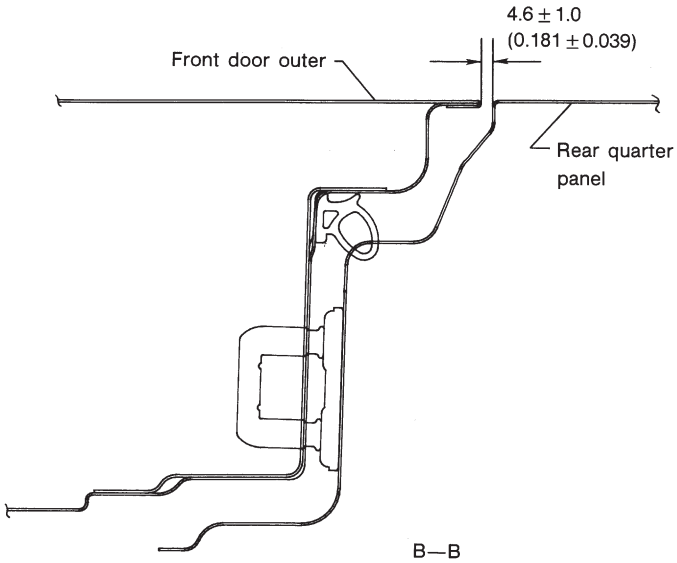
G5M0485

2. COUPE MODEL

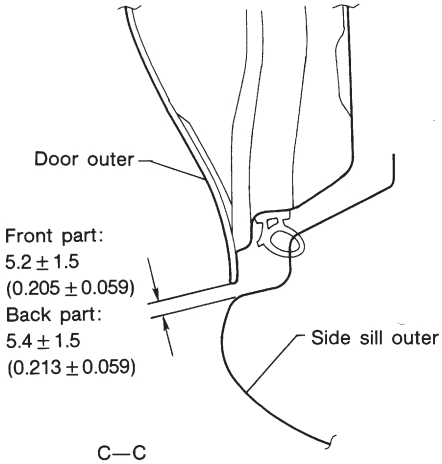




A—A



B—B

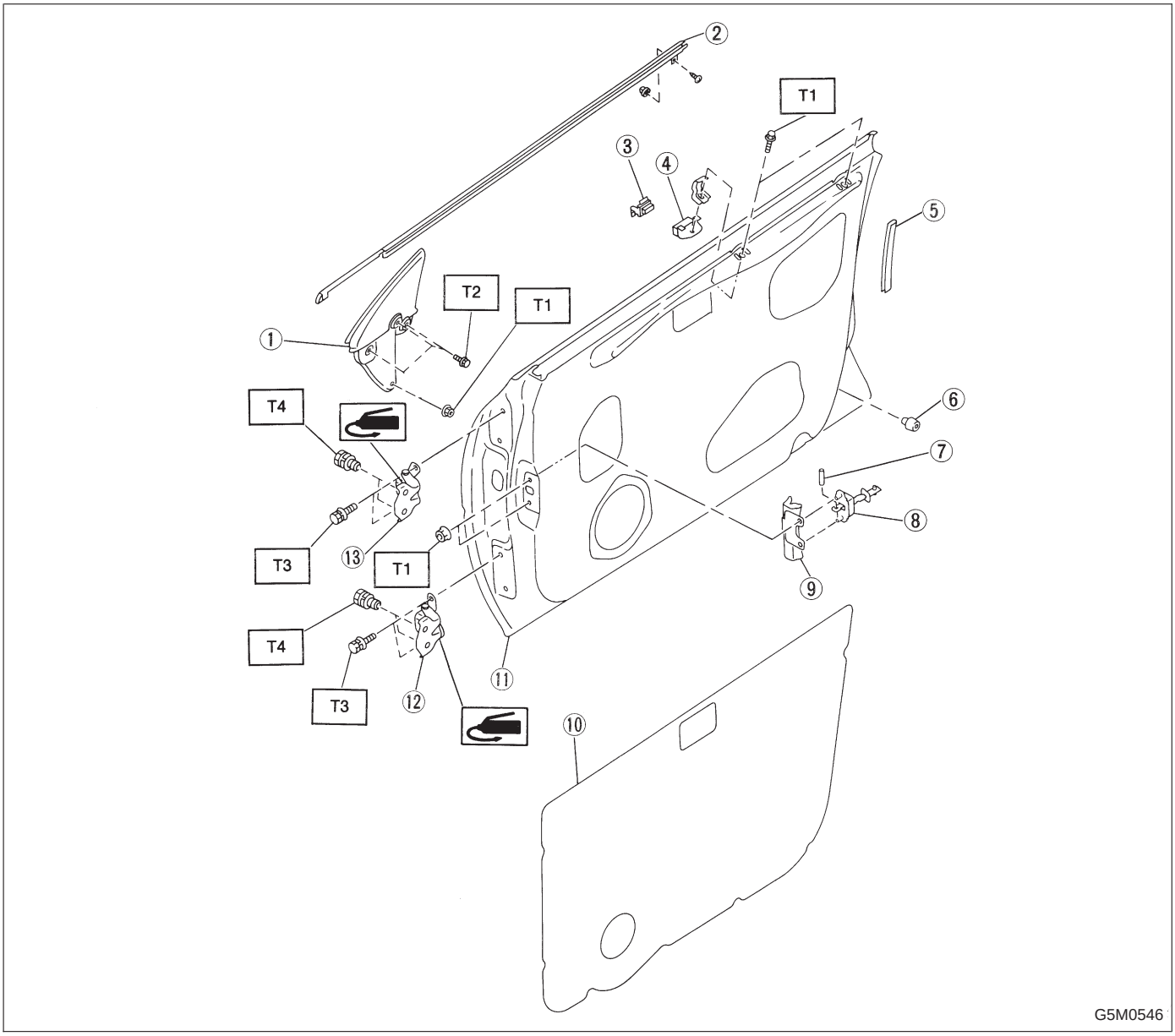


C—C

Unit: mm (in)

G5M0637

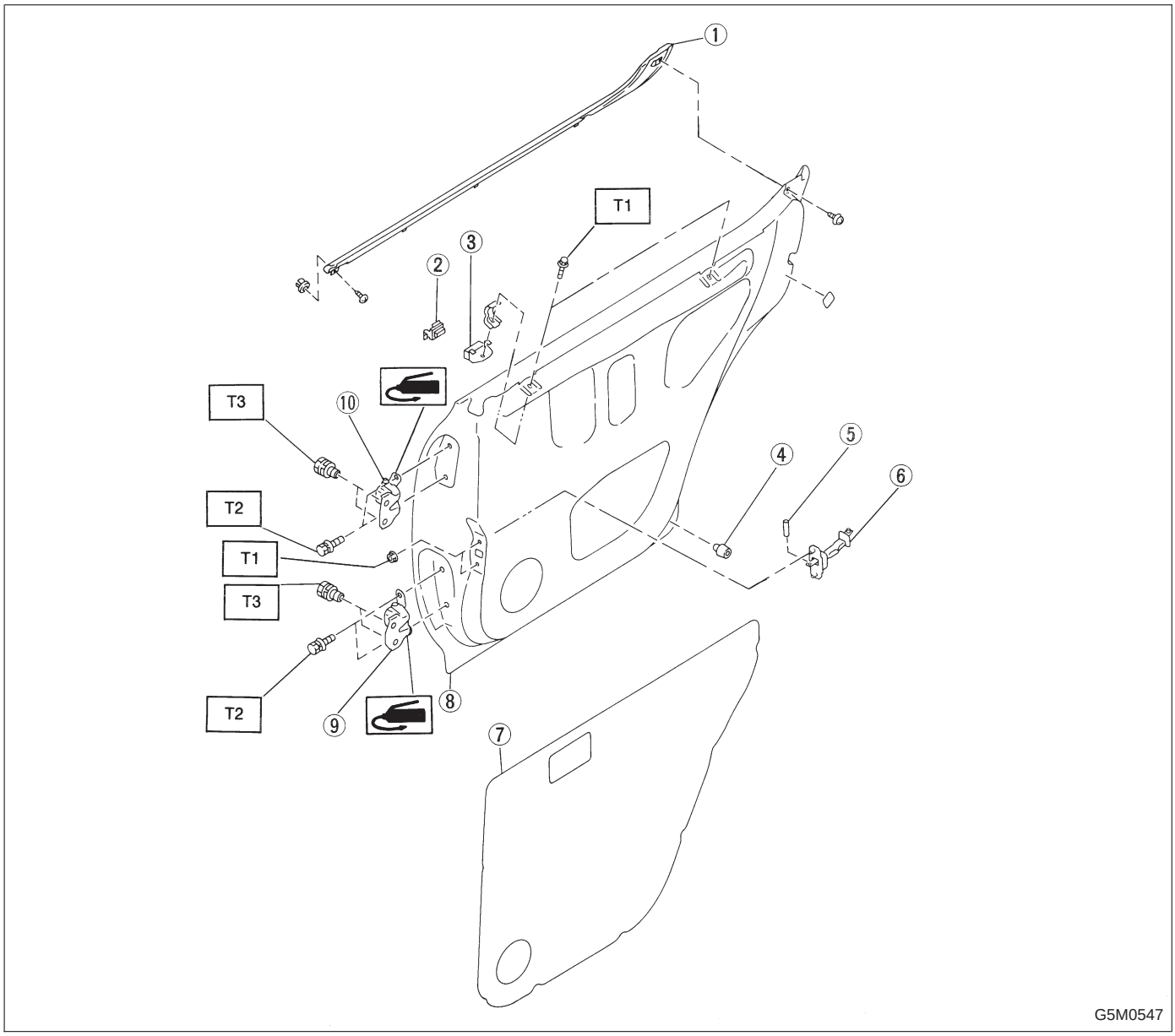
1. Front Door



① Gusset
② Weatherstrip
③ Stabilizer (Outer)
④ Stabilizer (Inner)
⑤ Protector
⑥ Stopper
⑦ Knock pin
⑧ Checker
⑨ Guide
⑩ Sealing cover
⑪ Door panel
⑫ Lower hinge
⑬ Upper hinge

Tightening torque: N·m (kg-m, ft-lb)
T1: 5.4 — 9.3
(0.55 — 0.95, 4.0 — 6.9)
T2: 10 — 16 (1.0 — 1.6, 7 — 12)
T3: 22 — 27 (2.2 — 2.8, 16 — 20)
T4: 25 — 34 (2.5 — 3.5, 18 — 25)

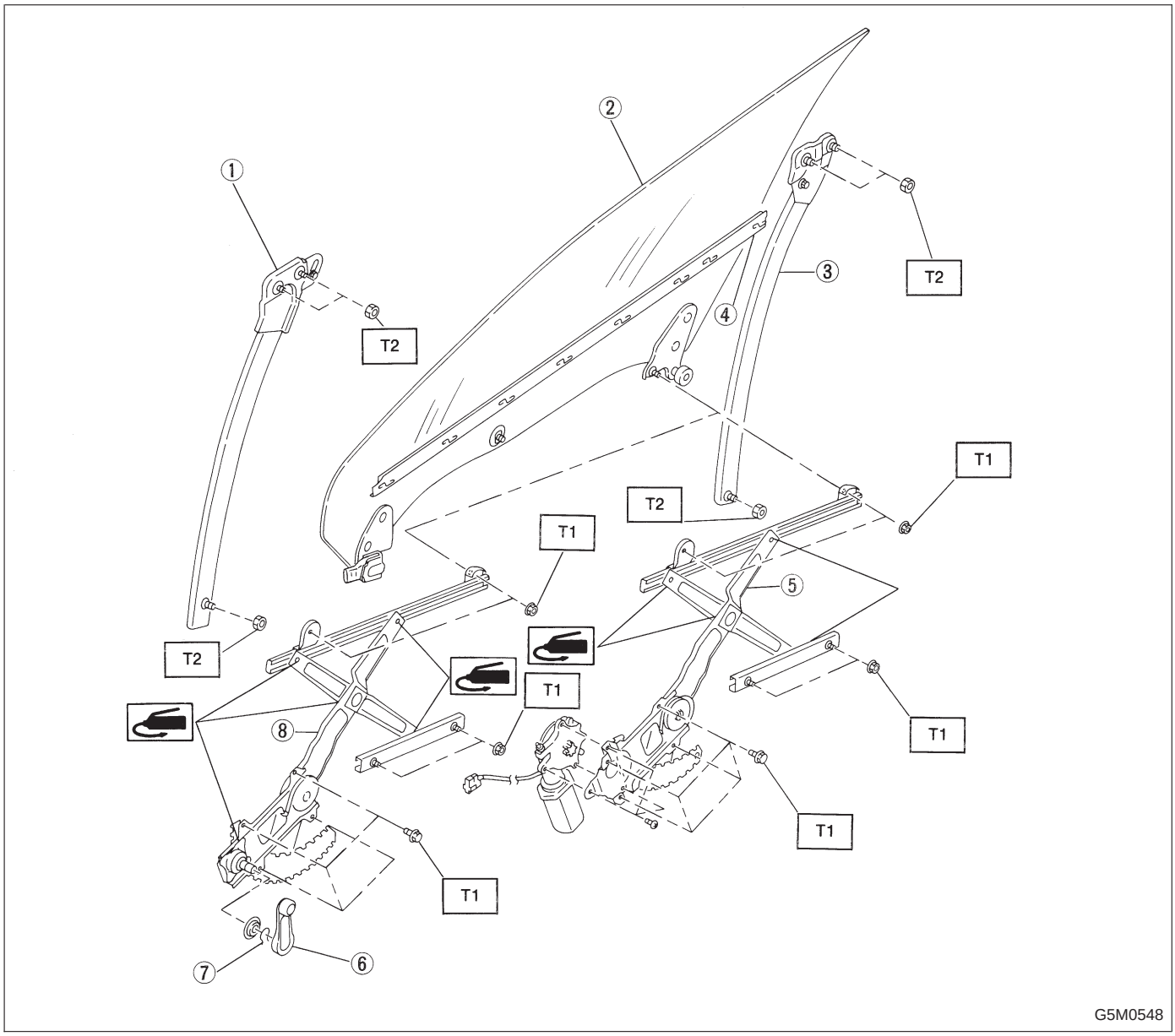
2. Rear Door



① Weatherstrip
② Stabilizer (Outer)
③ Stabilizer (Inner)
④ Stopper
⑤ Knock pin
⑥ Checker
⑦ Seating cover
⑧ Door panel
⑨ Lower hinge
⑩ Upper hinge

Tightening torque: N·m (kg-m, ft-lb)
T1: 5.4 — 9.3
(0.55 — 0.95, 4.0 — 6.9)
T2: 22 — 27 (2.2 — 2.8, 16 — 20)
T3: 25 — 34 (2.5 — 3.5, 18 — 25)

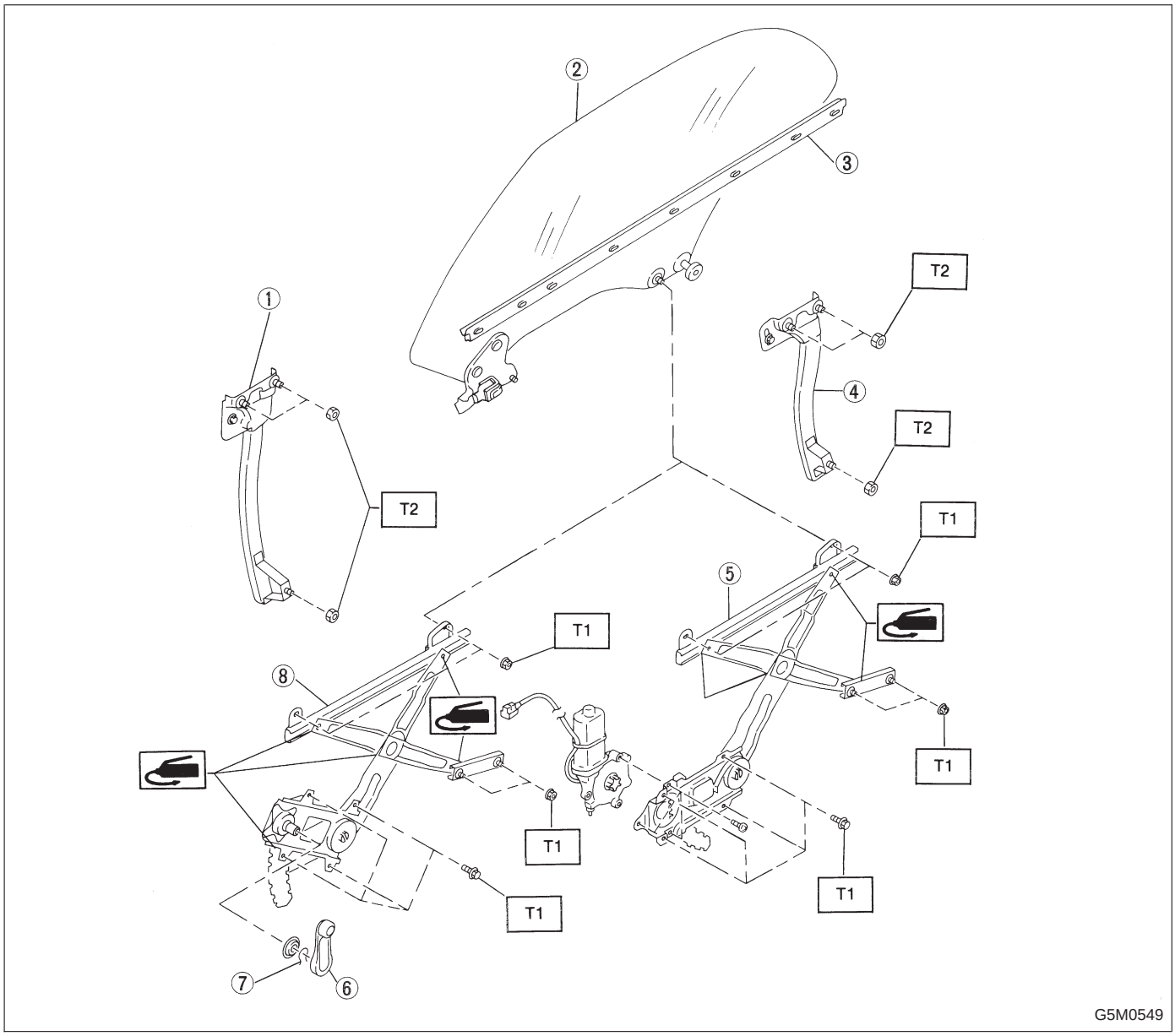
3. Front Door Glass



① Door sash (Front)
② Glass
③ Door sash (Rear)
④ Weatherstrip (Inner)
⑤ Regulator and motor ASSY
⑥ Regulator handle (Except power window)
⑦ Retainer spring
⑧ Regulator ASSY

Tightening torque: N·m (kg-m, ft-lb)
T1: 5.4 — 9.3 (0.55 — 0.95, 4.0 — 6.9)
T2: 10 — 18 (1.0 — 1.8, 7 — 13)

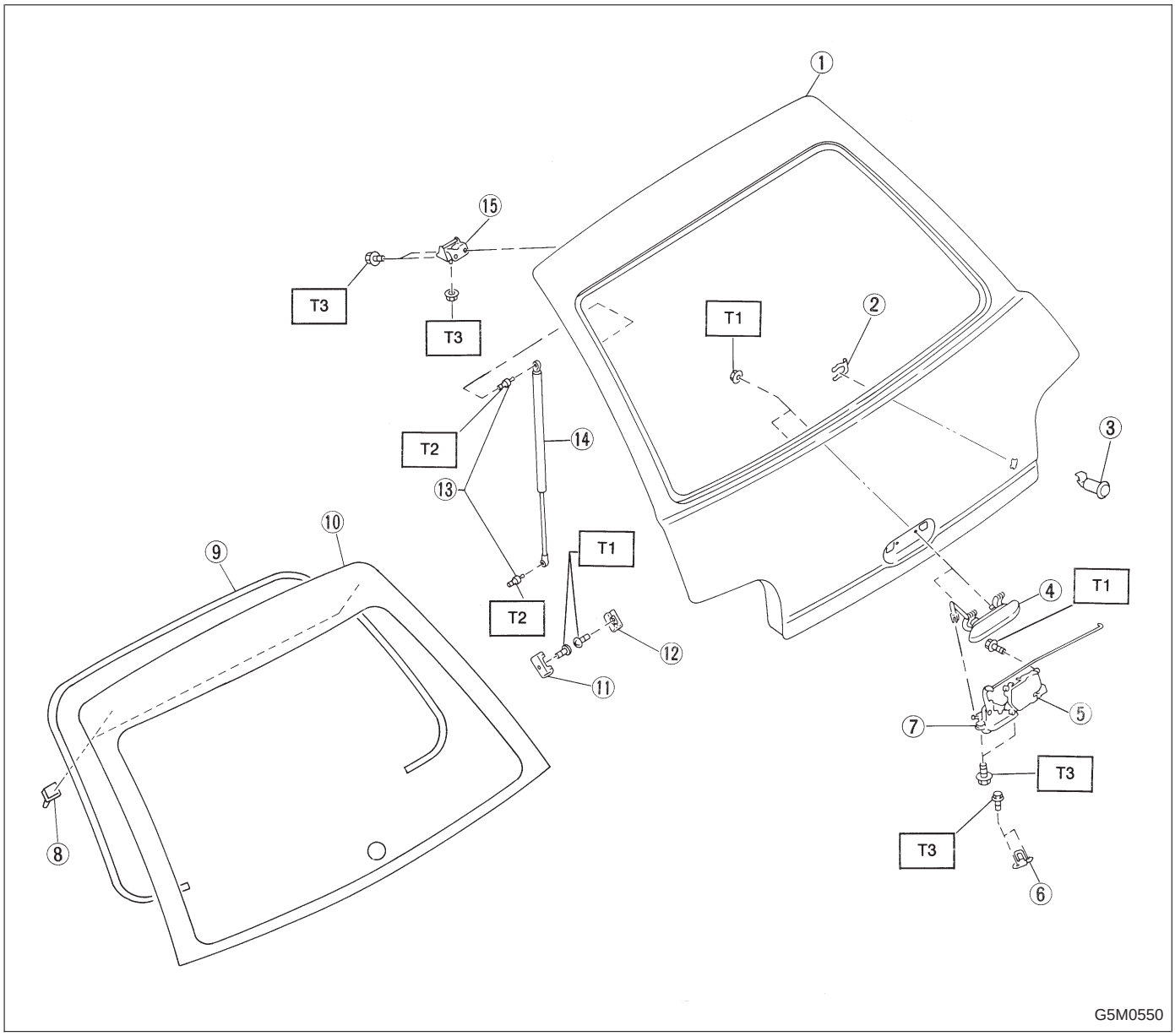
4. Rear Door Glass



① Door sash (Front)
② Glass
③ Weatherstrip (Inner)
④ Door sash (Rear)
⑤ Regulator and motor ASSY
⑥ Regulator handle (Except power window)
⑦ Retainer spring
⑧ Regulator ASSY

Tightening torque: N·m (kg-m, ft-lb)
T1: 5.4 — 9.3 (0.55 — 0.95, 4.0 — 6.9)
T2: 10 — 18 (1.0 — 1.8, 7 — 13)

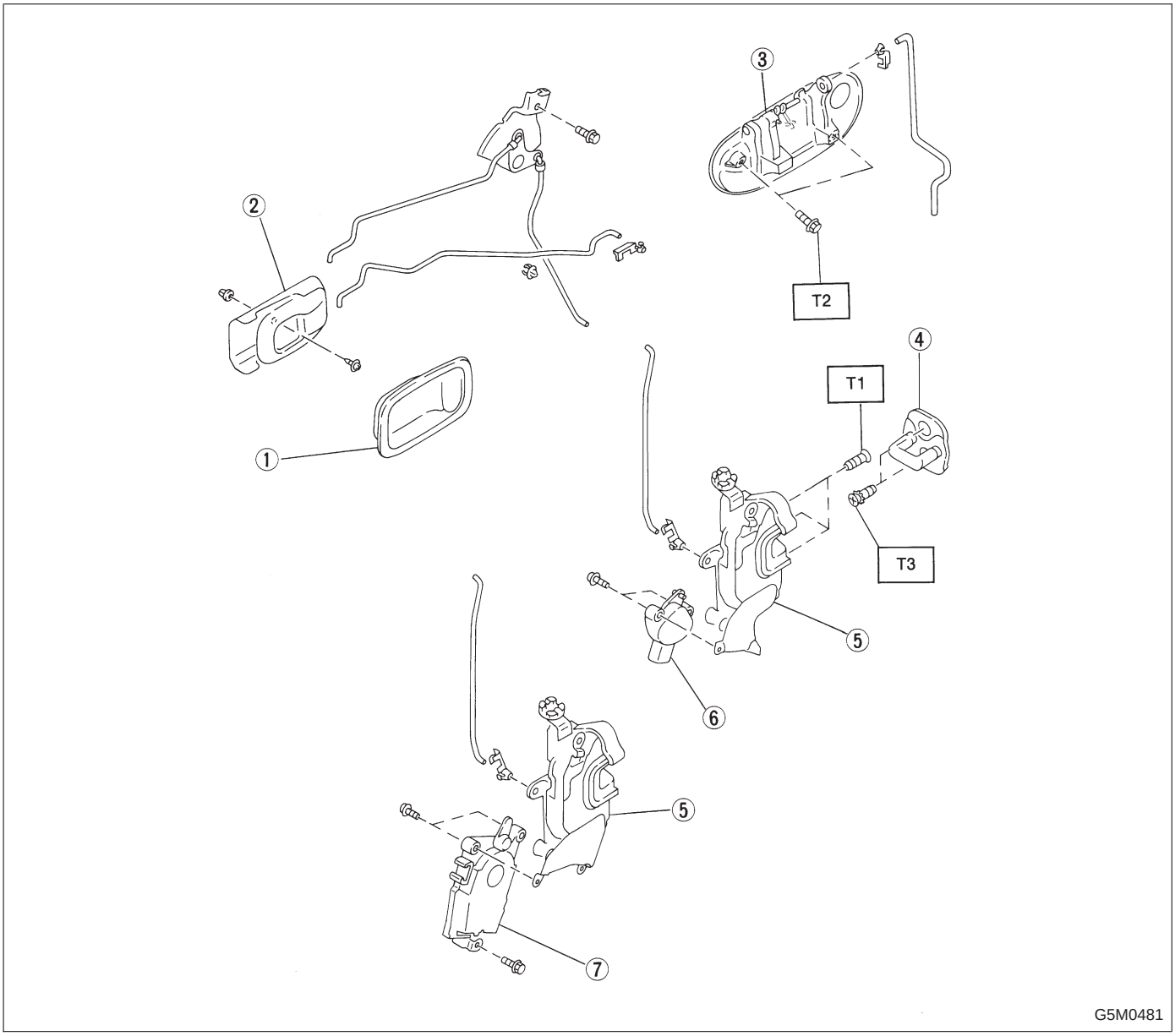
5. Rear Gate and Glass



① Rear gate
② Clip
③ Key cylinder
④ Outer handle
⑤ Auto-door lock actuator
⑥ Striker
⑦ Latch
⑧ Glass pin
⑨ Trim
⑩ Glass
⑪ Buffer
⑫ Rear gate side buffer
⑬ Stud
⑭ Gas stay
⑮ Hinge

Tightening torque: N·m (kg-m, ft-lb)
T1: 5.4 — 9.3
(0.55 — 0.95, 4.0 — 6.9)
T2: 10 — 18 (1.0 — 1.8, 7 — 13)
T3: 20 — 29 (2.0 — 3.0, 14 — 22)

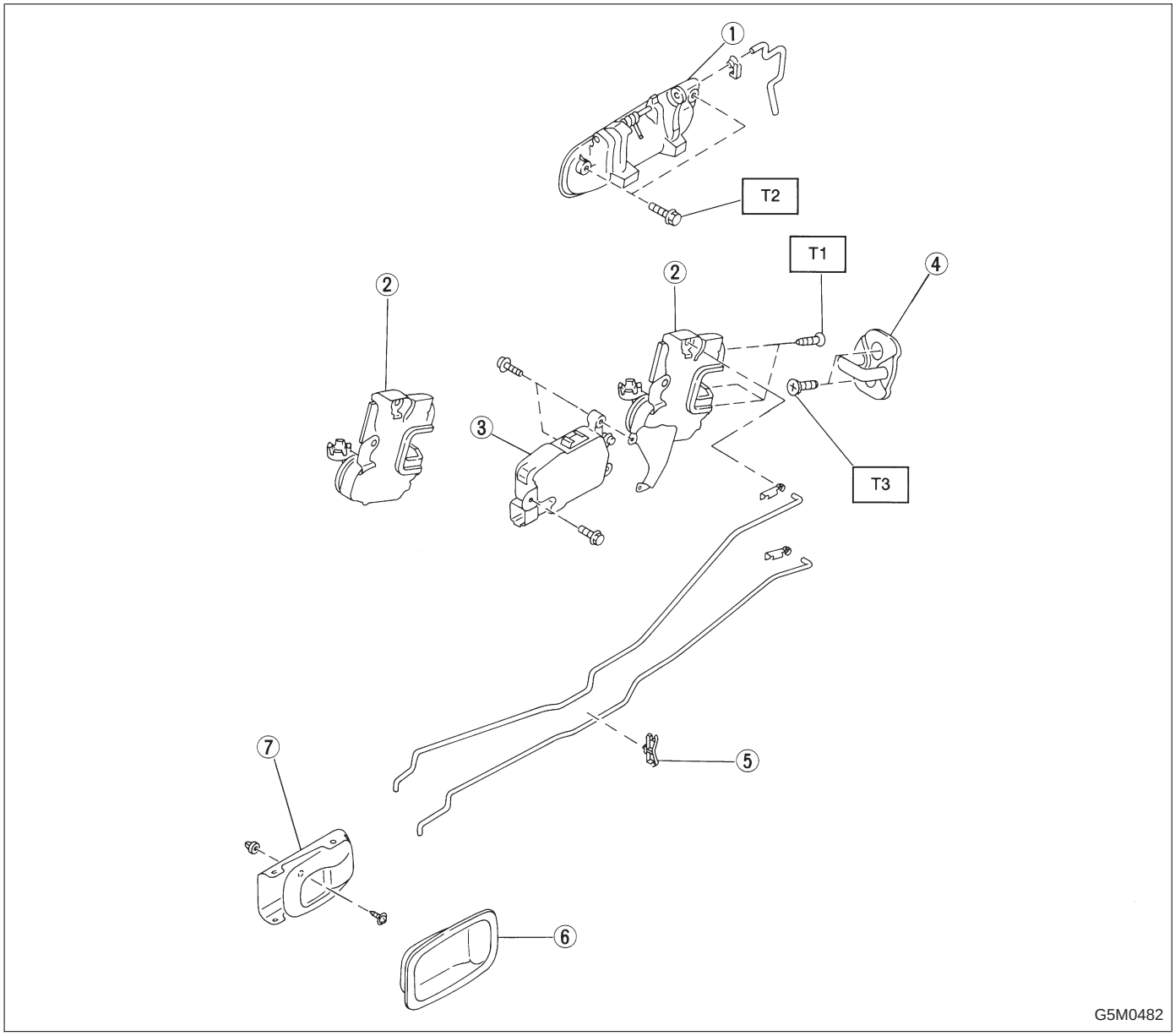
6. Door Lock Assembly (Front)



① Cover
② Inner remote ASSY
③ Door outer handle
④ Striker
⑤ Door latch
⑥ Switch ASSY
⑦ Auto-door lock actuator

Tightening torque: N·m (kg-m, ft-lb)
T1: 4.4 — 8.3 (0.45 — 0.85, 3.3 — 6.1)
T2: 5.4 — 9.3 (0.55 — 0.95, 4.0 — 6.9)
T3: 14 — 22 (1.4 — 2.2, 10 — 16)

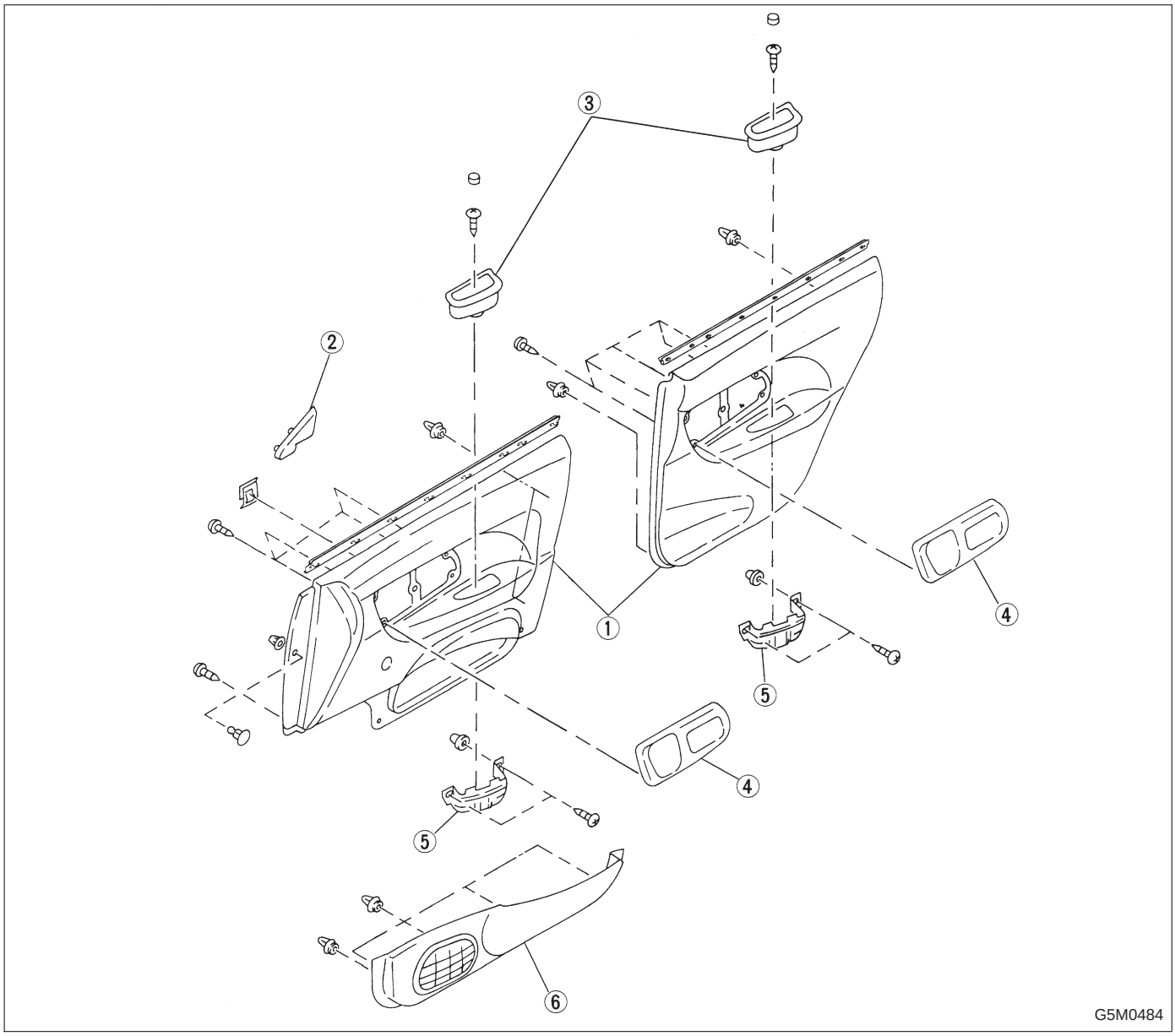
7. Door Lock Assembly (Rear)



① Door outer handle
② Door latch
③ Auto-door lock actuator
④ Striker
⑤ Rod holder
⑥ Cover
⑦ Inner remote ASSY

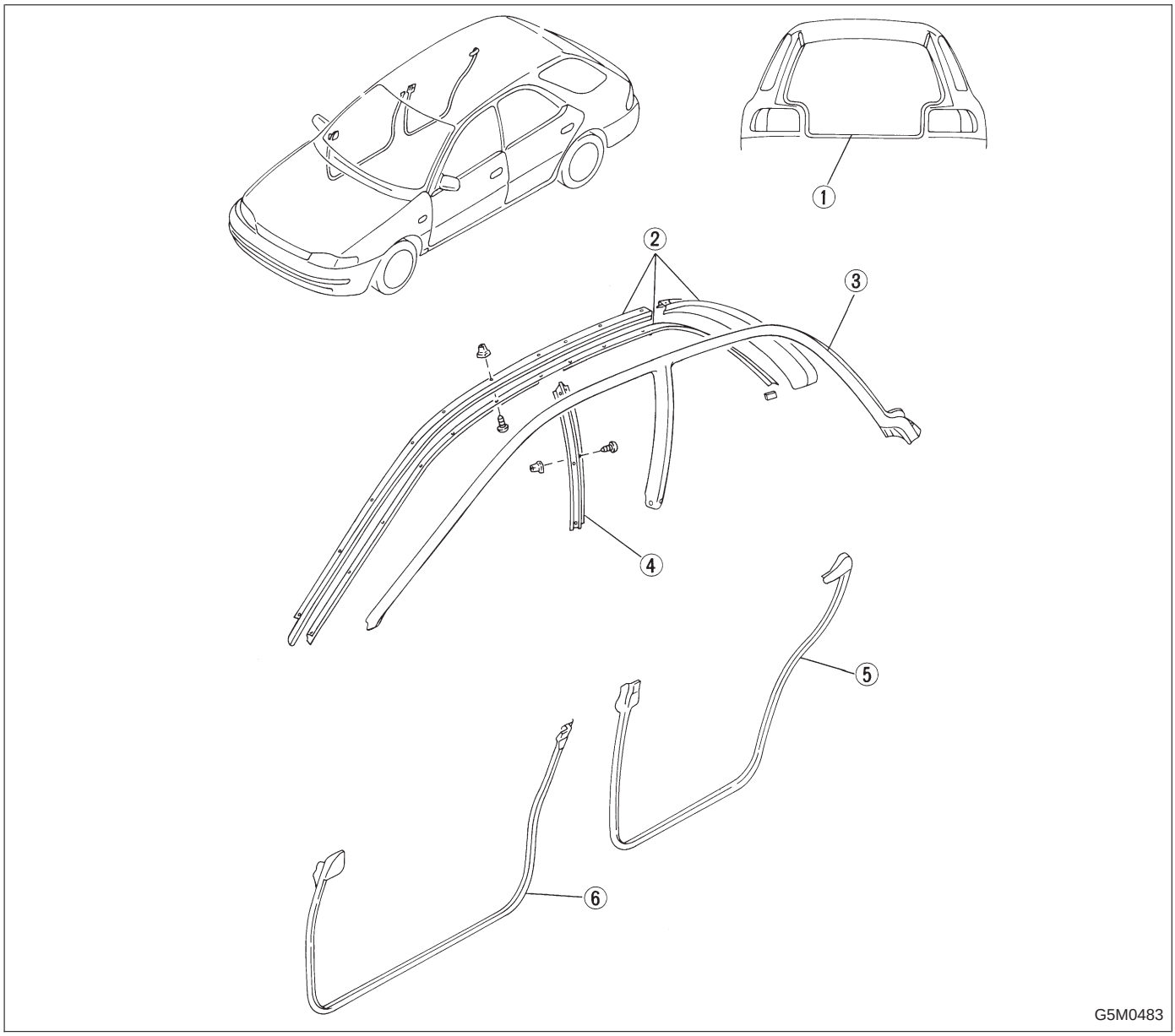
Tightening torque: N·m (kg-m, ft-lb)
T1: 4.4 — 8.3 (0.45 — 0.85, 3.3 — 6.1)
T2: 5.4 — 9.3 (0.55 — 0.95, 4.0 — 6.9)
T3: 14 — 22 (1.4 — 2.2, 10 — 16)

8. Trim



① Trim panel
② Gusset cover
③ Pull handle
④ Cover
⑤ Bracket
⑥ Pocket

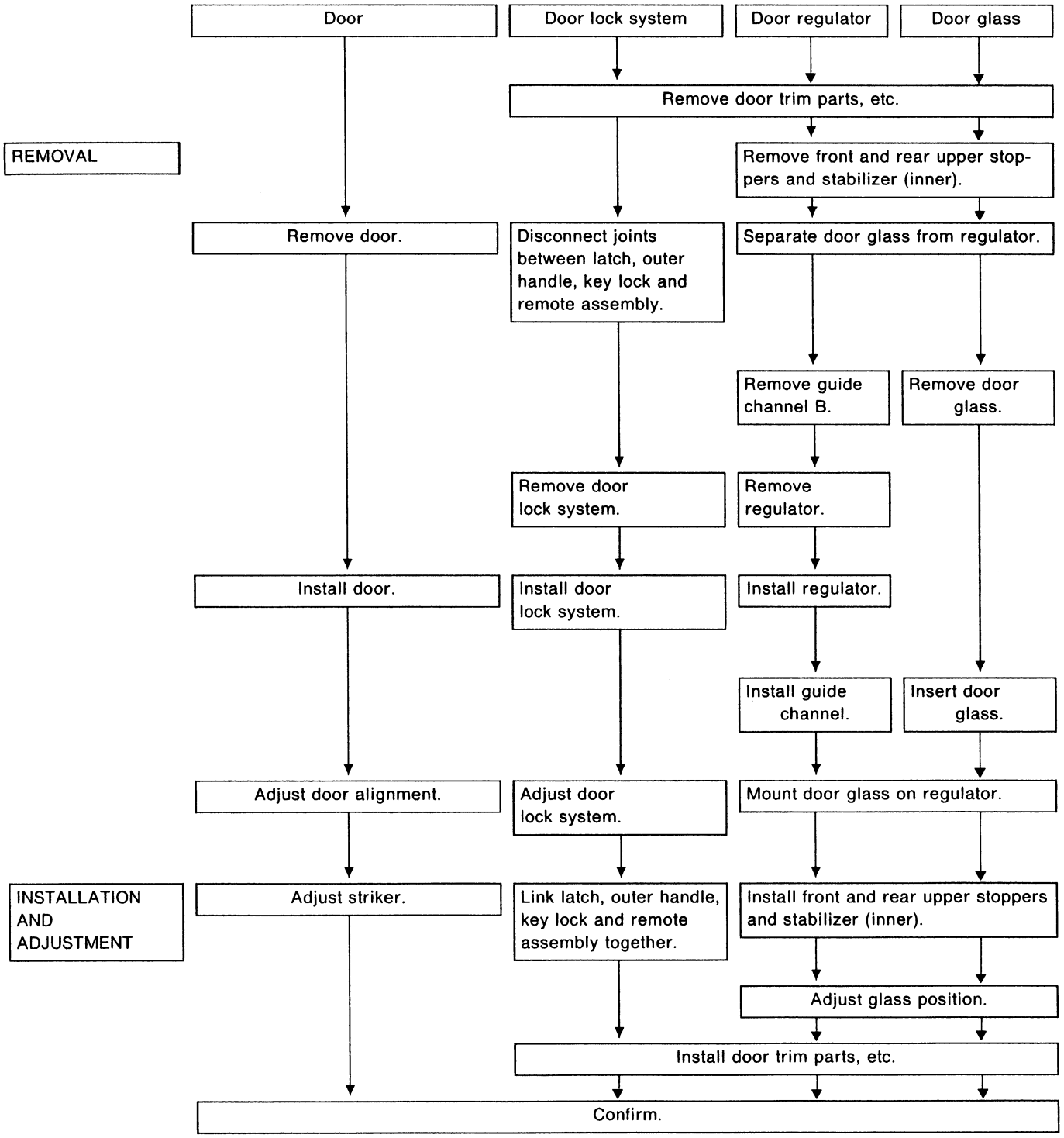
9. Weatherstrip

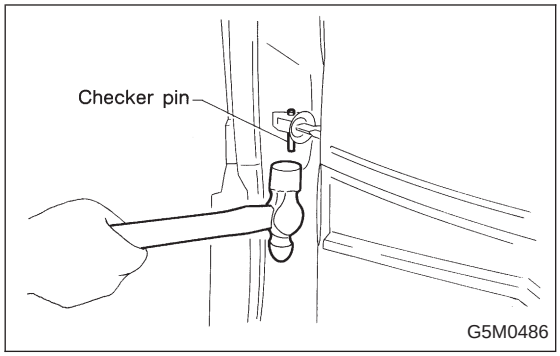


① Rear gate weatherstrip (Wagon only)
② Retainer and molding
③ Upper and side weatherstrip
④ Retainer (Center)
⑤ Weatherstrip (Rear door)
⑥ Weatherstrip (Front door)

1. Procedure Chart for Removing and Installing Door and Related Parts

NOTE:
This flowchart shows the main procedures for removing and installing the door and its related parts. For details, refer to the text.

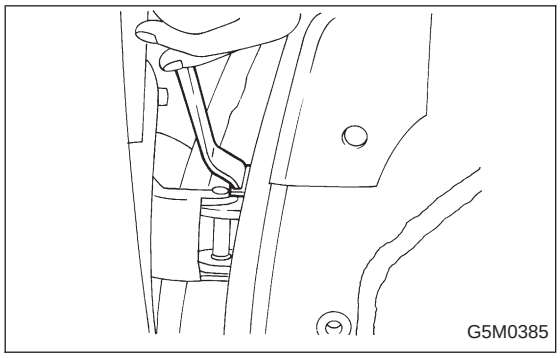




2. Door and Hinge

A: REMOVAL AND INSTALLATION

1) Remove lower trim and disconnect connectors from body harness.
2) Place a cloth or a wood block under door to prevent damage, and support it with a jack.
3) Remove checker pin by driving it upward. Be careful not to damage door and body.



4) Remove bolts (M8) securing upper and lower hinges to door, and remove door from hinges.

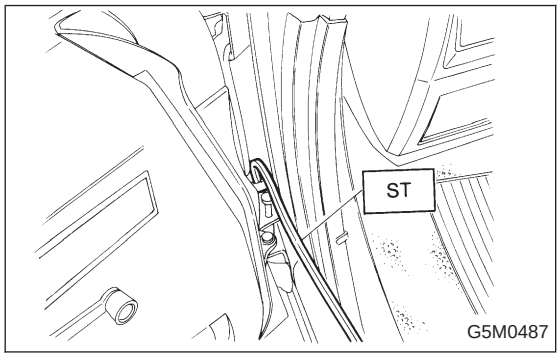
Tightening torque:
22 — 27 N·m (2.2 — 2.8 kg-m, 16 — 20 ft-lb)

5) Remove hinges by loosening hinges mounting bolt (M8) off of body.

Tightening torque:
25 — 34 N·m (2.5 — 3.5 kg-m, 18 — 25 ft-lb)

CAUTION:
Work carefully to avoid damaging door.

Installation is in the reverse order of removal.
NOTE:
Apply grease to moving parts of door hinges.



B: ADJUSTMENT

1) Using ST, loosen bolts securing upper and lower hinges to body, and adjust fore-and-aft and vertical alignment of door.

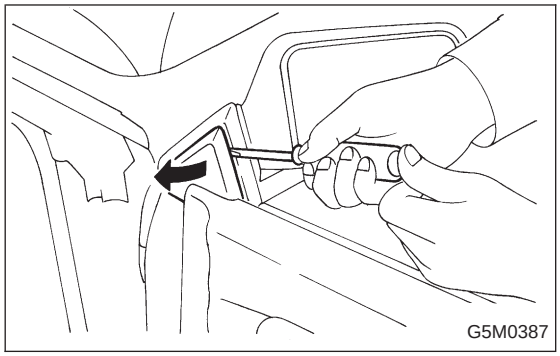
ST 925610000 DOOR HINGE WRENCH

2) Loosen screw one complete rotation, and adjust opening/closing direction of door using a hammer covered with a cloth.

CAUTION:
Be careful not to damage striker.

Hinge tightening torque (body side):
25 — 34 N·m (2.5 — 3.5 kg-m, 18 — 25 ft-lb)

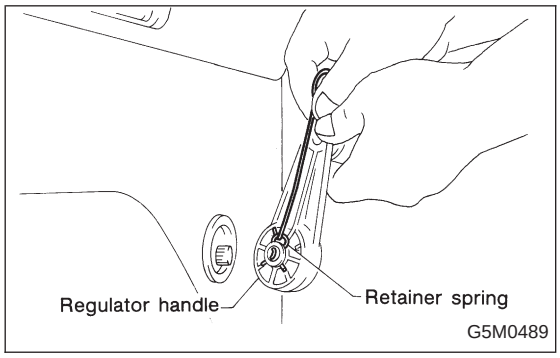
Striker tightening torque:
14 — 22 N·m (1.4 — 2.2 kg-m, 10 — 16 ft-lb)


G5M0387

3. Trim Panel

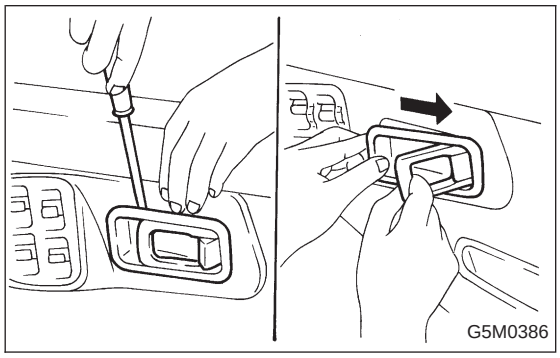
A: REMOVAL AND INSTALLATION

1) Remove gusset cover.

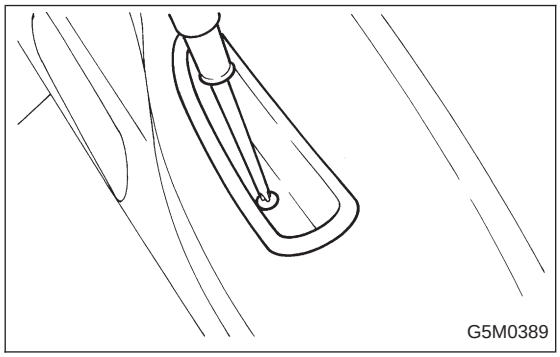


G5M0489

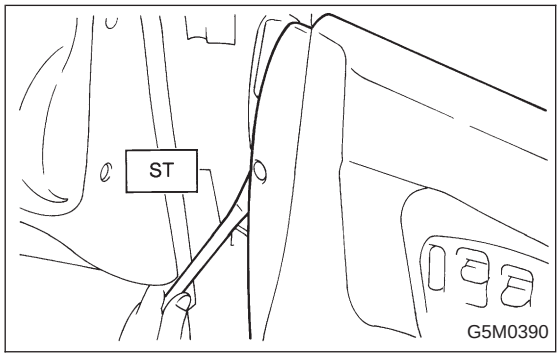
2) Remove retainer spring and then regulator handle. Use a wire bent at one end, as shown in figure, for easier removal of retainer spring. (models without power window)


G5M0386

3) Remove remote handle cover.


G5M0389

4) Remove pull handle attaching screw and then remove pull handle.

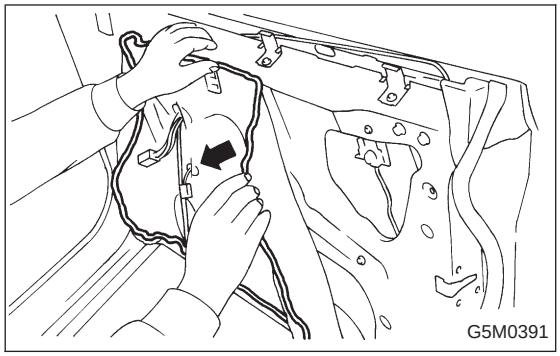


G5M0390

5) Using ST, disengage the clip.
ST 925580000 PULLER
6) Remove trim panel and then disconnect connector. (models with power window)

CAUTION:
Be careful not to break clip by applying undue force.

Installation is in the reverse order of removal.



4. Sealing Cover

A: REMOVAL

1) Remove trim panel.
2) Remove speaker, trim bracket and remote assembly and disconnect connectors.
3) Remove sealer with a spatula.

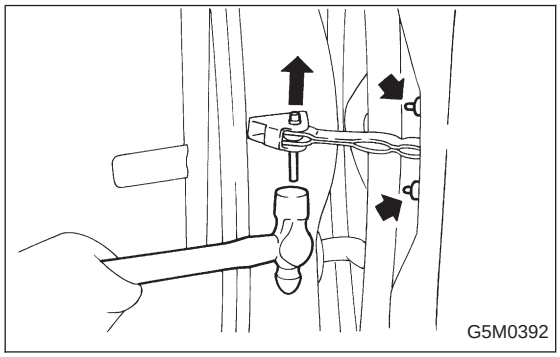
CAUTION:
Be careful because cover may break if sealer is removed forcefully.

B: INSTALLATION

1) Confirm that sealer is properly applied without breaks. Then install sealing cover.
2) When repairing or replacing sealing cover, use “CEMEDINE 5430L” as sealer. It may be overlaid on existing sealer.

Sealer:
CEMEDINE 5430L

CAUTION:
Any breaks in sealer can cause water leakage or entry of air and dust. Be sure sealer is applied in a continuous line.



5. Checker

A: REMOVAL AND INSTALLATION

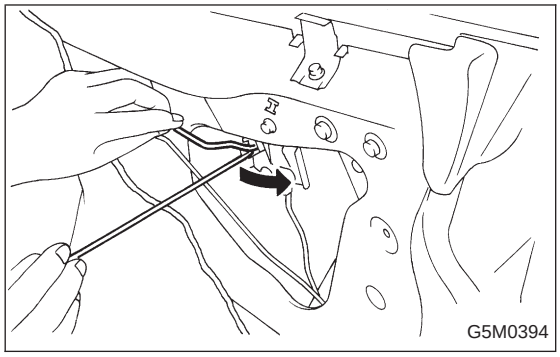
1) Remove trim panel.
2) Remove sealing cover.
3) Apply a cloth to door and body to prevent damaging them, and remove checker pin by driving it upward.

CAUTION:
Be careful not to damage door and body.

4) Completely close door glass.
5) Loosen two nuts securing checker, and take out checker through access hole in underside.

Installation should be made in the reverse order of removal.

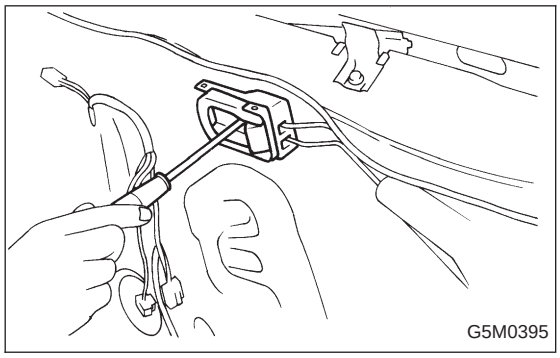
Tightening torque:
5.4 — 9.3 N·m (0.55 — 0.95 kg-m, 4.0 — 6.9 ft-lb)


G5M0394

6. Inner Remote Assembly

A: REMOVAL

1) Remove trim panel.
2) Remove sealing cover.
3) Disconnect joints of two rods.
4) Unlatch rod holder.

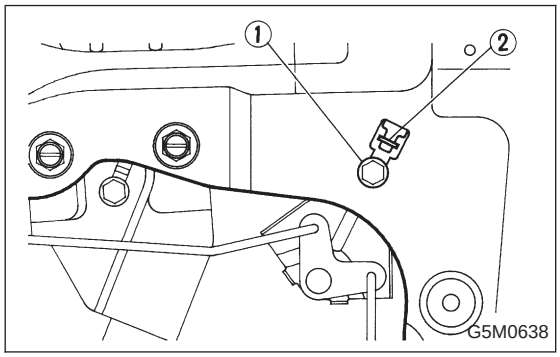

G5M0395

5) Remove screws holding remote assembly.

B: INSTALLATION

1) After passing two rods through holder, attach remote assembly to inner panel.
2) Latch rod holder.

NOTE:
If rear door is equipped with child safety lock, check that child lock lever moves without dragging.



G5M0638

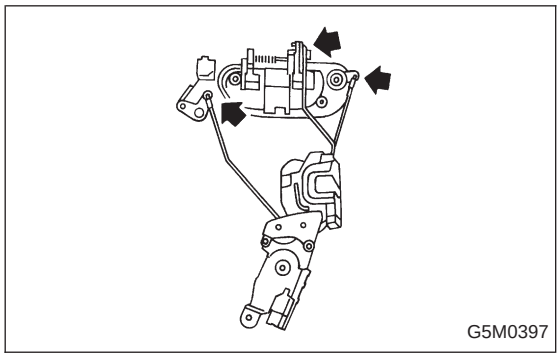
C: ADJUSTMENT

1) Lock the door.
2) Loosen bolt ①.
3) Lower bell crank ② and then tighten bolt ①.

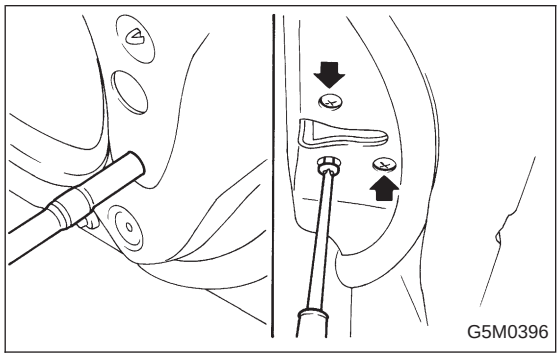
7. Door Latch

A: REMOVAL AND INSTALLATION

1) Remove trim panel.
2) Remove inner remote assembly.
3) Remove sealing cover around latch service hole.
4) Completely close door glass.


G5M0397

5) Remove latch and actuator assembly.
   (1) Turn rod holder to disconnect joint between key lock and rod.
   (2) Turn rod holder to disconnect joint between outer handle and rod.
   (3) Turn rod holder to disconnect joint between crank and rod.


G5M0396

6) Loosen screws securing both latch and actuator, then remove latch and actuator assembly through service hole in bottom.

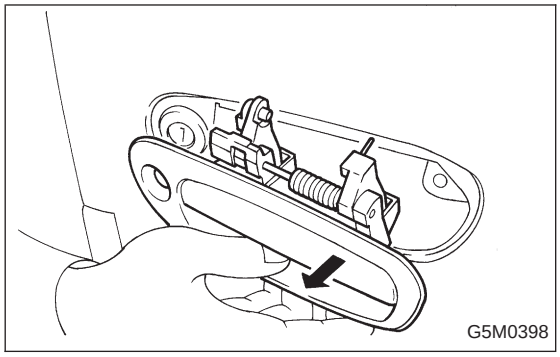
Tightening torque (screw):
4.4 — 8.3 N·m (0.45 — 0.85 kg-m, 3.3 — 6.1 ft-lb)

Installation is in the reverse order of removal.

B: INSPECTION

1) Check operation of each part.
2) Check each sliding part for proper lubrication.

CAUTION:
After installation, be sure lock mechanism operates normally.



8. Outer Handle

A: REMOVAL AND INSTALLATION

1) Remove trim panel.
2) Remove sealing cover.
3) Detach door latch rod from outer handle and key lock.
4) Loosen nut securing outer handle and then remove outer handle from outside.

CAUTION:
Be careful not to damage door.

Installation is in the reverse order of removal.

Tightening torque:
5.4 — 9.3 N·m (0.55 — 0.95 kg-m, 4.0 — 6.9 ft-lb)

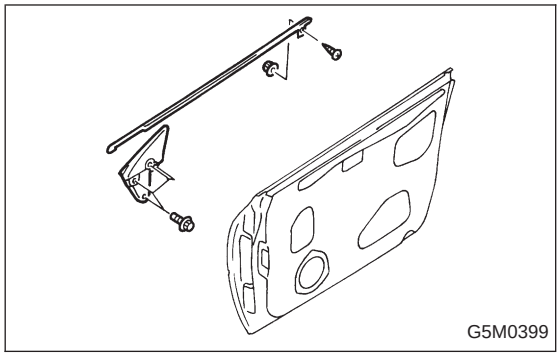
9. Key Lock

A: REMOVAL AND INSTALLATION

1) Remove trim panel.
2) Remove sealing cover.
3) Completely close door glass.
4) Remove outer handle.
5) Loosen spring securing key lock.
6) Remove key lock from outer handle.

Installation is in the reverse order of removal.

NOTE:
Install so that key slot in key lock comes to center of hole in outer handle.


G5M0399

10. Gusset Assembly

A: REMOVAL AND INSTALLATION

NOTE:
Be sure window is all the way down.
1) Remove gusset cover.
2) Remove trim panel.
3) Remove door rearview mirror.
4) Remove outer weatherstrip.
5) Remove sealing cover.

NOTE:
Be careful not to drop nuts on the “IN” side (See figure).

6) Remove bolts and nuts which secure gusset.

Tightening torque: Bolt
10 — 16 N·m (1.0 — 1.6 kg-m, 7 — 12 ft-lb)

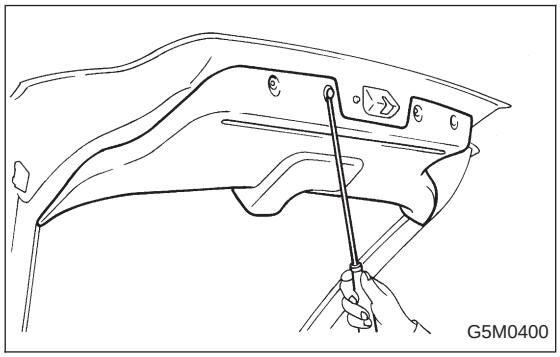
Tightening torque: Nut
5.4 — 9.3 N·m (0.55 — 0.95 kg-m, 4.0 — 6.9 ft-lb)

7) Lift out gusset.

To install, reverse the above removal procedures.

11. Rear Gate

CAUTION:
● Be careful not to scratch coated surfaces of car body and window glass during removal. Place a cloth over the affected area.
● Be careful not to damage trim panels.
● Use an assistant when handling heavy parts.
● Be careful not to damage or lose small parts.

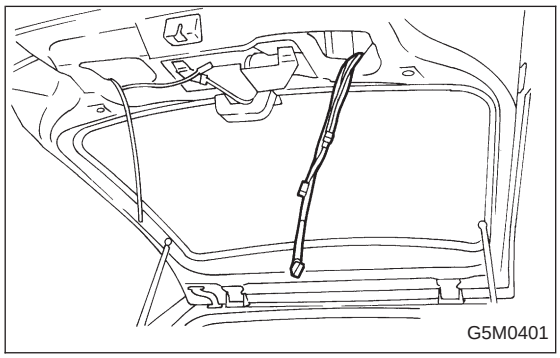

G5M0400

A: REMOVAL

1) Remove clips from trim panel and detach trim panel.

CAUTION:
Be careful not to damage clips or their holes.

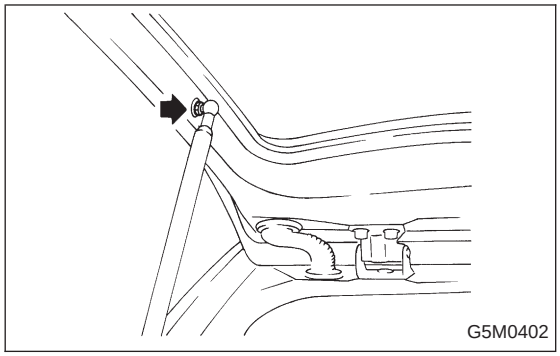
2) Disconnect connectors and terminal.
3) Disconnect rear washer hose from wiper motor.
4) Remove high-mount stop light.


G5M0401

5) If disconnected harness is re-used, tie connector with a string and place on the upper side of rear gate for ready use.

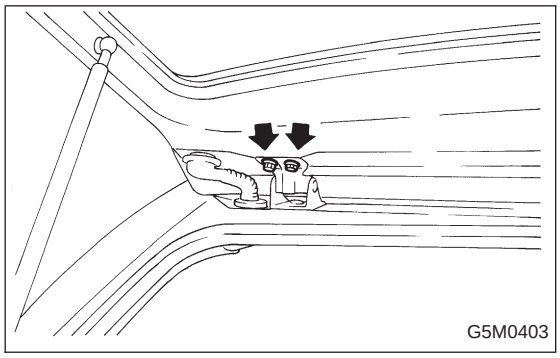
CAUTION:
Do not forcefully pull cords, lead wires, etc. since damage may result; carefully extract them in a wavy motion while holding connectors.

6) Remove rear wiper. <Ref. to 6-2 [W6B0].>
7) Remove both rubber ducts and then extract washer hose and harness connector.

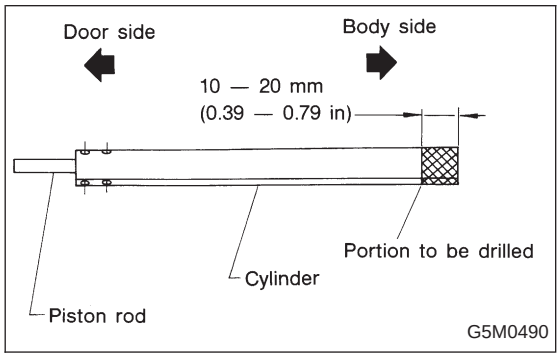

G5M0402

8) Gas stay
(1) Completely open rear gate.
(2) Remove bolts which hold gas stay to rear gate.

CAUTION:
● Be careful because rear gate drops while removing bolts. Have an assistant support it while removing bolts.
● Be sure to place a folded cloth between rear gate and body to prevent scratches.


G5M0403

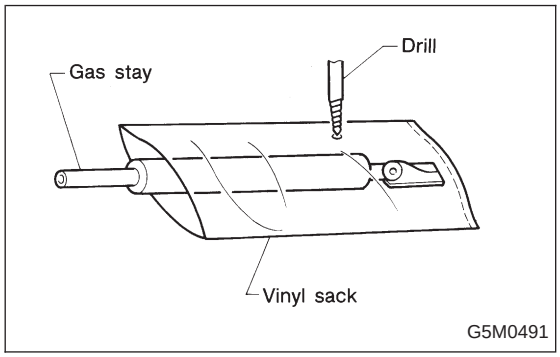
9) Remove the bolts which hold rear gate to hinge and then detach rear gate.



G5M0490

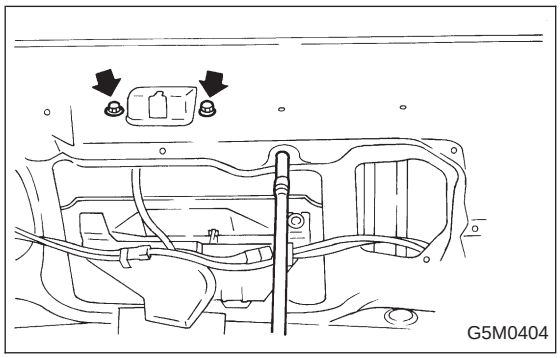
● General precautions in handling rear gate gas stay

CAUTION:
● Do not attempt to disassemble gas stay because its cylinder is filled with gas.
● Before discarding gas stay, place it at a slight angle with the cylinder body side facing up and drill a 2 to 3 mm (0.08 to 0.12 in) dia. hole to completely discharge the content. (Gas is odorless, colorless and harmless; however, metal powder may come out of the hole.)

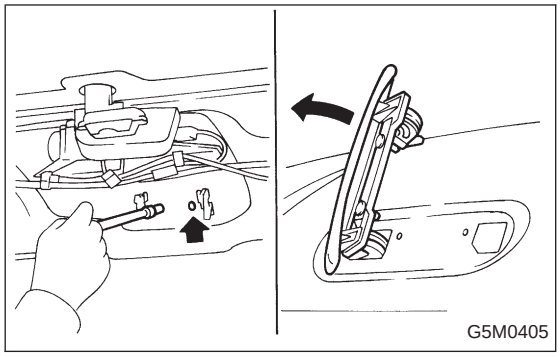


G5M0491

● It is good practice to place a vinyl sack over it before drilling the hole because oil may spurt out. Be careful to prevent vinyl cover from becoming entangled on the drill.
● Be careful not to scratch the exposed section of piston rod or allow oil or paint to come in contact with it.
● Do not attempt to rotate the extended piston rod.


G5M0404

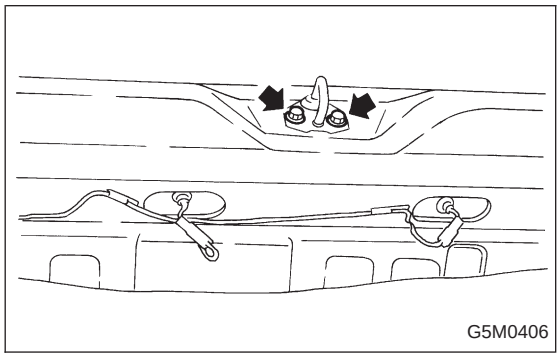
10) Latch
(1) Remove trim panel.
(2) Disengage rod from holder (= key cylinder).
(3) Remove bolts from auto-door lock actuator.
(4) Remove bolts from latch, and detach latch.
(5) Disconnect rear gate switch connector.
(6) Disconnect auto-door lock actuator connector.
(7) Detach latch.


G5M0405

11) Rear gate outer handle
(1) Remove trim panel.
(2) Remove latch.
(3) Remove two nuts used to hold outer handle to the inside of rear gate, and detach outer handle.

CAUTION:
Be careful not to damage packing when removing outer handle.

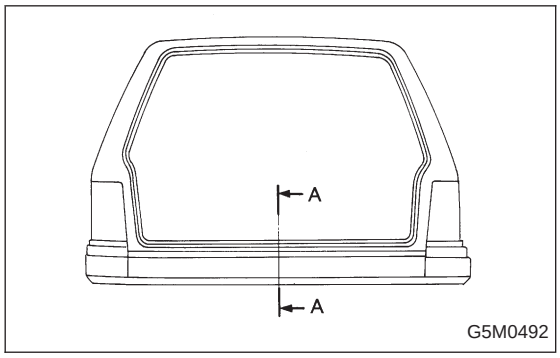
12) Key cylinder
(1) Remove trim panel.
(2) Disengage rod from holder.
(3) Remove retaining spring from key cylinder, and detach key cylinder from outside.


G5M0406

13) Striker
(1) Remove rear skirt trim.
(2) Remove two bolts from striker and detach striker.

B: INSTALLATION

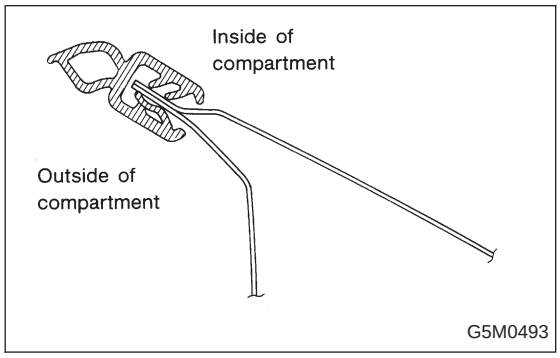
Install in reverse order of removal. Some special items will be described below.



1. WEATHERSTRIP

1) Place weatherstrip so that its joints meet at lower center of vehicle body, and install by inserting flanged portion from below, as shown in section A—A in figure.
2) Tap along entire length with a rubber hammer to firmly insert body flange into weatherstrip.

CAUTION:
- **Be careful not to install in wrong direction.**
- **Install weatherstrip carefully and firmly.**



2. OUTER HANDLE (REAR GATE)

Tightening torque:
Outer handle mounting nut
5.4 — 9.3 N·m (0.55 — 0.95 kg-m, 4.0 — 6.9 ft-lb)

CAUTION:
Completely insert latch pin into handle lever.

3. LATCH

Tightening torque:
Latch mounting bolt
20 — 29 N·m (2.0 — 3.0 kg-m, 14 — 22 ft-lb)

CAUTION:
Firmly join latch with key cylinder, and outer handle.

4. HINGE

Tightening torque:
Hinge mounting bolt and nut
Door side
20 — 29 N·m (2.0 — 3.0 kg-m, 14 — 22 ft-lb)
Body side
20 — 29 N·m (2.0 — 3.0 kg-m, 14 — 22 ft-lb)

CAUTION:
● Be sure to add sealer to hinge.
● When installing rear gate, be careful not to damage coating on body and rear gate.

5. GAS STAY

Tightening torque:
Stud bolt
10 — 18 N·m (1.0 — 1.8 kg-m, 7 — 13 ft-lb)

6. STRIKER

Tightening torque:
Striker mounting bolt
20 — 29 N·m (2.0 — 3.0 kg-m, 14 — 22 ft-lb)

7. BUFFER

Tightening torque:
Buffer mounting bolt
5.4 — 9.3 N·m (0.55 — 0.95 kg-m, 4.0 — 6.9 ft-lb)

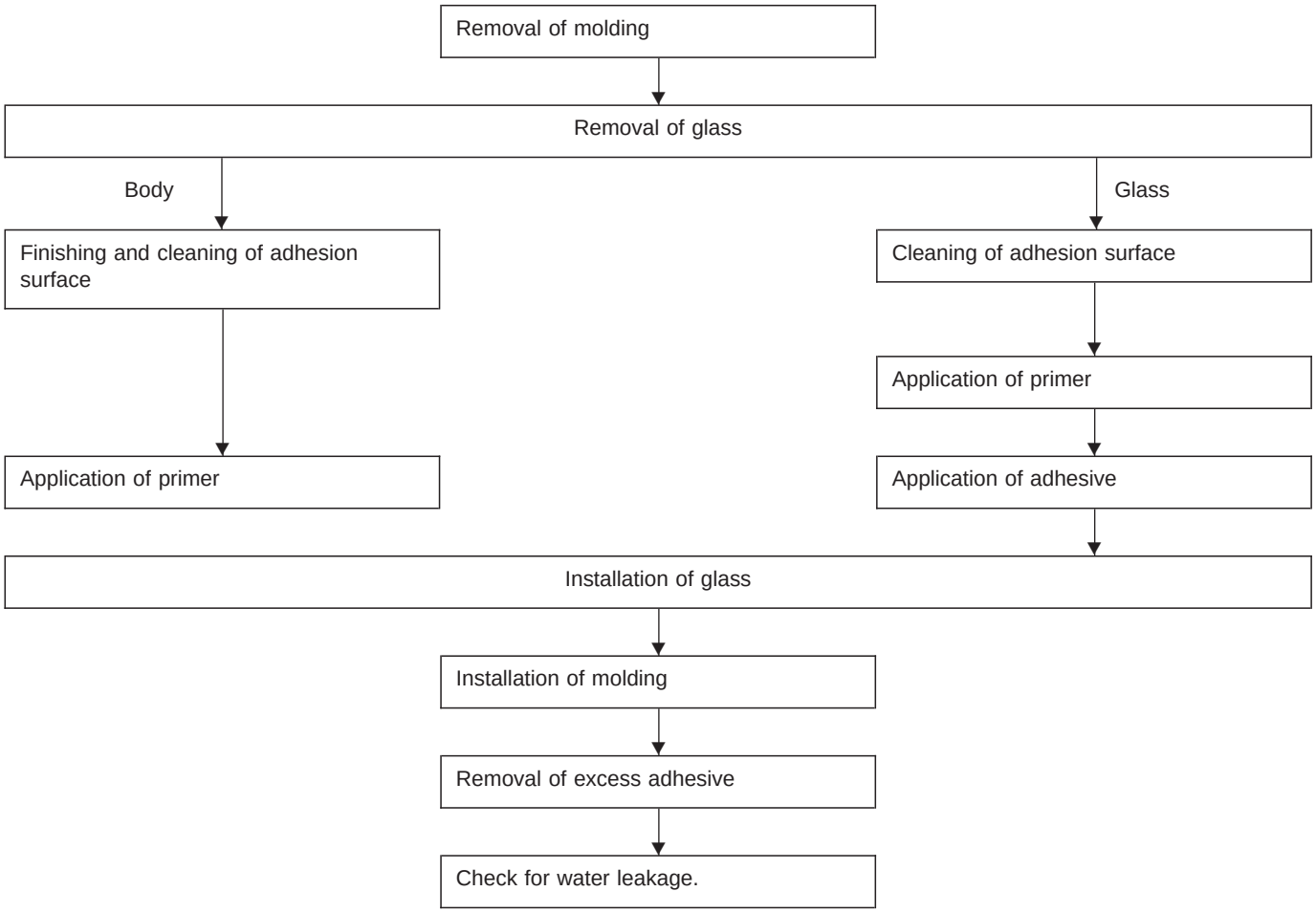
CAUTION:
Be careful not to mistake RH and LH body side buffers.

8. AUTO DOOR LOCK ACTUATOR

Tightening torque:
Actuator mounting bolt
5.4 — 9.3 N·m (0.55 — 0.95 kg-m, 4.0 — 6.9 ft-lb)

12. Procedure Chart for Removal and Installing Window Glass

1. PROCEDURES OF REMOVAL AND INSTALLATION



2. MATERIALS REQUIRED FOR APPLICATION

Description	Remarks
Repair adhesive set ● Cartridge of single-liquid urethane adhesive ● Primer for glass and body	Sunstar No. 580 or Essex Chemical Corp's Urethane E Sunstar No. 435-580
Windshield knife or piano wire	For cutting windshield
Sealant gun	For applying adhesive
Suction cups	For holding glass
Putty knife	For finishing adhesion surface and cutting spacer
Sponge	For applying primer
Gauze or cloth	For cleaning
Alcohol or white gasoline	For cleaning adhesion surface
Tape	For preventing damage to painted surface

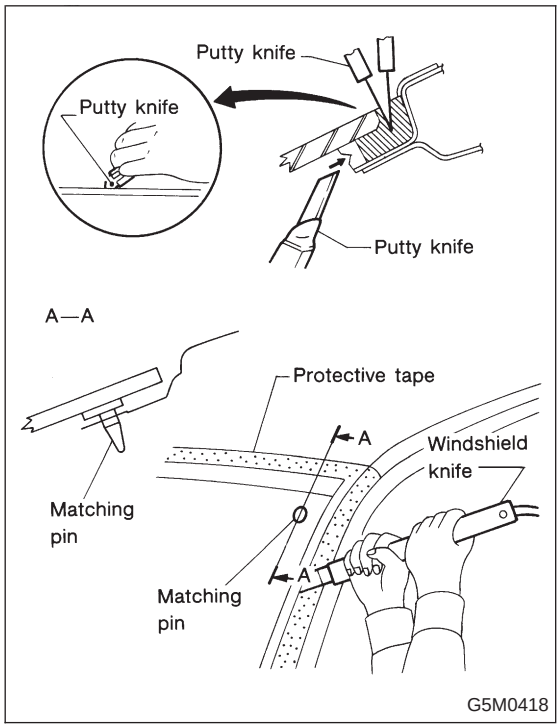
13. Windshield

A: REMOVAL

1. USING WINDSHIELD KNIFE

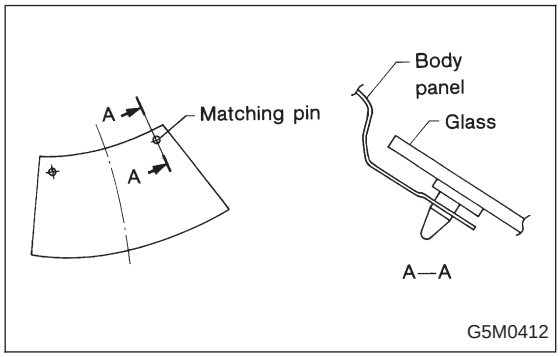
The following procedure for the front windshield can also be applied to other window glass.

1) Remove wiper arm and cowl panel.
2) Remove roof molding and front window molding upper.



3) Remove glass.
   (1) Put protective tape on body to prevent damage.
   (2) Apply soapy water to the surface of the adhesive agent so the knife blade slides smoothly.
   (3) Cut off excess adhesive agent.
   (4) Put windshield knife into layer of adhesive.
   (5) Cut adhesive layer with the windshield knife.

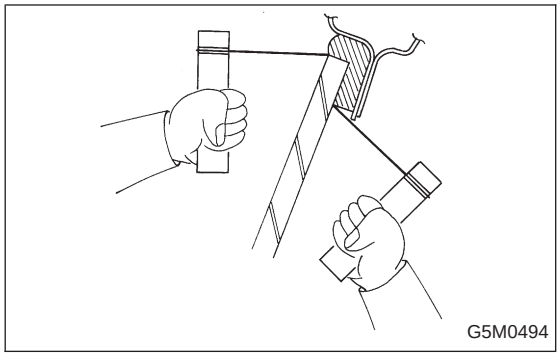
CAUTION:
- **Keep knife edge along glass surface and end face.**
- **When first putting knife into layer of adhesive, select point with wide gap between body and glass.**



NOTE:
A matching pin is cemented to corners of glass on compartment side.
Use a piano wire when cutting each pin.

2. USING PIANO WIRE

1) Remove wiper arm and cowl panel.
2) Remove roof molding and front window molding upper.

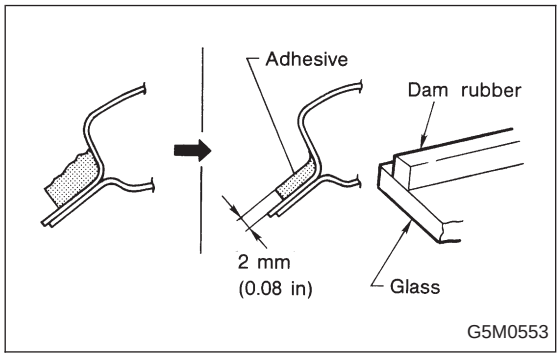

G5M0494

3) Remove glass.
(1) Put protective tape on body to prevent damage.
(2) Using drill or putty knife, make through-hole (one place) in adhesive agent.
(3) Pass piano wire through the hole from inside the compartment, and connect both ends of wire securely to wooden blocks.
(4) Cut adhesive layer with the wire by pulling it back and forth.

CAUTION:
When making through-hole into adhesive layer and cutting the adhesive, be careful not to damage interior and exterior parts.

B: INSTALLATION

1) After cutting layer of adhesive, remove gum rubber remaining on body.

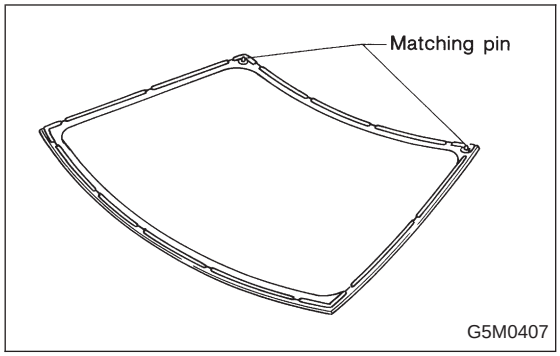


G5M0553

2) Finishing adhesion surface on body side
Using a cutter knife etc., cut layer of adhesive sticking firmly to body, and finish it to a smooth surface of about 2 mm (0.08 in) in thickness.

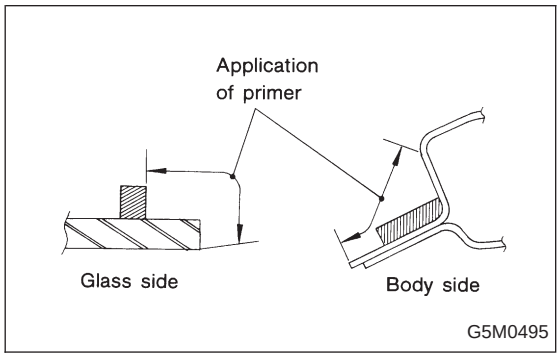
CAUTION:
Take extra care not to cause damage to body paint.

3) Cleaning body surface
(1) Thoroughly remove chips, dirt and dust from body surface.
(2) Clean body wall surface and upper surface of layer of adhesive with a solvent such as alcohol or white gasoline.



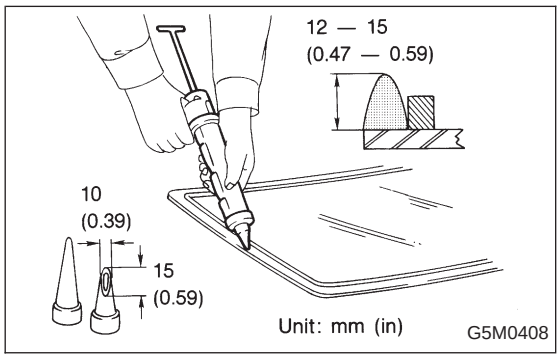
4) Positioning glass
(1) Mount glass on body.
(2) Adjust position of glass so that gap between body and glass is uniform on all sides.
(3) Put matching pin on body and glass in several places.

5) Cleaning glass
(1) Dismount glass from body.
(2) Clean surface of glass to be adhered with alcohol or white gasoline.

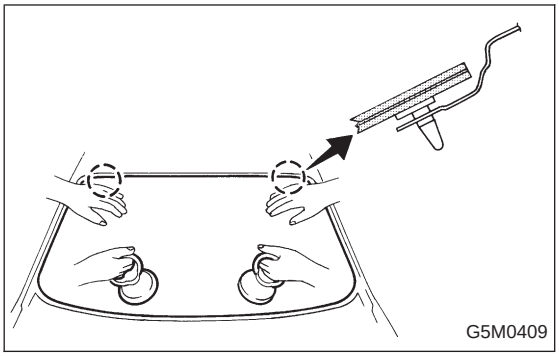


6) Application of primer
(1) Using a sponge, apply primer to part of glass to be adhered.
(2) Apply primer to part of body to be adhered.

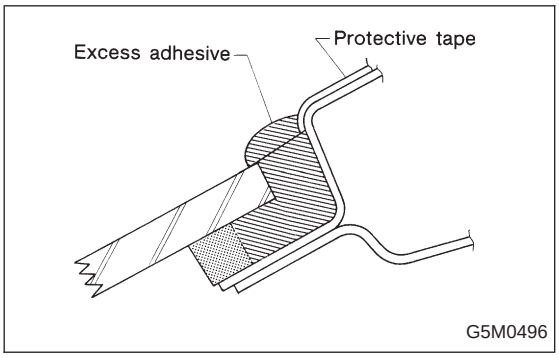
CAUTION:
- **Primer is hard to wipe off of body paint, instrument panel, inner trim, etc. So put masking around these areas for protection.**
- **After application, let 1st primer dry spontaneously for about 10 minutes.**
- **Do not touch primer-coated surface under any circumstances.**



7) Application of adhesive
(1) Cut nozzle tip of cartridge as shown in figure.
(2) Open cartridge and put it into a gun with nozzle attached.
(3) Apply adhesive uniformly to all sides of adhesion surface while operating gun along glass end face.


G5M0409

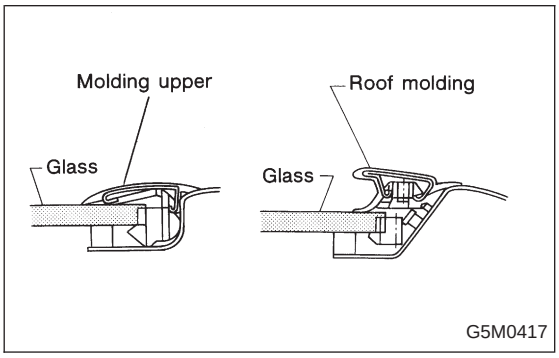
8) Installation of glass
(1) Hold glass with rubber suction cups.
(2) Mount glass on body with matching pin aligned.
(3) Stick them fast by pressing all sides lightly.



G5M0496

9) Installation of molding
(1) Remove adhesive overflowing from outside of glass until it becomes level with outer height of glass. Then, add adhesive to portions that need it, and clean with alcohol or white gasoline.
(2) Firstly, press-fit front window molding upper and lastly, roof molding.

CAUTION:
Do not open and close door after moldings have been installed. When opening and closing door for unavoidable reason, lower door glass and gently move door.



G5M0417

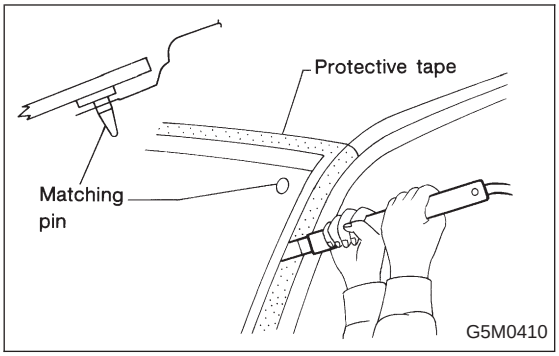
10) Water leakage test
Test for water leakage about one hour after installation.

CAUTION:
- **Move vehicle very gently.**
- **Do not squirt strong hose stream on vehicle.**

11) Spontaneous drying
After completing all operations, leave vehicle alone for 24 hours.

CAUTION:
When delivering vehicle to user, tell him that vehicle should not be subjected to heavy shocks for at least three days.

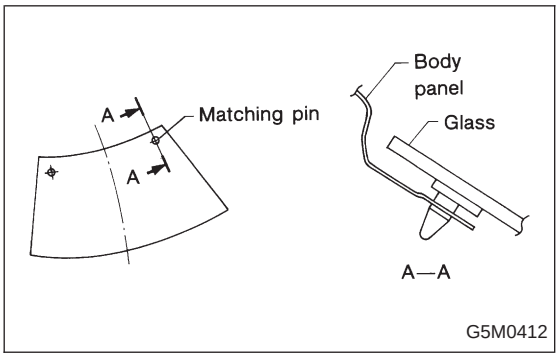
12) Install cowl panel and wiper arm.



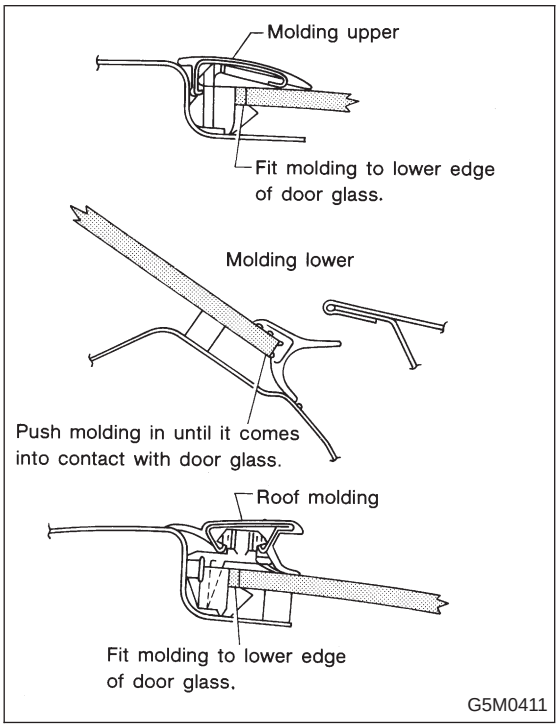
14. Rear Window Glass (Sedan and Coupe)

A: REMOVAL

1) Remove roof molding.
2) Remove rear window molding upper and lower.
3) Disconnect connector from rear defogger terminal.
4) Remove glass in same manner as in windshield.

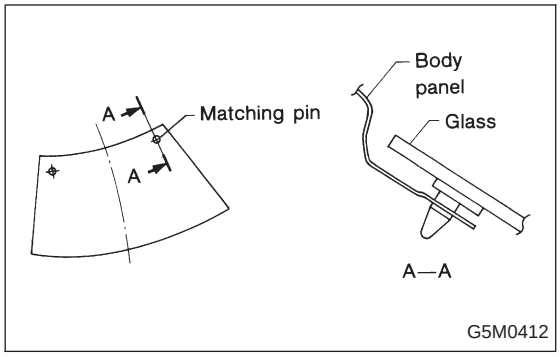


NOTE:
A matching pin is cemented to the corners of glass on compartment side. Use a piano wire when cutting each pin.



B: INSTALLATION

1) Install glass in same manner as in windshield.
2) Firstly, press-fit molding upper, then lower and lastly, roof molding.
3) After installation, test for water leakage after about one hour, and leave vehicle alone for 24 hours.
4) Make rear defogger connections.



15. Rear Window Glass (Wagon)

NOTE:
It is impossible to remove the molding from the glass.
If molding is broken, replace rear glass.

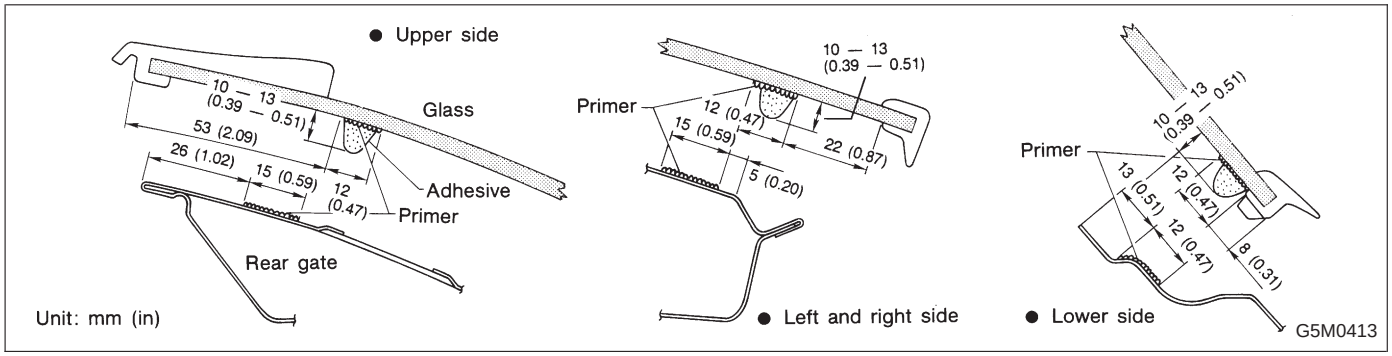
A: REMOVAL

1) Remove rear wiper and rear gate trimming.
2) Disconnect connector from rear defogger terminal.
3) Remove high mount stop light.
4) Remove glass in same manner as for windshield.

CAUTION:
Be careful not to damage molding re-installing the old rear window glass using a piano wire.

NOTE:
A matching pin is cemented to corners of glass on compartment side. Use a piano wire when cutting each pin.

B: INSTALLATION

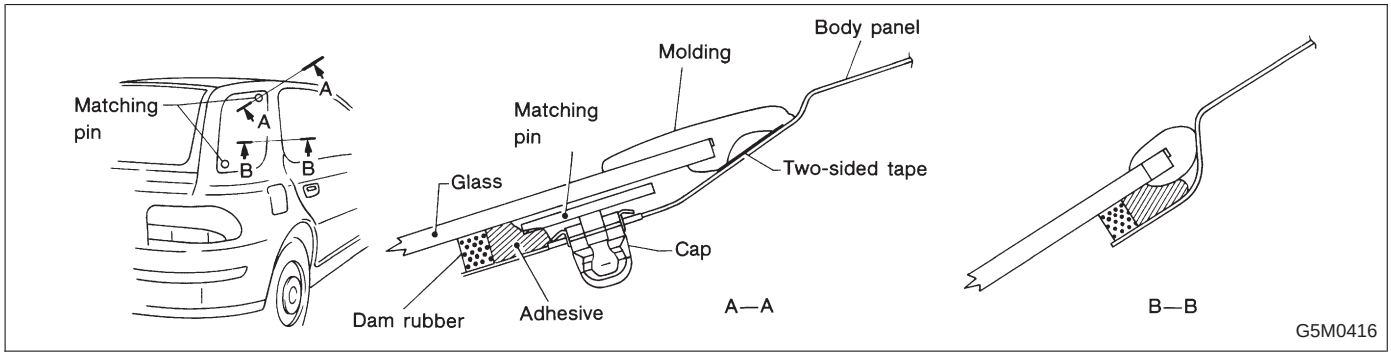


1) Install rear gate trimming.
2) Install glass in same manner as windshield.
3) About one hour after installation, test for water leakage. Leave vehicle for 24 hours before using it.
4) Connect rear defogger connections.
5) Install high mount stop light and rear wiper.

16. Rear Quarter Glass

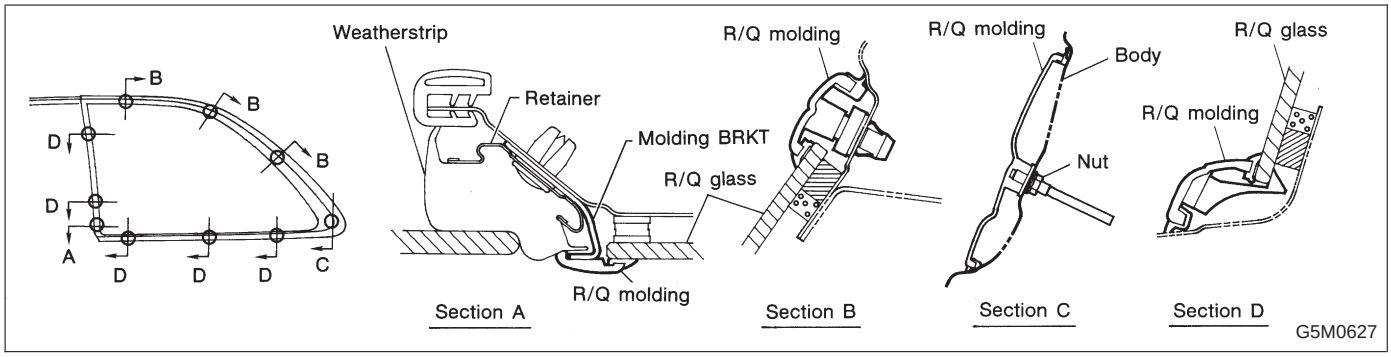
A: REMOVAL

1. WAGON MODEL

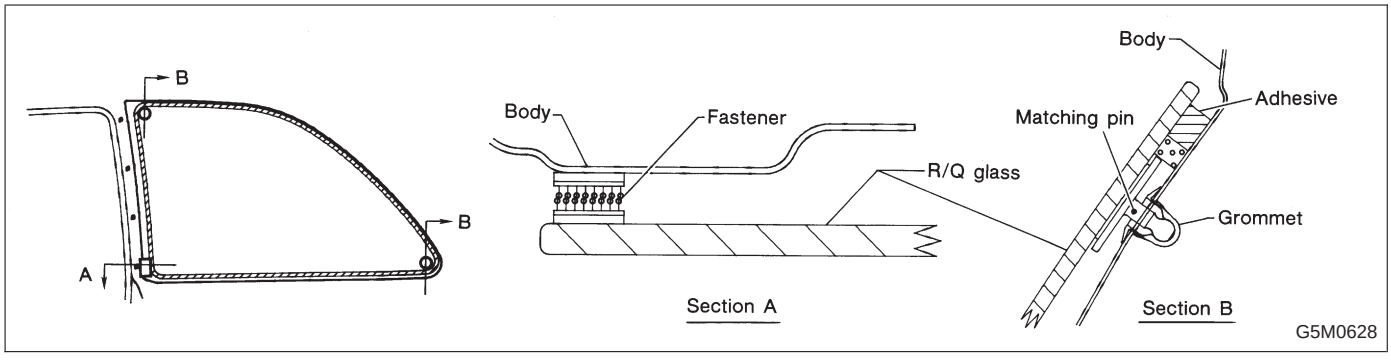


1) Remove rear quarter molding on corner.
2) Remove glass in same manner as in windshield.

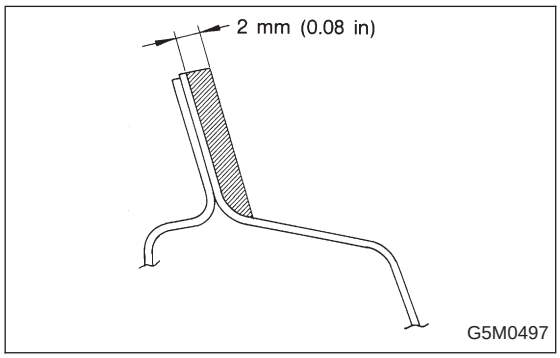
2. COUPE MODEL



1) Remove rear quarter molding.



2) Remove glass in same manner as in windshield.



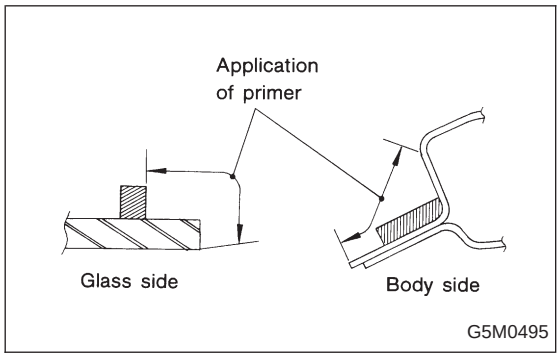
B: INSTALLATION

1. WAGON MODEL

1) Finish surface of adhesive layer on body.
Using a putty knife, etc., cut layer of adhesive stick firmly to body and finish it into a smooth surface of about 2 mm (0.08 in) in thickness.

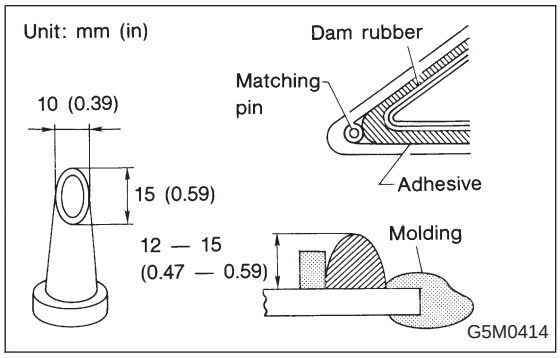
CAUTION:
Be careful not to damage body finish.

2) Cleaning of body surface
   (1) Remove chips, dirt and dust from body surface.
   (2) Clean body wall surface and upper surface of adhesive layer with a solvent such as alcohol or white gasoline.
3) Cleaning glass
   (1) Remove dirt and dust from surface of glass to be adhered.
   (2) Clean surface of glass to be adhered with alcohol or white gasoline.

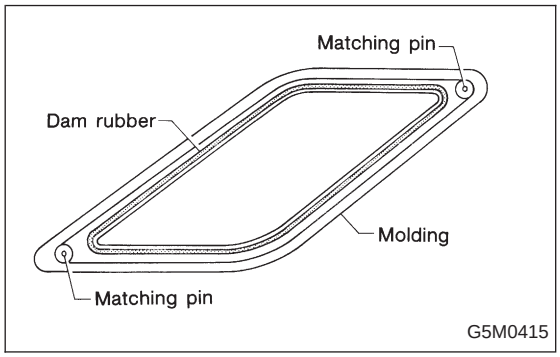


4) Application of primer
   (1) Using a sponge, apply primer to surface of glass to be adhered.
   (2) Apply primer to surface of body to be adhered.

CAUTION:
● If primer has dropped on body finish, it is hard to wipe it off. So protect with masking.
● Primer must not project from black frame of glass.
● After applying primer, let it dry spontaneously for about 10 minutes.



5) Application of adhesive
   (1) Cut nozzle tip as shown in figure.
   (2) Open cartridge and put it into a gun with nozzle attached.
   (3) Apply adhesive uniformly to all sides of adhesion surface while operating gun along glass end face.



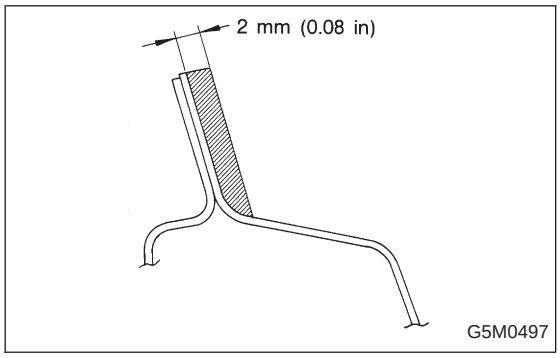
6) Installation of glass.
   (1) Hold glass with rubber suction cups.
   (2) Mount glass on body with matching pin aligned.
   (3) Stick them fast by pressing all sides lightly.

7) Water leakage test.
After installing glass, test for water leakage after about one hour.

CAUTION:
● Move vehicle slowly.
● When opening and closing door, lower door glass and move door gently.
● Do not squirt strong hose stream on vehicle.

8) Spontaneous drying.
After completing all operations, leave vehicle alone for 24 hours.

CAUTION:
When delivering vehicle to user, tell him that vehicle should not be subjected to heavy shocks for at least three days.



2. COUPE MODEL

1) Finish surface of adhesive layer on body.
Using a putty knife, etc., cut layer of adhesive stick firmly to body and finish it into a smooth surface of about 2 mm (0.08 in) in thickness.

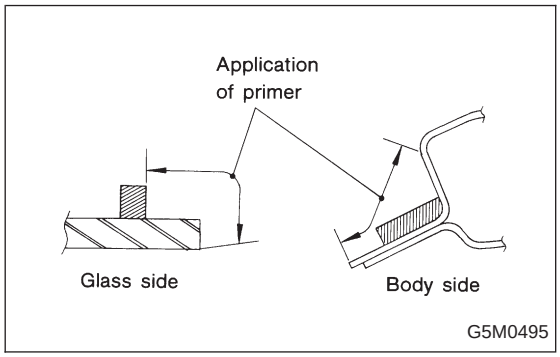
CAUTION:
Be careful not to damage body finish.

2) Cleaning of body surface

(1) Remove chips, dirt and dust from body surface.
(2) Clean body wall surface and upper surface of adhesive layer with a solvent such as alcohol or white gasoline.

3) Cleaning glass

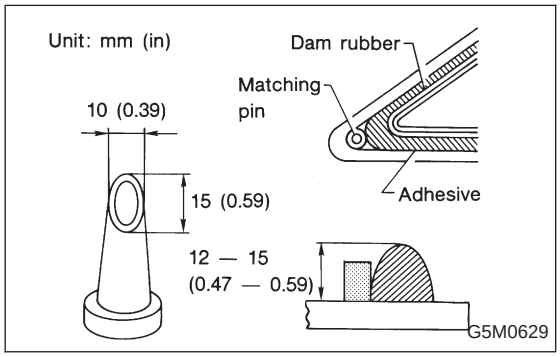
(1) Remove dirt and dust from surface of glass to be adhered.
(2) Clean surface of glass to be adhered with alcohol or white gasoline.



4) Application of primer

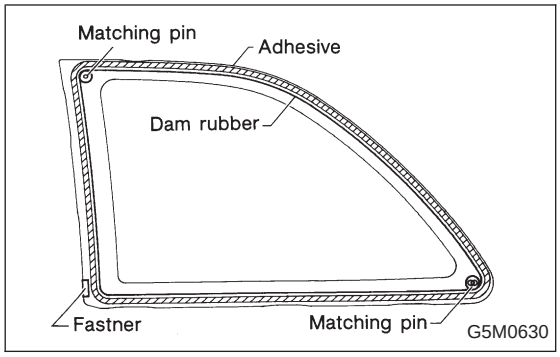
(1) Using a sponge, apply primer to surface of glass to be adhered.
(2) Apply primer to surface of body to be adhered.

CAUTION:
● If primer has dropped on body finish, it is hard to wipe it off. So protect with masking.
● Primer must not project from black frame of glass.
● After applying primer, let it dry spontaneously for about 10 minutes.



5) Application of adhesive

(1) Cut nozzle tip as shown in figure.
(2) Open cartridge and put it into a gun with nozzle attached.
(3) Apply adhesive uniformly to all sides of adhesion surface while operating gun along glass end face.



6) Installation of glass
   (1) Hold glass with rubber suction cups.
   (2) Mount glass on body with matching pin aligned.
   (3) Stick them fast by pressing all sides lightly.

7) Water leakage test

After installing glass, test for water leakage after about one hour.

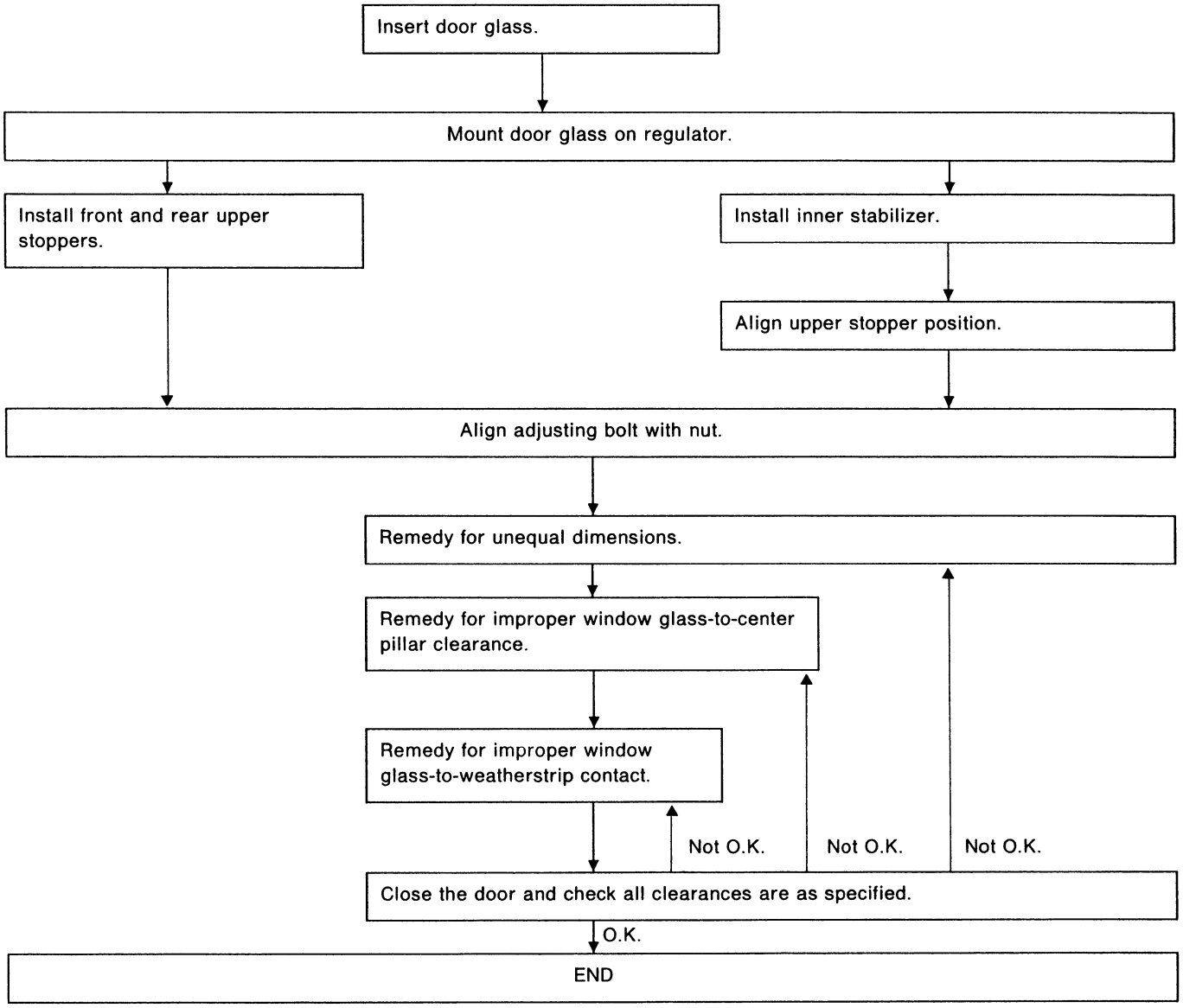
CAUTION:
- **Move vehicle slowly.**
- **When opening and closing door, lower door glass and move door gently.**
- **Do not squirt strong hose stream on vehicle.**

8) Spontaneous drying

After completing all operations, leave vehicle alone for 24 hours.

CAUTION:
When delivering vehicle to user, tell him that vehicle should not be subjected to heavy shocks for at least three days.

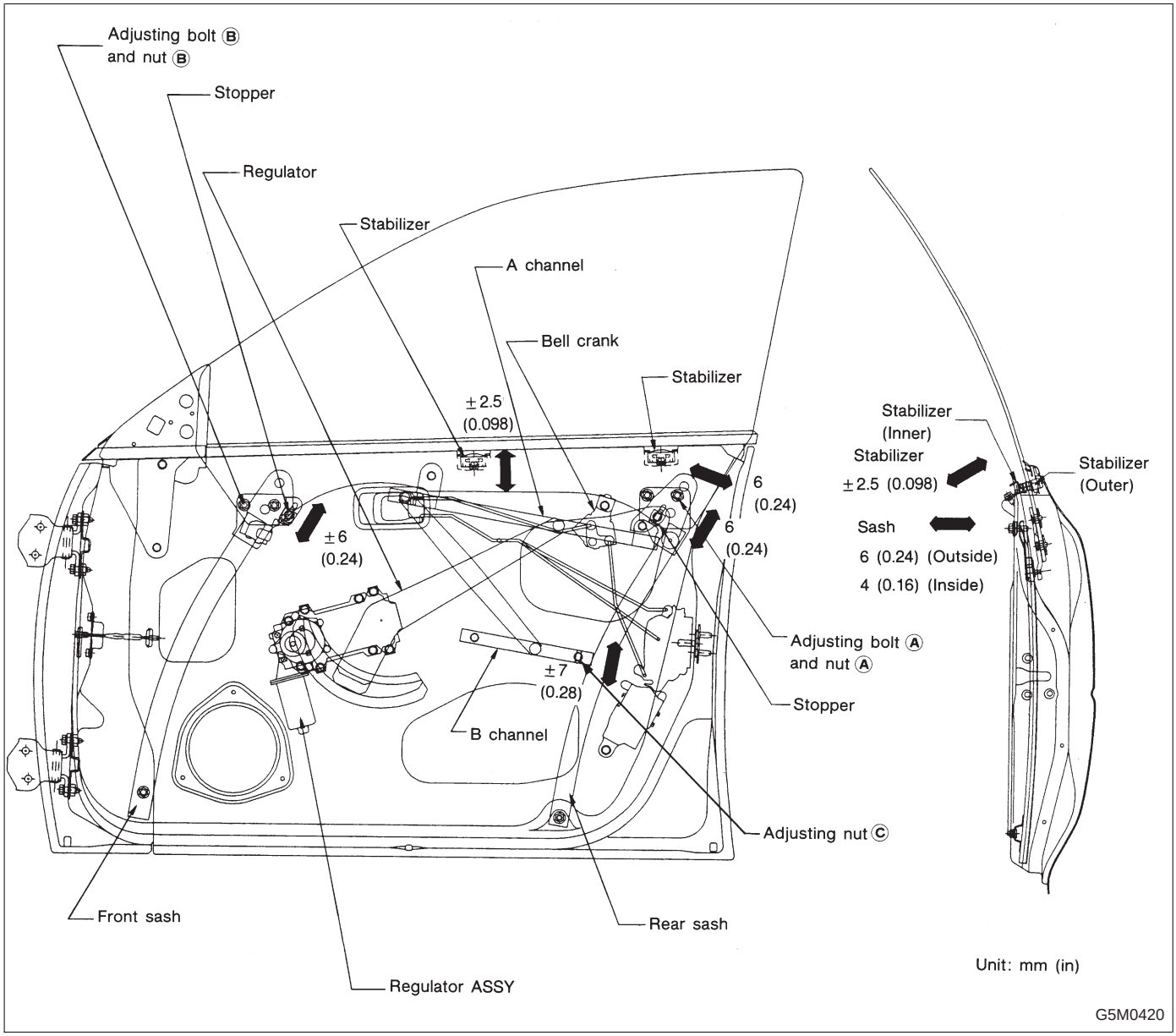
17. Procedure Chart for Adjusting Door Glass



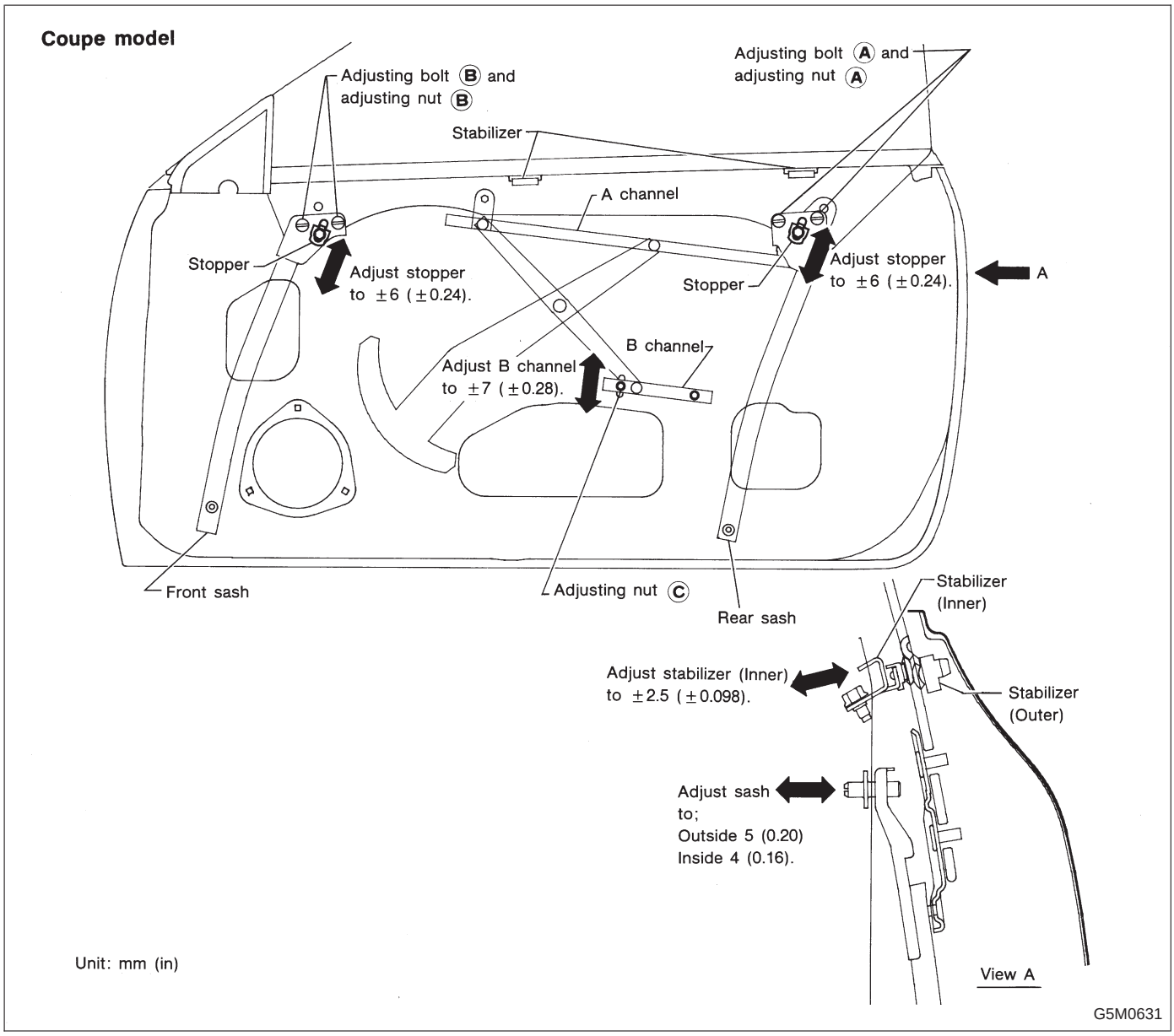
18. Front Door Glass Adjustment

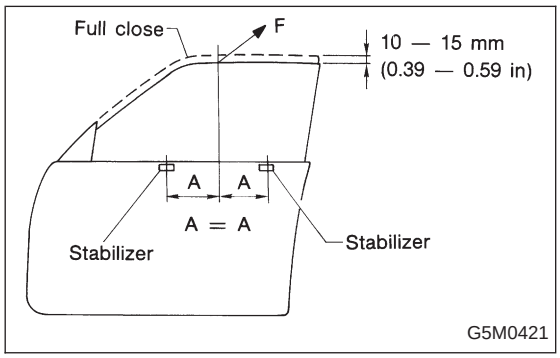
A: ADJUSTMENT

1. SEDAN AND WAGON MODEL



2. COUPE MODEL





3. DOOR GLASS FIT ADJUSTMENT

Before adjusting door glass alignment, ensure adjusting bolts for stabilizers, upper stoppers and sashes are loose and glass is raised so that it is in contact with upper and side weatherstrip.

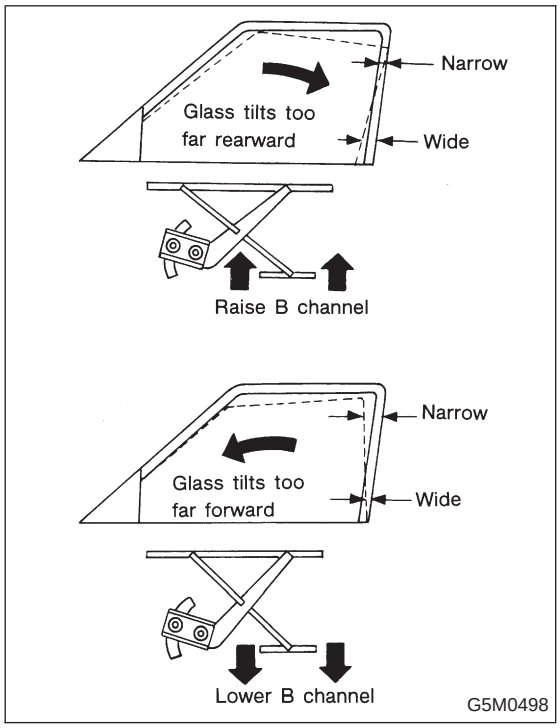
1) Temporarily tighten one of the two rear sash adjusting bolts, at midpoint of oblong hole on inner panel.

2) Temporarily tighten regulator B channel at a position slightly lower than midpoint of oblong hole on inner panel.

3) Lower door glass 10 to 15 mm (0.39 to 0.59 in) from fully closed position. While applying outward pressure (load) to upper edge of glass above midpoint of two outer stabilizers, press inner stabilizer until it just touches the glass, then secure it.

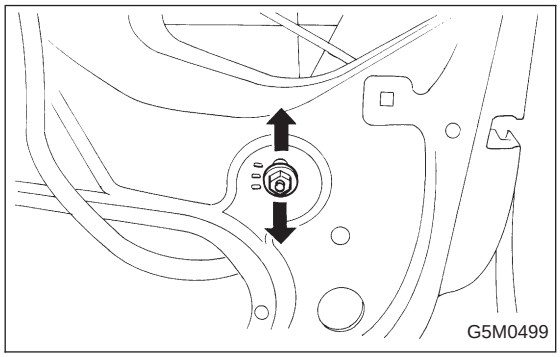
Load: F

Front door glass 39 — 49 N (4 — 5 kg, 9 — 11 lb)
Rear door glass 39 — 49 N (4 — 5 kg, 9 — 11 lb)

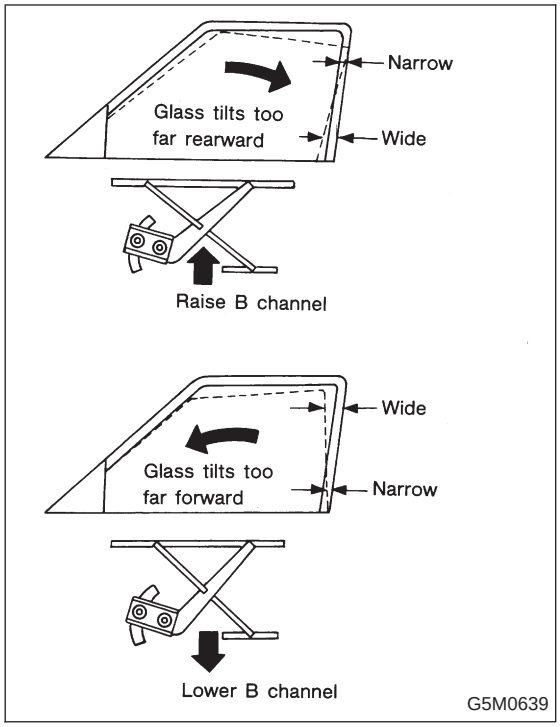


4. REMEDY FOR UNEQUAL DIMENSIONS, BETWEEN UPPER, LOWER AND CENTER PILLAR SIDES (SEDAN AND WAGON MODEL)

1) Close front door and raise door glass.
2) Make sure of unequal dimensions.

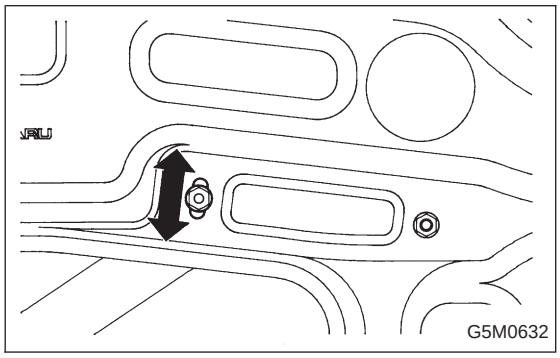


3) If glass tilts to far rearward, loosen adjusting nut Ⓒ and adjust glass to be parallel with center pillar, then after adjustment, tighten adjusting nut Ⓒ.



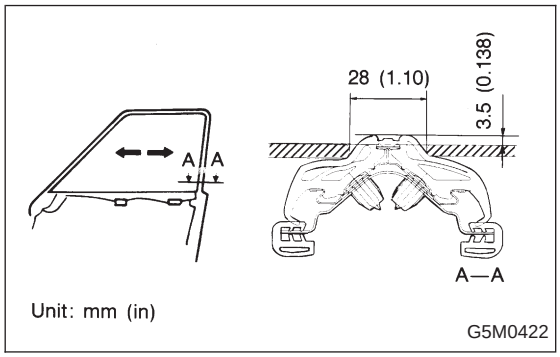
5. REMEDY FOR UNEQUAL DIMENSIONS, BETWEEN UPPER, LOWER AND CENTER PILLAR SIDES (COUPE MODEL)

1) Close front door and raise door glass.
2) Make sure of unequal dimensions.



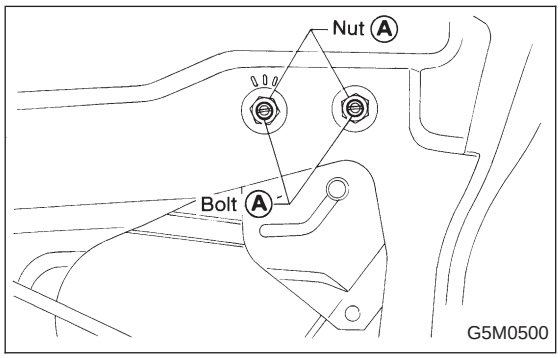
3) If glass tilts to far rearward, loosen adjusting nut Ⓒ and adjust glass to be parallel with center pillar, then after adjustment, tighten adjusting nut Ⓒ.

Tightening torque:
7.4±2.0 N·m (0.75±0.2 kg-m, 5.4±1.4 ft-lb)

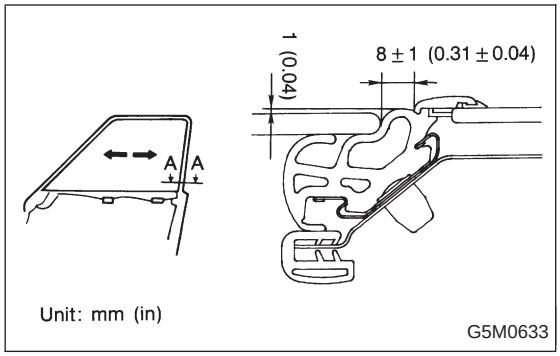


6. REMEDY FOR IMPROPER GLASS TO CENTER PILLAR CLEARANCE (SEDAN ADN WAGON MODEL)

1) Close front door and raise door glass.
2) Make sure of improper clearance.

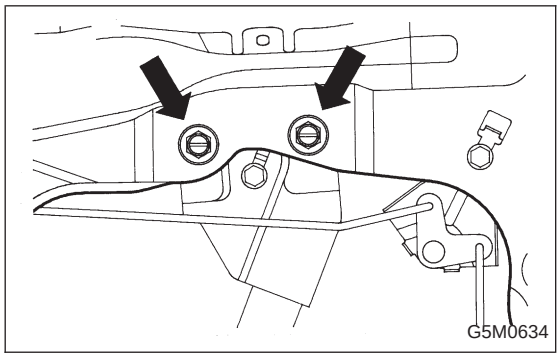


3) If clearance is improper, loosen adjusting nut Ⓐ, bolt Ⓑ and adjust glass to center pillar.

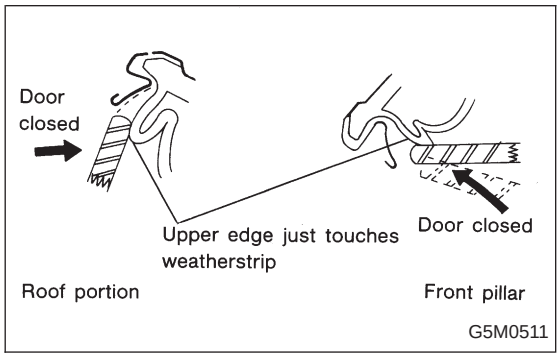


7. REMEDY FOR IMPROPER GLASS TO CENTER PILLAR CLEARANCE (COUPE MODEL)

1) Close front door and raise door glass.
2) Make sure of improper clearance.

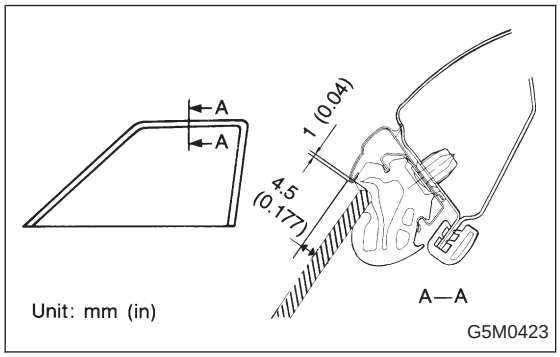


3) If clearance is improper, loosen adjusting nut Ⓐ, bolt Ⓐ and adjust glass to center pillar.



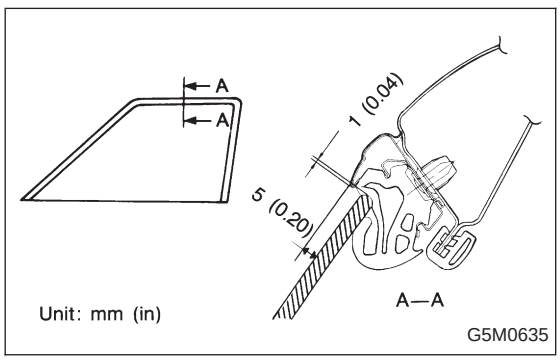
8. REMEDY FOR IMPROPER UPPER STOP POINT OF DOOR GLASS

1) Loosen front and rear sash stoppers.
2) Increase the upward travel of window glass up to the position where upper edge just touches weatherstrip surface with door closed.
3) After adjustment, temporarily tighten stoppers.
NOTE:
Make sure that each glass stopper is touched.



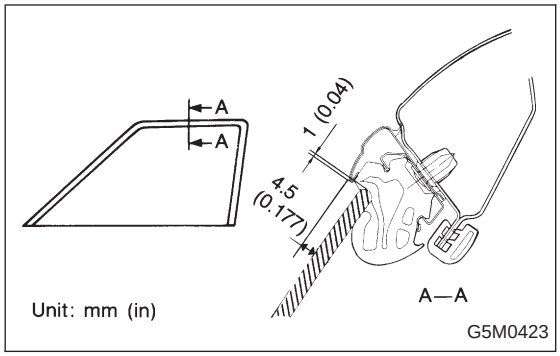
9. REMEDY FOR INCORRECT CONTACT OF DOOR GLASS TO WEATHERSTRIP (SEDAN AND WAGON MODEL)

1) Close front door and raise door glass.
2) If clearance is below specifications, loosen bolt Ⓐ and bolt Ⓑ.
3) If clearance is over specifications, tighten bolt Ⓐ and bolt Ⓑ.



10. REMEDY FOR INCORRECT CONTACT OF DOOR GLASS TO WEATHERSTRIP (COUPE MODEL)

1) Close front door and raise door glass.
2) If clearance is below specifications, loosen bolt Ⓐ and bolt Ⓑ.
3) If clearance is over specifications, tighten bolt Ⓐ and bolt Ⓑ.



11. FIT ADJUSTMENT (SEDAN AND WAGON MODEL)

Door glass fit is adjusted by displacing the glass front edge with a stabilizer.

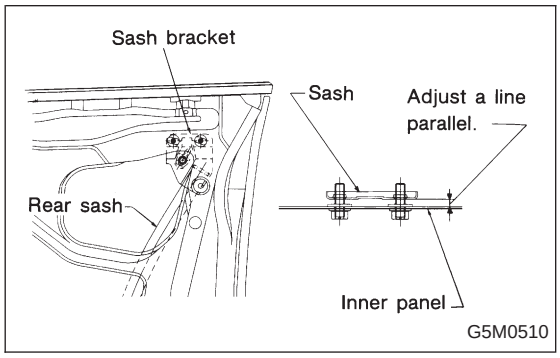
NOTE:

Before adjusting glass fit, visually check to determine relative adjusting positions of retainer and molding (on roof side) and glass surface.

1) Alternately adjust two rear sash adjusting bolts Ⓐ until dimensions (indicated in figure) are obtained.

CAUTION:

Do not loosen two adjusting nuts Ⓐ at the same time, as this moves sash fore and aft, creating unequal glass-to-sash clearance. During adjustment, loosen only one nut and keep the other tightened.



NOTE:

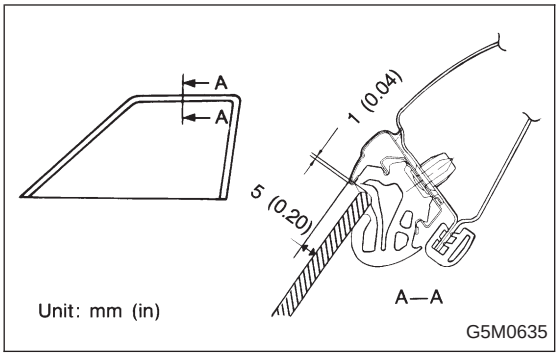
Always adjust two rear sash adjusting bolts Ⓐ by the same amount. Do not adjust the adjusting bolts with sash bracket inclined toward inner panel, as this increases effort required to operate regulator.

2) Adjust front sash fit using rear sash adjustment procedure outlined above as a guide. Two adjusting bolts must be adjusted by the same amount.

NOTE:

Front and rear sash adjustment procedures are basically the same; however, the amount of adjustment is not always the same due to alignment dispersion of individual doors. Adjust front and rear sash fit, as equally as possible. Otherwise, effort required to operate regulator may increase.

3) After adjusting front sash-to-glass fit, secure front sash.



12. FIT ADJUSTMENT (COUPE MODEL)

Door glass fit is adjusted by displacing the glass front edge with a stabilizer.

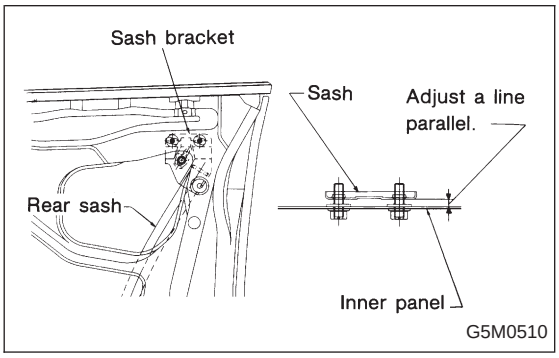
NOTE:

Before adjusting glass fit, visually check to determine relative adjusting positions of retainer and molding (on roof side) and glass surface.

1) Alternately adjust two rear sash adjusting bolts Ⓐ until dimensions (indicated in figure) are obtained.

CAUTION:

Do not loosen two adjusting nuts Ⓐ at the same time, as this moves sash fore and aft, creating unequal glass-to-sash clearance. During adjustment, loosen only one nut and keep the other tightened.



NOTE:

Always adjust two rear sash adjusting bolts Ⓐ by the same amount. Do not adjust the adjusting bolts with sash bracket inclined toward inner panel, as this increases effort required to operate regulator.

2) Adjust front sash fit using rear sash adjustment procedure outlined above as a guide. Two adjusting bolts must be adjusted by the same amount.

NOTE:

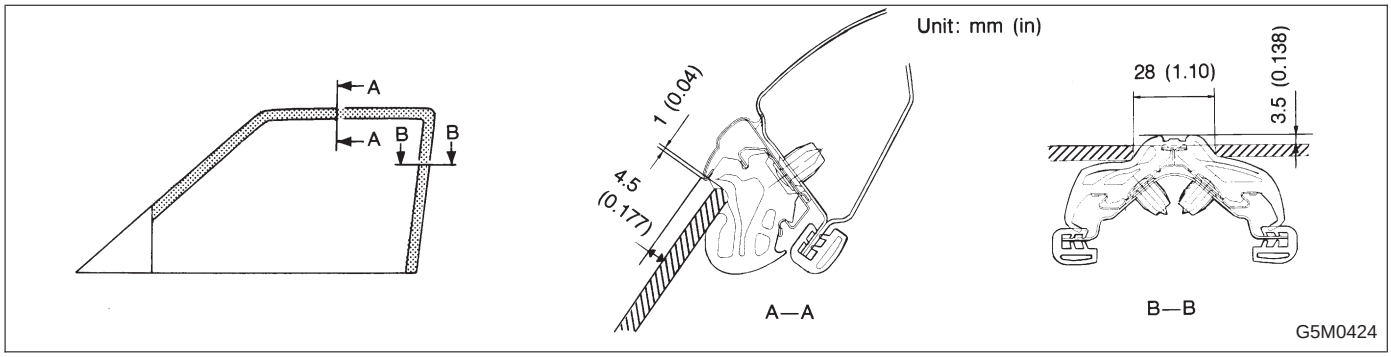
- Front and rear sash adjustment procedures are basically the same; however, the amount of adjustment is not always the same due to alignment dispersion of individual doors.
- Adjust front and rear sash fit, as equally as possible. Otherwise, effort required to operate regulator may increase.

3) After adjusting front sash-to-glass fit, secure front sash.

B: INSPECTION

1. SEDAN AND WAGON MODEL

1) Close front door and make sure of all clearances.



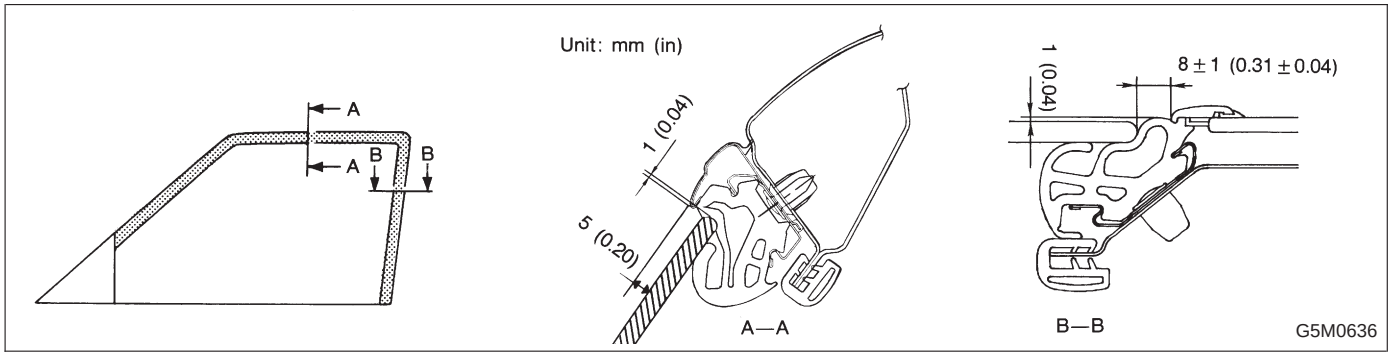
2) If any clearance is not correct, adjust affected parts. Recheck all clearances.

CAUTION:

- **Repeatedly adjust parts until all clearances are correct.**
- **After clearance adjustment, make sure that all adjusting bolts and nuts are tightened.**

2. COUPE MODEL

1) Close front door and make sure of all clearances.



2) If any clearance is not correct, adjust affected parts. Recheck all clearances.

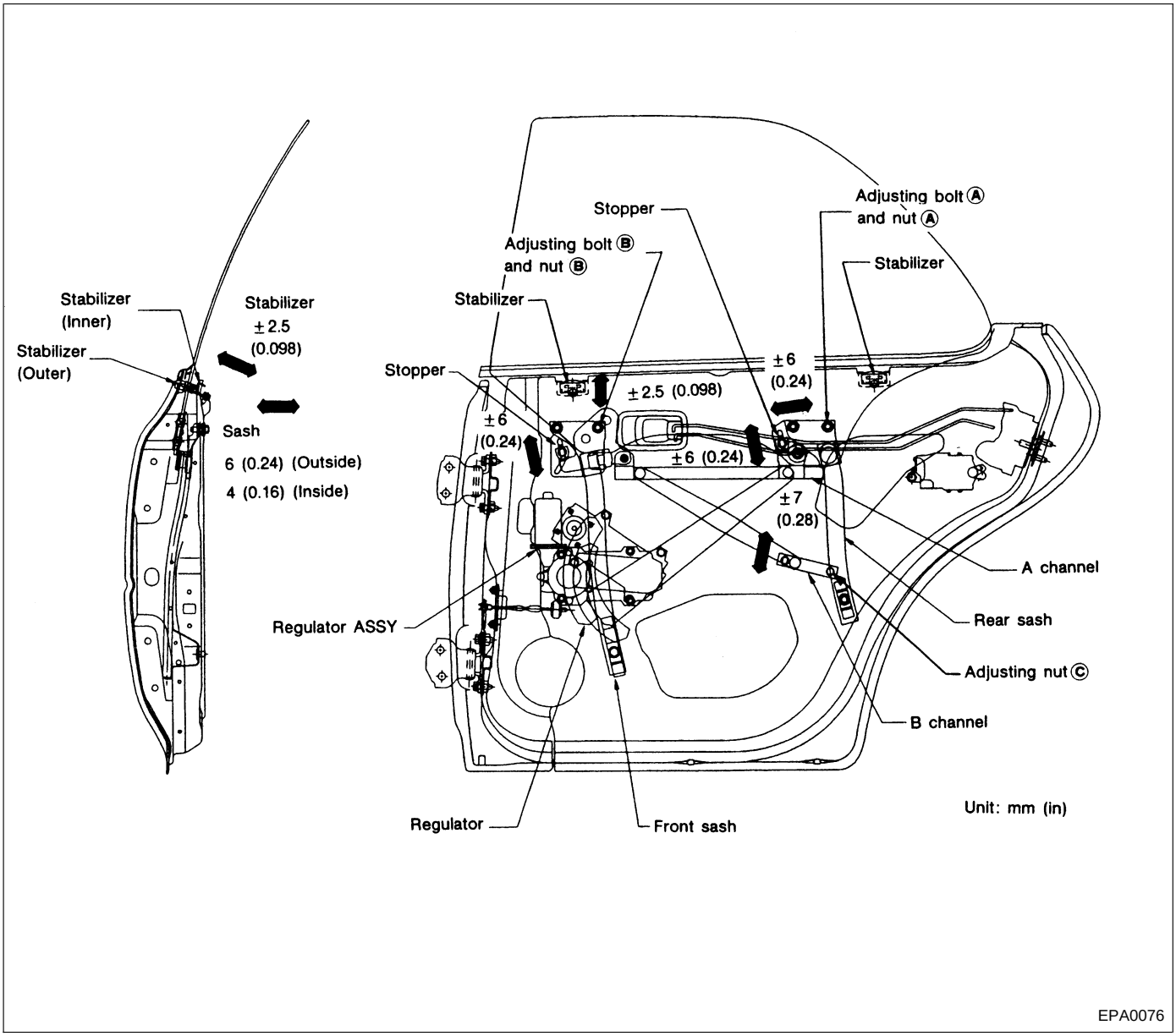
CAUTION:

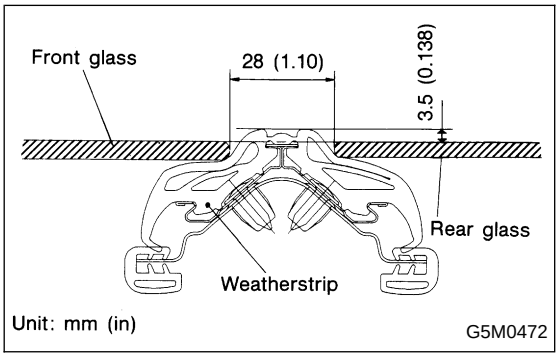
- **Repeatedly adjust parts until all clearances are correct.**
- **After clearance adjustment, make sure that all adjusting bolts and nuts are tightened.**

19. Rear Door Glass Adjustment

A: ADJUSTMENT

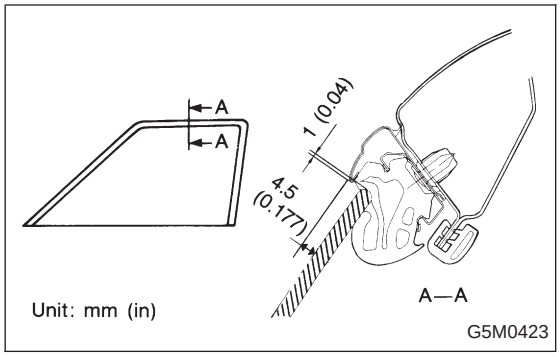
Alignment of rear door glass is basically the same as for the front door glass. Due to slight difference in adjustment dimensions for fore-aft, up-down, and in-out alignments, key points for rear door adjustment are described below.





1. FORE-AFT ADJUSTMENT

1) Door glass alignment must be adjusted so that glass-to-center pillar fit is equal at all points. Always use dimensions (indicated in figure) as a guide during adjustment.
NOTE:
If dimensions are smaller than those indicated, glass will be caught in weatherstrip and may not raise to the fully closed position.
2) After making fore-aft adjustment, raise and lower glass to ensure it is free from any binding.

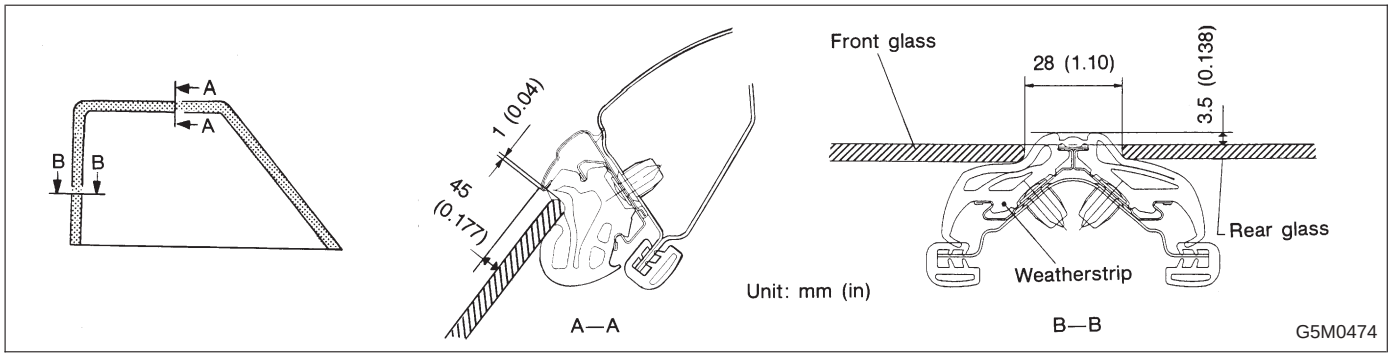


2. FIT ADJUSTMENT

Increasing contact pressure causes rear door glass to be caught in center pillar upper and lower weatherstrip; this will cause premature weatherstrip wear. For this reason, always use dimensions indicated below as a guide during glass fit adjustment.

B: INSPECTION

1) Close rear door and make sure of all clearances.

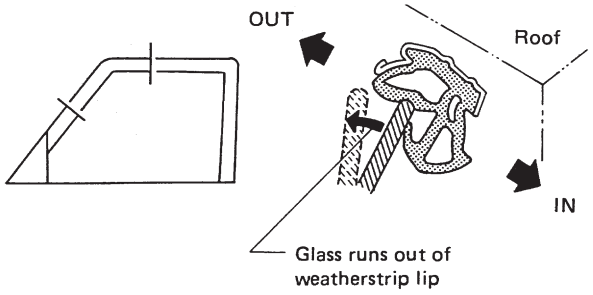
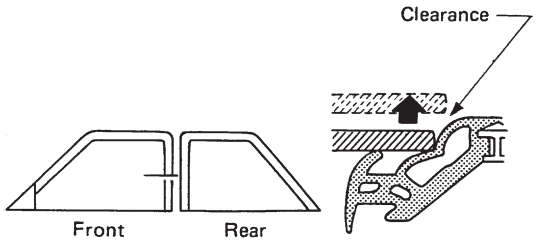
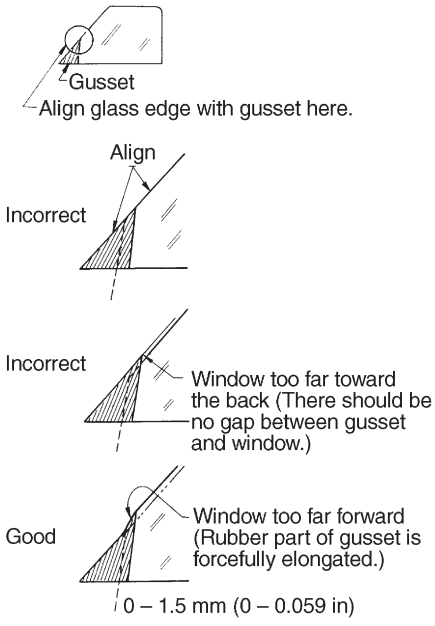


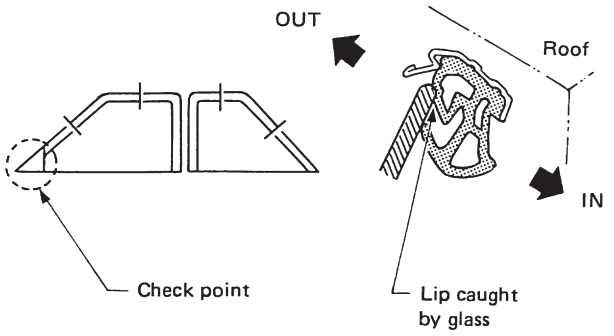
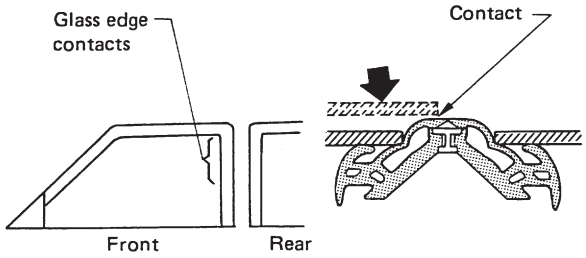
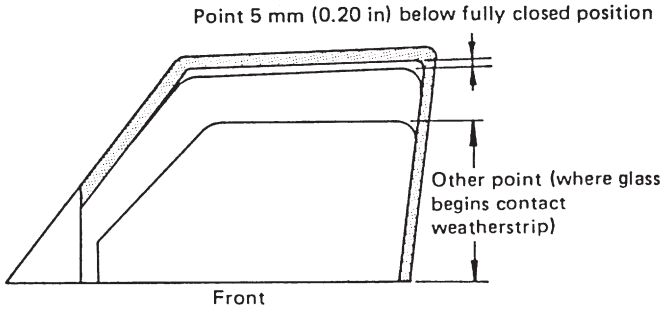
2) If any clearance is not correct, adjust affected parts. Re-check that all clearances are correct.

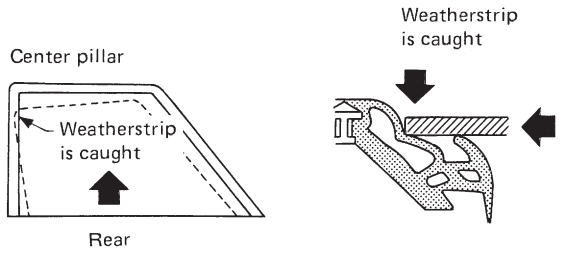
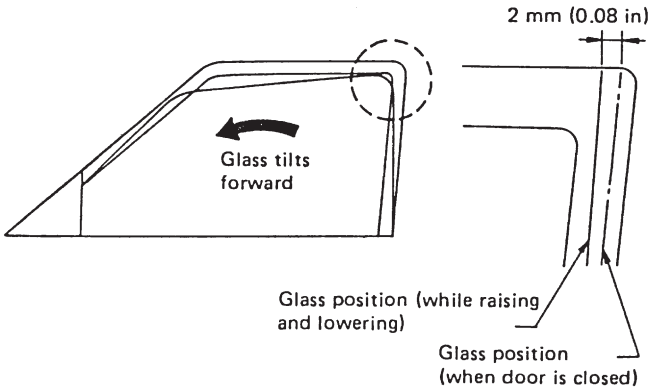
CAUTION:

- **Repeatedly adjust parts until all clearances are correct.**
- **After clearance adjustment, make sure that all adjusting bolts and nuts are tightened.**

1. Door Glass

	Condition	Apparent cause/Correction
Glass in fully closed position	1) Glass runs out of weatherstrip lip when considerable hand pressure is applied to it from inside.  G5M0502 (This condition may cause wind/booming noise during high-speed operation.)	• Insufficient upward travel of glass Increase upward travel of glass.
	2) Clearance exists between glass and weatherstrip when light hand pressure is applied to it at center and rear pillar locations.  G5M0503 (This condition may cause wind noise and/or water leakage.)	• Insufficient glass-to-door weatherstrip contact Check stabilizer and glass for proper contact. Increase contact using upper sash adjustment bolt. • Improper adjustment of striker in “in-out” direction Close door and check for alignment of striker with car body.
	3) Adjust door glass so that it is aligned with door rearview mirror gusset.  H5M0672A	• Window is not properly adjusted in up-down/fore-aft direction. Adjust window. If necessary, move “B” channel for regulator to eliminate window “tilt”. • Gusset is not properly adjusted in fore-aft direction. Adjust gusset after loosing all bolts and nuts witch tightening it.

	Condition	Apparent cause/Correction
Door in fully closed/ open position	1) Glass rides over weatherstrip lip when door is closed.  G5M0505 (This condition increases wind/booming noise, leakage and/or effort required to close door.)	● Improper up-down and in-out glass alignments Adjust glass for up-down and in-out alignments (incl. rear sash, upper stopper adjustment, etc.). If necessary, correct glass tilt by moving regulator “B” channel.
	2) Edge of glass contacts retainer when door is fully closed.  G5M0506	● Improper glass-to-center pillar weatherstrip or excessive glass contact to weatherstrip Excessive adjusting in contact to weatherstrip. Causes rear edge of glass to tilt inboard closer to center pillar. Adjust rear sash adjustment bolt to reduce glass contact to weatherstrip.
Raise or lower window glass	1) Considerable effort or time is required to operate regulator. Standard operating effort: ● Entire up-down travel except for point 5 mm (0.20 in) below fully closed position: 29.4 N (3.0 kg, 6.6 lb) ● Point 5 mm (0.20 in) below fully closed position: 45.0 N (4.5 kg, 10.12 lb)  G5M0507	● Sliding resistance increased due to high stabilizer-to-glass contact pressure Reduce contact by mounting inner stabilizer to inside of the car. ● High glass-to-windshield contact pressure Reduce contact using upper sash adjustment bolt. ● Unequal contact adjustment stroke between front and rear sashes Set to equal stroke. ● Tilt of rear sash adjustment bolt mounting bracket Correct tilt of bracket so it is parallel to inner panel.

	Condition	Apparent cause/Correction
Raise or lower window glass	2) Center pillar weatherstrip is caught by rear window glass when glass is raised.  G5M0508	● Improper fore-aft or in-out alignment of window glass Lower regulator “B” channel to tilt window glass back.
	3) Glass tilts forward by more than 2 mm (0.08 in).  G5M0509 (Excessive tilt of glass forward is due to excessive glass “contact” which causes reaction of center pillar weatherstrip.) Glass can be tilted forward due to increase in reaction of shoulder weatherstrip or free play between sash and roller. Taking these symptoms into account, glass should be aligned.	● Excessive glass contact pressure or improper in-out alignment 1) Lower regulator “B” channel to tilt glass rearward. 2) Reduce contact pressure using upper sash adjustment bolt.

2. Door Lock System

No.	Trouble	Possible cause	Remedy
1	Door cannot be opened by outer handle. (Door can be opened by inner handle.)	Disconnect outer handle rod.	Connect firmly.
2	Door cannot be opened by inner handle. (Door can be opened by outer handle.)	a. Joint of upper rod is disconnected. b. Rear door child lock lever is set to lock side.	Connect firmly. Functionally normal.
3	Door does not open when outer or inner handle is operated with inner lock knob set to unlock position.	a. Joint of lower rod is disconnected. b. Lock is not released due to improper adjustment of lower rod.	Connect firmly. Remove rod from latch. Adjust rod so that lock knob is set in “lock” position is locked.
4	Door opens even when inner lock knob is set to lock position. (Keyless locking is impossible.)	a. Lower rod joint is separated. b. Door is not locked due to improperly adjusted lower rod.	Same as a in No. 3. Same as a in No. 3.
5	Child lock lever will not come up.	a. Inner handle fails to return completely. b. Joint of upper rod is disconnected.	Refer to No. 6.
6	Inner handle stops halfway.	Contact of upper rod with inner handle mounting case.	Eliminate contact by bending upper rod properly.
7	Door cannot be locked or unlocked by key.	Joint of key lock rod is disconnected.	Connect firmly.
8	Auto door-lock switch does not act when inner lock knob is pushed.	Auto door-lock switch does not act due to improperly adjusted lower rod.	Same as a in No. 3.

3. Power Window

Symptom	Battery	Fuse in fuse box	Circuit breaker and relay	Main switch	Sub switch of each passenger side	Motor of driver side	Motor of each passenger side	Regulator assembly of each window	Power supply line of main switch	Ground line	Harness and connector
All windows does not move.	①	②	③	④					⑤	⑥	⑦
The window of driver side does not move.				①		②			③		④
The window of driver side does not move “AUTO” up-down.				①		②			③		④
The window of each passenger side does not move.				①	②		③	④			⑤
				①	②		③	④			⑤
				①	②		③	④			⑤

◯: Figures in a circle refer to diagnostic procedures.

SEATS, SEAT BELTS, AND INTERIOR 5-3

PRECAUTION FOR SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

The Supplemental Restraint System "Airbag" helps to reduce the risk or severity of injury to the driver in a frontal collision.

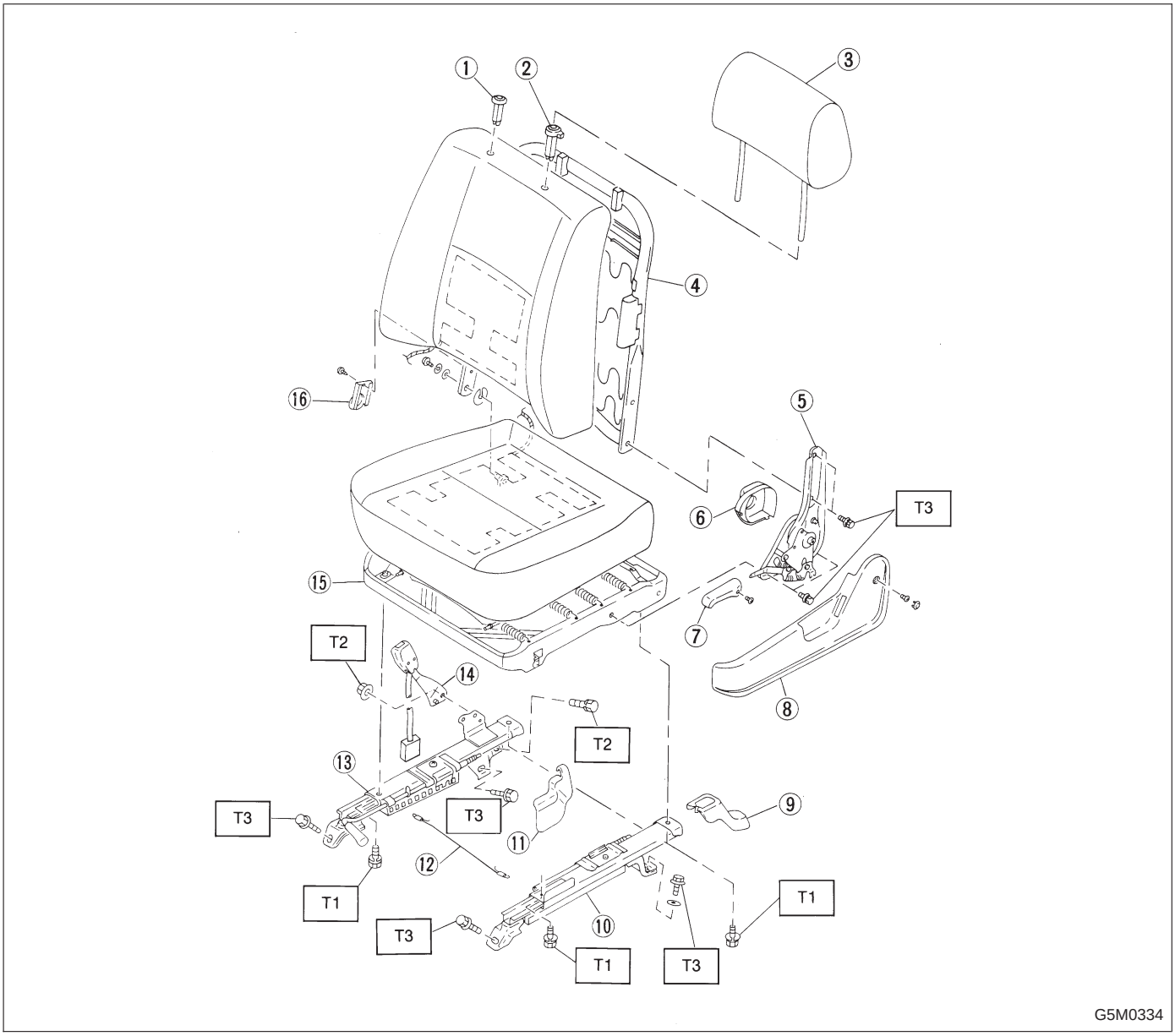
The Supplemental Restraint System consists of an airbag module (located in the center of the steering wheel), sensors, a control module, warning light, wiring harness and roll connector.

Information necessary to service the safety is included in the "5-5. SUPPLEMENTAL RESTRAINT SYSTEM" of this Service Manual.

WARNING:

- **To avoid rendering the Airbag system inoperative, which could lead to personal injury or death in the event of a severe frontal collision, all maintenance must be performed by an authorized SUBARU dealer.**
- **Improper maintenance, including incorrect removal and installation of the Airbag system, can lead to personal injury caused by unintentional activation of the Airbag system.**
- **All Airbag system electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the Supplemental Restraint System "Airbag".**

1. Front Seat

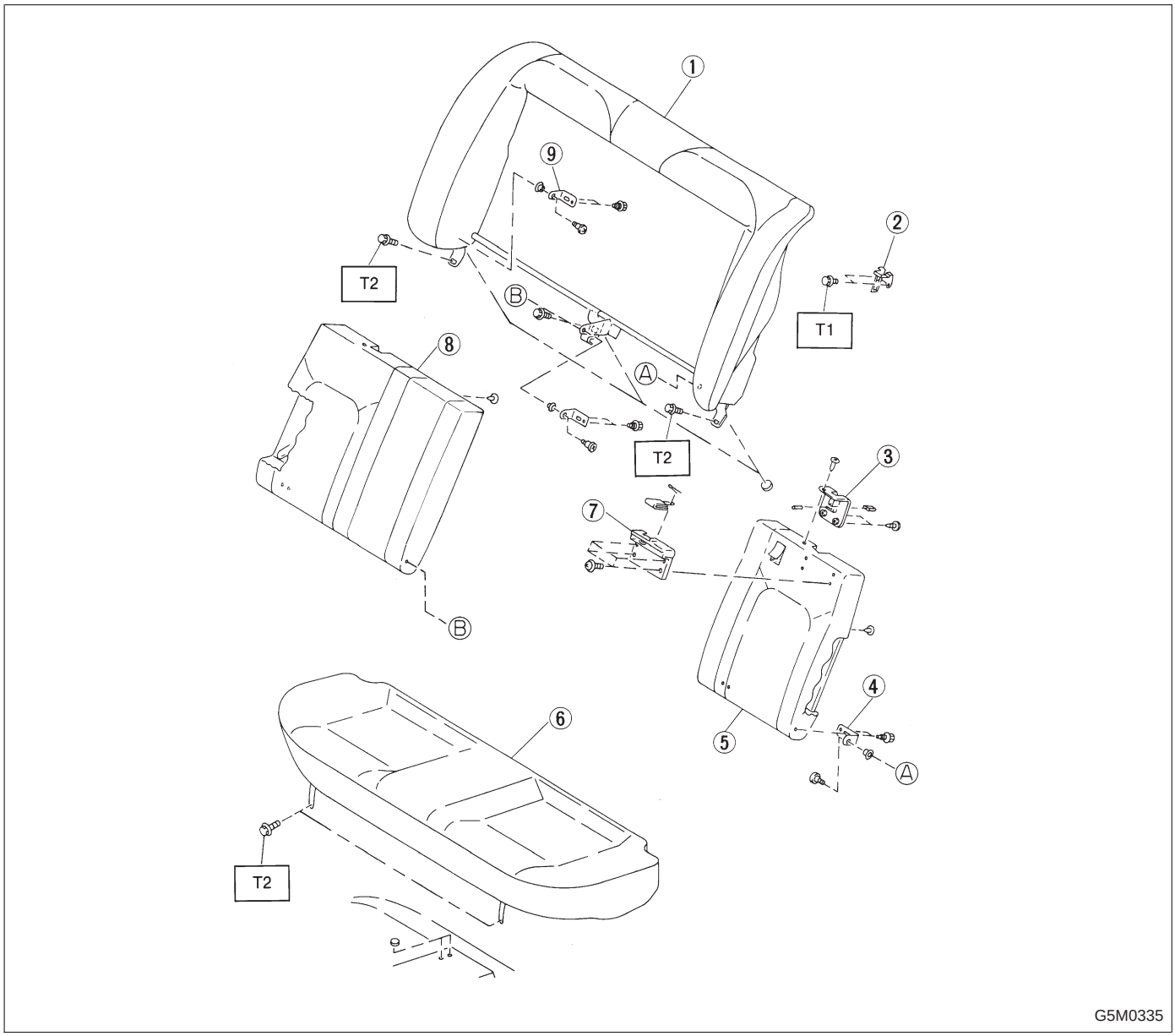


① Headrest free bushing
② Headrest lock bushing
③ Pad and cover ASSY
④ Front backrest frame ASSY
⑤ Reclining hinge ASSY
⑥ Hinge spring cover
⑦ Reclining lever
⑧ Hinge cover
⑨ Cover (Bolt) (outer)
⑩ Outer slide rail ASSY
⑪ Cover (Bolt) (inner)
⑫ Connect wire
⑬ Inner slide rail ASSY
⑭ Inner belt ASSY
⑮ Front cushion frame ASSY
⑯ Protector

Tightening torque: N·m (kg-m, ft-lb)
T1: 18 — 27 (1.8 — 2.8, 13 — 20)
T2: 23 — 36 (2.3 — 3.7, 17 — 27)
T3: 42 — 62 (4.3 — 6.3, 31 — 46)

2. Rear Seat (Sedan and Coupe)

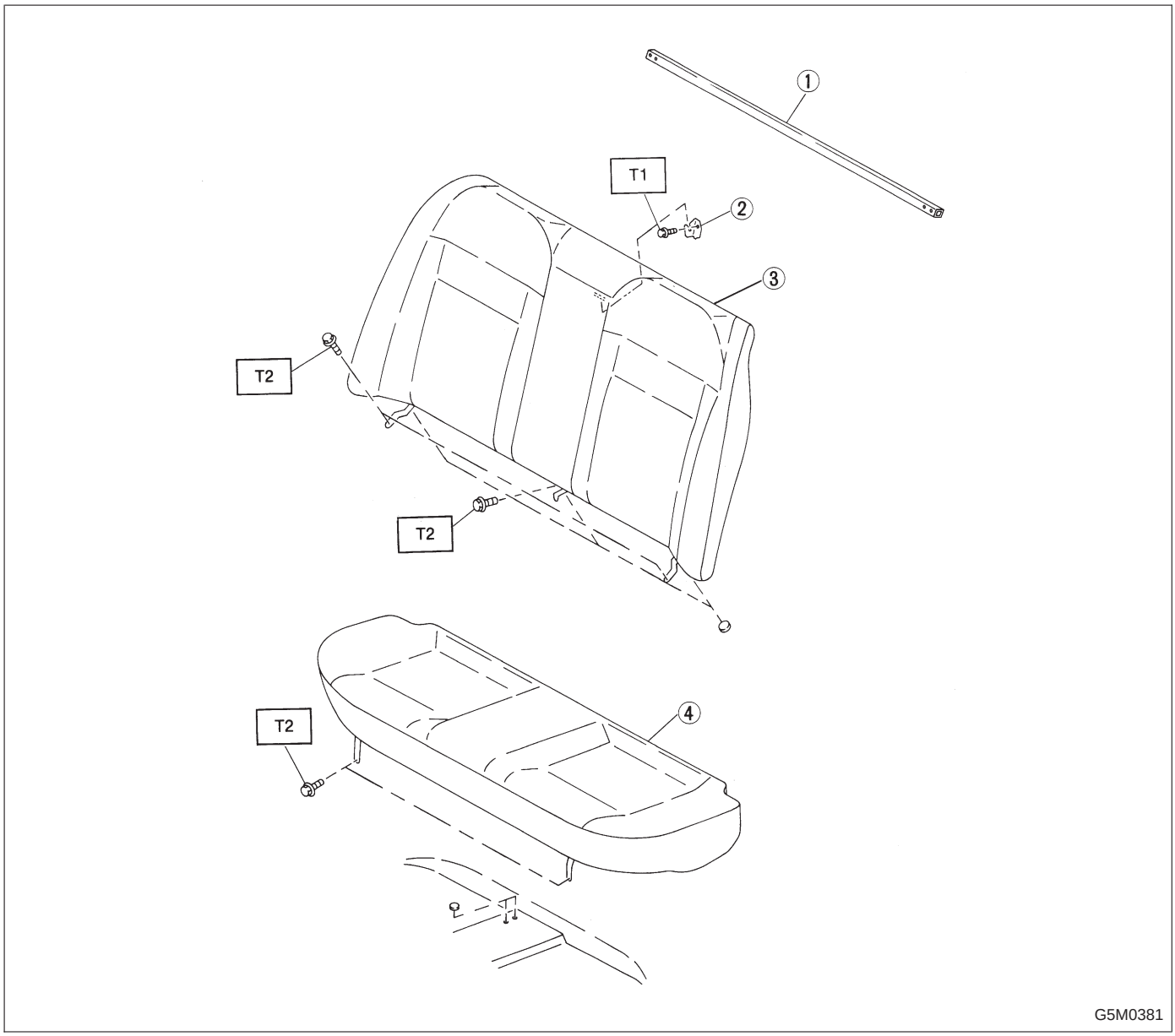
1. FOLD-DOWN TYPE



① Backrest
② Striker
③ Lock cover
④ Bracket (LH)
⑤ Backrest (LH)
⑥ Cushion
⑦ Lock ASSY
⑧ Backrest (RH)
⑨ Bracket (RH)

Tightening torque: N·m (kg-m, ft-lb)
T1: 7 — 13 (0.7 — 1.3, 5.1 — 9.4)
T2: 18 — 31 (1.8 — 3.2, 13 — 23)

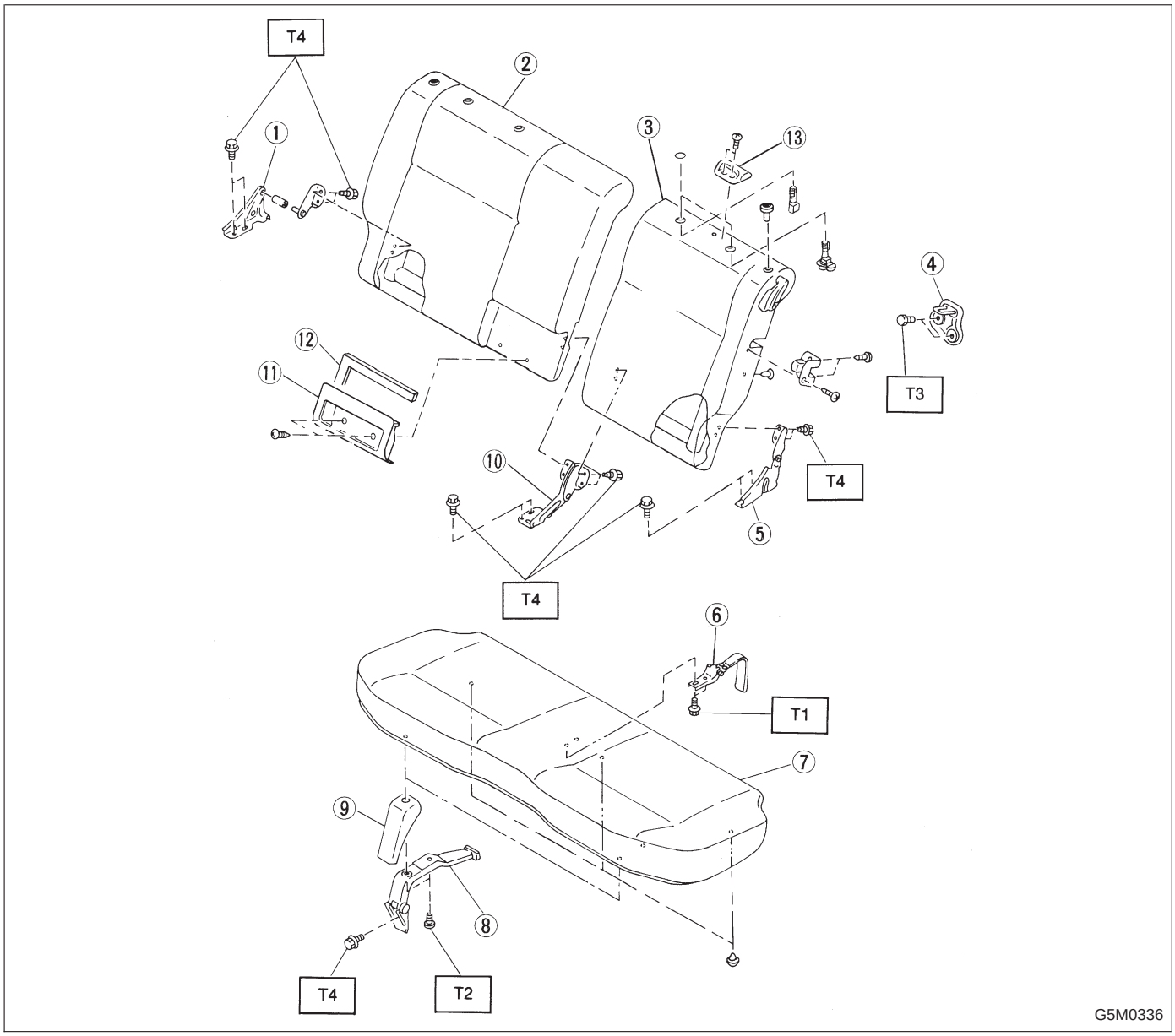
2. FIXED TYPE



① Rear seat reinforcement
② Hook
③ Backrest
④ Rear cushion

Tightening torque: N·m (kg-m, ft-lb)
T1: 7 — 13 (0.7 — 1.3, 5.1 — 9.4)
T2: 18 — 31 (1.8 — 3.2, 13 — 23)

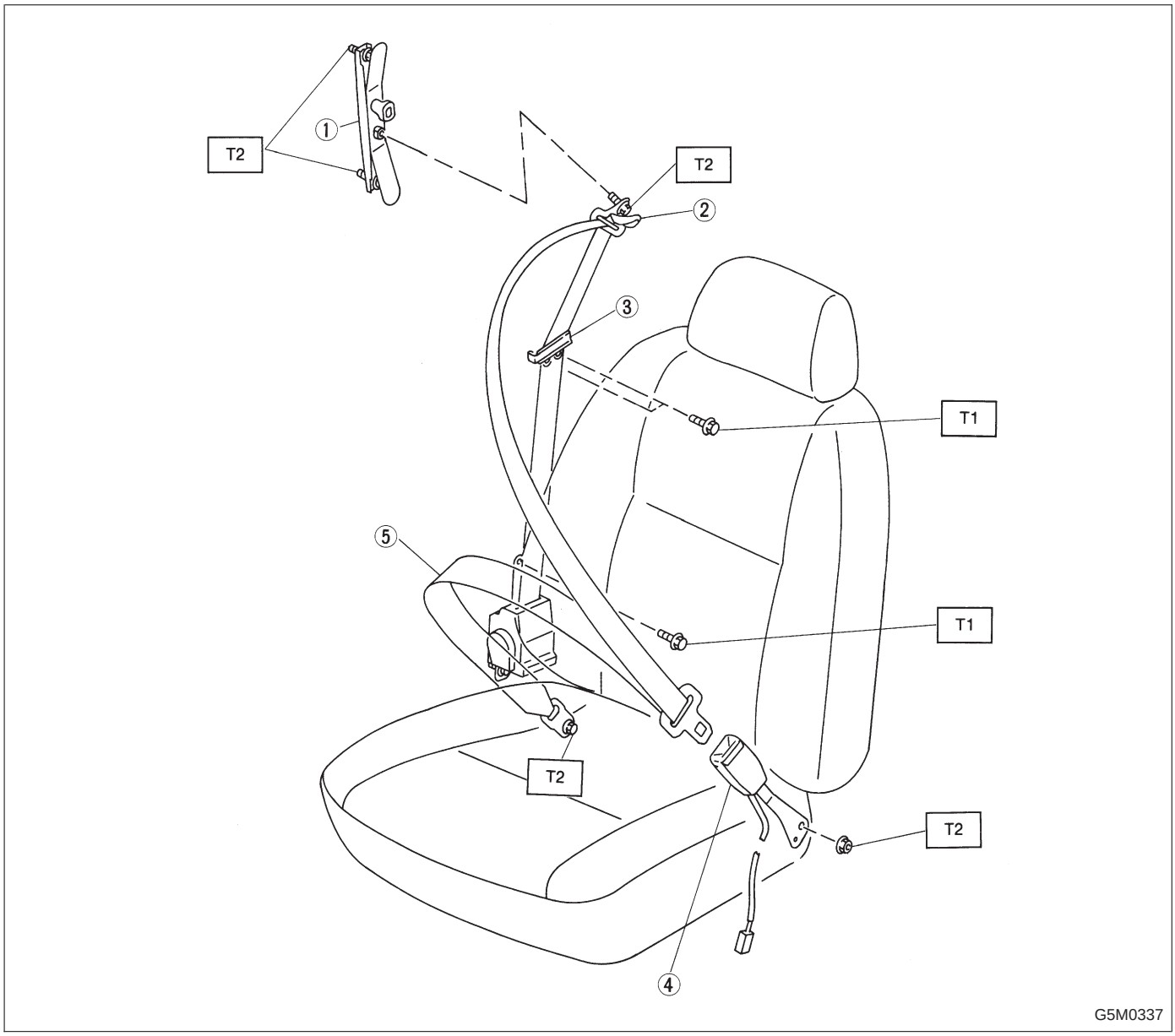
3. Rear Seat (Wagon)



① Hinge bracket (RH)
② Backrest (RH)
③ Backrest (LH)
④ Striker
⑤ Hinge bracket (LH)
⑥ Lock hinge
⑦ Rear cushion
⑧ Hinge
⑨ Hinge cover
⑩ Backrest center hinge
⑪ Belt pocket
⑫ Pad ASSY pocket
⑬ Hook

Tightening torque: N·m (kg-m, ft-lb)
T1: 1 — 3 (0.1 — 0.3, 0.7 — 2.2)
T2: 4.4 — 7.4
(0.45 — 0.75, 3.3 — 5.4)
T3: 7 — 13 (0.7 — 1.3, 5.1 — 9.4)
T4: 18 — 31 (1.8 — 3.2, 13 — 23)

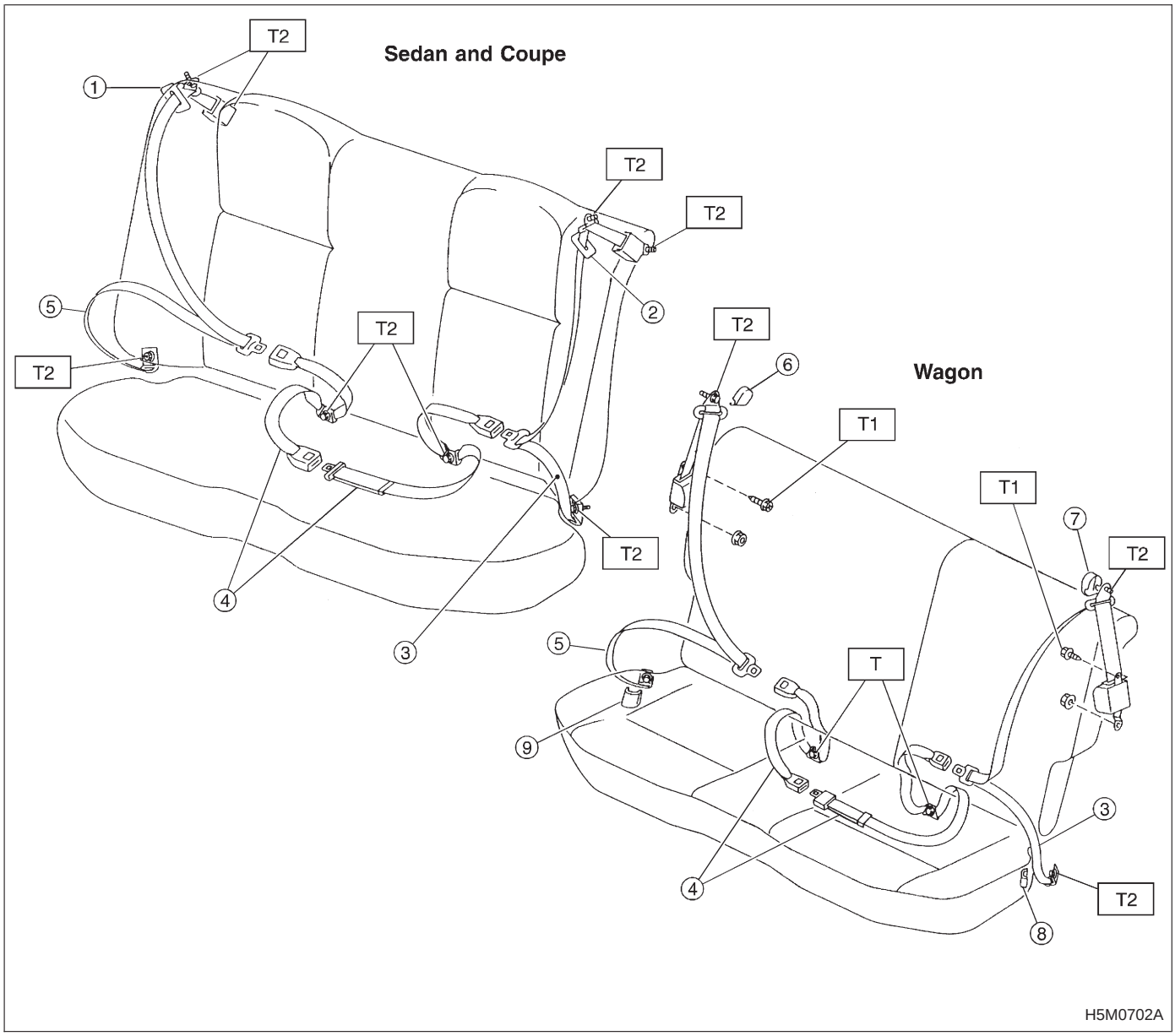
4. Front Seat Belts



① Adjuster anchor ASSY
② Through cover
③ Webbing guide
④ Inner belt ASSY
⑤ Outer belt ASSY

Tightening torque: N·m (kg-m, ft-lb)
T1: 10 — 16 (1.0 — 1.6, 7 — 12)
T2: 23 — 49 (2.3 — 5.0, 17 — 36)

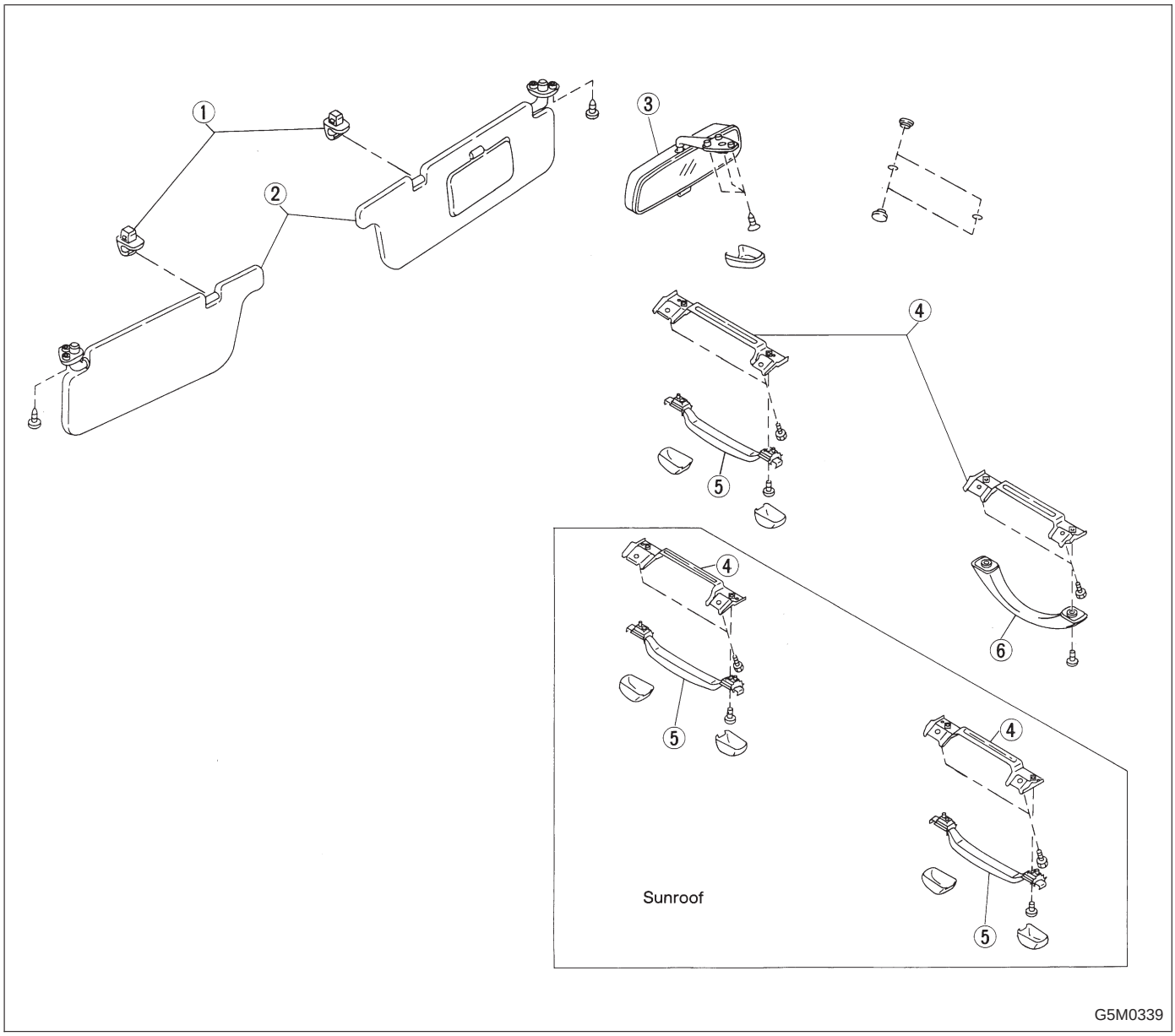
5. Rear Seat Belts



① Webbing cover (RH)
② Webbing cover (LH)
③ Outer seat belt (LH)
④ Center seat belt
⑤ Outer seat belt (RH)
⑥ Through cap (RH)
⑦ Through cap (LH)
⑧ Lap anchor cover (LH)
⑨ Lap anchor cover (RH)

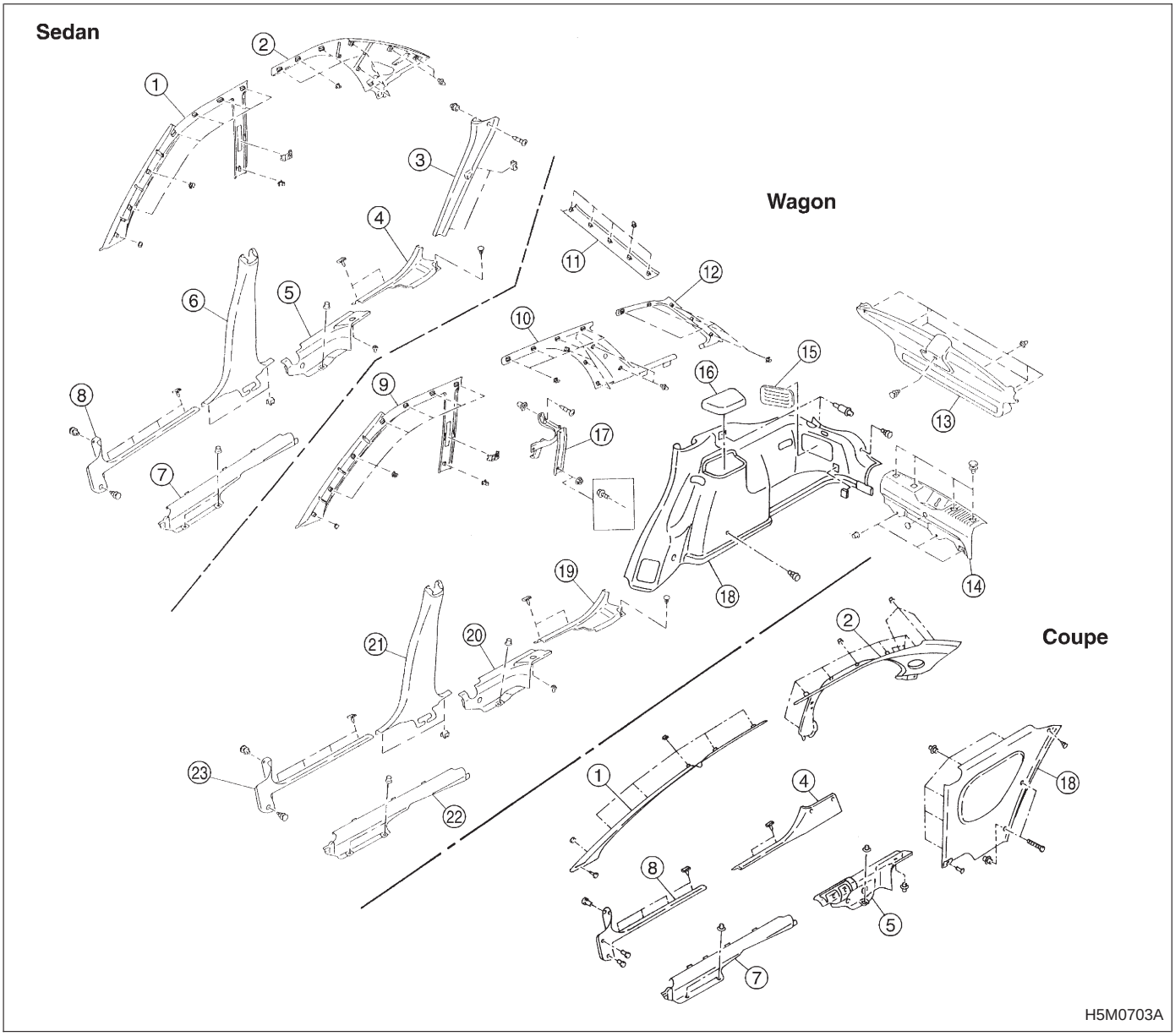
Tightening torque: N·m (kg-m, ft-lb)
T1: 10 — 16 (1.0 — 1.6, 7 — 12)
T2: 23 — 49 (2.3 — 5.0, 17 — 36)

6. Inner Accessories

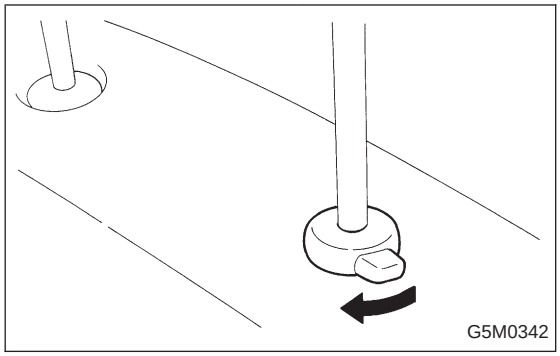


① Hook
② Sun visor
③ Rearview mirror
④ Assist rail bracket
⑤ Assist grip (retractable)
⑥ Assist grip (fixed)

7. Inner Trim



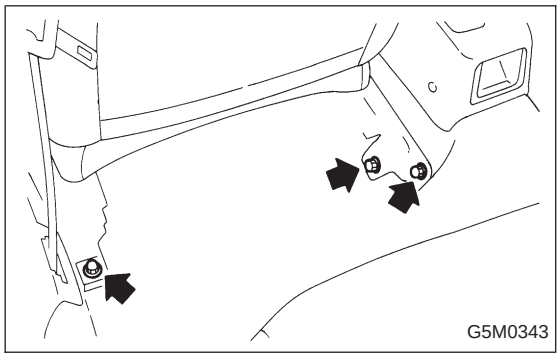
① Front pillar upper trim
② Rear pillar upper trim
③ Rear pillar lower trim
④ Side sill rear upper cover
⑤ Side sill rear lower cover
⑥ Center pillar lower trim
⑦ Side sill front lower cover
⑧ Front pillar lower trim
⑨ Front pillar upper trim
⑩ Rear quarter upper front trim
⑪ Rear rail trim
⑫ Rear quarter upper rear trim
⑬ Rear gate trim
⑭ Rear skirt trim
⑮ Lamp cover
⑯ Speaker cover
⑰ Trim bracket
⑱ Rear quarter trim
⑲ Side sill rear upper cover
⑳ Side sill rear lower cover
㉑ Center pillar lower trim
㉒ Side sill front lower cover
㉓ Front pillar lower trim


G5M0342

1. Front Seat

A: REMOVAL

1) While operating knob (located on top of backrest), lift headrest out with hand placed between backrest and headrest.
2) Pull reclining lever back to fold backrest all the way forward. While pulling slide adjuster lever, move seat all the way forward.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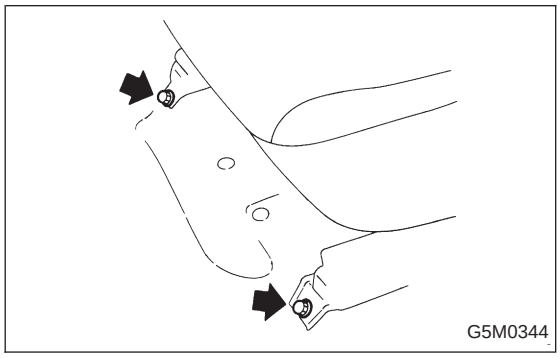
3) Remove bolt cover at rear end of slide rail.
4) Remove bolts securing seat rear.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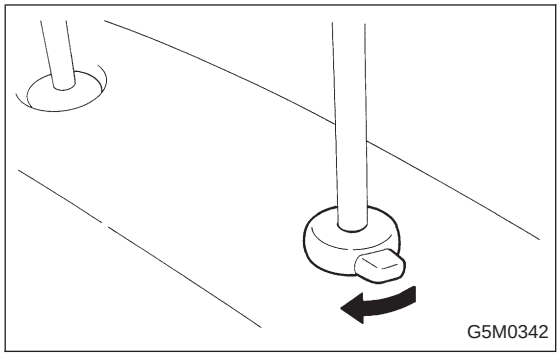
5) While pulling slide adjuster lever, slide seat all the way back.
6) Remove bolts securing front of seat, and remove seat belt from belt guide.

7) Remove front seat from vehicle, then install headrest.

CAUTION:
Be careful not to scratch seat when removing it from vehicle.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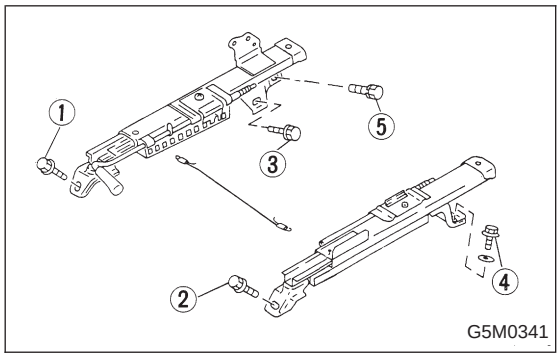
B: INSTALLATION

1) While operating knob (located on top of backrest), lift headrest out by placing your hand between backrest and headrest.
2) Pull reclining lever back to fold backrest all the way forward. Pull slide adjuster lever and move lower slide rail all the way backward.

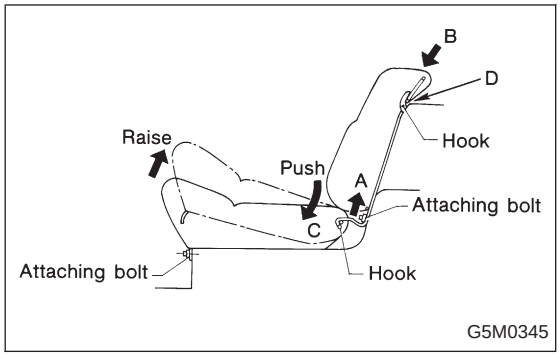


G5M0341

3) Position seat in compartment and align the holes on the seat with the holes on the car body side.
4) Secure the front of seat using inward and outward bolts ① and ② in that order.
5) While pulling slide adjuster lever, move seat all the way forward.
6) Secure the rear of seat using inward and outward bolts ③ and ④.
7) Install bolt ⑤.

CAUTION:
Check that all lock plate pawls are completely and equally inserted into the holes in the slide rail brackets.

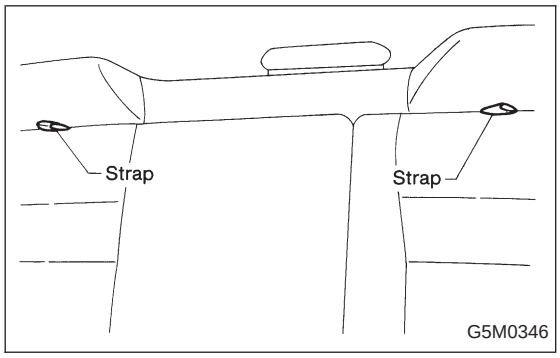
8) After installation, ensure that all mechanisms operate properly and lock.
9) If any mechanism does not function properly, loosen bolts ③, ④ and ⑤, slide seat as required, insert all lock plate pawls into holes in slide rail brackets, and tighten bolts ③, ④ and ⑤in that order.
10) Install bolt cover on rear end of slide rail.
11) Install headrest on backrest.
NOTE:
Tighten bolts in the designated order.



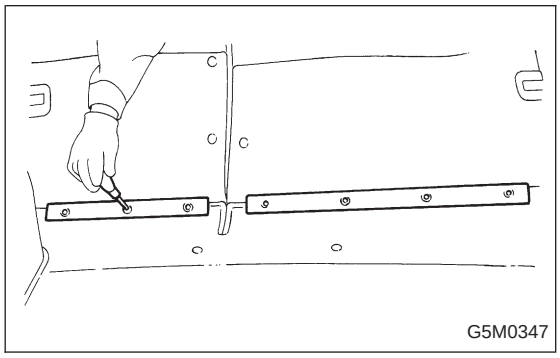
2. Rear Seat (Sedan and Coupe)

A: REMOVAL

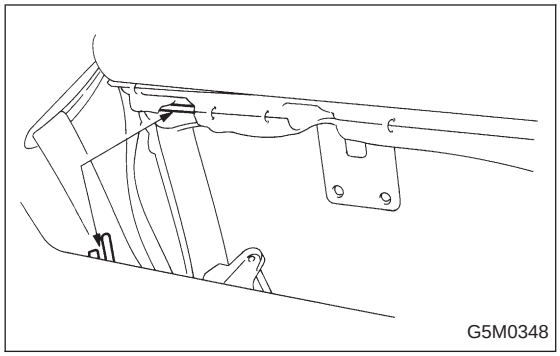
1) Remove bolts securing hinges (located at front of cushion) to body.
2) Slightly raise front of cushion while pushing down on cushion in the direction of “C”. With cushion held in that position, move it forward until it is unhooked.

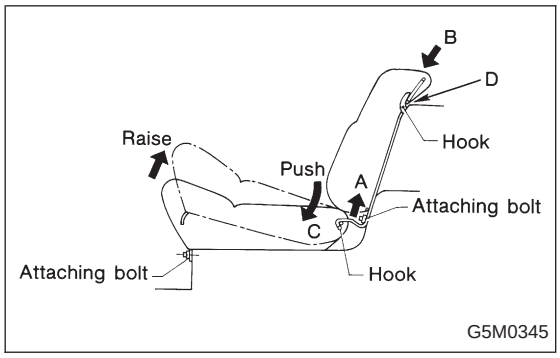


3) Remove bolts securing lower portion of backrest to body.
4) Pull strap (located in center of fold-down backrest) to release lock, and fold backrest onto cushion. (Fold-Down type)



5) Remove screws (located at overlapped portions of trunk compartment mat) and mat (on rear of backrest), and remove edges. (Fold-Down type)
6) Lift rear seat backrest in direction “A” until it is released from upper hooks.


G5M0348



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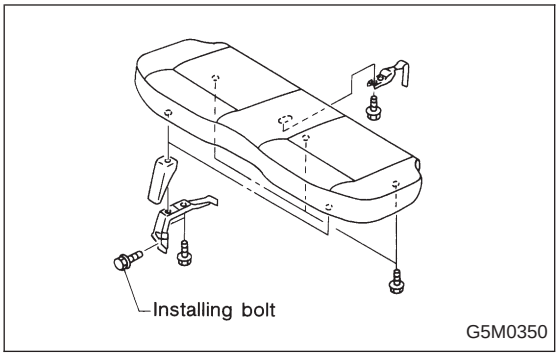
B: INSTALLATION

1) Before installing backrest, ensure that trim panel, insulator and seat belt are properly installed.
2) Transfer outer seat belt webbing to front of backrest and fold backrest forward. Attach seat belt webbing to upper hooks (2 places), and move pillow in the direction of “B” until backrest is aligned with lower mounting holes in body.
3) Engage backrest’s folding mechanism with striker.
4) Secure lower center and both sides of backrest to body with bolts.
5) Slightly raise front section of cushion while pushing down on cushion in the direction of “C”. With cushion held in that position, attach rear section of cushion to hooks at lower frame location.
6) Secure front of cushion to body with bolts.
7) Fold backrest onto cushion and overlap trunk mat and mat (on backrest). While pushing down on edges of the mats, tighten with screws.

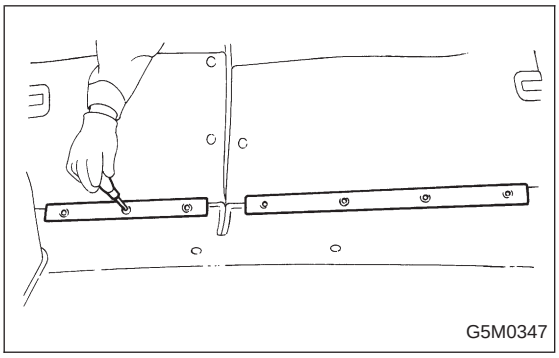
CAUTION:
- **Before installing seat, ensure that seat belt is placed on cushion.**
- **Observe instructions when storing seat belt in belt pocket in backrest.**
- **Before removing or installing backrest, remove seat belt from belt pocket.**
- **Confirm that winding of three-point type seat belt can operate regularly.**



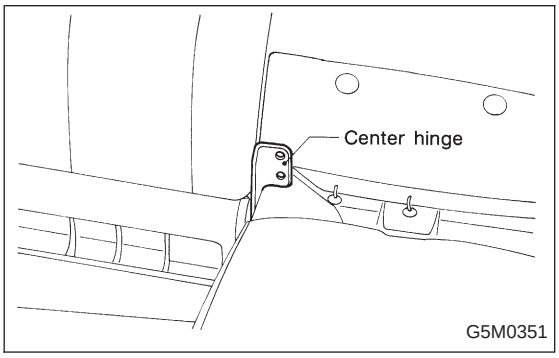
3. Rear Seat (Wagon)

A: REMOVAL

1) Remove bolts securing hinges (located at front of seat) to body.
2) Pull strap (located in middle rear portion of cushion) to release lock. Lift cushion out and away from body.
3) Pull knobs (located at each side of backrest's upper portion) up to release lock, and fold backrest all the way forward.

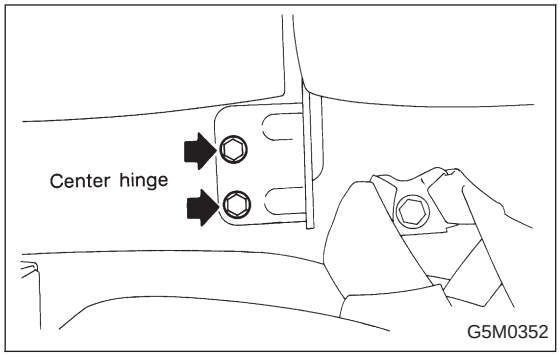


4) Remove screws which secure overlapped portions of luggage compartment mat and mat directly behind backrest.
5) Roll up mat (located at rear of left backrest) and remove the bolt which secures center hinge to backrest.



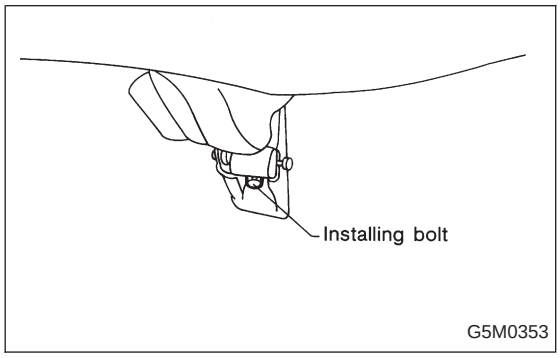
6) Tilt left backrest forward until striker engages with lock, and remove the bolt which secures side hinge to body.
7) Pull knob up until left backrest lock is released. Slide backrest forward and away from body.
8) Remove the bolt which secures center hinge of right backrest to body.

9) Pull knob up until right backrest lock is released. While tilting backrest forward, remove hinge pin from hole in bracket, and remove backrest and away from body.



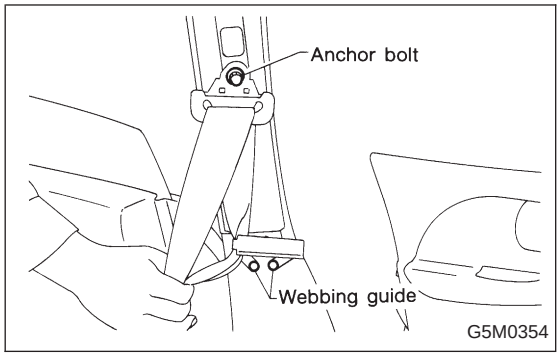
B: INSTALLATION

1) Install hinge bracket to body.
2) Insert right backrest hinge pin into hole in bracket. Tilt backrest backward until striker engages with lock.
3) Secure right backrest center hinge to body using a bolt.
4) Temporarily install left backrest side hinge to body using a bolt, and fold backrest forward to the floor.
5) Roll up mat (located at rear of left backrest), and install center hinge using a bolt.
6) Tilt left backrest until striker engages with lock, and tighten bolt [refer to step 4)].



7) Install hinges to front of cushion and tighten with bolts. Check that lock properly engages.
8) Fold backrest onto cushion and overlap trunk mat and mat at rear of backrest. While pushing down on edges of these mats, tighten screws.

CAUTION:
- **Do not allow center seat belt to get under cushion when folding cushion.**
- **Ensure that side seat belt tongue is free from cushion and trim panel.**
- **Before folding cushion, store seat belt in belt pocket located in backrest.**
- **Lift front of cushion to ensure that cushion is properly locked.**
- **Before removing or installing backrest, pull seat belt out of backrest belt pocket.**

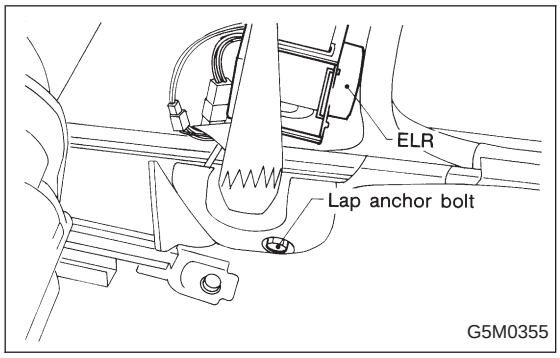


4. Front Seat Belt

A: REMOVAL

1. OUTER BELT (SEDAN AND WAGON MODEL)

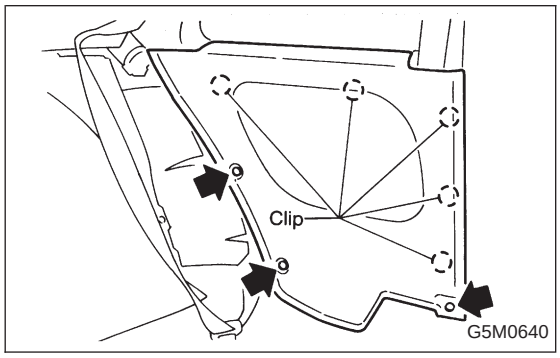
1) Remove through-anchor cover cap.
2) Remove shoulder anchor bolt.
3) Remove webbing guide.



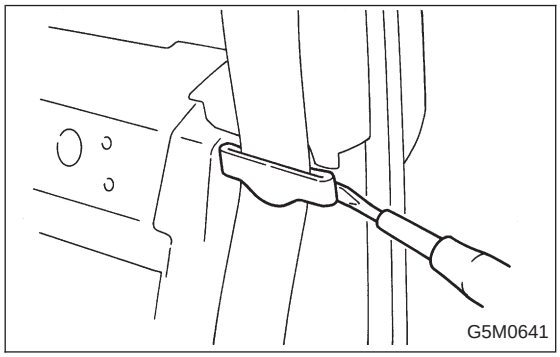
4) Remove center lower pillar trim panel.
5) Remove front cover side plate.
6) Roll up floor mat at the bottom of center pillar.
7) Remove lap anchor bolt.
8) Remove belt retractor and outer belt.

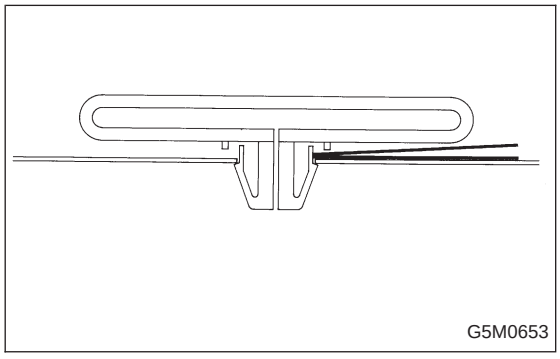
2. OUTER BELT (COUPE MODEL)

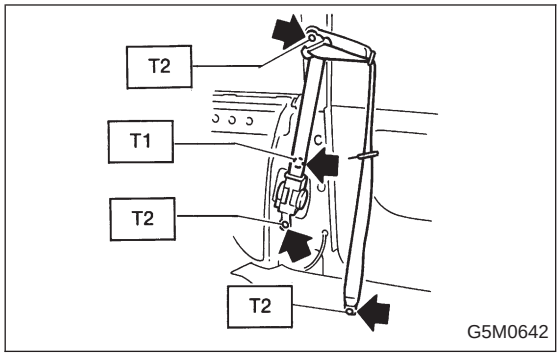
1) Remove rear seat cushion and back rest.
<Ref. to 5-3 [W2A0].>
2) Remove rear quarter trim.



3) Remove webbing guide.

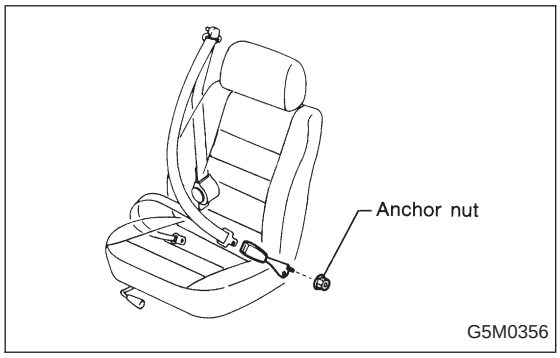






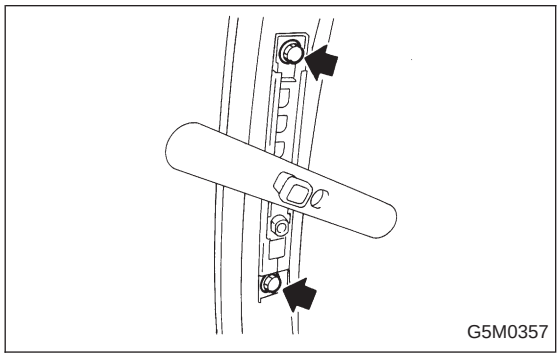
4) Remove anchor cover cap.
5) Remove four bolts and then belt retractor and outer belt.

Tightening torque:
T1: 13±3 N·m (1.3±0.3 kg-m, 9.4±2.2 ft-lb)
T2: 35±13 N·m (3.6±1.3 kg-m, 26±9 ft-lb)



3. INNER BELT

1) Remove anchor nut.



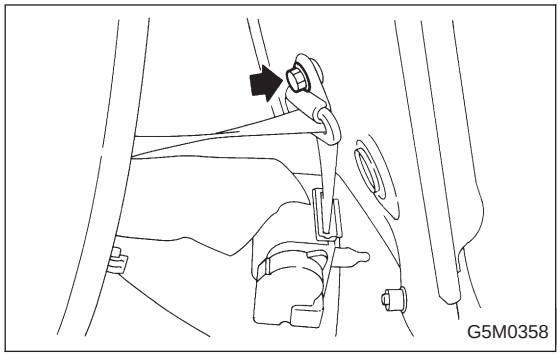
4. ADJUSTABLE SHOULDER ANCHOR

1) Remove shoulder anchor bolt.
2) Remove lower center pillar trim.
3) Remove front and front pillar trim panel.
4) Remove adjustable shoulder anchor assembly.

B: INSTALLATION

Installation is in the reverse order of removal.

CAUTION:
● The left and right ELR's are not mutually interchangeable because different sensors are used.
● Be careful not to twist belts during installation.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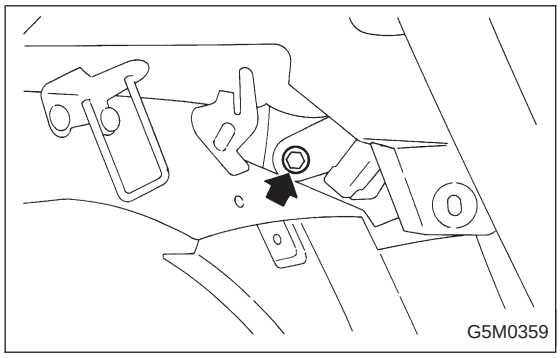
5. Rear Seat Belt

A: REMOVAL

1. SEDAN MODEL

1) Remove rear cushion from body.
2) Remove rear backrest from body.
3) Remove screw from lower side of rear quarter trim, and lift up lower side of rear quarter trim.
4) Remove trim panel rear bracket upper.
5) Remove rear quarter trim.
6) Remove outer anchor bolts.
7) Remove rear bolt from ELR.
8) Remove belt from outlet in rear quarter along slit.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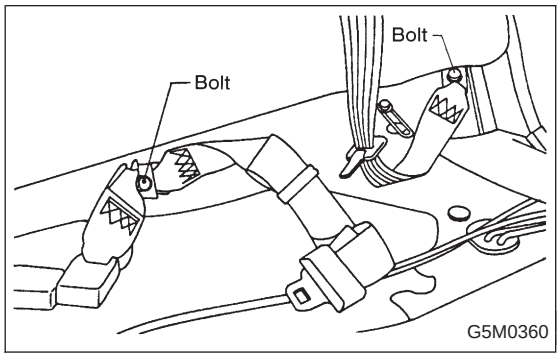

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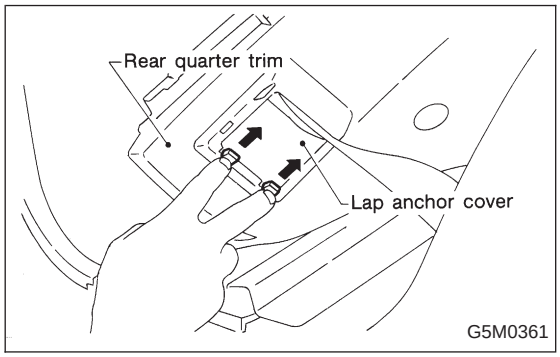
9) Remove inner bolts which secure outer seat.
10) Remove washer from bolt, then remove bolt, belt assembly, and anchor plate bracket.
11) Remove inner bolts (2 places) from center seat.
12) Remove washer from bolt, and remove bolt, belt assembly and anchor plate bracket.

2. WAGON MODEL

1) Raise rear cushion.
2) Remove rear backrest from body.
Remove shoulder anchor cover and anchor bolt.
3) Remove lower portion of rear quarter trim.
4) Remove lap anchor cover and bolt.



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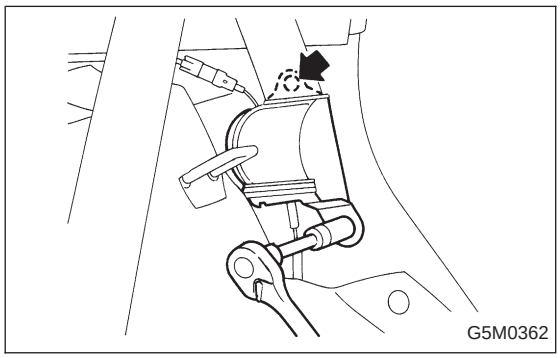

G5M0362

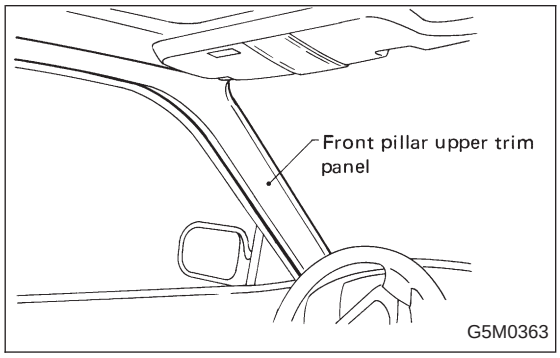
5) Remove 7/16-20 UNF nuts which secure ELR and remove ELR.

CAUTION:
Remove outer seat belt and center seat belt in similar manner used to remove those from Sedan.

B: INSTALLATION

Installation is in the reverse order of removal. Ensure that seat belt is properly reeled on and off after installation of ELR.

CAUTION:
● Be extremely careful not to confuse center seat anchor plate with outer seat anchor plate during installation.
● Ensure that seat belts are free from twisting after installation.
● Ensure that tongues, buckles and belts are properly placed on seat.



6. Front Pillar Upper Trim Panel

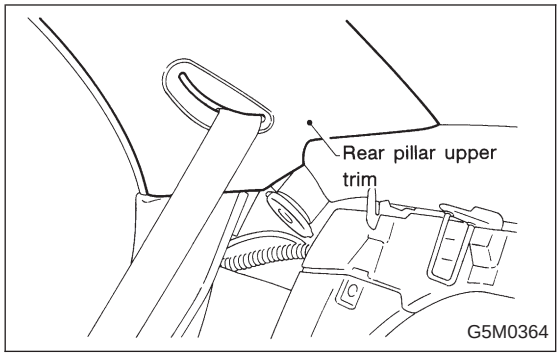
A: REMOVAL

1) Remove center pillar lower trim panel.
2) Remove seat belt anchor bolts.
3) Pry pawls off body flange of front pillar upper trim panel using screwdriver.
4) Remove clips which hold front pillar upper trim panel, and lift trim panel out by moving it toward the compartment.

B: INSTALLATION

Installation is in the reverse order of removal.

CAUTION:
Be sure to securely hook pawls of front pillar upper trim panel on body flange.



7. Rear Pillar Upper Trim Panel (Sedan and Coupe)

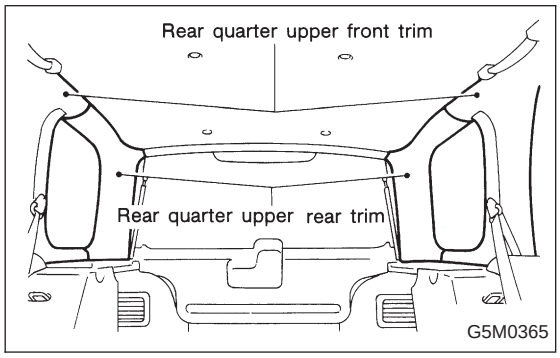
A: REMOVAL

1) Remove rear seat cushion and backrest.
2) Remove tapping screw from rear pillar lower trim panel, and remove trim panel by sliding it forward.
3) Remove front pillar upper trim end.
4) Pry the pawl off front end using screwdriver.
5) Remove clips which hold rear pillar upper trim, and remove trim panel by sliding it forward.

B: INSTALLATION

Installation is in the reverse order of removal.

CAUTION:
Be sure to securely hook pawls of rear pillar upper trim panel on body flange.



8. Rear Quarter Pillar Upper Trim Panel (Wagon)

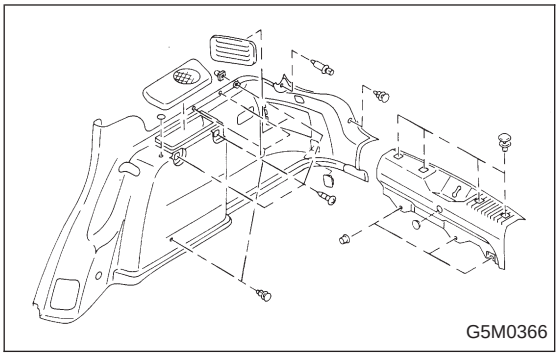
A: REMOVAL

1) Set rear seat cushion up.
2) Remove rear seat backrest.
3) Remove rear quarter lower trim.
4) Remove rear rail trim.
5) Remove rear quarter upper front trim.
6) Remove rear quarter upper rear trim.

B: INSTALLATION

Installation is in the reverse order of removal.

CAUTION:
Be sure to securely hook pawls of rear quarter pillar trim panel on body flange.


G5M0366

9. Rear Quarter Trim Panel (Wagon)

A: REMOVAL

1) Set rear seat cushion up.
2) Remove rear seat backrest.
3) Remove sideshelf and rear skirt trim.
4) Remove clip and screw of rear quarter lower trim.
5) Remove rear quarter lower trim.

B: INSTALLATION

Installation is in the reverse order of removal.

CAUTION:
Be careful not to ride trim panel over harness, insulators, etc.

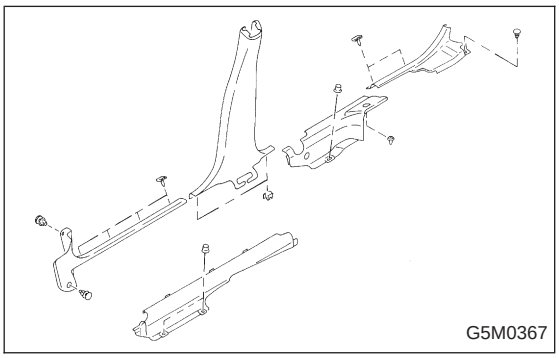
10. Floor Mat AIRBAG

Supplemental Restraint System "Airbag"

Airbag system wiring harness is routed near floor mat.

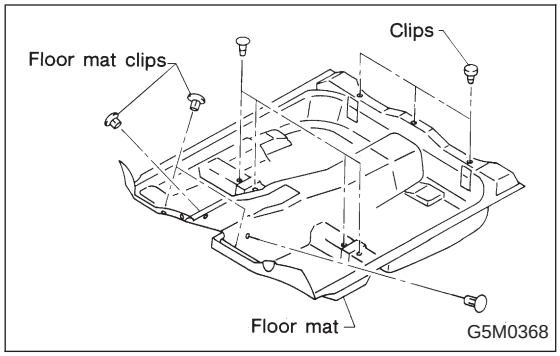
CAUTION:
● All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
● Be careful not to damage Airbag system wiring harness when servicing floor mat.

The following procedure is applicable to all models.


G5M0367

A: REMOVAL

1) Remove front seats.
2) Remove rear seat cushion.
3) Remove center tray, indicator cover, cover assembly, and console box, depending on the specifications.
4) Remove front pillar lower trim panel.
5) Remove center pillar lower trim panel.
6) Remove three clips under rear seat cushion.
7) Remove rear cover side plate and rear pillar lower trim.
8) Pull out edge in the groove of side sill cover.



9) Remove four clips under front seat.
10) Remove four clips in toe board area.

NOTE:
When pulling out edge, do not pull mat alone; pull mat together with edge.
Pry off two steel clips on side sill front cover and one on side sill rear cover using screwdriver.

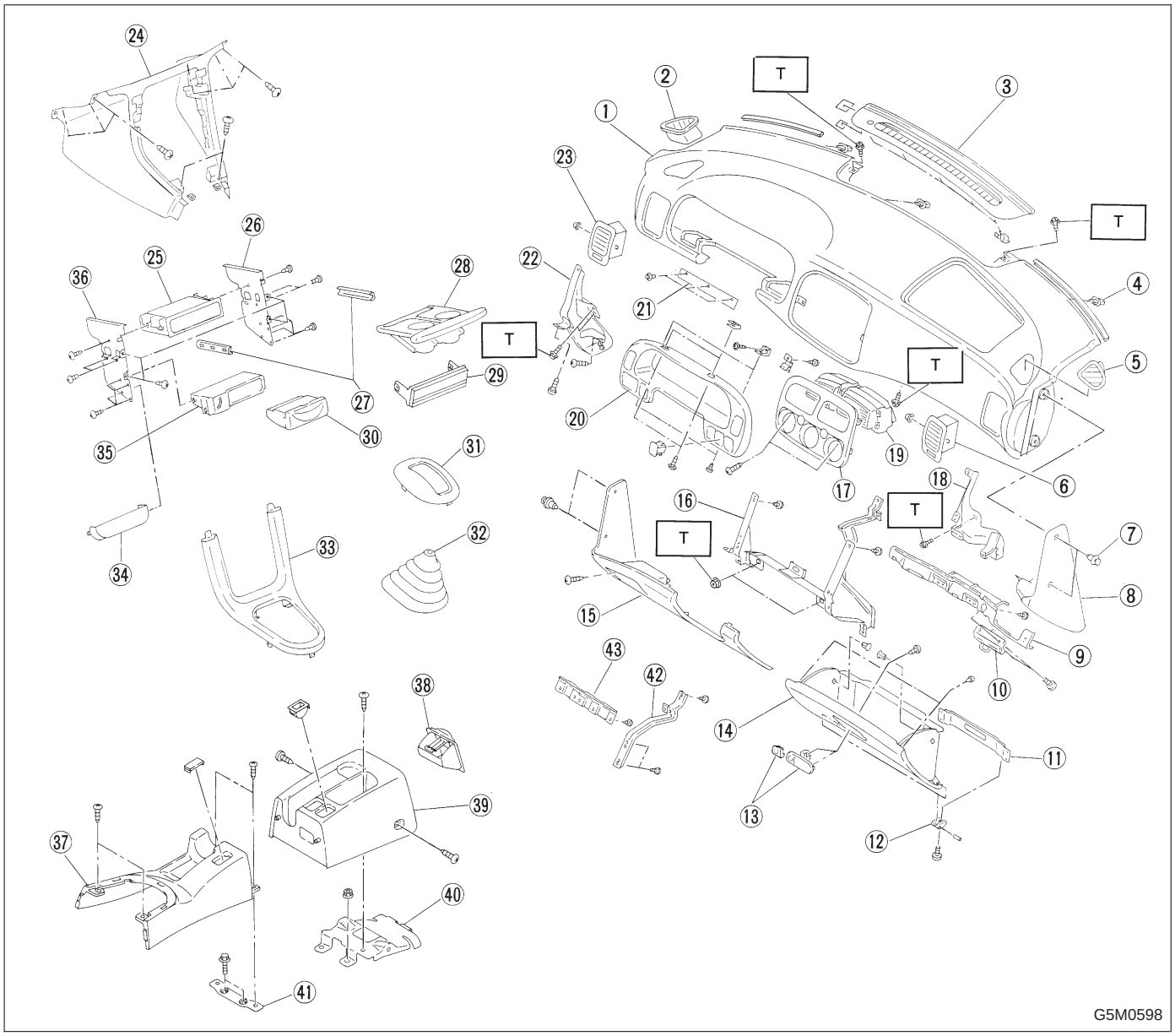
11) Remove mat hook.
12) Remove mat from toe board area.
13) Remove mat from heater unit.
14) Roll mat, and take it out of opened rear door.

B: INSTALLATION

Installation is in the reverse order of removal.
1) Secure mat firmly with hook and velcro tape.
2) Insert mat edge firmly into the groove of side sill cover.

INSTRUMENT PANEL 5-4

1. Instrument Panel



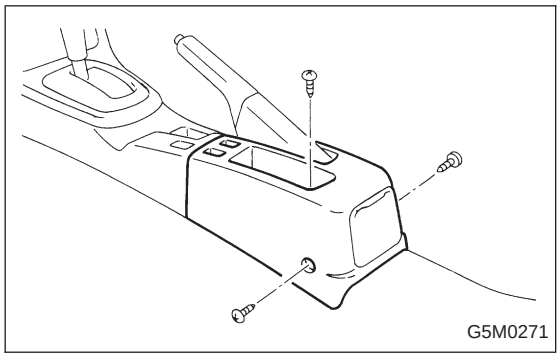
① Pad & frame
② Grille SD def. (D)
③ Front def. grille
④ Grommet
⑤ Grille SD def. (P)
⑥ Grille vent (P)
⑦ Clip
⑧ SD panel (P)
⑨ Reinf. airbag CTR
⑩ Striker
⑪ Frame pocket
⑫ Hinge
⑬ Lock ASSY
⑭ Pocket ASSY
⑮ Lower cover ASSY
⑯ Reinf. CTR
⑰ Panel CTR (A)
⑱ Reinf. (P)
⑲ Grille CTR def.
⑳ Meter visor
㉑ Cover
㉒ Reinf. (D)
㉓ Grille vent (D)
㉔ Instrument panel console
㉕ Pocket CTR
㉖ BRKT (Radio) RH
㉗ Rail (Cup holder)
㉘ Cup holder
㉙ Panel (Radio)
㉚ Ash tray
㉛ Panel (AT) ASSY
㉜ Shift boot
㉝ Console cover
㉞ Panel (Airbag)
㉟ Housing (Ash tray)
㊱ BRKT (Radio) LH
㊲ Center console
㊳ Ash tray
㊴ Rear console box
㊵ Rear console BRKT
㊶ Center console BRKT
㊷ Reinf. airbag B
㊸ Reinf. airbag UPPER

Tightening torque: N·m (kg-cm, in-lb)
T: 6.9±1.0 (70±10, 60.8±8.7)

1. Instrument Panel AIRBAG

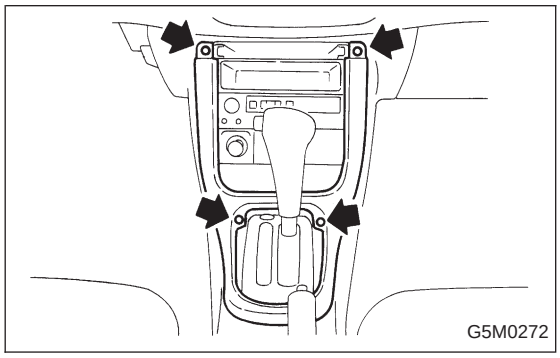
Airbag system wiring harness is routed near combination meter.

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 combination meter.

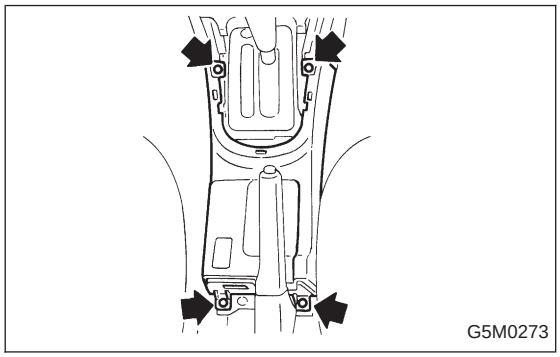

G5M0271

A: REMOVAL

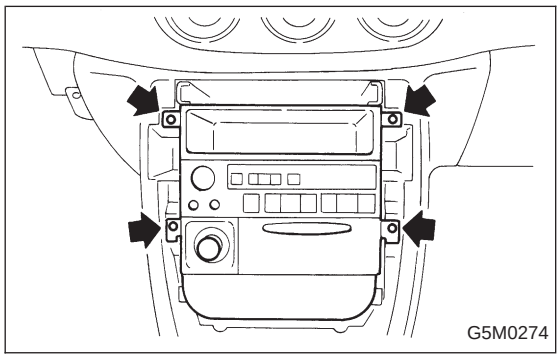
1) Disconnect GND cable from battery.
2) Remove rear console box.


G5M0272

3) Pull cup holder.
4) Turn over shift lever boot of front end (MT model). Remove select lever cover (AT model).
5) Remove console cover.

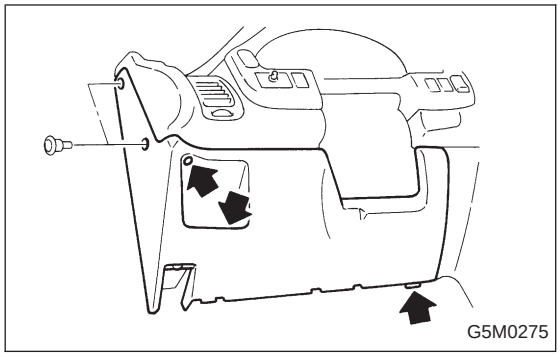

G5M0273

6) Remove center console.

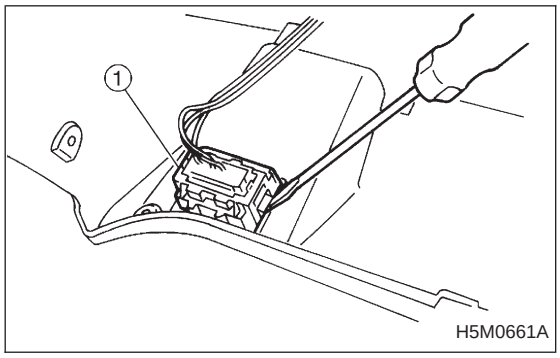

G5M0274

7) Remove audio assembly and then disconnect radio antenna feeder and connectors.

CAUTION:
Be sure to hold socket section and not harness when disconnecting.

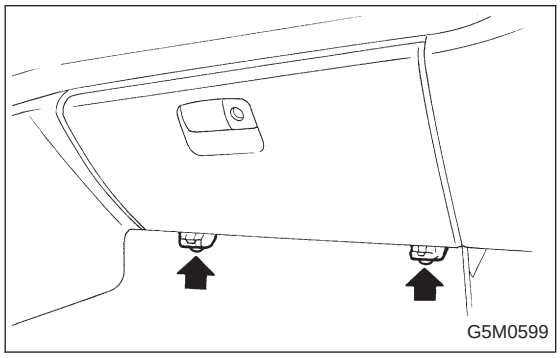

G5M0275

8) Remove lower cover and then disconnect seat belt timer connector.

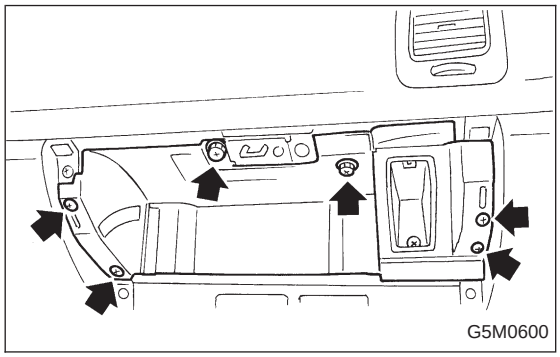


H5M0661A

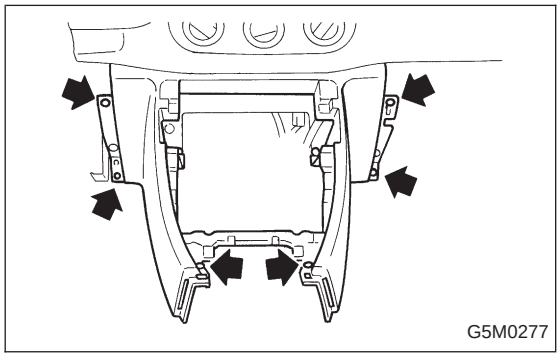
9) Disconnect data link connector ① from lower cover.


G5M0599

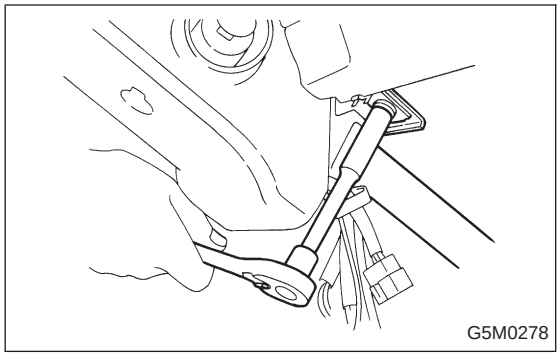
10) Remove glove box.


G5M0600

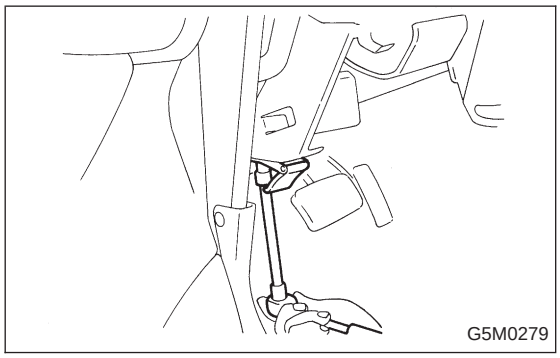
11) Remove pocket back panel.


G5M0277

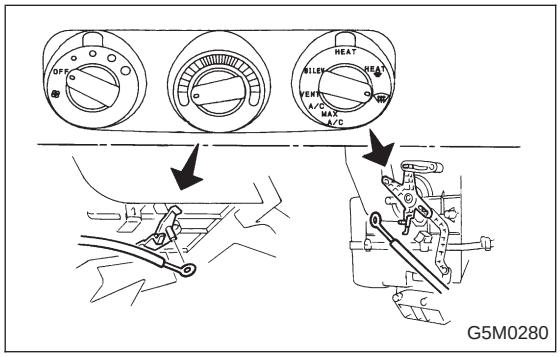
12) Remove instrument panel console.


G5M0278

13) Remove two bolts and lower steering column.


G5M0279

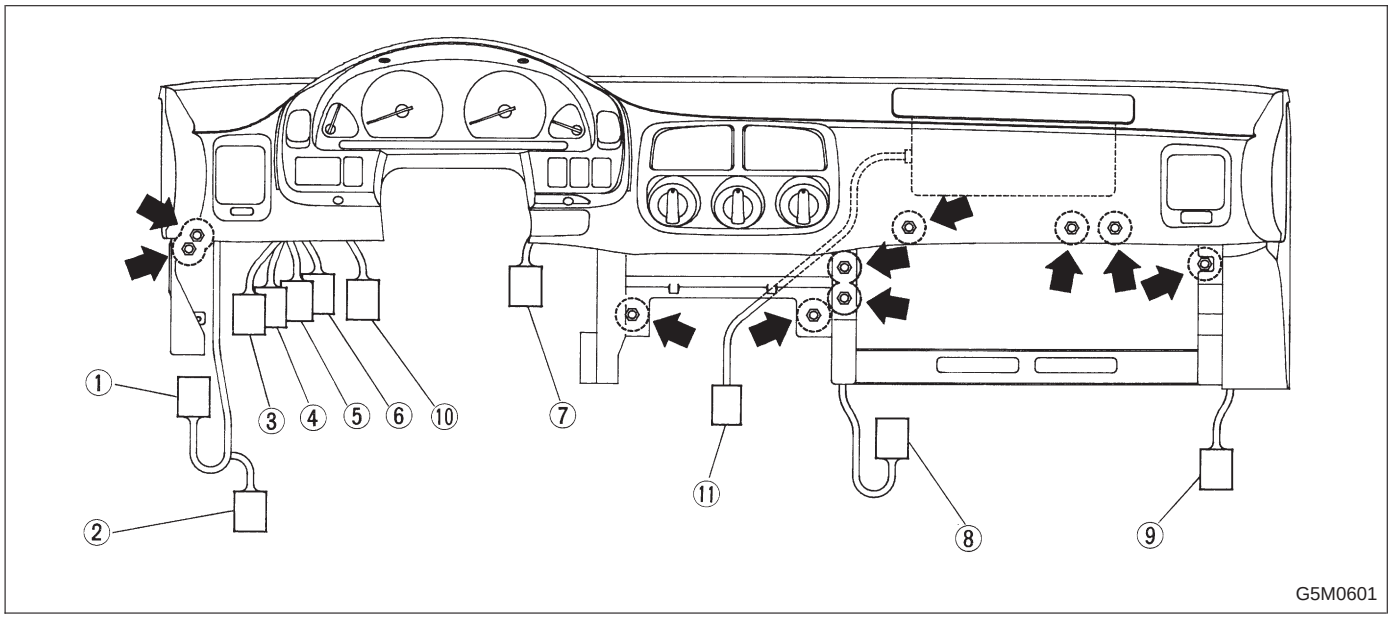
14) Remove hood opener lever.



G5M0280

15) Set temperature control switch to Max. COLD, and mode selector switch to defroster position.
16) Disconnect both temperature control cable and mode selector cable from link.

NOTE:
Do not move switch and link when installing.



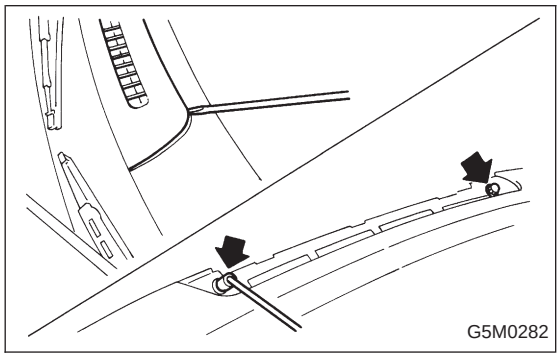
G5M0601

17) Disconnect harness connectors. (①: 15P/Gray, ②: 5P/Natural, ③: 20P/White, ④: 20P/Blue, ⑤: 12P/Black, ⑥: 8P/Natural, ⑦: 1P/Blue, ⑧: 6P/Black, ⑨: 20P/Natural, ⑩: 8P/Natural & Black, ⑪: Airbag connector (AB10)/Yellow <Ref. to 5-5 [M2-6].>.

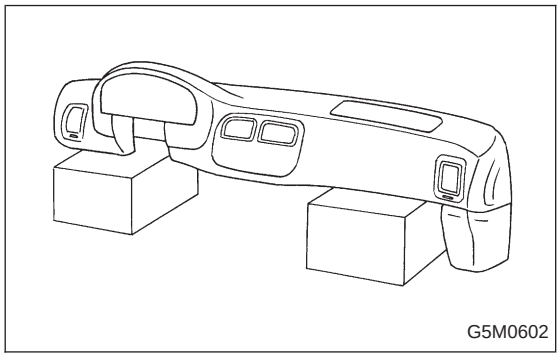
CAUTION:
● Be sure to hold socket section and not harness when disconnecting.
● When disconnecting airbag connector (AB10), <refer to 5-5 [M2-6].>

NOTE:
Put matching mark, if necessary, for easy re-assembly.

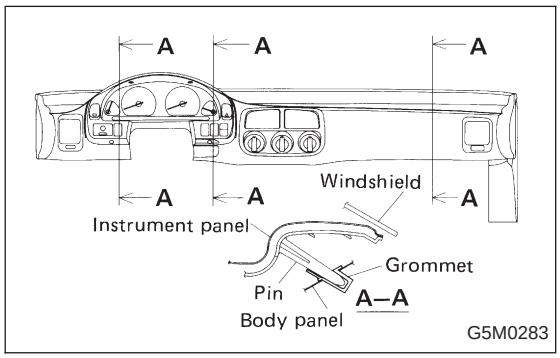
18) Remove the ten bolts and nuts.


G5M0282

19) Remove front defroster grille and two bolts.
20) Remove instrument panel carefully from the body and then disconnect speedometer cable from back of combination meter.


G5M0602

CAUTION:
When storing removed instrument panel with passenger airbag module, place it standing up on the floor.



G5M0283

B: INSTALLATION

1) Installation is in the reverse order of removal.
Observe the following:
When setting instrument panel into position, push three pins into grommet on body panel

CAUTION:
- **Be careful not to snag the harness.**
- **Make sure to connect harness connectors.**

SUPPLEMENTAL RESTRAINT SYSTEM 5-5

1. Inspection and Replacement Standards

1. VEHICLES WHICH BECOME INVOLVED IN A COLLISION

If the vehicle equipped with an SRS airbag system is damaged in a collision, the airbag system parts must be checked and replaced in accordance with the following standards:
After faulty parts are replaced, the warning light operation must be checked.
- **When the ignition switch is turned ON, it lights up for 8 seconds and then it goes out for at least 30 seconds.**
- **The trouble code stored in memory must be erased after the check.**

2. AIRBAG MODULE (DRIVER AND PASSENGER)

Inspection standard:
- The vehicle damaged in a collision (regardless of whether or not airbag is deployed).
- The designated trouble code is output during self-diagnosis. (Refer to “Troubleshooting” Section.)

Replacement standard:
- Airbag is deployed.
- The pad surface is scratched or cracked.
- Harness and/or connector is deformed or cracked, their circuits are broken, lead wire is exposed, etc.
- Mounting bracket is cracked or deformed.
- The module surface is fouled with foreign matter (grease, oil, water, cleaning solvent, etc.)
- Airbag module dropped to the floor/ground.
- Airbag module determined as faulty during self-diagnosis.

3. MAIN HARNESS

Inspection standard:
- A vehicle damaged in a collision (regardless of whether or not airbag is deployed).
- The designated trouble code is output during self-diagnosis. (Refer to “Troubleshooting” Section.)

Replacement standard:
- Harness circuit is broken, lead wire is exposed, corrugated tube is cracked, etc.
- Connector is scratched or cracked.
- The designated trouble code is output during self-diagnosis.

4. AIRBAG CONTROL MODULE

Inspection standard:
- A vehicle damaged in a collision (regardless of whether or not airbag is deployed).
- The designated trouble code is output during self-diagnosis. (Refer to “Troubleshooting” Section.)

Replacement standard:
- Control module is cracked or deformed.
- Mounting bracket is cracked or deformed.
- Connector is scratched or cracked.
- Control module dropped to the floor/ground.
- Control module determined as faulty during troubleshooting.
- Airbag is deployed.

5. COMBINATION SWITCH

Inspection standard:
- A vehicle damaged in a collision (regardless of whether or not airbag is deployed).
- The designated trouble code is output during self-diagnosis. (Refer to “Troubleshooting” Section.)

Replacement standard:
- Combination switch or steering roll connector is deformed or cracked.

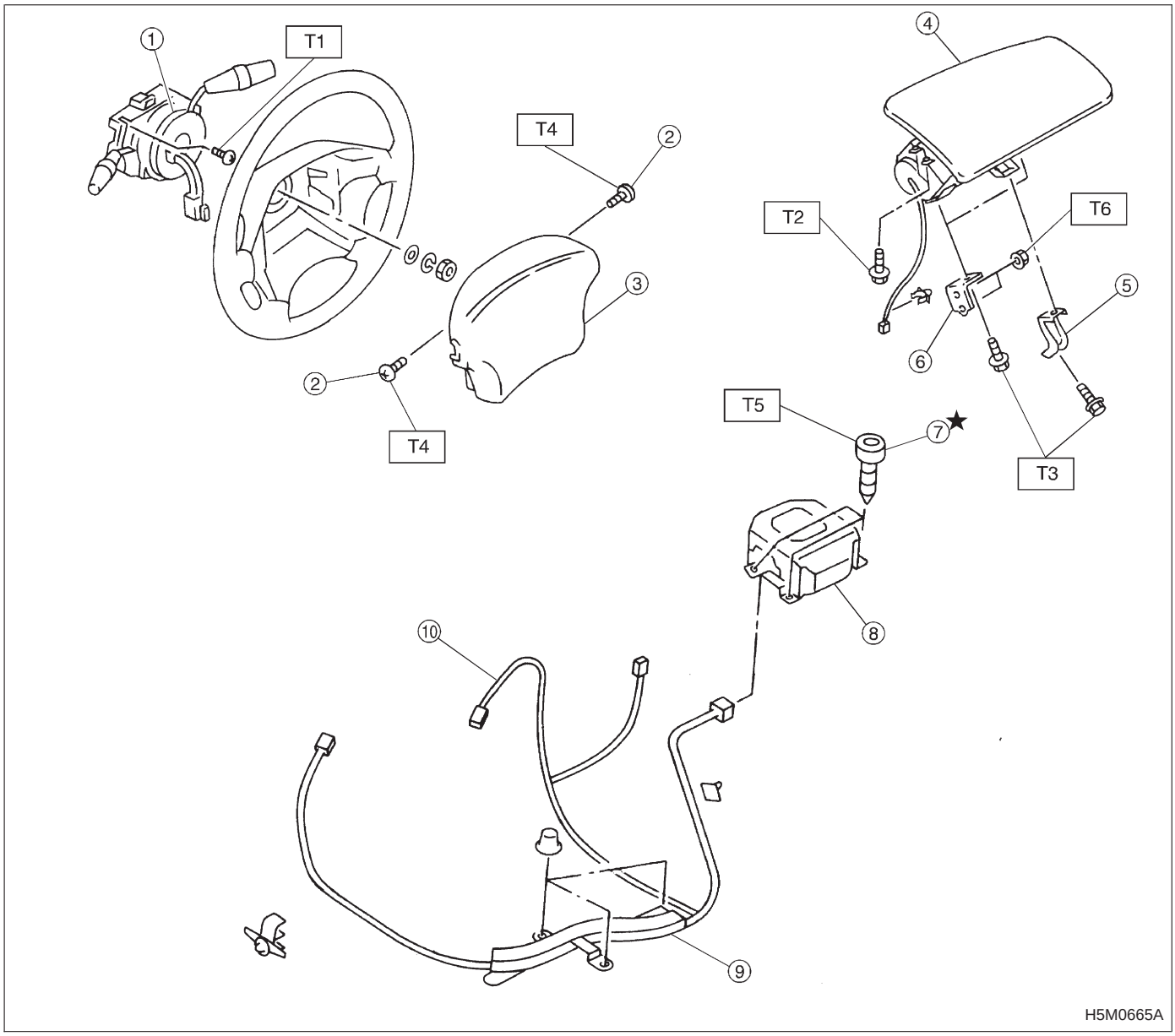
6. STEERING WHEEL

<Ref. to 4-3 [W2C2].>

7. STEERING COLUMN ASSEMBLY

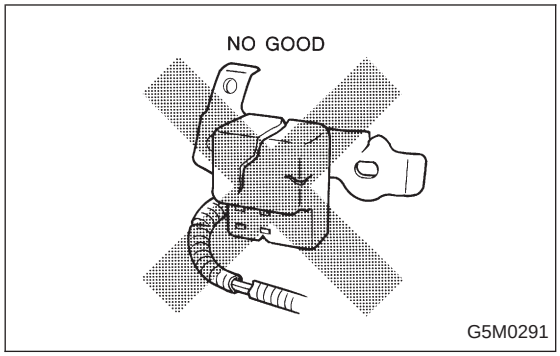
<Ref. to 4-3 [W2C2].>

1. SRS Airbag



① Combination switch ASSY with roll connector
② TORX® bolt
③ Airbag module ASSY (Driver)
④ Airbag module ASSY (Passenger)
⑤ BRKT A
⑥ BRKT B
⑦ TORX® bolt
⑧ Airbag control module
⑨ Protector LH
⑩ Airbag main harness

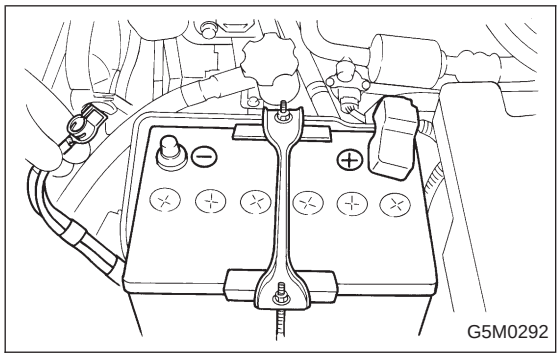
Tightening torque: N·m (kg-cm, in-lb)
T1: 2.5±0.5 (25±5, 21.7±4.3)
T2: 4.4±1.5 (45±15, 39±13)
T3: 7.4±0.2 (75±2, 65.1±1.7)
T4: 9.8±2.0 (100±20, 87±17)
T5: 9.81±2.45 (100.0±25.0, 86.8±21.7)
T6: 17.7±4.9 (180±50, 156±43)



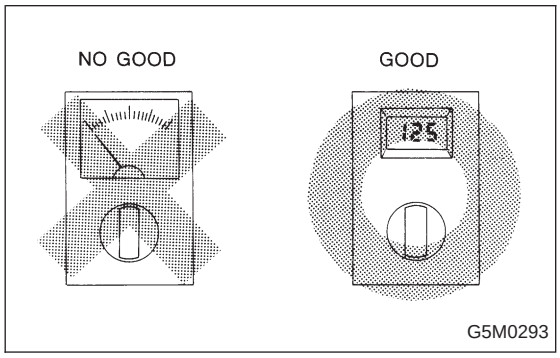
1. Precaution

1. GENERAL CAUTIONS

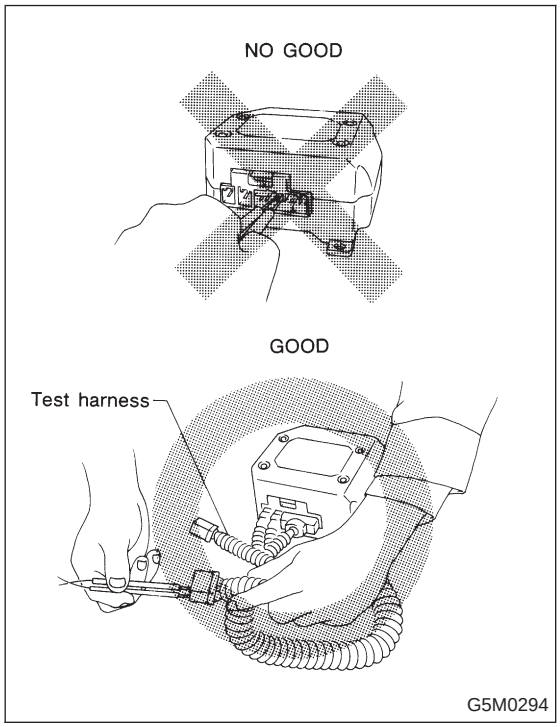
1) If any of the airbag system parts such as sensors, airbag module, control module and harness are damaged or deformed, replace with new genuine parts.

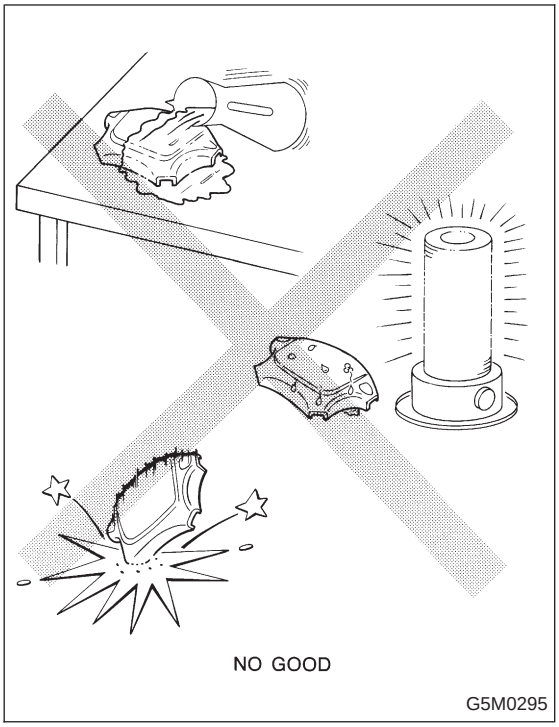


2) When servicing, be sure to turn the ignition switch off, disconnect the negative (−) battery terminal then the positive (+) terminal in advance, and wait for more than 20 seconds before starting.

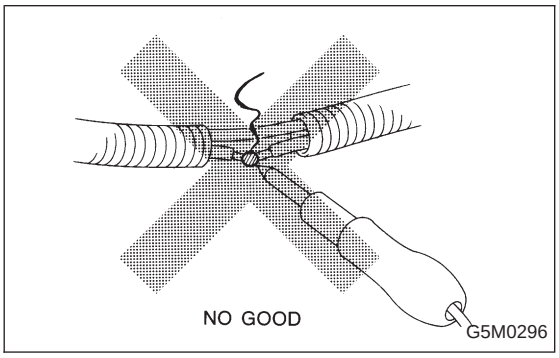


3) When checking the system, be sure to use a digital circuit tester. Use of an analog circuit tester may cause the airbag to activate erroneously. Do not directly apply the tester probe to any connector terminal of the airbag. When checking, use a test harness.

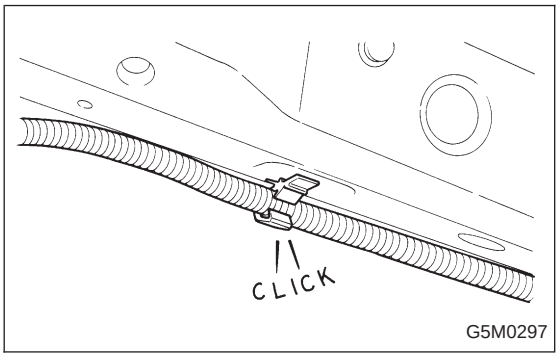




4) Do not drop the airbag modulator parts, subject it to high temperatures over 90°C (194°F), or apply oil, grease, or water to it; otherwise, the internal parts may be damaged and its reliability greatly lowered.

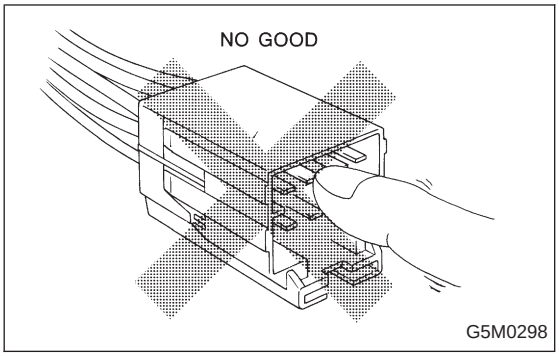


5) If any damage or open is found on the SRS airbag system wire harness, do not attempt to repair using soldering, etc. Be sure to replace the faulty harness with a new genuine part.

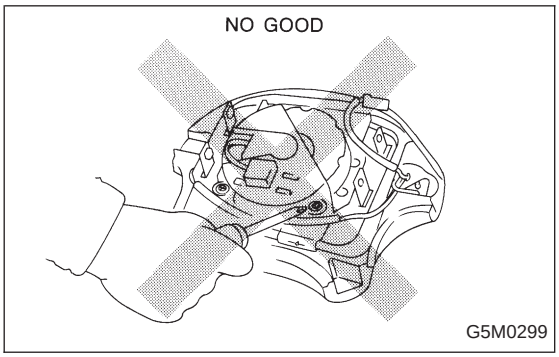


6) Install the wire harness securely with the specified clips so as to avoid interference or jamming with other parts.

7) Before connecting the airbag system to ground, make sure that the grounding terminal is free from paint and contamination.

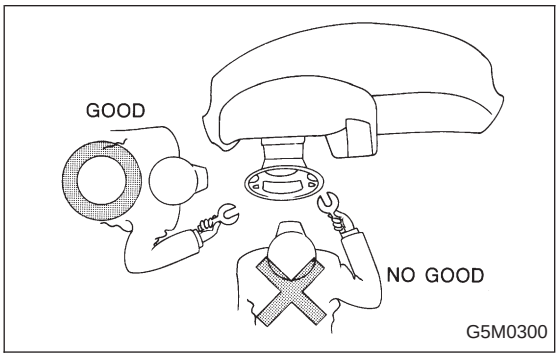


8) Do not allow water or oil to come in contact with the connector terminals. Do not touch the connector terminals.

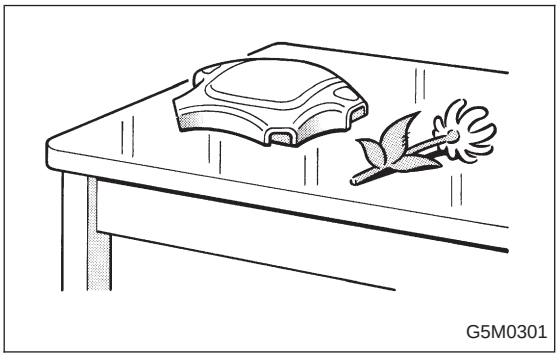


2. AIRBAG MODULE

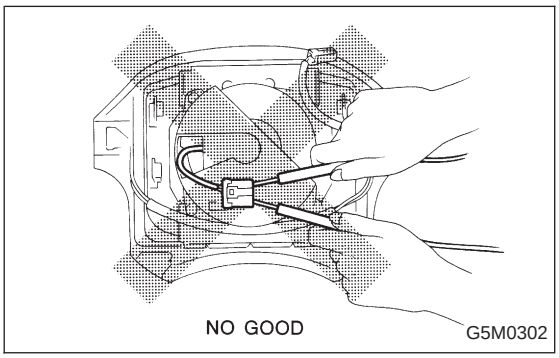
1) The airbag module (driver side and passenger side) must not be disassembled. The airbag module cannot be used again once inflated.



2) When removing and installing the airbag module (driver side and passenger side), the operator should stand, as much as possible, on the side of the airbag module.



3) After removal, the airbag module (driver side and passenger side) should be kept away from heat and light sources, and stored on a clean, flat surface to prevent from any damage to its lower structure.

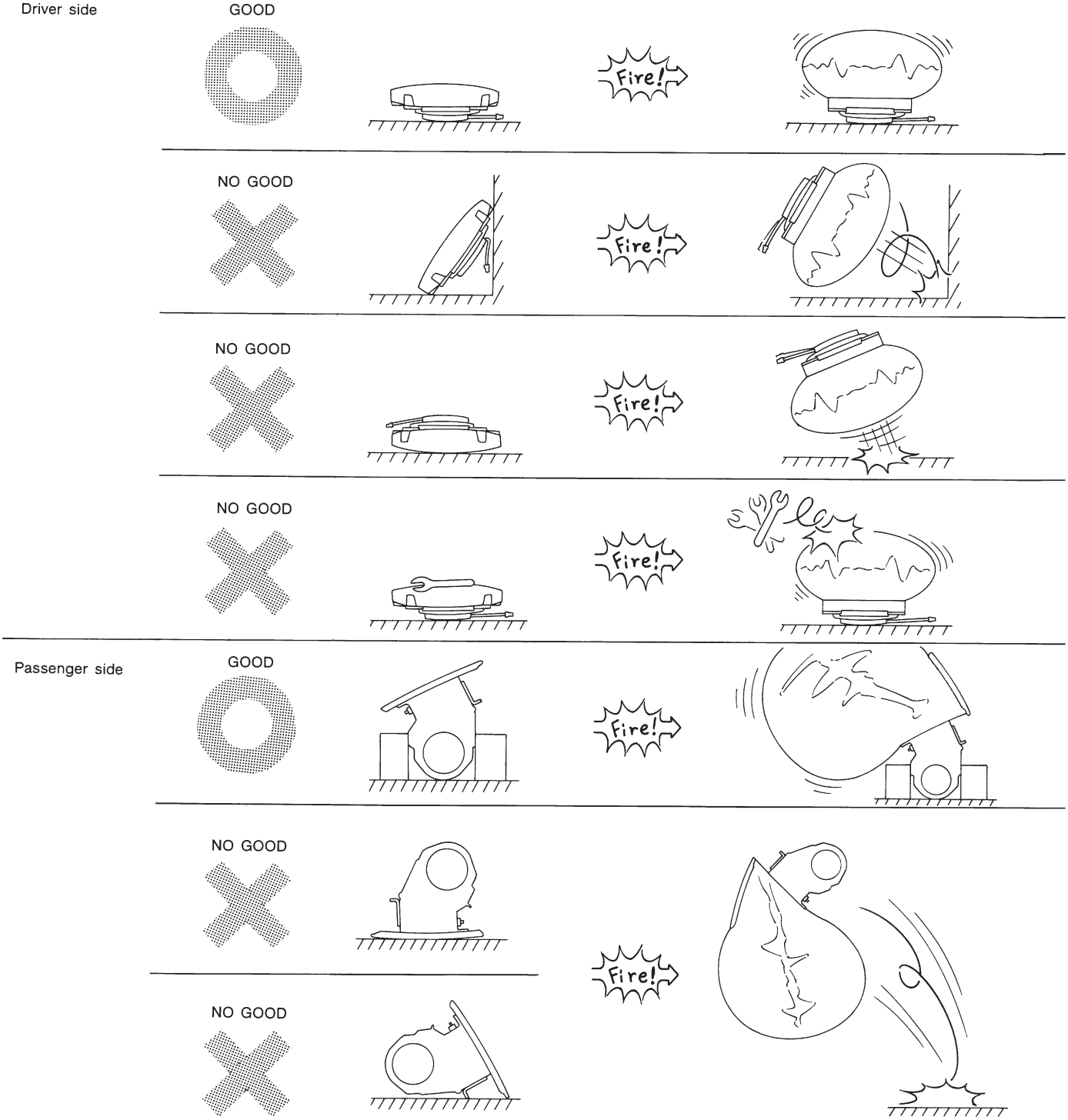


4) Do not check airbag module (driver side and passenger side) continuity with airbag removed from the vehicle body.

5) Replace airbag module (driver side and passenger side) with a new one, should any of the following conditions develop.

- Pad surface is scratched or cracked.
- Connector harness is damaged.
- Inflator side structure of module is cracked or deformed.
- Module is excessively stained with water, oil, etc.
- Module was accidentally dropped.

6) When storing a removed airbag module (driver side and passenger side), be sure to place it in parallel with floor with the pad facing up. Do not place it against a wall, or place anything on the pad; otherwise, a dangerous condition may be created if the module malfunctions.



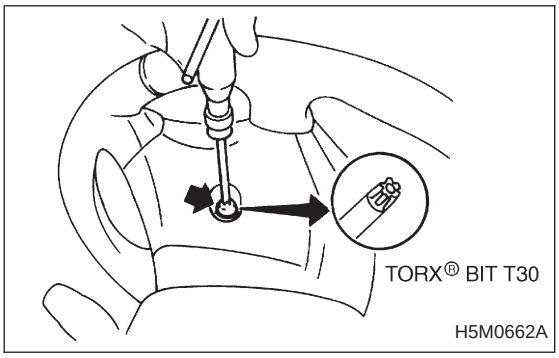
G5M0604

2. Airbag Module

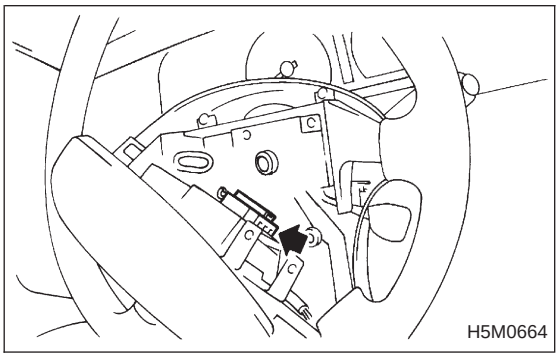
A: REMOVAL

1. DRIVER SIDE

1) Set front wheels in straight ahead position.
2) Turn ignition switch off.
3) Disconnect ground cable from battery and wait for at least 20 seconds before starting work.



4) Using TORX® BIT T30, remove two TORX® bolts.

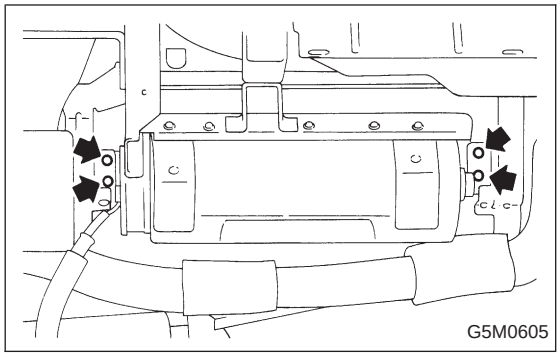


5) Disconnect airbag and horn connectors on back of airbag module. <Ref. to 5-5 [M2-6].>

6) Refer to “Precaution” for handling of a removed airbag module.

2. PASSENGER SIDE

1) Remove instrument panel. <Ref. to 5-4 [W1A0].>



2) Remove four bolts and then carefully remove airbag module.

3) Refer to “5-5 [W102]” for handing of a removed airbag module.

B: INSTALLATION

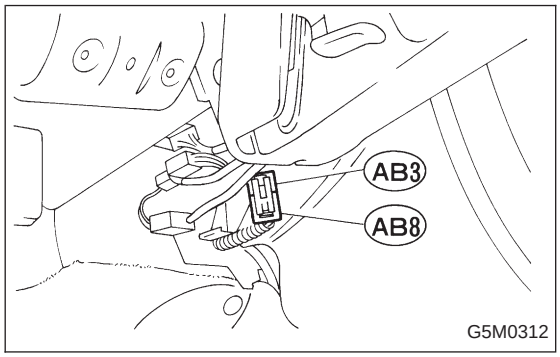
Installation is in reverse order of removal procedures.
Observe the following: Make sure that ignition switch is off.

CAUTION:
Do not allow harness and connectors to interfere or get caught with other parts.

3. Main Harness

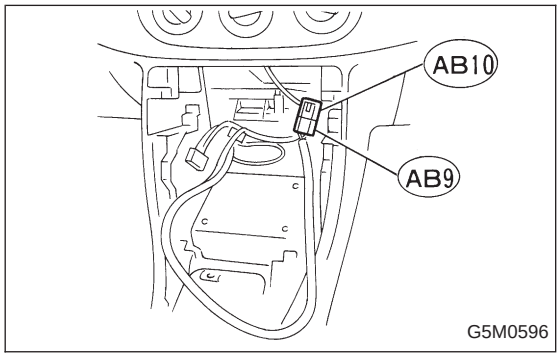
A: REMOVAL

1) Turn ignition switch off.
2) Disconnect ground cable from battery and wait for at least 20 seconds before starting work.

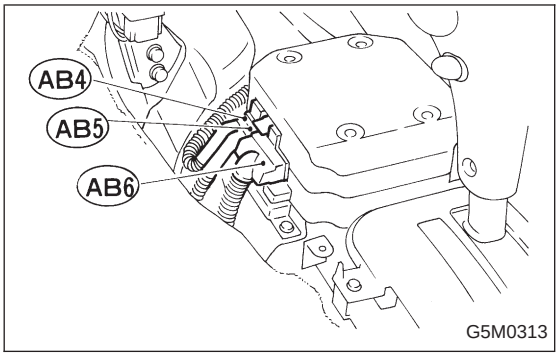


3) Remove lower cover. <Ref. to 5-4 [W1A0].>
Disconnect airbag connector (AB3) and (AB8) below steering column.

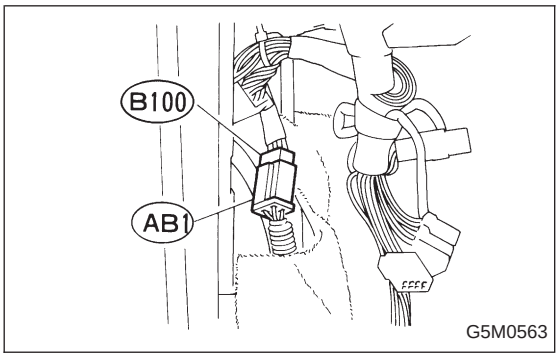
CAUTION:
Do not reconnect airbag connector at steering column until main harness are securely re-installed.



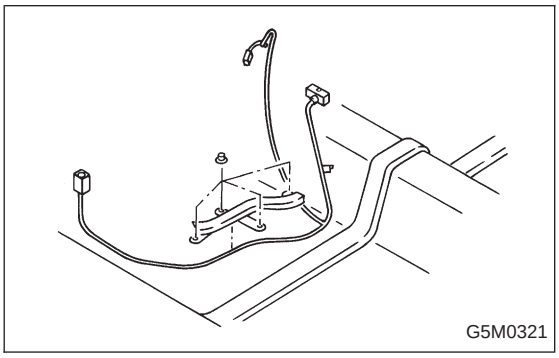
4) Disconnect airbag connector (AB9) and (AB10) <Ref. to 5-5 [T5F1].>



5) Remove instrument panel console. <Ref. to 5-4 [W1A0].> Disconnect 12-pin yellow connector (AB6) from airbag control unit. <Ref. to 5-5 [M2-6].>



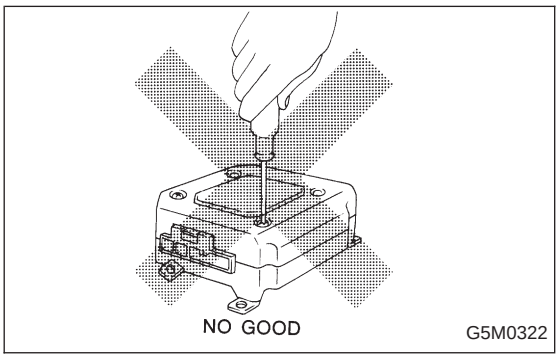
6) Disconnect body harness connector (B39) from connector (AB1).



7) Roll up floor mat and side sill cover. (LH side). Remove main harness from clip and protector.

B: INSTALLATION

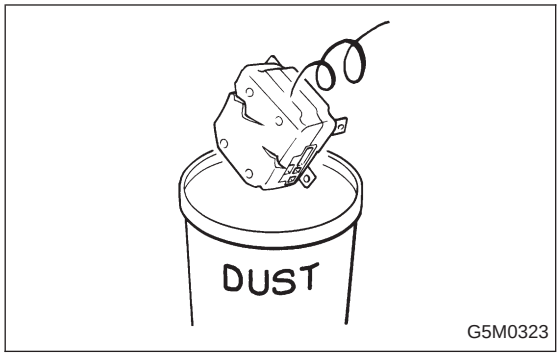
Installation is in reverse order of removal procedures.



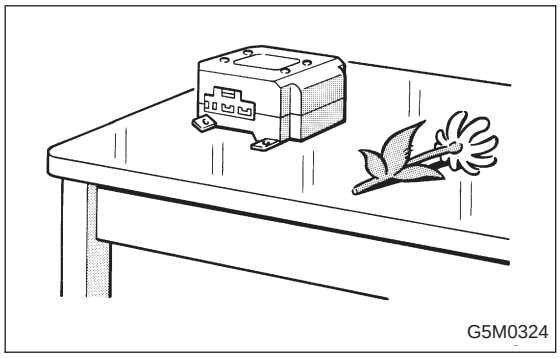
4. Airbag Control Module

CAUTION:

- **Do not disassemble the airbag control module.**



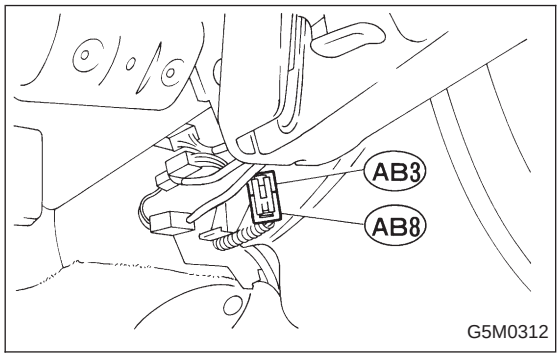
● **If the airbag control module is deformed, or if water damage is suspected, replace the airbag control module with a new genuine part.**



● **After removal, keep the airbag control module on a dry, clean surface away from heat and light sources, and moisture and dust.**

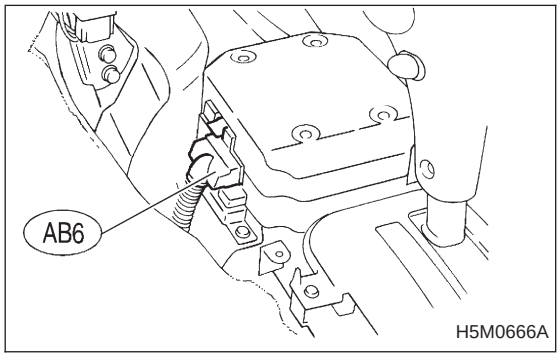
A: REMOVAL

1) Turn ignition switch off.
2) Disconnect ground cable from battery and wait for at least 20 seconds before starting work.

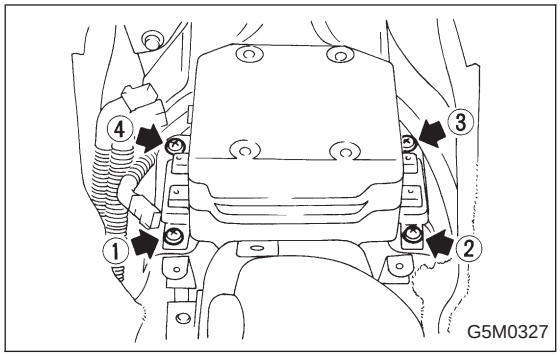


3) Remove lower cover. <Ref. to 5-4 [W1A0].>
Disconnect airbag connector (AB3) and (AB8) below steering column.

CAUTION:
Do not reconnect airbag connector at steering column until airbag control module is securely re-installed.



4) Remove instrument panel console. <Ref. to 5-4 [W1A0].>
5) Disconnect 12-pin yellow connector (AB6) from airbag control module. <Ref. to 5-5 [M2-6].>



6) Using TORX® BIT T30, remove four TORX® bolts in numerical sequence shown in figure.
Discard the old TORX® bolts.

CAUTION:
Use new TORX® bolts during re-assembly.

B: INSTALLATION

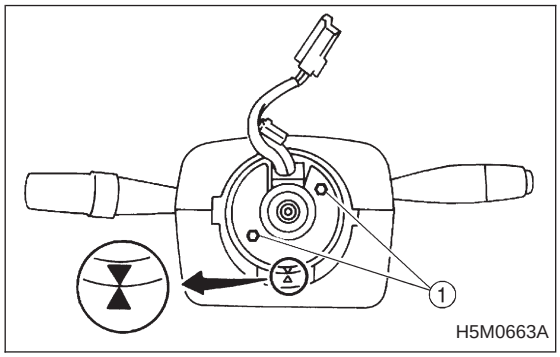
Installation is in reverse order of removal procedures.

CAUTION:
Be sure to fully secure all airbag system connectors during re-assembly and confirm that all green double lock mechanisms are engaged.

5. Combination Switch

1. CENTERING ROLL CONNECTOR

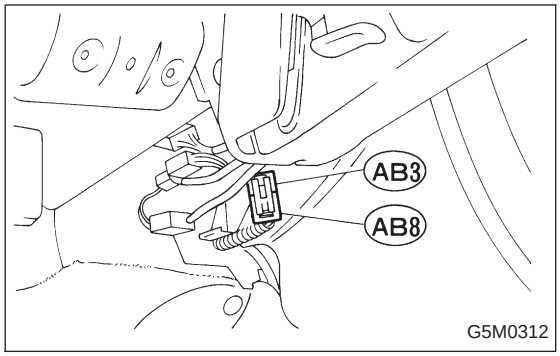
Before installing combination switch and steering wheel, make sure to center roll connector built into combination switch.
1) Make sure that front wheels are positioned straight ahead.
2) Install steering gearbox, steering shaft and combination switch properly. Turn roll connector pin ① **clockwise** until it stops.



3) Then, back off roll connector pin ① approximately 2.65 turns until "▲" marks aligned.

A: REMOVAL

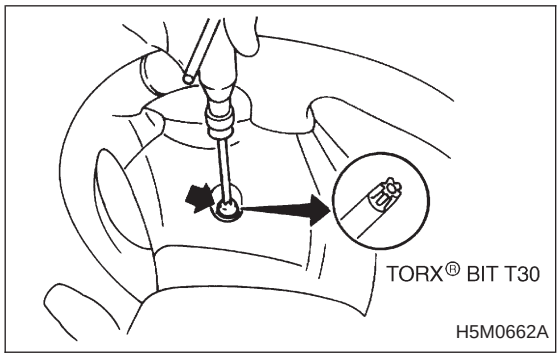
1) Turn ignition switch off.
2) Disconnect ground cable from battery and wait for at least 20 seconds before starting work.



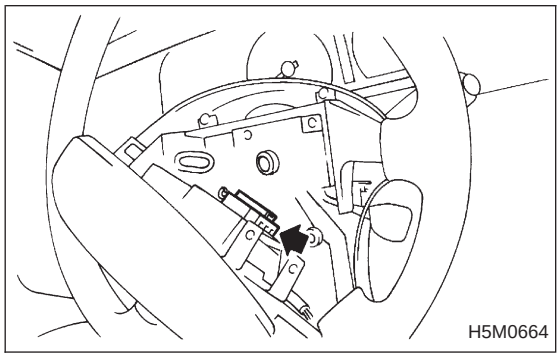
3) Remove lower cover. <Ref. to 5-4 [W1A0].> Disconnect airbag connector (AB3) and (AB8) below steering column.

CAUTION:
Do not reconnect airbag connector at steering column until combination switch is securely re-installed.

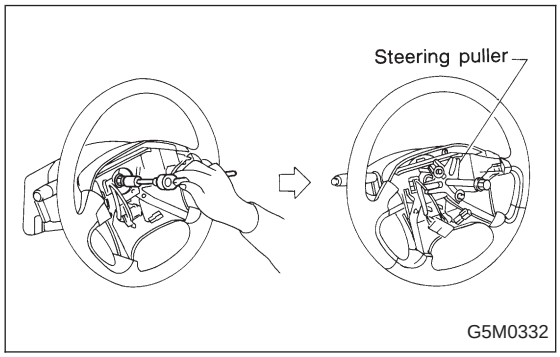
4) Disconnect combination switch connectors from body harness connector.



5) Set front wheels in straight ahead position. Using TORX® BIT T30, remove two TORX® bolts.

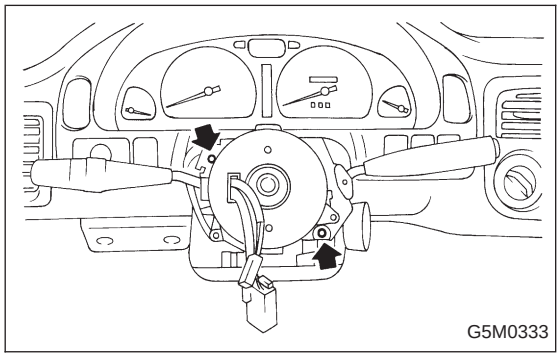


6) Disconnect airbag connector and horn connector on back of airbag module. Remove airbag module, and place it with pad side facing upward. <Ref. to 5-5 [W102].>

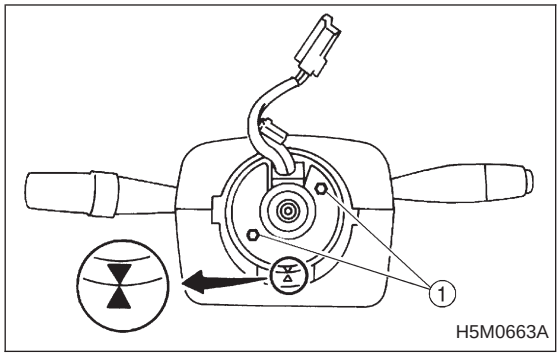


7) Using steering puller, remove steering wheel.

CAUTION:
Do not allow connector to interfere when removing steering wheel.



8) Remove steering column covers.
9) Removing two retaining screws, remove combination switch.



B: INSTALLATION

1) Before installing combination switch, check to ensure that combination switch is off and front wheels are set in the straight ahead position.

CAUTION:
Failure to do this might damage roll connector.

2) Install column cover and center roll connector. <Ref. to 5-5 [W501].>

3) Install steering wheel in neutral position. Carefully insert roll connector pin ① into hole on steering wheel.

NOTE:
If steering wheel angle requires fine adjustment, adjust tie-rod. <Ref. to 4-3 [W3F0].>

4) Install airbag module and lower cover in the reverse order of removal.

ENGINE ELECTRICAL SYSTEM 6-1

1. Engine Electrical

A: SPECIFICATIONS

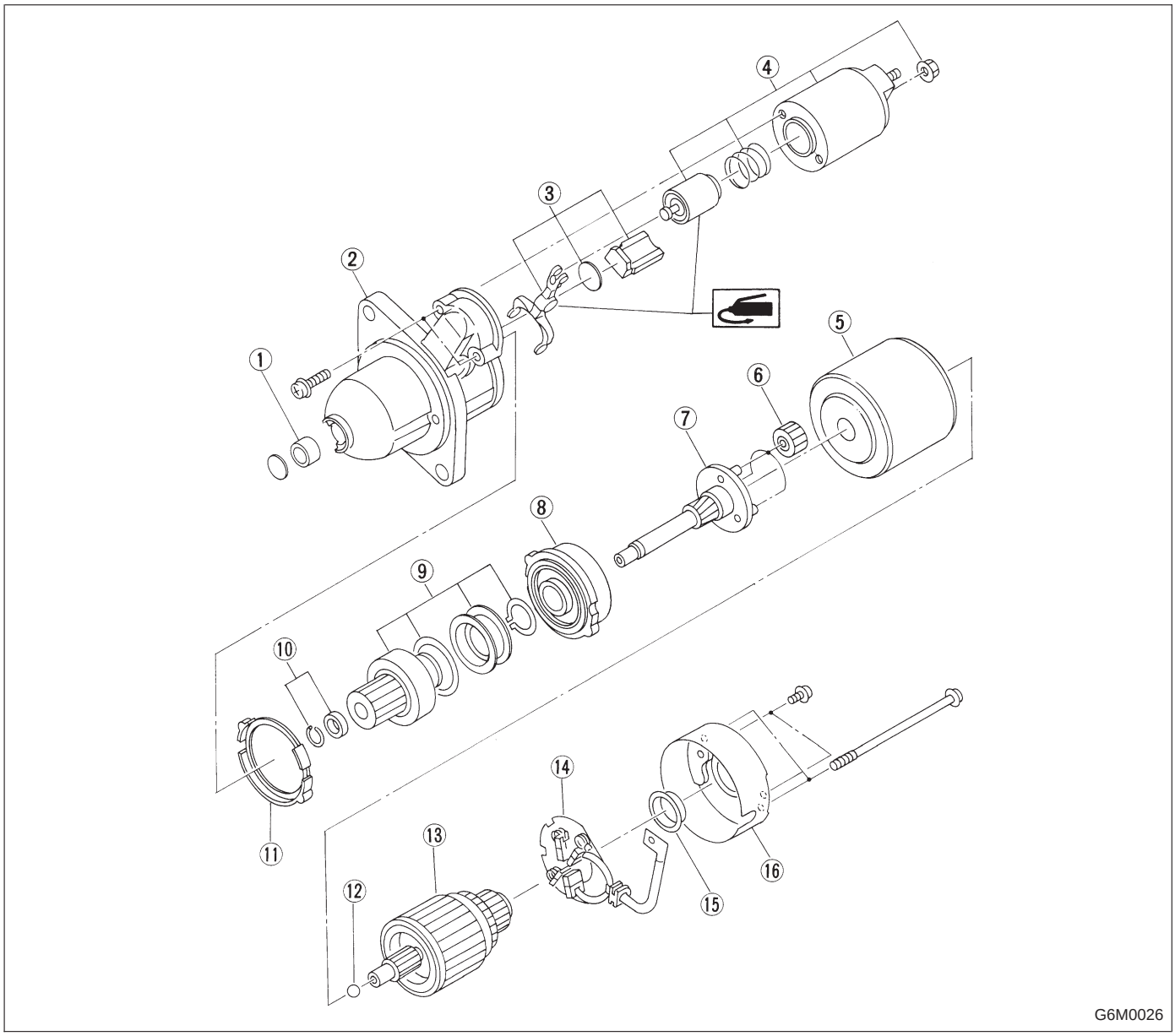
1. 1800 cc MODEL

Item			Designation	
Starter	Type		Reduction type	
	Model		MT M001T77181	AT M1T-75681
	Manufacturer		Mitsubishi Electric	
	Voltage and output		12 V — 1.0 kW	12 V — 1.4 kW
	Direction of rotation		Counterclockwise (when observed from pinion)	
	Number of pinion teeth		8	9
	No-load characteristics	Voltage	11 V	
		Current	90 A or less	
		Rotating speed	3,000 rpm or more	
	Load characteristics	Voltage	8 V	7.7 V
		Current	280 A or less	300 A or less
		Torque	8.5 N·m (0.87 kg-m, 6.3 ft-lb)	10 N·m (1.0 kg-m, 7 ft-lb)
		Rotating speed	980 rpm or more	1,000 rpm or more
	Lock characteristics	Voltage	4 V	
		Current	780 A or less	980 A or less
		Torque	17.6 N·m (1.80 kg-m, 13.0 ft-lb) or more	23 N·m (2.3 kg-m, 17 ft-lb) or more
Generator	Type		Rotating-field three-phase type, Voltage regulator built-in type	
	Model		A2T39091	
	Manufacturer		Mitsubishi Electric	
	Voltage and output		12 V — 75 A	
	Polarity on ground side		Negative	
	Rotating direction		Clockwise (when observed from pulley side)	
	Armature connection		3-phase Y-type	
	Output current		1,500 rpm — 30 A or more 2,500 rpm — 64 A or more 5,000 rpm — 76 A or more	
	Regulated voltage		14.1 — 14.8 V [20°C (68°F)]	
Ignition coil	Model		CM12-100	
	Manufacturer		HITACHI	
	Primary coil resistance		0.63 — 0.77 Ω	
	Secondary coil resistance		10.4 — 15.6 kΩ	
	Insulation resistance between primary terminal and case		More than 10 MΩ	
Spark plug	Type and manufacturer		BKR6E-11 ..... NGK	
	Thread size	mm	14, P = 1.25	
	Spark gap	mm (in)	1.0 — 1.1 (0.039 — 0.043)	

2. 2200 cc MODEL

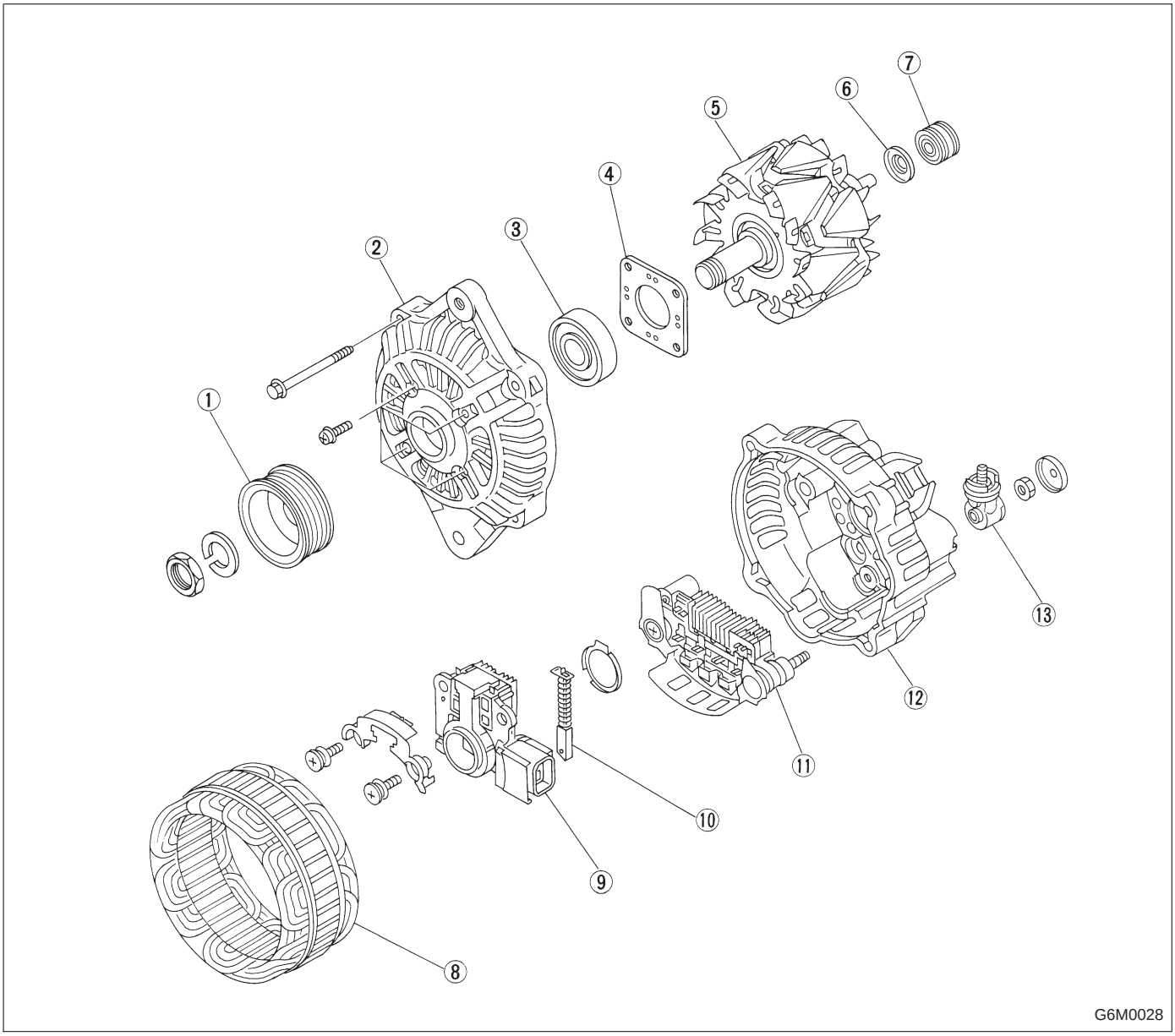
Item			Designation
Starter	Type		Reduction type
	Model		M001T75681
	Manufacturer		MITSUBISHI
	Voltage and output		12 V — 1.4 kW
	Direction of rotation		Counterclockwise (when observed from pinion)
	Number of pinion teeth		9
	No-load characteristics	Voltage	11 V
		Current	90 A or less
		Rotating speed	3,000 rpm, or more
	Load characteristics	Voltage	7.7 V
		Current	300 A
		Torque	9.81 N·m (1.001 kg-m, 7.236 ft-lb)
		Rotating speed	1,000 rpm or more
	Lock characteristics	Voltage	4 V
		Current	980 A or less
		Torque	23 N·m (2.35 kg-m, 17.0 ft-lb) or more
Generator	Type		Rotating-field three-phase type, Voltage regulator built-in type
	Model		A2T39091
	Manufacturer		Mitsubishi Electric
	Voltage and output		12 V — 75 A
	Polarity on ground side		Negative
	Rotating direction		Clockwise (when observed from pulley side)
	Armature connection		3-phase Y-type
	Output current		1,500 rpm — 30 A or more 2,500 rpm — 64 A or more 5,000 rpm — 76 A or more
	Regulated voltage		$14.5^{+0.3}_{-0.4}$ V [20°C (68°F)]
Ignition coil	Model		F-569-01R
	Manufacturer		Diamond
	Primary coil resistance		0.69 Ω±10%
	Secondary coil resistance		21.0 kΩ±15%
	Insulation resistance between primary terminal and case		More than 10 MΩ
Spark plug	Type and manufacturer		Alternate: RC10YC4 ..... CHAMPION (BKR6E-11 ..... NGK K20PR-U11 ..... NIPPONDENSO)
	Thread size mm		14, P = 1.25
	Spark gap mm (in)		1.0 — 1.1 (0.039 — 0.043)

1. Starter

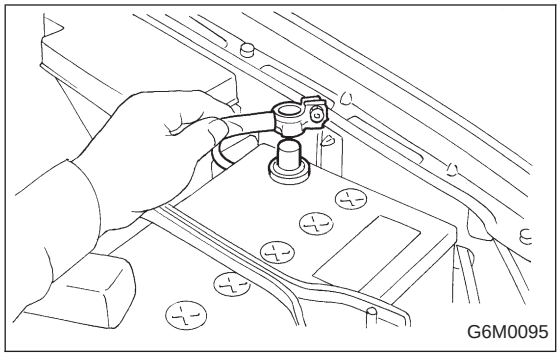


① Sleeve bearing
② Front bracket
③ Lever set
④ Magnet switch Assy
⑤ Yoke
⑥ Gear ASSY
⑦ Shaft ASSY
⑧ Internal gear ASSY
⑨ Over running clutch
⑩ Stopper set
⑪ Packing
⑫ Ball
⑬ Armature
⑭ Brush holder
⑮ Bearing
⑯ Rear bracket

2. Generator



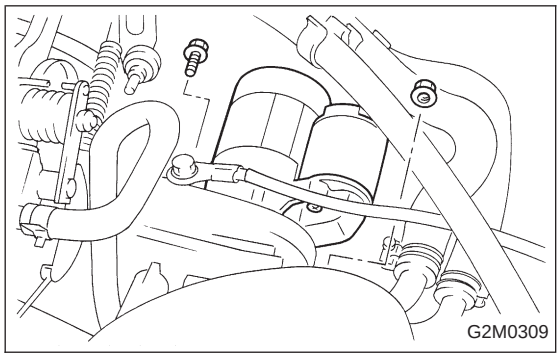
① Pulley
② Front cover
③ Ball bearing
④ Bearing retainer
⑤ Rotor
⑥ Holder
⑦ Bearing
⑧ Stator coil
⑨ Brush holder
⑩ Brush
⑪ IC regulator
⑫ Rear cover
⑬ Terminal


G6M0095

1. Starter

A: REMOVAL AND INSTALLATION

1) Disconnect battery ground cable.


G2M0309

2) Disconnect connector and terminal from starter.
3) Remove starter from transmission.
4) Installation is in the reverse order of removal.

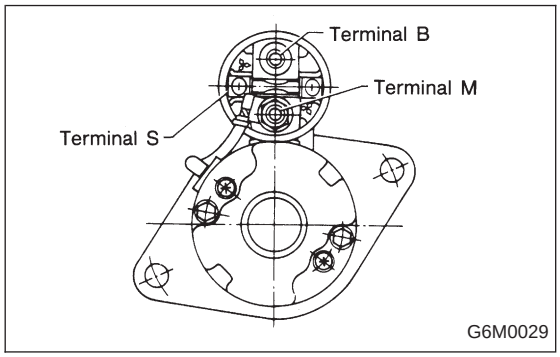
Tightening torque:
46 — 54 N·m (4.7 — 5.5 kg-m, 34 — 40 ft-lb)

B: TEST

1. SWITCH ASSEMBLY OPERATION

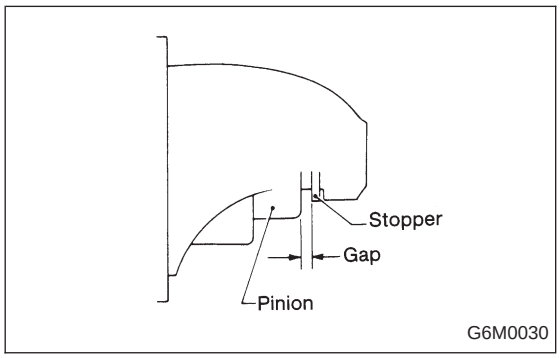
1) Connect terminal S of switch assembly to positive terminal of battery with a lead wire, and starter body to ground terminal of battery. Pinion should be forced endwise on shaft.

CAUTION:
With pinion forced endwise on shaft, starter motor can sometimes rotate because current flows, through pull-in coil, to motor. This is not a problem.



G6M0029

2) Disconnect connector from terminal M, and connect positive terminal of battery and terminal M using a lead wire and ground terminal to starter body.
In this test set up, pinion should return to its original position even when it is pulled out with a screwdriver.



G6M0030

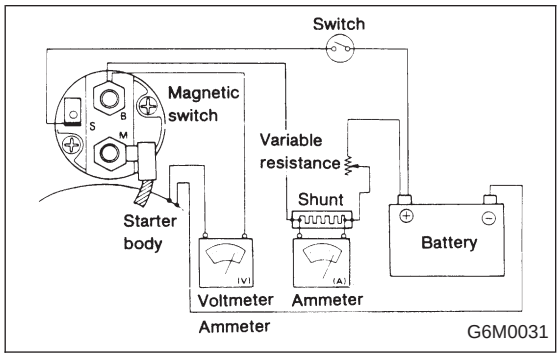
2. PINION GAP

1) With pinion forced endwise on shaft, as outlined in step 1) above, measure pinion gap.

Pinion gap:
0.5 — 2.0 mm (0.020 — 0.079 in)

If motor is running with the pinion forced endwise on the shaft, disconnect connector from terminal M of switch assembly and connect terminal M to ground terminal (−) of battery with a lead wire. Next, gently push pinion back with your fingertips and measure pinion gap.

2) If pinion gap is outside specified range, remove or add number of adjustment washers used on the mounting surface of switch assembly until correct pinion gap is obtained.



3. PERFORMANCE TEST

The starter should be submitted to performance tests whenever it has been overhauled, to assure its satisfactory performance when installed on the engine.
Three performance tests, no-load test, load test, and lock test, are presented here; however, if the load test and lock test cannot be performed, carry out at least the no-load test.
For these performance tests, use the circuit shown in figure.

1) No-load test
With switch on, adjust the variable resistance to obtain 11 V, take the ammeter reading and measure the starter speed. Compare these values with the specifications.

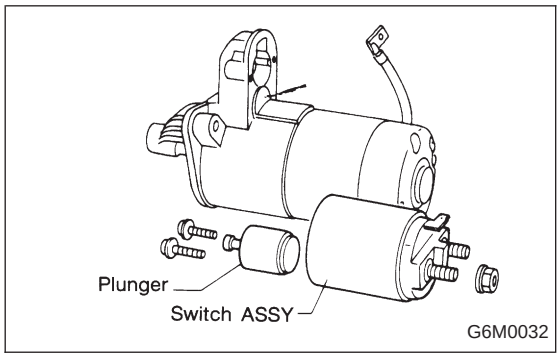
No-load test (Standard):
Voltage / Current
11 V / 90 A max.
Rotating speed
3,000 rpm / min.

2) Load test
Apply the specified braking torque to starter. The condition is satisfactory if the current draw and starter speed are within specifications.

Load test (Standard):
Voltage / Load
7.7 V / 10 N·m (1.0 kg-m, 7 ft-lb)
Current / Speed
300 A max. / 1,000 rpm / min.

3) Lock test
With starter stalled, or not rotating, measure the torque developed and current draw when the voltage is adjusted to the specified voltage.

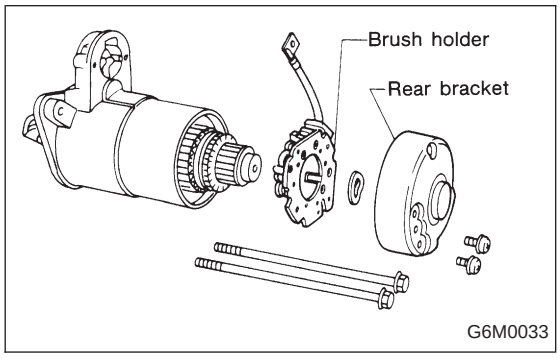
Lock test (Standard):
Voltage / Current
4 V / 980 A max.
Torque
23 N·m (2.3 kg-m, 17 ft-lb) min.



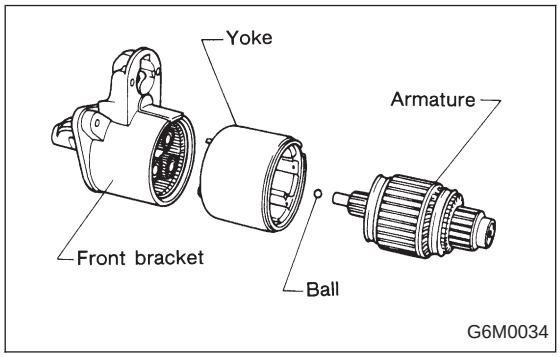
C: DISASSEMBLY

1) Loosen nut which holds terminal M of switch assembly, and disconnect connector.
2) Remove bolts which hold switch assembly, and remove switch assembly, plunger and plunger spring from starter as a unit.

CAUTION:
Be careful because pinion gap adjustment washer may sometimes be used on the mounting surface of switch assembly.

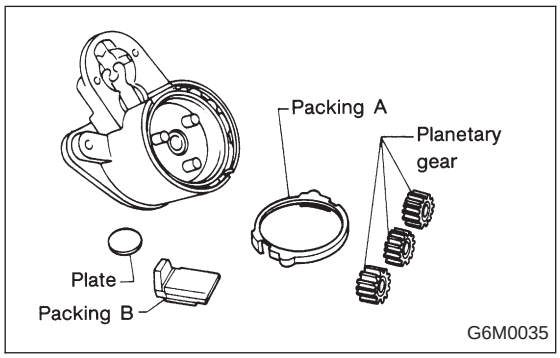


3) Remove both through-bolts and brush holder screws, and detach rear bracket and brush holder.

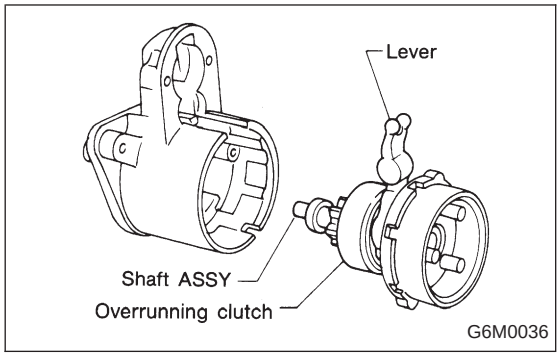


4) Remove armature and yoke. Ball used as a bearing will then be removed from the end of armature.

CAUTION:
Be sure to mark an alignment mark on yoke and front bracket before removing yoke.

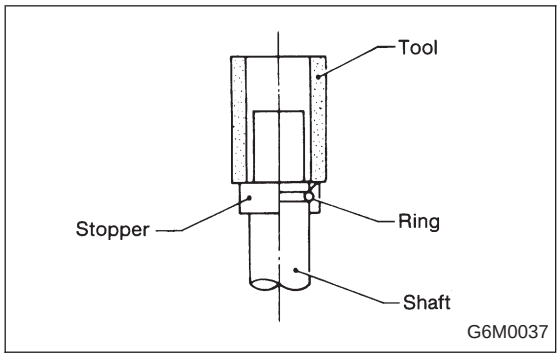


5) Remove packing A, three planetary gears, packing B and plate.



6) Remove shaft assembly and overrunning clutch as a unit.

CAUTION:
Record the direction of lever before removing.



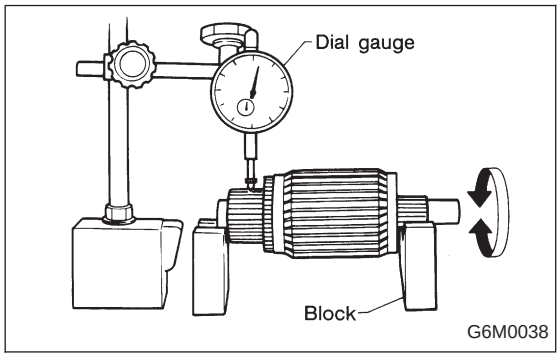
7) Remove overrunning clutch from shaft assembly as follows:

(1) Remove stopper from ring by lightly tapping a fit tool placed on stopper.
(2) Remove ring, stopper and clutch from shaft.

D: INSPECTION

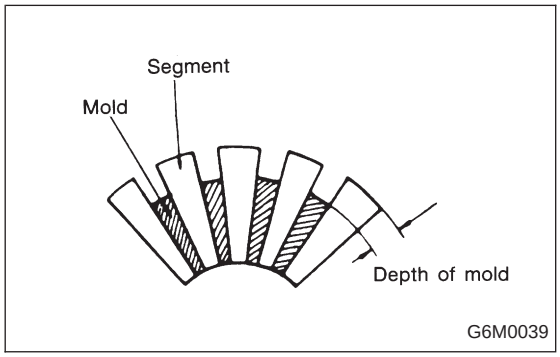
1. ARMATURE

1) Check commutator for any sign of burns of rough surfaces or stepped wear. If wear is of a minor nature, correct it by using sand paper.



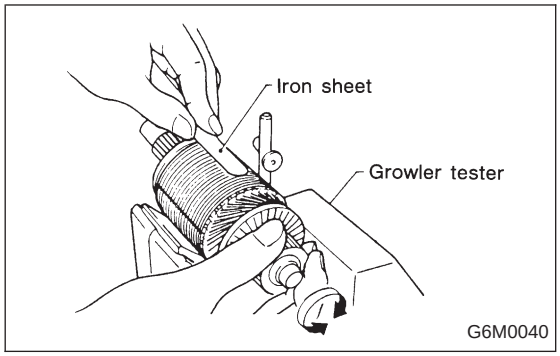
2) Run-out test
Check the commutator run-out and replace if it exceeds the limit.

Commutator run-out:
Standard
0.05 mm (0.0020 in)
Service limit
Less than 0.10 mm (0.0039 in)

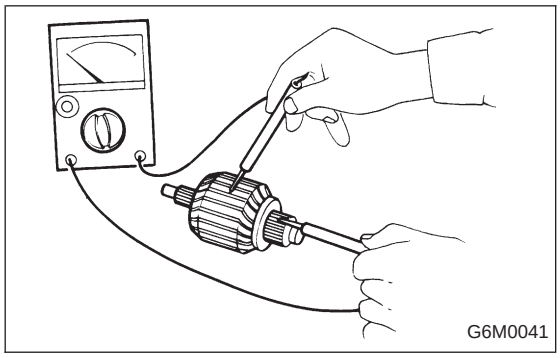


3) Depth of segment mold
Check the depth of segment mold.

Depth of segment mold:
0.5 — 0.8 mm (0.020 — 0.031 in)



4) Armature short-circuit test
Check armature for short-circuit by placing it on growler tester. Hold a hacksaw blade against armature core while slowly rotating armature. A short-circuited armature will cause the blade to vibrate and to be attracted to core. If the hacksaw blade is attracted or vibrates, the armature, which is short-circuited, must be replaced or repaired.



5) Armature ground test
Using circuit tester, touch one probe to the commutator segment and the other to shaft. There should be no continuity. If there is a continuity, armature is grounded.
Replace armature if it is grounded.

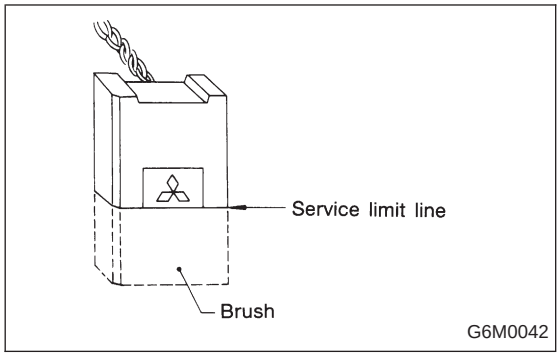
2. YOKE

Make sure pole is set in position.

3. OVERRUNNING CLUTCH

Inspect teeth of pinion for wear and damage. Replace if it damaged. Rotate pinion in direction of rotation (clockwise). It should rotate smoothly. But in opposite direction, it should be locked.

CAUTION:
Do not clean overrunning clutch with oil to prevent grease from flowing out.



4. BRUSH AND BRUSH HOLDER

1) Brush length

Measure the brush length and replace if it exceeds the service limit.

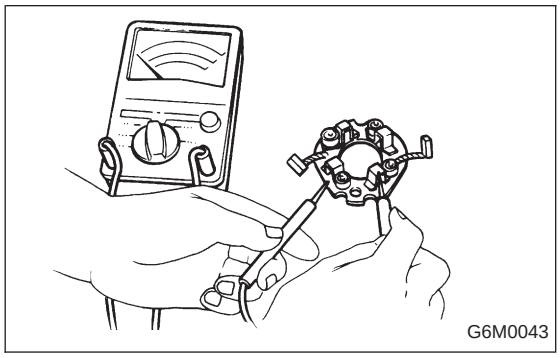
Replace if abnormal wear or cracks are noticed.

Brush length:

Standard	***17.0 mm (0.669 in)***
Service limit	***11.5 mm (0.453 in)***

2) Brush movement

Be sure brush moves smoothly inside brush holder.



3) Insulation resistance of brush holder

Be sure there is no continuity between brush holder and its plate.

4) Brush spring force

Measure brush spring force with a spring scale. If it is less than the service limit, replace brush spring.

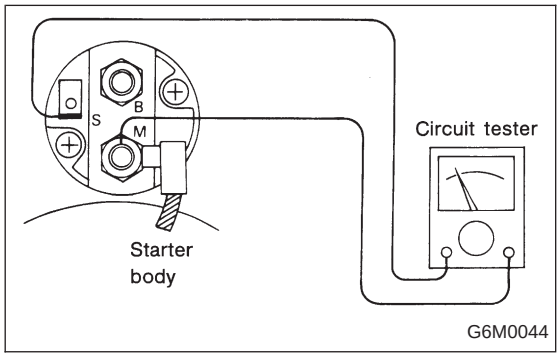
Brush spring force:

Standard

18.6 N (1.9 kg, 4.2 lb) (when new)

Service limit

6.9 N (0.7 kg, 1.5 lb)



5. SWITCH ASSEMBLY

Be sure there is continuity between terminals S and M, and between terminal S and ground. Use a circuit tester (set in "ohm").

Also check to be sure there is no continuity between terminal M and B.

Terminal / Specified resistance:

S — M / 10 Ω, max.

S — Ground / 10 Ω, max.

M — B / 1 MΩ, min.

E: ASSEMBLY

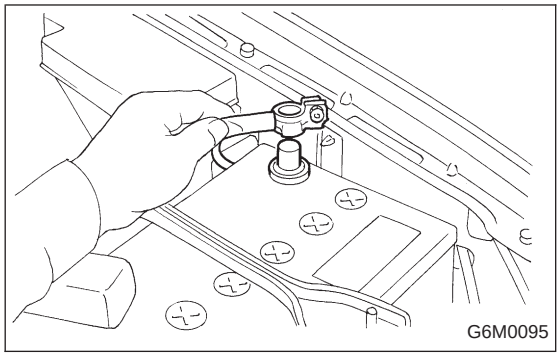
Assembly is in the reverse order of disassembly procedures. Observe the following:

1) Carefully assemble all parts in the order of assembly and occasionally inspect nothing has been overlooked.

2) Apply grease to the following parts during assembly.

- Front bracket sleeve bearing
- Armature shaft gear
- Outer periphery of plunger
- Mating surface of plunger and lever
- Gear shaft splines
- Mating surface of lever and clutch
- Ball at the armature shaft end
- Internal and planetary gears

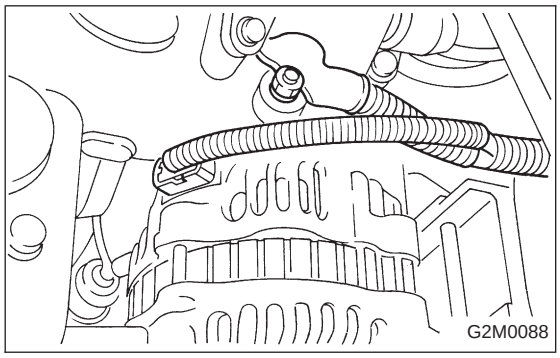
3) After assembling parts correctly, check to be sure starter operates properly.



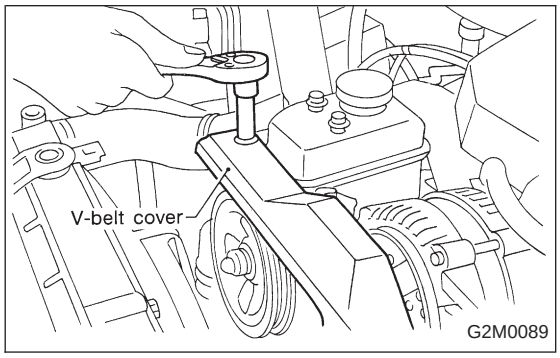
2. Generator

A: REMOVAL AND INSTALLATION

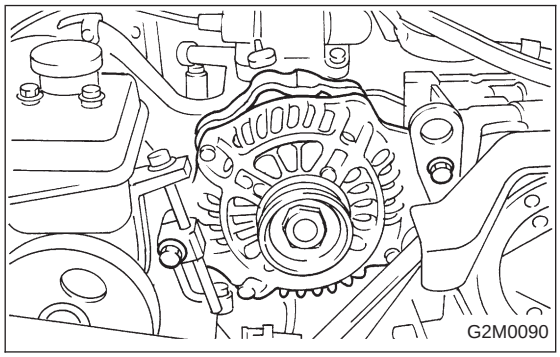
1) Disconnect battery ground cable.



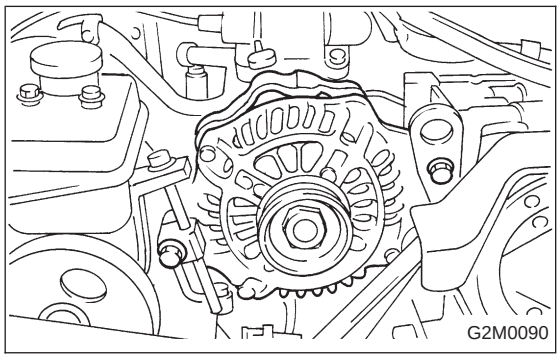
2) Disconnect connector and terminal from generator.



3) Remove V-belt cover.
4) Remove front side V-belt.

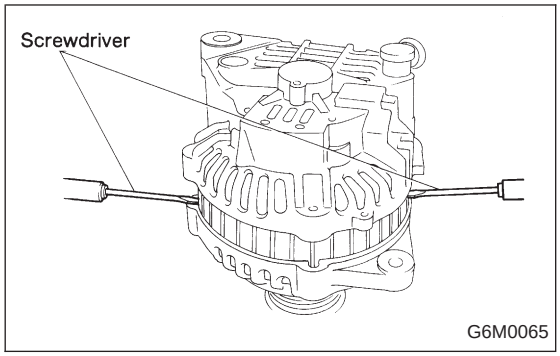


5) Remove bolts which install generator onto bracket.



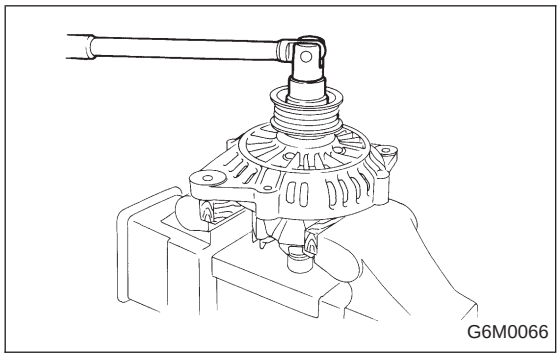
6) Installation is in the reverse order of removal.

CAUTION:
Check and adjust V-belt tension. <Ref. to 1-5 [W1A0].>

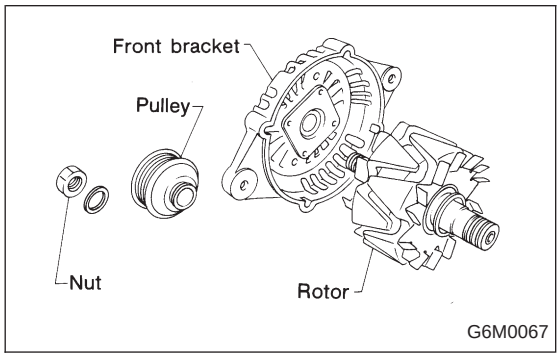


B: DISASSEMBLY

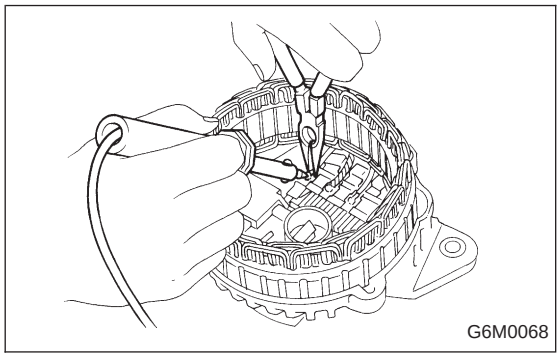
1) Remove the four through-bolts. Then insert the tip of a flat-head screwdriver into the gap between the stator core and front bracket. Pry then apart to disassemble.



2) Hold rotor with a vise and remove pulley nut.

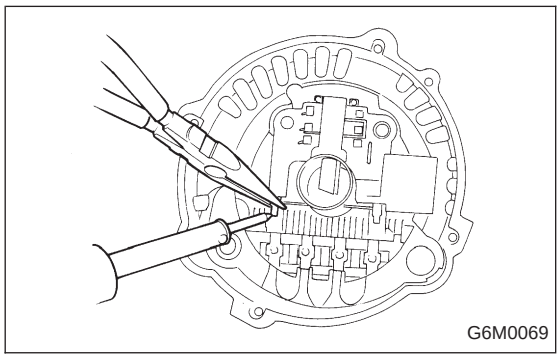


CAUTION:
When holding rotor with vise, insert aluminum plates or wood pieces on the contact surfaces of the vise to prevent rotor from damage.

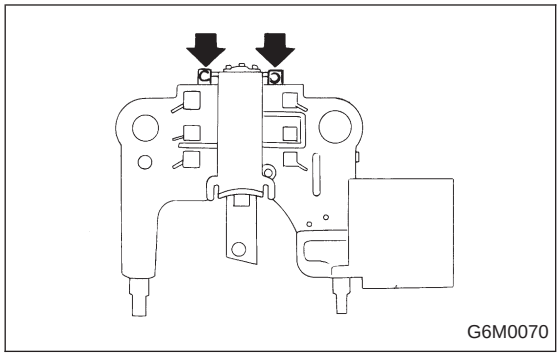


3) Unsolder connection between rectifier and stator coil to remove stator coil.

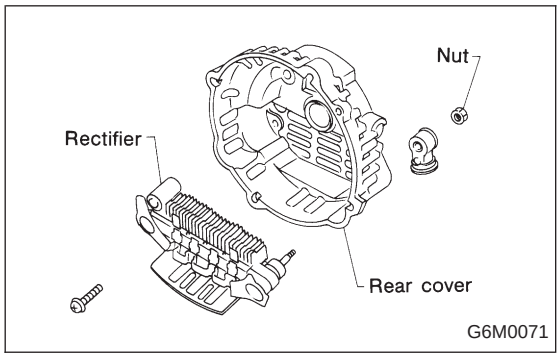
CAUTION:
Finish the work rapidly (less than three seconds) because the rectifier cannot withstand heat very well.



4) Remove screws which secure IC regulator to rear cover, and unsolder connection between IC regulator and rectifier to remove IC regulator.


G6M0070

5) Remove the brushes by unsoldering at the pigtails.



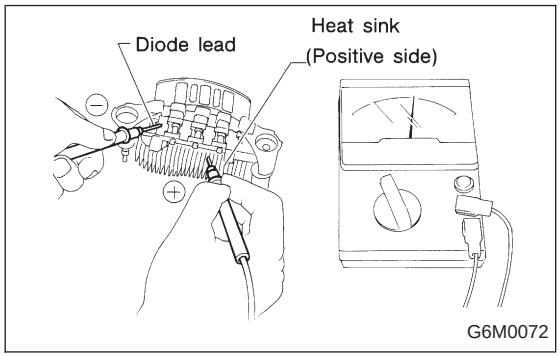
G6M0071

6) Remove the nut and insulating bushing at terminal B. Remove rectifier.

C: INSPECTION AND REPAIR

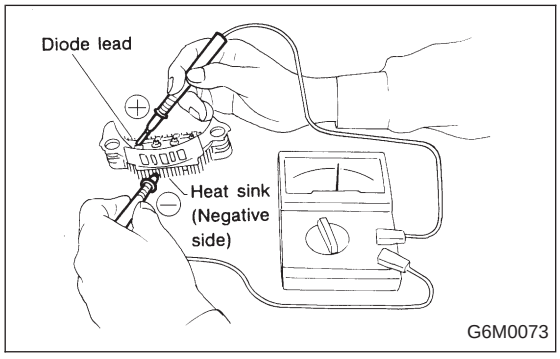
1. DIODE

CAUTION:
Never use a megger tester (measuring use for high voltage) or any other similar measure for this test; otherwise, the diodes may be damaged.



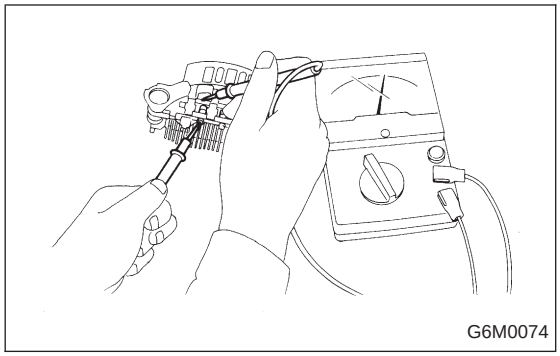
G6M0072

1) Checking positive diode
Check for continuity between the diode lead and the positive side heat sink. The positive diode is in good condition if continuity exists only in the direction from the diode lead to the heat sink.



G6M0073

2) Checking negative diode
Check for continuity between the negative side heat sink and diode lead. The negative diode is in good condition if continuity exists only in the direction from the heat sink to the diode lead.


G6M0074

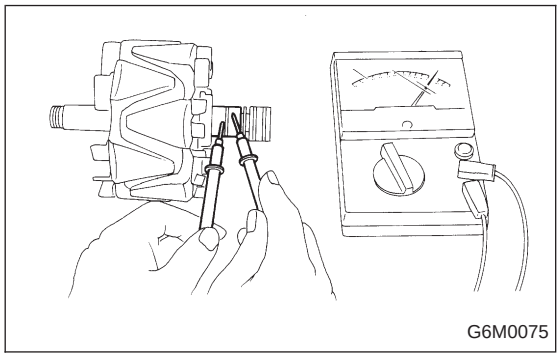
3) Checking trio diode
Check the trio diode using a circuit tester. It is in good condition if continuity exists only in one direction.

2. ROTOR

1) Slip ring surface
Inspect slip rings for contamination or any roughness of the sliding surface. Repair slip ring surface using a lathe or sand paper.

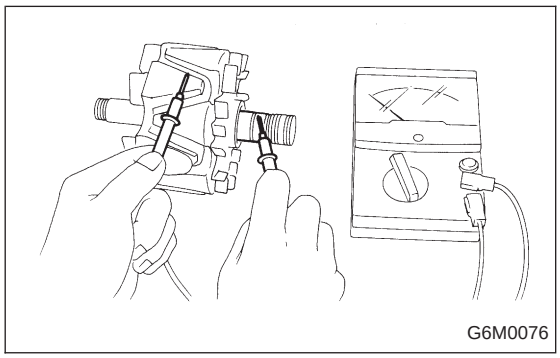
2) Slip ring outer diameter
Measure slip ring outer diameter. If slip ring is worn replace rotor assembly.

Slip ring outer diameter:
Standard
22.7 mm (0.894 in)
Limit
22.1 mm (0.870 in)

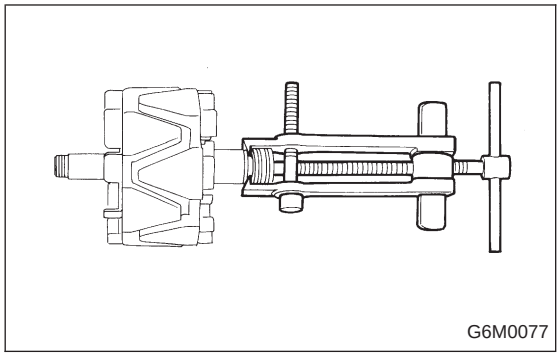

G6M0075

3) Continuity test
Check resistance between slip rings using circuit tester.
If the resistance is not within specification, replace rotor assembly.

Specified resistance:
Approx. 3 Ω (A2T39091)
Approx. 2 — 6 Ω (A2T37291)


G6M0076

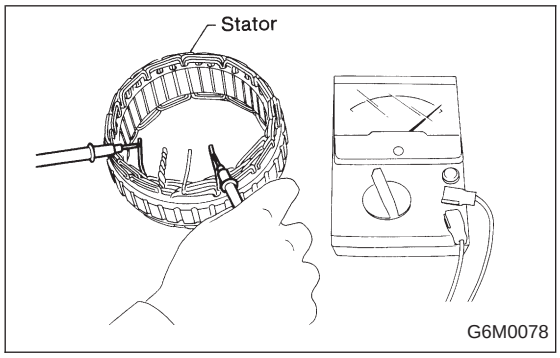
4) Insulation test
Check continuity between slip ring and rotor core or shaft. If continuity exists, the rotor coil is short-circuited, and so replace rotor assembly.


G6M0077

5) Ball bearing (rear side)

(1) Check rear ball bearing. Replace if it is noisy or if rotor does not turn smoothly.

(2) The rear bearing can be removed by using common bearing puller.

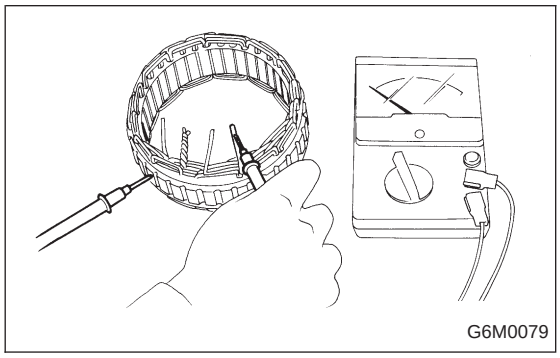


G6M0078

3. STATOR

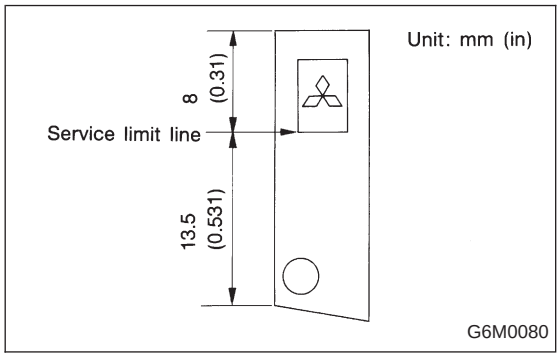
1) Continuity test

Inspect stator coil for continuity between each end of the lead wires. If there is no continuity between individual lead wires, the lead wire is broken, and so replace stator assembly.


G6M0079

2) Insulation test

Inspect stator coil for continuity between stator core and each end of the lead wire. If there is continuity, the stator coil is short-circuited, and so replace stator assembly.



G6M0080

4. BRUSH

1) Measure the length of each brush. If wear exceeds the service limit, replace the brush. Each brush has the service limit mark on it.

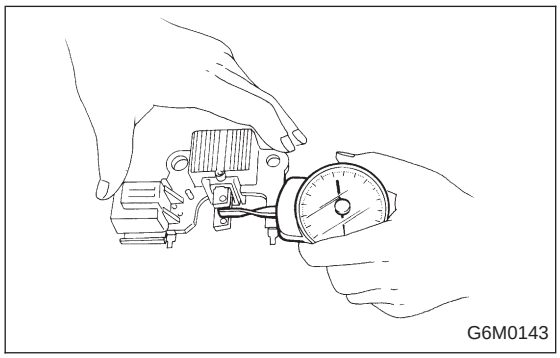
Brush length:

Standard

21.5 mm (0.846 in)

Service limit

8.0 mm (0.315 in)

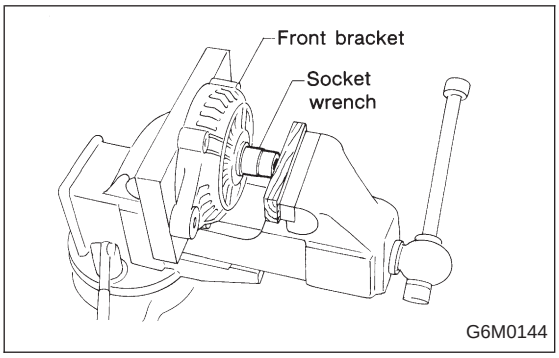

G6M0143

2) Checking brush spring for proper pressure

Using a spring pressure indicator, push the brush into the brush holder until its tip protrudes 2 mm (0.08 in). Then measure the pressure of the brush spring. If the pressure is less than 3.236 N (330 g, 11.64 oz), replace the brush spring with a new one. The new spring must have a pressure of 5.786 to 6.963 N (590 to 710 g, 20.81 to 25.04 oz).

5. BEARING (FRONT SIDE)

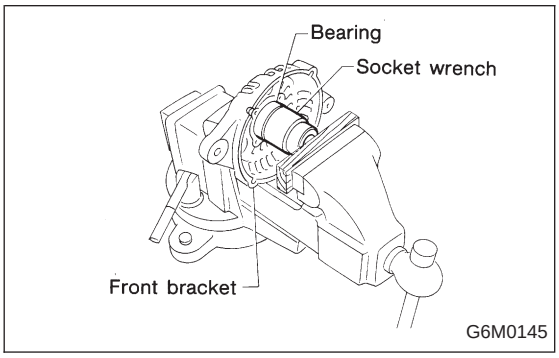
1) Check front ball bearing. If resistance is felt while rotating, or if abnormal noise is heard, replace the ball bearing.



2) Replacing front bearing

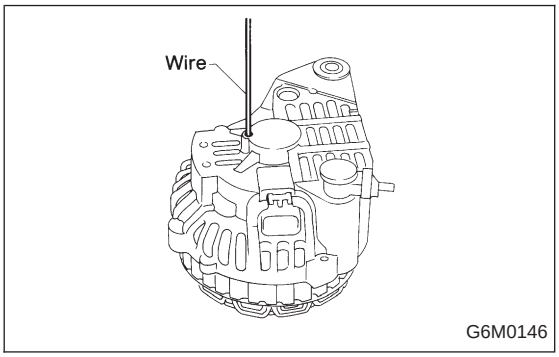
(1) Remove front bearing retainer.

(2) Closely install a fit tool on the bearing inner race. Press the bearing down out of front bracket with a hand press or vise. A socket wrench can serve as the tool.



(3) Set a new bearing and closely install a fit tool on the bearing outer race. Press the bearing down into place with a hand press or vise. A socket wrench can serve as the tool.

(4) Install front bearing retainer.



D: ASSEMBLY

To assemble, reverse order of disassembly.

1) Pulling up brush

Before assembling, press the brush down into the brush holder with your finger and secure in that position by passing a [2 mm (0.08 in) dia. length 4 to 5 cm (1.6 to 2.0 in)] wire through the hole shown in the figure.

CAUTION:
Be sure to remove the wire after reassembly.

2) Heat the rear bracket [50 to 60°C (122 to 140°F)] and press the rear bearing into the rear bracket. Then lubricate the rear bracket.

3) After reassembly, turn the pulley by hand to check that the rotor turns smoothly.

3. Spark Plug

A: REMOVAL AND INSTALLATION

CAUTION:
All spark plugs installed on an engine, must be of the same heat range.

Spark plug:
- ***1800 cc model***

NGK: BKR6E-11
CHAMPION: RC8YC4
- ***2200 cc model***

CHAMPION: R10YC4
(Alternate)
NGK: BKR6E-11
NIPPONDENSO: K20PR-U11

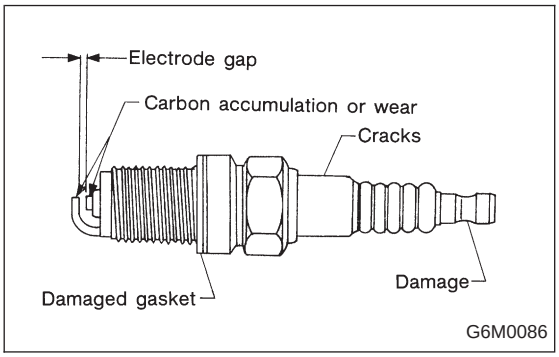
1) Remove spark plug cords by pulling boot, not cord itself.
2) Remove spark plugs.
3) When installing spark plugs on cylinder head, use spark plug wrench.

Tightening torque (Spark plug):
21±3 N·m (2.1±0.3 kg-m, 15.2±2.2 ft-lb)

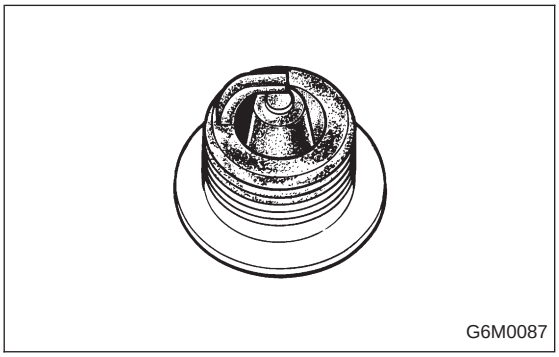
CAUTION:
The above torque should be only applied to new spark plugs without oil on their threads.
In case their threads are lubricated, the torque should be reduced by approximately 1/3 of the specified torque in order to avoid their over-stressing.

4) Connect spark plug cords.

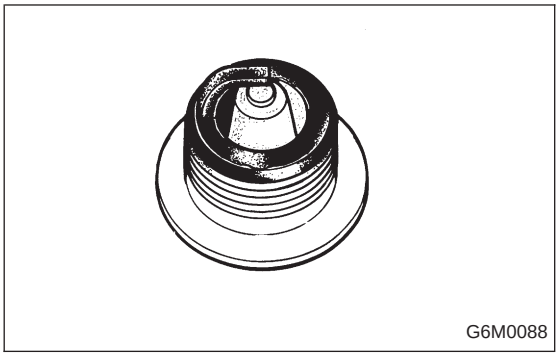
B: INSPECTION



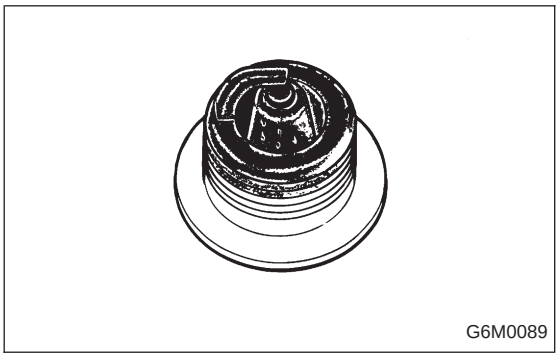
Check electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion.



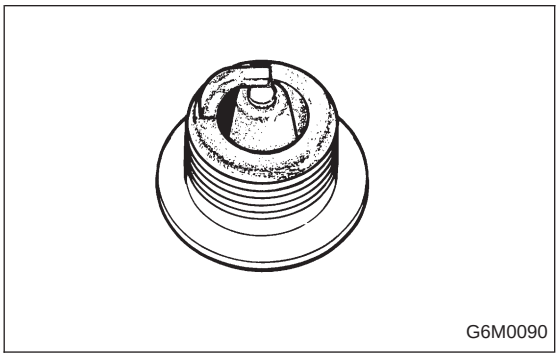
1) Normal
Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.


G6M0088

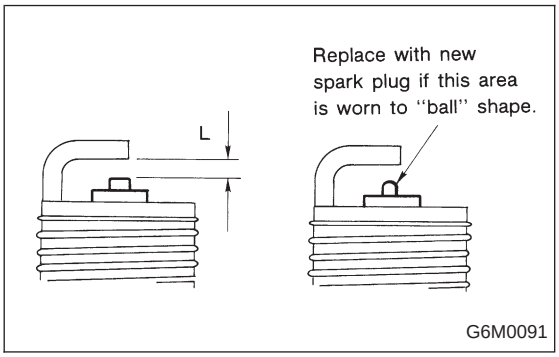
2) Carbon fouled
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.
It is advisable to replace with plugs having hotter heat range.


G6M0089

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 same condition remains after repair, use a hotter plug.


G6M0090

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.

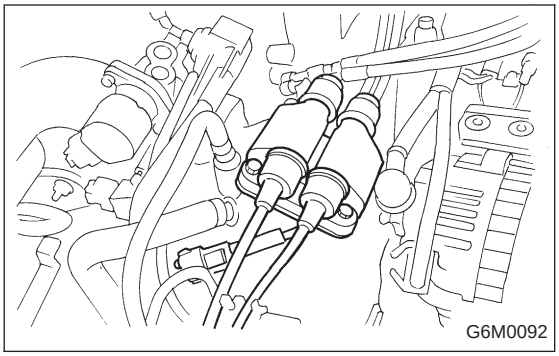


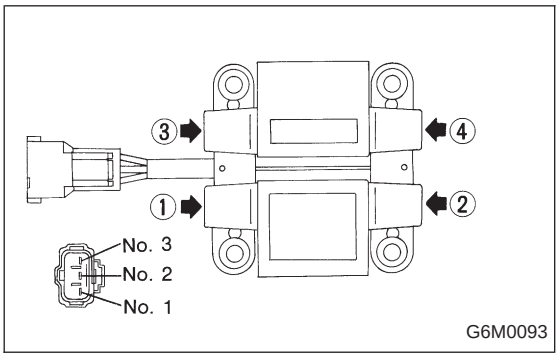
G6M0091

C: CLEANING AND REGAPPING

Clean spark plugs in a sand blast type cleaner.
Avoid excessive blasting. Clean and remove carbon or oxide deposits, but do not wear away porcelain.
If deposits are too stubborn, discard plugs.
After cleaning spark plugs, recondition firing surface of electrodes with file. Then correct the spark plug gap using a gap gauge.

Spark plug gap: L
1.0 — 1.1 mm (0.039 — 0.043 in)


G6M0092



G6M0093

4. Ignition Coil

A: REMOVAL AND INSTALLATION

1) Disconnect battery ground cable.
2) Disconnect connector from ignition coil.
3) Remove ignition coil.
4) Installation is in the reverse order of removal.

CAUTION:
Be sure to connect wires to their proper positions. Failure to do so will damage unit.

B: INSPECTION

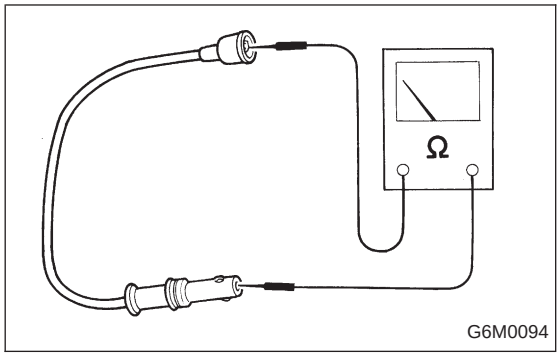
Using accurate tester, inspect the following items, and replace if defective.
1) Primary resistance
2) Secondary coil resistance

CAUTION:
If the resistance is extremely low, this indicates the presence of a short-circuit.

Specified resistance:

- ***1800 cc model***
  [Primary side]
  Between ① and ②
  Between ③ and ④
  MT model 0.62 — 0.76 Ω
  AT model 0.63 — 0.77 Ω
  [Secondary side]
  Between terminal No. 1 and No. 2
  Between terminal No. 2 and No. 3
  MT model 17.9 — 24.5 kΩ
  AT model 10.4 — 15.6 kΩ
- ***2200 cc model***
  [Primary side]
  Between ① and ②
  Between ③ and ④
  0.69 Ω±10%
  [Secondary side]
  Between terminal No. 1 and No. 2
  Between terminal No. 2 and No. 3
  21.0 kΩ±15%

3) Insulation between primary terminal and case: 10 MΩ or more.



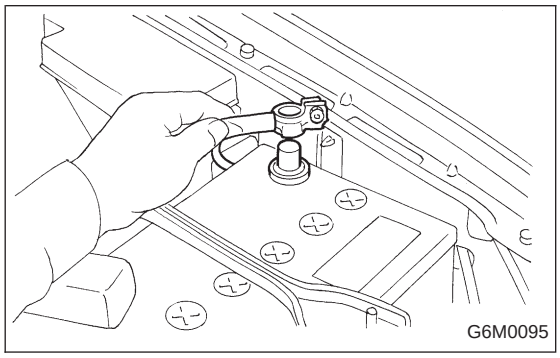
5. Spark Plug Cord

A: INSPECTION

Check for:
1) Damage to cords, deformation, burning or rust formation of terminals.
2) Resistance values of cords.

Resistance value:

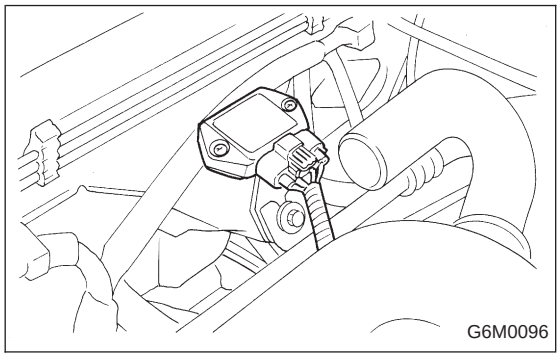
- ***1800 cc model***
  #1 and #3 cords 4.95 — 11.56 kΩ
  #2 cord 4.86 — 11.33 kΩ
  #4 cord 5.24 — 12.23 kΩ
- ***2200 cc model***
  5.12 — 12.34 kΩ



6. Ignitor

A: REMOVAL AND INSTALLATION

1) Disconnect battery ground cable.

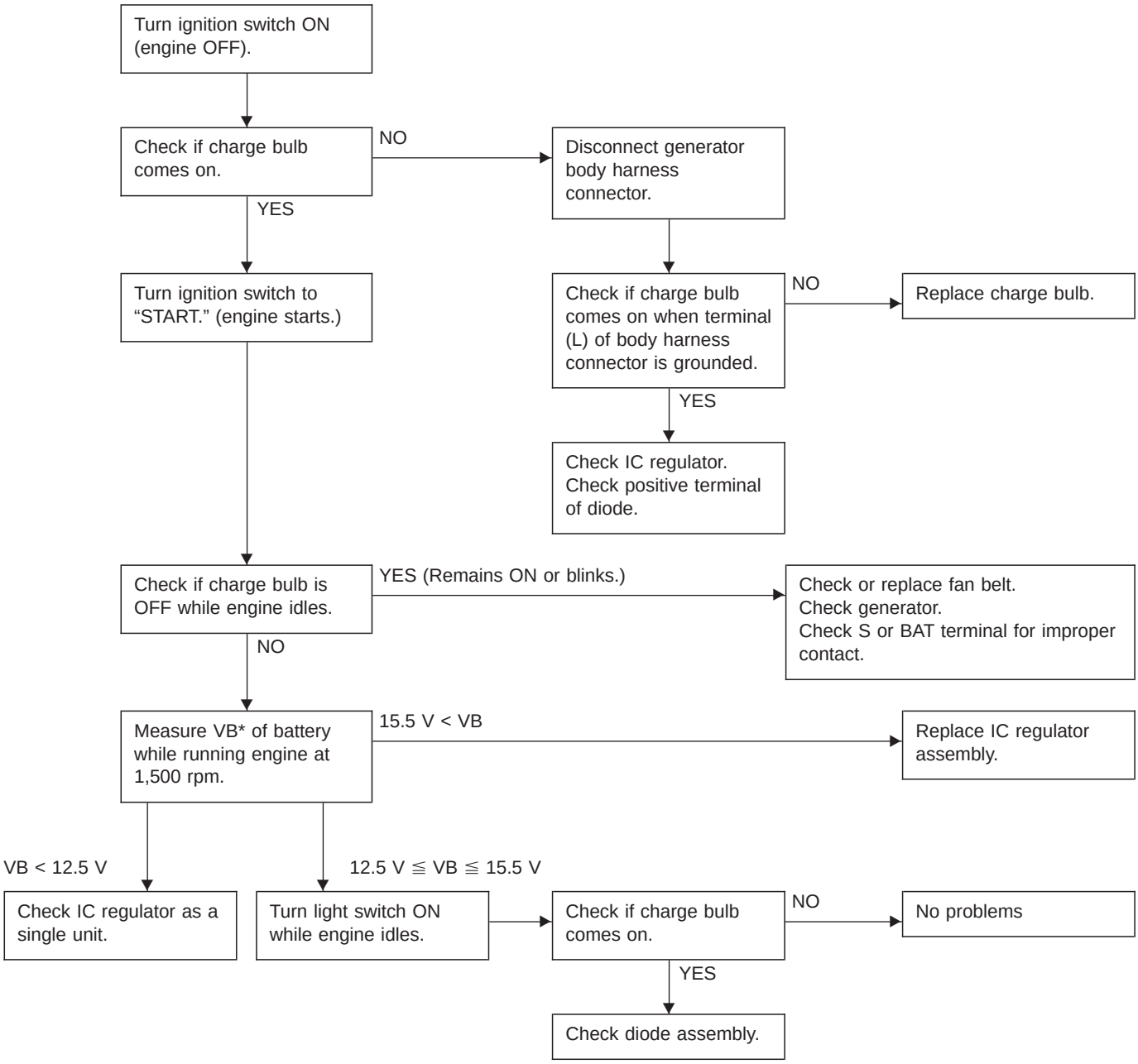


2) Disconnect connector from ignitor.
3) Remove screws which hold ignitor onto body.
4) Installation is in the reverse order of removal.

1. Starter

Trouble		Probable cause
Starter does not start.	Magnet switch does not operate. (no clicks are heard.)	Magnet switch poor contact or discontinuity of pull-in coil circuit
		Improper sliding of magnet switch plunger
	Magnet switch operates. (clicks are issued.)	Poor contact of magnet switch's main contact point
		Layer short of armature
		Contaminants on armature commutator
		High armature mica
		Improper grounding of yoke field coil
		Insufficient carbon brush length
		Insufficient brush spring pressure
Starter starts but does not crank engine.	Failure of pinion gear to engage ring gear	Worn pinion teeth
		Improper sliding of overrunning clutch
		Improper adjustment of stud bolt
	Clutch slippage	Faulty clutch roller spring
Starter starts but engine cranks too slowly.		Poor contact of magnet switch's main contact point
		Layer short of armature
		Discontinuity, burning or wear of armature commutator
		Poor grounding of yoke field coil
		Insufficient brush length
		Insufficient brush spring pressure
		Abnormal brush wear
Starter overruns.		Magnet switch coil is a layer short.

2. Generator



*: Terminal voltage

BODY ELECTRICAL SYSTEM 6-2

PRECAUTION FOR SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

The Supplemental Restraint System "Airbag" helps to reduce the risk or severity of injury to the driver in a frontal collision.

The Supplemental Restraint System consists of an airbag module (located in the center of the steering wheel), sensors, a control module, warning light, wiring harness and roll connector.

Information necessary to service the safety is included in the "5-5. SUPPLEMENTAL RESTRAINT SYSTEM" of this Service Manual.

WARNING:

- **To avoid rendering the Airbag system inoperative, which could lead to personal injury or death in the event of a severe frontal collision, all maintenance must be performed by an authorized SUBARU dealer.**
- **Improper maintenance, including incorrect removal and installation of the Airbag system, can lead to personal injury caused by unintentional activation of the Airbag system.**
- **All Airbag system electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the Supplemental Restraint System "Airbag".**

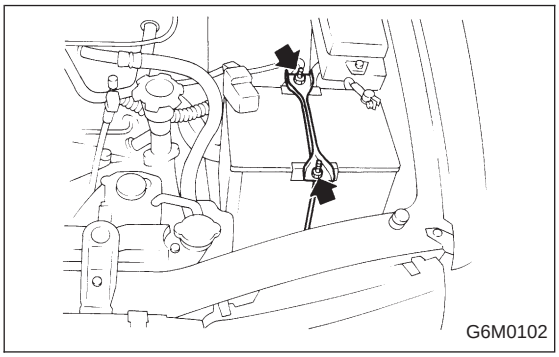
1. Body Electrical

Battery	Type		MT model: 55D23L (MF) AT model: 75D23L (MF)
	Capacity	Reverse capacity	MT model: 100 minutes AT model: 120 minutes
		Cold cranking ampere	MT model: 430 amperes AT model: 520 amperes
Combination meter	Speedometer		Eddy current type
	Temperature gauge		Thermistor cross coil type
	Fuel gauge		Resistance cross coil type
	Tachometer		Electric impulse type
	Turn signal indicator light		12 V — 1.4 W
	Charge indicator light		12 V — 1.4 W
	Oil pressure indicator light		12 V — 1.4 W
	A.B.S. warning light		12 V — 1.4 W
	CHECK ENGINE warning light		12 V — 1.4 W
	HI-beam indicator light		12 V — 3.4 W
	Door open warning light		12 V — 1.4 W
	Seat belt warning light		12 V — 1.4 W
	Brake fluid and parking brake warning light		12 V — 3.4 W
	FWD warning light		12 V — 1.4 W
	AIRBAG warning light		12 V — 1.4 W
	Meter illumination light		12 V — 3.4 W
	AT OIL TEMP. warning light		12 V — 1.4 W
Headlight			12 V — 60/55 W (Halogen)
Front turn signal light			12 V — 27 W
Side turn light			12 V — 3.8 W
Side marker/Parking light			12 V — 3.8 W
Rear combination light		Tail/Stop light	12 V — 8/27 W
		Turn signal light	12 V — 27 W
		Back-up light	12 V — 27 W
License plate light			12 V — 3.8 W
High-mount stop light			Sedan: 12 V — 18 W Wagon: 12 V — 13 W
Room light			12 V — 8 W
Spot light			12 V — 8 W
Trunk room light			12 V — 5 W
Luggage room light			12 V — 5 W
Selector lever illumination light			12 V — 1.7 W

1. Precaution

● Before disassembling or reassembling parts, always disconnect battery ground cable. When repairing radio, control units, etc. which are provided with memory functions, record memory contents before disconnecting battery ground cable. Otherwise, these contents are cancelled upon disconnection.
● Reassemble parts in reverse order of disassembly procedure unless otherwise indicated.
● Adjust parts to specifications contained in this manual if so designated.
● Connect connectors and hoses securely during reassembly.
● After reassembly, ensure functional parts operate smoothly.

CAUTION:
● Airbag system wiring harness is routed near the electrical parts and switch.
● All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
● Be careful not to damage Airbag system wiring harness when servicing the ignition key cylinder.


G6M0102

2. Battery

A: REMOVAL AND INSTALLATION

1) Disconnect the positive (+) terminal after disconnecting the negative (−) terminal of battery.
2) Remove flange nuts from battery rods and take off battery holder.
3) Remove battery.

Tightening torque:
2.5 — 4.4 N·m (25 — 45 kg-cm, 22 — 39 in-lb)

NOTE:
● Clean battery cable terminals and apply grease to retard the formation of corrosion.
● Connect the positive (+) terminal of battery and then the negative (−) terminal of the battery.

B: INSPECTION

1. BATTERY

1) External parts

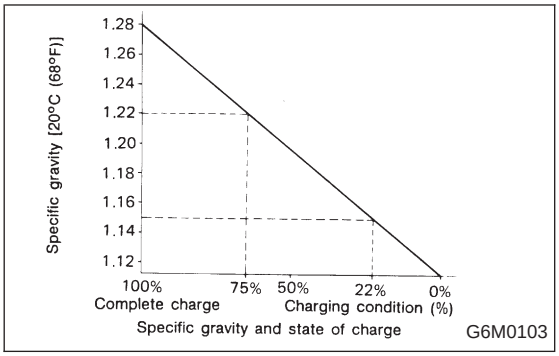
Check for the existence of dirt or cracks on the battery case, top cover, vent plugs, and terminal posts. If necessary, clean with water and wipe with a dry cloth.
Apply a thin coat of grease on the terminal posts to prevent corrosion.

2) Electrolyte level

Check the electrolyte level in each cell. If the level is below MIN LEVEL, bring the level to MAX LEVEL by pouring distilled water into the battery cell. Do not fill beyond MAX LEVEL.

WARNING:

- **Electrolyte has toxicity; be careful handling the fluid.**
- **Avoid contact with skin, eyes or clothing. Especially at contact with eyes, blush with water for 15 minutes and get prompt medical attention.**
- **Batteries produce explosive gasses. Keep sparks, flame, cigarettes away.**
- **Ventilate when charging or using in enclosed space.**
- **For safety, in case an explosion does occur, wear eye protection or shield your eyes when working near any battery. Never lean over a battery.**
- **Do not let battery fluid contact eyes, skin, fabrics, or paint-work because battery fluid is corrosive acid.**
- **To lessen the risk of sparks, remove rings, metal watch-bands, and other metal jewelry. Never allow metal tools to contact the positive battery terminal and anything connected to it WHILE you are at the same time in contact with any other metallic portion of the vehicle because a short circuit will be caused.**



3) Specific gravity of electrolyte
Measure specific gravity of electrolyte using a hydrometer and a thermometer.
Specific gravity varies with temperature of electrolyte so that it must be corrected at 20°C (68°F) using the following Equation:

S_{20} = St + 0.0007 x (t − 20)

S_{20}:Specific gravity corrected at electrolyte temperature of 20°C
St :Measured specific gravity
t :Measured temperature (°C)

Determine whether or not battery must be charged, according to corrected specific gravity.
Standard specific gravity: 1.220 — 1.290 [at 20°C (68°F)]

Measuring the specific gravity of the electrolyte in the battery will disclose the state of charge of the battery. The relation between the specific gravity and the state of charge is as shown in figure.

C: CHARGING

WARNING:
● Do not bring an open flame close to the battery at this time.

CAUTION:
● Prior to charging, corroded terminals should be cleaned with a brush and common baking soda solution.
● Be careful since battery electrolyte overflows while charging the battery.
● Observe instructions when handling battery charger.
● Before charging the battery on vehicle, disconnect battery ground terminal. Failure to follow this rule may damage alternator's diodes or other electrical units.

1. NORMAL CHARGING

Charge the battery at current value specified by manufacturer or at approximately 1/10 of battery's ampere-hour rating.

2. QUICK CHARGING

Quick charging is a method in which the battery is charged in a short period of time with a relatively large current by using a quick charger.
Since a large current flow raises electrolyte temperature, the battery is subject to damage if the large current is used for prolonged time. For this reason, the quick charging must be carried out within a current range that will not increase the electrolyte temperature above 40°C (104°F).
It should be also remembered that the quick charging is a temporary means to bring battery voltage up to a fair value and, as a rule, a battery should be charged slowly with a low current.

CAUTION:
- **Observe the items in 1. NORMAL CHARGING.**
- **Never use more than 10 amperes when charging the battery because that will shorten battery life.**

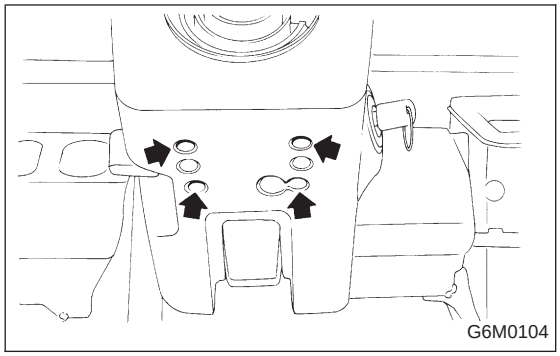
3. JUDGMENT OF BATTERY IN CHARGED CONDITION

1) Specific gravity of electrolyte is held at a specific value in a range from 1.250 to 1.290 for more than one hour.
2) Voltage per battery cell is held at a specific value in a range from 2.5 to 2.8 volts for more than one hour.

4. CHECK HYDROMETER FOR STATE OF CHARGE

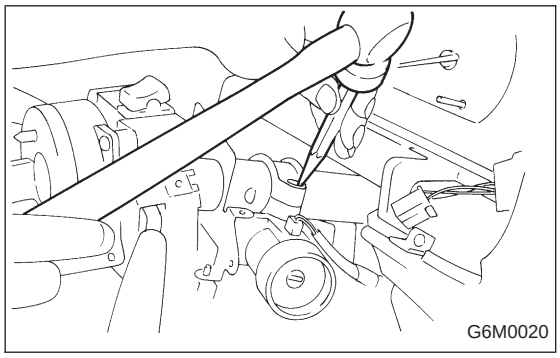
Hydrometer indicator	State of charge	Required action
Green dot	Above 65%	Load test
Dark dot	Below 65%	Charge battery
Clear dot	Low electrolyte	Replace battery* (If cranking complaint)

*: Check electrical system before replacement.

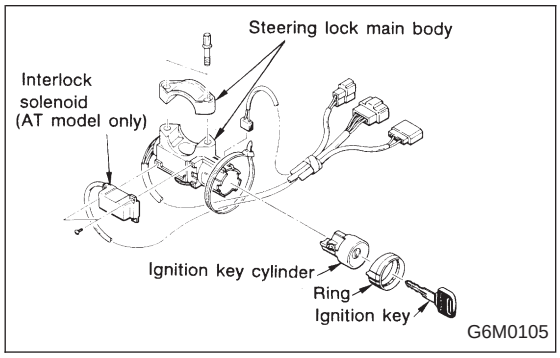

G6M0104

3. Ignition Key Switch

1) Remove screws, separate upper column cover and lower column cover.
2) Remove knee protector.
3) Remove meter visor.

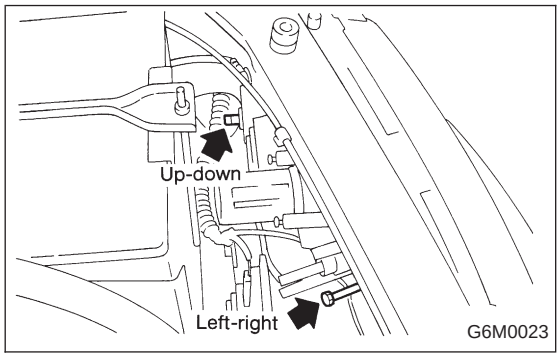

G6M0020

4) Disconnect ignition switch connector from body harness.
5) Using a drift and hammer, hit the torn bolt head to loosen and remove the ignition switch.



G6M0105

6) When installing, tighten the connecting bolt until its head twists off.



G6M0023

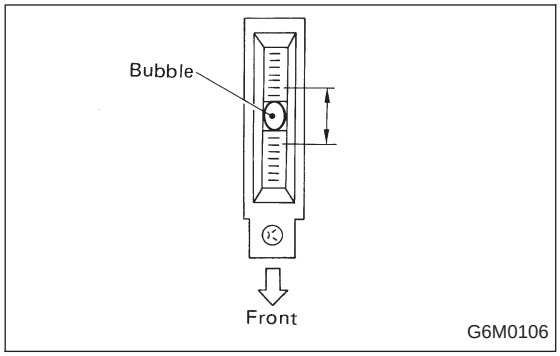
4. Lighting

A: ADJUSTMENT

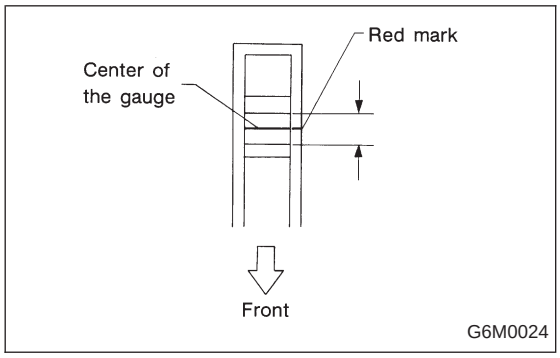
1. HEADLIGHT AIMING

Before checking the headlight aiming:
- Be sure that the area around the headlights has not sustained any accident damage or other type of deformation.
- Park the vehicle on level ground.
- Check the tires for correct inflation pressure.
- Make certain that the vehicle's gas tank is full and that someone is seated in the driver's seat.
- Bounce the vehicle several times to normalize the suspension.

NOTE:
- Adjust vertical aim first, then horizontal aim.
- If headlight location is slightly shifted due to body deformity, etc., repair surface to be mated with headlight. <Ref. to 5-1 [S400].>



1) Look at the beam angle gauge (vertical movement). The bubble on the gauge should not deviate from the center of the gauge.



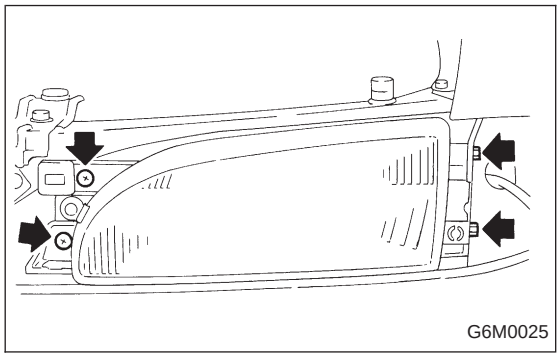
2) Look at the beam angle gauge (horizontal movement). The center mark (the red line on the inner scale) should not deviate from the red line on the outer case.

B: REMOVAL AND INSTALLATION

1. HEADLIGHT AND FRONT TURN SIGNAL LIGHT

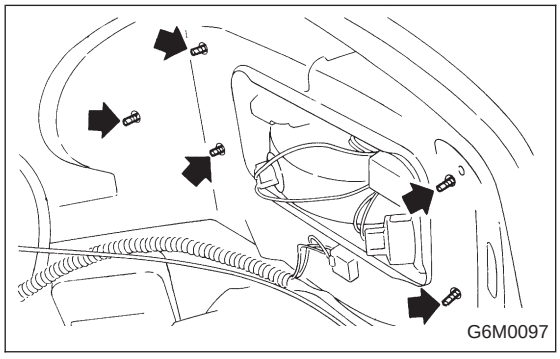
1) Remove front grille and disconnect connector from headlight.
2) Remove screws which secure front turn signal light.
3) Remove front turn signal light while disconnecting connector.

NOTE:
When installing, securely fit clip (on fender side) into locating (on front turn signal light side).



4) Remove screws and bolts which secure headlight and remove headlight.

Tightening torque:
6 — 7 N·m (0.6 — 0.7 kg-m, 4.3 — 5.1 ft-lb)



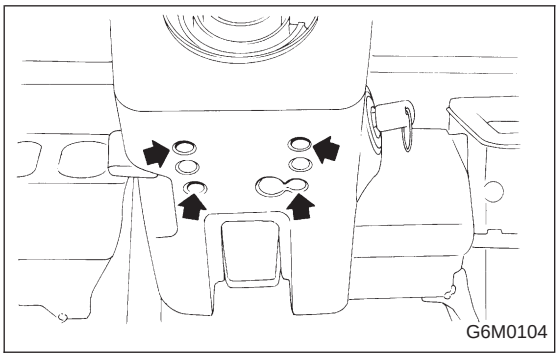
2. REAR COMBINATION LIGHT

1) Remove rear trim.
2) Remove nuts and disconnect connector.

Tightening torque:
6 — 7 N·m (0.6 — 0.7 kg-m, 4.3 — 5.1 ft-lb)

3) Attach adhesive cloth tape to body area around rear combination light.
4) Using a standard screwdriver, carefully pry rear combination light off and away from the front of vehicle.

CAUTION:
● Do not pry rear combination light forcefully as this may scratch vehicle body.
● Remove all traces of adhesive tape from body before installation.
● Attach butyl rubber tape to back of rear combination light before installing rear combination light on body for sealing purposes.


G6M0104

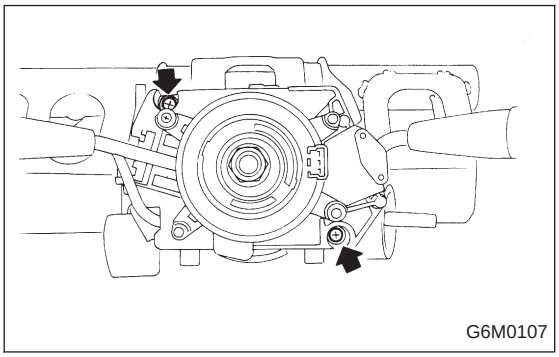
3. COMBINATION SWITCH (WITHOUT AIRBAG MODEL)

Refer to 5-5 [W5A0] as for removal of combination switch on airbag equipped model.

1) Remove steering wheel.
2) Remove screws which secure upper column cover to lower column cover.
3) Remove screws which secure knee protector and remove knee protector.

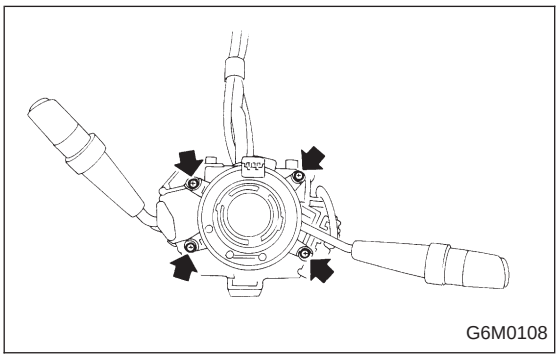
CAUTION:
When installing knee protector, ensure that harness is not caught by adjacent parts.

4) Disconnect connector from body harness and undo holddown band.


G6M0107

5) Remove screws which secure switch and remove switch.

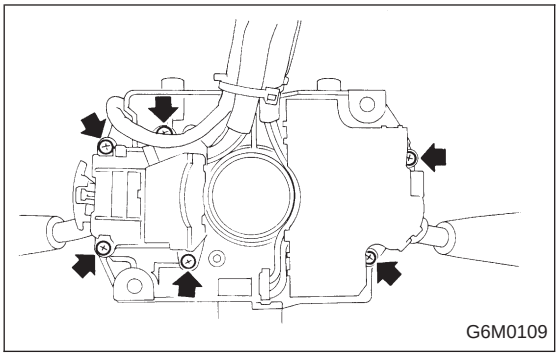
CAUTION:
During installation (with key interlock)
● When routing combination switch harness around steering system, do not place it over key interlock release knob.
● After installing lower column cover, ensure that key interlock release knob is accessible.


G6M0108

C: DISASSEMBLY AND ASSEMBLY

1. COMBINATION SWITCH

1) Remove screws which secure slip ring to combination switch, and remove slip ring.


G6M0109

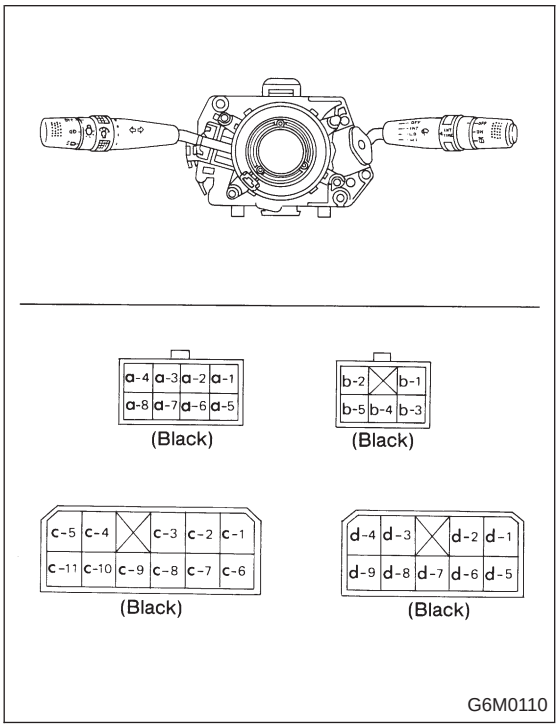
2) Remove screws which secure lighting switch, wiper and washer switch. Remove both switches.

Assembly is in the reverse order of disassembly.

D: INSPECTION

1. COMBINATION SWITCH (ON-CAR)

1) Remove instrument panel lower cover.
2) Remove lower column cover.



G6M0110

3) Unfasten holddown clip which secures harness, and disconnect connectors from body harness.

Move combination switch to respective positions and check continuity between terminals as indicated in the following tables.

LIGHTING SWITCH

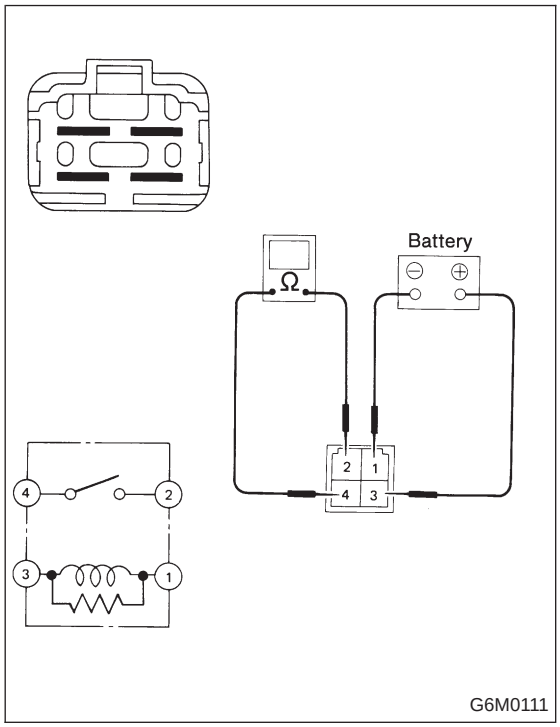
Terminal (Wire color) / Switch position	c-1 (W)	c-2 (W)	c-3 (R)
OFF			
Tail	○	○	
Head	○	○	○

PARKING SWITCH

Terminal (Wire color) / Switch position	c-10 (R)	c-11 (RG)	c-9 (RW)
OFF	○	○	
ON		○	○

DIMMER AND PASSING SWITCH

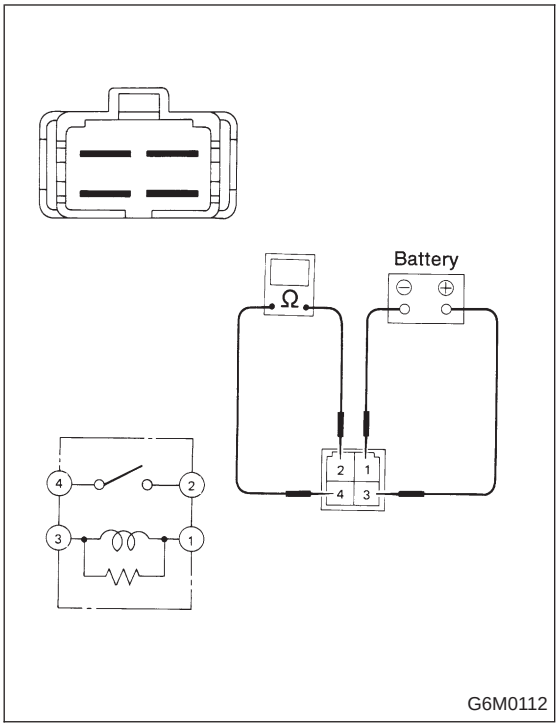
Terminal (Wire color) / Switch position	a-3 (B)	a-2 (RB)	a-1 (RY)	a-4 (YR)
Flash	○		○	○
Low beam	○	○		
HI-beam	○		○	



2. HEADLIGHT RELAY

Check continuity between terminals (indicated in table below) when terminal (3) is connected to battery and terminal (1) is grounded.

When current flows.	Between terminals (2) and (4)	Continuity exists.
When current does not flow.	Between terminals (2) and (4)	Continuity does not exist.
	Between terminals (1) and (3)	Continuity exists.

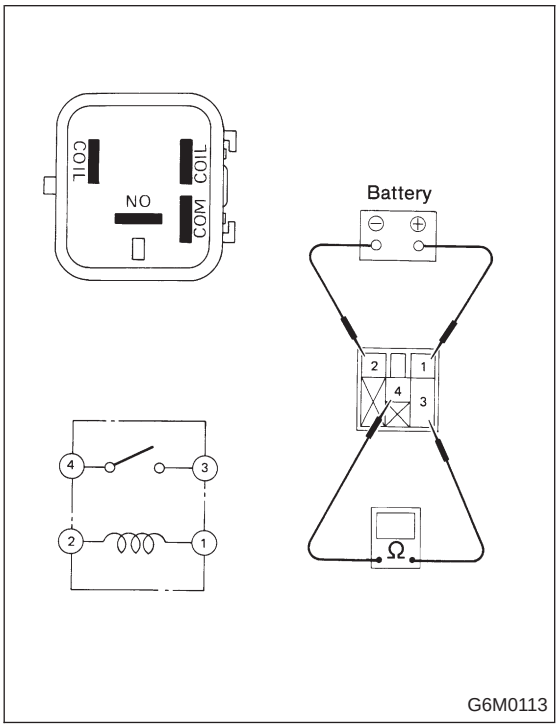


G6M0112

3. TAIL AND ILLUMINATION RELAY

Check continuity between terminals (indicated in table below) when terminal (3) is connected to battery and terminal (1) is grounded.

When current flows.	Between terminals (2) and (4)	Continuity exists.
When current does not flow.	Between terminals (2) and (4)	Continuity does not exist.
	Between terminals (1) and (3)	Continuity exists.

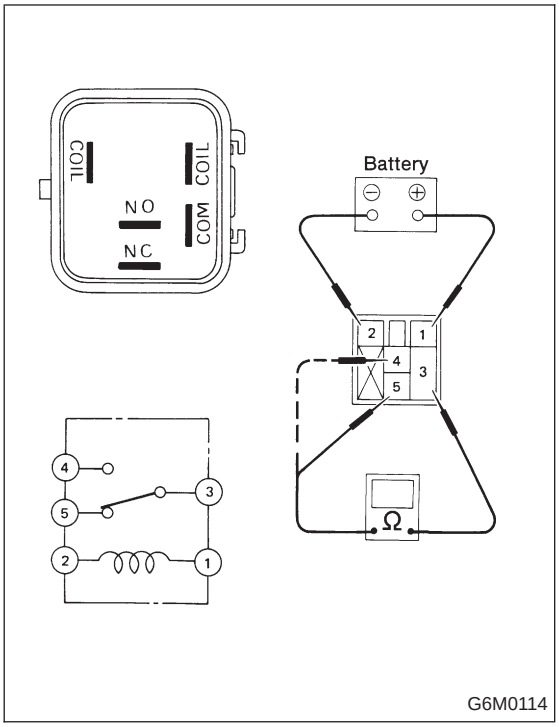


G6M0113

4. DAYTIME RUNNING LIGHT RELAY

Check continuity between terminals (indicated in table below) when terminal (1) is connected to battery and terminal (2) is grounded.

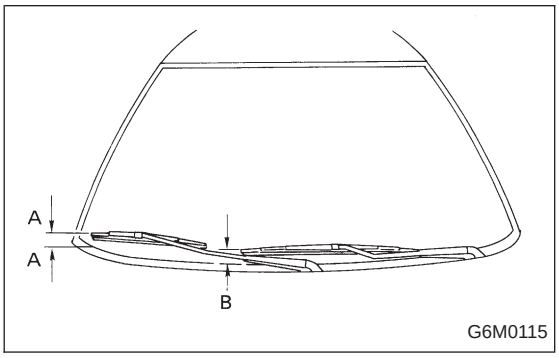
When current flows.	Between terminals (3) and (4)	Continuity exists.
When current does not flow.	Between terminals (3) and (4)	Continuity does not exist.
	Between terminals (1) and (2)	Continuity exists.



G6M0114

Check continuity between terminals (indicated in table below) when terminal (1) is connected to battery and terminal (2) is grounded.

When current flows.	Between terminals (3) and (5)	Continuity does not exist.
	Between terminals (3) and (4)	Continuity exists.
When current does not flow.	Between terminals (3) and (5)	Continuity exists.
	Between terminals (3) and (4)	Continuity does not exist.
	Between terminals (1) and (2)	Continuity exists.



G6M0115

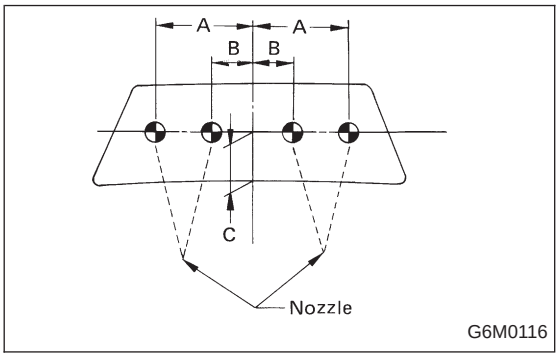
5. Front Wiper and Washer

A: ON-CAR SERVICES

1. ADJUSTMENT

1) When wiper switch is in “OFF” position, adjust blades in original position as shown in figure by changing wiper arm installation.

Original position:
A: 15 — 30 mm (0.59 — 1.18 in)
B: 25 — 40 mm (0.98 — 1.57 in)



G6M0116

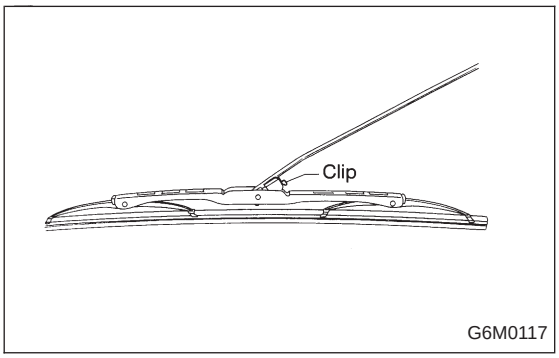
2) Adjust washer ejecting point on windshield glass as shown in figure when car stops.

Ejecting point:
A: 375 mm (14.76 in)
B: 150 mm (5.91 in)
C: 350 mm (13.78 in)

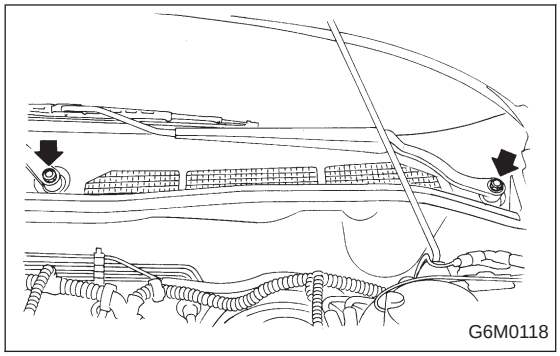
B: REMOVAL AND INSTALLATION

1. BLADE

Pull out blade from arm while pushing up clip.



G6M0117


G6M0118

2. WIPER ARM

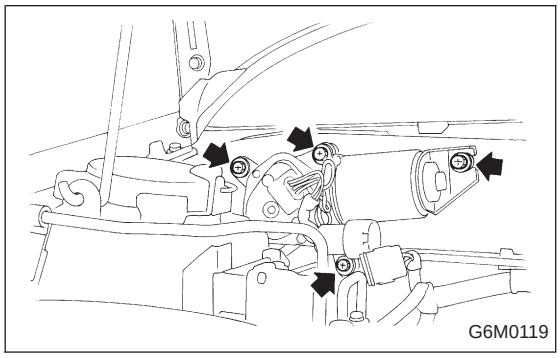
1) Open front hood.
2) Remove cap. Remove the nut which secure wiper arm, and remove wiper arm.

Tightening torque:
10 — 18 N·m (1.0 — 1.8 kg-m, 7 — 13 ft-lb)

3. WIPER MOTOR AND LINK

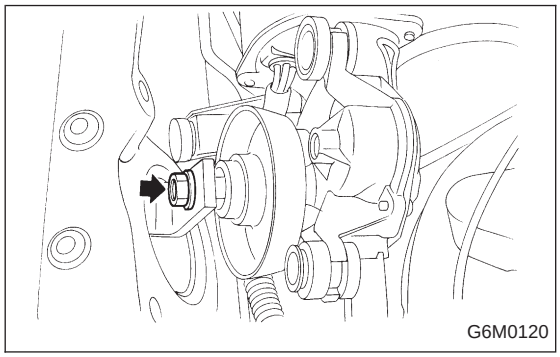
1) Detach weatherstrip and cowl net. <Ref. to 5-1.>

NOTE:
Apply silicone oil or soap water to both sides of cowl net to facilitate removal.


G6M0119

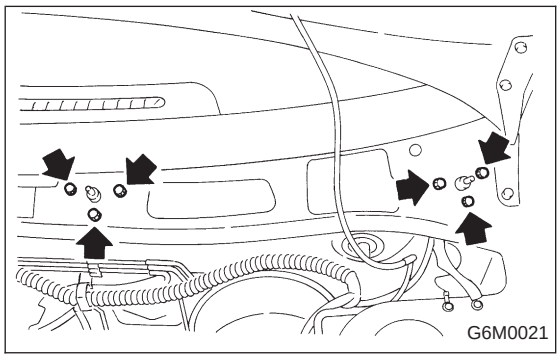
2) Disconnect electric connector, and remove motor attaching bolts.

Tightening torque:
4.4 — 7.4 N·m (0.45 — 0.75 kg-m, 3.3 — 5.4 ft-lb)


G6M0120

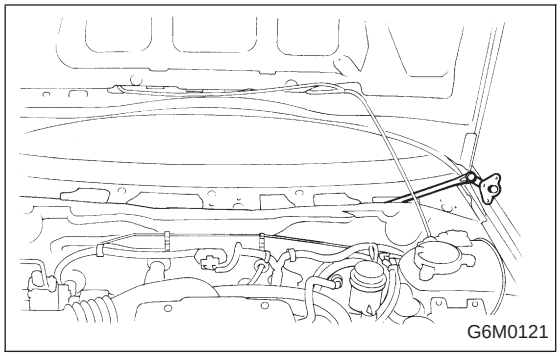
3) Remove nut securing motor link on the back side of motor.

Tightening torque:
12 — 18 N·m (1.2 — 1.8 kg-m, 9 — 13 ft-lb)

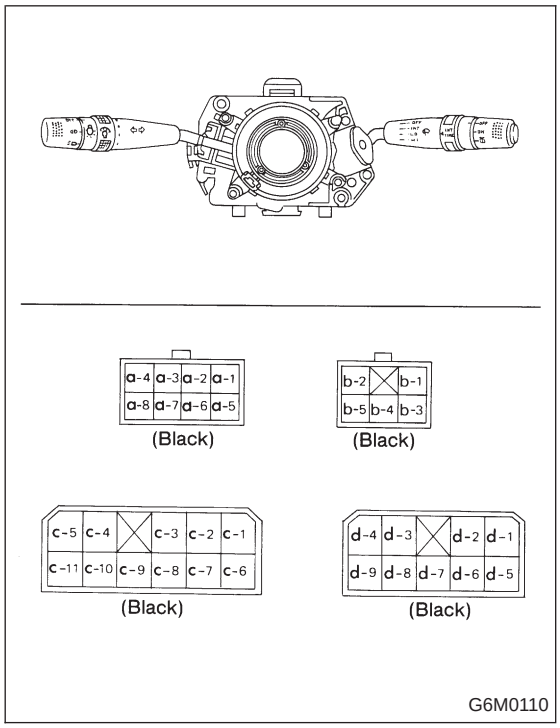

G6M0021

4) Remove nuts which secure sleeve unit.

Tightening torque:
4.4 — 7.4 N·m (0.45 — 0.75 kg-m, 3.3 — 5.4 ft-lb)


G6M0121

5) Remove wiper link from service hole in front panel.



G6M0110

C: INSPECTION

1. FRONT WIPER AND WASHER SWITCH

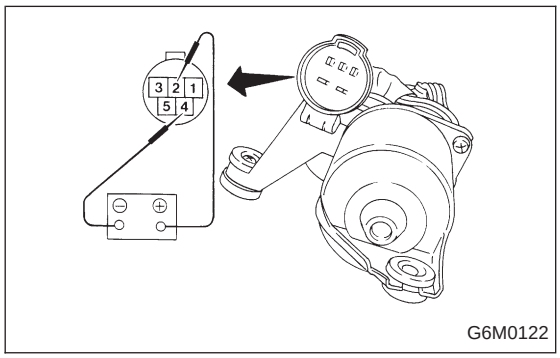
Set wiper switch to each position and check continuity between terminals (indicated in table below).

Wiper switch

Terminal (Wire color) / Switch position		d-9 (Y)	d-8 (L)	d-6 (LY)	d-7 (LW)	INT1	INT2
OFF	OFF	○	○				
		x		x			
	MIST		○	○			
INT	OFF	○	○			○	○
		x		x			
	MIST		○	○		○	○
		x		x			
LO	OFF		○	○			
	MIST		○	○			
HI	OFF			○	○		
	MIST		○	○	○		

Washer switch

Terminal (Wire color) / Switch position	d-5 (B)	d-2 (W)
OFF		
ON	○	○

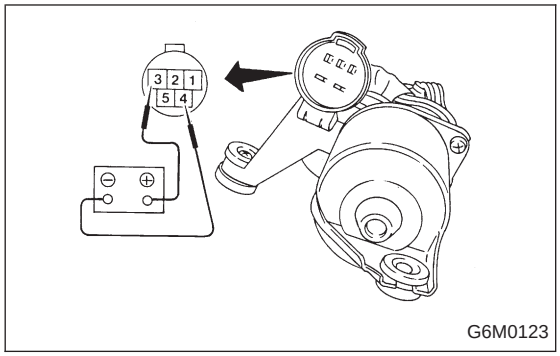


G6M0122

2. WIPER MOTOR

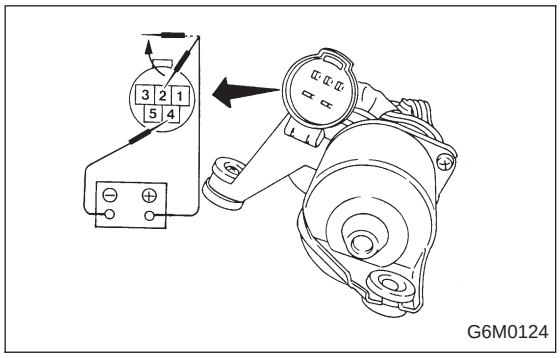
1) Check wiper motor operation at low speed.

Connect battery to wiper motor. Check wiper motor for proper operation at low speed.



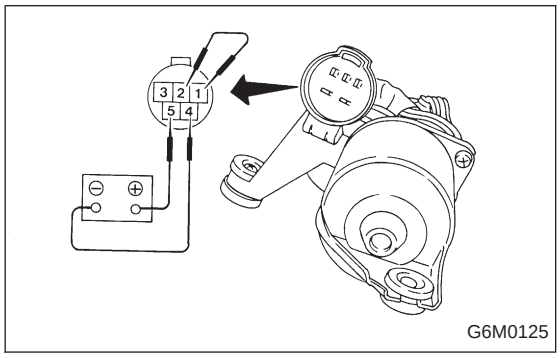
G6M0123

2) Check wiper motor operation at high speed.
Connect battery wiper motor. Check wiper motor for proper operation at high speed.



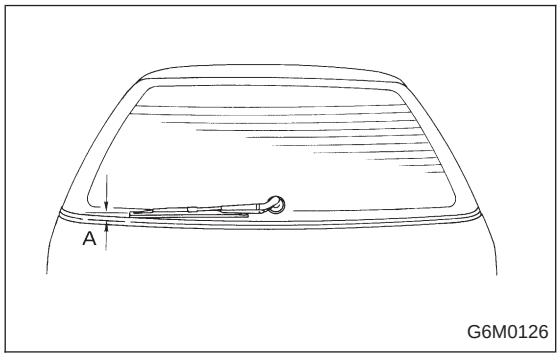
G6M0124

3) Check wiper motor for proper stoppage.
Connect battery to wiper motor. After operating wiper motor at low speed, disconnect battery to stop it.



G6M0125

Reconnect battery and ensure that wiper motor stops at “AUTO STOP” after operating at low speed.



G6M0126

6. Rear Wiper and Washer

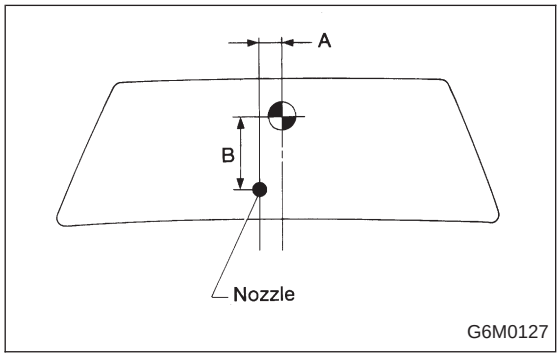
A: ON-CAR SERVICES

1. ADJUSTMENT

1) Adjust wiper blade in original position as shown in figure by changing wiper arm installation.

Original position:

A: 25 — 35 mm (0.98 — 1.38 in)



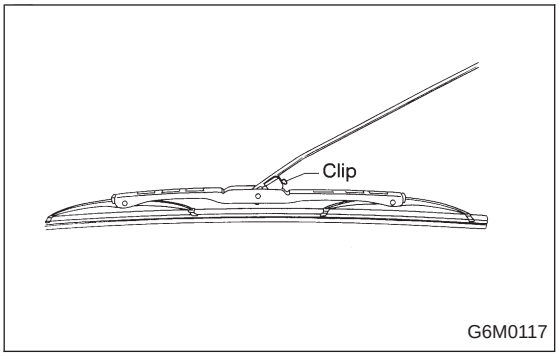
G6M0127

2) Adjust washer ejecting point on rear gate window as shown in figure when the car stops.

Ejecting point:

A: 25 mm (0.98 in)

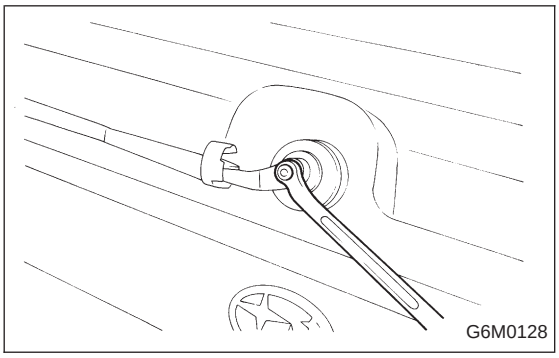
B: 200 — 300 mm (7.87 — 11.81 in)



B: REMOVAL AND INSTALLATION

1. BLADE

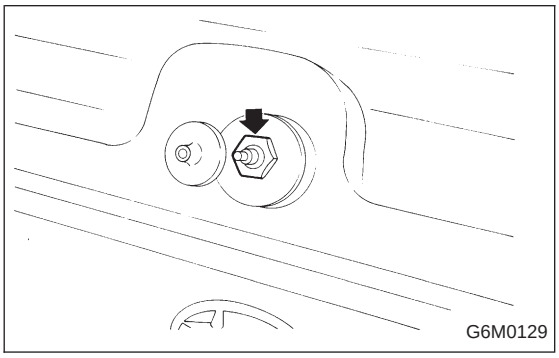
Pull out blade from arm while pushing up clip.



2. WIPER ARM

1) Remove head cover.
2) Remove nut and wiper arm.

Tightening torque:
4.4 — 7.4 N·m (0.45 — 0.75 kg-m, 3.3 — 5.4 ft-lb)



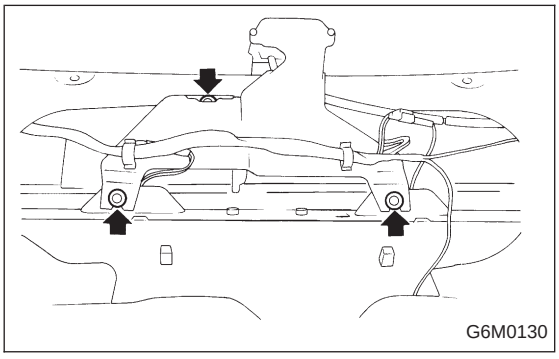
3. WIPER MOTOR

1) Remove cap and special nut.

CAUTION:
Be careful not to strike service tool against nozzle during removal.

Tightening torque:
6 — 9 N·m (0.6 — 0.9 kg-m, 4.3 — 6.5 ft-lb)

2) Remove rear gate trim. <Ref. to 5-2.>
3) Undo clips which secure harness, and disconnect connector.



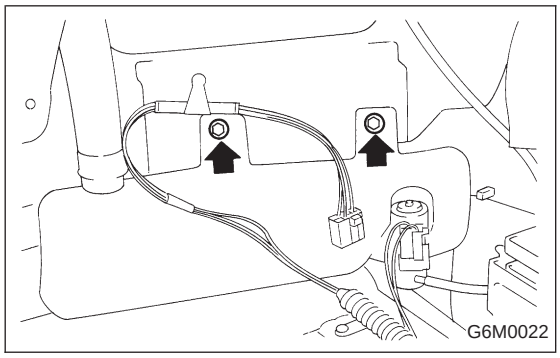
4) Separate washer hoses at joint.
5) Remove attaching screws and take out wiper motor assembly.

CAUTION:
Be careful not to damage O-ring when removing wiper motor assembly.

Tightening torque:
4.4 — 7.4 N·m (0.45 — 0.75 kg-m, 3.3 — 5.4 ft-lb)

4. WASHER TANK

1) Remove rear quarter trim. <Ref. to 5-2.>



2) Disconnect washer hose and connector.
3) Remove attaching bolts.

Tightening torque:
4.4 — 7.4 N·m (0.45 — 0.75 kg-m, 3.3 — 5.4 ft-lb)

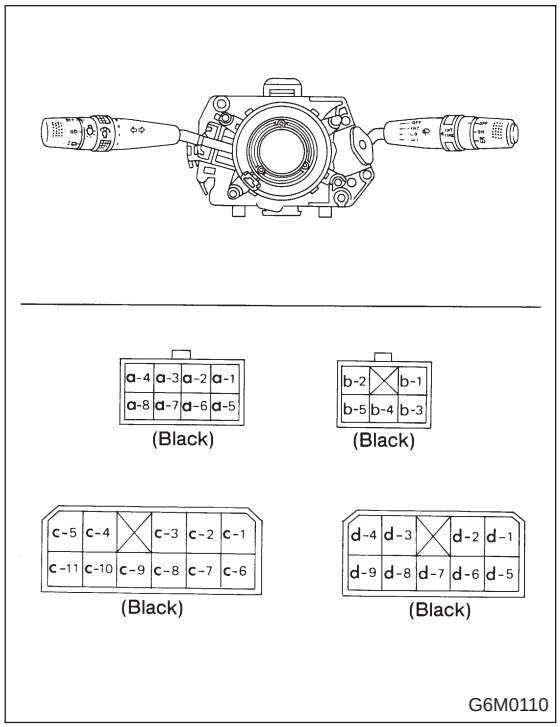
C: INSPECTION

1. REAR WIPER AND WASHER SWITCH

Set rear wiper and washer switch to each position and check continuity between terminals (indicated in table below).

WITHOUT INTERMITTENT REAR WIPER

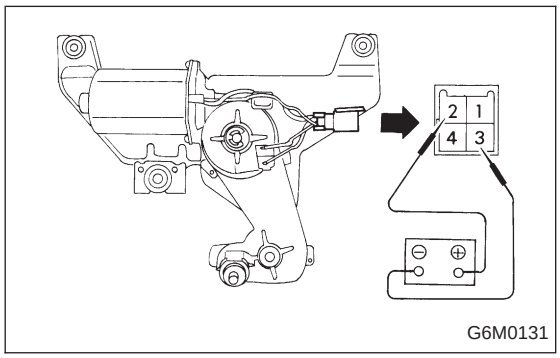
Terminal / Switch position	d-2	d-1		d-3
WASH	○	○		○
OFF				
ON	○			○
WASH	○	○		○

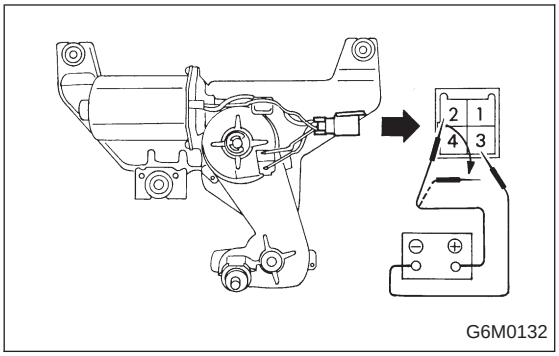


2. WIPER MOTOR

1) Operational check

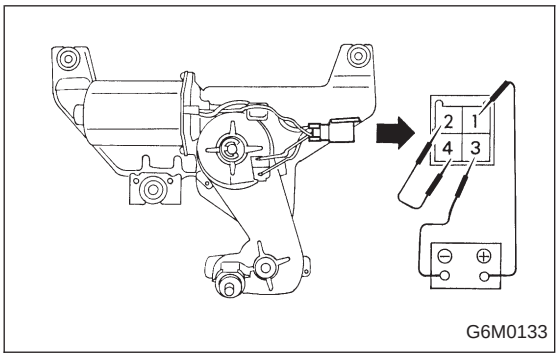
Connect battery to wiper motor and check operation of wiper motor.





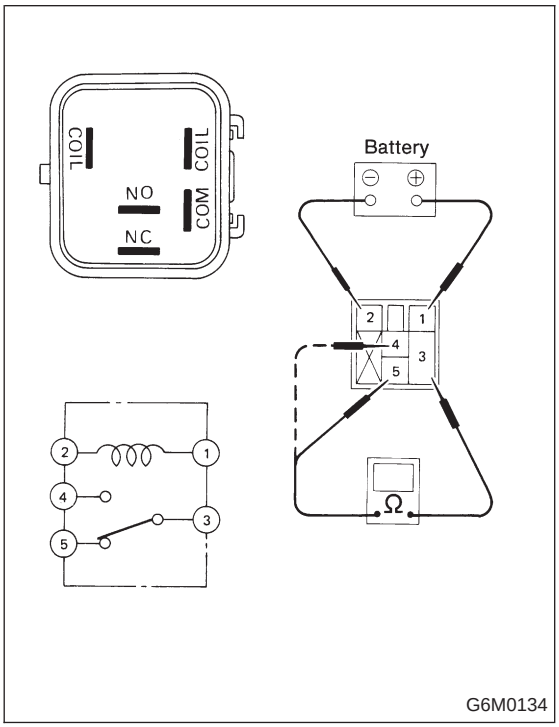
G6M0132

2) Check wiper motor for proper stoppage.
After operating wiper motor, disconnect battery from wiper motor.



G6M0133

3) Reconnect battery and ensure that wiper motor stops at "AUTO STOP" after it has been operated.

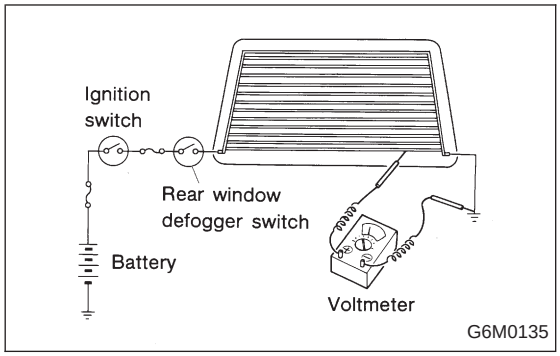


G6M0134

3. REAR WIPER RELAY

Connect battery to terminal (1) and ground terminal (2). Check continuity between terminals (indicated in table below).

When current flows.	Between terminals (3) and (5)	Continuity does not exist.
	Between terminals (3) and (4)	Continuity exists.
When current does not flow.	Between terminals (3) and (5)	Continuity exists.
	Between terminals (3) and (4)	Continuity does not exist.
	Between terminals (1) and (2)	Continuity exists.

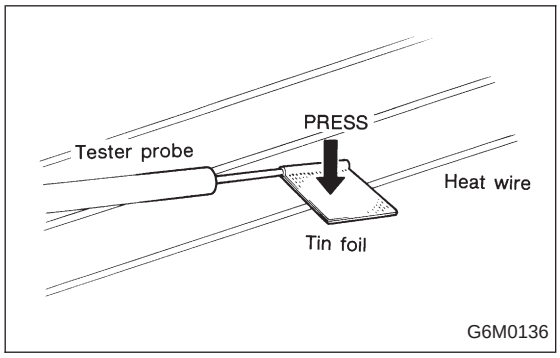


7. Rear Window Defogger

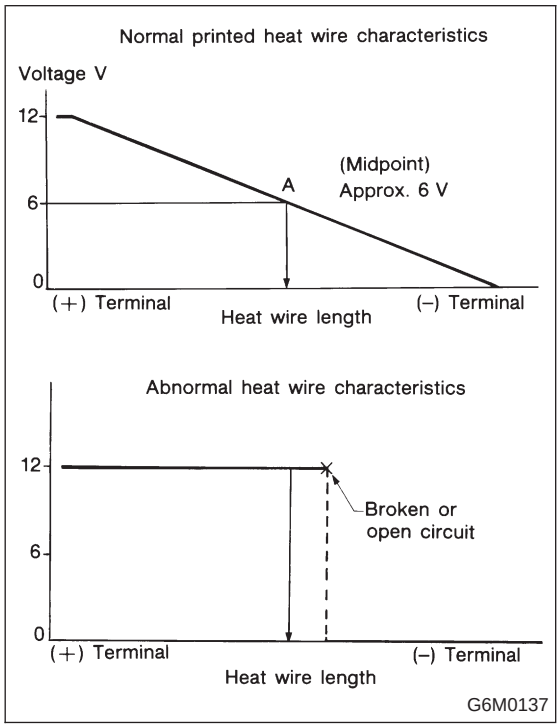
A: INSPECTION

1. HEAT WIRES

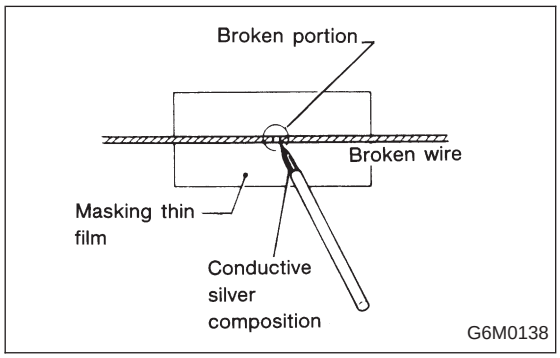
1) Start the engine so that battery is being charged.
2) Turn defogger switch ON.
3) Check each heat wire at its center position for discontinuity by setting direct current voltmeter.
Normal indication is about 6 volts.



NOTE:
When measuring voltage, wind a piece of tin foil around the tip of the tester probe and press the foil against the wire with your finger.

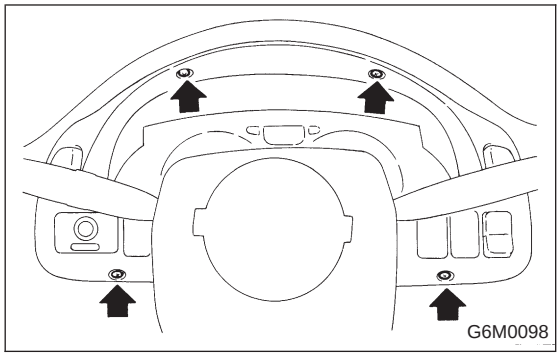


4) When tester indicates 12 volts when its probe reaches point “A”, a broken circuit occurs between point “A” and the negative terminal. Slowly move tester probe toward the negative terminal while contacting it on heat wire to locate point where tester indication changes abruptly (0 volts). This is the point where a broken circuit occurs.
When tester indicates 0 volts when its probe reaches point “A”, a broken circuit occurs between point “A” and the positive terminal. Locate a point where tester indication changes abruptly (12 volts) while slowly moving tester probe toward the positive terminal.



B: REPAIR

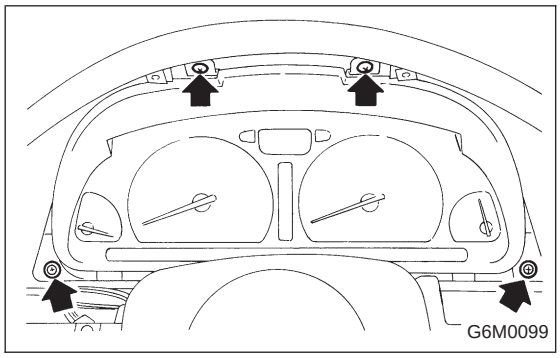
1) Clean broken wire and its surrounding area.
2) Cut off slit on (used) thin film by 0.5 mm (0.020 in) width and 10 mm (0.39 in) length.
3) Place the slit on glass along the broken wire, and deposit conductive silver composition (DUPONT No. 4817) on the broken portion.
4) Dry out the deposited portion.
5) Inspect the repaired wire for continuity.


G6M0098

8. Combination Meter

A: REMOVAL AND INSTALLATION

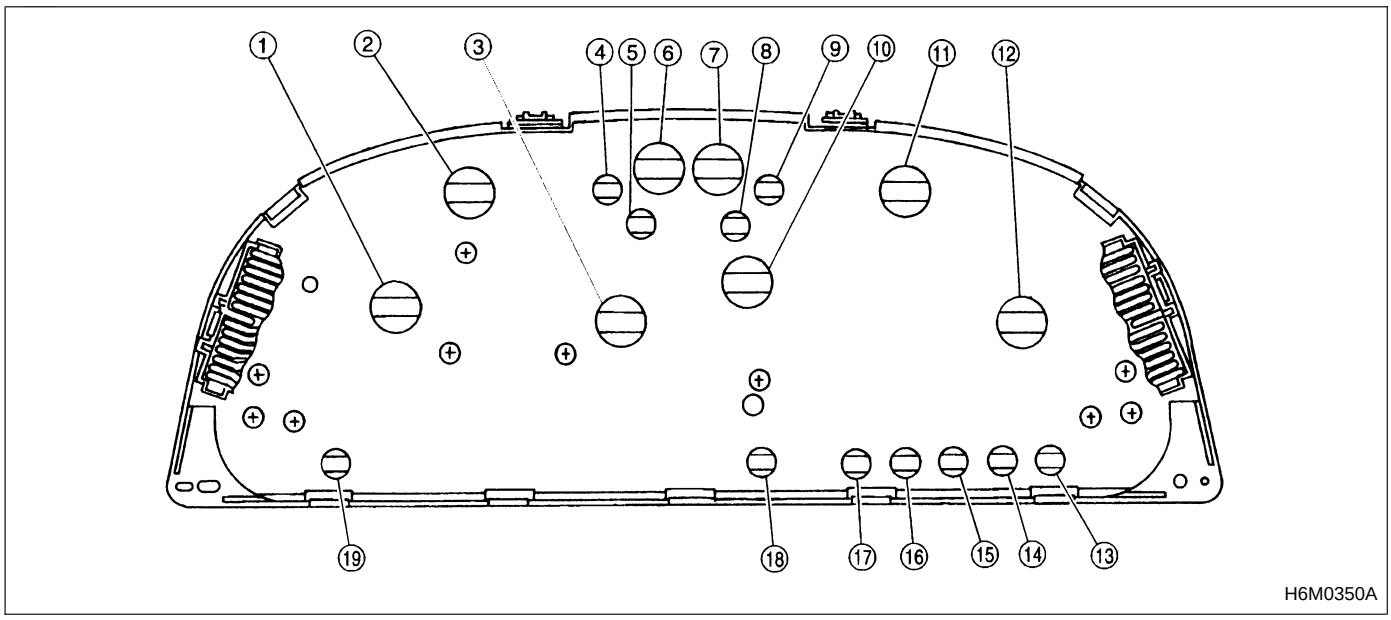
1) Move steering wheel down.
2) Remove screws which secure visor and remove visor.
3) Disconnect switch connectors.


G6M0099

4) Remove screws which secure combination meter, and pull combination meter out.
5) Disconnect connector and speedometer cable from back of combination meter.

CAUTION:
When installing combination meter, be sure to connect speedometer cable and connectors to backside of combination meter.

B: BULB REPLACEMENT

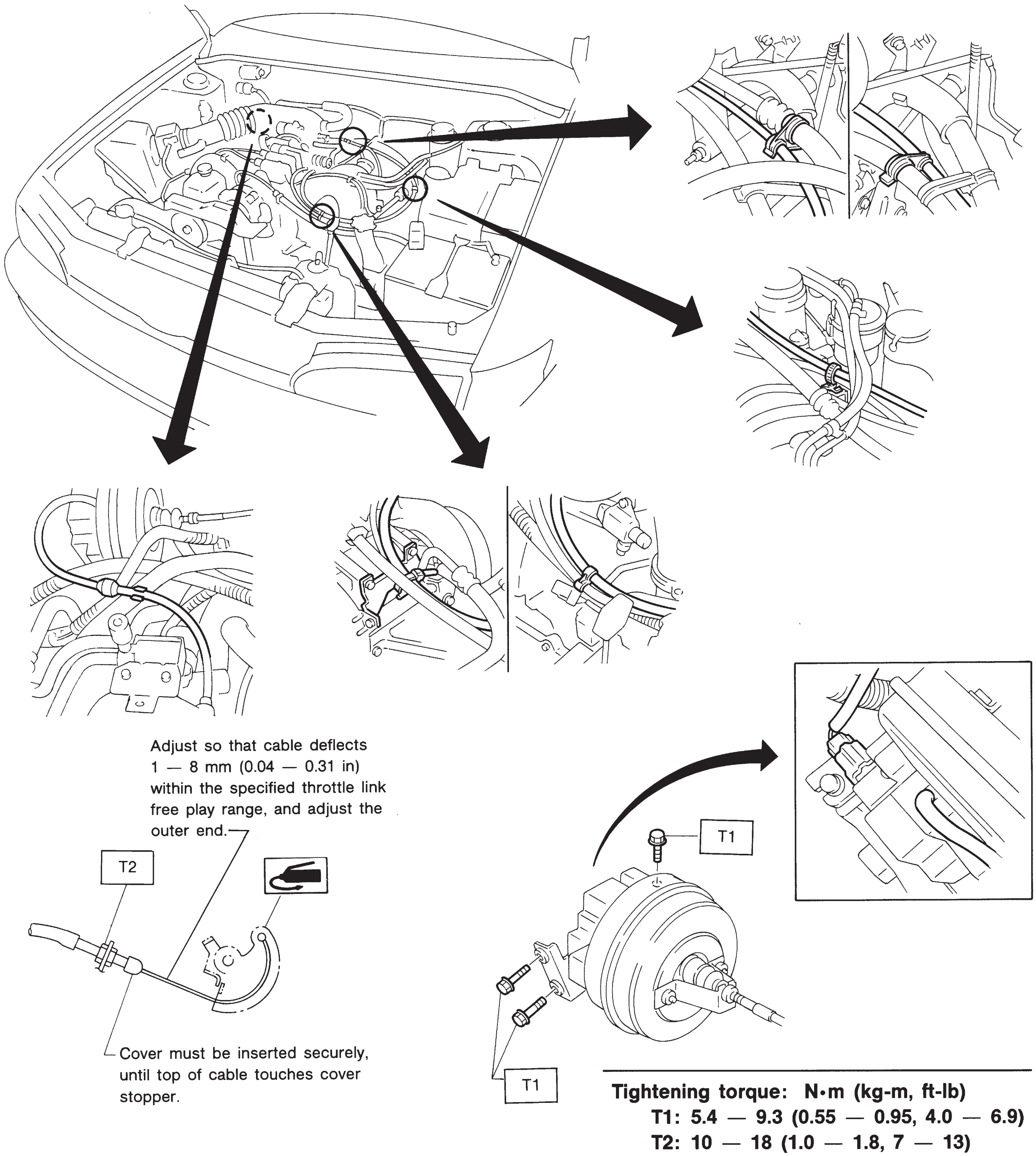


H6M0350A

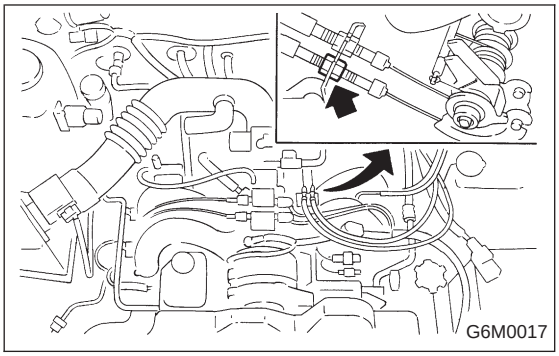
① Speedometer and fuel gauge
② Speedometer
③ Speedometer and AT indicator
④ Turn RH
⑤ Door open
⑥ Hi-beam
⑦ Brake
⑧ Seat belt
⑨ Turn LH
⑩ Tachometer and AT indicator
⑪ Tachometer
⑫ Tachometer and temperature gauge
⑬ Check engine
⑭ Charge
⑮ Oil pressure
⑯ AT oil temp.
⑰ A.B.S.
⑱ Rear defogger
⑲ FWD

9. Cruise Control AIRBAG

A: ADJUSTMENT



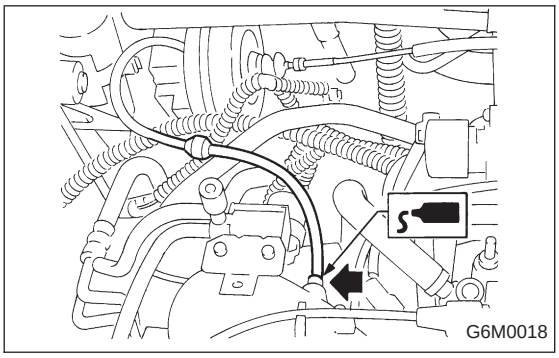
G6M0016


G6M0017

B: REMOVAL AND INSTALLATION

1. ACTUATOR

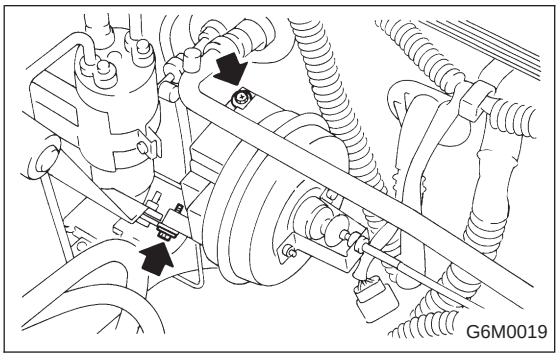
1) Remove air intake duct. Remove the nut which secures control cable end to throttle cam, and remove control cable end.
2) Remove clip bands from control cable.


G6M0018

3) Disconnect cruise control hose from intake manifold.

CAUTION:
When inserting hose into intake manifold, apply sealant to hose.

Fluid packing:
THREE BOND 1105 or equivalent


G6M0019

4) Disconnect actuator connector.
5) Remove attaching bolts and actuator.

Tightening torque:
5.4 — 9.3 N·m (0.55 — 0.95 kg-m, 4.0 — 6.9 ft-lb)

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; 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.

2. STOP AND BRAKE SWITCH

<Ref. to 4-5.>

3. CLUTCH SWITCH

<Ref. to 4-5.>

4. CRUISE CONTROL MAIN SWITCH

1) Remove meter visor, and then remove cruise control main switch by pushing it outward.
2) Disconnect connector.

5. CRUISE CONTROL SUB SWITCH

1) Remove horn pad.
2) Disconnect horn switch connector and remove attaching screws.

WARNING:
Refer to 5-5 when removing or installing the module from the airbag equipped model.

C: DRIVING TESTS

Conduct road tests by selecting a smooth, flat road or use free rollers as road test simulation.

1. MAIN SWITCH

1) Turn ignition switch ON.
2) Check that indicator light comes on when main switch is pressed (ON).
3) Check that indicator light goes out when main switch is pressed again (OFF).
4) Turn ignition switch OFF with main switch ON (which is indicated by illumination). Turn ignition switch ON again to ensure that indicator light remains OFF.

2. SUB SWITCH

1) Check that sub switch is properly set in “SET/ COAST”, “RESUME/ACCEL” or “CANCEL” mode.
2) Also check that sub switch returns to the original position when released.

3. CONSTANT SPEED TEST

1) Turn main switch ON.
2) Drive vehicle at speed greater than 40 km/h (25 MPH).
3) Press sub switch to set in “SET/COAST” mode.
4) Ensure that vehicle is maintained at the speed set when sub switch was pressed.

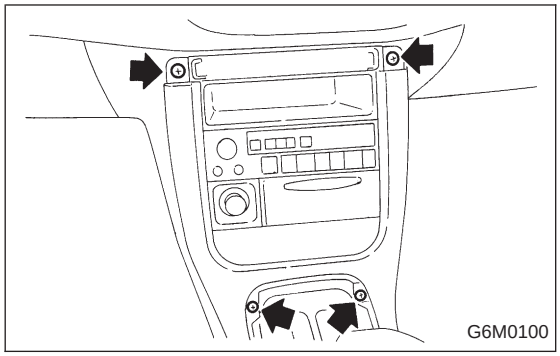
4. ACCELERATION TEST

1) Set vehicle speed at speed greater than 40 km/h (25 MPH).
2) Ensure that vehicle continues to accelerate while holding sub switch in RESUME/ACCEL mode, and that vehicle maintains that optional speed when sub switch is released.

5. DECELERATION TEST

1) Set vehicle speed at optional speed greater than 40 km/h (25 MPH).
2) Ensure that vehicle continues to decelerate while holding sub switch in SET/COAST mode, and that it maintains that optional speed when sub switch is released.

NOTE:
When vehicle speed reaches the lower speed limit of 30 km/h (19 MPH) during deceleration, cruise control will be released.

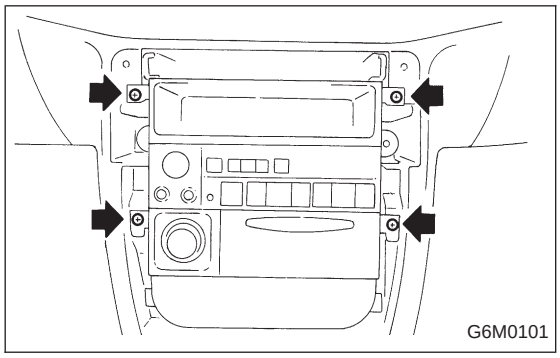


10. Radio, Speaker and Antenna

A: REMOVAL AND INSTALLATION

1. RADIO BODY

1) Remove cup holder.
2) Remove AT cover (AT model).
3) Remove screws which secure center panel. Remove center panel.



4) Remove fitting screws, and slightly pull radio out of instrument panel.
5) Disconnect electric connectors and antenna feeder cord.

2. FRONT SPEAKER

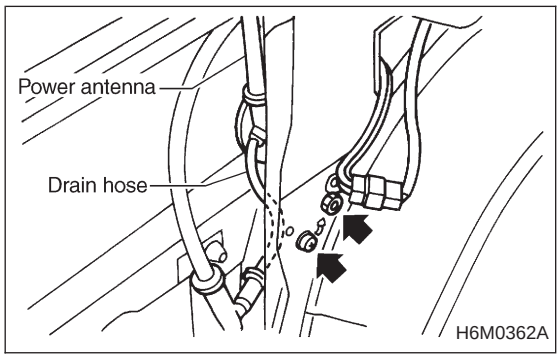
1) Remove door trim and disconnect connector. <Ref. to 5-2.>
2) Remove screws which secure front speaker. Remove speaker.

3. REAR SPEAKER (WAGON)

1) Remove rear quarter trim. <Ref. to 5-3.>
2) Remove nuts which secure speaker bracket.
3) Remove speaker and disconnect connector.

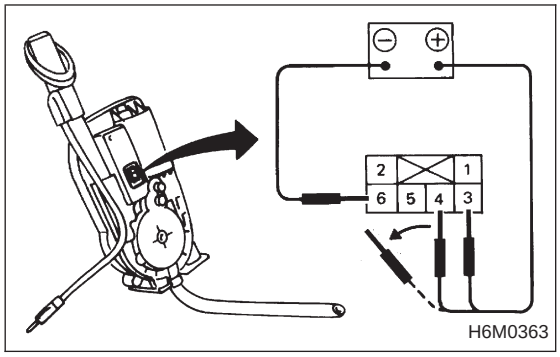
4. REAR SPEAKER (SEDAN)

1) Remove rear shelf trim panels. <Ref. to 5-3.>
2) Remove screws which secure rear speakers.
3) Disconnect connector and remove speakers.



5. POWER ANTENNA

1) Remove left side trunk trim (SEDAN), or left side rear lower quarter trim (WAGON).
2) Remove nuts which secure power antenna.
3) Remove power antenna while disconnecting connector and water drain hose.



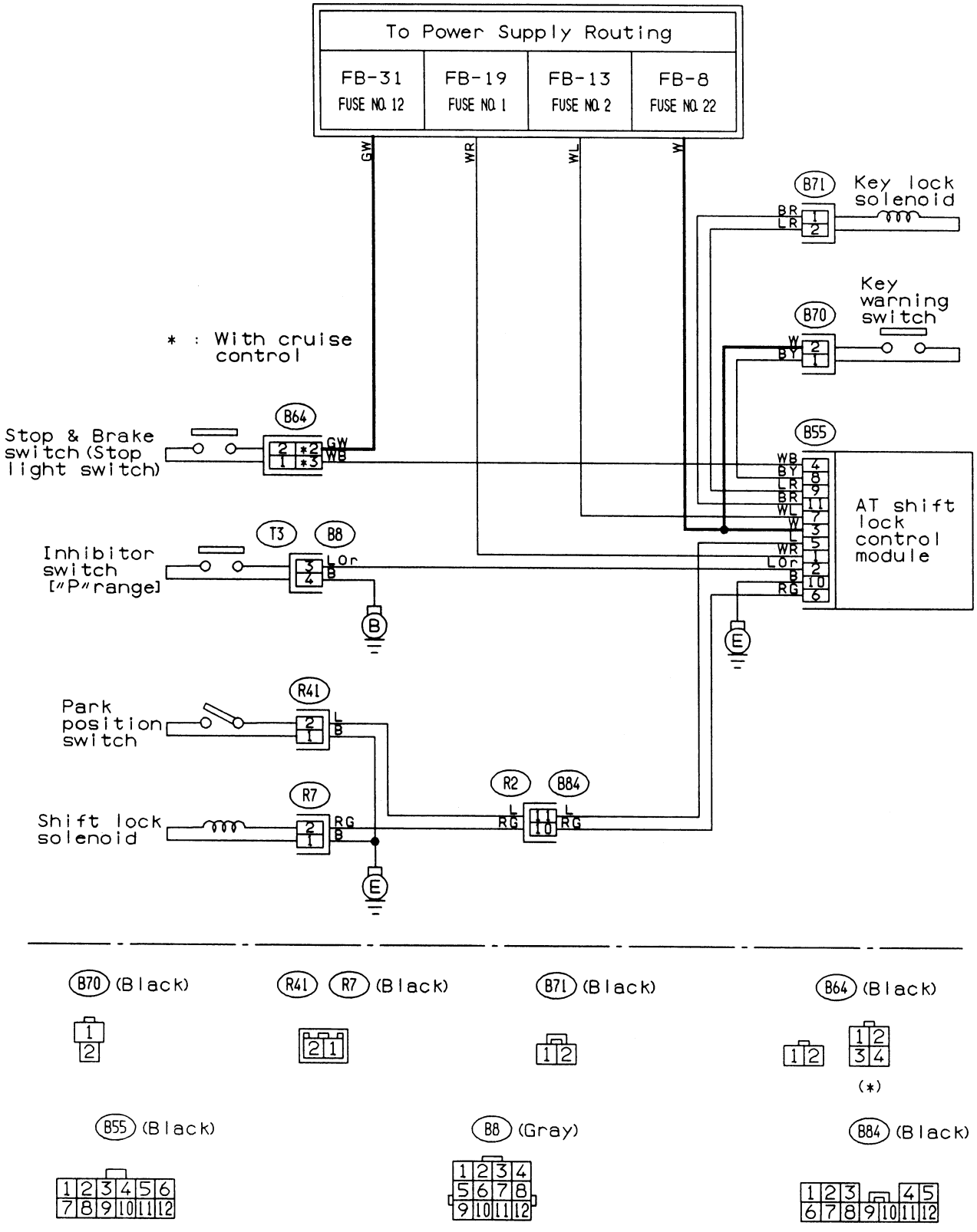
B: INSPECTION

1. POWER ANTENNA

1) Connect battery positive (+) terminal to terminal No. 3 and connect terminal No. 6 to ground. Ensure that antenna rod extends properly when battery positive (+) terminal is connected to terminal No. 4.
2) Ensure that antenna rod retracts properly when battery positive (+) terminal is disconnected from terminal No. 4.

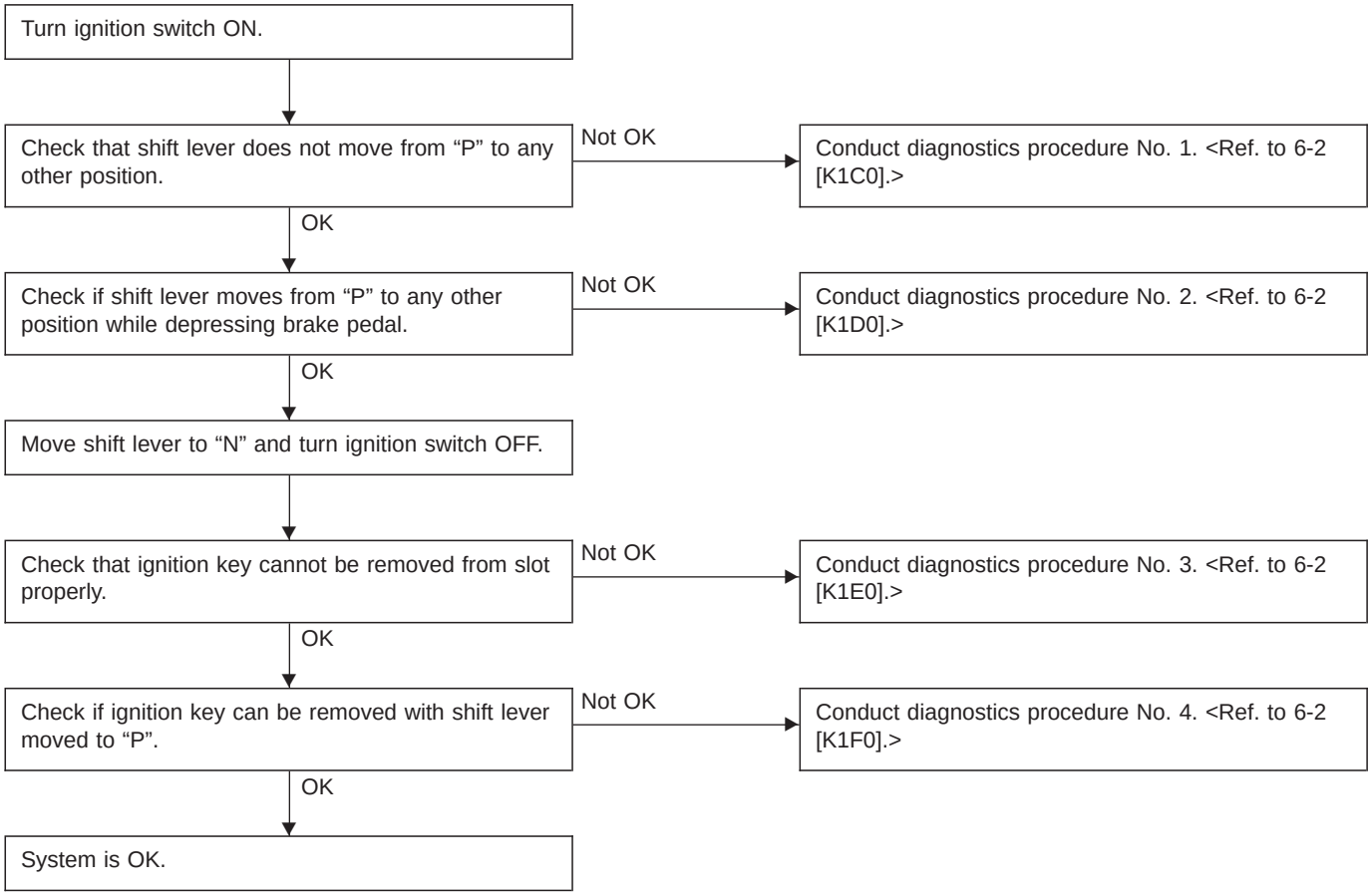
1. AT Shift Lock System

A: WIRING DIAGRAM

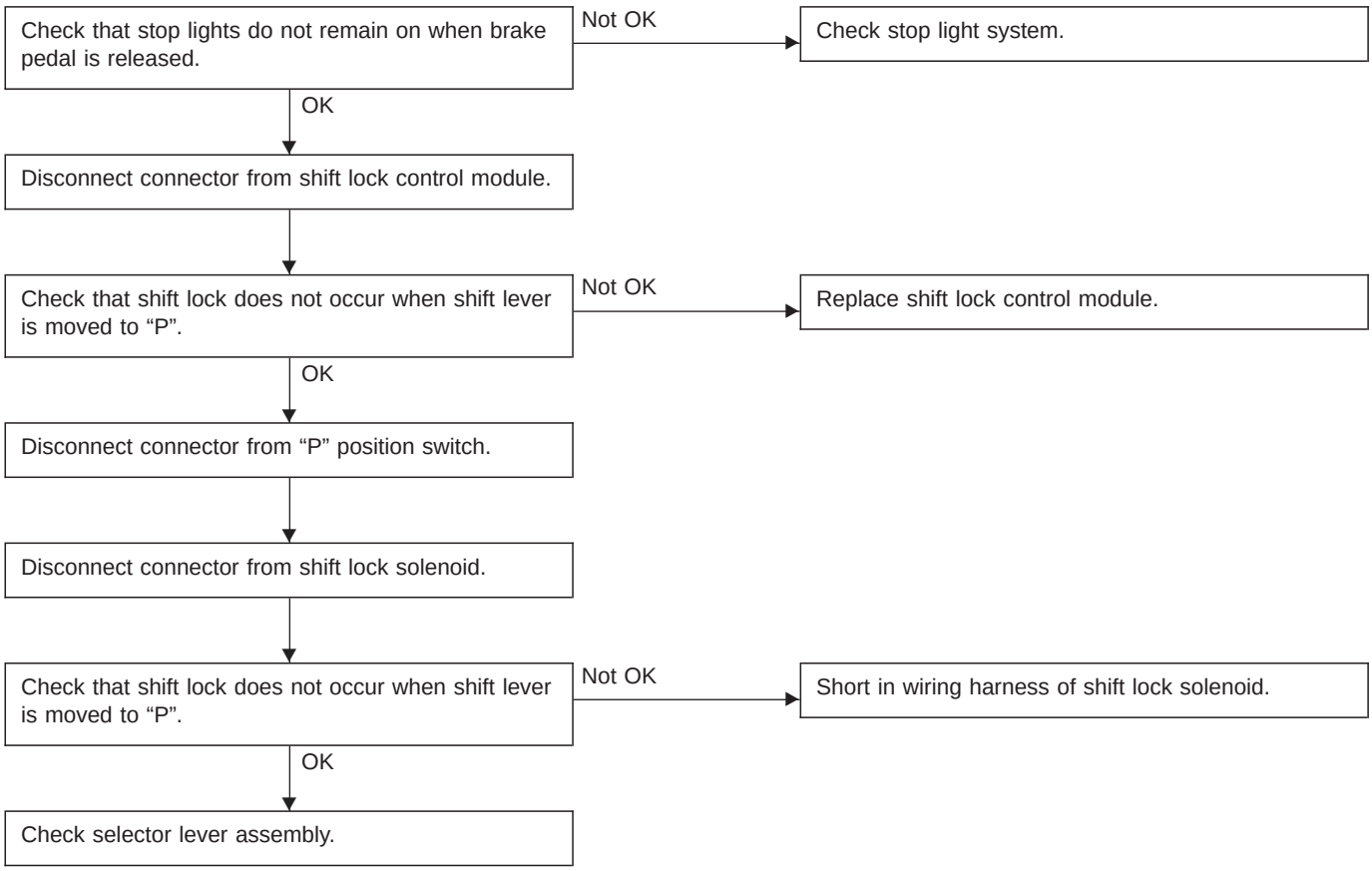


GU42-02

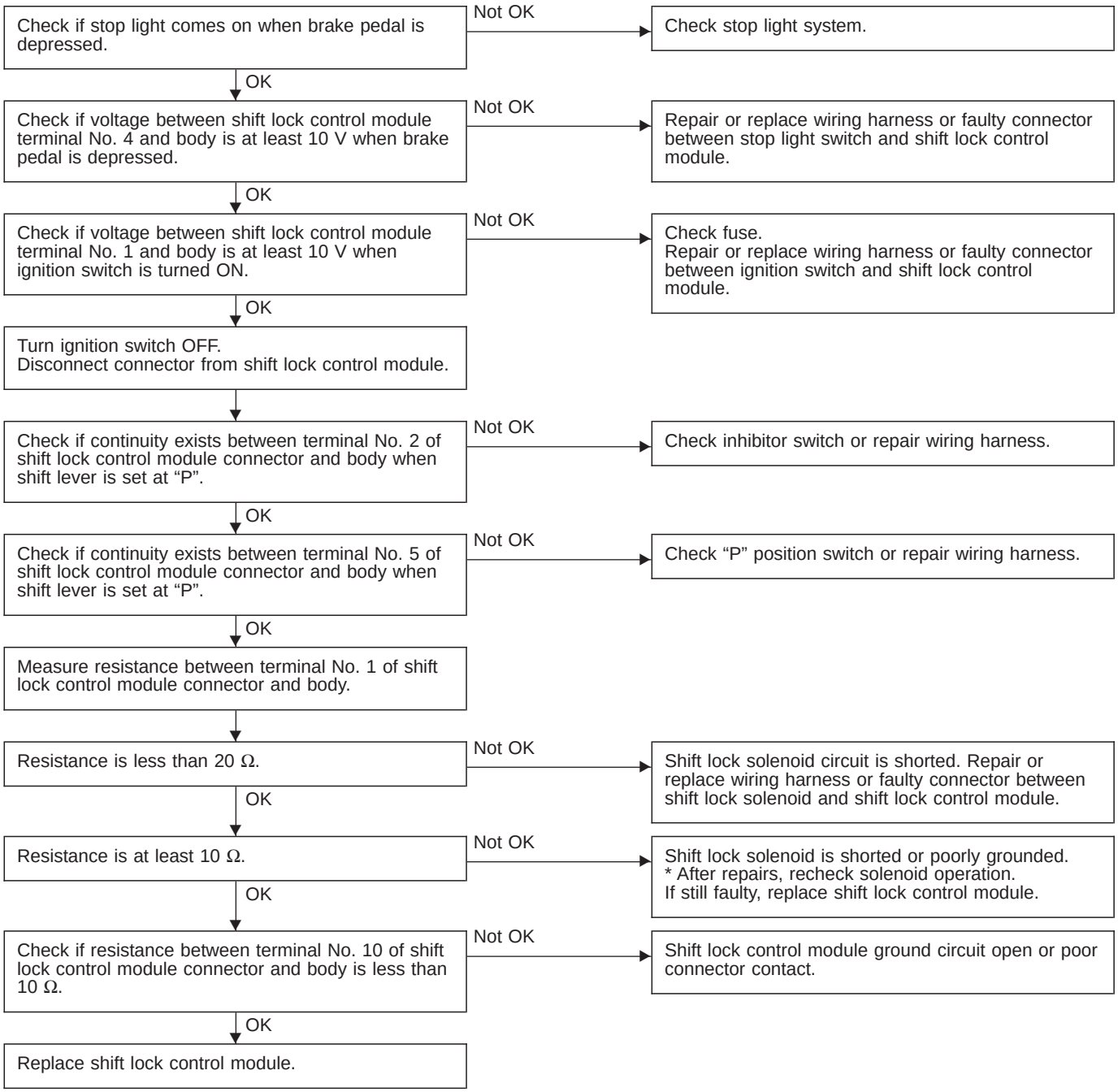
B: BASIC DIAGNOSTICS CHART



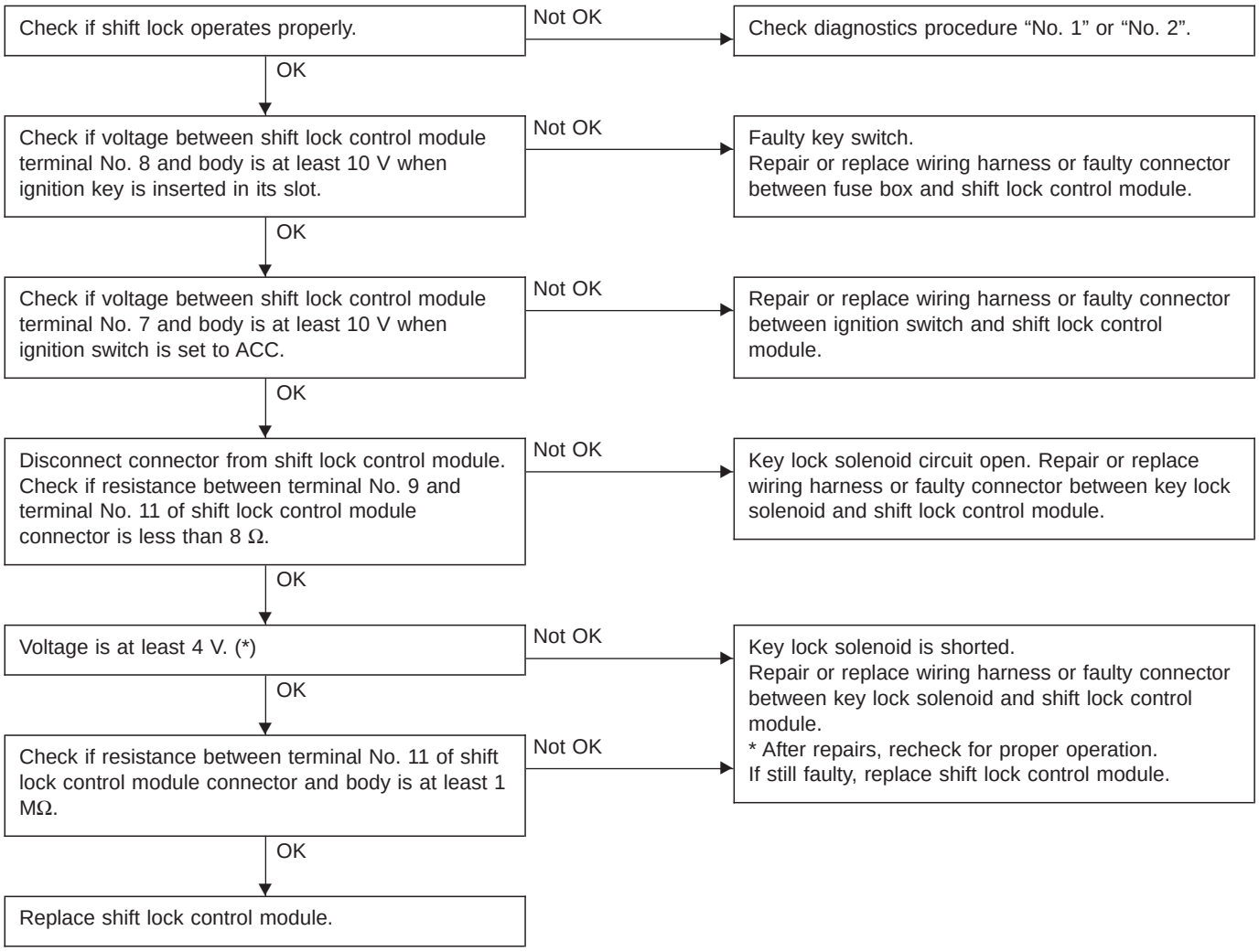
C: DIAGNOSTICS PROCEDURE No. 1



D: DIAGNOSTICS PROCEDURE No. 2 (SHIFT LOCK DOES NOT RELEASE.)

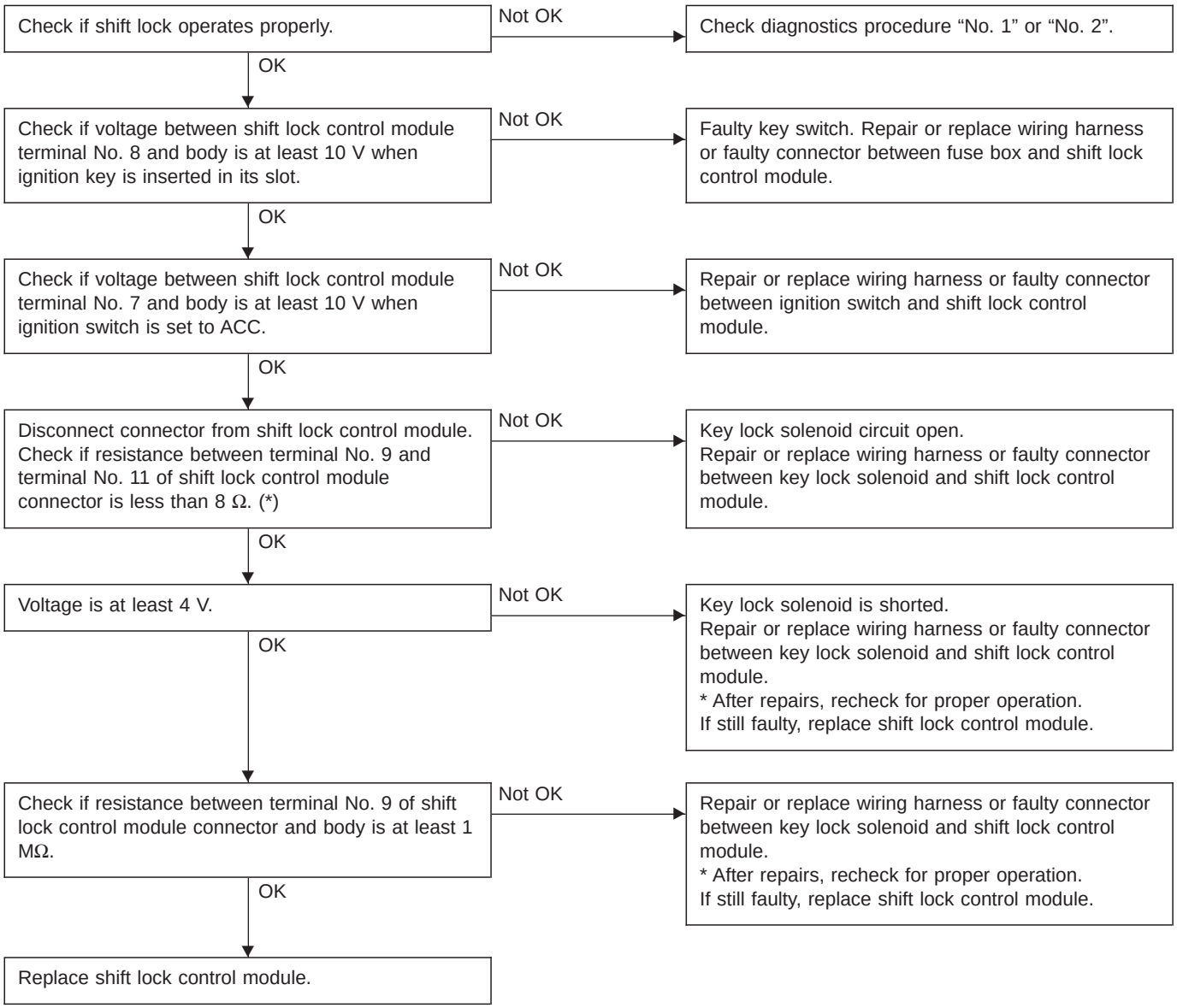


E: DIAGNOSTICS PROCEDURE No. 3 (KEY INTERLOCK DOES NOT OPERATE.)



***: When conducting operational checks of the key lock solenoid, do not apply 12 V to solenoid for more than one second, since this may break solenoid circuit.**

F: DIAGNOSTICS PROCEDURE No. 4 (KEY INTERLOCK DOES NOT RELEASE.)



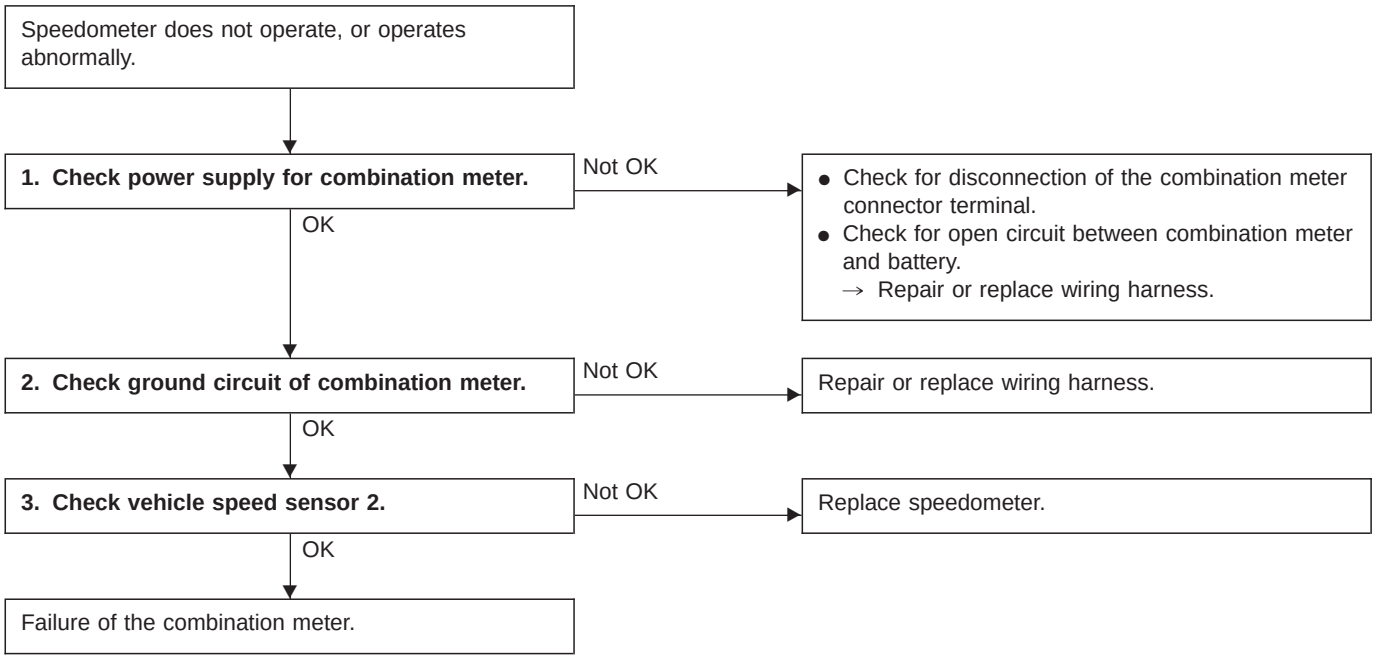
***: When conducting operational checks of the key lock solenoid, do not apply 12 V to solenoid for more than one second, since this may break solenoid circuit.**

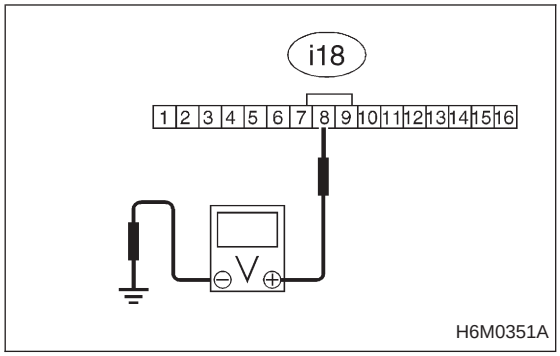
2. Combination Meter

A: DIAGNOSTICS PROCEDURE

If speedometer does not operate, or operates abnormally, check combination meter circuit (shown in flow chart as described below).

CAUTION:
Make sure that trouble code of vehicle speed sensor 2 system appears in electrical system on-board diagnosis.

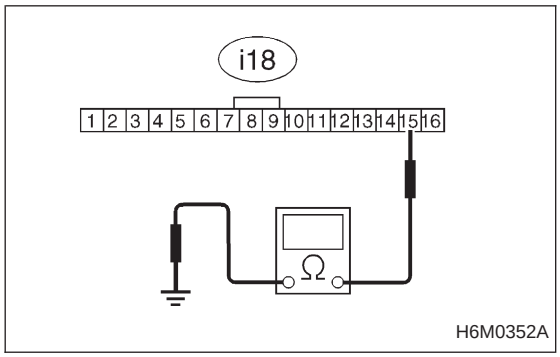




1. CHECK POWER SUPPLY FOR COMBINATION METER.

1) Remove combination meter.
2) Turn ignition switch to ON.
3) Measure voltage at combination meter connector terminal.

Connector & terminal / Specified voltage:
(i18) No. 8 — Body / 10 V, or more



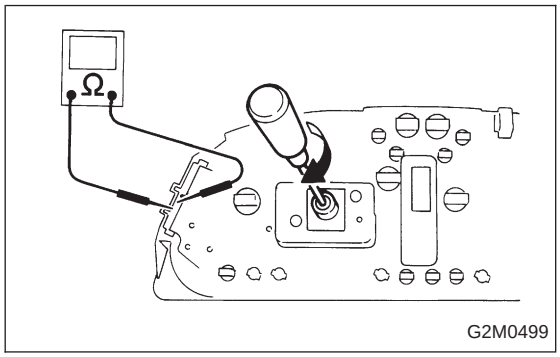
2. CHECK GROUND CIRCUIT OF COMBINATION METER.

1) Turn ignition switch to OFF.
2) Measure resistance of harness connector between combination meter and body.

Connector & terminal / Specified resistance:
(i18) No. 15 — Body / 10 Ω, max.

3. CHECK VEHICLE SPEED SENSOR 2.

NOTE:
- If resistance between terminals of vehicle speed sensor 2 is out of specification, the sensor may have a failure.
- If resistance is OK, mechanical trouble may be present in combination meter, speedometer cable and speedometer drive/driven gears in transmission.



1) Remove combination meter.
2) Measure resistance between terminals of combination meter by rotating rotor of speedometer cable hole with screwdriver.

Terminals / Specified resistance:
No. 8 — No. 15 / 10 Ω, max. ↔ 1 MΩ, min.
(Four times per rotation)

DIAGNOSTICS SECTION

FOREWORD

This portion of the 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.
The diagnostics relating to the Electronic Control System which is made up of various electronic components (ECM's etc.) are explained in this manual.
For the repair or exchange of defective parts, please refer to the SERVICE MANUAL (Repair Section).
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.

Important safety notice

- Providing appropriate service and repair is a matter of great importance in the serviceman's safety maintenance and safe operation, function and performance which the SUBARU vehicle possesses.
- In case the replacement of parts or replenishment of consumables is required, genuine SUBARU parts whose parts numbers are designated or their equivalents must be utilized.
- It must be made well known that the safety of the serviceman and the safe operation of the vehicle would be jeopardized if the used any service parts, consumables, special tools and work procedure manuals which are not approved or designated by SUBARU.

How to use this manual

- This Service Manual is divided into four volumes by section so that it can be used with ease at work. Refer to the Table of Contents, select and use the necessary section.

  - GENERAL INFORMATION SECTION
  - REPAIR SECTION
  - DIAGNOSTICS SECTION
  - WIRING DIAGRAM SECTION

- The description of each area is provided with four types of titles different in size as shown below. The Title No. or Symbol prefixes each title in order that the construction of the article and the flow of explanation can be easily understood.

  [Example of each title]

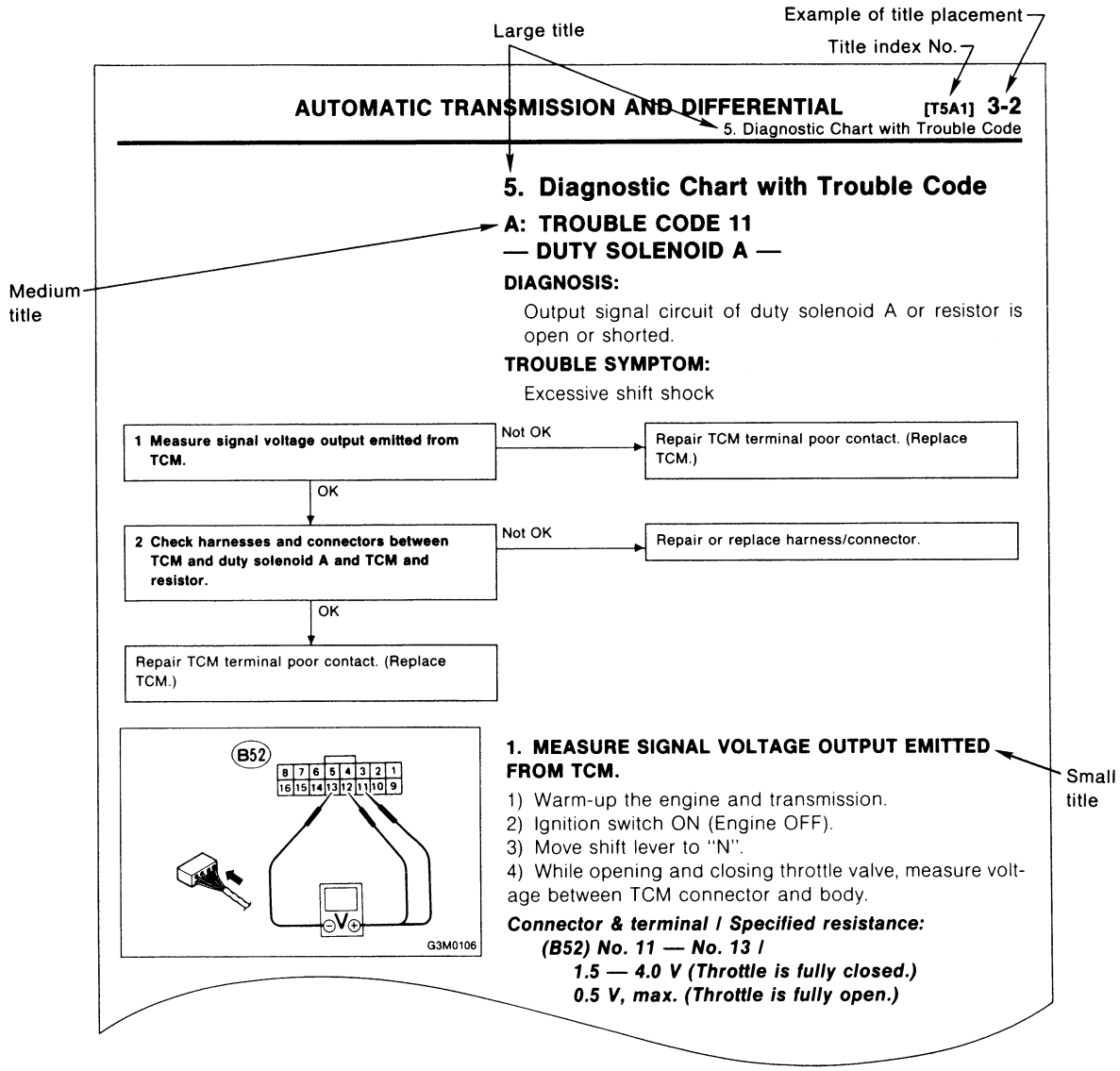
  - Area title: T. DIAGNOSTICS
  - Large title (Heading): 1. Diagnostics Chart with Select Monitor
    (to denote the main item of explanation)
  - Medium title (Section): A: BASIC DIAGNOSTICS CHART
    (to denote the type of work in principle)
  - Small title (Sub-section): 1. CHECK INPUT SIGNAL FOR ECM
    (to denote a derivative item of explanation)

- The Title Index No. is indicated on the top left (or right) side of the page as the book is opened. This is useful for retrieving the necessary portion.

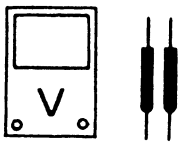
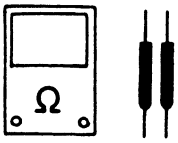
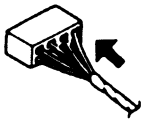
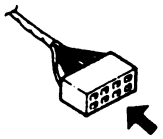
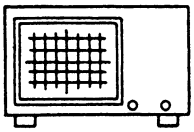
(Example of usage)

Refer to 3 - 2 [T 5 A 0]

- Small title (Sub-section)
- Medium title (Section)
- Large title (Heading)
- DIAGNOSTICS
- Chapter no.



- In this manual, the following symbols are used.

	Circuit tester Voltage measurement
	Circuit tester Resistance measurement
	The arrow indicates that insertion of the probe or numbering of the connector pins is made from the side indicated.
	The arrow indicates that insertion of the probe or numbering of the connector pins is made from the side indicated.
	Oscilloscope
	Oscilloscope probe

- WARNING, CAUTION, NOTE
  - WARNING: Indicates the item which must be observed precisely during performance of maintenance services in order to avoid injury to the mechanics and other persons.
  - CAUTION: Indicates that item which must be followed precisely during performance of maintenance services so as to avoid damage and breakage to the vehicle and its parts and components.
  - NOTE: Indicates the hints, knacks, etc. which make the maintenance job easier.

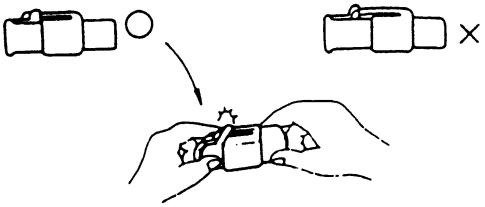
Basic checks

DISCONNECTING CONNECTORS

- Always hold the connector itself.

CAUTION:
Don't pull the harness.

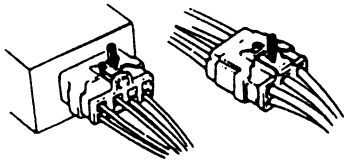
- Insert a connector by pushing it all the way in. If the connector is equipped with a locking device, push it in until a clicking sound is heard.



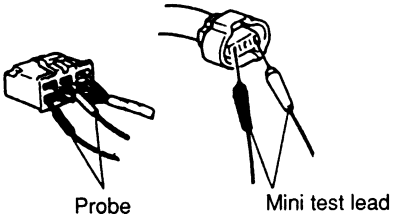
- To disconnect a locking connector, first re-lease the lock, then pull the connector off.

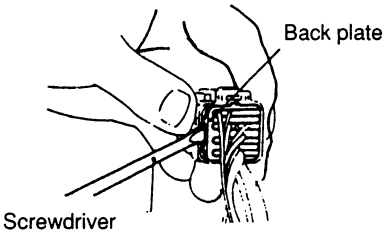
<Unlock by pulling the locking tab>

<Unlock by pushing the locking tab>



INSERTING A PROBE

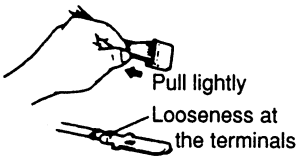


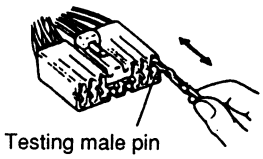


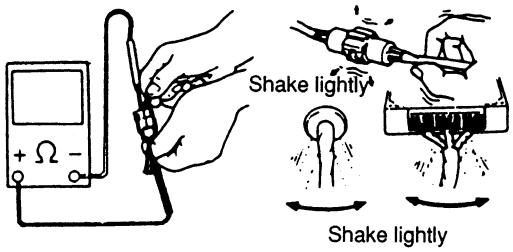
- Generally, probes are inserted into connectors from the rear.
- Connectors equipped with shock protectors must be checked with a mini probe (thin), or it will be necessary to remove the shock protector.
- When removing the shock protector take care not to deform it; this also applies to waterproof connectors, which cannot be tested from the wire side.
- When the connector has a back plate, remove the plate after removing the projection of the plate first. (Be careful not to use excessive force, since the terminals might brake off).

CHECKING FOR POOR CONTACT ON PLUG-IN CONNECTORS

Poor contact Poor contact is frequently caused by corroded terminals, dirt, foreign substances, weak contact points between male and female connectors, etc. Quite often a plug with poor contact will work perfectly again after it has been pulled off and reconnected. If harness and connector checks do not reveal any defect, it can be assumed that an intermittent contact in a connector is the source of trouble.







Visual inspection

- Disconnect the two connector halves.
- Check the connector pins for signs of corrosion or foreign material.
- Check the connector for loose and damaged terminals, and make sure they are set correctly in the connector.

NOTE:
When the harness is pulled lightly, the terminals should not come out.

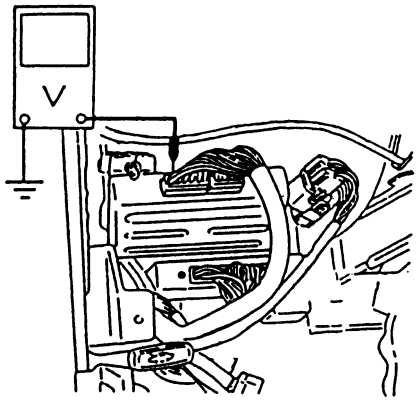
- Insert the male pin of the connector into the female pin, then pull it out.

NOTE:
If one of the pins allows to pull out easily, it is a likely source of a malfunction.

- Shake lightly the connector and the harness, and check for sudden changes in voltage or resistance.

Diagnosis and checking prodecdure using instruments

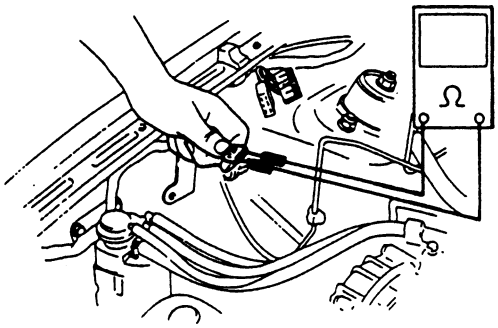
USING A CIRCUIT TESTER



J3-1012

- **Voltage ckeck (range set to DC V)**

Connect the positive probe to the terminal to be tested, and the negative probe to body ground (or the ground terminal of the ECM)



J3-830

- **Checking the connection (range set to Ω)**

Measure the resistance and check for open or shorted wire in the harness or the connector.
NOTE:
This check must be carried out with both connectors disconnected.
(This avoids by-passing the connection through other circuits).
1) Check for open circuit (range: Ω x 1K)
Measure the resistance between the respective pins in both connectors.
Specified resistance:
1 MΩ, min. (No continuity) Open circuit
10 Ω, max. (Continuity) O.K.
2) Check for correct insulation value (range: Ω x 1K)
Measure the resistance between the pins in both connectors, as well as between the suspected pin and the body (body short).
Specified resistance:
1 MΩ, min. (No continuity) O.K.
10 Ω, max. (Continuity) Short circuit

- Resistance measurement (range set to Ω)

Measuring the internal resistance of sensors, solenoid valves etc. to check the operating condition of components.
NOTE:
- Select the appropriate range for measuring the internal resistance, or the measurement will result in an incorrect reading.
- Before changing the measurement range the gauge must be reset to zero.

USING A SUBARU SELECT MONITOR

With this testing procedure the defective component can be determined by directly monitoring input/output signals of the ECM or the trouble codes.

Features

- A variety of data can be checked without movements from the drivers seat, passenger's seat or from outside the vehicle.
- This unit allows the identification of the type of malfunction, for example whether the cause is an open or shorted wire in the input/output signal line, or whether the breakdown of a component is caused by a lack of maintenance.

Diagnosis

- Refer to the reference values for input/output and control data to determine whether the malfunction is caused by a worn out component, an open wire, a short etc.
- Perform the diagnostics procedure as described in chapter "Check based on trouble codes" by monitoring the trouble codes.

NOTE:
It will be easier to determine a malfunction if the vehicle data for normal conditions are available for comparison.

USING AN OSCILLOSCOPE

A malfunction can be determined by displaying the waveforms of input/output signals on the oscilloscope.

Diagnosis

A simple comparison of the waveforms may lead to an incorrect diagnosis. To exactly determine the sources of the malfunction it will be necessary to determine them under consideration about information other than waveforms.

Applying input/output signals

Connect the probe directly with the terminal of the signal.

TABLE OF CONTENTS

1. Supplemental Restraint System “Airbag”

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 Airbag system wiring harness when servicing the engine control module (ECM), main relay and fuel pump relay.**

2. Precautions

1) 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.

2) Do not disconnect the battery terminals while the engine is running.
- A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as ECM, etc.

3) Before disconnecting the connectors of each sensor and the ECM, be sure to turn OFF the ignition switch.

4) Before removing ECM from the located position, disconnect two cables on battery.
● Otherwise, the ECM may be damaged.
5) 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.
6) Every MFI-related part is a precision part. Do not drop them.
7) 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 items a. thru c. above.
● Incorrect installation of the radio may affect the operation of the ECM.

8) 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.

3. Pre-inspection

Before performing diagnostics, check the following items which might affect engine problems:

1. POWER SUPPLY

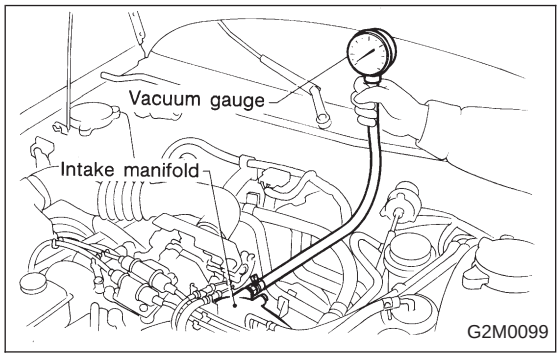
1) Measure battery voltage and specific gravity of electrolyte.

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. CAPS AND PLUGS

1) Check that the fuel cap is properly closed.
2) Check that the oil filler cap is properly closed.
3) Check that the oil level gauge is properly inserted.



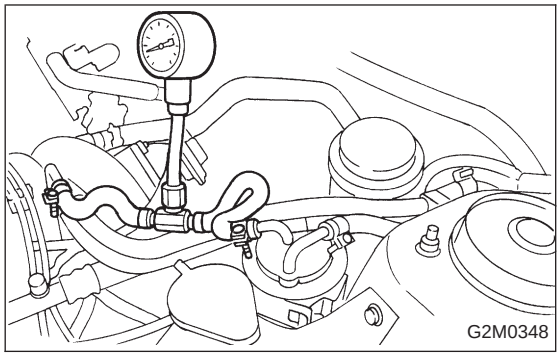
3. INTAKE MANIFOLD VACUUM PRESSURE

1) After warming-up the engine, measure intake manifold vacuum pressure while at idle.

Standard vacuum pressure:
More than −66.7 kPa (−500 mmHg, −19.69 inHg)

<Ref. to 2-2 [05A0].>

2) Unusual vacuum pressure occurs because of air leaks, fuel or engine problems. In such a case, engine idles roughly.



4. FUEL PRESSURE

1) Release fuel pressure

<Ref. to 2-8 [W1A0].>

2) Connect fuel pressure gauge between fuel filter and hose, and measure fuel pressure at idling.

<Ref. to 2-8 [W2A0].>

Fuel pressure:

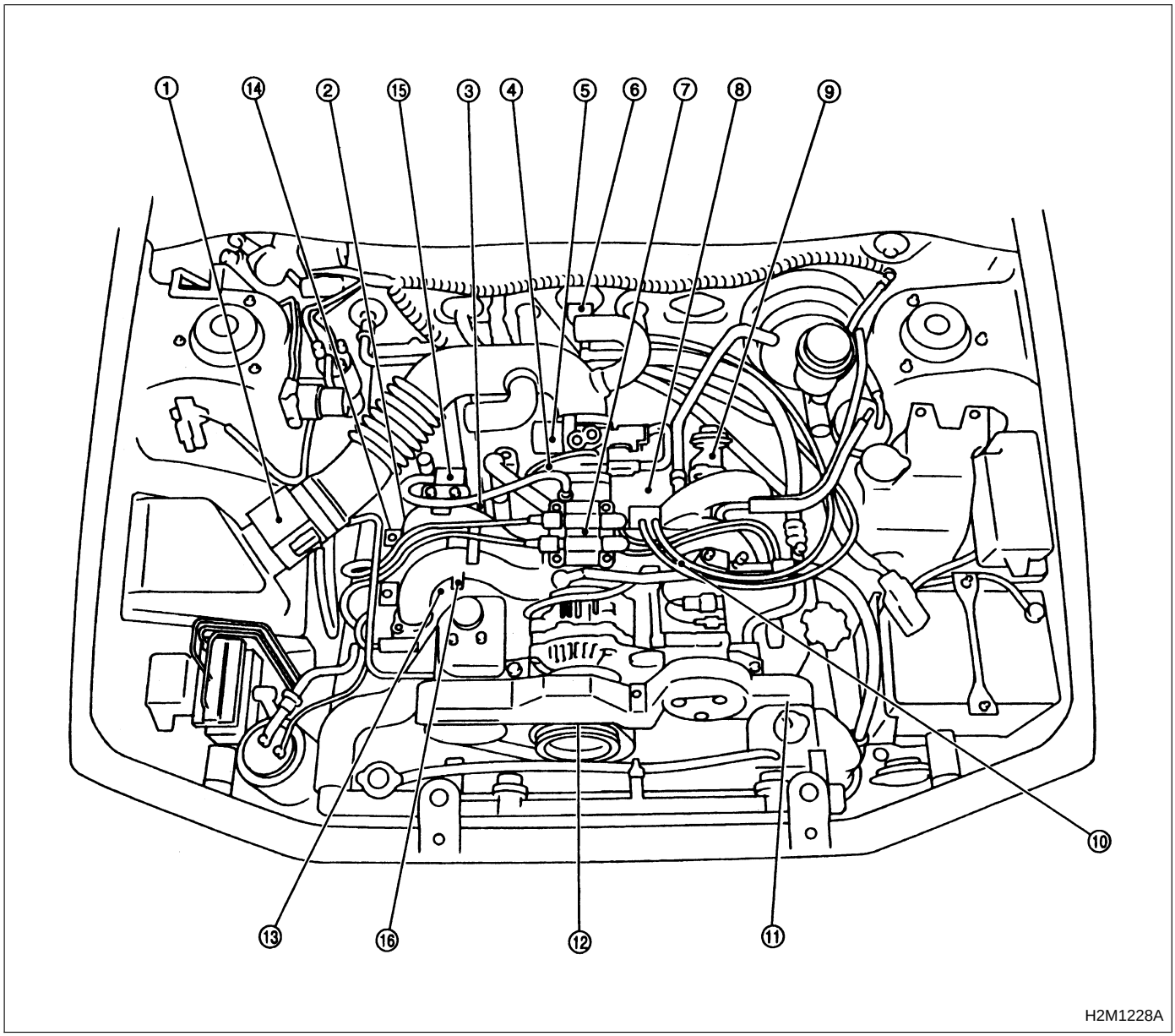
177 — 206 kPa (1.8 — 2.1 kg/cm², 26 — 30 psi)

5. ENGINE GROUNDING

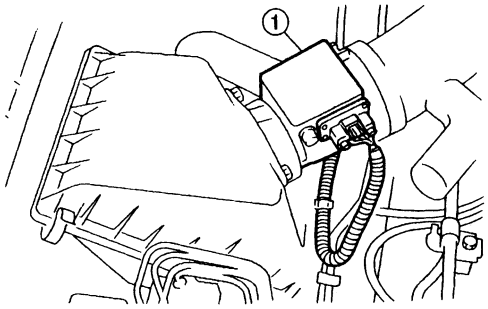
Make sure the engine grounding terminal is properly connected to the engine.

4. Electrical Unit Location

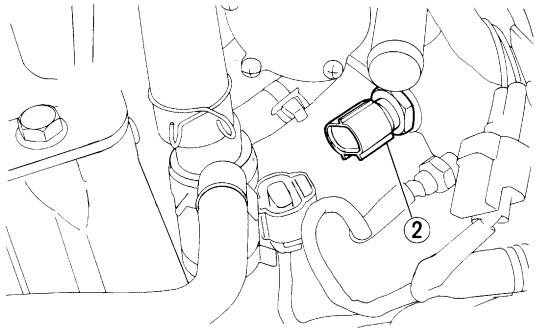
1. SENSOR AND SOLENOID VALVE



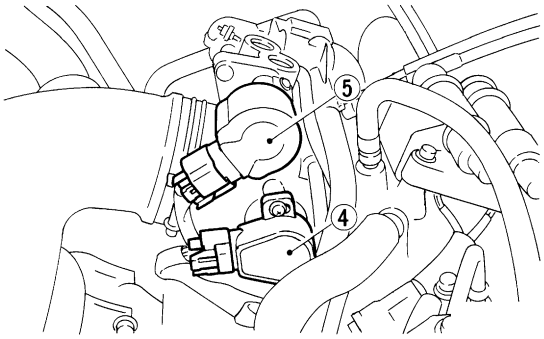
① Mass air flow sensor
② Engine coolant temperature sensor
③ Air suction solenoid valve
④ Throttle position sensor
⑤ Idle air control solenoid valve
⑥ Ignitor
⑦ Ignition coil
⑧ Recirculation gas temperature sensor
⑨ EGR valve
⑩ EGR solenoid valve
⑪ Camshaft position sensor
⑫ Crankshaft position sensor
⑬ Purge control solenoid valve
⑭ Air suction valve
⑮ FICD solenoid valve (With A/C model)
⑯ Purge control solenoid valve (California FWD model)



H2M1229A



G2M0406



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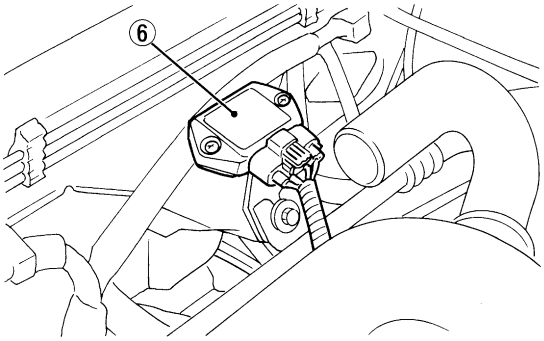

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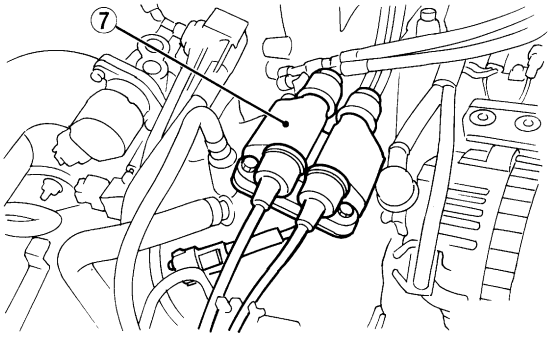

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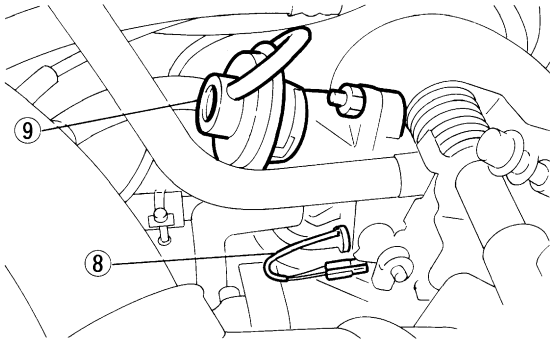

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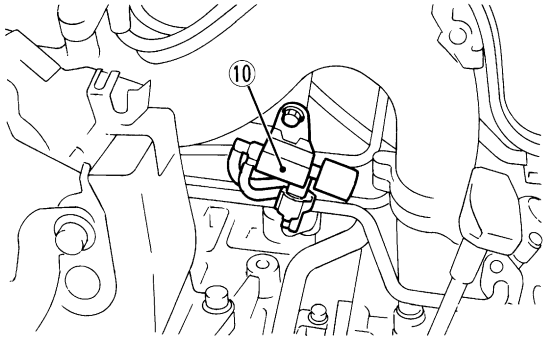

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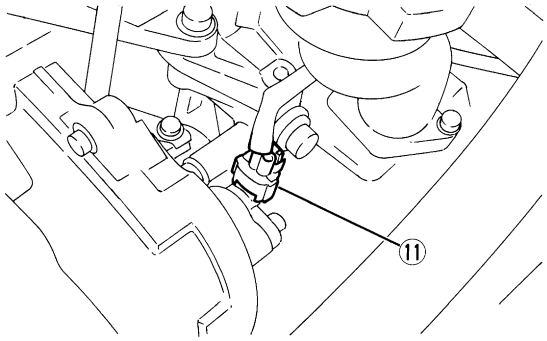

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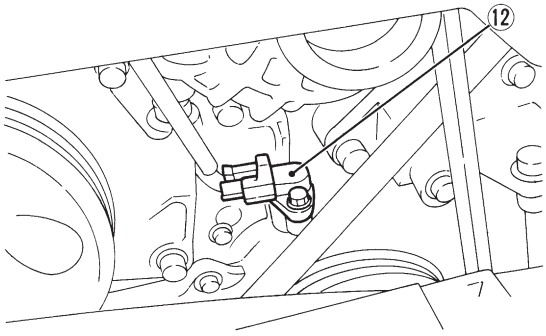

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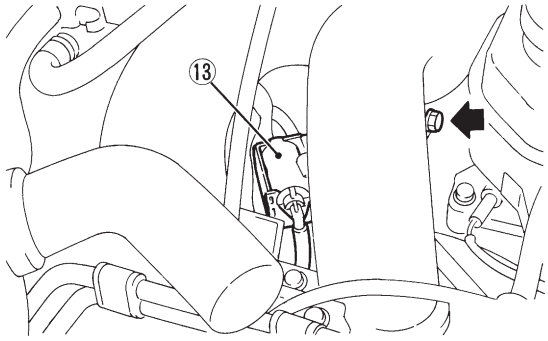

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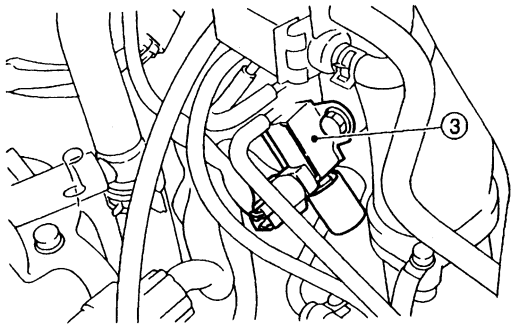

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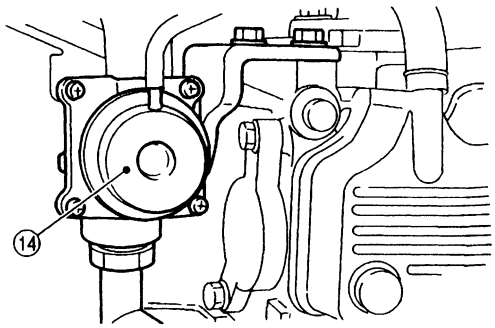

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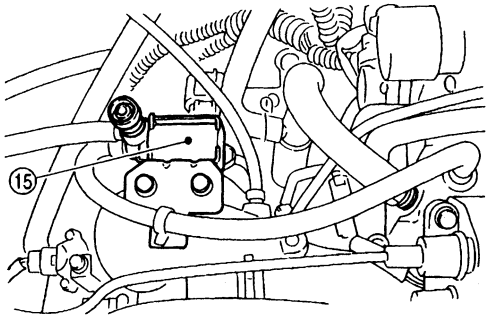

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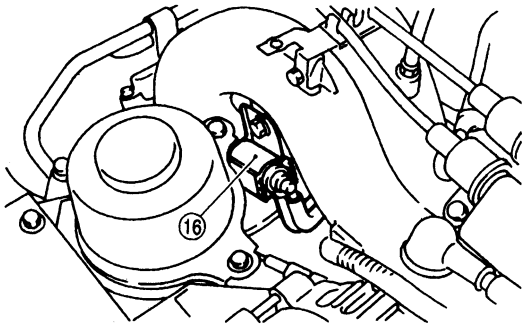

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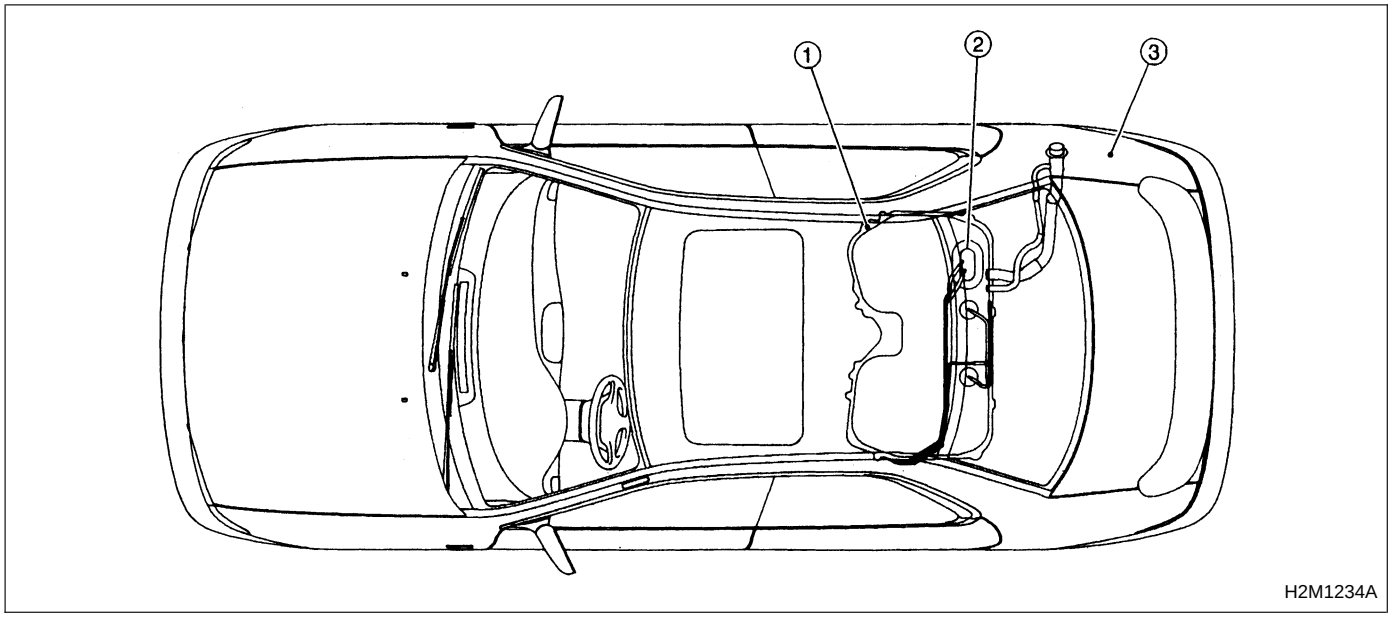
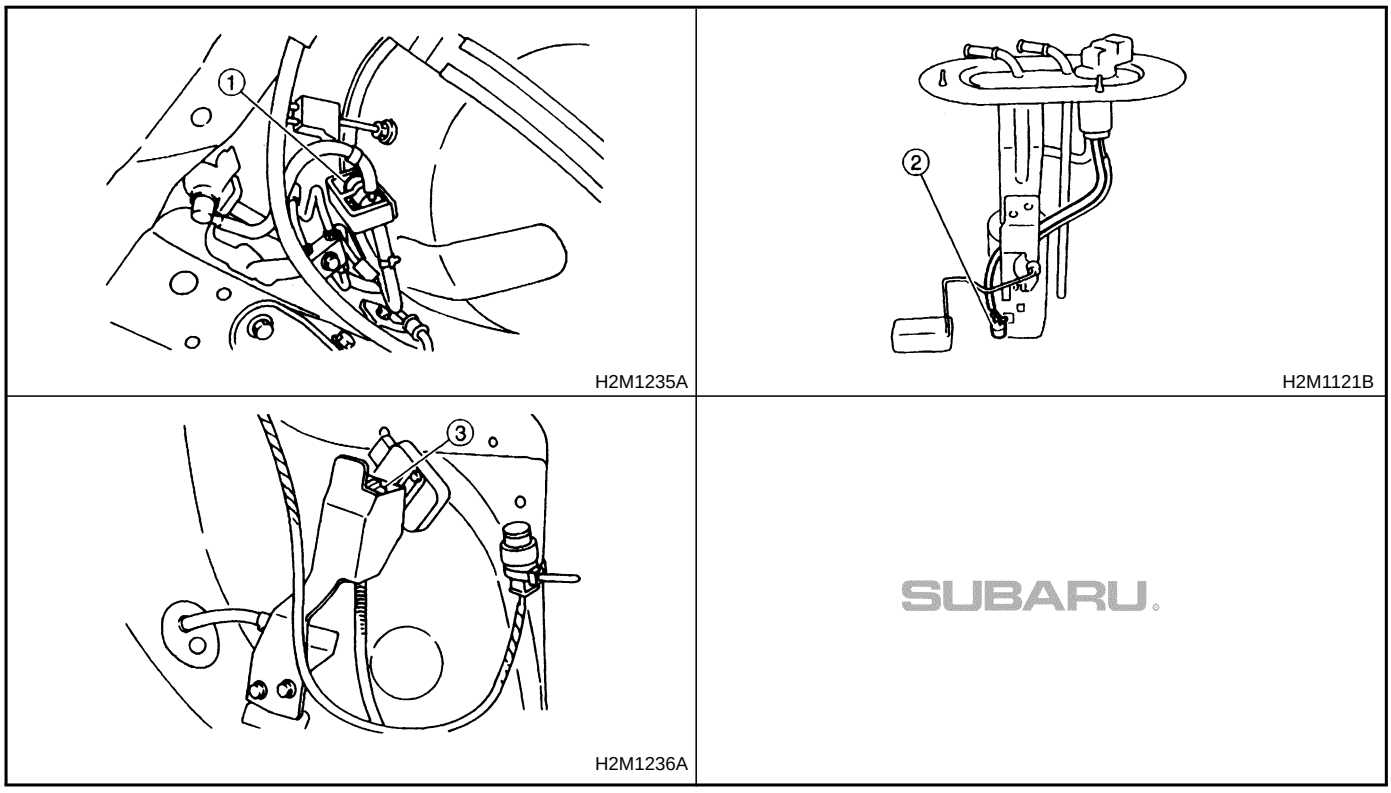
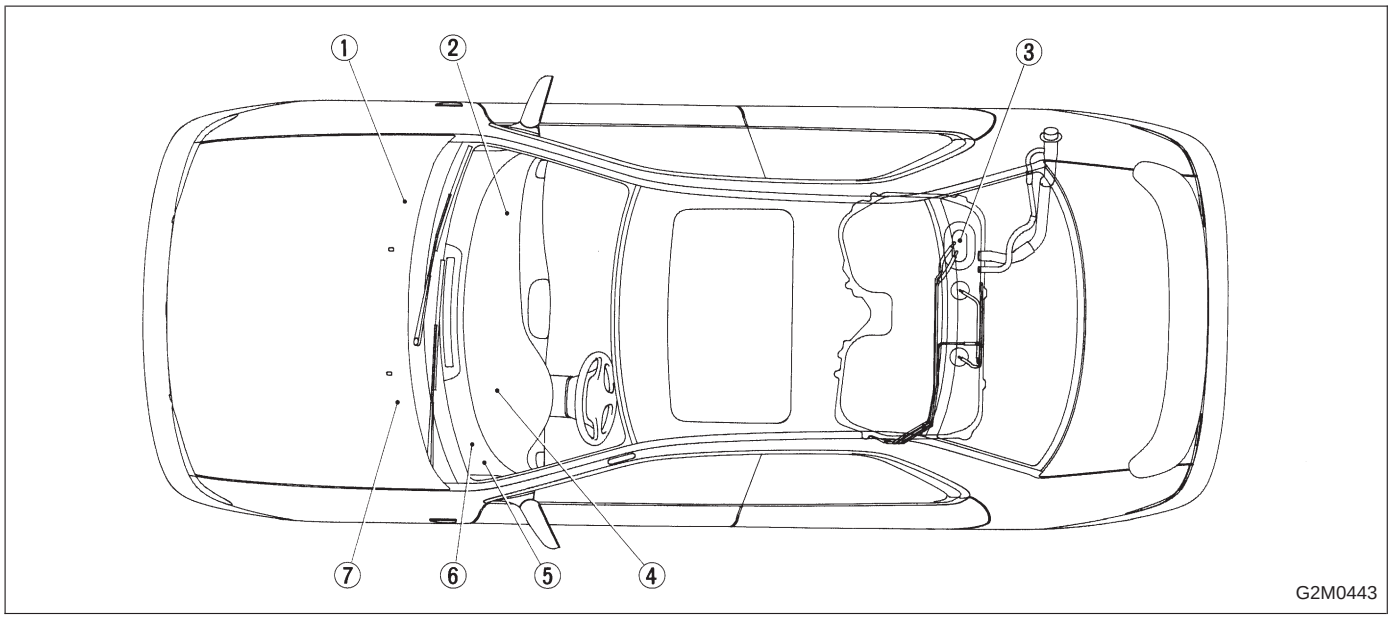


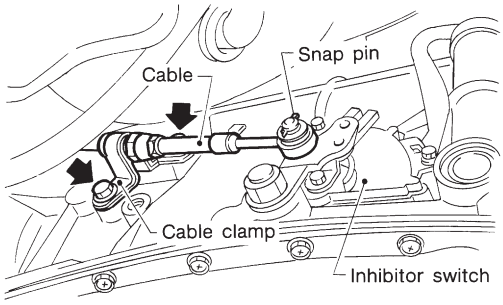
① Fuel tank pressure control solenoid valve
② Fuel temperature sensor
③ Fuel tank pressure sensor



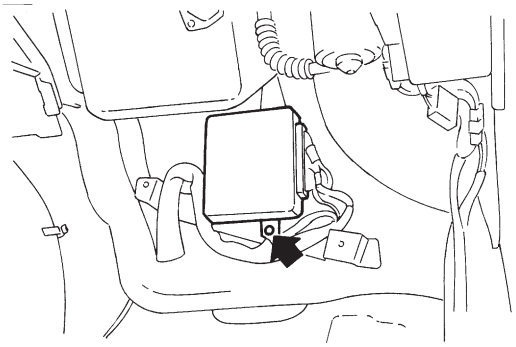
2. MODULE AND RELAY



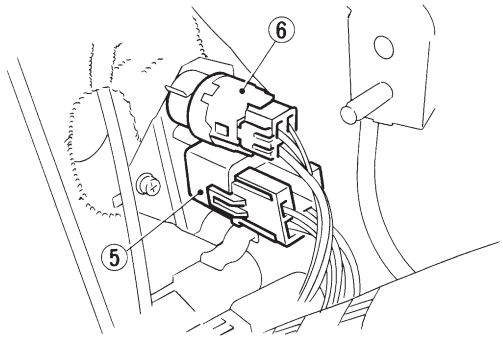
① Inhibitor switch
② ECM
③ Fuel pump
④ TCM
⑤ Main relay
⑥ Fuel pump relay
⑦ Starter
⑧ Read memory connector
⑨ Test mode connector
⑩ Data link connector



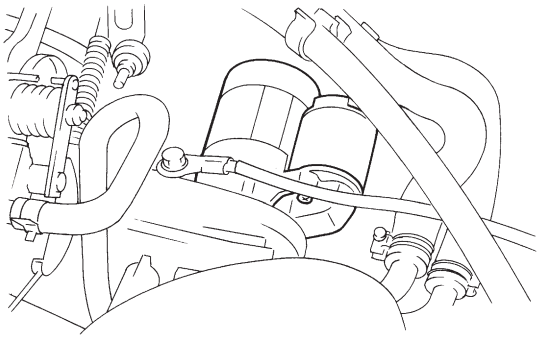
G3M0699



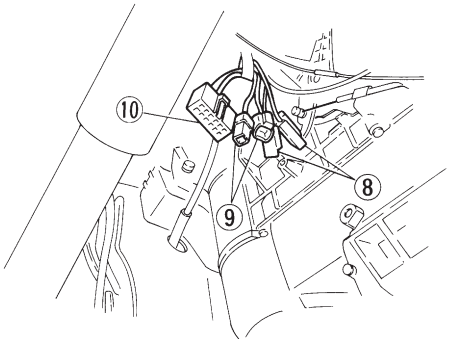
G2M0435



G2M0568



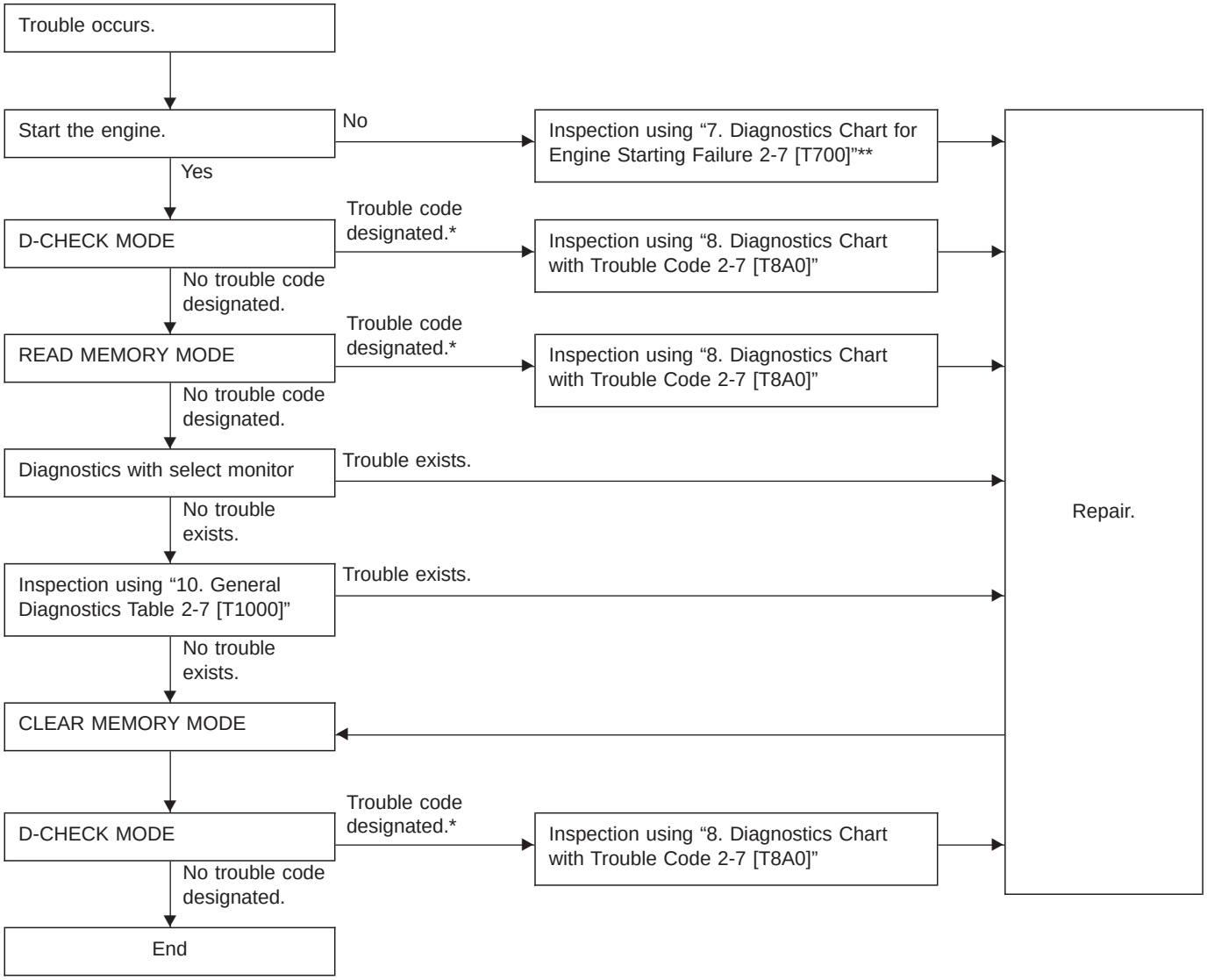
G2M0569



G2M0449

5. Diagnostics Chart for On-board Diagnosis System

A: BASIC DIAGNOSTICS PROCEDURE



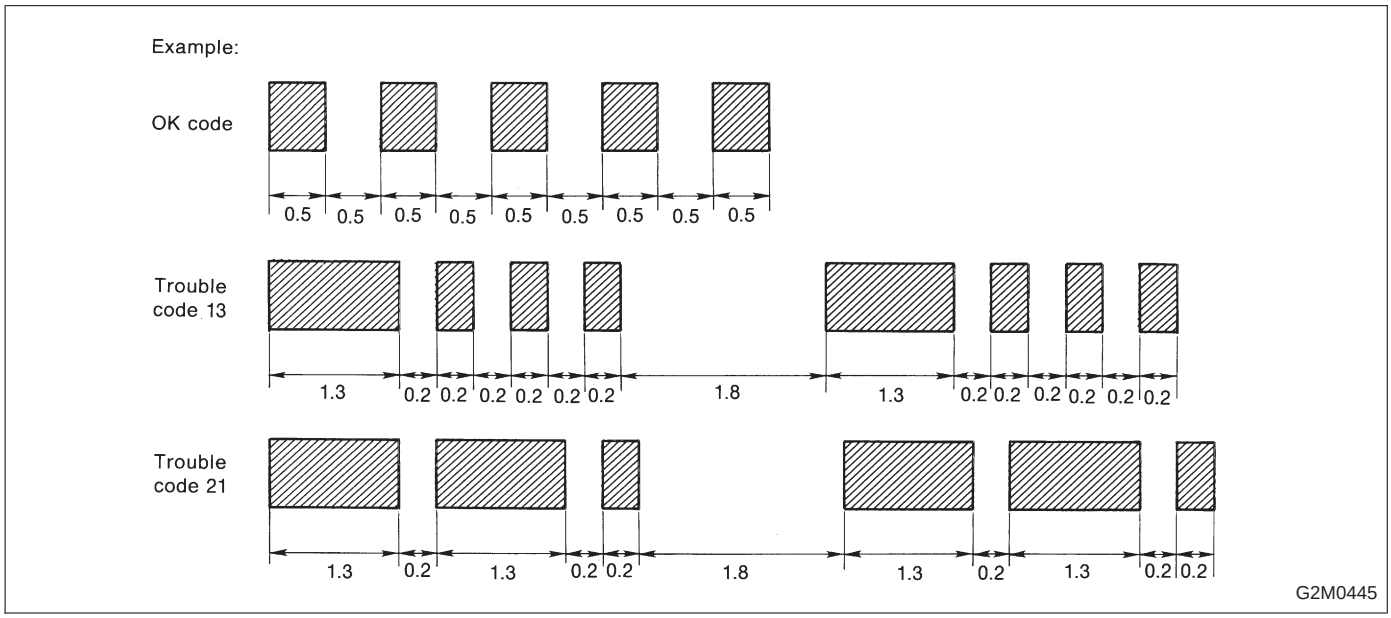
*: When more than one trouble code is out-putted, begin diagnostics with the smallest trouble code number and proceed to the next higher code.
After correcting each problem, conduct the D-CHECK and ensure that the corresponding trouble code no longer appears.
**: When a trouble code is displayed in the READ MEMORY MODE, conduct diagnostics measures which correspond with the code.

CAUTION:
- **Check the connector while it is connected unless specified otherwise.**
- **Be sure to check again from the beginning in order to prevent secondary trouble caused by repair work.**

B: TROUBLE CODE

1. HOW TO READ TROUBLE CODE

The malfunction indicator lamp flashes the code corresponding to the faulty parts. The long segment (1.3 seconds ON) indicates a “ten”, and the short segment (0.2 seconds ON) signifies “one”. And middle segment (0.5 seconds ON) means OK code.

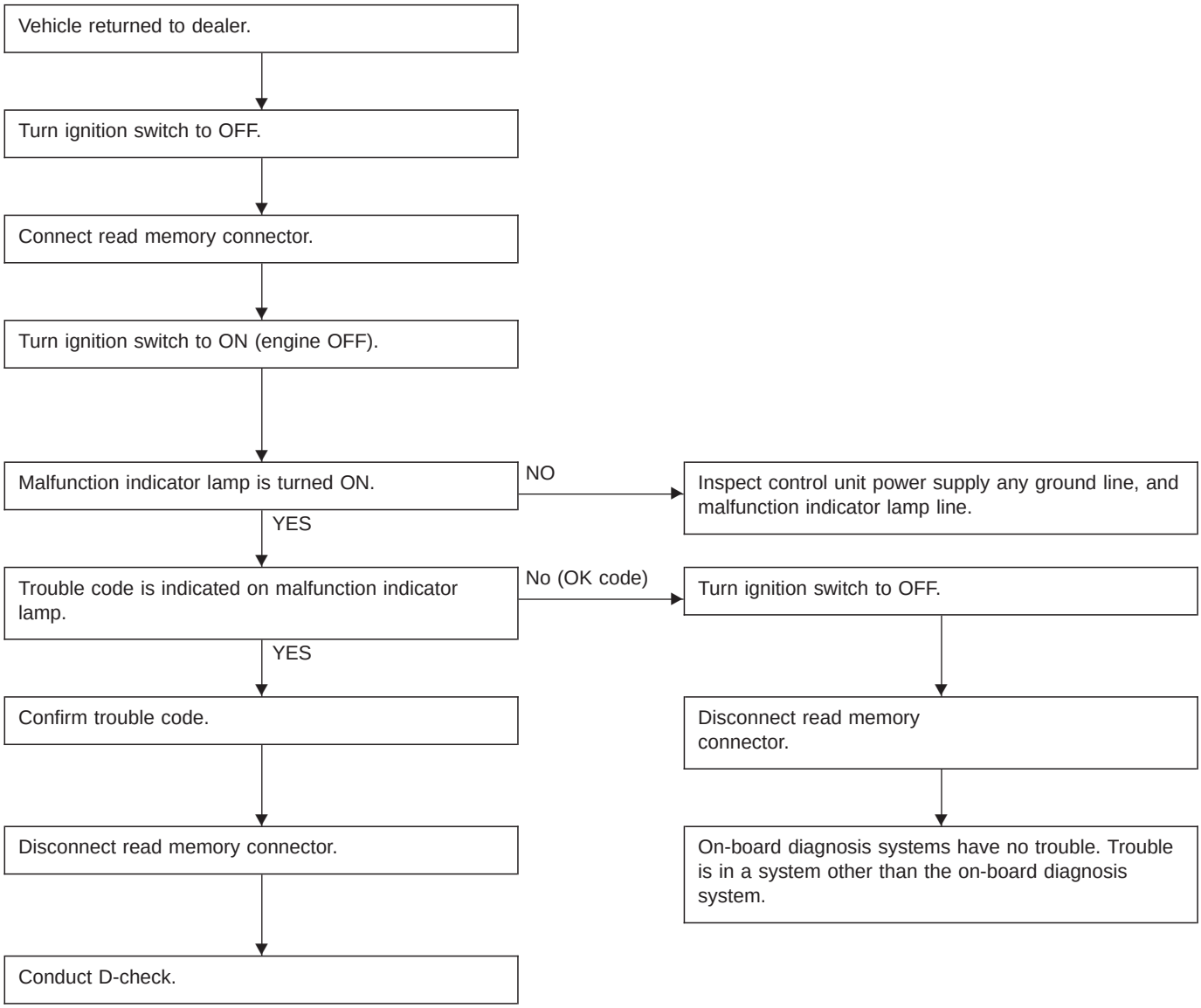


2. LIST OF TROUBLE CODE

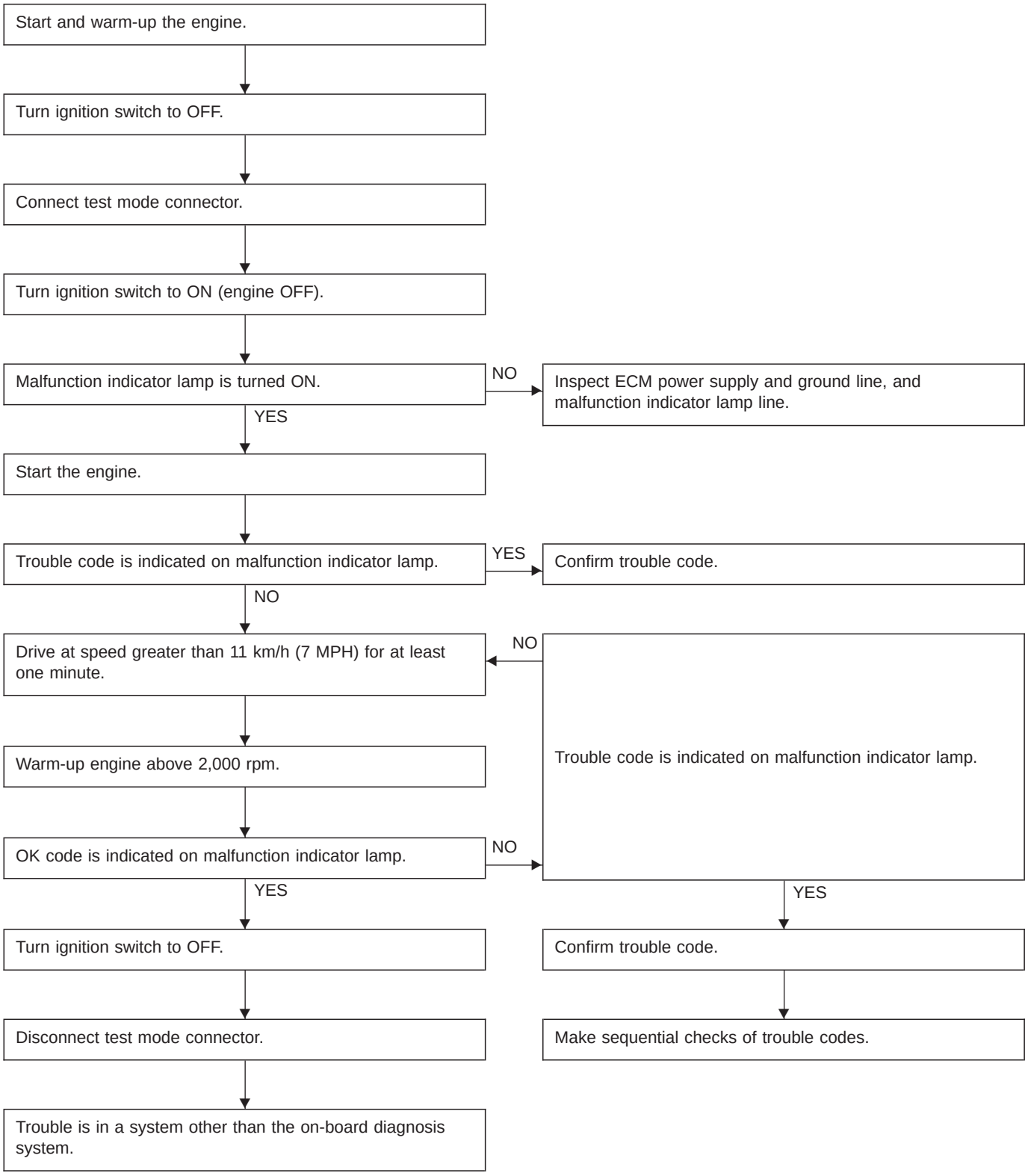
Trouble code	Item	Contents of diagnosis
11	Crankshaft position sensor	No signal entered from crankshaft position sensor, but signal entered from camshaft position sensor.
12	Starter switch	● The starter switch signal is abnormal. ● The harness connector between ECM and starter switch is in short or open.
13	Camshaft position sensor	No signal entered from camshaft position sensor, but signal entered from crankshaft position sensor.
14	Fuel injector # 1	Fuel injection is not in function. (Abnormal signal emitted from monitor circuit.)
15	Fuel injector # 2	
16	Fuel injector # 3	
17	Fuel injector # 4	
21	Engine coolant temperature sensor	● The engine coolant temperature sensor signal is abnormal. ● The harness connector between ECM and engine coolant temperature sensor is in short or open.
23	Mass air flow sensor	● The mass air flow sensor signal is abnormal. ● The harness connector between ECM and mass air flow sensor is in short or open.
24	Idle air control solenoid valve	● The idle air control solenoid valve is not in function. ● The harness connector between ECM and idle air control solenoid valve is in short or open.
31	Throttle position sensor	● The throttle position sensor signal is abnormal. ● The harness connector between ECM and throttle position sensor is in short or open.
32	Oxygen sensor	● The oxygen sensor is not in function. ● The harness connector between ECM and oxygen sensor is in short or open.
33	Vehicle speed sensor 2	● The vehicle speed sensor 2 is not in function. ● The harness connector between ECM and vehicle speed sensor 2 is in short or open.
34	EGR solenoid valve	● The EGR solenoid valve is not in function. ● The harness connector between ECM and EGR solenoid valve is in short or open.
35	Purge control solenoid valve	● The purge control solenoid valve is not in function. ● The harness connector between ECM and purge control solenoid valve is in short or open.
36	Air suction solenoid valve	● The air suction solenoid valve is not in function. ● The harness connector between ECM and air suction solenoid valve is in short or open.
41	A/F (air/fuel) learning control	Faulty leaning control function
51	Neutral position switch (MT)	● The neutral position switch signal is abnormal. ● The harness connector between ECM and neutral position switch is in short or open.
	Inhibitor switch (AT)	● The inhibitor switch signal is abnormal. ● The harness connector between ECM and inhibitor switch is in short or open.
55	Recirculation gas temperature sensor	● Recirculation gas temperature sensor is not in function. ● The harness connector between ECM and recirculation gas temperature sensor is in short or open.
56	EGR system	Faulty EGR system function

Trouble code	Item	Contents of diagnosis
61	Fuel tank pressure control solenoid valve (California FWD model only)	● The fuel tank pressure control solenoid valve is not in function. ● The harness connector between ECM and fuel tank pressure control solenoid valve is in short or open.
62	Fuel temperature sensor (California FWD model only)	● The fuel temperature sensor signal is abnormal. ● The harness connector between ECM and fuel temperature sensor is in short or open.
63	Fuel tank pressure sensor (California FWD model only)	● The fuel tank pressure sensor signal is abnormal. ● The harness connector between ECM and fuel tank pressure sensor is in short or open.

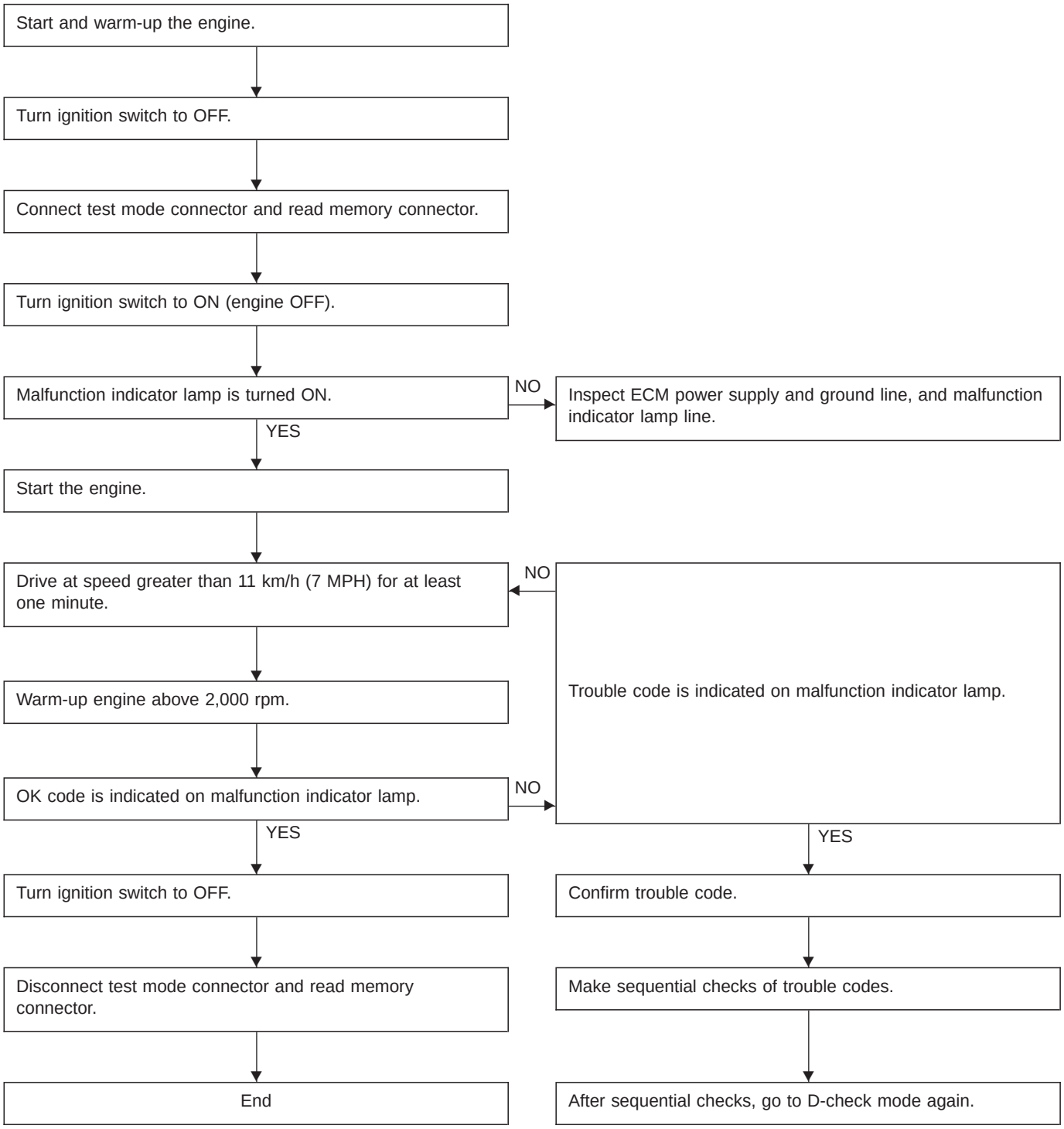
C: READ MEMORY MODE



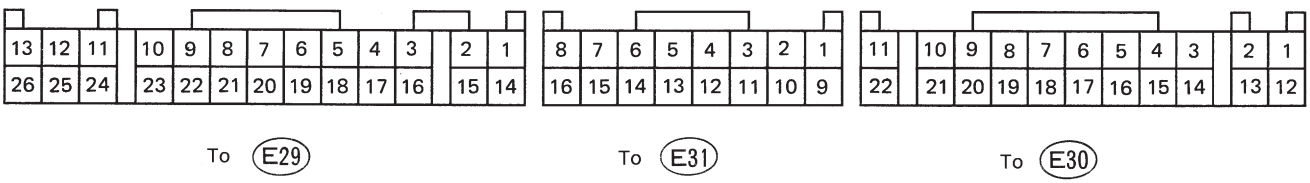
D: D-CHECK MODE



E: CLEAR MEMORY MODE



6. Control Module I/O Signal



G2M0446

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ig SW ON (Engine OFF)	Engine ON (Idling)	
Crankshaft position sensor	Signal (+)	E30	6	0	±6	Sensor output waveform
	Signal (−)	E30	7	0	0	—
	Shield	E30	11	0	0	—
Camshaft position sensor	Signal (+)	E30	8	0	±2.7	Sensor output waveform
	Signal (−)	E30	9	0	0	—
	Shield	E30	11	0	0	—
Mass air flow sensor	Signal	E30	5	0 — 0.3	0.8 — 1.2	—
	GND	E31	1	0	0	—
	Shield	E30	11	0	0	—
Throttle position sensor	Signal	E30	4	Fully closed: 0.2 — 1.0 Fully opened: 4.2 — 4.5		—
	Power supply	E30	15	5	5	—
	GND	E30	11	0	0	—
Oxygen sensor	Signal	E30	10	0	Rich mixture: 0.7 Lean mixture: 0	—
	Shield	E30	11	0	0	—
Engine coolant temperature sensor		E30	3	0.7 — 1.0	0.7 — 1.0	After warm-up
Vehicle speed sensor 2		E29	4	0 or 5	0 or 5	“5” and “0” are repeatedly displayed when vehicle is driven.
Starter switch		E29	12	0	0	Cranking: 10 — 14
A/C switch		E29	11	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch		E29	10	10 — 13	13 — 14	—
Neutral position switch (MT)		E29	16	ON: 0 OFF: 10 — 13		● On MT model; switch is ON when gear is in neutral position. ● On AT model; switch is ON when shift is in “P” or “N” position.
Park/Neutral position switch (AT)						
Test mode connector		E29	20	5	5	When connected: 0
Read memory connector		E29	19	5	5	When connected: 0
AT/MT identification		E29	17	(AT) 5 (MT) 0	(AT) 5 (MT) 0	When measuring voltage between ECM and body.
Back-up power supply		E29	26	10 — 13	13 — 14	—
Control unit power supply		E29	13	10 — 13	13 — 14	—

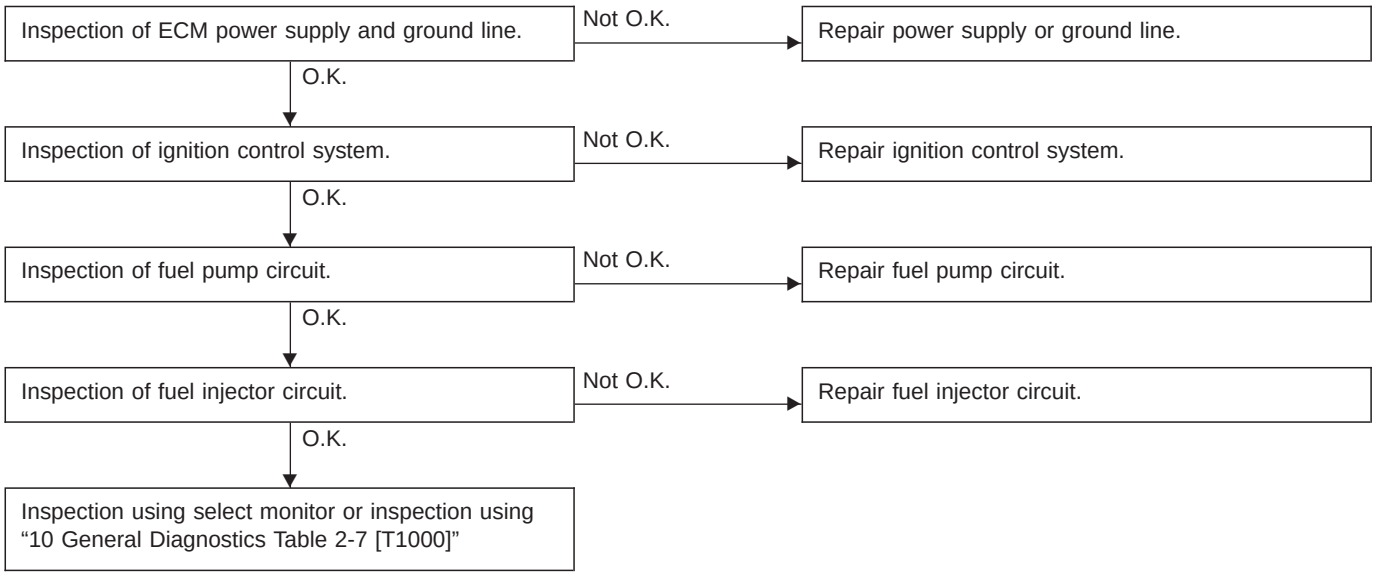
Content		Connector No.	Terminal No.	Signal (V)		Note
				Ig SW ON (Engine OFF)	Engine ON (Idling)	
Ignition control	# 1, # 2	E30	21	0	3.4, max.	—
	# 3, # 4	E30	20	0	3.4, max.	—
Fuel injector	# 1	E30	2	10 — 13	13 — 14	Waveform
	# 2	E30	1	10 — 13	13 — 14	Waveform
	# 3	E30	13	10 — 13	13 — 14	Waveform
	# 4	E30	12	10 — 13	13 — 14	Waveform
Idle air control solenoid valve	OPEN end	E29	2	—	1, max. — 13, min.	Waveform
	CLOSE end	E29	1	—	13, min. — 1, max.	Waveform
Fuel pump relay control		E29	8	ON: 0 OFF: 10 — 13	0	—
A/C relay control		E29	9	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Radiator fan relay 1 control		E29	23	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Radiator fan relay 2 control		E29	7	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Self-shutoff control		E29	18	10 — 13	13 — 14	—
Malfunction indicator lamp		E29	22	—	—	● Light “ON”: 1, or less ● Light “OFF”: 10 — 14
Engine speed output		E29	3	—	0 — 13, min.	Waveform
EGR solenoid valve		E30	18	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Air suction solenoid valve		E31	3	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
FICD solenoid valve		E29	24	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	A/C equipped model
Purge control solenoid valve		E30	19	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Power steering pressure		E30	14	5	5	● Steering wheel turned to extreme end of travel: 0 ● When driving straight forward: 5
Recirculation gas temperature sensor		E31	4	—	—	—
Fuel temperature sensor (California FWD model only)		E31	8	2.5 — 3.8	2.5 — 3.8	Ambient temperature: 25°C (77°F)
Tank pressure control solenoid valve (California FWD model only)		E29	21	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Fuel tank pressure sensor (California FWD model only)	Signal	E31	5	2.3 — 2.7	2.3 — 2.7	The value obtained after the fuel filler cap was removed once and recapped.
	Power supply	E30	15	5	5	—
	GND	E30	11	0	0	—
GND (sensors)		E30	11	0	0	—
GND (injectors)		E29	15	0	0	—
GND (ignition system)		E29	14	0	0	—

Content	Connector No.	Terminal No.	Signal (V)		Note
			Ig SW ON (Engine OFF)	Engine ON (Idling)	
GND (power supply)	E29	25	0	0	—
GND (control systems)	E30	22	0	0	—
Select Monitor Signal	E29	6	—	—	—
	E29	5	—	—	—

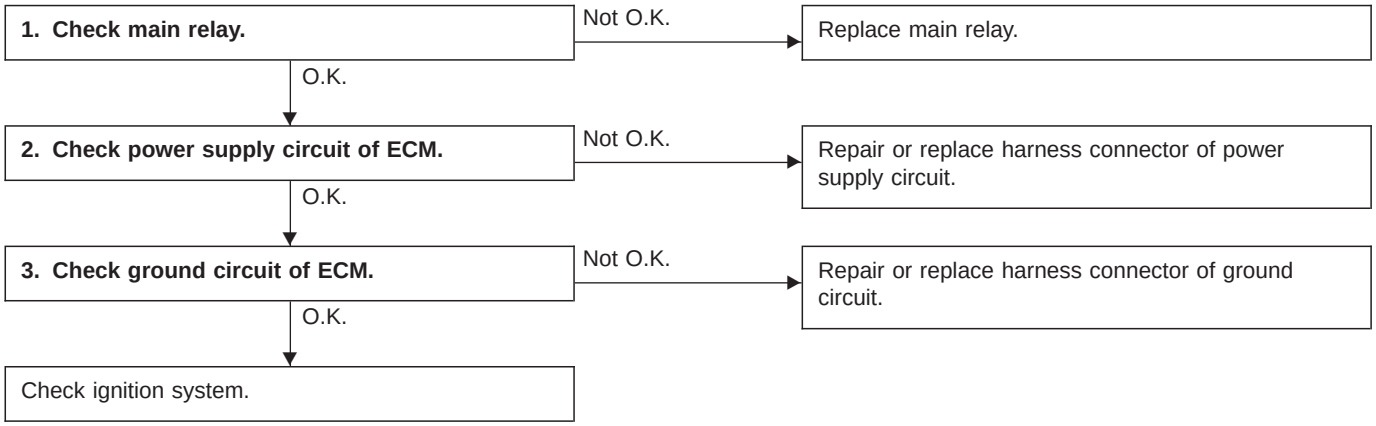
7. Diagnostics Chart for Engine Starting Failure

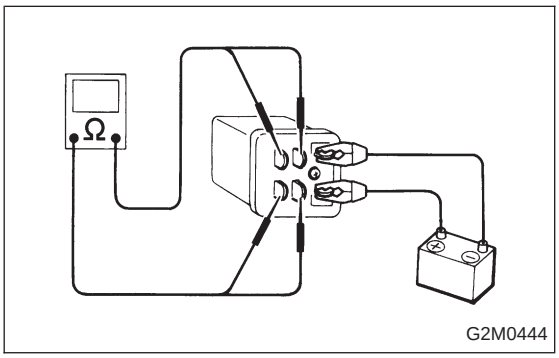
A: BASIC DIAGNOSTICS CHART

When engine cranks but does not start, perform diagnostics in accordance with the following chart.



B: CONTROL UNIT POWER SUPPLY AND GROUND LINE

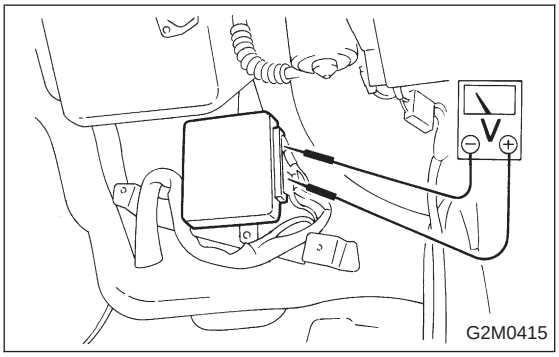




1. CHECK MAIN RELAY.

1) Turn the ignition switch to OFF.
2) Remove main relay.
3) Connect battery to main relay terminals No. 1 and No. 2.
4) Measure resistance between main relay terminals.

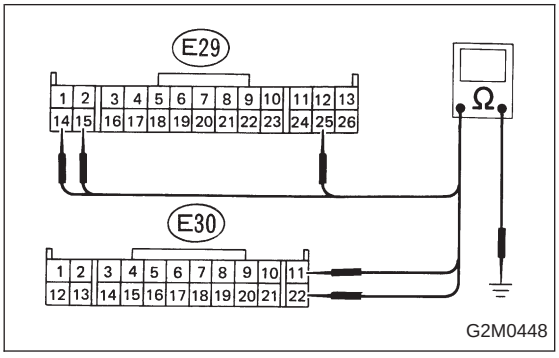
Terminals /Specified resistance:
No. 3 — No. 5/10 Ω, max.
No. 4 — No. 6/10 Ω, max.



2. CHECK POWER SUPPLY CIRCUIT OF ECM.

1) Install main relay.
2) Disconnect connectors from ECM.
3) Turn ignition switch to ON.
4) Measure power supply voltage between ECM connector terminals and body.

Connector & terminal /Specified voltage:
(E29) No. 13 — Body/10 V, min.
(E29) No. 26 — Body/10 V, min.

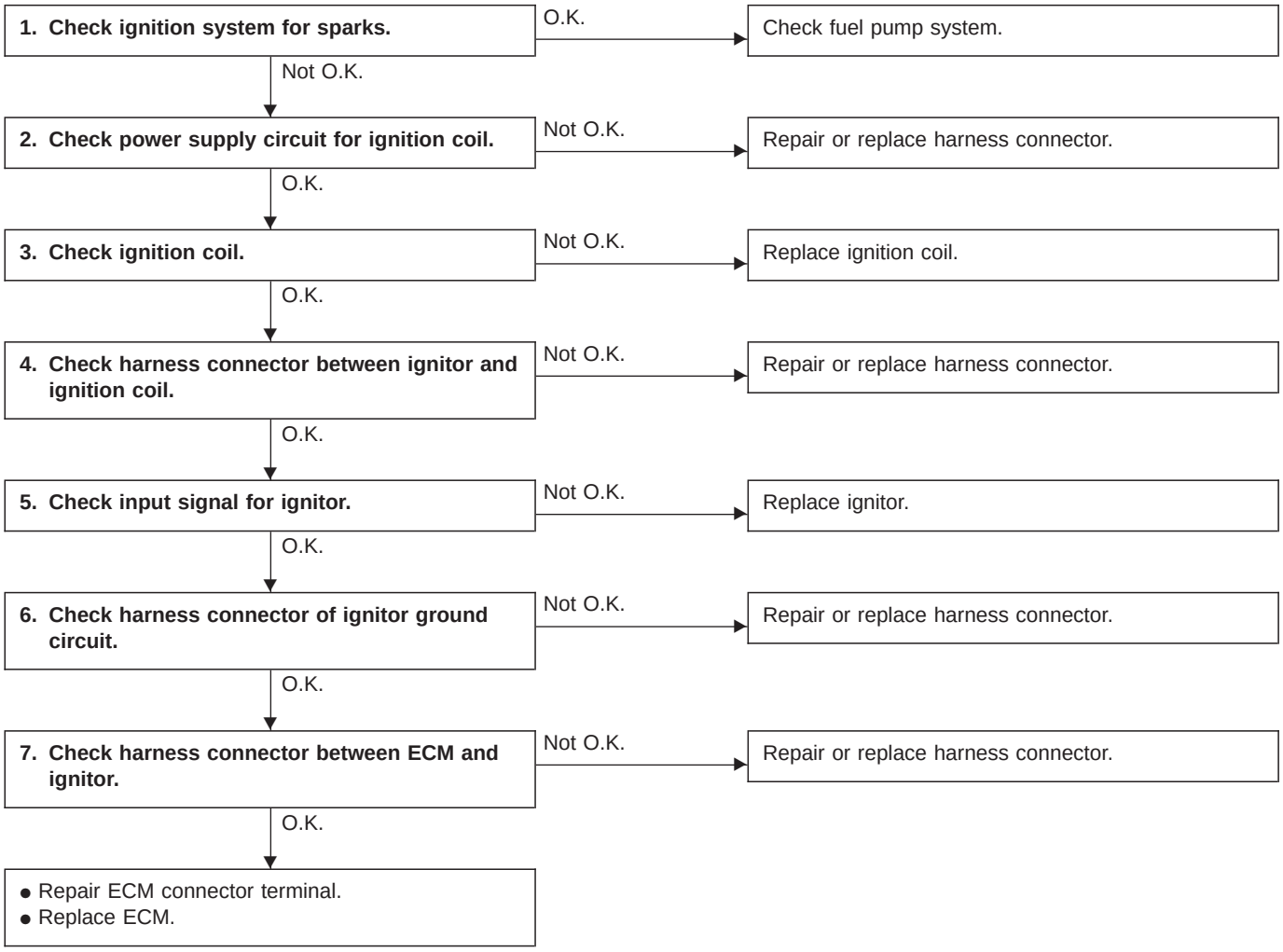


3. CHECK GROUND CIRCUIT OF ECM.

1) Turn ignition switch to OFF.
2) Measure resistance of harness connector between ECM and body.

Connector & terminal /Specified resistance:
(E29) No. 25 — Body/10 Ω, max.
(E29) No. 14 — Body/10 Ω, max.
(E29) No. 15 — Body/10 Ω, max.
(E30) No. 11 — Body/10 Ω, max.
(E30) No. 22 — Body/10 Ω, max.

C: IGNITION CONTROL SYSTEM

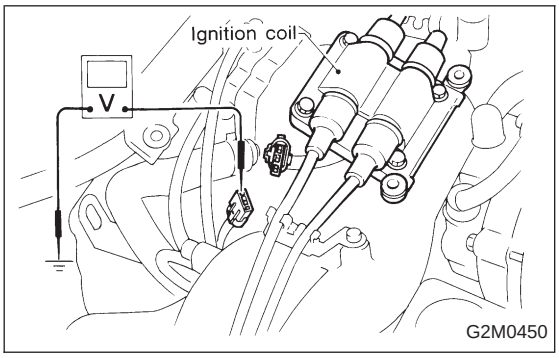


1. CHECK IGNITION SYSTEM FOR SPARKS.

1) Remove plug cord cap from each spark plug.
2) Install new spark plug on plug cord cap.

CAUTION:
Do not remove spark plug from engine.

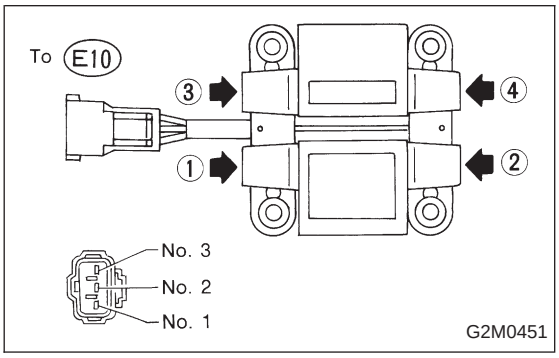
3) Contact spark plug's thread portion on engine.
4) While opening throttle valve fully, crank engine to check that spark occurs at each cylinder.



2. CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL.

1) Turn ignition switch to OFF.
2) Disconnect connector from ignition coil.
3) Turn ignition switch to ON.
4) Measure power supply voltage between ignition coil connector terminal and body.

Connector & terminal /Specified voltage:
(E9) No. 2 — Body/10 V, min.



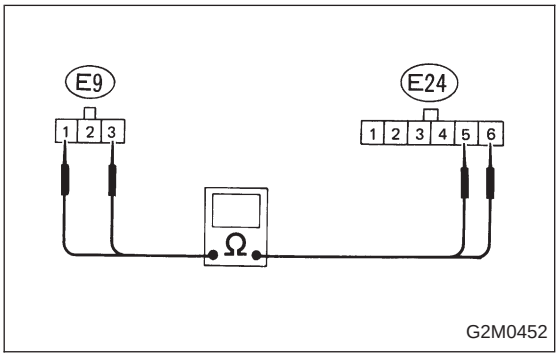
3. CHECK IGNITION COIL.

1) Measure resistance between ignition coil terminals to check primary coil.

Terminals /Specified resistance:
No. 2 — No. 1/0.7 Ω
No. 2 — No. 3/0.7 Ω

2) Measure resistance between spark plug cord contact portions to check secondary coil.

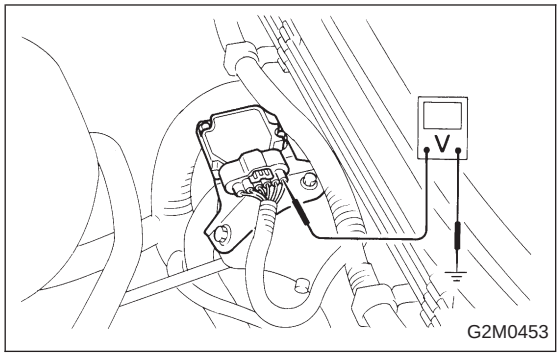
Connector & terminal/Specified resistance:
#1 — #2 /13.8 kΩ
#3 — #4 /13.8 kΩ



4. CHECK HARNESS CONNECTOR BETWEEN IGNITOR AND IGNITION COIL.

1) Turn ignition switch to OFF.
2) Disconnect connector from ignitor.
3) Measure resistance of harness connector between ignition coil and ignitor.

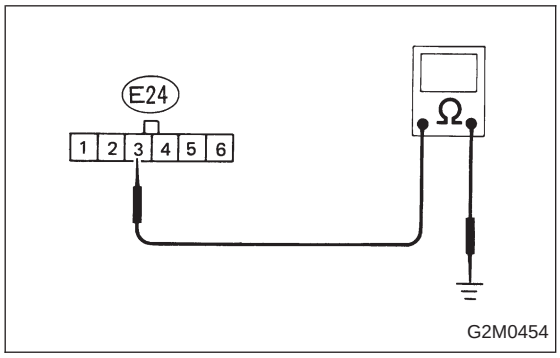
Connector & terminal /Specified resistance:
(E24) No. 5 — (E9) No. 1/10 Ω, max.
(E24) No. 6 — (E9) No. 3/10 Ω, max.



5. CHECK INPUT SIGNAL FOR IGNITOR.

Check if voltage varies synchronously with engine speed when cranking, while monitoring voltage between igniter connector and body.

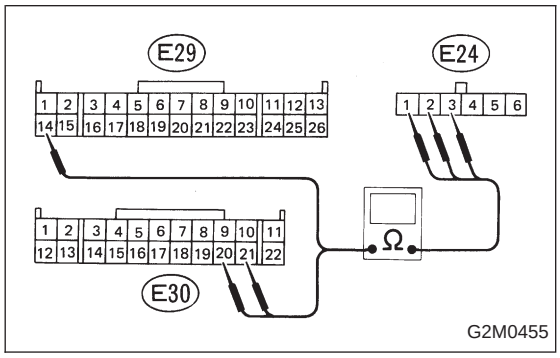
Connector & terminal /Specified voltage:
(E24) No. 1 — Body/0.1 V, min. — 3.4 V, max.
(E24) No. 2 — Body/0.1 V, min. — 3.4 V, max.



6. CHECK HARNESS CONNECTOR OF IGNITOR GROUND CIRCUIT.

1) Turn ignition switch to OFF.
2) Measure resistance between ignitor and body.

Connector & terminal /Specified resistance:
(E24) No. 3 — Body/10 Ω, max.

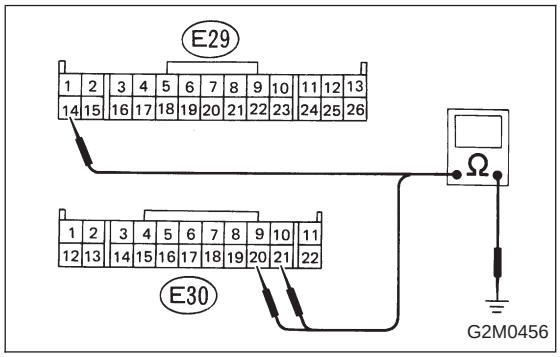


7. CHECK HARNESS CONNECTOR BETWEEN ECM AND IGNITOR.

1) Disconnect connector from ECM.

2) Measure resistance of harness connector between ECM and ignitor.

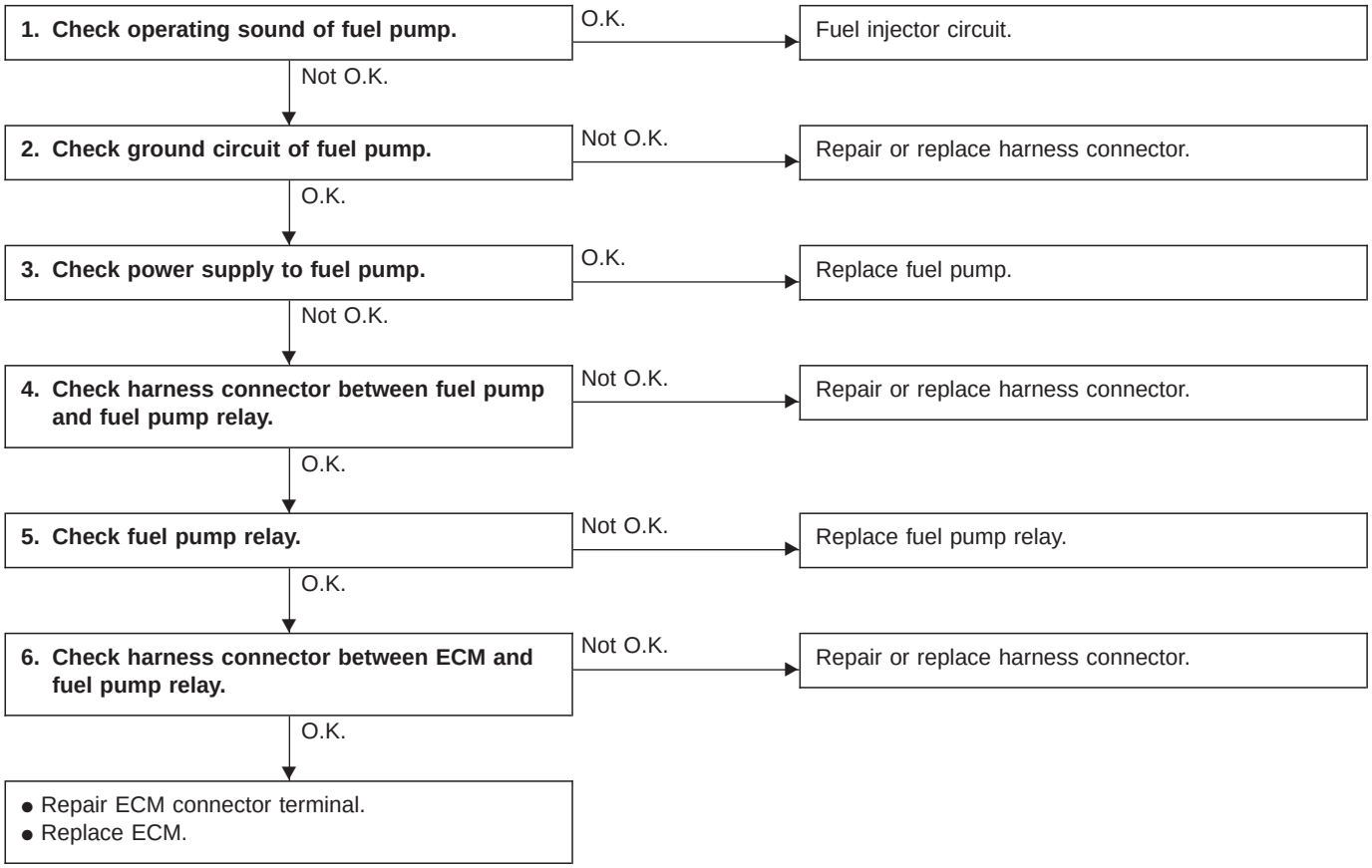
Connector & terminal /Specified resistance:
(E30) No. 20 — (E24) No. 1/10 Ω, max.
(E30) No. 21 — (E24) No. 2/10 Ω, max.
(E29) No. 14 — (E24) No. 3/10 Ω, max.



3) Measure resistance of harness connector between ECM and body to make sure that circuit does not short.

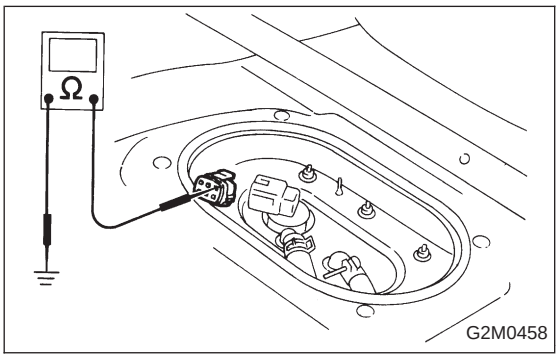
Connector & terminal /Specified resistance:
(E30) No. 20 — Body/1 MΩ, min.
(E30) No. 4 — Body/1 MΩ, min.
(E29) No. 14 — Body/1 MΩ, min.

D: FUEL PUMP CIRCUIT



1. CHECK OPERATING SOUND OF FUEL PUMP.

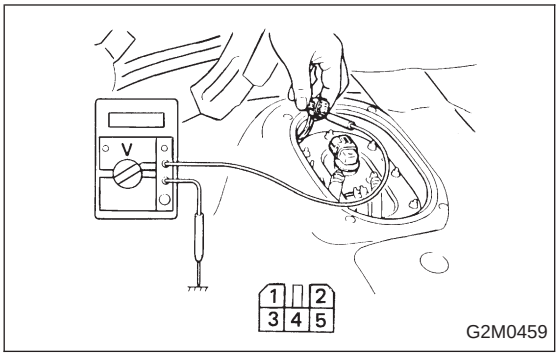
Make sure that fuel pump is in operation for two seconds when turning ignition switch to ON.



2. CHECK GROUND CIRCUIT OF FUEL PUMP.

1) Turn ignition switch to OFF.
2) Disconnect connector from fuel pump.
3) Measure resistance of harness connector between fuel pump and body.

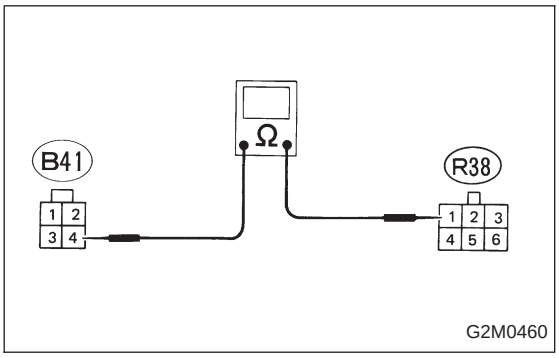
Connector & terminal /Specified resistance:
(R38) No. 3 — Body/10 Ω, max.



3. CHECK POWER SUPPLY TO FUEL PUMP.

1) Turn ignition switch to ON.
2) Measure voltage of power supply circuit between fuel pump connector and body.

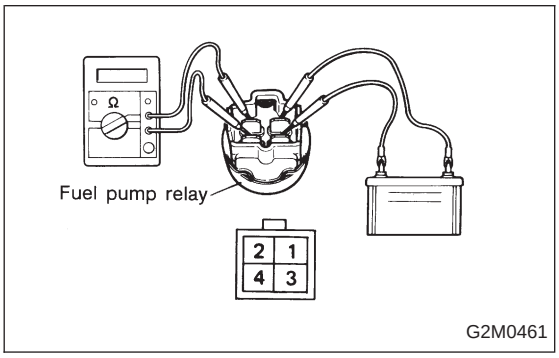
Connector & terminal /Specified voltage:
(R38) No. 1 — Body/10 V, min.



4. CHECK HARNESS CONNECTOR BETWEEN FUEL PUMP AND FUEL PUMP RELAY.

1) Turn ignition switch to OFF.
2) Measure resistance of harness connector between fuel pump and fuel pump relay.

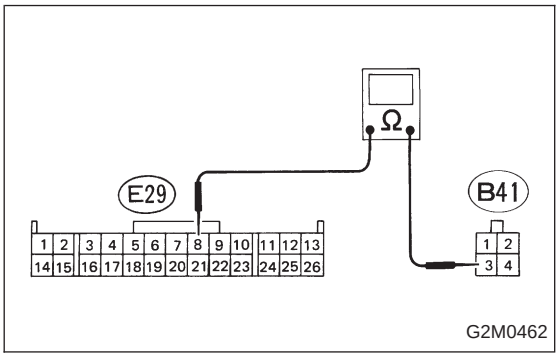
Connector & terminal /Specified resistance:
(R38) No. 1 — (B41) No. 4/10 Ω, max.



5. CHECK FUEL PUMP RELAY.

1) Disconnect connectors from fuel pump relay and main relay.
2) Remove fuel pump relay and main relay with bracket.
3) Connect battery to fuel pump relay connector terminals No. 1 and No. 3.
4) Measure resistance between connector terminals of fuel pump relay.

Terminals /Specified resistance:
No. 2 — No. 4/10 Ω, max.

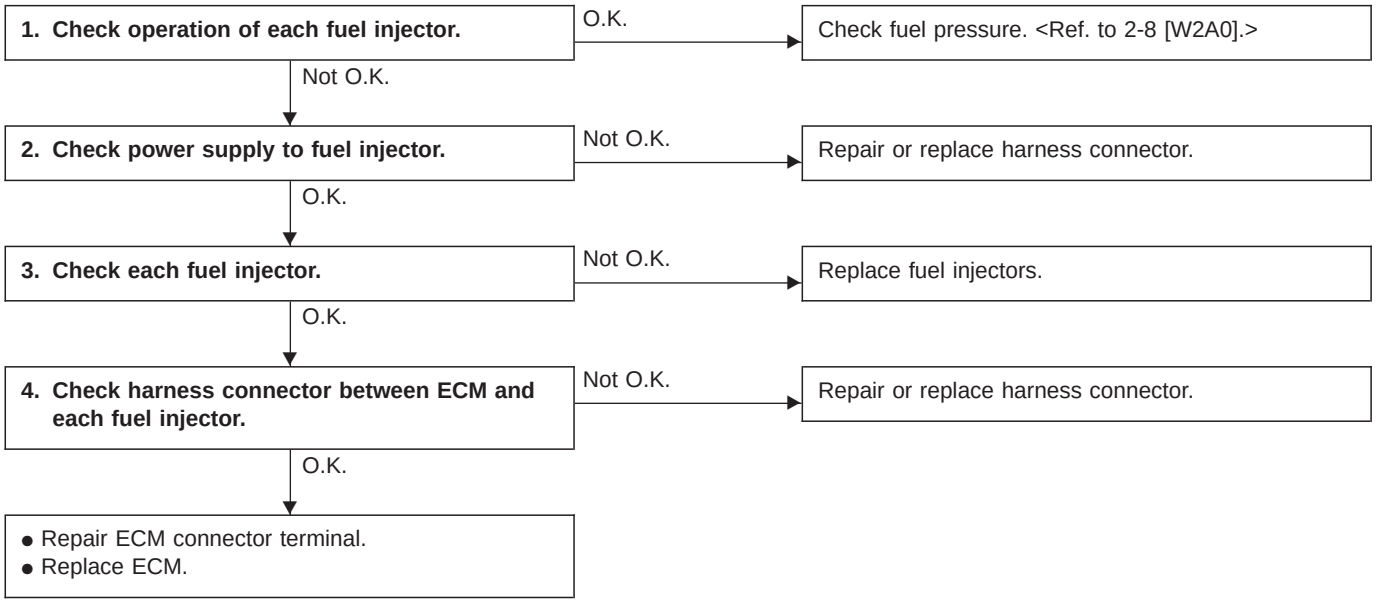


6. CHECK HARNESS CONNECTOR BETWEEN ECM AND FUEL PUMP RELAY.

1) Disconnect connectors from ECM.
2) Measure resistance of harness connector between ECM and fuel pump relay.

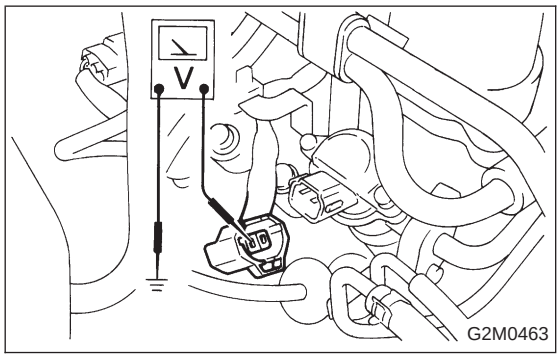
Connector & terminal /Specified resistance:
(E29) No. 8 — (B41) No. 3/10 Ω, max.

E: FUEL INJECTOR CIRCUIT



1. CHECK OPERATION OF EACH FUEL INJECTOR.

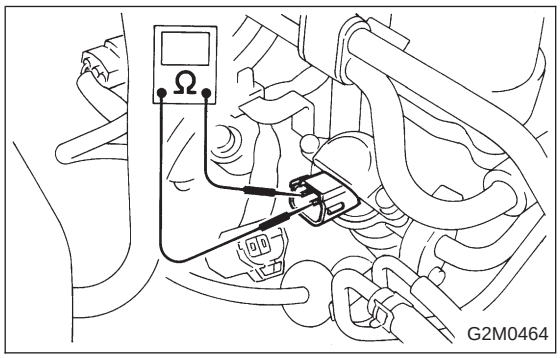
While cranking the engine, check that each fuel injector emits “operating” sound. Use a sound scope or attach a screwdriver to injector for this check.



2. CHECK POWER SUPPLY TO FUEL INJECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from each injector.
3) Turn ignition switch to ON.
4) Measure voltage between each fuel injector connector terminal and body.

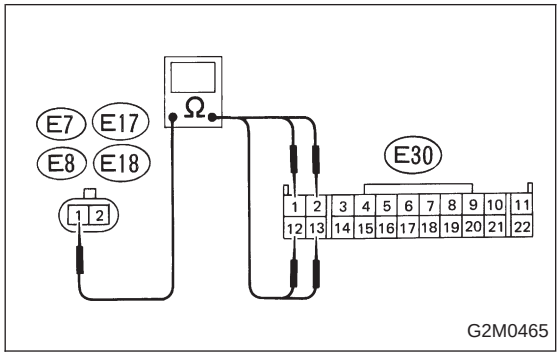
Connector & terminal /Specified voltage:
#1 (E7) No. 2 — Body /10 V, min.
#2 (E17) No. 2 — Body/10 V, min.
#3 (E8) No. 2 — Body /10 V, min.
#4 (E18) No. 2 — Body/10 V, min.



3. CHECK EACH FUEL INJECTOR.

Measure resistance between fuel injector terminals.

Terminals /Specified resistance:
No. 1 — No. 2/11 — 12 Ω



4. CHECK HARNESS CONNECTOR BETWEEN ECM AND EACH FUEL INJECTOR.

1) Disconnect connector from ECM.
2) Measure resistance of harness connector between ECM and each fuel injector.

Connector & terminal /Specified resistance:
(E30) No. 2 — (E7) No. 1 /10 Ω, max.
(E30) No. 1 — (E17) No. 1 /10 Ω, max.
(E30) No. 13 — (E8) No. 1 /10 Ω, max.
(E30) No. 12 — (E18) No. 1 /10 Ω, max.

8. Diagnostics Chart with Trouble Code

A: TROUBLE CODE

Trouble code	Item	Contents of diagnosis	Page
11	Crankshaft position sensor	● No signal entered from crankshaft position sensor, but signal entered from camshaft position sensor. ● The harness connector between ECM and crankshaft position sensor is in short or open.	33
12	Starter switch	● The starter switch signal is abnormal. ● The harness connector between ECM and starter switch is in short or open.	35
13	Camshaft position sensor	● No signal entered from camshaft position sensor, but signal entered from crankshaft position sensor. ● The harness connector between ECM and camshaft position sensor is in short or open.	37
14	Fuel injector #1	● The fuel injector is not in function. ● The harness connector between ECM and each fuel injector is in short or open.	39
15	Fuel injector #2		
16	Fuel injector #3		
17	Fuel injector #4		
21	Engine coolant temperature sensor	● The engine coolant temperature sensor signal is abnormal. ● The harness connector between ECM and engine coolant temperature sensor is in short or open.	41
23	Mass air flow sensor	● The mass air flow sensor signal is abnormal. ● The harness connector between ECM and mass air flow sensor is in short or open.	43
24	Idle air control solenoid valve	● The idle air control solenoid valve is not in function. ● The harness connector between ECM and idle air control solenoid valve is in short or open.	45
31	Throttle position sensor	● The throttle position sensor signal is abnormal. ● The throttle position sensor is installed abnormally. ● The harness connector between ECM and throttle position sensor is in short or open.	47
32	Oxygen sensor	● The oxygen sensor is not in function. ● The harness connector between ECM and oxygen sensor is in short or open.	50
33	Vehicle speed sensor 2	● The vehicle speed sensor 2 is not in function. ● The harness connector between ECM and vehicle speed sensor 2 is in short or open.	52
34	EGR solenoid valve	● The EGR solenoid valve is not in function. ● The harness connector between ECM and EGR solenoid valve is in short or open.	54
35	Purge control solenoid valve	● The purge control solenoid valve is not in function. ● The harness connector between ECM and purge control solenoid valve is in short or open.	56
36	Air suction solenoid valve	● The air suction solenoid valve is not in function. ● The harness connector between ECM and air suction solenoid valve is in short or open.	58
41	A/F (air/fuel) learning control	● Faulty leaning control function	60
51	Neutral position switch (MT)	● The neutral position switch signal is abnormal. ● The harness connector between ECM and neutral position switch is in short or open.	61
	Inhibitor switch (AT)	● The park/neutral position signal is abnormal. ● The shift cable is connected abnormally. ● The harness connector between ECM and inhibitor switch is in short or open.	63
55	Recirculation gas temperature sensor	● The recirculation gas temperature sensor is not in function. ● The harness connector between ECM and recirculation gas temperature sensor is in short or open.	65
56	EGR system	● Faulty EGR system function	66
61	Fuel tank pressure control solenoid valve (California FWD model only)	● The fuel tank pressure control solenoid valve is not in function. ● The harness connector between ECM and fuel tank pressure control solenoid valve is in short or open.	67

Trouble code	Item	Contents of diagnosis	Page
62	Fuel temperature sensor (California FWD model only)	● The fuel temperature sensor signal is abnormal. ● The harness connector between ECM and fuel temperature sensor is in short or open.	71
63	Fuel tank pressure sensor (California FWD model only)	● The fuel tank pressure sensor signal is abnormal. ● The harness connector between ECM and fuel tank pressure sensor is in short or open.	75

B: TROUBLE CODE (11)

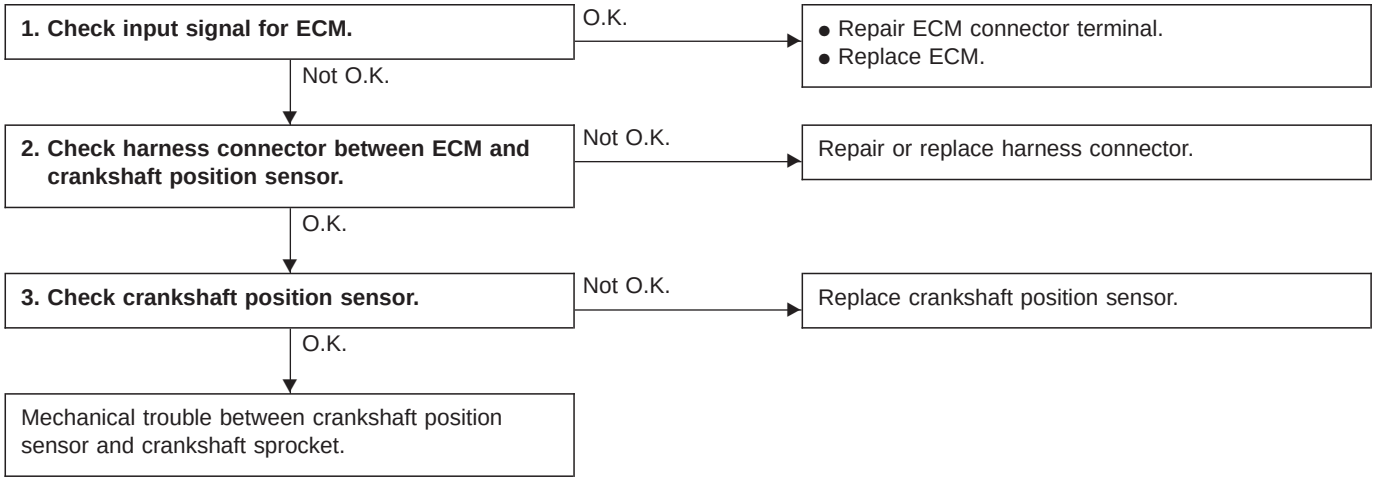
— CRANKSHAFT POSITION SENSOR —

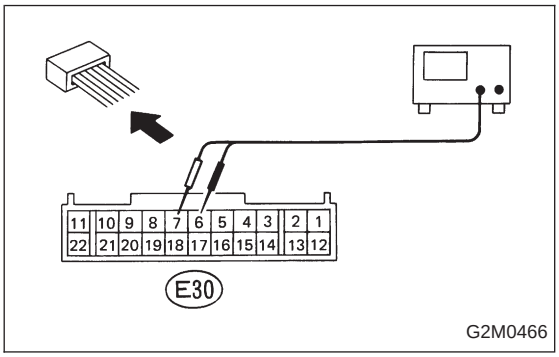
DIAGNOSIS:

- No signal entered from crankshaft position sensor, but signal entered from camshaft position sensor.
- The harness connector between ECM and crankshaft position sensor is in short or open.

TROUBLE SYMPTOM:

- Engine stalls.
- Restarting impossible

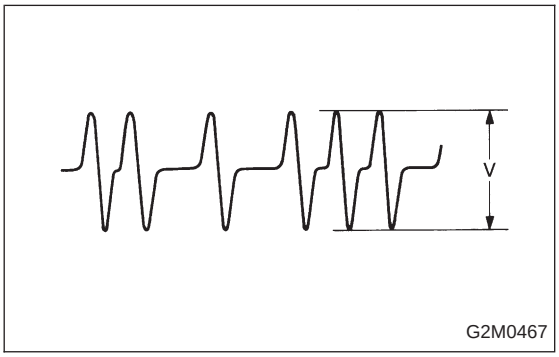




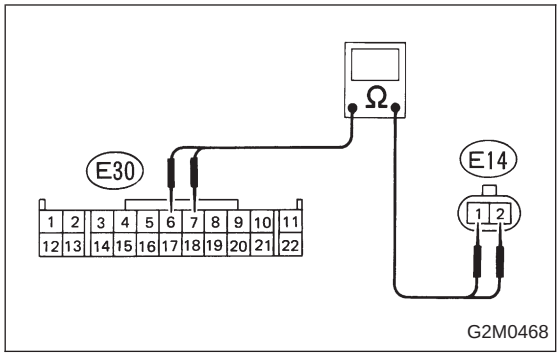
1. CHECK INPUT SIGNAL FOR ECM.

1) Set the positive (+) probe and earth lead of oscilloscope at ECM connector terminals.

Connector & terminal / (E30) No. 6 — (E30) No. 7



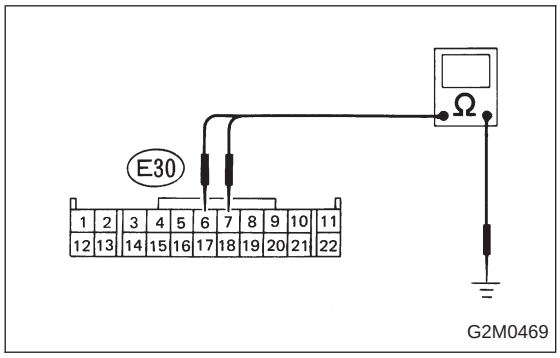
2) Measure signal voltage indicated on oscilloscope while cranking the engine.



2. CHECK HARNESS CONNECTOR BETWEEN ECM AND CRANKSHAFT POSITION SENSOR.

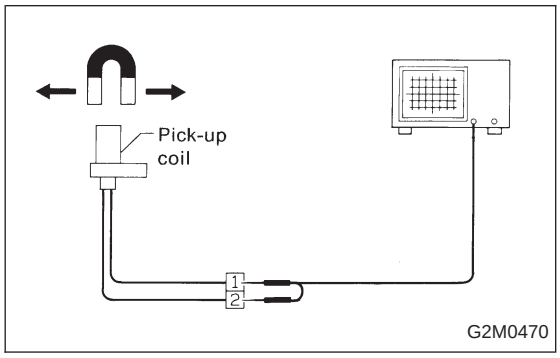
1) Turn ignition switch to OFF.
2) Disconnect connectors from ECM and crankshaft position sensor.
3) Measure resistance of harness connector between ECM and crankshaft position sensor.

Connector & terminal /Specified resistance:
(E30) No. 6 — (E14) No. 1 /10 Ω, max.
(E30) No. 7 — (E14) No. 2 /10 Ω, max.



4) Measure resistance of harness connector between ECM and body to make sure that circuit does not short.

Connector & terminal /Specified resistance:
(E30) No. 6 — Body /1 MΩ, min.
(E30) No. 7 — Body /1 MΩ, min.
(E30) No. 11 — Body/1 MΩ, min.



3. CHECK CRANKSHAFT POSITION SENSOR.

1) Remove crankshaft position sensor.
2) Set the position (+) probe at sensor connector terminal No. 1, and set earth lead at terminal No. 2.
3) Check that a wave profile appears crossing a magnet near the pick-up coil of crankshaft position sensor.

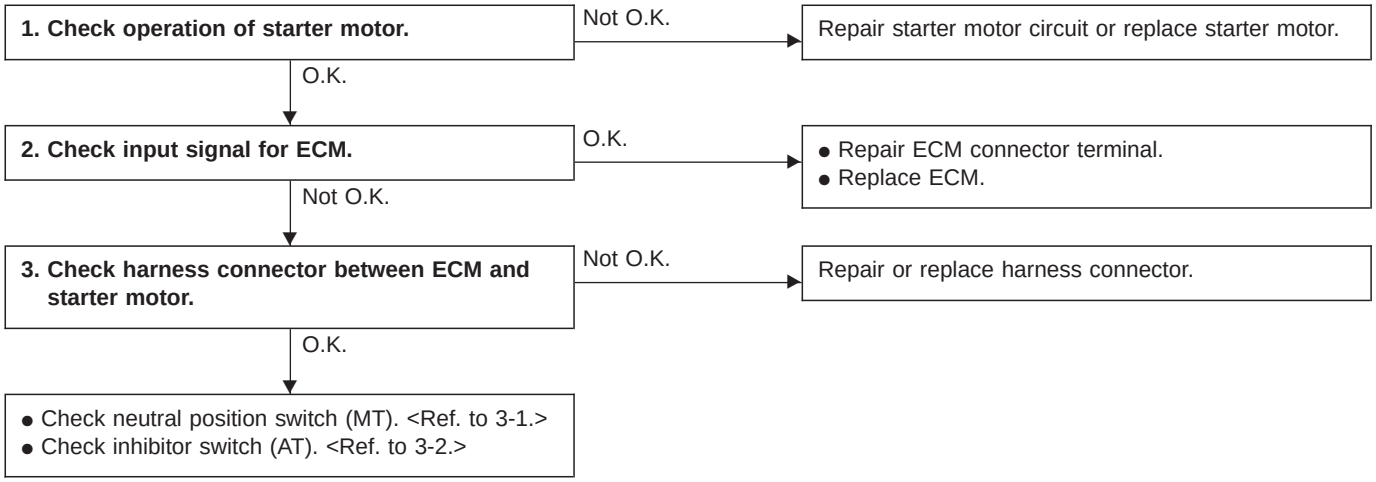
C: TROUBLE CODE (12) — STARTER SWITCH —

DIAGNOSIS:

- The starter switch signal is abnormal.
- The harness connector between ECM and starter switch is in short or open.

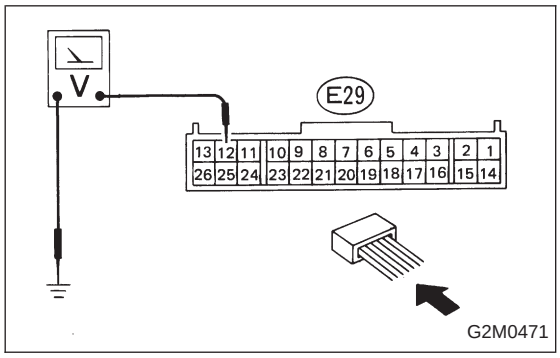
TROUBLE SYMPTOM:

- Failure of engine to start



1. CHECK OPERATION OF STARTER MOTOR.

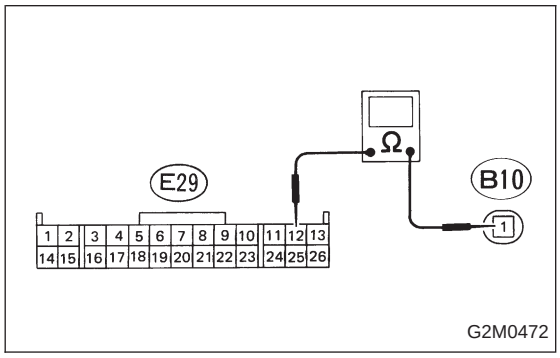
Turn ignition switch to “ST” to ensure that starter motor functions.



2. CHECK INPUT SIGNAL FOR ECM.

Measure voltage between ECM and body while cranking the engine.

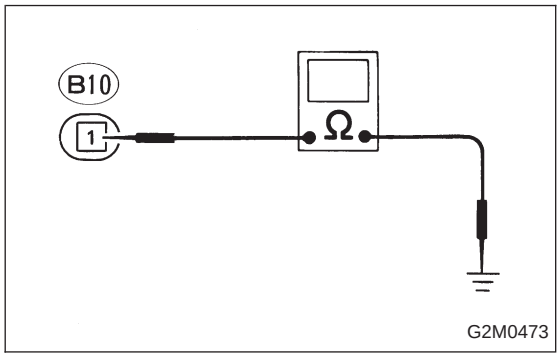
Connector & terminal /Specified voltage:
(E29) No. 12 — Body/13 — 14 V



3. CHECK HARNESS CONNECTOR BETWEEN ECM AND STARTER MOTOR.

1) Turn ignition switch to OFF.
2) Disconnect connectors from ECM and starter motor.
3) Measure resistance of harness connector between ECM and starter motor.

Connector & terminal /Specified resistance:
(E29) No. 12 — (B10) No. 1/0 Ω



4) Measure resistance of harness connector between starter motor and body to make sure that circuit does not short.

Connector & terminal /Specified resistance:
(B10) No. 1 — Body/1 MΩ, min.

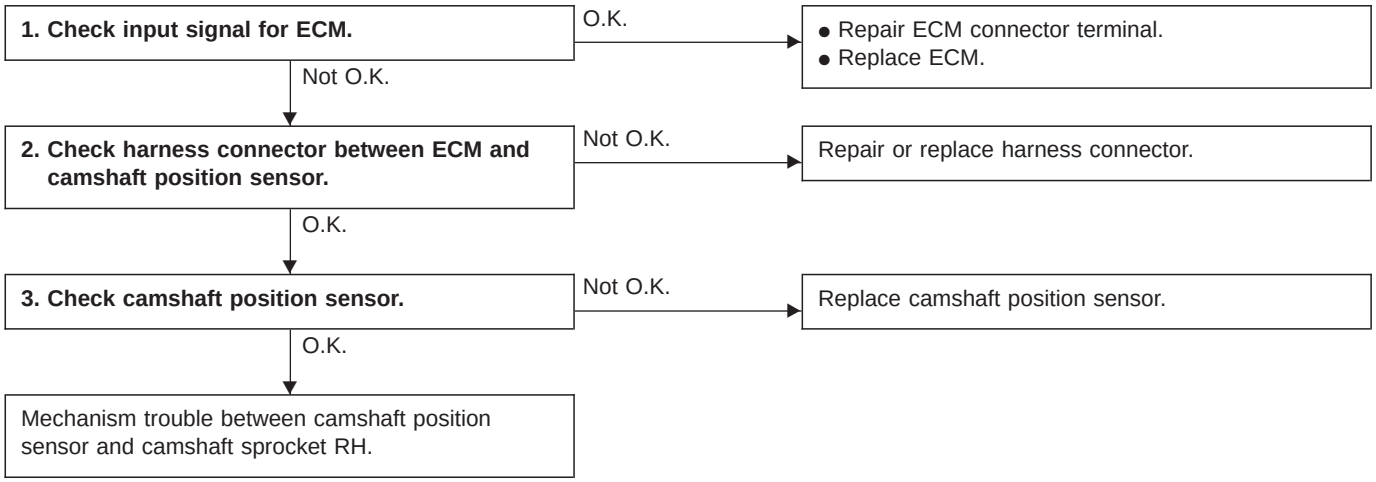
D: TROUBLE CODE (13) — CAMSHAFT POSITION SENSOR —

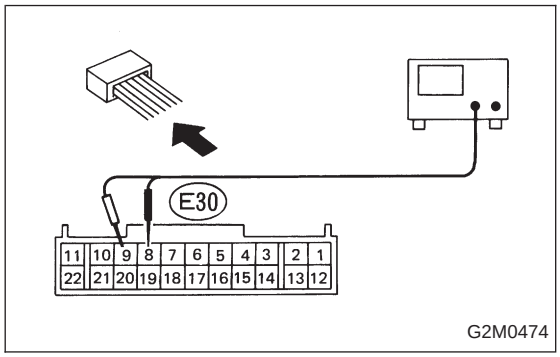
DIAGNOSIS:

- No signal entered from camshaft position sensor, but signal entered from crankshaft position sensor.
- The harness connector between ECM and camshaft position sensor is short or open.

TROUBLE SYMPTOM:

- Engine stalls
- Failure of engine to start

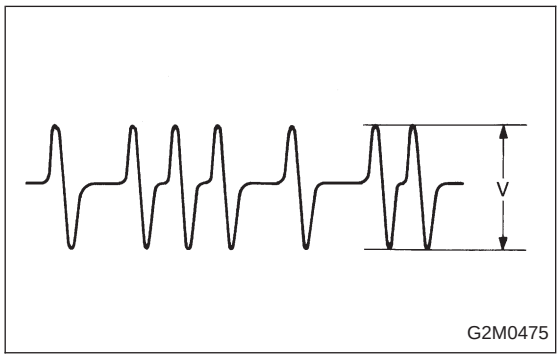




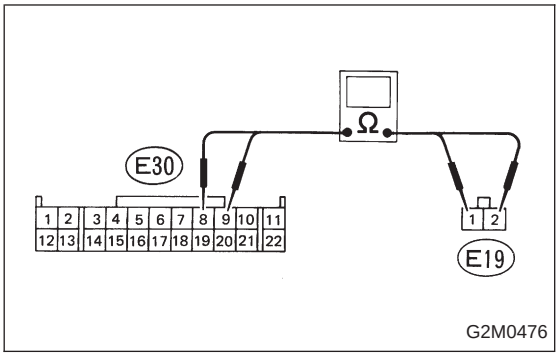
1. CHECK INPUT SIGNAL FOR ECM.

1) Set the positive (+) probe and earth lead of oscilloscope at ECM connector terminals.

Connector & terminal / (E30) No. 8 — (E30) No. 9



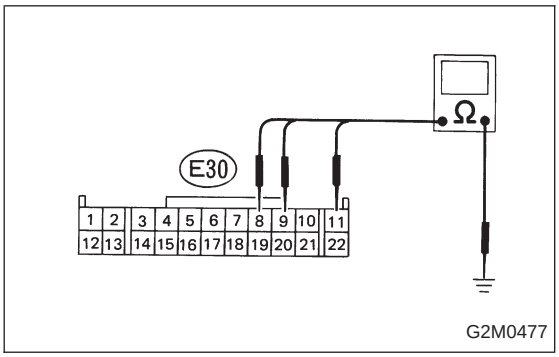
2) Measure signal voltage indicated on oscilloscope, while cranking the engine.



2. CHECK HARNESS CONNECTOR BETWEEN ECM AND CAMSHAFT POSITION SENSOR.

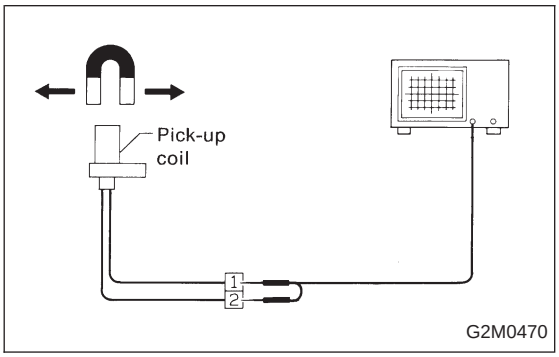
1) Turn ignition switch to OFF.
2) Disconnect connectors from ECM and camshaft position sensor.
3) Measure resistance of harness connector between ECM and camshaft position sensor.

Connector & terminal /Specified resistance:
(E30) No. 8 — (E19) No. 1 /10 Ω, max.
(E30) No. 9 — (E19) No. 2 /10 Ω, max.



4) Measure resistance of harness connector between ECM and body to make sure that circuit does not short.

Connector & terminal /Specified resistance:
(E30) No. 8 — Body /1 MΩ, min.
(E30) No. 9 — Body /1 MΩ, min.
(E30) No. 11 — Body/1 MΩ, min.



3. CHECK CAMSHAFT POSITION SENSOR.

1) Remove camshaft position sensor.
2) Set the position (+) probe at sensor connector terminal No. 1, and set earth lead at terminal No. 2.
3) Check that a wave profile appears crossing a magnet near the pick-up coil of crankshaft position sensor.

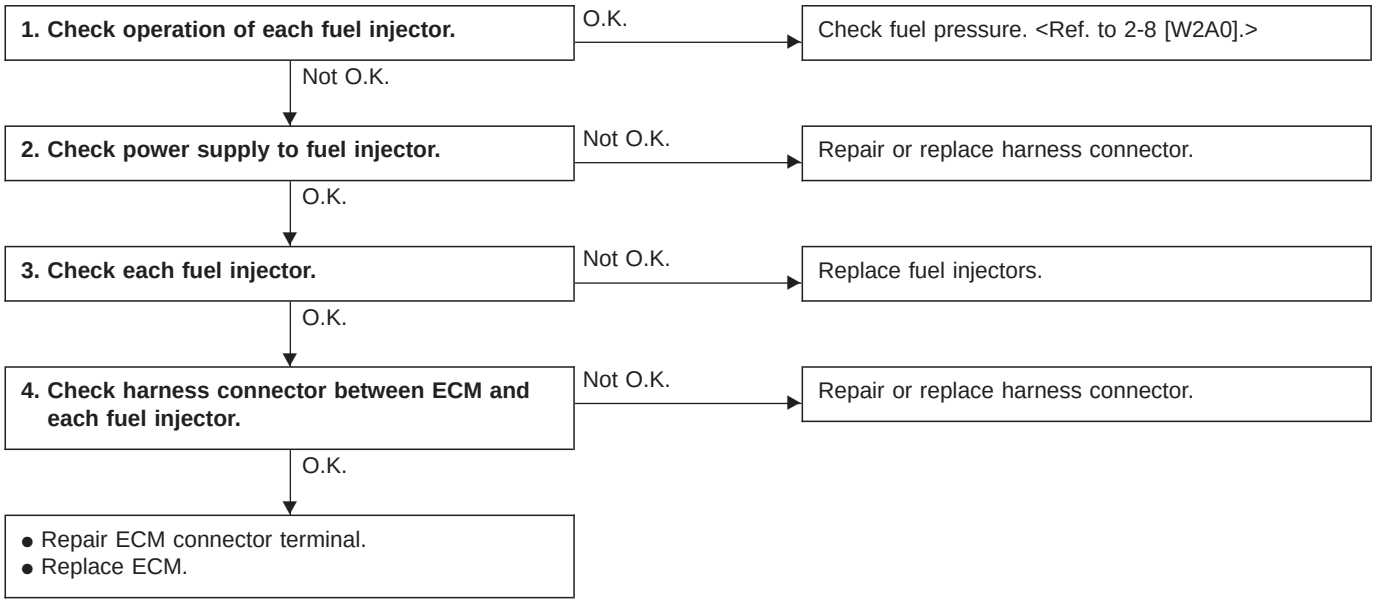
E: TROUBLE CODE 14, 15, 16, 17 — FUEL INJECTOR —

DIAGNOSIS:

- The fuel injector is not in function.
- The harness connector between ECM and each fuel injection is in short or open.

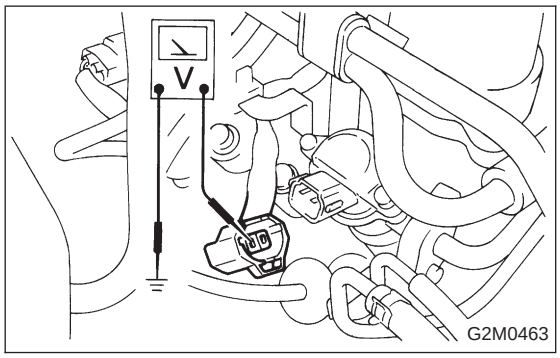
TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling
- Rough driving



1. CHECK OPERATION OF EACH FUEL INJECTOR.

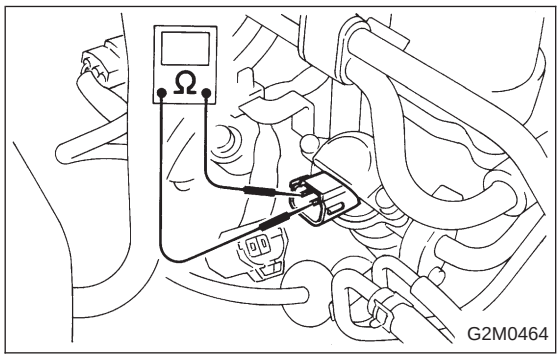
While cranking the engine, check that each fuel injector emits “operating” sound. Use a sound scope or attach a screwdriver to injector for this check.



2. CHECK POWER SUPPLY TO FUEL INJECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from each injector.
3) Turn ignition switch to ON.
4) Measure voltage between each injector connector terminal and body.

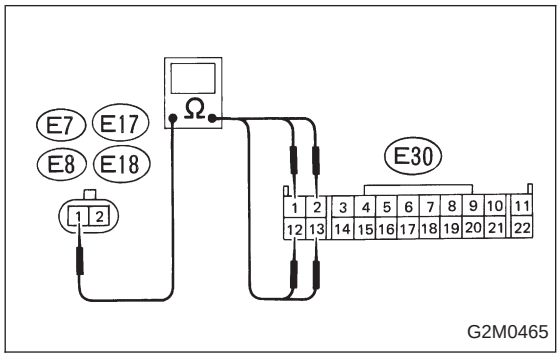
Connector & terminal /Specified voltage:
#1 (E7) No. 2 — Body /10 V, min.
#2 (E17) No. 2 — Body/10 V, min.
#3 (E8) No. 2 — Body /10 V, min.
#4 (E18) No. 2 — Body/10 V, min.



3. CHECK EACH FUEL INJECTOR.

Measure resistance between fuel injector terminals.

Terminals /Specified resistance:
No. 1 — No. 2/11 — 12 Ω



4. CHECK HARNESS CONNECTOR BETWEEN ECM AND EACH FUEL INJECTOR.

1) Disconnect connector from ECM.
2) Measure resistance of harness connector between ECM connector and each fuel injector.

Connector & terminal /Specified resistance:
(E30) No. 2 — (E7) No. 1 /10 Ω, max.
(E30) No. 1 — (E17) No. 1 /10 Ω, max.
(E30) No. 13 — (E8) No. 1 /10 Ω, max.
(E30) No. 12 — (E18) No. 1/10 Ω, max.

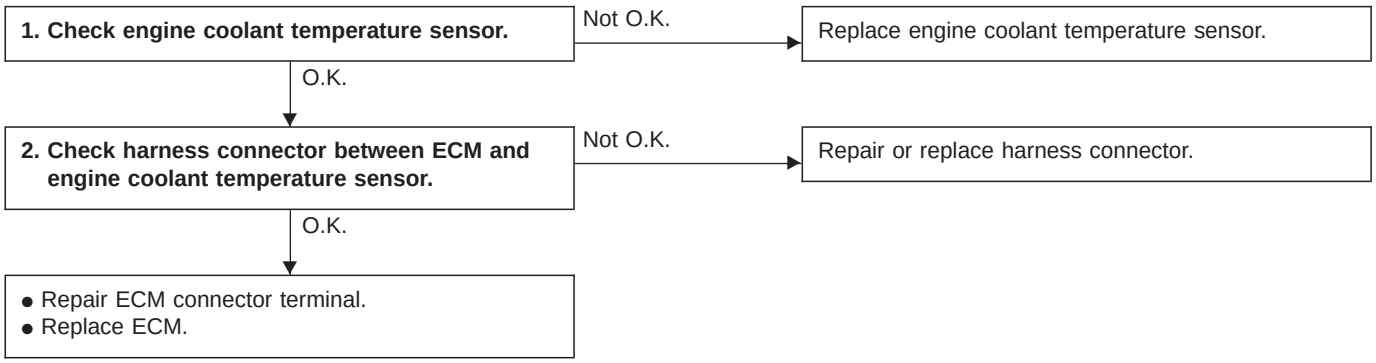
F: TROUBLE CODE (21) — ENGINE COOLANT TEMPERATURE SENSOR —

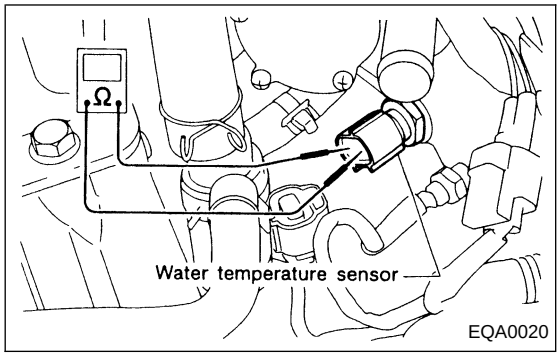
DIAGNOSIS:

- The engine coolant temperature sensor signal is abnormal.
- The harness connector between ECM and engine coolant temperature sensor is in short or open.

TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

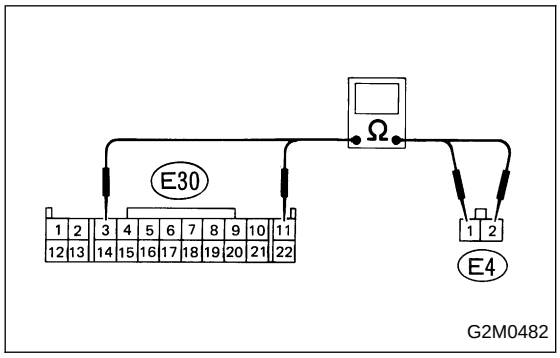




1. CHECK ENGINE COOLANT TEMPERATURE SENSOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from engine coolant temperature sensor.
3) Measure resistance between engine coolant temperature sensor terminals.

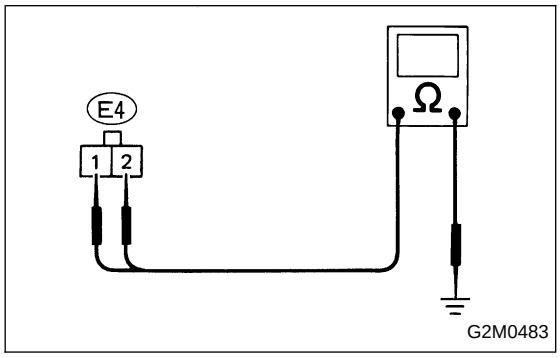
Terminals /Specified resistance:
No. 1 — No. 2/2.0 — 3.0 kΩ at 20°C (68°F)
No. 1 — No. 2/270 — 370 Ω at 80°C (176°F)



2. CHECK HARNESS CONNECTOR BETWEEN ECM AND ENGINE COOLANT TEMPERATURE SENSOR.

1) Disconnect connector from ECM.
2) Measure resistance of harness connector between ECM and engine coolant temperature connector.

Connector & terminal /Specified resistance:
(E30) No. 3 — (E4) No. 1 /10 Ω, max.
(E30) No. 11 — (E4) No. 2/10 Ω, max.



3) Measure resistance of harness connector between engine coolant temperature sensor and body to make sure that circuit does not short.

Connector & terminal /Specified resistance:
(E4) No. 1 — Body/1 MΩ, min.
(E4) No. 2 — Body/1 MΩ, min.

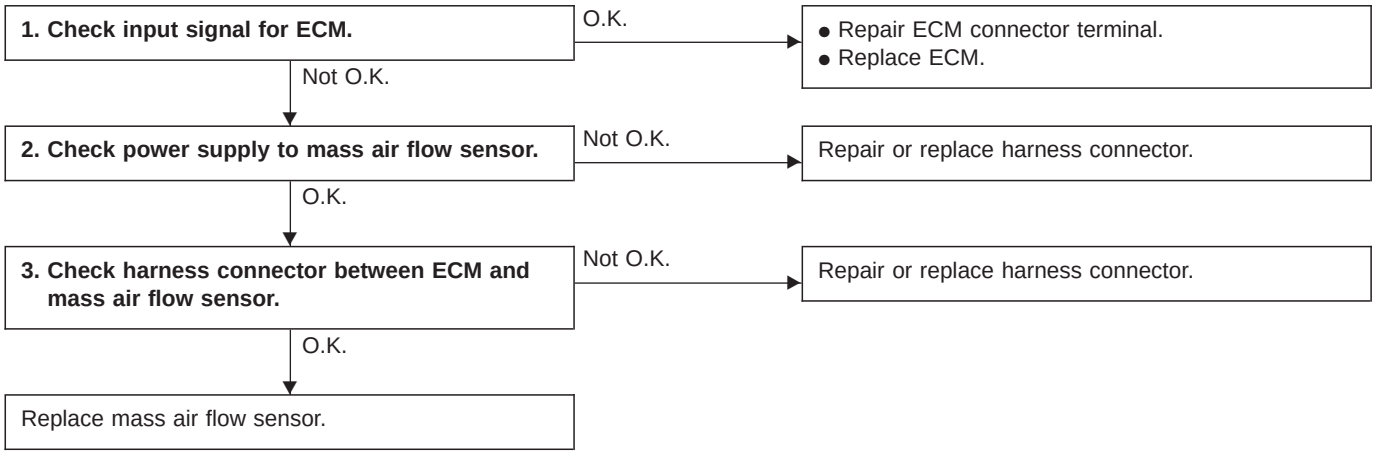
G: TROUBLE CODE (23) — MASS AIR FLOW SENSOR —

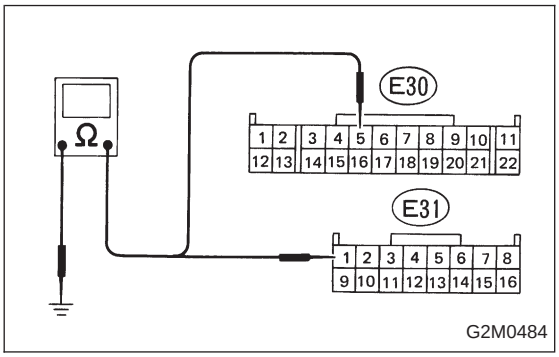
DIAGNOSIS:

- The mass air flow sensor signal is abnormal.
- The harness connector between ECM and mass air flow sensor is in short or open.

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance





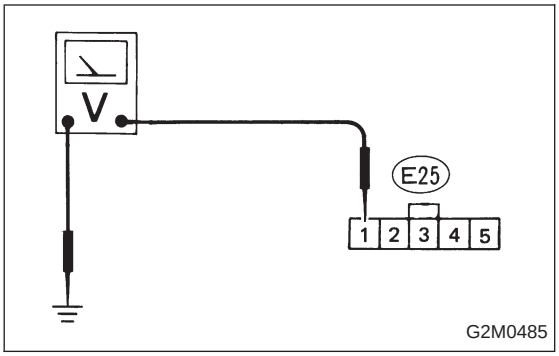
1. CHECK INPUT SIGNAL FOR ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and body.

Connector & terminal /Specified voltage:
(E30) No. 5 — Body/0 — 0.3 V
(E31) No. 1 — Body/0 V

3) Start engine, and idle it.
4) Measure voltage between ECM and body while engine is idling.

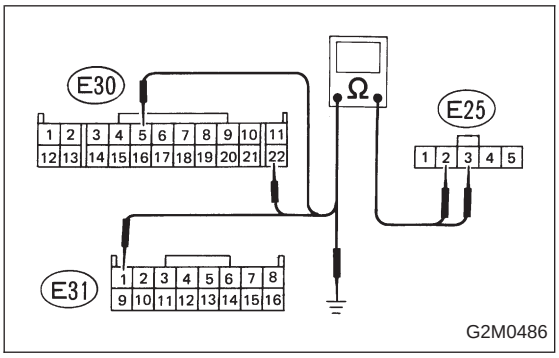
Connector & terminal /Specified voltage:
(E30) No. 5 — Body/0.8 — 1.2 V
(E31) No. 1 — Body/0 V



2. CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from mass air flow sensor.
3) Turn ignition switch to ON.
4) Measure voltage between mass air flow sensor connector and body.

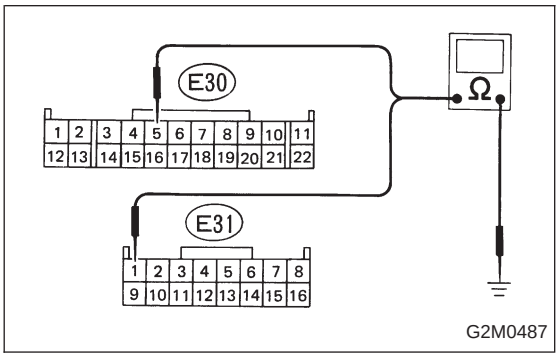
Connector & terminal /Specified voltage:
(E25) No. 1 — Body/10 — 13 V



3. CHECK HARNESS CONNECTOR BETWEEN ECM AND MASS AIR FLOW SENSOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Measure resistance of harness connector between ECM and mass air flow sensor.

Connector & terminal /Specified resistance:
(E30) No. 5 — (E25) No. 2 /10 Ω, max.
(E30) No. 22 — (E25) No. 3 /10 Ω, max.
(E25) No. 3 — Body /10 Ω, max.



4) Measure resistance of harness connector between ECM and body to make sure that circuit does not short.

Connector & terminal /Specified resistance:
(E30) No. 5 — Body/1 MΩ, min.
(E31) No. 1 — Body/1 MΩ, min.

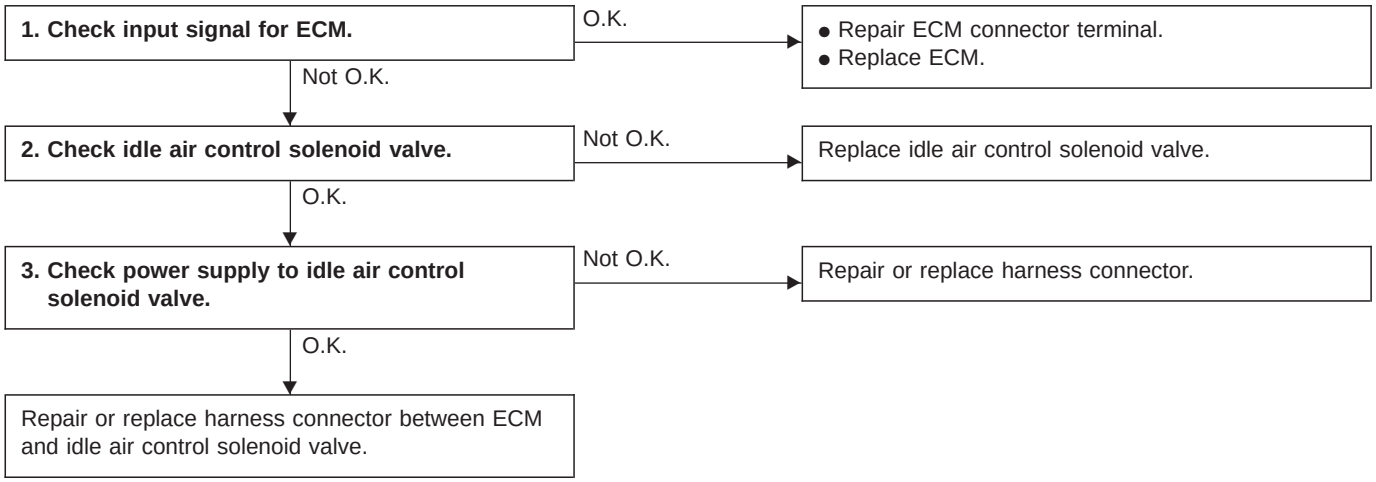
H: TROUBLE CODE (24) — IDLE AIR CONTROL SOLENOID VALVE —

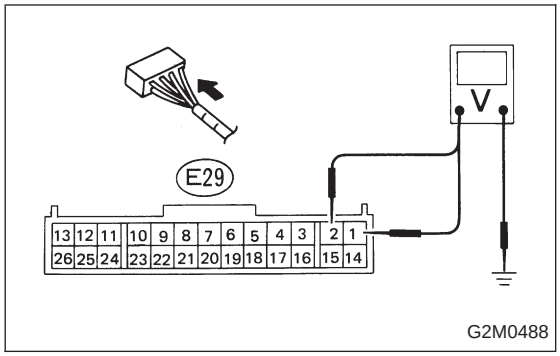
DIAGNOSIS:

- The idle air control solenoid valve is not in function.
- The harness connector between ECM and idle air control solenoid valve is in short or open.

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Engine breathing

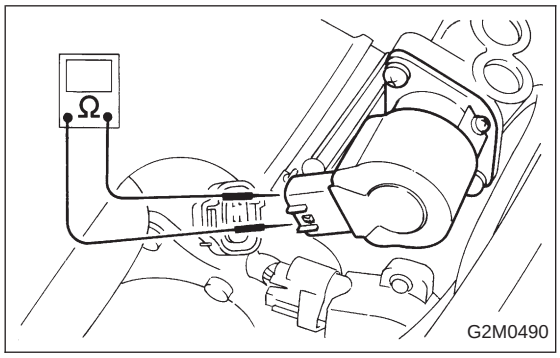




1. CHECK INPUT SIGNAL FOR ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and body.

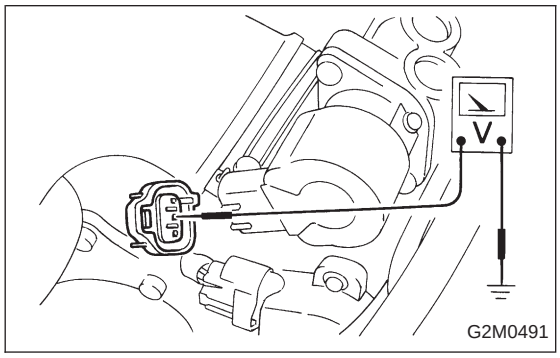
Connector & terminal /Specified voltage:
(E29) No. 2 — Body/0 V → 13 V
(E29) No. 1 — Body/13 V → 0 V



2. CHECK IDLE AIR CONTROL SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Disconnect connector from idle air control solenoid valve.
3) Measure resistance between solenoid valve terminals.

Terminals /Specified resistance:
No. 1 — No. 2/32 Ω
No. 2 — No. 3/32 Ω



3. CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE.

1) Turn ignition switch to ON.
2) Measure voltage between idle air control solenoid valve and body.

Connector & terminal /Specified voltage:
(E11) No. 2 — Body/10 V, min.

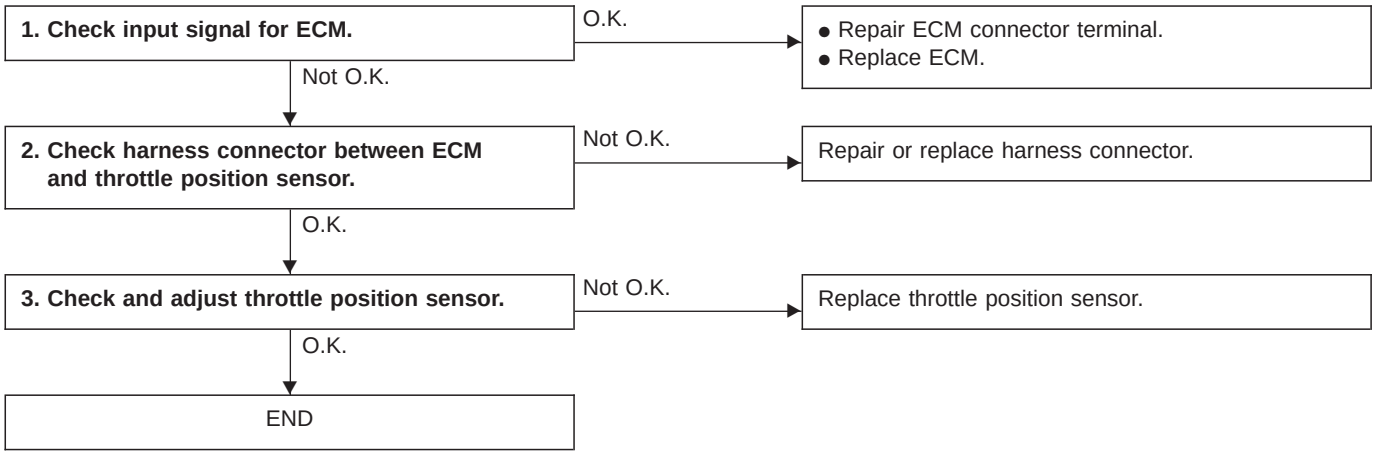
I: TROUBLE CODE (31) — THROTTLE POSITION SENSOR —

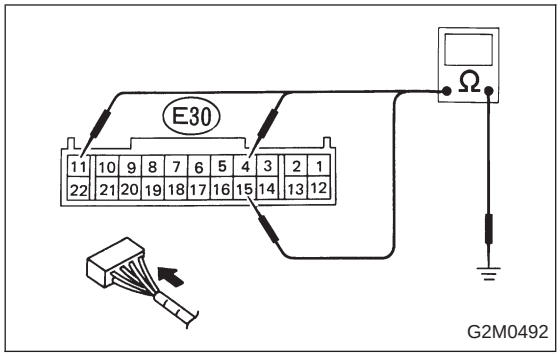
DIAGNOSIS:

- The throttle position sensor signal is abnormal.
- The throttle position sensor is installed abnormally.
- The harness connector between ECM and throttle position sensor is in short or open.

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance





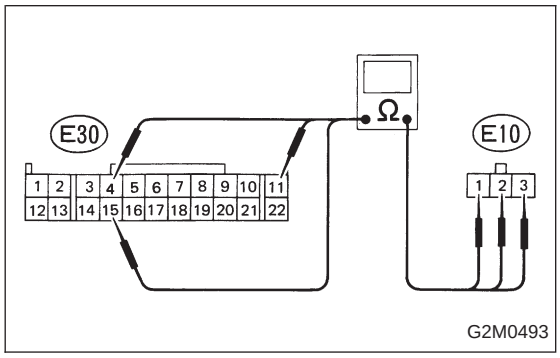
1. CHECK INPUT SIGNAL FOR ECM.

1) Turn ignition switch to ON.
2) Measure signal voltage between ECM and body while throttle valve is fully closed.

Connector & terminal /Specified voltage:
(E30) No. 15 — Body/4.4 — 5.5 V
(E30) No. 4 — Body /0.4 — 0.5 V
(E30) No. 11 — Body/0 V

3) Measure signal voltage between ECM and body while throttle valve is fully opened.

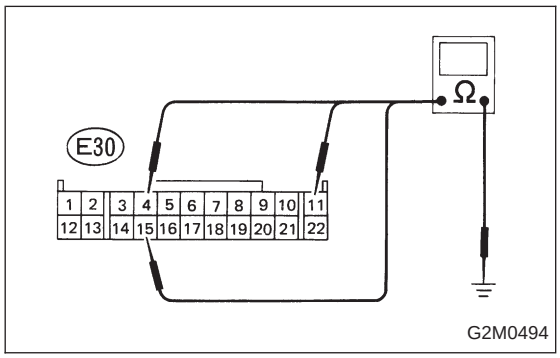
Connector & terminal /Specified voltage:
(E30) No. 15 — Body/4.4 — 5.5 V
(E30) No. 4 — Body /3.5 — 4.3 V
(E30) No. 11 — Body/0 V



2. CHECK HARNESS CONNECTOR BETWEEN ECM AND THROTTLE POSITION SENSOR.

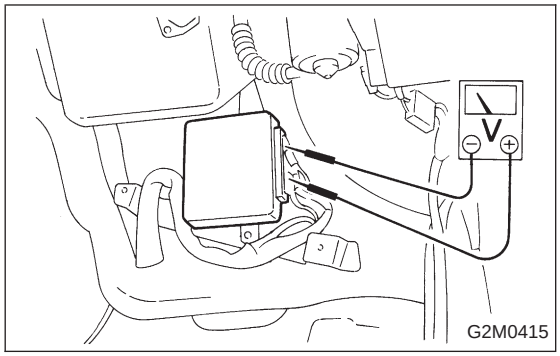
1) Turn ignition switch to OFF.
2) Disconnect connectors from ECM and throttle position sensor.
3) Measure resistance of harness connector between ECM and throttle position sensor.

Connector & terminal /Specified resistance:
(E30) No. 15 — (E10) No. 1/10 Ω, max.
(E30) No. 4 — (E10) No. 2 /10 Ω, max.
(E30) No. 11 — (E10) No. 3/10 Ω, max.



4) Measure resistance of harness connector between ECM and body to make sure that circuit does not short.

Connector & terminal /Specified resistance:
(E30) No. 15 — Body/1 MΩ, min.
(E30) No. 4 — Body /1 MΩ, min.
(E30) No. 11 — Body/1 MΩ, min.



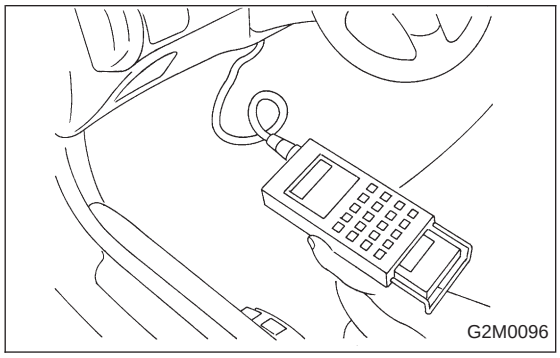
3. CHECK AND ADJUST THROTTLE POSITION SENSOR.

1) Connect all connectors.
2) Loosen throttle position sensor installing screws.
3) Adjust throttle position sensor while throttle valve is fully closed.

- Using voltage meter:
  (1) Turn ignition switch to ON.
  (2) Adjust throttle position sensor to specified voltage between ECM connector terminals.

Connector & terminal /Specified voltage:
(E30) No. 15 — (E30) No. 4/0.45 — 0.55 V

(3) Tighten throttle position sensor installing screws.



- Using select monitor:
  (1) Attach select monitor.
  (2) Turn ignition switch to ON.
  (3) Select mode “F10”.
  (4) Adjust throttle position sensor to specified data.

Conditions /Specified data:
Throttle valve fully closed/0.50 V

(5) Tighten throttle position sensor installing screws.

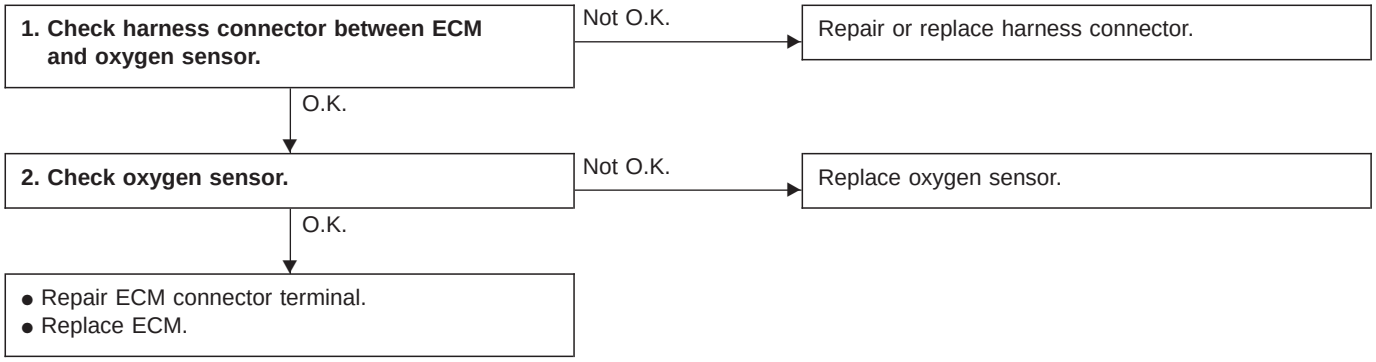
J: TROUBLE CODE (32) — OXYGEN SENSOR —

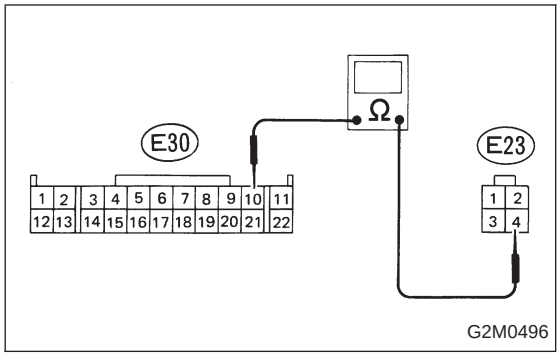
DIAGNOSIS:

- The oxygen sensor is not in function.
- The harness connector between ECM and oxygen sensor is in short or open.

TROUBLE SYMPTOM:

- Failure of engine to start
- Erroneous idling
- Poor driving performance
- Engine stalls.
- Idle mixture is out of specifications.

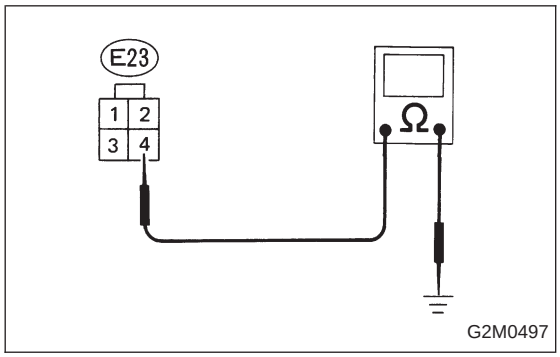




1. CHECK HARNESS CONNECTOR BETWEEN ECM AND OXYGEN SENSOR.

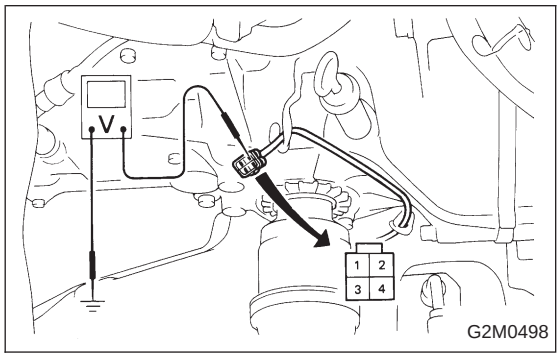
1) Disconnect connectors from ECM and oxygen sensor.
2) Measure resistance of harness connector between ECM and oxygen sensor.

Connector & terminal /Specified resistance:
(E30) No. 10 — (E23) No. 4/0 Ω



3) Measure resistance of harness connector between oxygen sensor and body to make sure that circuit does not short.

Connector & terminal /Specified resistance:
(E23) No. 4 — Body /1 MΩ, min.



2. CHECK OXYGEN SENSOR.

1) Idle engine.
2) Disconnect oxygen sensor connector.
3) Measure voltage between oxygen sensor terminal and body.

Connector & terminal/Specified voltage:
No. 4 — Body /0.1 — 1.0 V

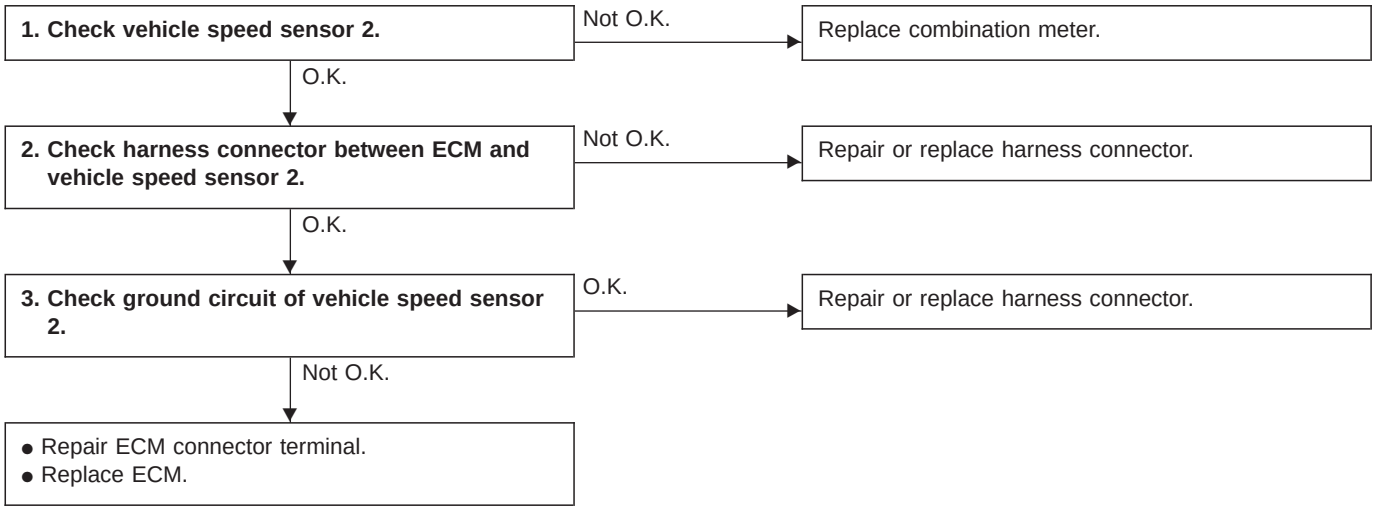
K: TROUBLE CODE (33) — VEHICLE SPEED SENSOR 2 —

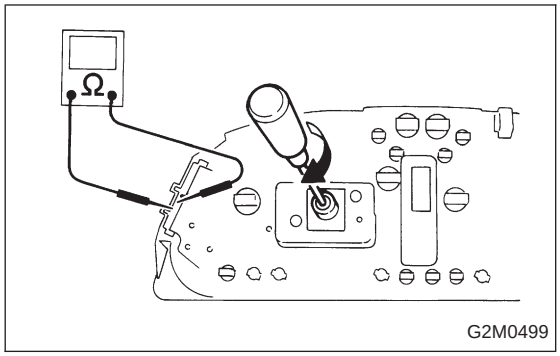
DIAGNOSIS:

- The vehicle speed sensor 2 is not in function.
- The harness connector between ECM and vehicle speed sensor 2 is in short or open.

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

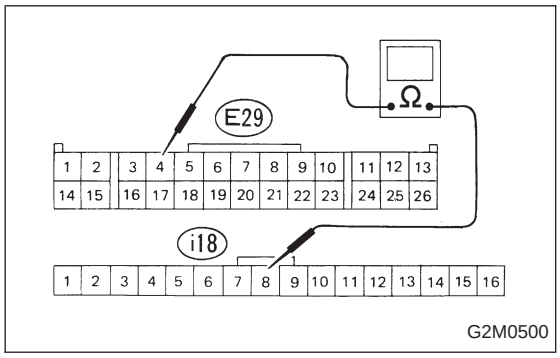




1. CHECK VEHICLE SPEED SENSOR 2.

1) Remove combination meter.
2) Measure resistance between connector terminals of combination meter by rotating rotor of speedometer cable hole with screwdriver.

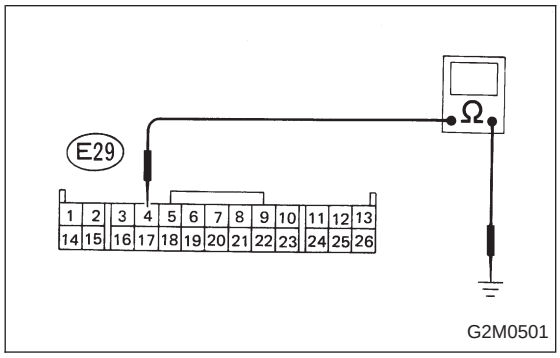
Terminals /Specified resistance:
No. 11 — No. 8/10 Ω, max. ↔ 1 MΩ, min.
(Four times per rotation)



2. CHECK HARNESS CONNECTOR BETWEEN ECM AND VEHICLE SPEED SENSOR 2.

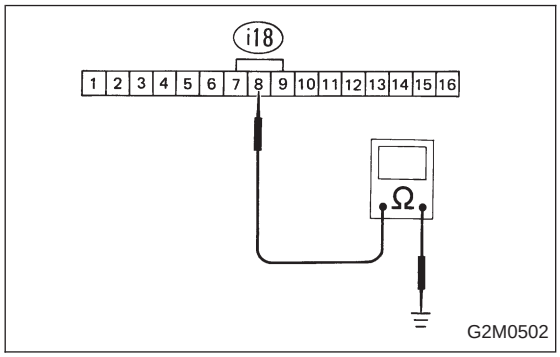
1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Measure resistance of harness connector between ECM and combination meter.

Connector & terminal /Specified resistance:
(E29) No. 4 — (i18) No. 8/10 Ω, max.



4) Measure resistance of harness connector between ECM and body to make sure that circuit does not short.

Connector & terminal /Specified resistance:
(E29) No. 4 — Body /1 MΩ, min.



3. CHECK GROUND CIRCUIT OF VEHICLE SPEED SENSOR 2.

Measure resistance between combination meter and body.

Connector & terminal /Specified resistance:
(i18) No. 8 — Body / 1 MΩ, min.

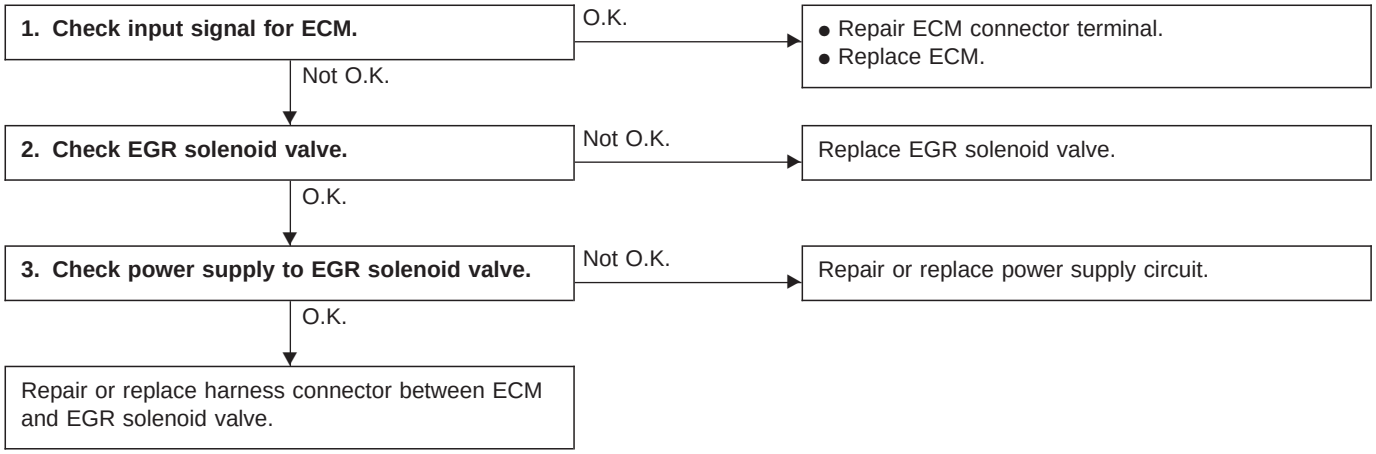
L: TROUBLE CODE (34) — EGR SOLENOID VALVE —

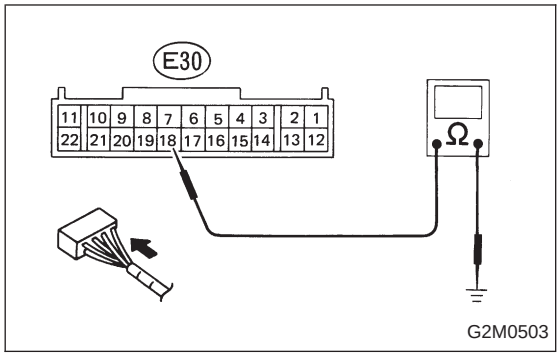
DIAGNOSIS:

- The EGR solenoid valve is not in function.
- The harness connector between ECM and EGR solenoid valve is in short or open.

TROUBLE SYMPTOM:

- Poor driving performance on low engine speed





1. CHECK INPUT SIGNAL FOR ECM.

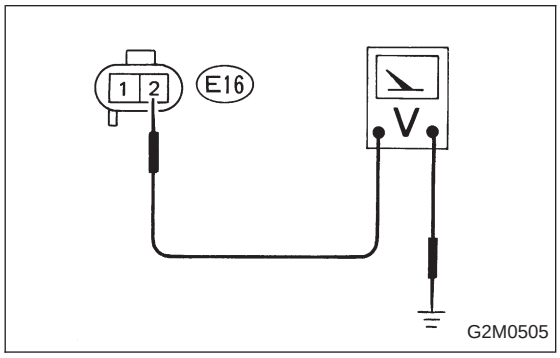
1) Turn ignition switch to ON.
2) Measure signal voltage between ECM and body.

Connector & terminal /Specified voltage:
(E30) No. 18 — Body/10 V, max.

2. CHECK EGR SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Disconnect connector from EGR solenoid valve.
3) Measure resistance between connector terminals of EGR solenoid valve.

Terminals /Specified resistance:
No. 1 — No. 2/36 Ω at 20°C (68°F)



3. CHECK POWER SUPPLY TO EGR SOLENOID VALVE.

1) Turn ignition switch to ON.
2) Measure voltage between EGR solenoid valve connector and body.

Connector & terminal /Specified voltage:
(E16) No. 2 — Body/10 V, max.

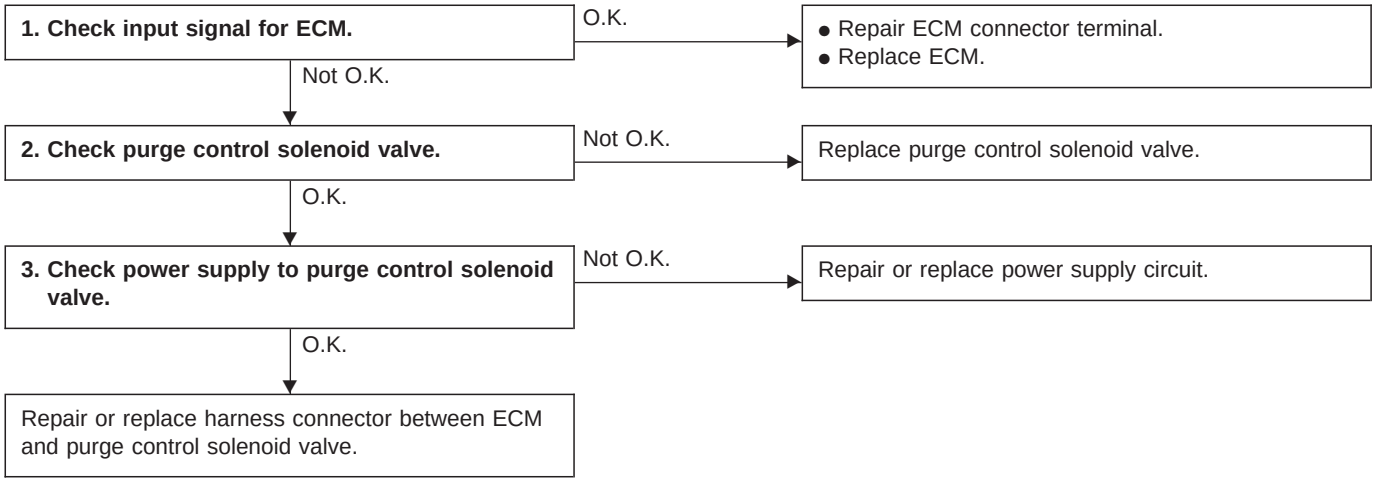
M: TROUBLE CODE (35) — PURGE CONTROL SOLENOID VALVE —

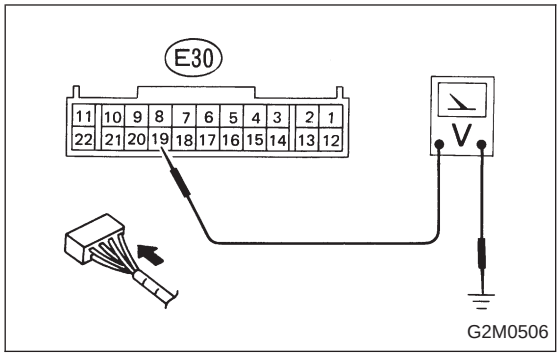
DIAGNOSIS:

- The purge control solenoid valve is not in function.
- The harness connector between ECM and purge control solenoid valve is in short or open.

TROUBLE SYMPTOM:

- Erroneous idling





1. CHECK INPUT SIGNAL FOR ECM.

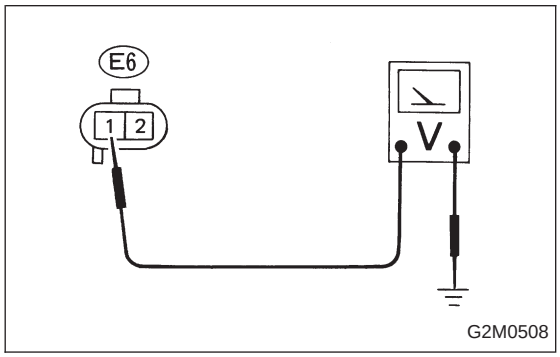
1) Turn ignition switch to ON.
2) Measure voltage between ECM connector terminal and body.

Connector & terminal /Specified voltage:
(E30) No. 19 — Body/10 — 13 V

2. CHECK PURGE CONTROL SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Remove purge control solenoid valve.
3) Measure resistance between solenoid valve terminals.

Terminals/Specified resistance:
No. 1 — No. 2/36 Ω [at 20°C (68°F)]



3. CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.

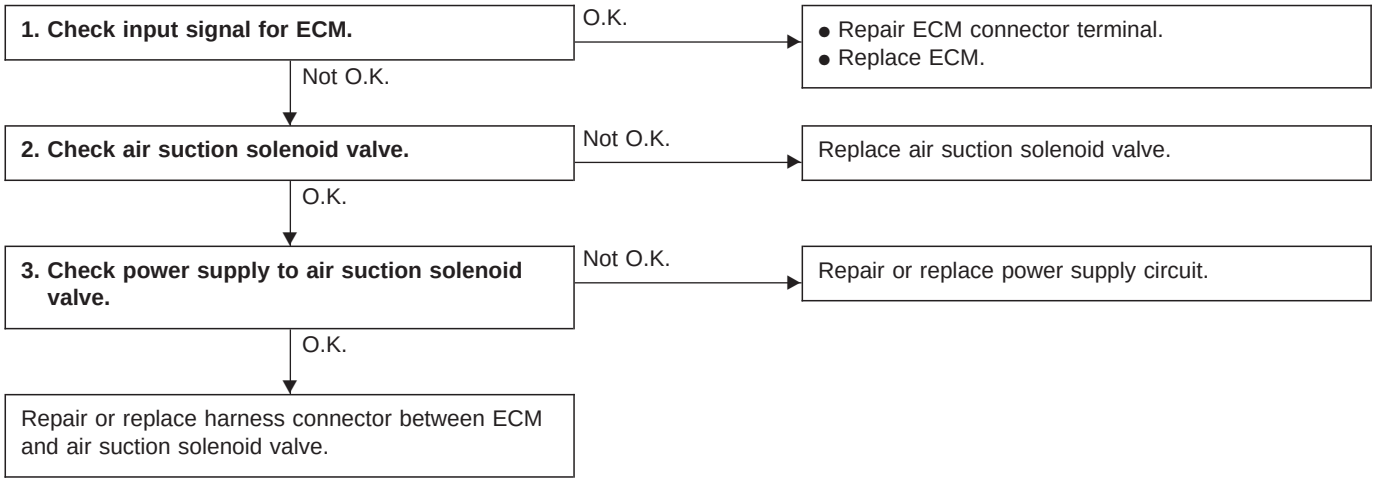
1) Turn ignition switch to ON.
2) Measure voltage between purge control solenoid valve connector and body.

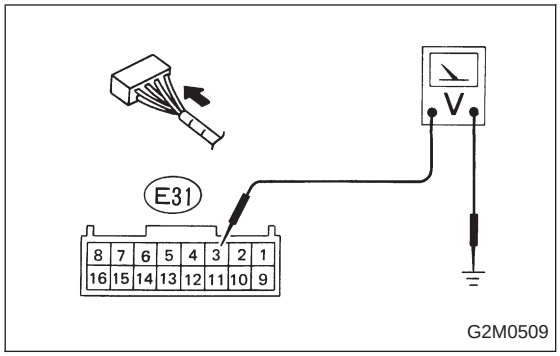
Connector & terminal /Specified voltage:
(E6) No. 1 — Body/10 V, min.

N: TROUBLE CODE (36) — AIR SUCTION SOLENOID VALVE —

DIAGNOSIS:

- The air suction solenoid valve is not in function.
- The harness connector between ECM and air suction solenoid valve is in short or open.

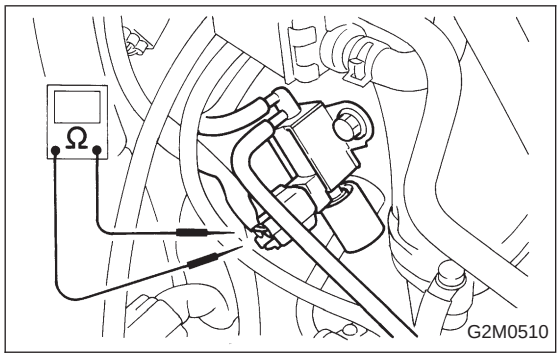




1. CHECK INPUT SIGNAL FOR ECM.

1) Turn ignition switch to ON.
2) Measure signal voltage between ECM and body.

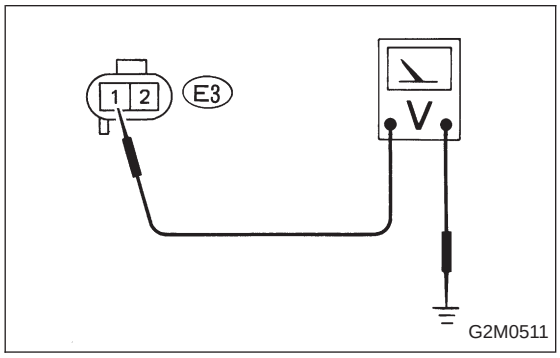
Connector & terminal /Specified voltage:
(E31) No. 3 — Body/10 V, max.



2. CHECK AIR SUCTION SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Disconnect connector from air suction solenoid valve.
3) Measure resistance between connector terminals of air suction solenoid valve.

Terminals /Specified resistance:
No. 1 — No. 2/36 Ω at 20°C (68°F)



3. CHECK POWER SUPPLY TO AIR SUCTION SOLENOID VALVE.

1) Turn ignition switch to ON.
2) Measure voltage between air suction solenoid valve connector and body.

Connector & terminal /Specified voltage:
(E3) No. 1 — Body/10 V, max.

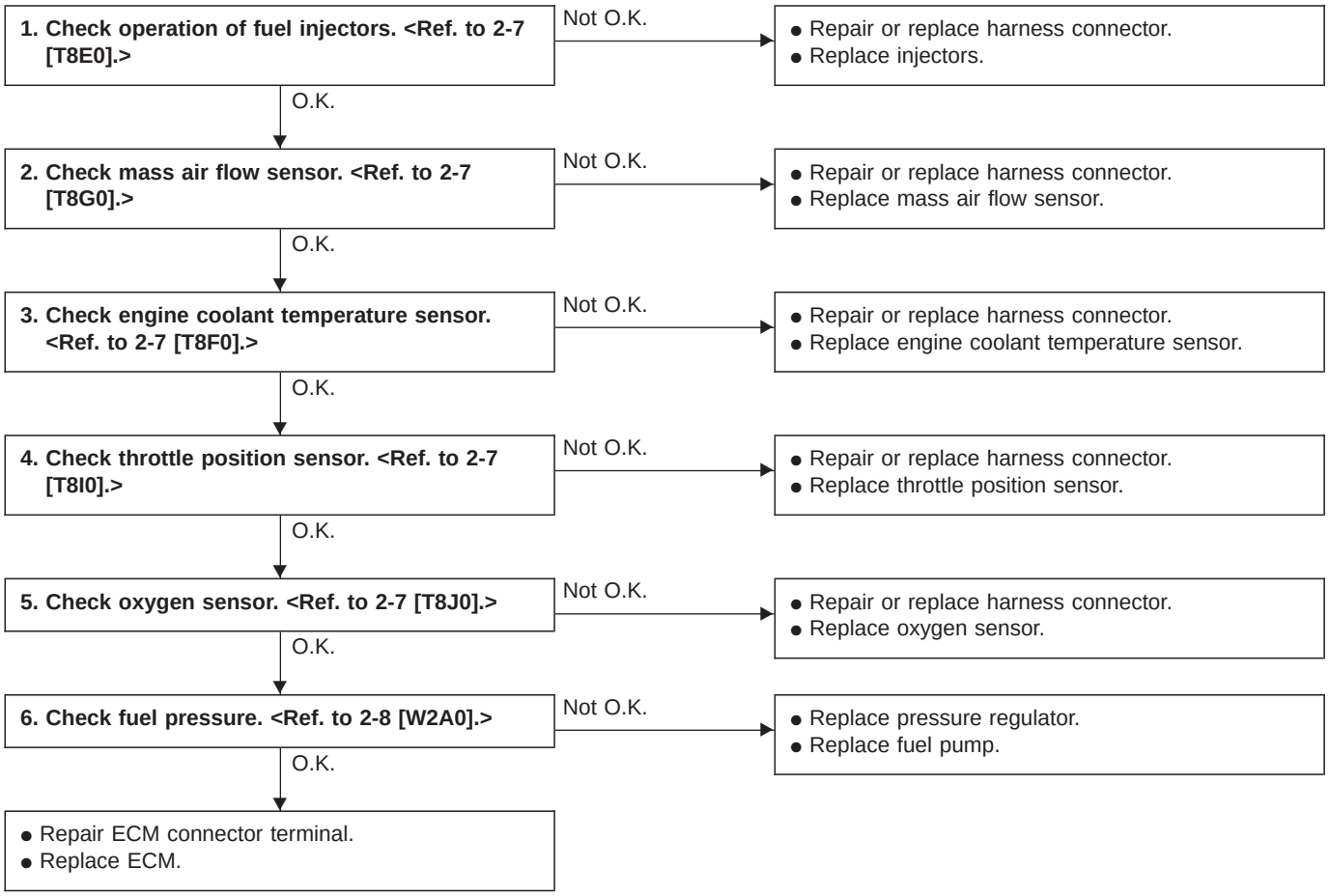
O: TROUBLE CODE (41)
— A/F (AIR/FUEL) LEARNING CONTROL —

DIAGNOSIS:

- Faulty learning control function

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.



P: TROUBLE CODE (51)

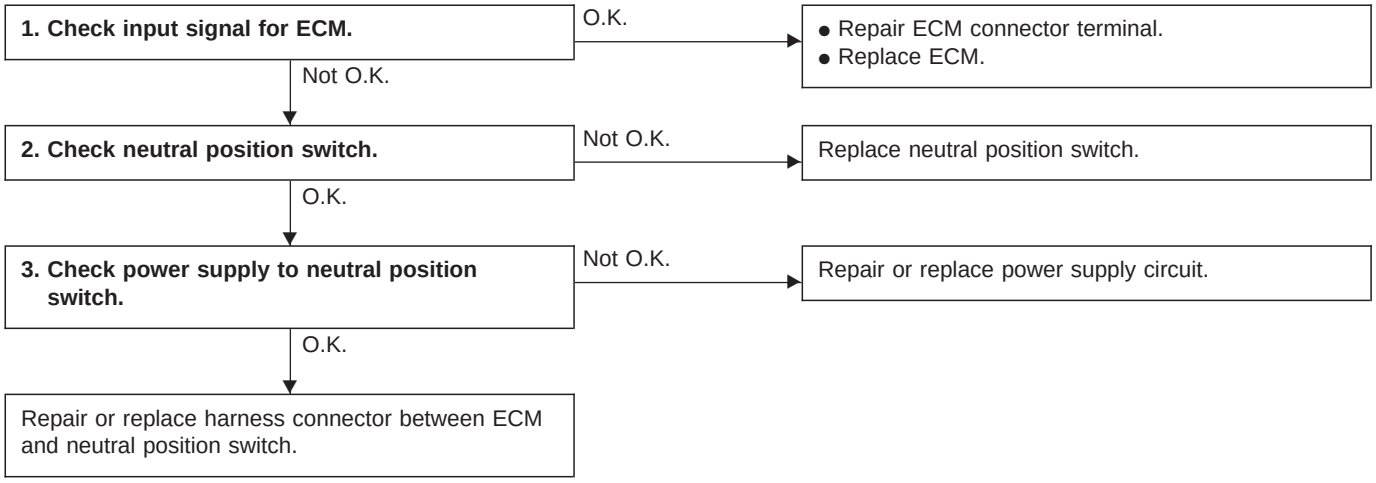
— NEUTRAL POSITION SWITCH (MT) —

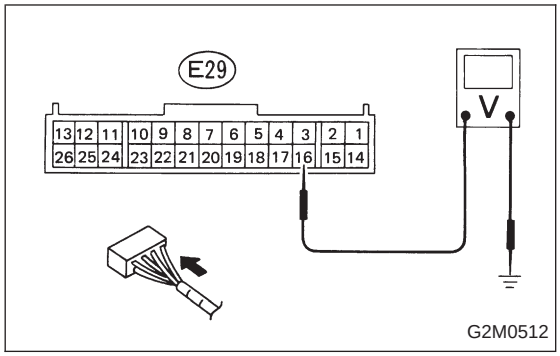
DIAGNOSIS:

- The neutral position switch signal is abnormal.
- The harness connector between ECM and neutral position switch is in short or open.

TROUBLE SYMPTOM:

- Erroneous idling

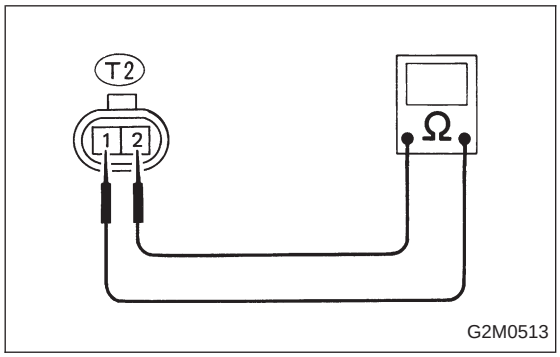




1. CHECK INPUT SIGNAL FOR ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and body.

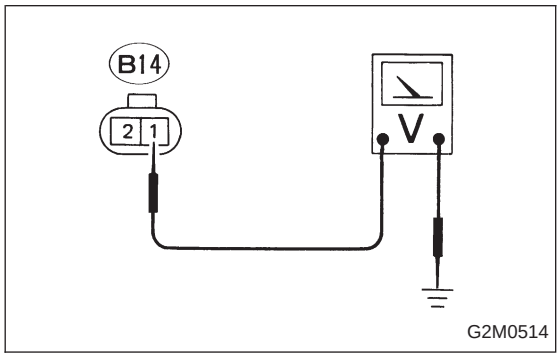
Connector & terminal /Specified voltage:
(E29) No. 16 — Body/10 — 14 V (Neutral position)
0 V (Other positions)



2. CHECK NEUTRAL POSITION SWITCH.

1) Turn ignition switch to OFF.
2) Disconnect connector from transmission harness.
3) Measure resistance between connector terminals of transmission harness.

Connector & terminal /Specified resistance:
(T2) No. 1 — (T2) No. 2 /1 MΩ, min.
(Neutral position)
10 Ω, max.
(Other positions)



3. CHECK POWER SUPPLY TO NEUTRAL POSITION SWITCH.

1) Turn ignition switch to ON.
2) Measure voltage between neutral position switch connector and body.

Connector & terminal /Specified voltage:
(B14) No. 1 — Body/10 V, min.

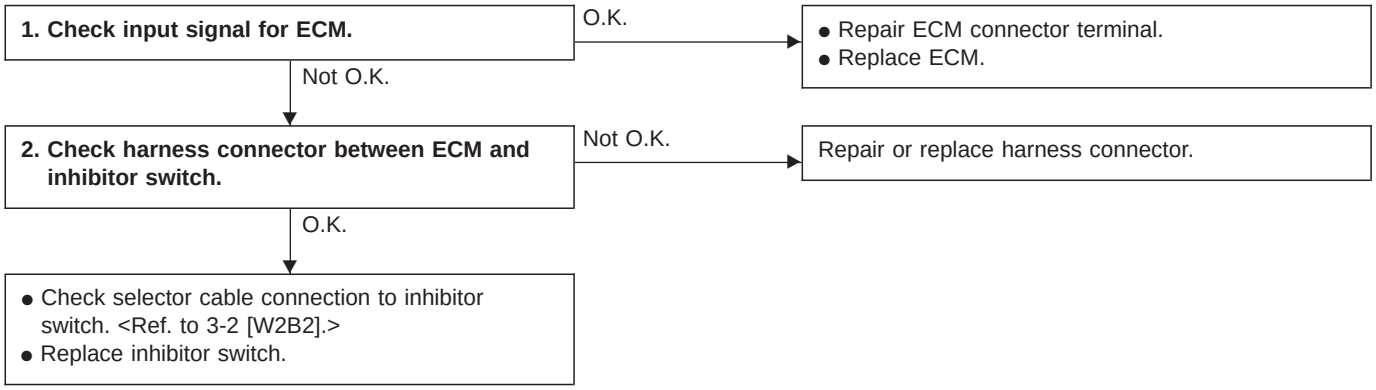
Q: TROUBLE CODE (51) — INHIBITOR SWITCH (AT) —

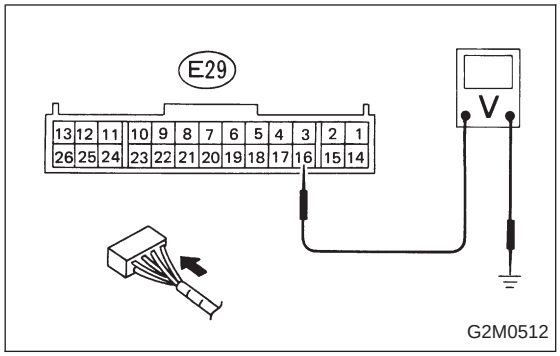
DIAGNOSIS:

- The park/neutral position switch signal is abnormal.
- The shift cable is connected abnormally.
- The harness connector between ECM and inhibitor switch is in short or open.

TROUBLE SYMPTOM:

- Erroneous idling

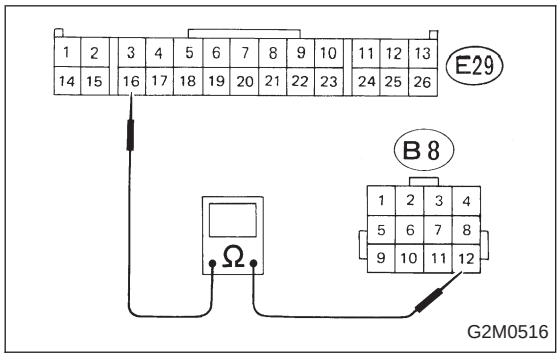




1. CHECK INPUT SIGNAL FOR ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and body.

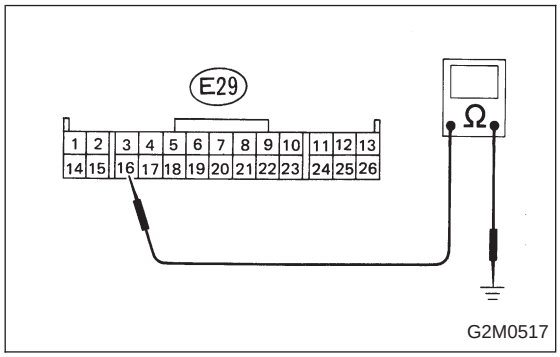
Connector & terminal /Specified voltage:
(E29) No. 16 — Body/10 — 14 V
("P" or "N" position)
0 V (Other positions)



2. CHECK HARNESS CONNECTOR BETWEEN ECM AND INHIBITOR SWITCH.

1) Turn ignition switch to OFF.
2) Disconnect connectors from ECM and transmission harness.
3) Measure resistance of harness connector between ECM and transmission harness.

Connector & terminal /Specified resistance:
(E29) No. 16 — (B8) No. 1/10 Ω, max.
(E29) No. 16 — (B8) No. 3/10 Ω, max.



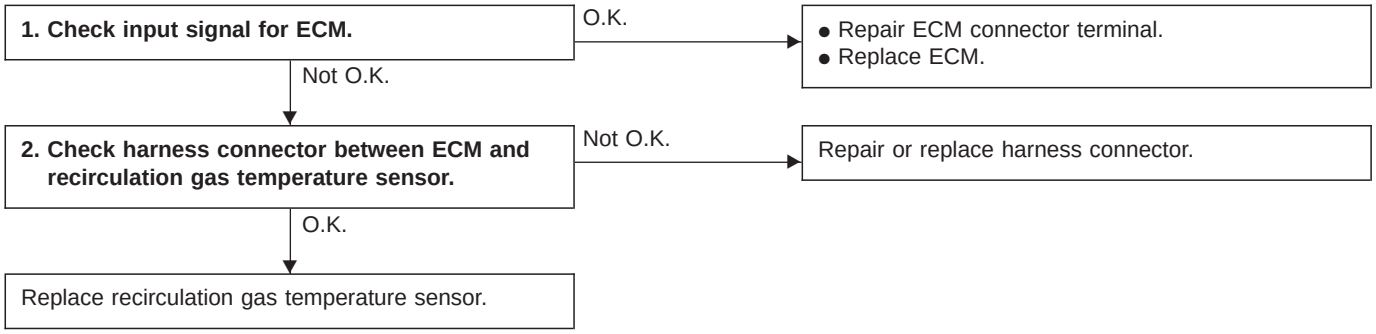
4) Measure resistance harness connector between ECM and body to make sure that circuit does not short.

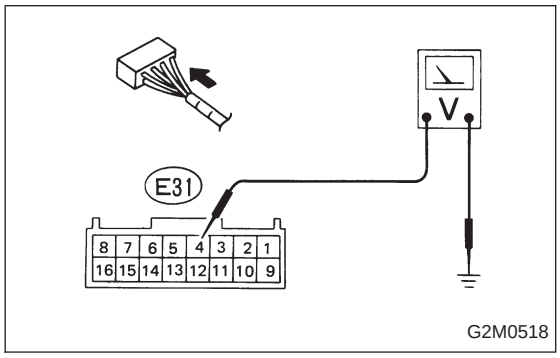
Connector & terminal /Specified resistance:
(E29) No. 16 — Body/1 MΩ, min.

R: TROUBLE CODE (55) — RECIRCULATION GAS TEMPERATURE SENSOR —

DIAGNOSIS:

- The recirculation gas temperature sensor is not in function.
- The harness connector between ECM and recirculation gas temperature sensor is in short or open.

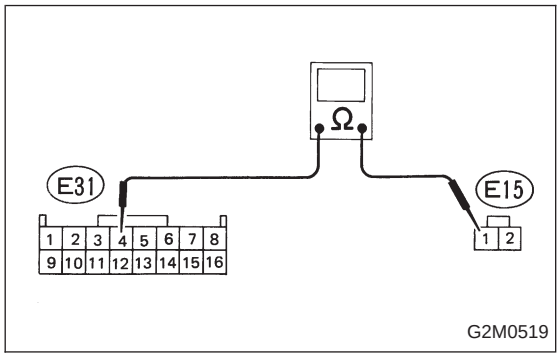




1. CHECK INPUT SIGNAL FOR ECM.

1) Turn ignition switch to ON.
2) Measure signal voltage between ECM and body.

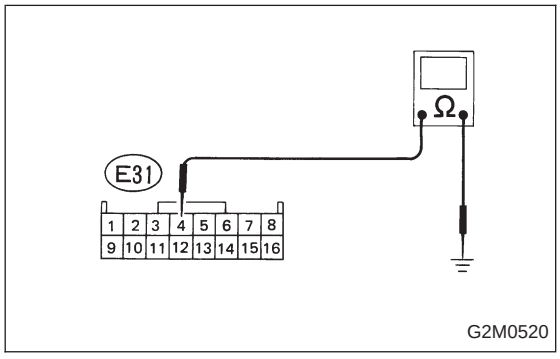
Connector & terminal /Specified voltage:
(E31) No. 4 — Body/4 — 4.8 V at 20°C (68°F)
(E31) No. 4 — Body/0.4 — 1.2 V at 100°C (212°F)



2. CHECK HARNESS CONNECTOR BETWEEN ECM AND RECIRCULATION GAS TEMPERATURE SENSOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from recirculation gas temperature sensor.
3) Measure resistance of harness connector between ECM and recirculation gas temperature sensor.

Connector & terminal /Specified resistance:
(E31) No. 4 — (E15) No. 1/10 Ω, max.



4) Measure resistance of harness connector between ECM and body to make sure that circuit does not short.

Connector & terminal /Specified resistance:
(E31) No. 4 — Body/1 MΩ, max.

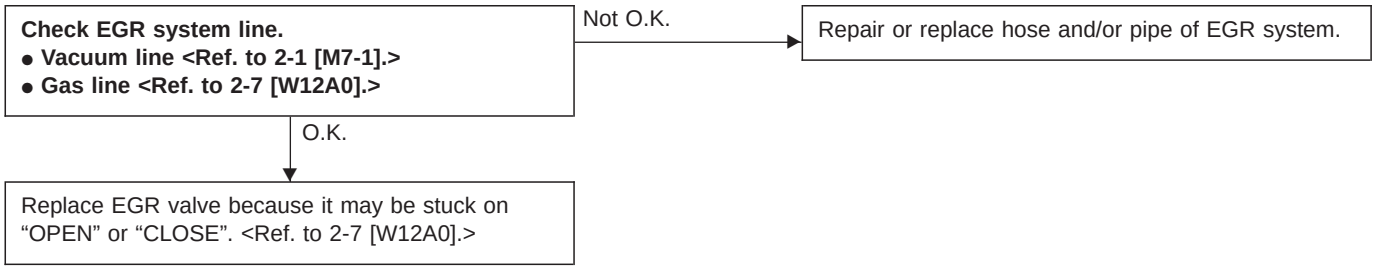
S: TROUBLE CODE (56) — EGR SYSTEM —

DIAGNOSIS:

● Faulty EGR system function

TROUBLE SYMPTOM:

● Poor driving performance on low engine speed

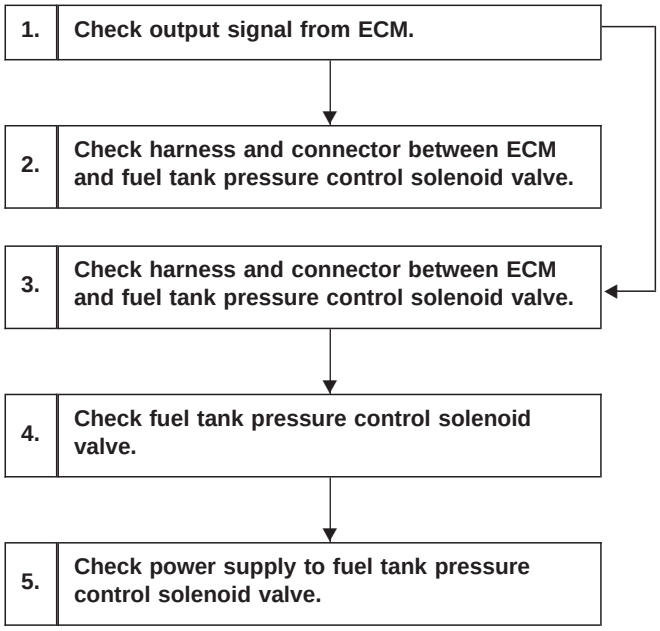


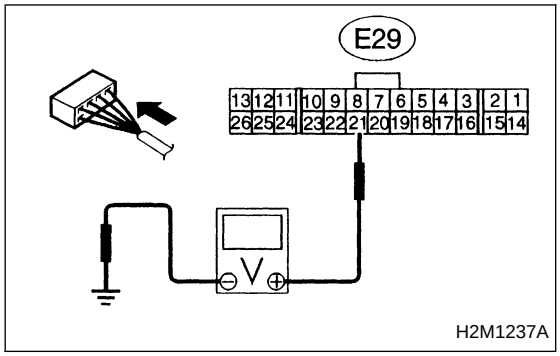
T: TROUBLE CODE (61)

— FUEL TANK PRESSURE CONTROL SOLENOID VALVE —

DIAGNOSIS:

● The fuel tank pressure control solenoid valve is not in function.
● The harness connector between ECM and fuel tank pressure control solenoid valve is in short or open.





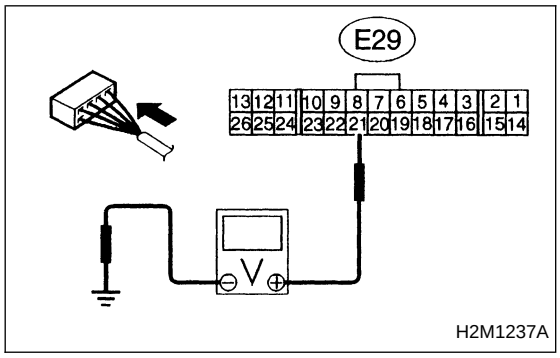
1. CHECK OUTPUT SIGNAL FROM ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM connector and body.

CHECK ***: Connector & terminal (E29) No. 21 — Body/10 V, or more***

YES : Go to step 2.

NO : Go to step 3.



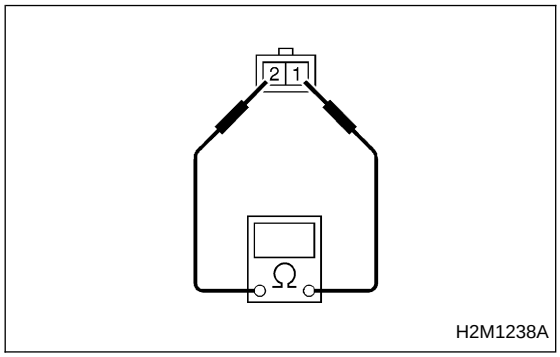
2. CHECK HARNESS AND CONNECTOR BETWEEN ECM AND FUEL TANK PRESSURE CONTROL SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Disconnect connector from fuel tank pressure control solenoid valve.
3) Turn ignition switch to ON.
4) Measure voltage between ECM and body.

CHECK ***: Connector & terminal (E29) No. 21 — Body/10 V, or more***

YES : Repair short circuit of harness between ECM and fuel tank pressure control solenoid valve connector. After repair, replace ECM with a new one.

NO : Go to next step.



5) Turn ignition switch to OFF.
6) Measure resistance between fuel tank pressure control solenoid valve terminals.

CHECK ***: Connector & terminal No. 1 — No. 2/1 Ω, or less***

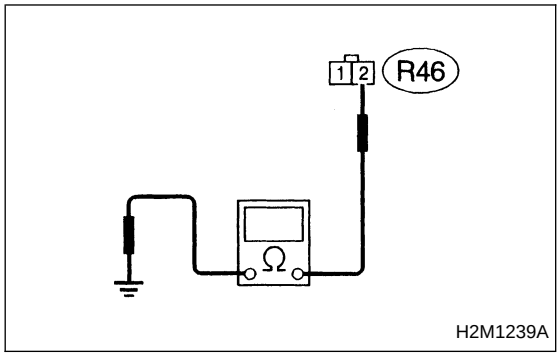
YES : Replace fuel tank pressure control solenoid valve and ECM.

NO : Go to next CHECK .

CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Replace ECM with a new one.



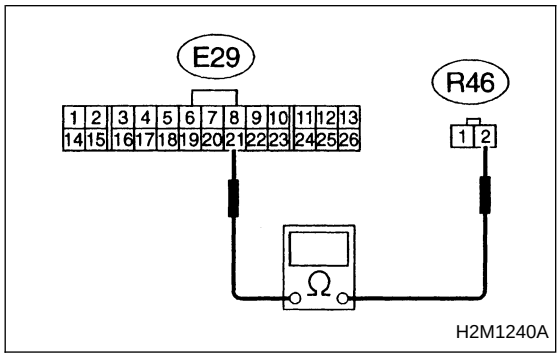
3. CHECK HARNESS AND CONNECTOR BETWEEN ECM AND FUEL TANK PRESSURE CONTROL SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Disconnect connectors from fuel tank pressure control solenoid valve and ECM.
3) Measure resistance between fuel tank pressure control solenoid valve connector and body.

CHECK ***: Connector & terminal***
(R46) No. 2 — Body/10 Ω, or less

YES : Repair short circuit of harness between ECM and fuel tank pressure control solenoid valve connector.

NO : Go to next step.



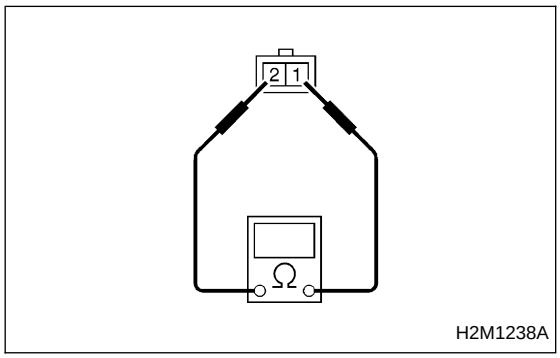
4) Measure resistance of harness between ECM and fuel tank pressure control solenoid valve connector.

CHECK ***: Connector & terminal***
(E29) No. 21 — (R46) No. 2/1 Ω, or less

YES : Go to step 4.

NO : In this case, repair the following items.

- Open circuit of harness between ECM and fuel tank pressure control solenoid valve connector
- Poor contact in ECM connector
- Poor contact in fuel tank pressure control solenoid valve connector
- Poor contact in coupling connectors (B74, B85 and R45)



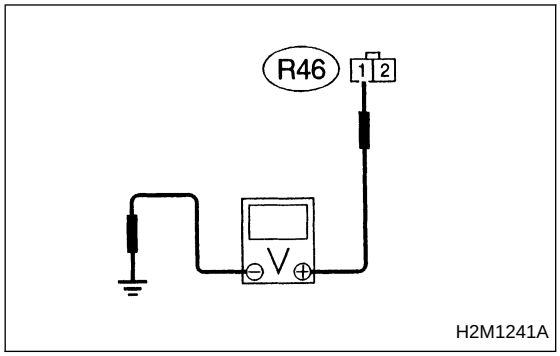
4. CHECK FUEL TANK PRESSURE CONTROL SOLENOID VALVE.

Measure resistance between fuel tank pressure control solenoid valve terminals.

CHECK ***: Terminals***
No. 1 — No. 2/10 — 100 Ω

YES : Go to step 5.

NO : Replace fuel tank pressure control solenoid valve with a new one.



5. CHECK POWER SUPPLY TO FUEL TANK PRESSURE CONTROL SOLENOID VALVE.

1) Connect connector to ECM.
2) Turn ignition switch to ON.
3) Measure voltage between fuel tank pressure control solenoid valve connector and body.

CHECK ***: Connector & terminal (R46) No. 1 — Body/10 V, or more***

YES : Go to next CHECK .

NO : In this case, repair the following items.

- Open circuit of harness between main relay and fuel tank pressure control solenoid valve connector
- Poor contact in main relay connector
- Poor contact in coupling connectors (B85 and R39)

CHECK ***: Is there poor contact in fuel tank pressure control solenoid valve connector?***

YES : Repair poor contact in fuel tank pressure control solenoid valve connector.

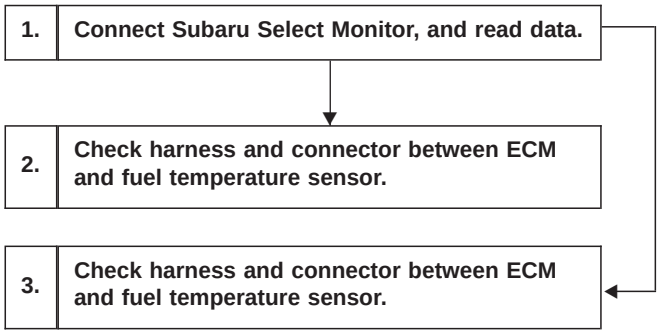
NO : Contact with SOA service.

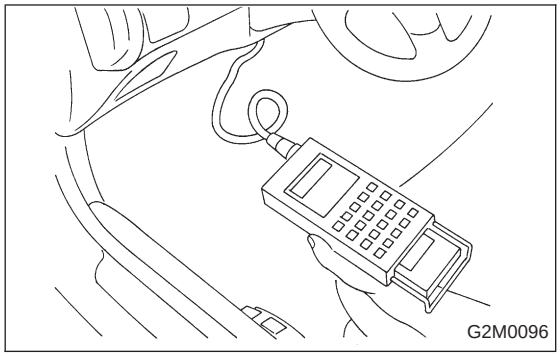
NOTE:
Inspection by DTM is required.

U: TROUBLE CODE (62) — FUEL TEMPERATURE SENSOR —

DIAGNOSIS:

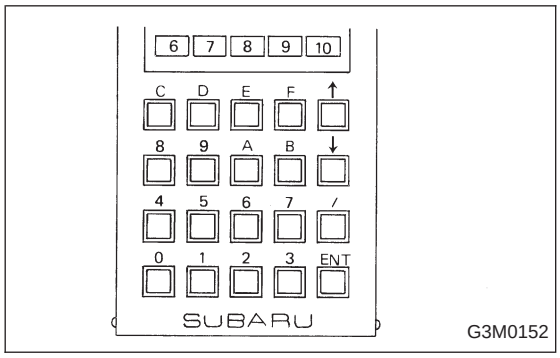
- The fuel temperature sensor signal is abnormal.
- The harness connector between ECM and fuel temperature sensor is in short or open.




G2M0096

1. CONNECT SUBARU SELECT MONITOR, AND READ DATA.

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor to data link connector.

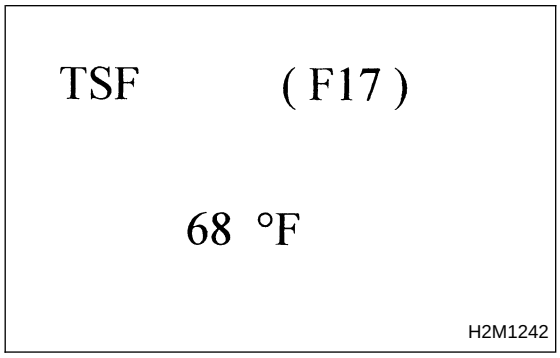


G3M0152

3) Turn ignition switch to ON and Subaru Select Monitor switch to ON.
4) Start engine.
5) Read data on Subaru Select Monitor.
● Subaru Select Monitor
Designate mode using function key.

Function mode: F17

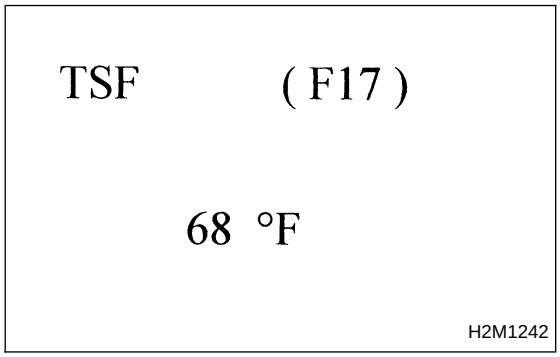
● F17: Fuel temperature is indicated in "°F".



H2M1242

CHECK ***: Is the value greater than 300°F with function mode F17?***

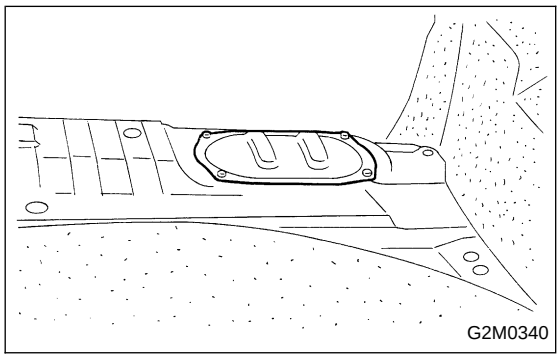
YES : Go to step 2.
NO : Go to next CHECK .



H2M1242

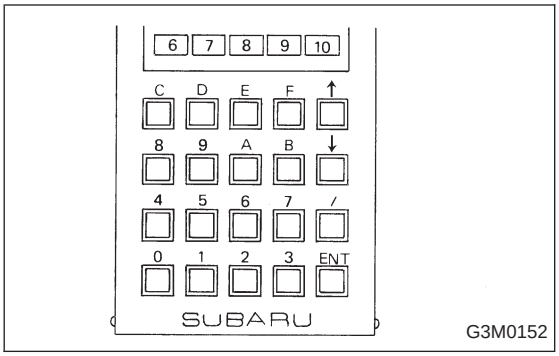
CHECK ***: Is the value less than −40°F with function mode F17?***

YES : Go to step 3.
NO : In this case, repair the following items.
● Poor contact in ECM connector
● Poor contact in fuel pump connector
● Poor contact in coupling connectors (B74, B84, B85 and R45)


G2M0340

2. CHECK HARNESS AND CONNECTOR BETWEEN ECM AND FUEL TEMPERATURE SENSOR.

1) Turn ignition switch to OFF.
2) Remove access hole lid.

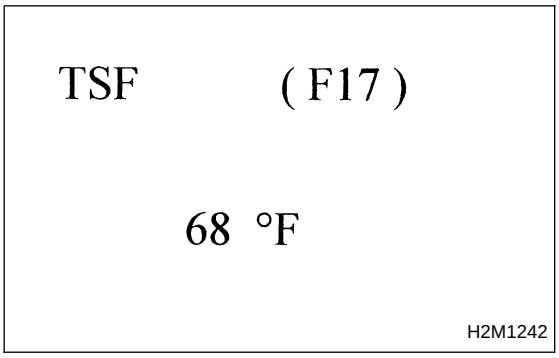


G3M0152

3) Disconnect connector from fuel pump.
4) Turn ignition switch to ON and Subaru Select Monitor switch to ON.
5) Read data on Subaru Select Monitor.
● Subaru Select Monitor
Designate mode using function key.

Function mode: F17

● F17: Fuel temperature is indicated in "°F".

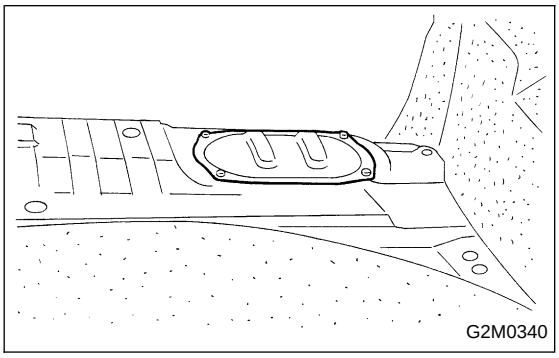


H2M1242

CHECK ***: Is the value less than −40°F with function mode F17?***

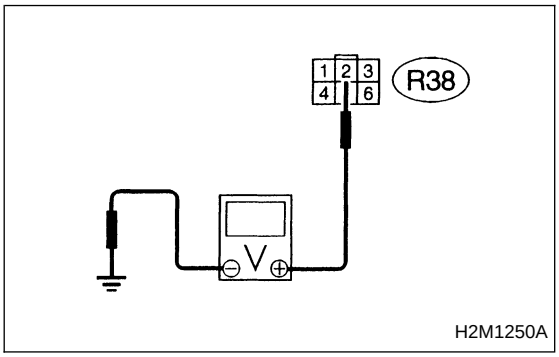
YES : Replace fuel temperature sensor.

NO : Repair short circuit of harness between ECM and fuel pump connector.


G2M0340

3. CHECK HARNESS AND CONNECTOR BETWEEN ECM AND FUEL TEMPERATURE SENSOR.

1) Turn ignition switch to OFF.
2) Remove access hole lid.



H2M1250A

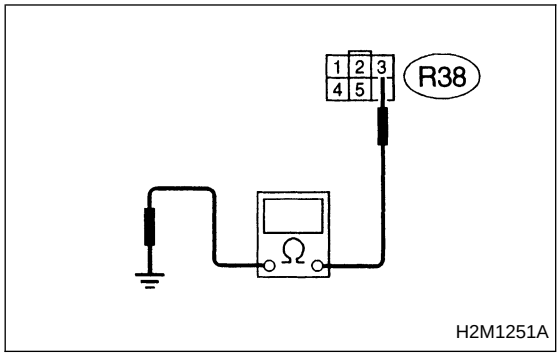
3) Disconnect connector from fuel pump.
4) Turn ignition switch to ON.
5) Measure voltage between fuel pump connector and body.

CHECK ***: Connector & terminal (R38) No. 2 — Body/4 V, or more***

YES : Go to next step.

NO : In this case, repair the following items.

● Repair open circuit of harness between ECM and fuel pump connector.
● Poor contact in ECM connector
● Poor contact in fuel pump connector
● Poor contact in coupling connectors (B74, B85 and R45)



6) Turn ignition switch to OFF.
7) Measure resistance of harness between fuel pump connector and body.

CHECK ***: Connector & terminal (R38) No. 3 — Body/5 Ω, or less***

YES : Replace fuel temperature sensor.

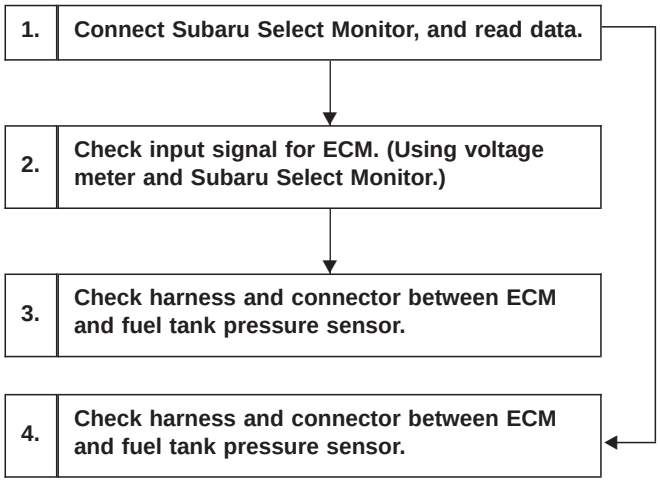
NO : In this case, repair the following items.

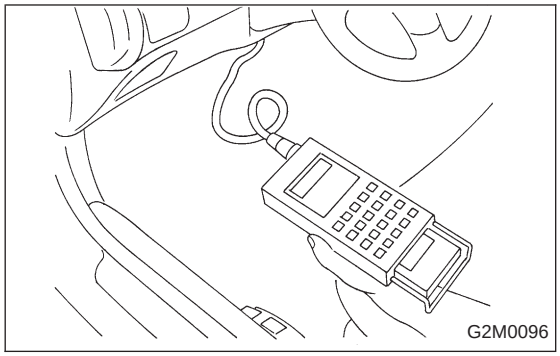
- Repair open circuit of harness between ECM and fuel pump connector.
- Poor contact in ECM connector
- Poor contact in fuel pump connector
- Poor contact in coupling connectors (B74, B84 and R45)

V: TROUBLE CODE (63) — FUEL TANK PRESSURE SENSOR —

DIAGNOSIS:

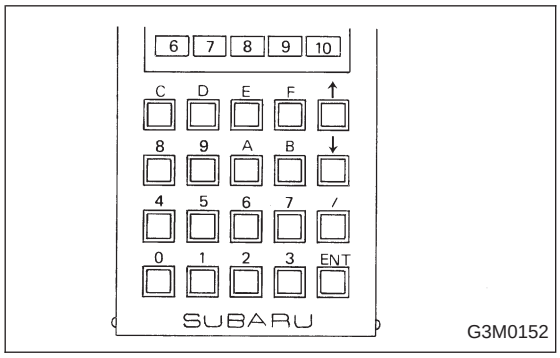
- The fuel tank pressure sensor signal is abnormal.
- The harness connector between ECM and fuel tank pressure sensor is in short or open.




G2M0096

1. CONNECT SUBARU SELECT MONITOR, AND READ DATA.

1) Turn ignition switch to OFF.
2) Remove fuel filler cap.
3) Install fuel filler cap.
4) Connect Subaru Select Monitor to data link connector.

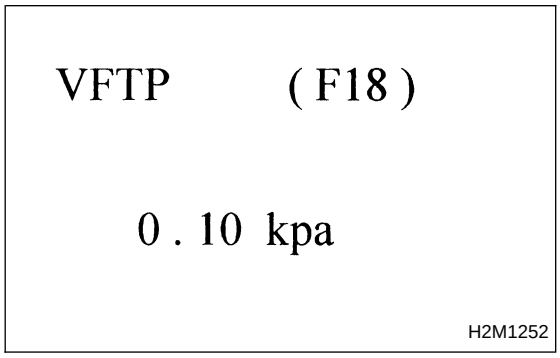


G3M0152

5) Turn ignition switch to ON and Subaru Select Monitor switch to ON.
6) Read data on Subaru Select Monitor.
● Subaru Select Monitor
Designate mode using function key.

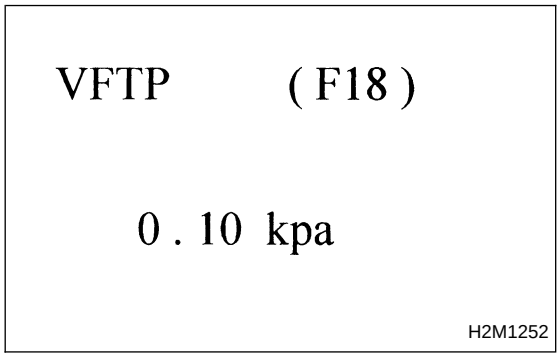
Function mode: F18

● F18: Fuel tank pressure sensor output signal is indicated.



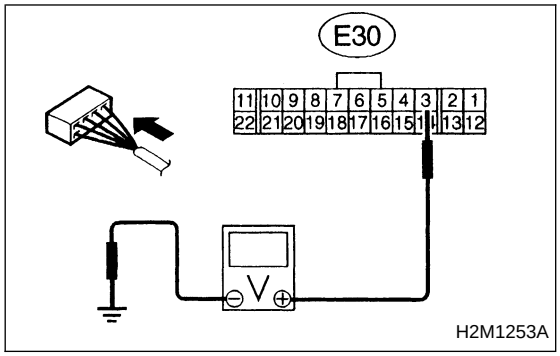
H2M1252

CHECK ***: Is the value less than −7.2 kPa?***
YES : Go to step 2.
NO : Go to next CHECK .



H2M1252

CHECK ***: Is the value more than 7.2 kPa?***
YES : Go to step 4.
NO : In this case, repair the following items.
● Open circuit of harness between ECM and fuel tank pressure sensor connector
● Poor contact in ECM connector
● Poor contact in fuel tank pressure sensor connector
● Poor contact in coupling connectors (B74, B84 and B85)



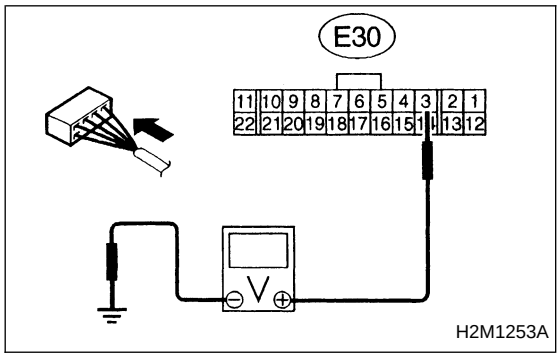
2. CHECK INPUT SIGNAL FOR ECM. (USING VOLTAGE METER AND SUBARU SELECT MONITOR.)

1) Measure voltage between ECM connector and body.

CHECK : ***Connector & terminal (E30) No. 3 — Body/4.5 V, or more***

YES : Go to next step.

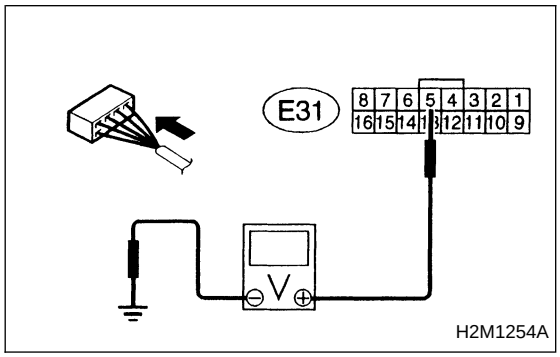
NO : Go to next CHECK .



CHECK : ***Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?***

YES : Repair poor contact in ECM connector.

NO : Replace ECM with a new one.

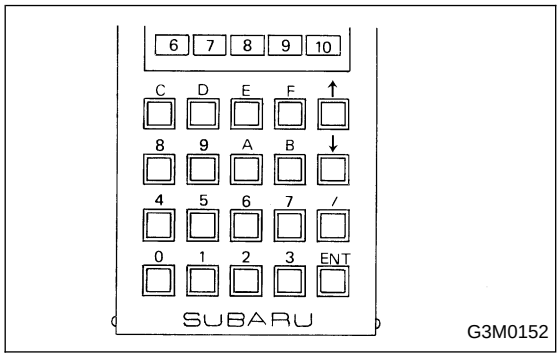


2) Measure voltage between ECM connector and body.

CHECK : ***Connector & terminal (E31) No. 5 — Body/0.2 V, or less***

YES : Go to step 3.

NO : Go to next step.



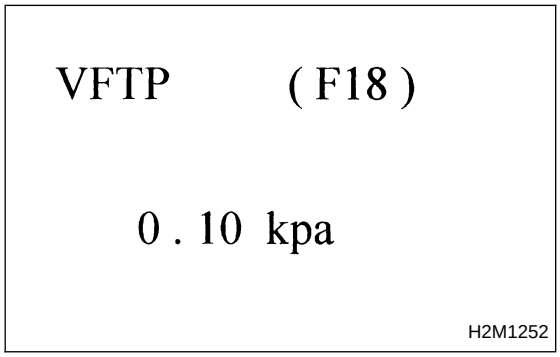
3) Read data on Subaru Select Monitor.

● Subaru Select Monitor

Designate mode using function key.

Function mode: F18

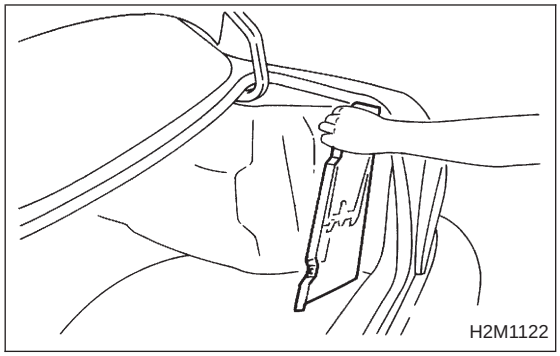
● F18: Fuel tank pressure sensor output signal is indicated.



CHECK : ***Does the value change more than −7.2 kPa by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?***

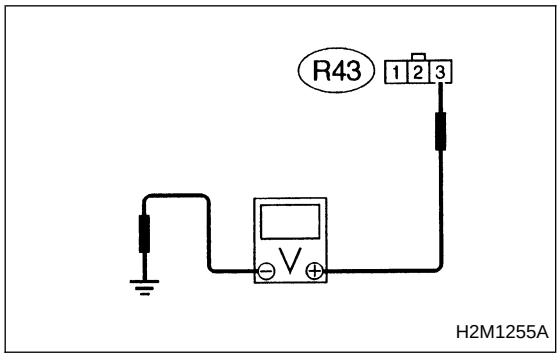
YES : Repair poor contact in ECM connector.

NO : Go to step 3.


H2M1122

3. CHECK HARNESS AND CONNECTOR BETWEEN ECM AND FUEL TANK PRESSURE SENSOR.

1) Turn ignition switch to OFF.
2) Remove right side rear quarter trim.



H2M1255A

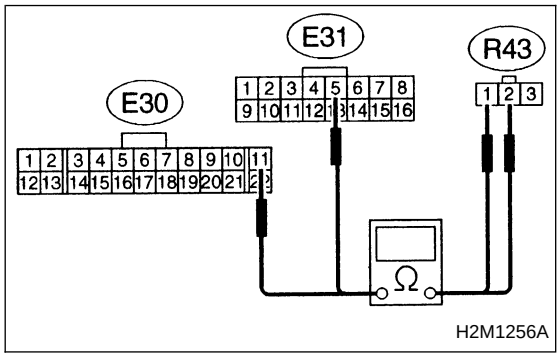
3) Disconnect connector from fuel tank pressure sensor.
4) Turn ignition switch to ON.
5) Measure voltage between fuel tank pressure sensor connector and body.

CHECK ***: Connector & terminal***
(R43) No. 3 — Body/4.5 V, or more

YES : Go to next CHECK .

NO : In this case, repair the following items.

- Open circuit of harness between ECM and fuel tank pressure sensor connector
- Poor contact in ECM connector
- Poor contact in fuel tank pressure sensor connector
- Poor contact in coupling connectors (B74 and B85)



H2M1256A

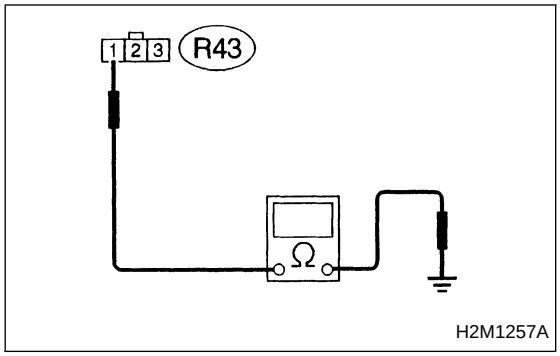
6) Turn ignition switch to OFF.
7) Disconnect connector from ECM.
8) Measure resistance of harness between ECM and fuel tank pressure sensor connector.

CHECK ***: Connector & terminal***
(E31) No.5 — (R43) No. 1/1 Ω, or less
(E30) No. 11 — (R43) No. 2/1 Ω, or less

YES : Go to next step.

NO : In this case, repair the following items.

- Open circuit of harness between ECM and fuel tank pressure sensor connector
- Poor contact in ECM connector
- Poor contact in fuel tank pressure sensor connector
- Poor contact in coupling connectors (B74 and B84)



9) Measure resistance between fuel tank pressure sensor connector and body.

CHECK ***: Connector & terminal (R43) No. 1 — Body/500 kΩ, or more***

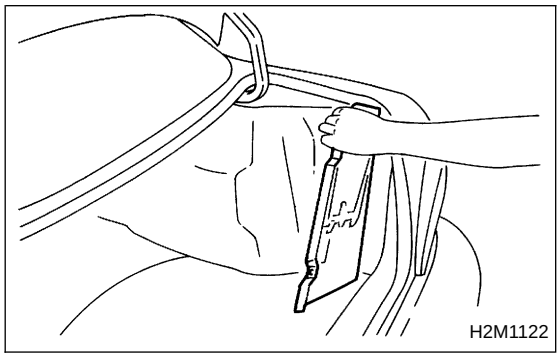
YES : Go to next CHECK .

NO : Repair short circuit of harness between ECM and fuel tank pressure sensor connector.

CHECK ***: Is there poor contact in fuel tank pressure sensor connector?***

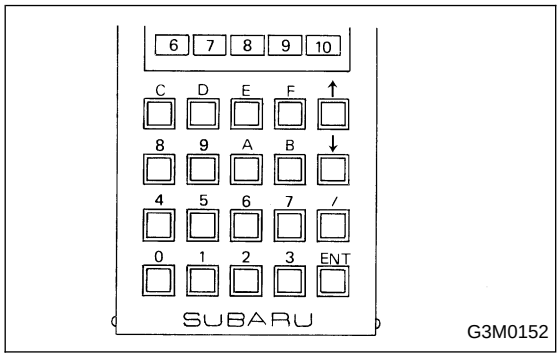
YES : Repair poor contact in fuel tank pressure sensor connector.

NO : Replace fuel tank pressure sensor with a new one.



4. CHECK HARNESS AND CONNECTOR BETWEEN ECM AND FUEL TANK PRESSURE SENSOR.

1) Turn ignition switch to OFF.
2) Remove right side rear quarter trim.



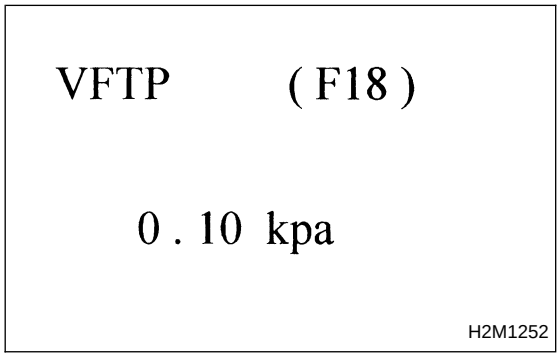
3) Disconnect connector from fuel tank pressure sensor.
4) Turn ignition switch to ON.
5) Read data on Subaru Select Monitor.

● Subaru Select Monitor

Designate mode using function key.

Function mode: F18

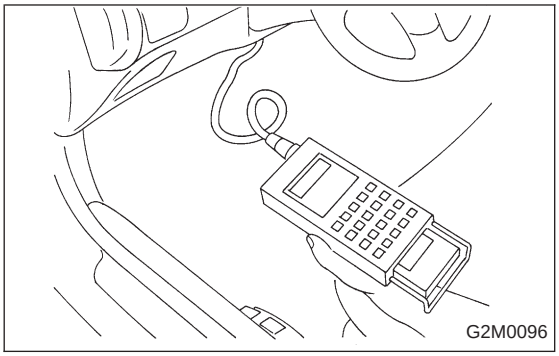
● F18: Fuel tank pressure sensor output signal is indicated.



CHECK ***: Is the value more than 7.2 kPa with function mode F18?***

YES : Repair short circuit of harness between ECM and fuel tank pressure sensor connector.

NO : Replace fuel tank pressure sensor with a new one.

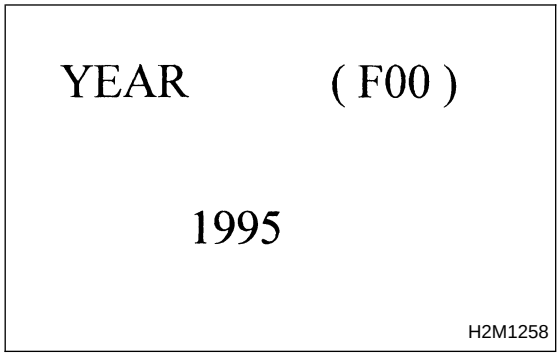


9. Diagnostics Chart with Select Monitor

A: FUNCTION MODE

Applicable cartridge of select monitor: No. 498345500

Function mode	Contents	Abbreviation	Unit of measure	Page
F00	ROM ID number	YEAR	—	81
F01	Battery voltage	VB	V	81
F02	Vehicle speed signal	VSP	MPH	82
F03	Vehicle speed signal	VSP	km/h	82
F04	Engine speed signal	EREV	rpm	83
F05	Engine coolant temperature signal	TW	deg F	84
F06	Engine coolant temperature signal	TW	deg C	84
F07	Ignition signal	ADVS	deg	84
F08	Mass air flow signal	QA	V	85
F09	Load data	LDATA	—	85
F10	Throttle position signal	THV	V	86
F11	Injector pulse width	TIM	mS	87
F12	Idle air control signal	ISC	%	88
F13	Oxygen sensor output signal	O_2	V	88
F14	Oxygen sensor MAX. output signal	O_2 MAX.	V	89
F15	Oxygen sensor MIN. output signal	O_2 MIN.	V	89
F16	A/F correction coefficient	ALPHA	%	90
F17	Fuel temperature signal	TSF	°F	90
F18	Fuel tank pressure signal	VFTP	kpa	90
F19	Purge control signal	CPCD	%	91
F22	Recirculation gas temperature	EGRT	deg C	91
FA0	ON ↔ OFF signal	—	—	92
FA1	ON ↔ OFF signal	—	—	92
FA2	ON ↔ OFF signal	—	—	93



B: MODE F00 — ROM ID NUMBER (YEAR) —

CONDITION:

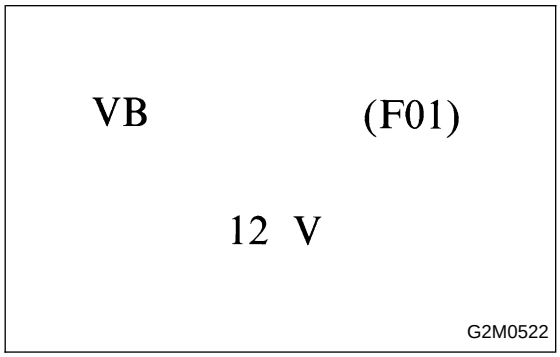
Ignition switch “ON”

SPECIFIED DATA:

Presentation display

- Probable cause (Item outside “specified data”)

1. Error 1	Check for loose or disconnected connector, and discontinued circuit, etc.
2. Error 2	Check for poor contact of cartridge, or different type cartridge.



C: MODE F01 — BATTERY VOLTAGE (VB) —

CONDITION:

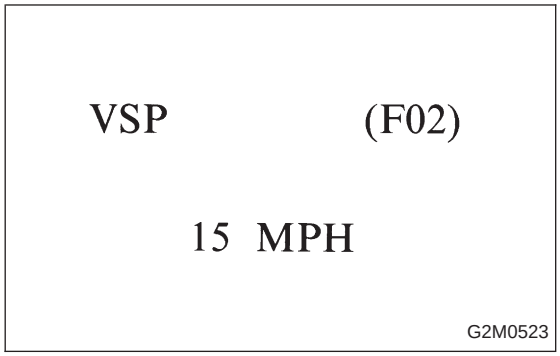
(1) Ignition switch “ON”
(2) Idling after warm-up

SPECIFIED DATA:

(1) 10 — 12 V
(2) 12 — 14 V

- Probable cause (Item outside “specified data”)

1. Battery	Check battery voltage and electrolyte’s specific gravity.
2. Charging system	● Check regulating voltage. (On no-load) ● Check alternator.
3. Power supply line	● Check main relay. <Ref. to 2-7 [T7B1].> ● Check harness connector of ECM power supply line. <Ref. to 2-7 [T7B2], [T7B3].>



D: MODE F02 AND F03 — VEHICLE SPEED SIGNAL (VSP) —

CONDITION:

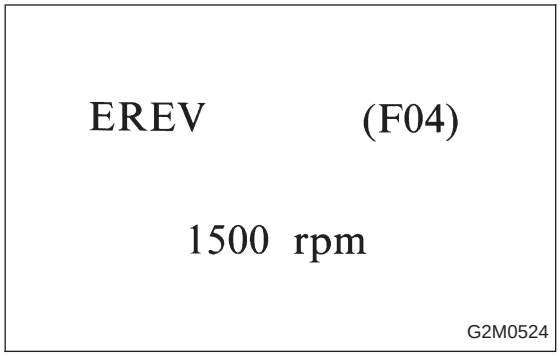
Driving at constant speed.

SPECIFIED DATA:

Compare speedometer with monitor indications.
- F02: Vehicle speed is indicated in mile per hour (MPH).
- F03: Vehicle speed is indicated in kilometer per hour (km/h).

- Probable cause (Item outside “specified data”)

1. Vehicle speed sensor 2	Check vehicle speed sensor line. <Ref. to 2-7 [T8K0].>



E: MODE F04
— ENGINE SPEED SIGNAL (EREV) —

CONDITION:

Operate engine at constant speed.

SPECIFIED DATA:

Compare engine speed indicated at tachometer.

- Probable cause (Item outside “specified data”)

1. Camshaft position sensor	Check camshaft position sensor line. <Ref. to 2-7 [T8D0].>
2. Crankshaft position sensor	Check crankshaft position sensor line. <Ref. to 2-7 [T8B0].>
3. Engine coolant temperature sensor	Check “MODE F05” or “MODE F06”. <Ref. to 2-7 [T9F0].>
4. Power steering pressure switch	Check “MODE FA0”. <Ref. to 2-7 [T9U0].>
5. Throttle position sensor	Check “MODE F10”. <Ref. to 2-7 [T9J0].>
6. Idle air control solenoid valve	Check “MODE F12”. <Ref. to 2-7 [T9L0].>
7. FICD solenoid valve (with A/C model)	Check “MODE FA1”. <Ref. to 2-7 [T9V0].>

F: MODE F05 AND F06 — ENGINE COOLANT TEMPERATURE SIGNAL (TW) —

CONDITION:

Idling after warm-up.

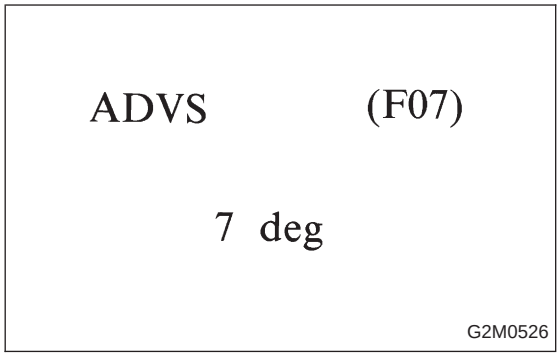
SPECIFIED DATA:

F05: 158 — 194 deg F
F06: 70 — 90 deg C

- F05: Water temperature is indicated in “deg F”.
- F06: Water temperature is indicated in “deg C”.

- Probable cause (Item outside “specified data”)

1. Cooling system	• Check coolant level. <Ref. to 1-5 [05A2].> • Check thermostat. <Ref. to 2-5 [W2B0].> • Check operation of radiator fan.
2. Engine coolant temperature sensor	• Check engine coolant temperature sensor. <Ref. to 2-7 [T8F0].>



G: MODE F07 — IGNITION SIGNAL (ADVS) —

CONDITION:

- Idling after warm-up.
- Shift lever is in Neutral position on MT model.
- Selector lever is in Neutral or Parking position on AT model.

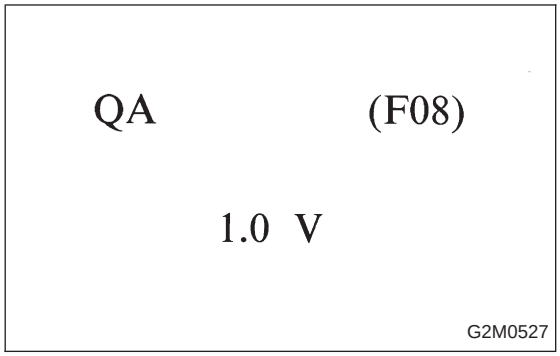
SPECIFIED DATA:

12 — 28 deg

- Probable cause (Item outside “specified data”)

1. Engine under load	Check “MODE F09”. <Ref. to 2-7 [T9I0].>
2. Mass air flow sensor	Check “MODE F08”. <Ref. to 2-7 [T9H0].>
3. Throttle position sensor	Check “MODE F10”. <Ref. to 2-7 [T9J0].>

NOTE:
The ignition timing value displayed in mode F07 is a value computed by ECM and will not always correspond with the value measured with a timing light.



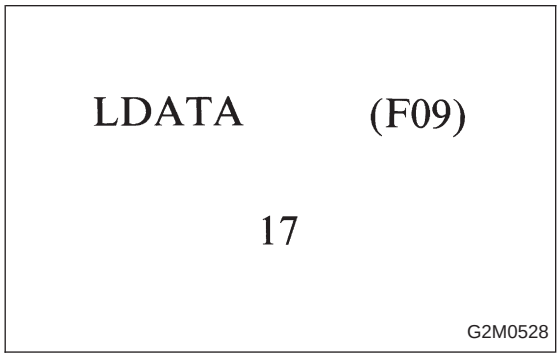
H: MODE F08 — MASS AIR FLOW SIGNAL (QA) —

CONDITION:
Idling after warm-up.

SPECIFIED DATA:
0.8 — 1.2 V

- Probable cause (Item outside “specified data”)

1. Mass air flow sensor	Check mass air flow sensor line. <Ref. to 2-7 [T8G0].>



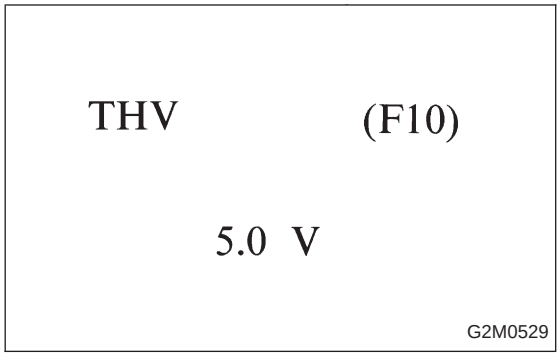
I: MODE F09 — LOAD DATA (LDATA) —

CONDITION:
Idling after warm-up.

SPECIFIED DATA:
15 — 20

- Probable cause (Item outside “specified data”)

1. Mass air flow sensor	Check “MODE F08”. <Ref. to 2-7 [T9H0].>
2. Engine speed	Check “MODE F04”. <Ref. to 2-7 [T9E0].>
3. Camshaft position sensor	Check camshaft position sensor line. <Ref. to 2-7 [T8D0].>
4. Crankshaft position sensor	Check crankshaft position sensor line. <Ref. to 2-7 [T8B0].>



J: MODE F10 — THROTTLE POSITION SIGNAL (THV) —

CONDITION:

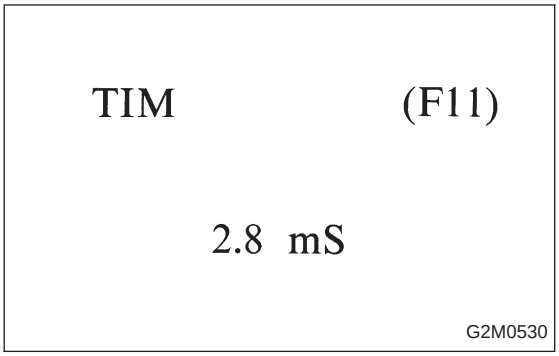
Check voltage while throttle valve is changing from “fully closed” to “fully opened”.

SPECIFIED DATA:

5.0 — 1.5 V

- Probable cause (Item outside “specified data”)

1. Throttle position sensor	→ Check throttle position sensor line. <Ref. to 2-7 [T8I0].>



K: MODE F11
— INJECTOR PULSE WIDTH (TIM) —

CONDITION:

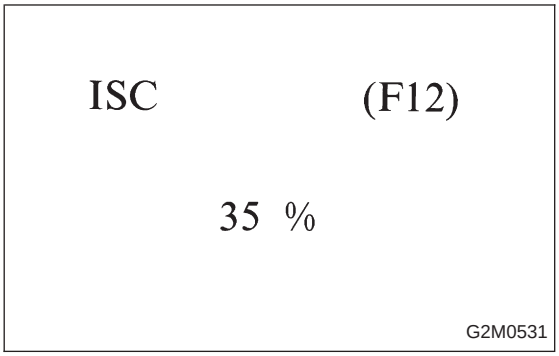
- Idling after warm-up.
- Electric load item and blower fan is turned OFF.
- Radiator fan is not in operation.

SPECIFIED DATA:

2.0 — 3.5 mS

- Probable cause (Item outside “specified data”)

1. Engine under load	Check “MODE F09”. <Ref. to 2-7 [T9I0].>
2. A/F correction coefficient	Check “MODE F16”. <Ref. to 2-7 [T9P0].>
3. Engine coolant temperature sensor	Check “MODE F05” or “MODE F06”. <Ref. to 2-7 [T9F0].>
4. Oxygen sensor	Check “MODE F13”. <Ref. to 2-7 [T9M0].>
5. Vehicle speed sensor 2	Check “MODE F02” or “MODE F03”. <Ref. to 2-7 [T9D0].>
6. Mass air flow sensor	Check “MODE F08”. <Ref. to 2-7 [T9H0].>
7. Idle air control solenoid valve	Check “MODE F12”. <Ref. to 2-7 [T9L0].>
8. Battery voltage	Check “MODE F01”. <Ref. to 2-7 [T9C0].>



L: MODE F12 — IDLE AIR CONTROL SIGNAL (ISC) —

CONDITION:

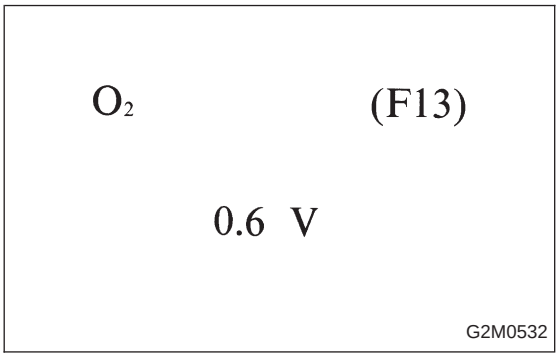
- Idling after warm-up.
- A/C is turned OFF.
- Radiator fan is not in operation.
- Battery voltage is above 13 volts.
- Vehicle is at sea level. (Not high altitudes)

SPECIFIED DATA:

25 — 40 %

- Probable cause (Item outside “specified data”)

1. Engine coolant temperature sensor	Check “MODE F05” or “MODE F06”. <Ref. to 2-7 [T9F0].>
2. Throttle position sensor	Check “MODE F10” <Ref. to 2-7 [T9J0].>
3. Neutral position switch (MT model)	Check neutral position switch line. <Ref. to 2-7 [T8P0].>
4. Park/Neutral position switch (AT model)	Check Park/Neutral position switch line. <Ref. to 2-7 [T8Q0].>



M: MODE F13 — OXYGEN SENSOR OUTPUT SIGNAL (O_2) —

CONDITION:

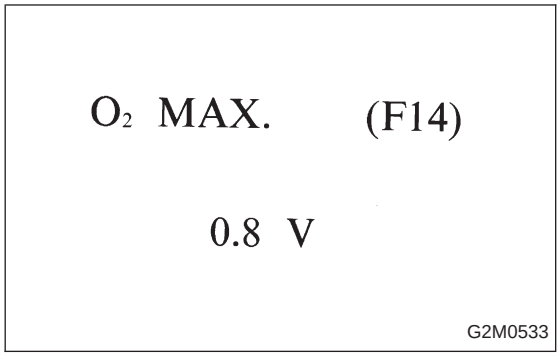
- Idling after warm-up.
- A/C is turned OFF.

SPECIFIED DATA:

0 — 1.0 V

- Probable cause (Item outside “specified data”)

1. Injection plus width	Check “MODE F11”. <Ref. to 2-7 [T9K0].>
2. Oxygen sensor	Check oxygen sensor line. <Ref. to 2-7 [T8J0].>



N: MODE F14 — OXYGEN SENSOR MAX. OUTPUT SIGNAL (O_2 MAX.) —

CONDITION:

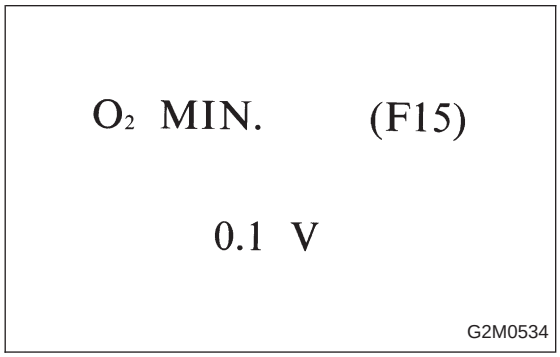
- Idling after warm-up.
- A/C is turned OFF.

SPECIFIED DATA:

0.7 — 1.0 V

- Probable cause (Item outside “specified data”)

1. Injection plus width	Check “MODE F11”. <Ref. to 2-7 [T9K0].>
2. Oxygen sensor	Check oxygen sensor line. <Ref. to 2-7 [T8J0].>



O: MODE F15 — OXYGEN SENSOR MIN. OUTPUT SIGNAL (O_2 MIN.) —

CONDITION:

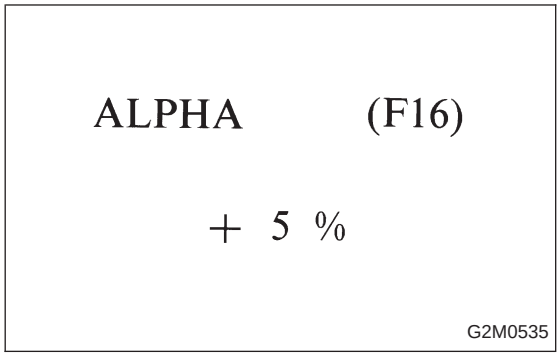
- Idling after warm-up.
- A/C is turned OFF.

SPECIFIED DATA:

0 — 0.2 V

- Probable cause (Item outside “specified data”)

1. Injection plus width	Check “MODE F11”. <Ref. to 2-7 [T9K0].>
2. Oxygen sensor	Check oxygen sensor line. <Ref. to 2-7 [T8J0].>



P: MODE F16 — A/F CORRECTION COEFFICIENT (ALPHA) —

CONDITION:

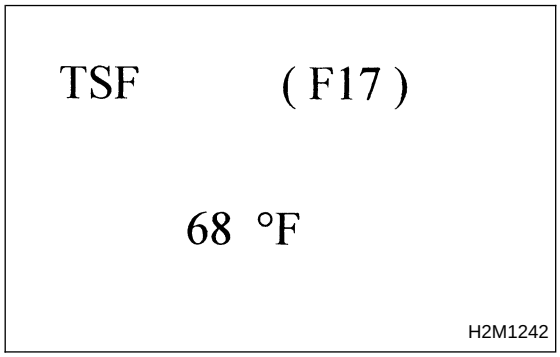
Idling after warm-up.

SPECIFIED DATA:

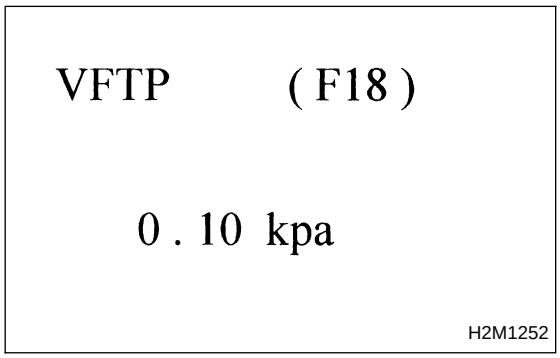
−10 to +10 %

- Probable cause (Item outside “specified data”)

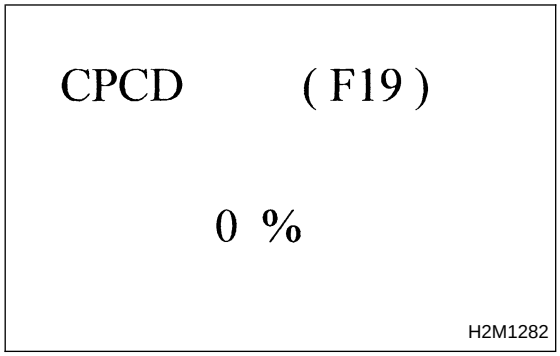
1. Injection plus width	Check “MODE F11”. <Ref. to 2-7 [T9K0].>
2. Oxygen sensor	Check oxygen sensor line. <Ref. to 2-7 [T8J0].>
3. Throttle position sensor	Check throttle position sensor line. <Ref. to 2-7 [T8I0].>



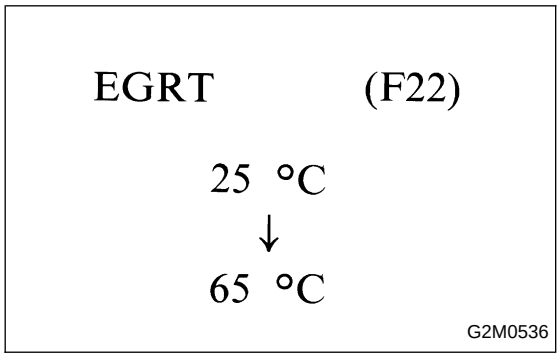
Q: MODE F17 — FUEL TEMPERATURE SIGNAL (TSF) —



R: MODE F18 — FUEL TANK PRESSURE SIGNAL (VFTP) —



S: MODE F19 — PURGE CONTROL SIGNAL (CPCD) —



T: MODE F22 — RECIRCULATION GAS TEMPERATURE (EGRT) —

CONDITION:

Idling after warm-up.

SPECIFIED DATA:

(1) Make sure to recirculate gas temperature when engine is idling.
(2) Open EGR valve by force.
(3) Make sure that indicated temperature rises.

- Probable cause (Item outside “specified data”)

1. Recirculation gas temperature sensor	→ Check recirculation gas temperature sensor line. <Ref. to 2-7 [T8R0].>

LED No.	Signal name	Display
1	Ignition switch	IG
2	Identification of AT model	AT
3	Test mode connector	UD
4	Read memory connector	RM
5	Fuel tank pressure control solenoid valve	PC
6	—	—
7	Park/Neutral position switch	NT
8	Power steering pressure	SS
9	—	—
10	Oxygen sensor signal	O2

IG	AT	UD	RM	PC
——	NT	SS	——	O2

1	2	3	4	5
6	7	8	9	10

U: MODE FA0

— ON ↔ OFF SIGNAL —

Requirement for LED “ON”.
LED No. 1 Ignition switch is turned ON.
LED No. 2 Vehicle is AT model.
LED No. 3 Test mode connector is connected.
LED No. 4 Read memory connector is connected.
LED No. 5 Fuel tank pressure control solenoid valve is in function.
LED No. 7 ● On MT model, gear position is in neutral.
● On AT model, shift position is in “P” or “N”.
LED No. 8 Steering is turned.
LED No. 10 Mixture ratio is rich.

NOTE:
● When LED Nos. 3 and 4 blink with the test mode connector connected and the ignition switch turned to ON, the corresponding parts are functioning properly.

LED No.	Signal name	Display
1	FICD solenoid valve	AF
2	A/C switch	AC
3	A/C relay	AR
4	Radiator fan relay 1	R1
5	Radiator fan relay 2	R2
6	—	—
7	—	—
8	—	—
9	—	—
10	Oxygen sensor signal	O2

AF	AC	AR	R1	R2
——	——	——	——	O2

1	2	3	4	5
6	7	8	9	10

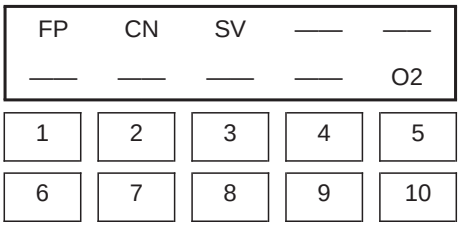
V: MODE FA1

— ON ↔ OFF SIGNAL —

Requirement for LED “ON”.
LED No. 1 FICD solenoid valve is in function.
LED No. 2 A/C switch is turned ON.
LED No. 3 A/C relay is turned ON.
LED No. 4 Radiator fan relay 1 is turned ON.
LED No. 5 Radiator fan relay 2 is turned ON.
LED No. 10 Mixture ratio is rich.

NOTE:
When LED No. 1 blinks with the test mode connector connected and the ignition switch turned to ON, the corresponding part is functioning properly.

LED No.	Signal name	Display
1	Fuel pump relay	FP
2	Purge control solenoid valve	CN
3	Air suction solenoid valve	SV
4	—	—
5	—	—
6	—	—
7	—	—
8	—	—
9	—	—
10	Oxygen sensor signal	O2



W: MODE FA2

— ON ↔ OFF SIGNAL —

Requirement for LED “ON”.
LED No. 1 Fuel pump relay is turned ON.
LED No. 2 Purge control solenoid valve is in function.
LED No. 3 Air suction solenoid valve is in function.
LED No. 10 Mixture ratio is rich.

NOTE:
● When LED Nos. 2 and 3 blink with the test mode connector connected and the ignition switch turned to ON, the corresponding parts are functioning properly.

10. General Diagnostics Table

		ECM power supply	Mass air flow sensor	Engine coolant temperature sensor	Throttle position sensor	Crankshaft position sensor	Camshaft position sensor	Vehicle speed sensor 2	Oxygen sensor	Ignition coil	Ignitor	Spark plug	Fuel pump	Pressure regulator	Fuel injector	Idle air control solenoid valve	FICD solenoid valve (models with A/C)	Engine ground terminal	Test mode or read memory connectors are connected.	Accelerator cable is out of adjustment.	Transmission Control Module (TCM)	Air leak in air intake system
Failure of engine to start	Internal combustion does not occur.	1		3		2	2			3	3	3	2	2	3	3		1				
	Internal combustion occurs.	1	3	2								1	3	2	3	3	3					
	Engine stalls after internal combustion.	1		2						3		2	3	3	3	3	3					
Engine stalls.		3	3		3	3		3		3		2	3			3				2	2	
Rough idling		3	2	2	3				3			1	3	2	3	2	2		3			2
Hard to drive at constant speed.			3	3	3								3	1	2							
Poor acceleration /deceleration			3	3	2					2		1	2	2	2	3						
Poor return to idling			3	3	2											2	3			1		
Back fire										3	3	1	3	3	2							
Knocking			3	3									2	2								
Excessive fuel consumption			1	1										2								
Shocks while driving.		2			2									1								
Poor engine revving			2	2	2								2	1								
Remarks		*1												*2		*2	*2					*2

*1: Include ECM grounding circuit.
*2: Check hoses.

ON-BOARD DIAGNOSTICS II SYSTEM 2-7b

1. General

1. GENERAL 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 trips, 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.

A: ENGINE

1. ENGINE AND EMISSION CONTROL SYSTEM

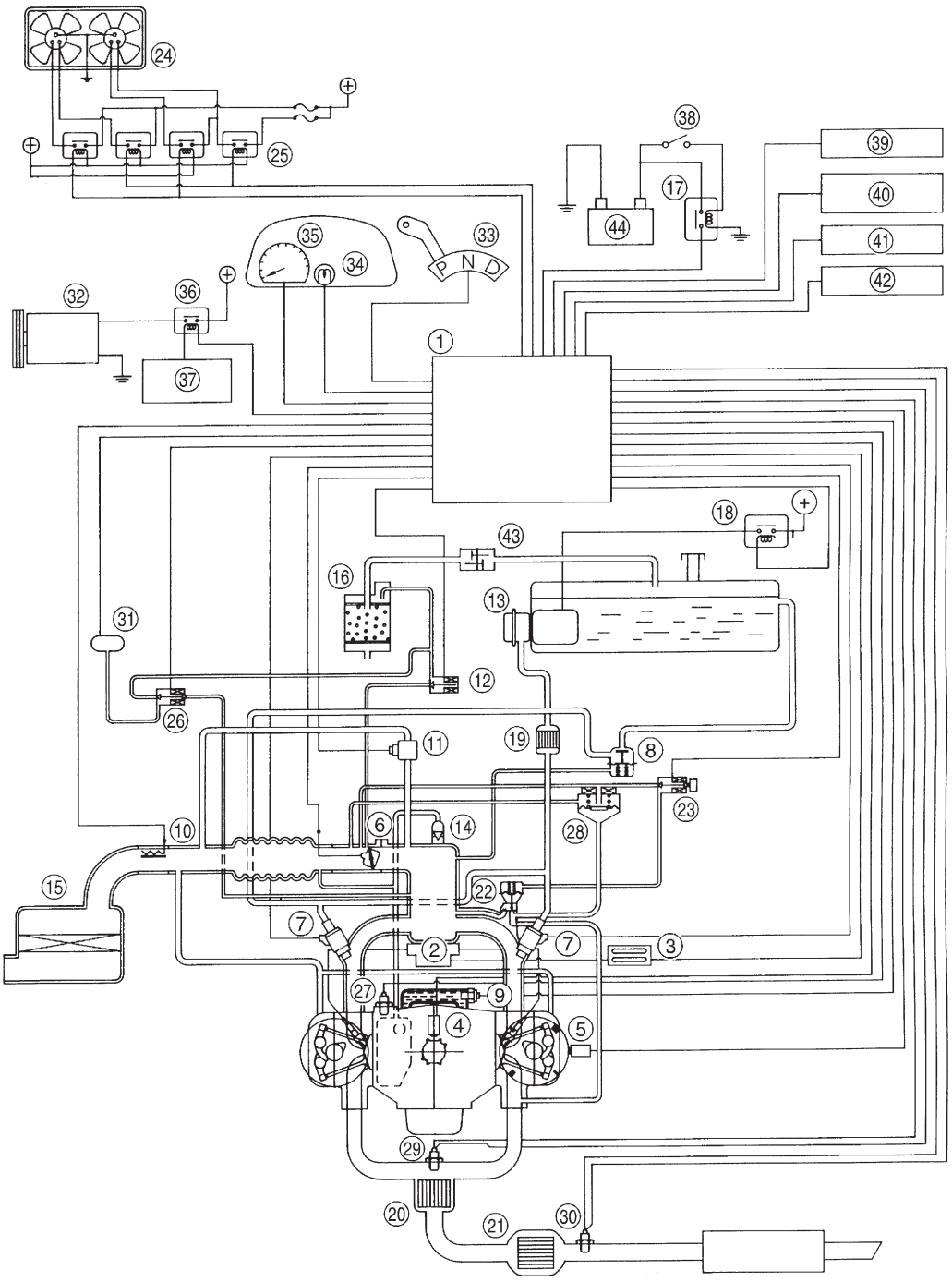
● The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.
With this system fuel, which is pressurized at a constant pressure, is injected into the intake 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 quan-

tity 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:

1) Reduced emission of harmful exhaust gases.
2) Reduced in fuel consumption.
3) Increased engine output.
4) Superior acceleration and deceleration.
5) Superior startability and warm-up performance in cold weather since compensation is made for coolant and intake air temperature.

2. SCHEMATIC



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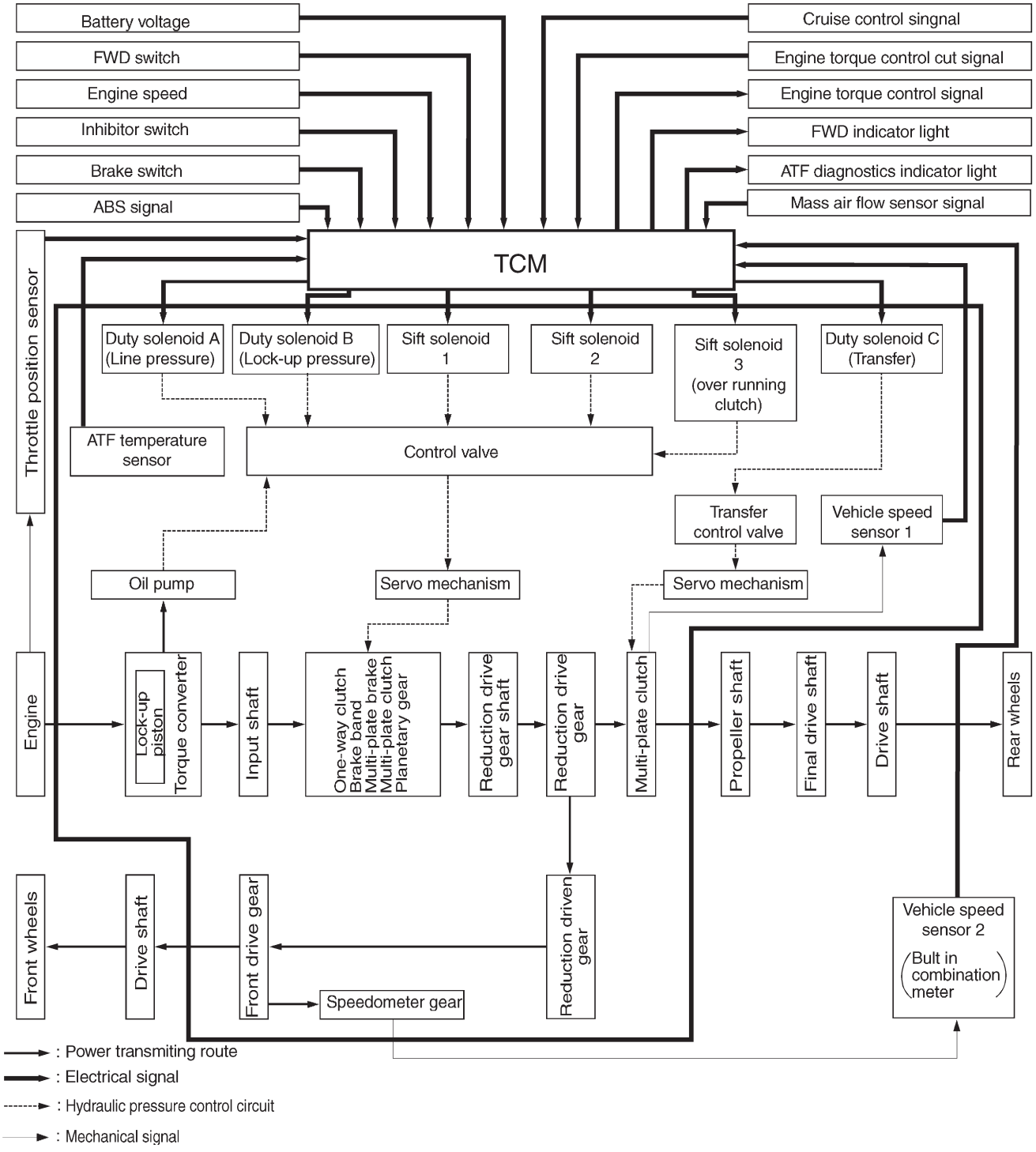
① Engine control module (ECM)
② Ignition coil
③ Ignitor
④ Crankshaft position sensor
⑤ Camshaft position sensor
⑥ Throttle position sensor
⑦ Fuel injectors
⑧ Pressure regulator
⑨ Engine coolant temperature sensor
⑩ Mass air flow sensor
⑪ Idle air control solenoid valve
⑫ Purge control solenoid valve
⑬ Fuel pump
⑭ PCV valve
⑮ Air cleaner
⑯ Canister
⑰ Main relay
⑱ Fuel pump relay
⑲ Fuel filter
⑳ Front catalytic converter
㉑ Rear catalytic converter
㉒ EGR valve
㉓ EGR control solenoid valve
㉔ Radiator fan
㉕ Radiator fan relay
㉖ Pressure sources switching solenoid valve
㉗ Knock sensor
㉘ Back-pressure transducer
㉙ Front oxygen sensor
㉚ Rear oxygen sensor
㉛ Pressure sensor
㉜ A/C compressor
㉝ Inhibitor switch
㉞ CHECK ENGINE malfunction indicator lamp (MIL)
㉟ Tachometer
㊱ A/C relay
㊲ A/C control module
㊳ Ignition switch
㊴ Transmission control module (TCM)
㊵ Vehicle speed sensor
㊶ Data link connector (Subaru select monitor)
㊷ Data link connector (OBD-II general scan tool)
㊸ Two way valve
㊹ Battery

B: AUTOMATIC TRANSMISSION

1. ELECTRONIC-HYDRAULIC CONTROL SYSTEM

The electronic-hydraulic control system consists of various sensors and switches, a transmission control module (TCM) and the hydraulic controller including solenoid valves. The system controls the transmission proper including shift control, lock-up control, overrunning clutch control, line pressure control and shift timing control. It also controls the AWD transfer clutch. In other words, the system detects various operating conditions from various input signals and sends output signals to shift solenoids 1, 2 and 3 and duty solenoids A, B and C (a total of six solenoids).

2. SCHEMATIC



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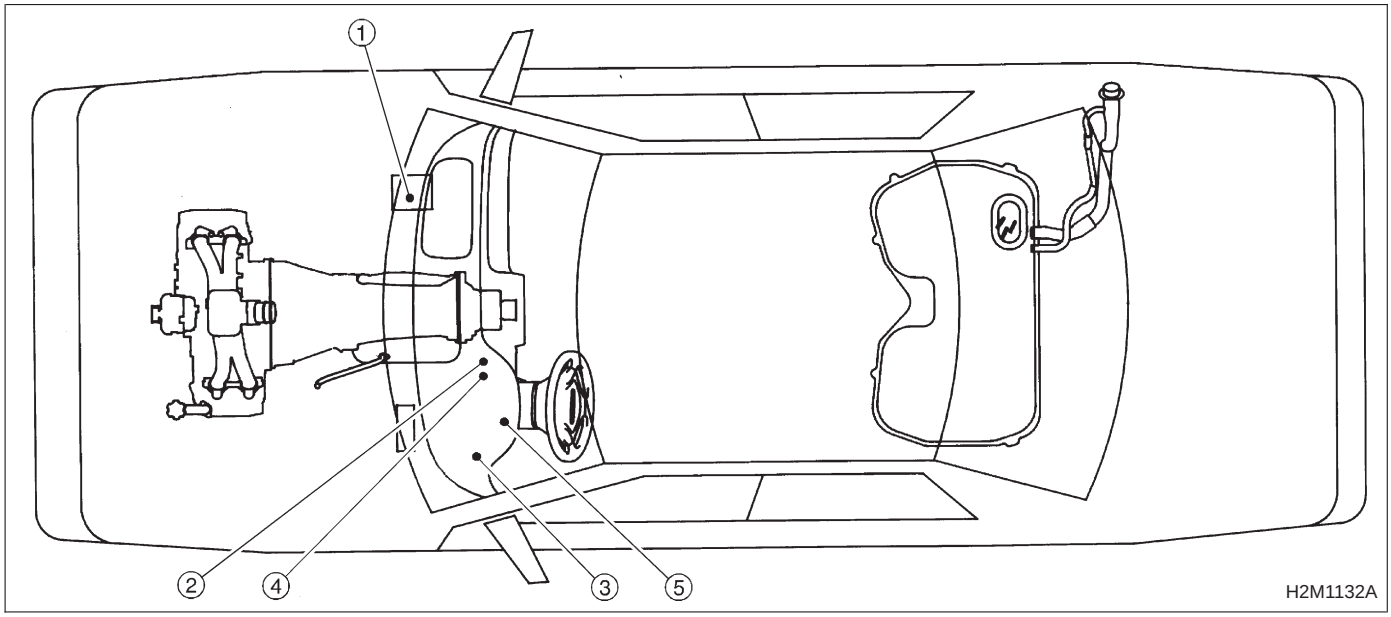
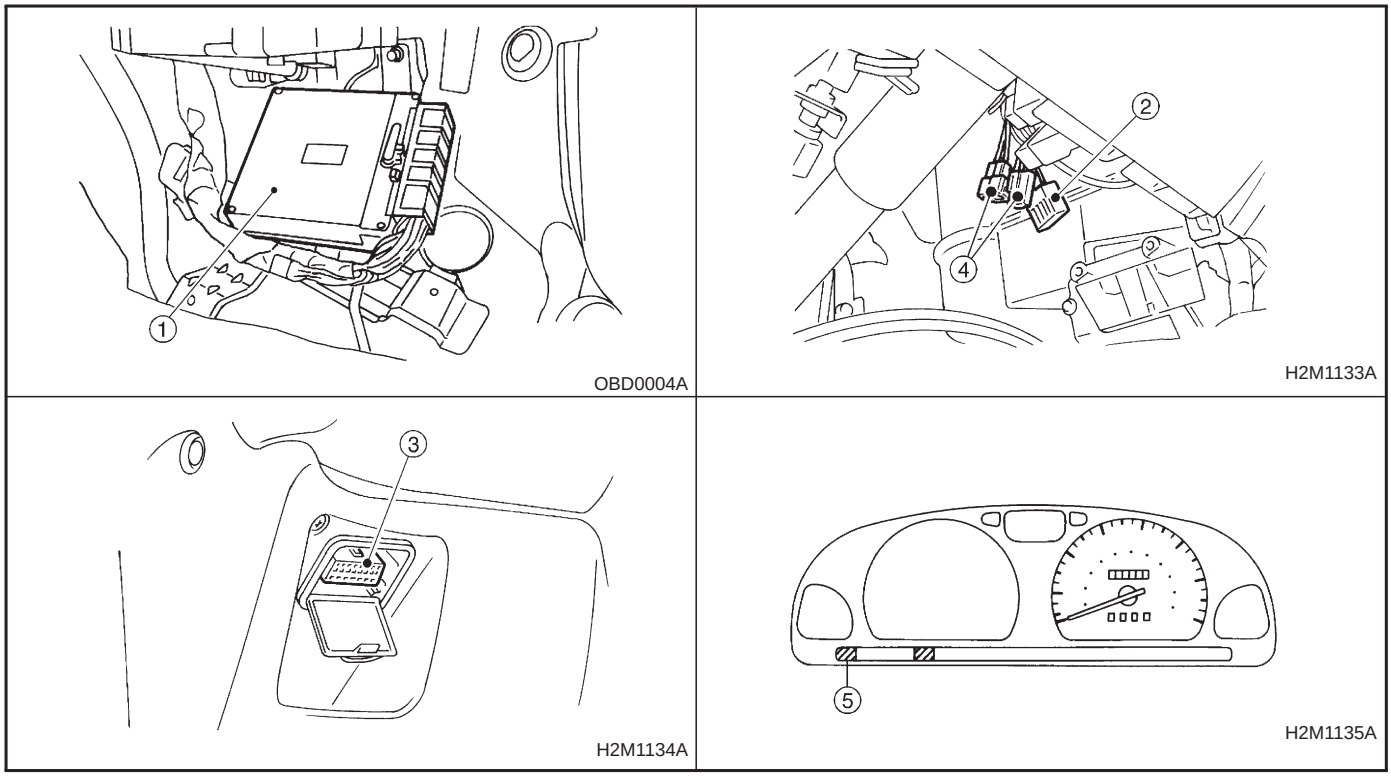
2. Electrical Components Location

A: ENGINE

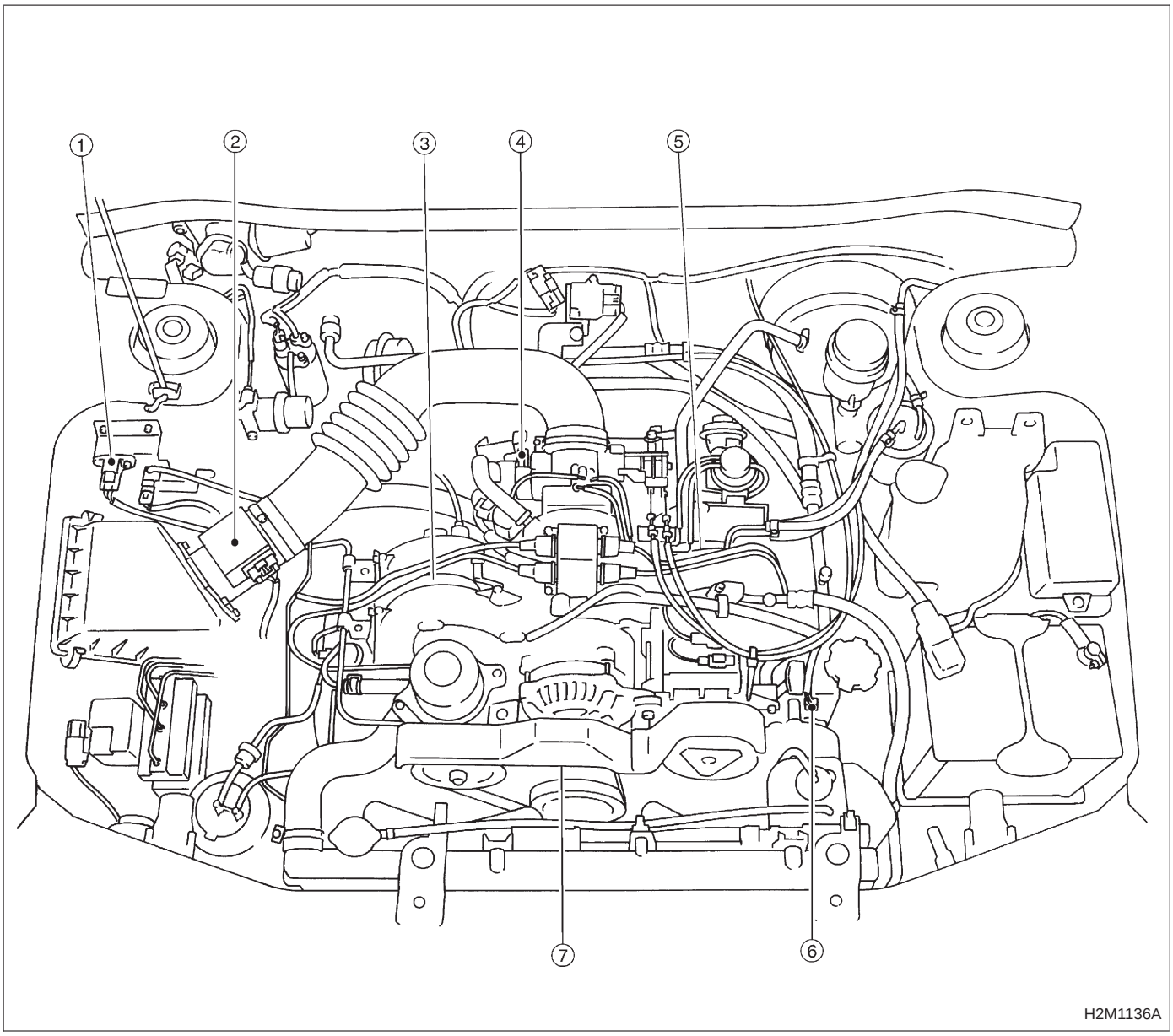
1. MODULE



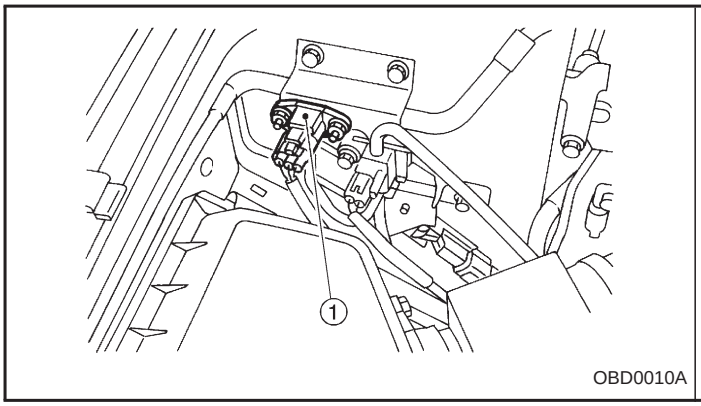
① Engine control module (ECM)
② Data link connector (for Subaru select monitor only)
③ Data link connector (for Subaru select monitor and OBD-II general scan tool)
④ Test mode connector
⑤ CHECK ENGINE malfunction indicator lamp (MIL)

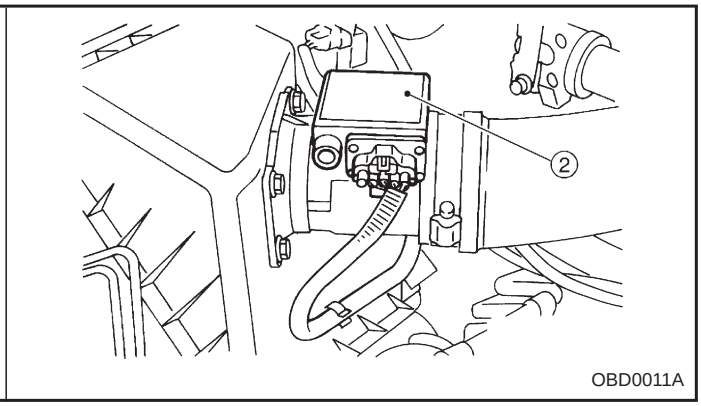


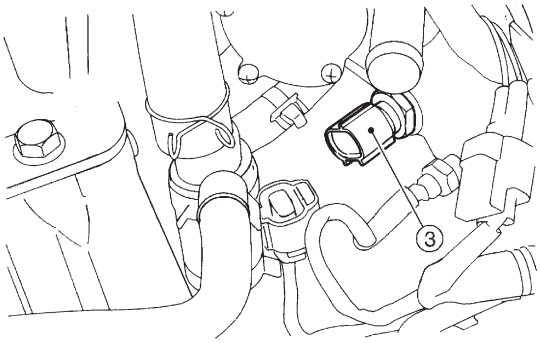
2. SENSOR



① Pressure sensor
② Mass air flow sensor
③ Engine coolant temperature sensor
④ Throttle position sensor
⑤ Knock sensor
⑥ Camshaft position sensor
⑦ Crankshaft position sensor







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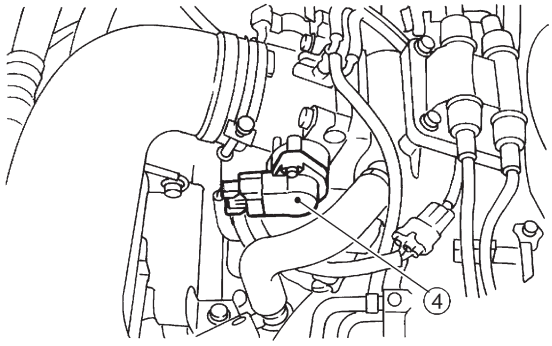

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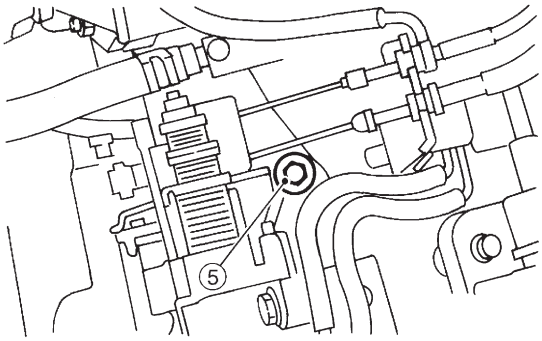
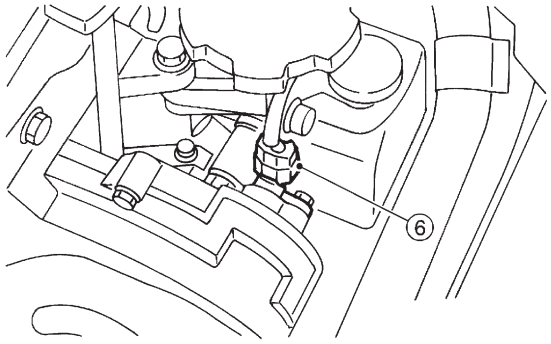
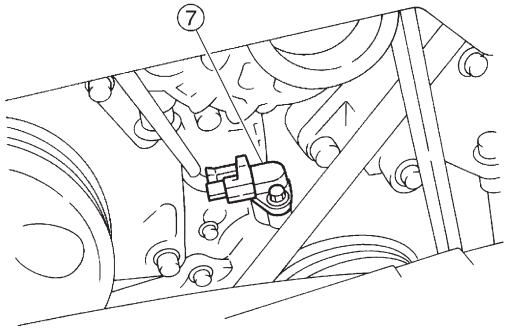


OBD0014A



OBD0015A



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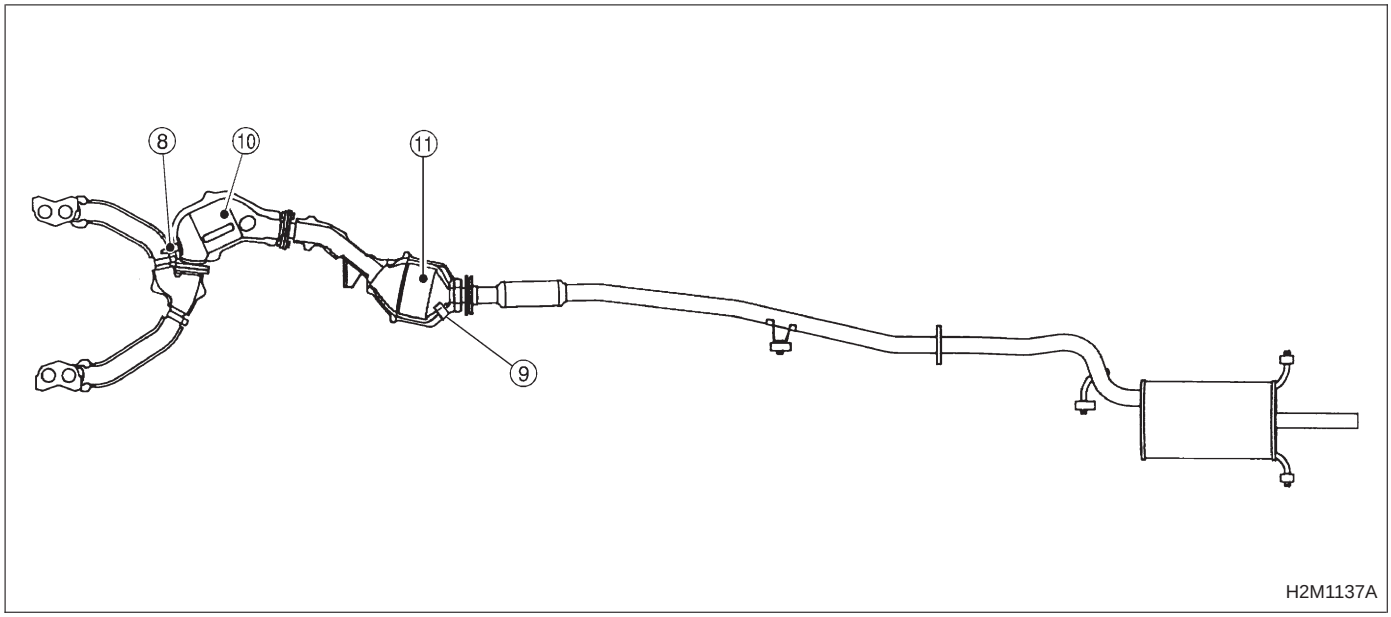
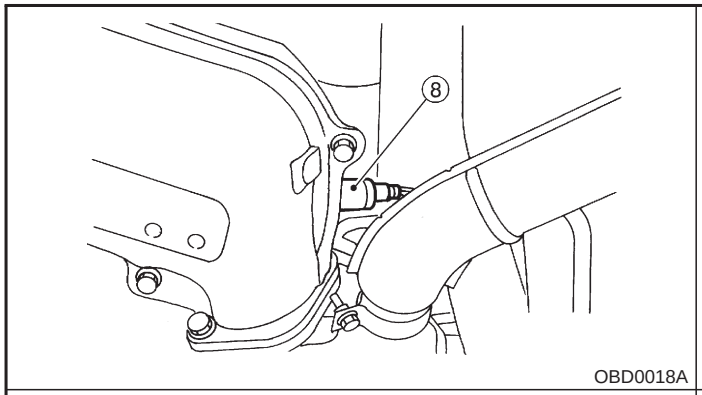
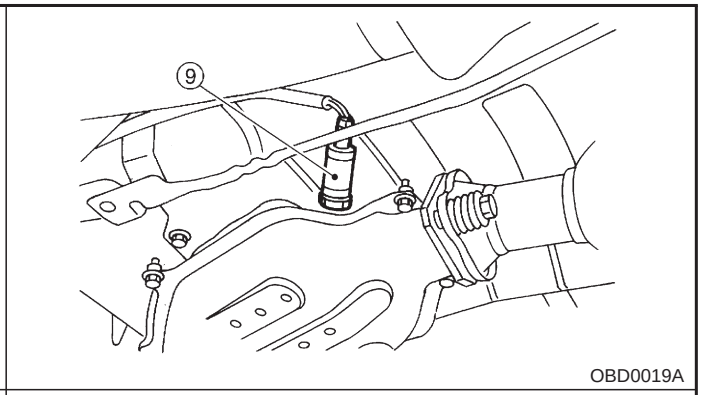
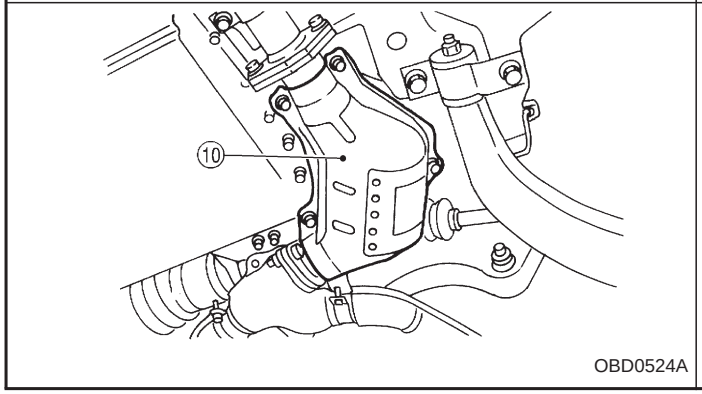
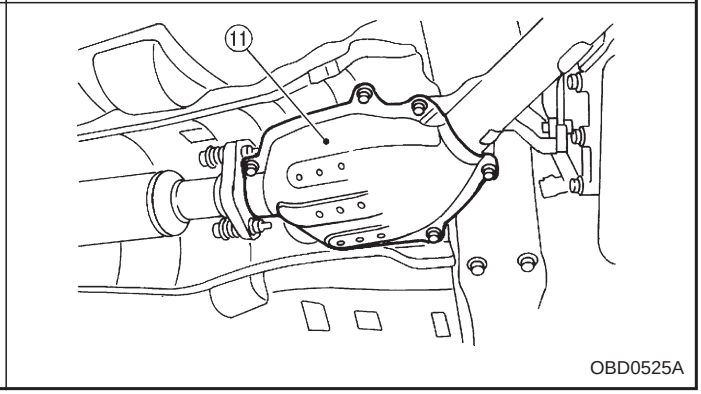


⑧ Front oxygen sensor
⑨ Rear oxygen sensor
⑩ Front catalytic converter
⑪ Rear catalytic converter

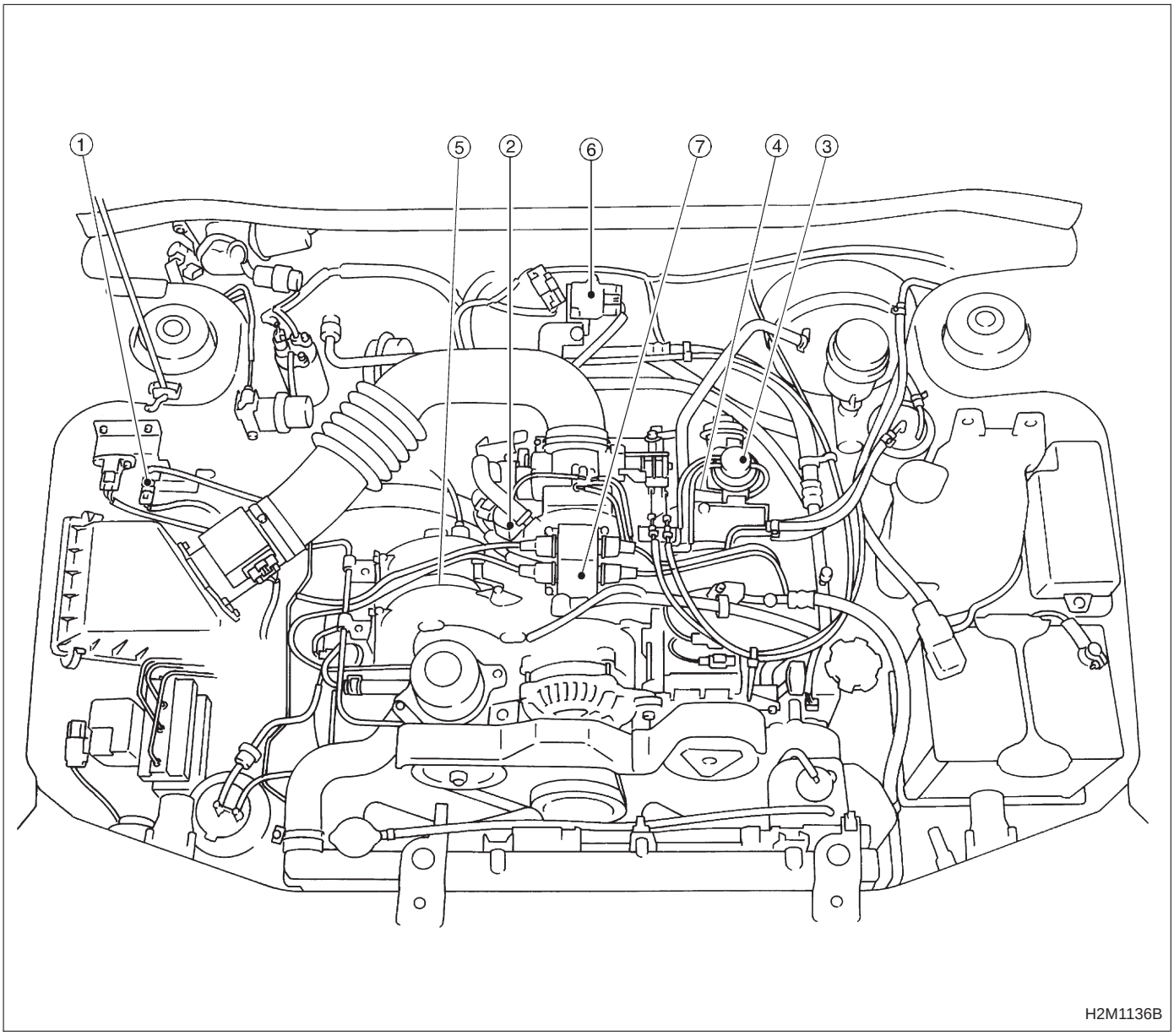




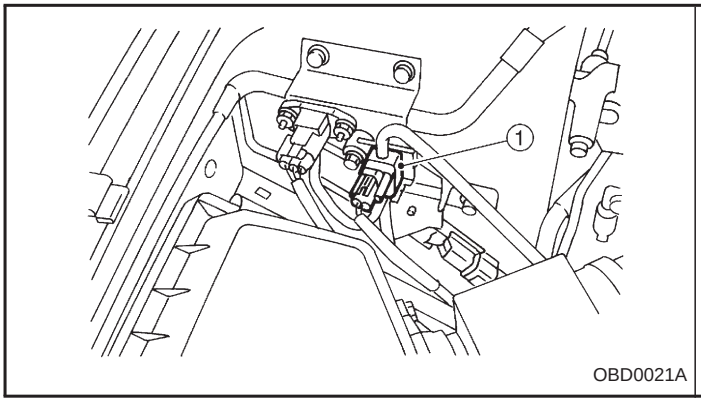


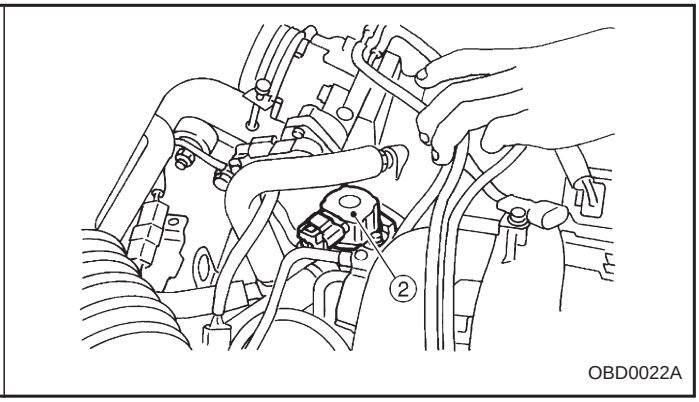


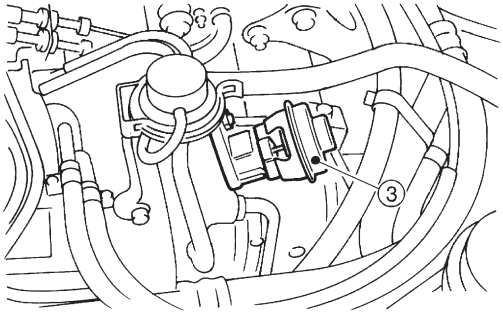
3. SOLENOID VALVE, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS



① Pressure sources switching solenoid valve
② Idle air control solenoid valve
③ EGR valve
④ EGR control solenoid valve
⑤ Purge control solenoid valve
⑥ Ignitor
⑦ Ignition coil







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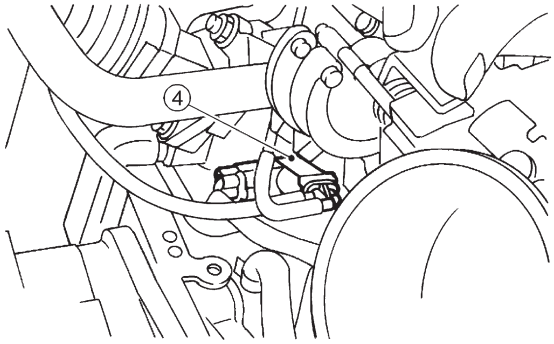
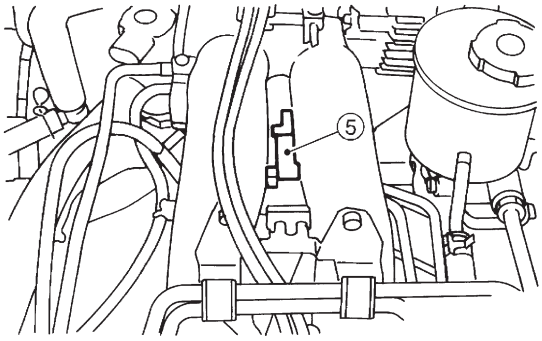
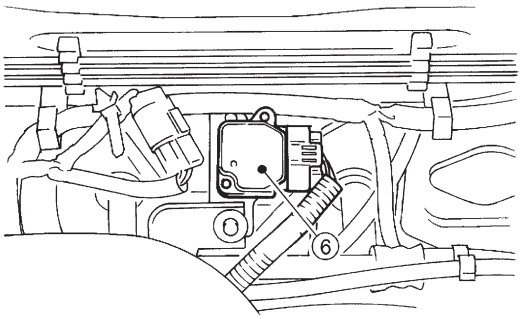


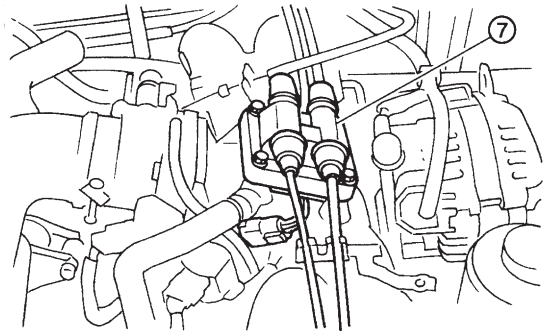
OBD0024A



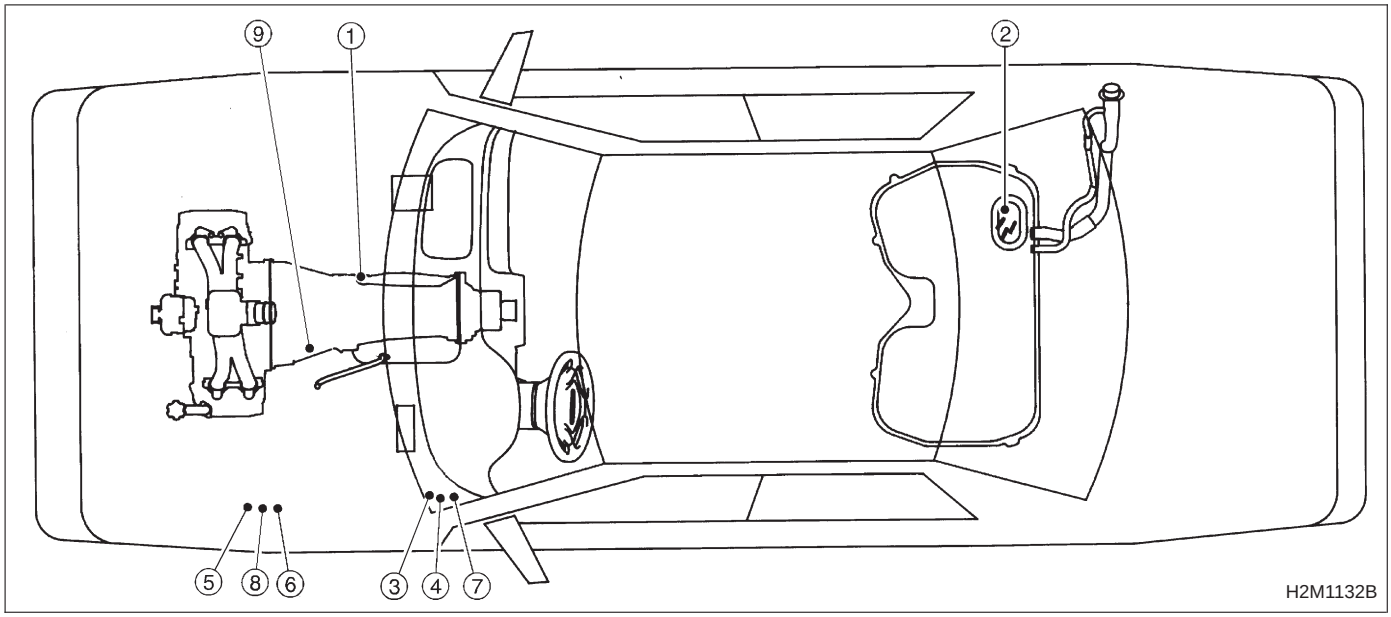
OBD0025A



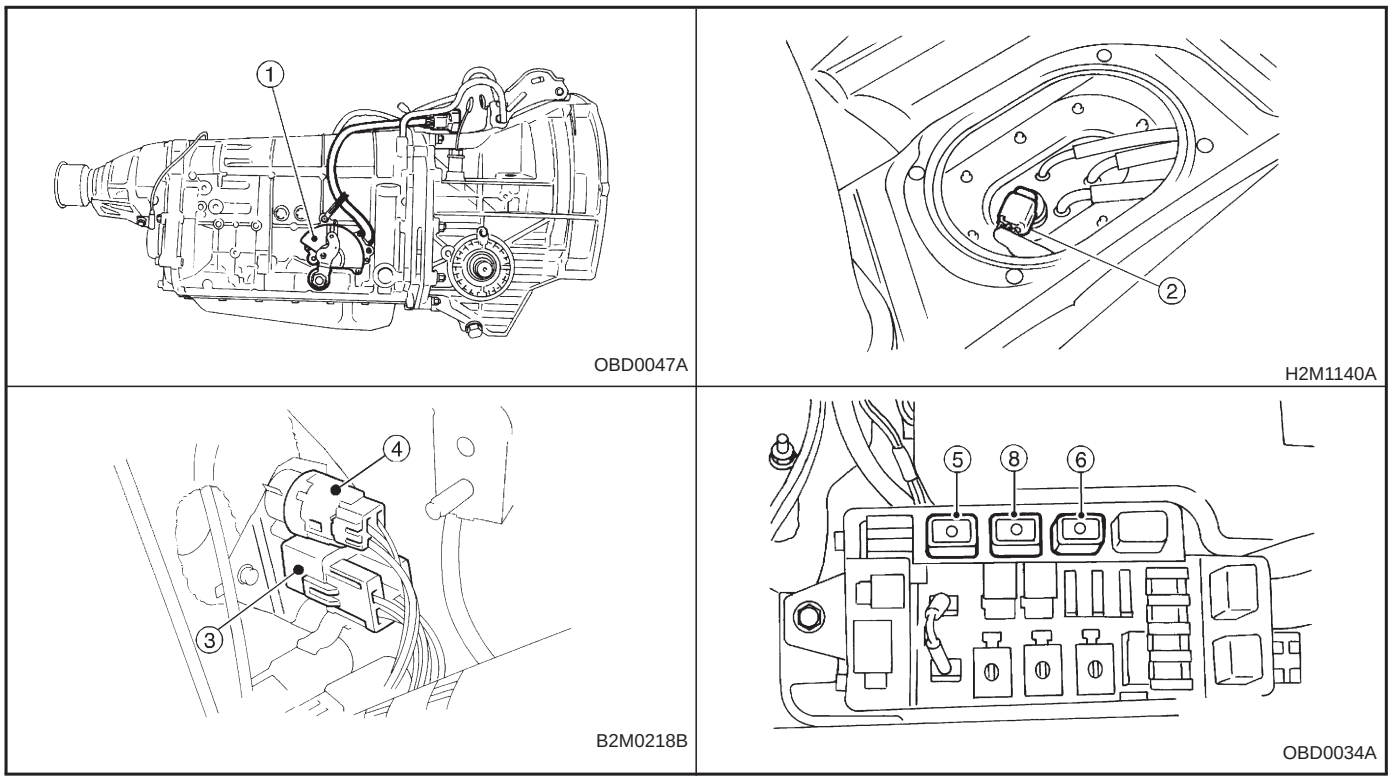
H2M1139A

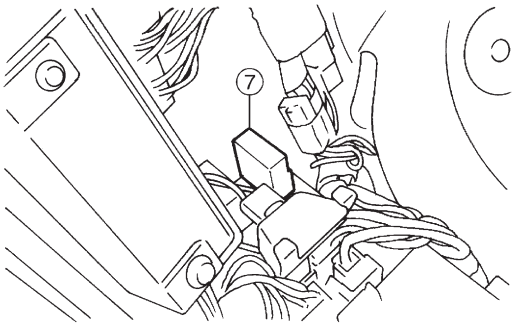


B6M0160A

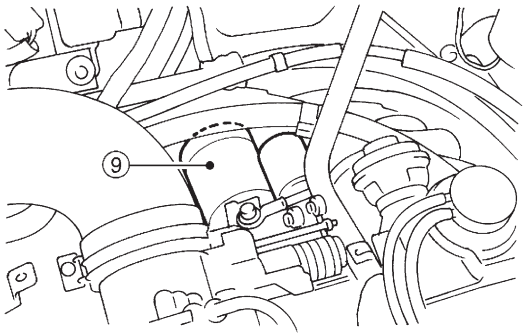


① Inhibitor switch
② Fuel pump
③ Main relay
④ Fuel pump relay
⑤ Radiator sub fan relay 2 (With A/C models only)
⑥ Radiator sub fan relay 1 (With A/C models only)
⑦ Main fan relay
⑧ Radiator main fan relay 2 (With A/C models only)
⑨ Starter





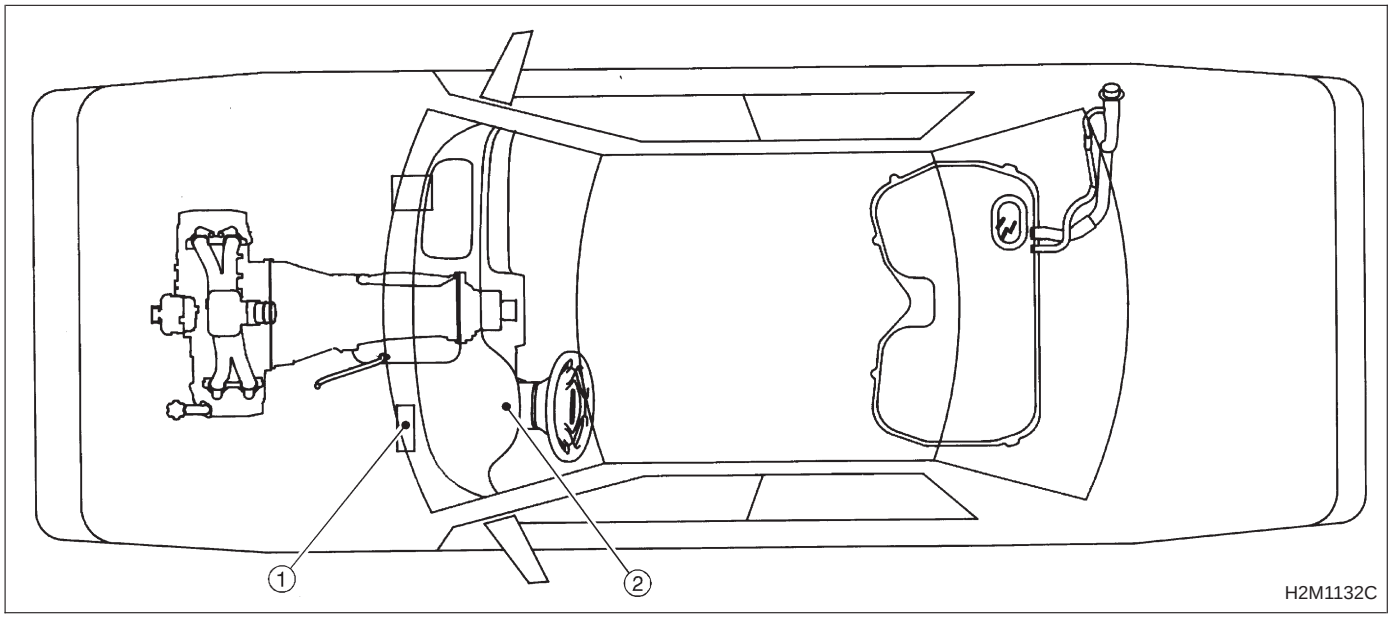
H2M1141A



H2M1142A

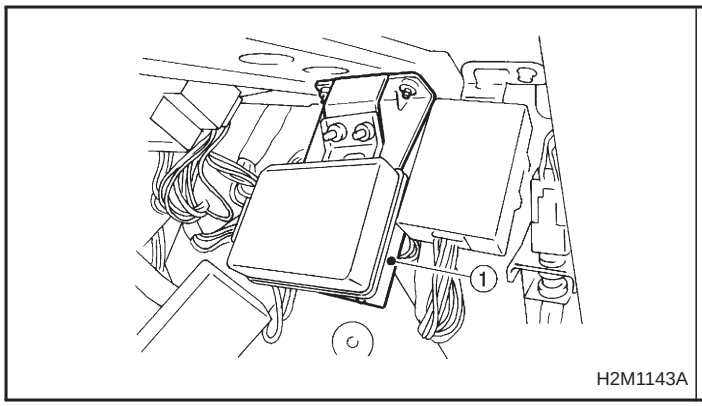
B: TRANSMISSION

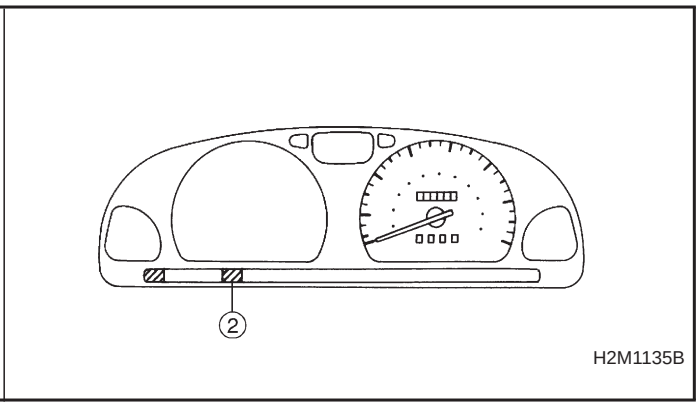
1. MODULE



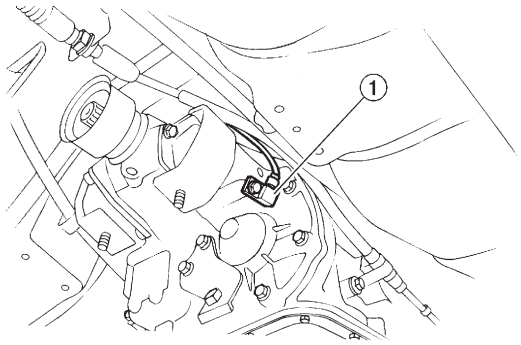
① Transmission Control Module (TCM)

② AT diagnostic indicator light

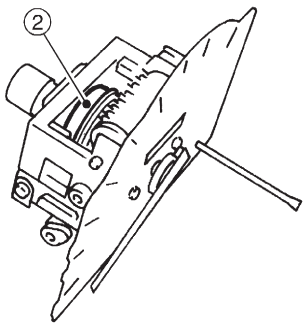




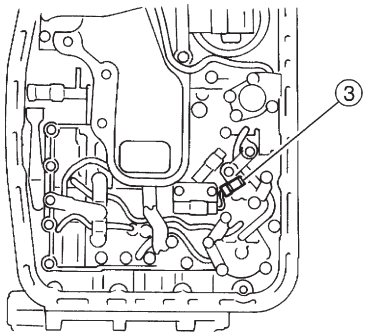
2. SENSOR



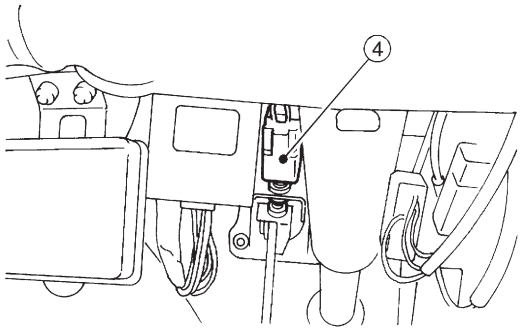
OBD0042B



H2M1144A



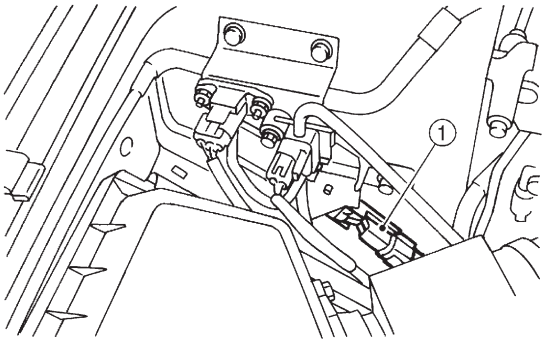
H2M1145A



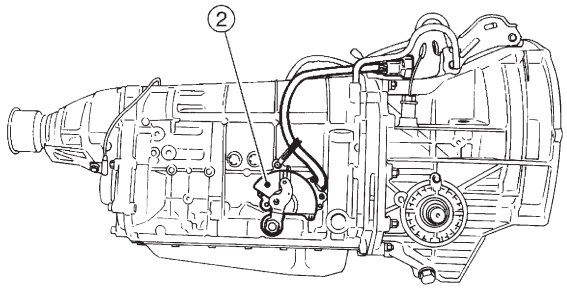
H2M1146A

① Vehicle speed sensor 1
② Vehicle speed sensor 2
③ ATF temperature sensor
④ Brake light switch

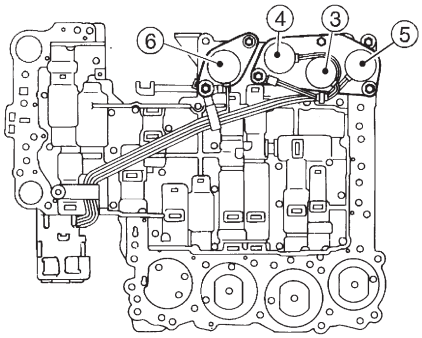
3. SOLENOID VALVE AND RELAY



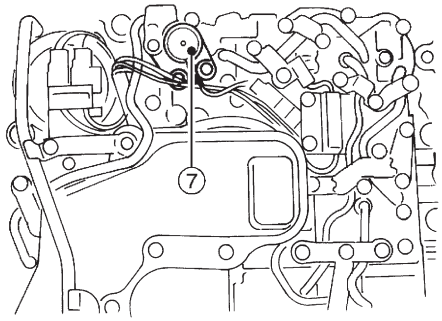
OBD0046B



OBD0047B

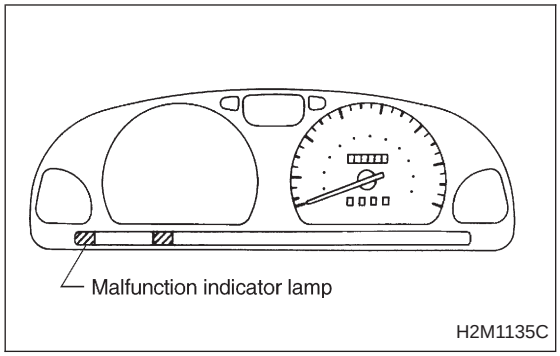


OBD0048A



H2M1147A

① Dropping resistor
② Inhibitor switch
③ Shift solenoid valve 1
④ Shift solenoid valve 2
⑤ Shift solenoid valve 3
⑥ Duty solenoid valve A
⑦ Duty solenoid valve B

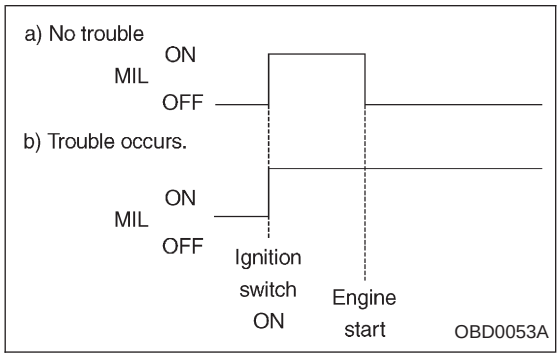


3. Diagnosis System

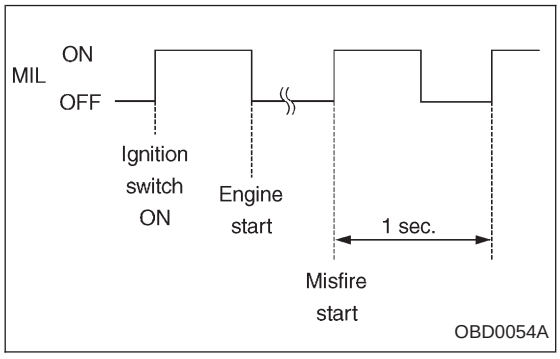
A: MALFUNCTION INDICATOR LAMP (MIL)

1. ACTIVATION OF MALFUNCTION INDICATOR LAMP (MIL)

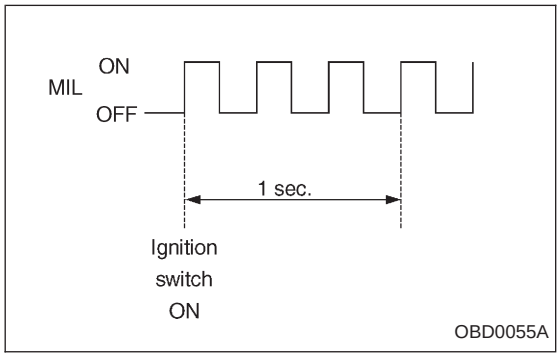
1) When ignition switch is turned to ON (engine off), the CHECK ENGINE malfunction indicator lamp (MIL) in the combination meter illuminates.
NOTE:
If the MIL does not illuminate, perform diagnostics of the CHECK ENGINE light circuit or the combination meter circuit. <Refer to "7. Diagnostics for CHECK ENGINE Malfunction Indicator Lamp (MIL), 2-7b [T700]".>



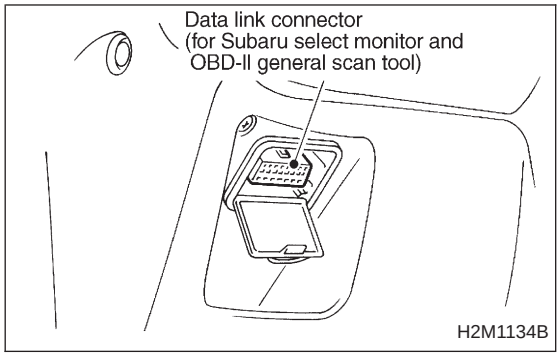
2) After starting the engine, the MIL goes out. If it does not, either the engine or the emission control system is malfunctioning.



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 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.



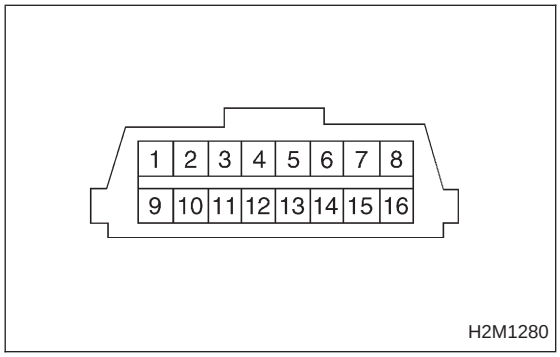
B: OBD-II GENERAL SCAN TOOL

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), to the lower cover.
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
(5) MODE $05: Oxygen sensor monitoring test results

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 "DIAGNOSTIC TROUBLE CODE (DTC) LIST", 2-7b [T10A0].



2. DATA LINK CONNECTOR (FOR OBD-II GENERAL SCAN TOOL AND SUBARU SELECT MONITOR)

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	Subaru Select Monitor signal (ECM to Subaru Select Monitor)*	12	Ground
5	Subaru Select Monitor signal (Subaru Select Monitor to ECM)*	13	Ground
6	Subaru Select Monitor clock*	14	Blank
7	Blank	15	Blank
8	Blank	16	Blank

*: Circuit only for Subaru Select Monitor

3. READ DATA LIST

- **MODE $01**

— Current powertrain diagnostic data —
Refers to data denoting the current operating condition of analog input/output, digital input/output and/or the powertrain system.
A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
01	Number of emission-related powertrain trouble codes and MIL status	ON/OFF
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
10	Air flow rate from mass air flow sensor	g/sec
11	Throttle valve opening angle	%
13	Check whether oxygen sensor is installed.	—
14	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor—bank 1	V and %
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor—bank 2	V and %
1C	On-board diagnosis system	—

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access generic OBD-II PIDs (MODE $01).

● **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).

● **MODE $03**

— Emission-related powertrain diagnostic trouble codes —

Refers to data denoting emission-related powertrain diagnostic trouble codes.

For details concerning diagnostic trouble codes, refer to the "DIAGNOSTIC TROUBLE CODE (DTC) LIST", 2-7b [T10A0].

NOTE:

Refer to OBD-II general scan tool manufacturer's instruction manual to access emission-related powertrain diagnostic trouble codes (MODE $03).

- **MODE $04**

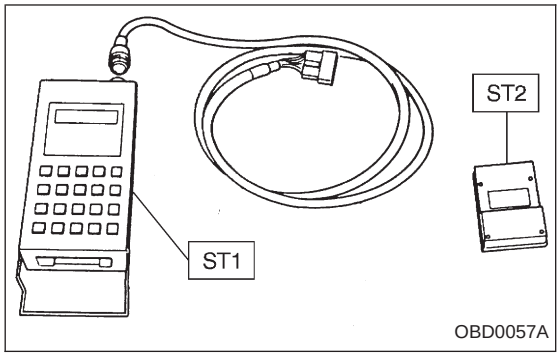
— Clear/Reset emission-related diagnostic information —
Refers to the mode used to clear or reset emission-related diagnostic information (OBD-II trouble diagnostic information).
NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to clear or reset emission-related diagnostic information (MODE $04).

- **MODE $05**

— Oxygen sensor monitoring test results —
Refers to the mode using oxygen sensor output data while the on-board diagnosis system is performing diagnosis on the oxygen sensor.
A list of the support oxygen sensor output data and test ID (identification) are shown in the following table.

Test ID	Data	Unit of measure
01	Rich to lean sensor threshold voltage (constant)	V
02	Lean to rich sensor threshold voltage (constant)	V
03	Low sensor voltage for switch time calculation (constant)	V
04	High sensor voltage for switch time calculation (constant)	V
05	Rich to lean sensor switch time (calculated)	sec.
06	Lean to rich sensor switch time (calculated)	sec.
07	Minimum sensor voltage for test cycle (calculated)	V
08	Maximum sensor voltage for test cycle (calculated)	V

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access oxygen sensor monitoring test results (MODE $05).

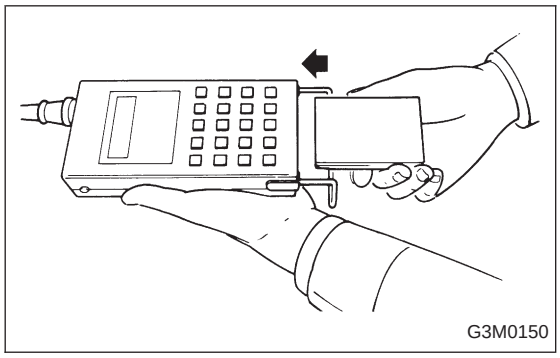


C: SUBARU SELECT MONITOR

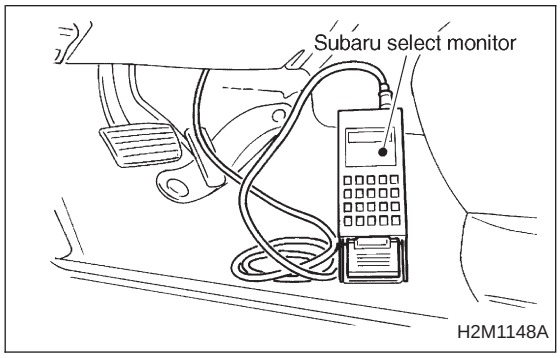
1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare Subaru select monitor and cartridge.

ST1 498307500 SELECT MONITOR KIT
ST2 498345500 CARTRIDGE

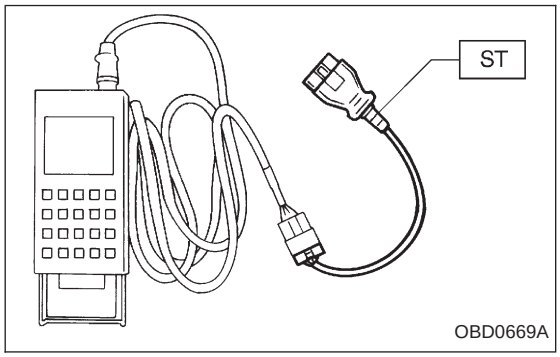


2) Turn ignition switch and Subaru select monitor switch to OFF.
3) Insert cartridge into Subaru select monitor.



4) Connect Subaru select monitor to data link connector.

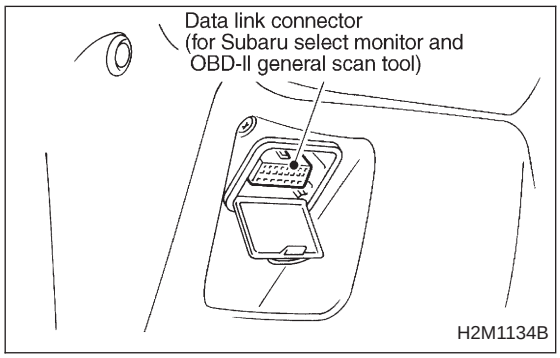
- Using data link connector for Subaru select monitor only, connect Subaru select monitor to its data link connector located in the lower portion of the instrument panel (on the driver's side), to the side of the center console box.



- Using data link connector for Subaru select monitor and OBD-II general scan tool;

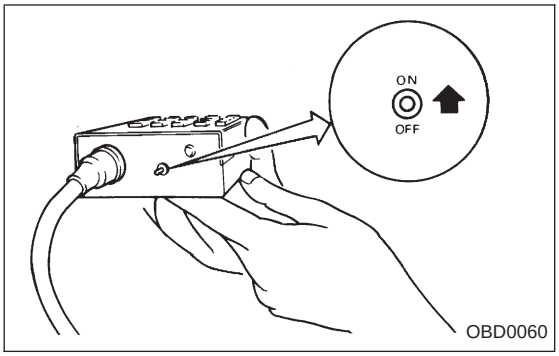
(1) Connect ST to Subaru select monitor cable.

ST 498357200 ADAPTER CABLE



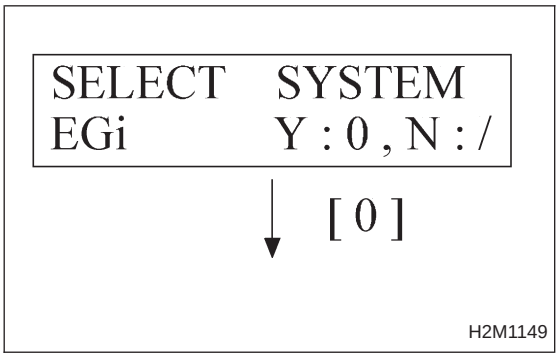
(2) Open the cover and connect Subaru select monitor to data link connector located in the lower portion of the instrument panel (on the driver's side), to the lower cover.

CAUTION:
Do not connect scan tools except for Subaru select monitor and OBD-II general scan tool.



OBD0060

5) Turn ignition switch ON (engine OFF) and Subaru select monitor switch ON.

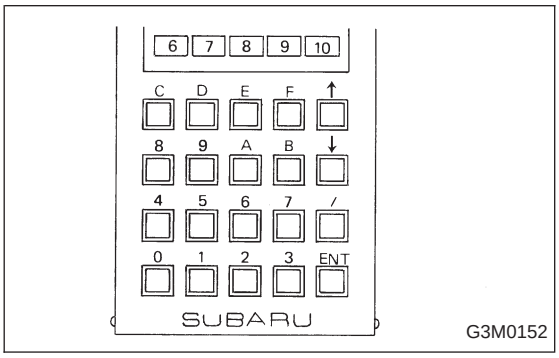


H2M1149

6) Using Subaru select monitor, call up diagnostic trouble code(s) and various data, then record them.

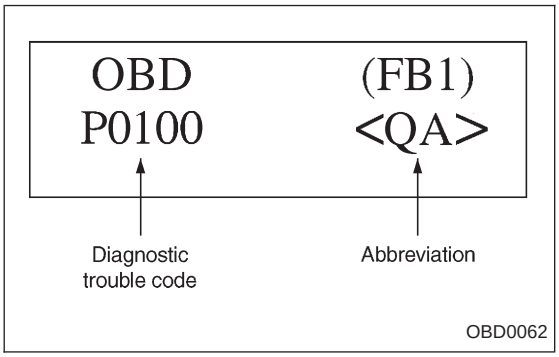
● **READ DIAGNOSTIC TROUBLE CODE (DTC) SHOWN ON DISPLAY. (MODE FB1)**

(1) Press the function key [0].



G3M0152

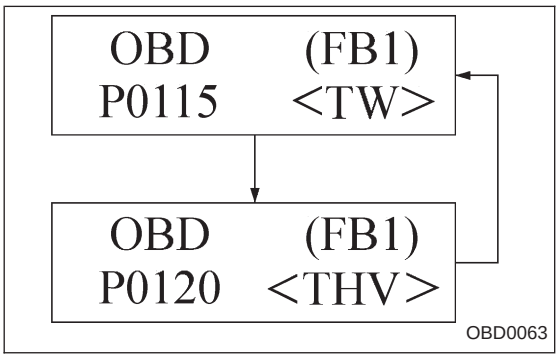
(2) Designate mode using function key.
Press [F] [B] [1] [ENT] in that order.



OBD0062

(3) Ensure diagnostic trouble code(s) is shown.

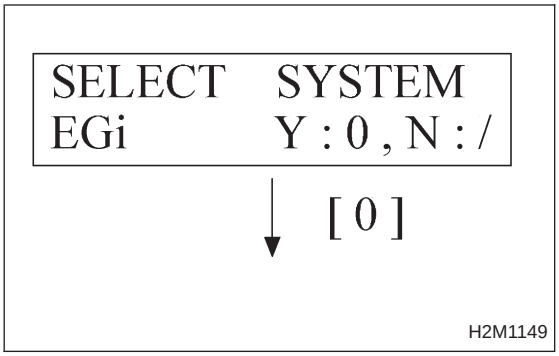
● When there is only one diagnostic trouble code.



OBD0063

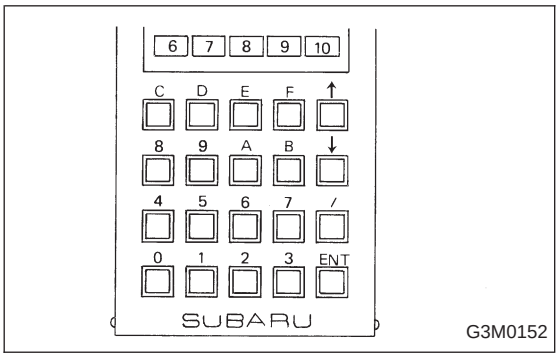
● When there are multiple diagnostic trouble codes.

NOTE:
For details concerning diagnostic trouble codes, refer to the “DIAGNOSTIC TROUBLE CODE (DTC) LIST”, 2-7b [T10A0].

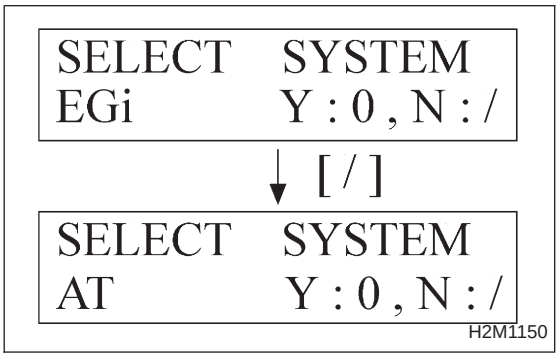


● READ CURRENT DATA AND FREEZE FRAME DATA SHOWN ON DISPLAY FOR ENGINE. (FUNCTION MODE)

(1) Press the function key [0].



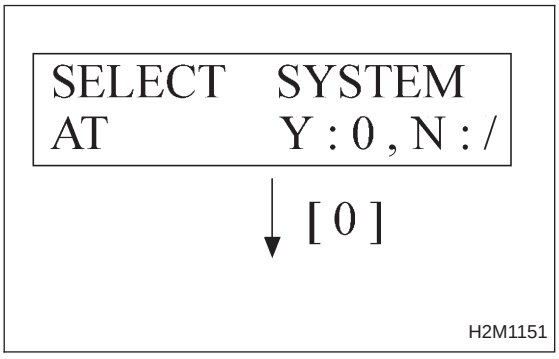
(2) Designate mode using function key.
Refer to “READ DATA FUNCTION KEY LIST FOR ENGINE”, 2-7b [T3C2].
(Example: Press [F] [0] [1] [ENT] in that order.)
(3) Ensure data of input or output signal is shown.

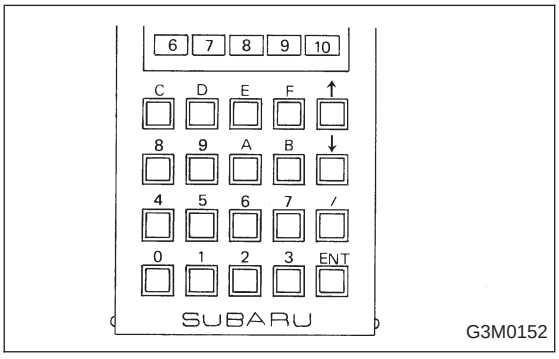


● READ CURRENT DATA SHOWN ON DISPLAY FOR AT. (FUNCTION MODE)

(1) Press the function key [/], and change to AT mode.

(2) Press the function key [0].





(3) Designate mode using function key.
Refer to “READ DATA FUNCTION KEY LIST FOR AT”, 2-7b [T3C6].
(Example: Press [F] [0] [2] [ENT] in that order.)
(4) Ensure data of input or output signal is shown.

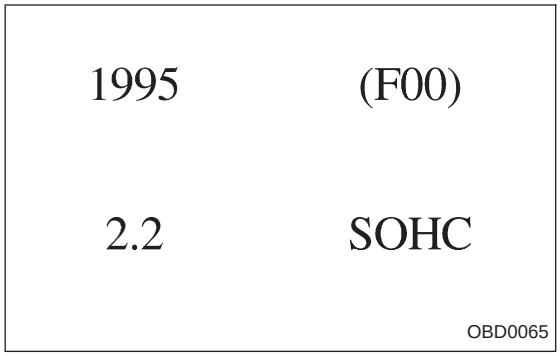
2. READ DATA FUNCTION KEY LIST FOR ENGINE

Function mode	Contents	Abbreviation	Unit of measure
F00	ROM ID number	YEAR	—
F01	Battery voltage	VB	V
F02	Vehicle speed signal	VSP	m/h
F03	Vehicle speed signal	VSP	km/h
F04	Engine speed signal	EREV	rpm
F05	Engine coolant temperature signal	TW	°F
F06	Engine coolant temperature signal	TW	°C
F07	Ignition signal	ADVS	deg
F08	Mass air flow signal	QA	V
F09	Load data	DATA	—
F10	Throttle position signal	THV	V
F11	Injector pulse width	TIM	mS
F12	Idle air control signal	ISC	%
F13	Front oxygen sensor output signal	FO2	V
F14	Front oxygen sensor maximum output signal	FO2max	V
F15	Front oxygen sensor minimum output signal	FO2min	V
F16	Rear oxygen sensor output signal	RO2	V
F17	Rear oxygen sensor maximum output signal	RO2max	V
F18	Rear oxygen sensor minimum output signal	RO2min	V
F19	Short term fuel trim	ALPHA	%
F20	Knock sensor signal	RTRD	deg
F21	A/F correction (short term trim) by rear oxygen sensor	PHOS	%
F23	Atmospheric absolute pressure signal	BARO. P	V
F24	Intake manifold absolute pressure signal	MANI. P	V
F25	Long term fuel trim	KBLRC	%
F28	Long term whole fuel trim	K0	%
F29	Front oxygen sensor heater current	FO2H	A
F30	Rear oxygen sensor heater current	RO2H	A
F38	Minimum EGR system pressure value	EGRmin	mmHg
F45	Load data	LOAD	%
F46	Throttle position signal	THV	%
F47	Mass air flow signal	QA	g/s
F48	Atmospheric absolute pressure signal	BARO. P	kPa
F49	Intake manifold absolute pressure signal	MANI. P	kPa
F50	Load data (Freeze frame data)	LOAD−F	%
F51	Engine coolant temperature signal (Freeze frame data)	TW−F	°C
F52	Throttle position signal (Freeze frame data)	ALPH−F	%
F53	Long term fuel trim (Freeze frame data)	KBLR−F	%
F54	Intake manifold absolute pressure signal (Freeze frame data)	MANI−F	kPa
F55	Engine speed signal (Freeze frame data)	EREV−F	rpm
F56	Vehicle speed signal (Freeze frame data)	VSP−F	km/h

Function mode	Contents	Abbreviation	Unit of measure
FA0	ON ↔ OFF signal	—	—
FA1	ON ↔ OFF signal	—	—
FA2	ON ↔ OFF signal	—	—
FA3	ON ↔ OFF signal	—	—
FA4	ON ↔ OFF signal	—	—
FB0	Diagnostic trouble code (DTC)	INSPECT	—
FB1	Diagnostic trouble code (DTC)	OBD	—
FC0	Clear memory	—	—

NOTE:
1) Subaru select monitor is also available for monitoring information other than that used for check and repair of the vehicle.
2) F38 (Minimum EGR system pressure value) will not read accurately until the EGR flow diagnosis terminates.

EGR flow diagnosis terminates when LED No.5 illuminates at function mode FA4.



● FUNCTION MODE: F00 — ROM ID NUMBER (YEAR) —

CONDITION:

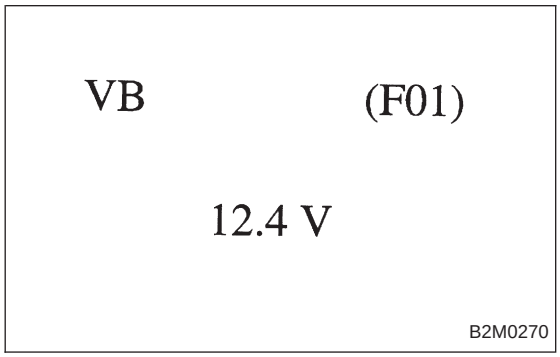
Ignition switch “ON”

SPECIFIED DATA:

Presentation display

● Probable cause (Item outside “specified data”)

1. Error 1	Check for loose or disconnected connector, and discontinued circuit, etc.
2. Error 2	Check for poor contact of cartridge, or different type cartridge.



● FUNCTION MODE: F01 — BATTERY VOLTAGE (VB) —

CONDITION:

(1) Ignition switch “ON”
(2) Idling after warm-up

SPECIFIED DATA:

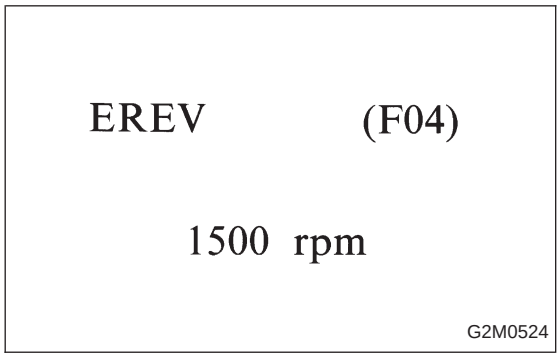
(1) 11±1 V
(2) 13±1 V

● Probable cause (Item outside “specified data”)

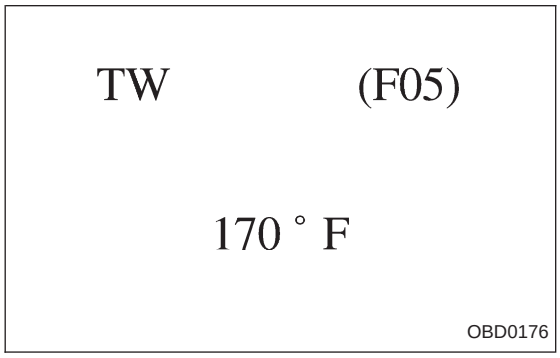
1. Battery	Check battery voltage and electrolyte’s specific gravity.
2. Charging system	● Check regulating voltage. (On no-load) ● Check alternator.
3. Power supply line	● Check main relay. <Ref. to 2-7b [T8C1].> ● Check harness connector of ECM power supply line. <Ref. to 2-7b [T8C2], [T8C3].>

● FUNCTION MODE: F02 AND F03 — VEHICLE SPEED SIGNAL (VSP) —

- F02: Vehicle speed is indicated in mile per hour (m/h).
- F03: Vehicle speed is indicated in kilometer per hour (km/h).

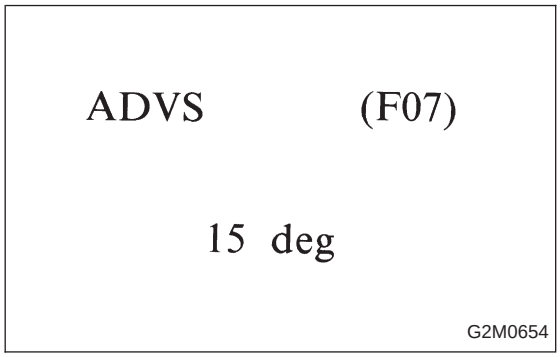


● FUNCTION MODE: F04 — ENGINE SPEED SIGNAL (EREV) —



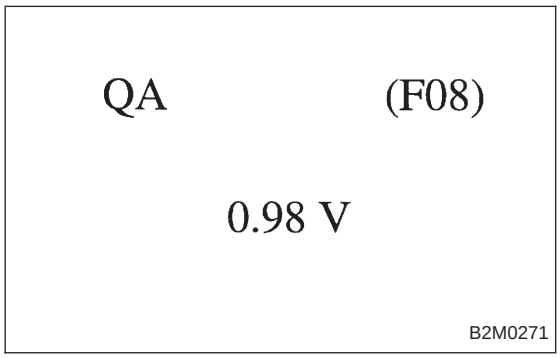
● FUNCTION MODE: F05 AND F06 — ENGINE COOLANT TEMPERATURE SIGNAL (TW) —

- F05: Engine coolant temperature is indicated in "°F".
- F06: Engine coolant temperature is indicated in "°C".

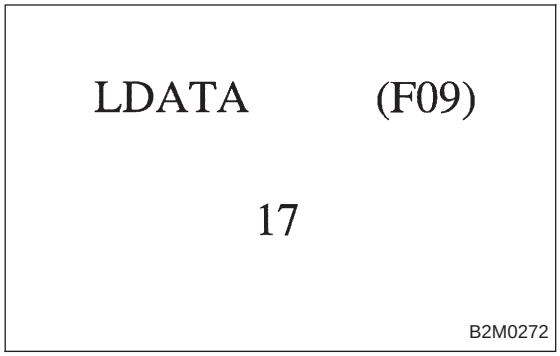


● FUNCTION MODE: F07 — IGNITION SIGNAL (ADVS) —

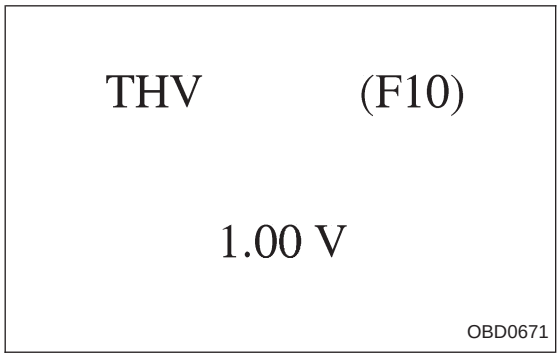
NOTE:
The ignition timing value displayed in mode F07 is a value computed by ECM and will not always correspond with the value measured with a timing light.



● FUNCTION MODE: F08 — MASS AIR FLOW SIGNAL (QA) —

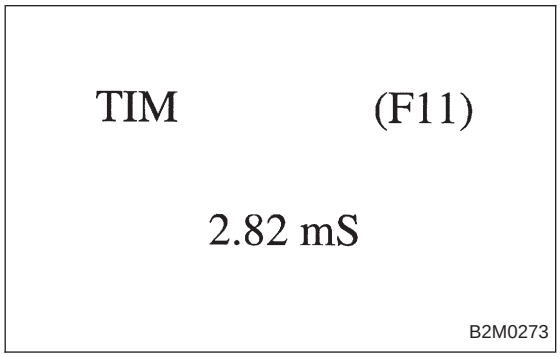


● **FUNCTION MODE: F09**
— LOAD DATA (LDATA) —

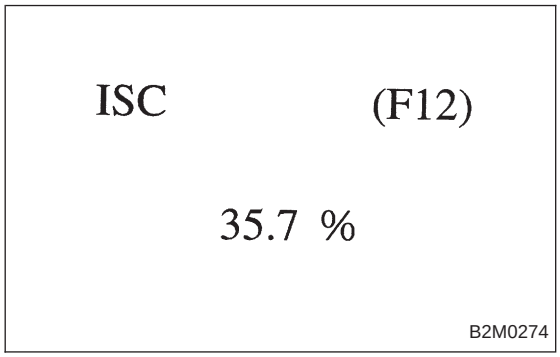


● **FUNCTION MODE: F10**
— THROTTLE POSITION SIGNAL (THV) —

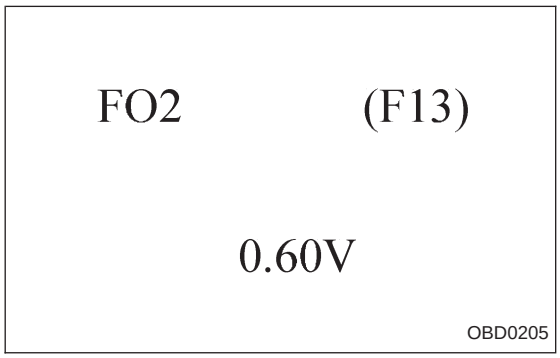
NOTE:
Be sure that the displayed value changes smoothly when changing throttle valve from fully closed to fully opened.



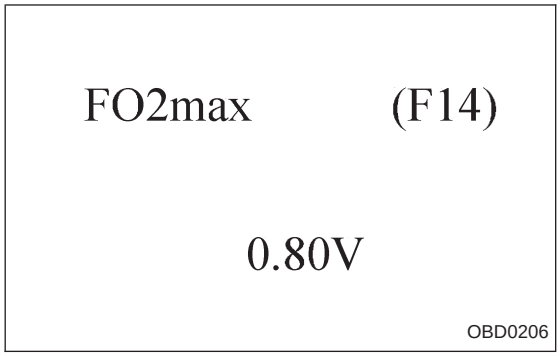
● **FUNCTION MODE: F11**
— INJECTOR PULSE WIDTH (TIM) —



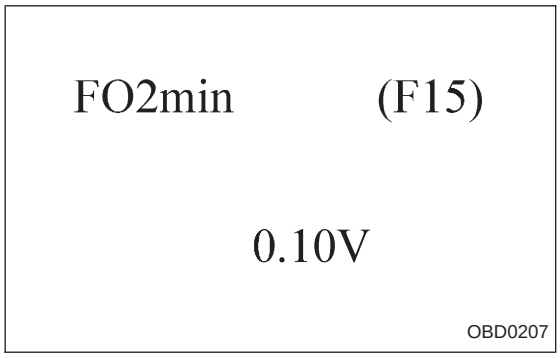
● **FUNCTION MODE: F12**
— IDLE AIR CONTROL SIGNAL (ISC) —



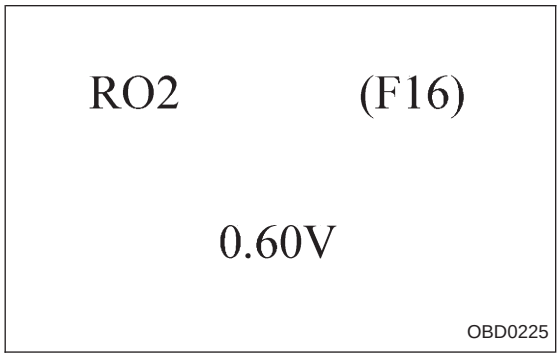
● **FUNCTION MODE: F13**
— FRONT OXYGEN SENSOR OUTPUT SIGNAL (FO2) —



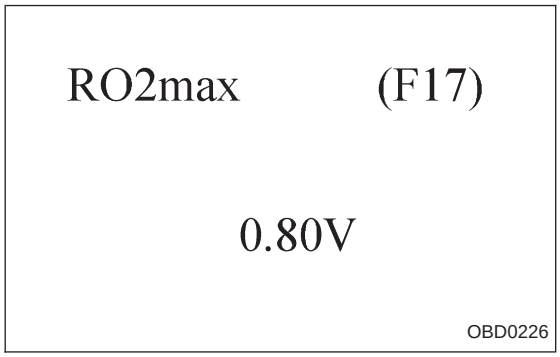
- **FUNCTION MODE: F14**
— FRONT OXYGEN SENSOR MAXIMUM OUTPUT SIGNAL (FO2MAX) —



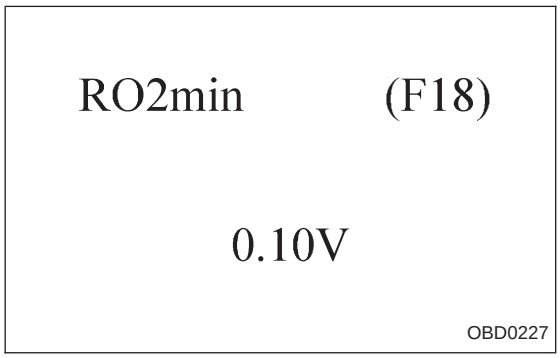
- **FUNCTION MODE: F15**
— FRONT OXYGEN SENSOR MINIMUM OUTPUT SIGNAL (FO2MIN) —



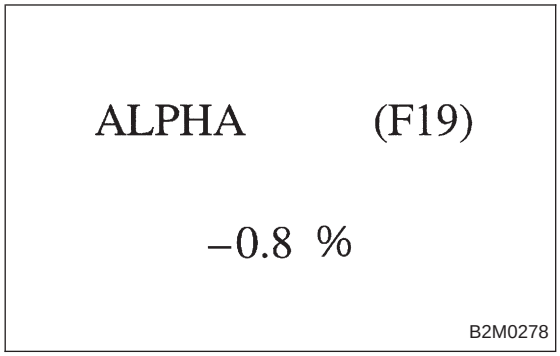
- **FUNCTION MODE: F16**
— REAR OXYGEN SENSOR OUTPUT SIGNAL (RO2) —



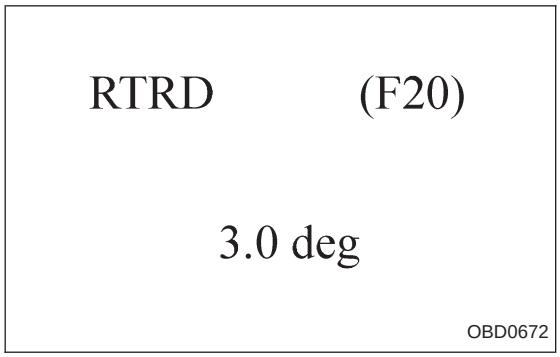
- **FUNCTION MODE: F17**
— REAR OXYGEN SENSOR MAXIMUM OUTPUT SIGNAL (RO2MAX) —



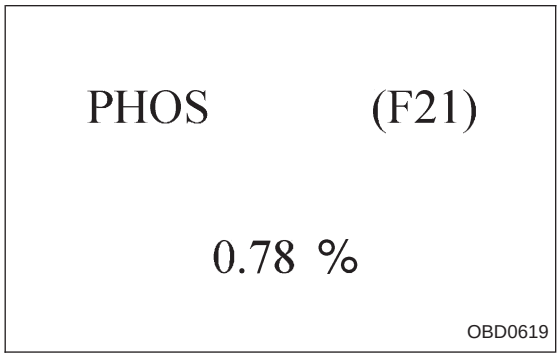
- **FUNCTION MODE: F18**
— REAR OXYGEN SENSOR MINIMUM OUTPUT SIGNAL (RO2MIN) —



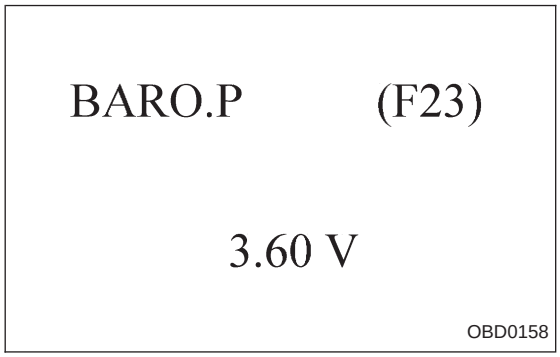
- **FUNCTION MODE: F19**
  — SHORT TERM FUEL TRIM [A/F CORRECTION COEFFICIENT] (ALPHA) —



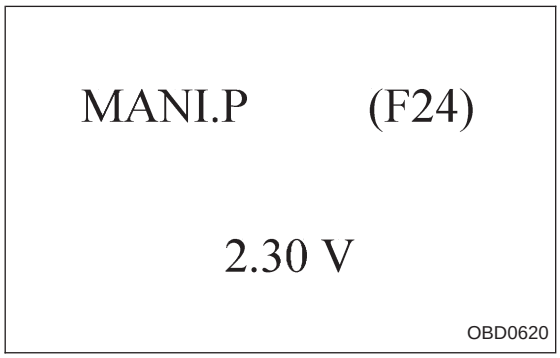
- **FUNCTION MODE: F20**
  — KNOCK SENSOR SIGNAL [IGNITION TIMING CORRECTION COEFFICIENT] (RTRD) —



- **FUNCTION MODE: F21**
  — A/F CORRECTION COEFFICIENT [SHORT TERM TRIM] BY REAR OXYGEN SENSOR (PHOS) —

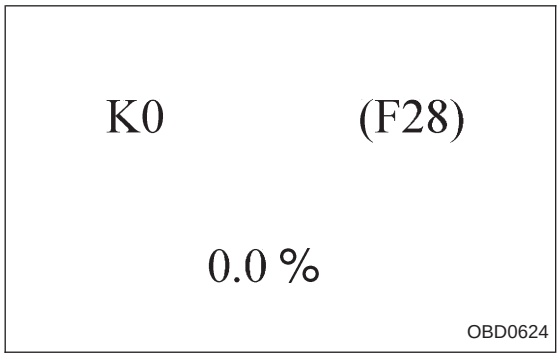


- **FUNCTION MODE: F23**
  — ATMOSPHERIC ABSOLUTE PRESSURE SIGNAL (BARO. P) —

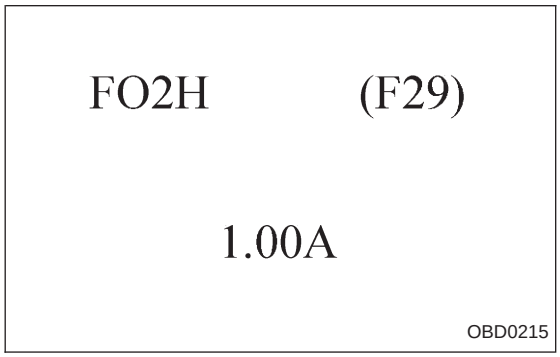


- **FUNCTION MODE: F24**
  — INTAKE MANIFOLD ABSOLUTE PRESSURE SIGNAL (MANI. P) —

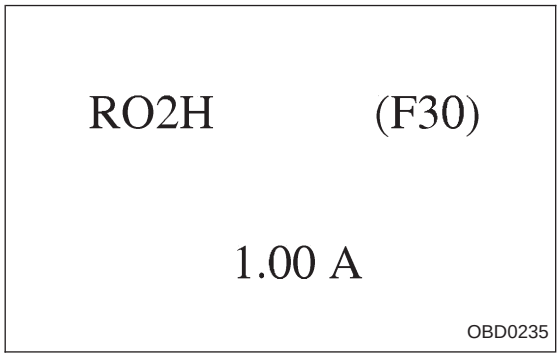
● **FUNCTION MODE: F25**
— LONG TERM FUEL TRIM [A/F LEARNING CORRECTION COEFFICIENT] (KBLRC) —



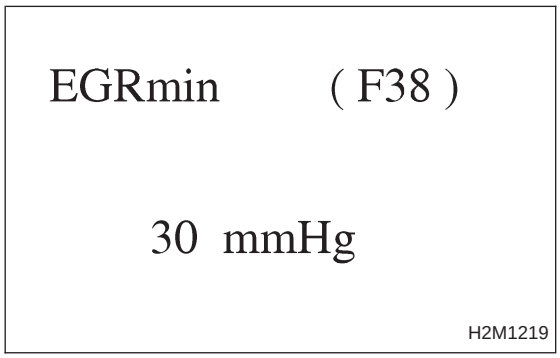
● **FUNCTION MODE: F28**
— LONG TERM FUEL TRIM WHOLE [A/F LEARNING CONTROL COEFFICIENT] (K0) —



● **FUNCTION MODE: F29**
— FRONT OXYGEN SENSOR HEATER CURRENT (FO2H) —



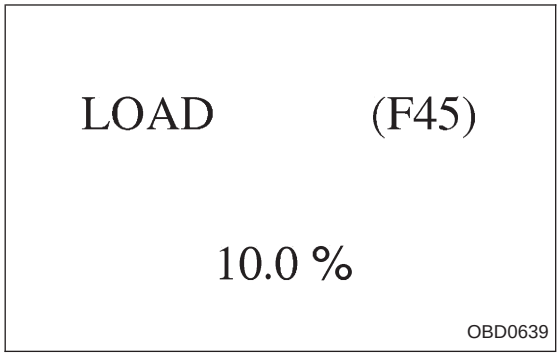
● **FUNCTION MODE: F30**
— REAR OXYGEN SENSOR HEATER CURRENT (RO2H) —



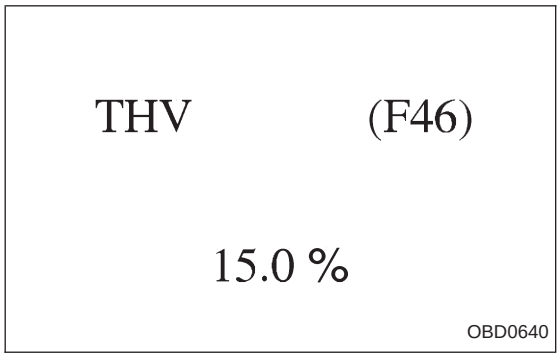
● **FUNCTION MODE: F38**
— MINIMUM EGR SYSTEM PRESSURE VALUE (EGRMIN) —

NOTE:
Minimum EGR system pressure value will not read accurately until the EGR flow diagnosis terminates.

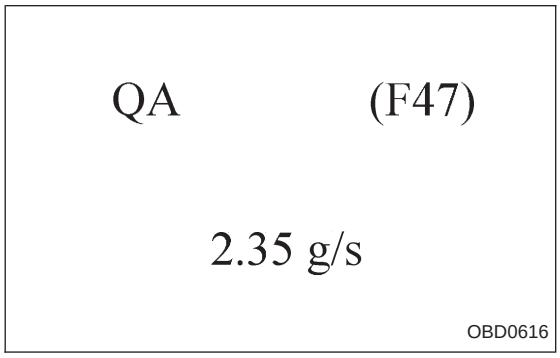
EGR flow diagnosis terminates when LED No.5 illuminates at function mode FA4.



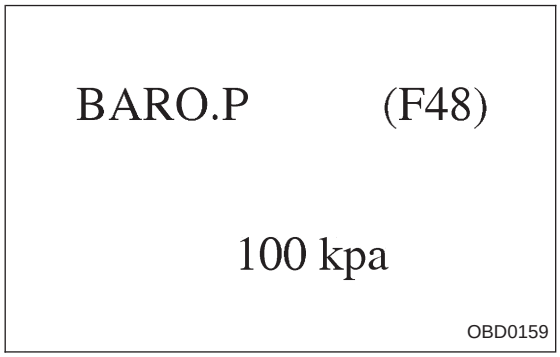
- **FUNCTION MODE: F45**
— LOAD DATA (LOAD) —



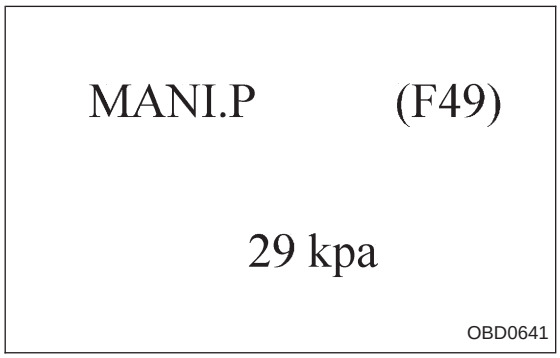
- **FUNCTION MODE: F46**
— THROTTLE POSITION SIGNAL (THV) —



- **FUNCTION MODE: F47**
— MASS AIR FLOW SIGNAL (QA) —

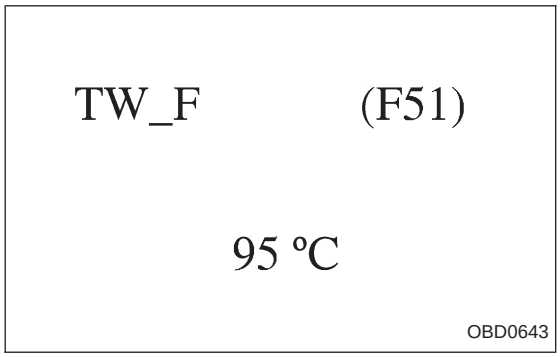


- **FUNCTION MODE: F48**
— ATMOSPHERIC ABSOLUTE PRESSURE SIGNAL (BARO. P) —

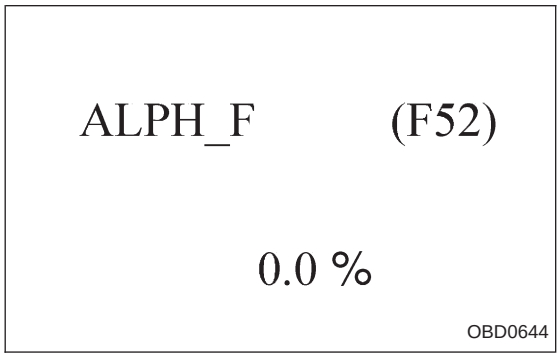


- **FUNCTION MODE: F49**
— INTAKE MANIFOLD ABSOLUTE PRESSURE SIGNAL (MANI. P) —

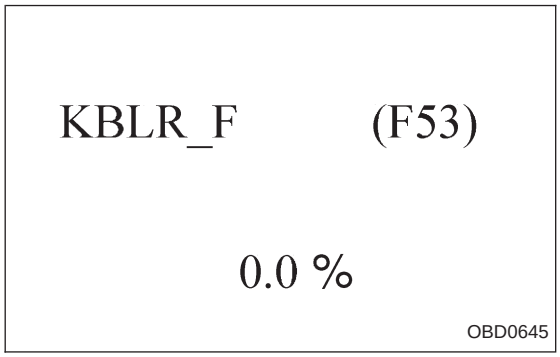
● **FUNCTION MODE: F50**
— LOAD DATA [FREEZE FRAME DATA) (LOAD – F) —



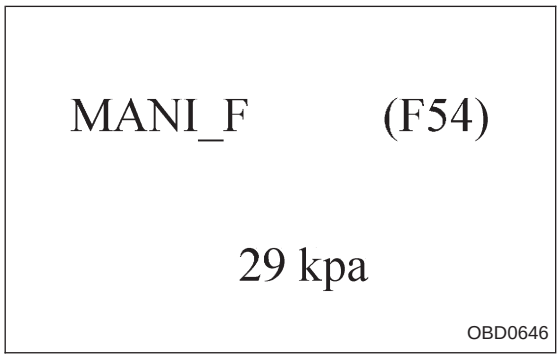
● **FUNCTION MODE: F51**
— ENGINE COOLANT TEMPERATURE SIGNAL [FREEZE FRAME DATA] (TW – F) —



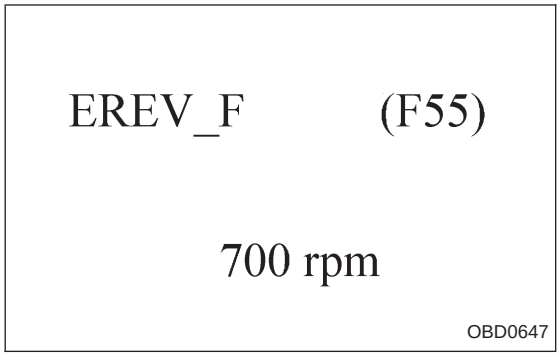
● **FUNCTION MODE: F52**
— THROTTLE POSITION SIGNAL [FREEZE FRAME DATA] (ALPH – F) —



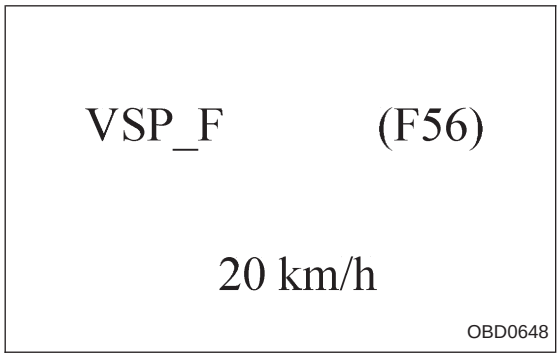
● **FUNCTION MODE: F53**
— LONG TERM FUEL TRIM <A/F LEARNING CONTROL COEFFICIENT> [FREEZE FRAME DATA] (KBLR – F) —



● **FUNCTION MODE: F54**
— INTAKE MANIFOLD ABSOLUTE PRESSURE SIGNAL [FREEZE FRAME DATA] (MANI – F) —



● **FUNCTION MODE: F55**
— ENGINE SPEED SIGNAL [FREEZE FRAME DATA] (EREV – F) —



● **FUNCTION MODE: F56**
— VEHICLE SPEED SIGNAL [FREEZE FRAME DATA] (VSP – F) —

3. FA MODE FOR ENGINE

Function mode	LED No.	Contents	Display	LED “ON” requirements
FA0	1	Ignition switch	IG	When ignition switch is turned ON.
	2	AT/MT identification signal	AT	When AT identification signal is entered.
	3	Test mode connector	UD	When test mode connector is connected.
	5	Idle speed control identification signal	IC	When engine rpm is less than the established value.
	7	Neutral switch	NT	When neutral position signal is entered.
FA1	2	Air conditioner switch	AC	When air conditioner switch is turned ON.
	3	Air conditioner relay	AR	When air conditioner relay is in function.
	4	Radiator fan relay 1	R1	When radiator fan relay 1 is in function.
	5	Radiator fan relay 2	R2	When radiator fan relay 2 is in function.
	6	Fuel pump relay	FP	When fuel pump relay is in function.
	7	Purge control solenoid valve	CP	When purge control solenoid valve is in function.
	8	Pressure sources switching solenoid valve	BR	When pressure sources switching solenoid valve is in function.
FA2	3	EGR solenoid valve	EG	When EGR solenoid valve is in function.
	4	Engine torque control signal	TR	When engine torque control signal is entered.
	5	Engine torque control cut signal	TC	When engine torque control cut signal is got out.
	9	Front oxygen sensor signal	FO	When front oxygen sensor mixture ratio is rich.
	10	Rear oxygen sensor signal	RO	When rear oxygen sensor mixture ratio is rich.

LED No.	Signal name	Display
1	Ignition switch	IG
2	Identification of AT model	AT
3	Test mode connector	UD
4	—	—
5	—	—
6	—	—
7	Park/Neutral position switch	NT
8	—	—
9	—	—
10	—	—

IG	AT	UD	ID	IC
—	NT	—	—	—

1	2	3	4	5
6	7	8	9	10

● FUNCTION MODE: FA0

— ON ↔ OFF SIGNAL —

Requirement for LED “ON”.
LED No. 1 Ignition switch is turned ON.
LED No. 2 Vehicle is AT model.
LED No. 3 Test mode connector is connected.
LED No. 7 Shift position is in “P” or “N”.

LED No.	Signal name	Display
1	—	—
2	A/C switch	AC
3	A/C relay	AR
4	Radiator fan relay 1	R1
5	Radiator fan relay 2	R2
6	Fuel pump relay	FP
7	Purge control solenoid valve	CP
8	—	—
9	Pressure sources switching solenoid valve	BR
10	—	—

—	AC	AR	R1	R2
FP	CP	—	BR	—

1	2	3	4	5
6	7	8	9	10

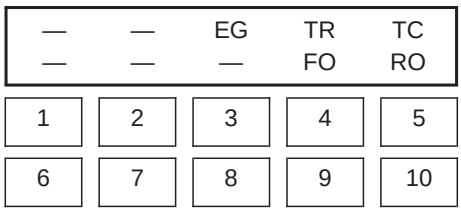
● FUNCTION MODE: FA1

— ON ↔ OFF SIGNAL —

Requirement for LED “ON”.
LED No. 2 A/C switch is turned ON.
LED No. 3 A/C relay is turned ON.
LED No. 4 Radiator fan relay 1 is turned ON.
LED No. 5 Radiator fan relay 2 is turned ON.
LED No. 6 Fuel pump relay is turned ON.
LED No. 7 Purge control solenoid valve is in function.
LED No. 9 Pressure sources switching solenoid valve is in function.

NOTE:
When LED No. 3, 4, 5, 6, 7 and 9 blinks with the test mode connector connected and the ignition switch turned to ON, the corresponding part is functioning properly.

LED No.	Signal name	Display
1	—	—
2	—	—
3	EGR solenoid valve	EG
4	Torque control signal	TR
5	Torque control cut signal	TC
6	—	—
7	—	—
8	—	—
9	Front oxygen sensor signal	FO
10	Rear oxygen sensor signal	RO



● FUNCTION MODE: FA2

— ON ↔ OFF SIGNAL —

Requirement for LED “ON”.
LED No. 3 EGR solenoid valve is in function.
LED No. 4 ECM entered the torque control signal emitted from TCM.
LED No. 5 Engine torque control cut signal goes out.
LED No. 9 Front oxygen sensor mixture ratio is rich.
LED No. 10 Rear oxygen sensor mixture ratio is rich.

4. FB MODE FOR ENGINE

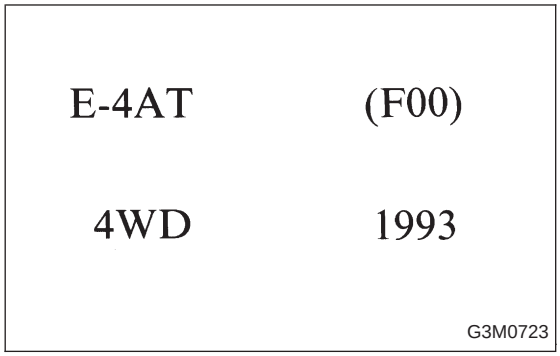
Function mode	Abbreviation	Contents	Contents of display	Page
FB0	INSPECT	On-board diagnostics (Inspection)	Current trouble code indicated by on-board diagnostics after clear memory.	49
FB1	OBD	On-board diagnostics (Read data)	Current trouble code indicated by on-board diagnostics.	24

5. FC MODE FOR ENGINE

Function mode	Abbreviation	Contents	Contents of display	Page
FC0	MEMORY CLR	Back-up memory clear	Function of clearing trouble code stored in memory.	48

6. READ DATA FUNCTION KEY LIST FOR AT

Function mode	Contents	Abbr.	Unit
F00	Mode display	—	—
F01	Battery voltage	VB	V
F02	Vehicle speed sensor 1	VSP1	m/h
F03	Vehicle speed sensor 1	VSP1	km/h
F04	Vehicle speed sensor 2	VSP2	m/h
F05	Vehicle speed sensor 2	VSP2	km/h
F06	Engine speed	EREV	rpm
F07	ATF temperature sensor	ATFT	deg F
F08	ATF temperature sensor	ATFT	deg C
F09	Throttle position sensor	THV	V
F10	Gear position	GEAR	—
F11	Line pressure duty	PLDTY	%
F12	Lock-up duty	LUDTY	%
F13	AWD duty	4WDTY	%
F14	Throttle position sensor power supply	THVCC	V
F15	Mass air flow sensor	AFM	V



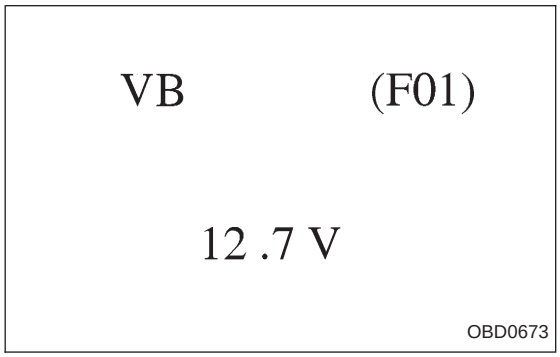
● FUNCTION MODE: F00 — MODE DISPLAY —

SPECIFIED DATA:

Data at the left should be indicated.

Probable cause (if outside “specified data”)

1. Communication failure (No communication method can be confirmed with power ON.)	(1) Check loose or poor connectors, or shortcircuit. (2) Check type of cartridge.
2. Vehicle types cannot be identified (due to communication failure).	Check improper cartridge. Replace with proper one.



● FUNCTION MODE: F01 — BATTERY VOLTAGE (VB) —

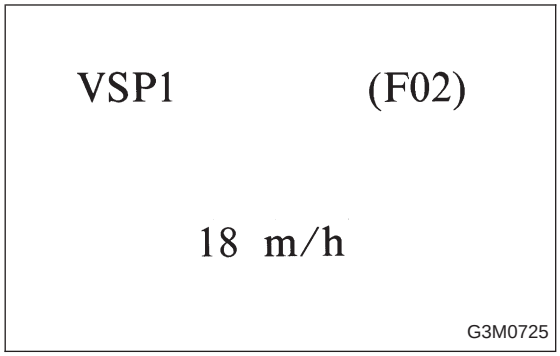
CONDITION:

(1) Ignition switch ON
(2) Engine idling after warm-up

SPECIFIED DATA:

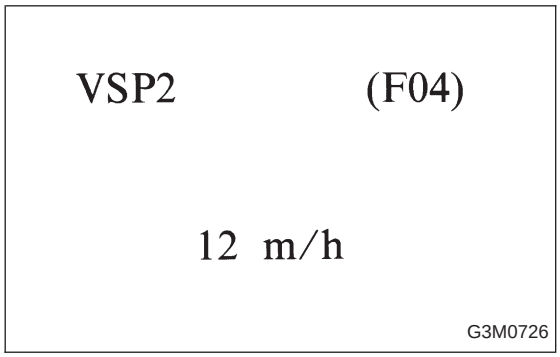
(1) 12±1 V
(2) 13±1 V

1. Battery	Check battery voltage and specific gravity of electrolyte.
2. Charging system	(1) Measure regulating voltage under no loads. (2) Check generator (as a single unit).



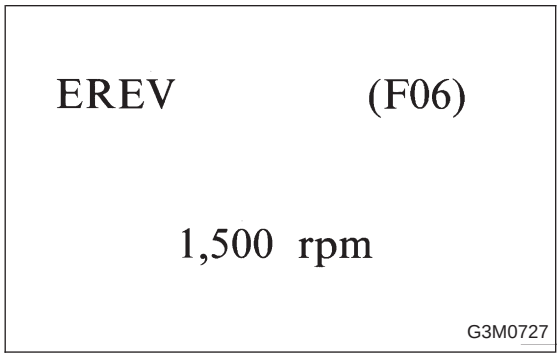
● FUNCTION MODE: F02 — VEHICLE SPEED SENSOR 1 (VSP1) —

● F02: Vehicle speed is indicated in mile per hour (m/h).
● F03: Vehicle speed is indicated in kilometer per hour (km/h).



● FUNCTION MODE: F04 — VEHICLE SPEED SENSOR 2 (VSP2) —

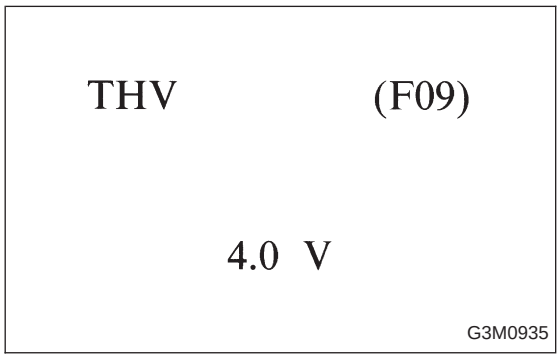
● F04: Vehicle speed is indicated in mile per hour (m/h).
● F05: Vehicle speed is indicated in kilometer per hour (km/h).



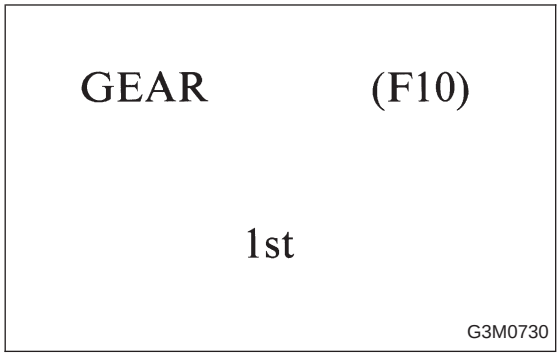
● FUNCTION MODE: F06 — ENGINE SPEED (EREV) —

● FUNCTION MODE: F07 — ATF TEMPERATURE SENSOR (ATFT) —

● F07: ATF temperature is indicated in “deg F”.
● F08: ATF temperature is indicated in “deg C”.

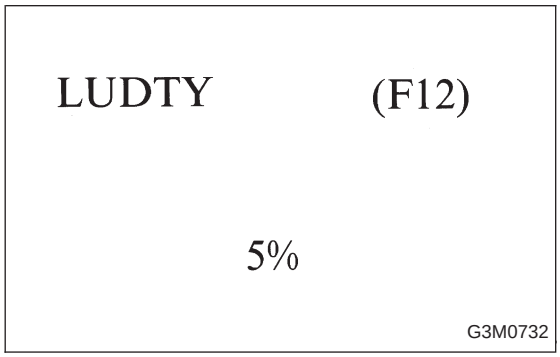


● FUNCTION MODE: F09 — THROTTLE POSITION SENSOR (THV) —

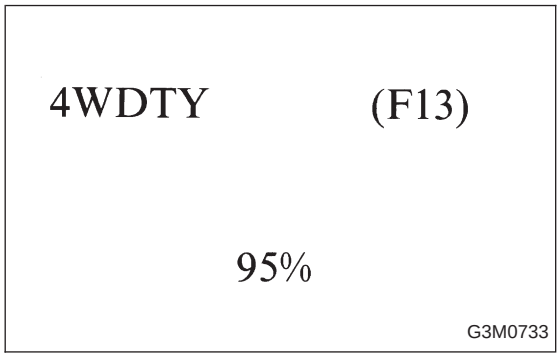


● **FUNCTION MODE: F10**
— GEAR POSITION (GEAR) —

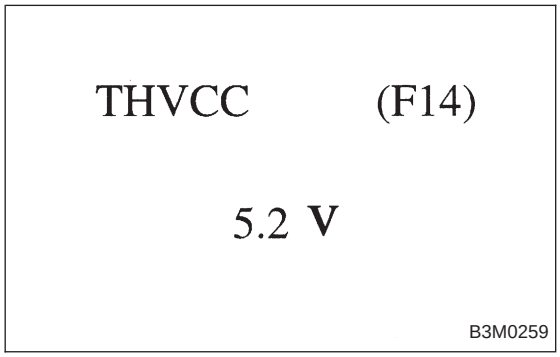
● **FUNCTION MODE: F11**
— LINE PRESSURE DUTY (PLDTY) —



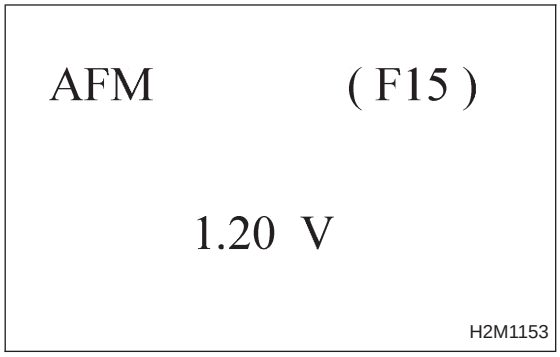
● **FUNCTION MODE: F12**
— LOCK-UP DUTY (LUDTY) —



● **FUNCTION MODE: F13**
— AWD DUTY (4WDTY) —



● **FUNCTION MODE: F14**
— THROTTLE POSITION SENSOR POWER SUPPLY (THVCC) —



- **FUNCTION MODE: F15**

— MASS AIR FLOW SENSOR (AFM) —

LED No.	Signal name	Display
1	FWD switch	FF
2	Kick-down switch	KD
3	—	—
4	—	—
5	Brake switch	BR
6	ABS switch	AB
7	Cruise control set	CR
8	Power switch	PW
9	—	—
10	—	—

FF	KD	—	—	BR
AB	CR	PW	—	—

1	2	3	4	5
6	7	8	9	10

● FUNCTION MODE: FA0

— ON ↔ OFF SIGNAL —

Requirement for LED “ON”.
LED No. 1 Fuse is installed in FWD switch.
LED No. 2 Kick-down switch is turned ON. (Europe and General models only)
LED No. 5 Brake pedal is depressed.
LED No. 6 ABS signal is entered.
LED No. 7 Cruise control is set.
LED No. 8 Power switch is turned ON. (Europe and General models only)

LED No.	Signal name	Display
1	N/P range switch	NP
2	R range switch	RR
3	D range switch	RD
4	3 range switch	R3
5	2 range switch	R2
6	1 range switch	R1
7	Diagnosis switch	SS
8	—	—
9	—	—
10	—	—

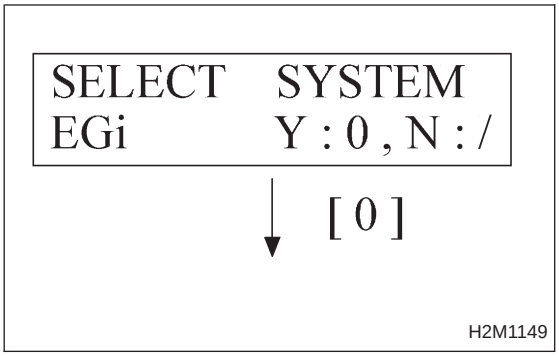
NP	RR	RD	R3	R2
R1	SS	—	—	—

1	2	3	4	5
6	7	8	9	10

● FUNCTION MODE: FA1

— ON ↔ OFF SIGNAL —

Requirement for LED “ON”.
LED No. 1 “N” or “P” range is selected.
LED No. 2 “R” range is selected.
LED No. 3 “D” range is selected.
LED No. 4 “3” range is selected.
LED No. 5 “2” range is selected.
LED No. 6 “1” range is selected.
LED No. 7 Diagnosis connector is connected.



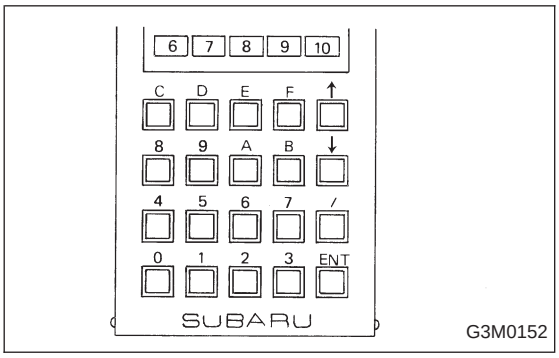
D: CLEAR MEMORY MODE

1. SUBARU SELECT MONTOR

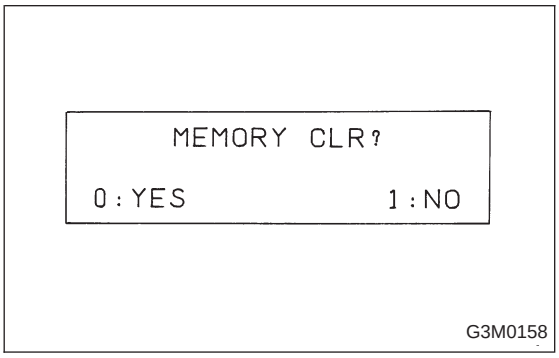
1) Select engine mode or AT mode using function key.
- Engine mode:

Press the function key [0].
- AT mode:

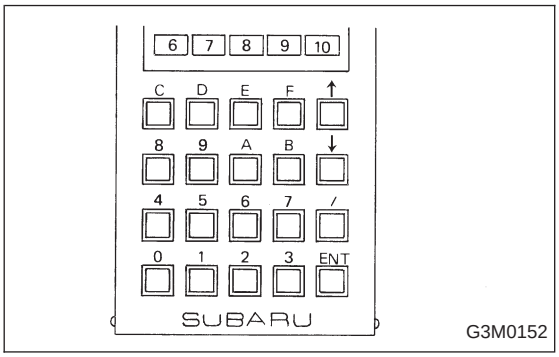
Press the function key [/] [0] in that order.



2) Designate mode using function key.
Press [F] [C] [0] [ENT] in that order.



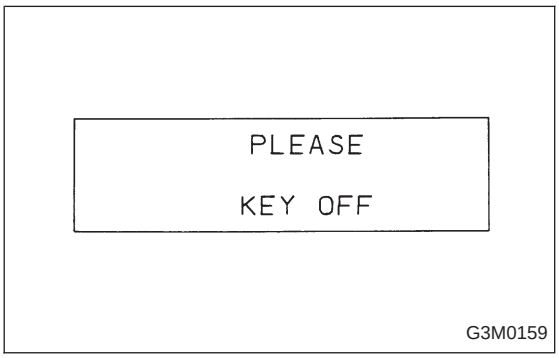
3) Ensure displayed message.



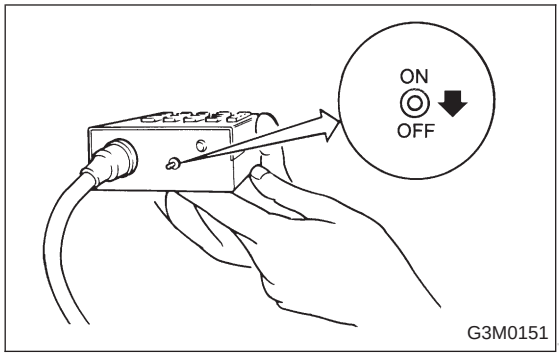
4) Press function key.
- When executing, (YES)

Press [0] [ENT] in that order.
- When not executing, (NO)

Press [1] [ENT] in that order.



5) When executed, the indication as shown here appears for approximately four seconds, and the past trouble history is deleted.

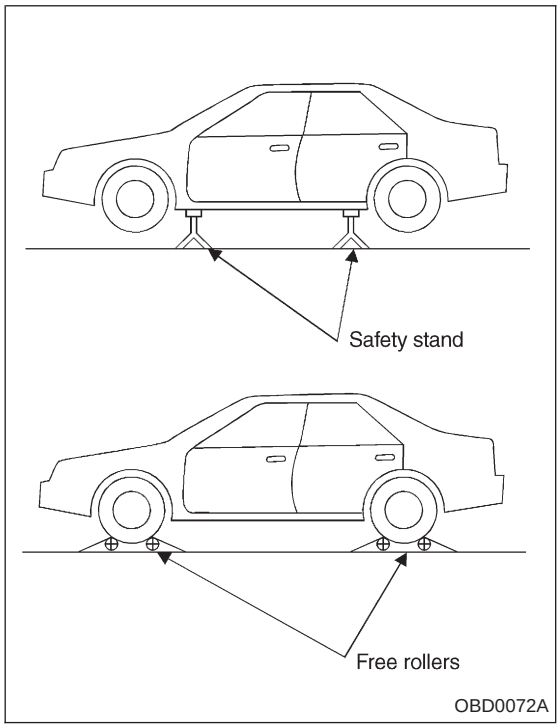


6) After the display is gone, turn Subaru select monitor switch and ignition switch to OFF.

NOTE:
When the ECM, battery terminals, etc. are disconnected after memory is cleared, idling speed may increase. This is not considered a problem because the ISC valve duty controlled learning value has been cleared. To return the engine to idling speed, idle for approximately 2 minutes with air conditioner off.

2. 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.



E: INSPECTION MODE

1. PREPARATIONS FOR THE INSPECTION MODE

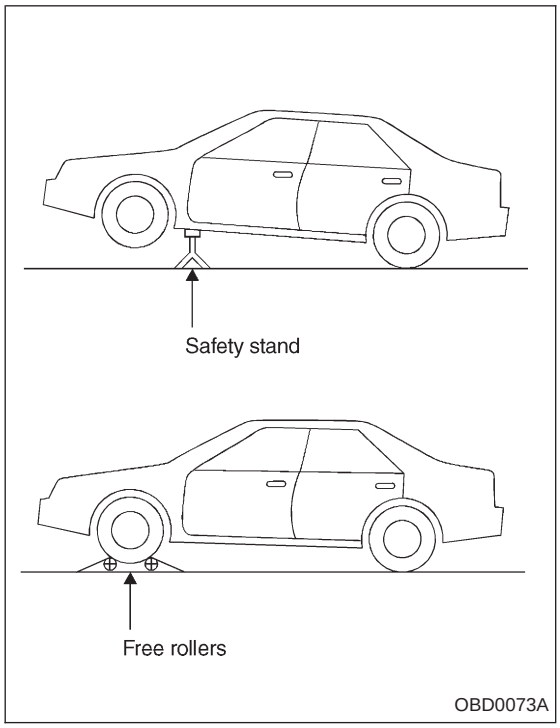
Raise the vehicle using a garage jack and place on safety stands or drive the vehicle onto free rollers.

- **FULL-TIME AWD MODELS**

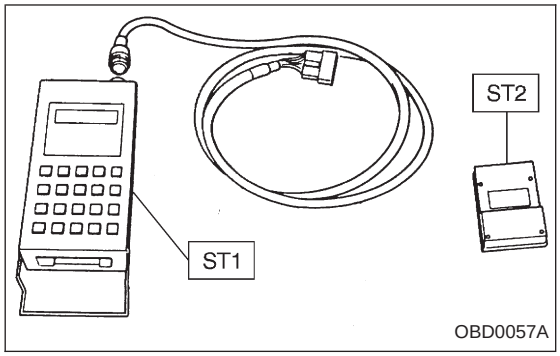
WARNING:

- **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 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 roting, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



● FWD MODELS
WARNING:
● Before raising the vehicle, ensure parking brakes are applied.
● Do not use a pantograph jack in place of a safety stand.
● If only the front wheels are raised or placed on a free roller, apply parking brakes and lock the rear wheels.
● 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 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 roting, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.

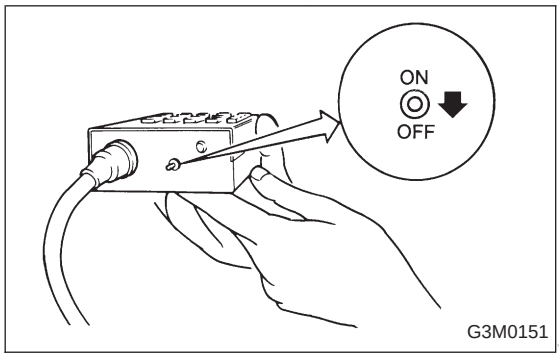


2. SUBARU SELECT MONITOR

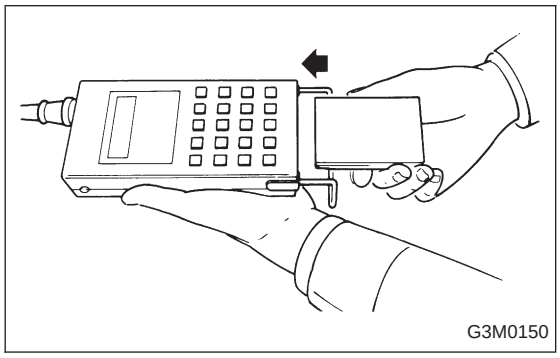
After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data.

1) Prepare Subaru select monitor and cartridge.

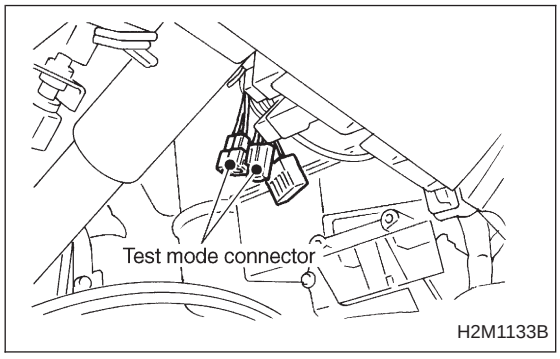
ST1 498307500 SELECT MONITOR KIT
ST2 498345500 CARTRIDGE



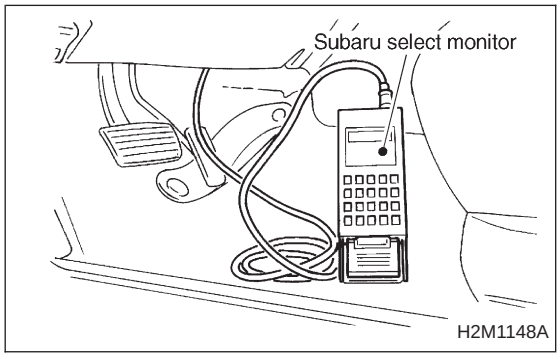
2) Turn ignition switch and monitor switch to OFF.



3) Insert cartridge into Subaru select monitor.

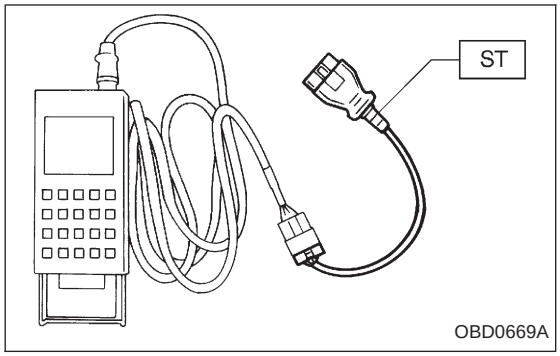


4) Connect test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box.



5) Connect Subaru select monitor to data link connector.

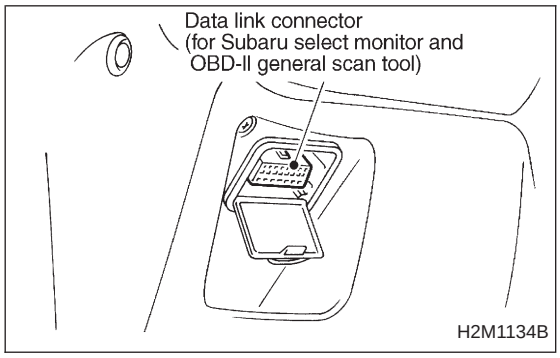
● Using data link connector for Subaru select monitor only:
Connect Subaru select monitor to its data link connector located in the lower portion of the instrument panel (on the driver's side), to the side of the center console box.



● Using data link connector for Subaru select monitor and OBD-II general scan tool:

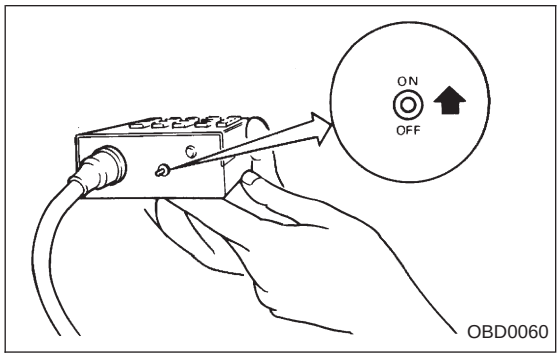
(1) Connect ST to Subaru select monitor cable.

ST 498357200 ADAPTER CABLE



(2) Open the cover and connect Subaru select monitor to data link connector located in the lower portion of the instrument panel (on the driver's side), to the lower cover.

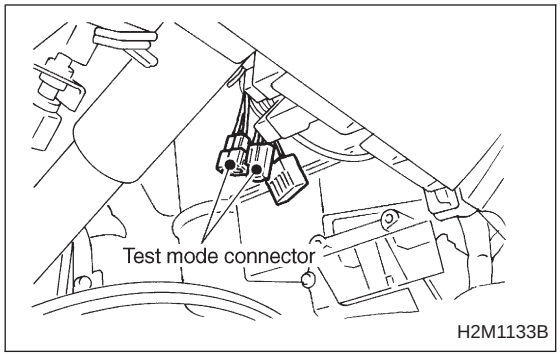
CAUTION:
Do not connect scan tools except for Subaru select monitor and OBD-II general scan tool.



6) Turn ignition switch ON (engine OFF) and Subaru select monitor switch ON.
7) Start the engine.
NOTE:
Ensure the selector lever is placed in the "P" position before starting.
8) Using the selector lever or shift lever, turn the "P" position switch and the "N" position switch to ON.
9) Depress the brake pedal to turn the brake switch ON.
10) Keep engine speed in the 2,500 — 3,000 rpm range for 40 seconds.

NOTE:
On models without tachometer, use the Subaru select monitor or tachometer (Secondary pickup type).

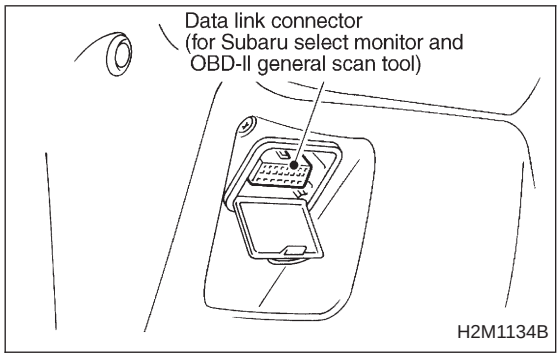
11) Place the selector lever or shift lever in the "D" position and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).
NOTE:
● On AWD vehicles, release the parking brake.
● The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system. <Ref. to 4-4 [T1C2].>



3. OBD-II GENERAL SCAN TOOL

After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data:

1) Connect test mode connector at the lower side of the instrument panel (on the driver's side), to the side of the center console box.



2) Open the cover and 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), to the lower cover.

CAUTION:
Do not connect the scan tools except for Subaru select monitor and OBD-II general scan tool.

3) Start the engine.

NOTE:
Ensure the selector lever is placed in the "P" position before starting.

4) Using the selector lever or shift lever, turn the "P" position switch and the "N" position switch to ON.

5) Depress the brake pedal to turn the brake switch ON.

6) Keep engine speed in the 2,500 — 3,000 rpm range for 40 seconds.

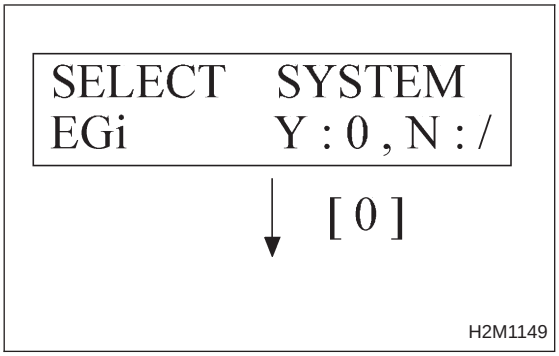
NOTE:
On models without tachometer, use the Subaru select monitor or tachometer (Secondary pickup type).

7) Place the selector lever or shift lever in the "D" position and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:
- On AWD vehicles, release the parking brake.
- The speed difference between front and rear wheels may light 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. <Ref. to 4-4 [T1C2].>

8) 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 details concerning diagnostic trouble codes, refer to the "DIAGNOSTIC TROUBLE CODE (DTC) LIST", 2-7b [T10A0].

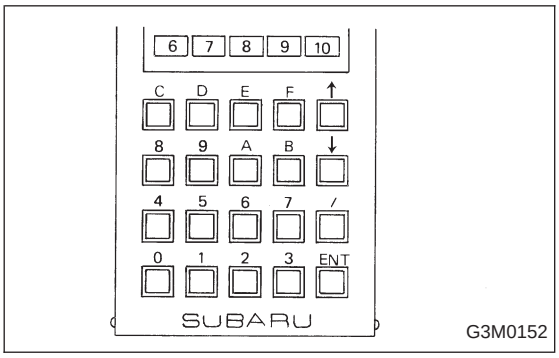


4. CHECK FOR DIAGNOSTICS TROUBLE CODE

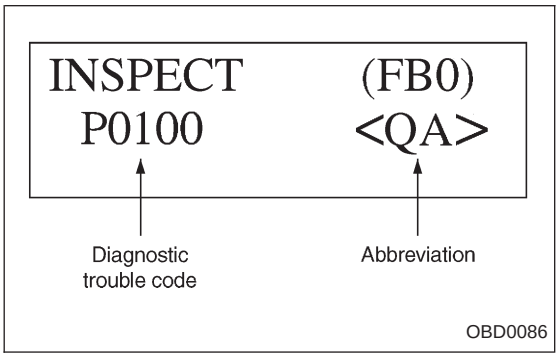
Using Subaru select monitor, check for diagnostic trouble code(s) and record the result(s).

● READ DIAGNOSTIC TROUBLE CODE (DTC) SHOWN ON DISPLAY. (MODE FB0 <INSPECTION MODE>)

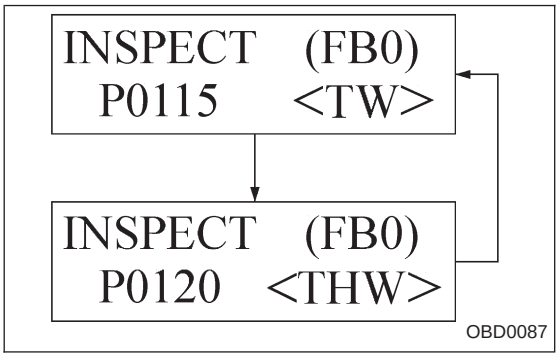
(1) Press the function key [0].



(2) Designate mode using function key.
Press [F] [B] [0] [ENT] in that order.

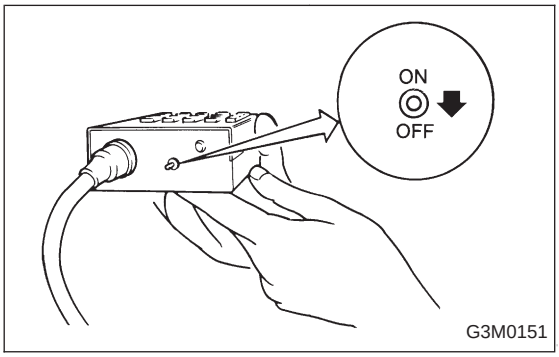


(3) Ensure diagnostic trouble code(s) is shown.
- When there is only one diagnostic trouble code.



- When there are multiple diagnostic trouble codes.

NOTE:
For details concerning diagnostic trouble code(s), refer to the “DIAGNOSTIC TROUBLE CODE (DTC) LIST”, 2-7b [T10A0].



5. FINISHING DIAGNOSIS OPERATION

1) Disconnect test mode connector at the lower portion of instrument panel (on the driver’s side), to the side of the center console box.
2) Turn Subaru select monitor switch and ignition switch to OFF.
3) Disconnect Subaru select monitor from its data link connector.

4. Cautions

A: SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

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 Airbag system wiring harness when servicing the engine control module (ECM), transmission control module (TCM), main relay and fuel pump relay.**

B: PRECAUTIONS

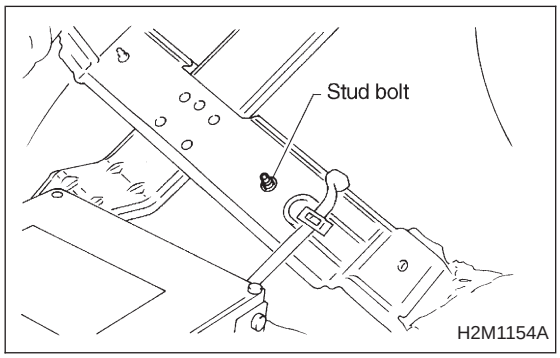
1) Never connect the battery in reverse polarity.
- The ECM will be destroyed instantly.
- The fuel injector and other part will be damaged in just a few minutes more.

2) Do not disconnect the battery terminals while the engine is running.
- A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as ECM, etc.

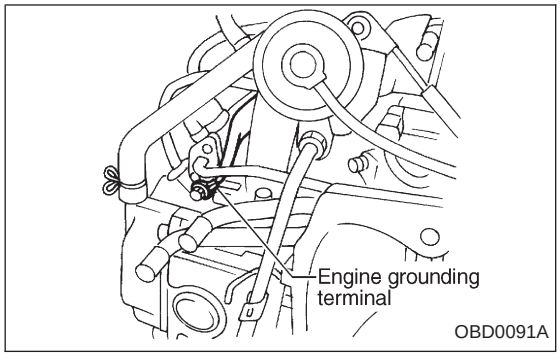
3) Before disconnecting the connectors of each sensor and the ECM, be sure to turn OFF the ignition switch.

4) Before removing ECM from the located position, disconnect two cables on battery.
- Otherwise, the ECM may be damaged.

5) 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.



6) Use ECM mounting stud bolts at the body head grounding point when measuring voltage and resistance inside the passenger compartment.



7) Use engine grounding terminal or engine proper as the grounding point to the body when measuring voltage and resistance in the engine compartment.

8) Every MFI-related part is a precision part. Do not drop them.
9) 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.

10) 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.
11) 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.
12) 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.
13) In AT vehicles, do not continue the stall for more than five seconds at a time (from closed throttle, fully open throttle to stall engine speed).
14) 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. <Ref. to 4-4 [T1C2].>

C: PRE-INSPECTION

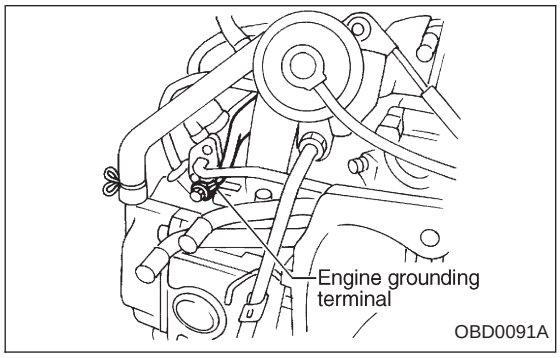
Before performing diagnostics, check the following items which might affect engine problems:

1. POWER SUPPLY

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.

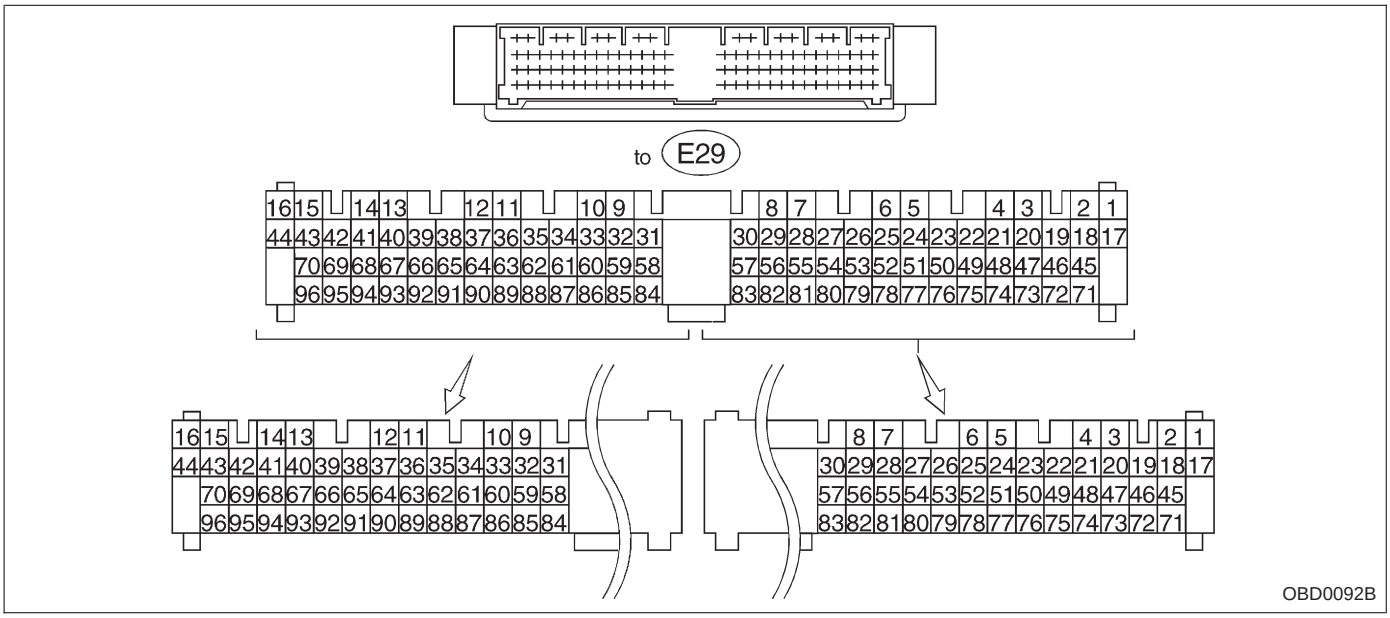


2. ENGINE GROUNDING

Make sure the engine grounding terminal is properly connected to the engine.

5. Specified Data

1. ENGINE CONTROL MODULE (ECM) I/O SIGNAL



Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Crankshaft position sensor	Signal (+)	E29	8	0	−7 — +7	Sensor output waveform
	Signal (−)	E29	7	0	0	—
	Shield	E29	52	0	0	—
Camshaft position sensor	Signal (+)	E29	6	0	−7 — +7	Sensor output waveform
	Signal (−)	E29	5	0	0	—
	Shield	E29	52	0	0	—
Mass air flow sensor	Signal	E29	26	0 — 0.3	0.8 — 1.2	—
	Shield	E29	54	0	0	—
	GND	E29	25	0	0	—
Throttle position sensor	Signal	E29	24	Fully closed: 0.2 — 1.0 Fully opened: 4.2 — 4.7		—
	Power supply	E29	22	5	5	—
	GND	E29	25	0	0	—
Front oxygen sensor	Signal	E29	28	0	0 — 0.9	—
	Shield	E29	56	0	0	—
Rear oxygen sensor	Signal	E29	27	0	0 — 0.9	—
	Shield	E29	56	0	0	—
Engine coolant temperature sensor		E29	29	1.0 — 1.4	1.0 — 1.4	After warm-up
Vehicle speed sensor 2		E29	57	0 or 5	0 or 5	“5” and “0” are repeatedly displayed when vehicle is driven.
Starter switch		E29	81	0	0	Cranking: 8 to 14
A/C switch		E29	80	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch		E29	79	10 — 13	13 — 14	—

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Neutral position switch		E29	78	ON: 0 OFF: 5.0±0.5		Switch is ON when shift is in "N" or "P" position.
Test mode connector		E29	75	5	5	When connected: 0
Knock sensor	Signal	E29	30	2.8	2.8	—
	Shield	E29	56	0	0	—
Back-up power supply		E29	42	10 — 13	13 — 14	Ignition switch "OFF": 10 — 13
Control unit power supply		E29	15	10 — 13	13 — 14	—
			16			
Ignition control	# 1, # 2	E29	14	0	1 — 3.4	—
	# 3, # 4	E29	13	0	1 — 3.4	—
Fuel injector	# 1	E29	2	10 — 13	1 — 14	Waveform
	# 2	E29	1	10 — 13	1 — 14	Waveform
	# 3	E29	18	10 — 13	1 — 14	Waveform
	# 4	E29	17	10 — 13	1 — 14	Waveform
Idle air control solenoid valve	OPEN end	E29	12	—	1 — 13	Waveform
	CLOSE end	E29	11	—	13 — 1	Waveform
Fuel pump relay control		E29	84	ON: 0.5, or less OFF: 10 — 13	0.5, or less	—
A/C relay control		E29	85	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 1 control		E29	77	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
			88			
Radiator fan relay 2 control		E29	61	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	With A/C vehicles only
Self-shutoff control		E29	86	10 — 13	13 — 14	—
Malfunction indicator lamp		E29	31	—	—	Light "ON": 1, or less Light "OFF": 10 — 14
Engine speed output		E29	33	—	0 — 13, or more	Waveform
Torque control signal		E29	49	5	5	—
Torque control cut signal		E29	36	8	8	—
Mass air flow signal for AT		E29	35	0 — 0.3	0.8 — 1.2	—
Purge control solenoid valve		E29	59	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
Atmospheric pressure sensor		E29	23	3.9 — 4.1	2.0 — 2.3	—
Pressure sources switching solenoid valve		E29	58	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
EGR solenoid valve		E29	60	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
Front oxygen sensor heater signal		E29	44	0 — 1.0	0 — 1.0	—
Rear oxygen sensor heater signal		E29	43	0 — 1.0	0 — 1.0	—
AT diagnosis input signal		E29	48	Less than 1 ↔ More than 4	Less than 1 ↔ More than 4	Waveform
GND (sensors)		E29	25	0	0	—
GND (injectors)		E29	71	0	0	—
			72			
GND (ignition system)		E29	69	0	0	—

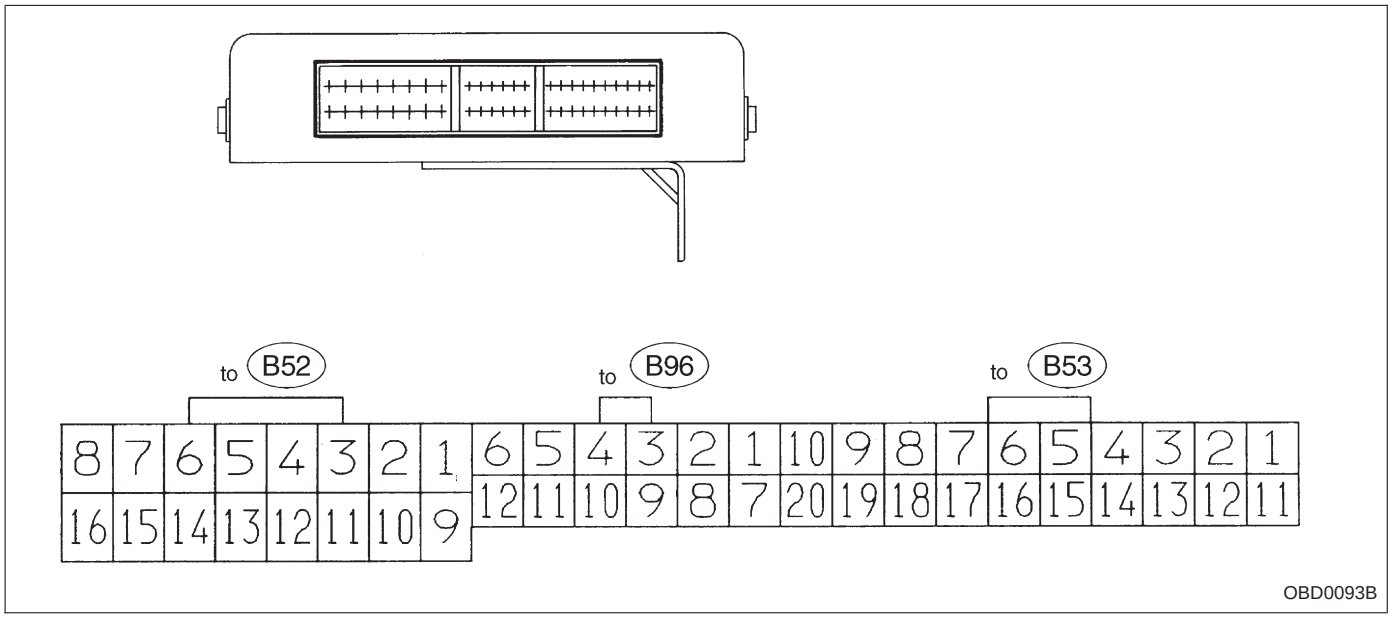
Content	Connector No.	Terminal No.	Signal (V)		Note
			Ignition SW ON (Engine OFF)	Engine ON (Idling)	
GND (power supply)	E29	95	0	0	—
		96			
GND (control systems)	E29	45	0	0	—
		46			
GND (oxygen sensor heater)	E29	70	0	0	—

2. ENGINE CONDITION DATA

Content	Specified data
Mass air flow	1.9 — 3.6 (g/sec): Idling
	7.0 — 14.8 (g/sec): 2,500 rpm racing
Engine load	1.9 — 3.6 (%): Idling
	7.0 — 14.8 (%): 2,500 rpm racing

Measuring condition:
- Gear position is in “N” or “P” position.
- A/C is turned OFF.
- All accessory switches are turned OFF.

3. TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

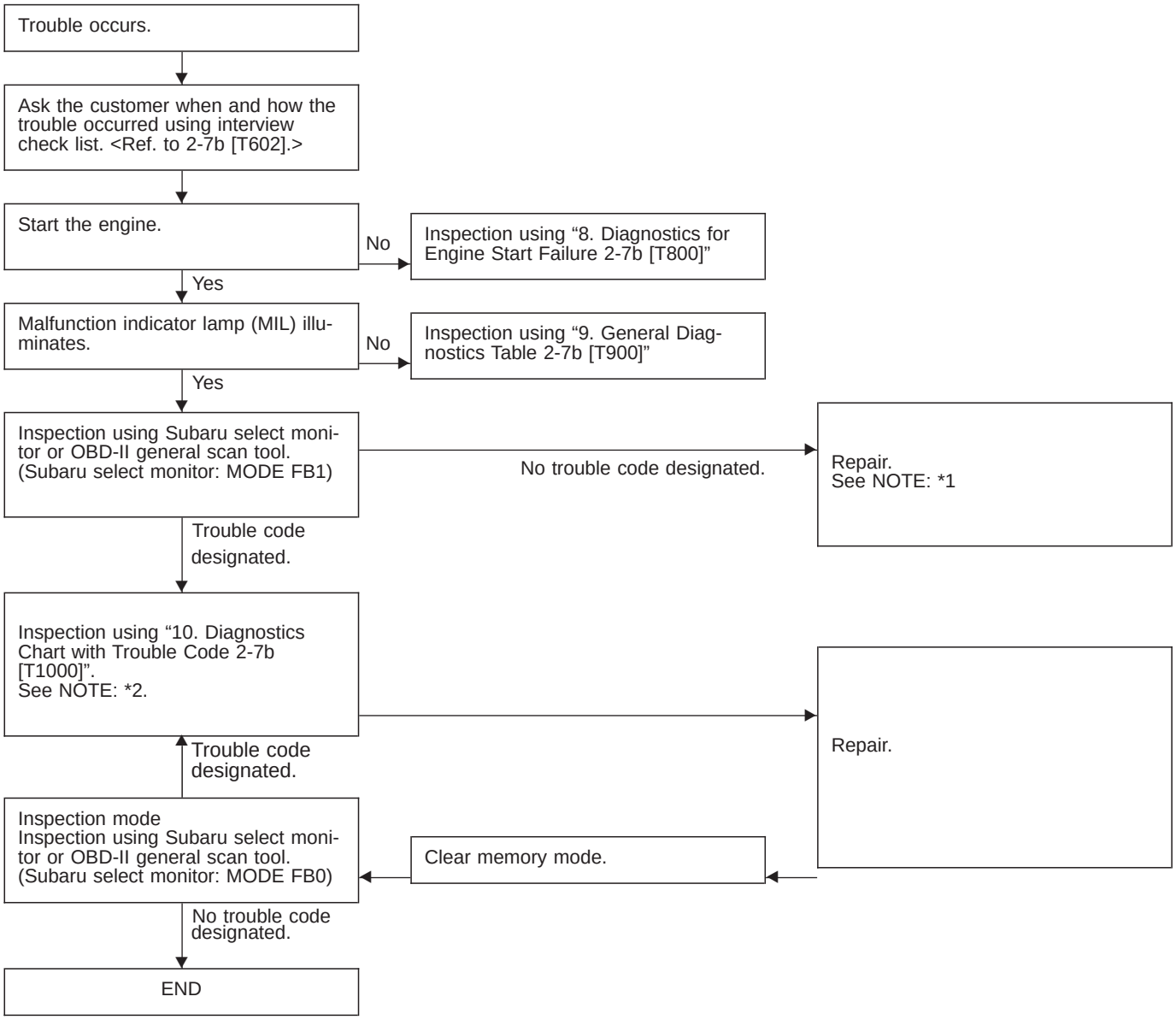


Check with ignition switch ON.

Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)
Back-up power supply		B53	14	Ignition switch OFF	10 — 16
Ignition power supply		B96	6	Ignition switch ON (with engine OFF)	10 — 16
		B52	1		
Inhibitor switch	“P” range switch	B53	9	Selector lever in “P” range	Less than 1
				Selector lever in any other than “P” range	More than 8
	“N” range switch	B53	8	Selector lever in “N” range	Less than 1
				Selector lever in any other than “N” range	More than 8
	“R” range switch	B53	10	Selector lever in “R” range	Less than 1
				Selector lever in any other than “R” range	More than 6
	“D” range switch	B96	1	Selector lever in “D” range	Less than 1
				Selector lever in any other than “D” range	More than 6
	“3” range switch	B96	2	Selector lever in “3” range	Less than 1
				Selector lever in any other than “3” range	More than 6
	“2” range switch	B96	3	Selector lever in “2” range	Less than 1
				Selector lever in any other than “2” range	More than 6
	“1” range switch	B96	4	Selector lever in “1” range	Less than 1
				Selector lever in any other than “1” range	More than 6
Brake switch		B53	7	Brake pedal depressed	More than 10.5
				Brake pedal released	Less than 1
ABS signal		B53	5	ABS switch ON	Less than 1
				ABS switch OFF	More than 6.5
AT diagnostics signal		B52	12	Ignition switch ON (with engine OFF)	Less than 1
				Ignition switch ON (with engine ON)	More than 10
Diagnosis switch		B53	6	Diagnosis connector connected.	Less than 1
				Diagnosis connector disconnected.	More than 6

Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Throttle position sensor	B96	8	Throttle fully closed.	0.3 — 0.7	—
			Throttle fully open.	4.3 — 4.9	
Throttle position sensor power supply	B53	19	Ignition switch ON (with engine OFF)	4.8 — 5.3	—
ATF temperature sensor	B96	10	ATF temperature 20°C (68°F)	2.9 — 4.0	2.1 k — 2.9 k
			ATF temperature 80°C (176°F)	1.0 — 1.4	275 — 375
Vehicle speed sensor 1	B96	12	Vehicle stopped.	0	450 — 720
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Vehicle speed sensor 2	B53	11	When vehicle is slowly moved at least 2 meters (7ft).	Less than 1 ↔ More than 4	—
Engine speed signal	B96	5	Ignition switch ON (with engine OFF).	More than 10.5	—
			Ignition switch ON (with engine ON).	8 — 11	
Cruise set signal	B53	3	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	B52	16	Ignition switch ON	4 — 6	—
Torque control cut signal	B53	16	Ignition switch ON	6 — 9	—
Mass air flow signal	B96	9	Engine idling after warm-up	0.5 — 1.2	—
Shift solenoid 1	B52	14	1st or 4th gear	More than 9	20 — 32
			2nd or 3rd gear	Less than 1	
Shift solenoid 2	B52	13	1st or 2nd gear	More than 9	20 — 32
			3rd or 4th gear	Less than 1	
Shift solenoid 3	B52	15	Selector lever in “N” range (with throttle fully closed).	Less than 1	20 — 32
			Selector lever in “D” range (with throttle fully closed).	More than 9	
Duty solenoid A	B52	8	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 4.0	1.5 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 1	
Dropping resistor	B52	7	Throttle fully closed (with engine OFF) after warm-up.	5 — 14	12 — 18
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
Duty solenoid B	B52	5	When lock up occurs.	More than 8.5	9 — 17
			When lock up is released.	Less than 0.5	
Duty solenoid C	B52	3	Fuse on FWD switch	More than 8.5	9 — 17
			Fuse removed from FWD switch (with throttle fully open and with select lever in 1st gear).	Less than 0.5	
Sensor ground line 1	B96	7	—	0	Less than 1
Sensor ground line 2	B53	20	—	0	Less than 1
System ground line	B53	1	—	0	Less than 1
Power system ground line	B52	10	—	0	Less than 1
FWD switch	B53	2	Fuse removed.	6 — 9.1	—
			Fuse installed.	Less than 1	
Data link signal (Subaru select monitor)	B53	12	—	—	—
		13	—	—	
AT diagnosis signal	B53	11	Ignition switch ON	Less than 1 ↔ More than 4	—

6. Basic Diagnostics Procedure



NOTE:
*1: If trouble code is not shown on display although the MIL illuminates, perform diagnostics of the MIL (CHECK ENGINE LIGHT) circuit or combination meter. <Ref. to “7. Diagnostics for CHECK ENGINE Malfunction Indicator Lamp (MIL), 2-7b [T700]”.>
*2: Carry out the basic check, only when trouble code about automatic transmission is shown on display. <Ref. to 2-7b [T601].>

1. BASIC CHECK ITEMS FOR AT

When 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
2) Differential gear oil level check
3) ATF leak check
4) Differential gear oil leak check
5) Brake band adjustment
6) Stall test
7) Line pressure test
8) Transfer clutch pressure test
9) Time lag test
10) Road test
11) Shift characteristics

NOTE:
As for the method, refer to 3-2 [W200], [W300].

2. CHECK LIST FOR INTERVIEW

Check the following items when problem occurred.

Customer's name		Engine no.	
Date of sale		Fuel brand	
Date of repair		Odometer reading	km miles
Vin no.			
Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other___		
Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (approx.___ °F/ ___ °C)		
Place	☐ Highway ☐ Suburbs ☐ Inner City ☐ Uphill ☐ Downhill ☐ Rough road ☐ Other_____		
Engine Temp.	☐ Cold ☐ Warming-up ☐ After warming-up ☐ Any temp. ☐ Other		
Engine speed	0 2,000 4,000 6,000 8,000 rpm		
Driving conditions	☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH) Vehicle speed 0 10 20 30 40 50 60 MPH		
Headlight	☐ ON / ☐ OFF		
Blower	☐ ON / ☐ OFF		
A/C compressor	☐ ON / ☐ OFF		
Cooling fan	☐ ON / ☐ OFF		
Front wiper	☐ ON / ☐ OFF		
Rear wiper	☐ ON / ☐ OFF		
Rear defogger	☐ ON / ☐ OFF		
Radio	☐ ON / ☐ OFF		
CD/Cassette	☐ ON / ☐ OFF		
Car phone	☐ ON / ☐ OFF		
CB			

NOTE: Use copies of this page for interviewing customers.

Check the following items about the vehicle's state when MIL turns on.

a) Other warning lights or indicators turn on. ☐ Yes / ☐ No
☐ ① Low fuel warning light
☐ ② Charge indicator light
☐ ③ AT diagnostics indicator light
☐ ④ ABS warning light
☐ ⑤ 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
☐ ① Engine does not start.
☐ ② Engine stalls during idling.
☐ ③ Engine stalls while driving.
☐ ④ Engine speed decreases.
☐ ⑤ Engine speed does not decrease.
☐ ⑥ Rough idling
☐ ⑦ Poor acceleration
☐ ⑧ Back fire
☐ ⑨ After fire
☐ ⑩ No shift
☐ ⑪ Excessive shift shock

NOTE: Use copies of this page for interviewing customers.

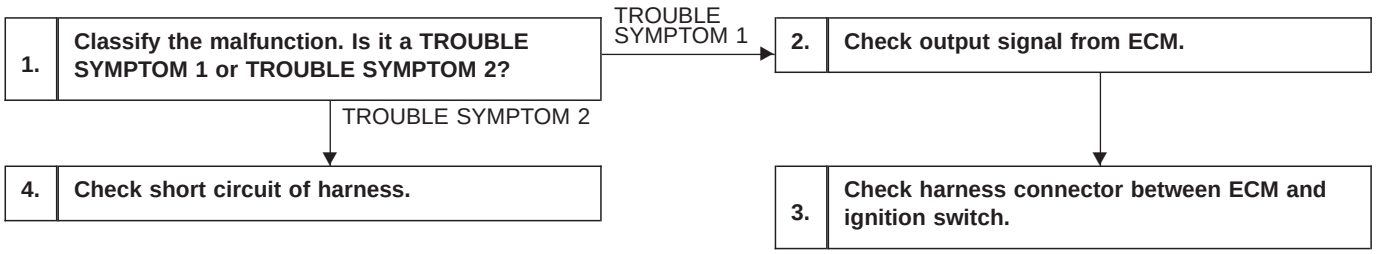
7. Diagnostics for CHECK ENGINE Malfunction Indicator Lamp (MIL)

DIAGNOSIS:

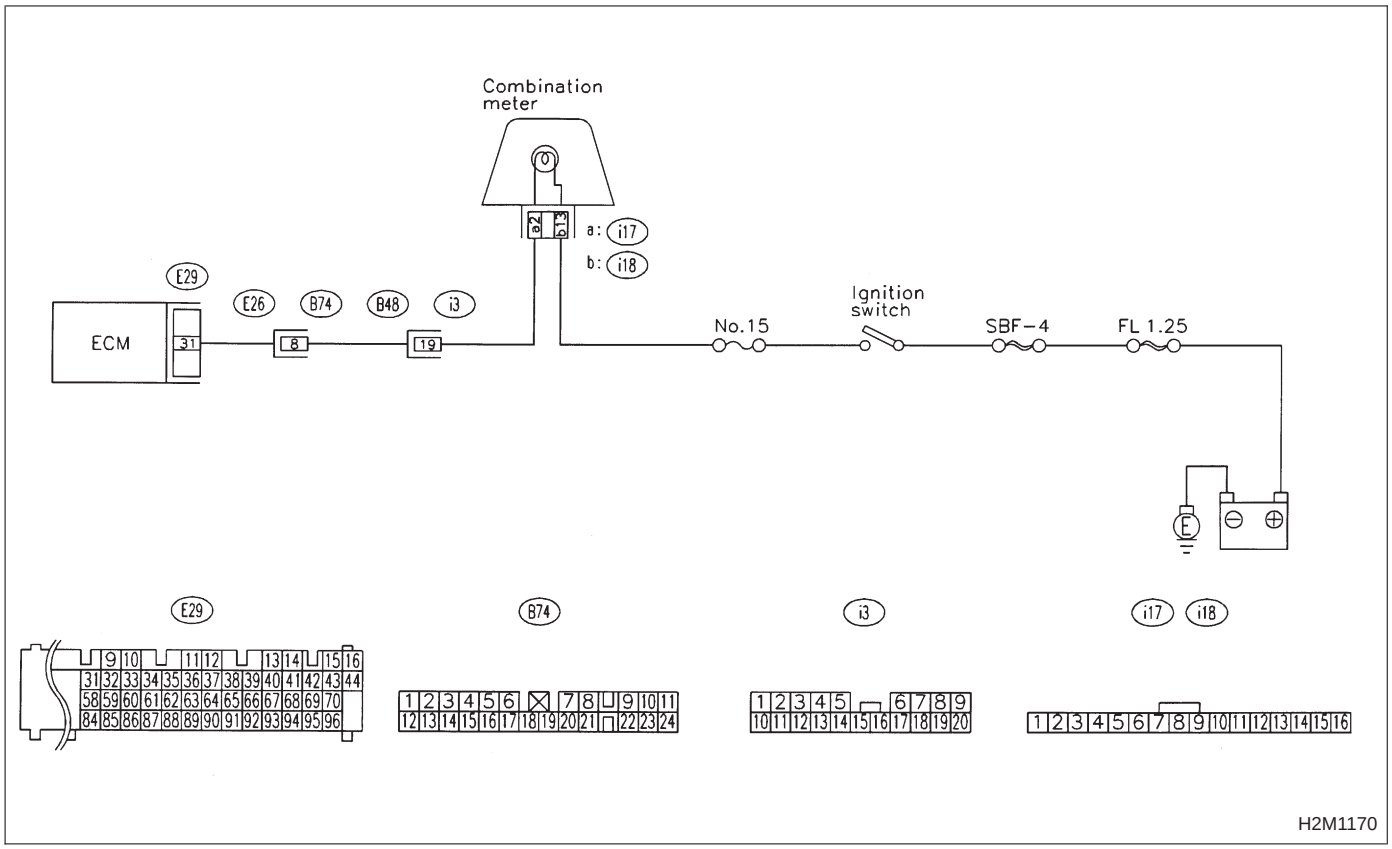
● The CHECK ENGINE malfunction indicator lamp (MIL) circuit is in short or open.

TROUBLE SYMPTOM:

● When ignition switch is turned to ON (engine OFF), MIL does not illuminate.....TROUBLE SYMPTOM 1
● Although MIL illuminates, trouble code is not shown on Subaru select monitor or the OBD-II general scan tool display.....TROUBLE SYMPTOM 2

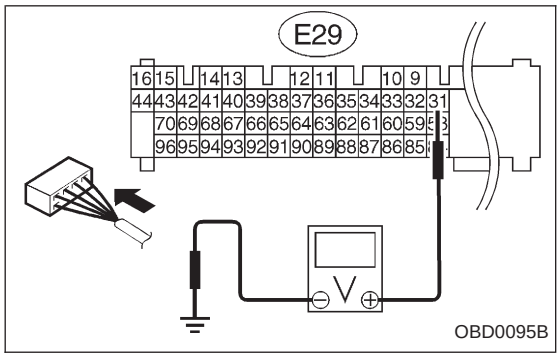


WIRING DIAGRAM:



1	CLASSIFY THE MALFUNCTION. IS IT A TROUBLE SYMPTOM 1 OR TROUBLE SYMPTOM 2?

If the malfunction shows TROUBLE SYMPTOM 1, go to step 2.
If the malfunction shows TROUBLE SYMPTOM 2, go to step 4.



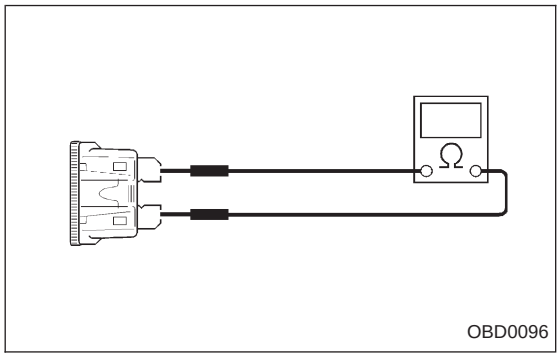
2	CHECK OUTPUT SIGNAL FROM ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and body.

CHECK : ***Connector & terminal (E29) No. 31 — Body/1 V, or less***

YES : Go to step 3.

NO : ● If MIL comes on when shaking or pulling ECM connector and harness, repair ECM connector.
● Check that ECM connector is correctly connected. If the MIL does not come on even when ECM connector is correctly connected, replace the ECM.



3	CHECK HARNESS CONNECTOR BETWEEN ECM AND IGNITION SWITCH.

Check the following and repair if necessary.
① Check that fuse (No. 15) is not blown out.
NOTE:
If replaced fuse (No. 15) blows out easily, check the harness for short circuit between fuse (No. 15) and combination meter.
② Check that harness from fuse to combination meter is not open.
③ Check that the MIL wiring is not open.
④ Check that harness from combination meter to the ECM is not open.
⑤ Check that the connectors (B48) and (B74) are correctly connected as the wiring diagram shows.

4	CHECK SHORT CIRCUIT OF HARNESS.

1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.

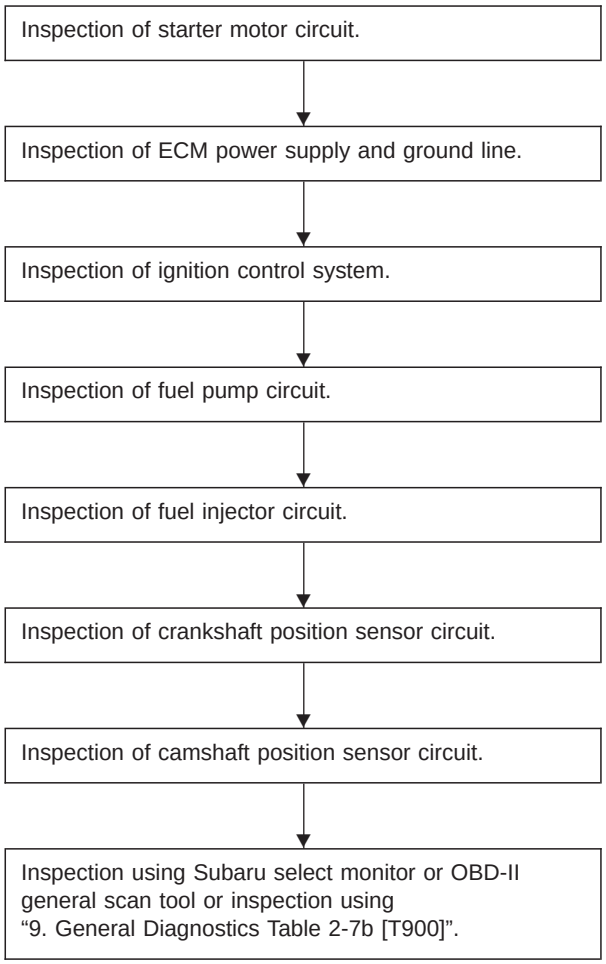
CHECK ***: Does the MIL comes on?***

YES : Repair short circuit of harness between ECM and combination meter.

NO : Replace ECM.

8. Diagnostics for Engine Starting Failure

A: BASIC DIAGNOSTICS CHART

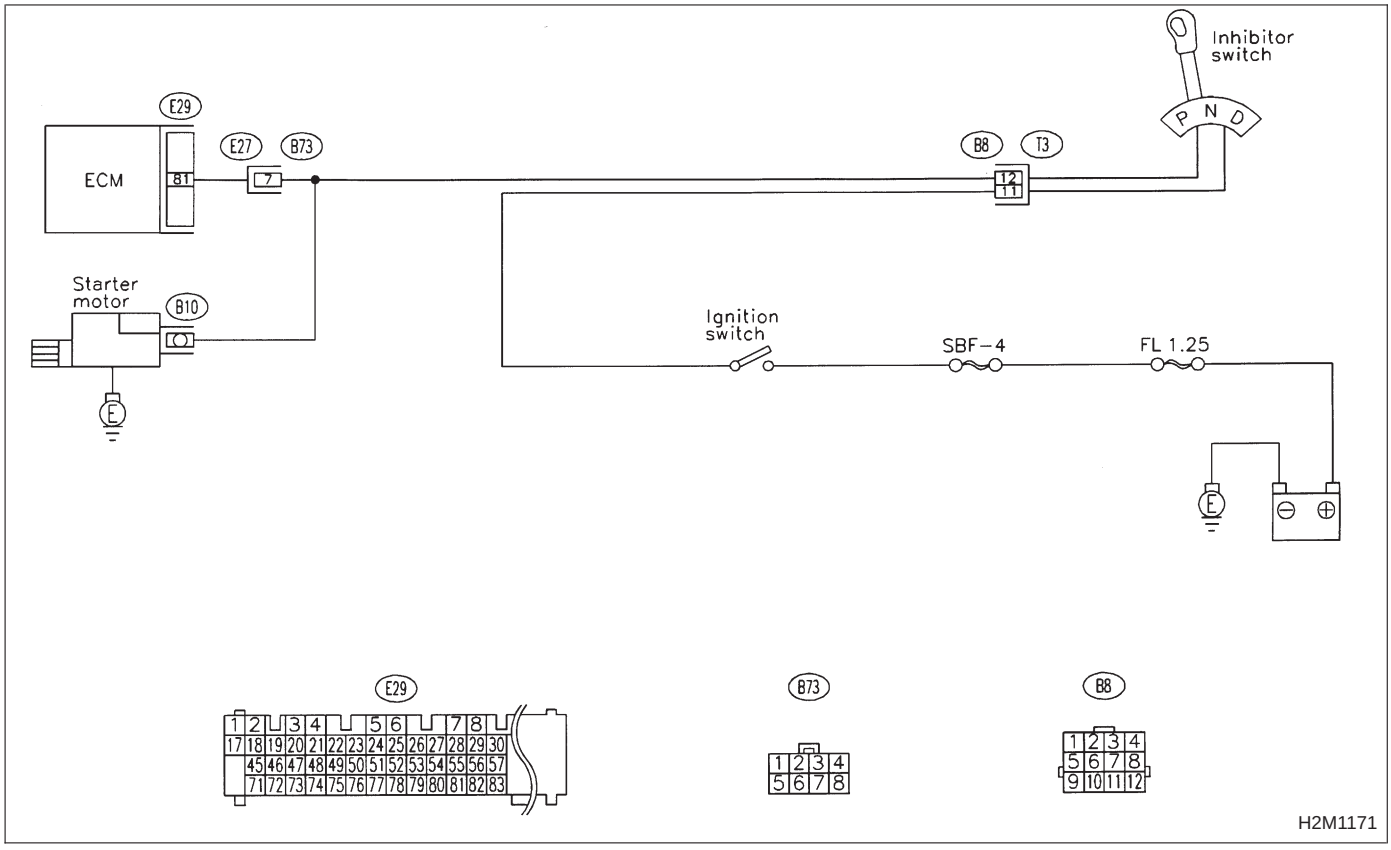


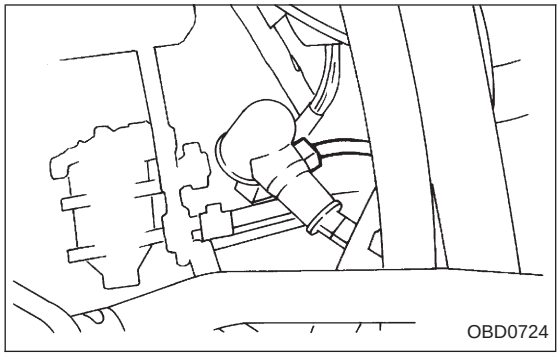
B: STARTER MOTOR CIRCUIT

1.	Check input signal for starter motor.
2.	Check ground circuit of starter motor.
3.	Check harness connector between battery and ignition switch.
4.	Check inhibitor switch.

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

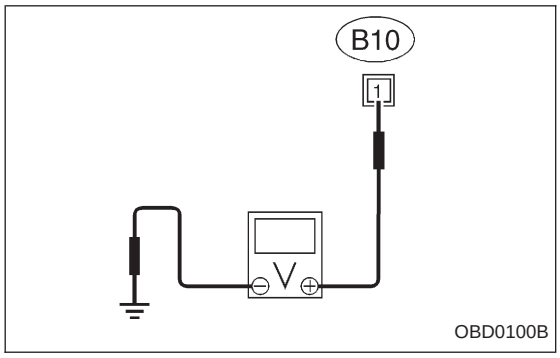
WIRING DIAGRAM:




OBD0724

1	CHECK INPUT SIGNAL FOR STARTER MOTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from starter motor.
3) Turn ignition switch to ST.



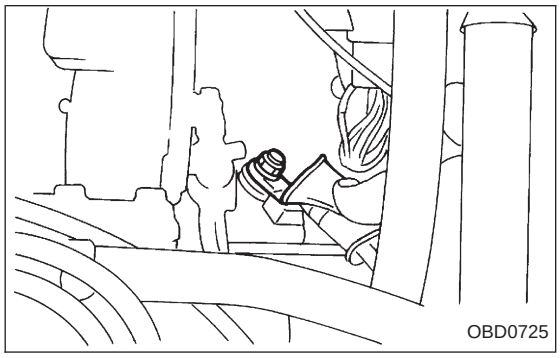
OBD0100B

4) Measure power supply voltage between starter motor connector terminal and body.

CHECK ***: Connector & terminal (B10) No. 1 — Body/10 V, or more***

NOTE:
Place the selector lever in the “P” or “N” position.

YES : Go to step 2.
NO : Go to step 3.


OBD0725

2	CHECK GROUND CIRCUIT OF STARTER MOTOR.

1) Turn ignition switch to OFF.
2) Disconnect terminal from starter motor.
3) Measure resistance of ground cable between ground cable terminal and body.

CHECK ***: Is resistance less than 5 Ω?***

YES : Check starter motor. <Ref. to 6-1 [T100].>
NO : Repair open circuit of ground cable.

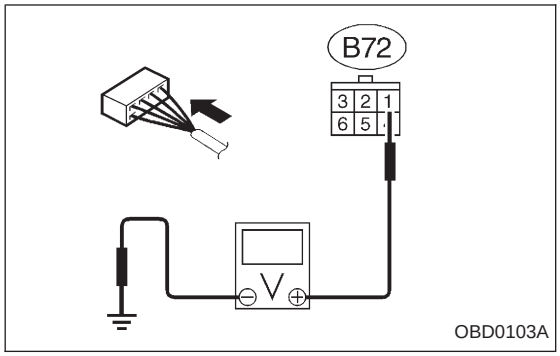
3	CHECK HARNESS CONNECTOR BETWEEN BATTERY AND IGNITION SWITCH.

1) Turn ignition switch to OFF.
2) Remove SBF No. 4 from main fuse box.
3) Measure resistance of fuse.

CHECK ***: Is resistance less than 1 Ω?***

NO : Replace SBF No. 4.
YES : Go to next step.

4) Install SBF No. 4 to main fuse box.
5) Turn ignition switch to ON.

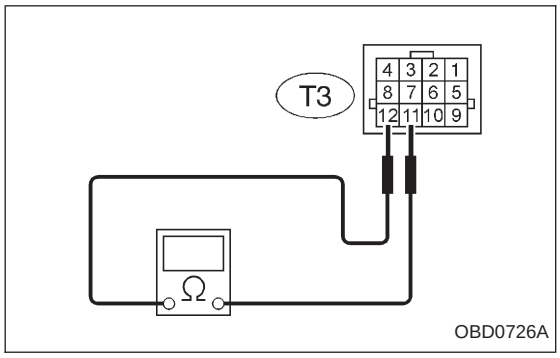


6) Measure power supply voltage between ignition switch connector and body.

CHECK : ***Connector & terminal***
(B72) No. 1 — Body/10 V, or more

YES : Go to step 4.

NO : Repair harness between ignition switch connector and body.



4	CHECK INHIBITOR SWITCH.

1) Turn ignition switch to OFF.
2) Disconnect connector from transmission.
3) Measure resistance between transmission harness connector receptacle's terminals.

CHECK : ***Connector & terminal***
(T3) No. 11 — No. 12/1 Ω, or less

YES : Repair harness between starter motor and ignition switch connector.

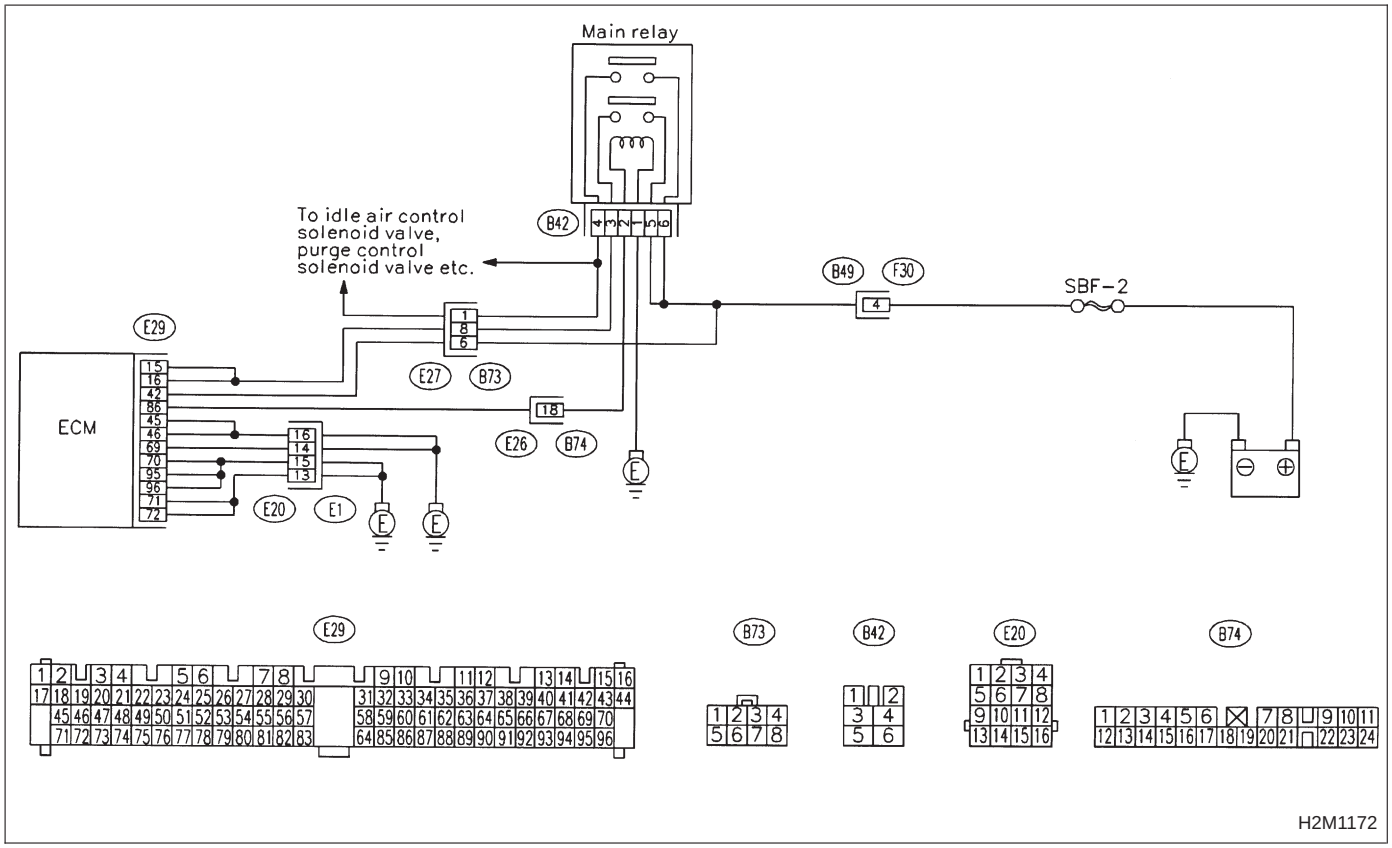
NO : Repair or replace inhibitor switch.

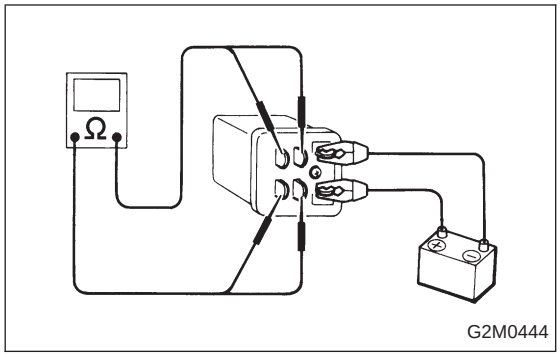
C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

1.	Check main relay.
2.	Check power supply circuit of ECM.
3.	Check ground circuit of ECM.

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



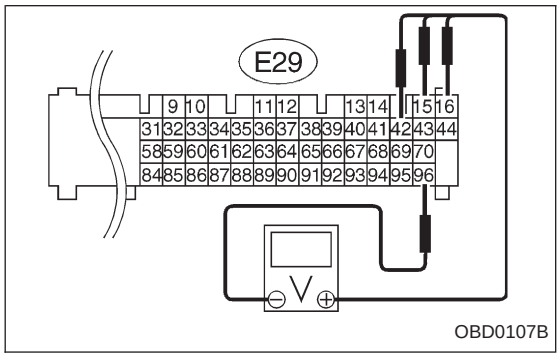


1	CHECK MAIN RELAY.

1) Turn the ignition switch to OFF.
2) Remove main relay.
3) Connect battery to main relay terminals No. 1 and No. 2.
4) Measure resistance between main relay terminals.

CHECK ***: Terminals***
No. 3 — No. 5/10 Ω, or less
No. 4 — No. 6/10 Ω, or less

YES : Go to step 2.
NO : Replace main relay.

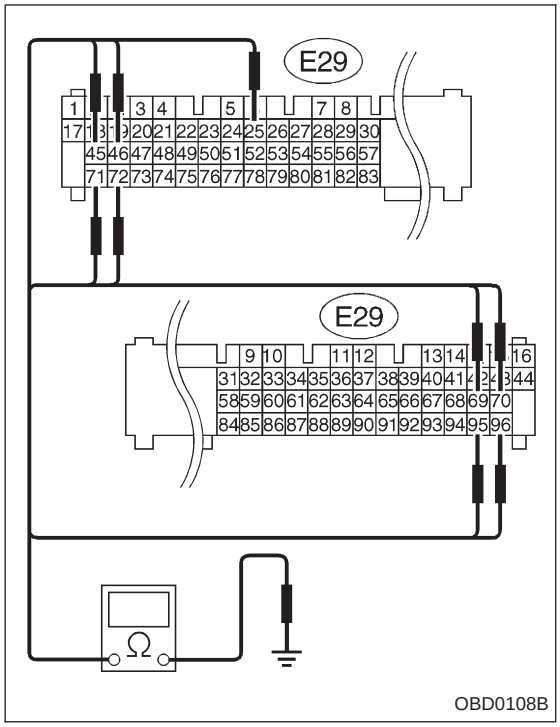


2	CHECK POWER SUPPLY CIRCUIT OF ECM.

1) Install main relay.
2) Disconnect connectors from ECM.
3) Turn ignition switch to ON.
4) Measure power supply voltage between ECM connector terminals.

CHECK ***: Connector & terminal***
(E29) No. 15 — No. 96/10 V, or more
(E29) No. 16 — No. 96/10 V, or more
(E29) No. 42 — No. 96/10 V, or more

YES : Go to step 3.
NO : Repair harness of power supply circuit.



3	CHECK GROUND CIRCUIT OF ECM.

1) Turn ignition switch to OFF.
2) Measure resistance of harness connector between ECM and body.

CHECK ***: Connector & terminal***
(E29) No. 25 — Body/5 Ω, or less
(E29) No. 45 — Body/5 Ω, or less
(E29) No. 46 — Body/5 Ω, or less
(E29) No. 69 — Body/5 Ω, or less
(E29) No. 70 — Body/5 Ω, or less
(E29) No. 71 — Body/5 Ω, or less
(E29) No. 72 — Body/5 Ω, or less
(E29) No. 95 — Body/5 Ω, or less
(E29) No. 96 — Body/5 Ω, or less

YES : Check ignition control system. <Ref. to 2-7b [T8D0].>

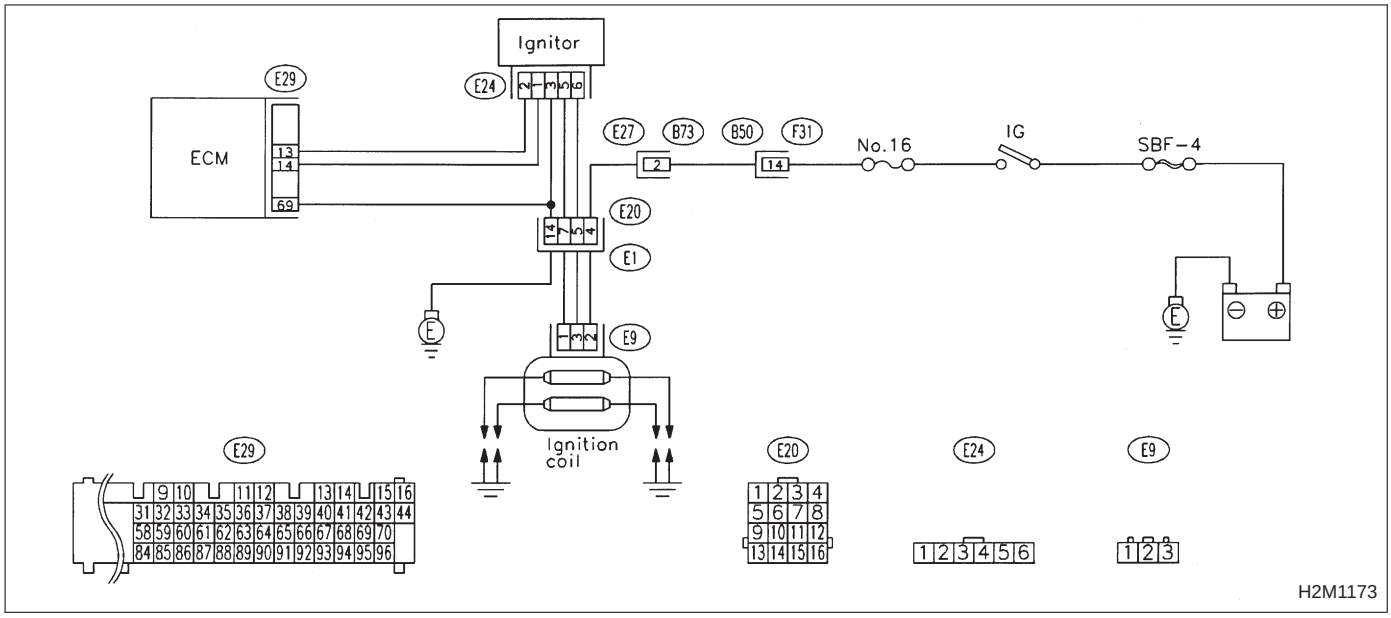
NO : Repair harness between ECM connector and body.

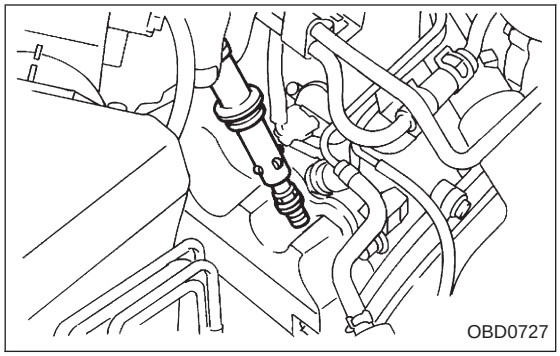
D: IGNITION CONTROL SYSTEM

1.	Check ignition system for sparks.
2.	Check power supply circuit for ignition coil.
3.	Check ignition coil.
4.	Check harness connector between ignitor and ignition coil.
5.	Check input signal for ignitor.
6.	Check harness connector of ignitor ground circuit.
7.	Check harness connector between ECM and ignitor.

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:





1	CHECK IGNITION SYSTEM FOR SPARKS.

1) Remove plug cord cap from each spark plug.
2) Install new spark plug on plug cord cap.

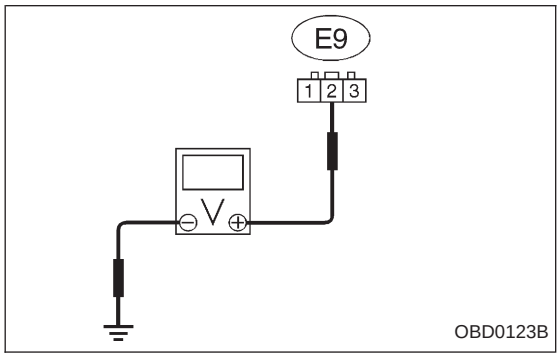
CAUTION:
Do not remove spark plug from engine.

3) Contact spark plug's thread portion on engine.
4) While opening throttle valve fully, crank engine to check that spark occurs at each cylinder.

CHECK ***: Does spark occur at each cylinder?***

YES : Check fuel pump system. <Ref. to 2-7b [T8E0].>

NO : Go to step 2.



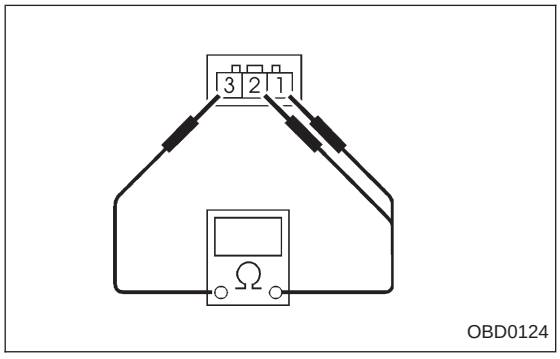
2	CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL.

1) Turn ignition switch to OFF.
2) Disconnect connector from ignition coil.
3) Turn ignition switch to ON.
4) Measure power supply voltage between ignition coil connector terminal and body.

CHECK ***: Connector & terminal***
(E9) No. 2 — Body/10 V, or more

YES : Go to step 3.

NO : Repair harness between ignition coil and ignition switch connector.



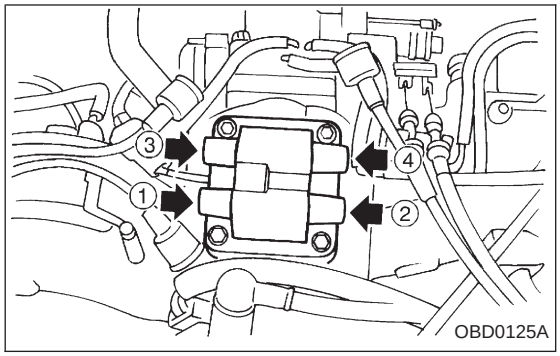
3	CHECK IGNITION COIL.

1) Measure resistance between ignition coil terminals to check primary coil.

CHECK ***: Terminals***
No. 2 — No. 1/0.7±0.3 Ω
No. 2 — No. 3/0.7±0.3 Ω

NO : Replace ignition coil.

YES : Go to next step.

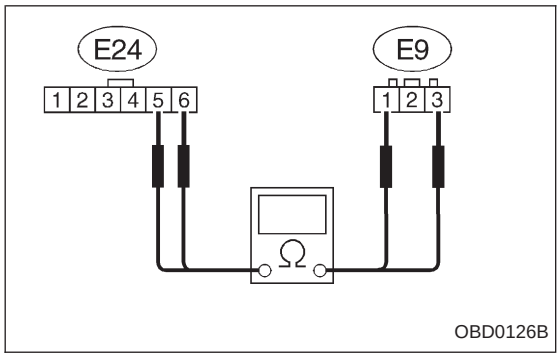


2) Measure resistance between spark plug cord contact portions to check secondary coil.

CHECK ***: Connector & terminal***
#1 — #2 /21±3 kΩ
#3 — #4 /21±3 kΩ

YES : Go to step 4.

NO : Replace ignition coil.



4	CHECK HARNESS CONNECTOR BETWEEN IGNITOR AND IGNITION COIL.

1) Turn ignition switch to OFF.
2) Disconnect connector from ignitor.
3) Measure resistance of harness connector between ignition coil and ignitor.

CHECK ***: Connector & terminal***
(E24) No. 5 — (E9) No. 1/1 Ω, or less
(E24) No. 6 — (E9) No. 3/1 Ω, or less

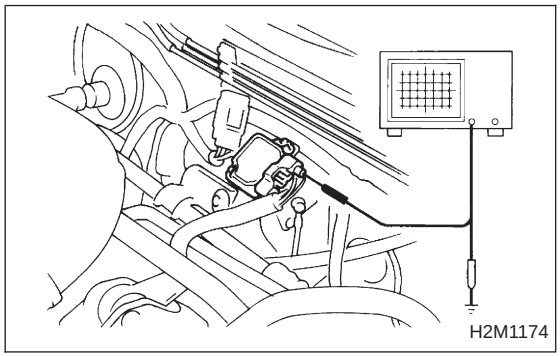
YES : Go to step 5.

NO : Go to next CHECK .

CHECK ***: Is there poor contact in coupling connector (B20)?***

YES : Repair poor contact in coupling connector.

NO : Repair harness between ignition coil and ignitor connector.



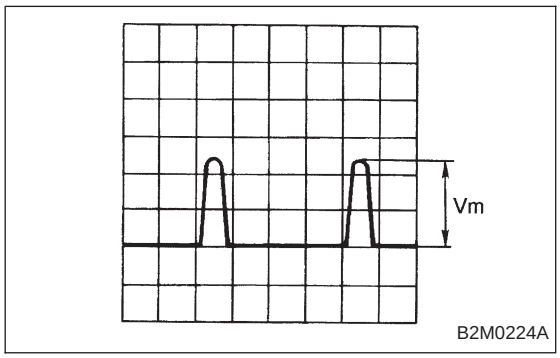
5	CHECK INPUT SIGNAL FOR IGNITOR.

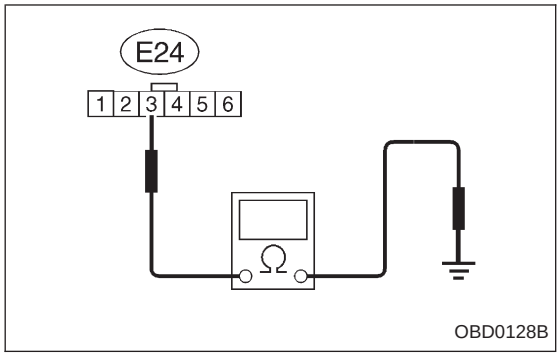
Check if voltage varies synchronously with engine speed when cranking, while monitoring voltage between ignitor connector and body.

CHECK ***: Connector & terminal:***
(E24) No. 1 — Body/10 V, or more
(E24) No. 2 — Body/10 V, or more

YES : Go to step 6.

NO : Replace ignitor.





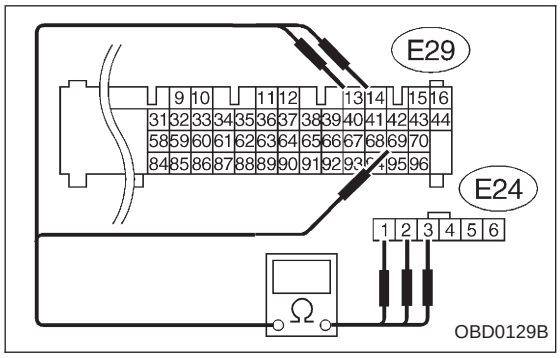
6	CHECK HARNESS CONNECTOR OF IGNITOR GROUND CIRCUIT.

1) Turn ignition switch to OFF.
2) Measure resistance between ignitor and body.

CHECK : ***Connector & terminal***
(E24) No. 3 — Body/5 Ω, or less

YES : Go to step 7.

NO : Repair harness between ignitor connector and body.



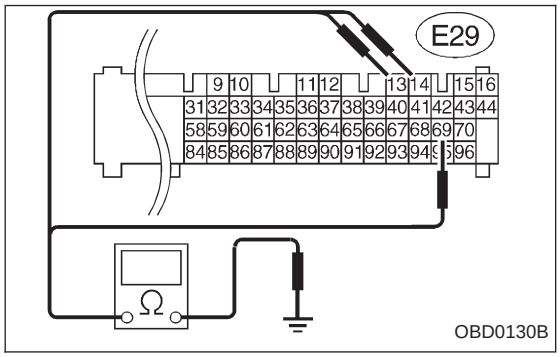
7	CHECK HARNESS CONNECTOR BETWEEN ECM AND IGNITOR.

1) Disconnect connector from ECM.
2) Measure resistance of harness connector between ECM and ignitor.

CHECK : ***Connector & terminal***
(E29) No. 14 — (E24) No. 1/1 Ω, or less
(E29) No. 13 — (E24) No. 2/1 Ω, or less
(E29) No. 69 — (E24) No. 3/1 Ω, or less

NO : Repair open circuit of harness between ECM and ignitor connector.

YES : Go to next step.



3) Measure resistance of harness connector between ECM and body.

CHECK : ***Connector & terminal***
(E29) No. 13 — Body/1 MΩ, or more
(E29) No. 14 — Body/1 MΩ, or more

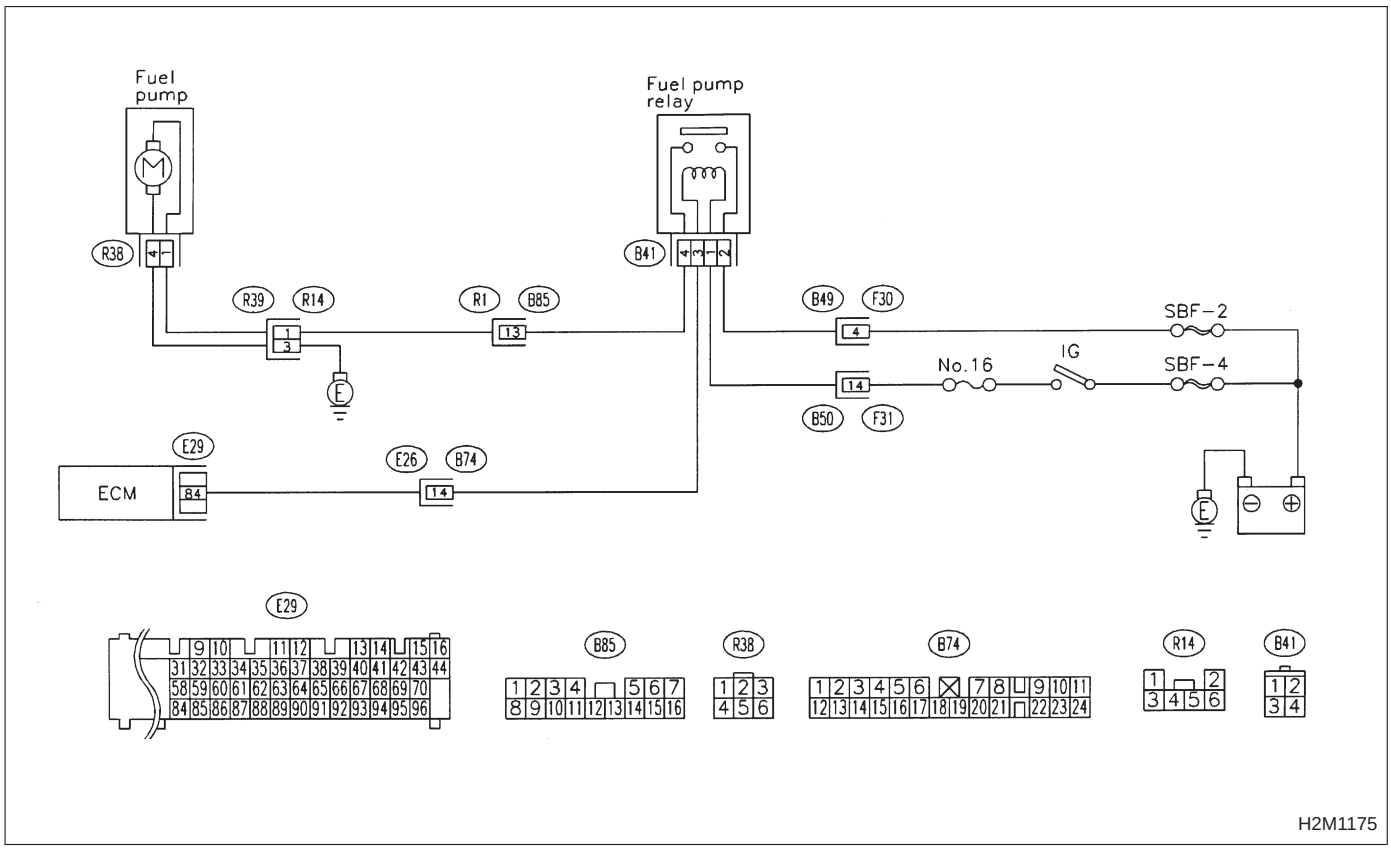
NO : Repair short circuit of harness between ECM and ignitor.

YES : Confirm good connection in ECM connector.

E: FUEL PUMP CIRCUIT

1. Check operating sound of fuel pump.
2. Check ground circuit of fuel pump.
3. Check power supply to fuel pump.
4. Check harness connector between fuel pump and fuel pump relay.
5. Check fuel pump relay.
6. Check harness connector between ECM and fuel pump relay.

WIRING DIAGRAM:



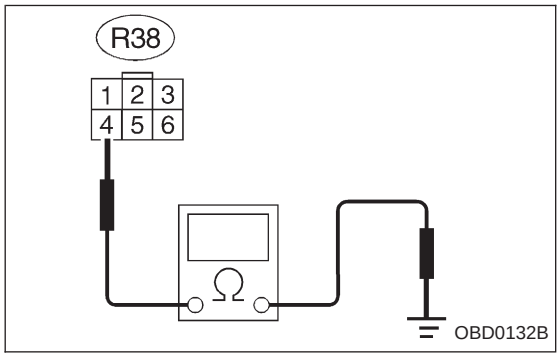
1	CHECK OPERATING SOUND OF FUEL PUMP.

Make sure that fuel pump is in operation for two seconds when turning ignition switch to ON.

CHECK ***: Does fuel pump produce operating sound?***

YES : Check fuel injector circuit. <Ref. to 2-7b [T10Q0].>

NO : Go to step 2.



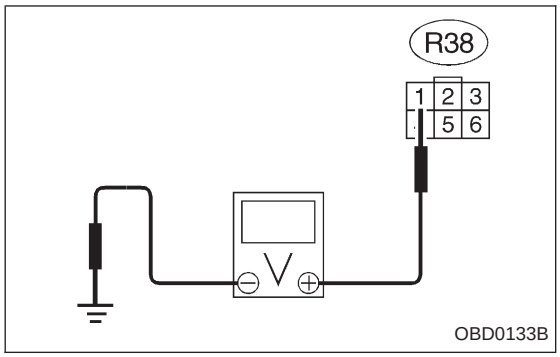
2	CHECK GROUND CIRCUIT OF FUEL PUMP.

1) Turn ignition switch to OFF.
2) Disconnect connector from fuel pump.
3) Measure resistance of harness connector between fuel pump and body.

CHECK ***: Connector & terminal***
(R38) No. 4 — Body/5 Ω, or less

YES : Go to step 3.

NO : Repair open circuit of fuel pump ground circuit.



3	CHECK POWER SUPPLY TO FUEL PUMP.

1) Turn ignition switch to ON.
2) Measure voltage of power supply circuit between fuel pump connector and body.

CHECK ***: Connector & terminal***
(R38) No. 1 — Body/10 V, or more

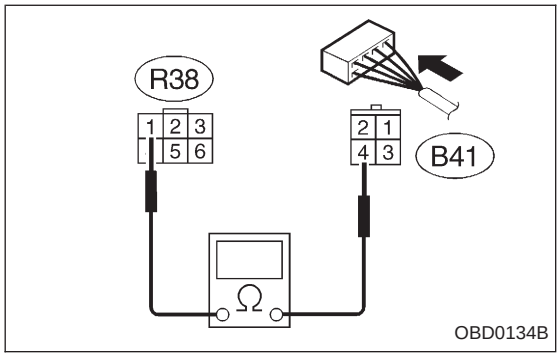
YES : Go to next CHECK .

NO : Go to step 4.

CHECK ***: Is there poor contact in fuel pump connector?***

YES : Repair poor contact in fuel pump connector.

NO : Replace fuel pump.



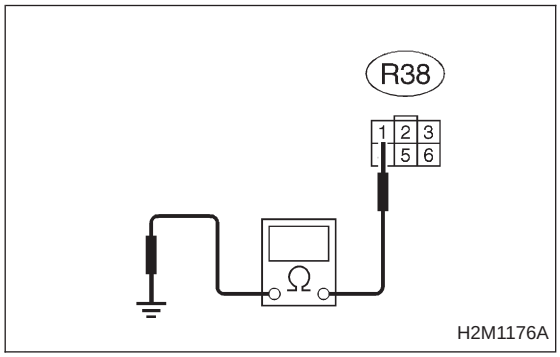
4	CHECK HARNESS CONNECTOR BETWEEN FUEL PUMP AND FUEL PUMP RELAY.

1) Turn ignition switch to OFF.
2) Measure resistance of harness connector between fuel pump and fuel pump relay.

CHECK ***: Connector & terminal***
(R38) No. 1 — (B41) No. 4/1 Ω, or less

YES : Go to next CHECK .

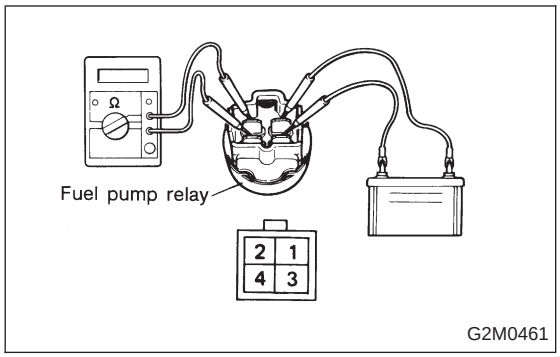
NO : Repair open circuit of harness between fuel pump and fuel pump relay connector.



CHECK : ***Connector & terminal***
(R38) No. 1 — Body/1 MΩ, or more

YES : Go to step 5.

NO : Repair short circuit of harness between fuel pump and fuel pump relay connector.



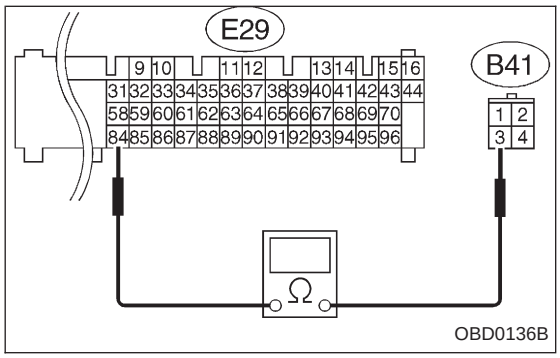
5	CHECK FUEL PUMP RELAY.

1) Disconnect connectors from fuel pump relay and main relay.
2) Remove fuel pump relay and main relay with bracket.
3) Connect battery to fuel pump relay connector terminals No. 1 and No. 3.
4) Measure resistance between connector terminals of fuel pump relay.

CHECK : ***Terminals***
No. 2 — No. 4/10 Ω, or less

YES : Go to step 6.

NO : Replace fuel pump relay.



6	CHECK HARNESS CONNECTOR BETWEEN ECM AND FUEL PUMP RELAY.

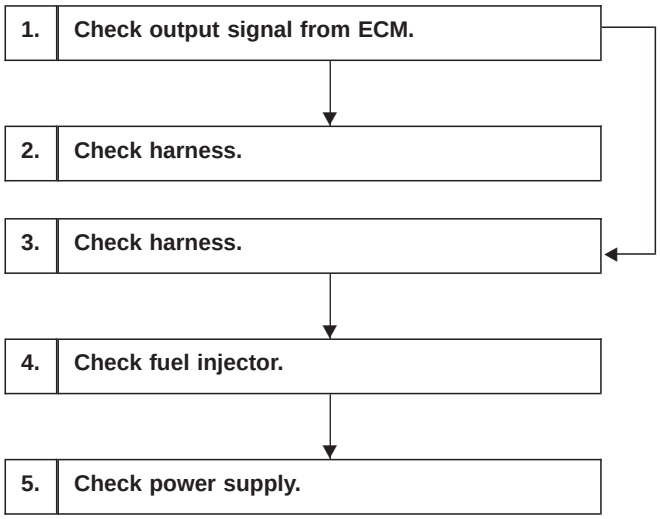
1) Disconnect connectors from ECM.
2) Measure resistance of harness connector between ECM and fuel pump relay.

CHECK : ***Connector & terminal***
(E29) No. 84 — (B41) No. 3/1 Ω, or less

NO : Confirm good connection in ECM connector.

YES : Repair open circuit of harness between ECM and fuel pump relay connector.

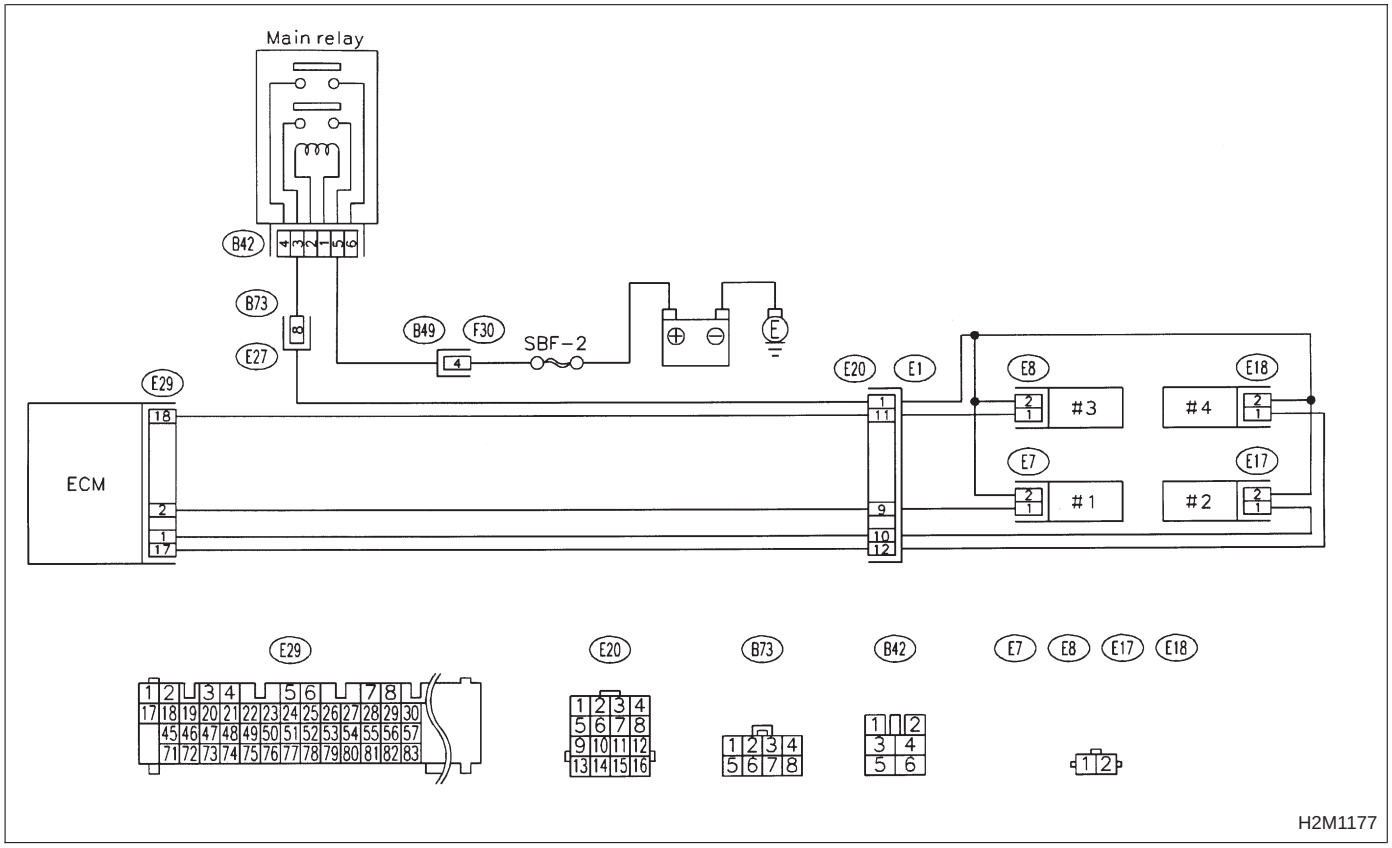
F: FUEL INJECTOR CIRCUIT



CAUTION:
- **Check or repair only faulty parts.**
- **After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.**

<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



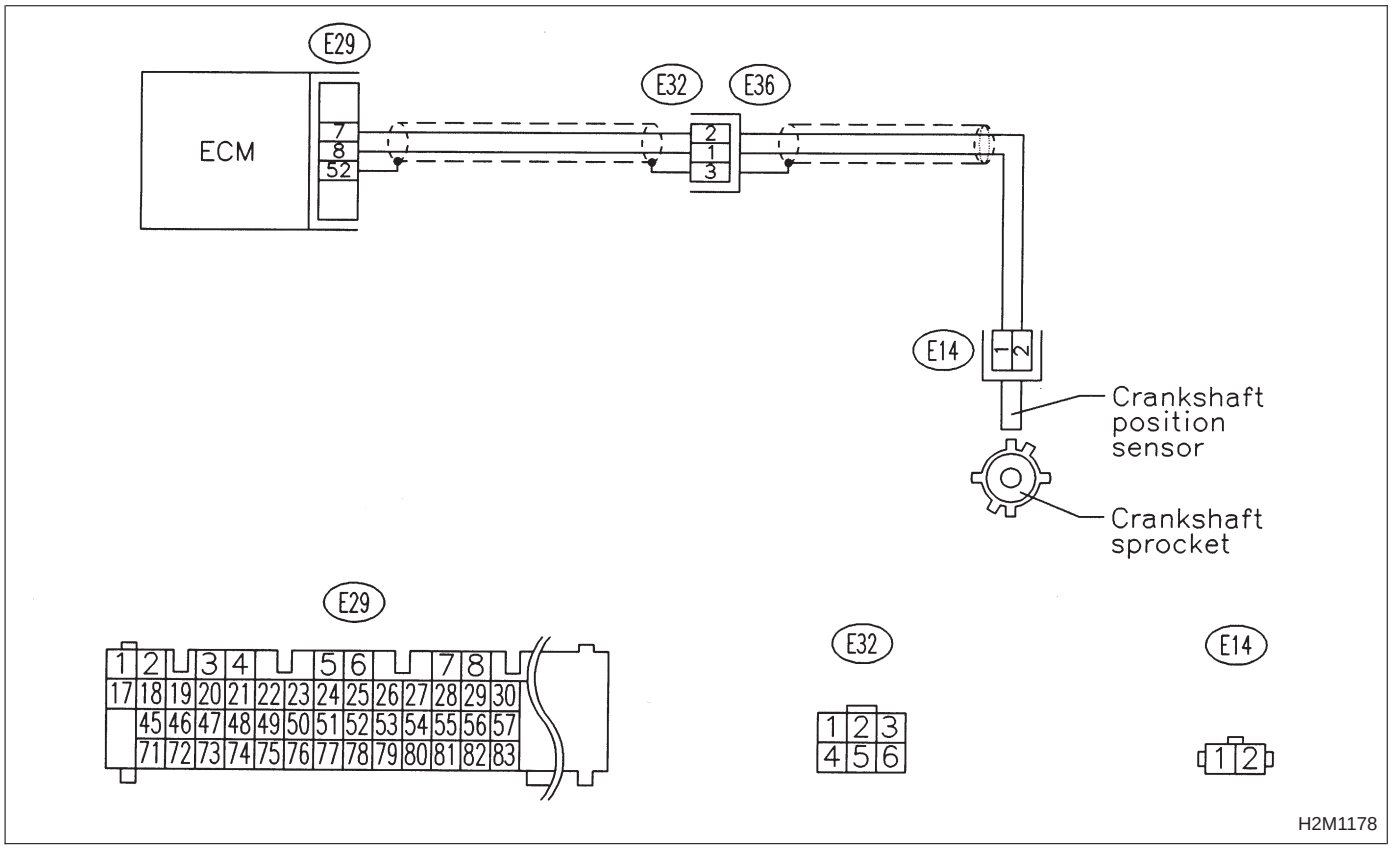
NOTE:
For the diagnostic procedure on fuel injector circuit, refer to 2-7b [T10Q0].

G: CRANKSHAFT POSITION SENSOR CIRCUIT

1.	Check harness.
2.	Check crankshaft position sensor.

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



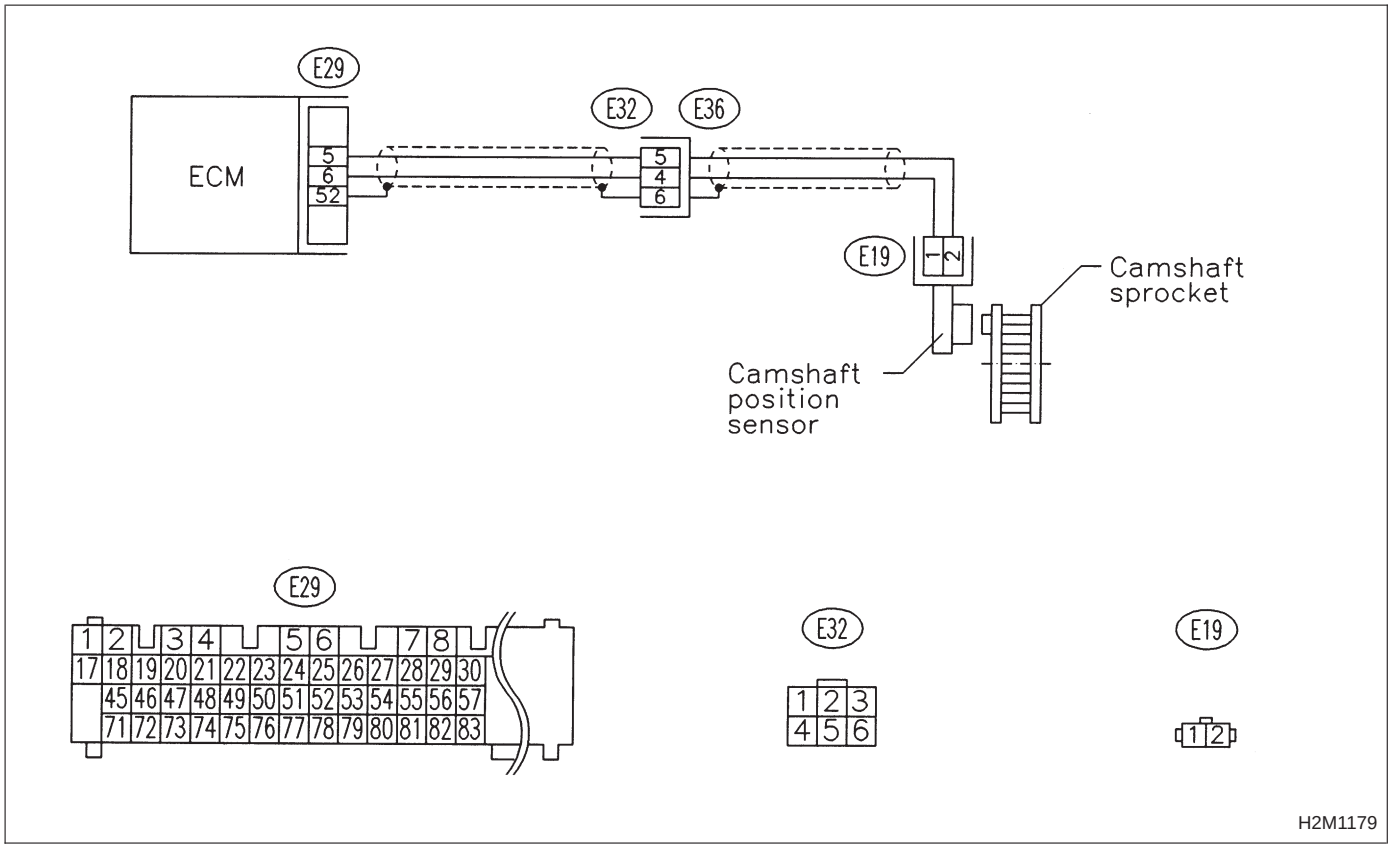
NOTE:
For the diagnostic procedure on crankshaft position sensor circuit, refer to 2-7b [T10Z0].

H: CAMSHAFT POSITION SENSOR CIRCUIT

1.	Check harness.
2.	Check camshaft position sensor.

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



NOTE:
For the diagnostic procedure on camshaft position sensor circuit, refer to 2-7b [T10A0].

9. General Diagnostics Table

1. FOR ENGINE

Problem parts / Symptom		1 Mass air flow sensor	2 Engine coolant temperature sensor (*1)	3 Throttle position sensor	4 Crankshaft position sensor & Camshaft position sensor (*2)	5 Idle air control solenoid valve	6 Knock sensor	7 Purge control solenoid valve	8 EGR valve	9 Fuel injection parts (*3)	10 Ignition parts (*4)	11 Fuel pump and relay	12 A/C switch and A/C cut relay	13 Engine torque control signal circuit
1	Engine stalls during idling.	○	△		□	○			○	○	○			
2	Rough idling	○	△	○	□	○			○					
3	Engine does not return to idle.	○		○		○								
4	Poor acceleration	○	△		□					○		○	○	○
5	Engine stalls or engine sags or hesitates at acceleration.	○	△	○	□			○	○	○		○		
6	Surge	○	△	○					○	○		○		
7	Spark knock	○					○			○		○		
8	After burning in exhaust system	○	△							○		○		

*1: The mark, △, indicates the symptom occurring only in cold temperatures.
*2: For items with the mark, □, ensure the secure installation of crankshaft position sensor and camshaft position sensor. Replacement is not necessary.
*3: Check fuel injector, fuel pressure regulator and fuel filter.
*4: Check igniter, ignition coil and spark plug.
NOTE:
Malfunction of parts other than the above is also possible. Refer to 1. Engine Trouble in General [T100] in Repair Section 2-3 of the Service Manual.

2. FOR AT

Problem parts / Symptom	Inhibitor switch	Control module	Vehicle speed sensor 1	Vehicle speed sensor 2	Select cable	Select lever	FWD switch	Starter motor and harness	Throttle position sensor	Hold switch	Accumulator ("N" — "D")	Accumulator (2A)	Accumulator (4A)	Accumulator (3R)	ATF temperature sensor	Strainer	Duty solenoid A	Duty solenoid B	Shift solenoid 1	Shift solenoid 2	Shift solenoid 3	Control valve	Detent spring	Manual plate	Transfer clutch	Transfer valve	Transfer pipe	Duty solenoid C	Forward clutch
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Starter does not rotate when select lever is in "P" or "N."; starter rotates when select lever is "R", "D", "3" or "2."	○				○	○		○																					
Abnormal noise when select lever is in "P" or "N."																○												○	
Hissing noise occurs during standing starts.																○													
Noise occurs while driving in "D_1" range.																													
Noise occurs while driving in "D_2" range.																													
Noise occurs while driving in "D_3" range.																													
Noise occurs while driving in "D_4" range.																													
Engine stalls while shifting from one range to another.																						○							
Vehicle moves when select lever is in "N."																													○
Shock occurs when select lever is moved from "N" to "D."		○									○											○							
Excessive time lag occurs when select lever is moved from "N" to "D."																						○							○
Shock occurs when select lever is moved from "N" to "R."		○											○									○							
Excessive time lag occurs when select lever is moved from "N" to "R."																						○							
Vehicle does not start in any shift range (engine revving up).																○						○							
Vehicle does not start in any shift range (engine stall).																													
Vehicle does not start in "R" range only (engine revving up).					○	○																○							
Vehicle does not start in "R" range only (engine stall).																													○
Vehicle does not start in "D" or "3" range (engine revving up).																													○
Vehicle does not start in "D", "3" or "2" range (engine revving up).																													○
Vehicle does not start in "D", "3" or "2" range (engine stall).																													
Vehicle starts in "R" range only (engine revving up).																						○							
Acceleration during standing starts is poor (high stall rpm).																						○							○
Acceleration during standing starts is poor (low stall rpm).																													
Acceleration is poor when select lever is in "D", "3" or "2" range (normal stall rpm).		○																				○							
Acceleration is poor when select lever is in "R" (normal stall rpm).																						○							
No shift occurs from 1st to 2nd gear.		○	○	○					○										○	○		○							
No shift occurs from 2nd to 3rd gear.		○																				○							
No shift occurs from 3rd to 4th gear.		○												○	○						○	○							
No "kick-down" shifts occur.		○							○																				
Engine brake is not effected when select lever is in "3" range.	○	○							○													○							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29

Overrunning clutch	Drive pinion	Crown gear	Axle shaft	Differential gear	Final gear	Seal pipe	Oil pump	High clutch	Band brake	Low & reverse clutch	Reverse clutch	One-way clutch (1-2)	One-way clutch (3-4)	Double oil seal	Input shaft	Output shaft	Planetary gear	Reduction gear	Drive plate	Torque converter one-way clutch	Lock-up facing	Lock-up damper	ATF deterioration	ATF level too high or too low	Differential gear oil level too high or too low	Engine performance	Engine speed signal	Parking brake mechanism	Problem parts
30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	Symptom
																													Starter does not rotate when select lever is in “P” or “N.”; starter rotates when select lever is “R”, “D”, “3” or “2.”
							○												○					○					Abnormal noise when select lever is in “P” or “N.”
																								○					Hissing noise occurs during standing starts.
					○												○	○							○				Noise occurs while driving in “D_1” range.
					○												○	○							○				Noise occurs while driving in “D_2” range.
					○													○						○				Noise occurs while driving in “D_3” range.
					○												○	○							○				Noise occurs while driving in “D_4” range.
																						○				○			Engine stalls while shifting from one range to another.
																													Vehicle moves when select lever is in “N.”
																							○						Shock occurs when select lever is moved from “N” to “D.”
																													Excessive time lag occurs when select lever is moved from “N” to “D.”
																							○						Shock occurs when select lever is moved from “N” to “R.”
										○	○																		Excessive time lag occurs when select lever is moved from “N” to “R.”
	○	○	○	○			○								○	○	○		○					○					Vehicle does not start in any shift range (engine revving up).
																												○	Vehicle does not start in any shift range (engine stall).
										○	○																		Vehicle does not start in “R” range only (engine revving up).
									○								○												Vehicle does not start in “R” range only (engine stall).
												○																	Vehicle does not start in “D” or “3” range (engine revving up).
																													Vehicle does not start in “D”, “3” or “2” range (engine revving up).
											○																		Vehicle does not start in “D”, “3” or “2” range (engine stall).
																													Vehicle starts in “R” range only (engine revving up).
											○														○				Acceleration during standing starts is poor (high stall rpm).
							○													○						○			Acceleration during standing starts is poor (low stall rpm).
								○	○								○												Acceleration is poor when select lever is in “D”, “3” or “2” range (normal stall rpm).
○								○	○								○												Acceleration is poor when select lever is in “R” (normal stall rpm).
									○																				No shift occurs from 1st to 2nd gear.
								○					○																No shift occurs from 2nd to 3rd gear.
									○																				No shift occurs from 3rd to 4th gear.
																													No “kick-down” shifts occur.
																													Engine brake is not effected when select lever is in “3” range.
30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	

Problem parts / Symptom	Inhibitor switch	Control module	Vehicle speed sensor 1	Vehicle speed sensor 2	Select cable	Select lever	FWD switch	Starter motor and harness	Throttle position sensor	Hold switch	Accumulator ("N" — "D")	Accumulator (2A)	Accumulator (4A)	Accumulator (3R)	ATF temperature sensor	Strainer	Duty solenoid A	Duty solenoid B	Shift solenoid 1	Shift solenoid 2	Shift solenoid 3	Control valve	Detent spring	Manual plate	Transfer clutch	Transfer valve	Transfer pipe	Duty solenoid C	Forward clutch
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Engine brake is not effected when select lever is in "3" or "2" range.																													
Engine brake is not effected when select lever is in "1" range.																						○							
Shift characteristics are erroneous.	○	○	○	○					○													○							
No lock-up occurs.		○							○						○							○							
Vehicle cannot be set in "D" range power mode.		○							○																				
"D" range power mode cannot be released.		○							○						○														
Parking brake is not effected.					○	○																							
Shift lever cannot be moved or is hard to move from "P" range.					○	○																							
Select lever is hard to move.					○	○																	○	○					
Select lever is too light to move (unreasonable resistance).																							○	○					
ATF spurts out.																													
Differential oil spurts out.																													
Differential oil level changes excessively.																													
Odor is produced from oil supply pipe.																									○				○
Shock occurs when select lever is moved from "1" to "2" range.		○							○			○			○		○					○							
Slippage occurs when select lever is moved from "1" to "2" range.		○							○			○			○		○					○							
Shock occurs when select lever is moved from "2" to "3" range.		○							○					○	○		○					○							
Slippage occurs when select lever is moved from "2" to "3" range.		○							○					○	○		○					○							
Shock occurs when select lever is moved from "3" to "4" range.		○							○				○		○		○					○							
Slippage occurs when select lever is moved from "3" to "4" range.		○							○				○		○		○					○							
Shock occurs when select lever is moved from "3" to "2" range.		○							○						○		○					○							
Shock occurs when select lever is moved from "D" to "1" range.		○							○						○		○					○							
Shock occurs when select lever is moved from "2" to "1" range.		○							○						○		○					○							
Shock occurs when accelerator pedal is released at medium speeds.		○							○						○		○					○							
Vibration occurs during straight-forward operation.		○																○											
Select lever slips out of position during acceleration or while driving on rough terrain.					○	○																	○	○					
Vibration occurs during turns (tight corner "braking" phenomenon).		○	○	○					○	○					○										○	○		○	
Front wheel slippage occurs during standing starts.		○		○			○		○	○					○							○			○	○	○	○	
Vehicle is not set in FWD mode.		○					○																		○	○		○	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29

Overrunning clutch	Drive pinion	Crown gear	Axle shaft	Differential gear	Final gear	Seal pipe	Oil pump	High clutch	Band brake	Low & reverse clutch	Reverse clutch	One-way clutch (1-2)	One-way clutch (3-4)	Double oil seal	Input shaft	Output shaft	Planetary gear	Reduction gear	Drive plate	Torque converter one-way clutch	Lock-up facing	Lock-up damper	ATF deterioration	ATF level too high or too low	Differential gear oil level too high or too low	Engine performance	Engine speed signal	Parking brake mechanism	Problem parts
30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	Symptom
○																													Engine brake is not effected when select lever is in “3” or “2” range.
										○																			Engine brake is not effected when select lever is in “1” range.
																													Shift characteristics are erroneous.
																					○						○		No lock-up occurs.
																													Vehicle cannot be set in “D” range power mode.
																													“D” range power mode cannot be released.
																												○	Parking brake is not effected.
																												○	Shift lever cannot be moved or is hard to move from “P” range.
																													Select lever is hard to move.
																													Select lever is too light to move (unreasonable resistance).
																								○					ATF spurts out.
																									○				Differential oil spurts out.
						○								○															Differential oil level changes excessively.
○								○	○	○	○										○		○						Odor is produced from oil supply pipe.
									○														○			○			Shock occurs when select lever is moved from “1” to “2” range.
									○																				Slippage occurs when select lever is moved from “1” to “2” range.
								○	○														○			○			Shock occurs when select lever is moved from “2” to “3” range.
								○	○																				Slippage occurs when select lever is moved from “2” to “3” range.
○									○														○			○			Shock occurs when select lever is moved from “3” to “4” range.
									○																				Slippage occurs when select lever is moved from “3” to “4” range.
○									○														○						Shock occurs when select lever is moved from “3” to “2” range.
																							○						Shock occurs when select lever is moved from “D” to “1” range.
										○													○						Shock occurs when select lever is moved from “2” to “1” range.
																						○				○			Shock occurs when accelerator pedal is released at medium speeds.
																					○	○							Vibration occurs during straight-forward operation.
																													Select lever slips out of position during acceleration or while driving on rough terrain.
																							○						Vibration occurs during turns (tight corner “braking” phenomenon).
																													Front wheel slippage occurs during standing starts.
																													Vehicle is not set in FWD mode.
30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	

10. Diagnostics Chart with Trouble Code

A: DIAGNOSTIC TROUBLE CODE (DTC) LIST

DTC No.	Abbreviation (Subaru select monitor)	Item	Page
P0100	QA	Mass air flow sensor circuit malfunction	95
P0101	QA — R	Mass air flow sensor circuit range/performance problem	100
P0105	P — S	Pressure sensor circuit malfunction	101
P0106	P — R	Pressure sensor circuit range/performance problem	107
P0115	TW	Engine coolant temperature sensor circuit malfunction	111
P0120	THV	Throttle position sensor circuit malfunction	115
P0121	TH — R	Throttle position sensor circuit range/performance problem	121
P0125	TW — CL	Insufficient coolant temperature for closed loop fuel control	122
P0130	FO2 — V	Front oxygen sensor circuit malfunction	123
P0133	FO2 — R	Front oxygen sensor circuit slow response	127
P0135	FO2H	Front oxygen sensor heater circuit malfunction	129
P0136	RO2 — V	Rear oxygen sensor circuit malfunction	134
P0139	RO2 — R	Rear oxygen sensor circuit slow response	138
P0141	RO2H	Rear oxygen sensor heater circuit malfunction	140
P0170	FUEL	Fuel trim malfunction	145
P0201	INJ1	Fuel injector circuit malfunction - #1	150
P0202	INJ2	Fuel injector circuit malfunction - #2	
P0203	INJ3	Fuel injector circuit malfunction - #3	
P0204	INJ4	Fuel injector circuit malfunction - #4	
P0301	MIS — 1	Cylinder 1 misfire detected	155
P0302	MIS — 2	Cylinder 2 misfire detected	
P0303	MIS — 3	Cylinder 3 misfire detected	
P0304	MIS — 4	Cylinder 4 misfire detected	
P0325	KNOCK	Knock sensor circuit malfunction	161
P0335	CRANK	Crankshaft position sensor circuit malfunction	165
P0340	CAM	Camshaft position sensor circuit malfunction	168
P0400	EGR	Exhaust gas recirculation flow malfunction	171
P0403	EGRSOL	Exhaust gas recirculation circuit malfunction	176
P0420	CAT	Catalyst system efficiency below threshold	181
P0441	CPC — F	Evaporative emission control system incorrect purge flow	183
P0443	CPC	Evaporative emission control system purge control valve circuit malfunction	185
P0500	VSP	Vehicle speed sensor malfunction	189
P0505	ISC	Idle control system malfunction	191
P0506	ISC — L	Idle control system RPM lower than expected	196
P0507	ISC — H	Idle control system RPM higher than expected	198
P0600	—	Serial communication link malfunction	200
P0601	RAM	Internal control module memory check sum error	202
P0703	BRK	Brake switch input malfunction	204

DTC No.	Abbreviation (Subaru select monitor)	Item	Page
P0705	RNG	Transmission range sensor circuit malfunction	207
P0710	ATF	Transmission fluid temperature sensor circuit malfunction	212
P0720	ATVSP	Output speed sensor (vehicle speed sensor 1) circuit malfunction	214
P0725	ATNE	Engine speed input circuit malfunction	216
P0731	GR — 1	Gear 1 incorrect ratio	218
P0732	GR — 2	Gear 2 incorrect ratio	
P0733	GR — 3	Gear 3 incorrect ratio	
P0734	GR — 4	Gear 4 incorrect ratio	
P0740	LU — F	Torque converter clutch system malfunction	222
P0743	LU	Torque converter clutch system electrical	226
P0748	PL	Pressure control solenoid electrical	228
P0753	SFT1	Shift solenoid A electrical	230
P0758	SFT2	Shift solenoid B electrical	232
P0760	OVR — F	Shift solenoid C malfunction	234
P0763	OVR	Shift solenoid C electrical	238
P1100	ST — SW	Starter switch circuit malfunction	240
P1101	N — SW	Neutral position switch circuit malfunction	242
P1102	BR	Pressure sources switching solenoid valve circuit malfunction	246
P1103	TRQ	Engine torque control signal circuit malfunction	250
P1500	FAN — 1	Radiator fan relay 1 circuit malfunction	252
P1502	FAN — F	Radiator fan function problem	258
P1700	ATTH	Throttle position sensor circuit malfunction for automatic transmission	260
P1701	CRS	Cruise control set signal circuit malfunction for automatic transmission	262
P1702	ATDIAG	Automatic transmission diagnosis input signal circuit malfunction	265

B: DTC P0100 — MASS AIR FLOW SENSOR CIRCUIT MALFUNCTION (QA) —

DTC DETECTING CONDITION:

- Immediately at fault recognition

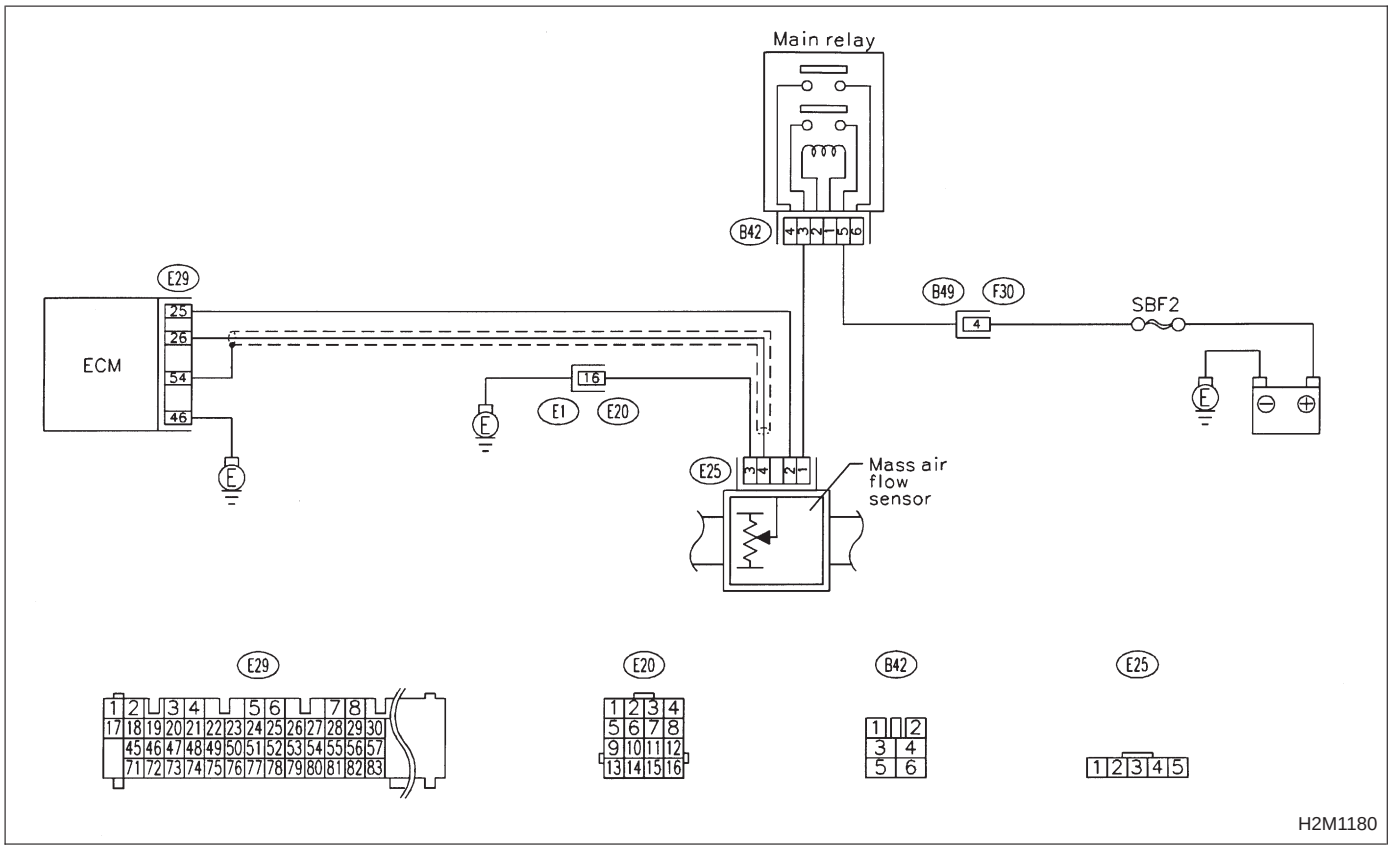
TROUBLE SYMPTOM:

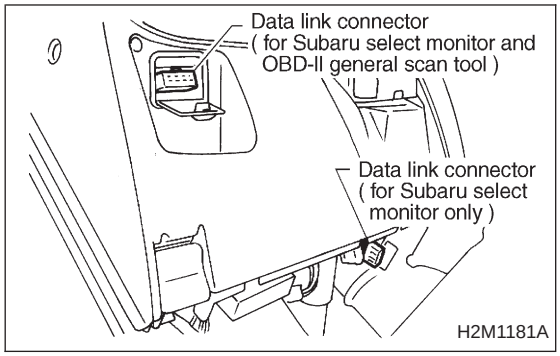
- Erroneous idling
- Engine stalls.
- Poor driving performance

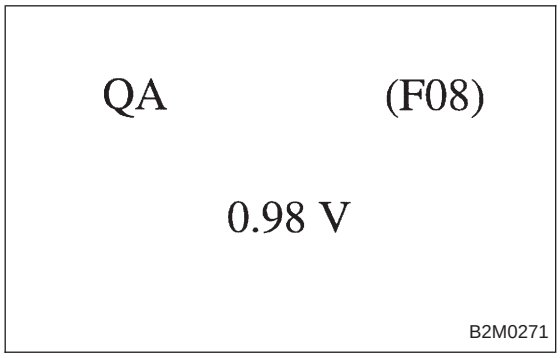
1.	Connect Subaru Select Monitor or the OBD-II general scan tool, and read data.
2.	Check input signal for ECM. (Using voltage meter and Subaru Select Monitor.)
3.	Check power supply to mass air flow sensor.
4.	Check harness connector between ECM and mass air flow sensor.
5.	Check harness.

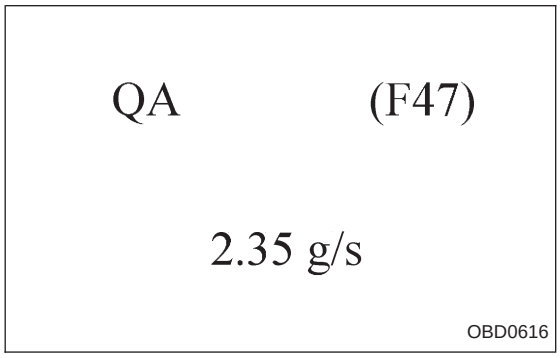
CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:









1	**CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.**

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Turn ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON.
4) Start engine.
5) Read data on Subaru Select Monitor or OBD-II general scan tool.

● Subaru Select Monitor

Designate mode using function key.

Function mode: F08 or F47

● F08: Voltage input from mass air flow sensor is shown on display.
● F47: Mass air flow is shown on display.

CHECK
- ***F08: Is sensor output equal to or more than 0.3 V and equal to or less than 5.0 V?***
- ***F47: Is sensor output equal to or more than 1.3 g/sec and equal to or less than 250 g/sec?***

Probable cause: Poor connect of connectors, circuit and grounding line.

YES : 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 of the mass air flow sensor.

HINT: ① Open or short circuit between mass air flow sensor and ECM.
② Poor contact of connectors for mass air flow sensor or ECM.

NO : Go to next CHECK .

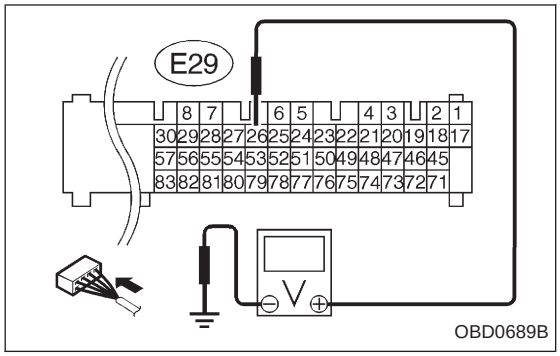
CHECK ***: Is the value less than 0.3 V (1.3 g/sec)?***

YES : Go to step 2.

NO : Go to step 5.

● OBD-II general scan tool

For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.



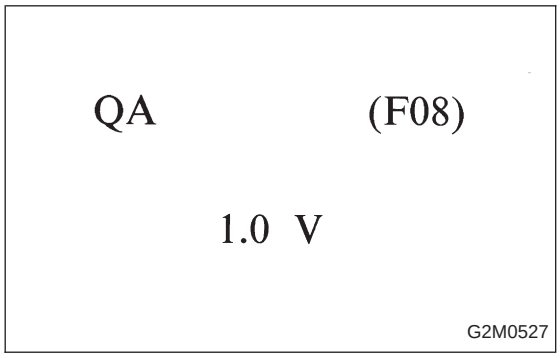
2	CHECK INPUT SIGNAL FOR ECM. (USING VOLTAGE METER AND SUBARU SELECT MONITOR.)

Measure voltage between ECM and body while engine is idling.

CHECK ***: Connector & terminal (E29) No. 26 — Body/0.3 V, or less***

YES : Go to step 3.

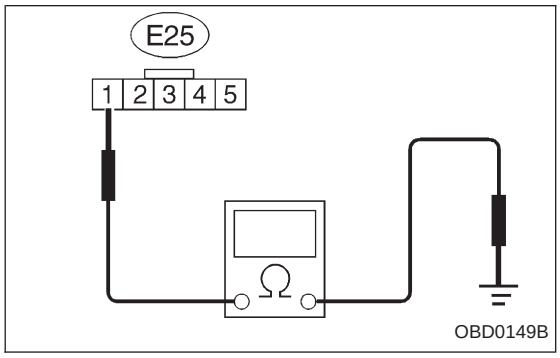
NO : Go to next CHECK .



CHECK ***: Is the voltage more than 0.3 V while shaking harness and connector of ECM and monitoring the value with Subaru select monitor?***

YES : Repair poor contact in ECM connector.

NO : Replace ECM with a new one.



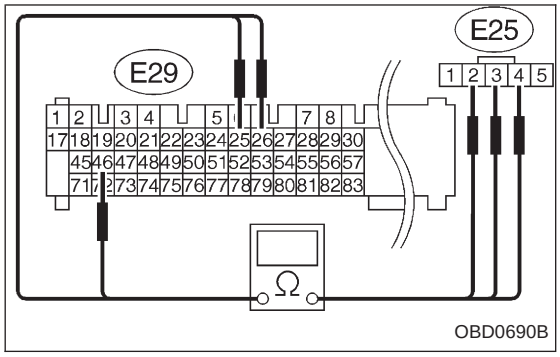
3	CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from mass air flow sensor.
3) Turn ignition switch to ON.
4) Measure voltage between mass air flow sensor connector and body.

CHECK ***: Connector & terminal (E25) No. 1 — Body/10 V, or more***

YES : Go to step 4.

NO : Repair open circuit of harness between main relay connector and mass air flow sensor connector.



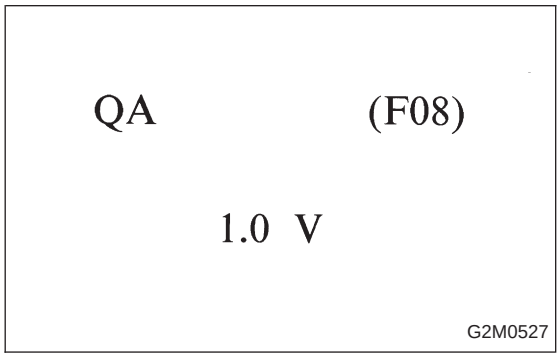
4	CHECK HARNESS CONNECTOR BETWEEN ECM AND MASS AIR FLOW SENSOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Measure resistance of harness connector between ECM and mass air flow sensor.

CHECK ***: Connector & terminal***
- ① ***(E29) No. 26 — (E25) No. 4/1 Ω, or less***
- ② ***(E29) No. 46 — (E25) No. 3/1 Ω, or less***
- ③ ***(E29) No. 25 — (E25) No. 2/1 Ω, or less***

YES : Replace mass air flow sensor with a new one.

NO : Repair poor contact and open circuit of harness between ECM and mass air flow sensor connector.



5	CHECK HARNESS.

1) Turn ignition switch to OFF.
2) Disconnect connector from mass air flow sensor.
3) Connect Subaru Select Monitor or OBD-II General Scan Tool to data link connector.
4) Turn ignition switch to ON.
5) Read data on Subaru select monitor or OBD-II general scan tool.

● Subaru Select Monitor
Designate mode using function key.

Function mode: F08

CHECK ***: Is the value more than 5 V?***

YES : Repair short circuit of harness between mass air flow sensor and ECM.

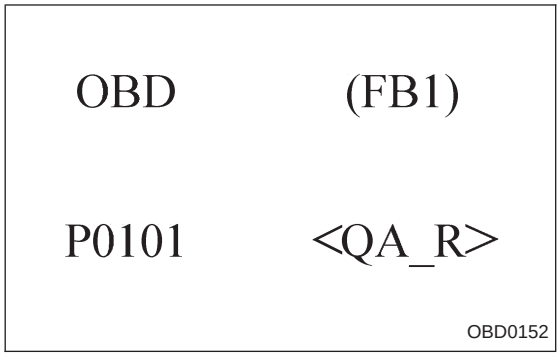
NO : Go to next CHECK .

CHECK ***: Is there poor contact in mass air flow sensor connector?***

YES : Repair poor contact in mass air flow sensor connector.

NO : Replace mass air flow sensor.

● OBD-II general scan tool
For detailed operation procedures, refer to OBD-II General Scan Tool Instruction Manual.



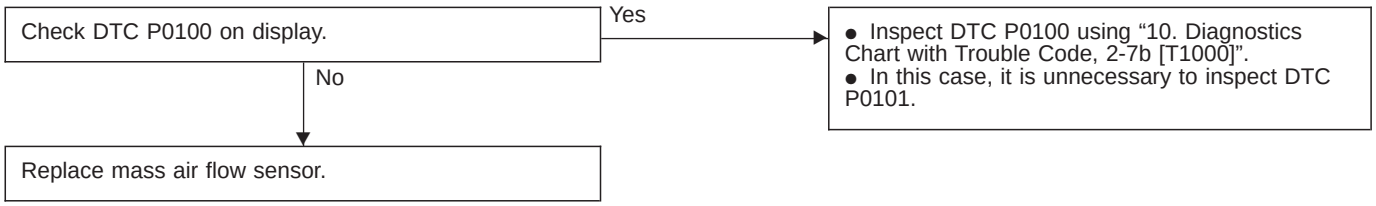
C: DTC P0101 — MASS AIR FLOW SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (QA – R) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

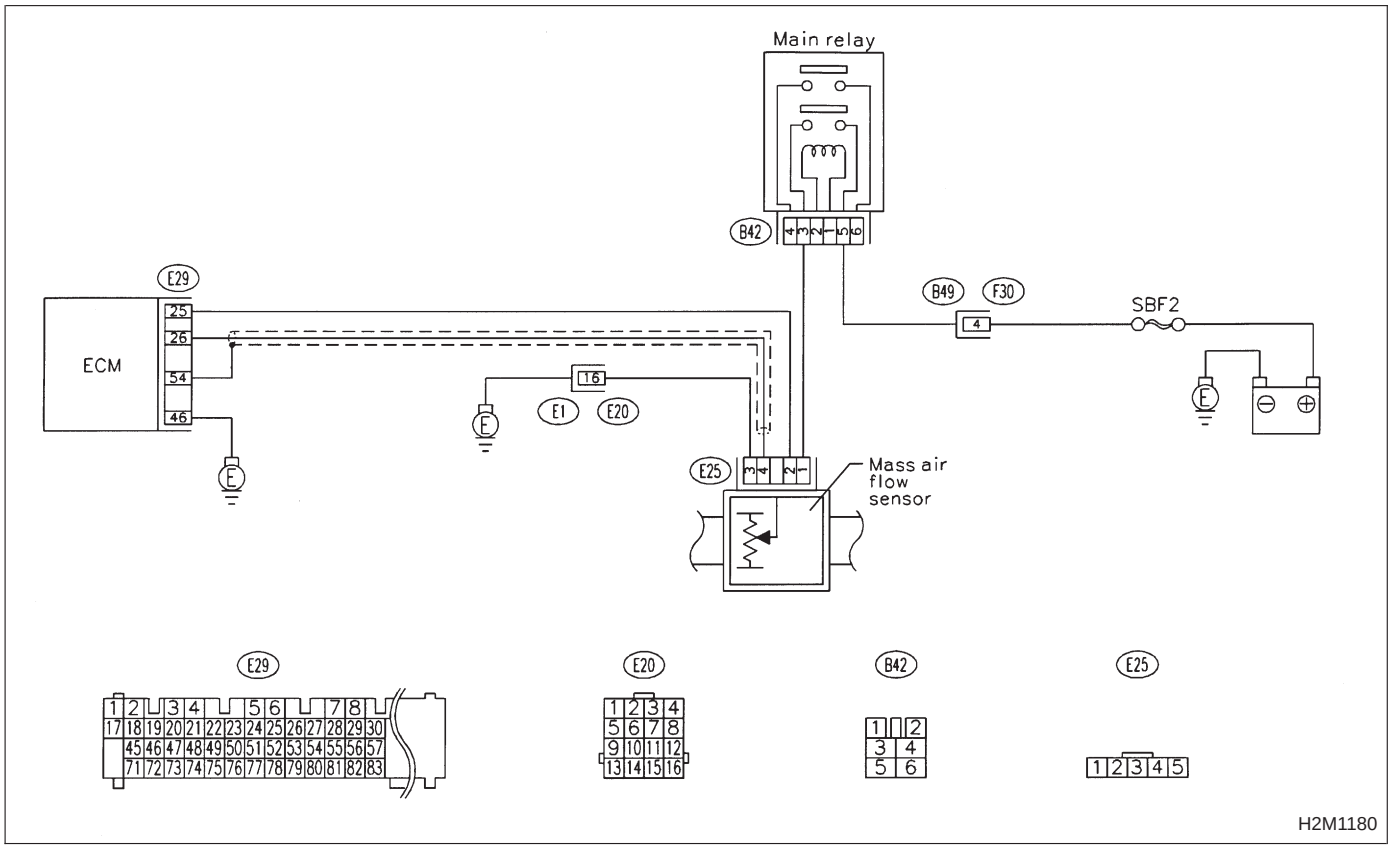
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



D: DTC P0105 — PRESSURE SENSOR CIRCUIT MALFUNCTION (P – S) —

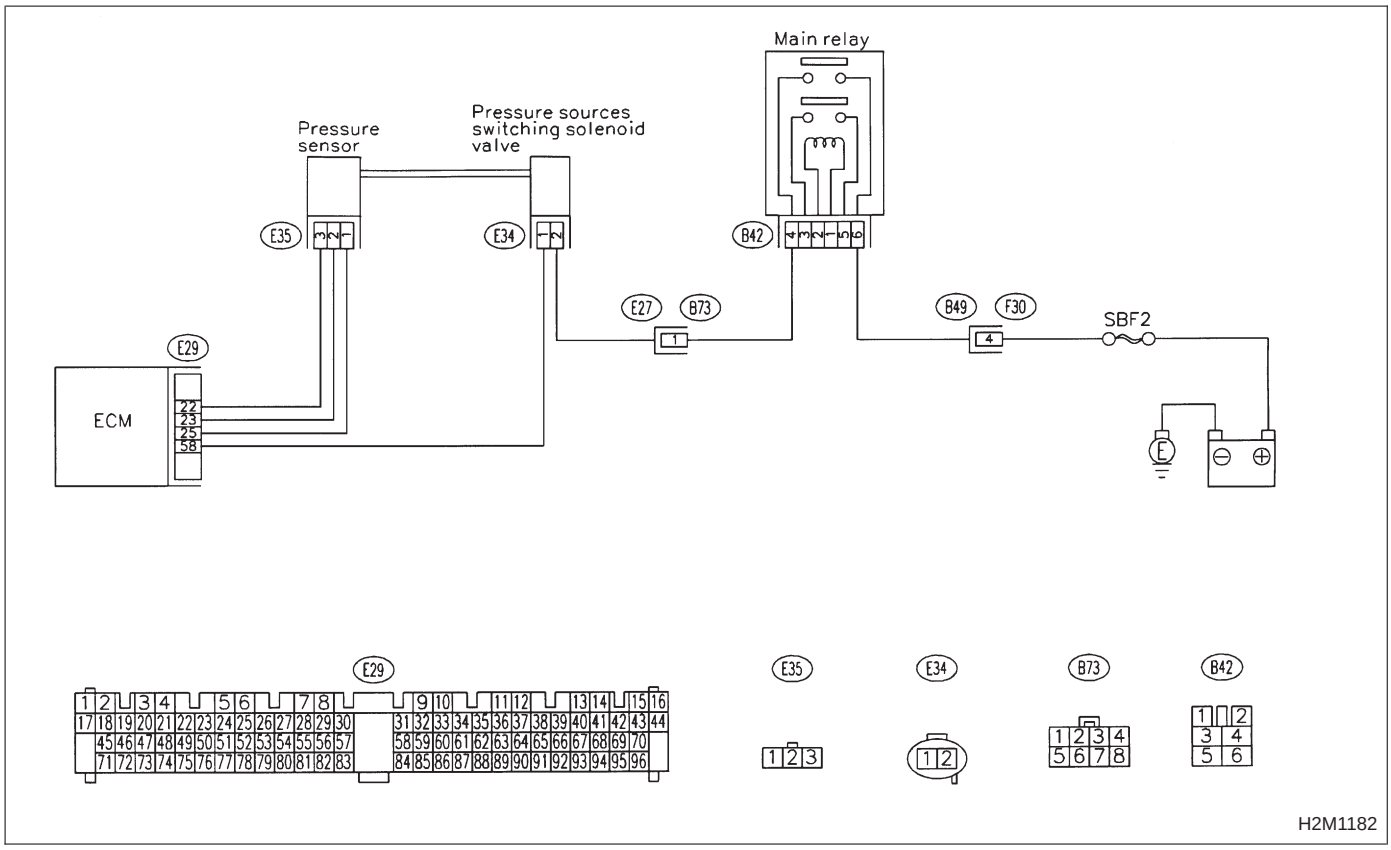
DTC DETECTING CONDITION:

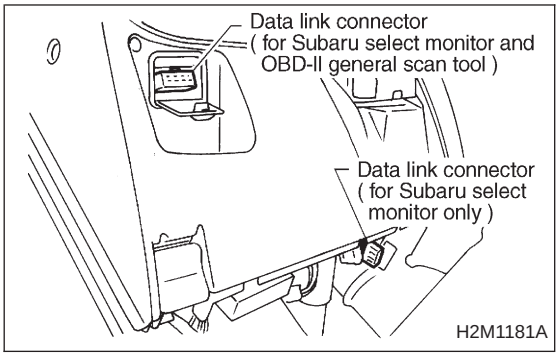
- Immediately at fault recognition

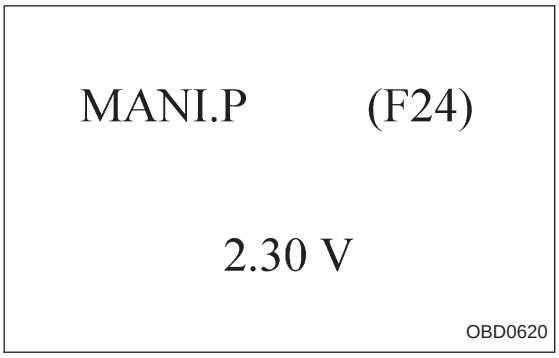
1.	**Connect Subaru Select Monitor or the OBD-II general scan tool, and read data.**
2.	**Check input signal for ECM. (Using voltage meter and Subaru Select Monitor.)**
3.	**Check harness connector between ECM and pressure sensor.**
4.	**Check harness connector between ECM and pressure sensor.**

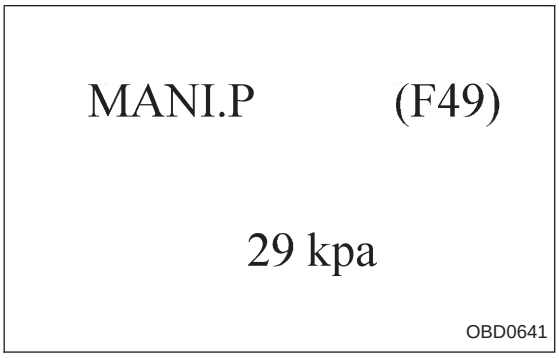
CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:









1	**CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.**

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Turn ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON.
4) Start engine.
5) Read the data on Subaru Select Monitor or the OBD-II general scan tool.

● Subaru Select Monitor

Designate mode using function key.

Function mode: F24 or F49

● F24: Display shows voltage signal value sent from pressure sensor.

● F49: Display shows pressure signal value sent from pressure sensor.

CHECK ***: Less than 0.2 V or 0 kPa***

YES : Go to step 2.

NO : Go to next CHECK .

CHECK ***: More than 4.9 V or 140 kPa***

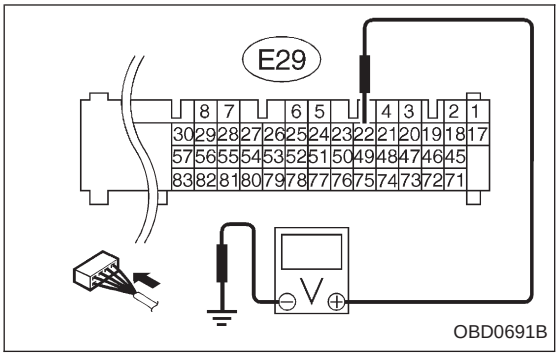
YES : Go to step 4.

NO : Repair the harness and connector between pressure sensor and ECM.

HINT: ① Open or short circuit of harness between pressure sensor and ECM.
② Poor contact of pressure sensor connector and ECM connector.

● OBD-II general scan tool

For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.



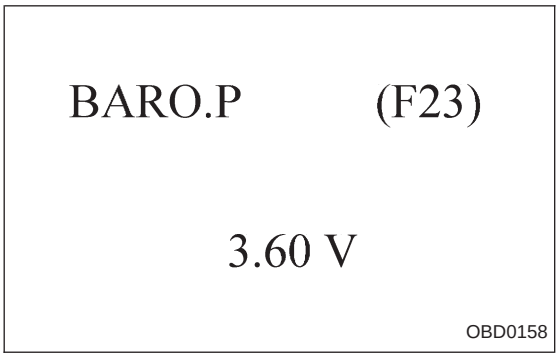
2	CHECK INPUT SIGNAL FOR ECM. (USING VOLTAGE METER AND SUBARU SELECT MONITOR.)

1) Measure voltage between ECM and body.

CHECK ***: Connector & terminal (E29) No. 22 — Body/4.5 V, or more***

YES : Go to next step.

NO : Go to next CHECK .



CHECK ***: Is the voltage more than 4.5 V while shaking harness and connector of ECM?***

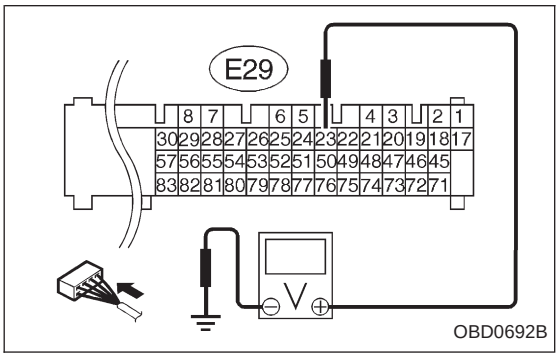
● Subaru Select Monitor
Designate mode using function key.

Function mode: F23

● F23: Display shows voltage signal value sent from pressure sensor.

YES : Repair poor contact in ECM connector.

NO : Replace ECM with a new one.

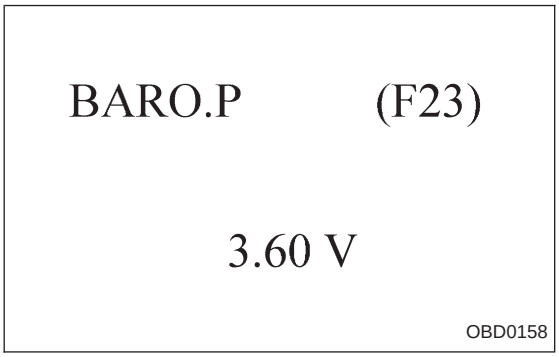


2) Measure voltage between ECM and body.

CHECK ***: Connector & terminal (E29) No. 23 — Body/0.2 V, or less***

YES : Go to step 3.

NO : Go to next CHECK .



CHECK ***: Is the voltage more than 0.2 V while shaking harness and connector of ECM and monitoring the value with Subaru select monitor?***

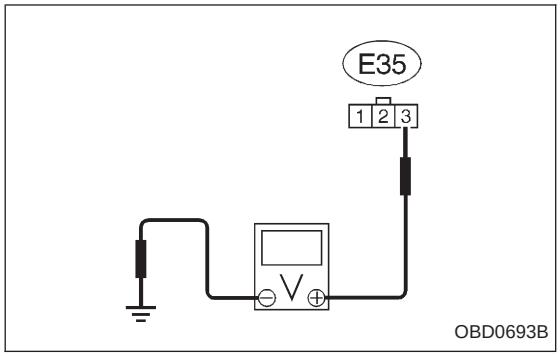
● Subaru Select Monitor
Designate mode using function key.

Function mode: F23

● F23: Display shows voltage signal value sent from pressure sensor.

YES : Repair poor contact in ECM connector.

NO : Go to step 3.



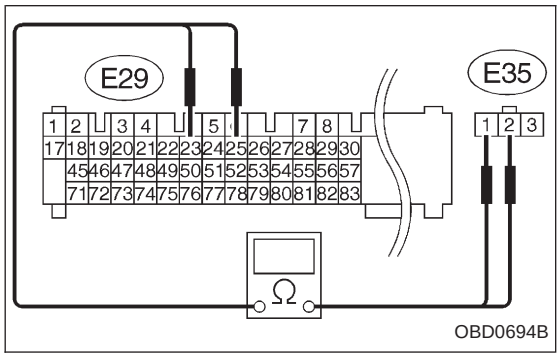
3	CHECK HARNESS CONNECTOR BETWEEN ECM AND PRESSURE SENSOR.

1) Turn ignition switch to OFF.
2) Disconnect connector pressure sensor.
3) Turn ignition switch to ON.
4) Measure voltage of harness connector between pressure sensor and body.

CHECK : ***Connector & terminal***
(E35) No. 3 — Body/4.5 V, or more

YES : Go to the next step.

NO : Repair open circuit of harness between ECM and pressure sensor.

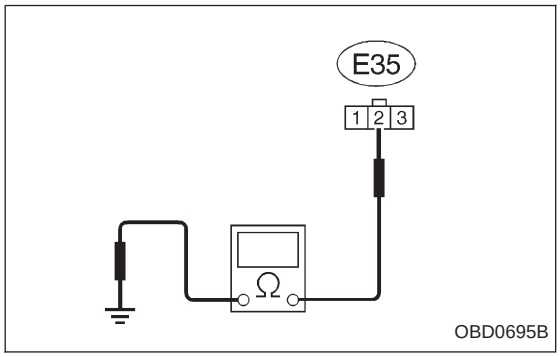


5) Turn ignition switch to OFF.
6) Disconnect connector from ECM.
7) Measure resistance of harness connector between ECM and pressure sensor.

CHECK : ***Connector & terminal***
(E29) No. 23 — (E35) No. 2/1 Ω, or less
(E29) No. 25 — (E35) No. 1/1 Ω, or less

YES : Go to the next step.

NO : Repair open circuit of harness between ECM and pressure sensor connector.



8) Measure resistance of the connector between pressure sensor and body.

CHECK : ***Connector & terminal***
(E35) No. 2 — Body/500 kΩ, or more

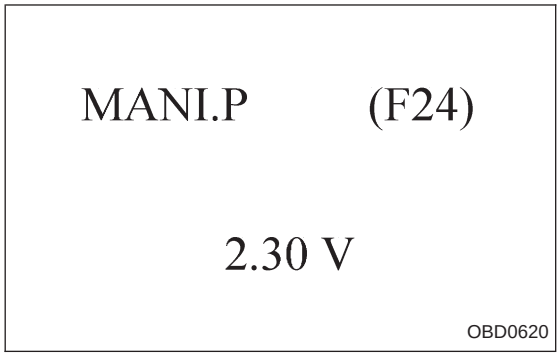
YES : Go to the next CHECK .

NO : Repair short circuit of the harness between ECM and pressure sensor connector.

CHECK : ***Is there poor contact in pressure sensor connector?***

YES : Repair poor contact in pressure sensor connector.

NO : Replace pressure sensor with a new one.



4	CHECK HARNESS CONNECTOR BETWEEN ECM AND PRESSURE SENSOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from pressure sensor.
3) Turn ignition switch to ON.
4) Read data on Subaru select monitor or the OBD-II general scan tool.

● Subaru Select Monitor

Designate mode using function key.

Function mode: F24

CHECK ***: Is the value more than 4.9 V?***

YES : Repair short circuit of harness between ECM and pressure sensor connector.

NO : Replace pressure sensor with a new one.

● OBD-II general scan tool

For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.

E: DTC P0106 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (P — R) —

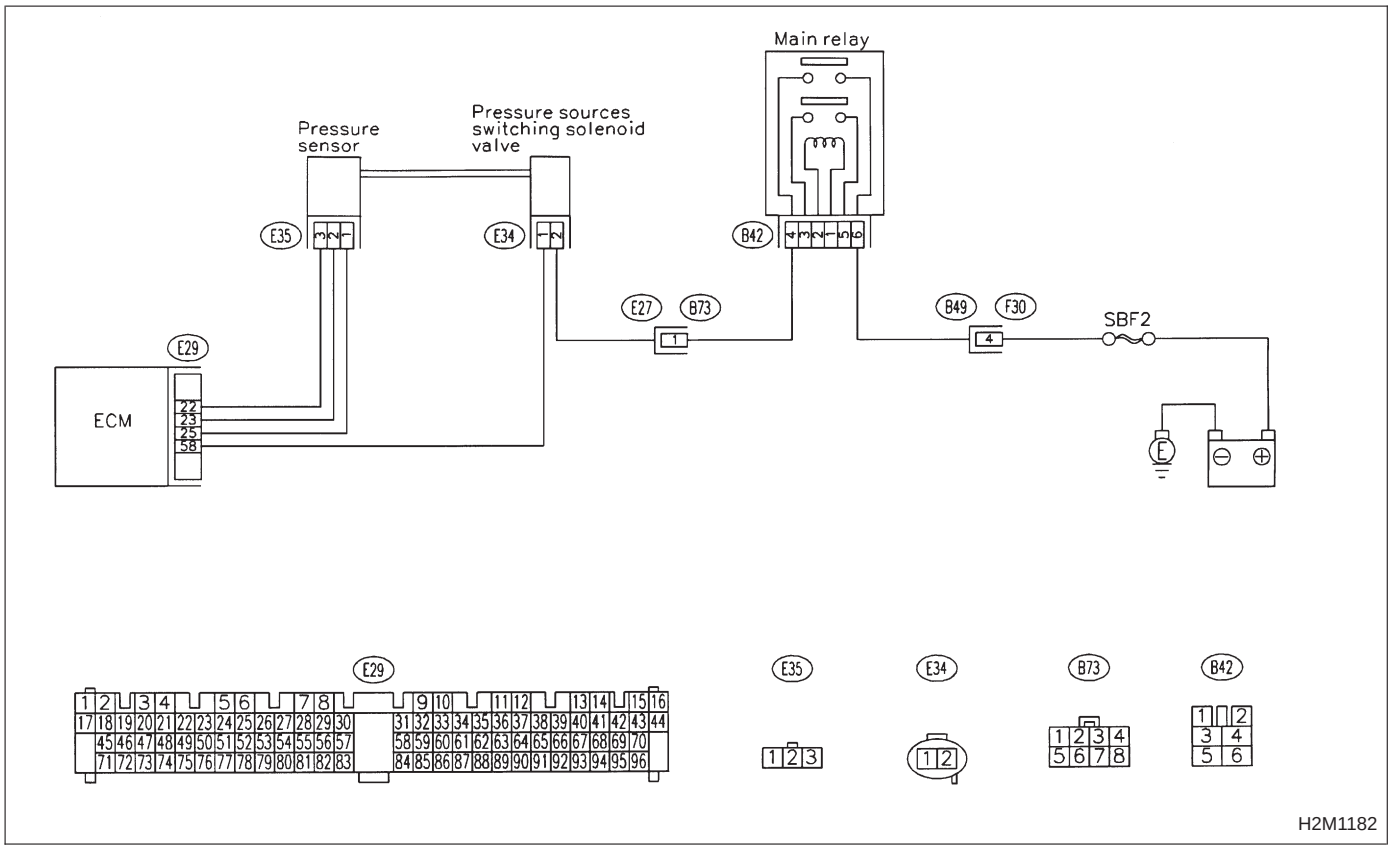
DTC DETECTING CONDITION:

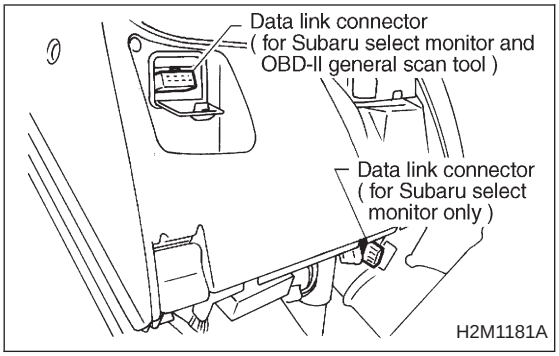
- Two consecutive trips with fault

1.	Check DTC P0105 or P1102 on display.	Yes	● Inspect DTC P0105 or P1102 using “10. Diagnostics Chart with Trouble Code, 2-7b [T1000]”. ● In this case, it is unnecessary to inspect DTC P0106.
		No	
2.	**Check data for control.**		
3.	**Check vacuum hose.**		
4.	**Check pressure sources of switching solenoid valve.**		

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

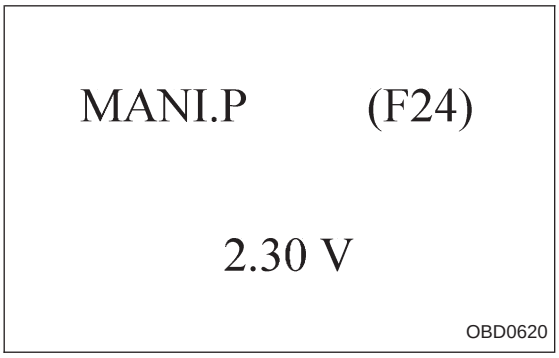
WIRING DIAGRAM:





2	CHECK DATA FOR CONTROL.

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Turn ignition switch ON and Subaru Select Monitor or the OBD-II general scan tool switch ON.
4) Start engine.



5) Read data on Subaru Select Monitor or the OBD-II general scan tool.

- Subaru Select Monitor

Designate mode using function key.

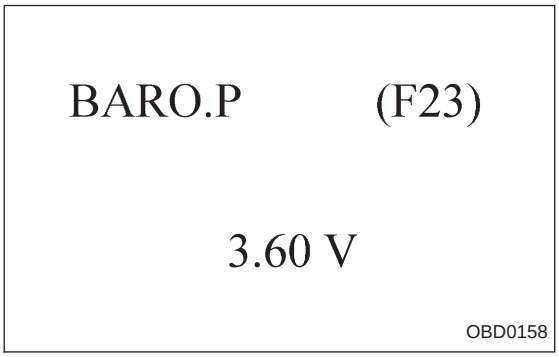
Function mode: F24 and F23

- F24: Display shows a voltage signal value sent from the pressure sensor.
- F23: Display shows a voltage signal value sent from the pressure sensor.

CHECK ***: Is the voltage more than 3.24 V with function mode F24?***

YES : Go to step 3.

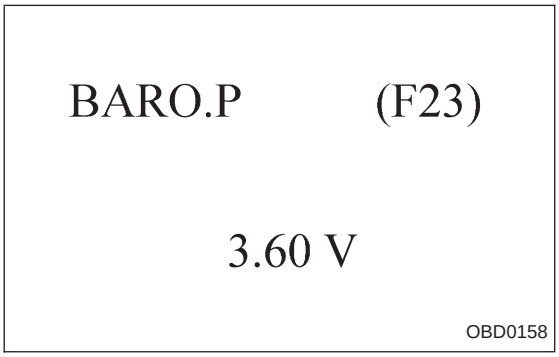
NO : Go to next CHECK .



CHECK ***: Is the voltage less than 1.6 V with function mode F23?***

YES : Go to step 4.

NO : Go to next CHECK .



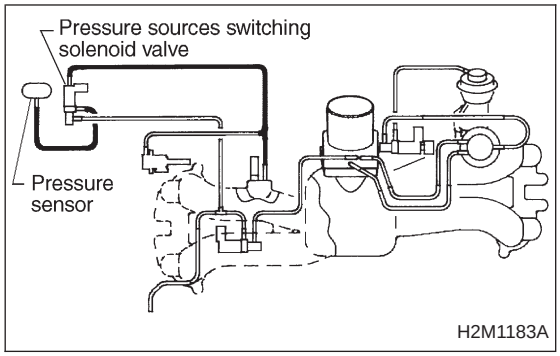
CHECK ***: Is the voltage more than 4.7 V with function mode F23?***

YES : Replace pressure sensor.

NO : Repair poor contact in pressure sensor connector, pressure sources switching solenoid valve connector, and ECM connector.

- OBD-II general scan tool

For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.

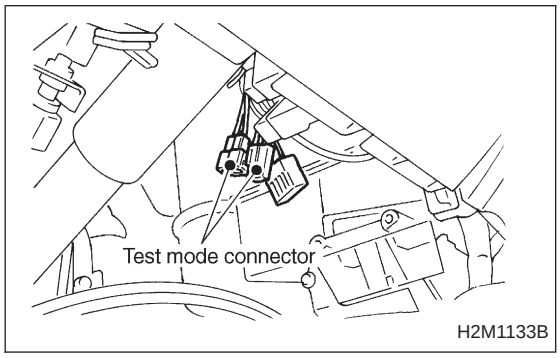


3	CHECK VACUUM HOSE.

CHECK : ***Check for disconnection, holes, or clogging of the vacuum hoses.***

NOTE:
Check the hoses;
- From pressure sources switching solenoid valve to intake manifold.
- From pressure sensor to pressure sources switching solenoid valve.

YES : Repair hoses.
NO : Go to step 4.



4	CHECK PRESSURE SOURCES OF SWITCHING SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Connect test mode connector.
3) Turn ignition switch to ON.

CHECK : ***Is operation sound of the pressure sources solenoid valve heard? (ON ↔ OFF each 1.5 sec.)***

YES : Replace pressure sensor.
NO : Replace pressure sources switching solenoid valve.

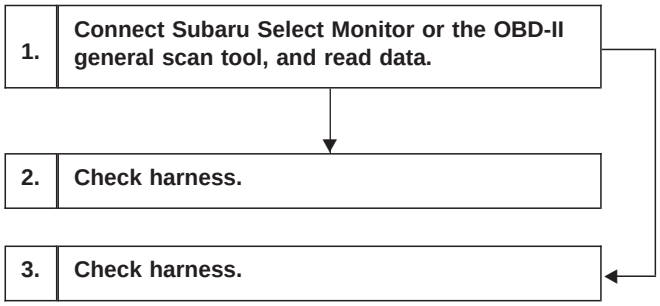
F: DTC P0115 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT MALFUNCTION (TW) —

DTC DETECTING CONDITION:

- Immediately at fault recognition

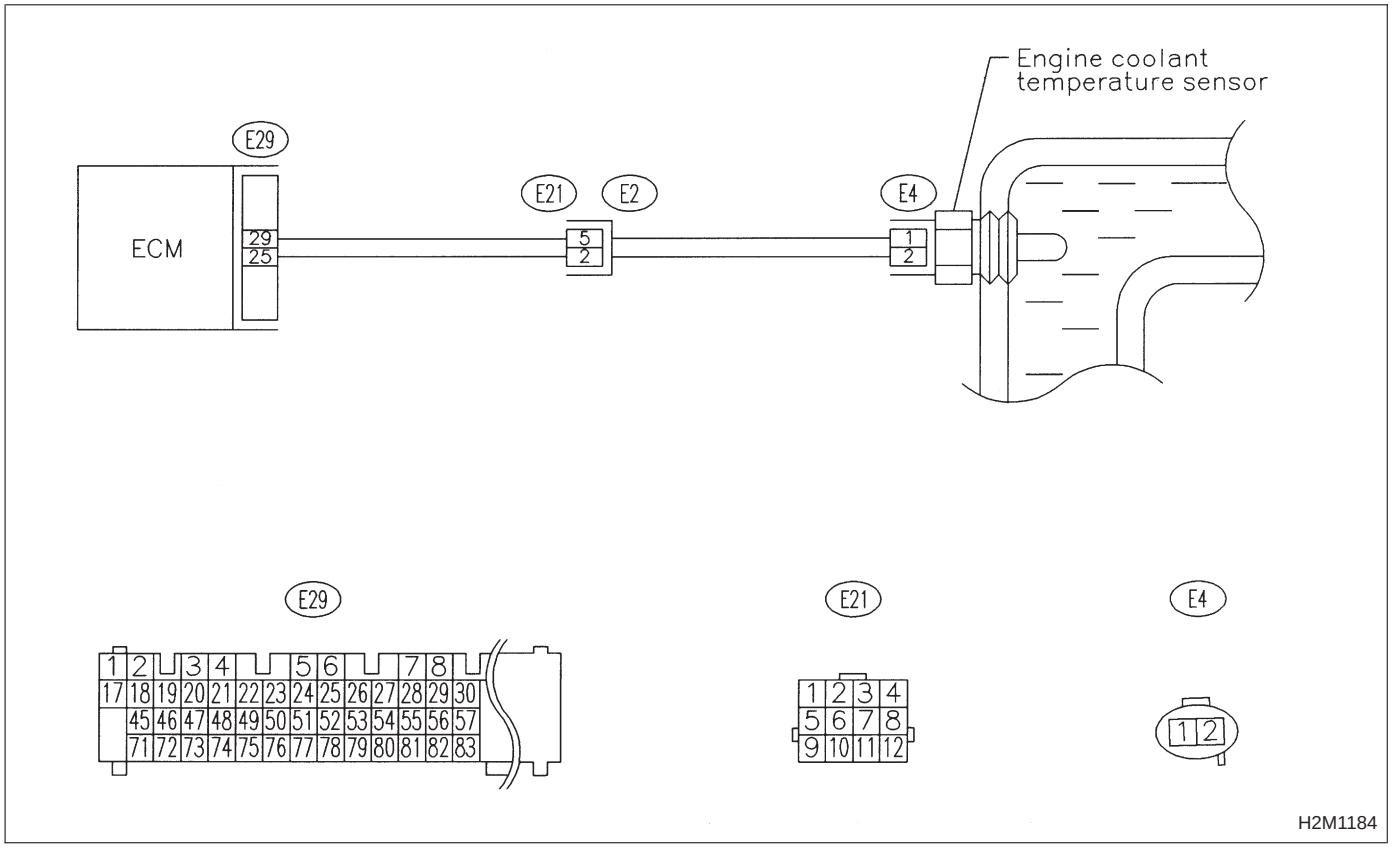
TROUBLE SYMPTOM:

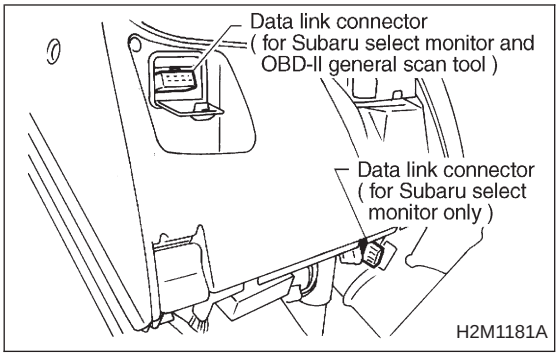
- Hard to start
- Erroneous idling
- Poor driving performance

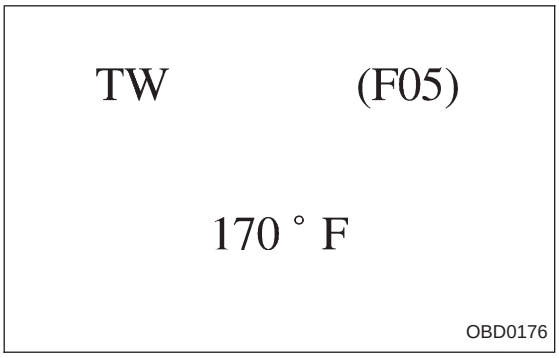


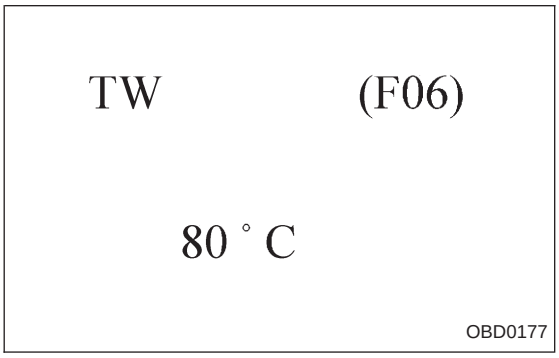
CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:









1	**CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.**

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Turn ignition switch to ON and Subaru Select Monitor or OBD-II general scan tool switch to ON.
4) Start engine.

5) Read data on Subaru Select Monitor or OBD-II general scan tool.

● Subaru Select Monitor
Designate mode using function key.

Function mode: F05 or F06

● F05: Water temperature is indicated in "°F".
● F06: Water temperature is indicated in "°C".

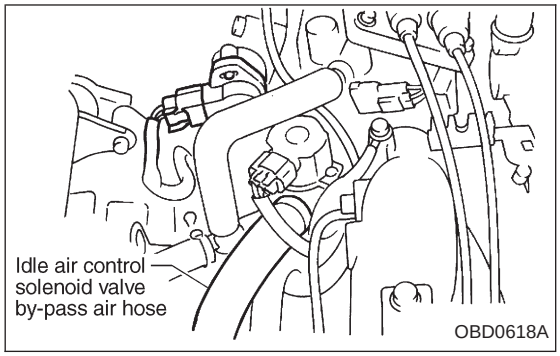
CHECK ***: ● Is the value greater than 300°F with function mode F05?***
● Is the value greater than 150°C with function mode F06?

YES : Go to step 2.
NO : Go to next CHECK .

CHECK ***: ● Is the value less than −40°F with function mode F05?***
● Is the value less than −40°C with function mode F06?

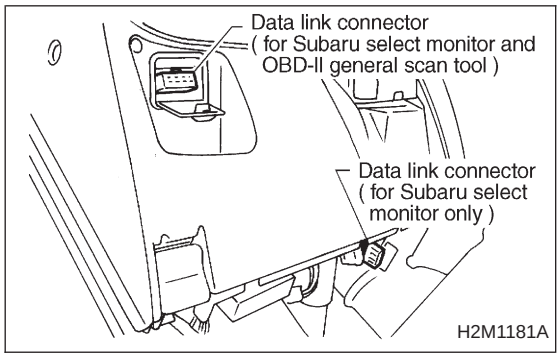
YES : Go to step 3.
NO : Repair poor contact in connectors or harness.
- Engine coolant temperature sensor connector
- ECM connector
- Coupling connector (B21)

● OBD-II general scan tool
For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.

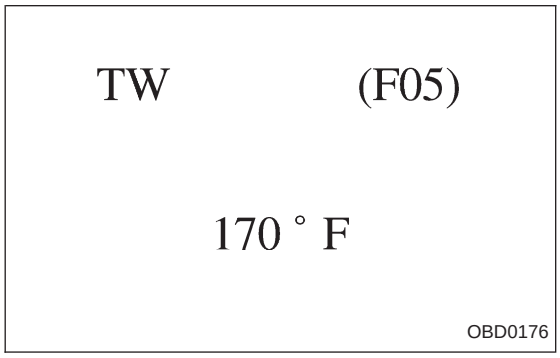


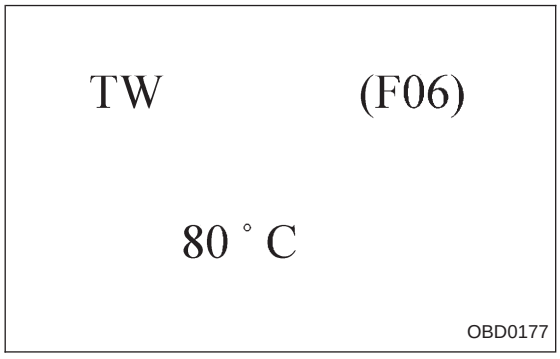
2	CHECK HARNESS.

1) Turn ignition switch to OFF.
2) Remove idle air control solenoid valve by-pass air hose.
3) Disconnect connector from engine coolant temperature sensor.



4) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.





5) Turn ignition switch and Subaru Select Monitor or OBD-II general scan tool switch to ON.
6) Read data on Subaru Select Monitor or the OBD-II general scan tool.

- Subaru Select Monitor

Designate mode using function key.

Function mode: F05 or F06

- F05: Water temperature is indicated in "°F".
- F06: Water temperature is indicated in "°C".

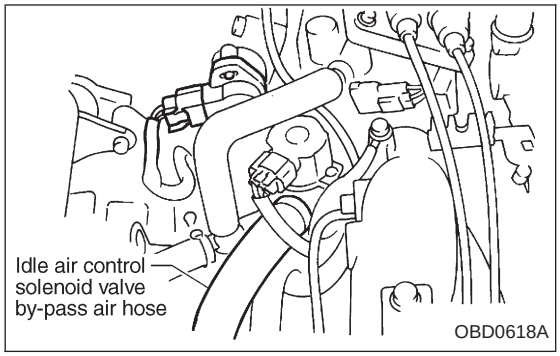
CHECK ***: ● Is the value less than −40°F with function mode F05?***
● Is the value less than −40°C with function mode F06?

YES : Replace engine coolant temperature sensor.

NO : Repair short circuit of harness between engine coolant temperature sensor connector and ECM connector.

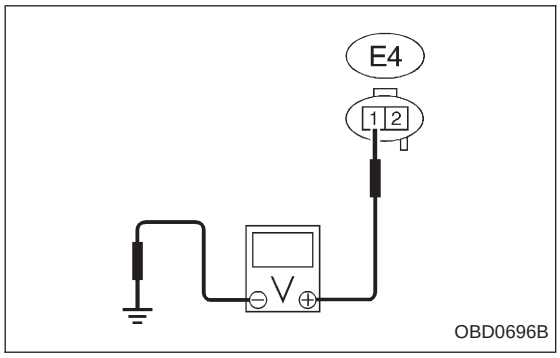
- OBD-II general scan tool

For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.



3	CHECK HARNESS.

1) Turn ignition switch to OFF.
2) Remove idle air control solenoid valve by-pass air hose.
3) Disconnect connector from engine coolant temperature sensor.
4) Turn ignition switch to ON.



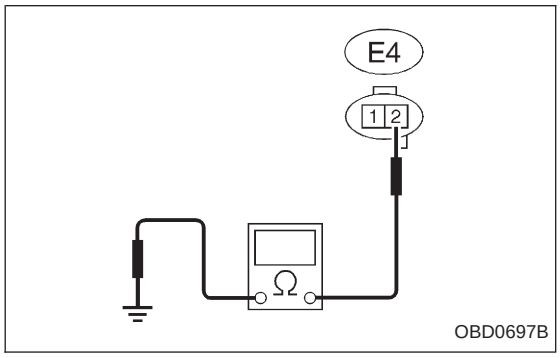
5) Measure voltage between engine coolant temperature sensor and body.

CHECK ***: Connector & terminal (E4) No. 1 — Body/4 V, or more***

YES : Go to the next step.

NO : Repair open circuit of harness or poor contact in ECM and engine coolant temperature sensor connector.

6) Turn ignition switch to OFF.



7) Measure resistance of harness between engine coolant temperature sensor connector and body.

CHECK ***: Connector & terminal (E4) No. 2 — Body/5 Ω, or less***

YES : Replace engine coolant temperature sensor.

NO : Repair open circuit of harness or poor contact in ECM and engine coolant temperature sensor connector.

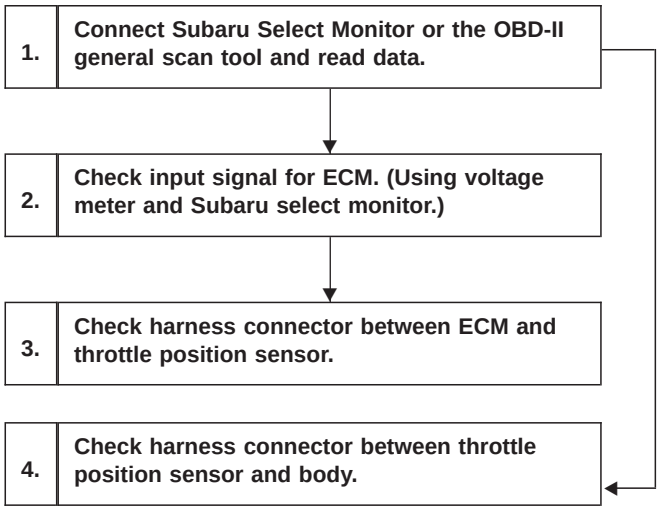
G: DTC P0120 — THROTTLE POSITION SENSOR CIRCUIT MALFUNCTION (THV) —

DTC DETECTING CONDITION:

- Immediately at fault recognition

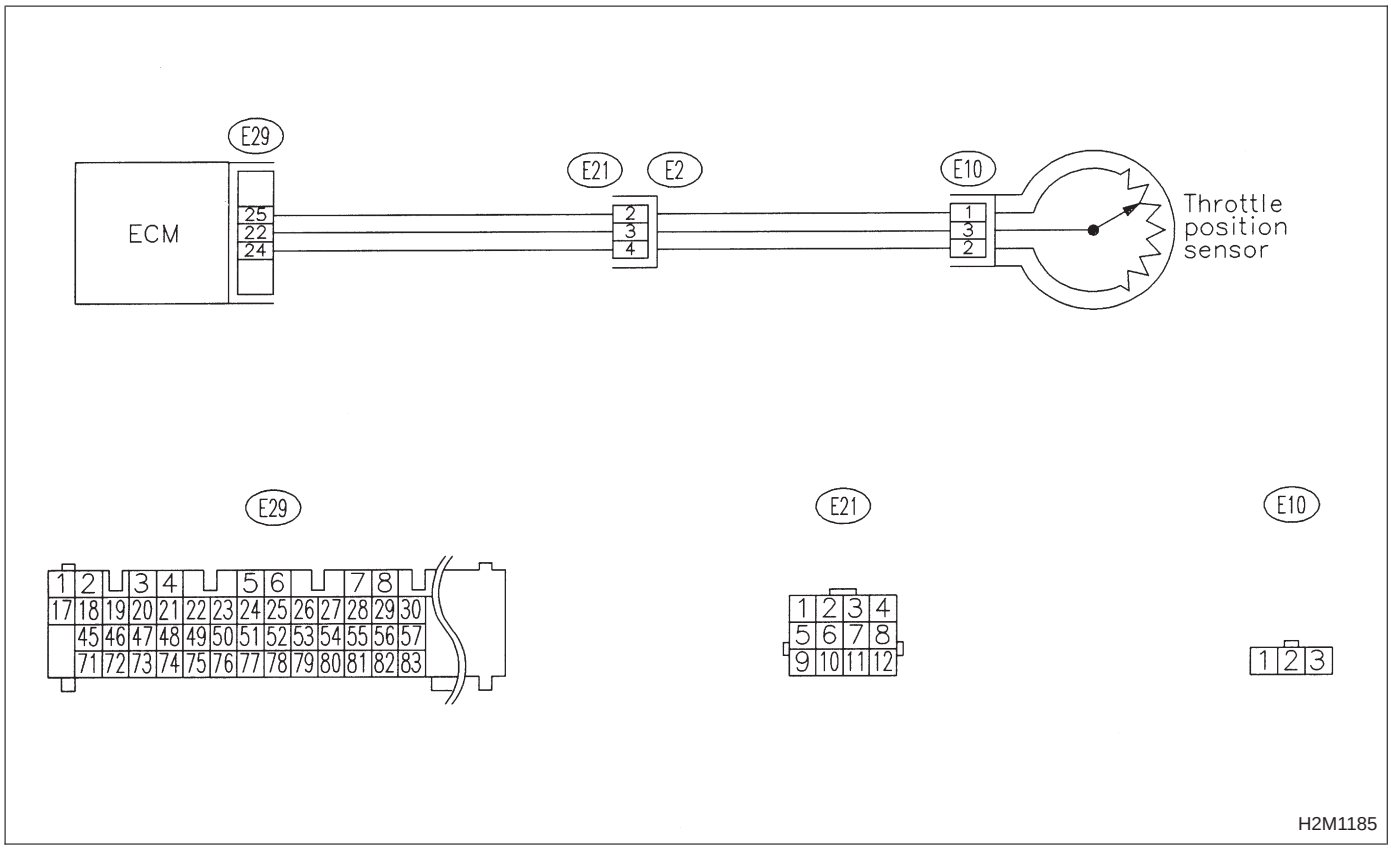
TROUBLE SYMPTOM:

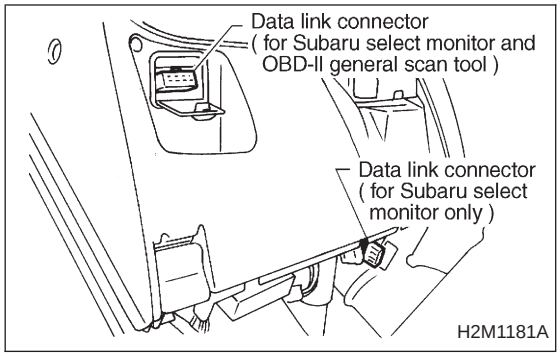
- Erroneous idling
- Engine stalls.
- Poor driving performance

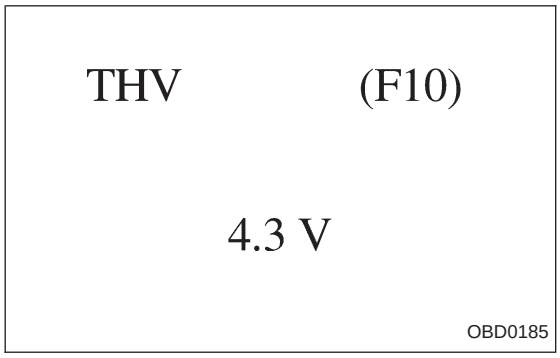


CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:







1	**CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.**

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Turn ignition switch to ON and Subaru Select Monitor or OBD-II general scan tool switch to ON.
4) Start engine.

5) Read data on Subaru Select Monitor or OBD-II general scan tool.
- Subaru Select Monitor

Designate mode using function key.

Function mode: F10

- F10: Throttle position sensor output signal is indicated.

CHECK ***: Is the voltage less than 0.1 V?***

YES : Go to step 2.

NO : Go to next CHECK .

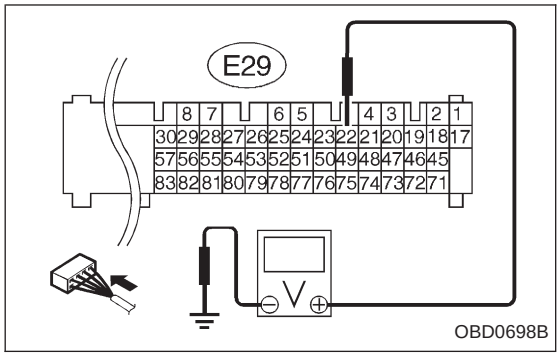
CHECK ***: Is the voltage more than 4.9 V?***

YES : Go to step 4.

NO : 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. Check and repair the following connectors.
- Throttle position sensor connector.
- ECM connector
- Coupling connector (E21)

- OBD-II general scan tool

For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.



2	CHECK INPUT SIGNAL FOR ECM. (USING VOLTAGE METER AND SUBARU SELECT MONITOR.)

1) Measure voltage between ECM and body while throttle valve is fully closed.

CHECK ***: Connector & terminal (E29) No. 22 — Body/4.5 V, or more***

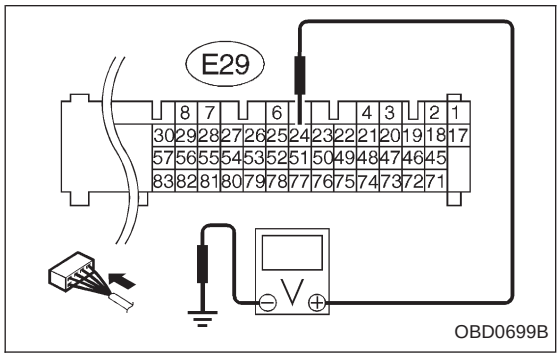
YES : Go to next step.

NO : Go to next CHECK .

CHECK ***: Is the voltage more than 4.5 V while shaking harness and connector of ECM?***

YES : Repair poor contact in ECM connector.

NO : Replace ECM.



2) Measure signal voltage between ECM and body.

CHECK ***: Connector & terminal (E29) No. 24 — Body/0.1 V, or less***

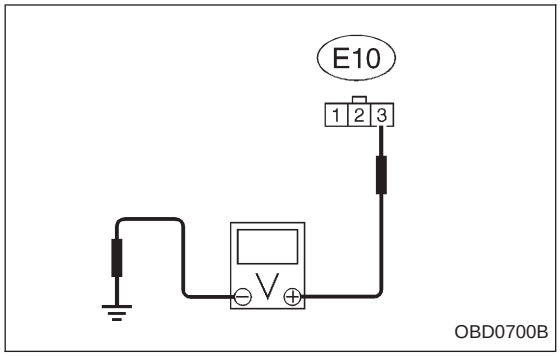
YES : Go to step 3.

NO : Go to next CHECK .

CHECK ***: Is the voltage more than 0.1 V while shaking harness and connector of ECM and monitoring the value with Subaru select monitor?***

YES : Repair poor contact in ECM connector.

NO : Go to step 3.



3	CHECK HARNESS CONNECTOR BETWEEN ECM AND THROTTLE POSITION SENSOR.

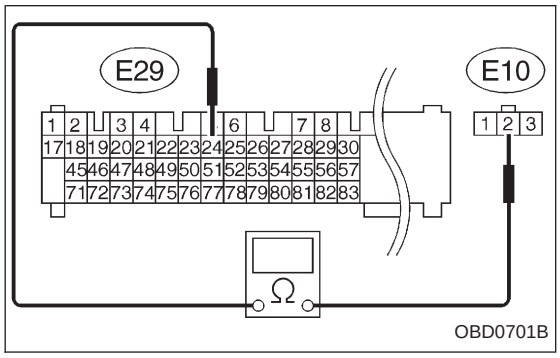
1) Turn ignition switch to OFF.
2) Disconnect connectors from throttle position sensor.
3) Turn ignition switch to ON.
4) Measure voltage between throttle position sensor connector and body.

CHECK ***: Connector & terminal***
(E10) No. 3 — Body/4.5 V, or more

YES : Go to the next step.

NO : Repair harness and connector.

NOTE:
In this case, the possible causes are:
① Open circuit of the harness between connector (E10) terminal No. 3 and connector (E29) terminal No. 22, or the following:
② Poor contact in throttle position sensor connector
③ Poor contact in ECM connector
④ Poor contact in coupling connector (E21)



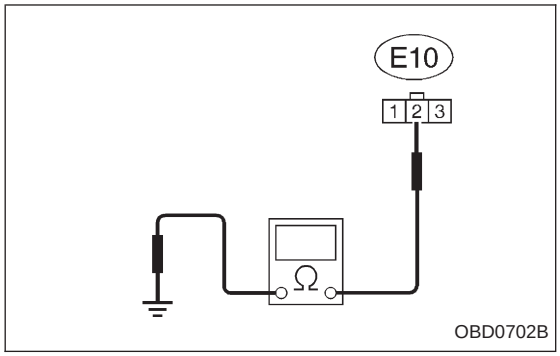
5) Turn ignition switch to OFF.
6) Measure resistance of harness between ECM connector and throttle position sensor connector.

CHECK ***: Connector & terminal***
(E29) No. 24 — (E10) No. 2/1 Ω, or less

YES : Go to next step.

NO : Repair harness and connector.

NOTE:
In this case, the following are the possible causes.
① Open circuit between connector (E29) terminal No. 24 and connector (E10) terminal No. 2.
② Poor contact in ECM connector.
③ Poor contact in throttle position sensor connector
④ Poor contact in coupling connector (E21)



7) Measure resistance of harness between throttle position sensor connector and body.

CHECK ***: Connector & terminal (E10) No. 2 — Body/10 Ω, or less***

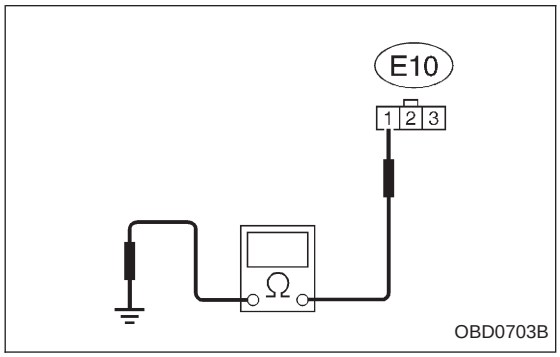
YES : Repair short circuit of harness between throttle position sensor and ECM connector.

NO : Go to next CHECK .

CHECK ***: Is there poor contact in throttle position sensor connector?***

YES : Repair poor contact in throttle position sensor connector.

NO : Replace throttle position sensor.



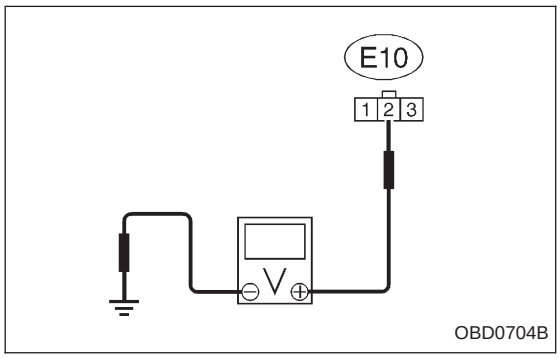
4	CHECK HARNESS CONNECTOR BETWEEN THROTTLE POSITION SENSOR AND BODY.

1) Turn ignition switch to OFF.
2) Disconnect connector from throttle position sensor.
3) Measure resistance of harness between throttle position sensor connector and body.

CHECK ***: Connector & terminal (E10) No. 1 — Body/5 Ω, or less***

YES : Go to the next step.

NO : Repair open circuit of harness between throttle position sensor and ECM connector.



4) Turn ignition switch to ON.
5) Measure voltage between throttle position sensor connector and body.

CHECK ***: Connector & terminal (E10) No. 2 — Body/4.9 V, or more***

YES : Repair short circuit of harness between throttle position sensor and ECM connector.

NO : Replace throttle position sensor.

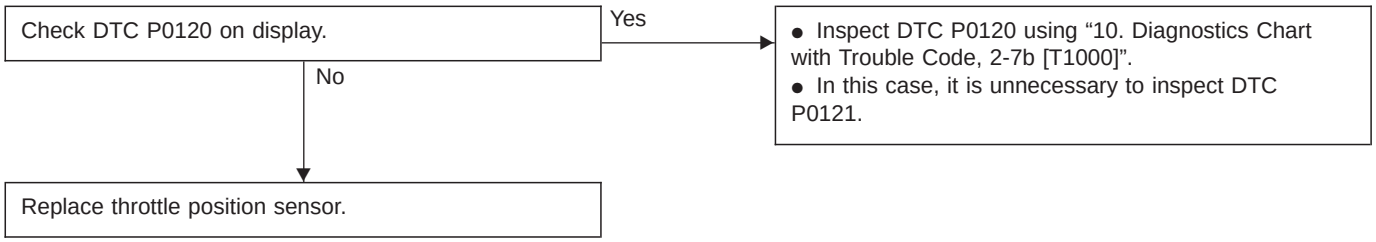
H: DTC P0121 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (TH – R) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

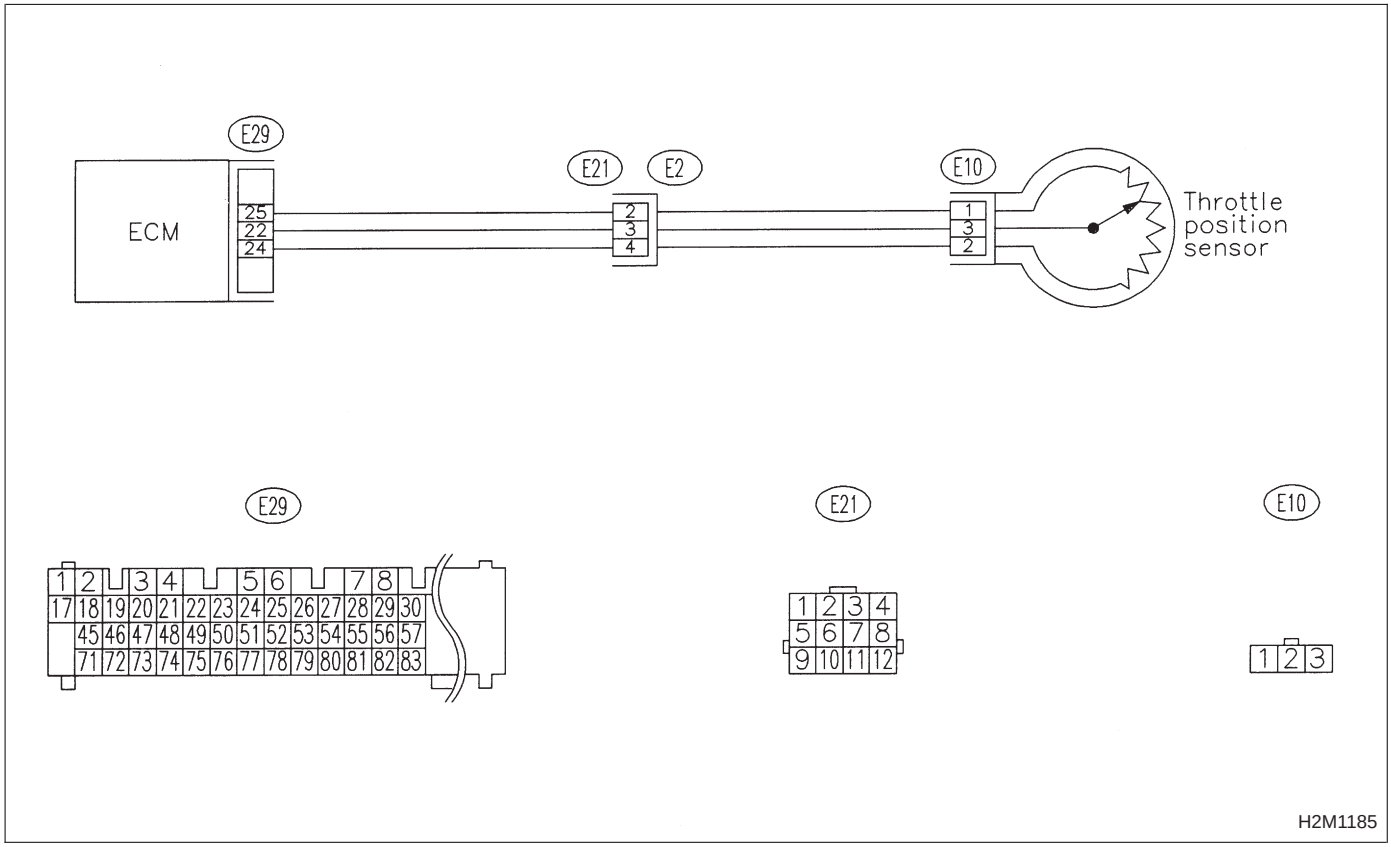
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



OBD (FB1)

P0125 <TW_CL>

OBD0191

I: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL (TW – CL) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

TROUBLE SYMPTOM:

- Engine would not return to idling.

Check DTC P0115 on display.

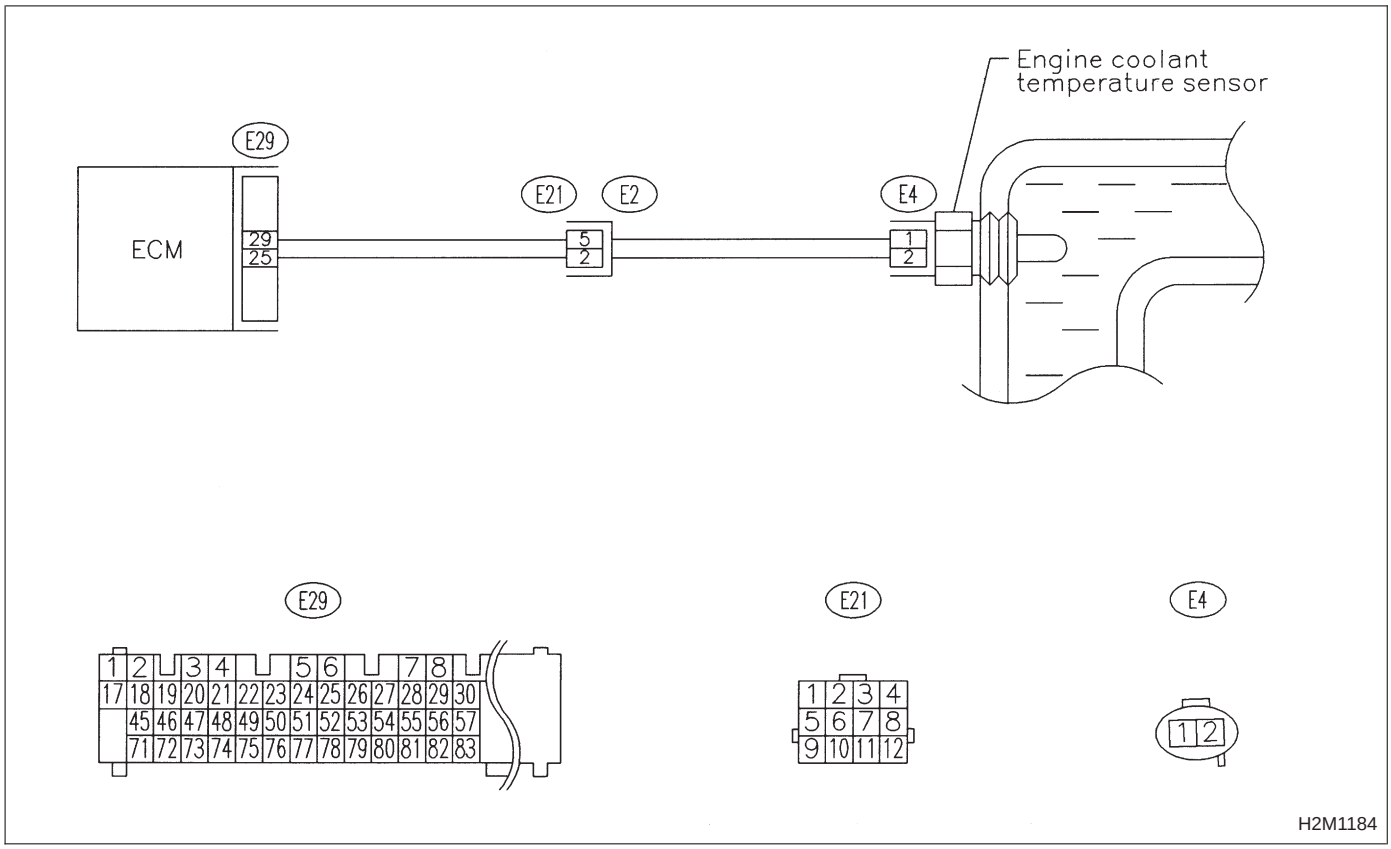
Yes → • Inspect DTC P0115 using "10. Diagnostics Chart with Trouble Code, 2-7b [T1000]".
• In this case, it is unnecessary to inspect DTC P0125.

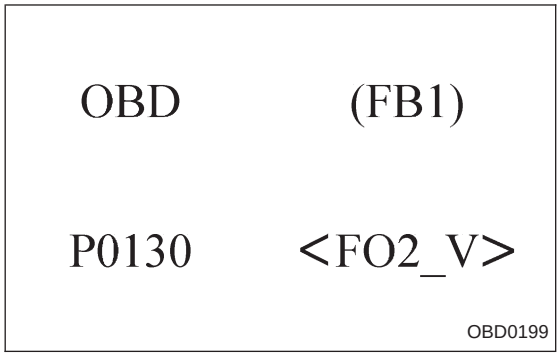
No ↓

Replace engine coolant temperature sensor.

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:

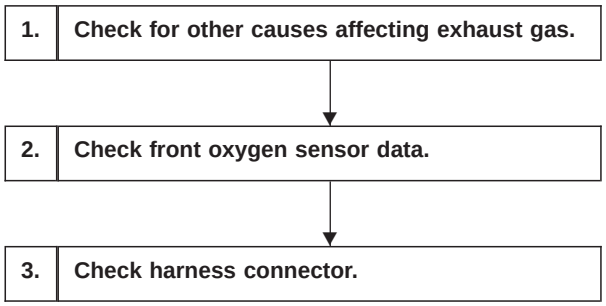




J: DTC P0130 — FRONT OXYGEN SENSOR CIRCUIT MALFUNCTION (FO2 — V) —

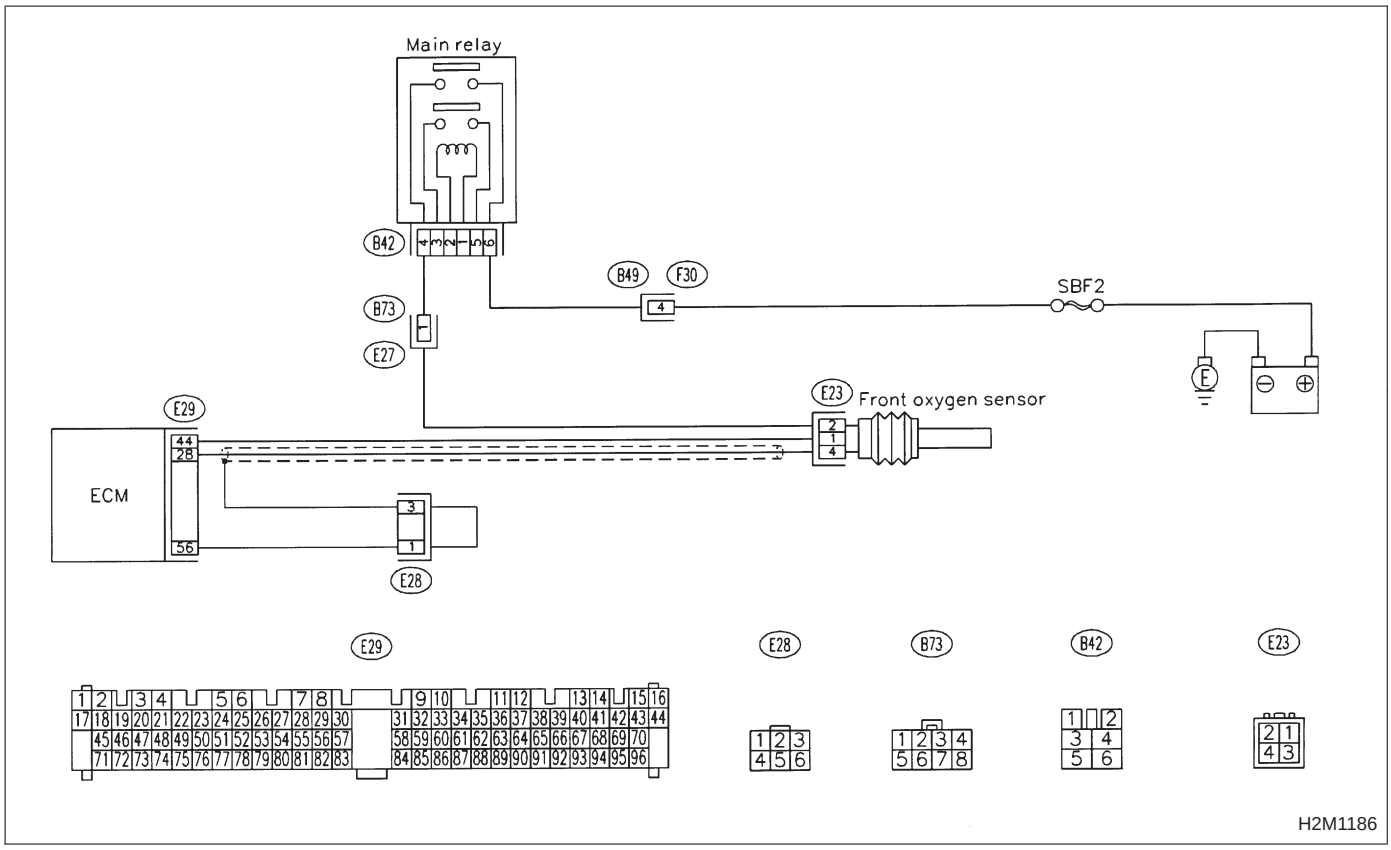
DTC DETECTING CONDITION:

- Two consecutive trips with fault



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



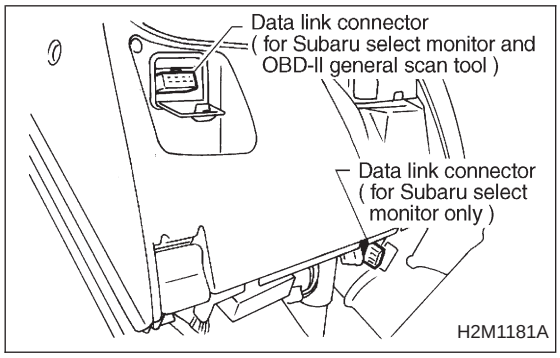
1	CHECK FOR OTHER CAUSES AFFECTING EXHAUST GAS.

CHECK ***: Is CO % more than 2 % after engine warm-up?***

YES : Check fuel system.

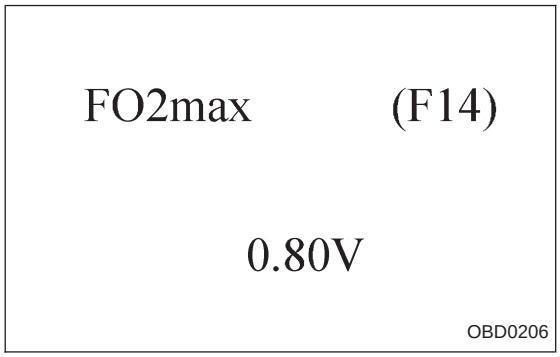
NOTE:
Check for use of improper fuel.
Check if engine oil or coolant level is extremely low.

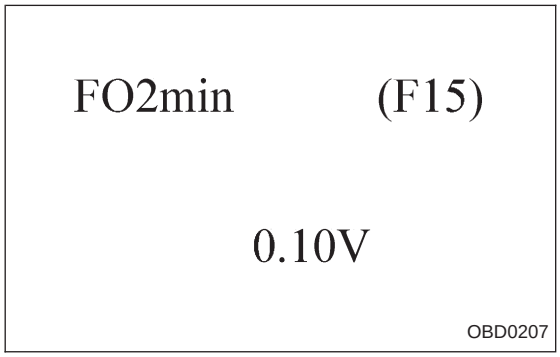
NO : Go to step 2.



2	CHECK FRONT OXYGEN SENSOR DATA.

1) Turn ignition switch to OFF.
2) Connect the Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Start engine and Turn the Subaru Select Monitor and the OBD-II general scan tool switch to ON.
4) Warm-up the engine until coolant temperature is above 70°C (160°F) and keep the engine speed at 2,000 rpm to 3,000 rpm for one minute.
5) Read data on Subaru Select Monitor or the OBD-II general scan tool.





- Subaru Select Monitor

Designate mode using function key.

Function mode: F14 or F15

- F14: Front oxygen sensor max. output signal is indicated.
- F15: Front oxygen sensor min. output signal is indicated.

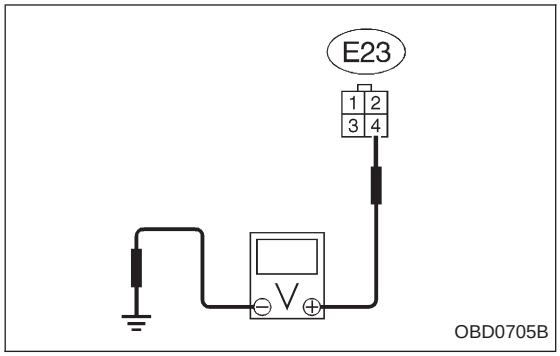
CHECK ***: Is the difference of voltage between F14 and F15 0.1 V, or less?***

YES : Go to step 3.

NO : Replace front oxygen sensor.

- OBD-II general scan tool

For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.



3	CHECK HARNESS CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from front oxygen sensor.
3) Turn ignition switch to ON.
4) Measure voltage between front oxygen sensor harness connector and body.

CHECK ***: Connector & terminal (E23) No. 4 — Body/0.2 V, or more***

YES : Go to next CHECK .

NO : Repair harness and connector.

NOTE:
In this case, the following are the possible causes.
① Open circuit of harness between ECM and front oxygen sensor.
② Poor contact in the ECM connector.

CHECK ***: Is there poor contact in front oxygen sensor connector?***

YES : Repair poor contact in front oxygen sensor connector.

NO : Replace front oxygen sensor.

K: DTC P0133 — FRONT OXYGEN SENSOR CIRCUIT SLOW RESPONSE (FO2 — R) —

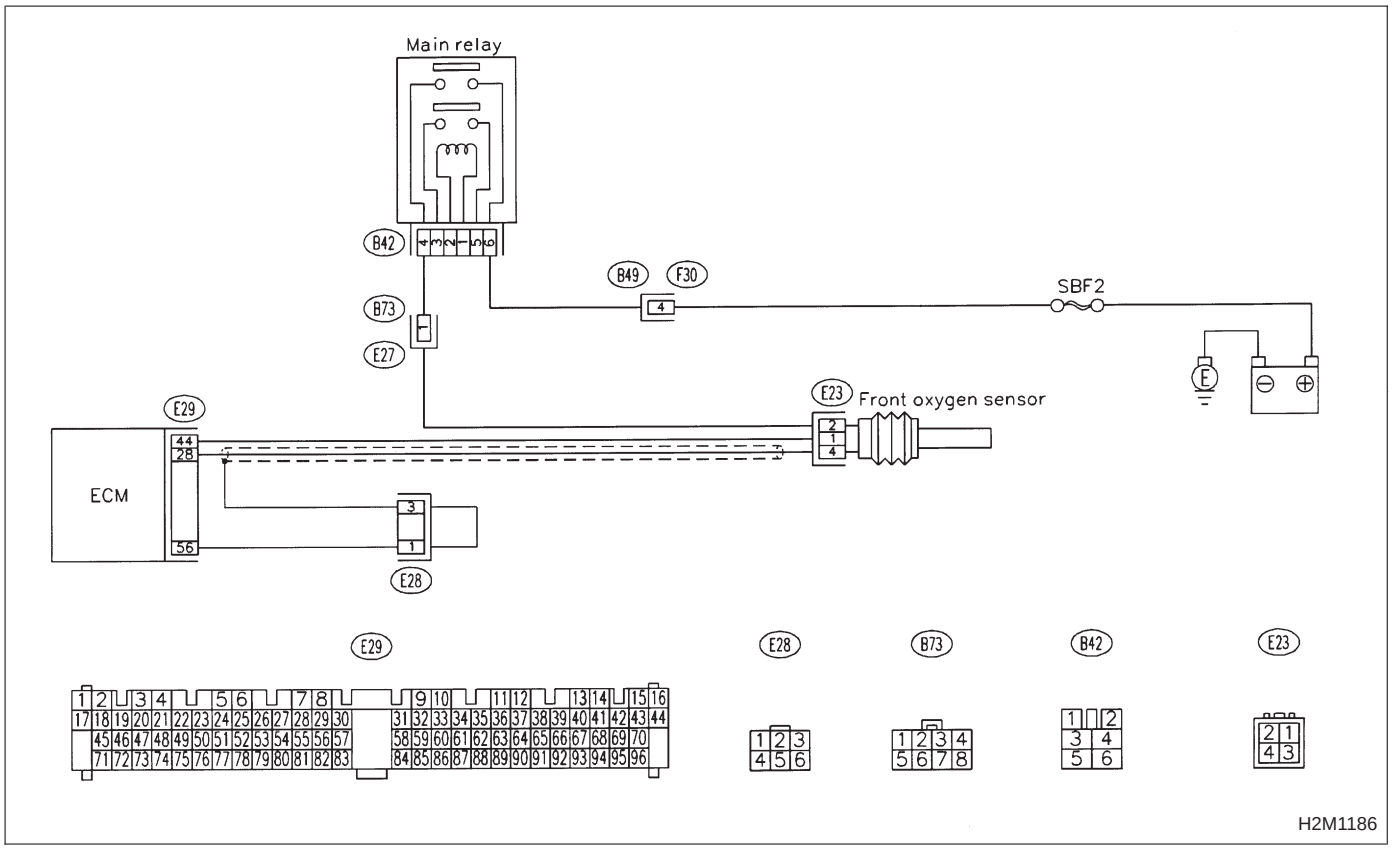
DTC DETECTING CONDITION:

- Two consecutive trips with fault

1.	Check DTC P0130 on display.	Yes →	● Inspect DTC P0130 using “10. Diagnostics Chart with Trouble Code, 2-7b [T1000]”. ● In this case, it is unnecessary to inspect DTC P0133.
	No ↓		
2.	**Check exhaust system.**		

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



2	CHECK EXHAUST SYSTEM.

CHECK : ***Check the following.***
- ***Looseness of installation portion of front exhaust pipe onto cylinder heads***
- ***Loosened connection of front exhaust pipe and front catalytic converter***
- ***Damage of exhaust pipe which make a hole***

YES : Repair exhaust system.

NO : Replace front oxygen sensor.

L: DTC P0135 — FRONT OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION (FO2H) —

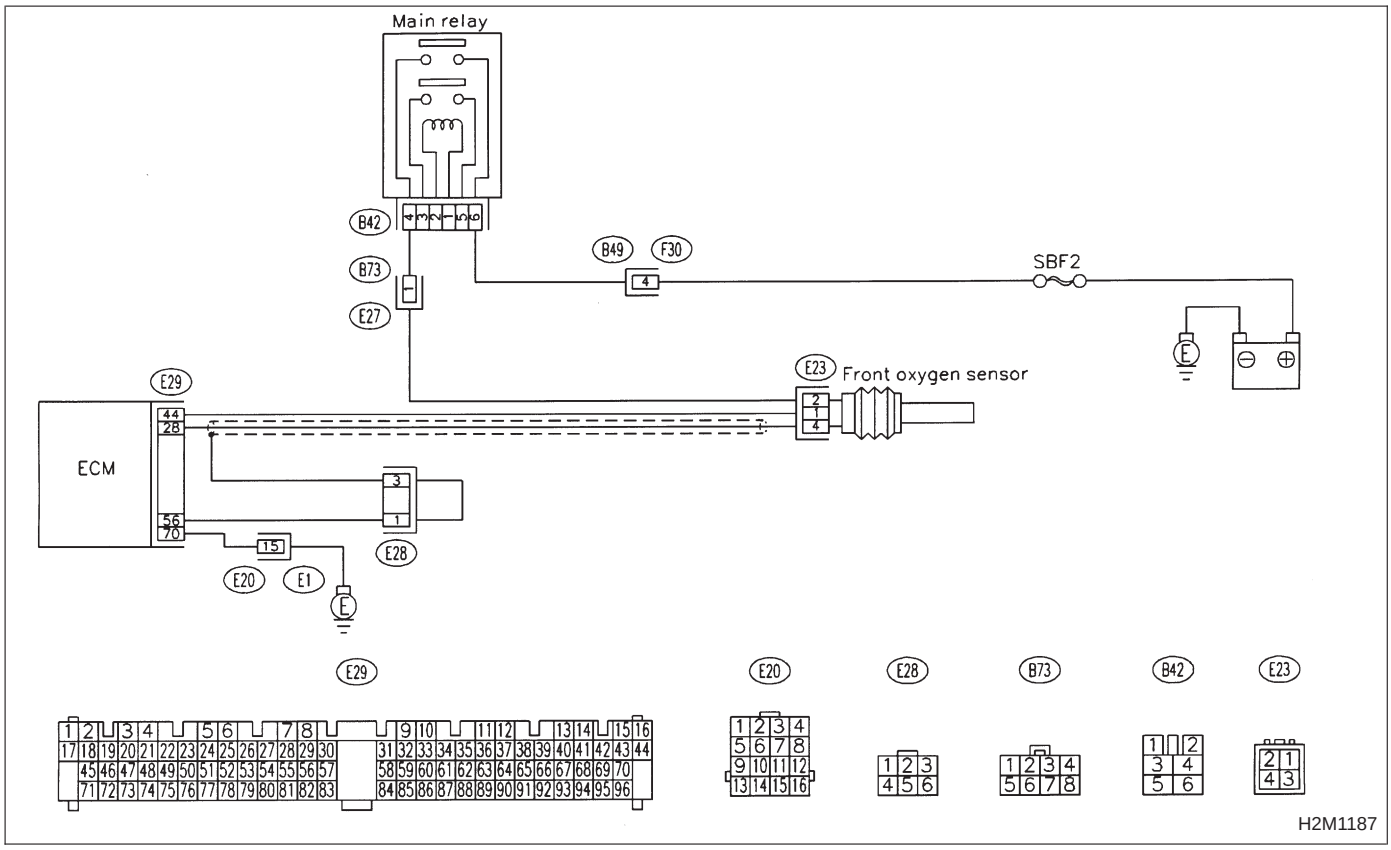
DTC DETECTING CONDITION:

- Two consecutive trips with fault

1.	**Check DTC P0141 on display.**
2.	**Connect Subaru Select Monitor or the OBD-II general scan tool, and read data.**
3.	**Check output signal from ECM. (Using voltage meter.)**
4.	**Check power supply to front oxygen sensor.**
5.	**Check front oxygen sensor.**

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:

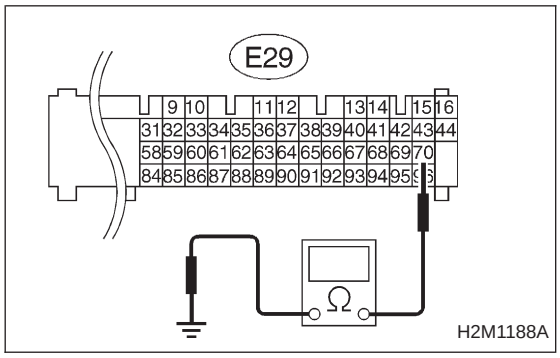


1	CHECK DTC P0141 ON DISPLAY.

CHECK : ***Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0135 and P0141 at the same time?***

YES : Go to next step.

NO : Go to step 2.



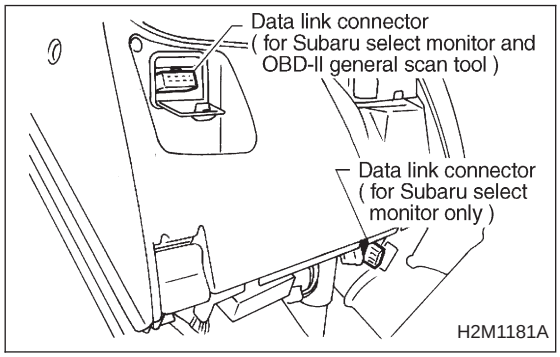
1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Measure resistance of harness between ECM connector and body.

CHECK : ***Connector & terminal (E29) No. 70 — Body/5 Ω, or less***

YES : Repair poor contact in ECM connector.

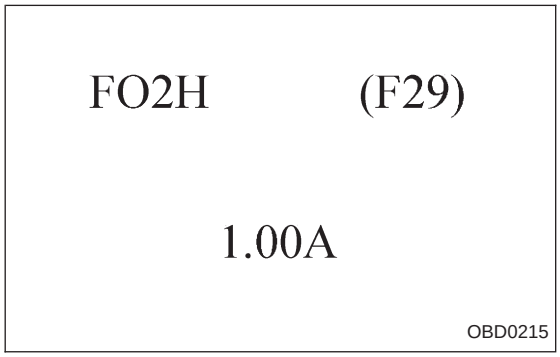
NO : Repair harness and connector.

NOTE:
In this case, repair the following items.
- Open circuit of harness between ECM and coupling connector (E20).
- Open circuit of harness between coupling connector (E20) and engine grounding terminal.
- Poor contact in front oxygen sensor connector.
- Poor contact in coupling connector (E20).



2	CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Turn ignition switch to ON and Subaru Select Monitor or OBD-II general scan tool switch to ON.
4) Start engine.



5) Read data on Subaru Select Monitor or OBD-II general scan tool.
- Subaru Select Monitor

Designate mode using function key.

Function mode: F29

- F29: Front oxygen sensor heater current is indicated.

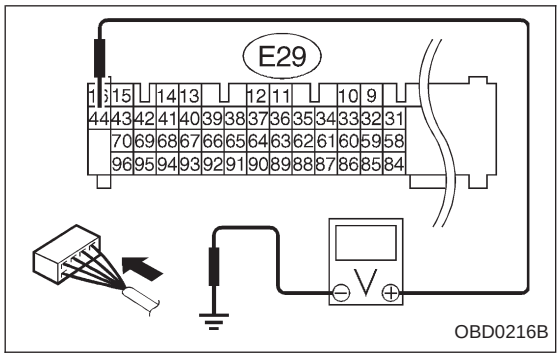
CHECK ***: Is the reading of F29 0.2 A, or more?***

YES : Repair connector.

NOTE:
In this case, poor contact in front oxygen sensor connector and ECM connector can be the possible cause.

NO : Go to step 3.

● OBD-II scan tool
For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.



3	CHECK OUTPUT SIGNAL FROM ECM. (USING VOLTAGE METER.)

1) Start and idle the engine.
2) Measure voltage between ECM and body.

CHECK ***: Connector & terminal (E29) No. 44 — Body/1.0 V, or less***

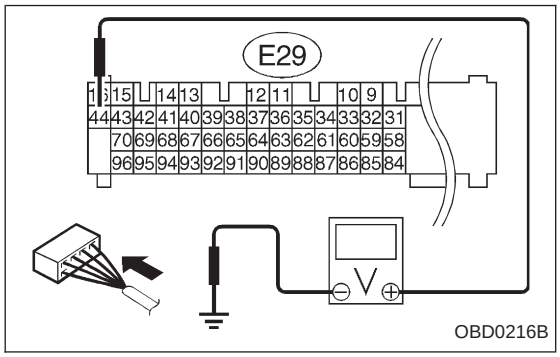
YES : Go to step 4.

NO : Go to next CHECK .

CHECK ***: Is the voltage less than 1.0 V while shaking harness and connector of ECM?***

YES : Repair poor contact in ECM connector.

NO : Go to next step.

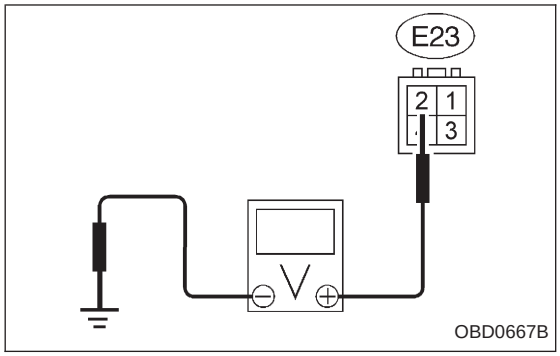


3) Disconnect connector from front oxygen sensor.
4) Measure voltage between ECM and body.

CHECK ***: Connector & terminal (E29) No. 44 — Body/1.0 V, or less***

YES : Replace ECM.

NO : Repair short circuit of harness between ECM and front oxygen sensor connector. After repair short circuit of harness, replace ECM.



4	CHECK POWER SUPPLY TO FRONT OXYGEN SENSOR.

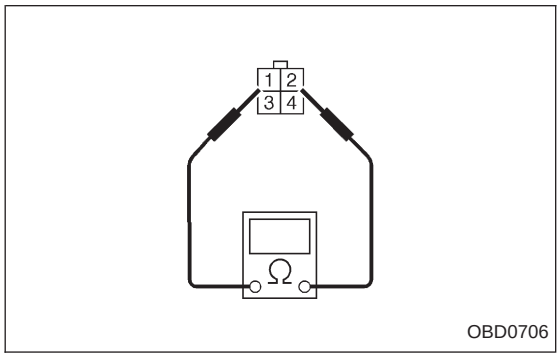
1) Turn ignition switch to OFF.
2) Disconnect connector from front oxygen sensor.
3) Turn ignition switch to ON.
4) Measure voltage between front oxygen sensor connector and body.

CHECK ***: Connector & terminal***
(E23) No. 2 — Body/10 V, or more

YES : Go to step 5.

NO : Repair power supply line.

NOTE:
In this case, repair poor contact in connector or open circuit of harness between main relay and front oxygen sensor.



5	CHECK FRONT OXYGEN SENSOR.

1) Turn ignition switch to OFF.
2) Measure resistance between front oxygen sensor connector terminals.

CHECK ***: Terminals***
No. 1 — No. 2/30 Ω, or less

YES : Repair harness and connector.

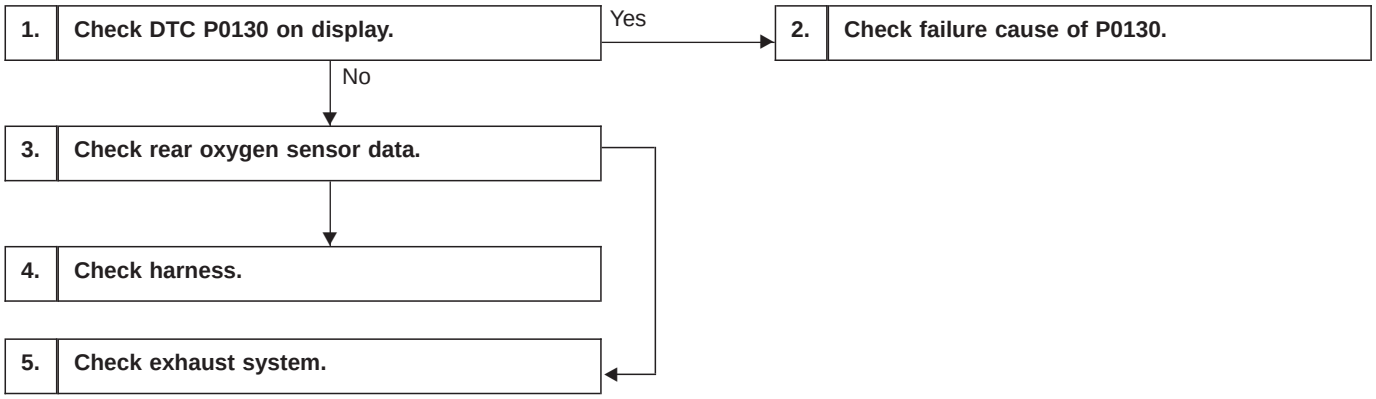
NOTE:
In this case, repair the following:
- Open circuit of harness between the front oxygen sensor connector and the ECM connector
- Poor contact in front oxygen sensor connector
- Poor contact in ECM connector

NO : Replace front oxygen sensor.

M: DTC P0136 — REAR OXYGEN SENSOR CIRCUIT MALFUNCTION (RO2 — V) —

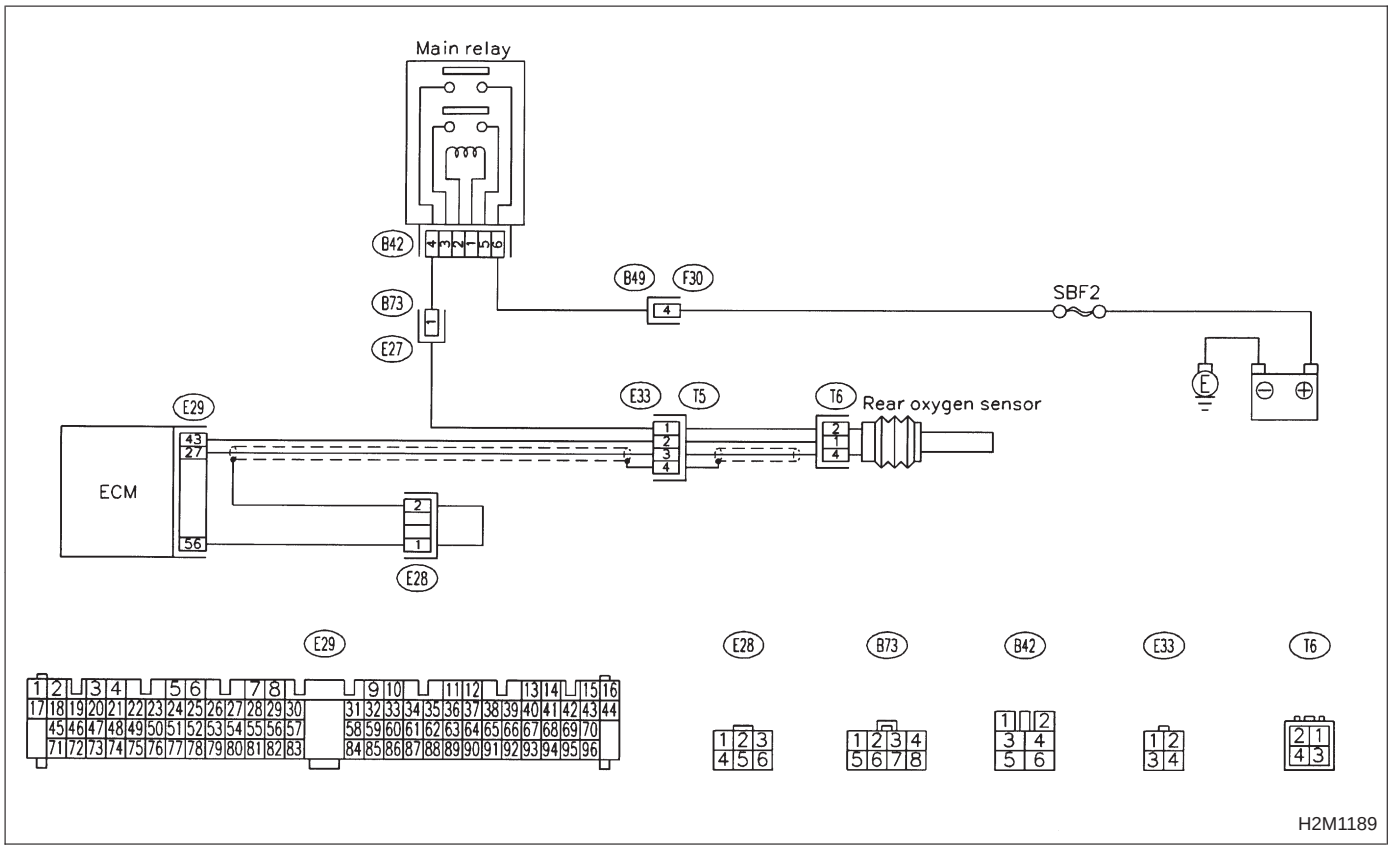
DTC DETECTING CONDITION:

- Two consecutive trips with fault



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



1	CHECK DTC P0130 ON DISPLAY.

CHECK : ***Check that Subaru Select Monitor or the OBD-II general scan tool shows P0130.***

YES : Go to step 2.

NO : Go to step 3.

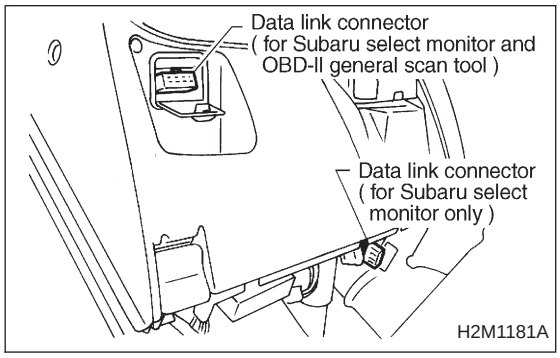
2	CHECK FAILURE CAUSE OF P0130.

Perform the step 1 of DTC P0130.

CHECK : ***Is the failure cause of P0130 in the fuel system?***

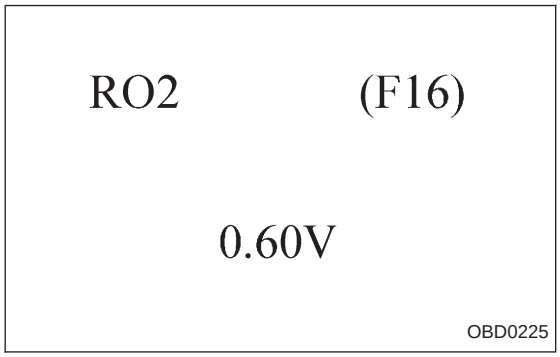
YES : Check fuel system. In this case, inspection of P0136 is not necessary.

NO : Go to step 3.



3	CHECK REAR OXYGEN SENSOR DATA.

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor or OBD-II general scan tool to data link connector.
3) Start the engine, and turn Subaru Select Monitor or OBD-II general scan tool switch to ON.
4) Warm-up the engine until engine coolant temperature is above 70°C (160°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for two minutes.



5) Read data on Subaru Select Monitor or OBD-II general scan tool.

- Subaru Select Monitor

Designate mode using function key.

Function mode: F16

- F16: Rear oxygen sensor output signal is indicated.

CHECK : ***Is the indicated data fluctuate?***

YES : Go to step 5.

NO : Go to next CHECK .

CHECK : ***Is the indicated data fixed at 0.3±0.1 V?***

YES : Go to step 4.

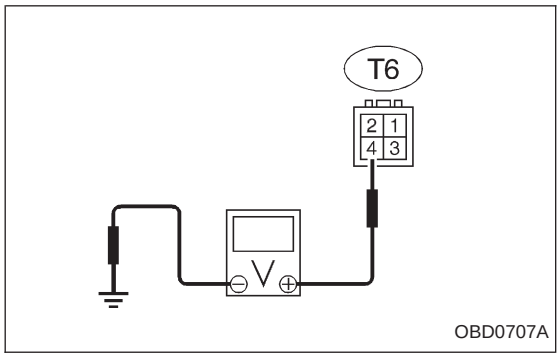
NO : Replace rear oxygen sensor.

- OBD-II general scan tool

For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.

4	CHECK HARNESS.

1) Turn ignition switch to OFF.
2) Disconnect connector from rear oxygen sensor.
3) Turn ignition switch to ON.



4) Measure voltage between rear oxygen sensor harness connector and body.

CHECK ***: Connector & terminal (T6) No. 4 — Body/0.2 V, or more***

YES : Replace rear oxygen sensor.

NO : Repair harness and connector.

NOTE:
In this case, the following are the possible causes.
- Open circuit of harness between rear oxygen sensor and ECM connector.
- Poor contact in rear oxygen sensor connector.
- Poor contact in ECM connector.
- Poor contact in rear oxygen sensor connecting harness connector.

5	CHECK EXHAUST SYSTEM.

CHECK ***: Check the following items.***
- ***Looseness of installation portions***
- ***Damage (crack, hole etc.) of parts***
- ***Looseness and opening of parts between front oxygen sensor and rear oxygen sensor.***

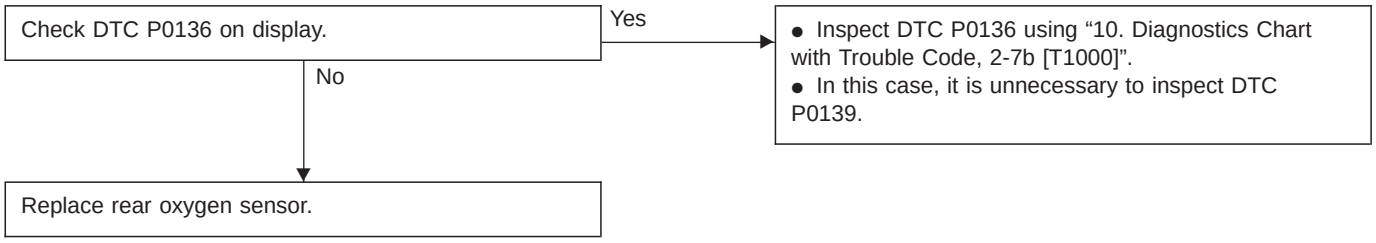
YES : Repair or replace faulty parts.

NO : Replace rear oxygen sensor.

N: DTC P0139 — REAR OXYGEN SENSOR CIRCUIT SLOW RESPONSE (RO2 – R) —

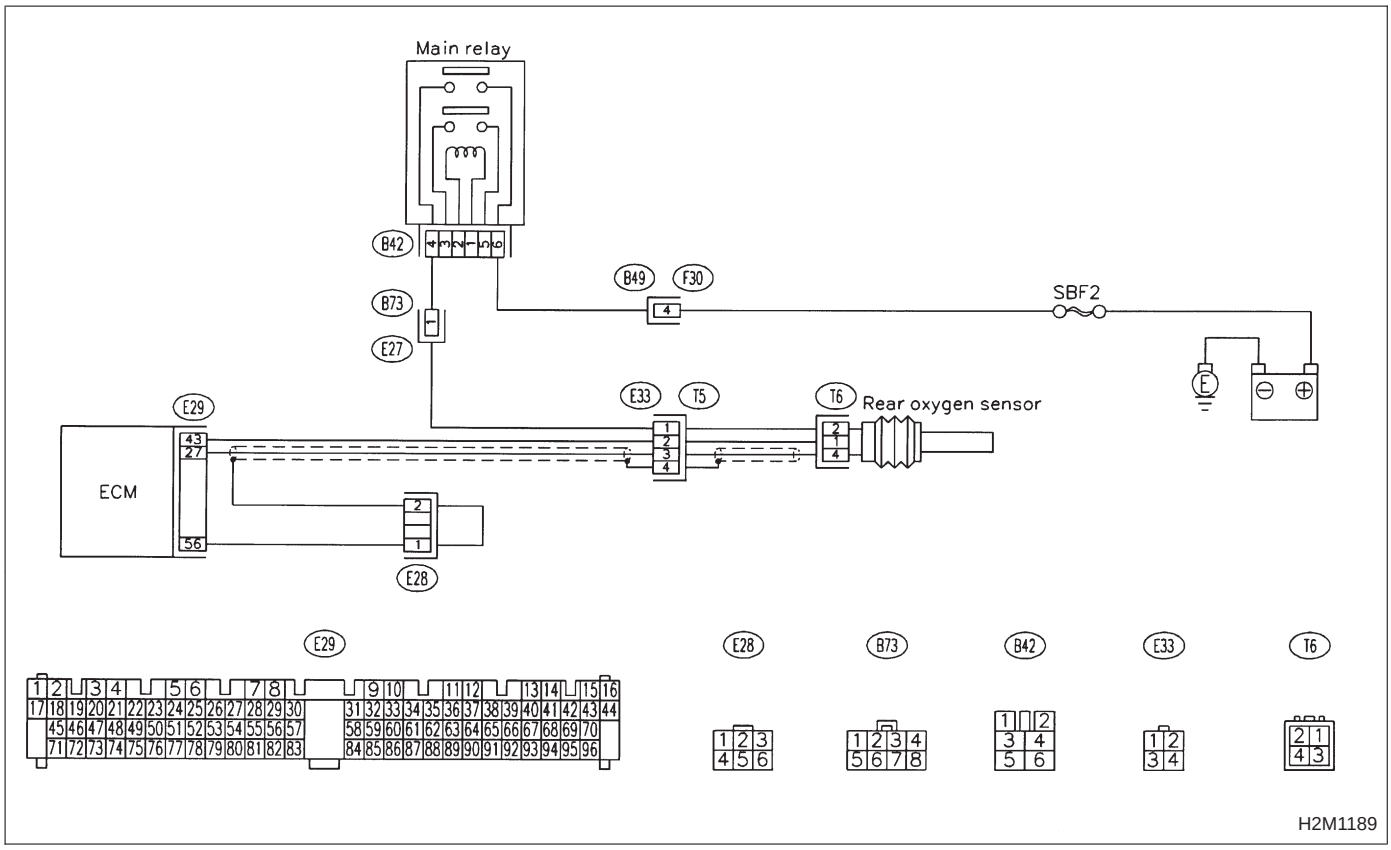
DTC DETECTING CONDITION:

- Two consecutive trips with fault



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



O: DTC P0141 — REAR OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION (RO2H) —

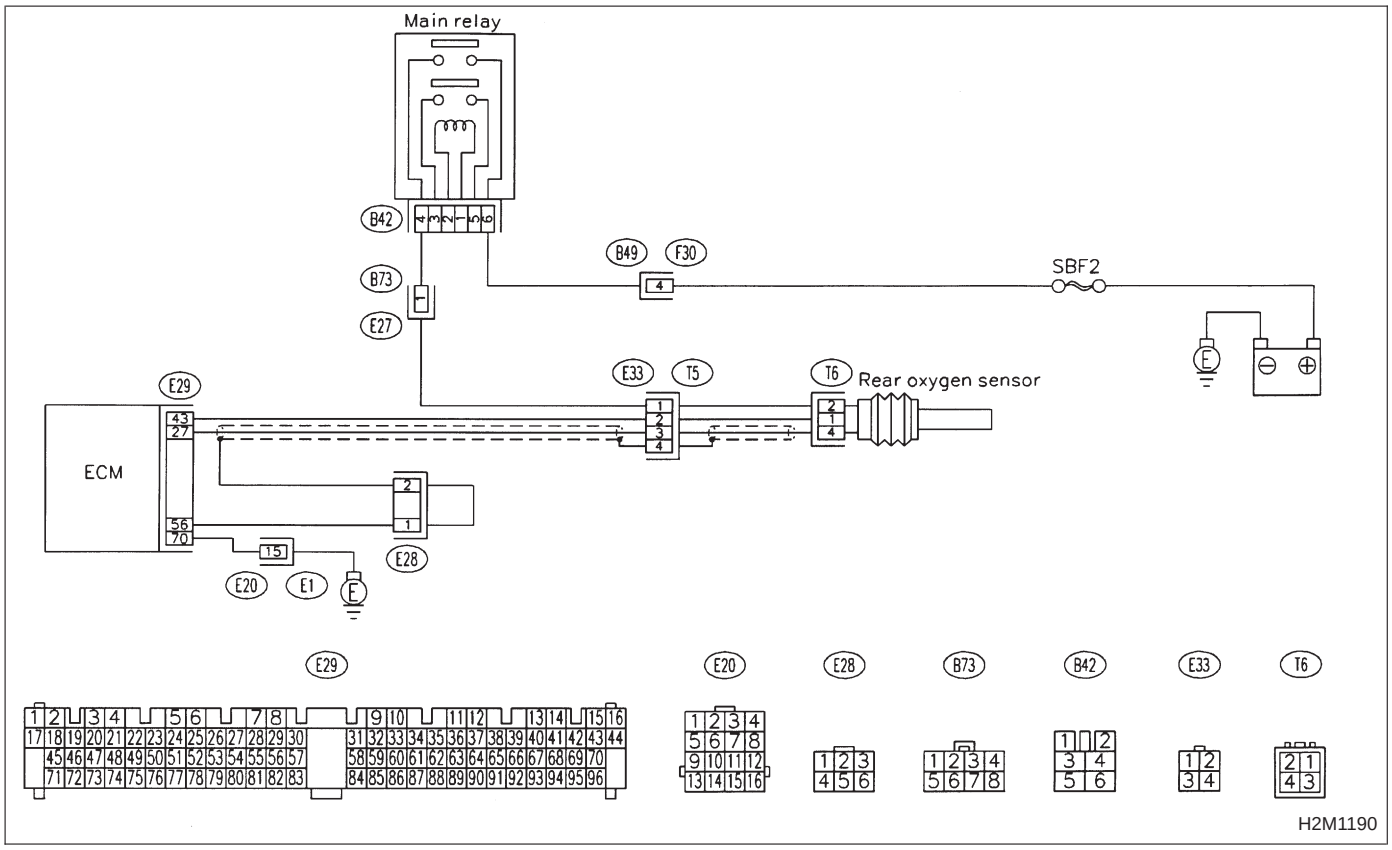
DTC DETECTING CONDITION:

- Two consecutive trips with fault

1.	**Check DTC P0135 on display.**
2.	**Connect Subaru Select Monitor or the OBD-II general scan tool, and read data.**
3.	**Check output signal from ECM. (Using voltage meter.)**
4.	**Check power supply to rear oxygen sensor.**
5.	**Check rear oxygen sensor.**

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:

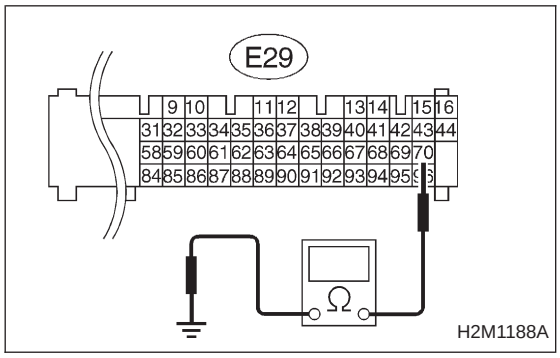


1	CHECK DTC P0135 ON DISPLAY.

CHECK : ***Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0141 and P0135 at the same time?***

YES : Go to next step.

NO : Go to step 2.



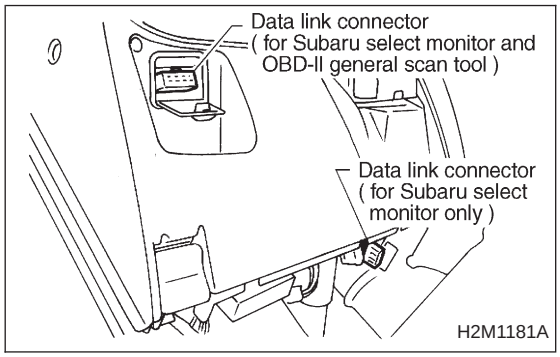
1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Measure resistance of harness between ECM connector and body.

CHECK : ***Connector & terminal (E29) No. 70 — Body/5 Ω, or less***

YES : Repair poor contact in ECM connector.

NO : Repair harness and connector.

NOTE:
In this case, repair the following items.
- Open circuit of harness between ECM and coupling connector (E20).
- Open circuit of harness between coupling connector (E20) and engine grounding terminal.
- Poor contact in rear oxygen sensor connector.
- Poor contact in rear oxygen sensor connecting harness connector (E33).
- Poor contact in coupling connector (E20).



2	CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Turn ignition switch to ON and Subaru Select Monitor or OBD-II general scan tool switch to ON.
4) Start engine.

5) Read data on Subaru Select Monitor or OBD-II general scan tool.
- Subaru Select Monitor

Designate mode using function key.

Function mode: F30

- F30: Rear oxygen sensor heater current is indicated.

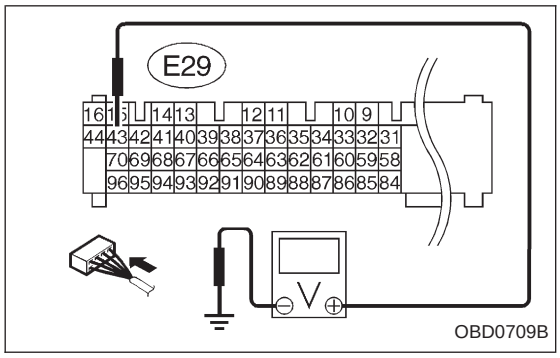
CHECK ***: Is the reading of F30 0.2 A, or more?***

YES : Repair connector.

NOTE:
In this case, poor contact of rear oxygen sensor connector and ECM connector can be the possible cause.

NO : Go to step 3.

● OBD-II scan tool
For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.



3	CHECK OUTPUT SIGNAL FROM ECM. (USING VOLTAGE METER.)

1) Start and idle the engine.
2) Measure voltage between ECM and body.

CHECK ***: Connector & terminal (E29) No. 43 — Body/1.0 V, or less***

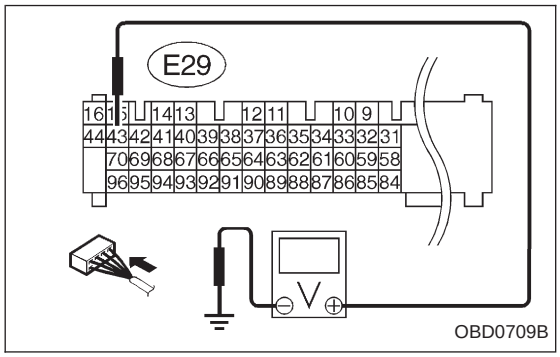
YES : Go to step 4.

NO : Go to next CHECK .

CHECK ***: Is the voltage less than 1.0 V while shaking harness and connector of ECM?***

YES : Repair poor contact in ECM connector.

NO : Go to next step.

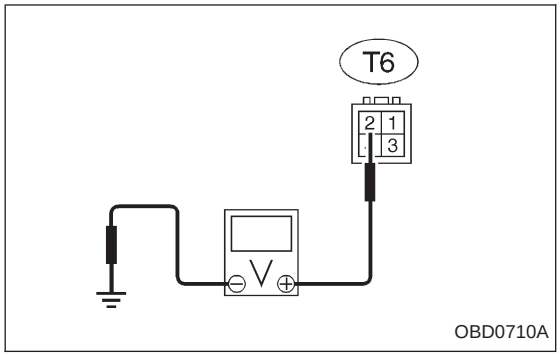


3) Disconnect connector from rear oxygen sensor.
4) Measure voltage between ECM and body.

CHECK ***: Connector & terminal (E29) No. 43 — Body/1.0 V, or less***

YES : Replace ECM.

NO : Repair short circuit of harness between ECM and rear oxygen sensor connector. After repair short circuit of harness, replace ECM.



4	CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.

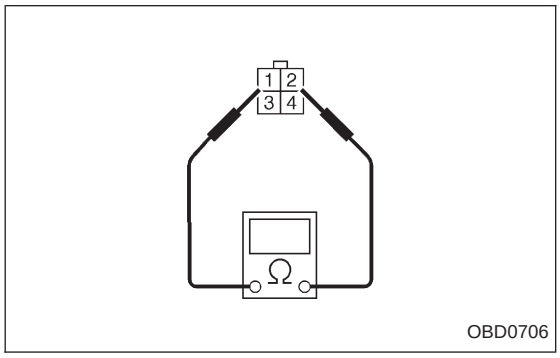
1) Turn ignition switch to OFF.
2) Disconnect connector from rear oxygen sensor.
3) Turn ignition switch to ON.
4) Measure voltage between rear oxygen sensor connector and body.

CHECK ***: Connector & terminal***
(T6) No. 2 — Body/10 V, or more

YES : Go to step 5.

NO : Repair power supply line.

NOTE:
In this case, repair poor contact in connector or open circuit of harness between main relay and rear oxygen sensor.



5	CHECK REAR OXYGEN SENSOR.

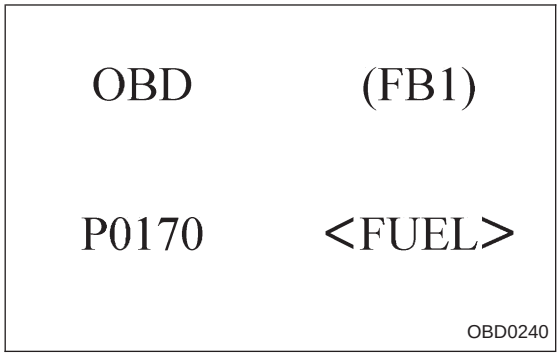
1) Turn ignition switch to OFF.
2) Measure resistance between rear oxygen sensor connector terminals.

CHECK ***: Terminals***
No. 1 — No. 2/30 Ω, or less

YES : Repair harness and connector.

NOTE:
In this case, repair the following.
- Open circuit of harness between rear oxygen sensor connector and ECM connector
- Poor contact in rear oxygen sensor connector
- Poor contact in ECM connector
- Poor contact in rear oxygen sensor connecting harness connector

NO : Replace rear oxygen sensor.



P: DTC P0170
— FUEL TRIM MALFUNCTION (FUEL) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

1.	**Check exhaust system.**
2.	**Check air intake system.**
3.	**Check fuel pressure.**
4.	**Check engine coolant temperature sensor. <Ref. to F: DTC P0115 2-7b [T10F0].>**
5.	**Check mass air flow sensor.**

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODE.
<Ref. to 2-7b [T3D0] and [T3E0].>

1	CHECK EXHAUST SYSTEM.

CHECK : ***Are there holes or loose bolts on exhaust system?***

YES : Repair exhaust system.

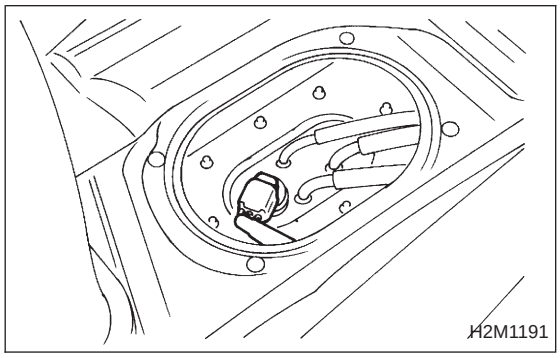
NO : Go to step 2.

2	CHECK AIR INTAKE SYSTEM.

CHECK : ***Are there holes, loose bolts or disconnection of hose on air intake system?***

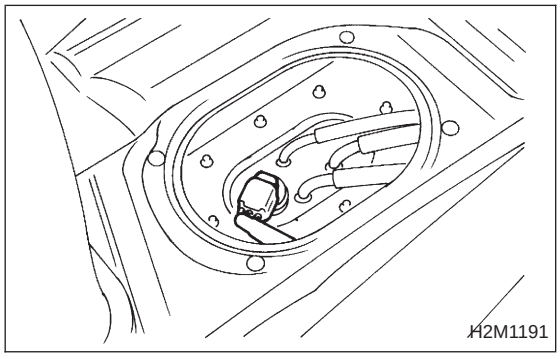
YES : Repair air intake system.

NO : Go to step 3.

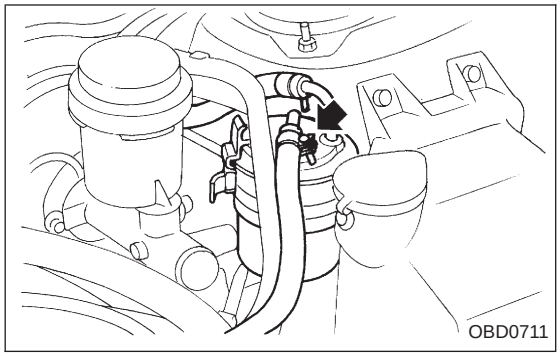


3	CHECK FUEL PRESSURE.

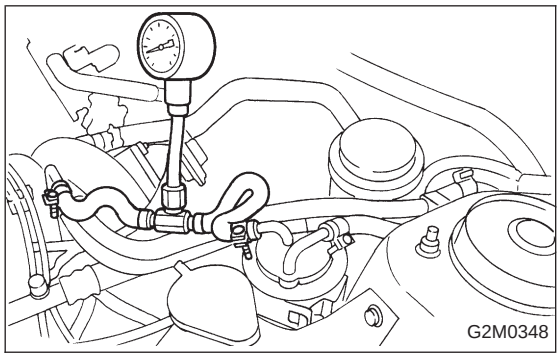
1) Release fuel pressure.
   (1) Remove fuel pump access hole lid located on the right rear of trunk compartment floor (Sedan) or luggage compartment floor (Wagon).
   (2) Disconnect connector from fuel tank.
   (3) Start the engine, and run it until it stalls.
   (4) After stopping the engine, crank the engine for 5 to 7 seconds to reduce fuel pressure.
   (5) Turn ignition switch to OFF.



2) Connect connector to fuel tank.



3) Disconnect fuel delivery hose from fuel filter, and connect fuel pressure gauge.



4) Start the engine and idle while gear position is neutral.
5) Measure fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold.

CHECK ***: Fuel pressure:***
226 — 275 kPa (2.3 — 2.8 kg/cm², 33 — 40 psi)

YES : Go to next step.

NO : 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

6) After connecting pressure regulator vacuum hose, measure fuel pressure.

CHECK ***: Fuel pressure:***
157 — 206 kPa (1.6 — 2.1 kg/cm², 23 — 30 psi)

YES : Go to step 4.

NO : 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

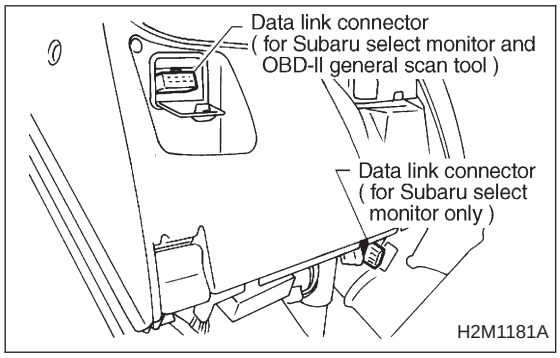
WARNING:
Before removing fuel pressure gauge, release fuel pressure.

NOTE:

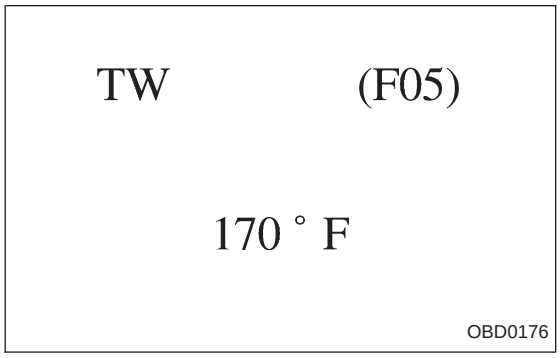
● If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.
● If out of specification as measured at step 6), check or replace pressure regulator and pressure regulator vacuum hose.

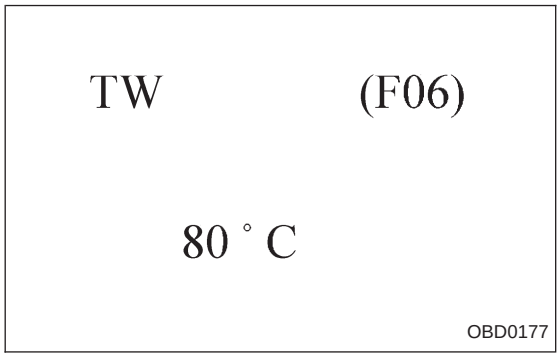
4	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** **< REF. TO F: DTC P0115, 2-7b [T10F0].>**

1) Turn ignition switch to OFF.



2) Connect the Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Start the engine and warm-up completely.





4) Read data on Subaru Select Monitor or the OBD-II general scan tool.

- Subaru Select Monitor

Designate mode using function key.

Function mode: F05 or F06

- F05: Water temperature is indicated in "°F".
- F06: Water temperature is indicated in "°C".

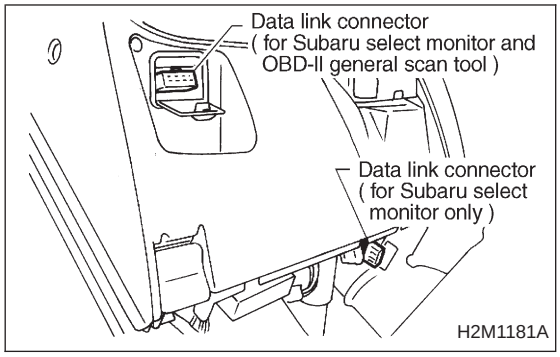
CHECK ***: Is temperature indicated on Subaru Select Monitor (F05) greater than 140°F?***
Is temperature indicated on Subaru Select Monitor (F06) greater than 60°C?

YES : Go to step 5.

NO : Replace engine coolant temperature sensor.

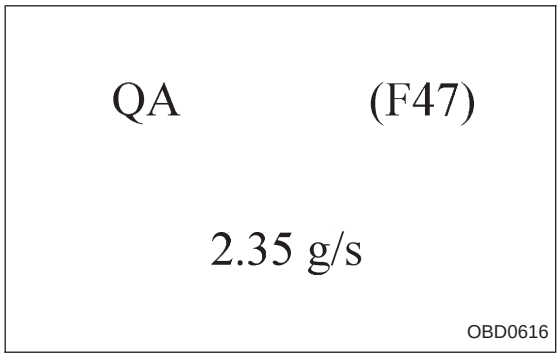
- OBD-II general scan tool

For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.



5	CHECK MASS AIR FLOW SENSOR.

1) Turn ignition switch to OFF.
2) Connect the Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).



4) Place the selector lever in “N” or “P” position.
5) Turn A/C switch to OFF.
6) Turn all accessory switches to OFF.
7) Read data on Subaru Select Monitor or OBD-II general scan tool.

● Subaru Select Monitor
Designate mode using function key.

Function mode: F47

● F47: Mass air flow is shown on display.

CHECK ***: Is the voltage within the specifications shown in the following table?***

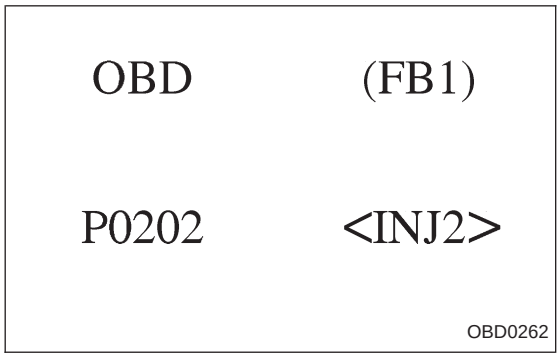
Engine speed	Specified value
Idling	1.9 — 3.6 (g/sec)
2,500 rpm	7.0 — 14.8 (g/sec)

YES : Contact with SOA service.
Note: Inspection by DTM is required.
Probable cause: Deterioration of plural parts

NO : Replace mass air flow sensor.

● OBD-II general scan tool
For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.

Q: DTC P0201
— FUEL INJECTOR CIRCUIT MALFUNCTION - #1 (INJ1) —



R: DTC P0202
— FUEL INJECTOR CIRCUIT MALFUNCTION - #2 (INJ2) —

S: DTC P0203
— FUEL INJECTOR CIRCUIT MALFUNCTION - #3 (INJ3) —

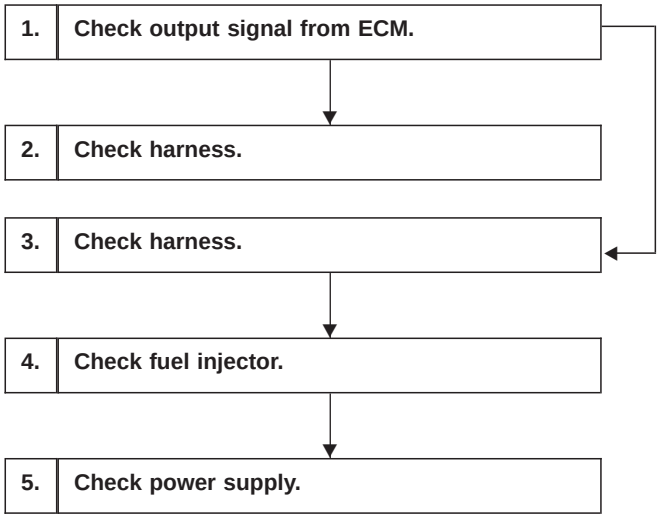
T: DTC P0204
— FUEL INJECTOR CIRCUIT MALFUNCTION - #4 (INJ4) —

DTC DETECTING CONDITION:

- Immediately at fault recognition

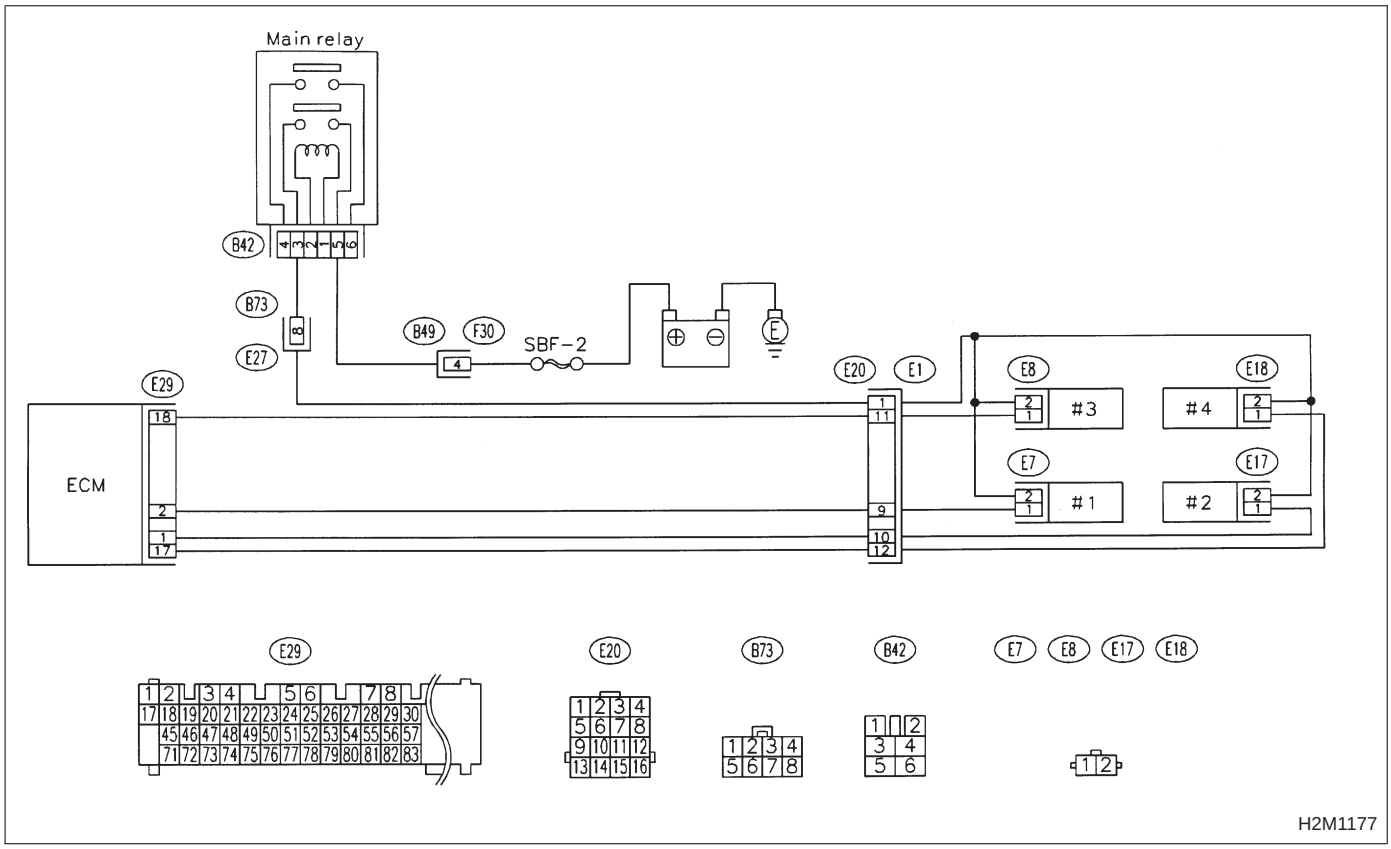
TROUBLE SYMPTOM:

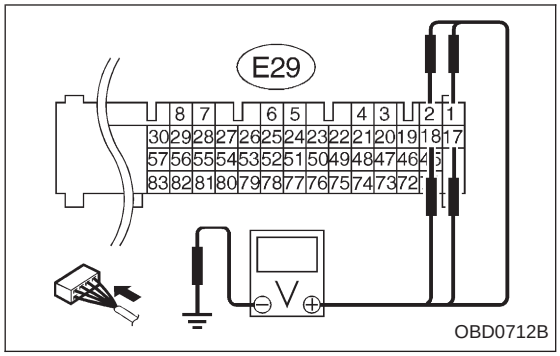
- Failure of engine to start
- Engine stalls.
- Erroneous idling
- Rough driving



CAUTION:
- **Check or repair only faulty cylinders.**
- **After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to 2-7b [T3D0] and [T3E0].>**

WIRING DIAGRAM:



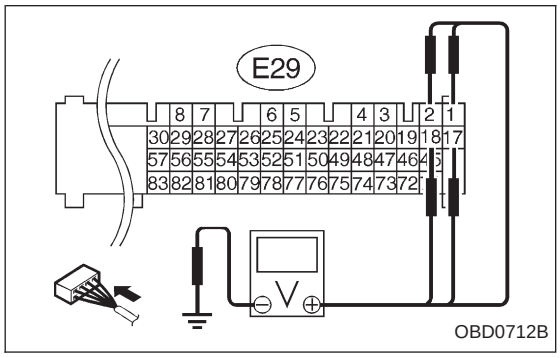


1	CHECK OUTPUT SIGNAL FROM ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM connector and body on faulty cylinders.

CHECK ***: Connector & terminal***
#1 (E29) No. 2 — Body/10 V, or more
#2 (E29) No. 1 — Body/10 V, or more
#3 (E29) No. 18 — Body/10 V, or more
#4 (E29) No. 17 — Body/10 V, or more

YES : Go to step 2.
NO : Go to step 3.

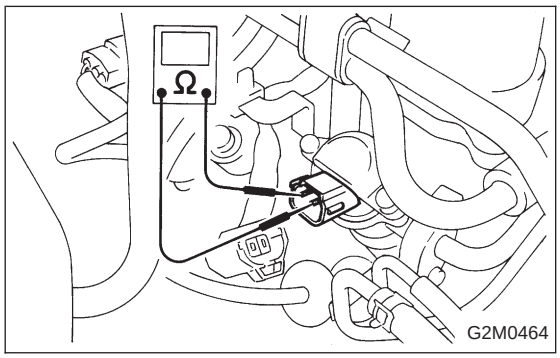


2	CHECK HARNESS.

1) Turn ignition switch to OFF.
2) Disconnect connector from fuel injector on faulty cylinder.
3) Turn ignition switch to ON.
4) Measure voltage between ECM connector and body on faulty cylinders.

CHECK ***: Connector & terminal***
#1 (E29) No. 2 — Body/10 V, or more
#2 (E29) No. 1 — Body/10 V, or more
#3 (E29) No. 18 — Body/10 V, or more
#4 (E29) No. 17 — Body/10 V, or more

YES : Repair short circuit of harness between ECM and fuel injector. After repair, replace ECM.
NO : Go to next step.

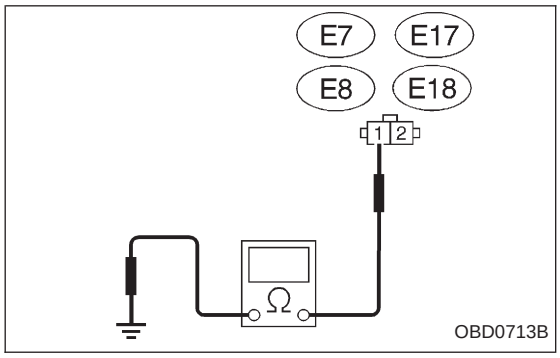


5) Turn ignition switch to OFF.
6) Measure resistance between fuel injector terminals on faulty cylinder.

CHECK ***: Terminals***
No. 1 — No. 2/1 Ω, or less

YES : Replace faulty fuel injector and ECM.
NO : Go to next CHECK .

CHECK ***: Is there poor contact in ECM connector?***
YES : Repair poor contact in ECM connector.
NO : Replace ECM.

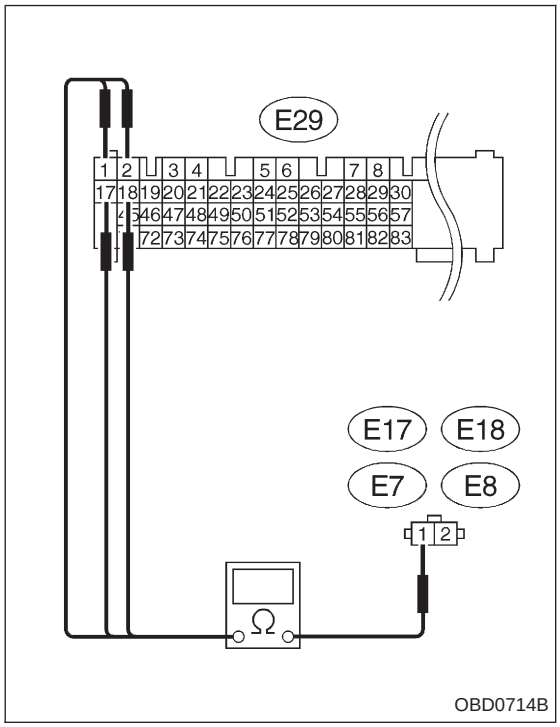


3	CHECK HARNESS.

1) Turn ignition switch to OFF.
2) Disconnect connector from fuel injector on faulty cylinders.
3) Measure voltage between ECM connector and body on faulty cylinders.

CHECK ***: Connector & terminal***
#1 (E7) No. 1 — Body/10 Ω, or less
#2 (E17) No. 1 — Body/10 Ω, or less
#3 (E8) No. 1 — Body/10 Ω, or less
#4 (E18) No. 1 — Body/10 Ω, or less

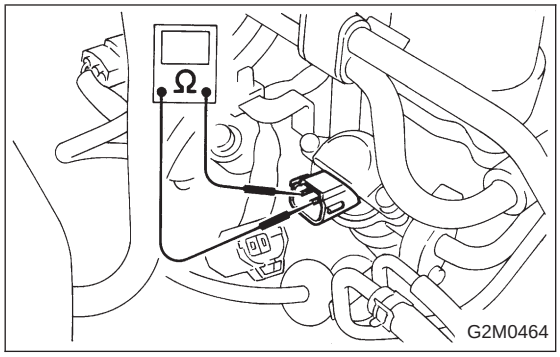
YES : Repair short circuit of harness between fuel injector and body.
NO : Go to the next step.



4) Measure resistance of harness connector between ECM connector and fuel injector on faulty cylinders.

CHECK ***: Connector & terminal***
#1 (E29) No. 2 — (E7) No. 1/1 Ω, or less
#2 (E29) No. 1 — (E17) No. 1/1 Ω, or less
#3 (E29) No. 18 — (E8) No. 1/1 Ω, or less
#4 (E29) No. 17 — (E18) No. 1/1 Ω, or less

YES : Go to step 4.
NO : Repair open circuit of harness between ECM and fuel injector.



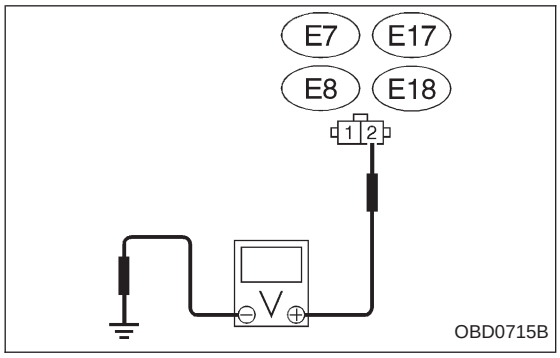
4	CHECK FUEL INJECTOR.

Measure resistance between fuel injector terminals on faulty cylinder.

CHECK ***: Terminals***
No. 1 — No. 2/5 — 20 Ω

YES : Go to step 5.

NO : Replace faulty fuel injector.



5	CHECK POWER SUPPLY.

1) Turn ignition switch to ON.
2) Measure voltage between fuel injector and body on faulty cylinders.

CHECK ***: Connector & terminal***
#1 (E7) No. 2 — Body/10 V, or more
#2 (E17) No. 2 — Body/10 V, or more
#3 (E8) No. 2 — Body/10 V, or more
#4 (E18) No. 2 — Body/10 V, or more

YES : Check for poor contact of all connectors in WIRING DIAGRAM on page 151.

NO : Check and repair the following items.
- Open circuit of harness between main relay and fuel injector for faulty cylinders
- Poor contact in main relay connector
- Poor contact in fuel injector connector for the faulty cylinders

U: DTC P0301
— CYLINDER 1 MISFIRE DETECTED (MIS — 1) —

V: DTC P0302
— CYLINDER 2 MISFIRE DETECTED (MIS — 2) —

W: DTC P0303
— CYLINDER 3 MISFIRE DETECTED (MIS — 3) —

X: DTC P0304
— CYLINDER 4 MISFIRE DETECTED (MIS — 4) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)

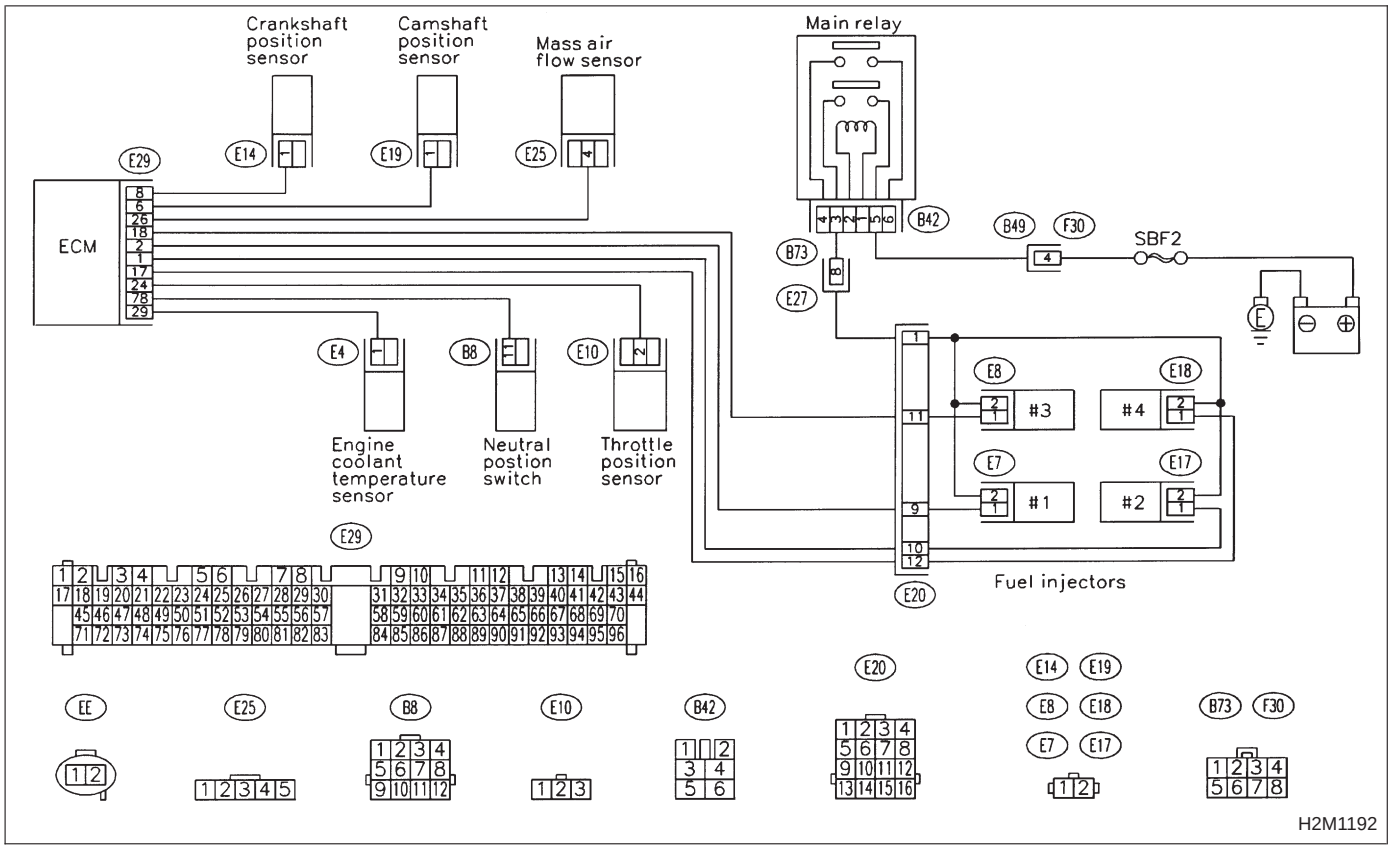
TROUBLE SYMPTOM:

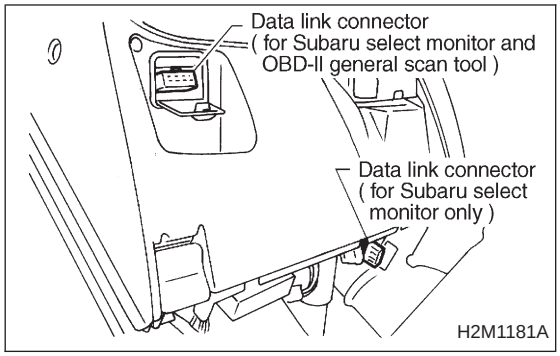
- Engine stalls.
- Erroneous idling
- Rough driving

1.	Check DTC P0100, P0101, P0115, P0125, P0201, P0202, P0203, P0204 and P0400 on display.	Yes	• Inspect DTC P0100, P0101, P0115, P0125, P0201, P0202, P0203, P0204 and P0400 using “10. Diagnostics Chart with Trouble Code, 2-7b [T1000]”. • In this case, it is unnecessary to inspect DTC P0301, P0302, P0303 and P0304.
	No		
2.	**Connect Subaru Select Monitor and read data.**		
3.	**Check air intake system.**		
4.	**Check misfire symptom.**		

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

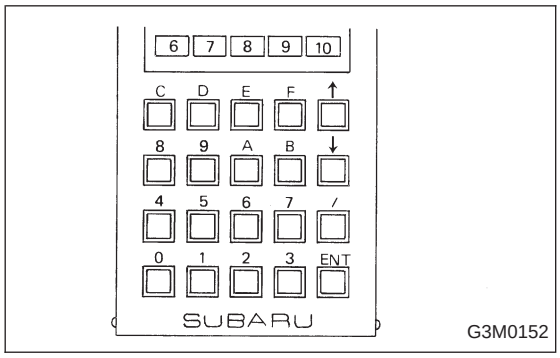
WIRING DIAGRAM:



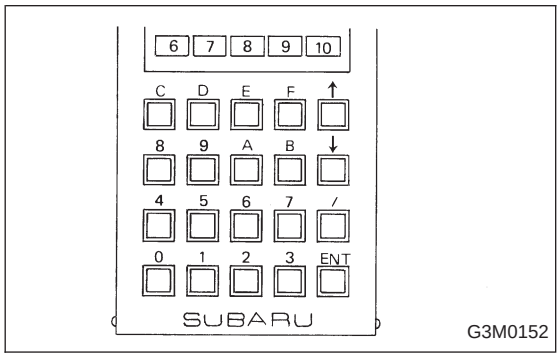


2	CONNECT SUBARU SELECT MONITOR AND READ DATA.

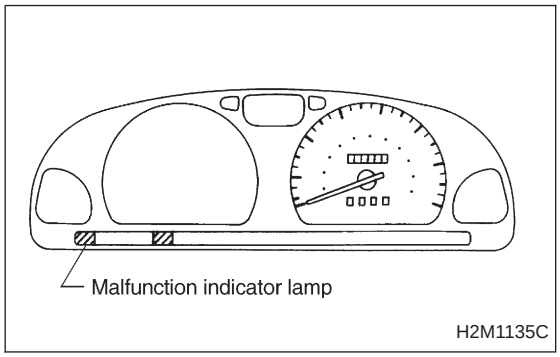
1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor to the data link connector.
3) Turn ignition switch to ON, and turn Subaru Select Monitor switch to ON.



4) Read data on Subaru Select Monitor.
Designate mode use function key.
Function mode: F38
NOTE:
F38: Minimum EGR system pressure value is indicated.



5) Clear memory on Subaru Select Monitor.
Designate mode use function key.
Press [F], [C], [0], [ENT] in that order.



6) Start engine, and drive the vehicle more than 10 minutes.

CHECK ***: Is the MIL coming on or blinking?***
YES : Go to step 3.
NO : Go to next CHECK .

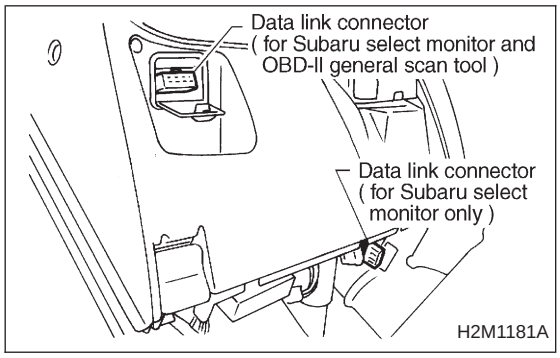
CHECK ***: The vehicle has been empty of fuel.***
YES : ● The engine has no abnormality.
● Finish diagnostics operation.
NO : Go to next CHECK .
CHECK ***: Check if the cause of misfire was made when the engine is running.***
Ex. Remove spark plug cord, etc.
YES : ● The engine has no abnormality.
● Finish diagnostics operation.
NO : Repair poor contact in ignitor, ignition coil, fuel injector, ECM and coupling harness connector.

3	CHECK AIR INTAKE SYSTEM.

CHECK : ***Check the following items.***
① Are there air leaks or air suction caused by loose or dislocated nuts and bolts?
② Are there cracks or any disconnection of hoses?

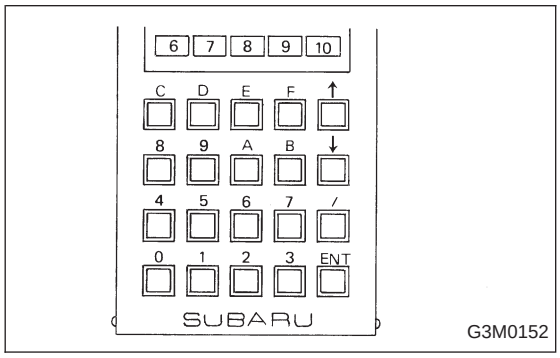
YES : Repair air intake system.

NO : Go to step 4.



4	CHECK MISFIRE SYMPTOM.

1) Turn ignition switch to OFF.
2) Connect the Subaru Select Monitor or the OBD-II general scan tool to data link connector.



3) Turn ignition switch to ON, and turn Subaru Select Monitor or OBD-II general scan tool switch to ON.
4) Read diagnostic trouble code (DTC).
● Subaru Select Monitor
Designate mode use function key.
Function mode: FB1

● 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.

DTC	Next CHECK
Only one cylinder	Go to step ①.
P0301 and P0302	Go to step ②.
P0303 and P0304	Go to step ③.
P0301 and P0303	Go to step ④.
P0302 and P0304	Go to step ⑤.
Others	Go to step ⑥.

① ONLY ONE CYLINDER

CHECK ***: Check the following items for that cylinder.***
- ***Spark plug***
- ***Spark plug cord***
- ***Fuel injector***
- ***Compression ratio***

② GROUP OF #1 AND #2 CYLINDERS

CHECK ***: Check the following items for #1 and #2 cylinders.***
- ***Spark plugs***
- ***Fuel injectors***
- ***Ignition coil***

NOTE:
If no abnormal is discovered, check for “8. F: IGNITION SYSTEM” of #1 and #2 cylinders side.

③ GROUP OF #3 AND #4 CYLINDERS

CHECK ***: Check the following items for #3 and #4 cylinders.***
- ***Spark plugs***
- ***Fuel injectors***
- ***Ignition coil***

NOTE:
If no abnormal is discovered, check for “8. F: IGNITION SYSTEM” of #3 and #4 cylinders side.

④ GROUP OF #1 AND #3 CYLINDERS

CHECK ***: Check the following items for #1 and #3 cylinders.***
- ***Spark plugs***
- ***Fuel injectors***
- ***Skipping timing belt teeth***

⑤ **GROUP OF #2 AND #4 CYLINDERS**

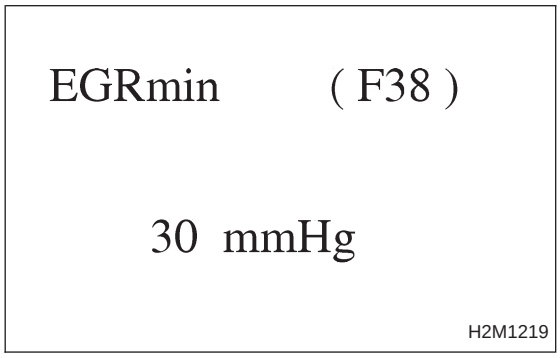
CHECK ***: Check the following items for #2 and #4 cylinders.***
- ***Spark plugs***
- ***Fuel injectors***
- ***Skipping timing belt teeth***

⑥ **THE CYLINDER AT RANDOM**

CHECK ***: Is the engine idle rough?***

YES : Go to next CHECK .

NO : Go to DTC P0170, 2-7b [T10P3], [T10P4] and [T10P5].



CHECK ***: Is the minimum EGR system pressure value (value of function mode (F38) less than 10 mmHg?***

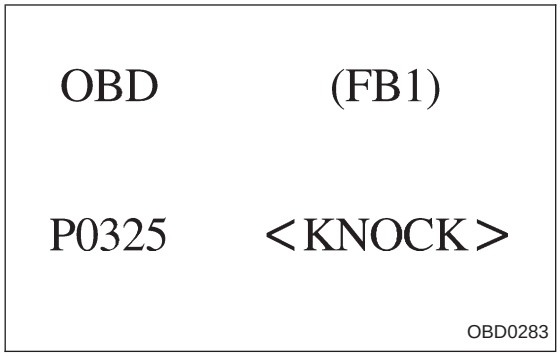
NOTE:
Use the value read in step 2 for function mode F38.

YES : Clean EGR valve.

CAUTION:
Do not use solvent when cleaning EGR valve assembly, as it can damage diaphragm.

NOTE:
- Remove and blow away the exhaust deposits. Make sure the valve operates smoothly and the valve seat area is completely cleaned.
- Replace EGR valve as required.

NO : Go to DTC P0170, 2-7b [T10P3], [T10P4] and [T10P5].



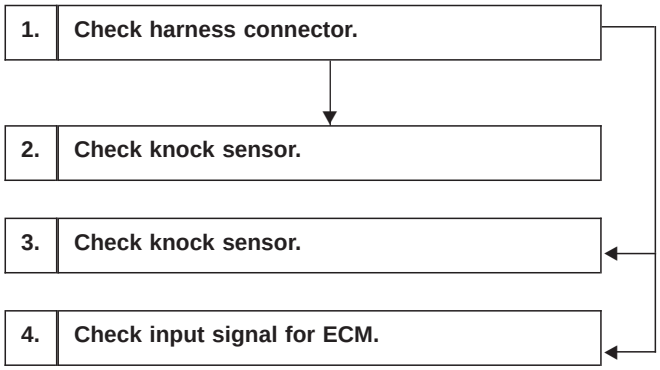
Y: DTC P0325 — KNOCK SENSOR CIRCUIT MALFUNCTION (KNOCK) —

DTC DETECTING CONDITION:

- Immediately at fault recognition

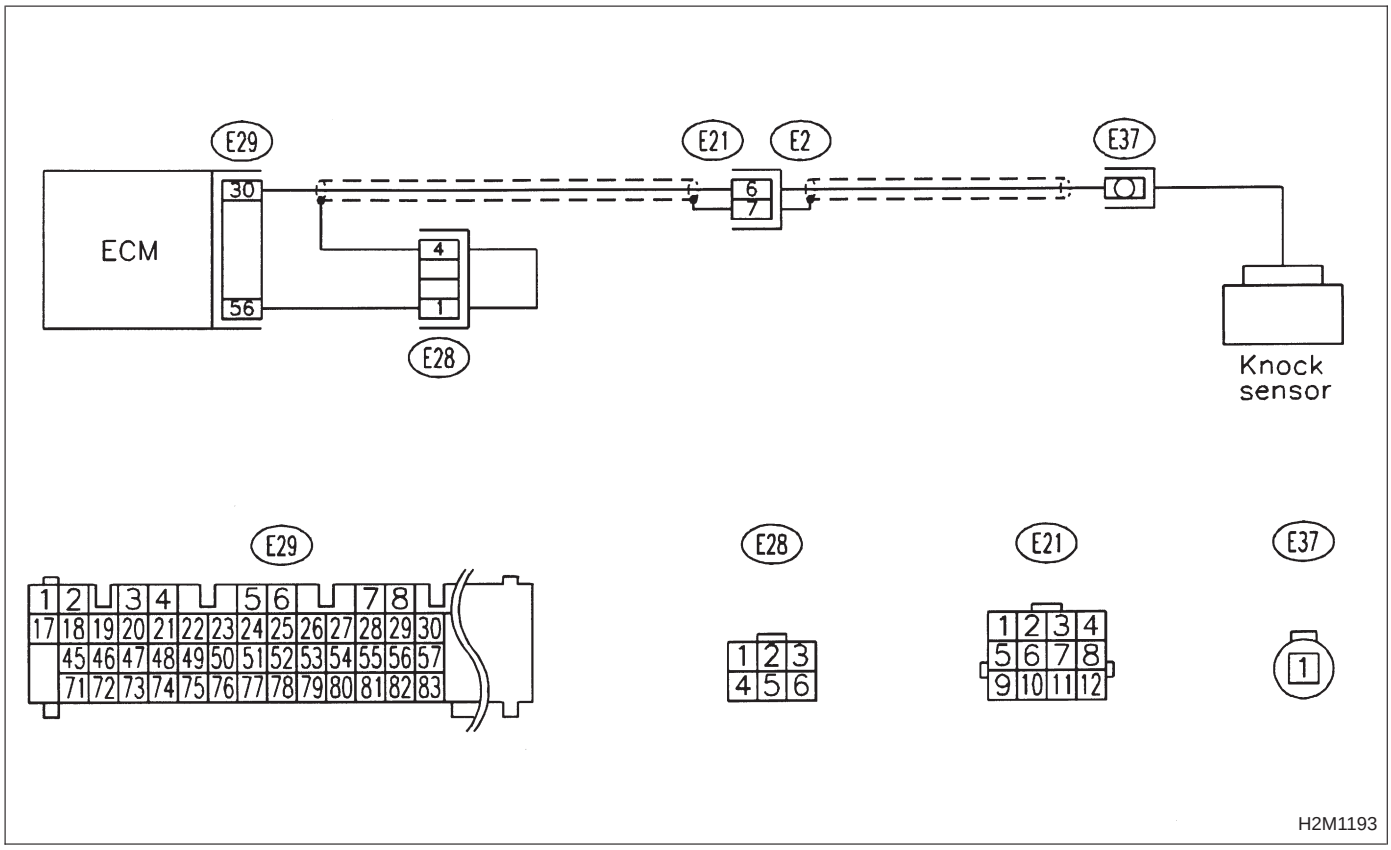
TROUBLE SYMPTOM:

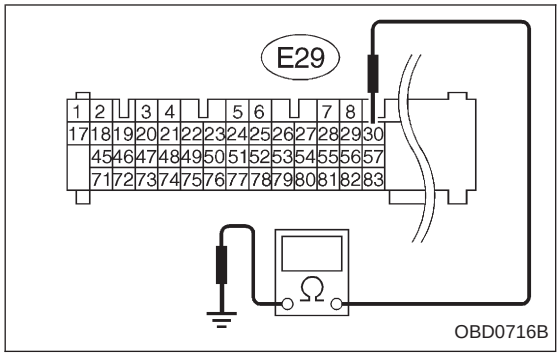
- Poor driving performance
- Knocking occurs.

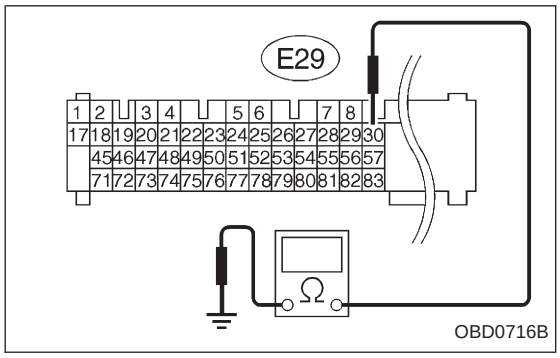


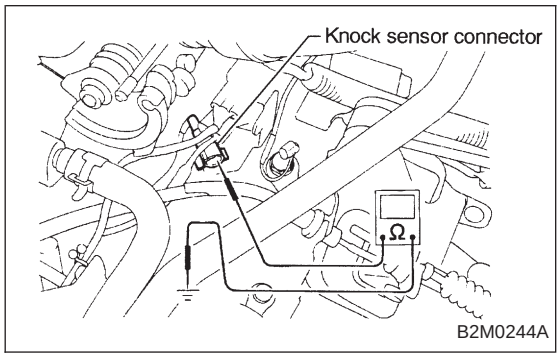
CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:









1	CHECK HARNESS CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Measure resistance between ECM harness connector and body.

CHECK : ***Connector & terminal (E29) No. 30 — Body/700 kΩ, or more***

YES : Go to step 2.

NO : Go to next CHECK .

CHECK : ***Connector & terminal (E29) No. 30 — Body/400 kΩ, or less***

YES : Go to step 3.

NO : Go to step 4.

2	CHECK KNOCK SENSOR.

1) Disconnect connector from knock sensor.
2) Measure voltage between knock sensor connector and body.

CHECK : ***Connector & terminal (E37) No. 1 — Body/700 kΩ, or more***

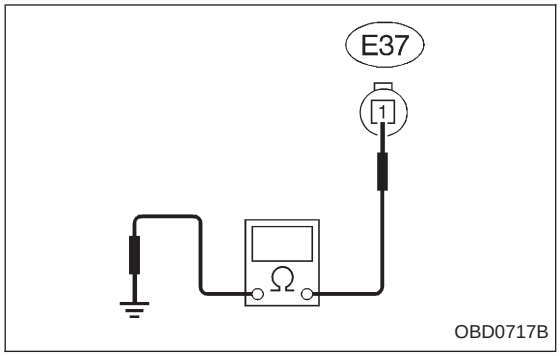
YES : Go to next CHECK .

NO : Check and repair the following items.
- Open circuit of the harness between knock sensor connector and ECM connector
- Poor contact of the knock sensor connector
- Poor contact of coupling connector (E21)

CHECK : ***Check for secure tightening of the knock sensor installation bolt.***

YES : Replace knock sensor.

NO : Tighten knock sensor installation bolt securely.



3	CHECK KNOCK SENSOR.

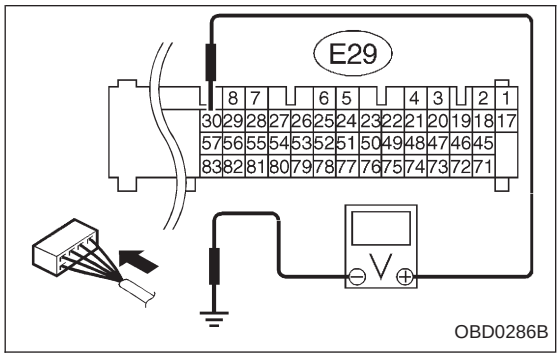
1) Disconnect connector from knock sensor.
2) Measure resistance of harness between knock sensor connector and body.

CHECK ***: Connector & terminal (E37) No. 1 — Body/400 kΩ, or less***

YES : Replace knock sensor.

NO : Repair short circuit of harness between knock sensor connector and ECM connector.

NOTE:
The harness between both connectors is shielded. Repair short circuit of harness together with shield.



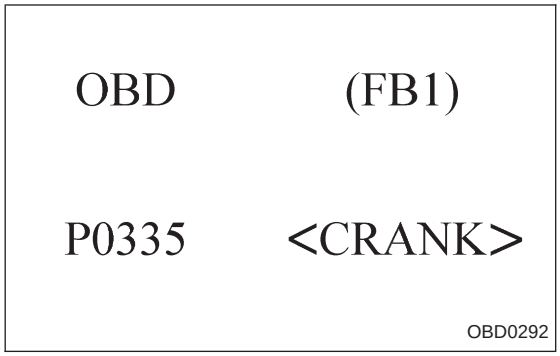
4	CHECK INPUT SIGNAL FOR ECM.

1) Connect connectors to ECM and knock sensor.
2) Turn ignition switch to ON.
3) Measure voltage between ECM and body.

CHECK ***: Connector & terminal (E29) No. 30 — Body/2 V, or more***

YES : Even if MIL lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.)
Check and repair the following connectors.
- Knock sensor connector
- ECM connector
- Coupling connector (E21)

NO : Repair poor contact in ECM connector.



Z: DTC P0335 — CRANKSHAFT POSITION SENSOR CIRCUIT MALFUNCTION (CRANK) —

DTC DETECTING CONDITION:

- Immediately at fault recognition

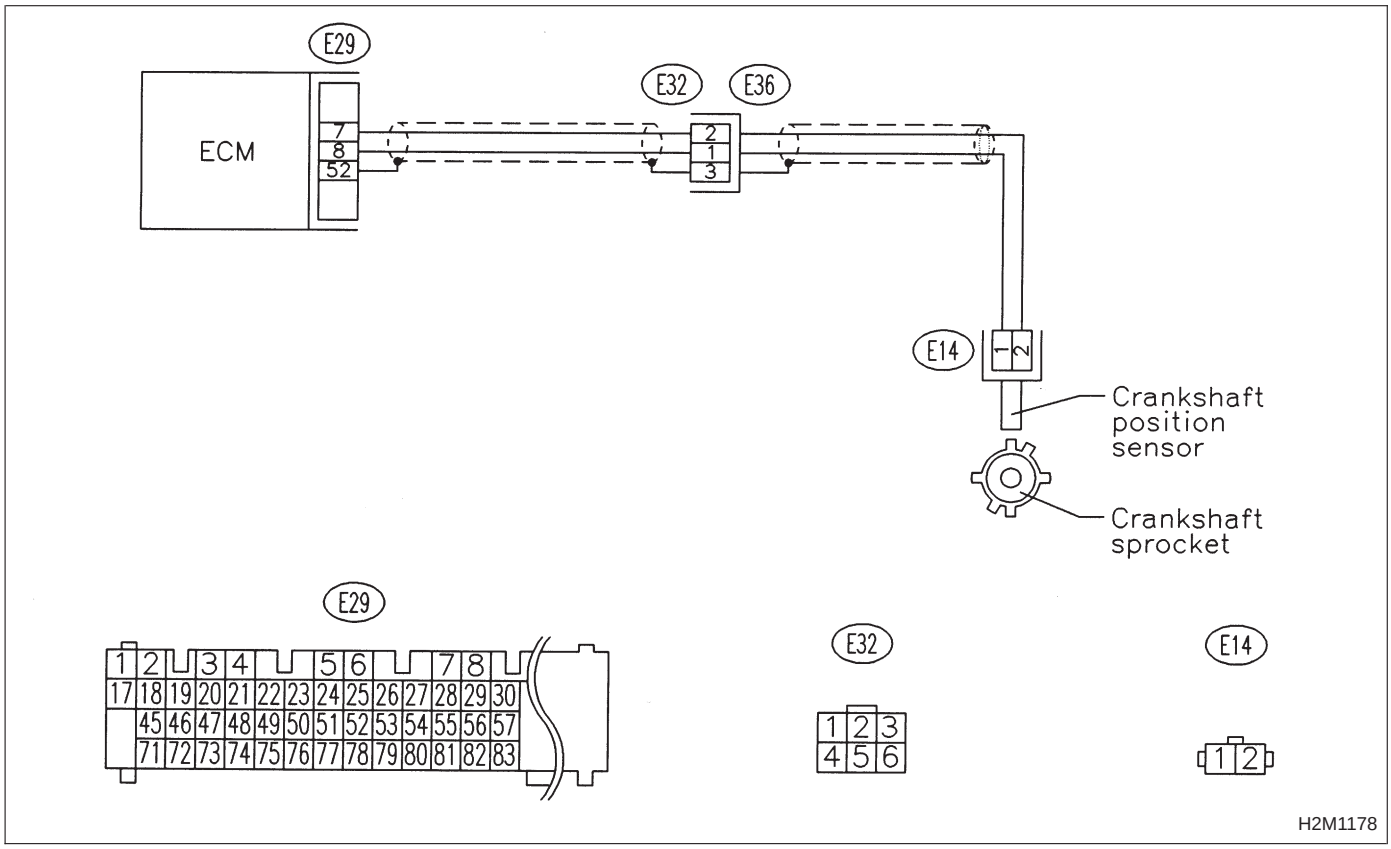
TROUBLE SYMPTOM:

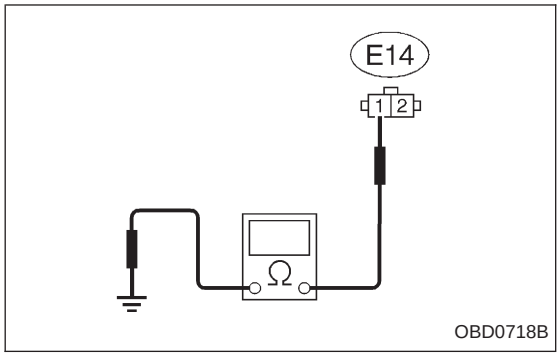
- Engine stalls.
- Failure of engine to start

1.	Check harness.
2.	Check crankshaft position sensor.

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:





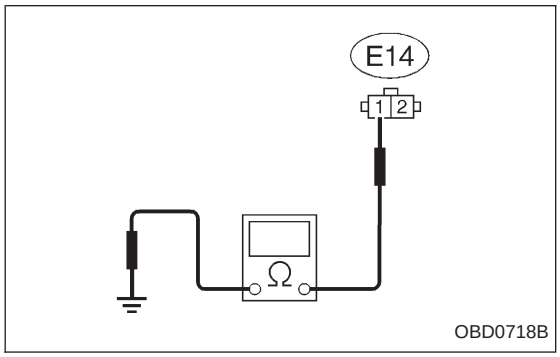
1	CHECK HARNESS.

1) Turn ignition switch to OFF.
2) Disconnect connector from crankshaft position sensor.
3) Measure resistance of harness between crankshaft position sensor connector and body.

CHECK ***: Connector & terminal (E14) No. 1 — Body/100 kΩ, or more***

YES : Check and repair the following items.
- Open circuit of harness between crankshaft position sensor connector and ECM connector
- Poor contact in ECM connector
- Poor contact in the coupling connector (E32)

NO : Go to next CHECK .

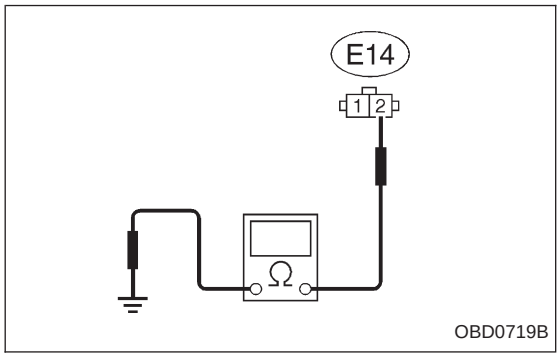


CHECK ***: Connector & terminal (E14) No. 1 — Body/10 Ω, or less***

YES : Repair short circuit of harness between crankshaft position sensor connector and ECM connector.

NOTE:
The harness between both connectors is shielded. Repair short circuit of harness together with shield.

NO : Go to next CHECK .



CHECK ***: Connector & terminal (E14) No. 2 — Body/5 Ω, or less***

YES : Go to step 2.

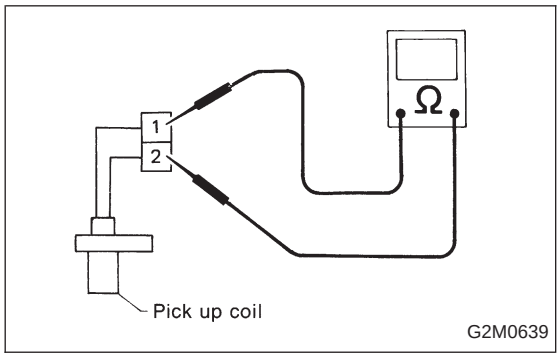
NO : Check and repair the following items.
- Open circuit of harness between crankshaft position sensor connector and ECM connector
- Poor contact in ECM connector
- Poor contact in the coupling connector (E32)

2	CHECK CRANKSHAFT POSITION SENSOR.

CHECK ***: Check for secure tightening of the installation bolts of the crankshaft position sensor.***

YES : Go to the next step.

NO : Tighten securely.



1) Remove crankshaft position sensor.
2) Measure resistance between connector terminals of crankshaft position sensor.

CHECK ***: Terminals***
No. 1 — No. 2/1 — 4 kΩ

YES : Repair poor contact in crankshaft position sensor connector.

NO : Replace crankshaft position sensor.

AA: DTC P0340 — CAMSHAFT POSITION SENSOR CIRCUIT MALFUNCTION (CAM) —

DTC DETECTING CONDITION:

- Immediately at fault recognition

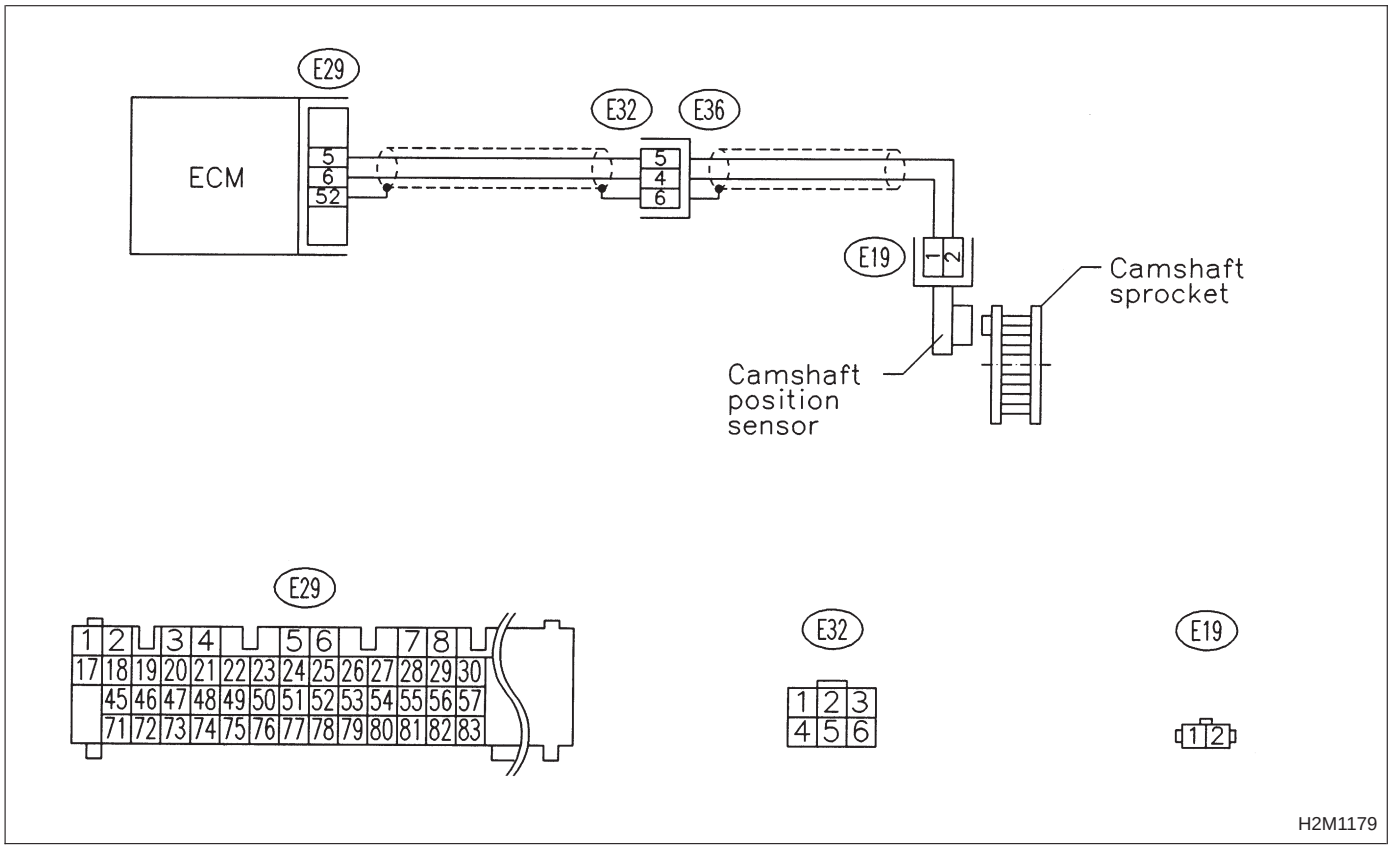
TROUBLE SYMPTOM:

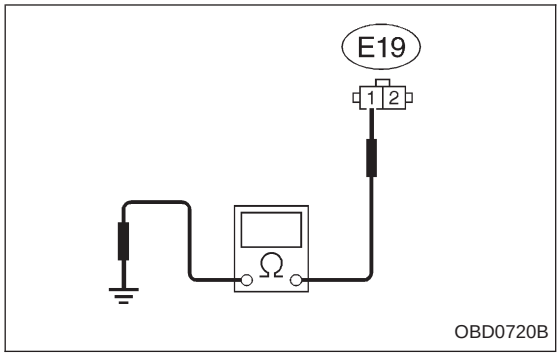
- Engine stalls.
- Failure of engine to start

1.	Check harness.
2.	Check camshaft position sensor.

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:





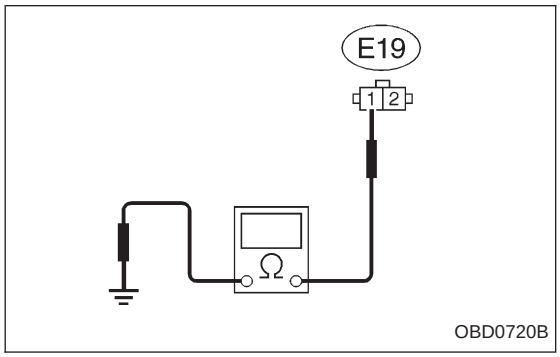
1	CHECK HARNESS.

1) Turn ignition switch to OFF.
2) Disconnect connector from camshaft position sensor.
3) Measure resistance of harness between camshaft position sensor connector and body.

CHECK ***: Connector & terminal (E19) No. 1 — Body/100 kΩ, or more***

YES : Check and repair the following items.
- Open circuit of harness between camshaft position sensor connector and ECM connector
- Poor contact in ECM connector
- Poor contact in the coupling connector (E32)

NO : Go to next CHECK .

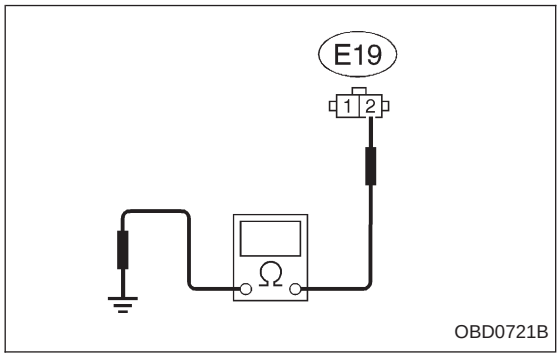


CHECK ***: Connector & terminal (E19) No. 1 — Body/10 Ω, or less***

YES : Repair short circuit of harness between camshaft position sensor connector and ECM connector.

NOTE:
The harness between both connectors is shielded. Repair short circuit of harness together with shield.

NO : Go to next CHECK .



CHECK ***: Connector & terminal (E19) No. 2 — Body/5 Ω, or less***

YES : Go to step 2.

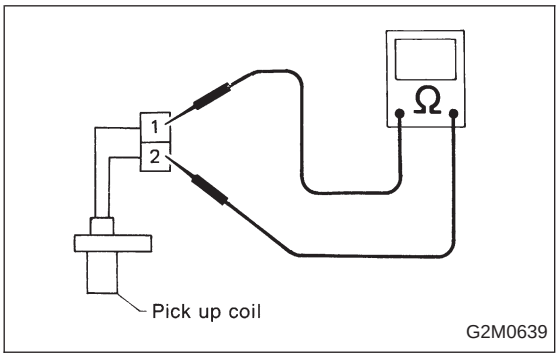
NO : Check and repair the following items.
- Open circuit of harness between camshaft position sensor connector and ECM connector
- Poor contact in ECM connector
- Poor contact in the coupling connector (E32)

2	CHECK CAMSHAFT POSITION SENSOR.

CHECK ***: Check for secure tightening of the installation bolts of the camshaft position sensor.***

YES : Go to the next step.

NO : Tighten securely.



1) Remove camshaft position sensor.
2) Measure resistance between connector terminals of camshaft position sensor.

CHECK ***: Terminals***
No. 1 — No. 2/1 — 4 kΩ

YES : Repair poor contact in camshaft position sensor connector.

NO : Replace camshaft position sensor.

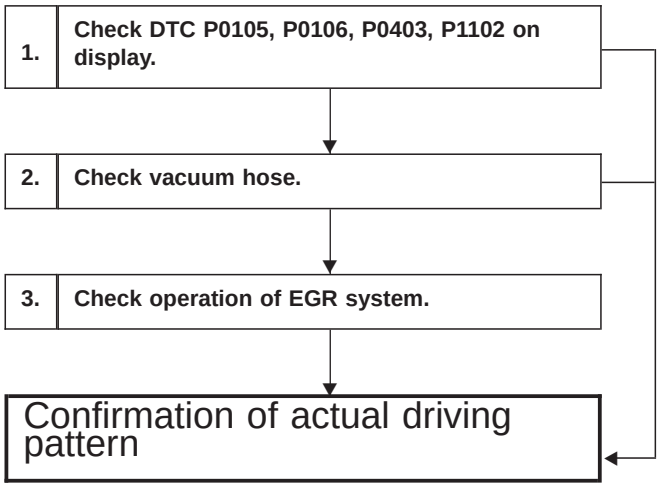
AB: DTC P0400 — EXHAUST GAS RECIRCULATION FLOW MALFUNCTION (EGR) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

TROUBLE SYMPTOM:

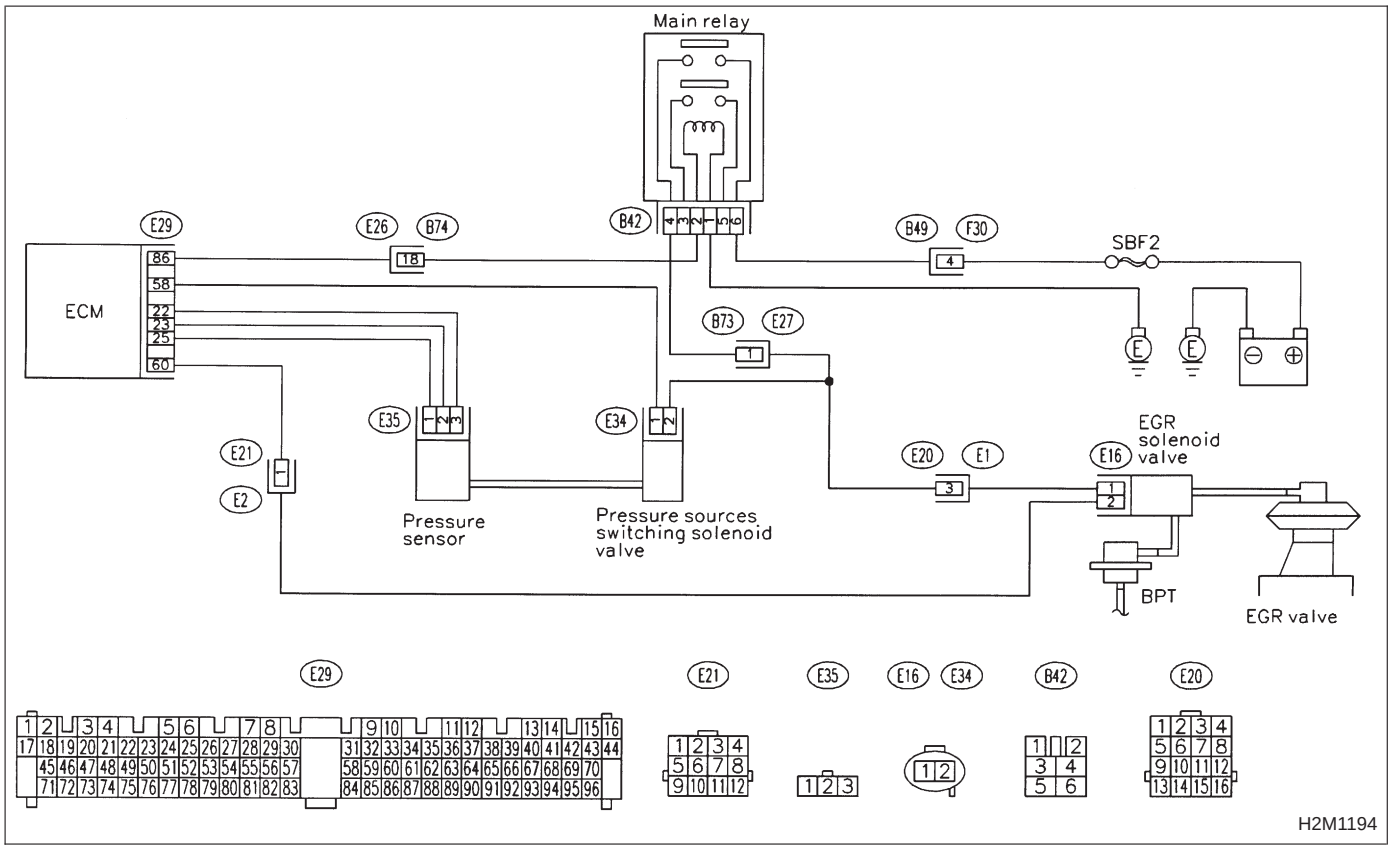
- Poor driving performance on low engine speed



CAUTION:

Before confirmation of actual driving pattern, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



1	**CHECK DTC P0105, P0106, P0403, P1102 ON DISPLAY.**

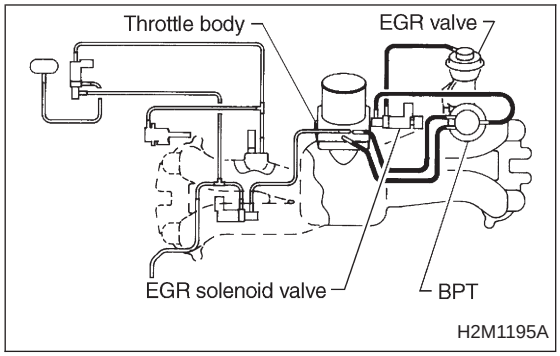
CHECK ***: Check that Subaru Select Monitor or OBD-II general scan tool shows P0105, P0106, P0403 and P1102.***

YES : ● Inspect the relevant DTC using “10. Diagnostics Chart with Trouble Code, 2-7b [T1000]”.
● Manually check that EGR valve diaphragm is not stuck.
● In this case, inspection of DTC P0400 is not necessary after the above items.

WARNING:
Be careful when checking EGR valve, since it may be extremely hot.

After checking the above item, go to **CONFIRMATION OF ACTUAL DRIVING PATTERN.**

NO : Go to step 2.



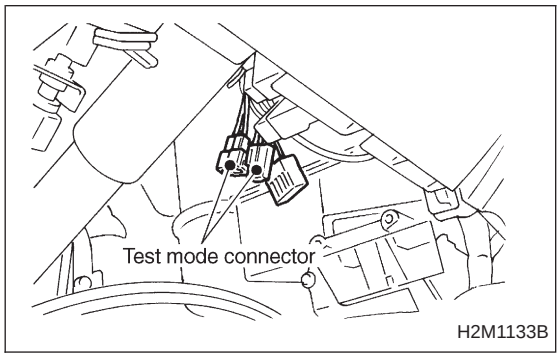
2	CHECK VACUUM HOSE.

CHECK : ***Check vacuum hoses for disconnection, leakage and clogging.***

YES : Check and repair the following items.
- Two lines of pipes and hoses running between throttle body and BPT
- Pipe and hose line connecting BPT and EGR solenoid valve
- Hose between EGR solenoid valve and EGR valve
- BPT pressure transmitting hose

And after the checking and repairing, go to **CONFIRMATION OF ACTUAL DRIVING PATTERN**.

NO : Go to step 3.



3	CHECK OPERATION OF EGR SYSTEM.

1) Turn ignition switch to OFF.
2) Connect the test mode connector.
3) Turn ignition switch to ON.

CHECK : ***Does EGR solenoid valve produce operating sound?***

NO : Replace EGR solenoid valve.

YES : Go to next step.

4) Turn ignition switch to OFF.
5) Disconnect connector from EGR solenoid valve.
6) Connect 12 V battery's ground ⊖ terminal to one terminal of the EGR solenoid valve. Then connect 12 V battery's ⊕ terminal to the other terminal of it.

CAUTION:
Do not use the 12 V battery installed in the vehicle, because the electrical system may be damaged.

7) Start the engine.

CHECK ***: Open throttle valve by 5 to 10 degrees and visually check EGR valve operation.***

YES : Possibly EGR valve malfunction may be due to freezing or clogging by foreign matter. At this point in time do not replace EGR valve, since it is not faulty. And after the checking, go to **CONFIRMATION OF ACTUAL DRIVING PATTERN.**

NOTE:

If malfunction is detected again in the confirmation of actual driving pattern, EGR valve is faulty. Go to next CHECK .

NO : Go to next CHECK .

CHECK ***: Is there clogging in the gas outlets of intake manifold or cylinder head, checking by breathing into the outlets?***

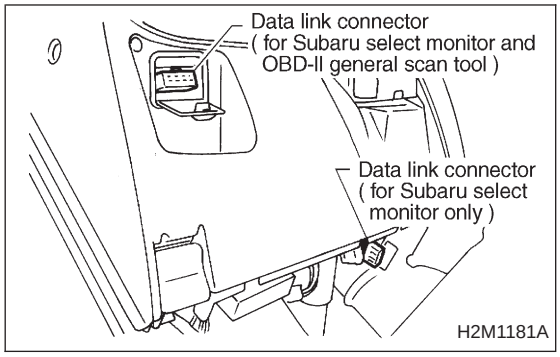
YES : Repair or replace intake manifold or cylinder head. And go to **CONFIRMATION OF ACTUAL DRIVING PATTERN.**

NO : Clean EGR valve. And go to **CONFIRMATION OF ACTUAL DRIVING PATTERN.**

CAUTION:
Do not use solvent when cleaning EGR valve assembly, as it can damage diaphragm.

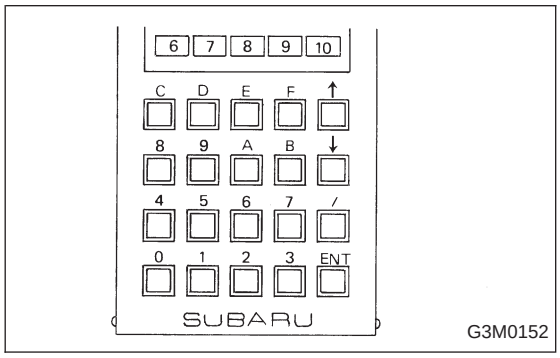
NOTE:

- Remove and blow away the exhaust deposits. Make sure the valve operates smoothly and the valve seat area is completely cleaned.
- Replace EGR valve as required.

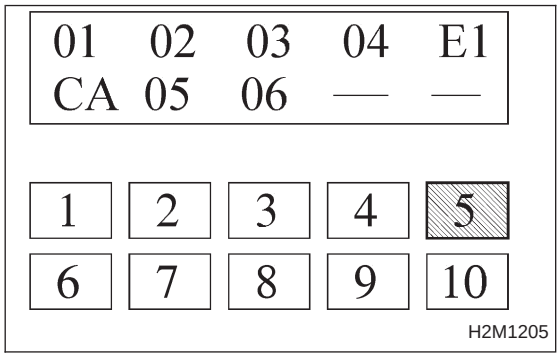


CONFIRMATION OF ACTUAL DRIVING PATTERN.

1) Conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to 2-7b [T3D0] and [T3E0].>
2) Connect Subaru select monitor to its data link connector.
3) Start and warm-up the engine until the radiator fan makes one complete rotation. (All accessory switches are OFF.)
4) Turn Subaru select monitor switch to ON.

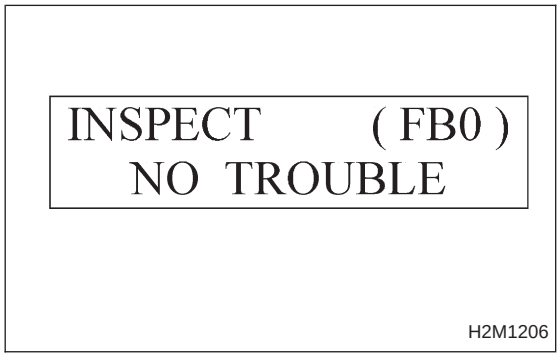


5) Designate mode using function key.
Function mode: FA4



6) Drive at 88±5 km/h (55±3 MPH) until the LED No. 5 comes on.

NOTE:
Keep the throttle valve opening at the same degree, since diagnosis will be interrupted when the opening varies.
Diagnosis starts in 190 seconds after starting engine and takes 4 seconds.
Put the gear to “D” range for the diagnosis.



7) Designate mode using function key.
Function mode: FB0
8) Confirm the “No trouble” indication on Subaru select monitor.

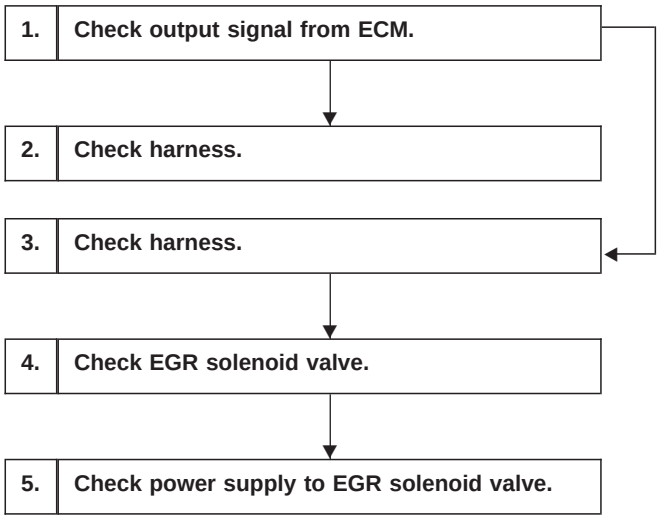
AC: DTC P0403 — EXHAUST GAS RECIRCULATION CIRCUIT MALFUNCTION (EGRSOL) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

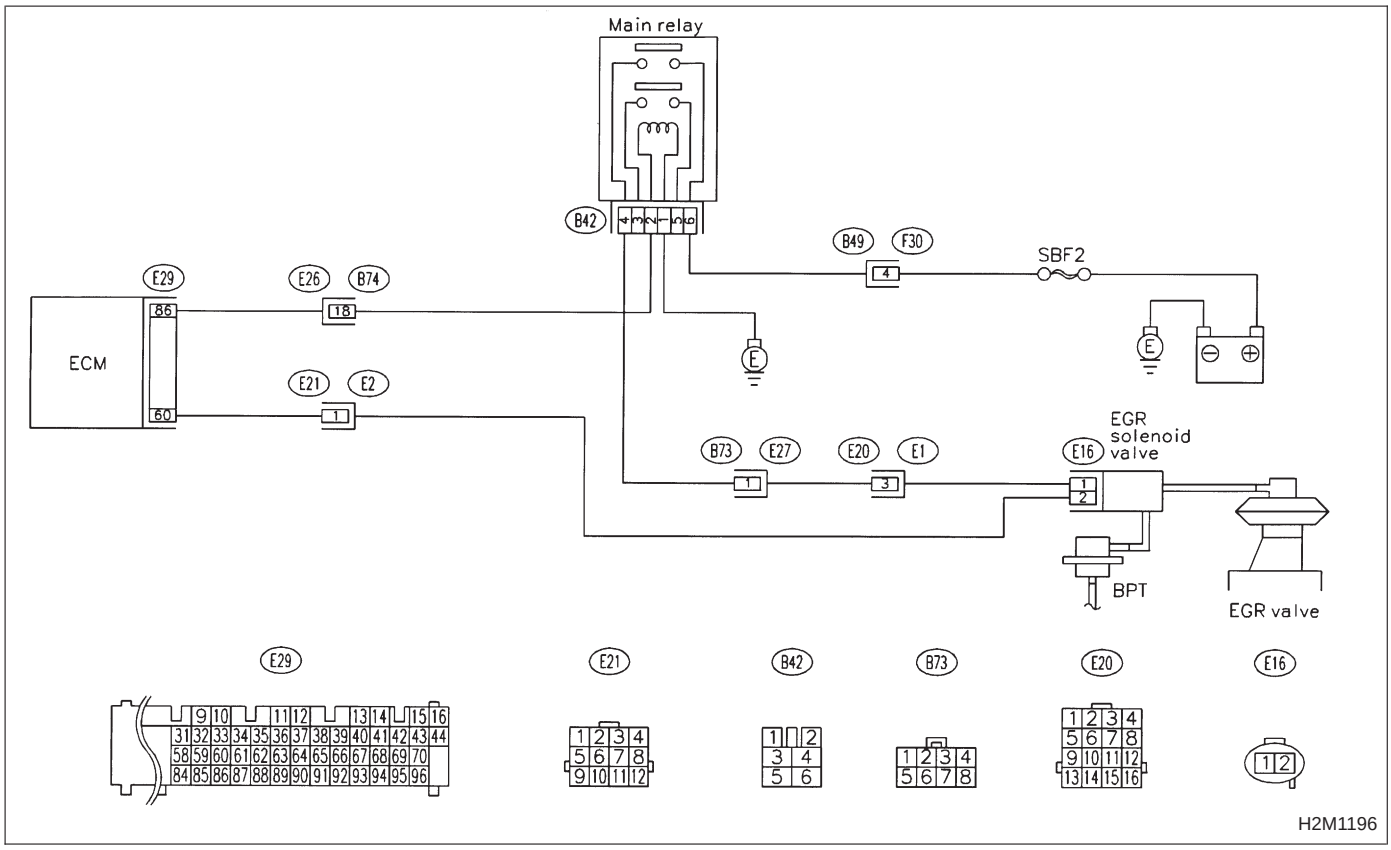
TROUBLE SYMPTOM:

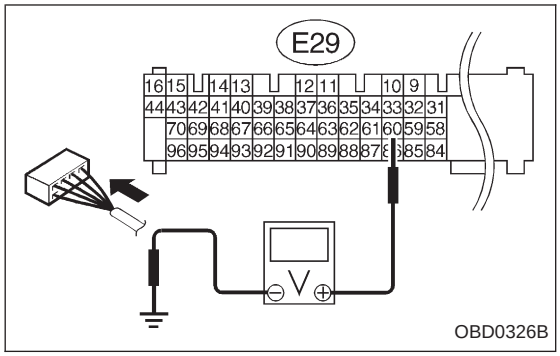
- Poor driving performance on low engine speed



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:





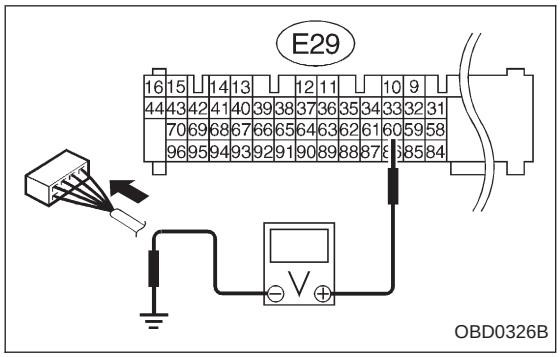
1	CHECK OUTPUT SIGNAL FROM ECM.

1) Turn ignition switch to ON.
2) Measure signal voltage between ECM and body.

CHECK ***: Connector & terminal (E29) No. 60 — Body / 10 V, or more***

YES : Go to step 2.

NO : Go to step 3.



2	CHECK HARNESS.

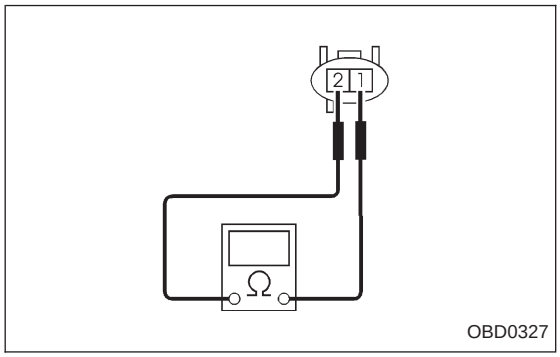
1) Turn ignition switch to OFF.
2) Disconnect connector from EGR solenoid valve.
3) Turn ignition switch to ON.
4) Measure voltage between ECM and body.

CHECK ***: Connector & terminal (E29) No. 60 — Body / 10 V, or more***

YES : Repair short circuit of harness and replace ECM.

NOTE:
The harness between ECM and EGR solenoid valve is in short circuit.

NO : Go to next step.



5) Turn ignition switch to OFF.
6) Measure resistance between EGR solenoid valve terminals.

CHECK ***: Terminals No. 1 — No. 2/1 Ω, or less***

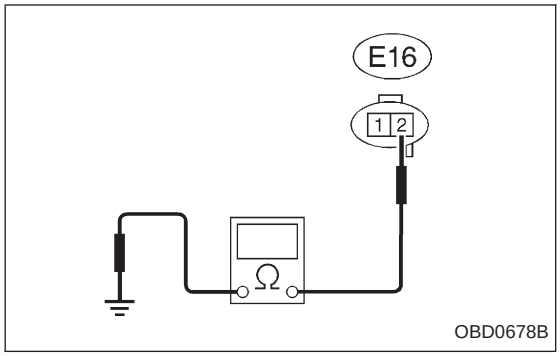
YES : Replace EGR solenoid valve and ECM.

NO : Go to next CHECK .

CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Replace ECM.



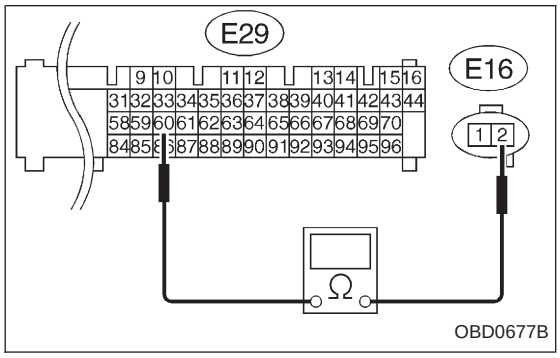
3	CHECK HARNESS.

1) Turn ignition switch to OFF.
2) Disconnect connectors from EGR solenoid valve and ECM.
3) Measure resistance of harness connector between EGR solenoid valve and body.

CHECK : ***Connector & terminal***
(E16) No. 2 — Body / 10 Ω, or less

YES : Repair short circuit of harness between ECM connector and EGR solenoid valve connector.

NO : Go to the next step.

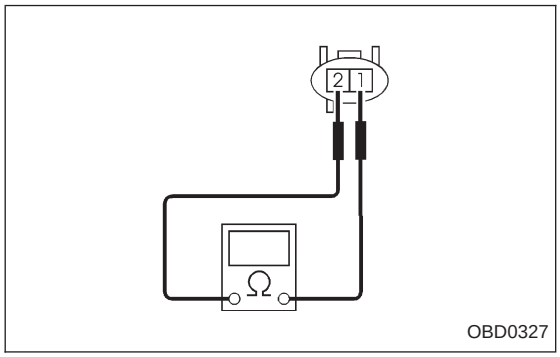


4) Measure resistance of harness connector between ECM and EGR solenoid valve.

CHECK : ***Connector & terminal***
(E29) No. 60 — (E16) No. 2 / 1 Ω, or less

YES : Go to step 4.

NO : Repair open circuit of harness between ECM connector and EGR solenoid valve connector.



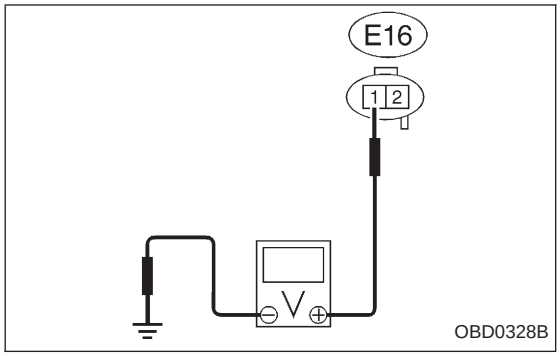
4	CHECK EGR SOLENOID VALVE.

Measure resistance between connector terminals of EGR solenoid valve.

CHECK : ***Terminals***
No. 1 — No. 2 / 10 — 100 Ω

YES : Go to step 5.

NO : Replace EGR solenoid valve.



5	CHECK POWER SUPPLY TO EGR SOLENOID VALVE.

1) Turn ignition switch to ON.
2) Measure voltage between EGR solenoid valve harness connector and body.

CHECK ***: Connector & terminal (E16) No. 1 — Body / 10 V, or more***

YES : Confirm good connection at EGR solenoid valve connector.

NO : Repair open circuit of harness between main relay connector and EGR solenoid valve connector.

AD: DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (CAT) —

DTC DETECTING CONDITION:

- Immediately at fault recognition

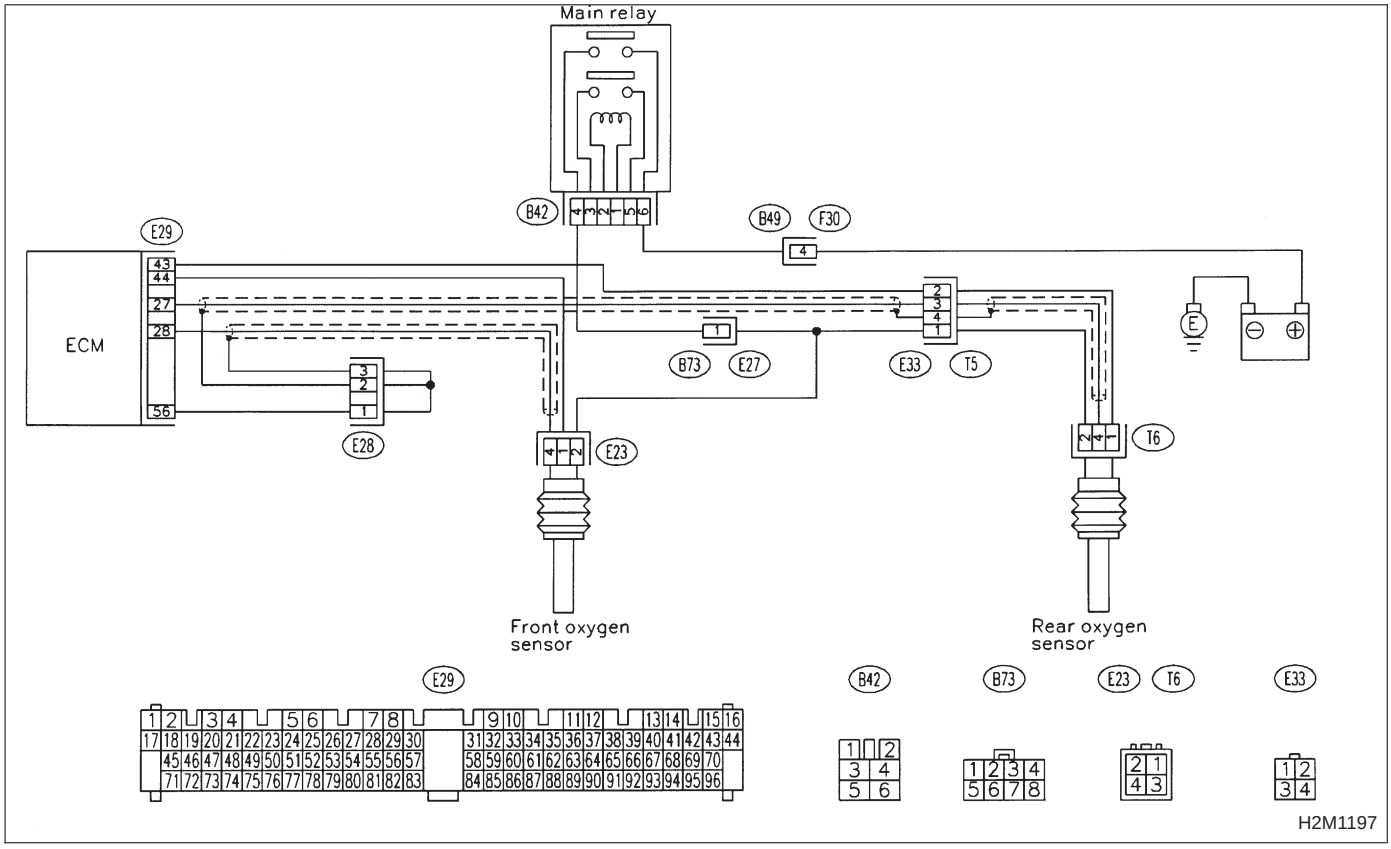
TROUBLE SYMPTOM:

- Engine stalls.
- Idle mixture is out of specifications.

1.	**Check any other DTC P0130, P0133, P0135, P0136, P0139 and P0141 on display.**
2.	**Check exhaust system.**
3.	**Check rear catalytic converter.**

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



1	CHECK ANY OTHER DTC P0130, P0133, P0135, P0136, P0139 AND P0141 ON DISPLAY.

CHECK : ***Check that Subaru Select Monitor or the OBD-II general scan tool shows P0130, P0133, P0135, P0136, P0139 and P0141.***

YES : Inspect the relevant DTC using “10. Diagnostics Chart with Trouble Code, 2-7b [T1000]”. Inspection of P0420 is not necessary after above.

NO : Go to step 2.

2	CHECK EXHAUST SYSTEM.

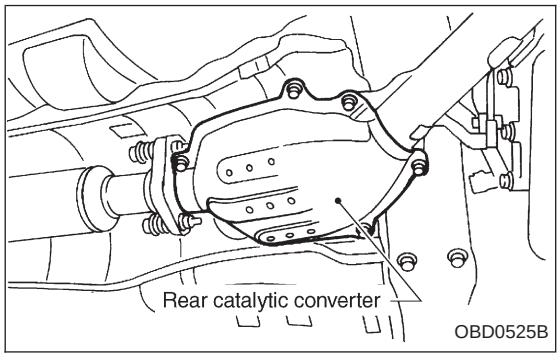
Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes.

CHECK : ***Check the following position of exhaust system.***

- ***Between cylinder head and front exhaust pipe.***
- ***Between front exhaust pipe and front catalytic converter.***
- ***Between front catalytic converter and rear catalytic converter.***

YES : Repair or replace exhaust system.

NO : Go to step 3.



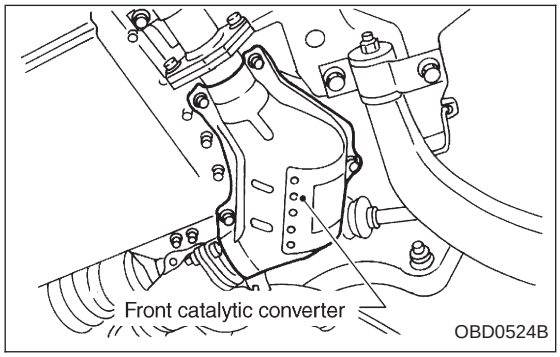
3	CHECK REAR CATALYTIC CONVERTER.

1) Separate rear catalytic converter from rear exhaust pipe.

CHECK : ***Is there damage at rear face of rear catalyst?***

YES : Replace front and rear catalytic converters.

NO : Go to next step.



2) Remove front catalytic converter.

CHECK : ***Is there damage at rear face or front face of front catalyst?***

If there is damage in front catalyst, replace front catalytic converter.

AE: DTC P0441 — EVAPORATIVE EMISSION CONTROL SYSTEM INCORRECT PURGE FLOW (CPC – F) —

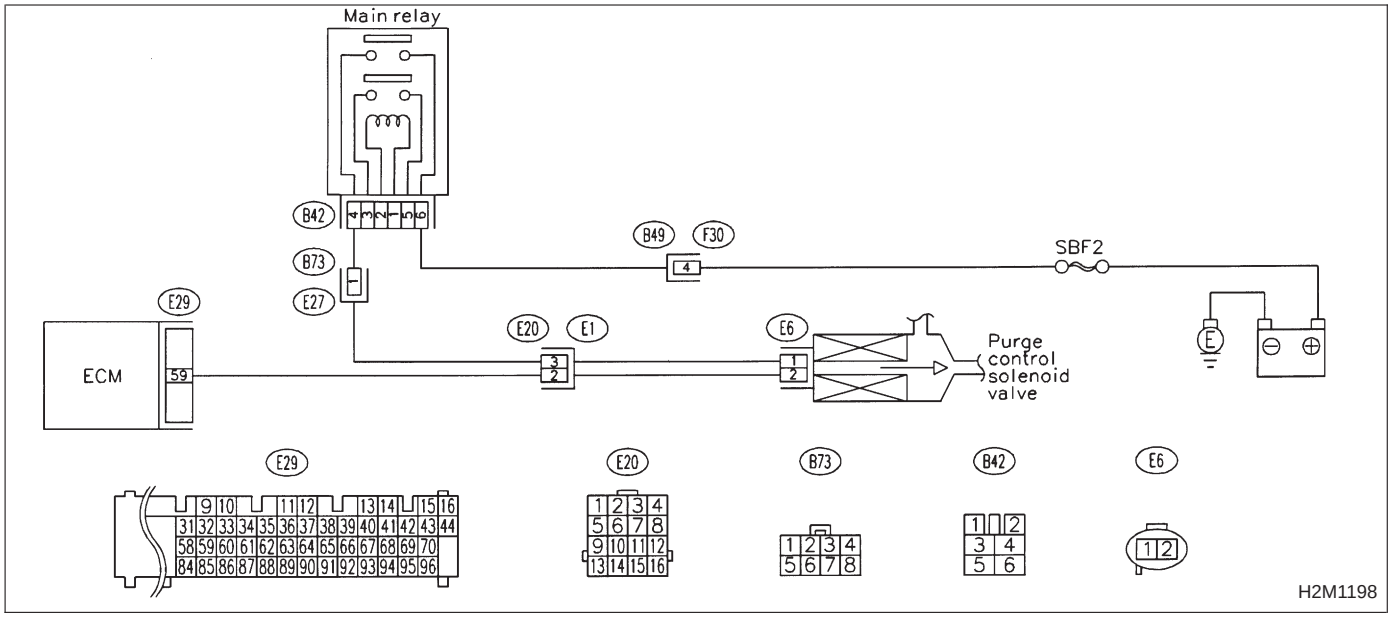
DTC DETECTING CONDITION:

- Two consecutive trips with fault

1.	**Check any other DTC P0105, P0106, P0443 and P1102 on display.**	● Inspect P0105, P0106, P0443 and P1102 using "10. Diagnostics Chart with Trouble Code, 2-7b [T1000]". ● It is unnecessary to inspect DTC P0441.
2.	**Check purge control solenoid valve operation.**	

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:

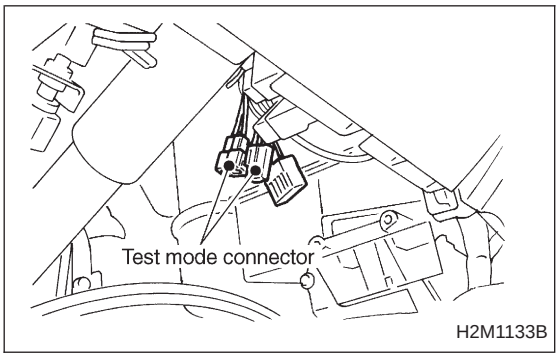


1	CHECK ANY OTHER DTC P0105, P0106, P0443 AND P1102 ON DISPLAY.

CHECK : ***Check that Subaru select monitor or the OBD-II general scan tool shows P0105, P0106, P0443 and P1102.***

YES : Inspect the relevant DTC using “10. Diagnostics Chart with Trouble Code, 2-7b [T1000]”.

NO : Go to step 2.



2	CHECK PURGE CONTROL SOLENOID VALVE OPERATION.

1) Turn ignition switch to OFF.
2) Connect 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 ignition switch to ON.

CHECK : ***Make sure that the ON/OFF operating sound of purge control solenoid valve occurs at about 0.3 Hz.***

YES : Go to next step.

NO : Replace purge control solenoid valve.

4) Disconnect canister purge hose from canister.

CHECK : ***Blow through the canister purge hose to check if pulsations occur.***

YES : Check and repair loose connections, cracks, and clogging in evaporation line.

NO : Replace purge control solenoid valve.

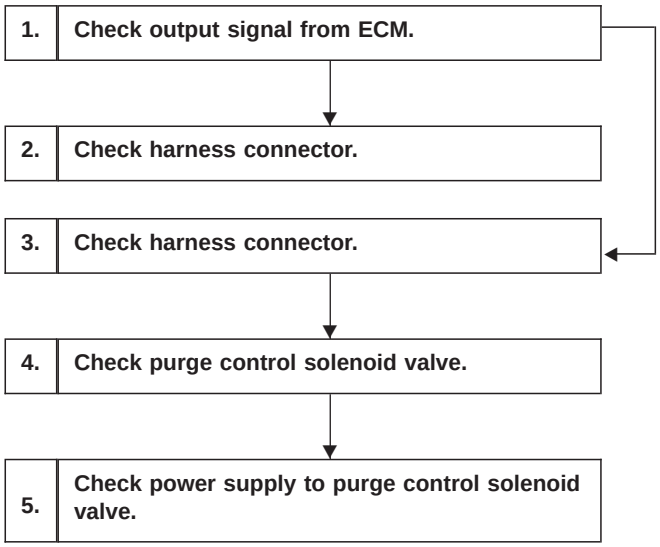
AF: DTC P0443 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT MALFUNCTION (CPC) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

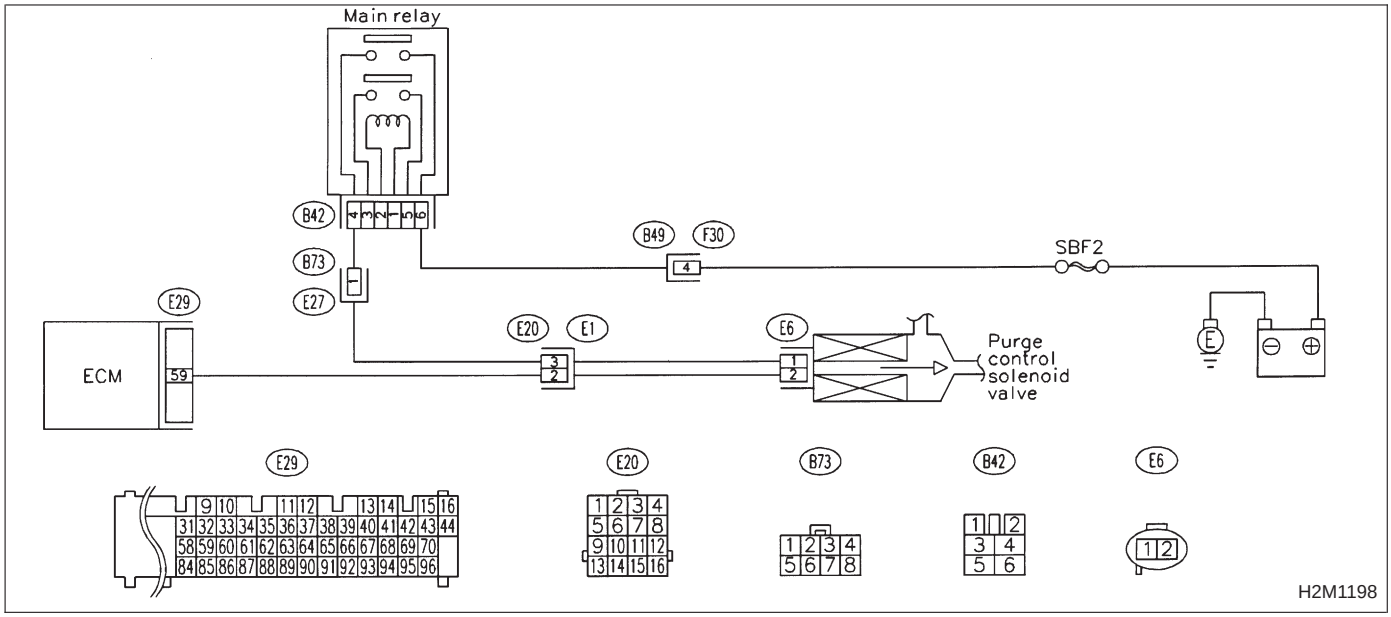
TROUBLE SYMPTOM:

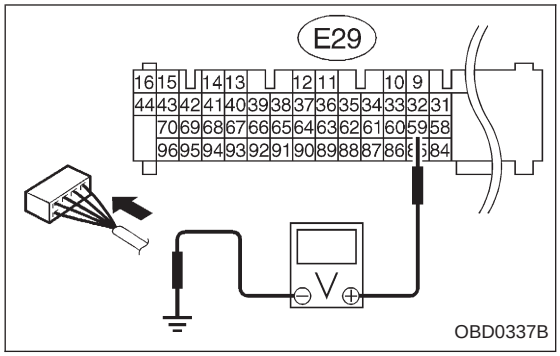
- Erroneous idling



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:





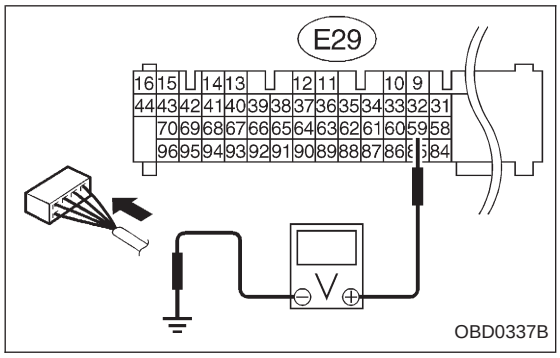
1	CHECK OUTPUT SIGNAL FROM ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM connector terminal and body.

CHECK ***: Connector & terminal***
(E29) No. 59 — Body / 10 V, or more

YES : Go to step 2.

NO : Go to step 3.



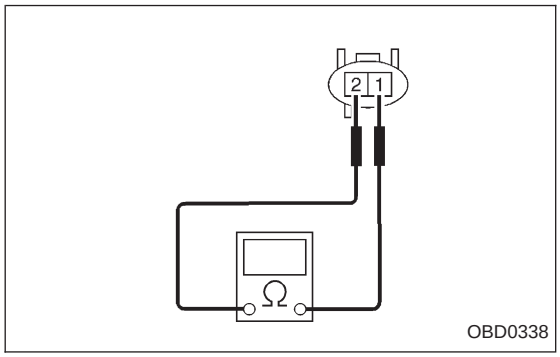
2	CHECK HARNESS CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from purge control solenoid valve.
3) Turn ignition switch to ON.
4) Measure voltage between ECM connector and body.

CHECK ***: Connector & terminal***
(E29) No. 59 — Body / 10 V, or more

YES : Repair short circuit of harness between ECM connector and purge control solenoid valve connector.

NO : Go to next step.



5) Turn ignition switch to OFF.
6) Measure resistance between purge control solenoid valve terminals.

CHECK ***: Terminals***
No. 1 — No. 2/1 Ω, or less

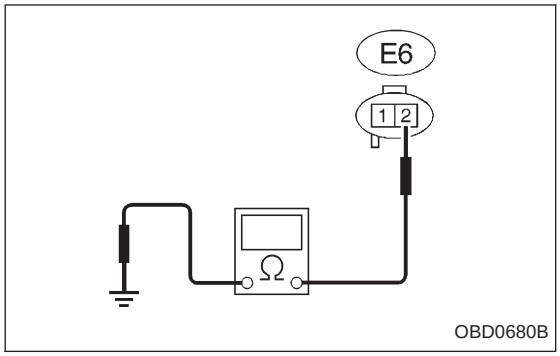
YES : Replace purge control solenoid valve and ECM.

NO : Go to next CHECK .

CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Replace ECM.



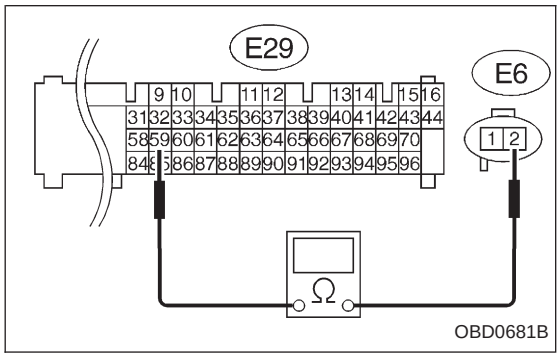
3	CHECK HARNESS CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connectors from purge control solenoid valve and ECM.
3) Measure resistance between purge control solenoid valve connector and body.

CHECK : ***Connector & terminal***
(E6) No. 2 — Body / 10 Ω, or less

YES : Repair short circuit of harness between ECM connector and purge control solenoid valve connector.

NO : Go to next step.

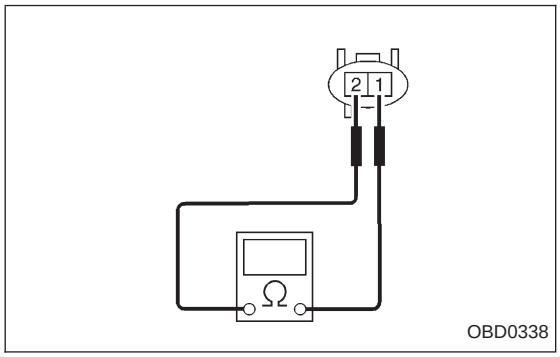


4) Measure resistance between ECM and purge control solenoid valve of harness connector.

CHECK : ***Connector & terminal***
(E29) No. 59 — (E6) No. 2 / 1 Ω, or less

YES : Go to step 4.

NO : Repair open circuit of harness between ECM connector and purge control solenoid valve connector.



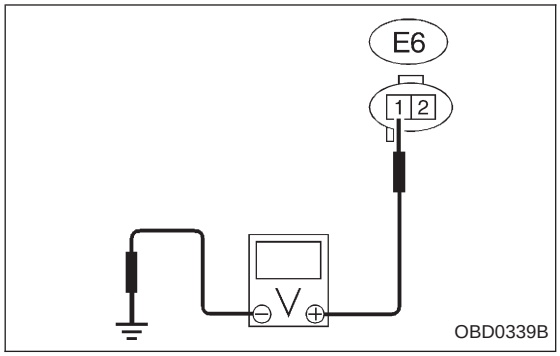
4	CHECK PURGE CONTROL SOLENOID VALVE.

1) Remove purge control solenoid valve.
2) Measure resistance between purge control solenoid valve terminals.

CHECK : ***Terminals***
No. 1 — No. 2 / 10 — 100 Ω

YES : Go to step 5.

NO : Replace purge control solenoid valve.



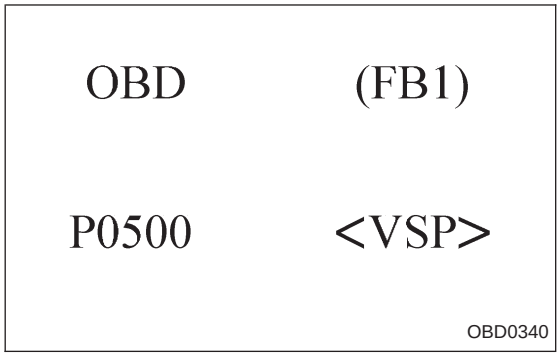
5	CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.

1) Turn ignition switch to ON.
2) Measure voltage between purge control solenoid valve connector and body.

CHECK ***: Connector & terminal (E6) No. 1 — Body / 10 V, or more***

YES : Confirm good connection at purge control solenoid valve connector.

NO : Repair open circuit of harness between main relay connector and purge control solenoid valve connector.



AG: DTC P0500 — VEHICLE SPEED SENSOR MALFUNCTION (VSP) —

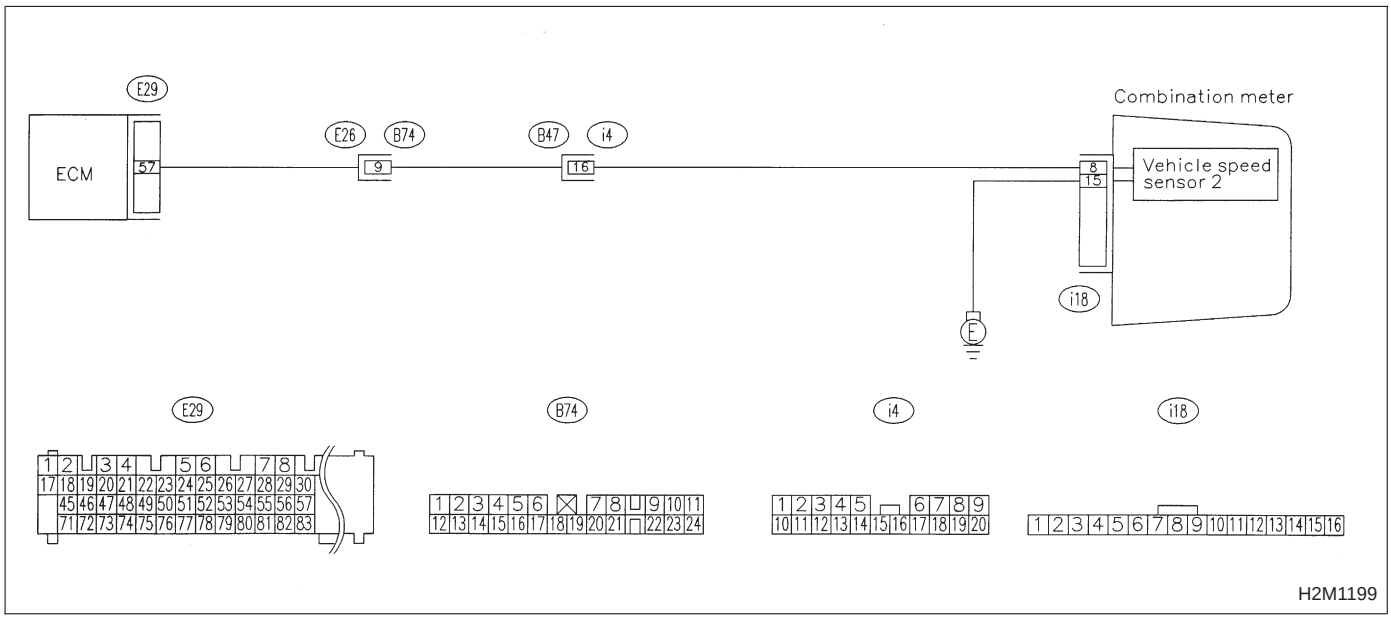
DTC DETECTING CONDITION:

- Immediately at fault recognition

1.	**Check speedometer operation in combination meter.**
2.	**Check harness connector.**
3.	**Check harness connector.**

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:

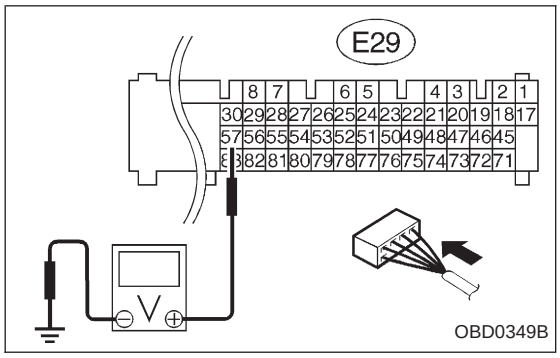


1	CHECK SPEEDOMETER OPERATION IN COMBINATION METER.

CHECK ***: Check normal operation of speedometer.***

YES : Go to step 2.

NO : Check speedometer and vehicle speed sensor <Ref. to 6-2 [K2A0].>.



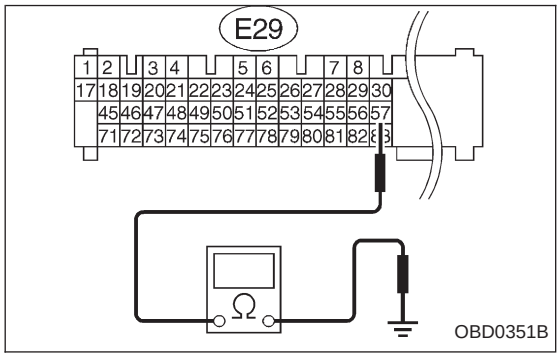
2	CHECK HARNESS CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from TCM.
3) Turn ignition switch to ON.
4) Measure voltage between ECM and body.

CHECK ***: Connector & terminal (E29) No. 57 — Body / 2 V, or more***

YES : Check the following and repair if necessary.
- Open circuit of harness between ECM connector and combination meter connector
- Poor contact in ECM connector
- Poor contact in combination meter connector
- Poor contact in coupling connectors (B74) and (i4)

NO : Go to step 3.



3	CHECK HARNESS CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Measure resistance of harness between ECM connector and body.

CHECK ***: Connector & terminal (E29) No. 57 — Body / 10 Ω, or less***

YES : Repair short circuit of harness between ECM connector and combination meter connector.

NO : Repair poor contact in ECM connector.

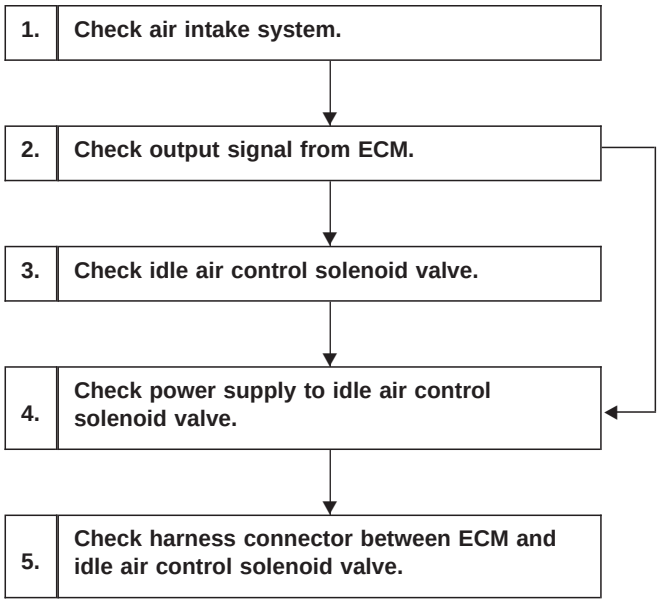
AH: DTC P0505 — IDLE CONTROL SYSTEM MALFUNCTION (ISC) —

DTC DETECTING CONDITION:

- Immediately at fault recognition

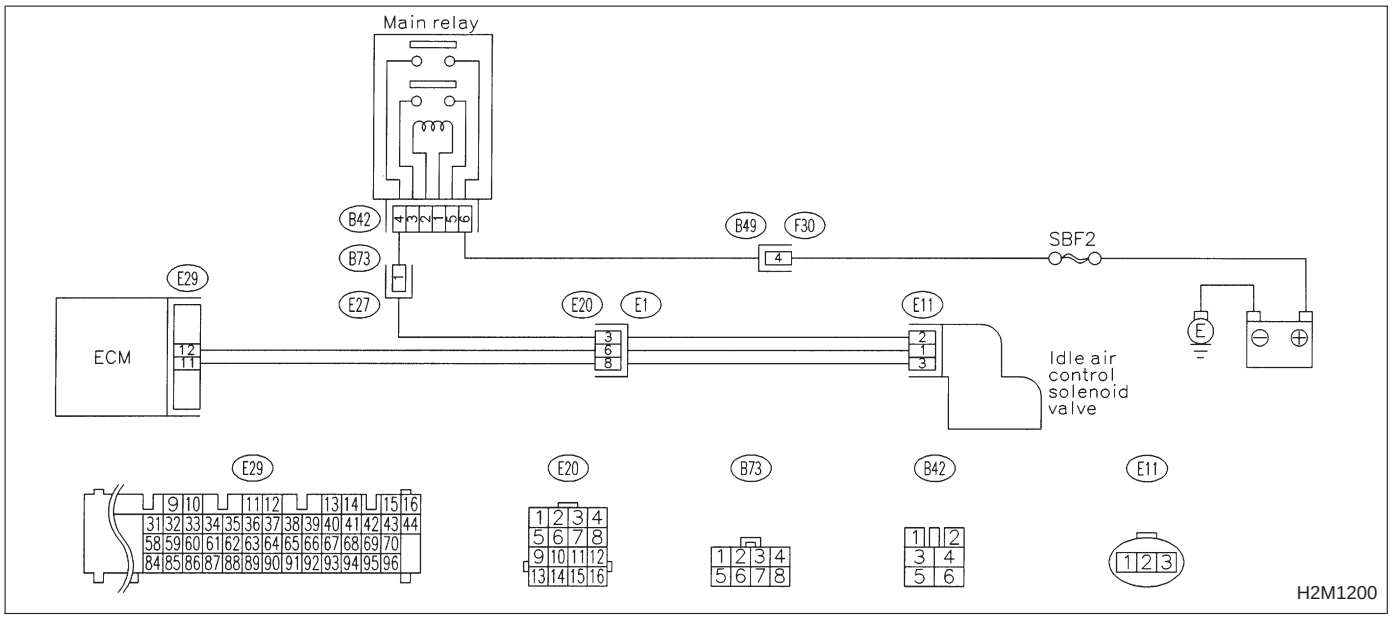
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Engine breathing



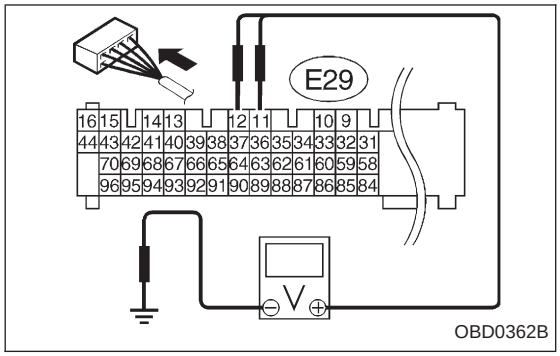
CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



1	CHECK AIR INTAKE SYSTEM.

1) Turn ignition switch to ON.
2) Start engine, and idle it.
3) Check intake manifold, idle air control solenoid valve and throttle body for loose installation and gasket for cracks.
4) Check by-pass hoses for loose connections and cracks.
5) Check vacuum hoses for disconnections.



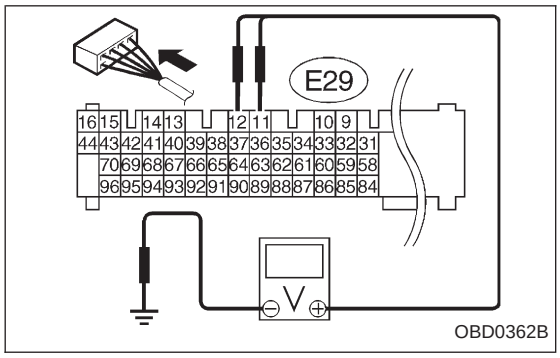
2	CHECK OUTPUT SIGNAL FROM ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and body.

CHECK : ***Connector & terminal***
(E29) No. 11 — Body / 3 V, or more
(E29) No. 12 — Body / 3 V, or more

YES : Go to the next step.

NO : Go to step 4.



3) Turn ignition switch to OFF.
4) Disconnect connector from idle air control solenoid valve.
5) Turn ignition switch to ON.
6) Measure voltage between ECM and body.

CHECK : ***Connector & terminal***
(E29) No. 11 — Body / 10 V, or more
(E29) No. 12 — Body / 10 V, or more

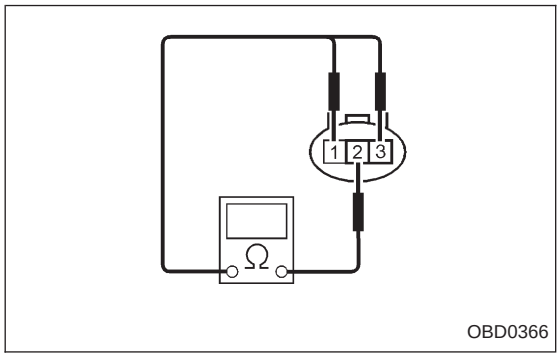
YES : Repair short circuit of harness and replace ECM.

NO : Go to next CHECK .

CHECK : ***Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Go to step 3.



3	CHECK IDLE AIR CONTROL SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Measure resistance between solenoid valve terminals.

CHECK : ***Terminals***
No. 1 — No. 2 / 20 Ω, or more
No. 2 — No. 3 / 20 Ω, or more

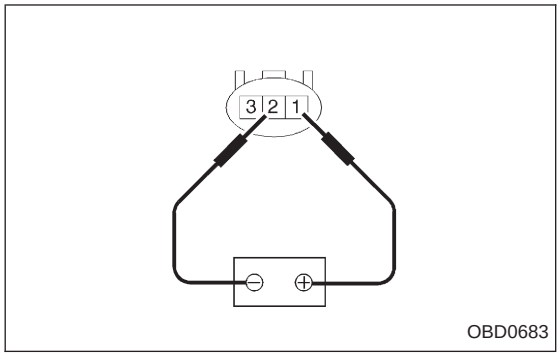
YES : Replace idle air control solenoid valve.

NO : Go to next CHECK .

CHECK : ***Terminals***
No. 1 — No. 2 / 5 Ω, or less
No. 2 — No. 3 / 5 Ω, or less

YES : Replace idle air control solenoid valve and ECM.

NO : Go to next step.

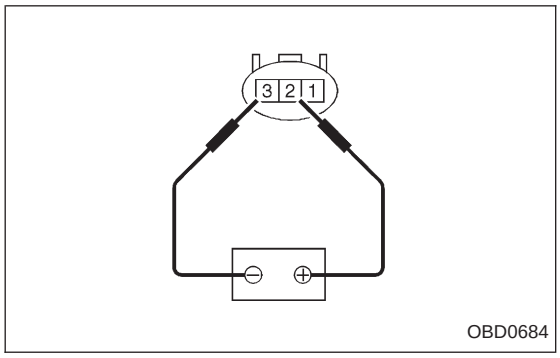


3) Remove idle air control solenoid valve. <Ref. to 2-7b [W12A0].>
4) Check operation of idle air control solenoid valve.

CHECK : ***When connecting the battery to terminals No. 1 and No. 2 of idle air control solenoid valve, check if it is fully opened.***

YES : Go to next CHECK .

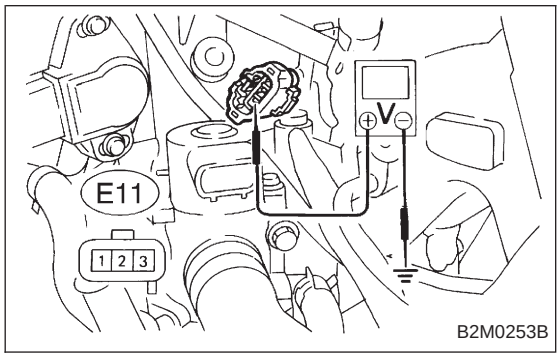
NO : Clean idle air control solenoid valve. <Ref. to 2-7b [W12B0].>



CHECK : ***When connecting the battery to terminals No. 3 and No. 2 of idle air control solenoid valve, check if it is fully closed.***

YES : Go to step 4.

NO : Clean idle air control solenoid valve. <Ref. to 2-7b [W12B0].>



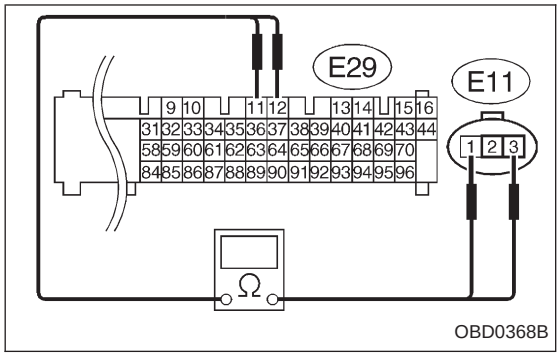
4	CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Disconnect connector from idle air control solenoid valve.
3) Turn ignition switch to ON.
4) Measure voltage between idle air control solenoid valve and body.

CHECK : ***Connector & terminal (E11) No. 2 — Body / 10 V, or more***

YES : Go to step 5.

NO : Repair open circuit of harness between idle air control solenoid valve connector and ECM connector.



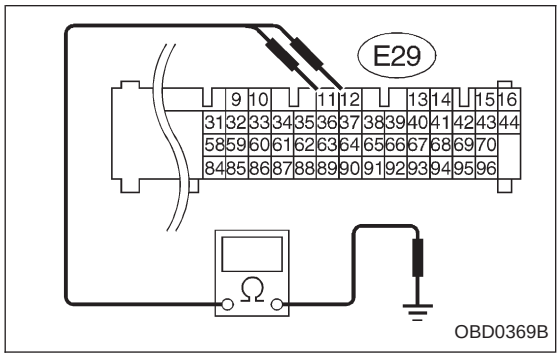
5	CHECK HARNESS CONNECTOR BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Measure resistance of harness connector between ECM and idle air control solenoid valve.

CHECK ***: Connector & terminal***
(E29) No. 11 — (E11) No. 3 / 1 Ω, or less
(E29) No. 12 — (E11) No. 1 / 1 Ω, or less

YES : Go to the next step.

NO : Repair open circuit of harness between ECM connector and idle air control solenoid valve connector.



4) Measure resistance of harness connector between ECM and body to make sure that circuit does not short.

CHECK ***: Connector & terminal***
(E29) No. 11 — Body / 1 MΩ, or more
(E29) No. 12 — Body / 1 MΩ, or more

YES : Confirm good condition in connectors of idle air control solenoid valve circuit.

NO : Repair short circuit of harness between ECM connector and idle air control solenoid valve connector.

AI: DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED (ISC – L) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

TROUBLE SYMPTOM:

- Engine is difficult to start.
- Engine does not start.
- Erroneous idling
- Engine stalls.

1.	Check DTC P0505 on display.	Yes	• Inspect DTC P0505 using “10. Diagnostics Chart with Trouble Code, 2-7b [T1000]”. • In this case, it is unnecessary to inspect DTC P0506.
		No	
2.	**Check air intake system.**		

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

2	CHECK AIR INTAKE SYSTEM.

1) Turn ignition switch to ON.
2) Start engine, and idle it.

CHECK ***: Is clogging the by-pass line between by-pass hose and intake duct?***

YES : Repair the by-pass line.

NO : Replace idle air control solenoid valve.

AJ: DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED (ISC – H) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

TROUBLE SYMPTOM:

- Engine keeps running at higher revolution than specified idling revolution.

1.	Check DTC P0505 on display.	Yes →	• Inspect DTC P0505 using “10. Diagnostics Chart with Trouble Code, 2-7b [T1000]”. • In this case, it is unnecessary to inspect DTC P0507.
	No ↓		
2.	**Check air intake system.**		

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

2	CHECK AIR INTAKE SYSTEM.

1) Turn ignition switch to ON.
2) Start engine, and idle it.

CHECK : ● ***Check intake manifold, idle air control solenoid valve and throttle body for loose installation and gasket for cracks.***
● ***Check by-pass hose for loose connection and cracks.***
● ***Check vacuum hoses for disconnections.***

YES : Repair air suction and leaks.

NO : Replace idle air control solenoid valve.

AK: DTC P0600 — SERIAL COMMUNICATION LINK MALFUNCTION —

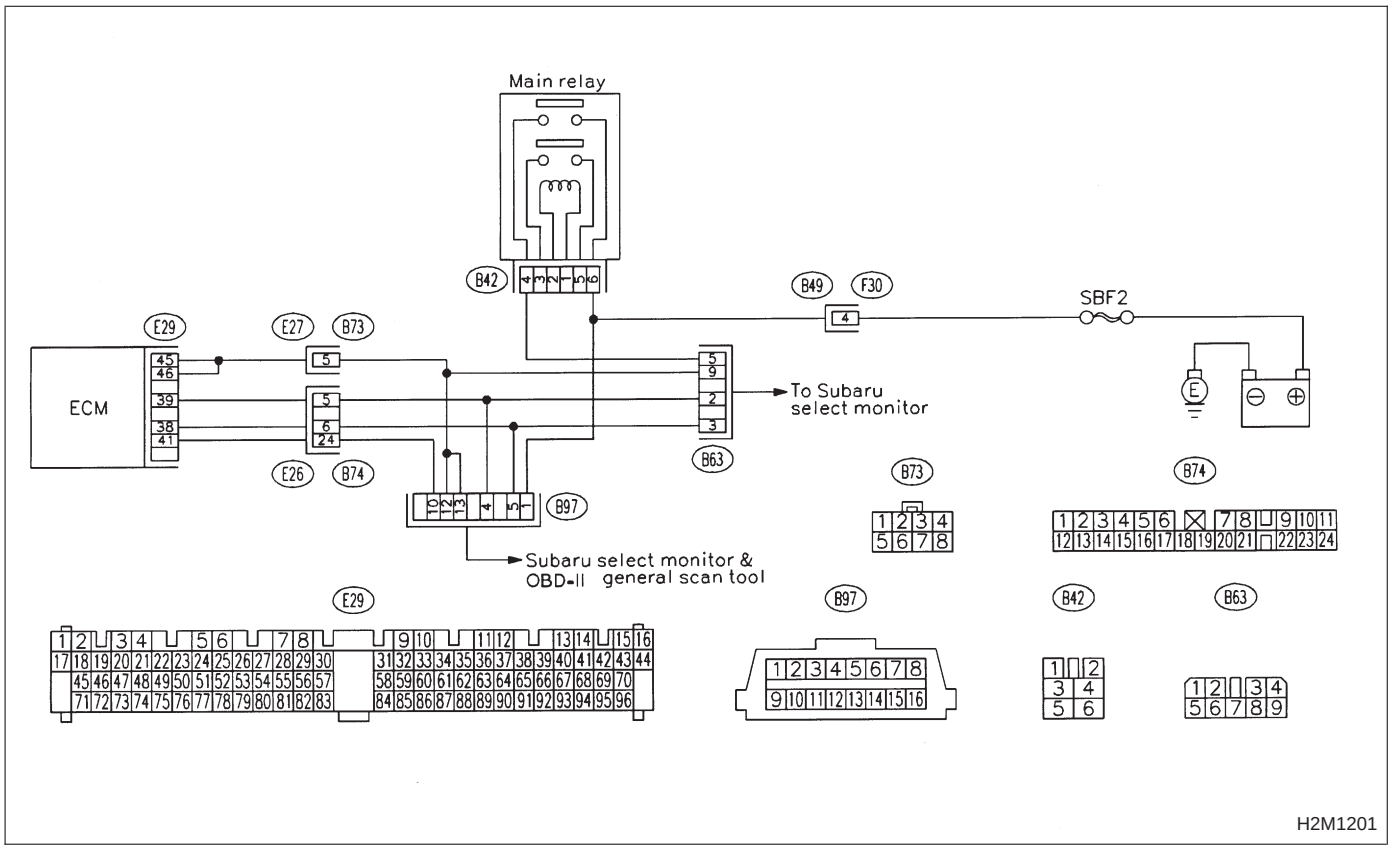
DTC DETECTING CONDITION:

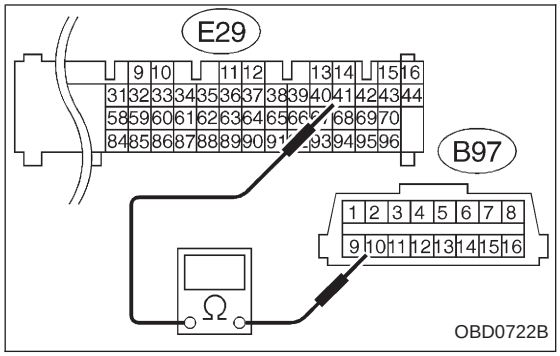
- Two consecutive trips with fault

1.	Check harness connector.

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:





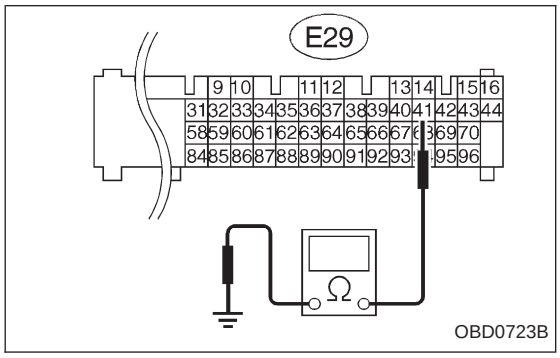
1	CHECK HARNESS CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Measure resistance of harness connector between ECM and data link connector (for OBD-II general scan tool).

CHECK ***: Connector & terminal***
(E29) No. 41 — (B97) No. 10 / 1 Ω, or less

YES : Go to the next step.

NO : Repair open circuit of harness between ECM connector and data link connector.



4) Measure resistance between ECM harness connector and body.

CHECK ***: Connector & terminal***
(E29) No. 41 — Body / 10 Ω, or less

YES : Repair short circuit of harness between ECM connector and data link connector.

NO : Repair poor contact in ECM connector and data link connector.

AL: DTC P0601 — INTERNAL CONTROL MODULE MEMORY CHECK SUM ERROR (RAM) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

TROUBLE SYMPTOM:

- Engine does not start.
- Engine stalls.

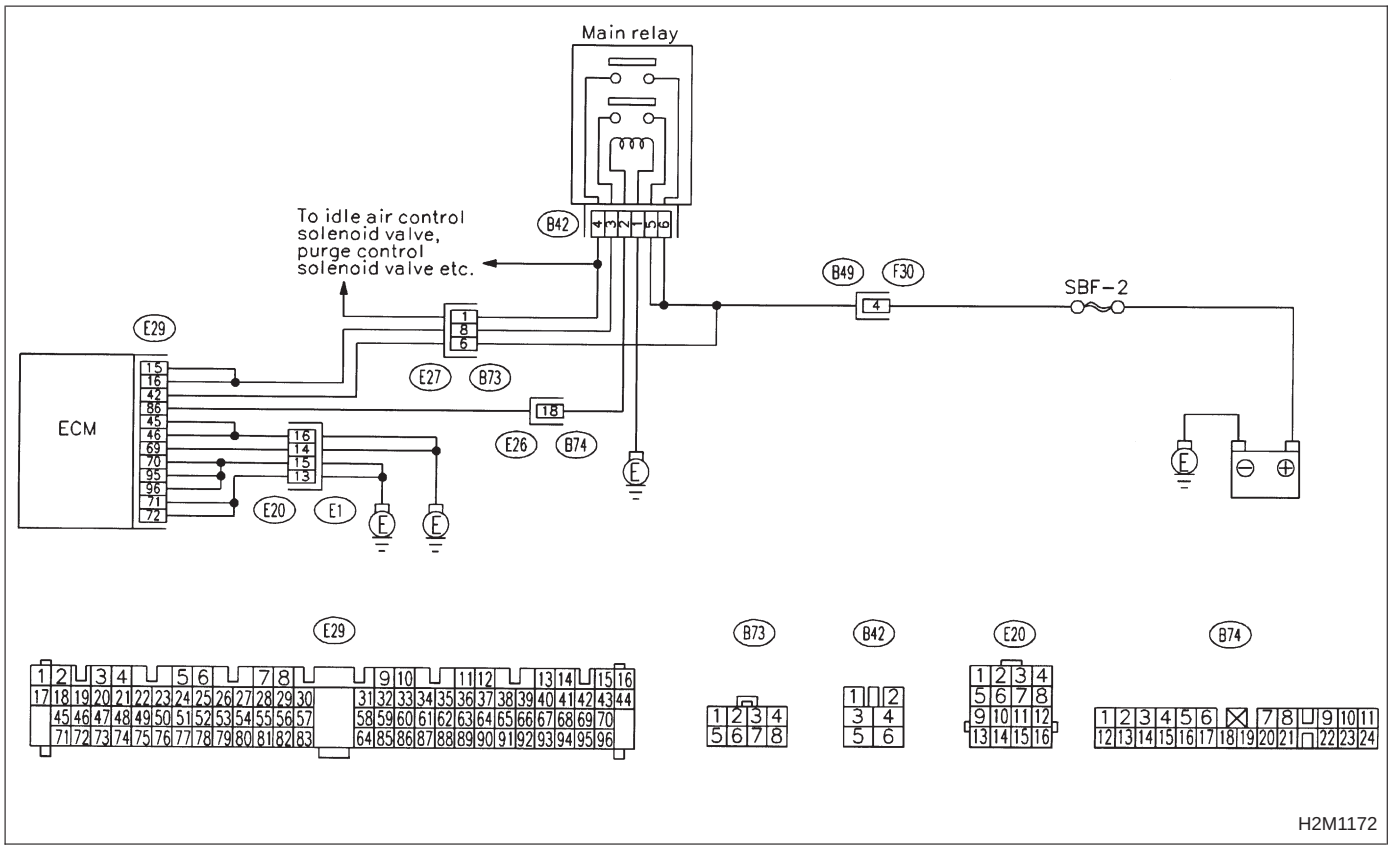
1.	**Check DTC P0601 on display.**

Yes

Replace ECM.

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



1	CHECK DTC P0601 ON DISPLAY.

CHECK : ***Check that DTC P0601 is indicated on Subaru Select Monitor or OBD-II general scan tool.***

YES : Replace ECM.

AM: DTC P0703 — BRAKE SWITCH INPUT MALFUNCTION (BRK) —

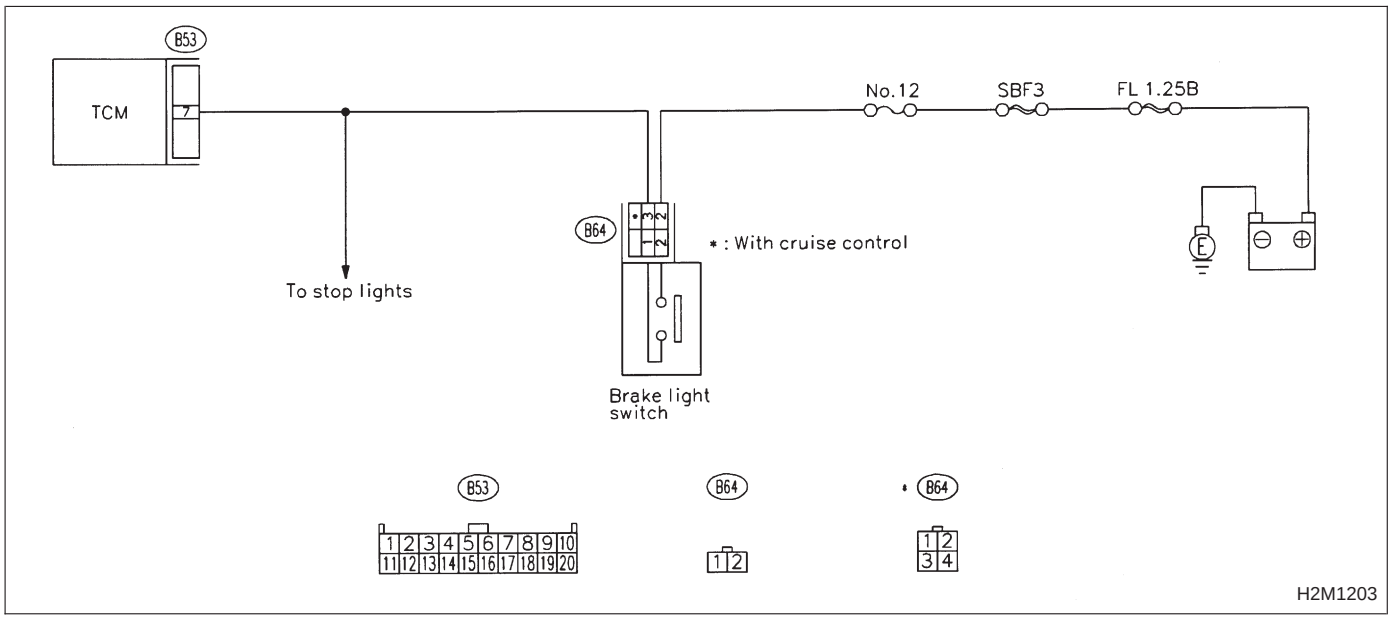
DTC DETECTING CONDITION:

- Two consecutive trips with fault

1.	**Check operation of brake light.**
2.	**Check harness connector between TCM and brake light switch.**
3.	**Check input signal for TCM.**

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:

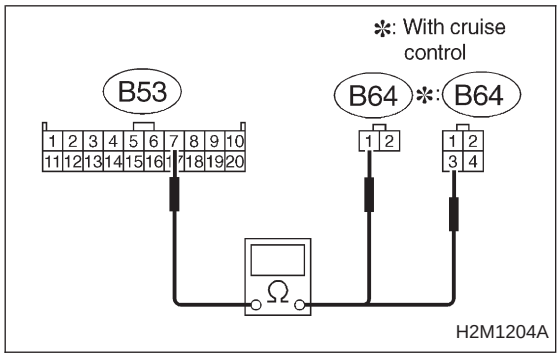


1	CHECK OPERATION OF BRAKE LIGHT.

CHECK : ***Depress brake pedal to ensure that brake light comes on.***

YES : Go to step 2.

NO : Repair or replace brake light circuit.



2	CHECK HARNESS CONNECTOR BETWEEN TCM AND BRAKE LIGHT SWITCH.

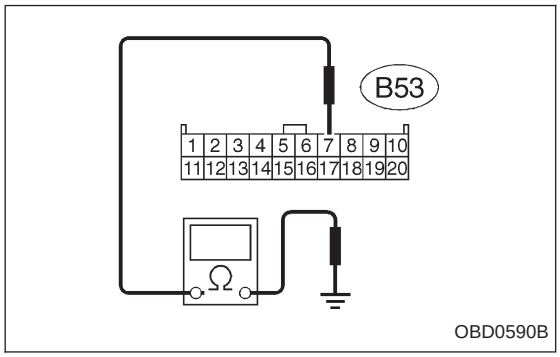
1) Disconnect connectors from TCM and brake light switch.
2) Measure resistance of harness connector between TCM and brake light switch.

CHECK : ***Connector & terminal***
(B53) No. 7 — (B64) No. 1 / 1 Ω, or less
(B53) No. 7 — (B64) No. 3 / 1 Ω, or less
(With cruise control)

YES : Go to next step.

NO : Repair or replace harness and connector.

NOTE:
In this case, there is a possibility of open circuit in the harness between the brake light switch connector and TCM connector.

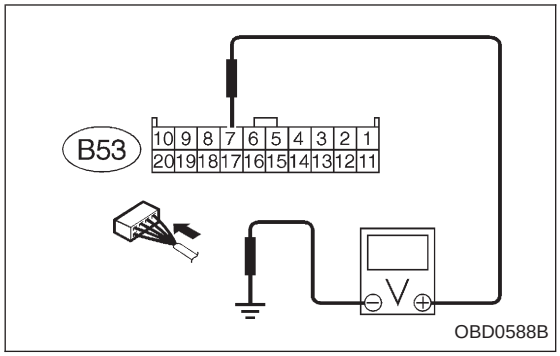


3) Measure resistance of harness connector between TCM and body.

CHECK : ***Connector & terminal***
(B53) No. 7 — Body / 1 MΩ, or more

YES : Go to step 3.

NO : Repair short circuit of harness between TCM connector and body.



3	CHECK INPUT SIGNAL FOR TCM.

1) Connect connectors to TCM and brake light switch.
2) Measure voltage between TCM and body.

CHECK ***: Connector & terminal***
(B53) No. 7 — Body / 1 V, or less [When release the brake pedal.]
(B53) No. 7 — Body / 10 V, or more [When depress the brake pedal.]

YES : Go to next CHECK .

NO : Adjust or replace brake light switch.

CHECK ***: Is there poor contact in TCM connector?***

YES : Repair poor contact in TCM connector.

NO : Replace TCM with a new one.

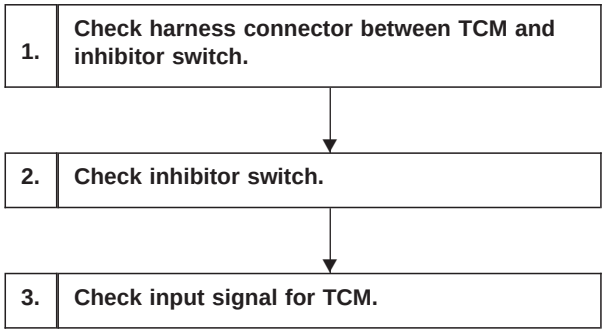
AN: DTC P0705 — TRANSMISSION RANGE SENSOR CIRCUIT MALFUNCTION (RNG) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

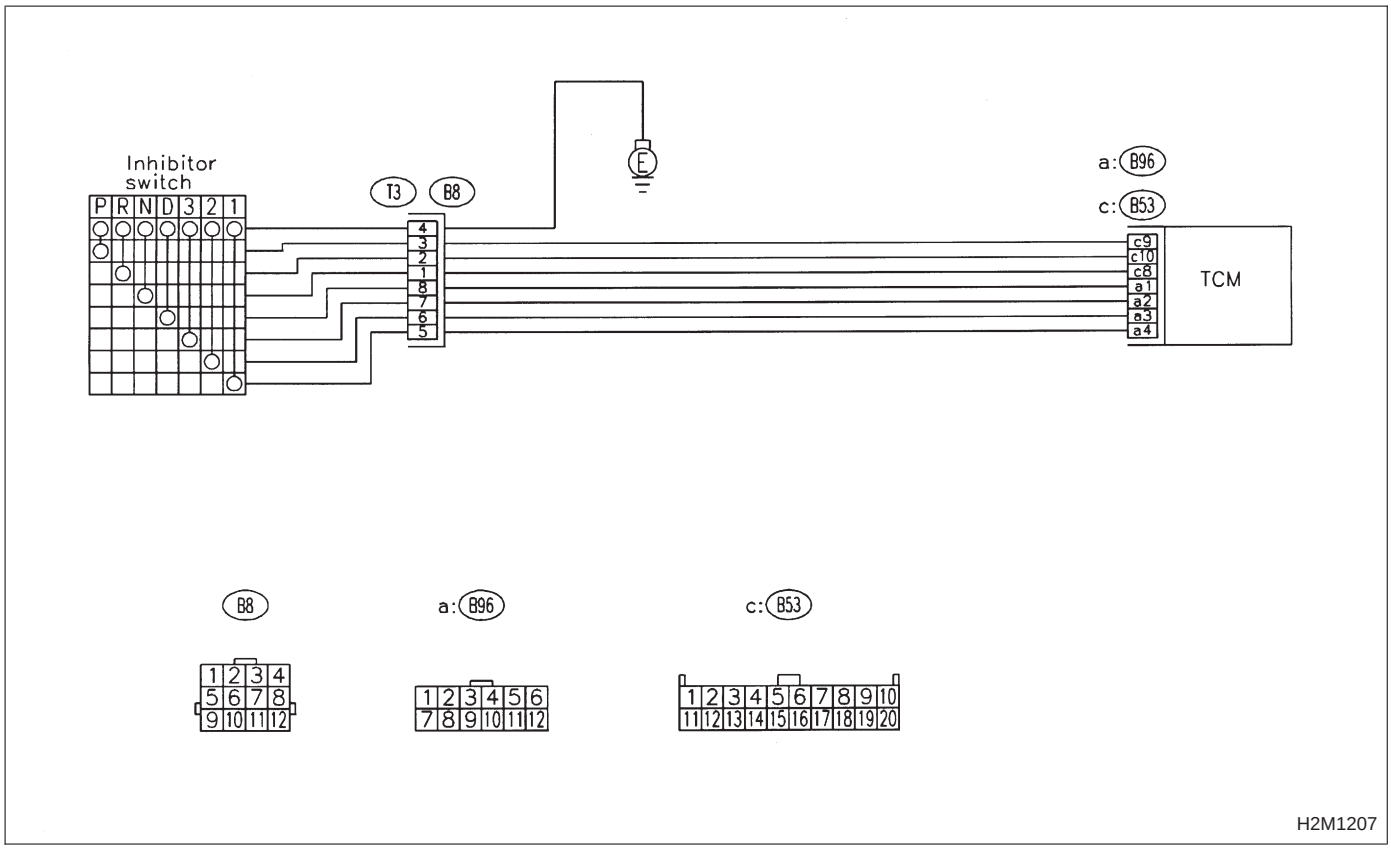
TROUBLE SYMPTOM:

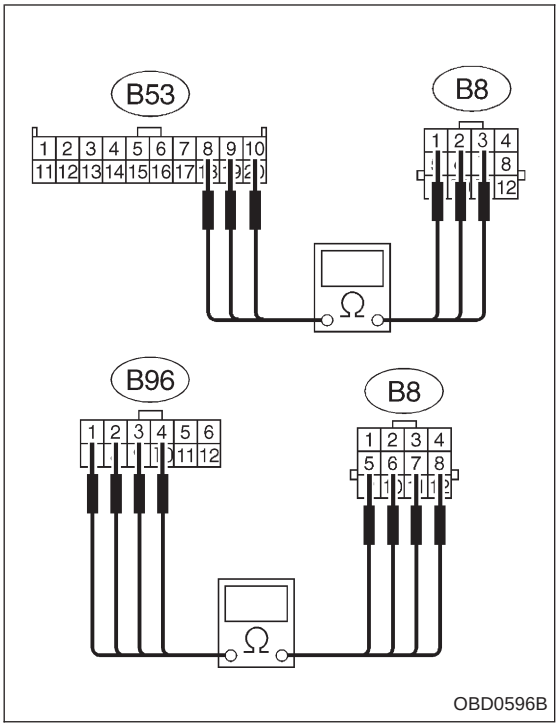
- Starter does not rotate when selector lever is in “P” or “N” range.
- Starter rotates when selector lever is in “R”, “D”, “3”, “2” or “1” range.
- Engine brake is not effected when selector lever is in “3” range.
- Shift characteristics are erroneous.



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:





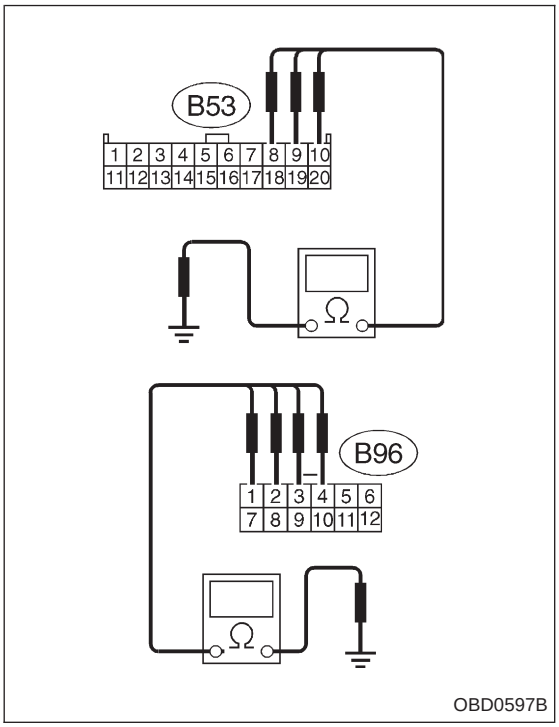
1	CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.

1) Turn ignition switch to OFF.
2) Disconnect connectors from TCM and transmission.
3) Measure resistance of harness connector between TCM and transmission.

CHECK : ***Connector & terminal***
(B53) No. 9 — (B8) No. 3 / 1 Ω, or less
(B53) No. 10 — (B8) No. 2 / 1 Ω, or less
(B53) No. 8 — (B8) No. 1 / 1 Ω, or less
(B96) No. 1 — (B8) No. 8 / 1 Ω, or less
(B96) No. 2 — (B8) No. 7 / 1 Ω, or less
(B96) No. 3 — (B8) No. 6 / 1 Ω, or less
(B96) No. 4 — (B8) No. 5 / 1 Ω, or less

YES : Go to next step.

NO : Repair open circuit of harness between TCM and transmission.

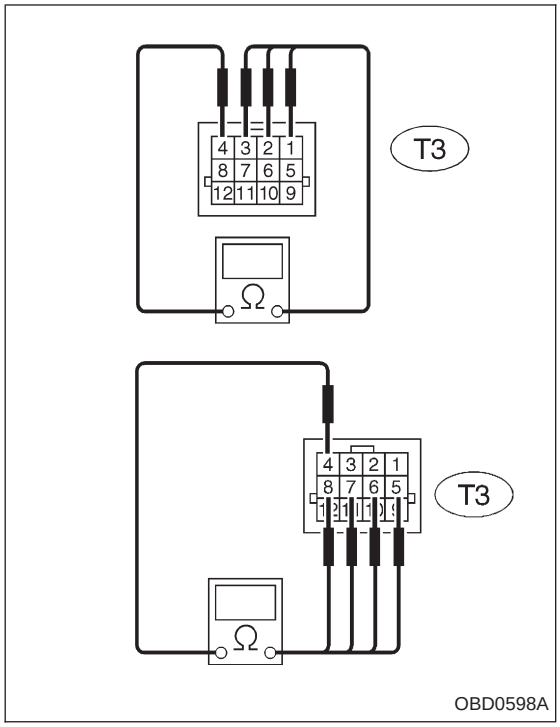


4) Measure resistance of harness connector between TCM and body.

CHECK : ***Connector & terminal***
(B53) No. 9 — Body / 1 MΩ, or more
(B53) No. 10 — Body / 1 MΩ, or more
(B53) No. 8 — Body / 1 MΩ, or more
(B96) No. 1 — Body / 1 MΩ, or more
(B96) No. 2 — Body / 1 MΩ, or more
(B96) No. 3 — Body / 1 MΩ, or more
(B96) No. 4 — Body / 1 MΩ, or more

YES : Go to step 2.

NO : Repair short circuit of harness between TCM and body.

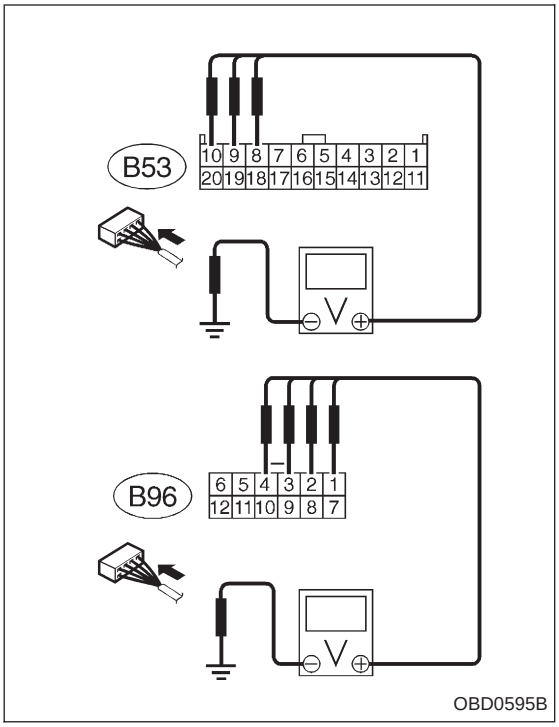


2	CHECK INHIBITOR SWITCH.

Measure resistance between transmission connector receptacle's terminals.

CHECK ***: Connector & terminal***
(T3) No. 3 — No. 4 / 1 Ω, or less ("P" position)
(T3) No. 3 — No. 4 / 1 MΩ, or more (Other positions)
(T3) No. 2 — No. 4 / 1 Ω, or less ("R" position)
(T3) No. 2 — No. 4 / 1 MΩ, or more (Other positions)
(T3) No. 1 — No. 4 / 1 Ω, or less ("N" position)
(T3) No. 1 — No. 4 / 1 MΩ, or more (Other positions)
(T3) No. 8 — No. 4 / 1 Ω, or less ("D" position)
(T3) No. 8 — No. 4 / 1 MΩ, or more (Other positions)
(T3) No. 7 — No. 4 / 1 Ω, or less ("3" position)
(T3) No. 7 — No. 4 / 1 MΩ, or more (Other positions)
(T3) No. 6 — No. 4 / 1 Ω, or less ("2" position)
(T3) No. 6 — No. 4 / 1 MΩ, or more (Other positions)
(T3) No. 5 — No. 4 / 1 Ω, or less ("1" position)
(T3) No. 5 — No. 4 / 1 MΩ, or more (Other positions)

YES : Go to step 3.
NO : Go to next CHECK .
CHECK ***: Is there faulty connection in the selector cable?***
YES : Repair connection of selector cable.
NO : Replace inhibitor switch.



3	CHECK INPUT SIGNAL FOR TCM.

1) Connect connector to TCM and transmission.
2) Turn ignition switch to ON.
3) Measure voltage between TCM and body.

CHECK ***: Connector & terminal***
(B53) No. 9 — Body / 1 V, or less (“P” and “N” positions)
(B53) No. 9 — Body / 8 V, or more (Other positions)
(B53) No. 10 — Body / 1 V, or less (“R” position)
(B53) No. 10 — Body / 6 V, or more (Other positions)
(B53) No. 8 — Body / 1 V, or less (“N” and “P” positions)
(B53) No. 8 — Body / 8 V, or more (Other positions)
(B96) No. 1 — Body / 1 V, or less (“D” position)
(B96) No. 1 — Body / 6 V, or more (Other positions)
(B96) No. 2 — Body / 1 V, or less (“3” position)
(B96) No. 2 — Body / 6 V, or more (Other positions)
(B96) No. 3 — Body / 1 V, or less (“2” position)
(B96) No. 3 — Body / 6 V, or more (Other positions)
(B96) No. 4 — Body / 1 V, or less (“1” position)
(B96) No. 4 — Body / 6 V, or more (Other positions)

YES : Repair poor contact in TCM connector.
NO : Go to next CHECK .
CHECK ***: Is there poor contact in TCM connector?***
YES : Repair poor contact in TCM connector.
NO : Replace TCM with a new one.

AO: DTC P0710 — TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT MALFUNCTION (ATF) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

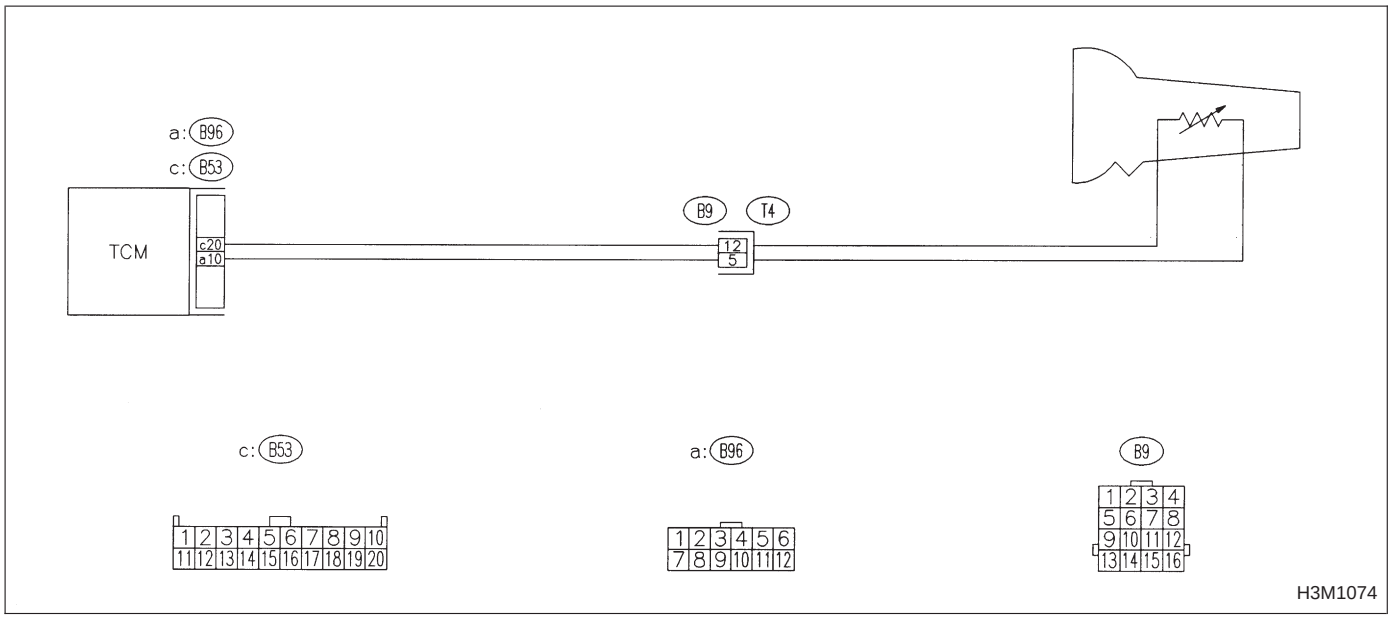
TROUBLE SYMPTOM:

- No shift up to 4th speed (after engine warm-up)
- No lock-up (after engine warm-up)
- Excessive shift shock

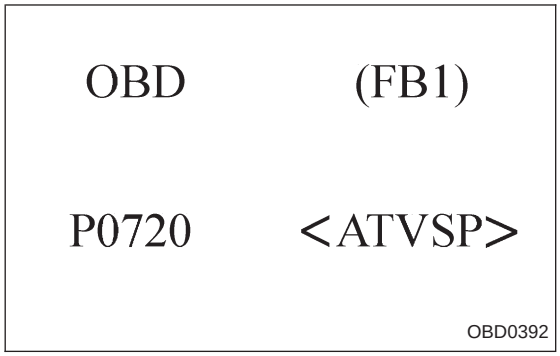
1.	Check harness connector between TCM and ATF temperature sensor.
2.	Check ATF temperature sensor.
3.	Check input signal for TCM.

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



NOTE:
For the diagnostic procedure on transmission fluid temperature sensor circuit, refer to 3-2b [T7G0].



AP: DTC P0720 — OUTPUT SPEED SENSOR (VEHICLE SPEED SENSOR 1) CIRCUIT MALFUNCTION (ATVSP) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

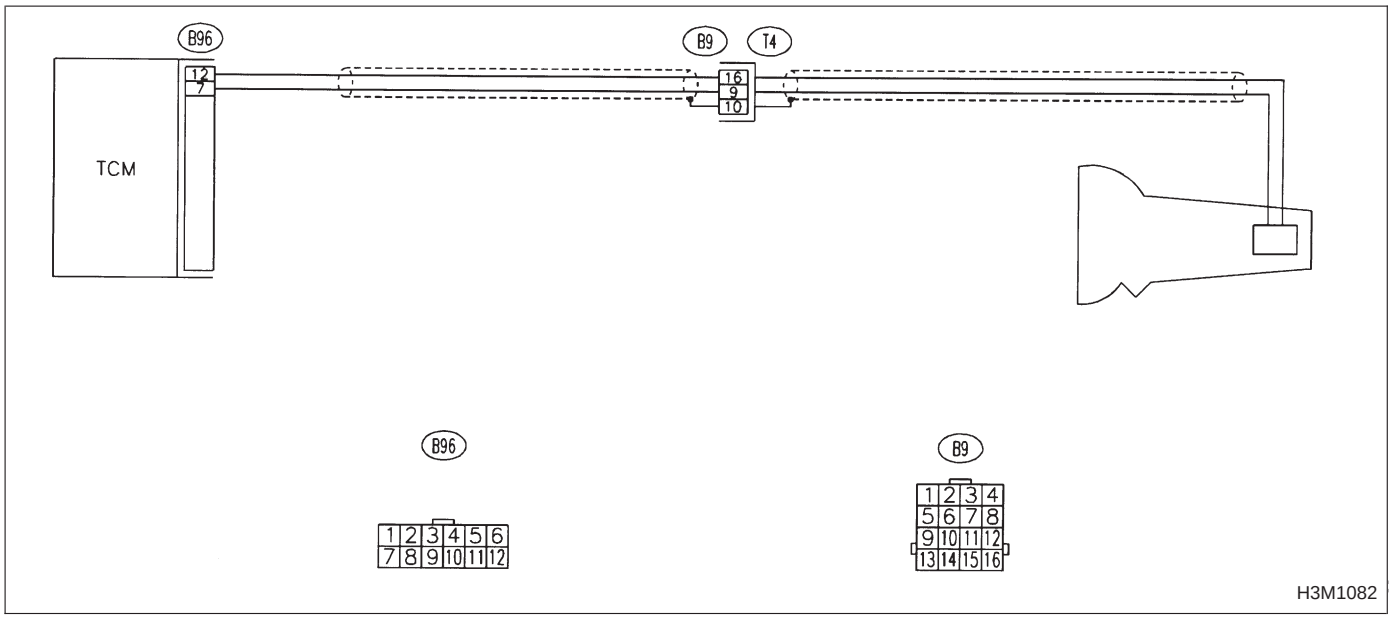
TROUBLE SYMPTOM:

- No shift or excessive tight corner “braking”

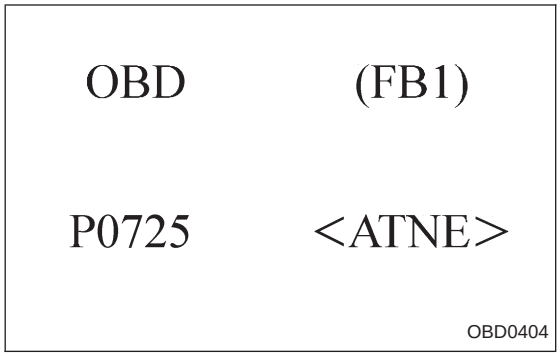
1.	Check harness connector between TCM and vehicle speed sensor 1.
2.	Check vehicle speed sensor 1.
3.	Check input signal for TCM.

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



NOTE:
For the diagnostic procedure on vehicle speed sensor 1 circuit, refer to 3-2b [T7M0].



AQ: DTC P0725 — ENGINE SPEED INPUT CIRCUIT MALFUNCTION (ATNE) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

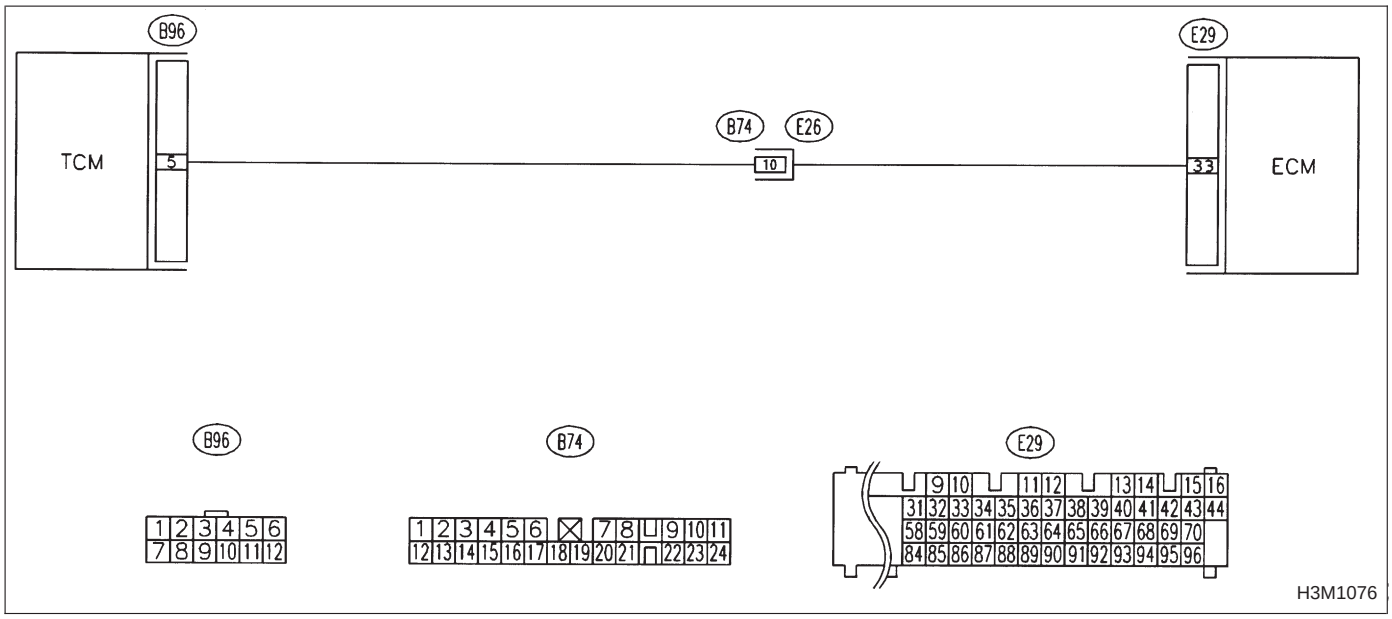
TROUBLE SYMPTOM:

- No lock-up (after engine warm-up)
- AT diagnostic indicator light (AT OIL TEMP indicator light) remains on when vehicle speed is “0”.

1.	Check harness connector between TCM and ECM (MFI).
2.	Check input signal for TCM.

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



NOTE:
For the diagnostic procedure on engine speed input circuit, refer to 3-2b [T7I0].

AR: DTC P0731 — GEAR 1 INCORRECT RATIO (GR — 1) —

AS: DTC P0732 — GEAR 2 INCORRECT RATIO (GR — 2) —

AT: DTC P0733 — GEAR 3 INCORRECT RATIO (GR — 3) —

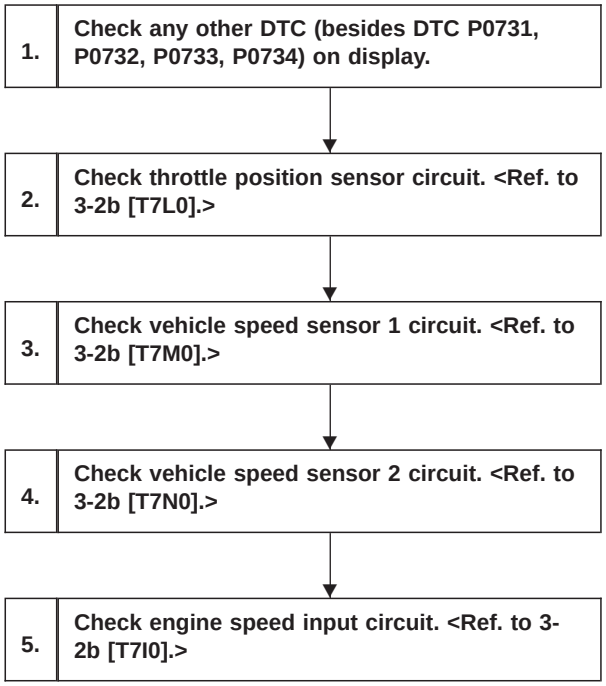
AU: DTC P0734 — GEAR 4 INCORRECT RATIO (GR — 4) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

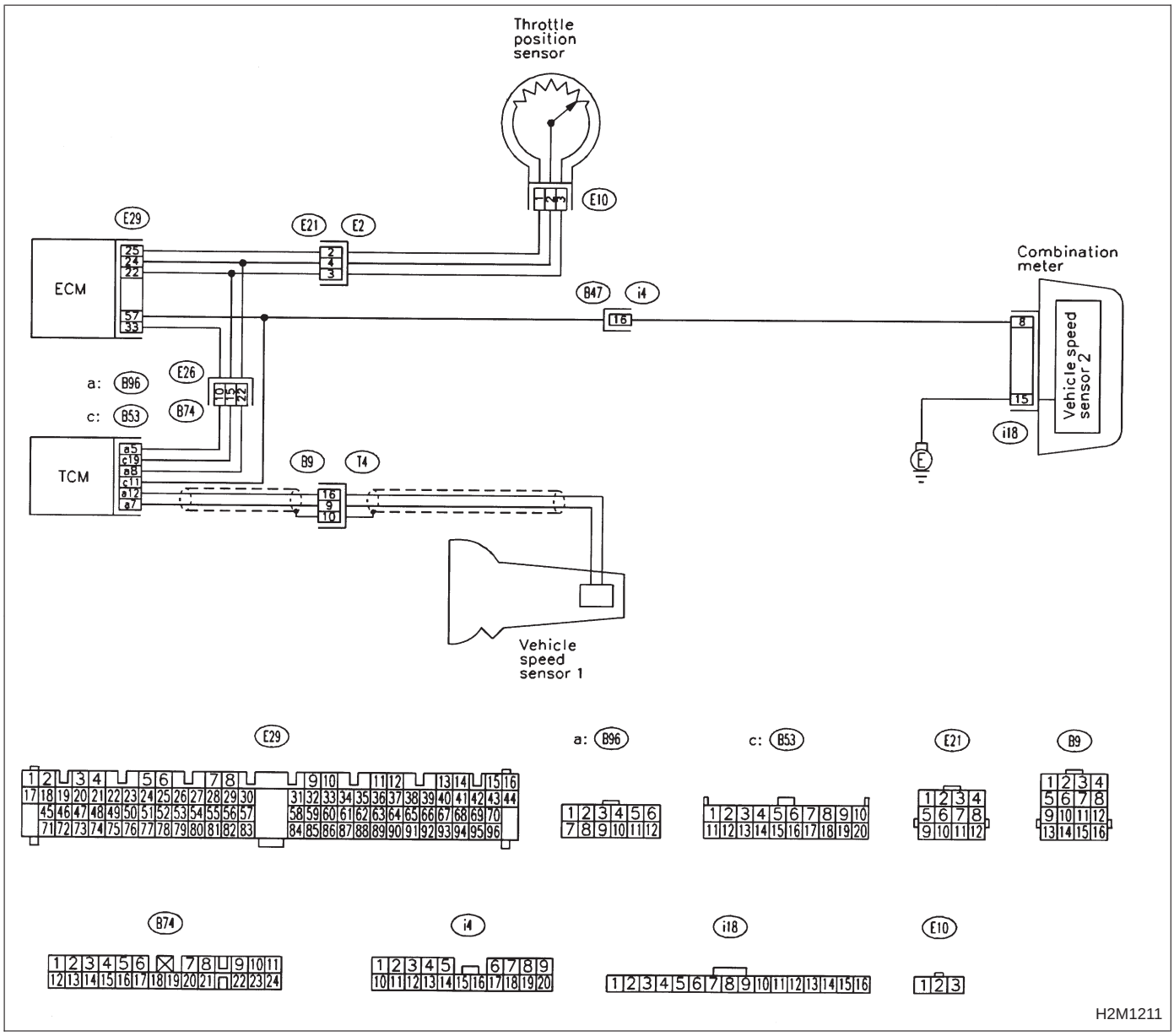
TROUBLE SYMPTOM:

- Shift point too high or too low; engine brake not effected in “3” range; excessive shift shock; excessive tight corner “braking”



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



1	CHECK ANY OTHER DTC (BESIDES DTC P0731, P0732, P0733, P0734) ON DISPLAY.

CHECK ***: Is there any other DTC on display?***

YES : Inspect relevant DTC using “10. Diagnostics Chart with Trouble Code, 2-7b [T1000]”.

NO : Go to step 2.

2	**CHECK THROTTLE POSITION SENSOR CIRCUIT. <REF. TO 3-2b [T7L0].>**

CHECK ***: Is there any trouble in throttle position sensor circuit?***

YES : Repair or replace throttle position sensor circuit.

NO : Go to step 3.

3	**CHECK VEHICLE SPEED SENSOR 1 CIRCUIT. <REF. TO 3-2b [T7M0].>**

CHECK ***: Is there any trouble in vehicle speed sensor 1 circuit?***

YES : Repair or replace vehicle speed sensor 1 circuit.

NO : Go to step 4.

4	**CHECK VEHICLE SPEED SENSOR 2 CIRCUIT. <REF. TO 3-2b [T7N0].>**

CHECK ***: Is there any trouble in vehicle speed sensor 2 circuit?***

YES : Repair or replace vehicle speed sensor 2 circuit.

NO : Go to step 5.

5	**CHECK ENGINE SPEED INPUT CIRCUIT. <REF. TO 3-2b [T7I0].>**

CHECK ***: Is there any trouble in engine speed input circuit?***

YES : Repair or replace engine speed input circuit.

NO : Go to next CHECK .

CHECK ***: Is there poor contact in TCM connector?***

YES : Repair poor contact in TCM connector.

NO : Go to next CHECK .

CHECK ***: Is there any mechanical trouble in automatic transmission?***

YES : Repair or replace automatic transmission.

NO : Replace TCM with a new one.

AV: DTC P0740 — TORQUE CONVERTER CLUTCH SYSTEM MALFUNCTION (LU – F) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

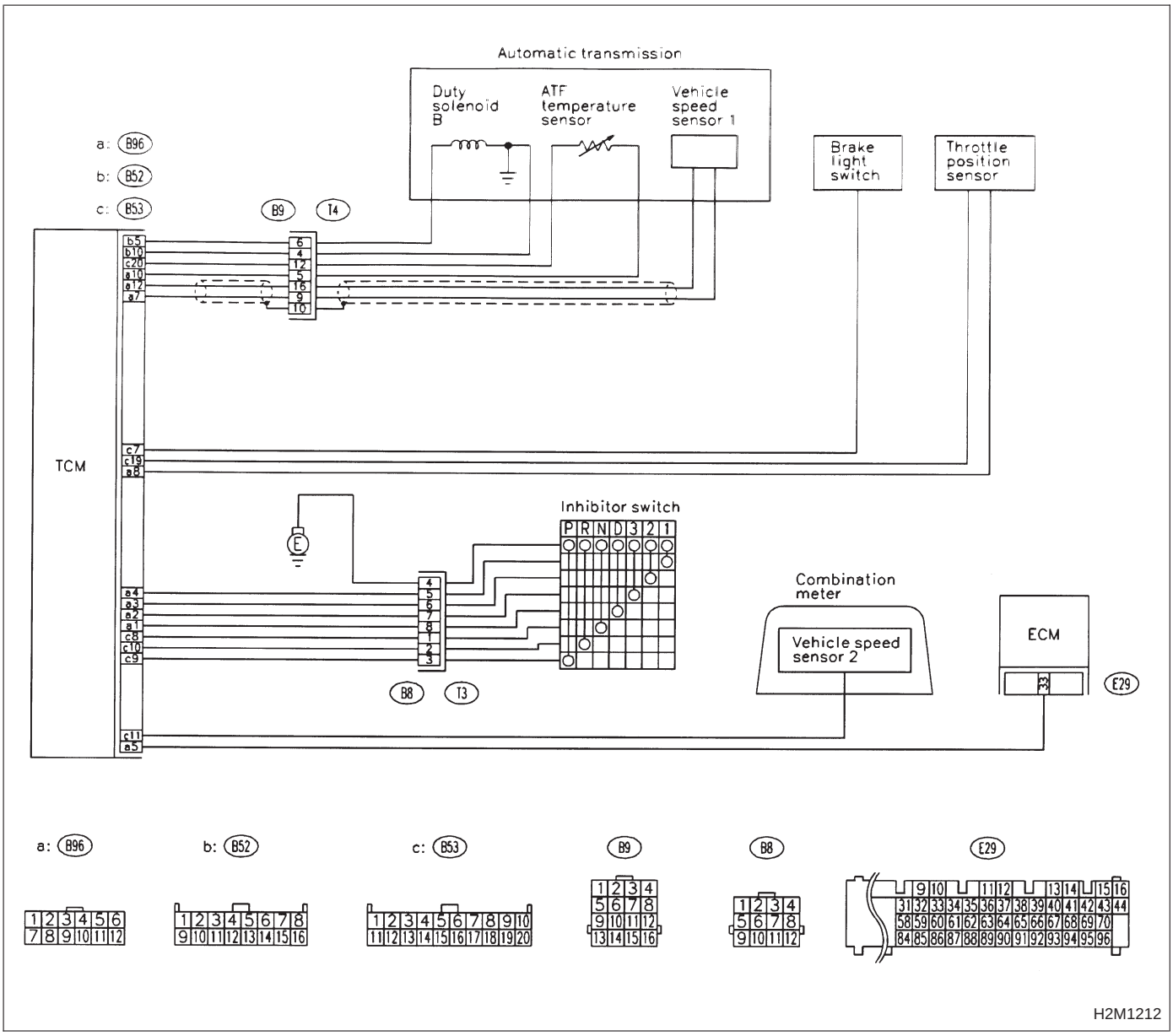
TROUBLE SYMPTOM:

- No lock-up (after engine warm-up)
- No shift or excessive tight corner “braking”

1.	**Check any other DTC (besides DTC P0740) on display.**
2.	**Check duty solenoid B circuit. <Ref. to 3-2b [T7B0].>**
3.	**Check throttle position sensor circuit. <Ref. to 3-2b [T7L0].>**
4.	**Check vehicle speed sensor 1 circuit. <Ref. to 3-2b [T7M0].>**
5.	**Check vehicle speed sensor 2 circuit. <Ref. to 3-2b [T7N0].>**
6.	**Check engine speed input circuit. <Ref. to 3-2b [T7I0].>**
7.	**Check inhibitor switch circuit. <Ref. to AN: DTC P0705, 2-7b [T10AN0].>**
8.	**Check brake light switch circuit. <Ref. to AM: DTC P0703, 2-7b [T10AM0].>**
9.	**Check ATF temperature sensor circuit. <Ref. to 3-2b [T7G0].>**

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



1	CHECK ANY OTHER DTC (BESIDES DTC P0740) ON DISPLAY.

CHECK ***: Is there any other DTC on display?***

YES : Inspect the relevant DTC using “10. Diagnostics Chart with Trouble Code, 2-7b [T1000]”.

NO : Go to step 2.

2	CHECK DUTY SOLENOID B CIRCUIT. <REF. TO 3-2b [T7B0].>

CHECK ***: Is there any trouble in duty solenoid B circuit?***

YES : Repair or replace duty solenoid B circuit.

NO : Go to step 3.

3	CHECK THROTTLE POSITION SENSOR CIRCUIT. <REF. TO 3-2b [T7L0].>

CHECK ***: Is there any trouble in throttle position sensor circuit?***

YES : Repair or replace throttle position sensor circuit.

NO : Go to step 4.

4	CHECK VEHICLE SPEED SENSOR 1 CIRCUIT. <REF. TO 3-2b [T7M0].>

CHECK ***: Is there any trouble in vehicle speed sensor 1 circuit?***

YES : Repair or replace vehicle speed sensor 1 circuit.

NO : Go to step 5.

5	CHECK VEHICLE SPEED SENSOR 2 CIRCUIT. <REF. TO 3-2b [T7N0].>

CHECK ***: Is there any trouble in vehicle speed sensor 2 circuit?***

YES : Repair or replace vehicle speed sensor 2 circuit.

NO : Go to step 6.

6	CHECK ENGINE SPEED INPUT CIRCUIT. <REF. TO 3-2b [T7I0].>

CHECK ***: Is there any trouble in engine speed input circuit?***

YES : Repair or replace engine speed input circuit.

NO : Go to step 7.

7	CHECK INHIBITOR SWITCH CIRCUIT. <REF. TO “AN: DTC P0705, 2-7b [T10AN0]”.>

CHECK ***: Is there any trouble in inhibitor switch circuit?***

YES : Repair or replace inhibitor switch circuit.

NO : Go to step 8.

8	CHECK BRAKE LIGHT SWITCH CIRCUIT. <REF. TO “AM: DTC P0703, 2-7b [T10AM0]”.>

CHECK ***: Is there any trouble in brake light switch circuit?***

YES : Repair or replace brake light switch circuit.

NO : Go to step 9.

9	CHECK ATF TEMPERATURE SENSOR CIRCUIT. <REF. TO 3-2b [T7G0].>

CHECK ***: Is there any trouble in ATF temperature sensor circuit?***

YES : Repair or replace ATF temperature sensor circuit.

NO : Go to next CHECK .

CHECK ***: Is there poor contact in TCM connector?***

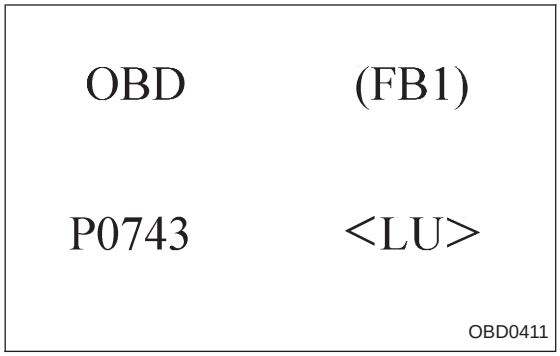
YES : Repair poor contact in TCM connector.

NO : Go to next CHECK .

CHECK ***: Is there any mechanical trouble in automatic transmission?***

YES : Repair or replace automatic transmission.

NO : Replace TCM with a new one.



AW: DTC P0743 — TORQUE CONVERTER CLUTCH SYSTEM (DUTY SOLENOID B) ELECTRICAL (LU) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

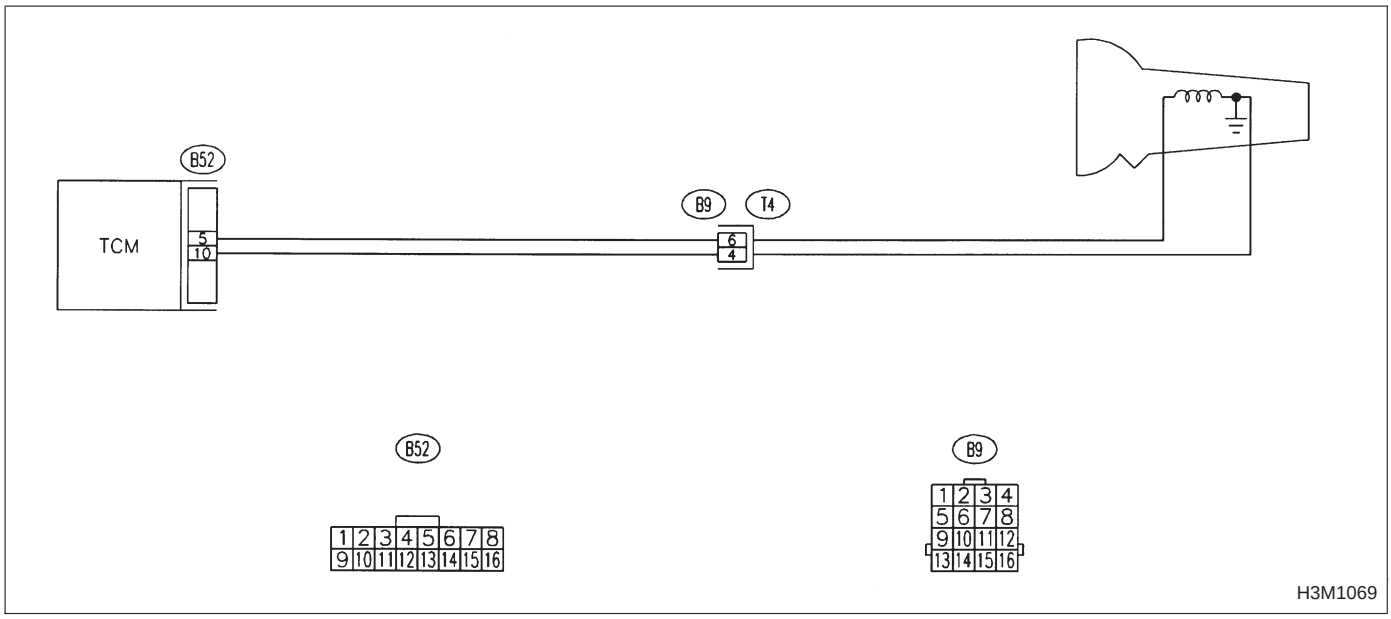
TROUBLE SYMPTOM:

- No lock-up (after engine warm-up)

1.	Check harness connector between TCM and duty solenoid B.
2.	Check duty solenoid B's ground line.
3.	Check duty solenoid B.
4.	Check output signal emitted from TCM.

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



NOTE:
For the diagnostic procedure on duty solenoid B circuit, refer to 3-2b [T7B0].

AX: DTC P0748 — PRESSURE CONTROL SOLENOID (DUTY SOLENOID A) ELECTRICAL (PL) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

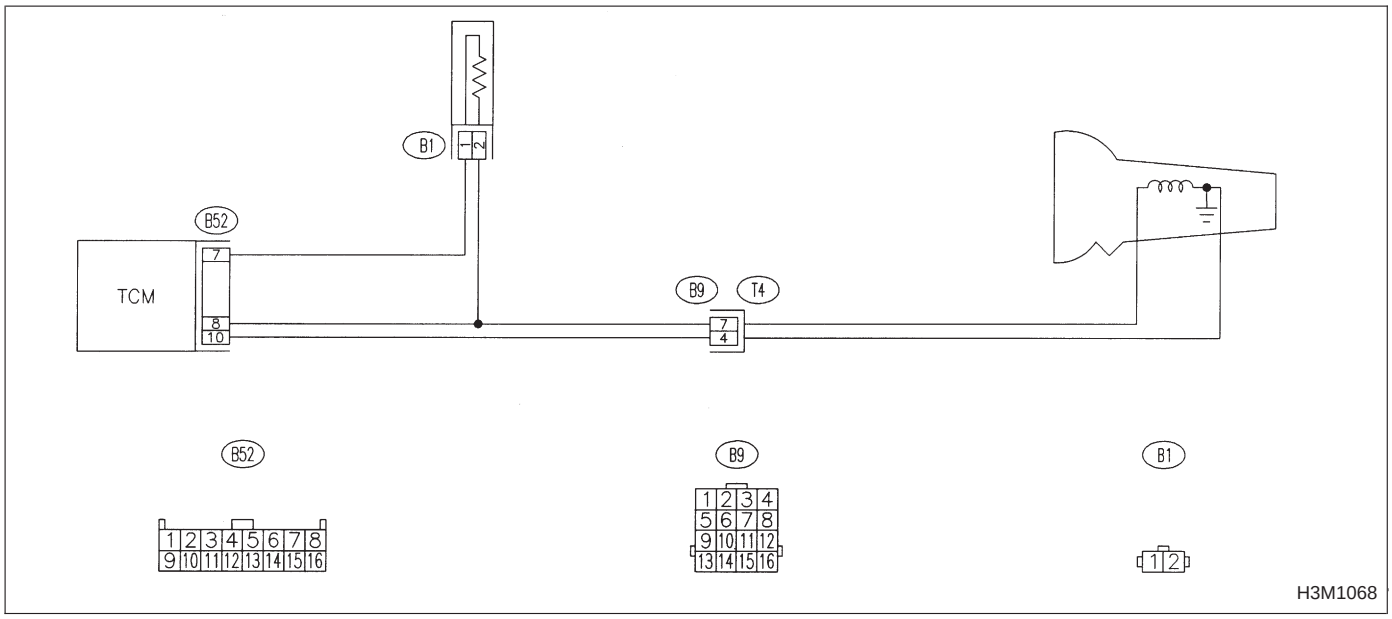
TROUBLE SYMPTOM:

- Excessive shift shock

1.	Check harness connector between TCM and duty solenoid A.
2.	Check harness connector between TCM and dropping resistor.
3.	Check duty solenoid A's ground line.
4.	Check dropping resistor.
5.	Check duty solenoid A.
6.	Check output signal emitted from TCM.

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



NOTE:
For the diagnostic procedure on duty solenoid A circuit, refer to 3-2b [T7A0].

AY: DTC P0753 — SHIFT SOLENOID A (SHIFT SOLENOID 1) ELECTRICAL (SFT1) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

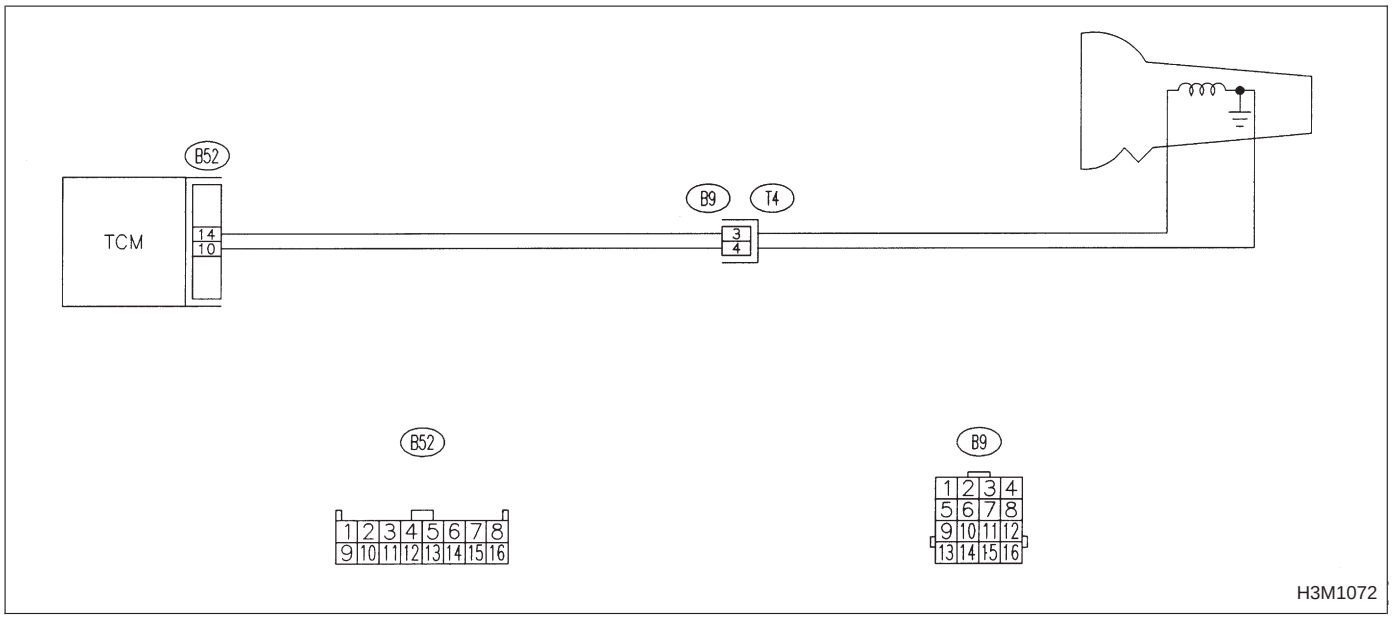
TROUBLE SYMPTOM:

- No shift

1.	Check harness connector between TCM and shift solenoid 1.
2.	Check shift solenoid 1's ground line.
3.	Check shift solenoid 1.
4.	Check output signal emitted from TCM.

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



NOTE:
For the diagnostic procedure on shift solenoid 1 circuit, refer to 3-2b [T7E0].

AZ: DTC P0758 — SHIFT SOLENOID B (SHIFT SOLENOID 2) ELECTRICAL (SFT2) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

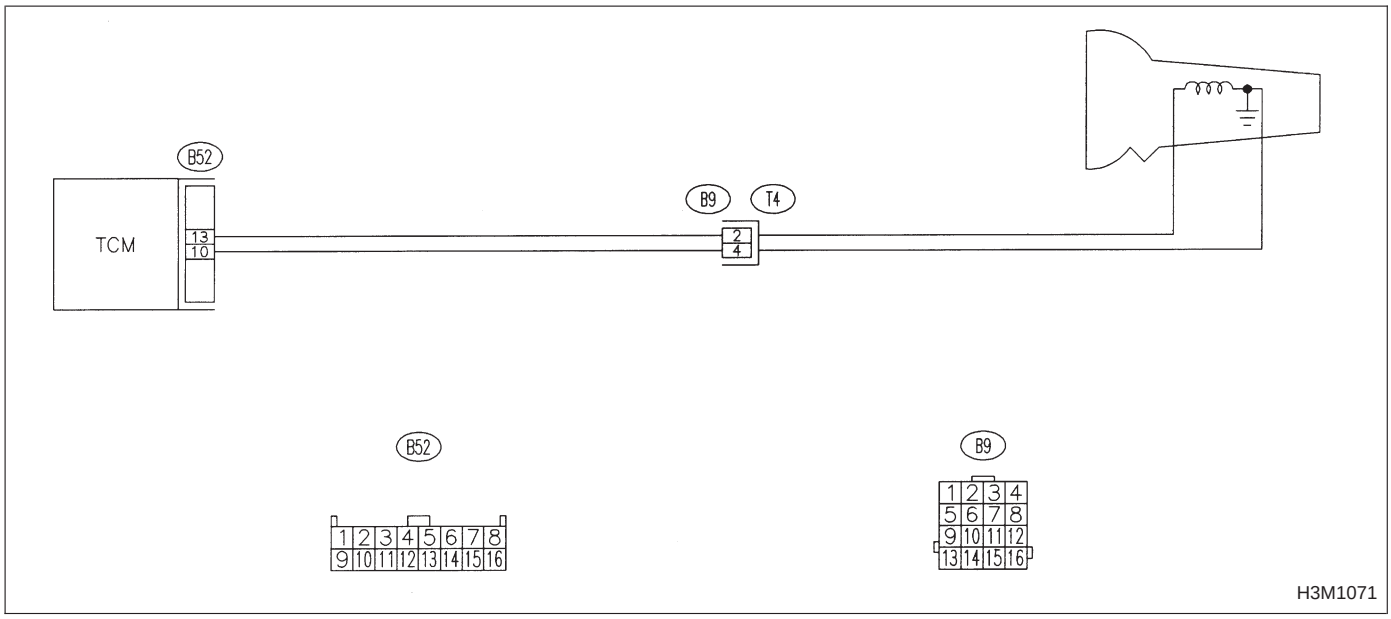
TROUBLE SYMPTOM:

- No shift

1.	Check harness connector between TCM and shift solenoid 2.
2.	Check shift solenoid 2's ground line.
3.	Check shift solenoid 2.
4.	Check output signal emitted from TCM.

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



NOTE:
For the diagnostic procedure on shift solenoid 2 circuit, refer to 3-2b [T7D0].

BA: DTC P0760 — SHIFT SOLENOID C (SHIFT SOLENOID 3) MALFUNCTION (OVR — F) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

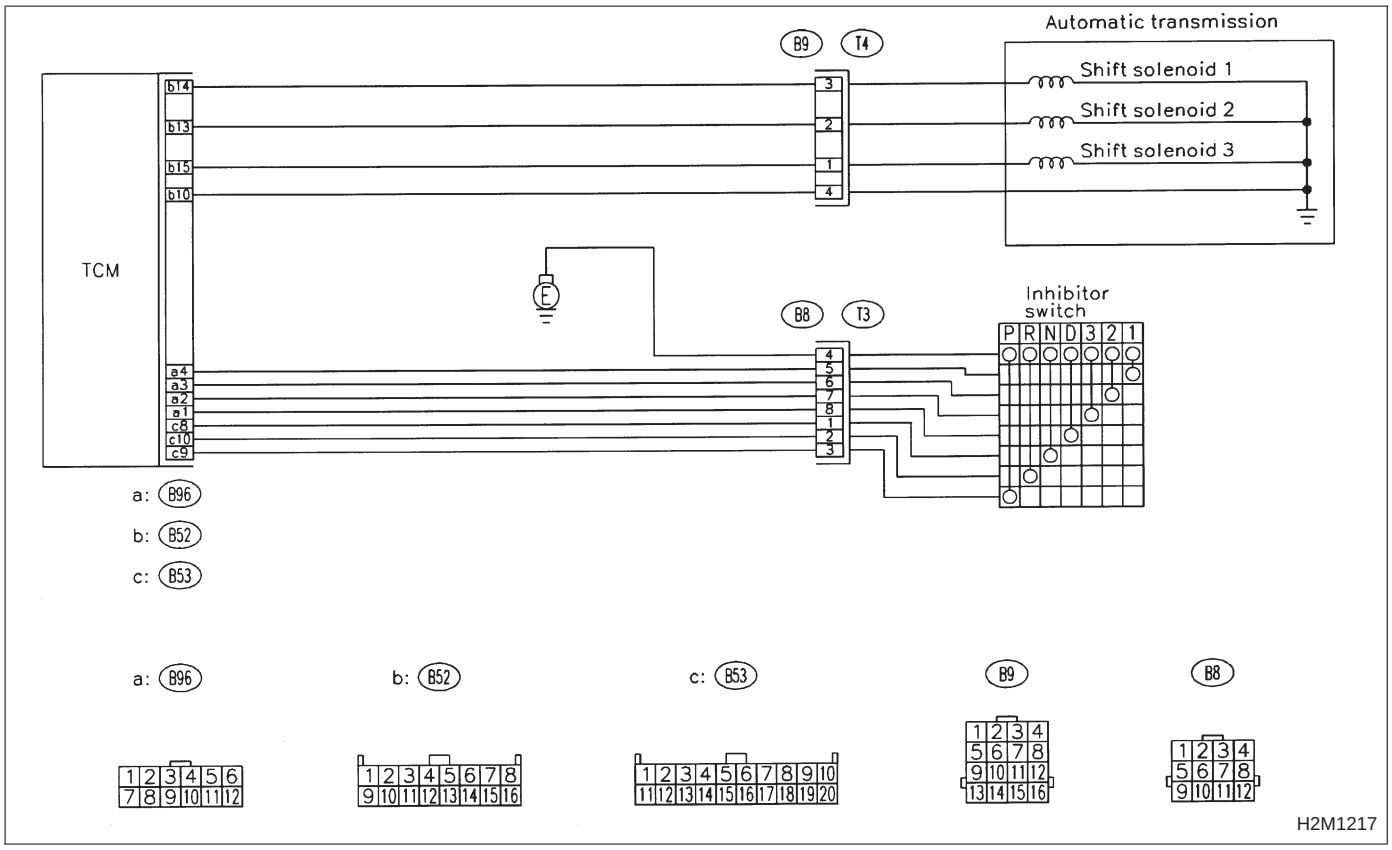
TROUBLE SYMPTOM:

- Ineffective engine brake with selector lever in “3”

1.	**Check any other DTC (besides DTC P0760) on display.**
2.	**Check inhibitor switch circuit. <Ref. to “AN: DTC P0705, 2-7b [T10AN0]”.>**
3.	**Check gear position.**
4.	**Check shift solenoid 1 circuit. <Ref. to 3-2b [T7E0].>**
5.	**Check shift solenoid 2 circuit. <Ref. to 3-2b [T7D0].>**
6.	**Check shift solenoid 3 circuit. <Ref. to 3-2b [T7C0].>**

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



1	CHECK ANY OTHER DTC (BESIDES DTC P0760) ON DISPLAY.

CHECK ***: Is there any other DTC on display?***

YES : Inspect relevant DTC using “10. Diagnostics Chart with Trouble Code, 2-7b [T1000]”.

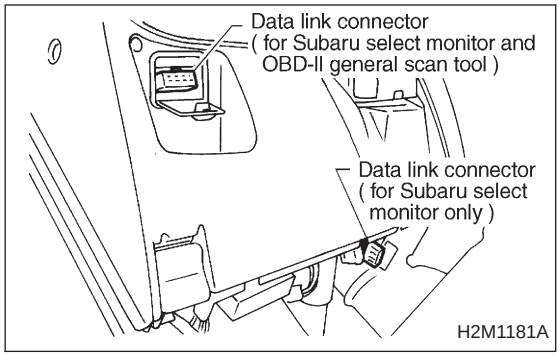
NO : Go to step 2.

2	CHECK INHIBITOR SWITCH CIRCUIT. <REF. TO “AN: DTC P0705, 2-7b [T10AN0]”.>

CHECK ***: Is there any trouble in inhibitor switch circuit?***

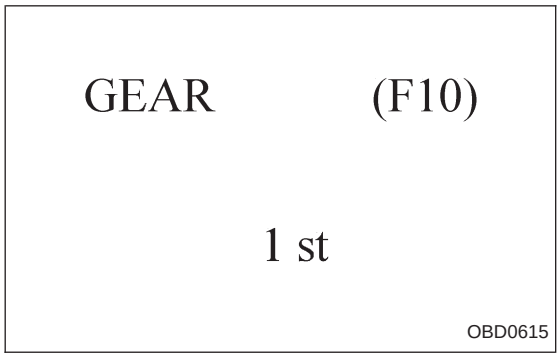
YES : Repair or replace inhibitor switch circuit.

NO : Go to step 3.



3	CHECK GEAR POSITION.

1) Turn ignition switch to OFF.
2) Connect the Subaru select monitor to data link connector.



3) Lift-up or raise the vehicle and support with safety stands.

CAUTION:
On AWD models, raise all wheels off ground.

4) Start and warm-up the engine and transmission.
5) Subaru select monitor switch to ON.
6) Designate mode using function key.

Function mode for AT: F10

7) Move selector lever to “D” and drive the vehicle.
8) Read data on Subaru select monitor.

CHECK ***: Change gear position according to throttle position and vehicle speed.***

YES : Go to next CHECK .

NO : Go to step 4.

CHECK ***: Is there poor contact in TCM connector?***

YES : Repair poor contact in TCM connector.

NO : Go to next CHECK .

CHECK ***: Is there any mechanical trouble in automatic transmission?***

YES : Repair or replace automatic transmission.

NO : Replace TCM with a new one.

4	CHECK SHIFT SOLENOID 1 CIRCUIT. <REF. TO 3-2b [T7E0].>

CHECK ***: Is there any trouble in shift solenoid 1 circuit?***

YES : Repair or replace shift solenoid 1 circuit.

NO : Go to step 5.

5	**CHECK SHIFT SOLENOID 2 CIRCUIT. <REF. TO 3-2b [T7D0].>**

CHECK ***: Is there any trouble in shift solenoid 2 circuit?***

YES : Repair or replace shift solenoid 2 circuit.

NO : Go to step 6.

6	**CHECK SHIFT SOLENOID 3 CIRCUIT. <REF. TO 3-2b [T7C0].>**

CHECK ***: Is there any trouble in shift solenoid 3 circuit?***

YES : Repair or replace shift solenoid 3 circuit.

NO : Go to next CHECK .

CHECK ***: Is there poor contact in TCM connector?***

YES : Repair poor contact in TCM connector.

NO : Go to next CHECK .

CHECK ***: Is there any mechanical trouble in automatic transmission?***

YES : Repair or replace automatic transmission.

NO : Replace TCM with a new one.

BB: DTC P0763 — SHIFT SOLENOID C (SHIFT SOLENOID 3) ELECTRICAL (OVR) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

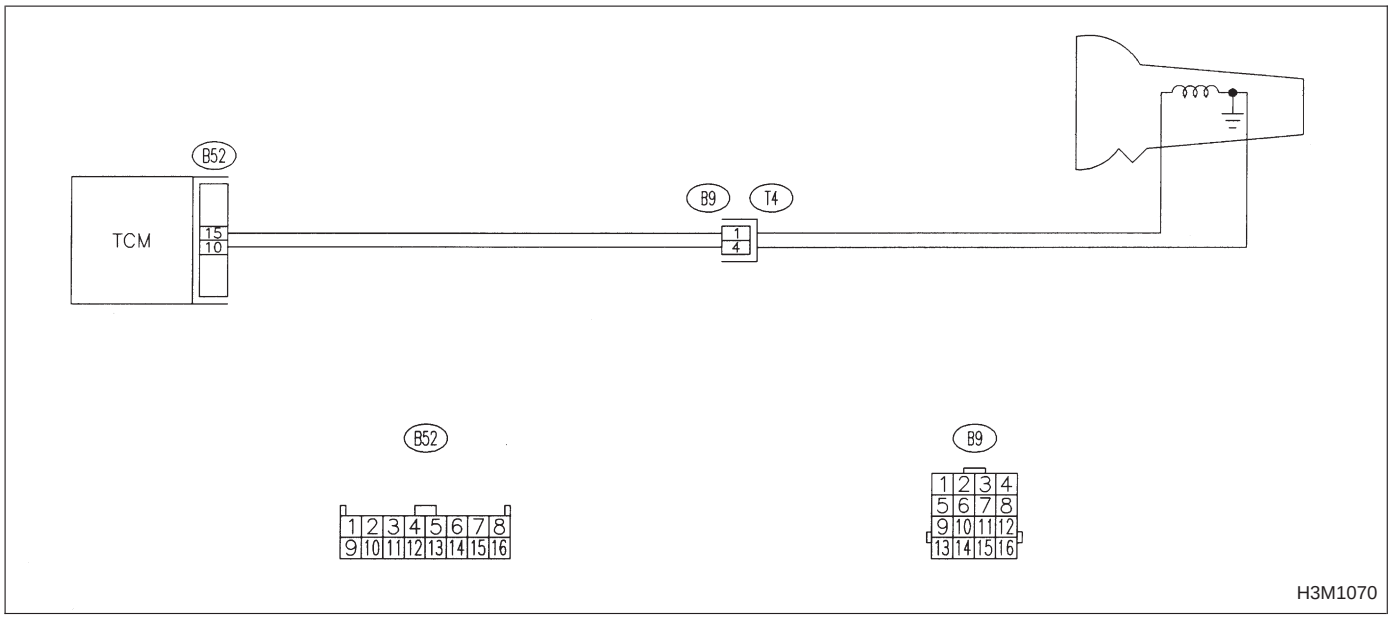
TROUBLE SYMPTOM:

- Ineffective engine brake with selector lever in “3”

1.	Check harness connector between TCM and shift solenoid 3.
2.	Check shift solenoid 3’s ground line.
3.	Check shift solenoid 3.
4.	Check output signal emitted from TCM.

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



NOTE:
For the diagnostic procedure on shift solenoid 3 circuit, refer to 3-2b [T7C0].

OBD	(FB1)
P1100	<ST_SW>

OBD0458

BC: DTC P1100 — STARTER SWITCH CIRCUIT MALFUNCTION (ST — SW) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

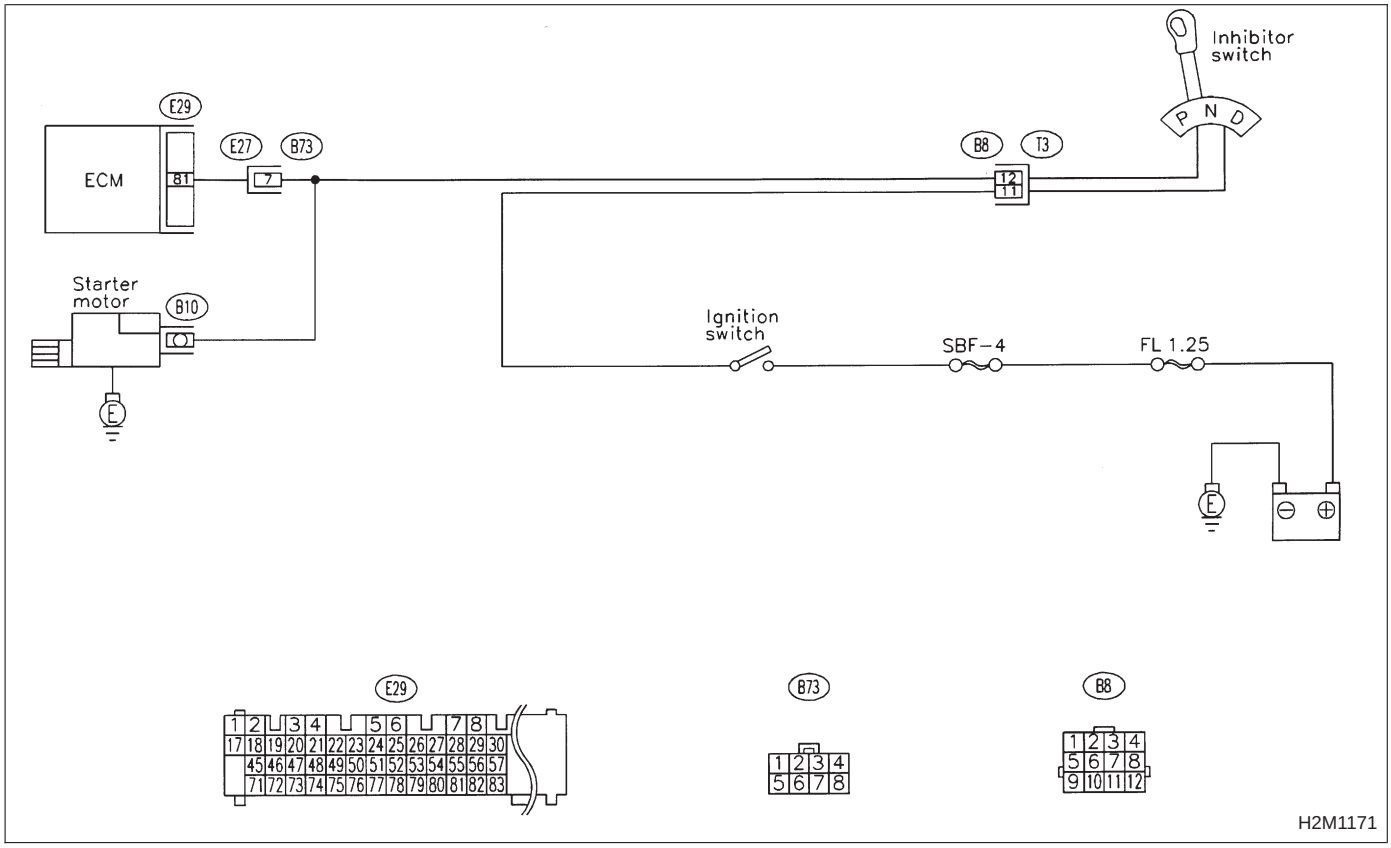
TROUBLE SYMPTOM:

- Failure of engine to start

1.	Check operation of starter motor.

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



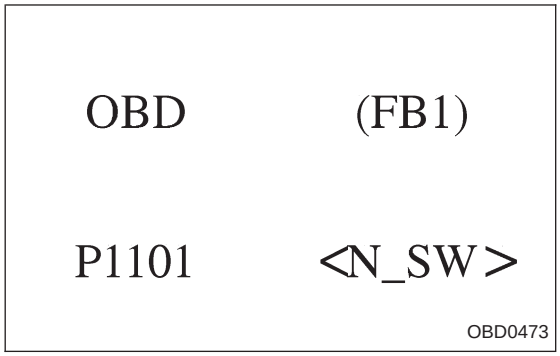
1	CHECK OPERATION OF STARTER MOTOR.

CHECK ***: Turn ignition switch to "ST" to ensure that starter motor operates.***

NOTE:
Place the selector lever in the "P" or "N" position.

YES : Repair open circuit or poor contact in ECM connector.

NO : Diagnose starter motor circuit <Ref. to 2-7b [T8B0].>



BD: DTC P1101 — NEUTRAL POSITION SWITCH CIRCUIT MALFUNCTION (N — SW) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

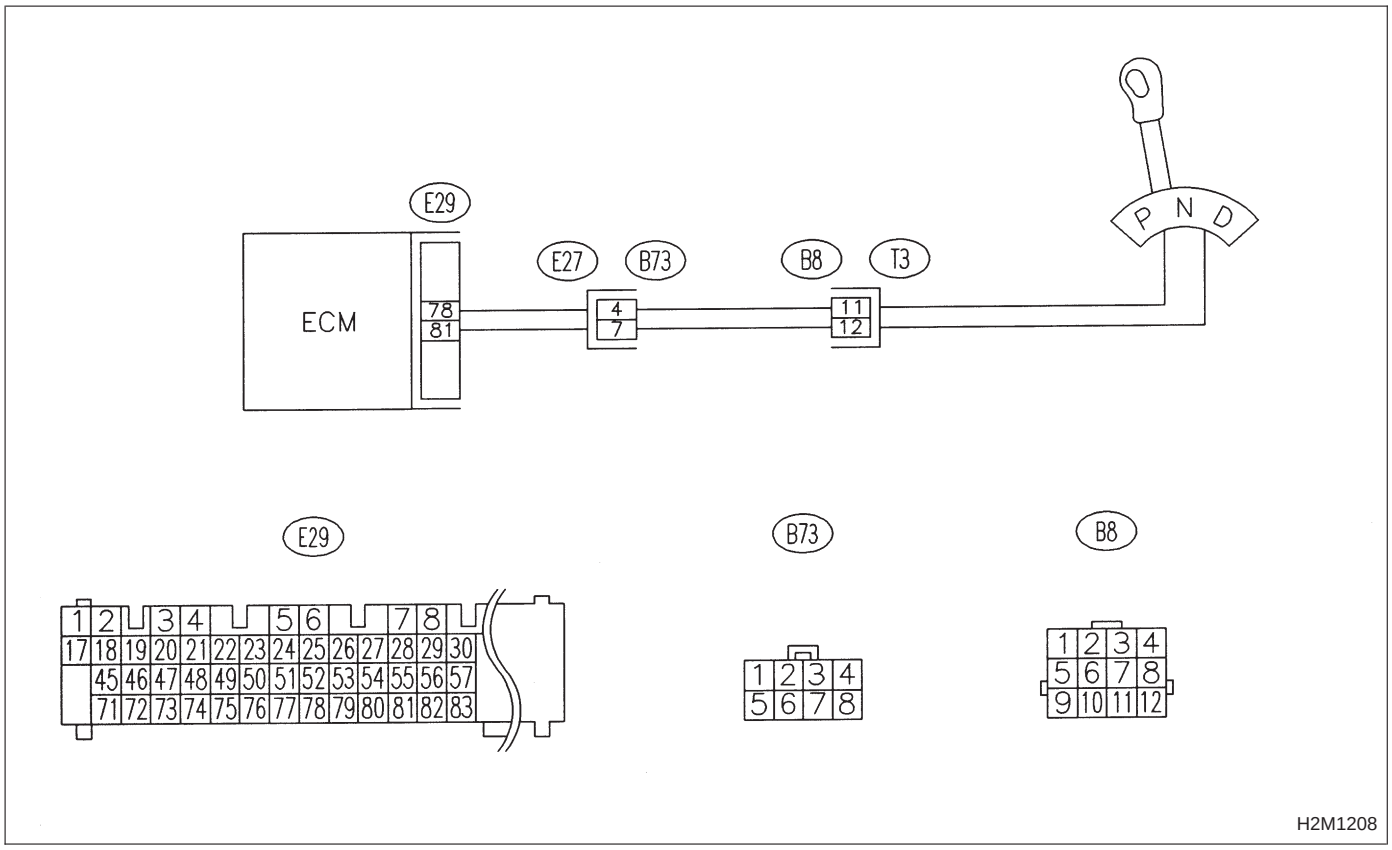
TROUBLE SYMPTOM:

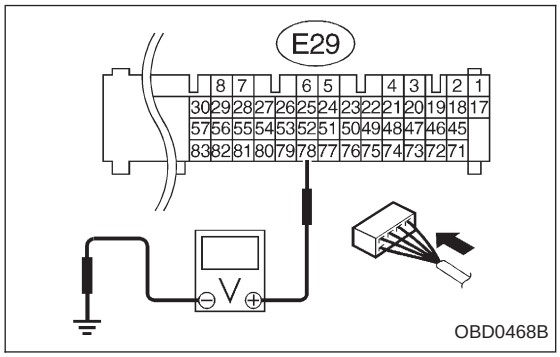
- Erroneous idling

1.	**Check input signal for ECM.**
2.	**Check harness connector between ECM and inhibitor switch.**
3.	**Check inhibitor switch.**

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



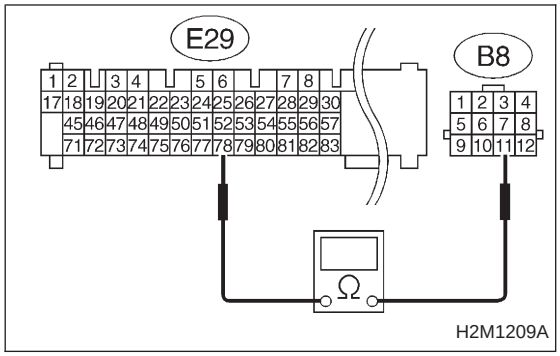


1	CHECK INPUT SIGNAL FOR ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and body.

CHECK ***: Connector & terminal***
(E29) No. 78 — Body / 0 V ("N" and "P" positions)
(E29) No. 78 — Body / 5.0±0.5 V (Other positions)

YES Go to next CHECK .
NO : Go to step 2.
CHECK ***: Is there poor contact in ECM connector?***
YES : Repair poor contact in ECM connector.
NO : Replace ECM with a new one.



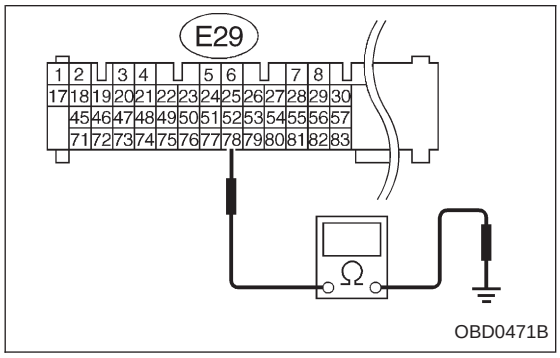
2	CHECK HARNESS CONNECTOR BETWEEN ECM AND INHIBITOR SWITCH.

1) Turn ignition switch to OFF.
2) Disconnect connectors from ECM and transmission.
3) Measure resistance of harness connector between ECM and transmission.

CHECK ***: Connector & terminal***
(E29) No. 78 — (B8) No. 11 / 1 Ω, or less

YES : Go to next step.

NO : Repair open circuit of harness between ECM connector and transmission connector.

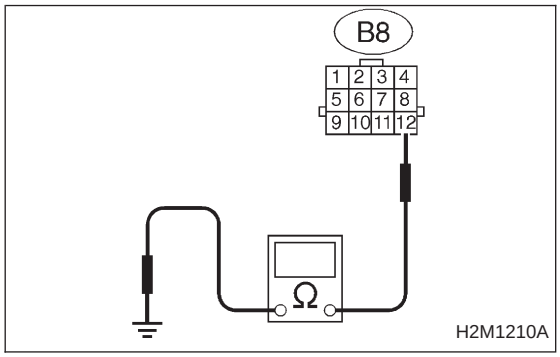


4) Measure resistance of harness connector between ECM and body.

CHECK ***: Connector & terminal***
(E29) No. 78 — Body / 1 MΩ, or more

YES : Go to next step.

NO : Repair short circuit of harness between ECM connector and transmission connector.

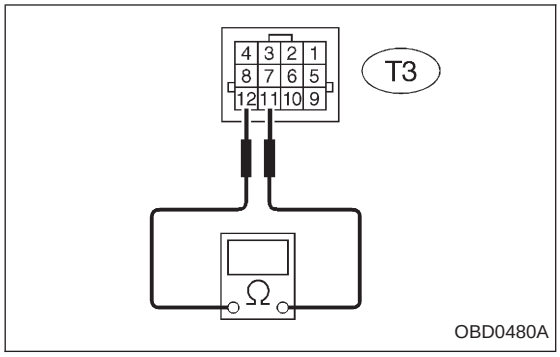


5) Measure resistance of harness connector between inhibitor switch and body.

CHECK ***: Connector & terminal***
(B8) No. 12 — Body / 5 Ω, or less

YES : Go to step 3.

NO : Repair open circuit of inhibitor switch ground line.



3	CHECK INHIBITOR SWITCH.

Measure resistance between transmission connector receptacle's terminals.

CHECK ***: Connector & terminal***
(T3) No. 12 — No. 11 / 10 Ω, or less
("N" and "P" positions)
(T3) No. 12 — No. 11 / 1 MΩ, or more
(Other positions)

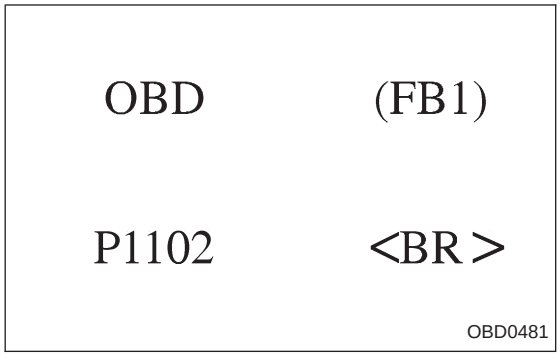
YES : Go to next CHECK .

NO : Replace inhibitor switch.

CHECK ***: Is there any fault in selector cable connection to inhibitor switch?***

YES : Repair selector cable connection. <Ref. to 3-2 [W2B2].>

NO : Replace ECM with a new one.



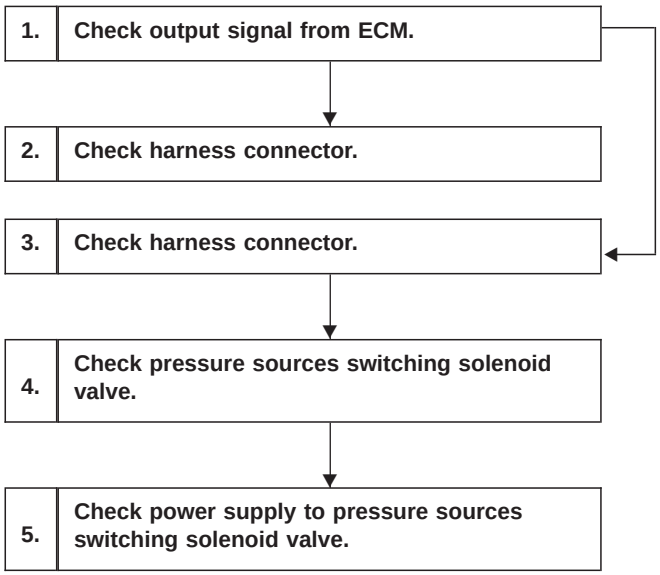
BE: DTC P1102 — PRESSURE SOURCES SWITCHING SOLENOID VALVE CIRCUIT MALFUNCTION (BR) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

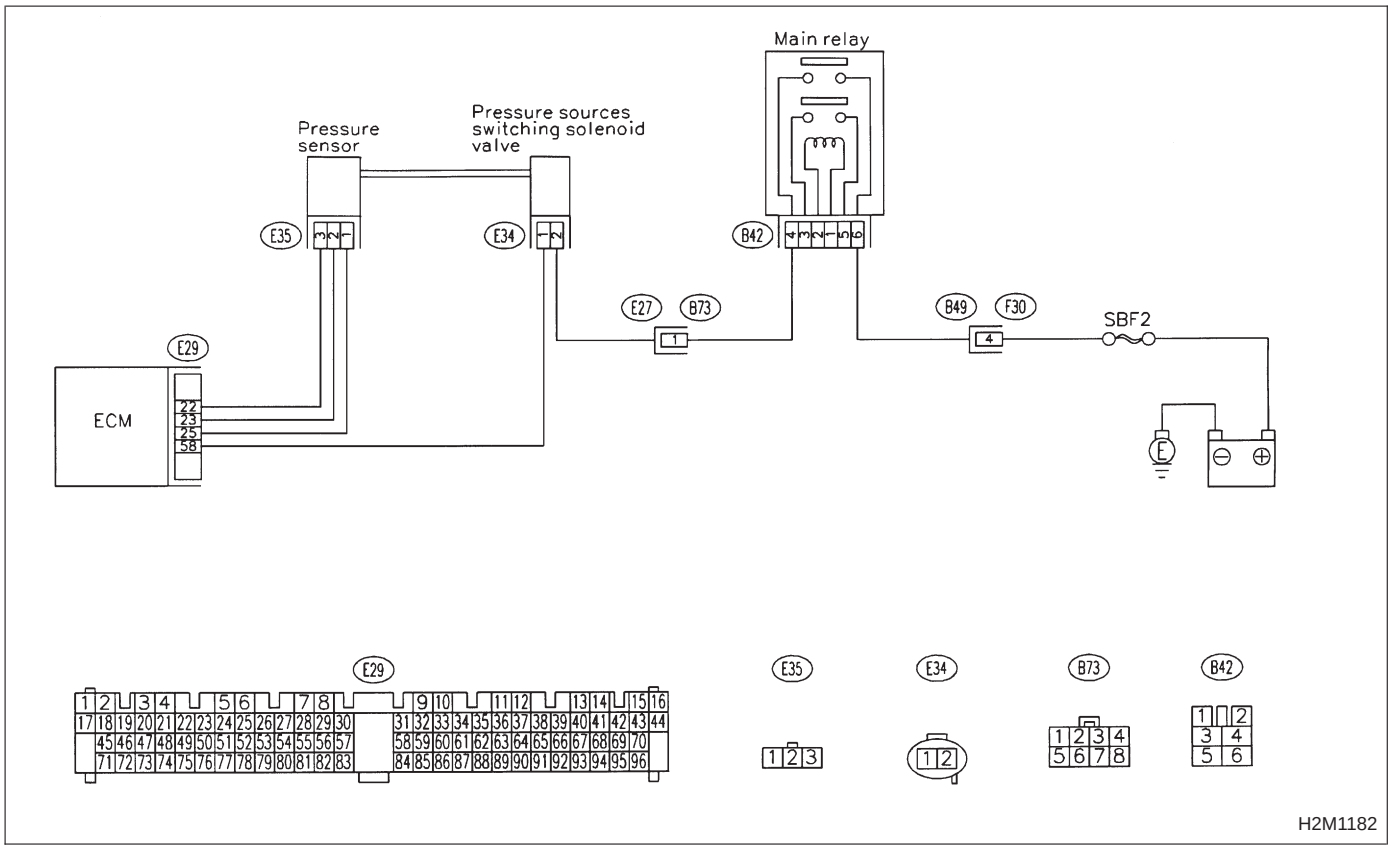
TROUBLE SYMPTOM:

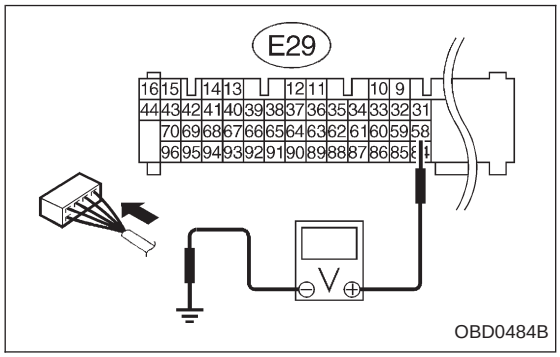
- Erroneous idling
- Failure of engine to start



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODE.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:





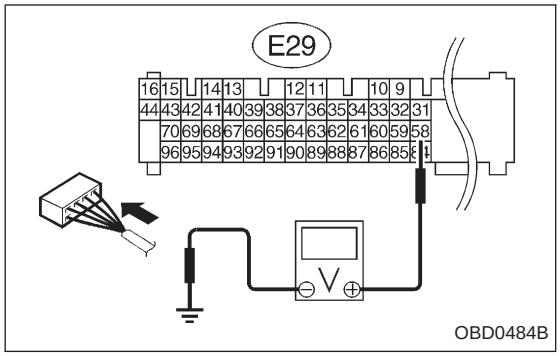
1	CHECK OUTPUT SIGNAL FROM ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and body.

CHECK ***: Connector & terminal (E29) No. 58 — Body / 10 V, or more***

YES : Go to step 2.

NO : Go to step 3.



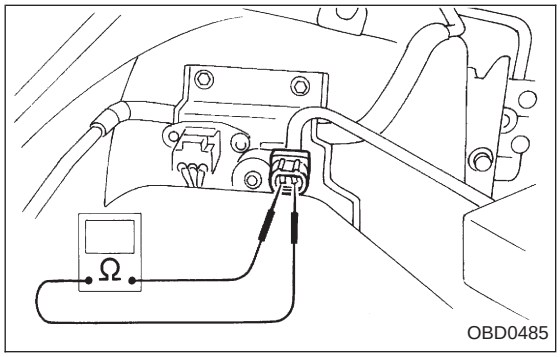
2	CHECK HARNESS CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from pressure sources switching solenoid valve.
3) Turn ignition switch to ON.
4) Measure voltage between ECM and body.

CHECK ***: Connector & terminal***
(E29) No. 58 — Body / 10 V, or more

YES : Repair short circuit of harness between ECM connector and pressure sources switching solenoid valve connector and replace ECM.

NO : Go to next step.



5) Turn ignition switch to OFF.
6) Measure resistance between pressure sources switching solenoid valve terminals.

CHECK ***: Terminals***
No. 1 — No. 2/1 Ω, or less

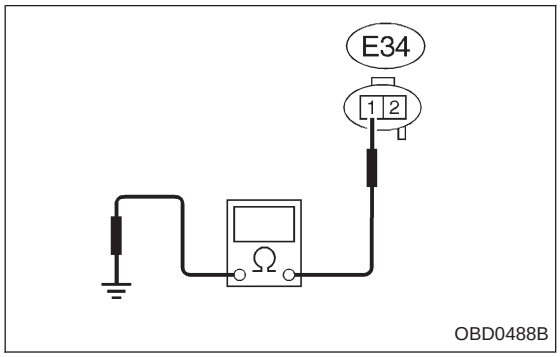
YES : Replace pressure sources switching solenoid valve and ECM.

NO : Go to next CHECK .

CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Replace ECM with a new one.



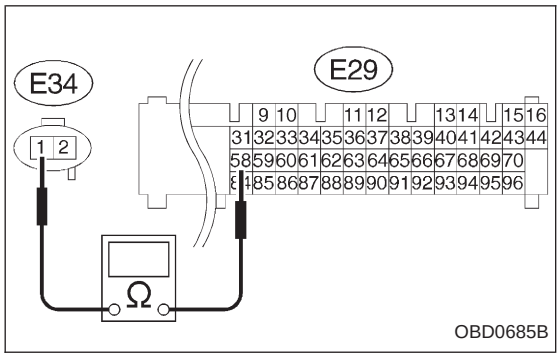
3	CHECK HARNESS CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from pressure sources switching solenoid valve and ECM.
3) Measure resistance of harness connector between pressure sources switching solenoid valve and body.

CHECK ***: Connector & terminal***
(E34) No. 1 — Body / 10 Ω, or less

YES : Repair short circuit of harness between ECM connector and pressure sources switching solenoid valve connector.

NO : Go to next step.

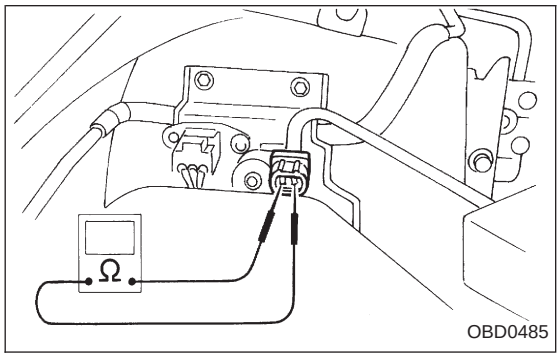


4) Measure resistance of harness connector between ECM and pressure sources switching solenoid valve.

CHECK : ***Connector & terminal***
(E29) No. 58 — (E34) No. 1 / 1 Ω, or less

YES : Go to step 4.

NO : Repair open circuit of harness between ECM connector and pressure sources switching solenoid valve connector.



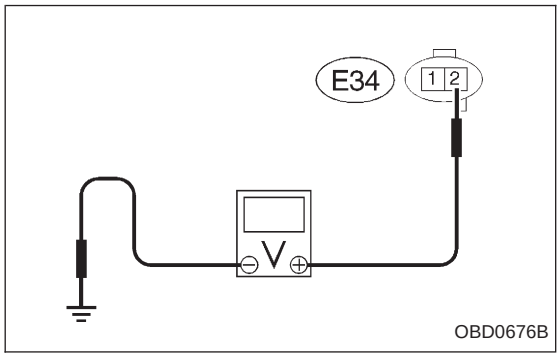
4	CHECK PRESSURE SOURCES SWITCHING SOLENOID VALVE.

Measure resistance between pressure sources switching solenoid valve connector terminals.

CHECK : ***Terminals***
No. 1 — No. 2 / 10 — 100 Ω

YES : Go to step 5.

NO : Replace pressure sources switching solenoid valve.



5	CHECK POWER SUPPLY TO PRESSURE SOURCES SWITCHING SOLENOID VALVE.

1) Turn ignition switch to ON.
2) Measure voltage between pressure sources switching solenoid valve harness connector and body.

CHECK : ***Connector & terminal***
(E34) No. 2 — Body / 10 V, or more

YES : Confirm good connection at pressure sources switching solenoid valve connector.

NO : Repair open circuit of harness between main relay connector and pressure sources switching solenoid valve connector.

BF: DTC P1103 — ENGINE TORQUE CONTROL SIGNAL CIRCUIT MALFUNCTION (TRQ) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

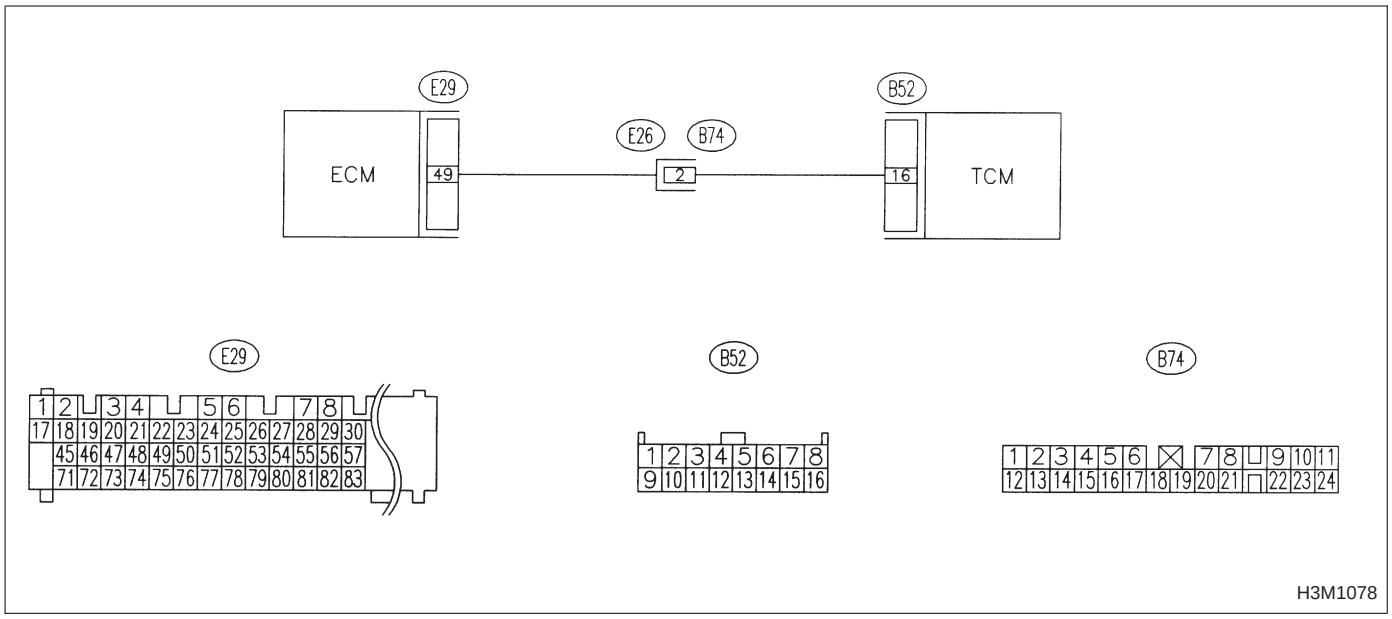
TROUBLE SYMPTOM:

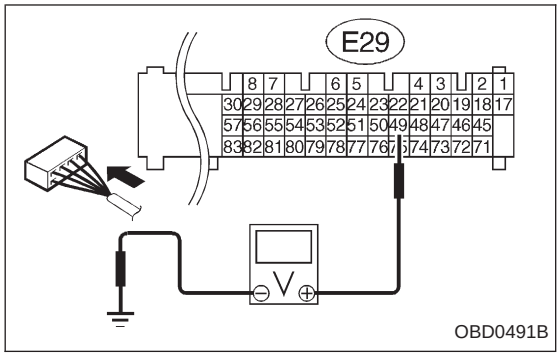
- Excessive shift shock

1.	**Check input signal for ECM.**
2.	**Check harness connector between ECM and TCM.**

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:





1	CHECK INPUT SIGNAL FOR ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and body.

CHECK ***: Connector & terminal (E29) No. 49 — Body / 4.5V, or more***

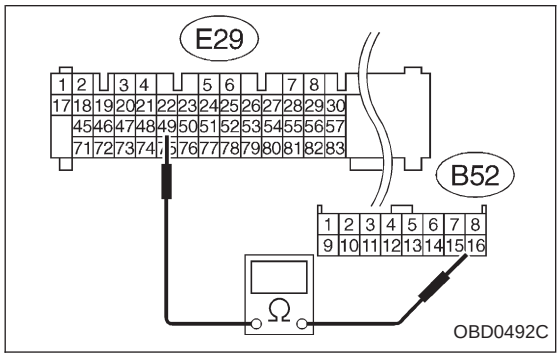
YES : Go to next CHECK .

NO : Go to step 2.

CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Replace ECM with a new one.



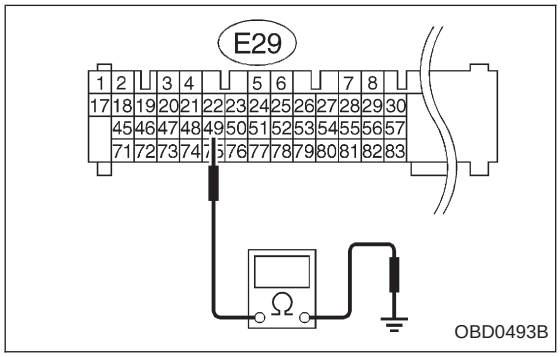
2	CHECK HARNESS CONNECTOR BETWEEN ECM AND TCM.

1) Turn ignition switch to OFF.
2) Disconnect connectors from ECM and TCM.
3) Measure resistance of harness connector between ECM and TCM.

CHECK ***: Connector & terminal (E29) No. 49 — (B52) No. 16 / 1 Ω, or less***

YES : Go to next step.

NO : Repair open circuit of harness between ECM connector and TCM connector.



4) Measure resistance of harness connector between ECM and body.

CHECK ***: Connector & terminal (E29) No. 49 — Body / 1 MΩ, or more***

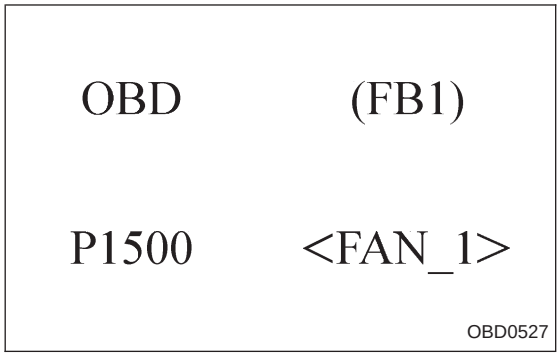
YES : Go to next CHECK .

NO : Repair short circuit of harness between ECM connector and TCM connector.

CHECK ***: Is there poor contact in TCM connector?***

YES : Repair poor contact in TCM connector.

NO : Replace TCM with a new one.



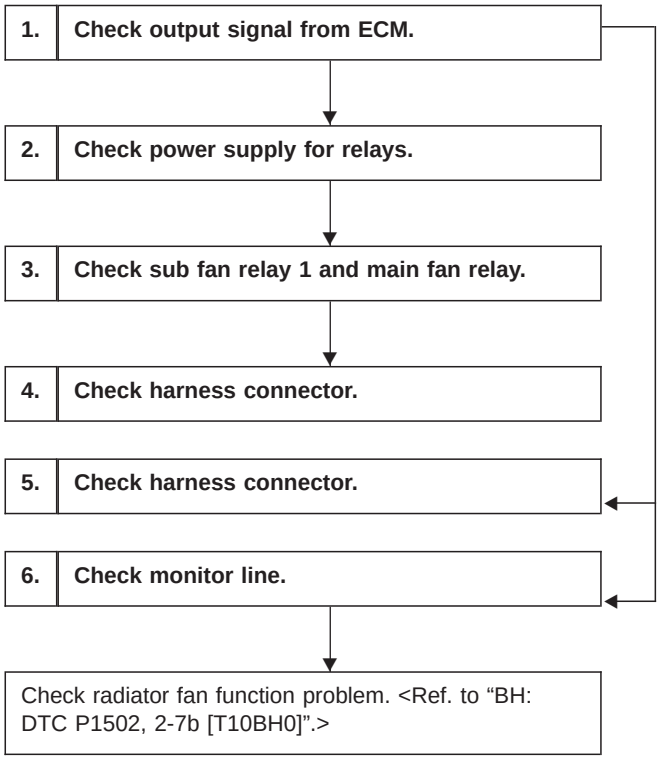
BG: DTC P1500 — RADIATOR FAN RELAY 1 CIRCUIT MALFUNCTION (FAN — 1) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

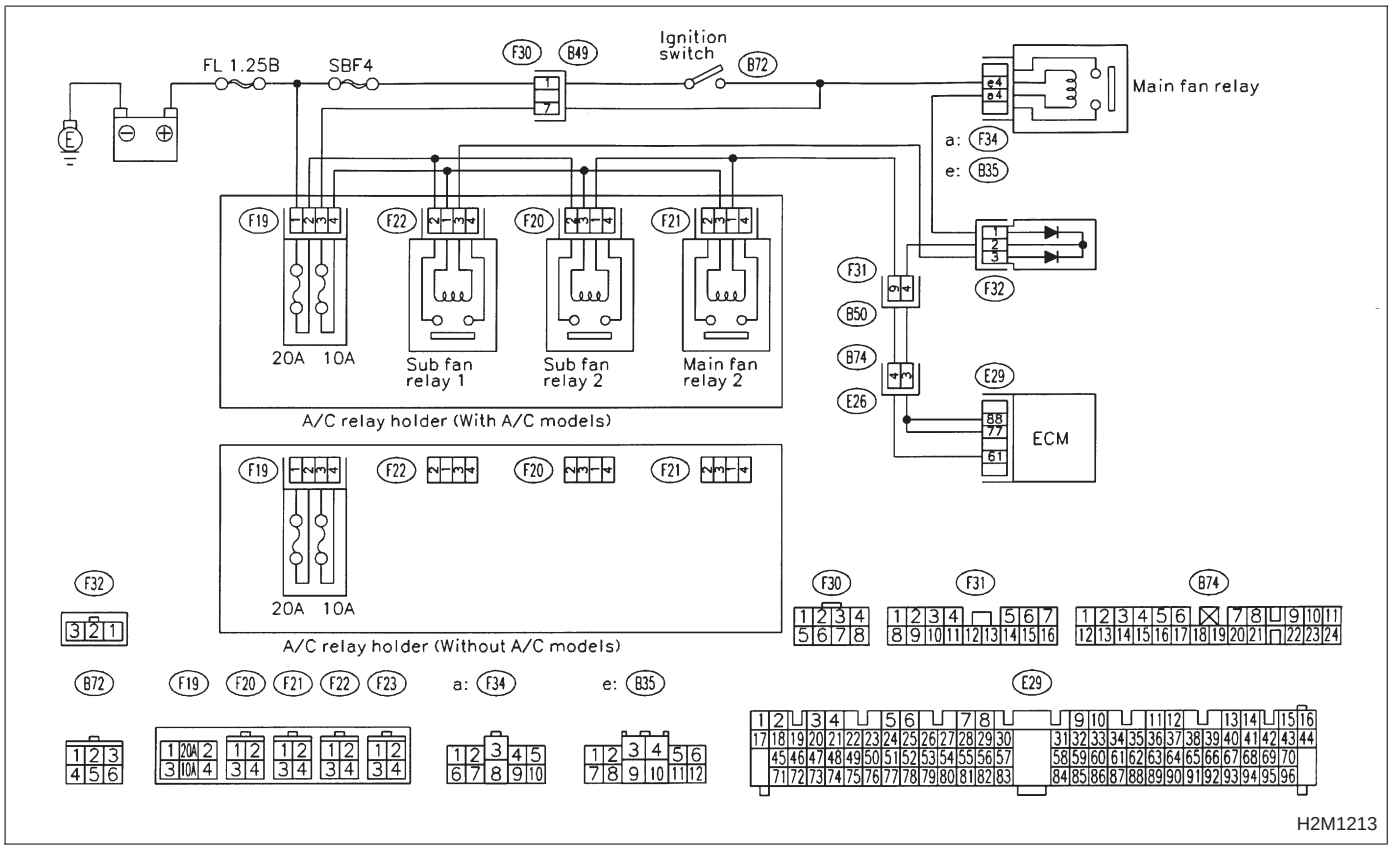
TROUBLE SYMPTOM:

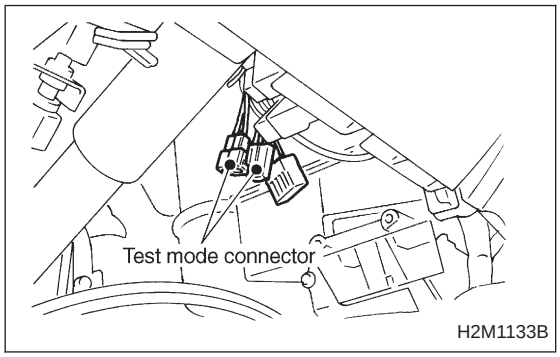
- Radiator fan does not operate properly.
- Overheating

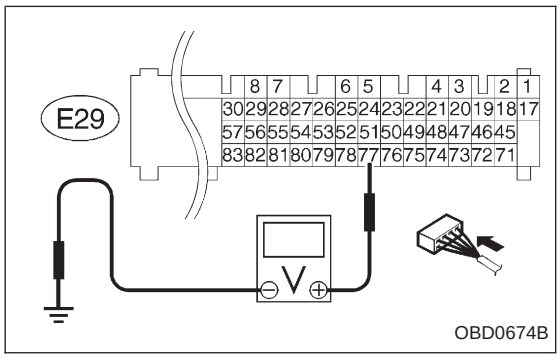


CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODE.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:







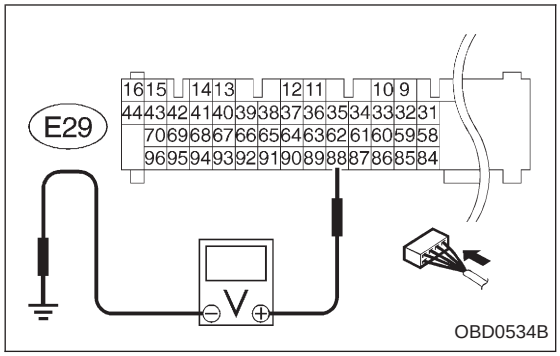
1	CHECK OUTPUT SIGNAL FROM ECM.

1) Turn ignition switch to OFF.
2) Connect 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 ignition switch to ON.
4) Measure voltage between ECM and body.

CHECK ***: Connector & terminal (E29) No. 77 — Body/10 V, or more and 1 V or less at every 2 seconds***

YES : Go to step 6.

NO : Go to next CHECK .



CHECK ***: Connector & terminal (E29) No. 88 — Body/10 V, or more***

YES : Go to step 5.

NO : Go to step 2.

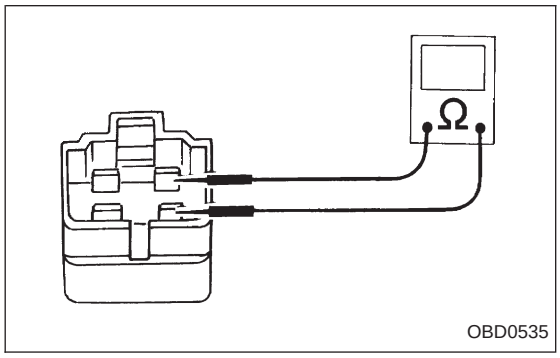
2	**CHECK POWER SUPPLY FOR RELAYS.**

Turn ignition switch to OFF.

CHECK ***: Is the fuse in power supply circuit broken?***

YES : Replace the fuse.

NO : Go to step 3.



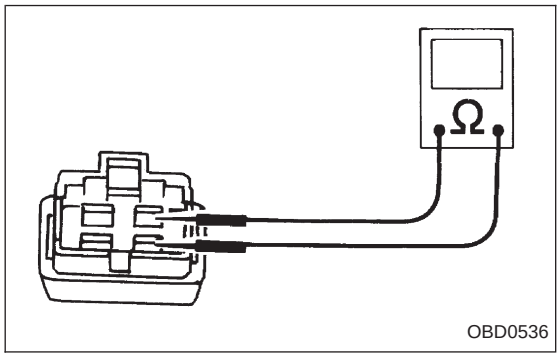
3	**CHECK SUB FAN RELAY 1 AND MAIN FAN RELAY.**

1) Remove sub fan relay 1. (With A/C models only)
2) Measure resistance between sub fan relay 1 terminals.

CHECK ***: Terminal No. 1 — No. 3/97±10 Ω***

YES : Go to next step.

NO : Replace sub fan relay 1.

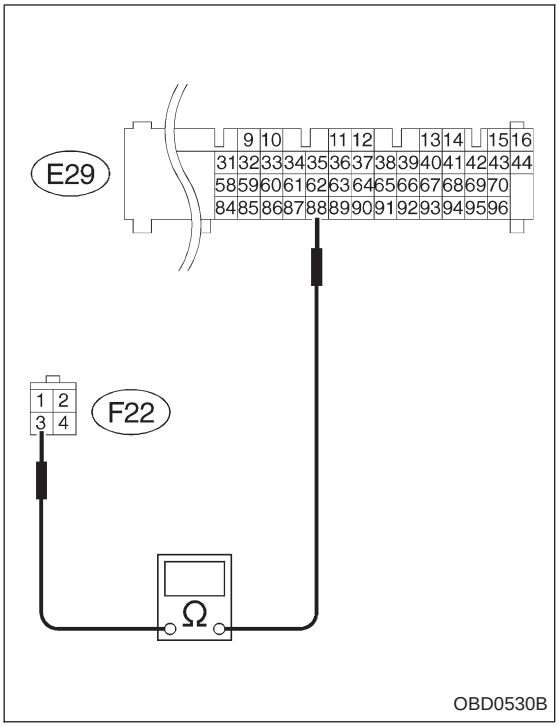


3) Remove main fan relay.
4) Measure resistance between main fan relay terminals.

CHECK ***: Terminal No. 1 — No. 3/100±17 Ω***

YES : Go to step 4.

NO : Replace main fan relay.



4	CHECK HARNESS CONNECTOR.

1) Disconnect connector from ECM.
2) Check if the harness connector is open circuit or has poor contact with the following circuits.

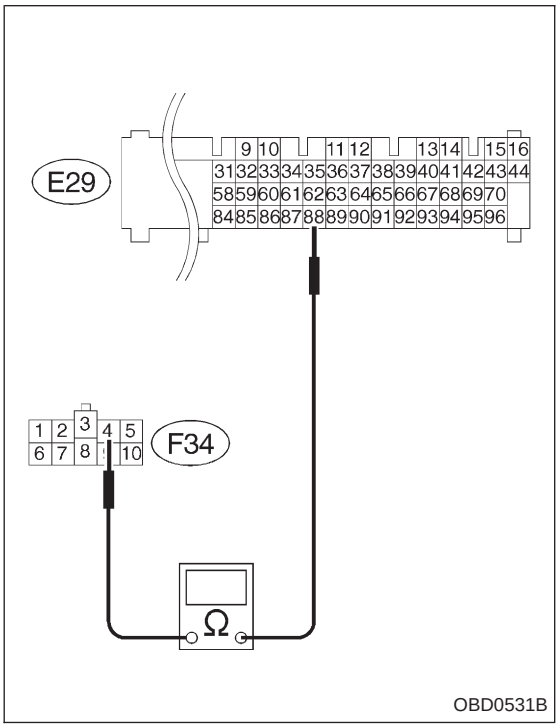
CHECK ***: Connector & terminal (E29) No. 88 — (F22) No. 3 / 1 Ω, or less***

NOTE:
With A/C models only.

YES : Go to next CHECK .
NO : Repair open circuit of harness between ECM connector and sub fan relay 1 connector.

CHECK ***: Is there poor contact in ECM or sub fan relay 1 connector?***

YES : Repair ECM or sub fan relay 1 connector.
NO : Go to next CHECK .

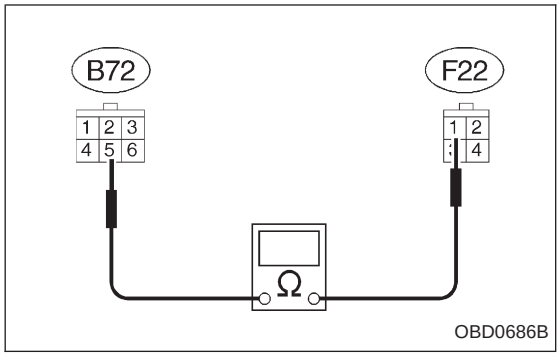


CHECK ***: Connector & terminal (E29) No. 88 — (F34) No. 4 / 1 Ω, or less***

YES : Go to next CHECK .
NO : Repair open circuit of harness between ECM connector and main fan relay connector.

CHECK ***: Is there poor contact in ECM or main fan relay connector?***

YES : Repair ECM or main fan relay connector.
NO : Go to next CHECK .



CHECK ***: Connector & terminal (F22) No. 1 — (B72) No. 5 / 1 Ω, or less***

YES : Go to next CHECK .

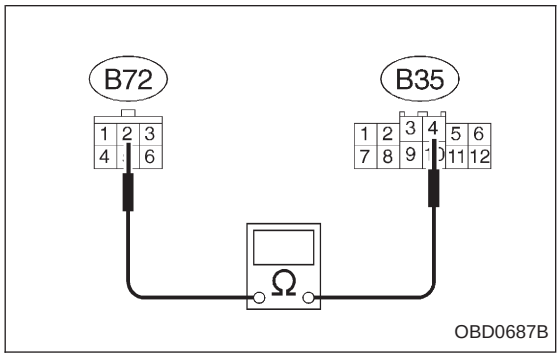
NO : Repair open circuit of harness between sub fan relay 1 connector and ignition switch connector.

CHECK ***: Is there poor contact in sub fan relay 1 or ignition switch connector?***

YES : Repair poor contact in sub fan relay 1 or ignition switch connector.

NO : Go to next CHECK .

NOTE:
With A/C models only.



CHECK ***: Connector & terminal (B35) No. 4 — (B72) No. 2 / 1 Ω, or less***

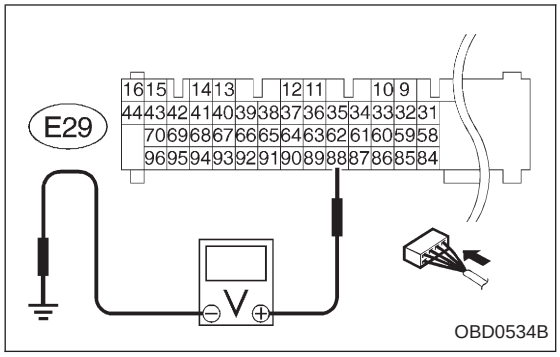
YES : Go to next CHECK .

NO : Repair open circuit of harness between main fan relay connector and ignition switch connector.

CHECK ***: Is there poor contact in main fan relay or ignition switch connector?***

YES : Repair poor contact in main fan relay or ignition switch connector.

NO : Replace ECM with a new one.



5	CHECK HARNESS CONNECTOR.

1) Turn ignition switch to OFF.
2) Remove main fan relay and sub fan relay 1. (with A/C models)
   Remove main fan relay. (without A/C models)
3) Disconnect test mode connector.
4) Turn ignition switch to ON.
5) Measure voltage between ECM and body.

CHECK ***: Connector & terminal***
(E29) No. 88 — Body / 10 V, or more

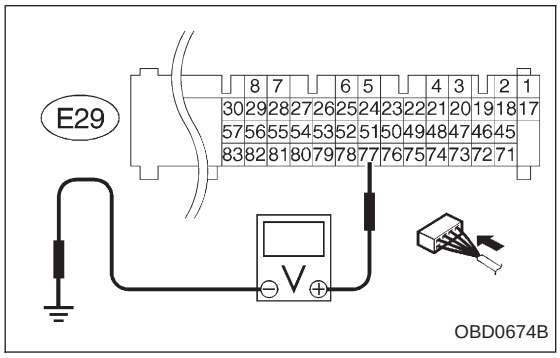
YES : Repair short circuit of harness and replace ECM.

NO : Go to next CHECK .

CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Replace ECM.



6	CHECK MONITOR LINE.

1) Turn ignition switch to OFF.
2) Connect test mode connector.
3) Turn ignition switch to ON.
4) Measure voltage between ECM and body.

CHECK ***: Connector & terminal***
(E29) No. 77 — Body / 10 V, or more and 1 V, or less at every 2 seconds.

YES : Repair poor contact in ECM connector.

NO : Repair open circuit of harness between ECM and main fan relay connector.

OBD (FB1)

P1502 <FAN_F>

OBD0538

BH: DTC P1502 — RADIATOR FAN FUNCTION PROBLEM (FAN – F) —

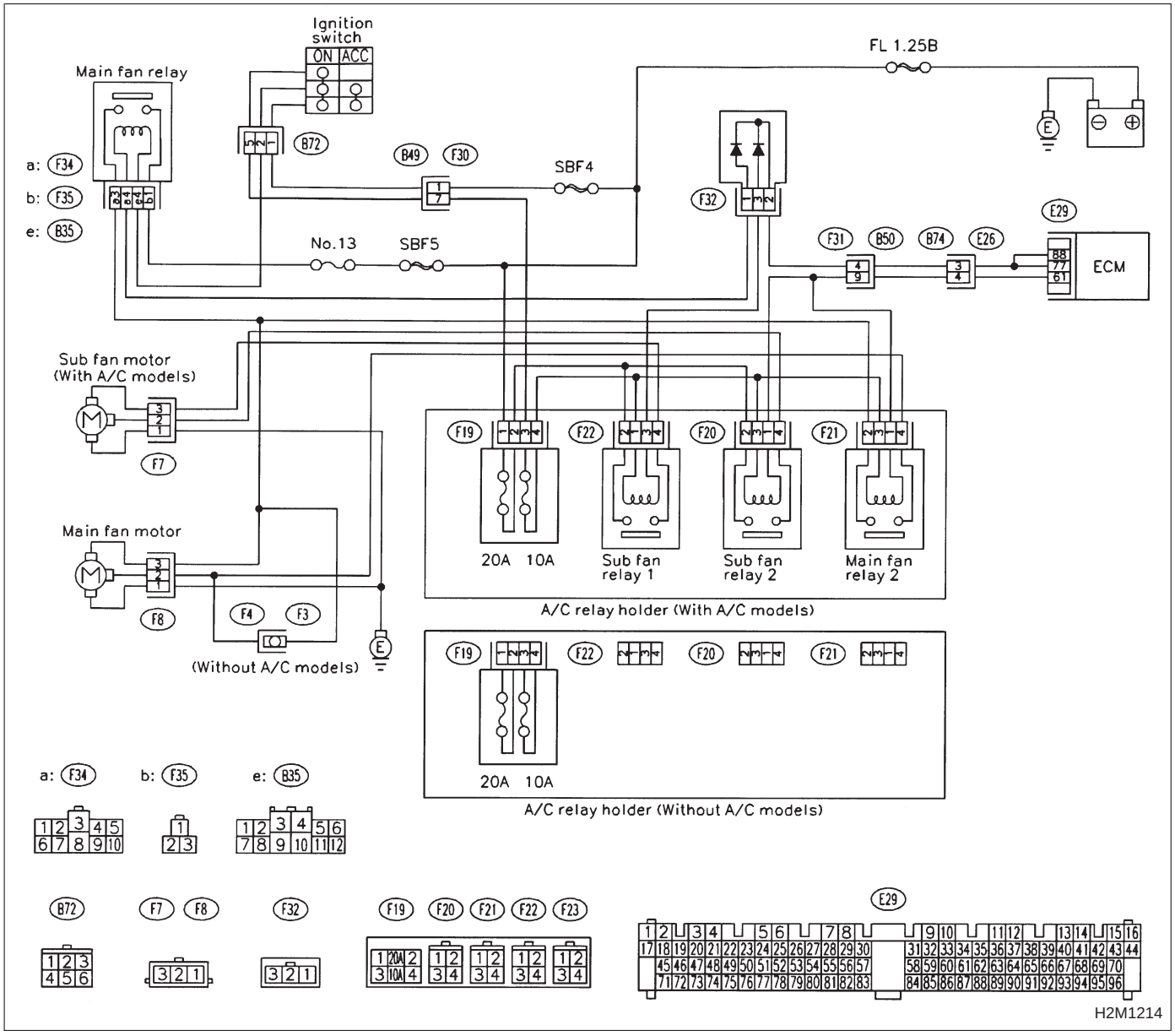
DTC DETECTING CONDITION:

- Two consecutive trips with fault

TROUBLE SYMPTOM:

- Occurrence of noise
- Overheating

WIRING DIAGRAM:



When DTC P1104 is on display, check engine cooling system. <Ref. to 2-5 [T100].>

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

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.

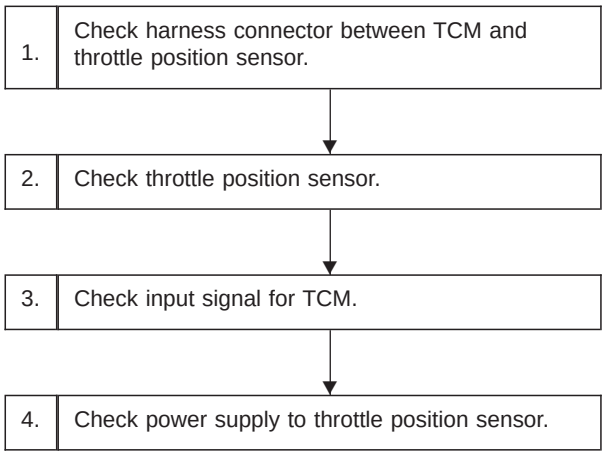
BI: DTC P1700 — THROTTLE POSITION SENSOR CIRCUIT MALFUNCTION FOR AUTOMATIC TRANSMISSION (ATTH) —

DTC DETECTING CONDITION:

- Two consecutive trips with fault

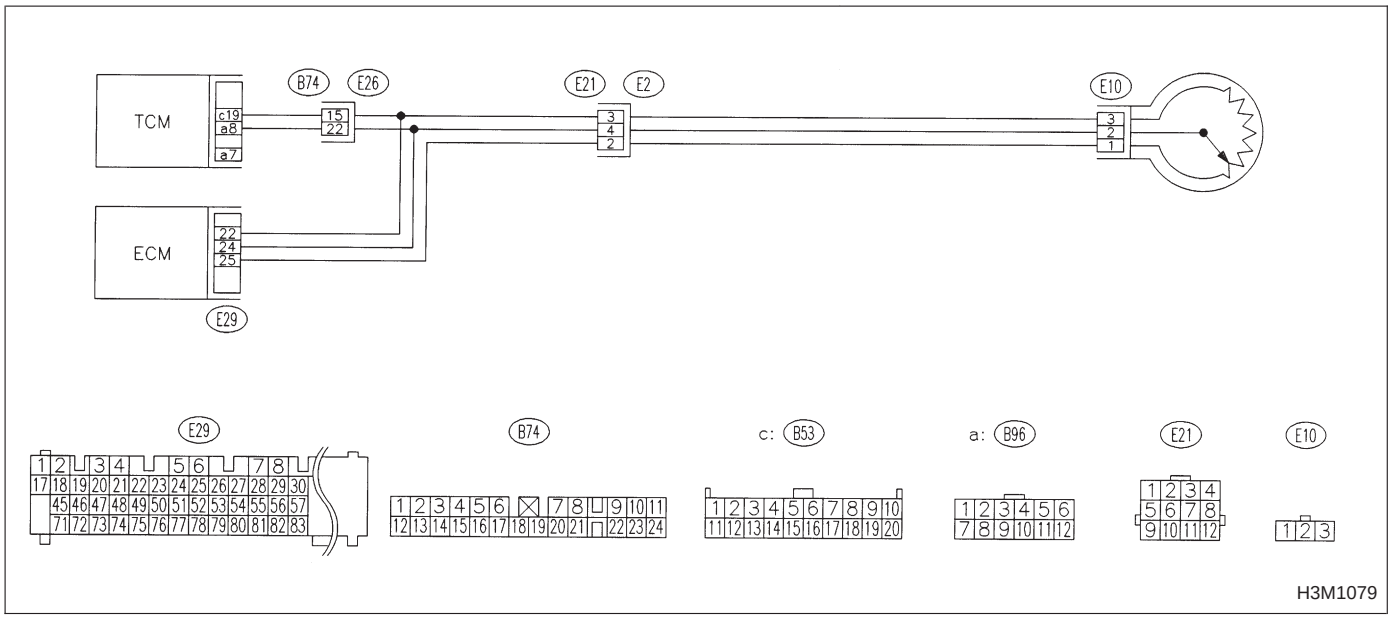
TROUBLE SYMPTOM:

- Shift point too high or too low; engine brake not effected in “3” range; excessive shift shock; excessive tight corner “braking”

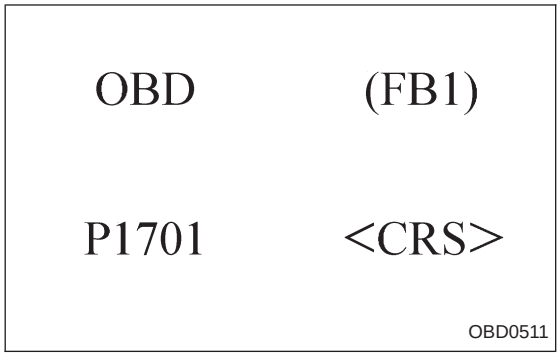


CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



NOTE:
For the diagnostic procedure on throttle position sensor circuit, refer to 3-2b [T7L0].



BJ: DTC P1701 — CRUISE CONTROL SET SIGNAL CIRCUIT MALFUNCTION FOR AUTOMATIC TRANSMISSION (CRS) —

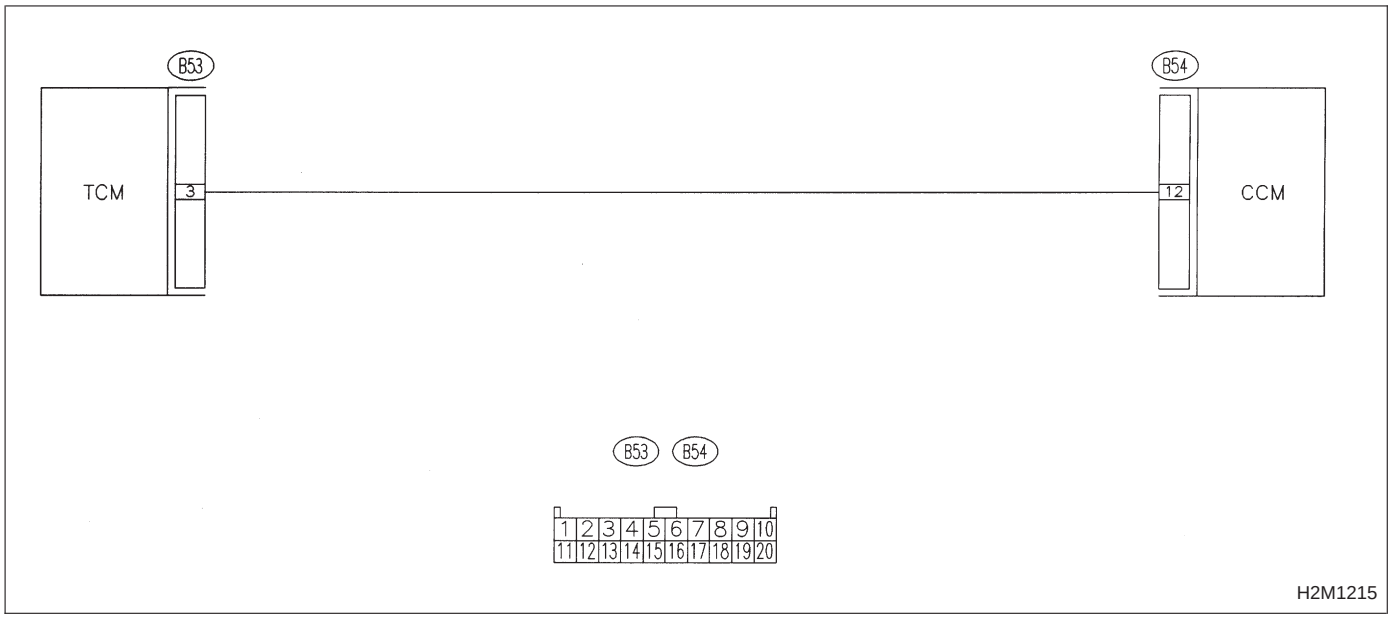
DTC DETECTING CONDITION:

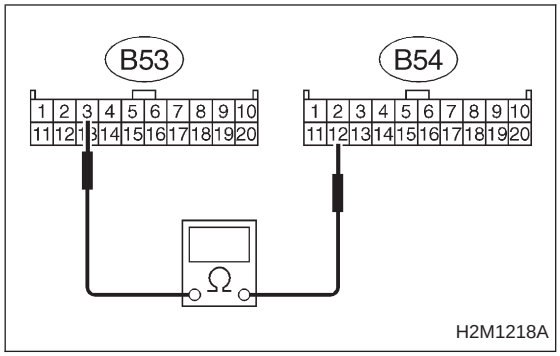
- Two consecutive trips with fault

1.	**Check harness connector between TCM and CCM.**
2.	**Check input signal for TCM.**

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:





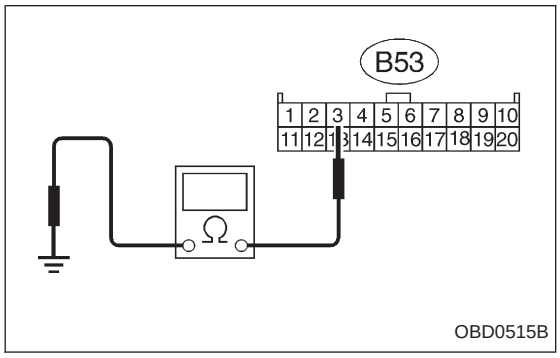
1.	CHECK HARNESS CONNECTOR BETWEEN TCM AND CCM.

1) Turn ignition switch to OFF.
2) Disconnect connectors from TCM and CCM.
3) Measure resistance of harness connector between TCM and CCM.

CHECK ***: Connector & terminal***
(B53) No. 3 — (B54) No. 12 / 1 Ω, or less

YES : Go to next step.

NO : Repair open circuit of harness between TCM connector and CCM connector.

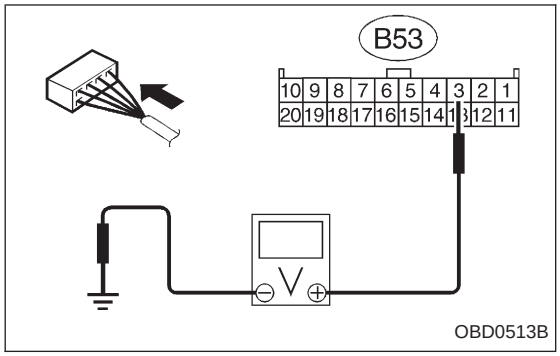


4) Measure resistance of harness connector between TCM and body.

CHECK ***: Connector & terminal***
(B53) No. 3 — Body / 1 MΩ, or more

YES : Go to step 2.

NO : Repair short circuit of harness between TCM connector and CCM connector.



2	CHECK INPUT SIGNAL FOR TCM.

1) Connect 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) Cruise control main switch to ON.
5) Move selector lever to “D” and slowly increase vehicle speed to 50 km/h (31 MPH).
6) Cruise control set switch to ON.
7) Measure voltage between TCM and body.

CHECK ***: Connector & terminal (B53) No. 3 — Body / 1 V, or less***

YES : Go to next CHECK .

NO : Check cruise control set circuit. <Ref. to 6-2 [T600].>

CHECK ***: Is there poor contact in TCM connector?***

YES : Repair poor contact in TCM connector.

NO : Replace TCM with a new one.

OBD (FB1)

P1702 <ATDIAG>

OBD0516

BK: DTC P1702 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT MALFUNCTION (ATDIAG) —

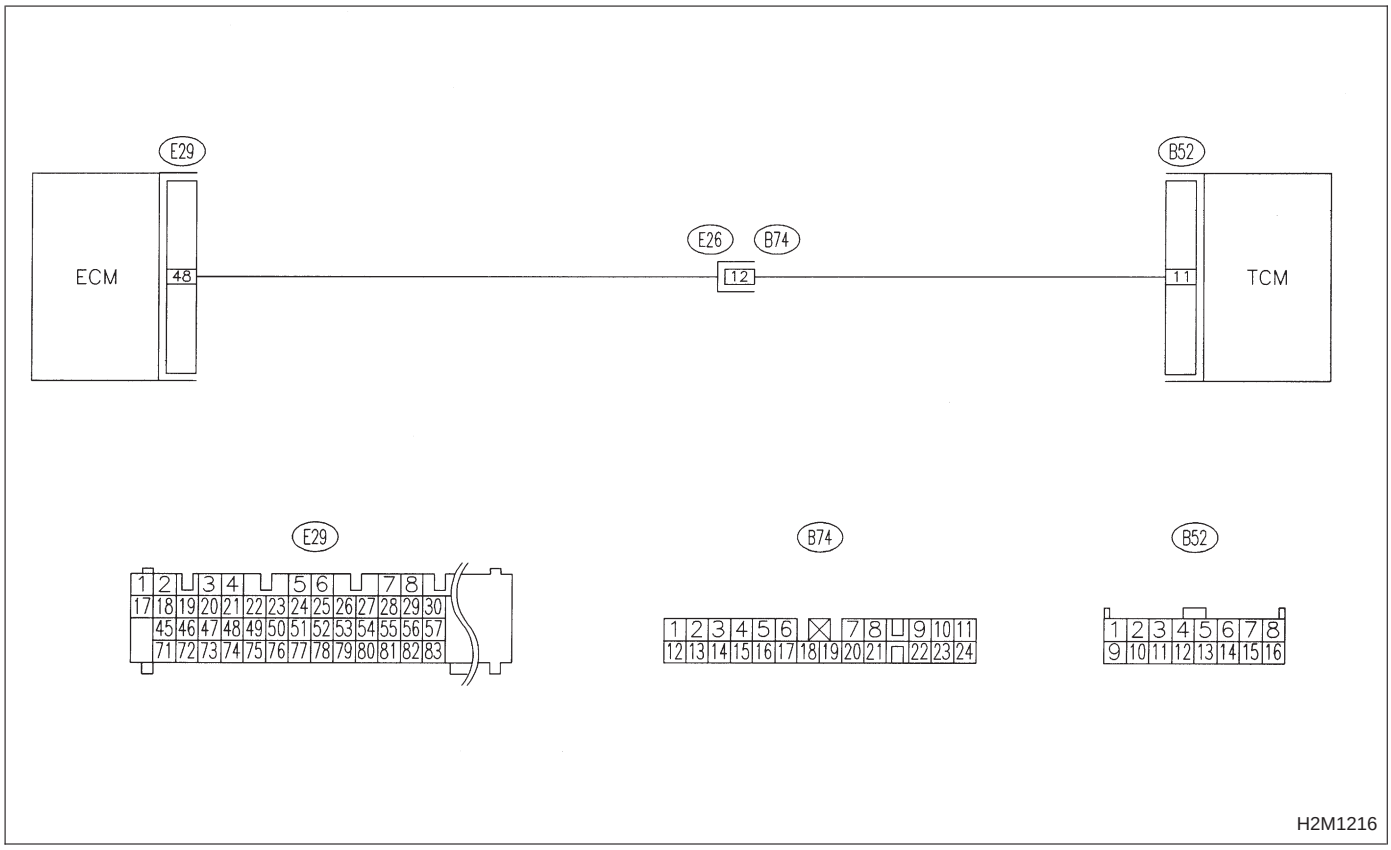
DTC DETECTING CONDITION:

- Two consecutive trips with fault

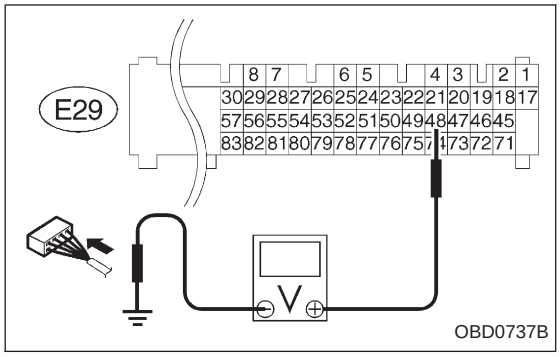
1.	**Check harness connector.**
2.	**Check harness connector.**

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7b [T3D0] and [T3E0].>

WIRING DIAGRAM:



H2M1216



1 CHECK HARNESS CONNECTOR

1) Turn ignition switch to ON.
2) Measure voltage between ECM connector and body.

CHECK : ***Connector & terminal (E29) No. 48 — Body / 4 V, or more***

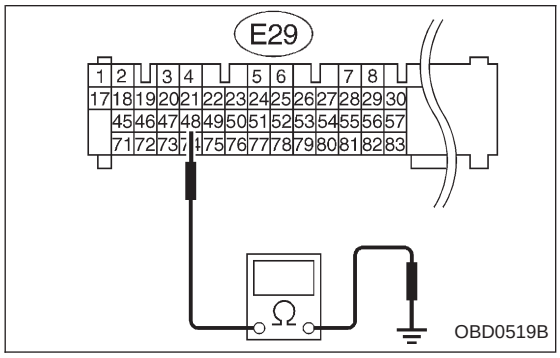
YES : ● Open circuit of harness between ECM connector and TCM connector
● Poor contact in ECM connector
● Poor contact in TCM connector
● Poor contact in coupling connector (B74)
Check the above and repair if necessary.

NO : Go to next CHECK .

CHECK : ***Connector & terminal (B84) No. 48 — Body / 1 V, or less***

YES : Go to step 2.

NO : Although MIL illuminates, circuit is now normal. Check all connectors for possible poor contact between ECM connector and TCM connector.



2 CHECK HARNESS CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Measure resistance between ECM harness connector and body.

CHECK : ***Connector & terminal (E29) No. 48 — Body / 10 Ω, or less***

YES : Repair short circuit of harness between ECM connector and TCM connector.

NO : Repair poor contact in ECM connector.

AUTOMATIC TRANSMISSION AND DIFFERENTIAL 3-2

1. Supplemental Restraint System “Airbag”

Airbag system wiring harness is routed near the transmission control module (TCM).

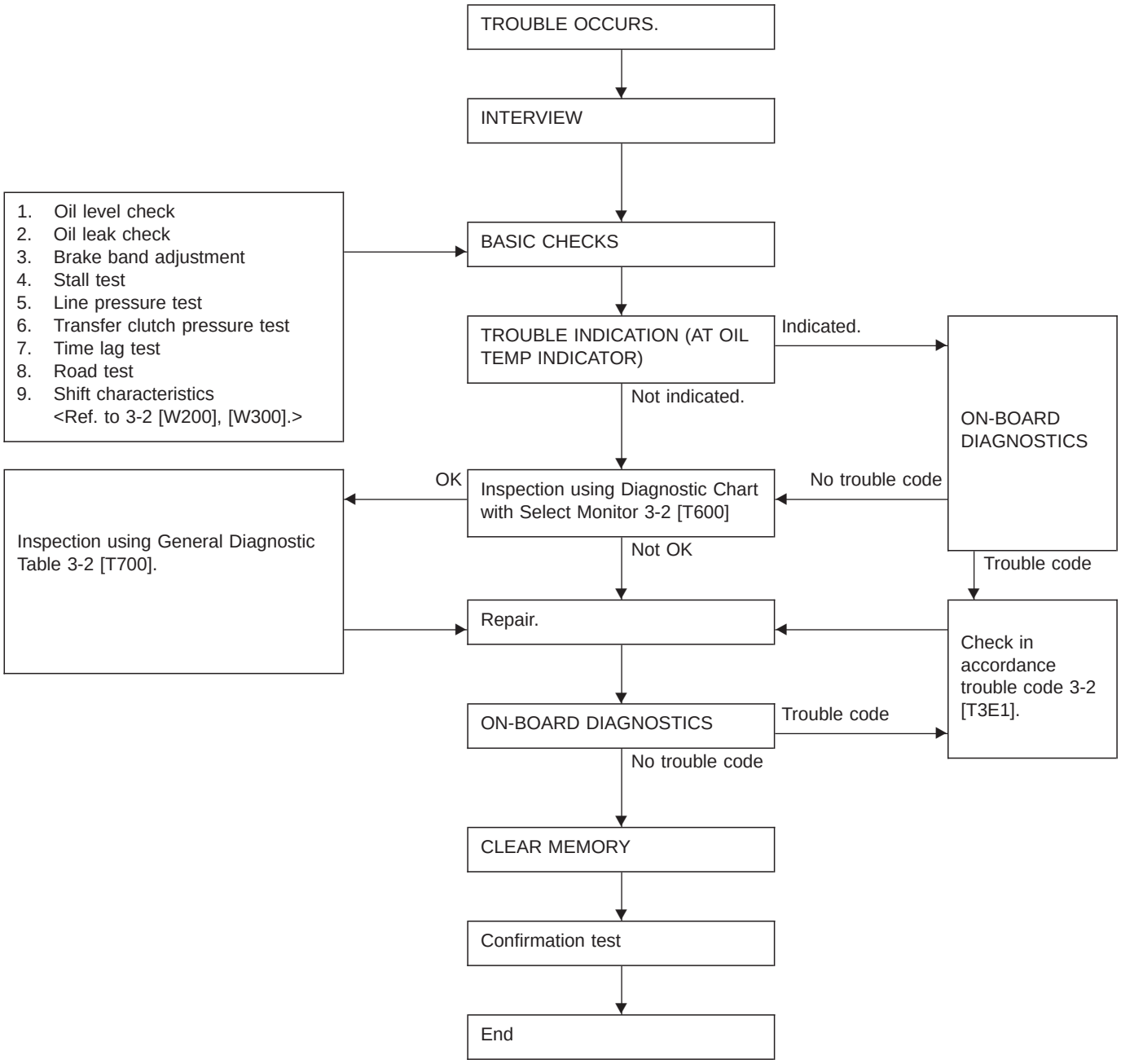
1. **All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.**
2. **Be careful not to damage Airbag system wiring harness when performing diagnostics and servicing the TCM.**

2. Precaution

1) 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.
2) 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.

3. Diagnostic Chart for On-board Diagnostic System

A: BASIC DIAGNOSTICS PROCEDURE

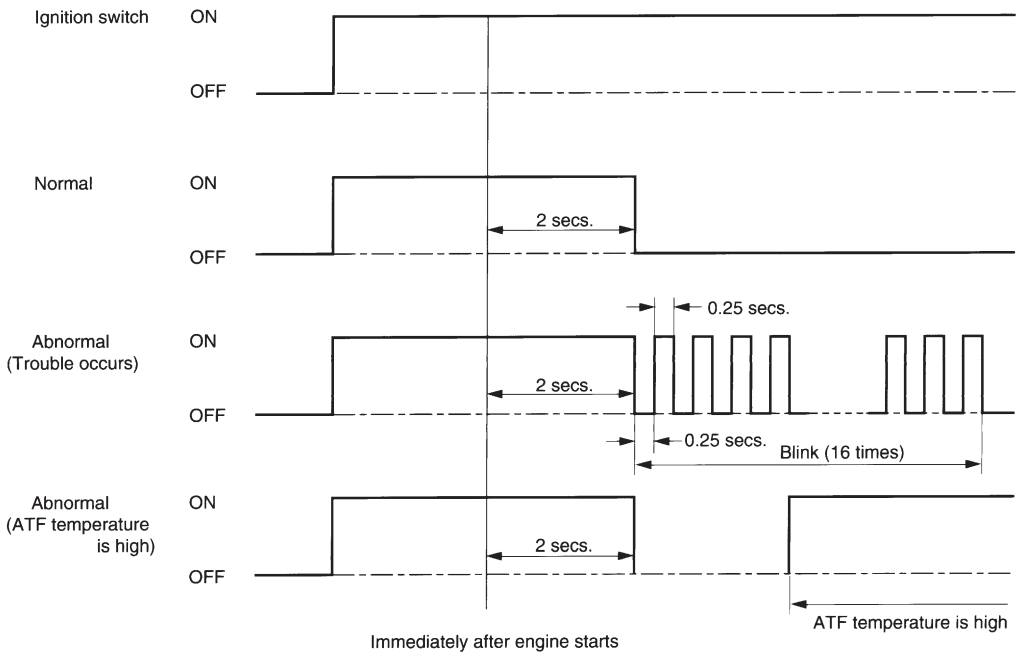


B: ABNORMAL DISPLAY ON “AT OIL TEMP” INDICATOR

When any on-board diagnostic item is malfunctioning, the display on the “AT OIL TEMP” indicator blinks immediately after the engine starts.
The malfunctioning part or unit can be determined by a trouble code during on-board diagnostic operation. Problems which occurred previously can also be identified through the memory function.
If the “AT OIL TEMP” indicator does not show a problem (although a problem is occurring), the problem can be determined by checking the performance characteristics of each sensor using the select monitor.
Indicator signal is as shown in the figure.

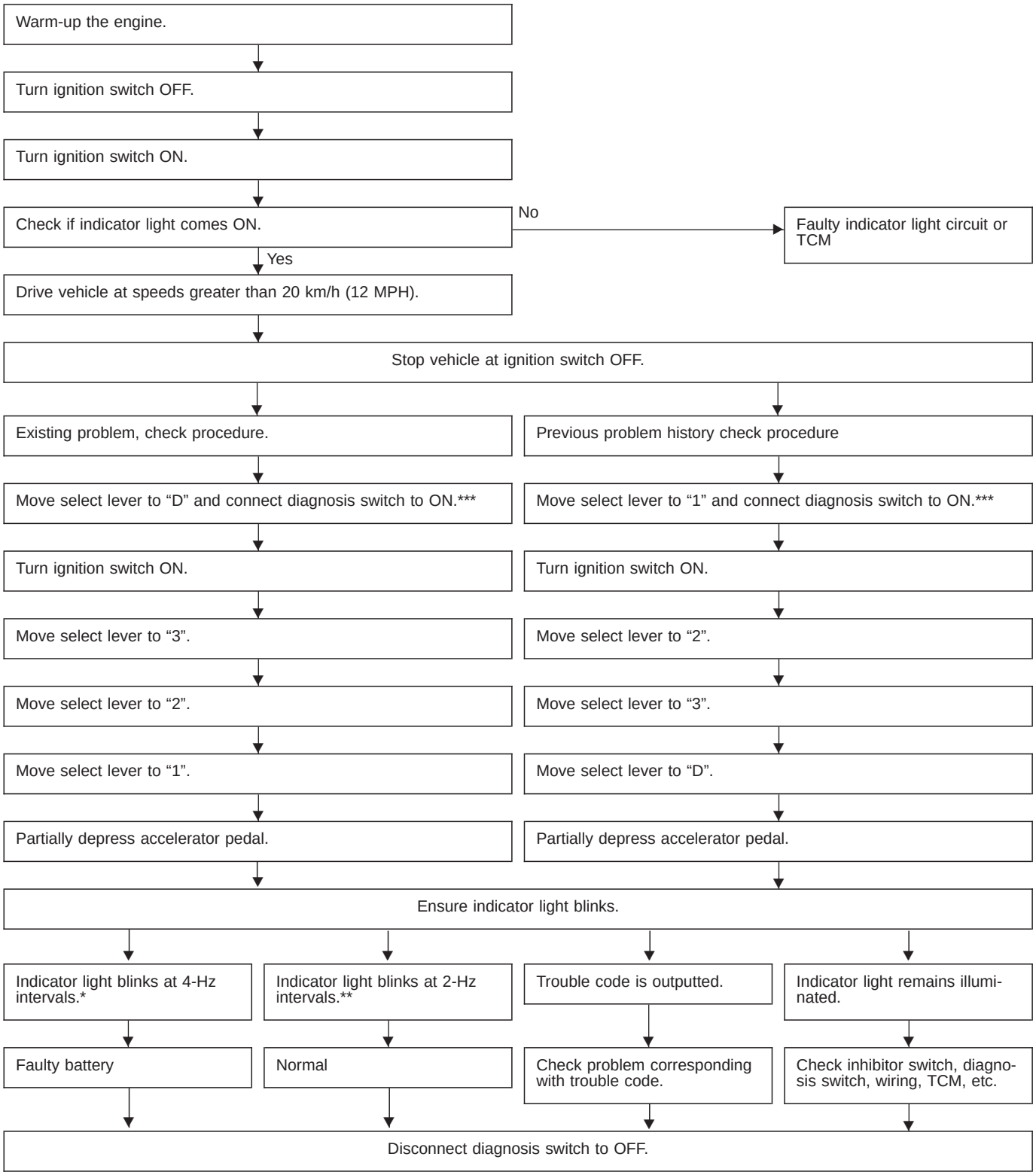
WARNING:

Warning can be noticed only when the engine is initially started.

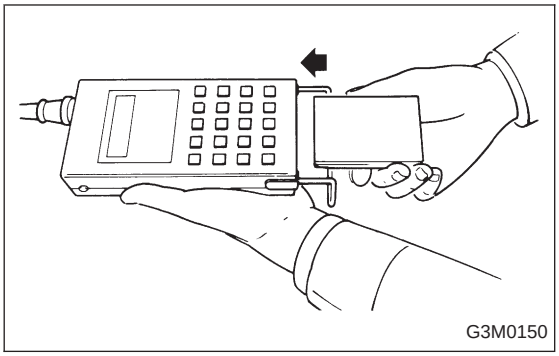


H3H1066

C: ON-BOARD DIAGNOSTICS



* : Blinks every 0.125 (1/8) seconds (until ignition switch is turned OFF).
** : Blinks every 0.25 (1/4) seconds (until ignition switch is turned OFF).
***: Plug in diagnosis terminal to diagnosis connector No. 5 located below instrument lower cover.

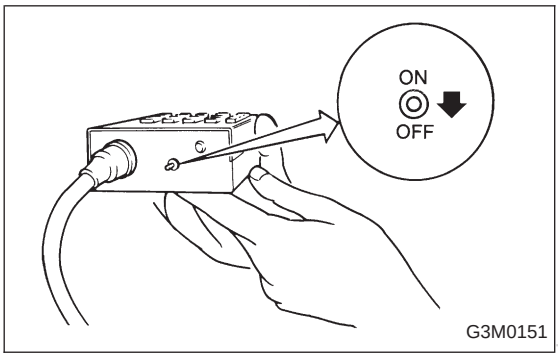

G3M0150

D: ON-BOARD DIAGNOSTICS WITH SELECT MONITOR

1. CONNECT SELECT MONITOR.

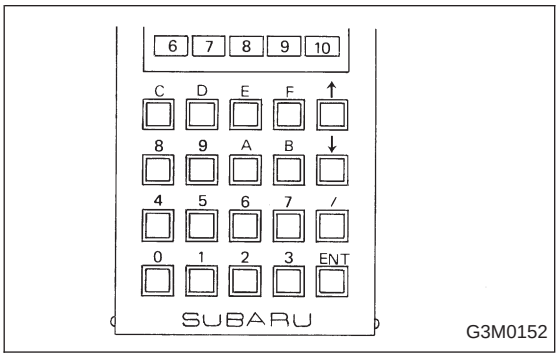
1) Connect select monitor to data link connector located under instrument panel (on driver's side).

Applicable cartridge : No. 498349300



G3M0151

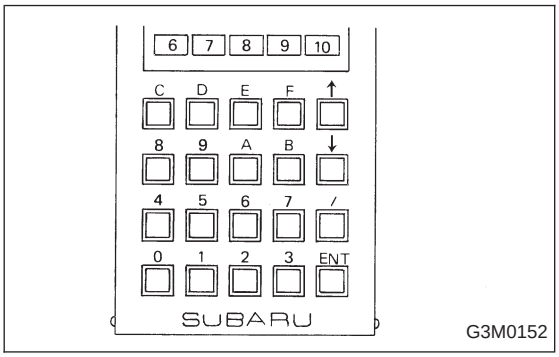
2) Turn ignition switch and select monitor switch ON.
3) After display is shown, press slash "/" key.
4) After AT mode is displayed, press function "[0]".
(Display returns to AT mode when slash "/" is pressed during on-board diagnostic operation.)



G3M0152

2. READ TROUBLE CODE SHOWN ON DISPLAY.

1) Connect select monitor.
2) Designate mode using function key.
Press [F] [B] [0] [ENT] in that order.
3) Ensure trouble code(s) is shown.



G3M0152

3. PREVIOUS TROUBLE CODE READING

1) Connect select monitor.
2) Designate mode using function key.
Press [F] [B] [1] [ENT] in that order.
3) Ensure displayed trouble code(s).

E: LIST OF TROUBLE CODE

1. TROUBLE CODE

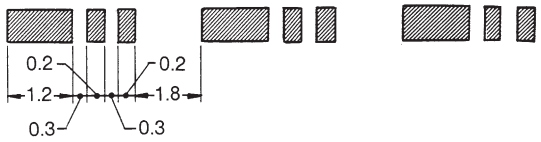
Trouble code	Item	Content of diagnosis	Abbr. (Select monitor)	Page
11	Duty solenoid A	Detects open or shorted drive circuit, as well as valve seizure.	PL	11
12	Duty solenoid B	Detects open or shorted drive circuit, as well as valve seizure.	L/U	14
13	Shift solenoid 3	Detects open or shorted drive circuit, as well as valve seizure.	OVR	16
14	Shift solenoid 2	Detects open or shorted drive circuit, as well as valve seizure.	SFT2	18
15	Shift solenoid 1	Detects open or shorted drive circuit, as well as valve seizure.	SFT1	20
21	ATF temperature sensor	Detects open or shorted input signal circuit.	ATFT	22
23	Engine speed signal	Detects open or shorted input signal circuit.	EREV	24
24	Duty solenoid C	Detects open or shorted drive circuit, as well as valve seizure.	4WD	26
31	Throttle position sensor	Detects open or shorted input signal circuit.	THV	29
32	Vehicle speed sensor 1	Detects open or shorted input signal circuit.	VSP1	32
33	Vehicle speed sensor 2	Detects open or shorted input signal circuit.	VSP2	34

2. HOW TO READ TROUBLE CODE OF INDICATOR LIGHT

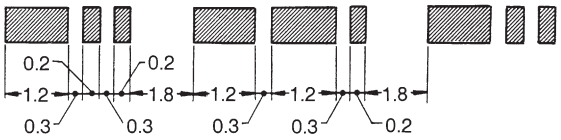
The power indicator light flashes the code corresponding to the faulty part.
The long segment (1.2 sec on) indicates a “ten”, and the short segment (0.2 sec on) signifies a “one”.

Example:

When only one part has failed:
Flashing code 12
(unit: second)



When two or more parts have failed:
Flashing codes 12 and 21
(unit: second)



G3M0104

F: CLEAR MEMORY

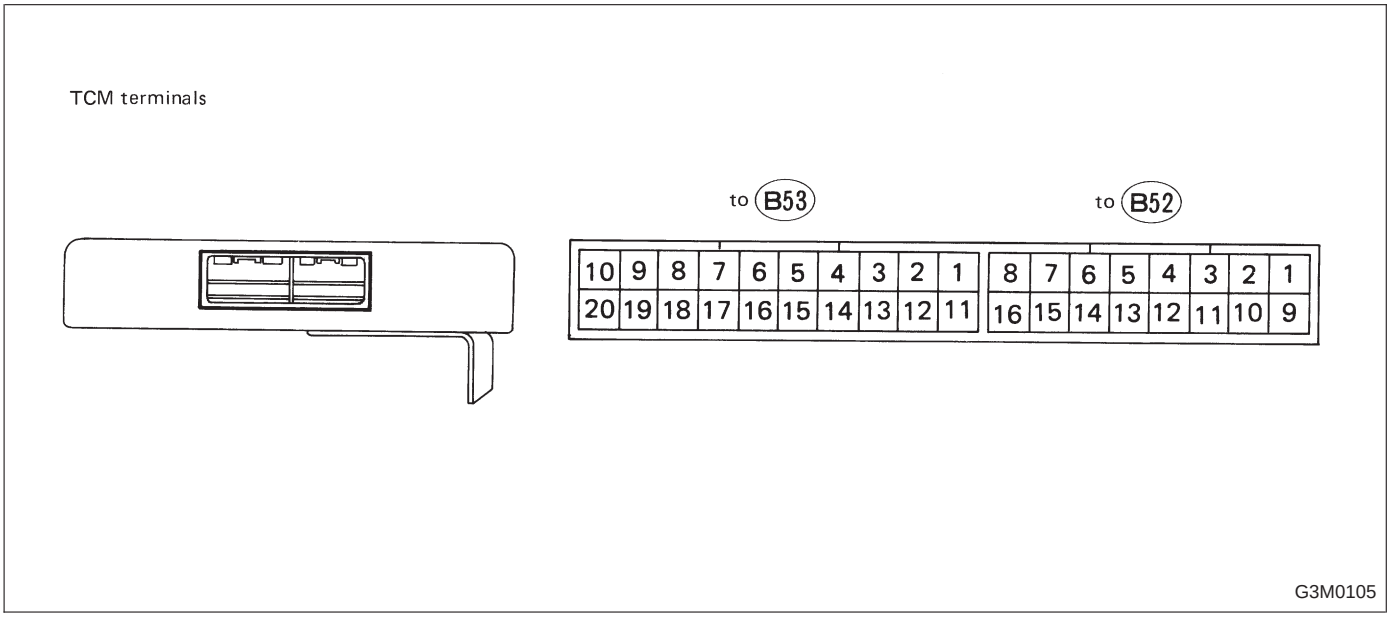
Current trouble codes shown on the display are cleared by turning the ignition switch OFF after conducting on-board diagnostic operation. Previous trouble codes, however, cannot be cleared since they are stored in the TCM memory which is operating on the back-up power supply. These trouble codes can be cleared by removing the specified fuse (located under the right lower portion of the instrument panel).

CLEAR MEMORY:

Removal of No. 14 fuse (for at least one minute)

- The No. 14 fuse is located in the line to the memory back-up power supply of the TCM and ECM (MFI). Removal of this fuse clears the previous trouble codes stored in the TCM and ECM (MFI) memory.
- Be sure to remove the No. 14 fuse for at least the specified length of time. Otherwise, trouble codes may not be cleared.

4. Transmission Control Module (TCM) I/O Signal



Check with ignition switch ON.

Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)
Battery supply		B52	1	Ignition switch OFF	11 — 13
Ignition power supply		B52 B52	15 16	Ignition switch ON (with engine OFF)	11 — 13
Inhibitor switch	“P” and “N” range switch	B53	12	Select lever in “P” or “N” range	Less than 1
				Select lever in any other than “P” or “N” range	More than 8
	“R” range switch	B52	3	Select lever in “R” range	Less than 1
				Select lever in any other than “R” range	More than 9.5
	“D” range switch	B53	11	Select lever in “D” range	Less than 1
				Select lever in any other than “D” range	More than 9.5
	“3” range switch	B53	3	Select lever in “3” range	Less than 1
				Select lever in any other than “3” range	More than 9.5
	“2” range switch	B53	10	Select lever in “2” range	Less than 1
				Select lever in any other than “2” range	More than 9.5
	“1” range switch	B53	9	Select lever in “1” range	Less than 1
				Select lever in any other than “1” range	More than 9.5
Diagnosis switch		B53	13	Diagnosis connector connected	Less than 1
				Diagnosis connector disconnected	More than 6
Brake switch		B53	8	Brake pedal depressed	More than 10.5
				Brake pedal released	Less than 1
ABS signal		B53	7	ABS switch ON	Less than 1
				ABS switch OFF	More than 6.5
AT diagnostic signal		B53	18	Ignition switch ON (with engine OFF)	Less than 1
				Ignition switch ON (with engine ON)	More than 10

Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Throttle position sensor	B53	20	Throttle fully closed.	0.3 — 0.7	—
			Throttle fully open.	3.9 — 4.3	
Throttle position sensor power supply voltage	B53	1	Ignition switch ON (with engine OFF)	4.8 — 5.7	—
ATF temperature sensor	B53	19	ATF temperature 20°C (68°F)	2.9 — 4.0	2.1 k — 2.9 k
			ATF temperature 80°C (176°F)	1.0 — 1.4	275 — 375
Vehicle speed sensor 1	B53	15	Vehicle stopped.	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Vehicle speed sensor 2	B52	5	When vehicle is slowly moved at least 2 meters (7ft).	Less than 1↔More than 4	—
Engine speed signal	B52	4	Ignition switch ON (with engine OFF)	More than 10.5	—
			Ignition switch ON (with engine ON)	8 — 11	
Cruise set signal	B53	6	When cruise control is set (SET lamp ON).	Less than 1	—
			When cruise control is not set (SET lamp OFF).	6 — 10	
Shift solenoid 1	B52	10	Select lever in 1st or 4th gear	More than 10	20 — 30
			Select lever in 2nd or 3rd gear	Less than 1	
Shift solenoid 2	B52	9	Select lever in 1st or 2nd gear	More than 10	20 — 30
			Select lever in 3rd or 4th gear	Less than 1	
Shift solenoid 3	B52	8	Select lever in “N” range (with throttle fully closed.)	Less than 1	20 — 30
			Select lever in “D” range (with throttle fully closed.)	More than 10	
Duty solenoid A	B52	11	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 4.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 1	
Dropping resistor	B52	12	Throttle fully closed (with engine OFF) after warm-up.	5 — 14	12 — 18
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
Duty solenoid B	B52	7	When lock up occurs.	More than 8.5	10 — 17
			When lock up is released.	Less than 0.5	
Duty solenoid C	B52	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	
Sensor ground line 1	B53	16	—	0	Less than 1
Sensor ground line 2	B53	4	—	0	Less than 1
System ground line	B52	14	—	0	Less than 1
Power system ground line	B52	13	—	0	Less than 1
FWD switch	B52	2	Fuse removed.	More than 10	
			Fuse installed.	Less than 1	

5. Diagnostic Chart with Trouble Code

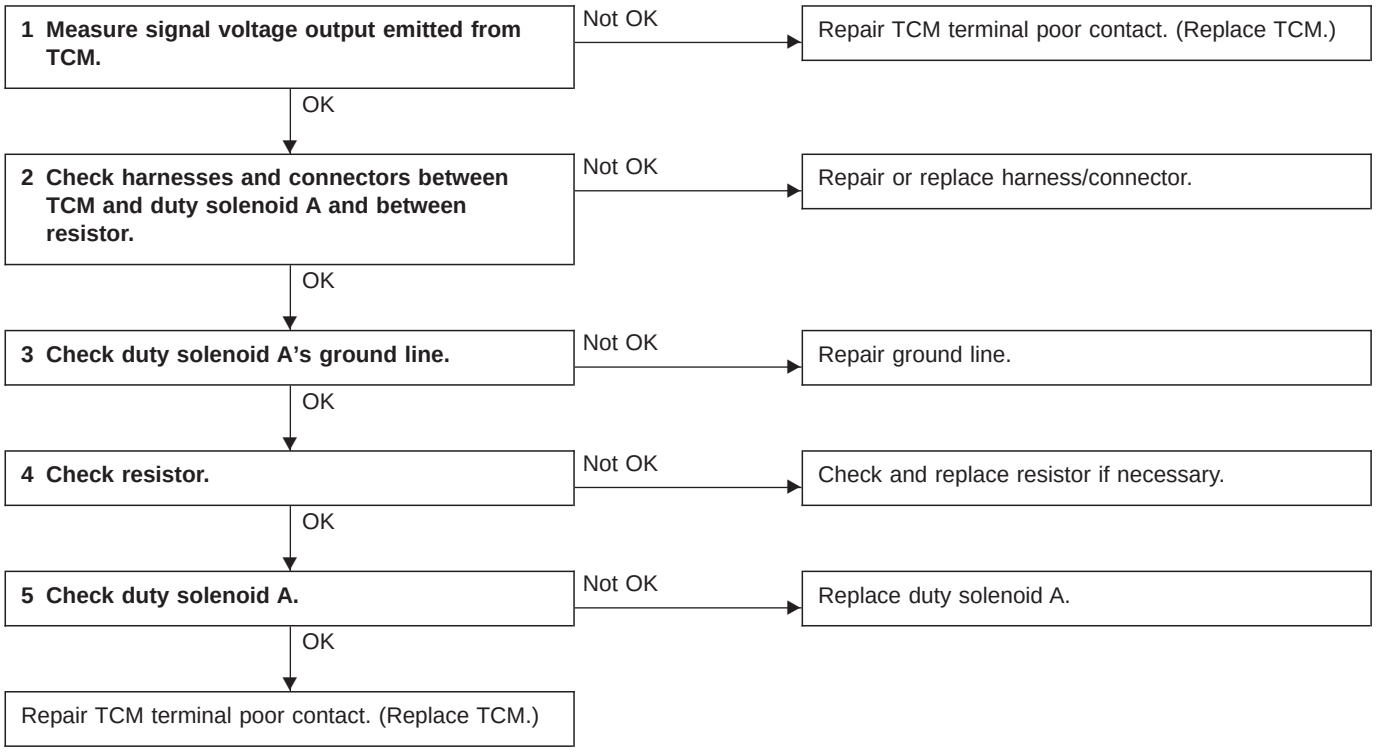
A: TROUBLE CODE 11 — DUTY SOLENOID A —

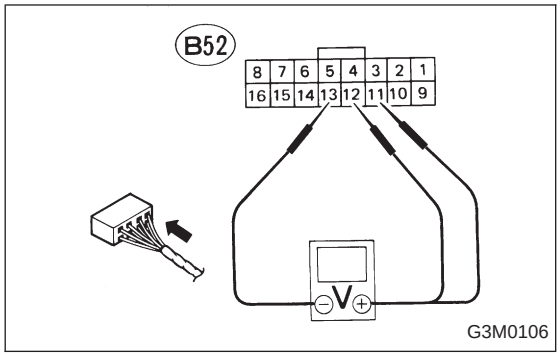
DIAGNOSIS:

Output signal circuit of duty solenoid A or resistor is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock





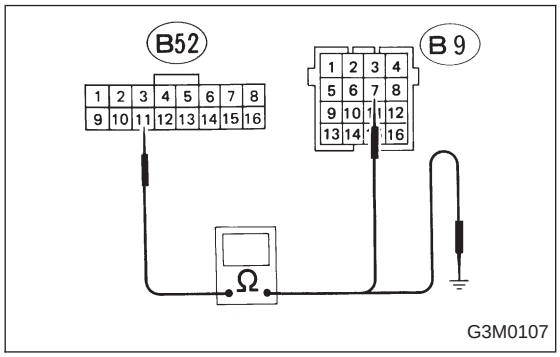
1. MEASURE SIGNAL VOLTAGE OUTPUT EMITTED FROM TCM.

1) Warm-up the engine and transmission.
2) Ignition switch ON (Engine OFF).
3) Move shift lever to “N”.
4) While opening and closing throttle valve, measure voltage between TCM connector and body.

Connector & terminal / Specified resistance:
(B52) No. 11 — No. 13 /
1.5 — 4.0 V (Throttle is fully closed.)
0.5 V, max. (Throttle is fully open.)
(B52) No. 12 — No.13 /
8.5 V, min. (Throttle is fully closed.)
0.5 V, max. (Throttle is fully open.)

● **SELECT MONITOR FUNCTION MODE**

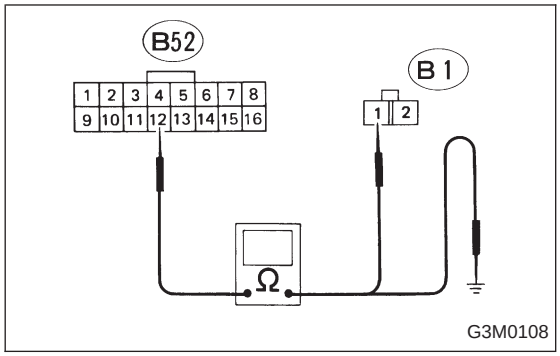
Mode: F11
Condition:
Ignition switch ON (Engine OFF) N range
Specified data:
PLDTY F11
Less than 25% (Throttle is fully open.)
100% (Throttle is fully closed.)



2. CHECK HARNESSES AND CONNECTORS BETWEEN TCM AND DUTY SOLENOID A AND BETWEEN RESISTOR.

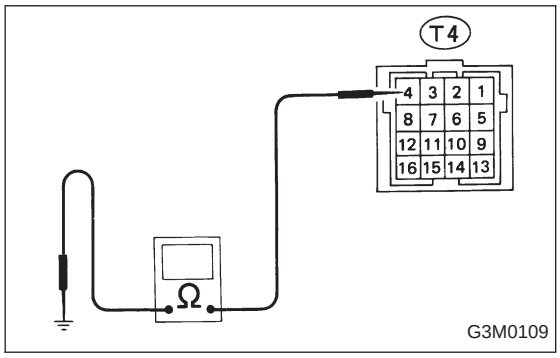
1) Disconnect connector from TCM.
2) Disconnect connector from transmission.
3) Disconnect connector from resistor.
4) Measure resistance between TCM connector and transmission and between TCM connector and body.

Connector & terminal / Specified resistance:
(B52) No. 11 — (B9) No. 7 / 1 Ω, max.
(B52) No. 11 — Body / 1 MΩ, min.



5) Measure resistance between TCM connector and resistor connector and between TCM connector and body.

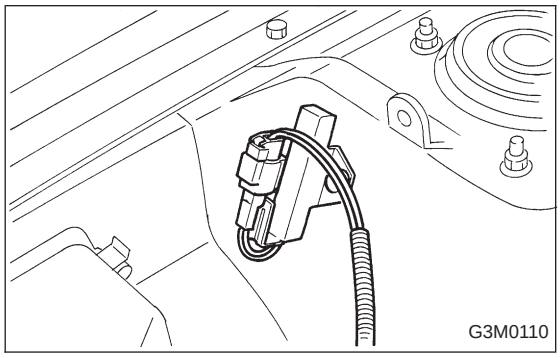
Connector & terminal / Specified resistance:
(B52) No. 12 — (B1) No. 1 / 1 Ω, max.
(B52) No. 12 — Body / 1 MΩ, min.



3. CHECK DUTY SOLENOID A'S GROUND LINE.

1) Disconnect connector from transmission.
2) Measure resistance between transmission connector receptacle (on transmission) and transmission case.

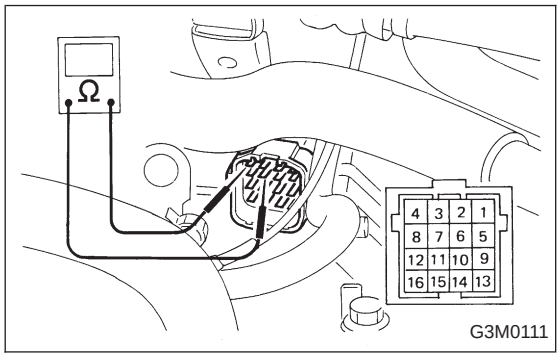
Connector & terminal / Specified resistance:
(T4) No. 4 — Transmission / 1 Ω, max.



4. CHECK RESISTOR.

1) Disconnect connector from resistor.
2) Measure resistance between resistor terminals.

Specified resistance:
9 — 15 Ω



5. CHECK DUTY SOLENOID A.

1) Disconnect connector from transmission.
2) Measure resistance between transmission connector receptacle (on transmission) terminals.

Connector & terminal / Specified resistance:
(T4) No. 7 — No. 4 / 2.0 — 4.5 Ω

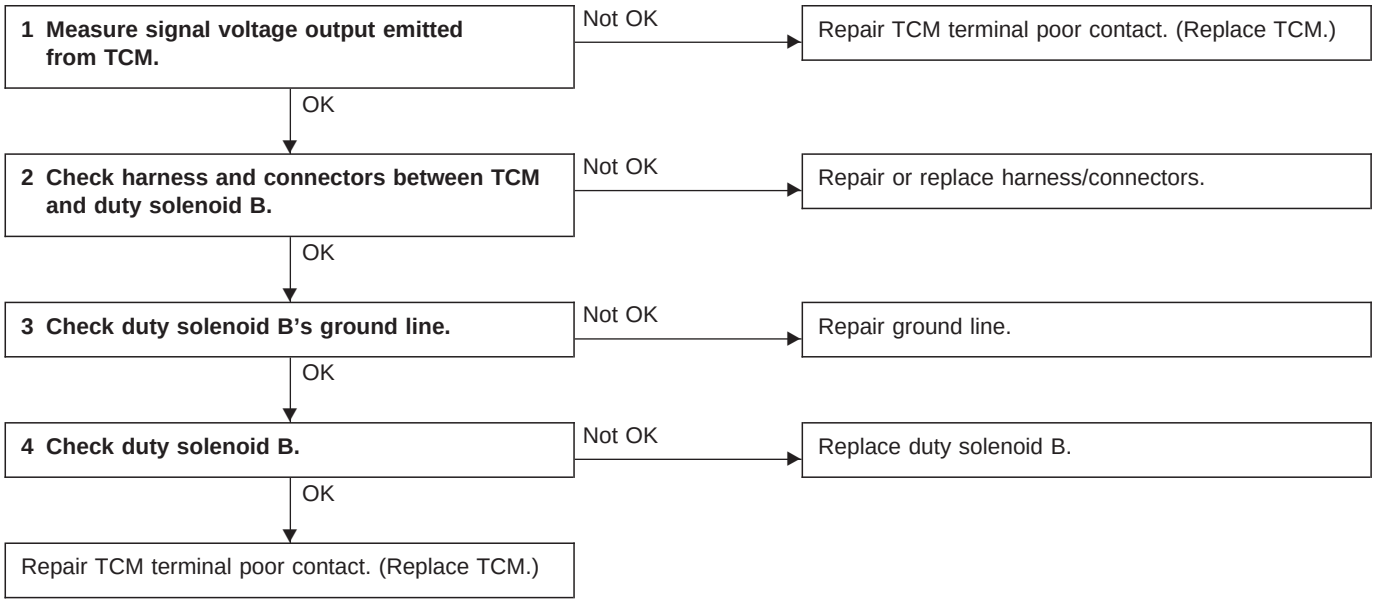
B: TROUBLE CODE 12 — DUTY SOLENOID B —

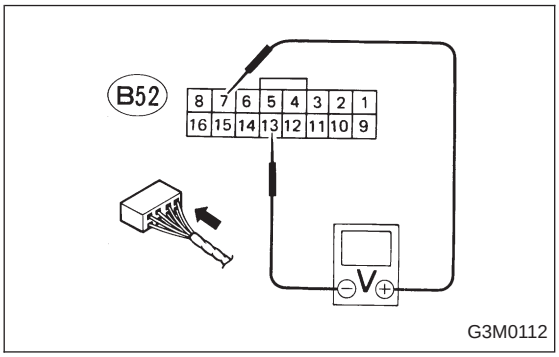
DIAGNOSIS:

Output signal circuit of duty solenoid B is open or shorted.

TROUBLE SYMPTOM:

No “locking-up” (after engine warm-up)





1. MEASURE SIGNAL VOLTAGE OUTPUT EMITTED FROM TCM.

1) Raise vehicle and support with safety stands.

CAUTION:

On AWD models, raise all wheels off ground.

2) Warm-up the engine and transmission.

3) Move shift lever to “D” and slowly increase vehicle speed to 75 km/h (47 MPH). Measure voltage output emitted from TCM.

Connector & terminal / Specified voltage:

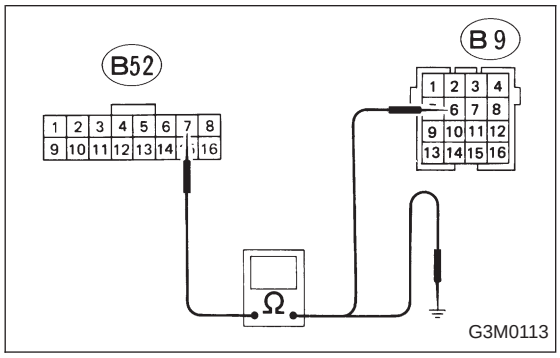
(B52) No. 7 — No. 13 / 8.5 V, min. (when wheels are locked-up.)

4) Return the engine to idling speed. Move shift lever to "N" and measure voltage output emitted from TCM.

Connector & terminal / Specified voltage:
(B33) No. 7 — No. 13 / 0.5 V, max.

- **SELECT MONITOR FUNCTION MODE**

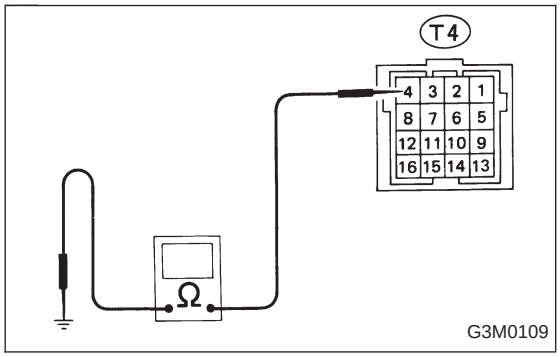
Mode: F12
Condition:
Start the engine and increase vehicle speed to 75 km/h (47 MPH). When wheels are locked-up:
Specified data:
LUDTY F12
95% (Wheel locked-up)
5% (Release)



2. CHECK HARNESS AND CONNECTORS BETWEEN TCM AND DUTY SOLENOID B.

1) Disconnect connector from TCM.
2) Disconnect connector from transmission.
3) Measure resistance between TCM connector and transmission connector, and between TCM connector and body.

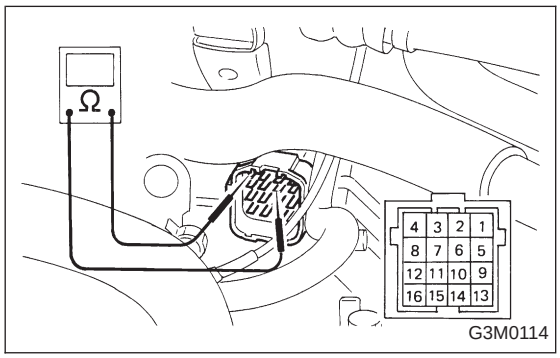
Connector & terminal / Specified resistance:
(B52) No. 7 — (B9) No. 6 / 1 Ω, max.
(B52) No. 7 — Body / 1 MΩ, min.



3. CHECK DUTY SOLENOID B'S GROUND LINE.

1) Disconnect connector from transmission.
2) Measure resistance between transmission connector receptacle and transmission case.

Connector & terminal / Specified resistance:
(T4) No. 4 — Transmission / 1 Ω, max.



4. CHECK DUTY SOLENOID B.

1) Disconnect connector from transmission.
2) Measure resistance between transmission connector receptacle's terminals.

Connector & terminal / Specified resistance:
(T4) No. 6 — No. 4 / 10 — 17 Ω

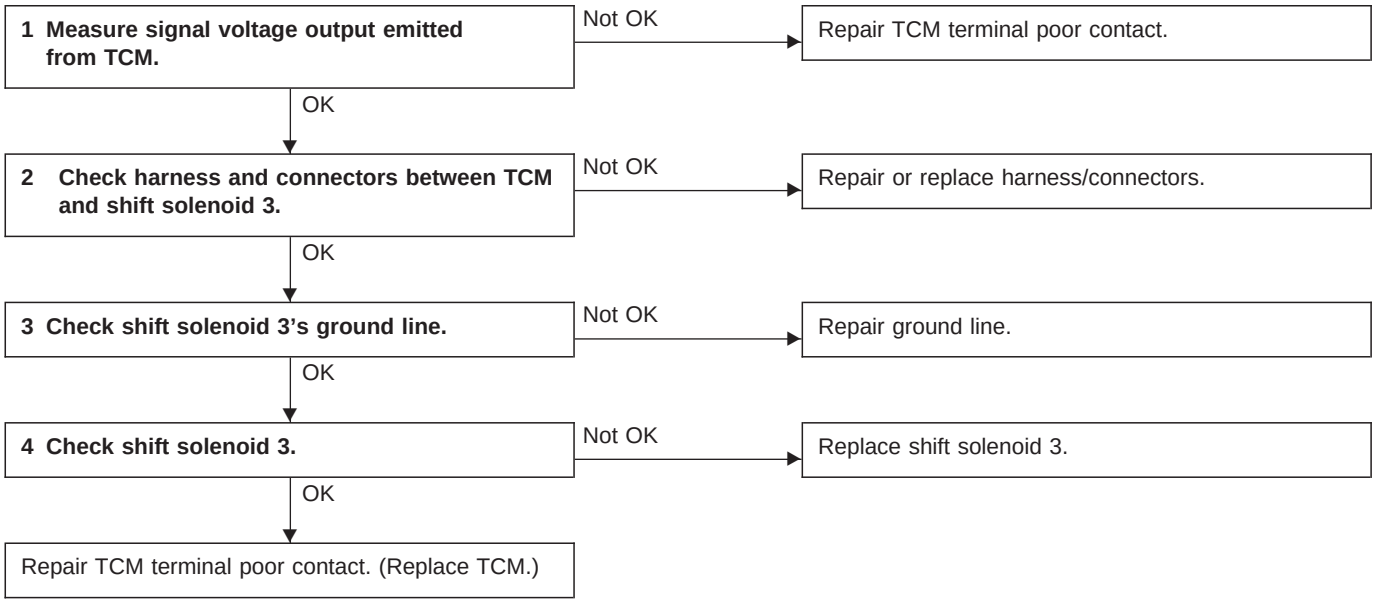
C: TROUBLE CODE 13 — SHIFT SOLENOID 3 —

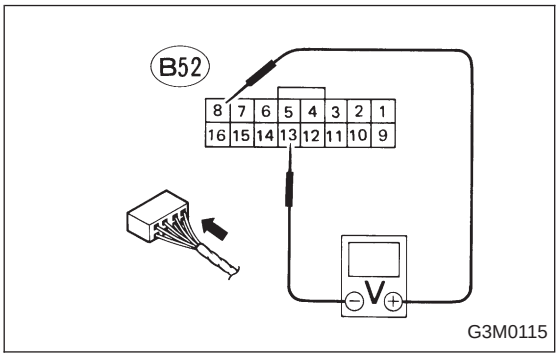
DIAGNOSIS:

Output signal circuit of shift solenoid 3 is open or shorted.

TROUBLE SYMPTOM:

Ineffective engine brake with shift lever in “3”





1. MEASURE SIGNAL VOLTAGE OUTPUT EMITTED FROM TCM.

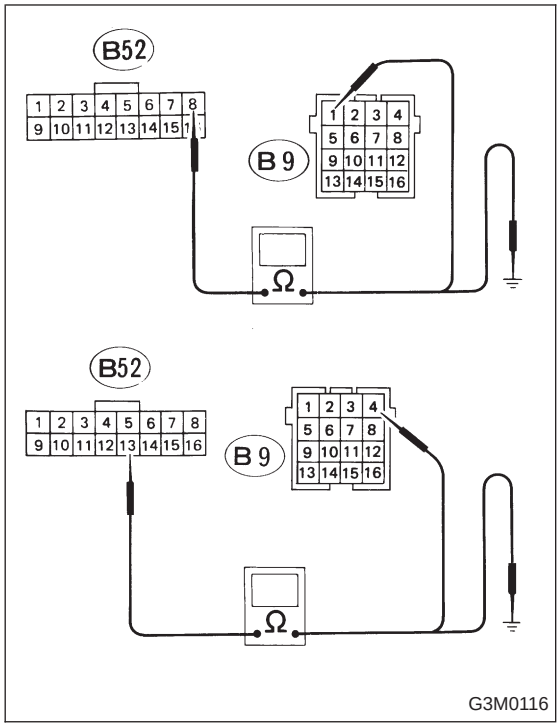
1) Raise vehicle and support with safety stands.

CAUTION:

On AWD models, raise all wheels off ground.

2) Warm-up the engine and transmission.
3) Move shift lever to “D”.
4) Measure signal voltage output emitted from TCM while idling the engine.

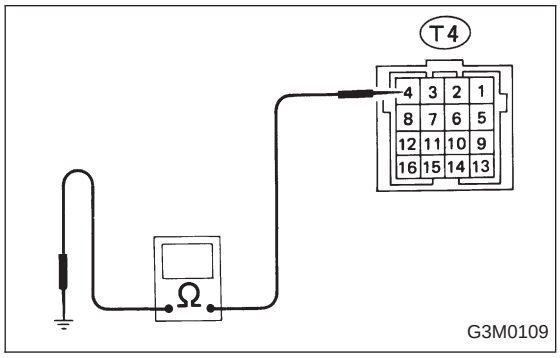
Connector & terminal / Specified voltage:
(B52) No. 8 — No. 13 / 9 V, min.



2. CHECK HARNESS AND CONNECTORS BETWEEN TCM AND SHIFT SOLENOID 3.

1) Disconnect connector from TCM.
2) Disconnect connector from transmission.
3) Measure resistance between TCM connector and transmission connector, and between TCM connector and body.

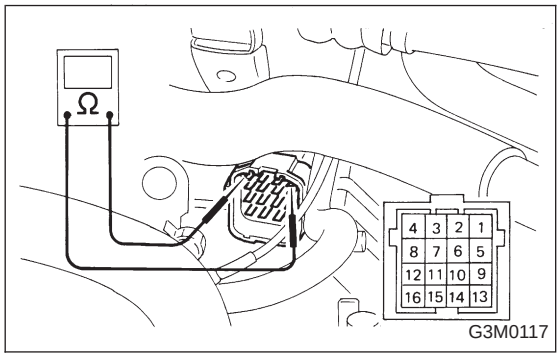
Connector & terminal / Specified resistance:
(B52) No. 8 — (B9) No. 1 / 1 Ω, max.
(B52) No. 8 — Body/ 1 MΩ, min.
(B52) No. 13 — (B9) No. 4 / 1 Ω, max.
(B52) No. 13 — Body / 1 MΩ, min.



3. CHECK SHIFT SOLENOID 3'S GROUNDING LINE.

1) Disconnect connector from transmission.
2) Measure resistance between transmission connector receptacle and transmission case.

Connector & terminal / Specified resistance:
(T4) No. 4 — Transmission / 1 Ω, max.



4. CHECK SHIFT SOLENOID 3.

1) Disconnect connector from transmission.
2) Measure resistance between transmission connector receptacle's terminals.

Connector & terminal / Specified resistance:
(T4) No. 1 — No. 4 / 20 — 30 Ω

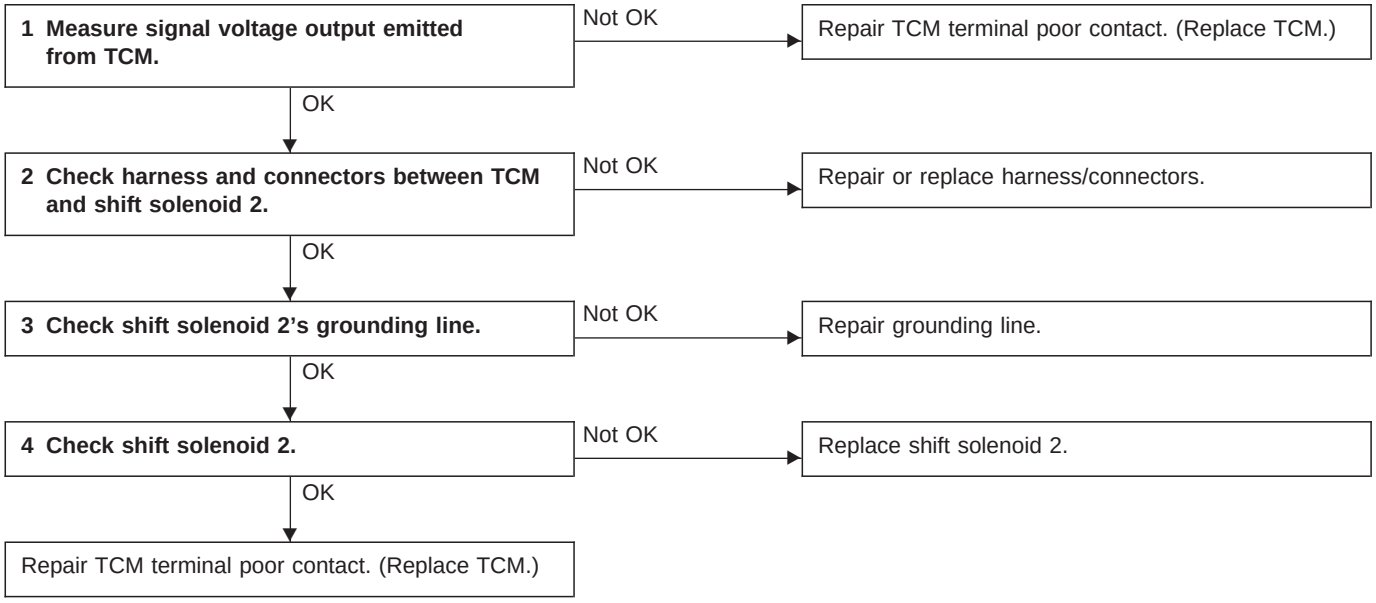
D: TROUBLE CODE 14 — SHIFT SOLENOID 2 —

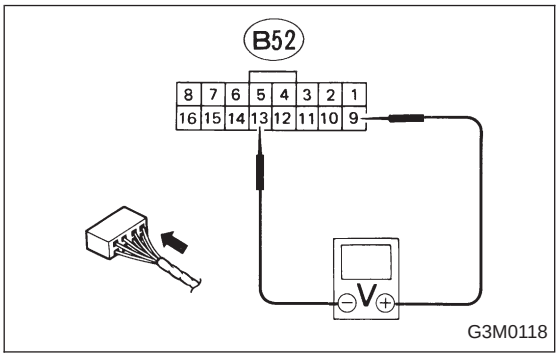
DIAGNOSIS:

Output signal circuit of shift solenoid 2 is open or shorted.

TROUBLE SYMPTOM:

No shift





1. MEASURE SIGNAL VOLTAGE OUTPUT EMITTED FROM TCM.

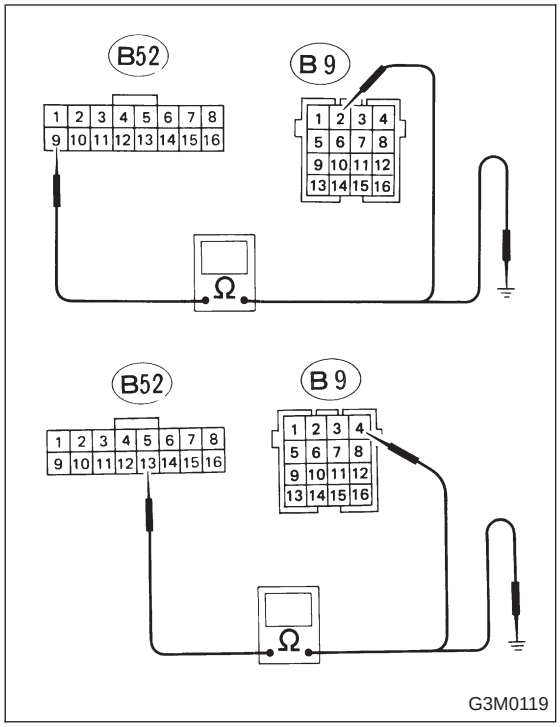
1) Raise vehicle and support with safety stands.

CAUTION:

On AWD models, raise all wheels off ground.

2) Warm-up the engine and transmission.
3) Move shift lever to "D".
4) Measure signal voltage output emitted from TCM while idling the engine.

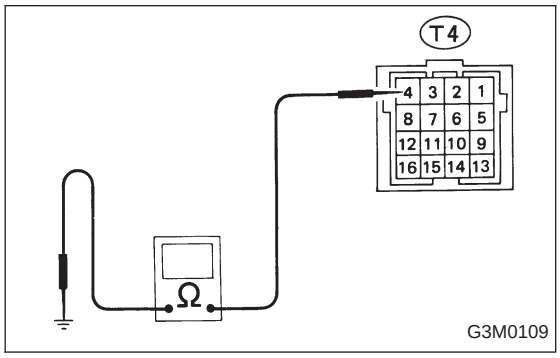
Connector & terminal / Specified voltage:
(B52) No. 9 — No. 13 / 9 V, min.



2. CHECK HARNESS AND CONNECTORS BETWEEN TCM AND SHIFT SOLENOID 2.

1) Disconnect connector from TCM.
2) Disconnect connector from transmission.
3) Measure resistance between TCM connector and transmission connector, and between TCM connector and body.

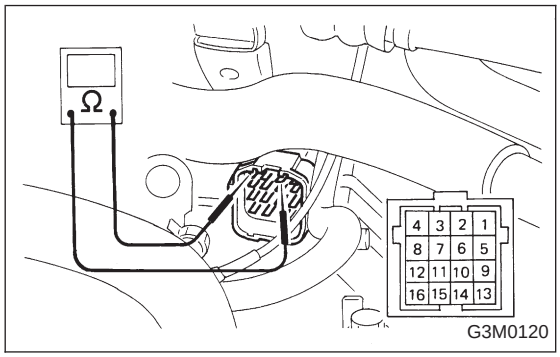
Connector & terminal / Specified resistance:
(B52) No. 9 — (B9) No. 2 / 1 Ω, max.
(B52) No. 9 — Body / 1 MΩ, min.
(B52) No. 13 — (B9) No. 4 / 1 Ω, max.
(B52) No. 13 — Body / 1 MΩ, min.



3. CHECK SHIFT SOLENOID 2'S GROUNDING LINE.

1) Disconnect connector from transmission.
2) Measure resistance between transmission connector receptacle and transmission case.

Connector & terminal / Specified resistance:
(T4) No. 4 — Transmission / 1 Ω, max.



4. CHECK SHIFT SOLENOID 2.

1) Disconnect connector from transmission.
2) Measure resistance between transmission connector receptacle's terminals.

Connector & terminal / Specified resistance:
(T4) No. 2 — No. 4 / 20 — 30 Ω

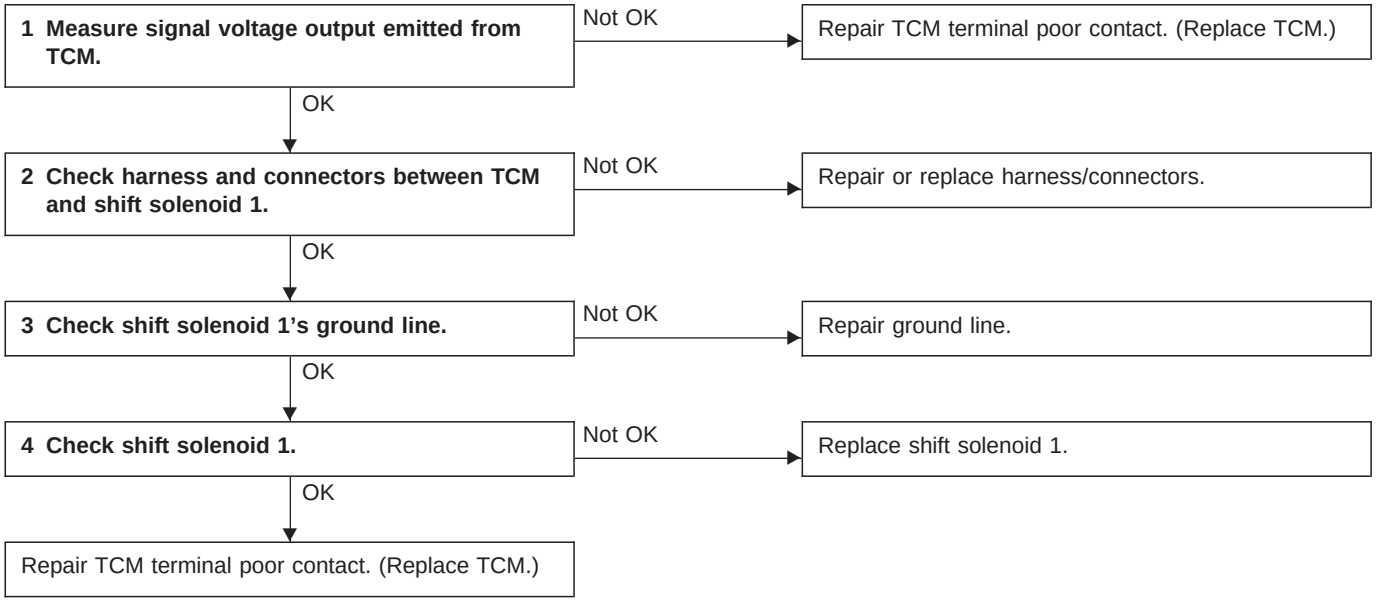
E: TROUBLE CODE 15 — SHIFT SOLENOID 1 —

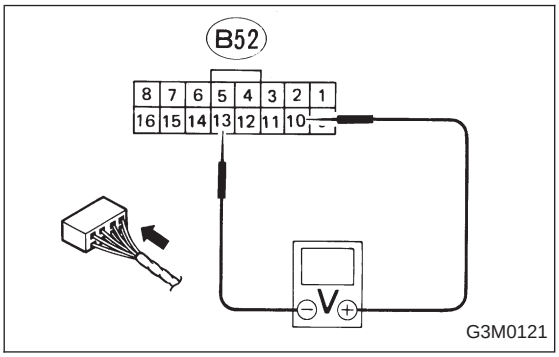
DIAGNOSIS:

Output signal circuit of shift solenoid 1 is open or shorted.

TROUBLE SYMPTOM:

No shift





1. MEASURE SIGNAL VOLTAGE OUTPUT EMITTED FROM TCM.

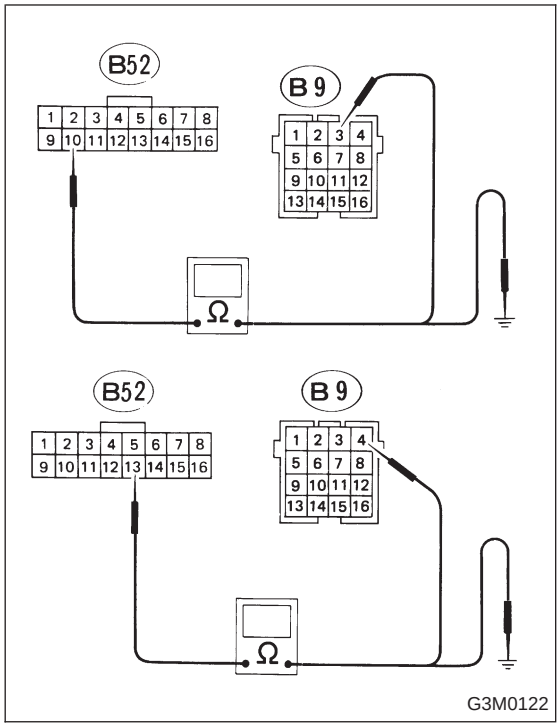
1) Raise vehicle and support with safety stands.

CAUTION:

On AWD models, raise all wheels off ground.

2) Warm-up the engine and transmission.
3) Move shift lever to "D".
4) Measure signal voltage output emitted from TCM while idling the engine.

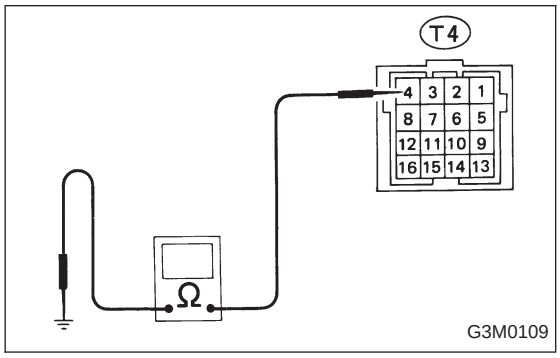
Connector & terminal / Specified voltage:
(B52) No. 10 — No. 13 / 9 V, min.



2. CHECK HARNESS AND CONNECTORS BETWEEN TCM AND SHIFT SOLENOID 1.

1) Disconnect connector from TCM.
2) Disconnect connector from transmission.
3) Measure resistance between TCM connector and transmission connector, and between TCM connector and body.

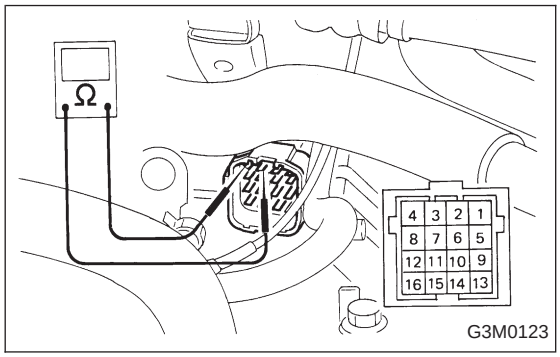
Connector & terminal / Specified resistance:
(B52) No. 10 — (B9) No. 3 / 1 Ω, max.
(B52) No. 10 — Body / 1 MΩ, min.
(B52) No. 13 — (B9) No. 4 / 1 Ω, max.
(B52) No. 13 — Body / 1 MΩ, min.



3. CHECK SHIFT SOLENOID 1'S GROUND LINE.

1) Disconnect connector from transmission.
2) Measure resistance between transmission connector receptacle and transmission case.

Connector & terminal / Specified resistance:
(T4) No. 4 — Transmission / 1 Ω, max.



4. CHECK SHIFT SOLENOID 1.

1) Disconnect connector from transmission.
2) Measure resistance between transmission connector receptacle's terminals.

Connector & terminal / Specified resistance:
(T4) No. 3 — No. 4 / 20 — 30 Ω

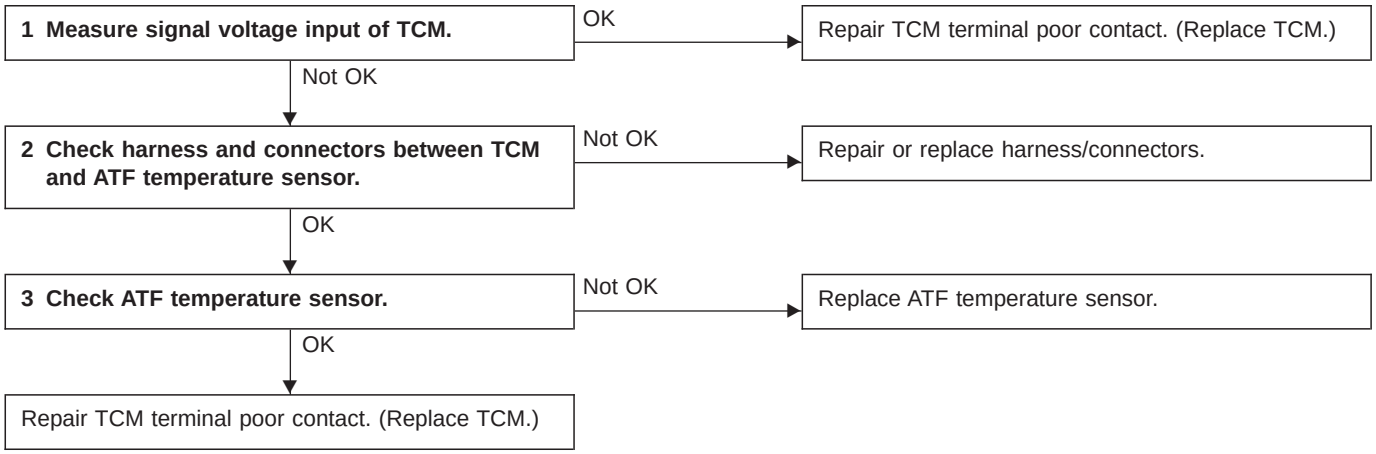
F: TROUBLE CODE 21
— ATF TEMPERATURE SENSOR —

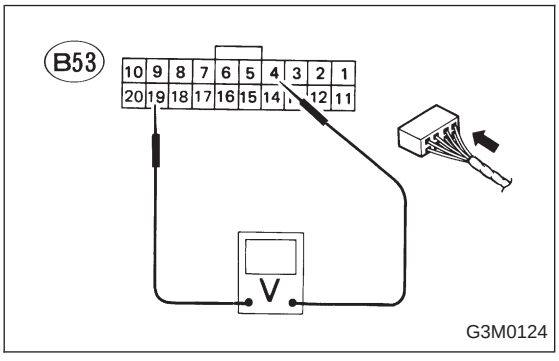
DIAGNOSIS:

Input signal circuit of TCM to ATF temperature sensor is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock





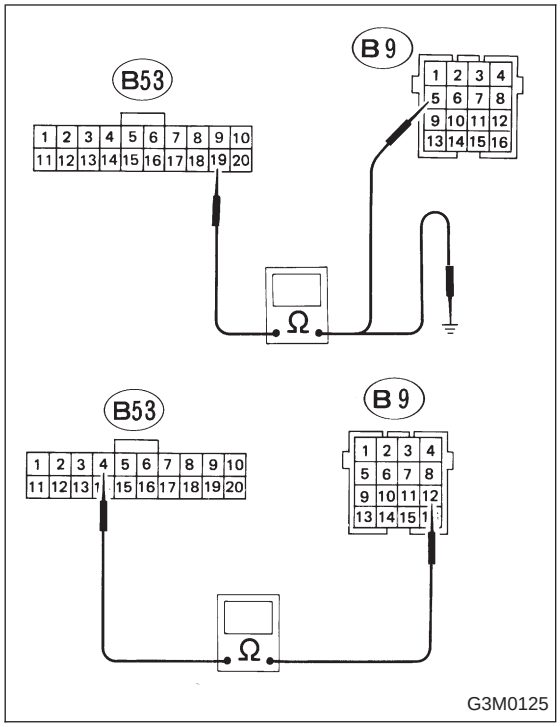
1. MEASURE SIGNAL VOLTAGE INPUT OF TCM.

1) Turn ignition switch ON (with engine OFF) and measure signal voltage input of TCM.
2) Start and warm-up the engine. Measure signal voltage input of TCM.

Connector & terminal / Specified voltage:
(B53) No. 19 — No. 4 /
2.9 — 4.0 V [ATF temperature: 20°C (68°F)]
1.0 — 1.4 V [ATF temperature: 80°C (176°F)]

- **SELECT MONITOR FUNCTION MODE**

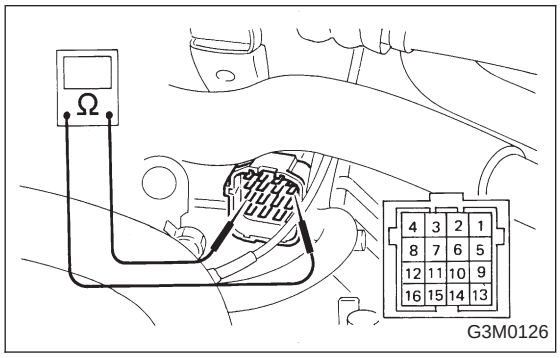
Mode: F08 or F07
Condition:
Warm-up the engine to increase ATF temperature.
Specified data:
ATFT F08 or F07
(Temperature shown on display increases.)



2. CHECK HARNESS AND CONNECTORS BETWEEN TCM AND ATF TEMPERATURE SENSOR.

1) Disconnect connector from TCM.
2) Disconnect connector from transmission.
3) Measure resistance between TCM connector and transmission connector, and between TCM connector and body.

Connector & terminal / Specified resistance:
(B53) No. 19 — (B9) No. 5 / 1 Ω, max.
(B53) No. 19 — Body / 1 MΩ, min.
(B53) No. 4 — (B9) No. 12 / 1 Ω, max.



3. CHECK ATF TEMPERATURE SENSOR.

1) Disconnect connector from transmission.
2) Measure resistance between transmission connector receptacle's terminals.

Connector & terminal / Specified resistance:
(T4) No. 5 — No. 12 /
2.1 — 2.9 kΩ [ATF temperature: 20°C (68°F)]

3) Connect connector to transmission, and warm-up the engine to increase ATF temperature.
4) Stop the engine and disconnect connector from transmission.
5) Measure resistance between transmission connector receptacle's terminals.

Connector & terminal / Specified resistance:
(T4) No. 5 — No. 12 /
275 — 375 Ω [ATF temperature: 80°C (176°F)]

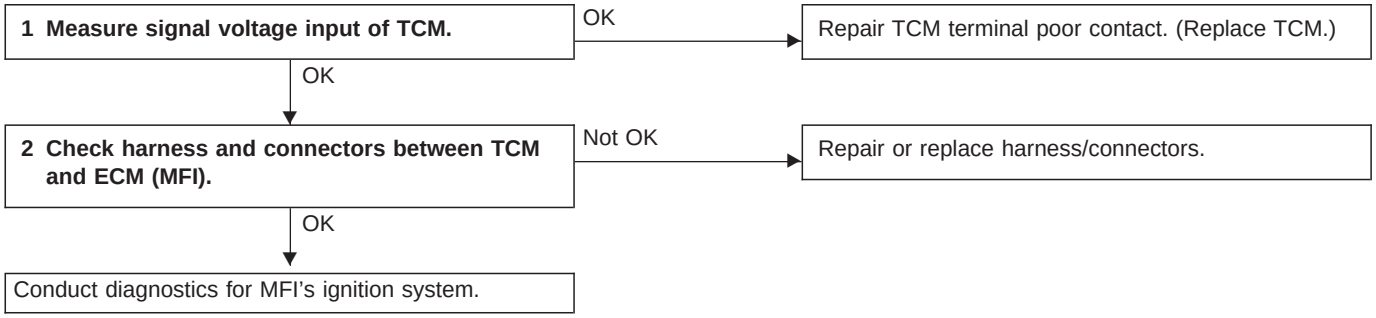
G: TROUBLE CODE 23 — ENGINE SPEED SIGNAL —

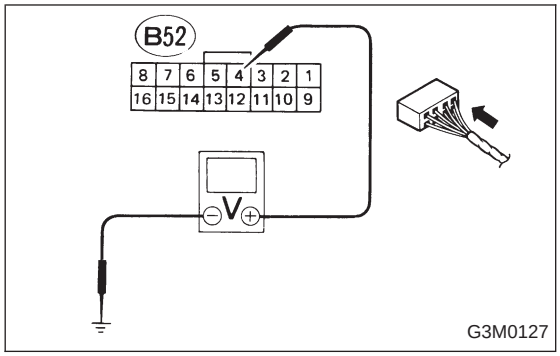
DIAGNOSIS:

Engine speed input signal circuit is open or shorted.

TROUBLE SYMPTOM:

- No lock-up occurs (after engine warm-up)
- Power indicator remains on when vehicle speed is “0”.





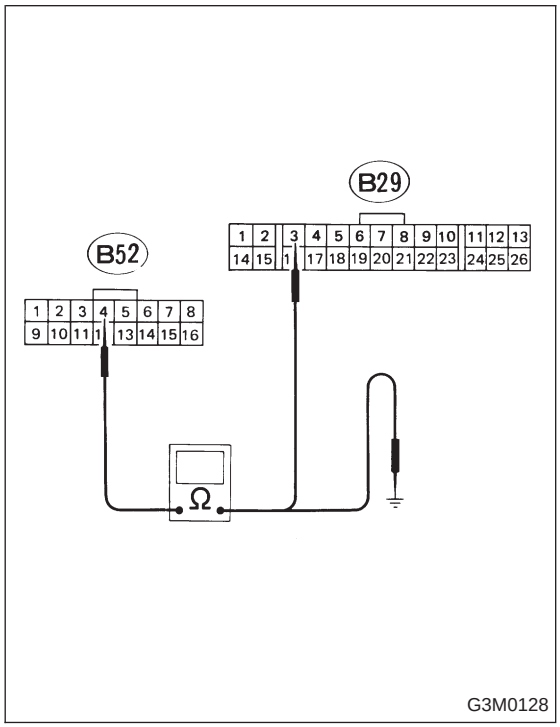
1. MEASURE SIGNAL VOLTAGE INPUT OF TCM.

1) Turn ignition switch ON (with engine OFF).
2) Measure signal voltage input of TCM.

Connector & terminal / Specified voltage:
(B52) No. 4 — Body / 10.5 V, min.

● **SELECT MONITOR FUNCTION MODE**

Mode: F06
Condition:
After warming-up the engine
Specified data: EREV F06
(Engine speed is shown in rpm.)



2. CHECK HARNESS AND CONNECTORS BETWEEN TCM AND ECM (MFI).

1) Disconnect connector from TCM.
2) Disconnect connector from ECM (MFI).
3) Measure resistance between TCM connector and ECM (MFI) connector.

Connector & terminal / Specified resistance:
(B52) No. 4 — (B29) No. 3 / 1 Ω, max.
(B52) No. 4 — Body / 1 MΩ, min.

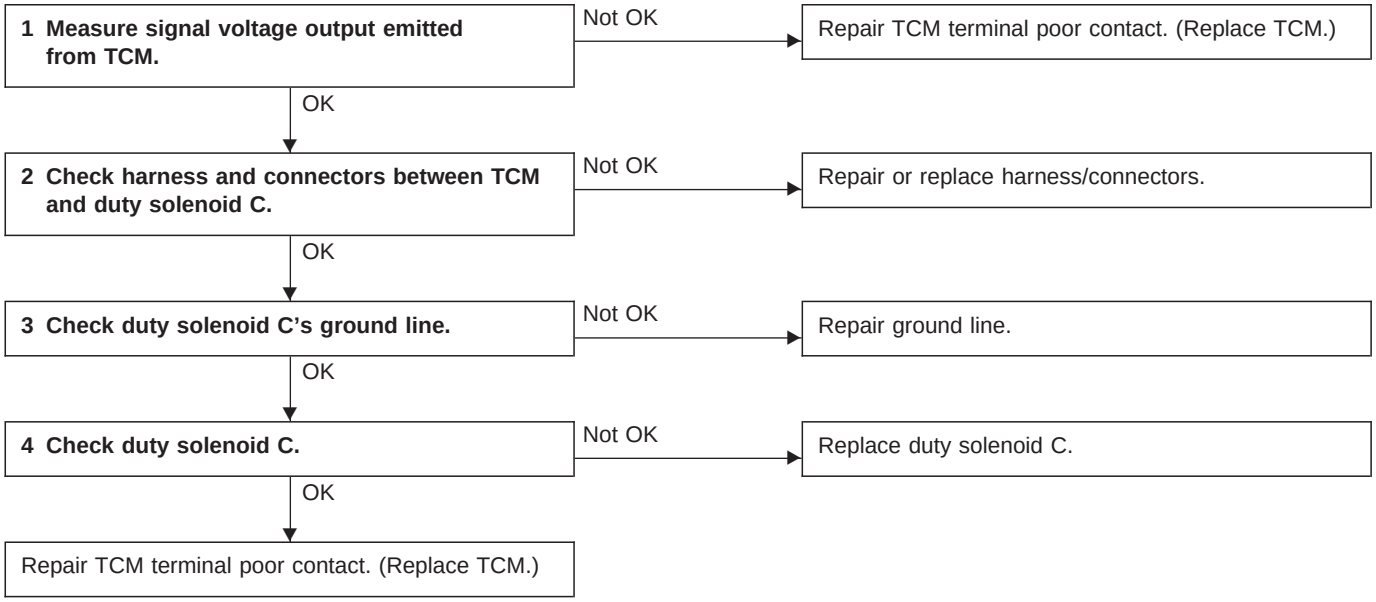
H: TROUBLE CODE 24 — DUTY SOLENOID C —

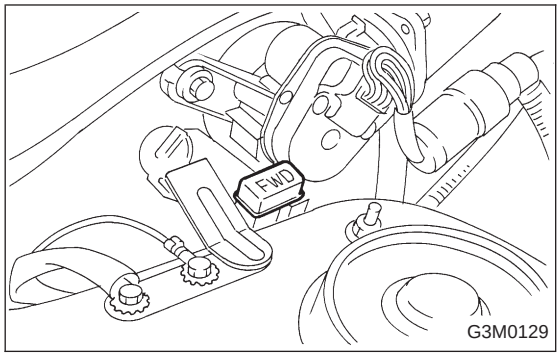
DIAGNOSIS:

Output signal circuit of duty solenoid C is open or shorted.

TROUBLE SYMPTOM:

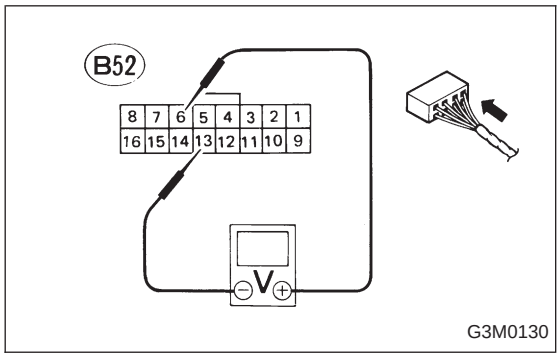
Excessive “braking” in tight corners





1. MEASURE SIGNAL VOLTAGE OUTPUT EMITTED FROM TCM.

1) Install spare fuse on FWD switch and set in FWD mode.



2) Turn ignition switch ON (with engine OFF).
3) Move select lever to “D”.
4) Measure voltage output emitted from TCM (with accelerator pedal released).

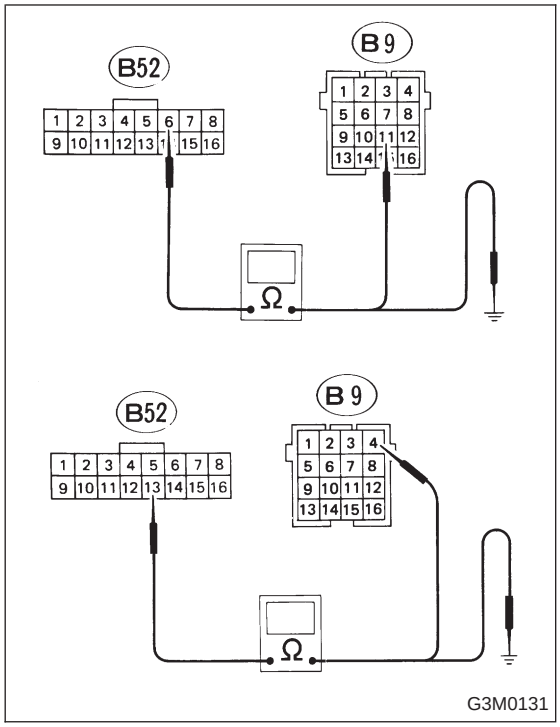
Connector & terminal / Specified voltage:
(B52) No. 6 — No. 13 / 8.5 V, min.

5) Turn ignition switch OFF.
6) Remove spare fuse from FWD switch.
7) Turn ignition switch ON (with engine OFF).
8) Move select lever to “D”.
9) Measure voltage output emitted from TCM (with accelerator pedal fully depressed).

Connector & terminal / Specified voltage:
(B52) No. 6 — No. 13 / 0.5 V, max.

● **SELECT MONITOR FUNCTION MODE**

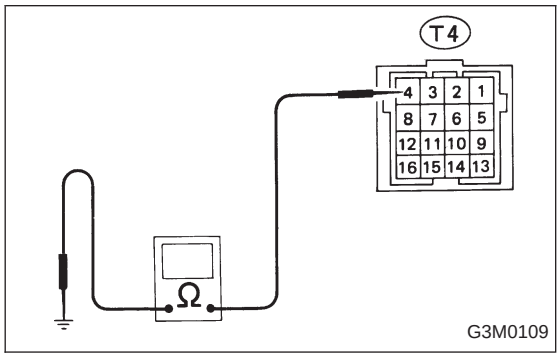
Mode: F13
Condition:
Ignition switch ON (Engine OFF)
Specified data:
4WDTY F13
95% (FWD mode)
25%, max. (AWD mode, D-range, full throttle)



2. CHECK HARNESS AND CONNECTORS BETWEEN TCM AND DUTY SOLENOID C.

1) Disconnect connector from TCM.
2) Disconnect connector from transmission.
3) Measure resistance between TCM connector and transmission connector.

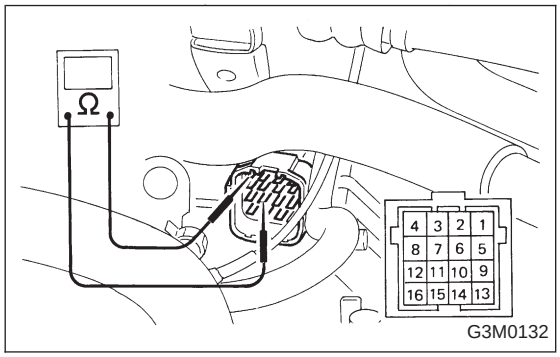
Connector & terminal / Specified resistance:
(B52) No. 6 — (B9) No. 11 / 1 Ω, max.
(B52) No. 6 — Body / 1 MΩ, min.
(B52) No. 13 — (B9) No. 4 / 1 Ω, max
(B52) No. 13 — Body / 1 MΩ, min.



3. CHECK DUTY SOLENOID C'S GROUND LINE.

1) Disconnect connector from transmission.
2) Measure resistance between transmission connector receptacle and transmission case.

Connector & terminal / Specified resistance:
(T4) No. 4 — Transmission / 1 Ω, max.



4. CHECK DUTY SOLENOID C.

1) Disconnect connector from transmission.
2) Measure resistance between transmission connector receptacle's terminals.

Connector & terminal / Specified resistance:
(T4) No. 11 — No. 4 / 10 — 17 Ω

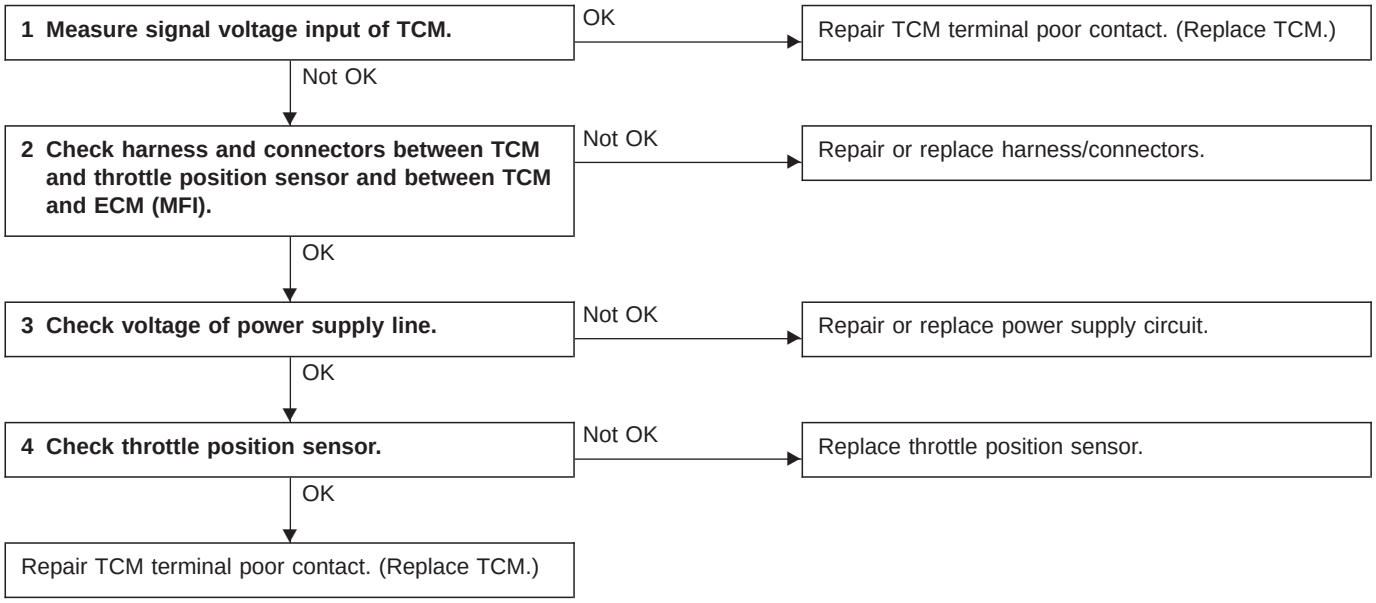
I: TROUBLE CODE 31 — THROTTLE POSITION SENSOR —

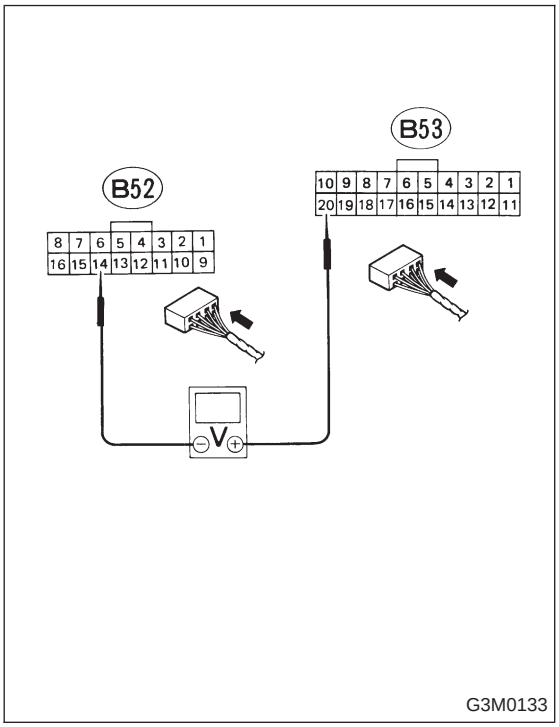
DIAGNOSIS:

Input signal circuit of throttle position sensor is open or shorted.

TROUBLE SYMPTOM:

Shift point too high or too low; engine brake not effected in “3”
range; excessive shift shock; excessive tight corner “braking”





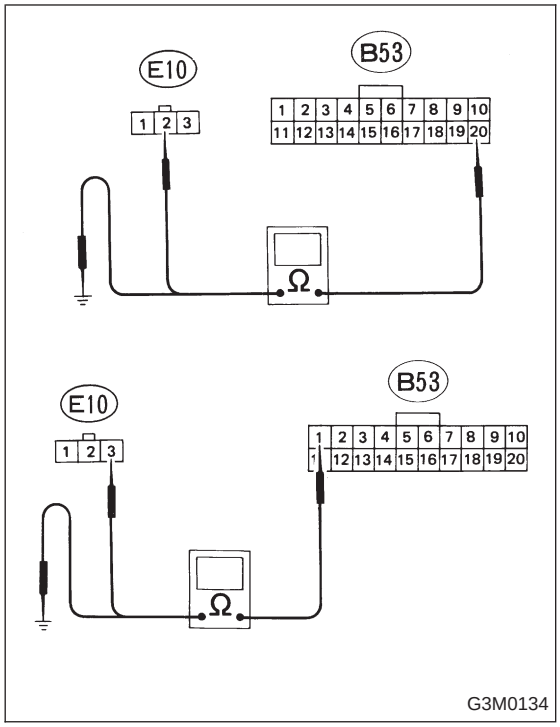
1. MEASURE SIGNAL VOLTAGE INPUT OF TCM.

1) Turn ignition switch ON (with engine OFF).
2) Measure signal voltage input emitted from throttle position sensor with accelerator pedal fully depressed.

Connector & terminal / Specified voltage:
(B53) No. 20 — (B52) No. 14 /
0.3 — 0.7 V (Throttle fully closed.)
3.9 — 4.3 V (Throttle fully open.)

- **SELECT MONITOR FUNCTION MODE**

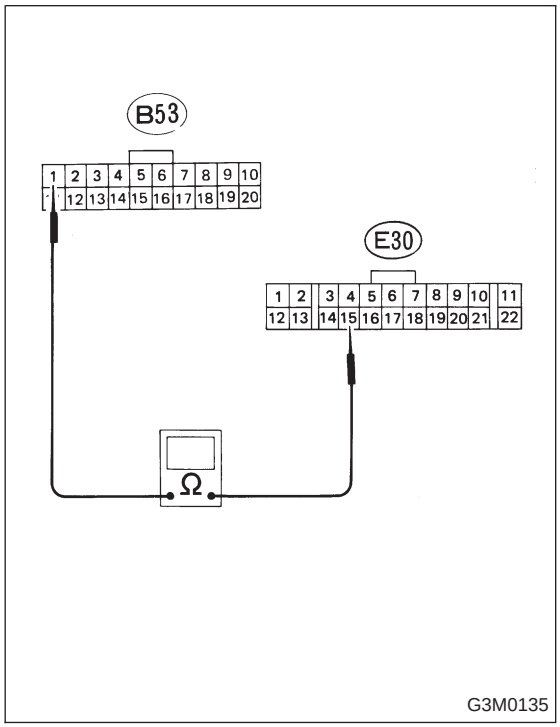
Mode: F09
Condition:
Ignition switch ON (Engine OFF)
Specified data:
THV F09
0.3 — 0.7 V (Throttle fully closed.)
3.9 — 4.3 V (Throttle fully open.)
[Must be changed correspondingly with accelerator pedal operation (from “released” to “depressed” position).]



2. CHECK HARNESS AND CONNECTORS BETWEEN TCM AND THROTTLE POSITION SENSOR AND BETWEEN TCM AND ECM (MFI).

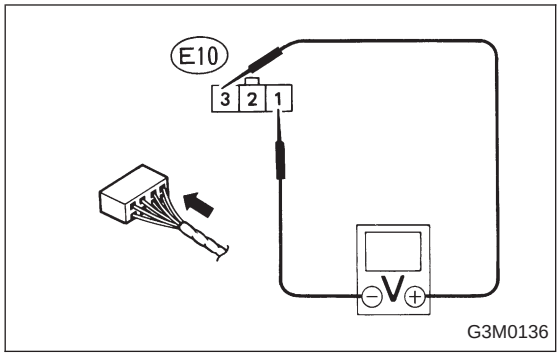
1) Disconnect connector from TCM.
2) Disconnect connector from ECM (MFI).
3) Disconnect connector from throttle position sensor.
4) Measure resistance between TCM and throttle position sensor connectors.

Connector & terminal / Specified resistance:
(B53) No. 20 — (E10) No. 2 / 1 Ω, max.
(B53) No. 20 — Body / 1 MΩ, min.
(B53) No. 1 — (E10) No. 3 / 1 Ω, max.
(B53) No. 1 — Body /1 MΩ, min.



5) Measure resistance between TCM and ECM (MFI) connectors.

Connector & terminal / Specified resistance:
(B53) No. 1 — (E30) No. 15 / 1 Ω, max.



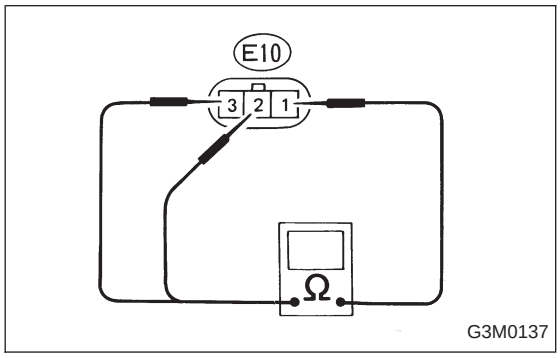
3. CHECK VOLTAGE OF POWER SUPPLY LINE.

1) Turn ignition switch ON (with engine OFF).
2) Measure voltage of throttle position sensor connector.

Connector & terminal / Specified voltage:
(E10) No. 3 — No. 1 / 4.8 — 5.3 V

● SELECT MONITOR FUNCTION MODE

Mode: F14
Condition:
Ignition switch ON (Engine OFF)
Specified data:
THVCC F14
4.8 — 5.3 V
(Throttle position sensor power supply voltage is indicated.)



4. CHECK THROTTLE POSITION SENSOR.

1) Disconnect connector from throttle position sensor.
2) Measure resistance between throttle position sensor terminals.

Terminal / Specified resistance:
(E10) No. 1 — No. 2 /
500 Ω (Throttle fully closed.)
4 — 4.5 kΩ (Throttle fully open.)
(E10) No. 1 — No. 3 / 5 kΩ

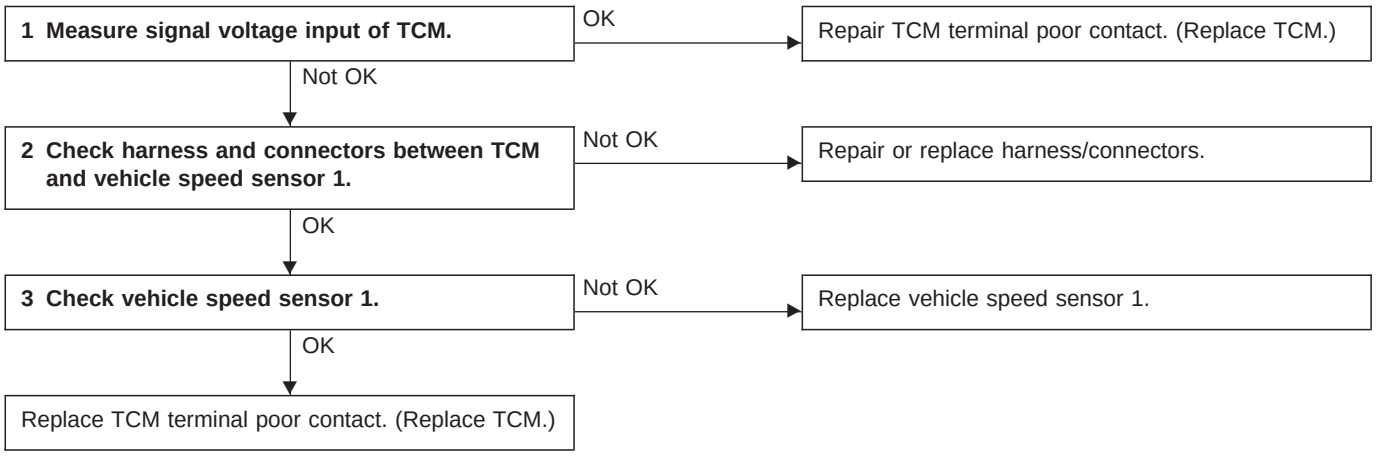
J: TROUBLE CODE 32 — VEHICLE SPEED SENSOR 1 —

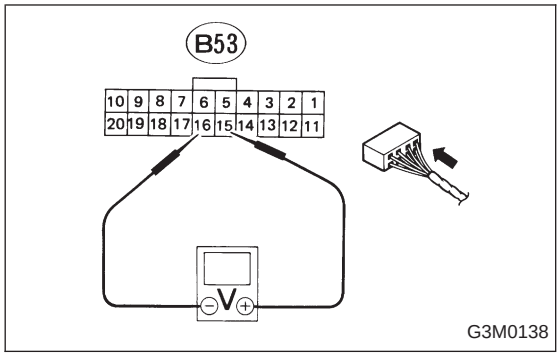
DIAGNOSIS:

Input signal circuit of TCM is open or shorted.

TROUBLE SYMPTOM:

No shift or excessive tight corner “braking”





1. MEASURE SIGNAL VOLTAGE INPUT OF TCM.

1) Raise vehicle and place safety stands.

CAUTION:

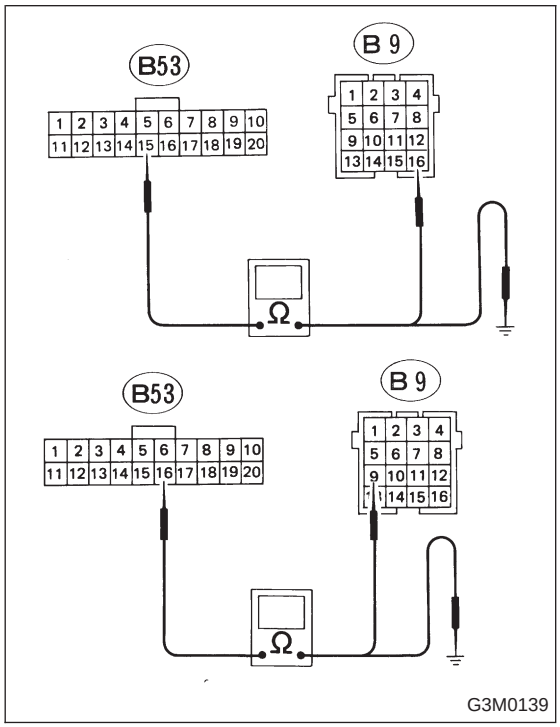
On AWD models, raise all wheels off floor.

2) Start the engine. Set vehicle in 12 miles/h condition.
3) Measure signal voltage input of TCM.

Connector & terminal / Specified voltage:
(B53) No. 15 — No. 16 / AC 1 V, min.

- **SELECT MONITOR FUNCTION MODE**

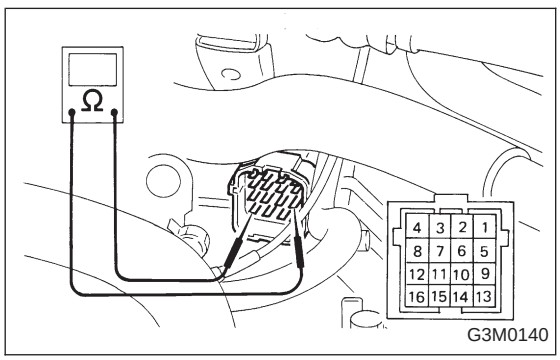
Mode: F02
Condition:
Simulated driving
Specified data:
VSP1 F02
(Vehicle speed) miles/h
Mode F03: "km/h" indication



2. CHECK HARNESS AND CONNECTORS BETWEEN TCM AND VEHICLE SPEED SENSOR 1.

1) Disconnect connector from TCM.
2) Disconnect connector from transmission.
3) Measure resistance between TCM connector and transmission connector.

Connector & terminal / Specified resistance:
(B53) No. 15 — (B9) No. 16 / 1 Ω, max.
(B53) No. 15 — Body / 1 MΩ, min.
(B53) No. 16 — (B9) No. 9 / 1 Ω, max.
(B53) No. 16 — Body / 1 MΩ, min.



3. CHECK VEHICLE SPEED SENSOR 1.

1) Disconnect connector from transmission.
2) Measure resistance between transmission connector receptacle's terminals.

Connector & terminal / Specified resistance:
(T4) No. 16 — No. 9 / 450 — 650 Ω

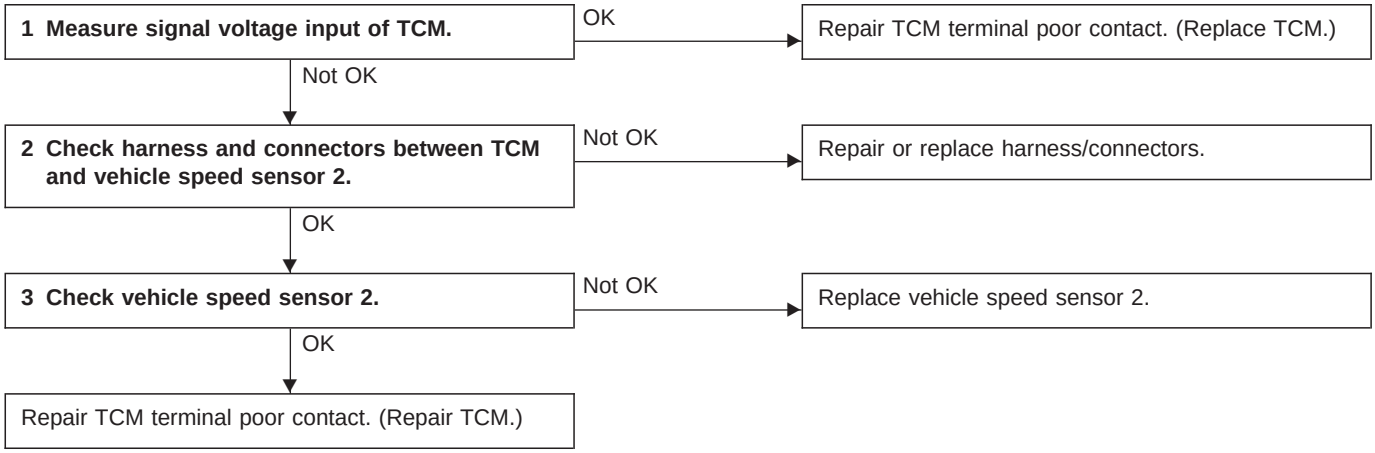
K: TROUBLE CODE 33 — VEHICLE SPEED SENSOR 2 —

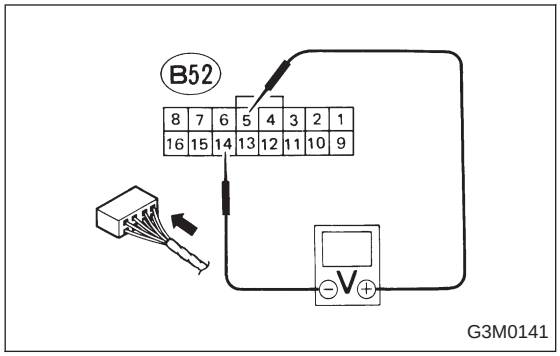
DIAGNOSIS:

Input signal circuit of vehicle speed sensor 2 is open or shorted.

TROUBLE SYMPTOM:

Improper shift points





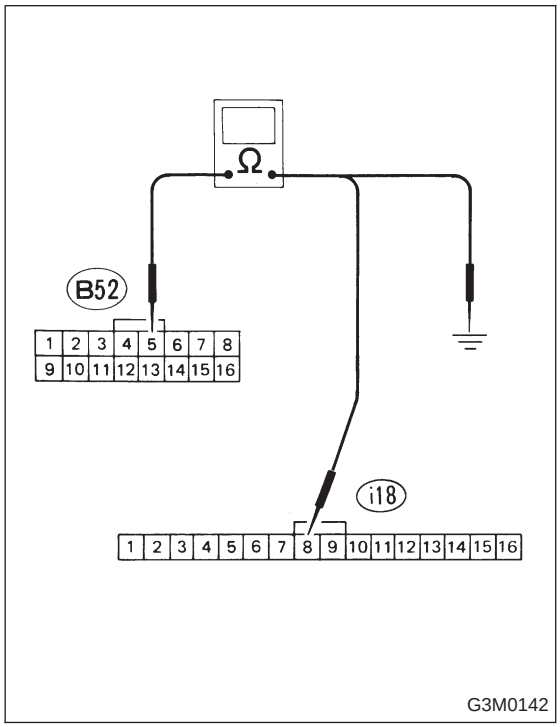
1. MEASURE SIGNAL VOLTAGE INPUT OF TCM.

1) Turn ignition switch ON (with engine OFF).
2) Move select lever to “N” and slowly move vehicle by pushing it.
3) While vehicle is slowly moving, measure signal voltage input of TCM.

Connector & terminal / Specified voltage:
(B52) No. 5 — No. 14 / repetition of 1 volt (max.) — 4 volts (min.)

- **SELECT MONITOR FUNCTION MODE**

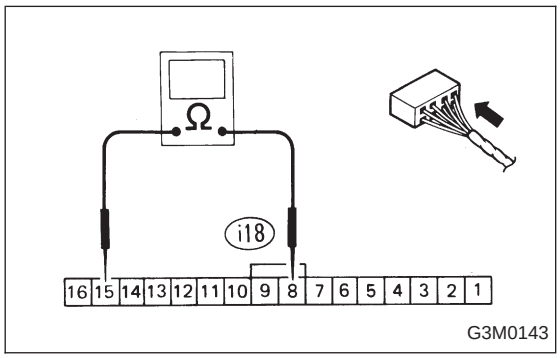
Mode: F04
Condition:
Simulated driving
Specified data:
VSP2 04
(vehicle speed) miles/h
Mode F05: “km/h” indication



2. CHECK HARNESS AND CONNECTORS BETWEEN TCM AND VEHICLE SPEED SENSOR 2.

1) Disconnect connector from TCM.
2) Disconnect connector from rear of combination meter.
3) Measure resistance between TCM connector and combination meter cable connector.

Connector & terminal / Specified resistance:
(B52) No. 5 — (i18) No. 8 / 1 Ω, max.
(B52) No. 5 — Body / 1 MΩ, min.



3. CHECK VEHICLE SPEED SENSOR 2.

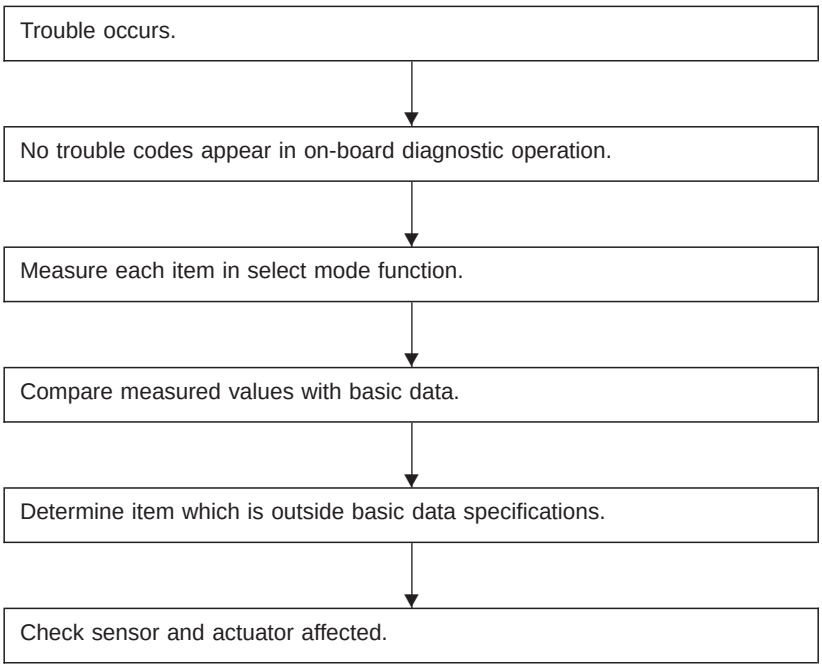
1) Remove combination meter from instrument panel.
2) Rotate combination meter with a screwdriver inserted into rear of combination meter at cable location.
3) Check that resistance across combination meter cable connector terminals changes (from 0 to more than 1 MΩ) four times per rotation.

Connector & terminal / Specified resistance:
(i18) No. 8 — (i18) No. 15 / 0 ↔ More than 1 MΩ

6. Diagnostic Chart with Select Monitor

A: BASIC DIAGNOSTIC CHART

If no trouble codes appear in the on-board diagnostic operation (although problems have occurred or are occurring), measure performance characteristics of sensors, actuators, etc., in the “F” mode (select-monitor function), and compare with the “basic data” to determine the cause of problems.



B: LIST OF OUTPUT MODES

1. FUNCTION MODE

Mode	Contents	Abbr.	Unit	Contents of display	Page
F00	Mode display	—	—	AT or EGI mode (when monitor is connected)	39
F01	Battery voltage	VB	V	Battery voltage applied to control unit.	39
F02	Vehicle speed sensor 1	VSP1	m/h	Vehicle speed (miles/h) sent from vehicle speed sensor 1.	40
F03	Vehicle speed sensor 1	VSP1	km/h	Vehicle speed (km/h) sent from vehicle speed sensor 1.	—
F04	Vehicle speed sensor 2	VSP2	m/h	Vehicle speed (miles/h) sent from vehicle speed sensor 2.	40
F05	Vehicle speed sensor 2	VSP2	km/h	Vehicle speed (km/h) sent from vehicle speed sensor 2.	—
F06	Engine speed	EREV	rpm	Engine speed sent from EGI unit.	41
F07	ATF temperature sensor	ATFT	°F	ATF temperature (°F) sent from ATF temperature sensor.	41
F08	ATF temperature sensor	ATFT	°C	ATF temperature (°C) sent from ATF temperature sensor.	—
F09	Throttle position sensor	THV	V	Voltage sent from throttle position sensor.	42
F10	Gear position	GEAR	—	Transmission gear position.	43
F11	Line pressure duty	PLDTY	%	Duty ratio flowing through duty solenoid A.	44
F12	Lock-up duty	LUDTY	%	Duty ratio flowing through duty solenoid B.	45
F13	AWD duty	4WDTY	%	Duty ratio flowing through duty solenoid C.	46
F14	Throttle position sensor power supply voltage	THVCC	V	Battery voltage applied to throttle position sensor.	47

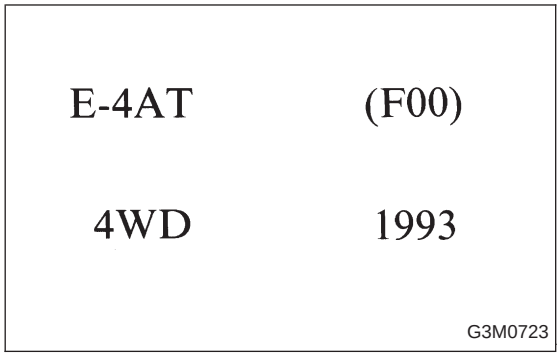
2. ON ←→ OFF SIGNAL LIST

Mode	LED No.	Signal name	Display	LED "ON" requirements	Page
FA0	1	FWD switch	FF	When fuse is installed in FWD switch.	—
	2	Kick-down switch	KD		—
	3	—	—		—
	4	—	—		—
	5	Brake switch	BR	When brake switch is turned ON.	—
	6	ABS switch	AB	When ABS signal is entered.	—
	7	Cruise control set	CR	When cruise control is set.	—
	8	Power switch	PW		—
	9	—	—		—
	10	—	—		—
FA1	1	P/N range switch	NP	When P or N range is selected.	—
	2	R range switch	RR	When R range is selected.	—
	3	D range switch	RD	When D range is selected.	—
	4	3 range switch	R3	When 3 range is selected.	—
	5	2 range switch	R2	When 2 range is selected.	—
	6	1 range switch	R1	When 1 range is selected.	—
	7	Diagnosis switch	SS	When diagnosis switch is turned ON.	50
	8	—	—		—
	9	—	—		—
	10	—	—		—

NOTE: LED Nos. 2 and 8 cannot be turned on.

3. DIAGNOSIS MODE

Mode	Contents	Abbr.	Contents of display	Page
FB0	On-board diagnostics	DIAG.U	Current trouble code determined by on-board diagnostics.	52
FB1	On-board diagnostics	DIAG.M	Previous trouble code stored in memory by on-board diagnostics.	53
FC0	Back-up clear	—	Function of clearing trouble code stored in memory.	54



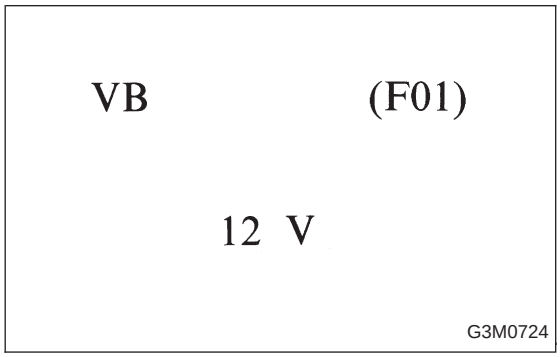
C: MODE F00 — MODE DISPLAY —

SPECIFIED DATA:

Following data should be indicated.

Probable cause (if outside “specified data”)

1	Communication failure (No communication method can be confirmed with power ON.)	→	(1) (2)	Check loose or poor connectors, or shortcircuit. Check type of cartridge.
2	Vehicle types cannot be identified (due to communication failure).	→		Check improper cartridge. Replace with proper one.



D: MODE F01 — BATTERY VOLTAGE (VB) —

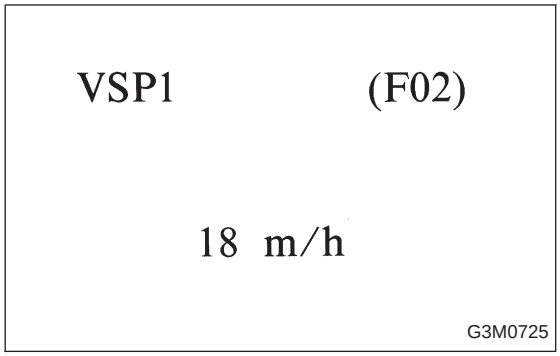
CONDITION:

- Ignition switch ON
- Engine idling after warm-up

SPECIFIED DATA:

VB: 10 — 15 V

1	Battery	→		Check battery voltage and specific gravity of electrolyte.
2	Charging system	→	(1) (2)	Measure regulating voltage under no loads Check alternator (as a single unit).



E: MODE F02
— VEHICLE SPEED SENSOR 1 (VSP1) —

CONDITION:

Raise vehicle off ground and operate at constant speed.

SPECIFIED DATA:

- Compare speedometer with monitor indications.
- Probable cause (if indications are different)

Probable cause (if outside “specified data”)

1	Vehicle speed sensor 1	→ Check performance characteristics of vehicle speed sensor 1. <Ref. to 3-2 [T5J0].> → OK → Check TCM and replace if necessary.

F: MODE F04
— VEHICLE SPEED SENSOR 2 (VSP2) —

CONDITION:

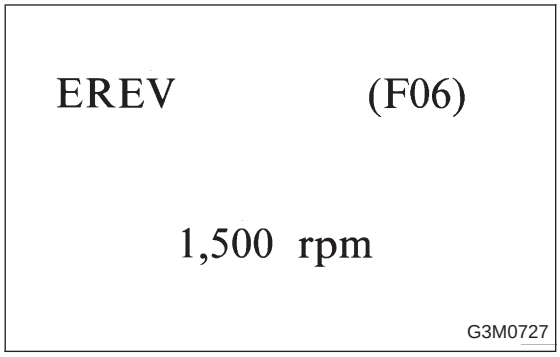
Raise vehicle off ground and operate at constant speed.

SPECIFIED DATA:

- Compare speedometer with monitor indications.
- Probable cause (if indications are different)

Probable cause (if outside “specified data”)

1	Vehicle speed sensor 2	→ Check performance characteristics of vehicle speed sensor 2. <Ref. to 3-2 [T5K0].> → OK → Check TCM and replace if necessary.



G: MODE F06 — ENGINE SPEED (EREV) —

CONDITION:

Measure with engine operating at constant speed.

SPECIFIED DATA:

Same as tachometer reading (in combination meter)

Probable cause (if outside “specified data”)

1	Conduct diagnostics in relation to MPFI system for engine speed.	OK →	Check TCM and replace if necessary.

H: MODE F07 — ATF TEMPERATURE SENSOR (ATFT) —

CONDITION:

- Low ATF temperature (before engine/vehicle starts)
- High ATF temperature (after driving vehicle for warm-up)

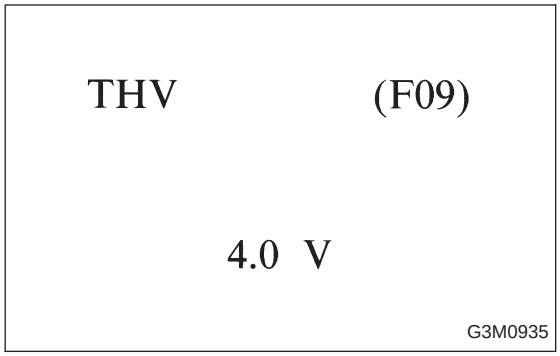
SPECIFIED DATA:

- Ambient temperature: ±50°F (±10°C)
- ATF temperature: 158 — 230°F (70 — 110°C)
- Open harness: 176 deg F (80 deg C)
- Shorted harness: 320 deg F (160 deg C)

Probable cause (if outside “specified data”)

1	ATF temperature sensor	→	Check performance characteristics of ATF temperature sensor.
		OK ↓	
			Check TCM and replace if necessary.

F08 = ATF temperature (ATFT):
to be indicated in “deg C”.



I: MODE F09 — THROTTLE POSITION SENSOR (THV) —

CONDITION:

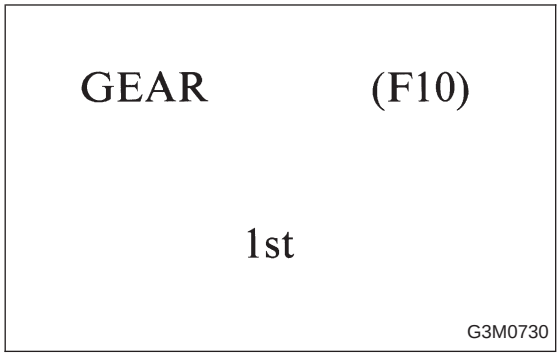
- Ignition switch ON (with engine OFF)
- Measure voltage while operating throttle valve from a fully closed position to a fully open position.

SPECIFIED DATA:

- Fully closed position: 0.3 — 0.7 V
- Fully open position: 3.9 — 4.3 V
- From fully closed to fully open position: Voltage must smoothly decrease.
- Open harness: 4.7 — 5.3 V
- Shorted harness: 0.00 V

Probable cause (if outside “specified data”)

1	Throttle position sensor	Check performance characteristics of throttle position sensor. <Ref. to 3-2 [T5I0].> → OK → Check TCM and replace if necessary.



J: MODE F10 — GEAR POSITION (GEAR) —

CONDITION:

Check while driving vehicle (after warm-up).

SPECIFIED DATA:

Gear position (Ref. to shift performance characteristics chart <Ref. to 3-2 [W200], [W300].>.)

Probable cause (item outside “specified data”)

1	Shift solenoid 1	Check performance characteristics of shift solenoid 1. <Ref. to 3-2 [T5E0].>
2	Shift solenoid 2	Check performance characteristics of shift solenoid 2. <Ref. to 3-2 [T5D0].>
3	Shift solenoid 3	Check performance characteristics of shift solenoid 3. <Ref. to 3-2 [T5C0].>

OK

OK

OK

Check TCM and replace as necessary.

K: MODE F11
— LINE PRESSURE DUTY (PLDTY) —

CONDITION:

- After sufficient warm-up
- Ignition ON (engine OFF)
- N range

SPECIFIED DATA:

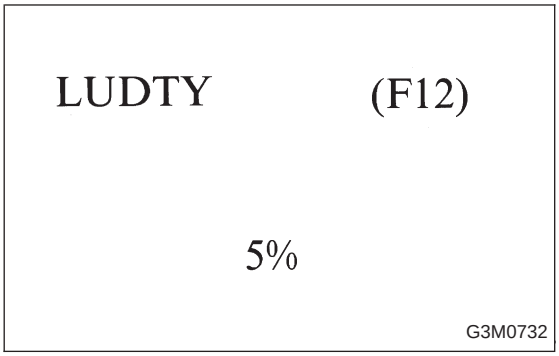
- Throttle fully closed: 100%
- Throttle fully open: Less than 25%

Probable cause (if outside “specified data”)

1	Throttle position sensor	Check in F09 mode. <Ref. to 3-2 [T6I0].>
2	Vehicle speed sensor 1	Check in F02 mode. <Ref. to 3-2 [T6E0].>
3	Vehicle speed sensor 2	Check in F04 mode. <Ref. to 3-2 [T6F0].>
4	Engine speed	Check in F06 mode. <Ref. to 3-2 [T6G0].>
5	ATF temperature sensor	Check in F07 mode. <Ref. to 3-2 [T6H0].>
6	Inhibitor switch	Check for operation.
7	Manual switch	Check for operation.

OK

Check TCM and replace if necessary.



L: MODE F12 — LOCK-UP DUTY (LUDTY) —

CONDITION:

- Idling (after sufficient warm-up) with lock-up system released.
- Driving at 75 km/h (47 MPH) (after sufficient warm-up) with lock-up system applied.

SPECIFIED DATA:

- Lock-up system released: 5%
- Lock-up system applied: 95%

Probable cause (if outside “specified data”)

1	Throttle position sensor	Check in F09 mode. <Ref. to 3-2 [T6I0].>
2	Vehicle speed sensor 1	Check in F02 mode. <Ref. to 3-2 [T6E0].>
3	Vehicle speed sensor 2	Check in F04 mode. <Ref. to 3-2 [T6F0].>
4	Engine speed	Check in F06 mode. <Ref. to 3-2 [T6G0].>
5	Inhibitor switch	Check for operation.

OK

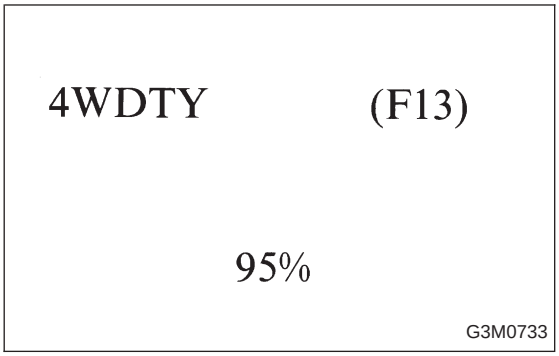
OK

OK

OK

OK

Check TCM and replace if necessary.



M: MODE F13 — AWD DUTY (4WDTY) —

CONDITION:

- After sufficient warm-up
- Ignition switch ON (engine OFF)
- FWD mode
- AWD mode, D range, full throttle

SPECIFIED DATA:

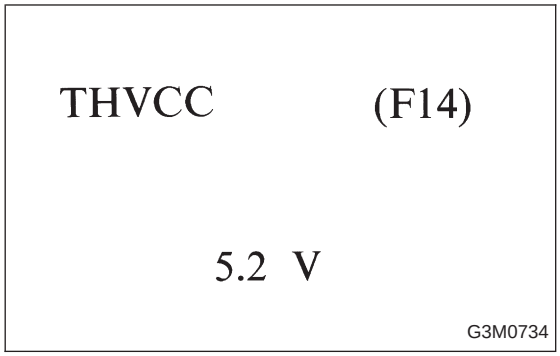
- 95% (FWD model)
- 25%, max. (vehicle speed 0 m/h)

Probable cause (if outside “specified data”)

1	Throttle position sensor	Check in F09 mode. <Ref. to 3-2 [T6I0].>
2	Vehicle speed sensor 1	Check in F02 mode. <Ref. to 3-2 [T6E0].>
3	Vehicle speed sensor 2	Check in F04 mode. <Ref. to 3-2 [T6F0].>
4	ATF temperature sensor	Check in F07 mode. <Ref. to 3-2 [T6H0].>
5	Inhibitor switch	Check for operation. <Ref. to 3-2 [W2B2].>
6	A.B.S. signal	Check A.B.S. system for operation.

OK

Check TCM and replace if necessary.



N: MODE F14 — THROTTLE POSITION SENSOR POWER SUPPLY VOLTAGE (THVCC) —

CONDITION:

Ignition switch ON (engine OFF)

SPECIFIED DATA:

4.8 — 5.3 V

Probable cause (if outside “specified data”)

1	Throttle position sensor

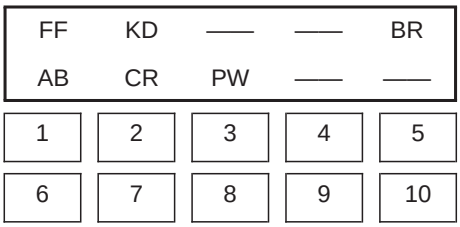
→ Check performance characteristics of throttle position sensor. <Ref. to 3-2 [T5I0].>

OK

→ Check TCM and replace if necessary.

DISPLAY

LED No.	Signal name	Symbol
1	FWD switch	FF
2	Kick-down switch	KD
3	—	—
4	—	—
5	Brake switch	BR
6	ABS switch	AB
7	Cruise control set	CR
8	Power switch	PW
9	—	—
10	—	—



O: MODE FA0 — SWITCH 1 (SW1) —

Reference values

- Lights up when the fuse is installed in FWD switch (No. 1).
- Lights up when the brake switch is turned ON (No. 5).
- Lights up when the A.B.S. signal is entered (No. 6).
- Lights up when the cruise control is set (No. 7).

P: MODE FA1 — SWITCH 2 (SW2) —

DISPLAY

LED No.	Signal name	Symbol
1	P/N range switch	NP
2	R range switch	RR
3	D range switch	RD
4	3 range switch	R3
5	2 range switch	R2
6	1 range switch	R1
7	Diagnosis switch	SS
8	—	—
9	—	—
10	—	—

NP	RR	RD	R3	R2
R1	SS	——	——	——

1	2	3	4	5
6	7	8	9	10

Reference values

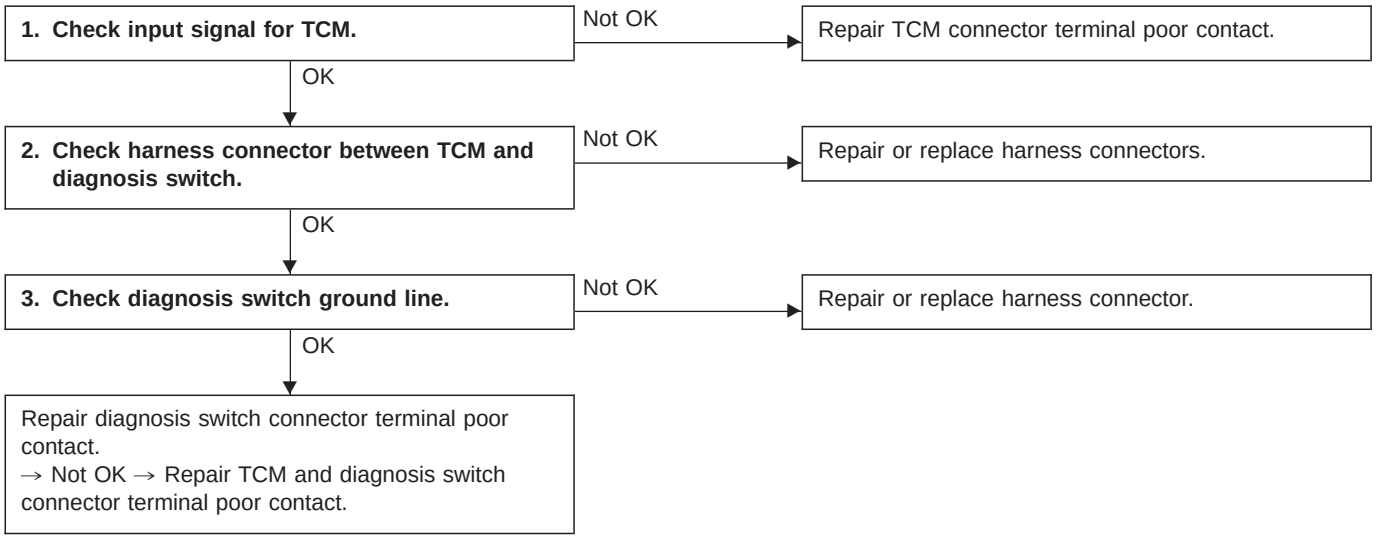
- Lights up when the N or P range is selected (No. 1).
- Lights up when the R range is selected (No. 2).
- Lights up when the D range is selected (No. 3).
- Lights up when the 3 range is selected (No. 4).
- Lights up when the 2 range is selected (No. 5).
- Lights up when the 1 range is selected (No. 6).
- Lights up when the diagnosis switch is connected (No. 7).

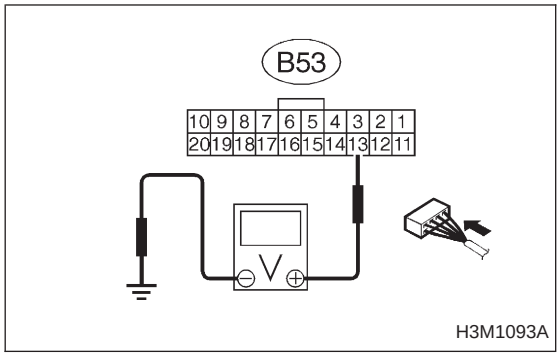
Q: MODE FA1
— LED No. 7, DIAGNOSIS SWITCH —

DIAGNOSIS:

- LED does not come on when diagnosis switch is ON.
- Diagnosis switch circuit is open or shorted.

Probable cause (if outside “specified data”)

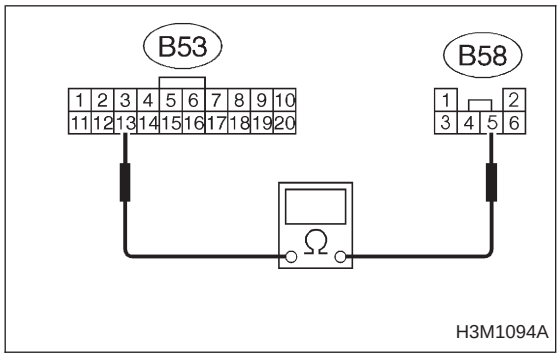




1. CHECK INPUT SIGNAL FOR TCM.

1) Turn ignition switch ON (with engine OFF).
2) Measure signal voltage for TCM while connecting and disconnecting the diagnosis terminal to diagnosis connector.

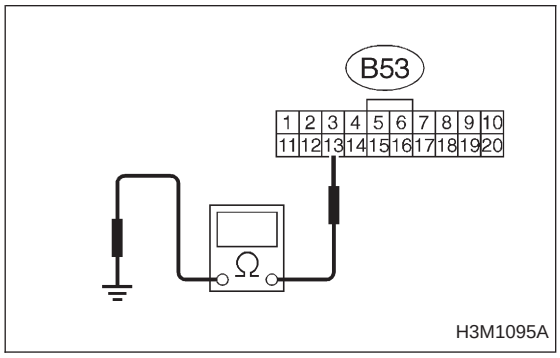
Connector & terminal / Specified voltage:
(B53) No. 13 — Body / Less than 1 V (Connected)
More than 6 V (Disconnected)



2. CHECK HARNESS CONNECTOR BETWEEN TCM AND DIAGNOSIS SWITCH.

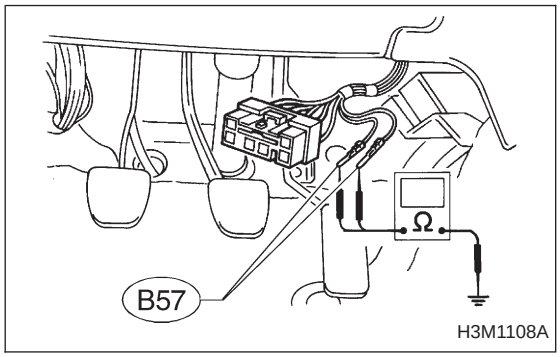
1) Turn ignition switch OFF.
2) Disconnect connector from TCM.
3) Measure resistance of harness connector between TCM and diagnosis switch.

Connector & terminal / Specified resistance:
(B53) No. 13 — (B58) No. 5 / 1 Ω, or less.



4) Measure resistance of harness connector between TCM and body to make sure that circuit does not short.

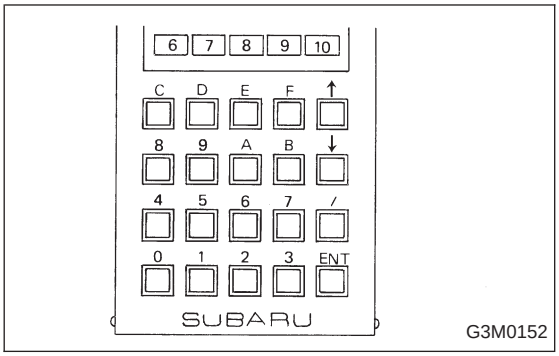
Connector & terminal / Specified resistance:
(B53) No. 13 — Body / 1 M Ω, or more



3. CHECK DIAGNOSIS SWITCH GROUND LINE.

Measure resistance of harness terminal between diagnosis terminal and body.

Connector & terminal / Specified resistance:
(B57) — Body / 1 Ω, or less



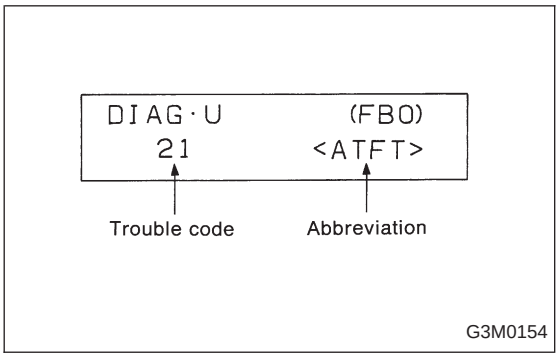
G3M0152

R: MODE FB0
— ON-BOARD DIAGNOSTICS (DIAG. U) —

DISPLAY:

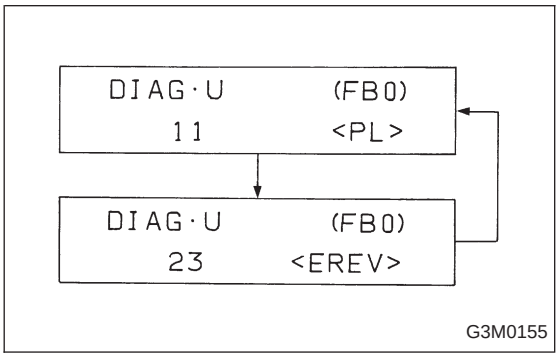
Current trouble code determined by on-board diagnostics.

1) Connect select monitor.
2) Designate mode using function key.
Press [F] [B] [0] [ENT] in that order.



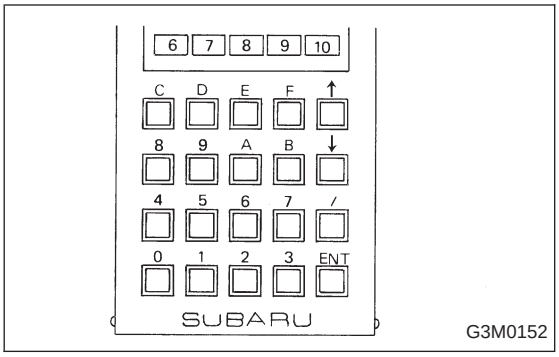
G3M0154

3) Ensure displayed trouble code(s).
- When there is only one trouble code



G3M0155

- When there are multiple trouble codes



G3M0152

S: MODE FB1
— ON-BOARD DIAGNOSTICS (DIAG. M) —

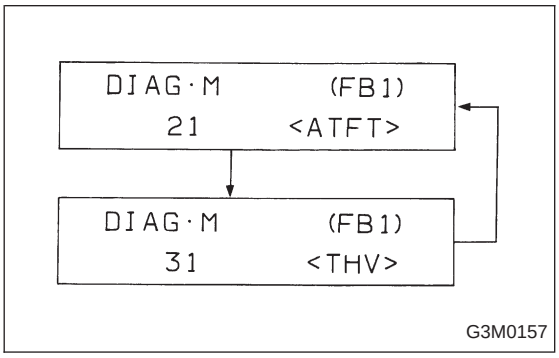
DISPLAY:

Previous trouble code stored in by on-board diagnostics.

1) Connect select monitor.
2) Designate mode using function key.
Press [F] [B] [1] [ENT] in that order.

G3M0156

3) Ensure displayed trouble code(s).
- When there is only one trouble code



G3M0157

- When there are multiple trouble codes

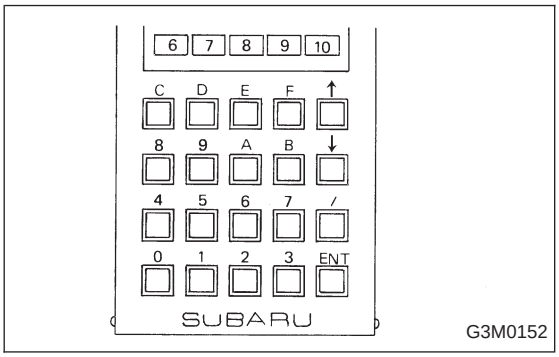
T: MODE FC0 — BACK-UP CLEAR —

DISPLAY:

Function of clearing trouble code stored in memory.

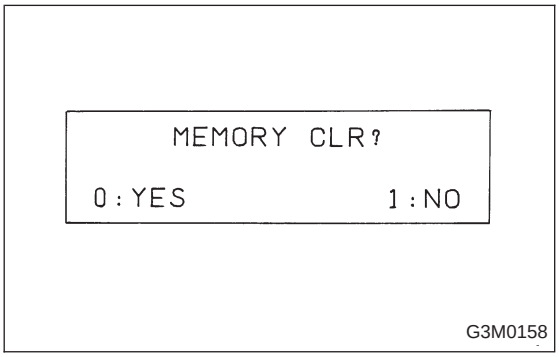
The current trouble history code is deleted from the monitor when the ignition switch is turned OFF after performing on-board diagnostics. However, past trouble history code are stored in TCM. They remain in memory even when the ignition switch is turned OFF, because there is a memory back-up battery. The current trouble history code can be displayed again when on-board diagnostics is performed after driving, provided that no inspection or repair has been made.
To delete past trouble history codes, first perform on-board diagnostics after inspection and repair using the current trouble history code, then confirm that no trouble code is displayed. Next, select and execute a particular mode on the select monitor.

NOTE:
● Since the past trouble history is deleted, it is necessary when erasing the trouble code to inspect and make repairs according to the trouble code, and ensure that no trouble code is indicated in on-board diagnostics.
● The past trouble history will not be not lost, provided inspection and repairs are performed according to the current trouble history code, and that no trouble remains.



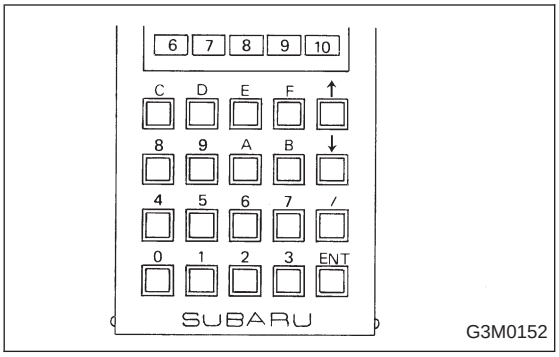
G3M0152

1) Connect select monitor.
2) Designate mode using function key.
Press [F] [C] [0] [ENT] in that order.



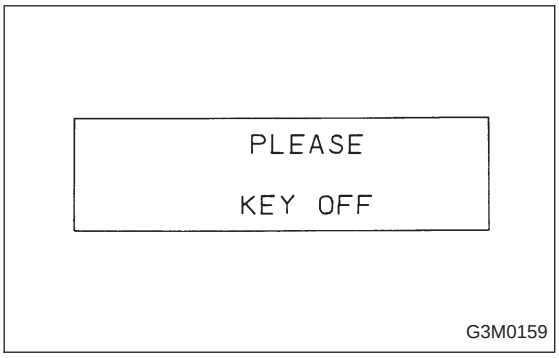
G3M0158

3) Ensure displayed message.



G3M0152

4) Press [ENT] key.
● When executing, (YES)
Press [0] [ENT] in that order.
● When not executing, (NO)
Press [1] [ENT] in that order.



G3M0159

5) When executed, the indication as shown here appears for approximately four seconds, and the past trouble history is deleted.

6) After the display is gone, turn ignition switch to OFF.

7. General Diagnostic Table

Problem parts / Symptom	Inhibitor switch	Control module	Vehicle speed sensor 1	Vehicle speed sensor 2	Select cable	Select lever	FWD switch	Starter motor and harness	Throttle position sensor	Diagnosis switch	Accumulator ("N" — "D")	Accumulator (2A)	Accumulator (4A)	Accumulator (3R)	ATF temperature sensor	Strainer	Duty solenoid A	Duty solenoid B	Shift solenoid 1	Shift solenoid 2	Shift solenoid 3	Control valve	Detent spring	Manual plate	Transfer clutch	Transfer valve	Transfer pipe	Duty solenoid C	Forward clutch
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Starter does not rotate when select lever is in "P" or "N."; starter rotates when select lever is "R", "D", "3" or "2."	X				X	X		X																					
Abnormal noise when select lever is in "P" or "N."																X												X	
Hissing noise occurs during standing starts.																X													
Noise occurs while driving in "D_1" range.																													
Noise occurs while driving in "D_2" range.																													
Noise occurs while driving in "D_3" range.																													
Noise occurs while driving in "D_4" range.																													
Engine stalls while shifting from one range to another.																						X							
Vehicle moves when select lever is in "N."																													X
Shock occurs when select lever is moved from "N" to "D."		X									X											X							
Excessive time lag occurs when select lever is moved from "N" to "D."																						X							X
Shock occurs when select lever is moved from "N" to "R."		X											X									X							
Excessive time lag occurs when select lever is moved from "N" to "R."																						X							
Vehicle does not start in any shift range (engine revving up).																X						X							
Vehicle does not start in any shift range (engine stall).																													
Vehicle does not start in "R" range only (engine revving up).					X	X																X							
Vehicle does not start in "R" range only (engine stall).																													X
Vehicle does not start in "D" or "3" range (engine revving up).																													X
Vehicle does not start in "D", "3" or "2" range (engine revving up).																													X
Vehicle does not start in "D", "3" or "2" range (engine stall).																													
Vehicle starts in "R" range only (engine revving up).																						X							
Acceleration during standing starts is poor (high stall rpm).																						X							X
Acceleration during standing starts is poor (low stall rpm).																													
Acceleration is poor when select lever is in "D", "3" or "2" range (normal stall rpm).		X																				X							
Acceleration is poor when select lever is in "R" (normal stall rpm).																						X							
No shift occurs from 1st to 2nd gear.		X	X	X					X										X	X		X							
No shift occurs from 2nd to 3rd gear.		X																				X							
No shift occurs from 3rd to 4th gear.		X												X	X						X	X							
No "kick-down" shifts occur.		X							X																				
Engine brake is not effected when select lever is in "3" range.	X	X							X													X							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29

Overrunning clutch	Drive pinion	Crown gear	Axle shaft	Differential gear	Final gear	Seal pipe	Oil pump	High clutch	Band brake	Low & reverse clutch	Reverse clutch	One-way clutch (1-2)	One-way clutch (3-4)	Double oil seal	Input shaft	Output shaft	Planetary gear	Reduction gear	Drive plate	Torque converter one-way clutch	Lock-up facing	Lock-up damper	ATF deterioration	ATF level too high or too low	Differential gear oil level too high or too low	Engine performance	Engine speed signal	Parking brake mechanism	Problem parts
30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	Symptom
																													Starter does not rotate when select lever is in “P” or “N.”; starter rotates when select lever is “R”, “D”, “3” or “2.”
							X												X					X					Abnormal noise when select lever is in “P” or “N.”
																								X					Hissing noise occurs during standing starts.
					X												X	X							X				Noise occurs while driving in “D_1” range.
					X												X	X							X				Noise occurs while driving in “D_2” range.
					X													X							X				Noise occurs while driving in “D_3” range.
					X												X	X							X				Noise occurs while driving in “D_4” range.
																						X				X			Engine stalls while shifting from one range to another.
																													Vehicle moves when select lever is in “N.”
																							X						Shock occurs when select lever is moved from “N” to “D.”
																													Excessive time lag occurs when select lever is moved from “N” to “D.”
																							X						Shock occurs when select lever is moved from “N” to “R.”
										X	X																		Excessive time lag occurs when select lever is moved from “N” to “R.”
	X	X	X	X			X								X	X	X		X					X					Vehicle does not start in any shift range (engine revving up).
																												X	Vehicle does not start in any shift range (engine stall).
										X	X																		Vehicle does not start in “R” range only (engine revving up).
									X								X												Vehicle does not start in “R” range only (engine stall).
												X																	Vehicle does not start in “D” or “3” range (engine revving up).
																													Vehicle does not start in “D”, “3” or “2” range (engine revving up).
											X																		Vehicle does not start in “D”, “3” or “2” range (engine stall).
																													Vehicle starts in “R” range only (engine revving up).
											X														X				Acceleration during standing starts is poor (high stall rpm).
							X													X						X			Acceleration during standing starts is poor (low stall rpm).
								X	X								X												Acceleration is poor when select lever is in “D”, “3” or “2” range (normal stall rpm).
X								X	X								X												Acceleration is poor when select lever is in “R” (normal stall rpm).
									X																				No shift occurs from 1st to 2nd gear.
								X					X																No shift occurs from 2nd to 3rd gear.
									X																				No shift occurs from 3rd to 4th gear.
																													No “kick-down” shifts occur.
																													Engine brake is not effected when select lever is in “3” range.
30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	

Problem parts / Symptom	Inhibitor switch	Control module	Vehicle speed sensor 1	Vehicle speed sensor 2	Select cable	Select lever	FWD switch	Starter motor and harness	Throttle position sensor	Diagnosis switch	Accumulator ("N" — "D")	Accumulator (2A)	Accumulator (4A)	Accumulator (3R)	ATF temperature sensor	Strainer	Duty solenoid A	Duty solenoid B	Shift solenoid 1	Shift solenoid 2	Shift solenoid 3	Control valve	Detent spring	Manual plate	Transfer clutch	Transfer valve	Transfer pipe	Duty solenoid C	Forward clutch
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Engine brake is not effected when select lever is in "3" or "2" range.																													
Engine brake is not effected when select lever is in "1" range.																						X							
Shift characteristics are erroneous.	X	X	X	X					X													X							
No lock-up occurs.		X							X						X							X							
Vehicle cannot be set in "D" range power mode.		X							X																				
"D" range power mode cannot be released.		X							X						X														
Parking brake is not effected.					X	X																							
Shift lever cannot be moved or is hard to move from "P" range.					X	X																							
Select lever is hard to move.					X	X																	X	X					
Select lever is too light to move (unreasonable resistance).																							X	X					
ATF spurts out.																													
Differential oil spurts out.																													
Differential oil level changes excessively.																													
Odor is produced from oil supply pipe.																									X				X
Shock occurs when select lever is moved from "1" to "2" range.		X							X			X			X		X					X							
Slippage occurs when select lever is moved from "1" to "2" range.		X							X			X			X		X					X							
Shock occurs when select lever is moved from "2" to "3" range.		X							X					X	X		X					X							
Slippage occurs when select lever is moved from "2" to "3" range.		X							X					X	X		X					X							
Shock occurs when select lever is moved from "3" to "4" range.		X							X				X		X		X					X							
Slippage occurs when select lever is moved from "3" to "4" range.		X							X				X		X		X					X							
Shock occurs when select lever is moved from "3" to "2" range.		X							X						X		X					X							
Shock occurs when select lever is moved from "D" to "1" range.		X							X						X		X					X							
Shock occurs when select lever is moved from "2" to "1" range.		X							X						X		X					X							
Shock occurs when accelerator pedal is released at medium speeds.		X							X						X		X					X							
Vibration occurs during straight-forward operation.		X																X											
Select lever slips out of position during acceleration or while driving on rough terrain.					X	X																	X	X					
Vibration occurs during turns (tight corner "braking" phenomenon).		X	X	X					X						X										X	X		X	
Front wheel slippage occurs during standing starts.		X		X			X		X						X							X			X	X	X	X	
Vehicle is not set in FWD mode.		X					X																		X	X		X	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29

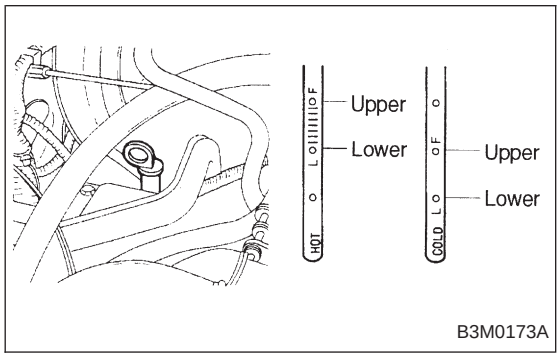
30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	Symptom
Overrunning clutch	Drive pinion	Crown gear	Axle shaft	Differential gear	Final gear	Seal pipe	Oil pump	High clutch	Band brake	Low & reverse clutch	Reverse clutch	One-way clutch (1-2)	One-way clutch (3-4)	Double oil seal	Input shaft	Output shaft	Planetary gear	Reduction gear	Drive plate	Torque converter one-way clutch	Lock-up facing	Lock-up damper	ATF deterioration	ATF level too high or too low	Differential gear oil level too high or too low	Engine performance	Engine speed signal	Parking brake mechanism	Problem parts
X																													Engine brake is not effected when select lever is in “3” or “2” range.
										X																			Engine brake is not effected when select lever is in “1” range.
																													Shift characteristics are erroneous.
																					X						X		No lock-up occurs.
																													Vehicle cannot be set in “D” range power mode.
																													“D” range power mode cannot be released.
																												X	Parking brake is not effected.
																												X	Shift lever cannot be moved or is hard to move from “P” range.
																													Select lever is hard to move.
																													Select lever is too light to move (unreasonable resistance).
																								X					ATF spurts out.
																									X				Differential oil spurts out.
						X								X															Differential oil level changes excessively.
X								X	X	X	X										X		X						Odor is produced from oil supply pipe.
									X														X			X			Shock occurs when select lever is moved from “1” to “2” range.
									X																				Slippage occurs when select lever is moved from “1” to “2” range.
								X	X														X			X			Shock occurs when select lever is moved from “2” to “3” range.
								X	X																				Slippage occurs when select lever is moved from “2” to “3” range.
X									X														X			X			Shock occurs when select lever is moved from “3” to “4” range.
									X																				Slippage occurs when select lever is moved from “3” to “4” range.
X									X														X						Shock occurs when select lever is moved from “3” to “2” range.
																							X						Shock occurs when select lever is moved from “D” to “1” range.
										X													X						Shock occurs when select lever is moved from “2” to “1” range.
																						X				X			Shock occurs when accelerator pedal is released at medium speeds.
																					X	X							Vibration occurs during straight-forward operation.
																													Select lever slips out of position during acceleration or while driving on rough terrain.
																							X						Vibration occurs during turns (tight corner “braking” phenomenon).
																													Front wheel slippage occurs during standing starts.
																													Vehicle is not set in FWD mode.
30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	

AUTOMATIC TRANSMISSION AND DIFFERENTIAL (2200 cc model) 3-2b

1. Supplemental Restraint System “Airbag”

Airbag system wiring harness is routed near the transmission control module (TCM).

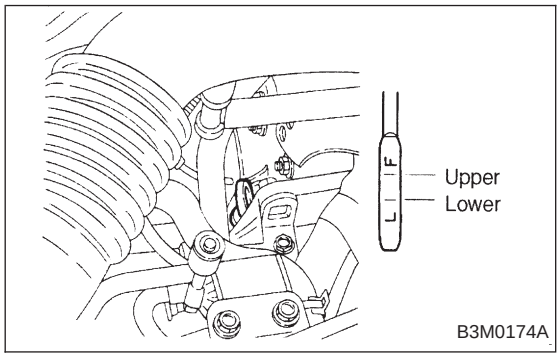
- **All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.**
- **Be careful not to damage Airbag system wiring harness when performing diagnostics and servicing the TCM.**



2. Pre-inspection

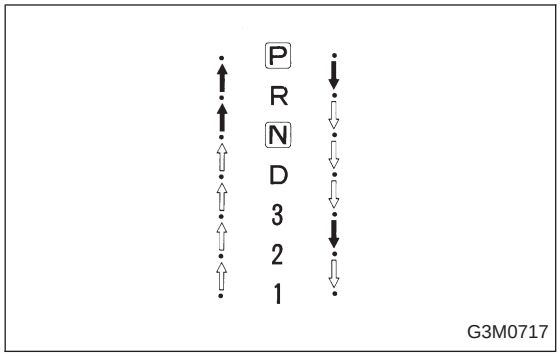
1. ATF LEVEL

Make sure that ATF level is in the specification.



2. FRONT DIFFERENTIAL OIL LEVEL

Make sure that front differential oil level is in the specification.



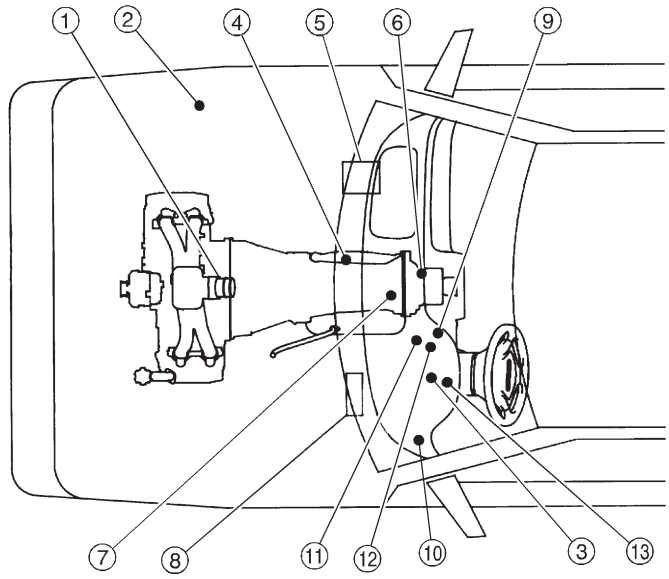
3. OPERATION OF SHIFT SELECTOR LEVER

WARNING:
Stop the engine while checking operation of selector lever.

1) Check that selector lever does not move from “N” to “R” without pushing the button.
2) Check that selector lever does not move from “R” to “P” without pushing the button.
3) Check that selector lever does not move from “P” to “R” without pushing the button.
4) Check that selector lever does not move from “3” to “2” without pushing the button.

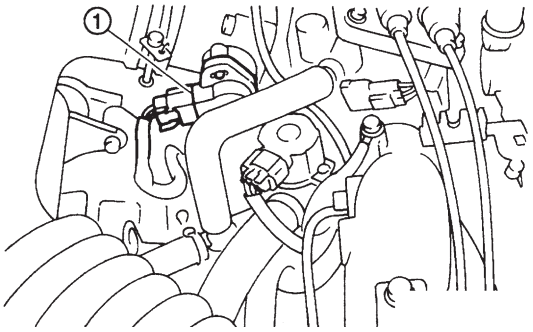
3. Electrical Components Location

1. SENSOR AND CONTROL MODULE

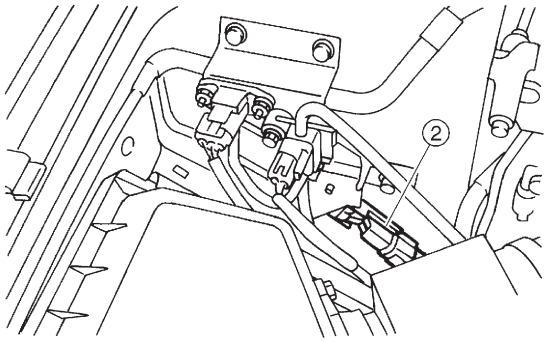


H3M1087A

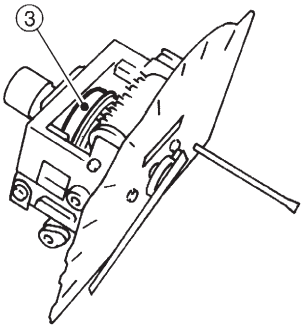
① Throttle position sensor
② Dropping resistor
③ Vehicle speed sensor 2
④ Inhibitor switch
⑤ ECM
⑥ Vehicle speed sensor 1 (AWD)
⑦ Vehicle speed sensor 1 (FWD)
⑧ TCM
⑨ Data link connector (for Subaru select monitor only)
⑩ Data link connector (for Subaru select monitor and OBD-II general scan tool)
⑪ Diagnosis connector
⑫ Diagnosis terminal
⑬ AT OIL TEMP indicator light (AT diagnostic indicator light)



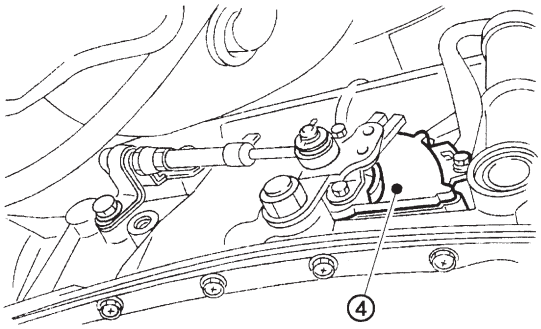
B2M0155A



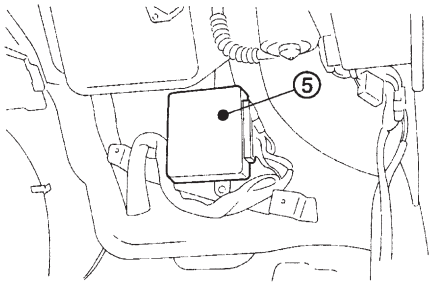
OBD0046A



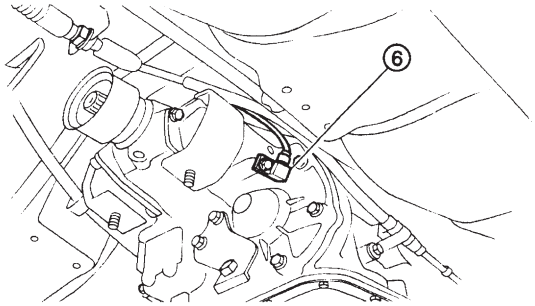
H2M1144B



B3M0182A



B3M0183A



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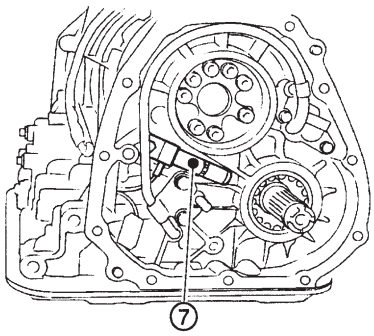

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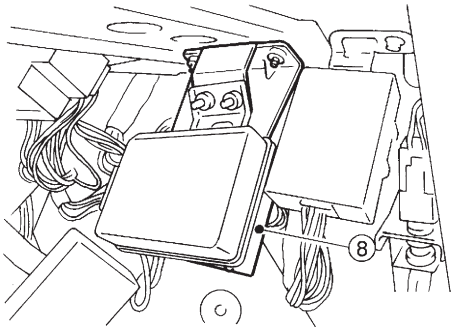

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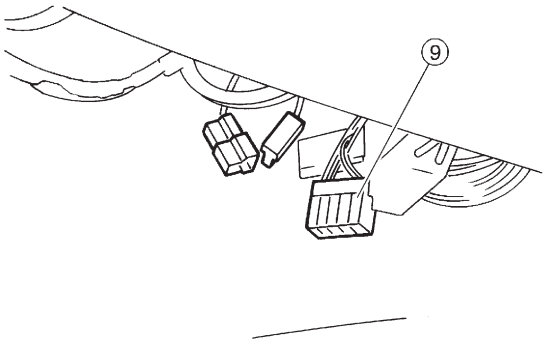
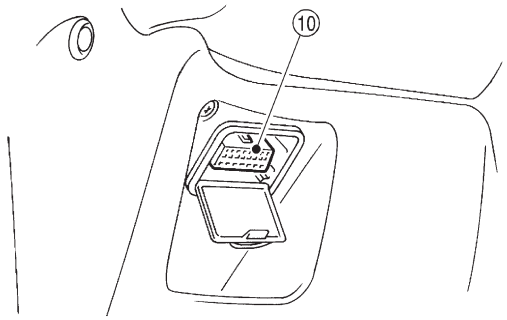


OBD0005C



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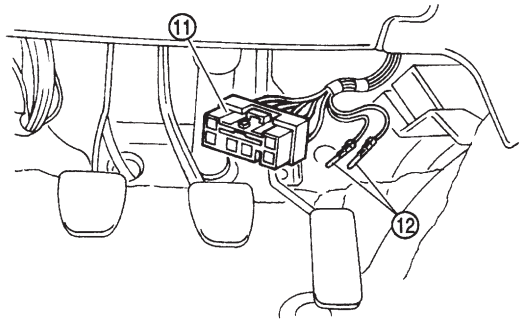

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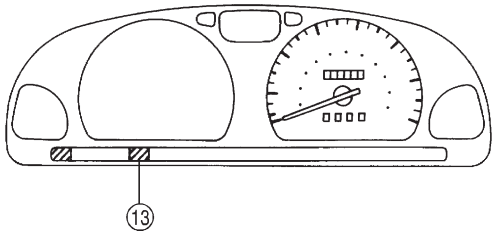
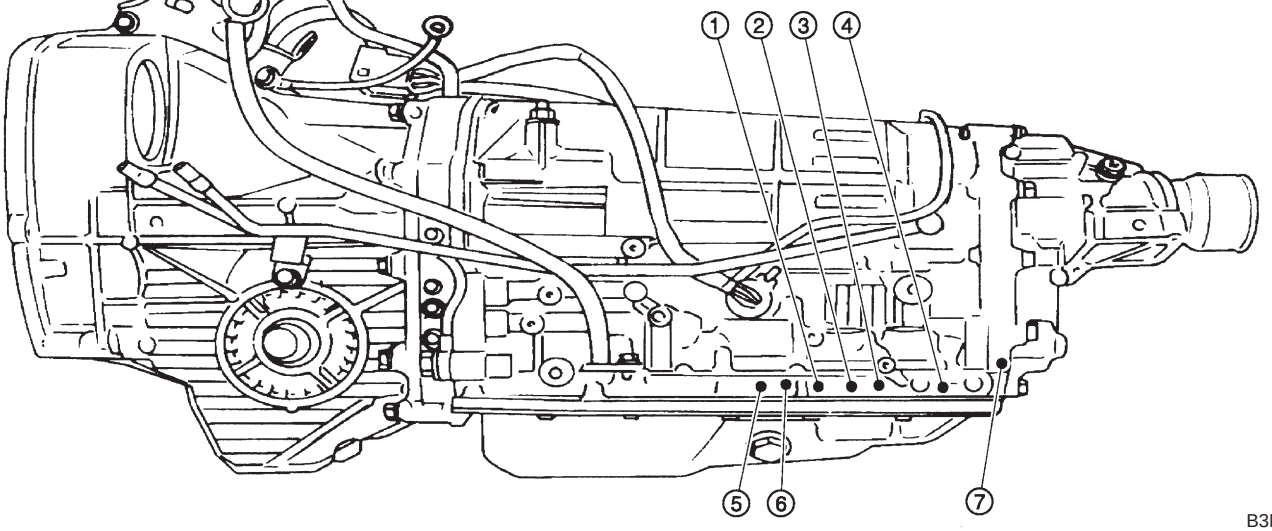


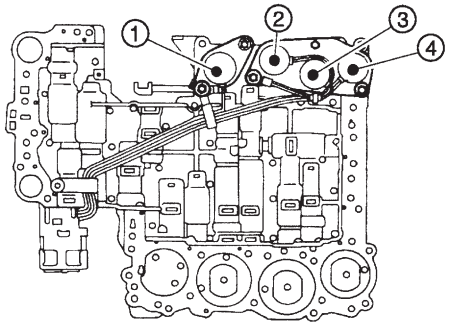
H2M1135D

2. SOLENOID



B3M0187A

① Duty solenoid A
② Solenoid 2
③ Solenoid 1
④ Solenoid 3
⑤ Duty solenoid B
⑥ ATF temperature sensor
⑦ Duty solenoid C (AWD)



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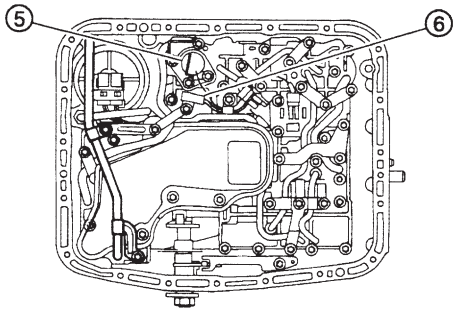

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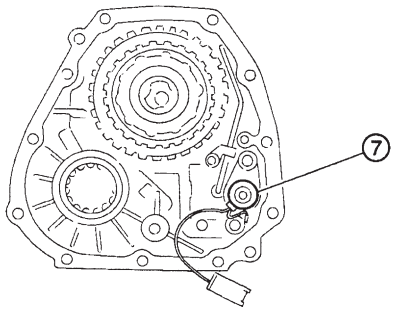
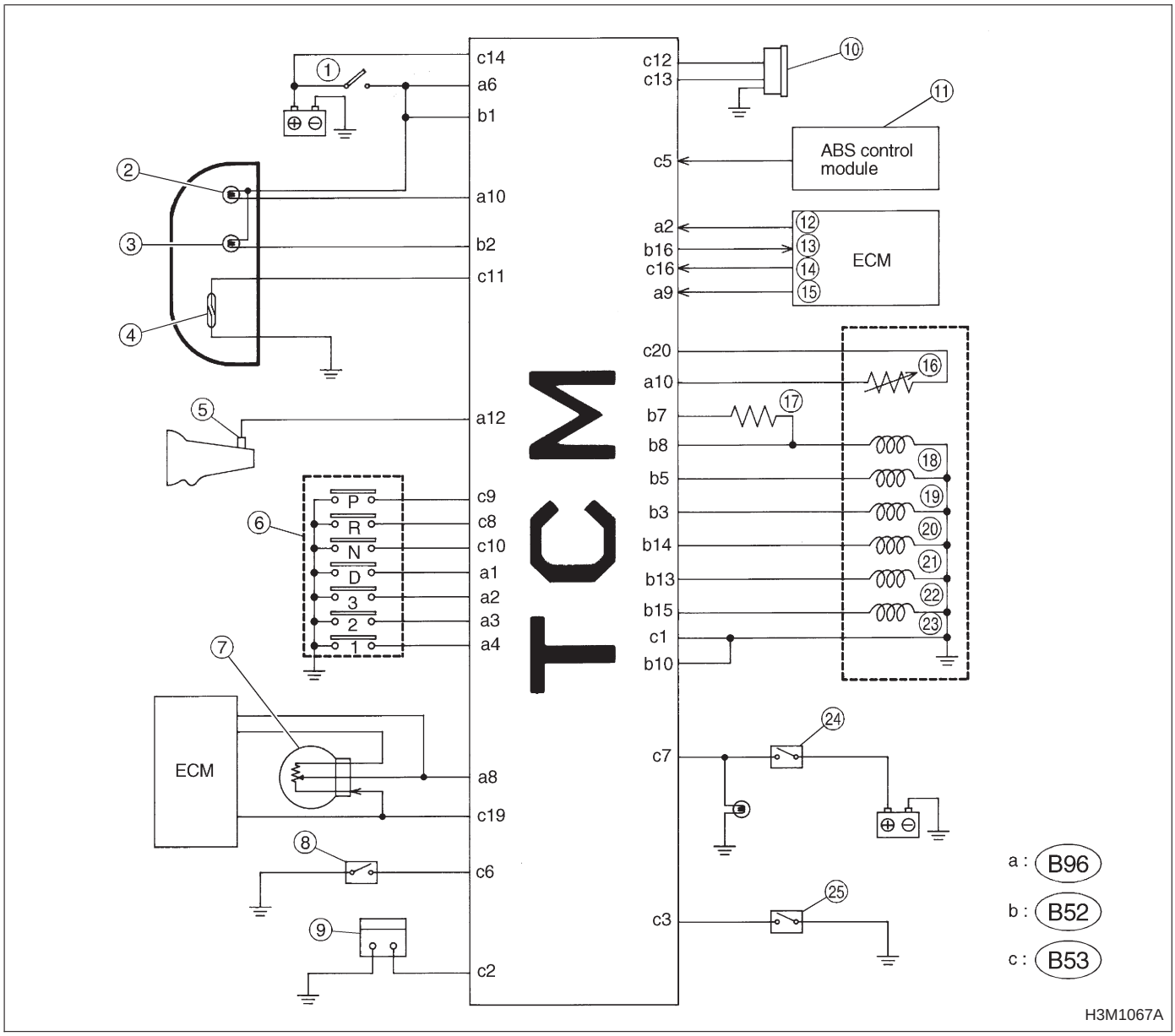


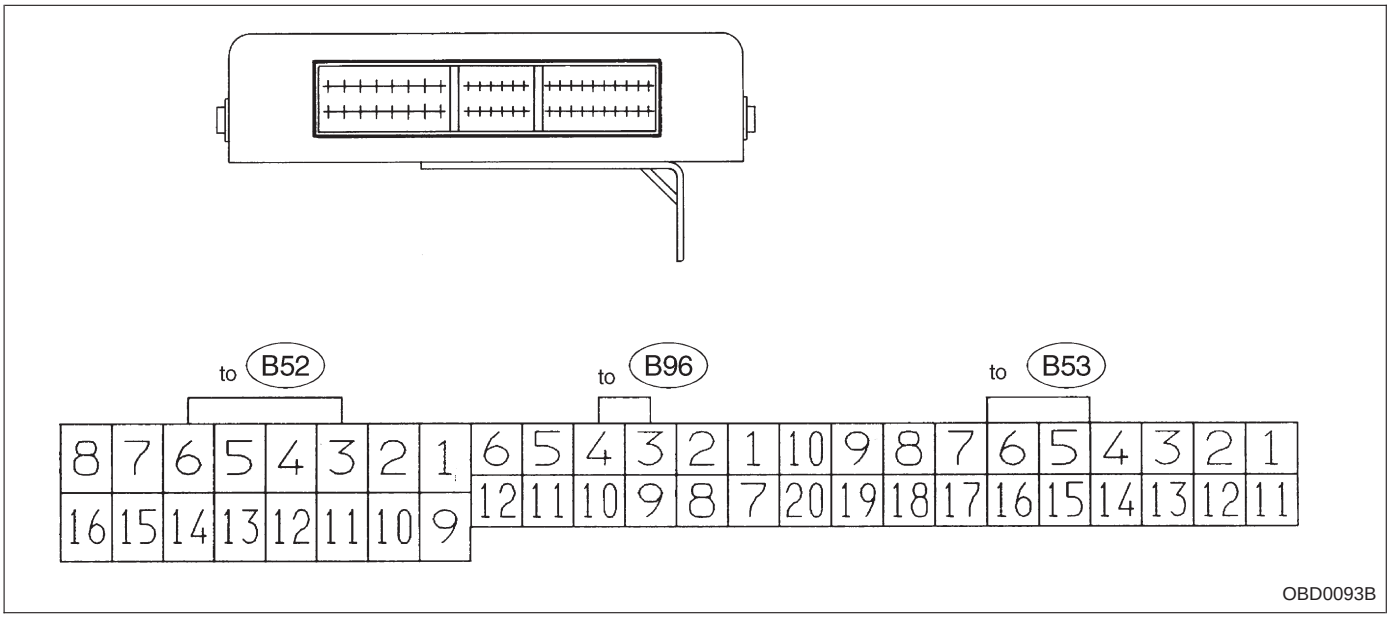
B3M0190A

4. Schematic



① Ignition switch
② FWD indicator light
③ AT OIL TEMP indicator light
④ Vehicle speed sensor 2
⑤ Vehicle speed sensor 1
⑥ Inhibitor switch
⑦ Throttle position sensor
⑧ Diagnosis switch
⑨ FWD switch (AWD)
⑩ Data link connector
⑪ ABS control module
⑫ Engine speed signal
⑬ Torque control signal
⑭ Torque control cut signal
⑮ Mass air flow signal
⑯ ATF temperature sensor
⑰ Dropping resistor
⑱ Duty solenoid A
⑲ Duty solenoid B
⑳ Duty solenoid C (AWD)
㉑ Shift solenoid 1
㉒ Shift solenoid 2
㉓ Shift solenoid 3
㉔ Brake switch
㉕ Cruise set switch

5. Transmission Control Module (TCM) I/O Signal



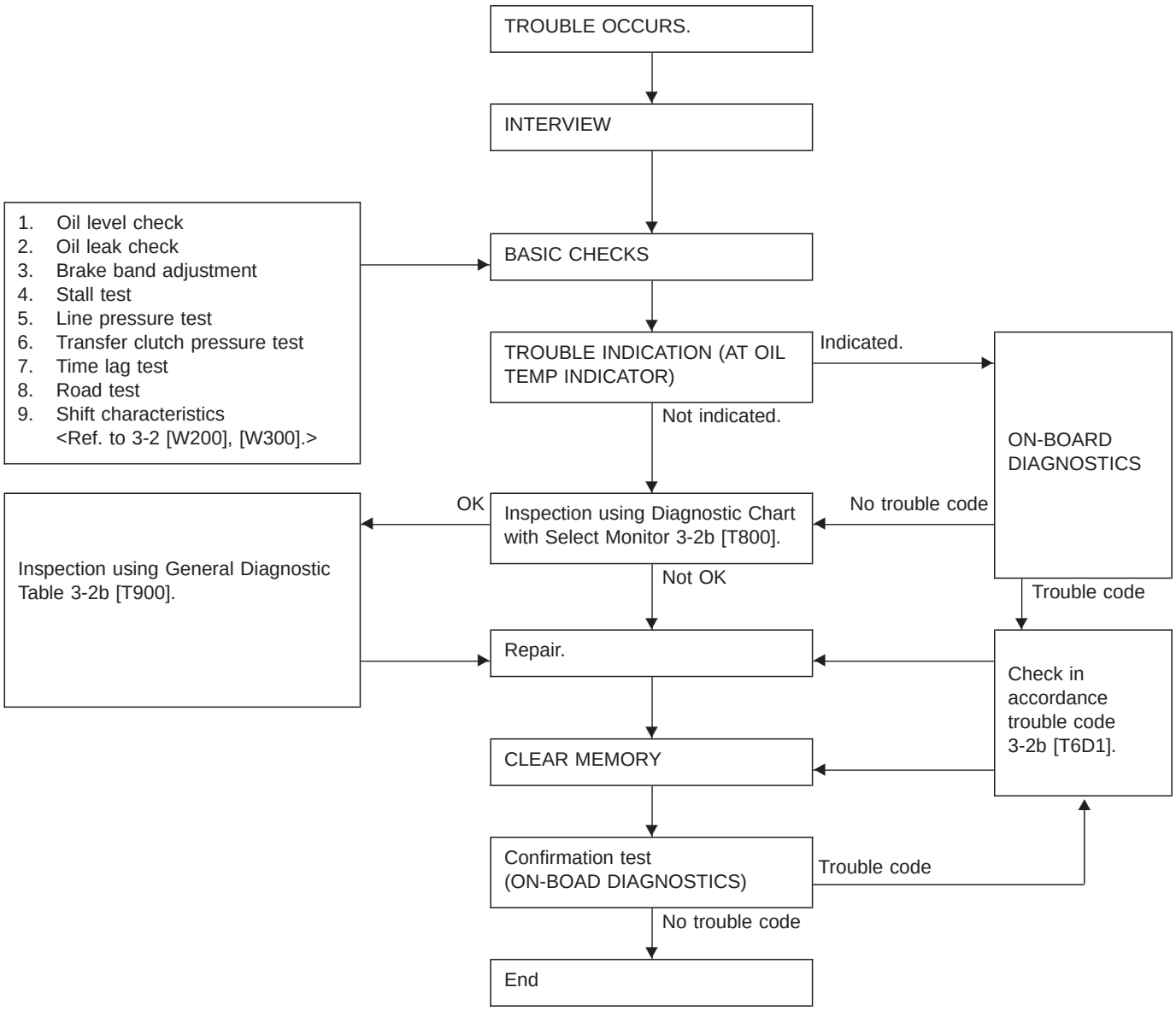
Check with ignition switch ON.

Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)
Back-up power supply		B53	14	Ignition switch OFF	10 — 16
Ignition power supply		B96	6	Ignition switch ON (with engine OFF)	10 — 16
		B52	1		
Inhibitor switch	“P” range switch	B53	9	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	B53	8	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	B53	10	Select lever in “R” range	Less than 1
				Select lever in any other than “R” range	More than 6
	“D” range switch	B96	1	Select lever in “D” range	Less than 1
				Select lever in any other than “D” range	More than 6
	“3” range switch	B96	2	Select lever in “3” range	Less than 1
				Select lever in any other than “3” range	More than 6
	“2” range switch	B96	3	Select lever in “2” range	Less than 1
				Select lever in any other than “2” range	More than 6
	“1” range switch	B96	4	Select lever in “1” range	Less than 1
				Select lever in any other than “1” range	More than 6
Diagnosis switch		B53	6	Diagnosis connector connected.	Less than 1
				Diagnosis connector disconnected.	More than 6
Brake switch		B53	7	Brake pedal depressed.	More than 10.5
				Brake pedal released.	Less than 1
ABS signal		B53	5	ABS switch ON	Less than 1
				ABS switch OFF	More than 6.5
AT diagnostic signal		B96	12	Ignition switch ON (With engine OFF)	Less than 1
				Ignition switch ON (With engine ON)	More than 10

Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Throttle position sensor	B96	8	Throttle fully closed.	0.5±0.2	—
			Throttle fully open.	4.6±0.3	
Throttle position sensor power supply	B53	19	Ignition switch ON (With engine OFF)	5.05±0.25	—
ATF temperature sensor	B96	10	ATF temperature 20°C (68°F)	3.45±0.55	2.1 — 2.9 k
			ATF temperature 80°C (176°F)	1.2±0.2	275 — 375
Vehicle speed sensor 1	B96	12	Vehicle stopped.	0	450 — 720
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Vehicle speed sensor 2	B53	11	When vehicle is slowly moved at least 2 meters (7ft).	Less than 1↔More than 4	—
Engine speed signal	B96	5	Ignition switch ON (with engine OFF).	More than 10.5	—
			Ignition switch ON (with engine ON).	8 — 11	
Cruise set signal	B53	3	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	B52	16	Ignition switch ON	5±1	—
Torque control cut signal	B53	16	Ignition switch ON	6 — 9	—
Mass air flow signal	B96	9	Engine idling after warm-up	0.5 — 1.2	—
Shift solenoid 1	B52	14	1st or 4th gear	More than 9	20 — 32
			2nd or 3rd gear	Less than 1	
Shift solenoid 2	B52	13	1st or 2nd gear	More than 9	20 — 32
			3rd or 4th gear	Less than 1	
Shift solenoid 3	B52	15	Select lever in “N” range (with throttle fully closed).	Less than 1	20 — 32
			Select lever in “D” range (with throttle fully closed).	More than 9	
Duty solenoid A	B52	8	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 4.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 1	
Dropping resistor	B52	7	Throttle fully closed (with engine OFF) after warm-up.	More than 8.5	12 — 18
			Throttle fully open (with engine OFF) after warm-up.	Less than 1	
Duty solenoid B	B52	5	When lock up occurs.	More than 8.5	9 — 17
			When lock up is released.	Less than 0.5	
Duty solenoid C (AWD model only)	B52	3	Fuse on FWD switch	More than 8.5	9 — 17
			Fuse removed from FWD switch (with throttle fully open and with select lever in 1st gear).	Less than 0.5	
Sensor ground line 1	B96	7	—	0	Less than 1
Sensor ground line 2	B53	20	—	0	Less than 1
System ground line	B53	1	—	0	Less than 1
Power system ground line	B52	10	—	0	Less than 1
FWD switch (AWD model only)	B53	2	Fuse removed.	6 — 9.1	—
			Fuse installed.	Less than 1	

6. Diagnostic Chart for On-board Diagnostic System

A: BASIC DIAGNOSTICS PROCEDURE

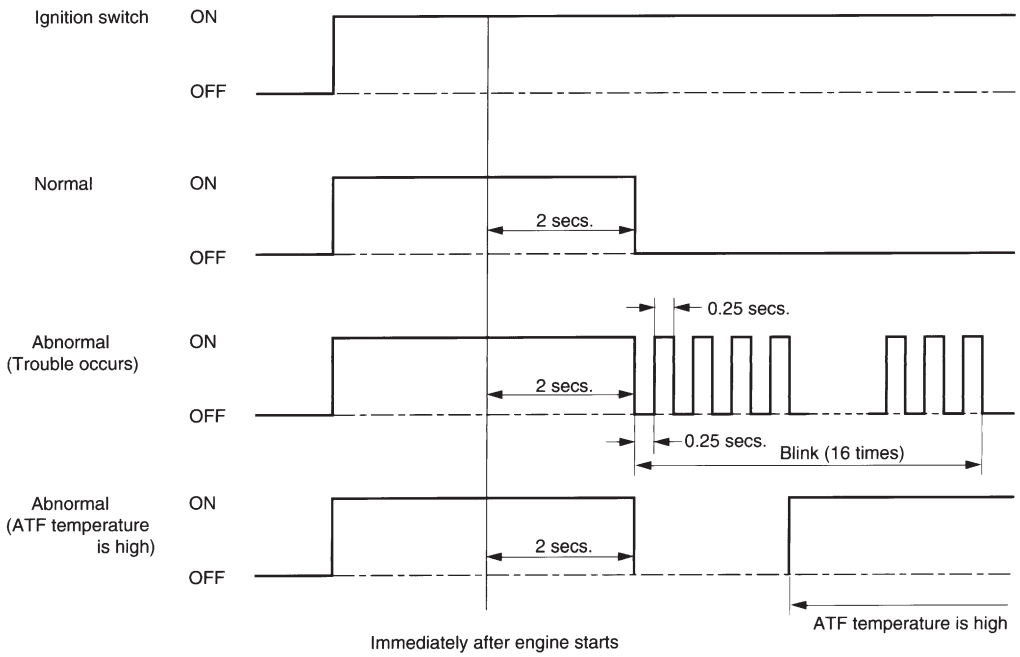


B: ABNORMAL DISPLAY ON AT OIL TEMP INDICATOR

When any on-board diagnostic item is malfunctioning, the display on the AT OIL TEMP indicator blinks immediately after the engine starts.
The malfunctioning part or unit can be determined by a trouble code during on-board diagnostic operation. Problems which occurred previously can also be identified through the memory function.
If the AT OIL TEMP indicator does not show a problem (although a problem is occurring), the problem can be determined by checking the performance characteristics of each sensor using the select monitor.
Indicator signal is as shown in the figure.

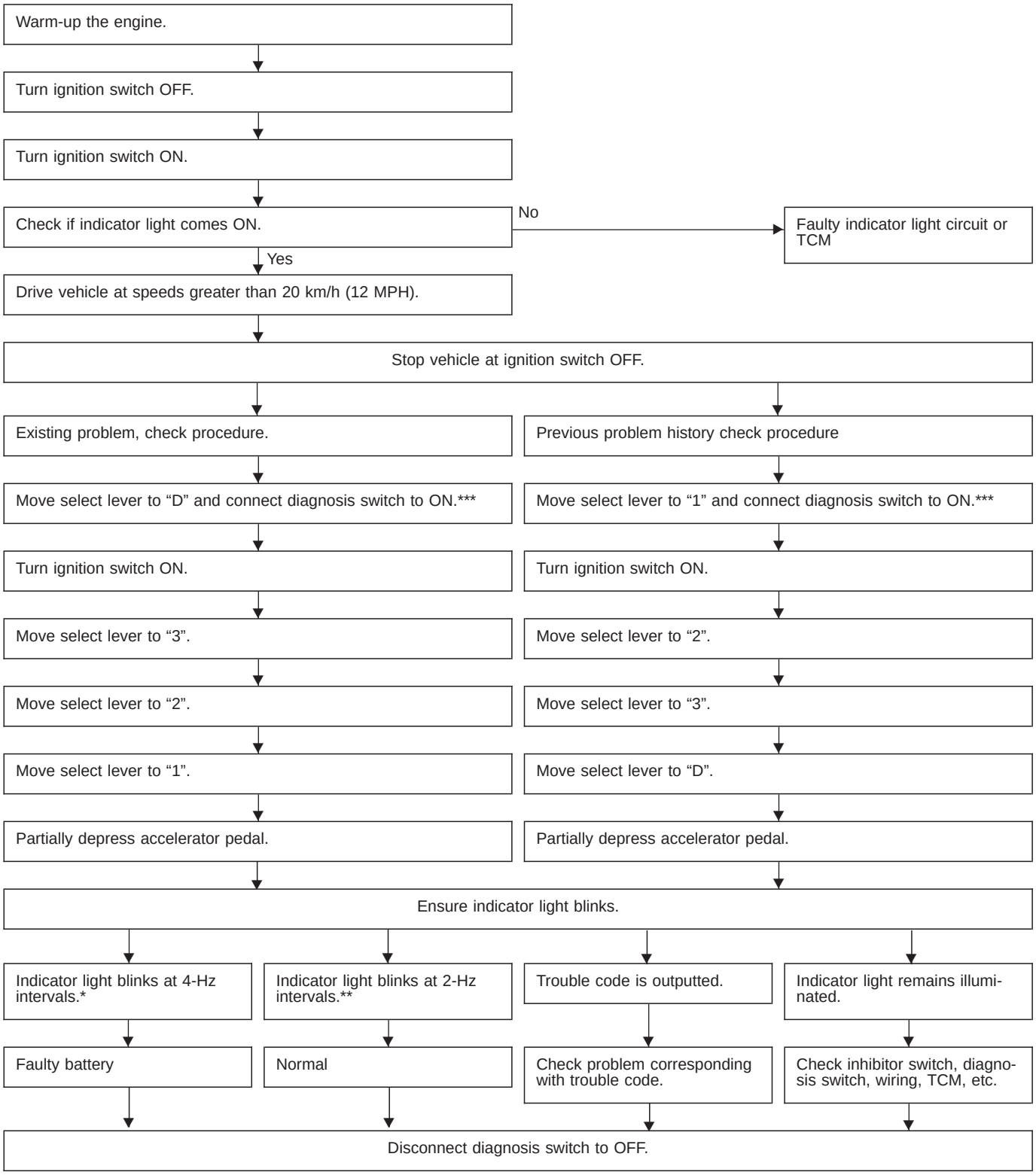
WARNING:

Warning can be noticed only when the engine is initially started.



H3H1066

C: ON-BOARD DIAGNOSTICS



* : Blinks every 0.125 (1/8) seconds (until ignition switch is turned OFF).
** : Blinks every 0.25 (1/4) seconds (until ignition switch is turned OFF).
***: Plug in diagnosis terminal to diagnosis connector No. 5 located below instrument lower cover.

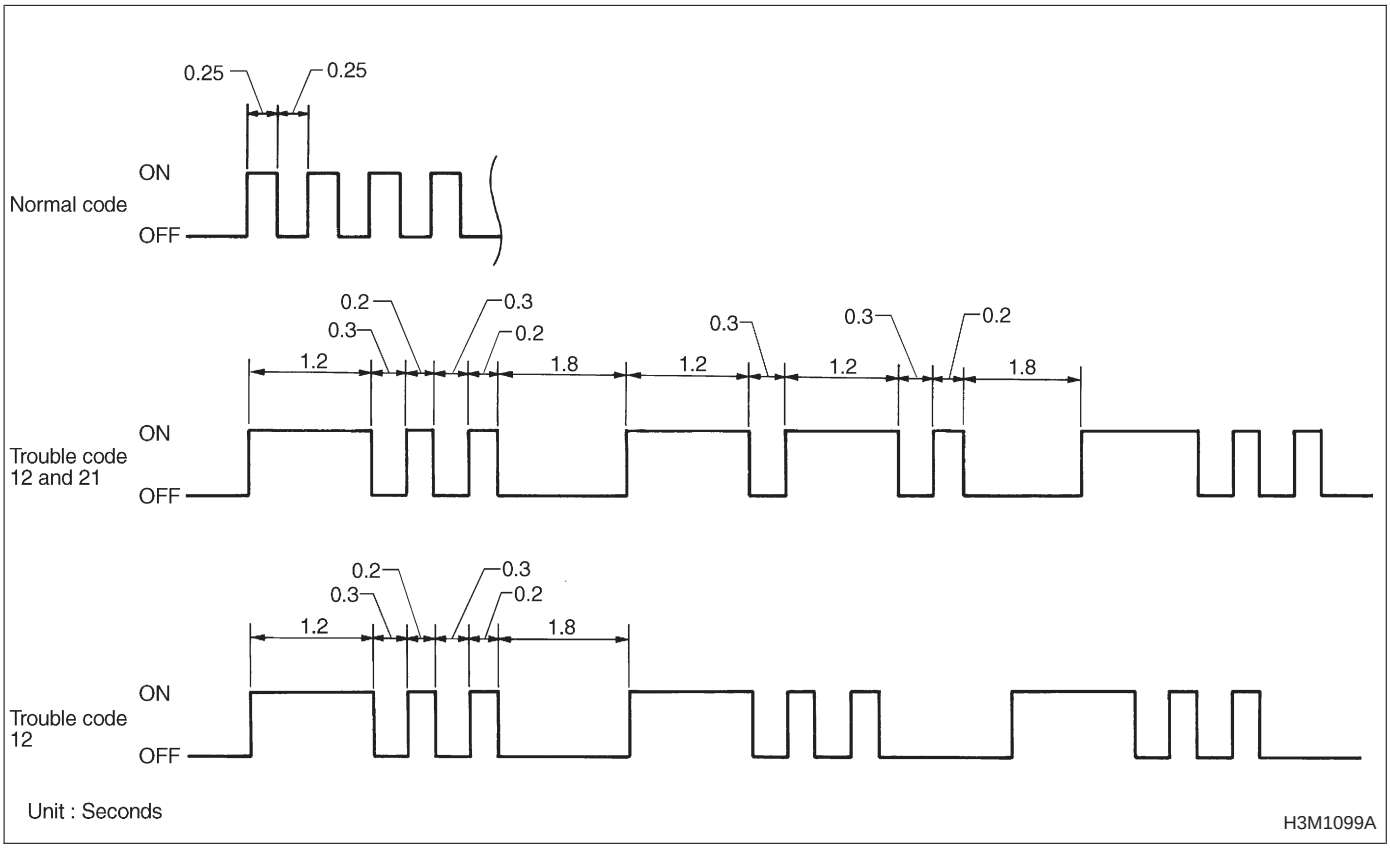
D: LIST OF TROUBLE CODE

1. TROUBLE CODE

Trouble code	Item	Content of diagnosis	Abbr. (Select monitor)	Page
11	Duty solenoid A	Detects open or shorted drive circuit, as well as valve seizure.	PL	16
12	Duty solenoid B	Detects open or shorted drive circuit, as well as valve seizure.	L/U	20
13	Shift solenoid 3	Detects open or shorted drive circuit, as well as valve seizure.	OVR	24
14	Shift solenoid 2	Detects open or shorted drive circuit, as well as valve seizure.	SFT2	26
15	Shift solenoid 1	Detects open or shorted drive circuit, as well as valve seizure.	SFT1	28
16	Torque control cut signal	Detects open or shorted input signal circuit.	TQ.DS	30
21	ATF temperature sensor	Detects open or shorted input signal circuit.	ATFT	32
22	Mass air flow signal	Detects open or shorted input signal circuit.	AFM	35
23	Engine speed signal	Detects open or shorted input signal circuit.	EREV	37
24	Duty solenoid C	Detects open or shorted drive circuit, as well as valve seizure.	4WD	39
25	Torque control signal	Detects open or shorted input signal circuit.	TQ.CT	41
31	Throttle position sensor	Detects open or shorted input signal circuit.	THV	43
32	Vehicle speed sensor 1	Detects open or shorted input signal circuit.	VSP1	46
33	Vehicle speed sensor 2	Detects open or shorted input signal circuit.	VSP2	50

2. HOW TO READ TROUBLE CODE OF INDICATOR LIGHT

The AT OIL TEMP indicator 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”.



E: CLEAR MEMORY

Current trouble codes shown on the display are cleared by turning the ignition switch OFF after conducting on-board diagnostic 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 right lower portion of the instrument panel).

CLEAR MEMORY:

Removal of No. 14 fuse (for at least one minute)

- The No. 14 fuse is located in the line to the memory back-up power supply of the TCM and ECM (MFI). Removal of this fuse clears the previous trouble codes stored in the TCM and ECM (MFI) memory.
- Be sure to remove the No. 14 fuse for at least the specified length of time. Otherwise, trouble codes may not be cleared.

7. Diagnostic Chart with Trouble Code

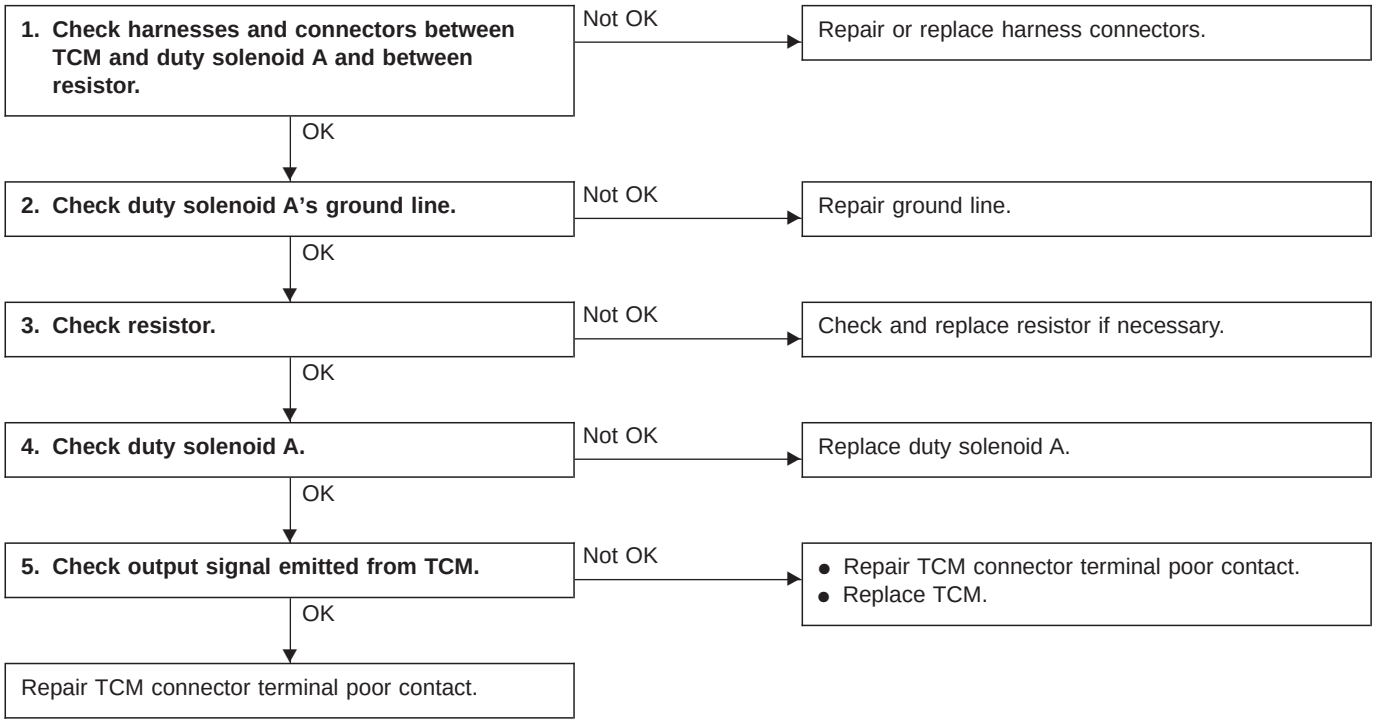
A: TROUBLE CODE 11 — DUTY SOLENOID A —

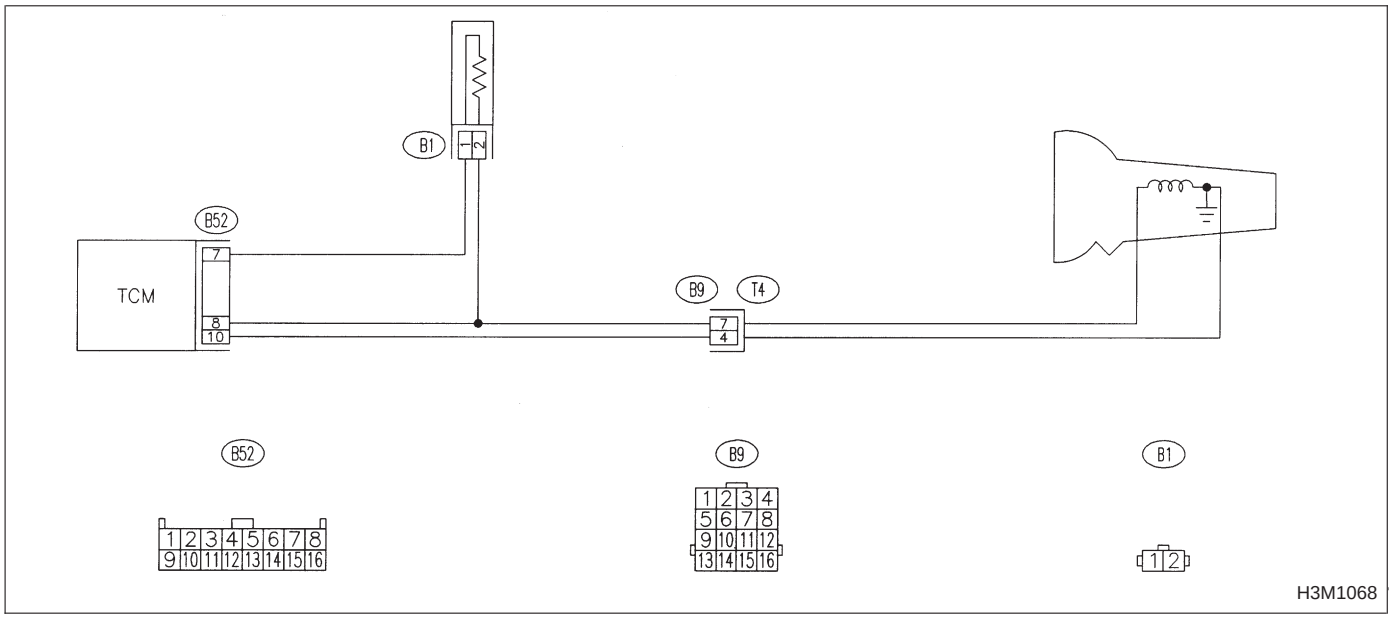
DIAGNOSIS:

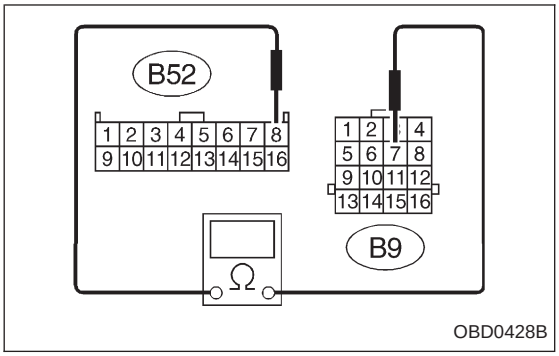
Output signal circuit of duty solenoid A or resistor is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock



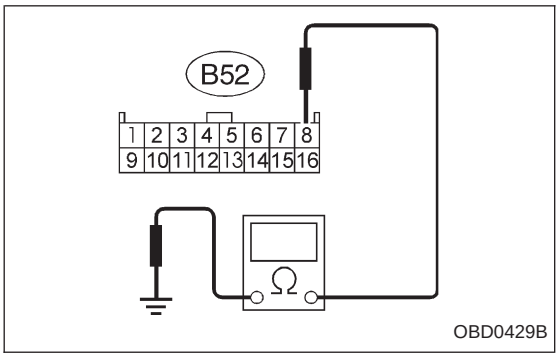




1. CHECK HARNESSES AND CONNECTORS BETWEEN TCM AND DUTY SOLENOID A AND BETWEEN RESISTOR.

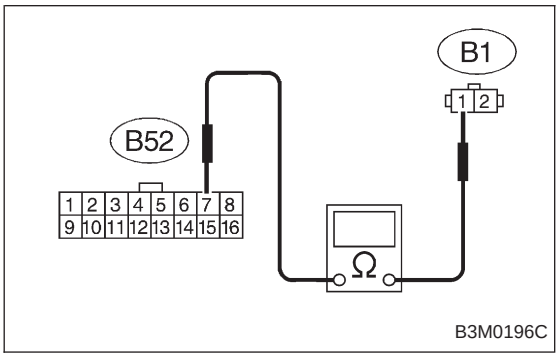
1) Turn ignition switch to OFF.
2) Disconnect connectors from TCM, transmission and resistor.
3) Measure resistance of harness connector between TCM and transmission.

Connector & terminal / Specified resistance:
(B52) No. 8 — (B9) No. 7 / 1 Ω, or less



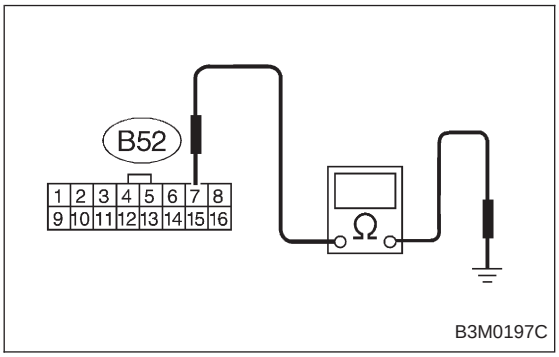
4) Measure resistance of harness connector between TCM and body to make sure that circuit does not short.

Connector & terminal / Specified resistance:
(B52) No. 8 — Body / 1 MΩ, or more



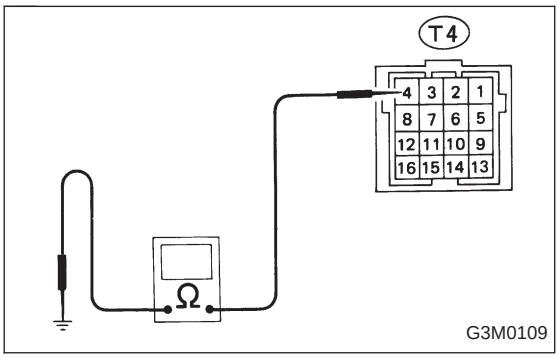
5) Measure resistance of harness connector between TCM and resistor connector.

Connector & terminal / Specified resistance:
(B52) No. 7 — (B1) No. 1 / 1 Ω, or less



6) Measure resistance of harness connector between TCM and body to make sure that circuit does not short.

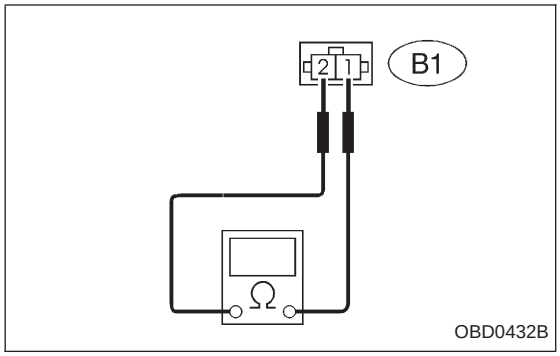
Connector & terminal / Specified resistance:
(B52) No. 7 — Body / 1 MΩ, or more



2. CHECK DUTY SOLENOID A's GROUND LINE.

Measure resistance between transmission connector receptacle (on transmission) and transmission case.

Connector & terminal / Specified resistance:
(T4) No. 4 — Transmission / 1 Ω, or less

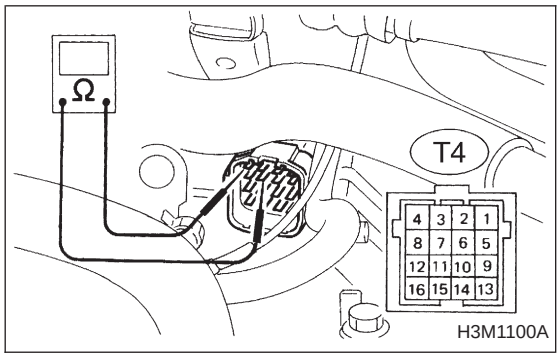


3. CHECK RESISTOR.

Measure resistance between resistor terminals.

Specified resistance:

(B1) No. 1 — No. 2 / 9 — 15 Ω

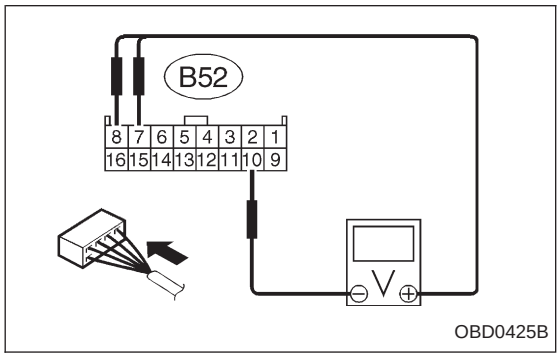


4. CHECK DUTY SOLENOID A.

Measure resistance between transmission connector receptacle (on transmission) terminals.

Connector & terminal / Specified resistance:

(T4) No. 7 — No. 4 / 1.5 — 4.5 Ω

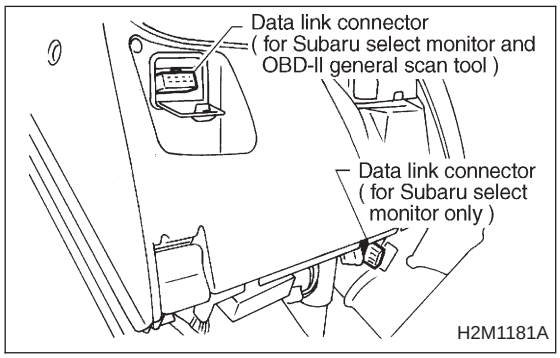


5. CHECK OUTPUT SIGNAL EMITTED FROM TCM.

1) Connect connectors to TCM, transmission and resistor.
2) Start and warm-up the engine and transmission.
3) Ignition switch ON (Engine OFF).
4) Move selector lever to “N”.
5) Measure voltage between TCM connector and body while opening and closing throttle position sensor.

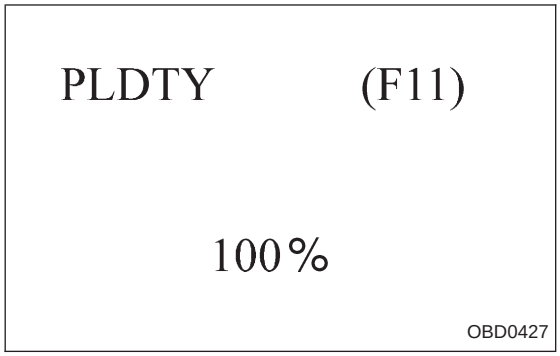
Connector & terminal / Specified resistance:

(B52) No. 8 — No. 10 / 1.5 — 4.0 V (Throttle is fully closed.)
(B52) No. 8 — No. 10 / 1 V, or less (Throttle is fully open.)
(B52) No. 7 — No. 10 / 5 — 14 V (Throttle is fully closed.)
(B52) No. 7 — No. 10 / 1 V, or less (Throttle is fully open.)



- Using Subaru select monitor:

  (1) Connect connectors to TCM, transmission and resistor.
  (2) Turn ignition switch to OFF.
  (3) Connect the Subaru select monitor to data link connector.
  (4) Turn ignition switch to ON and Subaru select monitor switch to ON.



(5) Start and warm-up the engine and transmission.
(6) Stop the engine and turn ignition switch to ON (Engine OFF).
(7) Move selector lever to “N”.
(8) Read data on Subaru select monitor.
(9) Designate mode using function key.

Function mode: F11

SPECIFIED DATA:

- ***100% (Throttle is fully closed.)***
- ***15% (Throttle is fully open.)***

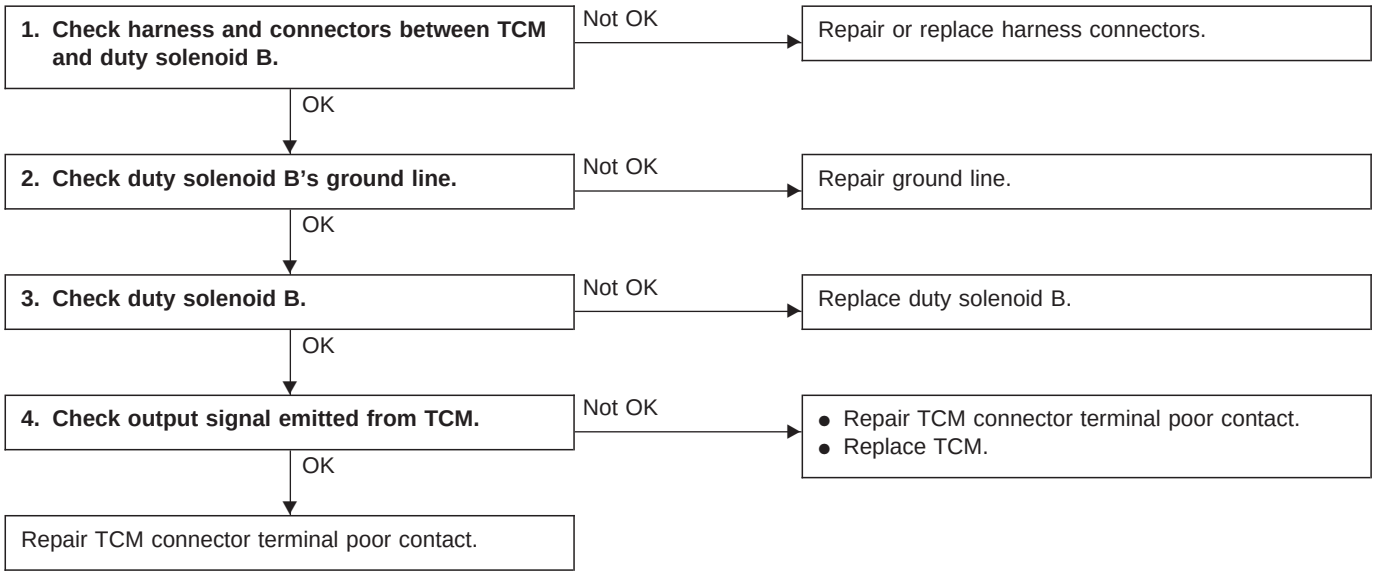
B: TROUBLE CODE 12 — DUTY SOLENOID B —

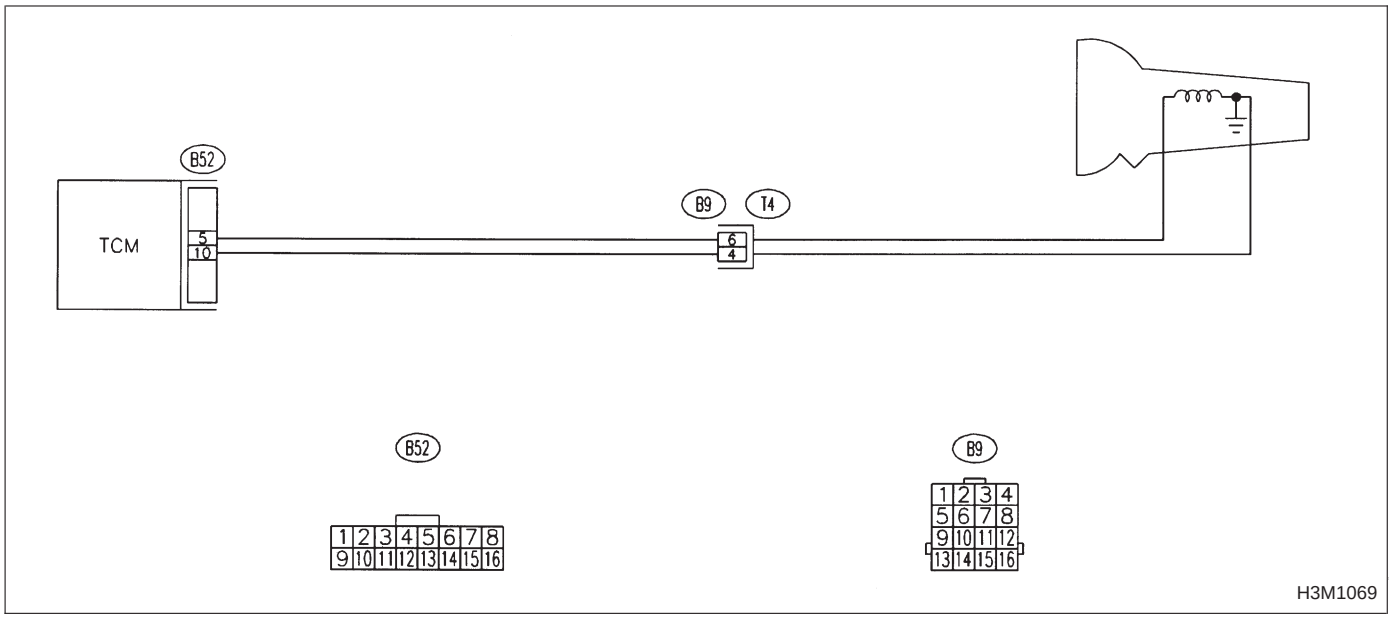
DIAGNOSIS:

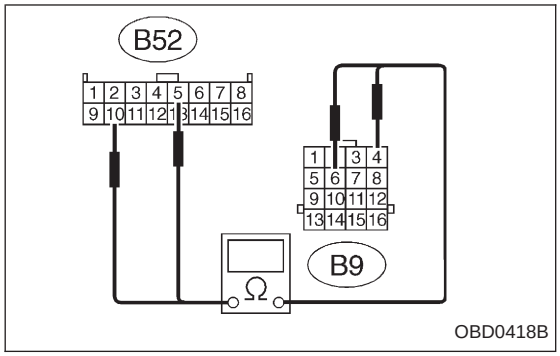
Output signal circuit of duty solenoid B is open or shorted.

TROUBLE SYMPTOM:

No lock-up (after engine warm-up)



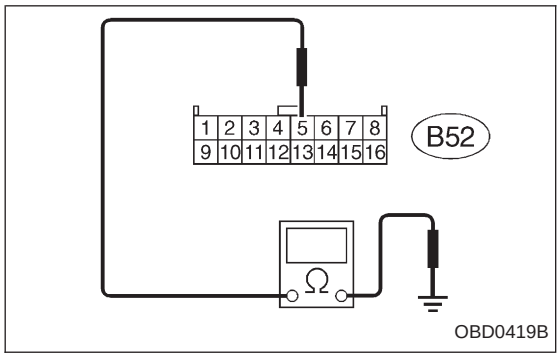




1. CHECK HARNESS AND CONNECTORS BETWEEN TCM AND DUTY SOLENOID B.

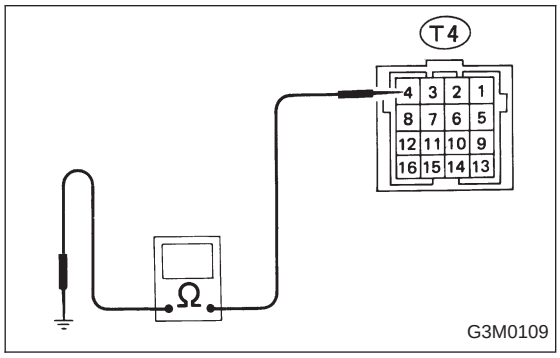
1) Turn ignition switch to OFF.
2) Disconnect connectors from TCM and transmission.
3) Measure resistance of harness connector between TCM and transmission connector.

Connector & terminal / Specified resistance:
(B52) No. 5 — (B9) No. 6 / 1 Ω, or less
(B52) No. 10 — (B9) No. 4 / 1 Ω, or less



4) Measure resistance of harness connector between TCM and body to make sure that circuit does not short.

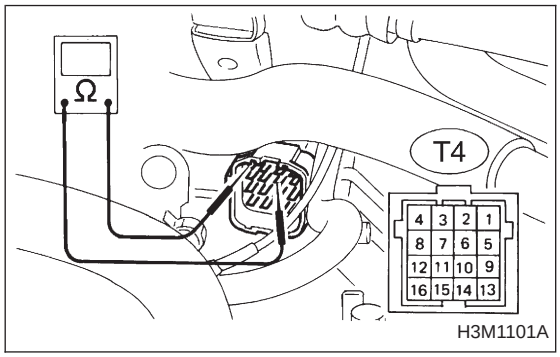
Connector & terminal / Specified resistance:
(B52) No. 5 — Body / 1 MΩ, or more



2. CHECK DUTY SOLENOID B's GROUND LINE.

Measure resistance between transmission connector receptacle and transmission case.

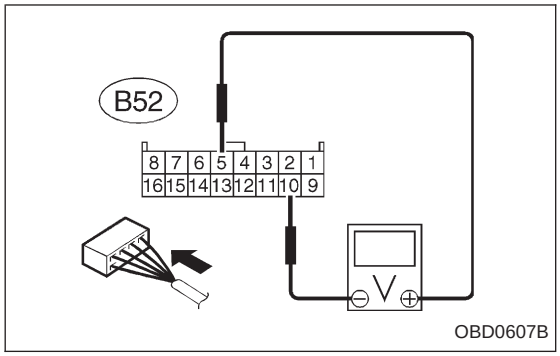
Connector & terminal / Specified resistance:
(T4) No. 4 — Transmission / 1 Ω, or less



3. CHECK DUTY SOLENOID B.

Measure resistance between transmission connector receptacle's terminals.

Connector & terminal / Specified resistance:
(T4) No. 6 — No. 4 / 9 — 17 Ω



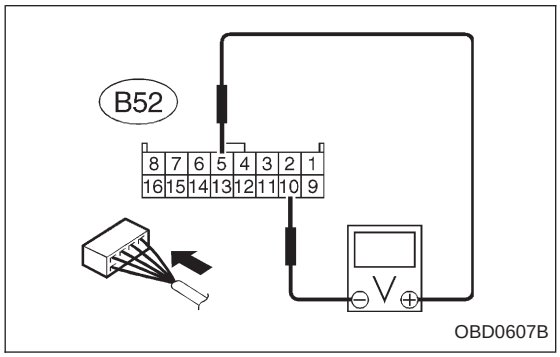
4. CHECK OUTPUT SIGNAL EMITTED FROM TCM.

1) Connect connectors to TCM and transmission.
2) Lift-up the vehicle or set the vehicle on free roller.

CAUTION:
On AWD models, raise all wheels off floor.

3) Start and warm-up the engine and transmission.
4) Move selector lever to “D” and slowly increase vehicle speed to 70 km/h or 44 MPH.
5) Measure voltage between TCM connector terminals.

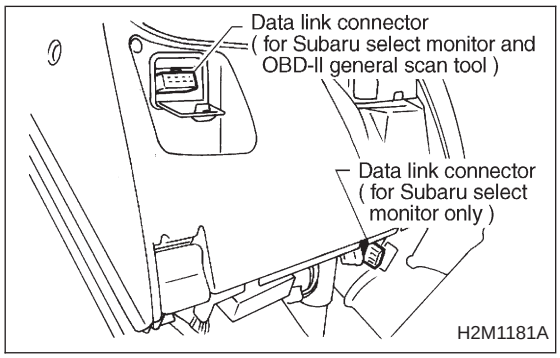
Connector & terminal / Specified voltage:
(B52) No. 5 — No. 10 / 8.5 V, or more (when wheels are locked-up.)



6) Return the engine to idling speed and move selector lever to “N”.
7) Measure voltage between TCM connector terminals.

Connector & terminal / Specified voltage:
(B52) No. 5 — No. 10 / 0.5 V, or less

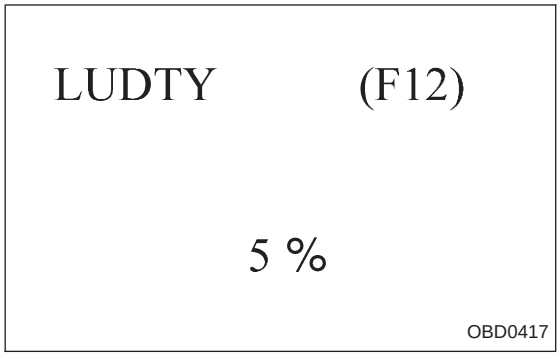
NOTE:
The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When AT control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.
<Ref. to 4-4 [T1C2].>



- Using Subaru select monitor:
  (1) Connect connectors to TCM and transmission.
  (2) Lift-up the vehicle or set the vehicle on free roller.

CAUTION:
On AWD models, raise all wheels off floor.

  (3) Turn ignition switch to OFF.
  (4) Connect the Subaru select monitor to data link connector.
  (5) Turn ignition switch to ON and Subaru select monitor switch to ON.



(6) Start and warm-up the engine and transmission.
(7) Designate mode using function key.

Function mode: F12

(8) Move selector lever to “D” and slowly increase vehicle speed to 70 km/h or 44 MPH.
(9) Read data on Subaru select monitor.

SPECIFIED DATA:

- ***95% (Wheel locked-up)***
- ***5% (Released)***

NOTE:
The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When AT control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.
<Ref. to 4-4 [T1C2].>

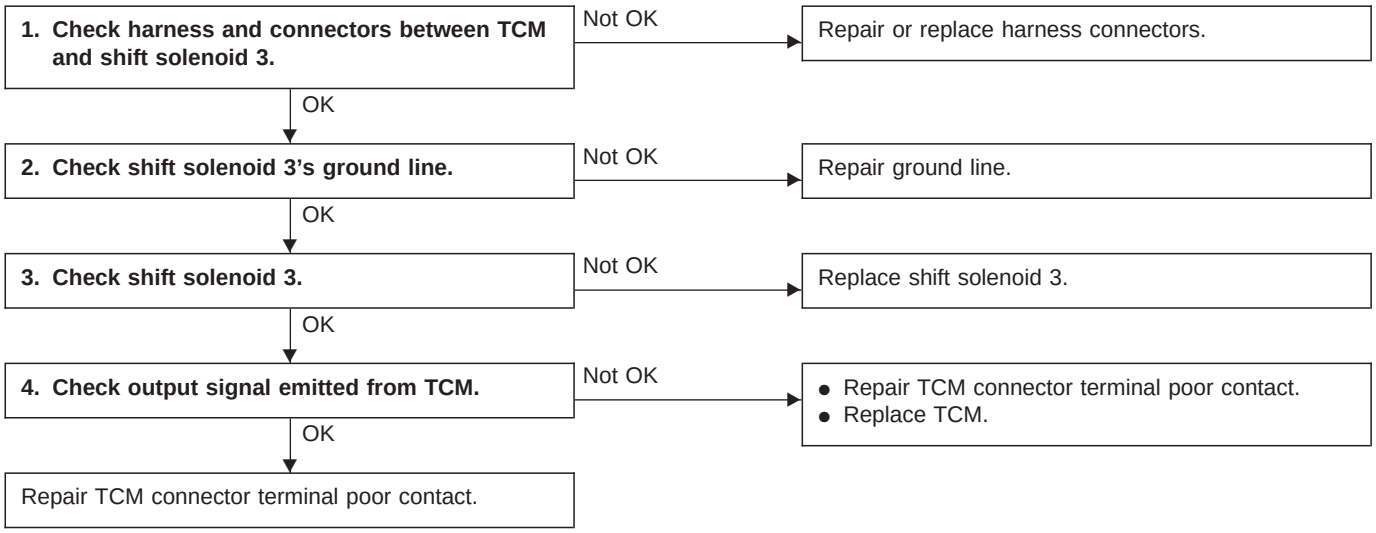
C: TROUBLE CODE 13 — SHIFT SOLENOID 3 —

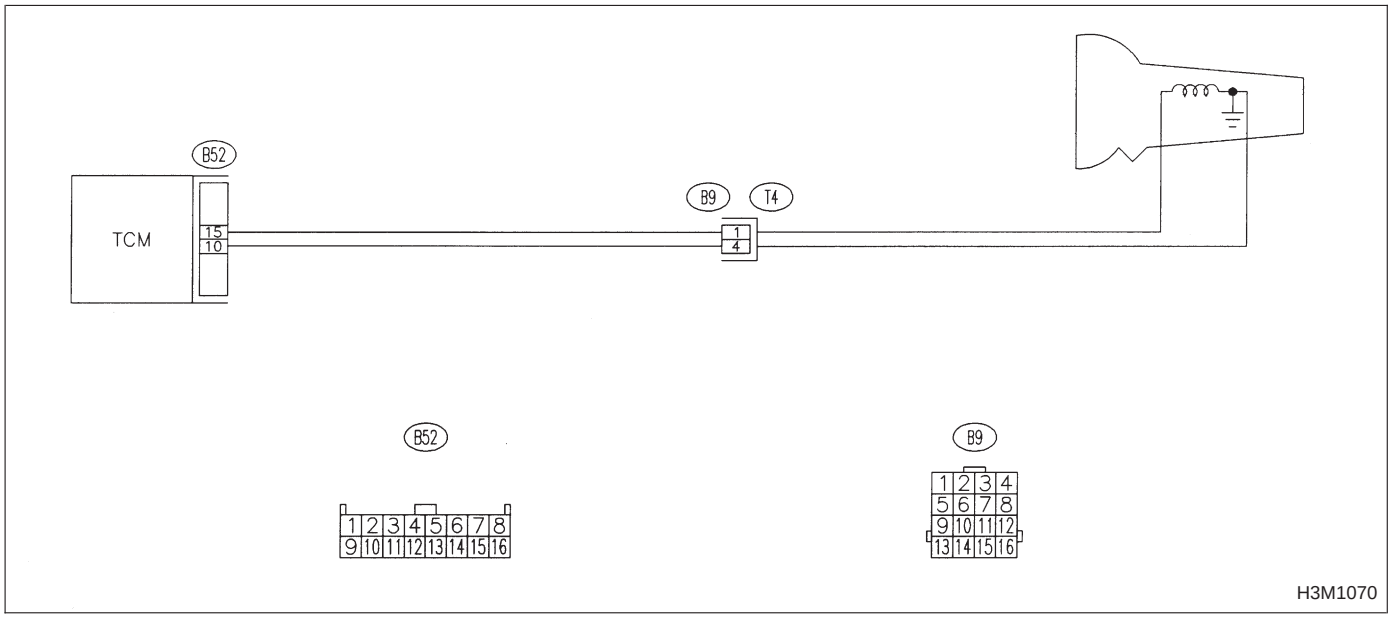
DIAGNOSIS:

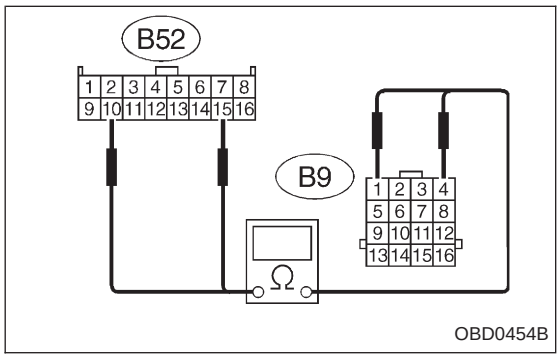
Output signal circuit of shift solenoid 3 is open or shorted.

TROUBLE SYMPTOM:

Ineffective engine brake with shift lever in “3”





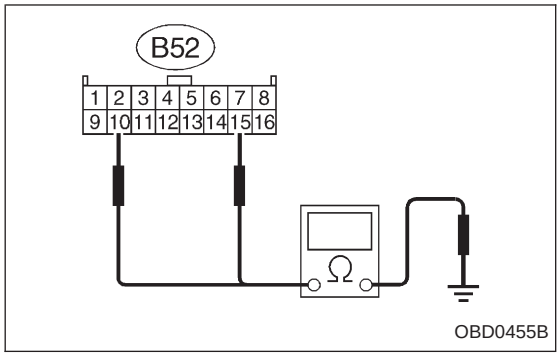


1. CHECK HARNESS AND CONNECTORS BETWEEN TCM AND SHIFT SOLENOID 3.

1) Turn ignition switch to OFF.
2) Disconnect connectors from TCM and transmission.
3) Measure resistance of harness connector between TCM and transmission connector.

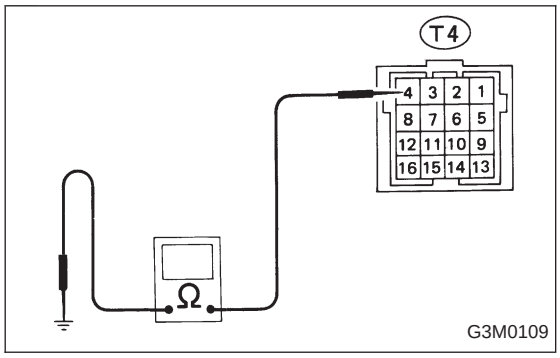
Connector & terminal / Specified resistance:

(B52) No. 15 — (B9) No. 1 / 1 Ω, or less
(B52) No. 10 — (B9) No. 4 / 1 Ω, or less



4) Measure resistance of harness connector between TCM and body to make sure that circuit does not short.

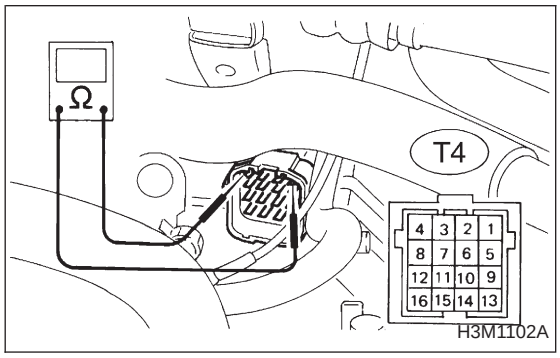
Connector & terminal / Specified resistance:
(B52) No. 15 — Body / 1 MΩ, or more
(B52) No. 10 — Body / 1 MΩ, or more



2. CHECK SHIFT SOLENOID 3's GROUND LINE.

Measure resistance between transmission connector receptacle and transmission case.

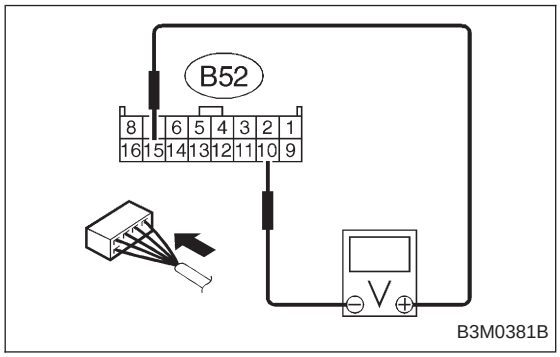
Connector & terminal / Specified resistance:
(T4) No. 4 — Transmission / 1 Ω, or less



3. CHECK SHIFT SOLENOID 3.

Measure resistance between transmission connector receptacle's terminals.

Connector & terminal / Specified resistance:
(T4) No. 1 — No. 4 / 20 — 32 Ω



4. CHECK OUTPUT SIGNAL EMITTED FROM TCM.

1) Connect 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 and warm-up the engine and transmission.
4) Idle the engine.
5) Move selector lever to "D".
6) Measure voltage between TCM connector terminals.

Connector & terminal / Specified voltage:
(B52) No. 15 — No. 10 / 9 V, or more

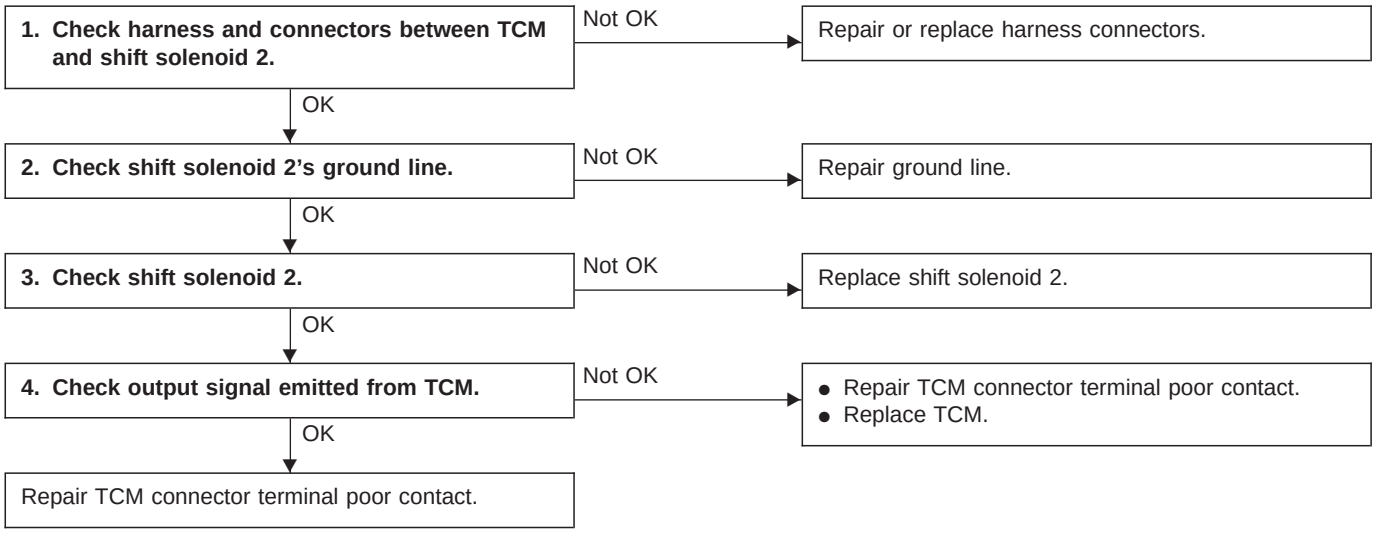
D: TROUBLE CODE 14 — SHIFT SOLENOID 2 —

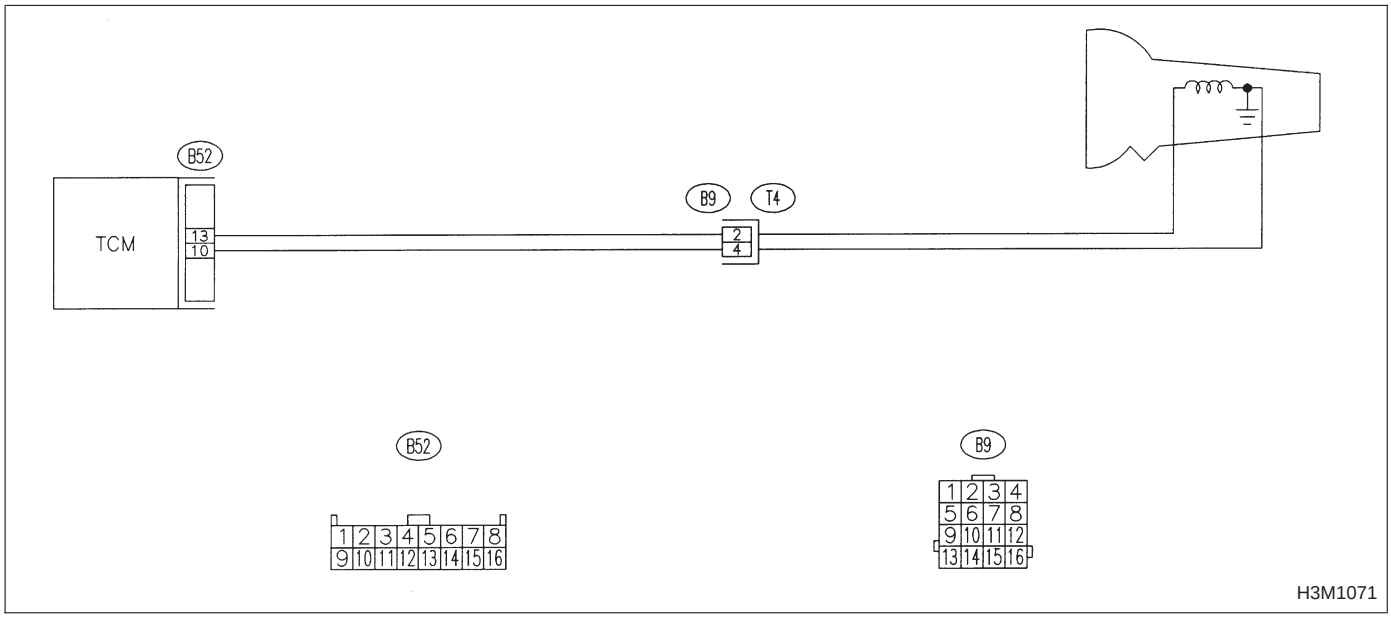
DIAGNOSIS:

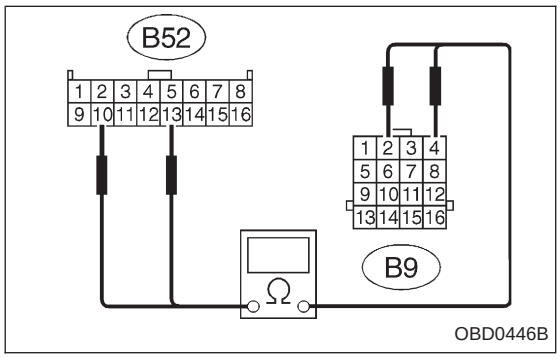
Output signal circuit of shift solenoid 2 is open or shorted.

TROUBLE SYMPTOM:

No shift





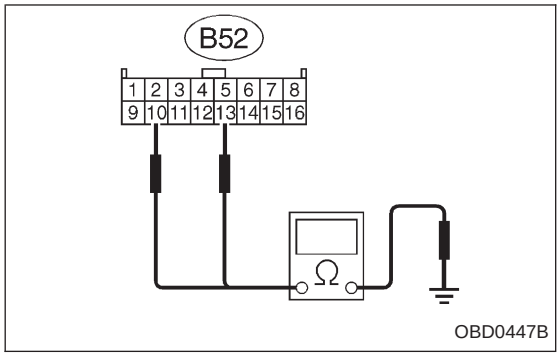


1. CHECK HARNESS AND CONNECTORS BETWEEN TCM AND SHIFT SOLENOID 2.

1) Turn ignition switch to OFF.
2) Disconnect connectors from TCM and transmission.
3) Measure resistance of harness connector between TCM and transmission connector.

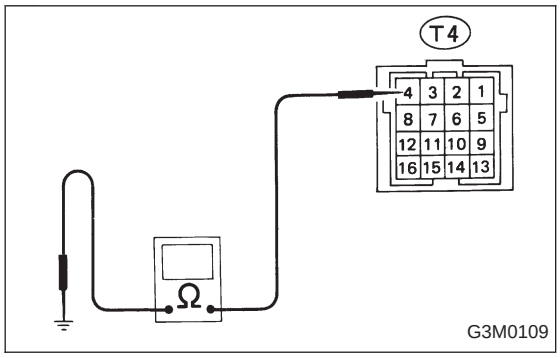
Connector & terminal / Specified resistance:

(B52) No. 13 — (B9) No. 2 / 1 Ω, or less
(B52) No. 10 — (B9) No. 4 / 1 Ω, or less



4) Measure resistance of harness connector between TCM and body to make sure that circuit does not short.

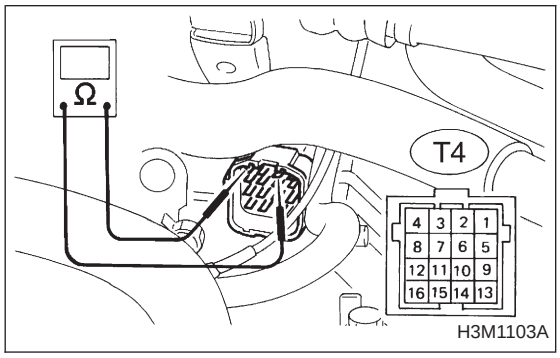
Connector & terminal / Specified resistance:
(B52) No. 13 — Body / 1 MΩ, or more
(B52) No. 10 — Body / 1 MΩ, or more



2. CHECK SHIFT SOLENOID 2's GROUND LINE.

Measure resistance between transmission connector receptacle and transmission case.

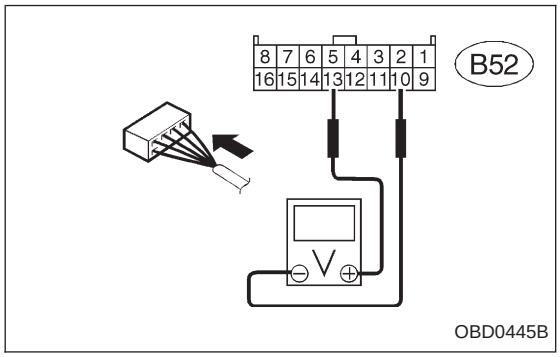
Connector & terminal / Specified resistance:
(T4) No. 4 — Transmission / 1 Ω, or less



3. CHECK SHIFT SOLENOID 2.

Measure resistance between transmission connector receptacle's terminals.

Connector & terminal / Specified resistance:
(T4) No. 2 — No. 4 / 20 — 32 Ω



4. CHECK OUTPUT SIGNAL EMITTED FROM TCM.

1) Connect 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 and warm-up the engine and transmission.
4) Idle the engine.
5) Move selector lever to "D".
6) Measure voltage between TCM connector terminals.

Connector & terminal / Specified voltage:
(B52) No. 13 — No. 10 / 9 V, or more

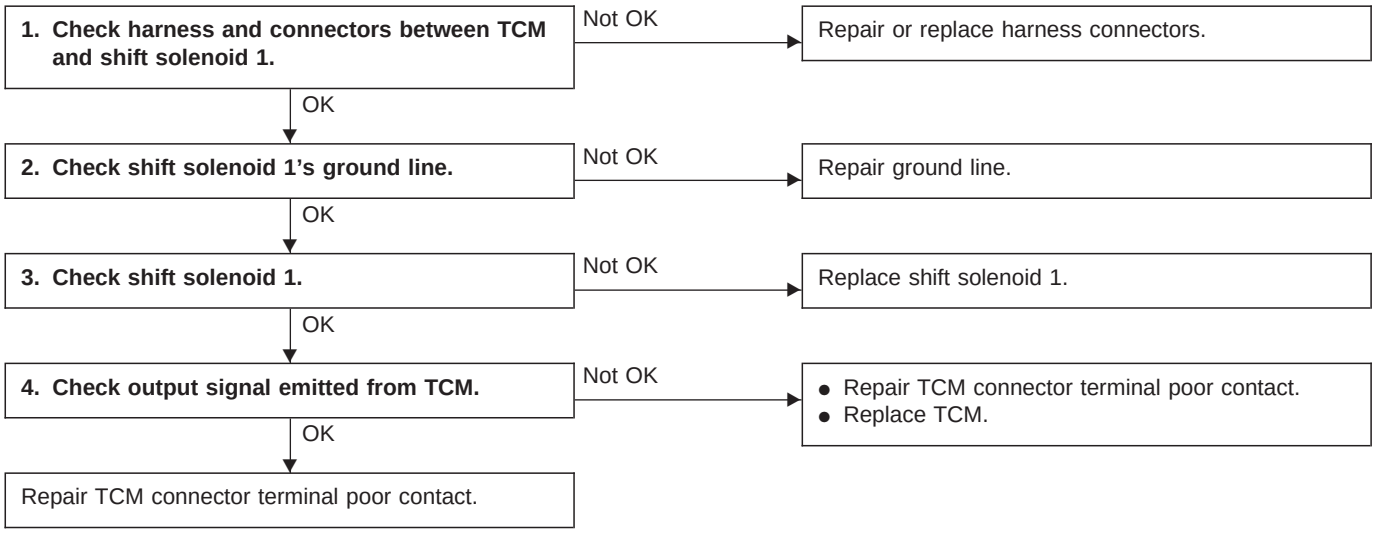
E: TROUBLE CODE 15 — SHIFT SOLENOID 1 —

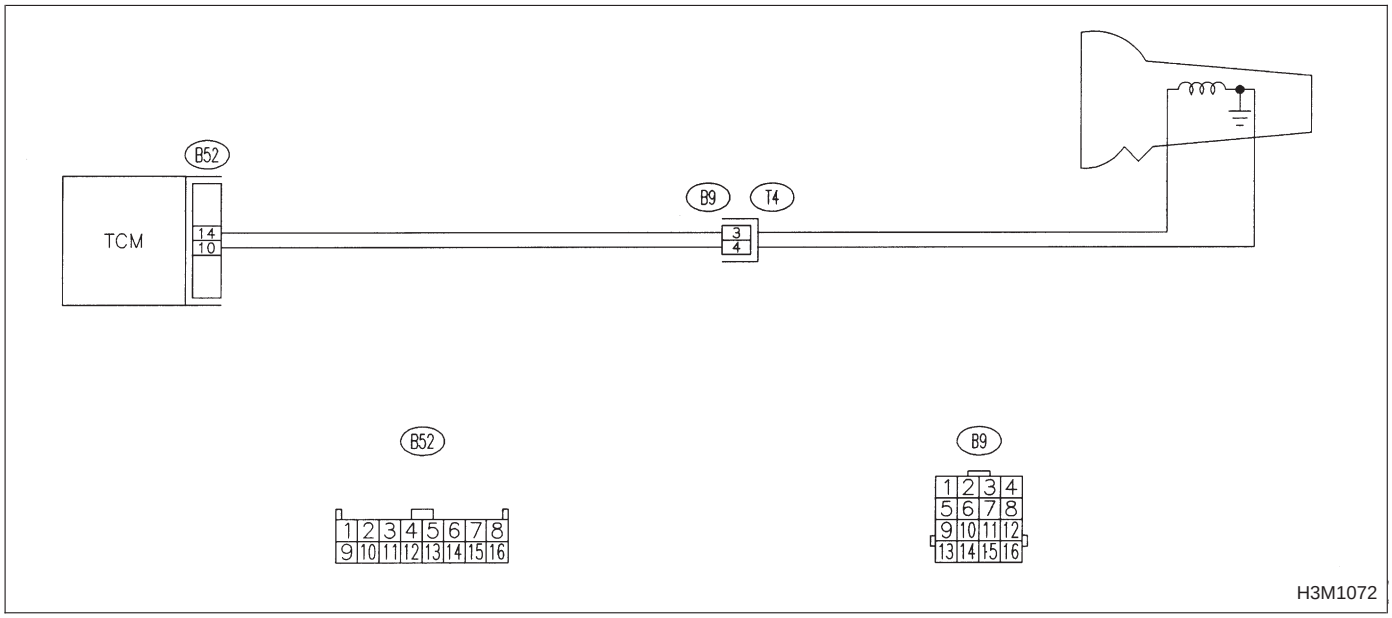
DIAGNOSIS:

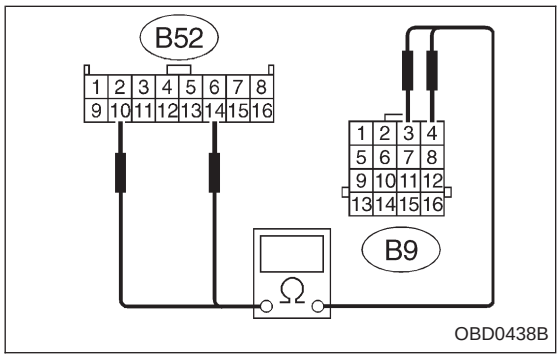
Output signal circuit of shift solenoid 1 is open or shorted.

TROUBLE SYMPTOM:

No shift





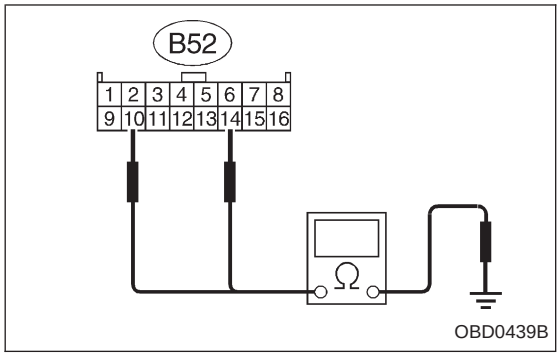


1. CHECK HARNESS AND CONNECTORS BETWEEN TCM AND SHIFT SOLENOID 1.

1) Turn ignition switch to OFF.
2) Disconnect connectors from TCM and transmission.
3) Measure resistance of harness connector between TCM and transmission connector.

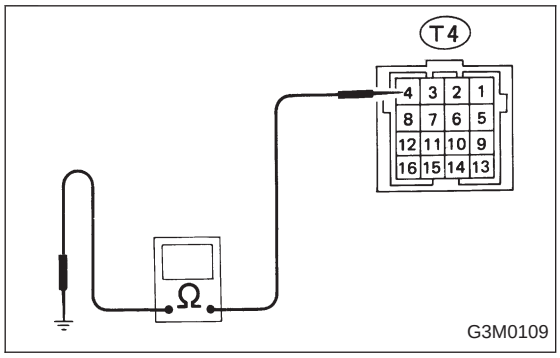
Connector & terminal / Specified resistance:

(B52) No. 14 — (B9) No. 3 / 1 Ω, or less
(B52) No. 10 — (B9) No. 4 / 1 Ω, or less



4) Measure resistance of harness connector between TCM and body to make sure that circuit does not short.

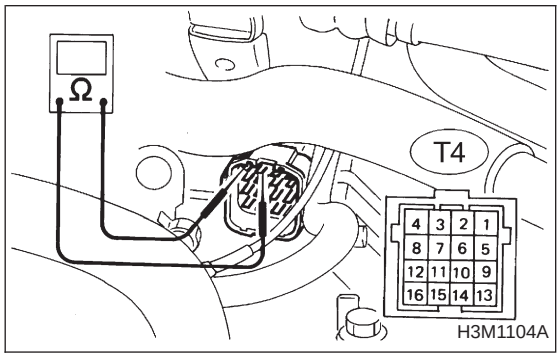
Connector & terminal / Specified resistance:
(B52) No. 14 — Body / 1 MΩ, or more
(B52) No. 10 — Body / 1 MΩ, or more



2. CHECK SHIFT SOLENOID 1's GROUND LINE.

Measure resistance between transmission connector receptacle and transmission case.

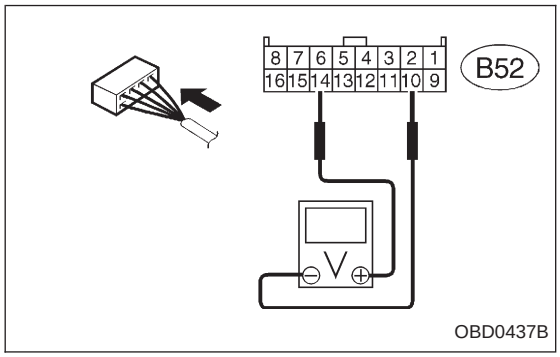
Connector & terminal / Specified resistance:
(T4) No. 4 — Transmission / 1 Ω, or less



3. CHECK SHIFT SOLENOID 1.

Measure resistance between transmission connector receptacle's terminals.

Connector & terminal / Specified resistance:
(T4) No. 3 — No. 4 / 20 — 32 Ω



4. CHECK OUTPUT SIGNAL EMITTED FROM TCM.

1) Connect 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.

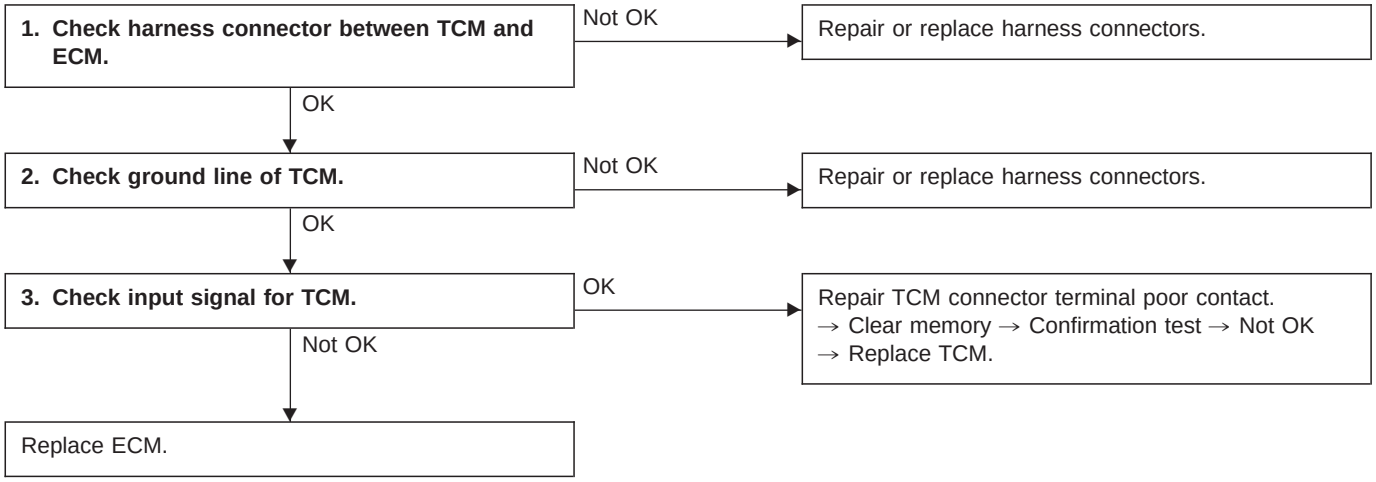
3) Start and warm-up the engine and transmission.
4) Idle the engine.
5) Move selector lever to "D".
6) Measure voltage between TCM connector terminals.

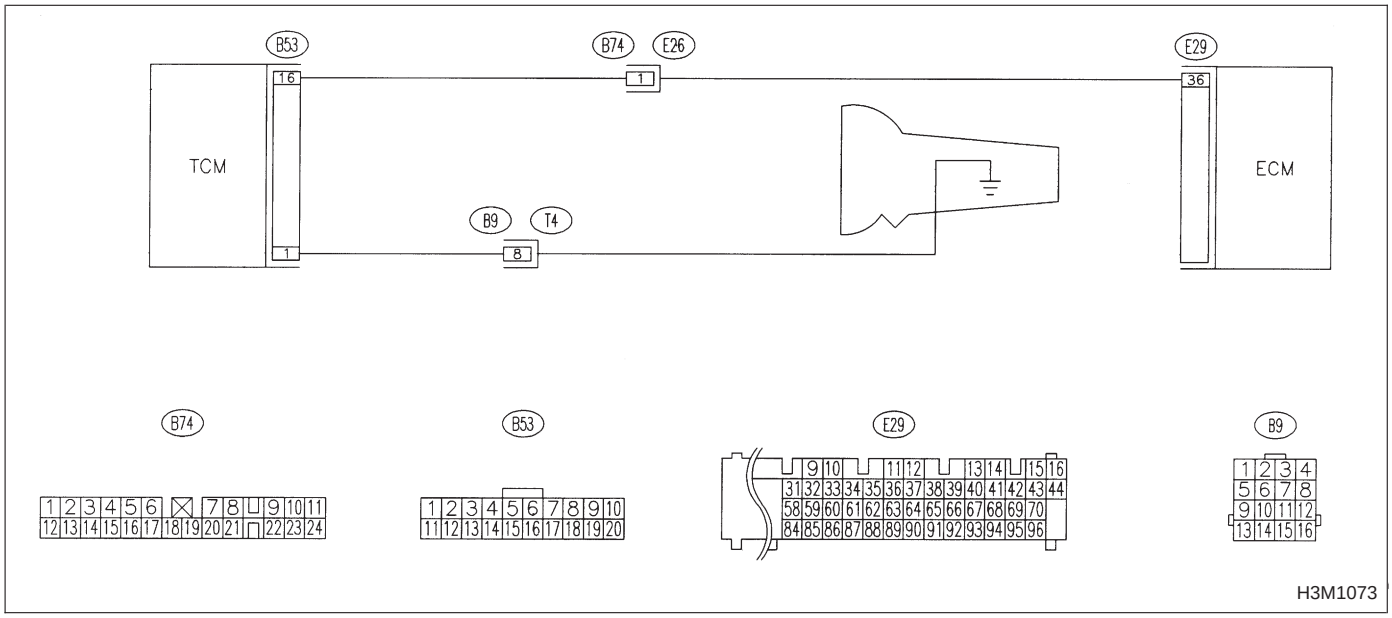
Connector & terminal / Specified voltage:
(B52) No. 14 — No. 10 / 9 V, or more

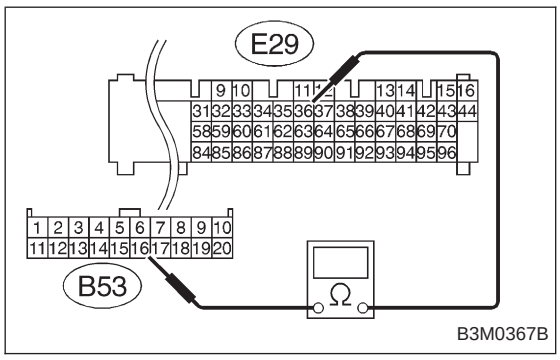
F: TROUBLE CODE 16
— TORQUE CONTROL CUT SIGNAL —

DIAGNOSIS:

- Torque control cut signal is not emitted from ECM.
- The signal circuit is open or shorted.



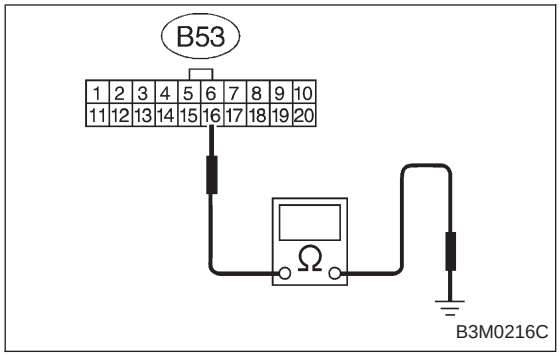




1. CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.

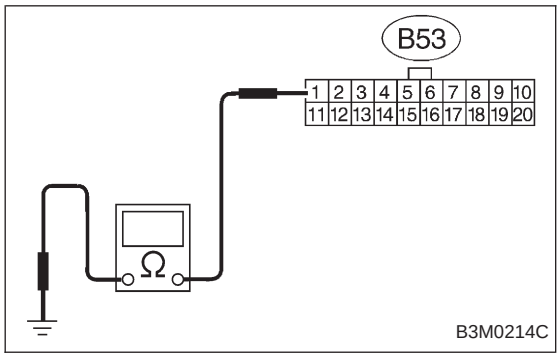
1) Turn ignition switch to OFF.
2) Disconnect connectors from ECM and TCM.
3) Measure resistance of harness connector between TCM and ECM.

Connector & terminal / Specified resistance:
(B53) No. 16 — (E29) No. 36/ 1 Ω, or less



4) Measure resistance of harness connector between TCM and body to make sure that circuit does not short.

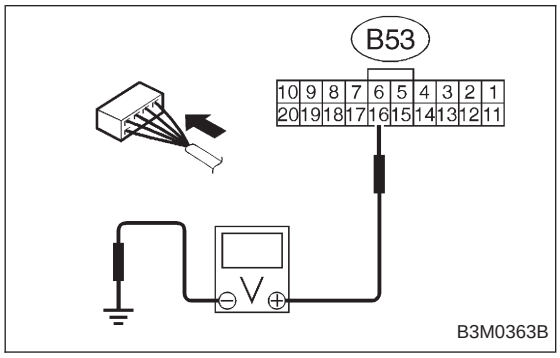
Connector & terminal / Specified resistance:
(B53) No. 16 — Body / 1 MΩ, or more



2. CHECK GROUND LINE OF TCM.

Measure resistance of harness connector between TCM and body.

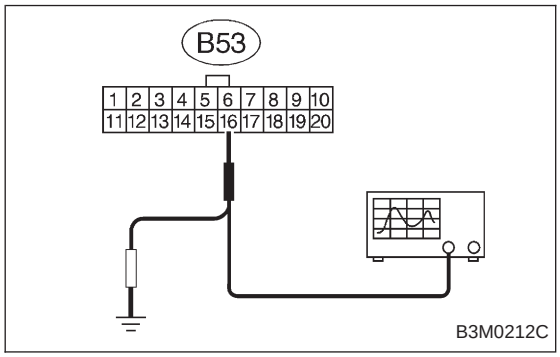
Connector & terminal / Specified resistance:
(B53) No. 1 — Body / 1 Ω, or less



3. CHECK INPUT SIGNAL FOR TCM.

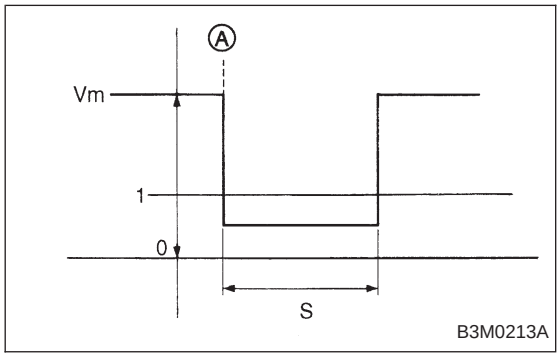
1) Connect connectors to ECM and TCM.
2) Turn ignition switch to ON.
3) Measure voltage between TCM and body.

Connector & terminal / Specified voltage:
(B53) No. 16 — Body / 6 — 9 V



- Using oscilloscope:
  (1) Connect connectors to ECM and TCM.
  (2) Set oscilloscope to TCM connector terminals.

Connector & terminals:
Positive probe; (B53) No. 16
Earth lead; Body



(3) Measure voltage while starting the engine.

CAUTION:
Make sure that signal voltage is below 1 V for one second after starting the engine (point Ⓐ).

Vm: 6 — 9 V
S: 1 second

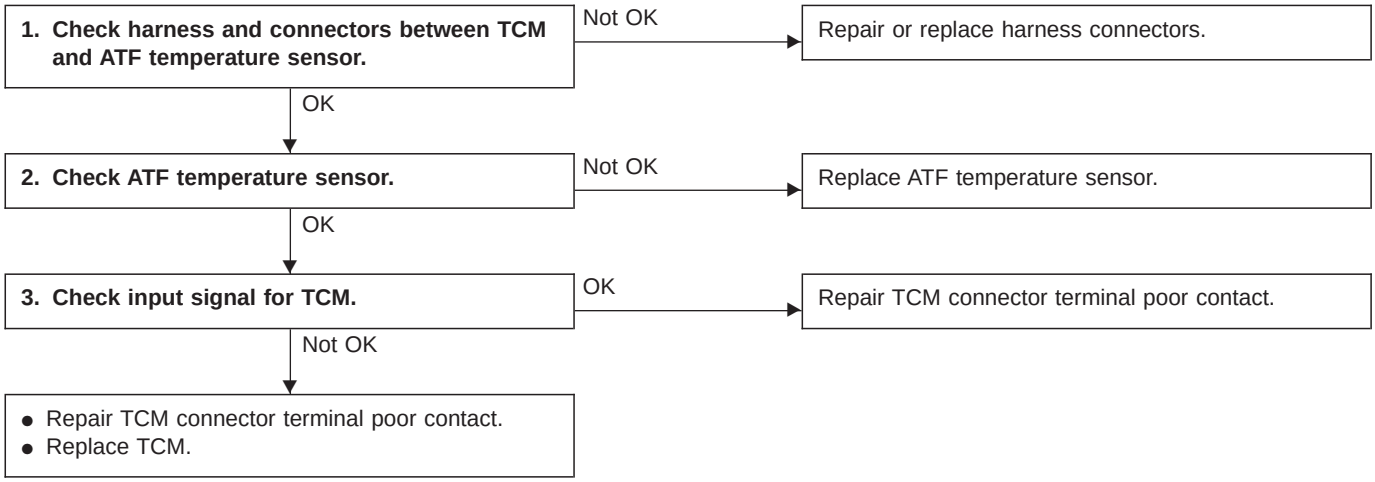
G: TROUBLE CODE 21
— ATF TEMPERATURE SENSOR —

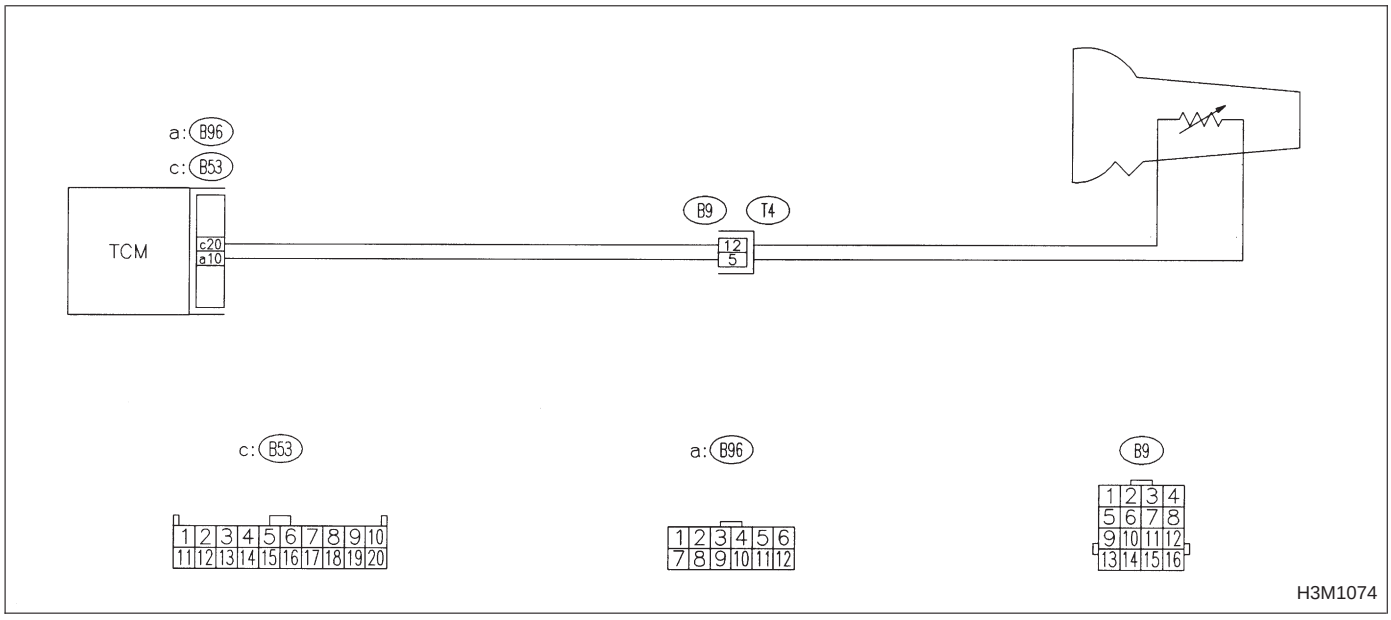
DIAGNOSIS:

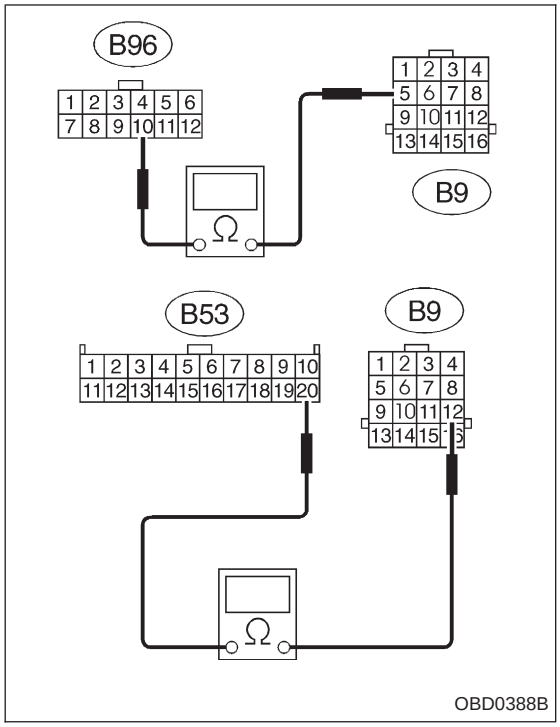
Input signal circuit of TCM to ATF temperature sensor is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock



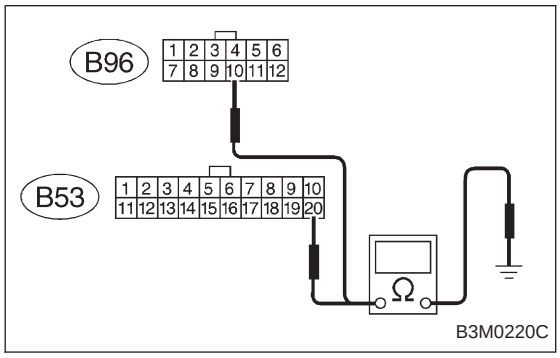




1. CHECK HARNESS AND CONNECTORS BETWEEN TCM AND ATF TEMPERATURE SENSOR.

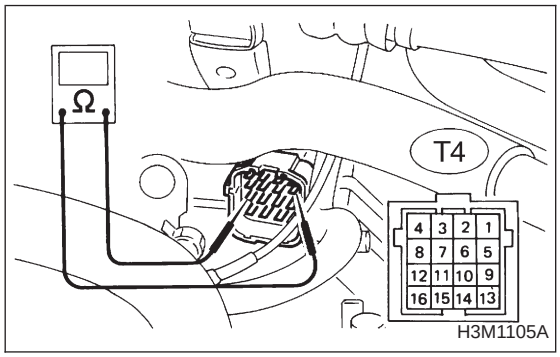
1) Turn ignition switch to OFF.
2) Disconnect connectors from TCM and transmission.
3) Measure resistance of harness connector between TCM and transmission connector.

Connector & terminal / Specified voltage:
(B96) No. 10 — (B9) No. 5 / 1 Ω, or less
(B53) No. 20 — (B9) No. 12 / 1 Ω, or less



4) Measure resistance of harness connector between TCM and body to make sure that circuit does not short.

Connector & terminal / Specified resistance:
(B96) No. 10 — Body / 1 MΩ, or more
(B53) No. 20 — Body / 1 MΩ, or more



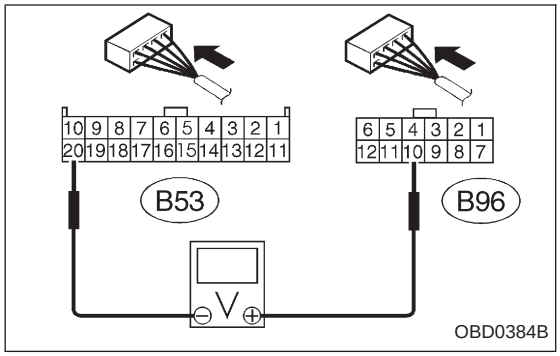
2. CHECK ATF TEMPERATURE SENSOR.

1) Measure resistance between transmission connector receptacle's terminals.

Connector & terminal / Specified resistance:
(T4) No. 5 — No. 12 /
2.1 — 2.9 kΩ [ATF temperature: 20 deg C (68 deg F)]

2) Connect connectors to transmission and TCM.
3) Start and warm-up the engine until ATF temperature has increased.
4) Stop the engine and disconnect connector from transmission.
5) Measure resistance between transmission connector receptacle's terminals.

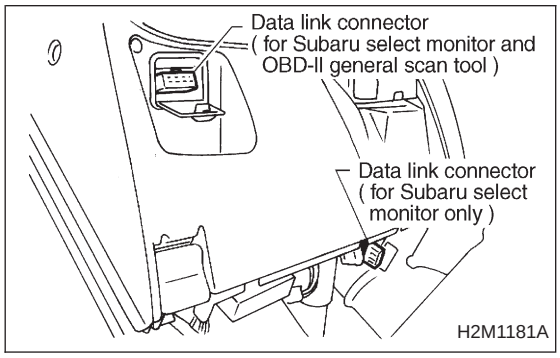
Connector & terminal / Specified resistance:
(T4) No. 5 — No. 12 /
275 — 375 Ω [ATF temperature: 80 deg C (176 deg F)]



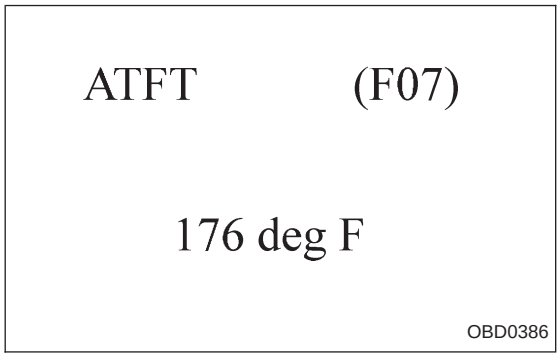
3. CHECK INPUT SIGNAL FOR TCM.

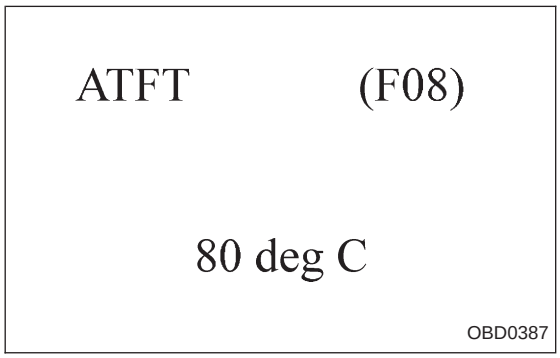
1) Turn ignition switch ON (with engine OFF) and measure signal voltage input of TCM.
2) Start and warm-up the engine. Measure signal voltage input of TCM.

Connector & terminal / Specified voltage:
(B96) No. 10 — (B53) No. 20 /
3.45±0.55 V [ATF temperature: 20 deg C (68 deg F)]
1.2±0.2 V [ATF temperature: 80 deg C (176 deg F)]



- Using Subaru select monitor:
  (1) Turn ignition switch to OFF.
  (2) Connect the Subaru select monitor to data link connector.
  (3) Turn ignition switch to ON and Subaru select monitor switch to ON.





  (4) Start and warm-up the engine.
  (5) Read data on Subaru select monitor.
  (6) Designate mode using function key.

Function mode: F07 or F08

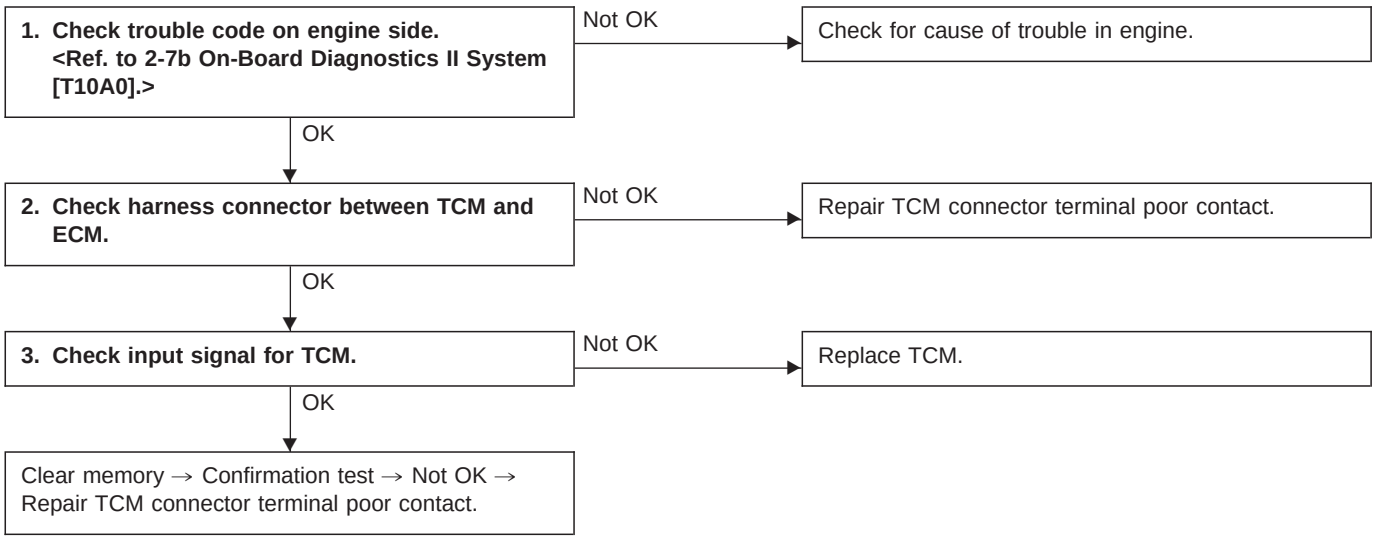
SPECIFIED DATA:
F07: ● ***Ambient temperature: ±50 deg F***
● ***ATF temperature: 158 — 230 deg F***
● ***Open harness: 176 deg F***
● ***Shorted harness: 320 deg F***
F08: ● ***Ambient temperature: ±10 deg C***
● ***ATF temperature: 70 — 110 deg C***
● ***Open harness: 80 deg C***
● ***Shorted harness: 160 deg C***

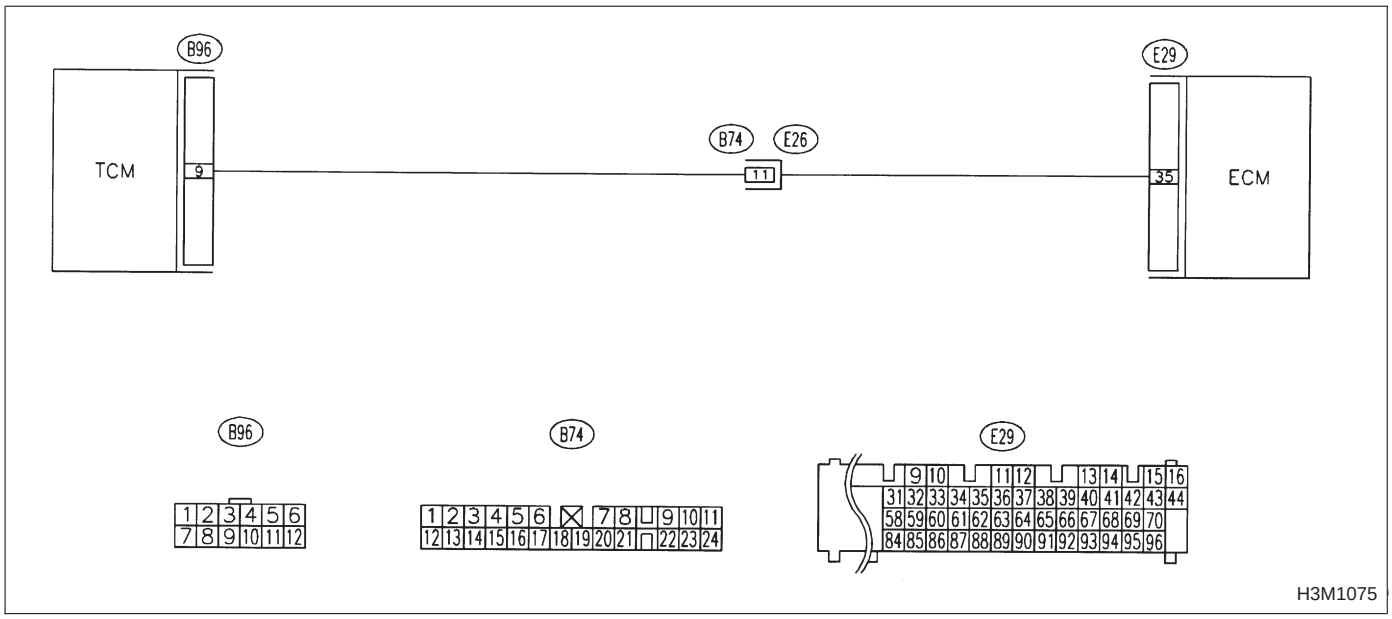
- F07: ATF temperature is indicated in “deg F”.
- F08: ATF temperature is indicated in “deg C”.

H: TROUBLE CODE 22
— MASS AIR FLOW SIGNAL —

DIAGNOSIS:

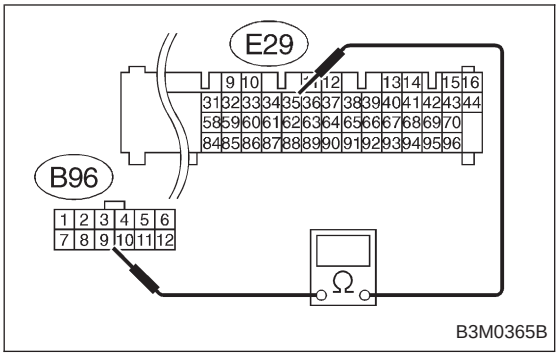
Input signal circuit of TCM from ECM is open or shorted.





1. CHECK TROUBLE CODE ON ENGINE SIDE.

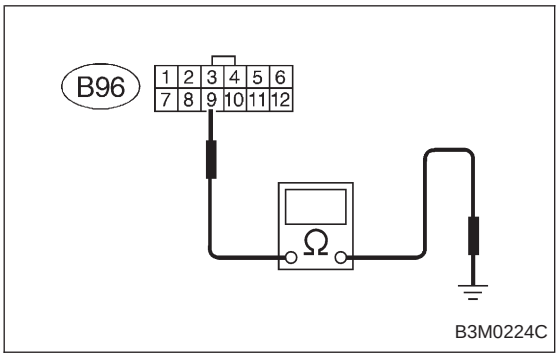
Using Subaru select monitor or OBD-II general scan tool, check trouble code of mass air flow sensor on engine side.



2. CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.

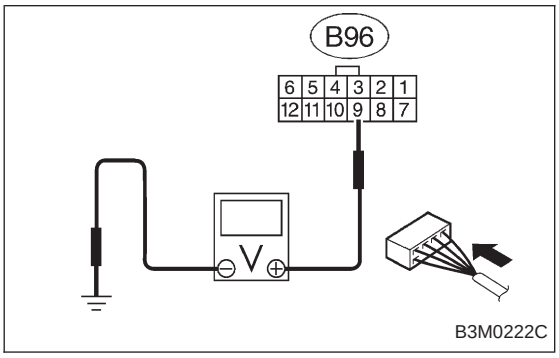
1) Turn ignition switch to OFF.
2) Disconnect connectors from TCM and ECM.
3) Measure resistance of harness connector between TCM and ECM.

Connector & terminal / Specified resistance:
(B96) No. 9 — (E29) No. 35 / 1 Ω, or less



4) Measure resistance of harness connector between TCM and body to make sure that circuit does not short.

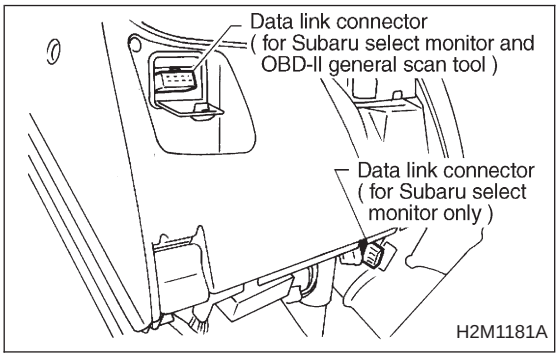
Connector & terminal / Specified resistance:
(B96) No. 9 — Body / 1 MΩ, or more



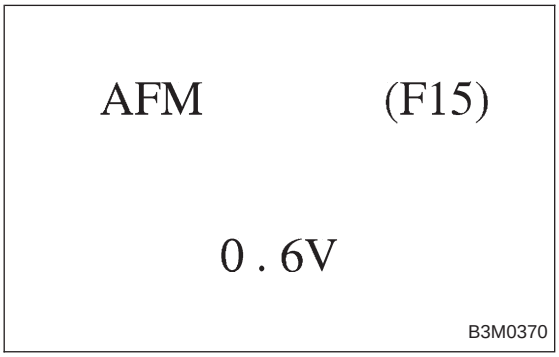
3. CHECK INPUT SIGNAL FOR TCM.

1) Connect connectors to TCM and ECM.
2) Start the engine. (engine idling after warm-up)
3) Measure signal voltage between TCM connector terminal and body.

Connector & terminal / Specified voltage:
Engine warm-up;
(B96) No. 9 — Body / 0.5 — 1.2 V



- Using Subaru select monitor:
  (1) Connect connectors to TCM and ECM.
  (2) Turn ignition switch to OFF.
  (3) Connect the Subaru select monitor to data link connector.
  (4) Turn ignition switch to ON and Subaru select monitor switch to ON.
  (5) Start and warm-up the engine.



(6) Read data on Subaru select monitor.
(7) Designate mode using function key.

Function mode: F15

SPECIFIED DATA:
0.5 — 1.2 V (Engine warm-up)

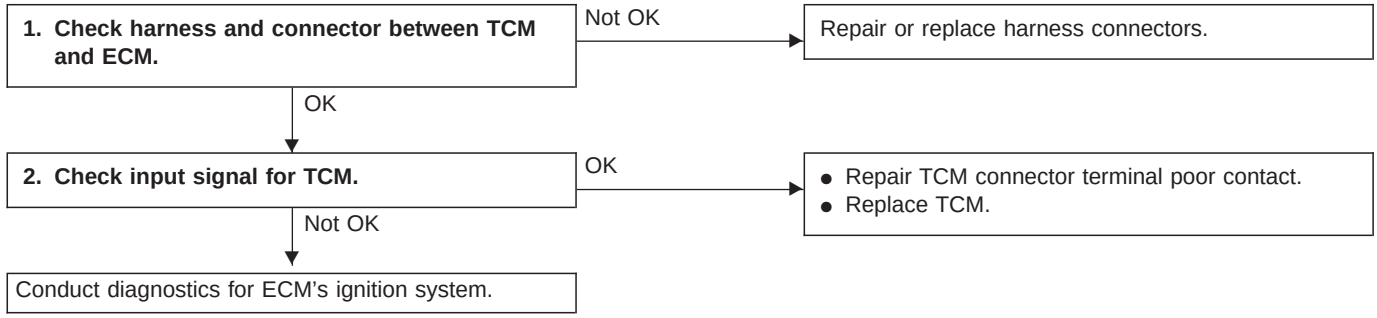
I: TROUBLE CODE 23 — ENGINE SPEED SIGNAL —

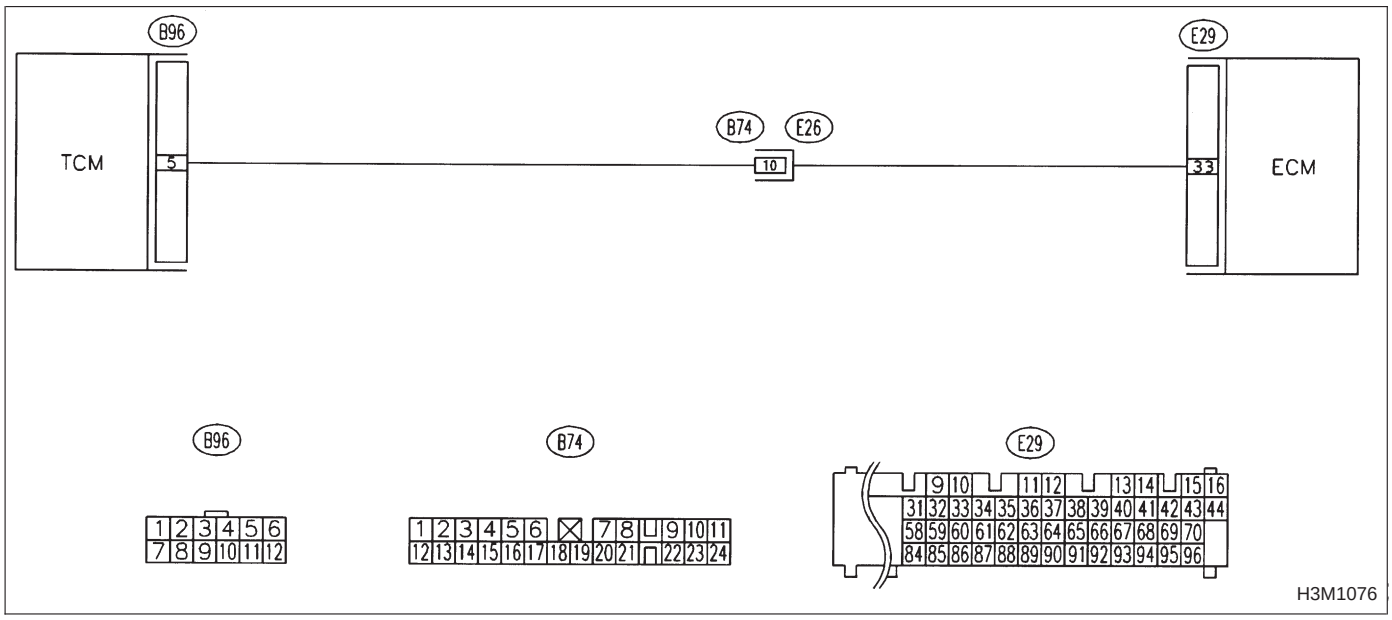
DIAGNOSIS:

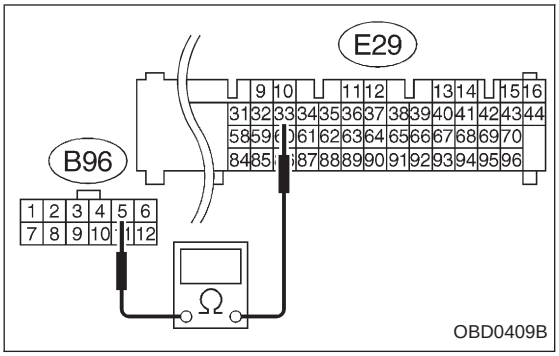
Engine speed input signal circuit is open or shorted.

TROUBLE SYMPTOM:

- No lock-up (after engine warm-up)
- AT OIL TEMP indicator remains on when vehicle speed is “0”.



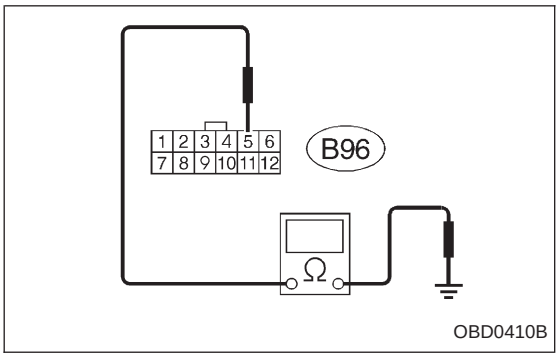




1. CHECK HARNESS AND CONNECTOR BETWEEN TCM AND ECM.

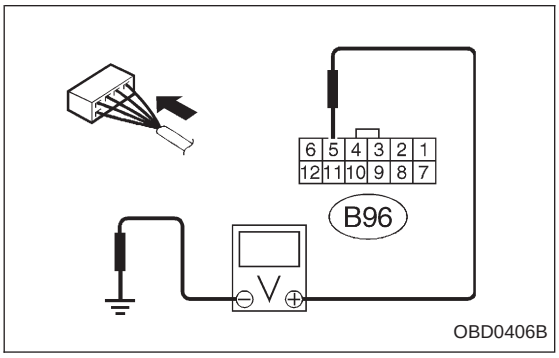
1) Turn ignition switch to OFF.
2) Disconnect connectors from TCM and ECM.
3) Measure resistance of harness connector between TCM and ECM.

Connector & terminal / Specified resistance:
(B96) No. 5 — (E29) No. 33 / 1 Ω, or less



4) Measure resistance of harness connector between TCM and body to make sure that circuit does not short.

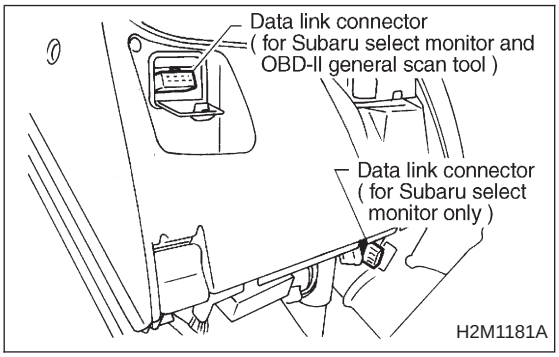
Connector & terminal / Specified resistance:
(B96) No. 5 — Body / 1 MΩ, or more



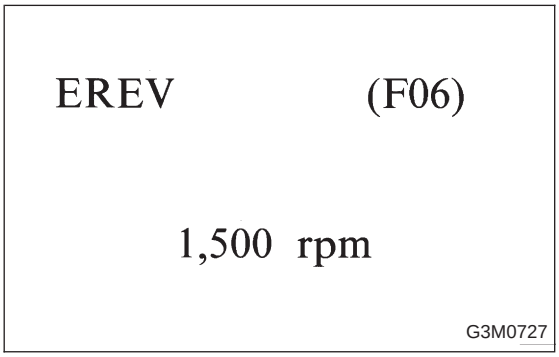
2. CHECK INPUT SIGNAL FOR TCM.

1) Connect connectors to ECM and TCM.
2) Turn ignition switch ON (with engine OFF).
3) Measure signal voltage for TCM.

Connector & terminal / Specified voltage:
(B96) No. 5 — Body / 10.5 V, or more



- Using Subaru select monitor:
  (1) Connect connectors to ECM and TCM.
  (2) Turn ignition switch to OFF.
  (3) Connect the Subaru select monitor to data link connector.
  (4) Turn ignition switch to ON and Subaru select monitor switch to ON.



(5) Start and warm-up the engine.
(6) Operate at constant engine speed.
(7) Read data on Subaru select monitor.
(8) Designate mode using function key.

Function mode: F06

SPECIFIED DATA:
Same as tachometer reading (in combination meter)

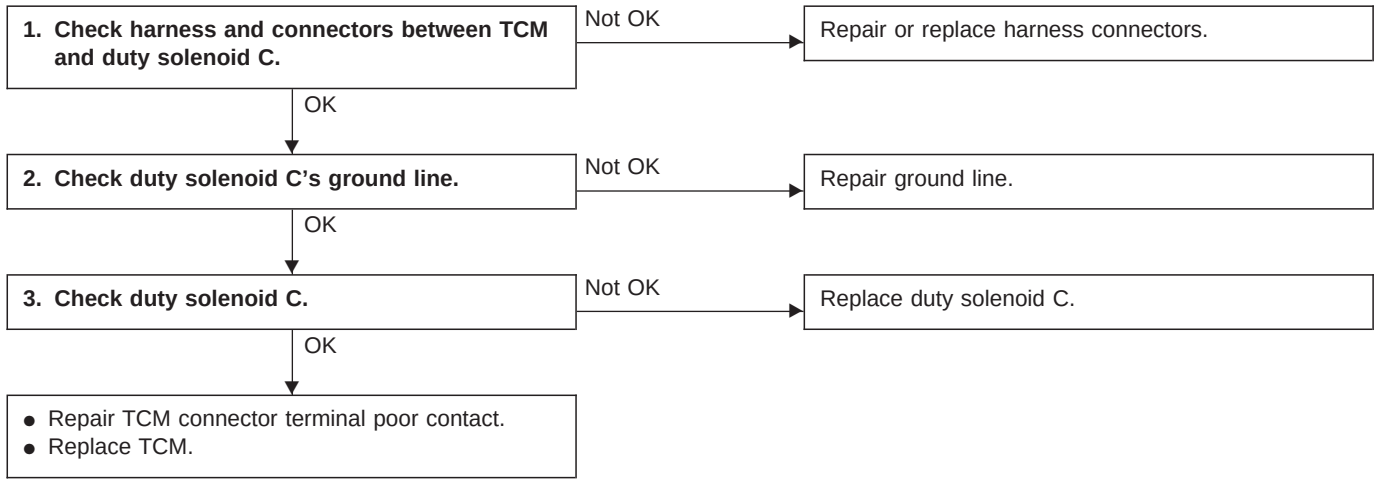
J: TROUBLE CODE 24 — DUTY SOLENOID C —

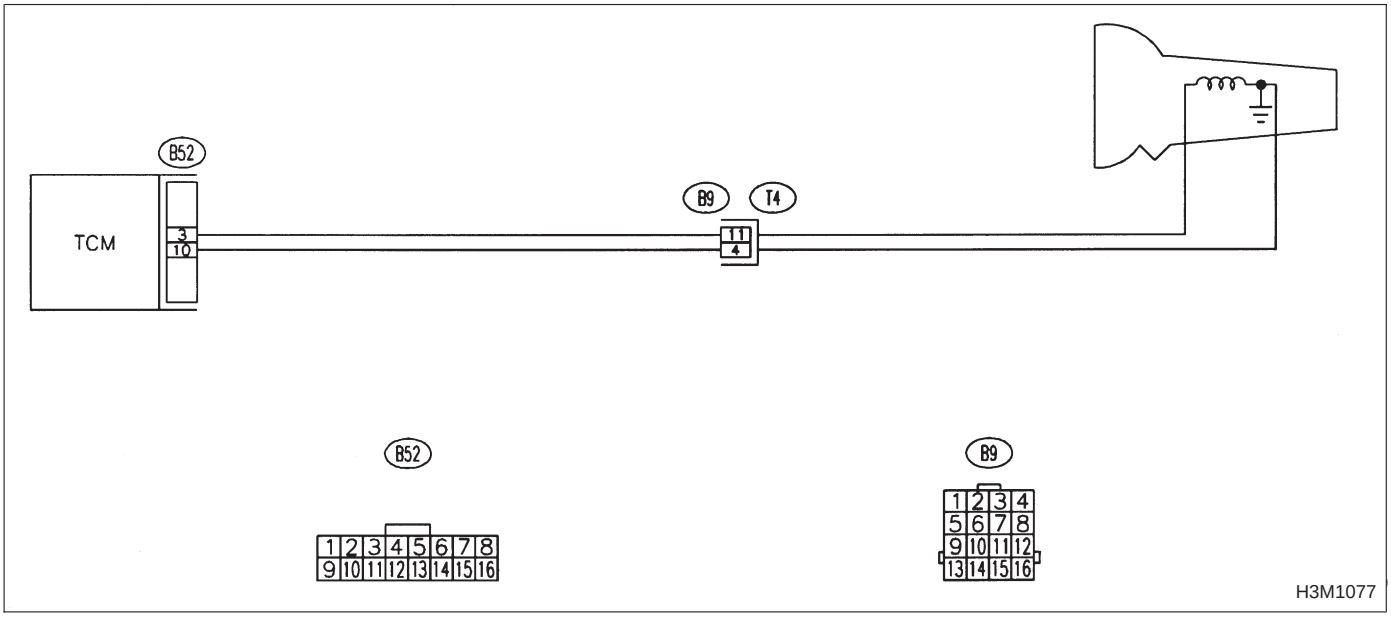
DIAGNOSIS:

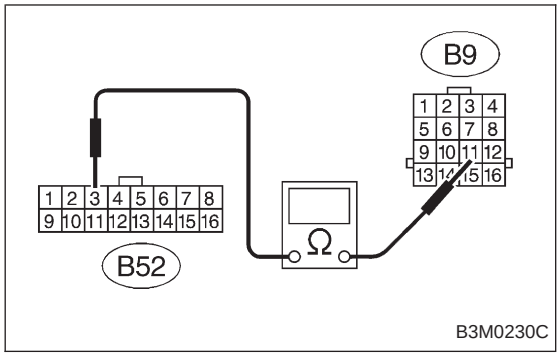
Output signal circuit of duty solenoid C is open or shorted.

TROUBLE SYMPTOM:

Excessive “braking” in tight corners



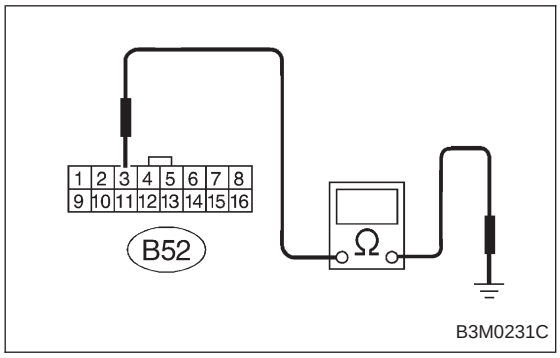




1. CHECK HARNESS AND CONNECTORS BETWEEN TCM AND DUTY SOLENOID C.

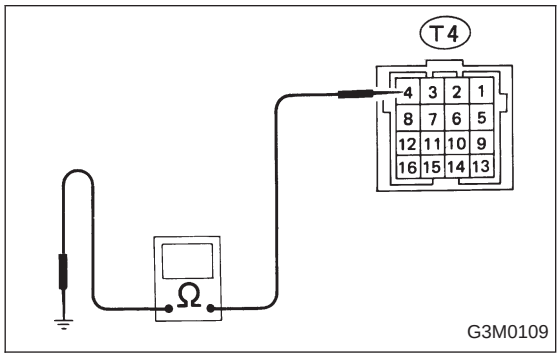
1) Turn ignition switch to OFF.
2) Disconnect connectors from TCM and transmission.
3) Measure resistance of harness connector between TCM and transmission.

Connector & terminal / Specified resistance:
(B52) No. 3 — (B9) No. 11 / 1 Ω, or less



4) Measure resistance of harness connector between TCM and body to make sure that circuit does not short.

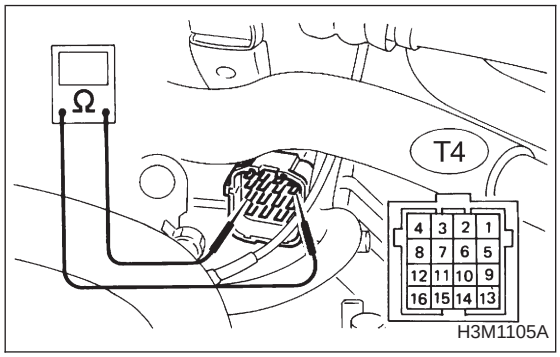
Connector & terminal / Specified resistance:
(B52) No. 3 — Body / 1 MΩ, or more



2. CHECK DUTY SOLENOID C's GROUND LINE.

Measure resistance between transmission connector receptacle and transmission case.

Connector & terminal / Specified resistance:
(T4) No. 4 — Transmission / 1 Ω, or less



3. CHECK DUTY SOLENOID C.

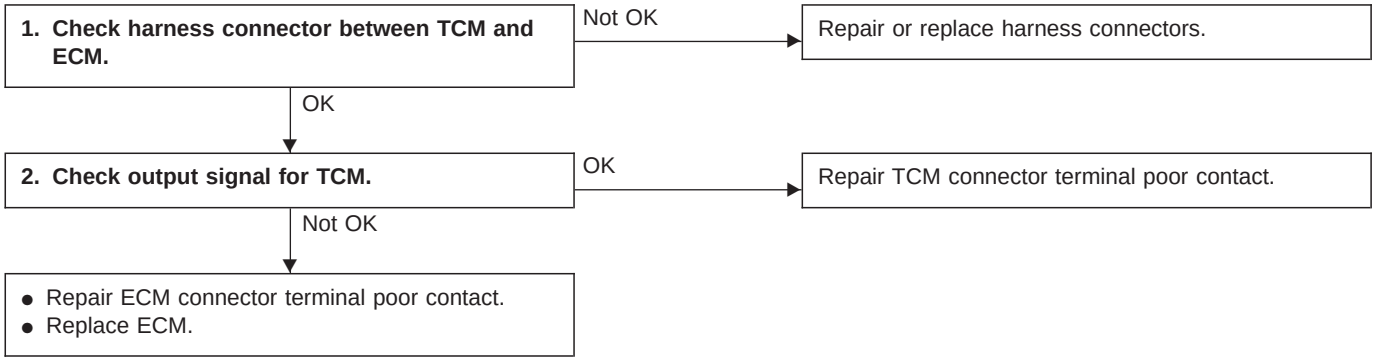
Measure resistance between transmission connector receptacle's terminals.

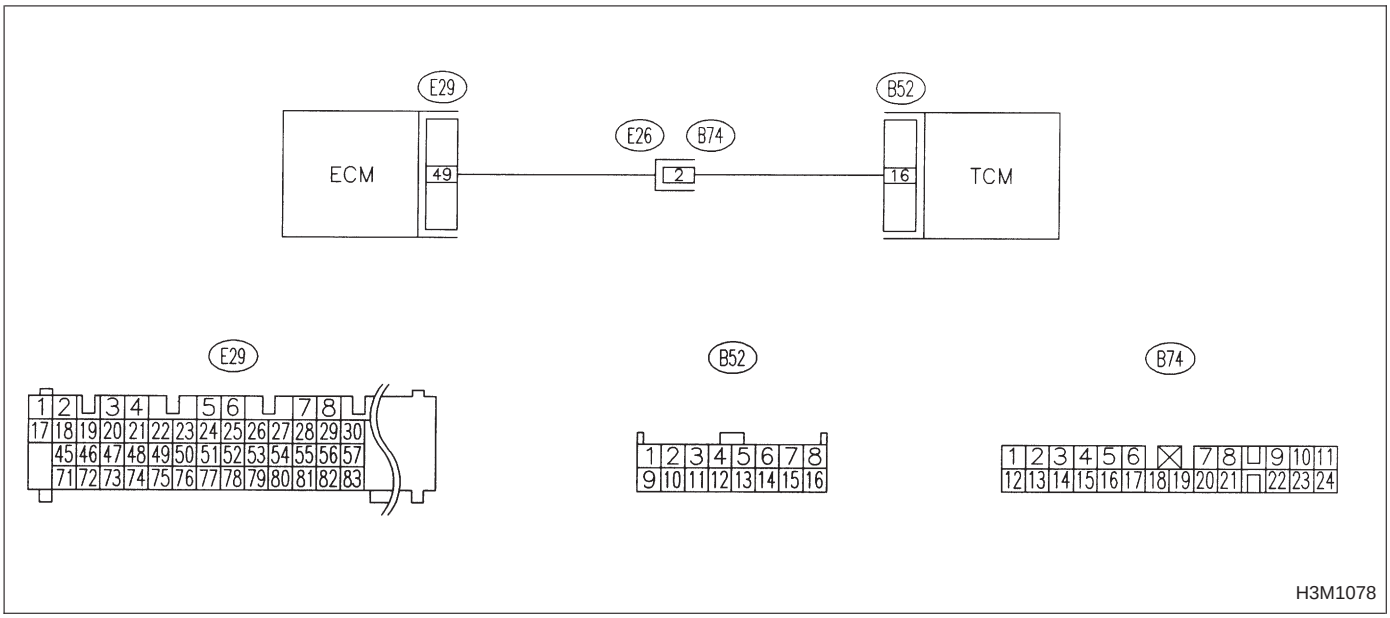
Connector & terminal / Specified resistance:
(T4) No. 11 — No. 4 / 9 — 17 Ω

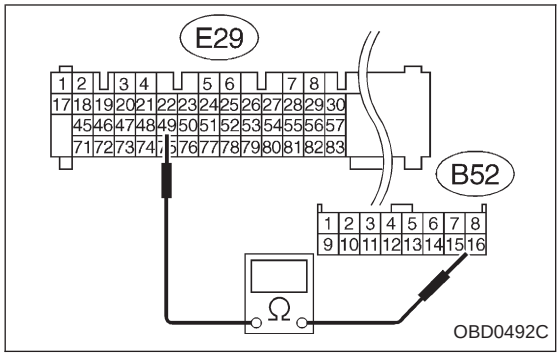
K: TROUBLE CODE 25
— TORQUE CONTROL SIGNAL —

DIAGNOSIS:

- Torque control signal is not emitted from TCM.
- The signal circuit is open or shorted.



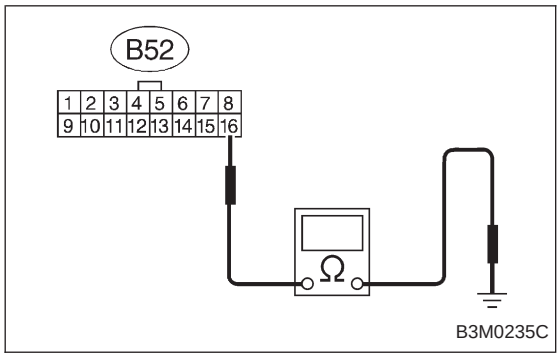




1. CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.

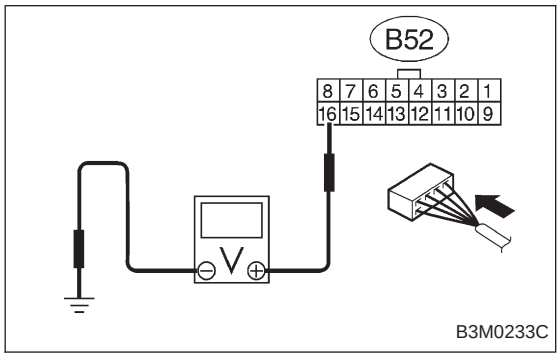
1) Turn ignition switch to OFF.
2) Disconnect connectors from TCM and ECM.
3) Measure resistance of harness connector between TCM and ECM.

Connector & terminal / Specified resistance:
(B52) No. 16 — (E29) No. 49 / 1 Ω, or less



4) Measure resistance of harness connector between TCM and body to make sure that circuit does not short.

Connector & terminal / Specified resistance:
(B52) No. 16 — Body / 1 MΩ, or more



2. CHECK INPUT SIGNAL FOR TCM.

1) Connect connectors to TCM and ECM.
2) Turn ignition switch to ON.
3) Measure signal voltage between TCM connector terminal and body.

Connector & terminal / Specified voltage:
(B52) No. 16 — Body / 5±1 V

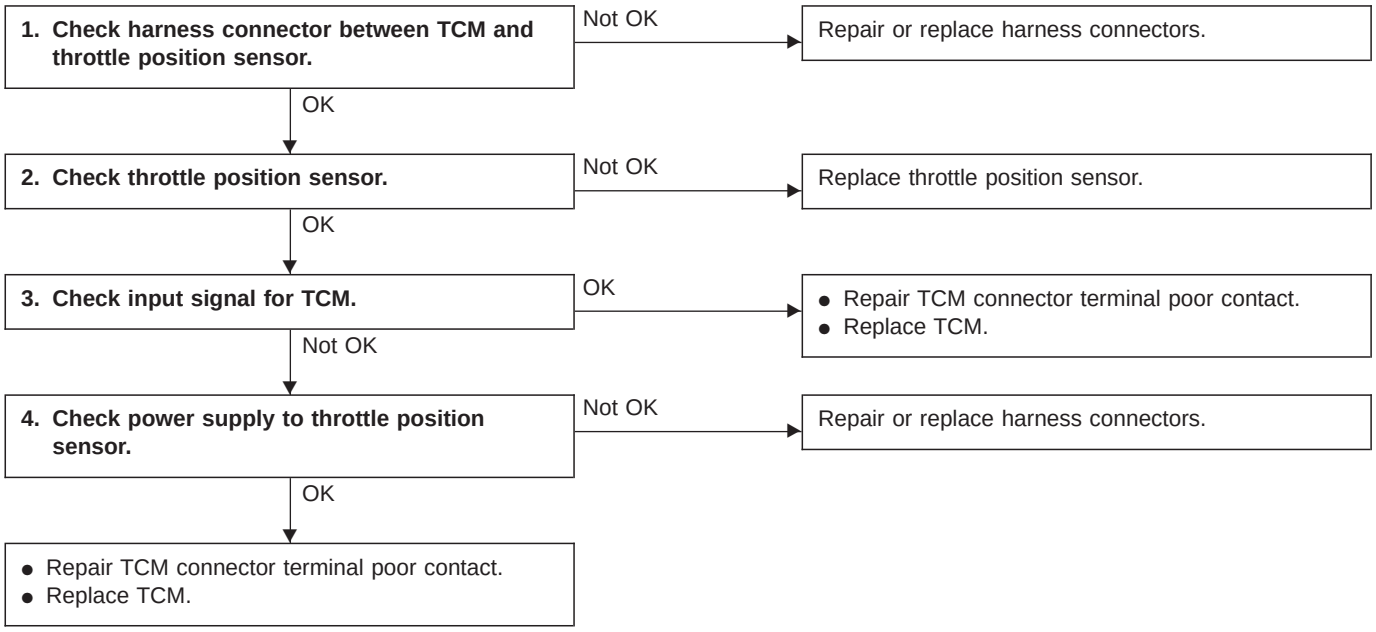
L: TROUBLE CODE 31
— THROTTLE POSITION SENSOR —

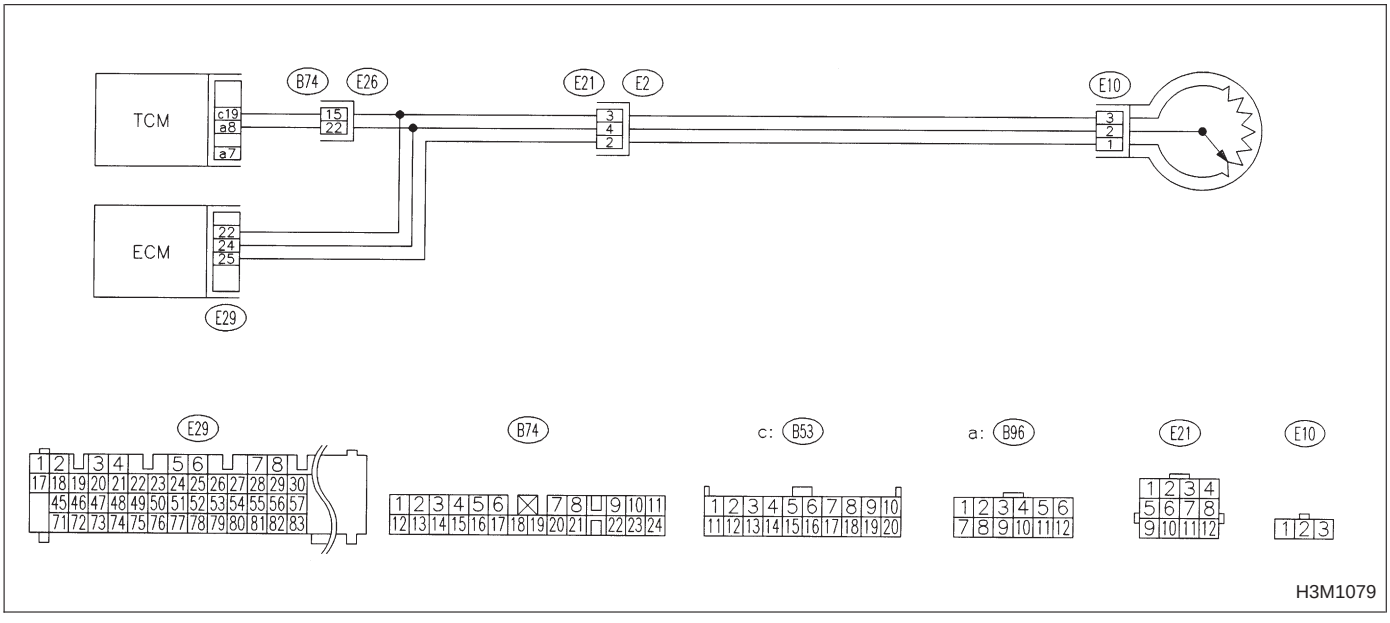
DIAGNOSIS:

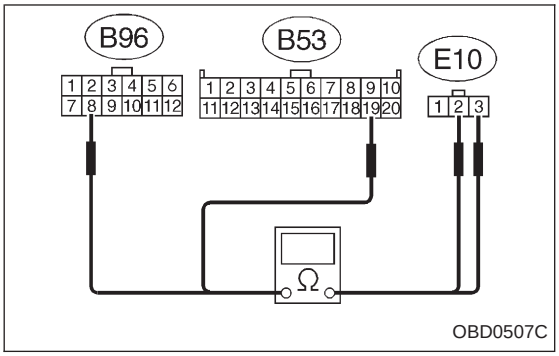
Input signal circuit of throttle position sensor is open or shorted.

TROUBLE SYMPTOM:

Shift point too high or too low; engine brake not effected in “3” range; excessive shift shock; excessive tight corner “braking”



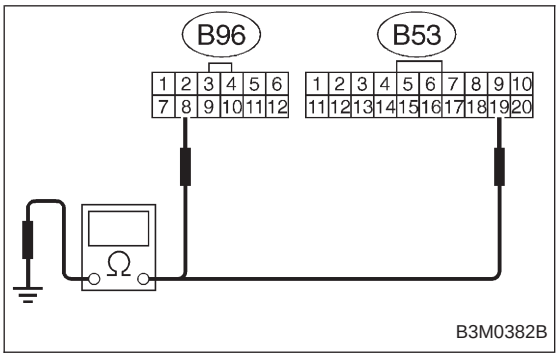




1. CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR.

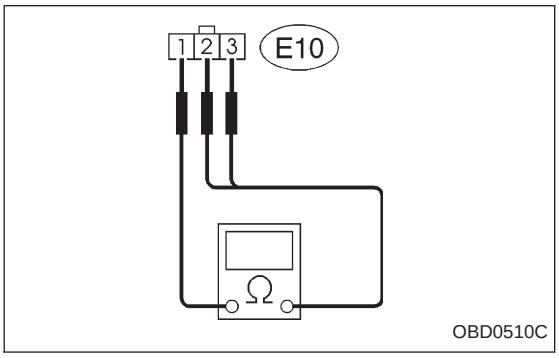
1) Turn ignition switch to OFF.
2) Disconnect connector from TCM and throttle position sensor.
3) Measure resistance of harness connector between TCM and throttle position sensor.

Connector & terminal / Specified resistance:
(B96) No. 8 — (E10) No. 2 / 1 Ω, or less
(B53) No. 19 — (E10) No. 3 / 1 Ω, or less



4) Measure resistance of harness connector between TCM and body to make sure that circuit does not short.

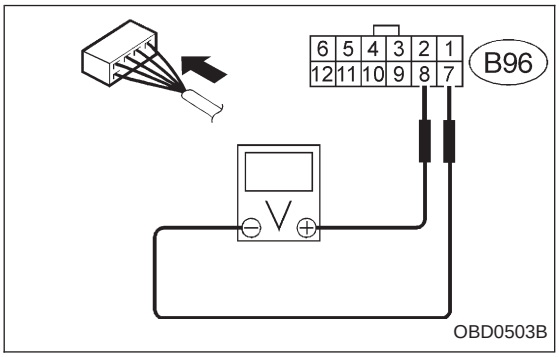
Connector & terminal / Specified resistance:
(B96) No. 8 — Body / 1 MΩ, or more
(B53) No. 19 — Body / 1 MΩ, or more



2. CHECK THROTTLE POSITION SENSOR.

Measure resistance between throttle position sensor terminals.

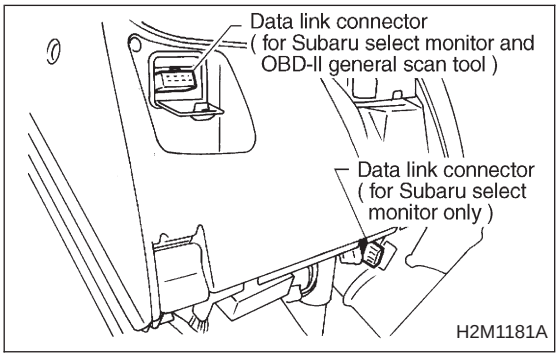
Terminals / Specified resistance:
(E10) No. 1 — No. 2 / 0.3 — 0.7 kΩ
(Throttle fully closed.)
3 — 6 kΩ
(Throttle fully open.)
(E10) No. 1 — No. 3 / 3.5 — 6.5 kΩ



3. CHECK INPUT SIGNAL FOR TCM.

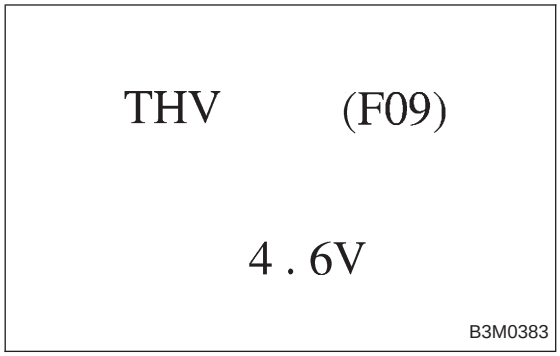
1) Connect connectors to TCM and throttle position sensor.
2) Turn ignition switch ON (with engine OFF).
3) Measure signal voltage input emitted from throttle position sensor with accelerator pedal fully depressed.

Connector & terminal / Specified voltage:
(B96) No. 8 — No. 7 /
0.5±0.2 V (Throttle fully closed.)
4.6±0.3 V (Throttle fully open.)



- Using Subaru select monitor:

(1) Connect connectors to TCM and throttle position sensor.
(2) Turn ignition switch to OFF.
(3) Connect the Subaru select monitor to data link connector.
(4) Turn ignition switch to ON and Subaru select monitor switch to ON.

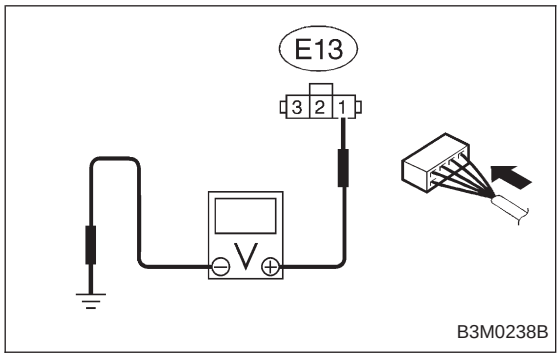


(5) Designate mode using function key.
(6) Read data on Subaru select monitor.

Function mode: F09

SPECIFIED DATA:

0.5±0.2 V (Throttle fully closed.)
4.6±0.2 V (Throttle fully open.)
[Must be changed correspondingly with accelerator pedal operation (from "released" to "depressed" position).]

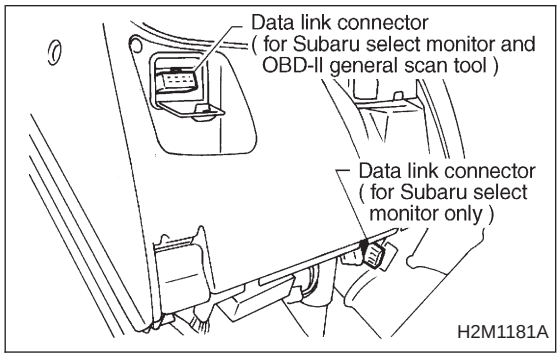


4. CHECK POWER SUPPLY TO THROTTLE POSITION SENSOR.

1) Turn ignition switch to ON (with engine OFF).
2) Measure power supply voltage to throttle position sensor.

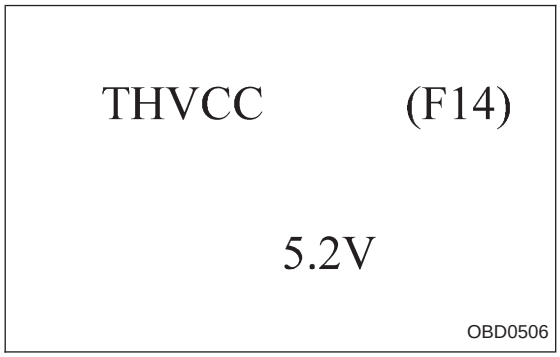
Connector & terminal / Specified voltage:

(E13) No. 1 — Body / 5.12±0.1 V



- Using Subaru select monitor:

(1) Turn ignition switch to OFF.
(2) Connect the Subaru select monitor to data link connector.
(3) Turn ignition switch to ON (engine OFF) and Subaru select monitor switch to ON.



(4) Designate mode using function key.
(5) Read data on Subaru select monitor.

Function mode: F14

SPECIFIED DATA:

5.12±0.1 V

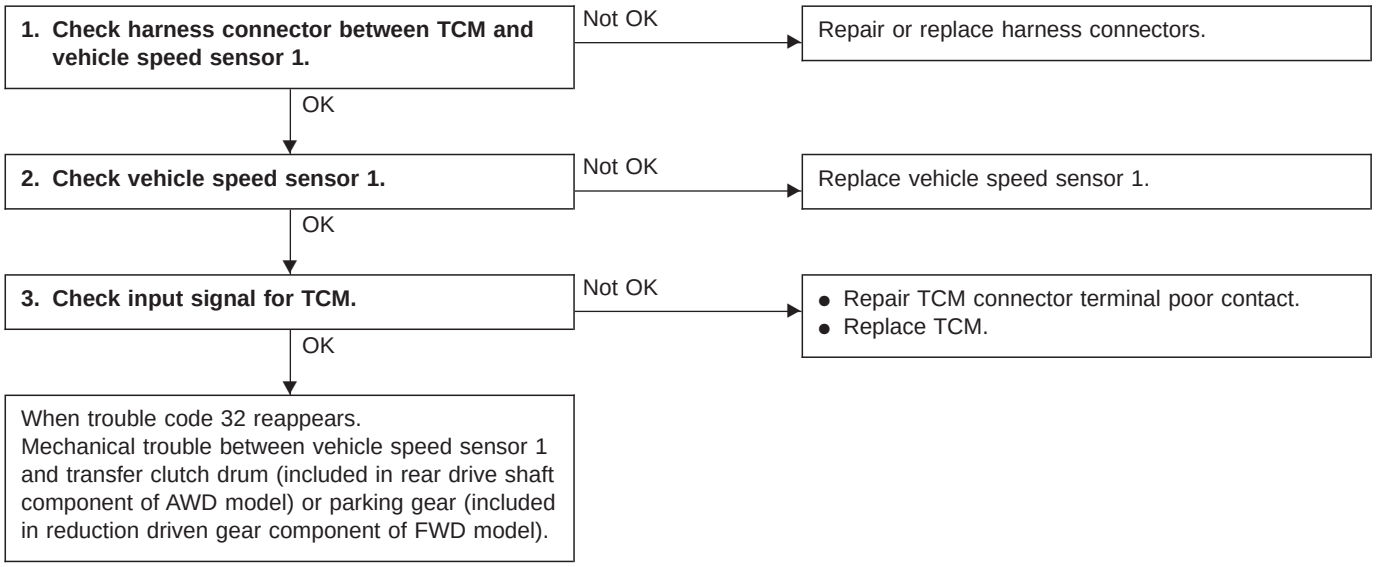
M: TROUBLE CODE 32 — VEHICLE SPEED SENSOR 1 —

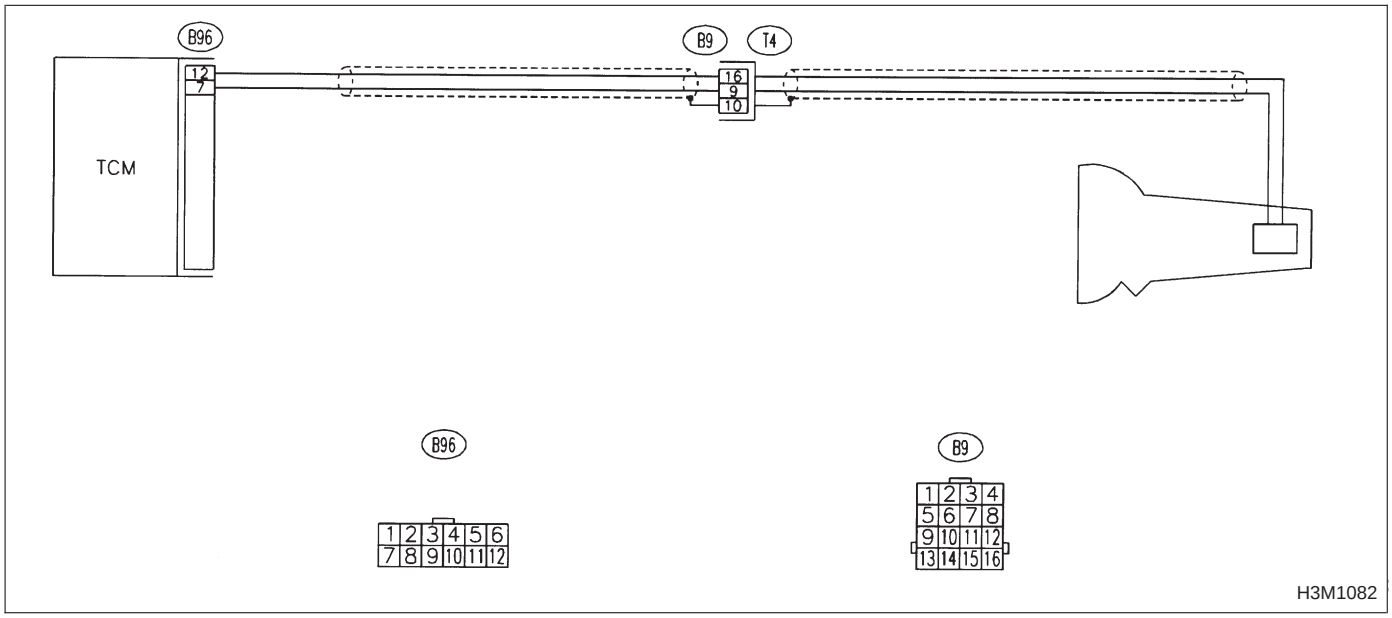
DIAGNOSIS:

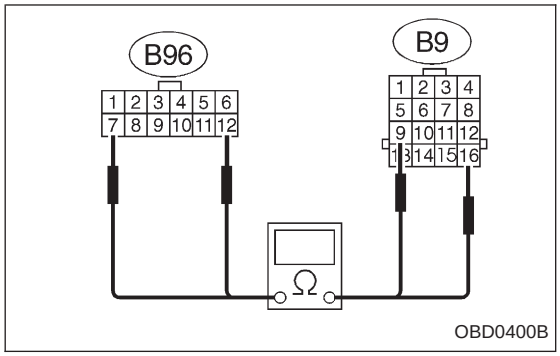
Input signal circuit of TCM is open or shorted.

TROUBLE SYMPTOM:

No lock-up or excessive tight corner “braking”



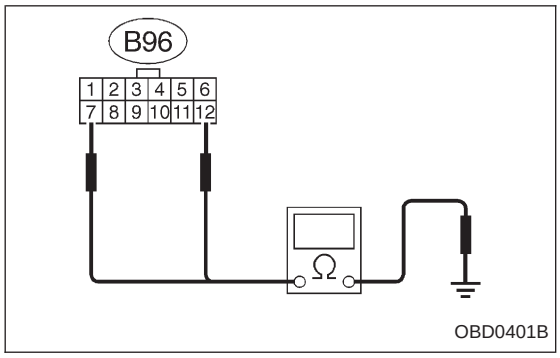




1. CHECK HARNESS CONNECTOR BETWEEN TCM AND VEHICLE SPEED SENSOR 1.

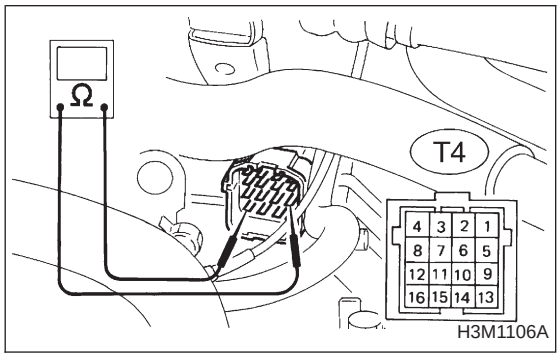
1) Turn ignition switch to OFF.
2) Disconnect connectors from TCM and transmission.
3) Measure resistance of harness connector between TCM and transmission connector.

Connector & terminal / Specified resistance:
(B96) No. 12 — (B9) No. 16 / 1 Ω, or less
(B96) No. 7 — (B9) No. 9 / 1 Ω, or less



4) Measure resistance of harness connector between TCM and body to make sure that circuit does not short.

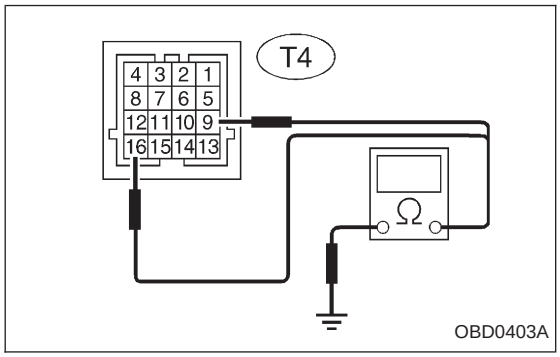
Connector & terminal / Specified resistance:
(B96) No. 7 — Body / 1 MΩ, or more
(B96) No. 12 — Body / 1 MΩ, or more



2. CHECK VEHICLE SPEED SENSOR 1.

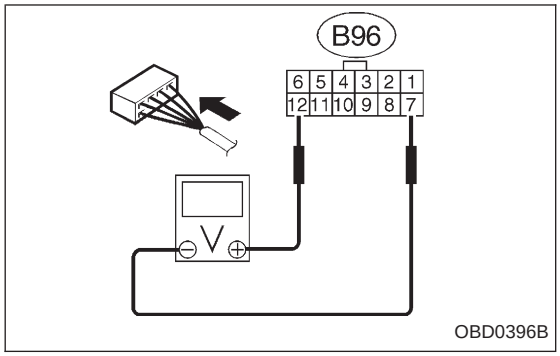
1) Measure resistance between transmission connector receptacle's terminals.

Connector & terminal / Specified resistance:
(T4) No. 16 — No. 9 / 450 — 720 Ω



2) Measure resistance of harness connector between transmission connector and transmission case to make sure that circuit does not short.

Connector & terminal / Specified resistance:
(T4) No. 16 — Transmission / 1 MΩ, or more
(T4) No. 9 — Transmission / 1 MΩ, or more



3. CHECK INPUT SIGNAL FOR TCM.

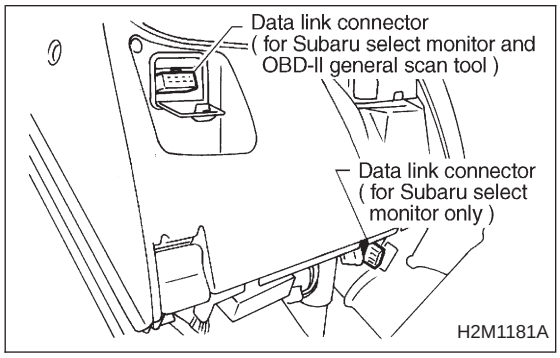
1) Connect connectors to TCM and transmission.
2) Lift-up or raise the vehicle and place safety stands.

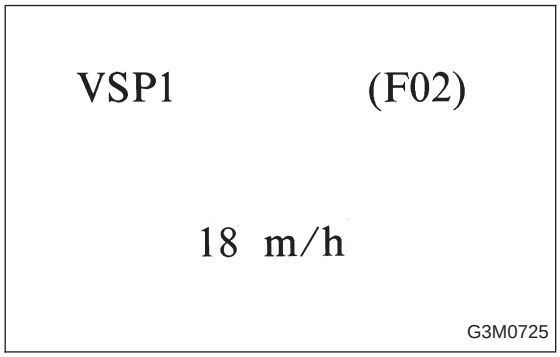
CAUTION:
On AWD models, raise all wheels off floor.

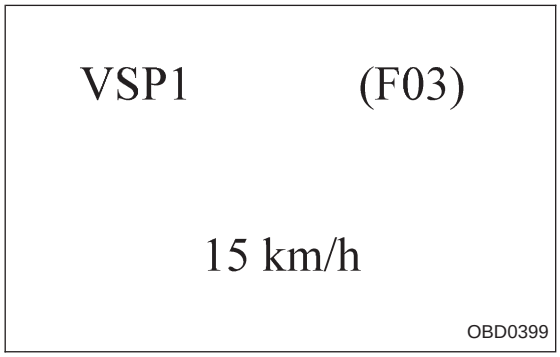
3) Start the engine and set vehicle in 20 km/h (12 MPH) condition.
4) Measure voltage between TCM connector terminals.

Connector & terminal / Specified voltage:
(B96) No. 12 — No. 7 / AC 1 V, or more

NOTE:
The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When AT control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.
<Ref. to 4-4 [T1C2].>







- Using Subaru select monitor:
  (1) Connect connectors to TCM and transmission.
  (2) Turn ignition switch to OFF.
  (3) Connect the Subaru select monitor to data link connector.
  (4) Lift-up or raise the vehicle and place safety stands.

CAUTION:
On AWD models, raise all wheels off floor.

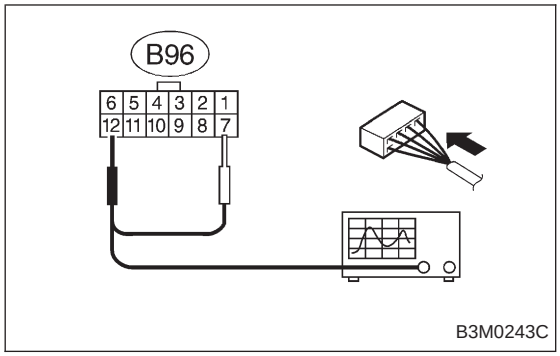
  (5) Turn ignition switch to ON and Subaru select monitor switch to ON.
  (6) Start the engine and operate at constant speed.
  (7) Read data on Subaru select monitor.
  (8) Designate mode using function key.

Function mode: F02 or F03

SPECIFIED DATA:
F02: Compare speedometer with monitor indications.
F03: Compare speedometer with monitor indications.

- F02: Vehicle speed is indicated in “m/h”.
- F03: Vehicle speed is indicated in “km/h”.

NOTE:
The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When AT control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.
<Ref. to 4-4 [T1C2].>



- Using oscilloscope:
  (1) Connect connectors to TCM and transmission.
  (2) Lift-up the vehicle and place safety stands.

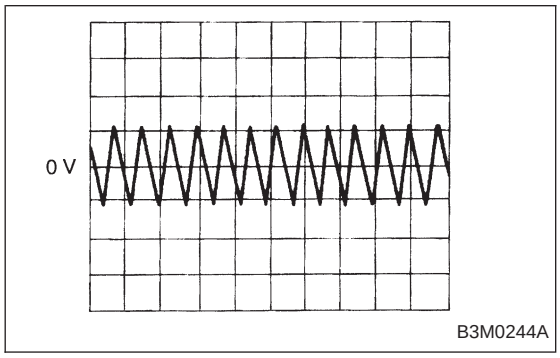
WARNING:

On AWD models, make sure that all wheels are raised off floor.

(3) Set oscilloscope to TCM connector terminals.

Connector & terminals:

Positive probe; (B96) No. 12
Earth lead; (B96) No. 7



(4) Start the engine, and set vehicle in 20 km/h (12 MPH) condition.
(5) Measure signal voltage indicated on oscilloscope.

Specified voltage: AC 1 V, or more

NOTE:
The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When AT control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.
<Ref. to 4-4 [T1C2].>

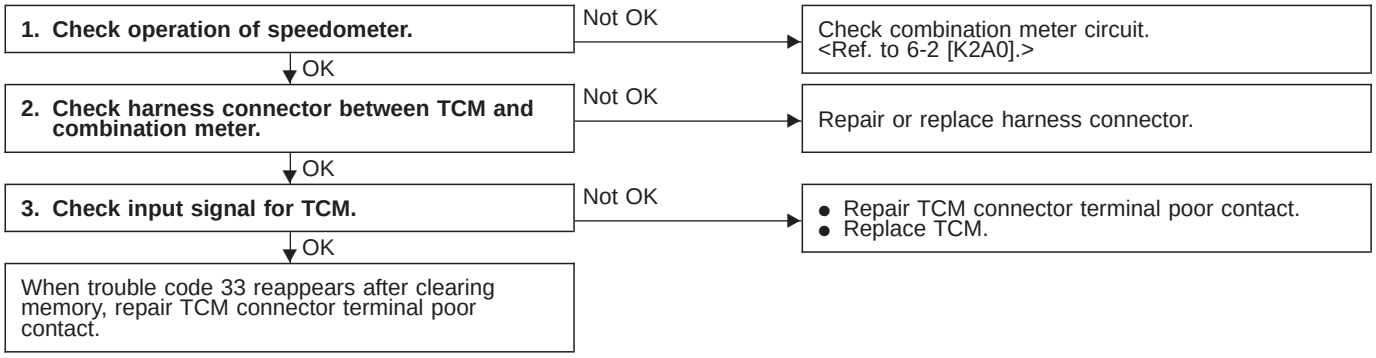
N: TROUBLE CODE 33 — VEHICLE SPEED SENSOR 2 —

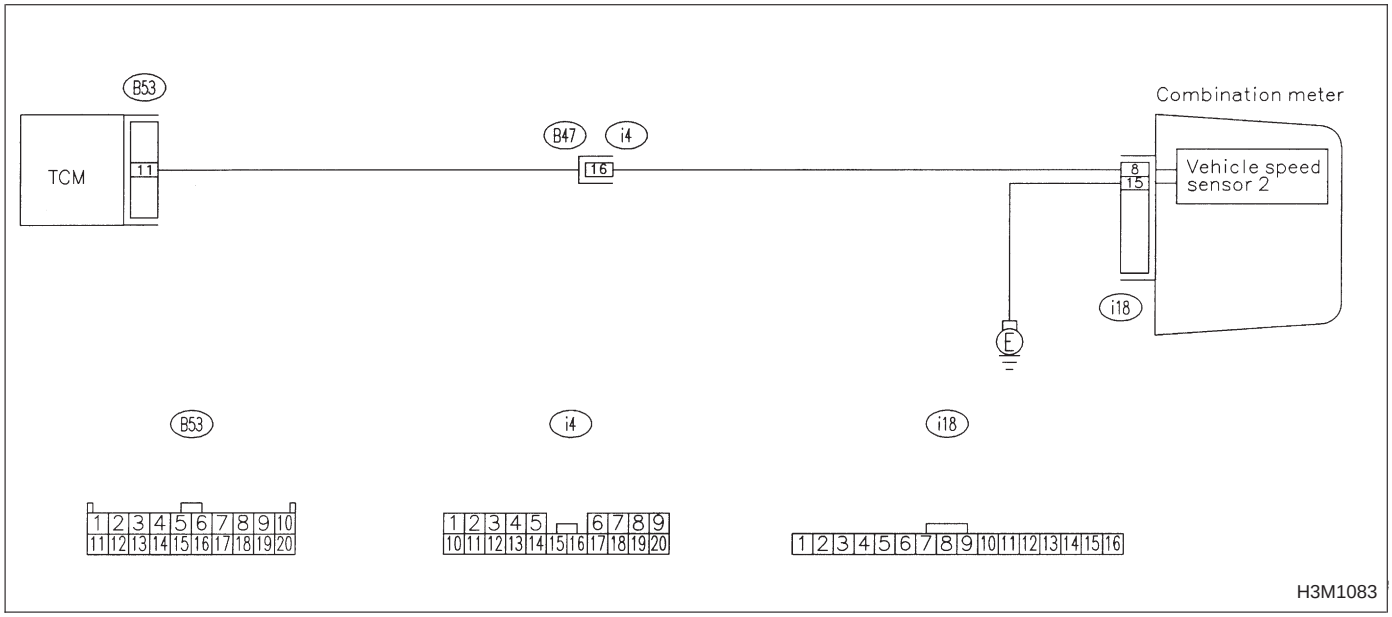
DIAGNOSIS:

The harness connector between TCM and vehicle speed sensor is in short or open.

TROUBLE SYMPTOM:

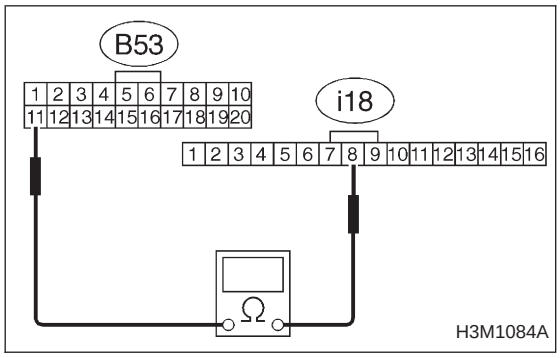
Improper shift point





1. CHECK OPERATION OF SPEEDOMETER.

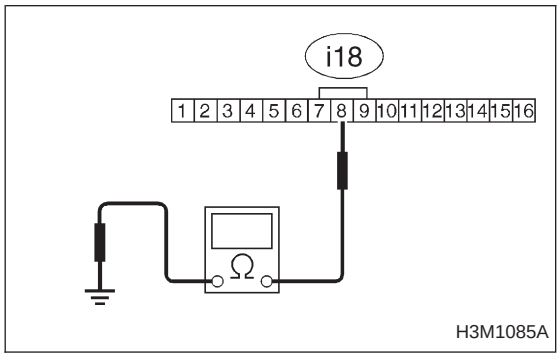
Make sure that speedometer indicates the vehicle speed by driving the vehicle.



2. CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.

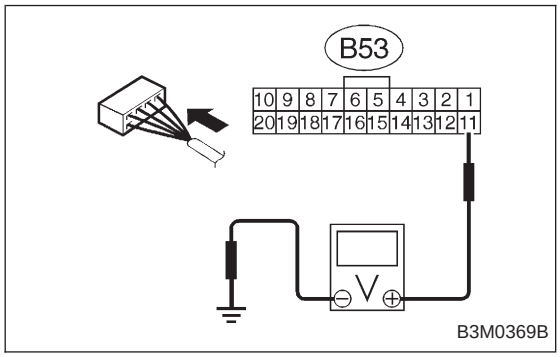
1) Turn ignition switch to OFF.
2) Remove combination meter.
3) Disconnect connectors from TCM and combination meter.
4) Measure resistance of harness connector between TCM and combination meter.

Connector & terminal / Specified resistance:
(B53) No. 11 — (i18) No. 8 / 1 Ω, or less



5) Measure resistance of harness connector between combination meter and body to make sure that circuit does not short.

Connector & terminal / Specified resistance:
(i18) No. 8 — Body / 1 MΩ, or more



3. CHECK INPUT SIGNAL FOR TCM.

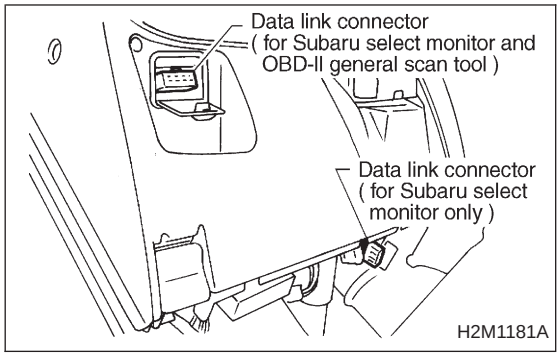
1) Connect connector to combination meter.
2) Install combination meter.
3) Lift-up the vehicle or set the vehicle on free roller.

CAUTION:
On AWD models, raise all wheels off floor.

4) Start the engine, and drive the wheels slowly.
5) Measure voltage between TCM and body.

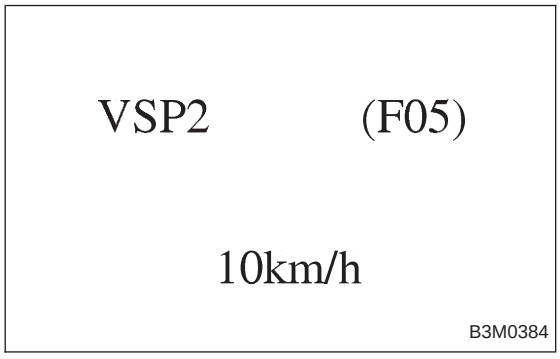
Connector & terminal / Specified voltage:
(B53) No. 11 — Body / Less than 1 ↔ more than 4 V

NOTE:
The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When AT control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.
<Ref. to 4-4 [T1C2].>



- Using Subaru select monitor:
  (1) Connect connector to combination meter.
  (2) Install combination meter.
  (3) Connect connectors to TCM.
  (4) Lift-up the vehicle or set the vehicle on free roller.
  (5) Turn ignition switch to OFF.
  (6) Connect the Subaru select monitor to data link connector.
  (7) Turn ignition switch to ON and Subaru select monitor switch to ON.

CAUTION:
On AWD models, raise all wheels off floor.



(8) Start the engine, and drive the wheels.
(9) Read data on Subaru select monitor.
(10) Designate mode using function key.

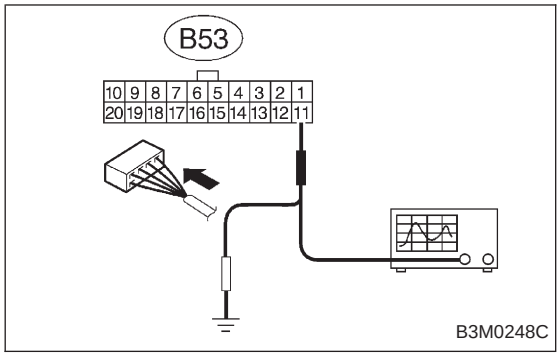
Function mode: F04 or F05

SPECIFIED DATA:

Compare speedometer with select monitor indications.

- F04: Vehicle speed is indicated in mile per hour (MPH).
- F05: Vehicle speed is indicated in kilometer per hour (km/h).

NOTE:
The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When AT control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.
<Ref. to 4-4 [T1C2].>

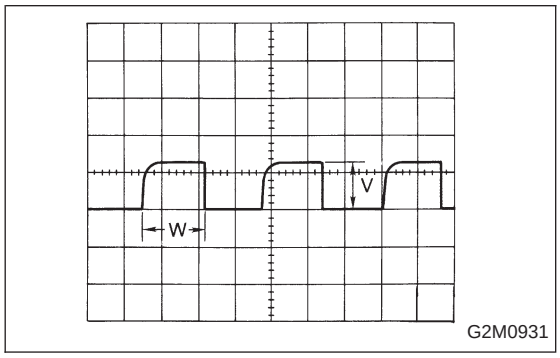


● Using oscilloscope:
(1) Connect connector to combination meter.
(2) Install combination meter.
(3) Lift-up the vehicle or set the vehicle on free rollers.

CAUTION:
On AWD models, raise all wheels off floor.

(4) Set oscilloscope to TCM connector terminals.

Connector & terminals:
Positive probe; (B53) No. 11
Earth lead; Body



(5) Start the engine.
(6) Shift on the gear position, and keep the vehicle speed at constant.
(7) Measure signal voltage.

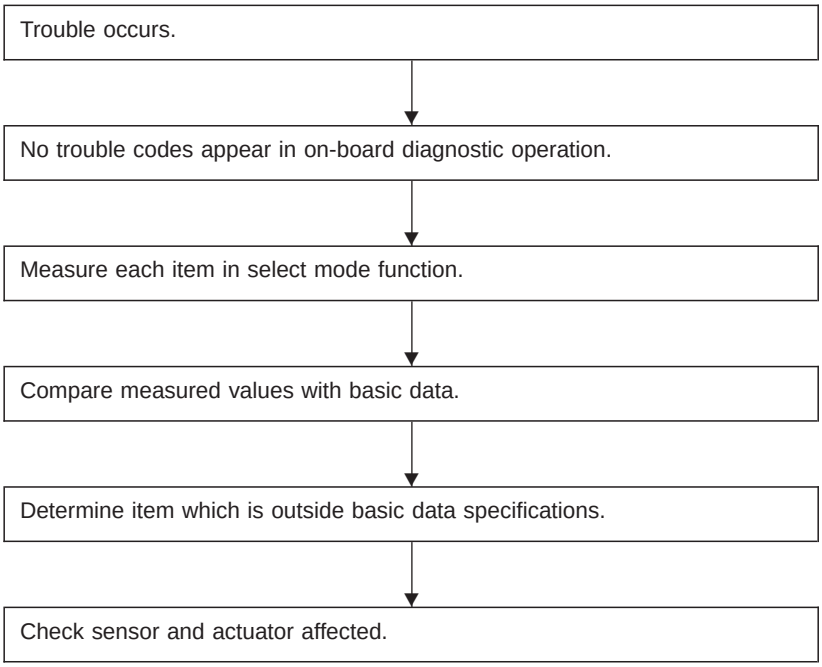
Specified voltage: 2 V, or more

NOTE:
● If vehicle speed increases, the width of amplitude (W) decreases.
● The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When AT control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.
<Ref. to 4-4 [T1C2].>

8. Diagnostic Chart with Select Monitor

A: BASIC DIAGNOSTIC CHART

If no trouble codes appear in the on-board diagnostic operation (although problems have occurred or are occurring), measure performance characteristics of sensors, actuators, etc., in the “F” mode (select monitor function), and compare with the “basic data” to determine the cause of problems.



B: LIST OF OUTPUT MODES

1. FUNCTION MODE

Mode	Contents	Abbr.	Unit	Contents of display	Page
F00	Mode display	—	—	AT or EGI mode (when monitor is connected.)	57
F01	Battery voltage	VB	V	Battery voltage applied to control unit.	57
F02	Vehicle speed sensor 1	VSP1	m/h	Vehicle speed (miles/h) sent from vehicle speed sensor 1.	58
F03	Vehicle speed sensor 1	VSP1	km/h	Vehicle speed (km/h) sent from vehicle speed sensor 1.	58
F04	Vehicle speed sensor 2	VSP2	m/h	Vehicle speed (miles/h) sent from vehicle speed sensor 2.	58
F05	Vehicle speed sensor 2	VSP2	km/h	Vehicle speed (km/h) sent from vehicle speed sensor 2.	58
F06	Engine speed	EREV	rpm	Engine speed sent from ECM.	59
F07	ATF temperature sensor	ATFT	°F	ATF temperature (°F) sent from ATF temperature sensor.	59
F08	ATF temperature sensor	ATFT	°C	ATF temperature (°C) sent from ATF temperature sensor.	59
F09	Throttle position sensor	THV	V	Voltage sent from throttle position sensor.	60
F10	Gear position	GEAR	—	Transmission gear position	60
F11	Line pressure duty	PLDTY	%	Duty ratio flowing through duty solenoid A.	61
F12	Lock-up duty	LUDTY	%	Duty ratio flowing through duty solenoid B.	62
F13	AWD duty	4WDTY	%	Duty ratio flowing through duty solenoid C.	63
F14	Throttle position sensor power supply	THVCC	V	Power supply voltage to throttle position sensor	64
F15	Mass air flow signal	AFM	V	Output voltage from air flow sensor	64

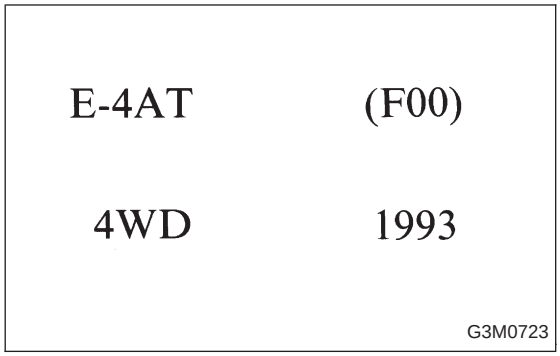
2. ON ←→ OFF SIGNAL LIST

Mode	LED No.	Signal name	Display	LED "ON" requirements	Page
FA0	1	FWD switch	FF	When fuse is installed in FWD switch.	—
	2	Kick-down switch	KD		—
	3	—	—		—
	4	—	—		—
	5	Brake switch	BR	When brake switch is turned ON.	—
	6	ABS switch	AB	When ABS signal is entered.	—
	7	Cruise control set	CR	When cruise control is set.	—
	8	Power switch	PW		—
	9	—	—		—
	10	—	—		—
FA1	1	P/N range switch	NP	When P or N range is selected.	—
	2	R range switch	RR	When R range is selected.	—
	3	D range switch	RD	When D range is selected.	—
	4	3 range switch	R3	When 3 range is selected.	—
	5	2 range switch	R2	When 2 range is selected.	—
	6	1 range switch	R1	When 1 range is selected.	—
	7	Diagnosis switch	SS	When diagnosis switch is turned ON.	66
	8	—	—		—
	9	—	—		—
	10	—	—		—

NOTE: LED Nos. 2 and 8 cannot be turned on.

3. DIAGNOSIS MODE

Mode	Contents	Abbr.	Contents of display
FB0	On-board diagnostics	DIAG.U	Current trouble code determined by on-board diagnostics.
FB1	On-board diagnostics	DIAG.M	Previous trouble code stored in memory by on-board diagnostics.
FC0	Back-up clear	—	Function of clearing trouble code stored in memory.



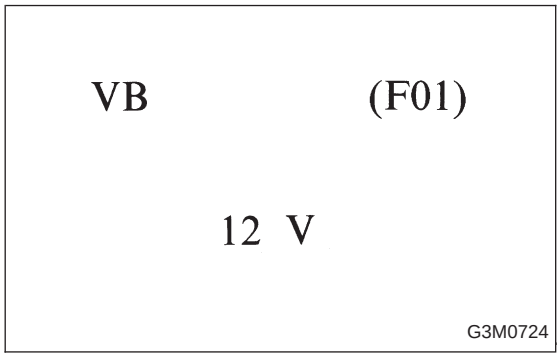
C: MODE F00 — MODE DISPLAY —

SPECIFIED DATA:

Data at the left should be indicated.

Probable cause (if outside “specified data”)

1. Communication failure (No communication method can be confirmed with power ON.)	● Check loose or poor connectors, or shortcircuit. ● Check type of cartridge.
2. Vehicle types cannot be identified (due to communication failure).	● Check improper cartridge. ● Replace with proper one.



D: MODE F01 — BATTERY VOLTAGE (VB) —

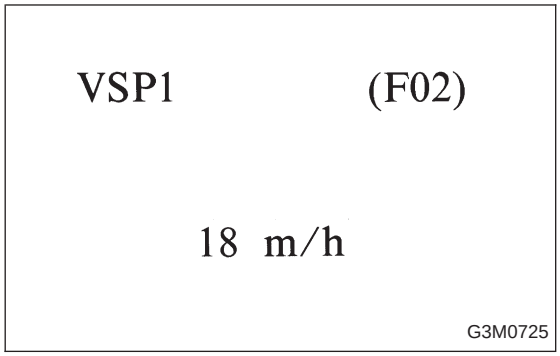
CONDITION:

- Ignition switch ON
- Engine idling after warm-up

SPECIFIED DATA:

VB: 10 — 16 V

1. Battery	Check battery voltage and specific gravity of electrolyte.
2. Charging system	● Measure regulating voltage under no loads. ● Check generator (as a single unit).



E: MODE F02 — VEHICLE SPEED SENSOR 1 (VSP1) —

F03 = vehicle speed (VSP1): to be indicated in “km/h”.

CONDITION:

Raise vehicle off ground and operate at constant speed.

SPECIFIED DATA:

Compare speedometer with monitor indications.

Probable cause (if outside “specified data”)

1. Vehicle speed sensor 1	Check performance characteristics of vehicle speed sensor 1. <Ref. to 3-2b [T7M0].>
	OK
	Check TCM and replace if necessary.

F: MODE F04 — VEHICLE SPEED SENSOR 2 (VSP2) —

F05 = vehicle speed (VSP2): to be indicated in “km/h”.

CONDITION:

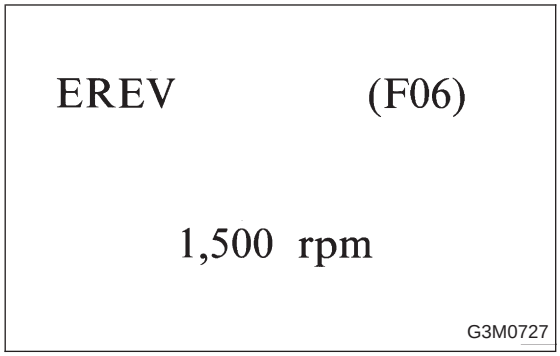
Raise vehicle off ground and operate at constant speed.

SPECIFIED DATA:

Compare speedometer with monitor indications.

Probable cause (if outside “specified data”)

1. Vehicle speed sensor 2	Check performance characteristics of vehicle speed sensor 2. <Ref. to 3-2b [T7N0].>
	OK
	Check TCM and replace if necessary.



G: MODE F06 — ENGINE SPEED (EREV) —

CONDITION:

Measure with engine operating at constant speed.

SPECIFIED DATA:

Same as tachometer reading (in combination meter)

Probable cause (if outside “specified data”)

1. Conduct diagnostics in relation to MPFI system for engine speed.	OK →	Check TCM and replace if necessary.

H: MODE F07 — ATF TEMPERATURE SENSOR (ATFT) —

F08 = ATF temperature (ATFT): to be indicated in “deg C”.

CONDITION:

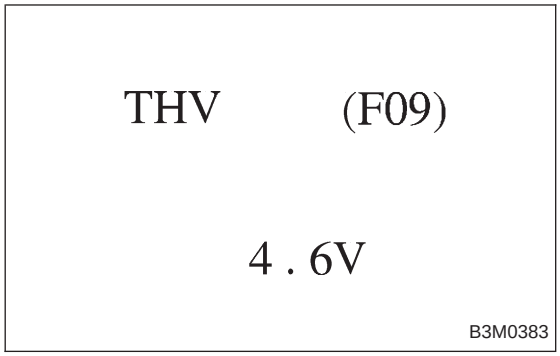
- Low ATF temperature (before engine/vehicle starts.)
- High ATF temperature (after driving vehicle for warm-up.)

SPECIFIED DATA:

- Ambient temperature: ±50 deg F (±10 deg C) (Low ATF temperature)
- ATF temperature: 158 — 230 deg F (70 — 110 deg C) (High ATF temperature)
- Open harness: 176 deg F (80 deg C)
- Shorted harness: 320 deg F (160 deg C)

Probable cause (if outside “specified data”)

1. ATF temperature sensor	→	Check performance characteristics of ATF temperature sensor. <Ref. to 3-2b [T7G0].>
		OK ↓
		Check TCM and replace if necessary.



I: MODE F09 — THROTTLE POSITION SENSOR (THV) —

CONDITION:

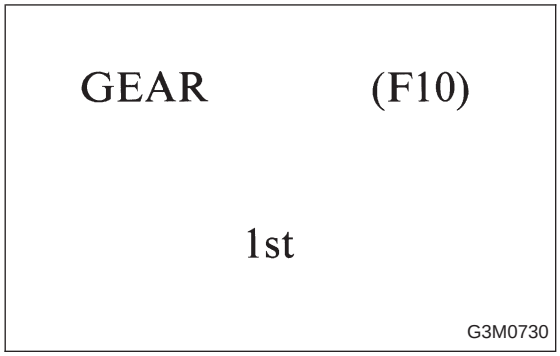
- Ignition switch ON (with engine OFF)
- Measure voltage while operating throttle valve from a fully closed position to a fully open position.

SPECIFIED DATA:

- Fully closed position: 0.5±0.2 V
- Fully open position: 4.6±0.2 V
- From fully closed to fully open position: Voltage must smoothly decrease.
- Open harness: 5.0±0.3 V
- Shorted harness: 0.00 V

Probable cause (if outside “specified data”)

1. Throttle position sensor	Check performance characteristics of throttle position sensor. <Ref. to 3-2b [T7L0].> → OK → Check TCM and replace if necessary.



J: MODE F10 — GEAR POSITION (GEAR) —

CONDITION:

Check while driving vehicle (after warm-up).

SPECIFIED DATA:

Gear position (Refer to shift performance characteristics chart.)

Probable cause (item outside “specified data”)

1. Shift solenoid 1	Check performance characteristics of shift solenoid 1. <Ref. to 3-2b [T7E0].> → OK
2. Shift solenoid 2	Check performance characteristics of shift solenoid 2. <Ref. to 3-2b [T7D0].> → OK
3. Shift solenoid 3	Check performance characteristics of shift solenoid 3. <Ref. to 3-2b [T7C0].> → OK → Check TCM and replace as necessary.

K: MODE F11
— LINE PRESSURE DUTY (PLDTY) —

CONDITION:

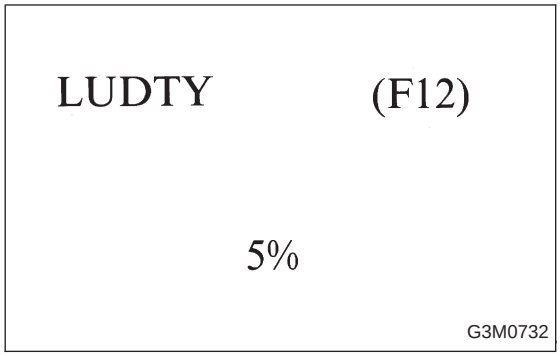
- After sufficient warm-up
- Ignition ON (engine OFF)
- N range

SPECIFIED DATA:

- Throttle fully closed: 100%
- Throttle fully open : 15%

Probable cause (if outside “specified data”)

1. Throttle position sensor	→	Check in F09 mode. <Ref. to 3-2b [T8I0].>
		OK ↓
2. Vehicle speed sensor 1	→	Check in F02 mode. <Ref. to 3-2b [T8E0].>
		OK ↓
3. Vehicle speed sensor 2	→	Check in F04 mode. <Ref. to 3-2b [T8F0].>
		OK ↓
4. Engine speed	→	Check in F06 mode. <Ref. to 3-2b [T8G0].>
		OK ↓
5. ATF temperature sensor	→	Check in F07 mode. <Ref. to 3-2b [T8H0].>
		OK ↓
6. Inhibitor switch	→	Check for operation.
		OK ↓
7. Power switch	→	Check for operation.
		OK ↓
		Check TCM and replace if necessary.



L: MODE F12 — LOCK-UP DUTY (LUDTY) —

CONDITION:

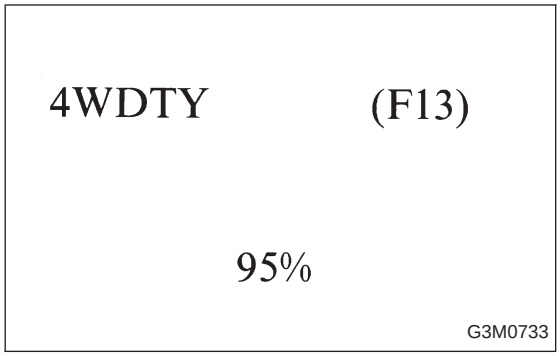
- Idling (after sufficient warm-up) with lock-up system released.
- Driving at 70 km/h or 44 MPH (after sufficient warm-up) with lock-up system applied.

SPECIFIED DATA:

- Lock-up system released: 5%
- Lock-up system applied: 95%

Probable cause (if outside “specified data”)

1. Throttle position sensor	Check in F09 mode. <Ref. to 3-2b [T8I0].>
	OK
2. Vehicle speed sensor 1	Check in F02 mode. <Ref. to 3-2b [T8E0].>
	OK
3. Vehicle speed sensor 2	Check in F04 mode. <Ref. to 3-2b [T8F0].>
	OK
4. Engine speed	Check in F06 mode. <Ref. to 3-2b [T8G0].>
	OK
5. Inhibitor switch	Check for operation.
	OK
	Check TCM and replace if necessary.



M: MODE F13 — AWD DUTY (4WDTY) —

CONDITION:

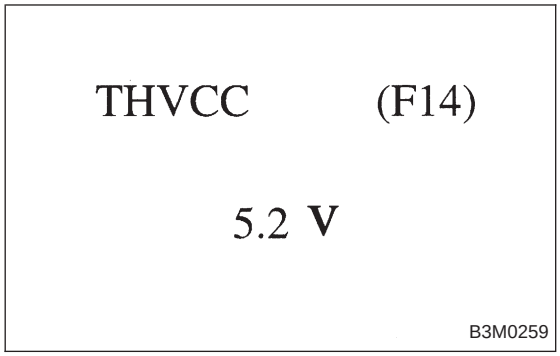
- FWD mode
  (1) After sufficient warm-up
  (2) Ignition switch ON (engine OFF)
- AWD mode
  (1) After sufficient warm-up
  (2) Ignition switch ON (engine OFF)
  (3) D range and full throttle
  (4) Vehicle speed 0 km/h or 0 MPH

SPECIFIED DATA:

- 95% (FWD mode)
- 25% or less (AWD mode)

Probable cause (if outside “specified data”)

1. Throttle position sensor	→	Check in F09 mode. <Ref. to 3-2b [T8I0].>
		OK ↓
2. Vehicle speed sensor 1	→	Check in F02 mode. <Ref. to 3-2b [T8E0].>
		OK ↓
3. Vehicle speed sensor 2	→	Check in F04 mode. <Ref. to 3-2b [T8F0].>
		OK ↓
4. ATF temperature sensor	→	Check in F07 mode. <Ref. to 3-2b [T8H0].>
		OK ↓
5. Inhibitor switch	→	Check for operation.
		OK ↓
6. ABS signal	→	Check ABS system for operation.
		OK ↓
		Check TCM and replace if necessary.



N: MODE F14
— THROTTLE POSITION SENSOR POWER SUPPLY (THVCC) —

CONDITION:

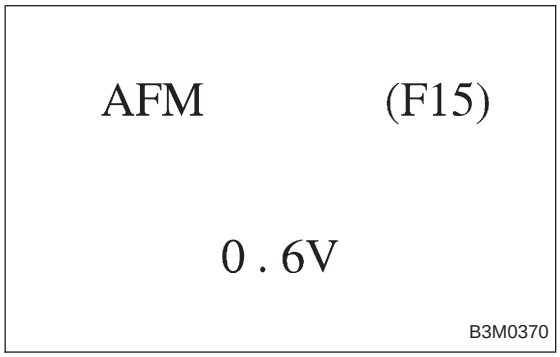
Ignition switch ON (engine OFF)

SPECIFIED DATA:

5.12±0.1 V

Probable cause (Item outside “specified data”)

1. Throttle position sensor power supply	Check throttle sensor line. <Ref. to 3-2b [T7L0].>
	OK
	Check TCM and replace if necessary.



O: MODE F15
— MASS AIR FLOW SIGNAL (AFM) —

CONDITION:

- Ignition switch ON (engine ON)
- N range
- Idling

SPECIFIED DATA:

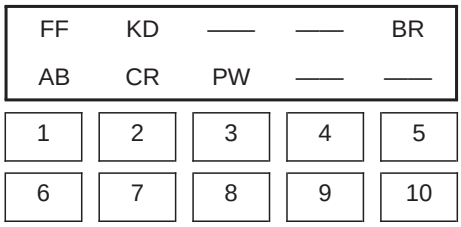
Engine warm-up: 0.55±0.25 V

Probable cause (if outside “specified data”)

1. Mass air flow signal	Check performance characteristics of mass air flow signal. <Ref. to 3-2b [T7H0].>
	OK
	Check TCM and replace if necessary.

DISPLAY

LED No.	Signal name	Symbol
1	FWD switch	FF
2	Kick-down switch	KD
3	—	—
4	—	—
5	Brake	BR
6	ABS switch	AB
7	Cruise control set	CR
8	Power switch	PW
9	—	—
10	—	—



P: MODE FA0 — SWITCH 1 (SW1) —

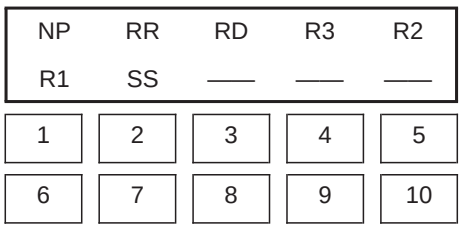
Reference values

- Lights up when the fuse is installed in FWD switch (No. 1).
- Light up when the brake pedal is depressed (No. 5).
- Light up when the ABS signal is entered (No. 6).
- Lights up when the cruise control is set (No. 7).

NOTE:
LED Nos. 2 and 8 do not come on.

DISPLAY

LED No.	Signal name	Symbol
1	N/P range switch	NP
2	R range switch	RR
3	D range switch	RD
4	3 range switch	R3
5	2 range switch	R2
6	1 range switch	R1
7	Diagnosis switch	SS
8	—	—
9	—	—
10	—	—



Q: MODE FA1 — SWITCH 2 (SW2) —

Reference values

- Lights up when the N or P range is selected (No. 1).
- Lights up when the R range is selected (No. 2).
- Lights up when the D range is selected (No. 3).
- Lights up when the 3 range is selected (No. 4).
- Lights up when the 2 range is selected (No. 5).
- Lights up when the 1 range is selected (No. 6).
- Lights up when the diagnosis switch is connected (No. 7).

NOTE:
If each LED does not illuminate in the above conditions, inhibitor switch malfunction may occur. Perform diagnostics on inhibitor switch. <Ref. to 2-7b [T10AN0].>

R: MODE FA1
— LED No. 7, DIAGNOSIS SWITCH —

DIAGNOSIS:

- LED does not come on when diagnosis switch is ON.
- Diagnosis switch circuit is open or shorted.

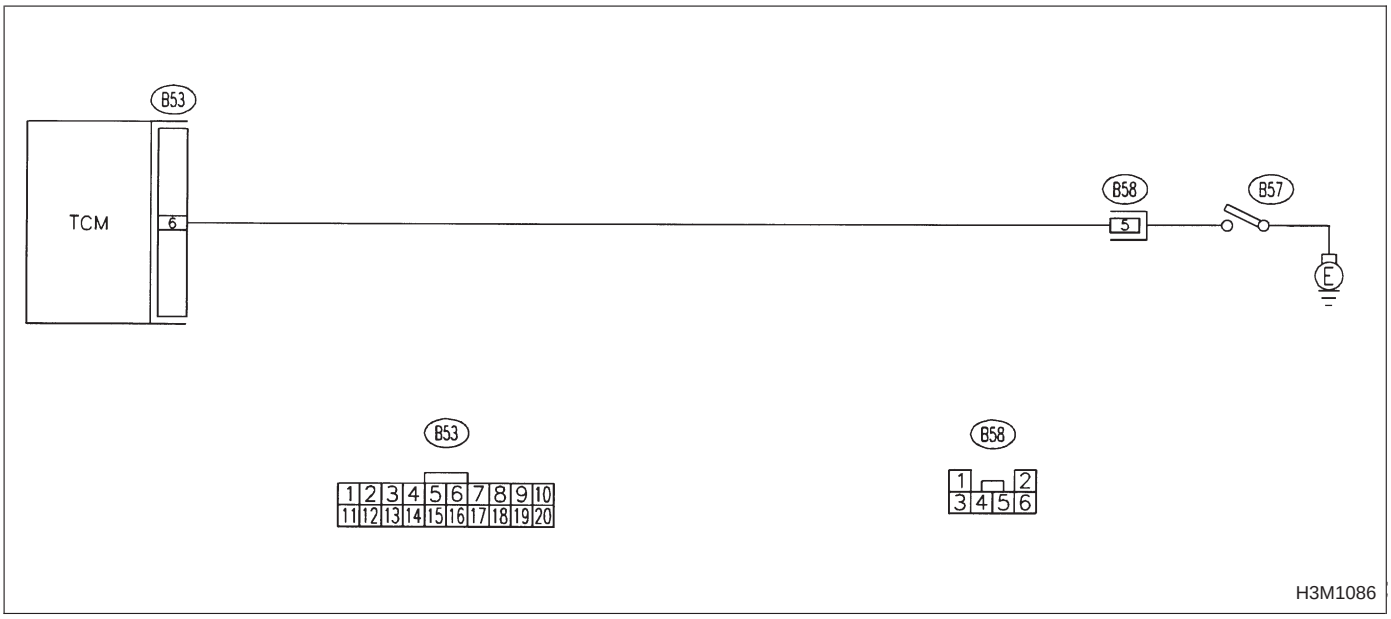
Probable cause (if outside “specified data”)

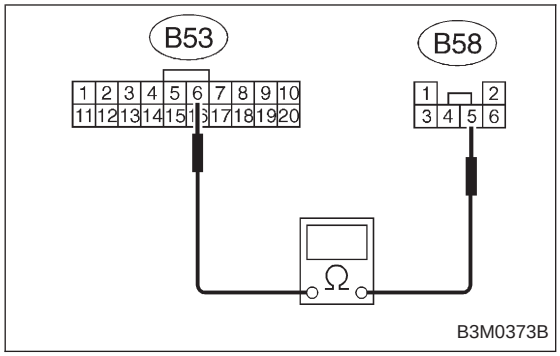
1. Check harness connector between TCM and diagnosis switch.
Not OK → Repair or replace harness connectors.
OK ↓

2. Check input signal for TCM.
Not OK → Repair TCM connector terminal poor contact.
OK ↓

3. Check diagnosis switch ground line.
Not OK → Repair or replace harness connector.
OK ↓

Repair diagnosis switch connector terminal poor contact.
→ Not OK → Repair TCM and diagnosis switch connector terminal poor contact.

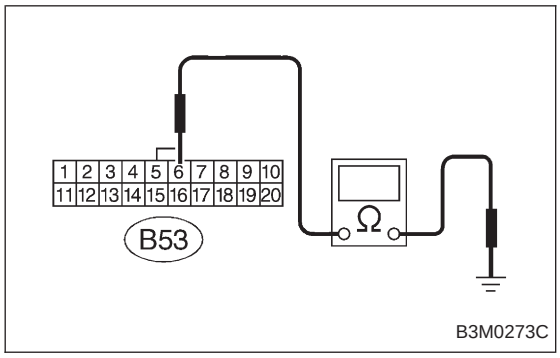




1. CHECK HARNESS CONNECTOR BETWEEN TCM AND DIAGNOSIS SWITCH.

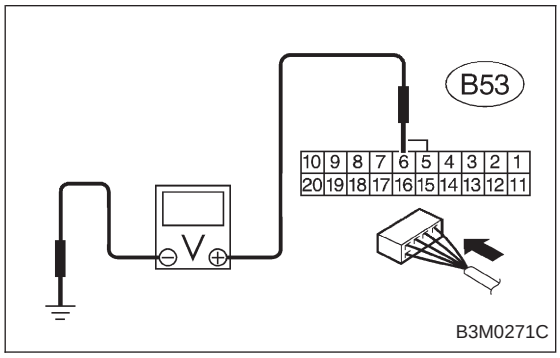
1) Turn ignition switch OFF.
2) Disconnect connector from TCM.
3) Measure resistance of harness connector between TCM and diagnosis switch.

Connector & terminal / Specified resistance:
(B53) No. 6 — (B58) No. 5 / 1 Ω, or less.



4) Measure resistance of harness connector between TCM and body to make sure that circuit does not short.

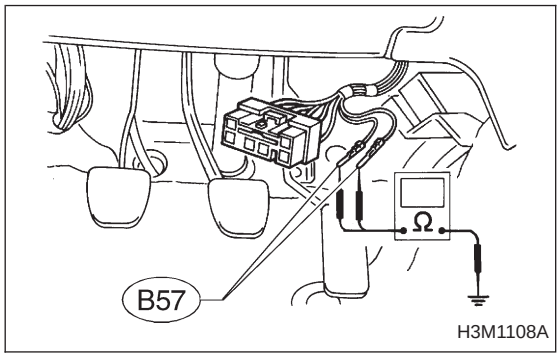
Connector & terminal / Specified resistance:
(B53) No. 6 — Body / 1 M Ω, or more



2. CHECK INPUT SIGNAL FOR TCM.

1) Connect connector to TCM.
2) Turn ignition switch ON (with engine OFF).
3) Measure signal voltage for TCM while connecting and disconnecting the diagnosis terminal to diagnosis connector.

Connector & terminal / Specified voltage:
(B53) No. 6 — Body / Less than 1 V (Connected)
More than 6 V (Disconnected)



3. CHECK DIAGNOSIS SWITCH GROUND LINE.

Measure resistance of harness terminal between diagnosis terminal and body.

Connector & terminal / Specified resistance:
(B57) — Body / 1 Ω, or less

9. General Diagnostic Table

Problem parts / Symptom	Inhibitor switch	Control module	Vehicle speed sensor 1	Vehicle speed sensor 2	Select cable	Select lever	FWD switch	Starter motor and harness	Throttle position sensor	Diagnosis switch	Accumulator ("N" — "D")	Accumulator (2A)	Accumulator (4A)	Accumulator (3R)	ATF temperature sensor	Strainer	Duty solenoid A	Duty solenoid B	Shift solenoid 1	Shift solenoid 2	Shift solenoid 3	Control valve	Detent spring	Manual plate	Transfer clutch	Transfer valve	Transfer pipe	Duty solenoid C	Forward clutch
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Starter does not rotate when select lever is in "P" or "N."; starter rotates when select lever is "R", "D", "3" or "2."	X				X	X		X																					
Abnormal noise when select lever is in "P" or "N."																X												X	
Hissing noise occurs during standing starts.																X													
Noise occurs while driving in "D_1" range.																													
Noise occurs while driving in "D_2" range.																													
Noise occurs while driving in "D_3" range.																													
Noise occurs while driving in "D_4" range.																													
Engine stalls while shifting from one range to another.																						X							
Vehicle moves when select lever is in "N."																													X
Shock occurs when select lever is moved from "N" to "D."		X									X											X							
Excessive time lag occurs when select lever is moved from "N" to "D."																						X							X
Shock occurs when select lever is moved from "N" to "R."		X											X									X							
Excessive time lag occurs when select lever is moved from "N" to "R."																						X							
Vehicle does not start in any shift range (engine revving up).																X						X							
Vehicle does not start in any shift range (engine stall).																													
Vehicle does not start in "R" range only (engine revving up).					X	X																X							
Vehicle does not start in "R" range only (engine stall).																													X
Vehicle does not start in "D" or "3" range (engine revving up).																													X
Vehicle does not start in "D", "3" or "2" range (engine revving up).																													X
Vehicle does not start in "D", "3" or "2" range (engine stall).																													
Vehicle starts in "R" range only (engine revving up).																						X							
Acceleration during standing starts is poor (high stall rpm).																						X							X
Acceleration during standing starts is poor (low stall rpm).																													
Acceleration is poor when select lever is in "D", "3" or "2" range (normal stall rpm).		X																				X							
Acceleration is poor when select lever is in "R" (normal stall rpm).																						X							
No shift occurs from 1st to 2nd gear.		X	X	X					X										X	X		X							
No shift occurs from 2nd to 3rd gear.		X																				X							
No shift occurs from 3rd to 4th gear.		X												X	X						X	X							
No "kick-down" shifts occur.		X							X																				
Engine brake is not effected when select lever is in "3" range.	X	X							X													X							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29

Overrunning clutch	Drive pinion	Crown gear	Axle shaft	Differential gear	Final gear	Seal pipe	Oil pump	High clutch	Band brake	Low & reverse clutch	Reverse clutch	One-way clutch (1-2)	One-way clutch (3-4)	Double oil seal	Input shaft	Output shaft	Planetary gear	Reduction gear	Drive plate	Torque converter one-way clutch	Lock-up facing	Lock-up damper	ATF deterioration	ATF level too high or too low	Differential gear oil level too high or too low	Engine performance	Engine speed signal	Parking brake mechanism	Problem parts
30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	Symptom
																													Starter does not rotate when select lever is in “P” or “N.”; starter rotates when select lever is “R”, “D”, “3” or “2.”
							X												X					X					Abnormal noise when select lever is in “P” or “N.”
																								X					Hissing noise occurs during standing starts.
					X												X	X							X				Noise occurs while driving in “D_1” range.
					X												X	X							X				Noise occurs while driving in “D_2” range.
					X													X							X				Noise occurs while driving in “D_3” range.
					X												X	X							X				Noise occurs while driving in “D_4” range.
																						X				X			Engine stalls while shifting from one range to another.
																													Vehicle moves when select lever is in “N.”
																							X						Shock occurs when select lever is moved from “N” to “D.”
																													Excessive time lag occurs when select lever is moved from “N” to “D.”
																							X						Shock occurs when select lever is moved from “N” to “R.”
										X	X																		Excessive time lag occurs when select lever is moved from “N” to “R.”
	X	X	X	X			X								X	X	X		X					X					Vehicle does not start in any shift range (engine revving up).
																												X	Vehicle does not start in any shift range (engine stall).
										X	X																		Vehicle does not start in “R” range only (engine revving up).
									X								X												Vehicle does not start in “R” range only (engine stall).
												X																	Vehicle does not start in “D” or “3” range (engine revving up).
																													Vehicle does not start in “D”, “3” or “2” range (engine revving up).
											X																		Vehicle does not start in “D”, “3” or “2” range (engine stall).
																													Vehicle starts in “R” range only (engine revving up).
											X														X				Acceleration during standing starts is poor (high stall rpm).
							X													X						X			Acceleration during standing starts is poor (low stall rpm).
								X	X								X												Acceleration is poor when select lever is in “D”, “3” or “2” range (normal stall rpm).
X								X	X								X												Acceleration is poor when select lever is in “R” (normal stall rpm).
									X																				No shift occurs from 1st to 2nd gear.
								X					X																No shift occurs from 2nd to 3rd gear.
									X																				No shift occurs from 3rd to 4th gear.
																													No “kick-down” shifts occur.
																													Engine brake is not effected when select lever is in “3” range.
30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	

9. General Diagnostic Table

Problem parts / Symptom	Inhibitor switch	Control module	Vehicle speed sensor 1	Vehicle speed sensor 2	Select cable	Select lever	FWD switch	Starter motor and harness	Throttle position sensor	Diagnosis switch	Accumulator ("N" — "D")	Accumulator (2A)	Accumulator (4A)	Accumulator (3R)	ATF temperature sensor	Strainer	Duty solenoid A	Duty solenoid B	Shift solenoid 1	Shift solenoid 2	Shift solenoid 3	Control valve	Detent spring	Manual plate	Transfer clutch	Transfer valve	Transfer pipe	Duty solenoid C	Forward clutch
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Engine brake is not effected when select lever is in "3" or "2" range.																													
Engine brake is not effected when select lever is in "1" range.																						X							
Shift characteristics are erroneous.	X	X	X	X					X													X							
No lock-up occurs.		X							X						X							X							
Vehicle cannot be set in "D" range power mode.		X							X																				
"D" range power mode cannot be released.		X							X						X														
Parking brake is not effected.					X	X																							
Shift lever cannot be moved or is hard to move from "P" range.					X	X																							
Select lever is hard to move.					X	X																	X	X					
Select lever is too light to move (unreasonable resistance).																							X	X					
ATF spurts out.																													
Differential oil spurts out.																													
Differential oil level changes excessively.																													
Odor is produced from oil supply pipe.																									X				X
Shock occurs when select lever is moved from "1" to "2" range.		X							X			X			X		X					X							
Slippage occurs when select lever is moved from "1" to "2" range.		X							X			X			X		X					X							
Shock occurs when select lever is moved from "2" to "3" range.		X							X					X	X		X					X							
Slippage occurs when select lever is moved from "2" to "3" range.		X							X					X	X		X					X							
Shock occurs when select lever is moved from "3" to "4" range.		X							X				X		X		X					X							
Slippage occurs when select lever is moved from "3" to "4" range.		X							X				X		X		X					X							
Shock occurs when select lever is moved from "3" to "2" range.		X							X						X		X					X							
Shock occurs when select lever is moved from "D" to "1" range.		X							X						X		X					X							
Shock occurs when select lever is moved from "2" to "1" range.		X							X						X		X					X							
Shock occurs when accelerator pedal is released at medium speeds.		X							X						X		X					X							
Vibration occurs during straight-forward operation.		X																X											
Select lever slips out of position during acceleration or while driving on rough terrain.					X	X																	X	X					
Vibration occurs during turns (tight corner "braking" phenomenon).		X	X	X					X						X										X	X		X	
Front wheel slippage occurs during standing starts.		X		X			X		X						X							X			X	X	X	X	
Vehicle is not set in FWD mode.		X					X																		X	X		X	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29

Overrunning clutch	Drive pinion	Crown gear	Axle shaft	Differential gear	Final gear	Seal pipe	Oil pump	High clutch	Band brake	Low & reverse clutch	Reverse clutch	One-way clutch (1-2)	One-way clutch (3-4)	Double oil seal	Input shaft	Output shaft	Planetary gear	Reduction gear	Drive plate	Torque converter one-way clutch	Lock-up facing	Lock-up damper	ATF deterioration	ATF level too high or too low	Differential gear oil level too high or too low	Engine performance	Engine speed signal	Parking brake mechanism	Problem parts
30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	Symptom
X																													Engine brake is not effected when select lever is in “3” or “2” range.
										X																			Engine brake is not effected when select lever is in “1” range.
																													Shift characteristics are erroneous.
																					X						X		No lock-up occurs.
																													Vehicle cannot be set in “D” range power mode.
																													“D” range power mode cannot be released.
																												X	Parking brake is not effected.
																												X	Shift lever cannot be moved or is hard to move from “P” range.
																													Select lever is hard to move.
																													Select lever is too light to move (unreasonable resistance).
																								X					ATF spurts out.
																									X				Differential oil spurts out.
						X								X															Differential oil level changes excessively.
X								X	X	X	X										X		X						Odor is produced from oil supply pipe.
									X														X			X			Shock occurs when select lever is moved from “1” to “2” range.
									X																				Slippage occurs when select lever is moved from “1” to “2” range.
								X	X														X			X			Shock occurs when select lever is moved from “2” to “3” range.
								X	X																				Slippage occurs when select lever is moved from “2” to “3” range.
X									X														X			X			Shock occurs when select lever is moved from “3” to “4” range.
									X																				Slippage occurs when select lever is moved from “3” to “4” range.
X									X														X						Shock occurs when select lever is moved from “3” to “2” range.
																							X						Shock occurs when select lever is moved from “D” to “1” range.
										X													X						Shock occurs when select lever is moved from “2” to “1” range.
																						X				X			Shock occurs when accelerator pedal is released at medium speeds.
																					X	X							Vibration occurs during straight-forward operation.
																													Select lever slips out of position during acceleration or while driving on rough terrain.
																							X						Vibration occurs during turns (tight corner “braking” phenomenon).
																													Front wheel slippage occurs during standing starts.
																													Vehicle is not set in FWD mode.
30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	

ANTILOCK BRAKE SYSTEM 4-4

1. Diagnostics Chart for On-board Diagnosis System

SUPPLEMENTAL RESTRAINT SYSTEM “AIRBAG”

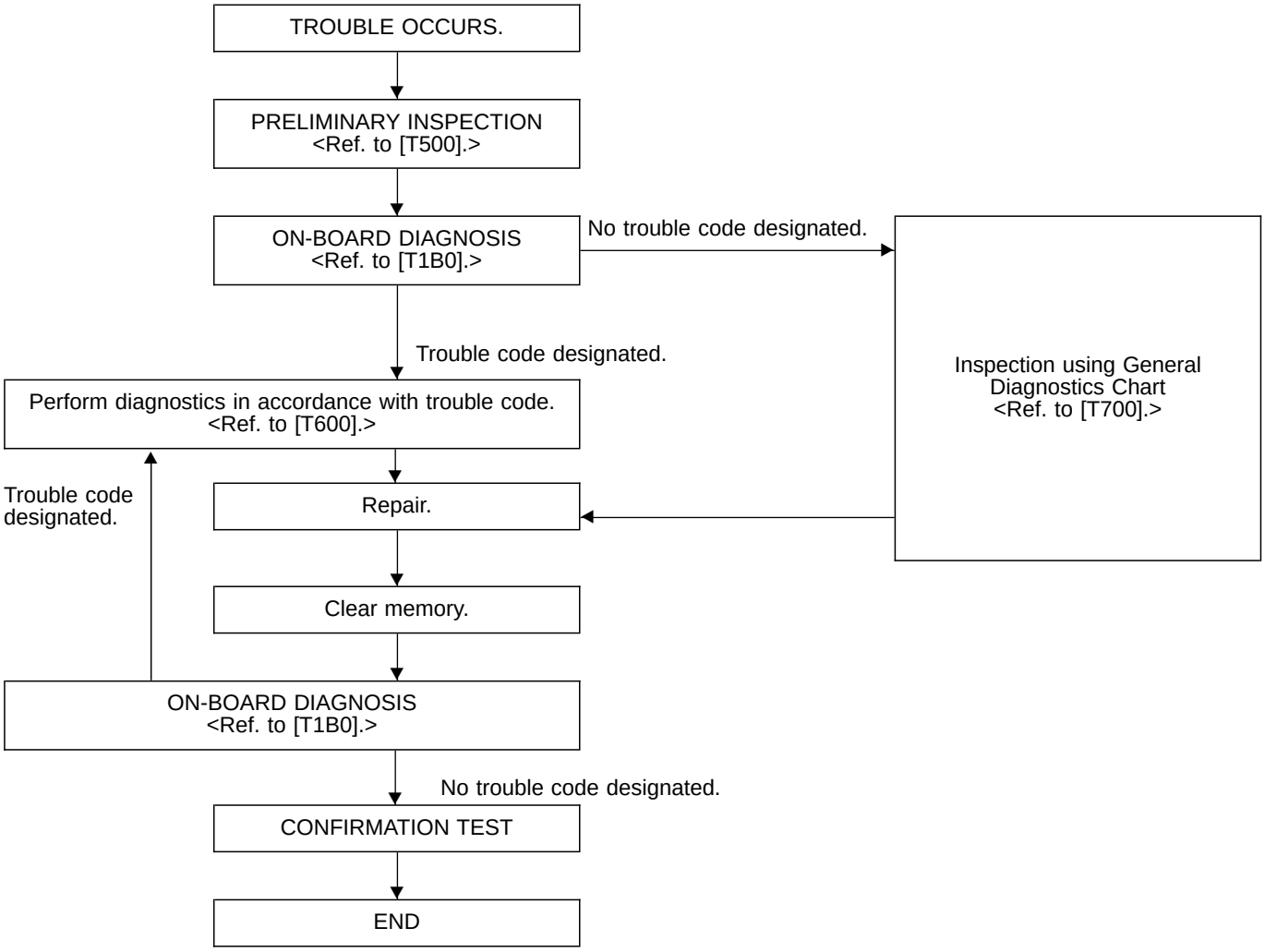
Airbag system wiring harness is routed near the bulkhead harness.

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 Airbag system wiring harness when servicing the bulkhead harness.

A: BASIC DIAGNOSTICS PROCEDURE



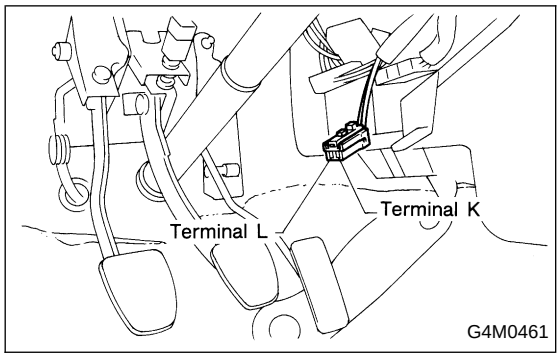
NOTE:

● To check harness for broken wires or short circuits, shake it while holding it or the connector.

● When A.B.S. warning light illuminates, read and record trouble code indicated by A.B.S. warning light.

B: ON-BOARD DIAGNOSIS

The on-board diagnosis system is designed to detect problems after the vehicle has been driven at 10 km/h (6 MPH) or more for at least 20 seconds. If a problem is found, the A.B.S. warning light will illuminate to inform the driver of the occurrence of a problem. When the warning light is on, the A.B.S. system will be inactive and the normal braking function will work. It is possible for a maximum of three trouble codes to be stored in memory until cleared.



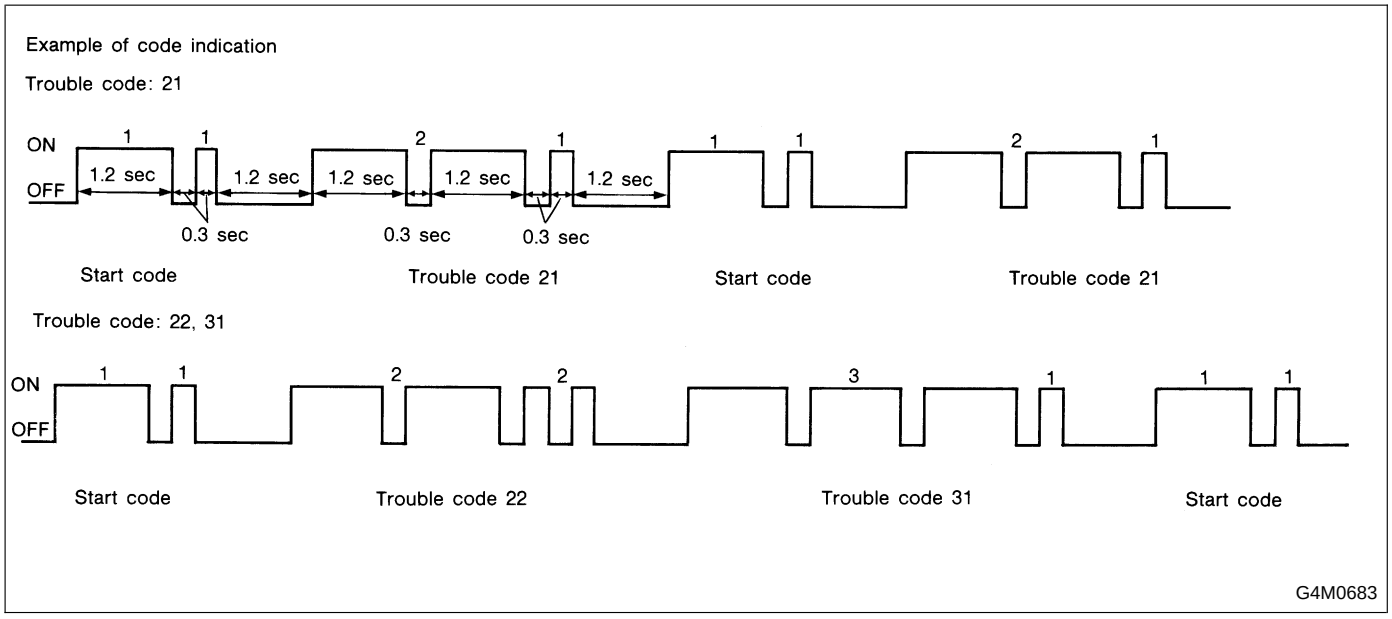
C: TROUBLE CODES

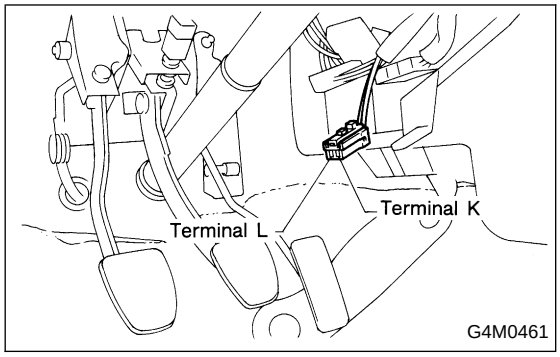
When on-board diagnosis of the A.B.S. control module detects a problem, the information (up to a maximum of three) will be stored in the EEP ROM as a trouble code. When there are more than three, the most recent three will be stored. (Stored codes will stay in memory until they are cleared.)

1. CALLING UP A TROUBLE CODE

1) Take out A.B.S. check connector from under side of steering column.
2) Turn ignition switch OFF.
3) Ground A.B.S. check connector terminal L.
4) Turn ignition switch ON.
5) A.B.S. warning light is set in the diagnostic mode and blinks to identify trouble code.
6) After the start code (11) is shown, the trouble codes will be shown in order of the last information first.
These repeat for a maximum of 5 minutes.

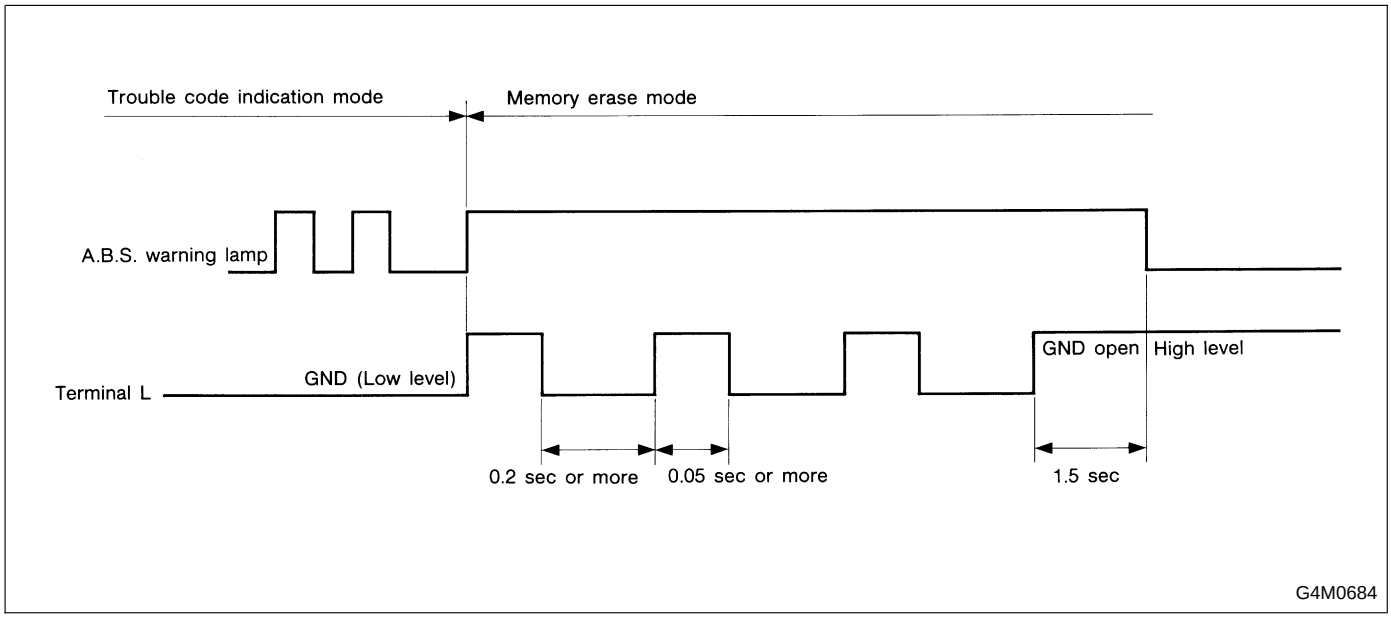
NOTE:
When there are no trouble codes in memory, only the start code (11) is shown.





2. CLEARING MEMORY

1) After calling up a trouble code, disconnect A.B.S. check connector terminal L from body ground.
2) Repeat 3 times within approx. 12 seconds; connecting and disconnecting terminal L and body ground for at least 0.05 seconds each time.

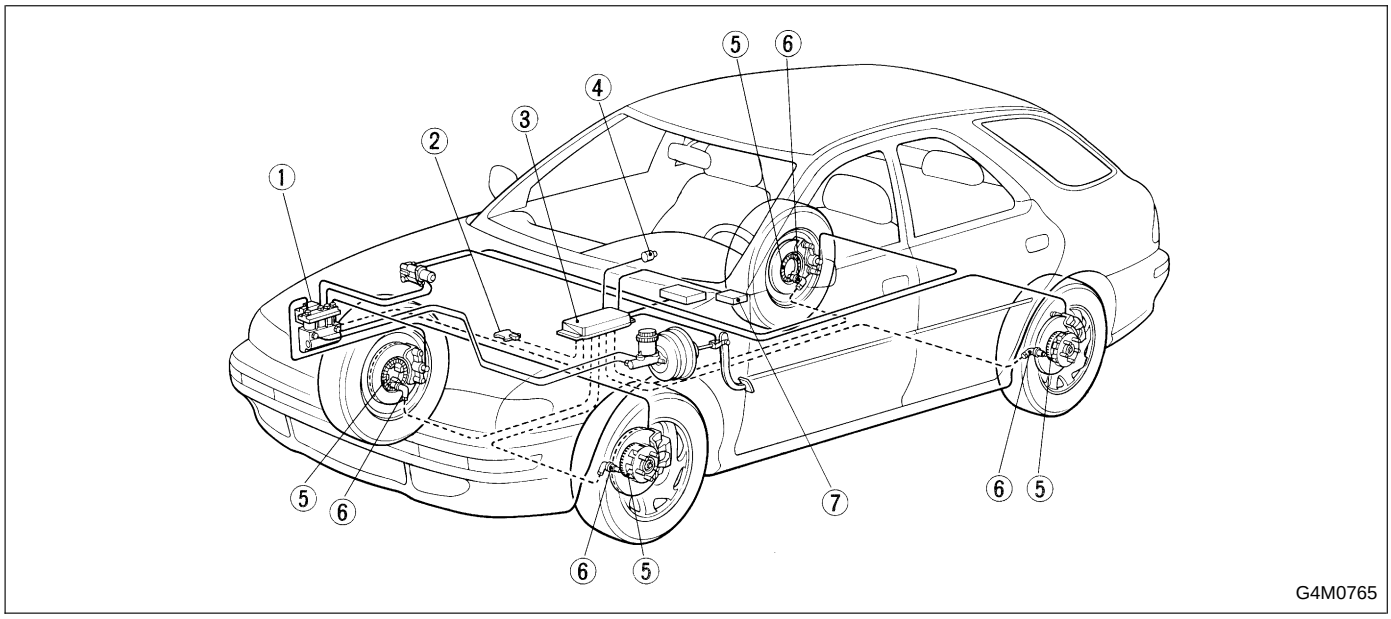


3. LIST OF TROUBLE CODES

Trouble code	Contents of diagnosis	
NONE: A [Warning light OFF]	Trouble in warning light drive circuit (Warning light is not on for 1.5 seconds after ignition switch is on.)	
NONE: B [Warning light ON] or [Abnormal trouble code output]	Trouble in warning light drive circuit	
11	**Start code:** ● **Trouble code is shown after start code.** ● **Only start code is shown in normal condition.**	
21	Faulty A.B.S. sensor (Open circuit or input voltage excessive)	Front right wheel sensor
23		Front left wheel sensor
25		Rear right wheel sensor
27		Rear left wheel sensor
22	Faulty A.B.S. sensor (When there is no open circuit or speed signal input.)	Front right wheel sensor
24		Front left wheel sensor
26		Rear right wheel sensor
28		Rear left wheel sensor
29	Faulty tone wheel, etc.	
31	Faulty solenoid valve circuit(s) in hydraulic unit	Front right wheel control
33		Front left wheel control
39		Rear wheels control
41	Faulty A.B.S. control module	
42	Source voltage is low.	
51	Faulty valve relay	
52	Faulty hydraulic motor and/or motor relay	
54	Faulty stop light circuit	
56	Use of improper A.B.S. control module specification, or faulty G sensor	

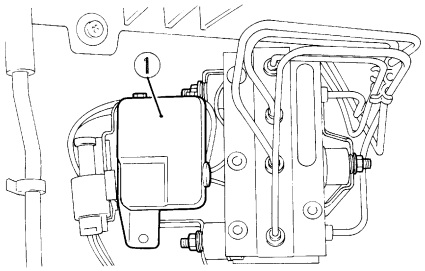
After diagnostics is completed, make sure to clear memory. Make sure only start code (11) is shown after memory is cleared.

2. Electrical Unit Location

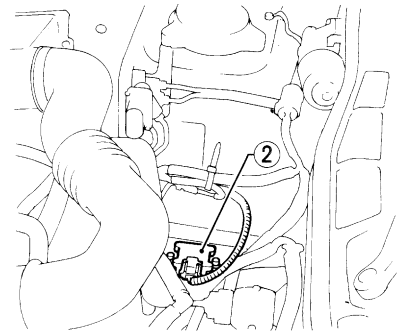


G4M0765

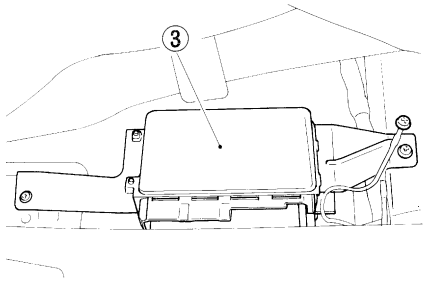
① Hydraulic control unit
② G sensor (AWD MT model)
③ A.B.S. control module
④ Warning light
⑤ Tone wheel
⑥ A.B.S. sensor
⑦ Check connector



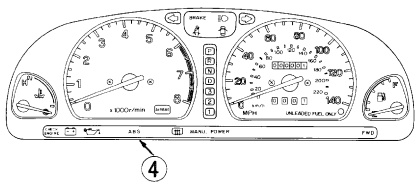
G4M0766



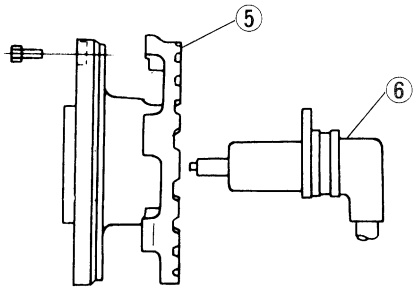
G4M0767



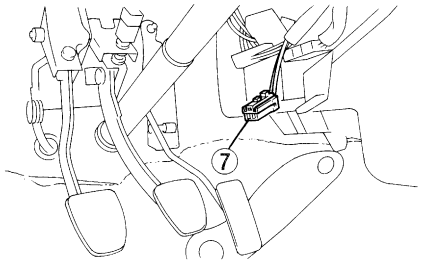
G4M0917



G4M0770

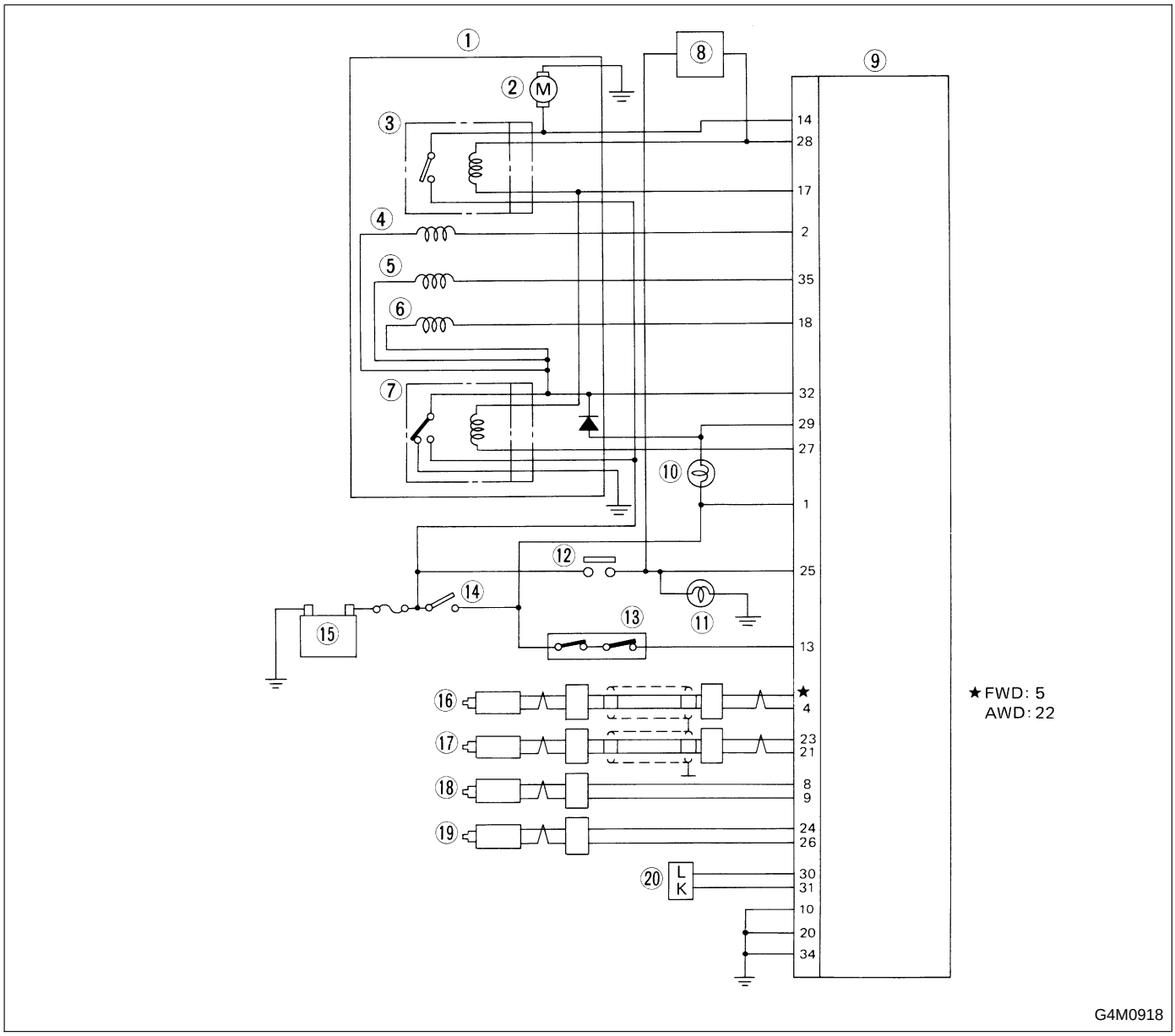


G4M0769



G4M0771

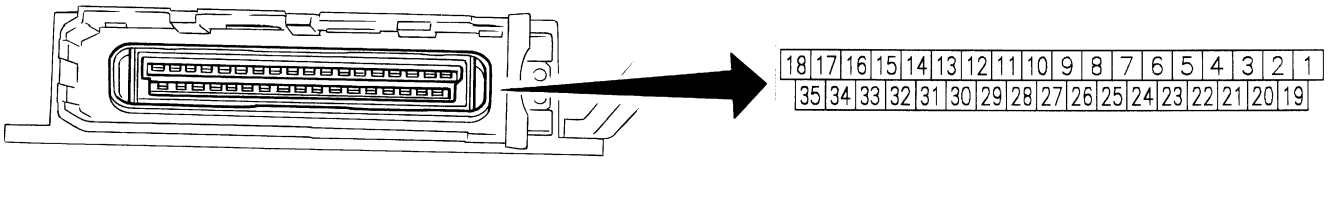
3. Schematic



① Hydraulic unit
② Motor
③ Motor relay
④ Front left solenoid valve
⑤ Front right solenoid valve
⑥ Rear solenoid valve
⑦ Valve relay
⑧ AT control module
⑨ A.B.S. control module
⑩ Warning light
⑪ Stop light
⑫ Stop light switch
⑬ G sensor (AWD MT model)
⑭ Ignition switch
⑮ Battery
⑯ Front left sensor
⑰ Front right sensor
⑱ Rear left sensor
⑲ Rear right sensor
⑳ Check connector

4. Control Module I/O Signal

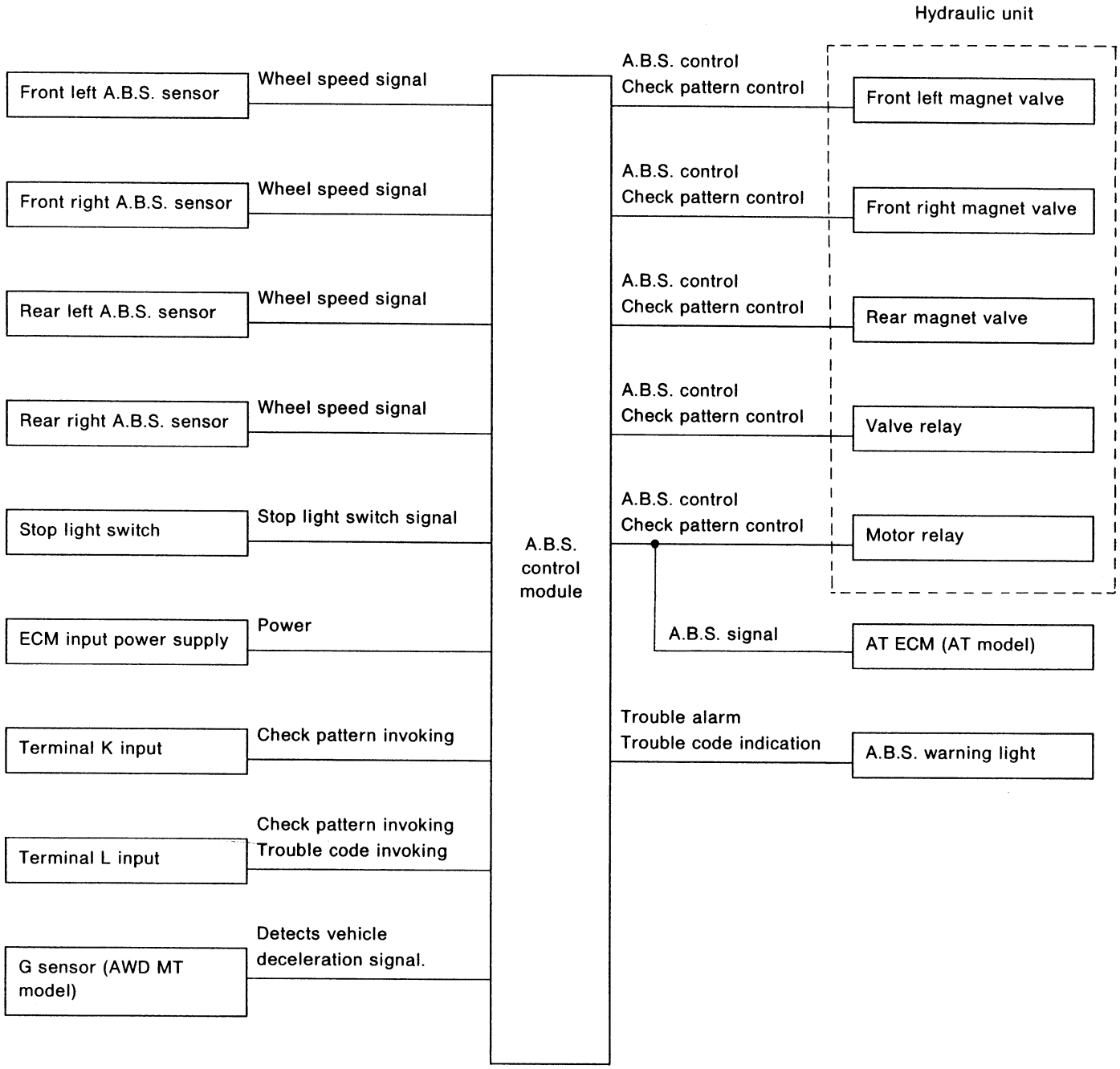
1. I/O SIGNAL VOLTAGE



G4M0685

Contents			Terminal No.	Ignition switch ON, engine OFF	Input/output signals	
					Measured value	Measuring conditions
A.B.S. sensor	Front left wheel		FWD 5	0V	0.12 — 1V (When it is 10 Hz)	• No. 22 or No. 5 — No. 4
			AWD 22			
	GND		4			
	Front right wheel		23	0V	0.12 — 1V (When it is 10 Hz)	• No. 23 — No. 21
	GND		21			
	Rear left wheel		8	0V	0.12 — 1V (When it is 10 Hz)	• No. 8 — No. 9
	GND		9			
	Rear right wheel		24	0V	0.12 — 1V (When it is 10 Hz)	• No. 24 — No. 26
	GND		26			
G sensor (AWD MT model)			13	10 — 12V	0V	When slanting about 14° — 21.3° (θ)
Check connector			30	—	—	—
			31			
Stop light switch			25	0V	5 — 10V	When brake pedal is depressed.
Motor monitoring			14	0V	10 — 12V	When motor operates.
Valve power supply monitoring			32	10 — 12V	10 — 12V	—
Hydraulic unit	Solenoid	Front left wheel	2	10 — 12V	0V	When solenoid is energized to produce output.
		Front right wheel	35	10 — 12V	0V	
		Rear wheel	18	10 — 12V	0V	
	Valve relay coil		27	0V	0V	—
	Motor relay coil		28	10 — 12V	0V	When motor operates to produce output.
Warning light			29	0V	10 — 12V	Ignition switch ON (Engine OFF)
Power supply	Battery		1	10 — 12V	10 — 12V	—
	Relay coil (valve, motor, etc.)		17	10 — 12V	10 — 12V	—
Grounding line			10	0V	0V	—
			20	0V	0V	—
			34	0V	0V	—

2. I/O SIGNAL DIAGRAM



5. Preliminary Inspection

Before performing diagnostics, check the following items which might affect A.B.S. problems:

1. POWER SUPPLY

1) Measure battery voltage and specific gravity of electrolyte.

Standard voltage: 12V, or more
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. BRAKE FLUID

1) Brake fluid level
2) Brake fluid leakage

3. BRAKE DRAG

4. BRAKE PAD AND ROTOR

5. TIRE SPECIFICATIONS, TIRE WEAR AND AIR PRESSURE

6. Diagnostics Chart with Trouble Code

Trouble code	Contents of diagnosis		Page
NONE: A [Warning light OFF]	Trouble in warning light drive circuit (Warning light is not on for 1.5 seconds after ignition switch is on.)		12
NONE: B [Warning light ON] or [Abnormal trouble code output]	Trouble in warning light drive circuit		14
11	**Start code:** ● **Trouble code is shown after start code.** ● **Only start code is shown in normal condition.**		—
21	Faulty A.B.S. sensor (Open circuit or input voltage excessive)	Front right wheel sensor	16
23		Front left wheel sensor	16
25		Rear right wheel sensor	16
27		Rear left wheel sensor	16
22	Faulty A.B.S. sensor (When there is no open circuit or speed signal input.)	Front right wheel sensor	20
24		Front left wheel sensor	20
26		Rear right wheel sensor	20
28		Rear left wheel sensor	20
29	Faulty tone wheel, etc.		24
31	Faulty solenoid valve circuit(s) in hydraulic unit	Front right wheel control	28
33		Front left wheel control	28
39		Rear wheels control	28
41	Faulty A.B.S. control module		30
42	Source voltage is low.		30
51	Faulty valve relay		32
52	Faulty hydraulic motor and/or motor relay		36
54	Faulty stop light circuit		39
56	Use of improper A.B.S. control module specification, or faulty G sensor		40

A: TROUBLE CODE (NONE: A) — TROUBLE IN WARNING LIGHT DRIVE CIRCUIT —

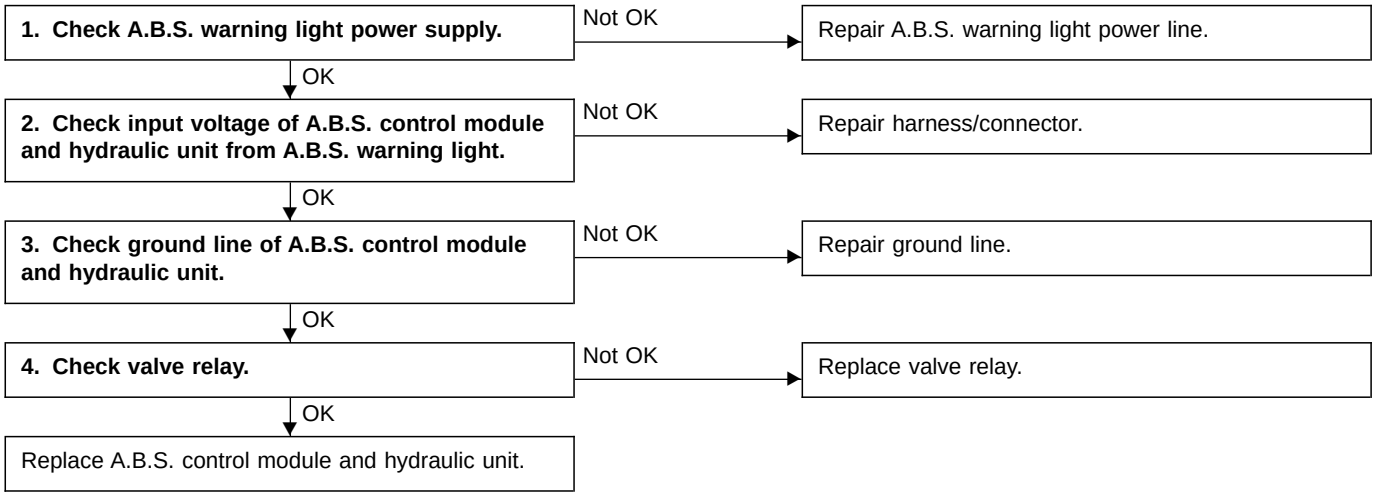
DIAGNOSIS:

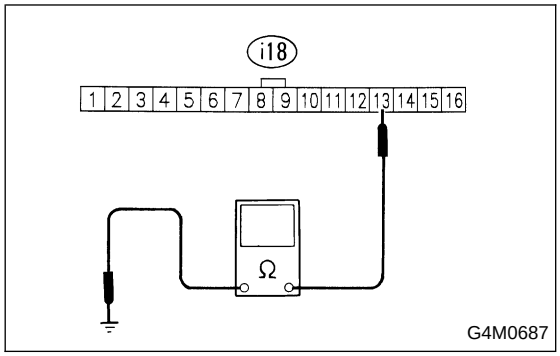
- Faulty A.B.S. warning light
- Faulty harness connector
- Faulty A.B.S. control module
- Faulty valve relay

TROUBLE SYMPTOM:

- Warning light does not illuminate.
- Impossible to read trouble code.

NOTE:
When ignition key is on, warning light should turn off after 1.5 seconds if system is normal.

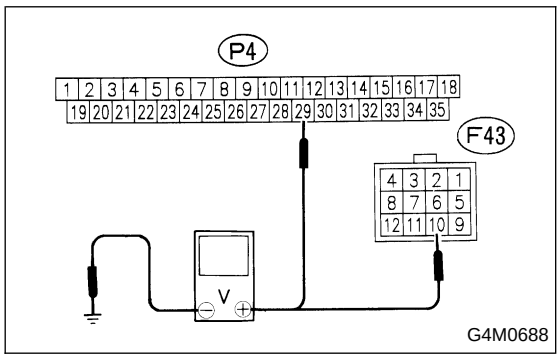




1. CHECK A.B.S. WARNING LIGHT POWER SUPPLY.

1) Turn ignition switch OFF.
2) Disconnect combination meter.
3) Check A.B.S. warning light valve.
4) Turn ignition switch ON.
5) Measure voltage between combination meter connector and body.

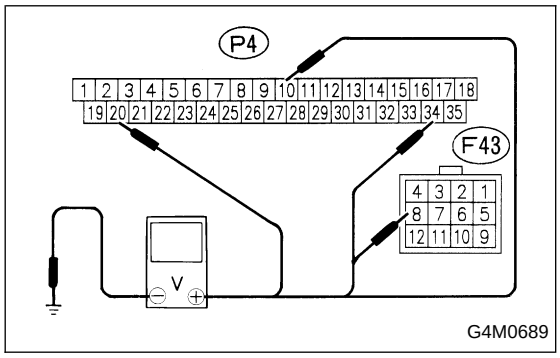
Connector & terminal / Specified voltage:
(i18) No. 13 — Body / 10 — 12 V



2. CHECK INPUT VOLTAGE OF A.B.S. CONTROL MODULE AND HYDRAULIC UNIT FROM A.B.S. WARNING LIGHT.

1) Turn ignition switch OFF and remove combination meter.
2) Disconnect connector from A.B.S. control module and hydraulic unit.
3) Turn ignition switch ON.
4) Measure voltage between A.B.S. control module and body, and between hydraulic unit and body.

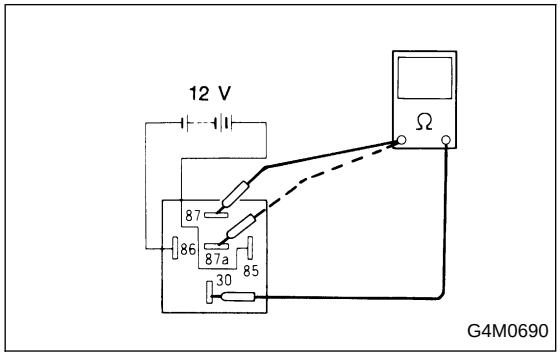
Connector & terminal / Specified voltage:
(P4) No. 29 — body / 10 — 12 V
(F43) No. 10 — body / 10 — 12 V



3. CHECK GROUND LINE OF A.B.S. CONTROL MODULE AND HYDRAULIC UNIT.

1) Measure resistance between A.B.S. control module and body, and between hydraulic unit and body.

Connector & terminal / Specified resistance:
(P4) No. 10 — body / 0 Ω
(P4) No. 20 — body / 0 Ω
(P4) No. 34 — body / 0 Ω
(F43) No. 8 — body / 0 Ω



4. CHECK VALVE RELAY.

1) Remove valve relay.
2) Attach circuit tester probes to terminals, as shown in figure.
3) Measure resistance between respective terminals.

Terminal / Specified resistance:
No. 87 — 30 / 0 Ω (when 12 volts applied.)
No. 87 — 30 / 1 MΩ (when no voltage is applied.)
No. 87a — 30 / 1 MΩ (when 12 volts applied.)
No. 87a — 30 / 0 Ω (when no voltage is applied.)

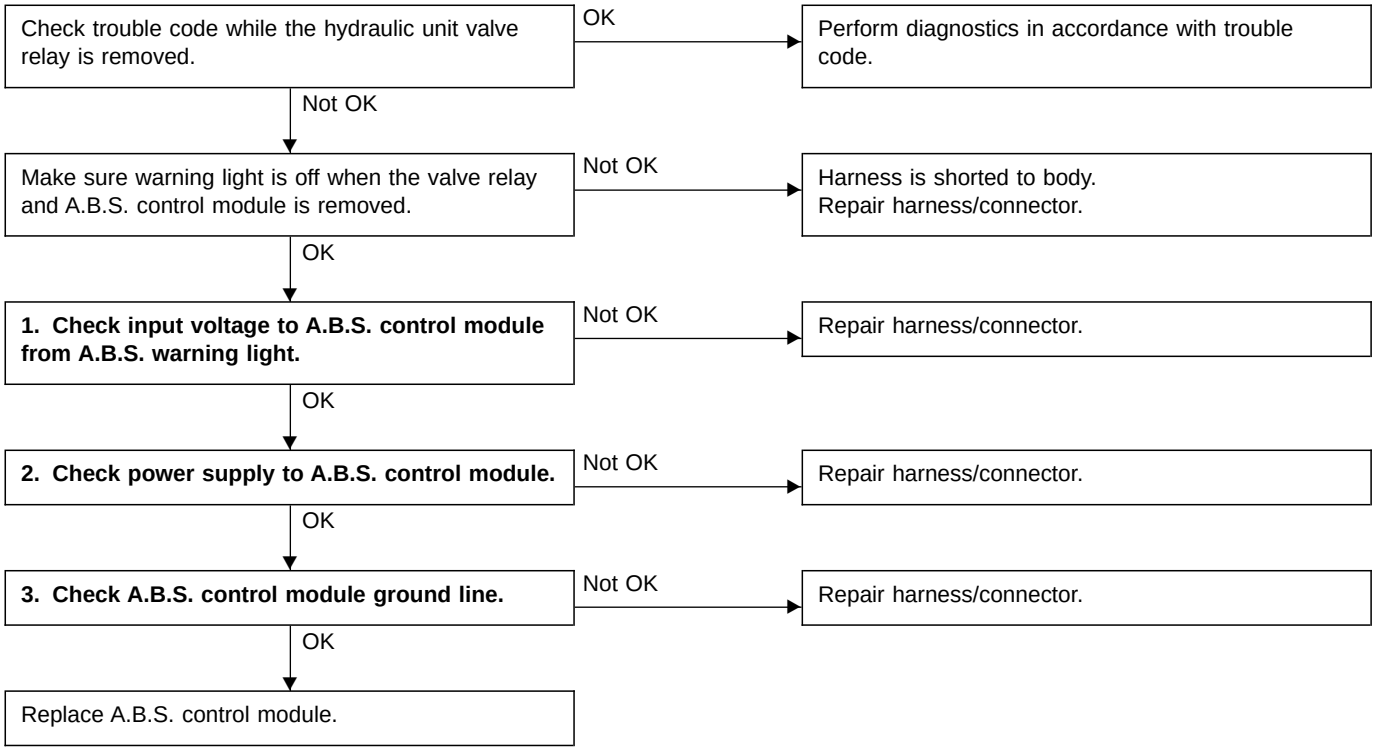
B: TROUBLE CODE (NONE: B) — TROUBLE IN WARNING LIGHT DRIVE CIRCUIT —

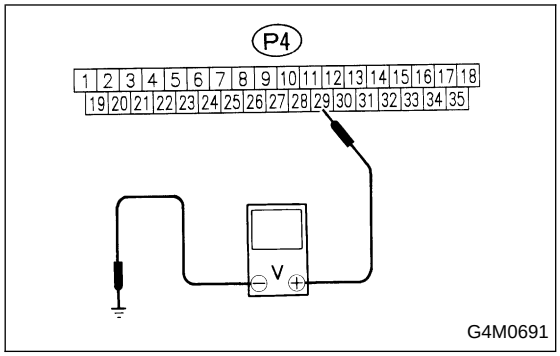
DIAGNOSIS:

- Faulty harness
- Faulty A.B.S. control module

TROUBLE SYMPTOM:

- Warning light remains on.
- Impossible to read trouble code.

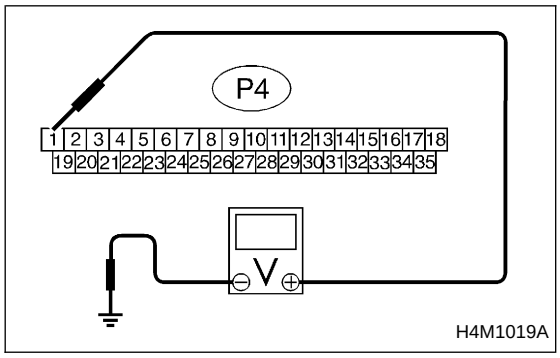




1. CHECK INPUT VOLTAGE TO A.B.S. CONTROL MODULE FROM A.B.S. WARNING LIGHT.

1) Turn ignition switch OFF.
2) Disconnect connector from A.B.S. control module.
3) Turn ignition switch ON.
4) Measure voltage between A.B.S. control module connector and body.

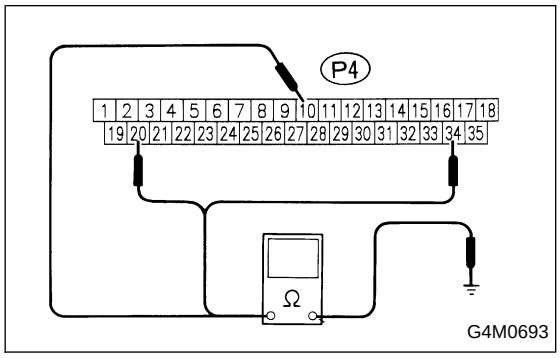
Connector & terminal / Specified voltage:
(P4) No. 29 — Body / 10 — 12 V



2. CHECK POWER SUPPLY TO A.B.S. CONTROL MODULE.

1) Turn ignition switch ON.
2) Measure voltage between A.B.S. control module connector and body.

Connector & terminal / Specified voltage:
(P4) No. 1 — Body / 10 — 12 V



3. CHECK A.B.S. CONTROL MODULE GROUND LINE.

1) Measure resistance between A.B.S. control module and body.

Connector & terminal / Specified resistance:
(P4) No. 10 — body / 0 Ω
(P4) No. 20 — body / 0 Ω
(P4) No. 34 — body / 0 Ω

C: TROUBLE CODE 21, 23, 25 AND 27 — FAULTY A.B.S. SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE EXCESSIVE) —

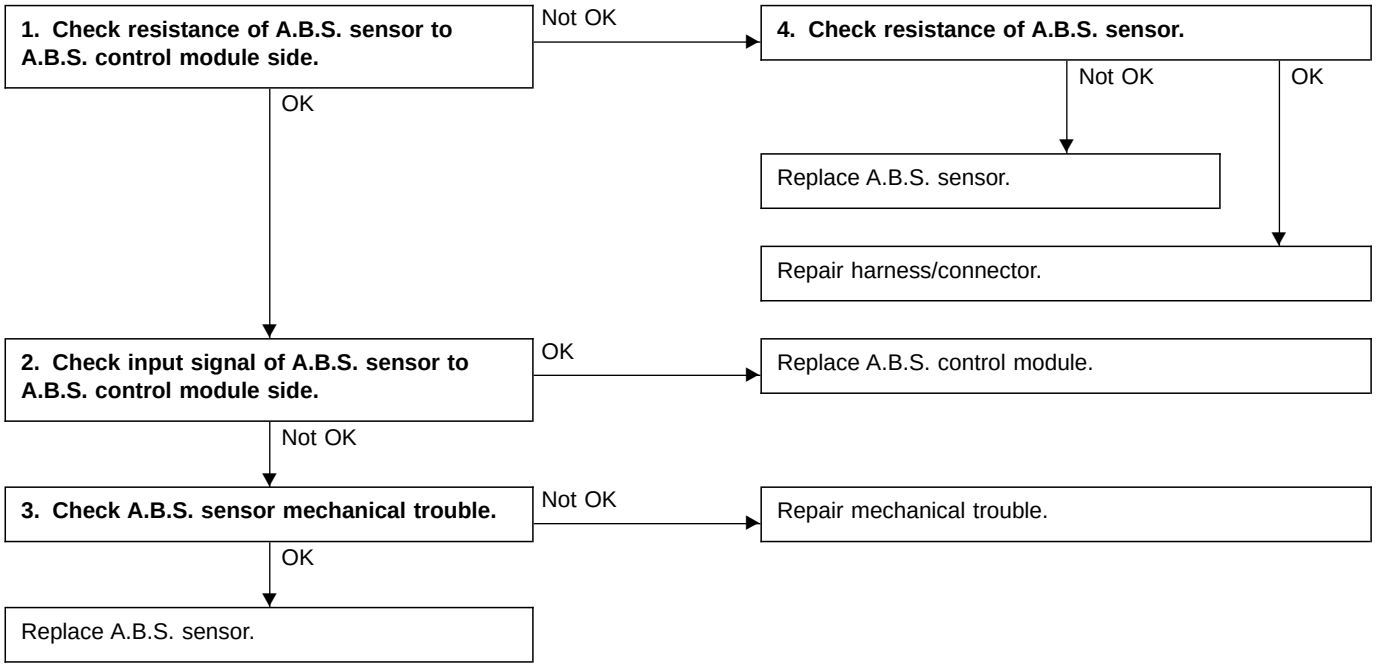
DIAGNOSIS:

- Faulty A.B.S. sensor
- Faulty harness
- Faulty A.B.S. control module

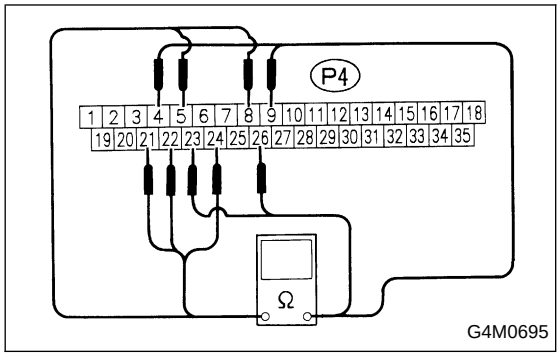
TROUBLE SYMPTOM:

- A.B.S. does not operate.

NOTE:
Trouble codes 21, 23, 25, and 27 will not be stored while vehicle is stationary and can't specify problem location. Drive vehicle first, perform diagnosis and read trouble code.



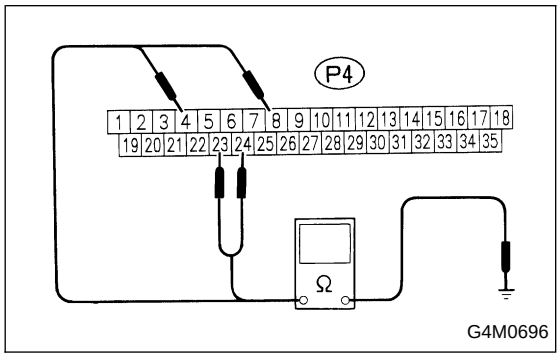
NOTE:
When checking A.B.S. sensor, carefully bend or swing connector and harness to check for improper contacts or open circuits.



1. CHECK RESISTANCE OF A.B.S. SENSOR TO A.B.S. CONTROL MODULE SIDE.

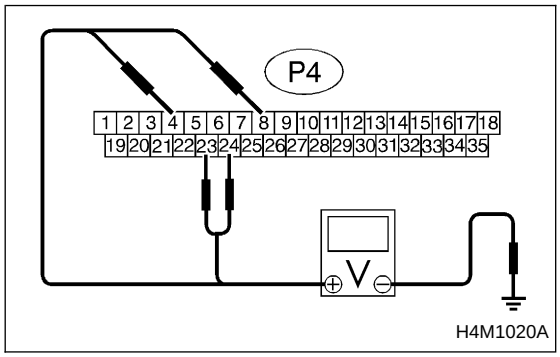
1) Turn ignition switch OFF.
2) Disconnect connector from A.B.S. control module.
3) Measure resistance between A.B.S. control module connector terminals.

TROUBLE CODE / Connector & terminal:
21 / (P4) No. 23 — No. 21
23 / (P4) No. 22 — No. 4: AWD
(P4) No. 5 — No. 4: FWD
25 / (P4) No. 24 — No. 26
27 / (P4) No. 8 — No. 9
Specified resistance: 0.8 — 1.3 kΩ



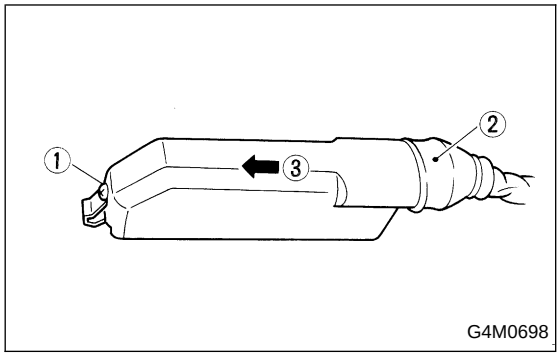
4) Measure resistance between A.B.S. control module connector and body.

TROUBLE CODE / Connector & terminal:
21 / (P4) No. 23 — body
23 / (P4) No. 4 — body
25 / (P4) No. 24 — body
27 / (P4) No. 8 — body
Specified resistance: 1 MΩ, min.



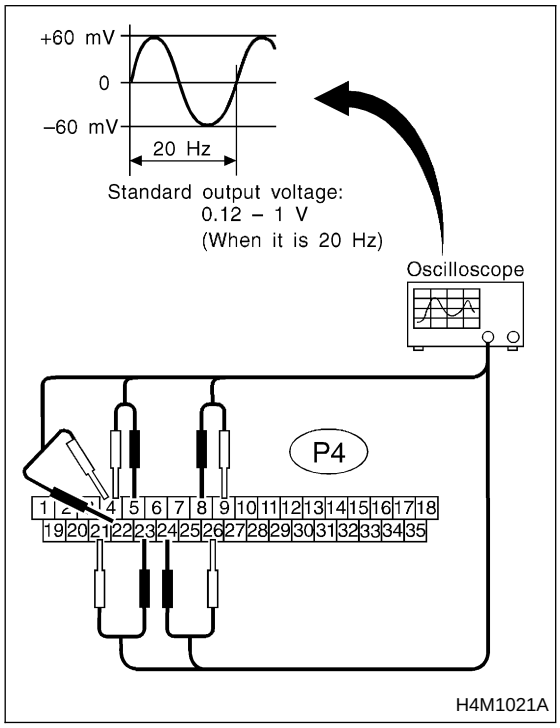
5) Turn ignition switch ON.
6) Measure voltage between A.B.S. control module connector and body.

TROUBLE CODE / Connector & terminal:
21 / (P4) No. 23 — body
23 / (P4) No. 4 — body
25 / (P4) No. 24 — body
27 / (P4) No. 8 — body
Specified voltage: 0 V



2. CHECK INPUT SIGNAL OF A.B.S. SENSOR TO A.B.S. CONTROL MODULE SIDE.

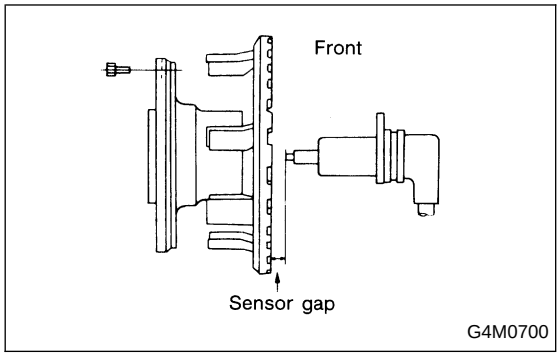
1) Raise all four wheels of ground.
2) Turn ignition switch OFF.
3) Disconnect connector from A.B.S. control module.
4) Disconnect connector cover from connector.
   (a) Remove screw from portion ①.
   (b) Move rubber boot ② back (toward harness).
   (c) Slide cover ③ in direction shown by arrow and remove.
5) Connect connector to A.B.S. control module.
6) Connect the oscilloscope to the A.B.S. control module connector in accordance with trouble code.
7) Turn ignition switch ON.

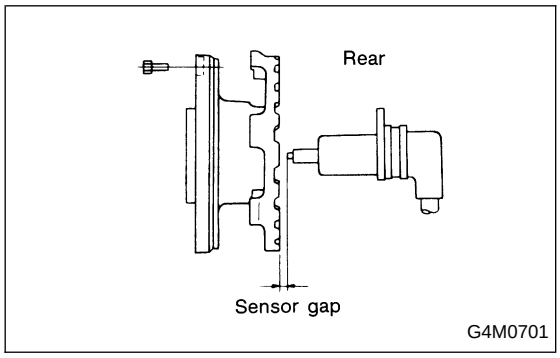


8) Rotate wheels and measure voltage at specified frequency.

NOTE:
When this inspection is completed, the A.B.S. control module sometimes stores the trouble code 29.

TROUBLE CODE / Connector & terminal:
21 / (P4) No. 23 — No. 21
23 / (P4) No. 22 — No. 4: AWD
(P4) No. 5 — No. 4: FWD
25 / (P4) No. 24 — No. 26
27 / (P4) No. 8 — No. 9
Specified voltage: 0.12 — 1 V (When it is 20 Hz)





3. CHECK A.B.S. SENSOR MECHANICAL TROUBLE.

1) Dismount brake as outlined in manual to gain access to A.B.S. sensor and tone wheel for inspection.
2) Check pole piece and tone wheel for accumulation of foreign particles. If necessary, remove foreign particles and clean.
3) Check tone wheel teeth for cracks for deformities. If necessary, replace tone wheel (No. of teeth: 44) with a new one.
4) Check tone wheel for looseness.

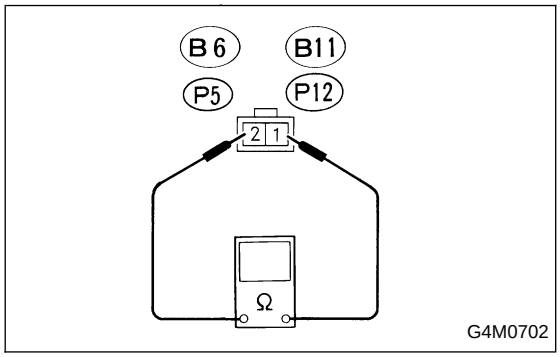
Tightening torque:
10 — 16 N·m (1 — 1.6 kg-m, 7 — 12 ft-lb)

5) Measure tone wheel-to-pole piece gap over entire perimeter of the wheel.

	Front wheel	Rear wheel
Specifications	0.9 — 1.4 mm (0.035 — 0.055 in)	0.7 — 1.2 mm (0.028 — 0.047 in)

If measurements check out “Not OK”, adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
6) Check hub runout.

Specifications	0.05 mm (0.0020 in)



4. CHECK RESISTANCE OF A.B.S. SENSOR.

1) Turn ignition switch OFF.
2) Disconnect connector from A.B.S. sensor.
3) Measure resistance between A.B.S. sensor connector terminals.

TROUBLE CODE / Connector & terminal:
21 / (B6) No. 1 — No. 2
23 / (B11) No. 1 — No. 2
25 / (P5) No. 1 — No. 2
27 / (P12) No. 1 — No. 2
Specified resistance: 0.8 — 1.3 kΩ

D: TROUBLE CODE 22, 24, 26 AND 28 — FAULTY A.B.S. SENSOR (WHEN THERE IS NO OPEN CIRCUIT OR SPEED SIGNAL INPUT.) —

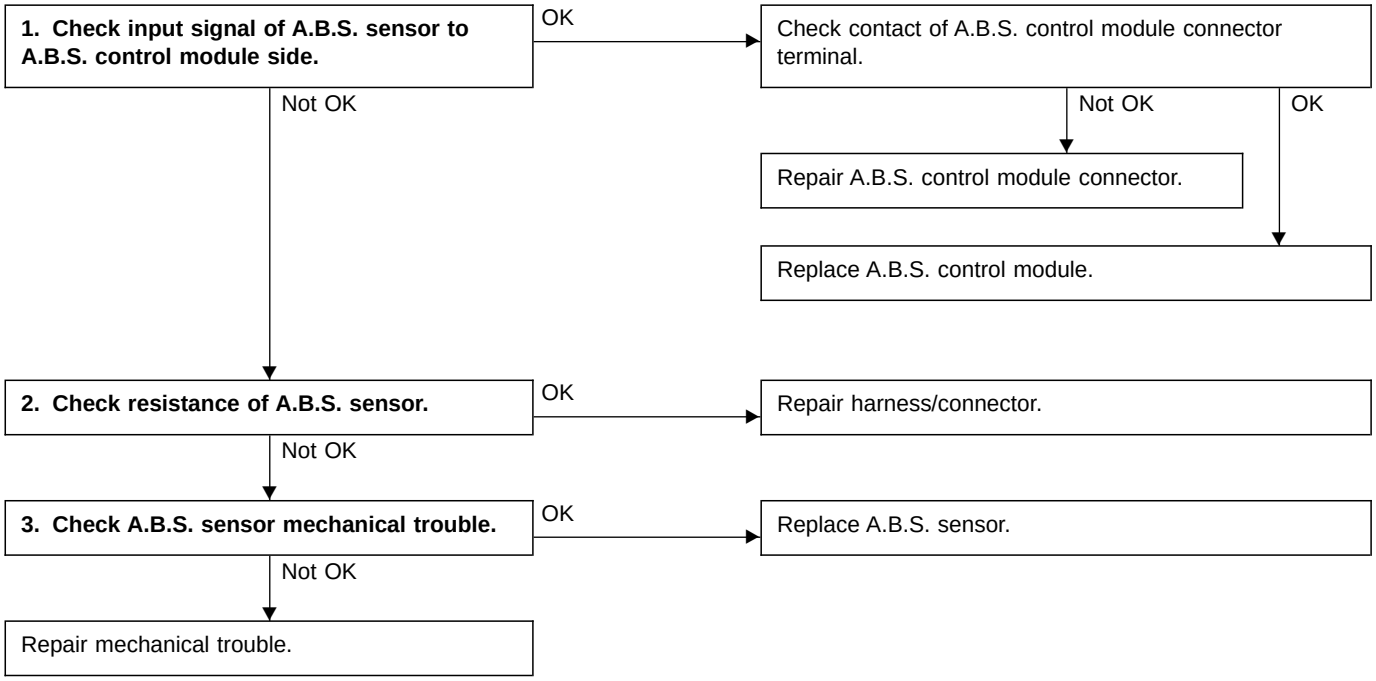
DIAGNOSIS:

- Faulty A.B.S. sensor/harness
- Faulty tone wheel
- Faulty A.B.S. control module

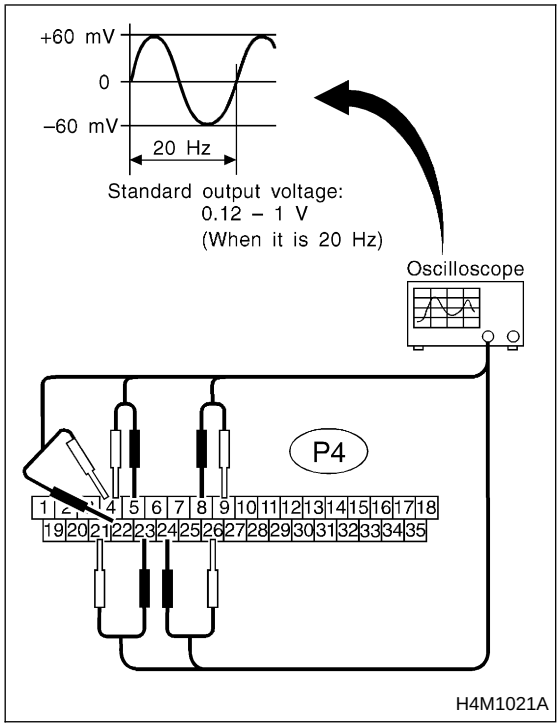
TROUBLE SYMPTOM:

- A.B.S. does not operate.

NOTE:
The A.B.S. control module will sense that the A.B.S. sensor circuit is “open” due to increased resistance but this trouble code will appear when the speed signal is not present or when it suddenly disappears while driving.



NOTE:
When checking A.B.S. sensor, carefully bend or swing connector and harness to check for improper contact or open circuits.

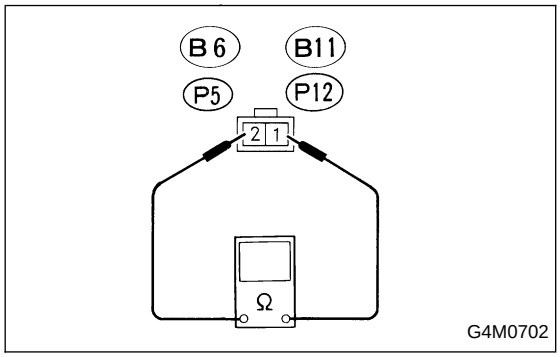


1. CHECK INPUT SIGNAL OF A.B.S. SENSOR TO A.B.S. CONTROL MODULE SIDE.

1) Raise all four wheels of ground.
2) Turn ignition switch OFF.
3) Disconnect connector from A.B.S. control module.
4) Disconnect connector cover from connector. <Ref. to 4-4 [T6C2].>
5) Connect connector to A.B.S. control module.
6) Connect the oscilloscope to the A.B.S. control module connector in accordance with the trouble code.
7) Turn ignition switch ON.
8) Rotate wheels and measure voltage at specified frequency.

NOTE:
When this inspection is completed, the A.B.S. control module sometimes memorizes the trouble code 29.

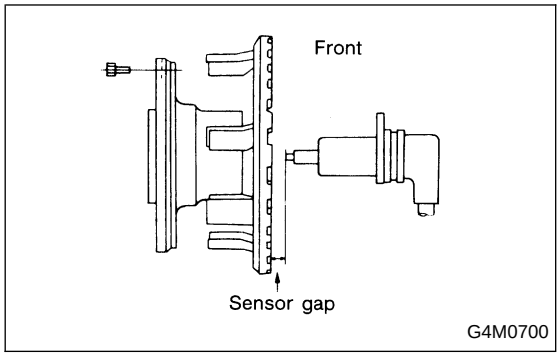
TROUBLE CODE / Connector & terminal:
21 / (P4) No. 23 — No. 21
23 / (P4) No. 22 — No. 4: AWD
(P4) No. 5 — No. 4: FWD
25 / (P4) No. 24 — No. 26
27 / (P4) No. 8 — No. 9
Specified voltage: 0.12 — 1 V (When it is 20 Hz)

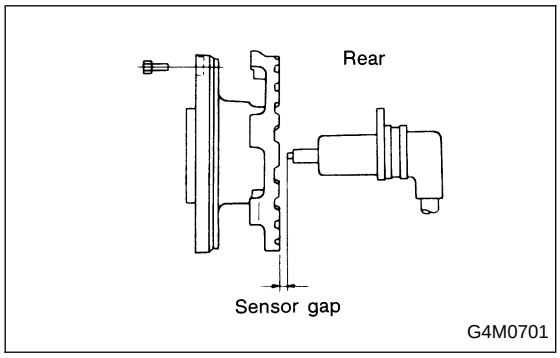


2. CHECK RESISTANCE OF A.B.S. SENSOR.

1) Turn ignition switch OFF.
2) Disconnect connector from A.B.S. sensor.
3) Measure resistance between A.B.S. sensor connector terminals.

TROUBLE CODE / Connector & terminal:
21 / (B6) No. 1 — No. 2
23 / (B11) No. 1 — No. 2
25 / (P5) No. 1 — No. 2
27 / (P12) No. 1 — No. 2
Specified resistance: 0.8 — 1.3 kΩ





3. CHECK A.B.S. SENSOR MECHANICAL TROUBLE.

1) Dismount brake as outlined in manual to gain access to A.B.S. sensor and tone wheel for inspection.
2) Check pole piece and tone wheel for accumulation of foreign particles. If necessary, remove foreign particles and clean.
3) Check tone wheel teeth for cracks for deformities. If necessary, replace tone wheel (No. of teeth: 44) with a new one.
4) Check tone wheel for looseness.

Tightening torque:
10 — 16 N·m (1 — 1.6 kg-m, 7 — 12 ft-lb)

5) Measure tone wheel-to-pole piece gap over entire perimeter of the wheel.

	Front wheel	Rear wheel
Specifications	0.9 — 1.4 mm (0.035 — 0.055 in)	0.7 — 1.2 mm (0.028 — 0.047 in)

If measurements check out “Not OK”, adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
6) Check hub runout.

Specifications	0.05 mm (0.0020 in)

E: TROUBLE CODE 29 — FAULTY TONE WHEEL, ETC. —

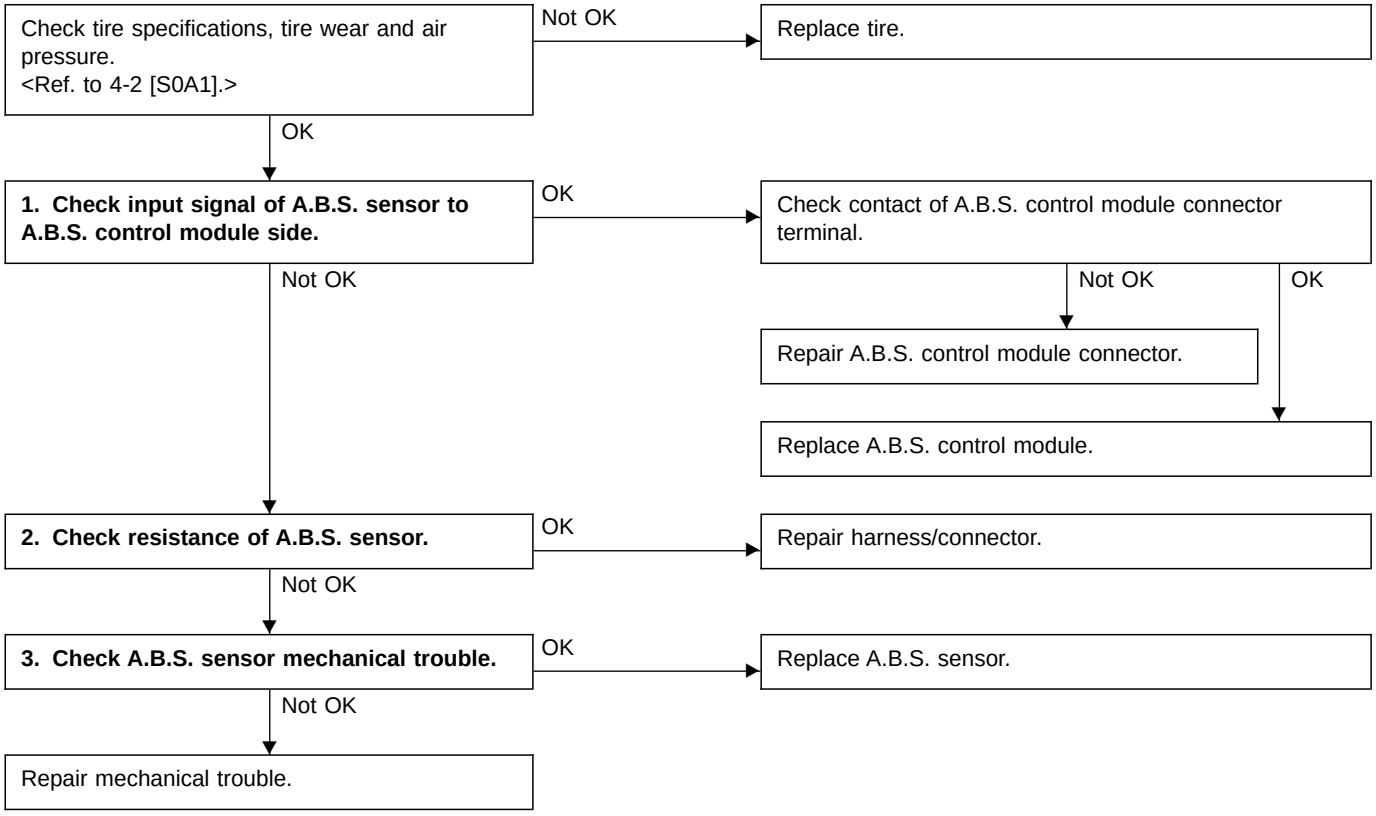
DIAGNOSIS:

- Faulty tone wheel
- Faulty A.B.S. control module

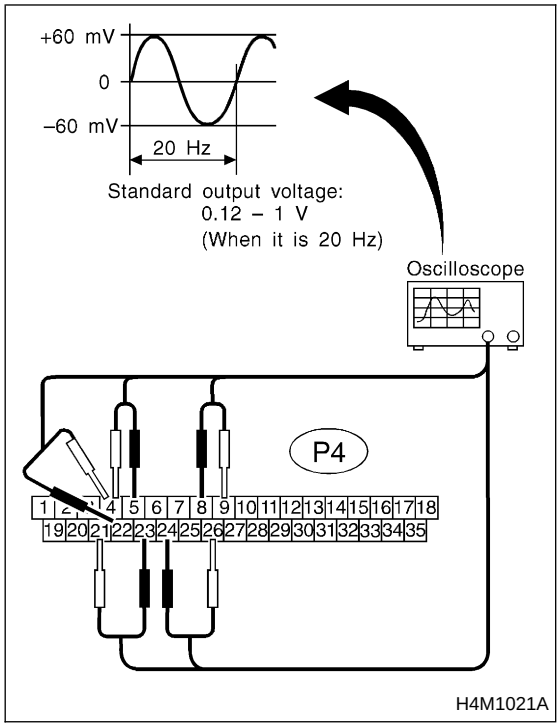
TROUBLE SYMPTOM:

- A.B.S. does not operate.

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.



NOTE:
When checking A.B.S. sensor, carefully bend or swing connector and harness to check for improper contact or open circuits.

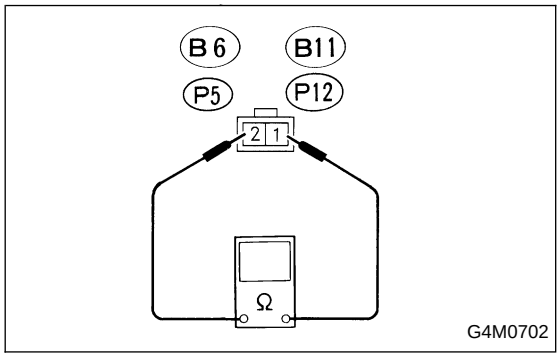


1. CHECK INPUT SIGNAL OF A.B.S. SENSOR TO A.B.S. CONTROL MODULE SIDE.

1) Raise all four wheels of ground.
2) Turn ignition switch OFF.
3) Disconnect connector from A.B.S. control module.
4) Disconnect connector cover from connector. <Ref. to 4-4 [T6C2].>
5) Connect connector to A.B.S. control module.
6) Connect the oscilloscope to the A.B.S. control module connector in accordance with the trouble code.
7) Turn ignition switch ON.
8) Rotate wheels and measure voltage at specified frequency.

NOTE:
When this inspection is completed, the A.B.S. control module sometimes memorizes the trouble code 29.

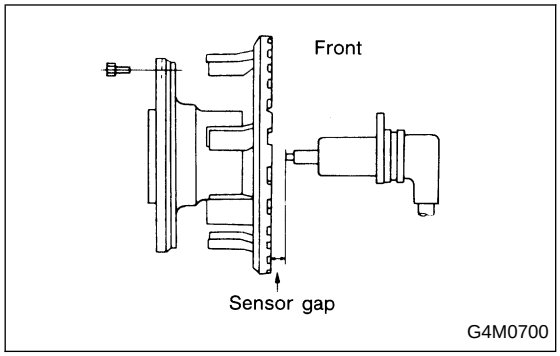
TROUBLE CODE / Connector & terminal:
21 / (P4) No. 23 — No. 21
23 / (P4) No. 22 — No. 4: AWD
(P4) No. 5 — No. 4: FWD
25 / (P4) No. 24 — No. 26
27 / (P4) No. 8 — No. 9
Specified voltage: 0.12 — 1 V (When it is 20 Hz)

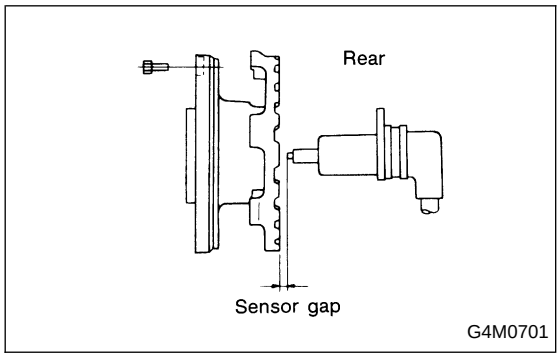


2. CHECK RESISTANCE OF A.B.S. SENSOR.

1) Turn ignition switch OFF.
2) Disconnect connector from A.B.S. sensor.
3) Measure resistance between A.B.S. sensor connector terminals.

TROUBLE CODE / Connector & terminal:
21 / (B6) No. 1 — No. 2
23 / (B11) No. 1 — No. 2
25 / (P5) No. 1 — No. 2
27 / (P12) No. 1 — No. 2
Specified resistance: 0.8 — 1.3 kΩ





3. CHECK A.B.S. SENSOR MECHANICAL TROUBLE.

1) Dismount brake as outlined in manual to gain access to A.B.S. sensor and tone wheel for inspection.
2) Check pole piece and tone wheel for accumulation of foreign particles. If necessary, remove foreign particles and clean.
3) Check tone wheel teeth for cracks for deformities. If necessary, replace tone wheel (No. of teeth: 44) with a new one.
4) Check tone wheel for looseness.

Tightening torque:
10 — 16 N·m (1 — 1.6 kg-m, 7 — 12 ft-lb)

5) Measure tone wheel-to-pole piece gap over entire perimeter of the wheel.

	Front wheel	Rear wheel
Specifications	0.9 — 1.4 mm (0.035 — 0.055 in)	0.7 — 1.2 mm (0.028 — 0.047 in)

If measurements check out “Not OK”, adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
6) Check hub runout.

Specifications	0.05 mm (0.0020 in)

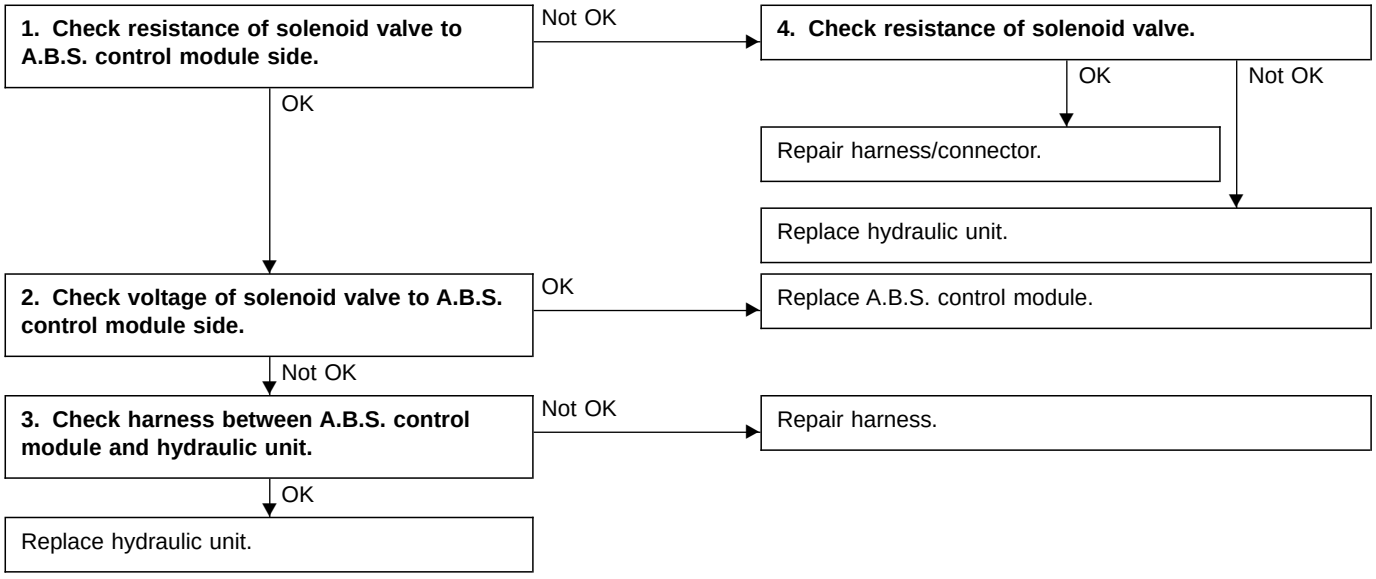
F: TROUBLE CODE 31, 33 AND 39 — FAULTY SOLENOID VALVE CIRCUIT(S) IN HYDRAULIC UNIT —

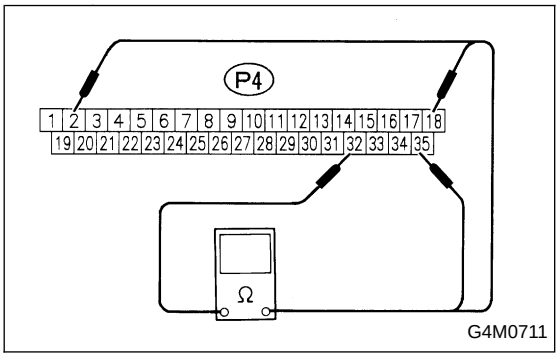
DIAGNOSIS:

- Faulty harness/connector
- Faulty solenoid valve in hydraulic unit
- Faulty A.B.S. control module

TROUBLE SYMPTOM:

- A.B.S. does not operate.

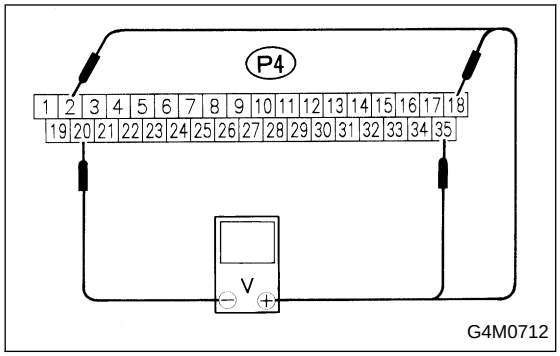




1. CHECK RESISTANCE OF SOLENOID VALVE TO A.B.S. CONTROL MODULE SIDE.

1) Turn ignition switch OFF.
2) Disconnect connector from A.B.S. control module.
3) Measure resistance between A.B.S. control module connector terminals.

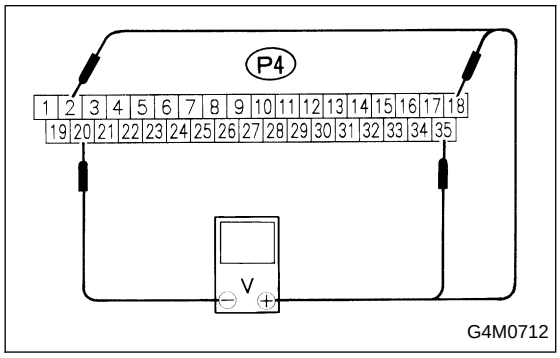
TROUBLE CODE / Connector & terminal:
31 / (P4) No. 35 — No. 32
33 / (P4) No. 2 — No. 32
39 / (P4) No. 18 — No. 32
Specified resistance: approx. 1 Ω



2. CHECK VOLTAGE OF SOLENOID VALVE TO A.B.S. CONTROL MODULE SIDE.

1) Turn ignition switch OFF.
2) Disconnect valve relay from hydraulic unit.
3) Turn ignition switch ON.
4) Measure voltage between A.B.S. control module connector terminals.

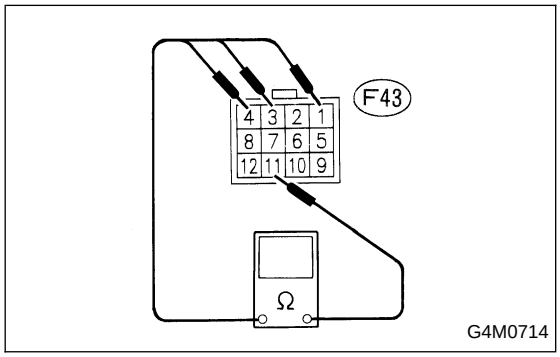
TROUBLE CODE / Connector & terminal:
31 / (P4) No. 35 — No. 20
33 / (P4) No. 2 — No. 20
39 / (P4) No. 18 — No. 20
Specified voltage: 0 V



3. CHECK HARNESS BETWEEN A.B.S. CONTROL MODULE AND HYDRAULIC UNIT.

1) Turn ignition switch OFF.
2) Disconnect connector from hydraulic unit.
3) Turn ignition switch ON.
4) Measure voltage between A.B.S. control module connector terminals.

TROUBLE CODE / Connector & terminal:
31 / (P4) No. 35 — No. 20
33 / (P4) No. 2 — No. 20
39 / (P4) No. 18 — No. 20
Specified voltage: 0 V



4. CHECK RESISTANCE OF SOLENOID VALVE.

1) Turn ignition switch OFF.
2) Disconnect connector from hydraulic unit.
3) Measure resistance between hydraulic unit terminals.

TROUBLE CODE / Connector & terminal:
31 / to (F43) No. 4 — No. 11
33 / to (F43) No. 3 — No. 11
39 / to (F43) No. 1 — No. 11
Specified resistance: approx. 1 Ω

G: TROUBLE CODE 41 — FAULTY A.B.S. CONTROL MODULE —

DIAGNOSIS:

- Faulty A.B.S. control module

TROUBLE SYMPTOM:

- A.B.S. does not operate.

Replace A.B.S. control module.

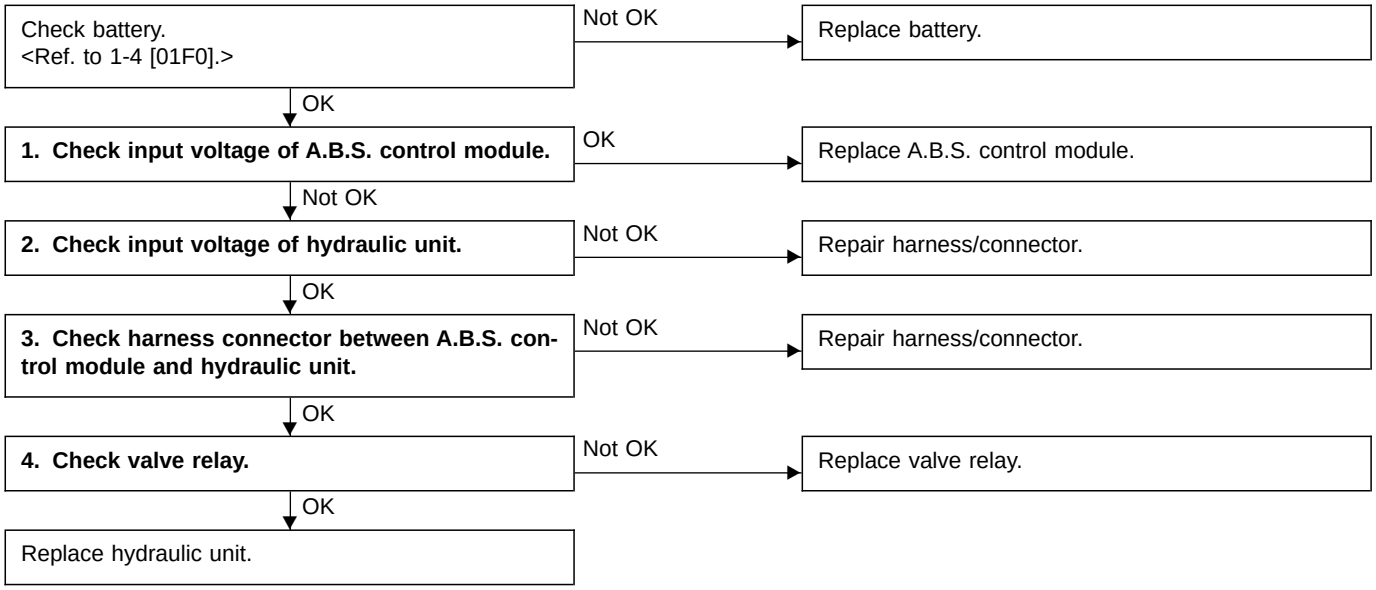
H: TROUBLE CODE 42 — SOURCE VOLTAGE IS LOW. —

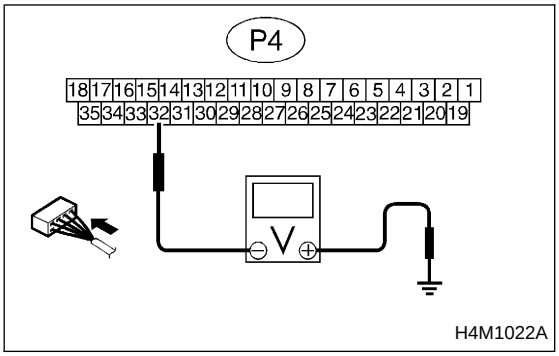
DIAGNOSIS:

- Faulty battery
- Faulty A.B.S. control module
- Faulty harness
- Faulty valve relay

TROUBLE SYMPTOM:

- A.B.S. does not operate.

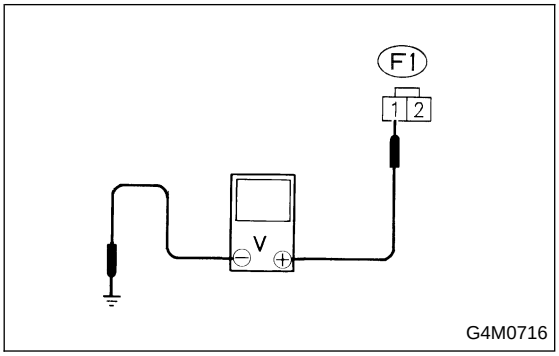




1. CHECK INPUT VOLTAGE OF A.B.S. CONTROL MODULE.

1) Turn ignition switch OFF.
2) Disconnect connector from A.B.S. control module.
3) Disconnect connector cover from connector. <Ref. to 4-4 [T6C2].>
4) Connect connector to A.B.S. control module.
5) Turn ignition switch ON.
6) Measure input voltage between A.B.S. control module connector and body.

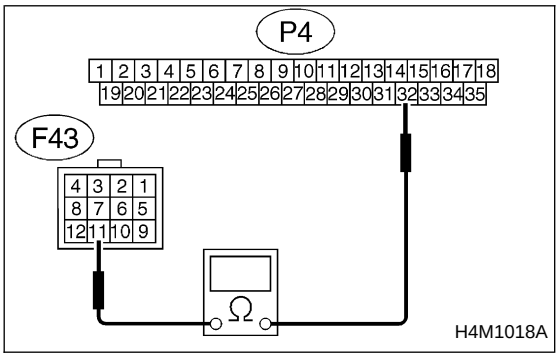
Connector & terminal / Specified voltage:
(P4) No. 32 — Body / 9.2 — 12 V



2. CHECK INPUT VOLTAGE OF HYDRAULIC UNIT.

1) Turn ignition switch OFF.
2) Disconnect connector from hydraulic unit.
3) Turn ignition switch ON.
4) Measure input voltage between hydraulic unit connector and body.

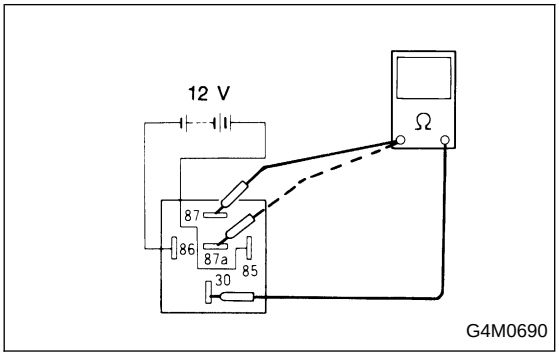
Connector & terminal / Specified voltage:
(F1) No. 1 — Body / 10 — 12 V



3. CHECK HARNESS CONNECTOR BETWEEN A.B.S. CONTROL MODULE AND HYDRAULIC UNIT.

1) Turn ignition switch OFF.
2) Disconnect connector from A.B.S. control module and hydraulic unit.
3) Measure resistance between A.B.S. control module and hydraulic unit.

Connector & terminal / Specified resistance:
(P4) No. 32 — (F43) No. 11 / 0 Ω



4. CHECK VALVE RELAY.

1) Remove valve relay.
2) Attach circuit tester probes to terminals, as shown in figure.
3) Measure resistance between respective terminals.

Terminal / Specified resistance:
No. 87 — 30 / 0 Ω (when 12 volts applied.)
No. 87 — 30 / 1 MΩ (when no voltage is applied.)
No. 87a — 30 / 1 MΩ (when 12 volts applied.)
No. 87a — 30 / 0 Ω (when no voltage is applied.)

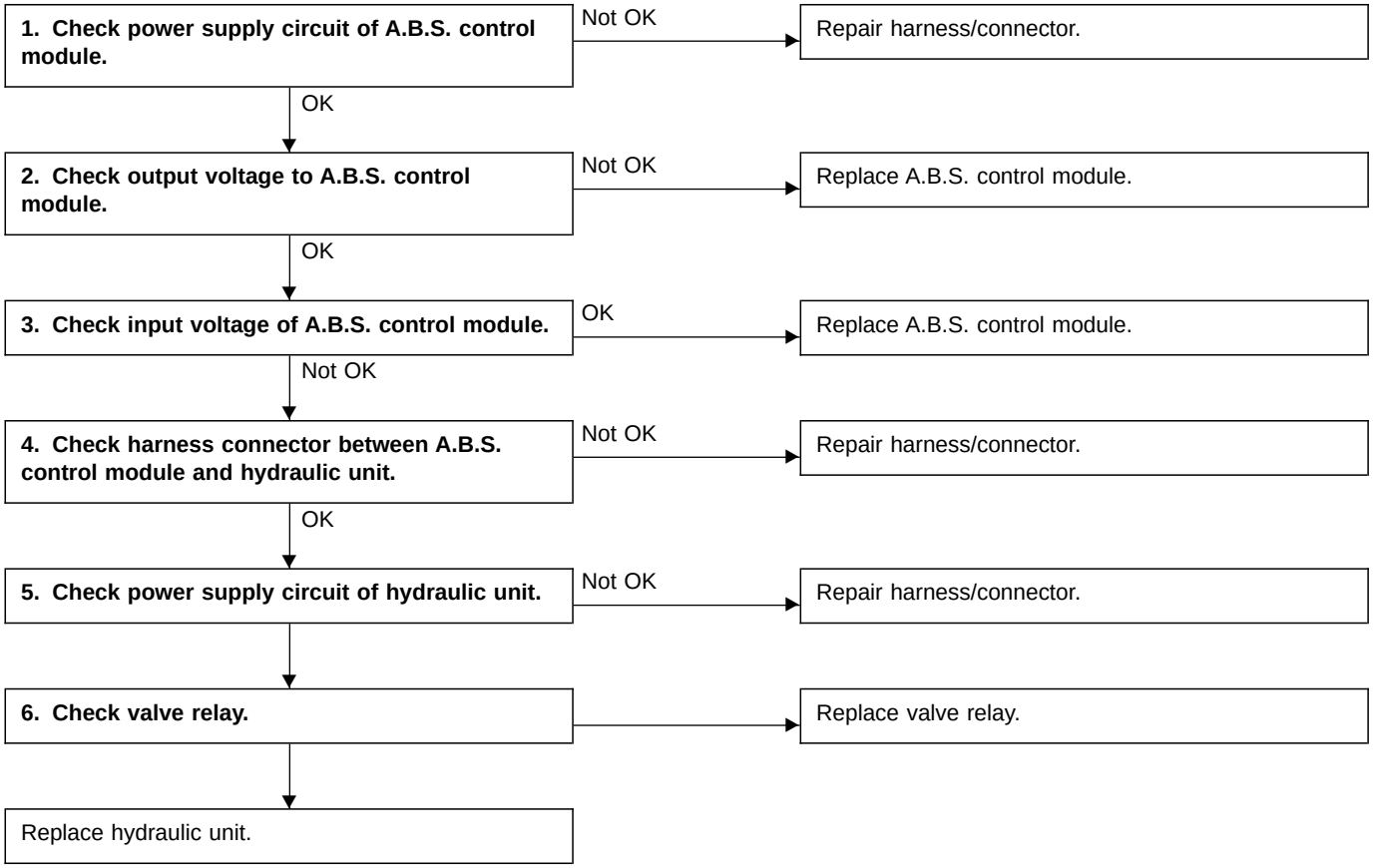
I: TROUBLE CODE 51 — FAULTY VALVE RELAY —

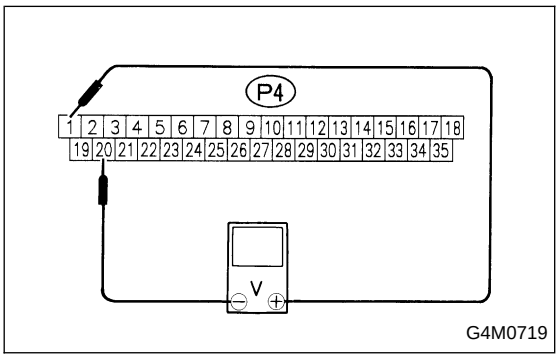
DIAGNOSIS:

- Faulty valve relay
- Faulty harness
- Faulty A.B.S. control module

TROUBLE SYMPTOM:

- A.B.S. does not operate.

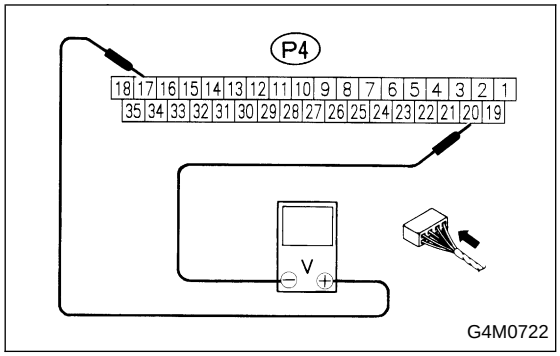




1. CHECK POWER SUPPLY CIRCUIT OF A.B.S. CONTROL MODULE.

1) Turn ignition switch OFF.
2) Disconnect connector from A.B.S. control module.
3) Turn ignition switch ON.
4) Measure voltage between A.B.S. control module connector terminals.

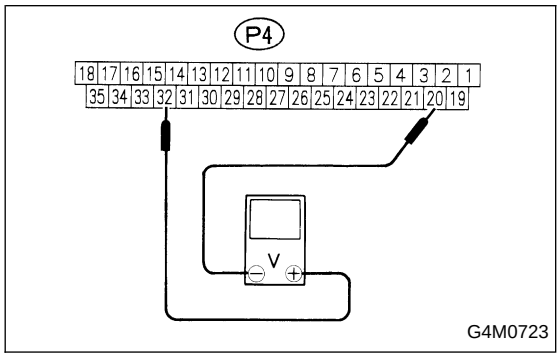
Connector & terminal / Specified voltage:
(P4) No. 1 — No. 20 / 10 — 12 V



2. CHECK OUTPUT VOLTAGE TO A.B.S. CONTROL MODULE.

1) Turn ignition switch OFF.
2) Disconnect connector from A.B.S. control module.
3) Disconnect connector cover from connector.
4) Connect connector to A.B.S. control module.
5) Turn ignition switch ON.
6) Measure voltage between A.B.S. control module connector terminals.

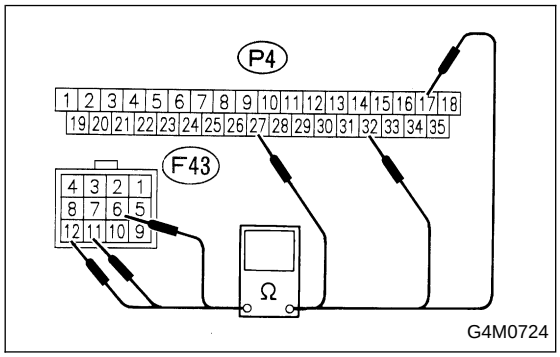
Connector & terminal / Specified voltage:
(P4) No. 17 — No. 20 / 10 — 12 V



3. CHECK INPUT VOLTAGE OF A.B.S. CONTROL MODULE.

1) Turn ignition switch ON.
2) Measure voltage between A.B.S. control module connector terminals.

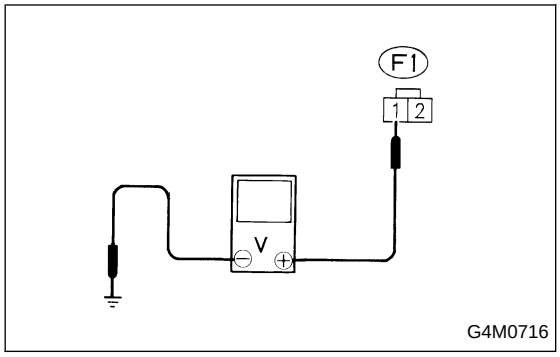
Connector & terminal / Specified voltage:
(P4) No. 32 — No. 20 / 10 — 12 V



4. CHECK HARNESS CONNECTOR BETWEEN A.B.S. CONTROL MODULE AND HYDRAULIC UNIT.

1) Turn ignition switch OFF.
2) Disconnect connector from A.B.S. control module and hydraulic unit.
3) Measure resistance between A.B.S. control module and hydraulic unit.

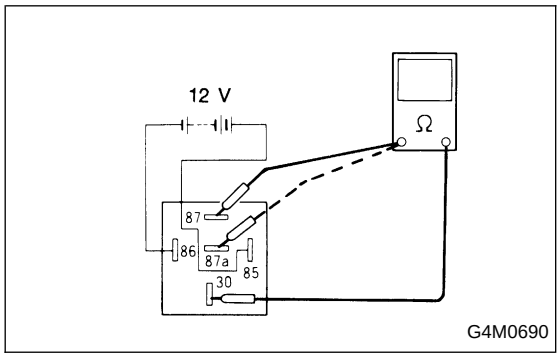
Connector & terminal / Specified resistance:
(P4) No. 17 — (F43) No. 6 / 0 Ω
(P4) No. 32 — (F43) No. 11 / 0 Ω
(P4) No. 27 — (F43) No. 12 / 0 Ω



5. CHECK POWER SUPPLY CIRCUIT OF HYDRAULIC UNIT.

1) Turn ignition switch OFF.
2) Disconnect connector from hydraulic unit.
3) Turn ignition switch ON.
4) Measure voltage between hydraulic unit and body.

Connector & terminal / Specified voltage:
(F1) No. 1 — Body / 10 — 12 V



6. CHECK VALVE RELAY.

1) Remove valve relay.
2) Attach circuit tester probes to terminals, as shown in figure.
3) Measure resistance between respective terminals.

Terminal / Specified resistance:
No. 87 — 30 / 0 Ω (when 12 volts applied.)
No. 87 — 30 / 1 MΩ (when no voltage is applied.)
No. 87a — 30 / 1 MΩ (when 12 volts applied.)
No. 87a — 30 / 0 Ω (when no voltage is applied.)

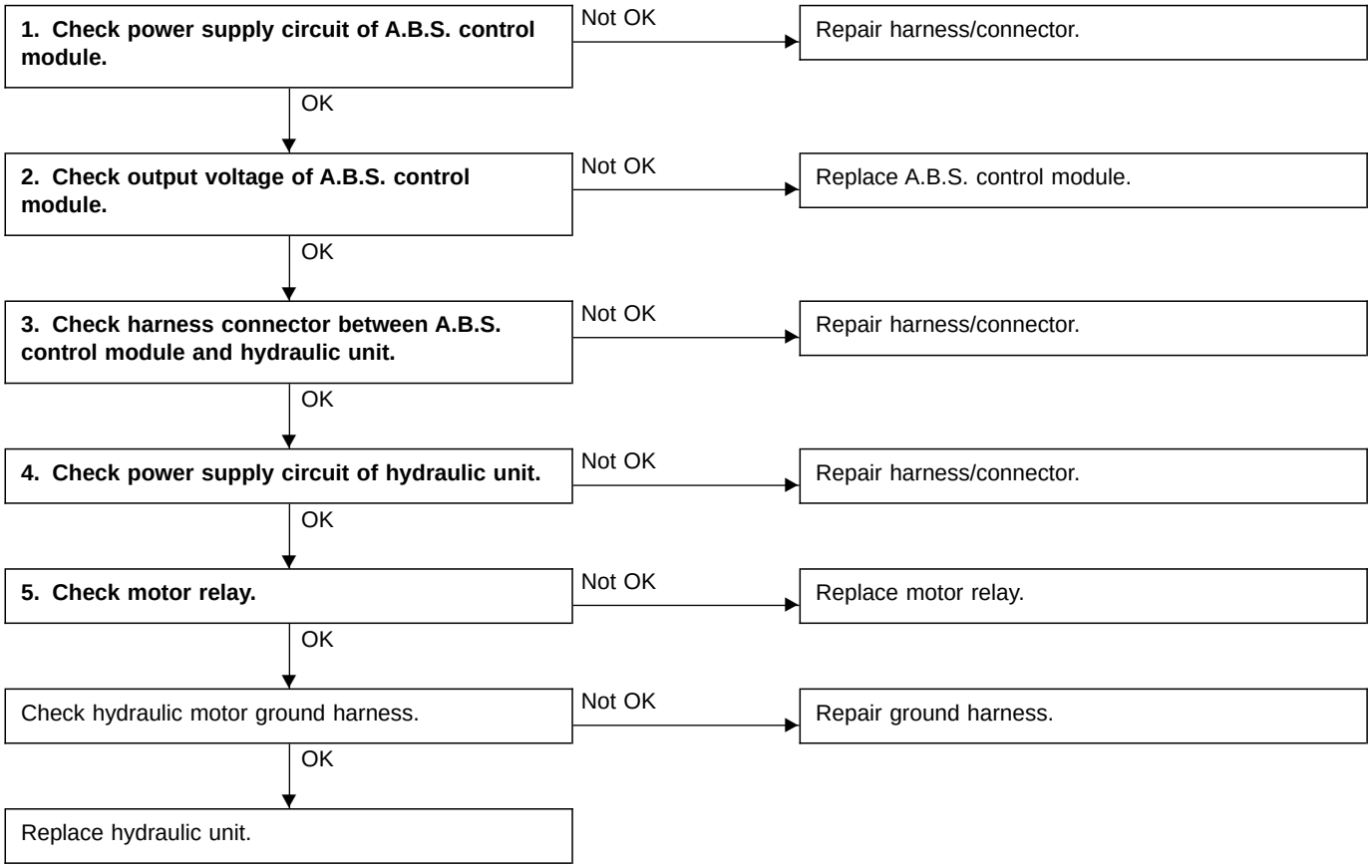
J: TROUBLE CODE 52 — FAULTY HYDRAULIC MOTOR AND/OR MOTOR RELAY —

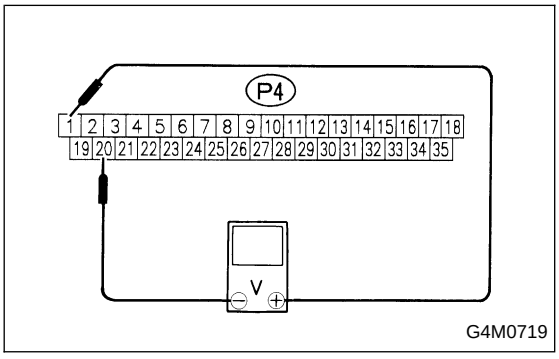
DIAGNOSIS:

- Faulty motor relay
- Faulty hydraulic unit
- Faulty harness
- Faulty A.B.S. control module

TROUBLE SYMPTOM:

- A.B.S. does not operate.

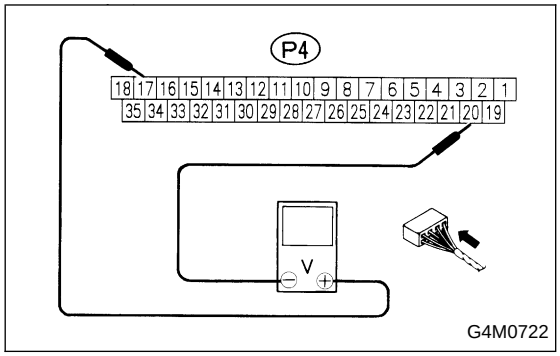




1. CHECK POWER SUPPLY CIRCUIT OF A.B.S. CONTROL MODULE.

1) Turn ignition switch OFF.
2) Disconnect connector from A.B.S. control module.
3) Turn ignition switch ON.
4) Measure voltage between A.B.S. control module connector terminals.

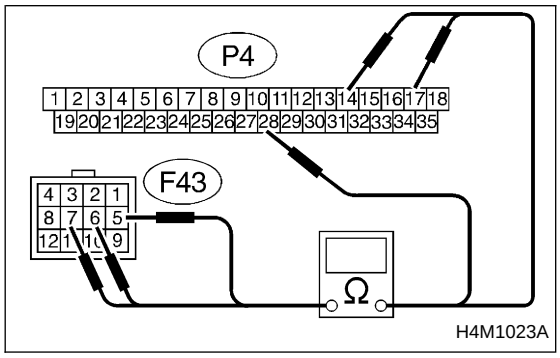
Connector & terminal / Specified voltage:
(P4) No. 1 — No. 20 / 10 — 12 V



2. CHECK OUTPUT VOLTAGE OF A.B.S. CONTROL MODULE.

1) Turn ignition switch OFF.
2) Disconnect connector from A.B.S. control module.
3) Disconnect connector cover from connector. <Ref. to 4-4 [T6C2].>
4) Connect connector to A.B.S. control module.
5) Turn ignition switch ON.
6) Measure voltage between A.B.S. control module connector terminals.

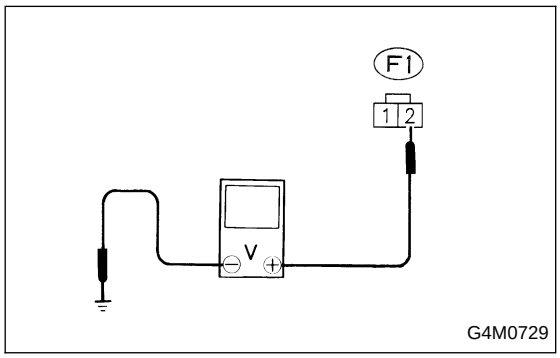
Connector & terminal / Specified voltage:
(P4) No. 17 — No. 20 / 10 — 12 V



3. CHECK HARNESS CONNECTOR BETWEEN A.B.S. CONTROL MODULE AND HYDRAULIC UNIT.

1) Turn ignition switch OFF.
2) Disconnect connector from A.B.S. control module.
3) Disconnect connector from hydraulic unit.
4) Measure resistance between A.B.S. control module connector and hydraulic unit connector.

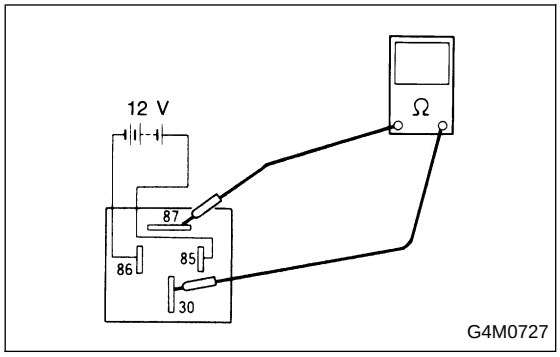
Connector & terminal / Specified resistance:
(P4) No. 17 — (F43) No. 6 / 0 Ω
(P4) No. 28 — (F43) No. 5 / 0 Ω
(P4) No. 14 — (F43) No. 7 / 0 Ω



4. CHECK POWER SUPPLY CIRCUIT OF HYDRAULIC UNIT.

1) Turn ignition switch OFF.
2) Disconnect connector from hydraulic unit.
3) Measure voltage between hydraulic unit connector and body.

Connector & terminal / Specified voltage:
(F1) No. 2 — Body / 10 — 12 V



5. CHECK MOTOR RELAY.

1) Remove motor relay.
2) Attach circuit tester probes to terminals, as shown in figure.
3) Measure resistance between terminals.

Terminal / Specified resistance:

No. 30 — 87 / 0 Ω (when 12 volts applied.)
No. 30 — 87 / 1 MΩ, min. (when no voltage is applied.)

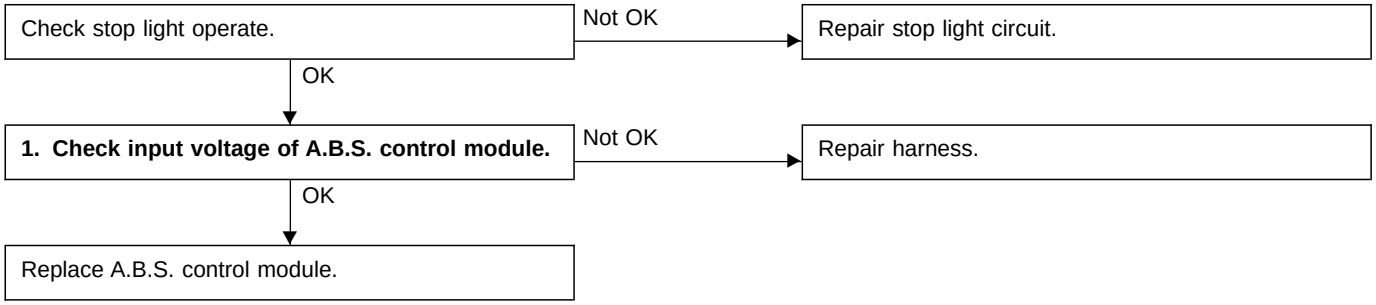
K: TROUBLE CODE 54 — FAULTY STOP LIGHT CIRCUIT —

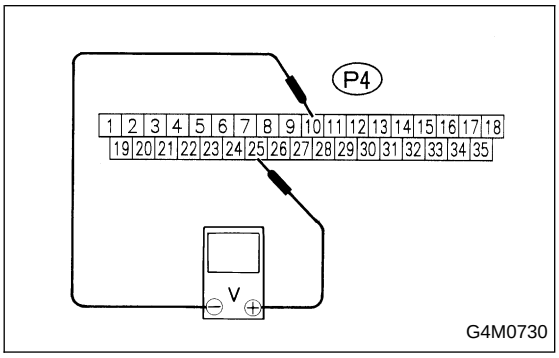
DIAGNOSIS:

- Faulty stop light circuit.
- Faulty harness
- Faulty A.B.S. control module

TROUBLE SYMPTOM:

- A.B.S. does not operate.





1. CHECK INPUT VOLTAGE OF A.B.S. CONTROL MODULE.

1) Turn ignition switch OFF.
2) Disconnect connector from A.B.S. control module.
3) Measure voltage between A.B.S. control module connector terminals.

Connector & terminal / Specified voltage:
(P4) No. 25 — No. 10 / More than 4 V (when brake pedal is depressed.)

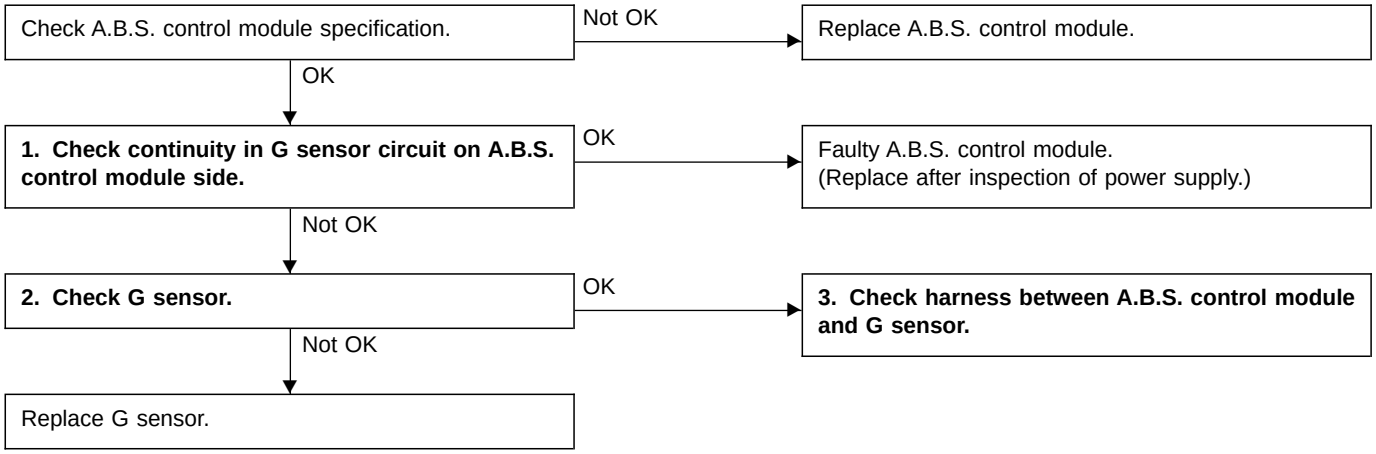
L: TROUBLE CODE 56 — USE OF IMPROPER A.B.S. CONTROL MODULE SPECIFICATION, OR FAULTY G SENSOR —

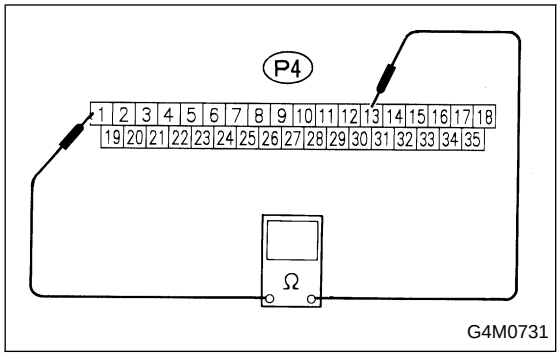
DIAGNOSIS:

- Improper A.B.S. control module specification
- Faulty G sensor
- Faulty G sensor harness and connector

TROUBLE SYMPTOM:

- A.B.S. does not operate.
- A.B.S. activates faster than specifications when braking on high "μ" (dry asphalt) road.
- Warning light comes on and trouble code "56" is displayed approximately 20 seconds after vehicle starts.

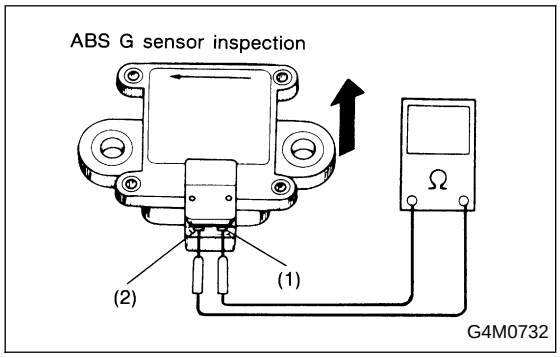




1. CHECK CONTINUITY IN G SENSOR CIRCUIT ON A.B.S. CONTROL MODULE SIDE.

1) Position vehicle on a flat surface.
2) Disconnect connector from A.B.S. control module.
3) Disassemble connector.
4) Measure resistance between A.B.S. control module connector terminals.

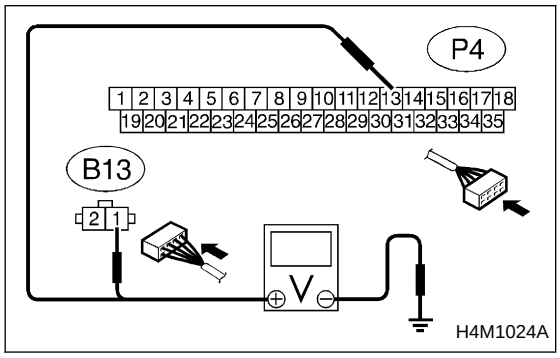
Connector & terminal / Specified Resistance:
(P4) No. 1 — No. 13 / 550 — 670 Ω



2. CHECK G SENSOR.

1) Disconnect G sensor connector.
2) Measure resistance between G sensor terminals. (Ensure that G sensor is horizontal during measurement.)

Specified Resistance:
550 — 670 Ω



3. CHECK HARNESS BETWEEN A.B.S. CONTROL MODULE AND G SENSOR.

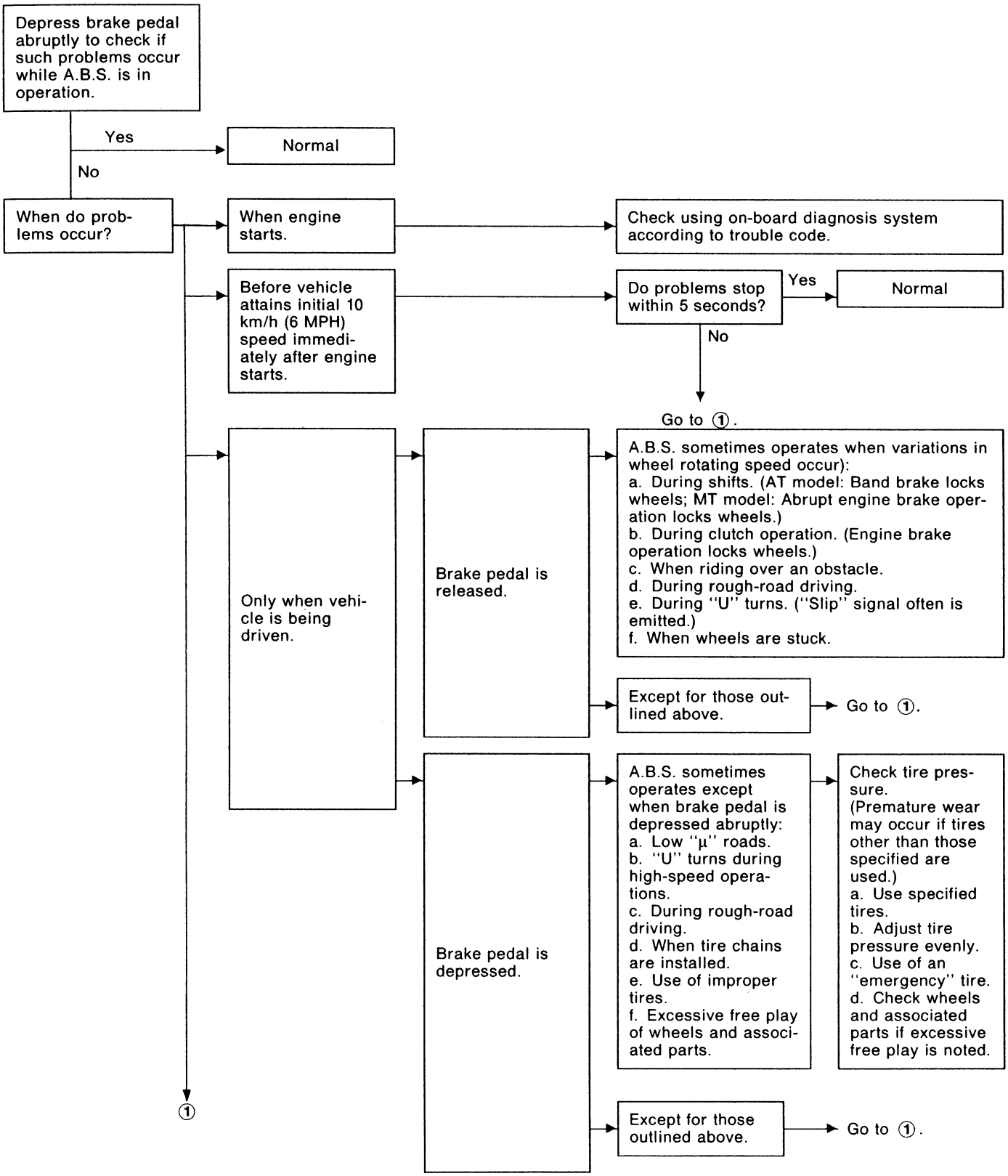
1) Turn ignition switch ON.
2) Connect G sensor connector.
3) Measure voltage between connector and body.

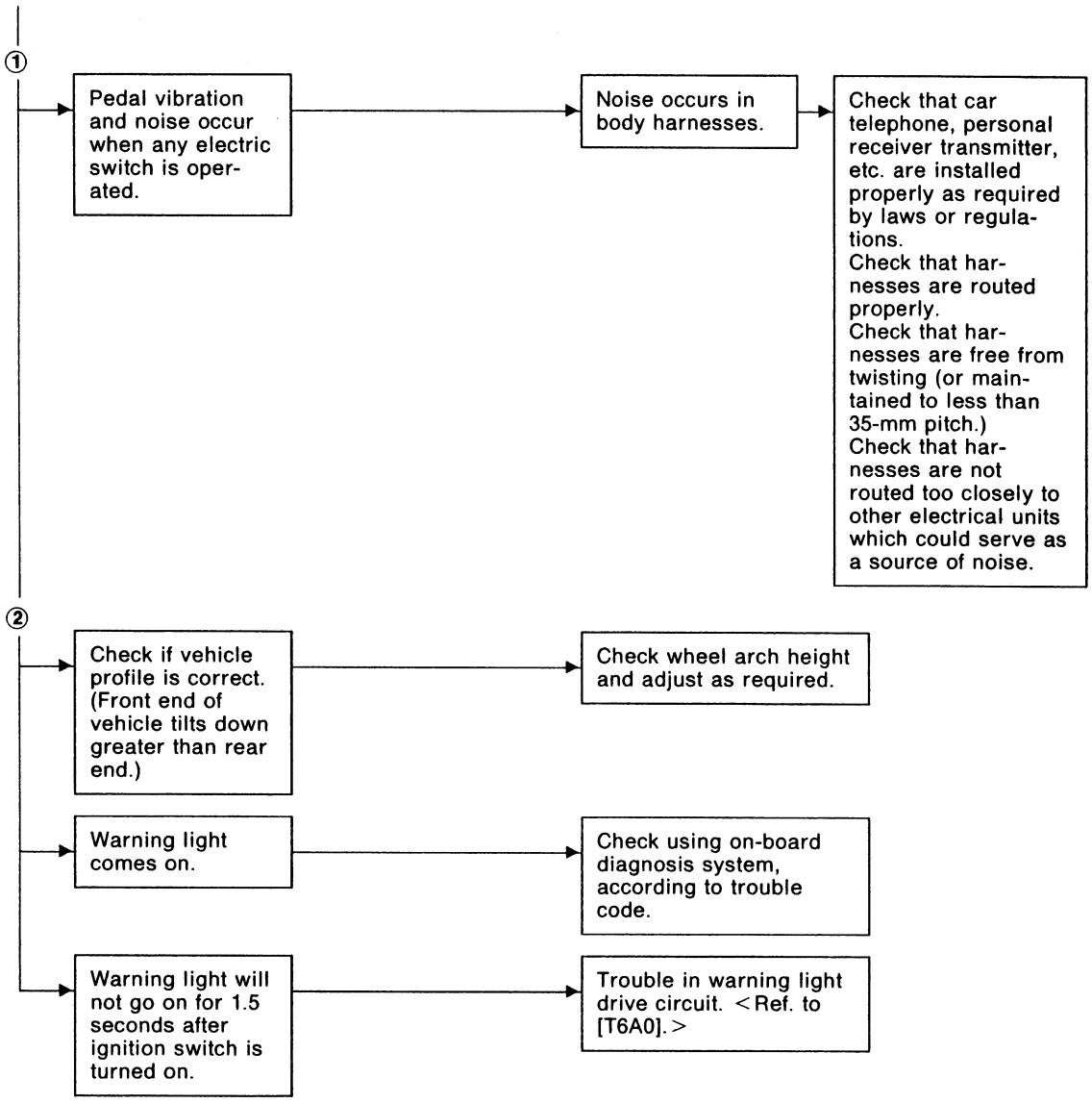
Connector & terminal / Specified Voltage:
(B13) No. 1 — Body / 10 — 12 V
(P4) No. 13 — Body / 10 — 12 V

NOTE:
When voltage checks out “OK”, replace A.B.S. control module.

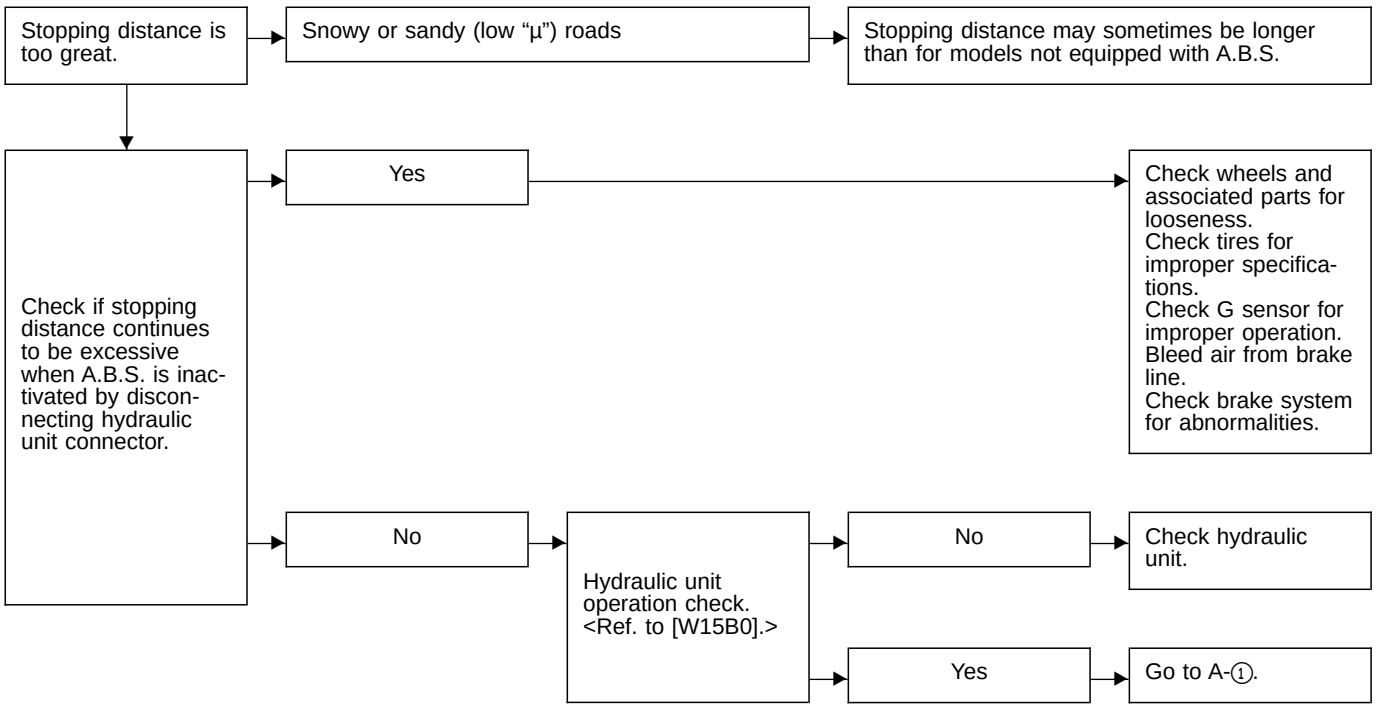
7. General Diagnostics Chart

A: VIBRATING PEDAL AND NOISE

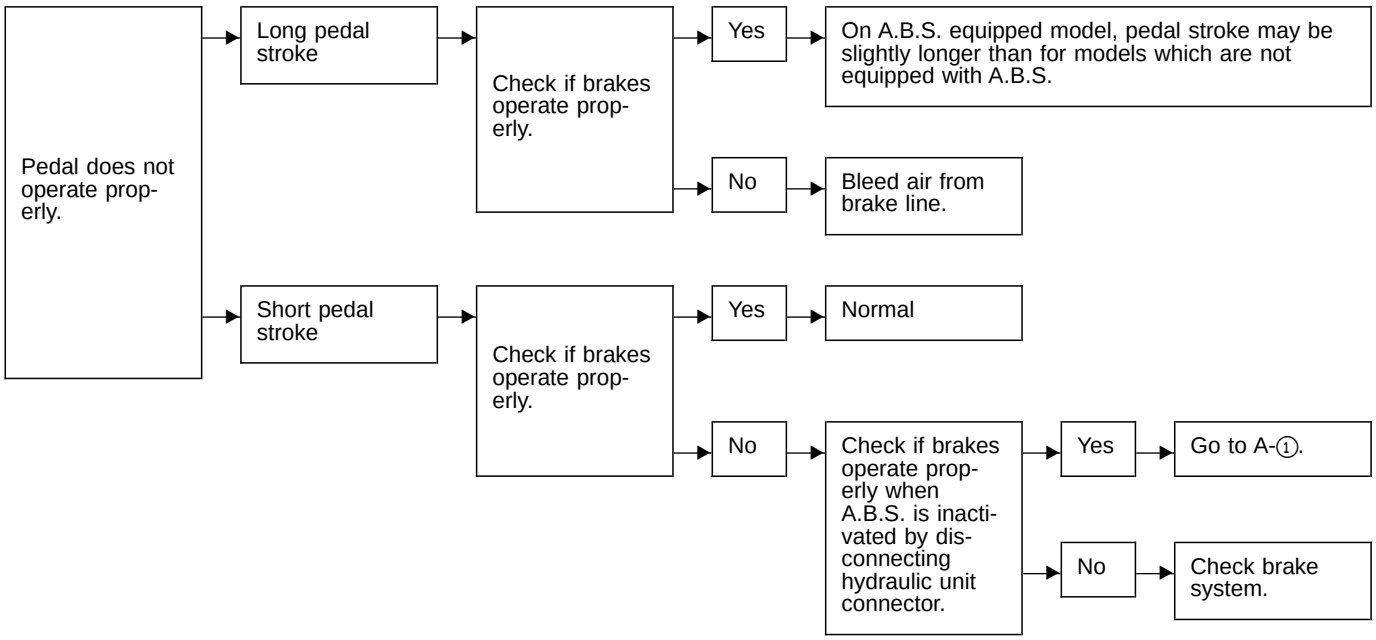



①
Pedal vibration and noise occur when any electric switch is operated.
Noise occurs in body harnesses.
Check that car telephone, personal receiver transmitter, etc. are installed properly as required by laws or regulations.
Check that harnesses are routed properly.
Check that harnesses are free from twisting (or maintained to less than 35-mm pitch.)
Check that harnesses are not routed too closely to other electrical units which could serve as a source of noise.
②
Check if vehicle profile is correct. (Front end of vehicle tilts down greater than rear end.)
Check wheel arch height and adjust as required.
Warning light comes on.
Check using on-board diagnosis system, according to trouble code.
Warning light will not go on for 1.5 seconds after ignition switch is turned on.
Trouble in warning light drive circuit. <Ref. to [T6A0].>

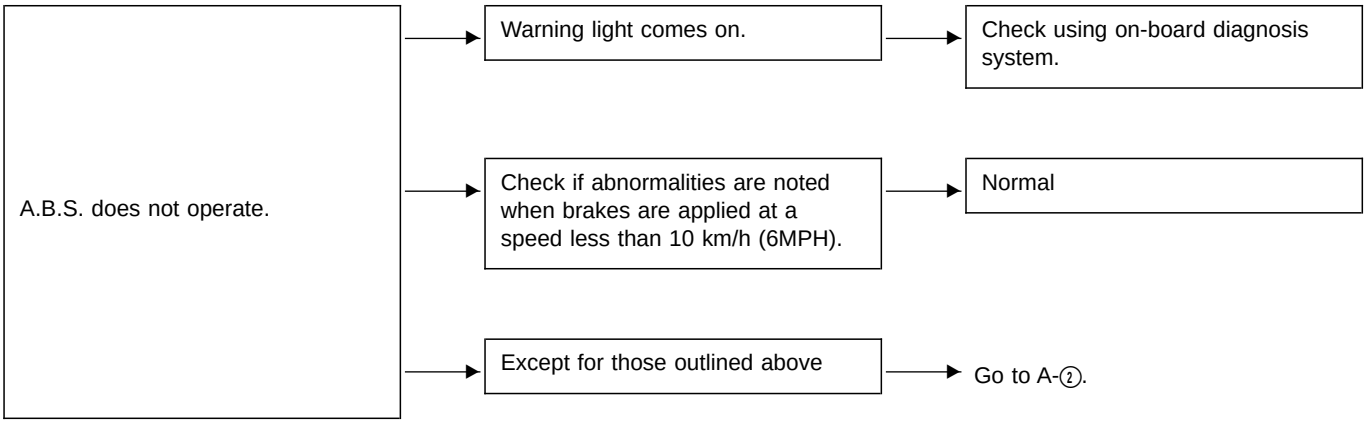
B: EXCESSIVE STOPPING DISTANCE



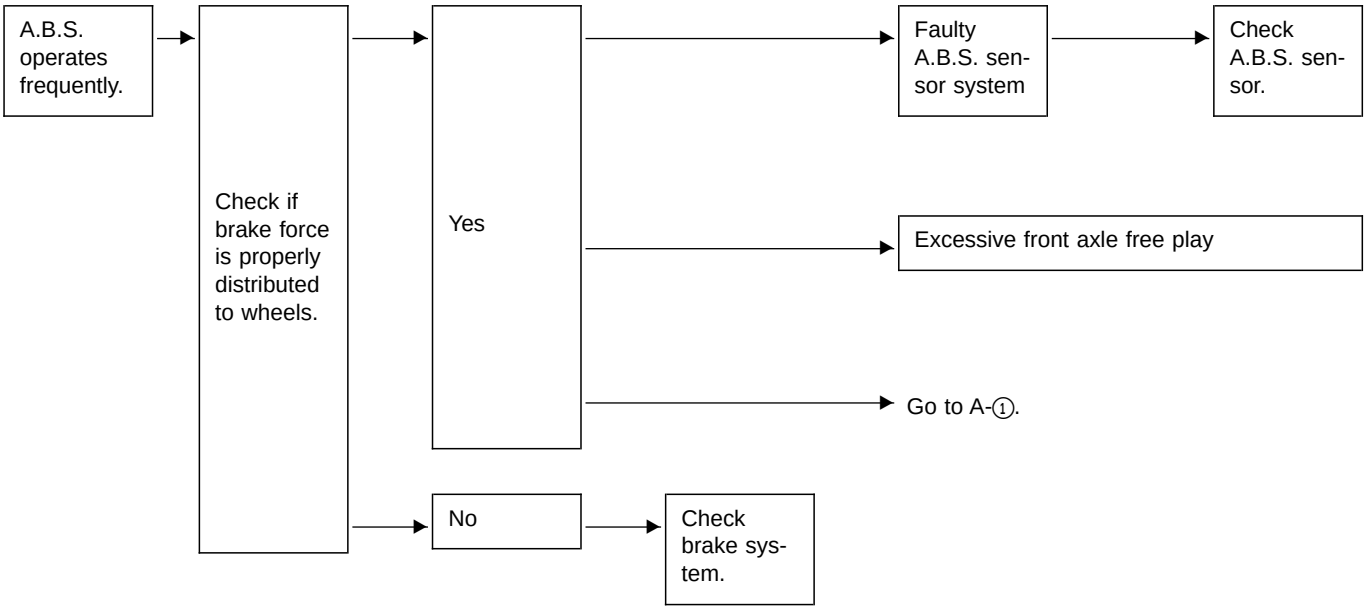
C: IMPROPER PEDAL OPERATION



D: A.B.S. INOPERATIVE



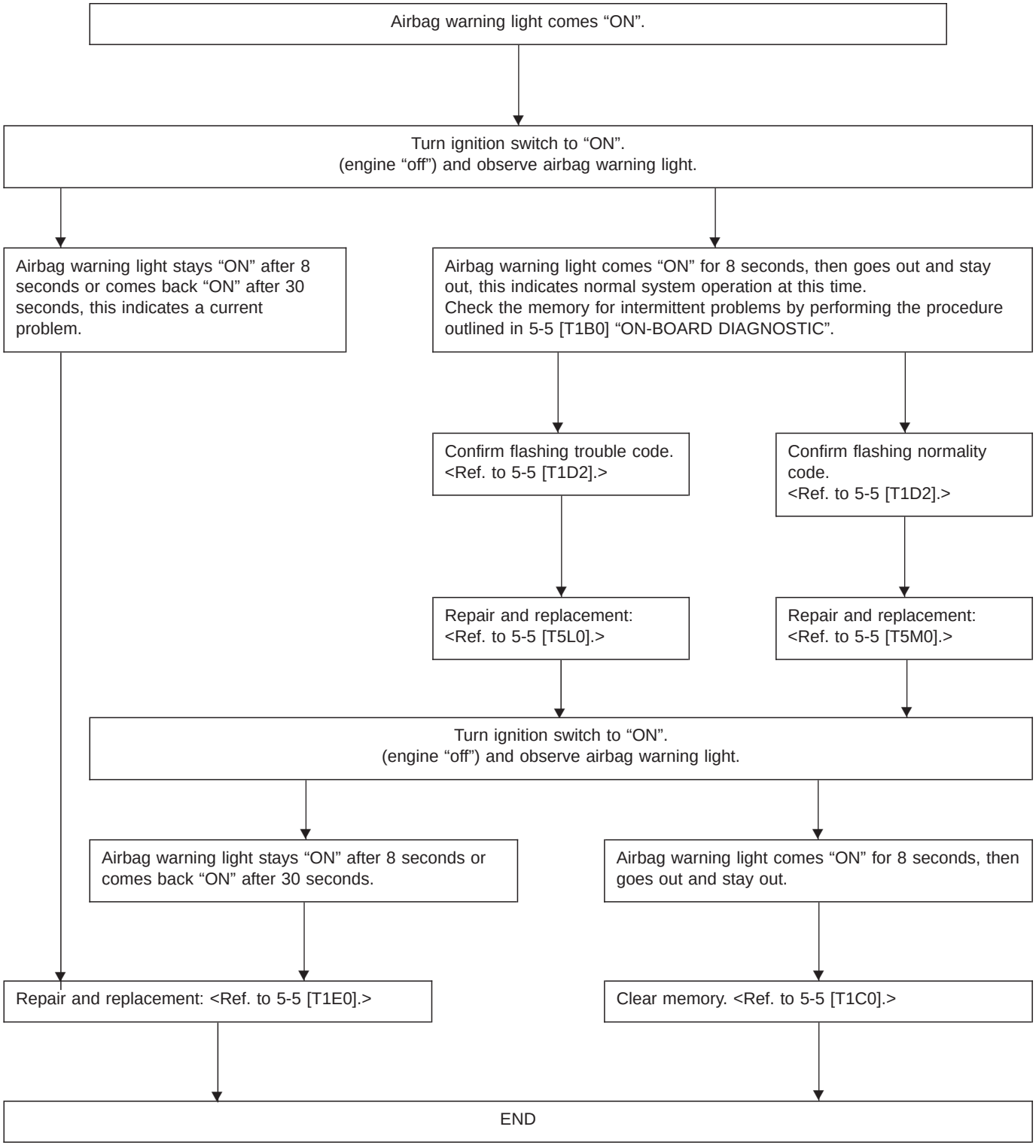
E: FREQUENT A.B.S. OPERATION

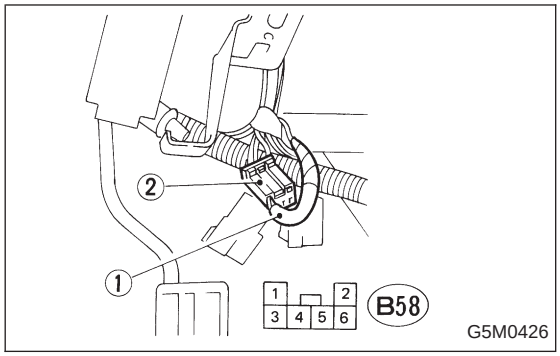


SUPPLEMENTAL RESTRAINT SYSTEM 5-5

1. Diagnostics Chart for On-board Diagnostic System

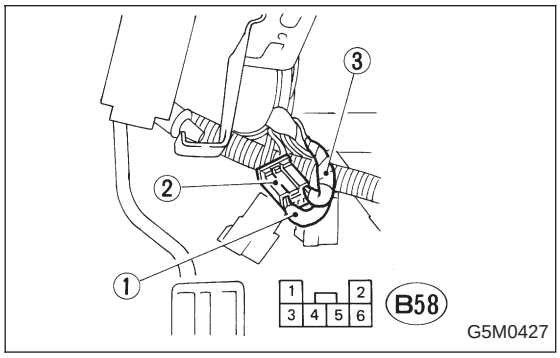
A: BASIC DIAGNOSTICS PROCEDURE





B: ON-BOARD DIAGNOSTIC

When the airbag system is in functioning condition, the airbag warning light will remain on for 8 seconds and go out when the ignition switch is set to ON.
If there is any malfunction, the airbag warning light will either stay on or off continuously. In such cases, perform on-board diagnostic in accordance with the specified procedure to determine trouble codes.
1) Turn ignition switch ON (with engine OFF).
2) Connect DIAG. terminal ① to No. 1 terminal of diagnosis connector ② located below lower cover.
3) Check in accordance with the trouble code indicated by the AIRBAG warning light, and record the trouble codes.
4) Turn the ignition switch “OFF” and remove the DIAG. terminal from No.1 terminal of diagnosis connector.



C: CLEAR MEMORY

After eliminating problem as per trouble code, clear memory as follows:
Make sure ignition switch is ON (and engine off). Connect one DIAG. terminal ① on diagnosis connector ② terminal No. 1.
While warning light is flashing, contact the other DIAG. terminal ③ on terminal No. 2 for at least three seconds.
After memory is cleared, normal warning light flashing rate resumes. (Warning light flashes every 0.6 seconds ON-OFF operation). Memory cannot be cleared if any problem exists.

D: LIST OF TROUBLE CODES

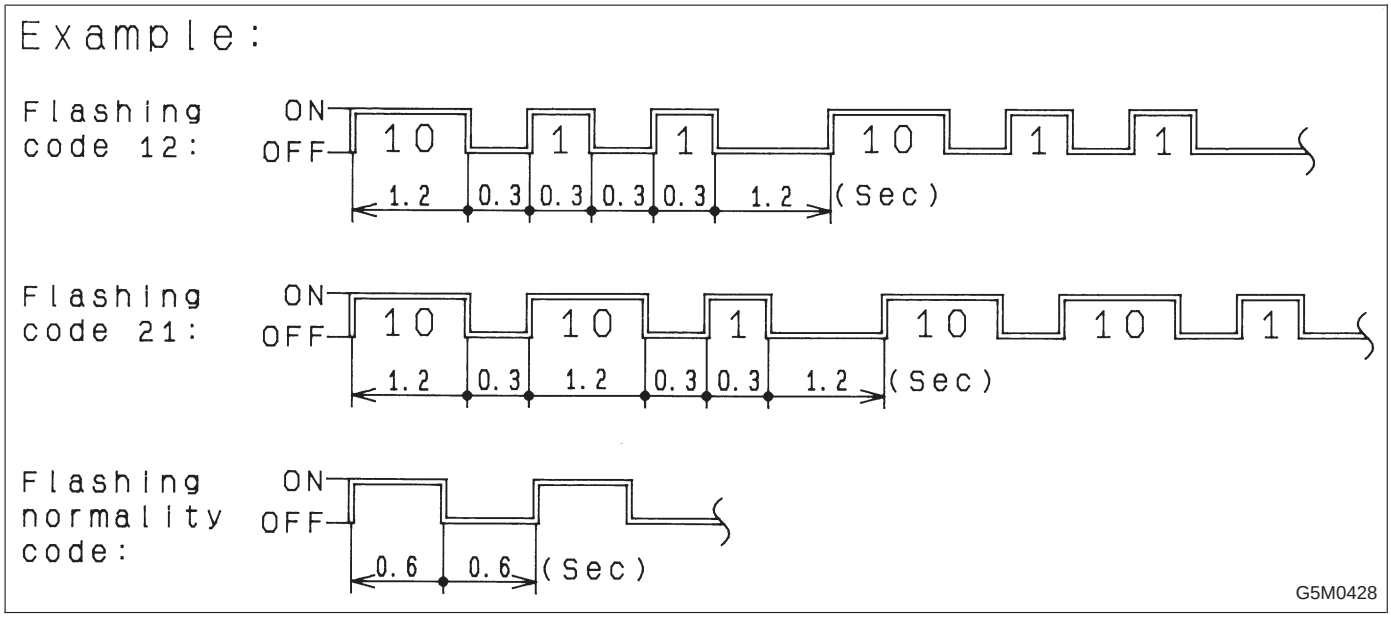
1. TROUBLE CODES

Trouble code/Contents of troubles	Memory function	Contents of diagnosis	Page
04	Provided.	1) Airbag main harness circuit is shorted. 2) Airbag module harness (Ps) circuit is shorted. 3) Airbag control module is faulty.	16
11	Provided.	1) Airbag control module is faulty. 2) Airbag main harness circuit is open. 3) Fuse No. 8 is blown. 4) Body harness circuit is open.	17
12	Provided.	1) Airbag main harness circuit is open. 2) Airbag module harness (Dr) circuit is open. 3) Roll connector circuit is open. 4) Airbag control module is faulty.	19
13	Provided.	1) Airbag main harness circuit is shorted. 2) Airbag module harness (Dr) is shorted. 3) Roll connector circuit is shorted. 4) Airbag control module is faulty.	20
14	Not provided.	1) (AB9) and (AB10) are not connected properly. 2) (AB2) and (AB7) are not connected properly. 3) (AB3) and (AB8) are not connected properly. 4) (AB6) is not connected properly to airbag control module.	21
21	Provided.	Airbag control module is faulty.	23
22	Provided.	1) Airbag main harness circuit is open. 2) Airbag module harness (Ps) circuit is open. 3) Airbag control module is faulty.	24
34	Provided.	1) Airbag main harness circuit (Ps) is shorted to power supply. 2) Airbag module harness (Ps) is shorted to power supply. 3) Airbag control module is faulty.	25
41	Provided.	1) Airbag main harness circuit (Dr) is shorted to ground. 2) Airbag module harness circuit (Dr) is shorted to ground. 3) Roll connector circuit is shorted to ground. 4) Airbag control module is faulty.	26
42	Provided.	1) Airbag main harness circuit (Ps) is shorted to ground. 2) Airbag module harness circuit (Ps) is shorted to ground. 3) Airbag control module is faulty.	27
43	Provided.	1) Airbag main harness circuit (Dr) is shorted to power supply. 2) Airbag module harness (Dr) is shorted to power supply. 3) Roll connector is shorted to power supply. 4) Airbag control module is faulty.	28
NOTE: Dr: Driver side Ps: Passenger side			

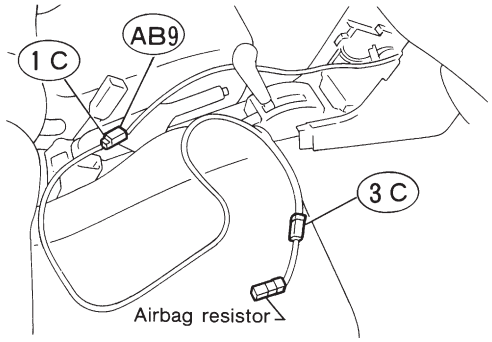
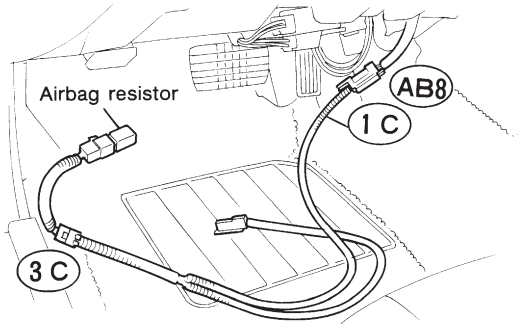
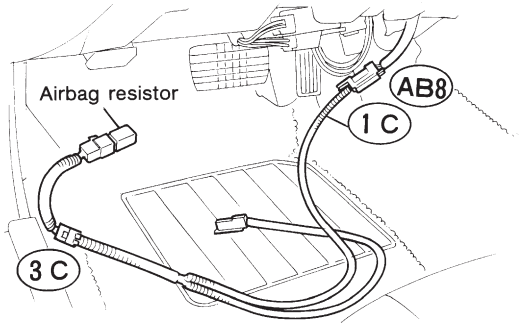
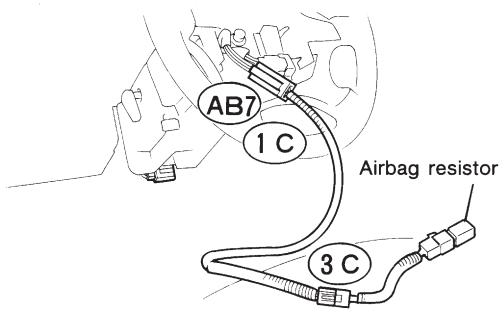
Trouble code/Contents of troubles		Memory function	Contents of diagnosis	Page
Airbag warning light remains on.		Not provided.	1) Airbag warning light is faulty. 2) Airbag control module to airbag warning light harness circuit is shorted or open. 3) Grounding circuit is faulty. 4) Airbag control module is faulty. 5) (AB1) and (B39) are not connected properly.	29
Airbag warning light remains off.		Not provided.	1) Fuse No. 15 is blown. 2) Body harness circuit is open. 3) Airbag warning light is faulty. 4) Airbag main harness is faulty. 5) Airbag control module is faulty.	32
Warning light indicates trouble code, then normality code.	Flashing trouble code.	Provided.	Airbag system component parts are faulty.	34
	Flashing normality code.	Not provided.	1) Airbag connector is faulty. 2) Fuse No. 16 is blown. 3) Airbag main harness is faulty. 4) Airbag control module is faulty. 5) Body harness is faulty.	37

2. HOW TO READ TROUBLE CODES

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”.

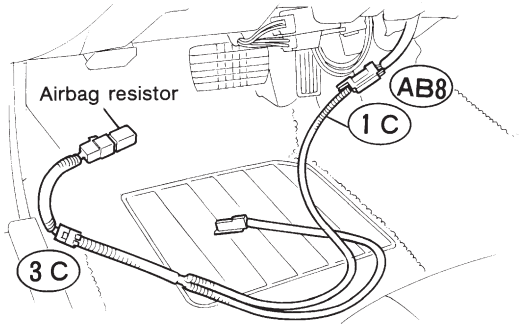


E: DIAGNOSTICS PROCEDURE

Airbag warning light stays on after 8 seconds.
1) Perform on-board diagnostic. <Ref. to 5-5 [T1B0].>
2) Are trouble codes 4, 12, 13, 22, 34, 41, 42 or 43 indicated? <Ref. to 5-5 [T1D1].> <Ref. to 5-5 [T1D2].> Record trouble codes. If “YES” proceed to step 4). If “NO” proceed to step 3).
3) Proceed with diagnostics and repair according to trouble code indicated then perform step 15).
4) If codes 4, 22, 34, 42 are indicated, proceed to step 5). If codes 4, 22, 34, 42 are not indicated, proceed to step 10).
5) If codes 12, 13, 41, 43 are indicated, proceed to step 6). If codes 12, 13, 41, 43 are not indicated, proceed to step 11).
6) Turn ignition switch “OFF”, disconnect battery ground cable, and wait 20 seconds. Disconnect passenger side airbag module connector (AB9) to (AB10). Connect test harness C connector (1C) to (AB9). Connect airbag resistor to test harness C connector (3C).  G5M0589 Remove lower cover panel and connect test harness C connector (1C) to (AB8) <Ref. to 5-4 [W1A0].> with airbag resistor attached to test harness C connector (3C). Connect battery ground cable and turn ignition switch “ON”. Does airbag warning light go “OFF” after 8 seconds and remain off for more than 30 seconds? See notes 1) and 2). (Refer to end of chart.) If “YES” proceed to step 7). If “NO” proceed to step 3).  G5M0429
7) Turn ignition switch “OFF”, disconnect battery ground cable, and wait 20 seconds. Connect passenger side airbag module connector (AB9) to (AB10). Connect battery ground cable and turn ignition switch “ON”. Does airbag warning light go “OFF” after 8 seconds and remain off for more than 30 seconds? See notes 1) and 2). (Refer to end of chart.) If “YES” proceed to step 8). If “NO” proceed to step 13).  G5M0429
8) Turn ignition switch “OFF”, disconnect battery ground cable, and wait 20 seconds. Connect connector (AB8) to (AB3). Remove driver side airbag module and connect test harness C connector (1C) to (AB7). <Ref. to 5-5 [W2A1].> Connect airbag resistor to test harness C connector (3C). Connect battery ground cable and turn ignition switch “ON”. Does airbag warning light go “OFF” after 8 seconds and remain off for more than 30 seconds? See note 1) and 2). (Refer to end of chart.) If “YES” proceed to step 9). If “NO” proceed to step 14).  G5M0430

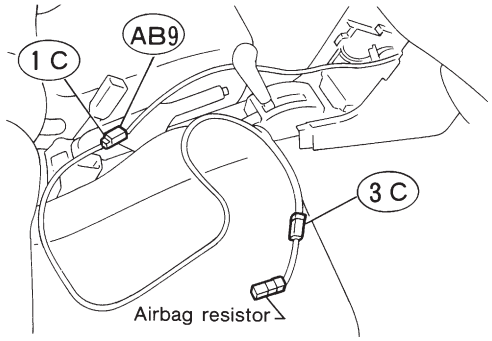
9) Turn ignition switch “OFF”, disconnect battery ground cable, and wait 20 seconds. Replace with a new driver side airbag module. <Ref. to 5-5 [W2A1].> Proceed to step 15).

10) Turn ignition switch “OFF”, disconnect battery ground cable, and wait 20 seconds. Remove lower cover panel and connect test harness C connector (1C) to (AB8) <Ref. to 5-4 [W1A0].> with airbag resistor attached to test harness C connector (3C).
Connect battery ground cable and turn ignition switch “ON”.
Does airbag warning light go “OFF” after 8 seconds and remain off for more than 30 seconds?
See notes 1) and 2). (Refer to end of chart.)
If “YES” proceed to step 8).
If “NO” proceed to step 3).



G5M0429

11) Turn ignition switch “OFF”, disconnect battery ground cable, and wait 20 seconds. Disconnect passenger side airbag module connector (AB9) to (AB10).
Connect test harness C connector (1C) to (AB9). Connect airbag resistor to test harness C connector (3C).
Connect battery ground cable and turn ignition switch “ON”.
Does airbag warning light go “OFF” after 8 seconds and remain off for more than 30 seconds?
See notes 1) and 2). (Refer to end of chart.)
If “YES” proceed to step 12).
If “NO” proceed to step 3).



G5M0589

12) Turn ignition switch “OFF”, disconnect battery ground cable, and wait 20 seconds. Replace with a new passenger side airbag module <Ref. to 5-5 [W2A2].> then proceed to step 15).

13) Turn ignition switch “OFF”, disconnect battery ground cable and wait 20 seconds. Replace with a new passenger side airbag module <Ref. to 5-5 [W2A2].> then proceed to step 7).

14) Turn ignition switch “OFF”, disconnect battery ground cable, and wait 20 seconds. Replace with a new combination switch, <Ref. to 5-5 [W5A0].> and install driver side airbag module <Ref. to 5-5 [W2A1].>.
Connect battery ground cable and turn ignition switch “ON”. Does airbag warning light go “OFF” after 8 seconds and remain off for more than 30 seconds?
See notes 1) and 2). (Refer to end of chart.)
If “YES” proceed to step 16).
If “NO” proceed to step 9).

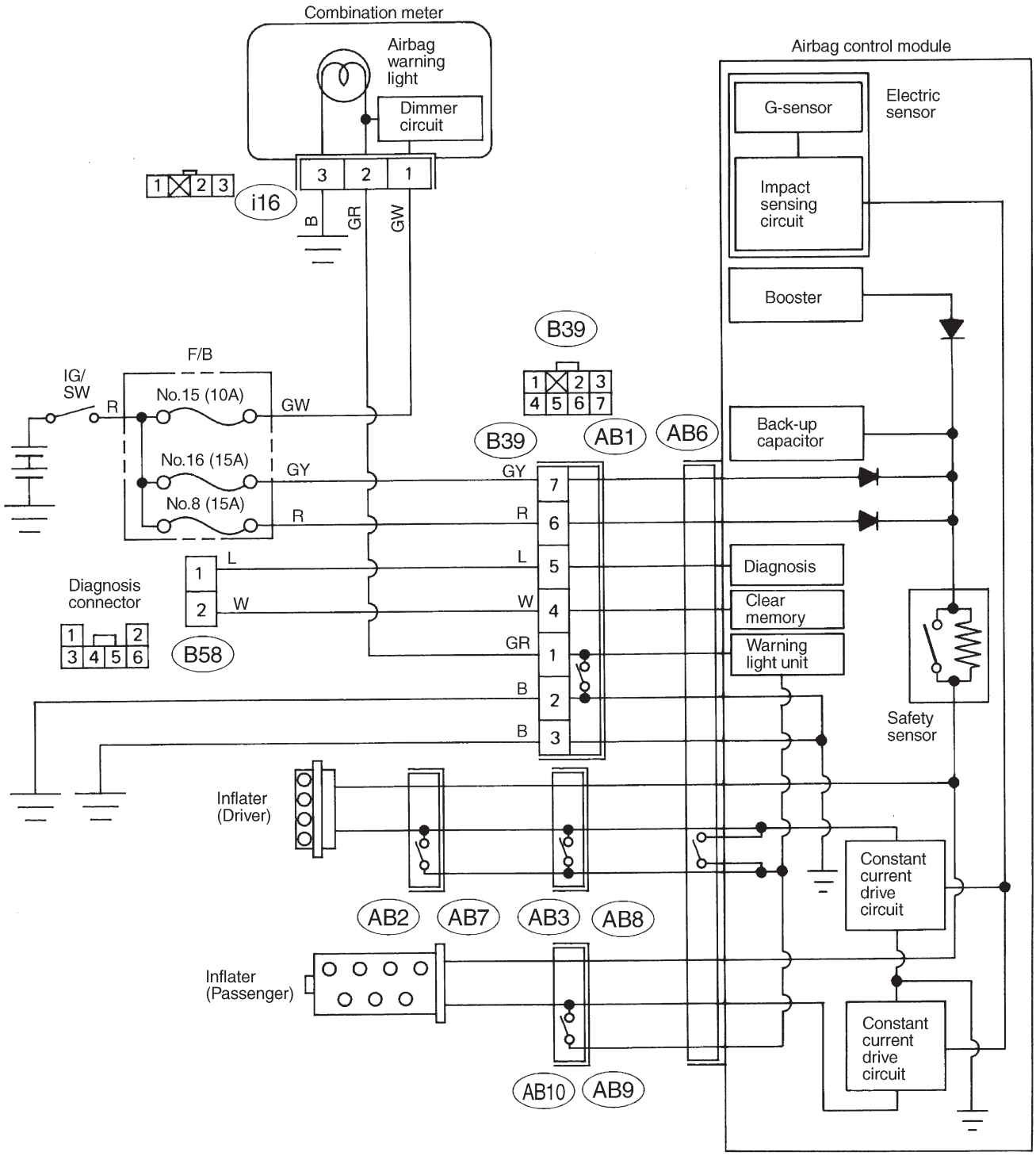
15) Connect battery ground cable and turn ignition switch “ON”. Does airbag warning light go “OFF” after 8 seconds and remain off for more than 30 seconds? See notes 1) and 2). (Refer to end of chart.)
If “YES” proceed to step 16).
If “NO” proceed to step 1).

16) Perform clear memory procedure. <Ref. to 5-5 [T1C0].>
If memory cannot be cleared, another trouble code exists. Return to step 1).
If memory can be cleared, proceed to step 17).

17) END

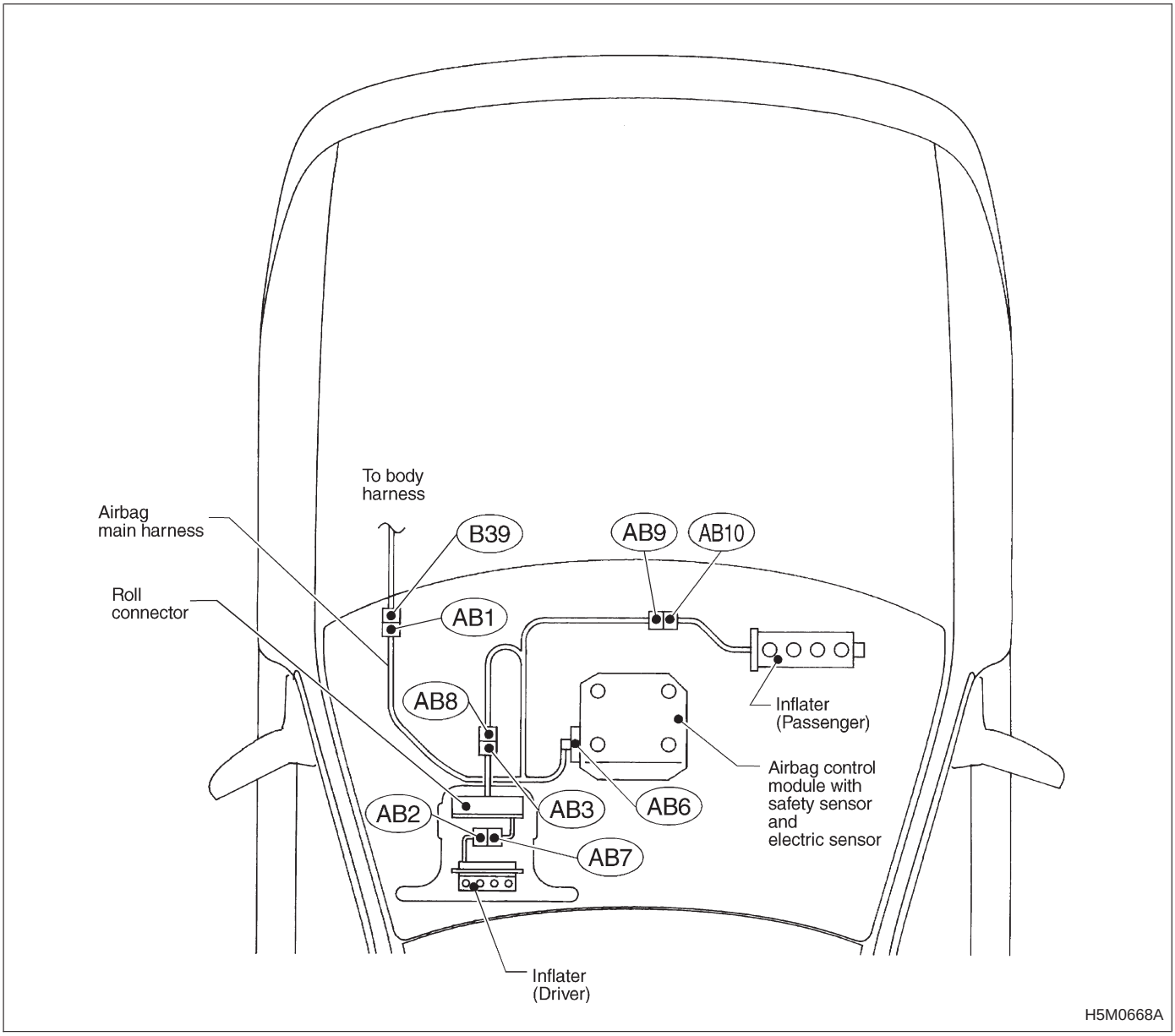
NOTES:
1) Always remember to secure the green double locks before turning the ignition switch “ON”.
2) In some cases the airbag warning light will go “OFF” after 8 seconds but will turn “ON” again within 30 seconds. In this case continue diagnostics with the basic diagnostics procedures or trouble code procedures.

2. Diagram of SRS Airbag



H5M0667A

3. Wiring Location

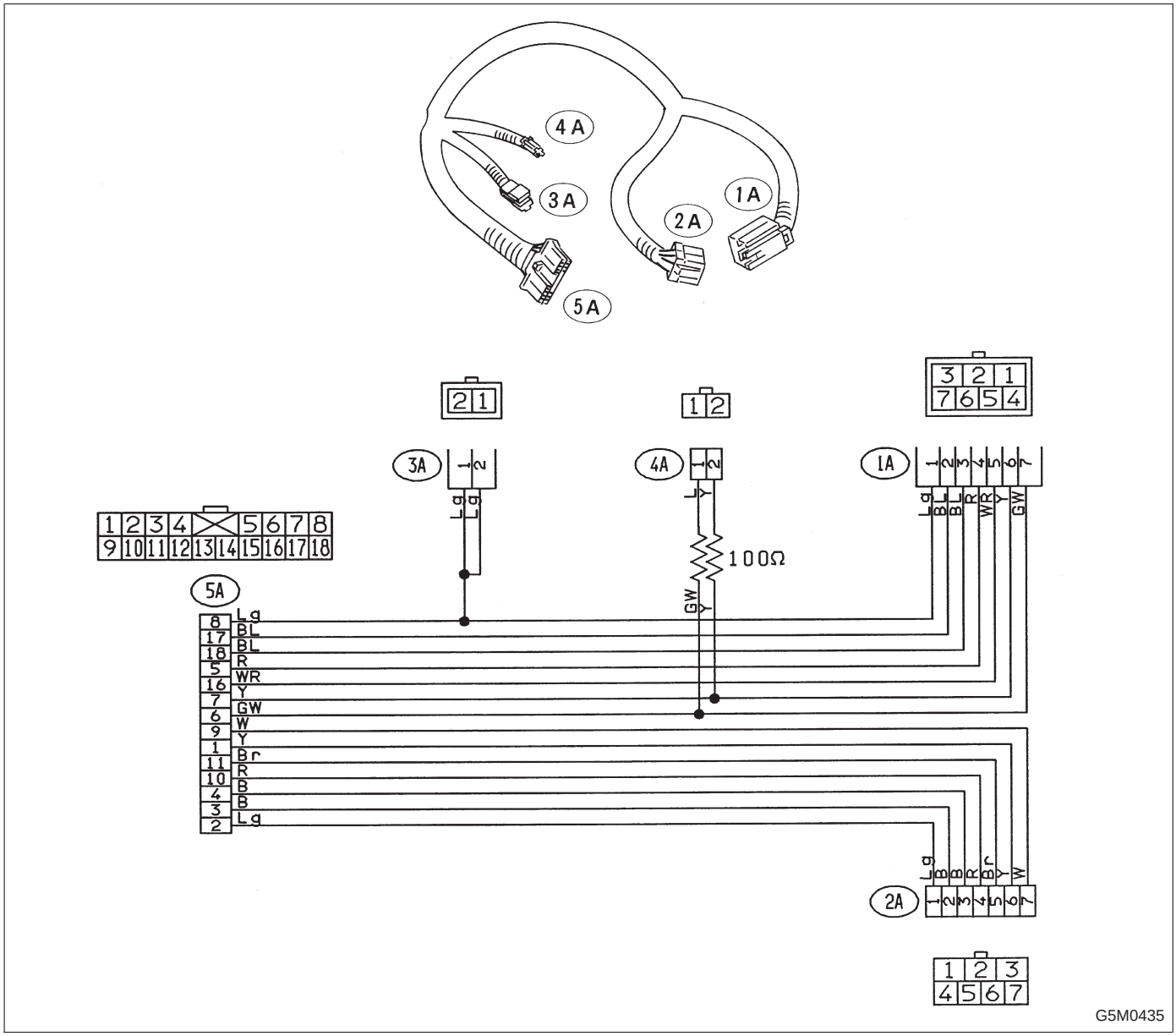


Connector No.	(AB1)	(AB2)	(AB3)	(AB6)	(AB7)	(AB8)	(AB9)	(AB10)
Pole	7	3	3	12	3	3	3	3
Color	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Male/Female	Male	Female	Female	Female	Male	Male	Male	Female

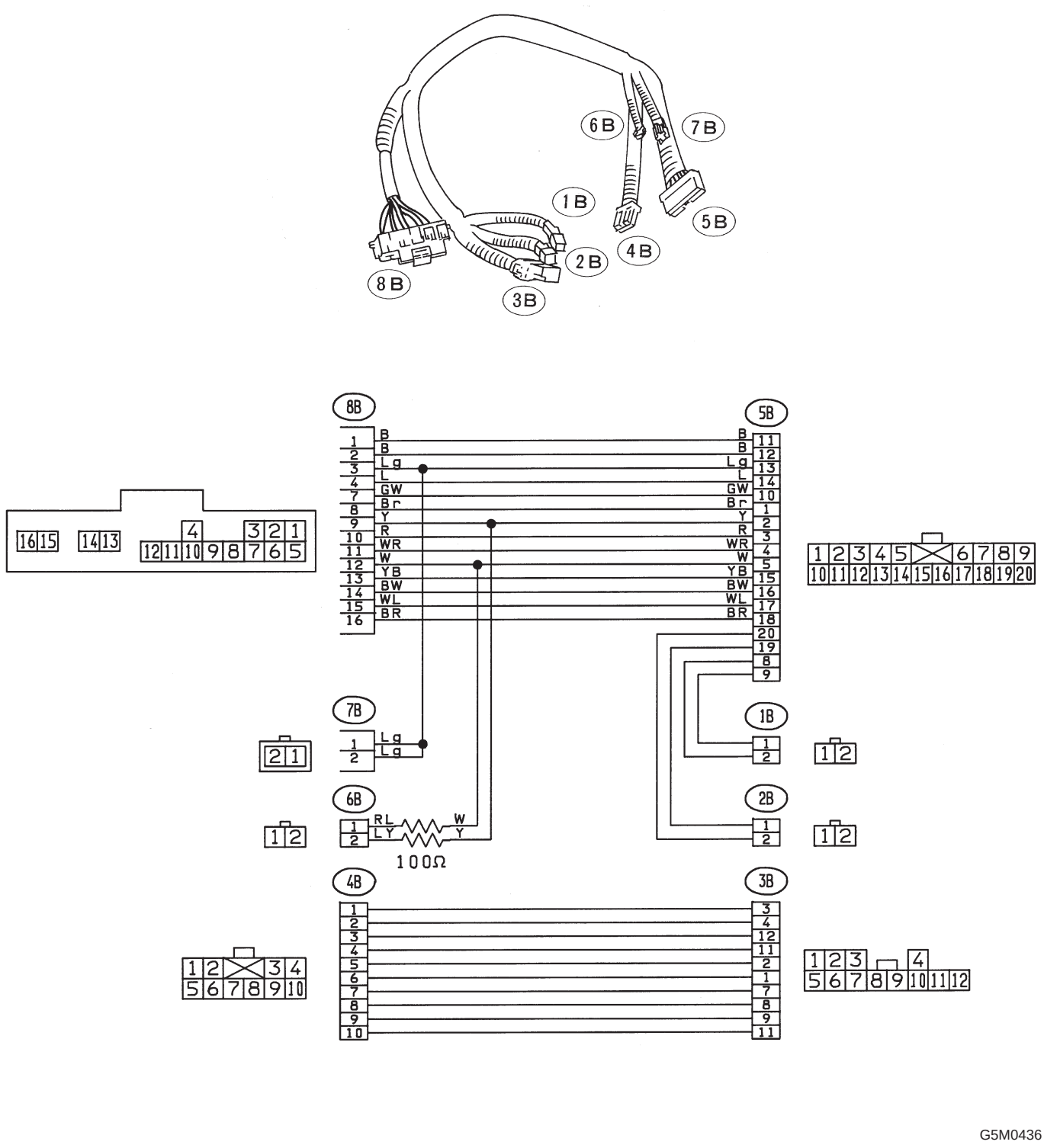
4. Test Harnesses and Airbag Resistor

CAUTION:
Be sure to use specified test harness A, B or C when measuring voltage, resistance, etc. of AIRBAG system component parts.

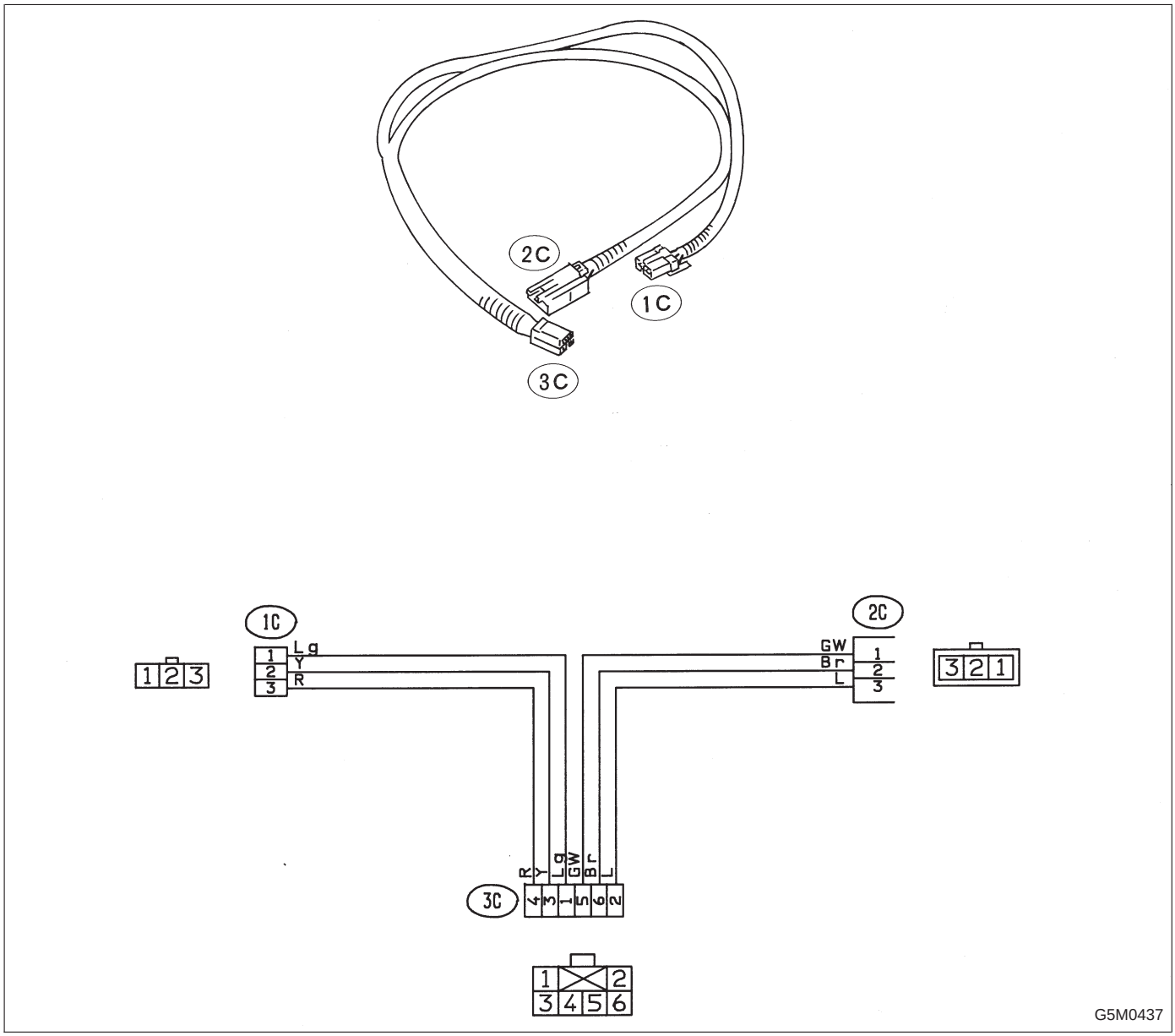
A: TEST HARNESS A (PN98299PA000)



B: TEST HARNESS B (PN98299PA010)

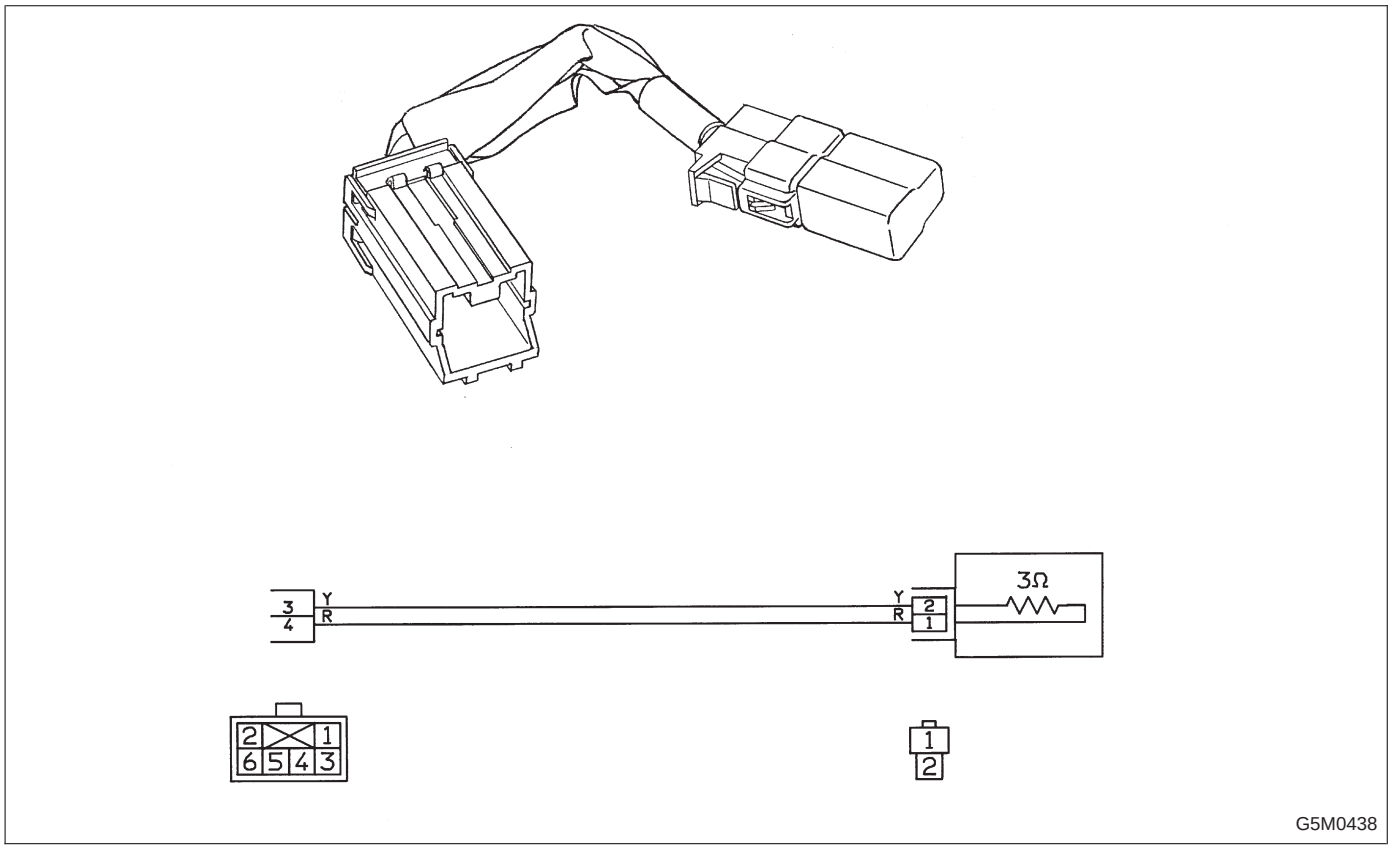


C: TEST HARNESS C (PN98299PA020)



D: AIRBAG RESISTOR (PN98299PA040)

The airbag resistor is used during diagnostics. The airbag resistor has the same resistance as the airbag module and thus provides safety when used instead of the airbag module. It also makes it possible to finish, diagnostics in less time.



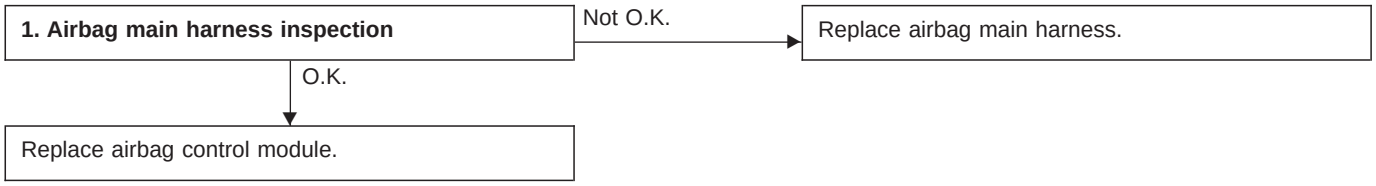
5. Diagnostics Chart with Trouble Code

Trouble code/Contents of troubles		Memory function	Contents of diagnosis	Page
04		Provided.	1) Airbag main harness circuit is shorted. 2) Airbag module harness (Ps) circuit is shorted. 3) Airbag control module is faulty.	16
11		Provided.	1) Airbag control module is faulty. 2) Airbag main harness circuit is open. 3) Fuse No. 8 is blown. 4) Body harness circuit is open.	17
12		Provided.	1) Airbag main harness circuit is open. 2) Airbag module harness (Dr) circuit is open. 3) Roll connector circuit is open. 4) Airbag control module is faulty.	19
13		Provided.	1) Airbag main harness circuit is shorted. 2) Airbag module harness (Dr) is shorted. 3) Roll connector circuit is shorted. 4) Airbag control module is faulty.	20
14		Not provided.	1) (AB9) and (AB10) are not connected properly. 2) (AB2) and (AB7) are not connected properly. 3) (AB3) and (AB8) are not connected properly. 4) (AB6) is not connected properly to airbag control module.	21
21		Provided.	Airbag control module is faulty.	23
22		Provided.	1) Airbag main harness circuit is open. 2) Airbag module harness (Ps) circuit is open. 3) Airbag control module is faulty.	24
34		Provided.	1) Airbag main harness circuit (Ps) is shorted to power supply. 2) Airbag module harness (Ps) is shorted to power supply. 3) Airbag control module is faulty.	25
41		Provided.	1) Airbag main harness circuit (Dr) is shorted to ground. 2) Airbag module harness circuit (Dr) is shorted to ground. 3) Roll connector circuit is shorted to ground. 4) Airbag control module is faulty.	26
42		Provided.	1) Airbag main harness circuit (Ps) is shorted to ground. 2) Airbag module harness circuit (Ps) is shorted to ground. 3) Airbag control module is faulty.	27
43		Provided.	1) Airbag main harness circuit (Dr) is shorted to power supply. 2) Airbag module harness (Dr) is shorted to power supply. 3) Roll connector is shorted to power supply. 4) Airbag control module is faulty.	28
Airbag warning light remains on.		Not provided.	1) Airbag warning light is faulty. 2) Airbag control module to airbag warning light harness circuit is shorted or open. 3) Grounding circuit is faulty. 4) Airbag control module is faulty. 5) (AB1) and (B39) are not connected properly.	29
Airbag warning light remains off.		Not provided.	1) Fuse No. 15 is blown. 2) Body harness circuit is open. 3) Airbag warning light is faulty. 4) Airbag main harness is faulty. 5) Airbag control module is faulty.	32
Warning light indicates trouble code, then normality code.	Flashing trouble code.	Provided.	Airbag system component parts are faulty.	34
	Flashing normality code.	Not provided.	1) Airbag connector is faulty. 2) Fuse No. 16 is blown. 3) Airbag main harness is faulty. 4) Airbag control module is faulty. 5) Body harness is faulty.	37
NOTE: Dr: Driver side Ps: Passenger side				

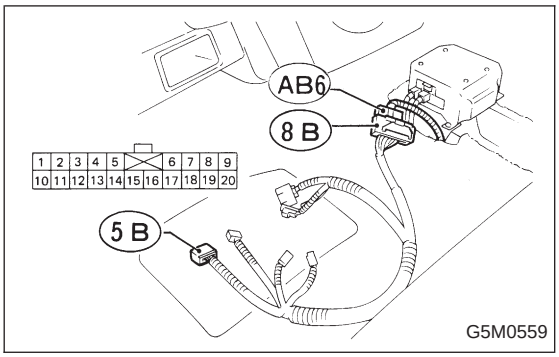
A: TROUBLE CODE 04

DIAGNOSIS:

- Airbag main harness circuit is shorted.
- Airbag module harness (Passenger) circuit is shorted.
- Airbag control module is faulty.



CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.
After 20 seconds elapse, remove instrument panel lower cover, and disconnect (AB3) and (AB8), (AB9) and (AB10).



1. AIRBAG MAIN HARNESS INSPECTION

1) Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W6A0].>, and connect (AB6) to test harness-B connector (8B).

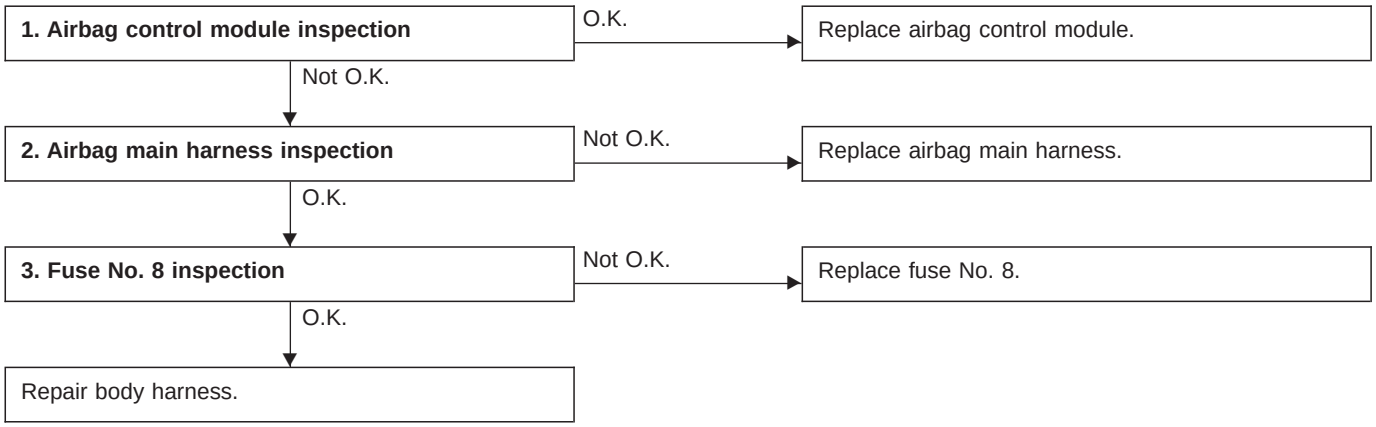
2) Measure resistance between test harness-B connector (5B) terminals.

(5B) Terminal / Specified resistance:
No. 6 — No. 7 / 10 kΩ, or more

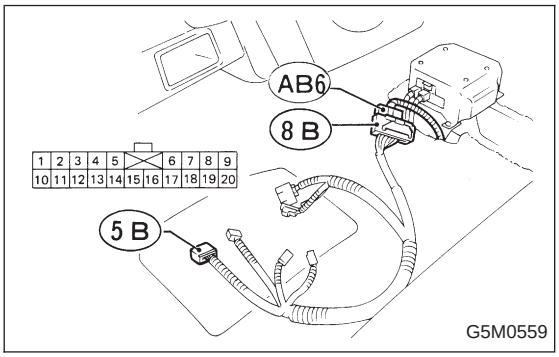
B: TROUBLE CODE 11

DIAGNOSIS:

- Airbag control module is faulty.
- Airbag main harness circuit is open.
- Fuse No. 8 is blown.
- Body harness circuit is open.



CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.
After 20 seconds elapse, remove instrument panel lower cover, and disconnect (AB3) and (AB8).



Test harness B-PN98299PA010

1. AIRBAG CONTROL MODULE INSPECTION

1) Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W5A0].> and connect it to test harness-B connector (8B).

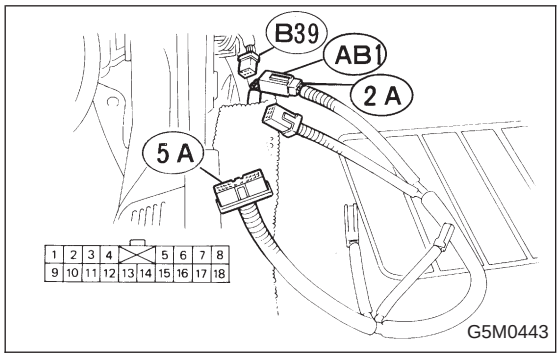
2) Connect battery ground cable and turn ignition switch "ON". (engine off)

3) Measure voltage across connector (5B) terminal and body.

(5B) Terminal / Specified voltage:
No. 2 — Body / 10 V, or more

2. AIRBAG MAIN HARNESS INSPECTION

1) Go to step 2) below after performing diagnostics on airbag system as per flowchart under “1. Airbag Control Module Inspection” previously outlined.
2) Turn ignition switch “OFF”, disconnect battery ground terminal and then wait at least 20 seconds.



Test harness A-PN98299PA000

3) Disconnect bulk harness connector (B39) from connector (AB1) at front lower pillar, and connect connector (AB1) to test harness-A connector (2A).

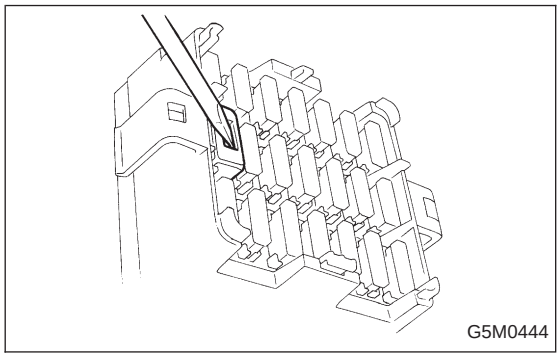
4) Measure resistance between test harness-A connector (5A) terminal and test harness-B connector (5B) terminal.

Connector & terminal / Specified resistance:
(5A) No. 1 — (5B) No. 2 / 10 Ω, or less

5) Measure resistance between terminals of connectors (5A) and (5B).

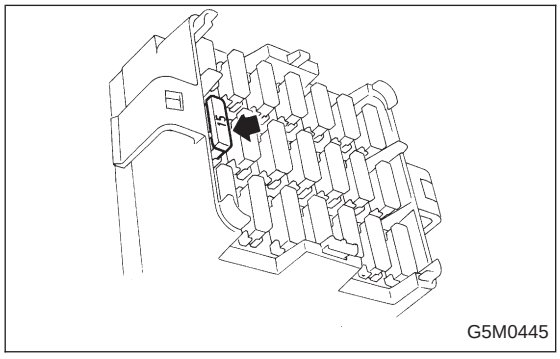
(5A) Terminal / Specified resistance:
No. 1 — Body / 10 kΩ, or more

(5B) Terminal / Specified resistance:
No. 2 — Body / 10 kΩ, or more



3. FUSE NO. 8 INSPECTION

1) Turn ignition switch “OFF”, and remove airbag fuse protector.

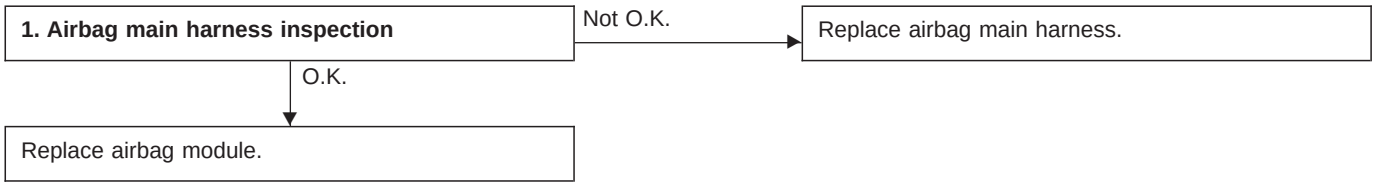


2) Remove and visually check fuse No. 8.

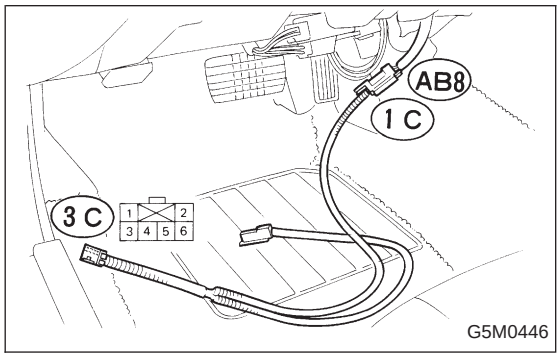
C: TROUBLE CODE 12

DIAGNOSIS:

- Airbag main harness circuit is open.
- Airbag module harness circuit is open.
- Roll connector circuit is open.
- Airbag control module is faulty.

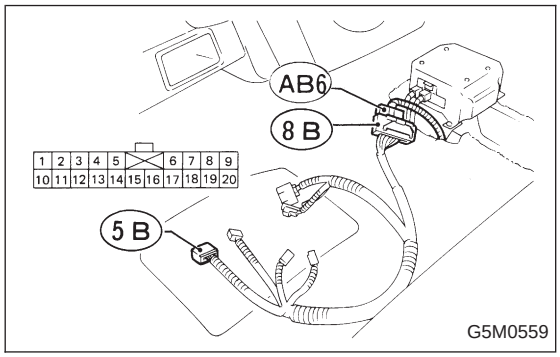


CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.



1. AIRBAG MAIN HARNESS INSPECTION

1) Remove lower cover panel <Ref. to 5-4 [W1A0].>, and connect connector (AB8) below steering column to test harness-C connector (1C).



2) Disconnect connector (AB6) <Ref. to 5-5 [W5A0].> from airbag control module, and connect it to test harness-B connector (8B) terminal.

3) Measure resistance between test harness-B connector (5B) and test harness-C connector (3C) terminals.

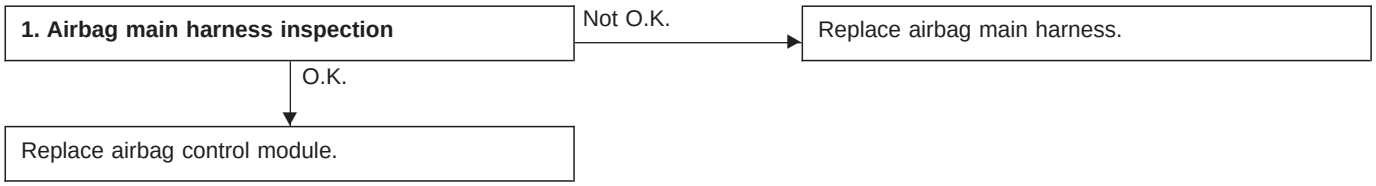
Connector & terminal / Specified resistance:
(5B) No. 14 — (3C) No. 2 / 10 Ω, or less
(5B) No. 1 — (3C) No. 3 / 10 Ω, or less

Test harness B-PN98299PA010
Test harness C-PN98299PA020

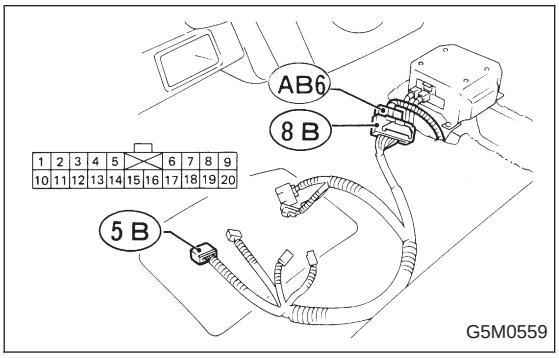
D: TROUBLE CODE 13

DIAGNOSIS:

- Airbag main harness circuit is shorted.
- Airbag module harness is shorted.
- Roll connector circuit is shorted.
- Airbag control module is faulty.



CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.
After 20 seconds elapse, remove instrument panel lower cover, and disconnect (AB3) and (AB8).



Test harness B-PN98299PA010

1. AIRBAG MAIN HARNESS INSPECTION

1) Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W5A0].>, and connect it to test harness-B connector (8B).

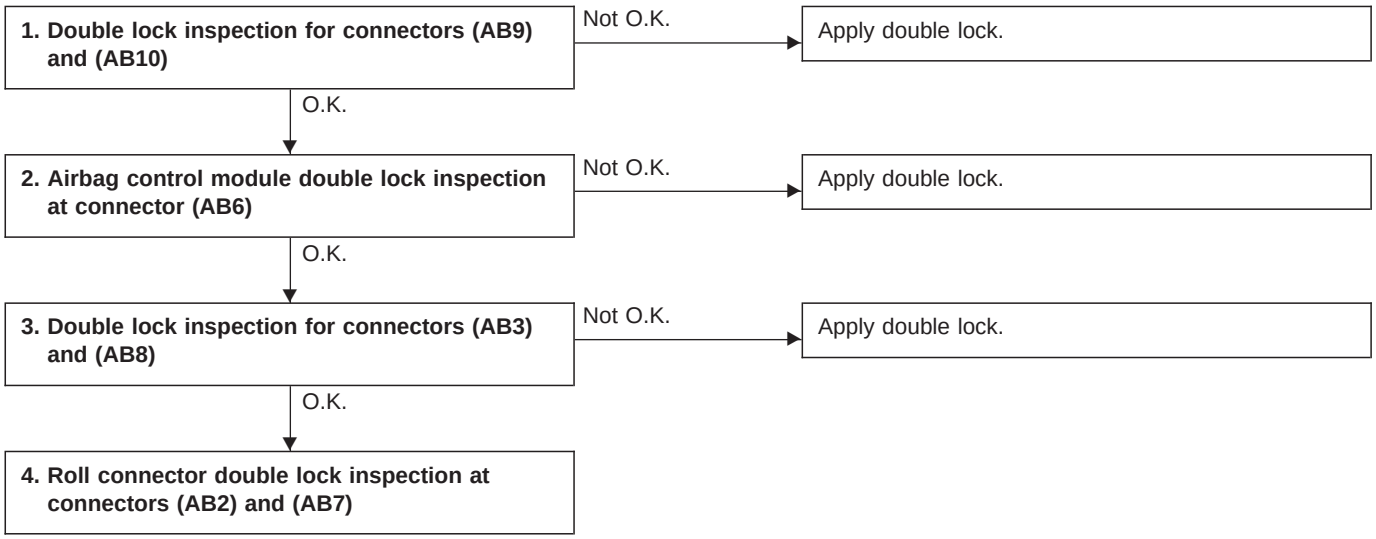
2) Measure resistance between test harness-B connector (5B) terminals.

(5B) Terminal / Specified resistance:
No. 1 — No. 14 / 10 kΩ, or more

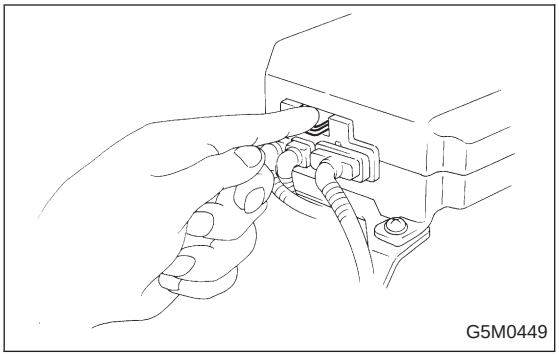
E: TROUBLE CODE 14

DIAGNOSIS:

- (AB9) and (AB10) are not connected properly.
- (AB2) and (AB7) are not connected properly.
- (AB3) and (AB8) are not connected properly.
- (AB6) is not connected properly to airbag control module.

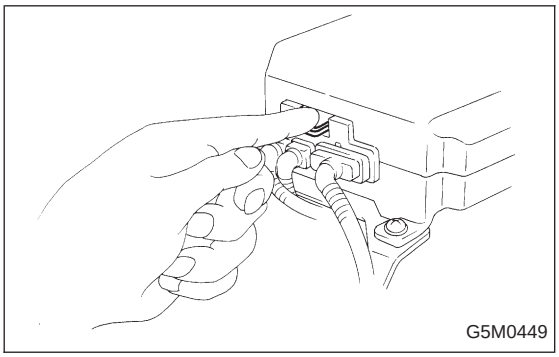


CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.


G5M0449

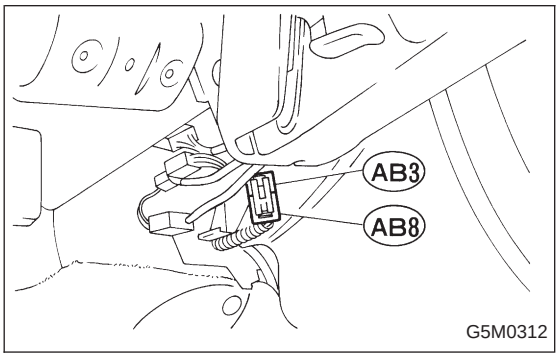
1. AIRBAG CONTROL MODULE DOUBLE LOCK INSPECTION AT CONNECTORS (AB4) (AB5) (AB6)

1) Check double lock of connectors (AB4) (AB5) (AB6) connected to airbag control module. <Ref. to 5-5 [W5A0].>


G5M0449

2. AIRBAG CONTROL MODULE DOUBLE LOCK INSPECTION AT CONNECTOR (AB6)

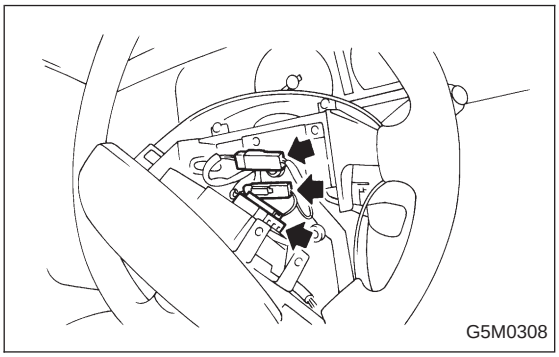
1) Check double lock of connector (AB6) connected to airbag control module. <Ref. to 5-5 [W5A0].>



G5M0312

3. DOUBLE LOCK INSPECTION FOR CONNECTORS (AB3) AND (AB8) BELOW STEERING COLUMN

1) Remove lower cover panel. <Ref. to 5-4 [W1A0].>
2) Check double lock of connectors (AB3) and (AB8) below steering column.


G5M0308

4. ROLL CONNECTOR DOUBLE LOCK INSPECTION AT CONNECTORS (AB2) AND (AB7)

1) Remove airbag module <Ref. to 5-5 [W2A0].>, and check double lock of connectors (AB2) and (AB7) at roll connector.

F: TROUBLE CODE 21

DIAGNOSIS:

- Airbag control module is faulty.

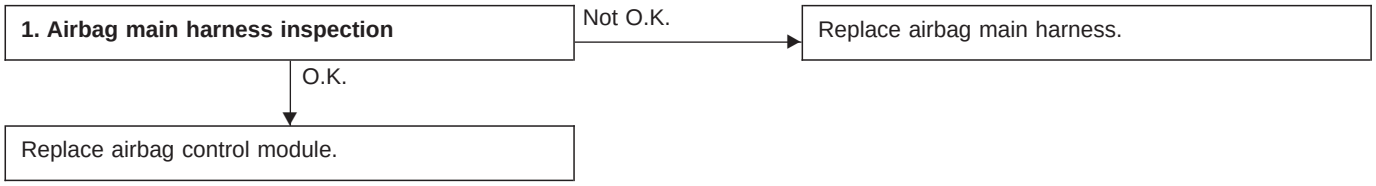
Replace airbag control module.

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch “OFF”, disconnect battery ground terminal, and then wait at least 20 seconds.

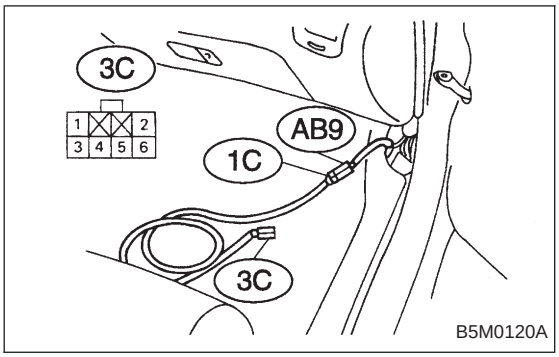
G: TROUBLE CODE 22

DIAGNOSIS:

- Airbag main harness circuit is open.
- Airbag module harness (Passenger) circuit is open.
- Airbag control module is faulty.

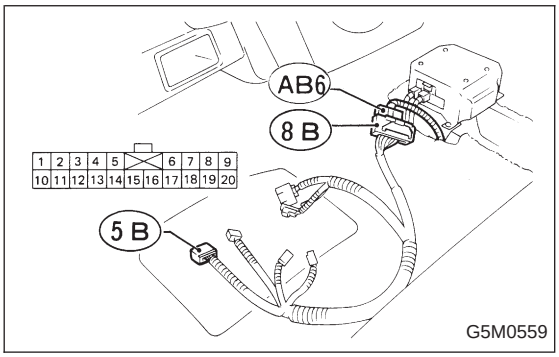


CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.



1. AIRBAG MAIN HARNESS INSPECTION

1) Remove front pillar lower trim (Passenger side). <Ref. to 5-3 [C700].>, disconnect connector (AB9) and (AB10) and connect connector (AB9) to test harness C connector (1C).



2) Disconnect connector (AB6) <Ref. to 5-5 [W6A0].> from airbag control module, and connect (AB6) to test harness-B connector (8B) terminal.

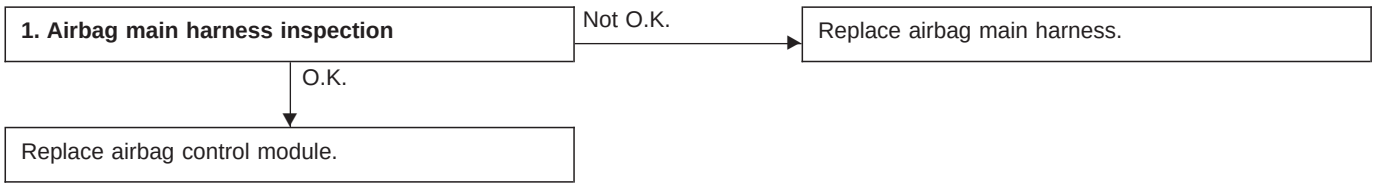
3) Measure resistance between test harness-B connector (5B) and test harness C connector (3C) terminals.

Connector & terminal / Specified resistance:
(5B) No. 6 — (3C) No. 4 / 10 Ω, or less
(5B) No. 7 — (3C) No. 3 / 10 Ω, or less

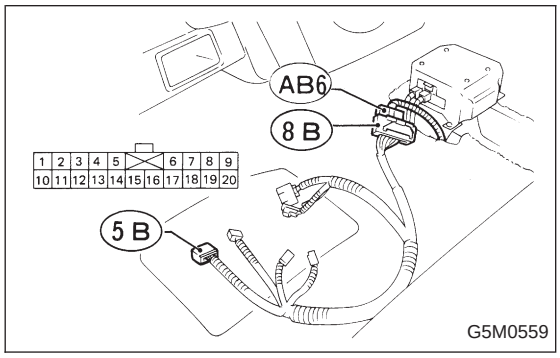
H: TROUBLE CODE 34

DIAGNOSIS:

- Airbag main harness circuit (Passenger) is shorted to power supply.
- Airbag module harness (Passenger) is shorted to power supply.
- Airbag control module is faulty.



CAUTION:
Before performing diagnostics on airbag system, turn ignition switch “OFF”, disconnect battery ground terminal and then wait at least 20 seconds.
After 20 seconds elapse, remove instrument panel lower cover, and disconnect (AB3) and (AB8), (AB9) and (AB10).



1. AIRBAG MAIN HARNESS INSPECTION

1) Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W5A0].>, and connect it to test harness-B connector (8B).

2) Connect battery ground cable and turn ignition switch “ON” (engine off).

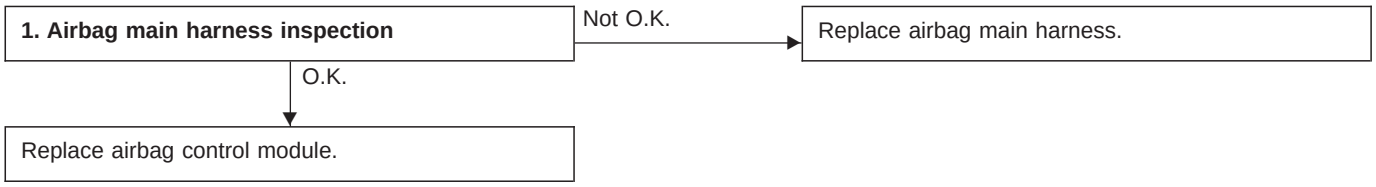
3) Measure voltage across each test harness-B connector (5B) terminal and body.

(5B) Terminals / Specified voltage:
No. 6 — Body / 1 V, or less
No. 7 — Body / 1 V, or less

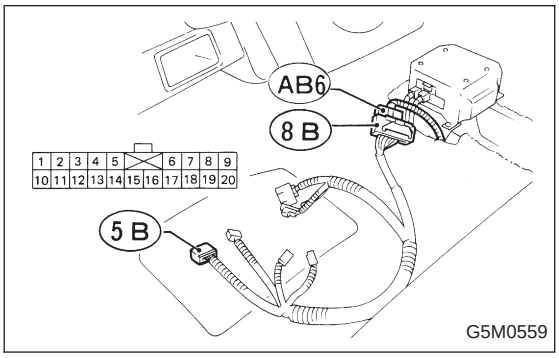
I: TROUBLE CODE 41

DIAGNOSIS:

- Airbag main harness circuit (Driver) is shorted to ground.
- Airbag module harness circuit (Driver) is shorted to ground.
- Roll connector circuit is shorted to ground.
- Airbag control module is faulty.



CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.
After 20 seconds elapse, remove instrument panel lower cover, and disconnect (AB3) and (AB8), (AB9) and (AB10).



1. AIRBAG MAIN HARNESS INSPECTION

1) Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W5A0].>, and connect it to test harness-B connector (8B).

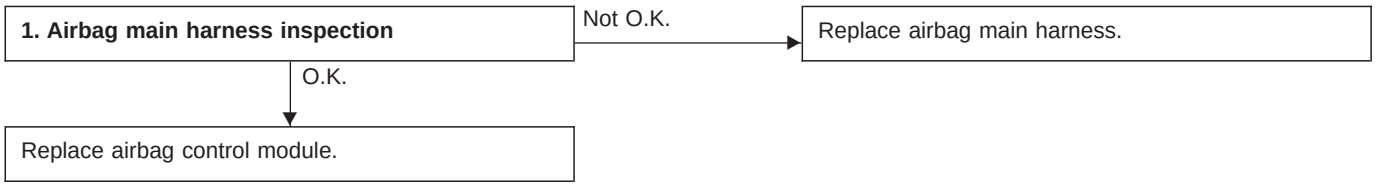
2) Measure resistance between test harness-B connector (5B) terminals and body.

(5B) Terminal / Specified resistance:
No. 1 — Body / 200 Ω, or more
No. 14 — Body / 200 Ω, or more

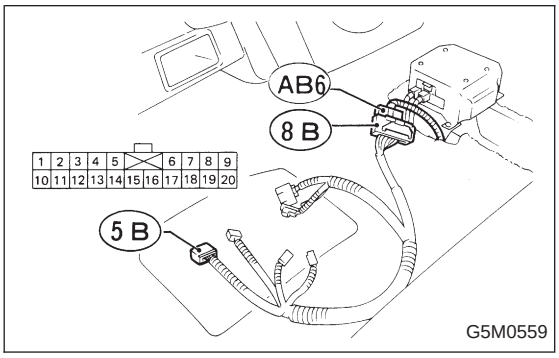
J: TROUBLE CODE 42

DIAGNOSIS:

- Airbag main harness circuit (Passenger) is shorted to ground.
- Airbag module harness circuit (Passenger) is shorted to ground.
- Airbag control module is faulty.



CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.
After 20 seconds elapse, remove instrument panel lower cover, and disconnect (AB3) and (AB8), (AB9) and (AB10).



1. AIRBAG MAIN HARNESS INSPECTION

1) Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W5A0].>, and connect it to test harness-B connector (8B).

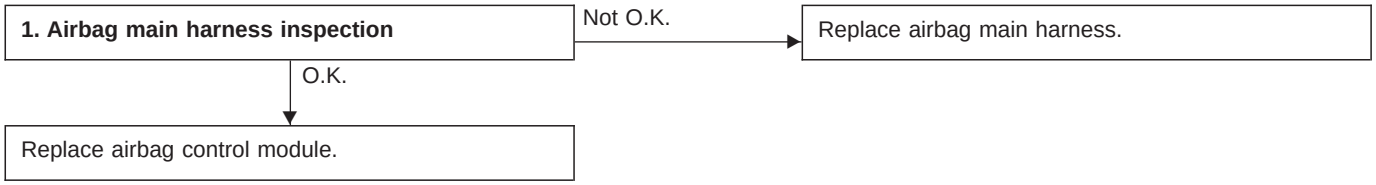
2) Measure resistance between test harness-B connector (5B) terminals and body.

(5B) Terminal / Specified resistance:
No. 6 — Body / 200 Ω, or more
No. 7 — Body / 200 Ω, or more

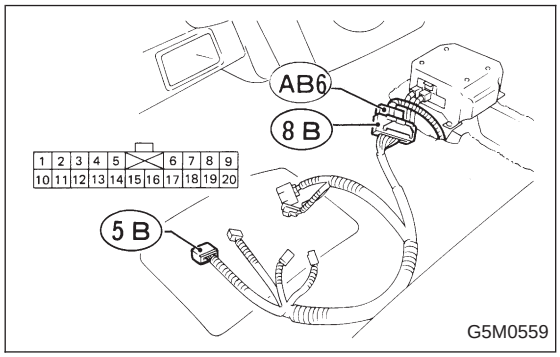
K: TROUBLE CODE 43

DIAGNOSIS:

- 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.



CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground terminal and then wait at least 20 seconds.
After 20 seconds elapse, remove instrument panel lower cover, and disconnect (AB3) and (AB8), (AB9) and (AB10).



1. AIRBAG MAIN HARNESS INSPECTION

1) Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W5A0].>, and connect it to test harness-B connector (8B).

2) Connect battery ground cable and turn ignition switch "ON" (engine off).

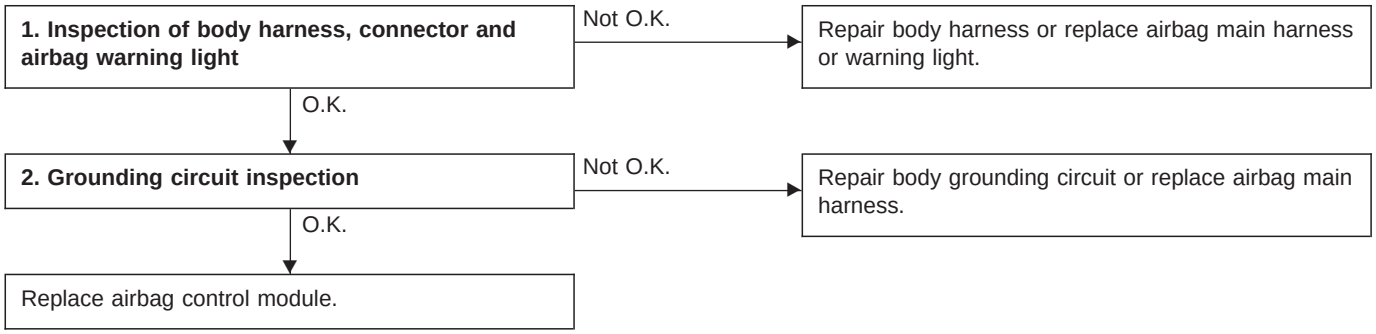
3) Measure voltage across each test harness-B connector (5B) terminal and body.

(5B) Terminals / Specified voltage:
No. 1 — Body / 1 V, or less
No. 14 — Body / 1 V, or less

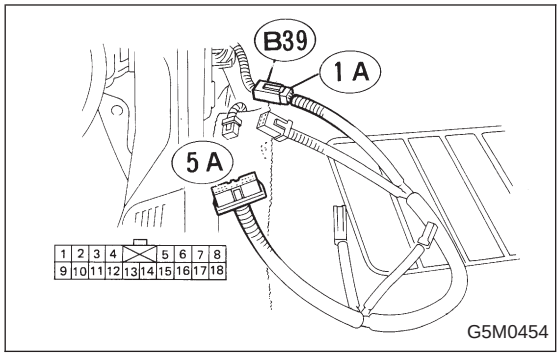
L: AIRBAG WARNING LIGHT REMAINS ON.

DIAGNOSIS:

- Airbag warning light is faulty.
- Airbag control module-to airbag warning light harness circuit is shorted or open.
- Grounding circuit is faulty.
- Airbag control module is faulty.
- (AB1) and (B39) are not connected properly.



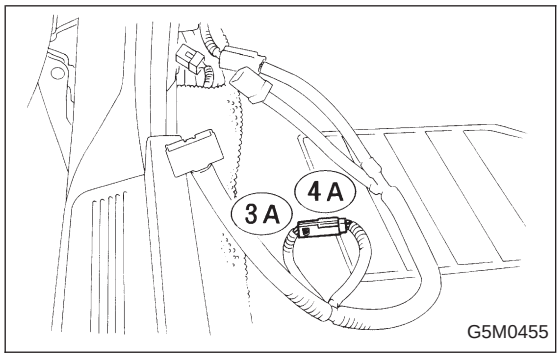
CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.



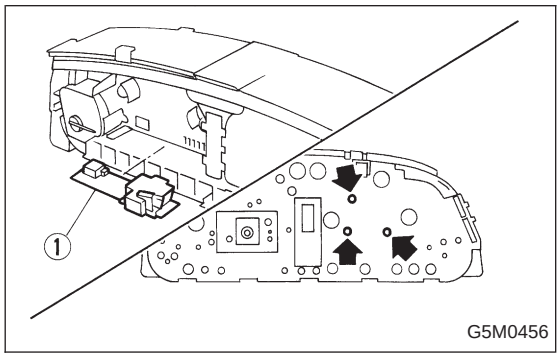
1. INSPECTION OF BODY HARNESS, CONNECTOR AND AIRBAG WARNING LIGHT

1) Turn ignition switch “OFF” and connect connector (B39) to test connector-A connector (1A).

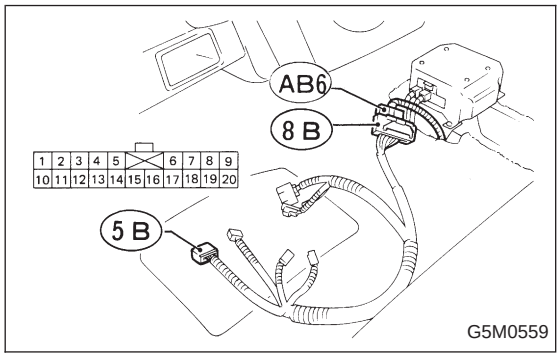
Test harness A-PN98299PA000



2) Connect battery ground cable and turn ignition switch “ON”, (engine off) and connect connectors (3A) and (4A) to check if warning light goes out. If it does, go to step 4) below. If it remains on, check body harness and repair if necessary.

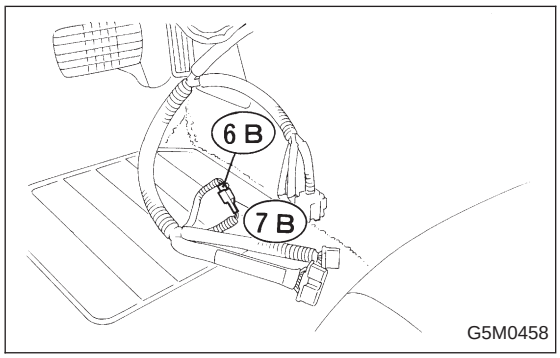


3) If body harness is satisfactory, replace airbag warning light unit ①. After problem has been eliminated, disconnect connectors (3A) and (4A).

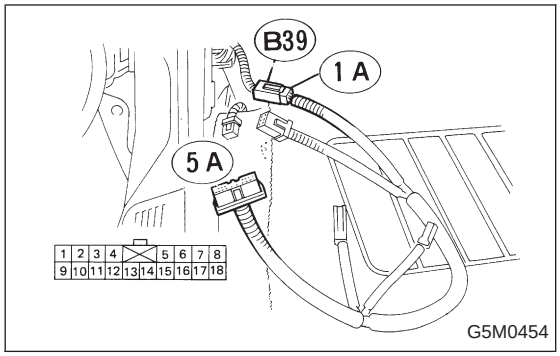


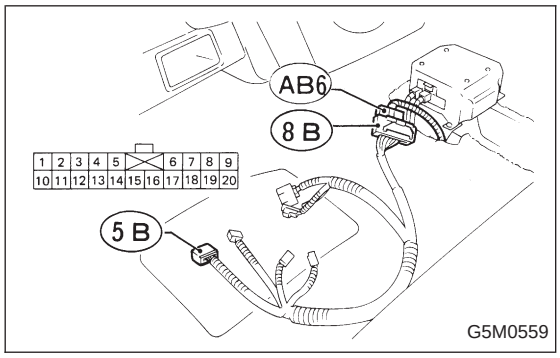
4) Turn ignition switch “OFF”, disconnect battery ground cable and then wait at least 20 seconds, and re-connect connectors (AB1) and (B39).
5) Remove instrument panel lower cover and disconnect (AB3) with (AB8), then disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W5A0].>, and connect it to test harness-B connector (8B).

Test harness B-PN98299PA010



6) Connect battery ground cable and turn ignition switch “ON”, (engine off) and connect connectors (6B) and (7B) to check if warning light goes out. If it does, go to “2. Grounding Circuit Inspection” below. If it remains on, replace airbag main harness. After problem has been eliminated, disconnect connectors (6B) and (7B).





Test harness A-PN98299PA000
Test harness B-PN98299PA010

2. GROUNDING CIRCUIT INSPECTION

1) Turn ignition switch “OFF”, disconnect battery ground cable and then wait at least 20 seconds. Disconnect connector (AB1) from bulk harness connector (B39), and connect connector (B39) to test harness-A connector (1A). Measure resistance between connector (5A) terminal and body.

(5A) Terminal / Specified resistance:
No. 17 — Body / 10 Ω, or less
No. 18 — Body / 10 Ω, or less

If resistance is greater than 10 ohms, body grounding circuit is faulty and should be repaired. If resistance is less than 10 ohms, go to step 2) below.

2) Connect connectors (AB1) and (B39). Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W5A0].>, and connect it to test harness-B connector (8B).

3) Measure resistance between each test harness-B connector (5B) terminal and body.

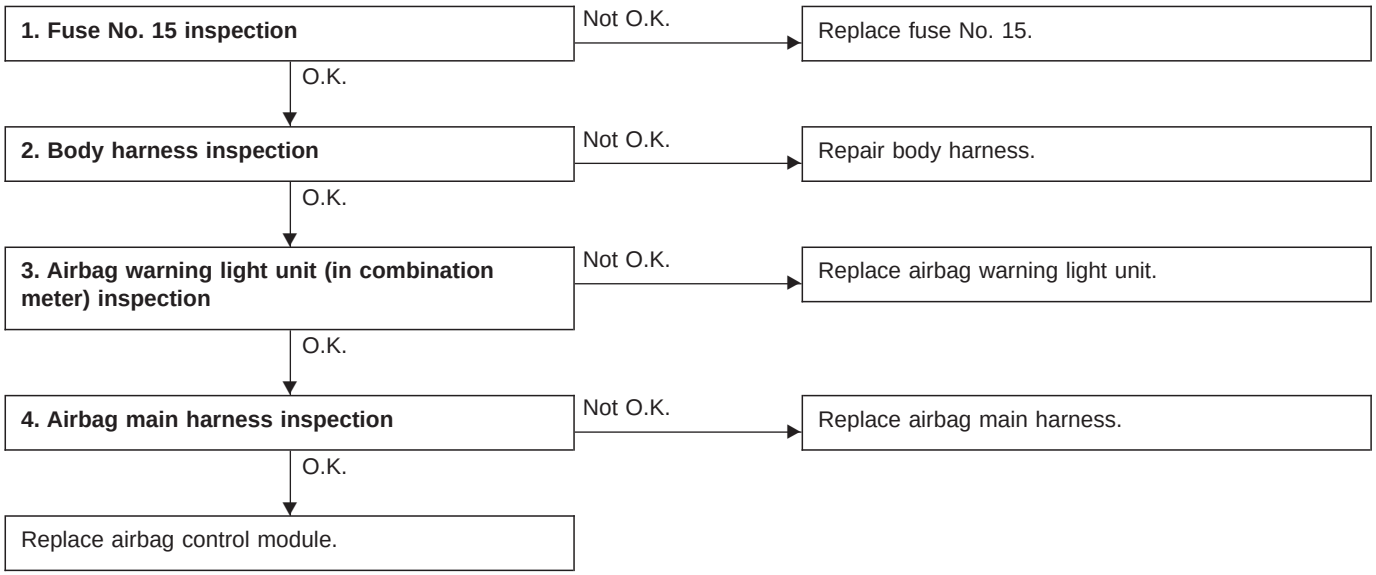
(5B) Terminal / Specified resistance:
No. 11 — Body / 10 Ω, or less
No. 12 — Body / 10 Ω, or less

If resistance is greater than 10 ohms, replace airbag main harness.
If resistance is less than 10 ohms, replace airbag control module.

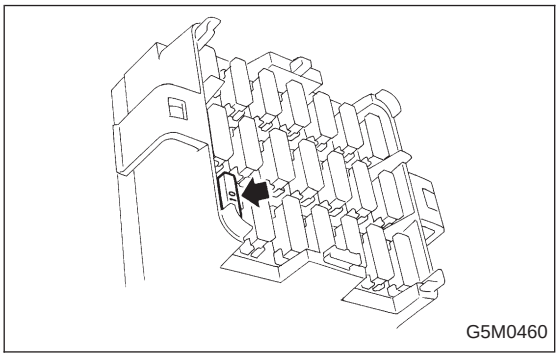
M: AIRBAG WARNING LIGHT REMAINS OFF.

DIAGNOSIS:

- Fuse No. 15 is blown.
- Body harness circuit is open.
- Airbag warning light is faulty.
- Airbag main harness is faulty.
- Airbag control module is faulty.



CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground terminal, and then wait at least 20 seconds.



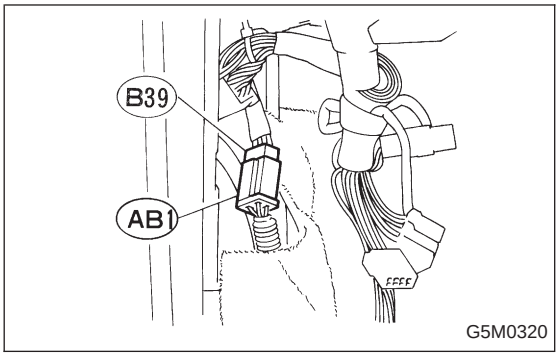
1. FUSE No. 15 INSPECTION

1) Remove and visually check fuse No. 15.

2) If fuse is blown, replace it with a new one. After connecting battery cable and turning ignition switch "ON", if it blows again, proceed to "2. BODY HARNESS INSPECTION".

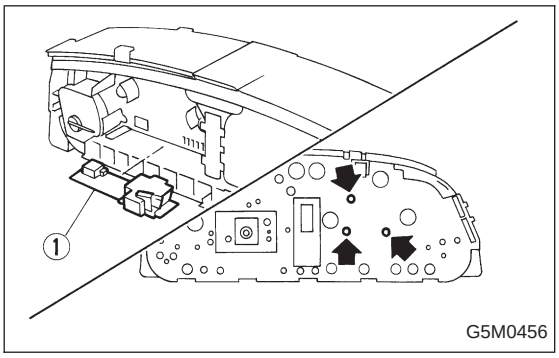
2. BODY HARNESS INSPECTION

1) Turn ignition switch "ON" (engine off) to make sure other warning lights (in combination meter) illuminate. If they do not, check body harness.

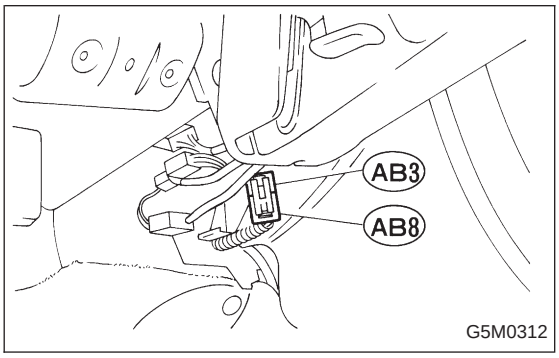


3. AIRBAG WARNING LIGHT UNIT (IN COMBINATION METER) INSPECTION

1) Turn ignition switch “OFF”, disconnect battery ground cable and then wait at least 20 seconds.
2) Disconnect bulk harness connector (B39) from connector (AB1).

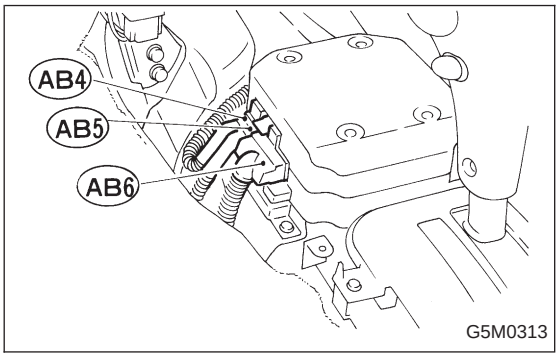


3) Connect battery ground cable and turn ignition switch “ON” (engine off) to make sure airbag warning light illuminates.
If it does not, replace airbag warning light unit ①.



4. AIRBAG MAIN HARNESS INSPECTION

1) Turn ignition switch “OFF”, disconnect battery ground cable and then wait at least 20 seconds.
2) Connect bulk harness connector (B39) and connector (AB1).
3) Disconnect connectors (AB3) and (AB8) below steering column. <Ref. to 5-5 [M2-6].>



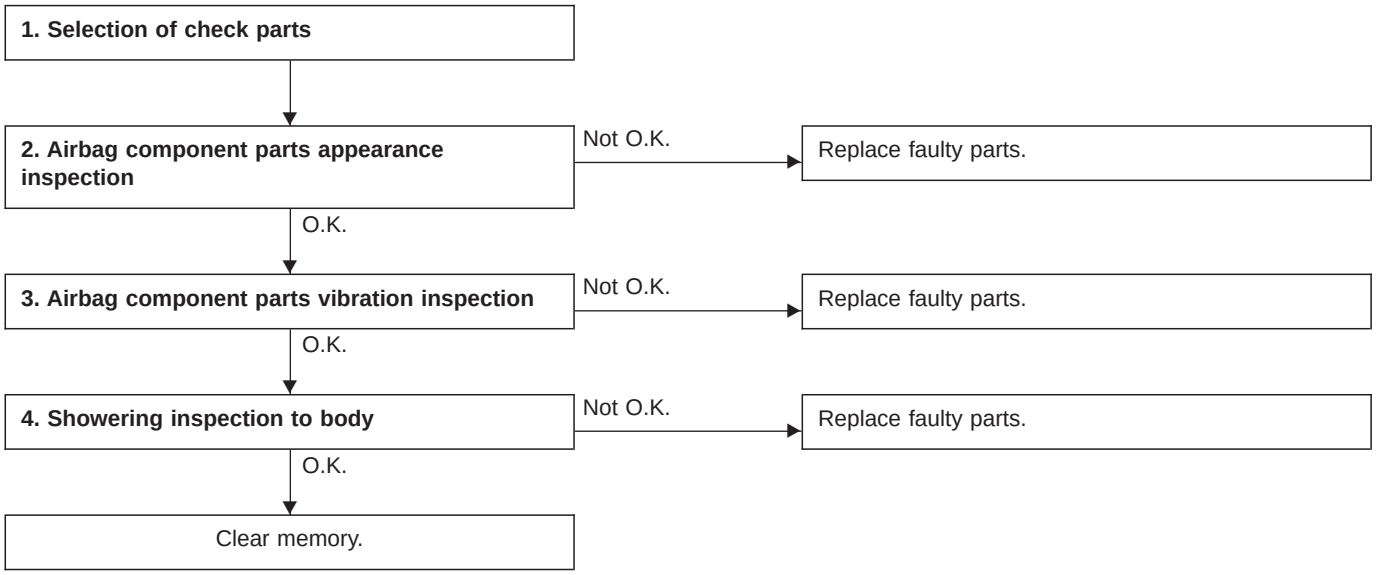
4) Disconnect connector (AB6) from airbag control module. <Ref. to 5-5 [W5A0].>

5) Connect battery ground cable and turn ignition switch “ON” to make sure airbag warning light illuminates.

N: WARNING LIGHT INDICATES TROUBLE CODE, THEN NORMALITY CODE.
— FLASHING TROUBLE CODE —

DIAGNOSIS:

- Airbag system component parts are faulty.



CAUTION:
Before performing diagnostics on airbag system, turn ignition switch “OFF”, disconnect battery ground cable, and then wait at least 20 seconds.

1. SELECTION OF CHECK PARTS

1) Conduct on-board diagnostic and call up trouble codes stored in memory. <Ref. to 5-5 [T1B0].>

2) Select trouble code required to check airbag component parts from those listed in table and reproduce symptom.

Trouble codes	Check parts	Refer to 5-5:
04	● Airbag module (Passenger) ● Airbag main harness ● Airbag control module	W2A2 W4A0 W5A0
11	● Fuse No. 8 ● Airbag main harness ● Airbag control module ● Body harness	T5A3 W4A0 W5A0 —
12	● Roll connector ● Airbag module (Driver) ● Airbag main harness ● Airbag control module	W6A0 W2A1 W4A0 W5A0
13	● Airbag module (Driver) ● Roll connector ● Airbag main harness ● Airbag control module	W2A1 W6A0 W4A0 W5A0
21	● Airbag control module	W5A0
22	● Airbag module (Passenger) ● Airbag main harness ● Airbag control module	W2A2 W4A0 W5A0
34	● Airbag main harness ● Airbag module (Passenger) ● Airbag control module	W4A0 W2A2 W5A0
41	● Airbag module (Driver) ● Roll connector ● Airbag main harness ● Airbag control module	W2A1 W6A0 W4A0 W5A0
42	● Airbag module (Passenger) ● Airbag main harness ● Airbag control module	W2A2 W4A0 W5A0
43	● Airbag module (Driver) ● Roll connector ● Airbag main harness ● Airbag control module	W2A1 W6A0 W4A0 W5A0

2. AIRBAG COMPONENT PARTS APPEARANCE INSPECTION

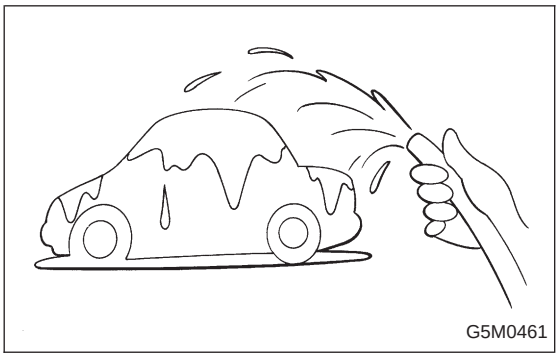
1) Conduct appearance inspection on parts selected.

NOTE:
Also check connector terminals, wiring harness, case, etc. for damage.

3. AIRBAG COMPONENT PARTS VIBRATION INSPECTION

1) Gently shake check parts (to determine faults.)

2) To check airbag module or roll connector, turn and tilt steering wheel.


G5M0461

4. SHOWERING INSPECTION TO BODY

1) Spray water on vehicle body.

CAUTION:
Do not directly spray water on airbag components.

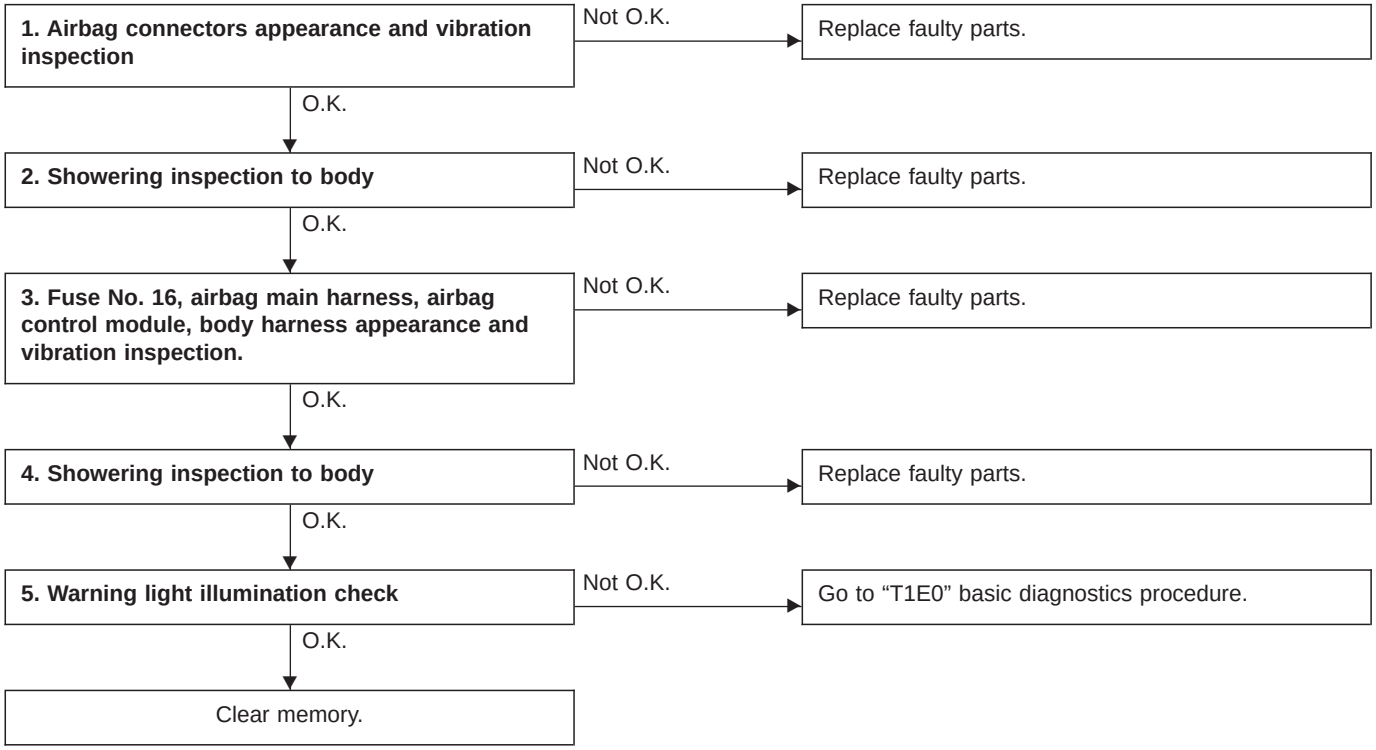
2) Check passenger compartment for traces of leaking.

NOTE:
Also check wiring harnesses as water may leak along them and get airbag component parts wet.

O: WARNING LIGHT INDICATES TROUBLE CODE, THEN NORMALITY CODE.
— FLASHING NORMALITY CODE —

DIAGNOSIS:

- Airbag connector is faulty.
- Fuse No. 16 is blown.
- Airbag main harness is faulty.
- Airbag control module is faulty.
- Body harness is faulty.



CAUTION:
Before performing diagnostics on airbag system, turn ignition switch “OFF”, disconnect battery ground cable, and then wait at least 20 seconds.

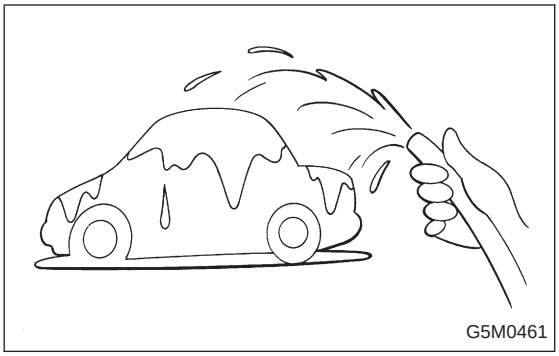
1. AIRBAG CONNECTORS APPEARANCE AND VIBRATION INSPECTION

1) Conduct appearance inspection on airbag connectors (AB2 through AB8). <Ref. to 5-5 [T300].>

NOTE:
Check terminals, case and wiring harnesses for damage.

2) Conduct vibration inspection on airbag connectors (AB2 through AB8). <Ref. to 5-5 [T300].>

NOTE:
Gently shake each airbag connector.



2. SHOWERING INSPECTION TO BODY

1) Spray water on vehicle body.

CAUTION:
Do not directly spray water on airbag connectors.

2) Check passenger compartment for traces of leaking.

NOTE:
If leaks are noted, also check wiring harnesses as water may leak along them and wet airbag connectors.

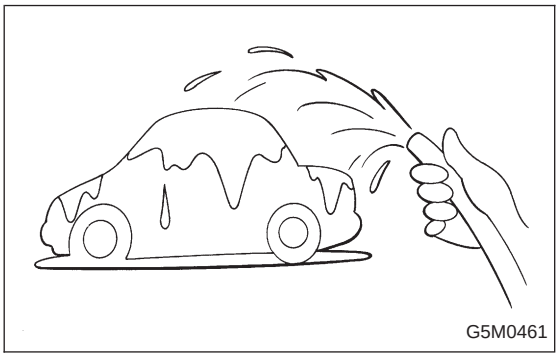
3. FUSE NO. 16, AIRBAG MAIN HARNESS, AIRBAG CONTROL MODULE, BODY HARNESS APPEARANCE AND VIBRATION INSPECTION

1) Conduct appearance inspection on fuse No. 16, airbag main harness <Ref. to 5-5 [W3A0].>, airbag control module <Ref. to 5-5 [W4A0].> and body harness.

NOTE:
Also check connectors, terminals, wiring harnesses and case for damage.

2) Conduct vibration inspection on fuse No. 16, airbag main harness, airbag control module and body harness.

NOTE:
Gently shake each part.



4. SHOWERING INSPECTION TO BODY

1) Spray water on vehicle body.

CAUTION:
Do not directly spray water on each part.

2) Check passenger compartment for traces of leaking.

NOTE:
If leaks are noted, check wiring harnesses as water may leak along them and get parts wet.

5. WARNING LIGHT ILLUMINATION CHECK

1) Turn ignition switch “ON” (engine “OFF”) and observe airbag warning light.
Airbag warning light comes “ON” for 8 seconds then goes out and stays out.

● **SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"**

Airbag system wiring harness is routed near the cruise control sub switch.

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 Airbag system wiring harness when servicing the cruise control sub switch.

1. On-board Diagnosis System

1. GENERAL

The on-board diagnosis function of the cruise control system uses an external select monitor. The on-board diagnosis function operates in two categories —- the cruise cancel conditions diagnosis and real-time diagnosis, which are used depending on the type of problems.

Applicable cartridge No.: 498349300

● Cruise cancel conditions diagnosis

This category of diagnosis requires actual vehicle driving in order to determine the cause, (as when cruise speed is cancelled during driving although no cruise cancel condition is not entered).

⇩

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 in order, for 2 seconds per Code No., on the select monitor.

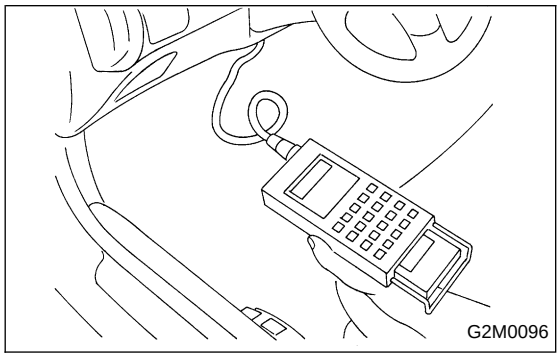
CAUTION:
● The cruise control memory stores not only the cruise "cancel" which occurred (although "cancel" operation is not entered by the driver), but also the "cancel" condition input by the driver.
● The content of memory is cleared when ignition switch or cruise main switch is turned OFF.

● Real-time diagnosis
The real-time diagnosis function is used to determine whether or not the input of output signal system is in good order, according to signal emitted from switches, sensors, etc.

Vehicle cannot be driven at cruise speed because problems occurs in the cruise control system or its associated circuits.

⇩

Dummy signals are manually entered from sub switch, etc.


G2M0096

2. ON-BOARD DIAGNOSIS PROCEDURES USING SELECT MONITOR

1) Connect select monitor to date link connector.
2) Turn ignition switch ON, then turn cruise main switch ON.
3) Turn select monitor's power ON. All LED's will come on. Select monitor display will read, after several seconds.

NOTE:
If cruise main switch is OFF, error 1 will appear. Turn cruise main switch ON and repeat steps 2.

4) Press "F", "B", "0", and "ENT" in that order, and enter the desired designated code ("FB0", for example), or press scroll key to select the code.

3. DIAGNOSIS OF CRUISE CANCEL CONDITIONS

1) Connect select monitor.
2) Turn ignition and cruise main switch ON, and set select monitor in “FB0” mode.
3) Start engine and drive vehicle at least 40 km/h (25 MPH) with cruise speed set.
4) If cruise speed is canceled itself (without doing any cancel operations), a trouble code will appear on select monitor display.

CAUTION:
● A 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.

Function code indication		Item to measure		Contents of diagnosis
Code No.	Abbreviation	Trouble code	Abbreviation	
FB0	CANCEL	10	OK	Normal
		11	BRAKE/STOP	Input signals from brake switch “OFF”, stop light switch “ON” (Brake pedal is depressed.)
		12	CLU or N	Input signals from clutch switch “OFF”, inhibitor switch “N” (Clutch pedal is depressed, or select lever is set to “N”.)
		13	SPEED LIM	Low-speed control limiter
		14	SET+RESUME	Input signal from cancel switch “ON”
		21	VAC VALVE	Faulty vacuum valve or valve drive system
		22	VENT2 VALVE	Faulty vent 2 valve or valve drive system
		23	VENT1 VALVE	Faulty vent 1 valve or valve drive system
		24	SP SENSOR	Faulty vehicle speed sensor
		25	CONTROL UNIT	Faulty control module

5) Trouble code will be cleared by turning ignition or cruise main switch OFF.

4. REAL-TIME DIAGNOSIS

1) Connect select monitor.
2) Turn ignition switch and cruise main switch ON.
3) Set select monitor in FA0 mode.
4) Ensure that normal indication is displayed when controls are operated as indicated below:

- When SET/COAST switch is pressed.
- WHEN RESUME/ACCEL switch is pressed.
- When brake pedal is depressed. (Stop and brake switch turns ON.)
- When clutch pedal is depressed (MT model).
- When select lever is set to “N” (AT model).

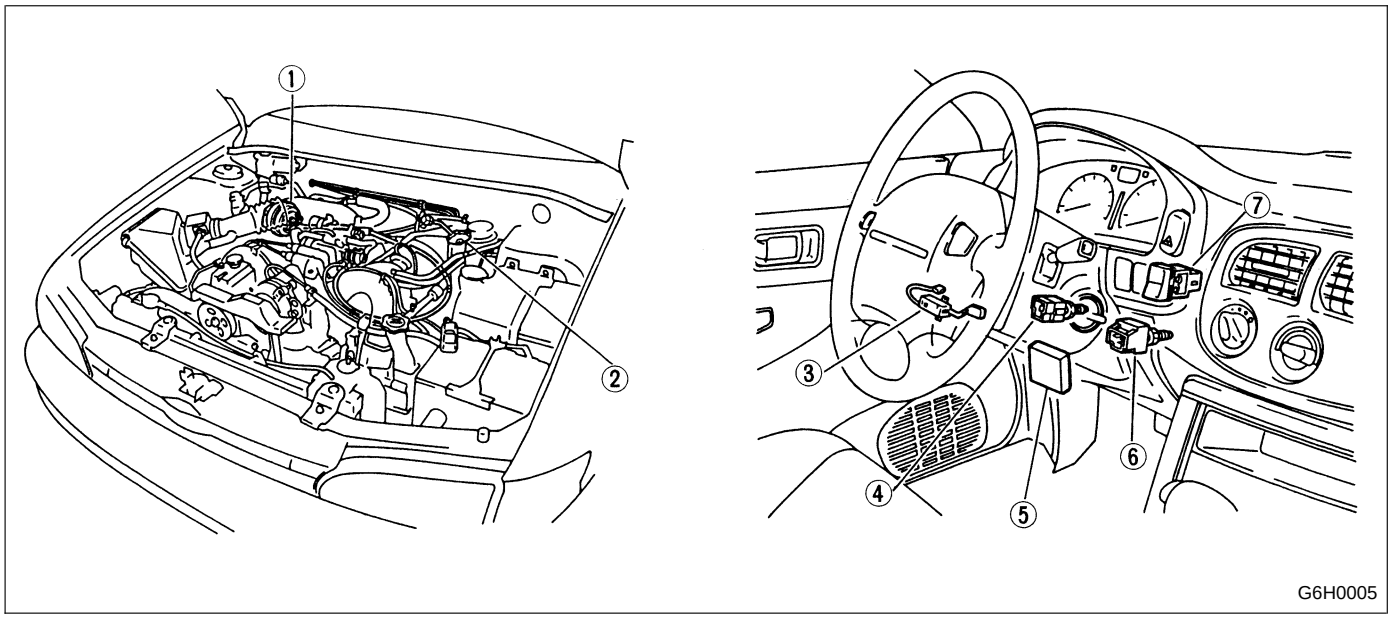
Function code indication		Item to measure	Content of items to be monitored
Code No.	Abbreviation		
FA0	ST	Stop light switch	LED No.1 comes on when switch is turned ON. (Brake pedal is depressed.)
	BR	Brake switch	LED No. 2 comes on when brake pedal is depressed.
	SE	SET/COAST switch	LED No. 3 comes on when switch is turned ON.
	RE	RESUME/ACCEL switch	LED No. 4 comes on when switch is turned ON.
	IH	Clutch switch/inhibitor switch	• LED No. 5 comes on when clutch pedal is depressed (MT model). • LED No. 5 comes on when select lever is set to “N” (AT model).

NOTE:
LED’s come on shortly after switches are pressed.

5. DATA SHOWN ON SELECT MONITOR DISPLAY DISPLAY

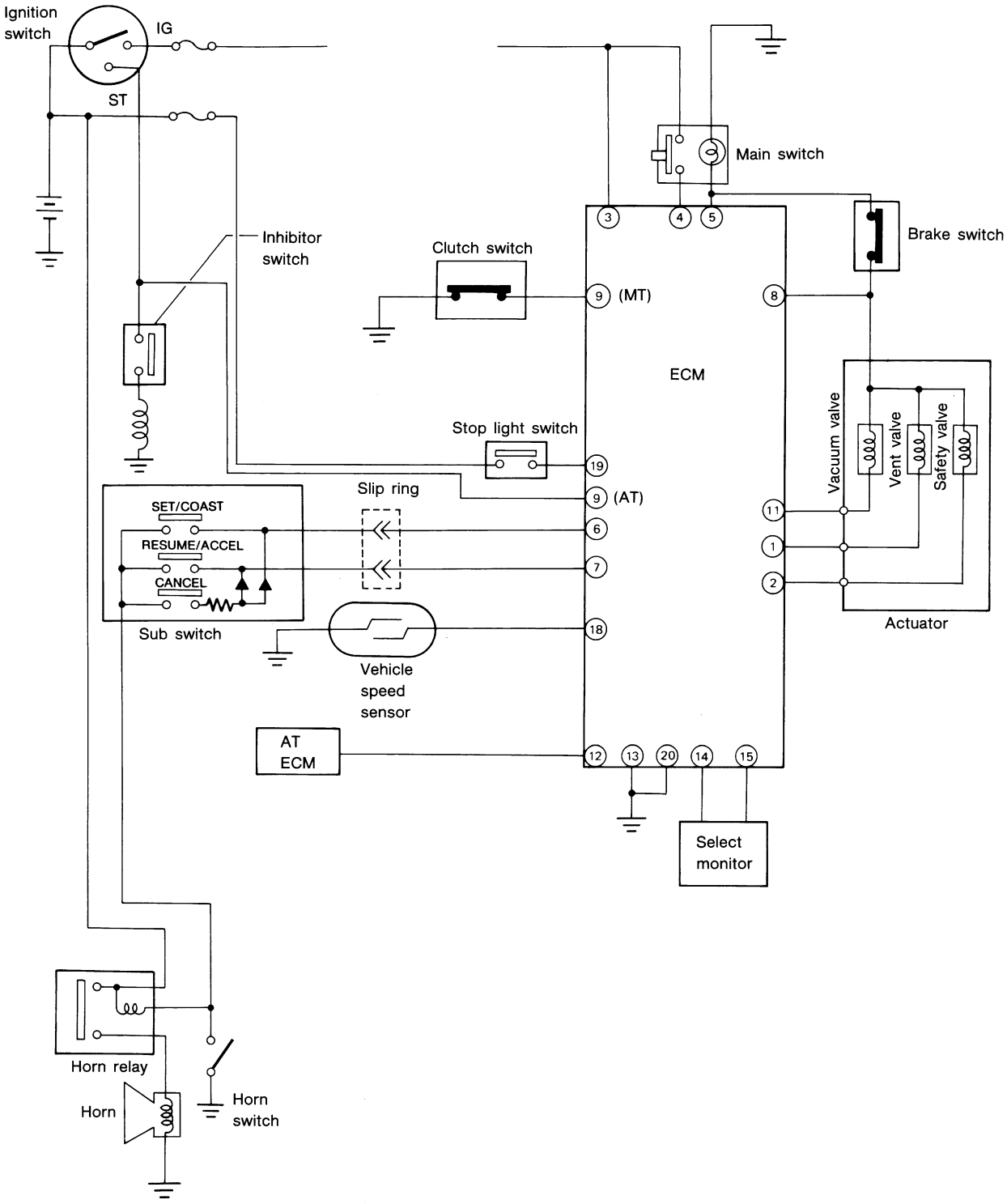
Indication of function code		Item to measure	Contents of items to be monitored
Code No.	Abbreviation		
F 00	CRUISE CONTROL	Cruise control module identification	Reads ROM ID number of cruise control module to display a possible communication state.
F 01	VSP (MPH)	Vehicle speed (MPH)	Displays vehicle speed data (in miles/h) determined by cruise control module in relation to signal emitted from vehicle speed sensor 2 in combination meter.
F 02	VSP (km/h)	Vehicle speed (km/h)	Displays vehicle speed in km/h.

2. Electrical Unit Location



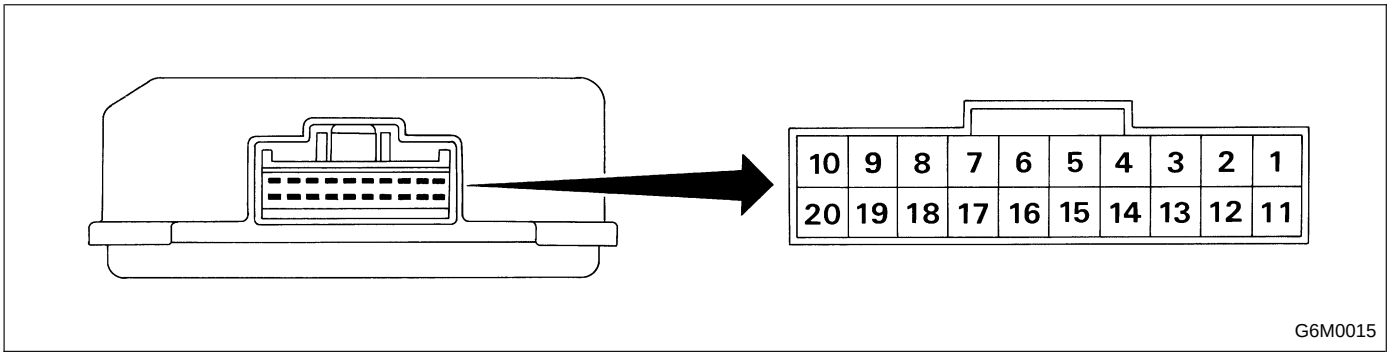
① Actuator
② Inhibitor switch
③ Sub switch
④ Clutch switch
⑤ Control module
⑥ Stop and brake switch
⑦ Main switch

3. Schematic



G6M0177

4. Control Module I/O Signal

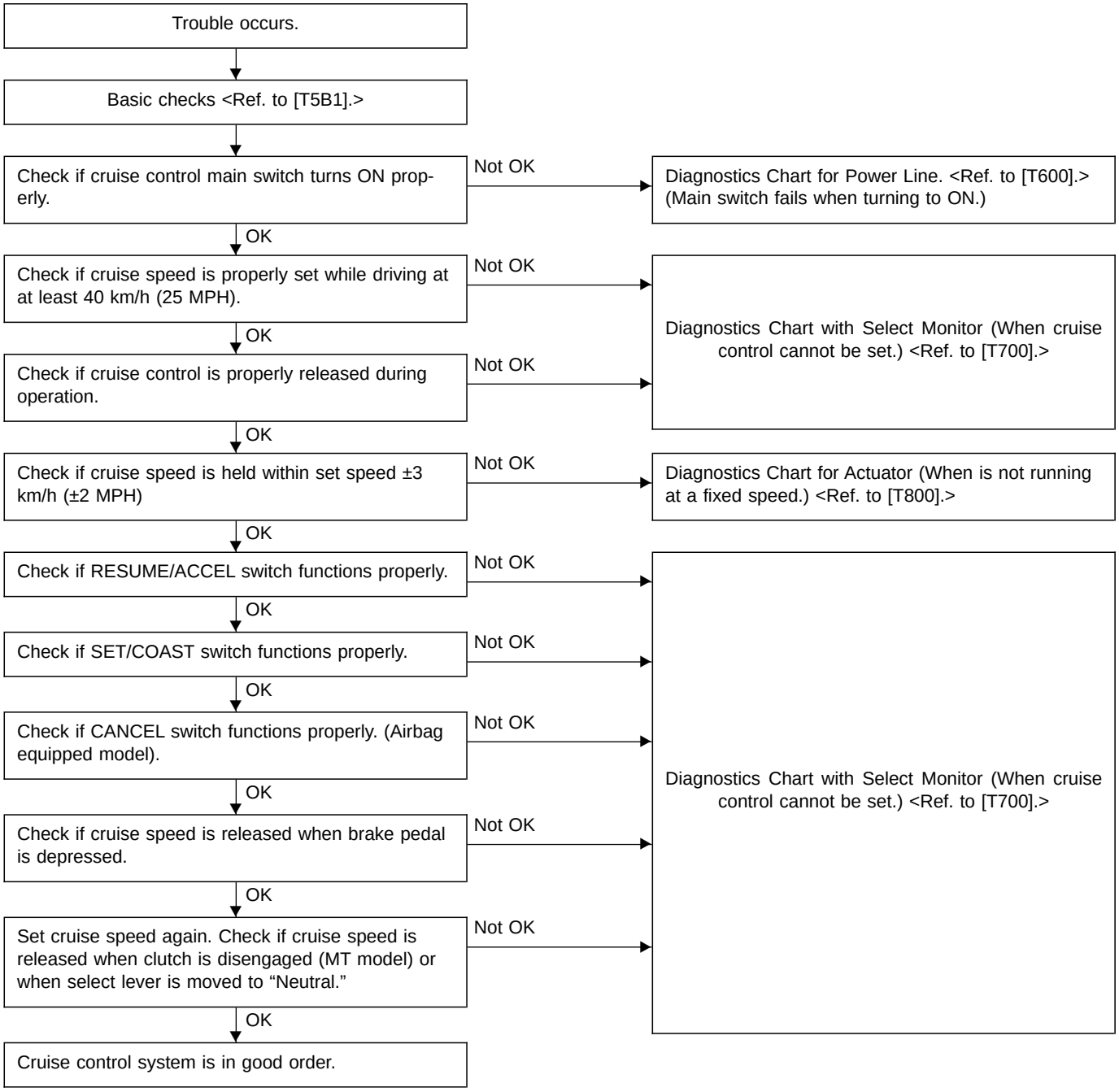


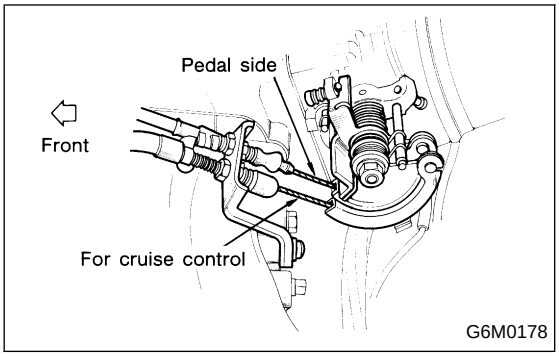
Content	Terminal No.	Measuring conditions and I/O signals (ignition switch ON and engine idling)
Vent valve	1	● Power supply is ON when vehicle is stopped. ● ON-and-OFF (0 and 12 volts) operation is alternately repeated while cruise control is operating.
Safety valve	2	● Power supply is ON when vehicle is stopped. ● ON-and-OFF (0 and 12 volts) operation is alternately repeated while cruise control is operating.
Ignition switch	3	● Battery voltage is present when switch is turned on.
Main switch	4	● When main switch is pressed, battery voltage is present. ● When main switch is OFF, “0” volt is present.
Power Supply to vacuum valve, vent valve, safety valve and set indicator	5	● When main switch is pressed, battery voltage is present.
SET/COAST switch	6	● When switch is turned ON, battery voltage is present. ● When switch is turned OFF, “0” volt is present.
RESUME/ACCEL switch	7	● When switch is turned ON, battery voltage is present. ● When switch is turned OFF, “0” volt is present.
Brake switch	8	Set select lever to any position other than “P” or “N” (AT model)/leave clutch released (MT model), with main switch ON. Then check that: ● 0 volt is present when brake pedal is depressed. ● Battery voltage is present when brake pedal is released, or ● 0 volt is present when clutch pedal is depressed (MT model). ● Battery voltage is present when clutch pedal is released (MT model). ● 0 volt is present when select lever is set to “P” or “N” (AT model). ● Battery voltage is present when select lever is in any position other than “P” or “N” (AT model).
Inhibitor switch Clutch switch	9	When switch is turned ON, “0” volt is present.
Vacuum valve	11	● Power supply is ON when vehicle is stopped. ● ON-and-OFF (0 and 12 volts) operation is alternately repeated while cruise control is operating.
AT control (Set signal)	12	ECM emits a ground-level signal while driving vehicle at least 40 km/h (25 MPH) with SET switch ON.
GND	13	—
Select monitor (Output)	14	—
Select monitor (Input)	15	—
Vehicle speed sensor	18	● When all four wheels are raised off ground and any wheel is rotated manually, approximately 5 and 0 volt pulse signals are alternately sent to cruise control module.
Stop light switch	19	With ignition switch ON or OFF: ● Depress brake pedal to check that battery voltage is present. ● “0” volt is present with brake pedal released.
GND	20	—

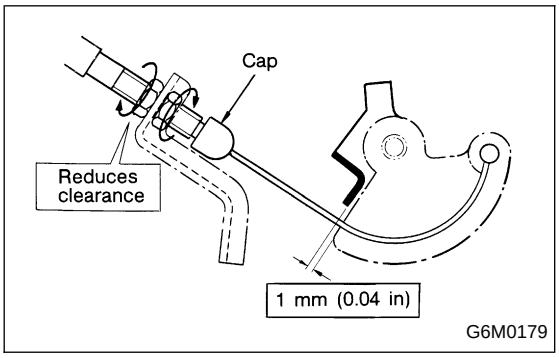
Voltage at terminals (1, 2, 11 and 12) cannot be checked unless vehicle is driving at cruising speed.

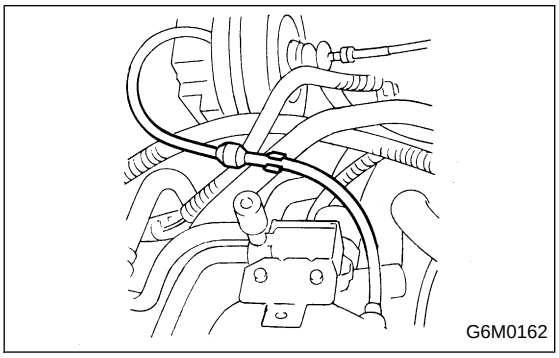
5. Diagnostics Chart for On-board Diagnosis System

A: BASIC DIAGNOSTICS PROCEDURE









B: BASIC CHECKS

1. CHECK CABLE

1) Cable installation
   (1) Ensure that cruise control cable is attached to the left of accelerator cable (on accelerator pedal side).
   (2) Ensure that accelerator cable throttle cam does not move when cruise control throttle cam is moved by hand.
   (3) Ensure that throttle cam moves smoothly.

2) Cable free play
   (1) Ensure that throttle cam-to-lever clearance is within specifications.

Standard value: 1 mm (0.04 in)

NOTE:
If clearance is not within specifications, adjust cable at its outer end.

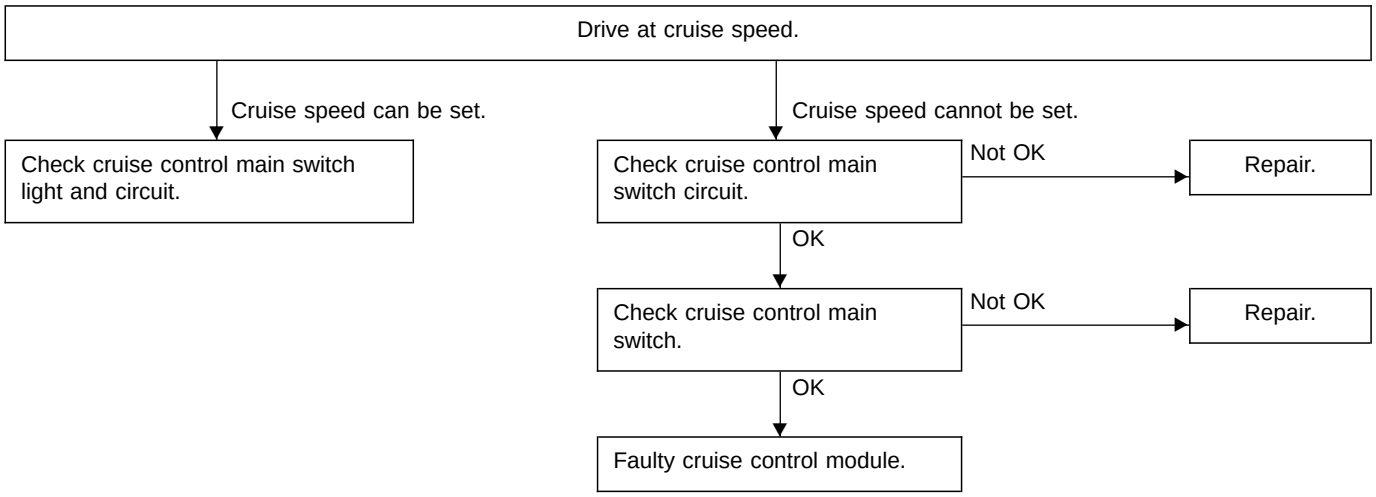
   (2) Ensure that cap is positioned in groove.
   (3) Ensure that cable deflects within specifications.

Standard value:
1 — 8 mm (0.04 — 0.31 in)

2. CHECK VACUUM HOSE

1) Check vacuum hose (which connects actuator and intake manifold) for disconnection or cracks.

6. Diagnostics Chart for Power Line



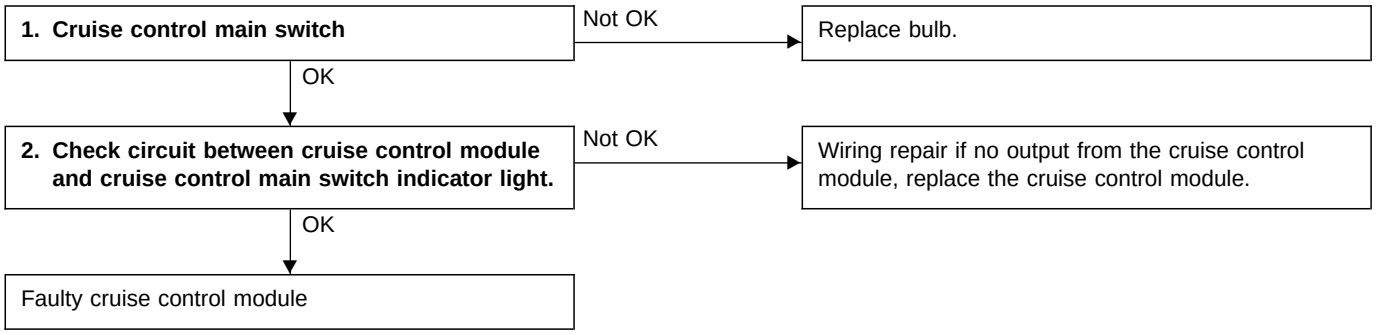
A: CHECK INDICATOR AND CIRCUIT IN CRUISE CONTROL MAIN SWITCH

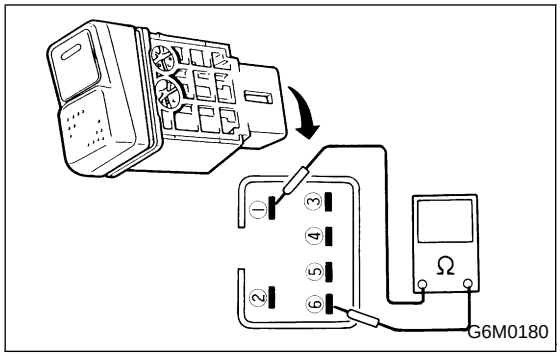
DIAGNOSIS:

- Bulb failure or open harness of the indicator circuit in the cruise control main switch.

TROUBLE SYMPTOM:

- Cruise control can be set, normally indicator does not come on. (When main switch is pressed.)

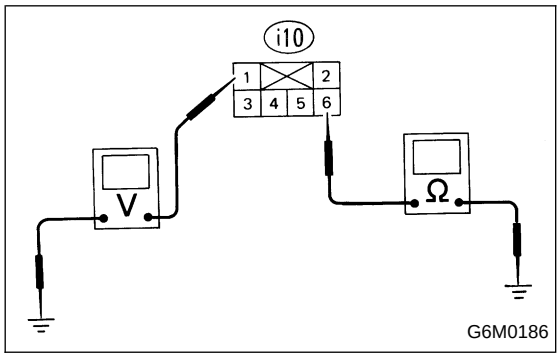




1. CRUISE CONTROL MAIN SWITCH

1) Remove cruise main switch.
Turn lower part of the housing upward to remove. If this cannot be done, insert a small screwdriver on the right hand side of the housing to remove the lock.
2) Measure resistance value between cruise control main switch terminals.

Terminal/Specified resistance:
No. 1 — No. 6/Approx. 120 Ω



2. CHECK CIRCUIT BETWEEN CRUISE CONTROL MODULE AND CRUISE CONTROL MAIN SWITCH INDICATOR LIGHT

1) Measure voltage between cruise control main switch and body. (Perform this measurement by turning ON the ignition switch and the cruise control main switch.)

Connector & terminal/Specified voltage:
(i10) No. 1 — Body/10 — 13 V

2) Remove the connector from the cruise control main switch.
3) Measure the resistance value between the cruise control main switch connector and the body.

Connector & terminal/Specified resistance:
(i10) No. 6 — Body/10 Ω, max.

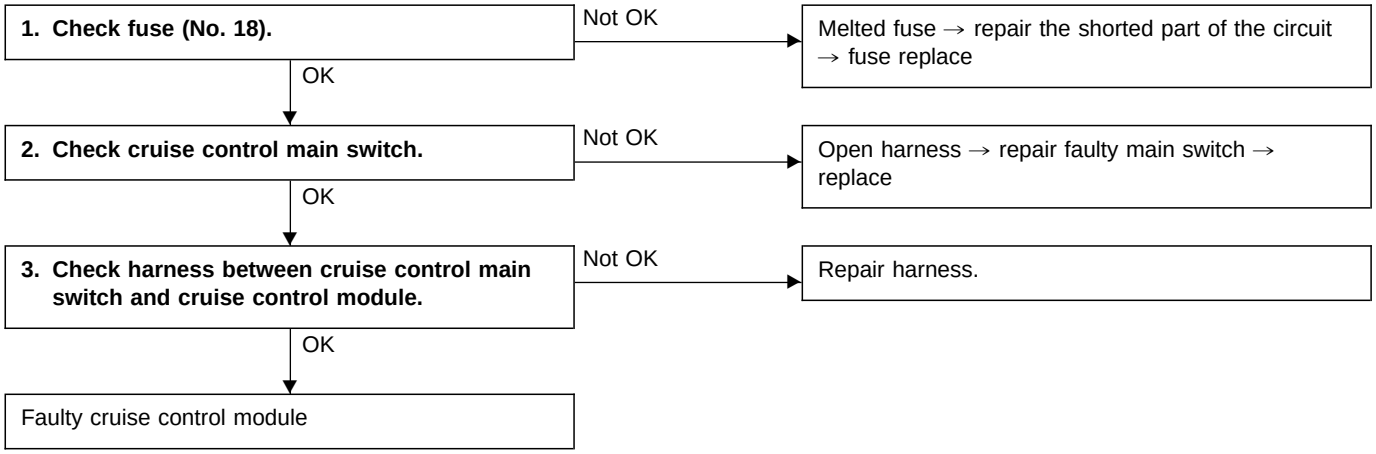
B: CHECK CRUISE CONTROL MAIN SWITCH

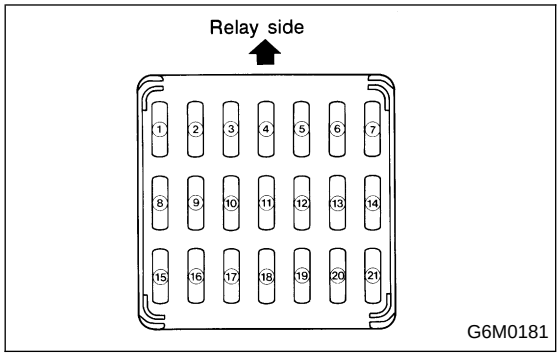
DIAGNOSIS:

- Faulty cruise control main switch, or open harness.

TROUBLE SYMPTOM:

- Cruise control main switch is not turned ON and cruise control cannot be set.

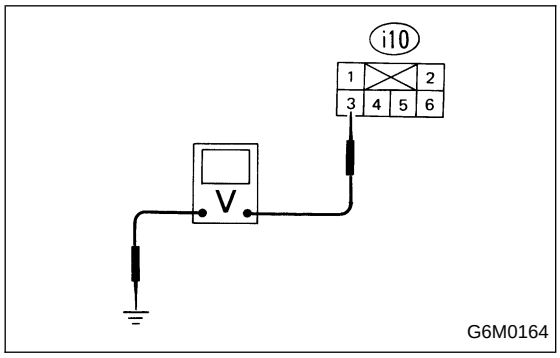




1. CHECK FUSE (NO. 18)

1) Check fuse.
Test circuit with a tester.
2) Checking voltage of the ignition power source
Turn ignition switch ON and measure the voltage between the fuse box connector and the body.

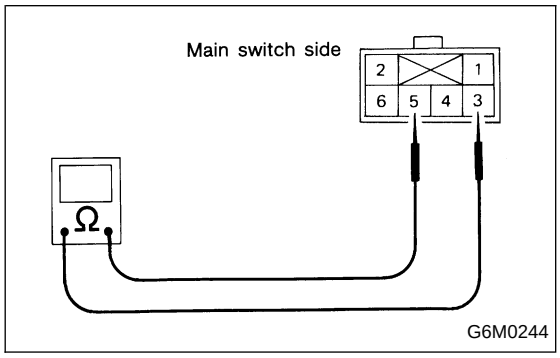
Connector & terminal/Specified voltage:
(B34) No. 4 — Body/10 — 13 V



2. CHECK CRUISE CONTROL MAIN SWITCH

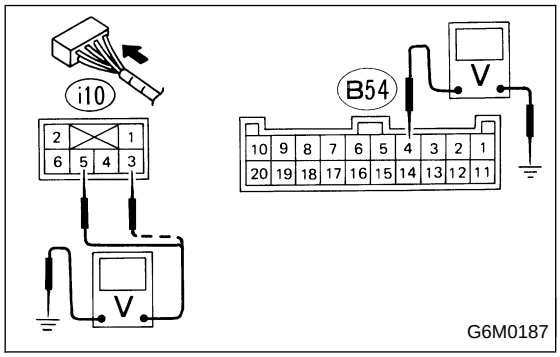
1) Remove cruise control main switch and disconnect connector.
Turn ignition switch ON and measure the voltage between cruise control main switch connector and body.

Connector & terminal/Specified voltage:
(i10) No. 3 — Body/10 — 13 V



2) Check ON/OFF function of main switch
Measure resistance between main switch and terminal.

Terminal/Specified resistance:
No. 3 — No. 5/10 Ω, max. (Switch ON)
1 MΩ, min. (Switch OFF)

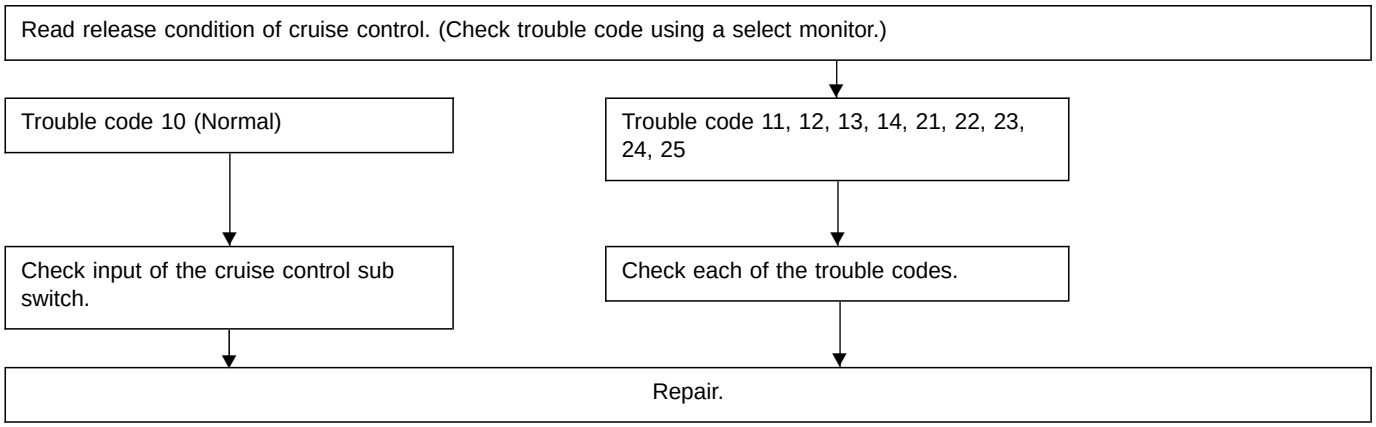


3. CHECK HARNESS BETWEEN CRUISE CONTROL MAIN SWITCH AND CRUISE CONTROL MODULE

1) Connect connector.
2) Turn ignition switch ON.
3) Turn cruise main switch ON.
4) Measure voltage between each of terminals and body.

Connector & terminal/Specified voltage:
(i10) No. 3 — Body/10 — 13 V
(i10) No. 5 — Body/10 — 13 V
(B54) No. 4 — Body/10 — 13 V

7. Diagnostics Chart with Select Monitor — When cruise control cannot be set —



Trouble code	Item	Contents of diagnosis	Page
10	OK	Normal	—
11	Brake/switch, Stop light switch	Input signals from brake switch “OFF”, stop light switch “ON” (Brake pedal is depressed.)	20
12	Clutch switch, N position	Input signals from clutch switch “OFF”, inhibitor switch “N” (Clutch pedal is depressed, or select lever is set to “N”.)	22
13	Speed limiter	Low-speed control limiter	24
14	Set switch and resume switch	Input signal from cancel switch “ON”	26
21	Vacuum valve	Faulty vacuum valve or valve drive system	27
22	Vent 2 valve	Faulty vent 2 valve or valve drive system	27
23	Vent 1 valve	Faulty vent 1 valve or valve drive system	27
24	Speed sensor	Faulty vehicle speed sensor	24
25	Control module	Faulty control module	28

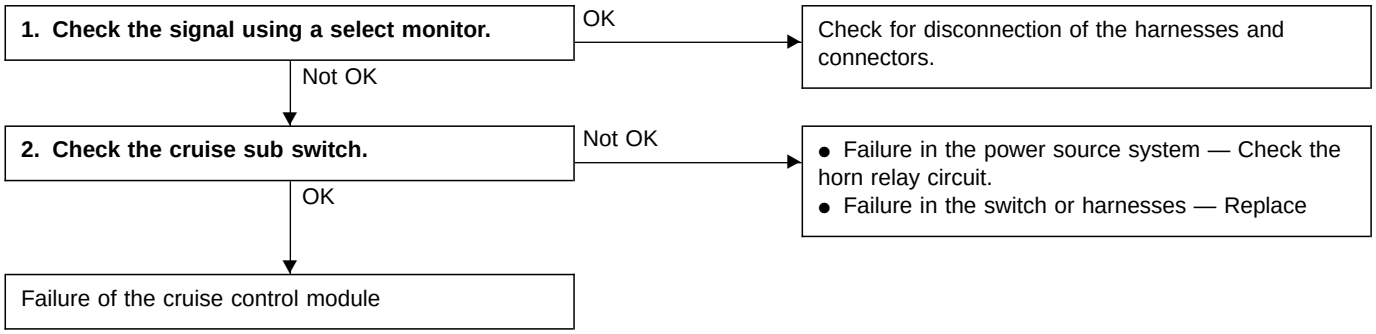
A: CHECKING INPUT OF CRUISE CONTROL SUB SWITCH

DIAGNOSIS:

- SET/COAST SW or disconnection of the wiring or short circuit.
- RESUME/ACCEL SW or disconnection of the wiring or short circuit.

TROUBLE SYMPTOM:

- Cruise control cannot be set, or it is cancelled immediately.
- RESUME/ACCEL cannot be operated.



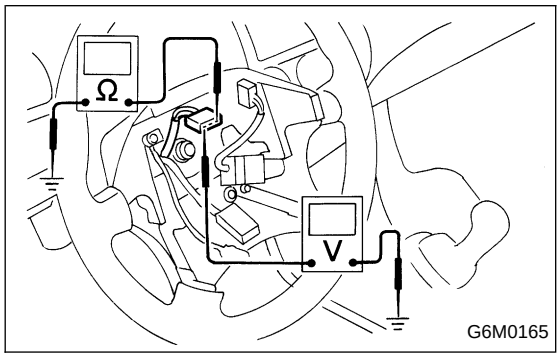
LED No.	Signal name	Display
1	—	—
2	—	—
3	SET/COAST switch	SE
4	RESUME/ACCEL switch	RE
5	—	—
6	—	—
7	—	—
8	—	—
9	—	—
10	—	—

ST	BR	SE	RE	IH
—	—	—	—	—

1	2	3	4	5
6	7	8	9	10

1. CHECK THE SIGNAL USING A SELECT MONITOR

- Measuring condition: Turn ON the ignition switch and cruise main switch.
- Operation of the function keys: FA0 ENT
  When pushing the SET SW: LED No. 3 goes out — lights
  When pushing the RESUME SW: LED No. 4 goes out — lights



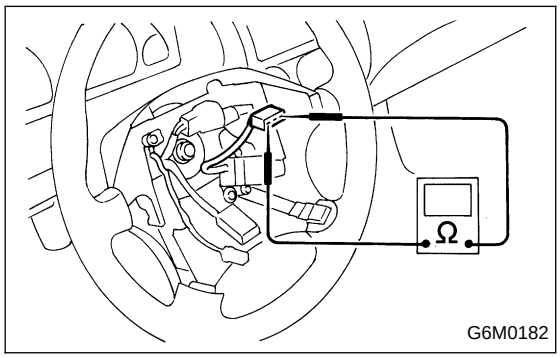
2. CHECK THE CRUISE SUB SWITCH

1) Separate connector from sub switch. (Use together with horn power supply.)
2) Check voltage between sub switch connector and body.

Terminals/Specified voltage:
No. 1 — Body/10 — 13 V

3) Check for harness short circuit between sub switch and cruise control module.

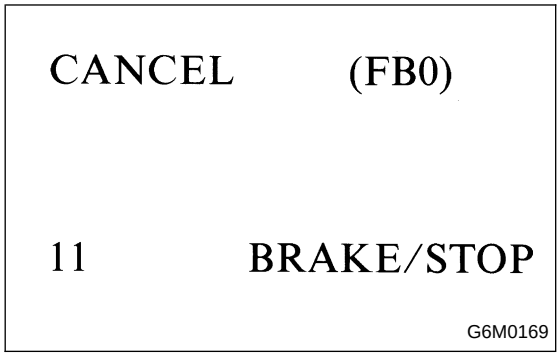
Terminals/Specified resistance:
No. 2 — Body/1 MΩ, min.
No. 3 — Body/1 MΩ, min.



4) Check inner switch of the cruise control sub switch and check continuity at switch side connector.

Terminals:
No. 1 — 2 (SET/COAST SWITCH)
No. 1 — 3 (RESUME/ACCEL SWITCH)

Specified resistance:
10 Ω, max. (Switch ON)
1 MΩ, min. (Switch OFF)



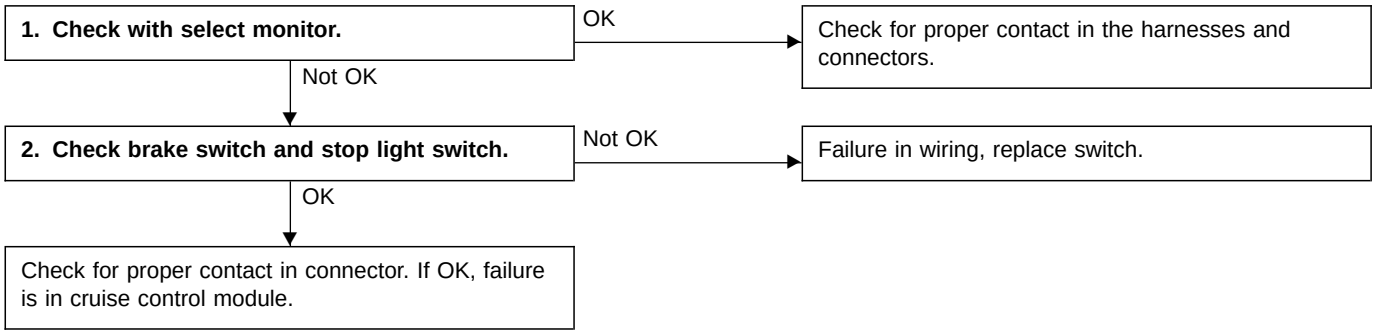
B: TROUBLE CODE 11 — BRAKE SW, STOP LIGHT SW —

DIAGNOSIS:

- Failure or disconnection of the stop light switch and brake switch.

TROUBLE SYMPTOM:

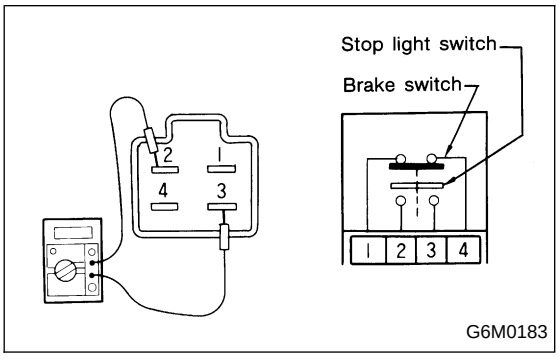
- Cruise control cannot be set.



LED No.	Signal name	Display
1	Stop light switch	ST
2	Brake switch	BR
3	—	—
4	—	—
5	—	—
6	—	—
7	—	—
8	—	—
9	—	—
10	—	—

ST	BR	SE	RE	IH
—	—	—	—	—

1	2	3	4	5
6	7	8	9	10



1. CHECK WITH SELECT MONITOR

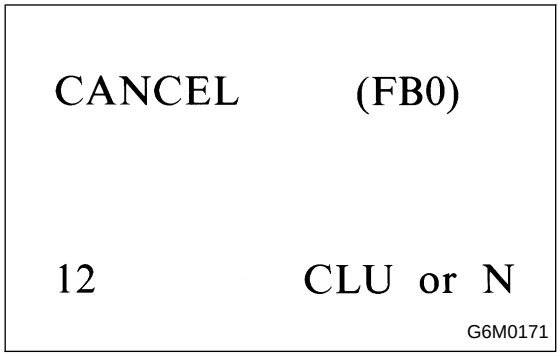
- Measurement condition: Turn ignition switch ON. Turn cruise main switch ON.
- Operation of the function keys: FA0 ENT

1) When depressing brake pedal (Set in the D range for AT, without depressing clutch pedal for MT)
Stop light switch: LED No. 1 goes out — lights.
Brake switch : LED No. 2 goes out — lights.

2. CHECK BRAKE SWITCH AND STOP LIGHT SWITCH

1) Remove connector of stop and brake switch.
2) Check circuit between each terminal.

Pedal operation	Brake switch between No. 1 — 4	Stop light switch between No. 2 — 3
Depressing the brake pedal.	Circuit failure	Circuit normal
Without depressing the brake pedal.	Circuit normal	Circuit failure



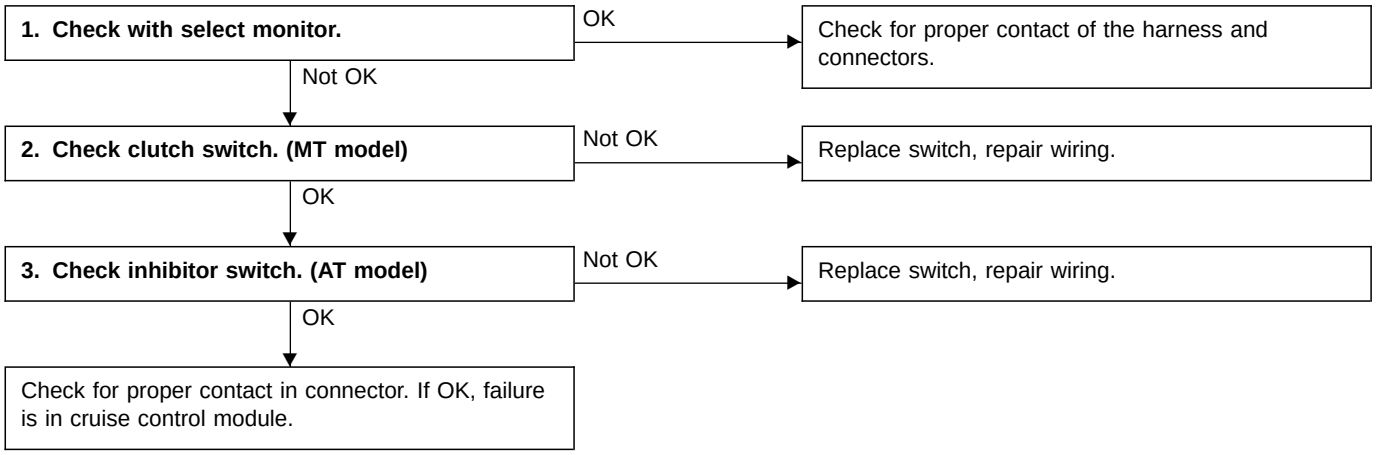
C: TROUBLE CODE 12 — CLUTCH SWITCH, N POSITION —

DIAGNOSIS:

- Failure or disconnection of inhibitor switch
- Failure or disconnection of clutch switch

TROUBLE SYMPTOM:

- Cruise control cannot be set.



LED No.	Signal name	Display
1	—	—
2	—	—
3	—	—
4	—	—
5	Clutch switch/inhibitor switch	IH
6	—	—
7	—	—
8	—	—
9	—	—
10	—	—

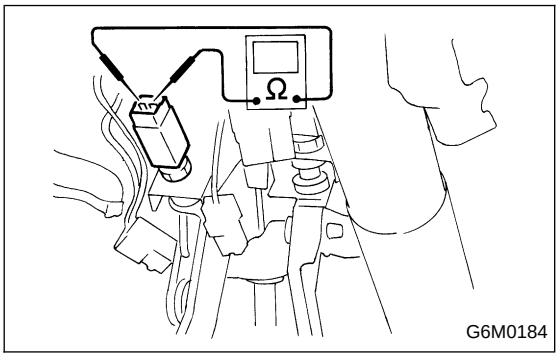
ST	BR	SE	RE	IH
—	—	—	—	—

1	2	3	4	5
6	7	8	9	10

1. CHECK WITH SELECT MONITOR

- Measurement condition: Turn ignition switch ON.
  Turn cruise main switch ON.
- Operation of function keys: FA0 ENT

1) When depressing clutch pedal;
LED No. 5 goes out — lights.
2) When setting shift lever in N position;
LED No. 5 goes out — lights.



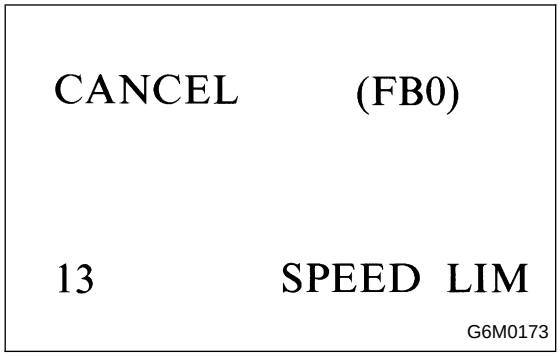
2. CHECK CLUTCH SWITCH (MT MODEL)

1) Check items for the clutch switch. (Circuit test between terminals)

Terminals/Specified resistance:
No. 1 — No. 2/10 Ω, max. (Without pedal depressing).
/1 MΩ, min. (Pedal depressing).

3. CHECK INHIBITOR SWITCH (AT MODEL)

1) When engine starts in the N position (the starter rotates), N position contact point of the inhibitor is normal.
2) Check the wiring harness.



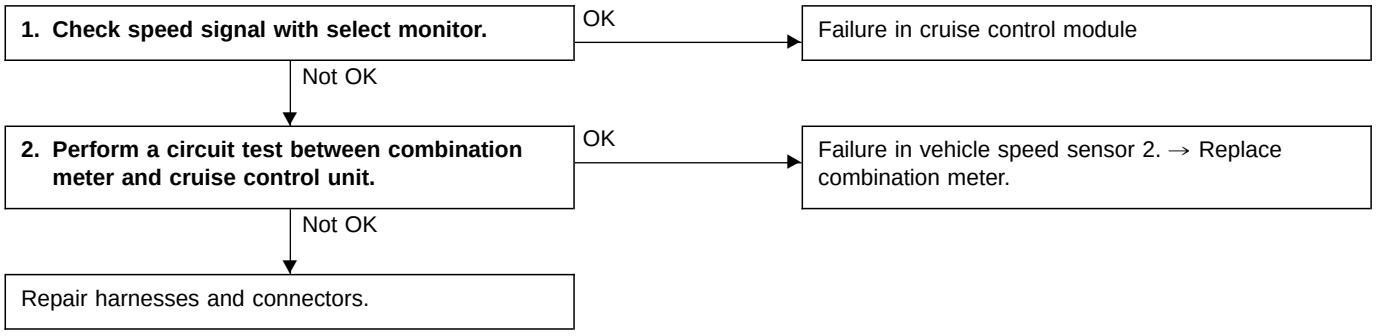
D: TROUBLE CODE 13 AND 24 — SPEED LIMITER, SPEED SENSOR —

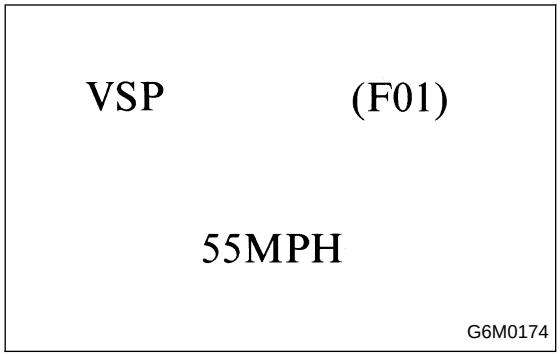
DIAGNOSIS:

- Disconnection or short circuit of speed sensor.

TROUBLE SYMPTOM:

- Cruise control cannot be set. (Cancelled immediately.)



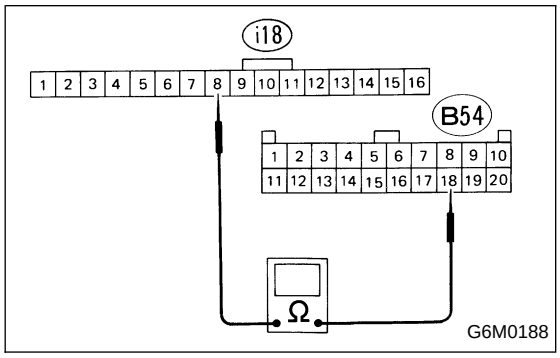


1. CHECK SPEED SIGNAL WITH SELECT MONITOR

- Driving condition: Running at speed greater than 40 km/h (25 MPH)
- Operation of the function keys: F02 ENT

NOTE:

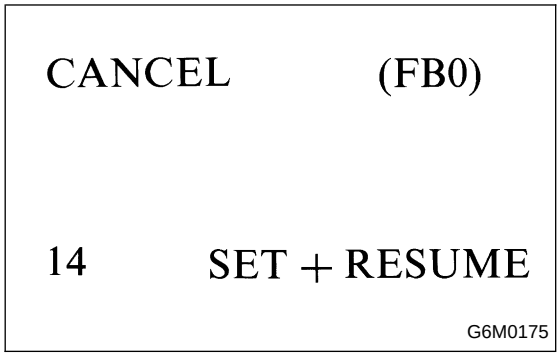
- When there is a failure in the meter cable or the vehicle speed sensor 2, the indicated value of the meter will be incorrect.
- When there is a disconnection or short circuit in the harness between the meter and the cruise control module, the indicated value will be 0 — 1 km/h.



2. PERFORM A CIRCUIT TEST BETWEEN COMBINATION METER AND CRUISE CONTROL UNIT

1) Separate connectors from combination meter and cruise control module.
2) Perform a circuit test in the harnesses.

Connector & terminal/Specified resistance:
(i18) No. 8 — (B54) No. 18/10 Ω, max.



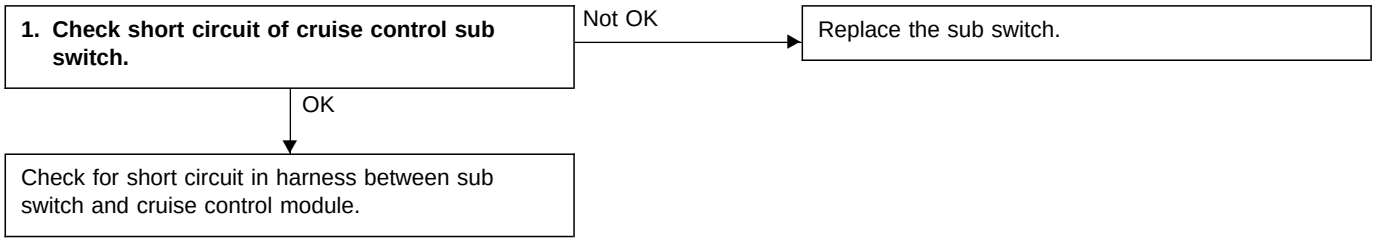
E: TROUBLE CODE 14 — SET SWITCH AND RESUME SWITCH (CANCEL SW-ON) —

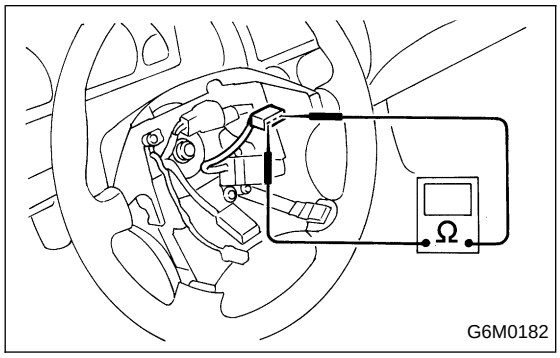
DIAGNOSIS:

- Short circuit inside the SET SW and RESUME SW.

TROUBLE SYMPTOM:

- Cruise control cannot be set. (Cancelled immediately.)



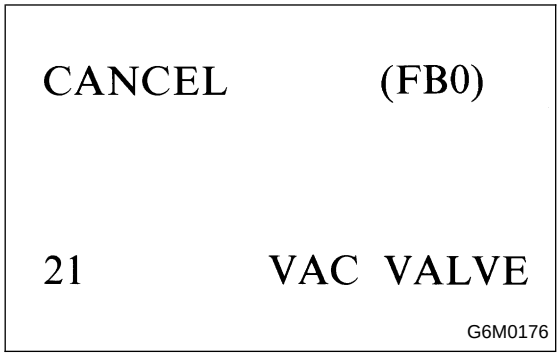


1. CHECK SHORT CIRCUIT OF CRUISE CONTROL SUB SWITCH

1) Separate connector of cruise control sub switch.
2) Measure resistance between each terminal of cruise control sub switch.

Terminal/Specified resistance:

SET switch ON No. 1 — No. 2/10 Ω, max.
RESUME switch ON No. 1 — No. 3/10 Ω, max.
CANCEL switch ON No. 1 — No. 2/10 Ω, max.
No. 1 — No. 3/10 Ω, max.



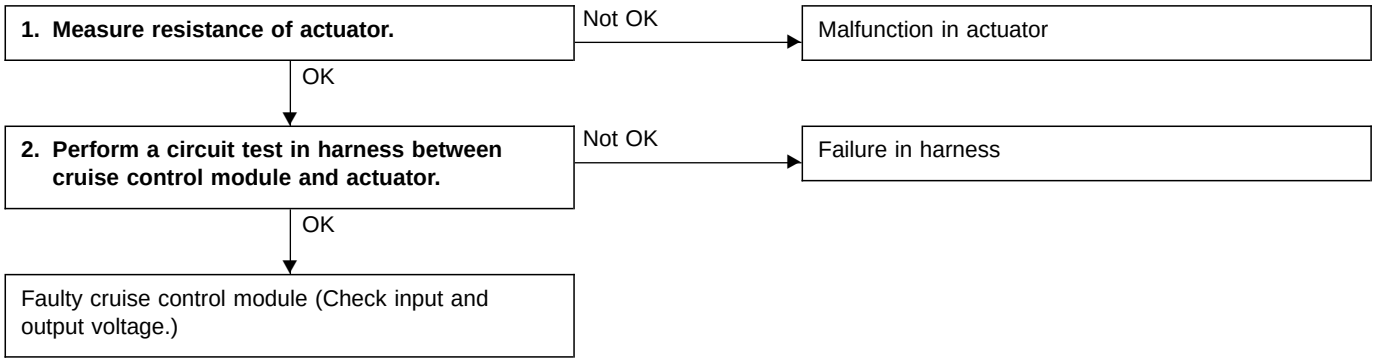
F: TROUBLE CODE 21, 22 AND 23 — VACUUM VALVE, VENT 1 VALVE, VENT 2 VALVE —

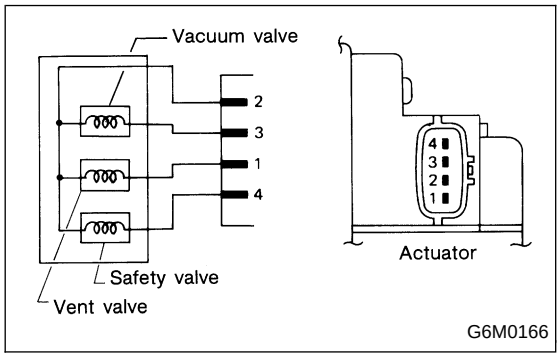
DIAGNOSIS:

- Open or poor contact of vacuum valve, vent 1 valve and vent 2 valve.

TROUBLE SYMPTOM:

- Cruise control cannot be set, or cancelled immediately.



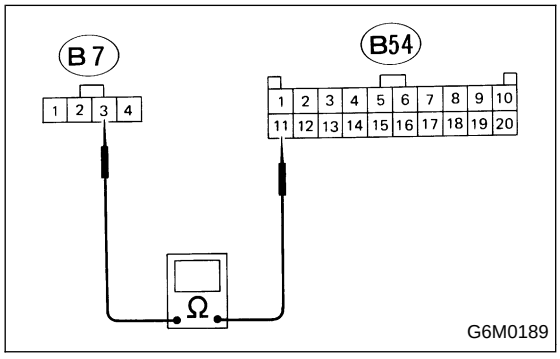


1. MEASURE RESISTANCE OF ACTUATOR

1) Separate the connector.
2) Measure the resistance value of the actuator.

Terminals/Specified resistance:

No. 2 — No. 1/55 Ω
No. 2 — No. 3/22 Ω
No. 2 — No. 4/55 Ω

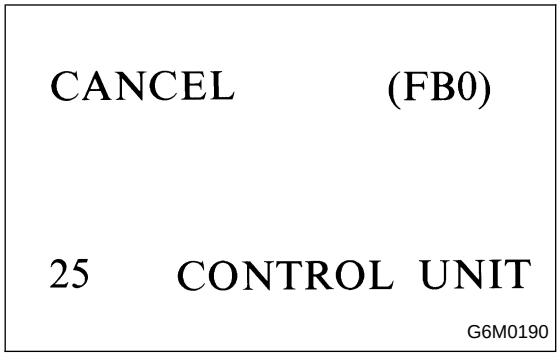


2. PERFORM A CIRCUIT TEST IN HARNESS BETWEEN CRUISE CONTROL MODULE AND ACTUATOR

1) Separate both sides of connectors.
2) Perform a circuit test between each of the harnesses.

Connector & terminal/Specified resistance:

(B7) No. 1 — (B54) No. 1/10 Ω, max.
(B7) No. 2 — (B54) No. 8/10 Ω, max.
(B7) No. 3 — (B54) No. 11/10 Ω, max.
(B7) No. 4 — (B54) No. 2/10 Ω, max.



Replace cruise control module.

G: TROUBLE CODE 25 — CONTROL MODULE —

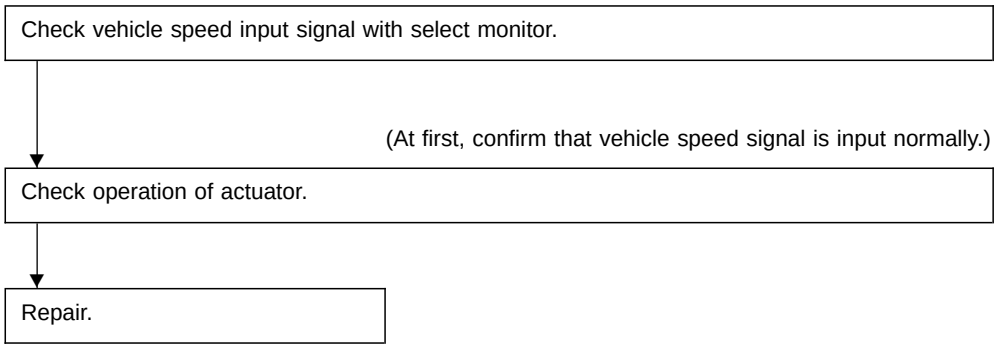
DIAGNOSIS:

- Faulty cruise control module.

TROUBLE SYMPTOM:

- Cruise control cannot be set.

8. Diagnostics Chart for Actuator



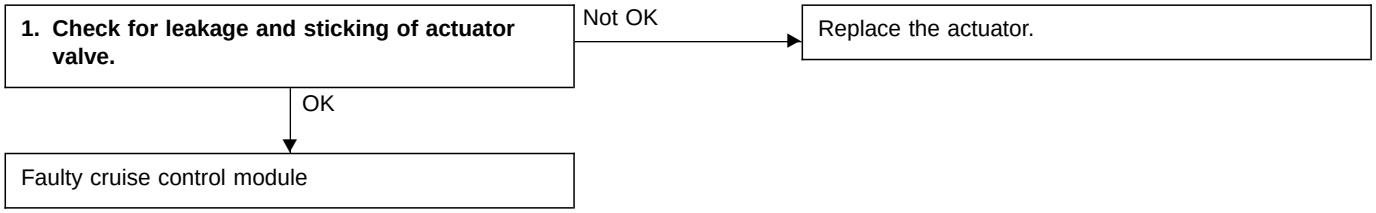
A: CHECK OPERATION OF ACTUATOR

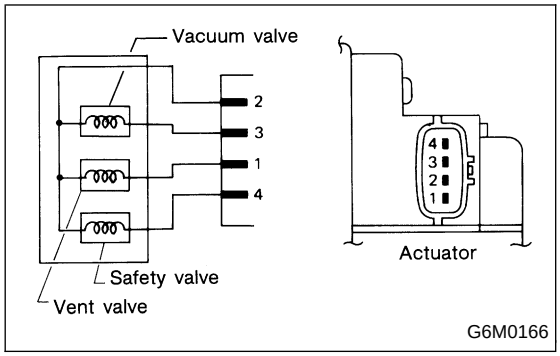
DIAGNOSIS:

- Sticking of air leaves of actuator, or sticking of valve and actuator diaphragm.

TROUBLE SYMPTOM:

- Cannot run at set speed ±3 km/h (±2 MPH).

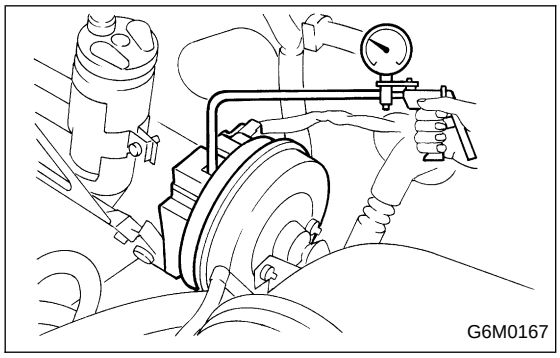




1. CHECK FOR LEAKAGE AND STICKING OF ACTUATOR VALVE

1) Measure resistance of actuator.

Terminals/Specified resistance:
No. 2 — No. 1/55 Ω (Vent valve)
No. 2 — No. 3/22 Ω (Vacuum valve)
No. 2 — No. 4/55 Ω (Safety valve)



2) Check operation of actuator.
(1) Connect ⊕ battery cable to terminal 2 and ⊖ battery cable to terminal 1, 3 and 4.
(2) Make sure cable moves smoothly when a vacuum pressure of 40.0 kPa (300 mmHg, 11.81 inHg) is applied to actuator using vacuum pump.

Stroke: 35 mm (1.38 in)
Movement time: Within 3 seconds

(3) When the battery is removed from condition (2) above, make sure the cable returns to its original position smoothly.

Movement time: Within 1.5 seconds

(4) Connect battery to each terminal and check cable movement when vacuum pressure is applied by vacuum pump.

Vacuum pressure	Terminal No.				Battery		Operation mode
	1	2	3	4	⊕	⊖	
OFF	—	—	—	—	—	—	—
ON (Vacuum pressure applied.)		○			○		Pull
			○			○	
	○					○	
				○		○	
		○			○		Hold
	○					○	
				○		○	
		○			○		Release
				○		○	

WIRING DIAGRAM SECTION

FOREWORD

This portion of the 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 both the fully qualified and the less-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.

Important safety notice

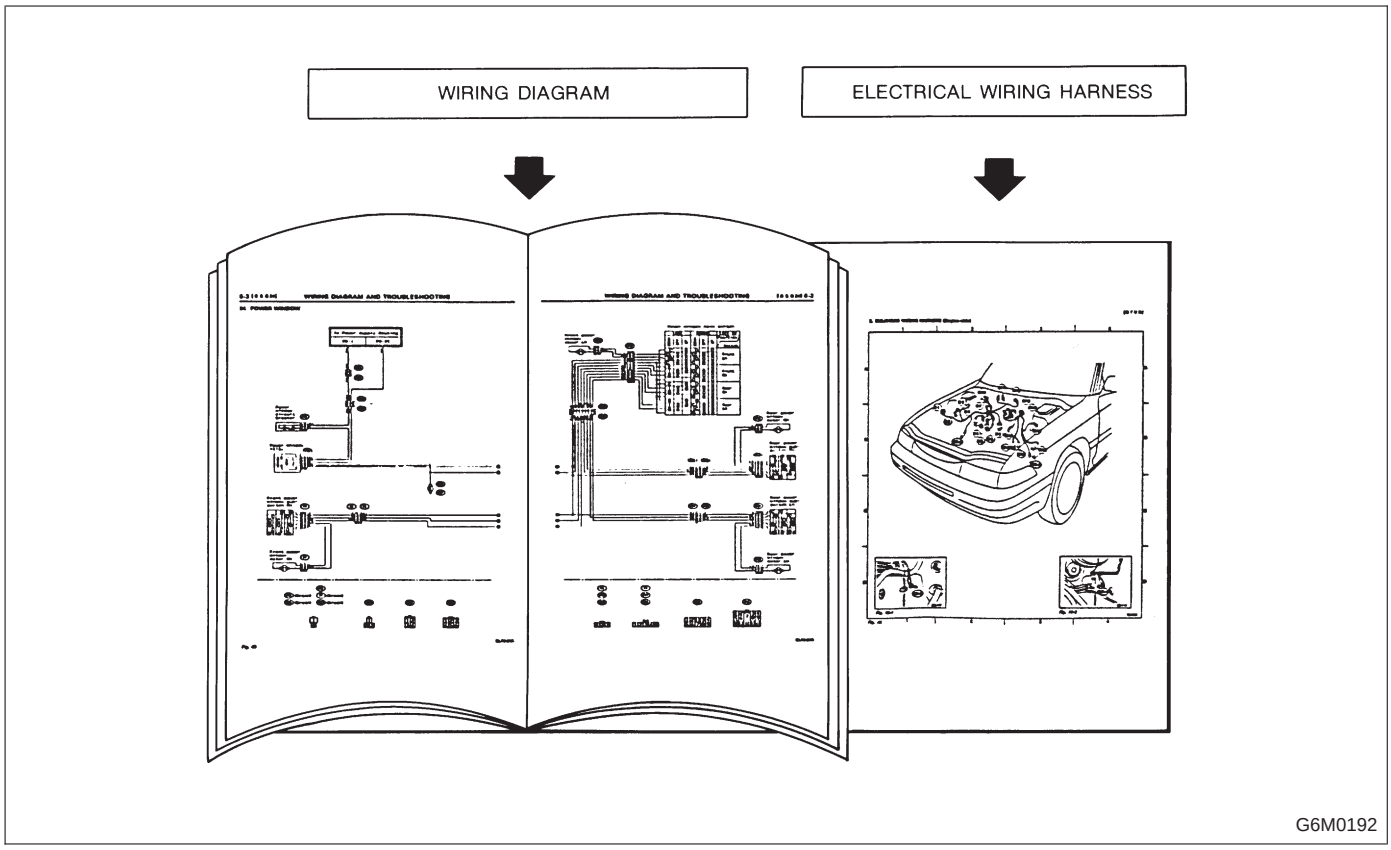
- Providing appropriate service and repair is a matter of great importance in the serviceman's safety maintenance and safe operation, function and performance which the SUBARU vehicle possesses.
- In case the replacement of parts or replenishment of consumables is required, genuine SUBARU parts whose parts numbers are designated or their equivalents must be utilized.
- It must be made well known that the safety of the serviceman and the safe operation of the vehicle would be jeopardized if he used any service parts, consumables, special tools and work procedure manuals which are not approved or designated by SUBARU.

WIRING DIAGRAM 6-3

1. General Description

1. HOW TO USE THIS MANUAL

The description of the electrical system is divided into the charging system, starting system, etc.
1) First, open to the necessary electrical system section and wiring diagram.
2) Next, open the foldout page of the electrical wiring diagram. By observing the electrical wiring harness' illustrations (front, instrument panel, etc.), the wiring diagram connector can be located.



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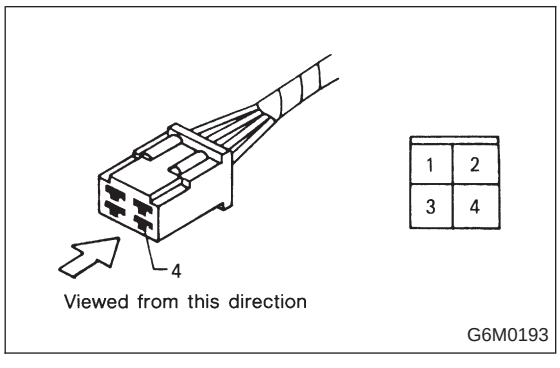
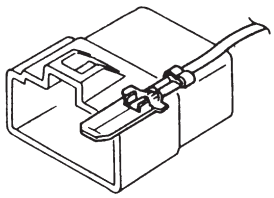
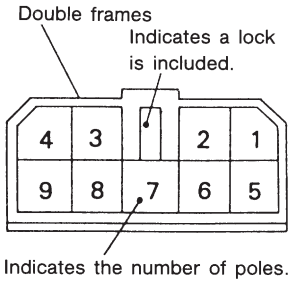
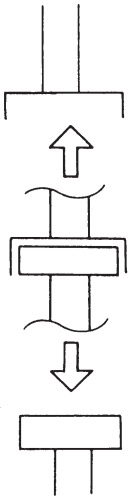
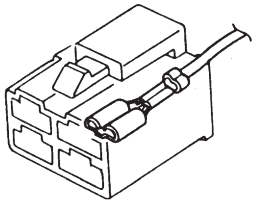
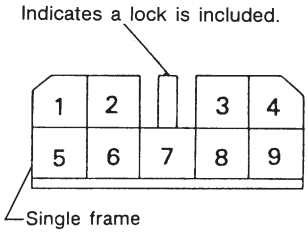


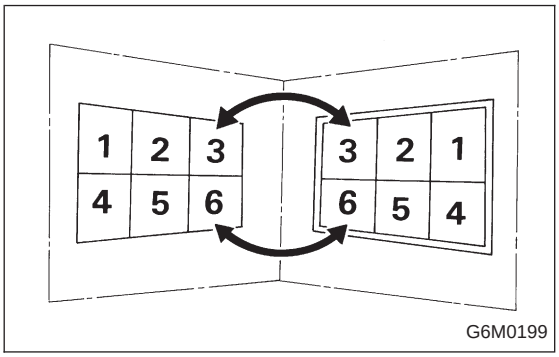
G6M0193

2. WIRING DIAGRAM

The wiring diagram of each system is illustrated so that you can understand the path through which the electric current flows from the battery.
Sketches and codes are used in the diagrams. They should read as follows:
1) Each connector and its terminal position are indicated by a sketch of the connector in a disconnected state which is viewed from the front, as shown in figure.

2) The number of poles or pins, presence of a lock, and pin number of each terminal are indicated in the sketch of each connector.
In the sketch, the highest pole number refers to the number of poles which the connector has. For example, the sketch of the connector shown in figure indicates the connector has 9 poles.

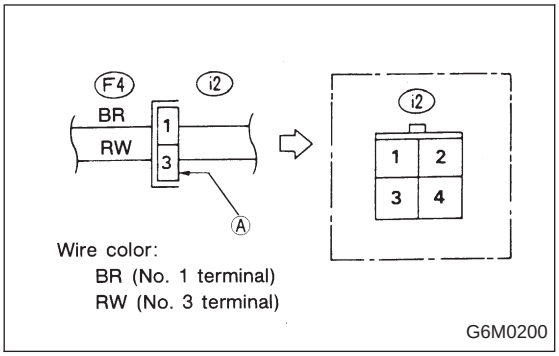
Connector used in vehicle	Connector shown in wiring diagram		
	Sketch	Symbol	Number of poles
 G6M0194	 G6M0196	 G6M0198	Numbered in order from upper right to lower left.
 G6M0195	 G6M0197		Numbered in order from upper left to lower right.



G6M0199

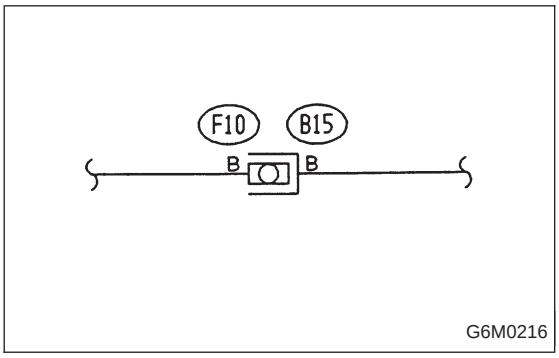
When one set of connectors is viewed from the front side, the pole numbers of one connector are symmetrical to those of the other. When these two connectors are connected as a unit, the poles which have the same number are joined.

3) Electrical wiring harness
The connectors are numbered along with the number of poles, external colors, and mating connections in the accompanying list.

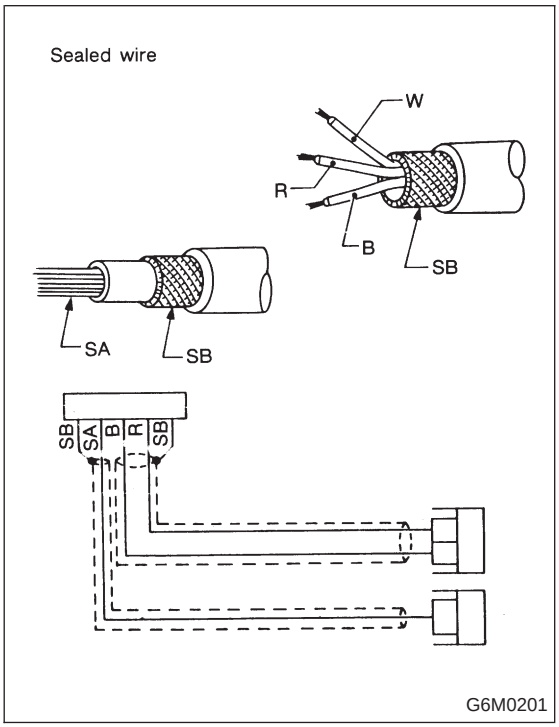


4) The sketch of each connector in the wiring diagram usually shows the “A” side of the connector. The relationship between the wire color, terminal number and connector is described in figure.

NOTE:
A wire which runs in one direction from a connector terminal sometimes may have a different color from that which runs in the other direction from that terminal.

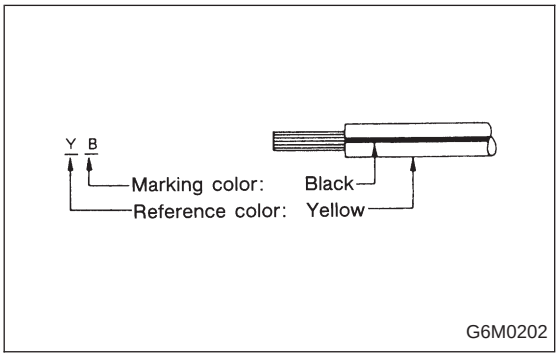


5) In wiring diagram, connectors which have no terminal number refer to one-pole types. Sketches of these connectors are omitted intentionally.



6) The following color codes are used to indicate the colors of the wires used.

Color code	Color
L	Blue
B	Black
Y	Yellow
G	Green
R	Red
W	White
Br	Brown
Lg	Light green
Gr	Gray
P	Pink
Or	Orange
Lb	Light Blue
V	Violet
SA	Sealed (Inner)
SB	Sealed (Outer)



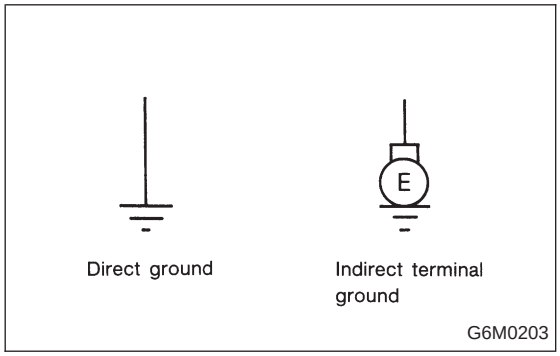
7) The wire color code, which consists of two letters (or three letters including Br or Lg), indicates the standard color (base color of the wire covering) by its first letter and the stripe marking by its second letter.

8) The table below lists the nominal sectional areas and allowable currents of the wires.

Nominal sectional area mm^2	No. of strands/ strand diameter	Outside diameter of finished wiring mm	Allowable current Amps/40°C
0.3	7/0.26	1.8	7
0.5	7/0.32	2.2 (or 2.0)	12
0.75	30/0.18	2.6 (or 2.4)	16
0.85	11/0.32	2.4 (or 2.2)	16
1.25	16/0.32	2.7 (or 2.5)	21
2	26/0.32	3.1 (or 2.9)	28
3	41/0.32	3.8 (or 3.6)	38
5	65/0.32	4.6 (or 4.4)	51
8	50/0.45	5.5	67

CAUTION:
- **When replacing or repairing a wire, be sure to use the same size and type of the wire which was originally used.**

NOTE:
- The allowable current in the above table indicates the tolerable amperage of each wire at an ambient temperature of 40°C (104°F).
- The allowable current changes with ambient temperature. Also, it changes if a bundle of more than two wires is used.



9) Each unit is directly grounded to the body or indirectly grounds through a harness ground terminal. Different symbols are used in the wiring diagram to identify the two grounding systems.

The ground points shown in the wiring diagram refer to the following:

(GB) Body ground

(GE) Engine ground

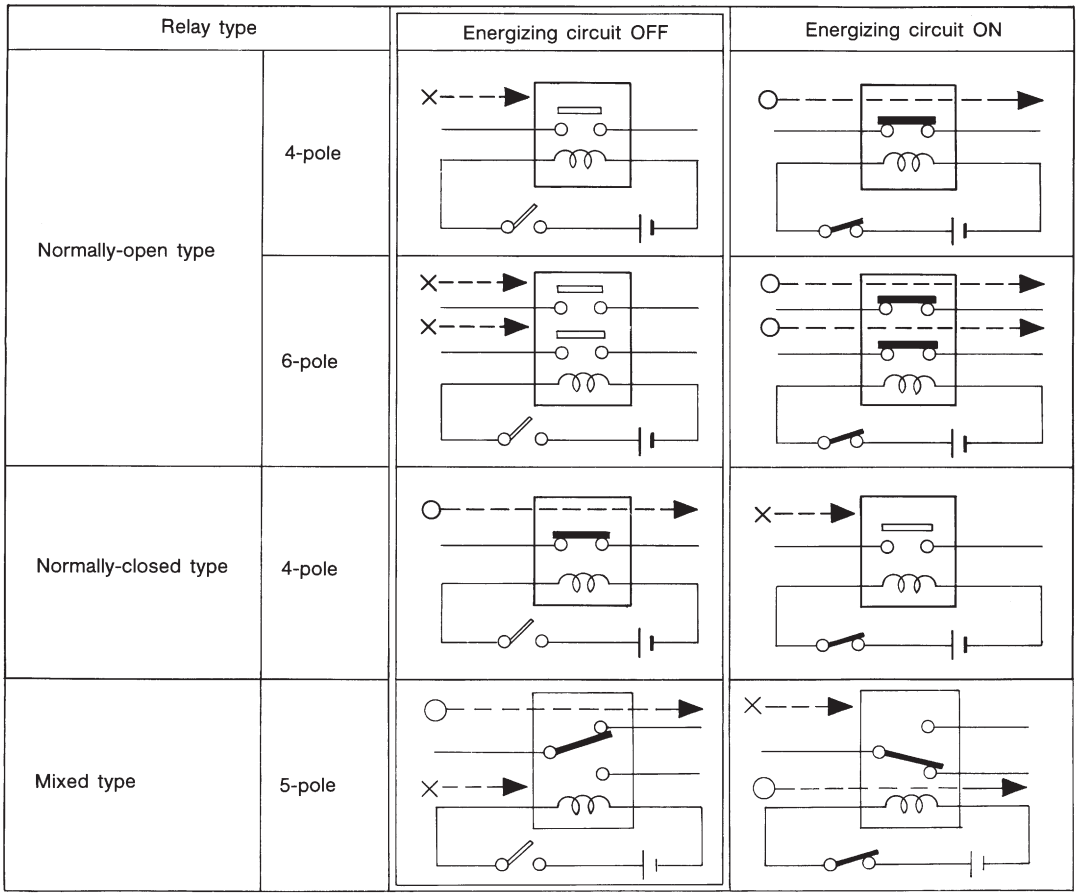
(GR) Radio ground

(GD) Rear defogger ground

All wiring harnesses are provided with a ground point which should be securely connected.

WIRING DIAGRAM

10) Relays are classified as normally-open or normally-closed.
The normally-closed relay has one or more contacts.
The wiring diagram shows the relay mode when the energizing circuit is OFF.



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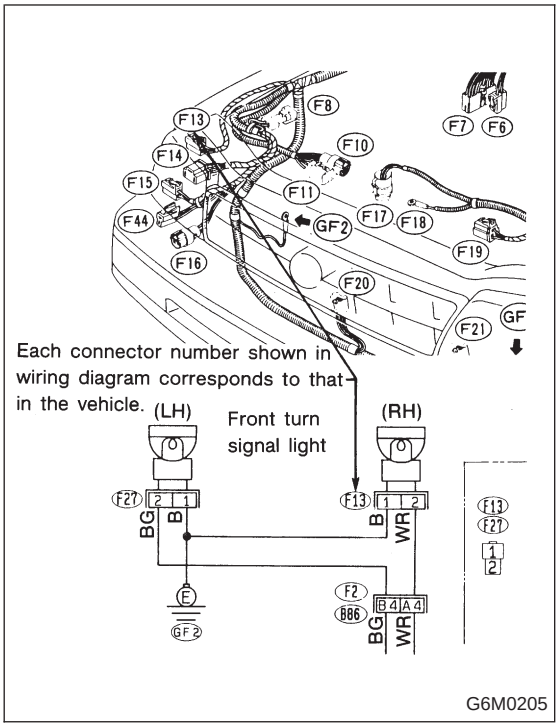
Key to symbols:
◯ → : Current flows.
X → : Current does not flow.



11) Each connector number shown in the wiring diagram corresponds to that in the wiring harness. The location of each connector in the actual vehicle is determined by reading the first character of the connector (for example, a “F” for F8, “i” for i16, etc.) and the type of wiring harness.
The first character of each connector number refers to the area or system of the vehicle, as indicated in table below.

Symbol	Wiring harness and Cord
F	Front wiring harness LH & RH
B	Bulkhead wiring harness
E	Engine wiring harness, Engine module wiring harness
T	Transmission cord
D	Door cord LH & RH, Rear door adapter cord LH & RH
I	Instrument panel wiring harness
R	Rear wiring harness, Rear defogger cord Room light cord, Fuel tank cord, Sunroof cord, Rear gate cord, Rear gate lock adapter cord
P	Power window main harness

2. Basic Diagnostics Procedure

The most important purpose of diagnostics is to determine which part is malfunctioning quickly, to save time and labor.

A: IDENTIFICATION OF TROUBLE SYMPTOM

Determine what the problem is based on the symptom.

B: PROBABLE CAUSE OF TROUBLE

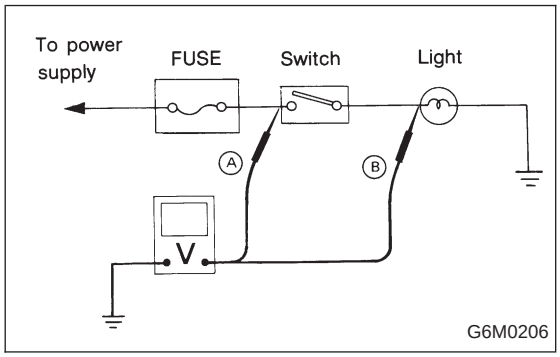
Look at the wiring diagram and check the system's circuit. Then check the switch, relay, fuse, ground, etc.

C: LOCATION AND REPAIR OF TROUBLE

1) Using the diagnostics narrow down the causes.
2) If necessary, use a voltmeter, ohmmeter, etc.
3) Before replacing certain component parts (switch, relay, etc.), check the power supply, ground, for open wiring harness, poor connectors, etc. If no problems are encountered, check the component parts.

D: CONFIRMATION OF SYSTEM OPERATION

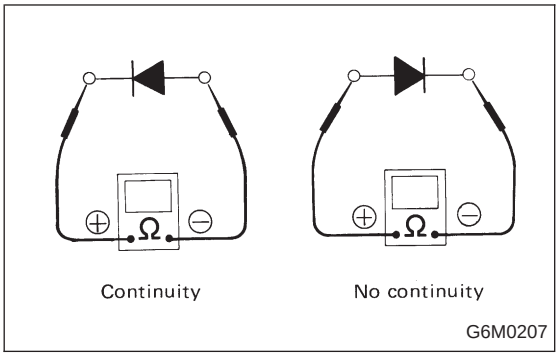
After repairing, ensure that the system operates properly.



E: INSPECTION

1. VOLTAGE MEASUREMENT

1) Using a voltmeter, connect the negative lead to a good ground point or negative battery terminal and the positive lead to the connector or component terminal.
2) Contact the positive probe of the voltmeter on connector (A).
The voltmeter will indicate a voltage.
3) Shift the positive probe to connector (B). The voltmeter will indicate no voltage.
With test set-up held as it is, turn switch ON. The voltmeter will indicate a voltage and, at the same time, the light will come on.
4) The circuit is in good order. If a problem such as a lamp failing to light occurs, use the procedures outlined above to track down the malfunction.



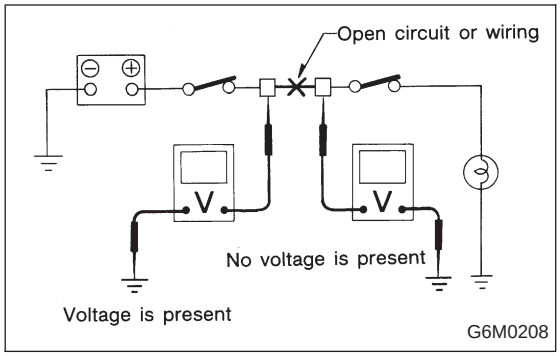
2. CIRCUIT CONTINUITY CHECKS

1) Disconnect the battery terminal or connector so there is no voltage between the check points.
Contact the two leads of an ohmmeter to each of the check points.
If the circuit has diodes, reverse the two leads and check again.

2) Use an ohmmeter to check for diode continuity.
When contacting the negative lead to the diode positive side and the positive lead to the negative side, there should be continuity.
When contacting the two leads in reverse, there should be no continuity.

3) Symbol “o—o” indicates that continuity exists between two points or terminals. For example, when a switch position is “3”, continuity exists among terminals 1, 3 and 6, as shown in table below.

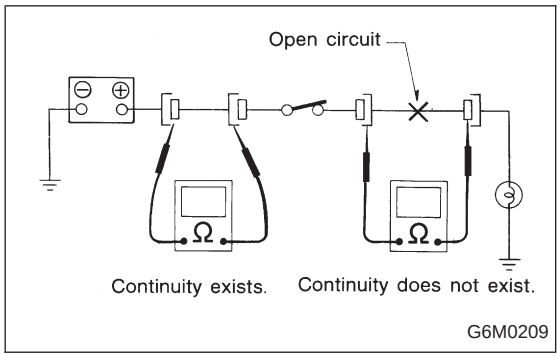
Terminal / Switch Position	1	2	3	4	5	6
OFF						
1	○				○	○
2	○			○		○
3	○		○			○
4	○	○				○



3. HOW TO DETERMINE AN OPEN CIRCUIT

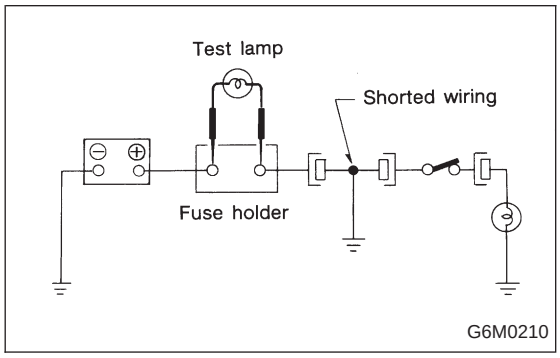
1) Voltmeter Method

An open circuit is determined by measuring the voltage between respective connectors and ground using a voltmeter, starting with the connector closest to the power supply. The power supply must be turned ON so that current flows in the circuit. If voltage is not present between a particular connector and ground, the circuit between that connector and the previous connector is open.



2) Ohmmeter method

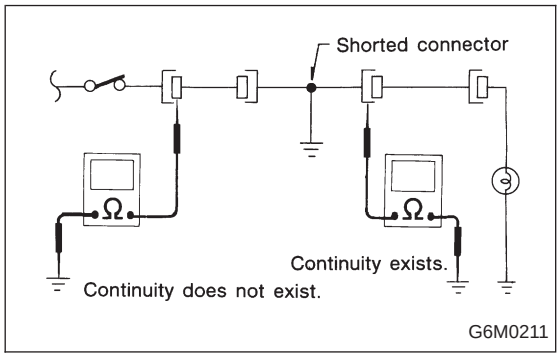
Disconnect all connectors affected, and check continuity in the wiring between adjacent connectors. When the ohmmeter indicates “infinite”, the wiring is open.



4. HOW TO DETERMINE A SHORTCIRCUIT

1) Test lamp method

Connect a test lamp (rated at approximately 3 watts) in place of the blown fuse and allow current to flow through the circuit. Disconnect one connector at a time from the circuit, starting with the one located farthest from the power supply. If the test lamp goes out when a connector is disconnected, the wiring between that connection and the next connector (farther from the power supply) is shorted.



2) Ohmmeter method

Disconnect all affected connectors, and check continuity between each connector and ground. When ohmmeter indicates continuity between a particular connector and ground, that connector is shorted.

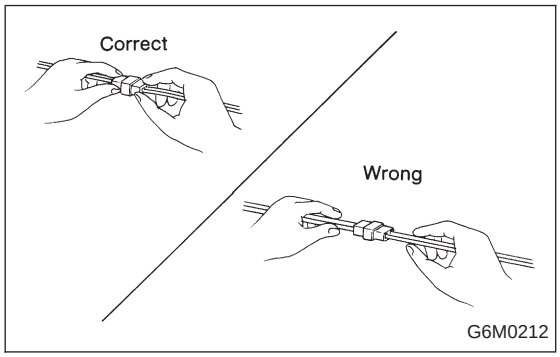
3. Working Precautions

1. PRECAUTIONS WHEN WORKING WITH THE PARTS MOUNTED ON THE VEHICLE

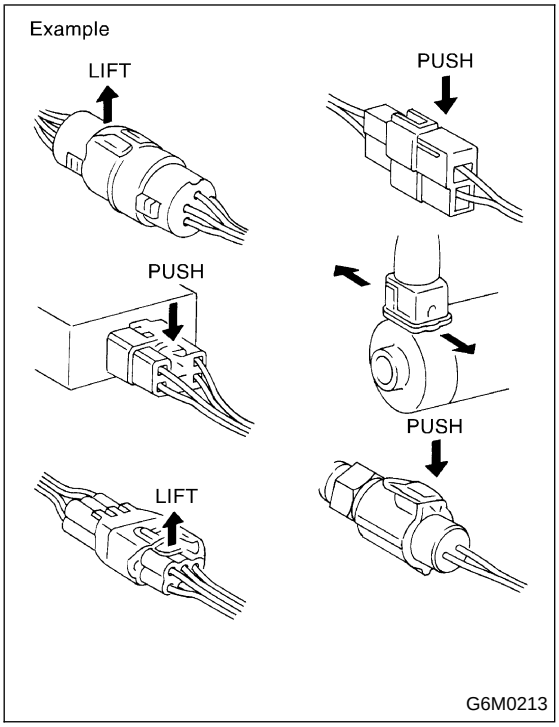
1) When working under a vehicle which is jacked-up, always be sure to use safety stands.
2) The parking brake must always be applied during working. Also, in automatic transmission vehicles, keep the select lever set to the P (Parking) range.
3) Be sure the workshop is properly ventilated when running the engine. Further, be careful not to touch the belt or fan while the engine is operating.
4) Be careful not to touch hot metal parts, especially the radiator and exhaust system immediately after the engine has been shut off.

2. PRECAUTIONS IN TROUBLE DIAGNOSIS AND REPAIR OF ELECTRIC PARTS

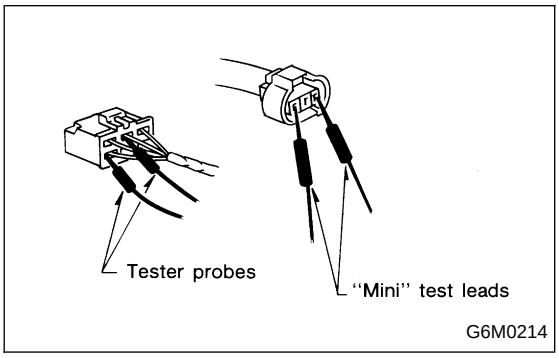
1) The battery cable must be disconnected from the battery's (−) terminal, and the ignition switch must be set to the OFF position, unless otherwise required by the diagnostics.
2) Securely fasten the wiring harness with clamps and slips so that the harness does not interfere with the body end parts or edges and bolts or screws.
3) When installing parts, be careful not to catch them on the wiring harness.



4) When disconnecting a connector, do not pull the wires, but pull while holding the connector body.



5) Some connectors are provided with a lock. One type of such a connector is disconnected by pushing the lock, and the other, by moving the lock up. In either type the lock shape must be identified before attempting to disconnect the connector.
To connect, insert the connector until it snaps and confirm that it is tightly connected.



6) When checking continuity between connector terminals, or measuring voltage across the terminal and ground, always contact tester probe(s) on terminals from the wiring connection side. If the probe is too thick to gain access to the terminal, use “mini” test leads.
To check water-proof connectors (which are not accessible from the wiring side), contact test probes on the terminal side being careful not to bend or damage the terminals.

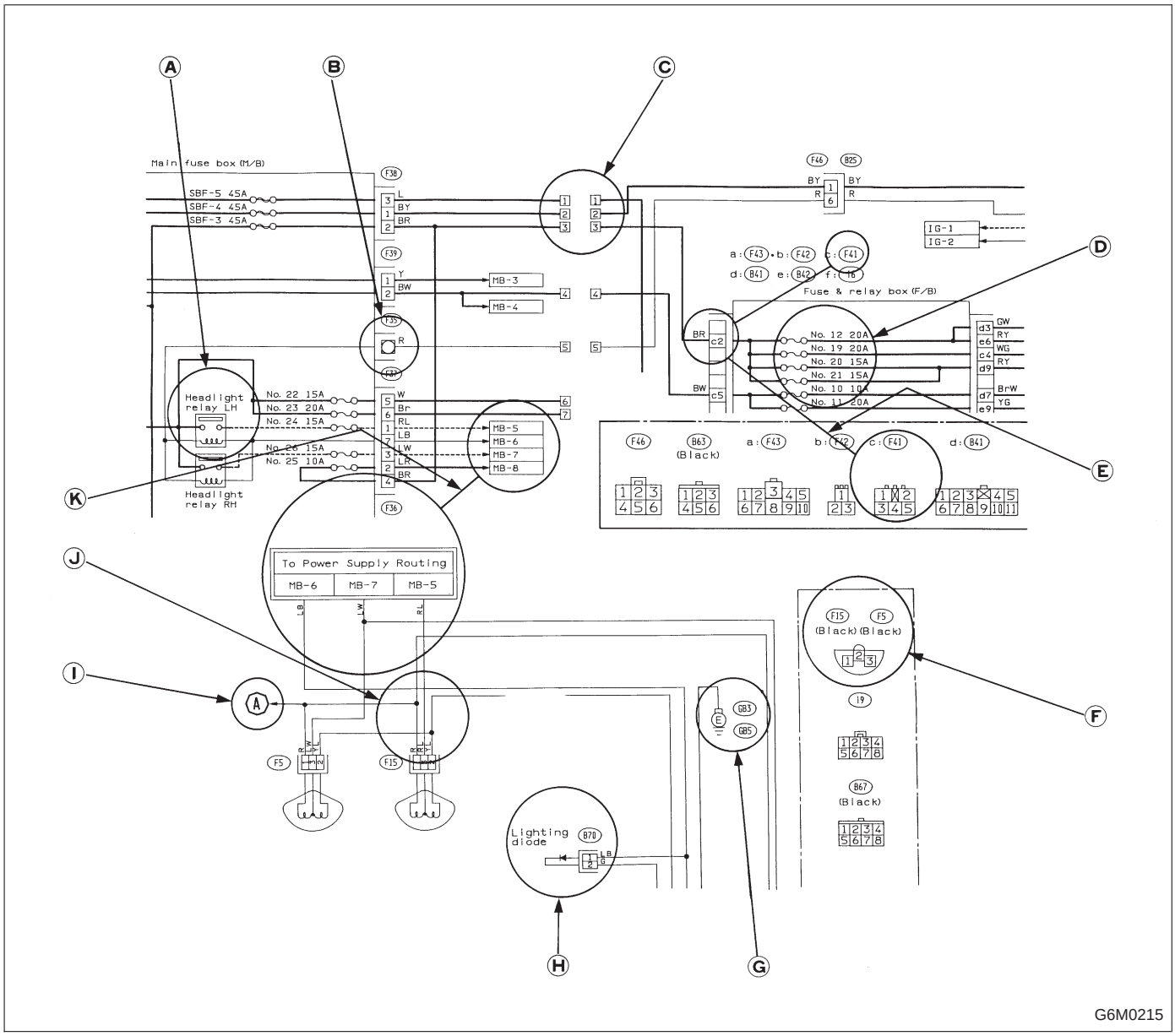
7) Sensors, relays, electrical unit, etc., are sensitive to strong impacts.
Handle them with care so that they are not dropped or mishandled.

ABBREVIATION LIST

Abbr.	Full name
A.B.S.	Antilock Brake System
ACC	Accessory
A/C	Air Conditioning
AD	Auto Down
AT	Automatic Transmission
AU	Auto Up
+B	Battery
DN	Down
DRL	Daytime Running Light
E	Ground
F/B	Fuse & Joint Box
FL1.5	Fusible link 1.5 mm^2
IG	Ignition
Illumi.	Illumination

Abbr.	Full name
LH	Left Hand
Lo	Low
M	Motor
M/B	Main Fuse Box
MG	Magnet
Mi	Middle
MPFI	Multi Point Fuel Injection Model
OP	Optional Parts
PASS	Passing
RH	Right Hand
SBF	Slow Blow Fuse
ST	Starter
SW	Switch
UP	Up
WASH	Washer

4. How to Use Wiring Diagram



A: RELAY

A symbol used to indicate a relay.

B: CONNECTOR-1

The sketch of the connector indicates the one-pole types.

C: WIRING CONNECTION

Some wiring diagrams are indicated in foldouts for convenience. Wiring destinations are indicated where necessary by corresponding symbols (as when two pages are needed for clear indication).

D: FUSE NO. & RATING

The “FUSE No. & RATING” corresponds with that used in the fuse box (main fuse box, fuse and joint box.)

E: CONNECTOR-2

1. Each connector is indicated by a symbol.
2. Each terminal number is indicated in the corresponding wiring diagram in an abbreviated form.
3. For example, terminal number “C2” refers to No. 2 terminal of connector (C:F41) shown in the connector sketch.

F: CONNECTOR SKETCH

1. Each connector sketch clearly identifies the shape and color of a connector as well as terminal locations. Non-colored connectors are indicated in natural color.
2. When more than two types of connector number are indicated in a connector sketch, it means that the same type connectors are used.

G: GROUND

Each grounding point can be located easily by referring to the corresponding wiring harness.

H: DIODE

A symbol is used to indicate a diode.

I: WIRE TRACING ON EXTENDED WIRING DIAGRAMS

For a wiring diagram extending over at least two pages, a symbol (consisting of the same characters with arrows), as shown below, facilitates wire tracing from one page to the next.

A ↔ A, B ↔ B

J: SYMBOLS OF WIRE CONNECTION AND CROSSING

 Symbol	Refers to wires which are connected and branched at the “dot” point.
 Symbol	Refers to wires which are crossed but not connected.

K: POWER SUPPLY ROUTING

A symbol is used to indicate the power supply in each wiring diagram.

“MB-5”, “MB-6”, etc., which are used as power-supply symbols throughout the text, correspond with those shown in the POWER SUPPLY ROUTING in the wiring diagram.

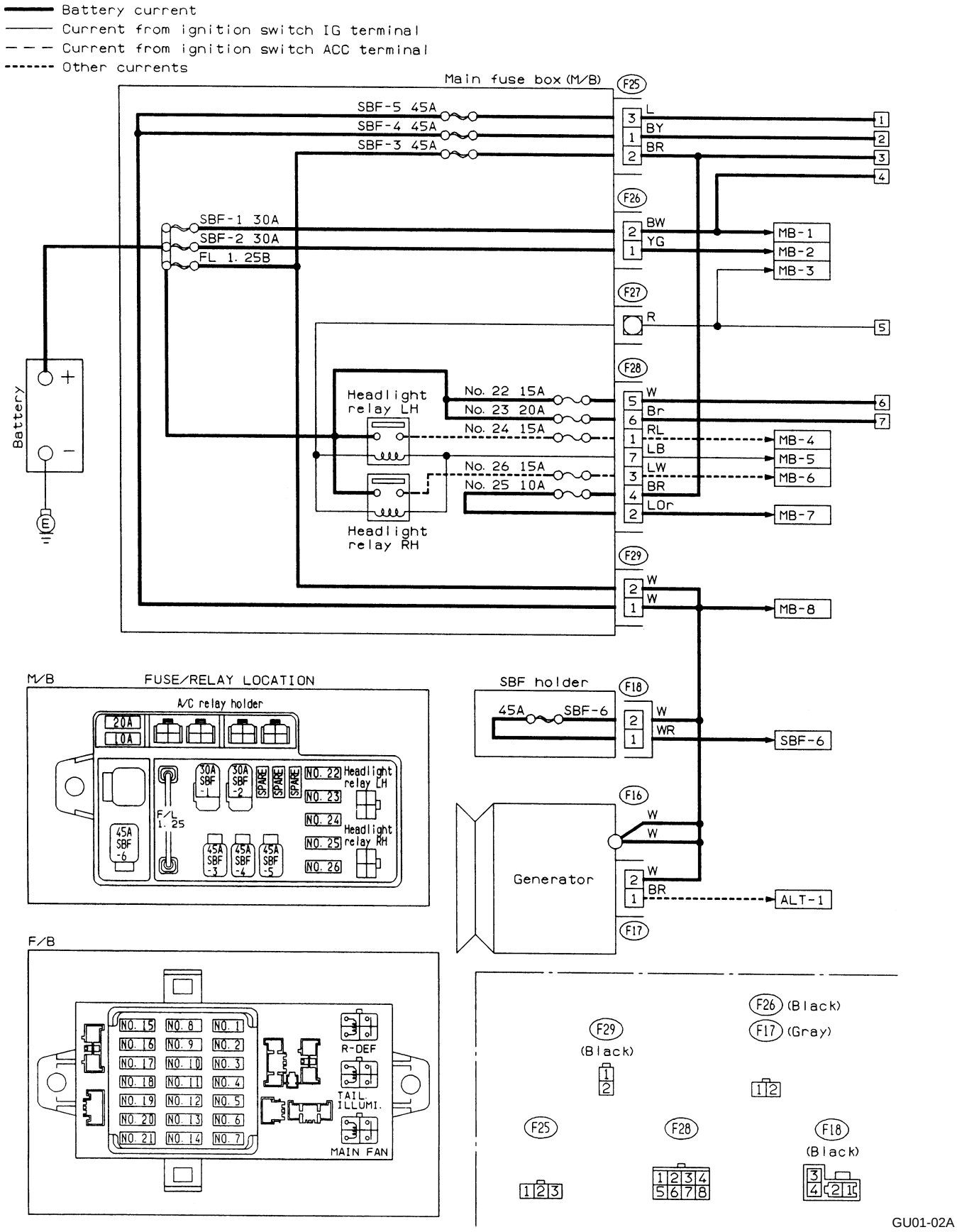
Accordingly, using the POWER SUPPLY ROUTING and wiring diagrams permits service personnel to understand the entire electrical arrangement of a system.

SYMBOLS AND ABBREVIATIONS

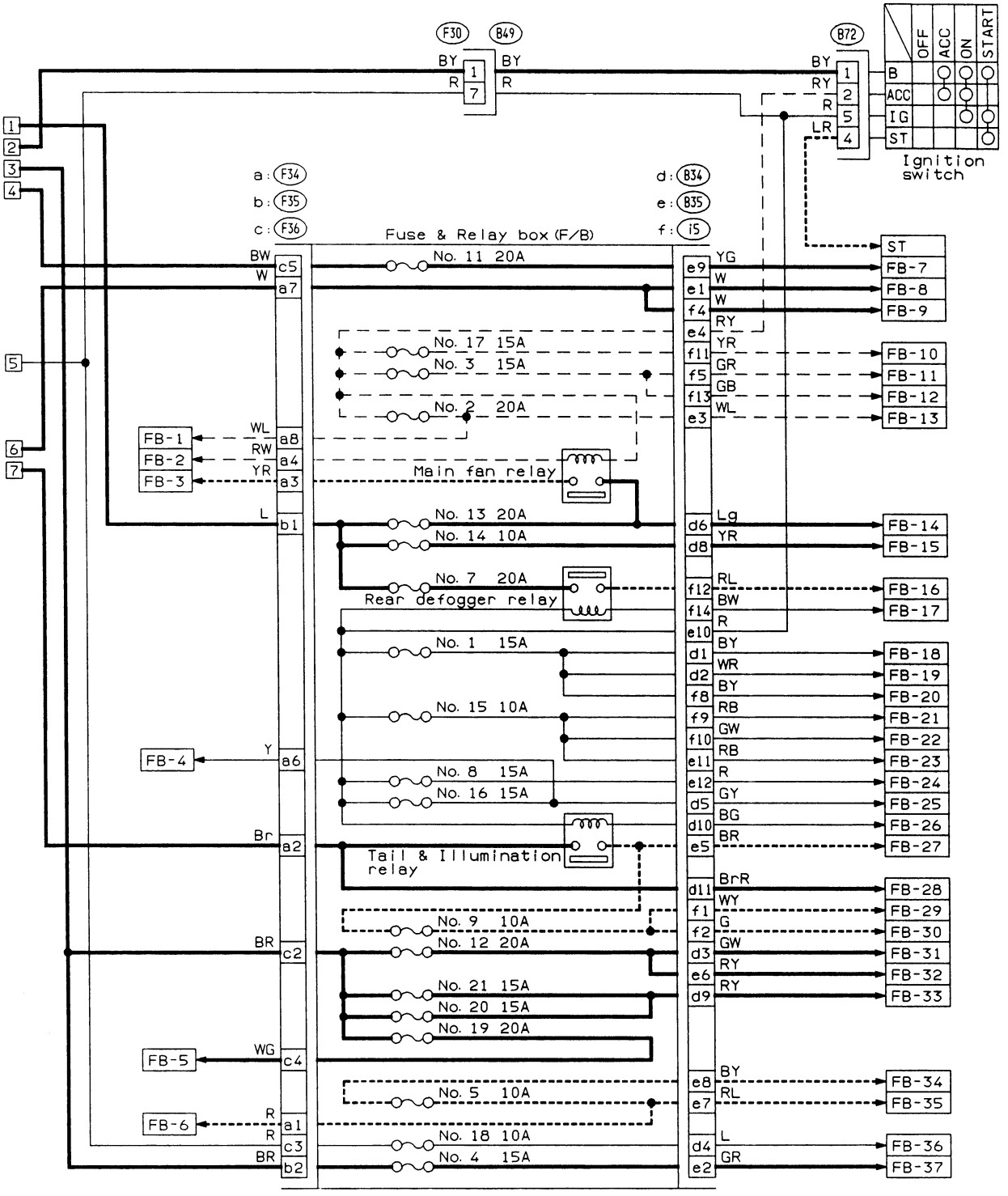
A number of symbols and abbreviations are used in each wiring diagram to easily identify parts or circuits.

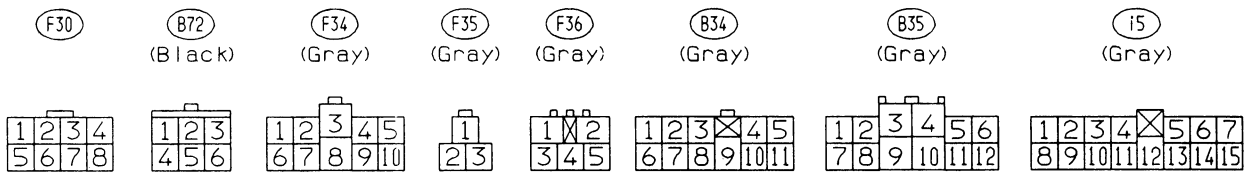
5. Wiring Diagram

1. POWER SUPPLY ROUTING



GU01-02A


F30
B49
B72
Ignition switch
OFF
ACC
ON
START
Fuse & Relay box (F/B)
No. 11 20A
No. 17 15A
No. 3 15A
No. 2 20A
Main fan relay
No. 13 20A
No. 14 10A
No. 7 20A
Rear defogger relay
No. 1 15A
No. 15 10A
No. 8 15A
No. 16 15A
Tail & Illumination relay
No. 9 10A
No. 12 20A
No. 21 15A
No. 20 15A
No. 19 20A
No. 5 10A
No. 18 10A
No. 4 15A
ST
FB-7
FB-8
FB-9
FB-10
FB-11
FB-12
FB-13
FB-1
FB-2
FB-3
FB-4
FB-5
FB-6
FB-14
FB-15
FB-16
FB-17
FB-18
FB-19
FB-20
FB-21
FB-22
FB-23
FB-24
FB-25
FB-26
FB-27
FB-28
FB-29
FB-30
FB-31
FB-32
FB-33
FB-34
FB-35
FB-36
FB-37


F30
B72 (Black)
F34 (Gray)
F35 (Gray)
F36 (Gray)
B34 (Gray)
B35 (Gray)
i5 (Gray)

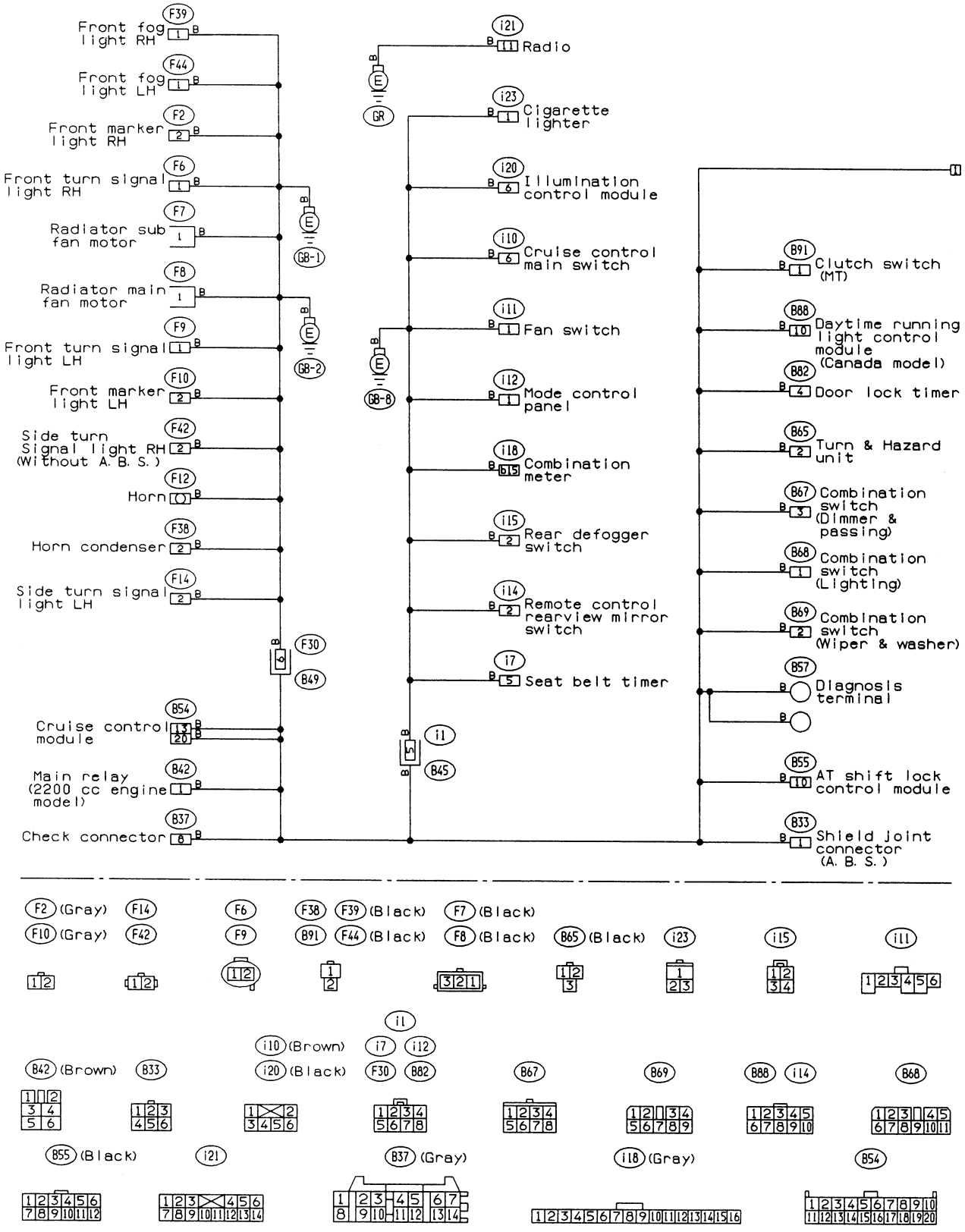
GU01-02B

WIRING DIAGRAM

No.	LOAD: SYSTEM No.
MB-1	P/W CIRCUIT BREAKER: 21, 31
MB-2	MAIN RELAY: 13 FUEL PUMP RELAY: 13
MB-3	A/C FUSE: 3, 22
MB-4	HEADLIGHT LH: 17
MB-5	DIODE (LIGHTING): 17 LIGHTING SWITCH: 17 DRL CONTROL MODULE: 17
MB-6	HEADLIGHT RH: 17 COMBINATION METER: 17
MB-7	RADIO: 7 SPOT LIGHT: 27 COMBINATION METER: 27 FUSE BOX ILLUMINATION: 27 ROOM LIGHT: 27 LUGGAGE ROOM LIGHT: 27 TRUNK LOOM LIGHT: 27
MB-8	A/C FUSE: 22
SBF-6	HYDRAULIC UNIT: 4
ALT-1	COMBINATION METER: 9, 20 DRL CONTROL MODULE: 17
ST	AT CONTROL MODULE: 5 INHIBITOR SWITCH: 13, 17, 29 ENGINE CONTROL MODULE: 13 STARTER INTERLOCK RELAY: 17, 29
FB-1	FRONT WASHER MOTOR: 14
FB-2	DIODE (A/C): 22
FB-3	MAIN FAN MOTOR: 22
FB-4	AT CONTROL MODULE: 5 FUEL PUMP RELAY: 13 ENGINE CONTROL MODULE:13 IGNITION COIL: 13
FB-5	HYDRAULIC UNIT: 4 MAIN FAN MOTOR: 22
FB-6	FRONT CLEARANCE LIGHT LH. RH: 18
FB-7	DOOR LOCK TIMER: 12
FB-8	AT SHIFT LOCK CONTROL MODULE: 6 KEY WARNING SWITCH: 6, 26
FB-9	HAZARD SWITCH: 32
FB-10	RADIO: 7
FB-11	CIGARETTE LIGHTER: 16
FB-12	REMOTE CONTROLLED REARVIEW MIRROR SWITCH: 25
FB-13	AT SHIFT LOCK CONTROL MODULE: 6 FRONT WIPER MOTOR: 14 FRONT WIPER SWITCH: 14 REAR WASHER MOTOR: 24 REAR WIPER RELAY: 24 REAR WIPER MOTOR: 24

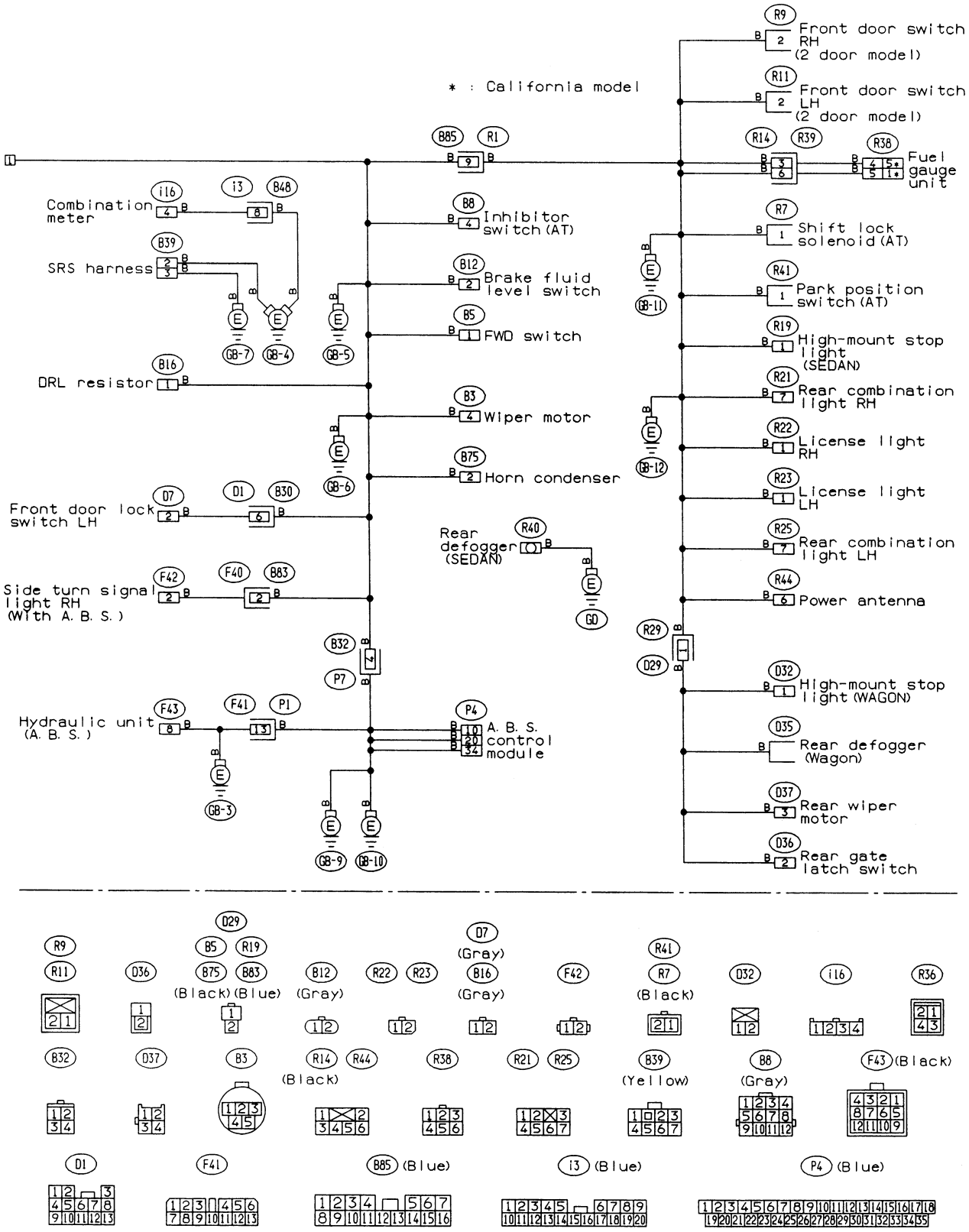
No.	LOAD: SYSTEM No.
FB-14	MAIN FAN RELAY 2: 22
FB-15	AT CONTROL MODULE: 5 ENGINE CONTROL MODULE: 13
FB-16	REAR DEFOGGER: 23
FB-17	COMBINATION METER: 23 REAR DEFOGGER SWITCH: 23
FB-18	BACK-UP LIGHT SWITCH: 8 INHIBITOR SWITCH: 8
FB-19	AT SHIFT LOCK CONTROL MODULE: 6
FB-20	HAZARD SWITCH: 32
FB-21	MODE CONTROL PANEL: 3 COMBINATION METER: 4, 5, 9, 13, 15, 19, 20, 26 SEAT BELT TIMER: 26
FB-22	COMBINATION METER: 28
FB-23	FRESH/RECIRC ACTUATOR: 3 EVAPORATION THERMOSWITCH: 3 BLOWER MOTOR RELAY: 3 CHECK CONNECTOR: 4, 5, 11, 13, 28 DRL CONTROL MODULE: 17 DRL RELAY: 17 DRL HI-BEAM RELAY: 17 P/W AND SUNROOF RELAY: 21, 31
FB-24	AIRBAG CONTROL MODULE: 28
FB-25	AIRBAG CONTROL MODULE: 28
FB-26	LIGHTING SWITCH: 18
FB-27	PARKING LIGHT SWITCH: 18
FB-28	PARKING LIGHT SWITCH: 18
FB-29	COMBINATION METER: 5, 18 ILLUMINATION LIGHTS: 18
FB-30	ILLUMINATION CONTROL MODULE: 18 ILLUMINATION LIGHTS: 18
FB-31	STOP LIGHT SWITCH: 5, 6, 11, 30
FB-32	HORN RELAY: 11, 16
FB-33	BLOWER MOTOR RELAY: 3
FB-34	PARKING LIGHT SWITCH: 18
FB-35	REAR COMBINATION LIGHT LH. RH: 18 LICENSE PLATE LIGHT LH. RH: 18
FB-36	A.B.S. G SENSOR: 14 A.B.S. CONTROL MODULE: 4 CRUISE CONTROL MODULE: 11 CRUISE CONTROL MAIN SWITCH: 11

2. GROUND DISTRIBUTION

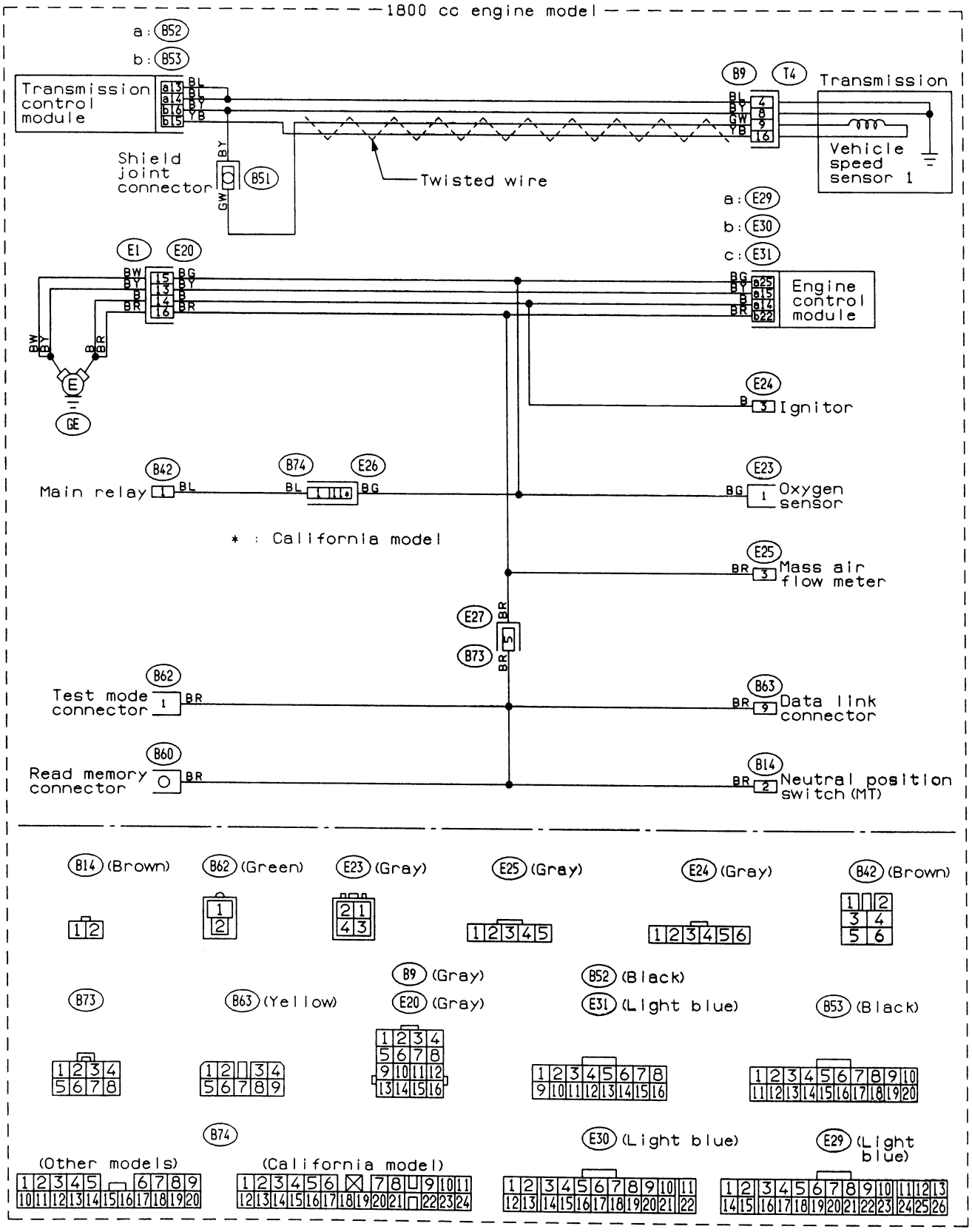


GU04-02A

WIRING DIAGRAM

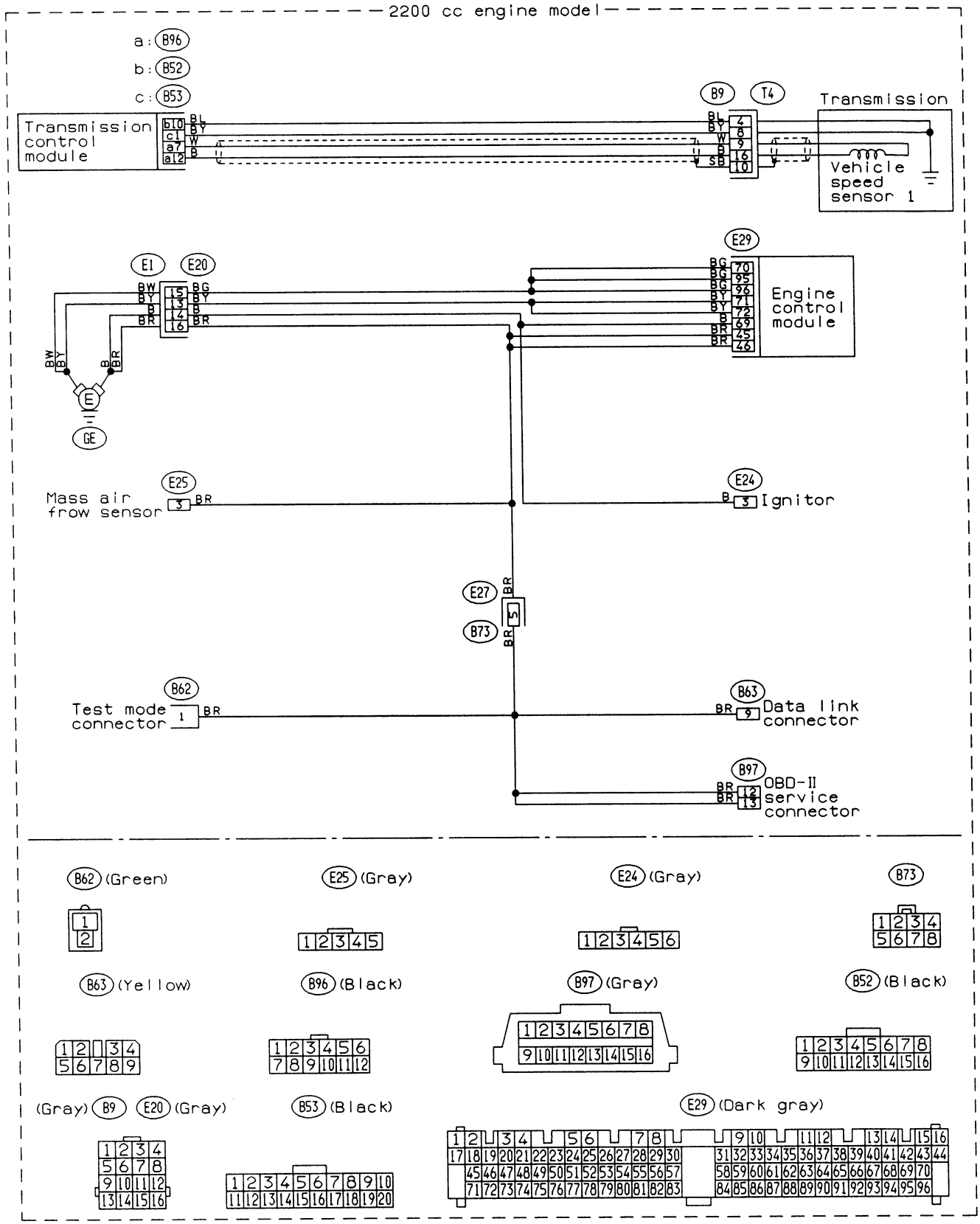


GU04-02B


1800 cc engine model
a: B52
b: B53
Transmission control module
Shield joint connector
B51
Twisted wire
B9
T4
Transmission
Vehicle speed sensor 1
a: E29
b: E30
c: E31
E1
E20
Engine control module
E24
Ignitor
E23
Oxygen sensor
B42
Main relay
B74
E26
* : California model
E25
Mass air flow meter
E27
B73
B62
Test mode connector
B63
Data link connector
B60
Read memory connector
B14
Neutral position switch (MT)
B14 (Brown)
B62 (Green)
E23 (Gray)
E25 (Gray)
E24 (Gray)
B42 (Brown)
B9 (Gray)
B52 (Black)
B73
B63 (Yellow)
E20 (Gray)
E31 (Light blue)
B53 (Black)
B74
E30 (Light blue)
E29 (Light blue)
(Other models)
(California model)

GU04-02C

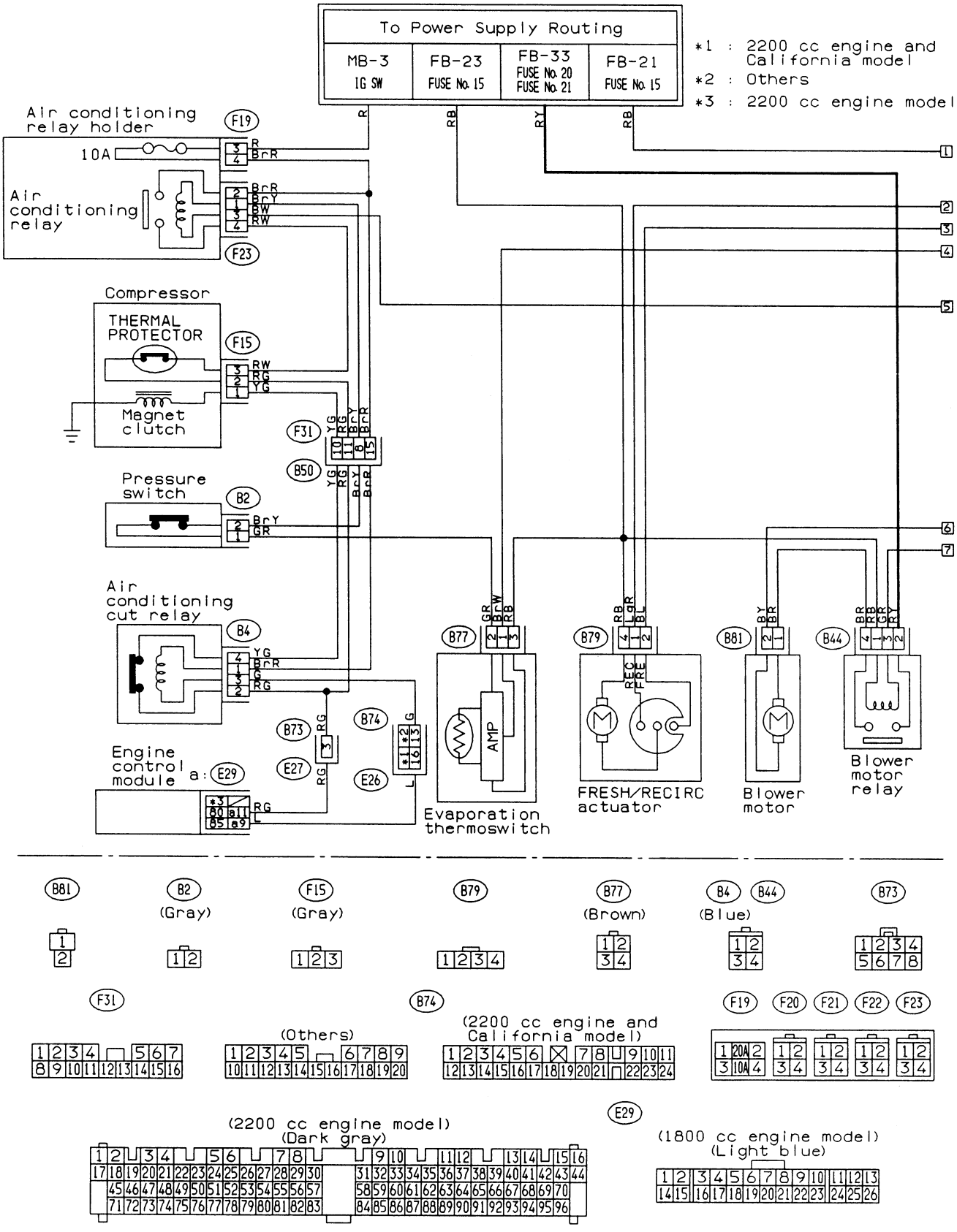
WIRING DIAGRAM



GU04-02D

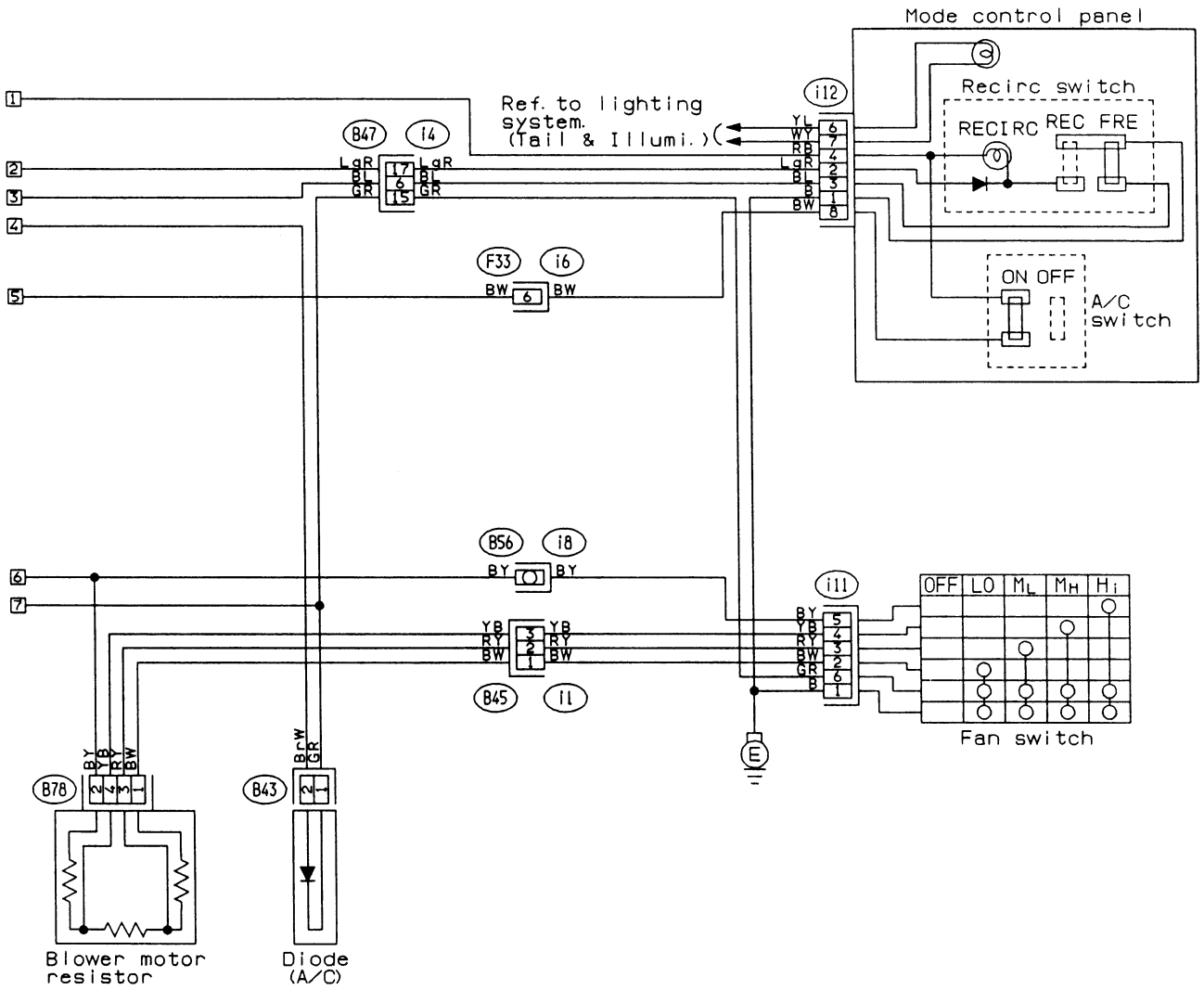
3. AIR CONDITIONING SYSTEM

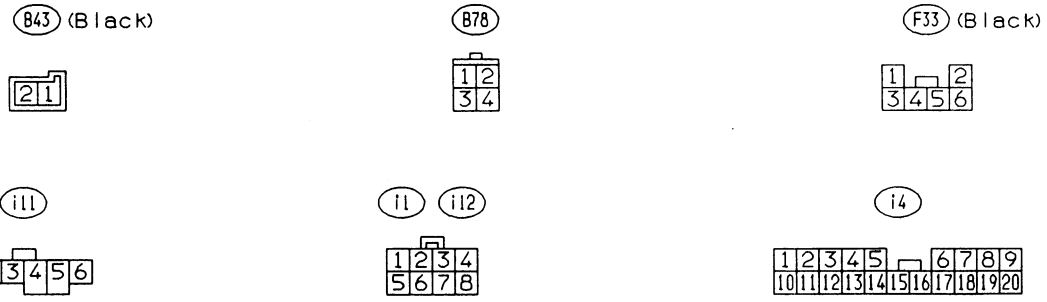
- **With A/C**



GU45-02A

WIRING DIAGRAM

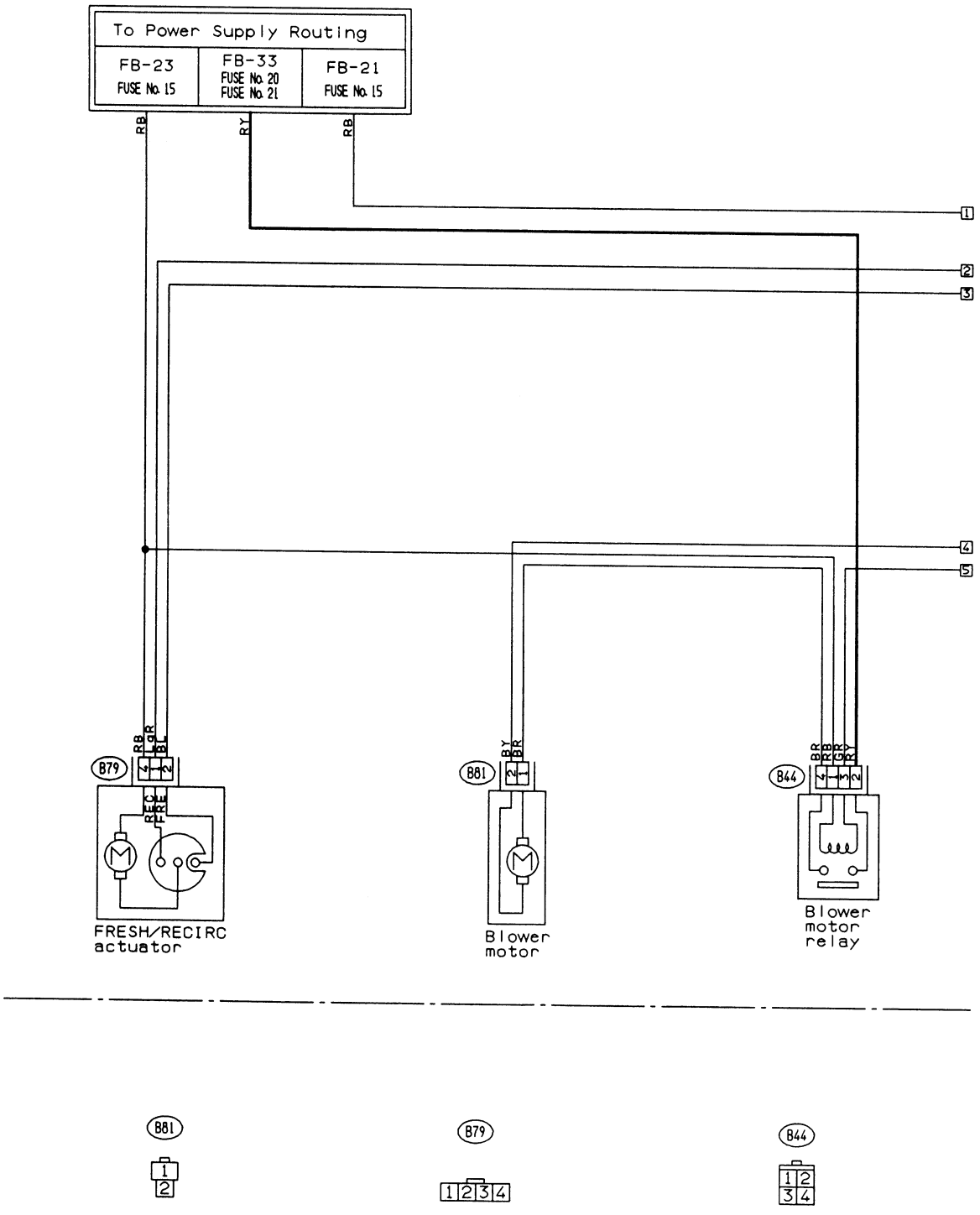




GU45-02B

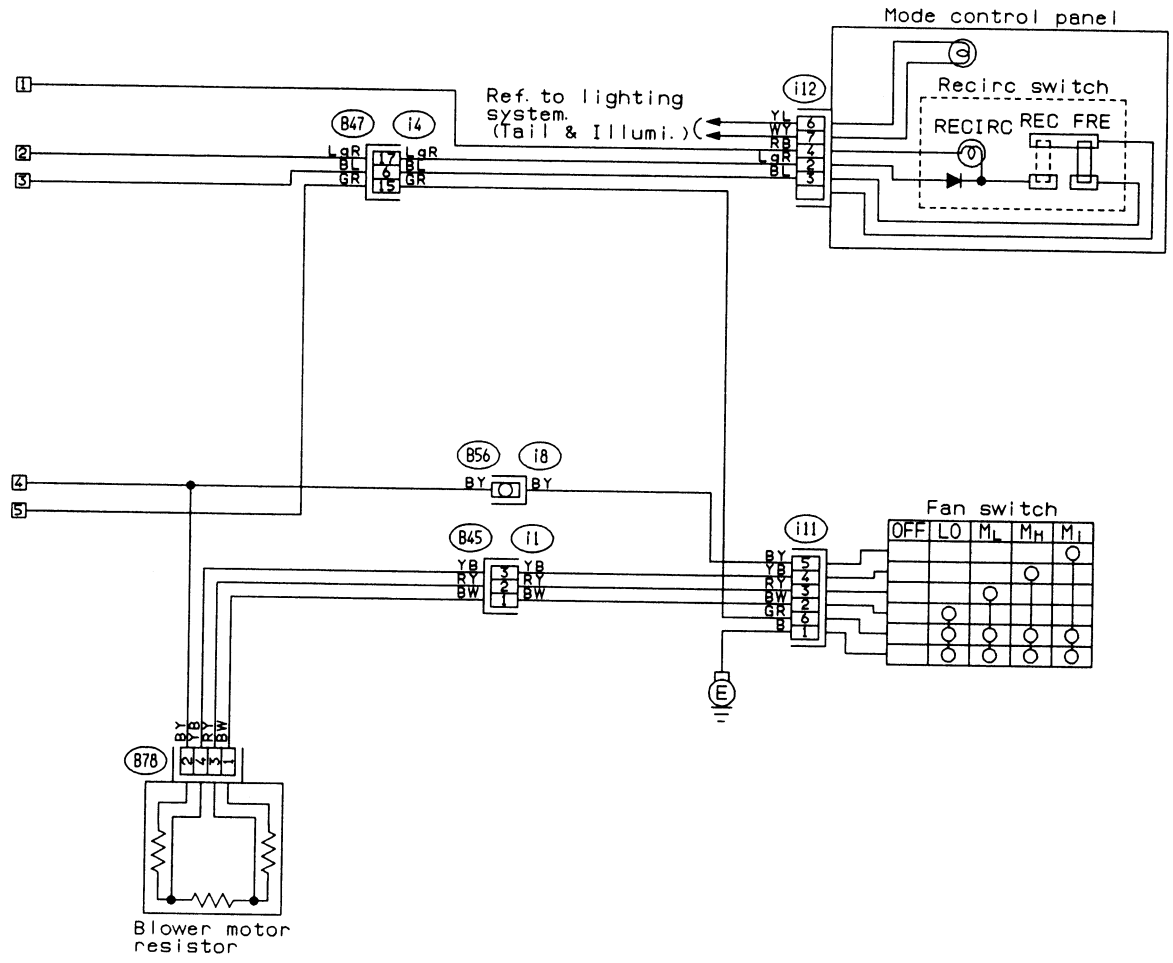
3. AIR CONDITIONING SYSTEM

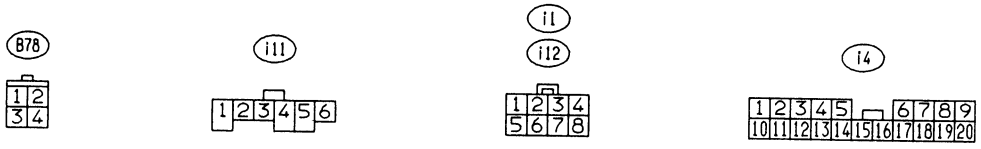
- **Without A/C**



GU78-01A

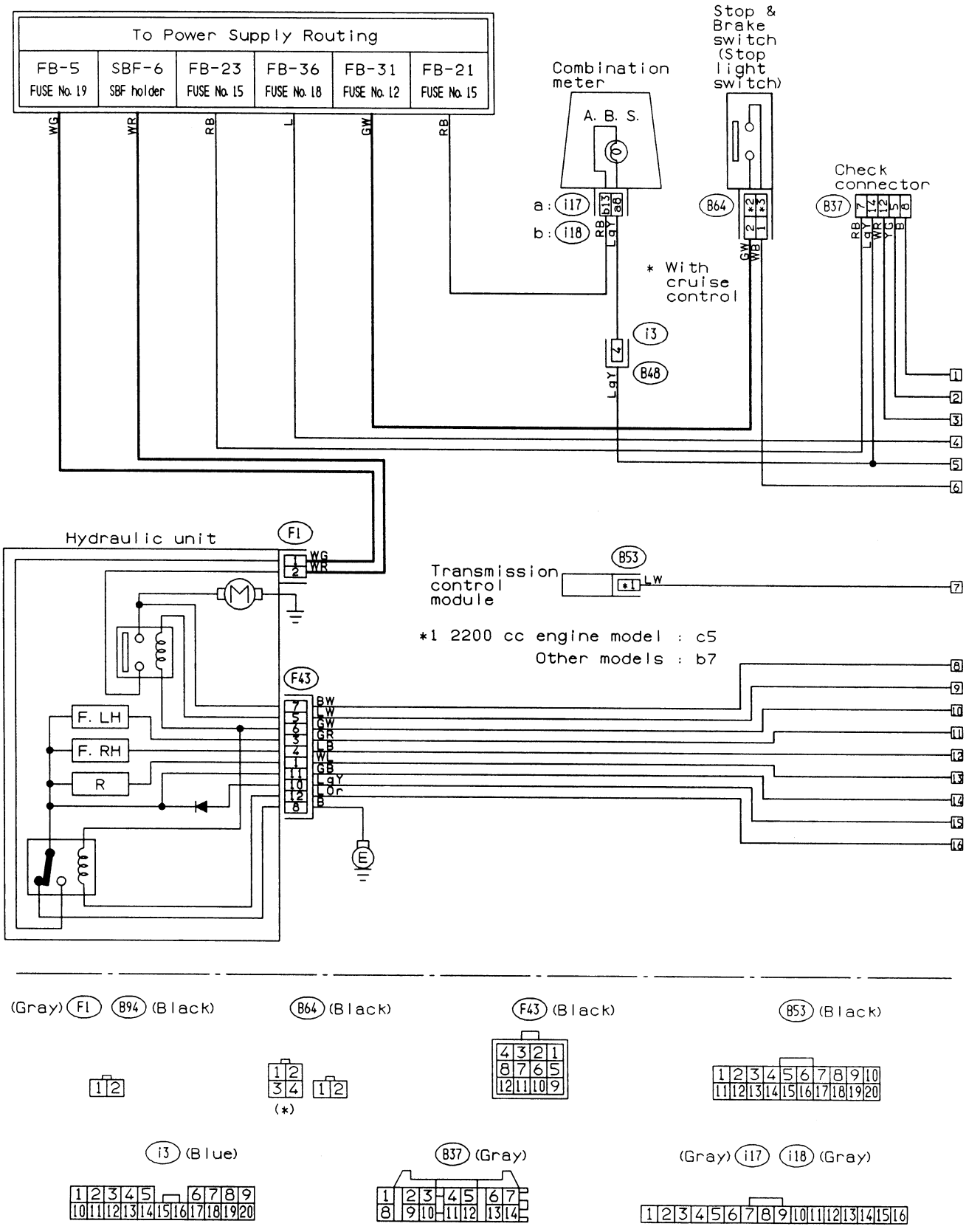
WIRING DIAGRAM





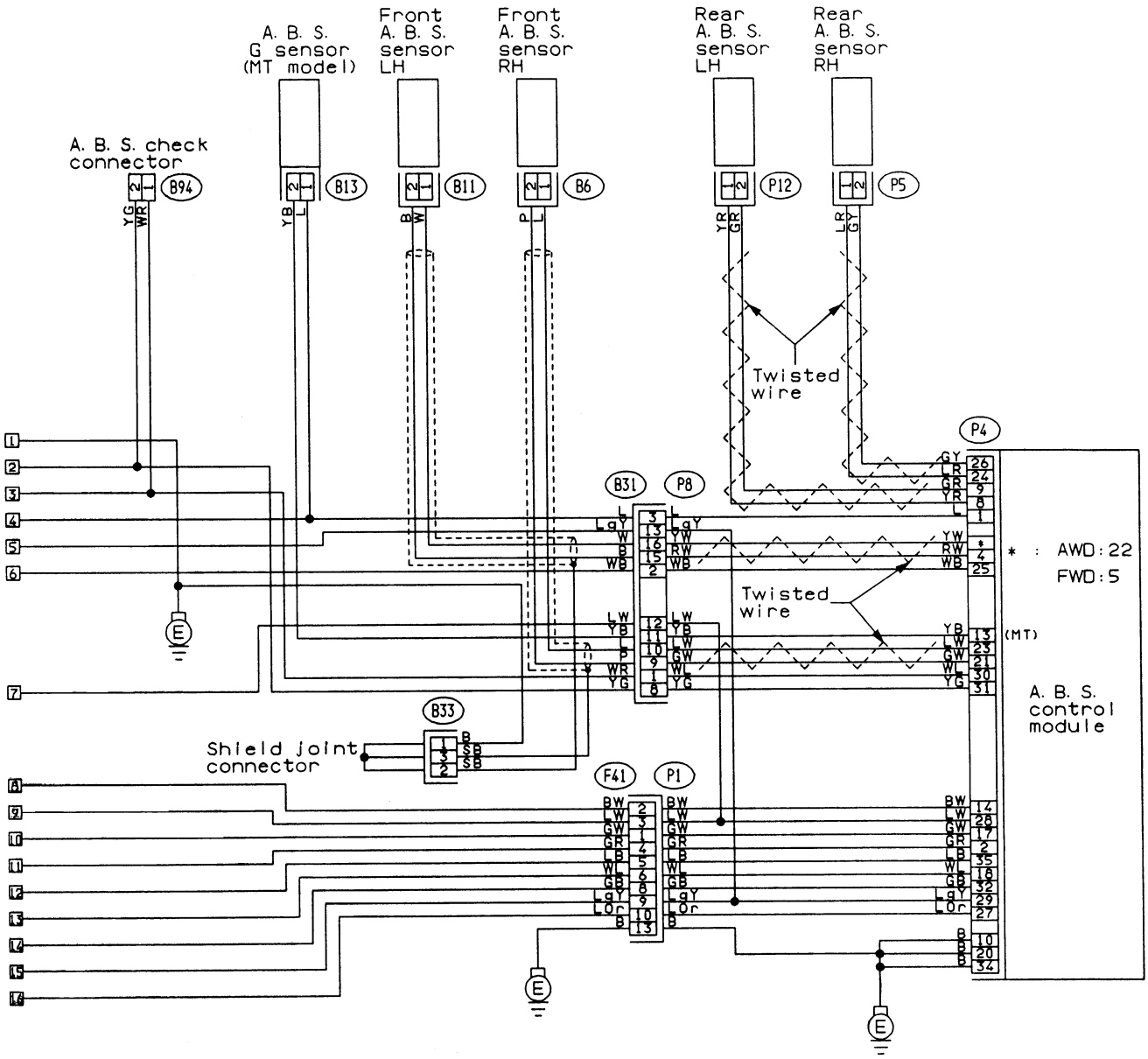
GU78-01B

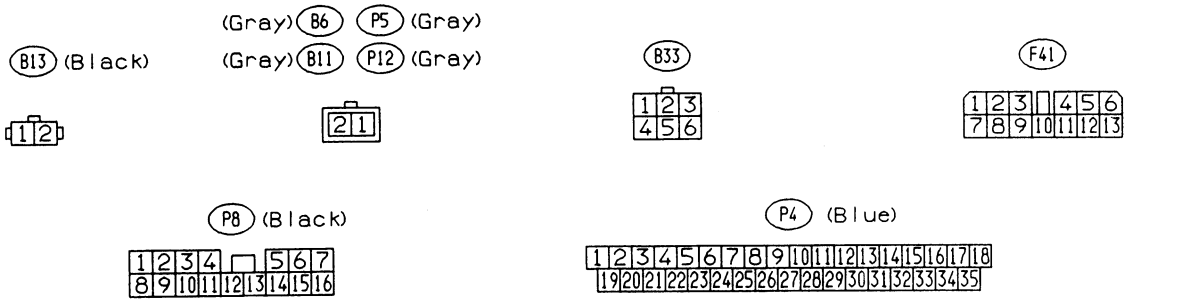
4. ANTI-LOCK BRAKE SYSTEM



GU82-02A

WIRING DIAGRAM

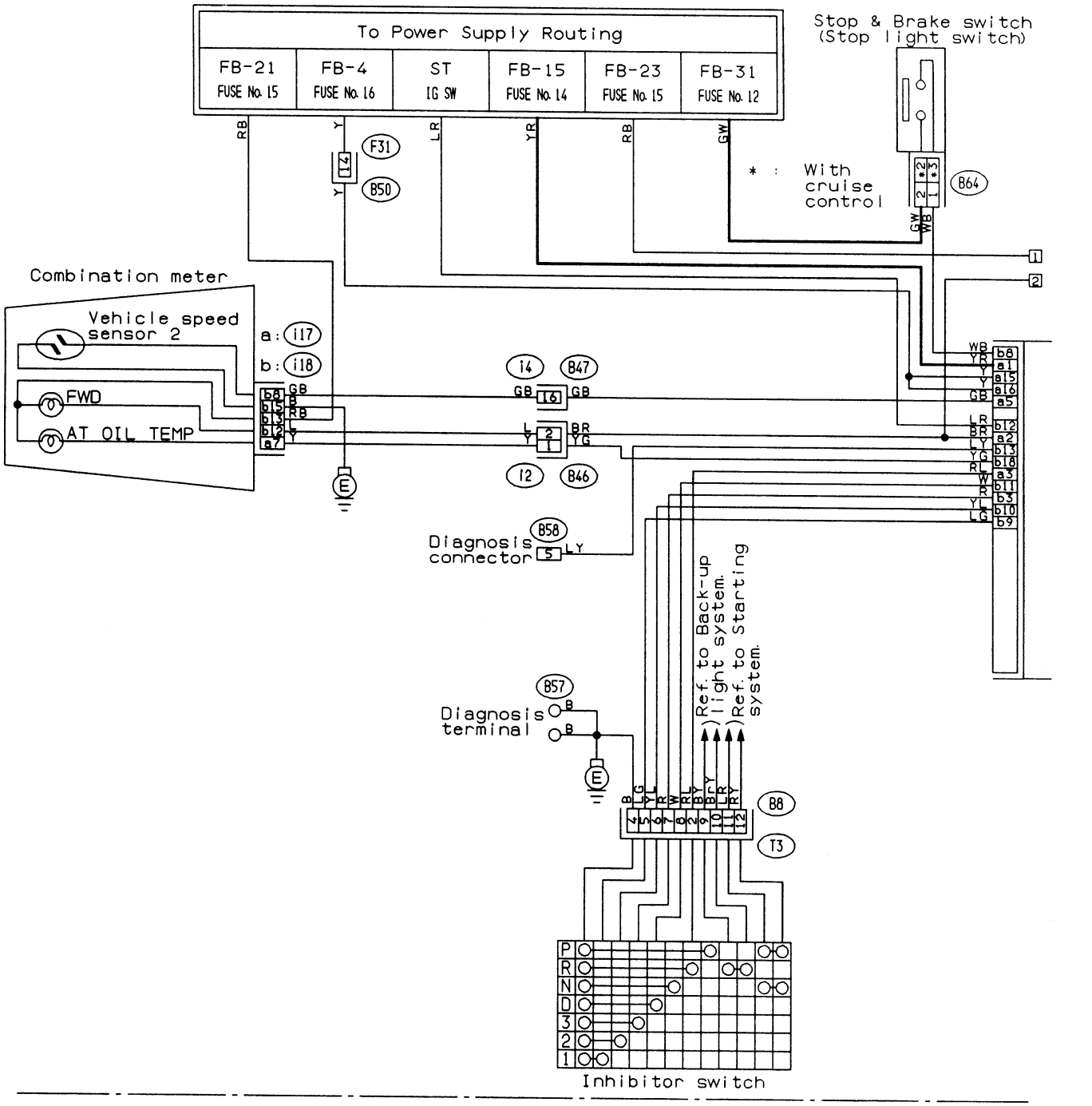




GU82-02B

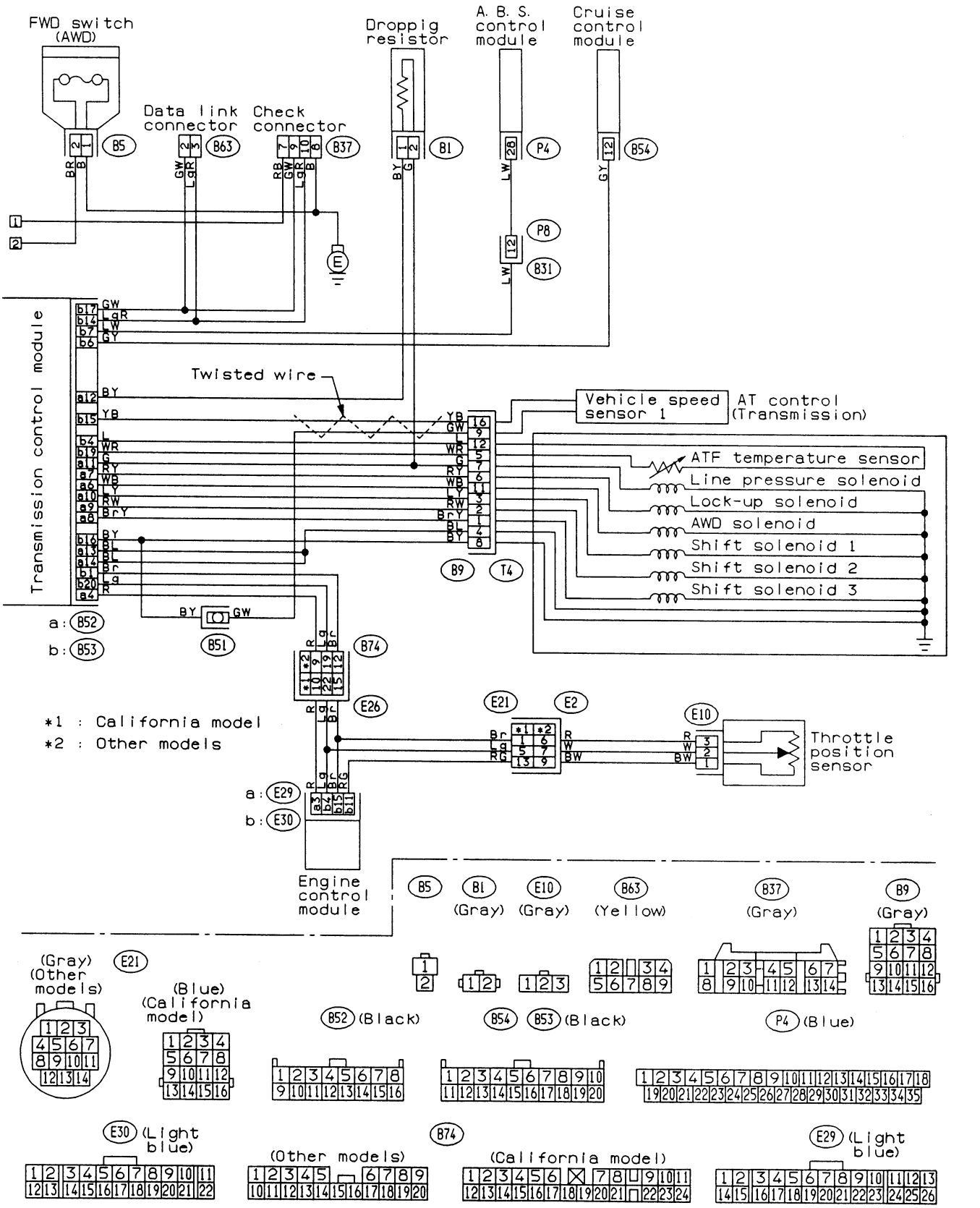
5. A/T CONTROL SYSTEM

- **1800 cc engine model**



GU41-02A

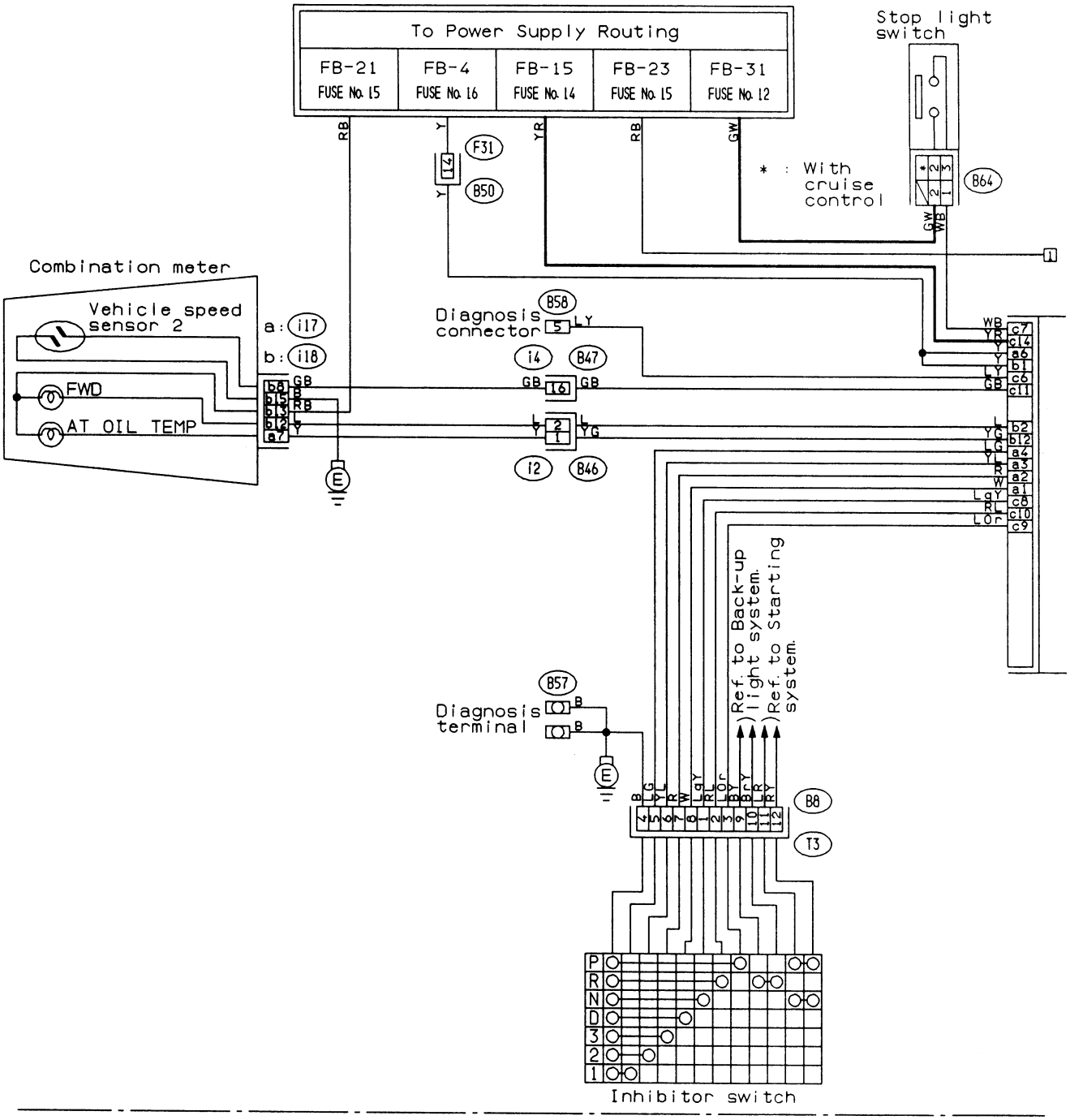
WIRING DIAGRAM



GU41-02B

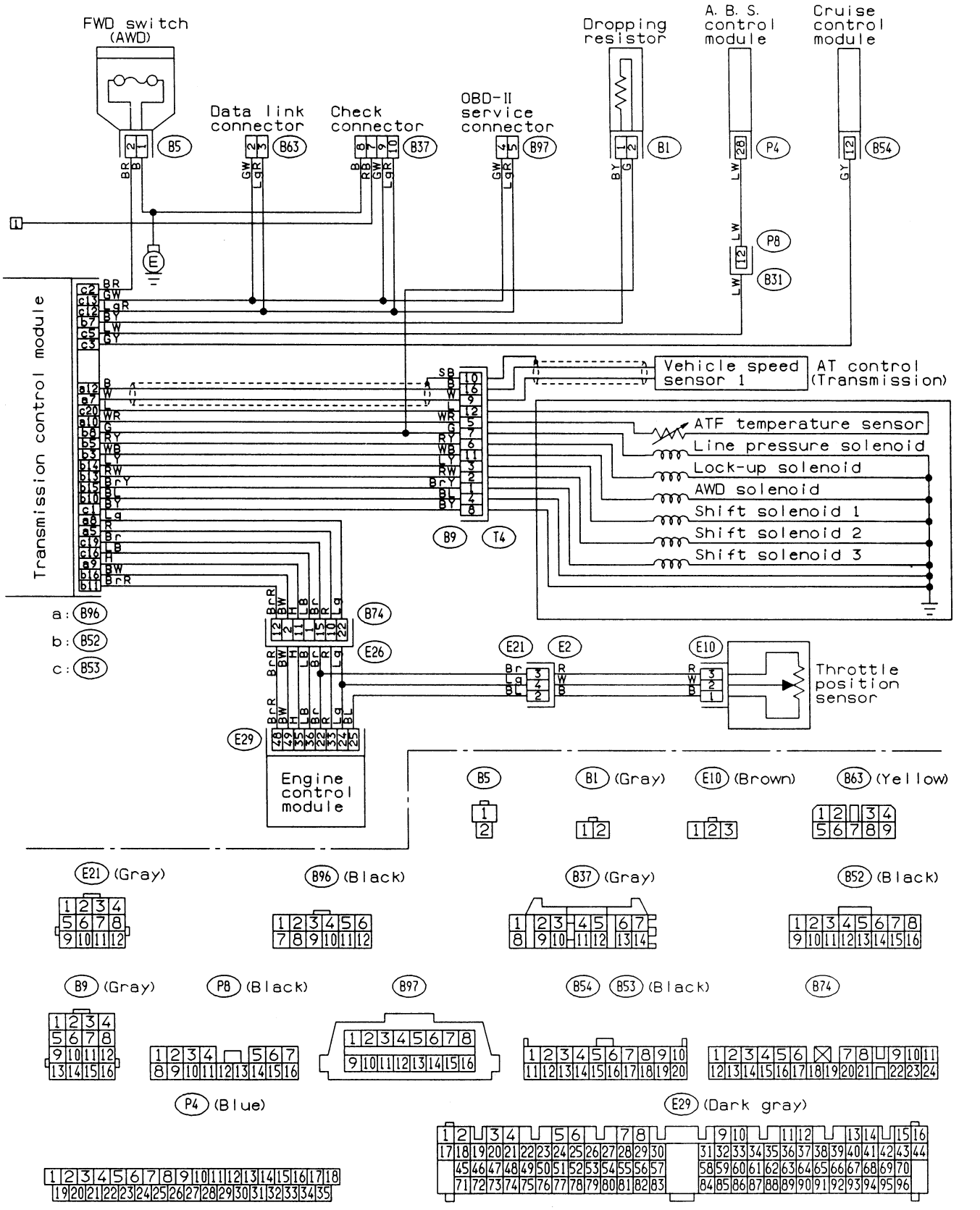
5. A/T CONTROL SYSTEM

- **2200 cc engine model**



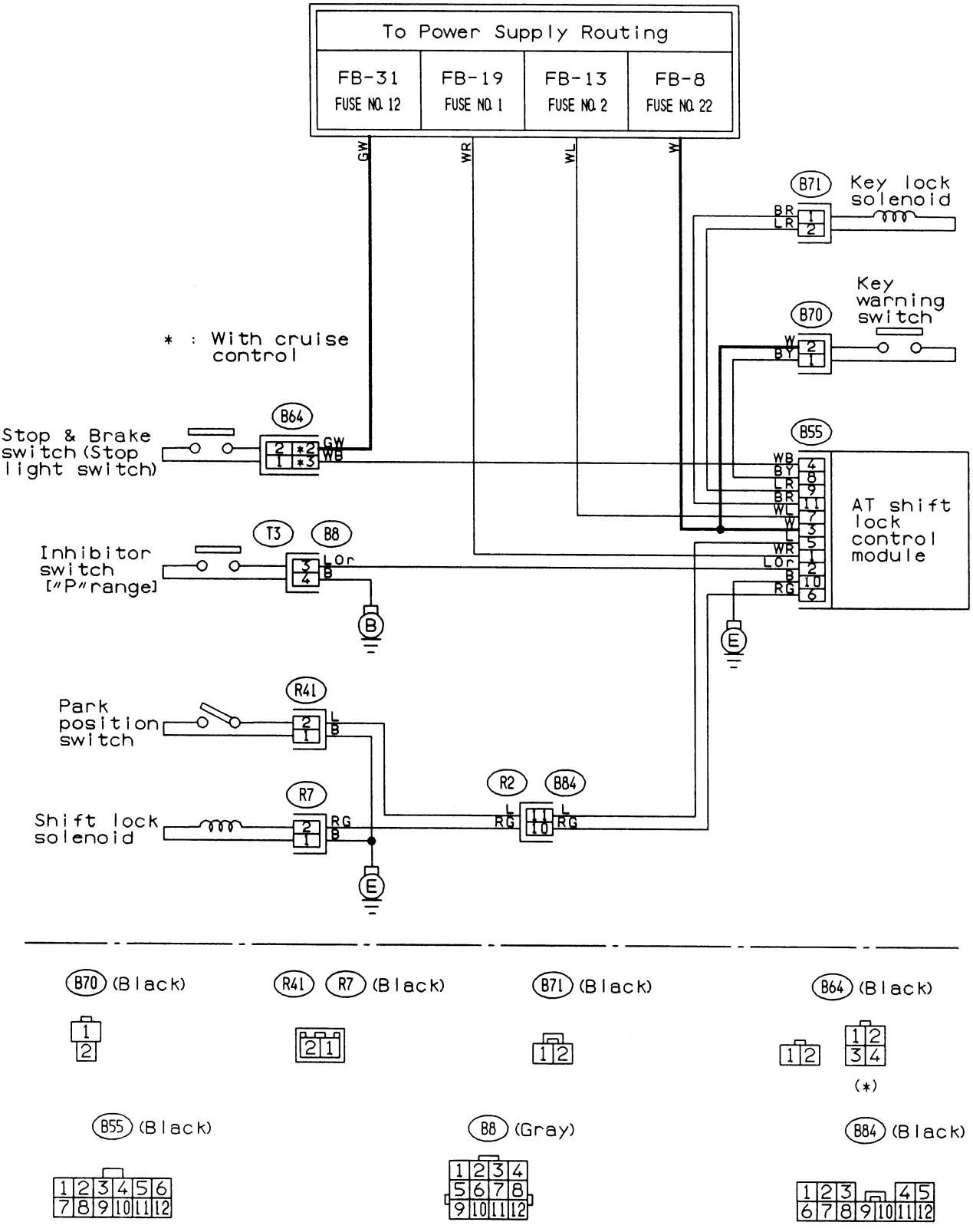
GU41-03A

WIRING DIAGRAM



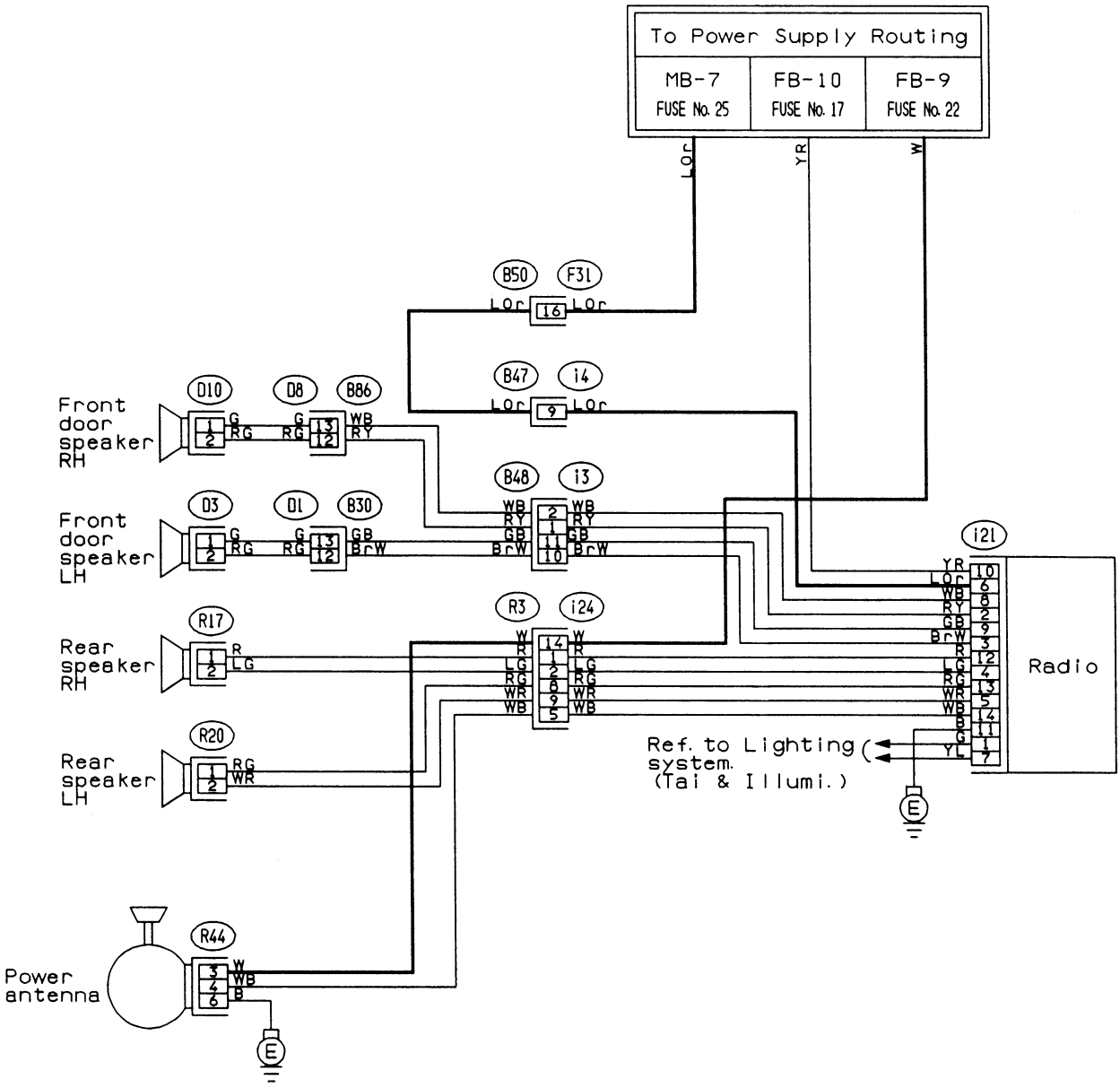
GU41-03B

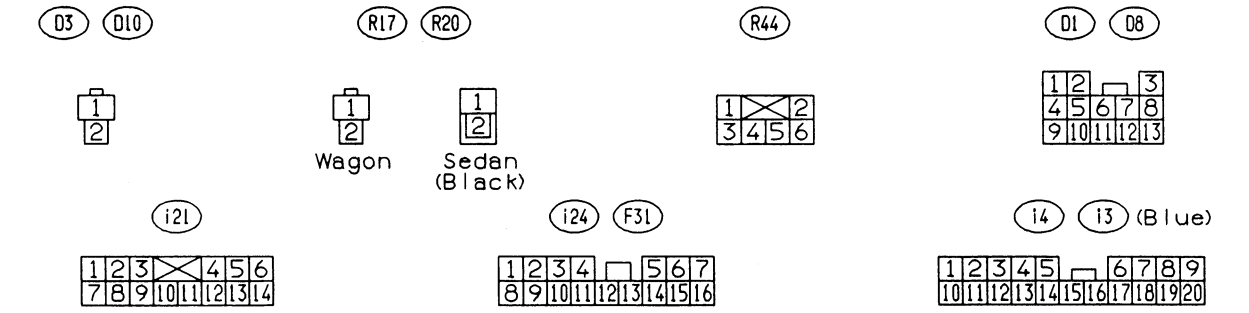
6. A/T SHIFT LOCK SYSTEM



GU42-02

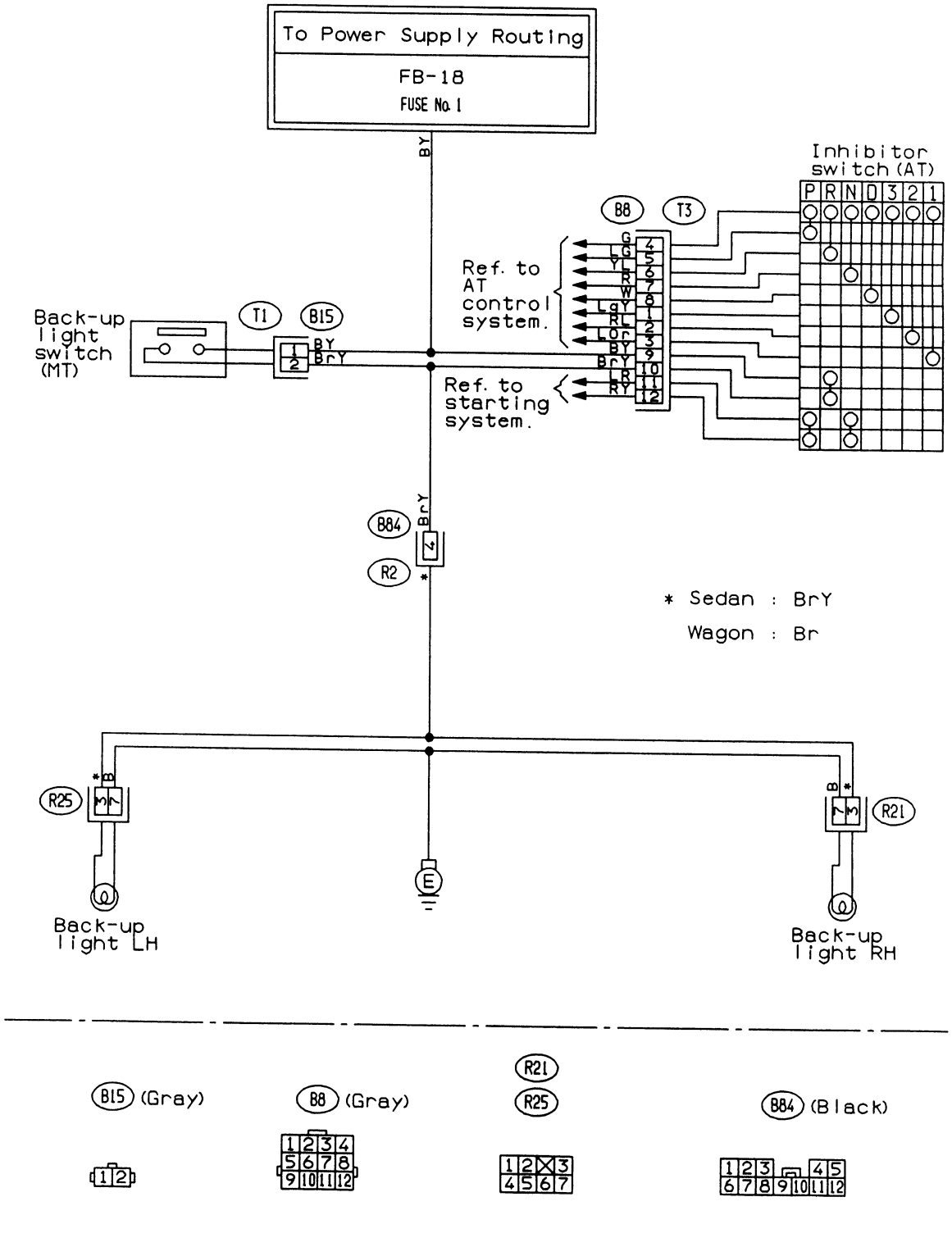
7. AUDIO SYSTEM





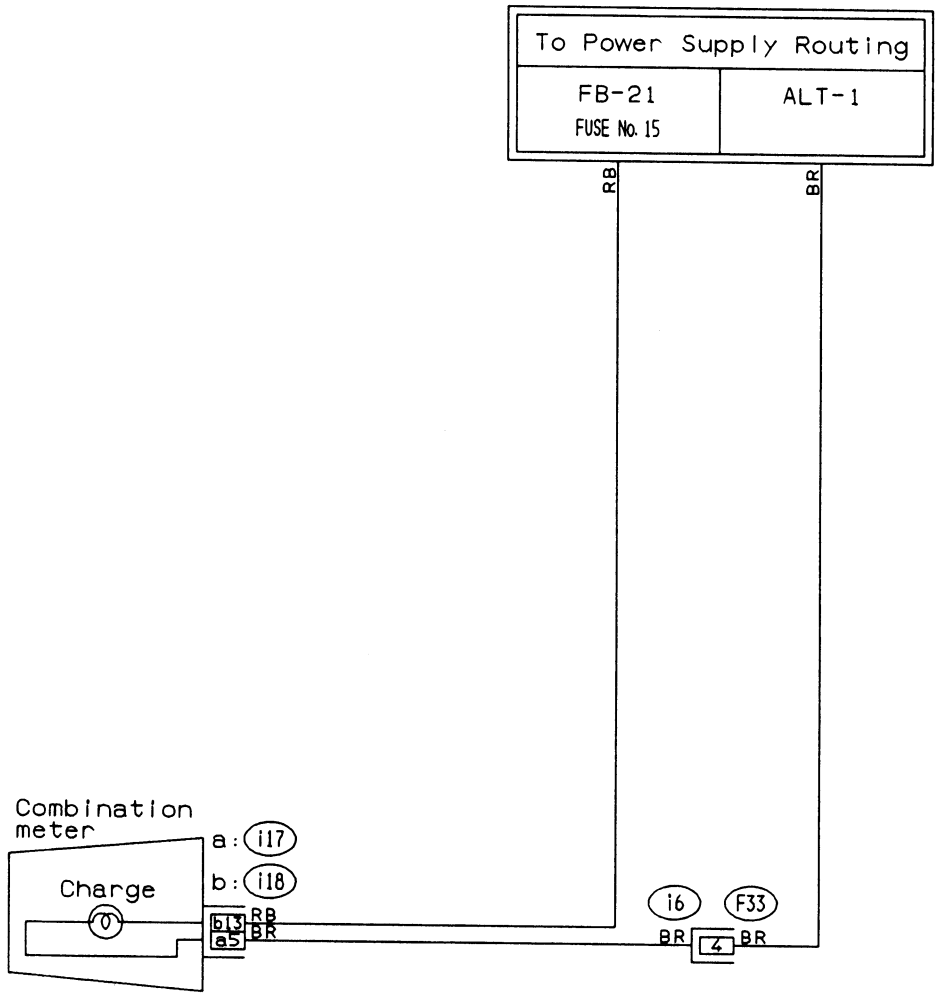
GU76-02

8. BACK-UP LIGHT SYSTEM



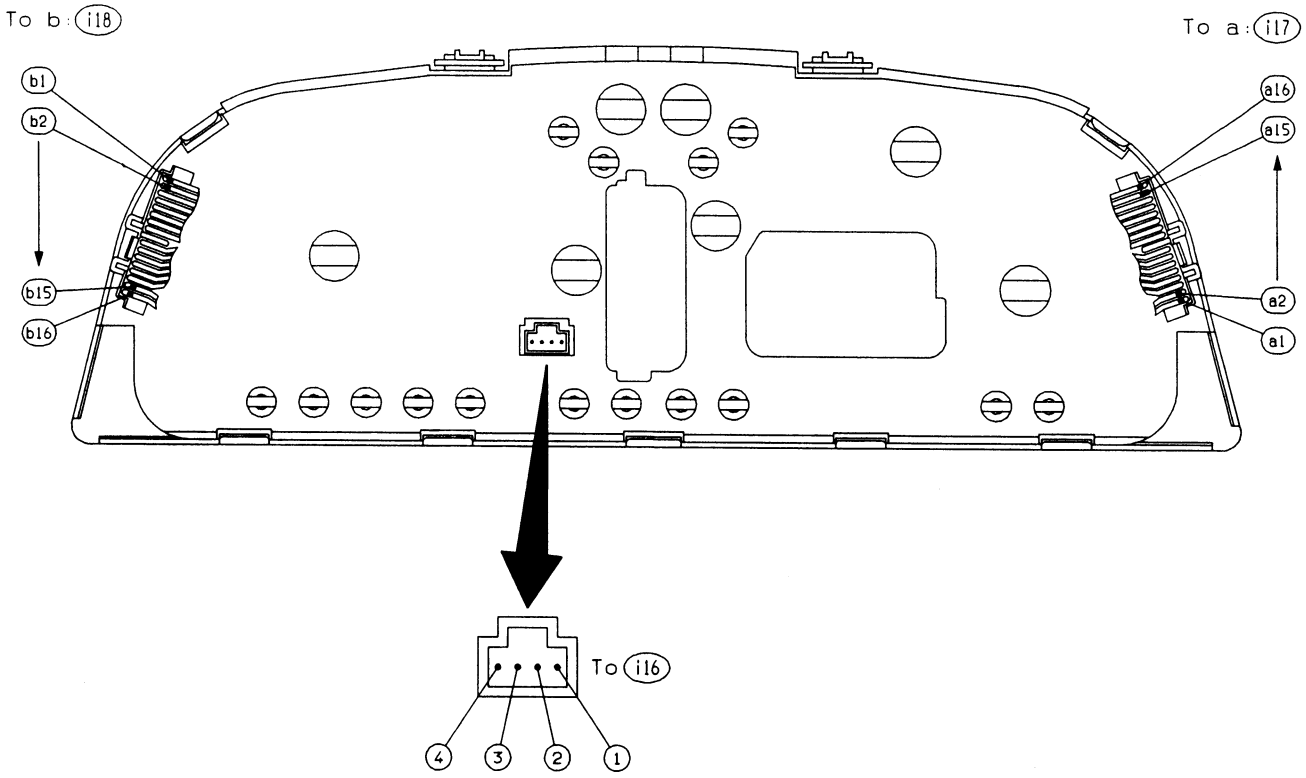
GU29-01

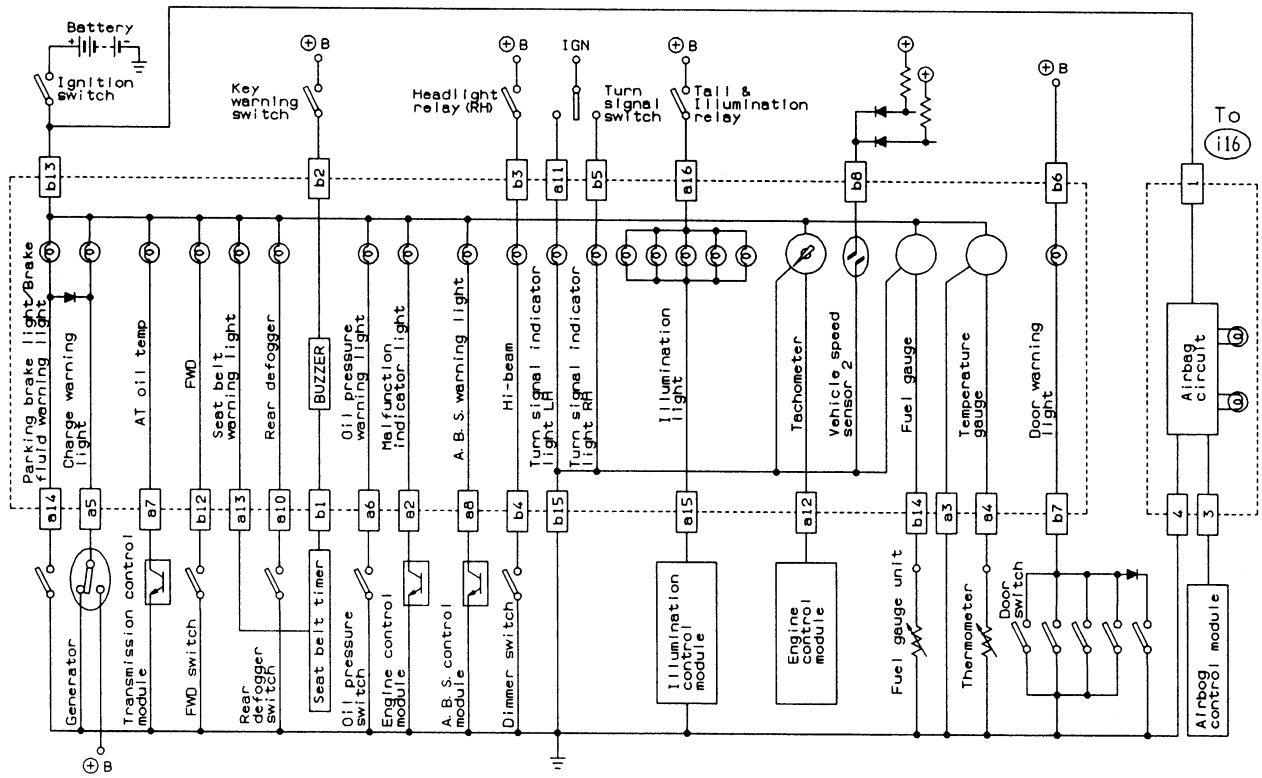
9. CHARGING SYSTEM



GU02-02

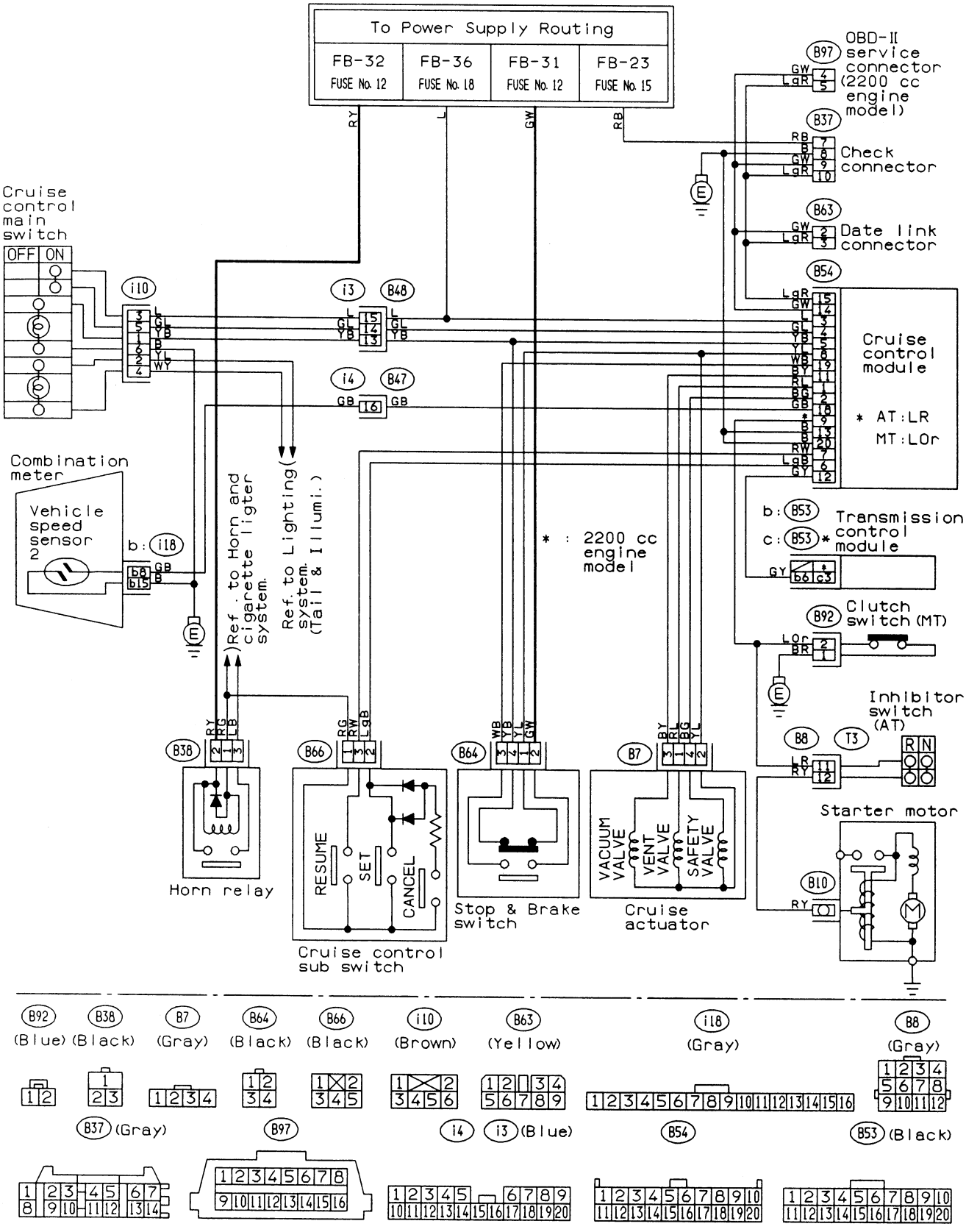
10. COMBINATION METER





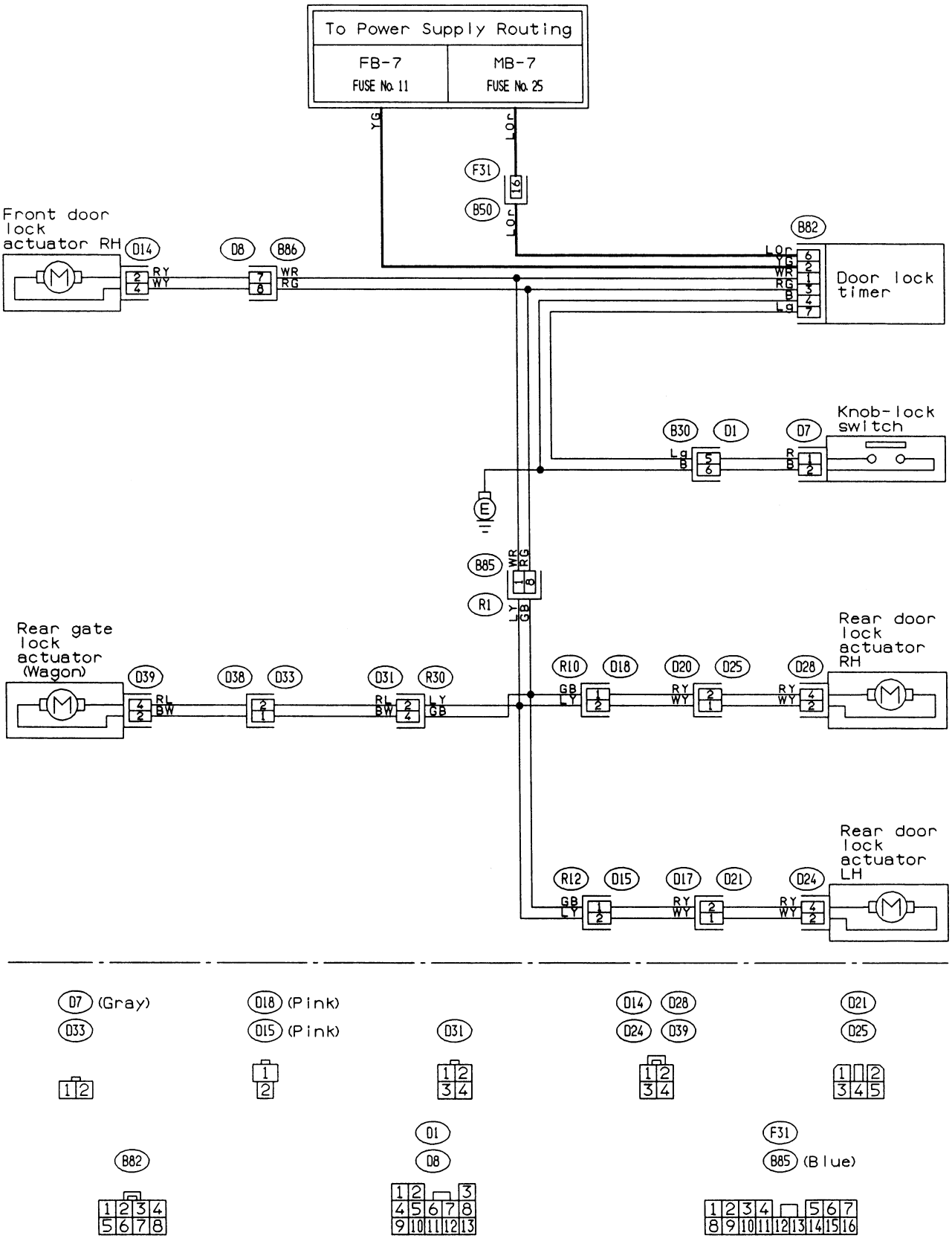
GU65-03

11. CRUISE CONTROL SYSTEM



GU71-02

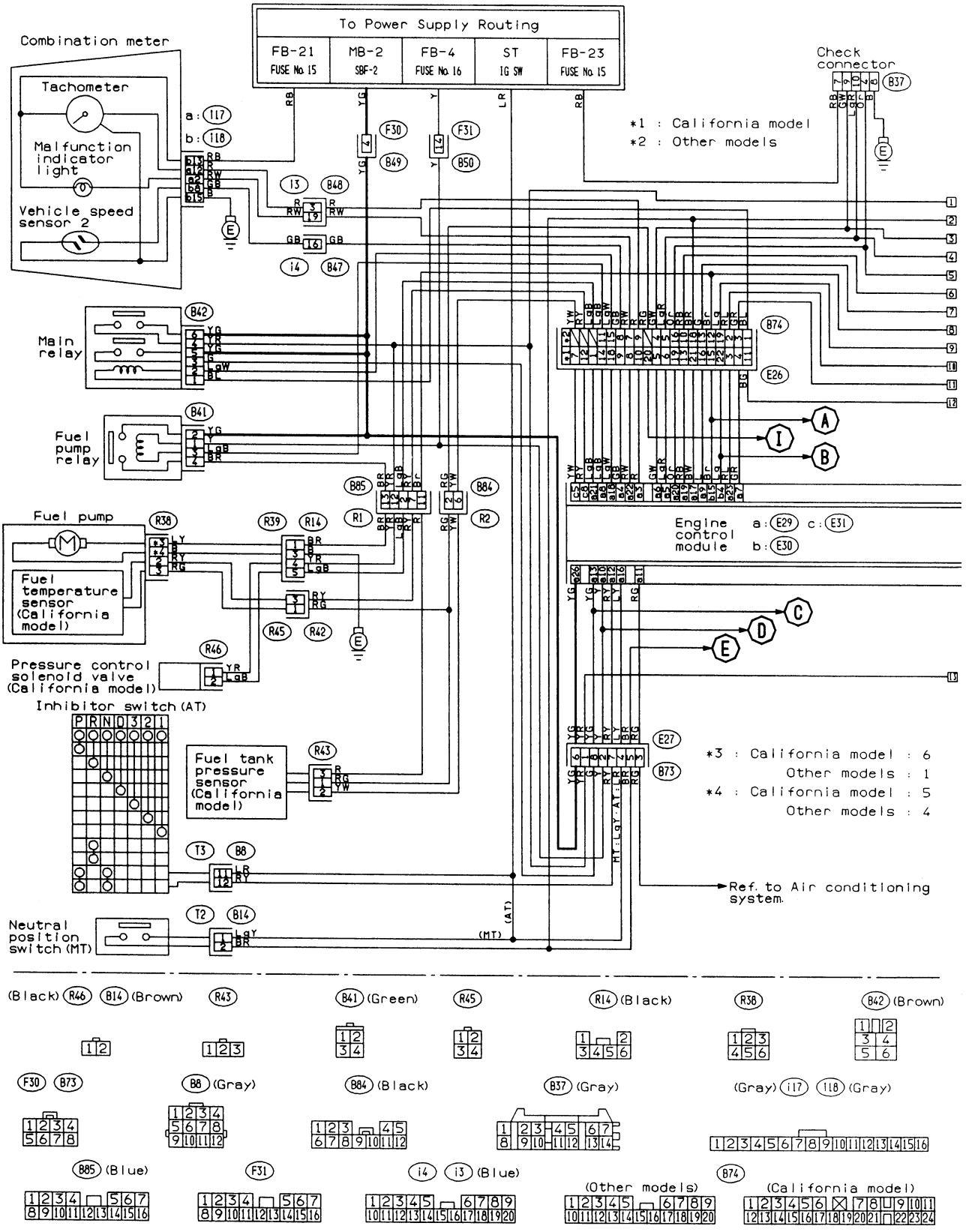
12. DOOR LOCK SYSTEM



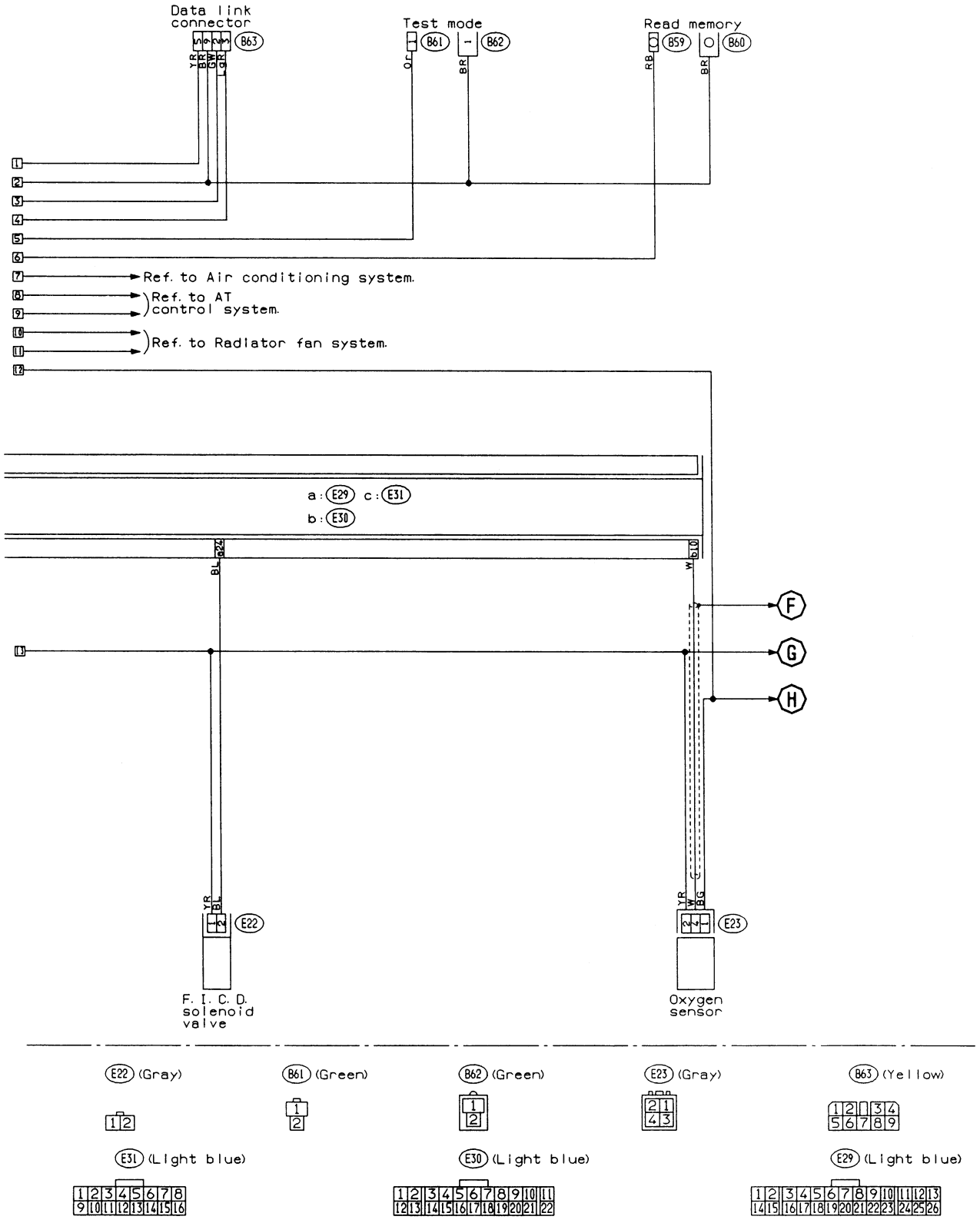
GU73-02

13. ENGINE ELECTRICAL SYSTEM

- **1800 cc engine model**

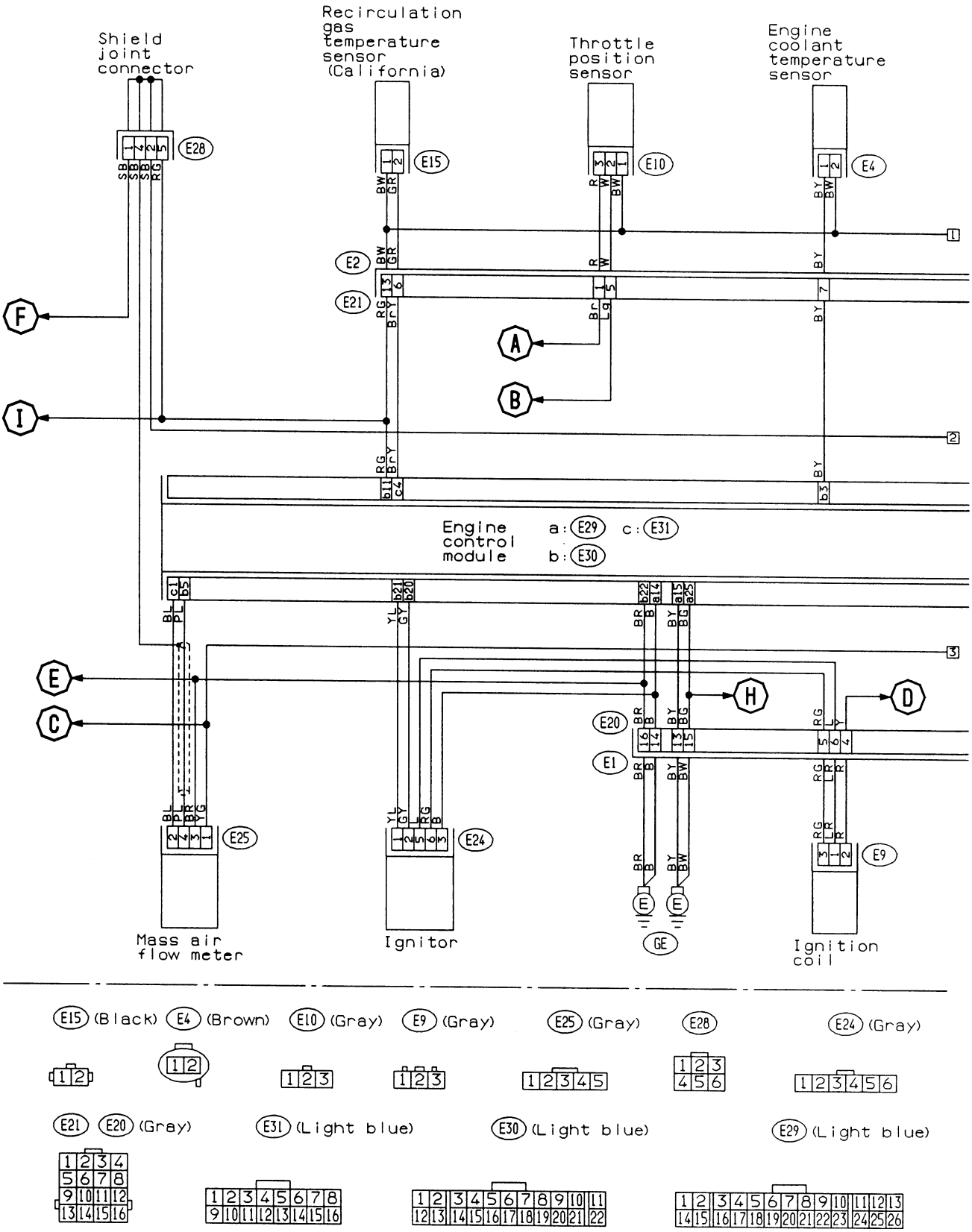


GU10-04A

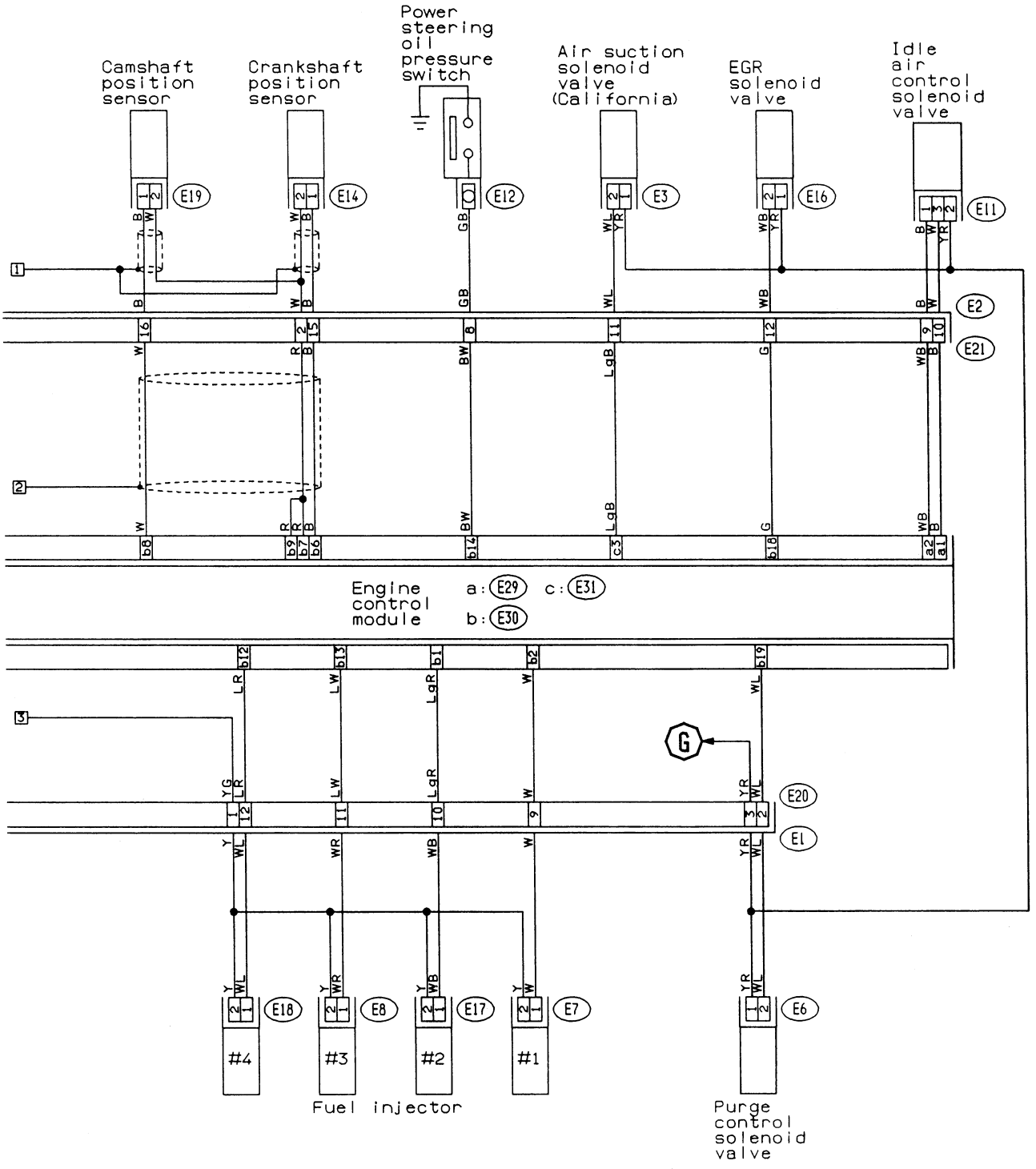

Data link connector
B63
Test mode
B61
B62
Read memory
B59
B60
Ref. to Air conditioning system.
Ref. to AT control system.
Ref. to Radiator fan system.
a : E29 c : E31
b : E30
F
G
H
E22
E23
F. I. C. D. solenoid valve
Oxygen sensor
E22 (Gray)
B61 (Green)
B62 (Green)
E23 (Gray)
B63 (Yellow)
E31 (Light blue)
E30 (Light blue)
E29 (Light blue)

GU10-04B

WIRING DIAGRAM



GU10-04C



E19 (Gray) (Gray) E7 E17 (Gray)
E14 (Gray) (Gray) E8 E18 (Gray)

E16 (Brown)

E3 (Gray)
E6 (Blue)

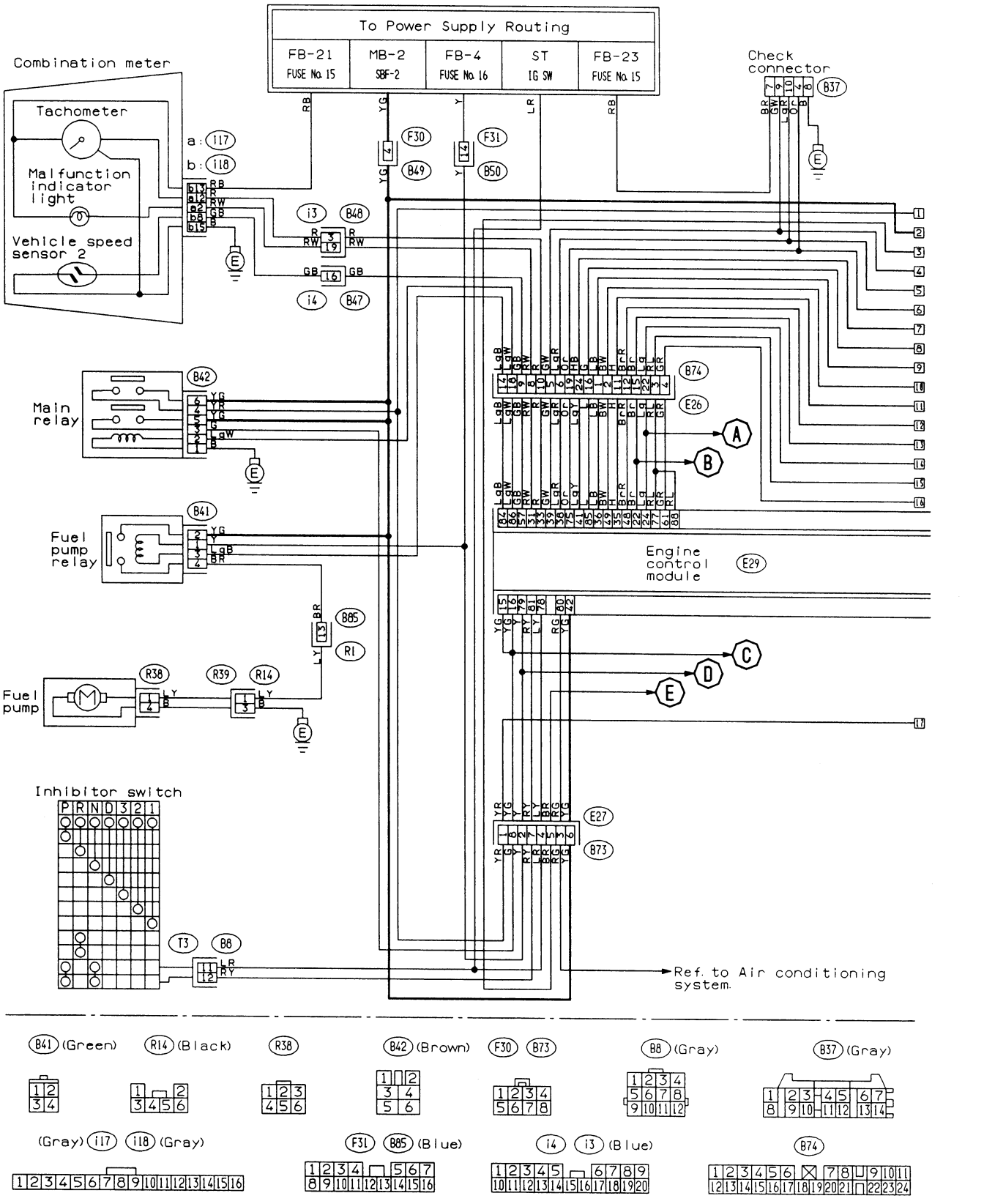
E11 (Gray)

GU10-04D

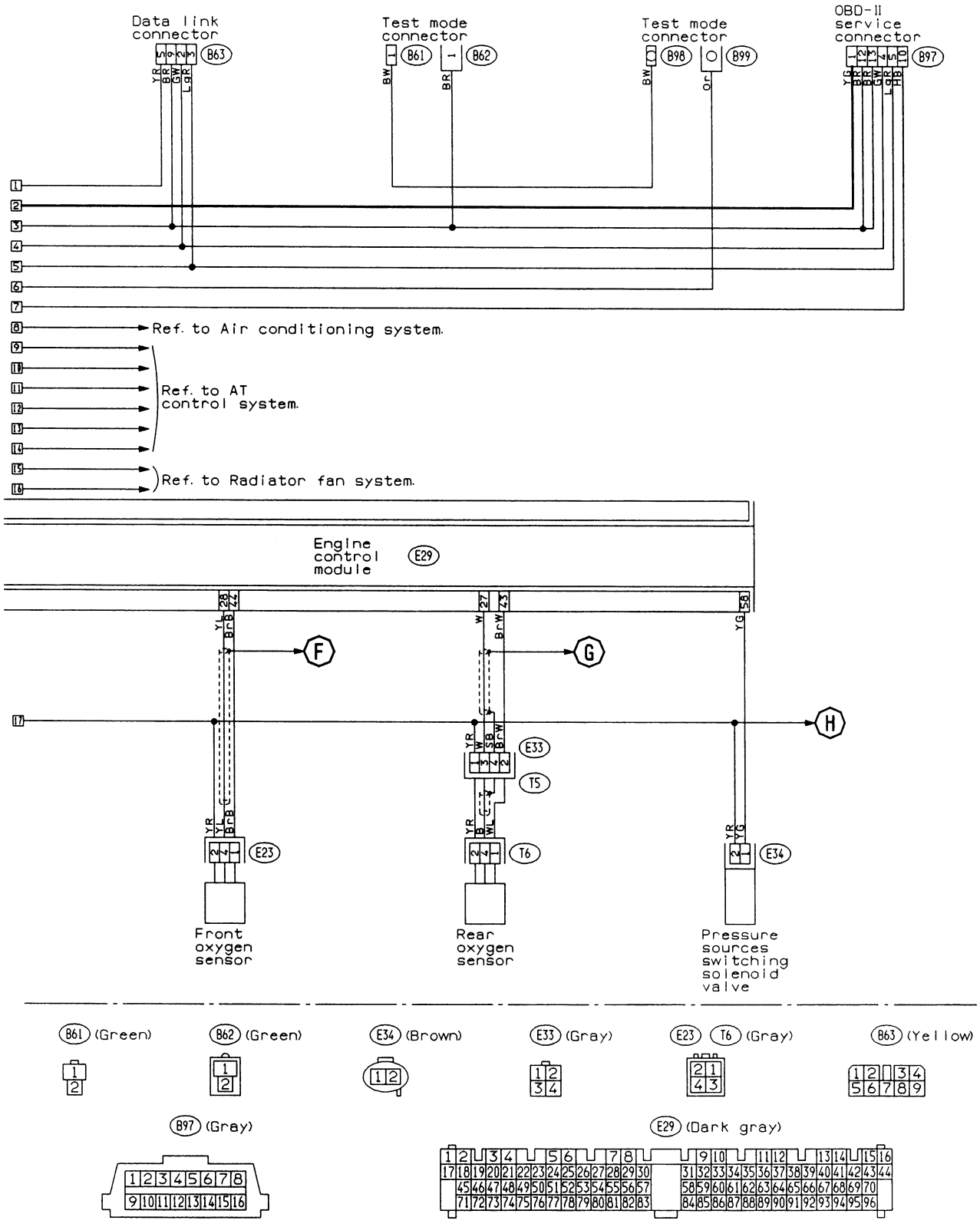
WIRING DIAGRAM

13. ENGINE ELECTRICAL SYSTEM

- **2200 cc engine model**

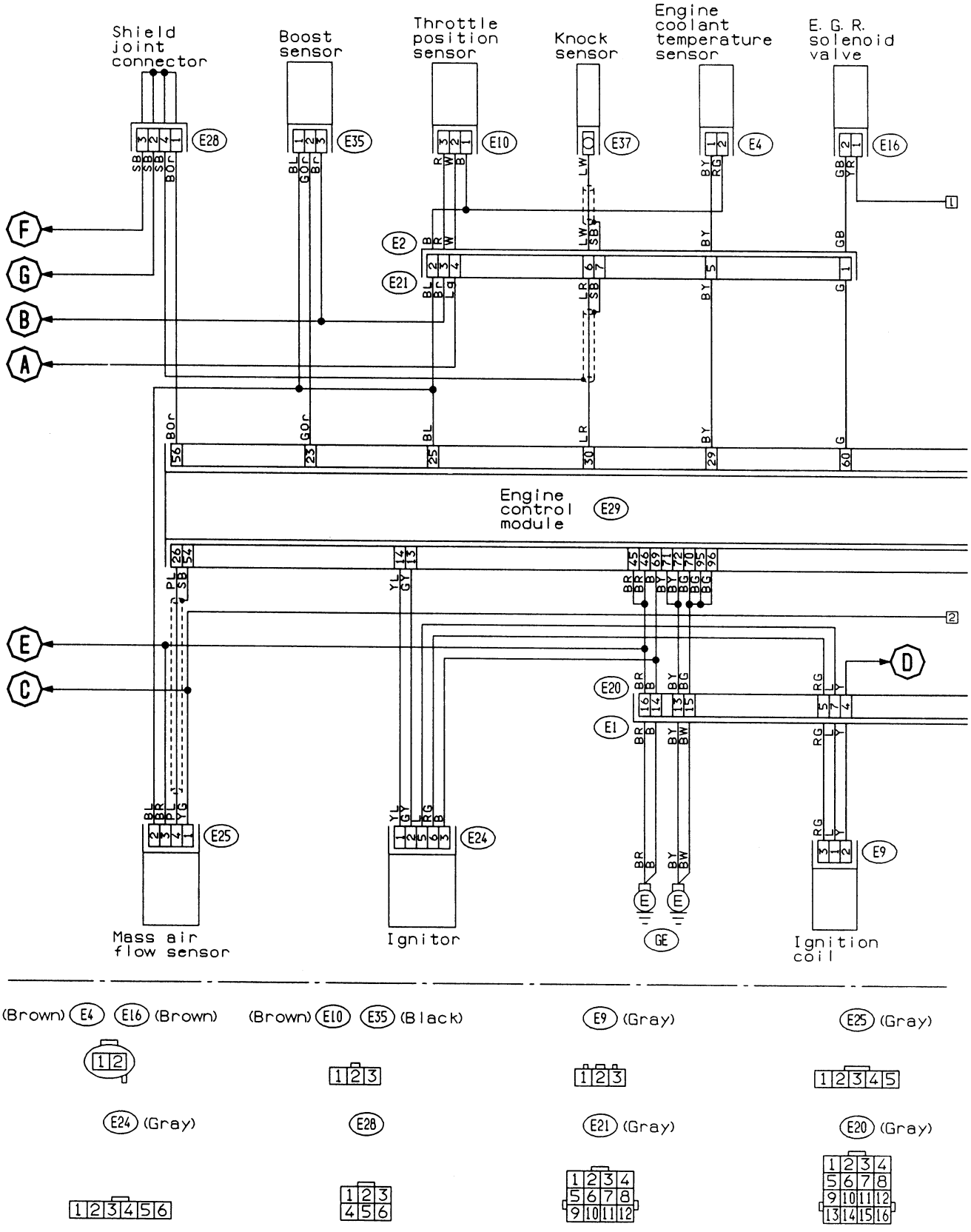


GU10-05A

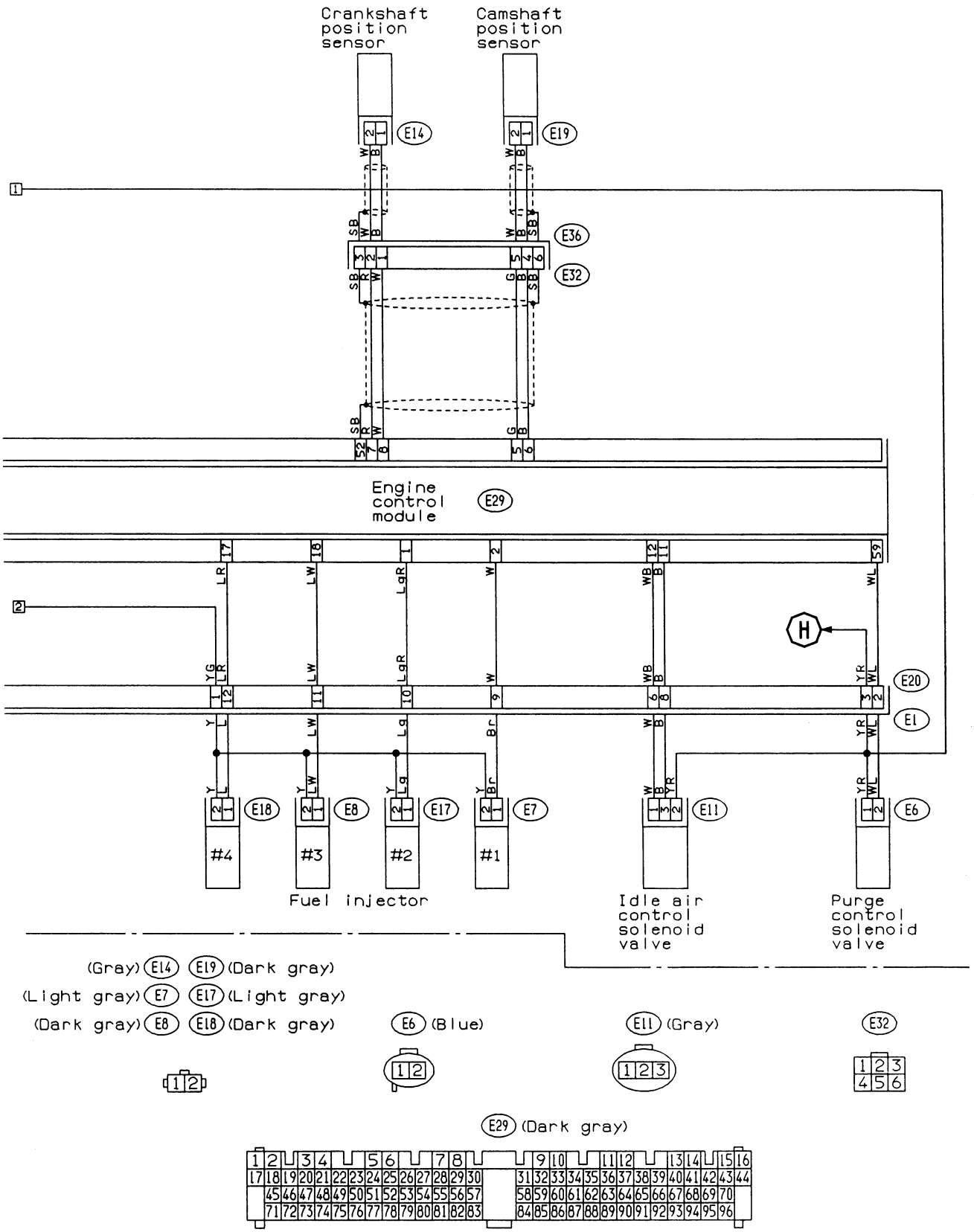

Data link connector
B63
Test mode connector
B61
B62
Test mode connector
B98
B99
OBD-II service connector
B97
Ref. to Air conditioning system.
Ref. to AT control system.
Ref. to Radiator fan system.
Engine control module
E29
F
G
H
E33
T5
T6
E23
E34
Front oxygen sensor
Rear oxygen sensor
Pressure sources switching solenoid valve
B61 (Green)
B62 (Green)
E34 (Brown)
E33 (Gray)
E23 T6 (Gray)
B63 (Yellow)
B97 (Gray)
E29 (Dark gray)

GU10-05B

WIRING DIAGRAM

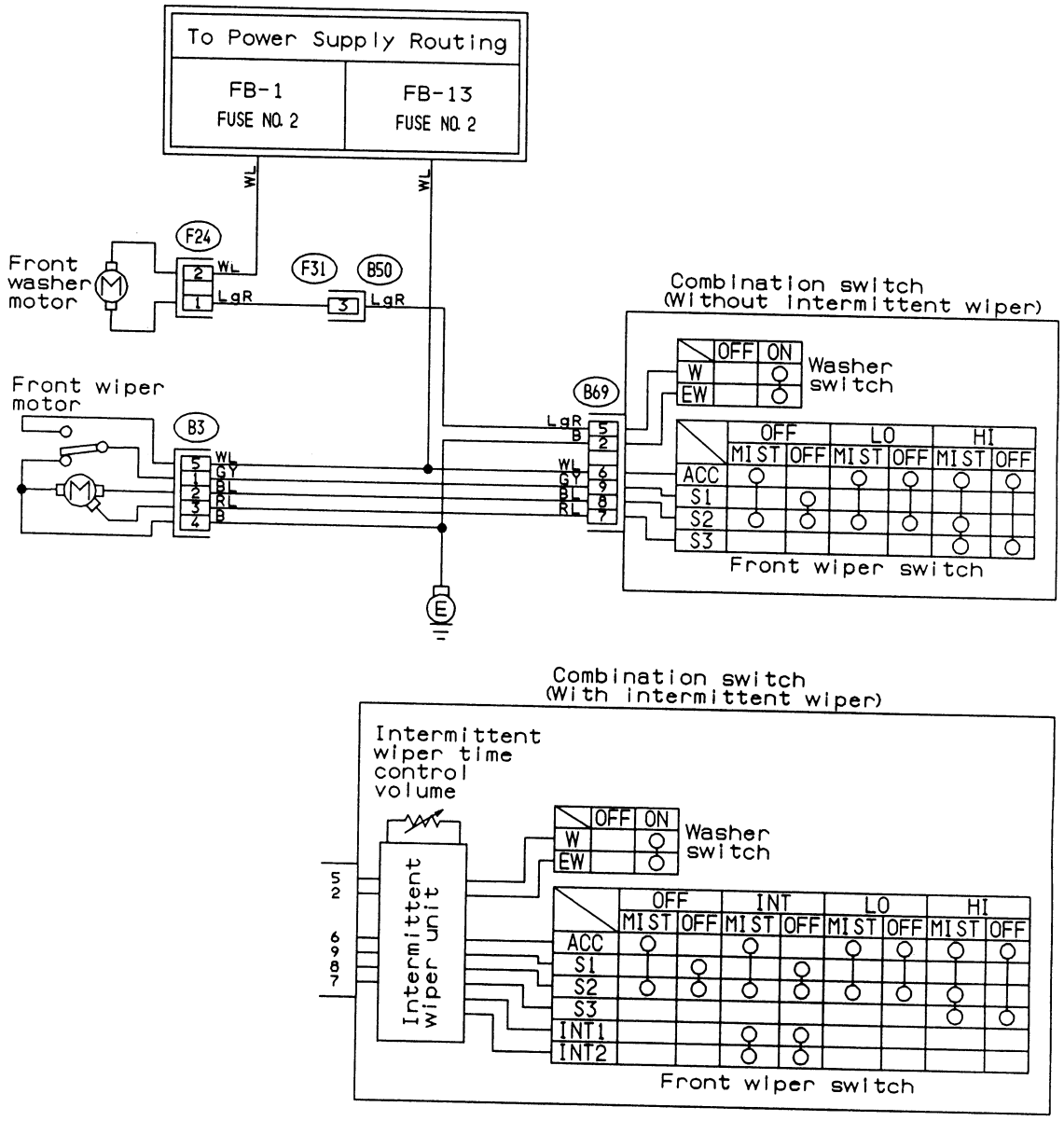


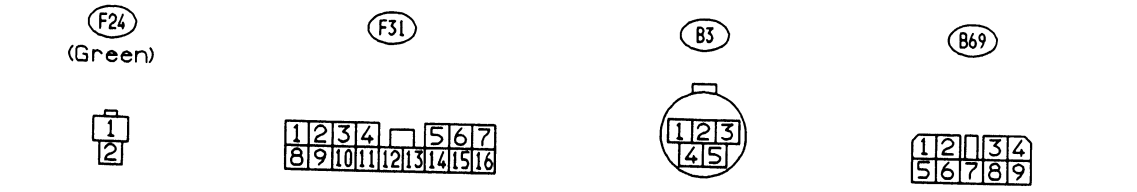
GU10-05C


Crankshaft position sensor
Camshaft position sensor
E14
E19
E36
E32
Engine control module
E29
E20
E1
E18
E8
E17
E7
E11
E6
#4
#3
#2
#1
Fuel injector
Idle air control solenoid valve
Purge control solenoid valve
(Gray) E14 E19 (Dark gray)
(Light gray) E7 E17 (Light gray)
(Dark gray) E8 E18 (Dark gray)
E6 (Blue)
E11 (Gray)
E32
E29 (Dark gray)

GU10-05D

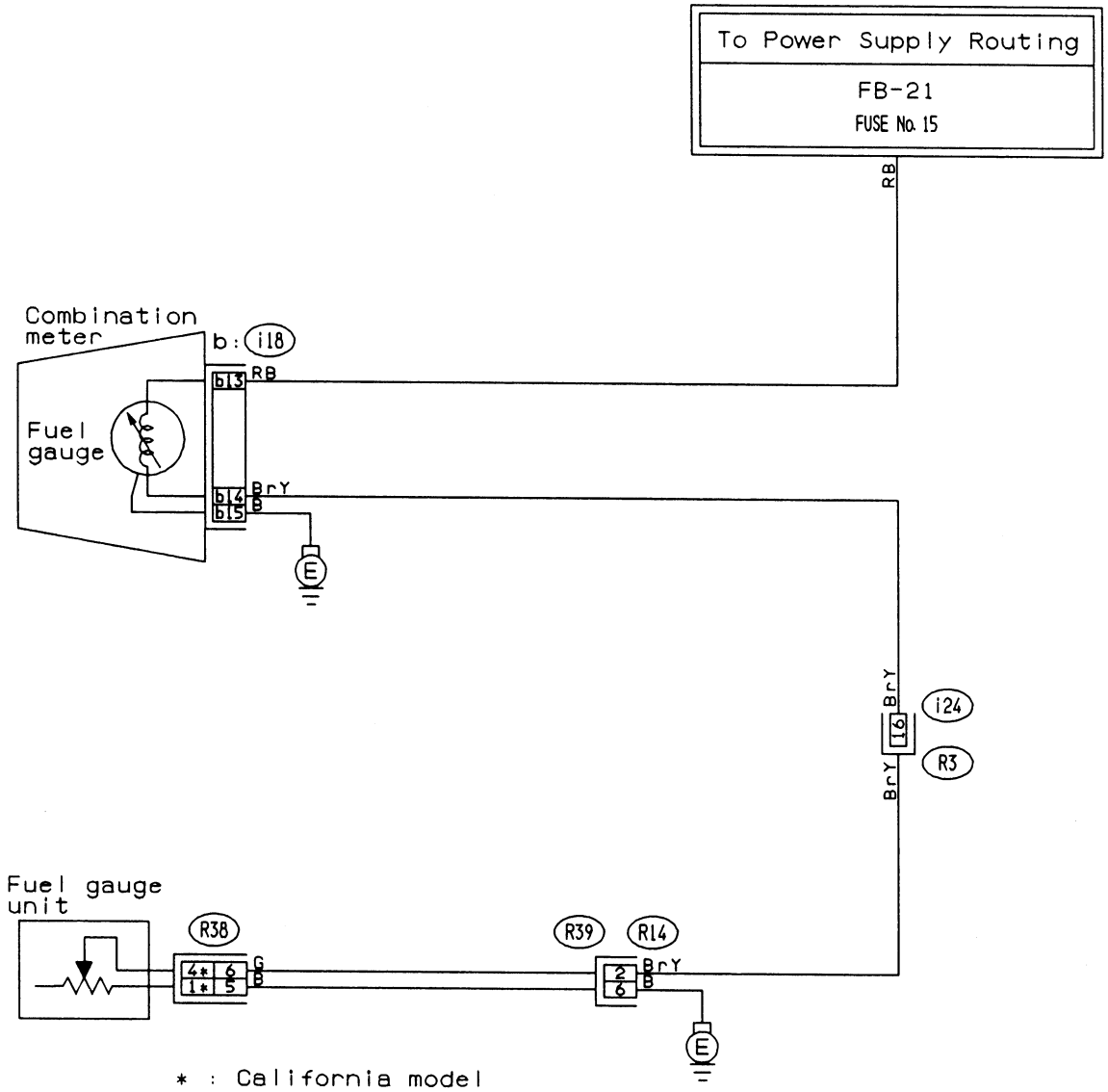
14. FRONT WIPER AND WASHER SYSTEM

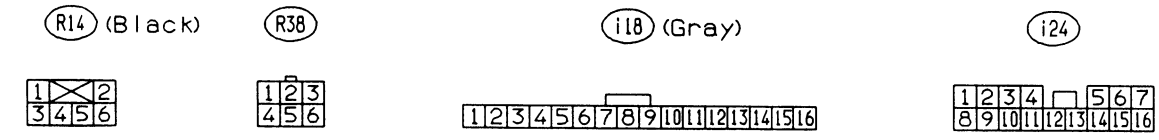




GU50-01

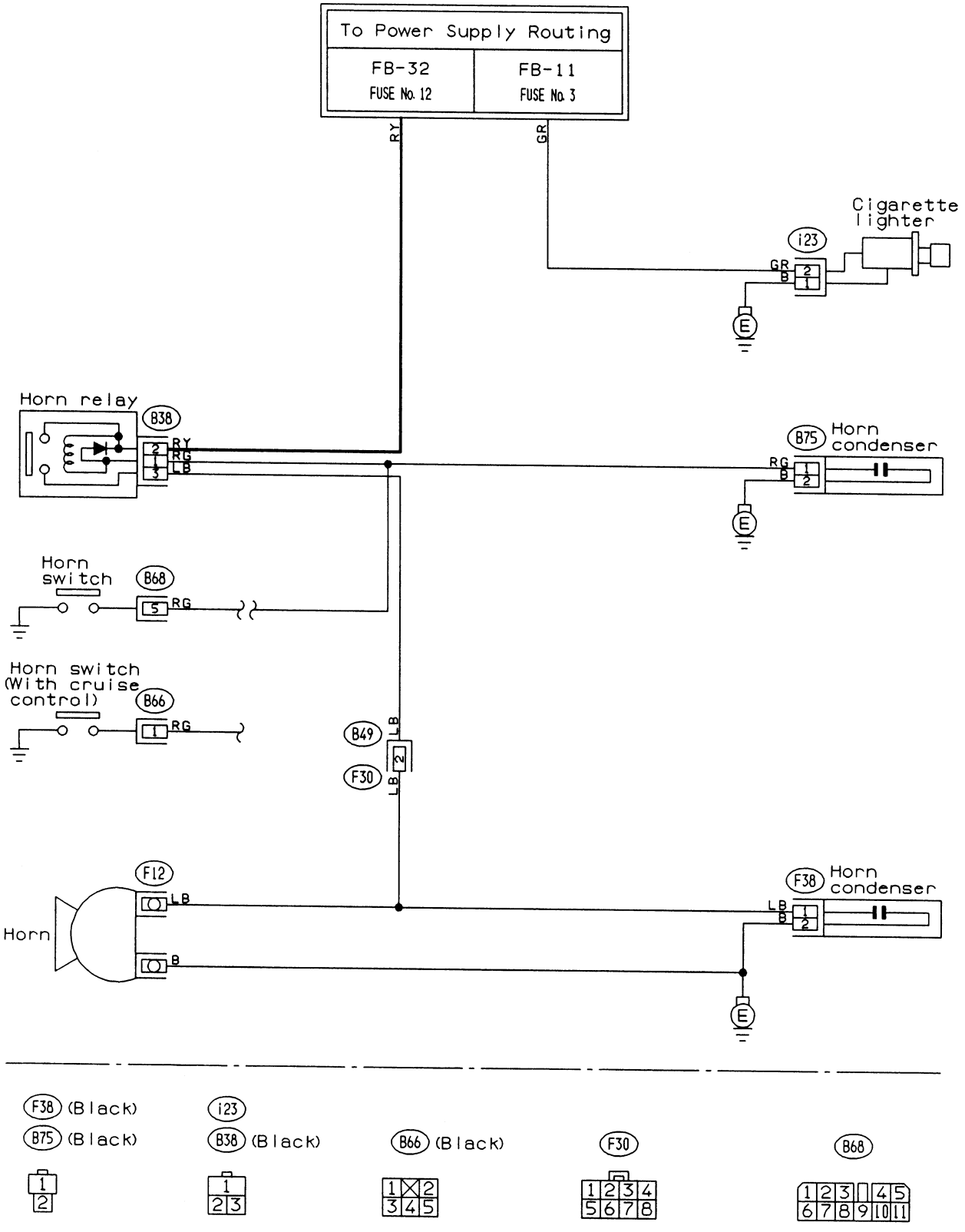
15. FUEL GAUGE SYSTEM





GU61-02

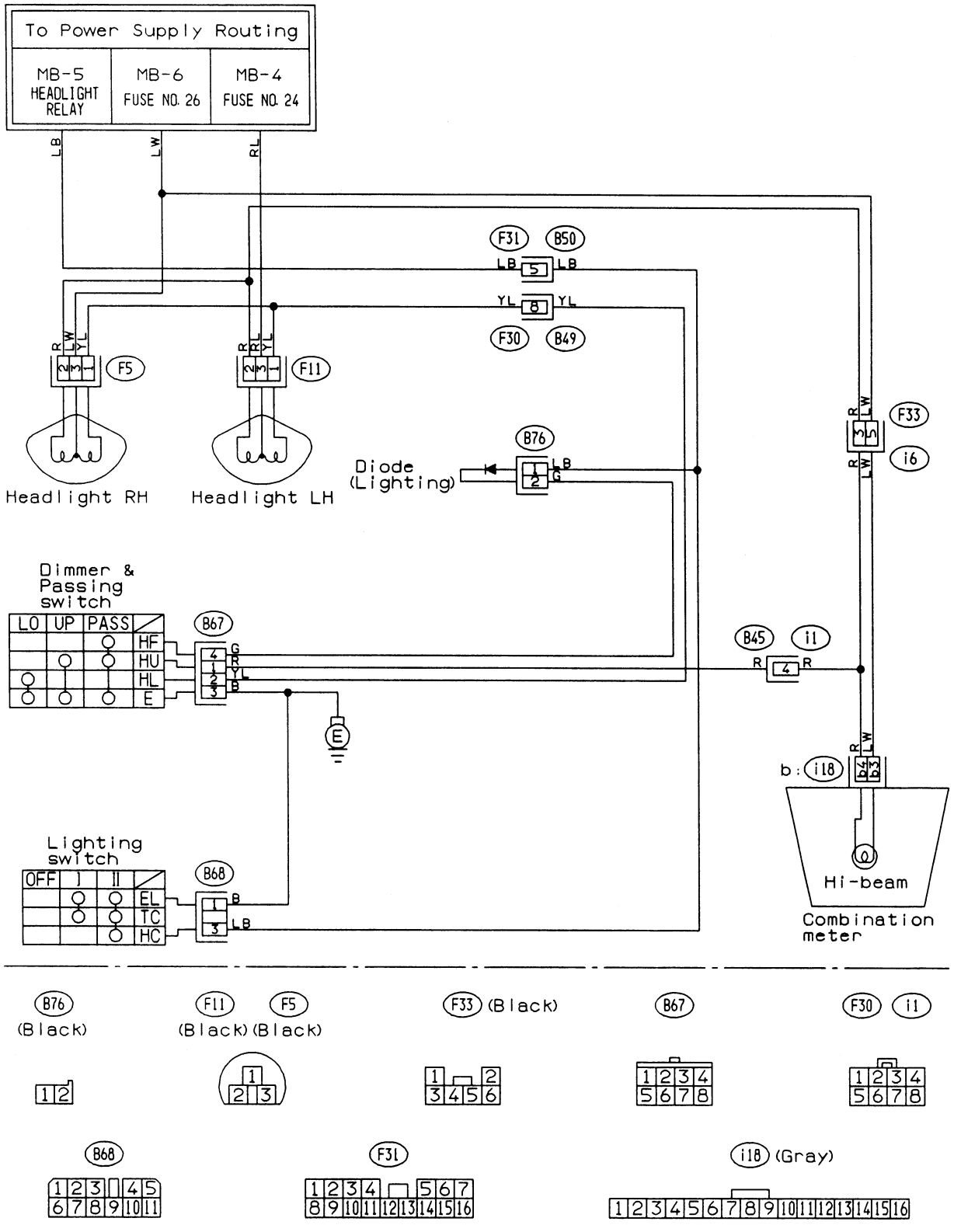
16. HORN AND CIGARETTE LIGHTER SYSTEM



GU74-02

17. LIGHTING (HEADLIGHT) SYSTEM

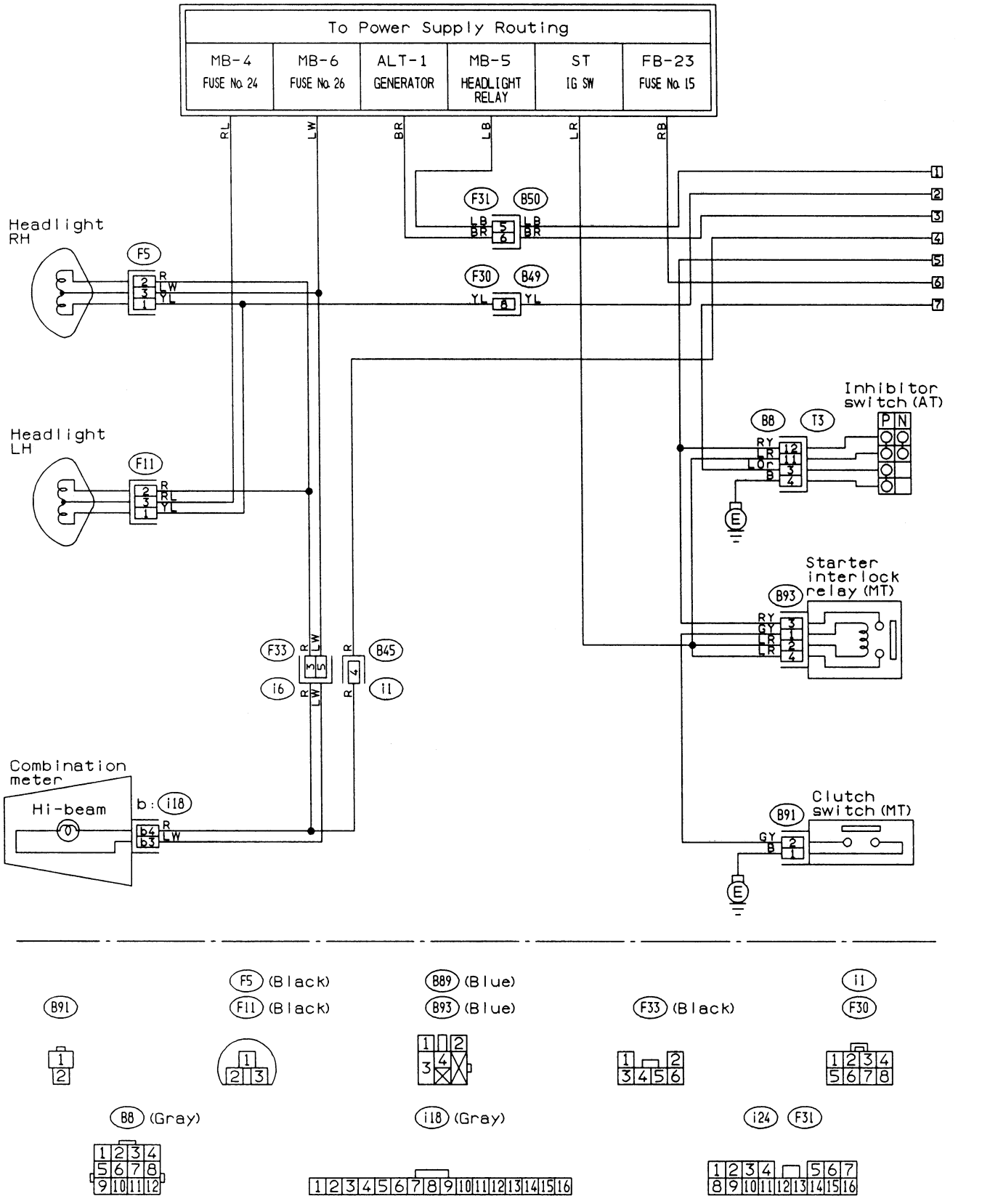
- **U.S.A. model**



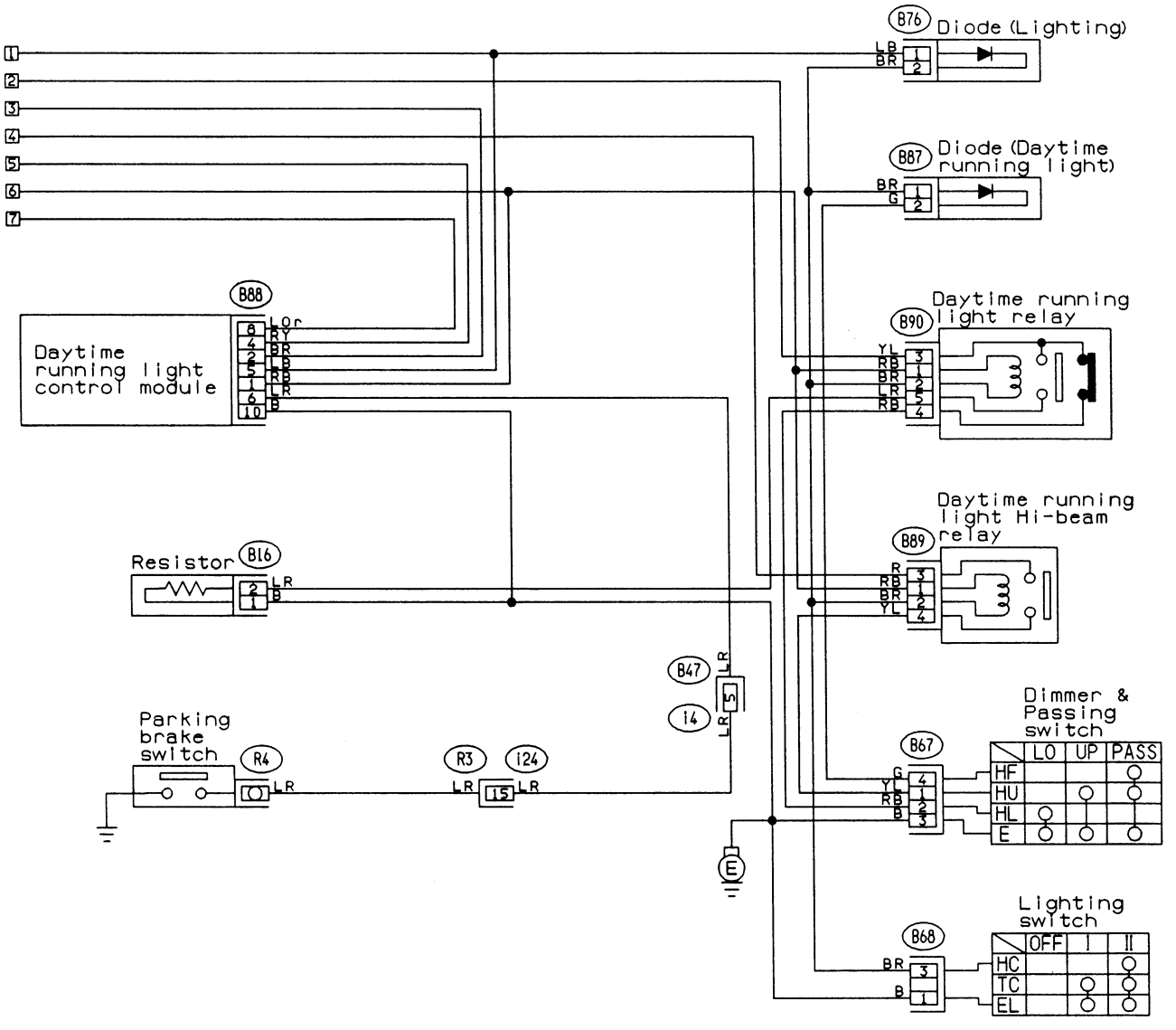
GU20-02

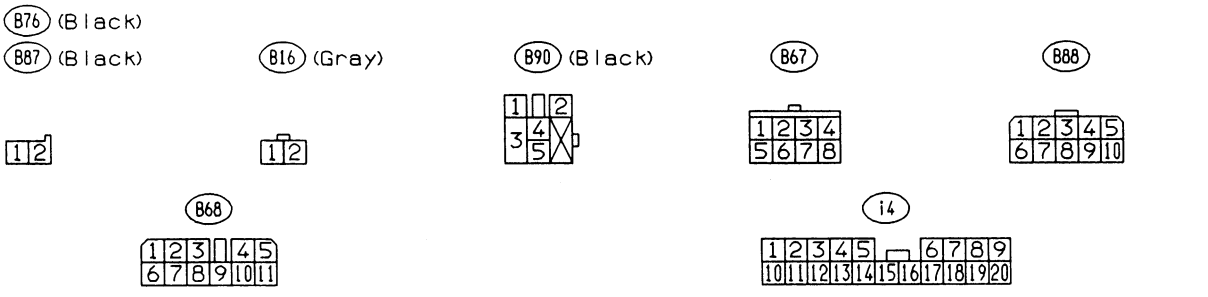
17. LIGHTING (HEADLIGHT) SYSTEM

- **Canada model**



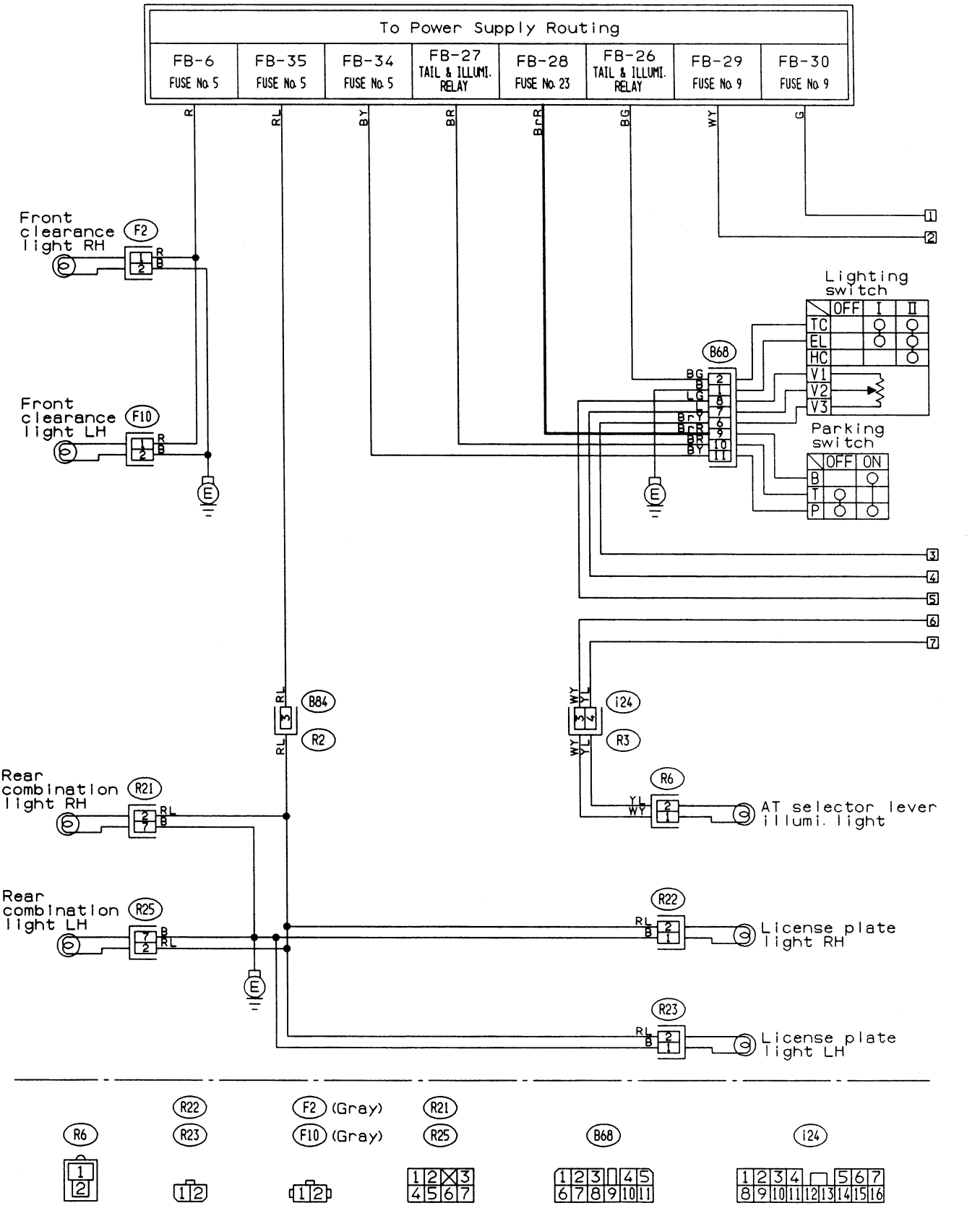
GC20-02A


B76 Diode (Lighting)
B87 Diode (Daytime running light)
B88
Daytime running light control module
B90 Daytime running light relay
B89 Daytime running light Hi-beam relay
Resistor B16
B47
14
Parking brake switch R4
R3
124
15
Dimmer & Passing switch
LO UP PASS
HF
HU
HL
E
Lighting switch
OFF I II
HC
TC
EL
B68

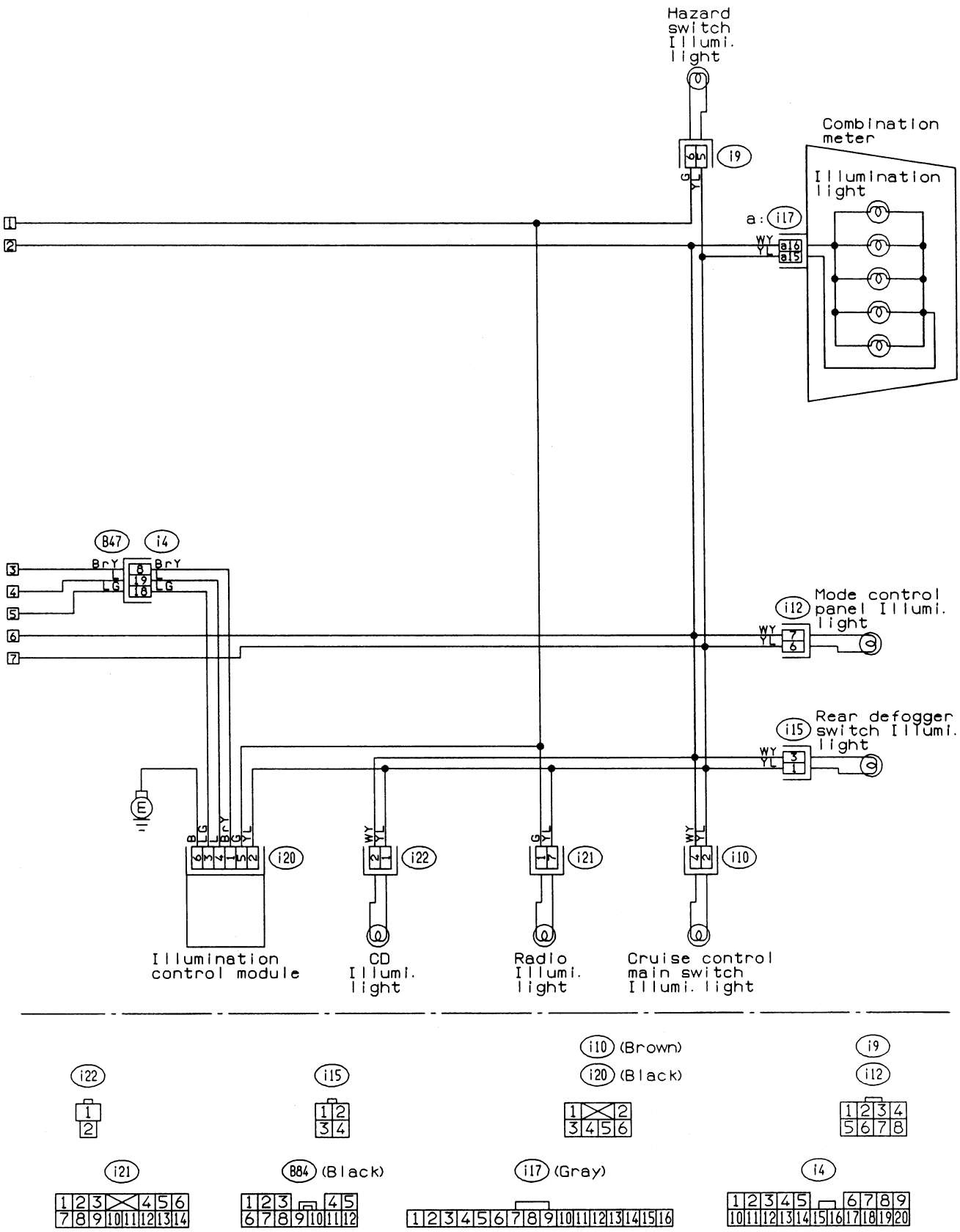

B76 (Black)
B87 (Black)
B16 (Gray)
B90 (Black)
B67
B88
B68
i4

GC20-02B

18. LIGHTING
(TAIL LIGHT·ILLUMINATION LIGHT·etc.) SYSTEM

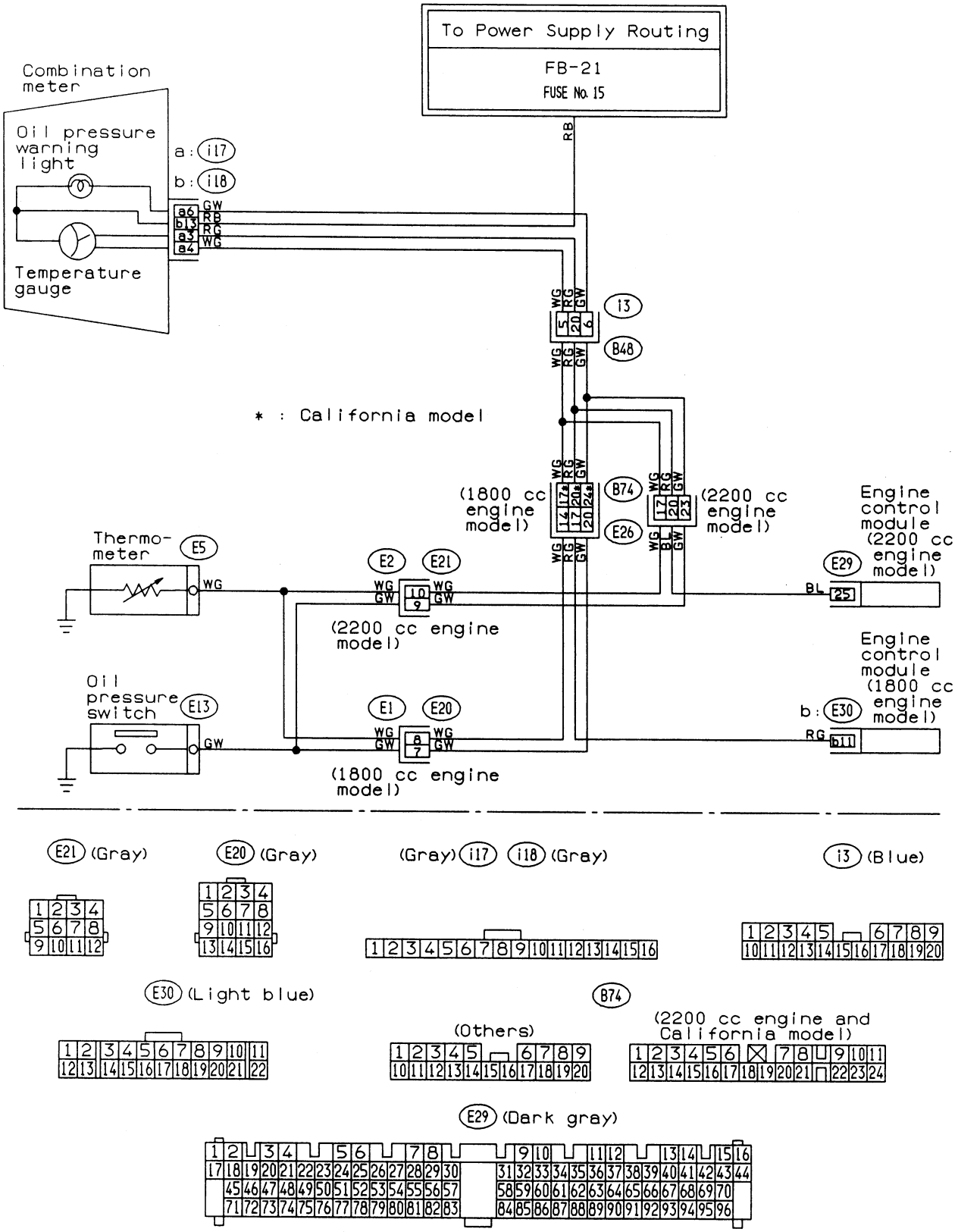


GU21-02A


Hazard switch Illumi. light
i9
Combination meter
Illumination light
a: i17
Mode control panel Illumi. light
i12
Rear defogger switch Illumi. light
i15
B47
i4
i20
i22
i21
i10
Illumination control module
CD Illumi. light
Radio Illumi. light
Cruise control main switch Illumi. light
i10 (Brown)
i20 (Black)
i9
i12
i22
i15
i21
B84 (Black)
i17 (Gray)
i4

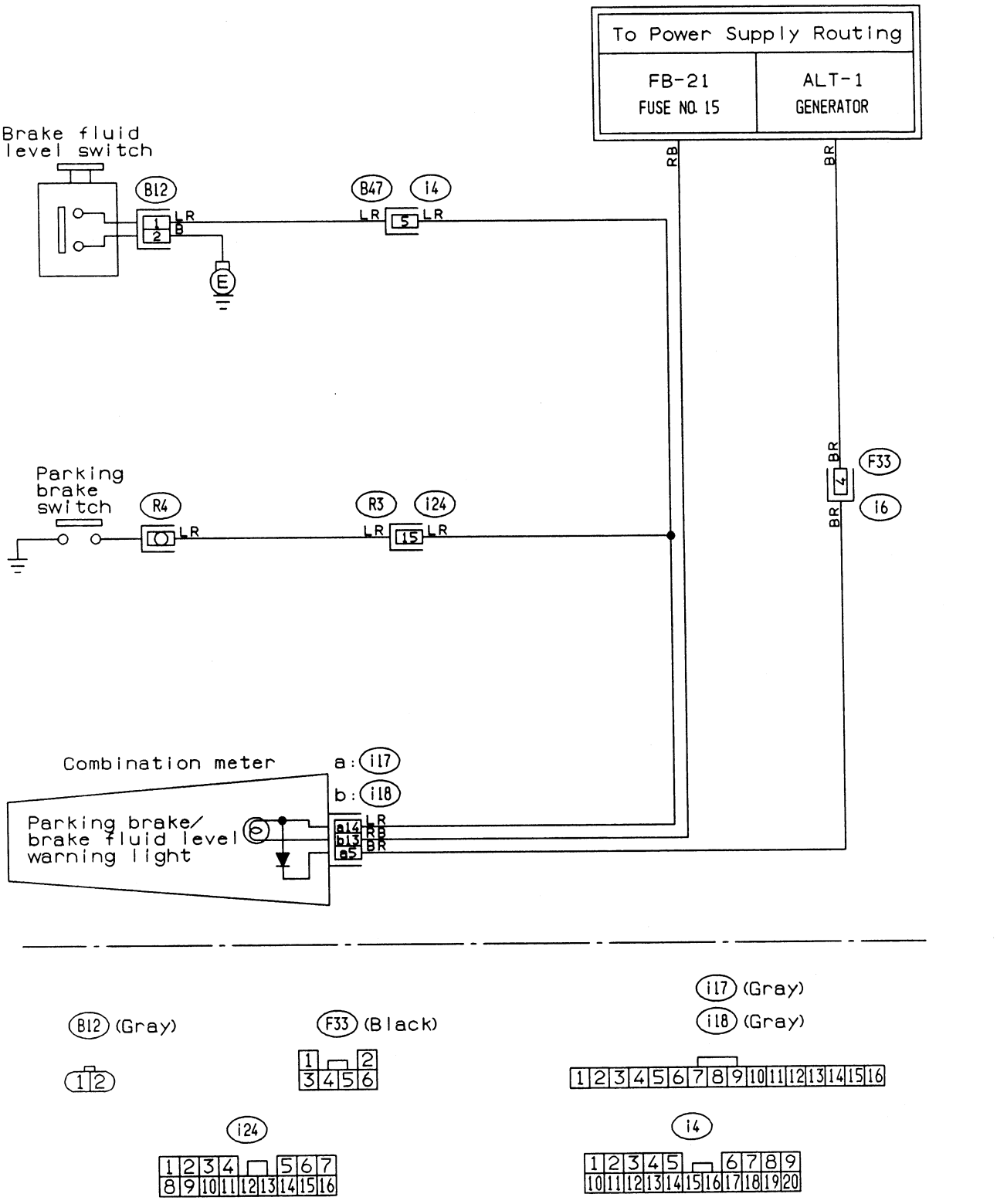
GU21-02B

19. OIL PRESSURE AND TEMPERATURE GAUGE SYSTEM



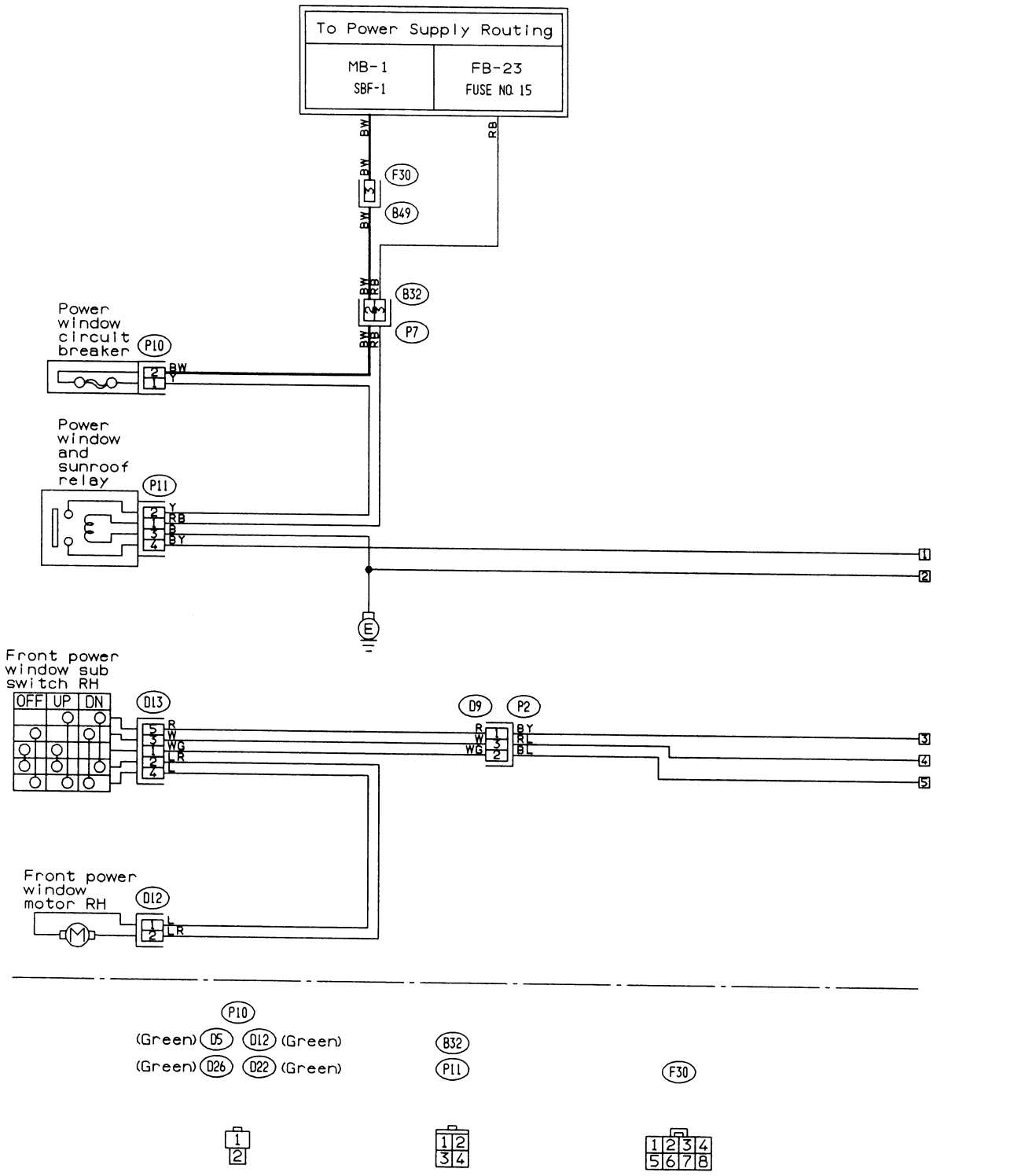
GU66-02

20. PARKING BRAKE AND BRAKE FLUID LEVEL WARNING SYSTEM

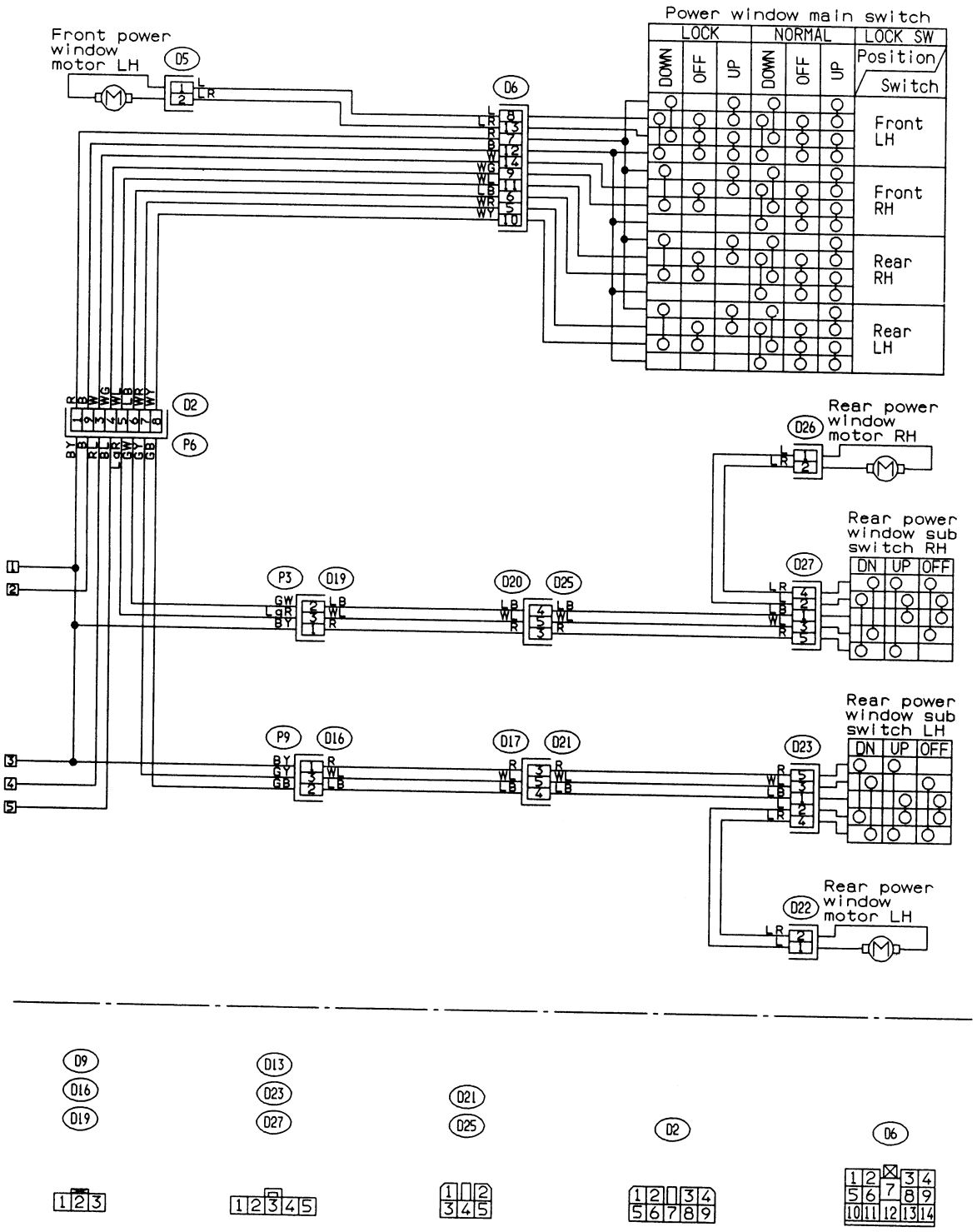


GU60-02

21. POWER WINDOW SYSTEM



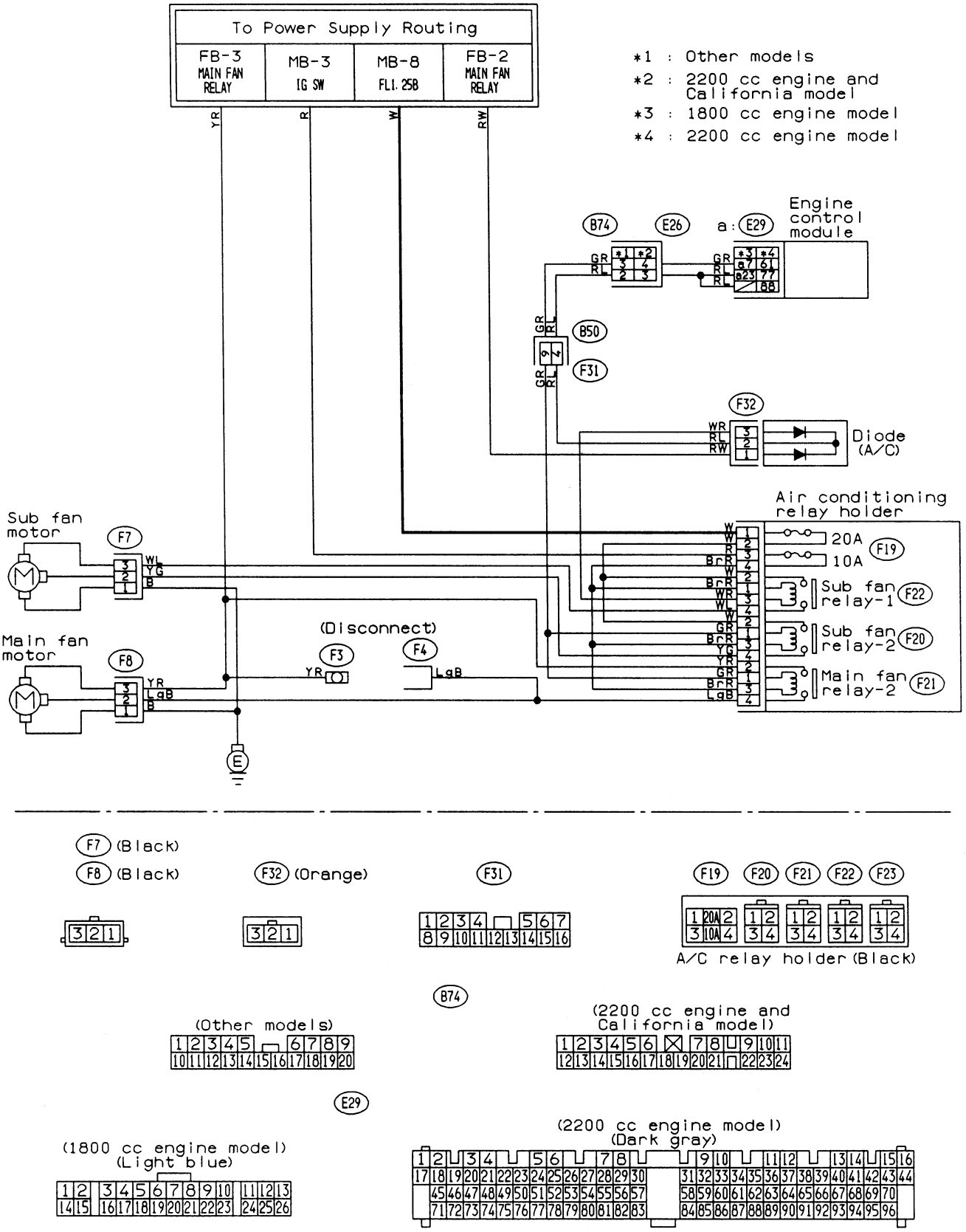
GU70-01A


Power window main switch
LOCK
NORMAL
LOCK SW
DOWN
OFF
UP
DOWN
OFF
UP
Position
Switch
Front LH
Front RH
Rear RH
Rear LH
Front power window motor LH
D5
D6
D2
P6
Rear power window motor RH
D26
Rear power window sub switch RH
D27
DN
UP
OFF
P3
D19
D20
D25
P9
D16
D17
D21
Rear power window sub switch LH
D23
Rear power window motor LH
D22
D9
D16
D19
D13
D23
D27
D21
D25
D2
D6

GU70-01B

22. RADIATOR FAN SYSTEM

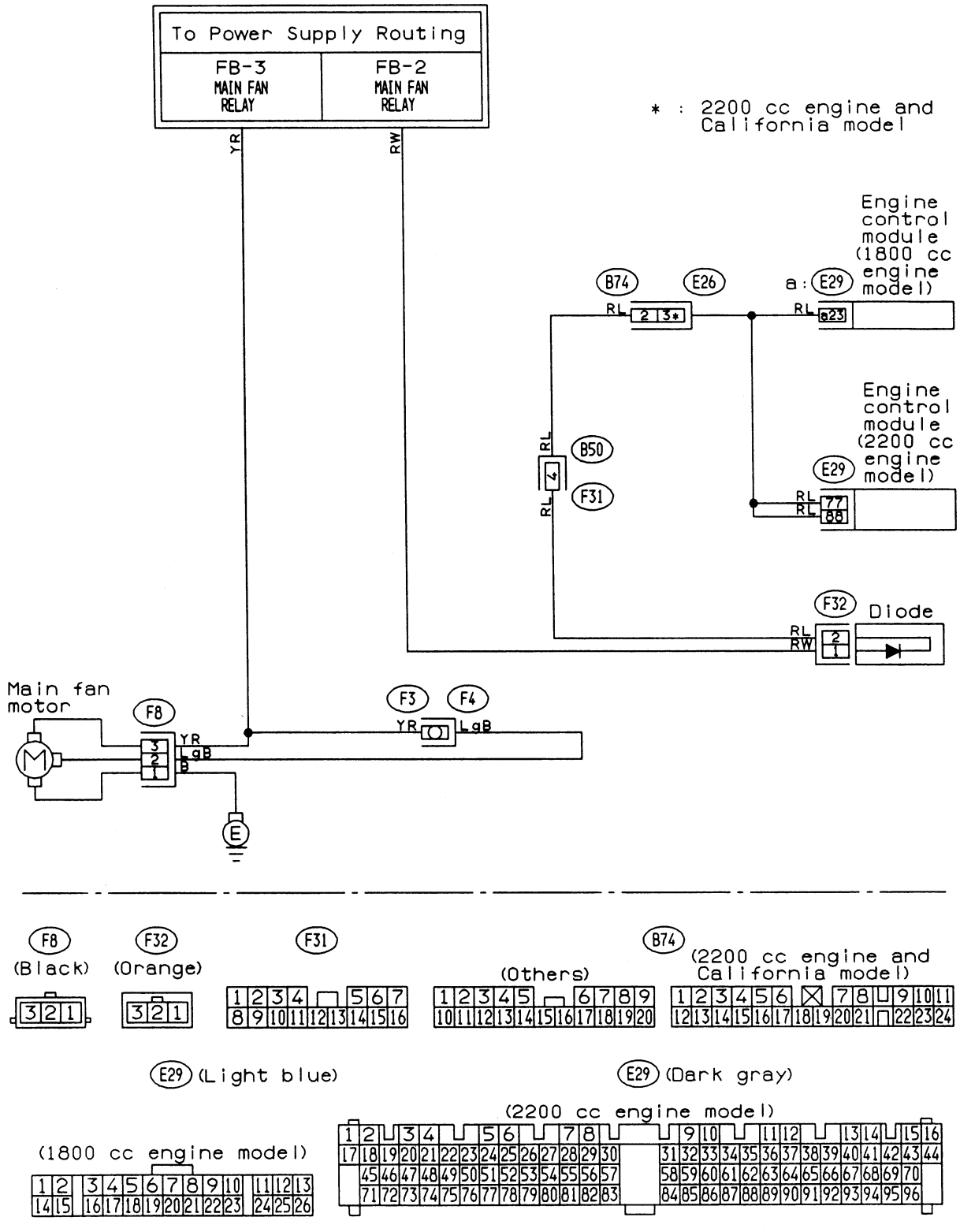
- **With A/C**



GU14-03

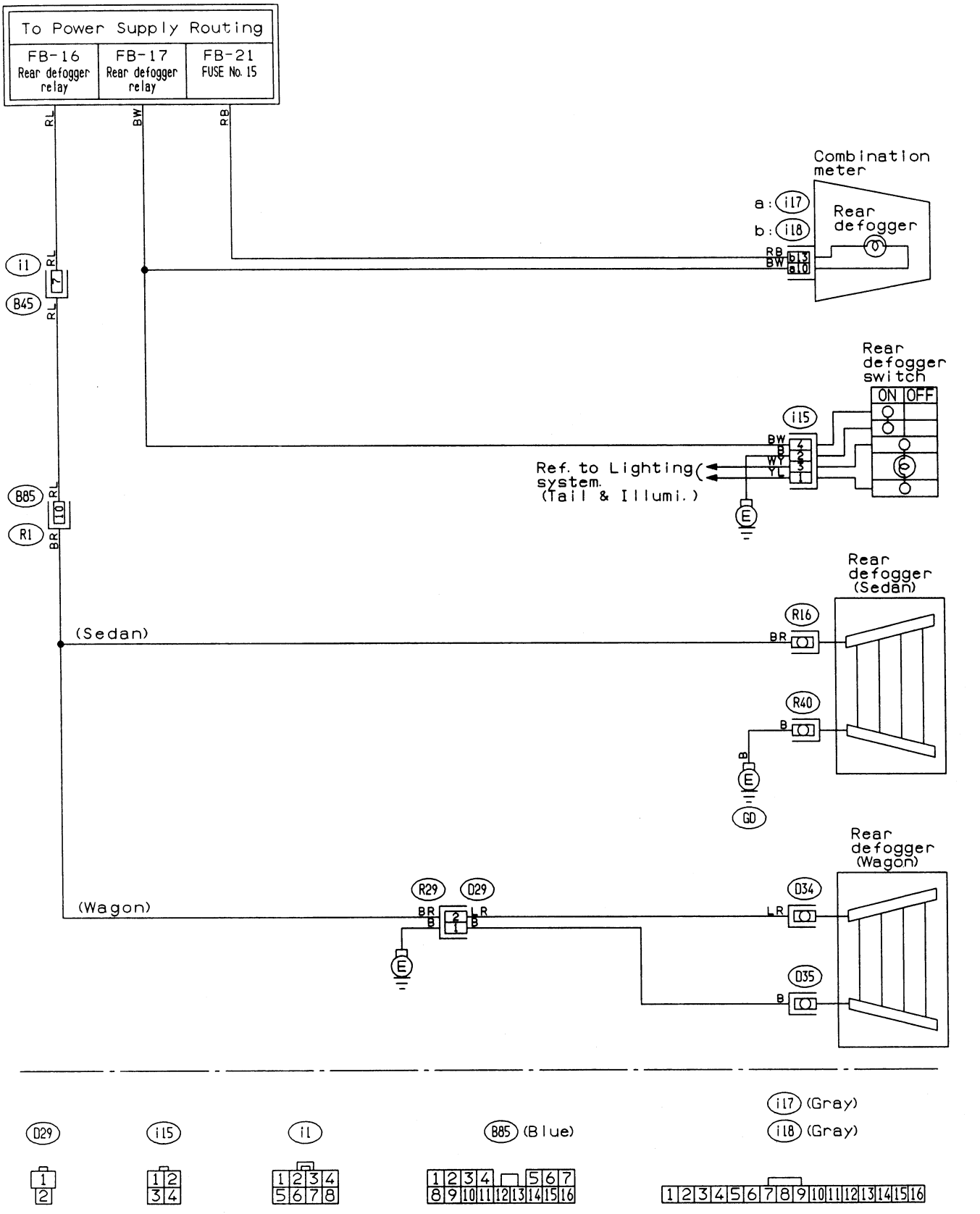
22. RADIATOR FAN SYSTEM

- **Without A/C**



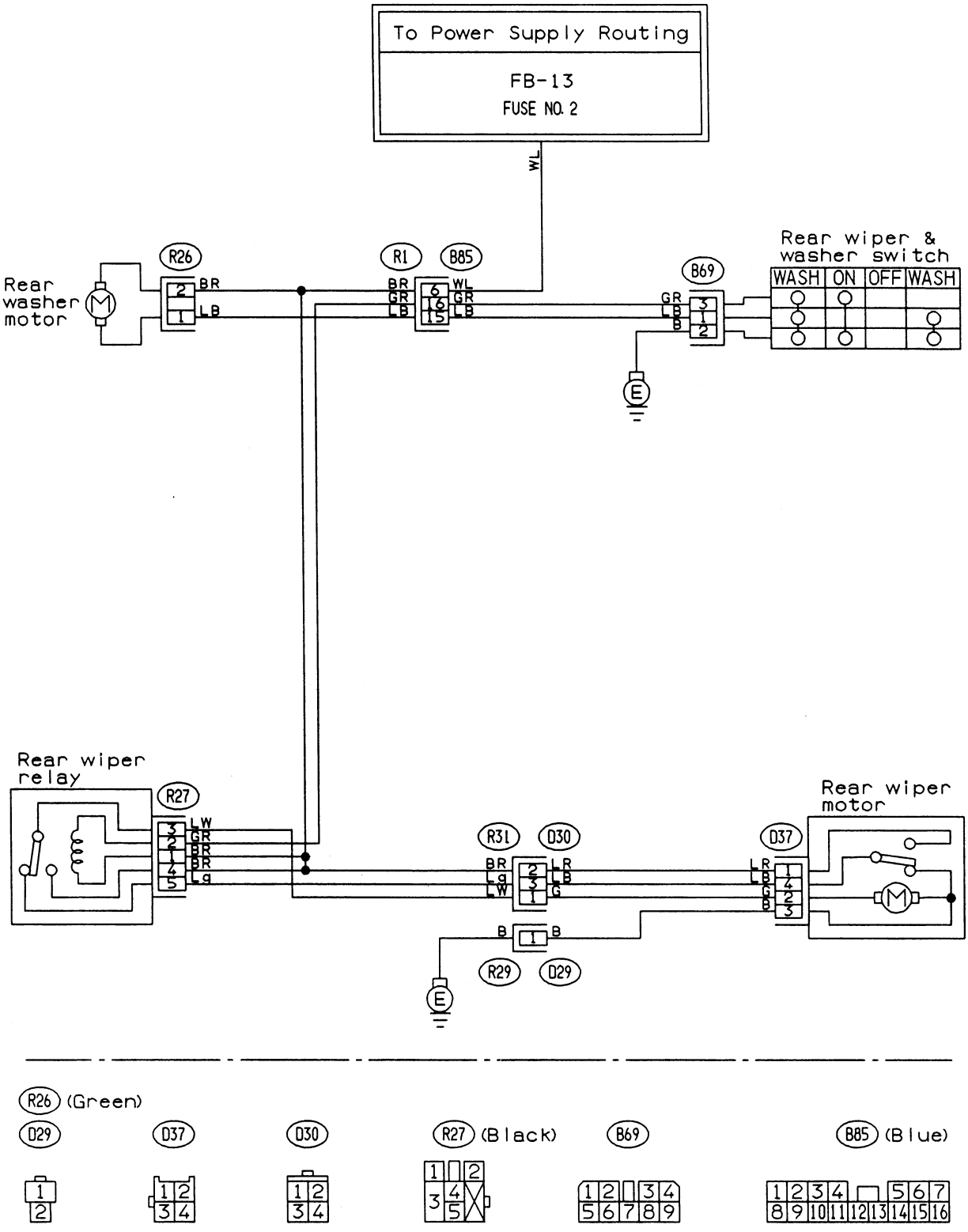
GU14-04

23. REAR WINDOW DEFOGGER SYSTEM



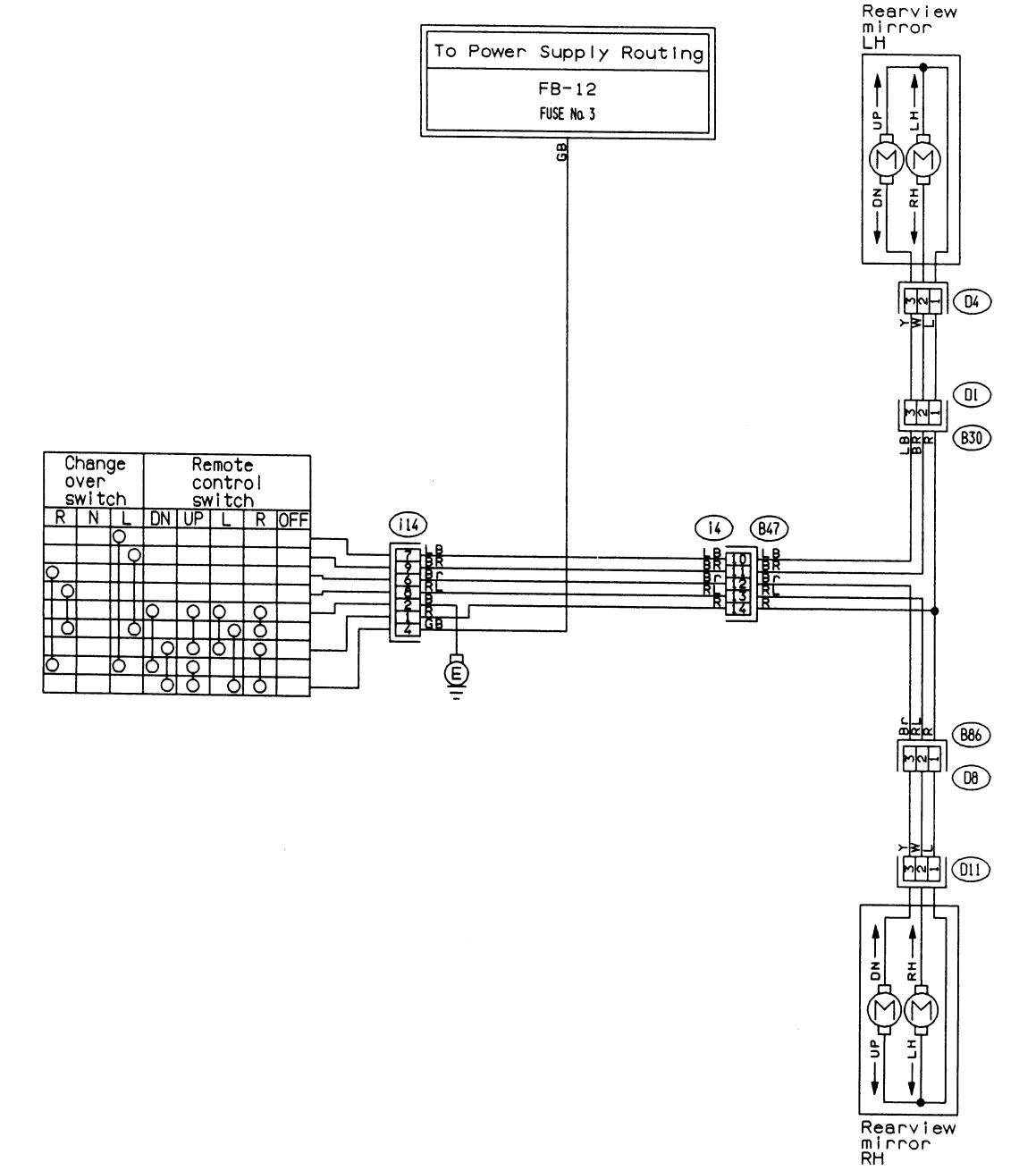
GU52-02

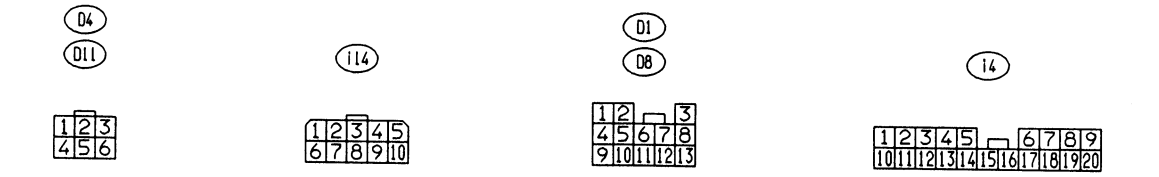
24. REAR WIPER AND WASHER SYSTEM



GU51-02

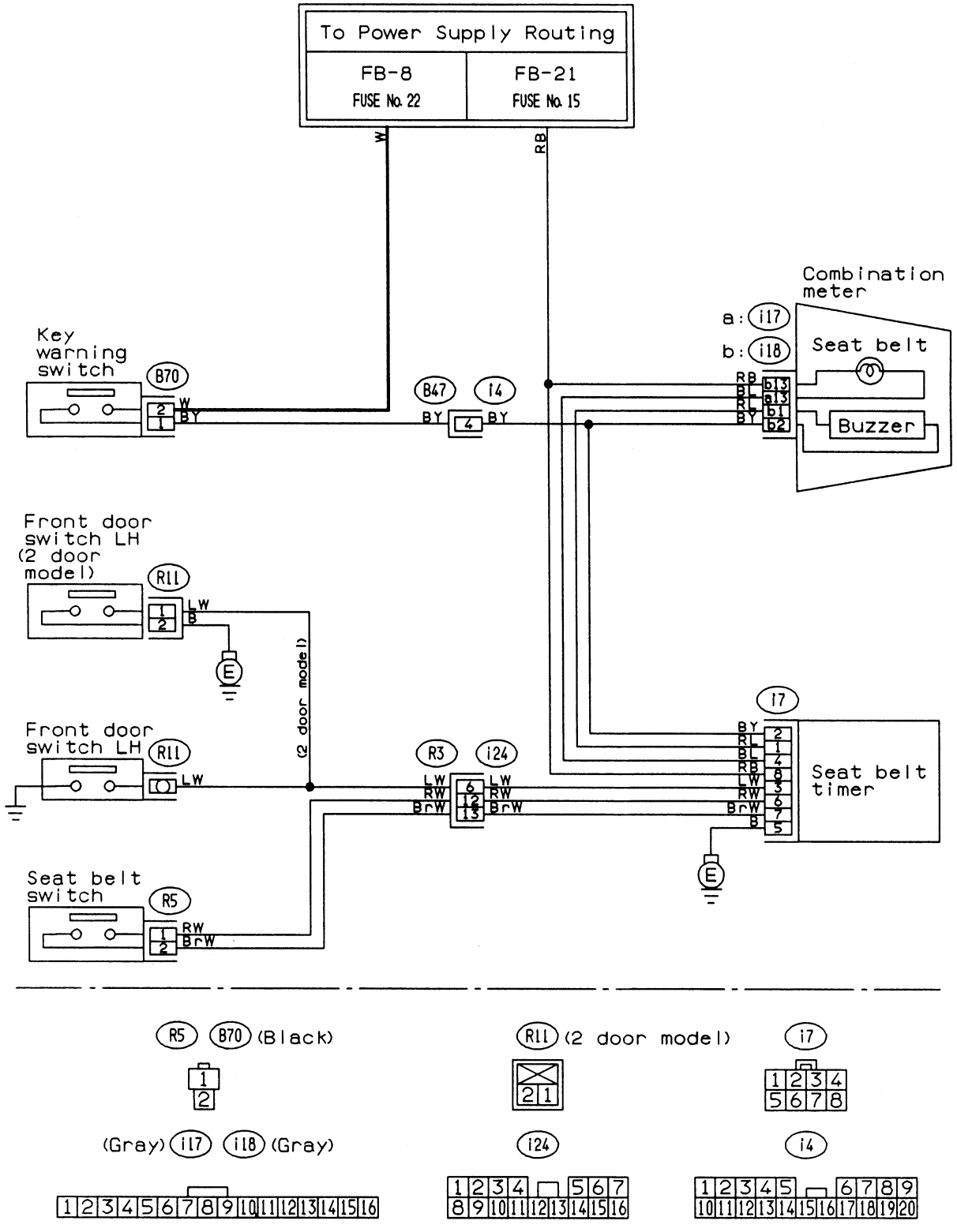
25. REMOTE CONTROL REARVIEW MIRROR SYSTEM





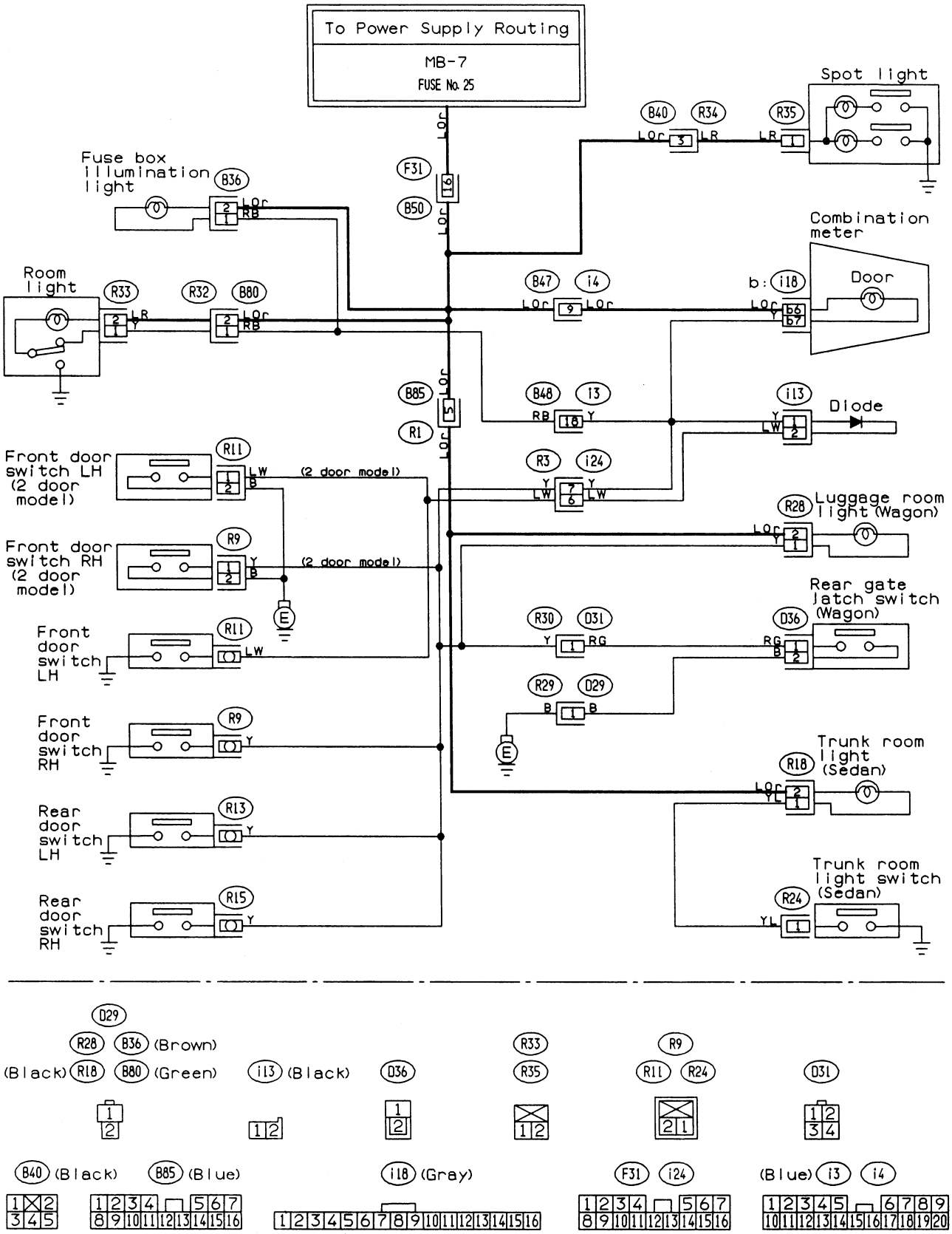
GU79-01

26. SEAT BELT WARNING AND KEY WARNING SYSTEM



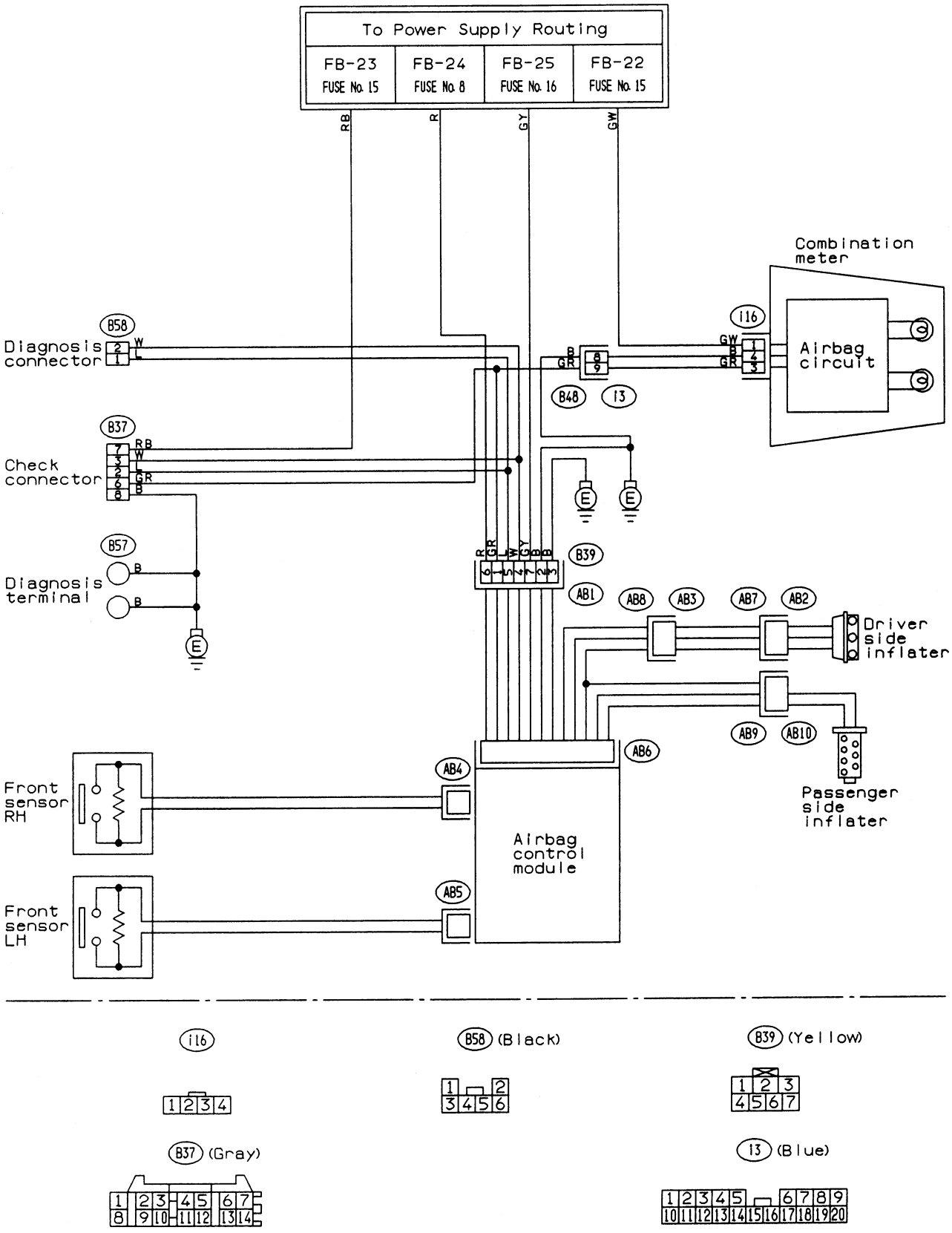
GU87-02

27. SPOT LIGHT, ROOM LIGHT, FUSE BOX LIGHT, LUGGAGE AND TRUNK ROOM LIGHT SYSTEM



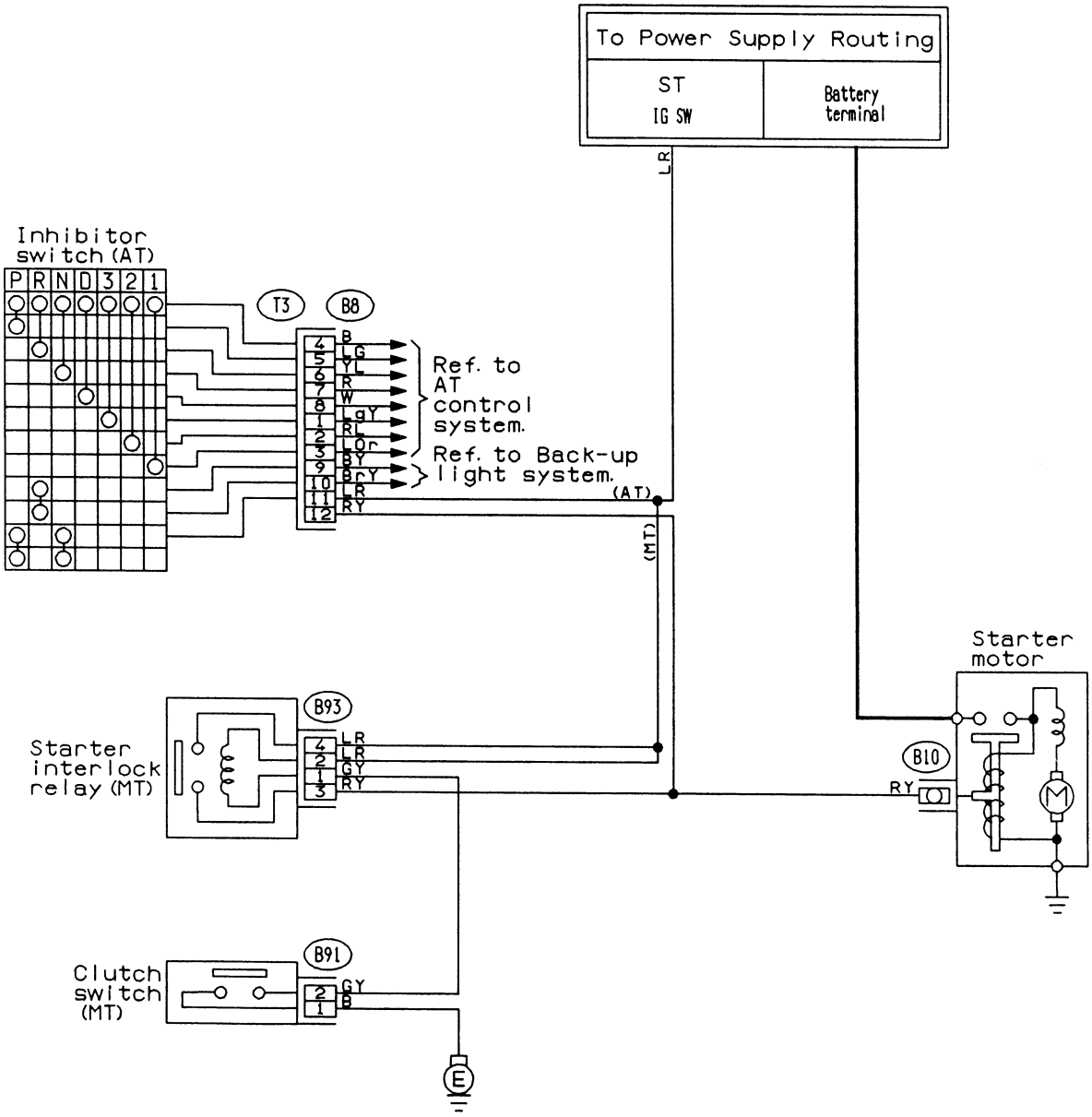
GU24-02

28. SRS (AIRBAG SYSTEM)



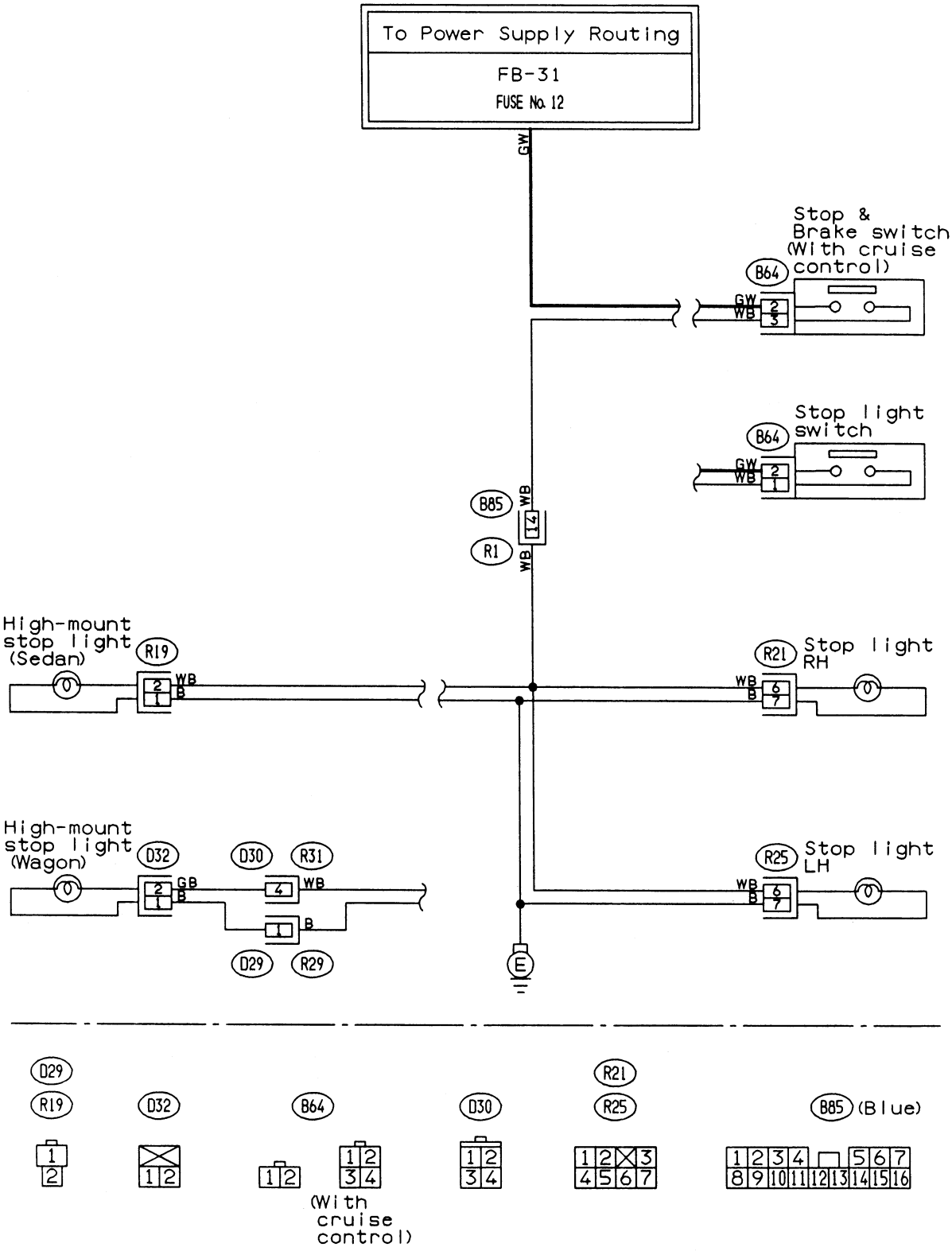
GU86-03

29. STARTING SYSTEM



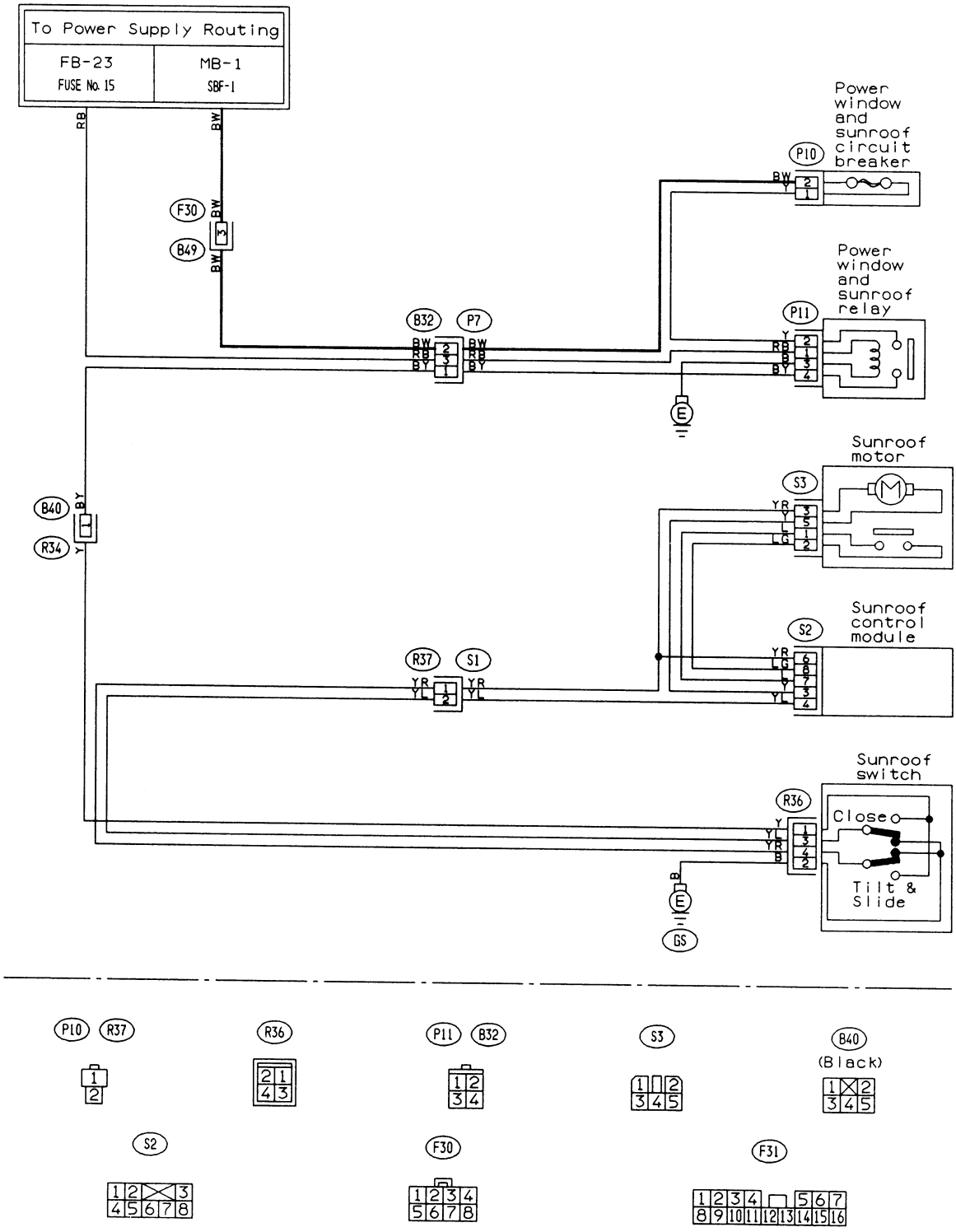
GU03-01

30. STOP LIGHT SYSTEM



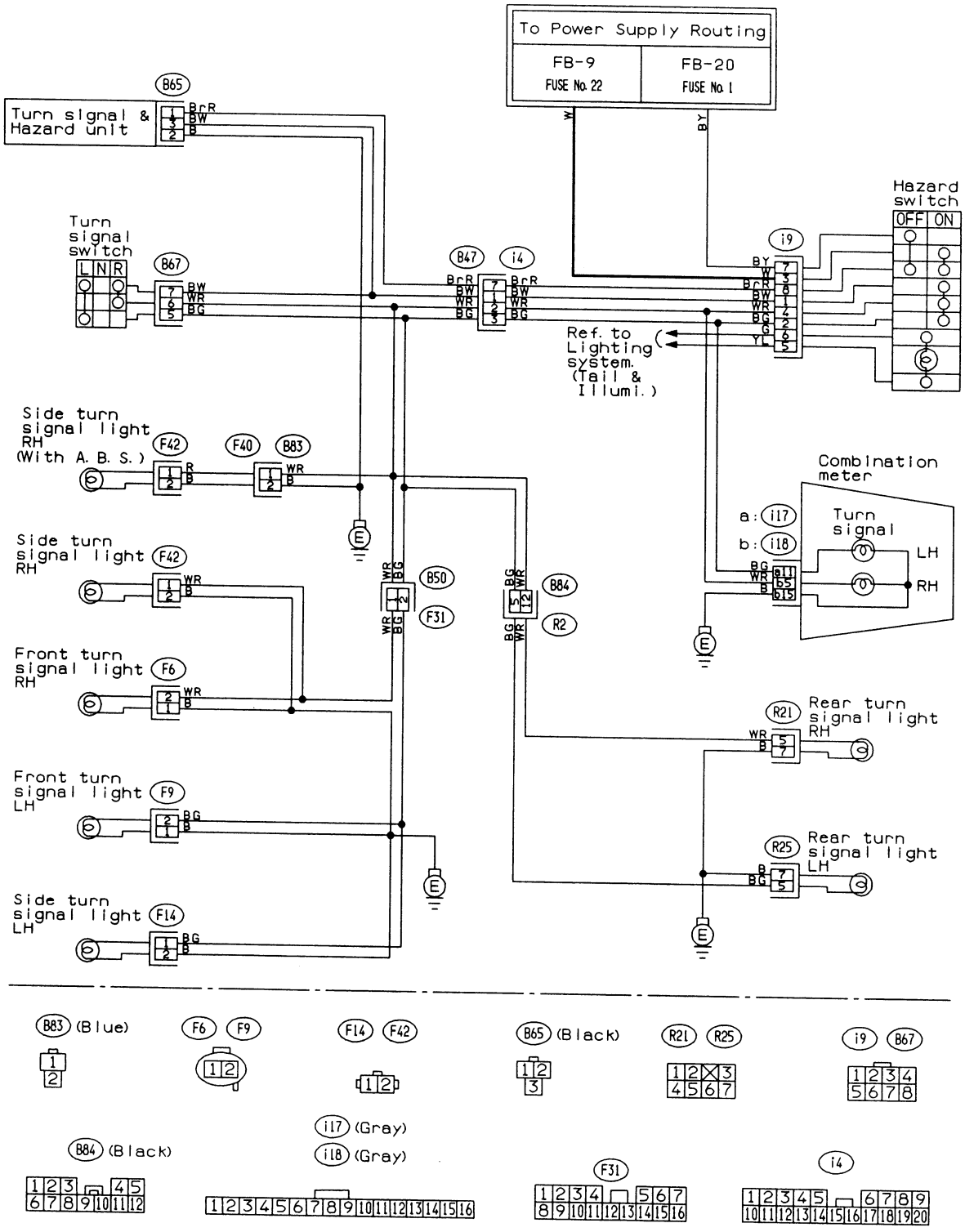
GU25-02

31. SUNROOF SYSTEM



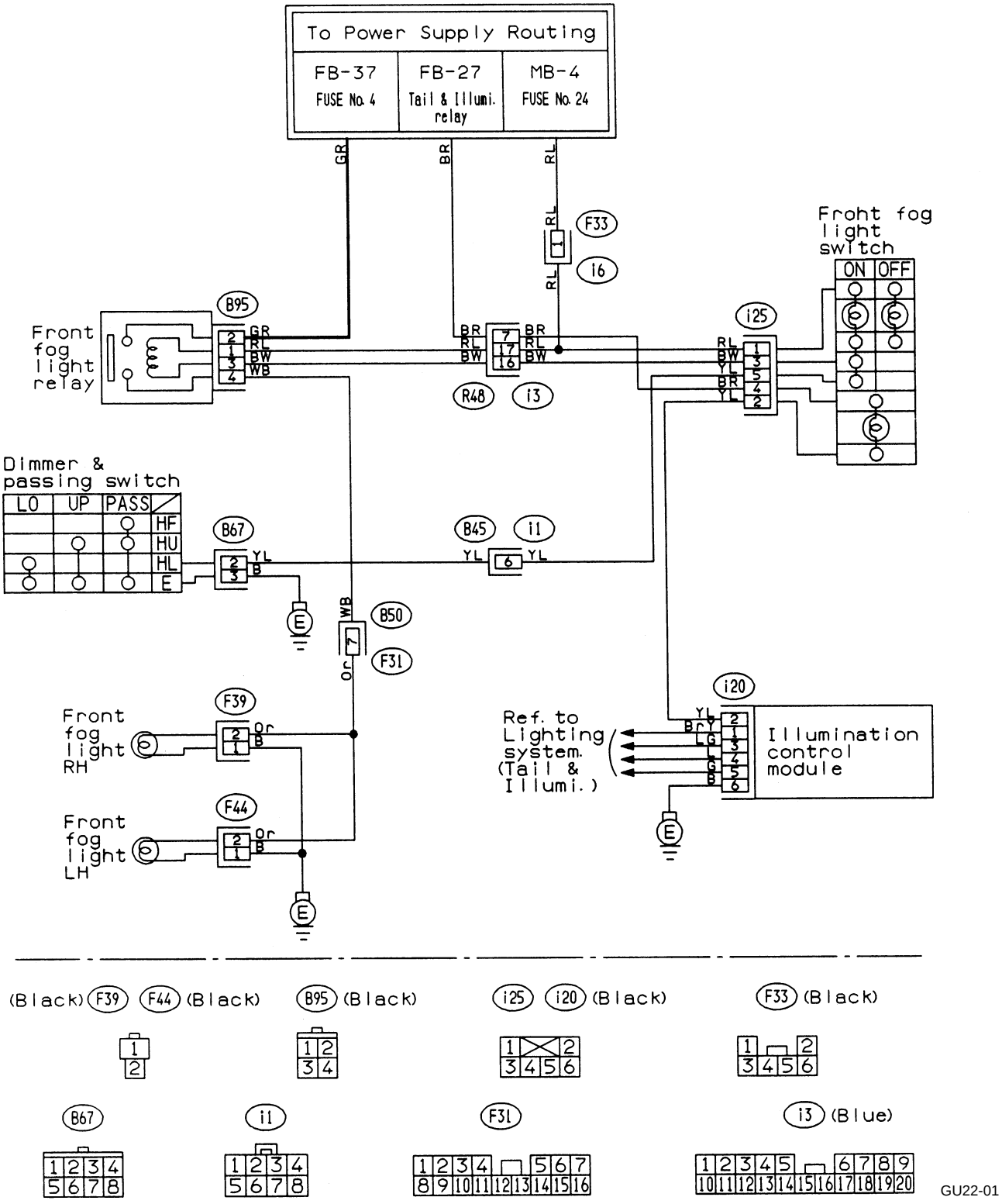
GU75-01

32. TURN SIGNAL AND HAZARD SYSTEM

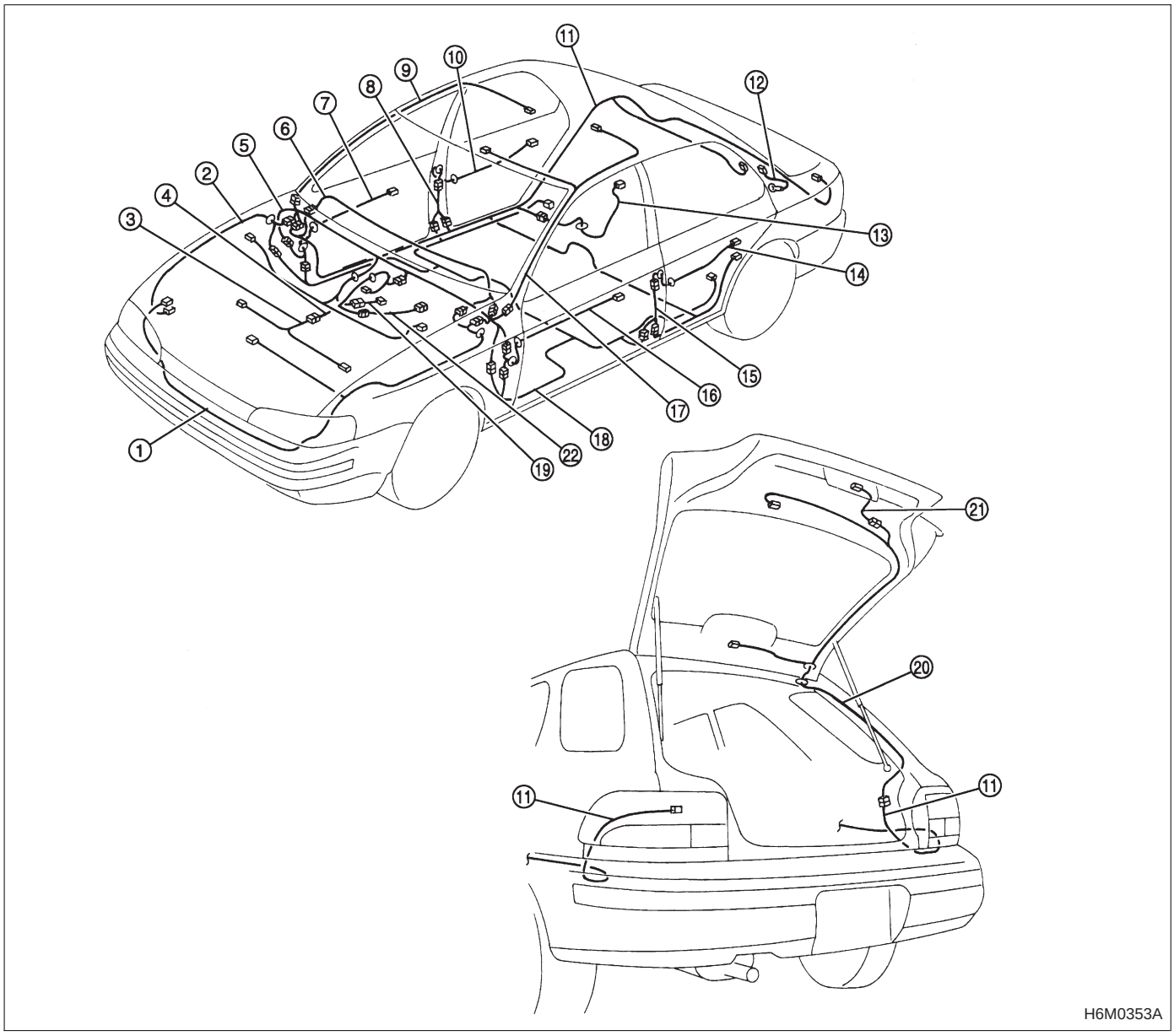


GU26-01

33. FRONT FOG LIGHT SYSTEM



6. Electrical Wiring Harness and Ground Point

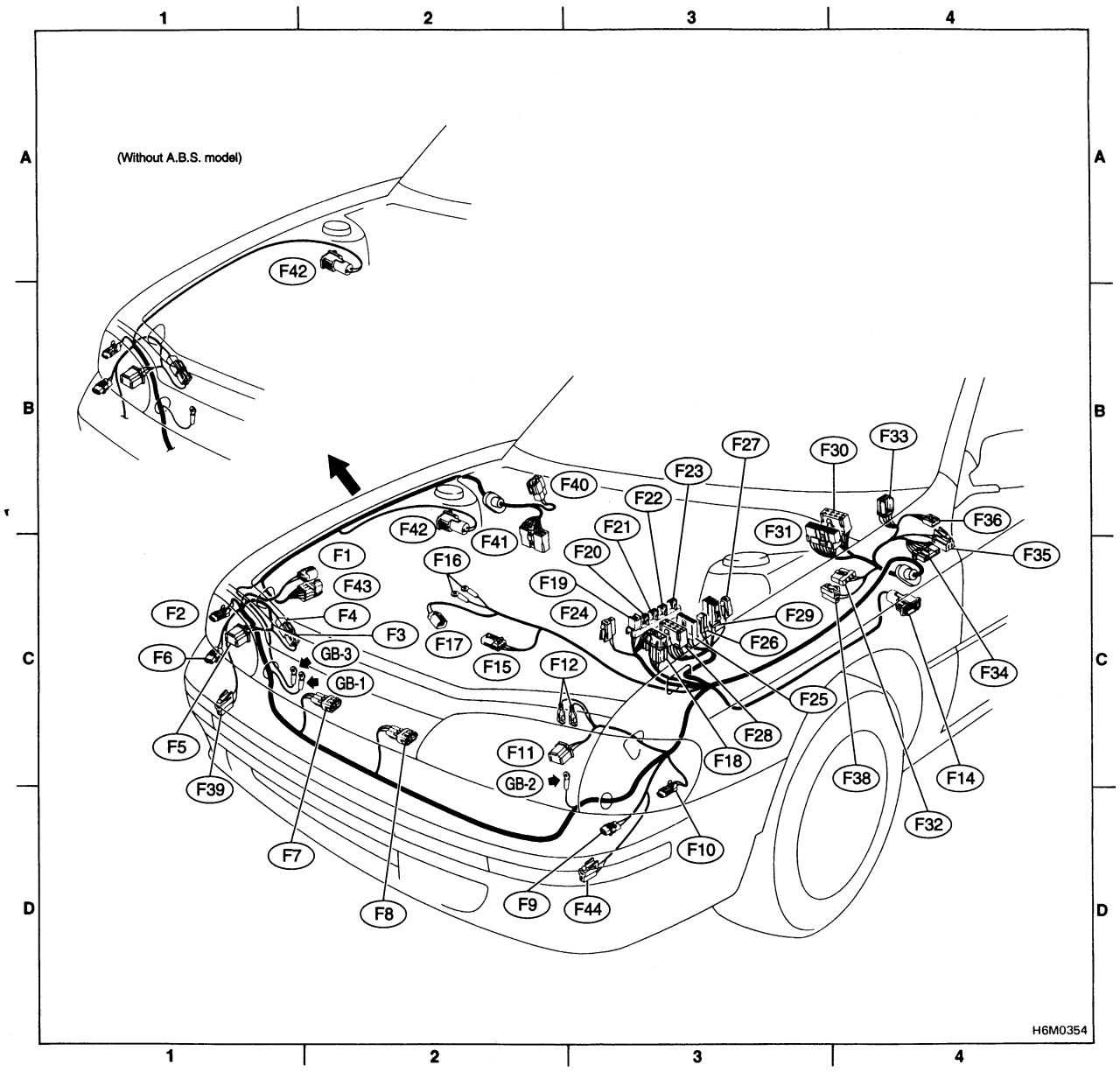


① Front wiring harness LH
② Front wiring harness RH
③ Engine wiring harness
④ Engine module wiring harness
⑤ Bulkhead wiring harness
⑥ Instrument panel wiring harness
⑦ Front door cord RH
⑧ Rear door adapter cord RH
⑨ Room light cord
⑩ Rear door cord RH
⑪ Rear wiring harness
⑫ Rear defogger cord (Ground)
⑬ Fuel tank cord
⑭ Rear door cord LH
⑮ Rear door adapter cord LH
⑯ Front door cord LH
⑰ Sunroof cord or spot light cord
⑱ Power window main harness
⑲ Transmission cord
⑳ Rear gate cord
㉑ Rear gate lock adapter cord
㉒ Rear oxygen sensor cord

Connector			Connecting to	
No.	Pole	Color	No.	Name
F1	2	Gray		Hydraulic unit
F2	2	Gray		Front marker light RH
F3	1	Black	F4	A/C short connector
F4	1	Black	F3	
F5	3	Black		Headlight RH
F6	2	★		Front fun signal light RH
F7	3	Black		Sub fan motor
F8	3	Black		Radiator main fan motor
F9	2	★		Front turn signal light LH
F10	2	Gray		Front marker light LH
F11	3	Black		Headlight LH
F12	1 x 2	★		Horn
F14	2	★		Side turn signal light LH
F15	3	Gray		A/C compressor
F16	1 x 2	★		Generator
F17	2	Gray		
F18	4	Black		SBF holder
F19	4	Black		A/C fuse (Relay holder)
F20	4	Black		A/C sub fan relay-2 (Relay holder)
F21	4	Black		A/C main fan relay (Relay holder)
F22	4	Black		A/C sub fan relay-1 (Relay holder)
F23	4	Black		A/C relay (Relay holder)
F24	2	Green		Front washer motor
F25	3	★		M/B
F26	2	Black		
F27	1	Brown		
F28	8	★		
F29	2	Black		
F30	8	★	B49	Bulkhead wiring harness
F31	16	★	B50	
F32	3	Orange		A/C diode
F33	6	Black	i6	Instrument panel wiring harness
F34	10	Gray		F/B
F35	3	Gray		
F36	5	Gray		
F38	2	Black		Horn condenser
F39	2	Black		Front fog light RH
F40	2	Blue	B83	Bulkhead wiring harness
F41	13	★	P1	Power window main harness
F42	2	★		Side turn signal light RH
F43	12	Black		Hydraulic unit
F44	2	Black		Front fog light LH

★: Non-colored

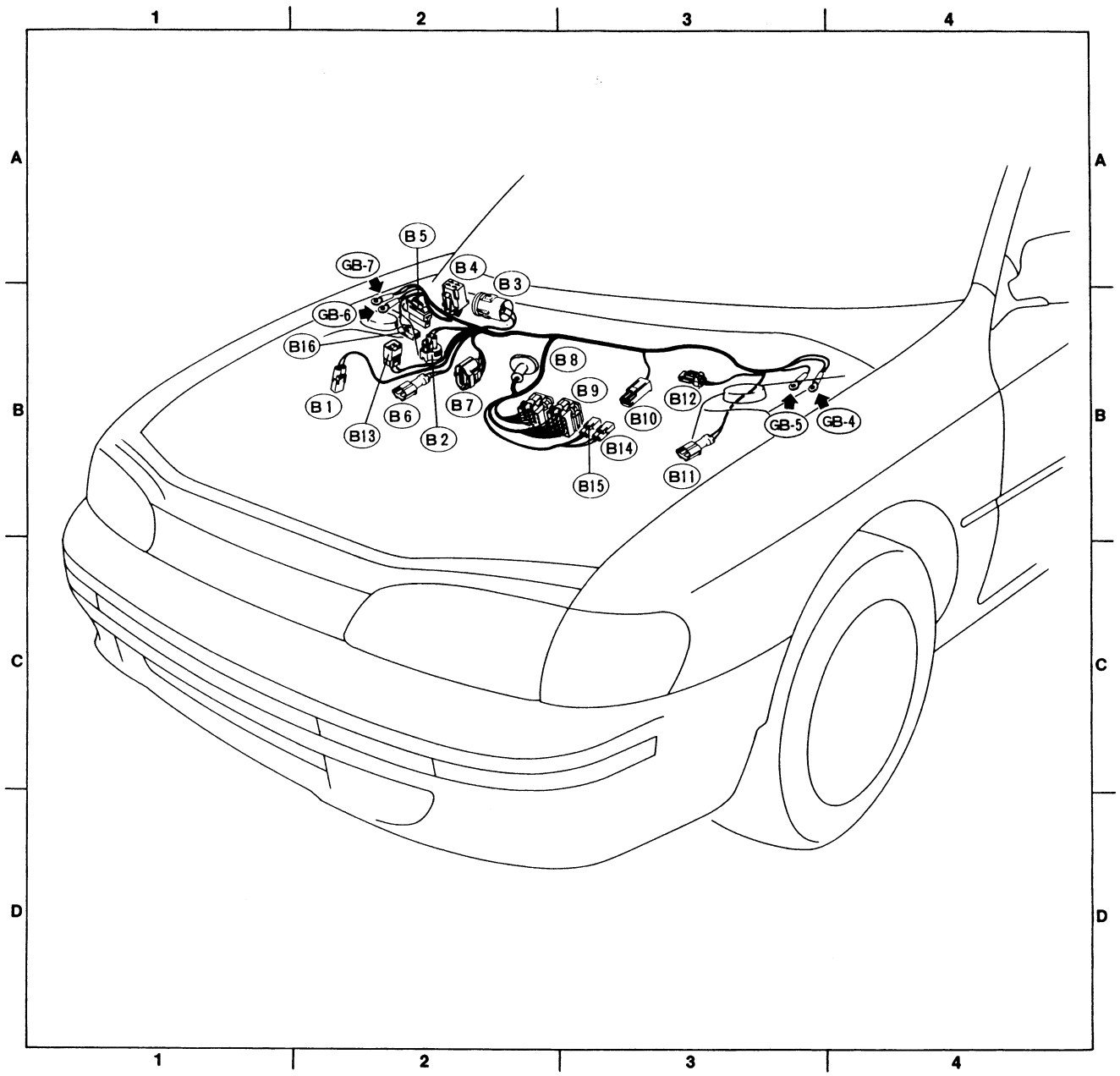
1. FRONT WIRING HARNESS AND GROUND POINT



H6M0354

Connector			Connecting to	
No.	Pole	Color	No.	Name
B1	2	Gray		AT dropping resistor
B2	2	Gray		A/C pressure switch
B3	5			Front wiper motor
B4	4	Blue		A/C cut relay
B5	2			FWD switch (AT)
B6	2	Gray		A.B.S. front sensor RH
B7	4	Gray		Cruise control actuator
B8	12	Gray	T3	Transmission (AT)
B9	16	Gray	T4	
B10	1	Black		Starter (Magnet)
B11	2	Gray		A.B.S. front sensor LH
B12	2	Gray		Brake fluid level switch
B13	2	Black		A.B.S. G sensor (MT)
B14	2	Brown	T2	Neutral position switch (MT)
B15	2	Gray	T1	Back-up light switch (MT)
B16	2	Gray	T1	Resistor (DRL)

2. BULKHEAD WIRING HARNESS AND GROUND POINT (IN ENGINE ROOM)



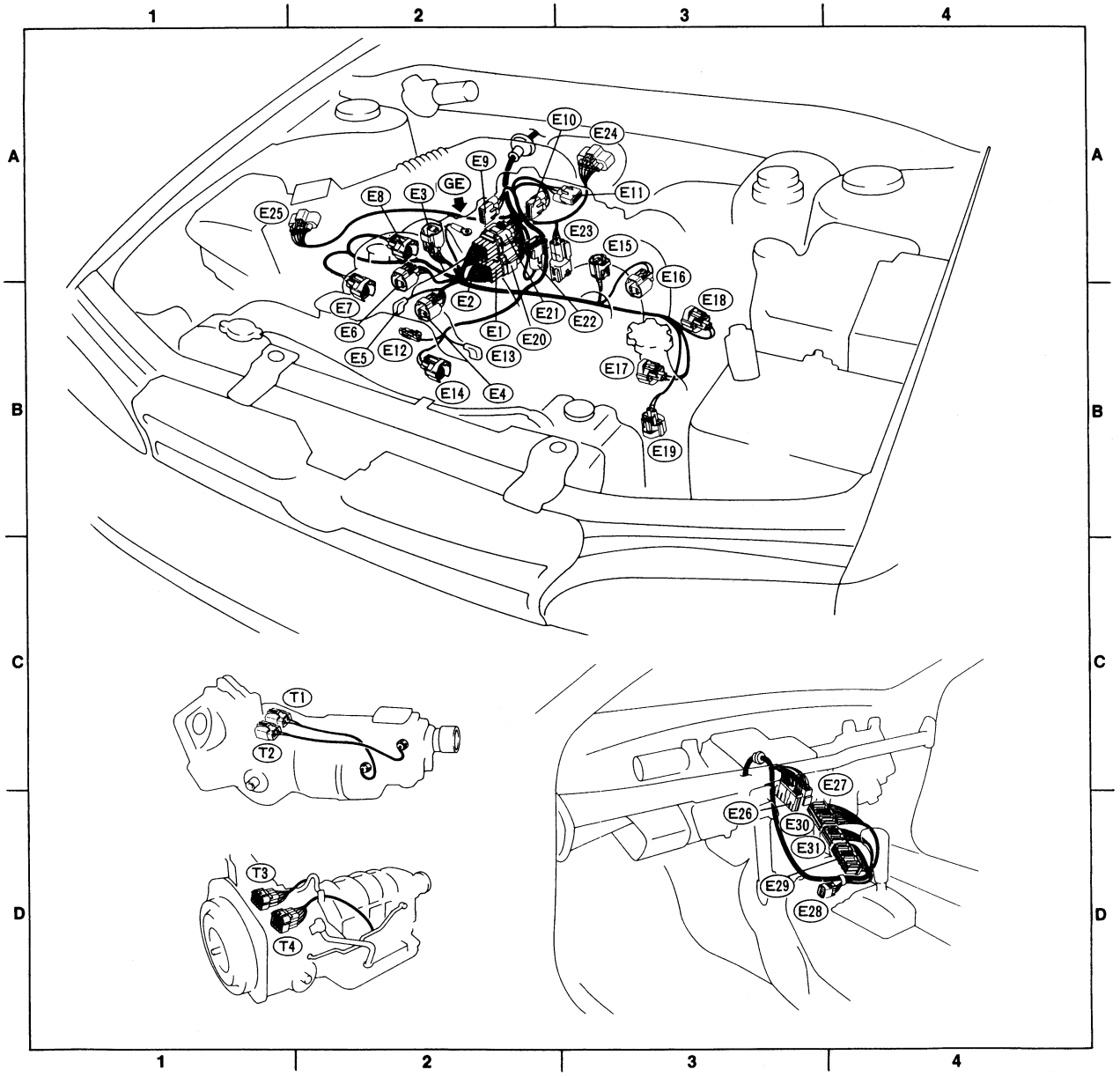
G6M0218

Connector			Connecting to	
No.	Pole	Color	No.	Name
E1	16	Gray	E20	Engine module wiring harness
E2	14	Gray	E21	
E3	2	Gray		Air suction solenoid valve (California)
E4	2	Brown		Engine coolant temperature sensor
E5	1	★		Thermometer
E6	2	Blue		Purge control solenoid valve
E7	2	Gray		Injector #1
E8	2	Gray		Injector #3
E9	3	Gray		Ignition coil
E10	3	Gray		Throttle position sensor
E11	3	Gray		Idle air control solenoid
E12	1	Gray		Power steering oil pressure switch
E13	1	★		Oil pressure switch
E14	2	Gray		Crankshaft position sensor
E15	2	Black		Recirculation gas temperature sensor (California)
E16	2	Brown		EGR solenoid valve
E17	2	Gray		Injector #2
E18	2	Gray		Injector #4
E19	2	Gray		Camshaft position sensor
E20	16	Gray	E1	Engine wiring harness
E21	16	★	E2	
E22	2	Gray		FICD solenoid
E23	4	Gray		Oxygen sensor
E24	6	Gray		Ignitor
E25	5	Gray		Mass air flow meter
E26	20	★	B74	Bulkhead wiring harness
	24	★	B74	Bulkhead wiring harness (California model)
E27	8	★	B73	Bulkhead wiring harness
E28	6	★		Shield joint connector
E29	26	Light blue		Engine control module
E30	22	Light blue		
E31	16	Light blue		

Connector			Connecting to	
No.	Pole	Color	No.	Name
T1	2	Gray	B15	Bulkhead wiring harness (MT)
T2	2	Brown	B14	
T3	12	Gray	B8	Bulkhead wiring harness (AT)
T4	16	Gray	B9	

★: Non-colored

3. ENGINE WIRING HARNESS · TRANSMISSION CORD AND GROUND POINT (1800 cc engine model)



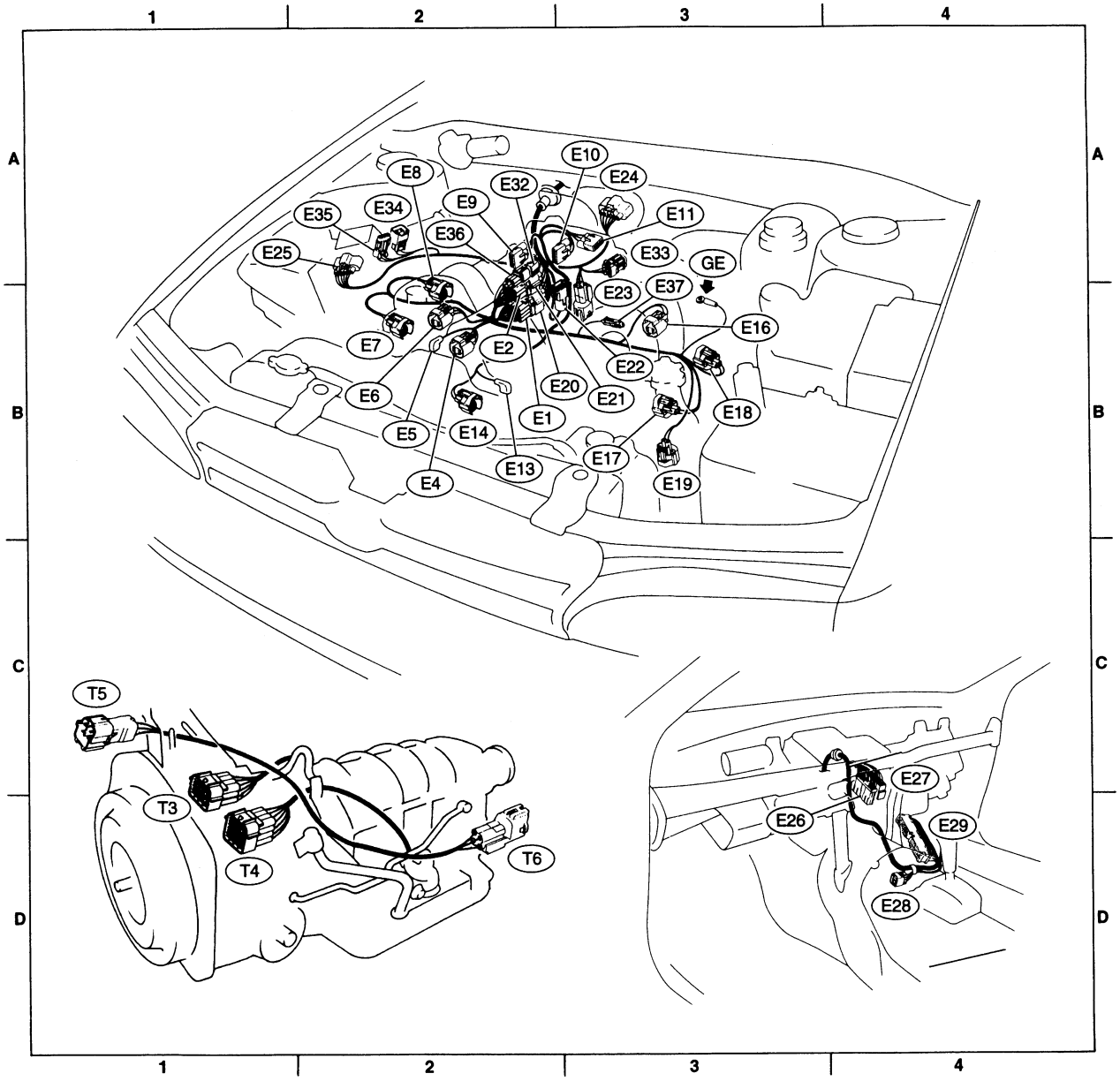
EPA0088

Connector			Connecting to	
No.	Pole	Color	No.	Name
E1	16	Gray	E20	Engine module wiring harness
E2	12	Gray	E21	
E4	2	Brown		Engine coolant temperature sensor
E5	1	★		Thermometer
E6	2	Blue		Purge control solenoid valve
E7	2	Light gray		Injector #1
E8	2	Dark gray		Injector #3
E9	3	Gray		Ignition coil
E10	3	Brown		Throttle position sensor
E11	3	Gray		Idle air control solenoid
E13	1	★		Oil pressure switch
E14	2	Gray		Crankshaft position sensor
E16	2	Brown		E.G.R. solenoid valve
E17	2	Light gray		Injector #2
E18	2	Dark gray		Injector #4
E19	2	Dark gray		Camshaft position sensor
E20	16	Gray	E1	Engine wiring harness
E21	12	Gray	E2	
E22	2	Gray		FICD solenoid valve
E23	4	★		Front oxygen sensor
E24	6	Gray		Ignitor
E25	5	Gray		Mass air flow sensor
E26	24	★	B74	Bulkhead wiring harness
E27	8	★	B73	
E28	6	★		Shield joint connector
E29	96	Dark gray		Engine control module
E32	6	★	E36	Engine wiring harness
E33	4	Gray	T5	Rear oxygen sensor cord
E34	2	Brown		Pressure source switching solenoid
E35	3	Black		Pressure sensor
E36	6	★	E32	Engine module wiring harness
E37	1	Gray		Knock sensor

Connector			Connecting to	
No.	Pole	Color	No.	Name
T3	12	Gray	B8	Bulkhead wiring harness
T4	16	Gray	B9	
T5	4	Gray	E33	Engine module wiring harness
T6	4	Gray		Rear oxygen sensor

★: Non-colored

4. ENGINE WIRING HARNESS · TRANSMISSION CORD AND GROUND POINT (2200 cc engine model)



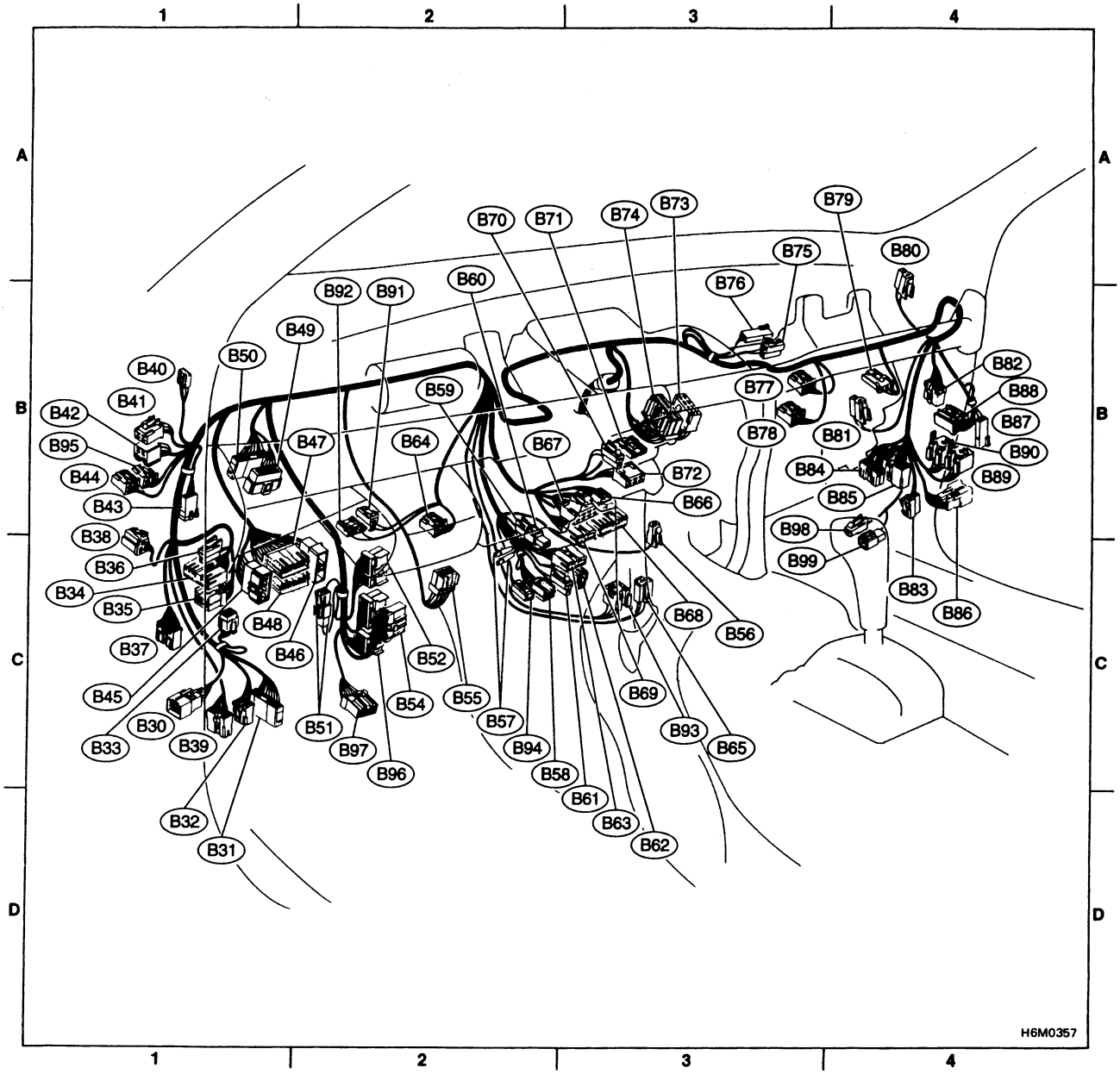
EPA0089

Connector			Connecting to	
No.	Pole	Color	No.	Name
B30	13	★	D1	Front door cord LH
B31	16	Black	P8	Power window main harness
B32	4	★	P7	
B33	6	★		Shield joint connector (A.B.S.)
B34	11	Gray		F/B
B35	12	Gray		
B36	2	Brown		F/B illumination light
B37	14	Gray		Check connector
B38	3	Black		Horn relay
B39	7	Yellow		SRS (Airbag) harness
B40	5	Black	R34	Sunroof cord
B41	4	Green		Fuel pump relay
B42	6	Brown		Main relay
B43	2	Black		Diode (A/C)
	4	Brown		Diode (A/C) (California model)
B44	4	★		Blower relay
B45	8	★	i1	Instrument panel wiring harness
B46	12	Black	i2 AT	
B47	20	★	i4	
B48	20	Blue	i3	
B49	8	★	F30	Front wiring harness LH
B50	16	★	F31	
B51	1 x 2	★		Twist joint connector (AT)
B52	16	Black		Transmission control module
B53	20	Black		
B54	20	★		Cruise control module
B55	12	Black		AT shift lock control module
B56	1	Blue	i8	Instrument panel wiring harness
B57	1 x 2	★		Diagnosis terminal (Ground)
B58	6	Black		Diagnosis connector (Airbag model)
B59	1	Black	B60	Read memory connector (Transit connector) Normally disconnected
B60	1	Black	B59	
B61	2	Green	B62	Test mode connector Normally disconnected
B62	2	Green	B61	
B63	9	Yellow		Date link connector
B64	4	Black		Stop and brake switch (With cruise control)
	2	Black		Stop light switch
B65	3	Black		Turn & hazard unit
B66	5	Black		Cruise control sub switch

Connector			Connecting to	
No.	Pole	Color	No.	Name
B67	8	★		Combination switch (Lighting switch)
B68	11	★		Combination switch
B69	9	★		Combination switch
B70	2	Black		Key warning switch
B71	2	Black		Key lock solenoid
B72	6	Black		Ignition switch
B73	8	★	E27	Engine module wiring harness
B74	20	★	E26	Engine module wiring harness
	24	★	E26	Engine module wiring harness (California and 2200 cc model)
B75	2	Black		Horn condenser
B76	2	Black		Diode (Lighting)
B77	4	Brown		Evaporator thermoswitch
B78	4	★		Blower motor resistor
B79	4	★		FRESH/RECIRC actuator
B80	2	Green	R32	Room light cord
B81	2	★		Blower motor
B82	8	★		Door lock timer
B83	2	Blue	F40	Front wiring harness RH (With A.B.S. model)
B84	12	Black	R2	Rear wiring harness
B85	16	Blue	R1	
B86	13	★	D8	Front door cord RH
B87	2	Black		Diode (Daytime running light) (Canada model)
B88	10	★		Daytime running light control module (Canada model)
B89	4	Blue		Daytime running light HI beam relay (Canada model)
B90	5	Black		Daytime running light relay (Canada model)
B91	2	★		Clutch switch (MT)
B92	2	Blue		Clutch switch (MT — cruise control)
B93	4	Blue		Starter interlock relay (MT)
B94	2	Black		Check connector (A.B.S.)
B95	4	Black		Front fog light relay
B96	12	Black		Transmission control module (2200 cc model)
B97	16	Gray		OBD-II service connector (2200 cc model)
B98	1	Green		Test mode connector (2200 cc model)
B99	1	Green		

★: Non-colored

5. BULKHEAD WIRING HARNESS (IN COMPARTMENT)

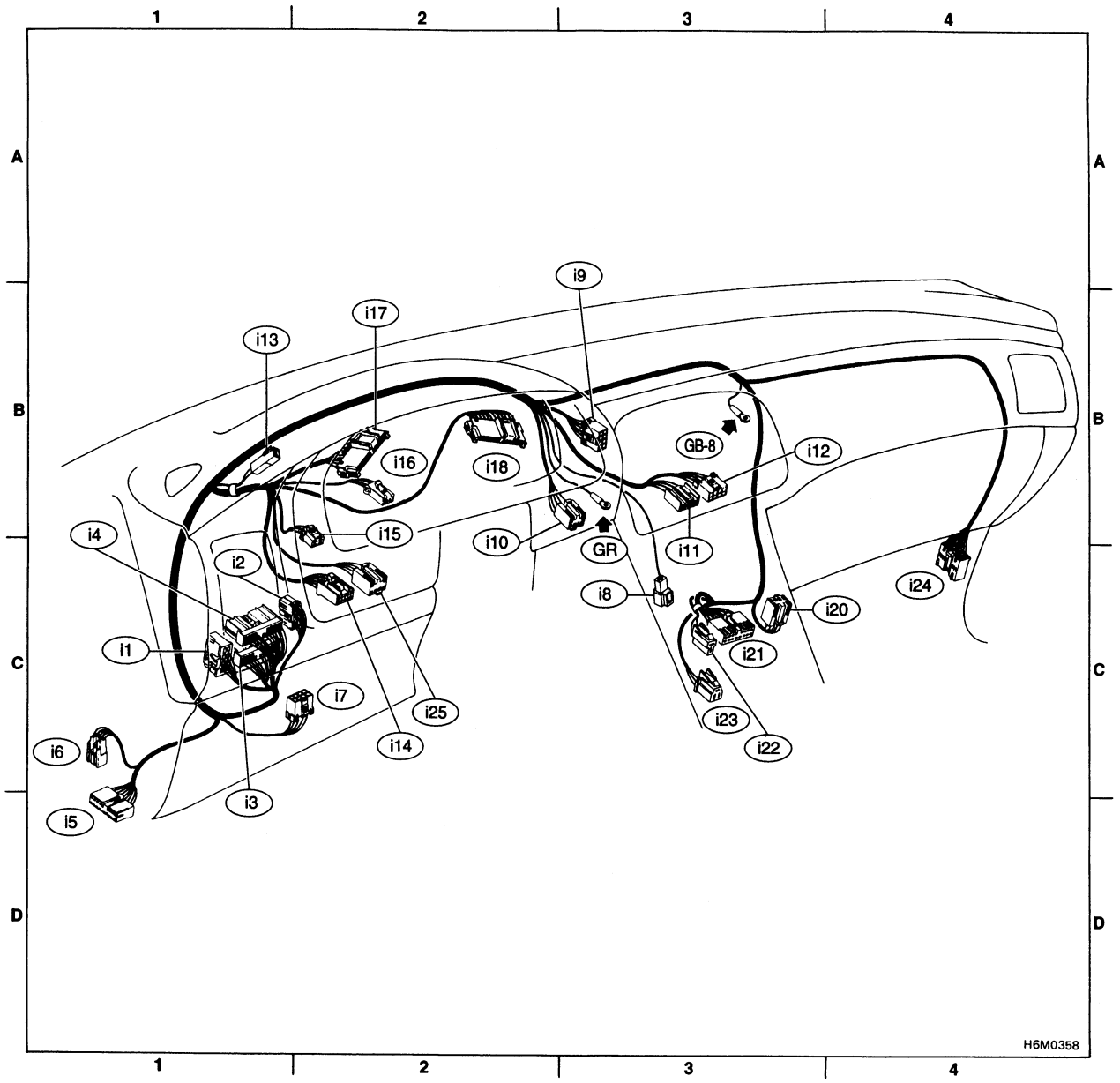


H6M0357

Connector			Connecting to	
No.	Pole	Color	No.	Name
i1	8	★	B45	Bulkhead wiring harness
i2	12	Black	B46 AT	
i3	20	Blue	B48	
i4	20	★	B47	
i5	15	Gray		F/B
i6	6	Black	F33	Front wiring harness LH
i7	8	★		Seat belt timer
i8	1	Blue	B56	Bulkhead wiring harness
i9	8	★		Hazard switch
i10	6	Brown		Cruise control main switch
i11	6	★		Fan switch
i12	8	★		Mode control panel
i13	2	Black		Diode (Seat belt)
i14	10	★		Remote control rearview mirror switch
i15	4	★		Rear defogger switch
i16	4	★		Combination meter (Airbag warning)
i17	16	Gray		Combination meter
i18	16	Gray		
i20	6	Black		Illumination control module
i21	14	★		Radio
i22	2	★		CD illumination light
i23	3	★		Cigarette lighter
i24	16	★	R3	Rear wiring harness
i25	6	★		Front fog light switch

★: Non-colored

6. INSTRUMENT PANEL WIRING HARNESS AND GROUND POINT

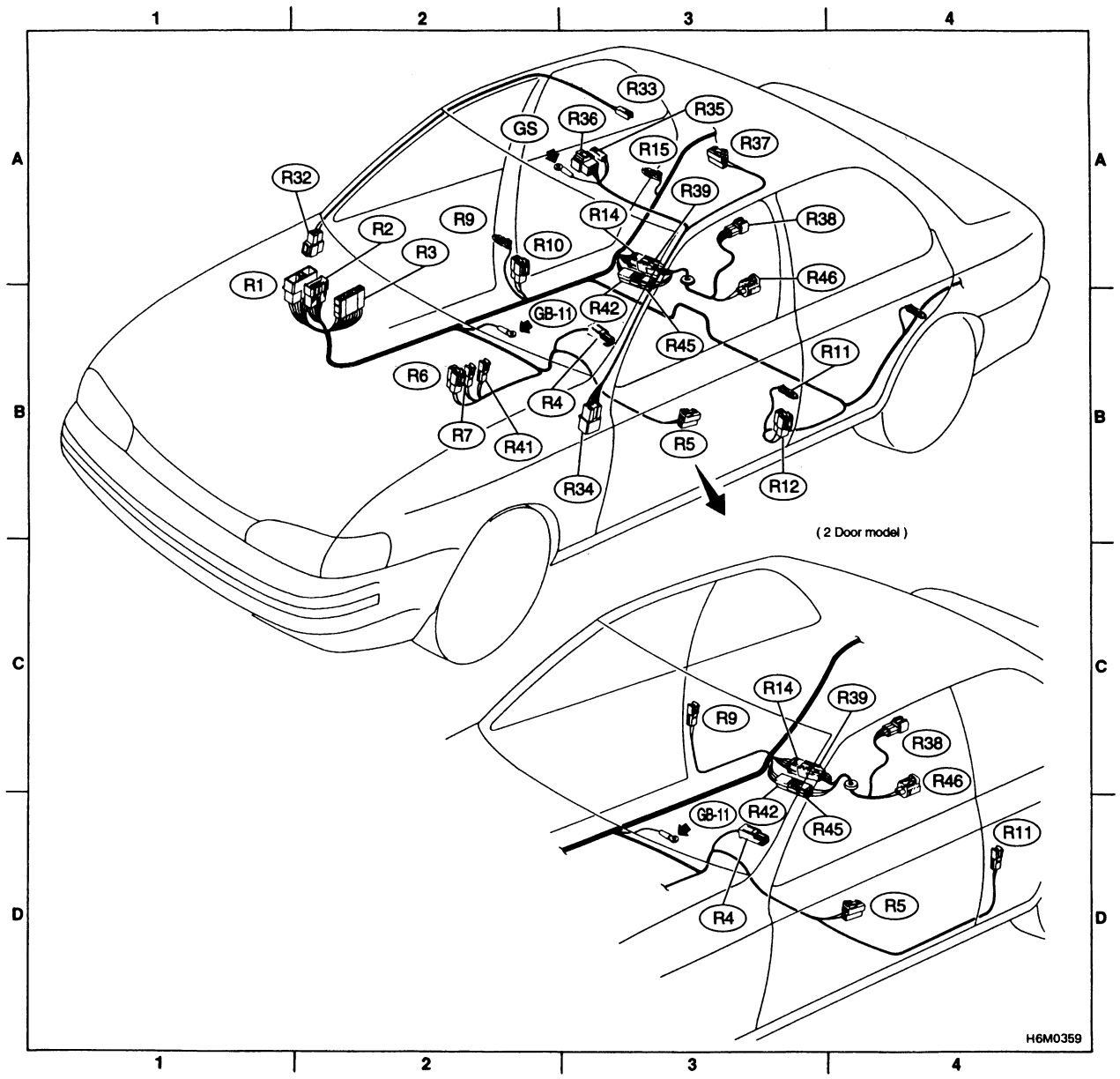


H6M0358

Connector			Connecting to	
No.	Pole	Color	No.	Name
R1	16	Blue	B85	Bulkhead wiring harness
R2	12	Black	B84	
R3	16	★	i24	Instrument panel wiring harness
R4	1	Black		Parking brake switch
R5	2	★		Seat belt switch
R6	2	★		Select lever illumination light (AT)
R7	2	Black		Shift lock solenoid (AT)
R9	1	Brown		Front door switch RH
R10	2	Pink	D18	Rear door cord RH
R11	1	Brown		Front door switch LH
R12	2	Pink	D15	Rear door cord LH
R13	1	Brown		Rear door switch LH
R14	6	Black	R39	Fuel tank cord
R15	1	Brown		Rear door switch RH
R32	2	Green	B80	Bulkhead wiring harness
R33	2	★		Room light
R34	5	Black	B40	Bulkhead wiring harness
R35	2	★		Spot light
R36	4	★		Sunroof switch
R37	2	★		Sunroof motor
R38	6	★		Fuel gauge unit
R39	6	Black	R14	Rear wiring harness
R41	2	★		Park position switch (AT)
R42	4	★	R45	Fuel tank cord (California model)
R45	4	★	R42	Rear wiring harness (California model)
R46	2	Black		Pressure control solenoid valve (California model)

★: Non-colored

7. REAR WIRING HARNESS AND GROUND POINT

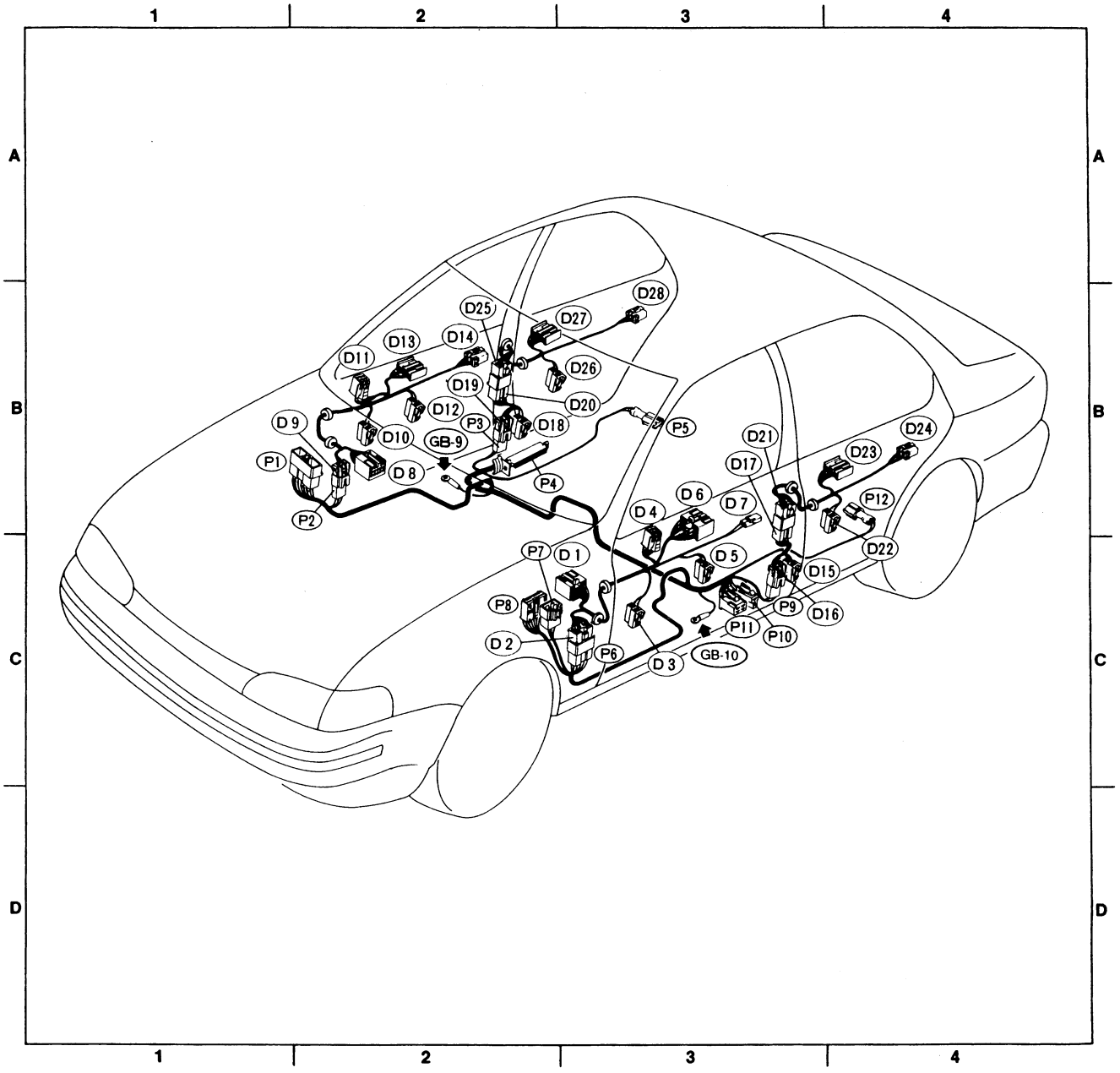


H6M0359

Connector			Connecting to	
No.	Pole	Color	No.	Name
P1	13		F41	Front wiring harness RH
P2	3		D9	Front door cord RH
P3	3		D19	Rear door adapter cord RH
P4	35	Blue		A.B.S. control module
P5	2	Gray		Rear A.B.S. sensor RH
P6	9		D2	Front door cord LH
P7	4		B32	Bulkhead wiring harness
P8	16	Black	B31	
P9	3		D16	Rear door adapter cord LH
P10	2			Power window circuit breaker
P11	4			Power window and sunroof relay
P12	2	Gray		Rear A.B.S. sensor LH

Connector			Connecting to	
No.	Pole	Color	No.	Name
D1	13		B30	Bulkhead wiring harness
D2	9		P6	Power window main harness
D3	2			Front speaker LH
D4	6			Remote control rearview mirror LH
D5	2	Green		Front power window motor LH
D6	14			Power window main switch
D7	2	Gray		Front door lock switch LH
D8	13		B86	Bulkhead wiring harness
D9	3		P2	Power window main harness
D10	2			Front speaker RH
D11	6			Remote control rearview mirror RH
D12	2	Green		Front power window motor RH
D13	5			Front power window sub switch RH
D14	4			Front door lock actuator RH
D15	2	Pink	R12	Rear wiring harness
D16	3		P9	Power window main harness
D17	5		D21	Rear door cord LH
D18	2	Pink	R10	Rear wiring harness
D19	3		P3	Power window main harness
D20	5		D25	Rear door cord RH
D21	5		D17	Rear door adapter cord LH
D22	2	Green		Rear power window motor LH
D23	5			Rear power window sub switch LH
D24	4			Rear door lock actuator LH
D25	5		D20	Rear door adapter cord RH
D26	2	Green		Rear power window motor RH
D27	5			Rear power window sub switch RH
D28	4			Rear door lock actuator RH

8. POWER WINDOW MAIN HARNESS, DOOR CORD AND GROUND POINT

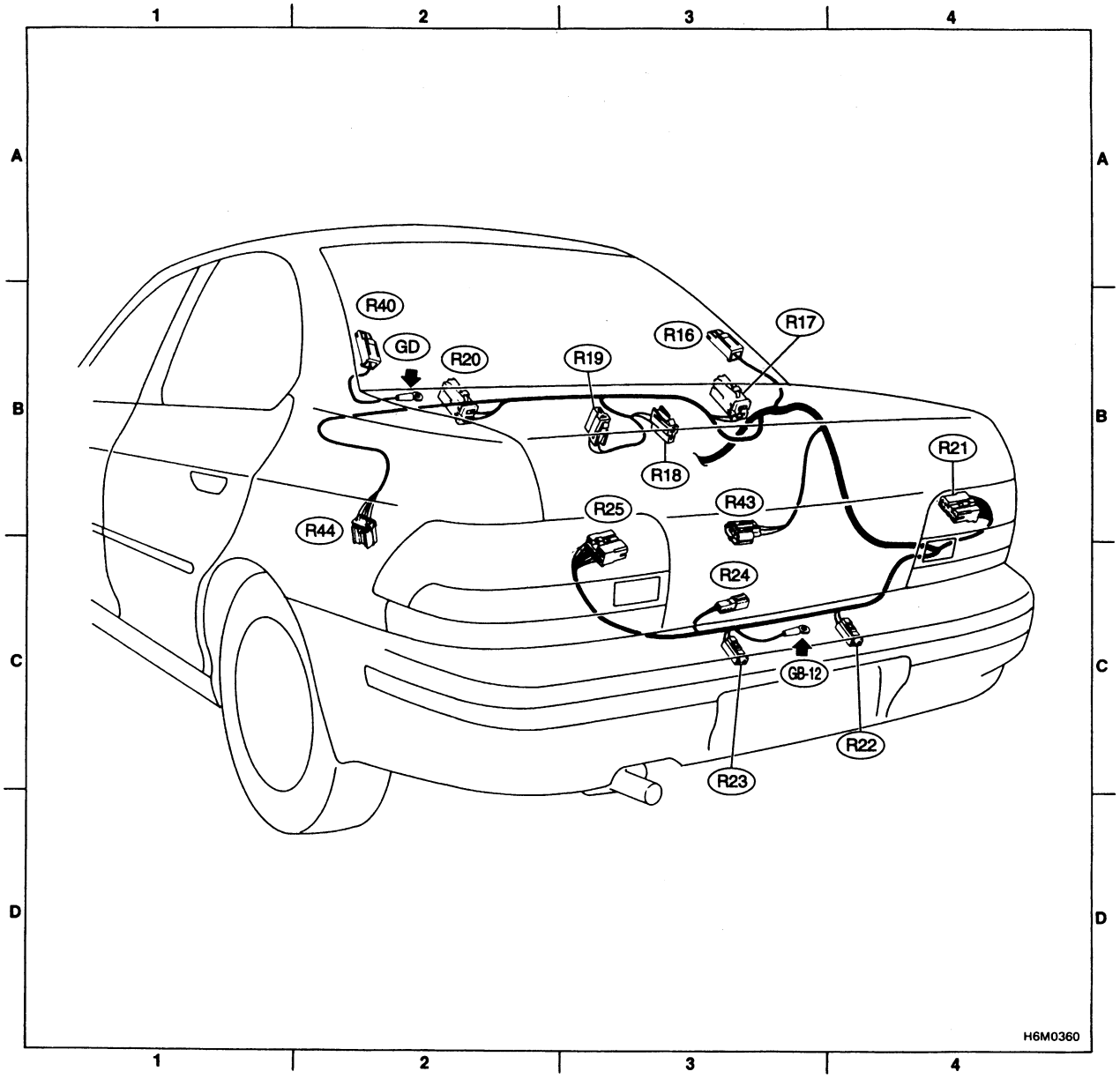


G6M0226

Connector			Connecting to	
No.	Pole	Color	No.	Name
R16	1	Black		Rear defogger (Power)
R17	2	Black		Rear speaker RH
R18	2	Black		Trunk room light
R19	2	★		High-mount stop light
R20	2	Black		Rear speaker LH
R21	7	★		Rear combination light RH
R22	2	★		License plate light RH
R23	2	★		License plate light LH
R24	2	★		Trunk room light switch
R25	7	★		Rear combination light LH
R40	1	Black		Rear defogger (Ground)
R43	3	★		Fuel tank pressure sensor (California model)
R44	6	★		Power antenna

★: Non-colored

9. REAR END WIRING HARNESS AND GROUND POINT OF SEDAN



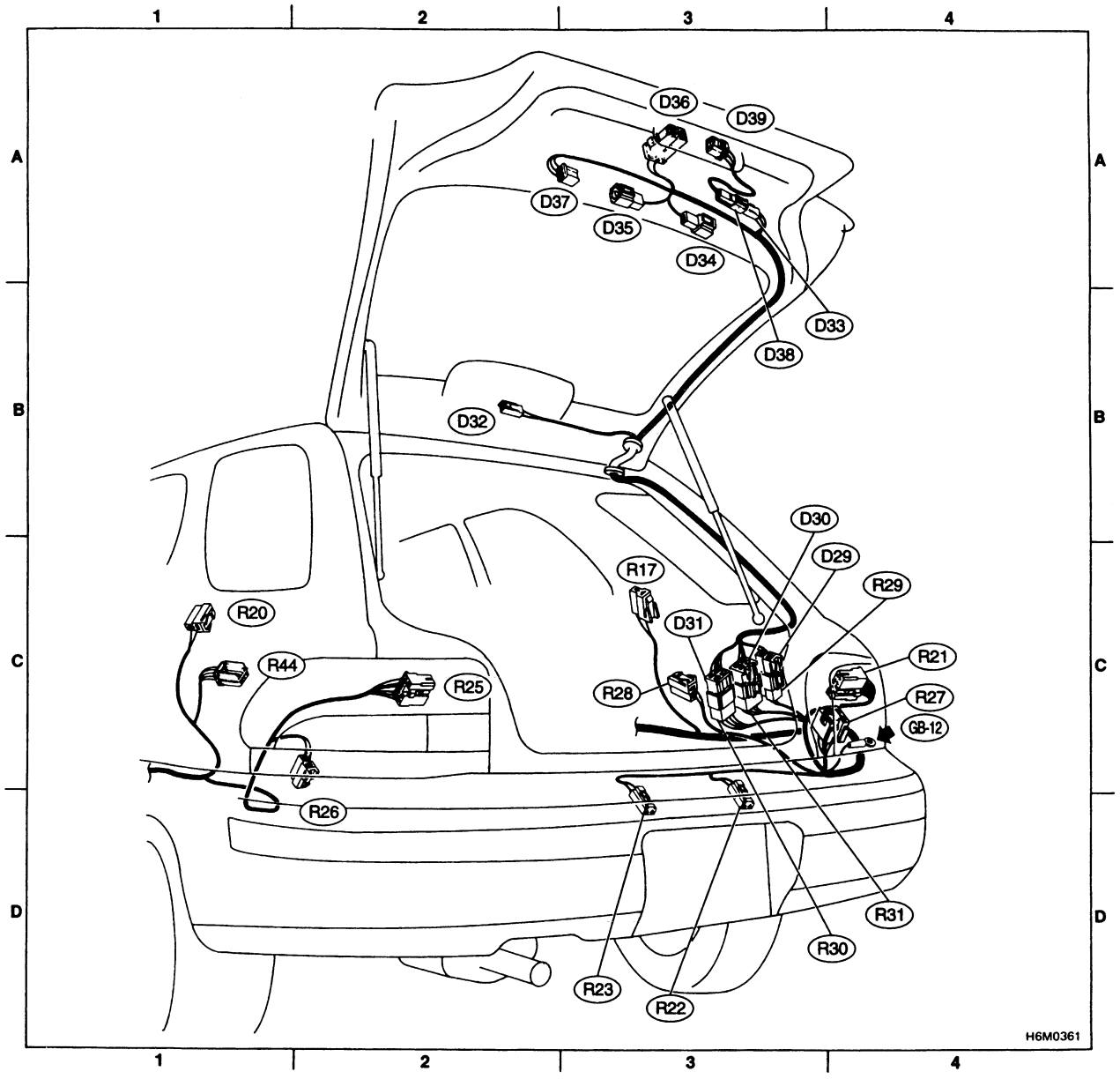
H6M0360

Connector			Connecting to	
No.	Pole	Color	No.	Name
R17	2	★		Rear speaker RH
R20	2	★		Rear speaker LH
R21	7	★		Rear combination light RH
R22	2	★		License plate light RH
R23	2	★		License plate light LH
R25	7	★		Rear combination light LH
R26	2	Green		Rear washer motor
R27	5	Black		Rear wiper relay
R28	2	★		Luggage room light
R29	2	★	D29	Rear gate cord
R30	4	★	D31	
R31	4	★	D30	
R44	6	★		Power antenna

Connector			Connecting to	
No.	Pole	Color	No.	Name
D29	2	★	R29	Rear wiring harness
D30	4	★	R31	
D31	4	★	R30	
D32	2	★		High-mount stop light
D33	2	★	D38	Rear gate lock adapter cord
D34	1	★		Rear defogger (Power)
D35	1	★		Rear defogger (Ground)
D36	2	★		Rear gate latch switch
D37	4	★		Rear wiper motor
D38	2	★	D33	Rear gate cord
D39	4	★		Rear gate lock actuator

★: Non-colored

10. REAR END WIRING HARNESS AND GROUND POINT OF WAGON



H6M0361